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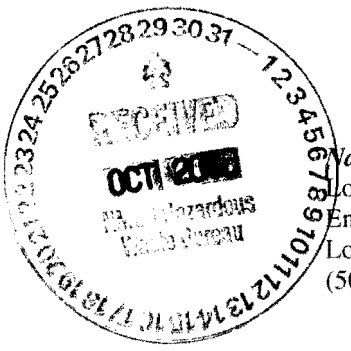

ENTERED

National Nuclear Security Administration
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Los Alamos, New Mexico 87544
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Date: OCT 29 2010
Refer To: EP2010-0488

James Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Revised Investigation Work Plan for Chaquehui Canyon Aggregate Area

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the Investigation Work Plan for Chaquehui Canyon Aggregate Area, Revision 1.

This revised investigation work plan is being submitted as required by the New Mexico Environment Department (NMED) in its October 1, 2010, direction to modify letter for the voluntary corrective action (VCA) report for Solid Waste Management Units (SWMUs) 33-002(a-c). The VCA report was submitted by the U.S. Department of Energy (DOE) and Los Alamos Nuclear Security, LLC. (LANS) to document previous investigation and remediation activities at SWMUs 33-002(a-c). The VCA report was submitted, as required by NMED's January 28, 2010, notice of disapproval (NOD) for the Chaquehui Canyon Aggregate Area investigation work plan, so that decision-level data from the VCA could be used to support decisions (e.g., the nature and extent of contamination and risk) for these sites. As indicated in the NOD response submitted by DOE and LANS, additional documentation of previous VCA activities at SWMUs 33-006(a), 33-007(b), 33-010 and Areas of Concern (AOCs) C-33-001 and C-33-003 were not presented in the VCA report because the investigation work plan did not propose to use data from previous activities for decision purposes at these five sites.

NMED's October 1, 2010, direction to modify letter provided comments on the VCA report but did not require DOE and LANS to respond to these comments or to submit a revised VCA report. Because the comments included information that is also being presented in the investigation work plan, however, DOE and LANS are providing responses to these comments to describe how the investigation work plan was modified to address NMED's comments. Also, although not required by the direction to modify letter, a redline-strikeout version of the revised investigation work plan is also being submitted electronically to identify how the investigation work plan was modified to help NMED ensure the comments and directions in the NOD and the direction to modify letters were appropriately addressed.

34066

If you have any questions, please contact John McCann at (505) 665-1091 (jmccann@lanl.gov) or Suzy Schulman at (505) 606-1962 (sschulman@doeal.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

George J. Rael, Manager
Environmental Projects Office
Los Alamos Site Office

MG/GR/DM/JM:sm

Enclosures: Two hard copies with electronic files:
(1) Response to the Direction to Modify the Voluntary Corrective Action Report for Chaquehui Canyon Aggregate Area (LA-UR-10-7223)
(2) Investigation Work Plan for Chaquehui Canyon Aggregate Area, Revision 1 (LA-UR-10-7226)
(3) An electronic copy of the redline-strikeout version of the plan that includes all changes and edits to the document

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Response to the Direction to Modify the Voluntary Corrective Action Report for the Investigation and Remediation of Solid Waste Management Units 33-002(a–c) at Technical Area 33, EPA ID No: NM0890010515, HWB-LANL-09-072, Dated October 1, 2010

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. The direction to modify letter presents comments on the July 2010 voluntary corrective action (VCA) report as well as directions for revising the investigation work plan for the Chaquehui Canyon Aggregate Area. The direction to modify letter does not require Los Alamos National Laboratory (LANL or the Laboratory) to respond to the comments on the VCA report or to revise the VCA report. Because these comments also relate to information presented in the investigation work plan, however, the Laboratory is providing responses indicating how these comments were addressed in the revised work plan. Similarly, responses to the directions are provided to show how the directions were addressed in the revised work plan. This response contains data on radioactive materials, including source, special nuclear, and byproduct material. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

COMMENTS

NMED Comment

1. Section 2.4.2, Summary of Previous Investigations, page 6:

The Permittees incorrectly indicated that antimony was detected above background values (BV) in a Phase II RCRA Facility Investigation (RFI). According to the Historical Investigation Report for Chaquehui Canyon Aggregate Area (HIR) the single reported detection of antimony was qualified as a nondetect.

LANL Response

1. Although the text in the VCA report was incorrect, the investigation work plan correctly states that antimony was not detected above background value (BV), but the detection limit for antimony was greater than BV. No revision to the investigation work plan is needed.

NMED Comment

2. Sections 6.1.3.1 Inorganic Chemicals, 6.1.3.2 Organic Chemicals, and 6.1.3.3 Radionuclides, pages 15-18:

In numerous instances the Permittees describe concentrations of analytes as "decreased laterally in the drain field." This circumstance is more accurately described as a decrease in concentrations along the drainline. Examples of inorganic chemicals that decreased in concentration laterally along the drainline are aluminum, arsenic, barium, calcium, lead, magnesium, selenium and vanadium. Examples of organic chemicals that decreased along concentration in the drainline are acenaphthene, acenaphthylene, Aroclor-1242, Aroclor-1254, benzo(a)anthracene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene and naphthalene.

LANL Response

2. Similar statements are not made in the investigation work plan, and no revision to the investigation work plan is needed.

NMED Comment

3. Section 6.1.3.1 Inorganic Chemicals, page 16:

The Permittees state that mercury was detected above the Qbt 3 BV at four locations. The correct number of locations where mercury was detected above the QBT 3 BV is five. The Permittees also stated that the concentration of mercury increased with depth at location 33-25093. The correct location is 33-25098.

LANL Response

3. Although the text in the VCA report is incorrect, the investigation work plan correctly states mercury was detected above the BV for tuff in five samples. The investigation work plan does not include text equivalent to that in the comment concerning vertical concentration trends. No revision to the investigation work plan is necessary.

NMED Comment

4. Section 6.2.2.2 Organic Chemicals in Tuff, page 20:

The Permittees state that four tuff (Qbt3) samples collected in SWMU 33-002(b) were analyzed for explosive compounds. Table 6.1-1 and laboratory reports in Appendix B indicate that ten tuff samples (two intervals at each of five locations) were analyzed for explosive compounds.

LANL Response

4. The investigation work plan does not contain a similar statement, and no revision to the investigation work plan is needed.

NMED Comment

5. Section 6.2.3.3 Radionuclides, page 24:

The Permittees state that Uranium-235/236 was detected above the BV at location 33-25125. Uranium-235/236 was also detected above the BV at location 33-25082.

LANL Response

5. The investigation work plan correctly states uranium-235/236 was detected above the tuff BV in two samples. No revision to the investigation work plan is needed.

NMED Comment

6. Figures 2.1-1, 6.2-1, 6.2-2, 6.2-3, 6.3-1, 6.3-2 and 6.3-3 and Plates 1, 2 and 3:

Figures and Plates indicate the locations of samples 33-24805,33-24806 and 33-24807 collected at the depths of 5.0 to 7.0 feet below ground surface (bgs) on June 30,2005 or July 1,2005. According to the HIR those samples were analyzed for VOCs only and one analyte was detected. The samples are not listed in Table 6.1-1 (Samples Collected and Analyses Requested During 2005 VCA at SWMUs 33-002 (a-c)) nor are results included in Table 6.1-3 (Organic Chemicals Detected in 2005 VCA Confirmation Samples at SWMUs 33-002(a-c)).

LANL Response

6. During preparation of the VCA report, it was determined that samples collected at locations 33-24805, 33-24806, and 33-24807 were waste characterization samples collected prior to excavation of the drain field and seepage pits, rather than investigation samples, and should not have been presented in the referenced figures and plates. Tables 4.1-1 and 4.1-3, Figures 4.1-1, and 4.1-3 through 4.1-8, and Plates 2 through 4 in the investigation work plan have been revised to remove these sample locations and associated results.

NMED Comment

7. Table 6.1-3 Organic Chemicals Detected in 2005 VCA Confirmation Samples at SWMUs 33-002(1-c), page 66:

Analytical data indicate that trichloroethene was detected at 0.006 mg/kg in sample RE33-05-63232 collected at a depth of 2.0 to 2.5 ft bgs, location ID 33-25125. This value is missing from Table 6.1-3.

LANL Response

7. The detection of trichloroethene in sample RE33-05-63232 was inadvertently omitted from Table 6.1-3 of the VCA report and from Table 4.1-3 of the investigation work plan. The latter table has been revised to include this result.

NMED Comment

8. Appendix C

Analytical results and laboratory reports for Samples RE33-04-63227, -63228, -63229, -63239, -63231, and -63232 are missing from Appendix C.

LANL Response

8. The analytical results and laboratory reports for samples RE33-04-63227, -63228, -63229, -63230, -63231, and -63232 are included in Appendix C. Samples RE33-04-63227, -63229, and -63231 are included in the documentation for analytical request 3895S, and samples RE33-04-63228, -63230, and -63232 are included in the documentation for analytical request 3877S. This appendix was not included in the investigation work plan, and no revision to the investigation work plan is necessary.

NMED Comment

9. Section 6.1.1 VCA Activities at SWMU 33-002(s) page 13; Section 6.2.1 VCA Activities at SWMU 33-002(b) page 19; and Section 6.3.1 VCA Activities at SWMU 33-002(c) page 24:

The Permittees reported the depths of sample intervals obtained below the drainlines, septic tank excavation, inlets, outlets, and other locations. However, the Permittees did not include the depths of the drainlines, inlets, and outlets themselves. The depth below ground surface that the samples were collected is not clear. Depth of the drainlines and septic tank should have been included in the Report.

LANL Response

9. The sampling depths reported in the VCA report were generally depths below the bottoms of excavations rather than depths below ground surface. Tables 4.1-1 through 4.1-4, Figures 4.1-3 through 4.1-8, and Plates 2 through 4 in the investigation work plan have been revised to present the depths of the samples below ground surface.

DIRECTIONS

NMED Direction

1. Proposed Activities, SWMU 33-002(a), SWMU 33-002(b) and SWMU 33-002(c):

The Permittees must review the list of sampling locations where the vertical extent of contamination has not been determined and propose additional samples at these locations to define the vertical extent.

LANL Response

1. The Laboratory reviewed the results of the VCA to identify the specific locations and constituents for which vertical extent is not defined at SWMUs 33-002(a–c). Section 4.1.1 of the investigation work plan was revised to summarize these results. Additional sampling at depths 3.0 to 4.0 ft below the deeper VCA sampling depth is proposed at each location. Samples from each location will be analyzed for all constituents for which vertical extent is not defined at that location.

NMED Direction

2. Proposed Activities, SWMU 33-002(a):

Where the vertical extent of contamination has not been determined the Permittees must propose to collect samples five feet below the removed piping (not 5 feet bgs) in accordance with Section DC.B.2.b.i of the Order, and at the fill/tuff interface.

LANL Response

2. At each VCA confirmation sampling location, the deeper of two confirmation samples was collected at a depth of 2.0 to 2.5 ft below the bottom of the excavation after the drainline had been removed. The investigation work plan was revised to propose the collection of additional samples 3.0 to 4.0 ft below

the deeper VCA sampling depth at each location where vertical extent is not defined. This interval will result in samples collected at least 5.0 ft below the bottom of the former drainlines.

NMED Direction

3. Proposed Activities, SWMU 33-002(a):

The Permittees must include sampling and analyses of explosive compounds in the SWMU 33-002(a) drain field sampling locations (33-25097, -25098, -25108, -25109, -25110, -25111, -25112, -25113, -25114, -25115, -25115, and -25-116) that were not analyzed for explosive compounds during the 2005 investigations.

LANL Response

3. The investigation work plan has been revised to include resampling of all locations at SWMUs 33-002(a-c) where samples had not been analyzed for explosive compounds during the VCA. At each location, samples will be collected at the depth of the deeper VCA sample and 3.0 ft to 4.0 ft below this depth.

LA-UR-10-7226
November 2010
EP2010-0485

Investigation Work Plan for Chaquehui Canyon Aggregate Area, Revision 1

Prepared by the Environmental Programs Directorate

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy under Contract No. DE-AC52-06NA25396, has prepared this document pursuant to the Compliance Order on Consent, signed March 1, 2005. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

LA-UR-10-7226
EP2010-0485

Investigation Work Plan for Chaquehui Canyon Aggregate Area, Revision 1

November 2010

Responsible project manager:

Printed Name	Signature	Title	Organization	Date
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Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Michael J. Graham	for MJG	Associate Director	Environmental Programs	10-28-2010

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
George J. Rael		Manager	DOE-LASO	10-29-2010

EXECUTIVE SUMMARY

The Chaquehui Canyon Aggregate Area includes a total of 51 solid waste management units (SWMUs) and areas of concern (AOCs) located in Technical Area 33 (TA-33) at Los Alamos National Laboratory (the Laboratory). Of these 51 sites, 8 have been previously investigated and/or remediated and have been approved for no further action. This investigation work plan identifies and describes the activities needed to complete the investigation of the remaining 43 SWMUs and AOCs. Details of previous investigations and analytical results for the 43 sites included in this work plan are provided in the historical investigation report for the Chaquehui Canyon Aggregate Area.

The sampling strategy proposed in this work plan will be integrated with the data results from the South Canyons investigation to assess potential contaminant migration from sites within the Chaquehui Canyon Aggregate Area. Additional data collected in Chaquehui Canyon under the Laboratory's National Pollutant Discharge Elimination System individual permit will also be used to assess potential contaminant migration from the Chaquehui Canyon Aggregate Area sites. All results relevant to the Chaquehui Canyon Aggregate Area sites will be included in the investigation report.

The objective of this work plan is to evaluate the historical data and, based on that evaluation, to propose additional sampling as necessary to define the nature and extent of contamination associated with the SWMUs and AOCs in the Chaquehui Canyon Aggregate Area.

CONTENTS

1.0 INTRODUCTION 1
1.1 Work Plan Overview 1
1.2 Work Plan Objectives 2

2.0 BACKGROUND 2
2.1 General Site Information 2
2.2 Operational History 2
2.3 Conceptual Site Model 3
2.3.1 Potential Contaminant Sources 3
2.3.2 Potential Contaminant Transport Mechanisms 3
2.3.3 Potential Receptors and Pathways 3
2.3.4 Cleanup Standards 3
2.4 Data Overview 4

3.0 SITE CONDITIONS 4
3.1 Surface Conditions 4
3.1.1 Soil 4
3.1.2 Surface Water 5
3.1.3 Land Use 5
3.2 Subsurface Conditions 5
3.2.1 Anticipated Stratigraphic Units 5
3.2.2 Hydrogeology 8

4.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES UNDER INVESTIGATION 9
4.1 Sites under Investigation at Main Site 9
4.1.1 Consolidated Unit 33-002(a)-99, MDA K 10
4.1.2 Consolidated Unit 33-004(a)-00, Main Site 23
4.1.3 Consolidated Unit 33-005(a)-00, Potential Soil Contamination 31
4.1.4 AOC 33-008(c), Surface Disposal Area 34
4.1.5 SWMU 33-011(e), Former Storage Area 37
4.1.6 SWMU 33-012(a), Former Storage Area 37
4.1.7 SWMU 33-016, Sump, Drainline, and Outfall 38
4.1.8 AOC C-33-001, Former Transformer 39
4.1.9 AOC C-33-003, Potential Soil Contamination 40
4.2 Sites under Investigation at Area 6 42
4.2.1 SWMU 33-004(d), Septic System 42
4.2.2 Consolidated Unit 33-004(g)-00, Area 6 Firing Site 44
4.2.3 SWMU 33-009, Surface Disposal Area 47
4.3 Sites under Investigation at South Site 49
4.3.1 Consolidated Unit 33-001(a)-99, MDA E 49
4.3.2 SWMU 33-004(b), Septic System 52
4.3.3 Consolidated Unit 33-004(j)-00 53
4.3.4 SWMU 33-010(g), Surface Disposal Area 64
4.4 Sites under Investigation at NRAO 65
4.4.1 SWMU 33-004(m), Septic System 65
4.4.2 AOC 33-011(b), Former Storage Area 66

5.0 INVESTIGATION METHODS 67
5.1 Field Surveys 67
5.1.1 Geodetic Surveys 67
5.1.2 Geophysical Surveys 67
5.2 Field Screening 68
5.2.1 VOCs 68
5.2.2 Radioactivity 68
5.2.3 Metals Field Screening (XRF) 69
5.2.4 HE Screening 69
5.3 Sample Collection 69
5.3.1 Surface Samples 69
5.3.2 Subsurface Samples 69
5.3.3 Sediment Samples 71
5.3.4 Test Pit and/or Trench Samples 71
5.4 Laboratory Methods 71
5.5 Health and Safety 71
5.6 Equipment Decontamination 71
5.7 IDW 72
5.8 Cleanup Activities 72
5.8.1 Removal of Surficial and Buried Waste, Inactive Units, and Contaminated Soil and Sediment 72
5.8.2 Waste Management and Disposal 73
5.8.3 Transportation 73
5.8.4 Confirmation Sampling 73

6.0 MONITORING PROGRAMS 73
6.1 Groundwater 74
6.2 Stormwater 74

7.0 SCHEDULE 74

8.0 REFERENCES AND MAP DATA SOURCES 74
8.1 References 74
8.2 Map Data Sources 81

Figures

Figure 1.0-1 Chaquehui Canyon Aggregate Area with respect to Laboratory TAs and surrounding land holdings 83
Figure 3.2-1 Generalized stratigraphy of bedrock units 84
Figure 4.1-1 Site features and decision-level sampling locations for Consolidated Unit 33-002(a)-99 85
Figure 4.1-2 Proposed sampling locations at Consolidated Unit 33-002(a)-99 86
Figure 4.1-3 Inorganic chemicals detected above BVs at SWMU 33-002(b) 87
Figure 4.1-4 Organic chemicals detected at SWMU 33-002(b) 88
Figure 4.1-5 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(b) 89
Figure 4.1-6 Inorganic chemicals detected above BVs at SWMU 33-002(c) 90
Figure 4.1-7 Organic chemicals detected at SWMU 33-002(c) 91

Figure 4.1-8 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(c) 92
Figure 4.1-9 Site features and decision-level sampling locations for Consolidated Unit 33-004(a)-00 93
Figure 4.1-10 Inorganic chemicals detected above BVs at SWMU 33-004(a) 94
Figure 4.1-11 Organic chemicals detected at SWMU 33-004(a) 95
Figure 4.1-12a Proposed sampling locations at SWMUs 33-004(h) and 33-004(i) 96
Figure 4.1-12b Proposed sampling locations at SWMUs 33-004(a), 33-011(d), and 33-015 97
Figure 4.1-12c Nineteen of the twenty-five proposed sampling locations at SWMU 33-017 98
Figure 4.1-13 Six of the twenty-five proposed sampling locations at SWMU 33-017 and proposed drainage sampling locations at Consolidated Unit 33-004(a)-00 99
Figure 4.1-14 Inorganic chemicals detected above BVs at SWMU 33-011(d) 100
Figure 4.1-15 Site features and historical drainage sampling locations for Consolidated Unit 33-004(a)-00 101
Figure 4.1-16 Site features for Consolidated Unit 33-005(a)-00 102
Figure 4.1-17 Proposed sampling locations at Consolidated Unit 33-005(a)-00 103
Figure 4.1-18 Proposed drainage sampling locations at Consolidated Unit 33-005(a)-00 104
Figure 4.1-19 Site features and decision-level sampling locations for AOC 33-008(c) 105
Figure 4.1-20 Proposed sampling locations at AOC 33-008(c) 106
Figure 4.1-21 Site features for SWMU 33-011(e) 107
Figure 4.1-22 Proposed sampling locations at SWMU 33-011(e) 108
Figure 4.1-23 Site features for SWMU 33-012(a) 109
Figure 4.1-24 Proposed sampling locations at SWMU 33-012(a) 110
Figure 4.1-25 Site features for SWMU 33-016 111
Figure 4.1-26 Proposed sampling locations at SWMU 33-016 112
Figure 4.1-27 Site features and decision-level sampling locations for AOC C-33-001 113
Figure 4.1-28 Organic chemicals detected at AOC C-33-001 114
Figure 4.1-29 Proposed sampling locations at AOC C-33-001 115
Figure 4.1-30 Site features and decision-level sampling locations for AOC C-33-003 116
Figure 4.1-31 Inorganic chemicals detected above BVs at AOC C-33-003 117
Figure 4.1-32 Organic chemicals detected at AOC C-33-003 118
Figure 4.1-33 Radionuclides detected or detected above BVs/FVs at AOC C-33-003 119
Figure 4.1-34 Proposed sampling locations at AOC C-33-003 120
Figure 4.1-35 Proposed sampling locations at SWMU 33-004(d) and AOC C-33-003 drainage 121
Figure 4.2-1 Site features and decision-level sampling locations for Consolidated Unit 33-004(g)-00 and SWMUs 33-004(d) and 33-009 122
Figure 4.2-2 Proposed sampling locations at Consolidated Unit 33-004(g)-00 and SWMUs 33-004(d) and 33-009 123
Figure 4.3-1 Site features and decision-level sampling locations for Consolidated Unit 33-001(a)-99 124
Figure 4.3-2 Inorganic chemicals detected above BVs at Consolidated Unit 33-001(a)-99 125
Figure 4.3-3 Organic chemicals detected at Consolidated Unit 33-001(a)-99 126

Figure 4.3-4 Radionuclides detected or detected above BVs/FVs at Consolidated Unit 33-001(a)-99 127
Figure 4.3-5 Proposed sampling locations at Consolidated Unit 33-001(a)-99 128
Figure 4.3-6 Site features and decision-level sampling locations for SWMU 33-004(b) 129
Figure 4.3-7 Inorganic chemicals detected above BVs at SWMU 33-004(b) 130
Figure 4.3-8 Organic chemicals detected at SWMU 33-004(b) 131
Figure 4.3-9 Proposed sampling locations at SWMU 33-004(b) 132
Figure 4.3-10 Site features and decision-level sampling locations for SWMUs 33-004(j) and 33-010(c) 133
Figure 4.3-11 Site features for SWMU 33-006(a) 134
Figure 4.3-12 Site features and decision-level sampling locations for SWMUs 33-007(b) and 33-011(c) 135
Figure 4.3-13 Site features and decision-level sampling locations for SWMUs 33-008(a), 33-010(h), and 33-014 136
Figure 4.3-14 Site features for SWMU 33-010(g) 137
Figure 4.3-15 Proposed sampling locations at SWMU 33-004(j) 138
Figure 4.3-16 Organic chemicals detected at SWMU 33-006(a) 139
Figure 4.3-17 Proposed sampling locations at SWMUs 33-006(a) 33-010(c), 33-010(g), and 33-010(h) 140
Figure 4.3-18 Inorganic chemicals detected above BVs at SWMU 33-007(b) 141
Figure 4.3-19 Organic chemicals detected at SWMU 33-007(b) 142
Figure 4.3-20 Radionuclides detected or detected above BVs/FVs at SWMU 33-007(b) 143
Figure 4.3-21 Proposed sampling locations at SWMUs 33-007(b) and 33-011(c) 144
Figure 4.3-22 Inorganic chemicals detected above BVs at SWMU 33-008(a) 145
Figure 4.3-23 Organic chemicals detected at SWMU 33-008(a) 146
Figure 4.3-24 Proposed sampling locations at SWMUs 33-008(a) and 33-014 147
Figure 4.3-25 Inorganic chemicals detected above BVs at SWMU 33-010(c) 148
Figure 4.3-26 Radionuclides detected or detected above BVs/FVs at SWMU 33-010(c) 149
Figure 4.4-1 Site features for SWMU 33-004(m) 150
Figure 4.4-2 Proposed sampling locations at SWMU 33-004(m) 151
Figure 4.4-3 Site features for AOC 33-011(b) 152
Figure 4.4-4 Proposed sampling locations at SWMU 33-011(b) 153

Tables

Table 1.1-1 Status of SWMUs and AOCs in Chaquehui Canyon Aggregate Area 155
Table 2.3-1 Industrial SSLs and SALs 157
Table 4.0-1 Summary of Proposed Samples and Analyses 161
Table 4.1-1 Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 Main Site 170
Table 4.1-2 Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 Main Site 177

Table 4.1-3 Organic Chemicals Detected in Previous Investigations at TA-33 Main Site 188
Table 4.1-4 Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 Main Site 203
Table 4.1-5 Summary of Phase I and Phase II RFI Sampling Locations at SWMU 33-017 to be Resampled 210
Table 4.2-1 Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 Area 6 211
Table 4.3-1 Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 South Site 212
Table 4.3-2 Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 South Site 215
Table 4.3-3 Organic Chemicals Detected in Previous Investigations at TA-33 South Site 217
Table 4.3-4 Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 South Site 219
Table 5.0-1 Summary of Investigation Methods 221

Appendixes

Appendix A Acronyms and Abbreviations, Metric Conversion Table, and Data Qualifier Definitions
Appendix B Management Plan for Investigation-Derived Waste

Plates

Plate 1 Chaquehui Canyon Aggregate Area
Plate 2 Inorganic chemicals detected above BVs at SWMU 33-002(a)
Plate 3 Organic chemicals detected at SWMU 33-002(a)
Plate 4 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(a)
Plate 5 Organic chemicals detected at SWMU 33-017
Plate 6 Inorganic chemicals detected above BVs at AOC 33-008(c)
Plate 7 Organic chemicals detected at AOC 33-008(c)

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by the Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau (Figure 1.0-1), which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above sea level. The location of the Chaquehui Canyon Aggregate Area with respect to the Laboratory technical areas (TAs) is shown in Figure 1.0-1.

The Laboratory is participating in a national effort by DOE to clean up sites and facilities. The goal of the Laboratory's effort is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are designated as either solid waste management units (SWMUs) or areas of concern (AOCs).

The SWMUs and AOCs addressed in this investigation work plan are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE Order 435.1, "Radioactive Waste Management." Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). This work plan describes work activities that will be executed and completed in accordance with the Consent Order.

1.1 Work Plan Overview

The Chaquehui Canyon Aggregate Area includes a total of 51 SWMUs and AOCs located in TA-33 at the Laboratory (Plate 1). Historical details of previous investigations and data for these sites are provided in the historical investigation report (HIR) for the Chaquehui Canyon Aggregate Area (LANL 2009, 107348). Of these 51 sites, 8 have been previously investigated and/or remediated and have been approved for no further action (NFA). The status of each site and the NFA-approval documents are referenced in Table 1.1-1. This investigation work plan identifies and describes the activities needed to complete the investigation of the remaining 43 SWMUs and AOCs. This work plan addresses the remaining 43 sites using the information from previous field investigations or removal actions to evaluate current conditions at each site.

Section 2 of the work plan presents the general site information, operational history, and the preliminary conceptual site model of the Chaquehui Canyon Aggregate Area sites. General site conditions are discussed in section 3. Section 4 provides summaries of previous investigations and data collected and presents the scope of proposed activities for each site. The sites in the Chaquehui Canyon Aggregate Area are located in four geographical areas (Main Site, South Site, Area 6, and National Radio Astronomy Observatory [NRAO]) in TA-33; therefore, they are organized by area in this work plan. Each TA-33 geographical area subsection includes background information on operational history, summary of releases, current site use, and status of the sites in the TAs. Section 5 provides investigation methods for proposed field activities. Ongoing monitoring and sampling programs in the Chaquehui Canyon

Aggregate Area are presented in section 6. Section 7 is an overview of the anticipated schedule of the investigation and reporting activities.

The references cited in this work plan and the map data sources are provided in section 8. Appendix A of this work plan includes a list of acronyms and abbreviations, a metric conversion table, and a data qualifier definitions table. Appendix B describes the management of investigation-derived waste (IDW).

1.2 Work Plan Objectives

The objective of this work plan is to determine the nature and extent of releases from the 43 sites.

To accomplish this objective, this work plan

- presents historical and background information on the sites;
- describes the rationale for proposed data collection activities;
- identifies and proposes appropriate methods and protocols for collecting, analyzing, and evaluating data to characterize these sites; and
- identifies and proposes appropriate methods and protocols for remediating select sites.

2.0 BACKGROUND

2.1 General Site Information

TA-33, also known as Hot Point (HP) Site, is located on the Lower Pajarito Plateau in the southeastern corner of the Laboratory (Plate 1). TA-33 occupies approximately 1000 acres and is currently used for experimental research activities that support the creation, delivery, and maintenance of innovative detection and energy-projection systems for remote applications in space and around the world. Structures within TA-33 are located on the mesa top that is bounded to the north by Ancho Canyon and on the south by Chaquehui Canyon. TA-33 extends southeast to the Rio Grande, southwest to Frijoles Canyon, northeast to Ancho Canyon, and northwest to NM 4.

2.2 Operational History

TA-33 was initially developed in 1947 as a test site for implosion-type initiator experiments using conventional high explosives (HE), depleted uranium (DU), and beryllium. Polonium-210 was prepared off-site and used as the radiation source for the experiments. The experiments were performed in underground chambers, on surface firing pads, and at firing sites equipped with large guns that fired projectiles into earthen berms. Initiator testing at TA-33 ceased in 1972. After 1972, TA-33 has been used for offices, laboratories, and storage in support of electronics design and fabrication and experiments formerly conducted at the Hot Dry Rock Program. An antenna for the NRAO Very Long Baseline Array radiotelescope was sited at TA-33 in 1985 and is operational. The high-pressure tritium facility (former building 33-0086) was constructed at TA-33 in 1955 and operated until 1990. The tritium facility was decommissioned and demolished in the mid-1990s.

TA-33 consists of five operational areas: a laboratory and office complex near the entrance of TA-33 at NM 4 (Main Site); the former western firing site (Area 6); the former southern firing site (South Site); the former eastern firing site (East Site); and the current site of the antenna for the NRAO Very Long Baseline Array radiotelescope. SWMUs and AOCs at East Site [Consolidated Unit 33-003(a)-99, Material Disposal

Area (MDA) D, and SWMUs 33-004(c), 33-004(k), and 33-010(b)] are located within the South Ancho Canyon Aggregate Area and therefore are not included in this work plan.

2.3 Conceptual Site Model

The sampling proposed in this work plan uses a conceptual site model to predict areas of potential contamination and allow for adequate characterization of these areas. A conceptual site model describes potential contaminant sources, transport mechanisms, and receptors.

2.3.1 Potential Contaminant Sources

Releases at sites within the Chaquehui Canyon Aggregate Area may have occurred as a result of surface and subsurface placement of solid wastes, air emissions, or effluent discharges. Previous sampling results indicate contamination from inorganic chemicals, organic chemicals, and radionuclides (LANL 2009, 107348). Additional sampling is needed to determine the nature and extent of contamination.

2.3.2 Potential Contaminant Transport Mechanisms

Current potential transport mechanisms that may lead to exposure include

- dissolution and/or particulate transport of surface contaminants during precipitation and runoff events,
- airborne transport of contaminated surface soil,
- continued dissolution and advective/dispersive transport of chemical contaminants contained in subsurface soil and tuff as a result of past operations,
- disturbance of contaminants in shallow soil and subsurface tuff by Laboratory operations, and
- disturbance and uptake of contaminants in shallow soil by plants and animals.

MDA E at South Site is located near the edge of the mesa near White Rock Canyon. Historically, large landslides have occurred in White Rock Canyon and have encroached on the mesa top. The potential for landslides to result in exposure of the wastes buried at MDA E was studied to determine whether this may be a potential transport mechanism (Reneau et al. 1995, 054405). This study concluded that future exposure of the wastes at MDA E by this mechanism over the period of hundreds to thousands of years is improbable.

2.3.3 Potential Receptors and Pathways

Potential receptors and pathways may include

- Laboratory workers and
- plants and animals both on-site and in areas immediately surrounding the sites.

2.3.4 Cleanup Standards

As specified in Section VIII.B.1 of the Consent Order, screening levels will be used as soil cleanup levels unless they are determined to be impracticable or unless values do not exist for the current and reasonably foreseeable future land use. Soil screening levels (SSLs) for an industrial scenario are presented in Table 2.3-1 for previously detected inorganic and organic chemicals. The screening action

levels (SALs) for the industrial scenario are also provided in Table 2.3-1 for previously detected radionuclides.

2.4 Data Overview

Data evaluated in this work plan include historical data collected from 1993 through 2005, as part of Resource Conservation and Recovery Act (RCRA) facility investigations (RFIs) and other corrective actions. In the Sample Management Database, all data records include a vintage code field denoting how and where samples were submitted for analyses.

Samples described in this work plan have undergone analyses at both on-site and off-site laboratories. Because analytical practices and documentation of analyses vary in quality and completeness, analytical data presented are either screening-level or decision-level data. Screening-level data are appropriate for applications that only require a determination of gross contamination areas and/or for general site characterization. Screening-level data are also often used to specify areas where additional data should be collected. Decision-level data are used to quantify the nature and extent of releases and to perform risk assessments. The decision-level data provide supporting information for the investigation activities proposed in the work plan.

Inorganic chemical and radionuclide data from previous investigations were compared with background values (BVs) and fallout values (FVs) (LANL 1998, 059730, p. 6-2). Organic chemicals and fallout radionuclides in soil greater than a depth of 1 ft or in rock are evaluated based on detection status.

This work plan summarizes the available decision-level data (and where appropriate, screening-level data) to determine whether the nature and extent of contamination are defined for each site. In addition, this work plan proposes sampling activities and analytical suites for those sites at which the nature and extent of contamination have not been defined.

3.0 SITE CONDITIONS

3.1 Surface Conditions

3.1.1 Soil

Soil on the Pajarito Plateau was initially mapped and described by Nyhan et al. (1978, 005702). The soil on the slopes between the mesa tops and canyon floors was mapped as mostly steep rock outcrops consisting of approximately 90% bedrock with patches of shallow, weakly developed colluvial soil. South-facing canyon walls generally are steep and usually have shallow soil in limited, isolated patches between rock outcrops. In contrast, the north-facing canyon walls generally have more extensive areas of shallow dark-colored soil under thicker forest vegetation. The canyon floors generally contain poorly developed, deep, well-drained soil on floodplain terraces or small alluvial fans (Nyhan et al. 1978, 005702).

Soil at TA-33 Main Site and the surrounding mesa top is classified as Hackroy Rock Complex (Nyhan et al. 1978, 005702). Field logs from sampling conducted at MDA K indicate that soil ranges in depth from 0 to 8 ft (LANL 1997, 071478, p. 9). Soil may be sandy and contain pumice pebbles ranging up to 0.5 in. in size. Clay lenses may be intermixed with pulverized tuff. Soil in the drainages is sandy, with some clay and many small pebbles. Bedrock is exposed at many areas on the lower (eastern) part of the site, including the drainage east of the septic system [SMWU 33-004(a)].

Soil at TA-33 South Site is classified as Hackroy Rock Complex (Nyhan et al. 1978, 005702). Parent Hackroy soil is shallow, well-drained soil that form on mesa tops from weathered tuff. The surface layer is

a brown, sandy loam approximately 4 in. thick. Hackroy subsoil is a reddish-brown clay mixed with gravel or loam approximately 8 in. deep. The Hackroy Rock outcrop complex contains 20% Hackroy soil, 10% Nyjack soil, and 70% rock outcrop. Nyjack soil is similar to Hackroy but deeper and more loamy (LANL 1997, 071478, p. 9). Much of the soil at South Site was scraped to bedrock to build the berms near the firing sites.

3.1.2 Surface Water

Most surface water in the Los Alamos area occurs as ephemeral, intermittent, or interrupted streams in canyons cut into the Pajarito Plateau. Springs on the flanks of the Jemez Mountains, west of the Laboratory's western boundary, supply flow to the upper reaches of Cañon de Valle and to Guaje, Los Alamos, Pajarito, and Water Canyons (Purtymun 1975, 011787; Stoker 1993, 056021). These springs discharge water perched in the Bandelier Tuff and Tschicoma Formation at rates from 2 to 135 gal./min (Abeele et al. 1981, 006273). The volume of flow from the springs maintains natural perennial reaches of varying lengths in each of the canyons. The Rio Grande flows through White Rock Canyon immediately to the southeast of TA-33.

At TA-33, ephemeral surface water flow from the mesa top to the surrounding canyons may be expected during spring snowmelt and summer thunderstorms. Surface water does not collect on the mesa top at any of the SWMUs or AOCs in the Chaquehui Canyon Aggregate Area.

3.1.3 Land Use

Currently, land use of the Chaquehui Canyon Aggregate Area is industrial. The majority of TA-33 is undeveloped. Within the mesa-top portion of the aggregate area, there are three industrially developed areas of TA-33: Main Site, Area 6, and South Site. Main Site is actively used and contains offices, laboratories, and shops. Area 6, located next to Main Site, is inactive. South Site, at the south end of the aggregate area, is largely inactive but contains several structures that are actively used. TA-33 is not accessible to the public.

3.2 Subsurface Conditions

3.2.1 Anticipated Stratigraphic Units

The stratigraphy of the Chaquehui Canyon Aggregate Area is summarized in this section. A generalized cross section of the stratigraphy is presented in Figure 3.2-1. Additional information on the geologic setting of the area and information on the Pajarito Plateau can be found in the Laboratory's hydrogeologic synthesis report (Collins et al. 2005, 092028).

The geology of the area near TA-33, including White Rock Canyon, has been described as part of an evaluation of potential landslides and mass movements (Reneau et al. 1995, 054405). Descriptions of the geologic units in that evaluation are summarized below. Principal units, from oldest to youngest, include sedimentary rocks of the Santa Fe Group, volcaniclastic and quartzite-rich gravels of the Puye Formation, older alluvial deposits, basaltic flows and phreatomagmatic deposits of the Cerros del Rio volcanic field, and the lower and upper Bandelier Tuff (Griggs and Hem 1964, 092516; Dethier 1997, 049843). The stratigraphy and selected characteristics of these units are summarized below.

3.2.1.1 Santa Fe Group

The Miocene Santa Fe Group exposed in White Rock Canyon is composed primarily of pinkish-grey to buff-colored, poorly to moderately lithified silty sandstone and pebbly sand with an arkosic matrix (Griggs and Hem 1964, 092516; Galusha and Blick 1971, 021526; Dethier 1997, 049843). Thin beds of altered dacitic tephra are locally abundant. These rocks record mainly fluvial deposition on the distal margins of alluvial fans constructed when the Española basin was internally drained. The sandstone, locally cemented with sparry calcite, crops out extensively near the Buckman townsite east of the Rio Grande but is poorly exposed west of the Rio Grande. The southernmost exposure in northern White Rock Canyon is at the confluence with Ancho Canyon, to the north of TA-33.

3.2.1.2 Puye Formation

The Puye Formation is principally a Pliocene volcanogenic alluvial fan sequence derived from the Jemez Mountains (Turbeville et al. 1989, 021587), but it includes ancestral Rio Grande gravels and lacustrine deposits, particularly along and west of White Rock Canyon. Following Dethier (1997, 049843), the Puye Formation is informally divided into a fanglomerate facies and an axial Rio Grande facies. Along White Rock Canyon and tributary canyons south of Otowi Bridge, these facies are interfingered laterally and in vertical sequences. The fanglomerate facies is mainly pinkish-grey to grey, locally cemented, weakly lithified pebble-to-boulder size gravel, boulder-rich debris flows, and sand. Highly weathered dacitic pumice-rich layers also occur, which have weathered to clay. The ancestral Rio Grande facies is mainly grey, poorly to moderately lithified, locally cemented quartzite-rich pebble-to-cobble gravel, but it includes beds of silt and silty sand. In Ancho Canyon, to the north of TA-33, the Puye Formation is at least 200 ft thick, including 80 ft of Rio Grande gravels underlain by at least 115 ft of fanglomerate.

3.2.1.3 Pliocene Fluvial and Lacustrine Deposits

Unlithified and generally uncemented Pliocene sedimentary deposits interlayered with basalt flows and phreatomagmatic deposits are exposed within a few miles of the Rio Grande. These rocks include buff to brownish-yellow sand and pebbly sand, silt, silty sand, and beds of cinders and debris flows. They are the temporal equivalent, in part, of the ancestral Rio Grande facies of the Puye Formation, but the presence of granitic clasts indicates they were derived from the southern Sangre de Cristo Range (Dethier 1997, 049843). They correlate with the older alluvium of Griggs and Hem (1964, 092516) and, in part, with the Ancha Formation of Spiegel and Baldwin (1963, 054259). Fine-grained units are locally rich in swelling clays that were probably produced from the alteration of basaltic glass derived from Cerros del Rio volcanism. Lacustrine deposits record a Rio Grande dammed south of Water Canyon contemporaneous with eruptions from maars and emplacement of basaltic flows.

3.2.1.4 Cerros del Rio Volcanic Field

Mafic Lavas

Lava flows of basalt, hawaiite, basaltic andesite, andesite, and related intrusive rocks of the Pliocene Cerros del Rio volcanic field form surface exposures along White Rock Canyon and east of the Rio Grande from Otowi Bridge to Cochiti Dam. Volcanic landforms include maars, shields, fissure vents, cinder cones near the Rio Grande, and a cinder cone at TA-33 Area 6. Near Otowi Bridge, mesa-capping flows are about 130 ft thick, whereas south of Water Canyon the flow sequence is greater than 260 ft thick, and near Chaquehui Canyon massive flows are greater than 400 ft thick. East of the Rio Grande, the sequence of basaltic flows also thickens to the south. The thickest flows appear to fill paleovalleys or craters greater than 200 ft deep, whereas some of the thinner flows apparently spread out over surfaces

of little relief. Flow bases are smooth to rubble-rich; locally a few tens of inches to a few feet of alluvium separate the flows.

Ages of 2.3 to 2.7 Ma (millions of years) have been obtained from rocks of the Cerros del Rio volcanic field near northern White Rock Canyon, including argon-40/argon-39 ages of 2.4 to 2.6 Ma from basalt flows and dikes at the TA-33 cinder cone (Laughlin et al. 1993, 054424; Dethier 1997, 049843). A topographically low flow in lower Water Canyon yielded a similar age of about 2.47 Ma, indicating a relatively short period of intense volcanism and over 650 ft of local aggradation occurred at about 2.4 to 2.6 Ma.

Phreatomagmatic Deposits

Thin-bedded to massive matrix-supported flow and fall deposits crop out at La Mesita, along Chino Mesa, between Chaquehui Canyon and Water Canyon, and in several other zones south to Cochiti Dam, mainly along the Rio Grande. These deposits were produced at maar volcanoes that formed when rising magmas reacted with groundwater along the Pliocene course of the Rio Grande (Aubele 1978, 054426; Heiken et al. 1989, 054425; Dethier 1997, 049843). At several of these volcanic centers, lava flows are interlayered with the upper portions of the phreatomagmatic sequences, and some maars probably were the source of thick flows of basaltic andesite (Dethier 1997, 049843). For instance, 100 ft of phreatomagmatic deposits along the southwest side of Chaquehui Canyon near the Rio Grande are overlain by a 200-ft-thick volcanic section that includes seven flows and interlayered phreatomagmatic deposits; these rocks are in turn capped by a package of flows 400 ft thick that may reflect a single cooling unit.

“Pajarito Plateau” Tholeiitic Basalt

Thin flows of tholeiitic basalt typically form the western rim of White Rock Canyon in the TA-33 area, extending north to Los Alamos Canyon. The flows were derived from vents to the west and northwest of White Rock, and one of these vents is exposed south of Pajarito Canyon, southwest of the intersection of Pajarito Road and NM 4. In late Pliocene time, the basalts entered a lake dammed in White Rock Canyon at an elevation of about 6200 ft. Deltas of pillow basalt and palagonitic breccia formed at the edge of the paleolake and are best exposed in Los Alamos and Mortandad Canyons. Available data indicate these tholeiitic flows can be distinguished from other Cerros del Rio lavas by their chemistry (Laughlin et al. 1993, 054424; Dethier 1997, 049843) in addition to their higher stratigraphic position and flow direction. Ages of 1.8 to 2.5 Ma have been obtained from these basalts (Laughlin et al. 1993, 054424; Dethier 1997, 049843; WoldeGabriel et al. 2001, 092523), including argon-40/argon-39 ages of 2.46 to 2.49 Ma near TA-33.

3.2.1.5 Otowi Member Bandelier Tuff

The Otowi Member of the Bandelier Tuff consists of light-grey, nonwelded pyroclastic flows of pumiceous rhyolite and a basal pumiceous fall unit, the Guaje Pumice Bed (Bailey et al. 1969, 021498). The Otowi Member was erupted from the Jemez Mountains about 1.6 Ma (Izett and Obradovich 1994, 048817). Only the Guaje Pumice Bed is widely preserved near White Rock Canyon, where it lies unconformably on surfaces cut into Pliocene basalt of the Cerros del Rio or on Pliocene alluvium. Near TA-33, small exposures of the Otowi Member are present in Ancho Canyon near NM 4, and the Otowi Member is also exposed farther down Ancho Canyon within a pre-Bandelier Tuff paleocanyon, possibly in an ancient cutoff meander bend.

3.2.1.6 Early Quaternary Alluvium

Early Quaternary alluvium is locally exposed near TA-33 below the Tshirege Member of the Bandelier Tuff. Volcanic fallout units of the Cerro Toledo rhyolite, which fill this stratigraphic interval to the northwest (Heiken et al. 1986, 048638), are apparently sparse in the vicinity of White Rock Canyon. In Ancho Canyon near NM 4, about 20 ft of dacite-rich bouldery stream gravels derived from a stream draining the Sierra de los Valles occurs between the Otowi and Tshirege Members. In lower Water Canyon and a northeastern tributary to lower Ancho Canyon, alluvial deposits composed largely of quartzite-rich gravels and river-polished basalt boulders occur beneath the Tshirege Member and indicate that the early Quaternary position of the Rio Grande was at an elevation of about 5700 to 5800 ft above sea level.

3.2.1.7 Tshirege Member Bandelier Tuff

The Tshirege Member of the Bandelier Tuff at TA-33 consists of light-grey nonwelded to slightly welded pumiceous pyroclastic flows and a thin basal pumiceous fall unit, the Tsankawi Pumice Bed (Bailey et al. 1969, 021498). These rocks were erupted from the Jemez Mountains about 1.22 Ma (Izett and Obradovich 1994, 048817). The Tshirege Member is the uppermost rock unit at TA-33 and underlies the SWMUs and AOCs within Chaquehui Canyon Aggregate Area. This unit is typically about 200 to 250 ft thick at TA-33 but pinches out over paleotopographic highs, such as the TA-33 cinder cone, and reaches a thickness of about 750 ft where it fills the early Quaternary paleocanyon.

The Tshirege Member can be divided into mapping units that reflect distinct flow units or cooling units and variations in alteration. Four mapping units modified from the units of Baltz et al. (1963, 008402) and Vaniman and Wohletz (1990, 009995.2) in other parts of the Pajarito Plateau are described below.

The lowest unit, unit 1g, consists of nonwelded ignimbrite with glassy pumice, following Vaniman and Wohletz (1990, 009995.2). The second lowest unit, unit 1v, consists of nonwelded vapor-phase-altered ignimbrite, also following Vaniman and Wohletz (1990, 009995.2). Unit 2 is the primary cliff-former at TA-33, consisting of slightly welded ignimbrite with discontinuous surge beds at the base. The contact of unit 2 with the overlying nonwelded to slightly welded ignimbrites of unit 3 is poorly defined and is here considered to be the approximate break in slope at the base of the upper, relatively steep tuff step.

3.2.2 Hydrogeology

The hydrogeology of the Pajarito Plateau is generally separable in terms of mesas and canyons forming the plateau. Mesas are generally devoid of water, both on the surface and within the rock forming the mesa. Canyons range from wet to relatively dry; the wettest canyons contain continuous streams and contain perennial groundwater in the canyon-bottom alluvium. Dry canyons have only occasional stream flow and may lack alluvial groundwater. Intermediate-perched groundwater has been found at certain locations on the plateau at depths ranging between 100 and 400 ft. The regional aquifer is found at depths of about 600 to 1200 ft.

The hydrogeologic conceptual site model for the Laboratory (Collins et al. 2005, 092028) shows that under natural conditions relatively small volumes of water move beneath mesa tops because of low rainfall, high evaporation, and efficient water use by vegetation. Atmospheric evaporation may extend into mesas, further inhibiting downward flow.

In the Los Alamos County area, groundwater occurs as (1) water in shallow alluvium in some of the larger canyons, (2) intermediate-perched groundwater (a perched groundwater body lies above a less permeable layer and is separated from the underlying aquifer by an unsaturated zone), and (3) the regional aquifer.

No groundwater wells are located in or near TA-33. Drilling to a depth of 315 ft during the investigation of MDA K in Main Site did not encounter perched water. Groundwater discharges from four springs (Springs 8A, 9, 9A, and Doe Spring) located in lower Chaquehui Canyon east of South Site above the Rio Grande. At South Site (elevation 6400 ft above sea level), the depth to groundwater is assumed to be 800 ft, based on the elevation (5600 ft above sea level) of Doe Spring.

4.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES UNDER INVESTIGATION

The following sections present site descriptions, summaries of previous investigation activities, proposed sampling activities, and proposed remedial activities. Table 4.0-1 summarizes the investigation strategy for each SWMU or AOC, including the analytical methods for site-characterization activities proposed in this work plan.

The Chaquehui Canyon Aggregate Area has been disturbed as a result of many years of new construction, demolition of former structures, and historical firing-site activities. Before sampling is conducted, geodetic and geophysical methods, in conjunction with radiological surveys, may be used to verify specific SWMU and AOC boundaries. The sampling locations proposed in this work plan may be relocated as a result of these surveys; however, the overall sampling strategy will remain the same.

Thirty-three sites [SWMUs 33-001(a–e), 33-002(a–e), 33-004(a), 33-004(g), 33-004(h), 33-004(i), 33-004(j), 33-004(m), 33-005(a–c), 33-007(b), 33-007(c), 33-009, 33-011(a–e), 33-012(a), 33-014, 33-016, and 33-017 and AOCs C-33-001 and C-33-003] are proposed for characterization. Ten sites [SWMUs 33-004(b), 33-004(d), 33-006(a), 33-008(a), 33-010(c), 33-010(f), 33-010(g), 33-010(h), and 33-015 and AOC 33-008(c)] are proposed for cleanup under this investigation work plan. Cleanup levels for the proposed sites are presented in Table 2.3-1.

The approved South Canyons investigation work plan addresses sources of contamination and the nature and extent of contamination in sediment, surface water of active stream channels, and groundwater beneath canyon floors (LANL 2006, 093713; NMED 2007, 095490). The South Canyons investigation includes sampling and analysis of media from the watersheds associated with Chaquehui Canyon and representative sections of canyon reaches. Three reaches have been identified in Chaquehui Canyon (CH-1, CH-2, and CHN-1) (Plate 1). For the Chaquehui Canyon Aggregate Area, the South Canyons investigation work plan proposes collecting 10 sediment samples in each reach. If necessary, subsequent sampling is generally limited to chemicals of potential concern (COPCs) identified during the initial sampling and analysis. Subsequent investigations may include additional sampling in previously investigated reaches or full investigations of new reaches, contingent on the results of the initial sampling and analysis. Analytical suites for these reaches include perchlorate, target analyte list (TAL) metals, cyanide, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbon (PAHs), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), radionuclides, and explosive compounds (LANL 2006, 093713, p. 14). Sediment sampling for the South Canyons approved work plan will begin in 2010, and the data will be reported in the South Canyons investigation report, due to NMED in August 2011.

4.1 Sites under Investigation at Main Site

This section provides descriptions and history of each of the sites being investigated at TA-33 Main Site, along with descriptions and results of previous investigations, and the proposed investigations. A summary of decision-level samples collected and analyses requested during previous investigations is presented in Table 4.1-1. Inorganic chemicals above BVs in previous decision-level samples are

presented in Table 4.1-2. Organic chemicals detected in previous decision-level samples are presented in Table 4.1-3. Radionuclides detected or detected above BVs/FVs in previous decision-level samples are presented in Table 4.1-4. Figures 4.1-1 through 4.1-35 show the site features, historical sampling locations, inorganic and organic chemicals and radionuclides detected above background, and the locations proposed for sampling in this work plan.

4.1.1 Consolidated Unit 33-002(a)-99, MDA K

Consolidated Unit 33-002(a)-99 consists of SWMUs 33-002(a–e) and 33-010(f) and is collectively referred to as MDA K. The SWMUs in this consolidated unit consist of the former locations of a septic system and two seepage pits with drainlines and outfalls that served the former tritium facility (building 33-0086) and a former surface disposal area. MDA K is in the southeast area of Main Site at TA-33.

4.1.1.1 SWMU 33-002(a), Septic System

Description and History

SWMU 33-002(a) is the former location of a septic system that served the former Tritium Facility (former building 33-0086) and a nearby guard station (former building 33-0090) (Figure 4.1-1). The septic system was installed in 1954 and consisted of a drainline, an 860-gal. septic tank (former structure 33-0093), a siphon tank, and an approximately 50-ft ×100-ft drain field. The septic system operated until 1990 when discharge of effluent from the Tritium Facility ceased; however, the septic system continued to receive effluent from the guard station until the mid-1990s. The principal waste stream received by the septic system was sanitary wastewater from former buildings 33-0086 and 33-0090. The system also received tritium- and uranium-contaminated liquids associated with operations and other releases from former building 33-0086, including two releases of plutonium-contaminated liquid in 1961 (LANL 1992, 007671, p. 3-19).

Previous Investigations

As part of the Laboratory's Environmental Surveillance Program, a radiation survey was conducted in 1986 at 30 points on a 32.8-ft × 32.8-ft grid covering the area east of former building 33-0086 and at five locations in the drainage channel to the east of the grid (LANL 1992, 007671, pp. 3-27–3-34). Surface soil samples (0 to 0.5 below ground surface [bgs]) were collected from the grid points and analyzed for tritium and uranium. Sampling data showed tritium levels above FV (LANL 1992, 007671, pp. 3-27–3-34). In 1989, two boreholes were drilled, one at the east end of the septic system drain field to a depth of 150 ft bgs (location 33-0019) and one just north of the septic system drain field to a depth of 174 ft bgs (location 33-0018) (LANL 1995, 050113, pp. 18–20). Eighteen samples were collected from borehole 33-0018 from depths of 4 to 5 ft, 9 to 10 ft, 14 to 15 ft, 24 to 25 ft, 49 to 50 ft, 59 to 60 ft, 79 to 80 ft, 89 to 90 ft, 99 to 100 ft, 109 to 110 ft, 119 to 120 ft, 129 to 130 ft, 139 to 140 ft, 149 to 150 ft, 159 to 160 ft, 169 to 170 ft, and 173 to 174 ft bgs. Twelve samples were collected from borehole 33-0019 from depths of 4 to 5 ft, 9 to 10 ft, 24 to 25 ft, 44 to 45 ft, 49 to 50 ft, 59 to 60 ft, 69 to 79 ft, 79 to 80 ft, 89 to 90 ft, 99 to 100 ft, and 129 to 130 ft bgs. Twenty-one samples were analyzed for tritium; 20 samples were analyzed for gamma-emitting radionuclides and uranium; 21 samples were analyzed for metals, uranium, SVOCs, VOCs, PCBs, and HE; and 22 samples were samples were analyzed for VOCs. All data collected in 1986 and 1989 are screening-level data and are not presented in this work plan; however, the data showed detected concentrations of VOCs, tritium above BV, and metals above BVs.

Phase I RFI sampling activities conducted in 1993 at SWMU 33-002(a) included the collection of one liquid and one sludge sample from the septic tank for waste characterization purposes; three samples

were collected at three depths (0 to 0.5 ft, 3 to 3.5 ft, and 4 to 4.5 ft bgs) from a 4-ft-deep borehole next to the septic tank, two samples were collected from depths of 5 and 10 ft bgs in each of two 10-ft-deep boreholes in the drain field east of the septic tank, and surface samples (0 to 0.5 ft bgs) were collected from two locations in the drain field. All samples were analyzed for uranium, tritium, isotopic plutonium, gamma emitters, metals, and SVOCs; seven subsurface samples were analyzed for VOCs. Data from the 1993 Phase I RFI are screening level and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.1.3 of the HIR contains a detailed summary of the screening-level data (LANL 2009, 107348).

Additional Phase I RFI sampling at SWMU 33-002(a) involved drilling three deep boreholes near the eastern (downgradient) edge of the drain field to depths of 230 to 315 ft bgs to investigate a tritium plume (Figure 4.1-1). Ten samples were collected from borehole 33-1230 from depths of 0 to 1 ft, 10 to 11 ft, 20 to 21 ft, 30 to 31 ft, 65 to 66 ft, 92 to 93 ft, 127 to 128 ft, 150 to 151 ft, 180 to 181 ft, and 230 to 231 ft bgs. All 10 samples were analyzed for tritium, 6 samples were analyzed for metals and SVOCs, and 4 samples were analyzed for VOCs. Thirteen samples were collected from borehole 33-1231 from depths of 0 to 0.5 ft, 10 to 11 ft, 20 to 21 ft, 30 to 31 ft, 60 to 61 ft, 94 to 95 ft, 124 to 126 ft, 153 to 155 ft, 183.9 to 184.6 ft, 211.5 to 212.2 ft, 244.5 to 245 ft, 268.7 to 269 ft, and 314 to 315 ft bgs. All 13 samples were analyzed for tritium, 6 samples were analyzed for metals and SVOCs, and 5 samples were analyzed for VOCs. Twelve samples were collected from borehole 33-1232 from depths of 0 to 0.5 ft, 10 to 11 ft, 20 to 21 ft, 30 to 31 ft, 60 to 61 ft, 90 to 91 ft, 95 to 97 ft, 125 to 126 ft, 150 to 151 ft, 180 to 181 ft, 210 to 211 ft, and 240 to 241 ft bgs. All 12 samples were analyzed for tritium, 5 samples were analyzed for metals and SVOCs, and 4 samples were analyzed for VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR. Section 2.1.1.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed detections of antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, uranium, and zinc above BV. Thirteen organic chemicals [acetone; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; chrysene; di-n-butylphthalate; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene] were each detected in the Phase I RFI samples. Radionuclides detected or detected above FVs were cesium-137, plutonium-238, plutonium-239/240, and tritium.

During the 1996 Phase II RFI, one borehole was advanced in the septic tank drain field (borehole 33-01696), and one borehole was advanced adjacent to the septic tank (borehole 33-01652) (Figure 4.1-1). Three samples were collected from borehole 33-1696 at depths of 2.3 to 3 ft, 8.25 to 8.7 ft, and 12.5 to 13.2 ft bgs, and three samples were collected from borehole 33-1652 at depths of 1 to 1.5 ft, 3.1 to 4.1 ft, and 12.5 to 12.9 ft bgs. All six samples were analyzed for isotopic plutonium, uranium, metals, VOCs, and SVOCs. The 1996 decision-level data are presented in this work plan. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

During a 1997 interim action (IA), the SWMU 33-002(a) septic tank was deactivated, the tank contents were removed and disposed of as mixed low-level waste (LLW), the tank's interior was steam-cleaned, the drainline connections to the tank were plugged, and the tank was left in place. No samples were collected.

During a 2005 voluntary corrective action (VCA), the SWMU 33-002(a) septic tank, inlet and outlet drainlines, and the drain field were removed and disposed of as LLW (LANL 2010, 110352). Sixteen confirmation samples were collected at eight locations beneath the septic tank inlet line from two depths (0 to 0.5 ft and 2 to 2.5 ft) beneath the bottom of the excavation after the drainline had been removed. Sampling locations were biased to drainline joints, elbows, and cleanouts; no soil staining, elevated radiation, or VOC field-screening readings were observed along the drainline. Six confirmation samples

were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) at one location beneath the septic tank inlet, one location beneath the septic tank outlet, and one location in the center of the septic tank excavation after it was removed (Figure 4.1-1). Samples collected beneath the inlet drainline, septic tank, and septic tank inlet and outlet connection were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, high explosives (HE), strontium-90, nitrate, and cyanide. Twenty-six confirmation samples were collected from 13 locations along the outlet drainline and within the drain field beneath the bottom of the drainlines. At each location, samples were collected at 0 to 0.5 ft and 2 to 2.5 ft below the bottom of the excavation after removing the drainlines. These samples were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, strontium-90, nitrate, and cyanide and also were to be analyzed for HE. However, while the sample collection paperwork was being prepared for the samples collected beneath the outlet drainline and the drain field, the analytical suite was inadvertently changed to include total petroleum hydrocarbons (TPH) diesel range organics (DRO) instead of the HE analysis. Therefore, no analytical data are available for HE in confirmation samples collected in the septic tank drain field after the drainlines had been removed. The 2005 decision-level data are presented in this investigation work plan. Samples collected during the 2005 VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the Phase II RFI and VCA samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Inorganic chemicals detected above soil BVs included aluminum, arsenic, barium, calcium, chromium, copper, lead, magnesium, mercury, nickel, nitrate, perchlorate, selenium, silver, uranium, vanadium, and zinc. Aluminum was detected above the tuff BV in nine samples. Arsenic was detected above the tuff BV in 11 samples. Barium was detected above the tuff BV in 11 samples and above the soil BV in 1 sample. Calcium was detected above the soil BV in 3 samples and above the tuff BV in 18 samples. Chromium was detected above the soil BV in one sample and above the tuff BV in six samples. Copper was detected above the soil BV in 7 samples and above the tuff BV in 13 samples. Lead was detected above the soil BV in one sample and above the tuff BV in five samples. Magnesium was detected above the tuff BV in eight samples. Mercury was detected above the soil BV in six samples and above the tuff BV in five samples. Nickel was detected above the tuff BV in three samples. Nitrate was detected in 27 soil samples and 9 tuff samples; there is no BV for nitrate. Perchlorate was detected in 19 soil samples and 1 tuff sample; there is no BV for perchlorate. Selenium was detected above the tuff BV in three samples. Silver was detected above soil BV in one sample and above the tuff BV in one sample. Uranium was detected above the soil BV in five samples and above the tuff BV in one sample. Vanadium was detected above the tuff BV in two samples. Zinc was detected above the soil BV in five samples and above the tuff BV in two samples. Antimony, cadmium, and total cyanide were not detected above soil and tuff BVs but had detection limits above BVs. Sampling locations and results for inorganic chemicals above BVs are shown on Plate 2.

Twenty-eight organic chemicals [acenaphthene; acenaphthylene; acetone; anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; bis(2-ethylhexyl)phthalate; Bromobenzene; 2-butanone; 4-chloroaniline; chrysene; di-n-butylphtalate; dibenzofuran; fluoranthene; fluorene, indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; toluene; and TPH-DRO] were detected. Bromobenzene, 4-chloroaniline, and dibenzofuran were each detected in one sample. Acenaphthylene, 2-butanone, and TPH-DRO were each detected in two samples. Aroclor-1242 was detected in three samples. Acetone, Aroclor-1260, and tetrachloroethene were each detected in five samples. Di-n-butylphtalate was detected in six samples. Benzo(a)anthracene and toluene were each detected in eight samples. Methylnaphthalene-2 was detected in 10 samples. Aroclor-1254 was detected in 12 samples. Naphthalene was detected in 14 samples. Benzo(g,h,i)perylene and indeno(1,2,3-cd)pyrene were each detected in 16 samples. Fluorene was detected in 17 samples. Acenaphthene, anthracene,

benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and phenanthrene were each detected in 18 samples. Fluoranthene and pyrene were each detected in 19 samples. Bis(2-ethylhexyl)phthalate was detected in 20 samples. Sampling locations and detected results for organic chemicals are shown on Plate 3.

Radionuclides detected or detected above BVs/FVs were americium-241, plutonium-238, plutonium-239/240, uranium-235/236, and tritium. Americium-241 was detected above the soil BV in one surface sample. Plutonium-238 was detected above the soil BV in one surface soil sample and was detected in one tuff sample. Plutonium-239/240 was detected above the soil BV in one surface sample. Uranium-235/236 was detected above tuff the BV in one sample, and uranium-238 was detected above the tuff BV in one sample. Tritium was detected in 35 subsurface soil samples and 31 tuff samples. Sampling locations and results for radionuclides detected or detected above BVs/FVs are shown on Plate 4.

The VCA report concluded that lateral extent of contamination was defined for all inorganic and organic chemicals and radionuclides at SWMU 33-002(a) (LANL 2010, 110352, pp. 15–19). Vertical extent was not defined at the following sampling locations for the specified constituents:

- 33-24716—Aroclor-1242 and bis(2-ethylhexyl)phthalate
- 33-24717—acenapthene; anthracene; benzo(a)anthracene; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; pyrene; plutonium-238; and tritium
- 33-24718—arsenic; calcium; silver; acenaphthene; anthracene; Aroclor-1254; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; phenanthrene; naphthalene; pyrene; and tritium
- 33-24719—bis(2-ethylhexyl)phthalate; indeno(1,2,3-cd)pyrene; and naphthalene
- 33-24720—barium and calcium
- 33-24721—aluminum, barium, and lead
- 33-24722—aluminum; lead; nickel; acenaphthene; anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; and uranium-238
- 33-24723—aluminum; arsenic; barium; chromium; magnesium; silver; vanadium; and benzo(g,h,i)perylene
- 33-24724—aluminum, selenium, and tritium
- 33-24725—aluminum
- 33-24726—aluminum, arsenic, barium, calcium, chromium, nickel, selenium, vanadium, and acenaphthene
- 33-25098—copper, mercury, and tritium
- 33-25117—tritium

Proposed Activities

As discussed above, the vertical extent of some inorganic chemicals, organic chemicals, and radionuclides has not been defined at several VCA sampling locations. Samples will be collected 3 to 4 ft beneath the deeper VCA confirmation sample at each sampling location indicated above where vertical

extent has not been determined. Samples will be analyzed for the specific constituents for which vertical extent was not defined. Additionally, the locations where samples were inadvertently not analyzed for explosive compounds will be resampled (locations 33-25097, 33-25098, 33-25107, 33-25108, 33-25109, 33-25110, 33-25111, 33-25112, 33-25113, 33-25114, 33-25115, 33-25116, and 33-25117). At each location, samples will be collected from the same interval as the deeper VCA confirmation sample and 3 to 4 ft below this depth and analyzed for explosive compounds. Proposed sampling locations are shown in Figure 4.1-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.2 SWMU 33-002(b), Seepage Pit

Description and History

SWMU 33-002(b) is the location of a former seepage pit (former structure 33-0134) connected to sinks and floor drains in former building 33-0086 (Figure 4.1-1). The seepage pit was an unlined, rubble-filled pit that is 6 ft in diameter and 8 ft deep, with a 3-in.-thick concrete lid. Discharges to the seepage pit began in 1955 and ceased in 1959 and the seepage pit was backfilled. The drainline discharging to the seepage pit was subsequently extended through the pit and routed approximately 75 ft downslope to daylight to an outfall [SWMU 33-002(e)] for the discharge of stormwater from roof drains on former building 33-0086. The new drainline angled to the northeast and then to the east following the natural drainage directly east of the SWMU 33-002(a) leach field; however, the two SWMUs were not connected. Wastes discharged to the SWMU 33-002(b) seepage pit between 1955 and 1959 contained organic solvents, including ethanol, methanol, trichlorethene (TCE), benzene, and acetone. Some of these solvents were contaminated with tritium. The SWMU 33-002(b) seepage pit also may have received beryllium, mercury, and DU.

Previous Investigations

In 1989, one surface sample (0 to 0.5 ft bgs) was collected at the location of the SWMU 33-002(b) seepage pit (former structure 33-0134) (LANL 1995, 050113, pp. 40–41) and analyzed for metals, PCBs/pesticides, tritium, and gamma spectroscopy. Data from the 1989 investigation are screening-level data and are not presented in this work plan; however, the data show only tritium was detected.

Phase I RFI activities conducted at SWMU 33-002(b) in 1993 (LANL 1995, 050113) consisted of collecting a single soil sample from a depth of 5 ft bgs within the seepage pit, augering a 2.5-ft-deep borehole next to the seepage pit to the soil-tuff interface, and collecting two soil samples from depths of 0 to 0.5 ft and 2.5 to 3 ft bgs. Samples were analyzed for uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, metals, VOCs, and SVOCs; the sample collected within the seepage pit was also analyzed for PCBs/pesticides. The RFI work plan called for collecting liquid and sludge samples from the seepage pit; however, the seepage pit had been backfilled with soil. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR. Section 2.1.2.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed uranium as the only metal detected above BV. No organic chemicals were detected. Radionuclides detected or detected above FVs in Phase I RFI samples were plutonium-238, plutonium-239/240, and tritium.

During Phase II RFI activities conducted at SWMU 33-002(b) in 1996 (LANL 1997, 071478), a borehole was advanced through the SWMU 33-002(b) seepage pit to a depth of 117.4 ft bgs (Figure 4.1-1). Twenty-five samples were collected at depth intervals of approximately 5 ft and analyzed for tritium. In

addition, three samples collected within the first 15 ft were analyzed for uranium, isotopic plutonium, metals, VOCs, and SVOCs. The 1996 decision-level data are presented in this work plan. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

During a 2005 VCA, the remaining sections of the SWMU 33-002(b) inlet and outlet drainlines for the seepage pit were removed and disposed of as LLW, and the entire seepage pit was excavated and disposed of as mixed LLW (LANL 2010, 110352). The seepage pit location was overexcavated to dimensions of 6 ft × 9 ft × 10 ft deep. The outlet drainline discharged to the SWMU 33-002(e) outfall. Twenty-two confirmation samples were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) beneath the bottom of the excavation after the drainlines had been removed at three locations beneath the remaining seepage pit inlet line and eight locations along the seepage pit outlet line (Figure 4.1-1). Sampling locations were biased to drainline joints and elbows; no soil staining, elevated radiation, or VOC field-screening readings were observed along the drainlines. Four confirmation samples were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) at two locations in the bottom of the seepage pit excavation. Samples were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, strontium-90, nitrate, and cyanide. All samples also were to be analyzed for HE. However, while the sample collection paperwork was being prepared for the samples collected beneath the seepage pit outlet drainline, the analytical suite was inadvertently changed to include TPH-DRO instead of the HE analysis. Therefore, no analytical data are available for HE in confirmation samples collected after the outlet drainline had been removed. Samples collected during the 2005 VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the Phase II RFI and VCA samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Inorganic chemicals detected above BV were aluminum, arsenic, barium, calcium, chromium, cobalt, copper, lead, magnesium, mercury, nickel, nitrate, perchlorate, selenium, uranium, and vanadium. Aluminum was detected above the tuff BV in four samples. Arsenic was detected above the tuff BV in four samples. Barium was detected above the tuff BV in nine samples. Calcium was detected above the tuff BV in 13 samples. Chromium was detected above the tuff BV in three samples. Cobalt was detected slightly above the tuff BV in two samples. Copper was detected above the soil BV in 1 sample and above the tuff BV in 13 samples. Lead was detected above the tuff BV in one sample. Magnesium was detected above the tuff BV in four samples. Mercury was detected above the tuff BV in seven samples. Nickel was detected above the tuff BV in three samples. Nitrate was detected in 3 soil samples and 15 tuff samples; there is no BV for nitrate. Perchlorate was detected in 3 soil samples and 14 tuff samples; there is no BV for perchlorate. Selenium was detected above the tuff BV in four samples. Uranium was detected above the tuff BV in one sample. Vanadium was detected above the tuff BV in two samples. Antimony and total cyanide were not detected above soil and tuff BVs but had detection limits above BVs. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-3.

Twenty-six organic chemicals [acenaphthene; acetone; anthracene; Aroclor-1254; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; chrysene; di-n-butylphthalate; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 4-isopropyltoluene; methylene chloride; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; toluene; 1,1,1-trichloroethane (TCA); TPH-DRO; and TCE] were detected. TPH-DRO; TCA; di-n-butylphthalate; fluorene; 2-methylnaphthalene; and naphthalene were each detected in one sample. Acenaphthene; anthracene; benzo(a)anthracene; benzo(g,h,i)perylene; benzoic acid; indeno(1,2,3-cd)pyrene; and benzo(k)fluoranthene were each detected in two samples. Aroclor-1254, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and toluene were each detected in three samples. Methylene chloride, phenanthrene, and pyrene were each detected in five samples. Fluoranthene and TCE were each

detected in six samples. Tetrachloroethene was detected in seven samples. Acetone was detected in eight samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-4.

Radionuclides detected or detected above BVs/FVs were americium-241, strontium-90, uranium-235/236, and tritium. Americium-241 was detected in two tuff samples. Strontium-90 was detected in four tuff samples. Uranium-235/236 was detected above the tuff BV in two samples. Tritium was detected in 3 subsurface soil samples and 37 tuff samples. Sampling locations and results for radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-5.

The VCA report concluded lateral and vertical extent of contamination were not defined for all inorganic and organic chemicals and radionuclides at SWMU 33-002(b). Lateral extent was not defined at the following sampling locations for the specified constituents:

- 33-25092—copper, selenium, acenaphthene, and TPH-DRO
- 33-25093—selenium

Vertical extent was not defined at the following sampling locations for the specified constituents:

- 33-25082—tritium
- 33-25083—tritium
- 33-25084—calcium
- 33-25087—calcium
- 33-25088—barium, mercury, and Aroclor-1254
- 33-25092—selenium and tritium
- 33-25093—strontium-90 and tritium
- 33-25094—calcium, strontium-90, and tritium
- 33-25095—calcium; indeno(1,2,3-cd)pyrene; americium-241; and tritium
- 33-25125—selenium and tetrachloroethene

Proposed Activities

As described above, lateral and vertical extent of specific inorganic chemicals, organic chemicals, and radionuclides have not been defined at several VCA sampling locations. Lateral extent will be defined by sampling downgradient of the end of the former drainline as part of the investigation for SWMU 33-002(e) (section 4.1.1.5). Samples will be collected from the interval 3 to 4 ft below the deeper VCA confirmation sample at each sampling location indicated above where vertical extent has not been determined. Samples will be analyzed for the specific constituents for which extent was not defined. Additionally, the locations where samples were inadvertently not analyzed for explosive compounds will be resampled (locations 33-25092, 3-25093, 33-25094, 33-25095, 33-25096, 33-25123, 33-25124, and 33-25125). At each location, samples will be collected from the same interval as the deeper VCA confirmation sample and 3 to 4 ft below this depth and analyzed for explosive compounds. Proposed sampling locations are shown in (Figure 4.1-2). Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.3 SWMU 33-002(c), Seepage Pit

Description and History

SWMU 33-002(c) is the location of a former seepage pit (former structure 33-0133) constructed in 1955 that received discharges from sinks and floor drains in former building 33-0086 (Figure 4.1-1). The seepage pit was an unlined, rubble-filled pit that is 6 ft in diameter and 8 ft deep with a 3-in.-thick concrete lid. Discharges to the seepage pit ceased in 1959. When the SWMU 33-002(c) seepage pit was deactivated, a drainline for noncontact cooling water from former building 33-0086 was extended through the pit and routed approximately 90-ft downslope to create an outfall [SWMU 33-002(d)]. Wastes discharged to the SWMU 33-002(c) seepage pit contained tritium and organic chemical solvents, including TCE, methanol, ethanol, acetone, and propanol (LANL 1992, 007671, p. 3-19).

Previous Investigations

In 1989, two surface samples were collected at the location of the SWMU 33-002(c) seepage pit (former structure 33-0133) (LANL 1995, 050113, p. 45) and analyzed for metals, PCBs/pesticides, SVOCs, VOCs, tritium, and gamma-emitting radionuclides. Data from the 1989 investigation are screening-level data and are not presented in this work plan; however, the data show tritium was detected above background and SVOCs were detected.

Phase I RFI activities conducted at SWMU 33-002(b) in 1993 (LANL 1995, 005113) consisted of collecting two soil samples from depths of 0 to 0.5 ft and 0 to 1.5 ft bgs within the seepage pit, augering a 5.5-ft-deep borehole next to the seepage pit to the soil-tuff interface, and collecting three soil samples from depths of 0 to 0.5 ft and 2.5 to 3 ft, and 5 to 5.5 ft bgs. Samples were analyzed for uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, metals, VOCs, and SVOCs; samples collected in the seepage pit were also analyzed for PCBs/pesticides. The RFI work plan called for collecting liquid and sludge samples from the seepage pit; however, the seepage pit had been backfilled with soil. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR. Section 2.1.3.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed only uranium detected above the BV. No organic chemicals were detected in the Phase I RFI samples. Radionuclides detected or detected above FVs were plutonium-238, plutonium-239/240, and tritium.

During Phase II RFI activities conducted at SWMU 33-002(c) in 1996 (LANL 1997, 071478), a borehole was advanced through the SWMU 33-002(c) seepage pit to a depth of 62 ft bgs (Figure 4.1-1). Twenty-five samples were collected at depth intervals of approximately 5 ft and analyzed for uranium and isotopic plutonium. In addition, three samples collected within the first 12 ft were analyzed for tritium, metals, uranium, VOCs, and SVOCs. The 1996 decision-level data are presented in this work plan. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

During a 2005 VCA, the SWMU 33-002(c) remaining sections of the inlet and outlet drainlines for the seepage pit were removed and disposed of as LLW, and the entire seepage pit was excavated and disposed of as mixed LLW (LANL 2010, 110352). The seepage pit location was overexcavated to dimensions of 6 ft × 9 ft × 10 ft deep. The outlet drainline discharged to the SWMU 33-002(d) outfall. Sixteen confirmation samples were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) beneath the bottom of the excavation after the drainlines had been removed at three locations beneath the remaining seepage pit inlet line and five locations along the seepage pit outlet line (Figure 4.1-1). Sampling

locations were biased to drainline joints; no soil staining, elevated radiation, or VOC field-screening readings were observed along the drainlines. Four confirmation samples were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) at two locations in the bottom of the seepage pit excavation. Samples were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, strontium-90, nitrate, and cyanide. All samples also were to be analyzed for HE. However, while the sample collection paperwork was being prepared for the samples collected beneath the seepage pit outlet drainline, the analytical suite was inadvertently changed to include TPH-DRO instead of the HE analysis. Therefore, no analytical data are available for HE in confirmation samples collected after the outlet drainline had been removed. Samples collected during the 2005 VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the Phase II RFI and VCA samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Inorganic chemicals detected above BVs were aluminum, arsenic, barium, cadmium, calcium, chromium, copper, lead, magnesium, mercury, nickel, nitrate, perchlorate, selenium, silver, and vanadium. Aluminum was detected above the tuff BV in four samples. Arsenic was detected above the tuff BV in two samples. Barium was detected above the tuff BV in 14 samples. Cadmium was detected above the tuff BV in one sample. Calcium was detected above the tuff BV in 17 samples. Chromium was detected above the tuff BV in six samples. Copper was detected above the tuff BV in five samples. Total cyanide was detected above the tuff BV in one tuff. Lead was detected above the tuff BV in three samples. Magnesium was detected above the tuff BV in two samples. Mercury was detected above the tuff BV in 12 samples. Nickel was detected above the tuff BV in two samples. Nitrate was detected in eight tuff samples; there is no BV for nitrate. Perchlorate was detected in nine tuff samples; there is no BV for perchlorate. Selenium was detected above the tuff BV in nine samples. Silver was detected above the tuff BV in one sample. Zinc was detected above the tuff BV in two samples. Antimony was not detected above the tuff BV but had detection limits above the BV. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-6.

Twenty-one organic chemicals [acenaphthene; anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; di-n-butylphthalate; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; TPH-DRO; and TCE] were detected. Acenaphthene, fluorene, 2-methylnaphthalene, and naphthalene were each detected in two samples. Anthracene, Aroclor-1260, benzo(a)anthracene, and benzo(k)fluoranthene were each detected in three samples. Aroclor-1254 and benzo(g,h,i)perylene were each detected in four samples. Benzo(a)pyrene was detected in seven samples. Phenanthrene and pyrene were each detected in 10 samples, and fluoranthene was detected in 11 samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-7.

Radionuclides detected or detected above FVs were americium-241, cesium-137, plutonium-238, plutonium-239, strontium-90, and tritium. Americium-241, cesium-137, and plutonium-239/240 were each detected in one tuff sample. Plutonium-238 and strontium-90 were each detected in three tuff samples. Tritium was detected in 29 tuff samples. Sampling locations and detected radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-8.

The VCA report concluded that lateral and vertical extent of contamination were not defined for all inorganic and organic chemicals and radionuclides at SWMU 33-002(c). Lateral extent was not defined at the following sampling location for the specified constituents:

- 33-25118—cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, TPH-DRO, and tritium

Vertical extent was not defined at the following sampling locations for the specified constituents:

- 33-24727—chromium, copper, lead, mercury, strontium-90, and tritium
- 33-24728—plutonium-238
- 33-25085—calcium
- 33-25086—phenanthrene, pyrene, plutonium-238, and tritium
- 33-25118—selenium
- 33-25119—calcium, selenium, plutonium-238, and tritium
- 33-25121—calcium and tritium
- 33-25122—barium, chromium, and perchlorate

Proposed Activities

As described above, lateral and vertical extent of specific inorganic chemicals, organic chemicals, and radionuclides has not been defined at several VCA sampling locations. Lateral extent will be defined by sampling performed downgradient of the end of the former drainline as part of the investigation for SWMU 33-002(d) (section 4.1.1.4). Samples will be collected 3 to 4 ft beneath the deeper VCA confirmation sample at each sampling location indicated above where vertical extent has not been determined. Samples will be analyzed for the specific constituents for which vertical extent was not defined. Additionally, the locations where samples were inadvertently not analyzed for explosive compounds will be resampled (locations 33-25118, 33-25119, 33-25120, 33-25121, and 33-25122). At each location, samples will be collected from the same interval as the deeper VCA confirmation sample and 3 to 4 ft below this depth and analyzed for explosive compounds. Proposed sampling locations are shown in Figure 4.1-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.4 SWMU 33-002(d), Outfall

Description and History

SWMU 33-002(d) is a former outfall that discharged noncontact cooling water from former building 33-0086 (Figure 4.1-1). This outfall was created when the SWMU 33-002(c) seepage pit was deactivated and disconnected from the building 33-0086 drainline. At that time, the drainline to the seepage pit was extended 90 ft to the east to create an outfall for the discharge of noncontact cooling water. The outfall operated under the Laboratory's National Pollution Discharge Elimination System (NPDES) permit until July 11, 1995, when it was removed from the permit. Tritium and metals were the potential contaminants in the noncontact cooling water. The drainline that discharged to this outfall was removed in 2005.

Previous Investigations

In 1989, two composite surface samples (0 to 6 in bgs) were collected at the SWMU 33-002(d) outfall (LANL 1995, 050113, p. 49) and analyzed for metals, PCBs/pesticides, SVOCs, VOCs, and tritium and by gamma spectroscopy. Data from the 1989 investigation are screening-level data and are not presented in this work plan. The data show cadmium and chromium were detected above background, and tritium and VOCs were detected.

The Phase I RFI conducted in 1993 at SWMU 33-002(d) (LANL 1995, 050113) consisted of collecting four surface samples (0 to 0.5 ft bgs) from four locations within the outfall and along the drainage channel east of the outfall. The samples were analyzed for uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, metals, and SVOCs. In addition, one sample was analyzed for PCBs and three samples were analyzed for pesticides. The drainage channel below the SWMU 33-002(d) outfall was resampled in December 1994 to determine whether tritium concentrations had changed after approximately 1.5 yr. Three surface samples (0 to 0.5 ft bgs) were collected from three locations at or near the original sampling locations and analyzed for tritium. Data from the 1993 Phase I RFI and 1994 supplemental sampling are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.4.3 of the HIR presents a detailed summary of the screening-level results.

Cadmium, chromium, lead, silver, uranium, and zinc were detected above BVs in samples from the 1993 RFI. Eleven organic chemicals [aldrin; Aroclor-1254; alpha-BHC (benzene hexachloride); delta-BHC; chrysene; 4,4-DDD (dichlorodiphenyldichloroethane); 4,4-DDT (dichlorophenyltrichloroethylene); endosulfan; fluoranthene; pyrene; and total PCBs] were detected in the Phase I RFI samples. Tritium was the only radionuclide detected or detected above BV/FV.

The drainline from the SWMU 33-002(c) seepage pit that discharged to the SWMU 33-002(d) outfall was removed during the 2005 VCA. No confirmation samples were collected within the outfall area or drainage.

No decision-level data are available for SWMU 33-002(d).

Proposed Activities

The extent of contamination has not been defined at the outfall and in the drainage channel east of the outfall for SWMU 33-002(d). Fifteen samples will be collected from three depths (0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs) from four locations within the drainage channel directly east of the site, downgradient of the outfall. The samples will be analyzed for isotopic uranium, tritium, isotopic plutonium, americium-241, metals, perchlorate, VOCs, SVOCs, strontium-90, nitrate, cyanide and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-2. These samples also will be used to define lateral extent for SWMU 33-002(c). Table 4.0-1 provides a summary of the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.5 SWMU 33-002(e), Outfall

Description and History

SWMU 33-002(e) consists of a roof drain and outfall at former building 33-0086. This drainline was 2 in. in diameter, approximately 90 ft long, and discharged to an outfall east of former building 33-0086 (Figure 4.1-1). This outfall was created when the SWMU 33-002(b) seepage pit was deactivated and disconnected from the building 33-0086 drainline. At that time, the drainline to the seepage pit was extended 90 ft to the east to create an outfall for the discharge of stormwater from roof drains on former building 33-0086. Stormwater discharges from building 33-0086 roof drains potentially contained tritium associated with releases from the former building 33-0086 air-emission stacks.

Previous Investigations

In 1989, one surface sample (0 to 0.5 ft bgs) was collected at the SWMU 33-002(e) outfall (LANL 1995, 050113, p. 56) and analyzed for metals, PCBs/pesticides, SVOCs, VOCs, tritium, uranium, and HE and by gamma spectroscopy. Data from the 1989 investigation are screening-level data and are not presented in this work plan. The data show tritium, VOCs and SVOCs (PAHs) were detected.

Phase I RFI activities conducted in 1993 at SWMU 33-002(e) (LANL 1995, 050113) consisted of collecting three surface samples (0 to 0.5 ft bgs) from three locations within the outfall area and drainage channel. The samples were analyzed for tritium and SVOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.5.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed no metals detected above BVs. Seventeen organic chemicals [acenaphthene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; dibenzofuran; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene] were detected in the Phase I RFI samples. Tritium was the only radionuclide detected or detected above BV/FV.

The drainline from the SWMU 33-002(b) seepage pit that discharged to the SWMU 33-002(e) outfall was removed during the 2005 VCA. No confirmation samples were collected within the outfall area or drainage.

No decision-level data are available for SWMU 33-002(e).

Proposed Activities

The lateral and vertical extent of contamination have not been defined within the outfall and drainage channel. Nine samples will be collected from three depths (0 to 1 ft, 2 to 3 ft and 4 to 5 ft bgs) from three locations within the drainage channel directly east of the outfall for SWMU 33-002(e) and analyzed for isotopic uranium, tritium, isotopic plutonium, americium-241, metals, perchlorate, VOCs, SVOCs, strontium-90, nitrate, and cyanide and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-2. These samples also will be used to define lateral extent for SWMU 33-002(b). Table 4.0-1 provides a summary of the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.6 SWMU 33-010(f), Surface Disposal Area

Description and History

SWMU 33-010(f) is a surface disposal area (Figure 4.1-1). The history of the site and the origins of the wastes are not known. The 1990 SWMU report (LANL 1990, 007513) states the SWMU was observed during a 1987 ER Project reconnaissance and describes it as concrete, cans, and metal pieces that littered the area east of former building 33-0086. The RFI report (LANL 1995, 071262) describes this SWMU as consisting of two small surface disposal areas located 300 ft southeast of former building 33-0086 and approximately 50 ft apart. One of the areas is described as approximately 15 ft^2 and the other as approximately 10 ft × 20 ft. Materials at the site included pieces of concrete; piles of tuff and cured asphalt; rusted metal cans, rebar, and strapping bands; and other debris. Although the source of these materials is not known, some are believed to be associated with roadwork activities.

Previous Investigations

Phase I RFI activities conducted in 1993 at SWMU 33-010(f) (LANL 1995, 071262) consisted of collecting two surface samples (0 to 0.5 ft bgs) from two locations, one at each small disposal area. Both samples were analyzed for tritium, gamma-emitting radionuclides, and metals. One sample was also analyzed for pesticides and herbicides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.6.3 of the HIR contains a detailed summary of the screening-level results.

Phase I RFI data showed no metals detected above BV. Two organic chemicals (4,4-DDE and endosulfan II) were detected. Tritium was the only radionuclide detected or detected above BV/FV. No decision-level data are available for SWMU 33-010(f).

Proposed Activities

Any debris remaining at the SWMU 33-010(f) surface disposal area will be removed, characterized, and disposed of in accordance with applicable waste management requirements, and the nature and extent of any residual contamination will be determined. Following debris removal, a total of 30 samples will be collected from three depths (0 to 1 ft, 3 to 4 ft and 5 to 6 ft bgs) at five locations at each of the two small disposal areas: one location in the center of each area and four step-out locations around each disposal area 10 ft out from the center of each area. Samples will be analyzed for cyanide, nitrate, perchlorate, VOCs, SVOCs, and metals. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

Proposed Activities for Consolidated Unit 33-002(a)-99

The lateral and vertical extent of the subsurface tritium plume associated with SWMUs 33-002(a–e) have not been determined. Seven boreholes will be advanced to the top of the basalt at the following locations: within the former location of the SWMU 33-002(a) septic tank leach field; north of the former location of the SWMU 33-002(a) septic tank leach field; south of the former location of the SWMU 33-002(a) septic tank leach field; within the former location of the building 33-0086 (former tritium facility); and east of the SWMU 33-002(a) septic tank leach field where the mesa top drops into the drainage (Figure 4.1-13). Soil, tuff, and pore-gas samples will be collected at 10-ft intervals from each borehole and analyzed for tritium. Tritium data will be reviewed to determine which boreholes, if any, will be completed as vapor-monitoring wells.

To determine if contaminants are migrating from the site, 10 samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from five locations in the main drainage channel downgradient of Consolidated Unit 33-002(a)-99 to the Chaquehui Canyon tributary drainage channel southeast of the site (Figure 4.1-13). The samples will be analyzed for isotopic uranium, tritium, isotopic plutonium, americium-241, metals, perchlorate, VOCs, SVOCs, strontium-90, nitrate, and cyanide and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed drainage sampling locations are shown in Figure 4.1-13. Table 4.0-1 provides a summary of the proposed sampling locations, depths, and analytical suites.

4.1.2 Consolidated Unit 33-004(a)-00, Main Site

Consolidated unit 33-004(a)-00 consists of SWMUs 33-004(a, h, and i); 33-011(d); 33-015; and 33-017. The SWMUs in this consolidated unit consist of a septic system, three outfalls, a storage area, an incinerator, and operational releases. All the SWMUs are geographically located in the northeast corner of TA-33 Main Site, and the boundaries of some of the SWMUs overlap (Figure 4.1-9). The SWMUs that make up this consolidated unit are generally associated with early operations at TA-33, which involved initiator development from 1950 to 1972. These SWMUs are not associated with the TA-33 tritium facility (building 33-0086) or the tritium operations conducted at TA-33.

4.1.2.1 SWMU 33-004(a), Septic System

Description and History

SWMU 33-004(a) consists of a septic tank (structure 33-0031), associated drainlines, two seepage pits, and a drain field. The septic tank has a capacity of 1360 gal. and is located 50 ft northeast of building 33-0039 (Figure 4.1-9). This septic tank is in use and serves all major buildings at the TA-33 Main Site. Septic tank 33-0031 received sanitary wastewater from a laboratory/office building (33-0019) and a storage building (33-0027). Industrial liquid wastes from building 33-0019 were discharged to a separate outfall. Septic tank 33-0031 discharged to a 90-ft × 80-ft drain field located approximately 200 ft northeast of the septic tank. This drain field is constructed of rows of 4-in. vitrified clay tiles spaced approximately 10 ft apart. In 1951, the system was redesigned to accept industrial wastes from laboratories in buildings 33-0019, 33-0113, and 33-0114 and the machine shop in building 33-0039. Also in 1951, two 4-ft-diameter × 50-ft-deep gravel-filled seepage pits were constructed to receive the discharge from septic tank 33-0031, and the drain field was disconnected and removed from service. The seepage pits continue to receive the effluent from the septic tank.

A 1993 study of drains and discharges at TA-33 identified the following sources of discharges to this septic system: restrooms, water fountains, showers, laboratory floor drains and sink drains in building 33-0019; janitor's closet sink drains in buildings 33-0019 and 33-0113; a floor drain in a shop in building 33-0039; a sink drain in a shop in building 33-0113; and roof drains from building 33-0019 (Santa Fe Engineering Ltd. 1992, 062036, Tables 2, 6, 7, and 13). The specific materials discharged to these drains are not well documented. A 1954 memorandum mentions occurrences of mercury spills in the electronics laboratory in building 33-0019, and spilled mercury could potentially have been released to the drains (Jordan 1954, 007918). The shop in building 33-0113 was primarily used to machine uranium but was also used for processing plastics and spray painting (Hyatt 1956, 007929).

Previous Investigations

During the 1993 Phase I RFI conducted at SWMU 33-004(a), one sludge sample and one liquid sample were collected from septic tank 33-0031 (LANL 1995, 071300) and analyzed for metals, SVOCs, VOCs, uranium, tritium, and gamma-emitting radionuclides. A borehole was drilled to a depth of 15 ft next to the septic tank and one surface sample (0 to 0.5 ft) and two subsurface samples (3 to 5 ft and 13 to 15 ft) were collected. All samples were analyzed for metals, SVOCs, tritium, uranium, and gamma-emitting radionuclides. The two subsurface samples were also analyzed for VOCs. A borehole was drilled next to each seepage pit to a depth of 50 ft, and four samples were collected at four depths from each of these boreholes (7 to 9 ft or 8 to 10 ft, 22 to 24 ft, 37 to 39 ft, and 47 to 49 ft bgs). All samples were analyzed for metals, SVOCs, VOCs, tritium, and gamma-emitting radionuclides, and all but one of the samples were also analyzed for uranium. Four surface (0 to 0.5 ft) and two subsurface (1.5 ft) samples were collected from random locations in the drain field and analyzed for metals, SVOCs, uranium, tritium, and gamma-

emitting radionuclides. Two surface samples were also analyzed for herbicides, pesticides, and PCBs, and the subsurface samples were also analyzed for VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected in the 1993 liquid samples from the septic tank were barium, lead, mercury, uranium, and zinc. Metals detected in the sludge sample were arsenic, barium, cadmium, chromium, lead, nickel, silver, uranium, and zinc. Four organic chemicals (chloroform, 4-methylphenol, phenol, and toluene) were detected in the liquid samples from the septic tank. Thirty-six organic chemicals [benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(-ethylhexyl)phthalate; 2-butanone; butylbenzylphthalate; n-butylbenzene; sec-butylbenzene; tert-butylbenzene; carbon disulfide; chloroform; chrysene; di-n-butylphthalate; di-n-octylphthalate; 1,4-dichlorobenzene; 1,1-dichloroethane; ethylbenzene; fluoranthene; indeno(1,2,3-cd)pyrene; isopropylbenzene; 4-isopropyltoluene; methylene chloride; 4-methylphenol; phenanthrene; propylbenzene; pyrene; 1,1,2,2-tetrachloroethane; tetrachloroethene; toluene; 1,1,2-trichloro-1,2,2-trifluoroethane; TCE; TCA; 1,2,4-trimethylbenzene; and total xylenes) were detected in the sludge sample. Tritium was detected in both the liquid and sludge samples.

Lead, mercury, uranium, and zinc were the only metals detected above BV in samples from the 1993 RFI borehole next to the septic tank. Eight organic chemicals [benzo(a)anthracene; benzo(a)pyrene; benzo(k)fluoranthene; chrysene; di-n-butylphthalate; fluoranthene; phenanthrene; and pyrene] were detected in samples from the borehole next to the septic tank. Radionuclides detected or detected above FV were cesium-137 and tritium.

Uranium and zinc were detected above BVs in 1993 RFI samples from the drain field. Four organic chemicals (Aroclor-1254, di-n-butylphthalate, fluoranthene, and pyrene) were detected in samples from the drain field. Tritium was the only radionuclide detected or detected above BV/FV.

Uranium was the only inorganic chemical detected above BV in 1993 RFI samples from the boreholes next to the seepage pits, and di-n-butylphthalate was the only organic chemical detected. Cesium-137 was the only radionuclide detected or detected above BV/FV.

In 1994, four additional samples were collected from the drain field to better characterize potential releases (LANL 1995, 071300). These subsurface samples (1 to 2 ft, 2 to 3 ft, and 2.5 to 3.5 ft bgs) were collected at joints in the vitrified-clay tiles and submitted for laboratory analysis of metals, SVOCs, VOCs, tritium, uranium, and gamma-emitting radionuclides. Data from the 1994 sampling are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in samples collected from the drain field in 1994 were cadmium, chromium, copper, lead, mercury, selenium, silver, uranium, vanadium, and zinc. Seventeen organic chemicals [acenaphthene; acenaphthalene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene] were detected in samples from the drain field. Radionuclides detected or detected above BVs/FVs were cesium-137 and tritium.

In 1997, the ER Project collected one soil sample at each of three locations (below the tank, under the inlet, and under the outlet) (Figure 4.1-9 and Table 4.1-1). Soil samples were analyzed for metals and VOCs (Michelotti and Kidman 1997, 074002).

Decision-level data from the 1997 samples are presented in Tables 4.1-2 and 4.1-3. Metals detected above BV in samples collected under and next to the septic tank in 1997 were lead and zinc. Lead was detected above the BV in one soil sample. Zinc was detected above the BV in two soil samples. Antimony and uranium were not detected above the BV for soil but had detection limits above the BV. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-10.

Methylene chloride was detected in one sample. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-11.

Proposed Activities

Previous sampling results showed metals, organic chemicals (primarily PAHs), and radionuclides at SWMU 33-004(a). Because this septic system has remained active since the last sampling was performed in 1997, additional sampling is proposed to characterize current conditions. Sampling of the active system is proposed along the inlet drainlines, next to the septic tank, along the outlet drainline, and next to the seepage pits. Sampling locations are as follows:

- between buildings 33-0019 and 33-0039 where two active drainlines come together,
- at the septic tank inlet,
- next to the downgradient (south) side of the septic tank,
- at the septic tank outlet,
- next to the manhole east of the Main Site fence,
- next to the two active seepage pits, and
- within the inactive drain field.

Samples collected next to the drainlines, manholes, and septic tank will be collected at depths of 0 to 1 and 3 to 4 ft below the bottom of the adjacent structure. Samples will be collected next to the seepage pits at intervals of 9 to 10 ft, 19 to 20 ft, 29 to 30 ft, 39 to 40 ft, 49 to 50 ft, 59 to 60 ft, and 69 to 70 ft bgs.

The inactive drain field has not received waste since the previous sampling, but the existing data are not decision level, and previous sampling locations and depths may not have been sufficient to determine the extent of contamination. Samples from the drain field will be collected at eight locations within the drain field. At each location, the vitrified clay pipe (VCP) drain pipe will be exposed and samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft below the pipe joints.

All samples collected at SWMU 33-004(a) will be analyzed for metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, isotopic uranium, isotopic plutonium, and gamma-emitting radionuclides. Twenty percent of the samples will also be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-12b. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.2 SWMU 33-004(h), Outfall

Description and History

SWMU 33-004(h) consists of an outfall associated with a warehouse (building 33-0020) located at the south side of Main Site (Figure 4.1-9). The warehouse was constructed in 1950 and used from 1952 to 1972 to store materials associated with initiator tests, including beryllium and uranium. The building subsequently was cleaned and used by other groups as a light laboratory and for general storage. The

RFI work plan for Operable Unit (OU) 1122 states historical engineering drawings show an 8-in.-diameter VCP drain exiting the southeast corner of the building, which reportedly discharged to an outfall (LANL 1992, 007671, p. 3-23). A study of building drains at TA-33 identified two floor drains in building 33-0020 but could not locate an outfall. The study also noted there was no source of water in the building (Santa Fe Engineering, 1993, 062036, p. 5).

Previous Investigations

A Phase I RFI was conducted at SWMU 33-004(h) in 1993 (LANL 1995, 071262). Because the outfall could not be located visually, a geophysical survey was conducted to identify the possible location of the drainline. Three sampling locations were selected based on the results of the geophysical survey. These locations were at and downgradient of the location where the geophysical survey results indicated the outfall should have discharged. Three surface samples (0 to 0.5 ft) were collected at these locations and submitted for laboratory analysis of metals, tritium, uranium, and gamma-emitting radionuclides. One sample also was submitted for laboratory analysis of herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.2.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 Phase I RFI samples were cadmium, lead, nickel, uranium, and zinc. Two organic chemicals (p,p'-DDE and endosulfan II) were detected. No radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-004(h).

Proposed Activities

The Phase I RFI data showed concentrations of inorganic chemicals generally above BVs, very few detections of organic chemicals (although organic analysis was limited), and no radionuclides detected or detected above BVs/FVs. These data are screening level, however, and cannot be used to determine extent. In addition, the Phase I RFI sampling was performed at only one depth, which is insufficient to determine vertical extent. Therefore, the three previous Phase I RFI sampling locations (33-01051, 33-01052, and 33-01054) at and downgradient of the outfall will be resampled, and the samples will be collected at greater depth than those collected during the RFI to determine vertical extent. Three samples will be collected at each location at depth intervals of 0 to 1, 2 to 3, and 4 to 5 ft bgs and analyzed for TAL metals, cyanide, nitrate, perchlorate, isotopic uranium, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Samples will not be analyzed for radionuclides because they were not detected during the Phase I RFI. Proposed sampling locations are shown in Figure 4.1-12a. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.3 SWMU 33-004(i), Outfalls

Description and History

SWMU 33-004(i) consists of two outfalls associated with a machine shop (building 33-0039) located near the east side of Main Site (Figure 4.1-9). This machine shop was completed in 1951 and housed a welding and soldering bench that used cadmium and silver, a lead-melting facility, a beryllium-machining room, and a sand blaster. Cadmium, uranium, stainless steel, and polystyrene plastic also were machined in the building. Machine shop operations ceased in the late 1990s. The outfalls are associated with two 4-in.-diameter VCPs that run to the east of building 33-0039. The northernmost of the two outfalls is located approximately 30 ft east of the building, and the other outfall is located approximately 40 ft east of the building.

The sources of discharges to these outfalls are not known. A study of building drains at TA-33 confirmed that all wastewater discharges from building 33-0039 are connected to the SWMU 33-004(a) septic system (Santa Fe Engineering, 1993, 062036, p. 7).

Previous Investigations

During the 1993 Phase I RFI conducted at SWMU 33-004(i), a geophysical survey was performed, and the drainlines and outfalls were located (LANL 1995, 071262). Surface samples (0 to 0.5 ft) were collected at each outfall and at two locations in the drainages downstream of each outfall, for a total of six samples. All samples were submitted for laboratory analysis of metals, SVOCs, tritium, uranium, and gamma-emitting radionuclides. One sample was also analyzed for herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.3.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in samples collected during the 1993 Phase I RFI were cadmium, chromium, lead, nickel, uranium, and zinc. Eleven organic chemicals [acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene] were detected. No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-004(i).

Proposed Activities

Screening-level data from the Phase I RFI showed concentrations of 6 inorganic chemicals above BVs and detections of 11 organic chemicals. Detected concentrations often decreased with distance downgradient of the outfalls, but not in all cases. The Phase I RFI sampling locations are therefore not adequate to determine lateral extent, and additional samples are needed farther downgradient. Also, samples were collected only at the surface, and additional sampling depths are needed to define vertical extent.

To determine lateral extent, the six previous Phase I RFI sampling locations at and downgradient of the outfalls will be resampled (locations 33-01055, 33-01056, and 33-01057 at north outfall and locations 33-10158, 33-01059, 33-01060 at the south outfall), along with two additional locations farther downgradient and east of each outfall for a total of five sampling locations for each outfall. Samples will be collected at greater depths than the RFI samples to determine vertical extent. Three samples will be collected at each location at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs.

All samples will be analyzed for TAL metals, cyanide, isotopic uranium, perchlorate, nitrate, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Samples will not be analyzed for radionuclides because they were not detected during the Phase I RFI. Proposed sampling locations are shown in Figure 4.1-12a. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

Data from the 10 samples to be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from five locations in the main drainage channel downgradient of Consolidated Unit 33-004(a)-00 to the Chaquehui Canyon tributary drainage channel southeast of the site will also be used to determine if contaminants are migrating from the site (Figure 4.1-13).

4.1.2.4 SWMU 33-011(d), Former Storage Area

Description and History

SWMU 33-011(d) consists of a storage area located on the asphalt next to a warehouse (building 33-0020) near the south side of Main Site (Figure 4.1-9). Beryllium and uranium were stored around building 33-0020 from 1950 to 1972. In addition, recovered scrap from shots containing uranium, beryllium, and tungsten was stored south of building 33-0020. The amount of uranium stored at this site is reported to have been “tons” (Ahlquist 1983, 006854). Much of the material stored here was salvaged for use elsewhere. A 1987 site survey found no materials remaining in storage at this location (LANL 1992, 007671, p. 3-24).

Previous Investigations

During the Phase I RFI conducted at SWMU 33-011(d) in 1993, two asphalt samples and three soil samples from beneath the asphalt were collected at three sampling locations (LANL 1995, 071300). Soil samples were collected at depth intervals of 0.17 to 0.5 ft and submitted for laboratory analysis of metals, uranium, and gamma-emitting radionuclides. Two soil samples were also analyzed for tritium and isotopic plutonium. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.4.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV during the 1993 Phase I sampling were beryllium, cadmium, lead, nickel, uranium, and zinc. Radionuclides detected or detected above BVs/FVs were plutonium-238, plutonium-239, and tritium.

Based on the results of the Phase I RFI, Phase II RFI sampling was performed in 1996 to better characterize contamination at the site (LANL 1997, 071478). One surface (0 to 0.5 ft bgs) and one subsurface sample (0.17 to 0.58 ft, 0.42 to 0.67 ft, 0.5 to 0.67 ft, 0.5 to 0.75 ft, and 0.67 to 1 ft bgs) were collected at each of seven locations (Figure 4.1-9). Six of these locations were beneath asphalt and one was in a drainage south of the asphalt. The six subsurface samples were collected beneath the pad at the soil-tuff interface. All samples collected from beneath the pad were submitted for laboratory analysis of metals and uranium. The two samples from the drainage were submitted for analysis of isotopic uranium. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the 1996 Phase II RFI samples are presented in Table 4.1-2. Metals detected above BV were calcium, iron, lead, mercury, uranium, vanadium, and zinc. Calcium and iron were detected above the soil BV in one sample. Lead was detected above the soil BV in three samples. Mercury and zinc were detected above the soil BV in two samples. Uranium and vanadium were each detected above the tuff BV in one sample. Antimony, cadmium, silver, and thallium were not detected above BV but had detection limits above BV. No uranium isotopes were detected above BV. Sampling locations and results for inorganic chemicals above BV are shown in Figure 4.1-14.

Proposed Activities

The Phase I screening-level data and Phase II decision-level data showed detections of inorganic chemicals above BVs. The decision-level data were not sufficient to establish extent. Decreasing concentrations were not observed with distance away from the storage area to determine lateral extent, and decreasing concentrations were not noted with depth to define vertical extent (Figures 4.1-14). In addition, the Phase I and Phase II analytical suites did not include organic chemicals. Therefore,

additional sampling at greater distances from the storage area and at greater depth intervals and analysis of samples with an expanded analytical suite are needed to determine nature and extent.

The Phase I and Phase II sampling locations beneath the asphalt pad where inorganic chemicals were detected at concentrations greater than 5 times BVs will be resampled. These locations are

- 33-01081—uranium detected at 488 times BV at 0.17–0.5 ft bgs,
- 33-01566—lead detected at 35 times BV at 0.67–1.0 ft bgs,
- 33-01567—lead detected at 13 times BV at 0.0–0.5 ft bgs, and
- 33-01571 and 33-01572—mercury detected at 20 times BV at 0.5–0.75 ft bgs.

To determine lateral extent, step-out samples will be collected at four locations away from the asphalt pad in a downgradient direction from the above four locations. At each location, samples will be collected at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft below the bottom of the asphalt in paved areas or from the ground surface in unpaved areas. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, isotopic uranium, isotopic plutonium, and tritium. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figures 4.1-12b. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.5 SWMU 33-015, Incinerator

Description and History

SWMU 33-015 consists of an incinerator (structure 33-0110) located approximately 50 ft southeast of building 33-0039 on a hillside that slopes to a side wash of Chaquehui Canyon (Figure 4.1-9). The incinerator is approximately 4 ft × 4 ft × 6 ft high and mounted on a concrete base. The incinerator was used previously to burn uncontaminated office trash. The incinerator was first used in 1955. The date that its use stopped is not known.

Previous Investigations

During the Phase I RFI conducted at SWMU 33-015 in 1993, two surface soil samples (0 to 0.5 ft bgs) were collected, one from each of the two downslope corners of the concrete base (LANL 1995, 071262) and submitted for laboratory analysis of metals, tritium, uranium, and gamma-emitting radionuclides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.5.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 RFI were cadmium, lead, silver, uranium, and zinc. No radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-015.

Proposed Activities

The Phase I screening level data showed inorganic chemicals above BVs next to the concrete base of the incinerator. Because the incinerator is no longer used, it will be removed, along with the concrete pad, and disposed of. Samples will be collected from the center of the pad and at four step-out locations around the pad. At each location, samples will be collected at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs and analyzed for TAL metals, cyanide, VOCs, SVOCs, and dioxins/furans. In addition, 20% of all

samples will be analyzed for PCBs. Proposed sampling locations are shown in Figures 4.1-12b. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.6 SWMU 33-017, Potential Soil Contamination

Description and History

SWMU 33-017 consists of areas potentially impacted by operational releases from the TA-33 Main Site. SWMU 33-017 is located at the northern and eastern edges of Main Site and is approximately 600 ft long × 100 ft to 600 ft wide (Figure 4.1-9). The site generally slopes downward to the east and is at the head of a small drainage tributary of Chaquehui Canyon. SWMU 33-017 is potentially impacted by runoff from the paved areas of the TA-33 Main Site complex by deposition from airborne releases from TA-33 Main Site facilities and by operational releases from an area east of building 33-39 used for vehicle maintenance. Operations conducted within Main Site included uranium processing and machining, cadmium and silver welding and soldering, lead melting and casting, cadmium and beryllium machining, and tritium processing and decontamination. These operations began in 1949 and most continued until 1972. Following these operations, some of the facilities were used for offices and electronics laboratories.

Previous Investigations

A Phase I RFI was conducted at SWMU 33-017 during 1993 (LANL 1995, 071262). To characterize the extent of general sitewide contamination that resulted from operational releases, 42 surface samples (0 to 0.5 ft, 0 to 0.66 ft, or 0 to 0.75 ft bgs) were collected at 41 locations, which were random offsets from a 100-ft grid overlying the Main Site and four radial extensions from the grid (Figures 4.1-9 and 4.1-15). To characterize the extent of contamination of surface drainages, 19 surface samples (0 to 0.5 ft bgs) and 1 subsurface sample (0.5 to 1.5 ft bgs) were collected from drainage channels that receive runoff from the Main Site. To characterize potential contamination that resulted from releases at the vehicle maintenance area, five surface samples (0 to 0.5 ft bgs) were collected from this area. All 67 samples were submitted for laboratory analysis of metals and gamma-emitting radionuclides. Sixty-six of these samples were also submitted for analysis of SVOCs, 65 for isotopic plutonium, and 64 for tritium and uranium. In addition, 13 samples were submitted for analysis of herbicides, 8 for pesticides, and 3 for PCBs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.6.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV during the 1993 Phase I RFI were arsenic, cadmium, chromium, lead, nickel, silver, uranium, and zinc. Twenty-three organic chemicals [acenaphthene; aniline; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; beta-BHC; bis-(2-ethylhexyl)phthalate; chrysene; p,p'-DDE; dibenzo(a,h)anthracene; dibenzofuran; dieldrin; di-n-butylphthalate; endrin; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; phenanthrene; and pyrene) were detected. Cesium-137, plutonium-238, plutonium-239/240, and tritium were the only radionuclides detected or detected above FVs.

A Phase II RFI was conducted at SWMU 33-017 in 1996. The area of investigation focused on the eastern side of building 33-0039 at the location of the former vehicle maintenance area. Twenty-four surface soil samples (0 to 0.5 ft bgs) and one subsurface sample (1 to 1.5 ft bgs) were collected from 24 locations (Figures 4.1-9 and 4.1-15). Eighteen samples were submitted for laboratory analysis of SVOCs, and the remaining seven samples were submitted for laboratory analysis of PCBs. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the 1996 Phase II RFI samples are presented in Table 4.1-3. Twenty-two organic chemicals [acenaphthene; anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzon(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; butylbenzylphthalate; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; dibenzofuran; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene] were detected in samples from the 1996 Phase II RFI at the vehicle-maintenance area. Organic chemicals were detected in 24 samples. Sampling locations and detected results for organic chemicals are shown on Plate 5.

Proposed Activities

The Phase I screening-level data showed inorganic chemicals above BVs, detected organic chemicals (primarily PAHs), fallout radionuclides above FVs, and elevated levels of tritium. The Phase II decision-level data showed detected organic chemicals consisting of PAHs and PCBs. All data are from analyses of surface samples and cannot be used to determine vertical extent. In addition, the Phase II sampling was focused at one location with a limited analytical suite and cannot be used to determine nature and extent for the entire SWMU. Based on the results of the previous investigations, additional sampling is needed to determine nature and extent, especially for metals, PCBs, and tritium. The 25 Phase I and Phase II sampling locations with the highest detections of metals, PCBs, and tritium will be resampled at three depths (0 to 1 ft, 2 to 3 ft, and 4 to 5 ft) to determine vertical extent. These locations also comprise the locations where most of the detections of other organic chemicals occurred. These locations are summarized in Table 4.1-5. The proposed sampling locations are shown in Figures 4.1-12c and 4.1-13.

Lateral extent of releases from SWMU 33-017 will be determined by sampling the main drainage channel that collects runoff from Main Site. Samples will be collected at five locations in the channel between the Main Site boundary down to the site fence upstream of gaging station E340 (Figure 4.1-13). Samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs at each location and may also be used to determine lateral extent of other SMWUs and AOCs in Main Site, including the SWMUs in Consolidated Unit 33-004(a)-00 and AOC 33-008(c).

All samples from SWMU 33-017 will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, PCBs, isotopic uranium, isotopic plutonium, and tritium and by gamma spectroscopy. Proposed sampling locations are shown in Figures 4.1-12c and 4.1-13. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.3 Consolidated Unit 33-005(a)-00, Potential Soil Contamination

Consolidated Unit 33-005(a)-00 consists of SWMUs 33-005(a–c) and 33-011(a). The SWMUs in this consolidated unit consist of a former septic system, former drainlines, and a former drum storage area (Figure 4.1-16). These SWMUs are geographically located in the Main Site area of TA-33 across West Road approximately 325 ft west of the former tritium facility (former building 33-0086) and are associated with managing liquid and solid wastes generated at former building 33-0021. Building 33-0021 was constructed in 1950 and originally housed glove boxes used to section projectiles for initiator tests. The projectiles contained uranium, beryllium, and polonium-210. Building 33-0021 was later used for other experiments involving plutonium. An accidental release of a mixture of plutonium and beryllium powders in April 1960 contaminated the entire facility, which was decontaminated within weeks but never used again. In 1974, the building, septic system, drains, drainlines and leach field were removed and the entire area was decontaminated and restored (Cox 1975, 009728, Figure 2). Any soil containing gross-alpha radioactivity above 20 pCi/g was excavated. Soil over much of the site was removed down to bedrock. Radioactive debris and soil were disposed of at MDA G at TA-54. Excavations were backfilled with clean

fill and revegetated. Because contamination associated with individual sites in this consolidated unit is indistinguishable, the sites will be investigated as a consolidated unit.

4.1.3.1 SWMU 33-005(a), Former Septic System

Description and History

SWMU 33-005(a) consists of the former septic system that served restrooms and change-room lavatories in former building 33-0021 (Figure 4.1-16). Drainlines discharged to a manhole (former structure 33-0074), which drained to a septic tank (former structure 33-0032). The outfall for the septic system was reported to be a few feet south of the septic tank (LANL 1992, 007671, pp. 3-21–3-25). Building 33-0021 and all associated building drainlines and the septic system and septic system drainlines were removed in 1974 and disposed of at MDA G at TA-54 (LANL 1995, 044113, pp. 71–79). Soil was removed until radiation readings were below detection levels of approximately 20 pCi/g gross alpha, and the area was backfilled with clean fill and leveled.

Previous Investigations

The 1993 Phase I RFI conducted at SWMU 33-005(a) consisted of advancing one borehole at the former septic tank location and collecting one surface sample (0 to 0.5 ft bgs) and one subsurface sample (2 to 2.5 ft bgs). Because soil backfill at the site was thinner than anticipated, the depth of the borehole was less than that specified in the RFI work plan (LANL 1992, 007671, pp. 3-21–3-25). Three surface samples (0 to 0.5 ft bgs) were collected at the former location of the outfall and at two locations in the drainage downslope of the outfall. Samples were field screened for radioactivity and organic chemicals and submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, and SVOCs; the subsurface sample was analyzed for VOCs (LANL 1995, 044113, pp. 71–78). Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 Phase I RFI samples were uranium and zinc. Fifteen organic chemicals were detected in the 1993 Phase I RFI samples [acenaphthene; acetone; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; phenanthrene; and pyrene]. Cesium-137 and plutonium-239/240 were detected or detected above FVs. Decision-level data are not available for SWMU 33-005(a).

4.1.3.2 SWMU 33-005(b), Former Drainline

Description and History

SWMU 33-005(b) consists of a former drainline that served a sink, floor drain, and safety shower in the counting room in former building 33-0021 (Figure 4.1-16). No information concerning the quantities or characteristics of wastes associated with this SWMU is available. The drainline discharged to an outfall located northwest of former building 33-0021 (Cox et al. 1975, 009728, p. 3 and Figure 7).

Previous Investigations

Phase I RFI activities conducted at the SWMU 33-005(b) drainline in 1993 involved collecting three surface samples (0 to 0.5 ft bgs): one at the former location of the outfall, as determined from engineering drawings and topography; one at the location in the drainage downslope of the outfall; and one at the

location upslope of the outfall. The samples were field screened for radioactivity and organic chemicals and submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, and SVOCs (LANL 1995, 044113, pp. 71–78). Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.2.3 of the HIR presents a detailed summary of the screening-level results.

Uranium and zinc were the only metals detected above BVs in the 1993 Phase I RFI samples. Twenty-one organic chemicals [acenaphthene; acenaphthalene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; dibenzofuran; 2,4-dimethylphenol; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; 2-methylphenol; 4-methylphenol; naphthalene; phenanthrene; and pyrene] were detected. Plutonium-239/240 was the only radionuclide detected or detected above FV. Decision-level data are not available for SWMU 33-005(b).

Based on a review of site drawings and descriptions provided in the document titled “Disposition of TA-33-21, A Plutonium Contaminated Experimental Facility” (Cox et al. 1975, 009728), the former drainline that connected to a sink, floor drain, and safety shower in the counting room in former building 33-0021 actually exited the building at the northwest corner, and the outfall was located approximately 50 ft northwest of the building. Therefore, the 1993 RFI samples were not collected near the location of the former drainline and outfall, as intended.

4.1.3.3 SWMU 33-005(c), Former Drainline

Description and History

SWMU 33-005(c) is a former drainline that served sink, shower, and glove box drains in the process and hot-change rooms in former building 33-0021 (Figure 4.1-16). The drainline discharged to a leach field located approximately 50 ft south of the building. This line was removed during 1974 removal activities. Approximately 30 ft of the drainline trench was found to be contaminated, resulting in the removal of 8.2 ft^3 of contaminated soil (LANL 1992, 007671, pp. 3-21–3-25).

Previous Investigations

During the Phase I RFI conducted at the SWMU 33-005(c) drainline in 1993, four surface samples (0 to 0.5 ft bgs) and four subsurface samples (1 to 1.5 ft bgs) were collected from four boreholes. One borehole was advanced at the location of the former leach field, as determined from engineering drawings and site topography, and the others were collected at random locations in the vicinity of the leach field. Three boreholes were advanced to a depth of 2 ft and one to a depth of 5 ft. Because the soil backfill was thinner than anticipated, the depth of the boreholes was less than specified in the RFI work plan. Samples were field screened for radioactivity and organic chemicals and submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, and SVOCs. In addition, one surface sample and one subsurface sample were analyzed for VOCs, PCBs, pesticides, and herbicides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.3.3 of the HIR presents a detailed summary of the screening-level results.

Cadmium and uranium were the only inorganic chemicals detected above BV in the 1993 Phase I RFI samples. Seven organic chemicals were detected (acetone, butyl benzyl phthalate, di-n-butyl phthalate, fluoranthene, 4-isopropyltoluene, phenanthrene, and pyrene). No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-005(c).

4.1.3.4 SWMU 33-011(a), Former Drum Storage Area

Description and History

SWMU 33-011(a) is a former drum storage area located directly south of former building 33-0021 (Figure 4.1-16). This unpaved area occupied 0.25 acre and was used to store 55-gal. drums of waste oil. The drums were stored on pallets or directly on the soil and are present in an aerial photograph taken in 1986 (Koogle and Pouls Engineering 1986, 017907). During the implementation of the Phase I RFI in 1993, the location of SWMU 33-011(a) was being used to store drilling equipment, including drilling pipe associated with the Hot Dry Rock Program.

Previous Investigations

During the Phase I RFI conducted at SWMU 33-011(a) in 1993, three surface samples (0 to 0.5 ft bgs) were collected from three locations based on the former drum storage area location depicted in the 1986 aerial photograph (Koogle and Pouls Engineering 1986, 017907). Samples were field screened for radioactivity and organic chemicals and submitted for analysis of SVOCs and PCBs. One sample also was submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, pesticides, and herbicides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.4.3 of the HIR presents a detailed summary of the screening-level results.

Lead was the only metal detected above the BV in the 1993 Phase I RFI samples. Seventeen organic chemicals [anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene, 4,4'-DDE; 4.4'-DDT; dieldrin; 2,4-endosulfan I; endosulfan II; endrin aldehyde; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene] were detected in the RFI samples. No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-011(a).

4.1.3.5 Proposed Activities for Consolidated Unit 33-005(a)-00

The nature and extent of residual contamination at all four sites of Consolidated Unit 33-005(a)-00 has not been determined. Sixty samples will be collected from three depths (2 to 3 ft, 5 to 6 ft and 8 to 9 ft bgs) from all 14 previous RFI sampling locations (33-01061–33-01068, 33-10170, 33-01072, 33-01073, 33-01076–33-01078) and from 6 new sampling location along the former SWMU 33-005(b) drainline and within the outfall drainage. The sampling intervals are designed to avoid the clean fill placed over the site following the removal of all structures in 1974.

In addition, 10 samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at five locations in the drainage downgradient of the consolidated unit. All samples will be analyzed for metals, VOCs, SVOCs, perchlorate, isotopic uranium, isotopic plutonium, cyanide, and nitrate and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations for four sites in Consolidated Unit 33-005(a)-00 are shown in Figures 4.1-17 and 4.1-18. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.4 AOC 33-008(c), Surface Disposal Area

4.1.4.1 Description and History

AOC 33-008(c) is a former surface disposal area located east of Main Site buildings 33-0039 and 33-0113 outside of the Main Site security fence (Figure 4.1-19). This former disposal site consists of two

areas, one near a culvert discharge where glass bottles and other debris were discovered and the other an area of surface debris situated north of the culvert. The culvert receives stormwater runoff from Main Site, is directly east of building 33-0039, and is located in a drainage channel that leads to a tributary of Chaquehui Canyon. Debris observed included machined metal turnings, cable, glass bottles, and general trash on the ground surface and in the channel downstream of the culvert. The outlines of a possible trenched area are visible in aerial photographs from 1958 (USAF 1958, 015987). A small asphalt pad is located at the west end of the northern area and a partially full bottle was present on the ground surface. In 1999, a best management practice (BMP) was performed and all visible debris was removed from the watercourse (LANL 2000, 068748, p. 5).

4.1.4.2 Previous Investigations

During the 1996 Phase I RFI implemented at AOC 33-008(c), geophysical surveys using metal detection and electromagnetic induction were conducted at the suspected fill areas. Survey results showed the presence of shallow metallic debris but did not indicate the presence of a landfill or buried debris (LANL 1996, 054963, p. 8). Survey results for the trench area did not identify geophysical anomalies. Nine surface samples (0 to 0.5 ft) were collected from nine locations within the three surface debris areas and the drainage channel. Two subsurface samples (0.5 to 0.83 ft and 1 to 1.5 ft bgs) were collected at the culvert and 40 ft downgradient of the culvert. Ten subsurface samples were collected from four boreholes drilled in the area near the culvert (Figure 4.1-19). Samples were collected from depth intervals of 1 to 2 ft, 3 to 5 ft, and 5 to 7 ft bgs from borehole 33-01679; from depth intervals of 0 to 0.5 ft, 1 to 2 ft, and 2 to 4 ft bgs from borehole 33-01680; from depth intervals of 0.5 to 1.25 ft, and 5 to 6 ft bgs from borehole 33-01681; and from depth intervals of 0 to 1 ft and 1 to 2 ft bgs from borehole 33-01682. The samples were screened for inorganic chemicals using an x-ray fluorescence (XRF) spectrometer and submitted for analysis of metals, cyanide, SVOCs, VOCs, and total uranium (LANL 1996, 054963, p. 6). Samples collected during the 1996 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

In 1999, a BMP was performed at AOC 33-008(c) to remove all visible debris from the area and from the water course (LANL 2000, 068748, p. 5). A partially full 55-gal. drum of debris was removed from the area. Two sediment catchments were constructed within the drainage below the culvert to prevent migration of contaminated sediments. The first catchment was constructed 15 ft below the culvert, and the second was constructed 200 ft below the culvert (LANL 1999, 065351, p. 1).

Decision-level data from the 1996 Phase I RFI samples are presented in Tables 4.1-2 and 4.1-3. Inorganic chemicals detected above BVs were aluminum, antimony, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. Aluminum was detected above the tuff BV in one sample and above the sediment BV in one sample. Antimony was detected above the soil BV in two samples, above the tuff sample in one sample, and above the sediment BV in six samples. Arsenic was detected above the sediment BV in five samples. Barium was detected above the sediment BV in five samples and above the tuff BV in one sample. Cadmium was detected above the soil BV in 3 samples, above the tuff BV in 2 samples, and above the sediment BV in 10 samples. Calcium was detected above the sediment BV in two samples. Chromium was detected above the soil BV in two samples, above the tuff BV in three samples, and above the sediment BV in eight samples. Cobalt was detected above the sediment BV in five samples and above the soil BV in three samples. Copper was detected above the soil BV in 4 samples, above the tuff BV in 2 samples, and above the sediment BV in 14 samples. Iron was detected above the soil BV in three samples, above the sediment BV in four samples, and above the tuff BV in one sample. Lead was detected above the soil BV in 3 samples, above the tuff BV in 3 samples, and above the sediment BV in 10 samples. Magnesium was detected above the tuff BV in one sample. Manganese

was detected above the soil BV in three samples and above the sediment BV in four samples. Mercury was detected above the soil BV in 3 samples, above the tuff BV in 2 samples, and above the sediment BV in 11 samples. Nickel was detected above the soil BV in three samples, above the tuff BV in three samples, and above the sediment BV in eight samples. Selenium was detected above the sediment BV in one sample. Silver was detected above the soil BV in 2 samples, above the tuff BV in 1 sample and above the sediment BV in 11 samples. Thallium was detected above soil BV in one sample and above the sediment BV in one sample. Uranium was detected above the soil BV in 6 samples, above the tuff BV in 3 samples, and above the sediment BV in 11 samples. Vanadium was detected above the tuff BV in two samples and above the sediment BV in two samples. Zinc was detected above the soil BV in 3 samples, above the tuff BV in 3 samples, and above the sediment BV in 11 samples. Sampling locations and results for inorganic chemicals above BVs are shown on Plate 6.

Thirty-nine organic chemicals were detected in the 1996 Phase I RFI samples [acenaphthene; acetone; anthracene; azobenzene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; bis(2-ethylhexyl)phthalate; 2-butanone; carbazole; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; dibenzofuran; di-n-butylphthalate; dibenz(a,h)anthracene; 1,4-dichlorobenzene; 2,4-dimethylphenol; fluoranthene; fluorene; 2-hexanone; indeno(1,2,3-cd)pyrene; methylene chloride; 2-methylnaphthalene; 2-methylphenol; 4-methylphenol; naphthalene; phenanthrene; phenol; pyrene; pyridine; TCA; TCE; toluene; 1,2,4-trimethylbenzene; and xylene] were detected. Organic chemicals were detected in 16 samples. Sampling locations and detected results for organic chemicals are shown on Plate 7.

4.1.4.3 Proposed Activities

Any debris in the watercourse and surface areas of the site exposed since 1999 will be removed, characterized, and disposed of in accordance with Laboratory waste management requirements. The lateral and vertical extent of contamination in the areas where surface debris was deposited have not been determined, and the extent of contamination within the watercourse downgradient of the site has not been determined. Within the North Area, 12 samples will be collected from two depths (0 to 1 ft and 5 to 6 ft bgs) from the two former RFI sampling locations (33-01685 and 33-01670) and from four new sampling locations. Within the culvert area, 30 samples will be collected from three depths (0 to 1 ft, 5 to 6 ft, and 9 to 10 ft bgs) from six of the former RFI sampling locations (33-01672, 33-01679, 33-01680, 33-01681, 33-01682, and 33-01684) and from four additional locations downgradient of the area. The samples will be analyzed for metals, cyanide, VOCs, SVOCs, isotopic plutonium, and isotopic uranium and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations for AOC 33-008(c) are shown in Figure 4.1-20. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

In addition, lateral extent of releases from AOC 33-008(c) will be determined by sampling the main drainage channel that collects runoff from Main Site. Ten samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at five locations in the channel downslope of Main Site (see section 4.1.2.6 and Figure 4.1-13). Samples collected from the main drainage channel will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, PCBs, isotopic uranium, isotopic plutonium, and tritium and by gamma spectroscopy. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.5 SWMU 33-011(e), Former Storage Area

4.1.5.1 Description and History

SWMU 33-011(e) is a former drum-storage area located at the south end of TA-33 Main Site, approximately 30 ft northwest of building 33-0022, a former HE storage magazine (Figure 4.1-21). The area is unpaved and gradually slopes to the southwest. Drums containing unknown materials were previously stored at this area. The date the materials were first stored at this site is not known. At the time that the OU 1122 RFI work plan was prepared in 1992, all drums had been removed from the site and the area had been cleared (LANL 1992, 007671, p. 3-25). The site is currently not used.

4.1.5.2 Previous Investigations

Previous environmental investigations at SWMU 33-011(e) include soil sampling that was conducted in 1987. The results of this sampling reported uranium and gamma-emitting radionuclides above background (LANL 1990, 007513).

During the Phase I RFI conducted at SWMU 33-011(e) in 1993, two surface samples (0 to 0.5 ft bgs) were collected from two random locations within a 20- × 100-ft area to the northwest of building 33-0022 where drums were believed to have been stored (LANL 1995, 071262). All samples were submitted for laboratory analysis of uranium and gamma-emitting radionuclides. One sample was also submitted for analysis of herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.5.3 of the HIR presents a detailed summary of the screening-level results.

Uranium was the only inorganic chemical detected above BV in the 1993 Phase I RFI samples. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-011(e).

4.1.5.3 Proposed Activities

The Phase I sampling approach was not adequate to determine the nature and extent of contamination. Samples were collected at only one depth, so vertical extent cannot be determined, and the analytical suite was very limited. The two Phase I RFI sampling locations (33-01084 and 33-01085) within the former storage area will be resampled at greater depths and with an expanded analytical suite to determine vertical extent. Samples will also be collected at two additional locations within the former storage area and four additional locations around the storage area to determine lateral extent. Samples at all eight locations will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. Because the nature of the materials stored at this site is not known, a broad analytical suite is proposed. All samples will be analyzed for metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, isotopic uranium, and tritium, and by gamma spectroscopy. Proposed sampling locations are shown in Figure 4.1-22. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.6 SWMU 33-012(a), Former Storage Area

4.1.6.1 Description and History

SWMU 33-012(a) is a former drum storage area for a machine shop (building 33-0039) (Figure 4.1-23). This storage area is an asphalt pad located on the east side of building 33-0039, between the building and a storage shed. The asphalt pad is approximately 20 ft wide × 20 ft long. The area was used to accumulate 55-gal. drums of solvents and solvent-contaminated oil that potentially may have been

contaminated with PCBs and metals. The drums were placed on pallets or directly on the asphalt pad. The 1990 SWMU report notes the presence of multiple oil stains at this site (LANL 1990, 007513). The 1992 RFI work plan, however, states no evidence of oil staining was found (LANL 1992, 007671). The asphalt pad is level, and the ground surface east of building 33-0039 slopes to the east. The beginning date of operation of the storage area is not known; however, building 33-0039 was constructed in 1951. The storage area was deactivated in 1992 or 1993.

4.1.6.2 Previous Investigations

A Phase I RFI was conducted at SWMU 33-012(a) during 1993 (LANL 1995, 071262). A grid-based radiation survey was conducted and no anomalies were identified. Soil samples were collected at two random locations on the pad and at two locations on the edge of the pad. All samples were collected beneath the asphalt and the depth intervals sampled were 0 to 0.33 ft, 0 to 0.5 ft, 0.5 to 0.8 ft, and 0.8 to 1.2 ft bgs. All samples were submitted for analysis of metals, SVOCs, PCBs, and gamma-emitting radionuclides. One sample was also submitted for analysis of herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.6.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV during the 1993 Phase I RFI were cadmium, chromium, lead, nickel, and zinc. Eleven organic chemicals [Aroclor-1254; benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; bis-(2ethylhexyl)phthalate; chrysene; 4,4'-DDT; fluoranthene; phenanthrene; pyrene; and total PCB] were detected. No radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-012(a).

4.1.6.3 Proposed Activities

Phase I RFI screening-level data showed metals above BVs and detected organic chemicals, primarily PAHs and PCBs. Samples were collected at only one depth beneath the asphalt pad, so additional sampling depths are needed to determine vertical extent. Additional samples are also needed away from the storage pad to determine lateral extent.

To determine lateral extent, RFI sampling locations 33-01086, 33-01087, and 33-01089, where low concentrations of PCBs and elevated metals were previously detected in 1993, along with three new locations next to the pad will be sampled along with one new location downgradient of the site toward the head of the drainage that collects runoff from the site. Samples will be collected at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs and analyzed for TAL metals, VOCs, SVOCs, cyanide, perchlorate, nitrate, isotopic uranium, and PCBs and by gamma spectroscopy. Proposed sampling locations are shown in Figure 4.1-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.7 SWMU 33-016, Sump, Drainline, and Outfall

4.1.7.1 Description and History

SWMU 33-016 is a formerly used sump and associated drainline and outfall at a process bunker (structure 33-0023) located in the southern portion of Main Site (Figure 4.1-25). The concrete sump is 3 ft × 2 ft × 2 ft deep and is located next to the northwest corner of the bunker's exterior wall, near the door. A drainline leads from the sump to an outfall approximately 250 ft southwest of the building to a small side canyon to Chaquehui Canyon. The sump was connected to a sink and floor drain in the bunker, which was constructed in 1950. From 1950 until 1972, the bunker was used as a trim building to prepare propellant charges for gun tests at South Site. Structure 33-0023 was subsequently used until

1994 to store lithologic cores from the Hot Dry Rock Program. In addition to the sink and floor drain, the sump also may have received rainwater and snowmelt. The sump was decommissioned in 1995.

4.1.7.2 Previous Investigations

During the Phase I RFI conducted at SWMU 33-016 in 1993, two liquid and two sludge samples were collected from the sump for waste characterization purposes (LANL 1995, 050113, pp. 53–57). One surface sample (0 to 0.5 ft bgs) and two subsurface samples (3 to 5 ft and 10 to 12 ft bgs) were collected next to the sump from a single borehole advanced to a depth of 12 ft. In addition, four surface samples (0 to 0.5 ft bgs) were collected at and downslope of the outfall, field screened for radioactivity, organic chemicals, and HE, and submitted for analysis of SVOCs and HE. The subsurface samples were also analyzed for VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.7.3 of the HIR presents a detailed summary of the screening-level results.

Two organic chemicals [acetone and bis(2-ethylhexyl)phthalate] were detected in the 1993 Phase I RFI samples.

The voluntary corrective action (VCA) implemented at SWMU 33-016 in 1995 involved removing the contents of the sump, filling the sump with approximately 3 yd^3 of sand and gravel and capping the sump with 1 ft of concrete (LANL 1995, 050113, Addendum 1, pp. 1–2). No decision-level data are available for SWMU 33-016.

4.1.7.3 Proposed Activities

The nature and extent of residual contamination have not been determined for this site. Ten samples will be collected from two depths (0 to 1 ft and 3 to 4 ft beneath the bottom of the sump) from two locations next to the sump and from three locations along the drainline (0 to 1 ft and 3 to 4 ft beneath the bottom of the drainline). In addition, eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at four locations within the outfall and drainage downgradient of the outfall. All sample will be analyzed for metals, VOCs, SVOCs, perchlorate, cyanide, isotopic uranium, and nitrate. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-26. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.8 AOC C-33-001, Former Transformer

4.1.8.1 Description and History

AOC C-33-001 consists of a former electrical transformer (former structure 33-0124) at the TA-33 Main Site (Figure 4.1-27). The transformer was mounted on a 15 ft × 50 ft concrete pad next to the east wall of building 33-0114. The transformer was located next to the northeast wall of building 33-0114 and was bounded by asphalt to the north, east, and south. The pad was enclosed by a fence and accessible only through a locked gate. Because this transformer was placed into service in the 1950s, the oil in the transformer may have contained PCBs. Oil stains were observed on the concrete pad and leaks from the transformer were observed during routine inspections conducted between September 1985 and March 1992. In 1992, the transformer was replaced by a non-PCB transformer. Sampling conducted during transformer replacement was limited to areas where the old transformer had been placed temporarily during removal.

4.1.8.2 Previous Investigations

The 1992 RFI work plan stated that the transformer pad would be cleaned and sampled during transformer replacement and proposed no additional sampling (LANL 1992, 007671, p. 3-26). When it conducted Phase I RFI activities at TA-33 in 1993, the ER Project determined sampling conducted during transformer replacement did not meet RFI objectives. The RFI report, therefore, recommended additional sampling to determine whether historical releases of PCBs had occurred. The proposed sampling included field screening the stained areas on the concrete pad and the soil around the perimeter of the pad. If field screening detected PCBs in soil at the perimeter of the pad, additional screening samples were to be collected at greater distances from the pad until the extent of PCB contamination had been bounded (LANL 1995, 050113, pp. 90–93).

In 1996, sampling was conducted at AOC C-33-001. Five samples were collected and submitted to an off-site laboratory for analysis of PCBs/pesticides (Figure 4.1-27). Confirmation samples collected in 1996 and the analyses requested for the decision-level data are presented in Table 4.1-1. Sampling results have not been presented in a report.

A BMP plan, written and implemented in 1999, consisted of a PCB cleanup conducted using a vacuum system on the asphalt area between buildings 33-0113 and 33-0114. The field team began by vacuuming the area closest to the transformer pads next to building 33-0114 and then continued to pick up sediment present in low-lying depressions on the asphalt. Special emphasis was placed on cracks and potholes that had developed over the years. In addition, the field team followed a low-grade slope from building 33-0114 east between buildings 33-0113 and 33-0039, which could potentially carry off surface sediment during storm events. A total volume of 55-gal. of material was collected.

Decision-level data from the 1996 sampling event are presented in Table 4.1-3. Aroclor-1260 was detected in four soil samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-28. Although these data are of decision-level quality, the sampling depths and locations were not sufficient to define the extent of contamination. As a result, the 1996 sampling locations will be resampled, and the 1996 data will not be used for decision purposes.

4.1.8.3 Proposed Activities

The lateral and vertical extent of PCB contamination have not been determined for this site. A total of 12 samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from the four previous RFI locations (33-01748, 33-01749, 33-01751, and 33-01752) around the concrete pad where the transformer was located and from two additional downgradient locations and analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-29. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.9 AOC C-33-003, Potential Soil Contamination

4.1.9.1 Description and History

AOC C-33-003 consists of two fill areas located at the Main Site area of TA-33 (Figure 4.1-30). This fill was used to level sites for two portable trailers. One of the trailers (structure 33-169) was installed next to the Main Site water tower. The filled area to accommodate trailer 33-0169 is approximately 100 ft × 100 ft × 4 ft deep. The other trailer (structure 33-0170) was installed north of building 33-0114. The filled area to accommodate trailer 33-0170 is approximately 70 ft × 90 ft × 7 ft deep. Both trailers were installed in January 1984 and removed in June 1988. After the trailers were removed, no further improvements were made to these sites. Three projectiles, one of which contained uranium, were discovered at the fill

area near the water tower during brush-clearing activities conducted during the spring of 1996. The source of these projectiles appears to have been the fill material that had been obtained from the cinder cone located in Area 6, just west of Main Site. Projectiles historically were fired into the base of the cinder cone during experiments conducted at the Area 6 firing area [SWMU 33-007(c)].

4.1.9.2 Previous Investigations

Previous environmental investigations at AOC C-33-003 include geophysical investigations conducted at both fill areas in 1997. The results of these surveys included anomalies that may have been indicative of other projectiles. AOC C-33-003 was not included in the RFI work plan for TA-33 because it was discovered after the work plan had been prepared.

A VCA was implemented at AOC C-33-003 in 1999 (LANL 1999, 063678). Fill material was excavated until native soil or tuff was encountered. A total of 408.5 yd^3 of fill material was excavated. Radiation surveys of the excavated areas showed no readings greater than 2 times background. Confirmation samples were collected to verify cleanup levels had been achieved. Confirmation samples consisted of a surface and subsurface sample collected at each of four locations at each site (Figure 4.1-30) and submitted for laboratory analysis of metals, isotopic uranium, and organic chemicals. Two additional samples were collected from the drainage at the site near the water tower (there is no drainage at the other filled area) and submitted for laboratory analysis of metals and isotopic uranium. The excavated material was transported to a Segmented Gate System (SGS) treatment plant, where radioactive materials were separated from the fill. A total of 1.45 yd^3 of contaminated fill was separated and disposed of as LLW at MDA G at TA-54. Three samples of the treated fill were collected to verify decontamination. Two of these samples were submitted for laboratory analysis of metals, total uranium, tritium, and organic chemicals. The third sample was submitted for analysis of isotopic uranium and organic chemicals. The decontaminated fill was then returned to the site, and the site was restored and revegetated (LANL 2000, 066889, pp. 22–35). Confirmation samples collected during the 1999 VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the 1999 VCA confirmation samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Metals detected above BVs in the confirmation samples from the excavated areas were antimony, barium, calcium, cobalt, copper, lead, magnesium, nickel, and selenium. Antimony was detected above the soil BV in seven samples and above the sediment BV in one sample. Barium was detected above the tuff BV in five samples and above the sediment BV in one sample. Calcium was detected above the soil BV in three samples, above the tuff BV in two samples, and above the sediment BV in one sample. Cobalt was detected above the soil BV in four samples, above the tuff BV in one sample, and above the sediment BV in two samples. Copper was detected above the soil BV in four samples, above the tuff BV in eight samples, and above the sediment BV in two samples. Lead was detected above the tuff BV in two samples and above the sediment BV in two samples. Magnesium was detected above the soil BV in six samples and above the sediment BV in two samples. Nickel was detected above the soil BV in six samples and above the sediment BV in two samples. Selenium was detected above the soil BV in one sample, above the tuff BV in two samples, and above the sediment BV in two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-31.

Eighteen organic chemicals were detected in confirmation samples from the excavated areas: acenaphthene; anthracene; benzene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; phenanthrene; pyrene; toluene; and TCE. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-32.

Radionuclides detected above BVs in the confirmation samples from the excavated areas were uranium-234 and uranium-238; both radionuclides were detected above the soil BVs in two soil samples. Sampling locations and results for radionuclides detected above BVs/FVs are shown in Figure 4.1-33.

Although the 1999 VCA data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. As a result, the VCA sampling locations will be resampled, and the VCA data will not be used for decision purposes.

4.1.9.3 Proposed Activities

The lateral and vertical extent of residual contamination have not been determined at this site. Seventy-eight samples will be collected from three depths (0 to 1 ft and 4 to 5 ft bgs, and 0 to 1 ft into the tuff) from the 10 previous confirmation sampling locations (33-01708 through 33-01717) and 16 new sampling locations within and downgradient of the two AOC C-33-003 fill areas. In addition, six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at three locations in the drainage channel downgradient of the southwest fill area (next to the water tower). Samples will be analyzed for metals, isotopic uranium, perchlorate, cyanide, nitrate, VOCs, and SVOCs and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figures 4.1-34 and 4.1-35. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

Data from the six sampling locations in the drainage downgradient of SWMU 33-004(d) will also be used to determine extent (see section 4.2.1.3 and Figures 4.1-35 and 4.2-2).

4.2 Sites under Investigation at Area 6

4.2.1 SWMU 33-004(d), Septic System

4.2.1.1 Description and History

SWMU 33-004(d) consists of an abandoned septic tank (structure 33-0121) and associated drainline and drain field located at Area 6 (Figure 4.2-1). Septic tank 33-0121 is located approximately 100 ft east of building 33-0016. The septic tank is constructed of corrugated iron and has a capacity of 500 gal. Septic tank 33-0121 received wastewater from a toilet and sink in a former laboratory building (33-0001). Building 33-0001 and associated machine shop building 33-0002 were built on skids and moved on site sometime in 1946 or 1947 (Ahlquist 1983, 006854). Although use of building 33-0001 was discontinued in 1991 and the building was removed in 1994, the septic tank is still in place. While building 33-0001 was occupied, effluent was discharged from the septic tank to a drain field located approximately 20 ft east of the tank. The drain field is constructed of a single row of vitrified-clay tiles installed in gravel approximately 5 ft below grade. The RFI work plan (LANL 1992, 007671) states an outfall from the drain field was buried in a side wash of Chaquehui Canyon. Land surface at the tank location slopes east approximately 200 ft to a shallow drainage eroded into the bedrock that flows south.

Building 33-0001 was used from 1948 to 1955 to support nonexplosive initiator tests conducted at Area 6. In 1958, the building was used to grow crystals of potassium niobate and possibly other types of crystals (aluminates, titanates, tungstates, etc.) (Schulte 1958, 007946). Silver plating was also reportedly performed in this building (Ahlquist 1983, 006854). Later, building 33-0001 was used as office space and for storage until use of the building was discontinued in 1991. A 1993 study of drains and discharges at TA-33 identified the only discharges to the septic system were from a lavatory, toilet, and sink drain (Santa Fe Engineering 1993, 062036, Table 1).

4.2.1.2 Previous Investigations

A Phase I RFI was conducted at SWMU 33-004(d) in 1993 (LANL 1995, 071262). The RFI work plan specified sampling the contents of the tank. At the time of the investigation, however, the tank was dry and samples could not be collected. Three shallow (7 to 8 ft bgs) boreholes were sampled during the investigation. One borehole was placed next to the tank, and two were placed downslope of the tank along the line of drain tiles. At each borehole, samples were collected at the surface (0 to 0.2 ft or 0 to 0.5 ft bgs) and at two subsurface intervals samples (3 to 5 ft, 4.5 to 5 ft, 6.3 to 8 ft, 6.5 to 7 ft, or 7.5 to 8 ft bgs). A total of three surface and six subsurface samples were collected. Six additional surface samples (0 to 0.5 ft bgs) were collected at six locations on the slope below the outfall and along the drainage. All samples were submitted for laboratory analysis of metals, cyanide, uranium, SVOCs, and gamma-emitting radionuclides. Four of the samples from the boreholes along the drainlines were also submitted for analysis of VOCs. The two subsurface samples from the borehole nearest the septic tank were later resampled and submitted for laboratory analysis of VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.1.3 of the HIR presents a detailed summary of the screening-level results.

Inorganic chemicals detected above BV during the 1993 Phase I RFI were cadmium, cyanide, lead, nickel, uranium, and zinc. Four organic chemicals (acetone, fluoranthene, phenanthrene, and pyrene) were detected. No radionuclides were detected or detected above BVs/FVs. Decision-level data for SWMU 33-004(d) are not available.

4.2.1.3 Proposed Activities

The septic tank is no longer needed so it will be removed and the drainlines plugged. After the tank is removed, samples will be collected to characterize any remaining contamination. Six samples will be collected from two depths at one location within the excavation at a location beneath the former tank, one location beneath of inlet to the tank, and one location beneath the outlet of the tank at depths of 0 to 1 ft and 3 to 4 ft below the bottom of the excavation and the bottom of the inlet and outlet. Because sampling was not previously conducted below the drainline between building 33-0001 and the septic tank, one location along this inlet drainline will be sampled at depths of 0 to 1 and 3 to 4 ft below the drainline.

Data from the Phase I RFI samples collected in the drain field showed only sporadic detections of inorganic and organic chemicals. These data are screening-level data, however, and cannot be used to define extent. These locations (33-01183 and 33-01184) will be resampled at the two deepest and one additional depth to define vertical extent. Samples will be collected at depths of 4 to 5 ft, 7 to 8 ft, and 9 to 10 ft bgs.

Data from the Phase I RFI samples collected on the slope below the outfall and along the drainage channel show decreasing concentrations downslope, but these data cannot be used to determine extent because they are screening-level data. Also, samples were collected at only one depth. These locations (33-01185, 33-01186, 33-01187, 33-01189, 33-01190, and 33-01191) will be sampled along with two additional locations at depths of 0 to 1 ft and 2 to 3 ft bgs to determine lateral and vertical extent of contamination.

All samples for SWMU 33-004(d) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, and isotopic uranium and by gamma spectroscopy. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.2 Consolidated Unit 33-004(g)-00, Area 6 Firing Site

Consolidated Unit 33-004(g)-00 consists of SWMUs 33-004(g) and 33-007(c), an outfall and firing areas, respectively. These SWMUs are located in the northwest corner of TA-33 (Figure 4.2-1) and are associated with past activities in Area 6, including initiator tests conducted from 1949 to 1955.

4.2.2.1 SWMU 33-004(g), Drainline and Outfall

Description and History

SWMU 33-004(g) is an outfall and associated drainline that discharged wastewater from building 33-0016. The outfall is located at the end of a VCP that runs west approximately 50 ft from the northwest corner of building 33-0016 (Figure 4.2-1). The pipe daylights at the edge of a level area above a drainage channel that leads to a tributary of Chaquehui Canyon. The ground surface below the outfall slopes steeply down to the tributary channel, which is approximately 70 ft lower than the outfall. A culvert under a roadway, approximately 60 ft southwest of the outfall, receives runoff from most of the paved portion of Area 6. Building 33-0016 was constructed in 1949 as a gun building for initiator tests. It housed a gas gun that was used to fire projectiles as well as electronic equipment used to measure neutron production. Large-bore (2-in. to 5-in.-diameter) guns were also mounted on concrete pads around building 33-0016 and used to fire projectiles containing initiator test assemblies. These activities continued until 1955. Photographs may have been developed in building 33-0016 or in a small trailer parked next to the drainage from the site (LANL 1992, 071262, p. 57). In 1956, building 33-0016 was used to make and machine laminating materials that contained barium, lead, titanium, and zinc (Milford 1956, 007934). Toxic fumes were reportedly released from a fume hood in the building used to cure epoxy resins (Hyatt 1957, 007939). Building 33-0016 later was used as a library and storage building and has been empty since 1991. A study of drains and discharges at TA-33 was conducted to identify all sources of discharges from TA-33 buildings. This study identified no discharges from building 33-0016 (Santa Fe Engineering 1993, 062036, p. 4). Thus, the source of the discharge from the SWMU 33-004(g) outfall is not known.

A long-time TA-33 staff member reported that the drainline from building 33-0016 also served two trailers that were parked on the pad north of the building when Area 6 was occupied. One trailer was used for assembly and the other contained a darkroom (Hoard 1991, 009734).

Previous Investigations

A Phase I RFI was conducted at SWMU 33-004(g) in 1993 (LANL 1992, 007671). The outfall was located and surface samples (0 to 0.5 ft bgs) were collected at the outfall and at three locations downstream of the outfall. Downstream sampling locations were in sediment traps in the drainage channel that leads to the tributary channel and were approximately 100 ft apart. Another surface sample (0 to 0.5 ft bgs) was collected at the culvert discharge point southwest of the outfall for a total of five samples. All samples were submitted for laboratory analysis of metals, uranium, SVOCs, HE, and gamma-emitting radionuclides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.2.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 Phase I RFI samples were barium, cadmium, lead, nickel, silver, uranium, and zinc. The only organic chemical detected was bis(2-ethylhexyl)phthalate. No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-004(g).

Proposed Activities

Data from the Phase I RFI samples collected at SWMU 33-004(g) showed concentrations of metals decreased with distance downslope from the outfall and culvert. Therefore, the Phase I sampling locations should be sufficient to define nature and extent. Phase I samples were collected only at the surface, and additional sampling depths are needed to determine vertical extent. The five Phase I sampling locations (33-01192–33-01196) will be resampled. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs at each location and analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium and by gamma spectroscopy. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.2.2 SWMU 33-007(c), Firing Sites

Description and History

SWMU 33-007(c) consists of abandoned firing sites associated with the initiator tests conducted at Area 6. The firing sites included firing pads and two catcher boxes (Figure 4.2-1). One pad was located immediately west of building 33-0016. The catcher boxes were located approximately 20 ft south of building 33-0016 and were approximately 6 ft × 6 ft, constructed of timber, and filled with soil, wood chips, and vermiculite. Guns (2-in. to 5-in. bore) were placed on the concrete pads and used to fire projectiles containing test assemblies into targets placed in front of the catcher boxes. Materials used in the projectiles included beryllium, polonium-210, uranium, copper, lead, tungsten, and stainless steel (Hoard 1991, 009733). The projectiles frequently cracked open, contaminating the pads and surrounding area with polonium-210. Contaminated areas on the guns and pads were painted with lead-based paint to fix surface contamination (LANL 1992, 007671, p. 3-42).

Several other firing pads were on a level area excavated into a basaltic cinder cone southwest of building 33-0016. This area was used to test nuclear gun mock-ups (Hoard 1991, 009733). A 4-in. to 5-in. bore gun was used to fire projectiles into the back of the excavation. The back of the excavation currently extends about 75 ft farther back than when the site was used (Hoard 1991, 009734).

A 1951 memorandum describes a test at Area 6 that resulted in leakage of radioactive material from a projectile. The site was cleaned up by using a bulldozer to scrap away the contaminated soil and embankment (Buckland 1951, 007845). A 1954 memorandum describes decontamination of one of the Area 6 gun barrels. The memorandum describes removing loose material and leaving impregnated spots as high as 1 million counts per minute. Contaminated surface dirt was bulldozed from the shot area into the adjacent canyon (LASL 1954, 107465).

Previous Investigations

A Phase I RFI was conducted at SWMU 33-007(c) in 1993 (LANL 1992, 007671). Fourteen surface samples (0 to 0.5 ft bgs) were collected from 14 locations around the firing areas (Figure 4.2-1) and submitted for laboratory analysis of metals, HE, and gamma-emitting radionuclides; all but one of the samples were also submitted for uranium analysis. In addition, three samples were submitted for analysis of herbicides, two for pesticides, and two for PCBs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.2.2.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BVs during the 1993 RFI sampling were arsenic, barium, beryllium, cadmium, chromium, lead, nickel, uranium, and zinc. Three organic chemicals (Aroclor-1254; Aroclor-1260; and

2,4-dichlorophenoxyacetic acid) were detected. No radionuclides were detected or detected above BVs/FVs.

Additional RFI activities were conducted in 1994, including trenching through the catcher-box area. Chunks of uranium and several experimental devices were discovered during trenching. No external radiation was measured from the experimental devices. Eight soil samples were collected from six locations within the trench (4 ft bgs), and one additional soil sample was collected next to the trench (4 ft bgs) and submitted for laboratory analysis of metals and uranium; three samples were also analyzed for isotopic uranium. Data from the 1994 Phase I RFI showed metals detected above BVs and isotopes of uranium detected above BV. Because these sampling locations were subsequently excavated during the 1996 VCA described below, the data are summarized below but are not included in the HIR.

Metals detected above BV in the 1994 catcher-box trench samples were cadmium, lead, mercury, nickel, selenium, uranium, and zinc. Cadmium and uranium were each detected above the soil BV in eight samples. Lead and zinc were each detected above the soil BV in one sample. Mercury and nickel were each detected above the soil BV in five samples. Selenium was detected above the soil BV in three samples. No radionuclides were detected above the BVs/FVs for soil.

Based on the results of the RFI, an IA was conducted at SWMU 33-007(c) in 1995 (LANL 1996, 052919). The IA involved stabilizing the site to prevent migration of the contamination identified during the RFI. A high-density polyethylene (HDPE) cover was placed over the catcher boxes to prevent run-on and runoff of precipitation. Additionally, the culvert west of building 33-0016 was dammed with sandbags to prevent water from entering the culvert.

In April and May 1996, a pilot test of the SGS and containerized vat leach (CVL) system was conducted using the soil in the catcher boxes. The SGS unit was used to radiologically screen the soil in the catcher boxes and separate the soil into clean and contaminated fractions. The CVL was then used to treat the contaminated soil by leaching uranium from the soil. Approximately 200 yd^3 of soil was removed from the catcher boxes and processed. Fifty-six experimental projectiles totaling 1720 lb were discovered as the soil was screened before it was placed in the SGS. These projectiles were stored pending final disposition.

In conjunction with the pilot test, a VCA plan for SWMU 33-007(c) was prepared in 1996 (LANL 1996, 054906). The objective of the VCA was to verify the effectiveness of the SGS and CVL processes for remediating uranium-contaminated soil. The VCA plan also included developing cleanup levels for uranium-contaminated soil.

The VCA was implemented during 1996 (LANL 1996, 062541). The clean soil separated using the SGS was sampled to determine whether it met cleanup levels. Thirteen samples were collected from the stockpile of clean soil processed through the SGS. An additional eight confirmation samples were collected from the bottoms and sides of the catcher-box excavations (Figure 4.2-1). All samples were submitted for laboratory analysis of isotopic uranium. After sampling confirmed the clean soil met cleanup levels, it was returned to the site. The projectiles previously placed into storage were characterized and disposed of as LLW. Confirmation samples collected in 1996 and the analyses requested for the decision-level data are presented in Table 4.2-1.

No uranium isotopes were detected above BV in any of the confirmation samples collected from the bottoms and sides of the excavation. Sampling performed on the clean soil pile determined 95% upper confidence bounds on the mean activity of uranium-234, uranium-235, and uranium-238 to be 15.8 pCi/g, 0.515 pCi/g, and 15.7 pCi/g, respectively (LANL 1996, 062541, p. 14); these values are all substantially below the respective cleanup levels of 114 pCi/g, 72 pCi/g, and 116 pCi/g.

Proposed Activities

The 1993 Phase I RFI sampling performed around the firing site near building 33-0016 showed sporadic detections of metals at concentrations approximately 2 times BVs or less. Organic chemicals were detected infrequently, although not all samples were analyzed for organic chemicals. Higher concentrations of metals were detected in the 1994 catcher-box samples. This soil was subsequently treated using the SGS and returned to the site, but confirmation sampling did not include analysis for metals.

Based on these results, samples will be collected from within the footprint of the catcher boxes and outside the catcher boxes to determine nature and extent. Samples will be collected at three locations where the catcher boxes were previously located. At each location, samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs into the treated soil backfill and 0 to 1 ft bgs into undisturbed tuff below the treated soil. Samples will also be collected at four locations around the former catcher boxes, outside the area of treated soil. At each location, samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, and isotopic uranium. Twenty percent of the samples will also be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

The 1993 Phase I RFI sampling of the cinder cone firing area showed the highest concentrations of metals within the cinder cone against the wall of the excavation. Concentrations generally decreased away from this location and down the slope to the west. The only organic chemicals detected were PCBs, which were detected at low concentrations on the slope, and which may be associated with SWMU 33-009. Phase I RFI sampling locations within and around the cinder cone to the edge of the slope will be resampled to characterize current conditions and to define vertical extent at these locations. Lateral extent of contamination from this site will be determined using the results of sampling on the slope and drainage to the west to be performed for SWMU 33-009.

The following Phase I RFI locations will be resampled: 33-01199, 33-01203, 33-01204, 33-01206, 33-01211, and 33-01212 at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs at each location. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.3 SWMU 33-009, Surface Disposal Area

4.2.3.1 Description and History

SWMU 33-009 is a former surface disposal area located in Area 6, west of the TA-33 Main Site (Figure 4.2-1). The disposal site includes an area approximately 100 ft long × 75 ft wide that has been leveled into the side of a natural basaltic cinder cone as well as an area that extends approximately 80 ft down the slope of the cinder cone. The slope continues below the disposal site until it reaches a tributary of Chaquehui Canyon. The debris within this surface disposal area is believed to be associated with the activities at a nearby gun-firing site [SWMU 33-007(c)]. This gun-firing site operated from 1949 until 1955. When the firing area became contaminated as a result of firing activities, contaminated soil and debris was bulldozed over the edge of the canyon. SWMU 33-009 also received various debris from general operations at TA-33, including metal wastes, light bulbs, tires, and drums. In 1960, the site received uranium turnings from the building 33-0113 machine shop. In addition, from 1967 until 1972, the site served as a storage and disposal site for defective electrical capacitors from the Sherwood Project. These capacitors had an average weight of 300 lb and were about 4 to 6 ft^3 in volume (Reider 1967, 007471).

Disposal of the capacitors at this site ceased in 1972, at which time defective capacitors were sent to Area L at TA-54 for disposal (Reider 1972, 008204).

In December 1974, the site was partially cleaned up as part of general cleanup activities conducted at TA-33. Several truck loads of material were taken to MDA G for disposal. Material removed from the site included DU pieces, electrical capacitors, metal turnings, old tires, and fluorescent light tubes (Ahlquist 1983, 006854). A radiation survey was performed after the cleanup. The area was surveyed at intervals of about 10 ft across the slope and 16 ft up and down the slope. Radiation above background was not detected (Smith 1974, 006911). Not all material was removed in 1974. Broken glass and chunks of metal were still present when the RFI was conducted in 1993. An empty capacitor containing small amounts of PCB-contaminated oil was also discovered partially buried on the site in 1994 and was removed (LANL 1995, 071300, p. 38).

4.2.3.2 Previous Investigations

During the 1993 Phase I RFI conducted at SWMU 33-009, a geophysical survey that used magnetic and electromagnetic methods detected no anomalies that could not be attributed to site features (LANL 1995, 071300). Six surface samples (0 to 0.5 ft) were collected from six locations in the former disposal area, and four surface samples (0 to 0.5 ft) were collected from four locations in the drainage channel downslope of the disposal area. All samples were submitted for laboratory analysis of metals, uranium, SVOCs, PCBs, and gamma-emitting radionuclides. One of the disposal area samples was also submitted for analysis of herbicides and pesticides. The four drainage samples also were submitted for HE analysis. When the capacitor was discovered on the hillside in 1994, a sample of the soil beneath the capacitor was collected and submitted for laboratory analysis of PCBs. Two samples of the residual oil inside the capacitor were also collected and submitted for PCB analysis. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.3.3 of the HIR presents a detailed summary of the screening-level results. The 1994 sampling of the soil beneath the capacitor was performed by Laboratory PCB waste management staff, and the data are summarized below but are not included in the HIR.

Metals detected above BVs during the 1993 Phase RFI were cadmium, lead, nickel, uranium, and zinc. Aroclor-1254 was the only organic chemical detected. No radionuclides were detected or detected above BVs/FVs.

Aroclor-1254 was the only organic chemical detected in the 1994 soil sample collected beneath the capacitor. Decision-level data are not available for SWMU 33-009.

4.2.3.3 Proposed Activities

PCBs were detected in only one of the Phase I RFI samples collected on the cinder cone slope. This location was near the top of the slope where the capacitors had been disposed of. PCBs were also detected on the slope at the location of the capacitor that was discovered in 1994 but not in Phase I RFI samples downslope of this location. Contamination on the cinder cone slope will be characterized by collecting samples from two transects across the slope. The first transect will be located approximately 50 ft below the edge of the mesa, approximately where PCBs were detected during the Phase I RFI. The second transect will be midway between the first transect and the drainage channel at the bottom of the slope. Samples will be collected at five locations along each transect. At each location, samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling

locations, depths, and analytical suites. These samples will also serve to characterize releases from SWMU 33-007(c).

Data from the Phase I RFI samples collected in the drainage below the cinder cone slope at SWMU 33-009 showed concentrations of PCBs to decrease with distance down the site drainage. However, metals above BVs and PCBs were detected in the most downstream sample. Therefore, additional samples farther down the site drainage than the Phase I sampling locations are needed to define lateral extent. Samples will be collected from six locations in the drainage channel. At each location, samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium. Proposed sampling locations are shown in Figure 4.2-2, and samples and analyses are summarized in Table 4.0-1. These samples will also serve to characterize extent of releases from SWMUs 33-004(g) and 33-007(c).

4.3 Sites under Investigation at South Site

This section provides descriptions and history of each of the sites being investigated at TA-33 South Site, along with descriptions and results of previous investigations, and the proposed investigations. A summary of decision-level samples collected and analyses requested during previous investigations is presented in Table 4.3-1. Inorganic chemicals above BVs in previous decision-level samples are presented in Table 4.3-2. Organic chemicals detected in previous decision-level samples are presented in Table 4.3-3. Radionuclides detected or detected above BVs/FVs in previous decision-level samples are presented in Table 4.3-4. Figures 4.3-1 through 4.3-26 show the site features, historical sampling locations, inorganic and organic chemicals and radionuclides detected above background, and the locations proposed for sampling in this work plan.

4.3.1 Consolidated Unit 33-001(a)-99, MDA E

Consolidated Unit 33-001(a)-99, which consists of SWMUs 33-001(a–e), is collectively referred to as MDA E. The SWMUs in this consolidated unit consist of waste disposal pits and an underground test chamber and shaft. This consolidated unit is located at the south end of TA-33 near the edge of Chaquehui Canyon. It occupies an area approximately 140 ft × 220 ft and is enclosed by an 8-ft fence (Figure 4.3-1).

SWMUs 33-001(a–d) are abandoned waste disposal pits 1 through 4, respectively. SWMU 33-001(e) is a former test chamber (structure 33-0029) and shaft (structure 33-0003). The test chamber and shaft were abandoned in place in April 1950 and use of the disposal pits ceased in 1963. Two additional pits (pits 5 and 6) are located within the fenced area of MDA E. No documentation indicates if pits 5 and 6 were ever used, and they are not designated as SWMUs or AOCs. Based upon 1962 recommendations, radiation control area signs were posted around the fenced sides of MDA E, pit 2 was covered with approximately 2 ft of dirt, and all excess equipment and debris were removed from the site (Rogers 1977, 005708, p. E-5). Currently, MDA E is surrounded by a fence, and the area is vegetated with trees, shrubs, and grasses.

4.3.1.1 Description and History

SWMU 33-001(a), Disposal Pit 1

SWMU 33-001(a), disposal pit 1, is located inside the western edge of the fenced area of MDA E (Figure 4.3-1). The pit dimensions are approximately 15 ft × 75 ft × 7 ft deep. Documentation indicates that pit 1 contains polonium-beryllium contaminated targets. The pit may also contain spent projectiles,

uranium components, beryllium, and explosive test shot debris. The pit was backfilled and compacted in 1963 (Rogers 1977, 005708, p. E-1).

SWMU 33-001(b), Disposal Pit 2

SWMU 33-001(b), disposal pit 2, is located along the southern edge of the fenced area of MDA E (Figure 4.3-1). Pit dimensions are approximately 15 ft × 45 ft × 7 ft deep. Explosive test shot debris and a spent explosives device were buried in pit 2. According to engineering drawing R-3644, pit 2 was open in November 1962 and was backfilled sometime during 1963 (Rogers 1977, 005708, p. E-1).

SWMU 33-001(c), Disposal Pit 3

SWMU 33-001(c), disposal pit 3, is located near the southeast corner of the fenced area of MDA E (Figure 4.3-1). Pit dimensions are approximately 5 ft in diameter and 7 ft deep. Pit 3 reportedly contains a can of beryllium dust immersed in kerosene (Rogers 1977, 005708, p. E-1) and may have contained other explosive test shot debris. Pit 3 was closed in September 1951 and backfilled.

SWMU 33-001(d), Disposal Pit 4

SWMU 33-001(d), disposal pit 4, is located along the east fence line of MDA E (Figure 4.3-1). The pit dimensions are approximately 15 ft × 100 ft × 7 ft deep. Pit 4 contains explosive test shot debris, a spent explosives device, and miscellaneous radioactive material (Rogers 1977, 005708, p. E-1). According to Rogers (1977, 005708, p. E-1), pit 4 was still used for disposal during the 1960s. It was backfilled sometime before 1977.

SWMU 33-001(e), Shot Chamber

SWMU 33-001(e) consists of an underground chamber, designated chamber 3 (structure 33-0029), and an associated underground elevator shaft (structure 33-0003) (Figure 4.3-1). A portable cable building (33-0030) was attached to the elevator shaft and housed electrical and ventilation equipment for both the chamber and the shaft. The chamber and shaft were constructed between 1949 and 1950. The chamber was constructed of 2-ft-thick concrete walls, and its dimensions were 11 ft ×14 ft. The chamber was situated 46 ft bgs. The elevator shaft was constructed of wood, iron, and concrete, and its dimensions were 6 ft × 8 ft × 60 ft tall. The bottom of the shaft was 48 ft bgs. Chamber 33-0029 collapsed during an experiment conducted in April 1950 and was left in place. According to engineering drawing R-152, the portable cable building and the aboveground portions of the elevator shaft were removed in 1954. The chamber was used to conduct tests involving explosives, beryllium, and tungsten (LANL 1992, 007671, p. 3-51).

4.3.1.2 Previous Investigations

The Laboratory's Environmental Surveillance Program conducted surface and subsurface sampling at MDA E in 1982 and 1983; additional subsurface sampling was conducted in 1989 (LANL 1992, 007671, pp. 3-55–3-60). These sampling efforts were undertaken to determine whether releases from MDA E had occurred. In 1982, samples were collected from two 50-ft boreholes located outside the MDA E fence at multiple depth intervals (0 to 3 ft, 3 to 8 ft, 8 to 13 ft, 13 to 18 ft, 18 to 23 ft, 23 to 28 ft, 28 to 33 ft, 33 to 38 ft, 38 to 43 ft, and 43 to 48 ft bgs) and analyzed for tritium, uranium, and cesium-137. Tritium was detected in four samples, but these results were suspect because of the low moisture content of the samples. Uranium was detected above the BV in all 20 samples and cesium-137 was detected slightly above the FV in 5 samples. In 1983, 90 surface samples were collected within MDA E from 45 random

locations on a 30-ft × 30-ft sampling grid. Samples were collected from intervals of 0 to 0.4 in. and 0.4 to 2.5 in. and analyzed for tritium, uranium, and cesium-137. Tritium and uranium were detected or detected above the soil BV in 88 of the 90 samples, and cesium-137 was detected above the soil FV in 8 samples. In 1989, six boreholes were advanced within MDA E to depths ranging from 9 ft to 59 ft bgs. Nineteen samples were collected from numerous depths (4 ft, 9 ft, 13 ft, 14 ft, 28 ft, 29 ft, 44 ft, 54 ft, and 59 ft bgs) and analyzed for tritium, uranium, and lead (LANL 1992, 007671, pp. 3-55–3-60). Tritium was detected in all but one sample. Uranium was detected above the BV in 16 samples, and lead was detected above the BV in 3 samples from one borehole (LANL 1992, 007671, pp. 3-56, 3-60).

As part of 1996 Phase I RFI activities performed at South Site, two boreholes were drilled within the fenced area at MDA E. Each borehole was drill to 40 ft bgs, and four samples were collected from each borehole. Samples were collected from 1.7 to 1.9 ft, 17 to 17.4 ft, 24 to 25 ft, and 39 to 40 ft bgs in the first borehole and from 1 to 2 ft, 14 to 15 ft, 24 to 25 ft, and 39 to 40 ft bgs in the second borehole. All samples were submitted for laboratory analysis of HE, metals, VOCs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, and tritium. Samples collected during the 1996 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1996 Phase I RFI samples are presented in Tables 4.3-2, 4.3-3, and 4.3-4. Inorganic chemicals detected above soil BVs included calcium, selenium, and uranium. Calcium was detected above the soil BV in one sample and above the tuff BV in one sample. Selenium was detected above the soil BV in one sample. Uranium was detected above the tuff BV in two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-2.

Six organic chemicals [acetone; bis(2-ethylhexyl)phthalate; naphthalene; toluene; 1,2,3-trichlorobenzene; and 1,3,5-trinitrobenzene] were detected in the RFI samples. Toluene; 1,2,3-trichlorobenzene; and 1,2,4-trichlorobenzene were each detected in one soil sample. Acetone was detected in two tuff samples. Naphthalene was detected in one soil sample and one tuff sample. Bis(2-ethylhexyl)phthalate was detected in one soil sample and four tuff samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.3-3. Tritium was detected in two soil samples and six tuff samples. Sampling locations and detected results for radionuclides are shown in Figure 4.3-4.

4.3.1.3 Proposed Activities

To determine if any releases have occurred from any of the SWMUs within MDA E, one borehole will be drilled to a minimum depth of 70 ft bgs (or until field radiological and VOC screening indicates no detects above background) directly adjacent to the outside edge of each SWMU [adjacent to the western edge of disposal pit 1 [SWMU 33-001(a)], directly next to the southern edge of disposal pit 2 [SWMU 33-001(b)], directly next to the southeastern edge of disposal pit 3 [SWMU 33-001(c)], directly next to the eastern edge of disposal pit 3 [SWMU 33-001(d)], and directly next to the northern edge of chamber 3 and the associated shaft [SWMU 33-001(e)]. The fence may need to be rolled back to allow access to each site. Samples will be collected at 10-ft intervals and analyzed for isotopic uranium, isotopic plutonium, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, metals, and tritium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-5. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.2 SWMU 33-004(b), Septic System

4.3.2.1 Description and History

SWMU 33-004(b) consists of an abandoned septic tank (structure 33-0033) and its associated drainline and outfall located at South Site (Figure 4.3-6). This septic tank received wastewater from building 33-0024, a control building constructed in 1949 to support experiments conducted at underground chamber 33-0029 [SWMU 33-001(e)] and possibly at firing pad 33-0026 [SWMU 33-006(a)]. The septic tank had a capacity of 730 gal. and is located approximately 300 ft south of building 33-0024. The tank was connected to building 33-0024 with a 6-in.-diameter steel pipe. A 6-in.-diameter steel pipe connected the septic tank to an outfall located approximately 35 ft southwest of the tank (LANL 1995, 051903, p. 37). The outfall is situated on the southern rim of Chaquehui Canyon. Building 33-0024 housed a darkroom and electronic equipment and was also used for storage. There is no documented historical use of hazardous or radioactive materials within building 33-0024, although photographic chemicals were likely used (LANL 1992, 007671, p. 3-52).

4.3.2.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-004(b), one surface sample (0 to 0.5 ft) and two subsurface samples (3.5 to 4 ft and 5 to 6 ft bgs) were collected at a location approximately 5 ft south of the septic tank. Three surface samples (0 to 0.5 ft) were collected at three locations at and downslope of the outfall. Liquid and sludge were not present in the tank. One sediment sample was collected from the bottom of the tank. Samples were field screened for radioactivity and organic chemicals and submitted for laboratory analysis of metals, cyanide, VOCs, SVOCs, and cesium-137. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.2.3 of the HIR presents a detailed summary of the screening-level results.

Inorganic chemicals detected above BV in the Phase I RFI soil or tuff samples were aluminum, barium, calcium, chromium, copper, cyanide, iron, lead, magnesium, silver, and uranium. Six organic chemicals were detected [benzo(b)fluoranthene, di-n-butylphthalate, fluoranthene, methylene chloride phenanthrene, and pyrene]. Cesium-137 was the only radionuclide detected or detected above BV/FV in soil or two tuff samples. Arsenic, chromium, copper, cyanide, lead, nickel, mercury, silver, and zinc were detected in the septic tanks contents along with 11 organic chemicals [acetone; anthracene; benzo(a)anthracene; benzo[b]fluoranthene; benzo(a)pyrene; chrysene; di-n-butylphthalate; fluoranthene; isopropyl alcohol; phenanthrene; and 1,1,2-trichloroethane].

In 1995, one borehole was drilled approximately 4 ft west of the septic tank to a depth of 10.5 ft bgs. One sample was collected from a depth of 8.5 to 10.5 ft and submitted for analysis of metals, cyanide, VOCs, SVOCs, and total uranium. The single sample collected in 1995 and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the single 1995 RFI sample are presented in Tables 4.3-2 and 4.3-3. Metals detected above BVs or with detection limits above BVs in the single 1995 RFI sample were antimony, calcium, chromium, cyanide, selenium, and uranium. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-7. Bis(2-ethylhexyl)phthalate was the organic chemical detected in the single RFI sample. Sampling locations and detected results for organic chemicals are shown in Figure 4.3-8.

4.3.2.3 Proposed Activities

SWMU 33-004(b) is proposed for remediation. The septic tank (including any contents) will be characterized, excavated, and disposed of in accordance with applicable Laboratory waste management requirements. The inlet and outlet drainlines will be plugged. The method to meet waste disposition requirements is described in Appendix B and will be further described in the investigation report. Proposed cleanup activities are summarized in section 5.8 of this work plan. Following removal of the septic tank, the excavated area will be surveyed for radiation, explosive compounds, metals, and VOCs. Additional media will be excavated until field-screening results indicate no detected VOCs or explosive compounds and no gross radiation or metals above background. Six confirmation samples will be collected from two depths (0 to 1 ft and 3 to 4 ft below the structures) from three locations: beneath the tank inlet, within the tank excavation, and beneath the tank outlet. Four samples will be collected from two depths (0 to 1 ft and 3 to 4 ft beneath the drainline) at two locations along the inlet drainline from former building 33-0024. Two samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) at one location in the outfall area, and six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from three locations in the drainage downgradient of the outfall. Samples will be analyzed for metals, VOCs, SVOCs, isotopic uranium, explosive compounds, perchlorate, cyanide, and nitrate. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-9. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3 Consolidated Unit 33-004(j)-00

Consolidated Unit 33-004(j)-00 consists of SWMUs 33-004(j), 33-006(a), 33-007(b), 33-008(a), 33-010(c and h), 33-011(c), and 33-014 (Figures 4.3-10 through 4.3-13). The SWMUs in this consolidated unit consist of an outfall, a firing site and associated debris area, gun-firing sites, a landfill, two surface disposal sites, a radioactive materials storage area, and an open-burning area. These SWMUs are located in the south-central portion of TA-33 in an area known as South Site and were all abandoned. South Site was used primarily from 1950 to 1956 to test initiators, and the SWMUs that comprise this consolidated unit are generally associated with this use.

4.3.3.1 SWMU 33-004(j), Drainline and Outfall

Description and History

SWMU 33-004(j) consists of a 4-in. steel drainpipe and outfall connected to structure 33-0026, a culvert located immediately east of structure 33-0026, and the drainage channel that flows south and empties into Chaquehui Canyon (Figure 4.3-10). The pipe is connected to a drain located on the concrete pad at the entrance to structure 33-0026. Structure 33-0026, held electronic equipment used for experiments on the shot pad [SWMU 33-006(a)] located directly above the structure. The drainpipe extends 75 ft southeast and discharges to an open channel that drains into Chaquehui Canyon. The culvert is situated beneath the unpaved portion of the road that extends beyond structure 33-0026. The upper portion of the drainage channel where both the outfall pipe and the culvert discharge has been cut into the tuff (LANL 1995, 051903, pp. 48–49).

Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-004(j), two surface soil samples (0 to 0.5 ft) were collected from two locations at the culvert discharge point approximately 75 ft south of building 33-0026. Two samples collected as part of the SWMU 33-006(a) investigation were collected from two locations, one at the outfall and one in the drainage located approximately 30 ft south of the outfall, were used to

characterize SWMU 33-004(j) (LANL 1995, 051903, p. 49). Samples were field screened for radioactivity and submitted for analysis of metals, cesium-137, and total uranium. The two samples collected at the outfall and downgradient of the outfall were also analyzed for HE. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.1.3 of the HIR presents a more detailed summary of the screening-level results.

Metals detected above BV in the Phase I RFI samples were copper and uranium. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-004(j).

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Four samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from two locations, one at the culvert discharge point and one at the outfall. In addition, four samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from two locations in the drainage downgradient of the site. This same drainage will also be part of the investigation of SWMUs 33-006(a), 33-007(b), 33-010(c), and 33-010(h). Samples will be analyzed for metals, cyanide, VOCs, SVOCs, explosive compounds, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-15. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3.2 SWMU 33-006(a), Firing Site

Description and History

SWMU 33-006(a) is a shot pad at South Site where implosion studies were conducted (Figure 4.3-11). The shot pad was a 50-ft-diameter circular area located immediately north of and next to the roof of structure 33-0026, an X-unit chamber (i.e., a control chamber containing a firing voltage distribution system used for the remote detonation of test firings). Structure 33-0026 was completed in 1950. Implosion tests performed at the shot pad contained up to 5000 lb of HE. Before detonations, wooden boxes covered the assemblages. Detonations from the shot pad scattered debris, shrapnel, and wood fragments over the mesa top of South Site and into Chaquehui Canyon. Shrapnel has been found at distances up to a mile away from the shot pad. The shot pad has not been used since 1955 when implosion testing was discontinued at TA-33. Currently, the pad is covered with up to a foot or more of sand and firing site debris (LANL 1995, 051903, p. 58).

Previous Investigations

Phase I RFI activities conducted at the SWMU 33-006(a) shot pad and surrounding area in 1994 involved collecting 46 surface soil samples (0 to 0.5 ft) from 42 randomly selected locations across SWMU 33-006(a). In addition, 11 surface soil samples (0 to 0.5 ft) were collected from 10 locations in the drainage that receives runoff from the site. Samples were field screened for radioactivity and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. In addition, two of the drainage samples were submitted for analysis of PCBs, pesticides, and herbicides. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.2.3 of the HIR presents a more detailed summary of the screening-level results.

Metals detected above BV in samples collected during the 1994 Phase I RFI were aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, selenium, silver,

uranium, vanadium, and zinc. Five organic chemicals [4-amino-2,6-dinitritoluene; 2-amino-4,6-dinitrotoluene; nitrobenzene; 2-nitrotoluene; 3-nitrotoluene; 4-nitrotoluene; RDX (hexahydro-1,3,5-trinitro-1,3,5 triazine), tetryl; and 1, 3, 5-trinitrobenzene] were detected in the Phase I RFI samples. Radionuclides detected or detected above FVs were cesium-137, plutonium-238, plutonium-239/240, and tritium.

An IA was performed at SWMU 33-006(a) in 1996 to remove contaminated debris within a half-mile radius from the SWMU 33-006(a) shot pad and to prevent the off-site migration from Chaquehui Canyon to Rio Grande. Firing site shrapnel and debris were removed from mesa-top areas and drainages along the southern rim of Chaquehui Canyon within Bandelier National Monument, from drainage channels along the northern rim of Chaquehui Canyon, and from the canyon bottom. A total of 1261 lb of debris was removed during the IA. Of the total, 770 lb was radioactively contaminated. For waste management purposes, all the debris was screened with an XRF detector to determine whether hazardous metals were present. A total of 20 lb of the debris contained lead and was handled as hazardous waste. Approximately 20 lb of the debris contained lead, was radioactively contaminated, and was handled as mixed waste. The remaining 451 lb of debris was considered nonhazardous and nonradioactive waste and was recycled.

In 1996, eight surface samples (0 to 0.5 ft) were collected from eight locations that had been sampled previously during the 1994 Phase I RFI at SWMU 33-006(a) because holding times for the HE analyses had been missed. The eight samples were submitted for analysis of HE. Two organic chemicals, 1,3-dinitrobenzene and 1,3,5-trinitrobenzene, were detected (1.5 mg/kg and 1.9 mg/kg, respectively) in one sample (0333-96-0588) from sampling location 33-01448 in SWMU 33-007(b), directly south of building 33-0025 (Figure 4.3-16). Since 1996, the entire area south of building 33-0025 (including former sampling location 33-01448) has been significantly disturbed by the installation of new utilities for the complete renovation of building 33-0025. This area will be thoroughly investigated as part of the characterization of SWMU 33-007(b) (section 4.3.3.3) (Figure 4.3-17).

Although the 1996 data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. In addition, the 1996 data may not be representative of current conditions because of disturbance to the site. As a result, the 1996 data will not be used for decision purposes.

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Four samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from two locations within the SWMU 33-006(a) shot pad and 16 samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from four 10-ft step-out sampling locations around the former shot pad and from four 30-ft step-out sampling locations around the shot pad. Any firing site debris observed within the proposed sampling area will be flagged and subsequently removed, containerized, and characterized for disposal. The location where debris is removed will be field screened for radioactivity and HE; any soil with gross radioactivity detected above BVs or with detected HE will be excavated. Confirmation samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) in the bottom of any excavation.

In addition, the lateral extent of releases from SWMU 33-006(a) will be determined by the collection of 27 samples from three depths (0 to 1 ft, from the soil/tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages. Sampling locations will target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-010(c), 33-010(g), and 33-010(h).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17, and samples and analyses are summarized in Table 4.0-1.

4.3.3.3 SWMU 33-007(b), Firing Sites

Description and History

SWMU 33-007(b) consists of two former gun-firing sites. The first area is located approximately 600 ft north of structure 33-0026 [SWMU 33-006(a)] and consists of a 6-ft × 6-ft concrete pad and gun mount (structure 33-0085), a u-shaped soil berm (structure 33-0043), and a catcher box (Figure 4.3-12). The berm and catcher box were constructed in August 1950. The concrete pad and gun mount were constructed in June 1952. This area was used to test free-recoil weapons. Tests involved firing projectiles into the berm and the catcher box. Projectiles fired from the guns contained uranium, beryllium, titanium, and tritium housed inside steel casings. Activities at South Site were discontinued in the late 1950s (LANL 1992, 007671, p. 3-53). This area was used to support atmospheric physics measurements during the late 1980s and early 1990s. Structures associated with these activities include a tower (structure 33-0203) constructed in 1987 and two trailers (structures 33-0201 and 33-0202). All structures have been removed.

The second site was located approximately 400 ft northwest of structure 33-0026 and included a gun building (structure 33-0025) and a soil berm (structure 33-0063). Both structures were built in 1950. The gun building housed 2-in. to 4-in. bore guns that were used to fire projectiles into berm 33-0063. The projectiles used at this site contained uranium, beryllium, and tungsten. Firing site activities at SWMU 33-007(b) were discontinued in the late 1950s (LANL 1992, 007671, p.3-53). A VCA was performed at berm 33-0063 in 1999. During the VCA, the berm was removed. Treated soil was returned to the location of the former berm. The site was graded, compacted, and reseeded with native seed. Recently, approximately 1 to 2 ft of engineered fill has been placed over the location of the former berm. Building 33-0025 was renovated in 2005 and 2006.

Previous Investigations

Phase I RFI activities were conducted at both areas of SWMU 33-007(b) in 1994. Activities at the first site (structure 33-0043) involved collecting 11 surface soil samples (0 to 0.5 ft) from 11 locations. These samples were field screened for radioactivity, organic chemicals, and HE and submitted for laboratory analysis of metals, gamma-emitting radionuclides, SVOCs, and HE.

Three surface locations were resampled in 1995 and analyzed for metals. Two surface soil samples (0 to 0.5 ft bgs) were collected from the main drainage that flows southward and into Chaquehui Canyon. Subsurface samples were collected from trenches excavated at berm (structure 33-0043) and at the catcher box. A backhoe was used to excavate one trench at berm 33-0043. This trench was 20 ft long and was excavated to approximately 7 ft below the top of berm. Five samples were collected at various distance intervals and depths along the trench transect. Sampling intervals and depths (beginning from the toe of the berm and measured from the top of the berm downward) were 3 ft in and 3 ft deep; 5 ft in and 2 ft deep; 6 ft in and 5 ft deep; 18 ft in and 5 to 7 ft deep; and 20 ft in and 5 ft deep. A backhoe was used to excavate one 20 ft long trench at the catcher box. Five samples were collected from various distance intervals along the trench (3 ft in, 5 ft in, 10 ft in, 15 ft in, and 20 ft in), and all were collected at a depth of 6 ft from the top of the catcher-box.

Sampling activities at the second site (structure 33-0063) included collecting both surface and subsurface soil samples from the berm. Nine surface soil samples (0 to 0.5 ft) were collected from the surface of the berm. Three surface soil samples (0 to 0.5 ft bgs) were collected in the drainage channel that flows westward into Chaquehui Canyon from berm 33-0063 (Figure 4.3-12). One trench was excavated into the berm, and a total of 11 subsurface soil samples were collected from various depth and distance intervals from the toe of the berm. Sample intervals and depths (beginning from the toe of the berm and measured from the top of the berm downward) were 3 ft in and 2 ft deep; 4 ft in and 5 ft deep; 6 ft in and 4 ft deep; 7 ft in and 4 ft deep; 11 ft in and 4 ft deep; 12 ft in and 5 ft deep; 17 ft in and 5 ft deep; 19 ft in and 6 ft deep; 24 ft in and 7 ft deep; and 27 ft in and 5 ft deep. Samples were field screened for radioactivity and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE.

Data from the 1994 Phase I RFI are screening-level data and are summarized below. Section 4.3.3.3 of the HIR (LANL 2009, 107348) presents a more detailed discussion of the screening-level results. Samples collected in 1995 and the analyses requested for the decision-level data are presented in Table 4.3-1.

Metals detected above BV in the 1994 Phase I RFI samples are arsenic, cadmium, chromium, cobalt, copper, lead, nickel, potassium, selenium, silver, uranium, and zinc. Three organic chemicals were detected (di-n-butylphthalate; 2,4-dinitrotoluene; and nitrobenzene). Radionuclides detected or detected above BVs/FVs are cesium-137, uranium-234, uranium-235/236, and uranium-238.

Decision-level data from the 1995 resampling at structure 33-0043 are presented in Table 4.3-2. Metals detected above BV were cadmium, chromium, cobalt, copper, and lead. Each of these metals was detected at less than 2 times BV in one fill sample.

An IA was performed at both areas of SWMU 33-007(b) in 1996 to prevent the migration of contaminants from the sites during stormwater runoff events. Activities performed during the IA included the construction of straw bale dams within the drainage channel that flows southward from berm 33-0063, constructing a sandbag retaining wall along the toe of the 33-0043 berm, constructing a straw bale dam along a lower crest of the 33-0043 berm to enhance a natural ponding area, and spreading loose straw over the surface of the berm and laying Poly-Jute matting over the straw to stabilize the berm slope and prevent wind and runoff migration from the site (LANL 1996, 054623 pp. 3 – 5) .

A VCA was performed at berm 33-0063 in 1999 (LANL 2000, 066889). All soil within the berm was excavated to undisturbed native soil and removed. The VCA used the SGS technology to separate radioactively contaminated soil and debris from nonradioactively contaminated soil and debris. The SGS unit consisted of conveyor systems, radiation detectors, and computer controls programmed to divert soil and debris with radioactivity above a cleanup criteria of 50 pCi/g. A total of 1677.87 yd^3 of material was removed from berm 33-0063. Sixteen large projectiles were uncovered during the excavation activities. These projectiles were not classified and were nonradioactive. Uranium metal pieces ranging up to 5 in. in diameter were uncovered and removed and disposed of as radioactive waste. Once the berm had been excavated to native soil, the excavated area was surveyed for radioactivity. Areas of radioactivity that exceeded 2 times background were further excavated and resurveyed to confirm removal. Four surface soil samples (0 to 0.5 ft) and four subsurface samples (2 to 2.5 ft depth) were collected from four locations in the footprint of the former berm. Two surface samples (0 to 6 in. depth) were collected from the drainage located west of berm 33-0063 that empties into Chaquehui Canyon. All samples were submitted for laboratory analysis of isotopic uranium and inorganic chemicals. Soil with radioactivity levels below the cleanup criterion was returned to the SWMU boundaries. A total of 411.63 yd^3 of soil exceeded the cleanup criterion of 50 pCi/g; the remaining 1266.24 yd^3 of soil was below the cleanup criterion and was returned to the SWMU boundary. The soil was regraded, compacted, and reseeded with native

vegetation (LANL 2000, 066889). Samples collected following the 1999 VCA and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1996 samples and 1999 VCA samples are presented in Tables 4.3-2, 4.3-3, and 4.3-4. Inorganic chemicals detected above soil BVs included cadmium, chromium, cobalt, copper, lead, nickel, selenium, thallium, and uranium. At the berm 33-0043 area, cadmium, chromium, cobalt, copper, and lead were each detected above the soil BV in one sample. Samples were collected from the native soil beneath the former berm 33-0063 area, and the inorganic chemicals detected above the soil BV included cadmium, lead, and thallium. Cadmium, lead, and thallium were each detected above the soil BV in one sample. Drainage samples collected in the drainage west of building 33-0025 showed detections of copper, nickel, selenium, and uranium above sediment BVs. Copper, nickel, and uranium were each detected above the sediment BV in one sample. Selenium was detected above the sediment BV in two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-18.

Toluene was the only organic chemical detected and was detected in one sample at 0.00093 mg/kg (Figure 4.3-19). Radionuclides detected from the soil beneath the former berm 33-0063 include uranium-234, uranium 235/236, and uranium-238. Uranium-234 was detected above the soil BV in two samples. Uranium 235/236 was detected above the soil BV in one sample. Uranium-238 was detected above the soil BV in two samples. Sampling locations and detected results for radionuclides are shown in Figure 4.3-20.

Although the 1999 VCA data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. As a result, the 1999 VCA data will not be used for decision purposes.

Proposed Activities

Because residual contamination associated with SWMUs 33-007(b) and 33-011(c) is indistinguishable, the two sites will be addressed together. The vertical and lateral extent of contamination have not been determined at either of the berm firing sites or in the associated drainages.

At structure 33-0025 [SWMUs 33-007(b) and 33-011(c)], 24 samples will be collected from three depths (0 to 1 ft, 4 to 5 ft and 9 to 10 ft bgs) at eight locations from the footprint of former gun firing site berm 33-0063 and the former unpaved storage area used in the past to stage tritium containers. Samples must be collected beneath the engineered fill that has been added to the site.

At berm 33-0043 [SWMU 33-007(b)], eight samples will be collected from two depths (0 to 1 ft and 5 to 6 ft below the fill used in the former catcher box location) from four locations in and around the former catcher box location. Four samples will be collected from two depths (0 to 1 ft and 4 to 5 ft bgs) at two sampling locations below the bottom of the embankment where projectiles were fired (east of the former catcher box location). Six samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from three sampling locations in the drainage south of the berm 33-0043 [SWMU 33-007(b)].

In addition, four samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from two locations in the drainage southwest of SWMUs 33-011(c) and SWMU 33-007(b) to determine if contaminants are migrating from the sites. Samples to be collected in the other South Sites drainages will complete this determination (Figure 4.3-21).

Samples will be analyzed for metals, cyanide, nitrate, VOCs, SVOCs, explosive compounds, isotopic uranium, isotopic plutonium, tritium, and perchlorate and by gamma-spectroscopy. In addition, 20% of the

samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-21 and samples and analyses are summarized in Table 4.0-1.

4.3.3.4 SWMU 33-008(a), Landfill

Description and History

SWMU 33-008(a) is a landfill created in 1984 during the cleanup of the TA-33 firing sites. The landfill is located inside the horseshoe-shaped berm (structure 33-0043) within SWMU 33-007(b) (Figure 4.3-13). The dimensions of the landfill are approximately 50 ft × 60 ft × 8 ft deep. Large uncontaminated debris, including telephone poles, timber, and railroad ties, was disposed of in this landfill. All debris was screened for radioactivity before disposal. After disposal was complete, the landfill surface was graded, and the corners of the fill area were marked with metal posts (LANL 1992, 007671, p. 3-54).

Previous Investigations

Phase I RFI activities performed at SWMU 33-008(a) in 1994 included collecting four surface soil samples (0 to 0.5 ft). Three of the samples were collected along the northern edge of the landfill, and the fourth sample was collected in the drainage west of the bermed area. Samples were submitted for laboratory analysis of metals, uranium, gamma-emitting radionuclides, and HE (LANL 1995, 071300, p. 84). Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.4.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1994 Phase I RFI samples are arsenic and copper. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs.

Additional Phase I RFI activities performed in 1996 included drilling boreholes into the landfill at four randomly selected locations (Figure 4.3-13). The boreholes were drilled to the soil-tuff interface and ranged in depth from 5 ft to 12.5 ft. Four samples were collected from each borehole at various depth intervals (0 to 1 ft, 2.5 to 3 ft, 3 to 3.5 ft, and 4 to 5 ft depth; 0 to 1 ft, 2 to 2.5 ft, 2.5 to 3.5 ft, and 4 to 5 ft depth; 0 to 1 ft, 2.5 to 5 ft, 7.5 to 10 ft, and 10 to 12.5 ft depth; and 2.5 to 3.5 ft, 5 to 6 ft, 6 to 7 ft, and 9 to 10 ft depth, respectively). The samples were field screened for radioactivity, organic chemicals, and HE and submitted for laboratory analysis of metals, uranium, SVOCs, and HE. Samples collected during the 1996 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1996 Phase I RFI borehole samples are presented in Tables 4.3-2 and 4.3-3. Inorganic chemicals detected above soil BVs include arsenic, calcium, copper, iron, uranium, and zinc. Arsenic was detected above the tuff BV in five samples. Calcium was detected above the soil BV in two samples. Copper was detected above the oil BV in three samples. Iron was detected above the tuff BV in five samples. Uranium was detected above the soil BV in 11 samples and above the tuff BV in 5 samples. Zinc was detected above the soil BV in two samples and above the tuff BV in one sample. Detection limits were above BVs for antimony, cadmium, and selenium. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-22.

Twenty-two organic chemicals [acenaphthene; acenaphthylene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; carbazole; 4-chloroaniline; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; dibenzofuran; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene) were detected. Organic chemicals were detected in 10 samples at concentrations ranging from 0.071 mg/kg to 15.0 mg/kg. Sampling locations and detected results for organic chemicals are shown in Figure 4.3-23.

Proposed Activities

SWMU 33-008(a) is proposed for remediation. Preliminary site activities will include a surface radiological survey and geophysical surveys (magnetometry, electromagnetic [EM], and resistivity), followed by the excavation of test pits and trenches to locate and define the landfill boundaries. Remediation activities will involve waste characterization, waste and soil/fill excavation, segregation, containerization, transportation, off-site disposal, confirmation sampling, and backfilling and site restoration. The method to meet waste-disposition requirements is described in Appendix B and will be further described in the investigation report. Proposed cleanup activities are summarized in section 5.8 of this work plan. Historical information indicates that the landfill dimensions area approximately 50 ft × 60 ft × 8 ft deep. Once located and characterized, all visible waste and stained soil and/or tuff will be removed from the landfill and the bottom and sides of the excavation and surveyed for radiation, explosive compounds, metals, and VOCs. Additional media will be excavated until field-screening results indicate no detected HE or VOCs and no elevated gross radiation above background.

Confirmation samples will be collected within and next to the excavation boundaries to confirm cleanup and to define the nature and extent of any residual contamination. Twelve samples will be collected from two depths (0 to 1 ft and 4 to 5 ft bgs) at six locations from the bottom of the landfill excavation. Sixteen samples will be collected from two depths (4 to 5 ft and 9 to 10 ft bgs) at eight step-out sampling locations (two locations on each side of the landfill excavation). Step-out sampling locations will be 6 ft from the edge of the landfill excavation. Samples will be analyzed for metals, cyanide, VOCs, SVOCs, nitrate, isotopic uranium, isotopic plutonium, explosive compounds, and perchlorate and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. The final analytical suite will be confirmed and supplemented, if necessary, with waste characterization data. Proposed sampling locations are shown in Figure 4.3-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3.5 SWMU 33-010(c), Surface Disposal Area

Description and History

SWMU 33-010(c) is a former surface disposal area located at South Site (Figure 4.3-10) on the northern rim of Chaquehui Canyon, approximately 230 ft south of structure 33-0026. The disposal area dimensions were approximately 50 ft × 30 ft × 2 ft to 4 ft deep. The area is located along the western edge of the main South Site drainage channel. From approximately 1950 to 1955, this site was used to dispose of debris from the implosion tests conducted at SWMU 33-006(a). Debris disposed of at the site includes copper and aluminum shrapnel, pieces of electronic cable, and wood. Between shots, the shot pad and surrounding area were scraped and the debris deposited at SWMU 33-010(c) (LANL 1992, 007671, p. 3-53). A VCA was performed in 1999, and the debris pile was excavated and removed.

Previous Investigations

Phase I RFI activities conducted at SWMU 33-010(c) in 1994 involved collecting six surface soil samples (0 to 0.5 ft) from five locations on the face of the disposal pile. Additionally, six sediment samples (0 to 0.5 ft) were collected from five locations in the drainage below the disposal pile as part of the investigation of SWMU 33-006(a) and were used to characterize SWMU 33-010(c) (LANL 1995, 051903, p. 110). Samples were field screened for radioactivity, organic chemicals, and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. Two sediment samples were also submitted for analysis of VOCs. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of

the HIR (LANL 2009, 107348). Section 4.3.5.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1994 Phase I RFI samples were antimony, barium, cadmium, lead, selenium, uranium, and zinc. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs.

A VCA was performed at SWMU 33-010(c) in 1999. All soil within the SWMU was excavated to undisturbed native soil and removed. The VCA used the SGS to separate radioactively contaminated soil and debris from nonradioactive soil and debris. The SGS unit was initially programmed to divert soil and debris at with radioactivity above a cleanup criterion of 50 pCi/g at SWMU 33-010(c). Because of the fine, homogeneous nature of the contamination in the soil from disposal area, the SGS was unable to separate the material efficiently. The SGS was reprogrammed to a target cleanup criterion of 65 pCi/g, and all soils from SWMU 33-010(c) were reprocessed through the SGS unit. A total of 289.39 yd^3 of soil and debris was excavated and processed through the SGS. Once the disposal area had been excavated to native soil, the excavated area was surveyed for radioactivity. Areas of radioactivity that exceeded 2 times local background were further excavated and resurveyed to confirm removal. Four surface soil samples (0 to 0.5 ft) and four subsurface samples (2 to 2.5 ft depth) were collected from four locations within the excavated area. Three surface samples (0 to 0.5 ft) were collected from the drainage located east of the disposal area that empties into Chaquehui Canyon (Figure 4.3-10). Samples were submitted for laboratory analysis of isotopic uranium and metals. Soil with radioactivity levels above the cleanup criterion of 65 pCi/g removed during the VCA was disposed of at Area G at TA-54. Soil with radioactivity levels below the cleanup criterion was returned to the SWMU boundaries. A total of 0.58 $yd^3$of soil exceeded the cleanup criterion of 65 pCi/g; the remaining 288.81 yd^3 of soil was below the cleanup criterion and was returned to the SWMU boundary. The soil was regraded, compacted, and reseeded with native vegetation (LANL 2000, 066889). Confirmation samples collected during the 1999 VCA and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1999 VCA confirmation samples are presented in Tables 4.3-2 and 4.3-3. Metals detected above BVs include barium, copper, selenium and silver. Barium, selenium and silver were each detected above the sediment BV in one sample. Copper was detected above the soil BV in two samples and above the sediment BV in three samples. Detection limits were greater than the soil BV for antimony for two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-25. Radionuclides detected or detected above BVs/FVs in the 1999 VCA confirmation samples include uranium-234, uranium 235/236, and uranium-238; each radionuclide was detected above the soil BV in six samples and above the sediment BV in three samples. Sampling locations and results for radionuclides detected or detected above BVs are shown in Figure 4.3-26.

Although the 1999 VCA data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. As a result, the 1999 VCA data will not be used for decision purposes.

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Eighteen samples will be collected from three depths (0 to 1 ft and 3 to 4 ft, and 6 to 7 ft bgs) from two locations within the remediated portion of SWMU 33-010(c) and from four locations around SWMU 33-010(c).

In addition, the lateral extent of releases from SWMU 33-010(c) will be determined by collecting 27 samples from three depths (0 to 1 ft, from the soil-tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages. Sampling locations will target sediment

traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-006(a), 33-010(g), and 33-010(h).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17 and samples and analyses are summarized in Table 4.0-1.

4.3.3.6 SWMU 33-010(h), Surface Disposal Area

Description and History

SWMU 33-010(h) is a surface disposal area (Figure 4.3-13) located approximately 450 ft northeast of structure 33-0026 and immediately south of berm 33-0043. The area appears to be a mound of dirt and firing-site debris is scattered on the soil surface. Debris includes metal, wood, cable, and shrapnel. The area is approximately 100 ft × 100 ft. There is no documentation regarding the history of the disposal area. The main drainage for South Site bounds the disposal area on the west, and an unimproved road is located to the east (LANL 1995, 051903, pp. 115–116).

Previous Investigations

During the 1994 Phase I RFI activities conducted at SWMU 33-010(h), a geophysical survey to determine the presence of subsurface anomalies was performed, and none were identified. A backhoe was used to excavate a 42-ft-long trench through the center of the area. Most of the trench was 0.5 ft to 2 ft deep. Two areas along the transect were excavated to a depth of 4 ft, and every bucket of soil was surveyed for the presence of debris. Debris was not observed during the trenching activity. Two subsurface samples (4 ft) were collected from the trenched area, field screened for radioactivity, organic chemicals, and HE, and submitted for analysis of metals, gamma-emitting radionuclides, SVOCs, and HE. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.6.3 of the HIR presents a detailed summary of the screening-level results.

No metals were detected above BV and no organic chemicals were detected. Cesium-137 was the only radionuclide were detected or detected above FV. Decision-level data are not available for SWMU 33-010(h).

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Eighteen samples will be collected from three depths (0 to 1 ft and 3 to 4 ft, and 6 to 7 ft bgs) from two locations within the disposal area of and from four locations around SWMU 33-010(h).

In addition, the lateral extent of releases from SWMU 33-010(h) will be determined by collecting 27 samples from three depths (0 to 1 ft, from the soil/tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages (see section 4.3.3.5). The sampling locations will target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-006(a), 33-010(c), and 33-010(g).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma-spectroscopy. In addition, 20% of the samples

collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17 and samples and analyses are summarized in Table 4.0-1.

4.3.3.7 SWMU 33-011(c), Storage Area

Description and History

SWMU 33-011(c) is a former unpaved storage area used to hold tritium containers, called blivits, used in acceleration tests performed at TA-33 (Figure 4.3-12). This storage area was located at South Site between building 33-025 and building 33-024. After the acceleration tests, blivits were placed in this area and allowed to discharge to the atmosphere. This practice was discontinued in 1972 (LANL 1992, 007671, p. 3-54).

Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-011(c), two surface samples (0 to 0.5 ft) were collected from two locations, field screened for radioactivity, and submitted for analysis of metals and gamma-emitting radionuclides. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.7.3 of the HIR presents a detailed summary of the screening-level results.

No metals were detected above BV in the 1994 Phase I RFI samples. Tritium was the only radionuclide detected or detected above BV/FV. Decision-level data are not available for SWMU 33-011(c).

Proposed Activities

The proposed activities for SWMU 33-011(c) are discussed with those for SWMU 33-007(b) in section 4.3.3.3 and are shown in Figure 4.3-21.

4.3.3.8 SWMU 33-014, Open Burn Area

Description and History

SWMU 33-014 is the former location of an open burn area located approximately 300 ft north of the fence surrounding MDA E [Consolidated Unit 33-001(a)-99] (Figure 4.3-13). The soil at the burn site has been scraped to bedrock, and some bedrock is blackened from burning. This burn area was believed to have been established in 1950 when operations at South Site began and may have served all of TA-33. Materials burned at this site may have included construction debris, timber, sawdust used in catcher boxes, and black powder. It is not known when burning operations were discontinued at this site (LANL 1992, 007671, p. 3-54).

Previous Investigations

Phase I RFI activities conducted at SWMU 33-014 in 1994 involved the collection of five surface samples (0 to 0.5 ft) from five locations. Samples were field screened for radioactivity and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. Two of the samples also were submitted for analysis of SVOCs. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.8.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1994 Phase I RFI samples were cadmium, chromium, copper, lead, mercury, nickel, uranium, and zinc. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-014.

Proposed Activities

The vertical and lateral extent of contamination have not been determined at this site. Eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from four locations within the former burn area. In addition, eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from four step-out locations around the burn area and analyzed for metals, SVOCs, VOCs, explosive compounds, isotopic uranium, cyanide, dioxins/furans, nitrate, and perchlorate. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.4 SWMU 33-010(g), Surface Disposal Area

4.3.4.1 Description and History

SWMU 33-010(g) is a former disposal area located on the northern rim of Chaquehui Canyon (Figure 4.3-14). Debris was scattered along the rim and upper walls of the canyon. This former disposal area is located next to MDA E [Consolidated Unit 33-001(a)-99]. Some debris present at SWMU 33-010(g) (such as dead tree trunks, rocks, and scraped earth) may have originated from the initial clearing of South Site in the 1940s. Other debris, including chunks of metal, was also present. The period of operation for this disposal site is not known, but firing site operations associated with initiator testing at South Site were conducted from 1950 to 1956 (LANL 1992, 007671, p. 3-54). The debris was removed and disposed of in 1995.

4.3.4.2 Previous Investigations

During the Phase I RFI performed at SWMU 33-010(g) in 1994, nine surface samples (0 to 0.5 ft) were collected from nine locations on the mesa top amid debris and the canyon side below the disposal area. Samples were field screened for radioactivity, organic chemicals, and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. One sample also was submitted for analysis of herbicides. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.4.3 of the HIR presents a detailed summary of the screening-level results.

The only inorganic chemicals detected above the BV in the 1994 Phase RFI samples were calcium and mercury. No organic chemicals were detected and radionuclides were not detected or detected above BVs/FVs.

A VCA was implemented at SWMU 33-010(g) in 1995. The debris was field screened for radioactivity and metals. Debris smaller than 3 in. in diameter was removed if radioactive screening results were above background levels. A total of 4 yd^3 of nonhazardous/nonradioactive debris and 2 ft^2 of radioactive debris was removed. Nonhazardous/nonradioactive metal debris was recycled. Low-level radioactive debris was disposed of at MDA G. All other nonhazardous/nonradioactive debris was disposed of at the Los Alamos County landfill (LANL 1996, 054755, p. 15). Decision-level data are not available for SWMU 33-010(g).

4.3.4.3 Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Eighteen samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from eight locations within the western portion of SWMU 33-010(g) and from one location at the head of the drainage directly downgradient of the western portion of SWMU 33-010(g). Twenty samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from 10 locations within the eastern portion of SWMU 33-010(g).

In addition, the lateral extent of releases from SWMU 33-010(g) will be determined by collecting 27 samples from three depths (0 to 1 ft, from the soil/tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages (section 4.3.3.5). Sampling locations will target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-006(a), 33-010(c), and 33-010(h).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17 and samples and analyses are summarized in Table 4.0-1.

4.4 Sites under Investigation at NRAO

4.4.1 SWMU 33-004(m), Septic System

4.4.1.1 Description and History

SWMU 33-004(m) consists of a septic tank (structure 33-0179) at the NRAO site (Figure 4.4-1). Septic tank 33-0179 has a capacity of 1000 gal. and still receives wastewater from the NRAO support building (33-0178), which was constructed in 1987. The septic tank serves the restroom, kitchen, water fountain, and utility room floor drains in building 33-0178 (SF Engineering 1992, 062036, p. 10). The septic tank discharges to a leach field; both the septic tank and leach field are located outside the northeast corner of the fenced area surrounding building 33-0178 and the radiotelescope. The septic tank was excavated into bedrock, and bedrock is exposed downslope of the leach field area. There is no documented use of hazardous or radioactive materials within building 33-0178.

4.4.1.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-004(m), one sample of liquid and one sample of sludge were collected from the septic tank, and five surface soil samples (0 to 0.5 ft) and six subsurface soil samples (4 to 5 ft, 2 to 4 ft, and 3.5 to 4 ft bgs) were collected from three locations near the septic tank and drainline. Samples were field screened for organic chemicals and submitted for analysis of VOCs and SVOCs. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 5.1.3 of the HIR presents a detailed summary of the screening-level results.

Five organic chemicals (acetone; ethylbenzene; toluene; 1,3,5-trimethylbenzene; and xylene) were detected in the sludge sample collected during the 1994 Phase I RFI. Two organic chemicals (acetone and toluene) were detected in the liquid sample. Organic chemicals were not detected in any of the soil samples. Decision-level data are not available for SWMU 33-004(m).

4.4.1.3 Proposed Activities

Because this septic system has remained active since the last sampling, additional sampling is proposed to characterize current conditions. Sampling of the active system is proposed along the inlet drainline, next to the septic tank, along the outlet drainline, around the leach field, and downgradient of the site. Eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs beneath the bottom of the septic system structure) from one location beneath to the bottom of the east side of the septic tank, one location adjacent to the septic tank inlet, one location next to the septic tank outlet, and from one location next to the inlet drainline. Nine samples will be collected from three depths (0 to 1 ft, at the soil-tuff interface, and 1 ft into the tuff) at three locations around the leach field. In addition, six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from three locations in the drainage downgradient of the site.

Samples will be analyzed for metals, VOCs, SVOCs, nitrate, perchlorate, and cyanide. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.2 AOC 33-011(b), Former Storage Area

4.4.2.1 Description and History

AOC 33-011(b) is a former storage area located just outside the northwest corner of the NRAO site at TA-33 (Figure 4.4-3). This storage area was approximately 300 ft wide × 600 ft long. Beginning in the 1950s, the site served as a storage area for equipment and materials such as tungsten, uranium, and beryllium were stored at the site. Equipment used at the TA-33 firing sites was also stored at the site. The storage area was cleaned in 1984, and most materials and debris were removed at that time, although some debris remained. Approximately 75% of the area had been scraped and leveled to or near the tuff bedrock.

4.4.2.2 Previous Investigations

During the Phase I RFI conducted at AOC 33-011(b) in 1994, 10 surface samples (0 to 0.5 ft) were collected from 10 locations. Six samples were collected at the former storage area, and four were collected from the drainage west of the former storage area, field screened for radioactivity, and submitted for laboratory analysis of metals and gamma-emitting radionuclides. One sample also was submitted for analysis of organic chemicals. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 5.2.3 of the HIR presents a detailed summary of the screening-level results.

Calcium was the only metal detected above BV in the 1994 Phase I RFI samples. No organic chemicals were detected. Cesium-137 was the only radionuclide detected or detected above BV/FV.

A VCA was performed in 1996, and all remaining surface debris was removed from the site. A total of 2 yd^3 of nonhazardous/nonradioactive debris was removed from SWMU 33-011(c), and approximately 0.5 ft^3 of radioactive debris (shrapnel) was removed and disposed of at Area G at TA-54. The nonhazardous/nonradioactive metal debris was recycled by the ACE Salvage Company, and the remainder of the nonhazardous/nonradioactive debris was disposed of at the Los Alamos County landfill (LANL 1996, 054755, p. 15). Decision-level data are not available for SWMU 33-011(b).

4.2.2.3 Proposed Activities

The lateral and vertical extent of contamination have not been determined at this site. Twelve samples will be collected from two depths (0 to 1 ft and 4 to 5 ft bgs) from all six previous RFI locations (33-01435, 33-01436, 33-01438, 33-01439, 33-01440, and 33-01441) within the former storage area. In addition, six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from three locations downgradient and west of the site. All samples will be analyzed for metals, VOCs, SVOCs, cyanide, perchlorate, nitrate, explosive compounds, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-4. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

5.0 INVESTIGATION METHODS

A summary of investigation methods to be implemented is presented in Table 5.0-1. The standard operating procedures (SOPs) used to implement these methods are available at http://www.lanl.gov/environment/all/qa.shtml.

Summaries of the field-investigation methods are provided below. Additional procedures may be added as necessary to describe and document quality-affecting activities.

Chemical and radionuclide analyses will be performed in accordance with the analytical statement of work (LANL 2000, 071233). Accredited contract analytical laboratories will use the most recent EPA- and industry-accepted extraction and analytical methods for analyses of the samples.

5.1 Field Surveys

The following sections describe the field surveys that will be conducted at the Chaquehui Canyon Aggregate Area sites.

5.1.1 Geodetic Surveys

Geodetic surveys will be conducted by a land surveyor in accordance with the latest version of procedure SOP-5028, Coordinating and Evaluating Geodetic Surveys, to locate historical structures and to document field activities such as sampling and excavation locations. The surveyors will use a Trimble GeoXT hand-held global-positioning system (GPS) or equivalent for the surveys. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (transverse mercator), Central Zone, North American Datum 1983. Elevations will be reported per the National Geodetic Vertical Datum of 1929. All GPS equipment used will meet the accuracy requirements specified in SOP-5028.

5.1.2 Geophysical Surveys

Geophysical surveys will be performed at selected sites to identify anomalies that would indicate the location of former waste disposal sites, including SWMU 33-008(a). Geophysical methods will include terrain conductivity (EM-31 or equivalent), high-sensitivity metal detection (EM-61 or equivalent), and GPR.

Terrain conductivity and high-sensitivity metal detection data will be recorded at approximately 2-ft intervals along lines spaced approximately 20 ft apart. Higher resolution coverage will be completed, as needed, in selected targeted areas using 5-ft line spacing. Line and station separation may vary depending upon surface obstructions. Geodetic coordinates will be recorded at 1-s intervals using an

integrated GPS. A base station free from cultural interference will be occupied at the beginning and end of each survey day to calibrate the instrument and perform system functional tests. During these tests, battery, phasing, and sensitivity checks will be performed.

The GPR survey will be performed using a digital subsurface interface radar system. After initial field tests are conducted to determine maximum penetration and sufficient resolution, an appropriate transducer will be selected to perform the survey. Different transducers may be used in an attempt to provide greater penetration depths. Data will be digitally recorded, displayed, and analyzed during acquisition to allow real-time interpretation. Line locations will be selected based on electromagnetic anomaly and surface obstructions.

5.2 Field Screening

Because sampling is primarily being conducted to finalize nature and extent based on previous investigations, field screening will be conducted mainly for health and safety purposes. However, if elevated field-screening levels are observed for the deepest sample collected from a specific sampling location, sample collection will continue until field-screening results show no elevated readings. The Laboratory's proposed field-screening approach will be to (1) visually examine all samples for evidence of contamination, (2) screen for organic vapors, and (3) screen for radioactivity. As appropriate at certain sites, screening may also be performed for metals and HE. The field-screening methods are discussed below.

5.2.1 VOCs

Based on the previous RFI results, significant VOC contamination is not expected to be encountered, and VOC screening will be conducted primarily for health and safety purposes.

Screening will be conducted using a photoionization detector (PID) capable of measuring quantities as low as 1 ppm. Vapor screening of soil, sediment, and subsurface core for VOCs will be conducted using a PID equipped with an 11.7 electron volt (eV) lamp. All samples will be screened for VOCs in headspace gas in accordance with SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector.

The PID will be calibrated daily to the manufacturer's standard for instrument operation, and the daily calibration results will be documented in the field logbooks. All instrument background checks, background ranges, and calibration procedures will be documented daily in the field logbooks in accordance with SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

5.2.2 Radioactivity

Field screening for radioactivity will be conducted primarily for health and safety purposes. Radiological screening will target gross-alpha, -beta, and -gamma radiation. Field screening for alpha, beta, and gamma radiation will be conducted within 6 in. from the core material and will be performed using appropriate field instruments calibrated in accordance with the Laboratory's Health Physics Operations Group procedures. All instrument calibration activities will be documented daily in the field logbooks in accordance with SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

5.2.3 Metals Field Screening (XRF)

A field-portable XRF instrument will used to field screen for a few specific metals (e.g., barium, copper, and lead) previously detected at sites and typically associated with firing-site activities at TA-33 in accordance with the manufacturer's instructions. An elevated detection for XRF analysis is defined as an instrument reading that exceeds 2 times the BV of the sample matrix. The XRF field-screening results will be recorded in the field boring or test pit logs as well as in sample collection logs (SCLs). The instrument will be operated in accordance with the manufacturer's instructions, including collecting and preparing samples and analyzing standard samples. XRF-screening surveys will be performed as described in the proposed activities in section 4.0 of this work plan for SWMUs 33-006(a), 33-010(c), 33-010(f), 33-010(g), and 33-010(h).

5.2.4 HE Screening

The Strategic Diagnostics, Inc., D TECH RDX immunoassay test kits will be used to field screen quantitatively for RDX and TNT (2,4,6-trinitrotoluene). All assays will be conducted following the manufacturer's instructions, including equipment calibration, equipment use, sample dilution, and reagent storage. An elevated immunoassay result is defined as 2 times the estimated quantitation limit (approximately 2 mg/kg). Immunoassay field-screening results will be recorded in the field boring or test pit logs as well as in SCLs.

5.3 Sample Collection

5.3.1 Surface Samples

Samples will be placed in appropriate containers in accordance with SOP-5056, Sample Container and Preservation. Quality assurance/quality control (QA/QC) samples will include field duplicate samples, equipment blanks, and trip blanks. These samples will be collected following the current version of SOP-5059, Field Quality Control Samples, and will comply with a frequency of 10% of total samples collected for field duplicates and rinsate blanks. Trip blanks will be supplied and remain with analytical samples when samples are collected for VOC analysis. QA/QC samples are used to monitor the validity of the sample collection procedures.

Surface and shallow subsurface soil and sediment samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. Decontamination will be completed using a dry decontamination method with disposable paper towels and an over-the-counter cleaner, such as Fantastik or an equivalent. If the surface location is at bedrock, an axe or hammer and chisel will be used to collect samples.

5.3.2 Subsurface Samples

Subsurface samples will be collected using hand- or hollow-stem auger or direct-push methods, depending on the depth of the samples and the material being sampled. A brief description of these methods is provided below.

5.3.2.1 Hand Auger

Hand augers may be used to bore shallow holes (e.g., 0 to 10 ft). The hand auger is advanced by turning or pounding the auger into the soil until the barrel is filled. The auger is removed and the sample is

dumped out into a clean bowl. Hand-auger samples will be collected in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler.

5.3.2.2 Direct Push

Direct push is a subsurface sampling method that pushes a tool string into the ground using the weight of a truck in combination with a hydraulic ram or hammer. Various tool strings can be used to collect discrete samples, continuous samples, both discrete and continuous samples, and groundwater samples. The direct-push core samples collected in this investigation will be continuous. The inside of the continuous sampler is exposed to the subsurface environment as it is advanced to the sampling interval. This is a dual-tube sampler, so named because it uses two sets of rods to collect soil cores. The outer rods receive the driving force from the hydraulic pushing method and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination or cave-in. The inner set of rods is placed within the outer rods and holds a sampler in place as the outer rods are driven to the sample interval. The inner rods are then retracted to retrieve the soil core. The direct-push methods will follow the American Society of Testing and Materials D18 Subcommittee on Direct Push Sampling (D18.21.01) (ASTM 1997, 057511).

5.3.2.3 Hollow-Stem Auger

Hollow-stem augers will be used to collect subsurface samples where hand-augering is impractical because of the depth or the material being sampled. The hollow-stem auger consists of a hollow-steel shaft with a continuous spiraled steel flight welded onto the exterior of the stem. The stem is connected to an auger bit; when the auger is rotated, it transports cuttings to the surface. The hollow stem of the auger allows insertion of drill rods, split-spoon core barrels, Shelby tubes, and other samplers through the center of the auger so samples may be retrieved during drilling operations.

During sampling, the auger will be advanced to just above the desired sampling interval. The sample will then be collected by driving a split-spoon sampler into undisturbed soil/tuff to the desired depth in accordance with SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials. Immediately after sampling, boreholes will be abandoned using bentonite chips or a bentonite/concrete mixture. All borehole cuttings will be managed as IDW, as described in Appendix B of this work plan. All borehole abandonment information will be provided in the Chaquehui Canyon Aggregate Area investigation report.

Field documentation will include detailed borehole logs for each borehole drilled. The borehole logs will document the matrix material in detail and will include the results of all field screening; fractures and matrix samples will be assigned unique identifiers. All field documentation will be completed in accordance with the current version of SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials.

Borehole Abandonment

All hollow-stem auger boreholes will be properly abandoned in accordance with SOP-5034, Monitor Well and RFI Borehole Abandonment, by one of the following methods.

- Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are being added to ensure bridging does not occur.
- Boreholes greater than 20 ft in depth will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grout materials include cement or bentonite grout, neat cement, or concrete.

The use of backfill materials such as bentonite and grout will be documented in a field logbook with respect to volumes (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be presented in the investigation report.

5.3.3 Sediment Samples

Sediment samples will be collected using SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. Sediment samples will be collected from areas of sediment accumulation that include sediment judged to be representative of the historical period of Laboratory operations. The locations will be selected based on geomorphic relationships in areas likely to have been affected by discharges from Laboratory operations. Preliminary sediment sampling locations have been selected and are shown in section 4 figures. Because sediment systems are dynamic and subject to redistribution by runoff events, however, some locations may need to be adjusted at the time this work plan is implemented. In the course of collecting sediment samples, it may be determined that the selected location is not appropriate because of conditions observed during excavation of the sediment (e.g., the sediment is much shallower than anticipated, the sediment is predominantly coarse-grained, or the sediment shows evidence of being older than the target age). Sediment sampling locations may be adjusted as appropriate. Any changes to sediment sampling locations will be documented as deviations from this work plan in the investigation report.

5.3.4 Test Pit and/or Trench Samples

Excavations or test pits will be completed using a track excavator or backhoe to locate inactive landfills and septic tanks. Excavated soil will be staged a minimum of 3 ft from the edge of the excavation, and excavations deeper than 4 ft bgs will be appropriately benched to allow access and egress, if necessary. Confirmation samples will be collected from the walls and bottom of the excavation using SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. After field screening, confirmation sampling, and any necessary overexcavation work are completed, the test pits and/or trenches will be backfilled. The soil removed from the excavation will be returned to the excavation provided sampling shows it is not hazardous waste and residential SSLs are not exceeded. Otherwise, the excavations will be backfilled with clean fill material.

5.4 Laboratory Methods

The analytical suites vary by site as specified in section 4 and are summarized in Table 4.0-1. All analytical suites are presented in the statement of work for analytical laboratories (LANL 2000, 071233). The specific analytical methods to be used are specified in Table 4.0-1. Sample collection and analysis will be coordinated with the Laboratory's Sample Management Office (SMO).

5.5 Health and Safety

The field investigations described in this investigation work plan will comply with all applicable requirements pertaining to worker health and safety. An integrated work document and a site-specific health and safety plan will be in place before fieldwork is performed.

5.6 Equipment Decontamination

Equipment for drilling and sampling will be decontaminated before and after drilling and sampling activities (as well as between drilling boreholes) to minimize the potential for cross-contamination. Dry

decontamination methods are preferred and will be given priority because they do not generate liquid wastes. Residual material adhering to the equipment will be removed using dry decontamination methods, including wire-brushing and scraping, as described in SOP-5061, Field Decontamination of Equipment. Dry decontamination of sampling equipment may include use of a nonphosphate detergent such as Fantastik on a paper towel, and the equipment is wiped so no liquid waste is generated.

If dry decontamination methods are not effective, the equipment may be decontaminated by steam-cleaning or hot water pressure-washing, as described in SOP-5061. Wet decontamination methods will be conducted on a HDPE liner on a temporary decontamination pad. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions will be sampled and analyzed to determine the final disposition of the wastewater and the effectiveness of the decontamination procedures.

5.7 IDW

The IDW generated during field-investigation activities may include, but is not limited to, drill cuttings; contaminated soil; excavated debris; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other waste that has potentially come into contact with contaminants.

All IDW generated during field-investigation activities will be managed in accordance with applicable SOPs that incorporate the requirements of all applicable EPA and NMED regulations, DOE orders, and Laboratory implementation requirements. Appendix B presents the IDW management plan.

5.8 Cleanup Activities

SWMUs 33-004(b), 33-004(d), 33-006(a), 33-008(a), 33-010(c), 33-010(f), 33-010(g), 33-010(h), and 33-015 and AOC 33-008(c) are proposed for remediation under this investigation work plan. Excavation of waste, contaminated media, waste disposition, and confirmation sampling will be completed at these sites. The general sequence of activities for waste excavation, transportation, disposal, and confirmation sampling is summarized below.

5.8.1 Removal of Surficial and Buried Waste, Inactive Units, and Contaminated Soil and Sediment

The general sequence of waste-removal activities is described below.

- Mobilization
    - ❖ Assemble construction documents
    - ❖ Conduct construction readiness assessment
    - ❖ Conduct preconstruction meeting
    - ❖ Construct access roads
    - ❖ Construct staging area
    - ❖ Install temporary field trailers
    - ❖ Determine boundaries of waste. First, survey and stake the original waste limit coordinates, as determined in the RFI report and reported in the HIR (LANL 2009, 107348). Next, excavate and pothole with visual examination and screening using

methods described in section 5.1 to establish or confirm waste boundaries only where the original boundaries are inadequately defined to implement cleanup.

- ❖ Mobilize heavy equipment to site
- ❖ Identify underground utilities

- Site preparation
  - ❖ Install fencing
  - ❖ Install stormwater controls
  - ❖ Abandon/relocate utilities
  - ❖ Conduct preexcavation survey
- Removal of waste
  - ❖ Excavate waste
  - ❖ Stockpile and load rolloff container
  - ❖ Characterize waste for dispositioning
  - ❖ Transport waste to off-site disposal facility
  - ❖ Survey boundaries of excavation
  - ❖ Conduct confirmation sampling
  - ❖ Establish subgrade and conduct survey
- Backfill
  - ❖ Backfill and compact
  - ❖ Vegetate surface
  - ❖ Survey finished surface
- Demobilize

5.8.2 Waste Management and Disposal

Management of all IDW, including waste generated during cleanup, is described in Appendix B.

5.8.3 Transportation

All waste will be hauled in rolloff containers directly to the selected disposal facility.

5.8.4 Confirmation Sampling

Confirmation sampling will be performed at all remediated sites (section 4).

6.0 MONITORING PROGRAMS

Groundwater, sediment, and surface water monitoring is being conducted in the Chaquehui Canyon Aggregate Area as part of other environmental activities. This monitoring is described briefly below.

6.1 Groundwater

There are currently no alluvial, intermediate, or regional groundwater monitoring wells in the Chaquehui Canyon Aggregate Area. The nearest regional well is well R-31, located in North Ancho Canyon approximately 1 mi north of TA-33.

6.2 Stormwater

Monitoring of stormwater in Chaquehui Canyon under is being performed under the NPDES Multi-Sector General Permit (MSGP) and Federal Facility Compliance Agreement/Administrative Order (FFCA/AO). The MSGP and FFCA/AO are being replaced by a new NPDES individual permit (IP). Monitoring under the MSGP, FFCA/AO, and IP is performed using site-monitoring areas (SMAs) that monitor stormwater runoff from individual SWMUs and AOCs or groups of SWMUs and AOCs, and gage stations, which are used for watershed-scale monitoring in canyons and drainages. SWMUs and AOCs in the Chaquehui Canyon Aggregate Area subject to SMA monitoring are SWMUs 33-002(d) (IP only); 33-004(d); 33-004(h); 33-004(j); 33-005(a–c) (FFCA/AO only); 33-006(a); 33-007(b); 33-007(c) (IP only); 33-010(c); 33-010(f); 33-010(g); 33-010(h) (IP only); 33-011(d) (IP only); 33-011(e) (IP only); 33-012(a) (IP only); 33-014 (IP only); 33-015; 33-016 (IP only); and 33-017 (IP only); and AOCs 33-008(c); 33-011(b); C-33-001; and C-33-003, which are monitored using nine SMAs. Monitoring is also conducted at gage station E338, located in Chaquehui Canyon south of South Site, and gage E340, located in the main drainage channel approximately one-quarter mile east of Main Site. The monitoring requirements for each SMA and gage are contained in a Site Drainage Pollution Prevention Plan (SDPPP) for SWMUs and AOCs and the Storm Water Monitoring Plan, which is updated annually and submitted to EPA. The SDPPP also contains the monitoring results.

7.0 SCHEDULE

Preparation for field work will not proceed until the work plan is approved. The expected duration of field activities is 18 mo. The investigation report for Chaquehui Canyon Aggregate Area will be submitted within 6 mo after completion of field activities. Therefore, a submittal date of no later than March 31, 2013, is proposed for the investigation report.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 References

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Abeele, W.V., M.L. Wheeler, and B.W. Burton, October 1981. "Geohydrology of Bandelier Tuff," Los Alamos National Laboratory report LA-8962-MS, Los Alamos, New Mexico. (Abeele et al. 1981, 006273)

Ahlquist, A.J., November 1, 1983. "Conversations with Harlow Russ RE TA-33, 10/27/83," Los Alamos Scientific Laboratory memorandum to file from A.J. Ahlquist (HSE-8), Los Alamos, New Mexico. (Ahlquist 1983, 006854)

ASTM (American Society for Testing and Materials), June 1997. "D6001 Standard Guide for Direct-Push Water Sampling for Geoenvironmental Investigations," in *Annual Book of ASTM Standards*, Vol. 04.09 Soil and Rock (II), ASTM, West Conshohocken, Pennsylvania. (ASTM 1997, 057511)

Aubele, J.C., 1978. "Geology of the Cerros del Rio Volcanic Field," in *Guidebook to Rio Grande Rift in New Mexico and Colorado*, Circular 163, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico, pp. 198-201. (Aubele 1978, 054426)

Bailey, R.A., R.L. Smith, and C.S. Ross, 1969. "Stratigraphic Nomenclature of Volcanic Rocks in the Jemez Mountains, New Mexico," in *Contributions to Stratigraphy*, U.S. Geological Survey Bulletin 1274-P, Washington, D.C. (Bailey at el. 1969, 021498)

Baltz, E.H., J.H. Abrahams, Jr., and W.D. Purtymun, March 1963. "Preliminary Report on the Geology and Hydrology of Mortandad Canyon near Los Alamos, New Mexico, with Reference to Disposal of Liquid Low-Level Radioactive Waste," U.S. Geological Survey Open File Report, Albuquerque, New Mexico. (Baltz et al. 1963, 008402)

Buckland, C.W., October 20, 1951. "12 October 1951 Spill at TA-33," Los Alamos Scientific Laboratory memorandum to D.P. MacMillan (W-3) from C. Buckland (H-1), Los Alamos, New Mexico. (Buckland 1951, 007845)

Collins, K.A., A.M. Simmons, B.A. Robinson, and C.I. Nylander (Eds.), December 2005. "Los Alamos National Laboratory's Hydrogeologic Studies of the Pajarito Plateau: A Synthesis of Hydrogeologic Workplan Activities (1998–2004)," Los Alamos National Laboratory report LA-14263-MS, Los Alamos, New Mexico. (Collins et al. 2005, 092028)

Cox, E.J., R. Garde, and A.M. Valentine, July 21, 1975. "Disposition of TA-33-21, a Plutonium Contaminated Experimental Facility," Los Alamos Scientific Laboratory document LA-UR-75-1419, Los Alamos, New Mexico. (Cox et al. 1975, 009728)

Dethier, D.P., 1997. "Geology of White Rock Quadrangle, Los Alamos and Santa Fe Counties, New Mexico," Map 73, New Mexico Bureau of Mines and Mineral Resources. (Dethier 1997, 049843)

EPA (U.S. Environmental Protection Agency), January 21, 2005. "EPA's Prior Decisions on SWMU/AOC Sites at Los Alamos National Laboratory (LANL)," U.S. Environmental Protection Agency letter to J. Bearzi (NMED-HRMB) from L.F. King (EPA Federal Facilities Section Chief), Dallas, Texas. (EPA 2005, 088464)

EPA (U.S. Environmental Protection Agency), December 2007. "EPA Region 6 Human Health Medium-Specific Screening Levels," U.S. EPA Region 6, Dallas, Texas. (EPA 2007, 099314)

Galusha, T., and J.C. Blick, April 1971. "Stratigraphy of the Santa Fe Group, New Mexico," *Bulletin of the American Museum of Natural History,* Vol. 144, No. 1, pp. 1–128. (Galusha and Blick 1971, 021526)

Griggs, R.L., and J.D. Hem, 1964. "Geology and Ground-Water Resources of the Los Alamos Area, New Mexico," U.S. Geological Survey Water Supply Paper 1753, Washington, D.C. (Griggs and Hem 1964, 092516)

Heiken, G., F.E. Goff, J. Stix, S. Tamanyu, M. Shafiqullah, S.R. Garcia, and R.C. Hagan, February 10, 1986. "Intracaldera Volcanic Activity, Toledo Caldera and Embayment, Jemez Mountains, New Mexico," *Journal of Geophysical Research,* Vol. 91, No. B2, pp. 1799-1816. (Heiken et al. 1986, 048638)

Heiken, G., K. Wohletz, R.V. Fisher, and D.P. Dethier, 1989. "Maar Volcanoes of White Rock Canyon–Interaction of Ground and Surface Water with Basaltic Volcanoes of the Rio Grande Rift, New Mexico," Los Alamos National Laboratory document LA-UR-89-1917, Los Alamos, New Mexico. (Heiken et al. 1989, 054425)

Hoard, D., September 17, 1991. "Conversation with John Dougherty RE TA-33," Los Alamos National Laboratory memorandum (CLS-1/91-303-DH) to file from D. Hoard (CLS-1), Los Alamos, New Mexico. (Hoard 1991, 009733)

Hoard, D., September 17, 1991. "Conversation with Harlow Russ," Los Alamos National Laboratory memorandum (CLS-1/91-304-DH) to file from D. Hoard (CLS-1), Los Alamos, New Mexico. (Hoard 1991, 009734)

Hyatt, E.C., June 5, 1956. "Proposed Hot Machine Shop, TA-33, Building HP-113," Los Alamos Scientific Laboratory memorandum to J. Bolton (ENG-DO) from E.C. Hyatt (H-5), Los Alamos, New Mexico. (Hyatt 1956, 007929)

Hyatt, E.C., September 27, 1957. "Fume Hood Exhaust Stack in Building HP-16, TA-33," Los Alamos Scientific Laboratory memorandum to J. Dougherty (W-3) from E.C. Hyatt (H-5), Los Alamos, New Mexico. (Hyatt 1957, 007939)

Izett, G.A., and J.D. Obradovich, February 10, 1994. "$^{40}Ar/^{39}Ar$ Age Constraints for the Jaramillo Normal Subchron and the Matuyama-Brunhes Geomagnetic Boundary," *Journal of Geophysical Research,* Vol. 99, No. B2, pp. 2925–2934. (Izett and Obradovich 1994, 048817)

Jordan, H.S., August 2, 1954. "Industrial Hygiene Survey, TA-33," Los Alamos Scientific Laboratory memorandum to D. MacMillan (W-3) from H.S. Jordan (H-5), Los Alamos, New Mexico. (Jordan 1954, 007918)

Koogle and Pouls Engineering, November 29, 1986. "TA-33 and TA-39 aerial photograph," Los Alamos National Laboratory, Los Alamos, New Mexico. (Koogle and Pouls Engineering 1986, 017907)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Vol. III of IV (TA-26 through TA-50), Los Alamos National Laboratory document LA-UR-90-3400, Los Alamos, New Mexico. (LANL 1990, 007513)

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1122," Los Alamos National Laboratory document LA-UR-92-925, Los Alamos, New Mexico. (LANL 1992, 007671)

LANL (Los Alamos National Laboratory), December 1995. "RFI Report for Potential Release Sites 33-004(b), 33-004(c), 33-004(j), 33-004(m), 33-006(a), 33-006(b), 33-007(a), 33-007(b), 33-010(a), 33-010(b), 33-010(c), 33-010(d), 33-010(g), 33-010(h), 33-011(b), 33-011(c), 33-014," Los Alamos National Laboratory document LA-UR-95-4439, Los Alamos, New Mexico. (LANL 1995, 051903)

LANL (Los Alamos National Laboratory), January 31, 1995. "Field Unit 3, Operable Unit 1122, Technical Area 33, RFI Report for PRSs 33-004(d), 33-004(g), 33-004(h), 33-004(i), 33-005(a), 33-005(b), 33-005(c), 33-010(e), 33-010(f), 33-011(e), 33-012(a), 33-015, 33-007(c), 33-011(a)," Los Alamos National Laboratory document LA-UR-95-0882, Los Alamos, New Mexico. (LANL 1995, 071262)

LANL (Los Alamos National Laboratory), September 29, 1995. "RFI Report for Field Unit 3, Operable Unit 1122, Technical Area 33, RFI Report for PRSs 33-003(a), 33-004(a), 33-007(c), 33-009, 33-011(d), 33-013, 33-016, 33-017, Revised Sampling Plans for PRSs 33-003(b), 33-004(k), 33-008(a), 33-008(b), C-33-001, C-33-002," Los Alamos National Laboratory document LA-UR-95-3626, Los Alamos, New Mexico. (LANL 1995, 071300)

LANL (Los Alamos National Laboratory), September 29, 1995. "RFI Report for MDA K, PRSs 33-002(a,b,c,d,e)," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1995, 050113)

LANL (Los Alamos National Laboratory), February 1996. "Interim Action Report for Potential Release Site 33-007(c)," Los Alamos National Laboratory document LA-UR-96-710, Los Alamos, New Mexico. (LANL 1996, 052919)

LANL (Los Alamos National Laboratory), June 1996. "Voluntary Corrective Action Completion Report for Solid Waste Management Units at TA-33, 33-010(a), Canyon-Side Disposal Area, 33-010(d), Surface Disposal Area, 33-010(g), Canyon-Side Disposal Area, 33-011(b), General Storage Area," Los Alamos National Laboratory document LA-UR-96-1839, Los Alamos, New Mexico. (LANL 1996, 054755)

LANL (Los Alamos National Laboratory), July 1996. "Sampling and Analysis Plan, PRS 33-008(c)," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1996, 054963)

LANL (Los Alamos National Laboratory), August 1996. "Voluntary Corrective Action Plan for a Solid Waste Management Unit at TA-33, 33-007(c)," Los Alamos National Laboratory document LA-UR-96-2942, Los Alamos, New Mexico. (LANL 1996, 054906)

LANL (Los Alamos National Laboratory), September 1996. "Voluntary Corrective Action Report for a Solid Waste Management Unit at TA-33, 33-007(c)," Los Alamos National Laboratory document LA-UR-96-3198, Los Alamos, New Mexico. (LANL 1996, 062541)

LANL (Los Alamos National Laboratory), September 1997. "NFA Report for Potential Release Sites 33-002(b–c), 33-003(b), 33-004(k), 33-006(a), 33-008(a–b), 33-011(d), 33-013, 33-017 (located in former Operable Unit 1122)," Los Alamos National Laboratory document LA-UR-97-2944, Los Alamos, New Mexico. (LANL 1997, 071478)

LANL (Los Alamos National Laboratory), September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 059730)

LANL (Los Alamos National Laboratory), March 23, 1999. "VCA Plan for Potential Release Sites 33-007(b), 33-010(c), C-33-003," Los Alamos National Laboratory document LA-UR-99-3002, Los Alamos, New Mexico. (LANL 1999, 063678)

LANL (Los Alamos National Laboratory), September 1999. "Work Plan for Sandia Canyon and Cañada del Buey," Los Alamos National Laboratory document LA-UR-99-3610, Los Alamos, New Mexico. (LANL 1999, 064617)

LANL (Los Alamos National Laboratory), August 18, 2000. "Submittal of Response to Request for Supplemental Information (RSI) for the Voluntary Corrective Action (VCA) Plan for Potential Release Sites (PRSs) 33-007(b), 33-010(c), and C-33-003 [and attached 'Segmented Gate System, Voluntary Corrective Action Status Report for Potential Release Sites 33-007(b), 33-010(c), C-33-033]," Los Alamos National Laboratory letter (ER2000-0171) to J. Kieling (NMED-HWB) from J.A. Canepa (LANL) and T.J. Taylor (DOE-LAAO), Los Alamos, New Mexico. (LANL 2000, 066889)

LANL (Los Alamos National Laboratory), September 29, 2000. "Annual Transmittal of Best Management Practices (BMPs) Installed, Inspected, and Maintained at PRSs at Los Alamos National Laboratory (LANL)," Los Alamos National Laboratory letter (ER2000-0535) to J. Young (NMED-HWB) from J. Canepa (LANL) and T.J. Taylor (DOE-LAAO), Los Alamos, New Mexico. (LANL 2000, 068748)

LANL (Los Alamos National Laboratory), December 2000. "University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories," Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

LANL (Los Alamos National Laboratory), May 2005. "Derivation and Use of Radionuclide Screening Action Levels, Revision 1," Los Alamos National Laboratory document LA-UR-05-1849, Los Alamos, New Mexico. (LANL 2005, 088493)

LANL (Los Alamos National Laboratory), September 2006. "South Canyons Investigation Work Plan," Los Alamos National Laboratory document LA-UR-06-5979, Los Alamos, New Mexico. (LANL 2006, 093713)

LANL (Los Alamos National Laboratory), November 2009. "Historical Investigation Report for Chaquehui Canyon Aggregate Area," Los Alamos National Laboratory document LA-UR-09-7402, Los Alamos, New Mexico. (LANL 2009, 107348)

LANL (Los Alamos National Laboratory), July 2010. "Voluntary Corrective Action Completion Report for the Investigation and Remediation of Solid Waste Management Units 33-002(a-c) at Technical Area 33," Los Alamos National Laboratory document LA-UR-10-4928, Los Alamos, New Mexico. (LANL 2010, 110352)

LASL (Los Alamos Scientific Laboratory), November 1954. Excerpted pages from "H-Division Progress Report, October 20 - November 20, 1954," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (LASL 1954, 107465)

Laughlin, A.W., G. WoldeGabriel, and D.P. Dethier, October 29, 1993. "Volcanic Stratigraphy of the Pajarito Plateau," Preliminary Report FY93, Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (Laughlin et al. 1993, 054424)

Michelotti, R., and L. Kidman, October 30, 1997. "Transfer of Responsibility for Future Contamination at TA-33-31," Los Alamos National Laboratory memorandum (ER-RM-97-65) to P. Bussolini (NIS-33) from R. Michelotti (CST-18) and L. Kidman (ICF KE), Los Alamos, New Mexico. (Michelotti and Kidman 1997, 074002)

Milford, H.C., December 14, 1956. "Visit to Group W-3 at TA-33," Los Alamos Scientific Laboratory memorandum to W-3 file from H.C. Milford, Los Alamos, New Mexico. (Milford 1956, 007934)

NMED (New Mexico Environment Department), December 23, 1998. "Approval: Class III Permit Modification to Remove Ninety-nine (99) Solid Waste Management Units from the Department of Energy/Los Alamos National Laboratory RCRA Permit NM 0890010515," New Mexico Environment Department letter to T. Taylor (DOE-LAAO) and J.C. Browne (LANL Director) from E. Kelley (NMED-HRMB), Santa Fe, New Mexico. (NMED 1998, 063042)

NMED (New Mexico Environment Department), August 30, 2006. "Approval and Certificate of Completion, Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013, Technical Area 33," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2006, 093526)

NMED (New Mexico Environment Department), October 2006. "New Mexico Environment Department TPH Screening Guidelines," Santa Fe, New Mexico. (NMED 2006, 094614)

NMED (New Mexico Environment Department), March 28, 2007. "Approval with Modifications, South Canyons Investigation Work Plan," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 095490)

NMED (New Mexico Environment Department), August 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 106420)

Nyhan, J.W., L.W. Hacker, T.E. Calhoun, and D.L. Young, June 1978. "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory report LA-6779-MS, Los Alamos, New Mexico. (Nyhan et al. 1978, 005702)

Purtymun, W.D., December 1975. "Geohydrology of the Pajarito Plateau with Reference to Quality of Water, 1949-1972," Informal Report, Los Alamos Scientific Laboratory document LA-UR-02-4726, Los Alamos, New Mexico. (Purtymun 1975, 011787)

Reider, R., July 11, 1967. "Disposal of Capacitors," Los Alamos Scientific Laboratory memorandum to J.E. Dougherty (W-3) from R. Reider (Safety Director), Los Alamos, New Mexico. (Reider 1967, 007471)

Reider, R., August 7, 1972. "Disposal of Defective Energy Storage Capacitors," Los Alamos Scientific Laboratory memorandum to distribution from R. Reider (Safety Director), Los Alamos, New Mexico. (Reider 1972, 008204)

Reneau, S.L., D.P. Dethier, and J.S. Carney, 1995. "Landslides and Other Mass Movements near Technical Area 33, Los Alamos National Laboratory," Los Alamos National Laboratory report LA-12955-MS, Los Alamos, New Mexico. (Reneau et al. 1995, 054405)

Rogers, M.A., June 1977. "History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes (Areas A, B, C, D, E, F, G, and T)," Vol. II, Los Alamos Scientific Laboratory report LA-6848-MS, Los Alamos, New Mexico. (Rogers 1977, 005708)

Santa Fe Engineering Ltd., January 1992. "Wastewater Stream Characterization for TA-33, 39, 49 and 69, Los Alamos National Laboratory, Environmental Study, Characterization Report #26," draft report prepared for Los Alamos National Laboratory, Santa Fe, New Mexico. (Santa Fe Engineering, Ltd. 1992, 062036)

Schulte, H.F., June 24, 1958. "Control of Niobium Fumes," Los Alamos Scientific Laboratory memorandum to the file (W-3 at TA-33) from H.F. Schulte (H-5 Group Leader), Los Alamos, New Mexico. (Schulte 1958, 007946)

Smith, J., December 19, 1974. "Radiation Survey of Cleaned Up Dump Area at TA-33," Los Alamos Scientific Laboratory memorandum to J. Warren (H-8) from J. Smith (H-8), Los Alamos, New Mexico. (Smith 1974, 006911)

Spiegal, Z., and B. Baldwin, 1963. "Geology and Water Resources of the Santa Fe Area, New Mexico," Geological Survey Water Supply Paper 1525, U.S. Government Printing Office, Washington, D.C. (Spiegel and Baldwin 1963, 054259)

Stoker, A.K., March 31, 1993. "Direct Testimony of Alan K. Stoker on Behalf of Petitioners before the New Mexico Water Quality Control Commission," Los Alamos, New Mexico. (Stoker 1993, 056021)

Turbeville, B.N., D.B. Waresback, and S. Self, February 1989. "Lava-Dome Growth and Explosive Volcanism in the Jemez Mountains, New Mexico: Evidence from the Pilo-Pliestocene Puye Alluvial Fan," *Journal of Volcanology and Geothermal Research,* Vol. 36, pp. 267-291. (Turbeville et al. 1989, 021587)

USAF (U.S. Air Force), November 22, 1958. "TA-33 and TA-39 aerial photograph," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (USAF 1958, 015987)

Vaniman, D., and K. Wohletz, November 14, 1990. "Results of Geological Mapping/Fracture Studies: TA-55 Area," Los Alamos National Laboratory memorandum (EES1-SH90-17) to J.L. Gardner (EES-1) from D. Vaniman, and K. Wohletz, Los Alamos, New Mexico. (Vaniman and Wohletz 1990, 009995.2)

WoldeGabriel, G., R.G. Warren, D. Broxton, D. Vaniman, M.T. Heizler, E.C. Kluk, and L. Peters, 2001. "Episodic Volcanism, Petrology, and Lithostratigraphy of the Pajarito Plateau and Adjacent Areas of the Española Basin and the Jemez Mountains," *Volcanology in the New Mexico, NM Natural History and Science Bulletin,* Vol. 18, pp. 97-129. (WoldeGabriel et al. 2001, 092523)

8.2 Map Data Sources

Potential Release Sites; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2009-0137; 1:2,500 Scale Data; 13 March 2009; Modified PRS boundaries contained within WES GIS Team project folder, 09-0066, until change control complete.

Canyon Reaches; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0592; 1:24,000 Scale Data; Unknown publication date; Additional reach data contained in WES GIS Team project folder 09-0066

Aggregate Areas; Los Alamos National Laboratory, ENV Environmental Remediation & Surveillance Program, ER2005-0496; 1:2,500 Scale Data; 22 September 2005.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008; Additional former structures contained within WES GIS Team project folder, 09-0066.

Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Primary Gas Distribution Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Paved Parking; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 12 August 2002; as published 15 January 2009.

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Road Centerlines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 15 December 2005; as published 15 January 2009.

Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Storm Drain Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Hypsography, 2, 10, 20, & 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003; Additional drainage data contained within WES GIS Team project folder 08-0030.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2009-0162; 13 March 2009; Proposed sampling and modified/new point feature data contained within WES GIS Team project folder 09-0066.

Individual Permit (IP) Site Monitoring Area (SMA) Samplers; Los Alamos National Laboratory, Water Stewardship Program; Currently unpublished 2009 data contained within WES GIS Team project folder 07-0142.

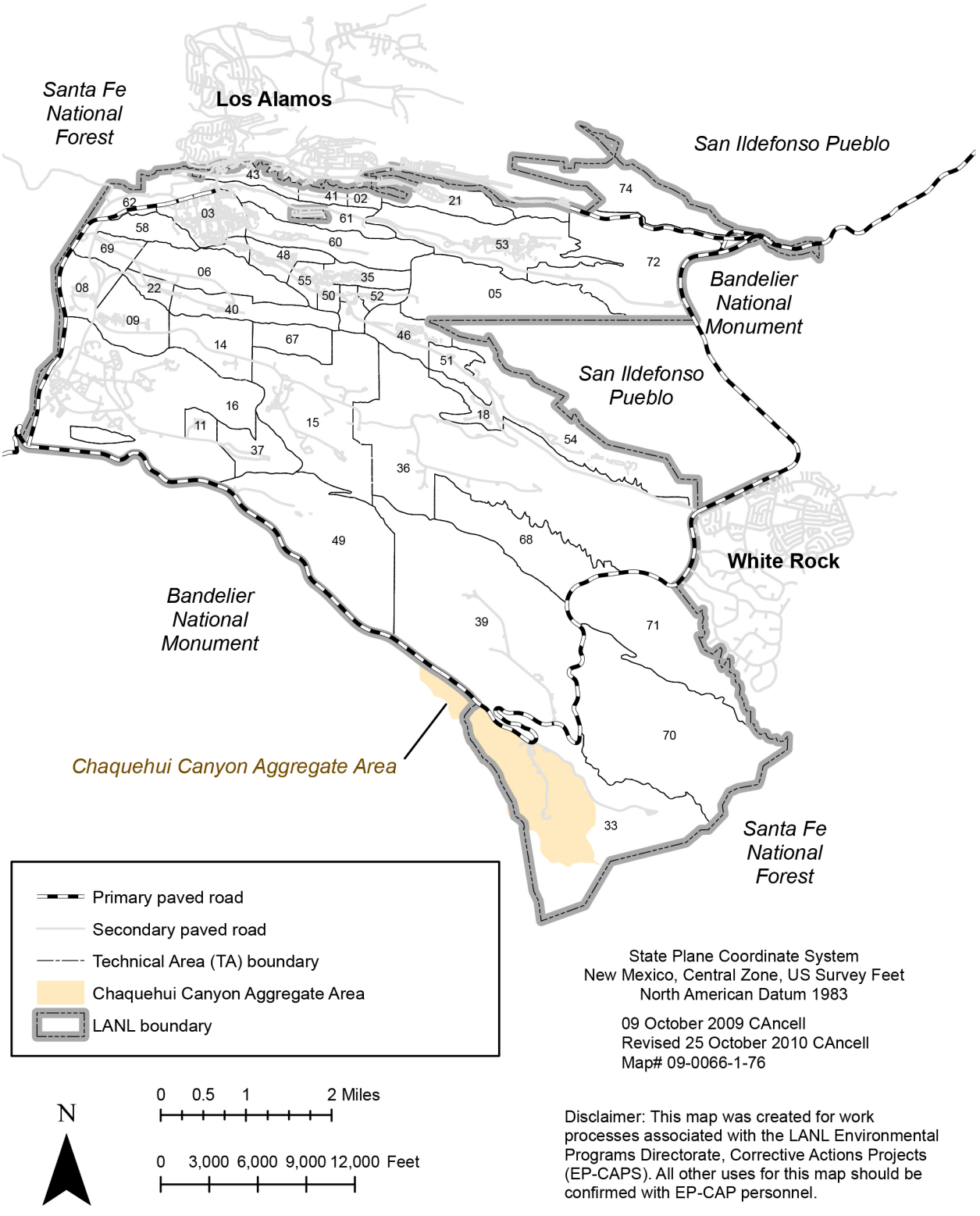


Figure 1.0-1 Chaquehui Canyon Aggregate Area with respect to Laboratory TAs and surrounding land holdings

Bandelier Tuff	Tshirege Member	Qbt 4	Ash-Flow Units
		Qbt 3	
		Qbt 2	
		Qbt 1v	
		Qbt 1g	
		Tsankawi Pumice Bed	
Cerro Toledo Interval		Volcaniclastic Sediments and Ash-Falls	
Bandelier Tuff	Otowi member	Ash-Flow Units	
		Guaje Pumice Bed	
Puye Formation	Fanglomerate	Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments	
	Basalt and Andesite	Cerros del Rio Basalts intercalated within the Puye Formation, includes up to four interlayered basaltic flows. Andesites of the Tschicoma Formation present in western part of plateau	
	Fanglomerate	Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments; includes “Old Alluvium”	
	Axial facies deposits of the ancestral Rio Grande	Totavi Lentil	
Santa Fe Group	Coarse Sediments	Coarse-Grained Upper Facies (formerly called the “Chaquehui Formation” by Purtymun 1995, 045344)	
	Basalt		
	Coarse Sediments		
	Basalt		
	Coarse Sediments		
	Basalt		
	Coarse Sediments		
	Arkosic clastic sedimentary deposits	Undivided Santa Fe Group (includes Chamita[?] and Tesuque Formations)	

Note: Source: LANL 1999, 064617. Modified by NWI 03/21/08.

Figure 3.2-1 Generalized stratigraphy of bedrock units

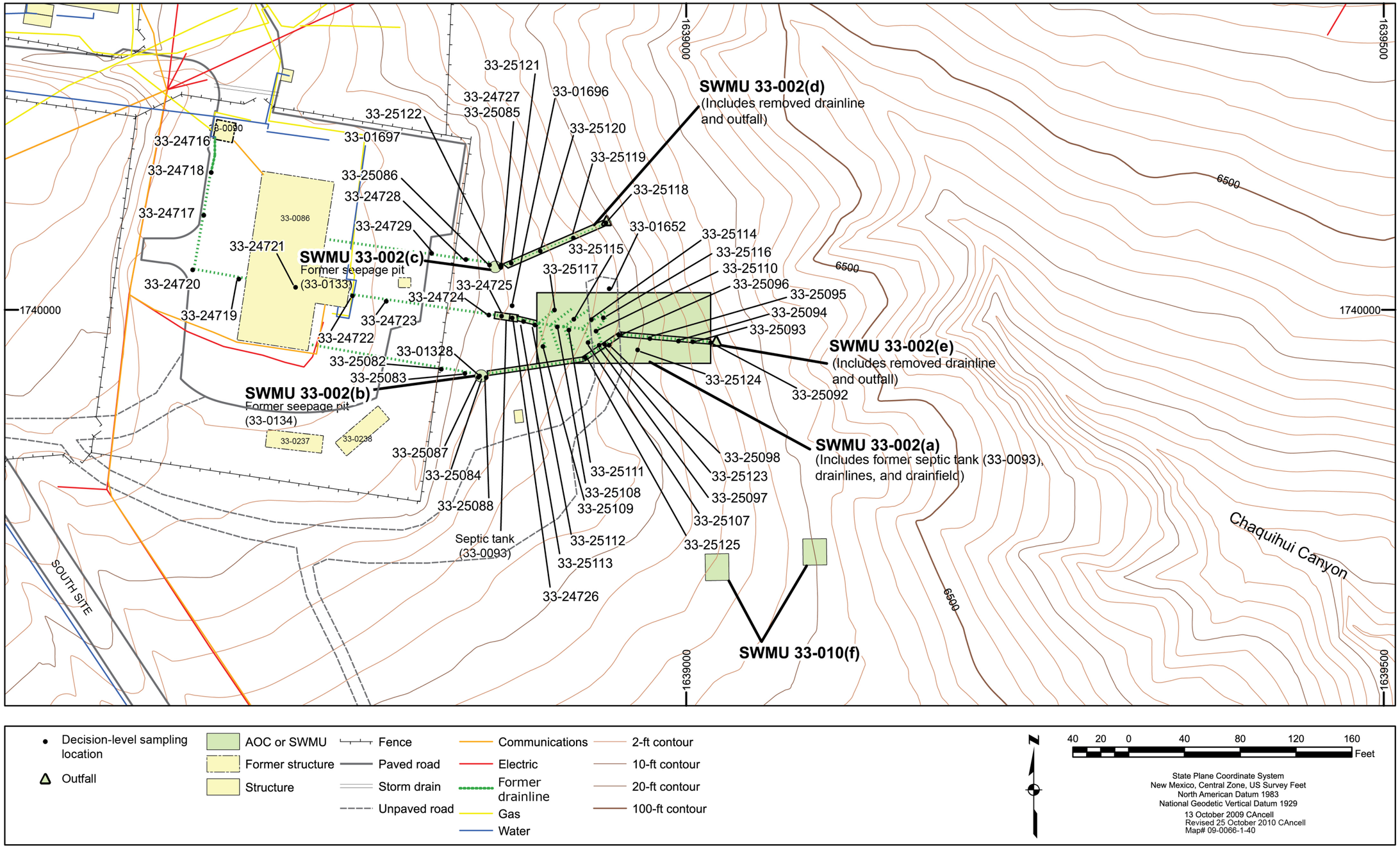


Figure 4.1-1 Site features and decision-level sampling locations for Consolidated Unit 33-002(a)-99

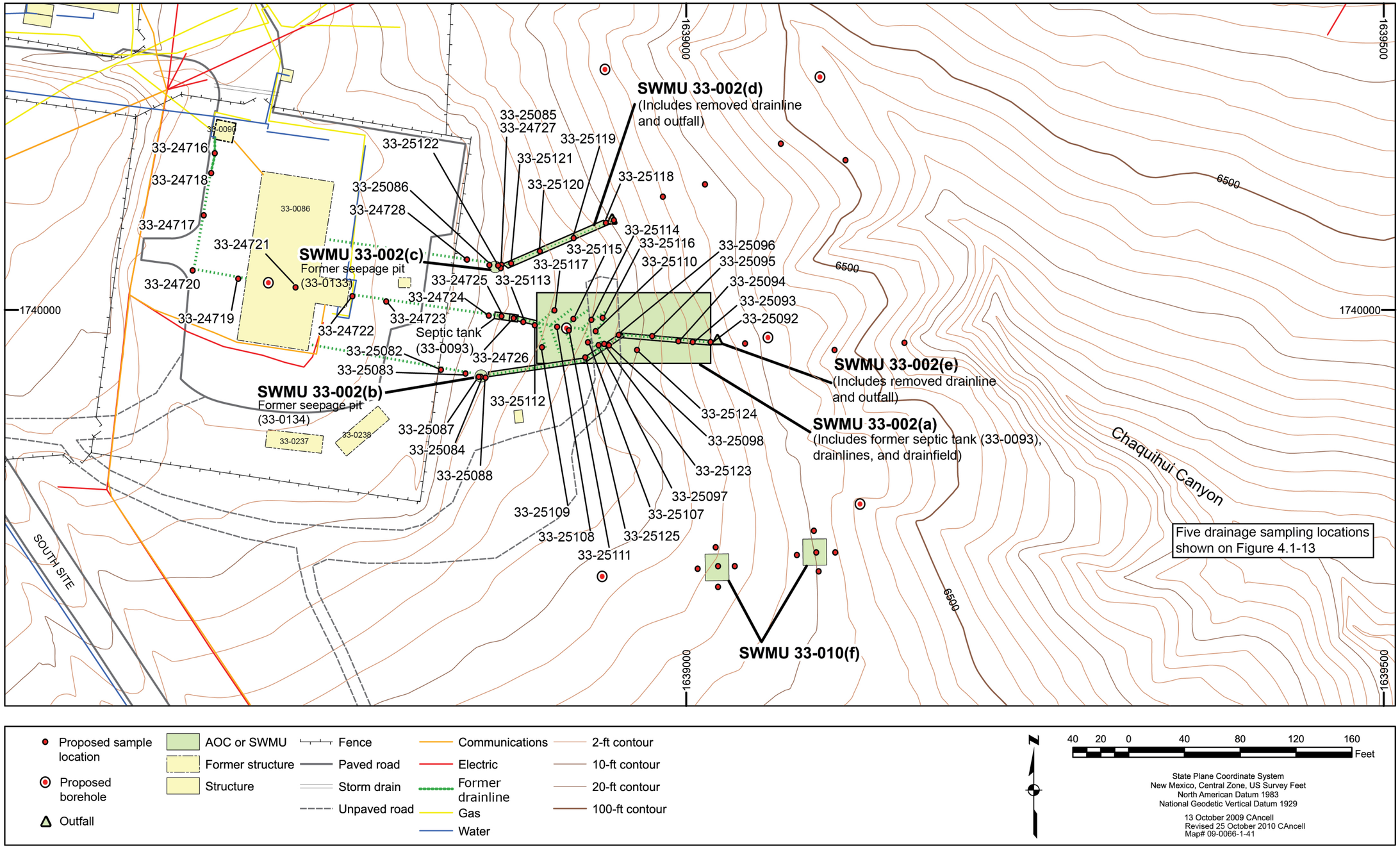


Figure 4.1-2 Proposed sampling locations at Consolidated Unit 33-002(a)-99

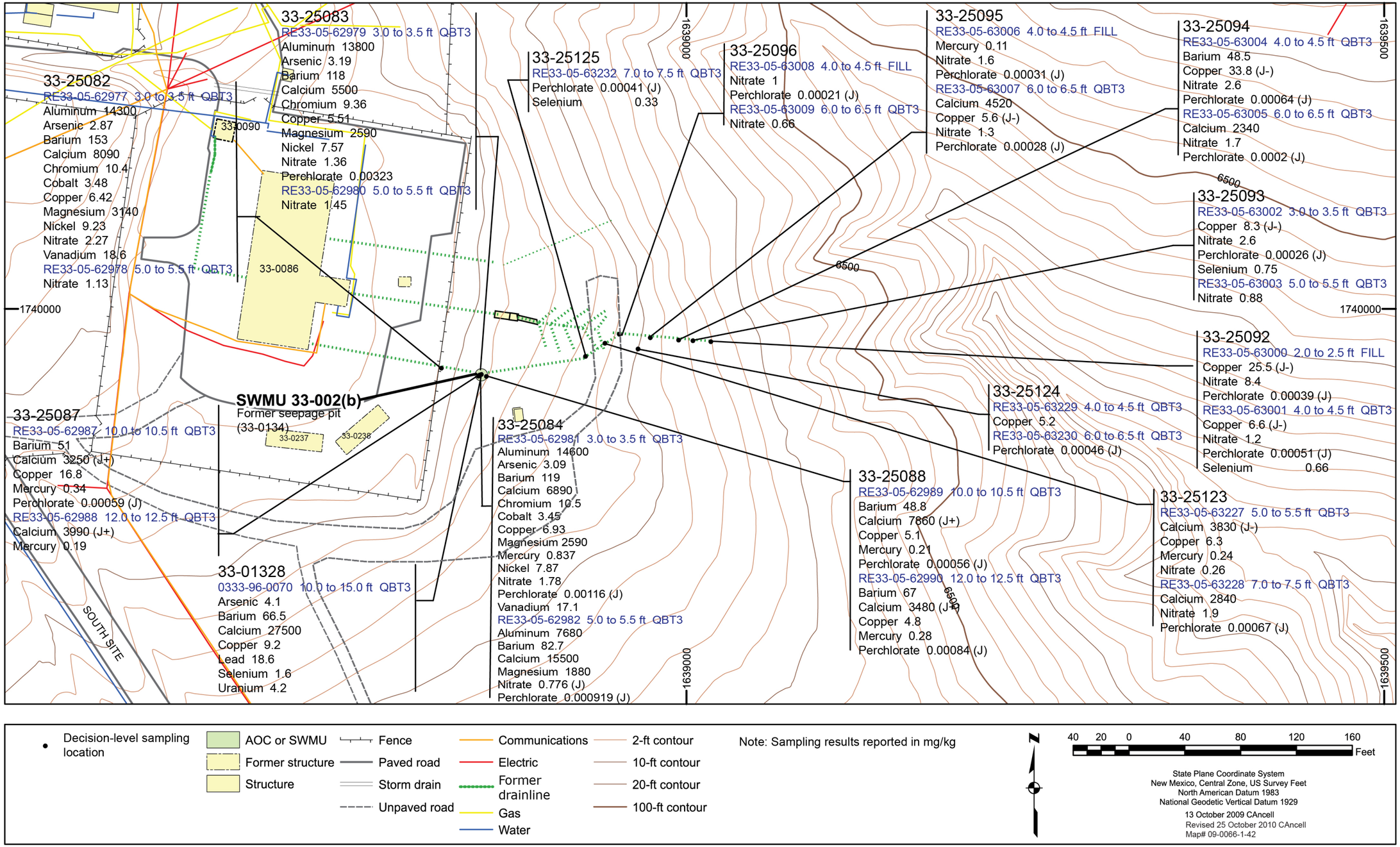


Figure 4.1-3 Inorganic chemicals detected above BVs at SWMU 33-002(b)

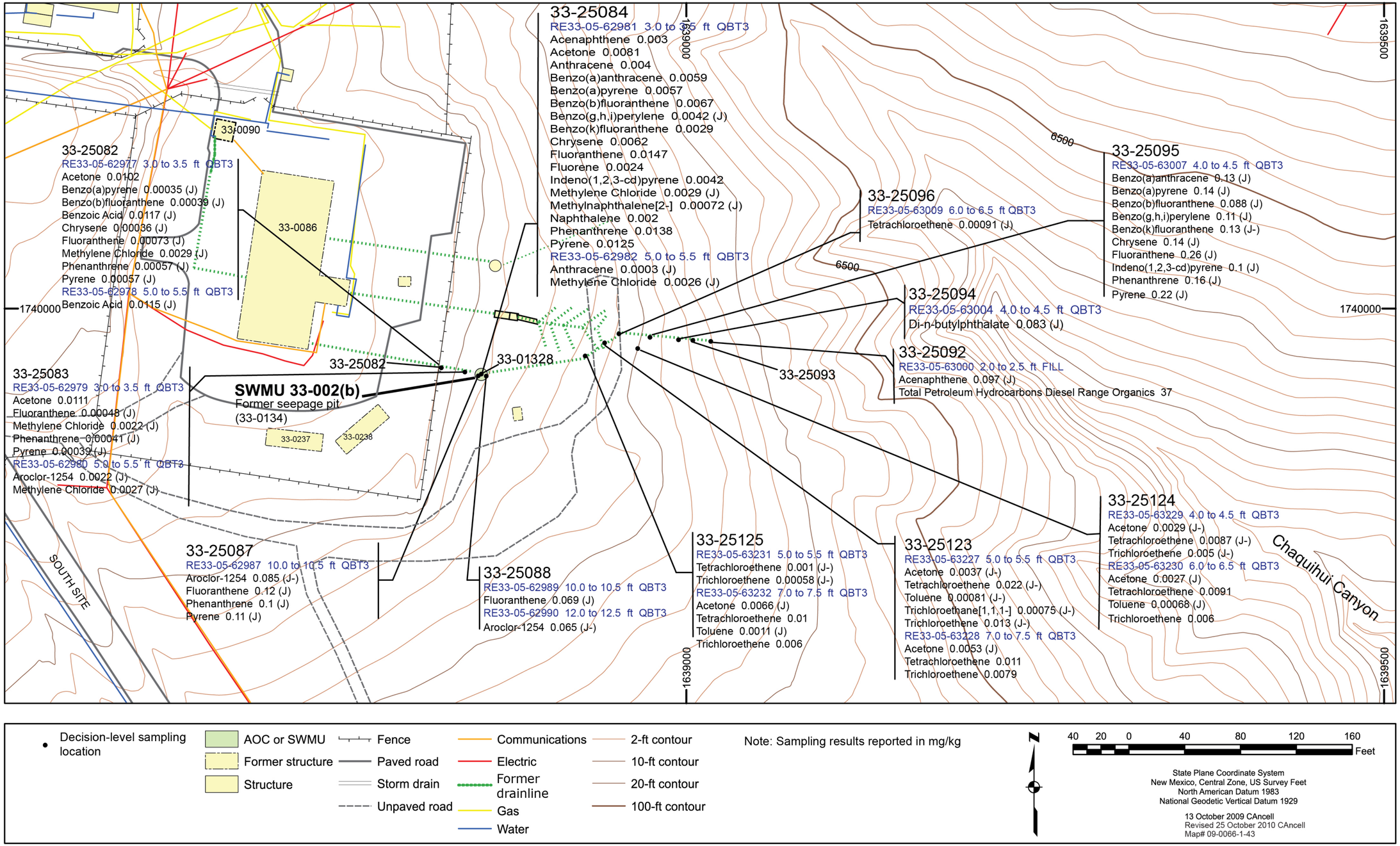


Figure 4.1-4 Organic chemicals detected at SWMU 33-002(b)

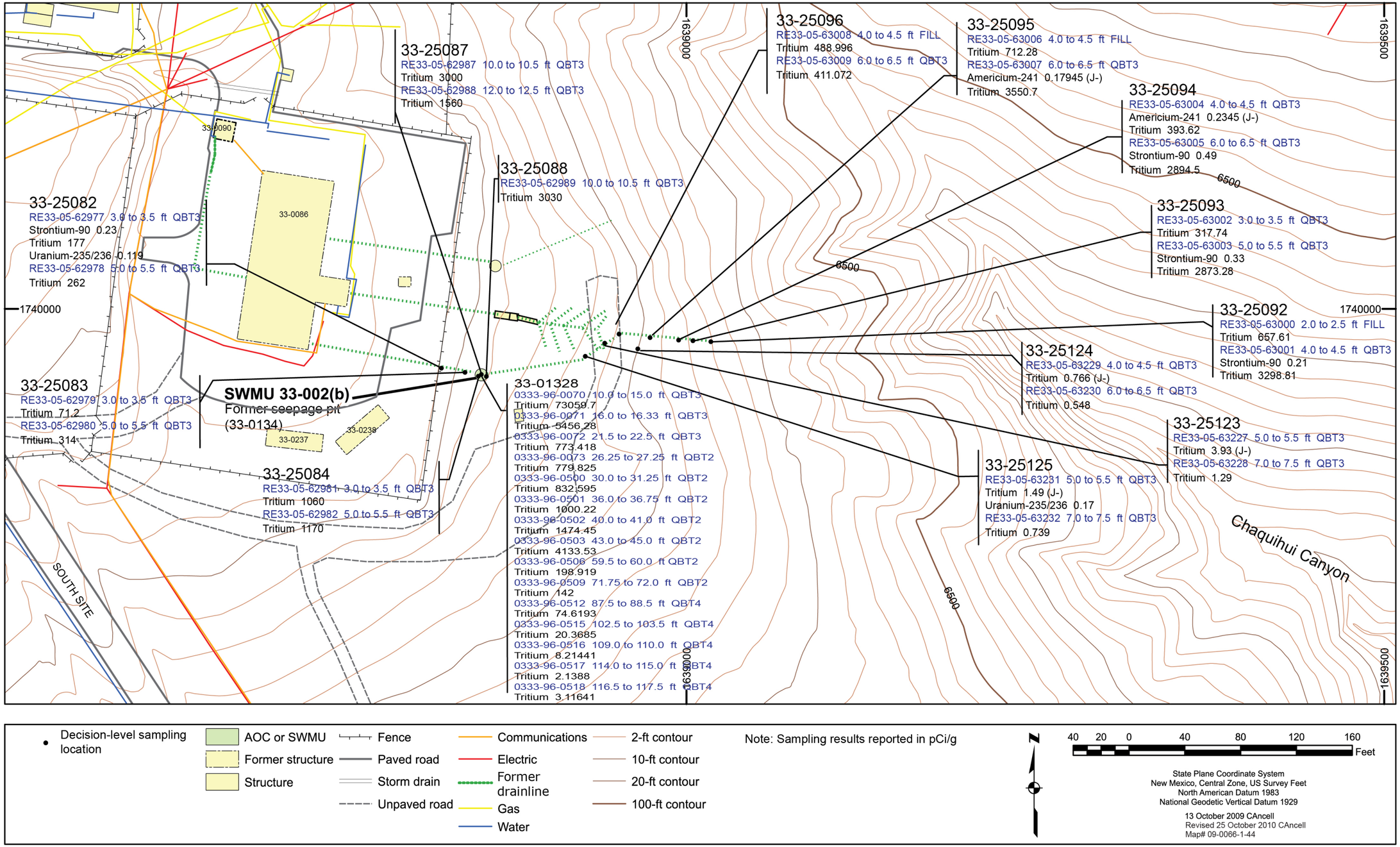


Figure 4.1-5 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(b)

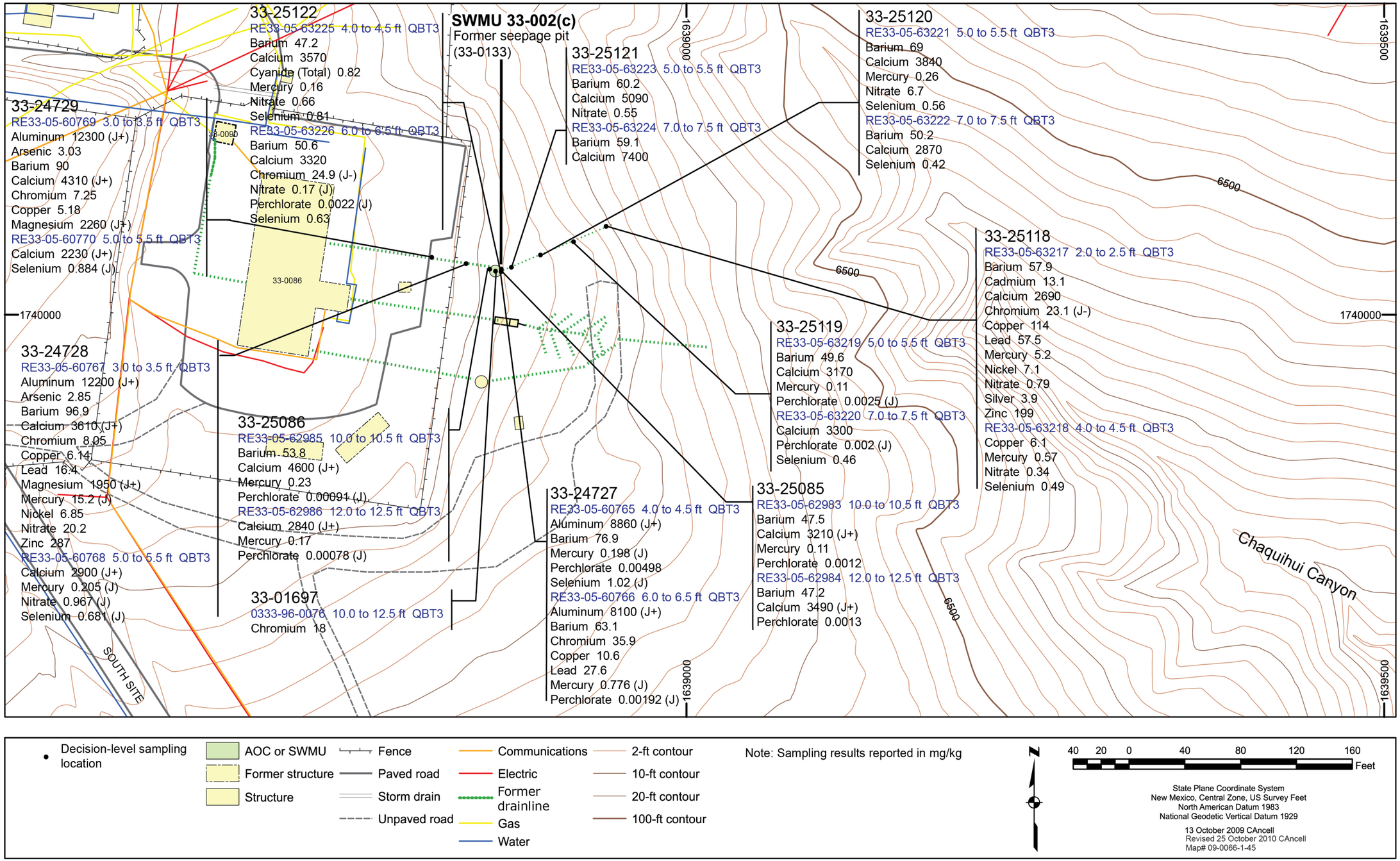


Figure 4.1-6 Inorganic chemicals detected above BVs at SWMU 33-002(c)

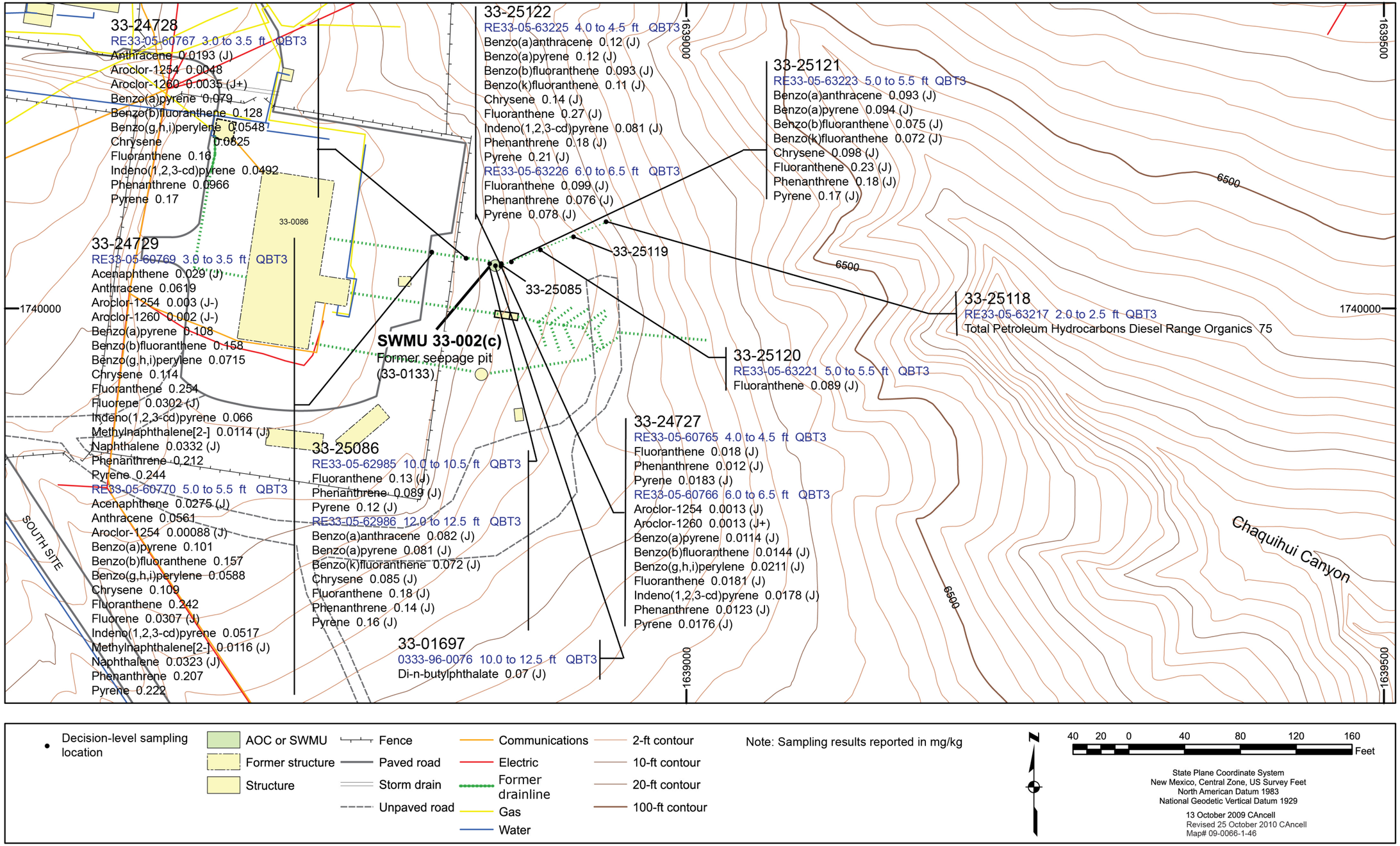


Figure 4.1-7 Organic chemicals detected at SWMU 33-002(c)

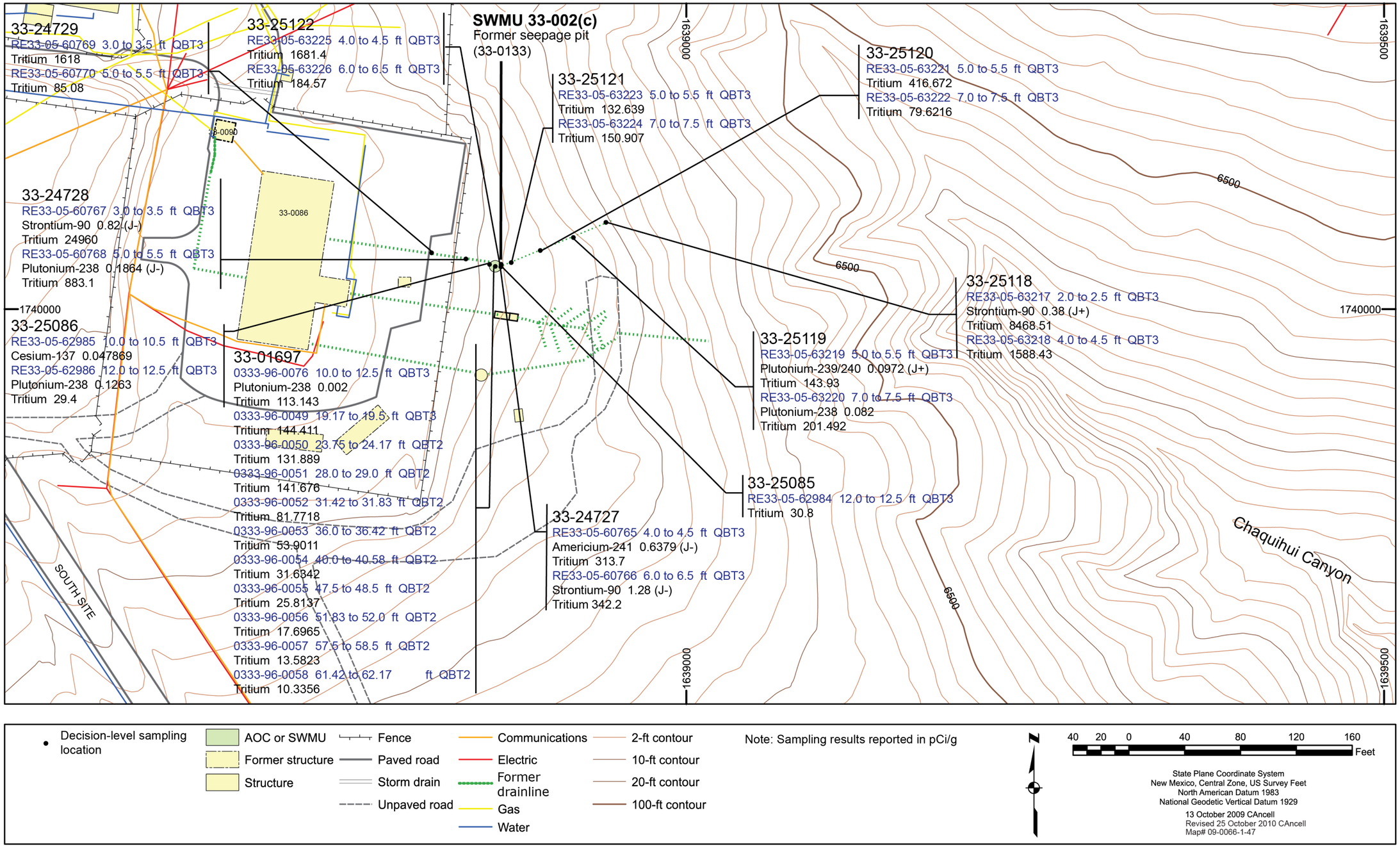


Figure 4.1-8 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(c)

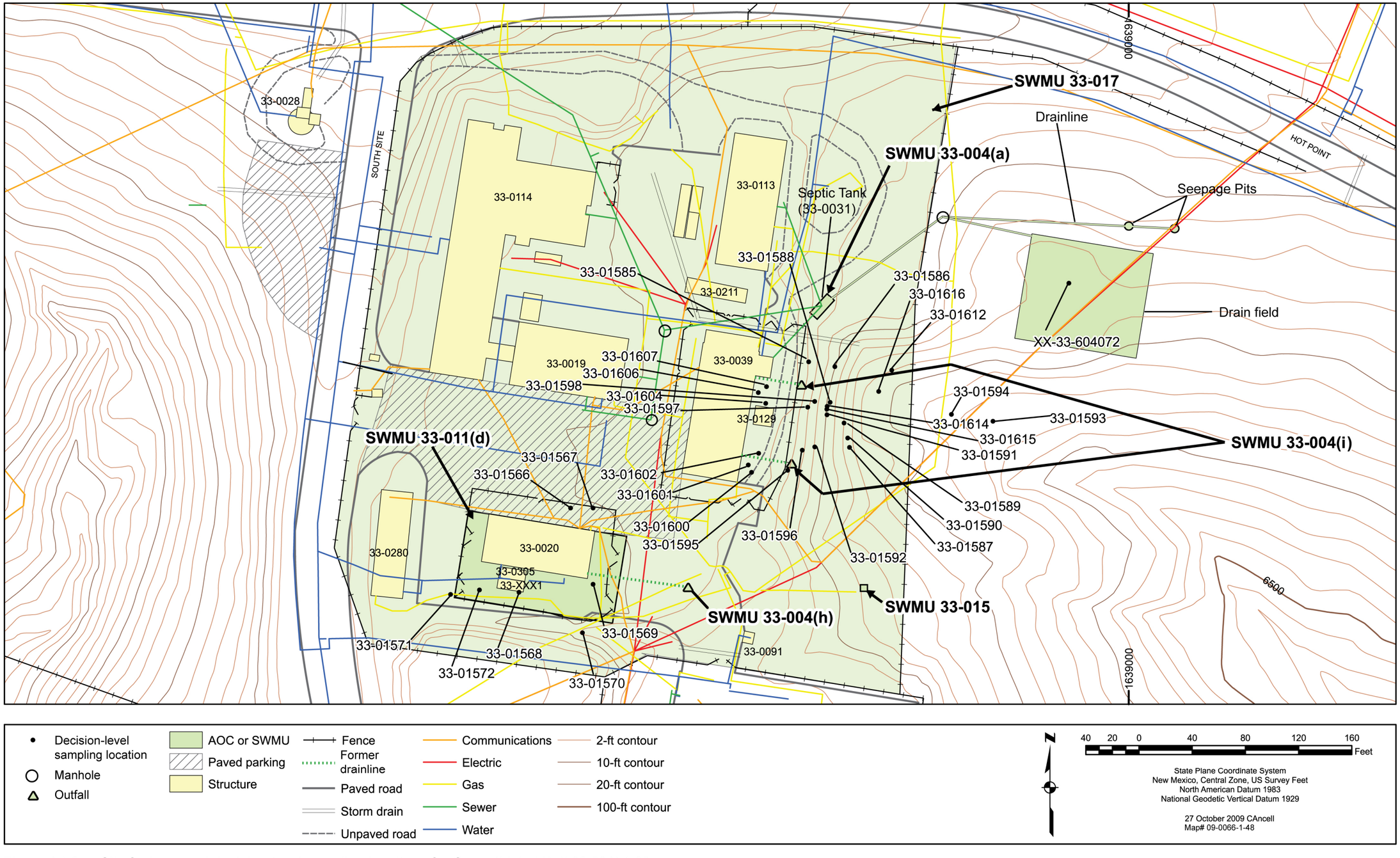


Figure 4.1-9 Site features and decision-level sampling locations for Consolidated Unit 33-004(a)-00

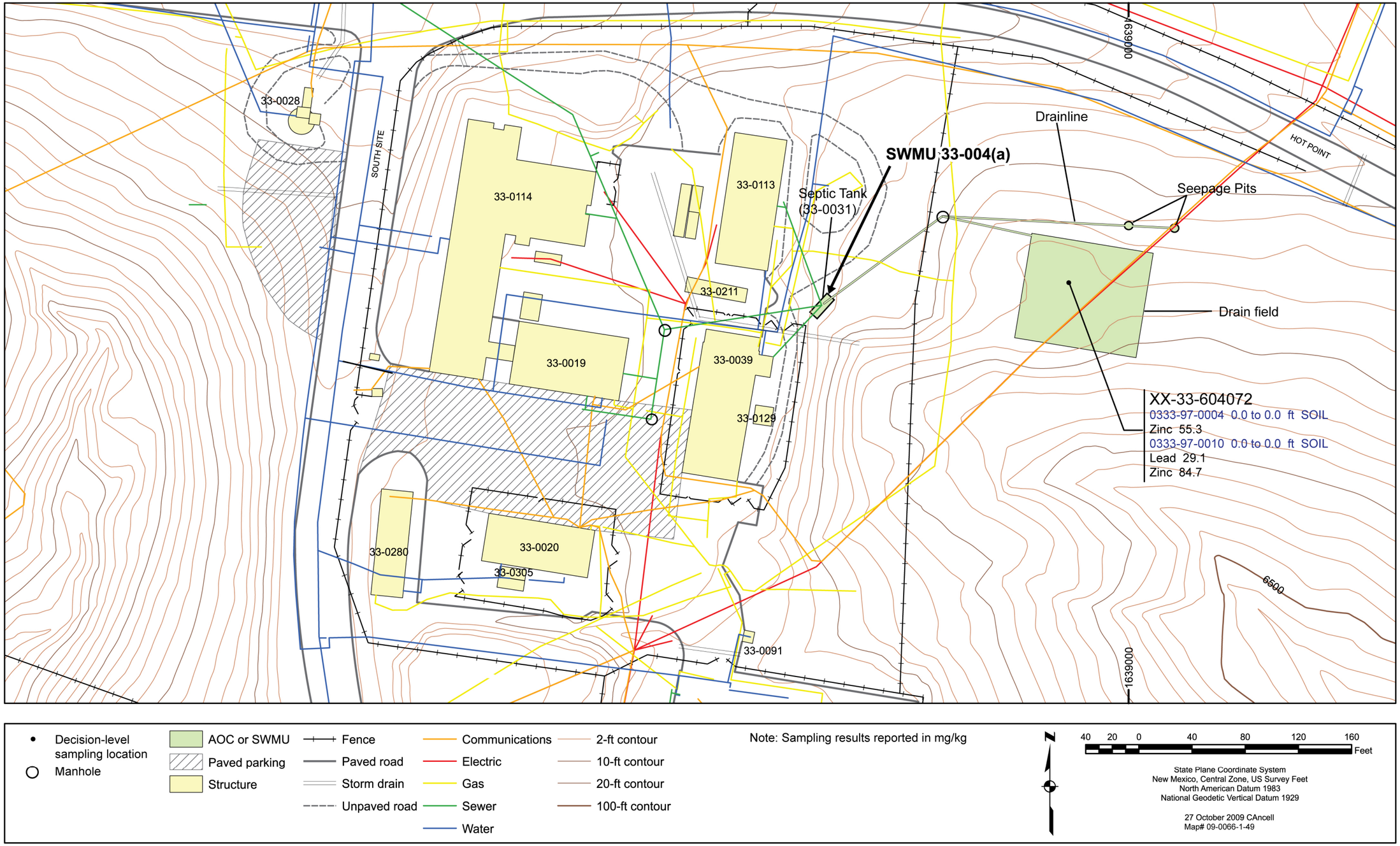


Figure 4.1-10 Inorganic chemicals detected above BVs at SWMU 33-004(a)

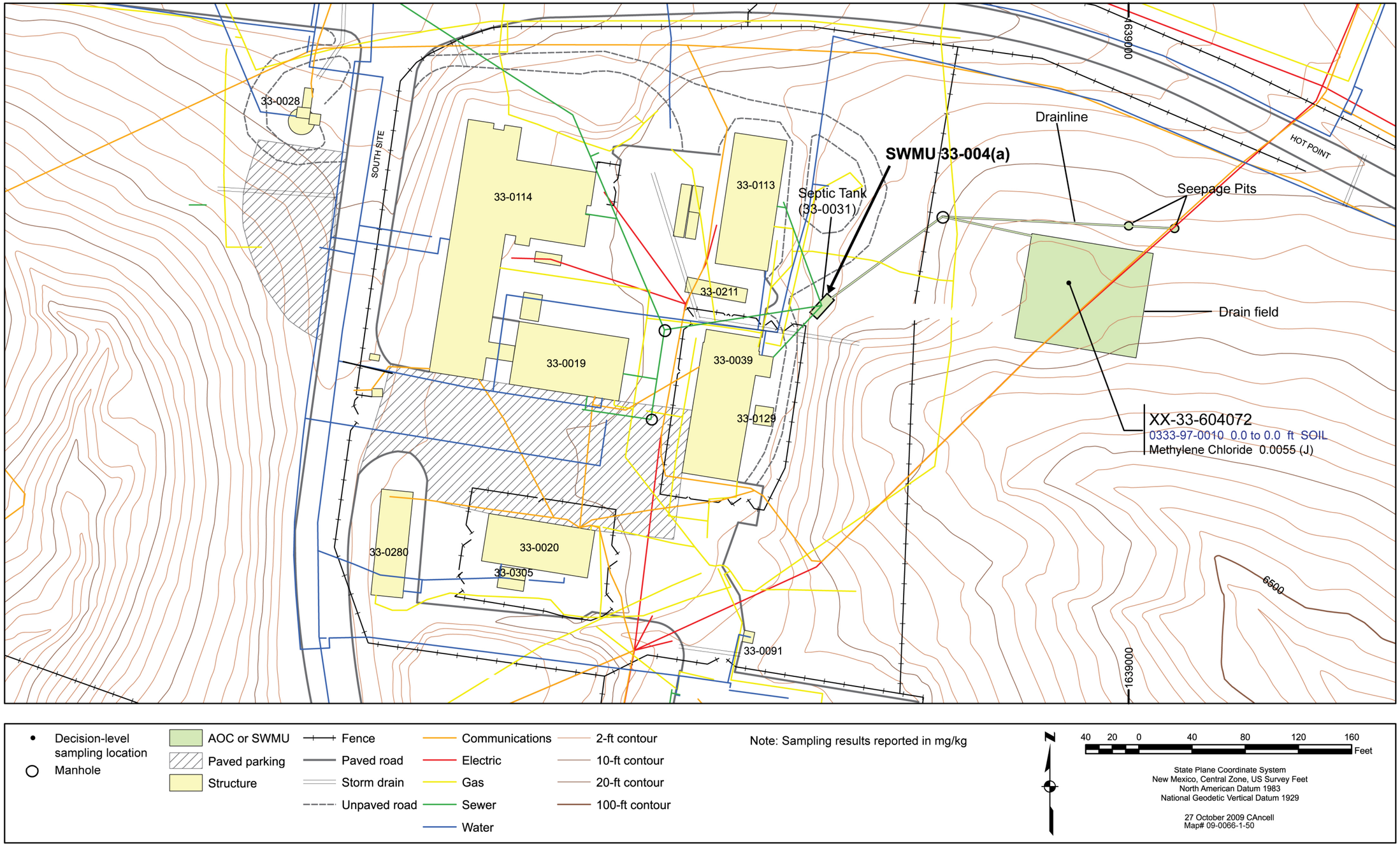


Figure 4.1-11 Organic chemicals detected at SWMU 33-004(a)

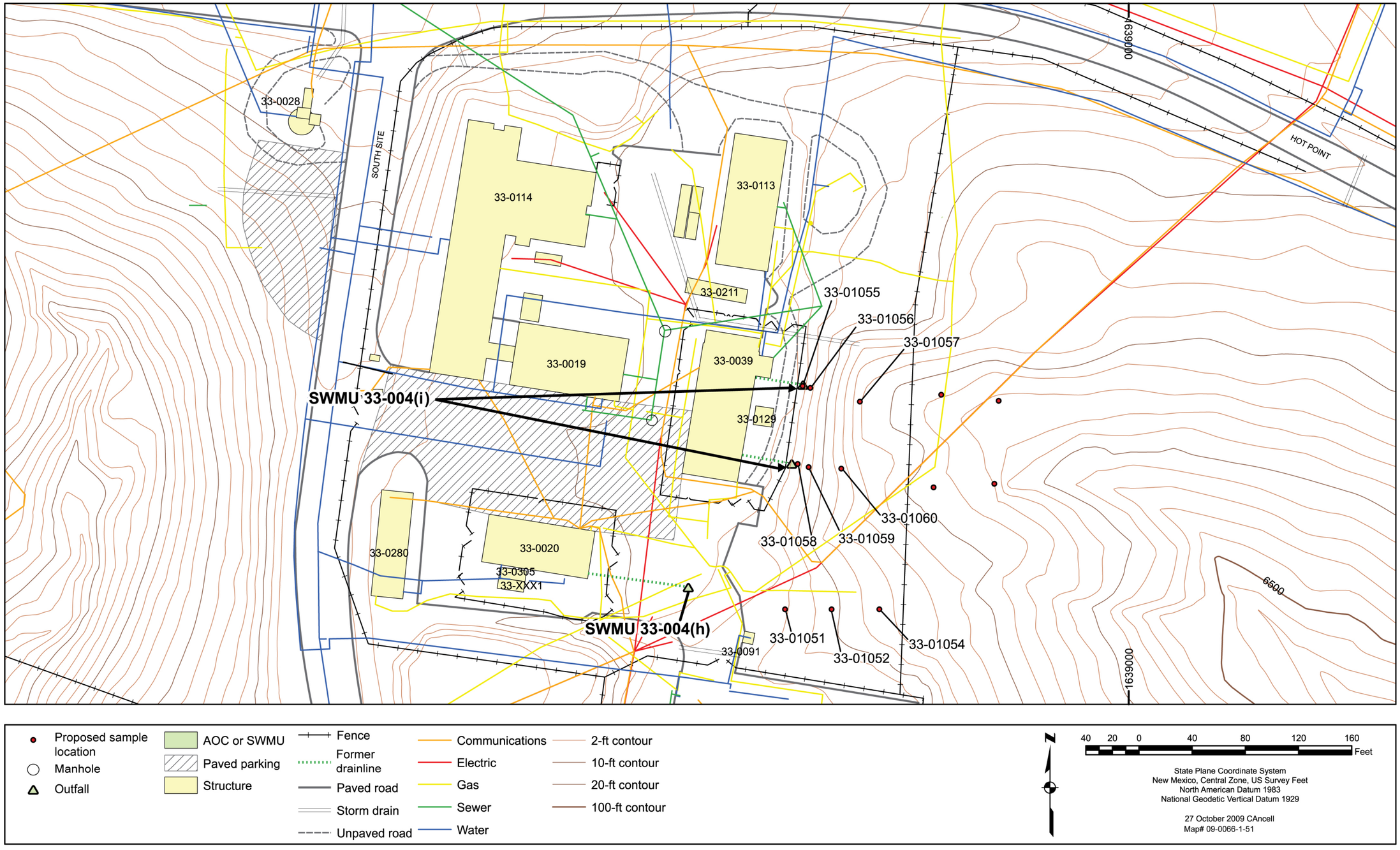


Figure 4.1-12a Proposed sampling locations at SWMUs 33-004(h) and 33-004(i)

Figure 4.1-12b Proposed sampling locations at SWMUs 33-004(a), 33-011(d), and 33-015

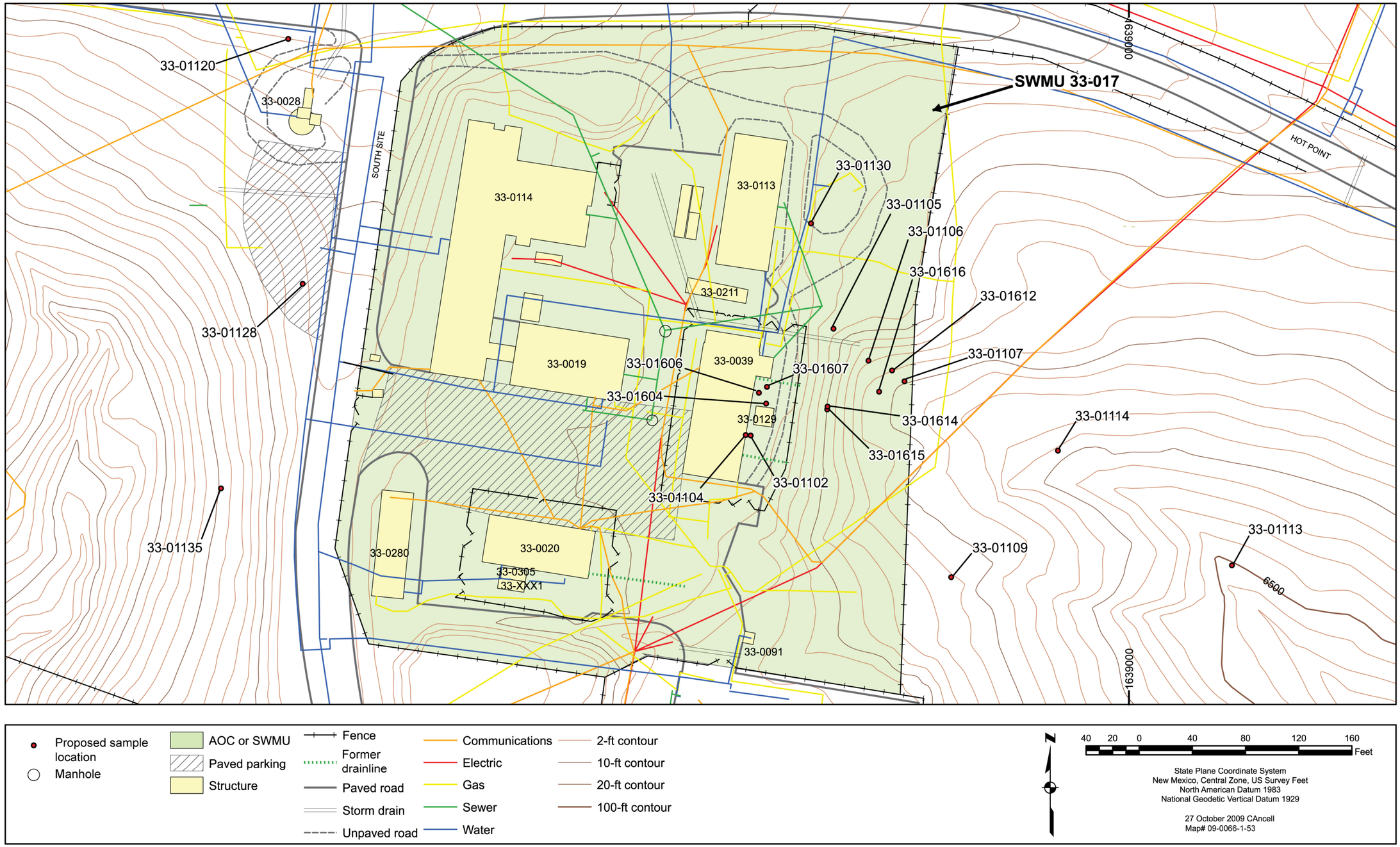


Figure 4.1-12c Nineteen of the twenty-five proposed sampling locations at SWMU 33-017

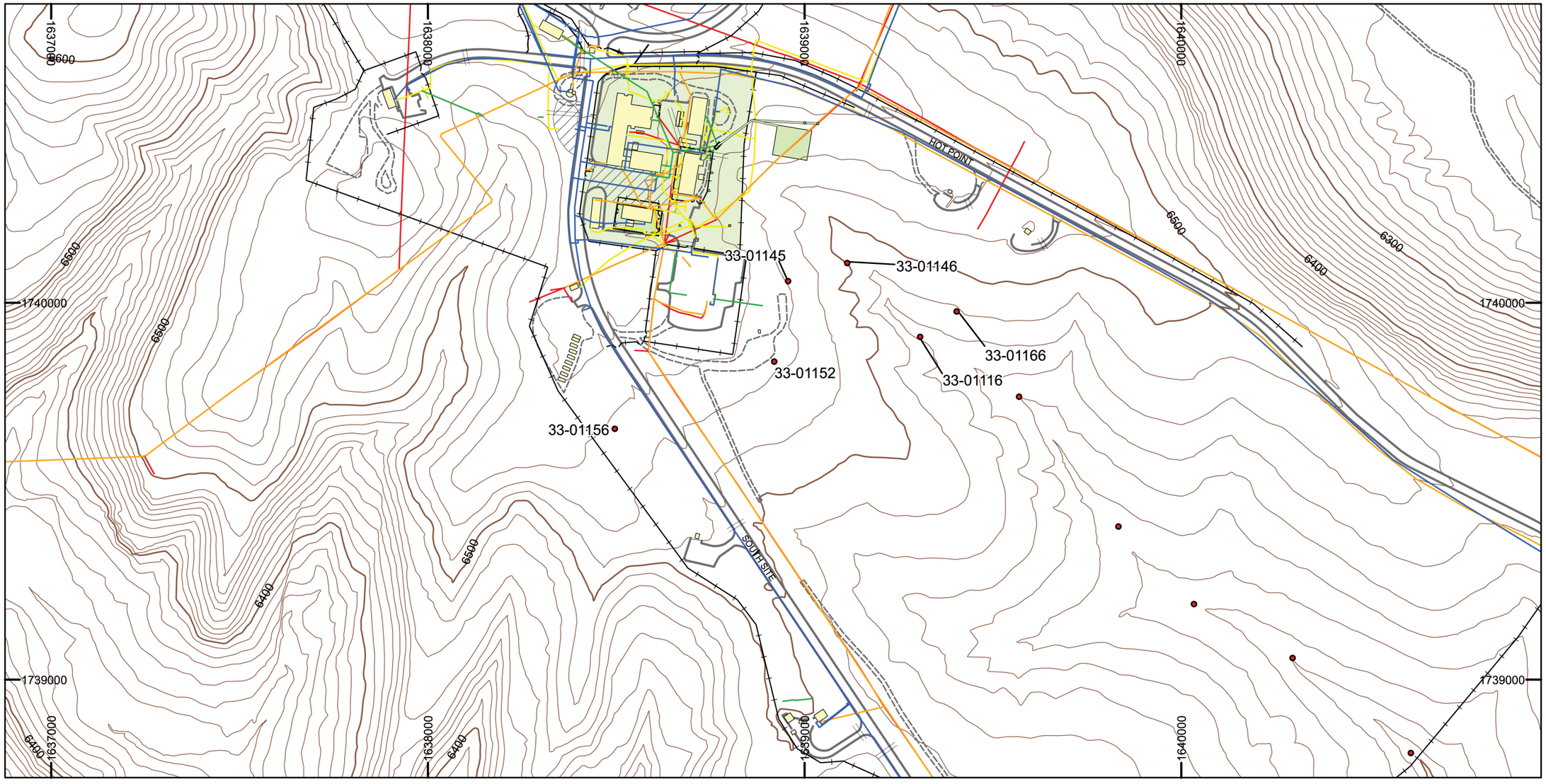


Figure 4.1-13 Six of the twenty-five proposed sampling locations at SWMU 33-017 and proposed drainage sampling locations at Consolidated Unit 33-004(a)-00

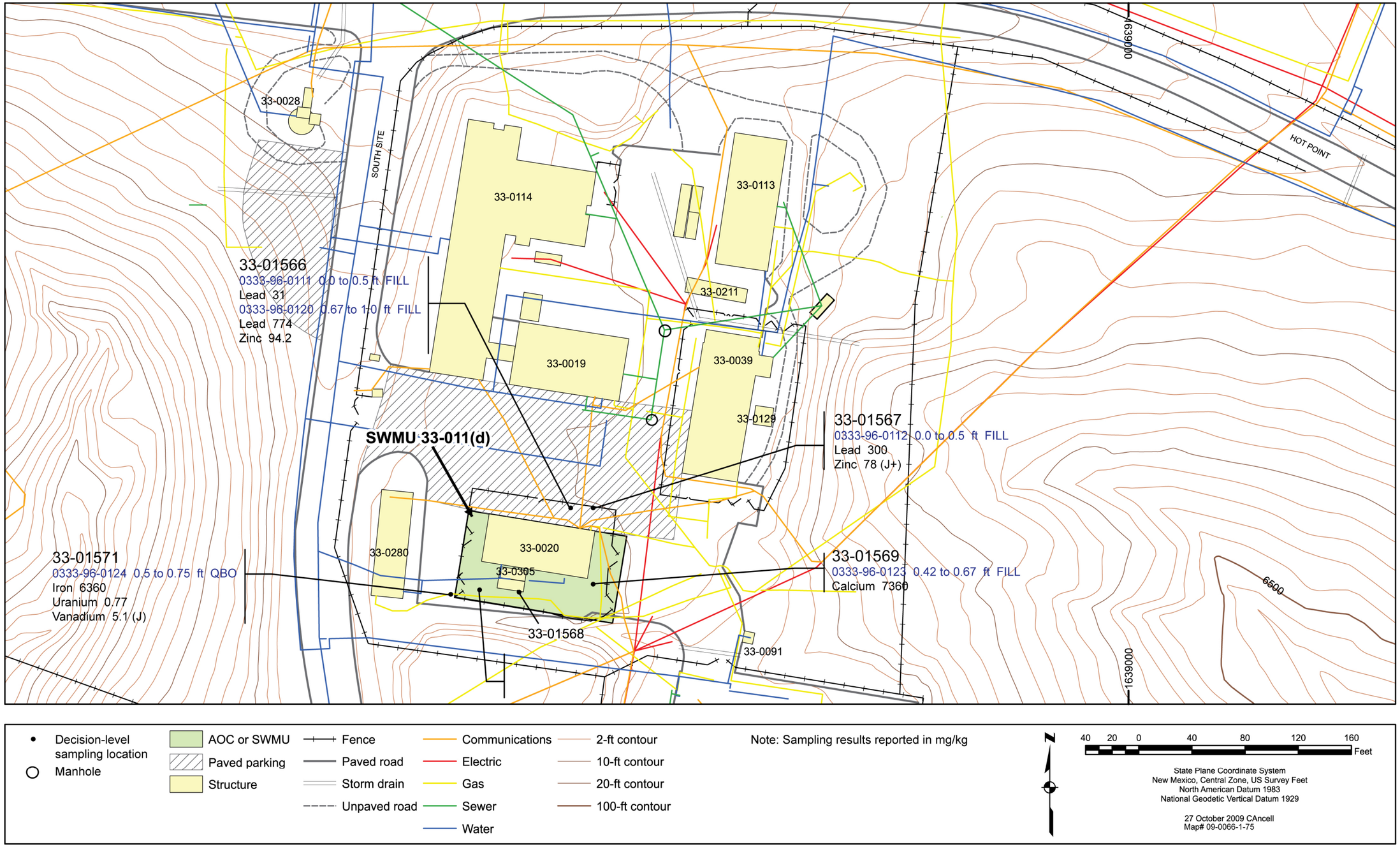


Figure 4.1-14 Inorganic chemicals detected above BVs at SWMU 33-011(d)

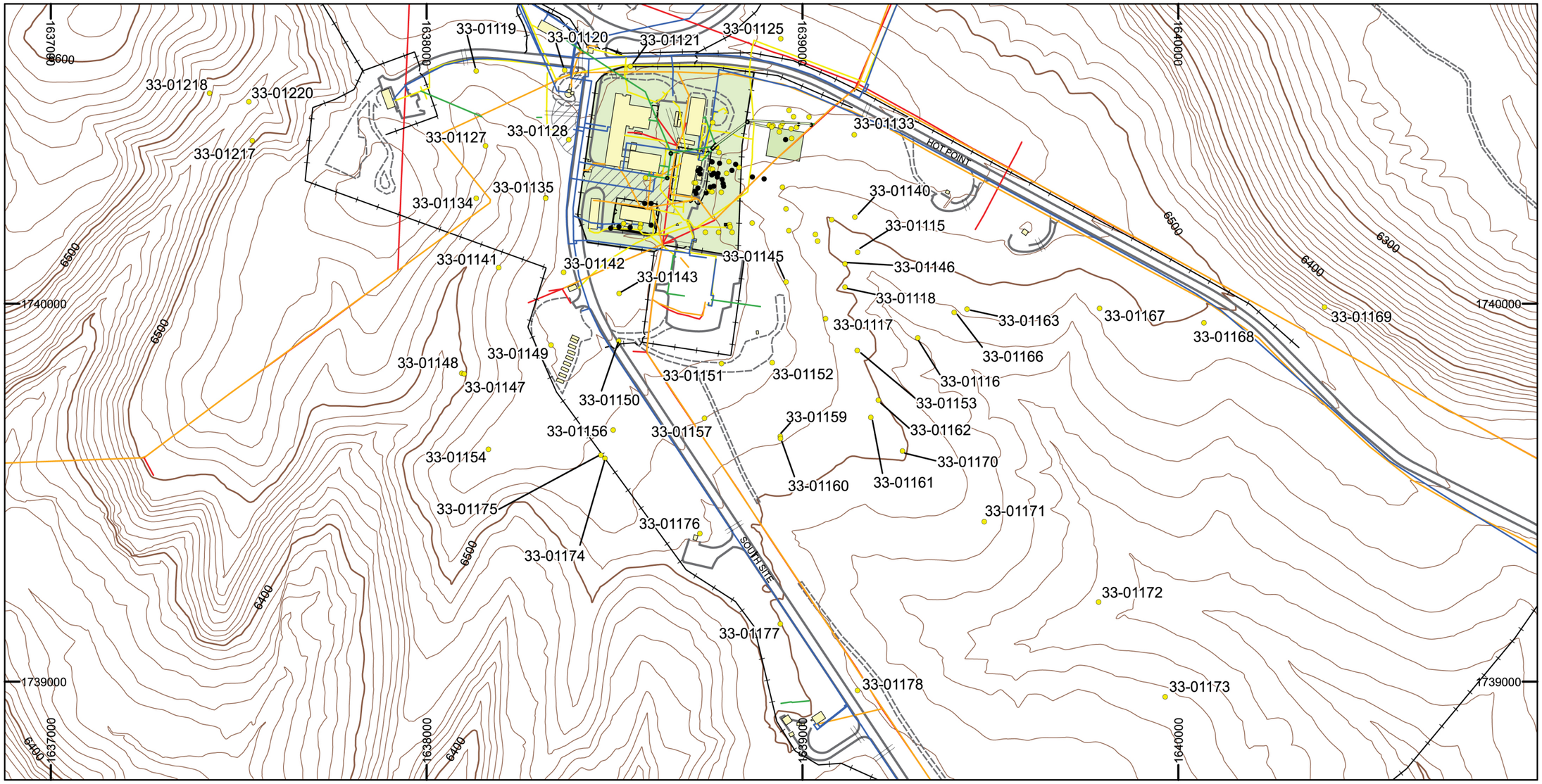


Figure 4.1-15 Site features and historical drainage sampling locations for Consolidated Unit 33-004(a)-00

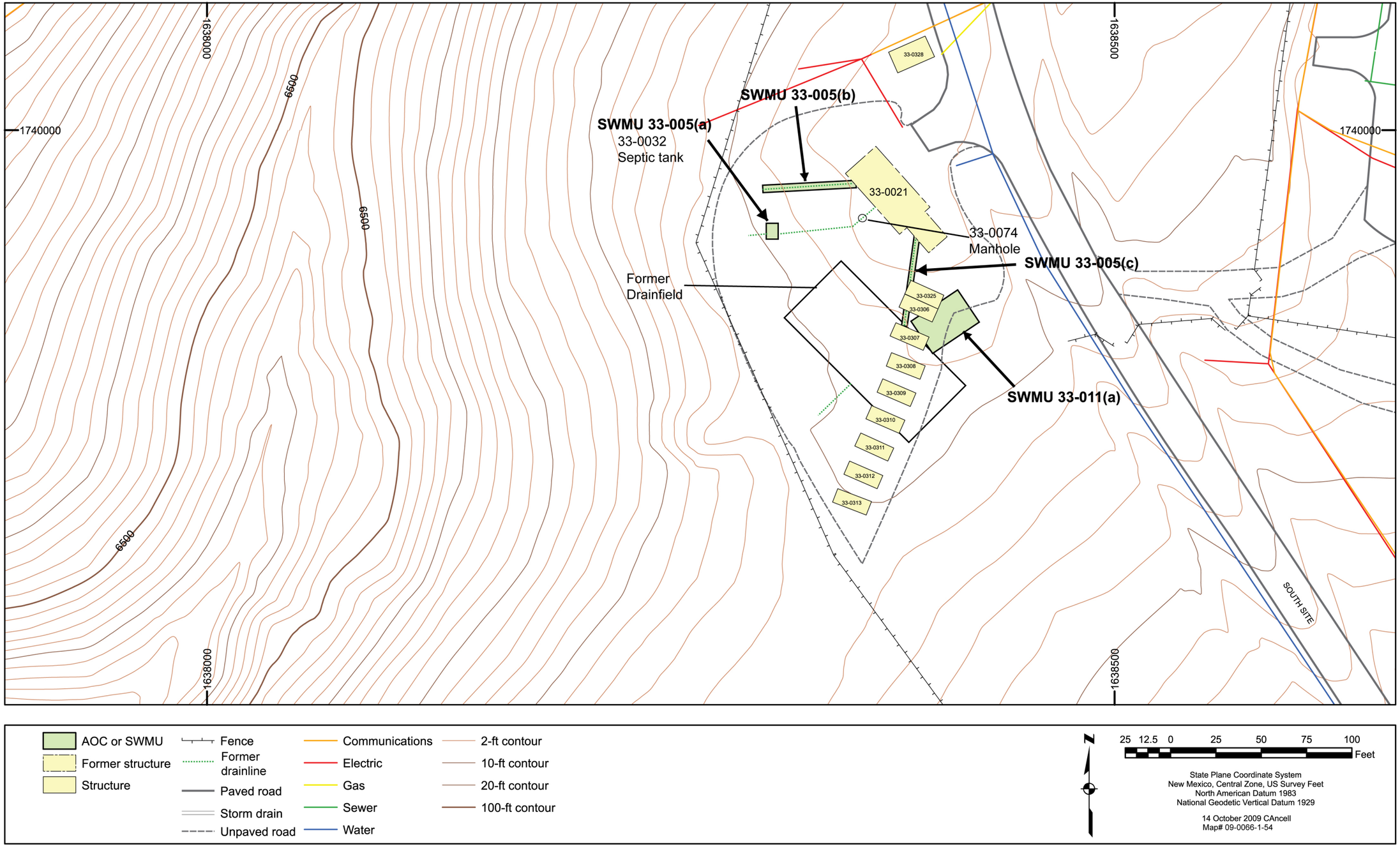


Figure 4.1-16 Site features for Consolidated Unit 33-005(a)-00

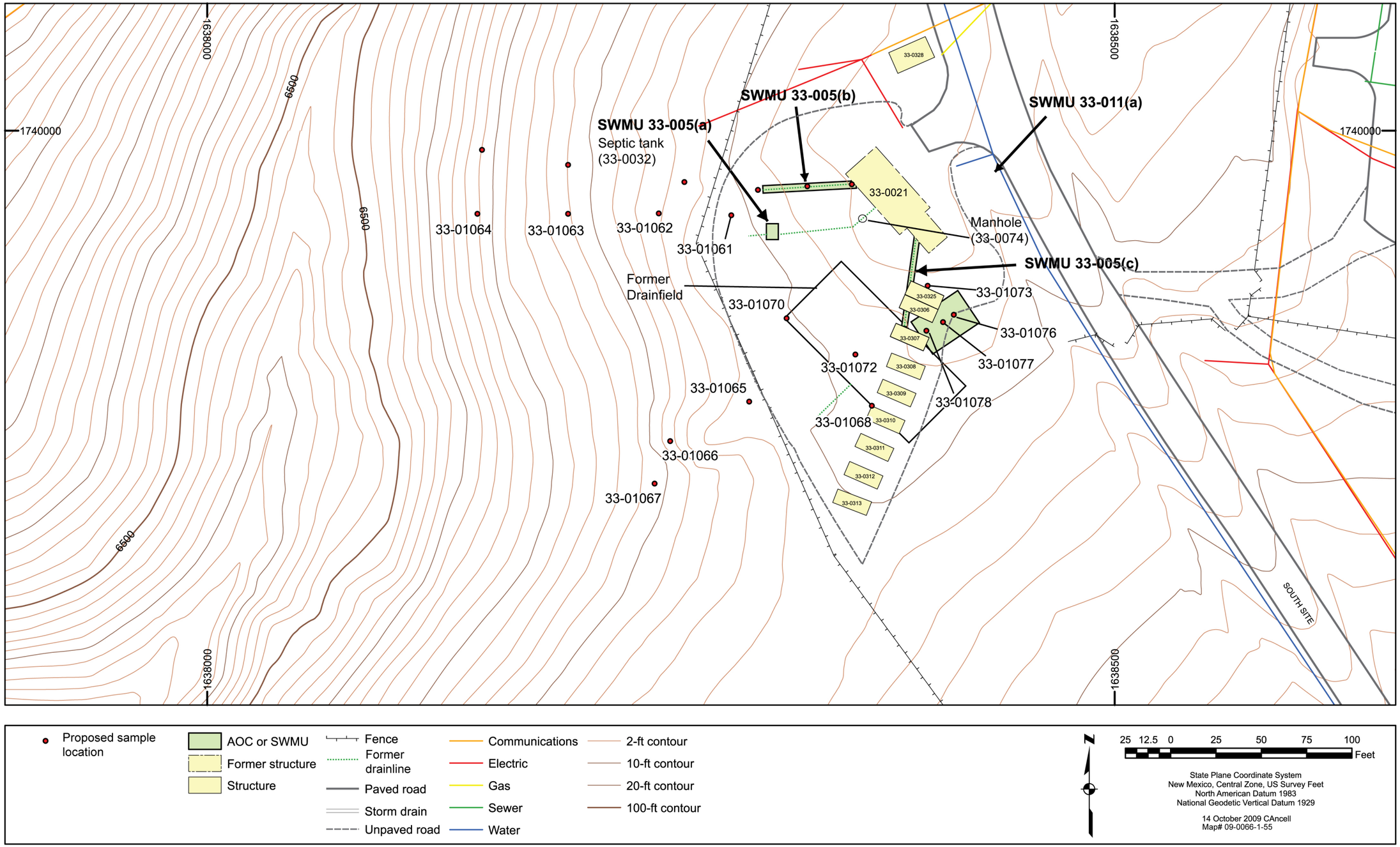


Figure 4.1-17 Proposed sampling locations at Consolidated Unit 33-005(a)-00

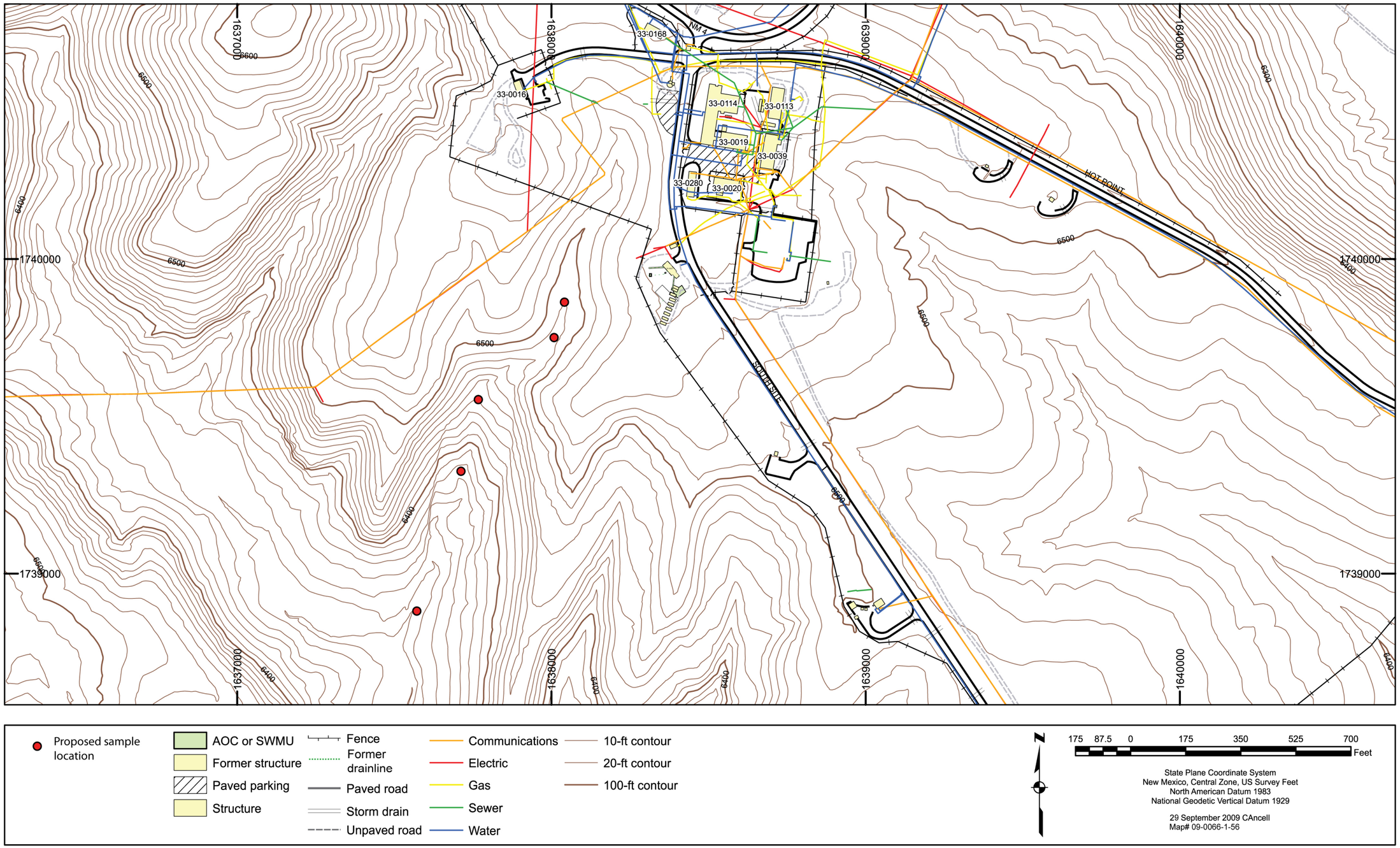


Figure 4.1-18 Proposed drainage sampling locations at Consolidated Unit 33-005(a)-00

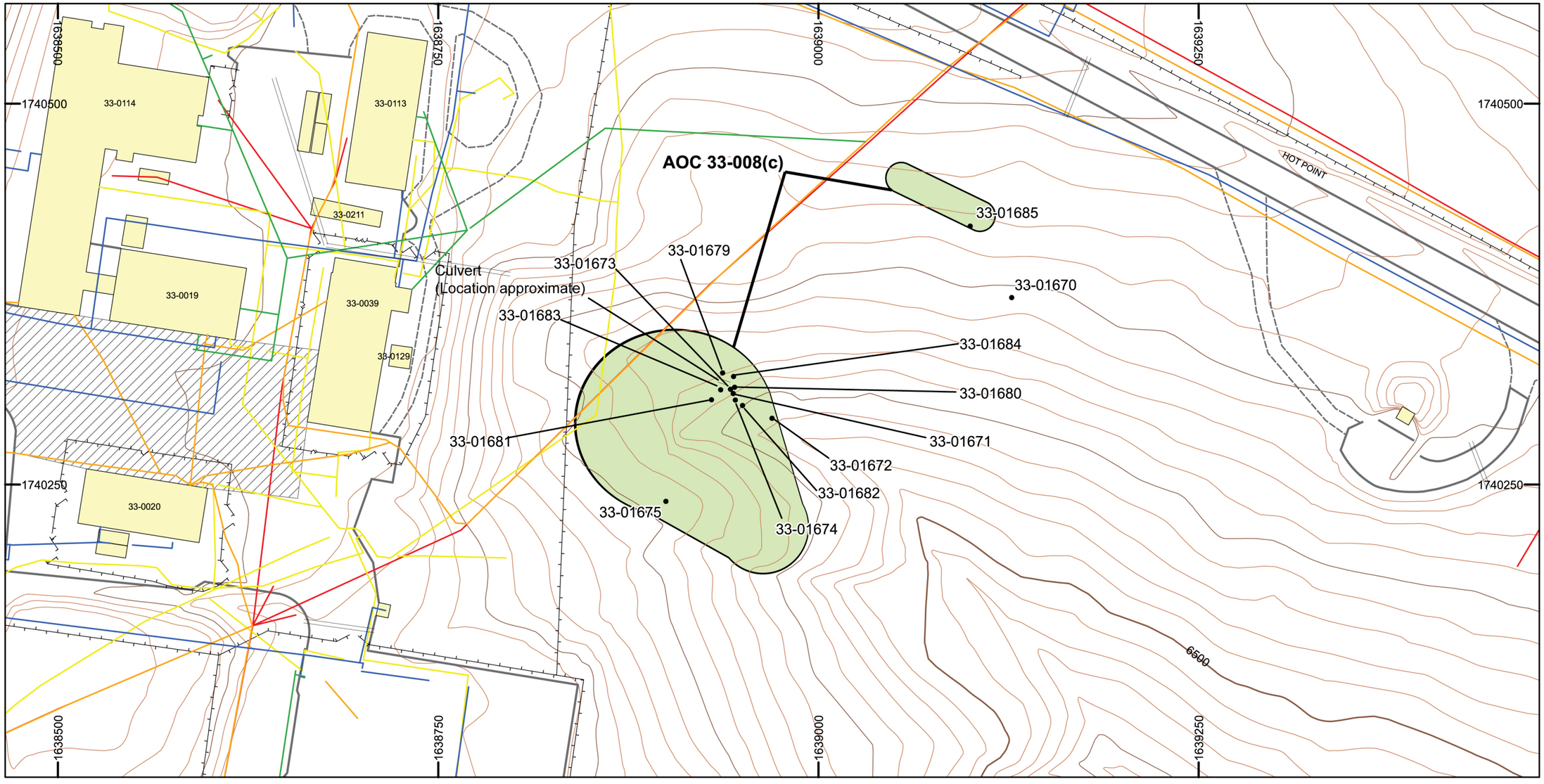


Figure 4.1-19 Site features and decision-level sampling locations for AOC 33-008(c)

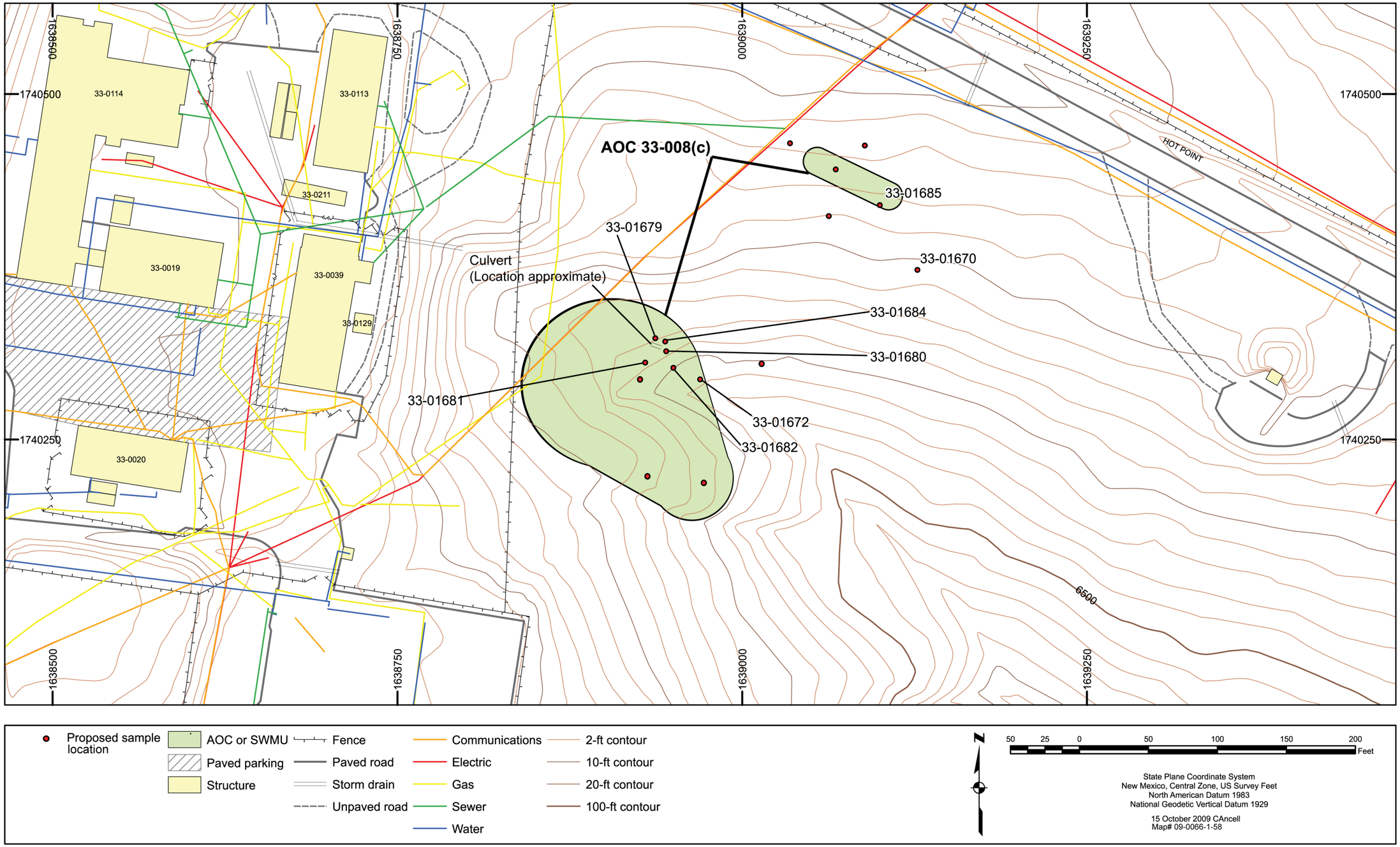


Figure 4.1-20 Proposed sampling locations at AOC 33-008(c)

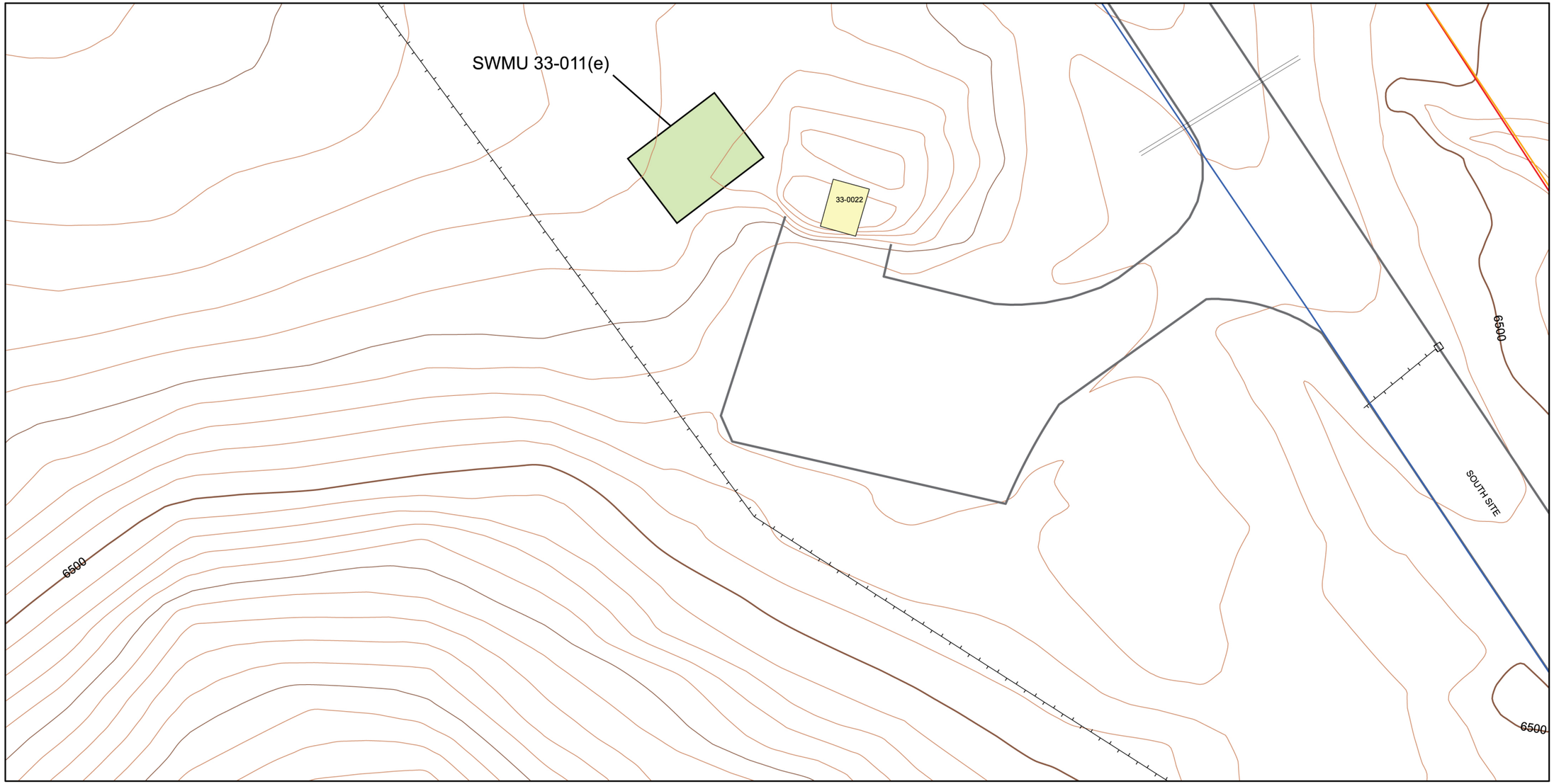


Figure 4.1-21 Site features for SWMU 33-011(e)

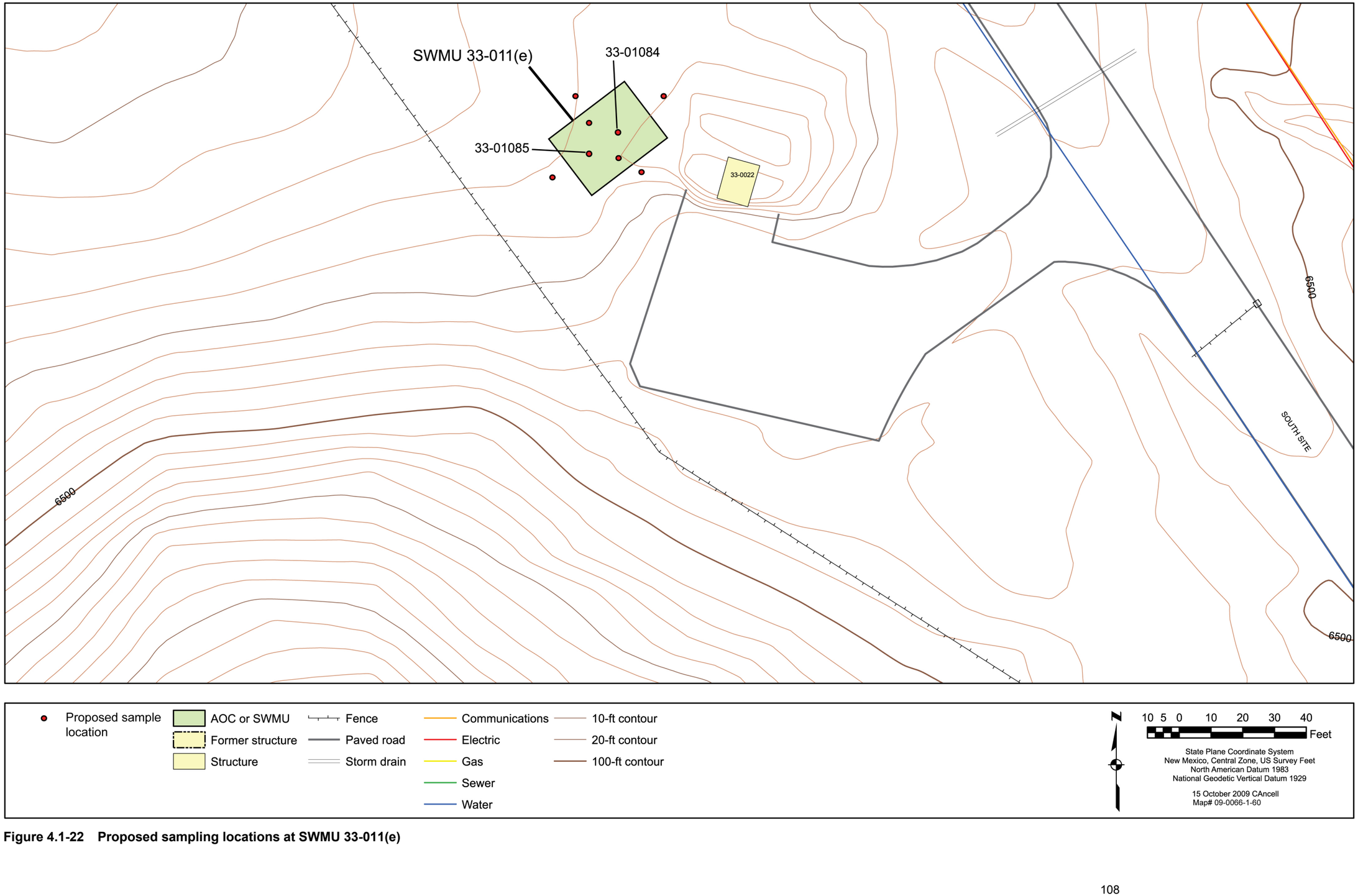


Figure 4.1-22 Proposed sampling locations at SWMU 33-011(e)

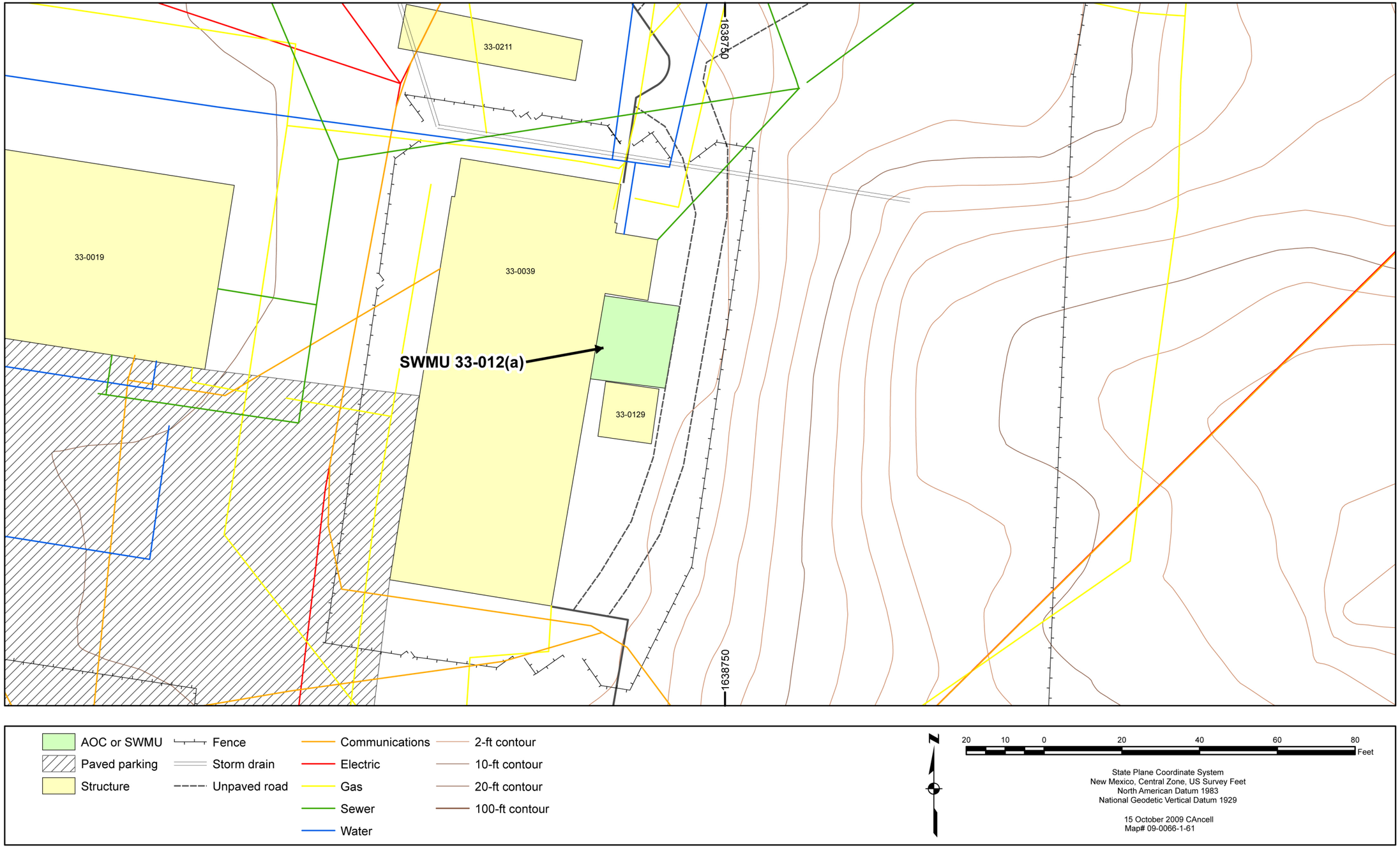


Figure 4.1-23 Site features for SWMU 33-012(a)

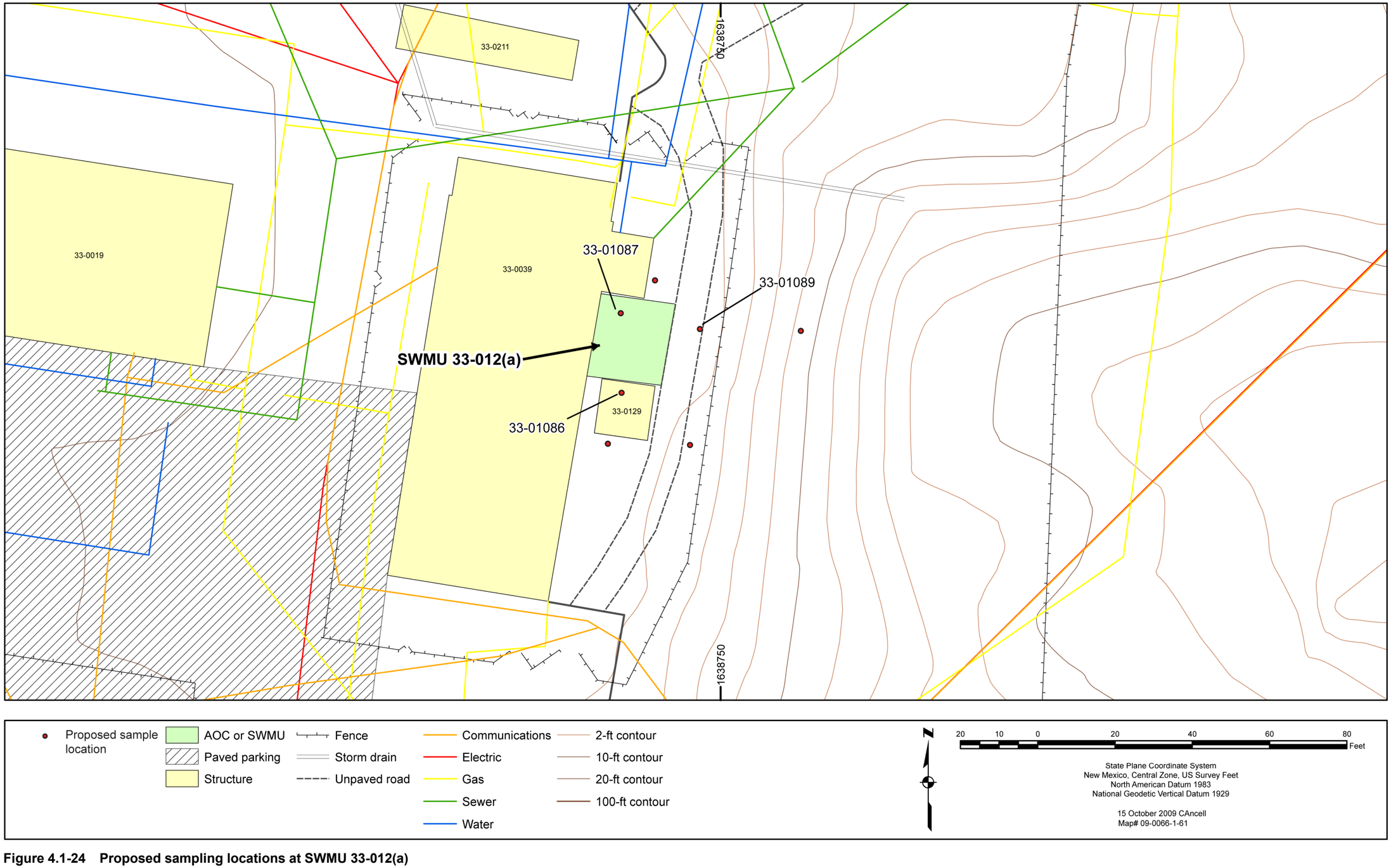


Figure 4.1-24 Proposed sampling locations at SWMU 33-012(a)

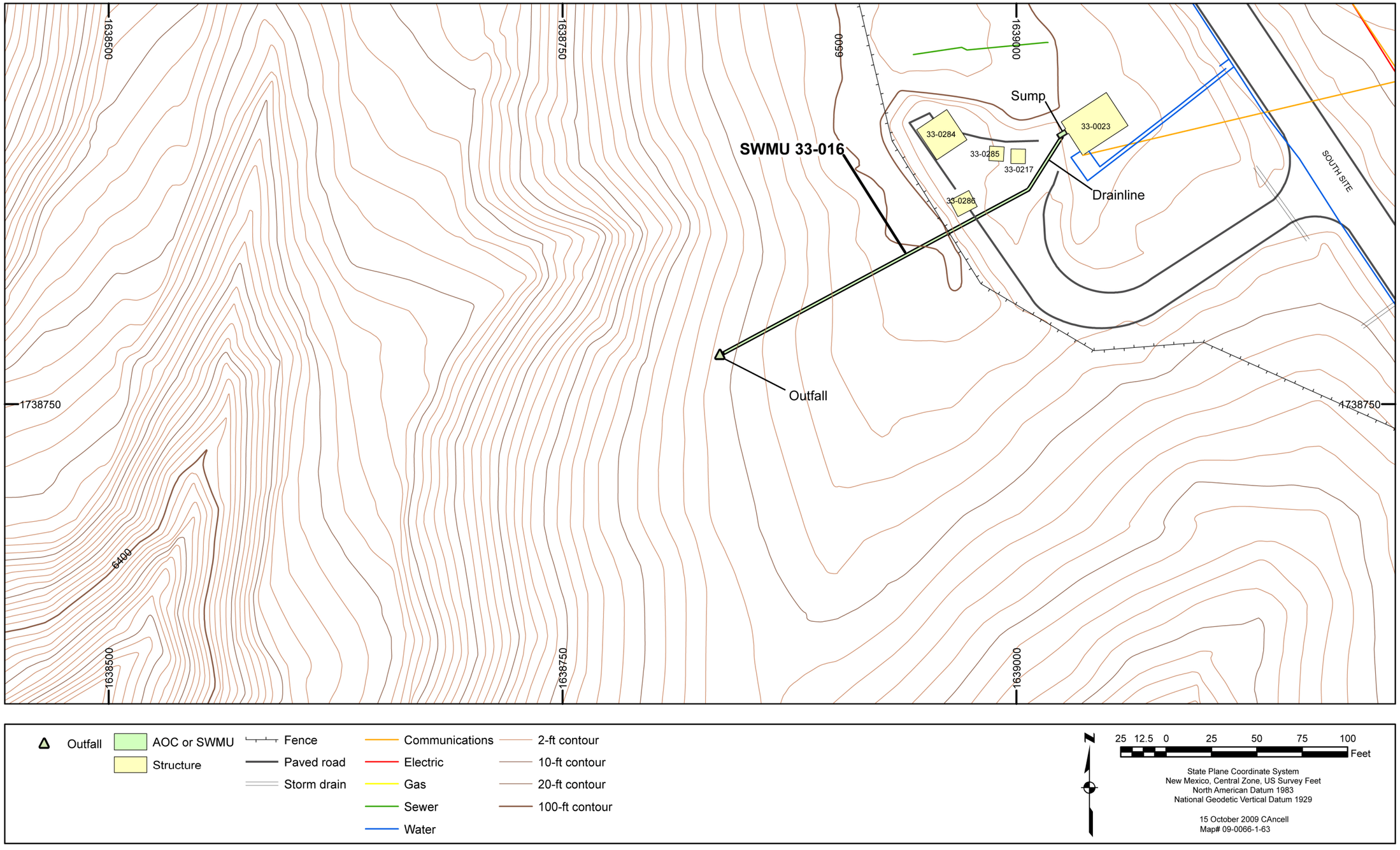


Figure 4.1-25 Site features for SWMU 33-016

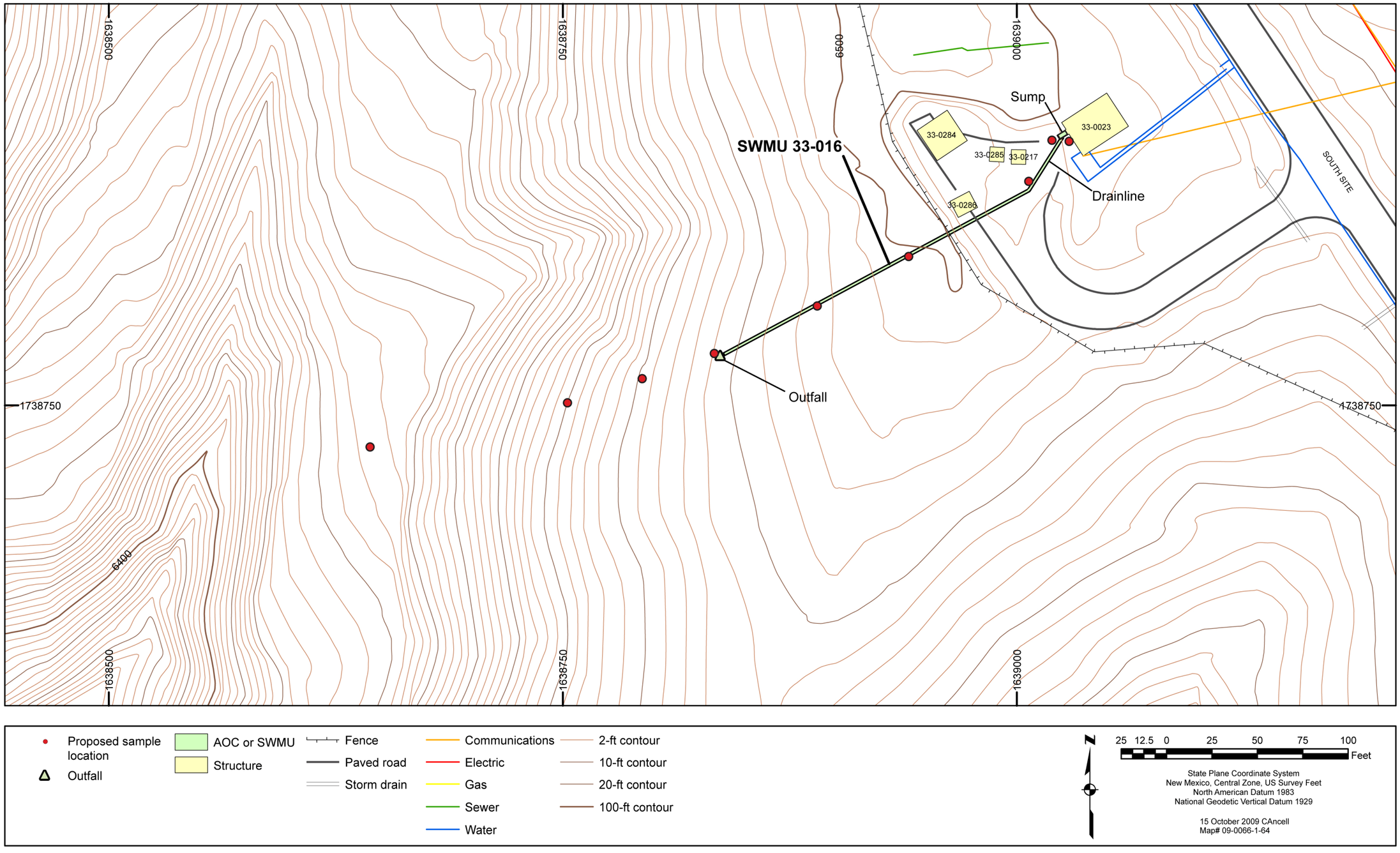


Figure 4.1-26 Proposed sampling locations at SWMU 33-016

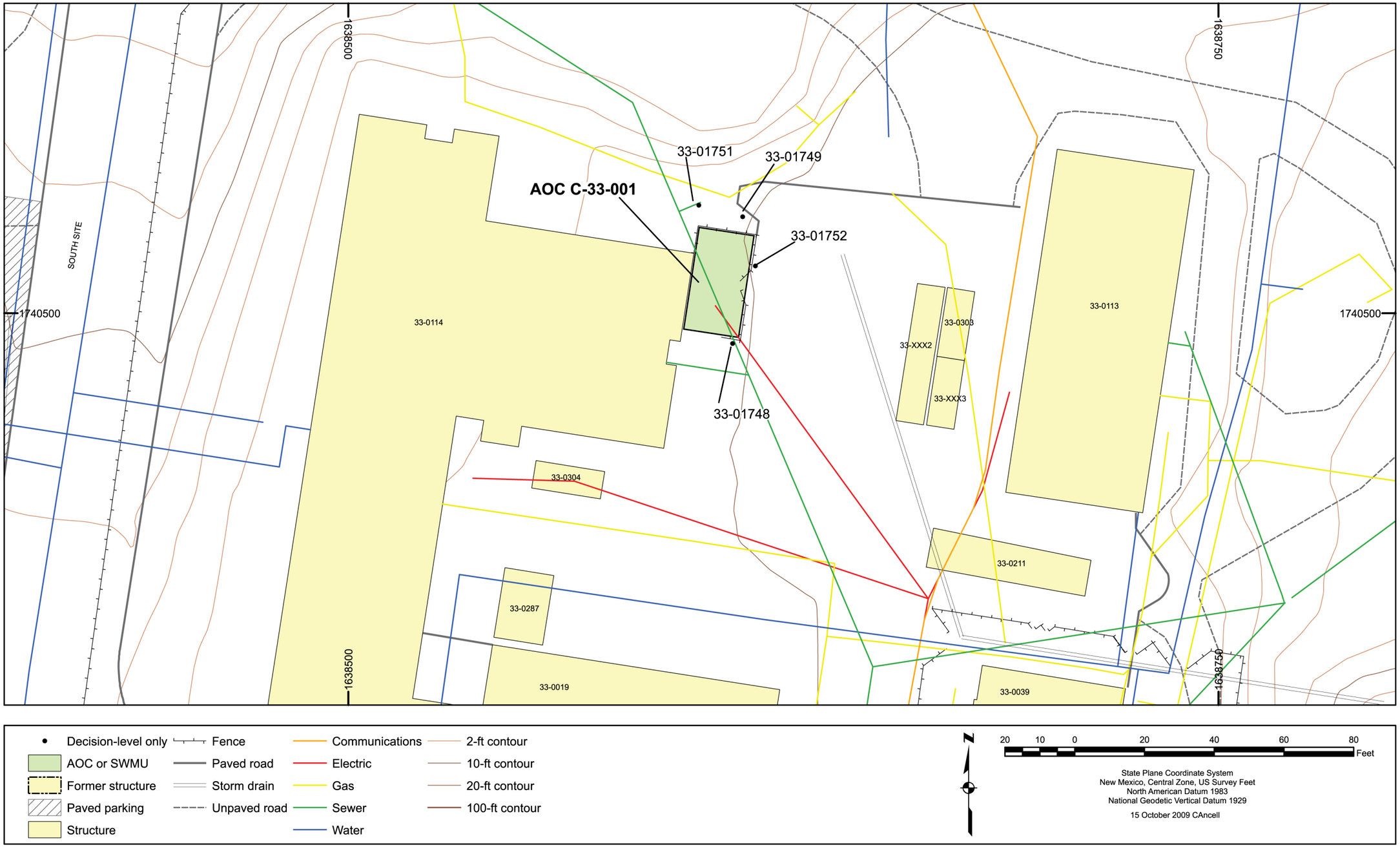


Figure 4.1-27 Site features and decision-level sampling locations for AOC C-33-001

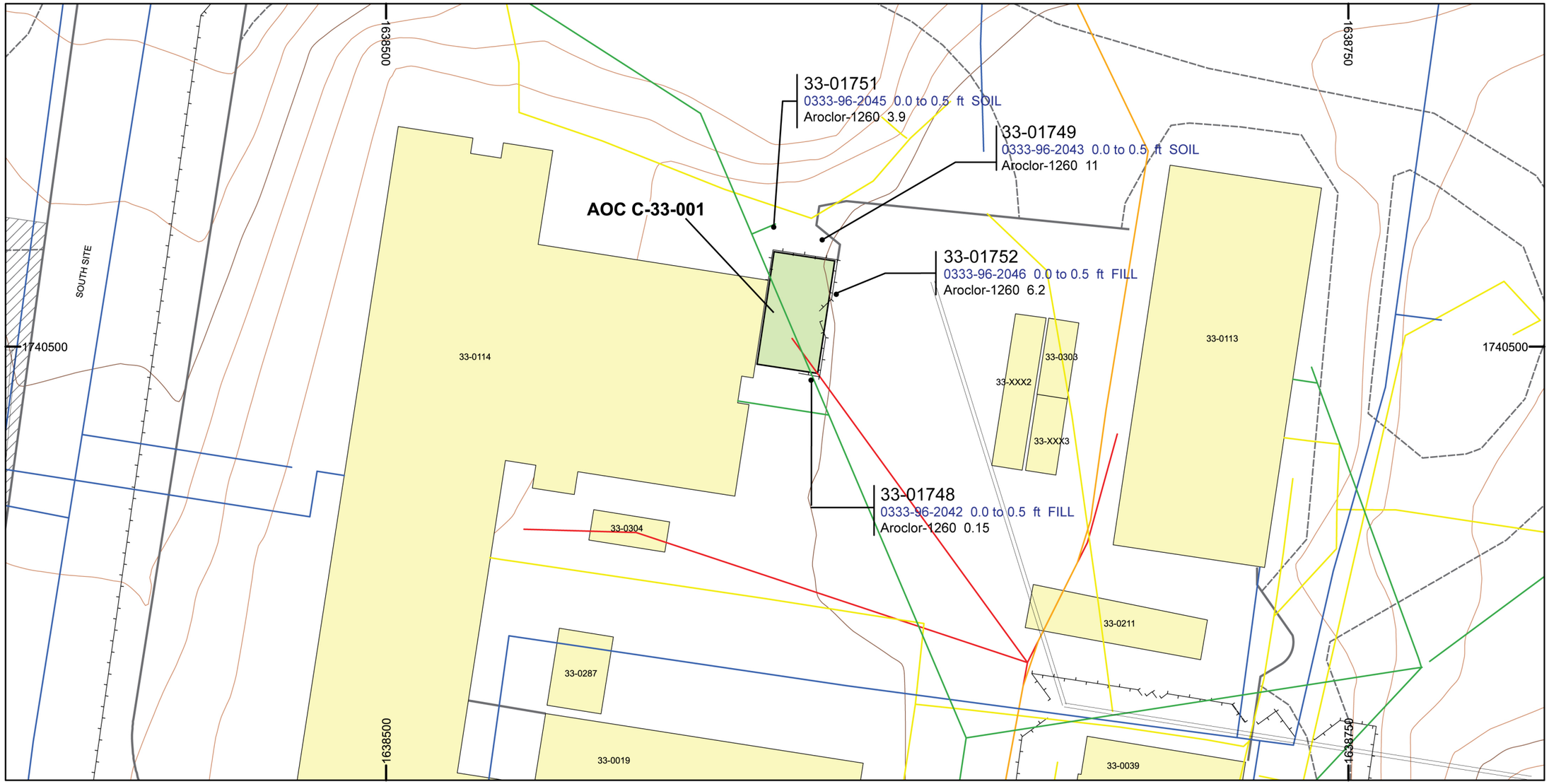


Figure 4.1-28 Organic chemicals detected at AOC C-33-001

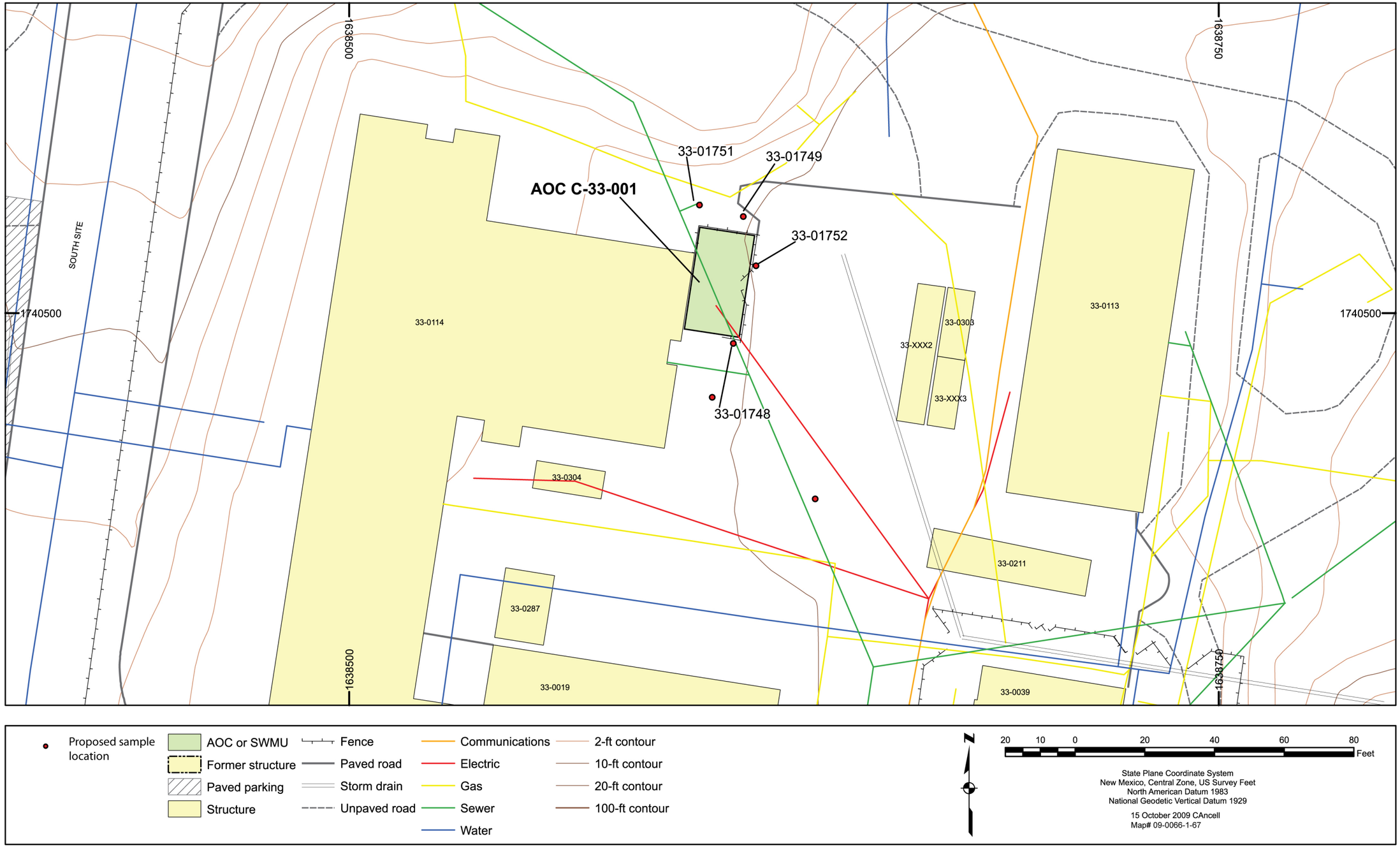


Figure 4.1-29 Proposed sampling locations at AOC C-33-001

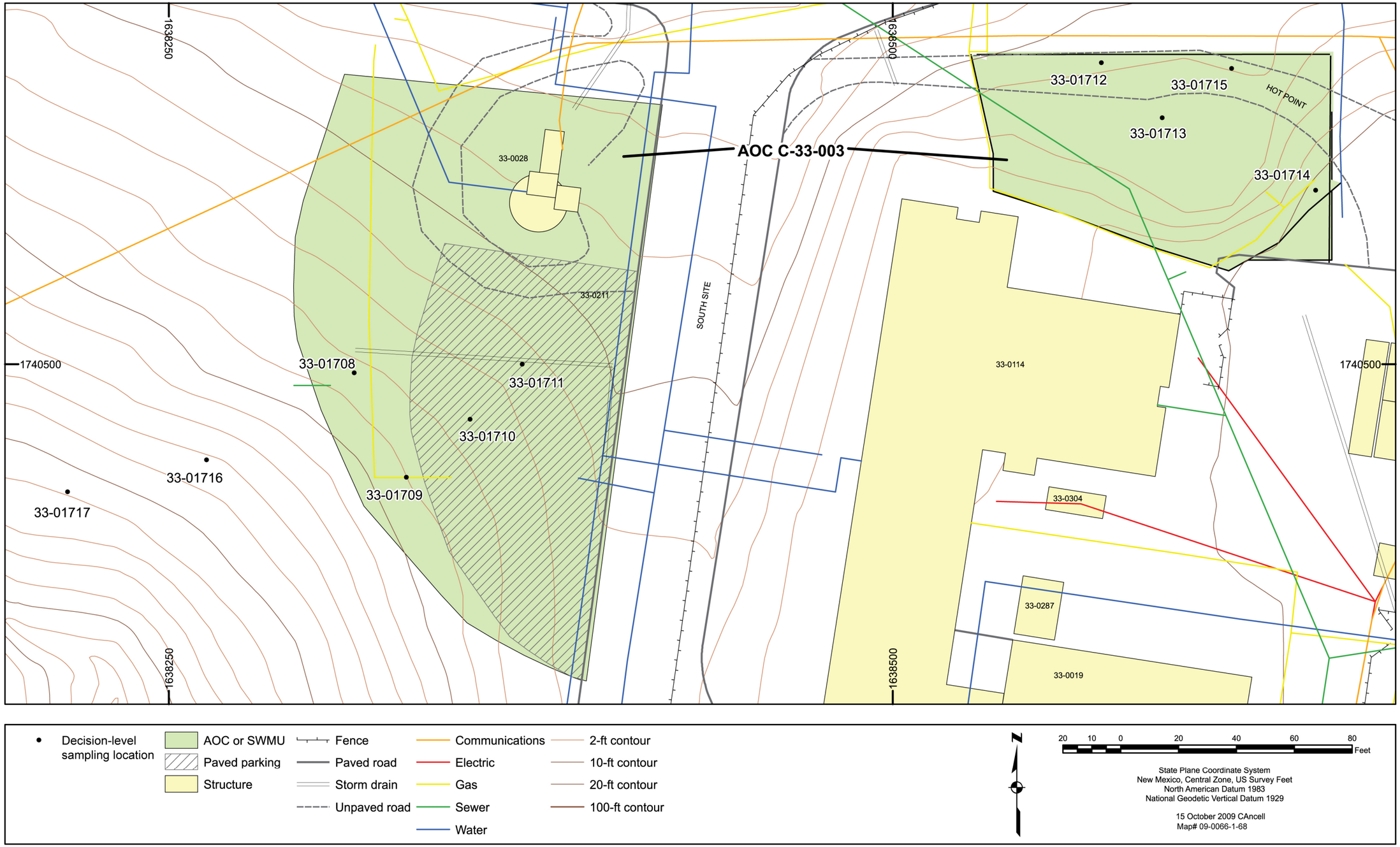


Figure 4.1-30 Site features and decision-level sampling locations for AOC C-33-003

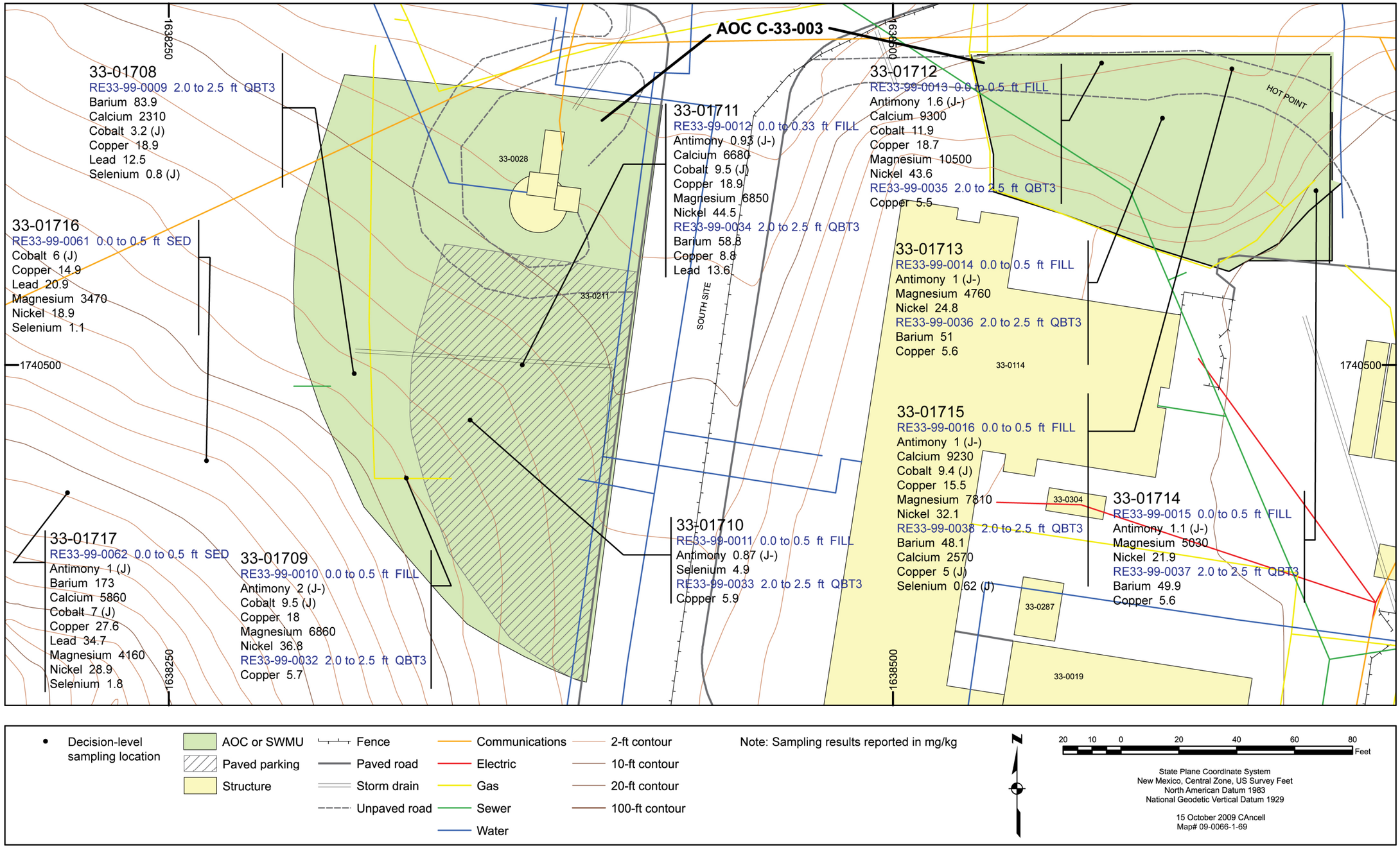


Figure 4.1-31 Inorganic chemicals detected above BVs at AOC C-33-003

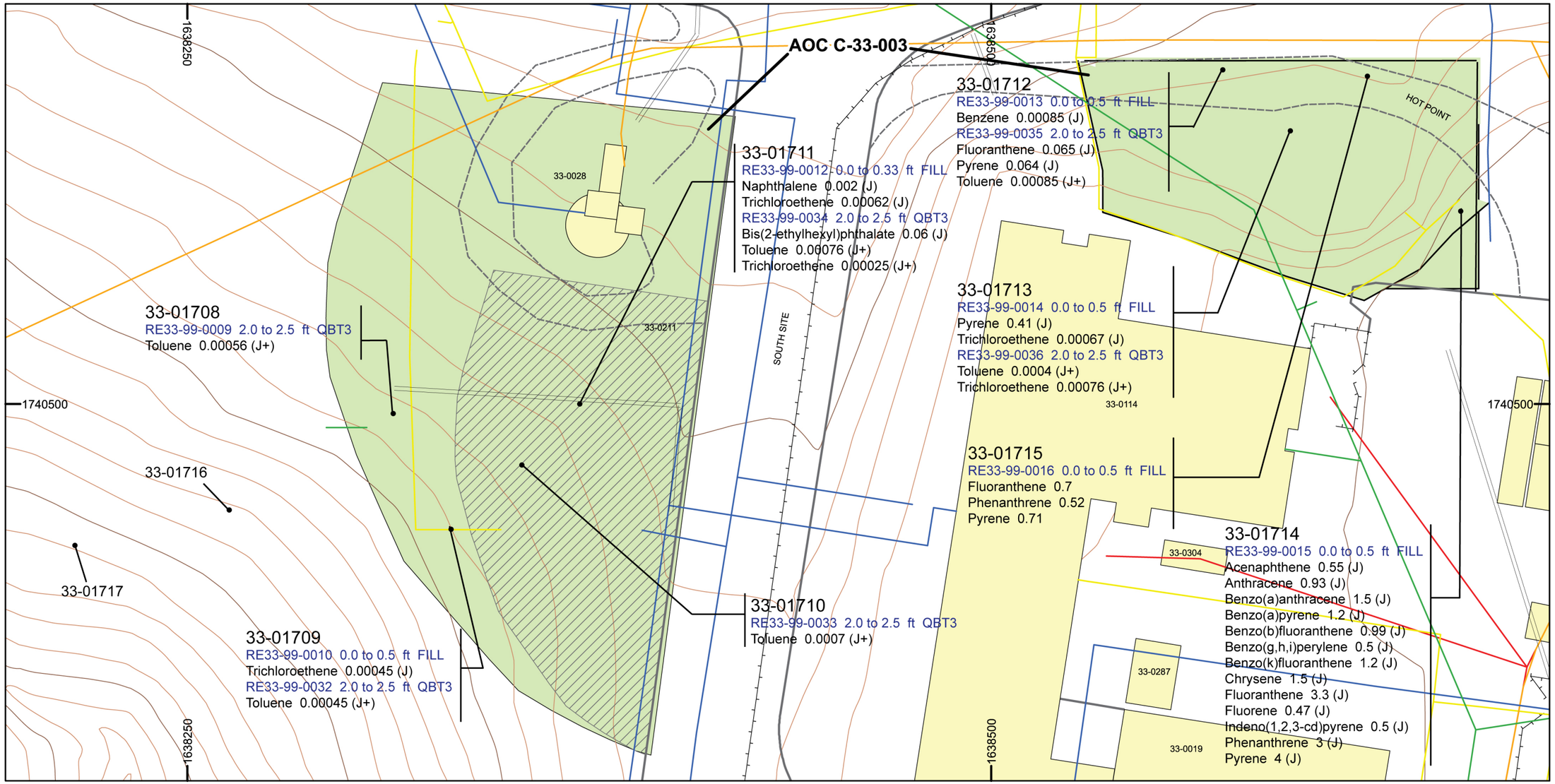


Figure 4.1-32 Organic chemicals detected at AOC C-33-003

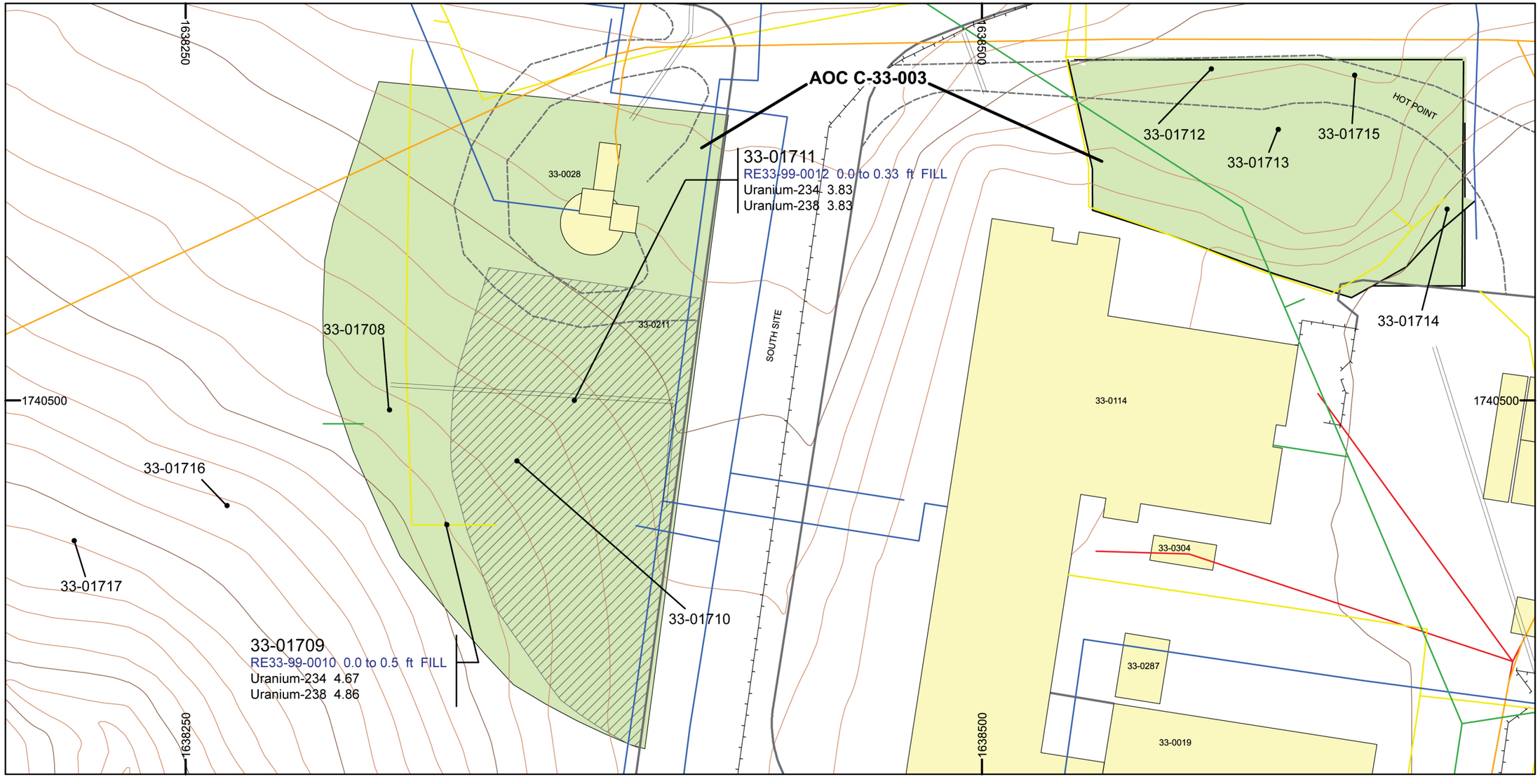


Figure 4.1-33 Radionuclides detected or detected above BVs/FVs at AOC C-33-003

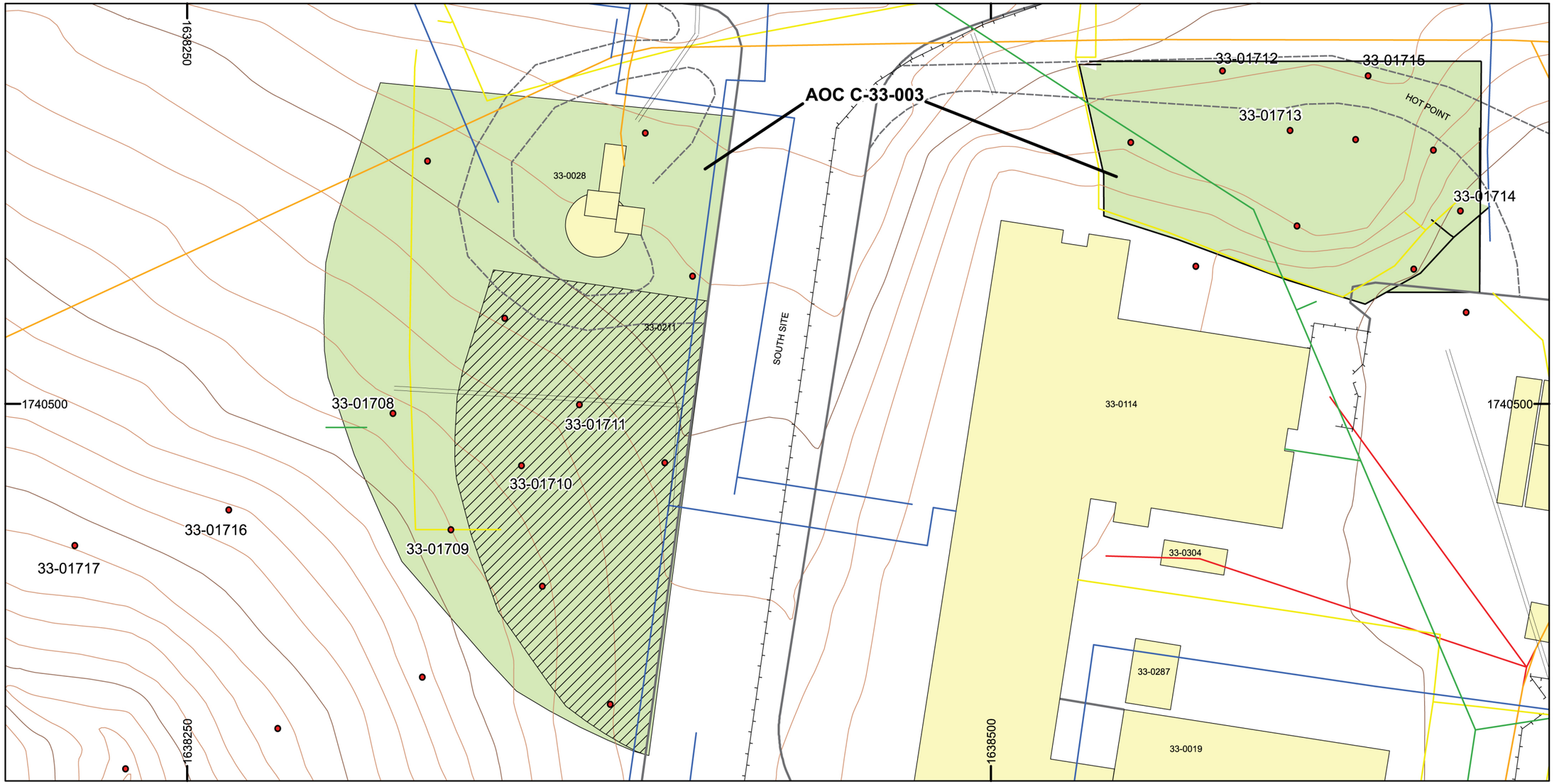


Figure 4.1-34 Proposed sampling locations at AOC C-33-003

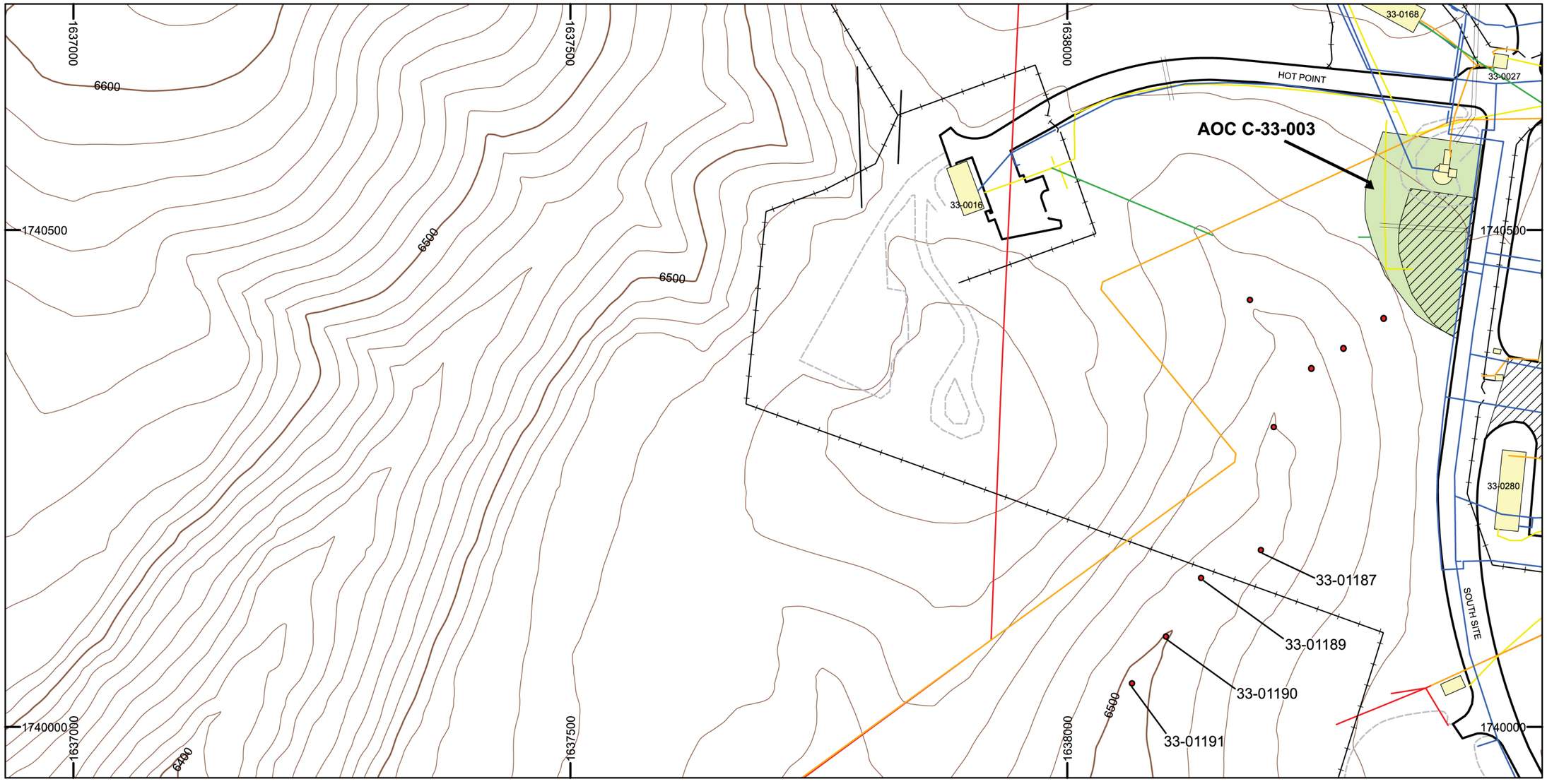


Figure 4.1-35 Proposed sampling locations at SWMU 33-004(d) and AOC C-33-003 drainage

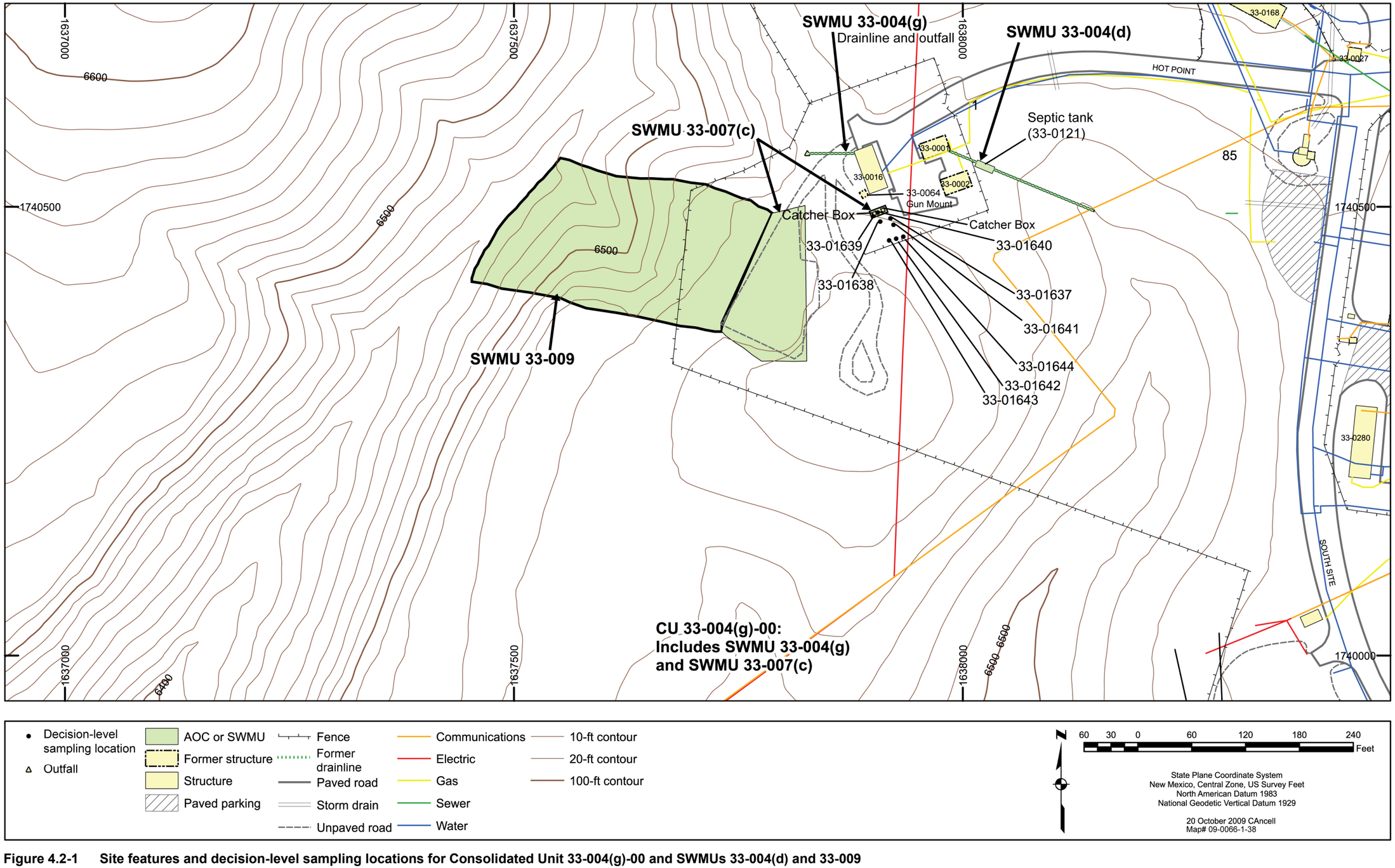


Figure 4.2-1 Site features and decision-level sampling locations for Consolidated Unit 33-004(g)-00 and SWMUs 33-004(d) and 33-009

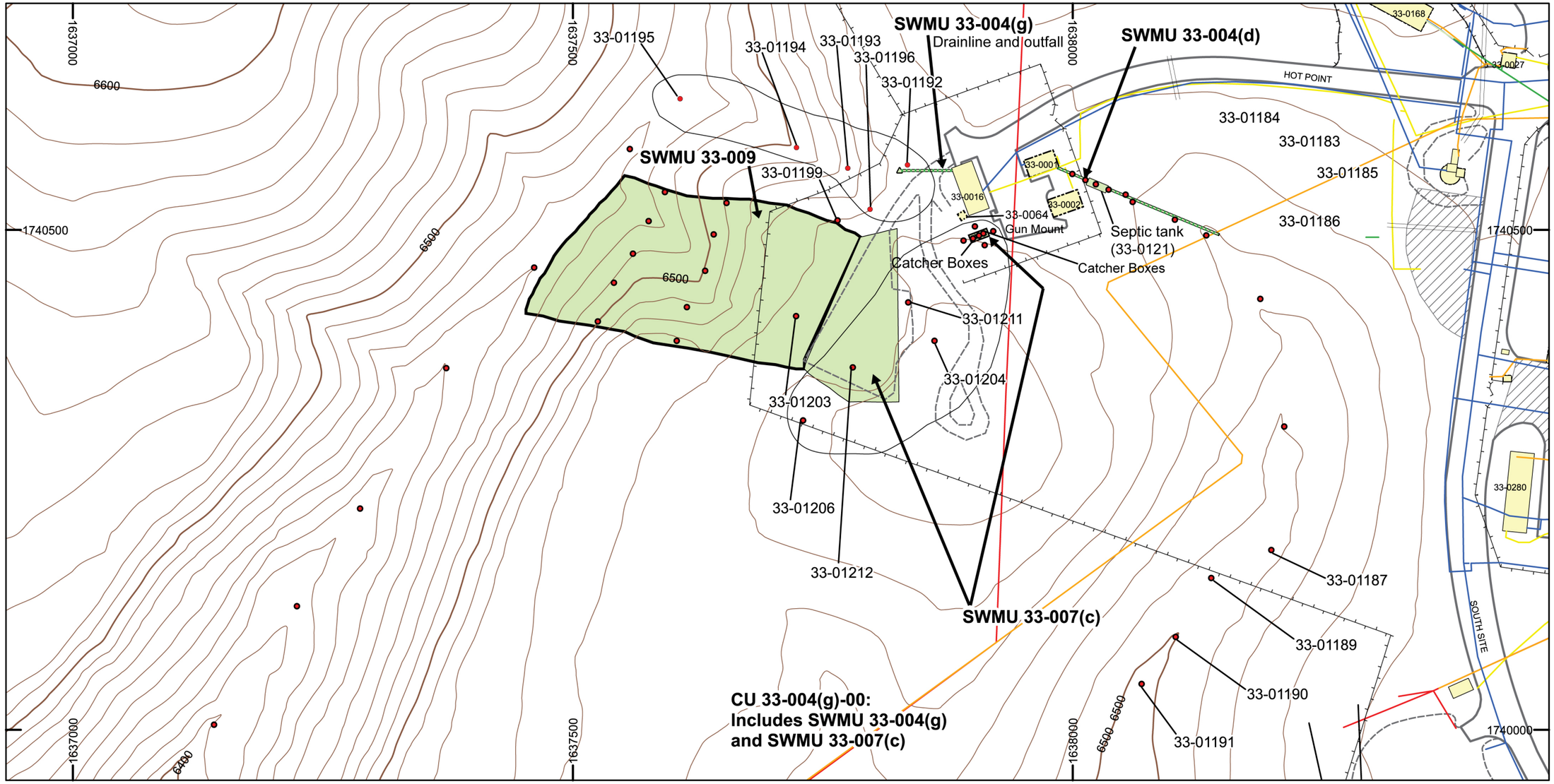


Figure 4.2-2 Proposed sampling locations at Consolidated Unit 33-004(g)-00 and SWMUs 33-004(d) and 33-009

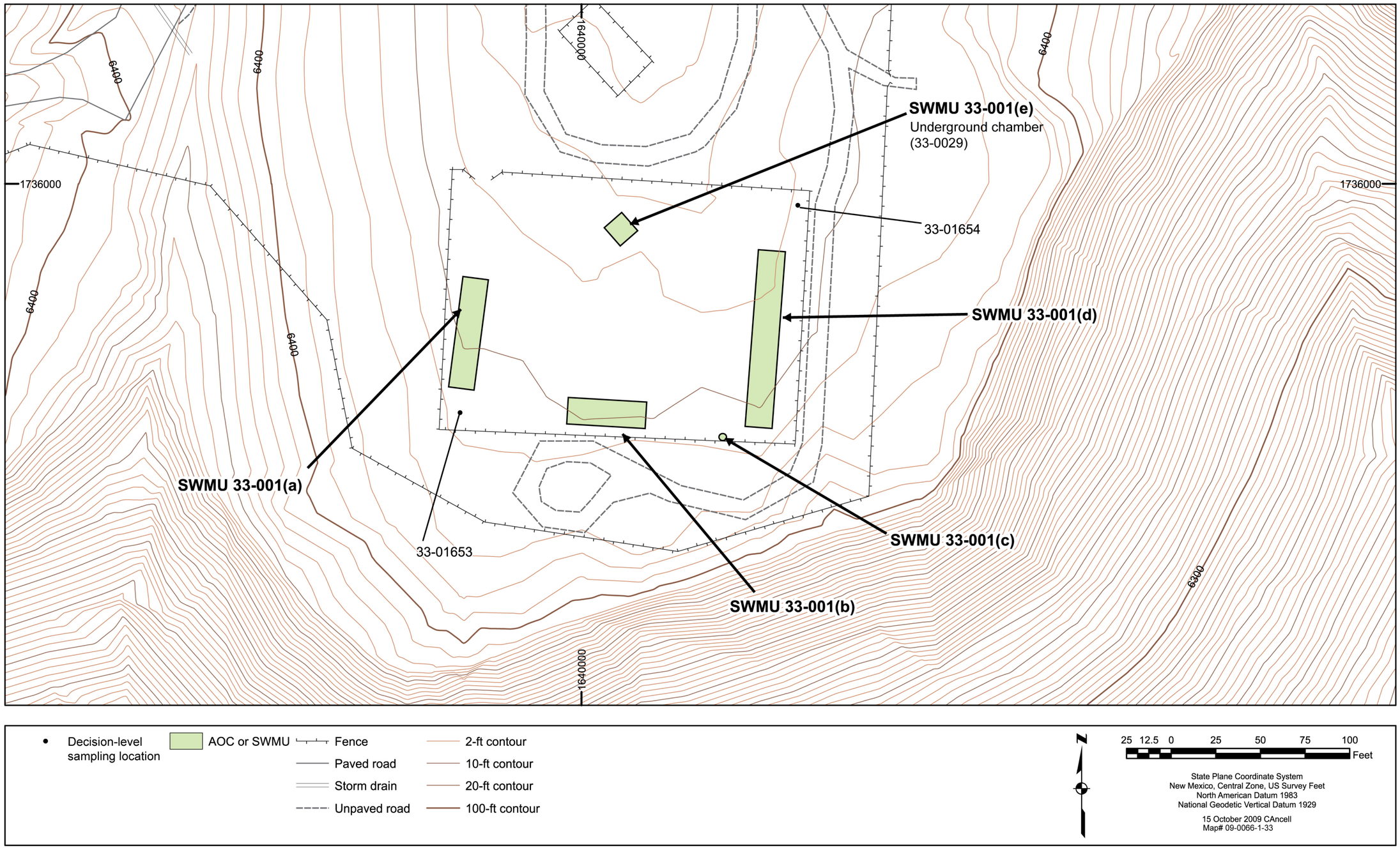


Figure 4.3-1 Site features and decision-level sampling locations for Consolidated Unit 33-001(a)-99

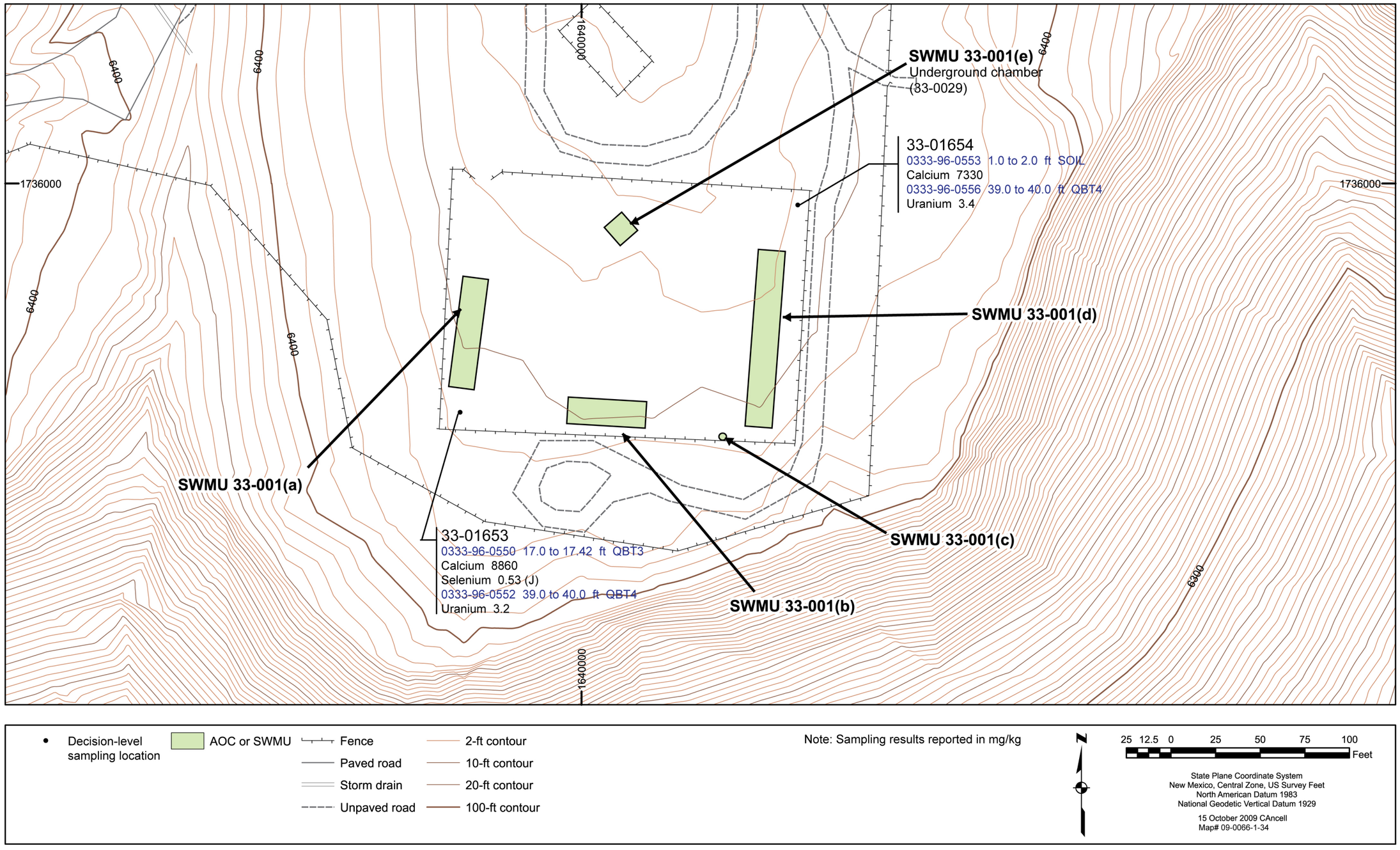


Figure 4.3-2 Inorganic chemicals detected above BVs at Consolidated Unit 33-001(a)-99

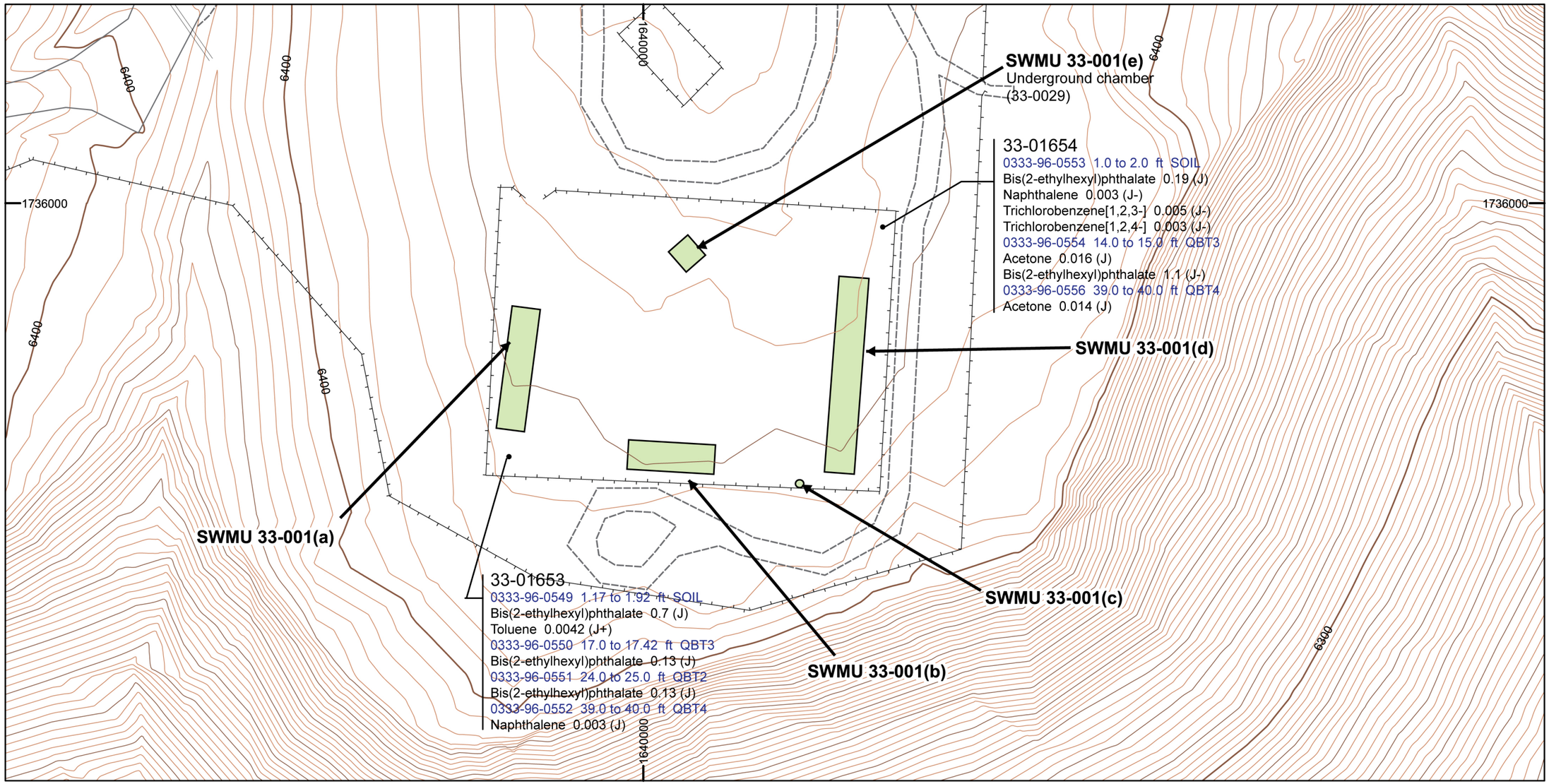


Figure 4.3-3 Organic chemicals detected at Consolidated Unit 33-001(a)-99

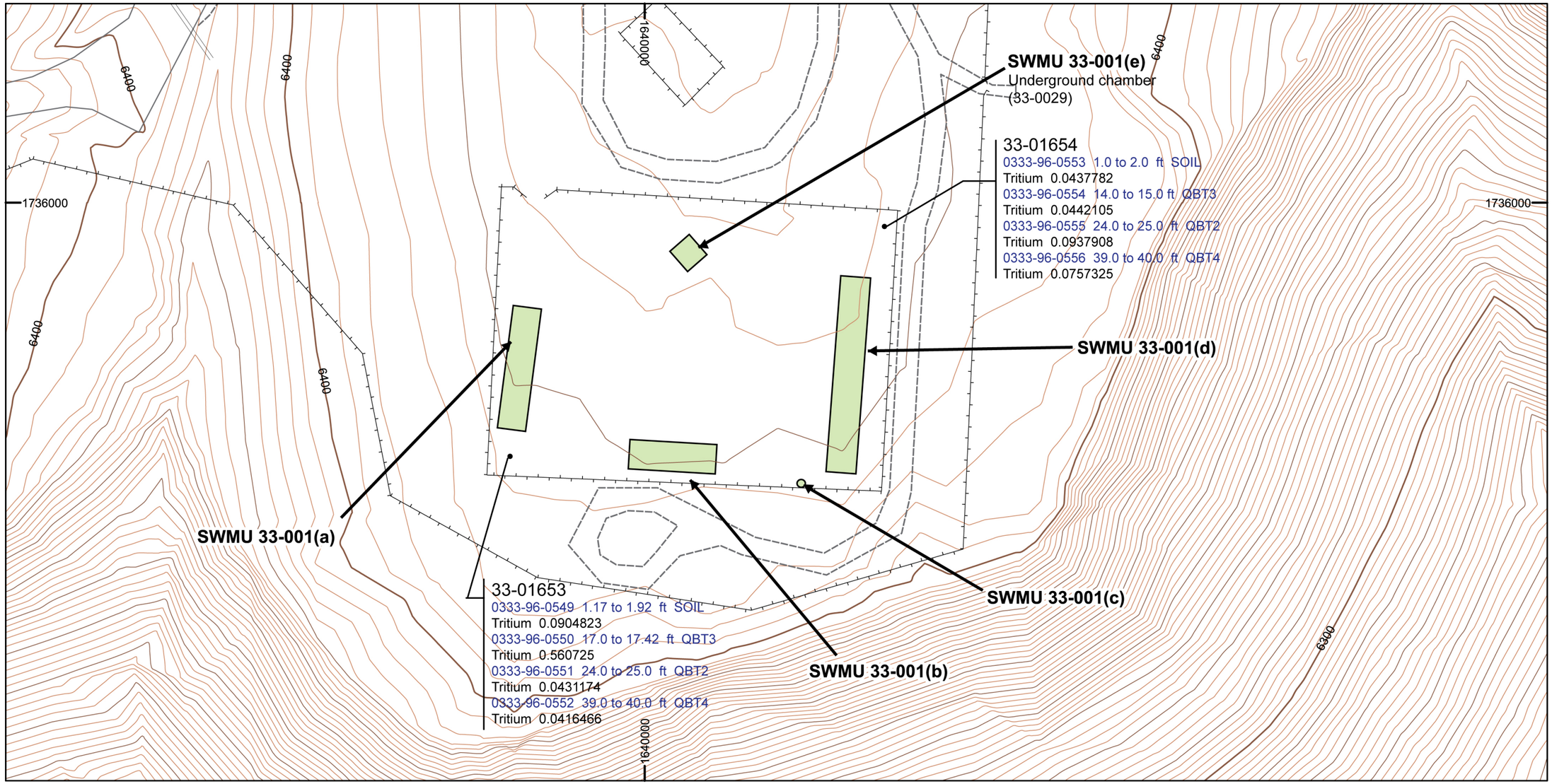


Figure 4.3-4 Radionuclides detected or detected above BVs/FVs at Consolidated Unit 33-001(a)-99

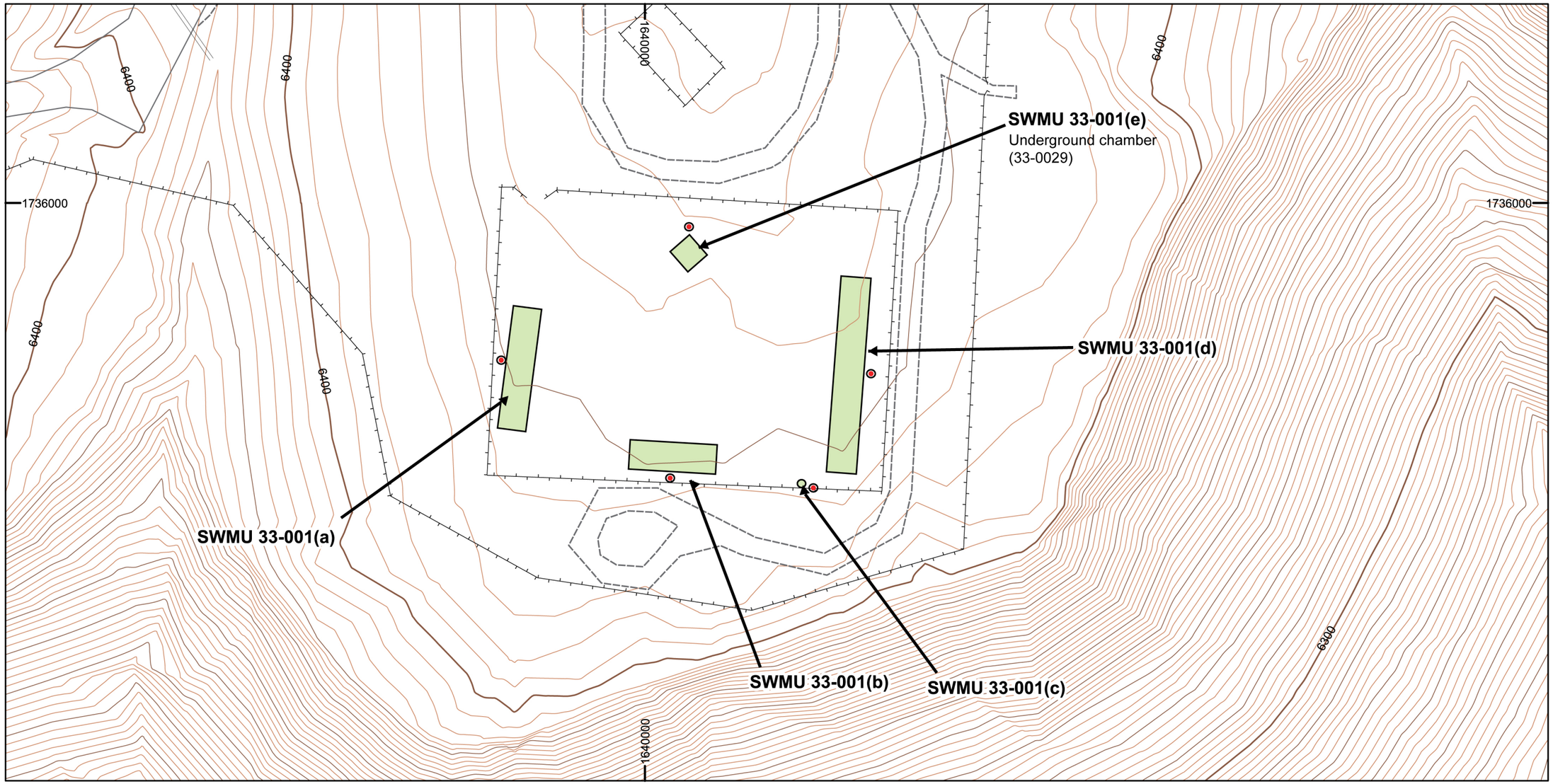


Figure 4.3-5 Proposed sampling locations at Consolidated Unit 33-001(a)-99

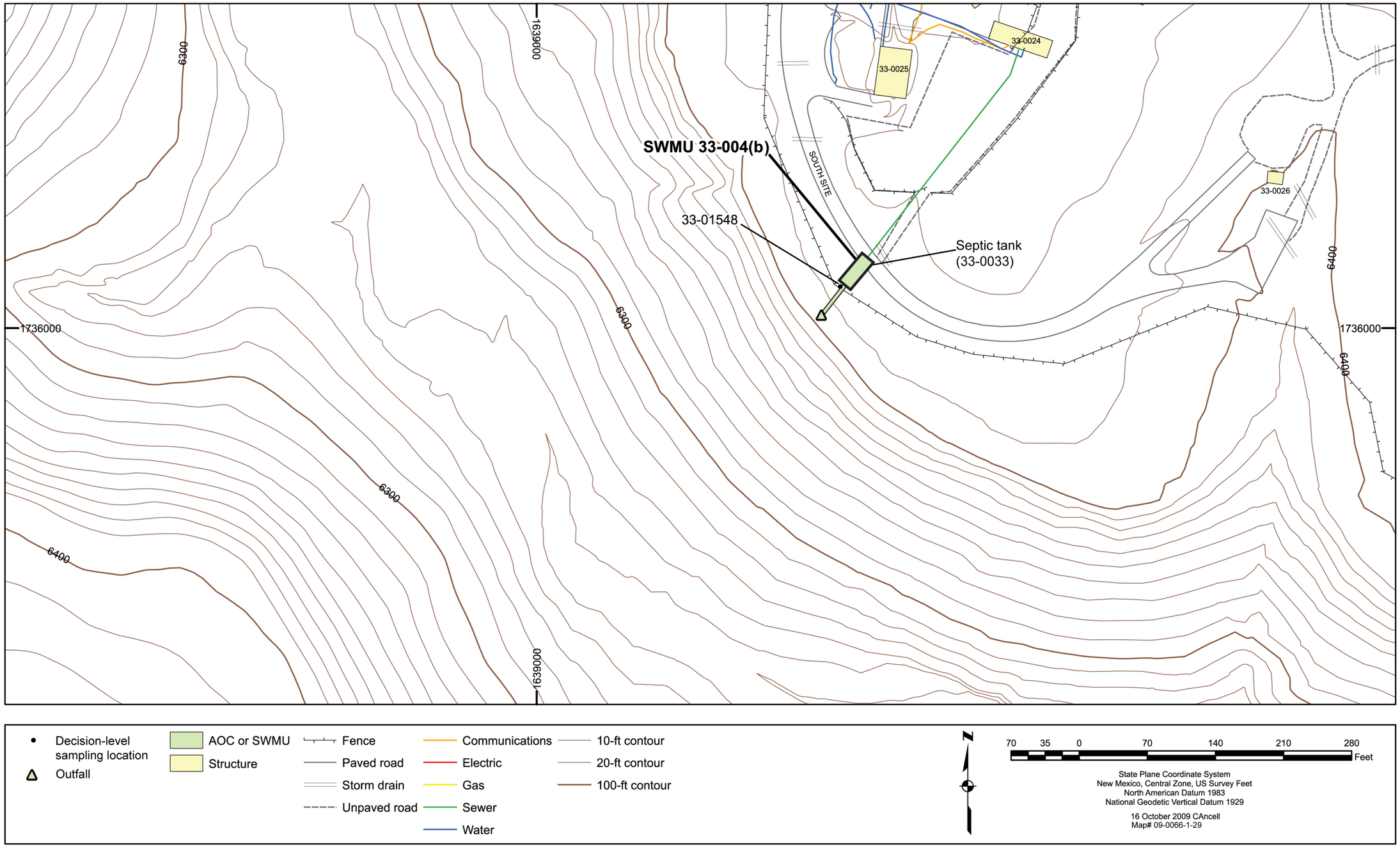


Figure 4.3-6 Site features and decision-level sampling locations for SWMU 33-004(b)

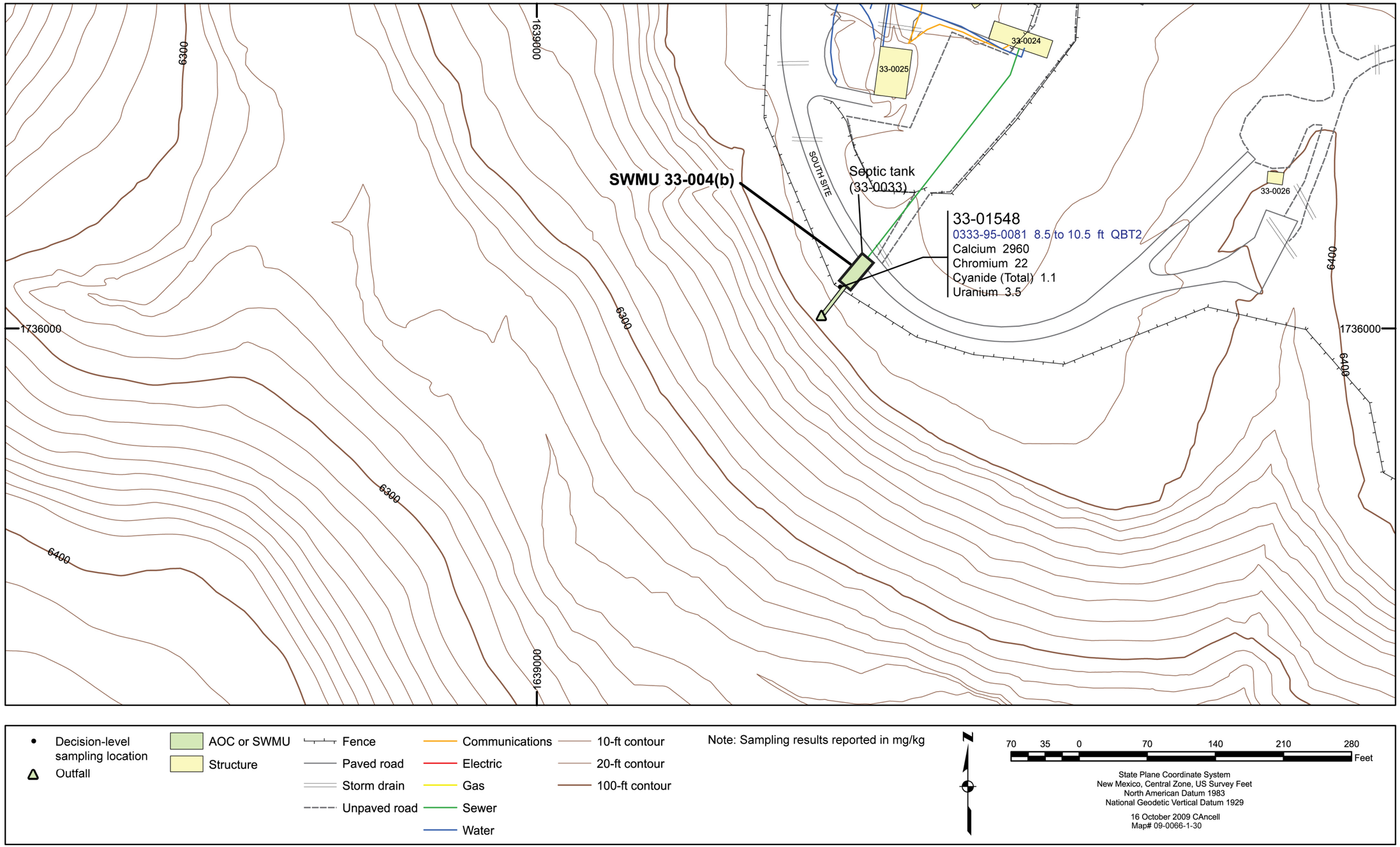


Figure 4.3-7 Inorganic chemicals detected above BVs at SWMU 33-004(b)

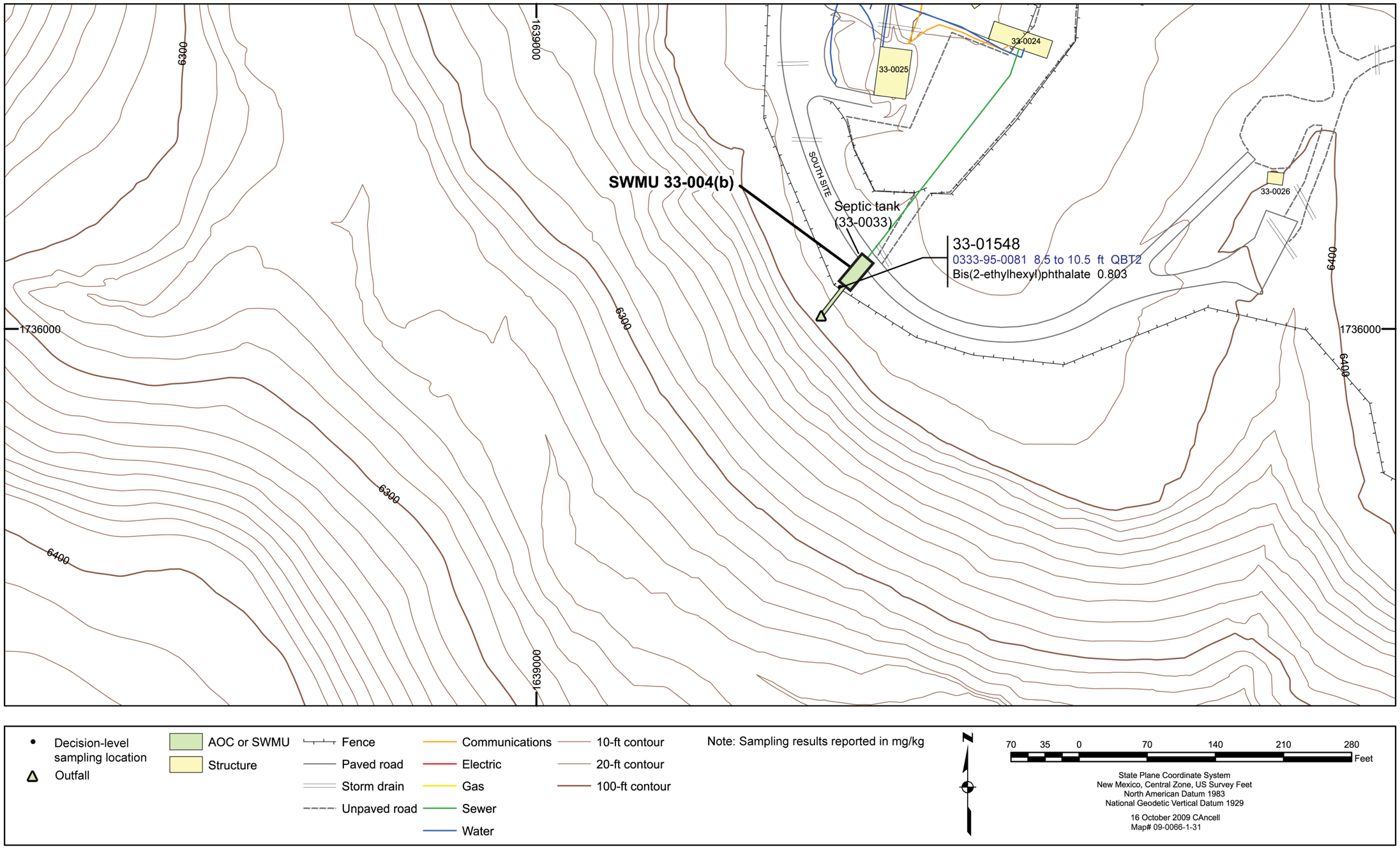


Figure 4.3-8 Organic chemicals detected at SWMU 33-004(b)

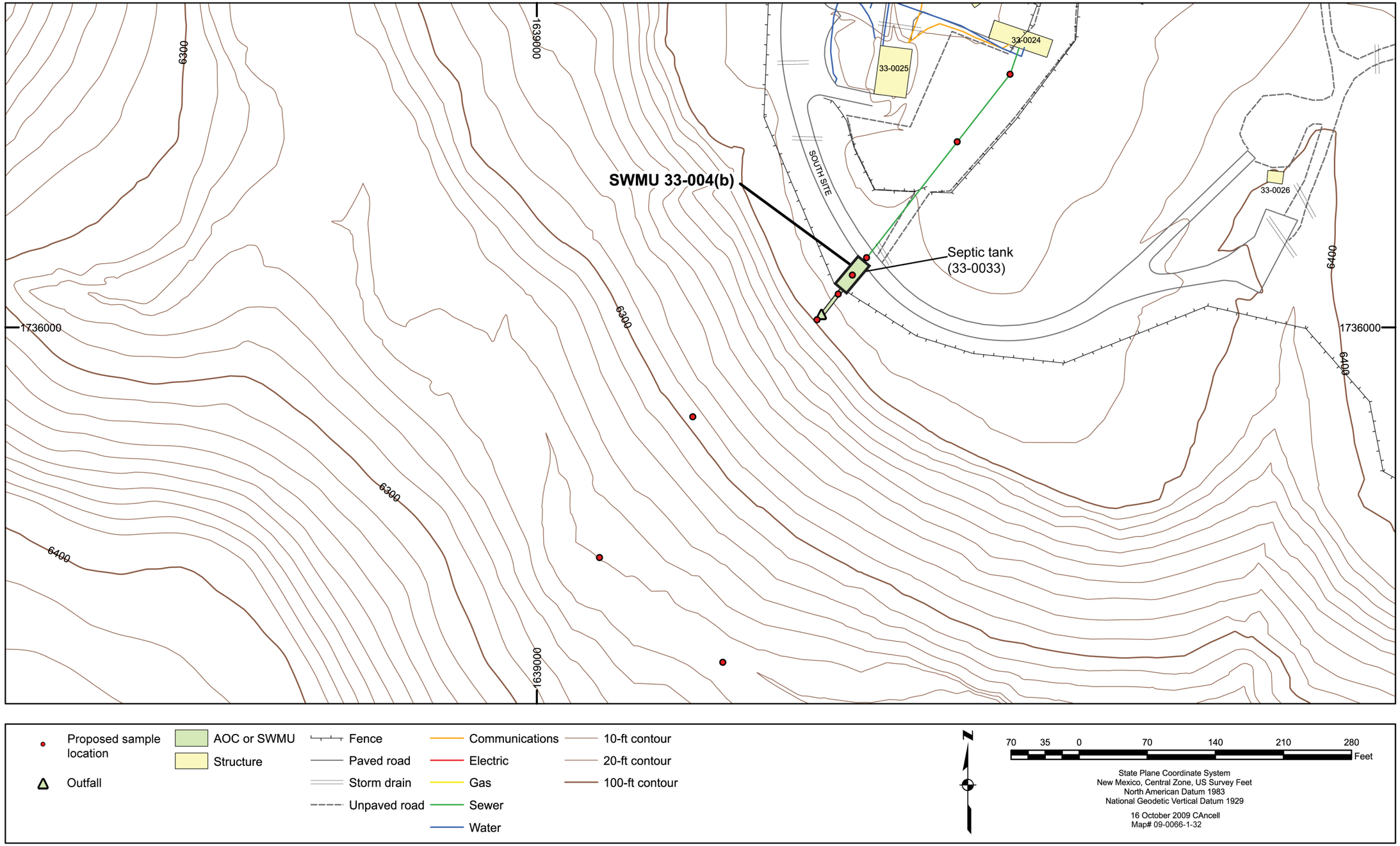


Figure 4.3-9 Proposed sampling locations at SWMU 33-004(b)

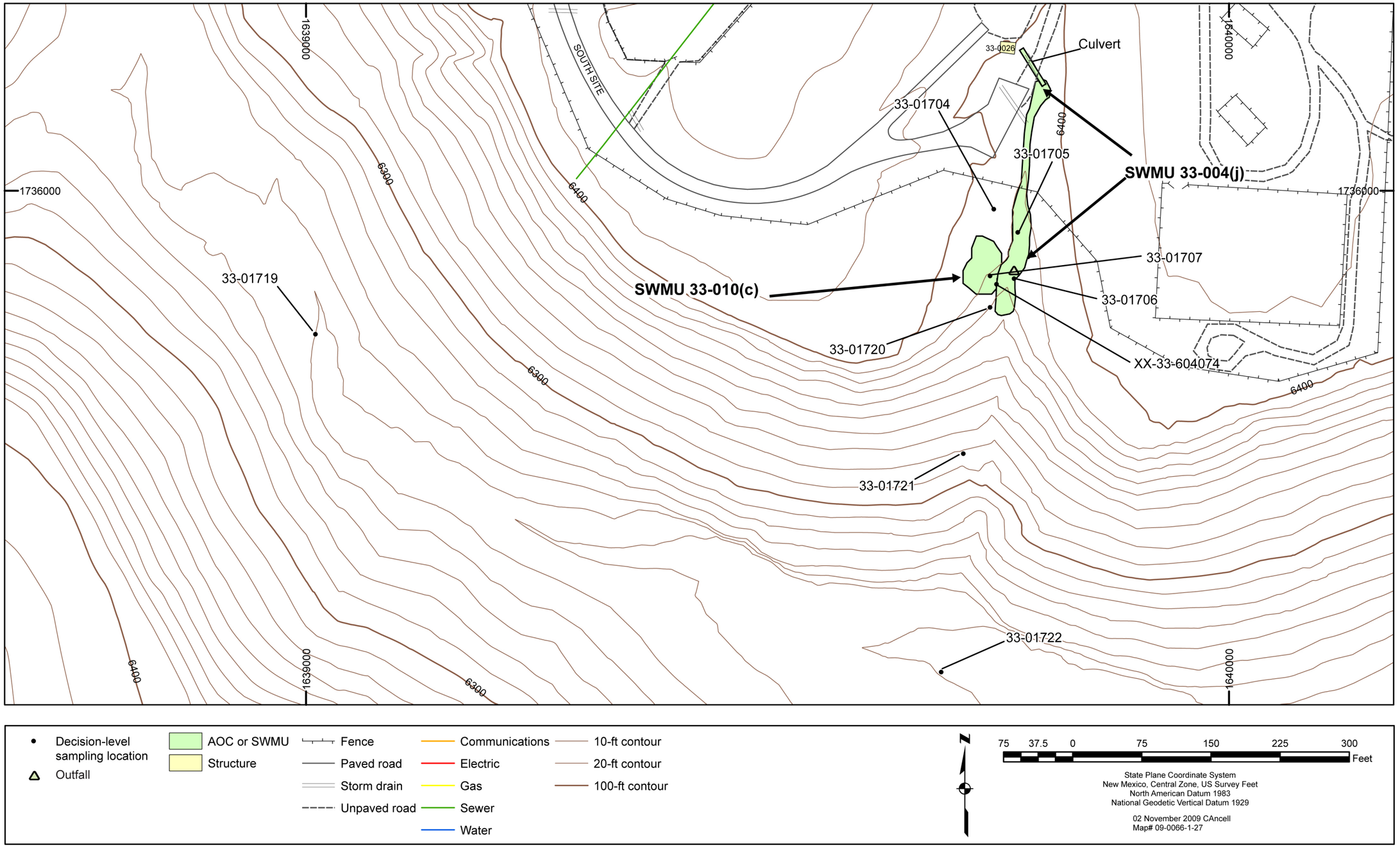


Figure 4.3-10 Site features and decision-level sampling locations for SWMUs 33-004(j) and 33-010(c)

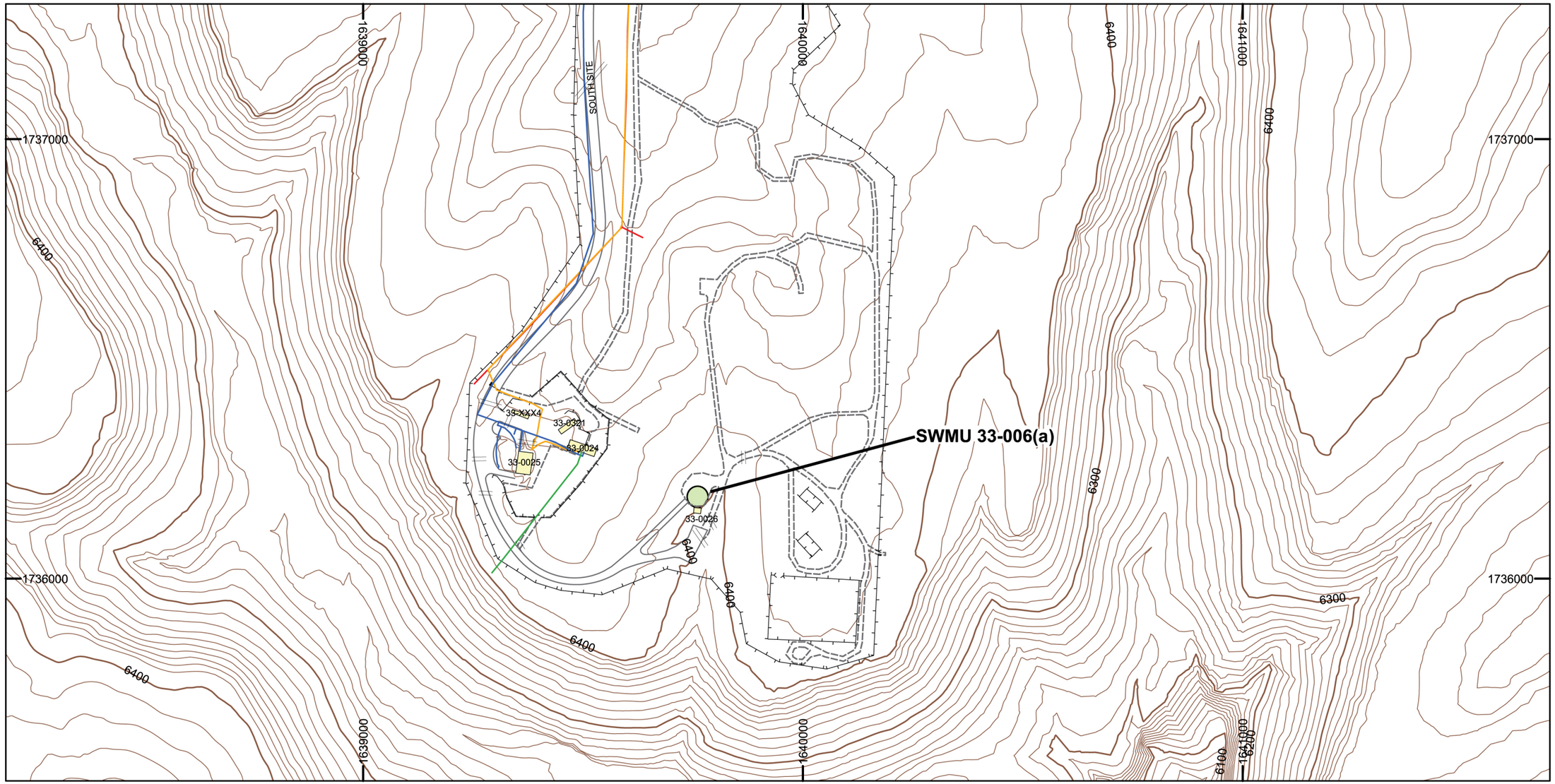


Figure 4.3-11 Site features for SWMU 33-006(a)

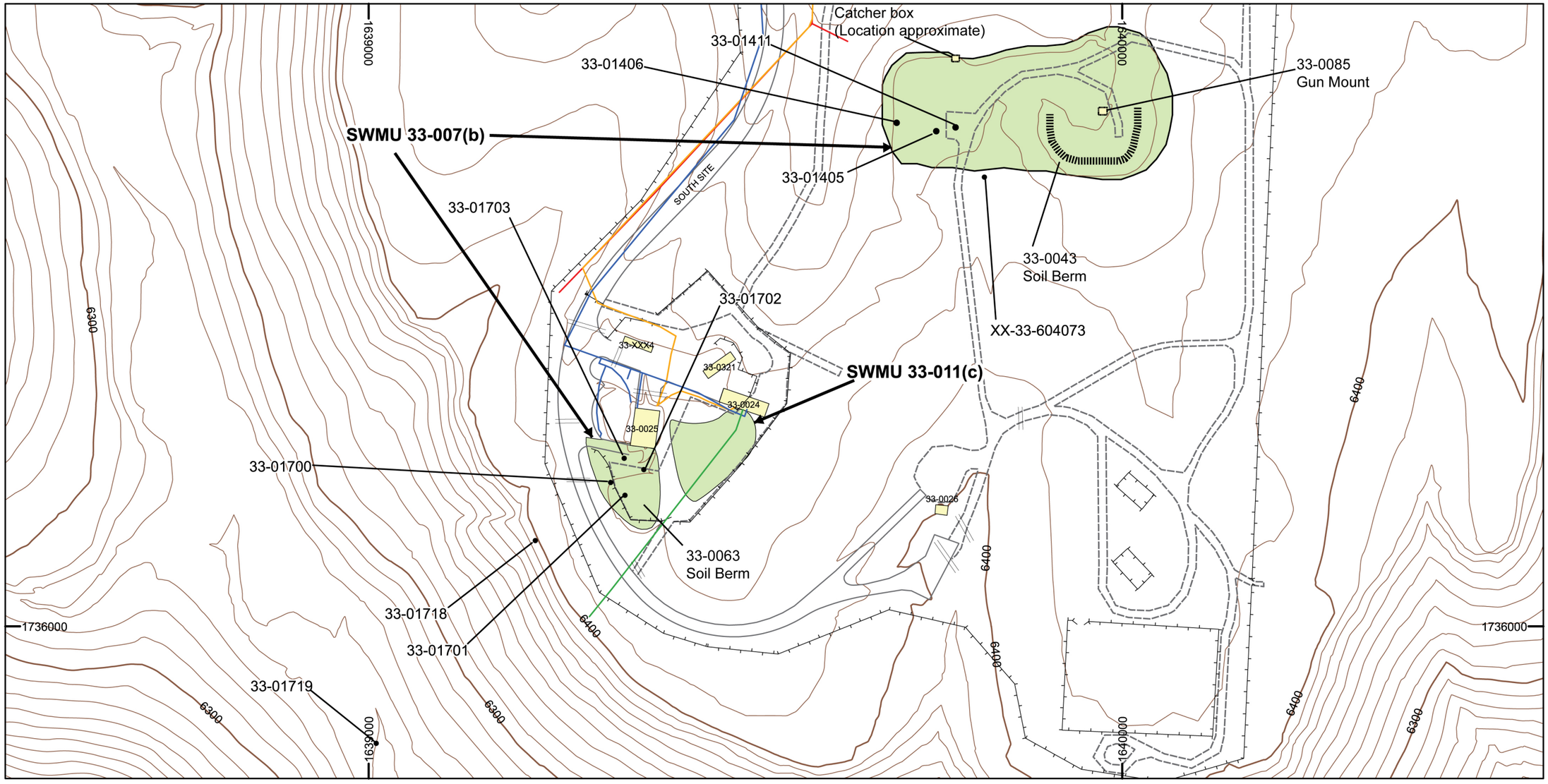


Figure 4.3-12 Site features and decision-level sampling locations for SWMUs 33-007(b) and 33-011(c)

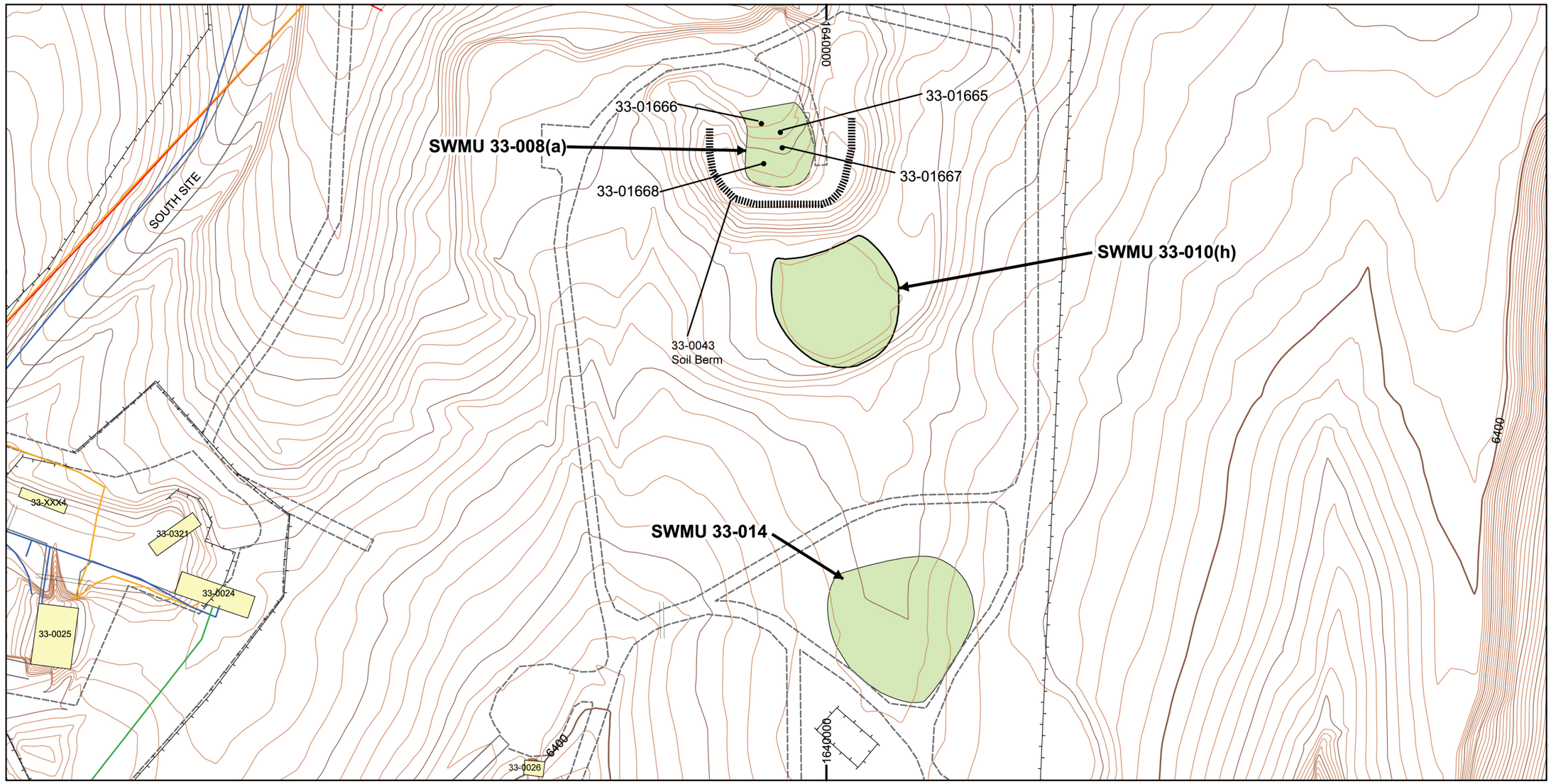


Figure 4.3-13 Site features and decision-level sampling locations for SWMUs 33-008(a), 33-010(h), and 33-014

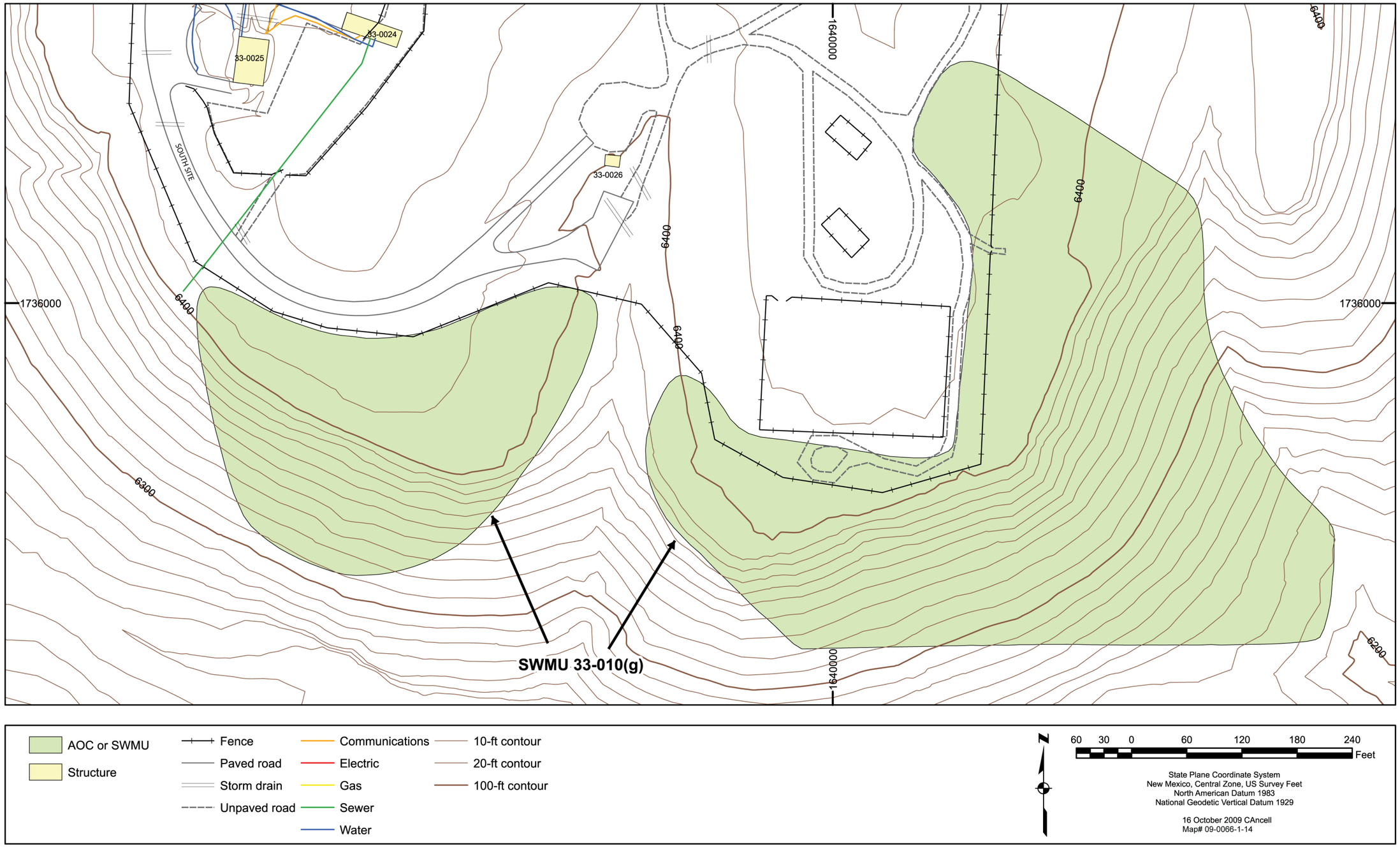


Figure 4.3-14 Site features for SWMU 33-010(g)

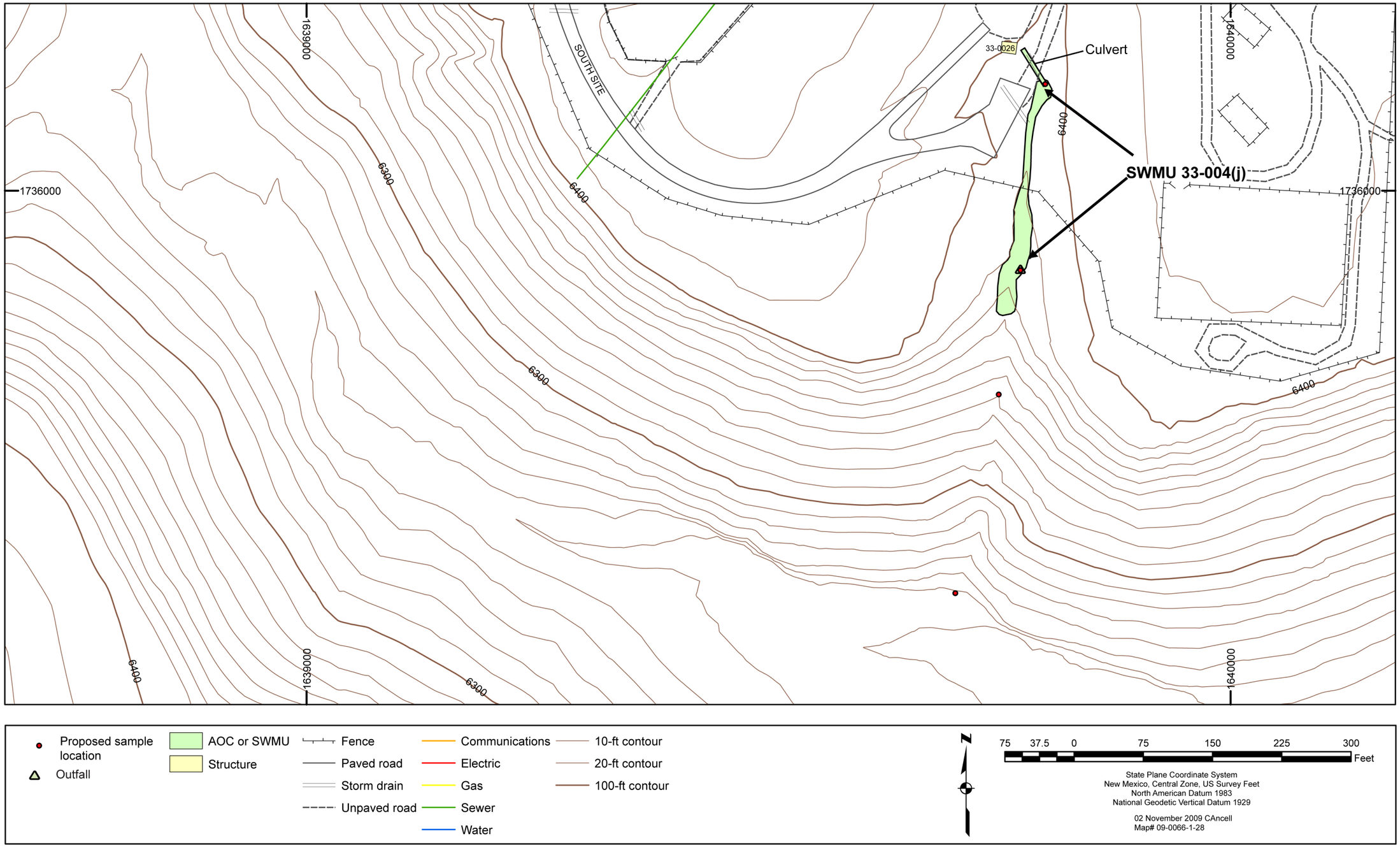


Figure 4.3-15 Proposed sampling locations at SWMU 33-004(j)

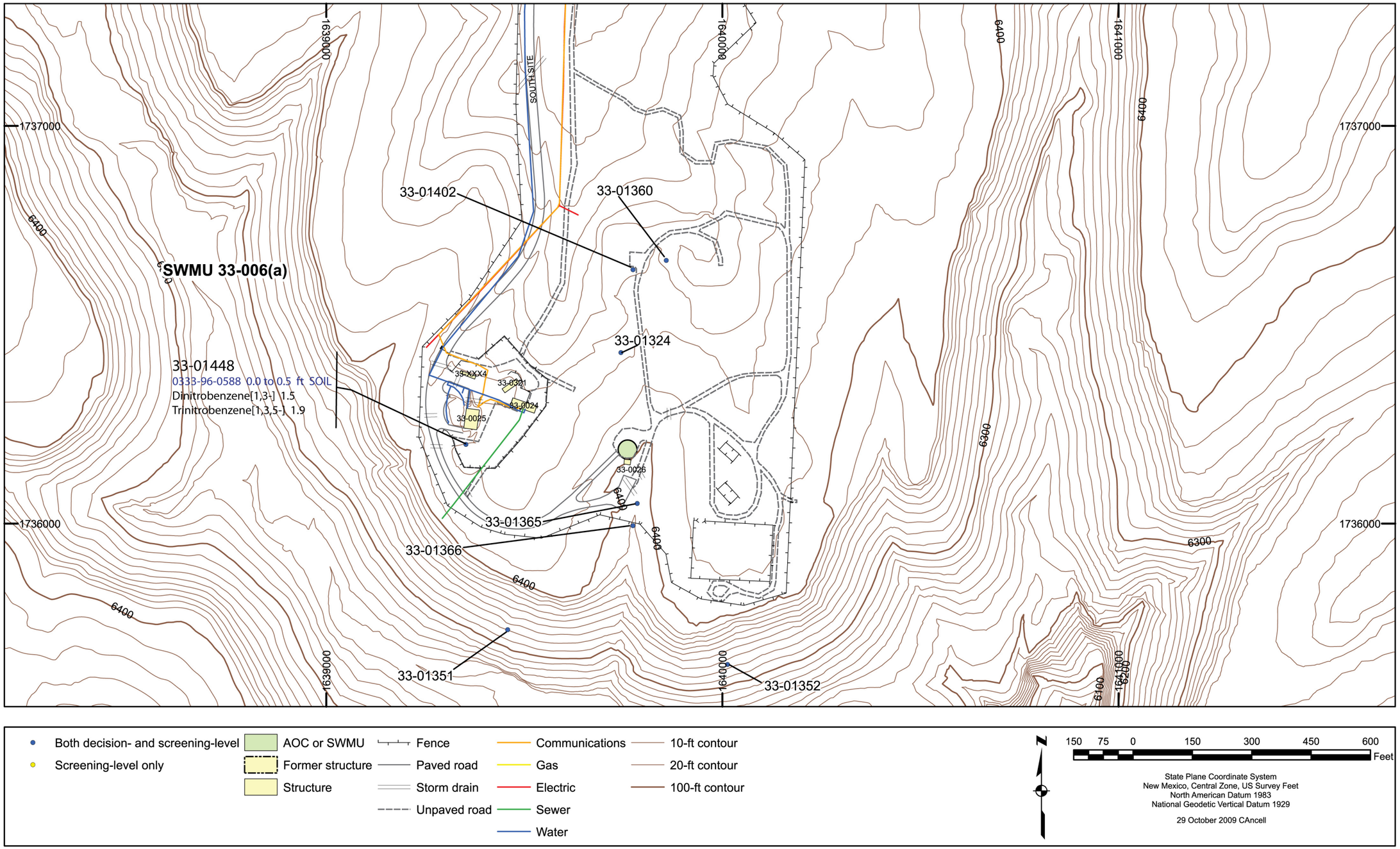


Figure 4.3-16 Organic chemicals detected at SWMU 33-006(a)

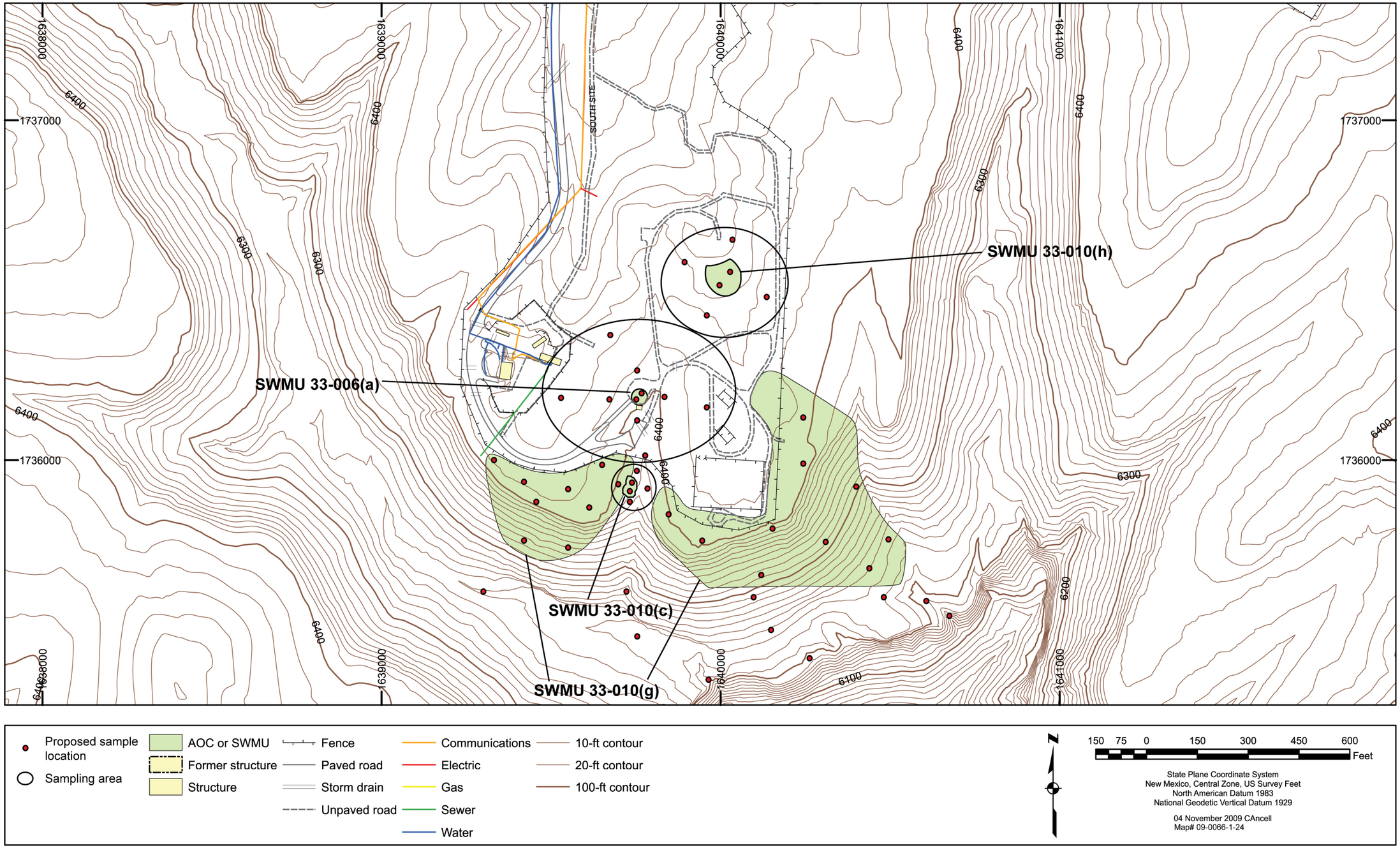


Figure 4.3-17 Proposed sampling locations at SWMUs 33-006(a) 33-010(c), 33-010(g), and 33-010(h)

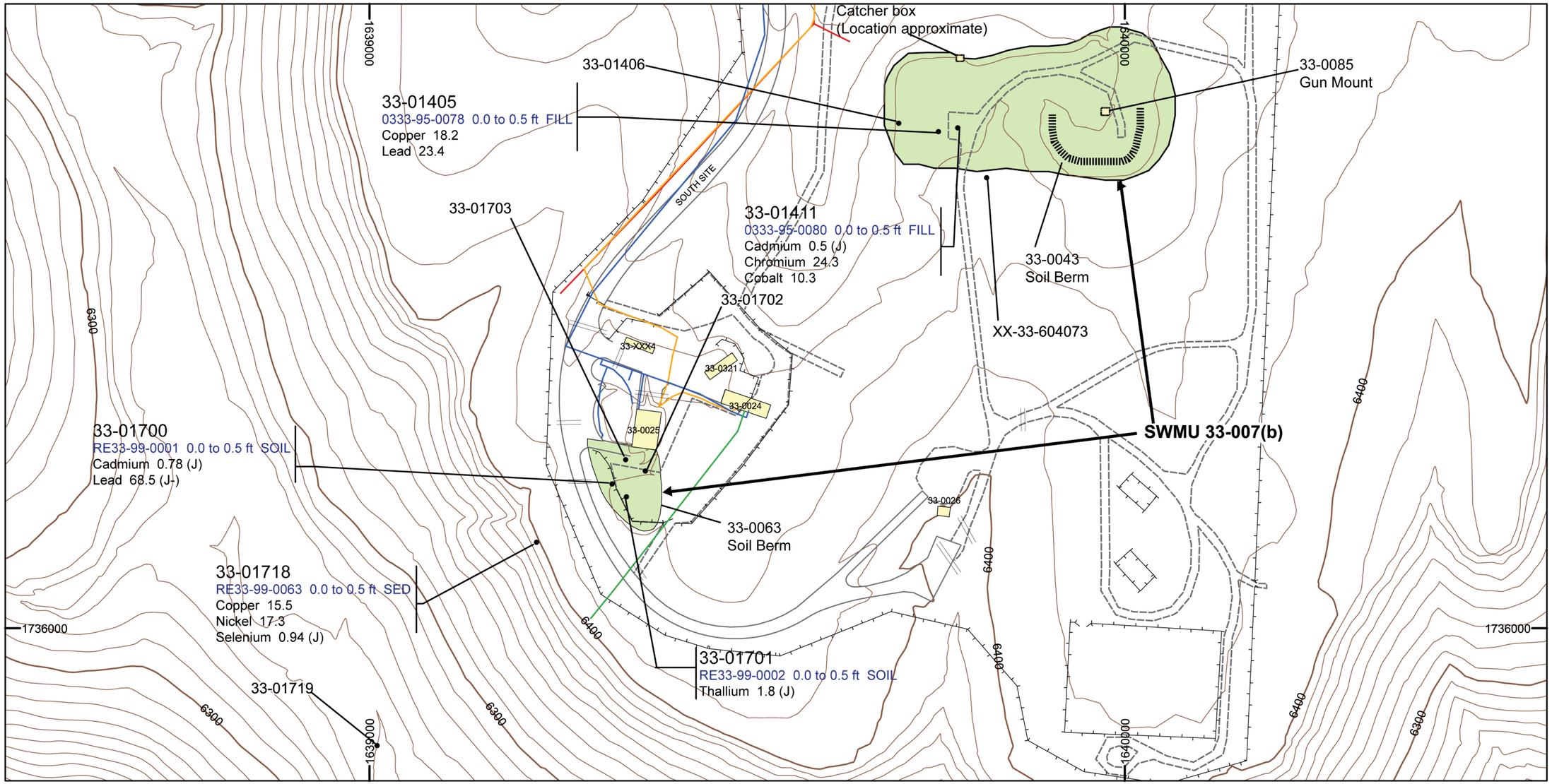


Figure 4.3-18 Inorganic chemicals detected above BVs at SWMU 33-007(b)

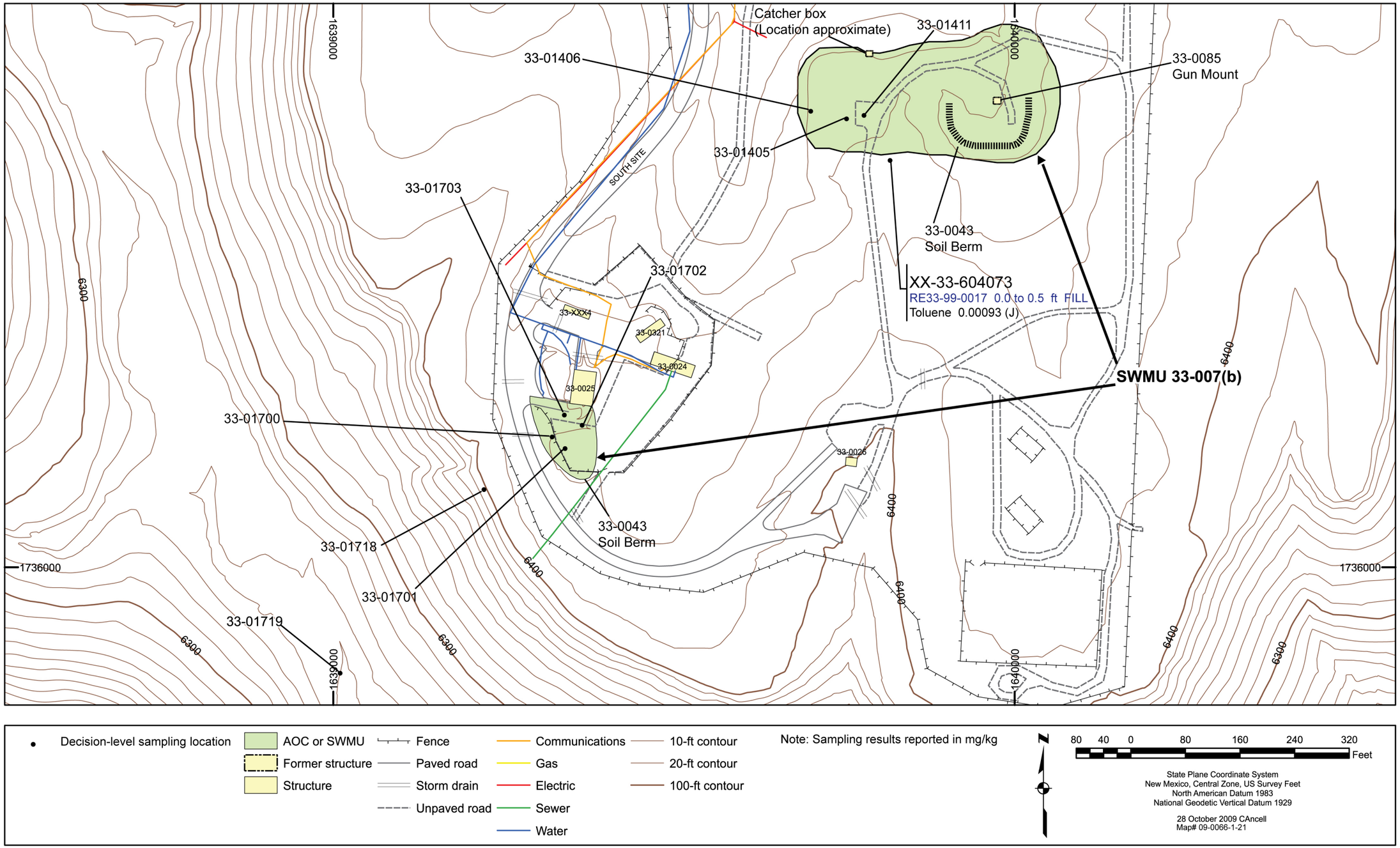


Figure 4.3-19 Organic chemicals detected at SWMU 33-007(b)

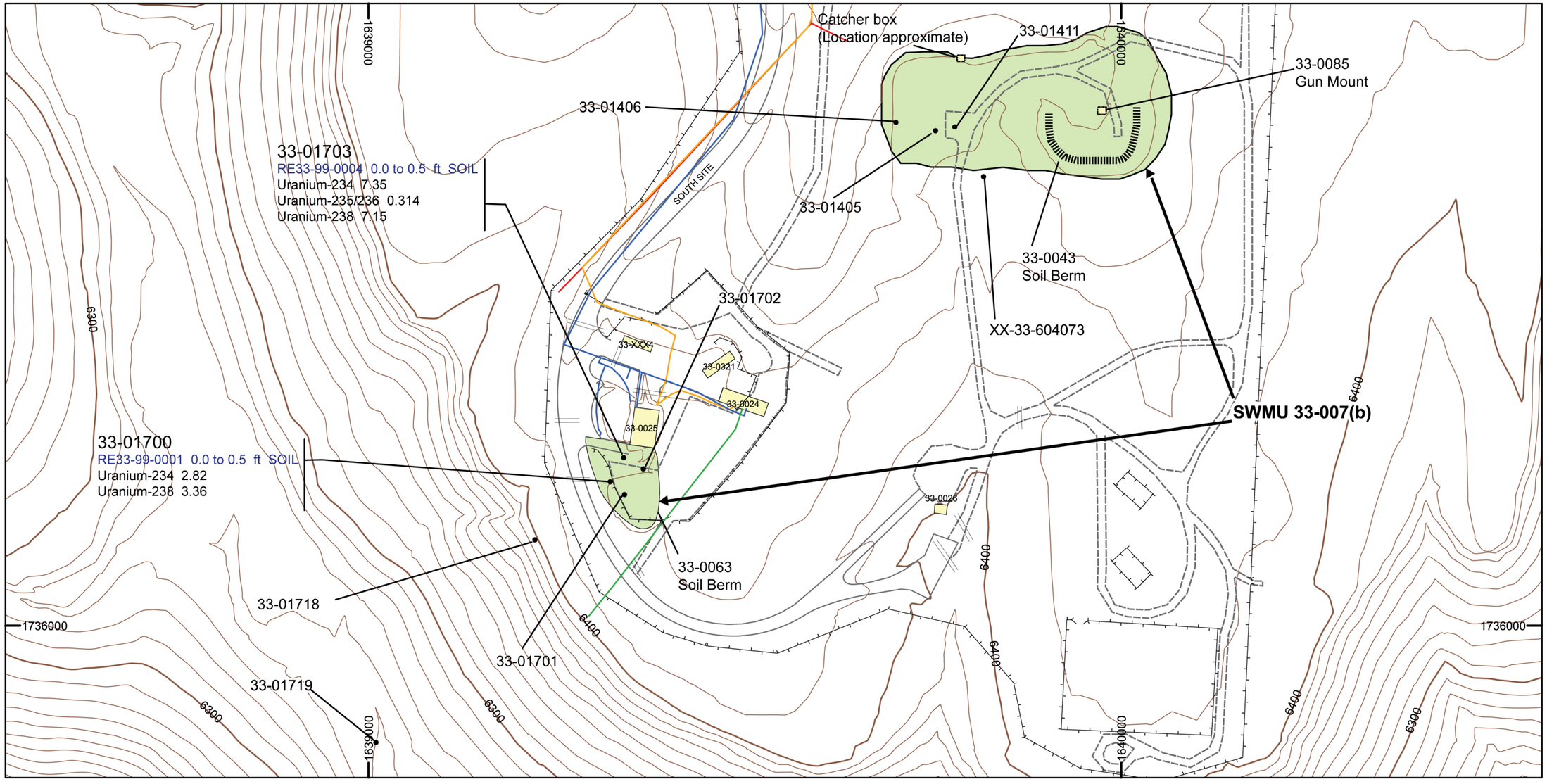


Figure 4.3-20 Radionuclides detected or detected above BVs/FVs at SWMU 33-007(b)

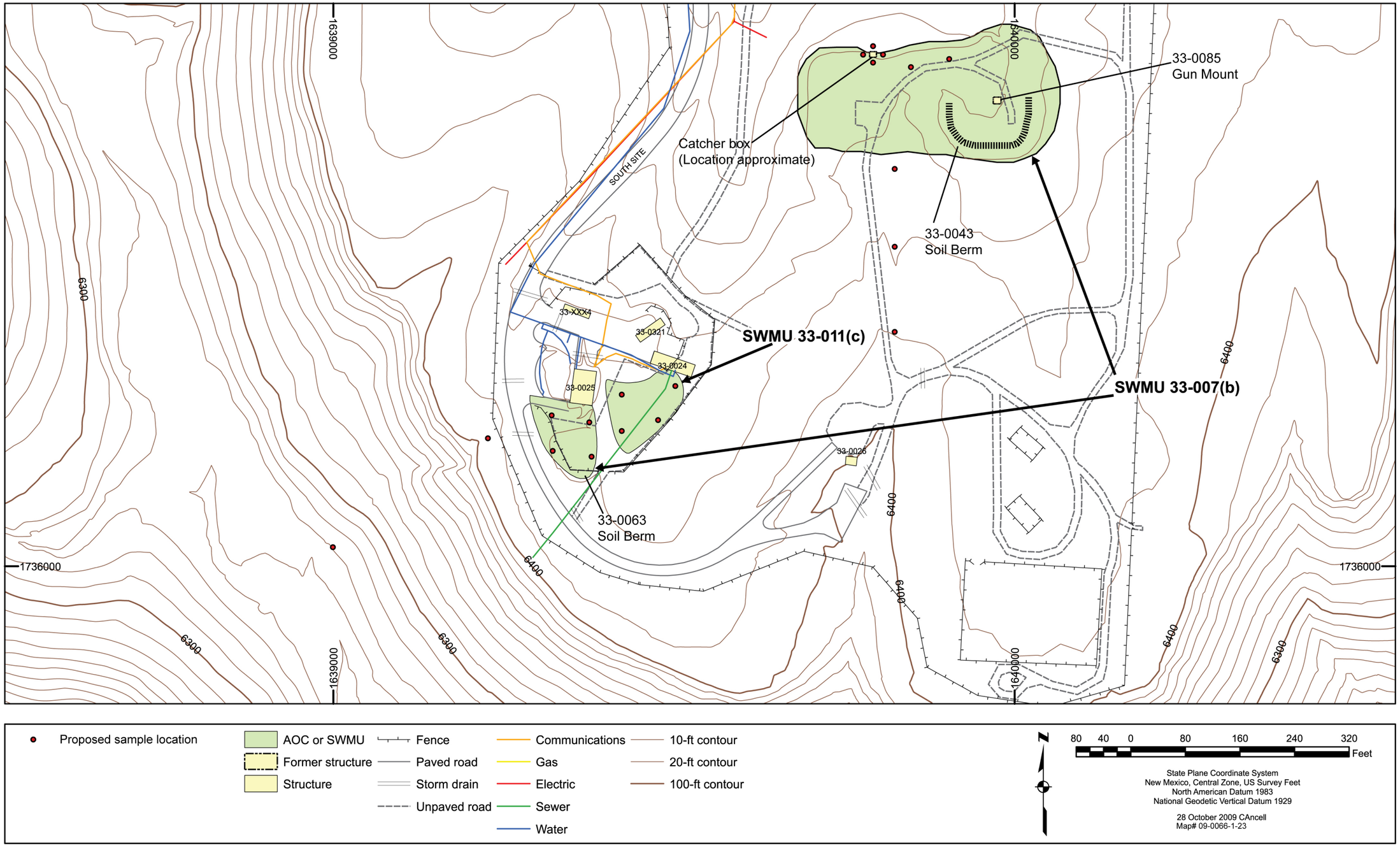


Figure 4.3-21 Proposed sampling locations at SWMUs 33-007(b) and 33-011(c)

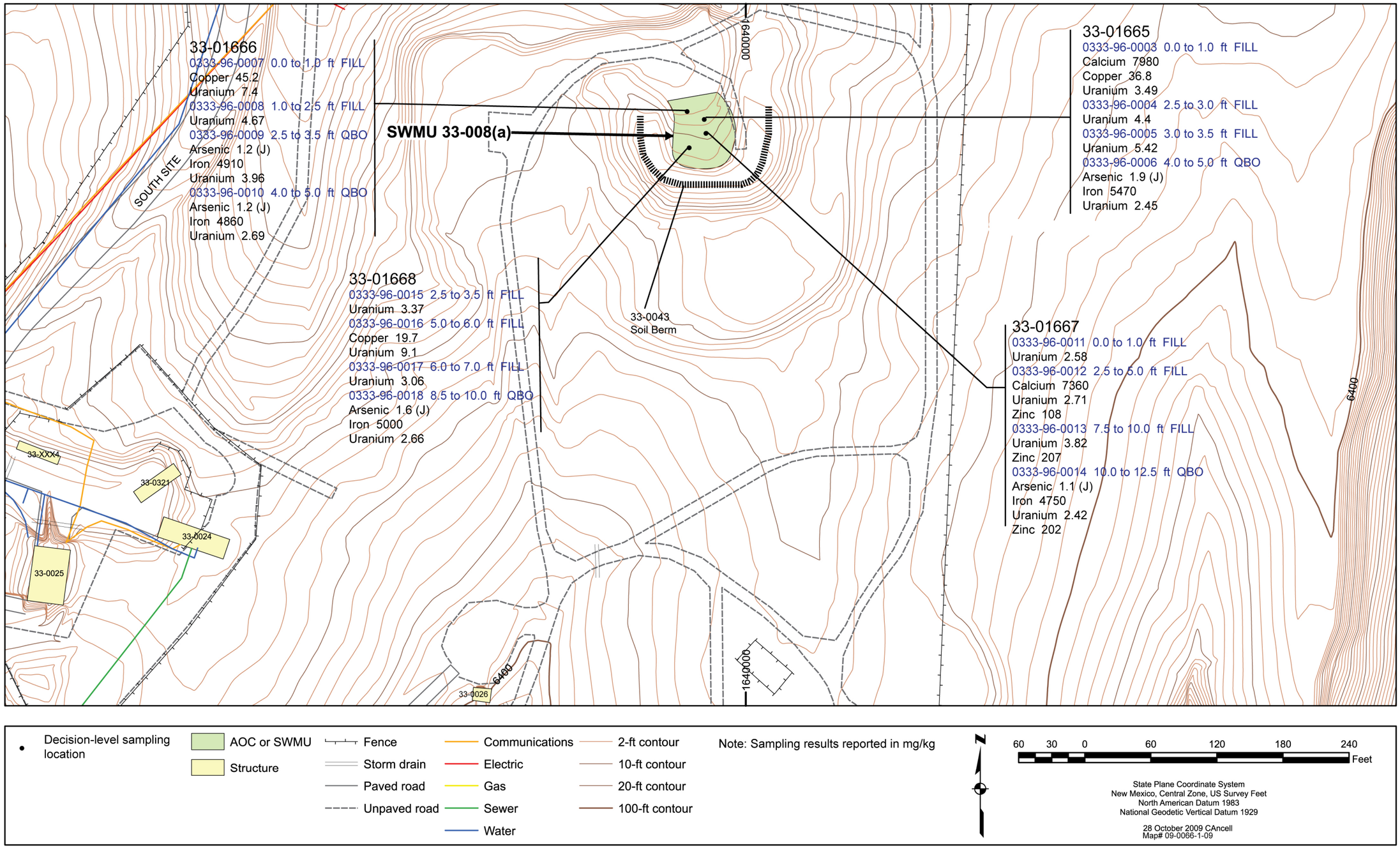


Figure 4.3-22 Inorganic chemicals detected above BVs at SWMU 33-008(a)

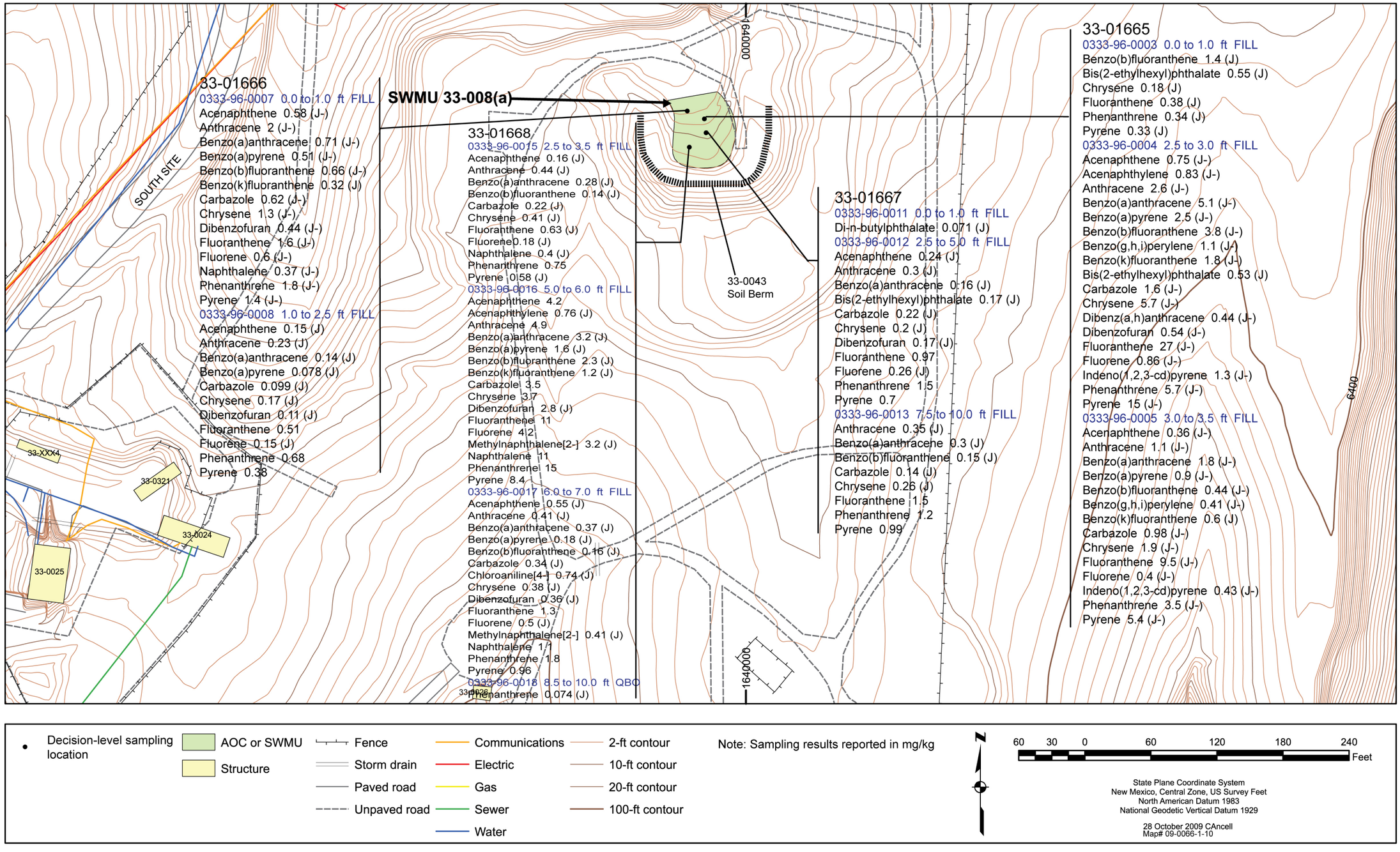


Figure 4.3-23 Organic chemicals detected at SWMU 33-008(a)

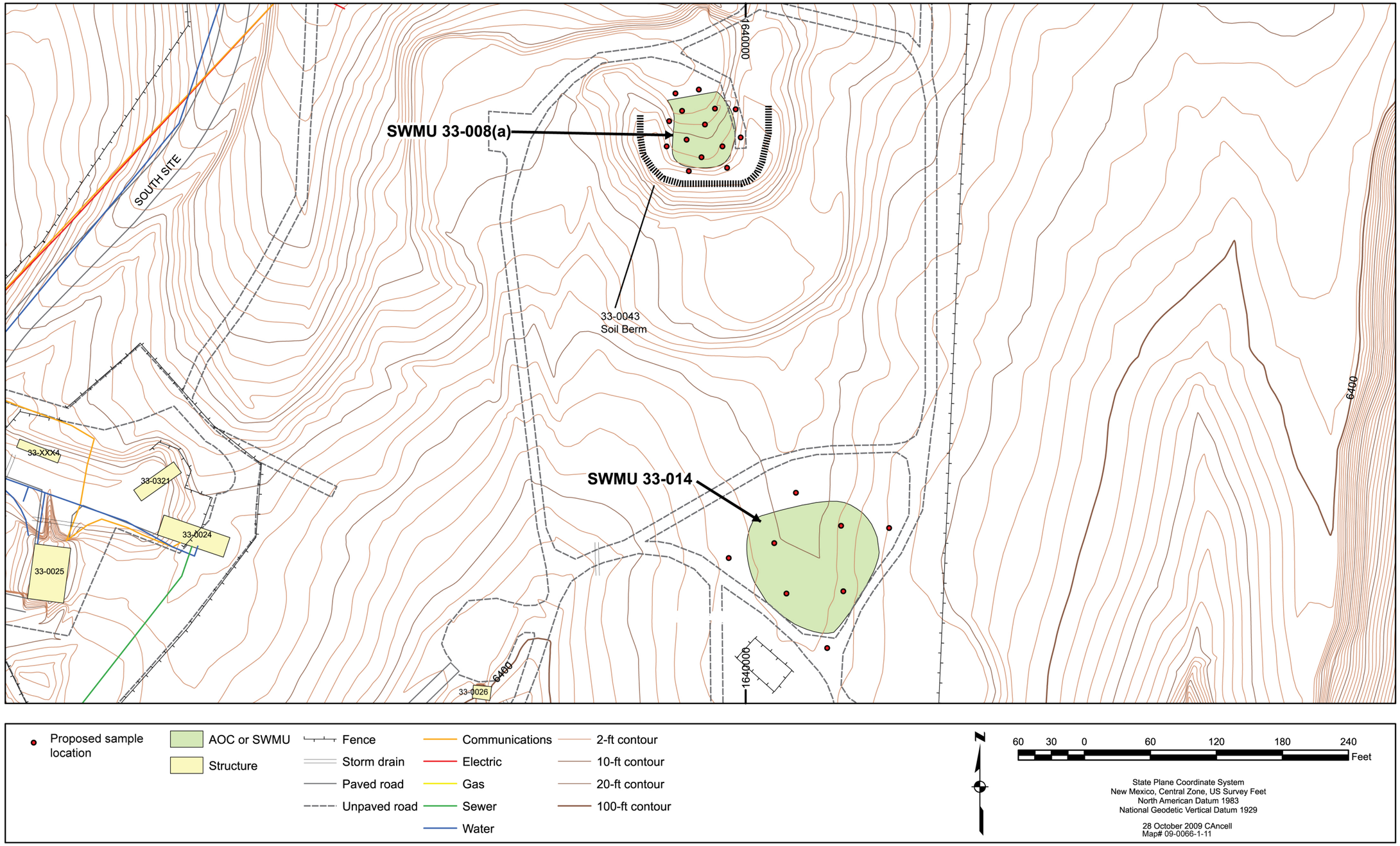


Figure 4.3-24 Proposed sampling locations at SWMUs 33-008(a) and 33-014

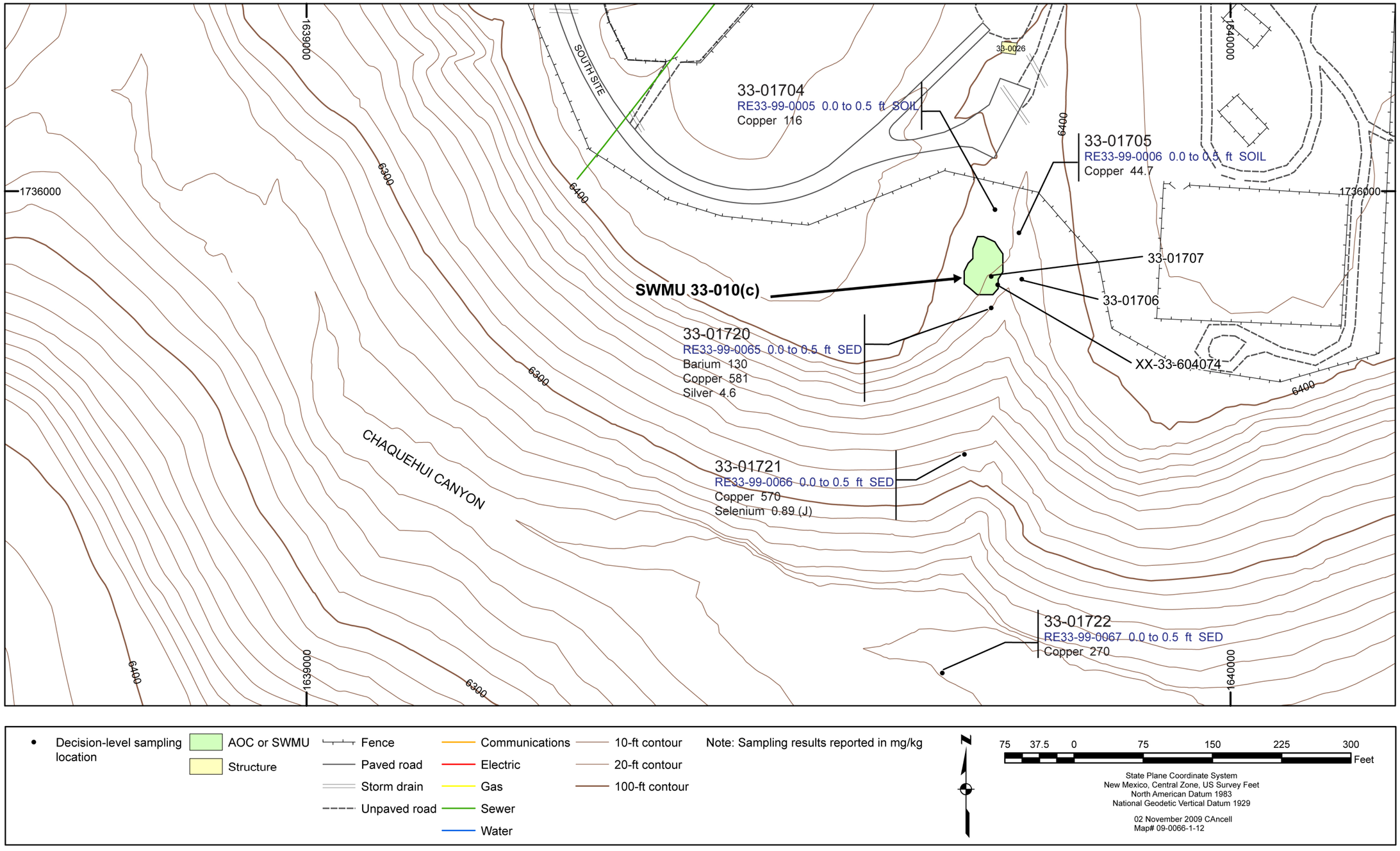


Figure 4.3-25 Inorganic chemicals detected above BVs at SWMU 33-010(c)

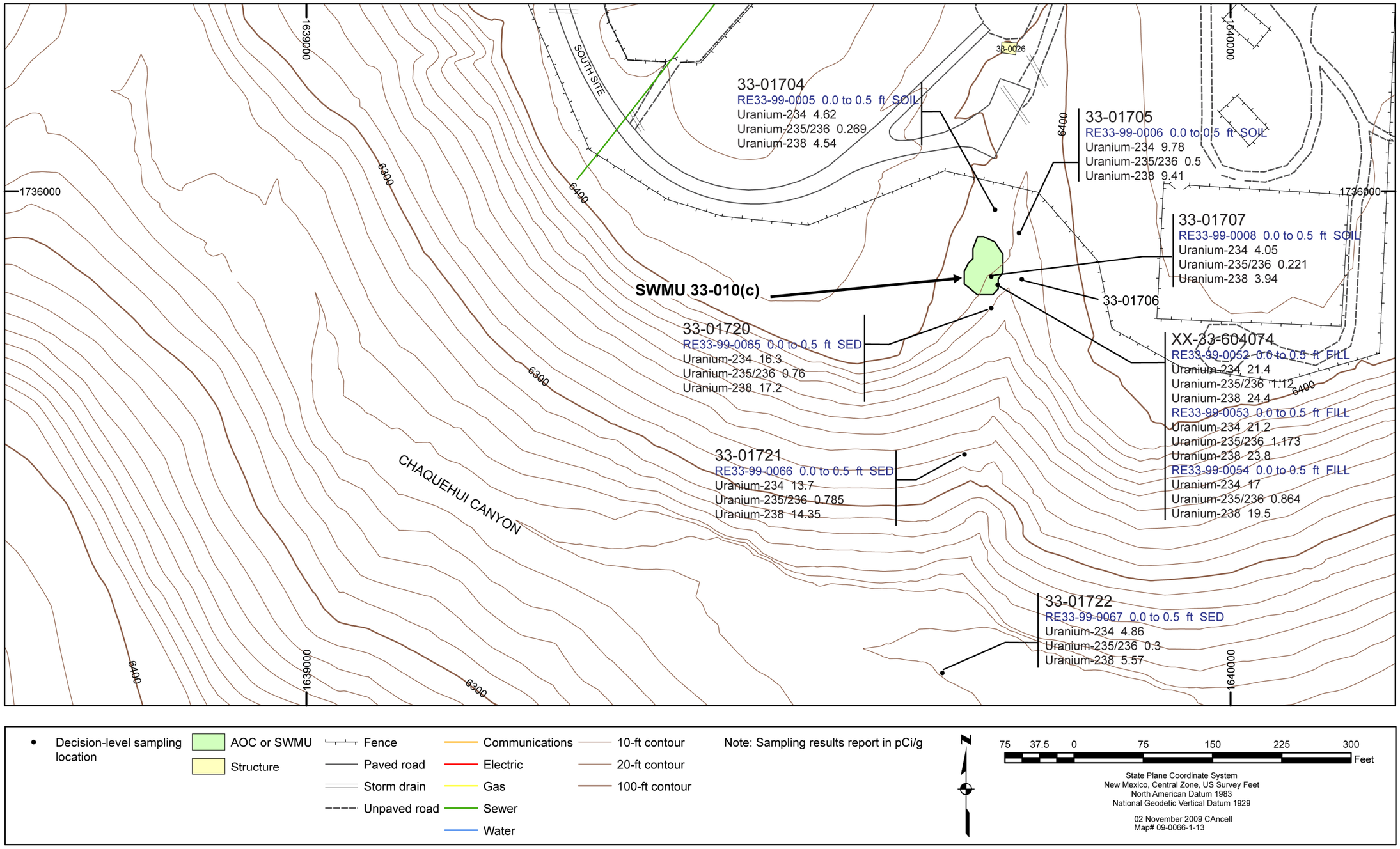


Figure 4.3-26 Radionuclides detected or detected above BVs/FVs at SWMU 33-010(c)

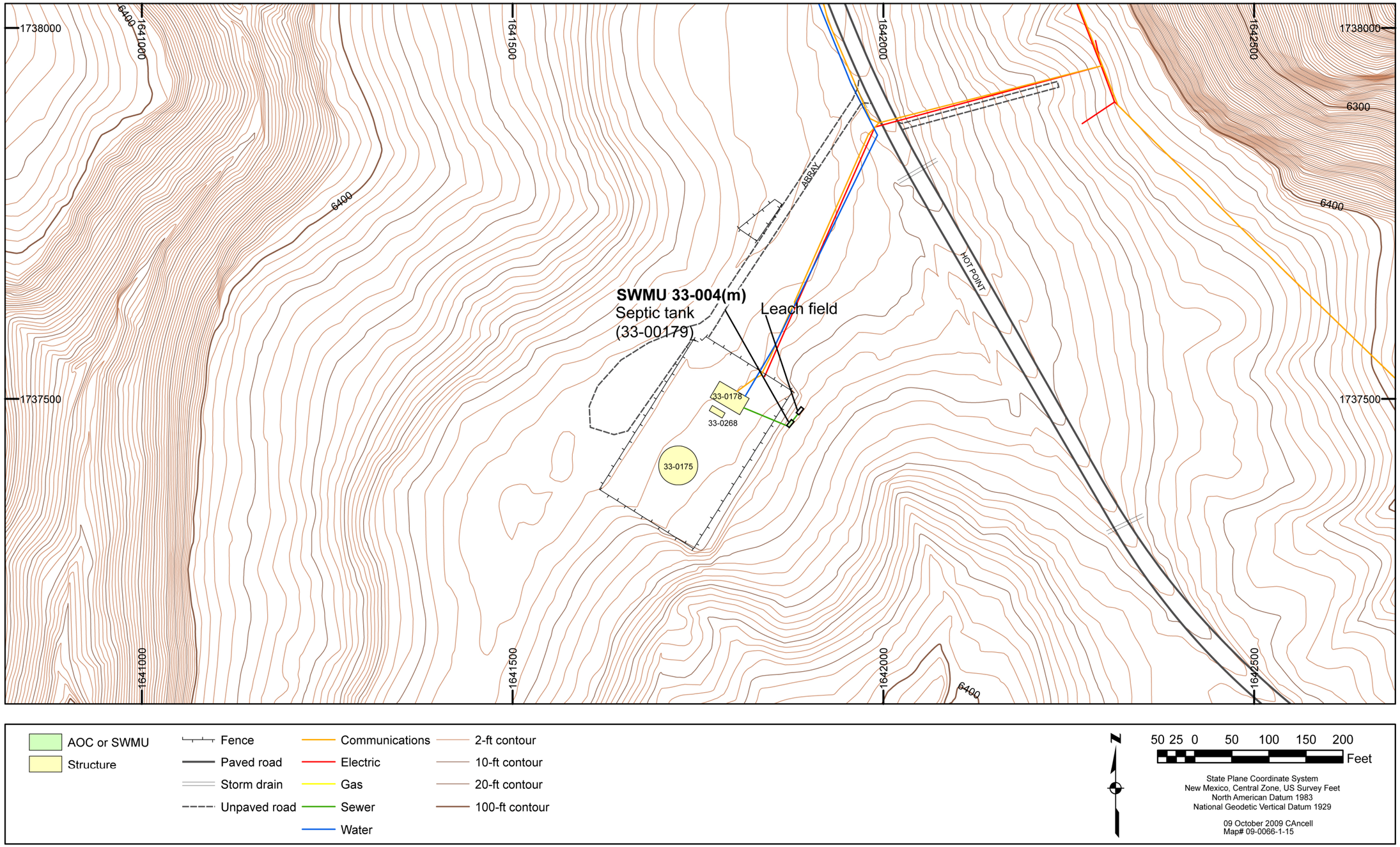


Figure 4.4-1 Site features for SWMU 33-004(m)

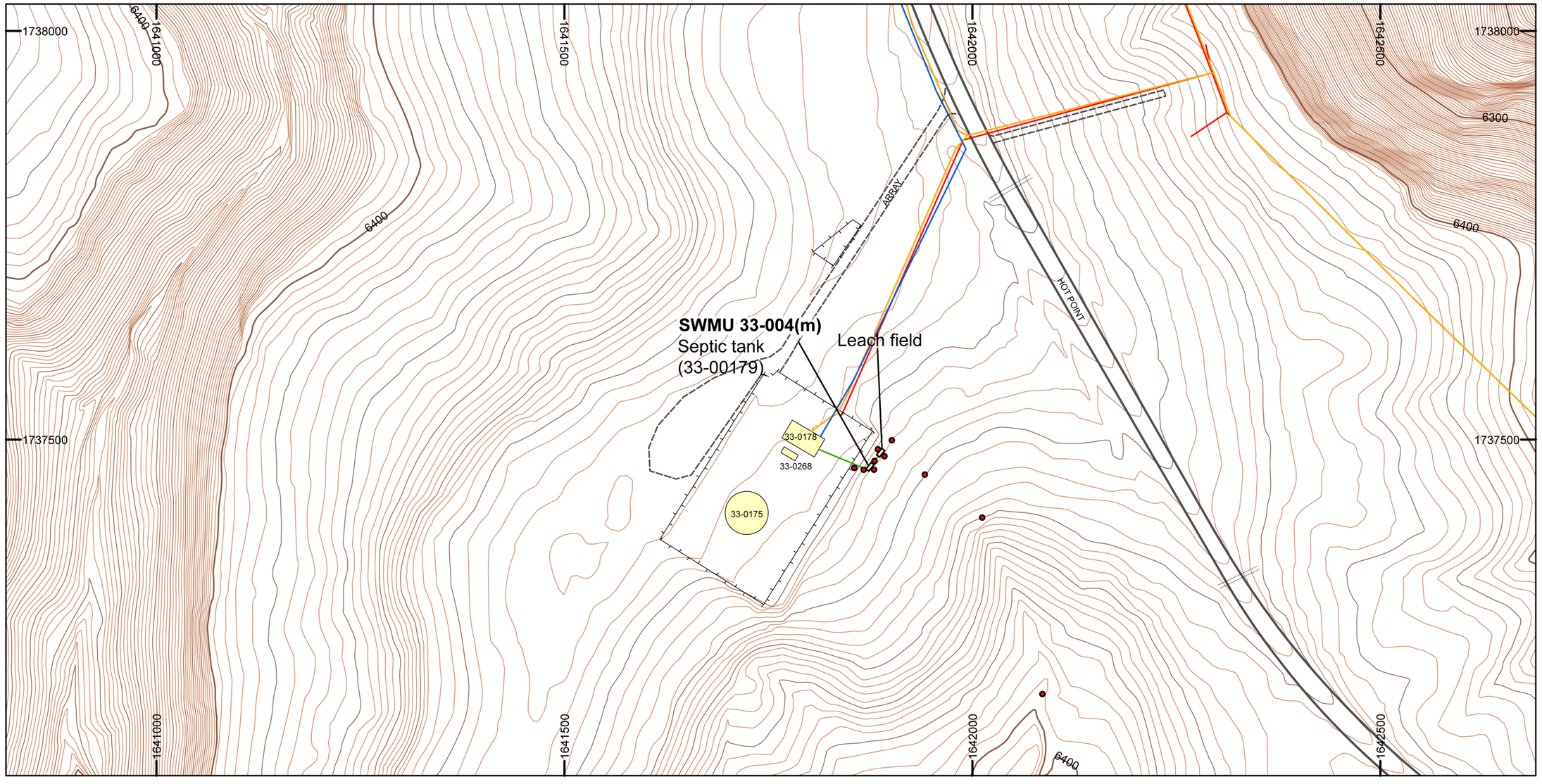


Figure 4.4-2 Proposed sampling locations at SWMU 33-004(m)

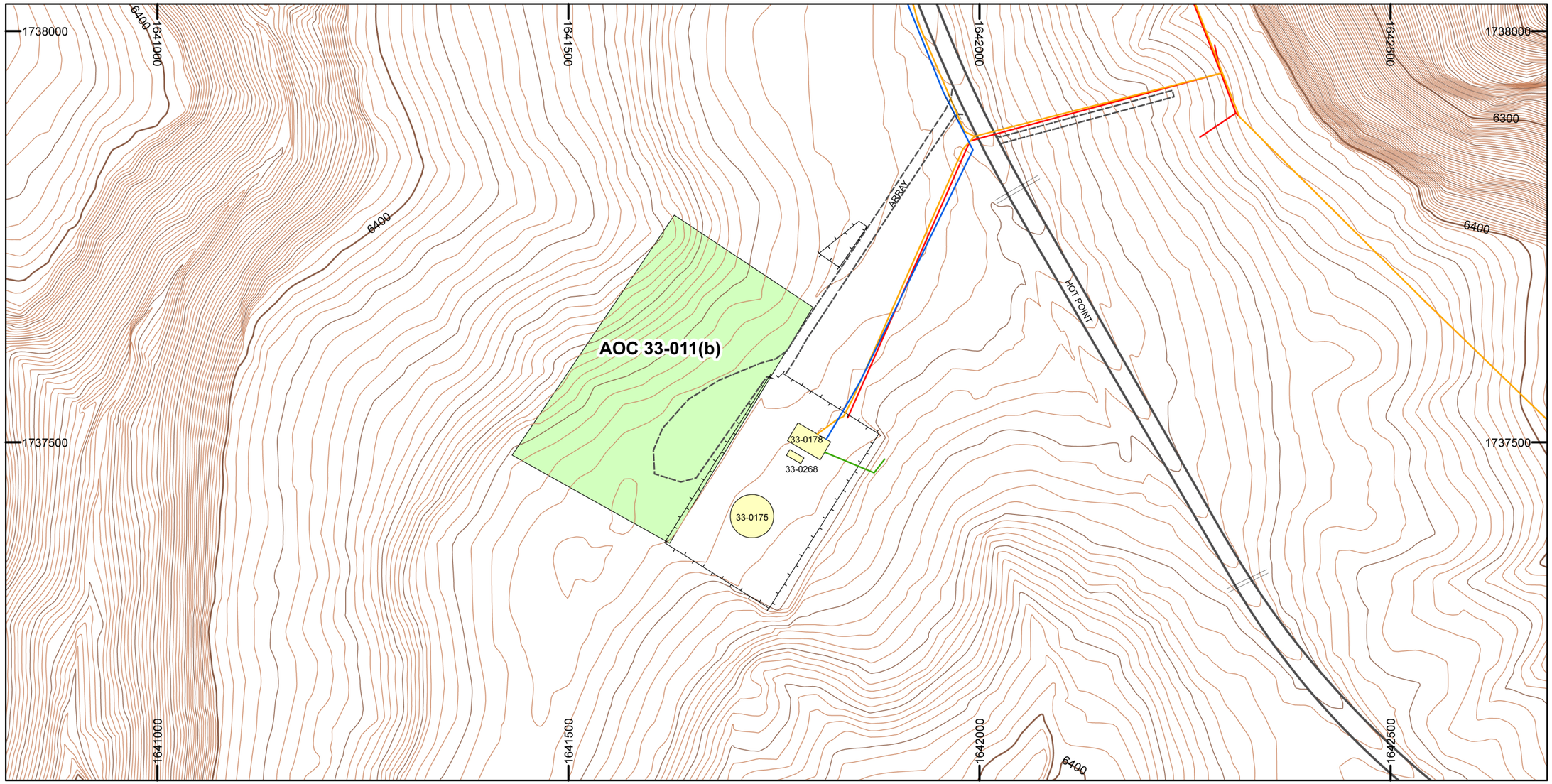


Figure 4.4-3 Site features for AOC 33-011(b)

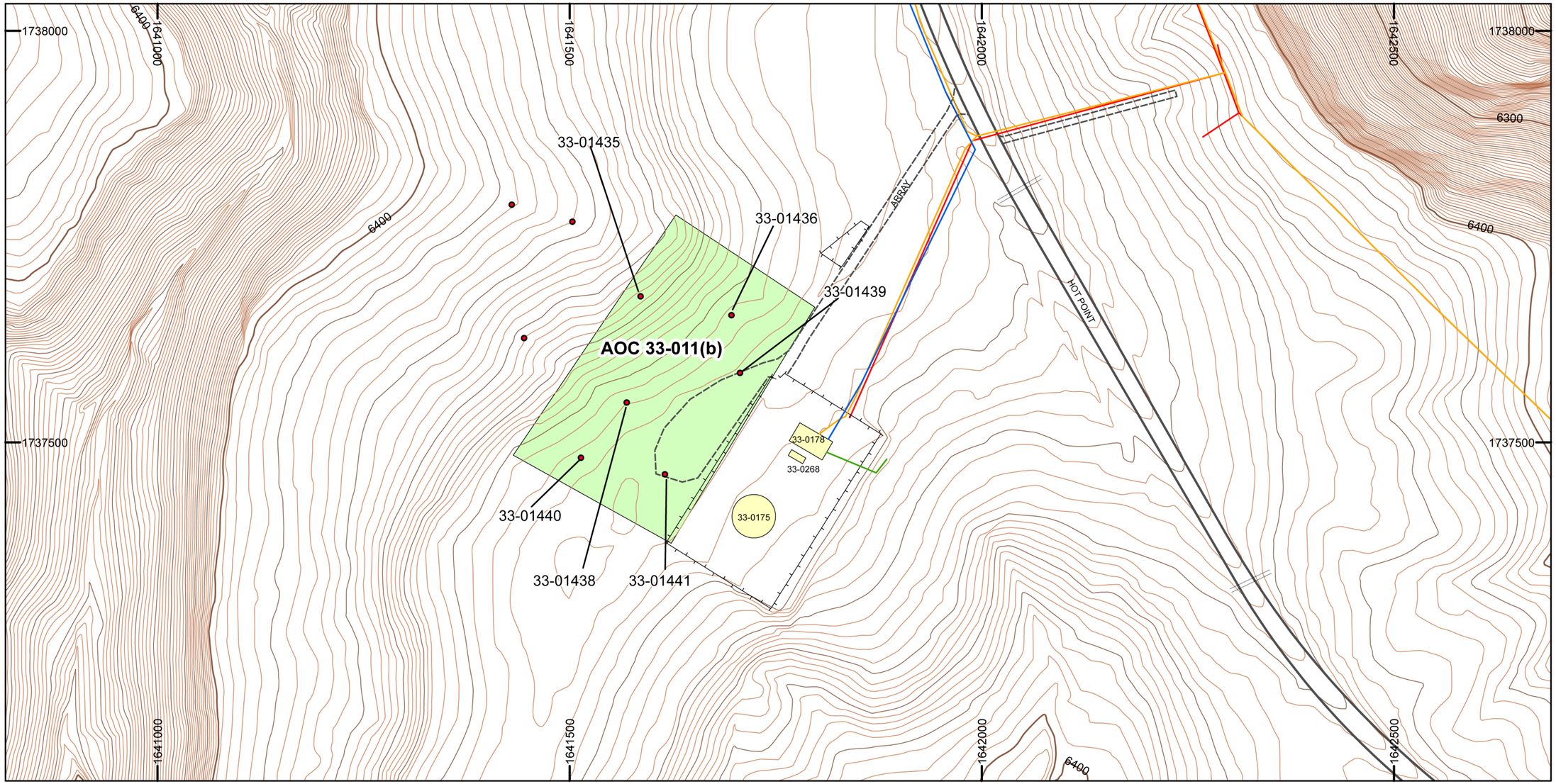


Figure 4.4-4 Proposed sampling locations at SWMU 33-011(b)

Table 1.1-1
Status of SWMUs and AOCs in Chaquehui Canyon Aggregate Area

Consolidated Unit	Site ID	Brief Description	Site Status	Reference*
33-001(a)-99	SWMU 33-001(a)	Disposal Pit 1 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(b)	Disposal Pit 2 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(c)	Disposal Pit 3 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(d)	Disposal Pit 4 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(e)	Shot Chamber (MDA E)	Under Investigation	Section 4.3.1
33-002(a)-99	SWMU 33-002(a)	Septic System (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(b)	Seepage Pit (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(c)	Seepage Pit (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(d)	Outfall (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(e)	Outfall (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-010(f)	Surface Disposal Area (MDA K)	Under Investigation	Section 4.1.1
33-004(a)-00	SWMU 33-004(a)	Septic System	Under Investigation	Section 4.1.2
	SWMU 33-004(h)	Outfall	Under Investigation	Section 4.1.2
	SWMU 33-004(i)	Outfalls	Under Investigation	Section 4.1.2
	SWMU 33-011(d)	Former Storage Area	Under Investigation	Section 4.1.2
	SWMU 33-015	Incinerator	Under Investigation	Section 4.1.2
	SWMU 33-017	Potential Soil Contamination	Under Investigation	Section 4.1.2
	SWMU 33-004(b)	Septic System	Under Investigation	Section 4.2.2
	SWMU 33-004(d)	Septic System	Under Investigation	Section 4.2.1
	SWMU 33-004(e)	Seepage Pit	Removed from the Module VIII of the Laboratory's Hazardous Waste Facility Permit 12/23/98	NMED 1998, 063042
	SWMU 33-004(f)	Septic System	Removed from the Module VIII of the Laboratory's Hazardous Waste Facility Permit 12/23/98	NMED 1998, 063042
33-004(g)-00	SWMU 33-004(g)	Drainline and Outfall	Under Investigation	Section 4.2.2
	SWMU 33-007(c)	Firing Sites	Under Investigation	Section 4.2.2
	SWMU 33-004(j)	Drainline and Outfall	Under Investigation	Section 4.3.3
	SWMU 33-006(a)	Firing Site	Under Investigation	Section 4.3.3
	SWMU 33-007(b)	Firing Sites	Under Investigation	Section 4.3.3
	SWMU 33-008(a)	Landfill	Under Investigation	Section 4.3.3
	SWMU 33-010(c)	Surface Disposal Area	Under Investigation	Section 4.3.3
	SWMU 33-010(h)	Surface Disposal Area	Under Investigation	Section 4.3.3
	SWMU 33-011(c)	Storage Area	Under Investigation	Section 4.3.3

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	Reference*
	SWMU 33-014	Open Burn Area	Under Investigation	Section 4.3.3
	SWMU 33-004(m)	Septic System	Under Investigation	Section 4.4.1
	AOC 33-004(n)	Septic System	NFA Approved 1/21/05	EPA 2005, 088464
33-005(a)-00	SWMU 33-005(a)	Former Septic System	Under Investigation	Section 4.1.3
	SWMU 33-005(b)	Former Drainline	Under Investigation	Section 4.1.3
	SWMU 33-005(c)	Former Drainline	Under Investigation	Section 4.1.3
	SWMU 33-011(a)	Former Storage Area	Under Investigation	Section 4.1.3
	AOC 33-008(c)	Surface Disposal Area	Under Investigation	Section 4.1.4
	SWMU 33-009	Surface Disposal Area	Under Investigation	Section 4.2.3
	AOC 33-010(e)	Surface Disposal Site	NFA Approved 01/21/05	EPA 2005, 088464
	SWMU 33-010(g)	Surface Disposal Area	Under Investigation	Section 4.3.4
	AOC 33-011(b)	Former Storage Area	Under Investigation	Section 4.4.2
	SWMU 33-011(e)	Former Storage Area	Under Investigation	Section 4.1.5
	SWMU 33-012(a)	Former Storage Area	Under Investigation	Section 4.1.6
	AOC 33-012(b)	Satellite Accumulation Area	NFA Approved 01/21/05	EPA 2005, 088464
	AOC 33-012(c)	Satellite Accumulation Area	NFA Approved 01/21/05	EPA 2005, 088464
	AOC 33-012(d)	Satellite Accumulation Area	NFA Approved 01/21/05	EPA 2005, 088464
	SWMU 33-013	Drum Storage Area	NFA Approved 08/30/06	NMED 2006, 093526
	SWMU 33-016	Sump, Drainline, and Outfall	Under Investigation	Section 4.1.7
	AOC C-33-001	Former Transformer	Under Investigation	Section 4.1.8
	AOC C-33-003	Potential Soil Contamination	Under Investigation	Section 4.1.9

Note: Shading denotes approved for NFA or complete with controls.
*References are to sections in the Chaquehui Canyon Aggregate Area investigation work plan, unless otherwise noted.

Table 2.3-1
Industrial SSLs and SALs

Chemical	Industrial SSL[a] (inorganic and organic chemicals) or Industrial SAL[b] (radionuclides)
Inorganic Chemicals (mg/kg)	
Aluminum	1,130,000
Antimony	454
Arsenic	17.7
Barium	224,000
Cadmium	1120
Calcium	na[c]
Chromium	2920[d]
Cobalt	300[e]
Copper	45,400
Cyanide (total)	22,700
Iron	795,000
Lead	800
Magnesium	na
Manganese	145,000
Mercury	310[e]
Nickel	22,700
Nitrate	1,820,000
Perchlorate	795
Selenium	5680
Silver	5680
Thallium	74.9
Uranium	3410
Vanadium	5680
Zinc	341,000
Organic Chemicals (mg/kg)	
Acenaphthene	36,700
Acenaphthylene	18,300[f]
Acetone	851,000
Anthracene	183,000
Aroclor-1242	8.26
Aroclor-1254	8.26
Aroclor-1260	8.26
Azobenzene	230[e]
Benzene	85.4
Benzo(a)anthracene	23.4

Table 2.3-1 (continued)

Chemical	Industrial SSL[a] (Inorganic and Organic Chemicals) or Industrial SAL[b] (Radionuclides)
Benzo(a)pyrene	2.34
Benzo(b)fluoranthene	23.4
Benzo(g,h,i)perylene	18,300[f]
Benzo(k)fluoranthene	234
Benzoic acid	2,500,000[e]
Bis(2-ethylhexyl)phthalate	1370
Bromobenzene	1800[e]
Butanone[2-]	36,900
Butylbenzylphthalate	9100[e]
Carbazole	2900[g]
4-Chloroaniline	86[e]
Chrysene	2340
Di-n-butylphthalate	68,400
Dibenz(a,h)anthracene	2.34
Dibenzofuran	2800[g]
1,3-Dichlorobenzene	130[g]
1,4-Dichlorobenzene	180
2,4-Dimethylphenol	13,700
Fluoranthene	24,400
Fluorene	24,400
2-Hexanone	369,000[h]
Indeno(1,2,3-cd)pyrene	23.4
4-Isopropyltoluene	14,900[i]
Methylene chloride	1090
2-Methylnaphthalene	4100[e]
2-Methylphenol	34,000[g]
4-Methylphenol	3400[g]
Naphthalene	252
Phenanthrene	20,500
Phenol	205,000
Pyrene	18,300
Pyridine	1000[e]
Tetrachloroethene	36.4
Toluene	57,900
TPH-DRO	1120[j]
1,1,1-Trichloroethane	77,100
Trichloroethene	253
1,2,3-Trichlorobenzene	525[k]

Table 2.3-1 (continued)

Chemical	Industrial SSL[a] (Inorganic and Organic Chemicals) or Industrial SAL[b] (Radionuclides)
1,2,4-Trichlorobenzene	525
1,2,4-Trimethylbenzene	260[e]
1,3,5-Trinitrobenzene	27,000[e]
Xylene (total)	3610
Radionuclides (pCi/g)	
Americium-241	180
Cesium-137	23
Plutonium-238	240
Plutonium-239/240	210
Strontium-90	1900
Tritium	440,000
Uranium-234	1500
Uranium-235	87
Uranium-238	430

[a] SSLs from NMED 2009, 106420, unless otherwise noted.

[b] SALs from LANL 2005, 088493.

[c] na = Not available.

[d] SSL is for hexavalent chromium.

[e] SSL is from the EPA regional screening table (http://www.epa.gov/region6/6pd/rcra_c/pd-n/screen.htm).

[f] SSL is for pyrene, based on structural similarity.

[g] SSL from EPA 2007, 099314.

[h] SSL is for 2-butanone, based on structural similarity.

[i] SSL is for isopropylbenzene (cumene), based on structural similarity.

[j] SSL from NMED 2006, 094614.

[k] SSL is for 1,2,4-trichlorobenzene, based on structural similarity.

Table 4.0-1
Summary of Proposed Samples and Analyses

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
Main Site																				
33-002(a)-99	SWMU 33-002(a)	Collect 9 samples from VCA locations 33-24718, 33-24720, 33-24721, 33-24722, 33-24723, 33-24724, 33-24725, 33-24726, and 33-25098 at the next deeper interval (5 to 6 ft beneath bottom of former septic system structures) to define the vertical extent of metals.	9 locations, 9 samples	5–6 beneath bottom of former septic system structures	Soil, tuff	X[a]	—[b]	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(a)	Collect 3 samples from VCA locations 33-24716, 33-24718, and 33-24722 at the next deeper interval (5 to 6 ft beneath bottom of former septic system structures) to define the vertical extent of PCBs.	3 locations, 3 samples	5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
	SWMU 33-002(a)	Collect 7 samples from VCA locations 33–24716, 33-24717, 33-24718, 33-24719, 33-24722, 33-24723, and 33-24726 at the next deeper interval (5 to 6 ft beneath bottom of former septic system structures) to define the vertical extent of SVOCs.	7 locations, 7 samples	5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	X	—	—	—	—	—	—	—	—	—
	SWMU 33-002(a)	Collect one sample from VCA location 33-24717 at the next deeper interval (5 to 6 ft beneath bottom of former septic system structures) to define the vertical extent of plutonium-238.	1 location, 1 sample	5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	—	—	—	—	—	X	—	—	—	—
	SWMU 33-002(a)	Collect one sample from VCA location 33-24722 at the next deeper interval (5 to 6 ft beneath bottom of former septic system structures) to define the vertical extent of uranium-235/236.	1 location, 1 sample	5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	—	—	—	—	X	—	—	—	—	—
	SWMU 33-002(a)	Collect 5 samples from VCA locations 33-24717, 33-24718, 33-24724, 33-25098, and 33-25117 at the next deeper interval (5 to 6 ft beneath bottom of former septic system structures) to define the vertical extent of tritium.	5 locations 5 samples	5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
	SWMU 33-002(a)	Collect 26 samples from VCA locations 33-25097, 33-25098, 33-25107, 33-25108, 33-25109, 33-25110, 33-25111, 33-25112, 33-25113, 33-25114, 33-25115, 33-25116, and 33-25117 at deeper VCA depth and next deeper interval (2 to 3 ft and 5 to 6 ft beneath bottom of former septic system structures) to define vertical extent of explosive compounds.	13 locations 26 samples	2–3 and 5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect 7 samples from VCA locations 33-25084, 33-25087, 33-25088, 33-25092, 33-25093, 33-25094, and 33-25125 (5 to 6 ft beneath bottom of former seepage pit drainlines and bottom of former seepage pit) to define the vertical extent of metals.	7 locations, 7 samples	5–6 beneath former seepage pit drainlines and former seepage pit	Soil, tuff	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect one sample from VCA location 33-25088 (5 to 6 ft beneath bottom of former seepage pit) to define the vertical extent of PCBs.	1 location, 1 sample	5–6 beneath bottom of former seepage pit	Soil, tuff	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
33-002(a)-99 (continued)	SWMU 33-002(b)	Collect one sample from VCA location 33-25095 (5 to 6 ft beneath bottom of former seepage pit drainline) to define the vertical extent of SVOCs.	1 location, 1 sample	5–6 beneath former seepage pit drainline	Soil, tuff	—	—	—	—	—	X	—	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect one sample from VCA location 33-25125 (5 to 6 ft beneath bottom of former seepage pit drainline) to define the vertical extent of VOCs.	1 location, 1 sample	5–6 beneath former seepage pit drainlines	Soil, tuff	—	—	—	—	X	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect one sample from VCA location 33-25095 (5 to 6 ft beneath bottom of former seepage pit drainline) to define the vertical extent of americium-241.	1 location, 1 sample	5–6 beneath former seepage pit drainline	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—
	SWMU 33-002(b)	Collect two samples from VCA locations 33-25093 and 33-25094 (5 to 6 ft beneath bottom of former seepage pit drainlines) to define the vertical extent of strontium-90.	2 locations, 2 samples	5–6 beneath former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X
	SWMU 33-002(b)	Collect 6 samples from VCA locations 33-25082, 33-25083, 33-25092, 33-25093, 33-25094, and 33-25095 (5 to 6 ft beneath bottom of former seepage pit drainlines) to define the vertical extent of tritium.	6 locations, 6 samples	5–6 beneath former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
	SWMU 33-002(b)	Collect 16 samples from VCA locations 33-25092, 33-25093, 33-25094, 33-25095, 33-25096, 33-25123, 33-25124, and 33-25125 at deeper VCA depth and next deeper interval (2 to 3 ft and 5 to 6 ft beneath bottom of former seepage pit drainlines) to define vertical extent of explosive compounds.	8 locations 16 samples	2–3 and 5–6 beneath bottom of former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—
	SWMU 33-002(c)	Collect six samples from VCA locations 33-24727, 33-25085, 33-25118, 33-25119, 33-25121, and 33-25122 (5 to 6 ft beneath bottom of former seepage pit drainlines and bottom of former seepage pit) to define the vertical extent of metals.	6 locations, 6 samples	5–6 beneath former seepage pit drainlines and former seepage pit	Soil, tuff	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(c)	Collect one sample from VCA location 33-25122 (5 to 6 ft beneath bottom of former seepage pit drainline) to define the vertical extent of perchlorate.	1 location, 1 sample	5–6 beneath former seepage pit drainline	Soil, tuff	—	—	—	X	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(c)	Collect three samples from VCA locations 33-24728, 33-25086, and 33-25119 (5 to 6 ft beneath bottom of former seepage pit drainlines and former seepage pit) to define the vertical extent of plutonium-238.	3 locations, 3 samples	5–6 beneath former seepage pit drainlines and former seepage pit	Soil, tuff	—	—	—	—	—	—	—	—	—	—	X	—	—	—	—
	SWMU 33-002(c)	Collect one sample from VCA location 33-24727 (5 to 6 ft beneath bottom of former seepage pit drainline) to define the vertical extent of strontium-90.	1 location, 1 sample	5–6 beneath former seepage pit drainline	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X
	SWMU 33-002(c)	Collect four samples from ACA location 33-24727, 33-25086, 33-25119, and 33-25121 (5 to 6 ft beneath bottom of former seepage pit drainlines and bottom of former seepage pit) to define the vertical extent of tritium.	4 locations 4 samples	5–6 beneath former seepage pit drainlines and former seepage pit	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
33-002(a)-99 (continued)	SWMU 33-002(c)	Collect one sample from VCA location 33-25086 (5 to 6 ft beneath bottom of former seepage pit) to define the vertical extent of SVOCs.	1 location, 1 sample	5–6 beneath former seepage pit	Soil, tuff	—	—	—	—	—	X	—	—	—	—	—	—	—	—	—
	SWMU 33-002(c)	Collect 10 samples from VCA locations 33-25118, 33-25119, 33-25120, 33-25121, and 33-25122 at deeper VCA depth and next deeper interval (2 to 3 ft and 5 to 6 ft beneath bottom of former seepage pit drainlines) to define vertical extent of explosive compounds.	5 locations, 5 samples	2–3 and 5–6 beneath bottom of former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—
	SWMU 33-002(d)	Collect 15 samples from three depths at five locations at the outfall and in the drainage channel directly east of the outfall to define vertical and lateral extent of contamination.	5 locations, 15 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	X	X	X
	SWMU 33-002(e)	Collect nine samples from three depths at three locations at the outfall and in the drainage channel directly east of the outfall to define vertical and lateral extent of contamination.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	X	X	X
	SWMU 33-010(f)	After debris removal, collect a total of 30 samples from three depths at five locations within each debris area: one in the center of each area and four step-out locations around the debris area 10 ft out from the center of each area.	10 locations, 30 samples	0–1, 3–4, 5–6	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	Sitewide subsurface tritium	Advance seven boreholes to the top of the basalt, collect soil, tuff, and pore gas samples at 10-ft intervals; data will be used to determine the extent of the subsurface tritium plume associated with SWMUs 33-002(a–e) and if any boreholes will be completed as vapor-monitoring wells.	7 locations Number of samples TBD	10-ft intervals to top of basalt	Soil, tuff, pore gas	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
	Site drainage	Collect ten samples from two depths from five locations in the main drainage channel downgradient of Consolidated Unit 33-002(a)-00 to the Chaquehui Canyon tributary drainage channel southeast of the site to determine if contaminants are migrating from the site.	5 locations 10 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	X	X	X
33-004(a)-00	SWMU 33-004(a)	Collect 10 samples from two depths beneath septic system structures at one location west of building 33-0039 where two drainlines come together, one location at septic tank inlet, one location next to the downgradient (south) side of the septic tank, one location at the septic tank outlet, and one location next to the manhole east of the facility fence. Samples to be collected from deeper intervals to determine extent.	5 locations, 10 samples	0–1, 3–4 below structures	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	X	—
	SWMU 33-004(a), Seepage pits	Collect 14 samples from two boreholes drilled next to the two active seepage pits.	2 locations, 14 samples	9–10, 19–20, 29–30, 39–40, 49–50, 59–60, 69–70	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
33-004(a)-00 (continued)	SWMU 33-004(a), Drain field	Collect 24 samples at eight locations within the inactive drain field from three depths beneath the bottom of the drain field VCP. Samples to be collected from deeper intervals to determine extent.	8 locations, 24 samples	0–1, 2–3, 4–5 below pipe joints	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	—
	SWMU 33-004(h)	Collect nine samples from three depths at the three previous RFI locations (33-01051, 33-01052, and 33-01054) at and downgradient of the outfall to determine extent. Data from downgradient drainage samples to be collected for other SWMUs and AOCs in Consolidated Unit 33-004(a)-00 may be used to determine extent for SWMU 33-004(h), if needed.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
	SWMU 33-004(i)	Collect 30 samples from three depths at the three previous RFI sampling locations for each outfall area (33-01055, 33-01056, and 33-01057 at north outfall and locations 33-10158, 33-01059, 33-01060 at the south outfall) and at two additional locations in the drainages downgradient of each outfall. Samples to be collected from deeper intervals to determine extent. Data from the five downgradient drainage samples to be collected for other SWMUs and AOCs in Consolidated Unit 33-004(a)-00 may be used to determine extent for SWMU 33-004(i), if needed.	10 locations, 30 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
	SWMU 33-011(d)	Collect 15 samples from three depths at five previous RFI locations (33-01081, 33-01566, 33-01567, 33-01571, and 33-01572) beneath asphalt pad where inorganic chemicals were detected greater than 5 times BV to determine vertical extent. Collect 12 samples from three depths at four new step-out locations away from the asphalt pad to determine lateral extent.	5 locations, 15 samples 4 locations, 12 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	—	—	—
	SWMU 33-015	Collect 15 samples from three depths at five locations: one location beneath incinerator and four step-out (maximum 10 ft) locations adjacent to the incinerator; collect samples from deeper intervals to determine extent.	5 locations, 15 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	—	—	X	X	—	X	X[c]	—	—	—	—	—	—
	SWMU 33-017	Collect 75 samples from three depths at 25 previous RFI locations with highest detected contaminant concentrations (screening- and decision-level data) within Main Site samples collected from deeper intervals to determine extent. (See Table 4.1-5 for list of 25 previous RFI sampling locations.)	25 locations, 75 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X	X	X	X	X	—	—
	SWMU 33-017, Drainage	Collect 15 samples from three depths at five locations in the drainage downgradient of Main Site to the stormwater gauging station E340 in the Chaquehui Canyon tributary. NOTE: drainage sample data will be used to characterize extent for other SWMUs and AOCs in and around Consolidated Unit 33-004(a)-00, including AOC 33-008(c).	5 locations, 15 samples	0–1, 2–3, 4–5	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X	X	X	X	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
33-005(a)-00	SWMU 33-005(a–c), 33-011(a)	Collect a total of 60 samples from three depths at all 14 previous RFI sampling locations and from 6 new sampling locations along the former SMWU 33-005(b) drainline to determine the vertical extent of residual contamination.	20 locations, 60 samples	2–3, 5–6, 8–9	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	—
	SWMU 33-005(a–c), 33-011(a), Drainage	Collect 10 samples from two depths at five locations in the drainage downgradient of the consolidated unit sites.	5 locations, 10 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	—
	AOC 33-008(c), North Area	Collect 12 samples from two depths from the two former RFI sampling locations (33-01685 and 33-01670) and from four new sampling locations around the site; deeper intervals to define extent.	6 locations, 12 samples	0–1, 5–6	Soil, tuff	X	X	—	—	X	X	—	—	X[c]	X	X	—	X	—	—
	AOC 33-008(c), Culvert Area	Collect 30 samples from three depths from six of the former RFI sampling locations (33-01672, 33-01679, 33-01680, 33-01681, 33-01682, and 33-01684) and from four additional locations downgradient of the area.	10 locations, 30 samples	0–1, 5–6, 9–10	Soil, tuff	X	X	—	—	X	X	—	—	X[c]	X	X	—	X	—	—
	SWMU 33-011(e)	Collect 18 samples from three depths from two previous RFI locations within the former storage area (33-01094 and 33-01085), two new locations within the former storage area, and four locations around the former storage area. Deeper sample intervals will determine extent.	8 locations, 24 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	X	X	—	—
	SWMU 33-012(a)	Collect 21 samples from three depths from three previous RFI locations under the pad (locations 33-01086, 33-01087 and 33-01089), three new locations next to the pad, and one new location downgradient of the pad. Deeper sample intervals will determine extent.	7 locations, 21 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X	X	—	—	X	—	—
	SWMU 33-016	Collect 10 samples from two depths beneath bottom of sump from two locations adjacent to sump and from three locations along drainline beneath bottom of drainline.	5 locations, 10 samples	0–1, 3–4 beneath sump and drainline	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
		Collect eight samples from two depths at four locations within the outfall and drainage downgradient of the outfall.	4 locations, 8 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
	AOC C-33-001	Collect 12 samples from two depths from four previous RFI locations around concrete pad (33-01748, 33-01749, 33-01751, and 01752) and two additional downgradient locations to determine extent.	6 locations, 12 samples	0–1, 3–4	Soil, tuff	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
	AOC C-33-003	Collect 78 samples from three depths from all 10 previous confirmation sampling locations and 16 new sampling locations within and downgradient of both fill areas.	26 locations, 78 samples	0–1, 4–5, into tuff	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	AOC C-33-003	Collect six samples from two depths at three locations in the drainage channel downgradient of the southwest fill area next to the water tower. Extent downslope will be determined by data from the 6 sampling locations in the drainage downgradient of SWMU 33-004(d).	3 locations, 6 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	X	—	—	X	—	—
Area 6																				
	SWMU 33-004(d)	Collect eight confirmation samples from two depths beneath each structure: at one location within septic tank excavation, one location beneath the inlet, one location beneath the outlet, and from one location along the inlet drainline.	4 locations, 8 samples	0–1, 3–4 Beneath structures	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	X	—	—
	SWMU 33-004(d), Drain field	Collect six samples from deeper intervals from two previous RFI locations (33-01183 and 33-01184) in drain field beneath the drainline.	2 locations, 6 samples	4–5, 7–8, 9–10,	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	X	—	—
	SWMU 33-004(d), Outfall and drainage channel	Collect 16 samples from deeper interval from six previous RFI locations (33-01185, 33-01186, 33-01187, 33-01189, 33-01190, and 33-01191) along outlet line, in drain field, and in the drainage channel downgradient of the site. NOTE: Data from the six drainage samples will be used to determine extent for AOC C-33-033.	8 locations, 16 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	X	—	—
33-004(g)-00	SWMU 33-004(g)	Collect 10 samples from two depths at five previous RFI locations at culvert and within outfall area (33-01192 and 33-01196), including a deeper interval to determine extent.	5 locations, 10 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	—	X	—	—
	SWMU 33-007(c), Former catcher boxes	Collect nine samples from three depths at three locations within footprint of former catcher boxes where treated backfill was emplaced.	3 locations, 9 samples	0–1 and 2–3 into backfill, 0–1 into undisturbed tuff	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-007(c), Former catcher boxes	Collect 12 samples from three depths at four step-out locations around former catcher boxes to determine extent.	4 locations, 12 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-007(c), Cinder cone	Collect samples from three depths at six previous RFI locations (33-01199, 33-01203, 33-01204, 33-01206, 33-01211, and 33-01212) within and around cinder cone to edge of slope to determine extent to north, south, and east. Extent downslope to the west will be determined by SWMU 33-009 sampling.	6 locations, 18 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—
	SWMU 33-009, Cinder cone slope disposal area	Collect samples from three depths at five locations along each of two transects across slope within and below disposal area to determine extent.	10 locations, 30 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—
	SWMU 33-009, Drainage	Collect samples from two depths at six locations in the drainage below cinder cone slope to determine extent. Samples may also be used to determine extent from SWMUs 33-004(g) and 33-007(c).	6 locations, 12 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
South Site																				
33-001(a)-99	SWMUs 33-001(a–e)	Drill five boreholes to a minimum of 70-ft-depth bgs next to and as close as possible to the outside edge of each disposal pit and the test shaft to determine extent of any releases from MDA E. NOTE: the borehole next to the test shaft may have to be drilled inside the fence.	5 locations, 35 samples	10 ft intervals	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-004(b)	Collect six confirmation samples from two depths (0 to 1 ft and 3 to 4 ft below the structures) from three locations: beneath the tank inlet, within the tank excavation, and beneath the tank outlet.	3 locations, 6 samples	0–1, 3–4	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-004(b)	Collect four samples from two depths (0 to 1 ft and 3 to 4 ft beneath the drainline) at two locations along the inlet drainline from former building 33-0024. Collect two samples from two depths (0 to 1 ft and 3 to 4 ft bgs) at one location at the outfall.	3 locations, 6 samples	0–1, 3–4	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-004(b), Drainage	Collect six samples from two depths from three locations in the drainage downgradient of the outfall.	3 locations, 6 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
33-004(j)-00	SWMU 33-004(j)	Collect four samples from two depths from two locations: one at the culvert discharge point and one at the outfall.	2 locations, 4 samples	0–1, 2–3	Soil, tuff	X	X	—	—	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-004(j), Drainage	Collect four samples from two depths from two locations in the drainage downgradient of the site. This same drainage will also be investigated as part of SWMUs 33-006(a), 33-007(b), and 33-010(c).	2 locations, 4 samples	0–1, 2–3	Soil, tuff, sediment	X	X	—	—	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-006(a), Removal locations	Collect confirmation samples from two depths in bottom of excavation at areas where soils with elevated radioactivity or HE are observed following the removal of firing site debris within the sampling area around the former shot pad.	To be determined	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-006(a)	Collect four samples from two depths from two locations within the SWMU 33-006(a) shot pad. Collect 16 samples from two depths from four 10-ft step-out sampling locations around the former shot pad and from four 30-ft step-out sampling locations around the shot pad.	10 locations, 20 samples	0–1, 2–3 0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-006(a), SWMU 33-010(c), SWMU 33-010(g), SWMU 33-010(h), Drainages	Collect 27 samples from three depths at three locations in each of the three main South Site drainages. Sampling locations will be targeted to the sediment traps within each drainage.	9 locations, 27 samples	0–1, soil-tuff interface, 1 ft into the tuff.	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), North location	At berm 33-0043 [SWMU 33-007(b)], collect eight samples from two depths (0 to 1 ft and 5 to 6 ft below the fill used in the former catcher box location) from four locations in and around the former catcher box location.	4 locations, 8 samples	0–1, 5–6	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
33-004(j)-00 (continued)	SWMU 33-007(b), SWMU 33-011(c), North location embankment	Collect four samples from two depths at two locations below the bottom of the embankment where projectiles were fired.	2 locations, 4 samples	0–1, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), North location, drainage	Collect six samples from two depths at three locations within the drainage downgradient of SWMU 33-007(b) (east location).	3 locations, 6 samples	0–1, 3–4	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), Building 33-0025	At building 33-0025 [SWMUs 33-007(b) and 33-011(c)], collect 24 from three depths at eight locations from the footprint of former gun firing site berm 33-0063 and the former unpaved storage area formerly used to stage tritium containers. Ensure samples are collected beneath the engineering fill recently added to the site.	8 locations, 24 samples	0–1, 4–5, 9–10	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), Building 33-0025	Collect 4 samples from two depths at two locations in the drainage southwest of building 33-0025 [SWMUs 33-007(b) and 33-011(c)], Samples to be collected in the other South Sites drainages will complete this determination (see Figure 4.3-17).	2 locations, 4 samples	0–1, 3–4	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-008(a)	Collect 12 confirmation samples from two depths from six locations beneath the bottom of the landfill excavation to determine vertical extent.	6 locations, 12 samples	0–1, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
		Collect 16 samples from two depths at eight step-out locations (6 ft) locations surrounding the landfill to determine lateral extent.	8 locations, 16 samples	4–5, 9–10	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-010(c)	Collect 18 samples from three depths from two locations within the remediated portion of SWMU 33-010(c) and from four locations around SWMU 33-010(c).	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-010(c)	See description of drainage sampling locations under SWMU 33-006(a) above.	n/a[d]	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-010(h)	Collect 18 samples from three depths from two locations within disposal area and from four locations around SWMU 33-010(h).	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-010(h)	See description of drainage sampling locations under SWMU 33-006(a) above.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-014	Collect eight samples from two depths from four locations within the former burn area. In addition, collect eight samples from two depths from four step-out locations around the former burn area.	8 locations, 16 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	X	X[c]	X	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-010(g)	Collect eighteen samples from two depths from eight locations within the western portion of SWMU 33-010(g) and from one location at the head of the drainage directly downgradient of the western portion of SWMU 33-010(g).	9 locations, 18 samples	0–1, 3–4	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
		Collect twenty samples from two depths from ten locations within the eastern portion of SWMU 33-010(g).	10 locations, 20 samples	0–1, 3–4																
	SWMU 33-010(g)	See description of drainage sampling locations under SWMU 33-006(a) above.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
NRAO																				
	SWMU 33-004(m)	Collect eight samples from two depths from one location next to the bottom of the east side of the septic tank, one location adjacent to the septic tank inlet, one location adjacent to the septic tank outlet, and from one location adjacent the inlet drain line.	4 locations, 8 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	SWMU 33-004(m), Leach field	Collect nine samples from three depths at three locations surrounding the leach field.	3 locations, 9 samples	0–1, soil/tuff interface 1 ft into tuff	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	SWMU 33-004(m), Downgradient drainage	Collect six samples from two depths (0 to 1 ft and 2 o 3 ft bgs) from three locations in the drainage downgradient of the site.	3 locations, 6 samples	0-1, 2-3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	AOC 33-011(b)	Collect 12 samples from two depths from all six previous RFI locations (33-01435, 33-01436, 33-01438, 33-01439, 33-01440, and 33-01441) within the former storage area; deeper intervals will define extent.	6 locations, 12 samples	0–1, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
		Collect six samples from two depths from three locations downgradient and west of the site.	3 locations, 6 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—

[a] X = Analysis proposed.

[b] — = Analysis will not be performed.

[c] 20% of samples collected will be analyzed for PCBs.

[d] n/a = Not applicable.

Table 4.1-1
Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
SWMU 33-002(a)																				
0333-96-0525	33-01652	1.0–1.5	Soil	—[a]	—	—	—	2293[b]	—	2292, 2293	—	—	—	—	—	2291	—	2293	—	2291
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	2293	—	2292, 2293	—	—	—	—	—	2291	—	2293	—	2291
0333-96-0546	33-01652	6.0–7.0	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0527	33-01652	12.5–12.9	Soil	—	—	—	—	2293	—	2292, 2293	—	—	—	—	—	2291	—	2293	—	2291
0333-96-0528	33-01652	15.08–16.08	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2293	—	—
0333-96-0529	33-01652	23.42–24.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2293	—	—
0333-96-0531	33-01652	30.08–31.08	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0537	33-01652	61.0–61.83	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0534	33-01652	73.42–74.58	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0540	33-01652	76.92–77.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0543	33-01652	92.5–93.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0547	33-01652	113.0–113.67	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0548	33-01652	117.5–118.33	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	2167	—	2166, 2167	—	—	—	—	—	2165	—	2167	—	2165
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	2167	—	2166, 2167	—	—	—	—	—	2165	—	2167	—	2165
0333-96-0045	33-01696	12.58–13.17	Qbt3	—	—	—	—	2167	—	2166, 2167	—	—	—	—	—	2165	—	2167	—	2165
0333-96-0046	33-01696	19.0–19.58	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2167	—	—
0333-96-0047	33-01696	24.0–25.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2167	—	—
0333-96-0048	33-01696	26.0–26.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2167	—	—
RE33-05-60743	33-24716	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60747	33-24716	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60745	33-24717	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60749	33-24717	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60744	33-24718	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60748	33-24718	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60746	33-24719	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60750	33-24719	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60751	33-24720	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60752	33-24720	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60753	33-24721	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60754	33-24721	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60755	33-24722	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-60756	33-24722	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60757	33-24723	3.0–3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60758	33-24723	5.0–5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60759	33-24724	2.0–2.5	Fill	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60760	33-24724	4.0–4.5	Qbt3	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60761	33-24725	8.0–8.5	Fill	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60762	33-24725	10.0–10.5	Qbt3	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60763	33-24726	3.0–3.5	Fill	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60764	33-24726	5.0–5.5	Qbt3	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-63010	33-25097	3.0–3.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63011	33-25097	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63012	33-25098	3.0–3.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63013	33-25098	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63195	33-25107	5.0–5.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63196	33-25107	7.0–7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63197	33-25108	5.0–5.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63198	33-25108	7.0–7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63199	33-25109	5.0–5.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63200	33-25109	7.0–7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63201	33-25110	3.0–3.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63202	33-25110	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63203	33-25111	4.0–4.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63204	33-25111	6.0–6.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63205	33-25112	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63206	33-25112	7.0–7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63207	33-25113	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63208	33-25113	7.0–7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63209	33-25114	3.0–3.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63210	33-25114	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63211	33-25115	4.0–4.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63212	33-25115	6.0–6.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63213	33-25116	3.0–3.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63214	33-25116	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63215	33-25117	5.0–5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-63216	33-25117	7.0–7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
SWMU 33-002(b)																				
0333-96-0070	33-01328	10.0–15.0	Qbt3	—	—	—	—	2178	—	2177 ,2178	—	—	—	—	—	2176	—	2178	—	2176
0333-96-0071	33-01328	16.0–16.33	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2178	—	—
0333-96-0072	33-01328	21.5–22.5	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2178	—	—
0333-96-0073	33-01328	26.25–27.25	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2178	—	—
0333-96-0500	33-01328	30.0–31.25	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0501	33-01328	36.0–36.75	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0502	33-01328	40.0–41.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0503	33-01328	43.0–45.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0506	33-01328	59.5–60.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0509	33-01328	71.75–72.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0512	33-01328	87.5–88.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0515	33-01328	102.5–103.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0516	33-01328	109.0–110.0	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0517	33-01328	114.0–115.0	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0518	33-01328	116.5–117.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
RE33-05-62977	33-25082	3.0–3.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62978	33-25082	5.0–5.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62979	33-25083	3.0–3.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62980	33-25083	5.0–5.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62981	33-25084	3.0–3.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62982	33-25084	5.0–5.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62987	33-25087	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62988	33-25087	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62989	33-25088	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62990	33-25088	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	—	—	3970S
RE33-05-63000	33-25092	2.0–2.5	Fill	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63001	33-25092	4.0–4.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63002	33-25093	3.0–3.5	Qbt3	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63003	33-25093	5.0–5.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63004	33-25094	4.0–4.5	Qbt3	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63005	33-25094	6.0–6.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63006	33-25095	4.0–4.5	Fill	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-63007	33-25095	6.0–6.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63008	33-25096	4.0–4.5	Fill	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63009	33-25096	6.0–6.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63227	33-25123	5.0–5.5	Qbt3	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	—	3895S
RE33-05-63228	33-25123	7.0–7.5	Qbt3	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	—	3877S
RE33-05-63229	33-25124	4.0–4.5	Qbt3	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	—	3895S
RE33-05-63230	33-25124	6.0–6.5	Qbt3	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	—	3877S
RE33-05-63231	33-25125	5.0–5.5	Qbt3	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	—	3895S
RE33-05-63232	33-25125	7.0–7.5	Qbt3	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	—	3877S
SWMU 33-002(c)																				
0333-96-0076	33-01697	10.0–12.5	Qbt3	—	—	—	—	2190	—	2189, 2190	—	—	—	—	—	2188	—	2190	—	2188
0333-96-0049	33-01697	19.17–19.5	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0050	33-01697	23.75–24.17	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0051	33-01697	28.0–29.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0052	33-01697	31.42–31.83	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0053	33-01697	36.0–36.42	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0054	33-01697	40.0–40.58	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0055	33-01697	47.5–48.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0056	33-01697	51.83–52.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0057	33-01697	57.5–58.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0058	33-01697	61.42–62.17	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
RE33-05-60765	33-24727	4.0–4.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60766	33-24727	6.0–6.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60767	33-24728	3.0–3.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60768	33-24728	5.0–5.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60769	33-24729	3.0–3.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60770	33-24729	5.0–5.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-62983	33-25085	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	—	—	3970S
RE33-05-62984	33-25085	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62985	33-25086	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	—	—	3970S
RE33-05-62986	33-25086	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-63217	33-25118	2.0–2.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63218	33-25118	4.0–4.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63219	33-25119	5.0–5.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-63220	33-25119	7.0–7.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63221	33-25120	5.0–5.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63222	33-25120	7.0–7.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63223	33-25121	5.0–5.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63224	33-25121	7.0–7.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63225	33-25122	4.0–4.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63226	33-25122	6.0–6.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
SWMU 33-004(a)																				
0333-97-0004	XX-33-604072	0.0–0.0	Soil	—	—	—	—	—	—	3751R	—	—	—	—	—	—	—	—	—	3750R
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	—	—	—	—	3796R	—	—	—	—	—	—	—	—	—	3795R
AOC 33-008(c)																				
0333-96-0652	33-01670	0.0–0.5	Soil	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0654	33-01671	0.5–0.8	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	2655
0333-96-0655	33-01672	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0656	33-01672	1.0–1.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	2655
0333-96-0657	33-01673	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0658	33-01674	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0659	33-01675	0.0–0.5	Soil	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0675	33-01679	5.0–7.0	Qbo	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0677	33-01680	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0678	33-01680	0.0–2.0	Sed	—	2669	—	—	—	—	2669	—	—	—	—	—	2668	—	—	2670	2668
0333-96-0679	33-01680	2.0–4.0	Qbo	—	2669	—	—	—	—	2669	—	—	—	—	—	2668	—	—	2670	2668
0333-96-0681	33-01681	0.5–1.25	Sed	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0682	33-01681	5.0–6.0	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0684	33-01682	0.0–1.0	Sed	—	2681	—	—	—	—	2681	—	—	—	—	—	2680	—	—	2682	2680
0333-96-0685	33-01682	1.0–2.0	Qbo	—	2681	—	—	—	—	2681	—	—	—	—	—	2680	—	—	2682	2680
0333-96-0669	33-01683	0.0–0.5	Sed	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
0333-96-0670	33-01684	0.0–0.5	Fill	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
0333-96-0671	33-01685	0.0–0.5	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
SWMU 33-011(d)																				
0333-96-0111	33-01566	0.0–0.5	Fill	—	—	—	—	—	—	2365, 2366	—	—	—	—	—	—	—	—	—	—

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
0333-96-0120	33-01566	0.67–1.0	Fill	—	—	—	—	—	—	2376, 2377	—	—	—	—	—	—	—	—	—	—
0333-96-0112	33-01567	0.0–0.5	Fill	—	—	—	—	—	—	2365, 2366	—	—	—	—	—	—	—	—	—	—
0333-96-0121	33-01567	0.67–1.0	Fill	—	—	—	—	—	—	2376, 2377	—	—	—	—	—	—	—	—	—	—
0333-96-0113	33-01568	0.0–0.5	Fill	—	—	—	—	—	—	2365, 2366	—	—	—	—	—	—	—	—	—	—
0333-96-0122	33-01568	0.67–1.0	Fill	—	—	—	—	—	—	2376, 2377	—	—	—	—	—	—	—	—	—	—
0333-96-0114	33-01569	0.0–0.5	Fill	—	—	—	—	—	—	2365,2366	—	—	—	—	—	—	—	—	—	—
0333-96-0123	33-01569	0.42–0.67	Fill	—	—	—	—	—	—	2376,2377	—	—	—	—	—	—	—	—	—	—
0333-96-0110	33-01570	0.0–0.5	Sed	—	—	—	—	—	2366	—	—	—	—	—	—	—	—	—	—	—
0333-96-0117	33-01570	0.17–0.58	Fill	—	—	—	—	—	2377	—	—	—	—	—	—	—	—	—	—	—
0333-96-0115	33-01571	0.0–0.5	Soil	—	—	—	—	—	—	2365,2366	—	—	—	—	—	—	—	—	—	—
0333-96-0124	33-01571	0.5–0.75	Qbo	—	—	—	—	—	—	2376,2377	—	—	—	—	—	—	—	—	—	—
0333-96-0116	33-01572	0.0–0.5	Fill	—	—	—	—	—	—	2365,2366	—	—	—	—	—	—	—	—	—	—
0333-96-0125	33-01572	0.5–0.67	Fill	—	—	—	—	—	—	2376,2377	—	—	—	—	—	—	—	—	—	—
SWMU 33-017																				
0333-96-0130	33-01585	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0140	33-01595	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0141	33-01596	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0144	33-01601	1.0–1.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0149	33-01604	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0151	33-01606	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
0333-96-0152	33-01607	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0157	33-01612	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0159	33-01614	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2367	—	—	—	—	—	—
0333-96-0160	33-01615	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2367	—	—	—	—	—	—
0333-96-0161	33-01616	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2367	—	—	—	—	—	—
AOC C-33-001																				
0333-96-2042	33-01748	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
0333-96-2043	33-01749	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
0333-96-2045	33-01751	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
0333-96-2046	33-01752	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
AOC C-33-003																				
RE33-99-0009	33-01708	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0032	33-01709	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0011	33-01710	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0033	33-01710	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0034	33-01711	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0035	33-01712	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0036	33-01713	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0015	33-01714	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0037	33-01714	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0038	33-01715	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0061	33-01716	0.0–0.5	Sed	—	—	—	—	—	5683R	5682R	—	—	—	—	—	—	—	—	—	—
RE33-99-0062	33-01717	0.0–0.5	Sed	—	—	—	—	—	5683R	5682R	—	—	—	—	—	—	—	—	—	—

[a] — = Analysis not requested.

[b] Analytical request number.

Table 4.1-2
Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
SWMU 33-002(a)															
0333-96-0525	33-01652	1.0–1.5	Soil	—[b]	7.2 (U)	—	—	0.5 (U)	—	—	—	—	NA[c]	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	7.5 (U)	—	—	0.52 (U)	—	—	—	—	NA	—	—
0333-96-0527	33-01652	12.5–12.9	Soil	—	7.5 (U)	—	—	0.52 (U)	—	—	—	—	NA	—	—
0333-96-0043	33-01696	2.3–3.0	Soil	—	5.3 (U)	—	—	—	—	—	—	—	NA	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	5 (U)	—	—	—	—	—	—	—	NA	—	—
0333-96-0045	33-01696	12.6–13.2	Qbt 3	—	5 (U)	—	—	—	—	—	—	—	NA	—	—
RE33-05-60743	33-24716	3.0–3.5	Qbt 3	—	—	3.29	—	—	13300 (J)	—	—	5.33	—	—	44.5 (J-)
RE33-05-60747	33-24716	5.0–5.5	Qbt 3	—	—	—	—	—	3940 (J)	—	—	—	—	—	—
RE33-05-60745	33-24717	3.0–3.5	Qbt 3	—	—	2.95	—	—	13000 (J)	—	—	—	—	—	—
RE33-05-60749	33-24717	5.0–5.5	Qbt 3	—	—	2.91	—	—	12600 (J)	—	—	—	—	—	—
RE33-05-60744	33-24718	3.0–3.5	Qbt 3	—	—	—	—	—	4280 (J)	—	—	5.04	—	—	—
RE33-05-60748	33-24718	5.0–5.5	Qbt 3	—	—	3.06	—	—	12500 (J)	—	—	5.31	—	—	—
RE33-05-60746	33-24719	3.0–3.5	Qbt 3	—	—	—	79.7 (J-)	—	22200 (J)	—	—	6.83	—	—	—
RE33-05-60750	33-24719	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60751	33-24720	3.0–3.5	Qbt 3	—	—	—	46.8 (J-)	—	7670 (J)	—	—	5.22	—	—	—
RE33-05-60752	33-24720	5.0–5.5	Qbt 3	—	—	—	54.4 (J-)	—	8230 (J)	—	—	—	—	—	—
RE33-05-60753	33-24721	3.0–3.5	Qbt 3	12900	—	3.75	147 (J-)	—	17100 (J)	—	—	9.24	—	—	81.1 (J-)
RE33-05-60754	33-24721	5.0–5.5	Qbt 3	13800	—	3.74	156 (J-)	—	14900 (J)	—	—	5.56	—	—	88.8 (J-)
RE33-05-60755	33-24722	3.0–3.5	Qbt 3	13000	—	3.49	101 (J-)	—	8740 (J)	8.05	—	8.44	—	—	—
RE33-05-60756	33-24722	5.0–5.5	Qbt 3	13200	—	3.46	102 (J-)	—	7630 (J)	7.3	—	6.97	—	—	12.6 (J-)
RE33-05-60757	33-24723	3.0–3.5	Qbt 3	14300	—	3.77	112 (J-)	—	6720 (J)	8.22	—	37.3	—	—	—
RE33-05-60758	33-24723	5.0–5.5	Qbt 3	17000	—	4.13	131 (J-)	—	6500 (J)	10.5	—	20.9	—	—	—
RE33-05-60759	33-24724	2.0–2.5	Fill	—	—	—	339 (J)	0.569 (U)	10400 (J)	—	—	—	—	—	—
RE33-05-60760	33-24724	4.0–4.5	Qbt 3	9970 (J+)	—	—	75.4 (J)	—	4590 (J)	—	—	—	—	—	—
RE33-05-60761	33-24725	8.0–8.5	Fill	—	—	—	—	—	10900 (J)	—	—	35.4	—	—	—
RE33-05-60762	33-24725	10.0–10.5	Qbt 3	8630 (J+)	—	—	58.6 (J)	—	2880 (J)	—	—	5.85	—	—	—
RE33-05-60763	33-24726	3.0–3.5	Fill	—	—	—	—	—	8120 (J)	—	—	88	—	—	57.7
RE33-05-60764	33-24726	5.0–5.5	Qbt 3	10900 (J+)	—	3.19	81.9 (J)	—	17100 (J)	10.9	—	37.8	—	—	19.2
RE33-05-63010	33-25097	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63011	33-25097	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63012	33-25098	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
RE33-05-63013	33-25098	5.0–5.5	Fill	—	—	—	—	—	—	—	—	21.7	0.54 (U)	—	—
RE33-05-63195	33-25107	5.0–5.5	Fill	—	—	—	—	—	—	30.6	—	66.6 (J-)	0.53 (U)	—	—
RE33-05-63196	33-25107	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
RE33-05-63197	33-25108	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63198	33-25108	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63199	33-25109	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE33-05-63200	33-25109	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63201	33-25110	3.0–3.5	Fill	—	—	—	—	—	—	—	—	25.4	0.54 (U)	—	—
RE33-05-63202	33-25110	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63203	33-25111	4.0–4.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63204	33-25111	6.0–6.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE33-05-63205	33-25112	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63206	33-25112	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63207	33-25113	5.0–5.5	Fill	—	—	—	—	—	—	—	—	22.3	0.57 (U)	—	—
RE33-05-63208	33-25113	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE33-05-63209	33-25114	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63210	33-25114	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
RE33-05-63211	33-25115	4.0–4.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE33-05-63212	33-25115	6.0–6.5	Fill	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE33-05-63213	33-25116	3.0–3.5	Fill	—	—	—	—	—	—	—	—	19.6	0.55 (UJ)	—	—
RE33-05-63214	33-25116	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (UJ)	—	—
RE33-05-63215	33-25117	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.59 (UJ)	—	—
RE33-05-63216	33-25117	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
SWMU 33-002(b)															
0333-96-0070	33-01328	10.0–15.0	Qbt 3	—	4.9 (U)	4.1	66.5	—	27500	—	—	9.2	NA	—	18.6
RE33-05-62977	33-25082	3.0–3.5	Qbt 3	14300	—	2.87	153	—	8090	10.4	3.48	6.42	—	—	—
RE33-05-62978	33-25082	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62979	33-25083	3.0–3.5	Qbt 3	13800	—	3.19	118	—	5500	9.36	—	5.51	—	—	—
RE33-05-62980	33-25083	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62981	33-25084	3.0–3.5	Qbt 3	14600	—	3.09	119	—	6890	10.5	3.45	6.93	—	—	—
RE33-05-62982	33-25084	5.0–5.5	Qbt 3	7680	—	—	82.7	—	15500	—	—	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	51	—	3250 (J+)	—	—	16.8	0.52 (U)	—	—
RE33-05-62988	33-25087	12.0–12.5	Qbt 3	—	—	—	—	—	3990 (J+)	—	—	—	—	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	48.8	—	7860 (J+)	—	—	5.1	0.52 (U)	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	67	—	3480 (J+)	—	—	4.8	0.52 (U)	—	—
RE33-05-63000	33-25092	2.0–2.5	Fill	—	—	—	—	—	—	—	—	25.5 (J-)	0.63 (U)	—	—
RE33-05-63001	33-25092	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	6.6 (J-)	0.51 (U)	—	—
RE33-05-63002	33-25093	3.0–3.5	Qbt 3	—	—	—	—	—	—	—	—	8.3 (J-)	0.57 (U)	—	—
RE33-05-63003	33-25093	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
RE33-05-63004	33-25094	4.0–4.5	Qbt 3	—	—	—	48.5	—	—	—	—	33.8 (J-)	0.61 (U)	—	—
RE33-05-63005	33-25094	6.0–6.5	Qbt 3	—	—	—	—	—	2340	—	—	—	0.53 (U)	—	—
RE33-05-63006	33-25095	4.0–4.5	Fill	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE33-05-63007	33-25095	6.0–6.5	Qbt 3	—	—	—	—	—	4520	—	—	5.6 (J-)	0.52 (U)	—	—
RE33-05-63008	33-25096	4.0–4.5	Fill	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE33-05-63009	33-25096	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63227	33-25123	5.0–5.5	Qbt 3	—	—	—	—	—	3830 (J-)	—	—	6.3	0.57 (UJ)	—	—
RE33-05-63228	33-25123	7.0–7.5	Qbt 3	—	—	—	—	—	2840	—	—	—	0.53 (U)	—	—
RE33-05-63229	33-25124	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	5.2	0.54 (UJ)	—	—
RE33-05-63230	33-25124	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63231	33-25125	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE33-05-63232	33-25125	7.0–7.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
SWMU 33-002(c)															
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	4.9 (U)	—	—	—	—	18	—	—	NA	—	—
RE33-05-60765	33-24727	4.0–4.5	Qbt 3	8860 (J+)	—	—	76.9	—	—	—	—	—	—	—	—
RE33-05-60766	33-24727	6.0–6.5	Qbt 3	8100 (J+)	—	—	63.1	—	—	35.9	—	10.6	—	—	27.6
RE33-05-60767	33-24728	3.0–3.5	Qbt 3	12200 (J+)	—	2.85	96.9	—	3610 (J+)	8.05	—	6.14	—	—	16.4
RE33-05-60768	33-24728	5.0–5.5	Qbt 3	—	—	—	—	—	2900 (J+)	—	—	—	—	—	—
RE33-05-60769	33-24729	3.0–3.5	Qbt 3	12300 (J+)	—	3.03	90	—	4310 (J+)	7.25	—	5.18	—	—	—
RE33-05-60770	33-24729	5.0–5.5	Qbt 3	—	—	—	—	—	2230 (J+)	—	—	—	—	—	—
RE33-05-62983	33-25085	10.0–10.5	Qbt 3	—	—	—	47.5	—	3210 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-62984	33-25085	12.0–12.5	Qbt 3	—	—	—	47.2	—	3490 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	53.8	—	4600 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	2840 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-63217	33-25118	2.0–2.5	Qbt 3	—	—	—	57.9	13.1	2690	23.1 (J-)	—	114	0.56 (U)	—	57.5
RE33-05-63218	33-25118	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	6.1	0.52 (U)	—	—
RE33-05-63219	33-25119	5.0–5.5	Qbt 3	—	—	—	49.6	—	3170	—	—	—	0.56 (U)	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
RE33-05-63220	33-25119	7.0–7.5	Qbt 3	—	—	—	—	—	3300	—	—	—	—	—	—
RE33-05-63221	33-25120	5.0–5.5	Qbt 3	—	—	—	69	—	3840	—	—	—	0.55 (U)	—	—
RE33-05-63222	33-25120	7.0–7.5	Qbt 3	—	—	—	50.2	—	2870	—	—	—	0.51 (U)	—	—
RE33-05-63223	33-25121	5.0–5.5	Qbt 3	—	—	—	60.2	—	5090	—	—	—	0.54 (U)	—	—
RE33-05-63224	33-25121	7.0–7.5	Qbt 3	—	—	—	59.1	—	7400	—	—	—	0.51 (U)	—	—
RE33-05-63225	33-25122	4.0–4.5	Qbt 3	—	—	—	47.2	—	3570	—	—	—	0.82	—	—
RE33-05-63226	33-25122	6.0–6.5	Qbt 3	—	—	—	50.6	—	3320	24.9 (J-)	—	—	—	—	—
SWMU 33-004(a)															
0333-97-0004	XX-33-604072	0.0–0.0	Soil	—	1 (U)	—	—	—	—	—	—	—	NA	—	—
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	—	—	—	—	—	—	—	NA	—	29.1
AOC 33-008(c)															
0333-96-0652	33-01670	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	2.7 (J-)	4.6 (U)	—	1.9	—	11.9	—	3100	—	—	322
0333-96-0654	33-01671	0.5–0.83	Sed	—	28.2 (J-)	4.7 (U)	—	1.4	—	—	—	1630	—	—	6960
0333-96-0655	33-01672	0.0–0.5	Sed	—	—	4.4 (U)	163	4.2	—	13.7	—	498	—	—	176
0333-96-0656	33-01672	1.0–1.5	Sed	—	4.4 (J-)	6	189	8	—	52.1	8.8 (J)	1320	—	75600	238
0333-96-0657	33-01673	0.0–0.5	Sed	—	2.4 (J-)	—	—	2.7	—	27.5	5.9 (J)	1670	—	54000	205
0333-96-0658	33-01674	0.0–0.5	Sed	—	—	4 (U)	—	2.1	—	—	—	744	—	—	81.7
0333-96-0659	33-01675	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	5.6 (U)	—	—	0.71 (U)	—	—	—	24.6	—	—	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	5.9 (U)	—	—	0.74 (U)	—	—	—	—	—	—	—
0333-96-0675	33-01679	5.0–7.0	Qbo	6200	5.9 (U)	1.1 (J)	42 (J)	0.75 (U)	—	7.8	—	5 (J)	—	9820	—
0333-96-0677	33-01680	0.0–0.5	Sed	—	17 (J-)	8.5	719	41.6	9120	118	19.2	25200	—	52300	2040
0333-96-0678	33-01680	0.0–2.0	Sed	—	—	4.8	210	20.9 (J-)	—	63.7 (J+)	9 (J)	2920	—	29000	484
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	1.2 (J)	—	0.75 (J-)	—	27.5 (J+)	—	994	—	—	56.5
0333-96-0681	33-01681	0.5–1.25	Sed	19400	7.9 (J)	14	615	139	6830	297	38.2	10500	—	125000	2350
0333-96-0682	33-01681	5.0–6.0	Soil	—	6.6 (U)	—	—	2.5	—	—	12.2	172	—	24000	75.3
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	—	—	2.4	—	—	—	470	—	—	145
0333-96-0685	33-01682	1.0–2.0	Qbo	—	1.1 (J-)	2.9 (U)	—	1.7	—	79.3	—	1090	—	7390	2860
0333-96-0669	33-01683	0.0–0.5	Sed	—	6.4 (U)	—	—	0.81 (U)	—	11.5	—	38	—	—	54
0333-96-0670	33-01684	0.0–0.5	Fill	—	5.7 (J)	—	—	8.6	—	43.7	11.3	762	—	61300	217
0333-96-0671	33-01685	0.0–0.5	Soil	—	8.1 (J)	—	—	17.6	—	35.6	10.5	6070	—	44900	690

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
SWMU 33-011(d)															
0333-96-0111	33-01566	0.0–0.5	Fill	—	11 (UJ)	—	—	0.53 (U)	—	—	—	—	NA	—	31
0333-96-0120	33-01566	0.67–1.0	Fill	—	8.3 (U)	—	—	0.73 (U)	—	—	—	—	NA	—	774
0333-96-0112	33-01567	0.0–0.5	Fill	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	300
0333-96-0121	33-01567	0.67–1.0	Fill	—	8.4 (U)	—	—	0.74 (U)	—	—	—	—	NA	—	—
0333-96-0113	33-01568	0.0–0.5	Fill	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	—
0333-96-0122	33-01568	0.67–1.0	Fill	—	8.4 (U)	—	—	0.74 (U)	—	—	—	—	NA	—	—
0333-96-0114	33-01569	0.0–0.5	Fill	—	11 (UJ)	—	—	0.53 (U)	—	—	—	—	NA	—	—
0333-96-0123	33-01569	0.42–0.67	Fill	—	8.5 (U)	—	—	0.75 (U)	7360	—	—	—	NA	—	—
0333-96-0115	33-01571	0.0–0.5	Soil	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	—
0333-96-0124	33-01571	0.5–0.75	Qbo	—	8.5 (U)	—	—	0.75 (U)	—	—	—	—	NA	6360	—
0333-96-0116	33-01572	0.0–0.5	Fill	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	—
0333-96-0125	33-01572	0.5–0.67	Fill	—	7.9 (U)	—	—	0.7 (U)	—	—	—	—	NA	—	—
AOC C-33-003															
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	0.75 (U)	—	83.9	—	2310	—	3.2 (J)	18.9	NA	—	12.5
RE33-99-0010	33-01709	0.0–0.5	Fill	—	2 (J-)	—	—	—	—	—	9.5 (J)	18	NA	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	0.74 (U)	—	—	—	—	—	—	5.7	NA	—	—
RE33-99-0011	33-01710	0.0–0.5	Fill	—	0.87 (J-)	—	—	—	—	—	—	—	NA	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	0.74 (U)	—	—	—	—	—	—	5.9	NA	—	—
RE33-99-0012	33-01711	0.0–0.3300	Fill	—	0.93 (J-)	—	—	—	6680	—	9.5 (J)	18.9	NA	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	0.75 (U)	—	58.8	—	—	—	—	8.8	NA	—	13.6
RE33-99-0013	33-01712	0.0–0.5	Fill	—	1.6 (J-)	—	—	—	9300	—	11.9	18.7	NA	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	0.77 (U)	—	—	—	—	—	—	5.5	NA	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	1 (J-)	—	—	—	—	—	—	—	NA	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	0.74 (U)	—	51	—	—	—	—	5.6	NA	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	—	1.1 (J-)	—	—	—	—	—	—	—	NA	—	—
RE33-99-0037	33-01714	2.0–2.5	Qbt 3	—	0.75 (U)	—	49.9	—	—	—	—	5.6	NA	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	1 (J-)	—	—	—	9230	—	9.4 (J)	15.5	NA	—	—
RE33-99-0038	33-01715	2.0–2.5	Qbt 3	—	0.78 (U)	—	48.1	—	2570	—	—	5 (J)	NA	—	—
RE33-99-0061	33-01716	0.0–0.5	Sed	—	—	—	—	—	—	—	6 (J)	14.9	NA	—	20.9
RE33-99-0062	33-01717	0.0–0.5	Sed	—	1 (J)	—	173	—	5860	—	7 (J)	27.6	NA	—	34.7

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SWMU 33-002(a)															
0333-96-0525	33-01652	1.0–1.5	Soil	—	—	—	—	NA	NA	—	1.2 (U)	—	3.6	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	NA	NA	—	1.3 (U)	—	4.1	—	—
0333-96-0527	33-01652	12.5–12.9	Soil	—	—	—	—	NA	NA	—	1.3 (U)	—	3.7	—	—
0333-96-0043	33-01696	2.3–3.0	Soil	—	—	—	—	NA	NA	—	—	—	3.9	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	NA	NA	—	—	—	3.8	—	—
0333-96-0045	33-01696	12.6–13.2	Qbt 3	—	—	—	—	NA	NA	0.33 (J)	—	—	3.6	—	—
RE33-05-60743	33-24716	3.0–3.5	Qbt 3	—	—	—	—	2.05	—	1.65 (U)	—	—	NA	—	—
RE33-05-60747	33-24716	5.0–5.5	Qbt 3	—	—	—	—	—	—	1.68 (U)	—	—	NA	—	—
RE33-05-60745	33-24717	3.0–3.5	Qbt 3	—	—	—	—	—	—	1.66 (U)	—	—	NA	—	—
RE33-05-60749	33-24717	5.0–5.5	Qbt 3	—	—	—	—	1.02 (J)	—	1.67 (U)	—	—	NA	—	—
RE33-05-60744	33-24718	3.0–3.5	Qbt 3	—	—	—	—	—	0.00083 (J)	1.65 (U)	—	—	NA	—	—
RE33-05-60748	33-24718	5.0–5.5	Qbt 3	—	—	—	—	—	—	1.68 (U)	1.51	—	NA	—	—
RE33-05-60746	33-24719	3.0–3.5	Qbt 3	—	—	—	—	—	—	1.56 (U)	—	—	NA	—	—
RE33-05-60750	33-24719	5.0–5.5	Qbt 3	—	—	—	—	—	—	1.69 (U)	—	—	NA	—	—
RE33-05-60751	33-24720	3.0–3.5	Qbt 3	—	—	—	—	—	—	1.61 (U)	—	—	NA	—	—
RE33-05-60752	33-24720	5.0–5.5	Qbt 3	—	—	—	—	—	—	1.64 (U)	—	—	NA	—	—
RE33-05-60753	33-24721	3.0–3.5	Qbt 3	2690 (J-)	—	—	—	5.18	—	1.76 (U)	—	—	NA	—	—
RE33-05-60754	33-24721	5.0–5.5	Qbt 3	2670 (J-)	—	—	—	4.75	—	1.76 (U)	—	—	NA	—	—
RE33-05-60755	33-24722	3.0–3.5	Qbt 3	2170 (J-)	—	0.47	6.91	2.12	—	1.7 (U)	—	—	NA	—	64.7
RE33-05-60756	33-24722	5.0–5.5	Qbt 3	2150 (J-)	—	0.187	8.83	1.51	—	1.66 (U)	—	—	NA	—	—
RE33-05-60757	33-24723	3.0–3.5	Qbt 3	2480 (J-)	—	0.235	—	1.12 (J)	—	1.77 (U)	—	—	NA	—	—
RE33-05-60758	33-24723	5.0–5.5	Qbt 3	2950 (J-)	—	0.182	—	1.9	—	1.73 (U)	5.49	—	NA	19.3 (J)	—
RE33-05-60759	33-24724	2.0–2.5	Fill	—	—	—	—	—	0.00177 (J)	1.71 (U)	—	—	NA	—	—
RE33-05-60760	33-24724	4.0–4.5	Qbt 3	1930	—	—	—	—	—	0.823 (J)	—	—	NA	—	—
RE33-05-60761	33-24725	8.0–8.5	Fill	—	—	0.161	—	—	—	—	—	—	NA	—	70.9
RE33-05-60762	33-24725	10.0–10.5	Qbt 3	—	—	—	—	—	—	1.61 (U)	—	—	NA	—	—
RE33-05-60763	33-24726	3.0–3.5	Fill	—	—	0.361	—	0.964 (J)	—	—	—	—	NA	—	176
RE33-05-60764	33-24726	5.0–5.5	Qbt 3	1920	—	0.193	7.27 (J-)	0.976 (J)	—	1.24 (J)	—	—	NA	18.2	99.2
RE33-05-63010	33-25097	3.0–3.5	Fill	—	—	—	—	1.1	0.00016 (J)	—	—	—	NA	—	—
RE33-05-63011	33-25097	5.0–5.5	Fill	—	—	—	—	0.62	0.0006 (J)	—	—	—	NA	—	—
RE33-05-63012	33-25098	3.0–3.5	Fill	—	—	—	—	2	—	—	—	—	NA	—	50.1

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-05-63013	33-25098	5.0–5.5	Fill	—	—	0.21	—	0.79	0.00038 (J)	—	—	—	NA	—	—
RE33-05-63195	33-25107	5.0–5.5	Fill	—	—	0.65	—	5.5	—	—	—	—	NA	—	83
RE33-05-63196	33-25107	7.0–7.5	Fill	—	—	—	—	0.54	0.0003 (J)	—	—	—	NA	—	—
RE33-05-63197	33-25108	5.0–5.5	Fill	—	—	—	—	3.4	—	—	—	—	NA	—	—
RE33-05-63198	33-25108	7.0–7.5	Fill	—	—	—	—	0.56	0.0004 (J)	—	—	—	NA	—	—
RE33-05-63199	33-25109	5.0–5.5	Fill	—	—	—	—	1.7	—	—	—	—	NA	—	—
RE33-05-63200	33-25109	7.0–7.5	Fill	—	—	—	—	0.92	0.00065 (J)	—	—	—	NA	—	—
RE33-05-63201	33-25110	3.0–3.5	Fill	—	—	0.15	—	2.8	—	—	—	—	NA	—	67.8
RE33-05-63202	33-25110	5.0–5.5	Fill	—	—	—	—	1.9	0.00036 (J)	—	—	—	NA	—	—
RE33-05-63203	33-25111	4.0–4.5	Fill	—	—	—	—	0.74	—	—	—	—	NA	—	—
RE33-05-63204	33-25111	6.0–6.5	Fill	—	—	—	—	0.53	0.00027 (J)	—	—	—	NA	—	—
RE33-05-63205	33-25112	5.0–5.5	Fill	—	—	—	—	1.6	0.00036 (J)	—	—	—	NA	—	—
RE33-05-63206	33-25112	7.0–7.5	Fill	—	—	—	—	1.6	0.00025 (J)	—	—	—	NA	—	—
RE33-05-63207	33-25113	5.0–5.5	Fill	—	—	0.13	—	2.2	0.00017 (J)	—	—	—	NA	—	—
RE33-05-63208	33-25113	7.0–7.5	Fill	—	—	—	—	0.87	0.00037 (J)	—	—	—	NA	—	—
RE33-05-63209	33-25114	3.0–3.5	Fill	—	—	—	—	0.51	0.00027 (J)	—	—	—	NA	—	—
RE33-05-63210	33-25114	5.0–5.5	Fill	—	—	—	—	0.68	0.00016 (J)	—	—	—	NA	—	—
RE33-05-63211	33-25115	4.0–4.5	Fill	—	—	—	—	0.34	0.00029 (J)	—	—	—	NA	—	—
RE33-05-63212	33-25115	6.0–6.5	Fill	—	—	—	—	0.88	0.00034 (J)	—	—	—	NA	—	—
RE33-05-63213	33-25116	3.0–3.5	Fill	—	—	0.13	—	0.92	—	—	—	—	NA	—	—
RE33-05-63214	33-25116	5.0–5.5	Fill	—	—	—	—	0.42	0.00017 (J)	—	—	—	NA	—	—
RE33-05-63215	33-25117	5.0–5.5	Fill	—	—	—	—	0.12 (J+)	—	—	—	—	NA	—	—
RE33-05-63216	33-25117	7.0–7.5	Fill	—	—	—	—	1.2 (J+)	0.00022 (J)	—	—	—	NA	—	—
SWMU 33-002(b)															
0333-96-0070	33-01328	10.0–15.0	Qbt 3	—	—	NA	—	NA	NA	1.6	—	—	4.2	—	—
RE33-05-62977	33-25082	3.0–3.5	Qbt 3	3140	—	—	9.23	2.27	—	1.57 (U)	—	—	NA	18.6	—
RE33-05-62978	33-25082	5.0–5.5	Qbt 3	—	—	—	—	1.13	—	1.51 (U)	—	—	NA	—	—
RE33-05-62979	33-25083	3.0–3.5	Qbt 3	2590	—	—	7.57	1.36	0.00323	1.52 (U)	—	—	NA	—	—
RE33-05-62980	33-25083	5.0–5.5	Qbt 3	—	—	—	—	1.45	—	1.55 (U)	—	—	NA	—	—
RE33-05-62981	33-25084	3.0–3.5	Qbt 3	2590	—	0.837	7.87	1.78	0.00116 (J)	1.51 (U)	—	—	NA	17.1	—
RE33-05-62982	33-25084	5.0–5.5	Qbt 3	1880	—	—	—	0.776 (J)	0.000919 (J)	1.53 (U)	—	—	NA	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	0.34	—	—	0.00059 (J)	—	—	—	NA	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-05-62988	33-25087	12.0–12.5	Qbt 3	—	—	0.19	—	—	—	—	—	—	NA	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	0.21	—	—	0.00056 (J)	—	—	—	NA	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	0.28	—	—	0.00084 (J)	—	—	—	NA	—	—
RE33-05-63000	33-25092	2.0–2.5	Fill	—	—	—	—	8.4	0.00039 (J)	—	—	—	NA	—	—
RE33-05-63001	33-25092	4.0–4.5	Qbt 3	—	—	—	—	1.2	0.00051 (J)	0.66	—	—	NA	—	—
RE33-05-63002	33-25093	3.0–3.5	Qbt 3	—	—	—	—	2.6	0.00026 (J)	0.75	—	—	NA	—	—
RE33-05-63003	33-25093	5.0–5.5	Qbt 3	—	—	—	—	0.88	—	0.4 (U)	—	—	NA	—	—
RE33-05-63004	33-25094	4.0–4.5	Qbt 3	—	—	—	—	2.6	0.00064 (J)	0.6 (U)	—	—	NA	—	—
RE33-05-63005	33-25094	6.0–6.5	Qbt 3	—	—	—	—	1.7	0.0002 (J)	—	—	—	NA	—	—
RE33-05-63006	33-25095	4.0–4.5	Fill	—	—	0.11	—	1.6	0.00031 (J)	—	—	—	NA	—	—
RE33-05-63007	33-25095	6.0–6.5	Qbt 3	—	—	—	—	1.3	0.00028 (J)	—	—	—	NA	—	—
RE33-05-63008	33-25096	4.0–4.5	Fill	—	—	—	—	1	0.00021 (J)	—	—	—	NA	—	—
RE33-05-63009	33-25096	6.0–6.5	Qbt 3	—	—	—	—	0.66	—	—	—	—	NA	—	—
RE33-05-63227	33-25123	5.0–5.5	Qbt 3	—	—	0.24	—	0.26	—	—	—	—	NA	—	—
RE33-05-63228	33-25123	7.0–7.5	Qbt 3	—	—	—	—	1.9	0.00067 (J)	—	—	—	NA	—	—
RE33-05-63229	33-25124	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	NA	—	—
RE33-05-63230	33-25124	6.0–6.5	Qbt 3	—	—	—	—	—	0.00046 (J)	—	—	—	NA	—	—
RE33-05-63231	33-25125	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	NA	—	—
RE33-05-63232	33-25125	7.0–7.5	Qbt 3	—	—	—	—	—	0.00041 (J)	0.33	—	—	NA	—	—
SWMU 33-002(c)															
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	NA	NA	—	—	—	NA	—	—
RE33-05-60765	33-24727	4.0–4.5	Qbt 3	—	—	0.198 (J)	—	—	0.00498	1.02 (J)	—	—	NA	—	—
RE33-05-60766	33-24727	6.0–6.5	Qbt 3	—	—	0.776 (J)	—	—	0.00192 (J)	1.52 (U)	—	—	NA	—	—
RE33-05-60767	33-24728	3.0–3.5	Qbt 3	1950 (J+)	—	15.2 (J)	6.85	20.2	—	1.74 (U)	—	—	NA	—	287
RE33-05-60768	33-24728	5.0–5.5	Qbt 3	—	—	0.205 (J)	—	0.967 (J)	—	0.681 (J)	—	—	NA	—	—
RE33-05-60769	33-24729	3.0–3.5	Qbt 3	2260 (J+)	—	—	—	—	—	1.75 (U)	—	—	NA	—	—
RE33-05-60770	33-24729	5.0–5.5	Qbt 3	—	—	—	—	—	—	0.884 (J)	—	—	NA	—	—
RE33-05-62983	33-25085	10.0–10.5	Qbt 3	—	—	0.11	—	—	0.0012	—	—	—	NA	—	—
RE33-05-62984	33-25085	12.0–12.5	Qbt 3	—	—	—	—	—	0.0013	—	—	—	NA	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	0.23	—	—	0.00091 (J)	—	—	—	NA	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	0.17	—	—	0.00078 (J)	—	—	—	NA	—	—
RE33-05-63217	33-25118	2.0–2.5	Qbt 3	—	—	5.2	7.1	0.79	—	—	3.9	—	NA	—	199

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-05-63218	33-25118	4.0–4.5	Qbt 3	—	—	0.57	—	0.34	—	0.49	—	—	NA	—	—
RE33-05-63219	33-25119	5.0–5.5	Qbt 3	—	—	0.11	—	—	0.0025 (J)	—	—	—	NA	—	—
RE33-05-63220	33-25119	7.0–7.5	Qbt 3	—	—	—	—	—	0.002 (J)	0.46	—	—	NA	—	—
RE33-05-63221	33-25120	5.0–5.5	Qbt 3	—	—	0.26	—	6.7	—	0.56	—	—	NA	—	—
RE33-05-63222	33-25120	7.0–7.5	Qbt 3	—	—	—	—	—	—	0.42	—	—	NA	—	—
RE33-05-63223	33-25121	5.0–5.5	Qbt 3	—	—	—	—	0.55	—	—	—	—	NA	—	—
RE33-05-63224	33-25121	7.0–7.5	Qbt 3	—	—	—	—	—	—	—	—	—	NA	—	—
RE33-05-63225	33-25122	4.0–4.5	Qbt 3	—	—	0.16	—	0.66	—	0.81	—	—	NA	—	—
RE33-05-63226	33-25122	6.0–6.5	Qbt 3	—	—	—	—	0.17 (J)	0.0022 (J)	0.63	—	—	NA	—	—
SWMU 33-004(a)															
0333-97-0004	XX-33-604072	0.0–0.0	Soil	—	—	—	—	NA	NA	—	—	—	20.7 (U)	—	55.3
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	—	—	NA	NA	—	—	—	12.8 (U)	—	84.7
AOC 33-008(c)															
0333-96-0652	33-01670	0.0–0.5	Soil	—	—	—	—	NA	NA	—	—	0.81 (U)	2.6	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	—	0.59	20.9	NA	NA	0.9 (U)	11.2	0.86 (U)	6.2	—	351
0333-96-0654	33-01671	0.5–0.83	Sed	—	—	1.8	13.8	NA	NA	0.43 (U)	6.5	0.82 (U)	5.08	—	288
0333-96-0655	33-01672	0.0–0.5	Sed	—	—	3.2	24.2	NA	NA	1.1 (U)	15.8	0.89 (U)	9.2	—	721
0333-96-0656	33-01672	1.0–1.5	Sed	—	—	3.9	92	NA	NA	2.3 (U)	11.1	1.7 (U)	12.4	—	1310
0333-96-0657	33-01673	0.0–0.5	Sed	—	—	5.6	31	NA	NA	1.3 (U)	2.7	1.6 (U)	10.7	—	607
0333-96-0658	33-01674	0.0–0.5	Sed	—	855	1.9	—	NA	NA	0.69 (U)	2.1 (J)	2.2 (J)	4.53	—	1090
0333-96-0659	33-01675	0.0–0.5	Soil	—	—	—	—	NA	NA	—	—	0.76 (U)	2.79	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	—	—	—	NA	NA	—	—	—	3.22	—	114
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	—	NA	NA	—	—	—	2.3	—	—
0333-96-0675	33-01679	5.0–7.0	Qbo	1500	—	—	6.5 (U)	NA	NA	0.39 (U)	—	—	1.69	7.2 (J)	41
0333-96-0677	33-01680	0.0–0.5	Sed	—	888	15.3	232	NA	NA	3.6	42.1	1.8 (J)	134	—	9440
0333-96-0678	33-01680	0.0–2.0	Sed	—	837	272	78.9 (J+)	NA	NA	0.44 (U)	14.5 (J-)	—	19.5	—	2230
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	3.7	4 (J)	NA	NA	0.41 (U)	—	—	2.62	—	453
0333-96-0681	33-01681	0.5–1.25	Sed	—	8310	11.7	1820	NA	NA	0.4 (U)	31.9	—	117	29.9	12700
0333-96-0682	33-01681	5.0–6.0	Soil	—	1050	0.47	23.2	NA	NA	—	—	—	6.92	—	510
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	1.7 (J+)	12.6	NA	NA	0.44 (U)	12.7	0.84 (U)	5.95	—	326
0333-96-0685	33-01682	1.0–2.0	Qbo	—	—	1.8 (J+)	48.6	NA	NA	0.43 (U)	1.4 (J)	—	2.76	8.6 (J)	329
0333-96-0669	33-01683	0.0–0.5	Sed	—	—	0.43	—	NA	NA	0.44 (U)	9.6	—	4.11	28	210

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
0333-96-0670	33-01684	0.0–0.5	Fill	—	737	0.5	60.7	NA	NA	—	1.9 (J)	—	4.61	—	948
0333-96-0671	33-01685	0.0–0.5	Soil	—	842	22.9	62.8	NA	NA	—	12.7	—	44	—	1780
SWMU 33-011(d)															
0333-96-0111	33-01566	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.1 (U)	1.3 (U)	—	—	—
0333-96-0120	33-01566	0.67–1.0	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	94.2
0333-96-0112	33-01567	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.4 (U)	—	—	78 (J+)
0333-96-0121	33-01567	0.67–1.0	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	—
0333-96-0113	33-01568	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.3 (U)	—	—	—
0333-96-0122	33-01568	0.67–1.0	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	—
0333-96-0114	33-01569	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.1 (U)	1.3 (U)	—	—	—
0333-96-0123	33-01569	0.42–0.67	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	—
0333-96-0115	33-01571	0.0–0.5	Soil	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.4 (U)	—	—	—
0333-96-0124	33-01571	0.5–0.75	Qbo	—	—	2	2.8 (U)	NA	NA	—	1.5 (U)	—	0.77	5.1 (J)	—
0333-96-0116	33-01572	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.4 (U)	—	—	—
0333-96-0125	33-01572	0.5–0.67	Fill	—	—	0.77	—	NA	NA	—	1.4 (U)	—	—	—	—
AOC C-33-003															
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.8 (J)	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	6860	—	—	36.8	NA	NA	—	—	—	—	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.45 (U)	—	—	—	—	—
RE33-99-0011	33-01710	0.0–0.5	Fill	—	—	—	—	NA	NA	4.9	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.46 (U)	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.3300	Fill	6850	—	—	44.5	NA	NA	—	—	—	—	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.46 (U)	—	—	—	—	—
RE33-99-0013	33-01712	0.0–0.5	Fill	10500	—	—	43.6	NA	NA	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.47 (U)	—	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	4760	—	—	24.8	NA	NA	—	—	—	—	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.45 (U)	—	—	—	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	5030	—	—	21.9	NA	NA	—	—	—	—	—	—
RE33-99-0037	33-01714	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.46 (U)	—	—	—	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	7810	—	—	32.1	NA	NA	—	—	—	—	—	—
RE33-99-0038	33-01715	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.62 (J)	—	—	—	—	—
RE33-99-0061	33-01716	0.0–0.5	Sed	3470	—	—	18.9	NA	NA	1.1	—	—	—	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-99-0062	33-01717	0.0–0.5	Sed	4160	—	—	28.9	NA	NA	1.8	—	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

[c] NA = Not analyzed.

[d] na = Not available.

Table 4.1-3
Organic Chemicals Detected in Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
SWMU 33-002(a)																			
0333-96-0525	33-01652	1.0–1.5	Soil	—[a]	—	—	—	NA[b]	NA	NA	—	—	—	—	—	—	—	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	NA	NA	NA	—	—	—	—	—	—	—	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	NA	NA	NA	—	—	—	—	—	—	—	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	0.019 (J)	—	NA	NA	NA	—	—	—	—	—	—	—	—	—
RE33-05-60743	33-24716	3.0–3.5	Qbt 3	0.0325 (J)	—	—	0.078	—	—	—	—	—	—	0.264	0.37	0.231	—	—	0.179 (J)
RE33-05-60747	33-24716	5.0–5.5	Qbt 3	0.0197 (J)	—	—	0.0355 (J)	0.0182 (J)	—	—	—	—	—	0.19	0.247	0.172	—	—	0.196 (J)
RE33-05-60745	33-24717	3.0–3.5	Qbt 3	0.0545 (J)	—	—	0.12 (J)	—	0.0045 (J-)	—	—	—	—	0.633	0.783	0.615	—	—	0.677 (J)
RE33-05-60749	33-24717	5.0–5.5	Qbt 3	0.0842	—	—	0.176	—	—	—	—	—	0.303	0.345	0.534	0.272	—	—	0.208 (J)
RE33-05-60744	33-24718	3.0–3.5	Qbt 3	0.104	0.0131 (J)	—	0.221	—	0.0177 (J)	—	—	—	0.48	0.525	0.807	0.347	—	—	0.194 (J)
RE33-05-60748	33-24718	5.0–5.5	Qbt 3	0.304 (J)	—	—	0.537	—	0.0768	—	—	—	1.35	2.21	3	1.96	—	—	1.52 (J)
RE33-05-60746	33-24719	3.0–3.5	Qbt 3	0.528	0.0371	—	1.09	0.0583 (J)	0.0404 (J)	—	—	—	1.59	1.38	2.35	0.69	—	—	0.184 (J)
RE33-05-60750	33-24719	5.0–5.5	Qbt 3	—	—	—	0.155 (J)	—	—	—	—	—	—	1.28	1.47	—	—	—	1.54 (J)
RE33-05-60751	33-24720	3.0–3.5	Qbt 3	0.42	—	—	0.854	—	—	—	—	—	—	1.68	2.3	1.32	—	—	0.677 (J)
RE33-05-60752	33-24720	5.0–5.5	Qbt 3	0.0892 (J)	—	—	0.201	—	—	—	—	—	—	0.72	0.952	0.645	—	—	0.677 (J)
RE33-05-60753	33-24721	3.0–3.5	Qbt 3	0.236	—	—	0.417	—	—	0.0589	—	—	0.715	0.976	1.37	0.851	—	—	0.678 (J)
RE33-05-60754	33-24721	5.0–5.5	Qbt 3	0.0842	—	—	0.198	—	—	—	—	—	0.348	0.386	0.566	0.286	—	—	0.44
RE33-05-60755	33-24722	3.0–3.5	Qbt 3	0.106 (J)	—	—	0.199	—	—	—	—	—	—	0.741	0.956	0.729	—	—	0.658 (J)
RE33-05-60756	33-24722	5.0–5.5	Qbt 3	0.159	—	—	0.317	0.0693	0.0324 (J)	0.0206 (J)	—	—	—	0.909	1.26	0.779	—	—	0.708 (J)
RE33-05-60757	33-24723	3.0–3.5	Qbt 3	0.0524 (J-)	—	—	0.112 (J-)	—	0.0078 (J-)	0.0037 (J)	—	—	0.183 (J-)	0.267 (J-)	0.352 (J-)	—	—	—	0.182 (J-)
RE33-05-60758	33-24723	5.0–5.5	Qbt 3	0.0342 (J)	—	—	0.089	—	0.0064	0.0035 (J)	—	—	0.162	0.228	0.314	0.199	—	—	0.173 (J)
RE33-05-60759	33-24724	2.0–2.5	Fill	0.0804	—	—	0.123	—	0.0987 (J)	0.0384 (J)	—	—	—	0.247	0.438	0.158	—	—	—
RE33-05-60760	33-24724	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60761	33-24725	8.0–8.5	Fill	0.0395 (J)	—	0.04	0.0954	—	—	—	—	—	—	0.201	0.367	0.135	—	—	—
RE33-05-60762	33-24725	10.0–10.5	Qbt 3	—	—	0.0064	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60763	33-24726	3.0–3.5	Fill	—	—	0.0519	—	—	0.124 (J)	—	—	—	—	—	—	—	—	—	0.728
RE33-05-60764	33-24726	5.0–5.5	Qbt 3	0.0437	—	0.016	—	—	—	—	—	—	—	—	—	—	—	—	0.11 (J)
RE33-05-63011	33-25097	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63012	33-25098	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63013	33-25098	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63195	33-25107	5.0–5.5	Fill	—	—	—	—	—	0.17 (J+)	—	—	—	—	—	—	—	—	—	0.15 (J)
RE33-05-63196	33-25107	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
RE33-05-63201	33-25110	3.0–3.5	Fill	—	—	—	—	—	0.055	—	—	—	—	—	—	—	—	—	—
RE33-05-63205	33-25112	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63207	33-25113	5.0–5.5	Fill	—	—	—	—	—	0.055	—	—	—	—	—	—	—	—	—	—
RE33-05-63211	33-25115	4.0–4.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.31 (J)
RE33-05-63213	33-25116	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(b)																			
RE33-05-62977	33-25082	3.0–3.5	Qbt 3	—	—	0.0102	—	—	—	—	—	—	—	0.00035 (J)	0.00039 (J)	—	—	0.0117 (J)	—
RE33-05-62978	33-25082	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.0115 (J)	—
RE33-05-62979	33-25083	3.0–3.5	Qbt 3	—	—	0.0111	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62980	33-25083	5.0–5.5	Qbt 3	—	—	—	—	—	0.0022 (J)	—	—	—	—	—	—	—	—	—	—
RE33-05-62981	33-25084	3.0–3.5	Qbt 3	0.003	—	0.0081	0.004	—	—	—	—	—	0.0059	0.0057	0.0067	0.0042 (J)	0.0029	—	—
RE33-05-62982	33-25084	5.0–5.5	Qbt 3	—	—	—	0.0003 (J)	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	0.085 (J-)	—	—	—	—	—	—	—	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	—	—	0.065 (J-)	—	—	—	—	—	—	—	—	—	—
RE33-05-63000	33-25092	2.0–2.5	Fill	0.097 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63004	33-25094	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63007	33-25095	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.13 (J)	0.14 (J)	0.088 (J)	0.11 (J)	0.13 (J-)	—	—
RE33-05-63009	33-25096	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63227	33-25123	5.0–5.5	Qbt 3	—	—	0.0037 (J-)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63228	33-25123	7.0–7.5	Qbt 3	—	—	0.0053 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63229	33-25124	4.0–4.5	Qbt 3	—	—	0.0029 (J-)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63230	33-25124	6.0–6.5	Qbt 3	—	—	0.0027 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63231	33-25125	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63232	33-25125	7.0–7.5	Qbt 3	—	—	0.0066 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(c)																			
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	—	NA	NA	—	—	—	—	—	—	—	—	—
RE33-05-60765	33-24727	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60766	33-24727	6.0–6.5	Qbt 3	—	—	—	—	—	0.0013 (J)	0.0013 (J+)	—	—	—	0.0114 (J)	0.0144 (J)	0.0211 (J)	—	—	—
RE33-05-60767	33-24728	3.0–3.5	Qbt 3	—	—	—	0.0193 (J)	—	0.0048	0.0035 (J+)	—	—	—	0.079	0.128	0.0548	—	—	—
RE33-05-60769	33-24729	3.0–3.5	Qbt 3	0.029 (J)	—	—	0.0619	—	0.003 (J-)	0.002 (J-)	—	—	—	0.108	0.158	0.0715	—	—	—
RE33-05-60770	33-24729	5.0–5.5	Qbt 3	0.0275 (J)	—	—	0.0561	—	0.00088 (J)	—	—	—	—	0.101	0.157	0.0588	—	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.082 (J)	0.081 (J)	—	—	0.072 (J)	—	—
RE33-05-63217	33-25118	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63221	33-25120	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63223	33-25121	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.093 (J)	0.094 (J)	0.075 (J)	—	0.072 (J)	—	—
RE33-05-63225	33-25122	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.12 (J)	0.12 (J)	0.093 (J)	—	0.11 (J)	—	—
RE33-05-63226	33-25122	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-004(a)																			
0333-97-0010	XX-33-604072	0.0–0.0	Soil	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	NA	NA
AOC 33-008(c)																			
0333-96-0652	33-01670	0.0–0.5	Soil	—	—	NA	—	—	—	—	—	NA	—	—	—	—	1.6	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	—	NA	—	—	—	—	0.43(J)	NA	—	—	—	—	—	—	—
0333-96-0654	33-01671	0.5–0.83	Sed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0655	33-01672	0.0–0.5	Sed	0.41 (J)	—	NA	0.65 (J)	—	—	—	—	NA	1.6 (J)	1.7	2.9	0.48 (J)	2.9	—	—
0333-96-0656	33-01672	1.0–1.5	Sed	—	—	—	0.38 (J)	—	—	—	—	—	1.2 (J)	1.5 (J)	2.8	1.1 (J)	2.8	—	—
0333-96-0658	33-01674	0.0–0.5	Sed	—	—	NA	—	—	—	—	—	NA	0.19 (J)	—	0.27 (J)	—	0.27 (J)	—	—
0333-96-0659	33-01675	0.0–0.5	Soil	—	—	NA	—	—	—	—	—	NA	—	—	—	—	—	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	—	NA	—	—	—	—	—	NA	0.058 (J)	0.077 (J)	0.056 (J)	0.053 (J)	0.06 (J)	—	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0677	33-01680	0.0–0.5	Sed	1.9 (J)	—	NA	2.9 (J)	—	—	—	—	NA	5.7 (J)	6.2 (J)	10	3.4 (J)	10	—	—
0333-96-0678	33-01680	0.0–2.0	Sed	—	—	0.014 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	—	—	—	—	—	—	—	0.6	0.76	0.77	0.74	0.37	—	—
0333-96-0681	33-01681	0.5–1.25	Sed	4.4	—	—	6.8	—	—	—	—	—	9	9.6	6	6.1	6.8	0.11 (J)	2.3
0333-96-0682	33-01681	5.0–6.0	Soil	0.14 (J)	—	—	0.27 (J)	—	—	—	—	—	0.45	0.46	0.31 (J)	0.31 (J)	0.35 (J)	—	—
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	—	—	—	—	—	—	—	0.36 (J)	0.47 (J)	0.75 (J)	0.21 (J)	NA	—	—
0333-96-0685	33-01682	1.0–2.0	Qbo	0.16 (J)	—	0.012 (J)	0.32 (J)	—	—	—	—	—	0.41 (J)	0.37 (J)	0.65 (J)	0.17 (J)	NA	—	—
0333-96-0669	33-01683	0.0–0.5	Sed	0.13 (J)	—	NA	0.19 (J)	—	—	—	—	NA	0.55	0.69	0.57	0.47	0.61	—	0.045 (J)
0333-96-0670	33-01684	0.0–0.5	Fill	—	—	NA	—	—	—	—	—	NA	0.16 (J)	0.22 (J)	0.23 (J)	0.23 (J)	0.22 (J)	—	—
0333-96-0671	33-01685	0.0–0.5	Soil	—	—	NA	—	—	—	—	—	NA	0.052 (J)	0.077 (J)	0.064 (J)	0.055 (J)	0.063 (J)	—	—
33-017																			
0333-96-0130	33-01585	0.0–0.5	Fill	0.14 (J)	—	—	0.34	—	NA	NA	—	NA	0.84	0.78	0.99	0.11 (J)	0.25 (J)	—	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.54	0.25 (J)	0.43	—	—	—	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	0.41	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
0333-96-0133	33-01588	0.0–0.5	Fill	0.61 (J)	—	—	1 (J)	—	NA	NA	—	NA	1.5 (J)	1.8 (J)	2.6 (J)	0.67 (J)	1.1 (J)	0.22 (J)	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	0.63 (J)	0.38 (J)	0.78 (J)	—	—	0.21 (J)	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.41	—	—	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	0.5 (J)	0.16 (J)	0.53 (J)	—	—	0.19 (J)	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.37 (J)	—	0.054 (J)	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	0.26 (J)	—	—	0.42	—	NA	NA	—	—	1.2	1.1	1.4	0.4	—	—	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	NA	NA	—	—	0.084 (J)	0.074 (J)	0.17 (J)	0.096 (J)	—	—	—
0333-96-0140	33-01595	0.0–0.5	Fill	1.3	—	—	2	—	NA	NA	—	—	3.5	2.4	2.7	0.75	0.97	—	—
0333-96-0141	33-01596	0.0–0.5	Fill	0.058 (J)	—	—	0.18 (J)	—	NA	NA	—	—	0.6	0.55	0.66	0.23 (J)	0.084 (J)	—	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	—	—	—	0.76 (J)	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	0.045 (J)	—	—	0.18 (J)	—	NA	NA	—	NA	0.44	0.41	0.49	0.21 (J)	—	—	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	—	0.12 (J)	0.22 (J)	0.11 (J)	—	—	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.12 (J)	0.1 (J)	—	—	—	—	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.2 (J)	0.2 (J)	—	0.11 (J)	—	—	—
0333-96-0149	33-01604	0.0–0.5	Fill	NA	NA	NA	NA	—	0.12	0.13	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0151	33-01606	0.0–0.5	Fill	NA	NA	NA	NA	—	0.083	0.099	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0152	33-01607	0.0–0.5	Fill	NA	NA	NA	NA	—	0.18	0.29	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0157	33-01612	0.0–0.5	Soil	NA	NA	NA	NA	—	—	5.5	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0159	33-01614	0.0–0.5	Soil	NA	NA	NA	NA	—	1.4	0.87	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0160	33-01615	0.0–0.5	Fill	NA	NA	NA	NA	—	0.85	0.92	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0161	33-01616	0.0–0.5	Soil	NA	NA	NA	NA	—	—	3.7	—	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-001																			
0333-96-2042	33-01748	0.0–0.5	Fill	NA	NA	NA	NA	—	—	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2043	33-01749	0.0–0.5	Soil	NA	NA	NA	NA	—	—	11	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2045	33-01751	0.0–0.5	Soil	NA	NA	NA	NA	—	—	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2046	33-01752	0.0–0.5	Fill	NA	NA	NA	NA	—	—	6.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-003																			
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.06 (J)

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	—	—	—	0.00085 (J)	—	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	0.55 (J)	—	—	0.93 (J)	—	—	—	—	—	1.5 (J)	1.2 (J)	0.99 (J)	0.5 (J)	1.2 (J)	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
SWMU 33-002(a)																			
0333-96-0525	33-01652	1.0–1.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	—	—	0.037 (J)	—	—	—	—	—	—	—	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	—	—	0.034 (J)	—	—	—	—	—	—	—	—	—
RE33-05-60743	33-24716	3.0–3.5	Qbt 3	—	—	—	—	—	0.18	—	—	—	—	—	0.365	0.0268 (J)	—	0.252	—
RE33-05-60747	33-24716	5.0–5.5	Qbt 3	—	—	—	—	—	0.0965	—	—	—	—	—	0.17	0.0158 (J)	—	0.199	—
RE33-05-60745	33-24717	3.0–3.5	Qbt 3	—	—	—	—	—	0.257	—	—	—	—	—	0.496	0.0472 (J)	—	—	—
RE33-05-60749	33-24717	5.0–5.5	Qbt 3	—	—	—	—	—	0.292	—	—	—	—	—	0.629	0.0716	—	0.285	—
RE33-05-60744	33-24718	3.0–3.5	Qbt 3	—	—	—	—	—	0.508	—	—	—	—	—	0.984	0.105	—	0.378	—
RE33-05-60748	33-24718	5.0–5.5	Qbt 3	—	—	—	—	—	1.41	—	—	—	—	—	2.39	0.242 (J)	—	2.2	—
RE33-05-60746	33-24719	3.0–3.5	Qbt 3	—	—	—	—	—	1.46	—	—	0.464	—	—	3.83	0.498	—	0.7	—
RE33-05-60750	33-24719	5.0–5.5	Qbt 3	—	—	—	—	—	0.288 (J)	—	—	—	—	—	0.51	—	—	1.68	—
RE33-05-60751	33-24720	3.0–3.5	Qbt 3	—	—	—	—	—	1.56	—	—	—	—	—	2.9	0.381	—	1.31	—
RE33-05-60752	33-24720	5.0–5.5	Qbt 3	—	—	—	—	—	0.368	—	—	—	—	—	0.762	0.0716 (J)	—	0.753	—
RE33-05-60753	33-24721	3.0–3.5	Qbt 3	—	—	—	—	—	0.719	—	—	—	—	—	1.44	0.21	—	0.907	—
RE33-05-60754	33-24721	5.0–5.5	Qbt 3	—	—	—	—	—	0.344	—	—	—	—	—	0.683	0.0737	—	0.306	—
RE33-05-60755	33-24722	3.0–3.5	Qbt 3	—	—	—	—	—	0.398	—	—	—	—	—	0.7	0.0816 (J)	—	0.832	—
RE33-05-60756	33-24722	5.0–5.5	Qbt 3	—	—	—	—	—	0.575	—	—	—	—	—	1.17	0.123 (J)	—	0.863	—
RE33-05-60757	33-24723	3.0–3.5	Qbt 3	—	—	—	—	—	0.19 (J-)	—	—	—	—	—	0.36 (J-)	0.0458 (J-)	—	0.245 (J-)	—
RE33-05-60758	33-24723	5.0–5.5	Qbt 3	—	—	—	—	—	0.157	—	—	—	—	—	0.328	0.0314 (J)	—	0.216	—
RE33-05-60759	33-24724	2.0–2.5	Fill	—	—	—	—	—	0.251	—	—	—	—	—	0.594	0.0613	—	0.169	—
RE33-05-60760	33-24724	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.0169 (J)	—	—	—	—
RE33-05-60761	33-24725	8.0–8.5	Fill	—	0.0049 (J)	—	—	—	0.2	—	—	—	—	—	0.431	0.0387 (J)	—	—	—
RE33-05-60762	33-24725	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60763	33-24726	3.0–3.5	Fill	—	—	—	—	0.174 (J)	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60764	33-24726	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63011	33-25097	5.0–5.5	Fill	—	0.0043 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63012	33-25098	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63013	33-25098	5.0–5.5	Fill	—	—	—	—	—	—	0.094 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63195	33-25107	5.0–5.5	Fill	—	—	—	—	—	—	0.25 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63196	33-25107	7.0–7.5	Fill	—	—	—	—	—	—	0.12 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63201	33-25110	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63205	33-25112	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63207	33-25113	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
RE33-05-63211	33-25115	4.0–4.5	Fill	—	—	—	—	—	—	0.079 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63213	33-25116	3.0–3.5	Fill	0.00023 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(b)																			
RE33-05-62977	33-25082	3.0–3.5	Qbt 3	—	—	—	—	—	0.00036 (J)	—	—	—	—	—	0.00073 (J)	—	—	—	—
RE33-05-62978	33-25082	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62979	33-25083	3.0–3.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.00048 (J)	—	—	—	—
RE33-05-62980	33-25083	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62981	33-25084	3.0–3.5	Qbt 3	—	—	—	—	—	0.0062	—	—	—	—	—	0.0147	0.0024	—	0.0042	—
RE33-05-62982	33-25084	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.12 (J)	—	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.069 (J)	—	—	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63000	33-25092	2.0–2.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63004	33-25094	4.0–4.5	Qbt 3	—	—	—	—	—	—	0.083 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63007	33-25095	6.0–6.5	Qbt 3	—	—	—	—	—	0.14 (J)	—	—	—	—	—	0.26 (J)	—	—	0.1 (J)	—
RE33-05-63009	33-25096	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63227	33-25123	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63228	33-25123	7.0–7.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63229	33-25124	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63230	33-25124	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63231	33-25125	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63232	33-25125	7.0–7.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(c)																			
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	—	—	0.07 (J)	—	—	—	—	—	—	—	—	—
RE33-05-60765	33-24727	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.018 (J)	—	—	—	—
RE33-05-60766	33-24727	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.0181 (J)	—	—	0.0178 (J)	—
RE33-05-60767	33-24728	3.0–3.5	Qbt 3	—	—	—	—	—	0.0825	—	—	—	—	—	0.16	—	—	0.0492	—
RE33-05-60769	33-24729	3.0–3.5	Qbt 3	—	—	—	—	—	0.114	—	—	—	—	—	0.254	0.0302 (J)	—	0.066	—
RE33-05-60770	33-24729	5.0–5.5	Qbt 3	—	—	—	—	—	0.109	—	—	—	—	—	0.242	0.0307 (J)	—	0.0517	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.13 (J)	—	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	0.085 (J)	—	—	—	—	—	0.18 (J)	—	—	—	—
RE33-05-63217	33-25118	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63221	33-25120	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.089 (J)	—	—	—	—
RE33-05-63223	33-25121	5.0–5.5	Qbt 3	—	—	—	—	—	0.098 (J)	—	—	—	—	—	0.23 (J)	—	—	—	—
RE33-05-63225	33-25122	4.0–4.5	Qbt 3	—	—	—	—	—	0.14 (J)	—	—	—	—	—	0.27 (J)	—	—	0.081 (J)	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
RE33-05-63226	33-25122	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.099 (J)	—	—	—	—
SWMU 33-004(a)																			
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	NA	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	—	NA	—
AOC 33-008(c)																			
0333-96-0652	33-01670	0.0–0.5	Soil	NA	NA	—	—	—	—	—	—	—	—	—	—	—	NA	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	NA	NA	—	—	—	—	—	—	—	—	—	0.63 (J)	—	NA	—	—
0333-96-0654	33-01671	0.5–0.83	Sed	—	—	—	—	—	—	—	—	—	—	—	0.47 (J)	—	—	—	—
0333-96-0655	33-01672	0.0–0.5	Sed	NA	NA	—	0.83 (J)	—	1.5 (J)	—	—	—	—	—	2.8	—	NA	0.64 (J)	—
0333-96-0656	33-01672	1.0–1.5	Sed	—	—	—	0.45 (J)	—	1.3 (J)	—	—	—	—	—	1.9	—	—	1.2 (J)	—
0333-96-0658	33-01674	0.0–0.5	Sed	NA	NA	—	—	—	—	—	—	—	—	—	—	—	NA	—	—
0333-96-0659	33-01675	0.0–0.5	Soil	NA	NA	—	—	—	—	—	—	—	—	—	0.21 (J)	—	NA	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	NA	NA	—	NA	—	0.072 (J)	—	—	—	—	—	0.11 (J)	—	NA	0.049 (J)	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	NA	—	—	—	—	—	—	—	—	—	0.023	—	—
0333-96-0677	33-01680	0.0–0.5	Sed	NA	NA	—	3 (J)	—	5.1 (J)	—	—	—	—	—	10	—	NA	4.1 (J)	—
0333-96-0678	33-01680	0.0–2.0	Sed	—	0.007 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	—	—	—	0.7	1.3	0.2 (J)	—	—	—	0.75	—	—	0.56	—
0333-96-0681	33-01681	0.5–1.25	Sed	—	—	—	NA	—	9.6	1.7	2.5	3.3	—	0.24 (J)	21	5.7	—	6.1	—
0333-96-0682	33-01681	5.0–6.0	Soil	—	—	—	NA	—	0.49	0.16 (J)	0.12 (J)	0.089 (J)	—	—	1	0.16 (J)	—	0.28 (J)	—
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	—	0.19 (J)	—	0.41 (J)	—	—	—	—	—	0.68 (J)	—	—	0.23 (J)	—
0333-96-0685	33-01682	1.0–2.0	Qbo	—	—	—	0.39 (J)	—	0.38 (J)	—	—	—	—	—	1.1	—	—	0.2 (J)	—
0333-96-0669	33-01683	0.0–0.5	Sed	NA	NA	—	NA	—	0.71	0.049 (J)	0.17 (J)	0.059 (J)	0.18 (J)	—	1.2	0.11 (J)	NA	0.45	—
0333-96-0670	33-01684	0.0–0.5	Fill	NA	NA	—	NA	—	0.24 (J)	0.063 (J)	0.083 (J)	—	—	—	0.2 (J)	—	NA	0.17 (J)	—
0333-96-0671	33-01685	0.0–0.5	Soil	NA	NA	—	NA	—	0.064 (J)	4.8	—	—	—	—	0.098 (J)	—	NA	0.05 (J)	—
SWMU 33-017																			
0333-96-0130	33-01585	0.0–0.5	Fill	—	—	—	—	—	0.8	—	—	—	—	—	1.8	0.088 (J)	—	0.28 (J)	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	0.48	—	—	—	—	—	0.59	—	—	0.1 (J)	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	0.29 (J)	—	—	—	—	—	0.051 (J)	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	—	—	—	—	—	1.4	0.085 (J)	—	0.14 (J)	—	—	3.5	0.43 (J)	—	0.81 (J)	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	0.57 (J)	0.26 (J)	—	—	—	—	0.7 (J)	—	—	0.1 (J)	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	0.3 (J)	—	—	—	—	—	0.072 (J)	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	0.43 (J)	—	—	0.41 (J)	—	—	—	—	—	0.32 (J)	—	—	0.063 (J)	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	0.26 (J)	—	—	—	—	—	—	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	—	—	—	—	—	1.2	—	0.18 (J)	0.046 (J)	—	—	2.6	0.24 (J)	—	0.6	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	0.094 (J)	—	—	—	—	—	0.042 (J)	—	—	0.21 (J)	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
0333-96-0140	33-01595	0.0–0.5	Fill	—	—	—	—	—	2.5	—	0.33 (J)	0.43	—	—	6.4	0.94	—	1	—
0333-96-0141	33-01596	0.0–0.5	Fill	—	—	—	—	—	0.61	—	—	—	—	—	1.4	—	—	0.37	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	—	—	—	—	—	0.44	—	—	—	—	—	0.96	—	—	0.34	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	0.14 (J)	0.079 (J)	—	—	—	—	0.17 (J)	—	—	0.22 (J)	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	0.13 (J)	—	—	—	—	—	0.13 (J)	—	—	0.21 (J)	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	0.23 (J)	0.034 (J)	—	—	—	—	0.4	—	—	0.23 (J)	—
0333-96-0149	33-01604	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0151	33-01606	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0152	33-01607	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0157	33-01612	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0159	33-01614	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0160	33-01615	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0161	33-01616	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-001																			
0333-96-2042	33-01748	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2043	33-01749	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2045	33-01751	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2046	33-01752	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-003																			
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.065 (J)	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	—	—	—	—	—	1.5 (J)	—	—	—	—	—	3.3 (J)	0.47 (J)	—	0.5 (J)	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	0.7	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
SWMU 33-002(a)																			
0333-96-0525	33-01652	1.0–1.5	Soil	—	—	—	—	—	—	—	—	—	—	0.002 (J)	NA	—	—	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	—	—	—	—	—	—	0.003 (J)	NA	—	—	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-60743	33-24716	3.0–3.5	Qbt 3	—	—	—	—	—	0.299	—	0.353	—	—	—	NA	—	—	—	—
RE33-05-60747	33-24716	5.0–5.5	Qbt 3	—	—	—	—	0.0116 (J)	0.141	—	0.156	—	—	—	NA	—	—	—	—
RE33-05-60745	33-24717	3.0–3.5	Qbt 3	—	—	—	—	—	0.43	—	0.494	—	—	—	NA	—	—	—	—
RE33-05-60749	33-24717	5.0–5.5	Qbt 3	—	0.0309 (J)	—	—	0.0455	0.0455	—	0.615	—	—	—	NA	—	—	—	—
RE33-05-60744	33-24718	3.0–3.5	Qbt 3	—	0.0276 (J)	—	—	0.0511	0.0511	—	0.916	—	—	—	NA	—	—	—	—
RE33-05-60748	33-24718	5.0–5.5	Qbt 3	—	—	—	—	0.178 (J)	2.24	—	2.9	—	—	—	NA	—	—	—	—
RE33-05-60746	33-24719	3.0–3.5	Qbt 3	—	0.288	—	—	0.58	3.84	—	3.51	—	—	—	NA	—	—	—	—
RE33-05-60750	33-24719	5.0–5.5	Qbt 3	—	—	—	—	—	0.544	—	0.564	—	—	—	NA	—	—	—	—
RE33-05-60751	33-24720	3.0–3.5	Qbt 3	—	—	—	—	0.251	3.25	—	3.3	—	—	—	NA	—	—	—	—
RE33-05-60752	33-24720	5.0–5.5	Qbt 3	—	—	—	—	0.0633 (J)	0.746	—	0.681	—	—	—	NA	—	—	—	—
RE33-05-60753	33-24721	3.0–3.5	Qbt 3	—	0.0967 (J)	—	—	0.251	1.58	—	1.6	—	—	—	NA	—	—	—	—
RE33-05-60754	33-24721	5.0–5.5	Qbt 3	—	0.023 (J)	—	—	0.0553	0.679	—	0.736	—	—	—	NA	—	—	—	—
RE33-05-60755	33-24722	3.0–3.5	Qbt 3	—	0.0405 (J)	—	—	0.102 (J)	0.773	—	0.832	—	—	—	NA	—	—	—	—
RE33-05-60756	33-24722	5.0–5.5	Qbt 3	—	0.0619 (J)	—	—	0.118 (J)	1.25	—	1.13	—	—	—	NA	—	—	—	—
RE33-05-60757	33-24723	3.0–3.5	Qbt 3	—	0.0136 (J-)	—	—	0.0339 (J-)	0.39 (J-)	—	0.417 (J-)	—	—	—	NA	—	—	—	—
RE33-05-60758	33-24723	5.0–5.5	Qbt 3	—	0.0093 (J)	—	—	0.0184 (J)	0.346	—	0.3	—	—	—	NA	—	—	—	—
RE33-05-60759	33-24724	2.0–2.5	Fill	—	0.016 (J)	—	—	0.0346 (J)	0.457	—	0.536	—	—	0.00038 (J)	NA	—	—	—	—
RE33-05-60760	33-24724	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	0.013 (J)	—	—	0.00044 (J)	NA	—	—	—	—
RE33-05-60761	33-24725	8.0–8.5	Fill	—	—	—	—	—	0.324	—	0.427	—	—	0.001 (J)	NA	—	—	—	—
RE33-05-60762	33-24725	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00052 (J)	NA	—	—	—	—
RE33-05-60763	33-24726	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	0.0015	NA	—	—	—	—
RE33-05-60764	33-24726	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00058 (J)	NA	—	—	—	—
RE33-05-63011	33-25097	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.001 (J)	—	—	—	—	—	—
RE33-05-63012	33-25098	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	0.0015 (J)	—	—	—	—	—	—
RE33-05-63013	33-25098	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63195	33-25107	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.0034 (J+)	—	27	—	—	—	—
RE33-05-63196	33-25107	7.0–7.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63201	33-25110	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	0.004 (J)	—	30	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
RE33-05-63205	33-25112	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	0.0011 (J)	—	—	—	—	—	—
RE33-05-63207	33-25113	5.0–5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63211	33-25115	4.0–4.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63213	33-25116	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(b)																			
RE33-05-62977	33-25082	3.0–3.5	Qbt 3	0.0029 (J)	—	—	—	—	0.00057 (J)	—	0.00057 (J)	—	—	—	NA	—	—	—	—
RE33-05-62978	33-25082	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62979	33-25083	3.0–3.5	Qbt 3	0.0022 (J)	—	—	—	—	0.00041 (J)	—	0.00039 (J)	—	—	—	NA	—	—	—	—
RE33-05-62980	33-25083	5.0–5.5	Qbt 3	0.0027 (J)	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62981	33-25084	3.0–3.5	Qbt 3	0.0029 (J)	0.00072 (J)	—	—	0.002	0.0138	—	0.0125	—	—	—	NA	—	—	—	—
RE33-05-62982	33-25084	5.0–5.5	Qbt 3	0.0026 (J)	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	0.1 (J)	—	0.11 (J)	—	—	—	NA	—	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-63000	33-25092	2.0–2.5	Fill	—	—	—	—	—	—	—	—	—	—	—	37	—	—	—	—
RE33-05-63004	33-25094	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63007	33-25095	6.0–6.5	Qbt 3	—	—	—	—	—	0.16 (J)	—	0.22 (J)	—	—	—	—	—	—	—	—
RE33-05-63009	33-25096	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.00091 (J)	—	—	—	—	—	—
RE33-05-63227	33-25123	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.022 (J-)	0.00081 (J-)	—	0.00075 (J-)	0.013 (J-)	—	—
RE33-05-63228	33-25123	7.0–7.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.011	—	—	—	0.0079	—	—
RE33-05-63229	33-25124	4.0–4.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.0087 (J-)	—	—	—	0.005 (J-)	—	—
RE33-05-63230	33-25124	6.0–6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.0091	0.00068 (J)	—	—	0.006	—	—
RE33-05-63231	33-25125	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.001 (J-)	—	—	—	0.00058 (J-)	—	—
RE33-05-63232	33-25125	7.0–7.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.01	0.0011 (J)	—	—	0.006	—	—
SWMU 33-002(c)																			
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-60765	33-24727	4.0–4.5	Qbt 3	—	—	—	—	—	0.012 (J)	—	0.0183 (J)	—	—	—	NA	—	—	—	—
RE33-05-60766	33-24727	6.0–6.5	Qbt 3	—	—	—	—	—	0.0123 (J)	—	0.0176 (J)	—	—	—	NA	—	—	—	—
RE33-05-60767	33-24728	3.0–3.5	Qbt 3	—	—	—	—	—	0.0966	—	0.17	—	—	—	NA	—	—	—	—
RE33-05-60769	33-24729	3.0–3.5	Qbt 3	—	0.0114 (J)	—	—	0.0332 (J)	0.212	—	0.244	—	—	—	NA	—	—	—	—
RE33-05-60770	33-24729	5.0–5.5	Qbt 3	—	0.0116 (J)	—	—	0.0323 (J)	0.207	—	0.222	—	—	—	NA	—	—	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	—	—	0.089 (J)	—	0.12 (J)	—	—	—	NA	—	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	0.14 (J)	—	0.16 (J)	—	—	—	NA	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
RE33-05-63217	33-25118	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	75	—	—	—	—
RE33-05-63221	33-25120	5.0–5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63223	33-25121	5.0–5.5	Qbt 3	—	—	—	—	—	0.18 (J)	—	0.17 (J)	—	—	—	—	—	—	—	—
RE33-05-63225	33-25122	4.0–4.5	Qbt 3	—	—	—	—	—	0.18 (J)	—	0.21 (J)	—	—	—	—	—	—	—	—
RE33-05-63226	33-25122	6.0–6.5	Qbt 3	—	—	—	—	—	0.076 (J)	—	0.078 (J)	—	—	—	—	—	—	—	—
SWMU 33-004(a)																			
0333-97-0010	XX-33-604072	0.0–0.0	Soil	0.0055 (J)	NA	NA	NA	NA	NA	NA	NA	NA	—	—	NA	—	—	—	—
AOC 33-008(c)																			
0333-96-0652	33-01670	0.0–0.5	Soil	NA	—	—	—	—	—	—	—	1.6	NA	NA	—	NA	NA	NA	NA
0333-96-0653	33-01671	0.0–0.5	Sed	NA	—	—	—	—	0.54 (J)	—	0.66 (J)	—	NA	NA	—	NA	NA	NA	NA
0333-96-0654	33-01671	0.5–0.83	Sed	0.0082	—	—	—	—	0.45 (J)	—	0.54 (J)	—	—	—	—	—	—	—	—
0333-96-0655	33-01672	0.0–0.5	Sed	NA	—	—	—	0.75 (J)	2.8	—	3.4	—	NA	NA	—	NA	NA	NA	NA
0333-96-0656	33-01672	1.0–1.5	Sed	0.0029 (J)	—	—	—	—	1.5 (J)	—	2	—	—	—	—	—	—	—	—
0333-96-0658	33-01674	0.0–0.5	Sed	NA	—	—	—	—	—	—	0.23 (J)	—	NA	NA	—	NA	NA	NA	NA
0333-96-0659	33-01675	0.0–0.5	Soil	NA	—	—	—	—	—	—	0.24 (J)	—	NA	NA	—	NA	NA	NA	NA
0333-96-0673	33-01679	0.0–2.0	Soil	NA	—	—	—	—	0.1 (J)	—	0.1 (J)	NA	NA	NA	—	NA	NA	NA	NA
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	—	—	—	—	—	NA	0.002 (J)	0.002 (J)	—	—	0.002 (J)	—	0.002 (J)
0333-96-0677	33-01680	0.0–0.5	Sed	NA	—	—	—	3.3 (J)	11	—	11	—	NA	NA	—	NA	NA	NA	NA
0333-96-0678	33-01680	0.0–2.0	Sed	—	—	—	—	—	—	—	—	NA	—	—	—	—	—	—	—
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	—	—	—	0.47	—	0.82	NA	—	—	—	—	—	—	—
0333-96-0681	33-01681	0.5–1.25	Sed	—	3	0.16 (J)	0.41	9.6	25	0.22 (J)	18	NA	—	0.004 (J)	—	—	0.003 (J)	0.002 (J)	0.002 (J)
0333-96-0682	33-01681	5.0–6.0	Soil	—	0.065 (J)	—	—	0.25 (J)	0.98	—	0.82	NA	0.002 (J)	0.002 (J)	—	—	0.002 (J)	0.002 (J)	0.003 (J)
0333-96-0684	33-01682	0.0–1.0	Sed	0.005 (J)	—	—	—	—	0.46 (J)	—	0.71 (J)	—	—	—	—	—	—	—	—
0333-96-0685	33-01682	1.0–2.0	Qbo	0.0029 (J)	—	—	—	—	1	—	0.92	—	—	—	—	—	—	—	—
0333-96-0669	33-01683	0.0–0.5	Sed	NA	—	—	—	0.06 (J)	0.91	—	1	NA	NA	NA	—	NA	NA	NA	NA
0333-96-0670	33-01684	0.0–0.5	Fill	NA	—	—	—	—	0.076 (J)	—	0.19 (J)	NA	NA	NA	—	NA	NA	NA	NA
0333-96-0671	33-01685	0.0–0.5	Soil	NA	—	—	—	—	0.064 (J)	—	0.11 (J)	NA	NA	NA	—	NA	NA	NA	NA
SWMU 33-017																			
0333-96-0130	33-01585	0.0–0.5	Fill	—	—	0.049 (J)	—	0.062 (J)	1.6	—	1.2	—	—	—	—	—	—	—	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	0.46	—	0.72	—	—	—	—	—	—	—	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	—	—	0.48	—	—	—	—	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	—	0.11 (J)	—	—	0.22 (J)	3.7	—	3.3	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	0.54 (J)	—	0.99 (J)	—	—	—	—	—	—	—	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	—	—	0.48	—	—	—	—	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	—	—	—	0.2 (J)	—	0.8 (J)	—	—	—	—	—	—	—	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	—	—	0.42 (J)	—	—	—	—	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	—	—	—	—	0.33 (J)	2.1	—	2.1	—	—	—	—	—	—	—	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	—	—	0.15 (J)	—	—	—	—	—	—	—	—
0333-96-0140	33-01595	0.0–0.5	Fill	—	0.15 (J)	—	—	0.51	7.1	—	5.1	—	—	—	—	—	—	—	—
0333-96-0141	33-01596	0.0–0.5	Fill	—	—	—	—	—	1	—	1.1	—	—	—	—	—	—	—	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	—	—	—	—	—	0.79	—	0.81	—	—	—	—	—	—	—	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	0.13 (J)	—	0.24 (J)	—	—	—	—	—	—	—	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	—	—	0.2 (J)	—	—	—	—	—	—	—	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	0.14 (J)	—	0.38	—	—	—	—	—	—	—	—
0333-96-0149	33-01604	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0151	33-01606	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0152	33-01607	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0157	33-01612	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0159	33-01614	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0160	33-01615	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0161	33-01616	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-001																			
0333-96-2042	33-01748	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2043	33-01749	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2045	33-01751	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2046	33-01752	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-003																			
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00056 (J+)	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00045 (J)	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00045 (J+)	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.0007 (J+)	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	0.002 (J)	—	—	—	—	—	—	—	—	0.00062 (J)	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00076 (J+)	—	—	0.00025 (J+)	—	—
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	0.064 (J)	—	—	0.00085 (J+)	—	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	—	—	0.41 (J)	—	—	—	—	—	0.00067 (J)	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.0004 (J+)	—	—	0.00076 (J+)	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	—	—	—	—	—	3 (J)	—	4 (J)	—	—	—	—	—	—	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	0.52	—	0.71	—	—	—	—	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] — = Result was not detected.

[b] NA = Not analyzed.

Table 4.1-4
Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
SWMU 33-002(a)												
0333-96-0525	33-01652	1.0–1.5	Soil	NA[c]	NA	—[d]	—	NA	1.98864	—	NA	NA
0333-96-0526	33-01652	3.08–4.08	Soil	NA	NA	—	—	NA	7.09863	—	NA	NA
0333-96-0546	33-01652	6.0–7.0	Qbt 4	NA	NA	NA	NA	NA	1.50206	—	NA	NA
0333-96-0527	33-01652	12.5–12.9	Soil	NA	NA	—	—	NA	5.28672	—	NA	NA
0333-96-0528	33-01652	15.08–16.08	Soil	NA	NA	NA	NA	NA	4.96459	—	NA	NA
0333-96-0529	33-01652	23.42–24.0	Qbt 2	NA	NA	NA	NA	NA	1.80899	—	NA	NA
0333-96-0531	33-01652	30.08–31.08	Qbt 2	NA	NA	NA	NA	NA	1.09728	—	NA	NA
0333-96-0537	33-01652	61.0–61.83	Qbt 2	NA	NA	NA	NA	NA	0.815294	—	NA	NA
0333-96-0534	33-01652	73.42–74.58	Qbt 2	NA	NA	NA	NA	NA	0.613415	—	NA	NA
0333-96-0540	33-01652	76.92–77.5	Qbt 2	NA	NA	NA	NA	NA	0.748673	—	NA	NA
0333-96-0543	33-01652	92.5–93.5	Qbt 4	NA	NA	NA	NA	NA	0.807143	—	NA	NA
0333-96-0547	33-01652	113.0–113.67	Qbt 4	NA	NA	NA	NA	NA	0.75451	—	NA	NA
0333-96-0548	33-01652	117.5–118.33	Qbt 4	NA	NA	NA	NA	NA	0.797231	—	NA	NA
0333-96-0043	33-01696	2.33–3.0	Soil	NA	NA	—	—	NA	5.51375	—	NA	NA
0333-96-0044	33-01696	8.25–8.75	Soil	NA	NA	—	—	NA	1.79177	—	NA	NA
0333-96-0045	33-01696	12.58–13.17	Qbt 3	NA	NA	—	—	NA	0.641785	—	NA	NA
0333-96-0046	33-01696	19.0–19.58	Qbt 3	NA	NA	NA	NA	NA	1.53038	—	NA	NA
0333-96-0047	33-01696	24.0–25.0	Qbt 2	NA	NA	NA	NA	NA	1.61283	—	NA	NA
0333-96-0048	33-01696	26.0–26.5	Qbt 2	NA	NA	NA	NA	NA	1.86087	—	NA	NA

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-60743	33-24716	3.0–3.5	Qbt 3	—	—	—	—	—	74.13	—	0.2453	—
RE33-05-60747	33-24716	5.0–5.5	Qbt 3	—	—	—	—	—	43.4	—	—	—
RE33-05-60745	33-24717	3.0–3.5	Qbt 3	—	—	—	—	—	42.97	—	—	—
RE33-05-60749	33-24717	5.0–5.5	Qbt 3	—	—	0.1484	—	—	84.68	—	—	—
RE33-05-60744	33-24718	3.0–3.5	Qbt 3	—	—	—	—	—	60.78	—	—	—
RE33-05-60748	33-24718	5.0–5.5	Qbt 3	—	—	—	—	—	236.2	—	—	—
RE33-05-60746	33-24719	3.0–3.5	Qbt 3	—	—	—	—	—	229.1	—	—	—
RE33-05-60750	33-24719	5.0–5.5	Qbt 3	—	—	—	—	—	57.54	—	—	—
RE33-05-60751	33-24720	3.0–3.5	Qbt 3	—	—	—	—	—	102.1	—	—	—
RE33-05-60752	33-24720	5.0–5.5	Qbt 3	—	—	—	—	—	49.2	—	—	—
RE33-05-60753	33-24721	3.0–3.5	Qbt 3	—	—	—	—	—	116.2	—	—	—
RE33-05-60755	33-24722	3.0–3.5	Qbt 3	—	—	—	—	—	4249	—	—	—
RE33-05-60756	33-24722	5.0–5.5	Qbt 3	—	—	—	—	—	765.2	—	—	1.96176 (J-)
RE33-05-60757	33-24723	3.0–3.5	Qbt 3	—	—	—	—	—	306	—	—	—
RE33-05-60758	33-24723	5.0–5.5	Qbt 3	—	—	—	—	—	217.4	—	—	—
RE33-05-60759	33-24724	2.0–2.5	Fill	—	—	—	—	—	12.6	—	—	—
RE33-05-60760	33-24724	4.0–4.5	Qbt 3	—	—	—	—	—	33	—	—	—
RE33-05-60761	33-24725	8.0–8.5	Fill	—	—	—	—	—	199	—	—	—
RE33-05-60762	33-24725	10.0–10.5	Qbt 3	—	—	—	—	—	42.5	—	—	—
RE33-05-60763	33-24726	3.0–3.5	Fill	—	—	—	—	—	204	—	—	—
RE33-05-60764	33-24726	5.0–5.5	Qbt 3	—	—	—	—	—	177	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-63010	33-25097	3.0–3.5	Fill	—	—	—	—	—	547.488	—	—	—
RE33-05-63011	33-25097	5.0–5.5	Fill	—	—	—	—	—	385.926	—	—	—
RE33-05-63012	33-25098	3.0–3.5	Fill	0.1967 (J-)	—	—	0.13849 (J+)	—	963.725	—	—	—
RE33-05-63013	33-25098	5.0–5.5	Fill	—	—	—	—	—	1010.44	—	—	—
RE33-05-63195	33-25107	5.0–5.5	Fill	—	—	—	—	—	1874.71	—	—	—
RE33-05-63196	33-25107	7.0–7.5	Fill	—	—	—	—	—	500.205	—	—	—
RE33-05-63197	33-25108	5.0–5.5	Fill	—	—	—	—	—	6120.08	—	—	—
RE33-05-63198	33-25108	7.0–7.5	Fill	—	—	—	—	—	278.045	—	—	—
RE33-05-63199	33-25109	5.0–5.5	Fill	—	—	—	—	—	1279.12	—	—	—
RE33-05-63200	33-25109	7.0–7.5	Fill	—	—	—	—	—	337.442	—	—	—
RE33-05-63201	33-25110	3.0–3.5	Fill	—	—	—	—	—	2207.25	—	—	—
RE33-05-63202	33-25110	5.0–5.5	Fill	—	—	—	—	—	1389.63	—	—	—
RE33-05-63203	33-25111	4.0–4.5	Fill	—	—	—	—	—	725.477	—	—	—
RE33-05-63204	33-25111	6.0–6.5	Fill	—	—	—	—	—	283.174	—	—	—
RE33-05-63205	33-25112	5.0–5.5	Fill	—	—	0.40388 (J+)	—	—	330.88	—	—	—
RE33-05-63206	33-25112	7.0–7.5	Fill	—	—	—	—	—	344.783	—	—	—
RE33-05-63207	33-25113	5.0–5.5	Fill	—	—	—	—	—	992.573	—	—	—
RE33-05-63208	33-25113	7.0–7.5	Fill	—	—	—	—	—	350.082	—	—	—
RE33-05-63209	33-25114	3.0–3.5	Fill	—	—	—	—	—	520.774	—	—	—
RE33-05-63210	33-25114	5.0–5.5	Fill	—	—	—	—	—	542.635	—	—	—
RE33-05-63211	33-25115	4.0–4.5	Fill	—	—	—	—	—	354.12	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-63212	33-25115	6.0–6.5	Fill	—	—	—	—	—	232.03	—	—	—
RE33-05-63213	33-25116	3.0–3.5	Fill	—	—	—	—	—	1605.49	—	—	—
RE33-05-63214	33-25116	5.0–5.5	Fill	—	—	—	—	—	363.769	—	—	—
RE33-05-63215	33-25117	5.0–5.5	Fill	—	—	—	—	—	392.076	—	—	—
RE33-05-63216	33-25117	7.0–7.5	Fill	—	—	—	—	—	814.007	—	—	—
SWMU 33-002(b)												
0333-96-0070	33-01328	10.0–15.0	Qbt 3	NA	NA	—	—	NA	73059.7	—	NA	NA
0333-96-0071	33-01328	16.0–16.33	Qbt 3	NA	NA	NA	NA	NA	5456.28	—	NA	NA
0333-96-0072	33-01328	21.5–22.5	Qbt 3	NA	NA	NA	NA	NA	773.418	—	NA	NA
0333-96-0073	33-01328	26.25–27.25	Qbt 2	NA	NA	NA	NA	NA	779.825	—	NA	NA
0333-96-0500	33-01328	30.0–31.25	Qbt 2	NA	NA	NA	NA	NA	832.595	—	NA	NA
0333-96-0501	33-01328	36.0–36.75	Qbt 2	NA	NA	NA	NA	NA	1000.22	—	NA	NA
0333-96-0502	33-01328	40.0–41.0	Qbt 2	NA	NA	NA	NA	NA	1474.45	—	NA	NA
0333-96-0503	33-01328	43.0–45.0	Qbt 2	NA	NA	NA	NA	NA	4133.53	—	NA	NA
0333-96-0506	33-01328	59.5–60.0	Qbt 2	NA	NA	NA	NA	NA	198.919	—	NA	NA
0333-96-0509	33-01328	71.75–72.0	Qbt 2	NA	NA	NA	NA	NA	142	—	NA	NA
0333-96-0512	33-01328	87.5–88.5	Qbt 4	NA	NA	NA	NA	NA	74.6193	—	NA	NA
0333-96-0515	33-01328	102.5–103.5	Qbt 4	NA	NA	NA	NA	NA	20.3685	—	NA	NA
0333-96-0516	33-01328	109.0–110.0	Qbt 4	NA	NA	NA	NA	NA	8.21441	—	NA	NA
0333-96-0517	33-01328	114.0–115.0	Qbt 4	NA	NA	NA	NA	NA	2.1388	—	NA	NA
0333-96-0518	33-01328	116.5–117.5	Qbt 4	NA	NA	NA	NA	NA	3.11641	—	NA	NA

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-62977	33-25082	3.0–3.5	Qbt 3	—	—	—	—	0.23	177	—	0.119	—
RE33-05-62978	33-25082	5.0–5.5	Qbt 3	—	—	—	—	—	262	—	—	—
RE33-05-62979	33-25083	3.0–3.5	Qbt 3	—	—	—	—	—	71.2	—	—	—
RE33-05-62980	33-25083	5.0–5.5	Qbt 3	—	—	—	—	—	314	—	—	—
RE33-05-62981	33-25084	3.0–3.5	Qbt 3	—	—	—	—	—	1060	—	—	—
RE33-05-62982	33-25084	5.0–5.5	Qbt 3	—	—	—	—	—	1170	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	3000	—	—	—
RE33-05-62988	33-25087	12.0–12.5	Qbt 3	—	—	—	—	—	1560	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	3030	—	—	—
RE33-05-63000	33-25092	2.0–2.5	Fill	—	—	—	—	—	657.61	—	—	—
RE33-05-63001	33-25092	4.0–4.5	Qbt 3	—	—	—	—	0.21	3298.81	—	—	—
RE33-05-63002	33-25093	3.0–3.5	Qbt 3	—	—	—	—	—	317.74	—	—	—
RE33-05-63003	33-25093	5.0–5.5	Qbt 3	—	—	—	—	0.33	2873.28	—	—	—
RE33-05-63004	33-25094	4.0–4.5	Qbt 3	0.2345 (J-)	—	—	—	—	393.62	—	—	—
RE33-05-63005	33-25094	6.0–6.5	Qbt 3	—	—	—	—	0.49	2894.5	—	—	—
RE33-05-63006	33-25095	4.0–4.5	Fill	—	—	—	—	—	712.28	—	—	—
RE33-05-63007	33-25095	6.0–6.5	Qbt 3	0.17945 (J-)	—	—	—	—	3550.7	—	—	—
RE33-05-63008	33-25096	4.0–4.5	Fill	—	—	—	—	—	488.996	—	—	—
RE33-05-63009	33-25096	6.0–6.5	Qbt 3	—	—	—	—	—	411.072	—	—	—
RE33-05-63227	33-25123	5.0–5.5	Qbt 3	—	—	—	—	—	3.93 (J-)	—	—	—
RE33-05-63228	33-25123	7.0–7.5	Qbt 3	—	—	—	—	—	1.29	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-63229	33-25124	4.0–4.5	Qbt 3	—	—	—	—	—	0.766 (J-)	—	—	—
RE33-05-63230	33-25124	6.0–6.5	Qbt 3	—	—	—	—	—	0.548	—	—	—
RE33-05-63231	33-25125	5.0–5.5	Qbt 3	—	—	—	—	—	1.49 (J-)	—	0.17	—
RE33-05-63232	33-25125	7.0–7.5	Qbt 3	—	—	—	—	—	0.739	—	—	—
SWMU 33-002(c)												
0333-96-0076	33-01697	10.0–12.5	Qbt 3	NA	NA	0.002	—	NA	113.143	NA	NA	NA
0333-96-0049	33-01697	19.17–19.5	Qbt 3	NA	NA	NA	NA	NA	144.411	NA	NA	NA
0333-96-0050	33-01697	23.75–24.17	Qbt 2	NA	NA	NA	NA	NA	131.889	NA	NA	NA
0333-96-0051	33-01697	28.0–29.0	Qbt 2	NA	NA	NA	NA	NA	141.676	NA	NA	NA
0333-96-0052	33-01697	31.42–31.83	Qbt 2	NA	NA	NA	NA	NA	81.7718	NA	NA	NA
0333-96-0053	33-01697	36.0–36.42	Qbt 2	NA	NA	NA	NA	NA	53.9011	NA	NA	NA
0333-96-0054	33-01697	40.0–40.58	Qbt 2	NA	NA	NA	NA	NA	31.6342	NA	NA	NA
0333-96-0055	33-01697	47.5–48.5	Qbt 2	NA	NA	NA	NA	NA	25.8137	NA	NA	NA
0333-96-0056	33-01697	51.83–52.0	Qbt 2	NA	NA	NA	NA	NA	17.6965	NA	NA	NA
0333-96-0057	33-01697	57.5–58.5	Qbt 2	NA	NA	NA	NA	NA	13.5823	NA	NA	NA
0333-96-0058	33-01697	61.42–62.17	Qbt 2	NA	NA	NA	NA	NA	10.3356	NA	NA	NA
RE33-05-60765	33-24727	4.0–4.5	Qbt 3	0.6379 (J-)	—	—	—	—	313.7	—	—	—
RE33-05-60766	33-24727	6.0–6.5	Qbt 3	—	—	—	—	1.28 (J-)	342.2	—	—	—
RE33-05-60767	33-24728	3.0–3.5	Qbt 3	—	—	—	—	0.82 (J-)	24960	—	—	—
RE33-05-60768	33-24728	5.0–5.5	Qbt 3	—	—	0.1864 (J-)	—	—	883.1	—	—	—
RE33-05-60769	33-24729	3.0–3.5	Qbt 3	—	—	—	—	—	1618	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-60770	33-24729	5.0–5.5	Qbt 3	—	—	—	—	—	85.08	—	—	—
RE33-05-62984	33-25085	12.0–12.5	Qbt 3	—	—	—	—	—	30.8	—	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	0.048	—	—	—	NA	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	0.1263	—	—	29.4	—	—	—
RE33-05-63217	33-25118	2.0–2.5	Qbt 3	—	—	—	—	0.38 (J+)	8468.51	—	—	—
RE33-05-63218	33-25118	4.0–4.5	Qbt 3	—	—	—	—	—	1588.43	—	—	—
RE33-05-63219	33-25119	5.0–5.5	Qbt 3	—	—	—	0.0972 (J+)	—	143.93	—	—	—
RE33-05-63220	33-25119	7.0–7.5	Qbt 3	—	—	0.082	—	—	201.492	—	—	—
RE33-05-63221	33-25120	5.0–5.5	Qbt 3	—	—	—	—	—	416.672	—	—	—
RE33-05-63222	33-25120	7.0–7.5	Qbt 3	—	—	—	—	—	79.6216	—	—	—
RE33-05-63223	33-25121	5.0–5.5	Qbt 3	—	—	—	—	—	132.639	—	—	—
RE33-05-63224	33-25121	7.0–7.5	Qbt 3	—	—	—	—	—	150.907	—	—	—
RE33-05-63225	33-25122	4.0–4.5	Qbt 3	—	—	—	—	—	1681.4	—	—	—
RE33-05-63226	33-25122	6.0–6.5	Qbt 3	—	—	—	—	—	184.57	—	—	—
AOC C-33-003												
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	4.67	—	4.86
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	—	3.83	—	3.83

Notes: Units are pCi/g. Data qualifiers are defined in Appendix A.

[a] BVs/FVs from LANL 1998, 059730.

[b] na = Not available.

[c] NA = Not analyzed.

[d] — = Result was not detected or was below the BV/FV.

Table 4.1-5
Summary of Phase I and Phase II RFI Sampling Locations at SWMU 33-017 to be Resampled

Location ID	Basis for Resampling
33-01102	Zinc 15 times BV
33-01104	Cadmium 6 times BV, chromium 4 times BV, lead 8 times BV, nickel 5 times BV, zinc 35 times BV
33-01105	Nickel 6 times BV
33-01106	Cadmium 4 times BV, lead 4 times BV, silver 9 times BV, zinc 7 times BV
33-01107	Cadmium 4 times BV, lead 9 times BV, silver 46 times BV, zinc 7 times BV, 19.2 pCi/g tritium
33-01109	27.6 pCi/g tritium
33-01113	27.9 pCi/g tritium
33-01114	Cadmium 8 times BV, zinc 15 times BV
33-01116	Cadmium 3 times BV, 42.4 pCi/g tritium
33-01120	Cadmium 4 times BV, lead 40 times BV, zinc 4 times BV
33-01128	Nickel 4 times BV, uranium 23 times BV
33-01130	Nickel 30 times BV
33-01135	Lead 4 times BV
33-01145	43.6 pCi/g tritium
33-01146	Lead 1031 times BV
33-01152	Cadmium 13 times BV, silver 5 times BV
33-01156	Cadmium 7 times BV
33-01166	Cadmium 3 times BV, 10.4 pCi/g tritium
33-01604	Detected PCBs (0.12 mg/kg Aroclor-1254, 0.13 mg/kg Aroclor-1260)
33-01606	Detected PCBs (0.083 mg/kg Aroclor-1254, 0.099 mg/kg Aroclor-1260)
33-01607	Detected PCBs (0.18 mg/kg Aroclor-1254, 0.29 mg/kg Aroclor-1260)
33-01612	Detected PCBs (5.5 mg/kg Aroclor-1260)
33-01614	Detected PCBs (1.4 mg/kg Aroclor-1254, 0.87 mg/kg Aroclor-1260)
33-01615	Detected PCBs (0.85 mg/kg Aroclor-1254, 0.92 mg/kg Aroclor-1260)
33-01616	Detected PCBs (3.7 mg/kg Aroclor-1260)

Table 4.2-1
Summary of Decision-Level Samples Collected
and Analyses Requested for Previous Investigations at TA-33 Area 6

Sample ID	Location ID	Depth (ft)	Media	Isotopic Uranium
SWMU 33-007(c)				
0333-96-0179	33-01622	1.0–8.0	Soil	2136*
0333-96-0180	33-01622	1.0–8.0	Soil	2136
0333-96-0181	33-01637	1.0–8.0	Soil	2136
0333-96-0182	33-01638	1.0–8.0	Fill	2136
0333-96-0183	33-01639	1.0–8.0	Fill	2136
0333-96-0184	33-01640	1.0–8.0	Fill	2136
0333-96-0185	33-01641	1.0–8.0	Fill	2136
0333-96-0186	33-01642	1.0–8.0	Fill	2136
0333-96-0187	33-01643	1.0–8.0	Fill	2136
0333-96-0188	33-01644	1.0–8.0	Fill	2136

*Analytical request number.

Table 4.3-1
Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft)	Media	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	SVOC	Tritium	VOC
Consolidated Unit 33-001(a)-99												
0333-96-0549	33-01653	1.17–1.92	Soil	—[a]	2332[b]	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0553	33-01654	1.0–2.0	Soil	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0555	33-01654	24.0–25.0	Qbt 2	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
SWMU 33-004(b)												
0333-95-0081	33-01548	8.5–10.5	Qbt 2	1658	—	—	—	—	1658, 1659	1657	—	1657
SWMU 33-007(b)												
0333-95-0078	33-01405	0.0–0.5	Fill	—	—	—	—	—	1504	—	—	—
0333-95-0079	33-01406	0.0–0.5	Fill	—	—	—	—	—	1504	—	—	—
0333-95-0080	33-01411	0.0–0.5	Fill	—	—	—	—	—	1504	—	—	—
RE33-99-0001	33-01700	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0002	33-01701	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0003	33-01702	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0004	33-01703	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0063	33-01718	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—

Table 4.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	SVOC	Tritium	VOC
RE33-99-0064	33-01719	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0018	XX-33-604073	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0050	XX-33-604073	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0051	XX-33-604073	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
SWMU 33-008(a)												
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0004	33-01665	2.5–3.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0005	33-01665	3.0–3.5	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0006	33-01665	4.0–5.0	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0007	33-01666	0.0–1.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0008	33-01666	1.0–2.5	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0009	33-01666	2.5–3.5	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0010	33-01666	4.0–5.0	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0012	33-01667	2.5–5.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0013	33-01667	7.5–10.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0014	33-01667	10.0–12.5	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0015	33-01668	2.5–3.5	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0016	33-01668	5.0–6.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0017	33-01668	6.0–7.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0018	33-01668	8.5–10.0	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—

Table 4.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	SVOC	Tritium	VOC
SWMU 33-010(c)												
RE33-99-0005	33-01704	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0006	33-01705	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0007	33-01706	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0008	33-01707	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0065	33-01720	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0066	33-01721	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0067	33-01722	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0052	XX-33-604074	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0053	XX-33-604074	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0054	XX-33-604074	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—

[a] — = Analysis not requested.

[b] Analytical request number.

Table 4.3-2
Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft bgs)	Media	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide	Iron	Lead	Nickel	Selenium	Silver	Thallium	Uranium	Zinc
Soil BV[a]				**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**15.4**	**1.52**	**1**	**0.73**	**1.82**	**48.8**
Qbo BV[a]				**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**2**	**0.3**	**1**	**1.22**	**0.72**	**40**
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**6.58**	**0.3**	**1**	**1.1**	**2.4**	**63.5**
Sediment BV[a]				**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**9.38**	**0.3**	**1**	**0.73**	**2.22**	**60.2**
Consolidated Unit 33-001(a)-99																				
0333-96-0550	33-01653	17.00–17.42	Qbt 3	0.54 (UJ)	—[b]	—	8860	—	—	—	—	—	—	—	—	0.53 (J)	—	—	—	—
0333-96-0551	33-01653	24.0–25.0	Qbt 2	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
0333-96-0552	33-01653	39.0–40.0	Qbt 4	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	3.2	—
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	7330	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0554	33-01654	14.0–15.0	Qbt 3	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
0333-96-0555	33-01654	24.0–25.0	Qbt 2	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
0333-96-0556	33-01654	39.0–40.0	Qbt 4	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	3.4	—
SWMU 33-004(b)																				
0333-95-0081	33-01548	8.5–10.5	Qbt 2	3.2 (UJ)	—	—	—	2960	22	—	—	1.1	—	—	—	0.32 (U)	—	—	3.5	—
SWMU 33-007(b)																				
0333-95-0078	33-01405	0.0–0.5	Fill	—	—	—	—	—	—	—	18.2	—	—	23.4	—	—	—	—	—	—
0333-95-0080	33-01411	0.0–0.5	Fill	—	—	—	0.5 (J)	—	24.3	10.3	—	—	—	—	—	—	—	—	—	—
RE33-99-0001	33-01700	0.0–0.5	Soil	—	—	—	0.78 (J)	—	—	—	—	—	—	68.5 (J-)	—	—	—	—	—	—
RE33-99-0002	33-01701	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.8 (J)	—	—
RE33-99-0063	33-01718	0.0–0.5	Sed	—	—	—	—	—	—	—	15.5	—	—	—	17.3	0.94 (J)	—	—	—	—
RE33-99-0064	33-01719	0.0–0.5	Sed	—	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
SWMU 33-008(a)																				
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	—	—	7980	—	—	36.8	—	—	—	—	—	—	—	3.49	—
0333-96-0004	33-01665	2.5–3.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.4	—
0333-96-0005	33-01665	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.42	—
0333-96-0006	33-01665	4.0–5.0	Qbo	0.55 (UJ)	1.9 (J)	—	—	—	—	—	—	—	5470	—	—	0.45 (U)	—	—	2.45	—
0333-96-0007	33-01666	0.0–1.0	Fill	—	—	—	0.48 (U)	—	—	—	45.2	—	—	—	—	—	—	—	7.4	—
0333-96-0008	33-01666	1.0–2.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.67	—
0333-96-0009	33-01666	2.5–3.5	Qbo	0.57 (UJ)	1.2 (J)	—	—	—	—	—	—	—	4910	—	—	0.47 (U)	—	—	3.96	—
0333-96-0010	33-01666	4.0–5.0	Qbo	0.58 (UJ)	1.2 (J)	—	—	—	—	—	—	—	4860	—	—	0.47 (U)	—	—	2.69	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.58	—
0333-96-0012	33-01667	2.5–5.0	Fill	—	—	—	—	7360	—	—	—	—	—	—	—	—	—	—	2.71	108
0333-96-0013	33-01667	7.5–10.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.82	207
0333-96-0014	33-01667	10.0–12.5	Qbo	0.55 (UJ)	1.1 (J)	—	—	—	—	—	—	—	4750	—	—	0.45 (U)	—	—	2.42	202

Table 4.3-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide	Iron	Lead	Nickel	Selenium	Silver	Thallium	Uranium	Zinc
Soil BV[a]				**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**0.5**	**0.5**	**21500**	**0.1**	**1.52**	**1**	**0.73**	**1.82**	**48.8**
Qbo BV[a]				**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**2**	**0.3**	**1**	**1.22**	**0.72**	**40**
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**6.58**	**0.3**	**1**	**1.1**	**2.4**	**63.5**
Sediment BV[a]				**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**9.38**	**0.3**	**1**	**0.73**	**2.22**	**60.2**
0333-96-0015	33-01668	2.5–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.37	—
0333-96-0016	33-01668	5.0–6.0	Fill	—	—	—	—	—	—	—	19.7	—	—	—	—	—	—	—	9.1	—
0333-96-0017	33-01668	6.0–7.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.06	—
0333-96-0018	33-01668	8.5–10.0	Qbo	0.55 (UJ)	1.6 (J)	—	—	—	—	—	—	—	5000	—	—	0.45 (U)	—	—	2.66	—
SWMU 33-010(c)																				
RE33-99-0005	33-01704	0.0–0.5	Soil	—	—	—	—	—	—	—	116	—	—	—	—	—	—	—	—	—
RE33-99-0006	33-01705	0.0–0.5	Soil	0.91 (U)	—	—	—	—	—	—	44.7	—	—	—	—	—	—	—	—	—
RE33-99-0007	33-01706	0.0–0.5	Soil	0.86 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0065	33-01720	0.0–0.5	Sed	—	—	130	—	—	—	—	581	—	—	—	—	0.46 (U)	4.6	—	—	—
RE33-99-0066	33-01721	0.0–0.5	Sed	—	—	—	—	—	—	—	570	—	—	—	—	0.89 (J)	—	—	—	—
RE33-99-0067	33-01722	0.0–0.5	Sed	—	—	—	—	—	—	—	270	—	—	—	—	0.44 (U)	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

Table 4.3-3
Organic Chemicals Detected in Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene
Consolidated Unit 33-001(a)-99																		
0333-96-0549	33-01653	1.17–1.92	Soil	—[a]	—	—	—	—	—	—	—	—	0.7 (J)	—	—	—	—	—
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	—	—	—	—	—	—	—	—	0.13 (J)	—	—	—	—	—
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	—	—	—	—	—	—	—	—	0.13 (J)	—	—	—	—	—
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	—	—	—	—	—	—	0.19 (J)	—	—	—	—	—
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	—	0.016 (J)	—	—	—	—	—	—	1.1 (J-)	—	—	—	—	—
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	—	0.014 (J)	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-004(b)																		
0333-95-0081	33-01548	8.5–10.5	Qbt 2	—	—	—	—	—	—	—	—	—	0.803	—	—	—	—	—
SWMU 33-007(b)																		
RE33-99-0017	XX-33-604073	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-008(a)																		
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	—	—	—	—	1.4 (J)	—	—	0.55 (J)	—	—	0.18 (J)	—	—
0333-96-0004	33-01665	2.5–3.0	Fill	0.75 (J-)	0.83 (J-)	—	2.6 (J-)	5.1 (J-)	2.5 (J-)	3.8 (J-)	1.1 (J-)	1.8 (J-)	0.53 (J)	1.6 (J-)	—	5.7 (J-)	—	0.44 (J-)
0333-96-0005	33-01665	3.0–3.5	Fill	0.36 (J-)	—	—	1.1 (J-)	1.8 (J-)	0.9 (J-)	0.44 (J-)	0.41 (J-)	0.6 (J)	—	0.98 (J-)	—	1.9 (J-)	—	—
0333-96-0007	33-01666	0.0–1.0	Fill	0.58 (J-)	—	—	2 (J-)	0.71 (J-)	0.51 (J-)	0.66 (J-)	—	0.32 (J)	—	0.62 (J-)	—	1.3 (J-)	—	—
0333-96-0008	33-01666	1.0–2.5	Fill	0.15 (J)	—	—	0.23 (J)	0.14 (J)	0.078 (J)	—	—	—	—	0.099 (J)	—	0.17 (J)	—	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	0.071 (J)	—
0333-96-0012	33-01667	2.5–5.0	Fill	0.24 (J)	—	—	0.3 (J)	0.16 (J)	—	—	—	NA[b]	0.17 (J)	0.22 (J)	—	0.2 (J)	—	—
0333-96-0013	33-01667	7.5–10.0	Fill	NA	—	—	0.35 (J)	0.3 (J)	NA	0.15 (J)	NA	—	NA	0.14 (J)	NA	0.26 (J)	NA	NA
0333-96-0015	33-01668	2.5–3.5	Fill	0.16 (J)	—	—	0.44 (J)	0.28 (J)	—	0.14 (J)	—	NA	—	0.22 (J)	—	0.41 (J)	—	—
0333-96-0016	33-01668	5.0–6.0	Fill	4.2	0.76 (J)	—	4.9	3.2 (J)	1.6 (J)	2.3 (J)	—	1.2 (J)	—	3.5	—	3.7	—	—
0333-96-0017	33-01668	6.0–7.0	Fill	0.55 (J)	—	—	0.41 (J)	0.37 (J)	0.18 (J)	0.16 (J)	—	—	—	0.34 (J)	0.74 (J)	0.38 (J)	—	—
0333-96-0018	33-01668	8.5–10.0	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Dibenzofuran	Dinitrobenzene[1,3-]	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Naphthalene	Phenanthrene	Pyrene	Toluene	Trichlorobenzene[1,2,3-]	Trichlorobenzene[1,2,4-]	Trinitrobenzene[1,3,5-]
Consolidated Unit 33-001(a)-99																
0333-96-0549	33-01653	1.17–1.92	Soil	—	—	—	—	—	—	—	—	—	0.0042 (J+)	—	—	—
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	—	—	—	—	—	0.003 (J)	—	—	—	—	—	—
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	—	—	—	0.003 (J-)	—	—	—	0.005 (J-)	0.003 (J-)	—
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-004(b)																
0333-95-0081	33-01548	8.5–10.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—
33-007(b)																
RE33-99-0017	XX-33-604073	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	0.00093 (J)	—	—	—
33-008(a)																
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	0.38 (J)	—	—	—	—	0.34 (J)	0.33 (J)	—	—	—	—
0333-96-0004	33-01665	2.5–3.0	Fill	0.54 (J-)	—	27 (J-)	0.86 (J-)	1.3 (J-)	—	—	5.7 (J-)	15 (J-)	—	—	—	—
0333-96-0005	33-01665	3.0–3.5	Fill	—	—	9.5 (J-)	0.4 (J-)	0.43 (J-)	—	—	3.5 (J-)	5.4 (J-)	—	—	—	—
0333-96-0007	33-01666	0.0–1.0	Fill	0.44 (J-)	—	1.6 (J-)	0.6 (J-)	—	—	0.37 (J-)	1.8 (J-)	1.4 (J-)	—	—	—	—
0333-96-0008	33-01666	1.0–2.5	Fill	0.11 (J)	—	0.51	0.15 (J)	—	—	—	0.68	0.38	—	—	—	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0012	33-01667	2.5–5.0	Fill	0.17 (J)	—	0.97	0.26 (J)	—	—	—	1.5	0.7	—	—	—	—
0333-96-0013	33-01667	7.5–10.0	Fill	NA	—	1.5	NA	NA	NA	NA	1.2	0.99	—	—	—	—
0333-96-0015	33-01668	2.5–3.5	Fill	—	—	0.63 (J)	0.18 (J)	—	—	0.4 (J)	0.75	0.58 (J)	—	—	—	—
0333-96-0016	33-01668	5.0–6.0	Fill	2.8 (J)	—	11	4.2	—	3.2 (J)	11	15	8.4	—	—	—	—
0333-96-0017	33-01668	6.0–7.0	Fill	0.36 (J)	—	1.3	0.5 (J)	—	0.41 (J)	1.1	1.8	0.96	—	—	—	—
0333-96-0018	33-01668	8.5–10.0	Qbo	—	—	—	—	—	—	—	0.074 (J)	—	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] — = Result was not detected.

[b] NA = Not analyzed.

Table 4.3-4
Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft bgs)	Media	Cesium-137	Plutonium-238	Plutonium-239/240	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**1.65**	**0.023**	**0.054**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Sediment BV/FV[a]				**0.9**	**0.006**	**0.068**	**0.093**	**2.59**	**0.2**	**2.29**
Consolidated Unit 33-001(a)-99										
0333-96-0549	33-01653	1.17–1.92	Soil	—[c]	—	—	0.0904823	NA[d]	NA	NA
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	—	—	0.560725	NA	NA	NA
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	—	—	0.0431174	NA	NA	NA
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	—	—	0.0416466	NA	NA	NA
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	0.0437782	NA	NA	NA
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	—	—	0.0442105	NA	NA	NA
0333-96-0555	33-01654	24.0–25.0	Qbt 2	—	—	—	0.0937908	NA	NA	NA
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	—	—	0.0757325	NA	NA	NA
SWMU 33-007(b)										
RE33-99-0001	33-01700	0.0–0.5	Soil	NA	NA	NA	NA	2.82	—	3.36
RE33-99-0004	33-01703	0.0–0.5	Soil	NA	NA	NA	NA	7.35	0.314	7.15
SWMU 33-010(c)										
RE33-99-0005	33-01704	0.0–0.5	Soil	NA	NA	NA	NA	4.62	0.269	4.54
RE33-99-0006	33-01705	0.0–0.5	Soil	NA	NA	NA	NA	9.78	0.5	9.41
RE33-99-0008	33-01707	0.0–0.5	Soil	NA	NA	NA	NA	4.05	0.221	3.94
RE33-99-0065	33-01720	0.0–0.5	Sed	NA	NA	NA	NA	16.3	0.76	17.2

Table 4.3-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Cesium-137	Plutonium-238	Plutonium-239/240	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil/ BV/FV[a]				**1.65**	**0.023**	**0.054**	**na**[b]	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Sediment BV/FV[a]				**0.9**	**0.006**	**0.068**	**0.093**	**2.59**	**0.2**	**2.29**
RE33-99-0066	33-01721	0.0–0.5	Sed	—	—	—	—	13.7	0.785	14.35
RE33-99-0067	33-01722	0.0–0.5	Sed	—	—	—	—	4.86	0.3	5.57
RE33-99-0052	33-604074	0.0–0.5	Fill	—	—	—	—	21.4	1.12	24.4
RE33-99-0053	33-604074	0.0–0.5	Fill	—	—	—	—	21.2	1.173	23.8
RE33-99-0054	33-604074	0.0–0.5	Fill	—	—	—	—	17	0.864	19.5

Notes: Units are pCi/g. Data qualifiers are defined in Appendix A.

[a] BVs/FVs from LANL 1998, 059730.

[b] na = Not available.

[c] — = Result was not detected or was below the BV/FV.

[d] NA = Not analyzed.

Table 5.0-1
Summary of Investigation Methods

Method	Summary
Locating Utilities	Excavation/Soil Disturbance Permits will be obtained from the Industrial Hygiene and Safety–Operational Support Division. Underground utilities will be located, and the excavation permits secured before the readiness and planning review and before any field activities at the Chaquehui Aggregate Area are undertaken.
Spade-and-Scoop Collection of Soil Samples	This method will be used to collect surface (i.e., 0–1 ft) soil or fill samples. A hole will be dug to the desired depth, as prescribed in the work plan, and a discrete grab sample collected. The sample will be homogenized in a decontaminated stainless-steel bowl before it is transferred to the appropriate sample containers.
Hand Auger Collection of Soil Samples	This method will typically be used for sampling soil or sediment at depths of less than 10–15 ft but in some cases may be used to collect samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in.-inside diameter [I.D.]), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth is reached, the auger is decontaminated before the hole is advanced through the sampling depth. The sampling material is transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers are filled.
Split-Spoon Core-Barrel Sampling	The split-spoon core barrel is a cylindrical barrel split lengthwise so the two halves can be separated to expose the core sample. The stainless-steel core barrel (3 in.-I.D. and 5 ft long) is pushed directly into the subsurface media with a hollow-stem auger drilling rig. A continuous length of core is extracted with the core barrel. Once it is extracted, the section of core will be screened for radioactivity and organic vapors, photographed, and described in a lithologic log. If it is located within a targeted sampling interval, a portion of the core will be collected for fixed laboratory analysis.
Field Logging, Handling, and Documentation of Borehole Materials	When they reach the surface, the core barrels will be opened immediately for field screening, logging, and sampling. Logging of borehole materials includes run number, core recovery in feet, depth interval (in 5-ft increments), field-screening results, lithological and structural description, and photographs. Once the core material is logged, selected samples will be taken from discrete intervals of the core. All borehole material not sampled will be managed as IDW.
Borehole Abandonment	Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are added to ensure bridging does not occur. Boreholes greater than 20 ft deep will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grouting materials include cement or bentonite grout, neat cement, or concrete. The use of backfill materials such as bentonite and grout will be documented in a field logbook with respect to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be presented in the investigation report.
Geophysical Surveys	Geophysical surveys will be performed at selected sites to identify anomalies that would indicate the location of former waste disposal sites. Geophysical methods employed will include terrain conductivity (EM-31 or equivalent), high-sensitivity metal detection (EM-61 or equivalent), and GPR. The area to be surveyed will be gridded as specified in the work plan, and data will be digitally recorded. Geodetic coordinates will be recorded at 1-s intervals using an integrated GPS.
Headspace Vapor Screening	All soil and tuff samples will be field screened for VOCs by placing a portion of the sample in a glass jar. The jar will be sealed with foil and gently shaken and allowed to equilibrate for approximately 5 min. The sample will then be screened by inserting a PID probe equipped with an 11.7-eV lamp into the container. The results will be recorded in units of ppm.

Table 5.0-1 (continued)

Method	Summary
XRF Screening	Soil samples will be screened in the field using XRF to delineate areas of inorganic chemical contamination. The XRF used will have a detection limit equal to approximately 10% to 20% of the SSL for major site contaminants. Samples will be collected and analyzed in accordance with the XRF manufacturer's instructions, including analysis of standards and other QA/QC samples.
Handling, Packaging, and Shipping of Samples	Samples will be sealed and labeled before they are packed in ice. Sample and transport containers will be examined to ensure they are free of external contamination. Samples will be packaged to minimize the possibility of breakage during transport. After environmental samples are collected, packaged, and preserved, they will be transported to the SMO. A split of each sample will be sent to an SMO-approved radiation-screening laboratory under chain of custody (COC). Once radiation-screening results are received, the SMO will send the corresponding analytical samples to fixed laboratories for full analysis.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and QA. Specific requirements for each sample will be printed in the sample collection logs (SCLs) provided by the SMO (size and type of container, preservatives, etc.). All samples will be preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Sample Control and Field Documentation	The collection, screening, and transport of samples will be documented on standard forms generated by the SMO. These forms include SCLs, COC forms, and sample container labels. Collection logs will be completed at the time the samples are collected and signed by the sampler and a reviewer who verifies that the logs are complete and accurate. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. The COC forms will be completed and assigned to verify that the samples are not left unattended.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys will focus on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys will be conducted with a Trimble 5700 digital GPS. The survey data will conform to Laboratory Information Architecture project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management." All coordinates will be expressed as State Plane Coordinate System, North American Datum 83, New Mexico Central Zone, U.S. survey ft. All elevation data will be reported relative to the National Geodetic Vertical Datum of 1983.
Management, Characterization, and Storage of IDW	The IDW will be managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization will comply with on-site or off-site waste acceptance criteria, as appropriate. All stored IDW will be marked with appropriate signs and labels. Each waste generated container will be individually labeled with waste classification, item identification, and radioactivity (if applicable) immediately following containerization. All waste will be segregated by classification and compatibility to prevent cross-contamination.
Field Quality Control Samples	Field QC samples will be collected as follows. Field duplicate samples and equipment blanks will be collected at a frequency of 10%. Field duplicates and equipment blanks will be collected at the same time as a regular sample and submitted for the same analyses. Trip blanks will be collected whenever samples were collected for VOC analysis. Trip blanks will be collected at a frequency of one sample per day when VOC samples are collected. Trip-blank containers will consist of certified clean sand that are opened and kept with the other sample containers during the sampling process.
Field Decontamination of Equipment	Dry decontamination will be the preferred method at the Chaquehui Canyon Aggregate Area to minimize generating liquid waste. Dry decontamination will include using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by applying a commercial cleaning agent (i.e., Fantastik) and paper wipes.

Appendix A

Acronyms and Abbreviations,
Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

ACA	accelerated corrective action
AK	acceptable knowledge
AOC	area of concern
BCH	benzene hexachloride
bgs	below ground surface
BMP	best management practice
BV	background value
COC	chain of custody
COPC	chemicals of potential contamination
CVL	containerized vat leach
DDD	dichlorodiphenyldichloroethane
DDE	dichlorophenyltrichloroethylene
DDT	dichlorophenyltrichloroethylene
DOE	Department of Energy (U.S.)
DRO	diesel range organics
DU	depleted uranium
eV	electron volt
EM	electromagnetic
EP	Environmental Programs Directorate
ER	Environmental Restoration Project
FFCA/AO	Federal Facility Compliance Agreement/Administrative Order
FV	fallout value
GPS	global-positioning system
HDPE	high-density polyethylene
HE	high explosives
HIR	historical investigation report
HP	Hot Point
IA	interim action
I.D.	inside diameter
IDW	investigation-derived waste
IP	individual permit
LANL	Los Alamos National Laboratory

LLW	low-level waste
Ma	millions of years
MDA	material disposal area
MLLW	mixed low-level waste
NMED	New Mexico Environment Department
MSGP	Multi-Sector General Permit
NDA	no detectable activity
NFA	no further action
NOI	notice of intent
NPDES	National Pollution Discharge Elimination System
NRAO	National Radio Astronomy Observatory
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
ppm	part per million
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA facility investigation
RPF	Records Processing Facility
SAL	screening action level
SCL	sample collection log
SDPPP	Site Drainage Pollution Prevention Plan
SGS	Segmented Gate System
SMA	site-monitoring area
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area

TAL	target analyte list
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TNT	2,4,6-trinitrotoluene
TPH	total petroleum hydrocarbon x-ray fluorescence
VCA	voluntary corrective action
VCP	vitrified clay pipe
VOC	volatile organic compound
WAC	waste acceptance criteria
WCSF	waste characterization strategy form
XRF	x-ray fluorescence

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Management Plan for Investigation-Derived Waste

B-1.0 INTRODUCTION

This appendix describes how investigation-derived waste (IDW) generated during the Chaquehui Canyon Aggregate Area investigation will be managed by Los Alamos National Laboratory (the Laboratory). IDW may include, but is not limited to, drill cuttings, excavated media, excavated man-made debris, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contamination.

B-2.0 IDW

All IDW generated during investigation activities will be managed in accordance with the current version of standard operating procedure (SOP) 5238, Characterization and Management of Environmental Program Waste. This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory requirements.

The most recent version of the Laboratory's Hazardous Waste Minimization Report will be implemented during the investigation to minimize waste generation. The Hazardous Waste Minimization Report is updated annually as a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit.

A waste characterization strategy form (WCSF) will be prepared and approved per requirements of SOP-5238, Characterization and Management of Environmental Program Waste. The WCSF will provide detailed information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of sampling data and/or documentation or by direct sampling of the IDW or the media investigated (e.g., surface soil, subsurface soil, etc.). Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of listed hazardous waste are identified, a "contained in" determination may be submitted for approval to NMED.

Considerable amounts of material may potentially be excavated during the remediation of Solid Waste Management Units (SWMUs) 33-004(b), 33-004(d), 33-006(a), 33-008(a), 33-010(c), 33-010(f), 33-010(g), 33-010(h), and 33-015 and Area of Concern (AOC) 33-008(c). To facilitate the staging and segregation of these materials, the Laboratory may submit area of contamination designation requests for these sites to NMED for approval. The need for area of contamination designations for these sites will be evaluated based on the results of preliminary field-screening activities and waste characterization results from samples collected at each site before excavation activities begin. The request will specify the boundaries of the proposed areas of contamination and describe the activities to be conducted within the boundaries.

Wastes will be containerized and placed in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the WCSF and approved before the waste is generated. Table B-2.0-1 summarizes how waste is expected to be managed.

The waste streams anticipated to be generated during work plan implementation are described below.

B-2.1 Drill Cuttings

This waste stream consists of soil and rock chips generated by the drilling of boreholes with the intent to sample. Drill cuttings include excess core sample not submitted for analysis and any returned samples sent for analysis. Drill cuttings will be containerized in 20 yd^3 rolloff containers, 55-gal. drums, B-12 containers, or other appropriate containers at the point of generation. If drilling is conducted within the boundary of an area of contamination, the drill cuttings will be managed within those boundaries. If drilling occurs outside area of contamination boundaries, the initial management of cuttings will rely on the data from previous investigations and/or process knowledge. They will be managed in secure, designated areas appropriate to the type of waste. If new analytical data changes the expected waste category, the waste will be managed in accumulation areas appropriate to the final waste determination.

Cuttings will be land applied if they meet the criteria in the NMED-approved Notice of Intent (NOI) Decision Tree for Land Application of Investigation Derived Waste Solids from Construction of Wells and Boreholes. This waste stream will be characterized based either on direct sampling of the waste or on the results from core samples collected during drilling. If directly sampled, the following analyses will be performed: volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); nitrate, explosive compounds, and perchlorate (if screening and/or process knowledge indicates the presence of explosives); radionuclides; total metals; and, if needed, toxicity characteristic metals. If process knowledge, odors, or staining indicates the cuttings may be contaminated with petroleum products, the materials will also be analyzed for total petroleum hydrocarbons (TPH) and PCBs. Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility. The Laboratory expects most cuttings will be land applied or disposed of as a low-level waste (LLW); however, the waste may also be classified as hazardous, mixed low-level waste (MLLW), or PCB waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.2 Excavated Environmental Media

Layback and overburden spoils (including environmental media mixed with buried debris) will consist of soil and rock removed from within or next to (e.g., from benching to stabilize a trench) areas within the SWMUs and AOC to be excavated. This material will be field screened for radioactivity and VOCs during the excavation process. If contamination is not detected during screening, the spoils will be stored either in rolloff bins or other suitable containers or on the ground surface with appropriate best management practices. If field screening indicates the potential for contamination, the layback and overburden spoils will be placed in rolloff bins or other suitable containers. The spoils will remain within the area of contamination boundary of the SWMU or AOC from which they were excavated, awaiting analytical results. Incremental samples of the spoils will be collected as the spoils are excavated or the media may be sampled in piles or containers. A minimum of one sample will be collected for every 100 yd^3. The samples will be analyzed for VOCs; target analyte list (TAL) metals; nitrate, explosive compounds, and perchlorate, if screening and/or process knowledge indicates the presence of explosives; radionuclides; and toxicity characteristic metals, as needed. Other constituents may be analyzed as necessary to meet the WAC for a receiving facility. If process knowledge, odors, or staining indicates the soils may be contaminated with petroleum products, the materials will also be analyzed for TPH and PCBs. If the spoils are determined to be suitable for reuse (i.e., meets residential cleanup standards as determined using NMED's and DOE's soil screening guidance), the Laboratory will may use the soil to backfill the excavations. If the spoils are not suitable for reuse, they will be treated/disposed of at an authorized facility appropriate for the waste regulatory classification. Based on existing data, the Laboratory expects spoils that cannot be reused to be designated as industrial waste or LLW; however, the waste may also

be classified as hazardous, MLLW, or PCB waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3 Excavated Man-made Debris

Excavated man-made debris will be generated from the removal of four surface disposal areas, two septic tanks, an incinerator, and two landfill areas. Debris will be segregated as it is excavated, to the extent practical, based on factors such as the type and size of debris, the type of alternative treatment technology that would be used to treat the debris, field screening, process knowledge, and/or staining or odors. Where practicable, this waste stream will be characterized by direct sampling of the waste (e.g., concrete). Direct samples will be analyzed for VOCs; SVOCs; nitrate, explosive compounds, and perchlorate (if field screening or process knowledge indicates the presence of explosives); radionuclides; total metals; and, if needed, toxicity characteristic metals. Other constituents may be analyzed as necessary to meet the WAC for a receiving facility or if process knowledge or visual observations indicate other contaminants may be present (e.g., PCBs or asbestos). For debris that is difficult to characterize; acceptable knowledge (AK) will be used whenever possible, supplemented by sampling as needed. Sampling methods will often have to be identified on a case-by-case basis by qualified sampling personnel, and all decisions will be documented in the field activity notebook.

Waste minimization will be implemented, where practicable, through segregation of waste materials. Nonhazardous materials that can be shown to meet no detectable activity (NDA) for radionuclides or that can be decontaminated to meet NDA will be recycled, if practicable.

The types of debris expected to be excavated from each SWMU or AOC are identified in sections.B-2.3.1 through B-2.3.3.

B-2.3.1 Excavated Waste from SWMUs 33-010(f)

Based on the previous investigations and site visits significant amounts of debris are not expected to be encountered at SWMU 33-010(f). Small amounts of debris associated with former site activities (e.g., pieces of concrete; piles of tuff and cured asphalt; rusted metal cans, rebar, and strapping bands; and other debris) may be encountered. This material will initially be sampled, if necessary, and placed in containers (e.g., rolloff bins) within the boundaries of the area of contamination. The Laboratory expects most of this waste to be designated as industrial waste or as LLW that will be disposed of at an authorized on-site or off-site facility.

B-2.3.2 Excavated Waste from SWMU 33-008(a)

This waste stream will consist of large, uncontaminated debris including telephone poles, timbers, and railroad ties disposed of in the SWMU 33-008(a) disposal area and possibly contaminated soil that will be managed within the area of contamination boundaries for this site. Any soil generated will be managed as described in section B-2.2.

The excavated materials will be sampled, if necessary, and placed initially in containers (e.g., rolloff bins) within the boundaries of an area of contamination and characterized for waste management purposes. The Laboratory expects most of this waste to be designated as industrial waste or as LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated and disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.3 Excavated Waste from SWMU 33-008(c)

Any debris in the watercourse and surface areas of SWMU 33-008(c) that has been exposed since 1999 will be removed, characterized, and disposed of in accordance with Laboratory waste management requirements. Debris expected to be encountered at SWMU 33-008(c) may consist of machined metal turnings, cable, glass bottles, and general trash based on previous site cleanup activities. Some of the debris may be mixed with soil. To the extent practicable, soil will be brushed off or otherwise removed from the debris. The debris will be sampled, if necessary, and placed in containers (e.g., drums, rolloff bins) within the boundaries of the area of contamination and characterized. Any soil generated will be managed as described in section B-2.2. The debris will be managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The Laboratory expects most of this waste to be designated as industrial waste or as LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated and disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.4 Excavated Waste from SWMUs 33-004(b) and 33-004(d)

This waste stream will consist of debris from two abandoned septic tanks (e.g., piping, metal, concrete reinforced with steel rebar, and wood) and possibly contaminated soil that will be managed within the areas of contamination boundaries for these sites. The septic tanks [SWMUs 33-004(b) and 33-004(d)] were abandoned in place and the interior of both tanks was found to be dry during the Phase I RFI at both sites. The interior of both tanks will be pressure washed and chip sampled for waste characterization purposes before the tanks are removed; wastes generated from steam cleaning are discussed in section B-2.5. To the extent practicable, soil will be brushed off or otherwise removed from the debris. Soil at locations with elevated radioactivity and/or metals based on field screening within the septic tank excavations will be excavated.

The excavated materials will be sampled, if necessary, and placed in containers (e.g., rolloff bins) within the boundaries of an area of contamination. The debris will be managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. Any soil generated will be managed as described in section B-2.2. The Laboratory expects most of this waste to be designated as industrial waste or LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated and disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.5 Excavated Waste from SWMUs 33-010(c), 33-010(g), and 33-010(h)

This waste stream will consist of debris including copper and aluminum shrapnel, pieces of electronic cable, and wood debris from former firing site activities that were not removed during previous removal actions at the sites. Soil at locations with elevated radioactivity and/or metals within these three sites will be excavated and managed as described in section B-2.2.

To the extent practicable, soil will be brushed off or otherwise removed from the debris. The debris will be sampled, if necessary, and placed in containers (e.g., drums, rolloff bins) within the boundaries of the area of contamination and characterized. The debris will be managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The Laboratory expects most of this waste to be designated as industrial waste or LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated and disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.3.6 Excavated Waste from SWMU 33-015

This waste stream will consist of the small metal incinerator and the concrete pad it sits on. Only soil from beneath the concrete pad with visible staining or elevated field screening results (volatile organic chemicals and/or radiological) will be removed. However, since the incinerator was only used to burn uncontaminated office trash, no soil is expected to be excavated from SWMU 33-015. Any soil excavated will be managed as described in section B-2.2.

The incinerator and concrete pad will be characterized using swipe samples prior to removal. The removed materials will be placed initially in containers (e.g., rolloff bins) within the boundaries of the area of contamination. The Laboratory expects this waste to be designated as recyclable metal (if the metal is not radioactively contaminated), industrial waste, or LLW. Wastes will be disposed of at an authorized on-site or off-site facility.

B-2.4 Contact Waste

The contact waste stream consists of potentially contaminated materials that "contacted" waste during sampling and excavation. This waste stream consists primarily of, but is not limited, to personal protective equipment (PPE) such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Characterization of this waste stream will use AK of the waste materials, the methods of generation, and analysis of the material contacted (e.g., drill cuttings, soil,). Contact waste generated within an area of contamination will initially be placed in containers and managed within the area. If contact waste is generated at a location that is not within the area of contamination, the initial management of waste will rely on the data from previous investigations and/or process knowledge. It will be managed in secure, designated areas appropriate to the type of the waste. If new analytical data changes the expected waste category, the waste will be managed in accumulation areas appropriate to the final waste determination. The Laboratory expects most of the contact waste to be designated industrial waste or LLW; however, the waste may also be classified as hazardous, MLLW, or PCB waste. All wastes will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.5 Decontamination Fluids

The decontamination fluids waste stream will consist of liquid wastes from decontamination activities [i.e., decontamination solutions and rinse waters including water generated from the high pressure washing of the interior of the SWMUs 33-004(b) and 33-004(d) septic tanks]. Consistent with waste minimization practices, the Laboratory employs dry equipment decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation. The decontamination fluids will be characterized through AK of the waste materials, the levels of contamination measured in the environmental media (e.g., the results of the associated drill cuttings), and, if necessary, direct sampling of the containerized waste. If directly sampled, the following analyses will be performed: VOCs, SVOCs, radionuclides, total metals, and, if needed, toxicity characteristic metals and other analytes required by the receiving facility. The rinse water generated from the decontamination of the SWMU 33-004(b) and 33-004(d) septic tanks will be directly sampled. The Laboratory expects most of these wastes to be nonhazardous liquid waste or radioactive liquid waste that will be sent to one of the Laboratory's wastewater treatment facilities where the WAC allows the waste to be received.

Table B-2.0-1
Summary of Estimated IDW Generation and Management

Waste Stream	Expected Waste Type	Expected Disposition
Drill Cuttings	Industrial Hazardous PCB LLW MLLW	Land application or treatment/disposal at an authorized on-site or off-site facility
Excavated Environmental Media	Industrial Hazardous PCB LLW MLLW	Reused as fill at the excavation location or treated/disposed of at an authorized on-site or off-site facility
Excavated Man-made Debris	Industrial Hazardous PCB LLW MLLW	Disposal at an approved off-site facility or on-site at an authorized on-site or off-site facility, recycled, or reused
Contact Waste	Industrial Hazardous PCB LLW MLLW	Disposal at an approved on- or off-site facility
Decontamination Fluids	Industrial LLW	Treatment at an on-site wastewater treatment facility

TA-39

TA-39

TA-33

TA-70

Ancho Canyon

Chaquehui Canyon

Bandelier National Monument

Canon de los Frijoles

SWMU 33-004(g)

SWMU 33-004(d)

AOC C-33-003

SWMU 33-017

AOC C-33-001

SWMU 33-004(a)

SWMU 33-009

AOC 33-008(c)

SWMU 33-004(i)

SWMU 33-012(a)

SWMU 33-015

SWMU 33-011(d)

SWMU 33-002(d)

SWMU 33-007(c)

SWMU 33-002(c)

SWMU 33-005(b)

SWMU 33-002(e)

SWMU 33-005(a)

SWMU 33-011(a)

SWMU 33-002(a)

SWMU 33-004(h)

SWMU 33-010(f)

SWMU 33-005(c)

SWMU 33-002(b)

CHN-1

E340

SWMU 33-011(e)

SWMU 33-016

AOC 33-011(b)

SWMU 33-004(m)

CH-1

SWMU 33-007(b)

SWMU 33-008(a)

SWMU 33-011(c)

SWMU 33-010(h)

SWMU 33-006(a)

SWMU 33-014

SWMU 33-001(e)

SWMU 33-001(d)

SWMU 33-004(b)

SWMU 33-001(c)

SWMU 33-004(j)

SWMU 33-010(c)

E338

SWMU 33-001(b)

SWMU 33-001(a)

SWMU 33-010(g)

CH-2

- Outfall
- Stormwater runoff gaging station
- AOC or SWMU
- Canyon reach
- Chaquehui Canyon Aggregate Area
- Former structure
- Paved parking
- Structure
- Berm
- Fence
- Former drainline
- Paved road
- Storm drain
- Technical Area boundary
- Unpaved road
- Communications
- Electric
- Gas
- Sewer
- Water
- 20-ft contour
- 100-ft contour

Disclaimer: This map was created for work processes associated with the LANL Environmental Programs Directorate, Corrective Actions Projects (EP-CAPS). All other uses for this map should be confirmed with EP-CAP personnel.

N

500 250 0 500 1,000 1,500 2,000 Feet

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

03 November 2009 CAncell
Map# 09-0066-1-07

Plate 1 Chaquehui Canyon Aggregate Area

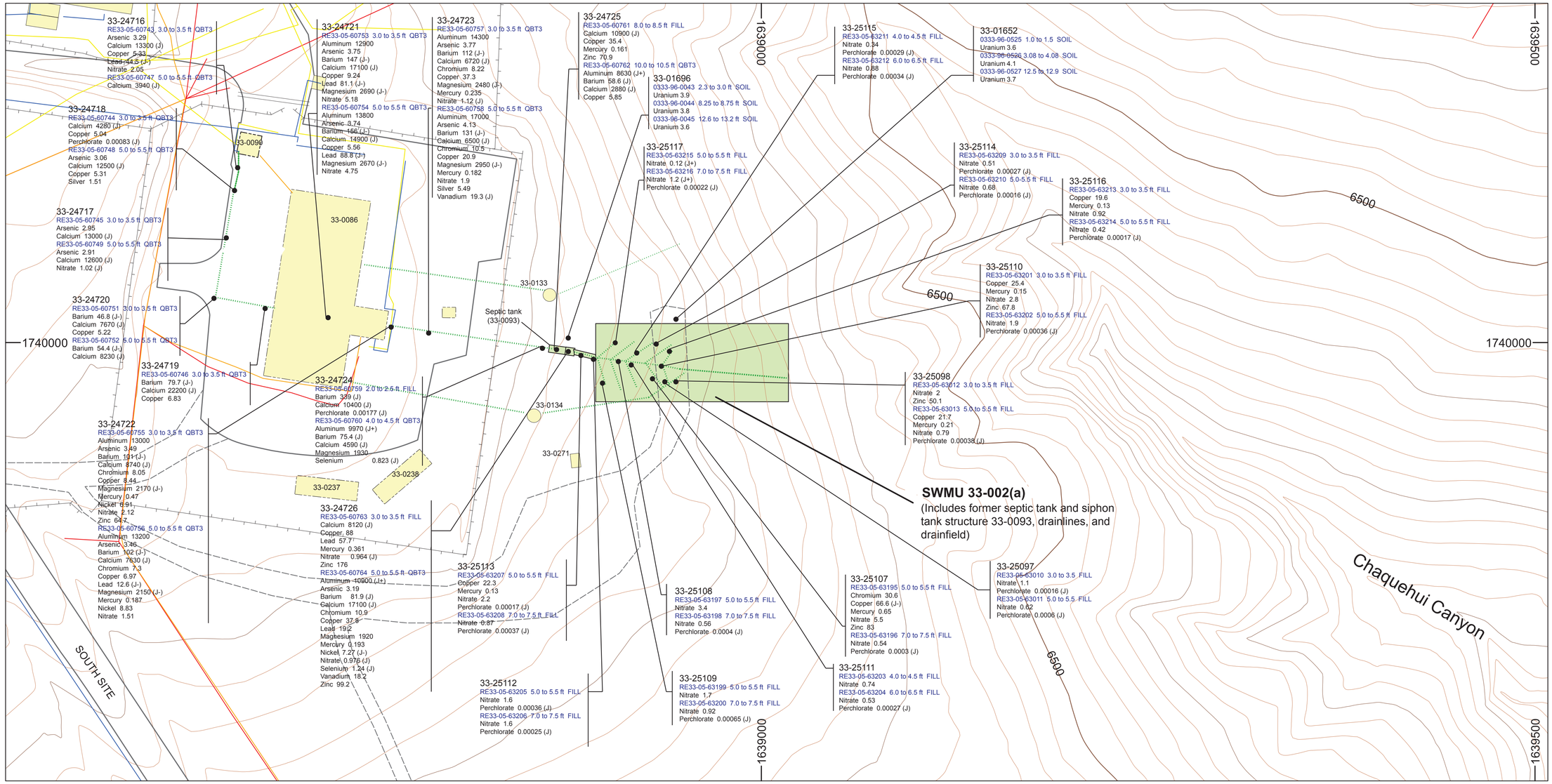


Plate 2 Inorganic chemicals detected above BVs at SWMU 33-002(a)

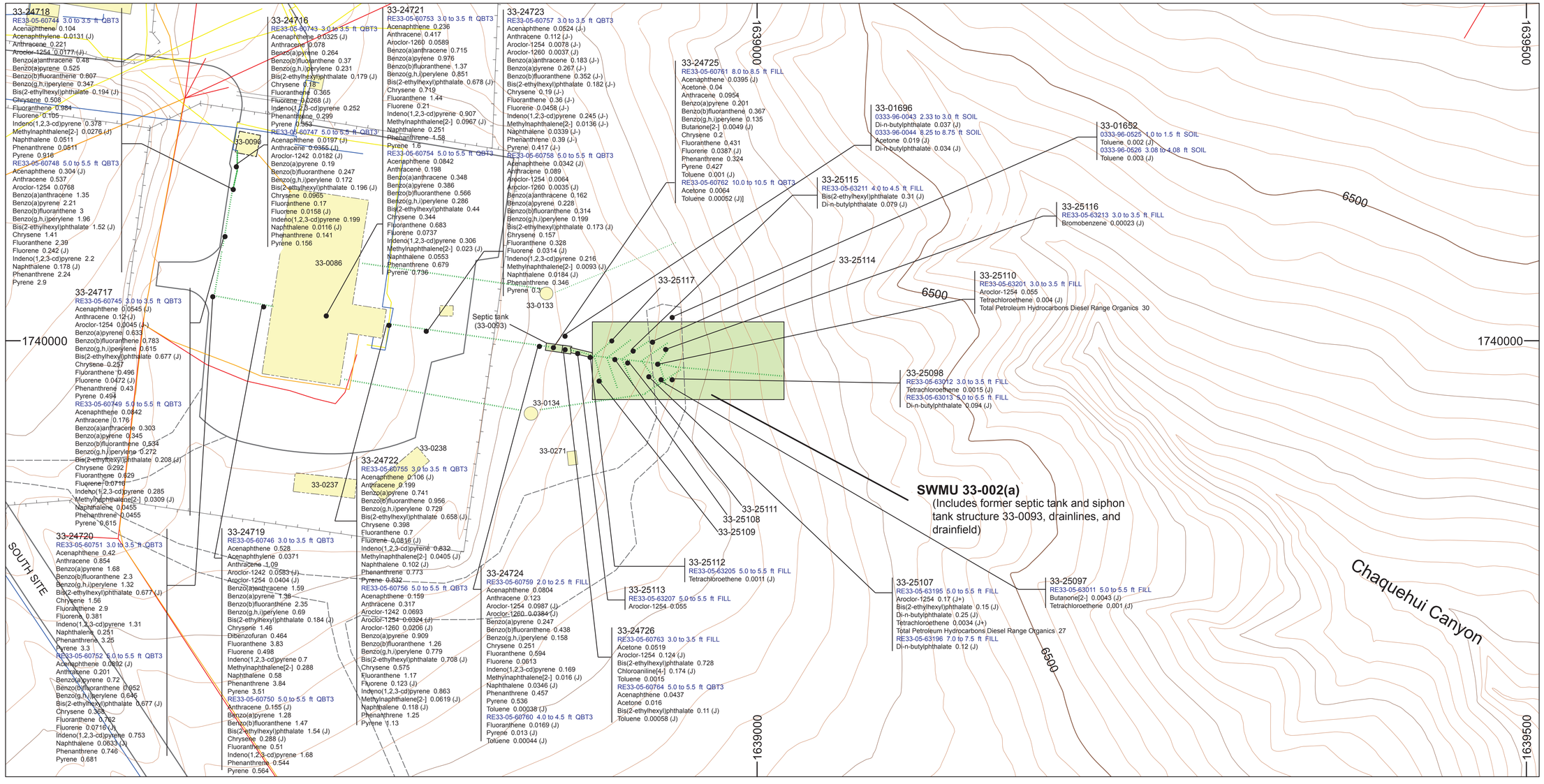


Plate 3 Organic chemicals detected at SWMU 33-002(a)

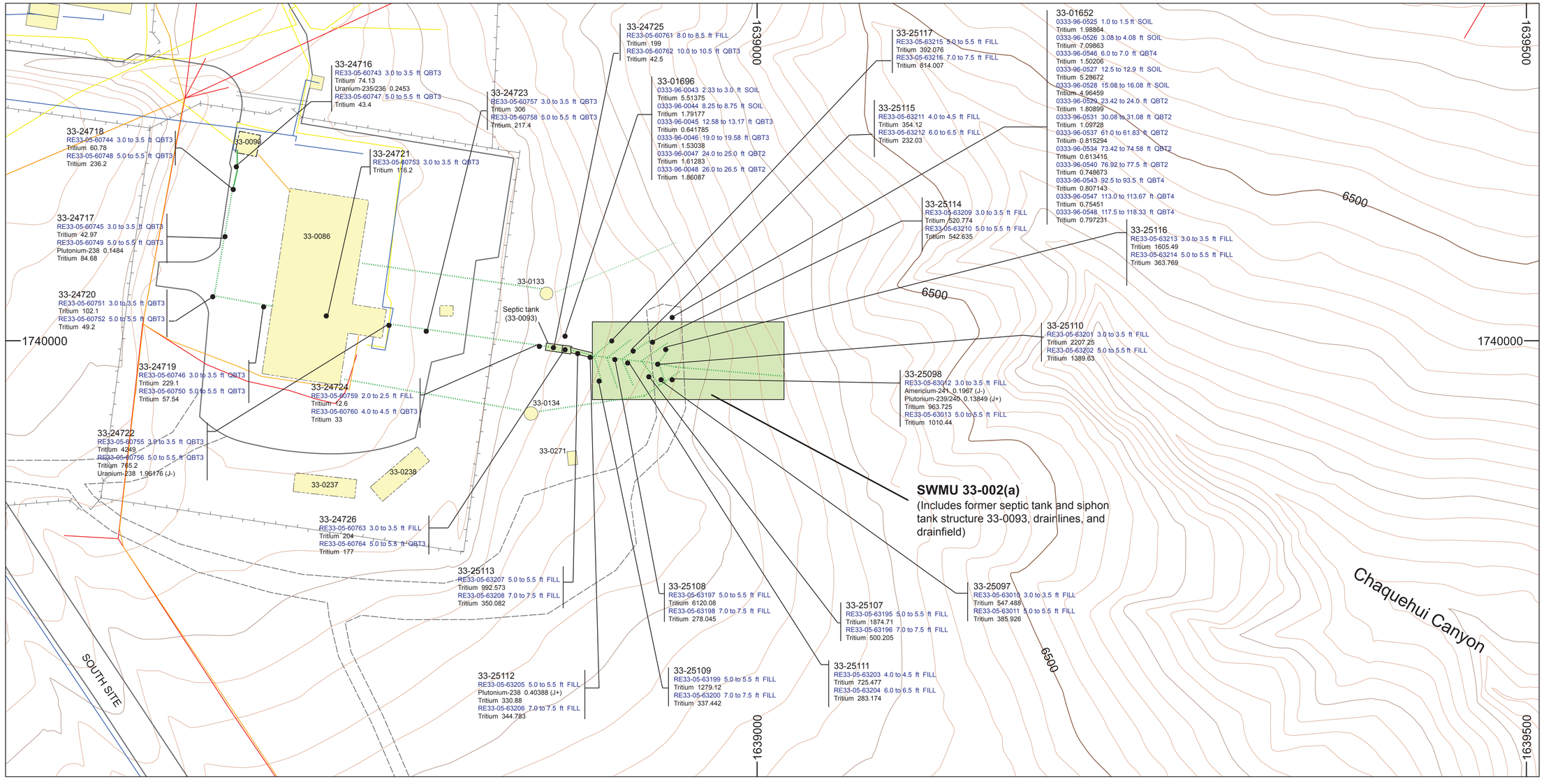
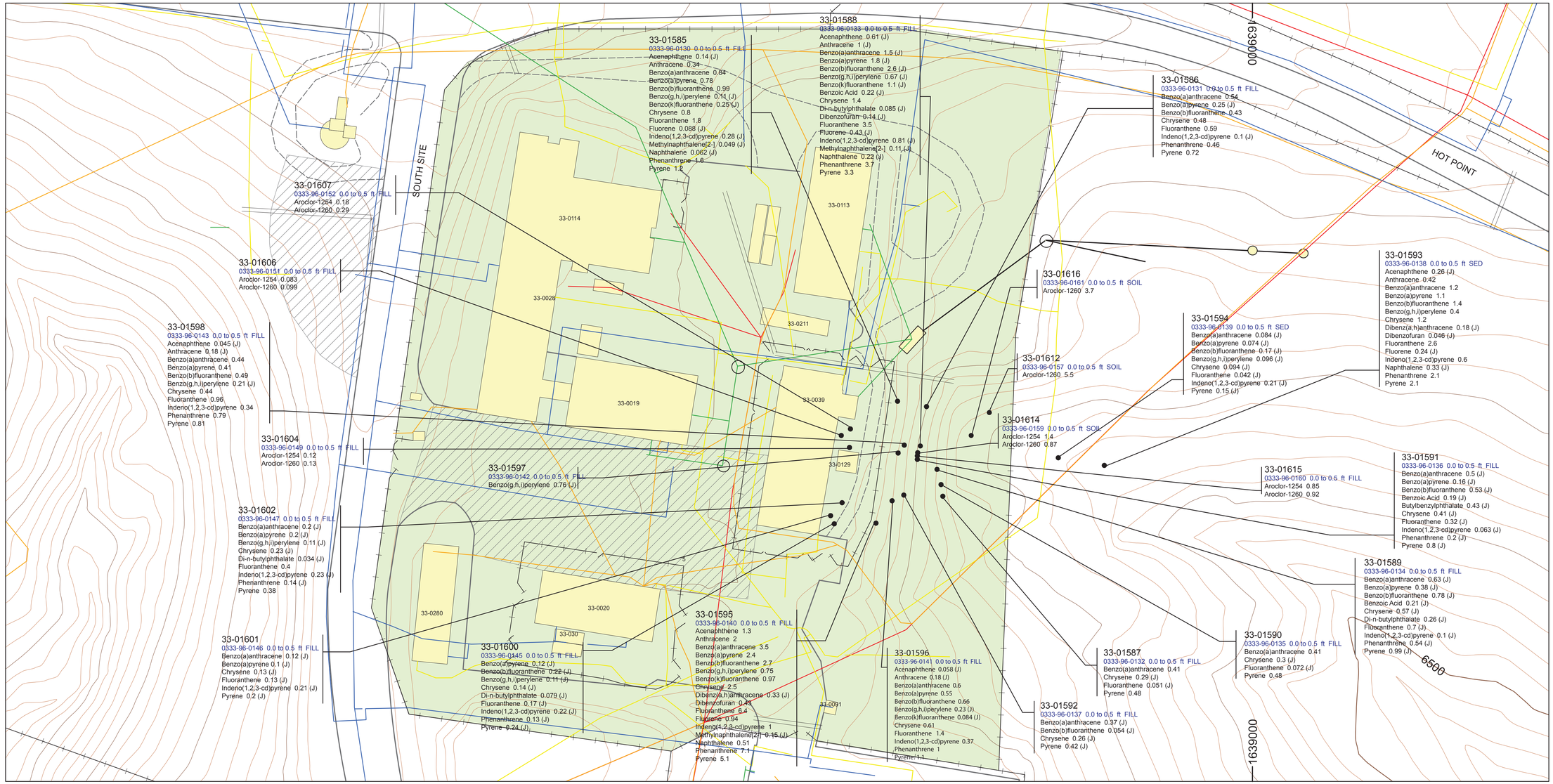


Plate 4 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(a)



- Decision-level sampling location
- Manhole

AOC or SWMU
Former structure
Paved parking
Structure

Fence
Paved road
Storm drain
Unpaved road

Communications
Electric
Gas
Sewer
Water

2-ft contour
10-ft contour
20-ft contour
100-ft contour

Note: Sampling results reported in mg/kg

40 20 0 40 80 120 160 Feet

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

27 October 2009 CAncell
Map# 09-0066-1-4

Plate 5 Organic chemicals detected at SWMU 33-017

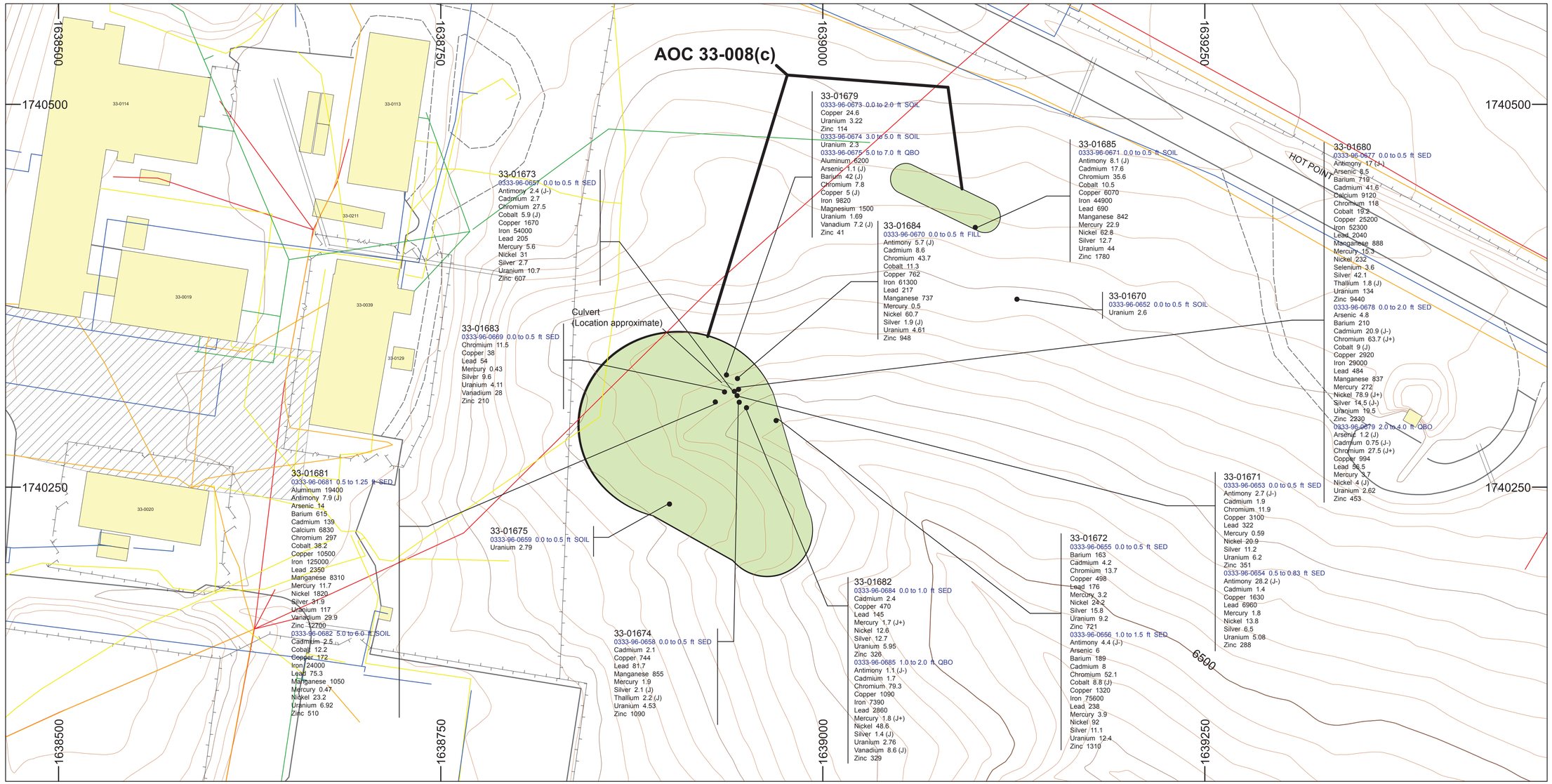
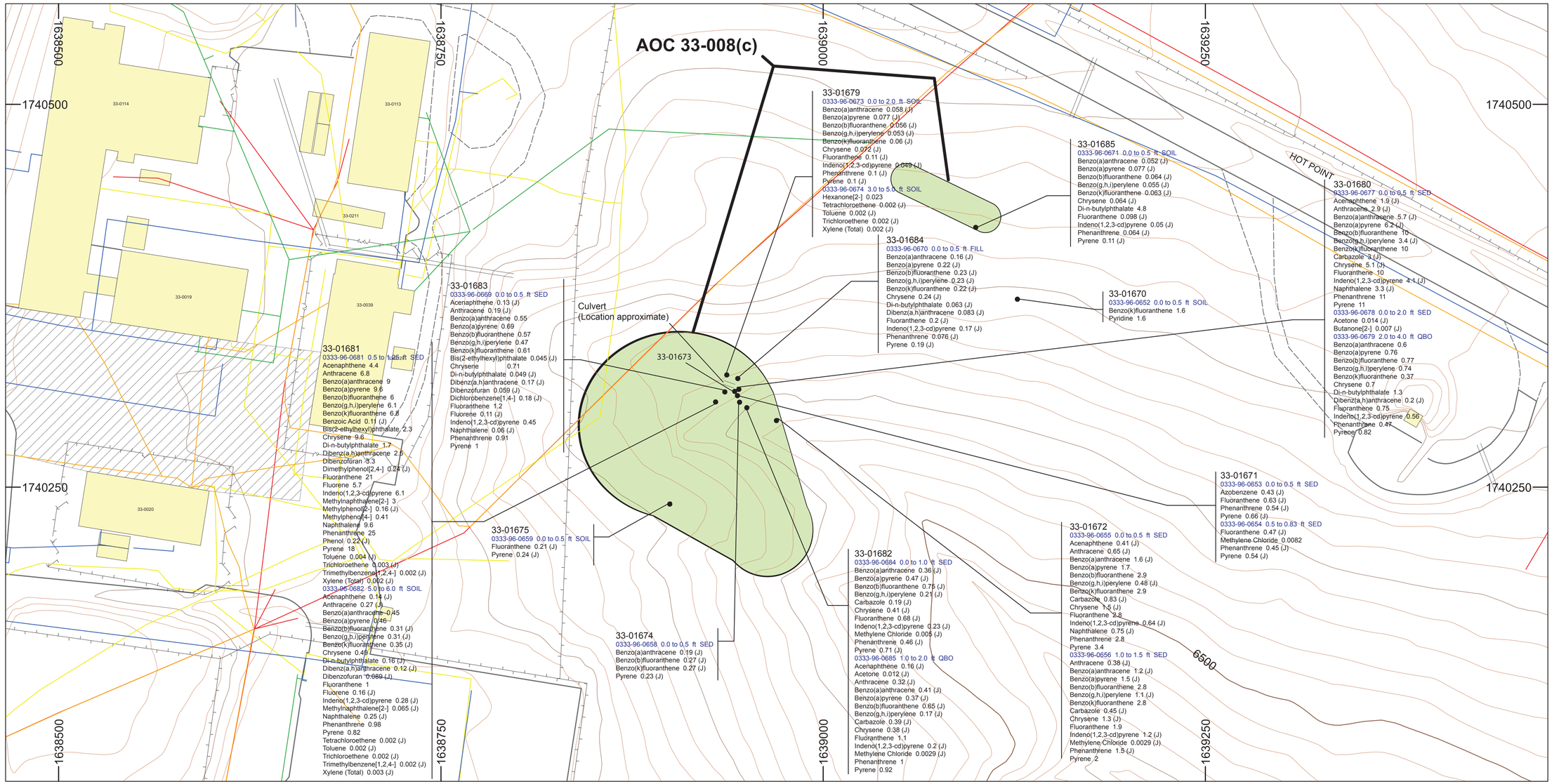


Plate 6 Inorganic chemicals detected above BVs at AOC 33-008(c)



- Decision-level sampling location

AOC or SWMU
Paved parking
Structure

Fence
Paved road
Storm drain
Unpaved road

Communications
Electric
Gas
Sewer
Water

2-ft contour
10-ft contour
20-ft contour
100-ft contour

Note: Sampling results reported in mg/kg

50 25 0 50 100 150 200 Feet

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

15 October 2009 CAncell
Map# 09-0066-1-6

Plate 7 Organic chemicals detected at AOC 33-008(c)

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November 20109
EP20109-04850554

Investigation Work Plan for Chaquehui Canyon Aggregate Area, Revision 1

Prepared by the Environmental Programs Directorate

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy under Contract No. DE-AC52-06NA25396, has prepared this document pursuant to the Compliance Order on Consent, signed March 1, 2005. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

LA-UR-109-72267401
EP20109-04850554

Investigation Work Plan for Chaquehui Canyon Aggregate Area, Revision 1

November 20109

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EXECUTIVE SUMMARY

The Chaquehui Canyon Aggregate Area includes a total of 51 solid waste management units (SWMUs) and areas of concern (AOCs) located in Technical Area 33 (TA-33) at Los Alamos National Laboratory (the Laboratory). Of these 51 sites, 8 have been previously investigated and/or remediated and have been approved for no further action. This investigation work plan identifies and describes the activities needed to complete the investigation of the remaining 43 SWMUs and AOCs. Details of previous investigations and analytical results for the 43 sites included in this work plan are provided in the historical investigation report for the Chaquehui Canyon Aggregate Area.

The sampling strategy proposed in this work plan will be integrated with the data results from the South Canyons investigation to assess potential contaminant migration from sites within the Chaquehui Canyon Aggregate Area. Additional data collected in Chaquehui Canyon under the Laboratory's National Pollutant Discharge Elimination System individual permit will also be used to assess potential contaminant migration from the Chaquehui Canyon Aggregate Area sites. All results relevant to the Chaquehui Canyon Aggregate Area sites will be included in the investigation report.

The objective of this work plan is to evaluate the historical data and, based on that evaluation, to propose additional sampling as necessary to define the nature and extent of contamination associated with the SWMUs and AOCs in the Chaquehui Canyon Aggregate Area.

CONTENTS

1.0 INTRODUCTION 1
1.1 Work Plan Overview 1
1.2 Work Plan Objectives 2

2.0 BACKGROUND 2
2.1 General Site Information 2
2.2 Operational History 2
2.3 Conceptual Site Model 3
2.3.1 Potential Contaminant Sources 3
2.3.2 Potential Contaminant Transport Mechanisms 3
2.3.3 Potential Receptors and Pathways 3
2.3.4 Cleanup Standards 3
2.4 Data Overview 4

3.0 SITE CONDITIONS 4
3.1 Surface Conditions 4
3.1.1 Soil 4
3.1.2 Surface Water 5
3.1.3 Land Use 5
3.2 Subsurface Conditions 5
3.2.1 Anticipated Stratigraphic Units 5
3.2.2 Hydrogeology 8

4.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES UNDER INVESTIGATION 9
4.1 Sites under Investigation at Main Site 9
4.1.1 Consolidated Unit 33-002(a)-99, MDA K 10
4.1.2 Consolidated Unit 33-004(a)-00, Main Site 24
4.1.3 Consolidated Unit 33-005(a)-00, Potential Soil Contamination 33
4.1.4 AOC 33-008(c), Surface Disposal Area 36
4.1.5 SWMU 33-011(e), Former Storage Area 38
4.1.6 SWMU 33-012(a), Former Storage Area 39
4.1.7 SWMU 33-016, Sump, Drainline, and Outfall 40
4.1.8 AOC C-33-001, Former Transformer 41
4.1.9 AOC C-33-003, Potential Soil Contamination 42
4.2 Sites under Investigation at Area 6 44
4.2.1 SWMU 33-004(d), Septic System 44
4.2.2 Consolidated Unit 33-004(g)-00, Area 6 Firing Site 45
4.2.3 SWMU 33-009, Surface Disposal Area 49
4.3 Sites under Investigation at South Site 51
4.3.1 Consolidated Unit 33-001(a)-99, MDA E 51
4.3.2 SWMU 33-004(b), Septic System 53
4.3.3 Consolidated Unit 33-004(j)-00 55
4.3.4 SWMU 33-010(g), Surface Disposal Area 66
4.4 Sites under Investigation at NRAO 67
4.4.1 SWMU 33-004(m), Septic System 67
4.4.2 AOC 33-011(b), Former Storage Area 68

5.0 INVESTIGATION METHODS 69
5.1 Field Surveys 69
5.1.1 Geodetic Surveys 69
5.1.2 Geophysical Surveys 69
5.2 Field Screening 70
5.2.1 VOCs 70
5.2.2 Radioactivity 70
5.2.3 Metals Field Screening (XRF) 70
5.2.4 HE Screening 71
5.3 Sample Collection 71
5.3.1 Surface Samples 71
5.3.2 Subsurface Samples 71
5.3.3 Sediment Samples 72
5.3.4 Test Pit and/or Trench Samples 73
5.4 Laboratory Methods 73
5.5 Health and Safety 73
5.6 Equipment Decontamination 73
5.7 IDW 74
5.8 Cleanup Activities 74
5.8.1 Removal of Surficial and Buried Waste, Inactive Units, and Contaminated Soil and Sediment 74
5.8.2 Waste Management and Disposal 75
5.8.3 Transportation 75
5.8.4 Confirmation Sampling 75

6.0 MONITORING PROGRAMS 75
6.1 Groundwater 75
6.2 Stormwater 75

7.0 SCHEDULE 76

8.0 REFERENCES AND MAP DATA SOURCES 76
8.1 References 76
8.2 Map Data Sources 83

Figures

Figure 1.0-1 Chaquehui Canyon Aggregate Area with respect to Laboratory TAs and surrounding land holdings 86
Figure 3.2-1 Generalized stratigraphy of bedrock units 87
Figure 4.1-1 Site features and decision-level sampling locations for Consolidated Unit 33-002(a)-99 85
Figure 4.1-2 Proposed sampling locations at Consolidated Unit 33-002(a)-99 86
Figure 4.1-3 Inorganic chemicals detected above BVs at SWMU 33-002(b) 87
Figure 4.1-4 Organic chemicals detected at SWMU 33-002(b) 88
Figure 4.1-5 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(b) 89
Figure 4.1-6 Inorganic chemicals detected above BVs at SWMU 33-002(c) 90
Figure 4.1-7 Organic chemicals detected at SWMU 33-002(c) 91

Figure 4.1-8 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(c) 92
Figure 4.1-9 Site features and decision-level sampling locations for Consolidated Unit 33-004(a)-00 93
Figure 4.1-10 Inorganic chemicals detected above BVs at SWMU 33-004(a) 94
Figure 4.1-11 Organic chemicals detected at SWMU 33-004(a) 95
Figure 4.1-12a Proposed sampling locations at SWMUs 33-004(h) and 33-004(i) 96
Figure 4.1-12b Proposed sampling locations at SWMUs 33-004(a), 33-011(d), and 33-015 97
Figure 4.1-12c Nineteen of the twenty-five proposed sampling locations at SWMU 33-017 98
Figure 4.1-13 Six of the twenty-five proposed sampling locations at SWMU 33-017 and proposed drainage sampling locations at Consolidated Unit 33-004(a)-00 99
Figure 4.1-14 Inorganic chemicals detected above BVs at SWMU 33-011(d) 100
Figure 4.1-15 Site features and historical drainage sampling locations for Consolidated Unit 33-004(a)-00 101
Figure 4.1-16 Site features for Consolidated Unit 33-005(a)-00 102
Figure 4.1-17 Proposed sampling locations at Consolidated Unit 33-005(a)-00 103
Figure 4.1-18 Proposed drainage sampling locations at Consolidated Unit 33-005(a)-00 104
Figure 4.1-19 Site features and decision-level sampling locations for AOC 33-008(c) 105
Figure 4.1-20 Proposed sampling locations at AOC 33-008(c) 106
Figure 4.1-21 Site features for SWMU 33-011(e) 107
Figure 4.1-22 Proposed sampling locations at SWMU 33-011(e) 108
Figure 4.1-23 Site features for SWMU 33-012(a) 109
Figure 4.1-24 Proposed sampling locations at SWMU 33-012(a) 110
Figure 4.1-25 Site features for SWMU 33-016 111
Figure 4.1-26 Proposed sampling locations at SWMU 33-016 112
Figure 4.1-27 Site features and decision-level sampling locations for AOC C-33-001 113
Figure 4.1-28 Organic chemicals detected at AOC C-33-001 114
Figure 4.1-29 Proposed sampling locations at AOC C-33-001 115
Figure 4.1-30 Site features and decision-level sampling locations for AOC C-33-003 116
Figure 4.1-31 Inorganic chemicals detected above BVs at AOC C-33-003 117
Figure 4.1-32 Organic chemicals detected at AOC C-33-003 118
Figure 4.1-33 Radionuclides detected or detected above BVs/FVs at AOC C-33-003 119
Figure 4.1-34 Proposed sampling locations at AOC C-33-003 120
Figure 4.1-35 Proposed sampling locations at SWMU 33-004(d) and AOC C-33-003 drainage 121
Figure 4.2-1 Site features and decision-level sampling locations for Consolidated Unit 33-004(g)-00 and SWMUs 33-004(d) and 33-009 122
Figure 4.2-2 Proposed sampling locations at Consolidated Unit 33-004(g)-00 and SWMUs 33-004(d) and 33-009 123
Figure 4.3-1 Site features and decision-level sampling locations for Consolidated Unit 33-001(a)-99 124
Figure 4.3-2 Inorganic chemicals detected above BVs at Consolidated Unit 33-001(a)-99 125
Figure 4.3-3 Organic chemicals detected at Consolidated Unit 33-001(a)-99 126

Figure 4.3-4 Radionuclides detected or detected above BVs/FVs at Consolidated Unit 33-001(a)-99 127
Figure 4.3-5 Proposed sampling locations at Consolidated Unit 33-001(a)-99 128
Figure 4.3-6 Site features and decision-level sampling locations for SWMU 33-004(b) 129
Figure 4.3-7 Inorganic chemicals detected above BVs at SWMU 33-004(b) 130
Figure 4.3-8 Organic chemicals detected at SWMU 33-004(b) 131
Figure 4.3-9 Proposed sampling locations at SWMU 33-004(b) 132
Figure 4.3-10 Site features and decision-level sampling locations for SWMUs 33-004(j) and 33-010(c) 133
Figure 4.3-11 Site features for SWMU 33-006(a) 134
Figure 4.3-12 Site features and decision-level sampling locations for SWMUs 33-007(b) and 33-011(c) 135
Figure 4.3-13 Site features and decision-level sampling locations for SWMUs 33-008(a), 33-010(h), and 33-014 136
Figure 4.3-14 Site features for SWMU 33-010(g) 137
Figure 4.3-15 Proposed sampling locations at SWMU 33-004(j) 138
Figure 4.3-16 Organic chemicals detected at SWMU 33-006(a) 139
Figure 4.3-17 Proposed sampling locations at SWMUs 33-006(a) 33-010(c), 33-010(g), and 33-010(h) 140
Figure 4.3-18 Inorganic chemicals detected above BVs at SWMU 33-007(b) 141
Figure 4.3-19 Organic chemicals detected at SWMU 33-007(b) 142
Figure 4.3-20 Radionuclides detected or detected above BVs/FVs at SWMU 33-007(b) 143
Figure 4.3-21 Proposed sampling locations at SWMUs 33-007(b) and 33-011(c) 144
Figure 4.3-22 Inorganic chemicals detected above BVs at SWMU 33-008(a) 145
Figure 4.3-23 Organic chemicals detected at SWMU 33-008(a) 146
Figure 4.3-24 Proposed sampling locations at SWMUs 33-008(a) and 33-014 147
Figure 4.3-25 Inorganic chemicals detected above BVs at SWMU 33-010(c) 148
Figure 4.3-26 Radionuclides detected or detected above BVs/FVs at SWMU 33-010(c) 149
Figure 4.4-1 Site features for SWMU 33-004(m) 150
Figure 4.4-2 Proposed sampling locations at SWMU 33-004(m) 151
Figure 4.4-3 Site features for AOC 33-011(b) 152
Figure 4.4-4 Proposed sampling locations at SWMU 33-011(b) 153

Tables

Table 1.1-1 Status of SWMUs and AOCs in Chaquehui Canyon Aggregate Area 155
Table 2.3-1 Industrial SSLs and SALs 157
Table 4.0-1 Summary of Proposed Samples and Analyses 161
Table 4.1-1 Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 Main Site 170
Table 4.1-2 Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 Main Site 177

Table 4.1-3 Organic Chemicals Detected in Previous Investigations at TA-33 Main Site 188
Table 4.1-4 Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 Main Site 203
Table 4.1-5 Summary of Phase I and Phase II RFI Sampling Locations at SWMU 33-017 to be Resampled 210
Table 4.2-1 Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 Area 6 211
Table 4.3-1 Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 South Site 212
Table 4.3-2 Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 South Site 215
Table 4.3-3 Organic Chemicals Detected in Previous Investigations at TA-33 South Site 217
Table 4.3-4 Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 South Site 219
Table 5.0-1 Summary of Investigation Methods 221

Appendixes

Appendix A Acronyms and Abbreviations, Metric Conversion Table, and Data Qualifier Definitions
Appendix B Management Plan for Investigation-Derived Waste

Plates

Plate 1 Chaquehui Canyon Aggregate Area
Plate 2 Inorganic chemicals detected above BVs at SWMU 33-002(a)
Plate 3 Organic chemicals detected at SWMU 33-002(a)
Plate 4 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(a)
Plate 5 Organic chemicals detected at SWMU 33-017
Plate 6 Inorganic chemicals detected above BVs at AOC 33-008(c)
Plate 7 Organic chemicals detected at AOC 33-008(c)

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by the Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau (Figure 1.0-1), which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above sea level. The location of the Chaquehui Canyon Aggregate Area with respect to the Laboratory technical areas (TAs) is shown in Figure 1.0-1.

The Laboratory is participating in a national effort by DOE to clean up sites and facilities. The goal of the Laboratory's effort is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are designated as either solid waste management units (SWMUs) or areas of concern (AOCs).

The SWMUs and AOCs addressed in this investigation work plan are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE Order 435.1, "Radioactive Waste Management." Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). This work plan describes work activities that will be executed and completed in accordance with the Consent Order.

1.1 Work Plan Overview

The Chaquehui Canyon Aggregate Area includes a total of 51 SWMUs and AOCs located in TA-33 at the Laboratory (Plate 1). Historical details of previous investigations and data for these sites are provided in the historical investigation report (HIR) for the Chaquehui Canyon Aggregate Area (LANL 2009, 107348). Of these 51 sites, 8 have been previously investigated and/or remediated and have been approved for no further action (NFA). The status of each site and the NFA-approval documents are referenced in Table 1.1-1. This investigation work plan identifies and describes the activities needed to complete the investigation of the remaining 43 SWMUs and AOCs. This work plan addresses the remaining 43 sites using the information from previous field investigations or removal actions to evaluate current conditions at each site.

Section 2 of the work plan presents the general site information, operational history, and the preliminary conceptual site model of the Chaquehui Canyon Aggregate Area sites. General site conditions are discussed in section 3. Section 4 provides summaries of previous investigations and data collected and presents the scope of proposed activities for each site. The sites in the Chaquehui Canyon Aggregate Area are located in four geographical areas (Main Site, South Site, Area 6, and National Radio Astronomy Observatory [NRAO]) in TA-33; therefore, they are organized by area in this work plan. Each TA-33 geographical area subsection includes background information on operational history, summary of releases, current site use, and status of the sites in the TAs. Section 5 provides investigation methods for proposed field activities. Ongoing monitoring and sampling programs in the Chaquehui Canyon

Aggregate Area are presented in section 6. Section 7 is an overview of the anticipated schedule of the investigation and reporting activities.

The references cited in this work plan and the map data sources are provided in section 8. Appendix A of this work plan includes a list of acronyms and abbreviations, a metric conversion table, and a data qualifier definitions table. Appendix B describes the management of investigation-derived waste (IDW).

1.2 Work Plan Objectives

The objective of this work plan is to determine the nature and extent of releases from the 43 sites.

To accomplish this objective, this work plan

- presents historical and background information on the sites;
- describes the rationale for proposed data collection activities;
- identifies and proposes appropriate methods and protocols for collecting, analyzing, and evaluating data to characterize these sites; and
- identifies and proposes appropriate methods and protocols for remediating select sites.

2.0 BACKGROUND

2.1 General Site Information

TA-33, also known as Hot Point (HP) Site, is located on the Lower Pajarito Plateau in the southeastern corner of the Laboratory (Plate 1). TA-33 occupies approximately 1000 acres and is currently used for experimental research activities that support the creation, delivery, and maintenance of innovative detection and energy-projection systems for remote applications in space and around the world. Structures within TA-33 are located on the mesa top that is bounded to the north by Ancho Canyon and on the south by Chaquehui Canyon. TA-33 extends southeast to the Rio Grande, southwest to Frijoles Canyon, northeast to Ancho Canyon, and northwest to NM 4.

2.2 Operational History

TA-33 was initially developed in 1947 as a test site for implosion-type initiator experiments using conventional high explosives (HE), depleted uranium (DU), and beryllium. Polonium-210 was prepared off-site and used as the radiation source for the experiments. The experiments were performed in underground chambers, on surface firing pads, and at firing sites equipped with large guns that fired projectiles into earthen berms. Initiator testing at TA-33 ceased in 1972. After 1972, TA-33 has been used for offices, laboratories, and storage in support of electronics design and fabrication and experiments formerly conducted at the Hot Dry Rock Program. An antenna for the NRAO Very Long Baseline Array radiotelescope was sited at TA-33 in 1985 and is operational. The high-pressure tritium facility (former building 33-0086) was constructed at TA-33 in 1955 and operated until 1990. The tritium facility was decommissioned and demolished in the mid-1990s.

TA-33 consists of five operational areas: a laboratory and office complex near the entrance of TA-33 at NM 4 (Main Site); the former western firing site (Area 6); the former southern firing site (South Site); the former eastern firing site (East Site); and the current site of the antenna for the NRAO Very Long Baseline Array radiotelescope. SWMUs and AOCs at East Site [Consolidated Unit 33-003(a)-99, Material Disposal

Area (MDA) D, and SWMUs 33-004(c), 33-004(k), and 33-010(b)] are located within the South Ancho Canyon Aggregate Area and therefore are not included in this work plan.

2.3 Conceptual Site Model

The sampling proposed in this work plan uses a conceptual site model to predict areas of potential contamination and allow for adequate characterization of these areas. A conceptual site model describes potential contaminant sources, transport mechanisms, and receptors.

2.3.1 Potential Contaminant Sources

Releases at sites within the Chaquehui Canyon Aggregate Area may have occurred as a result of surface and subsurface placement of solid wastes, air emissions, or effluent discharges. Previous sampling results indicate contamination from inorganic chemicals, organic chemicals, and radionuclides (LANL 2009, 107348). Additional sampling is needed to determine the nature and extent of contamination.

2.3.2 Potential Contaminant Transport Mechanisms

Current potential transport mechanisms that may lead to exposure include

- dissolution and/or particulate transport of surface contaminants during precipitation and runoff events,
- airborne transport of contaminated surface soil,
- continued dissolution and advective/dispersive transport of chemical contaminants contained in subsurface soil and tuff as a result of past operations,
- disturbance of contaminants in shallow soil and subsurface tuff by Laboratory operations, and
- disturbance and uptake of contaminants in shallow soil by plants and animals.

MDA E at South Site is located near the edge of the mesa near White Rock Canyon. Historically, large landslides have occurred in White Rock Canyon and have encroached on the mesa top. The potential for landslides to result in exposure of the wastes buried at MDA E was studied to determine whether this may be a potential transport mechanism (Reneau et al. 1995, 054405). This study concluded that future exposure of the wastes at MDA E by this mechanism over the period of hundreds to thousands of years is improbable.

2.3.3 Potential Receptors and Pathways

Potential receptors and pathways may include

- Laboratory workers and
- plants and animals both on-site and in areas immediately surrounding the sites.

2.3.4 Cleanup Standards

As specified in Section VIII.B.1 of the Consent Order, screening levels will be used as soil cleanup levels unless they are determined to be impracticable or unless values do not exist for the current and reasonably foreseeable future land use. Soil screening levels (SSLs) for an industrial scenario are presented in Table 2.3-1 for previously detected inorganic and organic chemicals. The screening action

levels (SALs) for the industrial scenario are also provided in Table 2.3-1 for previously detected radionuclides.

2.4 Data Overview

Data evaluated in this work plan include historical data collected from 1993 through 2005, as part of Resource Conservation and Recovery Act (RCRA) facility investigations (RFIs) and other corrective actions. In the Sample Management Database, all data records include a vintage code field denoting how and where samples were submitted for analyses.

Samples described in this work plan have undergone analyses at both on-site and off-site laboratories. Because analytical practices and documentation of analyses vary in quality and completeness, analytical data presented are either screening-level or decision-level data. Screening-level data are appropriate for applications that only require a determination of gross contamination areas and/or for general site characterization. Screening-level data are also often used to specify areas where additional data should be collected. Decision-level data are used to quantify the nature and extent of releases and to perform risk assessments. The decision-level data provide supporting information for the investigation activities proposed in the work plan.

Inorganic chemical and radionuclide data from previous investigations were compared with background values (BVs) and fallout values (FVs) (LANL 1998, 059730, p. 6-2). Organic chemicals and fallout radionuclides in soil greater than a depth of 1 ft or in rock are evaluated based on detection status.

This work plan summarizes the available decision-level data (and where appropriate, screening-level data) to determine whether the nature and extent of contamination are defined for each site. In addition, this work plan proposes sampling activities and analytical suites for those sites at which the nature and extent of contamination have not been defined.

3.0 SITE CONDITIONS

3.1 Surface Conditions

3.1.1 Soil

Soil on the Pajarito Plateau was initially mapped and described by Nyhan et al. (1978, 005702). The soil on the slopes between the mesa tops and canyon floors was mapped as mostly steep rock outcrops consisting of approximately 90% bedrock with patches of shallow, weakly developed colluvial soil. South-facing canyon walls generally are steep and usually have shallow soil in limited, isolated patches between rock outcrops. In contrast, the north-facing canyon walls generally have more extensive areas of shallow dark-colored soil under thicker forest vegetation. The canyon floors generally contain poorly developed, deep, well-drained soil on floodplain terraces or small alluvial fans (Nyhan et al. 1978, 005702).

Soil at TA-33 Main Site and the surrounding mesa top is classified as Hackroy Rock Complex (Nyhan et al. 1978, 005702). Field logs from sampling conducted at MDA K indicate that soil ranges in depth from 0 to 8 ft (LANL 1997, 071478, p. 9). Soil may be sandy and contain pumice pebbles ranging up to 0.5 in. in size. Clay lenses may be intermixed with pulverized tuff. Soil in the drainages is sandy, with some clay and many small pebbles. Bedrock is exposed at many areas on the lower (eastern) part of the site, including the drainage east of the septic system [SMWU 33-004(a)].

Soil at TA-33 South Site is classified as Hackroy Rock Complex (Nyhan et al. 1978, 005702). Parent Hackroy soil is shallow, well-drained soil that form on mesa tops from weathered tuff. The surface layer is

a brown, sandy loam approximately 4 in. thick. Hackroy subsoil is a reddish-brown clay mixed with gravel or loam approximately 8 in. deep. The Hackroy Rock outcrop complex contains 20% Hackroy soil, 10% Nyjack soil, and 70% rock outcrop. Nyjack soil is similar to Hackroy but deeper and more loamy (LANL 1997, 071478, p. 9). Much of the soil at South Site was scraped to bedrock to build the berms near the firing sites.

3.1.2 Surface Water

Most surface water in the Los Alamos area occurs as ephemeral, intermittent, or interrupted streams in canyons cut into the Pajarito Plateau. Springs on the flanks of the Jemez Mountains, west of the Laboratory's western boundary, supply flow to the upper reaches of Cañon de Valle and to Guaje, Los Alamos, Pajarito, and Water Canyons (Purtymun 1975, 011787; Stoker 1993, 056021). These springs discharge water perched in the Bandelier Tuff and Tschicoma Formation at rates from 2 to 135 gal./min (Abeele et al. 1981, 006273). The volume of flow from the springs maintains natural perennial reaches of varying lengths in each of the canyons. The Rio Grande flows through White Rock Canyon immediately to the southeast of TA-33.

At TA-33, ephemeral surface water flow from the mesa top to the surrounding canyons may be expected during spring snowmelt and summer thunderstorms. Surface water does not collect on the mesa top at any of the SWMUs or AOCs in the Chaquehui Canyon Aggregate Area.

3.1.3 Land Use

Currently, land use of the Chaquehui Canyon Aggregate Area is industrial. The majority of TA-33 is undeveloped. Within the mesa-top portion of the aggregate area, there are three industrially developed areas of TA-33: Main Site, Area 6, and South Site. Main Site is actively used and contains offices, laboratories, and shops. Area 6, located next to Main Site, is inactive. South Site, at the south end of the aggregate area, is largely inactive but contains several structures that are actively used. TA-33 is not accessible to the public.

3.2 Subsurface Conditions

3.2.1 Anticipated Stratigraphic Units

The stratigraphy of the Chaquehui Canyon Aggregate Area is summarized in this section. A generalized cross section of the stratigraphy is presented in Figure 3.2-1. Additional information on the geologic setting of the area and information on the Pajarito Plateau can be found in the Laboratory's hydrogeologic synthesis report (Collins et al. 2005, 092028).

The geology of the area near TA-33, including White Rock Canyon, has been described as part of an evaluation of potential landslides and mass movements (Reneau et al. 1995, 054405). Descriptions of the geologic units in that evaluation are summarized below. Principal units, from oldest to youngest, include sedimentary rocks of the Santa Fe Group, volcaniclastic and quartzite-rich gravels of the Puye Formation, older alluvial deposits, basaltic flows and phreatomagmatic deposits of the Cerros del Rio volcanic field, and the lower and upper Bandelier Tuff (Griggs and Hem 1964, 092516; Dethier 1997, 049843). The stratigraphy and selected characteristics of these units are summarized below.

3.2.1.1 Santa Fe Group

The Miocene Santa Fe Group exposed in White Rock Canyon is composed primarily of pinkish-grey to buff-colored, poorly to moderately lithified silty sandstone and pebbly sand with an arkosic matrix (Griggs and Hem 1964, 092516; Galusha and Blick 1971, 021526; Dethier 1997, 049843). Thin beds of altered dacitic tephra are locally abundant. These rocks record mainly fluvial deposition on the distal margins of alluvial fans constructed when the Española basin was internally drained. The sandstone, locally cemented with sparry calcite, crops out extensively near the Buckman townsite east of the Rio Grande but is poorly exposed west of the Rio Grande. The southernmost exposure in northern White Rock Canyon is at the confluence with Ancho Canyon, to the north of TA-33.

3.2.1.2 Puye Formation

The Puye Formation is principally a Pliocene volcanogenic alluvial fan sequence derived from the Jemez Mountains (Turbeville et al. 1989, 021587), but it includes ancestral Rio Grande gravels and lacustrine deposits, particularly along and west of White Rock Canyon. Following Dethier (1997, 049843), the Puye Formation is informally divided into a fanglomerate facies and an axial Rio Grande facies. Along White Rock Canyon and tributary canyons south of Otowi Bridge, these facies are interfingered laterally and in vertical sequences. The fanglomerate facies is mainly pinkish-grey to grey, locally cemented, weakly lithified pebble-to-boulder size gravel, boulder-rich debris flows, and sand. Highly weathered dacitic pumice-rich layers also occur, which have weathered to clay. The ancestral Rio Grande facies is mainly grey, poorly to moderately lithified, locally cemented quartzite-rich pebble-to-cobble gravel, but it includes beds of silt and silty sand. In Ancho Canyon, to the north of TA-33, the Puye Formation is at least 200 ft thick, including 80 ft of Rio Grande gravels underlain by at least 115 ft of fanglomerate.

3.2.1.3 Pliocene Fluvial and Lacustrine Deposits

Unlithified and generally uncemented Pliocene sedimentary deposits interlayered with basalt flows and phreatomagmatic deposits are exposed within a few miles of the Rio Grande. These rocks include buff to brownish-yellow sand and pebbly sand, silt, silty sand, and beds of cinders and debris flows. They are the temporal equivalent, in part, of the ancestral Rio Grande facies of the Puye Formation, but the presence of granitic clasts indicates they were derived from the southern Sangre de Cristo Range (Dethier 1997, 049843). They correlate with the older alluvium of Griggs and Hem (1964, 092516) and, in part, with the Ancha Formation of Spiegel and Baldwin (1963, 054259). Fine-grained units are locally rich in swelling clays that were probably produced from the alteration of basaltic glass derived from Cerros del Rio volcanism. Lacustrine deposits record a Rio Grande dammed south of Water Canyon contemporaneous with eruptions from maars and emplacement of basaltic flows.

3.2.1.4 Cerros del Rio Volcanic Field

Mafic Lavas

Lava flows of basalt, hawaiite, basaltic andesite, andesite, and related intrusive rocks of the Pliocene Cerros del Rio volcanic field form surface exposures along White Rock Canyon and east of the Rio Grande from Otowi Bridge to Cochiti Dam. Volcanic landforms include maars, shields, fissure vents, cinder cones near the Rio Grande, and a cinder cone at TA-33 Area 6. Near Otowi Bridge, mesa-capping flows are about 130 ft thick, whereas south of Water Canyon the flow sequence is greater than 260 ft thick, and near Chaquehui Canyon massive flows are greater than 400 ft thick. East of the Rio Grande, the sequence of basaltic flows also thickens to the south. The thickest flows appear to fill paleovalleys or craters greater than 200 ft deep, whereas some of the thinner flows apparently spread out over surfaces

of little relief. Flow bases are smooth to rubble-rich; locally a few tens of inches to a few feet of alluvium separate the flows.

Ages of 2.3 to 2.7 Ma (millions of years) have been obtained from rocks of the Cerros del Rio volcanic field near northern White Rock Canyon, including argon-40/argon-39 ages of 2.4 to 2.6 Ma from basalt flows and dikes at the TA-33 cinder cone (Laughlin et al. 1993, 054424; Dethier 1997, 049843). A topographically low flow in lower Water Canyon yielded a similar age of about 2.47 Ma, indicating a relatively short period of intense volcanism and over 650 ft of local aggradation occurred at about 2.4 to 2.6 Ma.

Phreatomagmatic Deposits

Thin-bedded to massive matrix-supported flow and fall deposits crop out at La Mesita, along Chino Mesa, between Chaquehui Canyon and Water Canyon, and in several other zones south to Cochiti Dam, mainly along the Rio Grande. These deposits were produced at maar volcanoes that formed when rising magmas reacted with groundwater along the Pliocene course of the Rio Grande (Aubele 1978, 054426; Heiken et al. 1989, 054425; Dethier 1997, 049843). At several of these volcanic centers, lava flows are interlayered with the upper portions of the phreatomagmatic sequences, and some maars probably were the source of thick flows of basaltic andesite (Dethier 1997, 049843). For instance, 100 ft of phreatomagmatic deposits along the southwest side of Chaquehui Canyon near the Rio Grande are overlain by a 200-ft-thick volcanic section that includes seven flows and interlayered phreatomagmatic deposits; these rocks are in turn capped by a package of flows 400 ft thick that may reflect a single cooling unit.

“Pajarito Plateau” Tholeiitic Basalt

Thin flows of tholeiitic basalt typically form the western rim of White Rock Canyon in the TA-33 area, extending north to Los Alamos Canyon. The flows were derived from vents to the west and northwest of White Rock, and one of these vents is exposed south of Pajarito Canyon, southwest of the intersection of Pajarito Road and NM 4. In late Pliocene time, the basalts entered a lake dammed in White Rock Canyon at an elevation of about 6200 ft. Deltas of pillow basalt and palagonitic breccia formed at the edge of the paleolake and are best exposed in Los Alamos and Mortandad Canyons. Available data indicate these tholeiitic flows can be distinguished from other Cerros del Rio lavas by their chemistry (Laughlin et al. 1993, 054424; Dethier 1997, 049843) in addition to their higher stratigraphic position and flow direction. Ages of 1.8 to 2.5 Ma have been obtained from these basalts (Laughlin et al. 1993, 054424; Dethier 1997, 049843; WoldeGabriel et al. 2001, 092523), including argon-40/argon-39 ages of 2.46 to 2.49 Ma near TA-33.

3.2.1.5 Otowi Member Bandelier Tuff

The Otowi Member of the Bandelier Tuff consists of light-grey, nonwelded pyroclastic flows of pumiceous rhyolite and a basal pumiceous fall unit, the Guaje Pumice Bed (Bailey et al. 1969, 021498). The Otowi Member was erupted from the Jemez Mountains about 1.6 Ma (Izett and Obradovich 1994, 048817). Only the Guaje Pumice Bed is widely preserved near White Rock Canyon, where it lies unconformably on surfaces cut into Pliocene basalt of the Cerros del Rio or on Pliocene alluvium. Near TA-33, small exposures of the Otowi Member are present in Ancho Canyon near NM 4, and the Otowi Member is also exposed farther down Ancho Canyon within a pre-Bandelier Tuff paleocanyon, possibly in an ancient cutoff meander bend.

3.2.1.6 Early Quaternary Alluvium

Early Quaternary alluvium is locally exposed near TA-33 below the Tshirege Member of the Bandelier Tuff. Volcanic fallout units of the Cerro Toledo rhyolite, which fill this stratigraphic interval to the northwest (Heiken et al. 1986, 048638), are apparently sparse in the vicinity of White Rock Canyon. In Ancho Canyon near NM 4, about 20 ft of dacite-rich bouldery stream gravels derived from a stream draining the Sierra de los Valles occurs between the Otowi and Tshirege Members. In lower Water Canyon and a northeastern tributary to lower Ancho Canyon, alluvial deposits composed largely of quartzite-rich gravels and river-polished basalt boulders occur beneath the Tshirege Member and indicate that the early Quaternary position of the Rio Grande was at an elevation of about 5700 to 5800 ft above sea level.

3.2.1.7 Tshirege Member Bandelier Tuff

The Tshirege Member of the Bandelier Tuff at TA-33 consists of light-grey nonwelded to slightly welded pumiceous pyroclastic flows and a thin basal pumiceous fall unit, the Tsankawi Pumice Bed (Bailey et al. 1969, 021498). These rocks were erupted from the Jemez Mountains about 1.22 Ma (Izett and Obradovich 1994, 048817). The Tshirege Member is the uppermost rock unit at TA-33 and underlies the SWMUs and AOCs within Chaquehui Canyon Aggregate Area. This unit is typically about 200 to 250 ft thick at TA-33 but pinches out over paleotopographic highs, such as the TA-33 cinder cone, and reaches a thickness of about 750 ft where it fills the early Quaternary paleocanyon.

The Tshirege Member can be divided into mapping units that reflect distinct flow units or cooling units and variations in alteration. Four mapping units modified from the units of Baltz et al. (1963, 008402) and Vaniman and Wohletz (1990, 009995.2) in other parts of the Pajarito Plateau are described below.

The lowest unit, unit 1g, consists of nonwelded ignimbrite with glassy pumice, following Vaniman and Wohletz (1990, 009995.2). The second lowest unit, unit 1v, consists of nonwelded vapor-phase-altered ignimbrite, also following Vaniman and Wohletz (1990, 009995.2). Unit 2 is the primary cliff-former at TA-33, consisting of slightly welded ignimbrite with discontinuous surge beds at the base. The contact of unit 2 with the overlying nonwelded to slightly welded ignimbrites of unit 3 is poorly defined and is here considered to be the approximate break in slope at the base of the upper, relatively steep tuff step.

3.2.2 Hydrogeology

The hydrogeology of the Pajarito Plateau is generally separable in terms of mesas and canyons forming the plateau. Mesas are generally devoid of water, both on the surface and within the rock forming the mesa. Canyons range from wet to relatively dry; the wettest canyons contain continuous streams and contain perennial groundwater in the canyon-bottom alluvium. Dry canyons have only occasional stream flow and may lack alluvial groundwater. Intermediate-perched groundwater has been found at certain locations on the plateau at depths ranging between 100 and 400 ft. The regional aquifer is found at depths of about 600 to 1200 ft.

The hydrogeologic conceptual site model for the Laboratory (Collins et al. 2005, 092028) shows that under natural conditions relatively small volumes of water move beneath mesa tops because of low rainfall, high evaporation, and efficient water use by vegetation. Atmospheric evaporation may extend into mesas, further inhibiting downward flow.

In the Los Alamos County area, groundwater occurs as (1) water in shallow alluvium in some of the larger canyons, (2) intermediate-perched groundwater (a perched groundwater body lies above a less permeable layer and is separated from the underlying aquifer by an unsaturated zone), and (3) the regional aquifer.

No groundwater wells are located in or near TA-33. Drilling to a depth of 315 ft during the investigation of MDA K in Main Site did not encounter perched water. Groundwater discharges from four springs (Springs 8A, 9, 9A, and Doe Spring) located in lower Chaquehui Canyon east of South Site above the Rio Grande. At South Site (elevation 6400 ft above sea level), the depth to groundwater is assumed to be 800 ft, based on the elevation (5600 ft above sea level) of Doe Spring.

4.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES UNDER INVESTIGATION

The following sections present site descriptions, summaries of previous investigation activities, proposed sampling activities, and proposed remedial activities. Table 4.0-1 summarizes the investigation strategy for each SWMU or AOC, including the analytical methods for site-characterization activities proposed in this work plan.

The Chaquehui Canyon Aggregate Area has been disturbed as a result of many years of new construction, demolition of former structures, and historical firing-site activities. Before sampling is conducted, geodetic and geophysical methods, in conjunction with radiological surveys, may be used to verify specific SWMU and AOC boundaries. The sampling locations proposed in this work plan may be relocated as a result of these surveys; however, the overall sampling strategy will remain the same.

Thirty-three sites [SWMUs 33-001(a–e), 33-002(a–e), 33-004(a), 33-004(g), 33-004(h), 33-004(i), 33-004(j), 33-004(m), 33-005(a–c), 33-007(b), 33-007(c), 33-009, 33-011(a–e), 33-012(a), 33-014, 33-016, and 33-017 and AOCs C-33-001 and C-33-003] are proposed for characterization. Ten sites [SWMUs 33-004(b), 33-004(d), 33-006(a), 33-008(a), 33-010(c), 33-010(f), 33-010(g), 33-010(h), and 33-015 and AOC 33-008(c)] are proposed for cleanup under this investigation work plan. Cleanup levels for the proposed sites are presented in Table 2.3-1.

The approved South Canyons investigation work plan addresses sources of contamination and the nature and extent of contamination in sediment, surface water of active stream channels, and groundwater beneath canyon floors (LANL 2006, 093713; NMED 2007, 095490). The South Canyons investigation includes sampling and analysis of media from the watersheds associated with Chaquehui Canyon and representative sections of canyon reaches. Three reaches have been identified in Chaquehui Canyon (CH-1, CH-2, and CHN-1) (Plate 1). For the Chaquehui Canyon Aggregate Area, the South Canyons investigation work plan proposes collecting 10 sediment samples in each reach. If necessary, subsequent sampling is generally limited to chemicals of potential concern (COPCs) identified during the initial sampling and analysis. Subsequent investigations may include additional sampling in previously investigated reaches or full investigations of new reaches, contingent on the results of the initial sampling and analysis. Analytical suites for these reaches include perchlorate, target analyte list (TAL) metals, cyanide, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbon (PAHs), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), radionuclides, and explosive compounds (LANL 2006, 093713, p. 14). Sediment sampling for the South Canyons approved work plan will begin in 2010, and the data will be reported in the South Canyons investigation report, due to NMED in August 2011.

4.1 Sites under Investigation at Main Site

This section provides descriptions and history of each of the sites being investigated at TA-33 Main Site, along with descriptions and results of previous investigations, and the proposed investigations. A summary of decision-level samples collected and analyses requested during previous investigations is presented in Table 4.1-1. Inorganic chemicals above BVs in previous decision-level samples are

presented in Table 4.1-2. Organic chemicals detected in previous decision-level samples are presented in Table 4.1-3. Radionuclides detected or detected above BVs/FVs in previous decision-level samples are presented in Table 4.1-4. Figures 4.1-1 through 4.1-35 show the site features, historical sampling locations, inorganic and organic chemicals and radionuclides detected above background, and the locations proposed for sampling in this work plan.

4.1.1 Consolidated Unit 33-002(a)-99, MDA K

Consolidated Unit 33-002(a)-99 consists of SWMUs 33-002(a–e) and 33-010(f) and is collectively referred to as MDA K. The SWMUs in this consolidated unit consist of the former locations of a septic system and two seepage pits with drainlines and outfalls that served the former tritium facility (building 33-0086) and a former surface disposal area. MDA K is in the southeast area of Main Site at TA-33.

4.1.1.1 SWMU 33-002(a), Septic System

Description and History

SWMU 33-002(a) is the former location of a septic system that served the former Tritium Facility (former building 33-0086) and a nearby guard station (former building 33-0090) (Figure 4.1-1). The septic system was installed in 1954 and consisted of a drainline, an 860-gal. septic tank (former structure 33-0093), a siphon tank, and an approximately 50-ft ×100-ft drain field. The septic system operated until 1990 when discharge of effluent from the Tritium Facility ceased; however, the septic system continued to receive effluent from the guard station until the mid-1990s. The principal waste stream received by the septic system was sanitary wastewater from former buildings 33-0086 and 33-0090. The system also received tritium- and uranium-contaminated liquids associated with operations and other releases from former building 33-0086, including two releases of plutonium-contaminated liquid in 1961 (LANL 1992, 007671, p. 3-19).

Previous Investigations

As part of the Laboratory's Environmental Surveillance Program, a radiation survey was conducted in 1986 at 30 points on a 32.8-ft × 32.8-ft grid covering the area east of former building 33-0086 and at five locations in the drainage channel to the east of the grid (LANL 1992, 007671, pp. 3-27–3-34). Surface soil samples (0 to 0.5 below ground surface [bgs]) were collected from the grid points and analyzed for tritium and uranium. Sampling data showed tritium levels above FV (LANL 1992, 007671, pp. 3-27–3-34). In 1989, two boreholes were drilled, one at the east end of the septic system drain field to a depth of 150 ft bgs (location 33-0019) and one just north of the septic system drain field to a depth of 174 ft bgs (location 33-0018) (LANL 1995, 050113, pp. 18–20). Eighteen samples were collected from borehole 33-0018 from depths of 4 to 5 ft, 9 to 10 ft, 14 to 15 ft, 24 to 25 ft, 49 to 50 ft, 59 to 60 ft, 79 to 80 ft, 89 to 90 ft, 99 to 100 ft, 109 to 110 ft, 119 to 120 ft, 129 to 130 ft, 139 to 140 ft, 149 to 150 ft, 159 to 160 ft, 169 to 170 ft, and 173 to 174 ft bgs. Twelve samples were collected from borehole 33-0019 from depths of 4 to 5 ft, 9 to 10 ft, 24 to 25 ft, 44 to 45 ft, 49 to 50 ft, 59 to 60 ft, 69 to 79 ft, 79 to 80 ft, 89 to 90 ft, 99 to 100 ft, and 129 to 130 ft bgs. Twenty-one samples were analyzed for tritium; 20 samples were analyzed for gamma-emitting radionuclides and uranium; 21 samples were analyzed for metals, uranium, SVOCs, VOCs, PCBs, and HE; and 22 samples were samples were analyzed for VOCs. All data collected in 1986 and 1989 are screening-level data and are not presented in this work plan; however, the data showed detected concentrations of VOCs, tritium above BV, and metals above BVs.

Phase I RFI sampling activities conducted in 1993 at SWMU 33-002(a) included the collection of one liquid and one sludge sample from the septic tank for waste characterization purposes; three samples

were collected at three depths (0 to 0.5 ft, 3 to 3.5 ft, and 4 to 4.5 ft bgs) from a 4-ft-deep borehole next to the septic tank, two samples were collected from depths of 5 and 10 ft bgs in each of two 10-ft-deep boreholes in the drain field east of the septic tank, and surface samples (0 to 0.5 ft bgs) were collected from two locations in the drain field. All samples were analyzed for uranium, tritium, isotopic plutonium, gamma emitters, metals, and SVOCs; seven subsurface samples were analyzed for VOCs. Data from the 1993 Phase I RFI are screening level and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.1.3 of the HIR contains a detailed summary of the screening-level data (LANL 2009, 107348).

Additional Phase I RFI sampling at SWMU 33-002(a) involved drilling three deep boreholes near the eastern (downgradient) edge of the drain field to depths of 230 to 315 ft bgs to investigate a tritium plume (Figure 4.1-1). Ten samples were collected from borehole 33-1230 from depths of 0 to 1 ft, 10 to 11 ft, 20 to 21 ft, 30 to 31 ft, 65 to 66 ft, 92 to 93 ft, 127 to 128 ft, 150 to 151 ft, 180 to 181 ft, and 230 to 231 ft bgs. All 10 samples were analyzed for tritium, 6 samples were analyzed for metals and SVOCs, and 4 samples were analyzed for VOCs. Thirteen samples were collected from borehole 33-1231 from depths of 0 to 0.5 ft, 10 to 11 ft, 20 to 21 ft, 30 to 31 ft, 60 to 61 ft, 94 to 95 ft, 124 to 126 ft, 153 to 155 ft, 183.9 to 184.6 ft, 211.5 to 212.2 ft, 244.5 to 245 ft, 268.7 to 269 ft, and 314 to 315 ft bgs. All 13 samples were analyzed for tritium, 6 samples were analyzed for metals and SVOCs, and 5 samples were analyzed for VOCs. Twelve samples were collected from borehole 33-1232 from depths of 0 to 0.5 ft, 10 to 11 ft, 20 to 21 ft, 30 to 31 ft, 60 to 61 ft, 90 to 91 ft, 95 to 97 ft, 125 to 126 ft, 150 to 151 ft, 180 to 181 ft, 210 to 211 ft, and 240 to 241 ft bgs. All 12 samples were analyzed for tritium, 5 samples were analyzed for metals and SVOCs, and 4 samples were analyzed for VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR. Section 2.1.1.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed detections of antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, uranium, and zinc above BV. Thirteen organic chemicals [acetone; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; chrysene; di-n-butylphthalate; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene] were each detected in the Phase I RFI samples. Radionuclides detected or detected above FVs were cesium-137, plutonium-238, plutonium-239/240, and tritium.

During the 1996 Phase II RFI, one borehole was advanced in the septic tank drain field (borehole 33-01696), and one borehole was advanced adjacent to the septic tank (borehole 33-01652) (Figure 4.1-1). Three samples were collected from borehole 33-1696 at depths of 2.3 to 3 ft, 8.25 to 8.7 ft, and 12.5 to 13.2 ft bgs, and three samples were collected from borehole 33-1652 at depths of 1 to 1.5 ft, 3.1 to 4.1 ft, and 12.5 to 12.9 ft bgs. All six samples were analyzed for isotopic plutonium, uranium, metals, VOCs, and SVOCs. The 1996 decision-level data are presented in this work plan. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

During a 1997 interim action (IA), the SWMU 33-002(a) septic tank was deactivated, the tank contents were removed and disposed of as mixed low-level waste (LLW), the tank's interior was steam-cleaned, the drainline connections to the tank were plugged, and the tank was left in place. No samples were collected.

During ~~the~~ a 2005 ~~accelerated~~ voluntary corrective action (~~A~~VCA), the SWMU 33-002(a) septic tank, inlet and outlet drainlines, and the drain field were removed and disposed of as LLW (LANL 2010, 110352). Sixteen confirmation samples were collected at eight locations beneath the septic tank inlet line from two depths (0 to 0.5 ft and 2 to 2.5 ft) beneath the bottom of the excavation after the drainline had been removed ~~(0 to 0.5 ft and 2 to 2.5 ft bgs)~~. Sampling locations were biased to drainline joints, elbows, and cleanouts; no soil staining, elevated radiation, or VOC field-screening readings were observed along the

drainline. Six confirmation samples were collected from two depths (0 to 0.5 ft and 2 to ~~3~~2.5 ft ~~bgs~~) at one location beneath the septic tank inlet, one location beneath the septic tank outlet, and one location in the center of the septic tank excavation after it was removed (Figure 4.1-1). Samples collected beneath the inlet drainline, septic tank, and septic tank inlet and outlet connection were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, high explosives (HE), strontium-90, nitrate, and cyanide. Twenty-six confirmation samples were collected from ~~two depths (0 to 0.5 ft and 2 to 32.5 ft bgs) at~~ 13 locations along the outlet drainline and within the drain field beneath the bottom of the drainlines. At each location, samples were collected at 0 to 0.5 ft and 2 to 2.5 ft below the bottom of the excavation after removing the drainlines. These samples were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, strontium-90, nitrate, and cyanide and also were to be analyzed for HE. However, while the sample collection paperwork was being prepared for the samples collected beneath the outlet drainline and the drain field, the analytical suite was inadvertently changed to include total petroleum hydrocarbons (TPH) diesel range organics (DRO) instead of the HE analysis. Therefore, no analytical data are available for HE in confirmation samples collected in the septic tank drain field after the drainlines had been removed. The 2005 decision-level data are presented in this ~~report~~ investigation work plan. Samples collected during the 2005 ~~A~~VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the Phase II RFI and ~~A~~VCA samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Inorganic chemicals detected above soil BVs included aluminum, arsenic, barium, calcium, chromium, copper, lead, magnesium, mercury, nickel, nitrate, perchlorate, selenium, silver, uranium, vanadium, and zinc. Aluminum was detected above the tuff BV in nine samples. Arsenic was detected above the tuff BV in 11 samples. Barium was detected above the tuff BV in 11 samples and above the soil BV in 1 sample. Calcium was detected above the soil BV in 3 samples and above the tuff BV in 18 samples. Chromium was detected above the soil BV in one sample and above the tuff BV in six samples. Copper was detected above the soil BV in 7 samples and above the tuff BV in 13 samples. Lead was detected above the soil BV in one sample and above the tuff BV in five samples. Magnesium was detected above the tuff BV in eight samples. Mercury was detected above the soil BV in six samples and above the tuff BV in five samples. Nickel was detected above the tuff BV in three samples. Nitrate was detected in 27 soil samples and 9 tuff samples; there is no BV for nitrate. Perchlorate was detected in 19 soil samples and 1 tuff sample; there is no BV for perchlorate. Selenium was detected above the tuff BV in three samples. Silver was detected above soil BV in one sample and above the tuff BV in one sample. Uranium was detected above the soil BV in five samples and above the tuff BV in one sample. Vanadium was detected above the tuff BV in two samples. Zinc was detected above the soil BV in five samples and above the tuff BV in two samples. Antimony, cadmium, and total cyanide were not detected above soil and tuff BVs but had detection limits above BVs. Sampling locations and results for inorganic chemicals above BVs are shown on Plate 2.

Twenty-eight organic chemicals [acenaphthene; acenaphthylene; acetone; anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; bis(2-ethylhexyl)phthalate; Bromobenzene; 2-butanone; 4-chloroaniline; chrysene; di-n-butylphtalate; dibenzofuran; fluoranthene; fluorene, indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; toluene; and TPH-DRO] were detected. Bromobenzene, 4-chloroaniline, and dibenzofuran were each detected in one sample. Acenaphthylene, 2-butanone, and TPH-DRO were each detected in two samples. Aroclor-1242 was detected in three samples. Acetone, Aroclor-1260, and tetrachloroethene were each detected in five samples. Di-n-butylphtalate was detected in six samples. Benzo(a)anthracene and toluene were each detected in eight samples. Methylnaphthalene-2 was detected in 10 samples. Aroclor-1254 was detected in 12 samples. Naphthalene was detected in 14 samples. Benzo(g,h,i)perylene and indeno(1,2,3-cd)pyrene were each

detected in 16 samples. Fluorene was detected in 17 samples. Acenaphthene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and phenanthrene were each detected in 18 samples. Fluoranthene and pyrene were each detected in 19 samples. Bis(2-ethylhexyl)phthalate was detected in 20 samples. Sampling locations and detected results for organic chemicals are shown on Plate 3.

Radionuclides detected or detected above BVs/FVs were americium-241, plutonium-238, plutonium-239/240, uranium-235/236, and tritium. Americium-241 was detected above the soil BV in one surface sample. Plutonium-238 was detected above the soil BV in one surface soil sample and was detected in one tuff sample. Plutonium-239/240 was detected above the soil BV in one surface sample. Uranium-235/236 was detected above tuff the BV in one sample, and uranium-238 was detected above the tuff BV in one sample. Tritium was detected in 35 subsurface soil samples and 31 tuff samples. Sampling locations and results for radionuclides detected or detected above BVs/FVs are shown on Plate 4.

The VCA report concluded that lateral extent of contamination was defined for all inorganic and organic chemicals and radionuclides at SWMU 33-002(a) (LANL 2010, 110352, pp. 15–19). Vertical extent was not defined at the following sampling locations for the specified constituents:

- 33-24716—Aroclor-1242 and bis(2-ethylhexyl)phthalate
- 33-24717—acenapthene; anthracene; benzo(a)anthracene; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; pyrene; plutonium-238; and tritium
- 33-24718—arsenic; calcium; silver; acenaphthene; anthracene; Aroclor-1254; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; phenanthrene; naphthalene; pyrene; and tritium
- 33-24719—bis(2-ethylhexyl)phthalate; indeno(1,2,3-cd)pyrene; and naphthalene
- 33-24720—barium and calcium
- 33-24721—aluminum, barium, and lead
- 33-24722—aluminum; lead; nickel; acenaphthene; anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; and uranium-238
- 33-24723—aluminum; arsenic; barium; chromium; magnesium; silver; vanadium; and benzo(g,h,i)perylene
- 33-24724—aluminum, selenium, and tritium
- 33-24725—aluminum
- 33-24726—aluminum, arsenic, barium, calcium, chromium, nickel, selenium, vanadium, and acenaphthene
- 33-25098—copper, mercury, and tritium
- 33-25117—tritium

Proposed Activities

~~The vertical extent of contamination has not been determined at several ACA confirmation sampling locations at SWMU 33-002(a):~~

- ~~The vertical extent of metals contamination has not been determined at ACA sampling locations 33-24717, 33-24718, 33-24719, 33-24720, 33-24721, 33-24722, 33-24723, 33-24724, 33-24725, 33-24726, and 33-25098.~~
- ~~The vertical extent of PCB contamination has not been determined at ACA sampling locations 33-24716, 33-24718, and 33-24722.~~
- ~~The vertical extent of SVOC contamination has not been determined at ACA sampling locations 33-24717, 33-24718, 33-24719, and 33-24722.~~
- ~~The vertical extent of plutonium-238 contamination has not been determined at ACA confirmation sampling location 33-24717; the vertical extent of uranium-235/236 contamination has not been determined at ACA confirmation sampling location 33-24722; and the vertical extent of tritium contamination has not been determined at ACA confirmation sampling locations 33-24717, 33-24218, 33-24724, 33-25098, 33-25112, 33-25114, and 33-25117.~~

As discussed above, the vertical extent of some inorganic chemicals, organic chemicals, and radionuclides has not been defined at several VCA sampling locations. Samples will be collected ~~from the next deeper interval (4 to 5 ft bgs) from~~ 3 to 4 ft beneath the deeper VA~~C~~A confirmation sample at each sampling location~~s~~ indicated above where vertical extent has not been determined. Samples will be analyzed for the specific constituents for which vertical extent was not defined. ~~Samples collected from locations 33-24717 through 33-24726, and 33-25098 will be analyzed for metals. Samples collected from locations 33-24716, 33-24718, and 33-24722 will be analyzed for PCBs. Samples collected from locations 33-24717 through 33-24719 and 33-24722 will be analyzed for SVOCs. In addition, the sample collected from location 33-24717 will be analyzed for isotopic plutonium, the sample collected from location 33-24722 will be analyzed for isotopic uranium, and samples collected from locations 33-24717, 33-24218, 33-24724, 33-25098, 33-25112, 33-25114, and 33-25117 will be analyzed for tritium. All the samples will be analyzed for nitrate. Cyanide, perchlorate, and explosive compounds were not detected in the ACA confirmation samples and therefore are not included in the analytical suites for SWMU 33-002(a).~~ Additionally, the locations where samples were inadvertently not analyzed for explosive compounds will be resampled (locations 33-25097, 33-25098, 33-25107, 33-25108, 33-25109, 33-25110, 33-25111, 33-25112, 33-25113, 33-25114, 33-25115, 33-25116, and 33-25117). At each location, samples will be collected from the same interval as the deeper VCA confirmation sample and 3 to 4 ft below this depth and analyzed for explosive compounds. Proposed sampling locations are shown in Figure 4.1-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.2 SWMU 33-002(b), Seepage Pit

Description and History

SWMU 33-002(b) is the location of a former seepage pit (former structure 33-0134) connected to sinks and floor drains in former building 33-0086 (Figure 4.1-1). The seepage pit was an unlined, rubble-filled pit that is 6 ft in diameter and 8 ft deep, with a 3-in.-thick concrete lid. Discharges to the seepage pit began in 1955 and ceased in 1959 and the seepage pit was backfilled. The drainline discharging to the seepage pit was subsequently extended through the pit and routed approximately 75 ft downslope to daylight to an outfall [SWMU 33-002(e)] for the discharge of stormwater from roof drains on former building 33-0086. The new drainline angled to the northeast and then to the east following the natural drainage directly east of the SWMU 33-002(a) leach field; however, the two SWMUs were not connected. Wastes discharged to the SWMU 33-002(b) seepage pit between 1955 and 1959 contained organic solvents, including ethanol, methanol, trichlorethene (TCE), benzene, and acetone. Some of these

solvents were contaminated with tritium. The SWMU 33-002(b) seepage pit also may have received beryllium, mercury, and DU.

Previous Investigations

In 1989, one surface sample (0 to 0.5 ft bgs) was collected at the location of the SWMU 33-002(b) seepage pit (former structure 33-0134) (LANL 1995, 050113, pp. 40–41) and analyzed for metals, PCBs/pesticides, tritium, and gamma spectroscopy. Data from the 1989 investigation are screening-level data and are not presented in this work plan; however, the data show only tritium was detected.

Phase I RFI activities conducted at SWMU 33-002(b) in 1993 (LANL 1995, 050113) consisted of collecting a single soil sample from a depth of 5 ft bgs within the seepage pit, augering a 2.5-ft-deep borehole next to the seepage pit to the soil-tuff interface, and collecting two soil samples from depths of 0 to 0.5 ft and 2.5 to 3 ft bgs. Samples were analyzed for uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, metals, VOCs, and SVOCs; the sample collected within the seepage pit was also analyzed for PCBs/pesticides. The RFI work plan called for collecting liquid and sludge samples from the seepage pit; however, the seepage pit had been backfilled with soil. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR. Section 2.1.2.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed uranium as the only metal detected above BV. No organic chemicals were detected. Radionuclides detected or detected above FVs in Phase I RFI samples were plutonium-238, plutonium-239/240, and tritium.

During Phase II RFI activities conducted at SWMU 33-002(b) in 1996 (LANL 1997, 071478), a borehole was advanced through the SWMU 33-002(b) seepage pit to a depth of 117.4 ft bgs (Figure 4.1-1). Twenty-five samples were collected at depth intervals of approximately 5 ft and analyzed for tritium. In addition, three samples collected within the first 15 ft were analyzed for uranium, isotopic plutonium, metals, VOCs, and SVOCs. The 1996 decision-level data are presented in this work plan. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

During a ~~the~~ 2005 ~~A~~VCA, the ~~SWMU 33-002(b)~~ remaining sections of the SWMU 33-002(b) inlet and outlet drainlines for the seepage pit were removed and disposed of as LLW, and the entire seepage pit was excavated and disposed of as mixed LLW ~~(LANL 2005, 091433)~~ (LANL 2010, 110352). The seepage pit location was overexcavated to dimensions of 6 ft × 9 ft ~~in diameter~~ × ~~8~~10 ft deep. The outlet drainline discharged to the SWMU 33-002(e) outfall. Twenty-two confirmation samples were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) beneath the bottom of the excavation after the drainlines had been removed ~~(0 to 0.5 ft and 2 to 2.5 ft bgs)~~ at three locations beneath the remaining seepage pit inlet line and eight locations along the seepage pit outlet line (Figure 4.1-1). Sampling locations were biased to drainline joints and elbows; no soil staining, elevated radiation, or VOC field-screening readings were observed along the drainlines. Four confirmation samples were collected from two depths (0 to 0.5 ft and 2 to ~~3~~2.5 ft ~~bgs~~) at two locations in the bottom of the seepage pit excavation. Samples were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, ~~HE,~~ strontium-90, nitrate, and cyanide. All samples also were to be analyzed for HE. However, while the sample collection paperwork was being prepared for the samples collected beneath the seepage pit outlet drainline, the analytical suite was inadvertently changed to include TPH-DRO instead of the HE analysis. Therefore, no analytical data are available for HE in confirmation samples collected after the outlet drainline had been removed. Samples collected during the 2005 ~~A~~VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the Phase II RFI and ~~A~~VCA samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Inorganic chemicals detected above BV were aluminum, arsenic, barium, calcium, chromium, cobalt, copper, lead, magnesium, mercury, nickel, nitrate, perchlorate, selenium, uranium, and vanadium. Aluminum was detected above the tuff BV in four samples. Arsenic was detected above the tuff BV in four samples. Barium was detected above the tuff BV in nine samples. Calcium was detected above the tuff BV in 13 samples. Chromium was detected above the tuff BV in three samples. Cobalt was detected slightly above the tuff BV in two samples. Copper was detected above the soil BV in 1 sample and above the tuff BV in 13 samples. Lead was detected above the tuff BV in one sample. Magnesium was detected above the tuff BV in four samples. Mercury was detected above the tuff BV in seven samples. Nickel was detected above the tuff BV in three samples. Nitrate was detected in 3 soil samples and 15 tuff samples; there is no BV for nitrate. Perchlorate was detected in 3 soil samples and 14 tuff samples; there is no BV for perchlorate. Selenium was detected above the tuff BV in four samples. Uranium was detected above the tuff BV in one sample. Vanadium was detected above the tuff BV in two samples. Antimony and total cyanide were not detected above soil and tuff BVs but had detection limits above BVs. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-3.

Twenty-six organic chemicals [acenaphthene; acetone; anthracene; Aroclor-1254; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; chrysene; di-n-butylphthalate; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 4-isopropyltoluene; methylene chloride; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; toluene; 1,1,1-trichloroethane (TCA); TPH-DRO; and TCE] were detected. TPH-DRO; TCA; di-n-butylphthalate; fluorene; 2-methylnaphthalene; and naphthalene were each detected in one sample. Acenaphthene; anthracene; benzo(a)anthracene; benzo(g,h,i)perylene; benzoic acid; indeno(1,2,3-cd)pyrene; and benzo(k)fluoranthene were each detected in two samples. Aroclor-1254, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and toluene were each detected in three samples. Methylene chloride, phenanthrene, and pyrene were each detected in five samples. Fluoranthene and TCE were each detected in six samples. Tetrachloroethene was detected in seven samples. Acetone was detected in eight samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-4.

Radionuclides detected or detected above BVs/FVs were americium-241, strontium-90, uranium-235/236, and tritium. Americium-241 was detected in two tuff samples. Strontium-90 was detected in four tuff samples. Uranium-235/236 was detected above the tuff BV in two samples. Tritium was detected in 3 subsurface soil samples and 37 tuff samples. Sampling locations and results for radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-5.

The VCA report concluded lateral and vertical extent of contamination were not defined for all inorganic and organic chemicals and radionuclides at SWMU 33-002(b). Lateral extent was not defined at the following sampling locations for the specified constituents:

- 33-25092—copper, selenium, acenaphthene, and TPH-DRO
- 33-25093—selenium

Vertical extent was not defined at the following sampling locations for the specified constituents:

- 33-25082—tritium
- 33-25083—tritium
- 33-25084—calcium
- 33-25087—calcium

- 33-25088—barium, mercury, and Aroclor-1254
- 33-25092—selenium and tritium
- 33-25093—strontium-90 and tritium
- 33-25094—calcium, strontium-90, and tritium
- 33-25095—calcium; indeno(1,2,3-cd)pyrene; americium-241; and tritium
- 33-25125—selenium and tetrachloroethene

Proposed Activities

As described above, lateral and vertical extent of specific inorganic chemicals, organic chemicals, and radionuclides have not been defined at several VCA sampling locations. Lateral extent will be defined by sampling downgradient of the end of the former drainline as part of the investigation for SWMU 33-002(e) (section 4.1.1.5). ~~The vertical extent of residual contamination has not been determined at several ACA confirmation sampling locations at SWMU 33-002(b):~~

- ~~The vertical extent of metals contamination has not been determined at ACA sampling locations 33-25084, 33-25087, 33-25088, 33-25092, and 33-25125.~~
- ~~The vertical extent of perchlorate contamination has not been determined at ACA sampling locations 33-25088 and 33-25092.~~
- ~~The vertical extent of PCB contamination has not been determined at ACA sampling locations 33-25083 and 33-25088.~~
- ~~The vertical extent of VOC and SVOC contamination has not been determined at ACA sampling locations 33-25095 and 33-25125.~~
- ~~The vertical extent of americium-241 has not been determined at ACA confirmation sampling location 33-25095; the vertical extent of strontium-90 has not been determined at ACA confirmation sampling locations 33-25092, 33-25093, and 33-25094; and the vertical extent of tritium has not been determined at ACA confirmation sampling locations 33-25083, 33-25084, 33-25092, 33-25093, 33-25094, and 33-25095.~~

Samples will be collected from the ~~next deeper~~ interval 3 to 4 ft below the ~~(4 to 5 ft or 14 to 15 ft) from the deeper~~ AVCA confirmation sample at each sampling location~~s~~ indicated above where vertical extent has not been determined. Samples will be analyzed for the specific constituents for which extent was not defined. Additionally, the locations where samples were inadvertently not analyzed for explosive compounds will be resampled (locations 33-25092, 3-25093, 33-25094, 33-25095, 33-25096, 33-25123, 33-25124, and 33-25125). At each location, samples will be collected from the same interval as the deeper VCA confirmation sample and 3 to 4 ft below this depth and analyzed for explosive compounds. ~~Samples collected from locations 33-25084, 33-25087, 33-25088, 33-25092, and 33-25125 will be analyzed for metals. Samples collected from locations 33-25088 and 33-25092 will be analyzed for perchlorate. Samples collected from locations 33-25083 and 33-25088 will be analyzed for PCBs. Samples collected from locations 33-25095 and 33-25125 will be analyzed for VOCs and SVOCs. In addition, the sample collected from location 33-25095 will be analyzed for americium-241; samples collected from locations 33-25092, 33-25093, and 33-25094 will be analyzed for strontium-90; and samples collected from locations 33-25082, 33-25084, 33-25092, 33-25093, 33-25094, and 33-25095 will be analyzed for tritium. Cyanide and explosive compounds were not detected in the ACA confirmation samples and therefore are not included in the analytical suite for SWMU 33-002(b).~~ Proposed sampling locations are shown in (Figure 4.1-2). Table 4.0-1 summarizes the proposed sampling locations, depths,

and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.3 SWMU 33-002(c), Seepage Pit

Description and History

SWMU 33-002(c) is the location of a former seepage pit (former structure 33-0133) constructed in 1955 that received discharges from sinks and floor drains in former building 33-0086 (Figure 4.1-1). The seepage pit was an unlined, rubble-filled pit that is 6 ft in diameter and 8 ft deep with a 3-in.-thick concrete lid. Discharges to the seepage pit ceased in 1959. When the SWMU 33-002(c) seepage pit was deactivated, a drainline for noncontact cooling water from former building 33-0086 was extended through the pit and routed approximately 90-ft downslope to create an outfall [SWMU 33-002(d)]. Wastes discharged to the SWMU 33-002(c) seepage pit contained tritium and organic chemical solvents, including TCE, methanol, ethanol, acetone, and propanol (LANL 1992, 007671, p. 3-19).

Previous Investigations

In 1989, two surface samples were collected at the location of the SWMU 33-002(c) seepage pit (former structure 33-0133) (LANL 1995, 050113, p. 45) and analyzed for metals, PCBs/pesticides, SVOCs, VOCs, tritium, and gamma-emitting radionuclides. Data from the 1989 investigation are screening-level data and are not presented in this work plan; however, the data show tritium was detected above background and SVOCs were detected.

Phase I RFI activities conducted at SWMU 33-002(b) in 1993 (LANL 1995, 005113) consisted of collecting two soil samples from depths of 0 to 0.5 ft and 0 to 1.5 ft bgs within the seepage pit, augering a 5.5-ft-deep borehole next to the seepage pit to the soil-tuff interface, and collecting three soil samples from depths of 0 to 0.5 ft and 2.5 to 3 ft, and 5 to 5.5 ft bgs. Samples were analyzed for uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, metals, VOCs, and SVOCs; samples collected in the seepage pit were also analyzed for PCBs/pesticides. The RFI work plan called for collecting liquid and sludge samples from the seepage pit; however, the seepage pit had been backfilled with soil. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR. Section 2.1.3.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed only uranium detected above the BV. No organic chemicals were detected in the Phase I RFI samples. Radionuclides detected or detected above FVs were plutonium-238, plutonium-239/240, and tritium.

During Phase II RFI activities conducted at SWMU 33-002(c) in 1996 (LANL 1997, 071478), a borehole was advanced through the SWMU 33-002(c) seepage pit to a depth of 62 ft bgs (Figure 4.1-1). Twenty-five samples were collected at depth intervals of approximately 5 ft and analyzed for uranium and isotopic plutonium. In addition, three samples collected within the first 12 ft were analyzed for tritium, metals, uranium, VOCs, and SVOCs. The 1996 decision-level data are presented in this work plan. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

During a ~~the~~ 2005 VCA, the SWMU 33-002(c) remaining sections of the inlet and outlet drainlines for the seepage pit were removed and disposed of as LLW, and the entire seepage pit was excavated and disposed of as mixed LLW (LANL 2010, 110352)~~(LANL 2005, 091433)~~. The seepage pit location was overexcavated to dimensions of 6 ft × 9 ft ~~in diameter~~ × 10 ft deep. The outlet drainline discharged to the

SWMU 33-002(d) outfall. Sixteen confirmation samples were collected from two depths (0 to 0.5 ft and 2 to 2.5 ft) beneath the bottom of the excavation after the drainlines ~~were~~had been removed ~~(0 to 0.5 ft and 2 to 2.5 ft bgs)~~ at three locations beneath the remaining seepage pit inlet line and five locations along the seepage pit outlet line (Figure 4.1-1). Sampling locations were biased to drainline joints; no soil staining, elevated radiation, or VOC field-screening readings were observed along the drainlines. Four confirmation samples were collected from two depths (0 to 0.5 ft and 2 to ~~3~~2.5 ft ~~bgs~~) at two locations in the bottom of the seepage pit excavation. Samples were analyzed for isotopic uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, americium-241, metals, perchlorate, PCBs, VOCs, SVOCs, ~~HE,~~ strontium-90, nitrate, and cyanide. All samples ~~were~~ also were to be analyzed for HE. However, while the sample collection paperwork was being prepared for the samples collected beneath the seepage pit outlet drainline, the analytical suite was inadvertently changed to include TPH-DRO instead of the HE analysis. Therefore, no analytical data are available for HE in confirmation samples collected after the outlet drainline had been removed. Samples collected during the 2005 ~~A~~VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the Phase II RFI and ~~A~~VCA samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Inorganic chemicals detected above BVs were aluminum, arsenic, barium, cadmium, calcium, chromium, copper, lead, magnesium, mercury, nickel, nitrate, perchlorate, selenium, silver, and vanadium. Aluminum was detected above the tuff BV in four samples. Arsenic was detected above the tuff BV in two samples. Barium was detected above the tuff BV in 14 samples. Cadmium was detected above the tuff BV in one sample. Calcium was detected above the tuff BV in 17 samples. Chromium was detected above the tuff BV in six samples. Copper was detected above the tuff BV in five samples. Total cyanide was detected above the tuff BV in one tuff. Lead was detected above the tuff BV in three samples. Magnesium was detected above the tuff BV in two samples. Mercury was detected above the tuff BV in 12 samples. Nickel was detected above the tuff BV in two samples. Nitrate was detected in eight tuff samples; there is no BV for nitrate. Perchlorate was detected in nine tuff samples; there is no BV for perchlorate. Selenium was detected above the tuff BV in nine samples. Silver was detected above the tuff BV in one sample. Zinc was detected above the tuff BV in two samples. Antimony was not detected above the tuff BV but had detection limits above the BV. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-6.

Twenty-one organic chemicals [acenaphthene; anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; di-n-butylphthalate; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; TPH-DRO; and TCE] were detected. Acenaphthene, fluorene, 2-methylnaphthalene, and naphthalene were each detected in two samples. Anthracene, Aroclor-1260, benzo(a)anthracene, and benzo(k)fluoranthene were each detected in three samples. Aroclor-1254 and benzo(g,h,i)perylene were each detected in four samples. Benzo(a)pyrene was detected in seven samples. Phenanthrene and pyrene were each detected in 10 samples, and fluoranthene was detected in 11 samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-7.

Radionuclides detected or detected above FVs were americium-241, cesium-137, plutonium-238, plutonium-239, strontium-90, and tritium. Americium-241, cesium-137, and plutonium-239/240 were each detected in one tuff sample. Plutonium-238 and strontium-90 were each detected in three tuff samples. Tritium was detected in 29 tuff samples. Sampling locations and detected radionuclides detected or detected above BVs/FVs are shown in Figure 4.1-8.

The VCA report concluded that lateral and vertical extent of contamination were not defined for all inorganic and organic chemicals and radionuclides at SWMU 33-002(c). Lateral extent was not defined at the following sampling location for the specified constituents:

- 33-25118—cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, TPH-DRO, and tritium

Vertical extent was not defined at the following sampling locations for the specified constituents:

- 33-24727—chromium, copper, lead, mercury, strontium-90, and tritium
- 33-24728—plutonium-238
- 33-25085—calcium
- 33-25086—phenanthrene, pyrene, plutonium-238, and tritium
- 33-25118—selenium
- 33-25119—calcium, selenium, plutonium-238, and tritium
- 33-25121—calcium and tritium
- 33-25122—barium, chromium, and perchlorate

Proposed Activities

As described above, lateral and vertical extent of specific inorganic chemicals, organic chemicals, and radionuclides has not been defined at several VCA sampling locations. Lateral extent will be defined by sampling performed downgradient of the end of the former drainline as part of the investigation for SWMU 33-002(d) (section 4.1.1.4). ~~The vertical extent of residual contamination has not been determined at several ACA confirmation sampling locations at SWMU 33-002(c):~~

- ~~The vertical extent of metals contamination has not been determined at ACA sampling locations 33-24727, 33-25119, and 33-25122.~~
- ~~The vertical extent of perchlorate contamination has not been determined at ACA sampling location 33-25122.~~
- ~~The vertical extent of PCB contamination has not been determined at ACA sampling location 33-24727.~~
- ~~The vertical extent of plutonium-238 has not been determined at ACA confirmation sampling locations 33-24728, 33-25086, and 33-25119; the vertical extent of strontium-90 has not been determined at ACA confirmation sampling location 33-24727; and the vertical extent of tritium has not been determined at ACA sampling locations 33-24727, 33-25119, and 33-25121.~~

Samples will be collected ~~next deeper from the previous~~ 3 to 4 ft beneath the deeper ~~A~~VCA confirmation sample ~~(4 to 5 ft) beneath bottom of former inlet drainline and seepage pit outlet connection and from the 14 to 15 ft bgs depth interval at ACA confirmation sampling location 33-25086 beneath the former seepage pit.~~ at each sampling location indicated above where vertical extent has not been determined. Samples will be analyzed for the specific constituents for which vertical extent was not defined. Additionally, the locations where samples were inadvertently not analyzed for explosive compounds will be resampled (locations 33-25118, 33-25119, 33-25120, 33-25121, and 33-25122). At each location, samples will be collected from the same interval as the deeper VCA confirmation sample and 3 to 4 ft below this depth and analyzed for explosive compounds.

~~Samples collected from locations 33-24727, 33-25119, and 33-25122 will be analyzed for metals. Samples collected from location 33-25122 will also be analyzed for perchlorate. The sample collected from location 33-24727 will be analyzed for PCBs. In addition, the samples collected from locations 33-24728, 33-25086, and 33-25119 will be analyzed for isotopic plutonium; the sample collected from location 33-24727 will be analyzed for strontium-90; and samples collected from locations 33-24727, 33-25119, and 33-25121 will be analyzed for tritium. Cyanide and HE were not detected in the ACA confirmation samples and therefore are not included in the analytical suites for SWMU 33-002(c).~~
Proposed sampling locations are shown in Figure 4.1-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.4 SWMU 33-002(d), Outfall

Description and History

SWMU 33-002(d) is a former outfall that discharged noncontact cooling water from former building 33-0086 (Figure 4.1-1). This outfall was created when the SWMU 33-002(c) seepage pit was deactivated and disconnected from the building 33-0086 drainline. At that time, the drainline to the seepage pit was extended 90 ft to the east to create an outfall for the discharge of noncontact cooling water. The outfall operated under the Laboratory's National Pollution Discharge Elimination System (NPDES) permit until July 11, 1995, when it was removed from the permit. Tritium and metals were the potential contaminants in the noncontact cooling water. The drainline that discharged to this outfall was removed in 2005.

Previous Investigations

In 1989, two composite surface samples (0 to 6 in bgs) were collected at the SWMU 33-002(d) outfall (LANL 1995, 050113, p. 49) and analyzed for metals, PCBs/pesticides, SVOCs, VOCs, and tritium and by gamma spectroscopy. Data from the 1989 investigation are screening-level data and are not presented in this work plan. The data show cadmium and chromium were detected above background, and tritium and VOCs were detected.

The Phase I RFI conducted in 1993 at SWMU 33-002(d) (LANL 1995, 050113) consisted of collecting four surface samples (0 to 0.5 ft bgs) from four locations within the outfall and along the drainage channel east of the outfall. The samples were analyzed for uranium, tritium, isotopic plutonium, gamma-emitting radionuclides, metals, and SVOCs. In addition, one sample was analyzed for PCBs and three samples were analyzed for pesticides. The drainage channel below the SWMU 33-002(d) outfall was resampled in December 1994 to determine whether tritium concentrations had changed after approximately 1.5 yr. Three surface samples (0 to 0.5 ft bgs) were collected from three locations at or near the original sampling locations and analyzed for tritium. Data from the 1993 Phase I RFI and 1994 supplemental sampling are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.4.3 of the HIR presents a detailed summary of the screening-level results.

Cadmium, chromium, lead, silver, uranium, and zinc were detected above BVs in samples from the 1993 RFI. Eleven organic chemicals [aldrin; Aroclor-1254; alpha-BHC (benzene hexachloride); delta-BHC; chrysene; 4,4-DDD (dichlorodiphenyldichloroethane); 4,4-DDT (dichlorophenyltrichloroethylene); endosulfan; fluoranthene; pyrene; and total PCBs] were detected in the Phase I RFI samples. Tritium was the only radionuclide detected or detected above BV/FV.

The drainline from the SWMU 33-002(c) seepage pit that discharged to the SWMU 33-002(d) outfall was removed during the 2005 VACA. No confirmation samples were collected within the outfall area or drainage.

No decision-level data are available for SWMU 33-002(d).

Proposed Activities

The extent of contamination has not been defined at the outfall and in the drainage channel east of the outfall for SWMU 33-002(d). Fifteen samples will be collected from three depths (0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs) from ~~five~~ four locations within the ~~outfall area and~~ drainage channel directly east of the site, downgradient of the outfall.~~,~~ The samples will be analyzed for isotopic uranium, tritium, isotopic plutonium, americium-241, metals, perchlorate, VOCs, SVOCs, strontium-90, nitrate, cyanide and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-2. These samples also will be used to define lateral extent for SWMU 33-002(c). Table 4.0-1 provides a summary of the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.5 SWMU 33-002(e), Outfall

Description and History

SWMU 33-002(e) consists of a roof drain and outfall at former building 33-0086. This drainline was 2 in. in diameter, approximately 90 ft long, and discharged to an outfall east of former building 33-0086 (Figure 4.1-1). This outfall was created when the SWMU 33-002(b) seepage pit was deactivated and disconnected from the building 33-0086 drainline. At that time, the drainline to the seepage pit was extended 90 ft to the east to create an outfall for the discharge of stormwater from roof drains on former building 33-0086. Stormwater discharges from building 33-0086 roof drains potentially contained tritium associated with releases from the former building 33-0086 air-emission stacks.

Previous Investigations

In 1989, one surface sample (0 to 0.5 ft bgs) was collected at the SWMU 33-002(e) outfall (LANL 1995, 050113, p. 56) and analyzed for metals, PCBs/pesticides, SVOCs, VOCs, tritium, uranium, and HE and by gamma spectroscopy. Data from the 1989 investigation are screening-level data and are not presented in this work plan. The data show tritium, VOCs and SVOCs (PAHs) were detected.

Phase I RFI activities conducted in 1993 at SWMU 33-002(e) (LANL 1995, 050113) consisted of collecting three surface samples (0 to 0.5 ft bgs) from three locations within the outfall area and drainage channel. The samples were analyzed for tritium and SVOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.5.3 of the HIR (LANL 2009, 107348) presents a detailed summary of the screening-level results.

Phase I RFI data showed no metals detected above BVs. Seventeen organic chemicals [acenaphthene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; dibenzofuran; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene] were detected in the Phase I RFI samples. Tritium was the only radionuclide detected or detected above BV/FV.

The drainline from the SWMU 33-002(b) seepage pit that discharged to the SWMU 33-002(e) outfall was removed during the 2005 VACA. No confirmation samples were collected within the outfall area or drainage.

No decision-level data are available for SWMU 33-002(e).

Proposed Activities

The lateral and vertical extent of contamination have not been defined within the outfall and drainage channel. Nine samples will be collected from three depths (0 to 1 ft, 2 to 3 ft and 4 to 5 ft bgs) from three locations within the drainage channel directly east of the outfall for SWMU 33-002(e) and analyzed for isotopic uranium, tritium, isotopic plutonium, americium-241, metals, perchlorate, VOCs, SVOCs, strontium-90, nitrate, and cyanide and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-2. These samples ~~will~~ also will be used to define lateral extent for SWMU 33-002(b). Table 4.0-1 provides a summary of the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

4.1.1.6 SWMU 33-010(f), Surface Disposal Area

Description and History

SWMU 33-010(f) is a surface disposal area (Figure 4.1-1). The history of the site and the origins of the wastes are not known. The 1990 SWMU report (LANL 1990, 007513) states the SWMU was observed during a 1987 ER Project reconnaissance and describes it as concrete, cans, and metal pieces that littered the area east of former building 33-0086. The RFI report (LANL 1995, 071262) describes this SWMU as consisting of two small surface disposal areas located 300 ft southeast of former building 33-0086 and approximately 50 ft apart. One of the areas is described as approximately 15 ft^2 and the other as approximately 10 ft × 20 ft. Materials at the site included pieces of concrete; piles of tuff and cured asphalt; rusted metal cans, rebar, and strapping bands; and other debris. Although the source of these materials is not known, some are believed to be associated with roadwork activities.

Previous Investigations

Phase I RFI activities conducted in 1993 at SWMU 33-010(f) (LANL 1995, 071262) consisted of collecting two surface samples (0 to 0.5 ft bgs) from two locations, one at each small disposal area. Both samples were analyzed for tritium, gamma-emitting radionuclides, and metals. One sample was also analyzed for pesticides and herbicides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.1.6.3 of the HIR contains a detailed summary of the screening-level results.

Phase I RFI data showed no metals detected above BV. Two organic chemicals (4,4-DDE and endosulfan II) were detected. Tritium was the only radionuclide detected or detected above BV/FV. No decision-level data are available for SWMU 33-010(f).

Proposed Activities

Any debris remaining at the SWMU 33-010(f) surface disposal area will be removed, characterized, and disposed of in accordance with applicable waste management requirements, and the nature and extent of any residual contamination will be determined. Following debris removal, a total of 30 samples will be

collected from three depths (0 to 1 ft, 3 to 4 ft and 5 to 6 ft bgs) at five locations at each of the two small disposal areas: one location in the center of each area and four step-out locations around each disposal area 10 ft out from the center of each area. Samples will be analyzed for cyanide, nitrate, perchlorate, VOCs, SVOCs, and metals. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. Drainage sampling locations downslope of Consolidated Unit 33-002(a)-99 are shown in Figure 4.1-13.

Proposed Activities for Consolidated Unit 33-002(a)-99

The lateral and vertical extent of the subsurface tritium plume associated with SWMUs 33-002(a–e) have not been determined. Seven boreholes will be advanced to the top of the basalt at the following locations: within the former location of the SWMU 33-002(a) septic tank leach field; north of the former location of the SWMU 33-002(a) septic tank leach field; south of the former location of the SWMU 33-002(a) septic tank leach field; within the former location of the building 33-0086 (former tritium facility); and east of the SWMU 33-002(a) septic tank leach field where the mesa top drops into the drainage (Figure 4.1-13). Soil, tuff, and pore-gas samples will be collected at 10-ft intervals from each borehole and analyzed for tritium. Tritium data will be reviewed to determine which boreholes, if any, will be completed as vapor-monitoring wells.

To determine if contaminants are migrating from the site, 10 samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from five locations in the main drainage channel downgradient of Consolidated Unit 33-002(a)-99 to the Chaquehui Canyon tributary drainage channel southeast of the site (Figure 4.1-13). The samples will be analyzed for isotopic uranium, tritium, isotopic plutonium, americium-241, metals, perchlorate, VOCs, SVOCs, strontium-90, nitrate, and cyanide and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed drainage sampling locations are shown in Figure 4.1-13. Table 4.0-1 provides a summary of the proposed sampling locations, depths, and analytical suites.

4.1.2 Consolidated Unit 33-004(a)-00, Main Site

Consolidated unit 33-004(a)-00 consists of SWMUs 33-004(a, h, and i); 33-011(d); 33-015; and 33-017. The SWMUs in this consolidated unit consist of a septic system, three outfalls, a storage area, an incinerator, and operational releases. All the SWMUs are geographically located in the northeast corner of TA-33 Main Site, and the boundaries of some of the SWMUs overlap (Figure 4.1-9). The SWMUs that make up this consolidated unit are generally associated with early operations at TA-33, which involved initiator development from 1950 to 1972. These SWMUs are not associated with the TA-33 tritium facility (building 33-0086) or the tritium operations conducted at TA-33.

4.1.2.1 SWMU 33-004(a), Septic System

Description and History

SWMU 33-004(a) consists of a septic tank (structure 33-0031), associated drainlines, two seepage pits, and a drain field. The septic tank has a capacity of 1360 gal. and is located 50 ft northeast of building 33-0039 (Figure 4.1-9). This septic tank is in use and serves all major buildings at the TA-33 Main Site. Septic tank 33-0031 received sanitary wastewater from a laboratory/office building (33-0019) and a storage building (33-0027). Industrial liquid wastes from building 33-0019 were discharged to a separate outfall. Septic tank 33-0031 discharged to a 90-ft × 80-ft drain field located approximately 200 ft northeast of the septic tank. This drain field is constructed of rows of 4-in. vitrified clay tiles spaced approximately

10 ft apart. In 1951, the system was redesigned to accept industrial wastes from laboratories in buildings 33-0019, 33-0113, and 33-0114 and the machine shop in building 33-0039. Also in 1951, two 4-ft-diameter × 50-ft-deep gravel-filled seepage pits were constructed to receive the discharge from septic tank 33-0031, and the drain field was disconnected and removed from service. The seepage pits continue to receive the effluent from the septic tank.

A 1993 study of drains and discharges at TA-33 identified the following sources of discharges to this septic system: restrooms, water fountains, showers, laboratory floor drains and sink drains in building 33-0019; janitor's closet sink drains in buildings 33-0019 and 33-0113; a floor drain in a shop in building 33-0039; a sink drain in a shop in building 33-0113; and roof drains from building 33-0019 (Santa Fe Engineering Ltd. 1992, 062036, Tables 2, 6, 7, and 13). The specific materials discharged to these drains are not well documented. A 1954 memorandum mentions occurrences of mercury spills in the electronics laboratory in building 33-0019, and spilled mercury could potentially have been released to the drains (Jordan 1954, 007918). The shop in building 33-0113 was primarily used to machine uranium but was also used for processing plastics and spray painting (Hyatt 1956, 007929).

Previous Investigations

During the 1993 Phase I RFI conducted at SWMU 33-004(a), one sludge sample and one liquid sample were collected from septic tank 33-0031 (LANL 1995, 071300) and analyzed for metals, SVOCs, VOCs, uranium, tritium, and gamma-emitting radionuclides. A borehole was drilled to a depth of 15 ft next to the septic tank and one surface sample (0 to 0.5 ft) and two subsurface samples (3 to 5 ft and 13 to 15 ft) were collected. All samples were analyzed for metals, SVOCs, tritium, uranium, and gamma-emitting radionuclides. The two subsurface samples were also analyzed for VOCs. A borehole was drilled next to each seepage pit to a depth of 50 ft, and four samples were collected at four depths from each of these boreholes (7 to 9 ft or 8 to 10 ft, 22 to 24 ft, 37 to 39 ft, and 47 to 49 ft bgs). All samples were analyzed for metals, SVOCs, VOCs, tritium, and gamma-emitting radionuclides, and all but one of the samples were also analyzed for uranium. Four surface (0 to 0.5 ft) and two subsurface (1.5 ft) samples were collected from random locations in the drain field and analyzed for metals, SVOCs, uranium, tritium, and gamma-emitting radionuclides. Two surface samples were also analyzed for herbicides, pesticides, and PCBs, and the subsurface samples were also analyzed for VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected in the 1993 liquid samples from the septic tank were barium, lead, mercury, uranium, and zinc. Metals detected in the sludge sample were arsenic, barium, cadmium, chromium, lead, nickel, silver, uranium, and zinc. Four organic chemicals (chloroform, 4-methylphenol, phenol, and toluene) were detected in the liquid samples from the septic tank. Thirty-six organic chemicals [benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(-ethylhexyl)phthalate; 2-butanone; butylbenzylphthalate; n-butylbenzene; sec-butylbenzene; tert-butylbenzene; carbon disulfide; chloroform; chrysene; di-n-butylphthalate; di-n-octylphthalate; 1,4-dichlorobenzene; 1,1-dichloroethane; ethylbenzene; fluoranthene; indeno(1,2,3-cd)pyrene; isopropylbenzene; 4-isopropyltoluene; methylene chloride; 4-methylphenol; phenanthrene; propylbenzene; pyrene; 1,1,2,2-tetrachloroethane; tetrachloroethene; toluene; 1,1,2-trichloro-1,2,2-trifluoroethane; TCE; TCA; 1,2,4-trimethylbenzene; and total xylenes) were detected in the sludge sample. Tritium was detected in both the liquid and sludge samples.

Lead, mercury, uranium, and zinc were the only metals detected above BV in samples from the 1993 RFI borehole next to the septic tank. Eight organic chemicals [benzo(a)anthracene; benzo(a)pyrene; benzo(k)fluoranthene; chrysene; di-n-butylphthalate; fluoranthene; phenanthrene; and pyrene] were

detected in samples from the borehole next to the septic tank. Radionuclides detected or detected above FV were cesium-137 and tritium.

Uranium and zinc were detected above BVs in 1993 RFI samples from the drain field. Four organic chemicals (Aroclor-1254, di-n-butylphthalate, fluoranthene, and pyrene) were detected in samples from the drain field. Tritium was the only radionuclide detected or detected above BV/FV.

Uranium was the only inorganic chemical detected above BV in 1993 RFI samples from the boreholes next to the seepage pits, and di-n-butylphthalate was the only organic chemical detected. Cesium-137 was the only radionuclide detected or detected above BV/FV.

In 1994, four additional samples were collected from the drain field to better characterize potential releases (LANL 1995, 071300). These subsurface samples (1 to 2 ft, 2 to 3 ft, and 2.5 to 3.5 ft bgs) were collected at joints in the vitrified-clay tiles and submitted for laboratory analysis of metals, SVOCs, VOCs, tritium, uranium, and gamma-emitting radionuclides. Data from the 1994 sampling are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in samples collected from the drain field in 1994 were cadmium, chromium, copper, lead, mercury, selenium, silver, uranium, vanadium, and zinc. Seventeen organic chemicals [acenaphthene; acenaphthalene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene] were detected in samples from the drain field. Radionuclides detected or detected above BVs/FVs were cesium-137 and tritium.

In 1997, the ER Project collected one soil sample at each of three locations (below the tank, under the inlet, and under the outlet) (Figure 4.1-9 and Table 4.1-1). Soil samples were analyzed for metals and VOCs (Michelotti and Kidman 1997, 074002).

Decision-level data from the 1997 samples are presented in Tables 4.1-2 and 4.1-3. Metals detected above BV in samples collected under and next to the septic tank in 1997 were lead and zinc. Lead was detected above the BV in one soil sample. Zinc was detected above the BV in two soil samples. Antimony and uranium were not detected above the BV for soil but had detection limits above the BV. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-10.

Methylene chloride was detected in one sample. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-11.

Proposed Activities

Previous sampling results showed metals, organic chemicals (primarily PAHs), and radionuclides at SWMU 33-004(a). Because this septic system has remained active since the last sampling was performed in 1997, additional sampling is proposed to characterize current conditions. Sampling of the active system is proposed along the inlet drainlines, next to the septic tank, along the outlet drainline, and next to the seepage pits. Sampling locations are as follows:

- between buildings 33-0019 and 33-0039 where two active drainlines come together,
- at the septic tank inlet,
- next to the downgradient (south) side of the septic tank,

- at the septic tank outlet,
- next to the manhole east of the Main Site fence,
- next to the two active seepage pits, and
- within the inactive drain field.

Samples collected next to the drainlines, manholes, and septic tank will be collected at depths of 0 to 1 and 3 to 4 ft below the bottom of the adjacent structure. Samples will be collected next to the seepage pits at intervals of 9 to 10 ft, 19 to 20 ft, 29 to 30 ft, 39 to 40 ft, 49 to 50 ft, 59 to 60 ft, and 69 to 70 ft bgs.

The inactive drain field has not received waste since the previous sampling, but the existing data are not decision level, and previous sampling locations and depths may not have been sufficient to determine the extent of contamination. Samples from the drain field will be collected at eight locations within the drain field. At each location, the vitrified clay pipe (VCP) drain pipe will be exposed and samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft below the pipe joints.

All samples collected at SWMU 33-004(a) will be analyzed for metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, isotopic uranium, isotopic plutonium, and gamma-emitting radionuclides. Twenty percent of the samples will also be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-12b. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.2 SWMU 33-004(h), Outfall

Description and History

SWMU 33-004(h) consists of an outfall associated with a warehouse (building 33-0020) located at the south side of Main Site (Figure 4.1-9). The warehouse was constructed in 1950 and used from 1952 to 1972 to store materials associated with initiator tests, including beryllium and uranium. The building subsequently was cleaned and used by other groups as a light laboratory and for general storage. The RFI work plan for Operable Unit (OU) 1122 states historical engineering drawings show an 8-in.-diameter VCP drain exiting the southeast corner of the building, which reportedly discharged to an outfall (LANL 1992, 007671, p. 3-23). A study of building drains at TA-33 identified two floor drains in building 33-0020 but could not locate an outfall. The study also noted there was no source of water in the building (Santa Fe Engineering, 1993, 062036, p. 5).

Previous Investigations

A Phase I RFI was conducted at SWMU 33-004(h) in 1993 (LANL 1995, 071262). Because the outfall could not be located visually, a geophysical survey was conducted to identify the possible location of the drainline. Three sampling locations were selected based on the results of the geophysical survey. These locations were at and downgradient of the location where the geophysical survey results indicated the outfall should have discharged. Three surface samples (0 to 0.5 ft) were collected at these locations and submitted for laboratory analysis of metals, tritium, uranium, and gamma-emitting radionuclides. One sample also was submitted for laboratory analysis of herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.2.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 Phase I RFI samples were cadmium, lead, nickel, uranium, and zinc. Two organic chemicals (p,p'-DDE and endosulfan II) were detected. No radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-004(h).

Proposed Activities

The Phase I RFI data showed concentrations of inorganic chemicals generally above BVs, very few detections of organic chemicals (although organic analysis was limited), and no radionuclides detected or detected above BVs/FVs. These data are screening level, however, and cannot be used to determine extent. In addition, the Phase I RFI sampling was performed at only one depth, which is insufficient to determine vertical extent. Therefore, the three previous Phase I RFI sampling locations (33-01051, 33-01052, and 33-01054) at and downgradient of the outfall will be resampled, and the samples will be collected at greater depth than those collected during the RFI to determine vertical extent. Three samples will be collected at each location at depth intervals of 0 to 1, 2 to 3, and 4 to 5 ft bgs and analyzed for TAL metals, cyanide, nitrate, perchlorate, isotopic uranium, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Samples will not be analyzed for radionuclides because they were not detected during the Phase I RFI. Proposed sampling locations are shown in Figure 4.1-12a. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.3 SWMU 33-004(i), Outfalls

Description and History

SWMU 33-004(i) consists of two outfalls associated with a machine shop (building 33-0039) located near the east side of Main Site (Figure 4.1-9). This machine shop was completed in 1951 and housed a welding and soldering bench that used cadmium and silver, a lead-melting facility, a beryllium-machining room, and a sand blaster. Cadmium, uranium, stainless steel, and polystyrene plastic also were machined in the building. Machine shop operations ceased in the late 1990s. The outfalls are associated with two 4-in.-diameter VCPs that run to the east of building 33-0039. The northernmost of the two outfalls is located approximately 30 ft east of the building, and the other outfall is located approximately 40 ft east of the building.

The sources of discharges to these outfalls are not known. A study of building drains at TA-33 confirmed that all wastewater discharges from building 33-0039 are connected to the SWMU 33-004(a) septic system (Santa Fe Engineering, 1993, 062036, p. 7).

Previous Investigations

During the 1993 Phase I RFI conducted at SWMU 33-004(i), a geophysical survey was performed, and the drainlines and outfalls were located (LANL 1995, 071262). Surface samples (0 to 0.5 ft) were collected at each outfall and at two locations in the drainages downstream of each outfall, for a total of six samples. All samples were submitted for laboratory analysis of metals, SVOCs, tritium, uranium, and gamma-emitting radionuclides. One sample was also analyzed for herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.3.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in samples collected during the 1993 Phase I RFI were cadmium, chromium, lead, nickel, uranium, and zinc. Eleven organic chemicals [acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene] were detected. No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-004(i).

Proposed Activities

Screening-level data from the Phase I RFI showed concentrations of 6 inorganic chemicals above BVs and detections of 11 organic chemicals. Detected concentrations often decreased with distance downgradient of the outfalls, but not in all cases. The Phase I RFI sampling locations are therefore not adequate to determine lateral extent, and additional samples are needed farther downgradient. Also, samples were collected only at the surface, and additional sampling depths are needed to define vertical extent.

To determine lateral extent, the six previous Phase I RFI sampling locations at and downgradient of the outfalls will be resampled (locations 33-01055, 33-01056, and 33-01057 at north outfall and locations 33-10158, 33-01059, 33-01060 at the south outfall), along with two additional locations farther downgradient and east of each outfall for a total of five sampling locations for each outfall. Samples will be collected at greater depths than the RFI samples to determine vertical extent. Three samples will be collected at each location at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs.

All samples will be analyzed for TAL metals, cyanide, isotopic uranium, perchlorate, nitrate, VOCs, and SVOCs. In addition, 20% of all samples will be analyzed for PCBs. Samples will not be analyzed for radionuclides because they were not detected during the Phase I RFI. Proposed sampling locations are shown in Figure 4.1-12a. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

Data from the 10 samples to be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from five locations in the main drainage channel downgradient of Consolidated Unit 33-004(a)-00 to the Chaquehui Canyon tributary drainage channel southeast of the site will also be used to determine if contaminants are migrating from the site (Figure 4.1-13).

4.1.2.4 SWMU 33-011(d), Former Storage Area

Description and History

SWMU 33-011(d) consists of a storage area located on the asphalt next to a warehouse (building 33-0020) near the south side of Main Site (Figure 4.1-9). Beryllium and uranium were stored around building 33-0020 from 1950 to 1972. In addition, recovered scrap from shots containing uranium, beryllium, and tungsten was stored south of building 33-0020. The amount of uranium stored at this site is reported to have been “tons” (Ahlquist 1983, 006854). Much of the material stored here was salvaged for use elsewhere. A 1987 site survey found no materials remaining in storage at this location (LANL 1992, 007671, p. 3-24).

Previous Investigations

During the Phase I RFI conducted at SWMU 33-011(d) in 1993, two asphalt samples and three soil samples from beneath the asphalt were collected at three sampling locations (LANL 1995, 071300). Soil samples were collected at depth intervals of 0.17 to 0.5 ft and submitted for laboratory analysis of metals, uranium, and gamma-emitting radionuclides. Two soil samples were also analyzed for tritium and isotopic plutonium. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.4.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV during the 1993 Phase I sampling were beryllium, cadmium, lead, nickel, uranium, and zinc. Radionuclides detected or detected above BVs/FVs were plutonium-238, plutonium-239, and tritium.

Based on the results of the Phase I RFI, Phase II RFI sampling was performed in 1996 to better characterize contamination at the site (LANL 1997, 071478). One surface (0 to 0.5 ft bgs) and one subsurface sample (0.17 to 0.58 ft, 0.42 to 0.67 ft, 0.5 to 0.67 ft, 0.5 to 0.75 ft, and 0.67 to 1 ft bgs) were collected at each of seven locations (Figure 4.1-9). Six of these locations were beneath asphalt and one was in a drainage south of the asphalt. The six subsurface samples were collected beneath the pad at the soil-tuff interface. All samples collected from beneath the pad were submitted for laboratory analysis of metals and uranium. The two samples from the drainage were submitted for analysis of isotopic uranium. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the 1996 Phase II RFI samples are presented in Table 4.1-2. Metals detected above BV were calcium, iron, lead, mercury, uranium, vanadium, and zinc. Calcium and iron were detected above the soil BV in one sample. Lead was detected above the soil BV in three samples. Mercury and zinc were detected above the soil BV in two samples. Uranium and vanadium were each detected above the tuff BV in one sample. Antimony, cadmium, silver, and thallium were not detected above BV but had detection limits above BV. No uranium isotopes were detected above BV. Sampling locations and results for inorganic chemicals above BV are shown in Figure 4.1-14.

Proposed Activities

The Phase I screening-level data and Phase II decision-level data showed detections of inorganic chemicals above BVs. The decision-level data were not sufficient to establish extent. Decreasing concentrations were not observed with distance away from the storage area to determine lateral extent, and decreasing concentrations were not noted with depth to define vertical extent (Figures 4.1-14). In addition, the Phase I and Phase II analytical suites did not include organic chemicals. Therefore, additional sampling at greater distances from the storage area and at greater depth intervals and analysis of samples with an expanded analytical suite are needed to determine nature and extent.

The Phase I and Phase II sampling locations beneath the asphalt pad where inorganic chemicals were detected at concentrations greater than 5 times BVs will be resampled. These locations are

- 33-01081—uranium detected at 488 times BV at 0.17–0.5 ft bgs,
- 33-01566—lead detected at 35 times BV at 0.67–1.0 ft bgs,
- 33-01567—lead detected at 13 times BV at 0.0–0.5 ft bgs, and
- 33-01571 and 33-01572—mercury detected at 20 times BV at 0.5–0.75 ft bgs.

To determine lateral extent, step-out samples will be collected at four locations away from the asphalt pad in a downgradient direction from the above four locations. At each location, samples will be collected at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft below the bottom of the asphalt in paved areas or from the ground surface in unpaved areas. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, isotopic uranium, isotopic plutonium, and tritium. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figures 4.1-12b. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.5 SWMU 33-015, Incinerator

Description and History

SWMU 33-015 consists of an incinerator (structure 33-0110) located approximately 50 ft southeast of building 33-0039 on a hillside that slopes to a side wash of Chaquehui Canyon (Figure 4.1-9). The incinerator is approximately 4 ft × 4 ft × 6 ft high and mounted on a concrete base. The incinerator was used previously to burn uncontaminated office trash. The incinerator was first used in 1955. The date that its use stopped is not known.

Previous Investigations

During the Phase I RFI conducted at SWMU 33-015 in 1993, two surface soil samples (0 to 0.5 ft bgs) were collected, one from each of the two downslope corners of the concrete base (LANL 1995, 071262) and submitted for laboratory analysis of metals, tritium, uranium, and gamma-emitting radionuclides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.5.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 RFI were cadmium, lead, silver, uranium, and zinc. No radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-015.

Proposed Activities

The Phase I screening level data showed inorganic chemicals above BVs next to the concrete base of the incinerator. Because the incinerator is no longer used, it will be removed, along with the concrete pad, and disposed of. Samples will be collected from the center of the pad and at four step-out locations around the pad. At each location, samples will be collected at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs and analyzed for TAL metals, cyanide, VOCs, SVOCs, and dioxins/furans. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figures 4.1-12b. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.2.6 SWMU 33-017, Potential Soil Contamination

Description and History

SWMU 33-017 consists of areas potentially impacted by operational releases from the TA-33 Main Site. SWMU 33-017 is located at the northern and eastern edges of Main Site and is approximately 600 ft long × 100 ft to 600 ft wide (Figure 4.1-9). The site generally slopes downward to the east and is at the head of a small drainage tributary of Chaquehui Canyon. SWMU 33-017 is potentially impacted by runoff from the paved areas of the TA-33 Main Site complex by deposition from airborne releases from TA-33 Main Site facilities and by operational releases from an area east of building 33-39 used for vehicle maintenance. Operations conducted within Main Site included uranium processing and machining, cadmium and silver welding and soldering, lead melting and casting, cadmium and beryllium machining, and tritium processing and decontamination. These operations began in 1949 and most continued until 1972. Following these operations, some of the facilities were used for offices and electronics laboratories.

Previous Investigations

A Phase I RFI was conducted at SWMU 33-017 during 1993 (LANL 1995, 071262). To characterize the extent of general sitewide contamination that resulted from operational releases, 42 surface samples (0 to 0.5 ft, 0 to 0.66 ft, or 0 to 0.75 ft bgs) were collected at 41 locations, which were random offsets from a 100-ft grid overlying the Main Site and four radial extensions from the grid (Figures 4.1-9 and 4.1-15). To characterize the extent of contamination of surface drainages, 19 surface samples (0 to 0.5 ft bgs) and 1 subsurface sample (0.5 to 1.5 ft bgs) were collected from drainage channels that receive runoff from the Main Site. To characterize potential contamination that resulted from releases at the vehicle maintenance area, five surface samples (0 to 0.5 ft bgs) were collected from this area. All 67 samples were submitted for laboratory analysis of metals and gamma-emitting radionuclides. Sixty-six of these samples were also submitted for analysis of SVOCs, 65 for isotopic plutonium, and 64 for tritium and uranium. In addition, 13 samples were submitted for analysis of herbicides, 8 for pesticides, and 3 for PCBs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.2.6.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV during the 1993 Phase I RFI were arsenic, cadmium, chromium, lead, nickel, silver, uranium, and zinc. Twenty-three organic chemicals [acenaphthene; aniline; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; beta-BHC; bis-(2-ethylhexyl)phthalate; chrysene; p,p'-DDE; dibenzo(a,h)anthracene; dibenzofuran; dieldrin; di-n-butylphthalate; endrin; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; phenanthrene; and pyrene) were detected. Cesium-137, plutonium-238, plutonium-239/240, and tritium were the only radionuclides detected or detected above FVs.

A Phase II RFI was conducted at SWMU 33-017 in 1996. The area of investigation focused on the eastern side of building 33-0039 at the location of the former vehicle maintenance area. Twenty-four surface soil samples (0 to 0.5 ft bgs) and one subsurface sample (1 to 1.5 ft bgs) were collected from 24 locations (Figures 4.1-9 and 4.1-15). Eighteen samples were submitted for laboratory analysis of SVOCs, and the remaining seven samples were submitted for laboratory analysis of PCBs. Samples collected during the 1996 Phase II RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the 1996 Phase II RFI samples are presented in Table 4.1-3. Twenty-two organic chemicals [acenaphthene; anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzon(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; butylbenzylphthalate; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; dibenzofuran; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene] were detected in samples from the 1996 Phase II RFI at the vehicle-maintenance area. Organic chemicals were detected in 24 samples. Sampling locations and detected results for organic chemicals are shown on Plate 5.

Proposed Activities

The Phase I screening-level data showed inorganic chemicals above BVs, detected organic chemicals (primarily PAHs), fallout radionuclides above FVs, and elevated levels of tritium. The Phase II decision-level data showed detected organic chemicals consisting of PAHs and PCBs. All data are from analyses of surface samples and cannot be used to determine vertical extent. In addition, the Phase II sampling was focused at one location with a limited analytical suite and cannot be used to determine nature and extent for the entire SWMU. Based on the results of the previous investigations, additional sampling is needed to determine nature and extent, especially for metals, PCBs, and tritium. The 25 Phase I and

Phase II sampling locations with the highest detections of metals, PCBs, and tritium will be resampled at three depths (0 to 1 ft, 2 to 3 ft, and 4 to 5 ft) to determine vertical extent. These locations also comprise the locations where most of the detections of other organic chemicals occurred. These locations are summarized in Table 4.1-5. The proposed sampling locations are shown in Figures 4.1-12c and 4.1-13.

Lateral extent of releases from SWMU 33-017 will be determined by sampling the main drainage channel that collects runoff from Main Site. Samples will be collected at five locations in the channel between the Main Site boundary down to the site fence upstream of gaging station E340 (Figure 4.1-13). Samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs at each location and may also be used to determine lateral extent of other SMWUs and AOCs in Main Site, including the SWMUs in Consolidated Unit 33-004(a)-00 and AOC 33-008(c).

All samples from SWMU 33-017 will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, PCBs, isotopic uranium, isotopic plutonium, and tritium and by gamma spectroscopy. Proposed sampling locations are shown in Figures 4.1-12c and 4.1-13. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.3 Consolidated Unit 33-005(a)-00, Potential Soil Contamination

Consolidated Unit 33-005(a)-00 consists of SWMUs 33-005(a–c) and 33-011(a). The SWMUs in this consolidated unit consist of a former septic system, former drainlines, and a former drum storage area (Figure 4.1-16). These SWMUs are geographically located in the Main Site area of TA-33 across West Road approximately 325 ft west of the former tritium facility (former building 33-0086) and are associated with managing liquid and solid wastes generated at former building 33-0021. Building 33-0021 was constructed in 1950 and originally housed glove boxes used to section projectiles for initiator tests. The projectiles contained uranium, beryllium, and polonium-210. Building 33-0021 was later used for other experiments involving plutonium. An accidental release of a mixture of plutonium and beryllium powders in April 1960 contaminated the entire facility, which was decontaminated within weeks but never used again. In 1974, the building, septic system, drains, drainlines and leach field were removed and the entire area was decontaminated and restored (Cox 1975, 009728, Figure 2). Any soil containing gross-alpha radioactivity above 20 pCi/g was excavated. Soil over much of the site was removed down to bedrock. Radioactive debris and soil were disposed of at MDA G at TA-54. Excavations were backfilled with clean fill and revegetated. Because contamination associated with individual sites in this consolidated unit is indistinguishable, the sites will be investigated as a consolidated unit.

4.1.3.1 SWMU 33-005(a), Former Septic System

Description and History

SWMU 33-005(a) consists of the former septic system that served restrooms and change-room lavatories in former building 33-0021 (Figure 4.1-16). Drainlines discharged to a manhole (former structure 33-0074), which drained to a septic tank (former structure 33-0032). The outfall for the septic system was reported to be a few feet south of the septic tank (LANL 1992, 007671, pp. 3-21–3-25). Building 33-0021 and all associated building drainlines and the septic system and septic system drainlines were removed in 1974 and disposed of at MDA G at TA-54 (LANL 1995, 044113, pp. 71–79). Soil was removed until radiation readings were below detection levels of approximately 20 pCi/g gross alpha, and the area was backfilled with clean fill and leveled.

Previous Investigations

The 1993 Phase I RFI conducted at SWMU 33-005(a) consisted of advancing one borehole at the former septic tank location and collecting one surface sample (0 to 0.5 ft bgs) and one subsurface sample (2 to 2.5 ft bgs). Because soil backfill at the site was thinner than anticipated, the depth of the borehole was less than that specified in the RFI work plan (LANL 1992, 007671, pp. 3-21–3-25). Three surface samples (0 to 0.5 ft bgs) were collected at the former location of the outfall and at two locations in the drainage downslope of the outfall. Samples were field screened for radioactivity and organic chemicals and submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, and SVOCs; the subsurface sample was analyzed for VOCs (LANL 1995, 044113, pp. 71–78). Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 Phase I RFI samples were uranium and zinc. Fifteen organic chemicals were detected in the 1993 Phase I RFI samples [acenaphthene; acetone; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; phenanthrene; and pyrene]. Cesium-137 and plutonium-239/240 were detected or detected above FVs. Decision-level data are not available for SWMU 33-005(a).

4.1.3.2 SWMU 33-005(b), Former Drainline

Description and History

SWMU 33-005(b) consists of a former drainline that served a sink, floor drain, and safety shower in the counting room in former building 33-0021 (Figure 4.1-16). No information concerning the quantities or characteristics of wastes associated with this SWMU is available. The drainline discharged to an outfall located northwest of former building 33-0021 (Cox et al. 1975, 009728, p. 3 and Figure 7).

Previous Investigations

Phase I RFI activities conducted at the SWMU 33-005(b) drainline in 1993 involved collecting three surface samples (0 to 0.5 ft bgs): one at the former location of the outfall, as determined from engineering drawings and topography; one at the location in the drainage downslope of the outfall; and one at the location upslope of the outfall. The samples were field screened for radioactivity and organic chemicals and submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, and SVOCs (LANL 1995, 044113, pp. 71–78). Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.2.3 of the HIR presents a detailed summary of the screening-level results.

Uranium and zinc were the only metals detected above BVs in the 1993 Phase I RFI samples. Twenty-one organic chemicals [acenaphthene; acenaphthalene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; dibenzofuran; 2,4-dimethylphenol; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; 2-methylphenol; 4-methylphenol; naphthalene; phenanthrene; and pyrene] were detected. Plutonium-239/240 was the only radionuclide detected or detected above FV. Decision-level data are not available for SWMU 33-005(b).

Based on a review of site drawings and descriptions provided in the document titled “Disposition of TA-33-21, A Plutonium Contaminated Experimental Facility” (Cox et al. 1975, 009728), the former drainline that connected to a sink, floor drain, and safety shower in the counting room in former building

33-0021 actually exited the building at the northwest corner, and the outfall was located approximately 50 ft northwest of the building. Therefore, the 1993 RFI samples were not collected near the location of the former drainline and outfall, as intended.

4.1.3.3 SWMU 33-005(c), Former Drainline

Description and History

SWMU 33-005(c) is a former drainline that served sink, shower, and glove box drains in the process and hot-change rooms in former building 33-0021 (Figure 4.1-16). The drainline discharged to a leach field located approximately 50 ft south of the building. This line was removed during 1974 removal activities. Approximately 30 ft of the drainline trench was found to be contaminated, resulting in the removal of 8.2 ft^3 of contaminated soil (LANL 1992, 007671, pp. 3-21–3-25).

Previous Investigations

During the Phase I RFI conducted at the SWMU 33-005(c) drainline in 1993, four surface samples (0 to 0.5 ft bgs) and four subsurface samples (1 to 1.5 ft bgs) were collected from four boreholes. One borehole was advanced at the location of the former leach field, as determined from engineering drawings and site topography, and the others were collected at random locations in the vicinity of the leach field. Three boreholes were advanced to a depth of 2 ft and one to a depth of 5 ft. Because the soil backfill was thinner than anticipated, the depth of the boreholes was less than specified in the RFI work plan. Samples were field screened for radioactivity and organic chemicals and submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, and SVOCs. In addition, one surface sample and one subsurface sample were analyzed for VOCs, PCBs, pesticides, and herbicides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.3.3 of the HIR presents a detailed summary of the screening-level results.

Cadmium and uranium were the only inorganic chemicals detected above BV in the 1993 Phase I RFI samples. Seven organic chemicals were detected (acetone, butyl benzyl phthalate, di-n-butyl phthalate, fluoranthene, 4-isopropyltoluene, phenanthrene, and pyrene). No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-005(c).

4.1.3.4 SWMU 33-011(a), Former Drum Storage Area

Description and History

SWMU 33-011(a) is a former drum storage area located directly south of former building 33-0021 (Figure 4.1-16). This unpaved area occupied 0.25 acre and was used to store 55-gal. drums of waste oil. The drums were stored on pallets or directly on the soil and are present in an aerial photograph taken in 1986 (Koogle and Pouls Engineering 1986, 017907). During the implementation of the Phase I RFI in 1993, the location of SWMU 33-011(a) was being used to store drilling equipment, including drilling pipe associated with the Hot Dry Rock Program.

Previous Investigations

During the Phase I RFI conducted at SWMU 33-011(a) in 1993, three surface samples (0 to 0.5 ft bgs) were collected from three locations based on the former drum storage area location depicted in the 1986 aerial photograph (Koogle and Pouls Engineering 1986, 017907). Samples were field screened for radioactivity and organic chemicals and submitted for analysis of SVOCs and PCBs. One sample also

was submitted for analysis of metals, gamma-emitting radionuclides, isotopic plutonium, pesticides, and herbicides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.3.4.3 of the HIR presents a detailed summary of the screening-level results.

Lead was the only metal detected above the BV in the 1993 Phase I RFI samples. Seventeen organic chemicals [anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene, 4,4'-DDE; 4.4'-DDT; dieldrin; 2,4-endosulfan I; endosulfan II; endrin aldehyde; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene] were detected in the RFI samples. No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-011(a).

4.1.3.5 Proposed Activities for Consolidated Unit 33-005(a)-00

The nature and extent of residual contamination at all four sites of Consolidated Unit 33-005(a)-00 has not been determined. Sixty samples will be collected from three depths (2 to 3 ft, 5 to 6 ft and 8 to 9 ft bgs) from all 14 previous RFI sampling locations (33-01061–33-01068, 33-10170, 33-01072, 33-01073, 33-01076–33-01078) and from 6 new sampling location along the former SWMU 33-005(b) drainline and within the outfall drainage. The sampling intervals are designed to avoid the clean fill placed over the site following the removal of all structures in 1974.

In addition, 10 samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at five locations in the drainage downgradient of the consolidated unit. All samples will be analyzed for metals, VOCs, SVOCs, perchlorate, isotopic uranium, isotopic plutonium, cyanide, and nitrate and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations for four sites in Consolidated Unit 33-005(a)-00 are shown in Figures 4.1-17 and 4.1-18. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.4 AOC 33-008(c), Surface Disposal Area

4.1.4.1 Description and History

AOC 33-008(c) is a former surface disposal area located east of Main Site buildings 33-0039 and 33-0113 outside of the Main Site security fence (Figure 4.1-19). This former disposal site consists of two areas, one near a culvert discharge where glass bottles and other debris were discovered and the other an area of surface debris situated north of the culvert. The culvert receives stormwater runoff from Main Site, is directly east of building 33-0039, and is located in a drainage channel that leads to a tributary of Chaquehui Canyon. Debris observed included machined metal turnings, cable, glass bottles, and general trash on the ground surface and in the channel downstream of the culvert. The outlines of a possible trenched area are visible in aerial photographs from 1958 (USAF 1958, 015987). A small asphalt pad is located at the west end of the northern area and a partially full bottle was present on the ground surface. In 1999, a best management practice (BMP) was performed and all visible debris was removed from the watercourse (LANL 2000, 068748, p. 5).

4.1.4.2 Previous Investigations

During the 1996 Phase I RFI implemented at AOC 33-008(c), geophysical surveys using metal detection and electromagnetic induction were conducted at the suspected fill areas. Survey results showed the presence of shallow metallic debris but did not indicate the presence of a landfill or buried debris (LANL 1996, 054963, p. 8). Survey results for the trench area did not identify geophysical anomalies. Nine

surface samples (0 to 0.5 ft) were collected from nine locations within the three surface debris areas and the drainage channel. Two subsurface samples (0.5 to 0.83 ft and 1 to 1.5 ft bgs) were collected at the culvert and 40 ft downgradient of the culvert. Ten subsurface samples were collected from four boreholes drilled in the area near the culvert (Figure 4.1-19). Samples were collected from depth intervals of 1 to 2 ft, 3 to 5 ft, and 5 to 7 ft bgs from borehole 33-01679; from depth intervals of 0 to 0.5 ft, 1 to 2 ft, and 2 to 4 ft bgs from borehole 33-01680; from depth intervals of 0.5 to 1.25 ft, and 5 to 6 ft bgs from borehole 33-01681; and from depth intervals of 0 to 1 ft and 1 to 2 ft bgs from borehole 33-01682. The samples were screened for inorganic chemicals using an x-ray fluorescence (XRF) spectrometer and submitted for analysis of metals, cyanide, SVOCs, VOCs, and total uranium (LANL 1996, 054963, p. 6). Samples collected during the 1996 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.1-1.

In 1999, a BMP was performed at AOC 33-008(c) to remove all visible debris from the area and from the water course (LANL 2000, 068748, p. 5). A partially full 55-gal. drum of debris was removed from the area. Two sediment catchments were constructed within the drainage below the culvert to prevent migration of contaminated sediments. The first catchment was constructed 15 ft below the culvert, and the second was constructed 200 ft below the culvert (LANL 1999, 065351, p. 1).

Decision-level data from the 1996 Phase I RFI samples are presented in Tables 4.1-2 and 4.1-3. Inorganic chemicals detected above BVs were aluminum, antimony, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. Aluminum was detected above the tuff BV in one sample and above the sediment BV in one sample. Antimony was detected above the soil BV in two samples, above the tuff sample in one sample, and above the sediment BV in six samples. Arsenic was detected above the sediment BV in five samples. Barium was detected above the sediment BV in five samples and above the tuff BV in one sample. Cadmium was detected above the soil BV in 3 samples, above the tuff BV in 2 samples, and above the sediment BV in 10 samples. Calcium was detected above the sediment BV in two samples. Chromium was detected above the soil BV in two samples, above the tuff BV in three samples, and above the sediment BV in eight samples. Cobalt was detected above the sediment BV in five samples and above the soil BV in three samples. Copper was detected above the soil BV in 4 samples, above the tuff BV in 2 samples, and above the sediment BV in 14 samples. Iron was detected above the soil BV in three samples, above the sediment BV in four samples, and above the tuff BV in one sample. Lead was detected above the soil BV in 3 samples, above the tuff BV in 3 samples, and above the sediment BV in 10 samples. Magnesium was detected above the tuff BV in one sample. Manganese was detected above the soil BV in three samples and above the sediment BV in four samples. Mercury was detected above the soil BV in 3 samples, above the tuff BV in 2 samples, and above the sediment BV in 11 samples. Nickel was detected above the soil BV in three samples, above the tuff BV in three samples, and above the sediment BV in eight samples. Selenium was detected above the sediment BV in one sample. Silver was detected above the soil BV in 2 samples, above the tuff BV in 1 sample and above the sediment BV in 11 samples. Thallium was detected above soil BV in one sample and above the sediment BV in one sample. Uranium was detected above the soil BV in 6 samples, above the tuff BV in 3 samples, and above the sediment BV in 11 samples. Vanadium was detected above the tuff BV in two samples and above the sediment BV in two samples. Zinc was detected above the soil BV in 3 samples, above the tuff BV in 3 samples, and above the sediment BV in 11 samples. Sampling locations and results for inorganic chemicals above BVs are shown on Plate 6.

Thirty-nine organic chemicals were detected in the 1996 Phase I RFI samples [acenaphthene; acetone; anthracene; azobenzene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; benzoic acid; bis(2-ethylhexyl)phthalate; 2-butanone; carbazole; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; dibenzofuran; di-n-butylphthalate;

dibenz(a,h)anthracene; 1,4-dichlorobenzene; 2,4-dimethylphenol; fluoranthene; fluorene; 2-hexanone; indeno(1,2,3-cd)pyrene; methylene chloride; 2-methylnaphthalene; 2-methylphenol; 4-methylphenol; naphthalene; phenanthrene; phenol; pyrene; pyridine; TCA; TCE; toluene; 1,2,4-trimethylbenzene; and xylene] were detected. Organic chemicals were detected in 16 samples. Sampling locations and detected results for organic chemicals are shown on Plate 7.

4.1.4.3 Proposed Activities

Any debris in the watercourse and surface areas of the site exposed since 1999 will be removed, characterized, and disposed of in accordance with Laboratory waste management requirements. The lateral and vertical extent of contamination in the areas where surface debris was deposited have not been determined, and the extent of contamination within the watercourse downgradient of the site has not been determined. Within the North Area, 12 samples will be collected from two depths (0 to 1 ft and 5 to 6 ft bgs) from the two former RFI sampling locations (33-01685 and 33-01670) and from four new sampling locations. Within the culvert area, 30 samples will be collected from three depths (0 to 1 ft, 5 to 6 ft, and 9 to 10 ft bgs) from six of the former RFI sampling locations (33-01672, 33-01679, 33-01680, 33-01681, 33-01682, and 33-01684) and from four additional locations downgradient of the area. The samples will be analyzed for metals, cyanide, VOCs, SVOCs, isotopic plutonium, and isotopic uranium and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations for AOC 33-008(c) are shown in Figure 4.1-20. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

In addition, lateral extent of releases from AOC 33-008(c) will be determined by sampling the main drainage channel that collects runoff from Main Site. Ten samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at five locations in the channel downslope of Main Site (see section 4.1.2.6 and Figure 4.1-13). Samples collected from the main drainage channel will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, PCBs, isotopic uranium, isotopic plutonium, and tritium and by gamma spectroscopy. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.5 SWMU 33-011(e), Former Storage Area

4.1.5.1 Description and History

SWMU 33-011(e) is a former drum-storage area located at the south end of TA-33 Main Site, approximately 30 ft northwest of building 33-0022, a former HE storage magazine (Figure 4.1-21). The area is unpaved and gradually slopes to the southwest. Drums containing unknown materials were previously stored at this area. The date the materials were first stored at this site is not known. At the time that the OU 1122 RFI work plan was prepared in 1992, all drums had been removed from the site and the area had been cleared (LANL 1992, 007671, p. 3-25). The site is currently not used.

4.1.5.2 Previous Investigations

Previous environmental investigations at SWMU 33-011(e) include soil sampling that was conducted in 1987. The results of this sampling reported uranium and gamma-emitting radionuclides above background (LANL 1990, 007513).

During the Phase I RFI conducted at SWMU 33-011(e) in 1993, two surface samples (0 to 0.5 ft bgs) were collected from two random locations within a 20- × 100-ft area to the northwest of building 33-0022 where drums were believed to have been stored (LANL 1995, 071262). All samples were submitted for

laboratory analysis of uranium and gamma-emitting radionuclides. One sample was also submitted for analysis of herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.5.3 of the HIR presents a detailed summary of the screening-level results.

Uranium was the only inorganic chemical detected above BV in the 1993 Phase I RFI samples. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-011(e).

4.1.5.3 Proposed Activities

The Phase I sampling approach was not adequate to determine the nature and extent of contamination. Samples were collected at only one depth, so vertical extent cannot be determined, and the analytical suite was very limited. The two Phase I RFI sampling locations (33-01084 and 33-01085) within the former storage area will be resampled at greater depths and with an expanded analytical suite to determine vertical extent. Samples will also be collected at two additional locations within the former storage area and four additional locations around the storage area to determine lateral extent. Samples at all eight locations will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. Because the nature of the materials stored at this site is not known, a broad analytical suite is proposed. All samples will be analyzed for metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, isotopic uranium, and tritium, and by gamma spectroscopy. Proposed sampling locations are shown in Figure 4.1-22. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.6 SWMU 33-012(a), Former Storage Area

4.1.6.1 Description and History

SWMU 33-012(a) is a former drum storage area for a machine shop (building 33-0039) (Figure 4.1-23). This storage area is an asphalt pad located on the east side of building 33-0039, between the building and a storage shed. The asphalt pad is approximately 20 ft wide × 20 ft long. The area was used to accumulate 55-gal. drums of solvents and solvent-contaminated oil that potentially may have been contaminated with PCBs and metals. The drums were placed on pallets or directly on the asphalt pad. The 1990 SWMU report notes the presence of multiple oil stains at this site (LANL 1990, 007513). The 1992 RFI work plan, however, states no evidence of oil staining was found (LANL 1992, 007671). The asphalt pad is level, and the ground surface east of building 33-0039 slopes to the east. The beginning date of operation of the storage area is not known; however, building 33-0039 was constructed in 1951. The storage area was deactivated in 1992 or 1993.

4.1.6.2 Previous Investigations

A Phase I RFI was conducted at SWMU 33-012(a) during 1993 (LANL 1995, 071262). A grid-based radiation survey was conducted and no anomalies were identified. Soil samples were collected at two random locations on the pad and at two locations on the edge of the pad. All samples were collected beneath the asphalt and the depth intervals sampled were 0 to 0.33 ft, 0 to 0.5 ft, 0.5 to 0.8 ft, and 0.8 to 1.2 ft bgs. All samples were submitted for analysis of metals, SVOCs, PCBs, and gamma-emitting radionuclides. One sample was also submitted for analysis of herbicides and pesticides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.6.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV during the 1993 Phase I RFI were cadmium, chromium, lead, nickel, and zinc. Eleven organic chemicals [Aroclor-1254; benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; bis-(2ethylhexyl)phthalate; chrysene; 4,4'-DDT; fluoranthene; phenanthrene; pyrene; and total PCB] were detected. No radionuclides were detected or detected above BVs/FVs. No decision-level data are available for SWMU 33-012(a).

4.1.6.3 Proposed Activities

Phase I RFI screening-level data showed metals above BVs and detected organic chemicals, primarily PAHs and PCBs. Samples were collected at only one depth beneath the asphalt pad, so additional sampling depths are needed to determine vertical extent. Additional samples are also needed away from the storage pad to determine lateral extent.

To determine lateral extent, RFI sampling locations 33-01086, 33-01087, and 33-01089, where low concentrations of PCBs and elevated metals were previously detected in 1993, along with three new locations next to the pad will be sampled along with one new location downgradient of the site toward the head of the drainage that collects runoff from the site. Samples will be collected at depth intervals of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs and analyzed for TAL metals, VOCs, SVOCs, cyanide, perchlorate, nitrate, isotopic uranium, and PCBs and by gamma spectroscopy. Proposed sampling locations are shown in Figure 4.1-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.7 SWMU 33-016, Sump, Drainline, and Outfall

4.1.7.1 Description and History

SWMU 33-016 is a formerly used sump and associated drainline and outfall at a process bunker (structure 33-0023) located in the southern portion of Main Site (Figure 4.1-25). The concrete sump is 3 ft × 2 ft × 2 ft deep and is located next to the northwest corner of the bunker's exterior wall, near the door. A drainline leads from the sump to an outfall approximately 250 ft southwest of the building to a small side canyon to Chaquehui Canyon. The sump was connected to a sink and floor drain in the bunker, which was constructed in 1950. From 1950 until 1972, the bunker was used as a trim building to prepare propellant charges for gun tests at South Site. Structure 33-0023 was subsequently used until 1994 to store lithologic cores from the Hot Dry Rock Program. In addition to the sink and floor drain, the sump also may have received rainwater and snowmelt. The sump was decommissioned in 1995.

4.1.7.2 Previous Investigations

During the Phase I RFI conducted at SWMU 33-016 in 1993, two liquid and two sludge samples were collected from the sump for waste characterization purposes (LANL 1995, 050113, pp. 53–57). One surface sample (0 to 0.5 ft bgs) and two subsurface samples (3 to 5 ft and 10 to 12 ft bgs) were collected next to the sump from a single borehole advanced to a depth of 12 ft. In addition, four surface samples (0 to 0.5 ft bgs) were collected at and downslope of the outfall, field screened for radioactivity, organic chemicals, and HE, and submitted for analysis of SVOCs and HE. The subsurface samples were also analyzed for VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 2.7.3 of the HIR presents a detailed summary of the screening-level results.

Two organic chemicals [acetone and bis(2-ethylhexyl)phthalate] were detected in the 1993 Phase I RFI samples.

The voluntary corrective action (VCA) implemented at SWMU 33-016 in 1995 involved removing the contents of the sump, filling the sump with approximately 3 yd^3 of sand and gravel and capping the sump with 1 ft of concrete (LANL 1995, 050113, Addendum 1, pp. 1–2). No decision-level data are available for SWMU 33-016.

4.1.7.3 Proposed Activities

The nature and extent of residual contamination have not been determined for this site. Ten samples will be collected from two depths (0 to 1 ft and 3 to 4 ft beneath the bottom of the sump) from two locations next to the sump and from three locations along the drainline (0 to 1 ft and 3 to 4 ft beneath the bottom of the drainline). In addition, eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at four locations within the outfall and drainage downgradient of the outfall. All sample will be analyzed for metals, VOCs, SVOCs, perchlorate, cyanide, isotopic uranium, and nitrate. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-26. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.8 AOC C-33-001, Former Transformer

4.1.8.1 Description and History

AOC C-33-001 consists of a former electrical transformer (former structure 33-0124) at the TA-33 Main Site (Figure 4.1-27). The transformer was mounted on a 15 ft × 50 ft concrete pad next to the east wall of building 33-0114. The transformer was located next to the northeast wall of building 33-0114 and was bounded by asphalt to the north, east, and south. The pad was enclosed by a fence and accessible only through a locked gate. Because this transformer was placed into service in the 1950s, the oil in the transformer may have contained PCBs. Oil stains were observed on the concrete pad and leaks from the transformer were observed during routine inspections conducted between September 1985 and March 1992. In 1992, the transformer was replaced by a non-PCB transformer. Sampling conducted during transformer replacement was limited to areas where the old transformer had been placed temporarily during removal.

4.1.8.2 Previous Investigations

The 1992 RFI work plan stated that the transformer pad would be cleaned and sampled during transformer replacement and proposed no additional sampling (LANL 1992, 007671, p. 3-26). When it conducted Phase I RFI activities at TA-33 in 1993, the ER Project determined sampling conducted during transformer replacement did not meet RFI objectives. The RFI report, therefore, recommended additional sampling to determine whether historical releases of PCBs had occurred. The proposed sampling included field screening the stained areas on the concrete pad and the soil around the perimeter of the pad. If field screening detected PCBs in soil at the perimeter of the pad, additional screening samples were to be collected at greater distances from the pad until the extent of PCB contamination had been bounded (LANL 1995, 050113, pp. 90–93).

In 1996, sampling was conducted at AOC C-33-001. Five samples were collected and submitted to an off-site laboratory for analysis of PCBs/pesticides (Figure 4.1-27). Confirmation samples collected in 1996 and the analyses requested for the decision-level data are presented in Table 4.1-1. Sampling results have not been presented in a report.

A BMP plan, written and implemented in 1999, consisted of a PCB cleanup conducted using a vacuum system on the asphalt area between buildings 33-0113 and 33-0114. The field team began by vacuuming

the area closest to the transformer pads next to building 33-0114 and then continued to pick up sediment present in low-lying depressions on the asphalt. Special emphasis was placed on cracks and potholes that had developed over the years. In addition, the field team followed a low-grade slope from building 33-0114 east between buildings 33-0113 and 33-0039, which could potentially carry off surface sediment during storm events. A total volume of 55-gal. of material was collected.

Decision-level data from the 1996 sampling event are presented in Table 4.1-3. Aroclor-1260 was detected in four soil samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-28. Although these data are of decision-level quality, the sampling depths and locations were not sufficient to define the extent of contamination. As a result, the 1996 sampling locations will be resampled, and the 1996 data will not be used for decision purposes.

4.1.8.3 Proposed Activities

The lateral and vertical extent of PCB contamination have not been determined for this site. A total of 12 samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from the four previous RFI locations (33-01748, 33-01749, 33-01751, and 33-01752) around the concrete pad where the transformer was located and from two additional downgradient locations and analyzed for PCBs. Proposed sampling locations are shown in Figure 4.1-29. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.1.9 AOC C-33-003, Potential Soil Contamination

4.1.9.1 Description and History

AOC C-33-003 consists of two fill areas located at the Main Site area of TA-33 (Figure 4.1-30). This fill was used to level sites for two portable trailers. One of the trailers (structure 33-169) was installed next to the Main Site water tower. The filled area to accommodate trailer 33-0169 is approximately 100 ft × 100 ft × 4 ft deep. The other trailer (structure 33-0170) was installed north of building 33-0114. The filled area to accommodate trailer 33-0170 is approximately 70 ft × 90 ft × 7 ft deep. Both trailers were installed in January 1984 and removed in June 1988. After the trailers were removed, no further improvements were made to these sites. Three projectiles, one of which contained uranium, were discovered at the fill area near the water tower during brush-clearing activities conducted during the spring of 1996. The source of these projectiles appears to have been the fill material that had been obtained from the cinder cone located in Area 6, just west of Main Site. Projectiles historically were fired into the base of the cinder cone during experiments conducted at the Area 6 firing area [SWMU 33-007(c)].

4.1.9.2 Previous Investigations

Previous environmental investigations at AOC C-33-003 include geophysical investigations conducted at both fill areas in 1997. The results of these surveys included anomalies that may have been indicative of other projectiles. AOC C-33-003 was not included in the RFI work plan for TA-33 because it was discovered after the work plan had been prepared.

A VCA was implemented at AOC C-33-003 in 1999 (LANL 1999, 063678). Fill material was excavated until native soil or tuff was encountered. A total of 408.5 yd^3 of fill material was excavated. Radiation surveys of the excavated areas showed no readings greater than 2 times background. Confirmation samples were collected to verify cleanup levels had been achieved. Confirmation samples consisted of a surface and subsurface sample collected at each of four locations at each site (Figure 4.1-30) and submitted for laboratory analysis of metals, isotopic uranium, and organic chemicals. Two additional

samples were collected from the drainage at the site near the water tower (there is no drainage at the other filled area) and submitted for laboratory analysis of metals and isotopic uranium. The excavated material was transported to a Segmented Gate System (SGS) treatment plant, where radioactive materials were separated from the fill. A total of 1.45 yd^3 of contaminated fill was separated and disposed of as LLW at MDA G at TA-54. Three samples of the treated fill were collected to verify decontamination. Two of these samples were submitted for laboratory analysis of metals, total uranium, tritium, and organic chemicals. The third sample was submitted for analysis of isotopic uranium and organic chemicals. The decontaminated fill was then returned to the site, and the site was restored and revegetated (LANL 2000, 066889, pp. 22–35). Confirmation samples collected during the 1999 VCA and the analyses requested for the decision-level data are presented in Table 4.1-1.

Decision-level data from the 1999 VCA confirmation samples are presented in Tables 4.1-2, 4.1-3, and 4.1-4. Metals detected above BVs in the confirmation samples from the excavated areas were antimony, barium, calcium, cobalt, copper, lead, magnesium, nickel, and selenium. Antimony was detected above the soil BV in seven samples and above the sediment BV in one sample. Barium was detected above the tuff BV in five samples and above the sediment BV in one sample. Calcium was detected above the soil BV in three samples, above the tuff BV in two samples, and above the sediment BV in one sample. Cobalt was detected above the soil BV in four samples, above the tuff BV in one sample, and above the sediment BV in two samples. Copper was detected above the soil BV in four samples, above the tuff BV in eight samples, and above the sediment BV in two samples. Lead was detected above the tuff BV in two samples and above the sediment BV in two samples. Magnesium was detected above the soil BV in six samples and above the sediment BV in two samples. Nickel was detected above the soil BV in six samples and above the sediment BV in two samples. Selenium was detected above the soil BV in one sample, above the tuff BV in two samples, and above the sediment BV in two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.1-31.

Eighteen organic chemicals were detected in confirmation samples from the excavated areas: acenaphthene; anthracene; benzene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; phenanthrene; pyrene; toluene; and TCE. Sampling locations and detected results for organic chemicals are shown in Figure 4.1-32.

Radionuclides detected above BVs in the confirmation samples from the excavated areas were uranium-234 and uranium-238; both radionuclides were detected above the soil BVs in two soil samples. Sampling locations and results for radionuclides detected above BVs/FVs are shown in Figure 4.1-33.

Although the 1999 VCA data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. As a result, the VCA sampling locations will be resampled, and the VCA data will not be used for decision purposes.

4.1.9.3 Proposed Activities

The lateral and vertical extent of residual contamination have not been determined at this site. Seventy-eight samples will be collected from three depths (0 to 1 ft and 4 to 5 ft bgs, and 0 to 1 ft into the tuff) from the 10 previous confirmation sampling locations (33-01708 through 33-01717) and 16 new sampling locations within and downgradient of the two AOC C-33-003 fill areas. In addition, six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) at three locations in the drainage channel downgradient of the southwest fill area (next to the water tower). Samples will be analyzed for metals, isotopic uranium, perchlorate, cyanide, nitrate, VOCs, and SVOCs and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. Proposed sampling locations are shown in

Figures 4.1-34 and 4.1-35. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

Data from the six sampling locations in the drainage downgradient of SWMU 33-004(d) will also be used to determine extent (see section 4.2.1.3 and Figures 4.1-35 and 4.2-2).

4.2 Sites under Investigation at Area 6

4.2.1 SWMU 33-004(d), Septic System

4.2.1.1 Description and History

SWMU 33-004(d) consists of an abandoned septic tank (structure 33-0121) and associated drainline and drain field located at Area 6 (Figure 4.2-1). Septic tank 33-0121 is located approximately 100 ft east of building 33-0016. The septic tank is constructed of corrugated iron and has a capacity of 500 gal. Septic tank 33-0121 received wastewater from a toilet and sink in a former laboratory building (33-0001). Building 33-0001 and associated machine shop building 33-0002 were built on skids and moved on site sometime in 1946 or 1947 (Ahlquist 1983, 006854). Although use of building 33-0001 was discontinued in 1991 and the building was removed in 1994, the septic tank is still in place. While building 33-0001 was occupied, effluent was discharged from the septic tank to a drain field located approximately 20 ft east of the tank. The drain field is constructed of a single row of vitrified-clay tiles installed in gravel approximately 5 ft below grade. The RFI work plan (LANL 1992, 007671) states an outfall from the drain field was buried in a side wash of Chaquehui Canyon. Land surface at the tank location slopes east approximately 200 ft to a shallow drainage eroded into the bedrock that flows south.

Building 33-0001 was used from 1948 to 1955 to support nonexplosive initiator tests conducted at Area 6. In 1958, the building was used to grow crystals of potassium niobate and possibly other types of crystals (aluminates, titanates, tungstates, etc.) (Schulte 1958, 007946). Silver plating was also reportedly performed in this building (Ahlquist 1983, 006854). Later, building 33-0001 was used as office space and for storage until use of the building was discontinued in 1991. A 1993 study of drains and discharges at TA-33 identified the only discharges to the septic system were from a lavatory, toilet, and sink drain (Santa Fe Engineering 1993, 062036, Table 1).

4.2.1.2 Previous Investigations

A Phase I RFI was conducted at SWMU 33-004(d) in 1993 (LANL 1995, 071262). The RFI work plan specified sampling the contents of the tank. At the time of the investigation, however, the tank was dry and samples could not be collected. Three shallow (7 to 8 ft bgs) boreholes were sampled during the investigation. One borehole was placed next to the tank, and two were placed downslope of the tank along the line of drain tiles. At each borehole, samples were collected at the surface (0 to 0.2 ft or 0 to 0.5 ft bgs) and at two subsurface intervals samples (3 to 5 ft, 4.5 to 5 ft, 6.3 to 8 ft, 6.5 to 7 ft, or 7.5 to 8 ft bgs). A total of three surface and six subsurface samples were collected. Six additional surface samples (0 to 0.5 ft bgs) were collected at six locations on the slope below the outfall and along the drainage. All samples were submitted for laboratory analysis of metals, cyanide, uranium, SVOCs, and gamma-emitting radionuclides. Four of the samples from the boreholes along the drainlines were also submitted for analysis of VOCs. The two subsurface samples from the borehole nearest the septic tank were later resampled and submitted for laboratory analysis of VOCs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.1.3 of the HIR presents a detailed summary of the screening-level results.

Inorganic chemicals detected above BV during the 1993 Phase I RFI were cadmium, cyanide, lead, nickel, uranium, and zinc. Four organic chemicals (acetone, fluoranthene, phenanthrene, and pyrene) were detected. No radionuclides were detected or detected above BVs/FVs. Decision-level data for SWMU 33-004(d) are not available.

4.2.1.3 Proposed Activities

The septic tank is no longer needed so it will be removed and the drainlines plugged. After the tank is removed, samples will be collected to characterize any remaining contamination. Six samples will be collected from two depths at one location within the excavation at a location beneath the former tank, one location beneath of inlet to the tank, and one location beneath the outlet of the tank at depths of 0 to 1 ft and 3 to 4 ft below the bottom of the excavation and the bottom of the inlet and outlet. Because sampling was not previously conducted below the drainline between building 33-0001 and the septic tank, one location along this inlet drainline will be sampled at depths of 0 to 1 and 3 to 4 ft below the drainline.

Data from the Phase I RFI samples collected in the drain field showed only sporadic detections of inorganic and organic chemicals. These data are screening-level data, however, and cannot be used to define extent. These locations (33-01183 and 33-01184) will be resampled at the two deepest and one additional depth to define vertical extent. Samples will be collected at depths of 4 to 5 ft, 7 to 8 ft, and 9 to 10 ft bgs.

Data from the Phase I RFI samples collected on the slope below the outfall and along the drainage channel show decreasing concentrations downslope, but these data cannot be used to determine extent because they are screening-level data. Also, samples were collected at only one depth. These locations (33-01185, 33-01186, 33-01187, 33-01189, 33-01190, and 33-01191) will be sampled along with two additional locations at depths of 0 to 1 ft and 2 to 3 ft bgs to determine lateral and vertical extent of contamination.

All samples for SWMU 33-004(d) will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, and isotopic uranium and by gamma spectroscopy. In addition, 20% of all samples will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.2 Consolidated Unit 33-004(g)-00, Area 6 Firing Site

Consolidated Unit 33-004(g)-00 consists of SWMUs 33-004(g) and 33-007(c), an outfall and firing areas, respectively. These SWMUs are located in the northwest corner of TA-33 (Figure 4.2-1) and are associated with past activities in Area 6, including initiator tests conducted from 1949 to 1955.

4.2.2.1 SWMU 33-004(g), Drainline and Outfall

Description and History

SWMU 33-004(g) is an outfall and associated drainline that discharged wastewater from building 33-0016. The outfall is located at the end of a VCP that runs west approximately 50 ft from the northwest corner of building 33-0016 (Figure 4.2-1). The pipe daylights at the edge of a level area above a drainage channel that leads to a tributary of Chaquehui Canyon. The ground surface below the outfall slopes steeply down to the tributary channel, which is approximately 70 ft lower than the outfall. A culvert under a roadway, approximately 60 ft southwest of the outfall, receives runoff from most of the paved portion of Area 6. Building 33-0016 was constructed in 1949 as a gun building for initiator tests. It housed a gas gun

that was used to fire projectiles as well as electronic equipment used to measure neutron production. Large-bore (2-in. to 5-in.-diameter) guns were also mounted on concrete pads around building 33-0016 and used to fire projectiles containing initiator test assemblies. These activities continued until 1955. Photographs may have been developed in building 33-0016 or in a small trailer parked next to the drainage from the site (LANL 1992, 071262, p. 57). In 1956, building 33-0016 was used to make and machine laminating materials that contained barium, lead, titanium, and zinc (Milford 1956, 007934). Toxic fumes were reportedly released from a fume hood in the building used to cure epoxy resins (Hyatt 1957, 007939). Building 33-0016 later was used as a library and storage building and has been empty since 1991. A study of drains and discharges at TA-33 was conducted to identify all sources of discharges from TA-33 buildings. This study identified no discharges from building 33-0016 (Santa Fe Engineering 1993, 062036, p. 4). Thus, the source of the discharge from the SWMU 33-004(g) outfall is not known.

A long-time TA-33 staff member reported that the drainline from building 33-0016 also served two trailers that were parked on the pad north of the building when Area 6 was occupied. One trailer was used for assembly and the other contained a darkroom (Hoard 1991, 009734).

Previous Investigations

A Phase I RFI was conducted at SWMU 33-004(g) in 1993 (LANL 1992, 007671). The outfall was located and surface samples (0 to 0.5 ft bgs) were collected at the outfall and at three locations downstream of the outfall. Downstream sampling locations were in sediment traps in the drainage channel that leads to the tributary channel and were approximately 100 ft apart. Another surface sample (0 to 0.5 ft bgs) was collected at the culvert discharge point southwest of the outfall for a total of five samples. All samples were submitted for laboratory analysis of metals, uranium, SVOCs, HE, and gamma-emitting radionuclides. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.2.1.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1993 Phase I RFI samples were barium, cadmium, lead, nickel, silver, uranium, and zinc. The only organic chemical detected was bis(2-ethylhexyl)phthalate. No radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-004(g).

Proposed Activities

Data from the Phase I RFI samples collected at SWMU 33-004(g) showed concentrations of metals decreased with distance downslope from the outfall and culvert. Therefore, the Phase I sampling locations should be sufficient to define nature and extent. Phase I samples were collected only at the surface, and additional sampling depths are needed to determine vertical extent. The five Phase I sampling locations (33-01192–33-01196) will be resampled. Samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs at each location and analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium and by gamma spectroscopy. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.2.2 SWMU 33-007(c), Firing Sites

Description and History

SWMU 33-007(c) consists of abandoned firing sites associated with the initiator tests conducted at Area 6. The firing sites included firing pads and two catcher boxes (Figure 4.2-1). One pad was located immediately west of building 33-0016. The catcher boxes were located approximately 20 ft south of building 33-0016 and were approximately 6 ft × 6 ft, constructed of timber, and filled with soil, wood chips, and vermiculite. Guns (2-in. to 5-in. bore) were placed on the concrete pads and used to fire projectiles containing test assemblies into targets placed in front of the catcher boxes. Materials used in the projectiles included beryllium, polonium-210, uranium, copper, lead, tungsten, and stainless steel (Hoard 1991, 009733). The projectiles frequently cracked open, contaminating the pads and surrounding area with polonium-210. Contaminated areas on the guns and pads were painted with lead-based paint to fix surface contamination (LANL 1992, 007671, p. 3-42).

Several other firing pads were on a level area excavated into a basaltic cinder cone southwest of building 33-0016. This area was used to test nuclear gun mock-ups (Hoard 1991, 009733). A 4-in. to 5-in. bore gun was used to fire projectiles into the back of the excavation. The back of the excavation currently extends about 75 ft farther back than when the site was used (Hoard 1991, 009734).

A 1951 memorandum describes a test at Area 6 that resulted in leakage of radioactive material from a projectile. The site was cleaned up by using a bulldozer to scrap away the contaminated soil and embankment (Buckland 1951, 007845). A 1954 memorandum describes decontamination of one of the Area 6 gun barrels. The memorandum describes removing loose material and leaving impregnated spots as high as 1 million counts per minute. Contaminated surface dirt was bulldozed from the shot area into the adjacent canyon (LASL 1954, 107465).

Previous Investigations

A Phase I RFI was conducted at SWMU 33-007(c) in 1993 (LANL 1992, 007671). Fourteen surface samples (0 to 0.5 ft bgs) were collected from 14 locations around the firing areas (Figure 4.2-1) and submitted for laboratory analysis of metals, HE, and gamma-emitting radionuclides; all but one of the samples were also submitted for uranium analysis. In addition, three samples were submitted for analysis of herbicides, two for pesticides, and two for PCBs. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.2.2.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BVs during the 1993 RFI sampling were arsenic, barium, beryllium, cadmium, chromium, lead, nickel, uranium, and zinc. Three organic chemicals (Aroclor-1254; Aroclor-1260; and 2,4-dichlorophenoxyacetic acid) were detected. No radionuclides were detected or detected above BVs/FVs.

Additional RFI activities were conducted in 1994, including trenching through the catcher-box area. Chunks of uranium and several experimental devices were discovered during trenching. No external radiation was measured from the experimental devices. Eight soil samples were collected from six locations within the trench (4 ft bgs), and one additional soil sample was collected next to the trench (4 ft bgs) and submitted for laboratory analysis of metals and uranium; three samples were also analyzed for isotopic uranium. Data from the 1994 Phase I RFI showed metals detected above BVs and isotopes of uranium detected above BV. Because these sampling locations were subsequently excavated during the 1996 VCA described below, the data are summarized below but are not included in the HIR.

Metals detected above BV in the 1994 catcher-box trench samples were cadmium, lead, mercury, nickel, selenium, uranium, and zinc. Cadmium and uranium were each detected above the soil BV in eight samples. Lead and zinc were each detected above the soil BV in one sample. Mercury and nickel were each detected above the soil BV in five samples. Selenium was detected above the soil BV in three samples. No radionuclides were detected above the BVs/FVs for soil.

Based on the results of the RFI, an IA was conducted at SWMU 33-007(c) in 1995 (LANL 1996, 052919). The IA involved stabilizing the site to prevent migration of the contamination identified during the RFI. A high-density polyethylene (HDPE) cover was placed over the catcher boxes to prevent run-on and runoff of precipitation. Additionally, the culvert west of building 33-0016 was dammed with sandbags to prevent water from entering the culvert.

In April and May 1996, a pilot test of the SGS and containerized vat leach (CVL) system was conducted using the soil in the catcher boxes. The SGS unit was used to radiologically screen the soil in the catcher boxes and separate the soil into clean and contaminated fractions. The CVL was then used to treat the contaminated soil by leaching uranium from the soil. Approximately 200 yd^3 of soil was removed from the catcher boxes and processed. Fifty-six experimental projectiles totaling 1720 lb were discovered as the soil was screened before it was placed in the SGS. These projectiles were stored pending final disposition.

In conjunction with the pilot test, a VCA plan for SWMU 33-007(c) was prepared in 1996 (LANL 1996, 054906). The objective of the VCA was to verify the effectiveness of the SGS and CVL processes for remediating uranium-contaminated soil. The VCA plan also included developing cleanup levels for uranium-contaminated soil.

The VCA was implemented during 1996 (LANL 1996, 062541). The clean soil separated using the SGS was sampled to determine whether it met cleanup levels. Thirteen samples were collected from the stockpile of clean soil processed through the SGS. An additional eight confirmation samples were collected from the bottoms and sides of the catcher-box excavations (Figure 4.2-1). All samples were submitted for laboratory analysis of isotopic uranium. After sampling confirmed the clean soil met cleanup levels, it was returned to the site. The projectiles previously placed into storage were characterized and disposed of as LLW. Confirmation samples collected in 1996 and the analyses requested for the decision-level data are presented in Table 4.2-1.

No uranium isotopes were detected above BV in any of the confirmation samples collected from the bottoms and sides of the excavation. Sampling performed on the clean soil pile determined 95% upper confidence bounds on the mean activity of uranium-234, uranium-235, and uranium-238 to be 15.8 pCi/g, 0.515 pCi/g, and 15.7 pCi/g, respectively (LANL 1996, 062541, p. 14); these values are all substantially below the respective cleanup levels of 114 pCi/g, 72 pCi/g, and 116 pCi/g.

Proposed Activities

The 1993 Phase I RFI sampling performed around the firing site near building 33-0016 showed sporadic detections of metals at concentrations approximately 2 times BVs or less. Organic chemicals were detected infrequently, although not all samples were analyzed for organic chemicals. Higher concentrations of metals were detected in the 1994 catcher-box samples. This soil was subsequently treated using the SGS and returned to the site, but confirmation sampling did not include analysis for metals.

Based on these results, samples will be collected from within the footprint of the catcher boxes and outside the catcher boxes to determine nature and extent. Samples will be collected at three locations

where the catcher boxes were previously located. At each location, samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs into the treated soil backfill and 0 to 1 ft bgs into undisturbed tuff below the treated soil. Samples will also be collected at four locations around the former catcher boxes, outside the area of treated soil. At each location, samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, and isotopic uranium. Twenty percent of the samples will also be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

The 1993 Phase I RFI sampling of the cinder cone firing area showed the highest concentrations of metals within the cinder cone against the wall of the excavation. Concentrations generally decreased away from this location and down the slope to the west. The only organic chemicals detected were PCBs, which were detected at low concentrations on the slope, and which may be associated with SWMU 33-009. Phase I RFI sampling locations within and around the cinder cone to the edge of the slope will be resampled to characterize current conditions and to define vertical extent at these locations. Lateral extent of contamination from this site will be determined using the results of sampling on the slope and drainage to the west to be performed for SWMU 33-009.

The following Phase I RFI locations will be resampled: 33-01199, 33-01203, 33-01204, 33-01206, 33-01211, and 33-01212 at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs at each location. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.2.3 SWMU 33-009, Surface Disposal Area

4.2.3.1 Description and History

SWMU 33-009 is a former surface disposal area located in Area 6, west of the TA-33 Main Site (Figure 4.2-1). The disposal site includes an area approximately 100 ft long × 75 ft wide that has been leveled into the side of a natural basaltic cinder cone as well as an area that extends approximately 80 ft down the slope of the cinder cone. The slope continues below the disposal site until it reaches a tributary of Chaquehui Canyon. The debris within this surface disposal area is believed to be associated with the activities at a nearby gun-firing site [SWMU 33-007(c)]. This gun-firing site operated from 1949 until 1955. When the firing area became contaminated as a result of firing activities, contaminated soil and debris was bulldozed over the edge of the canyon. SWMU 33-009 also received various debris from general operations at TA-33, including metal wastes, light bulbs, tires, and drums. In 1960, the site received uranium turnings from the building 33-0113 machine shop. In addition, from 1967 until 1972, the site served as a storage and disposal site for defective electrical capacitors from the Sherwood Project. These capacitors had an average weight of 300 lb and were about 4 to 6 ft^3 in volume (Reider 1967, 007471). Disposal of the capacitors at this site ceased in 1972, at which time defective capacitors were sent to Area L at TA-54 for disposal (Reider 1972, 008204).

In December 1974, the site was partially cleaned up as part of general cleanup activities conducted at TA-33. Several truck loads of material were taken to MDA G for disposal. Material removed from the site included DU pieces, electrical capacitors, metal turnings, old tires, and fluorescent light tubes (Ahlquist 1983, 006854). A radiation survey was performed after the cleanup. The area was surveyed at intervals of about 10 ft across the slope and 16 ft up and down the slope. Radiation above background was not detected (Smith 1974, 006911). Not all material was removed in 1974. Broken glass and chunks of metal were still present when the RFI was conducted in 1993. An empty capacitor containing small amounts of

PCB-contaminated oil was also discovered partially buried on the site in 1994 and was removed (LANL 1995, 071300, p. 38).

4.2.3.2 Previous Investigations

During the 1993 Phase I RFI conducted at SWMU 33-009, a geophysical survey that used magnetic and electromagnetic methods detected no anomalies that could not be attributed to site features (LANL 1995, 071300). Six surface samples (0 to 0.5 ft) were collected from six locations in the former disposal area, and four surface samples (0 to 0.5 ft) were collected from four locations in the drainage channel downslope of the disposal area. All samples were submitted for laboratory analysis of metals, uranium, SVOCs, PCBs, and gamma-emitting radionuclides. One of the disposal area samples was also submitted for analysis of herbicides and pesticides. The four drainage samples also were submitted for HE analysis. When the capacitor was discovered on the hillside in 1994, a sample of the soil beneath the capacitor was collected and submitted for laboratory analysis of PCBs. Two samples of the residual oil inside the capacitor were also collected and submitted for PCB analysis. Data from the 1993 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 3.3.3 of the HIR presents a detailed summary of the screening-level results. The 1994 sampling of the soil beneath the capacitor was performed by Laboratory PCB waste management staff, and the data are summarized below but are not included in the HIR.

Metals detected above BVs during the 1993 Phase RFI were cadmium, lead, nickel, uranium, and zinc. Aroclor-1254 was the only organic chemical detected. No radionuclides were detected or detected above BVs/FVs.

Aroclor-1254 was the only organic chemical detected in the 1994 soil sample collected beneath the capacitor. Decision-level data are not available for SWMU 33-009.

4.2.3.3 Proposed Activities

PCBs were detected in only one of the Phase I RFI samples collected on the cinder cone slope. This location was near the top of the slope where the capacitors had been disposed of. PCBs were also detected on the slope at the location of the capacitor that was discovered in 1994 but not in Phase I RFI samples downslope of this location. Contamination on the cinder cone slope will be characterized by collecting samples from two transects across the slope. The first transect will be located approximately 50 ft below the edge of the mesa, approximately where PCBs were detected during the Phase I RFI. The second transect will be midway between the first transect and the drainage channel at the bottom of the slope. Samples will be collected at five locations along each transect. At each location, samples will be collected at depths of 0 to 1 ft, 2 to 3 ft, and 4 to 5 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic uranium. Proposed sampling locations are shown in Figure 4.2-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites. These samples will also serve to characterize releases from SWMU 33-007(c).

Data from the Phase I RFI samples collected in the drainage below the cinder cone slope at SWMU 33-009 showed concentrations of PCBs to decrease with distance down the site drainage. However, metals above BVs and PCBs were detected in the most downstream sample. Therefore, additional samples farther down the site drainage than the Phase I sampling locations are needed to define lateral extent. Samples will be collected from six locations in the drainage channel. At each location, samples will be collected at depths of 0 to 1 ft and 2 to 3 ft bgs. All samples will be analyzed for TAL metals, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, PCBs, and isotopic

uranium. Proposed sampling locations are shown in Figure 4.2-2, and samples and analyses are summarized in Table 4.0-1. These samples will also serve to characterize extent of releases from SWMUs 33-004(g) and 33-007(c).

4.3 Sites under Investigation at South Site

This section provides descriptions and history of each of the sites being investigated at TA-33 South Site, along with descriptions and results of previous investigations, and the proposed investigations. A summary of decision-level samples collected and analyses requested during previous investigations is presented in Table 4.3-1. Inorganic chemicals above BVs in previous decision-level samples are presented in Table 4.3-2. Organic chemicals detected in previous decision-level samples are presented in Table 4.3-3. Radionuclides detected or detected above BVs/FVs in previous decision-level samples are presented in Table 4.3-4. Figures 4.3-1 through 4.3-26 show the site features, historical sampling locations, inorganic and organic chemicals and radionuclides detected above background, and the locations proposed for sampling in this work plan.

4.3.1 Consolidated Unit 33-001(a)-99, MDA E

Consolidated Unit 33-001(a)-99, which consists of SWMUs 33-001(a–e), is collectively referred to as MDA E. The SWMUs in this consolidated unit consist of waste disposal pits and an underground test chamber and shaft. This consolidated unit is located at the south end of TA-33 near the edge of Chaquehui Canyon. It occupies an area approximately 140 ft × 220 ft and is enclosed by an 8-ft fence (Figure 4.3-1).

SWMUs 33-001(a–d) are abandoned waste disposal pits 1 through 4, respectively. SWMU 33-001(e) is a former test chamber (structure 33-0029) and shaft (structure 33-0003). The test chamber and shaft were abandoned in place in April 1950 and use of the disposal pits ceased in 1963. Two additional pits (pits 5 and 6) are located within the fenced area of MDA E. No documentation indicates if pits 5 and 6 were ever used, and they are not designated as SWMUs or AOCs. Based upon 1962 recommendations, radiation control area signs were posted around the fenced sides of MDA E, pit 2 was covered with approximately 2 ft of dirt, and all excess equipment and debris were removed from the site (Rogers 1977, 005708, p. E-5). Currently, MDA E is surrounded by a fence, and the area is vegetated with trees, shrubs, and grasses.

4.3.1.1 Description and History

SWMU 33-001(a), Disposal Pit 1

SWMU 33-001(a), disposal pit 1, is located inside the western edge of the fenced area of MDA E (Figure 4.3-1). The pit dimensions are approximately 15 ft × 75 ft × 7 ft deep. Documentation indicates that pit 1 contains polonium-beryllium contaminated targets. The pit may also contain spent projectiles, uranium components, beryllium, and explosive test shot debris. The pit was backfilled and compacted in 1963 (Rogers 1977, 005708, p. E-1).

SWMU 33-001(b), Disposal Pit 2

SWMU 33-001(b), disposal pit 2, is located along the southern edge of the fenced area of MDA E (Figure 4.3-1). Pit dimensions are approximately 15 ft × 45 ft × 7 ft deep. Explosive test shot debris and a spent explosives device were buried in pit 2. According to engineering drawing R-3644, pit 2 was open in November 1962 and was backfilled sometime during 1963 (Rogers 1977, 005708, p. E-1).

SWMU 33-001(c), Disposal Pit 3

SWMU 33-001(c), disposal pit 3, is located near the southeast corner of the fenced area of MDA E (Figure 4.3-1). Pit dimensions are approximately 5 ft in diameter and 7 ft deep. Pit 3 reportedly contains a can of beryllium dust immersed in kerosene (Rogers 1977, 005708, p. E-1) and may have contained other explosive test shot debris. Pit 3 was closed in September 1951 and backfilled.

SWMU 33-001(d), Disposal Pit 4

SWMU 33-001(d), disposal pit 4, is located along the east fence line of MDA E (Figure 4.3-1). The pit dimensions are approximately 15 ft × 100 ft × 7 ft deep. Pit 4 contains explosive test shot debris, a spent explosives device, and miscellaneous radioactive material (Rogers 1977, 005708, p. E-1). According to Rogers (1977, 005708, p. E-1), pit 4 was still used for disposal during the 1960s. It was backfilled sometime before 1977.

SWMU 33-001(e), Shot Chamber

SWMU 33-001(e) consists of an underground chamber, designated chamber 3 (structure 33-0029), and an associated underground elevator shaft (structure 33-0003) (Figure 4.3-1). A portable cable building (33-0030) was attached to the elevator shaft and housed electrical and ventilation equipment for both the chamber and the shaft. The chamber and shaft were constructed between 1949 and 1950. The chamber was constructed of 2-ft-thick concrete walls, and its dimensions were 11 ft ×14 ft. The chamber was situated 46 ft bgs. The elevator shaft was constructed of wood, iron, and concrete, and its dimensions were 6 ft × 8 ft × 60 ft tall. The bottom of the shaft was 48 ft bgs. Chamber 33-0029 collapsed during an experiment conducted in April 1950 and was left in place. According to engineering drawing R-152, the portable cable building and the aboveground portions of the elevator shaft were removed in 1954. The chamber was used to conduct tests involving explosives, beryllium, and tungsten (LANL 1992, 007671, p. 3-51).

4.3.1.2 Previous Investigations

The Laboratory's Environmental Surveillance Program conducted surface and subsurface sampling at MDA E in 1982 and 1983; additional subsurface sampling was conducted in 1989 (LANL 1992, 007671, pp. 3-55–3-60). These sampling efforts were undertaken to determine whether releases from MDA E had occurred. In 1982, samples were collected from two 50-ft boreholes located outside the MDA E fence at multiple depth intervals (0 to 3 ft, 3 to 8 ft, 8 to 13 ft, 13 to 18 ft, 18 to 23 ft, 23 to 28 ft, 28 to 33 ft, 33 to 38 ft, 38 to 43 ft, and 43 to 48 ft bgs) and analyzed for tritium, uranium, and cesium-137. Tritium was detected in four samples, but these results were suspect because of the low moisture content of the samples. Uranium was detected above the BV in all 20 samples and cesium-137 was detected slightly above the FV in 5 samples. In 1983, 90 surface samples were collected within MDA E from 45 random locations on a 30-ft × 30-ft sampling grid. Samples were collected from intervals of 0 to 0.4 in. and 0.4 to 2.5 in. and analyzed for tritium, uranium, and cesium-137. Tritium and uranium were detected or detected above the soil BV in 88 of the 90 samples, and cesium-137 was detected above the soil FV in 8 samples. In 1989, six boreholes were advanced within MDA E to depths ranging from 9 ft to 59 ft bgs. Nineteen samples were collected from numerous depths (4 ft, 9 ft, 13 ft, 14 ft, 28 ft, 29 ft, 44 ft, 54 ft, and 59 ft bgs) and analyzed for tritium, uranium, and lead (LANL 1992, 007671, pp. 3-55–3-60). Tritium was detected in all but one sample. Uranium was detected above the BV in 16 samples, and lead was detected above the BV in 3 samples from one borehole (LANL 1992, 007671, pp. 3-56, 3-60).

As part of 1996 Phase I RFI activities performed at South Site, two boreholes were drilled within the fenced area at MDA E. Each borehole was drill to 40 ft bgs, and four samples were collected from each borehole. Samples were collected from 1.7 to 1.9 ft, 17 to 17.4 ft, 24 to 25 ft, and 39 to 40 ft bgs in the first borehole and from 1 to 2 ft, 14 to 15 ft, 24 to 25 ft, and 39 to 40 ft bgs in the second borehole. All samples were submitted for laboratory analysis of HE, metals, VOCs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, and tritium. Samples collected during the 1996 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1996 Phase I RFI samples are presented in Tables 4.3-2, 4.3-3, and 4.3-4. Inorganic chemicals detected above soil BVs included calcium, selenium, and uranium. Calcium was detected above the soil BV in one sample and above the tuff BV in one sample. Selenium was detected above the soil BV in one sample. Uranium was detected above the tuff BV in two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-2.

Six organic chemicals [acetone; bis(2-ethylhexyl)phthalate; naphthalene; toluene; 1,2,3-trichlorobenzene; and 1,3,5-trinitrobenzene] were detected in the RFI samples. Toluene; 1,2,3-trichlorobenzene; and 1,2,4-trichlorobenzene were each detected in one soil sample. Acetone was detected in two tuff samples. Naphthalene was detected in one soil sample and one tuff sample. Bis(2-ethylhexyl)phthalate was detected in one soil sample and four tuff samples. Sampling locations and detected results for organic chemicals are shown in Figure 4.3-3. Tritium was detected in two soil samples and six tuff samples. Sampling locations and detected results for radionuclides are shown in Figure 4.3-4.

4.3.1.3 Proposed Activities

To determine if any releases have occurred from any of the SWMUs within MDA E, one borehole will be drilled to a minimum depth of 70 ft bgs (or until field radiological and VOC screening indicates no detects above background) directly adjacent to the outside edge of each SWMU [adjacent to the western edge of disposal pit 1 [SWMU 33-001(a)], directly next to the southern edge of disposal pit 2 [SWMU 33-001(b)], directly next to the southeastern edge of disposal pit 3 [SWMU 33-001(c)], directly next to the eastern edge of disposal pit 3 [SWMU 33-001(d)], and directly next to the northern edge of chamber 3 and the associated shaft [SWMU 33-001(e)]. The fence may need to be rolled back to allow access to each site. Samples will be collected at 10-ft intervals and analyzed for isotopic uranium, isotopic plutonium, cyanide, nitrate, perchlorate, VOCs, SVOCs, explosive compounds, metals, and tritium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-5. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.2 SWMU 33-004(b), Septic System

4.3.2.1 Description and History

SWMU 33-004(b) consists of an abandoned septic tank (structure 33-0033) and its associated drainline and outfall located at South Site (Figure 4.3-6). This septic tank received wastewater from building 33-0024, a control building constructed in 1949 to support experiments conducted at underground chamber 33-0029 [SWMU 33-001(e)] and possibly at firing pad 33-0026 [SWMU 33-006(a)]. The septic tank had a capacity of 730 gal. and is located approximately 300 ft south of building 33-0024. The tank was connected to building 33-0024 with a 6-in.-diameter steel pipe. A 6-in.-diameter steel pipe connected the septic tank to an outfall located approximately 35 ft southwest of the tank (LANL 1995, 051903, p. 37). The outfall is situated on the southern rim of Chaquehui Canyon. Building 33-0024 housed a darkroom and electronic equipment and was also used for storage. There is no documented historical use of

hazardous or radioactive materials within building 33-0024, although photographic chemicals were likely used (LANL 1992, 007671, p. 3-52).

4.3.2.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-004(b), one surface sample (0 to 0.5 ft) and two subsurface samples (3.5 to 4 ft and 5 to 6 ft bgs) were collected at a location approximately 5 ft south of the septic tank. Three surface samples (0 to 0.5 ft) were collected at three locations at and downslope of the outfall. Liquid and sludge were not present in the tank. One sediment sample was collected from the bottom of the tank. Samples were field screened for radioactivity and organic chemicals and submitted for laboratory analysis of metals, cyanide, VOCs, SVOCs, and cesium-137. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.2.3 of the HIR presents a detailed summary of the screening-level results.

Inorganic chemicals detected above BV in the Phase I RFI soil or tuff samples were aluminum, barium, calcium, chromium, copper, cyanide, iron, lead, magnesium, silver, and uranium. Six organic chemicals were detected [benzo(b)fluoranthene, di-n-butylphthalate, fluoranthene, methylene chloride phenanthrene, and pyrene]. Cesium-137 was the only radionuclide detected or detected above BV/FV in soil or two tuff samples. Arsenic, chromium, copper, cyanide, lead, nickel, mercury, silver, and zinc were detected in the septic tanks contents along with 11 organic chemicals [acetone; anthracene; benzo(a)anthracene; benzo[b]fluoranthene; benzo(a)pyrene; chrysene; di-n-butylphthalate; fluoranthene; isopropyl alcohol; phenanthrene; and 1,1,2-trichloroethane].

In 1995, one borehole was drilled approximately 4 ft west of the septic tank to a depth of 10.5 ft bgs. One sample was collected from a depth of 8.5 to 10.5 ft and submitted for analysis of metals, cyanide, VOCs, SVOCs, and total uranium. The single sample collected in 1995 and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the single 1995 RFI sample are presented in Tables 4.3-2 and 4.3-3. Metals detected above BVs or with detection limits above BVs in the single 1995 RFI sample were antimony, calcium, chromium, cyanide, selenium, and uranium. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-7. Bis(2-ethylhexyl)phthalate was the organic chemical detected in the single RFI sample. Sampling locations and detected results for organic chemicals are shown in Figure 4.3-8.

4.3.2.3 Proposed Activities

SWMU 33-004(b) is proposed for remediation. The septic tank (including any contents) will be characterized, excavated, and disposed of in accordance with applicable Laboratory waste management requirements. The inlet and outlet drainlines will be plugged. The method to meet waste disposition requirements is described in Appendix B and will be further described in the investigation report. Proposed cleanup activities are summarized in section 5.8 of this work plan. Following removal of the septic tank, the excavated area will be surveyed for radiation, explosive compounds, metals, and VOCs. Additional media will be excavated until field-screening results indicate no detected VOCs or explosive compounds and no gross radiation or metals above background. Six confirmation samples will be collected from two depths (0 to 1 ft and 3 to 4 ft below the structures) from three locations: beneath the tank inlet, within the tank excavation, and beneath the tank outlet. Four samples will be collected from two depths (0 to 1 ft and 3 to 4 ft beneath the drainline) at two locations along the inlet drainline from former building 33-0024. Two samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) at one location in the outfall area, and six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs)

from three locations in the drainage downgradient of the outfall. Samples will be analyzed for metals, VOCs, SVOCs, isotopic uranium, explosive compounds, perchlorate, cyanide, and nitrate. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-9. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3 Consolidated Unit 33-004(j)-00

Consolidated Unit 33-004(j)-00 consists of SWMUs 33-004(j), 33-006(a), 33-007(b), 33-008(a), 33-010(c and h), 33-011(c), and 33-014 (Figures 4.3-10 through 4.3-13). The SWMUs in this consolidated unit consist of an outfall, a firing site and associated debris area, gun-firing sites, a landfill, two surface disposal sites, a radioactive materials storage area, and an open-burning area. These SWMUs are located in the south-central portion of TA-33 in an area known as South Site and were all abandoned. South Site was used primarily from 1950 to 1956 to test initiators, and the SWMUs that comprise this consolidated unit are generally associated with this use.

4.3.3.1 SWMU 33-004(j), Drainline and Outfall

Description and History

SWMU 33-004(j) consists of a 4-in. steel drainpipe and outfall connected to structure 33-0026, a culvert located immediately east of structure 33-0026, and the drainage channel that flows south and empties into Chaquehui Canyon (Figure 4.3-10). The pipe is connected to a drain located on the concrete pad at the entrance to structure 33-0026. Structure 33-0026, held electronic equipment used for experiments on the shot pad [SWMU 33-006(a)] located directly above the structure. The drainpipe extends 75 ft southeast and discharges to an open channel that drains into Chaquehui Canyon. The culvert is situated beneath the unpaved portion of the road that extends beyond structure 33-0026. The upper portion of the drainage channel where both the outfall pipe and the culvert discharge has been cut into the tuff (LANL 1995, 051903, pp. 48–49).

Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-004(j), two surface soil samples (0 to 0.5 ft) were collected from two locations at the culvert discharge point approximately 75 ft south of building 33-0026. Two samples collected as part of the SWMU 33-006(a) investigation were collected from two locations, one at the outfall and one in the drainage located approximately 30 ft south of the outfall, were used to characterize SWMU 33-004(j) (LANL 1995, 051903, p. 49). Samples were field screened for radioactivity and submitted for analysis of metals, cesium-137, and total uranium. The two samples collected at the outfall and downgradient of the outfall were also analyzed for HE. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.1.3 of the HIR presents a more detailed summary of the screening-level results.

Metals detected above BV in the Phase I RFI samples were copper and uranium. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-004(j).

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Four samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from two locations, one at the culvert discharge point and one at the outfall. In addition, four samples will be collected from two depths (0 to 1 ft and 2 to

3 ft bgs) from two locations in the drainage downgradient of the site. This same drainage will also be part of the investigation of SWMUs 33-006(a), 33-007(b), 33-010(c), and 33-010(h). Samples will be analyzed for metals, cyanide, VOCs, SVOCs, explosive compounds, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-15. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3.2 SWMU 33-006(a), Firing Site

Description and History

SWMU 33-006(a) is a shot pad at South Site where implosion studies were conducted (Figure 4.3-11). The shot pad was a 50-ft-diameter circular area located immediately north of and next to the roof of structure 33-0026, an X-unit chamber (i.e., a control chamber containing a firing voltage distribution system used for the remote detonation of test firings). Structure 33-0026 was completed in 1950. Implosion tests performed at the shot pad contained up to 5000 lb of HE. Before detonations, wooden boxes covered the assemblages. Detonations from the shot pad scattered debris, shrapnel, and wood fragments over the mesa top of South Site and into Chaquehui Canyon. Shrapnel has been found at distances up to a mile away from the shot pad. The shot pad has not been used since 1955 when implosion testing was discontinued at TA-33. Currently, the pad is covered with up to a foot or more of sand and firing site debris (LANL 1995, 051903, p. 58).

Previous Investigations

Phase I RFI activities conducted at the SWMU 33-006(a) shot pad and surrounding area in 1994 involved collecting 46 surface soil samples (0 to 0.5 ft) from 42 randomly selected locations across SWMU 33-006(a). In addition, 11 surface soil samples (0 to 0.5 ft) were collected from 10 locations in the drainage that receives runoff from the site. Samples were field screened for radioactivity and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. In addition, two of the drainage samples were submitted for analysis of PCBs, pesticides, and herbicides. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.2.3 of the HIR presents a more detailed summary of the screening-level results.

Metals detected above BV in samples collected during the 1994 Phase I RFI were aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, selenium, silver, uranium, vanadium, and zinc. Five organic chemicals [4-amino-2,6-dinitritoluene; 2-amino-4,6-dinitrotoluene; nitrobenzene; 2-nitrotoluene; 3-nitrotoluene; 4-nitrotoluene; RDX (hexahydro-1,3,5-trinitro-1,3,5 triazine), tetryl; and 1, 3, 5-trinitrobenzene] were detected in the Phase I RFI samples. Radionuclides detected or detected above FVs were cesium-137, plutonium-238, plutonium-239/240, and tritium.

An IA was performed at SWMU 33-006(a) in 1996 to remove contaminated debris within a half-mile radius from the SWMU 33-006(a) shot pad and to prevent the off-site migration from Chaquehui Canyon to Rio Grande. Firing site shrapnel and debris were removed from mesa-top areas and drainages along the southern rim of Chaquehui Canyon within Bandelier National Monument, from drainage channels along the northern rim of Chaquehui Canyon, and from the canyon bottom. A total of 1261 lb of debris was removed during the IA. Of the total, 770 lb was radioactively contaminated. For waste management purposes, all the debris was screened with an XRF detector to determine whether hazardous metals were present. A total of 20 lb of the debris contained lead and was handled as hazardous waste. Approximately

20 lb of the debris contained lead, was radioactively contaminated, and was handled as mixed waste. The remaining 451 lb of debris was considered nonhazardous and nonradioactive waste and was recycled.

In 1996, eight surface samples (0 to 0.5 ft) were collected from eight locations that had been sampled previously during the 1994 Phase I RFI at SWMU 33-006(a) because holding times for the HE analyses had been missed. The eight samples were submitted for analysis of HE. Two organic chemicals, 1,3-dinitrobenzene and 1,3,5-trinitrobenzene, were detected (1.5 mg/kg and 1.9 mg/kg, respectively) in one sample (0333-96-0588) from sampling location 33-01448 in SWMU 33-007(b), directly south of building 33-0025 (Figure 4.3-16). Since 1996, the entire area south of building 33-0025 (including former sampling location 33-01448) has been significantly disturbed by the installation of new utilities for the complete renovation of building 33-0025. This area will be thoroughly investigated as part of the characterization of SWMU 33-007(b) (section 4.3.3.3) (Figure 4.3-17).

Although the 1996 data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. In addition, the 1996 data may not be representative of current conditions because of disturbance to the site. As a result, the 1996 data will not be used for decision purposes.

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Four samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from two locations within the SWMU 33-006(a) shot pad and 16 samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from four 10-ft step-out sampling locations around the former shot pad and from four 30-ft step-out sampling locations around the shot pad. Any firing site debris observed within the proposed sampling area will be flagged and subsequently removed, containerized, and characterized for disposal. The location where debris is removed will be field screened for radioactivity and HE; any soil with gross radioactivity detected above BVs or with detected HE will be excavated. Confirmation samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) in the bottom of any excavation.

In addition, the lateral extent of releases from SWMU 33-006(a) will be determined by the collection of 27 samples from three depths (0 to 1 ft, from the soil/tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages. Sampling locations will target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-010(c), 33-010(g), and 33-010(h).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17, and samples and analyses are summarized in Table 4.0-1.

4.3.3.3 SWMU 33-007(b), Firing Sites

Description and History

SWMU 33-007(b) consists of two former gun-firing sites. The first area is located approximately 600 ft north of structure 33-0026 [SWMU 33-006(a)] and consists of a 6-ft × 6-ft concrete pad and gun mount (structure 33-0085), a u-shaped soil berm (structure 33-0043), and a catcher box (Figure 4.3-12). The berm and catcher box were constructed in August 1950. The concrete pad and gun mount were constructed in June 1952. This area was used to test free-recoil weapons. Tests involved firing projectiles into the berm and the catcher box. Projectiles fired from the guns contained uranium, beryllium, titanium,

and tritium housed inside steel casings. Activities at South Site were discontinued in the late 1950s (LANL 1992, 007671, p. 3-53). This area was used to support atmospheric physics measurements during the late 1980s and early 1990s. Structures associated with these activities include a tower (structure 33-0203) constructed in 1987 and two trailers (structures 33-0201 and 33-0202). All structures have been removed.

The second site was located approximately 400 ft northwest of structure 33-0026 and included a gun building (structure 33-0025) and a soil berm (structure 33-0063). Both structures were built in 1950. The gun building housed 2-in. to 4-in. bore guns that were used to fire projectiles into berm 33-0063. The projectiles used at this site contained uranium, beryllium, and tungsten. Firing site activities at SWMU 33-007(b) were discontinued in the late 1950s (LANL 1992, 007671, p.3-53). A VCA was performed at berm 33-0063 in 1999. During the VCA, the berm was removed. Treated soil was returned to the location of the former berm. The site was graded, compacted, and reseeded with native seed. Recently, approximately 1 to 2 ft of engineered fill has been placed over the location of the former berm. Building 33-0025 was renovated in 2005 and 2006.

Previous Investigations

Phase I RFI activities were conducted at both areas of SWMU 33-007(b) in 1994. Activities at the first site (structure 33-0043) involved collecting 11 surface soil samples (0 to 0.5 ft) from 11 locations. These samples were field screened for radioactivity, organic chemicals, and HE and submitted for laboratory analysis of metals, gamma-emitting radionuclides, SVOCs, and HE.

Three surface locations were resampled in 1995 and analyzed for metals. Two surface soil samples (0 to 0.5 ft bgs) were collected from the main drainage that flows southward and into Chaquehui Canyon. Subsurface samples were collected from trenches excavated at berm (structure 33-0043) and at the catcher box. A backhoe was used to excavate one trench at berm 33-0043. This trench was 20 ft long and was excavated to approximately 7 ft below the top of berm. Five samples were collected at various distance intervals and depths along the trench transect. Sampling intervals and depths (beginning from the toe of the berm and measured from the top of the berm downward) were 3 ft in and 3 ft deep; 5 ft in and 2 ft deep; 6 ft in and 5 ft deep; 18 ft in and 5 to 7 ft deep; and 20 ft in and 5 ft deep. A backhoe was used to excavate one 20 ft long trench at the catcher box. Five samples were collected from various distance intervals along the trench (3 ft in, 5 ft in, 10 ft in, 15 ft in, and 20 ft in), and all were collected at a depth of 6 ft from the top of the catcher-box.

Sampling activities at the second site (structure 33-0063) included collecting both surface and subsurface soil samples from the berm. Nine surface soil samples (0 to 0.5 ft) were collected from the surface of the berm. Three surface soil samples (0 to 0.5 ft bgs) were collected in the drainage channel that flows westward into Chaquehui Canyon from berm 33-0063 (Figure 4.3-12). One trench was excavated into the berm, and a total of 11 subsurface soil samples were collected from various depth and distance intervals from the toe of the berm. Sample intervals and depths (beginning from the toe of the berm and measured from the top of the berm downward) were 3 ft in and 2 ft deep; 4 ft in and 5 ft deep; 6 ft in and 4 ft deep; 7 ft in and 4 ft deep; 11 ft in and 4 ft deep; 12 ft in and 5 ft deep; 17 ft in and 5 ft deep; 19 ft in and 6 ft deep; 24 ft in and 7 ft deep; and 27 ft in and 5 ft deep. Samples were field screened for radioactivity and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE.

Data from the 1994 Phase I RFI are screening-level data and are summarized below. Section 4.3.3.3 of the HIR (LANL 2009, 107348) presents a more detailed discussion of the screening-level results. Samples collected in 1995 and the analyses requested for the decision-level data are presented in Table 4.3-1.

Metals detected above BV in the 1994 Phase I RFI samples are arsenic, cadmium, chromium, cobalt, copper, lead, nickel, potassium, selenium, silver, uranium, and zinc. Three organic chemicals were detected (di-n-butylphthalate; 2,4-dinitrotoluene; and nitrobenzene). Radionuclides detected or detected above BVs/FVs are cesium-137, uranium-234, uranium-235/236, and uranium-238.

Decision-level data from the 1995 resampling at structure 33-0043 are presented in Table 4.3-2. Metals detected above BV were cadmium, chromium, cobalt, copper, and lead. Each of these metals was detected at less than 2 times BV in one fill sample.

An IA was performed at both areas of SWMU 33-007(b) in 1996 to prevent the migration of contaminants from the sites during stormwater runoff events. Activities performed during the IA included the construction of straw bale dams within the drainage channel that flows southward from berm 33-0063, constructing a sandbag retaining wall along the toe of the 33-0043 berm, constructing a straw bale dam along a lower crest of the 33-0043 berm to enhance a natural ponding area, and spreading loose straw over the surface of the berm and laying Poly-Jute matting over the straw to stabilize the berm slope and prevent wind and runoff migration from the site (LANL 1996, 054623 pp. 3 – 5) .

A VCA was performed at berm 33-0063 in 1999 (LANL 2000, 066889). All soil within the berm was excavated to undisturbed native soil and removed. The VCA used the SGS technology to separate radioactively contaminated soil and debris from nonradioactively contaminated soil and debris. The SGS unit consisted of conveyor systems, radiation detectors, and computer controls programmed to divert soil and debris with radioactivity above a cleanup criteria of 50 pCi/g. A total of 1677.87 yd^3 of material was removed from berm 33-0063. Sixteen large projectiles were uncovered during the excavation activities. These projectiles were not classified and were nonradioactive. Uranium metal pieces ranging up to 5 in. in diameter were uncovered and removed and disposed of as radioactive waste. Once the berm had been excavated to native soil, the excavated area was surveyed for radioactivity. Areas of radioactivity that exceeded 2 times background were further excavated and resurveyed to confirm removal. Four surface soil samples (0 to 0.5 ft) and four subsurface samples (2 to 2.5 ft depth) were collected from four locations in the footprint of the former berm. Two surface samples (0 to 6 in. depth) were collected from the drainage located west of berm 33-0063 that empties into Chaquehui Canyon. All samples were submitted for laboratory analysis of isotopic uranium and inorganic chemicals. Soil with radioactivity levels below the cleanup criterion was returned to the SWMU boundaries. A total of 411.63 yd^3 of soil exceeded the cleanup criterion of 50 pCi/g; the remaining 1266.24 yd^3 of soil was below the cleanup criterion and was returned to the SWMU boundary. The soil was regraded, compacted, and reseeded with native vegetation (LANL 2000, 066889). Samples collected following the 1999 VCA and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1996 samples and 1999 VCA samples are presented in Tables 4.3-2, 4.3-3, and 4.3-4. Inorganic chemicals detected above soil BVs included cadmium, chromium, cobalt, copper, lead, nickel, selenium, thallium, and uranium. At the berm 33-0043 area, cadmium, chromium, cobalt, copper, and lead were each detected above the soil BV in one sample. Samples were collected from the native soil beneath the former berm 33-0063 area, and the inorganic chemicals detected above the soil BV included cadmium, lead, and thallium. Cadmium, lead, and thallium were each detected above the soil BV in one sample. Drainage samples collected in the drainage west of building 33-0025 showed detections of copper, nickel, selenium, and uranium above sediment BVs. Copper, nickel, and uranium were each detected above the sediment BV in one sample. Selenium was detected above the sediment BV in two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-18.

Toluene was the only organic chemical detected and was detected in one sample at 0.00093 mg/kg (Figure 4.3-19). Radionuclides detected from the soil beneath the former berm 33-0063 include

uranium-234, uranium 235/236, and uranium-238. Uranium-234 was detected above the soil BV in two samples. Uranium 235/236 was detected above the soil BV in one sample. Uranium-238 was detected above the soil BV in two samples. Sampling locations and detected results for radionuclides are shown in Figure 4.3-20.

Although the 1999 VCA data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. As a result, the 1999 VCA data will not be used for decision purposes.

Proposed Activities

Because residual contamination associated with SWMUs 33-007(b) and 33-011(c) is indistinguishable, the two sites will be addressed together. The vertical and lateral extent of contamination have not been determined at either of the berm firing sites or in the associated drainages.

At structure 33-0025 [SWMUs 33-007(b) and 33-011(c)], 24 samples will be collected from three depths (0 to 1 ft, 4 to 5 ft and 9 to 10 ft bgs) at eight locations from the footprint of former gun firing site berm 33-0063 and the former unpaved storage area used in the past to stage tritium containers. Samples must be collected beneath the engineered fill that has been added to the site.

At berm 33-0043 [SWMU 33-007(b)], eight samples will be collected from two depths (0 to 1 ft and 5 to 6 ft below the fill used in the former catcher box location) from four locations in and around the former catcher box location. Four samples will be collected from two depths (0 to 1 ft and 4 to 5 ft bgs) at two sampling locations below the bottom of the embankment where projectiles were fired (east of the former catcher box location). Six samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from three sampling locations in the drainage south of the berm 33-0043 [SWMU 33-007(b)].

In addition, four samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from two locations in the drainage southwest of SWMUs 33-011(c) and SWMU 33-007(b) to determine if contaminants are migrating from the sites. Samples to be collected in the other South Sites drainages will complete this determination (Figure 4.3-21).

Samples will be analyzed for metals, cyanide, nitrate, VOCs, SVOCs, explosive compounds, isotopic uranium, isotopic plutonium, tritium, and perchlorate and by gamma-spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-21 and samples and analyses are summarized in Table 4.0-1.

4.3.3.4 SWMU 33-008(a), Landfill

Description and History

SWMU 33-008(a) is a landfill created in 1984 during the cleanup of the TA-33 firing sites. The landfill is located inside the horseshoe-shaped berm (structure 33-0043) within SWMU 33-007(b) (Figure 4.3-13). The dimensions of the landfill are approximately 50 ft × 60 ft × 8 ft deep. Large uncontaminated debris, including telephone poles, timber, and railroad ties, was disposed of in this landfill. All debris was screened for radioactivity before disposal. After disposal was complete, the landfill surface was graded, and the corners of the fill area were marked with metal posts (LANL 1992, 007671, p. 3-54).

Previous Investigations

Phase I RFI activities performed at SWMU 33-008(a) in 1994 included collecting four surface soil samples (0 to 0.5 ft). Three of the samples were collected along the northern edge of the landfill, and the fourth sample was collected in the drainage west of the bermed area. Samples were submitted for laboratory analysis of metals, uranium, gamma-emitting radionuclides, and HE (LANL 1995, 071300, p. 84). Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.4.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1994 Phase I RFI samples are arsenic and copper. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs.

Additional Phase I RFI activities performed in 1996 included drilling boreholes into the landfill at four randomly selected locations (Figure 4.3-13). The boreholes were drilled to the soil-tuff interface and ranged in depth from 5 ft to 12.5 ft. Four samples were collected from each borehole at various depth intervals (0 to 1 ft, 2.5 to 3 ft, 3 to 3.5 ft, and 4 to 5 ft depth; 0 to 1 ft, 2 to 2.5 ft, 2.5 to 3.5 ft, and 4 to 5 ft depth; 0 to 1 ft, 2.5 to 5 ft, 7.5 to 10 ft, and 10 to 12.5 ft depth; and 2.5 to 3.5 ft, 5 to 6 ft, 6 to 7 ft, and 9 to 10 ft depth, respectively). The samples were field screened for radioactivity, organic chemicals, and HE and submitted for laboratory analysis of metals, uranium, SVOCs, and HE. Samples collected during the 1996 Phase I RFI and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1996 Phase I RFI borehole samples are presented in Tables 4.3-2 and 4.3-3. Inorganic chemicals detected above soil BVs include arsenic, calcium, copper, iron, uranium, and zinc. Arsenic was detected above the tuff BV in five samples. Calcium was detected above the soil BV in two samples. Copper was detected above the oil BV in three samples. Iron was detected above the tuff BV in five samples. Uranium was detected above the soil BV in 11 samples and above the tuff BV in 5 samples. Zinc was detected above the soil BV in two samples and above the tuff BV in one sample. Detection limits were above BVs for antimony, cadmium, and selenium. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-22.

Twenty-two organic chemicals [acenaphthene; acenaphthylene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; carbazole; 4-chloroaniline; chrysene; di-n-butylphthalate; dibenz(a,h)anthracene; dibenzofuran; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene) were detected. Organic chemicals were detected in 10 samples at concentrations ranging from 0.071 mg/kg to 15.0 mg/kg. Sampling locations and detected results for organic chemicals are shown in Figure 4.3-23.

Proposed Activities

SWMU 33-008(a) is proposed for remediation. Preliminary site activities will include a surface radiological survey and geophysical surveys (magnetometry, electromagnetic [EM], and resistivity), followed by the excavation of test pits and trenches to locate and define the landfill boundaries. Remediation activities will involve waste characterization, waste and soil/fill excavation, segregation, containerization, transportation, off-site disposal, confirmation sampling, and backfilling and site restoration. The method to meet waste-disposition requirements is described in Appendix B and will be further described in the investigation report. Proposed cleanup activities are summarized in section 5.8 of this work plan. Historical information indicates that the landfill dimensions area approximately 50 ft × 60 ft × 8 ft deep. Once located and characterized, all visible waste and stained soil and/or tuff will be removed from the landfill and the bottom and sides of the excavation and surveyed for radiation, explosive compounds,

metals, and VOCs. Additional media will be excavated until field-screening results indicate no detected HE or VOCs and no elevated gross radiation above background.

Confirmation samples will be collected within and next to the excavation boundaries to confirm cleanup and to define the nature and extent of any residual contamination. Twelve samples will be collected from two depths (0 to 1 ft and 4 to 5 ft bgs) at six locations from the bottom of the landfill excavation. Sixteen samples will be collected from two depths (4 to 5 ft and 9 to 10 ft bgs) at eight step-out sampling locations (two locations on each side of the landfill excavation). Step-out sampling locations will be 6 ft from the edge of the landfill excavation. Samples will be analyzed for metals, cyanide, VOCs, SVOCs, nitrate, isotopic uranium, isotopic plutonium, explosive compounds, and perchlorate and by gamma spectroscopy. In addition, 20% of the samples will be analyzed for PCBs. The final analytical suite will be confirmed and supplemented, if necessary, with waste characterization data. Proposed sampling locations are shown in Figure 4.3-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.3.5 SWMU 33-010(c), Surface Disposal Area

Description and History

SWMU 33-010(c) is a former surface disposal area located at South Site (Figure 4.3-10) on the northern rim of Chaquehui Canyon, approximately 230 ft south of structure 33-0026. The disposal area dimensions were approximately 50 ft × 30 ft × 2 ft to 4 ft deep. The area is located along the western edge of the main South Site drainage channel. From approximately 1950 to 1955, this site was used to dispose of debris from the implosion tests conducted at SWMU 33-006(a). Debris disposed of at the site includes copper and aluminum shrapnel, pieces of electronic cable, and wood. Between shots, the shot pad and surrounding area were scraped and the debris deposited at SWMU 33-010(c) (LANL 1992, 007671, p. 3-53). A VCA was performed in 1999, and the debris pile was excavated and removed.

Previous Investigations

Phase I RFI activities conducted at SWMU 33-010(c) in 1994 involved collecting six surface soil samples (0 to 0.5 ft) from five locations on the face of the disposal pile. Additionally, six sediment samples (0 to 0.5 ft) were collected from five locations in the drainage below the disposal pile as part of the investigation of SWMU 33-006(a) and were used to characterize SWMU 33-010(c) (LANL 1995, 051903, p. 110). Samples were field screened for radioactivity, organic chemicals, and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. Two sediment samples were also submitted for analysis of VOCs. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.5.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1994 Phase I RFI samples were antimony, barium, cadmium, lead, selenium, uranium, and zinc. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs.

A VCA was performed at SWMU 33-010(c) in 1999. All soil within the SWMU was excavated to undisturbed native soil and removed. The VCA used the SGS to separate radioactively contaminated soil and debris from nonradioactive soil and debris. The SGS unit was initially programmed to divert soil and debris at with radioactivity above a cleanup criterion of 50 pCi/g at SWMU 33-010(c). Because of the fine, homogeneous nature of the contamination in the soil from disposal area, the SGS was unable to separate the material efficiently. The SGS was reprogrammed to a target cleanup criterion of 65 pCi/g, and all soils

from SWMU 33-010(c) were reprocessed through the SGS unit. A total of 289.39 yd^3 of soil and debris was excavated and processed through the SGS. Once the disposal area had been excavated to native soil, the excavated area was surveyed for radioactivity. Areas of radioactivity that exceeded 2 times local background were further excavated and resurveyed to confirm removal. Four surface soil samples (0 to 0.5 ft) and four subsurface samples (2 to 2.5 ft depth) were collected from four locations within the excavated area. Three surface samples (0 to 0.5 ft) were collected from the drainage located east of the disposal area that empties into Chaquehui Canyon (Figure 4.3-10). Samples were submitted for laboratory analysis of isotopic uranium and metals. Soil with radioactivity levels above the cleanup criterion of 65 pCi/g removed during the VCA was disposed of at Area G at TA-54. Soil with radioactivity levels below the cleanup criterion was returned to the SWMU boundaries. A total of 0.58 yd^3 of soil exceeded the cleanup criterion of 65 pCi/g; the remaining 288.81 yd^3 of soil was below the cleanup criterion and was returned to the SWMU boundary. The soil was regraded, compacted, and reseeded with native vegetation (LANL 2000, 066889). Confirmation samples collected during the 1999 VCA and the analyses requested for the decision-level data are presented in Table 4.3-1.

Decision-level data from the 1999 VCA confirmation samples are presented in Tables 4.3-2 and 4.3-3. Metals detected above BVs include barium, copper, selenium and silver. Barium, selenium and silver were each detected above the sediment BV in one sample. Copper was detected above the soil BV in two samples and above the sediment BV in three samples. Detection limits were greater than the soil BV for antimony for two samples. Sampling locations and results for inorganic chemicals above BVs are shown in Figure 4.3-25. Radionuclides detected or detected above BVs/FVs in the 1999 VCA confirmation samples include uranium-234, uranium 235/236, and uranium-238; each radionuclide was detected above the soil BV in six samples and above the sediment BV in three samples. Sampling locations and results for radionuclides detected or detected above BVs are shown in Figure 4.3-26.

Although the 1999 VCA data are of decision-level quality, the sampling depths and locations and analytical suites were not sufficient to define the extent of contamination. As a result, the 1999 VCA data will not be used for decision purposes.

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Eighteen samples will be collected from three depths (0 to 1 ft and 3 to 4 ft, and 6 to 7 ft bgs) from two locations within the remediated portion of SWMU 33-010(c) and from four locations around SWMU 33-010(c).

In addition, the lateral extent of releases from SWMU 33-010(c) will be determined by collecting 27 samples from three depths (0 to 1 ft, from the soil-tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages. Sampling locations will target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-006(a), 33-010(g), and 33-010(h).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17 and samples and analyses are summarized in Table 4.0-1.

4.3.3.6 SWMU 33-010(h), Surface Disposal Area

Description and History

SWMU 33-010(h) is a surface disposal area (Figure 4.3-13) located approximately 450 ft northeast of structure 33-0026 and immediately south of berm 33-0043. The area appears to be a mound of dirt and firing-site debris is scattered on the soil surface. Debris includes metal, wood, cable, and shrapnel. The area is approximately 100 ft × 100 ft. There is no documentation regarding the history of the disposal area. The main drainage for South Site bounds the disposal area on the west, and an unimproved road is located to the east (LANL 1995, 051903, pp. 115–116).

Previous Investigations

During the 1994 Phase I RFI activities conducted at SWMU 33-010(h), a geophysical survey to determine the presence of subsurface anomalies was performed, and none were identified. A backhoe was used to excavate a 42-ft-long trench through the center of the area. Most of the trench was 0.5 ft to 2 ft deep. Two areas along the transect were excavated to a depth of 4 ft, and every bucket of soil was surveyed for the presence of debris. Debris was not observed during the trenching activity. Two subsurface samples (4 ft) were collected from the trenched area, field screened for radioactivity, organic chemicals, and HE, and submitted for analysis of metals, gamma-emitting radionuclides, SVOCs, and HE. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.6.3 of the HIR presents a detailed summary of the screening-level results.

No metals were detected above BV and no organic chemicals were detected. Cesium-137 was the only radionuclide were detected or detected above FV. Decision-level data are not available for SWMU 33-010(h).

Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Eighteen samples will be collected from three depths (0 to 1 ft and 3 to 4 ft, and 6 to 7 ft bgs) from two locations within the disposal area of and from four locations around SWMU 33-010(h).

In addition, the lateral extent of releases from SWMU 33-010(h) will be determined by collecting 27 samples from three depths (0 to 1 ft, from the soil/tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages (see section 4.3.3.5). The sampling locations will target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-006(a), 33-010(c), and 33-010(g).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma-spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17 and samples and analyses are summarized in Table 4.0-1.

4.3.3.7 SWMU 33-011(c), Storage Area

Description and History

SWMU 33-011(c) is a former unpaved storage area used to hold tritium containers, called blivits, used in acceleration tests performed at TA-33 (Figure 4.3-12). This storage area was located at South Site between building 33-025 and building 33-024. After the acceleration tests, blivits were placed in this area

and allowed to discharge to the atmosphere. This practice was discontinued in 1972 (LANL 1992, 007671, p. 3-54).

Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-011(c), two surface samples (0 to 0.5 ft) were collected from two locations, field screened for radioactivity, and submitted for analysis of metals and gamma-emitting radionuclides. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.7.3 of the HIR presents a detailed summary of the screening-level results.

No metals were detected above BV in the 1994 Phase I RFI samples. Tritium was the only radionuclide detected or detected above BV/FV. Decision-level data are not available for SWMU 33-011(c).

Proposed Activities

The proposed activities for SWMU 33-011(c) are discussed with those for SWMU 33-007(b) in section 4.3.3.3 and are shown in Figure 4.3-21.

4.3.3.8 SWMU 33-014, Open Burn Area

Description and History

SWMU 33-014 is the former location of an open burn area located approximately 300 ft north of the fence surrounding MDA E [Consolidated Unit 33-001(a)-99] (Figure 4.3-13). The soil at the burn site has been scraped to bedrock, and some bedrock is blackened from burning. This burn area was believed to have been established in 1950 when operations at South Site began and may have served all of TA-33. Materials burned at this site may have included construction debris, timber, sawdust used in catcher boxes, and black powder. It is not known when burning operations were discontinued at this site (LANL 1992, 007671, p. 3-54).

Previous Investigations

Phase I RFI activities conducted at SWMU 33-014 in 1994 involved the collection of five surface samples (0 to 0.5 ft) from five locations. Samples were field screened for radioactivity and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. Two of the samples also were submitted for analysis of SVOCs. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.3.8.3 of the HIR presents a detailed summary of the screening-level results.

Metals detected above BV in the 1994 Phase I RFI samples were cadmium, chromium, copper, lead, mercury, nickel, uranium, and zinc. No organic chemicals were detected, and no radionuclides were detected or detected above BVs/FVs. Decision-level data are not available for SWMU 33-014.

Proposed Activities

The vertical and lateral extent of contamination have not been determined at this site. Eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from four locations within the former burn area. In addition, eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from four step-out locations around the burn area and analyzed for metals, SVOCs, VOCs, explosive compounds, isotopic

uranium, cyanide, dioxins/furans, nitrate, and perchlorate. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-24. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.3.4 SWMU 33-010(g), Surface Disposal Area

4.3.4.1 Description and History

SWMU 33-010(g) is a former disposal area located on the northern rim of Chaquehui Canyon (Figure 4.3-14). Debris was scattered along the rim and upper walls of the canyon. This former disposal area is located next to MDA E [Consolidated Unit 33-001(a)-99]. Some debris present at SWMU 33-010(g) (such as dead tree trunks, rocks, and scraped earth) may have originated from the initial clearing of South Site in the 1940s. Other debris, including chunks of metal, was also present. The period of operation for this disposal site is not known, but firing site operations associated with initiator testing at South Site were conducted from 1950 to 1956 (LANL 1992, 007671, p. 3-54). The debris was removed and disposed of in 1995.

4.3.4.2 Previous Investigations

During the Phase I RFI performed at SWMU 33-010(g) in 1994, nine surface samples (0 to 0.5 ft) were collected from nine locations on the mesa top amid debris and the canyon side below the disposal area. Samples were field screened for radioactivity, organic chemicals, and HE and submitted for analysis of metals, gamma-emitting radionuclides, and HE. One sample also was submitted for analysis of herbicides. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 4.4.3 of the HIR presents a detailed summary of the screening-level results.

The only inorganic chemicals detected above the BV in the 1994 Phase RFI samples were calcium and mercury. No organic chemicals were detected and radionuclides were not detected or detected above BVs/FVs.

A VCA was implemented at SWMU 33-010(g) in 1995. The debris was field screened for radioactivity and metals. Debris smaller than 3 in. in diameter was removed if radioactive screening results were above background levels. A total of 4 yd^3 of nonhazardous/nonradioactive debris and 2 ft^2 of radioactive debris was removed. Nonhazardous/nonradioactive metal debris was recycled. Low-level radioactive debris was disposed of at MDA G. All other nonhazardous/nonradioactive debris was disposed of at the Los Alamos County landfill (LANL 1996, 054755, p. 15). Decision-level data are not available for SWMU 33-010(g).

4.3.4.3 Proposed Activities

The vertical and lateral extent of contamination have not been determined for this site. Eighteen samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from eight locations within the western portion of SWMU 33-010(g) and from one location at the head of the drainage directly downgradient of the western portion of SWMU 33-010(g). Twenty samples will be collected from two depths (0 to 1 ft and 3 to 4 ft bgs) from 10 locations within the eastern portion of SWMU 33-010(g).

In addition, the lateral extent of releases from SWMU 33-010(g) will be determined by collecting 27 samples from three depths (0 to 1 ft, from the soil/tuff interface, and 1 ft into the tuff) from three locations within each of the three main South Site drainages (section 4.3.3.5). Sampling locations will

target sediment traps located within each drainage. Data from these drainage samples will also be used to characterize the lateral extent of releases from SWMUs 33-006(a), 33-010(c), and 33-010(h).

Samples will be analyzed for metals, explosive compounds, perchlorate, cyanide, nitrate, VOCs, SVOCs, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.3-17 and samples and analyses are summarized in Table 4.0-1.

4.4 Sites under Investigation at NRAO

4.4.1 SWMU 33-004(m), Septic System

4.4.1.1 Description and History

SWMU 33-004(m) consists of a septic tank (structure 33-0179) at the NRAO site (Figure 4.4-1). Septic tank 33-0179 has a capacity of 1000 gal. and still receives wastewater from the NRAO support building (33-0178), which was constructed in 1987. The septic tank serves the restroom, kitchen, water fountain, and utility room floor drains in building 33-0178 (SF Engineering 1992, 062036, p. 10). The septic tank discharges to a leach field; both the septic tank and leach field are located outside the northeast corner of the fenced area surrounding building 33-0178 and the radiotelescope. The septic tank was excavated into bedrock, and bedrock is exposed downslope of the leach field area. There is no documented use of hazardous or radioactive materials within building 33-0178.

4.4.1.2 Previous Investigations

During the 1994 Phase I RFI conducted at SWMU 33-004(m), one sample of liquid and one sample of sludge were collected from the septic tank, and five surface soil samples (0 to 0.5 ft) and six subsurface soil samples (4 to 5 ft, 2 to 4 ft, and 3.5 to 4 ft bgs) were collected from three locations near the septic tank and drainline. Samples were field screened for organic chemicals and submitted for analysis of VOCs and SVOCs. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 5.1.3 of the HIR presents a detailed summary of the screening-level results.

Five organic chemicals (acetone; ethylbenzene; toluene; 1,3,5-trimethylbenzene; and xylene) were detected in the sludge sample collected during the 1994 Phase I RFI. Two organic chemicals (acetone and toluene) were detected in the liquid sample. Organic chemicals were not detected in any of the soil samples. Decision-level data are not available for SWMU 33-004(m).

4.4.1.3 Proposed Activities

Because this septic system has remained active since the last sampling, additional sampling is proposed to characterize current conditions. Sampling of the active system is proposed along the inlet drainline, next to the septic tank, along the outlet drainline, around the leach field, and downgradient of the site. Eight samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs beneath the bottom of the septic system structure) from one location beneath to the bottom of the east side of the septic tank, one location adjacent to the septic tank inlet, one location next to the septic tank outlet, and from one location next to the inlet drainline. Nine samples will be collected from three depths (0 to 1 ft, at the soil-tuff interface, and 1 ft into the tuff) at three locations around the leach field. In addition, six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from three locations in the drainage downgradient of the site.

Samples will be analyzed for metals, VOCs, SVOCs, nitrate, perchlorate, and cyanide. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-2. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

4.4.2 AOC 33-011(b), Former Storage Area

4.4.2.1 Description and History

AOC 33-011(b) is a former storage area located just outside the northwest corner of the NRAO site at TA-33 (Figure 4.4-3). This storage area was approximately 300 ft wide × 600 ft long. Beginning in the 1950s, the site served as a storage area for equipment and materials such as tungsten, uranium, and beryllium were stored at the site. Equipment used at the TA-33 firing sites was also stored at the site. The storage area was cleaned in 1984, and most materials and debris were removed at that time, although some debris remained. Approximately 75% of the area had been scraped and leveled to or near the tuff bedrock.

4.4.2.2 Previous Investigations

During the Phase I RFI conducted at AOC 33-011(b) in 1994, 10 surface samples (0 to 0.5 ft) were collected from 10 locations. Six samples were collected at the former storage area, and four were collected from the drainage west of the former storage area, field screened for radioactivity, and submitted for laboratory analysis of metals and gamma-emitting radionuclides. One sample also was submitted for analysis of organic chemicals. Data from the 1994 Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2009, 107348). Section 5.2.3 of the HIR presents a detailed summary of the screening-level results.

Calcium was the only metal detected above BV in the 1994 Phase I RFI samples. No organic chemicals were detected. Cesium-137 was the only radionuclide detected or detected above BV/FV.

A VCA was performed in 1996, and all remaining surface debris was removed from the site. A total of 2 yd^3 of nonhazardous/nonradioactive debris was removed from SWMU 33-011(c), and approximately 0.5 ft^3 of radioactive debris (shrapnel) was removed and disposed of at Area G at TA-54. The nonhazardous/nonradioactive metal debris was recycled by the ACE Salvage Company, and the remainder of the nonhazardous/nonradioactive debris was disposed of at the Los Alamos County landfill (LANL 1996, 054755, p. 15). Decision-level data are not available for SWMU 33-011(b).

4.2.2.3 Proposed Activities

The lateral and vertical extent of contamination have not been determined at this site. Twelve samples will be collected from two depths (0 to 1 ft and 4 to 5 ft bgs) from all six previous RFI locations (33-01435, 33-01436, 33-01438, 33-01439, 33-01440, and 33-01441) within the former storage area. In addition, six samples will be collected from two depths (0 to 1 ft and 2 to 3 ft bgs) from three locations downgradient and west of the site. All samples will be analyzed for metals, VOCs, SVOCs, cyanide, perchlorate, nitrate, explosive compounds, isotopic uranium, and isotopic plutonium and by gamma spectroscopy. In addition, 20% of the samples collected will be analyzed for PCBs. Proposed sampling locations are shown in Figure 4.4-4. Table 4.0-1 summarizes the proposed sampling locations, depths, and analytical suites.

5.0 INVESTIGATION METHODS

A summary of investigation methods to be implemented is presented in Table 5.0-1. The standard operating procedures (SOPs) used to implement these methods are available at http://www.lanl.gov/environment/all/qa.shtml.

Summaries of the field-investigation methods are provided below. Additional procedures may be added as necessary to describe and document quality-affecting activities.

Chemical and radionuclide analyses will be performed in accordance with the analytical statement of work (LANL 2000, 071233). Accredited contract analytical laboratories will use the most recent EPA- and industry-accepted extraction and analytical methods for analyses of the samples.

5.1 Field Surveys

The following sections describe the field surveys that will be conducted at the Chaquehui Canyon Aggregate Area sites.

5.1.1 Geodetic Surveys

Geodetic surveys will be conducted by a land surveyor in accordance with the latest version of procedure SOP-5028, Coordinating and Evaluating Geodetic Surveys, to locate historical structures and to document field activities such as sampling and excavation locations. The surveyors will use a Trimble GeoXT hand-held global-positioning system (GPS) or equivalent for the surveys. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (transverse mercator), Central Zone, North American Datum 1983. Elevations will be reported per the National Geodetic Vertical Datum of 1929. All GPS equipment used will meet the accuracy requirements specified in SOP-5028.

5.1.2 Geophysical Surveys

Geophysical surveys will be performed at selected sites to identify anomalies that would indicate the location of former waste disposal sites, including SWMU 33-008(a). Geophysical methods will include terrain conductivity (EM-31 or equivalent), high-sensitivity metal detection (EM-61 or equivalent), and GPR.

Terrain conductivity and high-sensitivity metal detection data will be recorded at approximately 2-ft intervals along lines spaced approximately 20 ft apart. Higher resolution coverage will be completed, as needed, in selected targeted areas using 5-ft line spacing. Line and station separation may vary depending upon surface obstructions. Geodetic coordinates will be recorded at 1-s intervals using an integrated GPS. A base station free from cultural interference will be occupied at the beginning and end of each survey day to calibrate the instrument and perform system functional tests. During these tests, battery, phasing, and sensitivity checks will be performed.

The GPR survey will be performed using a digital subsurface interface radar system. After initial field tests are conducted to determine maximum penetration and sufficient resolution, an appropriate transducer will be selected to perform the survey. Different transducers may be used in an attempt to provide greater penetration depths. Data will be digitally recorded, displayed, and analyzed during acquisition to allow real-time interpretation. Line locations will be selected based on electromagnetic anomaly and surface obstructions.

5.2 Field Screening

Because sampling is primarily being conducted to finalize nature and extent based on previous investigations, field screening will be conducted mainly for health and safety purposes. However, if elevated field-screening levels are observed for the deepest sample collected from a specific sampling location, sample collection will continue until field-screening results show no elevated readings. The Laboratory's proposed field-screening approach will be to (1) visually examine all samples for evidence of contamination, (2) screen for organic vapors, and (3) screen for radioactivity. As appropriate at certain sites, screening may also be performed for metals and HE. The field-screening methods are discussed below.

5.2.1 VOCs

Based on the previous RFI results, significant VOC contamination is not expected to be encountered, and VOC screening will be conducted primarily for health and safety purposes.

Screening will be conducted using a photoionization detector (PID) capable of measuring quantities as low as 1 ppm. Vapor screening of soil, sediment, and subsurface core for VOCs will be conducted using a PID equipped with an 11.7 electron volt (eV) lamp. All samples will be screened for VOCs in headspace gas in accordance with SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector.

The PID will be calibrated daily to the manufacturer's standard for instrument operation, and the daily calibration results will be documented in the field logbooks. All instrument background checks, background ranges, and calibration procedures will be documented daily in the field logbooks in accordance with SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

5.2.2 Radioactivity

Field screening for radioactivity will be conducted primarily for health and safety purposes. Radiological screening will target gross-alpha, -beta, and -gamma radiation. Field screening for alpha, beta, and gamma radiation will be conducted within 6 in. from the core material and will be performed using appropriate field instruments calibrated in accordance with the Laboratory's Health Physics Operations Group procedures. All instrument calibration activities will be documented daily in the field logbooks in accordance with SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

5.2.3 Metals Field Screening (XRF)

A field-portable XRF instrument will used to field screen for a few specific metals (e.g., barium, copper, and lead) previously detected at sites and typically associated with firing-site activities at TA-33 in accordance with the manufacturer's instructions. An elevated detection for XRF analysis is defined as an instrument reading that exceeds 2 times the BV of the sample matrix. The XRF field-screening results will be recorded in the field boring or test pit logs as well as in sample collection logs (SCLs). The instrument will be operated in accordance with the manufacturer's instructions, including collecting and preparing samples and analyzing standard samples. XRF-screening surveys will be performed as described in the proposed activities in section 4.0 of this work plan for SWMUs 33-006(a), 33-010(c), 33-010(f), 33-010(g), and 33-010(h).

5.2.4 HE Screening

The Strategic Diagnostics, Inc., D TECH RDX immunoassay test kits will be used to field screen quantitatively for RDX and TNT (2,4,6-trinitrotoluene). All assays will be conducted following the manufacturer's instructions, including equipment calibration, equipment use, sample dilution, and reagent storage. An elevated immunoassay result is defined as 2 times the estimated quantitation limit (approximately 2 mg/kg). Immunoassay field-screening results will be recorded in the field boring or test pit logs as well as in SCLs.

5.3 Sample Collection

5.3.1 Surface Samples

Samples will be placed in appropriate containers in accordance with SOP-5056, Sample Container and Preservation. Quality assurance/quality control (QA/QC) samples will include field duplicate samples, equipment blanks, and trip blanks. These samples will be collected following the current version of SOP-5059, Field Quality Control Samples, and will comply with a frequency of 10% of total samples collected for field duplicates and rinsate blanks. Trip blanks will be supplied and remain with analytical samples when samples are collected for VOC analysis. QA/QC samples are used to monitor the validity of the sample collection procedures.

Surface and shallow subsurface soil and sediment samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. Decontamination will be completed using a dry decontamination method with disposable paper towels and an over-the-counter cleaner, such as Fantastik or an equivalent. If the surface location is at bedrock, an axe or hammer and chisel will be used to collect samples.

5.3.2 Subsurface Samples

Subsurface samples will be collected using hand- or hollow-stem auger or direct-push methods, depending on the depth of the samples and the material being sampled. A brief description of these methods is provided below.

5.3.2.1 Hand Auger

Hand augers may be used to bore shallow holes (e.g., 0 to 10 ft). The hand auger is advanced by turning or pounding the auger into the soil until the barrel is filled. The auger is removed and the sample is dumped out into a clean bowl. Hand-auger samples will be collected in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler.

5.3.2.2 Direct Push

Direct push is a subsurface sampling method that pushes a tool string into the ground using the weight of a truck in combination with a hydraulic ram or hammer. Various tool strings can be used to collect discrete samples, continuous samples, both discrete and continuous samples, and groundwater samples. The direct-push core samples collected in this investigation will be continuous. The inside of the continuous sampler is exposed to the subsurface environment as it is advanced to the sampling interval. This is a dual-tube sampler, so named because it uses two sets of rods to collect soil cores. The outer rods receive the driving force from the hydraulic pushing method and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination or cave-in. The inner set of rods is placed

within the outer rods and holds a sampler in place as the outer rods are driven to the sample interval. The inner rods are then retracted to retrieve the soil core. The direct-push methods will follow the American Society of Testing and Materials D18 Subcommittee on Direct Push Sampling (D18.21.01) (ASTM 1997, 057511).

5.3.2.3 Hollow-Stem Auger

Hollow-stem augers will be used to collect subsurface samples where hand-augering is impractical because of the depth or the material being sampled. The hollow-stem auger consists of a hollow-steel shaft with a continuous spiraled steel flight welded onto the exterior of the stem. The stem is connected to an auger bit; when the auger is rotated, it transports cuttings to the surface. The hollow stem of the auger allows insertion of drill rods, split-spoon core barrels, Shelby tubes, and other samplers through the center of the auger so samples may be retrieved during drilling operations.

During sampling, the auger will be advanced to just above the desired sampling interval. The sample will then be collected by driving a split-spoon sampler into undisturbed soil/tuff to the desired depth in accordance with SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials. Immediately after sampling, boreholes will be abandoned using bentonite chips or a bentonite/concrete mixture. All borehole cuttings will be managed as IDW, as described in Appendix B of this work plan. All borehole abandonment information will be provided in the Chaquehui Canyon Aggregate Area investigation report.

Field documentation will include detailed borehole logs for each borehole drilled. The borehole logs will document the matrix material in detail and will include the results of all field screening; fractures and matrix samples will be assigned unique identifiers. All field documentation will be completed in accordance with the current version of SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials.

Borehole Abandonment

All hollow-stem auger boreholes will be properly abandoned in accordance with SOP-5034, Monitor Well and RFI Borehole Abandonment, by one of the following methods.

- Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are being added to ensure bridging does not occur.
- Boreholes greater than 20 ft in depth will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grout materials include cement or bentonite grout, neat cement, or concrete.

The use of backfill materials such as bentonite and grout will be documented in a field logbook with respect to volumes (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be presented in the investigation report.

5.3.3 Sediment Samples

Sediment samples will be collected using SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. Sediment samples will be collected from areas of sediment accumulation that include sediment judged to be representative of the historical period of Laboratory operations. The locations will be selected based on geomorphic relationships in areas likely to have been affected by discharges from Laboratory operations. Preliminary sediment sampling locations have been selected and are shown in section 4 figures. Because sediment systems are dynamic and subject to redistribution by runoff events,

however, some locations may need to be adjusted at the time this work plan is implemented. In the course of collecting sediment samples, it may be determined that the selected location is not appropriate because of conditions observed during excavation of the sediment (e.g., the sediment is much shallower than anticipated, the sediment is predominantly coarse-grained, or the sediment shows evidence of being older than the target age). Sediment sampling locations may be adjusted as appropriate. Any changes to sediment sampling locations will be documented as deviations from this work plan in the investigation report.

5.3.4 Test Pit and/or Trench Samples

Excavations or test pits will be completed using a track excavator or backhoe to locate inactive landfills and septic tanks. Excavated soil will be staged a minimum of 3 ft from the edge of the excavation, and excavations deeper than 4 ft bgs will be appropriately benched to allow access and egress, if necessary. Confirmation samples will be collected from the walls and bottom of the excavation using SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. After field screening, confirmation sampling, and any necessary overexcavation work are completed, the test pits and/or trenches will be backfilled. The soil removed from the excavation will be returned to the excavation provided sampling shows it is not hazardous waste and residential SSLs are not exceeded. Otherwise, the excavations will be backfilled with clean fill material.

5.4 Laboratory Methods

The analytical suites vary by site as specified in section 4 and are summarized in Table 4.0-1. All analytical suites are presented in the statement of work for analytical laboratories (LANL 2000, 071233). The specific analytical methods to be used are specified in Table 4.0-1. Sample collection and analysis will be coordinated with the Laboratory's Sample Management Office (SMO).

5.5 Health and Safety

The field investigations described in this investigation work plan will comply with all applicable requirements pertaining to worker health and safety. An integrated work document and a site-specific health and safety plan will be in place before fieldwork is performed.

5.6 Equipment Decontamination

Equipment for drilling and sampling will be decontaminated before and after drilling and sampling activities (as well as between drilling boreholes) to minimize the potential for cross-contamination. Dry decontamination methods are preferred and will be given priority because they do not generate liquid wastes. Residual material adhering to the equipment will be removed using dry decontamination methods, including wire-brushing and scraping, as described in SOP-5061, Field Decontamination of Equipment. Dry decontamination of sampling equipment may include use of a nonphosphate detergent such as Fantastik on a paper towel, and the equipment is wiped so no liquid waste is generated.

If dry decontamination methods are not effective, the equipment may be decontaminated by steam-cleaning or hot water pressure-washing, as described in SOP-5061. Wet decontamination methods will be conducted on a HDPE liner on a temporary decontamination pad. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions will be sampled and analyzed to determine the final disposition of the wastewater and the effectiveness of the decontamination procedures.

5.7 IDW

The IDW generated during field-investigation activities may include, but is not limited to, drill cuttings; contaminated soil; excavated debris; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other waste that has potentially come into contact with contaminants.

All IDW generated during field-investigation activities will be managed in accordance with applicable SOPs that incorporate the requirements of all applicable EPA and NMED regulations, DOE orders, and Laboratory implementation requirements. Appendix B presents the IDW management plan.

5.8 Cleanup Activities

SWMUs 33-004(b), 33-004(d), 33-006(a), 33-008(a), 33-010(c), 33-010(f), 33-010(g), 33-010(h), and 33-015 and AOC 33-008(c) are proposed for remediation under this investigation work plan. Excavation of waste, contaminated media, waste disposition, and confirmation sampling will be completed at these sites. The general sequence of activities for waste excavation, transportation, disposal, and confirmation sampling is summarized below.

5.8.1 Removal of Surficial and Buried Waste, Inactive Units, and Contaminated Soil and Sediment

The general sequence of waste-removal activities is described below.

- Mobilization
    - ❖ Assemble construction documents
    - ❖ Conduct construction readiness assessment
    - ❖ Conduct preconstruction meeting
    - ❖ Construct access roads
    - ❖ Construct staging area
    - ❖ Install temporary field trailers
    - ❖ Determine boundaries of waste. First, survey and stake the original waste limit coordinates, as determined in the RFI report and reported in the HIR (LANL 2009, 107348). Next, excavate and pothole with visual examination and screening using methods described in section 5.1 to establish or confirm waste boundaries only where the original boundaries are inadequately defined to implement cleanup.
    - ❖ Mobilize heavy equipment to site
    - ❖ Identify underground utilities
- Site preparation
    - ❖ Install fencing
    - ❖ Install stormwater controls
    - ❖ Abandon/relocate utilities
    - ❖ Conduct preexcavation survey

- Removal of waste
    - ❖ Excavate waste
    - ❖ Stockpile and load rolloff container
    - ❖ Characterize waste for dispositioning
    - ❖ Transport waste to off-site disposal facility
    - ❖ Survey boundaries of excavation
    - ❖ Conduct confirmation sampling
    - ❖ Establish subgrade and conduct survey
- Backfill
    - ❖ Backfill and compact
    - ❖ Vegetate surface
    - ❖ Survey finished surface
- Demobilize

5.8.2 Waste Management and Disposal

Management of all IDW, including waste generated during cleanup, is described in Appendix B.

5.8.3 Transportation

All waste will be hauled in rolloff containers directly to the selected disposal facility.

5.8.4 Confirmation Sampling

Confirmation sampling will be performed at all remediated sites (section 4).

6.0 MONITORING PROGRAMS

Groundwater, sediment, and surface water monitoring is being conducted in the Chaquehui Canyon Aggregate Area as part of other environmental activities. This monitoring is described briefly below.

6.1 Groundwater

There are currently no alluvial, intermediate, or regional groundwater monitoring wells in the Chaquehui Canyon Aggregate Area. The nearest regional well is well R-31, located in North Ancho Canyon approximately 1 mi north of TA-33.

6.2 Stormwater

Monitoring of stormwater in Chaquehui Canyon under is being performed under the NPDES Multi-Sector General Permit (MSGP) and Federal Facility Compliance Agreement/Administrative Order (FFCA/AO). The MSGP and FFCA/AO are being replaced by a new NPDES individual permit (IP). Monitoring under the MSGP, FFCA/AO, and IP is performed using site-monitoring areas (SMAs) that monitor stormwater

runoff from individual SWMUs and AOCs or groups of SWMUs and AOCs, and gage stations, which are used for watershed-scale monitoring in canyons and drainages. SWMUs and AOCs in the Chaquehui Canyon Aggregate Area subject to SMA monitoring are SWMUs 33-002(d) (IP only); 33-004(d); 33-004(h); 33-004(j); 33-005(a–c) (FFCA/AO only); 33-006(a); 33-007(b); 33-007(c) (IP only); 33-010(c); 33-010(f); 33-010(g); 33-010(h) (IP only); 33-011(d) (IP only); 33-011(e) (IP only); 33-012(a) (IP only); 33-014 (IP only); 33-015; 33-016 (IP only); and 33-017 (IP only); and AOCs 33-008(c); 33-011(b); C-33-001; and C-33-003, which are monitored using nine SMAs. Monitoring is also conducted at gage station E338, located in Chaquehui Canyon south of South Site, and gage E340, located in the main drainage channel approximately one-quarter mile east of Main Site. The monitoring requirements for each SMA and gage are contained in a Site Drainage Pollution Prevention Plan (SDPPP) for SWMUs and AOCs and the Storm Water Monitoring Plan, which is updated annually and submitted to EPA. The SDPPP also contains the monitoring results.

7.0 SCHEDULE

~~The scheduled notice date for NMED to approve this investigation work plan is February 28, 2010.~~ Preparation for field work will not proceed until the work plan is approved. The expected duration of field activities is 18 mo. The investigation report for Chaquehui Canyon Aggregate Area will be submitted within 6 mo after completion of field activities. Therefore, a submittal date of no later than ~~April~~ March 3~~1~~0, 201~~3~~2, is proposed for the investigation report.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 References

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Abeele, W.V., M.L. Wheeler, and B.W. Burton, October 1981. "Geohydrology of Bandelier Tuff," Los Alamos National Laboratory report LA-8962-MS, Los Alamos, New Mexico. (Abeele et al. 1981, 006273)

Ahlquist, A.J., November 1, 1983. "Conversations with Harlow Russ RE TA-33, 10/27/83," Los Alamos Scientific Laboratory memorandum to file from A.J. Ahlquist (HSE-8), Los Alamos, New Mexico. (Ahlquist 1983, 006854)

ASTM (American Society for Testing and Materials), June 1997. "D6001 Standard Guide for Direct-Push Water Sampling for Geoenvironmental Investigations," in *Annual Book of ASTM Standards*, Vol. 04.09 Soil and Rock (II), ASTM, West Conshohocken, Pennsylvania. (ASTM 1997, 057511)

Aubele, J.C., 1978. "Geology of the Cerros del Rio Volcanic Field," in *Guidebook to Rio Grande Rift in New Mexico and Colorado*, Circular 163, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico, pp. 198-201. (Aubele 1978, 054426)

Bailey, R.A., R.L. Smith, and C.S. Ross, 1969. "Stratigraphic Nomenclature of Volcanic Rocks in the Jemez Mountains, New Mexico," in *Contributions to Stratigraphy*, U.S. Geological Survey Bulletin 1274-P, Washington, D.C. (Bailey at el. 1969, 021498)

Baltz, E.H., J.H. Abrahams, Jr., and W.D. Purtymun, March 1963. "Preliminary Report on the Geology and Hydrology of Mortandad Canyon near Los Alamos, New Mexico, with Reference to Disposal of Liquid Low-Level Radioactive Waste," U.S. Geological Survey Open File Report, Albuquerque, New Mexico. (Baltz et al. 1963, 008402)

Buckland, C.W., October 20, 1951. "12 October 1951 Spill at TA-33," Los Alamos Scientific Laboratory memorandum to D.P. MacMillan (W-3) from C. Buckland (H-1), Los Alamos, New Mexico. (Buckland 1951, 007845)

Collins, K.A., A.M. Simmons, B.A. Robinson, and C.I. Nylander (Eds.), December 2005. "Los Alamos National Laboratory's Hydrogeologic Studies of the Pajarito Plateau: A Synthesis of Hydrogeologic Workplan Activities (1998–2004)," Los Alamos National Laboratory report LA-14263-MS, Los Alamos, New Mexico. (Collins et al. 2005, 092028)

Cox, E.J., R. Garde, and A.M. Valentine, July 21, 1975. "Disposition of TA-33-21, a Plutonium Contaminated Experimental Facility," Los Alamos Scientific Laboratory document LA-UR-75-1419, Los Alamos, New Mexico. (Cox et al. 1975, 009728)

Dethier, D.P., 1997. "Geology of White Rock Quadrangle, Los Alamos and Santa Fe Counties, New Mexico," Map 73, New Mexico Bureau of Mines and Mineral Resources. (Dethier 1997, 049843)

EPA (U.S. Environmental Protection Agency), January 21, 2005. "EPA's Prior Decisions on SWMU/AOC Sites at Los Alamos National Laboratory (LANL)," U.S. Environmental Protection Agency letter to J. Bearzi (NMED-HRMB) from L.F. King (EPA Federal Facilities Section Chief), Dallas, Texas. (EPA 2005, 088464)

EPA (U.S. Environmental Protection Agency), December 2007. "EPA Region 6 Human Health Medium-Specific Screening Levels," U.S. EPA Region 6, Dallas, Texas. (EPA 2007, 099314)

Galusha, T., and J.C. Blick, April 1971. "Stratigraphy of the Santa Fe Group, New Mexico," *Bulletin of the American Museum of Natural History,* Vol. 144, No. 1, pp. 1–128. (Galusha and Blick 1971, 021526)

Griggs, R.L., and J.D. Hem, 1964. "Geology and Ground-Water Resources of the Los Alamos Area, New Mexico," U.S. Geological Survey Water Supply Paper 1753, Washington, D.C. (Griggs and Hem 1964, 092516)

Heiken, G., F.E. Goff, J. Stix, S. Tamanyu, M. Shafiqullah, S.R. Garcia, and R.C. Hagan, February 10, 1986. "Intracaldera Volcanic Activity, Toledo Caldera and Embayment, Jemez Mountains, New Mexico," *Journal of Geophysical Research,* Vol. 91, No. B2, pp. 1799-1816. (Heiken et al. 1986, 048638)

Heiken, G., K. Wohletz, R.V. Fisher, and D.P. Dethier, 1989. "Maar Volcanoes of White Rock Canyon–Interaction of Ground and Surface Water with Basaltic Volcanoes of the Rio Grande Rift, New Mexico," Los Alamos National Laboratory document LA-UR-89-1917, Los Alamos, New Mexico. (Heiken et al. 1989, 054425)

Hoard, D., September 17, 1991. "Conversation with John Dougherty RE TA-33," Los Alamos National Laboratory memorandum (CLS-1/91-303-DH) to file from D. Hoard (CLS-1), Los Alamos, New Mexico. (Hoard 1991, 009733)

Hoard, D., September 17, 1991. "Conversation with Harlow Russ," Los Alamos National Laboratory memorandum (CLS-1/91-304-DH) to file from D. Hoard (CLS-1), Los Alamos, New Mexico. (Hoard 1991, 009734)

Hyatt, E.C., June 5, 1956. "Proposed Hot Machine Shop, TA-33, Building HP-113," Los Alamos Scientific Laboratory memorandum to J. Bolton (ENG-DO) from E.C. Hyatt (H-5), Los Alamos, New Mexico. (Hyatt 1956, 007929)

Hyatt, E.C., September 27, 1957. "Fume Hood Exhaust Stack in Building HP-16, TA-33," Los Alamos Scientific Laboratory memorandum to J. Dougherty (W-3) from E.C. Hyatt (H-5), Los Alamos, New Mexico. (Hyatt 1957, 007939)

Izett, G.A., and J.D. Obradovich, February 10, 1994. "$^{40}Ar/^{39}Ar$ Age Constraints for the Jaramillo Normal Subchron and the Matuyama-Brunhes Geomagnetic Boundary," *Journal of Geophysical Research,* Vol. 99, No. B2, pp. 2925–2934. (Izett and Obradovich 1994, 048817)

Jordan, H.S., August 2, 1954. "Industrial Hygiene Survey, TA-33," Los Alamos Scientific Laboratory memorandum to D. MacMillan (W-3) from H.S. Jordan (H-5), Los Alamos, New Mexico. (Jordan 1954, 007918)

Koogle and Pouls Engineering, November 29, 1986. "TA-33 and TA-39 aerial photograph," Los Alamos National Laboratory, Los Alamos, New Mexico. (Koogle and Pouls Engineering 1986, 017907)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Vol. III of IV (TA-26 through TA-50), Los Alamos National Laboratory document LA-UR-90-3400, Los Alamos, New Mexico. (LANL 1990, 007513)

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1122," Los Alamos National Laboratory document LA-UR-92-925, Los Alamos, New Mexico. (LANL 1992, 007671)

LANL (Los Alamos National Laboratory), December 1995. "RFI Report for Potential Release Sites 33-004(b), 33-004(c), 33-004(j), 33-004(m), 33-006(a), 33-006(b), 33-007(a), 33-007(b), 33-010(a), 33-010(b), 33-010(c), 33-010(d), 33-010(g), 33-010(h), 33-011(b), 33-011(c), 33-014," Los Alamos National Laboratory document LA-UR-95-4439, Los Alamos, New Mexico. (LANL 1995, 051903)

LANL (Los Alamos National Laboratory), January 31, 1995. "Field Unit 3, Operable Unit 1122, Technical Area 33, RFI Report for PRSs 33-004(d), 33-004(g), 33-004(h), 33-004(i), 33-005(a), 33-005(b), 33-005(c), 33-010(e), 33-010(f), 33-011(e), 33-012(a), 33-015, 33-007(c), 33-011(a)," Los Alamos National Laboratory document LA-UR-95-0882, Los Alamos, New Mexico. (LANL 1995, 071262)

LANL (Los Alamos National Laboratory), September 29, 1995. "RFI Report for Field Unit 3, Operable Unit 1122, Technical Area 33, RFI Report for PRSs 33-003(a), 33-004(a), 33-007(c), 33-009, 33-011(d), 33-013, 33-016, 33-017, Revised Sampling Plans for PRSs 33-003(b), 33-004(k), 33-008(a), 33-008(b), C-33-001, C-33-002," Los Alamos National Laboratory document LA-UR-95-3626, Los Alamos, New Mexico. (LANL 1995, 071300)

LANL (Los Alamos National Laboratory), September 29, 1995. "RFI Report for MDA K, PRSs 33-002(a,b,c,d,e)," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1995, 050113)

LANL (Los Alamos National Laboratory), February 1996. "Interim Action Report for Potential Release Site 33-007(c)," Los Alamos National Laboratory document LA-UR-96-710, Los Alamos, New Mexico. (LANL 1996, 052919)

LANL (Los Alamos National Laboratory), June 1996. "Voluntary Corrective Action Completion Report for Solid Waste Management Units at TA-33, 33-010(a), Canyon-Side Disposal Area, 33-010(d), Surface Disposal Area, 33-010(g), Canyon-Side Disposal Area, 33-011(b), General Storage Area," Los Alamos National Laboratory document LA-UR-96-1839, Los Alamos, New Mexico. (LANL 1996, 054755)

LANL (Los Alamos National Laboratory), July 1996. "Sampling and Analysis Plan, PRS 33-008(c)," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1996, 054963)

LANL (Los Alamos National Laboratory), August 1996. "Voluntary Corrective Action Plan for a Solid Waste Management Unit at TA-33, 33-007(c)," Los Alamos National Laboratory document LA-UR-96-2942, Los Alamos, New Mexico. (LANL 1996, 054906)

LANL (Los Alamos National Laboratory), September 1996. "Voluntary Corrective Action Report for a Solid Waste Management Unit at TA-33, 33-007(c)," Los Alamos National Laboratory document LA-UR-96-3198, Los Alamos, New Mexico. (LANL 1996, 062541)

LANL (Los Alamos National Laboratory), September 1997. "NFA Report for Potential Release Sites 33-002(b–c), 33-003(b), 33-004(k), 33-006(a), 33-008(a–b), 33-011(d), 33-013, 33-017 (located in former Operable Unit 1122)," Los Alamos National Laboratory document LA-UR-97-2944, Los Alamos, New Mexico. (LANL 1997, 071478)

LANL (Los Alamos National Laboratory), September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 059730)

LANL (Los Alamos National Laboratory), March 23, 1999. "VCA Plan for Potential Release Sites 33-007(b), 33-010(c), C-33-003," Los Alamos National Laboratory document LA-UR-99-3002, Los Alamos, New Mexico. (LANL 1999, 063678)

LANL (Los Alamos National Laboratory), September 1999. "Work Plan for Sandia Canyon and Cañada del Buey," Los Alamos National Laboratory document LA-UR-99-3610, Los Alamos, New Mexico. (LANL 1999, 064617)

LANL (Los Alamos National Laboratory), August 18, 2000. "Submittal of Response to Request for Supplemental Information (RSI) for the Voluntary Corrective Action (VCA) Plan for Potential Release Sites (PRSs) 33-007(b), 33-010(c), and C-33-003 [and attached 'Segmented Gate System, Voluntary Corrective Action Status Report for Potential Release Sites 33-007(b), 33-010(c), C-33-033]," Los Alamos National Laboratory letter (ER2000-0171) to J. Kieling (NMED-HWB) from J.A. Canepa (LANL) and T.J. Taylor (DOE-LAAO), Los Alamos, New Mexico. (LANL 2000, 066889)

LANL (Los Alamos National Laboratory), September 29, 2000. "Annual Transmittal of Best Management Practices (BMPs) Installed, Inspected, and Maintained at PRSs at Los Alamos National Laboratory (LANL)," Los Alamos National Laboratory letter (ER2000-0535) to J. Young (NMED-HWB) from J. Canepa (LANL) and T.J. Taylor (DOE-LAAO), Los Alamos, New Mexico. (LANL 2000, 068748)

LANL (Los Alamos National Laboratory), December 2000. "University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories," Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

LANL (Los Alamos National Laboratory), May 2005. "Derivation and Use of Radionuclide Screening Action Levels, Revision 1," Los Alamos National Laboratory document LA-UR-05-1849, Los Alamos, New Mexico. (LANL 2005, 088493)

LANL (Los Alamos National Laboratory), September 2006. "South Canyons Investigation Work Plan," Los Alamos National Laboratory document LA-UR-06-5979, Los Alamos, New Mexico. (LANL 2006, 093713)

LANL (Los Alamos National Laboratory), November 2009. "Historical Investigation Report for Chaquehui Canyon Aggregate Area," Los Alamos National Laboratory document LA-UR-09-7402, Los Alamos, New Mexico. (LANL 2009, 107348)

LANL (Los Alamos National Laboratory), July 2010. "Voluntary Corrective Action Completion Report for the Investigation and Remediation of Solid Waste Management Units 33-002(a-c) at Technical Area 33," Los Alamos National Laboratory document LA-UR-10-4928, Los Alamos, New Mexico. (LANL 2010, 110352)

LASL (Los Alamos Scientific Laboratory), November 1954. Excerpted pages from "H-Division Progress Report, October 20 - November 20, 1954," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (LASL 1954, 107465)

Laughlin, A.W., G. WoldeGabriel, and D.P. Dethier, October 29, 1993. "Volcanic Stratigraphy of the Pajarito Plateau," Preliminary Report FY93, Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (Laughlin et al. 1993, 054424)

Michelotti, R., and L. Kidman, October 30, 1997. "Transfer of Responsibility for Future Contamination at TA-33-31," Los Alamos National Laboratory memorandum (ER-RM-97-65) to P. Bussolini (NIS-33) from R. Michelotti (CST-18) and L. Kidman (ICF KE), Los Alamos, New Mexico. (Michelotti and Kidman 1997, 074002)

Milford, H.C., December 14, 1956. "Visit to Group W-3 at TA-33," Los Alamos Scientific Laboratory memorandum to W-3 file from H.C. Milford, Los Alamos, New Mexico. (Milford 1956, 007934)

NMED (New Mexico Environment Department), December 23, 1998. "Approval: Class III Permit Modification to Remove Ninety-nine (99) Solid Waste Management Units from the Department of Energy/Los Alamos National Laboratory RCRA Permit NM 0890010515," New Mexico Environment Department letter to T. Taylor (DOE-LAAO) and J.C. Browne (LANL Director) from E. Kelley (NMED-HRMB), Santa Fe, New Mexico. (NMED 1998, 063042)

NMED (New Mexico Environment Department), August 30, 2006. "Approval and Certificate of Completion, Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013, Technical Area 33," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2006, 093526)

NMED (New Mexico Environment Department), October 2006. "New Mexico Environment Department TPH Screening Guidelines," Santa Fe, New Mexico. (NMED 2006, 094614)

NMED (New Mexico Environment Department), March 28, 2007. "Approval with Modifications, South Canyons Investigation Work Plan," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 095490)

NMED (New Mexico Environment Department), August 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 106420)

Nyhan, J.W., L.W. Hacker, T.E. Calhoun, and D.L. Young, June 1978. "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory report LA-6779-MS, Los Alamos, New Mexico. (Nyhan et al. 1978, 005702)

Purtymun, W.D., December 1975. "Geohydrology of the Pajarito Plateau with Reference to Quality of Water, 1949-1972," Informal Report, Los Alamos Scientific Laboratory document LA-UR-02-4726, Los Alamos, New Mexico. (Purtymun 1975, 011787)

Reider, R., July 11, 1967. "Disposal of Capacitors," Los Alamos Scientific Laboratory memorandum to J.E. Dougherty (W-3) from R. Reider (Safety Director), Los Alamos, New Mexico. (Reider 1967, 007471)

Reider, R., August 7, 1972. "Disposal of Defective Energy Storage Capacitors," Los Alamos Scientific Laboratory memorandum to distribution from R. Reider (Safety Director), Los Alamos, New Mexico. (Reider 1972, 008204)

Reneau, S.L., D.P. Dethier, and J.S. Carney, 1995. "Landslides and Other Mass Movements near Technical Area 33, Los Alamos National Laboratory," Los Alamos National Laboratory report LA-12955-MS, Los Alamos, New Mexico. (Reneau et al. 1995, 054405)

Rogers, M.A., June 1977. "History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes (Areas A, B, C, D, E, F, G, and T)," Vol. II, Los Alamos Scientific Laboratory report LA-6848-MS, Los Alamos, New Mexico. (Rogers 1977, 005708)

Santa Fe Engineering Ltd., January 1992. "Wastewater Stream Characterization for TA-33, 39, 49 and 69, Los Alamos National Laboratory, Environmental Study, Characterization Report #26," draft report prepared for Los Alamos National Laboratory, Santa Fe, New Mexico. (Santa Fe Engineering, Ltd. 1992, 062036)

Schulte, H.F., June 24, 1958. "Control of Niobium Fumes," Los Alamos Scientific Laboratory memorandum to the file (W-3 at TA-33) from H.F. Schulte (H-5 Group Leader), Los Alamos, New Mexico. (Schulte 1958, 007946)

Smith, J., December 19, 1974. "Radiation Survey of Cleaned Up Dump Area at TA-33," Los Alamos Scientific Laboratory memorandum to J. Warren (H-8) from J. Smith (H-8), Los Alamos, New Mexico. (Smith 1974, 006911)

Spiegal, Z., and B. Baldwin, 1963. "Geology and Water Resources of the Santa Fe Area, New Mexico," Geological Survey Water Supply Paper 1525, U.S. Government Printing Office, Washington, D.C. (Spiegel and Baldwin 1963, 054259)

Stoker, A.K., March 31, 1993. "Direct Testimony of Alan K. Stoker on Behalf of Petitioners before the New Mexico Water Quality Control Commission," Los Alamos, New Mexico. (Stoker 1993, 056021)

Turbeville, B.N., D.B. Waresback, and S. Self, February 1989. "Lava-Dome Growth and Explosive Volcanism in the Jemez Mountains, New Mexico: Evidence from the Pilo-Pliestocene Puye Alluvial Fan," *Journal of Volcanology and Geothermal Research,* Vol. 36, pp. 267-291. (Turbeville et al. 1989, 021587)

USAF (U.S. Air Force), November 22, 1958. "TA-33 and TA-39 aerial photograph," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (USAF 1958, 015987)

Vaniman, D., and K. Wohletz, November 14, 1990. "Results of Geological Mapping/Fracture Studies: TA-55 Area," Los Alamos National Laboratory memorandum (EES1-SH90-17) to J.L. Gardner (EES-1) from D. Vaniman, and K. Wohletz, Los Alamos, New Mexico. (Vaniman and Wohletz 1990, 009995.2)

WoldeGabriel, G., R.G. Warren, D. Broxton, D. Vaniman, M.T. Heizler, E.C. Kluk, and L. Peters, 2001. "Episodic Volcanism, Petrology, and Lithostratigraphy of the Pajarito Plateau and Adjacent Areas of the Española Basin and the Jemez Mountains," *Volcanology in the New Mexico, NM Natural History and Science Bulletin,* Vol. 18, pp. 97-129. (WoldeGabriel et al. 2001, 092523)

8.2 Map Data Sources

Potential Release Sites; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2009-0137; 1:2,500 Scale Data; 13 March 2009; Modified PRS boundaries contained within WES GIS Team project folder, 09-0066, until change control complete.

Canyon Reaches; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0592; 1:24,000 Scale Data; Unknown publication date; Additional reach data contained in WES GIS Team project folder 09-0066

Aggregate Areas; Los Alamos National Laboratory, ENV Environmental Remediation & Surveillance Program, ER2005-0496; 1:2,500 Scale Data; 22 September 2005.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008; Additional former structures contained within WES GIS Team project folder, 09-0066.

Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Primary Gas Distribution Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Paved Parking; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 12 August 2002; as published 15 January 2009.

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Road Centerlines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 15 December 2005; as published 15 January 2009.

Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Storm Drain Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

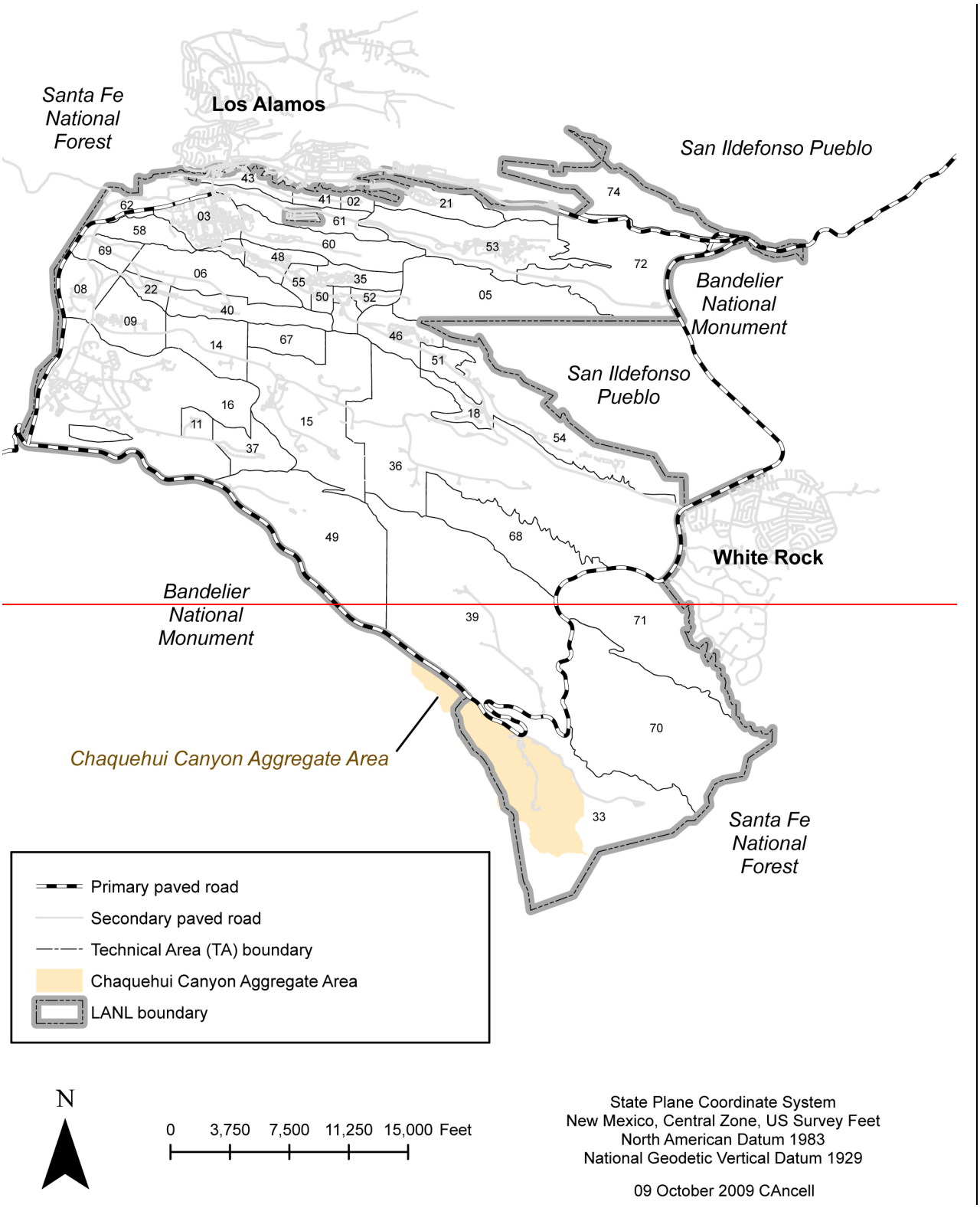
Hypsography, 2, 10, 20, & 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003; Additional drainage data contained within WES GIS Team project folder 08-0030.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2009-0162; 13 March 2009; Proposed sampling and modified/new point feature data contained within WES GIS Team project folder 09-0066.

Individual Permit (IP) Site Monitoring Area (SMA) Samplers; Los Alamos National Laboratory, Water Stewardship Program; Currently unpublished 2009 data contained within WES GIS Team project folder 07-0142.


Santa Fe National Forest
Los Alamos
San Ildefonso Pueblo
Bandelier National Monument
San Ildefonso Pueblo
White Rock
Bandelier National Monument
Chaquehui Canyon Aggregate Area
Santa Fe National Forest
Primary paved road
Secondary paved road
Technical Area (TA) boundary
Chaquehui Canyon Aggregate Area
LANL boundary
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0 3,750 7,500 11,250 15,000 Feet
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North American Datum 1983
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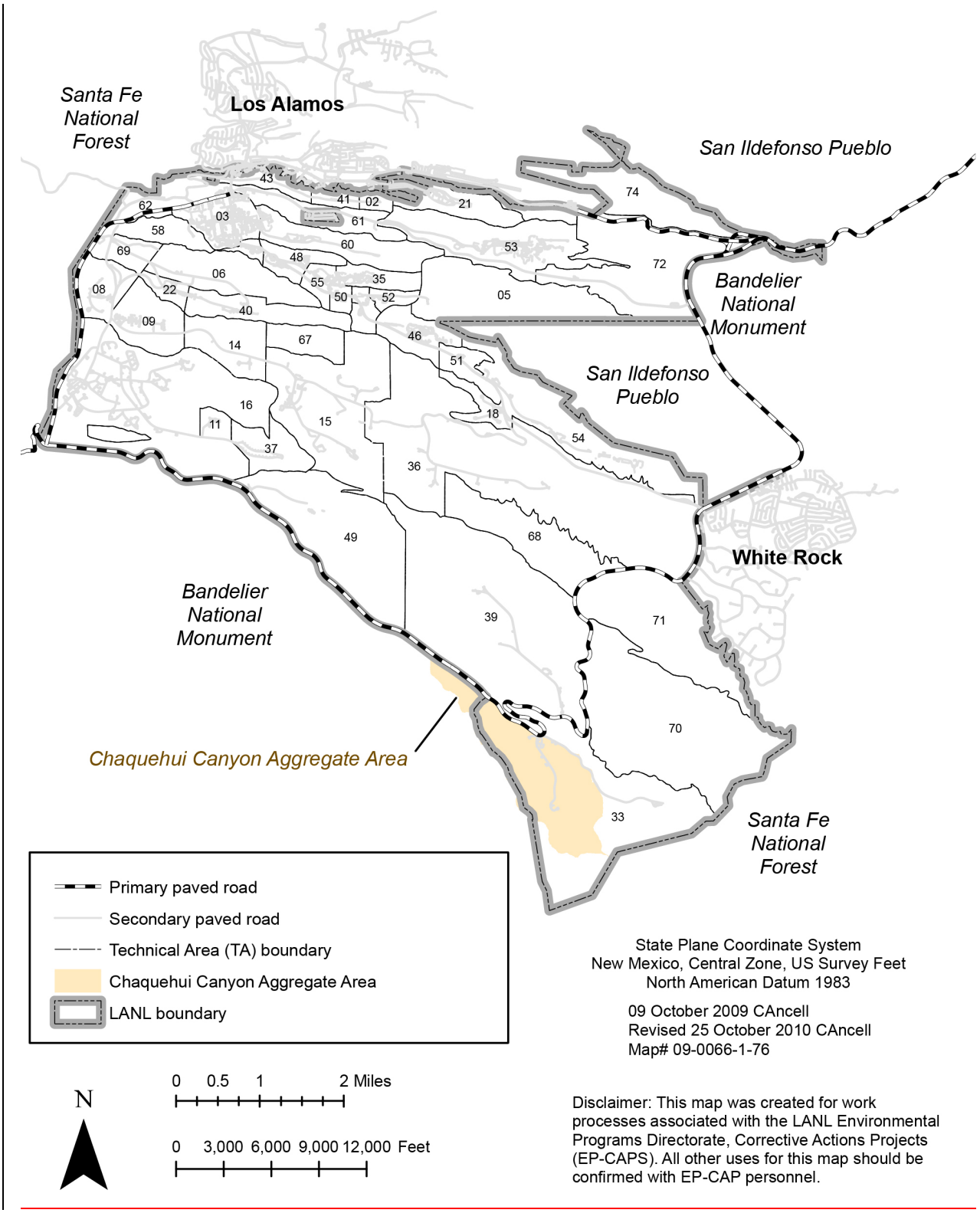


Figure 1.0-1 Chaquehui Canyon Aggregate Area with respect to Laboratory TAs and surrounding land holdings

<table>
<tr><td rowspan="6">Bandelier Tuff</td><td rowspan="6">Tshirege Member</td><td>Qbt 4</td><td rowspan="5">Ash-Flow Units</td></tr>
<tr><td>Qbt 3</td></tr>
<tr><td>Qbt 2</td></tr>
<tr><td>Qbt 1v</td></tr>
<tr><td>Qbt 1g</td></tr>
<tr><td colspan="2">Tsankawi Pumice Bed</td></tr>
<tr><td colspan="2">Cerro Toledo Interval</td><td colspan="2">Volcaniclastic Sediments and Ash-Falls</td></tr>
<tr><td rowspan="2">Bandelier Tuff</td><td rowspan="2">Otowi member</td><td colspan="2">Ash-Flow Units</td></tr>
<tr><td colspan="2">Guaje Pumice Bed</td></tr>
<tr><td rowspan="4">Puye Formation</td><td>Fanglomerate</td><td colspan="2">Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments</td></tr>
<tr><td>Basalt and Andesite</td><td colspan="2">Cerros del Rio Basalts intercalated within the Puye Formation, includes up to four interlayered basaltic flows. Andesites of the Tschicoma Formation present in western part of plateau</td></tr>
<tr><td>Fanglomerate</td><td colspan="2">Fanglomerate Facies includes sand, gravel, conglomerate, and tuffaceous sediments; includes “Old Alluvium”</td></tr>
<tr><td>Axial facies deposits of the ancestral Rio Grande</td><td colspan="2">Totavi Lentil</td></tr>
<tr><td rowspan="9">Santa Fe Group</td><td>Coarse Sediments</td><td colspan="2" rowspan="8">Coarse-Grained Upper Facies
(formerly called the “Chaquehui Formation” by Purtymun 1995, 045344)</td></tr>
<tr><td>Basalt</td></tr>
<tr><td>Coarse Sediments</td></tr>
<tr><td>Basalt</td></tr>
<tr><td>Coarse Sediments</td></tr>
<tr><td>Basalt</td></tr>
<tr><td>Coarse Sediments</td></tr>
<tr><td>Arkosic clastic sedimentary deposits</td><td colspan="2">Undivided Santa Fe Group
(includes Chamita[?] and Tesuque Formations)</td></tr>
</table>

Note: Source: LANL 1999, 064617. Modified by NWI 03/21/08.

Figure 3.2-1 Generalized stratigraphy of bedrock units

Table 1.1-1
Status of SWMUs and AOCs in Chaquehui Canyon Aggregate Area

Consolidated Unit	Site ID	Brief Description	Site Status	Reference*
33-001(a)-99	SWMU 33-001(a)	Disposal Pit 1 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(b)	Disposal Pit 2 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(c)	Disposal Pit 3 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(d)	Disposal Pit 4 (MDA E)	Under Investigation	Section 4.3.1
	SWMU 33-001(e)	Shot Chamber (MDA E)	Under Investigation	Section 4.3.1
33-002(a)-99	SWMU 33-002(a)	Septic System (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(b)	Seepage Pit (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(c)	Seepage Pit (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(d)	Outfall (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-002(e)	Outfall (MDA K)	Under Investigation	Section 4.1.1
	SWMU 33-010(f)	Surface Disposal Area (MDA K)	Under Investigation	Section 4.1.1
33-004(a)-00	SWMU 33-004(a)	Septic System	Under Investigation	Section 4.1.2
	SWMU 33-004(h)	Outfall	Under Investigation	Section 4.1.2
	SWMU 33-004(i)	Outfalls	Under Investigation	Section 4.1.2
	SWMU 33-011(d)	Former Storage Area	Under Investigation	Section 4.1.2
	SWMU 33-015	Incinerator	Under Investigation	Section 4.1.2
	SWMU 33-017	Potential Soil Contamination	Under Investigation	Section 4.1.2
	SWMU 33-004(b)	Septic System	Under Investigation	Section 4.2.2
	SWMU 33-004(d)	Septic System	Under Investigation	Section 4.2.1
	SWMU 33-004(e)	Seepage Pit	Removed from the Module VIII of the Laboratory's Hazardous Waste Facility Permit 12/23/98	NMED 1998, 063042
	SWMU 33-004(f)	Septic System	Removed from the Module VIII of the Laboratory's Hazardous Waste Facility Permit 12/23/98	NMED 1998, 063042
33-004(g)-00	SWMU 33-004(g)	Drainline and Outfall	Under Investigation	Section 4.2.2
	SWMU 33-007(c)	Firing Sites	Under Investigation	Section 4.2.2
	SWMU 33-004(j)	Drainline and Outfall	Under Investigation	Section 4.3.3
	SWMU 33-006(a)	Firing Site	Under Investigation	Section 4.3.3
	SWMU 33-007(b)	Firing Sites	Under Investigation	Section 4.3.3
	SWMU 33-008(a)	Landfill	Under Investigation	Section 4.3.3
	SWMU 33-010(c)	Surface Disposal Area	Under Investigation	Section 4.3.3
	SWMU 33-010(h)	Surface Disposal Area	Under Investigation	Section 4.3.3
	SWMU 33-011(c)	Storage Area	Under Investigation	Section 4.3.3

Table 1.1-1 (continued)

Consolidated Unit	Site ID	Brief Description	Site Status	Reference*
	SWMU 33-014	Open Burn Area	Under Investigation	Section 4.3.3
	SWMU 33-004(m)	Septic System	Under Investigation	Section 4.4.1
	AOC 33-004(n)	Septic System	NFA Approved 1/21/05	EPA 2005, 088464
33-005(a)-00	SWMU 33-005(a)	Former Septic System	Under Investigation	Section 4.1.3
	SWMU 33-005(b)	Former Drainline	Under Investigation	Section 4.1.3
	SWMU 33-005(c)	Former Drainline	Under Investigation	Section 4.1.3
	SWMU 33-011(a)	Former Storage Area	Under Investigation	Section 4.1.3
	AOC 33-008(c)	Surface Disposal Area	Under Investigation	Section 4.1.4
	SWMU 33-009	Surface Disposal Area	Under Investigation	Section 4.2.3
	AOC 33-010(e)	Surface Disposal Site	NFA Approved 01/21/05	EPA 2005, 088464
	SWMU 33-010(g)	Surface Disposal Area	Under Investigation	Section 4.3.4
	AOC 33-011(b)	Former Storage Area	Under Investigation	Section 4.4.2
	SWMU 33-011(e)	Former Storage Area	Under Investigation	Section 4.1.5
	SWMU 33-012(a)	Former Storage Area	Under Investigation	Section 4.1.6
	AOC 33-012(b)	Satellite Accumulation Area	NFA Approved 01/21/05	EPA 2005, 088464
	AOC 33-012(c)	Satellite Accumulation Area	NFA Approved 01/21/05	EPA 2005, 088464
	AOC 33-012(d)	Satellite Accumulation Area	NFA Approved 01/21/05	EPA 2005, 088464
	SWMU 33-013	Drum Storage Area	NFA Approved 08/30/06	NMED 2006, 093526
	SWMU 33-016	Sump, Drainline, and Outfall	Under Investigation	Section 4.1.7
	AOC C-33-001	Former Transformer	Under Investigation	Section 4.1.8
	AOC C-33-003	Potential Soil Contamination	Under Investigation	Section 4.1.9

Note: Shading denotes approved for NFA or complete with controls.
*References are to sections in the Chaquehui Canyon Aggregate Area investigation work plan, unless otherwise noted.

Table 2.3-1
Industrial SSLs and SALs

Chemical	Industrial SSL[a] (inorganic and organic chemicals) or Industrial SAL[b] (radionuclides)
Inorganic Chemicals (mg/kg)	
Aluminum	1,130,000
Antimony	454
Arsenic	17.7
Barium	224,000
Cadmium	1120
Calcium	na[c]
Chromium	2920[d]
Cobalt	300[e]
Copper	45,400
Cyanide (total)	22,700
Iron	795,000
Lead	800
Magnesium	na
Manganese	145,000
Mercury	310[e]
Nickel	22,700
Nitrate	1,820,000
Perchlorate	795
Selenium	5680
Silver	5680
Thallium	74.9
Uranium	3410
Vanadium	5680
Zinc	341,000
Organic Chemicals (mg/kg)	
Acenaphthene	36,700
Acenaphthylene	18,300[f]
Acetone	851,000
Anthracene	183,000
Aroclor-1242	8.26
Aroclor-1254	8.26
Aroclor-1260	8.26
Azobenzene	230[e]
Benzene	85.4
Benzo(a)anthracene	23.4

Table 2.3-1 (continued)

Chemical	Industrial SSL[a] (Inorganic and Organic Chemicals) or Industrial SAL[b] (Radionuclides)
Benzo(a)pyrene	2.34
Benzo(b)fluoranthene	23.4
Benzo(g,h,i)perylene	18,300[f]
Benzo(k)fluoranthene	234
Benzoic acid	2,500,000[e]
Bis(2-ethylhexyl)phthalate	1370
Bromobenzene	1800[e]
Butanone[2-]	36,900
Butylbenzylphthalate	9100[e]
Carbazole	2900[g]
4-Chloroaniline	86[e]
Chrysene	2340
Di-n-butylphthalate	68,400
Dibenz(a,h)anthracene	2.34
Dibenzofuran	2800[g]
1,3-Dichlorobenzene	130[g]
1,4-Dichlorobenzene	180
2,4-Dimethylphenol	13,700
Fluoranthene	24,400
Fluorene	24,400
2-Hexanone	369,000[h]
Indeno(1,2,3-cd)pyrene	23.4
4-Isopropyltoluene	14,900[i]
Methylene chloride	1090
2-Methylnaphthalene	4100[e]
2-Methylphenol	34,000[g]
4-Methylphenol	3400[g]
Naphthalene	252
Phenanthrene	20,500
Phenol	205,000
Pyrene	18,300
Pyridine	1000[e]
Tetrachloroethene	36.4
Toluene	57,900
TPH-DRO	1120[j]
1,1,1-Trichloroethane	77,100
Trichloroethene	253
1,2,3-Trichlorobenzene	525[k]

Table 2.3-1 (continued)

Chemical	Industrial SSL[a] (Inorganic and Organic Chemicals) or Industrial SAL[b] (Radionuclides)
1,2,4-Trichlorobenzene	525
1,2,4-Trimethylbenzene	260[e]
1,3,5-Trinitrobenzene	27,000[e]
Xylene (total)	3610
Radionuclides (pCi/g)	
Americium-241	180
Cesium-137	23
Plutonium-238	240
Plutonium-239/240	210
Strontium-90	1900
Tritium	440,000
Uranium-234	1500
Uranium-235	87
Uranium-238	430

[a] SSLs from NMED 2009, 106420, unless otherwise noted.

[b] SALs from LANL 2005, 088493.

[c] na = Not available.

[d] SSL is for hexavalent chromium.

[e] SSL is from the EPA regional screening table (http://www.epa.gov/region6/6pd/rcra_c/pd-n/screen.htm).

[f] SSL is for pyrene, based on structural similarity.

[g] SSL from EPA 2007, 099314.

[h] SSL is for 2-butanone, based on structural similarity.

[i] SSL is for isopropylbenzene (cumene), based on structural similarity.

[j] SSL from NMED 2006, 094614.

[k] SSL is for 1,2,4-trichlorobenzene, based on structural similarity.

Table 4.0-1
Summary of Proposed Samples and Analyses

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
Main Site																				
33-002(a)-99	SWMU 33-002(a)	Collect ~~11~~9 samples from ~~A~~VCA locations ~~33-24717,~~ 33-24718, ~~33-24719,~~ 33-24720, 33-24721, 33-24722, 33-24723, 33-24724, 33-24725, 33-24726, and 33-25098 at the next deeper interval (~~4~~5 to ~~5~~6 ft beneath bottom of former septic system structures) to define the vertical extent of metals.	~~11~~9 locations, ~~11~~9 samples	~~4~~5–~~5~~6 beneath bottom of former septic system structures	Soil, tuff	X[a]	—[b]	~~X~~—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(a)	Collect 3 samples from ~~A~~VCA locations 33-24716, 33-24718, and 33-24722 at the next deeper interval (~~4~~5 to ~~5~~6 ft beneath bottom of former septic system structures) to define the vertical extent of PCBs.	3 locations, 3 samples	~~4~~5–~~5~~6 beneath bottom of former septic system structures	Soil, tuff	—	—	~~X~~—	—	—	—	—	—	X	—	—	—	—	—	—
	SWMU 33-002(a)	Collect ~~4~~7 samples from ~~A~~VCA locations 33–24716, 33-24717, 33-24718, 33-24719, ~~and~~ 33-24722, 33-24723, and 33-24726 at the next deeper interval (~~4~~5 to ~~5~~6 ft beneath bottom of former septic system structures) to define the vertical extent of SVOCs.	~~4~~7 locations, ~~4~~7 samples	~~4~~5–~~5~~6 beneath bottom of former septic system structures	Soil, tuff	—	—	~~X~~—	—	—	X	—	—	—	—	—	—	—	—	—
	SWMU 33-002(a)	Collect one sample from ~~A~~VCA location 33-24717 at the next deeper interval (~~4~~5 to ~~5~~6 ft beneath bottom of former septic system structures) to define the vertical extent of plutonium-238.	1 location, 1 sample	~~4~~5–~~5~~6 beneath bottom of former septic system structures	Soil, tuff	—	—	~~X~~—	—	—	—	—	—	—	—	X	—	—	—	—
	SWMU 33-002(a)	Collect one sample from ~~A~~VCA location 33-24722 at the next deeper interval (~~4~~5 to ~~5~~6 ft beneath bottom of former septic system structures) to define the vertical extent of uranium-235/236.	1 location, 1 sample	~~4~~5–~~5~~6 beneath bottom of former septic system structures	Soil, tuff	—	—	~~X~~—	—	—	—	—	—	—	X	—	—	—	—	—
	SWMU~~s~~ 33-002(a)	Collect ~~7~~5 samples from ~~A~~VCA ~~-~~locations 33-24717, 33-24~~27~~18, 33-24724, 33-25098, ~~33-25112, 33-25114,~~ and 33-25117 at the next deeper interval (~~4~~5 to ~~5~~6 ft beneath bottom of former septic system structures) to define the vertical extent of tritium.	~~7~~5 locations ~~7~~5 samples	~~4~~5–~~5~~6 beneath bottom of former septic system structures	Soil, tuff	—	—	~~X~~—	—	—	—	—	—	—	—	—	X	—	—	—
	SWMU 33-002(a)	Collect 26 samples from VCA locations 33-25097, 33-25098, 33-25107, 33-25108, 33-25109, 33-25110, 33-25111, 33-25112, 33-25113, 33-25114, 33-25115, 33-25116, and 33-25117 at deeper VCA depth and next deeper interval (2 to 3 ft and 5 to 6 ft beneath bottom of former septic system structures) to define vertical extent of explosive compounds.	13 locations 26 samples	2–3 and 5–6 beneath bottom of former septic system structures	Soil, tuff	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect ~~5~~7 samples from ~~A~~VCA locations 33-25084, 33-25087, 33-25088, 33-25092, 33-25093, 33-25094, and 33-25125 (~~4~~5 to ~~5~~6 ft beneath bottom of former seepage pit drainlines~~; 14 to 15 ft beneath~~ and bottom of former seepage pit) to define the vertical extent of metals.	~~5~~7 locations, ~~5~~7 samples	~~4~~5–~~5~~6 beneath former seepage pit drainlines and ~~; 14–15 beneath~~ former seepage pit	Soil, tuff	X	—	~~-~~—	~~-~~—	—	—	—	—	—	—	—	—	—	—	—

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	~~SWMU 33-002(b)~~	~~Collect two samples from ACA locations 33-25088 and 33-25092 (4 to 5 ft beneath bottom of former seepage pit drainlines; 14 to 15 ft beneath bottom of former seepage pit) to define the vertical extent of perchlorate.~~	~~2 locations, 2 samples~~	~~4–5 beneath former seepage pit drainlines; 14–15 beneath former seepage pit~~	~~Soil, tuff~~	—	—	—	~~X~~	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect ~~two~~ one sample~~s~~ from ~~A~~VCA location~~s 33-25083 and~~ 33-25088 (~~4 to 5 ft beneath bottom of former seepage pit drainlines; 14~~5 to ~~15~~6 ft beneath bottom of former seepage pit) to define the vertical extent of PCBs.	~~2~~1 location~~s~~, ~~2~~1 sample~~s~~	~~4–5 beneath former seepage pit drainlines; 14~~5–~~15~~6~~ beneath bottom of former seepage pit	Soil, tuff	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
33-002(a)-99 (continued)	SWMU 33-002(b)	Collect ~~2~~one sample~~s~~ from ~~A~~VCA location~~s~~ 33-25095 ~~and 33-25125~~ (~~4~~5 to ~~5~~6 ft beneath bottom of former seepage pit drainline~~s~~) to define the vertical extent of ~~VOCs and~~ SVOCs.	~~2~~1 location~~s~~, ~~1~~2 sample~~s~~	~~4~~5–~~5~~6 beneath former seepage pit drainline~~s~~	Soil, tuff	—	—	—	—	~~X~~—	X	—	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect one sample from VCA location 33-25125 (5 to 6 ft beneath bottom of former seepage pit drainline) to define the vertical extent of VOCs.	1 location, 1 sample	5–6 beneath former seepage pit drainlines	Soil, tuff	—	—	—	—	X	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(b)	Collect one sample from ~~A~~VCA location 33-25095 (~~4~~5 to ~~5~~6 ft beneath bottom of former seepage pit drainline~~s~~) to define the vertical extent of americium-241.	1 location, 1 sample	~~4~~5–~~5~~6 beneath former seepage pit drainline~~s~~	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—
	SWMU 33-002(b)	Collect ~~three~~ two samples from ~~A~~VCA locations ~~33-25092,~~ 33-25093~~,~~ and 33-25094 (~~4~~5 to ~~5~~6 ft beneath bottom of former seepage pit drainlines) to define the vertical extent of strontium-90.	~~3~~2 locations, ~~3~~2 samples	~~4~~5–~~5~~6 beneath former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X
	SWMU 33-002(b)	Collect 6 samples from ~~A~~VCA locations 33-25082, 33-2508~~4~~3, 33-25092, 33-25093, 33-25094, and 33-25095 (~~4~~5 to ~~5~~6 ft beneath bottom of former seepage pit drainlines) to define the vertical extent of tritium.	6 locations, 6 samples	~~4~~5–~~5~~6 beneath former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
	SWMU 33-002(b)	Collect 16 samples from VCA locations 33-25092, 33-25093, 33-25094, 33-25095, 33-25096, 33-25123, 33-25124, and 33-25125 at deeper VCA depth and next deeper interval (2 to 3 ft and 5 to 6 ft beneath bottom of former seepage pit drainlines) to define vertical extent of explosive compounds.	8 locations 16 samples	2–3 and 5–6 beneath bottom of former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-002(c)	Collect ~~three~~ six samples from AVCA locations 33-24727, 33-25085, 33-25118, 33-25119, 33-25121, and 33-25122 (45 to ~~56~~ ft beneath bottom of former seepage pit drainlines~~; 14 to 15 ft beneath~~ and bottom of former seepage pit) to define the vertical extent of metals.	~~36~~ locations, ~~36~~ samples	45–~~56~~ beneath former seepage pit drainlines~~; 14–15 beneath bottom of~~ and former seepage pit	Soil, tuff	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-002(c)	Collect one sample from AVCA location 33-25122 (45 to ~~56~~ ft beneath bottom of former seepage pit drainline~~s~~) to define the vertical extent of perchlorate.	1 location, 1 sample	45–~~56~~ beneath former seepage pit drainline~~s~~	Soil, tuff	—	—	—	X	—	—	—	—	—	—	—	—	—	—	—
	~~SWMU 33-002(c)~~	~~Collect one sample from ACA location 33-24727 (4 to 5 ft beneath bottom of former seepage pit drainlines) to define the vertical extent of PCBs.~~	~~1 location, 1 sample~~	~~4–5 beneath former seepage pit drainlines~~	~~Soil, tuff~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~X~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~
	SWMU 33-002(c)	Collect three samples from AVCA locations 33-24728, 33-25086, and 33-25119 (45 to ~~56~~ ft beneath bottom of former seepage pit drainlines~~; 14 to 15 ft beneath bottom of~~ and former seepage pit) to define the vertical extent of plutonium-238.	3 locations, 3 samples	45–~~56~~ beneath former seepage pit drainlines ~~structures; 14–15 beneath bottom of~~ and former seepage pit	Soil, tuff	—	—	—	—	—	—	—	—	—	—	X	—	—	—	—
	SWMU 33-002(c)	Collect one sample from AVCA location 33-24727 (45 to ~~56~~ ft beneath bottom of former seepage pit drainline~~s~~) to define the vertical extent of strontium-90.	1 location, 1 sample	45–~~56~~ beneath former seepage pit ~~structures~~drainline	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X
	SWMU 33-002(c)	Collect ~~three~~ four samples from ACA location 33-24727, 33-25086, 33-25119, and 33-25121 (45 to ~~56~~ ft beneath bottom of former seepage pit drainlines and bottom of former seepage pit) to define the vertical extent of tritium.	~~34~~ locations ~~34~~ samples	45–~~56~~ beneath former seepage pit ~~structures~~drainlines and former seepage pit	Soil, tuff	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
33-002(a)-99 (continued)	SWMU 33-002(c)	Collect one sample from VCA location 33-25086 (5 to 6 ft beneath bottom of former seepage pit) to define the vertical extent of SVOCs.	1 location, 1 sample	5–6 beneath former seepage pit	Soil, tuff	—	—	—	—	—	X	—	—	—	—	—	—	—	—	—
	SWMU 33-002(c)	Collect 10 samples from VCA locations 33-25118, 33-25119, 33-25120, 33-25121, and 33-25122 at deeper VCA depth and next deeper interval (2 to 3 ft and 5 to 6 ft beneath bottom of former seepage pit drainlines) to define vertical extent of explosive compounds.	5 locations, 5 samples	2–3 and 5–6 beneath bottom of former seepage pit drainlines	Soil, tuff	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—
	SWMU 33-002(d)	Collect 15 samples from three depths at five locations at the outfall and in the drainage channel directly east of the outfall to define vertical and lateral extent of contamination.	5 locations, 15 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	X	X	X
	SWMU 33-002(e)	Collect nine samples from three depths at three locations at the outfall and in the drainage channel directly east of the outfall to define vertical and lateral extent of contamination.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	X	X	X

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-010(f)	After debris removal, collect a total of 30 samples from three depths at five locations within each debris area: one in the center of each area and four step-out locations around the debris area 10 ft out from the center of each area.	10 locations, 30 samples	0–1, 3–4, 5–6	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	Sitewide subsurface tritium	Advance seven boreholes to the top of the basalt, collect soil, tuff, and pore gas samples at 10-ft intervals; data will be used to determine the extent of the subsurface tritium plume associated with SWMUs 33-002(a–e) and if any boreholes will be completed as vapor-monitoring wells.	7 locations Number of samples TBD	10-ft intervals to top of basalt	Soil, tuff, pore gas	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
	Site drainage	Collect ten samples from two depths from five locations in the main drainage channel downgradient of Consolidated Unit 33-002(a)-00 to the Chaquehui Canyon tributary drainage channel southeast of the site to determine if contaminants are migrating from the site.	5 locations 10 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	X	X	X
33-004(a)-00	SWMU 33-004(a)	Collect 10 samples from two depths beneath septic system structures at one location west of building 33-0039 where two drainlines come together, one location at septic tank inlet, one location next to the downgradient (south) side of the septic tank, one location at the septic tank outlet, and one location next to the manhole east of the facility fence. Samples to be collected from deeper intervals to determine extent.	5 locations, 10 samples	0–1, 3–4 below structures	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	X	—
	SWMU 33-004(a), Seepage pits	Collect 14 samples from two boreholes drilled next to the two active seepage pits.	2 locations, 14 samples	9–10, 19–20, 29–30, 39–40, 49–50, 59–60, 69–70	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	
33-004(a)-00 (continued)	SWMU 33-004(a), Drain field	Collect 24 samples at eight locations within the inactive drain field from three depths beneath the bottom of the drain field VCP. Samples to be collected from deeper intervals to determine extent.	8 locations, 24 samples	0–1, 2–3, 4–5 below pipe joints	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	—
	SWMU 33-004(h)	Collect nine samples from three depths at the three previous RFI locations (33-01051, 33-01052, and 33-01054) at and downgradient of the outfall to determine extent. Data from downgradient drainage samples to be collected for other SWMUs and AOCs in Consolidated Unit 33-004(a)-00 may be used to determine extent for SWMU 33-004(h), if needed.	3 locations, 9 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-004(i)	Collect 30 samples from three depths at the three previous RFI sampling locations for each outfall area (33-01055, 33-01056, and 33-01057 at north outfall and locations 33-10158, 33-01059, 33-01060 at the south outfall) and at two additional locations in the drainages downgradient of each outfall. Samples to be collected from deeper intervals to determine extent. Data from the five downgradient drainage samples to be collected for other SWMUs and AOCs in Consolidated Unit 33-004(a)-00 may be used to determine extent for SWMU 33-004(i), if needed.	10 locations, 30 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
	SWMU 33-011(d)	Collect 15 samples from three depths at five previous RFI locations (33-01081, 33-01566, 33-01567, 33-01571, and 33-01572) beneath asphalt pad where inorganic chemicals were detected greater than 5 times BV to determine vertical extent. Collect 12 samples from three depths at four new step-out locations away from the asphalt pad to determine lateral extent.	5 locations, 15 samples 4 locations, 12 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	X	—	—	—
	SWMU 33-015	Collect 15 samples from three depths at five locations: one location beneath incinerator and four step-out (maximum 10 ft) locations adjacent to the incinerator; collect samples from deeper intervals to determine extent.	5 locations, 15 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	—	—	X	X	—	X	X[c]	—	—	—	—	—	—
	SWMU 33-017	Collect 75 samples from three depths at 25 previous RFI locations with highest detected contaminant concentrations (screening- and decision-level data) within Main Site samples collected from deeper intervals to determine extent. (See Table 4.1-5 for list of 25 previous RFI sampling locations.)	25 locations, 75 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X	X	X	X	X	—	—
	SWMU 33-017, Drainage	Collect 15 samples from three depths at five locations in the drainage downgradient of Main Site to the stormwater gauging station E340 in the Chaquehui Canyon tributary. NOTE: drainage sample data will be used to characterize extent for other SWMUs and AOCs in and around Consolidated Unit 33-004(a)-00, including AOC 33-008(c).	5 locations, 15 samples	0–1, 2–3, 4–5	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X	X	X	X	X	—	—
33-005(a)-00	SWMU 33-005(a–c), 33-011(a)	Collect a total of 60 samples from three depths at all 14 previous RFI sampling locations and from 6 new sampling locations along the former SMWU 33-005(b) drainline to determine the vertical extent of residual contamination.	20 locations, 60 samples	2–3, 5–6, 8–9	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	—
	SWMU 33-005(a–c), 33-011(a), Drainage	Collect 10 samples from two depths at five locations in the drainage downgradient of the consolidated unit sites.	5 locations, 10 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	X	X	—	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	AOC 33-008(c), North Area	Collect 12 samples from two depths from the two former RFI sampling locations (33-01685 and 33-01670) and from four new sampling locations around the site; deeper intervals to define extent.	6 locations, 12 samples	0–1, 5–6	Soil, tuff	X	X	—	—	X	X	—	—	X[c]	X	X	—	X	—	—
	AOC 33-008(c), Culvert Area	Collect 30 samples from three depths from six of the former RFI sampling locations (33-01672, 33-01679, 33-01680, 33-01681, 33-01682, and 33-01684) and from four additional locations downgradient of the area.	10 locations, 30 samples	0–1, 5–6, 9–10	Soil, tuff	X	X	—	—	X	X	—	—	X[c]	X	X	—	X	—	—
	SWMU 33-011(e)	Collect 18 samples from three depths from two previous RFI locations within the former storage area (33-01094 and 33-01085), two new locations within the former storage area, and four locations around the former storage area. Deeper sample intervals will determine extent.	8 locations, 24 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	X	X	—	—
	SWMU 33-012(a)	Collect 21 samples from three depths from three previous RFI locations under the pad (locations 33-01086, 33-01087 and 33-01089), three new locations next to the pad, and one new location downgradient of the pad. Deeper sample intervals will determine extent.	7 locations, 21 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	—	—	X	X	—	—	X	—	—
	SWMU 33-016	Collect 10 samples from two depths beneath bottom of sump from two locations adjacent to sump and from three locations along drainline beneath bottom of drainline.	5 locations, 10 samples	0–1, 3–4 beneath sump and drainline	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
		Collect eight samples from two depths at four locations within the outfall and drainage downgradient of the outfall.	4 locations, 8 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	X	—	—	—	—	—
	AOC C-33-001	Collect 12 samples from two depths from four previous RFI locations around concrete pad (33-01748, 33-01749, 33-01751, and 01752) and two additional downgradient locations to determine extent.	6 locations, 12 samples	0–1, 3–4	Soil, tuff	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
	AOC C-33-003	Collect 78 samples from three depths from all 10 previous confirmation sampling locations and 16 new sampling locations within and downgradient of both fill areas.	26 locations, 78 samples	0–1, 4–5, into tuff	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	X	—	—	X	—	—
	AOC C-33-003	Collect six samples from two depths at three locations in the drainage channel downgradient of the southwest fill area next to the water tower. Extent downslope will be determined by data from the 6 sampling locations in the drainage downgradient of SWMU 33-004(d).	3 locations, 6 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	X	—	—	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
Area 6																				
	SWMU 33-004(d)	Collect eight confirmation samples from two depths beneath each structure: at one location within septic tank excavation, one location beneath the inlet, one location beneath the outlet, and from one location along the inlet drainline.	4 locations, 8 samples	0–1, 3–4 Beneath structures	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	X	—	—
	SWMU 33-004(d), Drain field	Collect six samples from deeper intervals from two previous RFI locations (33-01183 and 33-01184) in drain field beneath the drainline.	2 locations, 6 samples	4–5, 7–8, 9–10,	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	X	—	—
	SWMU 33-004(d), Outfall and drainage channel	Collect 16 samples from deeper interval from six previous RFI locations (33-01185, 33-01186, 33-01187, 33-01189, 33-01190, and 33-01191) along outlet line, in drain field, and in the drainage channel downgradient of the site. NOTE: Data from the six drainage samples will be used to determine extent for AOC C-33-033.	8 locations, 16 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	X	—	—
33-004(g)-00	SWMU 33-004(g)	Collect 10 samples from two depths at five previous RFI locations at culvert and within outfall area (33-01192 and 33-01196), including a deeper interval to determine extent.	5 locations, 10 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	—	X	—	—
	SWMU 33-007(c), Former catcher boxes	Collect nine samples from three depths at three locations within footprint of former catcher boxes where treated backfill was emplaced.	3 locations, 9 samples	0–1 and 2–3 into backfill, 0–1 into undisturbed tuff	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-007(c), Former catcher boxes	Collect 12 samples from three depths at four step-out locations around former catcher boxes to determine extent.	4 locations, 12 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-007(c), Cinder cone	Collect samples from three depths at six previous RFI locations (33-01199, 33-01203, 33-01204, 33-01206, 33-01211, and 33-01212) within and around cinder cone to edge of slope to determine extent to north, south, and east. Extent downslope to the west will be determined by SWMU 33-009 sampling.	6 locations, 18 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—
	SWMU 33-009, Cinder cone slope disposal area	Collect samples from three depths at five locations along each of two transects across slope within and below disposal area to determine extent.	10 locations, 30 samples	0–1, 2–3, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—
	SWMU 33-009, Drainage	Collect samples from two depths at six locations in the drainage below cinder cone slope to determine extent. Samples may also be used to determine extent from SWMUs 33-004(g) and 33-007(c).	6 locations, 12 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X	X	—	—	—	—	—
South Site																				
33-001(a)-99	SWMUs 33-001(a–e)	Drill five boreholes to a minimum of 70-ft-depth bgs next to and as close as possible to the outside edge of each disposal pit and the test shaft to determine extent of any releases from MDA E. NOTE: the borehole next to the test shaft may have to be drilled inside the fence.	5 locations, 35 samples	10 ft intervals	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-004(b)	Collect six confirmation samples from two depths (0 to 1 ft and 3 to 4 ft below the structures) from three locations: beneath the tank inlet, within the tank excavation, and beneath the tank outlet.	3 locations, 6 samples	0–1, 3–4	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-004(b)	Collect four samples from two depths (0 to 1 ft and 3 to 4 ft beneath the drainline) at two locations along the inlet drainline from former building 33-0024. Collect two samples from two depths (0 to 1 ft and 3 to 4 ft bgs) at one location at the outfall.	3 locations, 6 samples	0–1, 3–4	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
	SWMU 33-004(b), Drainage	Collect six samples from two depths from three locations in the drainage downgradient of the outfall.	3 locations, 6 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	—	—	—	—	—
33-004(j)-00	SWMU 33-004(j)	Collect four samples from two depths from two locations: one at the culvert discharge point and one at the outfall.	2 locations, 4 samples	0–1, 2–3	Soil, tuff	X	X	—	—	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-004(j), Drainage	Collect four samples from two depths from two locations in the drainage downgradient of the site. This same drainage will also be investigated as part of SWMUs 33-006(a), 33-007(b), and 33-010(c).	2 locations, 4 samples	0–1, 2–3	Soil, tuff, sediment	X	X	—	—	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-006(a), Removal locations	Collect confirmation samples from two depths in bottom of excavation at areas where soils with elevated radioactivity or HE are observed following the removal of firing site debris within the sampling area around the former shot pad.	To be determined	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-006(a)	Collect four samples from two depths from two locations within the SWMU 33-006(a) shot pad. Collect 16 samples from two depths from four 10-ft step-out sampling locations around the former shot pad and from four 30-ft step-out sampling locations around the shot pad.	10 locations, 20 samples	0–1, 2–3 0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-006(a), SWMU 33-010(c), SWMU 33-010(g), SWMU 33-010(h), Drainages	Collect 27 samples from three depths at three locations in each of the three main South Site drainages. Sampling locations will be targeted to the sediment traps within each drainage.	9 locations, 27 samples	0–1, soil-tuff interface, 1 ft into the tuff.	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), North location	At berm 33-0043 [SWMU 33-007(b)], collect eight samples from two depths (0 to 1 ft and 5 to 6 ft below the fill used in the former catcher box location) from four locations in and around the former catcher box location.	4 locations, 8 samples	0–1, 5–6	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
33-004(j)-00 (continued)	SWMU 33-007(b), SWMU 33-011(c), North location embankment	Collect four samples from two depths at two locations below the bottom of the embankment where projectiles were fired.	2 locations, 4 samples	0–1, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-007(b), SWMU 33-011(c), North location, drainage	Collect six samples from two depths at three locations within the drainage downgradient of SWMU 33-007(b) (east location).	3 locations, 6 samples	0–1, 3–4	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), Building 33-0025	At building 33-0025 [SWMUs 33-007(b) and 33-011(c)], collect 24 from three depths at eight locations from the footprint of former gun firing site berm 33-0063 and the former unpaved storage area formerly used to stage tritium containers. Ensure samples are collected beneath the engineering fill recently added to the site.	8 locations, 24 samples	0–1, 4–5, 9–10	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-007(b), SWMU 33-011(c), Building 33-0025	Collect 4 samples from two depths at two locations in the drainage southwest of building 33-0025 [SWMUs 33-007(b) and 33-011(c)], Samples to be collected in the other South Sites drainages will complete this determination (see Figure 4.3-17).	2 locations, 4 samples	0–1, 3–4	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	X	X	—	—
	SWMU 33-008(a)	Collect 12 confirmation samples from two depths from six locations beneath the bottom of the landfill excavation to determine vertical extent.	6 locations, 12 samples	0–1, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
		Collect 16 samples from two depths at eight step-out locations (6 ft) locations surrounding the landfill to determine lateral extent.	8 locations, 16 samples	4–5, 9–10	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-010(c)	Collect 18 samples from three depths from two locations within the remediated portion of SWMU 33-010(c) and from four locations around SWMU 33-010(c).	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-010(c)	See description of drainage sampling locations under SWMU 33-006(a) above.	n/a[d]	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-010(h)	Collect 18 samples from three depths from two locations within disposal area and from four locations around SWMU 33-010(h).	6 locations, 18 samples	0–1, 3–4, 6–7	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
	SWMU 33-010(h)	See description of drainage sampling locations under SWMU 33-006(a) above.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	SWMU 33-014	Collect eight samples from two depths from four locations within the former burn area. In addition, collect eight samples from two depths from four step-out locations around the former burn area.	8 locations, 16 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	X	X	X[c]	X	—	—	—	—	—
	SWMU 33-010(g)	Collect eighteen samples from two depths from eight locations within the western portion of SWMU 33-010(g) and from one location at the head of the drainage directly downgradient of the western portion of SWMU 33-010(g).	9 locations, 18 samples	0–1, 3–4	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
		Collect twenty samples from two depths from ten locations within the eastern portion of SWMU 33-010(g).	10 locations, 20 samples	0–1, 3–4																

Table 4.0-1 (continued)

Consolidated Unit	Site	Sampling Justification	Number of Locations and Samples	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Cyanide (EPA SW-846:9012A)	Nitrate (EPA 300)	Perchlorate (EPA SW-846:6850)	VOCs (EPA SW-846:8260B)	SVOCs (EPA SW-846:8270C)	Explosive Compounds (EPA SW-846:8321A_MOD)	Dioxins/Furans (EPA SW-846:8280)	PCBs (EPA SW-846:8082)	Isotopic Uranium, (HASL-300)	Isotopic Plutonium (HASL 300)	Tritium	Gamma Spectroscopy (EPA 901.1M)	Americium-241 (HASL-300)	Strontium-90
	SWMU 33-010(g)	See description of drainage sampling locations under SWMU 33-006(a) above.	n/a	n/a	n/a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
NRAO																				
	SWMU 33-004(m)	Collect eight samples from two depths from one location next to the bottom of the east side of the septic tank, one location adjacent to the septic tank inlet, one location adjacent to the septic tank outlet, and from one location adjacent the inlet drain line.	4 locations, 8 samples	0–1, 2–3	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	SWMU 33-004(m), Leach field	Collect nine samples from three depths at three locations surrounding the leach field.	3 locations, 9 samples	0–1, soil/tuff interface 1 ft into tuff	Soil, tuff	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	SWMU 33-004(m), Downgradient drainage	Collect six samples from two depths (0 to 1 ft and 2 o 3 ft bgs) from three locations in the drainage downgradient of the site.	3 locations, 6 samples	0-1, 2-3	Soil, tuff, sediment	X	X	X	X	X	X	—	—	X[c]	—	—	—	—	—	—
	AOC 33-011(b)	Collect 12 samples from two depths from all six previous RFI locations (33-01435, 33-01436, 33-01438, 33-01439, 33-01440, and 33-01441) within the former storage area; deeper intervals will define extent.	6 locations, 12 samples	0–1, 4–5	Soil, tuff	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—
		Collect six samples from two depths from three locations downgradient and west of the site.	3 locations, 6 samples	0–1, 2–3	Soil, tuff, sediment	X	X	X	X	X	X	X	—	X[c]	X	X	—	X	—	—

[a] X = Analysis proposed.

[b] — = Analysis will not be performed.

[c] 20% of samples collected will be analyzed for PCBs.

[d] n/a = Not applicable.

Table 4.1-1
Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
SWMU 33-002(a)																				
0333-96-0525	33-01652	1.0–1.5	Soil	—[a]	—	—	—	2293[b]	—	2292, 2293	—	—	—	—	—	2291	—	2293	—	2291
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	2293	—	2292, 2293	—	—	—	—	—	2291	—	2293	—	2291
0333-96-0546	33-01652	6.0–7.0	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0527	33-01652	12.5–12.9	Soil	—	—	—	—	2293	—	2292, 2293	—	—	—	—	—	2291	—	2293	—	2291
0333-96-0528	33-01652	15.08–16.08	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2293	—	—
0333-96-0529	33-01652	23.42–24.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2293	—	—
0333-96-0531	33-01652	30.08–31.08	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0537	33-01652	61.0–61.83	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0534	33-01652	73.42–74.58	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0540	33-01652	76.92–77.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0543	33-01652	92.5–93.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0547	33-01652	113.0–113.67	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0548	33-01652	117.5–118.33	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2340	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	2167	—	2166, 2167	—	—	—	—	—	2165	—	2167	—	2165
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	2167	—	2166, 2167	—	—	—	—	—	2165	—	2167	—	2165
0333-96-0045	33-01696	12.58–13.17	Qbt3	—	—	—	—	2167	—	2166, 2167	—	—	—	—	—	2165	—	2167	—	2165
0333-96-0046	33-01696	19.0–19.58	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2167	—	—
0333-96-0047	33-01696	24.0–25.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2167	—	—
0333-96-0048	33-01696	26.0–26.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2167	—	—
RE33-05-60743	33-24716	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60747	33-24716	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60745	33-24717	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60749	33-24717	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60744	33-24718	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60748	33-24718	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60746	33-24719	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60750	33-24719	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60751	33-24720	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60752	33-24720	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60753	33-24721	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60754	33-24721	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60755	33-24722	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-60756	33-24722	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60757	33-24723	~~0~~3.0–~~0~~3.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60758	33-24723	~~2~~5.0–~~2~~5.5	Qbt3	3419S	3421S	3419S	3420S	3419S	3419S	3421S	3421S	3420S	3421S	—	3419S	3420S	—	3419S	—	3420S
RE33-05-60759	33-24724	~~0~~2.0–~~0~~2.5	Fill	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60760	33-24724	~~2~~4.0–~~2~~4.5	Qbt3	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60761	33-24725	~~0~~8.0–~~0~~8.5	Fill	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60762	33-24725	~~2~~10.0–~~2~~10.5	Qbt3	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60763	33-24726	~~0~~3.0–~~0~~3.5	Fill	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
RE33-05-60764	33-24726	~~2~~5.0–~~2~~5.5	Qbt3	3455S	3455S	3455S	3454S	3455S	3455S	3455S	3455S	3454S	3455S	—	3455S	3454S	—	3455S	—	3454S
~~RE33-05-61274~~	~~33-24807~~	~~5.0–7.0~~	~~Fill~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~3456S~~
RE33-05-63010	33-25097	~~0~~3.0–~~0~~3.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63011	33-25097	~~2~~5.0–~~2~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63012	33-25098	~~0~~3.0–~~0~~3.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63013	33-25098	~~2~~5.0–~~2~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63195	33-25107	~~0~~5.0–~~0~~5.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63196	33-25107	~~2~~7.0–~~2~~7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63197	33-25108	~~0~~5.0–~~0~~5.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63198	33-25108	~~2~~7.0–~~2~~7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63199	33-25109	~~0~~5.0–~~0~~5.5	Fill	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63200	33-25109	~~2~~7.0–~~2~~7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63201	33-25110	~~0~~3.0–~~0~~3.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63202	33-25110	~~2~~5.0–~~2~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63203	33-25111	~~0~~4.0–~~0~~4.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63204	33-25111	~~2~~6.0–~~2~~6.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63205	33-25112	~~0~~5.0–~~0~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63206	33-25112	~~2~~7.0–~~2~~7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63207	33-25113	~~0~~5.0–~~0~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63208	33-25113	~~2~~7.0–~~2~~7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63209	33-25114	~~0~~3.0–~~0~~3.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63210	33-25114	~~2~~5.0–~~2~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63211	33-25115	~~0~~4.0–~~0~~4.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63212	33-25115	~~2~~6.0–~~2~~6.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63213	33-25116	~~0~~3.0–~~0~~3.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63214	33-25116	~~2~~5.0–~~2~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-63215	33-25117	~~0~~5.0–~~0~~5.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
RE33-05-63216	33-25117	~~2~~7.0–~~2~~7.5	Fill	3769S	3768S	3769S	—	3769S	3769S	3768S	3768S	3767S	3768S	—	3769S	3767S	3767S	3769S	—	3767S
SWMU 33-002(b)																				
0333-96-0070	33-01328	10.0–15.0	Qbt3	—	—	—	—	2178	—	2177 ,2178	—	—	—	—	—	2176	—	2178	—	2176
0333-96-0071	33-01328	16.0–16.33	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2178	—	—
0333-96-0072	33-01328	21.5–22.5	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2178	—	—
0333-96-0073	33-01328	26.25–27.25	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2178	—	—
0333-96-0500	33-01328	30.0–31.25	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0501	33-01328	36.0–36.75	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0502	33-01328	40.0–41.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0503	33-01328	43.0–45.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0506	33-01328	59.5–60.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0509	33-01328	71.75–72.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0512	33-01328	87.5–88.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0515	33-01328	102.5–103.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0516	33-01328	109.0–110.0	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0517	33-01328	114.0–115.0	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
0333-96-0518	33-01328	116.5–117.5	Qbt4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2232	—	—
~~RE33-05-61273~~	~~33-24806~~	~~5.0–7.0~~	~~Fill~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~3456S~~
RE33-05-62977	33-25082	~~0~~3.0–~~0~~3.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62978	33-25082	~~2~~5.0–~~2~~5.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62979	33-25083	~~0~~3.0–~~0~~3.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62980	33-25083	~~2~~5.0–~~2~~5.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62981	33-25084	~~0~~3.0–~~0~~3.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62982	33-25084	~~2~~5.0–~~2~~5.5	Qbt3	3634S	3634S	3634S	3633S	3634S	3634S	3634S	3634S	3634S	3634S	—	3634S	3634S	—	3634S	—	3634S
RE33-05-62987	33-25087	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62988	33-25087	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62989	33-25088	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62990	33-25088	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	—	—	3970S
RE33-05-63000	33-25092	~~0~~2.0–~~0~~2.5	Fill	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63001	33-25092	~~2~~4.0–~~2~~4.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63002	33-25093	~~0~~3.0–~~0~~3.5	Qbt3	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63003	33-25093	~~2~~5.0–~~2~~5.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63004	33-25094	~~0~~4.0–~~0~~4.5	Qbt3	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-63005	33-25094	~~26~~.0–~~26~~.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63006	33-25095	~~04~~.0–~~04~~.5	Fill	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63007	33-25095	~~26~~.0–~~26~~.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63008	33-25096	~~04~~.0–~~04~~.5	Fill	3701S	3700S	3701S	—	3701S	3701S	3700S	3700S	3699S	3700S	—	3701S	3699S	3699S	3701S	—	3699S
RE33-05-63009	33-25096	~~26~~.0–~~26~~.5	Qbt3	3714S	3713S	3714S	—	3714S	3714S	3713S	3713S	3712S	3713S	—	3714S	3712S	3712S	3714S	—	3712S
RE33-05-63227	33-25123	~~05~~.0–~~05~~.5	Qbt3	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	—	3895S
RE33-05-63228	33-25123	~~27~~.0–~~27~~.5	Qbt3	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	—	3877S
RE33-05-63229	33-25124	~~04~~.0–~~04~~.5	Qbt3	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	—	3895S
RE33-05-63230	33-25124	~~26~~.0–~~26~~.5	Qbt3	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	—	3877S
RE33-05-63231	33-25125	~~05~~.0–~~05~~.5	Qbt3	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	3895S	3895S	—	3895S	3895S	3895S	3895S	—	3895S
RE33-05-63232	33-25125	~~27~~.0–~~27~~.5	Qbt3	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	3877S	3877S	—	3877S	3877S	3877S	3877S	—	3877S
SWMU 33-002(c)																				
0333-96-0076	33-01697	10.0–12.5	Qbt3	—	—	—	—	2190	—	2189, 2190	—	—	—	—	—	2188	—	2190	—	2188
0333-96-0049	33-01697	19.17–19.5	Qbt3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0050	33-01697	23.75–24.17	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0051	33-01697	28.0–29.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0052	33-01697	31.42–31.83	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0053	33-01697	36.0–36.42	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0054	33-01697	40.0–40.58	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0055	33-01697	47.5–48.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0056	33-01697	51.83–52.0	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0057	33-01697	57.5–58.5	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
0333-96-0058	33-01697	61.42–62.17	Qbt2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2195	—	—
RE33-05-60765	33-24727	~~04~~.0–~~04~~.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60766	33-24727	~~26~~.0–~~26~~.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60767	33-24728	~~03~~.0–~~03~~.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60768	33-24728	~~25~~.0–~~25~~.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60769	33-24729	~~03~~.0–~~03~~.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
RE33-05-60770	33-24729	~~25~~.0–~~25~~.5	Qbt3	3422S	3424S	3422S	3423S	3422S	3422S	3424S	3424S	3423S	3424S	—	3422S	3423S	—	3422S	—	3423S
~~RE33-05-61272~~	~~33-24805~~	~~5.0–7.0~~	~~Fill~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~3456S~~
RE33-05-62983	33-25085	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	—	—	3970S
RE33-05-62984	33-25085	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S
RE33-05-62985	33-25086	10.0–10.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	—	—	3970S
RE33-05-62986	33-25086	12.0–12.5	Qbt3	3972S	3971S	3972S	3970S	3972S	3972S	3971S	3971S	3970S	3971S	—	3972S	3970S	—	3971S	—	3970S

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
RE33-05-63217	33-25118	02.0–02.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63218	33-25118	24.0–24.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63219	33-25119	05.0–05.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63220	33-25119	27.0–27.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63221	33-25120	05.0–05.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63222	33-25120	27.0–27.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63223	33-25121	05.0–05.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63224	33-25121	27.0–27.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63225	33-25122	04.0–04.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
RE33-05-63226	33-25122	26.0–26.5	Qbt3	3818S	3817S	3818S	—	3818S	3818S	3817S	3817S	3816S	3817S	—	3818S	3816S	3816S	3818S	—	3816S
SWMU 33-004(a)																				
0333-97-0004	XX-33-604072	0.0–0.0	Soil	—	—	—	—	—	—	3751R	—	—	—	—	—	—	—	—	—	3750R
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	—	—	—	—	3796R	—	—	—	—	—	—	—	—	—	3795R
AOC 33-008(c)																				
0333-96-0652	33-01670	0.0–0.5	Soil	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0654	33-01671	0.5–0.8	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	2655
0333-96-0655	33-01672	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0656	33-01672	1.0–1.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	2655
0333-96-0657	33-01673	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0658	33-01674	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0659	33-01675	0.0–0.5	Soil	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0675	33-01679	5.0–7.0	Qbo	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0677	33-01680	0.0–0.5	Sed	—	2656	—	—	—	—	2656	—	—	—	—	—	2655	—	—	2657	—
0333-96-0678	33-01680	0.0–2.0	Sed	—	2669	—	—	—	—	2669	—	—	—	—	—	2668	—	—	2670	2668
0333-96-0679	33-01680	2.0–4.0	Qbo	—	2669	—	—	—	—	2669	—	—	—	—	—	2668	—	—	2670	2668
0333-96-0681	33-01681	0.5–1.25	Sed	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0682	33-01681	5.0–6.0	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	2674
0333-96-0684	33-01682	0.0–1.0	Sed	—	2681	—	—	—	—	2681	—	—	—	—	—	2680	—	—	2682	2680
0333-96-0685	33-01682	1.0–2.0	Qbo	—	2681	—	—	—	—	2681	—	—	—	—	—	2680	—	—	2682	2680
0333-96-0669	33-01683	0.0–0.5	Sed	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
0333-96-0670	33-01684	0.0–0.5	Fill	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
0333-96-0671	33-01685	0.0–0.5	Soil	—	2675	—	—	—	—	2675	—	—	—	—	—	2674	—	—	2676	—
SWMU 33-011(d)																				
0333-96-0111	33-01566	0.0–0.5	Fill	—	—	—	—	—	—	2365, 2366	—	—	—	—	—	—	—	—	—	—
0333-96-0120	33-01566	0.67–1.0	Fill	—	—	—	—	—	—	2376, 2377	—	—	—	—	—	—	—	—	—	—
0333-96-0112	33-01567	0.0–0.5	Fill	—	—	—	—	—	—	2365, 2366	—	—	—	—	—	—	—	—	—	—
0333-96-0121	33-01567	0.67–1.0	Fill	—	—	—	—	—	—	2376, 2377	—	—	—	—	—	—	—	—	—	—
0333-96-0113	33-01568	0.0–0.5	Fill	—	—	—	—	—	—	2365, 2366	—	—	—	—	—	—	—	—	—	—
0333-96-0122	33-01568	0.67–1.0	Fill	—	—	—	—	—	—	2376, 2377	—	—	—	—	—	—	—	—	—	—
0333-96-0114	33-01569	0.0–0.5	Fill	—	—	—	—	—	—	2365,2366	—	—	—	—	—	—	—	—	—	—
0333-96-0123	33-01569	0.42–0.67	Fill	—	—	—	—	—	—	2376,2377	—	—	—	—	—	—	—	—	—	—
0333-96-0110	33-01570	0.0–0.5	Sed	—	—	—	—	—	2366	—	—	—	—	—	—	—	—	—	—	—
0333-96-0117	33-01570	0.17–0.58	Fill	—	—	—	—	—	2377	—	—	—	—	—	—	—	—	—	—	—
0333-96-0115	33-01571	0.0–0.5	Soil	—	—	—	—	—	—	2365,2366	—	—	—	—	—	—	—	—	—	—
0333-96-0124	33-01571	0.5–0.75	Qbo	—	—	—	—	—	—	2376,2377	—	—	—	—	—	—	—	—	—	—
0333-96-0116	33-01572	0.0–0.5	Fill	—	—	—	—	—	—	2365,2366	—	—	—	—	—	—	—	—	—	—
0333-96-0125	33-01572	0.5–0.67	Fill	—	—	—	—	—	—	2376,2377	—	—	—	—	—	—	—	—	—	—
SWMU 33-017																				
0333-96-0130	33-01585	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0140	33-01595	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0141	33-01596	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0144	33-01601	1.0–1.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Nitrate	PCBs	Perchlorate	Pesticides/PCBs	Strontium-90	SVOCs	Total Petroleum Hydrocarbons/Diesel Range Organics	Tritium	Uranium	VOCs
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	2339	—	—	—	—
0333-96-0149	33-01604	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0151	33-01606	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0152	33-01607	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0157	33-01612	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2364	—	—	—	—	—	—
0333-96-0159	33-01614	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2367	—	—	—	—	—	—
0333-96-0160	33-01615	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2367	—	—	—	—	—	—
0333-96-0161	33-01616	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2367	—	—	—	—	—	—
AOC C-33-001																				
0333-96-2042	33-01748	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
0333-96-2043	33-01749	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
0333-96-2045	33-01751	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
0333-96-2046	33-01752	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	2393	—	—	—	—	—	—
AOC C-33-003																				
RE33-99-0009	33-01708	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0032	33-01709	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0011	33-01710	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0033	33-01710	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0034	33-01711	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0035	33-01712	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0036	33-01713	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0015	33-01714	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0037	33-01714	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	5579R	5578R	—	—	—	—	—	5577R	—	—	—	5570R
RE33-99-0038	33-01715	2.0–2.5	Qbt3	—	—	—	—	—	5653R	5652R	—	—	—	—	—	5651R	—	—	—	5651R
RE33-99-0061	33-01716	0.0–0.5	Sed	—	—	—	—	—	5683R	5682R	—	—	—	—	—	—	—	—	—	—
RE33-99-0062	33-01717	0.0–0.5	Sed	—	—	—	—	—	5683R	5682R	—	—	—	—	—	—	—	—	—	—

[a] — = Analysis not requested.

[b] Analytical request number.

Table 4.1-2
Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
SWMU 33-002(a)															
0333-96-0525	33-01652	1.0–1.5	Soil	—[b]	7.2 (U)	—	—	0.5 (U)	—	—	—	—	NA[c]	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	7.5 (U)	—	—	0.52 (U)	—	—	—	—	NA	—	—
0333-96-0527	33-01652	12.5–12.9	Soil	—	7.5 (U)	—	—	0.52 (U)	—	—	—	—	NA	—	—
0333-96-0043	33-01696	2.3–3.0	Soil	—	5.3 (U)	—	—	—	—	—	—	—	NA	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	5 (U)	—	—	—	—	—	—	—	NA	—	—
0333-96-0045	33-01696	12.6–13.2	Qbt 3	—	5 (U)	—	—	—	—	—	—	—	NA	—	—
RE33-05-60743	33-24716	~~3~~0.0–~~0~~3.5	Qbt 3	—	—	3.29	—	—	13300 (J)	—	—	5.33	—	—	44.5 (J-)
RE33-05-60747	33-24716	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	3940 (J)	—	—	—	—	—	—
RE33-05-60745	33-24717	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	2.95	—	—	13000 (J)	—	—	—	—	—	—
RE33-05-60749	33-24717	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	2.91	—	—	12600 (J)	—	—	—	—	—	—
RE33-05-60744	33-24718	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	4280 (J)	—	—	5.04	—	—	—
RE33-05-60748	33-24718	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	3.06	—	—	12500 (J)	—	—	5.31	—	—	—
RE33-05-60746	33-24719	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	79.7 (J-)	—	22200 (J)	—	—	6.83	—	—	—
RE33-05-60750	33-24719	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60751	33-24720	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	46.8 (J-)	—	7670 (J)	—	—	5.22	—	—	—
RE33-05-60752	33-24720	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	54.4 (J-)	—	8230 (J)	—	—	—	—	—	—
RE33-05-60753	33-24721	~~0~~3.0–~~0~~3.5	Qbt 3	12900	—	3.75	147 (J-)	—	17100 (J)	—	—	9.24	—	—	81.1 (J-)
RE33-05-60754	33-24721	~~2~~5.0–~~2~~5.5	Qbt 3	13800	—	3.74	156 (J-)	—	14900 (J)	—	—	5.56	—	—	88.8 (J-)
RE33-05-60755	33-24722	~~0~~3.0–~~0~~3.5	Qbt 3	13000	—	3.49	101 (J-)	—	8740 (J)	8.05	—	8.44	—	—	—
RE33-05-60756	33-24722	~~2~~5.0–~~2~~5.5	Qbt 3	13200	—	3.46	102 (J-)	—	7630 (J)	7.3	—	6.97	—	—	12.6 (J-)
RE33-05-60757	33-24723	~~0~~3.0–~~0~~3.5	Qbt 3	14300	—	3.77	112 (J-)	—	6720 (J)	8.22	—	37.3	—	—	—
RE33-05-60758	33-24723	~~2~~5.0–~~2~~5.5	Qbt 3	17000	—	4.13	131 (J-)	—	6500 (J)	10.5	—	20.9	—	—	—
RE33-05-60759	33-24724	~~0~~2.0–~~0~~2.5	Fill	—	—	—	339 (J)	0.569 (U)	10400 (J)	—	—	—	—	—	—
RE33-05-60760	33-24724	~~2~~4.0–~~2~~4.5	Qbt 3	9970 (J+)	—	—	75.4 (J)	—	4590 (J)	—	—	—	—	—	—
RE33-05-60761	33-24725	~~0~~8.0–~~0~~8.5	Fill	—	—	—	—	—	10900 (J)	—	—	35.4	—	—	—
RE33-05-60762	33-24725	~~2~~10.0–~~2~~10.5	Qbt 3	8630 (J+)	—	—	58.6 (J)	—	2880 (J)	—	—	5.85	—	—	—
RE33-05-60763	33-24726	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	8120 (J)	—	—	88	—	—	57.7
RE33-05-60764	33-24726	~~2~~5.0–~~2~~5.5	Qbt 3	10900 (J+)	—	3.19	81.9 (J)	—	17100 (J)	10.9	—	37.8	—	—	19.2
RE33-05-63010	33-25097	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63011	33-25097	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63012	33-25098	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
RE33-05-63013	33-25098	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	21.7	0.54 (U)	—	—
RE33-05-63195	33-25107	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	30.6	—	66.6 (J-)	0.53 (U)	—	—
RE33-05-63196	33-25107	~~2~~7.0–~~2~~7.5	Fill	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
RE33-05-63197	33-25108	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63198	33-25108	~~2~~7.0–~~2~~7.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63199	33-25109	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE33-05-63200	33-25109	~~2~~7.0–~~2~~7.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63201	33-25110	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	25.4	0.54 (U)	—	—
RE33-05-63202	33-25110	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE33-05-63203	33-25111	~~0~~4.0–~~0~~4.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63204	33-25111	~~2~~6.0–~~2~~6.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE33-05-63205	33-25112	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63206	33-25112	~~2~~7.0–~~2~~7.5	Fill	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63207	33-25113	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	—	—	22.3	0.57 (U)	—	—
RE33-05-63208	33-25113	~~2~~7.0–~~2~~7.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE33-05-63209	33-25114	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE33-05-63210	33-25114	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
RE33-05-63211	33-25115	~~0~~4.0–~~0~~4.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE33-05-63212	33-25115	~~2~~6.0–~~2~~6.5	Fill	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE33-05-63213	33-25116	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	19.6	0.55 (UJ)	—	—
RE33-05-63214	33-25116	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.55 (UJ)	—	—
RE33-05-63215	33-25117	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.59 (UJ)	—	—
RE33-05-63216	33-25117	~~2~~7.0–~~2~~7.5	Fill	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
SWMU 33-002(b)															
0333-96-0070	33-01328	10.0–15.0	Qbt 3	—	4.9 (U)	4.1	66.5	—	27500	—	—	9.2	NA	—	18.6
RE33-05-62977	33-25082	~~0~~3.0–~~0~~3.5	Qbt 3	14300	—	2.87	153	—	8090	10.4	3.48	6.42	—	—	—
RE33-05-62978	33-25082	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62979	33-25083	~~0~~3.0–~~0~~3.5	Qbt 3	13800	—	3.19	118	—	5500	9.36	—	5.51	—	—	—
RE33-05-62980	33-25083	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62981	33-25084	~~0~~3.0–~~0~~3.5	Qbt 3	14600	—	3.09	119	—	6890	10.5	3.45	6.93	—	—	—
RE33-05-62982	33-25084	~~2~~5.0–~~2~~5.5	Qbt 3	7680	—	—	82.7	—	15500	—	—	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	51	—	3250 (J+)	—	—	16.8	0.52 (U)	—	—
RE33-05-62988	33-25087	12.0–12.5	Qbt 3	—	—	—	—	—	3990 (J+)	—	—	—	—	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	48.8	—	7860 (J+)	—	—	5.1	0.52 (U)	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	67	—	3480 (J+)	—	—	4.8	0.52 (U)	—	—
RE33-05-63000	33-25092	~~02~~2.0–~~02~~2.5	Fill	—	—	—	—	—	—	—	—	25.5 (J-)	0.63 (U)	—	—
RE33-05-63001	33-25092	~~24~~4.0–~~24~~4.5	Qbt 3	—	—	—	—	—	—	—	—	6.6 (J-)	0.51 (U)	—	—
RE33-05-63002	33-25093	~~03~~3.0–~~03~~3.5	Qbt 3	—	—	—	—	—	—	—	—	8.3 (J-)	0.57 (U)	—	—
RE33-05-63003	33-25093	~~25~~5.0–~~25~~5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
RE33-05-63004	33-25094	~~04~~4.0–~~04~~4.5	Qbt 3	—	—	—	48.5	—	—	—	—	33.8 (J-)	0.61 (U)	—	—
RE33-05-63005	33-25094	~~26~~6.0–~~26~~6.5	Qbt 3	—	—	—	—	—	2340	—	—	—	0.53 (U)	—	—
RE33-05-63006	33-25095	~~04~~4.0–~~04~~4.5	Fill	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE33-05-63007	33-25095	~~26~~6.0–~~26~~6.5	Qbt 3	—	—	—	—	—	4520	—	—	5.6 (J-)	0.52 (U)	—	—
RE33-05-63008	33-25096	~~04~~4.0–~~04~~4.5	Fill	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE33-05-63009	33-25096	~~26~~6.0–~~26~~6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63227	33-25123	~~05~~5.0–~~05~~5.5	Qbt 3	—	—	—	—	—	3830 (J-)	—	—	6.3	0.57 (UJ)	—	—
RE33-05-63228	33-25123	~~27~~7.0–~~27~~7.5	Qbt 3	—	—	—	—	—	2840	—	—	—	0.53 (U)	—	—
RE33-05-63229	33-25124	~~04~~4.0–~~04~~4.5	Qbt 3	—	—	—	—	—	—	—	—	5.2	0.54 (UJ)	—	—
RE33-05-63230	33-25124	~~26~~6.0–~~26~~6.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE33-05-63231	33-25125	~~05~~5.0–~~05~~5.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE33-05-63232	33-25125	~~27~~7.0–~~27~~7.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
SWMU 33-002(c)															
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	4.9 (U)	—	—	—	—	18	—	—	NA	—	—
RE33-05-60765	33-24727	~~04~~4.0–~~04~~4.5	Qbt 3	8860 (J+)	—	—	76.9	—	—	—	—	—	—	—	—
RE33-05-60766	33-24727	~~26~~6.0–~~26~~6.5	Qbt 3	8100 (J+)	—	—	63.1	—	—	35.9	—	10.6	—	—	27.6
RE33-05-60767	33-24728	~~03~~3.0–~~03~~3.5	Qbt 3	12200 (J+)	—	2.85	96.9	—	3610 (J+)	8.05	—	6.14	—	—	16.4
RE33-05-60768	33-24728	~~25~~5.0–~~25~~5.5	Qbt 3	—	—	—	—	—	2900 (J+)	—	—	—	—	—	—
RE33-05-60769	33-24729	~~03~~3.0–~~03~~3.5	Qbt 3	12300 (J+)	—	3.03	90	—	4310 (J+)	7.25	—	5.18	—	—	—
RE33-05-60770	33-24729	~~25~~5.0–~~25~~5.5	Qbt 3	—	—	—	—	—	2230 (J+)	—	—	—	—	—	—
RE33-05-62983	33-25085	10.0–10.5	Qbt 3	—	—	—	47.5	—	3210 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-62984	33-25085	12.0–12.5	Qbt 3	—	—	—	47.2	—	3490 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	53.8	—	4600 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	2840 (J+)	—	—	—	0.52 (U)	—	—
RE33-05-63217	33-25118	~~02~~2.0–~~02~~2.5	Qbt 3	—	—	—	57.9	13.1	2690	23.1 (J-)	—	114	0.56 (U)	—	57.5
RE33-05-63218	33-25118	~~24~~4.0–~~24~~4.5	Qbt 3	—	—	—	—	—	—	—	—	6.1	0.52 (U)	—	—
RE33-05-63219	33-25119	~~05~~5.0–~~05~~5.5	Qbt 3	—	—	—	49.6	—	3170	—	—	—	0.56 (U)	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
RE33-05-63220	33-25119	~~7~~2.0–~~2~~7.5	Qbt 3	—	—	—	—	—	3300	—	—	—	—	—	—
RE33-05-63221	33-25120	~~0~~5.0–~~0~~5.5	Qbt 3	—	—	—	69	—	3840	—	—	—	0.55 (U)	—	—
RE33-05-63222	33-25120	~~2~~7.0–~~2~~7.5	Qbt 3	—	—	—	50.2	—	2870	—	—	—	0.51 (U)	—	—
RE33-05-63223	33-25121	~~0~~5.0–~~0~~5.5	Qbt 3	—	—	—	60.2	—	5090	—	—	—	0.54 (U)	—	—
RE33-05-63224	33-25121	~~2~~7.0–~~2~~7.5	Qbt 3	—	—	—	59.1	—	7400	—	—	—	0.51 (U)	—	—
RE33-05-63225	33-25122	~~0~~4.0–~~0~~4.5	Qbt 3	—	—	—	47.2	—	3570	—	—	—	0.82	—	—
RE33-05-63226	33-25122	~~2~~6.0–~~2~~6.5	Qbt 3	—	—	—	50.6	—	3320	24.9 (J-)	—	—	—	—	—
SWMU 33-004(a)															
0333-97-0004	XX-33-604072	0.0–0.0	Soil	—	1 (U)	—	—	—	—	—	—	—	NA	—	—
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	—	—	—	—	—	—	—	NA	—	29.1
AOC 33-008(c)															
0333-96-0652	33-01670	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	2.7 (J-)	4.6 (U)	—	1.9	—	11.9	—	3100	—	—	322
0333-96-0654	33-01671	0.5–0.83	Sed	—	28.2 (J-)	4.7 (U)	—	1.4	—	—	—	1630	—	—	6960
0333-96-0655	33-01672	0.0–0.5	Sed	—	—	4.4 (U)	163	4.2	—	13.7	—	498	—	—	176
0333-96-0656	33-01672	1.0–1.5	Sed	—	4.4 (J-)	6	189	8	—	52.1	8.8 (J)	1320	—	75600	238
0333-96-0657	33-01673	0.0–0.5	Sed	—	2.4 (J-)	—	—	2.7	—	27.5	5.9 (J)	1670	—	54000	205
0333-96-0658	33-01674	0.0–0.5	Sed	—	—	4 (U)	—	2.1	—	—	—	744	—	—	81.7
0333-96-0659	33-01675	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	5.6 (U)	—	—	0.71 (U)	—	—	—	24.6	—	—	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	5.9 (U)	—	—	0.74 (U)	—	—	—	—	—	—	—
0333-96-0675	33-01679	5.0–7.0	Qbo	6200	5.9 (U)	1.1 (J)	42 (J)	0.75 (U)	—	7.8	—	5 (J)	—	9820	—
0333-96-0677	33-01680	0.0–0.5	Sed	—	17 (J-)	8.5	719	41.6	9120	118	19.2	25200	—	52300	2040
0333-96-0678	33-01680	0.0–2.0	Sed	—	—	4.8	210	20.9 (J-)	—	63.7 (J+)	9 (J)	2920	—	29000	484
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	1.2 (J)	—	0.75 (J-)	—	27.5 (J+)	—	994	—	—	56.5
0333-96-0681	33-01681	0.5–1.25	Sed	19400	7.9 (J)	14	615	139	6830	297	38.2	10500	—	125000	2350
0333-96-0682	33-01681	5.0–6.0	Soil	—	6.6 (U)	—	—	2.5	—	—	12.2	172	—	24000	75.3
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	—	—	2.4	—	—	—	470	—	—	145
0333-96-0685	33-01682	1.0–2.0	Qbo	—	1.1 (J-)	2.9 (U)	—	1.7	—	79.3	—	1090	—	7390	2860
0333-96-0669	33-01683	0.0–0.5	Sed	—	6.4 (U)	—	—	0.81 (U)	—	11.5	—	38	—	—	54
0333-96-0670	33-01684	0.0–0.5	Fill	—	5.7 (J)	—	—	8.6	—	43.7	11.3	762	—	61300	217
0333-96-0671	33-01685	0.0–0.5	Soil	—	8.1 (J)	—	—	17.6	—	35.6	10.5	6070	—	44900	690

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**
Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**
Qbt 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**
SWMU 33-011(d)															
0333-96-0111	33-01566	0.0–0.5	Fill	—	11 (UJ)	—	—	0.53 (U)	—	—	—	—	NA	—	31
0333-96-0120	33-01566	0.67–1.0	Fill	—	8.3 (U)	—	—	0.73 (U)	—	—	—	—	NA	—	774
0333-96-0112	33-01567	0.0–0.5	Fill	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	300
0333-96-0121	33-01567	0.67–1.0	Fill	—	8.4 (U)	—	—	0.74 (U)	—	—	—	—	NA	—	—
0333-96-0113	33-01568	0.0–0.5	Fill	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	—
0333-96-0122	33-01568	0.67–1.0	Fill	—	8.4 (U)	—	—	0.74 (U)	—	—	—	—	NA	—	—
0333-96-0114	33-01569	0.0–0.5	Fill	—	11 (UJ)	—	—	0.53 (U)	—	—	—	—	NA	—	—
0333-96-0123	33-01569	0.42–0.67	Fill	—	8.5 (U)	—	—	0.75 (U)	7360	—	—	—	NA	—	—
0333-96-0115	33-01571	0.0–0.5	Soil	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	—
0333-96-0124	33-01571	0.5–0.75	Qbo	—	8.5 (U)	—	—	0.75 (U)	—	—	—	—	NA	6360	—
0333-96-0116	33-01572	0.0–0.5	Fill	—	11 (UJ)	—	—	0.54 (U)	—	—	—	—	NA	—	—
0333-96-0125	33-01572	0.5–0.67	Fill	—	7.9 (U)	—	—	0.7 (U)	—	—	—	—	NA	—	—
AOC C-33-003															
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	0.75 (U)	—	83.9	—	2310	—	3.2 (J)	18.9	NA	—	12.5
RE33-99-0010	33-01709	0.0–0.5	Fill	—	2 (J-)	—	—	—	—	—	9.5 (J)	18	NA	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	0.74 (U)	—	—	—	—	—	—	5.7	NA	—	—
RE33-99-0011	33-01710	0.0–0.5	Fill	—	0.87 (J-)	—	—	—	—	—	—	—	NA	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	0.74 (U)	—	—	—	—	—	—	5.9	NA	—	—
RE33-99-0012	33-01711	0.0–0.3300	Fill	—	0.93 (J-)	—	—	—	6680	—	9.5 (J)	18.9	NA	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	0.75 (U)	—	58.8	—	—	—	—	8.8	NA	—	13.6
RE33-99-0013	33-01712	0.0–0.5	Fill	—	1.6 (J-)	—	—	—	9300	—	11.9	18.7	NA	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	0.77 (U)	—	—	—	—	—	—	5.5	NA	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	1 (J-)	—	—	—	—	—	—	—	NA	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	0.74 (U)	—	51	—	—	—	—	5.6	NA	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	—	1.1 (J-)	—	—	—	—	—	—	—	NA	—	—
RE33-99-0037	33-01714	2.0–2.5	Qbt 3	—	0.75 (U)	—	49.9	—	—	—	—	5.6	NA	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	1 (J-)	—	—	—	9230	—	9.4 (J)	15.5	NA	—	—
RE33-99-0038	33-01715	2.0–2.5	Qbt 3	—	0.78 (U)	—	48.1	—	2570	—	—	5 (J)	NA	—	—
RE33-99-0061	33-01716	0.0–0.5	Sed	—	—	—	—	—	—	—	6 (J)	14.9	NA	—	20.9
RE33-99-0062	33-01717	0.0–0.5	Sed	—	1 (J)	—	173	—	5860	—	7 (J)	27.6	NA	—	34.7

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SWMU 33-002(a)															
0333-96-0525	33-01652	1.0–1.5	Soil	—	—	—	—	NA	NA	—	1.2 (U)	—	3.6	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	NA	NA	—	1.3 (U)	—	4.1	—	—
0333-96-0527	33-01652	12.5–12.9	Soil	—	—	—	—	NA	NA	—	1.3 (U)	—	3.7	—	—
0333-96-0043	33-01696	2.3–3.0	Soil	—	—	—	—	NA	NA	—	—	—	3.9	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	NA	NA	—	—	—	3.8	—	—
0333-96-0045	33-01696	12.6–13.2	Qbt 3	—	—	—	—	NA	NA	0.33 (J)	—	—	3.6	—	—
RE33-05-60743	33-24716	~~30~~.0–~~03~~.5	Qbt 3	—	—	—	—	2.05	—	1.65 (U)	—	—	NA	—	—
RE33-05-60747	33-24716	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	1.68 (U)	—	—	NA	—	—
RE33-05-60745	33-24717	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	—	1.66 (U)	—	—	NA	—	—
RE33-05-60749	33-24717	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	1.02 (J)	—	1.67 (U)	—	—	NA	—	—
RE33-05-60744	33-24718	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.00083 (J)	1.65 (U)	—	—	NA	—	—
RE33-05-60748	33-24718	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	1.68 (U)	1.51	—	NA	—	—
RE33-05-60746	33-24719	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	—	1.56 (U)	—	—	NA	—	—
RE33-05-60750	33-24719	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	1.69 (U)	—	—	NA	—	—
RE33-05-60751	33-24720	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	—	1.61 (U)	—	—	NA	—	—
RE33-05-60752	33-24720	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	1.64 (U)	—	—	NA	—	—
RE33-05-60753	33-24721	~~03~~.0–~~03~~.5	Qbt 3	2690 (J-)	—	—	—	5.18	—	1.76 (U)	—	—	NA	—	—
RE33-05-60754	33-24721	~~25~~.0–~~25~~.5	Qbt 3	2670 (J-)	—	—	—	4.75	—	1.76 (U)	—	—	NA	—	—
RE33-05-60755	33-24722	~~03~~.0–~~03~~.5	Qbt 3	2170 (J-)	—	0.47	6.91	2.12	—	1.7 (U)	—	—	NA	—	64.7
RE33-05-60756	33-24722	~~25~~.0–~~25~~.5	Qbt 3	2150 (J-)	—	0.187	8.83	1.51	—	1.66 (U)	—	—	NA	—	—
RE33-05-60757	33-24723	~~03~~.0–~~03~~.5	Qbt 3	2480 (J-)	—	0.235	—	1.12 (J)	—	1.77 (U)	—	—	NA	—	—
RE33-05-60758	33-24723	~~25~~.0–~~25~~.5	Qbt 3	2950 (J-)	—	0.182	—	1.9	—	1.73 (U)	5.49	—	NA	19.3 (J)	—
RE33-05-60759	33-24724	~~02~~.0–~~02~~.5	Fill	—	—	—	—	—	0.00177 (J)	1.71 (U)	—	—	NA	—	—
RE33-05-60760	33-24724	~~24~~.0–~~24~~.5	Qbt 3	1930	—	—	—	—	—	0.823 (J)	—	—	NA	—	—
RE33-05-60761	33-24725	~~08~~.0–~~08~~.5	Fill	—	—	0.161	—	—	—	—	—	—	NA	—	70.9
RE33-05-60762	33-24725	~~210~~.0–~~210~~.5	Qbt 3	—	—	—	—	—	—	1.61 (U)	—	—	NA	—	—
RE33-05-60763	33-24726	~~03~~.0–~~03~~.5	Fill	—	—	0.361	—	0.964 (J)	—	—	—	—	NA	—	176
RE33-05-60764	33-24726	~~25~~.0–~~25~~.5	Qbt 3	1920	—	0.193	7.27 (J-)	0.976 (J)	—	1.24 (J)	—	—	NA	18.2	99.2
RE33-05-63010	33-25097	~~03~~.0–~~03~~.5	Fill	—	—	—	—	1.1	0.00016 (J)	—	—	—	NA	—	—
RE33-05-63011	33-25097	~~25~~.0–~~25~~.5	Fill	—	—	—	—	0.62	0.0006 (J)	—	—	—	NA	—	—
RE33-05-63012	33-25098	~~03~~.0–~~03~~.5	Fill	—	—	—	—	2	—	—	—	—	NA	—	50.1

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-05-63013	33-25098	~~25~~.0–~~25~~.5	Fill	—	—	0.21	—	0.79	0.00038 (J)	—	—	—	NA	—	—
RE33-05-63195	33-25107	~~05~~.0–~~05~~.5	Fill	—	—	0.65	—	5.5	—	—	—	—	NA	—	83
RE33-05-63196	33-25107	~~27~~.0–~~27~~.5	Fill	—	—	—	—	0.54	0.0003 (J)	—	—	—	NA	—	—
RE33-05-63197	33-25108	~~05~~.0–~~05~~.5	Fill	—	—	—	—	3.4	—	—	—	—	NA	—	—
RE33-05-63198	33-25108	~~27~~.0–~~27~~.5	Fill	—	—	—	—	0.56	0.0004 (J)	—	—	—	NA	—	—
RE33-05-63199	33-25109	~~05~~.0–~~05~~.5	Fill	—	—	—	—	1.7	—	—	—	—	NA	—	—
RE33-05-63200	33-25109	~~27~~.0–~~27~~.5	Fill	—	—	—	—	0.92	0.00065 (J)	—	—	—	NA	—	—
RE33-05-63201	33-25110	~~03~~.0–~~03~~.5	Fill	—	—	0.15	—	2.8	—	—	—	—	NA	—	67.8
RE33-05-63202	33-25110	~~25~~.0–~~25~~.5	Fill	—	—	—	—	1.9	0.00036 (J)	—	—	—	NA	—	—
RE33-05-63203	33-25111	~~04~~.0–~~04~~.5	Fill	—	—	—	—	0.74	—	—	—	—	NA	—	—
RE33-05-63204	33-25111	~~26~~.0–~~26~~.5	Fill	—	—	—	—	0.53	0.00027 (J)	—	—	—	NA	—	—
RE33-05-63205	33-25112	~~05~~.0–~~05~~.5	Fill	—	—	—	—	1.6	0.00036 (J)	—	—	—	NA	—	—
RE33-05-63206	33-25112	~~27~~.0–~~27~~.5	Fill	—	—	—	—	1.6	0.00025 (J)	—	—	—	NA	—	—
RE33-05-63207	33-25113	~~05~~.0–~~05~~.5	Fill	—	—	0.13	—	2.2	0.00017 (J)	—	—	—	NA	—	—
RE33-05-63208	33-25113	~~27~~.0–~~27~~.5	Fill	—	—	—	—	0.87	0.00037 (J)	—	—	—	NA	—	—
RE33-05-63209	33-25114	~~03~~.0–~~03~~.5	Fill	—	—	—	—	0.51	0.00027 (J)	—	—	—	NA	—	—
RE33-05-63210	33-25114	~~25~~.0–~~25~~.5	Fill	—	—	—	—	0.68	0.00016 (J)	—	—	—	NA	—	—
RE33-05-63211	33-25115	~~04~~.0–~~04~~.5	Fill	—	—	—	—	0.34	0.00029 (J)	—	—	—	NA	—	—
RE33-05-63212	33-25115	~~26~~.0–~~26~~.5	Fill	—	—	—	—	0.88	0.00034 (J)	—	—	—	NA	—	—
RE33-05-63213	33-25116	~~03~~.0–~~03~~.5	Fill	—	—	0.13	—	0.92	—	—	—	—	NA	—	—
RE33-05-63214	33-25116	~~25~~.0–~~25~~.5	Fill	—	—	—	—	0.42	0.00017 (J)	—	—	—	NA	—	—
RE33-05-63215	33-25117	~~50~~.0–~~05~~.5	Fill	—	—	—	—	0.12 (J+)	—	—	—	—	NA	—	—
RE33-05-63216	33-25117	~~27~~.0–~~27~~.5	Fill	—	—	—	—	1.2 (J+)	0.00022 (J)	—	—	—	NA	—	—
SWMU 33-002(b)															
0333-96-0070	33-01328	10.0–15.0	Qbt 3	—	—	NA	—	NA	NA	1.6	—	—	4.2	—	—
RE33-05-62977	33-25082	~~03~~.0–~~03~~.5	Qbt 3	3140	—	—	9.23	2.27	—	1.57 (U)	—	—	NA	18.6	—
RE33-05-62978	33-25082	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	1.13	—	1.51 (U)	—	—	NA	—	—
RE33-05-62979	33-25083	~~03~~.0–~~03~~.5	Qbt 3	2590	—	—	7.57	1.36	0.00323	1.52 (U)	—	—	NA	—	—
RE33-05-62980	33-25083	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	1.45	—	1.55 (U)	—	—	NA	—	—
RE33-05-62981	33-25084	~~03~~.0–~~03~~.5	Qbt 3	2590	—	0.837	7.87	1.78	0.00116 (J)	1.51 (U)	—	—	NA	17.1	—
RE33-05-62982	33-25084	~~25~~.0–~~25~~.5	Qbt 3	1880	—	—	—	0.776 (J)	0.000919 (J)	1.53 (U)	—	—	NA	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	0.34	—	—	0.00059 (J)	—	—	—	NA	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-05-62988	33-25087	12.0–12.5	Qbt 3	—	—	0.19	—	—	—	—	—	—	NA	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	0.21	—	—	0.00056 (J)	—	—	—	NA	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	0.28	—	—	0.00084 (J)	—	—	—	NA	—	—
RE33-05-63000	33-25092	~~02~~.0–~~02~~.5	Fill	—	—	—	—	8.4	0.00039 (J)	—	—	—	NA	—	—
RE33-05-63001	33-25092	~~24~~.0–~~24~~.5	Qbt 3	—	—	—	—	1.2	0.00051 (J)	0.66	—	—	NA	—	—
RE33-05-63002	33-25093	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	2.6	0.00026 (J)	0.75	—	—	NA	—	—
RE33-05-63003	33-25093	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	0.88	—	0.4 (U)	—	—	NA	—	—
RE33-05-63004	33-25094	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	2.6	0.00064 (J)	0.6 (U)	—	—	NA	—	—
RE33-05-63005	33-25094	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	1.7	0.0002 (J)	—	—	—	NA	—	—
RE33-05-63006	33-25095	~~04~~.0–~~04~~.5	Fill	—	—	0.11	—	1.6	0.00031 (J)	—	—	—	NA	—	—
RE33-05-63007	33-25095	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	1.3	0.00028 (J)	—	—	—	NA	—	—
RE33-05-63008	33-25096	~~04~~.0–~~04~~.5	Fill	—	—	—	—	1	0.00021 (J)	—	—	—	NA	—	—
RE33-05-63009	33-25096	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	0.66	—	—	—	—	NA	—	—
RE33-05-63227	33-25123	~~05~~.0–~~05~~.5	Qbt 3	—	—	0.24	—	0.26	—	—	—	—	NA	—	—
RE33-05-63228	33-25123	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	1.9	0.00067 (J)	—	—	—	NA	—	—
RE33-05-63229	33-25124	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	NA	—	—
RE33-05-63230	33-25124	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	0.00046 (J)	—	—	—	NA	—	—
RE33-05-63231	33-25125	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	NA	—	—
RE33-05-63232	33-25125	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	0.00041 (J)	0.33	—	—	NA	—	—
SWMU 33-002(c)															
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	NA	NA	—	—	—	NA	—	—
RE33-05-60765	33-24727	~~04~~.0–~~04~~.5	Qbt 3	—	—	0.198 (J)	—	—	0.00498	1.02 (J)	—	—	NA	—	—
RE33-05-60766	33-24727	~~26~~.0–~~26~~.5	Qbt 3	—	—	0.776 (J)	—	—	0.00192 (J)	1.52 (U)	—	—	NA	—	—
RE33-05-60767	33-24728	~~03~~.0–~~03~~.5	Qbt 3	1950 (J+)	—	15.2 (J)	6.85	20.2	—	1.74 (U)	—	—	NA	—	287
RE33-05-60768	33-24728	~~25~~.0–~~25~~.5	Qbt 3	—	—	0.205 (J)	—	0.967 (J)	—	0.681 (J)	—	—	NA	—	—
RE33-05-60769	33-24729	~~03~~.0–~~03~~.5	Qbt 3	2260 (J+)	—	—	—	—	—	1.75 (U)	—	—	NA	—	—
RE33-05-60770	33-24729	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	0.884 (J)	—	—	NA	—	—
RE33-05-62983	33-25085	10.0–10.5	Qbt 3	—	—	0.11	—	—	0.0012	—	—	—	NA	—	—
RE33-05-62984	33-25085	12.0–12.5	Qbt 3	—	—	—	—	—	0.0013	—	—	—	NA	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	0.23	—	—	0.00091 (J)	—	—	—	NA	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	0.17	—	—	0.00078 (J)	—	—	—	NA	—	—
RE33-05-63217	33-25118	~~02~~.0–~~02~~.5	Qbt 3	—	—	5.2	7.1	0.79	—	—	3.9	—	NA	—	199

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-05-63218	33-25118	~~24~~.0–~~24~~.5	Qbt 3	—	—	0.57	—	0.34	—	0.49	—	—	NA	—	—
RE33-05-63219	33-25119	~~05~~.0–~~05~~.5	Qbt 3	—	—	0.11	—	—	0.0025 (J)	—	—	—	NA	—	—
RE33-05-63220	33-25119	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	0.002 (J)	0.46	—	—	NA	—	—
RE33-05-63221	33-25120	~~05~~.0–~~05~~.5	Qbt 3	—	—	0.26	—	6.7	—	0.56	—	—	NA	—	—
RE33-05-63222	33-25120	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	—	0.42	—	—	NA	—	—
RE33-05-63223	33-25121	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	0.55	—	—	—	—	NA	—	—
RE33-05-63224	33-25121	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	NA	—	—
RE33-05-63225	33-25122	~~04~~.0–~~04~~.5	Qbt 3	—	—	0.16	—	0.66	—	0.81	—	—	NA	—	—
RE33-05-63226	33-25122	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	0.17 (J)	0.0022 (J)	0.63	—	—	NA	—	—
SWMU 33-004(a)															
0333-97-0004	XX-33-604072	0.0–0.0	Soil	—	—	—	—	NA	NA	—	—	—	20.7 (U)	—	55.3
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	—	—	NA	NA	—	—	—	12.8 (U)	—	84.7
AOC 33-008(c)															
0333-96-0652	33-01670	0.0–0.5	Soil	—	—	—	—	NA	NA	—	—	0.81 (U)	2.6	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	—	0.59	20.9	NA	NA	0.9 (U)	11.2	0.86 (U)	6.2	—	351
0333-96-0654	33-01671	0.5–0.83	Sed	—	—	1.8	13.8	NA	NA	0.43 (U)	6.5	0.82 (U)	5.08	—	288
0333-96-0655	33-01672	0.0–0.5	Sed	—	—	3.2	24.2	NA	NA	1.1 (U)	15.8	0.89 (U)	9.2	—	721
0333-96-0656	33-01672	1.0–1.5	Sed	—	—	3.9	92	NA	NA	2.3 (U)	11.1	1.7 (U)	12.4	—	1310
0333-96-0657	33-01673	0.0–0.5	Sed	—	—	5.6	31	NA	NA	1.3 (U)	2.7	1.6 (U)	10.7	—	607
0333-96-0658	33-01674	0.0–0.5	Sed	—	855	1.9	—	NA	NA	0.69 (U)	2.1 (J)	2.2 (J)	4.53	—	1090
0333-96-0659	33-01675	0.0–0.5	Soil	—	—	—	—	NA	NA	—	—	0.76 (U)	2.79	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	—	—	—	NA	NA	—	—	—	3.22	—	114
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	—	NA	NA	—	—	—	2.3	—	—
0333-96-0675	33-01679	5.0–7.0	Qbo	1500	—	—	6.5 (U)	NA	NA	0.39 (U)	—	—	1.69	7.2 (J)	41
0333-96-0677	33-01680	0.0–0.5	Sed	—	888	15.3	232	NA	NA	3.6	42.1	1.8 (J)	134	—	9440
0333-96-0678	33-01680	0.0–2.0	Sed	—	837	272	78.9 (J+)	NA	NA	0.44 (U)	14.5 (J-)	—	19.5	—	2230
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	3.7	4 (J)	NA	NA	0.41 (U)	—	—	2.62	—	453
0333-96-0681	33-01681	0.5–1.25	Sed	—	8310	11.7	1820	NA	NA	0.4 (U)	31.9	—	117	29.9	12700
0333-96-0682	33-01681	5.0–6.0	Soil	—	1050	0.47	23.2	NA	NA	—	—	—	6.92	—	510
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	1.7 (J+)	12.6	NA	NA	0.44 (U)	12.7	0.84 (U)	5.95	—	326
0333-96-0685	33-01682	1.0–2.0	Qbo	—	—	1.8 (J+)	48.6	NA	NA	0.43 (U)	1.4 (J)	—	2.76	8.6 (J)	329
0333-96-0669	33-01683	0.0–0.5	Sed	—	—	0.43	—	NA	NA	0.44 (U)	9.6	—	4.11	28	210

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na[d]**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
0333-96-0670	33-01684	0.0–0.5	Fill	—	737	0.5	60.7	NA	NA	—	1.9 (J)	—	4.61	—	948
0333-96-0671	33-01685	0.0–0.5	Soil	—	842	22.9	62.8	NA	NA	—	12.7	—	44	—	1780
SWMU 33-011(d)															
0333-96-0111	33-01566	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.1 (U)	1.3 (U)	—	—	—
0333-96-0120	33-01566	0.67–1.0	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	94.2
0333-96-0112	33-01567	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.4 (U)	—	—	78 (J+)
0333-96-0121	33-01567	0.67–1.0	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	—
0333-96-0113	33-01568	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.3 (U)	—	—	—
0333-96-0122	33-01568	0.67–1.0	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	—
0333-96-0114	33-01569	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.1 (U)	1.3 (U)	—	—	—
0333-96-0123	33-01569	0.42–0.67	Fill	—	—	—	—	NA	NA	—	1.5 (U)	—	—	—	—
0333-96-0115	33-01571	0.0–0.5	Soil	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.4 (U)	—	—	—
0333-96-0124	33-01571	0.5–0.75	Qbo	—	—	2	2.8 (U)	NA	NA	—	1.5 (U)	—	0.77	5.1 (J)	—
0333-96-0116	33-01572	0.0–0.5	Fill	—	—	0.11 (U)	—	NA	NA	—	2.2 (U)	1.4 (U)	—	—	—
0333-96-0125	33-01572	0.5–0.67	Fill	—	—	0.77	—	NA	NA	—	1.4 (U)	—	—	—	—
AOC C-33-003															
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.8 (J)	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	6860	—	—	36.8	NA	NA	—	—	—	—	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.45 (U)	—	—	—	—	—
RE33-99-0011	33-01710	0.0–0.5	Fill	—	—	—	—	NA	NA	4.9	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.46 (U)	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.3300	Fill	6850	—	—	44.5	NA	NA	—	—	—	—	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.46 (U)	—	—	—	—	—
RE33-99-0013	33-01712	0.0–0.5	Fill	10500	—	—	43.6	NA	NA	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.47 (U)	—	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	4760	—	—	24.8	NA	NA	—	—	—	—	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.45 (U)	—	—	—	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	5030	—	—	21.9	NA	NA	—	—	—	—	—	—
RE33-99-0037	33-01714	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.46 (U)	—	—	—	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	7810	—	—	32.1	NA	NA	—	—	—	—	—	—
RE33-99-0038	33-01715	2.0–2.5	Qbt 3	—	—	—	—	NA	NA	0.62 (J)	—	—	—	—	—
RE33-99-0061	33-01716	0.0–0.5	Sed	3470	—	—	18.9	NA	NA	1.1	—	—	—	—	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Soil BV[a]				**4610**	**671**	**0.1**	**15.4**	**na**[d]	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Qbo BV[a]				**739**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
Qbt 3 BV[a]				**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
Sediment BV[a]				**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
RE33-99-0062	33-01717	0.0–0.5	Sed	4160	—	—	28.9	NA	NA	1.8	—	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

[c] NA = Not analyzed.

[d] na = Not available.

Table 4.1-3
Organic Chemicals Detected in Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
SWMU 33-002(a)																			
0333-96-0525	33-01652	1.0–1.5	Soil	—[a]	—	—	—	NA[b]	NA	NA	—	—	—	—	—	—	—	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	NA	NA	NA	—	—	—	—	—	—	—	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	NA	NA	NA	—	—	—	—	—	—	—	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	0.019 (J)	—	NA	NA	NA	—	—	—	—	—	—	—	—	—
RE33-05-60743	33-24716	~~03~~.0–~~03~~.5	Qbt 3	0.0325 (J)	—	—	0.078	—	—	—	—	—	—	0.264	0.37	0.231	—	—	0.179 (J)
RE33-05-60747	33-24716	~~25~~.0–~~25~~.5	Qbt 3	0.0197 (J)	—	—	0.0355 (J)	0.0182 (J)	—	—	—	—	—	0.19	0.247	0.172	—	—	0.196 (J)
RE33-05-60745	33-24717	~~03~~.0–~~03~~.5	Qbt 3	0.0545 (J)	—	—	0.12 (J)	—	0.0045 (J-)	—	—	—	—	0.633	0.783	0.615	—	—	0.677 (J)
RE33-05-60749	33-24717	~~25~~.0–~~25~~.5	Qbt 3	0.0842	—	—	0.176	—	—	—	—	—	0.303	0.345	0.534	0.272	—	—	0.208 (J)
RE33-05-60744	33-24718	~~03~~.0–~~03~~.5	Qbt 3	0.104	0.0131 (J)	—	0.221	—	0.0177 (J)	—	—	—	0.48	0.525	0.807	0.347	—	—	0.194 (J)
RE33-05-60748	33-24718	~~25~~.0–~~25~~.5	Qbt 3	0.304 (J)	—	—	0.537	—	0.0768	—	—	—	1.35	2.21	3	1.96	—	—	1.52 (J)
RE33-05-60746	33-24719	~~03~~.0–~~03~~.5	Qbt 3	0.528	0.0371	—	1.09	0.0583 (J)	0.0404 (J)	—	—	—	1.59	1.38	2.35	0.69	—	—	0.184 (J)
RE33-05-60750	33-24719	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	0.155 (J)	—	—	—	—	—	—	1.28	1.47	—	—	—	1.54 (J)
RE33-05-60751	33-24720	~~03~~.0–~~03~~.5	Qbt 3	0.42	—	—	0.854	—	—	—	—	—	—	1.68	2.3	1.32	—	—	0.677 (J)
RE33-05-60752	33-24720	~~25~~.0–~~25~~.5	Qbt 3	0.0892 (J)	—	—	0.201	—	—	—	—	—	—	0.72	0.952	0.645	—	—	0.677 (J)
RE33-05-60753	33-24721	~~03~~.0–~~03~~.5	Qbt 3	0.236	—	—	0.417	—	—	0.0589	—	—	0.715	0.976	1.37	0.851	—	—	0.678 (J)
RE33-05-60754	33-24721	~~25~~.0–~~25~~.5	Qbt 3	0.0842	—	—	0.198	—	—	—	—	—	0.348	0.386	0.566	0.286	—	—	0.44
RE33-05-60755	33-24722	~~03~~.0–~~03~~.5	Qbt 3	0.106 (J)	—	—	0.199	—	—	—	—	—	—	0.741	0.956	0.729	—	—	0.658 (J)
RE33-05-60756	33-24722	~~25~~.0–~~25~~.5	Qbt 3	0.159	—	—	0.317	0.0693	0.0324 (J)	0.0206 (J)	—	—	—	0.909	1.26	0.779	—	—	0.708 (J)
RE33-05-60757	33-24723	~~03~~.0–~~03~~.5	Qbt 3	0.0524 (J-)	—	—	0.112 (J-)	—	0.0078 (J-)	0.0037 (J)	—	—	0.183 (J-)	0.267 (J-)	0.352 (J-)	—	—	—	0.182 (J-)
RE33-05-60758	33-24723	~~25~~.0–~~25~~.5	Qbt 3	0.0342 (J)	—	—	0.089	—	0.0064	0.0035 (J)	—	—	0.162	0.228	0.314	0.199	—	—	0.173 (J)
RE33-05-60759	33-24724	~~02~~.0–~~02~~.5	Fill	0.0804	—	—	0.123	—	0.0987 (J)	0.0384 (J)	—	—	—	0.247	0.438	0.158	—	—	—
RE33-05-60760	33-24724	~~24~~.0–~~24~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60761	33-24725	~~08~~.0–~~08~~.5	Fill	0.0395 (J)	—	0.04	0.0954	—	—	—	—	—	—	0.201	0.367	0.135	—	—	—
RE33-05-60762	33-24725	~~210~~.0–~~210~~.5	Qbt 3	—	—	0.0064	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60763	33-24726	~~03~~.0–~~03~~.5	Fill	—	—	0.0519	—	—	0.124 (J)	—	—	—	—	—	—	—	—	—	0.728
RE33-05-60764	33-24726	~~25~~.0–~~25~~.5	Qbt 3	0.0437	—	0.016	—	—	—	—	—	—	—	—	—	—	—	—	0.11 (J)
RE33-05-63011	33-25097	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63012	33-25098	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63013	33-25098	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63195	33-25107	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	0.17 (J+)	—	—	—	—	—	—	—	—	—	0.15 (J)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
RE33-05-63196	33-25107	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
RE33-05-63201	33-25110	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	0.055	—	—	—	—	—	—	—	—	—	—
RE33-05-63205	33-25112	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63207	33-25113	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	0.055	—	—	—	—	—	—	—	—	—	—
RE33-05-63211	33-25115	~~04~~.0–~~04~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.31 (J)
RE33-05-63213	33-25116	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(b)																			
~~RE33-05-61273~~	~~33-24806~~	~~5.0–7.0~~	~~Fill~~	~~NA~~	~~NA~~	~~—~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~—~~	~~—~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
RE33-05-62977	33-25082	~~03~~.0–~~03~~.5	Qbt 3	—	—	0.0102	—	—	—	—	—	—	—	0.00035 (J)	0.00039 (J)	—	—	0.0117 (J)	—
RE33-05-62978	33-25082	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.0115 (J)	—
RE33-05-62979	33-25083	~~03~~.0–~~03~~.5	Qbt 3	—	—	0.0111	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62980	33-25083	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.0022 (J)	—	—	—	—	—	—	—	—	—	—
RE33-05-62981	33-25084	~~03~~.0–~~03~~.5	Qbt 3	0.003	—	0.0081	0.004	—	—	—	—	—	0.0059	0.0057	0.0067	0.0042 (J)	0.0029	—	—
RE33-05-62982	33-25084	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	0.0003 (J)	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	0.085 (J-)	—	—	—	—	—	—	—	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	—	—	0.065 (J-)	—	—	—	—	—	—	—	—	—	—
RE33-05-63000	33-25092	~~02~~.0–~~02~~.5	Fill	0.097 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63004	33-25094	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63007	33-25095	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.13 (J)	0.14 (J)	0.088 (J)	0.11 (J)	0.13 (J-)	—	—
RE33-05-63009	33-25096	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63227	33-25123	~~05~~.0–~~05~~.5	Qbt 3	—	—	0.0037 (J-)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63228	33-25123	~~27~~.0–~~27~~.5	Qbt 3	—	—	0.0053 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63229	33-25124	~~04~~.0–~~04~~.5	Qbt 3	—	—	0.0029 (J-)	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63230	33-25124	~~26~~.0–~~26~~.5	Qbt 3	—	—	0.0027 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
RE33-05-63231	33-25125	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63232	33-25125	~~27~~.0–~~27~~.5	Qbt 3	—	—	0.0066 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(c)																			
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	—	NA	NA	—	—	—	—	—	—	—	—	—
RE33-05-60765	33-24727	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60766	33-24727	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	0.0013 (J)	0.0013 (J+)	—	—	—	0.0114 (J)	0.0144 (J)	0.0211 (J)	—	—	—
RE33-05-60767	33-24728	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	0.0193 (J)	—	0.0048	0.0035 (J+)	—	—	—	0.079	0.128	0.0548	—	—	—
RE33-05-60769	33-24729	~~03~~.0–~~03~~.5	Qbt 3	0.029 (J)	—	—	0.0619	—	0.003 (J-)	0.002 (J-)	—	—	—	0.108	0.158	0.0715	—	—	—
RE33-05-60770	33-24729	~~25~~.0–~~25~~.5	Qbt 3	0.0275 (J)	—	—	0.0561	—	0.00088 (J)	—	—	—	—	0.101	0.157	0.0588	—	—	—
~~RE33-05-61272~~	~~33-24805~~	~~5.0–7.0~~	~~Fill~~	~~NA~~	~~NA~~	~~—~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~—~~	~~—~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.082 (J)	0.081 (J)	—	—	0.072 (J)	—	—
RE33-05-63217	33-25118	~~02~~.0–~~02~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63221	33-25120	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63223	33-25121	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.093 (J)	0.094 (J)	0.075 (J)	—	0.072 (J)	—	—
RE33-05-63225	33-25122	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.12 (J)	0.12 (J)	0.093 (J)	—	0.11 (J)	—	—
RE33-05-63226	33-25122	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-004(a)																			
0333-97-0010	XX-33-604072	0.0–0.0	Soil	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	NA	NA
AOC 33-008(c)																			
0333-96-0652	33-01670	0.0–0.5	Soil	—	—	NA	—	—	—	—	—	NA	—	—	—	—	1.6	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	—	—	NA	—	—	—	—	0.43(J)	NA	—	—	—	—	—	—	—
0333-96-0654	33-01671	0.5–0.83	Sed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0655	33-01672	0.0–0.5	Sed	0.41 (J)	—	NA	0.65 (J)	—	—	—	—	NA	1.6 (J)	1.7	2.9	0.48 (J)	2.9	—	—
0333-96-0656	33-01672	1.0–1.5	Sed	—	—	—	0.38 (J)	—	—	—	—	—	1.2 (J)	1.5 (J)	2.8	1.1 (J)	2.8	—	—
0333-96-0658	33-01674	0.0–0.5	Sed	—	—	NA	—	—	—	—	—	NA	0.19 (J)	—	0.27 (J)	—	0.27 (J)	—	—
0333-96-0659	33-01675	0.0–0.5	Soil	—	—	NA	—	—	—	—	—	NA	—	—	—	—	—	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	—	—	NA	—	—	—	—	—	NA	0.058 (J)	0.077 (J)	0.056 (J)	0.053 (J)	0.06 (J)	—	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0677	33-01680	0.0–0.5	Sed	1.9 (J)	—	NA	2.9 (J)	—	—	—	—	NA	5.7 (J)	6.2 (J)	10	3.4 (J)	10	—	—
0333-96-0678	33-01680	0.0–2.0	Sed	—	—	0.014 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	—	—	—	—	—	—	—	0.6	0.76	0.77	0.74	0.37	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
0333-96-0681	33-01681	0.5–1.25	Sed	4.4	—	—	6.8	—	—	—	—	—	9	9.6	6	6.1	6.8	0.11 (J)	2.3
0333-96-0682	33-01681	5.0–6.0	Soil	0.14 (J)	—	—	0.27 (J)	—	—	—	—	—	0.45	0.46	0.31 (J)	0.31 (J)	0.35 (J)	—	—
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	—	—	—	—	—	—	—	0.36 (J)	0.47 (J)	0.75 (J)	0.21 (J)	NA	—	—
0333-96-0685	33-01682	1.0–2.0	Qbo	0.16 (J)	—	0.012 (J)	0.32 (J)	—	—	—	—	—	0.41 (J)	0.37 (J)	0.65 (J)	0.17 (J)	NA	—	—
0333-96-0669	33-01683	0.0–0.5	Sed	0.13 (J)	—	NA	0.19 (J)	—	—	—	—	NA	0.55	0.69	0.57	0.47	0.61	—	0.045 (J)
0333-96-0670	33-01684	0.0–0.5	Fill	—	—	NA	—	—	—	—	—	NA	0.16 (J)	0.22 (J)	0.23 (J)	0.23 (J)	0.22 (J)	—	—
0333-96-0671	33-01685	0.0–0.5	Soil	—	—	NA	—	—	—	—	—	NA	0.052 (J)	0.077 (J)	0.064 (J)	0.055 (J)	0.063 (J)	—	—
33-017																			
0333-96-0130	33-01585	0.0–0.5	Fill	0.14 (J)	—	—	0.34	—	NA	NA	—	NA	0.84	0.78	0.99	0.11 (J)	0.25 (J)	—	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.54	0.25 (J)	0.43	—	—	—	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	0.41	—	—	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	0.61 (J)	—	—	1 (J)	—	NA	NA	—	NA	1.5 (J)	1.8 (J)	2.6 (J)	0.67 (J)	1.1 (J)	0.22 (J)	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	0.63 (J)	0.38 (J)	0.78 (J)	—	—	0.21 (J)	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.41	—	—	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	0.5 (J)	0.16 (J)	0.53 (J)	—	—	0.19 (J)	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.37 (J)	—	0.054 (J)	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	0.26 (J)	—	—	0.42	—	NA	NA	—	—	1.2	1.1	1.4	0.4	—	—	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	NA	NA	—	—	0.084 (J)	0.074 (J)	0.17 (J)	0.096 (J)	—	—	—
0333-96-0140	33-01595	0.0–0.5	Fill	1.3	—	—	2	—	NA	NA	—	—	3.5	2.4	2.7	0.75	0.97	—	—
0333-96-0141	33-01596	0.0–0.5	Fill	0.058 (J)	—	—	0.18 (J)	—	NA	NA	—	—	0.6	0.55	0.66	0.23 (J)	0.084 (J)	—	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	—	—	—	0.76 (J)	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	0.045 (J)	—	—	0.18 (J)	—	NA	NA	—	NA	0.44	0.41	0.49	0.21 (J)	—	—	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	NA	—	0.12 (J)	0.22 (J)	0.11 (J)	—	—	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.12 (J)	0.1 (J)	—	—	—	—	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	NA	NA	—	—	0.2 (J)	0.2 (J)	—	0.11 (J)	—	—	—
0333-96-0149	33-01604	0.0–0.5	Fill	NA	NA	NA	NA	—	0.12	0.13	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0151	33-01606	0.0–0.5	Fill	NA	NA	NA	NA	—	0.083	0.099	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0152	33-01607	0.0–0.5	Fill	NA	NA	NA	NA	—	0.18	0.29	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0157	33-01612	0.0–0.5	Soil	NA	NA	NA	NA	—	—	5.5	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0159	33-01614	0.0–0.5	Soil	NA	NA	NA	NA	—	1.4	0.87	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0160	33-01615	0.0–0.5	Fill	NA	NA	NA	NA	—	0.85	0.92	—	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0161	33-01616	0.0–0.5	Soil	NA	NA	NA	NA	—	—	3.7	—	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Azobenzene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate
AOC C-33-001																			
0333-96-2042	33-01748	0.0–0.5	Fill	NA	NA	NA	NA	—	—	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2043	33-01749	0.0–0.5	Soil	NA	NA	NA	NA	—	—	11	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2045	33-01751	0.0–0.5	Soil	NA	NA	NA	NA	—	—	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2046	33-01752	0.0–0.5	Fill	NA	NA	NA	NA	—	—	6.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-003																			
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.06 (J)
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	—	—	—	0.00085 (J)	—	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	0.55 (J)	—	—	0.93 (J)	—	—	—	—	—	1.5 (J)	1.2 (J)	0.99 (J)	0.5 (J)	1.2 (J)	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
SWMU 33-002(a)																			
0333-96-0525	33-01652	1.0–1.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	—	—	0.037 (J)	—	—	—	—	—	—	—	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	—	—	0.034 (J)	—	—	—	—	—	—	—	—	—
RE33-05-60743	33-24716	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.18	—	—	—	—	—	0.365	0.0268 (J)	—	0.252	—
RE33-05-60747	33-24716	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.0965	—	—	—	—	—	0.17	0.0158 (J)	—	0.199	—
RE33-05-60745	33-24717	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.257	—	—	—	—	—	0.496	0.0472 (J)	—	—	—
RE33-05-60749	33-24717	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.292	—	—	—	—	—	0.629	0.0716	—	0.285	—
RE33-05-60744	33-24718	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.508	—	—	—	—	—	0.984	0.105	—	0.378	—
RE33-05-60748	33-24718	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	1.41	—	—	—	—	—	2.39	0.242 (J)	—	2.2	—
RE33-05-60746	33-24719	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	1.46	—	—	0.464	—	—	3.83	0.498	—	0.7	—
RE33-05-60750	33-24719	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.288 (J)	—	—	—	—	—	0.51	—	—	1.68	—
RE33-05-60751	33-24720	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	1.56	—	—	—	—	—	2.9	0.381	—	1.31	—
RE33-05-60752	33-24720	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.368	—	—	—	—	—	0.762	0.0716 (J)	—	0.753	—
RE33-05-60753	33-24721	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.719	—	—	—	—	—	1.44	0.21	—	0.907	—
RE33-05-60754	33-24721	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.344	—	—	—	—	—	0.683	0.0737	—	0.306	—
RE33-05-60755	33-24722	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.398	—	—	—	—	—	0.7	0.0816 (J)	—	0.832	—
RE33-05-60756	33-24722	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.575	—	—	—	—	—	1.17	0.123 (J)	—	0.863	—
RE33-05-60757	33-24723	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	0.19 (J-)	—	—	—	—	—	0.36 (J-)	0.0458 (J-)	—	0.245 (J-)	—
RE33-05-60758	33-24723	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	0.157	—	—	—	—	—	0.328	0.0314 (J)	—	0.216	—
RE33-05-60759	33-24724	~~02~~.0–~~02~~.5	Fill	—	—	—	—	—	0.251	—	—	—	—	—	0.594	0.0613	—	0.169	—
RE33-05-60760	33-24724	~~24~~.0–~~24~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.0169 (J)	—	—	—	—
RE33-05-60761	33-24725	~~08~~.0–~~08~~.5	Fill	—	0.0049 (J)	—	—	—	0.2	—	—	—	—	—	0.431	0.0387 (J)	—	—	—
RE33-05-60762	33-24725	~~210~~.0–~~210~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60763	33-24726	~~03~~.0–~~03~~.5	Fill	—	—	—	—	0.174 (J)	—	—	—	—	—	—	—	—	—	—	—
RE33-05-60764	33-24726	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63011	33-25097	~~25~~.0–~~25~~.5	Fill	—	0.0043 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63012	33-25098	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63013	33-25098	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	—	0.094 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63195	33-25107	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	—	0.25 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63196	33-25107	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	—	0.12 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63201	33-25110	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63205	33-25112	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
RE33-05-63207	33-25113	05.0–05.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63211	33-25115	04.0–04.5	Fill	—	—	—	—	—	—	0.079 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63213	33-25116	03.0–03.5	Fill	0.00023 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(b)																			
RE33-05-61273	33-24806	5.0–7.0	Fill	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	—	NA	0.0018
RE33-05-62977	33-25082	03.0–03.5	Qbt 3	—	—	—	—	—	0.00036 (J)	—	—	—	—	—	0.00073 (J)	—	—	—	—
RE33-05-62978	33-25082	25.0–25.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62979	33-25083	03.0–03.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.00048 (J)	—	—	—	—
RE33-05-62980	33-25083	25.0–25.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62981	33-25084	03.0–03.5	Qbt 3	—	—	—	—	—	0.0062	—	—	—	—	—	0.0147	0.0024	—	0.0042	—
RE33-05-62982	33-25084	25.0–25.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.12 (J)	—	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.069 (J)	—	—	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63000	33-25092	02.0–02.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63004	33-25094	04.0–04.5	Qbt 3	—	—	—	—	—	—	0.083 (J)	—	—	—	—	—	—	—	—	—
RE33-05-63007	33-25095	26.0–26.5	Qbt 3	—	—	—	—	—	0.14 (J)	—	—	—	—	—	0.26 (J)	—	—	0.1 (J)	—
RE33-05-63009	33-25096	26.0–26.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63227	33-25123	05.0–05.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63228	33-25123	27.0–27.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63229	33-25124	04.0–04.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63230	33-25124	26.0–26.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63231	33-25125	05.0–05.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63232	33-25125	27.0–27.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(c)																			
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	—	—	0.07 (J)	—	—	—	—	—	—	—	—	—
RE33-05-60765	33-24727	04.0–04.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.018 (J)	—	—	—	—
RE33-05-60766	33-24727	26.0–26.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.0181 (J)	—	—	0.0178 (J)	—
RE33-05-60767	33-24728	03.0–03.5	Qbt 3	—	—	—	—	—	0.0825	—	—	—	—	—	0.16	—	—	0.0492	—
RE33-05-60769	33-24729	03.0–03.5	Qbt 3	—	—	—	—	—	0.114	—	—	—	—	—	0.254	0.0302 (J)	—	0.066	—
RE33-05-60770	33-24729	25.0–25.5	Qbt 3	—	—	—	—	—	0.109	—	—	—	—	—	0.242	0.0307 (J)	—	0.0517	—
RE33-05-61272	33-24805	5.0–7.0	Fill	—	—	NA	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	—	NA	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.13 (J)	—	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	0.085 (J)	—	—	—	—	—	0.18 (J)	—	—	—	—
RE33-05-63217	33-25118	02.0–02.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
RE33-05-63221	33-25120	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.089 (J)	—	—	—	—
RE33-05-63223	33-25121	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	0.098 (J)	—	—	—	—	—	0.23 (J)	—	—	—	—
RE33-05-63225	33-25122	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	0.14 (J)	—	—	—	—	—	0.27 (J)	—	—	0.081 (J)	—
RE33-05-63226	33-25122	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.099 (J)	—	—	—	—
SWMU 33-004(a)																			
0333-97-0010	XX-33-604072	0.0–0.0	Soil	—	—	NA	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	—	NA	—
AOC 33-008(c)																			
0333-96-0652	33-01670	0.0–0.5	Soil	NA	NA	—	—	—	—	—	—	—	—	—	—	—	NA	—	—
0333-96-0653	33-01671	0.0–0.5	Sed	NA	NA	—	—	—	—	—	—	—	—	—	0.63 (J)	—	NA	—	—
0333-96-0654	33-01671	0.5–0.83	Sed	—	—	—	—	—	—	—	—	—	—	—	0.47 (J)	—	—	—	—
0333-96-0655	33-01672	0.0–0.5	Sed	NA	NA	—	0.83 (J)	—	1.5 (J)	—	—	—	—	—	2.8	—	NA	0.64 (J)	—
0333-96-0656	33-01672	1.0–1.5	Sed	—	—	—	0.45 (J)	—	1.3 (J)	—	—	—	—	—	1.9	—	—	1.2 (J)	—
0333-96-0658	33-01674	0.0–0.5	Sed	NA	NA	—	—	—	—	—	—	—	—	—	—	—	NA	—	—
0333-96-0659	33-01675	0.0–0.5	Soil	NA	NA	—	—	—	—	—	—	—	—	—	0.21 (J)	—	NA	—	—
0333-96-0673	33-01679	0.0–2.0	Soil	NA	NA	—	NA	—	0.072 (J)	—	—	—	—	—	0.11 (J)	—	NA	0.049 (J)	—
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	NA	—	—	—	—	—	—	—	—	—	0.023	—	—
0333-96-0677	33-01680	0.0–0.5	Sed	NA	NA	—	3 (J)	—	5.1 (J)	—	—	—	—	—	10	—	NA	4.1 (J)	—
0333-96-0678	33-01680	0.0–2.0	Sed	—	0.007 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	—	—	—	0.7	1.3	0.2 (J)	—	—	—	0.75	—	—	0.56	—
0333-96-0681	33-01681	0.5–1.25	Sed	—	—	—	NA	—	9.6	1.7	2.5	3.3	—	0.24 (J)	21	5.7	—	6.1	—
0333-96-0682	33-01681	5.0–6.0	Soil	—	—	—	NA	—	0.49	0.16 (J)	0.12 (J)	0.089 (J)	—	—	1	0.16 (J)	—	0.28 (J)	—
0333-96-0684	33-01682	0.0–1.0	Sed	—	—	—	0.19 (J)	—	0.41 (J)	—	—	—	—	—	0.68 (J)	—	—	0.23 (J)	—
0333-96-0685	33-01682	1.0–2.0	Qbo	—	—	—	0.39 (J)	—	0.38 (J)	—	—	—	—	—	1.1	—	—	0.2 (J)	—
0333-96-0669	33-01683	0.0–0.5	Sed	NA	NA	—	NA	—	0.71	0.049 (J)	0.17 (J)	0.059 (J)	0.18 (J)	—	1.2	0.11 (J)	NA	0.45	—
0333-96-0670	33-01684	0.0–0.5	Fill	NA	NA	—	NA	—	0.24 (J)	0.063 (J)	0.083 (J)	—	—	—	0.2 (J)	—	NA	0.17 (J)	—
0333-96-0671	33-01685	0.0–0.5	Soil	NA	NA	—	NA	—	0.064 (J)	4.8	—	—	—	—	0.098 (J)	—	NA	0.05 (J)	—
SWMU 33-017																			
0333-96-0130	33-01585	0.0–0.5	Fill	—	—	—	—	—	0.8	—	—	—	—	—	1.8	0.088 (J)	—	0.28 (J)	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	0.48	—	—	—	—	—	0.59	—	—	0.1 (J)	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	0.29 (J)	—	—	—	—	—	0.051 (J)	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	—	—	—	—	—	1.4	0.085 (J)	—	0.14 (J)	—	—	3.5	0.43 (J)	—	0.81 (J)	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	0.57 (J)	0.26 (J)	—	—	—	—	0.7 (J)	—	—	0.1 (J)	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	0.3 (J)	—	—	—	—	—	0.072 (J)	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	0.43 (J)	—	—	0.41 (J)	—	—	—	—	—	0.32 (J)	—	—	0.063 (J)	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Bromobenzene	Butanone[2-]	Butylbenzylphthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,4-]	Dimethylphenol[2,4-]	Fluoranthene	Fluorene	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropyltoluene[4-]
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	0.26 (J)	—	—	—	—	—	—	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	—	—	—	—	—	1.2	—	0.18 (J)	0.046 (J)	—	—	2.6	0.24 (J)	—	0.6	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	0.094 (J)	—	—	—	—	—	0.042 (J)	—	—	0.21 (J)	—
0333-96-0140	33-01595	0.0–0.5	Fill	—	—	—	—	—	2.5	—	0.33 (J)	0.43	—	—	6.4	0.94	—	1	—
0333-96-0141	33-01596	0.0–0.5	Fill	—	—	—	—	—	0.61	—	—	—	—	—	1.4	—	—	0.37	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	—	—	—	—	—	0.44	—	—	—	—	—	0.96	—	—	0.34	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	0.14 (J)	0.079 (J)	—	—	—	—	0.17 (J)	—	—	0.22 (J)	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	0.13 (J)	—	—	—	—	—	0.13 (J)	—	—	0.21 (J)	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	0.23 (J)	0.034 (J)	—	—	—	—	0.4	—	—	0.23 (J)	—
0333-96-0149	33-01604	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0151	33-01606	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0152	33-01607	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0157	33-01612	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0159	33-01614	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0160	33-01615	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0161	33-01616	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-001																			
0333-96-2042	33-01748	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2043	33-01749	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2045	33-01751	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2046	33-01752	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-003																			
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	0.065 (J)	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	—	—	—	—	—	1.5 (J)	—	—	—	—	—	3.3 (J)	0.47 (J)	—	0.5 (J)	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	0.7	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
SWMU 33-002(a)																			
0333-96-0525	33-01652	1.0–1.5	Soil	—	—	—	—	—	—	—	—	—	—	0.002 (J)	NA	—	—	—	—
0333-96-0526	33-01652	3.08–4.08	Soil	—	—	—	—	—	—	—	—	—	—	0.003 (J)	NA	—	—	—	—
0333-96-0043	33-01696	2.33–3.0	Soil	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
0333-96-0044	33-01696	8.25–8.75	Soil	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-60743	33-24716	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	0.299	—	0.353	—	—	—	NA	—	—	—	—
RE33-05-60747	33-24716	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	0.0116 (J)	0.141	—	0.156	—	—	—	NA	—	—	—	—
RE33-05-60745	33-24717	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	0.43	—	0.494	—	—	—	NA	—	—	—	—
RE33-05-60749	33-24717	~~2~~5.0–~~2~~5.5	Qbt 3	—	0.0309 (J)	—	—	0.0455	0.0455	—	0.615	—	—	—	NA	—	—	—	—
RE33-05-60744	33-24718	~~0~~3.0–~~0~~3.5	Qbt 3	—	0.0276 (J)	—	—	0.0511	0.0511	—	0.916	—	—	—	NA	—	—	—	—
RE33-05-60748	33-24718	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	0.178 (J)	2.24	—	2.9	—	—	—	NA	—	—	—	—
RE33-05-60746	33-24719	~~0~~3.0–~~0~~3.5	Qbt 3	—	0.288	—	—	0.58	3.84	—	3.51	—	—	—	NA	—	—	—	—
RE33-05-60750	33-24719	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	0.544	—	0.564	—	—	—	NA	—	—	—	—
RE33-05-60751	33-24720	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	0.251	3.25	—	3.3	—	—	—	NA	—	—	—	—
RE33-05-60752	33-24720	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	0.0633 (J)	0.746	—	0.681	—	—	—	NA	—	—	—	—
RE33-05-60753	33-24721	~~0~~3.0–~~0~~3.5	Qbt 3	—	0.0967 (J)	—	—	0.251	1.58	—	1.6	—	—	—	NA	—	—	—	—
RE33-05-60754	33-24721	~~2~~5.0–~~2~~5.5	Qbt 3	—	0.023 (J)	—	—	0.0553	0.679	—	0.736	—	—	—	NA	—	—	—	—
RE33-05-60755	33-24722	~~0~~3.0–~~0~~3.5	Qbt 3	—	0.0405 (J)	—	—	0.102 (J)	0.773	—	0.832	—	—	—	NA	—	—	—	—
RE33-05-60756	33-24722	~~2~~5.0–~~2~~5.5	Qbt 3	—	0.0619 (J)	—	—	0.118 (J)	1.25	—	1.13	—	—	—	NA	—	—	—	—
RE33-05-60757	33-24723	~~0~~3.0–~~0~~3.5	Qbt 3	—	0.0136 (J-)	—	—	0.0339 (J-)	0.39 (J-)	—	0.417 (J-)	—	—	—	NA	—	—	—	—
RE33-05-60758	33-24723	~~2~~5.0–~~2~~5.5	Qbt 3	—	0.0093 (J)	—	—	0.0184 (J)	0.346	—	0.3	—	—	—	NA	—	—	—	—
RE33-05-60759	33-24724	~~0~~2.0–~~0~~2.5	Fill	—	0.016 (J)	—	—	0.0346 (J)	0.457	—	0.536	—	—	0.00038 (J)	NA	—	—	—	—
RE33-05-60760	33-24724	~~2~~4.0–~~2~~4.5	Qbt 3	—	—	—	—	—	—	—	0.013 (J)	—	—	0.00044 (J)	NA	—	—	—	—
RE33-05-60761	33-24725	~~0~~8.0–~~0~~8.5	Fill	—	—	—	—	—	0.324	—	0.427	—	—	0.001 (J)	NA	—	—	—	—
RE33-05-60762	33-24725	~~2~~10.0–~~2~~10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00052 (J)	NA	—	—	—	—
RE33-05-60763	33-24726	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	—	—	0.0015	NA	—	—	—	—
RE33-05-60764	33-24726	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00058 (J)	NA	—	—	—	—
RE33-05-63011	33-25097	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.001 (J)	—	—	—	—	—	—
RE33-05-63012	33-25098	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	—	—	—	—	0.0015 (J)	—	—	—	—	—	—
RE33-05-63013	33-25098	~~2~~5.0–~~2~~5.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63195	33-25107	~~0~~5.0–~~0~~5.5	Fill	—	—	—	—	—	—	—	—	—	0.0034 (J+)	—	27	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
RE33-05-63196	33-25107	27.0–27.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63201	33-25110	03.0–03.5	Fill	—	—	—	—	—	—	—	—	—	0.004 (J)	—	30	—	—	—	—
RE33-05-63205	33-25112	05.0–05.5	Fill	—	—	—	—	—	—	—	—	—	0.0011 (J)	—	—	—	—	—	—
RE33-05-63207	33-25113	05.0–05.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63211	33-25115	04.0–04.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63213	33-25116	03.0–03.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-002(b)																			
~~RE33-05-61273~~	~~33-24806~~	~~5.0–7.0~~	~~Fill~~	~~—~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~—~~	~~—~~	~~NA~~	~~—~~	~~—~~	~~—~~	~~—~~
RE33-05-62977	33-25082	03.0–03.5	Qbt 3	0.0029 (J)	—	—	—	—	0.00057 (J)	—	0.00057 (J)	—	—	—	NA	—	—	—	—
RE33-05-62978	33-25082	25.0–25.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62979	33-25083	03.0–03.5	Qbt 3	0.0022 (J)	—	—	—	—	0.00041 (J)	—	0.00039 (J)	—	—	—	NA	—	—	—	—
RE33-05-62980	33-25083	25.0–25.5	Qbt 3	0.0027 (J)	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62981	33-25084	03.0–03.5	Qbt 3	0.0029 (J)	0.00072 (J)	—	—	0.002	0.0138	—	0.0125	—	—	—	NA	—	—	—	—
RE33-05-62982	33-25084	25.0–25.5	Qbt 3	0.0026 (J)	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	0.1 (J)	—	0.11 (J)	—	—	—	NA	—	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-62990	33-25088	12.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-63000	33-25092	02.0–02.5	Fill	—	—	—	—	—	—	—	—	—	—	—	37	—	—	—	—
RE33-05-63004	33-25094	04.0–04.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63007	33-25095	26.0–26.5	Qbt 3	—	—	—	—	—	0.16 (J)	—	0.22 (J)	—	—	—	—	—	—	—	—
RE33-05-63009	33-25096	26.0–26.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.00091 (J)	—	—	—	—	—	—
RE33-05-63227	33-25123	05.0–05.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.022 (J-)	0.00081 (J-)	—	0.00075 (J-)	0.013 (J-)	—	—
RE33-05-63228	33-25123	27.0–27.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.011	—	—	—	0.0079	—	—
RE33-05-63229	33-25124	04.0–04.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.0087 (J-)	—	—	—	0.005 (J-)	—	—
RE33-05-63230	33-25124	26.0–26.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.0091	0.00068 (J)	—	—	0.006	—	—
RE33-05-63231	33-25125	05.0–05.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.001 (J-)	—	—	—	0.00058 (J-)	—	—
RE33-05-63232	33-25125	27.0–27.5	Qbt 3	—	—	—	—	—	—	—	—	—	0.01	0.0011 (J)	—	—	—0.006	—	—
SWMU 33-002(c)																			
0333-96-0076	33-01697	10.0–12.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	NA	—	—	—	—
RE33-05-60765	33-24727	04.0–04.5	Qbt 3	—	—	—	—	—	0.012 (J)	—	0.0183 (J)	—	—	—	NA	—	—	—	—
RE33-05-60766	33-24727	26.0–26.5	Qbt 3	—	—	—	—	—	0.0123 (J)	—	0.0176 (J)	—	—	—	NA	—	—	—	—
RE33-05-60767	33-24728	03.0–03.5	Qbt 3	—	—	—	—	—	0.0966	—	0.17	—	—	—	NA	—	—	—	—
RE33-05-60769	33-24729	03.0–03.5	Qbt 3	—	0.0114 (J)	—	—	0.0332 (J)	0.212	—	0.244	—	—	—	NA	—	—	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
RE33-05-60770	33-24729	25.0–25.5	Qbt 3	—	0.0116 (J)	—	—	0.0323 (J)	0.207	—	0.222	—	—	—	NA	—	—	—	—
~~RE33-05-61272~~	~~33-24805~~	~~5.0–7.0~~	~~Fill~~	~~—~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~0.00028 (J)~~	~~—~~	~~NA~~	~~—~~	~~0.003 (J+)~~	~~—~~	~~—~~
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	—	—	—	—	0.089 (J)	—	0.12 (J)	—	—	—	NA	—	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	—	—	—	0.14 (J)	—	0.16 (J)	—	—	—	NA	—	—	—	—
RE33-05-63217	33-25118	02.0–02.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	75	—	—	—	—
RE33-05-63221	33-25120	05.0–05.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-05-63223	33-25121	05.0–05.5	Qbt 3	—	—	—	—	—	0.18 (J)	—	0.17 (J)	—	—	—	—	—	—	—	—
RE33-05-63225	33-25122	04.0–04.5	Qbt 3	—	—	—	—	—	0.18 (J)	—	0.21 (J)	—	—	—	—	—	—	—	—
RE33-05-63226	33-25122	26.0–26.5	Qbt 3	—	—	—	—	—	0.076 (J)	—	0.078 (J)	—	—	—	—	—	—	—	—
SWMU 33-004(a)																			
0333-97-0010	XX-33-604072	0.0–0.0	Soil	0.0055 (J)	NA	NA	NA	NA	NA	NA	NA	NA	—	—	NA	—	—	—	—
AOC 33-008(c)																			
0333-96-0652	33-01670	0.0–0.5	Soil	NA	—	—	—	—	—	—	—	1.6	NA	NA	—	NA	NA	NA	NA
0333-96-0653	33-01671	0.0–0.5	Sed	NA	—	—	—	—	0.54 (J)	—	0.66 (J)	—	NA	NA	—	NA	NA	NA	NA
0333-96-0654	33-01671	0.5–0.83	Sed	0.0082	—	—	—	—	0.45 (J)	—	0.54 (J)	—	—	—	—	—	—	—	—
0333-96-0655	33-01672	0.0–0.5	Sed	NA	—	—	—	0.75 (J)	2.8	—	3.4	—	NA	NA	—	NA	NA	NA	NA
0333-96-0656	33-01672	1.0–1.5	Sed	0.0029 (J)	—	—	—	—	1.5 (J)	—	2	—	—	—	—	—	—	—	—
0333-96-0658	33-01674	0.0–0.5	Sed	NA	—	—	—	—	—	—	0.23 (J)	—	NA	NA	—	NA	NA	NA	NA
0333-96-0659	33-01675	0.0–0.5	Soil	NA	—	—	—	—	—	—	0.24 (J)	—	NA	NA	—	NA	NA	NA	NA
0333-96-0673	33-01679	0.0–2.0	Soil	NA	—	—	—	—	0.1 (J)	—	0.1 (J)	NA	NA	NA	—	NA	NA	NA	NA
0333-96-0674	33-01679	3.0–5.0	Soil	—	—	—	—	—	—	—	—	NA	0.002 (J)	0.002 (J)	—	—	0.002 (J)	—	0.002 (J)
0333-96-0677	33-01680	0.0–0.5	Sed	NA	—	—	—	3.3 (J)	11	—	11	—	NA	NA	—	NA	NA	NA	NA
0333-96-0678	33-01680	0.0–2.0	Sed	—	—	—	—	—	—	—	—	NA	—	—	—	—	—	—	—
0333-96-0679	33-01680	2.0–4.0	Qbo	—	—	—	—	—	0.47	—	0.82	NA	—	—	—	—	—	—	—
0333-96-0681	33-01681	0.5–1.25	Sed	—	3	0.16 (J)	0.41	9.6	25	0.22 (J)	18	NA	—	0.004 (J)	—	—	0.003 (J)	0.002 (J)	0.002 (J)
0333-96-0682	33-01681	5.0–6.0	Soil	—	0.065 (J)	—	—	0.25 (J)	0.98	—	0.82	NA	0.002 (J)	0.002 (J)	—	—	0.002 (J)	0.002 (J)	0.003 (J)
0333-96-0684	33-01682	0.0–1.0	Sed	0.005 (J)	—	—	—	—	0.46 (J)	—	0.71 (J)	—	—	—	—	—	—	—	—
0333-96-0685	33-01682	1.0–2.0	Qbo	0.0029 (J)	—	—	—	—	1	—	0.92	—	—	—	—	—	—	—	—
0333-96-0669	33-01683	0.0–0.5	Sed	NA	—	—	—	0.06 (J)	0.91	—	1	NA	NA	NA	—	NA	NA	NA	NA
0333-96-0670	33-01684	0.0–0.5	Fill	NA	—	—	—	—	0.076 (J)	—	0.19 (J)	NA	NA	NA	—	NA	NA	NA	NA
0333-96-0671	33-01685	0.0–0.5	Soil	NA	—	—	—	—	0.064 (J)	—	0.11 (J)	NA	NA	NA	—	NA	NA	NA	NA

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
SWMU 33-017																			
0333-96-0130	33-01585	0.0–0.5	Fill	—	—	0.049 (J)	—	0.062 (J)	1.6	—	1.2	—	—	—	—	—	—	—	—
0333-96-0131	33-01586	0.0–0.5	Fill	—	—	—	—	—	0.46	—	0.72	—	—	—	—	—	—	—	—
0333-96-0132	33-01587	0.0–0.5	Fill	—	—	—	—	—	—	—	0.48	—	—	—	—	—	—	—	—
0333-96-0133	33-01588	0.0–0.5	Fill	—	0.11 (J)	—	—	0.22 (J)	3.7	—	3.3	—	—	—	—	—	—	—	—
0333-96-0134	33-01589	0.0–0.5	Fill	—	—	—	—	—	0.54 (J)	—	0.99 (J)	—	—	—	—	—	—	—	—
0333-96-0135	33-01590	0.0–0.5	Fill	—	—	—	—	—	—	—	0.48	—	—	—	—	—	—	—	—
0333-96-0136	33-01591	0.0–0.5	Fill	—	—	—	—	—	0.2 (J)	—	0.8 (J)	—	—	—	—	—	—	—	—
0333-96-0137	33-01592	0.0–0.5	Fill	—	—	—	—	—	—	—	0.42 (J)	—	—	—	—	—	—	—	—
0333-96-0138	33-01593	0.0–0.5	Sed	—	—	—	—	0.33 (J)	2.1	—	2.1	—	—	—	—	—	—	—	—
0333-96-0139	33-01594	0.0–0.5	Sed	—	—	—	—	—	—	—	0.15 (J)	—	—	—	—	—	—	—	—
0333-96-0140	33-01595	0.0–0.5	Fill	—	0.15 (J)	—	—	0.51	7.1	—	5.1	—	—	—	—	—	—	—	—
0333-96-0141	33-01596	0.0–0.5	Fill	—	—	—	—	—	1	—	1.1	—	—	—	—	—	—	—	—
0333-96-0142	33-01597	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0143	33-01598	0.0–0.5	Fill	—	—	—	—	—	0.79	—	0.81	—	—	—	—	—	—	—	—
0333-96-0145	33-01600	0.0–0.5	Fill	—	—	—	—	—	0.13 (J)	—	0.24 (J)	—	—	—	—	—	—	—	—
0333-96-0146	33-01601	0.0–0.5	Fill	—	—	—	—	—	—	—	0.2 (J)	—	—	—	—	—	—	—	—
0333-96-0147	33-01602	0.0–0.5	Fill	—	—	—	—	—	0.14 (J)	—	0.38	—	—	—	—	—	—	—	—
0333-96-0149	33-01604	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0151	33-01606	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0152	33-01607	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0157	33-01612	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0159	33-01614	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0160	33-01615	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-0161	33-01616	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-001																			
0333-96-2042	33-01748	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2043	33-01749	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2045	33-01751	0.0–0.5	Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0333-96-2046	33-01752	0.0–0.5	Fill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AOC C-33-003																			
RE33-99-0009	33-01708	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00056 (J+)	—	—	—	—	—
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00045 (J)	—	—

Table 4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Methylnaphthalene[2-]	Methylphenol[2-]	Methylphenol[4-]	Naphthalene	Phenanthrene	Phenol	Pyrene	Pyridine	Tetrachloroethene	Toluene	Total Petroleum Hydrocarbons Diesel Range Organics	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Xylene (Total)
RE33-99-0032	33-01709	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00045 (J+)	—	—	—	—	—
RE33-99-0033	33-01710	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.0007 (J+)	—	—	—	—	—
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	0.002 (J)	—	—	—	—	—	—	—	—	0.00062 (J)	—	—
RE33-99-0034	33-01711	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.00076 (J+)	—	—	0.00025 (J+)	—	—
RE33-99-0013	33-01712	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0035	33-01712	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	0.064 (J)	—	—	0.00085 (J+)	—	—	—	—	—
RE33-99-0014	33-01713	0.0–0.5	Fill	—	—	—	—	—	—	—	0.41 (J)	—	—	—	—	—	0.00067 (J)	—	—
RE33-99-0036	33-01713	2.0–2.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.0004 (J+)	—	—	0.00076 (J+)	—	—
RE33-99-0015	33-01714	0.0–0.5	Fill	—	—	—	—	—	3 (J)	—	4 (J)	—	—	—	—	—	—	—	—
RE33-99-0016	33-01715	0.0–0.5	Fill	—	—	—	—	—	0.52	—	0.71	—	—	—	—	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] — = Result was not detected.

[b] NA = Not analyzed.

Table 4.1-4
Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 Main Site

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
SWMU 33-002(a)												
0333-96-0525	33-01652	1.0–1.5	Soil	NA[c]	NA	—[d]	—	NA	1.98864	—	NA	NA
0333-96-0526	33-01652	3.08–4.08	Soil	NA	NA	—	—	NA	7.09863	—	NA	NA
0333-96-0546	33-01652	6.0–7.0	Qbt 4	NA	NA	NA	NA	NA	1.50206	—	NA	NA
0333-96-0527	33-01652	12.5–12.9	Soil	NA	NA	—	—	NA	5.28672	—	NA	NA
0333-96-0528	33-01652	15.08–16.08	Soil	NA	NA	NA	NA	NA	4.96459	—	NA	NA
0333-96-0529	33-01652	23.42–24.0	Qbt 2	NA	NA	NA	NA	NA	1.80899	—	NA	NA
0333-96-0531	33-01652	30.08–31.08	Qbt 2	NA	NA	NA	NA	NA	1.09728	—	NA	NA
0333-96-0537	33-01652	61.0–61.83	Qbt 2	NA	NA	NA	NA	NA	0.815294	—	NA	NA
0333-96-0534	33-01652	73.42–74.58	Qbt 2	NA	NA	NA	NA	NA	0.613415	—	NA	NA
0333-96-0540	33-01652	76.92–77.5	Qbt 2	NA	NA	NA	NA	NA	0.748673	—	NA	NA
0333-96-0543	33-01652	92.5–93.5	Qbt 4	NA	NA	NA	NA	NA	0.807143	—	NA	NA
0333-96-0547	33-01652	113.0–113.67	Qbt 4	NA	NA	NA	NA	NA	0.75451	—	NA	NA
0333-96-0548	33-01652	117.5–118.33	Qbt 4	NA	NA	NA	NA	NA	0.797231	—	NA	NA
0333-96-0043	33-01696	2.33–3.0	Soil	NA	NA	—	—	NA	5.51375	—	NA	NA
0333-96-0044	33-01696	8.25–8.75	Soil	NA	NA	—	—	NA	1.79177	—	NA	NA
0333-96-0045	33-01696	12.58–13.17	Qbt 3	NA	NA	—	—	NA	0.641785	—	NA	NA
0333-96-0046	33-01696	19.0–19.58	Qbt 3	NA	NA	NA	NA	NA	1.53038	—	NA	NA
0333-96-0047	33-01696	24.0–25.0	Qbt 2	NA	NA	NA	NA	NA	1.61283	—	NA	NA
0333-96-0048	33-01696	26.0–26.5	Qbt 2	NA	NA	NA	NA	NA	1.86087	—	NA	NA

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-60743	33-24716	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	74.13	—	0.2453	—
RE33-05-60747	33-24716	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	43.4	—	—	—
RE33-05-60745	33-24717	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	42.97	—	—	—
RE33-05-60749	33-24717	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	0.1484	—	—	84.68	—	—	—
RE33-05-60744	33-24718	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	60.78	—	—	—
RE33-05-60748	33-24718	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	236.2	—	—	—
RE33-05-60746	33-24719	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	229.1	—	—	—
RE33-05-60750	33-24719	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	57.54	—	—	—
RE33-05-60751	33-24720	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	102.1	—	—	—
RE33-05-60752	33-24720	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	49.2	—	—	—
RE33-05-60753	33-24721	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	116.2	—	—	—
RE33-05-60755	33-24722	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	4249	—	—	—
RE33-05-60756	33-24722	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	765.2	—	—	1.96176 (J-)
RE33-05-60757	33-24723	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	306	—	—	—
RE33-05-60758	33-24723	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	217.4	—	—	—
RE33-05-60759	33-24724	~~0~~2.0–~~0~~2.5	Fill	—	—	—	—	—	12.6	—	—	—
RE33-05-60760	33-24724	~~2~~4.0–~~2~~4.5	Qbt 3	—	—	—	—	—	33	—	—	—
RE33-05-60761	33-24725	~~0~~8.0–~~0~~8.5	Fill	—	—	—	—	—	199	—	—	—
RE33-05-60762	33-24725	~~2~~10.0–~~2~~10.5	Qbt 3	—	—	—	—	—	42.5	—	—	—
RE33-05-60763	33-24726	~~0~~3.0–~~0~~3.5	Fill	—	—	—	—	—	204	—	—	—
RE33-05-60764	33-24726	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	177	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-63010	33-25097	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	547.488	—	—	—
RE33-05-63011	33-25097	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	385.926	—	—	—
RE33-05-63012	33-25098	~~03~~.0–~~03~~.5	Fill	0.1967 (J-)	—	—	0.13849 (J+)	—	963.725	—	—	—
RE33-05-63013	33-25098	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	1010.44	—	—	—
RE33-05-63195	33-25107	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	1874.71	—	—	—
RE33-05-63196	33-25107	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	500.205	—	—	—
RE33-05-63197	33-25108	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	6120.08	—	—	—
RE33-05-63198	33-25108	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	278.045	—	—	—
RE33-05-63199	33-25109	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	1279.12	—	—	—
RE33-05-63200	33-25109	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	337.442	—	—	—
RE33-05-63201	33-25110	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	2207.25	—	—	—
RE33-05-63202	33-25110	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	1389.63	—	—	—
RE33-05-63203	33-25111	~~04~~.0–~~04~~.5	Fill	—	—	—	—	—	725.477	—	—	—
RE33-05-63204	33-25111	~~26~~.0–~~26~~.5	Fill	—	—	—	—	—	283.174	—	—	—
RE33-05-63205	33-25112	~~05~~.0–~~05~~.5	Fill	—	—	0.40388 (J+)	—	—	330.88	—	—	—
RE33-05-63206	33-25112	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	344.783	—	—	—
RE33-05-63207	33-25113	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	992.573	—	—	—
RE33-05-63208	33-25113	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	350.082	—	—	—
RE33-05-63209	33-25114	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	520.774	—	—	—
RE33-05-63210	33-25114	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	542.635	—	—	—
RE33-05-63211	33-25115	~~04~~.0–~~04~~.5	Fill	—	—	—	—	—	354.12	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-63212	33-25115	~~26~~.0–~~26~~.5	Fill	—	—	—	—	—	232.03	—	—	—
RE33-05-63213	33-25116	~~03~~.0–~~03~~.5	Fill	—	—	—	—	—	1605.49	—	—	—
RE33-05-63214	33-25116	~~25~~.0–~~25~~.5	Fill	—	—	—	—	—	363.769	—	—	—
RE33-05-63215	33-25117	~~05~~.0–~~05~~.5	Fill	—	—	—	—	—	392.076	—	—	—
RE33-05-63216	33-25117	~~27~~.0–~~27~~.5	Fill	—	—	—	—	—	814.007	—	—	—
SWMU 33-002(b)												
0333-96-0070	33-01328	10.0–15.0	Qbt 3	NA	NA	—	—	NA	73059.7	—	NA	NA
0333-96-0071	33-01328	16.0–16.33	Qbt 3	NA	NA	NA	NA	NA	5456.28	—	NA	NA
0333-96-0072	33-01328	21.5–22.5	Qbt 3	NA	NA	NA	NA	NA	773.418	—	NA	NA
0333-96-0073	33-01328	26.25–27.25	Qbt 2	NA	NA	NA	NA	NA	779.825	—	NA	NA
0333-96-0500	33-01328	30.0–31.25	Qbt 2	NA	NA	NA	NA	NA	832.595	—	NA	NA
0333-96-0501	33-01328	36.0–36.75	Qbt 2	NA	NA	NA	NA	NA	1000.22	—	NA	NA
0333-96-0502	33-01328	40.0–41.0	Qbt 2	NA	NA	NA	NA	NA	1474.45	—	NA	NA
0333-96-0503	33-01328	43.0–45.0	Qbt 2	NA	NA	NA	NA	NA	4133.53	—	NA	NA
0333-96-0506	33-01328	59.5–60.0	Qbt 2	NA	NA	NA	NA	NA	198.919	—	NA	NA
0333-96-0509	33-01328	71.75–72.0	Qbt 2	NA	NA	NA	NA	NA	142	—	NA	NA
0333-96-0512	33-01328	87.5–88.5	Qbt 4	NA	NA	NA	NA	NA	74.6193	—	NA	NA
0333-96-0515	33-01328	102.5–103.5	Qbt 4	NA	NA	NA	NA	NA	20.3685	—	NA	NA
0333-96-0516	33-01328	109.0–110.0	Qbt 4	NA	NA	NA	NA	NA	8.21441	—	NA	NA
0333-96-0517	33-01328	114.0–115.0	Qbt 4	NA	NA	NA	NA	NA	2.1388	—	NA	NA
0333-96-0518	33-01328	116.5–117.5	Qbt 4	NA	NA	NA	NA	NA	3.11641	—	NA	NA

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-62977	33-25082	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	0.23	177	—	0.119	—
RE33-05-62978	33-25082	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	262	—	—	—
RE33-05-62979	33-25083	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	71.2	—	—	—
RE33-05-62980	33-25083	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	314	—	—	—
RE33-05-62981	33-25084	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	1060	—	—	—
RE33-05-62982	33-25084	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	—	1170	—	—	—
RE33-05-62987	33-25087	10.0–10.5	Qbt 3	—	—	—	—	—	3000	—	—	—
RE33-05-62988	33-25087	12.0–12.5	Qbt 3	—	—	—	—	—	1560	—	—	—
RE33-05-62989	33-25088	10.0–10.5	Qbt 3	—	—	—	—	—	3030	—	—	—
RE33-05-63000	33-25092	~~0~~2.0–~~0~~2.5	Fill	—	—	—	—	—	657.61	—	—	—
RE33-05-63001	33-25092	~~2~~4.0–~~2~~4.5	Qbt 3	—	—	—	—	0.21	3298.81	—	—	—
RE33-05-63002	33-25093	~~0~~3.0–~~0~~3.5	Qbt 3	—	—	—	—	—	317.74	—	—	—
RE33-05-63003	33-25093	~~2~~5.0–~~2~~5.5	Qbt 3	—	—	—	—	0.33	2873.28	—	—	—
RE33-05-63004	33-25094	~~0~~4.0–~~0~~4.5	Qbt 3	0.2345 (J-)	—	—	—	—	393.62	—	—	—
RE33-05-63005	33-25094	~~2~~6.0–~~2~~6.5	Qbt 3	—	—	—	—	0.49	2894.5	—	—	—
RE33-05-63006	33-25095	~~0~~4.0–~~0~~4.5	Fill	—	—	—	—	—	712.28	—	—	—
RE33-05-63007	33-25095	~~2~~6.0–~~2~~6.5	Qbt 3	0.17945 (J-)	—	—	—	—	3550.7	—	—	—
RE33-05-63008	33-25096	~~0~~4.0–~~0~~4.5	Fill	—	—	—	—	—	488.996	—	—	—
RE33-05-63009	33-25096	~~2~~6.0–~~2~~6.5	Qbt 3	—	—	—	—	—	411.072	—	—	—
RE33-05-63227	33-25123	~~0~~5.0–~~0~~5.5	Qbt 3	—	—	—	—	—	3.93 (J-)	—	—	—
RE33-05-63228	33-25123	~~2~~7.0–~~2~~7.5	Qbt 3	—	—	—	—	—	1.29	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-63229	33-25124	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	0.766 (J-)	—	—	—
RE33-05-63230	33-25124	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	0.548	—	—	—
RE33-05-63231	33-25125	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	1.49 (J-)	—	0.17	—
RE33-05-63232	33-25125	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	0.739	—	—	—
SWMU 33-002(c)												
0333-96-0076	33-01697	10.0–12.5	Qbt 3	NA	NA	0.002	—	NA	113.143	NA	NA	NA
0333-96-0049	33-01697	19.17–19.5	Qbt 3	NA	NA	NA	NA	NA	144.411	NA	NA	NA
0333-96-0050	33-01697	23.75–24.17	Qbt 2	NA	NA	NA	NA	NA	131.889	NA	NA	NA
0333-96-0051	33-01697	28.0–29.0	Qbt 2	NA	NA	NA	NA	NA	141.676	NA	NA	NA
0333-96-0052	33-01697	31.42–31.83	Qbt 2	NA	NA	NA	NA	NA	81.7718	NA	NA	NA
0333-96-0053	33-01697	36.0–36.42	Qbt 2	NA	NA	NA	NA	NA	53.9011	NA	NA	NA
0333-96-0054	33-01697	40.0–40.58	Qbt 2	NA	NA	NA	NA	NA	31.6342	NA	NA	NA
0333-96-0055	33-01697	47.5–48.5	Qbt 2	NA	NA	NA	NA	NA	25.8137	NA	NA	NA
0333-96-0056	33-01697	51.83–52.0	Qbt 2	NA	NA	NA	NA	NA	17.6965	NA	NA	NA
0333-96-0057	33-01697	57.5–58.5	Qbt 2	NA	NA	NA	NA	NA	13.5823	NA	NA	NA
0333-96-0058	33-01697	61.42–62.17	Qbt 2	NA	NA	NA	NA	NA	10.3356	NA	NA	NA
RE33-05-60765	33-24727	~~04~~.0–~~04~~.5	Qbt 3	0.6379 (J-)	—	—	—	—	313.7	—	—	—
RE33-05-60766	33-24727	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	1.28 (J-)	342.2	—	—	—
RE33-05-60767	33-24728	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	0.82 (J-)	24960	—	—	—
RE33-05-60768	33-24728	~~25~~.0–~~25~~.5	Qbt 3	—	—	0.1864 (J-)	—	—	883.1	—	—	—
RE33-05-60769	33-24729	~~03~~.0–~~03~~.5	Qbt 3	—	—	—	—	—	1618	—	—	—

Table 4.1-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Strontium-90	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**0.013**	**1.65**	**0.023**	**0.054**	**1.31**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
RE33-05-60770	33-24729	~~25~~.0–~~25~~.5	Qbt 3	—	—	—	—	—	85.08	—	—	—
RE33-05-62984	33-25085	12.0–12.5	Qbt 3	—	—	—	—	—	30.8	—	—	—
RE33-05-62985	33-25086	10.0–10.5	Qbt 3	—	0.048	—	—	—	NA	—	—	—
RE33-05-62986	33-25086	12.0–12.5	Qbt 3	—	—	0.1263	—	—	29.4	—	—	—
RE33-05-63217	33-25118	~~02~~.0–~~02~~.5	Qbt 3	—	—	—	—	0.38 (J+)	8468.51	—	—	—
RE33-05-63218	33-25118	~~24~~.0–~~24~~.5	Qbt 3	—	—	—	—	—	1588.43	—	—	—
RE33-05-63219	33-25119	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	0.0972 (J+)	—	143.93	—	—	—
RE33-05-63220	33-25119	~~27~~.0–~~27~~.5	Qbt 3	—	—	0.082	—	—	201.492	—	—	—
RE33-05-63221	33-25120	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	416.672	—	—	—
RE33-05-63222	33-25120	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	79.6216	—	—	—
RE33-05-63223	33-25121	~~05~~.0–~~05~~.5	Qbt 3	—	—	—	—	—	132.639	—	—	—
RE33-05-63224	33-25121	~~27~~.0–~~27~~.5	Qbt 3	—	—	—	—	—	150.907	—	—	—
RE33-05-63225	33-25122	~~04~~.0–~~04~~.5	Qbt 3	—	—	—	—	—	1681.4	—	—	—
RE33-05-63226	33-25122	~~26~~.0–~~26~~.5	Qbt 3	—	—	—	—	—	184.57	—	—	—
AOC C-33-003												
RE33-99-0010	33-01709	0.0–0.5	Fill	—	—	—	—	—	—	4.67	—	4.86
RE33-99-0012	33-01711	0.0–0.33	Fill	—	—	—	—	—	—	3.83	—	3.83

Notes: Units are pCi/g. Data qualifiers are defined in Appendix A.

[a] BVs/FVs from LANL 1998, 059730.

[b] na = Not available.

[c] NA = Not analyzed.

[d] — = Result was not detected or was below the BV/FV.

Table 4.1-5
Summary of Phase I and Phase II RFI Sampling Locations at SWMU 33-017 to be Resampled

Location ID	Basis for Resampling
33-01102	Zinc 15 times BV
33-01104	Cadmium 6 times BV, chromium 4 times BV, lead 8 times BV, nickel 5 times BV, zinc 35 times BV
33-01105	Nickel 6 times BV
33-01106	Cadmium 4 times BV, lead 4 times BV, silver 9 times BV, zinc 7 times BV
33-01107	Cadmium 4 times BV, lead 9 times BV, silver 46 times BV, zinc 7 times BV, 19.2 pCi/g tritium
33-01109	27.6 pCi/g tritium
33-01113	27.9 pCi/g tritium
33-01114	Cadmium 8 times BV, zinc 15 times BV
33-01116	Cadmium 3 times BV, 42.4 pCi/g tritium
33-01120	Cadmium 4 times BV, lead 40 times BV, zinc 4 times BV
33-01128	Nickel 4 times BV, uranium 23 times BV
33-01130	Nickel 30 times BV
33-01135	Lead 4 times BV
33-01145	43.6 pCi/g tritium
33-01146	Lead 1031 times BV
33-01152	Cadmium 13 times BV, silver 5 times BV
33-01156	Cadmium 7 times BV
33-01166	Cadmium 3 times BV, 10.4 pCi/g tritium
33-01604	Detected PCBs (0.12 mg/kg Aroclor-1254, 0.13 mg/kg Aroclor-1260)
33-01606	Detected PCBs (0.083 mg/kg Aroclor-1254, 0.099 mg/kg Aroclor-1260)
33-01607	Detected PCBs (0.18 mg/kg Aroclor-1254, 0.29 mg/kg Aroclor-1260)
33-01612	Detected PCBs (5.5 mg/kg Aroclor-1260)
33-01614	Detected PCBs (1.4 mg/kg Aroclor-1254, 0.87 mg/kg Aroclor-1260)
33-01615	Detected PCBs (0.85 mg/kg Aroclor-1254, 0.92 mg/kg Aroclor-1260)
33-01616	Detected PCBs (3.7 mg/kg Aroclor-1260)

Table 4.2-1
Summary of Decision-Level Samples Collected
and Analyses Requested for Previous Investigations at TA-33 Area 6

Sample ID	Location ID	Depth (ft)	Media	Isotopic Uranium
SWMU 33-007(c)				
0333-96-0179	33-01622	1.0–8.0	Soil	2136*
0333-96-0180	33-01622	1.0–8.0	Soil	2136
0333-96-0181	33-01637	1.0–8.0	Soil	2136
0333-96-0182	33-01638	1.0–8.0	Fill	2136
0333-96-0183	33-01639	1.0–8.0	Fill	2136
0333-96-0184	33-01640	1.0–8.0	Fill	2136
0333-96-0185	33-01641	1.0–8.0	Fill	2136
0333-96-0186	33-01642	1.0–8.0	Fill	2136
0333-96-0187	33-01643	1.0–8.0	Fill	2136
0333-96-0188	33-01644	1.0–8.0	Fill	2136

*Analytical request number.

Table 4.3-1
Summary of Decision-Level Samples Collected and Analyses Requested for Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft)	Media	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	SVOC	Tritium	VOC
Consolidated Unit 33-001(a)-99												
0333-96-0549	33-01653	1.17–1.92	Soil	—[a]	2332[b]	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0553	33-01654	1.0–2.0	Soil	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0555	33-01654	24.0–25.0	Qbt 2	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	2332	2324	2332	—	2325, 2332	2324	2332	2324
SWMU 33-004(b)												
0333-95-0081	33-01548	8.5–10.5	Qbt 2	1658	—	—	—	—	1658, 1659	1657	—	1657
SWMU 33-007(b)												
0333-95-0078	33-01405	0.0–0.5	Fill	—	—	—	—	—	1504	—	—	—
0333-95-0079	33-01406	0.0–0.5	Fill	—	—	—	—	—	1504	—	—	—
0333-95-0080	33-01411	0.0–0.5	Fill	—	—	—	—	—	1504	—	—	—
RE33-99-0001	33-01700	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0002	33-01701	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0003	33-01702	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0004	33-01703	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0063	33-01718	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—

Table 4.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	SVOC	Tritium	VOC
RE33-99-0064	33-01719	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0018	XX-33-604073	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0050	XX-33-604073	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0051	XX-33-604073	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
SWMU 33-008(a)												
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0004	33-01665	2.5–3.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0005	33-01665	3.0–3.5	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0006	33-01665	4.0–5.0	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0007	33-01666	0.0–1.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0008	33-01666	1.0–2.5	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0009	33-01666	2.5–3.5	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0010	33-01666	4.0–5.0	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0012	33-01667	2.5–5.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0013	33-01667	7.5–10.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0014	33-01667	10.0–12.5	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0015	33-01668	2.5–3.5	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0016	33-01668	5.0–6.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0017	33-01668	6.0–7.0	Fill	—	—	2113	—	—	2111, 2112	2110	—	—
0333-96-0018	33-01668	8.5–10.0	Qbo	—	—	2113	—	—	2111, 2112	2110	—	—

Table 4.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide	Gamma Spectroscopy	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	SVOC	Tritium	VOC
SWMU 33-010(c)												
RE33-99-0005	33-01704	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0006	33-01705	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0007	33-01706	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0008	33-01707	0.0–0.5	Soil	—	—	—	—	5608R	5607R	—	—	—
RE33-99-0065	33-01720	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0066	33-01721	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0067	33-01722	0.0–0.5	Sed	—	—	—	—	5683R	5682R	—	—	—
RE33-99-0052	XX-33-604074	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0053	XX-33-604074	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—
RE33-99-0054	XX-33-604074	0.0–0.5	Fill	—	—	—	—	5583R	—	—	—	—

[a] — = Analysis not requested.

[b] Analytical request number.

Table 4.3-2
Inorganic Chemicals Detected above BVs in Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft bgs)	Media	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide	Iron	Lead	Nickel	Selenium	Silver	Thallium	Uranium	Zinc
Soil BV[a]				**0.83**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**15.4**	**1.52**	**1**	**0.73**	**1.82**	**48.8**
Qbo BV[a]				**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**2**	**0.3**	**1**	**1.22**	**0.72**	**40**
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**6.58**	**0.3**	**1**	**1.1**	**2.4**	**63.5**
Sediment BV[a]				**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**9.38**	**0.3**	**1**	**0.73**	**2.22**	**60.2**
Consolidated Unit 33-001(a)-99																				
0333-96-0550	33-01653	17.00–17.42	Qbt 3	0.54 (UJ)	—[b]	—	8860	—	—	—	—	—	—	—	—	0.53 (J)	—	—	—	—
0333-96-0551	33-01653	24.0–25.0	Qbt 2	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
0333-96-0552	33-01653	39.0–40.0	Qbt 4	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	3.2	—
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	7330	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0554	33-01654	14.0–15.0	Qbt 3	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
0333-96-0555	33-01654	24.0–25.0	Qbt 2	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
0333-96-0556	33-01654	39.0–40.0	Qbt 4	0.54 (UJ)	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	3.4	—
SWMU 33-004(b)																				
0333-95-0081	33-01548	8.5–10.5	Qbt 2	3.2 (UJ)	—	—	—	2960	22	—	—	1.1	—	—	—	0.32 (U)	—	—	3.5	—
SWMU 33-007(b)																				
0333-95-0078	33-01405	0.0–0.5	Fill	—	—	—	—	—	—	—	18.2	—	—	23.4	—	—	—	—	—	—
0333-95-0080	33-01411	0.0–0.5	Fill	—	—	—	0.5 (J)	—	24.3	10.3	—	—	—	—	—	—	—	—	—	—
RE33-99-0001	33-01700	0.0–0.5	Soil	—	—	—	0.78 (J)	—	—	—	—	—	—	68.5 (J-)	—	—	—	—	—	—
RE33-99-0002	33-01701	0.0–0.5	Soil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.8 (J)	—	—
RE33-99-0063	33-01718	0.0–0.5	Sed	—	—	—	—	—	—	—	15.5	—	—	—	17.3	0.94 (J)	—	—	—	—
RE33-99-0064	33-01719	0.0–0.5	Sed	—	—	—	—	—	—	—	—	—	—	—	—	0.44 (U)	—	—	—	—
SWMU 33-008(a)																				
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	—	—	7980	—	—	36.8	—	—	—	—	—	—	—	3.49	—
0333-96-0004	33-01665	2.5–3.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.4	—
0333-96-0005	33-01665	3.0–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.42	—
0333-96-0006	33-01665	4.0–5.0	Qbo	0.55 (UJ)	1.9 (J)	—	—	—	—	—	—	—	5470	—	—	0.45 (U)	—	—	2.45	—
0333-96-0007	33-01666	0.0–1.0	Fill	—	—	—	0.48 (U)	—	—	—	45.2	—	—	—	—	—	—	—	7.4	—
0333-96-0008	33-01666	1.0–2.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.67	—
0333-96-0009	33-01666	2.5–3.5	Qbo	0.57 (UJ)	1.2 (J)	—	—	—	—	—	—	—	4910	—	—	0.47 (U)	—	—	3.96	—
0333-96-0010	33-01666	4.0–5.0	Qbo	0.58 (UJ)	1.2 (J)	—	—	—	—	—	—	—	4860	—	—	0.47 (U)	—	—	2.69	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.58	—
0333-96-0012	33-01667	2.5–5.0	Fill	—	—	—	—	7360	—	—	—	—	—	—	—	—	—	—	2.71	108
0333-96-0013	33-01667	7.5–10.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.82	207
0333-96-0014	33-01667	10.0–12.5	Qbo	0.55 (UJ)	1.1 (J)	—	—	—	—	—	—	—	4750	—	—	0.45 (U)	—	—	2.42	202

Table 4.3-2 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide	Iron	Lead	Nickel	Selenium	Silver	Thallium	Uranium	Zinc
Soil BV[a]				**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**0.5**	**0.5**	**21500**	**0.1**	**1.52**	**1**	**0.73**	**1.82**	**48.8**
Qbo BV[a]				**0.5**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**2**	**0.3**	**1**	**1.22**	**0.72**	**40**
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**6.58**	**0.3**	**1**	**1.1**	**2.4**	**63.5**
Sediment BV[a]				**0.83**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**9.38**	**0.3**	**1**	**0.73**	**2.22**	**60.2**
0333-96-0015	33-01668	2.5–3.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.37	—
0333-96-0016	33-01668	5.0–6.0	Fill	—	—	—	—	—	—	—	19.7	—	—	—	—	—	—	—	9.1	—
0333-96-0017	33-01668	6.0–7.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.06	—
0333-96-0018	33-01668	8.5–10.0	Qbo	0.55 (UJ)	1.6 (J)	—	—	—	—	—	—	—	5000	—	—	0.45 (U)	—	—	2.66	—
SWMU 33-010(c)																				
RE33-99-0005	33-01704	0.0–0.5	Soil	—	—	—	—	—	—	—	116	—	—	—	—	—	—	—	—	—
RE33-99-0006	33-01705	0.0–0.5	Soil	0.91 (U)	—	—	—	—	—	—	44.7	—	—	—	—	—	—	—	—	—
RE33-99-0007	33-01706	0.0–0.5	Soil	0.86 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE33-99-0065	33-01720	0.0–0.5	Sed	—	—	130	—	—	—	—	581	—	—	—	—	0.46 (U)	4.6	—	—	—
RE33-99-0066	33-01721	0.0–0.5	Sed	—	—	—	—	—	—	—	570	—	—	—	—	0.89 (J)	—	—	—	—
RE33-99-0067	33-01722	0.0–0.5	Sed	—	—	—	—	—	—	—	270	—	—	—	—	0.44 (U)	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL 1998, 059730.

[b] — = Result was not detected or was below the BV.

Table 4.3-3
Organic Chemicals Detected in Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Carbazole	Chloroaniline[4-]	Chrysene	Di-n-butylphthalate	Dibenz(a,h)anthracene
Consolidated Unit 33-001(a)-99																		
0333-96-0549	33-01653	1.17–1.92	Soil	—[a]	—	—	—	—	—	—	—	—	0.7 (J)	—	—	—	—	—
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	—	—	—	—	—	—	—	—	0.13 (J)	—	—	—	—	—
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	—	—	—	—	—	—	—	—	0.13 (J)	—	—	—	—	—
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	—	—	—	—	—	—	0.19 (J)	—	—	—	—	—
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	—	0.016 (J)	—	—	—	—	—	—	1.1 (J-)	—	—	—	—	—
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	—	0.014 (J)	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-004(b)																		
0333-95-0081	33-01548	8.5–10.5	Qbt 2	—	—	—	—	—	—	—	—	—	0.803	—	—	—	—	—
SWMU 33-007(b)																		
RE33-99-0017	XX-33-604073	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-008(a)																		
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	—	—	—	—	1.4 (J)	—	—	0.55 (J)	—	—	0.18 (J)	—	—
0333-96-0004	33-01665	2.5–3.0	Fill	0.75 (J-)	0.83 (J-)	—	2.6 (J-)	5.1 (J-)	2.5 (J-)	3.8 (J-)	1.1 (J-)	1.8 (J-)	0.53 (J)	1.6 (J-)	—	5.7 (J-)	—	0.44 (J-)
0333-96-0005	33-01665	3.0–3.5	Fill	0.36 (J-)	—	—	1.1 (J-)	1.8 (J-)	0.9 (J-)	0.44 (J-)	0.41 (J-)	0.6 (J)	—	0.98 (J-)	—	1.9 (J-)	—	—
0333-96-0007	33-01666	0.0–1.0	Fill	0.58 (J-)	—	—	2 (J-)	0.71 (J-)	0.51 (J-)	0.66 (J-)	—	0.32 (J)	—	0.62 (J-)	—	1.3 (J-)	—	—
0333-96-0008	33-01666	1.0–2.5	Fill	0.15 (J)	—	—	0.23 (J)	0.14 (J)	0.078 (J)	—	—	—	—	0.099 (J)	—	0.17 (J)	—	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—	0.071 (J)	—
0333-96-0012	33-01667	2.5–5.0	Fill	0.24 (J)	—	—	0.3 (J)	0.16 (J)	—	—	—	NA[b]	0.17 (J)	0.22 (J)	—	0.2 (J)	—	—
0333-96-0013	33-01667	7.5–10.0	Fill	NA	—	—	0.35 (J)	0.3 (J)	NA	0.15 (J)	NA	—	NA	0.14 (J)	NA	0.26 (J)	NA	NA
0333-96-0015	33-01668	2.5–3.5	Fill	0.16 (J)	—	—	0.44 (J)	0.28 (J)	—	0.14 (J)	—	NA	—	0.22 (J)	—	0.41 (J)	—	—
0333-96-0016	33-01668	5.0–6.0	Fill	4.2	0.76 (J)	—	4.9	3.2 (J)	1.6 (J)	2.3 (J)	—	1.2 (J)	—	3.5	—	3.7	—	—
0333-96-0017	33-01668	6.0–7.0	Fill	0.55 (J)	—	—	0.41 (J)	0.37 (J)	0.18 (J)	0.16 (J)	—	—	—	0.34 (J)	0.74 (J)	0.38 (J)	—	—
0333-96-0018	33-01668	8.5–10.0	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Dibenzofuran	Dinitrobenzene[1,3-]	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Naphthalene	Phenanthrene	Pyrene	Toluene	Trichlorobenzene[1,2,3-]	Trichlorobenzene[1,2,4-]	Trinitrobenzene[1,3,5-]
Consolidated Unit 33-001(a)-99																
0333-96-0549	33-01653	1.17–1.92	Soil	—	—	—	—	—	—	—	—	—	0.0042 (J+)	—	—	—
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	—	—	—	—	—	0.003 (J)	—	—	—	—	—	—
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	—	—	—	0.003 (J-)	—	—	—	0.005 (J-)	0.003 (J-)	—
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	—	—	—	—	—	—	—	—	—	—	—	—
SWMU 33-004(b)																
0333-95-0081	33-01548	8.5–10.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—
33-007(b)																
RE33-99-0017	XX-33-604073	0.0–0.5	Fill	—	—	—	—	—	—	—	—	—	0.00093 (J)	—	—	—
33-008(a)																
0333-96-0003	33-01665	0.0–1.0	Fill	—	—	0.38 (J)	—	—	—	—	0.34 (J)	0.33 (J)	—	—	—	—
0333-96-0004	33-01665	2.5–3.0	Fill	0.54 (J-)	—	27 (J-)	0.86 (J-)	1.3 (J-)	—	—	5.7 (J-)	15 (J-)	—	—	—	—
0333-96-0005	33-01665	3.0–3.5	Fill	—	—	9.5 (J-)	0.4 (J-)	0.43 (J-)	—	—	3.5 (J-)	5.4 (J-)	—	—	—	—
0333-96-0007	33-01666	0.0–1.0	Fill	0.44 (J-)	—	1.6 (J-)	0.6 (J-)	—	—	0.37 (J-)	1.8 (J-)	1.4 (J-)	—	—	—	—
0333-96-0008	33-01666	1.0–2.5	Fill	0.11 (J)	—	0.51	0.15 (J)	—	—	—	0.68	0.38	—	—	—	—
0333-96-0011	33-01667	0.0–1.0	Fill	—	—	—	—	—	—	—	—	—	—	—	—	—
0333-96-0012	33-01667	2.5–5.0	Fill	0.17 (J)	—	0.97	0.26 (J)	—	—	—	1.5	0.7	—	—	—	—
0333-96-0013	33-01667	7.5–10.0	Fill	NA	—	1.5	NA	NA	NA	NA	1.2	0.99	—	—	—	—
0333-96-0015	33-01668	2.5–3.5	Fill	—	—	0.63 (J)	0.18 (J)	—	—	0.4 (J)	0.75	0.58 (J)	—	—	—	—
0333-96-0016	33-01668	5.0–6.0	Fill	2.8 (J)	—	11	4.2	—	3.2 (J)	11	15	8.4	—	—	—	—
0333-96-0017	33-01668	6.0–7.0	Fill	0.36 (J)	—	1.3	0.5 (J)	—	0.41 (J)	1.1	1.8	0.96	—	—	—	—
0333-96-0018	33-01668	8.5–10.0	Qbo	—	—	—	—	—	—	—	0.074 (J)	—	—	—	—	—

Notes: Units are mg/kg. Data qualifiers are defined in Appendix A.

[a] — = Result was not detected.

[b] NA = Not analyzed.

Table 4.3-4
Radionuclides Detected or Detected above BVs/FVs in Previous Investigations at TA-33 South Site

Sample ID	Location ID	Depth (ft bgs)	Media	Cesium-137	Plutonium-238	Plutonium-239/240	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil BV/FV[a]				**1.65**	**0.023**	**0.054**	**na[b]**	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Sediment BV/FV[a]				**0.9**	**0.006**	**0.068**	**0.093**	**2.59**	**0.2**	**2.29**
Consolidated Unit 33-001(a)-99										
0333-96-0549	33-01653	1.17–1.92	Soil	—[c]	—	—	0.0904823	NA[d]	NA	NA
0333-96-0550	33-01653	17.0–17.42	Qbt 3	—	—	—	0.560725	NA	NA	NA
0333-96-0551	33-01653	24.0–25.0	Qbt 2	—	—	—	0.0431174	NA	NA	NA
0333-96-0552	33-01653	39.0–40.0	Qbt 4	—	—	—	0.0416466	NA	NA	NA
0333-96-0553	33-01654	1.0–2.0	Soil	—	—	—	0.0437782	NA	NA	NA
0333-96-0554	33-01654	14.0–15.0	Qbt 3	—	—	—	0.0442105	NA	NA	NA
0333-96-0555	33-01654	24.0–25.0	Qbt 2	—	—	—	0.0937908	NA	NA	NA
0333-96-0556	33-01654	39.0–40.0	Qbt 4	—	—	—	0.0757325	NA	NA	NA
SWMU 33-007(b)										
RE33-99-0001	33-01700	0.0–0.5	Soil	NA	NA	NA	NA	2.82	—	3.36
RE33-99-0004	33-01703	0.0–0.5	Soil	NA	NA	NA	NA	7.35	0.314	7.15
SWMU 33-010(c)										
RE33-99-0005	33-01704	0.0–0.5	Soil	NA	NA	NA	NA	4.62	0.269	4.54
RE33-99-0006	33-01705	0.0–0.5	Soil	NA	NA	NA	NA	9.78	0.5	9.41
RE33-99-0008	33-01707	0.0–0.5	Soil	NA	NA	NA	NA	4.05	0.221	3.94
RE33-99-0065	33-01720	0.0–0.5	Sed	NA	NA	NA	NA	16.3	0.76	17.2

Table 4.3-4 (continued)

Sample ID	Location ID	Depth (ft bgs)	Media	Cesium-137	Plutonium-238	Plutonium-239/240	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Soil/ BV/FV[a]				**1.65**	**0.023**	**0.054**	**na**[b]	**2.59**	**0.2**	**2.29**
Qbt 2, 3, 4 BV/FV[a]				**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Sediment BV/FV[a]				**0.9**	**0.006**	**0.068**	**0.093**	**2.59**	**0.2**	**2.29**
RE33-99-0066	33-01721	0.0–0.5	Sed	—	—	—	—	13.7	0.785	14.35
RE33-99-0067	33-01722	0.0–0.5	Sed	—	—	—	—	4.86	0.3	5.57
RE33-99-0052	33-604074	0.0–0.5	Fill	—	—	—	—	21.4	1.12	24.4
RE33-99-0053	33-604074	0.0–0.5	Fill	—	—	—	—	21.2	1.173	23.8
RE33-99-0054	33-604074	0.0–0.5	Fill	—	—	—	—	17	0.864	19.5

Notes: Units are pCi/g. Data qualifiers are defined in Appendix A.

[a] BVs/FVs from LANL 1998, 059730.

[b] na = Not available.

[c] — = Result was not detected or was below the BV/FV.

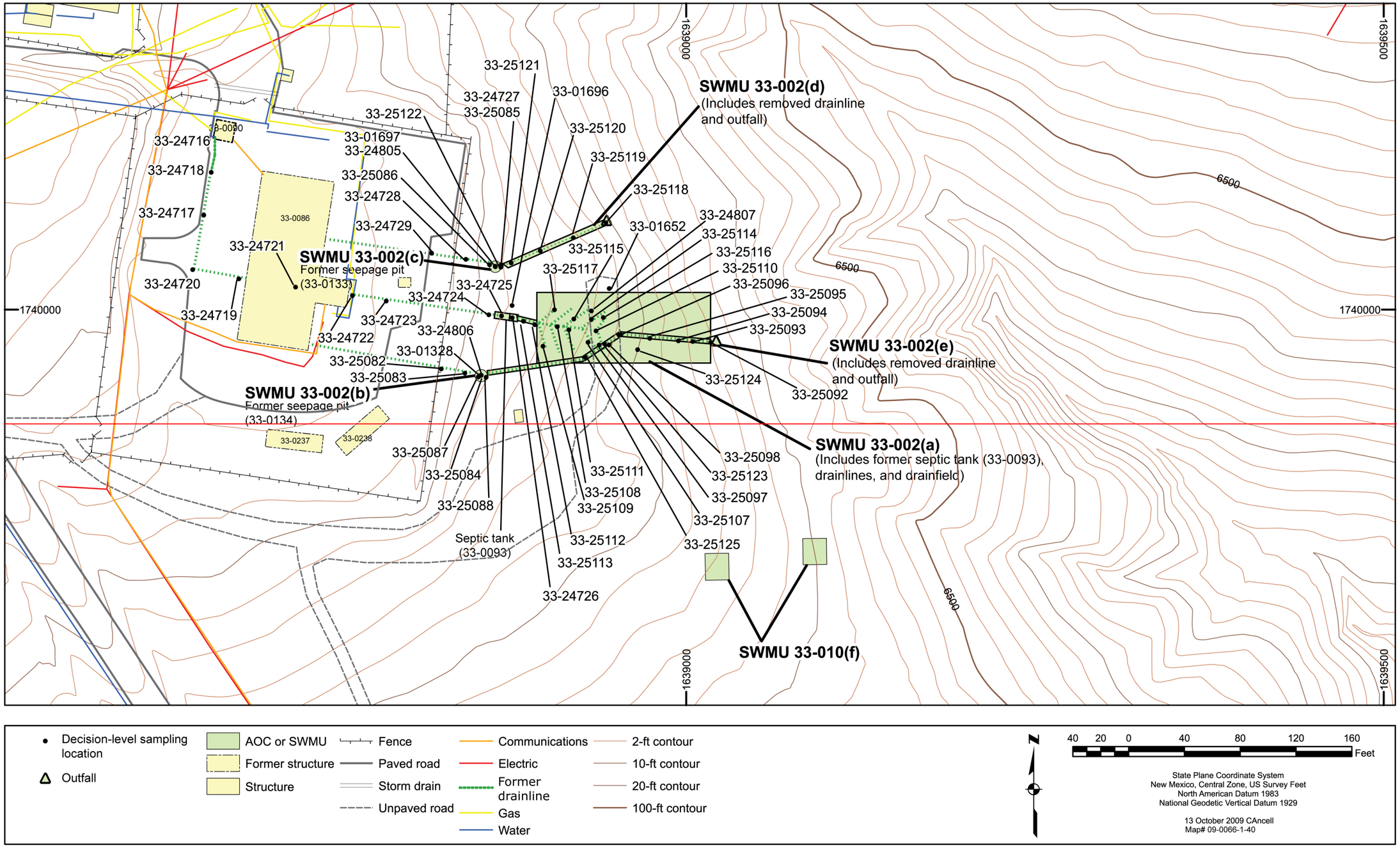
[d] NA = Not analyzed.

Table 5.0-1
Summary of Investigation Methods

Method	Summary
Locating Utilities	Excavation/Soil Disturbance Permits will be obtained from the Industrial Hygiene and Safety–Operational Support Division. Underground utilities will be located, and the excavation permits secured before the readiness and planning review and before any field activities at the Chaquehui Aggregate Area are undertaken.
Spade-and-Scoop Collection of Soil Samples	This method will be used to collect surface (i.e., 0–1 ft) soil or fill samples. A hole will be dug to the desired depth, as prescribed in the work plan, and a discrete grab sample collected. The sample will be homogenized in a decontaminated stainless-steel bowl before it is transferred to the appropriate sample containers.
Hand Auger Collection of Soil Samples	This method will typically be used for sampling soil or sediment at depths of less than 10–15 ft but in some cases may be used to collect samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in.-inside diameter [I.D.]), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth is reached, the auger is decontaminated before the hole is advanced through the sampling depth. The sampling material is transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers are filled.
Split-Spoon Core-Barrel Sampling	The split-spoon core barrel is a cylindrical barrel split lengthwise so the two halves can be separated to expose the core sample. The stainless-steel core barrel (3 in.-I.D. and 5 ft long) is pushed directly into the subsurface media with a hollow-stem auger drilling rig. A continuous length of core is extracted with the core barrel. Once it is extracted, the section of core will be screened for radioactivity and organic vapors, photographed, and described in a lithologic log. If it is located within a targeted sampling interval, a portion of the core will be collected for fixed laboratory analysis.
Field Logging, Handling, and Documentation of Borehole Materials	When they reach the surface, the core barrels will be opened immediately for field screening, logging, and sampling. Logging of borehole materials includes run number, core recovery in feet, depth interval (in 5-ft increments), field-screening results, lithological and structural description, and photographs. Once the core material is logged, selected samples will be taken from discrete intervals of the core. All borehole material not sampled will be managed as IDW.
Borehole Abandonment	Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are added to ensure bridging does not occur. Boreholes greater than 20 ft deep will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grouting materials include cement or bentonite grout, neat cement, or concrete. The use of backfill materials such as bentonite and grout will be documented in a field logbook with respect to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be presented in the investigation report.
Geophysical Surveys	Geophysical surveys will be performed at selected sites to identify anomalies that would indicate the location of former waste disposal sites. Geophysical methods employed will include terrain conductivity (EM-31 or equivalent), high-sensitivity metal detection (EM-61 or equivalent), and GPR. The area to be surveyed will be gridded as specified in the work plan, and data will be digitally recorded. Geodetic coordinates will be recorded at 1-s intervals using an integrated GPS.
Headspace Vapor Screening	All soil and tuff samples will be field screened for VOCs by placing a portion of the sample in a glass jar. The jar will be sealed with foil and gently shaken and allowed to equilibrate for approximately 5 min. The sample will then be screened by inserting a PID probe equipped with an 11.7-eV lamp into the container. The results will be recorded in units of ppm.

Table 5.0-1 (continued)

Method	Summary
XRF Screening	Soil samples will be screened in the field using XRF to delineate areas of inorganic chemical contamination. The XRF used will have a detection limit equal to approximately 10% to 20% of the SSL for major site contaminants. Samples will be collected and analyzed in accordance with the XRF manufacturer's instructions, including analysis of standards and other QA/QC samples.
Handling, Packaging, and Shipping of Samples	Samples will be sealed and labeled before they are packed in ice. Sample and transport containers will be examined to ensure they are free of external contamination. Samples will be packaged to minimize the possibility of breakage during transport. After environmental samples are collected, packaged, and preserved, they will be transported to the SMO. A split of each sample will be sent to an SMO-approved radiation-screening laboratory under chain of custody (COC). Once radiation-screening results are received, the SMO will send the corresponding analytical samples to fixed laboratories for full analysis.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and QA. Specific requirements for each sample will be printed in the sample collection logs (SCLs) provided by the SMO (size and type of container, preservatives, etc.). All samples will be preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Sample Control and Field Documentation	The collection, screening, and transport of samples will be documented on standard forms generated by the SMO. These forms include SCLs, COC forms, and sample container labels. Collection logs will be completed at the time the samples are collected and signed by the sampler and a reviewer who verifies that the logs are complete and accurate. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. The COC forms will be completed and assigned to verify that the samples are not left unattended.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys will focus on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys will be conducted with a Trimble 5700 digital GPS. The survey data will conform to Laboratory Information Architecture project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management." All coordinates will be expressed as State Plane Coordinate System, North American Datum 83, New Mexico Central Zone, U.S. survey ft. All elevation data will be reported relative to the National Geodetic Vertical Datum of 1983.
Management, Characterization, and Storage of IDW	The IDW will be managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization will comply with on-site or off-site waste acceptance criteria, as appropriate. All stored IDW will be marked with appropriate signs and labels. Each waste generated container will be individually labeled with waste classification, item identification, and radioactivity (if applicable) immediately following containerization. All waste will be segregated by classification and compatibility to prevent cross-contamination.
Field Quality Control Samples	Field QC samples will be collected as follows. Field duplicate samples and equipment blanks will be collected at a frequency of 10%. Field duplicates and equipment blanks will be collected at the same time as a regular sample and submitted for the same analyses. Trip blanks will be collected whenever samples were collected for VOC analysis. Trip blanks will be collected at a frequency of one sample per day when VOC samples are collected. Trip-blank containers will consist of certified clean sand that are opened and kept with the other sample containers during the sampling process.
Field Decontamination of Equipment	Dry decontamination will be the preferred method at the Chaquehui Canyon Aggregate Area to minimize generating liquid waste. Dry decontamination will include using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by applying a commercial cleaning agent (i.e., Fantastik) and paper wipes.



- Decision-level sampling location
- Outfall
- AOC or SWMU
- Former structure
- Structure
- Fence
- Paved road
- Storm drain
- Unpaved road
- Communications
- Electric
- Former drainline
- Gas
- Water
- 2-ft contour
- 10-ft contour
- 20-ft contour
- 100-ft contour

N

40 20 0 40 80 120 160 Feet

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

13 October 2009 CAncell
Map# 09-0066-1-40

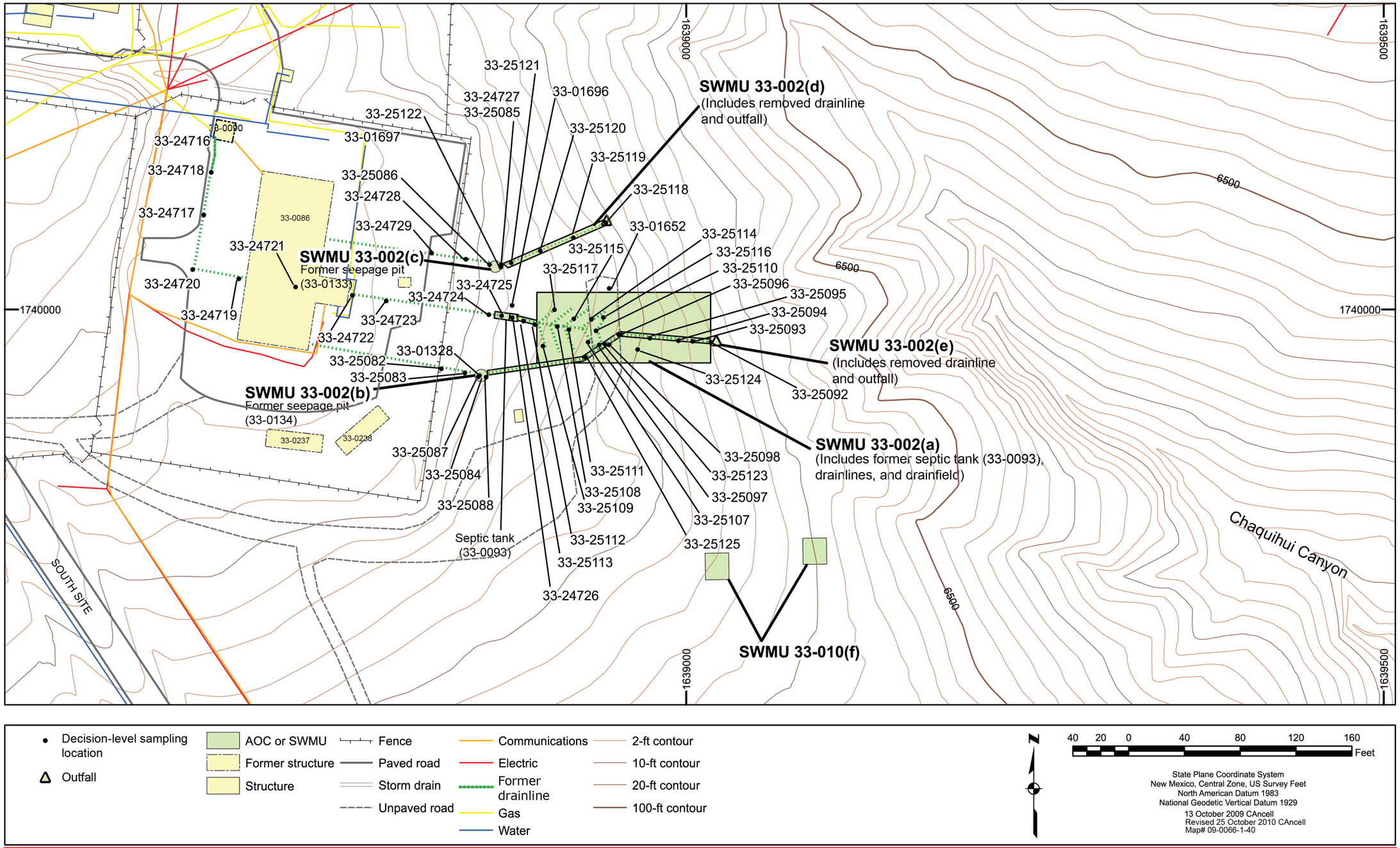
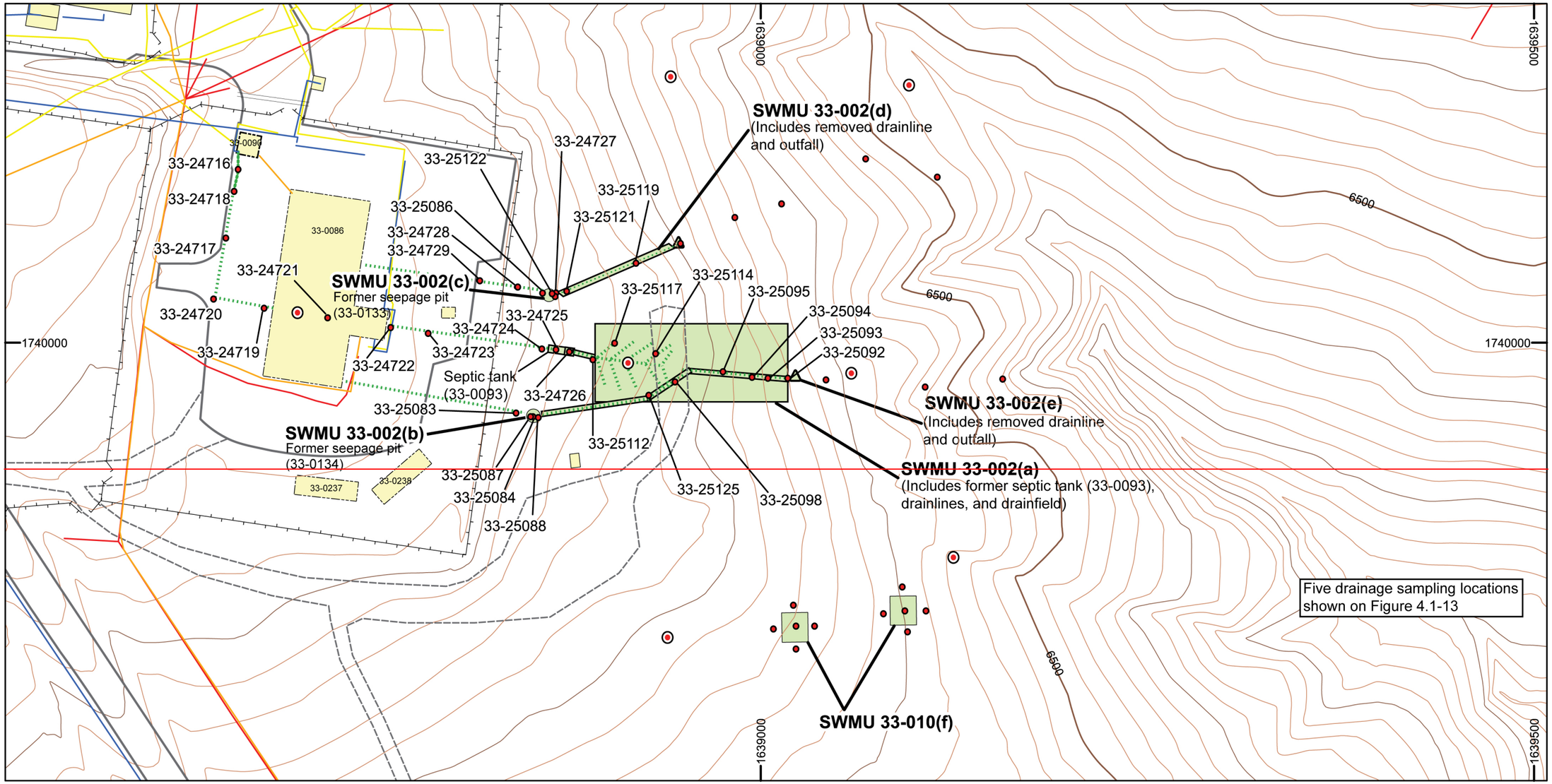


Figure 4.1-1 Site features and decision-level sampling locations for Consolidated Unit 33-002(a)-99


1639000
1639500
1740000
33-0090
33-24716
33-24718
33-24717
33-24721
33-24720
33-24719
33-0086
SWMU 33-002(c)
Former seepage pit
(33-0133)
33-24722
33-24723
33-24724
33-24725
33-24726
Septic tank
(33-0093)
33-25083
SWMU 33-002(b)
Former seepage pit
(33-0134)
33-0237
33-0238
33-25087
33-25084
33-25088
33-25122
33-24727
33-25086
33-24728
33-24729
33-25119
33-25121
SWMU 33-002(d)
(Includes removed drainline
and outfall)
33-25117
33-25114
33-25095
33-25094
33-25093
33-25092
33-25112
33-25125
33-25098
SWMU 33-002(e)
(Includes removed drainline
and outfall)
SWMU 33-002(a)
(Includes former septic tank (33-0093),
drainlines, and drainfield)
6500
Five drainage sampling locations
shown on Figure 4.1-13
SWMU 33-010(f)
Proposed sample location
Proposed borehole
Outfall
AOC or SWMU
Former structure
Structure
Fence
Paved road
Storm drain
Unpaved road
Communications
Electric
Former drainline
Gas
Water
2-ft contour
10-ft contour
20-ft contour
100-ft contour
N
40 20 0 40 80 120 160
Feet
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929
13 October 2009 CAncell
Map# 09-0066-1-41

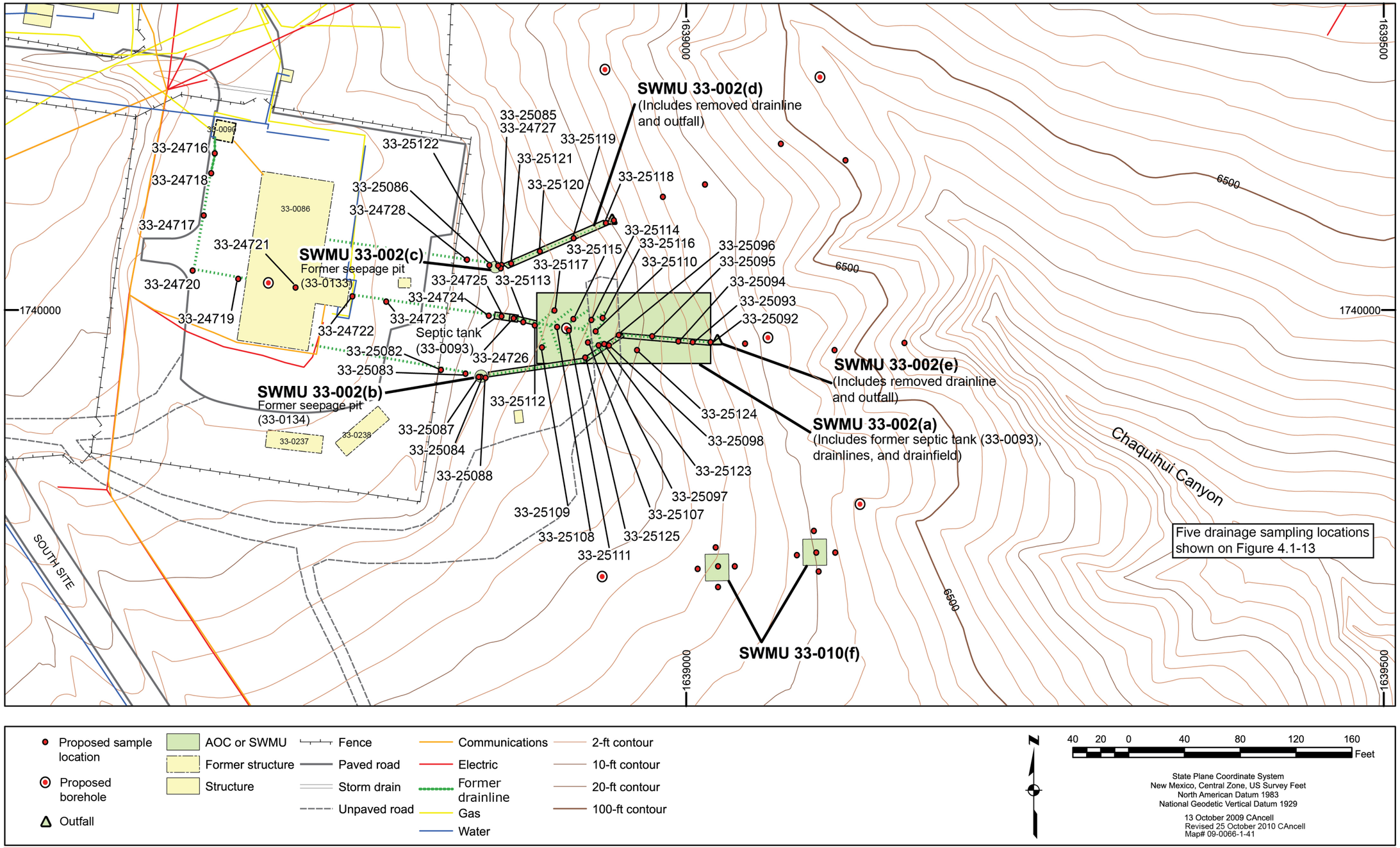
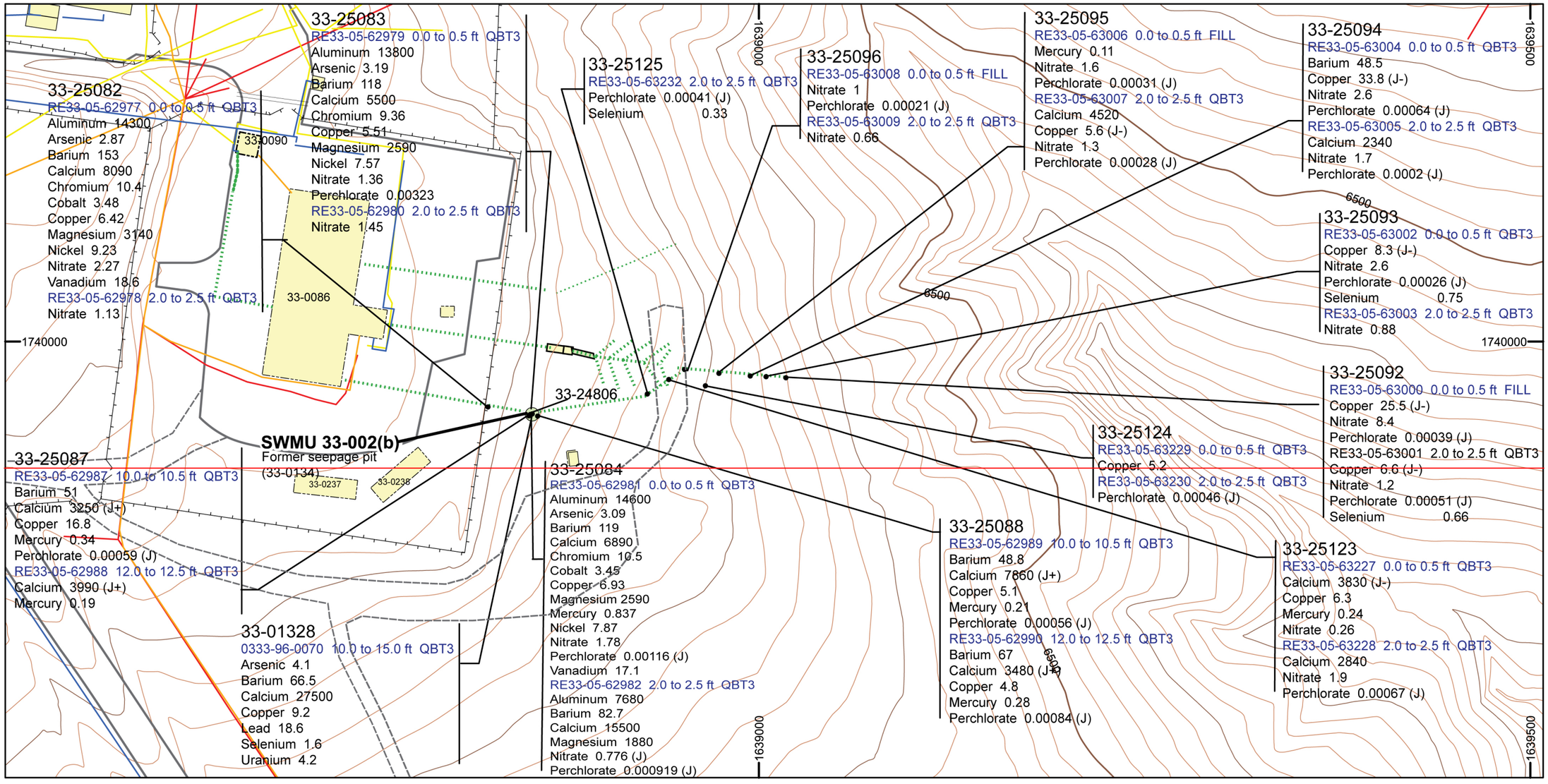


Figure 4.1-2 Proposed sampling locations at Consolidated Unit 33-002(a)-99


33-25082
RE33-05-62977 0.0 to 0.5 ft QBT3
Aluminum 14300
Arsenic 2.87
Barium 153
Calcium 8090
Chromium 10.4
Cobalt 3.48
Copper 6.42
Magnesium 3140
Nickel 9.23
Nitrate 2.27
Vanadium 18.6
RE33-05-62978 2.0 to 2.5 ft QBT3
Nitrate 1.13
33-25083
RE33-05-62979 0.0 to 0.5 ft QBT3
Aluminum 13800
Arsenic 3.19
Barium 118
Calcium 5500
Chromium 9.36
Copper 5.51
Magnesium 2590
Nickel 7.57
Nitrate 1.36
Perchlorate 0.00323
RE33-05-62980 2.0 to 2.5 ft QBT3
Nitrate 1.45
33-25125
RE33-05-63232 2.0 to 2.5 ft QBT3
Perchlorate 0.00041 (J)
Selenium 0.33
33-25096
RE33-05-63008 0.0 to 0.5 ft FILL
Nitrate 1
Perchlorate 0.00021 (J)
RE33-05-63009 2.0 to 2.5 ft QBT3
Nitrate 0.66
33-25095
RE33-05-63006 0.0 to 0.5 ft FILL
Mercury 0.11
Nitrate 1.6
Perchlorate 0.00031 (J)
RE33-05-63007 2.0 to 2.5 ft QBT3
Calcium 4520
Copper 5.6 (J-)
Nitrate 1.3
Perchlorate 0.00028 (J)
33-25094
RE33-05-63004 0.0 to 0.5 ft QBT3
Barium 48.5
Copper 33.8 (J-)
Nitrate 2.6
Perchlorate 0.00064 (J)
RE33-05-63005 2.0 to 2.5 ft QBT3
Calcium 2340
Nitrate 1.7
Perchlorate 0.0002 (J)
33-25093
RE33-05-63002 0.0 to 0.5 ft QBT3
Copper 8.3 (J-)
Nitrate 2.6
Perchlorate 0.00026 (J)
Selenium 0.75
RE33-05-63003 2.0 to 2.5 ft QBT3
Nitrate 0.88
33-25092
RE33-05-63000 0.0 to 0.5 ft FILL
Copper 25.5 (J-)
Nitrate 8.4
Perchlorate 0.00039 (J)
RE33-05-63001 2.0 to 2.5 ft QBT3
Copper 6.6 (J-)
Nitrate 1.2
Perchlorate 0.00051 (J)
Selenium 0.66
33-25124
RE33-05-63229 0.0 to 0.5 ft QBT3
Copper 5.2
RE33-05-63230 2.0 to 2.5 ft QBT3
Perchlorate 0.00046 (J)
33-25123
RE33-05-63227 0.0 to 0.5 ft QBT3
Calcium 3830 (J-)
Copper 6.3
Mercury 0.24
Nitrate 0.26
RE33-05-63228 2.0 to 2.5 ft QBT3
Calcium 2840
Nitrate 1.9
Perchlorate 0.00067 (J)
33-25088
RE33-05-62989 10.0 to 10.5 ft QBT3
Barium 48.8
Calcium 7660 (J+)
Copper 5.1
Mercury 0.21
Perchlorate 0.00056 (J)
RE33-05-62990 12.0 to 12.5 ft QBT3
Barium 67
Calcium 3480 (J+)
Copper 4.8
Mercury 0.28
Perchlorate 0.00084 (J)
33-25084
RE33-05-62981 0.0 to 0.5 ft QBT3
Aluminum 14600
Arsenic 3.09
Barium 119
Calcium 6890
Chromium 10.5
Cobalt 3.45
Copper 6.93
Magnesium 2590
Mercury 0.837
Nickel 7.87
Nitrate 1.78
Perchlorate 0.00116 (J)
Vanadium 17.1
RE33-05-62982 2.0 to 2.5 ft QBT3
Aluminum 7680
Barium 82.7
Calcium 15500
Magnesium 1880
Nitrate 0.776 (J)
Perchlorate 0.000919 (J)
33-25087
RE33-05-62987 10.0 to 10.5 ft QBT3
Barium 51
Calcium 3250 (J+)
Copper 16.8
Mercury 0.34
Perchlorate 0.00059 (J)
RE33-05-62988 12.0 to 12.5 ft QBT3
Calcium 3990 (J+)
Mercury 0.19
33-01328
0333-96-0070 10.0 to 15.0 ft QBT3
Arsenic 4.1
Barium 66.5
Calcium 27500
Copper 9.2
Lead 18.6
Selenium 1.6
Uranium 4.2
SWMU 33-002(b)
Former seepage pit
(33-0134)
33-0237
33-0238
33-0090
33-0086
33-24806
1740000
1639000
1639500
6500
Decision-level sampling location
AOC or SWMU
Former structure
Structure
Fence
Paved road
Storm drain
Unpaved road
Communications
Electric
Former drainline
Gas
Water
2-ft contour
10-ft contour
20-ft contour
100-ft contour
Note: Sampling results reported in mg/kg
N
40 20 0 40 80 120 160
Feet
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929
13 October 2009 CAncell
Map# 09-0066-1-42

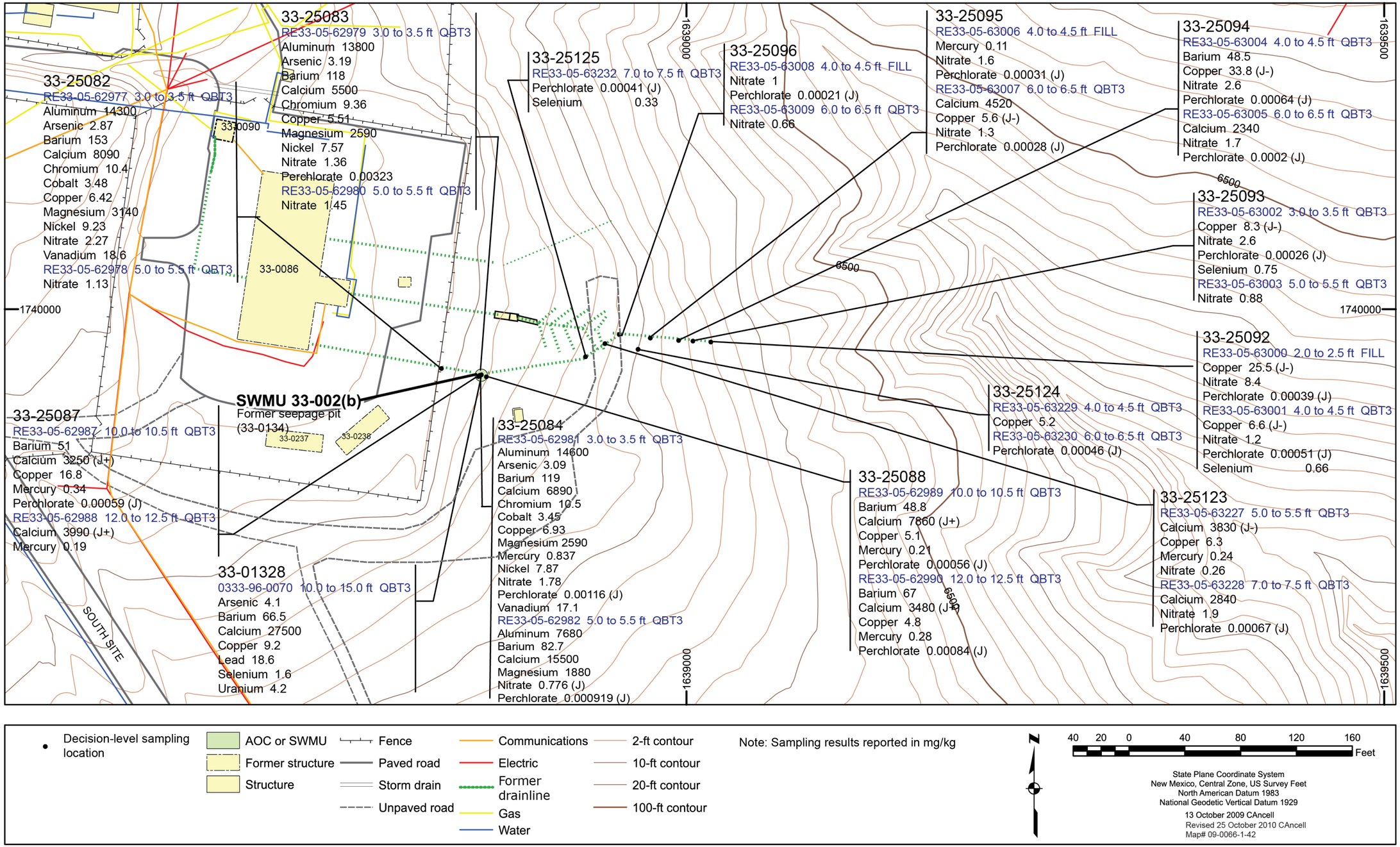
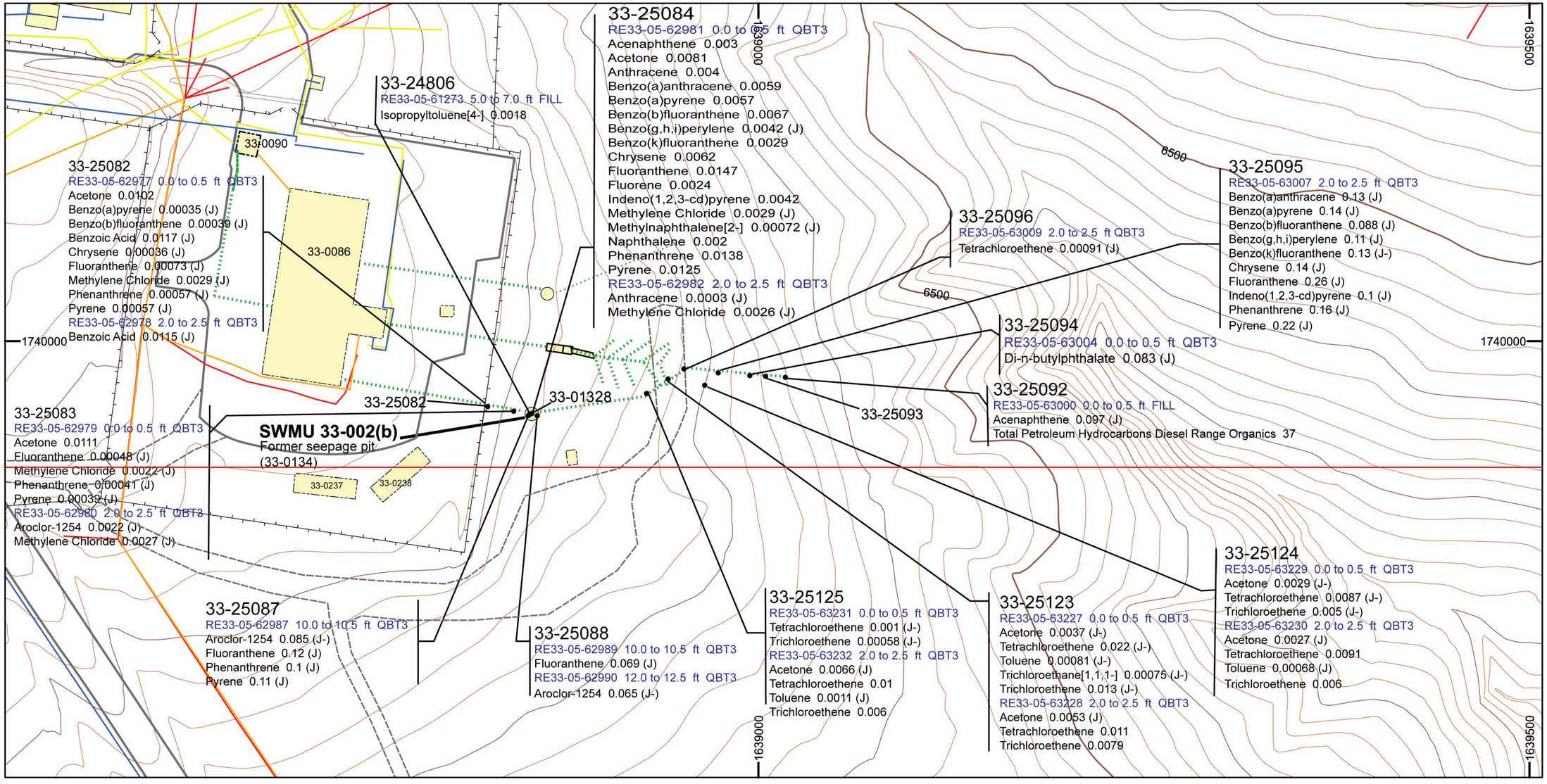


Figure 4.1-3 Inorganic chemicals detected above BVs at SWMU 33-002(b)



Decision-level sampling location

AOC or SWMU
Former structure
Structure

Fence
Paved road
Storm drain
Unpaved road

Communications
Electric
Former drainline
Gas
Water

2-ft contour
10-ft contour
20-ft contour
100-ft contour

Note: Sampling results reported in mg/kg

40 20 0 40 80 120 160 Feet

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

13 October 2009 CAncell
Map# 09-0066-1-43

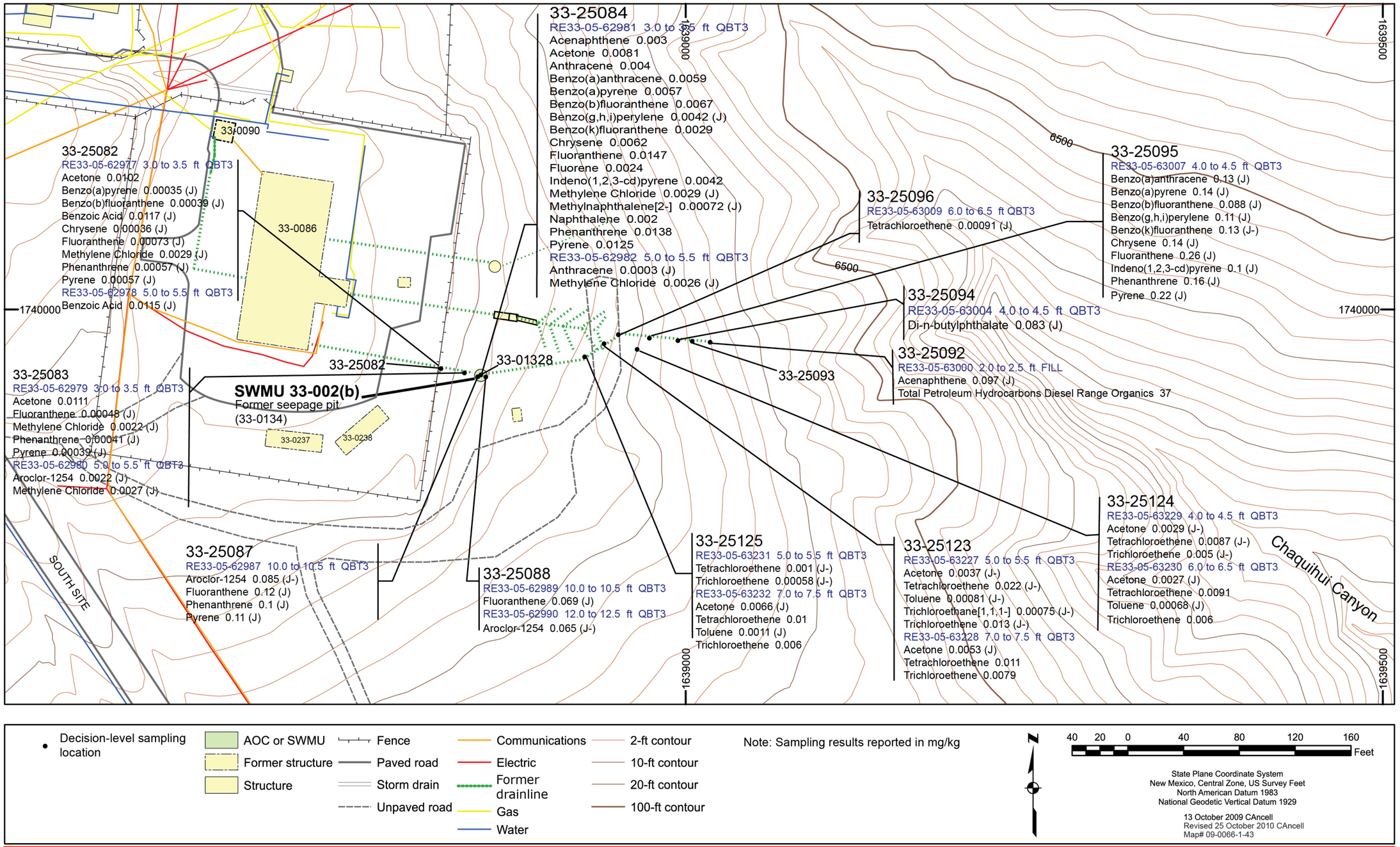
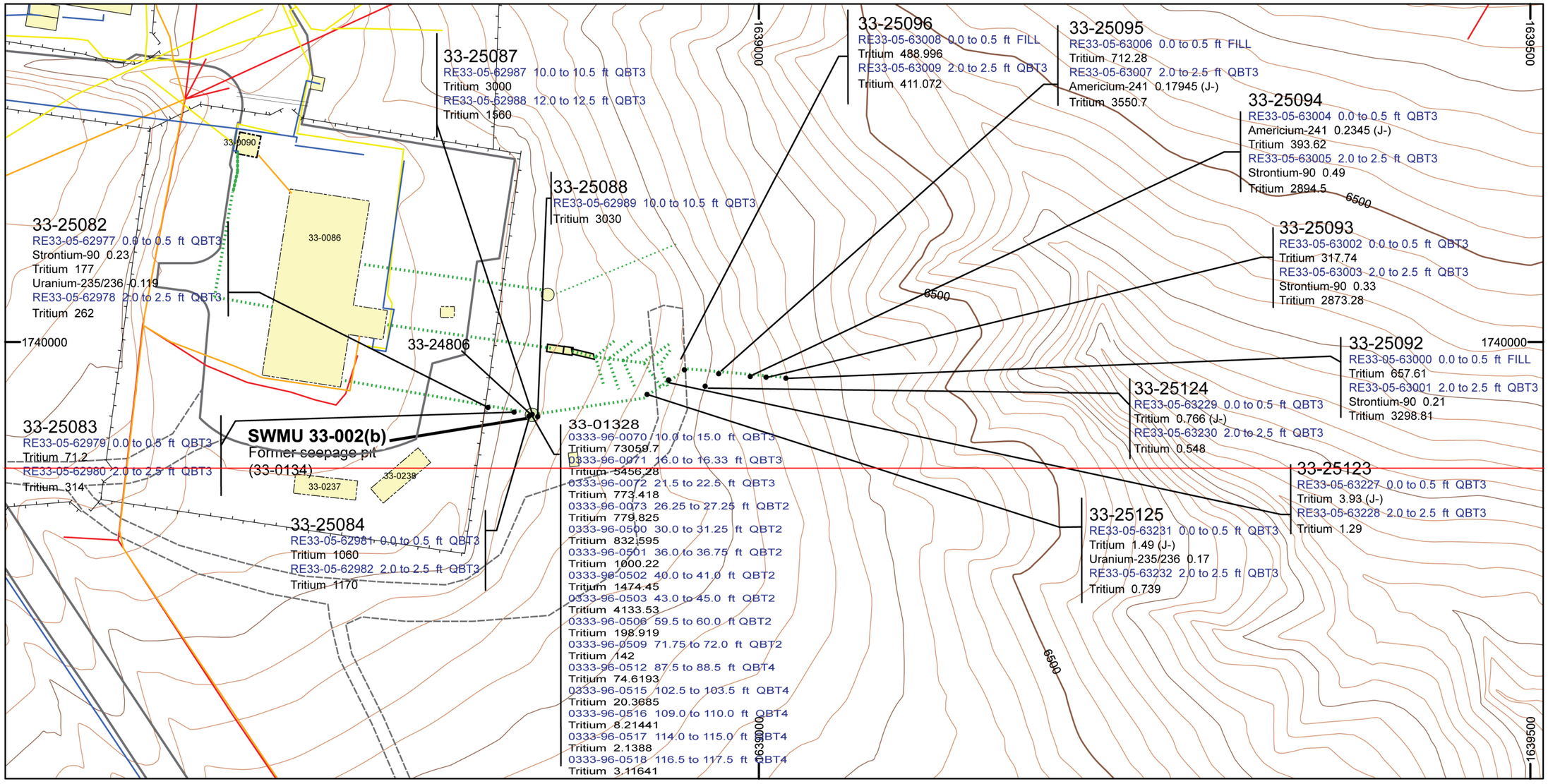


Figure 4.1-4 Organic chemicals detected at SWMU 33-002(b)



- Decision-level sampling location
- AOC or SWMU
- Former structure
- Structure
- Fence
- Paved road
- Storm drain
- Unpaved road
- Communications
- Electric
- Former drainline
- Gas
- Water
- 2-ft contour
- 10-ft contour
- 20-ft contour
- 100-ft contour

Note: Sampling results reported in pCi/g

N

40 20 0 40 80 120 160 Feet

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

13 October 2009 CAncell
Map# 09-0066-1-44

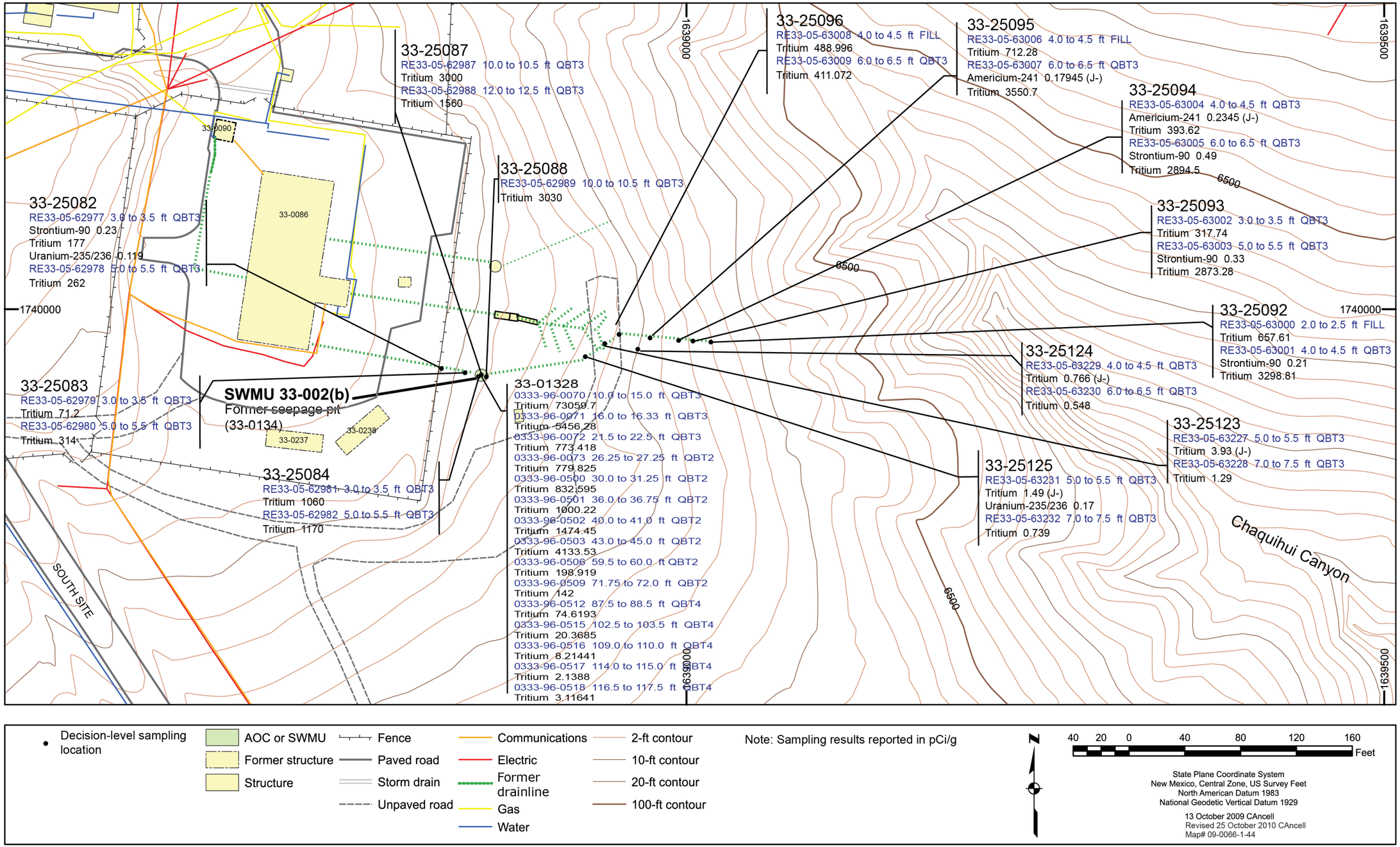
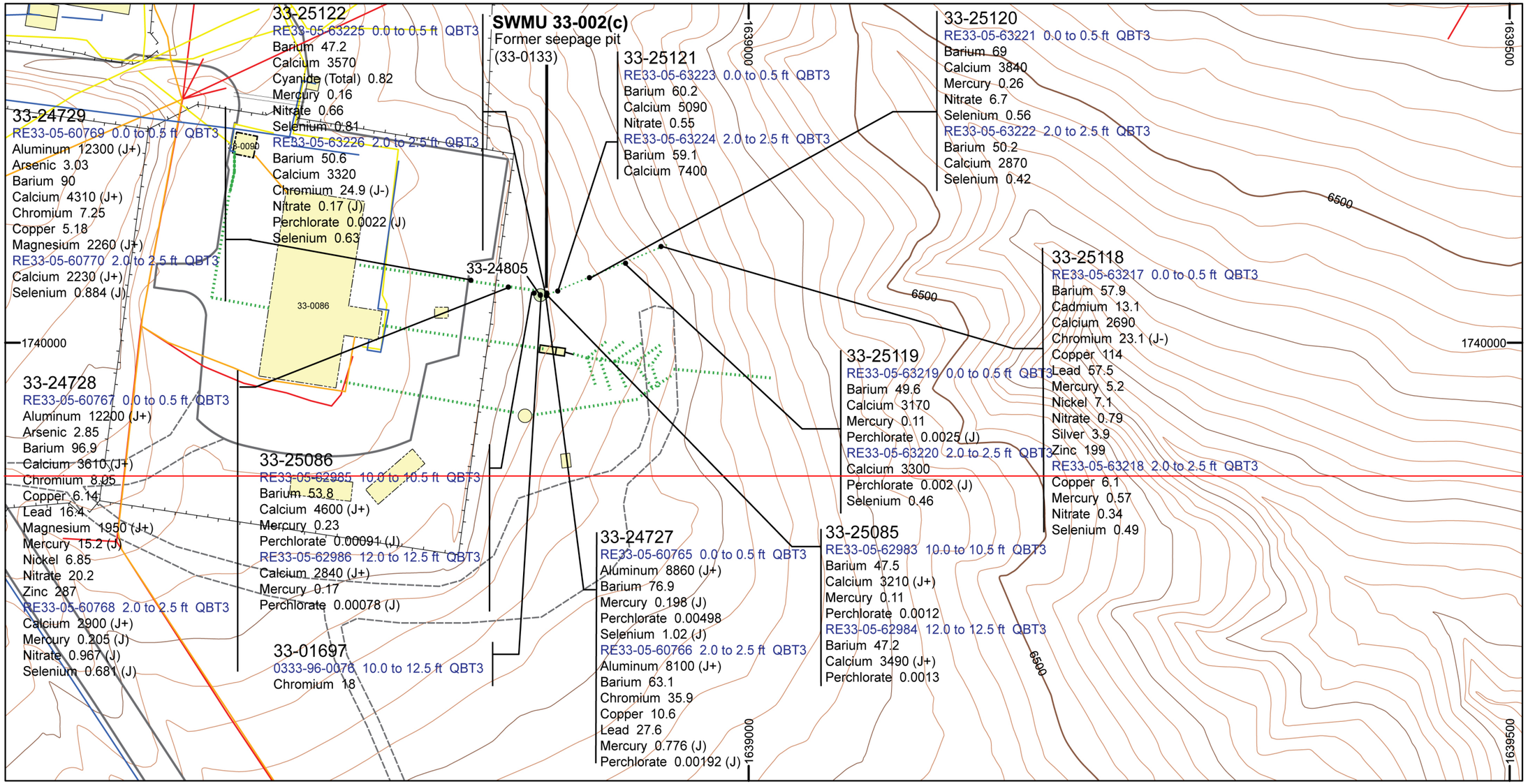


Figure 4.1-5 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(b)


33-25122
RE33-05-63225 0.0 to 0.5 ft QBT3
Barium 47.2
Calcium 3570
Cyanide (Total) 0.82
Mercury 0.16
Nitrate 0.66
Selenium 0.81
RE33-05-63226 2.0 to 2.5 ft QBT3
Barium 50.6
Calcium 3320
Chromium 24.9 (J-)
Nitrate 0.17 (J)
Perchlorate 0.0022 (J)
Selenium 0.63
SWMU 33-002(c)
Former seepage pit
(33-0133)
33-25121
RE33-05-63223 0.0 to 0.5 ft QBT3
Barium 60.2
Calcium 5090
Nitrate 0.55
RE33-05-63224 2.0 to 2.5 ft QBT3
Barium 59.1
Calcium 7400
33-25120
RE33-05-63221 0.0 to 0.5 ft QBT3
Barium 69
Calcium 3840
Mercury 0.26
Nitrate 6.7
Selenium 0.56
RE33-05-63222 2.0 to 2.5 ft QBT3
Barium 50.2
Calcium 2870
Selenium 0.42
33-24729
RE33-05-60769 0.0 to 0.5 ft QBT3
Aluminum 12300 (J+)
Arsenic 3.03
Barium 90
Calcium 4310 (J+)
Chromium 7.25
Copper 5.18
Magnesium 2260 (J+)
RE33-05-60770 2.0 to 2.5 ft QBT3
Calcium 2230 (J+)
Selenium 0.884 (J)
33-24805
33-25118
RE33-05-63217 0.0 to 0.5 ft QBT3
Barium 57.9
Cadmium 13.1
Calcium 2690
Chromium 23.1 (J-)
Copper 114
Lead 57.5
Mercury 5.2
Nickel 7.1
Nitrate 0.79
Silver 3.9
Zinc 199
RE33-05-63218 2.0 to 2.5 ft QBT3
Copper 6.1
Mercury 0.57
Nitrate 0.34
Selenium 0.49
33-25119
RE33-05-63219 0.0 to 0.5 ft QBT3
Barium 49.6
Calcium 3170
Mercury 0.11
Perchlorate 0.0025 (J)
RE33-05-63220 2.0 to 2.5 ft QBT3
Calcium 3300
Perchlorate 0.002 (J)
Selenium 0.46
33-24728
RE33-05-60767 0.0 to 0.5 ft QBT3
Aluminum 12200 (J+)
Arsenic 2.85
Barium 96.9
Calcium 3610 (J+)
Chromium 8.05
Copper 6.14
Lead 16.4
Magnesium 1950 (J+)
Mercury 15.2 (J)
Nickel 6.85
Nitrate 20.2
Zinc 287
RE33-05-60768 2.0 to 2.5 ft QBT3
Calcium 2900 (J+)
Mercury 0.205 (J)
Nitrate 0.967 (J)
Selenium 0.681 (J)
33-25086
RE33-05-62985 10.0 to 10.5 ft QBT3
Barium 53.8
Calcium 4600 (J+)
Mercury 0.23
Perchlorate 0.00091 (J)
RE33-05-62986 12.0 to 12.5 ft QBT3
Calcium 2840 (J+)
Mercury 0.17
Perchlorate 0.00078 (J)
33-24727
RE33-05-60765 0.0 to 0.5 ft QBT3
Aluminum 8860 (J+)
Barium 76.9
Mercury 0.198 (J)
Perchlorate 0.00498
Selenium 1.02 (J)
RE33-05-60766 2.0 to 2.5 ft QBT3
Aluminum 8100 (J+)
Barium 63.1
Chromium 35.9
Copper 10.6
Lead 27.6
Mercury 0.776 (J)
Perchlorate 0.00192 (J)
33-25085
RE33-05-62983 10.0 to 10.5 ft QBT3
Barium 47.5
Calcium 3210 (J+)
Mercury 0.11
Perchlorate 0.0012
RE33-05-62984 12.0 to 12.5 ft QBT3
Barium 47.2
Calcium 3490 (J+)
Perchlorate 0.0013
33-01697
0333-96-0076 10.0 to 12.5 ft QBT3
Chromium 18
33-0090
33-0086
1740000
1639000
1639500
6500
Decision-level sampling location
AOC or SWMU
Former structure
Structure
Fence
Paved road
Storm drain
Unpaved road
Communications
Electric
Former drainline
Gas
Water
2-ft contour
10-ft contour
20-ft contour
100-ft contour
Note: Sampling results reported in mg/kg
N
40 20 0 40 80 120 160
Feet
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929
13 October 2009 CAncell
Map# 09-0066-1-45

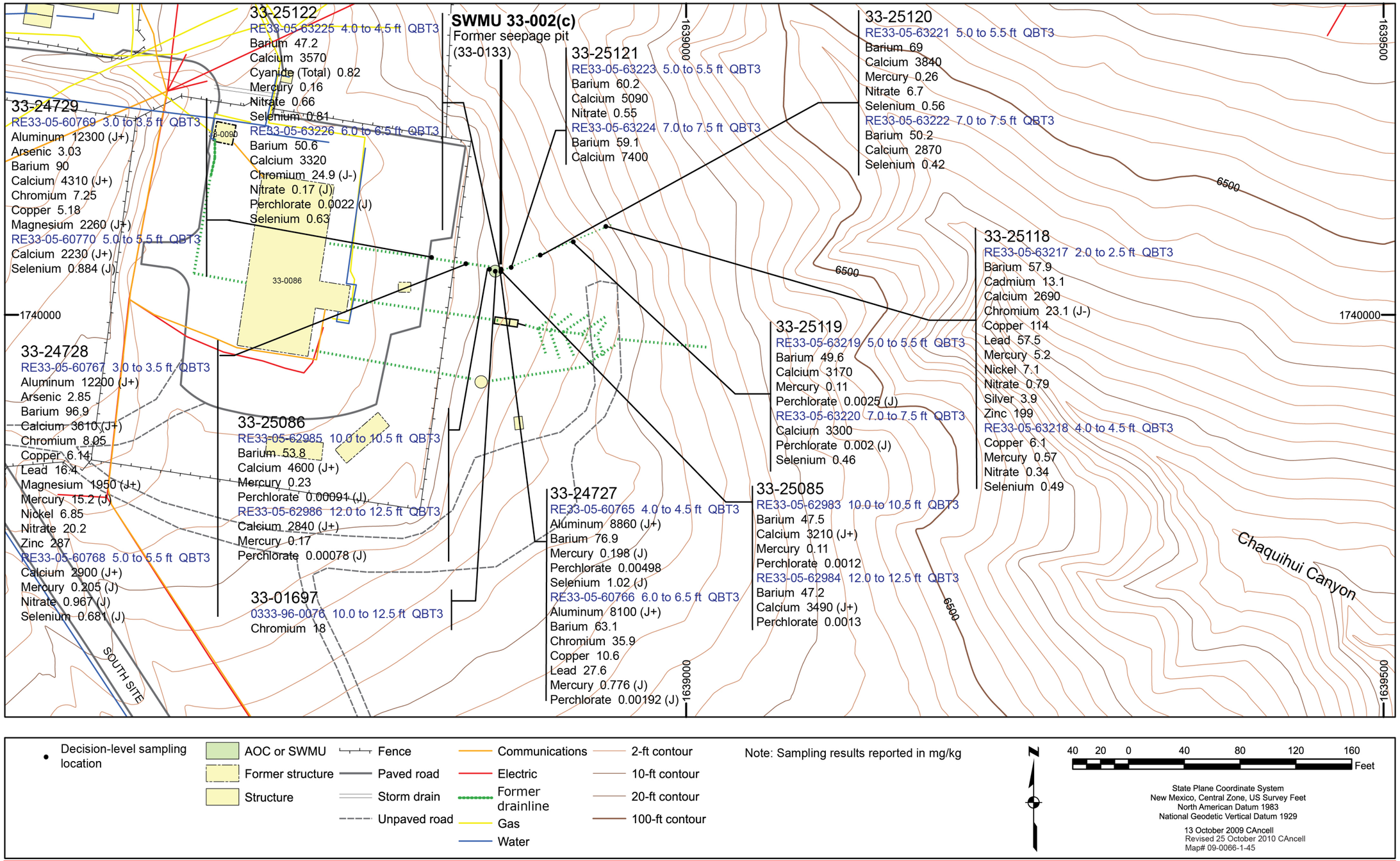
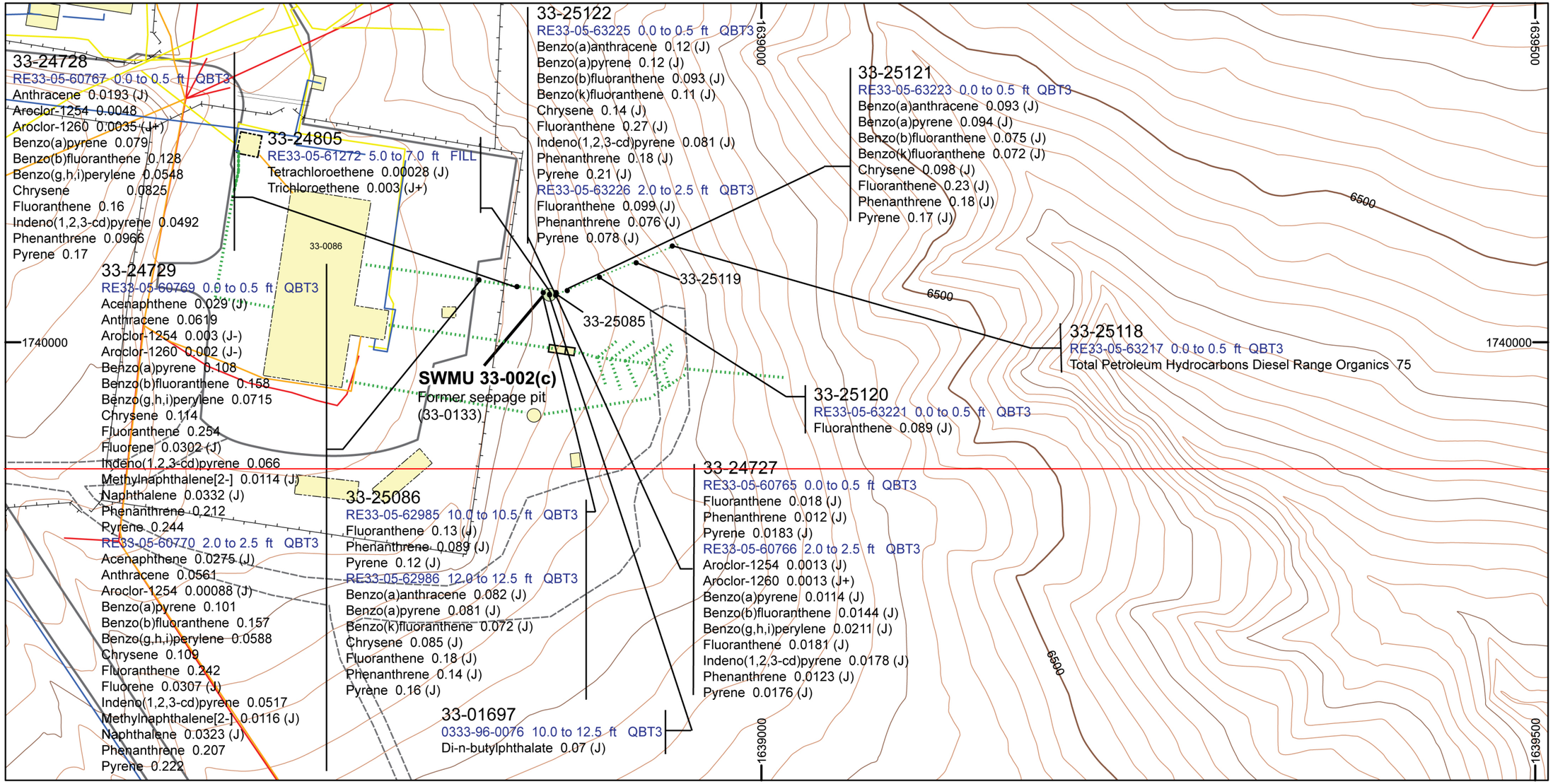


Figure 4.1-6 Inorganic chemicals detected above BVs at SWMU 33-002(c)


33-24728
RE33-05-60767 0.0 to 0.5 ft QBT3
Anthracene 0.0193 (J)
Aroclor-1254 0.0048
Aroclor-1260 0.0035 (J+)
Benzo(a)pyrene 0.079
Benzo(b)fluoranthene 0.128
Benzo(g,h,i)perylene 0.0548
Chrysene 0.0825
Fluoranthene 0.16
Indeno(1,2,3-cd)pyrene 0.0492
Phenanthrene 0.0966
Pyrene 0.17
33-24805
RE33-05-61272 5.0 to 7.0 ft FILL
Tetrachloroethene 0.00028 (J)
Trichloroethene 0.003 (J+)
33-25122
RE33-05-63225 0.0 to 0.5 ft QBT3
Benzo(a)anthracene 0.12 (J)
Benzo(a)pyrene 0.12 (J)
Benzo(b)fluoranthene 0.093 (J)
Benzo(k)fluoranthene 0.11 (J)
Chrysene 0.14 (J)
Fluoranthene 0.27 (J)
Indeno(1,2,3-cd)pyrene 0.081 (J)
Phenanthrene 0.18 (J)
Pyrene 0.21 (J)
RE33-05-63226 2.0 to 2.5 ft QBT3
Fluoranthene 0.099 (J)
Phenanthrene 0.076 (J)
Pyrene 0.078 (J)
33-25121
RE33-05-63223 0.0 to 0.5 ft QBT3
Benzo(a)anthracene 0.093 (J)
Benzo(a)pyrene 0.094 (J)
Benzo(b)fluoranthene 0.075 (J)
Benzo(k)fluoranthene 0.072 (J)
Chrysene 0.098 (J)
Fluoranthene 0.23 (J)
Phenanthrene 0.18 (J)
Pyrene 0.17 (J)
33-24729
RE33-05-60769 0.0 to 0.5 ft QBT3
Acenaphthene 0.029 (J)
Anthracene 0.0619
Aroclor-1254 0.003 (J-)
Aroclor-1260 0.002 (J-)
Benzo(a)pyrene 0.108
Benzo(b)fluoranthene 0.158
Benzo(g,h,i)perylene 0.0715
Chrysene 0.114
Fluoranthene 0.254
Fluorene 0.0302 (J)
Indeno(1,2,3-cd)pyrene 0.066
Methylnaphthalene[2-] 0.0114 (J)
Naphthalene 0.0332 (J)
Phenanthrene 0.212
Pyrene 0.244
RE33-05-60770 2.0 to 2.5 ft QBT3
Acenaphthene 0.0275 (J)
Anthracene 0.0561
Aroclor-1254 0.00088 (J)
Benzo(a)pyrene 0.101
Benzo(b)fluoranthene 0.157
Benzo(g,h,i)perylene 0.0588
Chrysene 0.109
Fluoranthene 0.242
Fluorene 0.0307 (J)
Indeno(1,2,3-cd)pyrene 0.0517
Methylnaphthalene[2-] 0.0116 (J)
Naphthalene 0.0323 (J)
Phenanthrene 0.207
Pyrene 0.222
33-0086
33-25119
33-25085
SWMU 33-002(c)
Former seepage pit
(33-0133)
33-25118
RE33-05-63217 0.0 to 0.5 ft QBT3
Total Petroleum Hydrocarbons Diesel Range Organics 75
33-25120
RE33-05-63221 0.0 to 0.5 ft QBT3
Fluoranthene 0.089 (J)
33-24727
RE33-05-60765 0.0 to 0.5 ft QBT3
Fluoranthene 0.018 (J)
Phenanthrene 0.012 (J)
Pyrene 0.0183 (J)
RE33-05-60766 2.0 to 2.5 ft QBT3
Aroclor-1254 0.0013 (J)
Aroclor-1260 0.0013 (J+)
Benzo(a)pyrene 0.0114 (J)
Benzo(b)fluoranthene 0.0144 (J)
Benzo(g,h,i)perylene 0.0211 (J)
Fluoranthene 0.0181 (J)
Indeno(1,2,3-cd)pyrene 0.0178 (J)
Phenanthrene 0.0123 (J)
Pyrene 0.0176 (J)
33-25086
RE33-05-62985 10.0 to 10.5 ft QBT3
Fluoranthene 0.13 (J)
Phenanthrene 0.089 (J)
Pyrene 0.12 (J)
RE33-05-62986 12.0 to 12.5 ft QBT3
Benzo(a)anthracene 0.082 (J)
Benzo(a)pyrene 0.081 (J)
Benzo(k)fluoranthene 0.072 (J)
Chrysene 0.085 (J)
Fluoranthene 0.18 (J)
Phenanthrene 0.14 (J)
Pyrene 0.16 (J)
33-01697
0333-96-0076 10.0 to 12.5 ft QBT3
Di-n-butylphthalate 0.07 (J)
1740000
1639000
1639500
6500
Decision-level sampling location
AOC or SWMU
Former structure
Structure
Fence
Paved road
Storm drain
Unpaved road
Communications
Electric
Former drainline
Gas
Water
2-ft contour
10-ft contour
20-ft contour
100-ft contour
Note: Sampling results reported in mg/kg
N
40 20 0 40 80 120 160
Feet
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929
13 October 2009 CAncell
Map# 09-0066-1-46

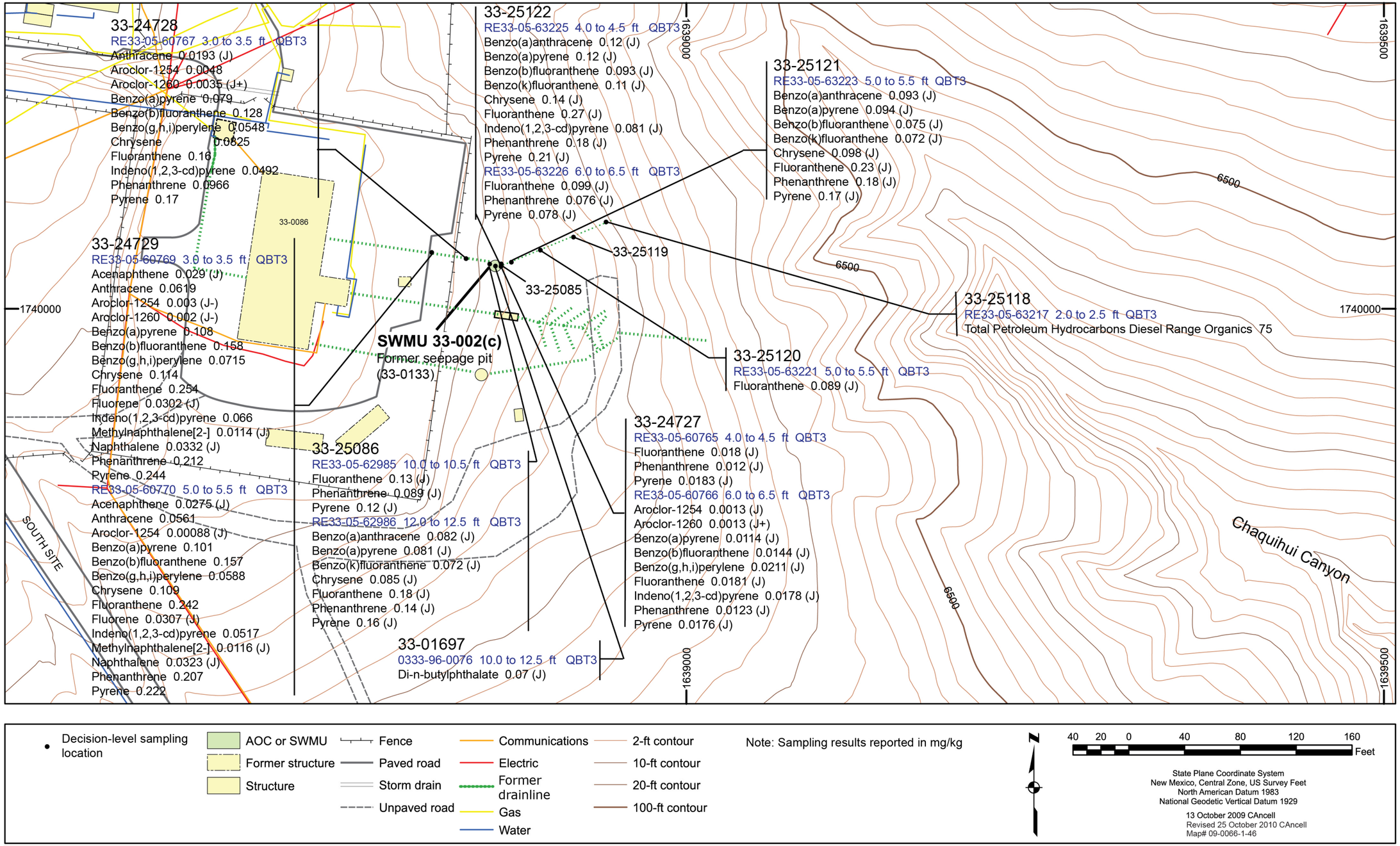
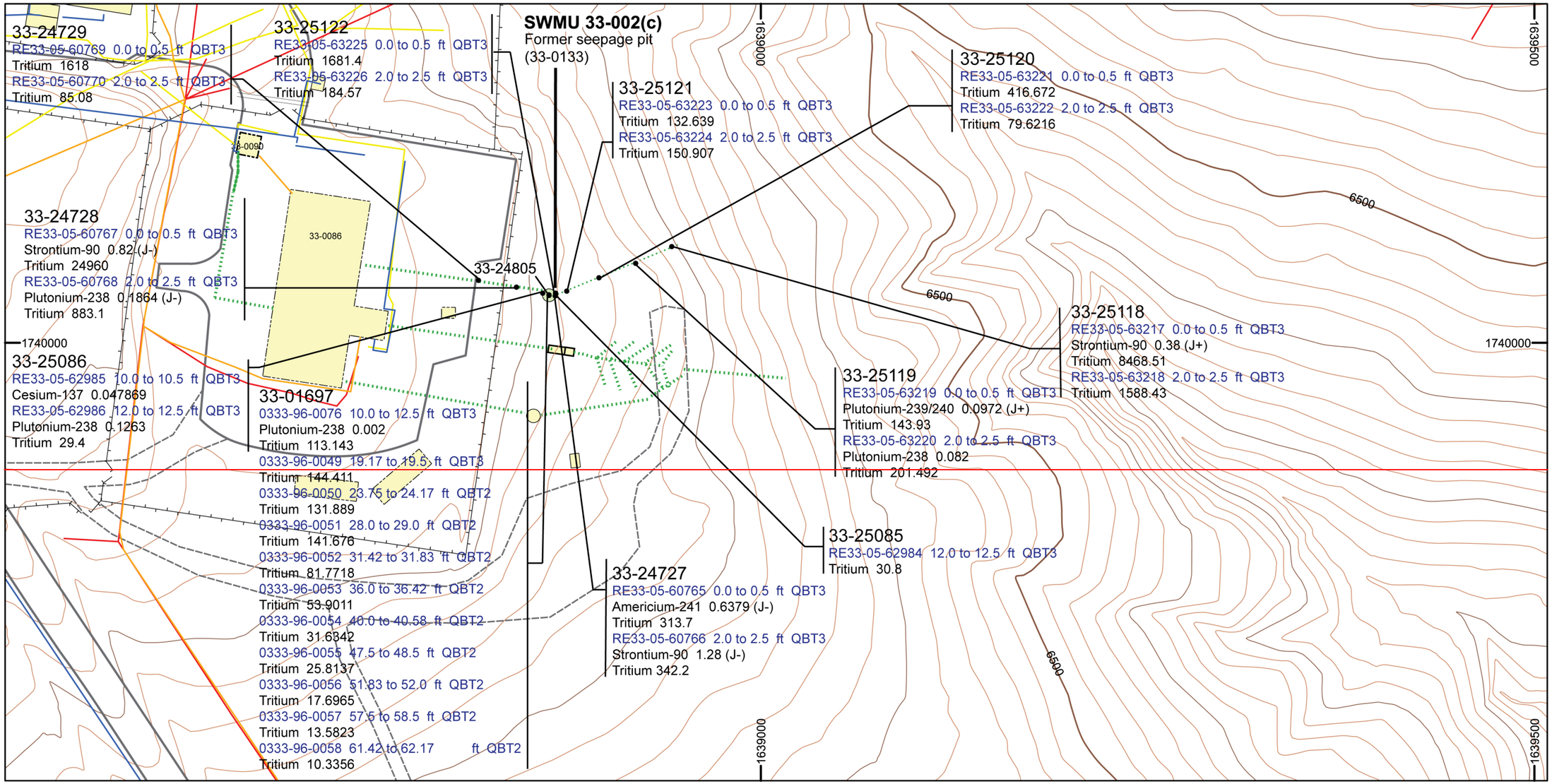


Figure 4.1-7 Organic chemicals detected at SWMU 33-002(c)


SWMU 33-002(c)
Former seepage pit
(33-0133)
33-24729
RE33-05-60769 0.0 to 0.5 ft QBT3
Tritium 1618
RE33-05-60770 2.0 to 2.5 ft QBT3
Tritium 85.08
33-25122
RE33-05-63225 0.0 to 0.5 ft QBT3
Tritium 1681.4
RE33-05-63226 2.0 to 2.5 ft QBT3
Tritium 184.57
33-25121
RE33-05-63223 0.0 to 0.5 ft QBT3
Tritium 132.639
RE33-05-63224 2.0 to 2.5 ft QBT3
Tritium 150.907
33-25120
RE33-05-63221 0.0 to 0.5 ft QBT3
Tritium 416.672
RE33-05-63222 2.0 to 2.5 ft QBT3
Tritium 79.6216
33-24728
RE33-05-60767 0.0 to 0.5 ft QBT3
Strontium-90 0.82 (J-)
Tritium 24960
RE33-05-60768 2.0 to 2.5 ft QBT3
Plutonium-238 0.1864 (J-)
Tritium 883.1
33-24805
33-25118
RE33-05-63217 0.0 to 0.5 ft QBT3
Strontium-90 0.38 (J+)
Tritium 8468.51
RE33-05-63218 2.0 to 2.5 ft QBT3
Tritium 1588.43
33-25086
RE33-05-62985 10.0 to 10.5 ft QBT3
Cesium-137 0.047869
RE33-05-62986 12.0 to 12.5 ft QBT3
Plutonium-238 0.1263
Tritium 29.4
33-01697
0333-96-0076 10.0 to 12.5 ft QBT3
Plutonium-238 0.002
Tritium 113.143
0333-96-0049 19.17 to 19.5 ft QBT3
Tritium 144.411
0333-96-0050 23.75 to 24.17 ft QBT2
Tritium 131.889
0333-96-0051 28.0 to 29.0 ft QBT2
Tritium 141.676
0333-96-0052 31.42 to 31.83 ft QBT2
Tritium 81.7718
0333-96-0053 36.0 to 36.42 ft QBT2
Tritium 53.9011
0333-96-0054 40.0 to 40.58 ft QBT2
Tritium 31.6342
0333-96-0055 47.5 to 48.5 ft QBT2
Tritium 25.8137
0333-96-0056 51.83 to 52.0 ft QBT2
Tritium 17.6965
0333-96-0057 57.5 to 58.5 ft QBT2
Tritium 13.5823
0333-96-0058 61.42 to 62.17 ft QBT2
Tritium 10.3356
33-25119
RE33-05-63219 0.0 to 0.5 ft QBT3
Plutonium-239/240 0.0972 (J+)
Tritium 143.93
RE33-05-63220 2.0 to 2.5 ft QBT3
Plutonium-238 0.082
Tritium 201.492
33-25085
RE33-05-62984 12.0 to 12.5 ft QBT3
Tritium 30.8
33-24727
RE33-05-60765 0.0 to 0.5 ft QBT3
Americium-241 0.6379 (J-)
Tritium 313.7
RE33-05-60766 2.0 to 2.5 ft QBT3
Strontium-90 1.28 (J-)
Tritium 342.2
33-0090
33-0086
1740000
1639000
1639500
6500
Decision-level sampling location
AOC or SWMU
Former structure
Structure
Fence
Paved road
Storm drain
Unpaved road
Communications
Electric
Former drainline
Gas
Water
2-ft contour
10-ft contour
20-ft contour
100-ft contour
Note: Sampling results reported in pCi/g
40 20 0 40 80 120 160
Feet
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929
13 October 2009 CAncell
Map# 09-0066-1-47

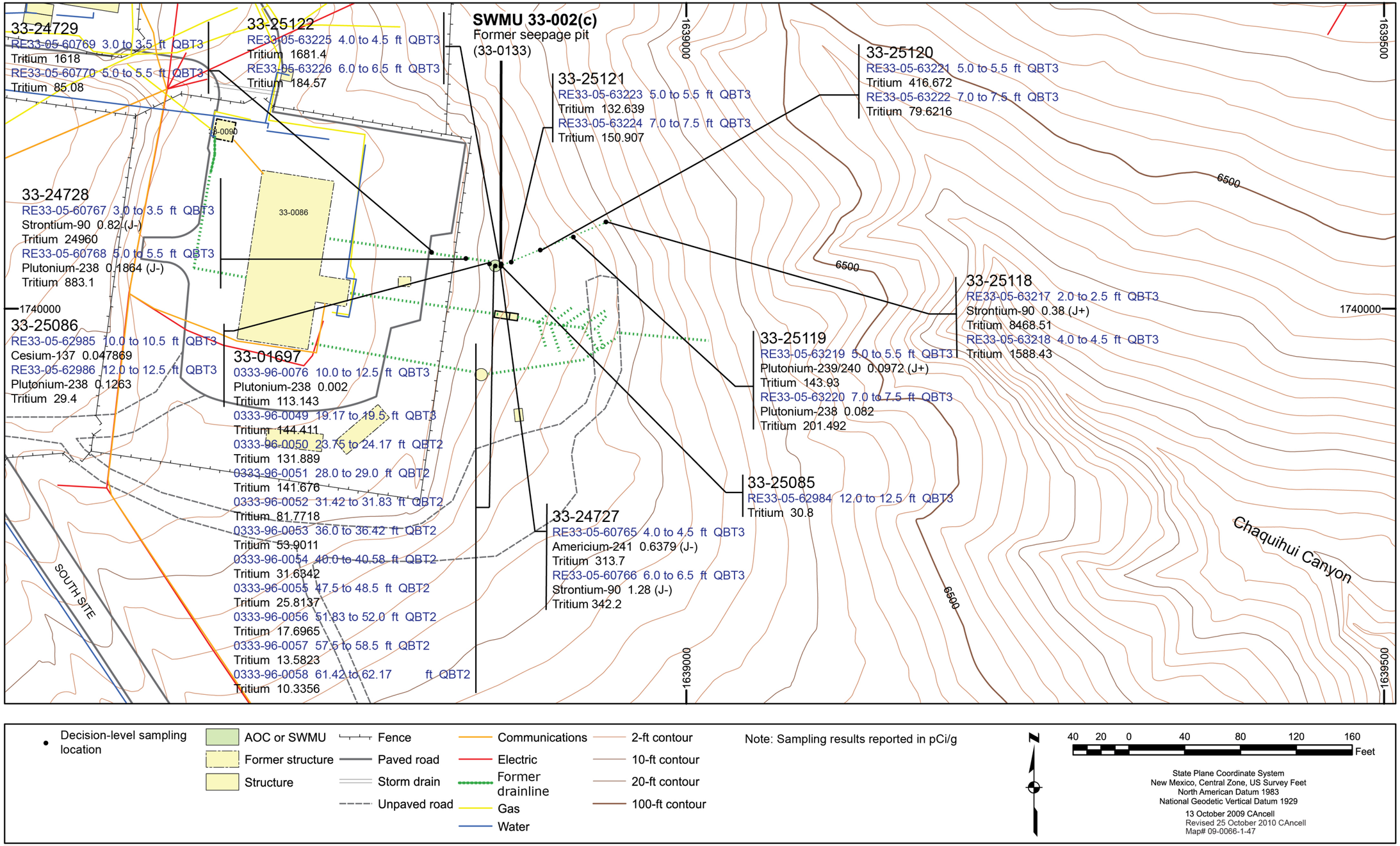


Figure 4.1-8 Radionuclides detected or detected above BVs/FVs at SWMU 33-002(c)

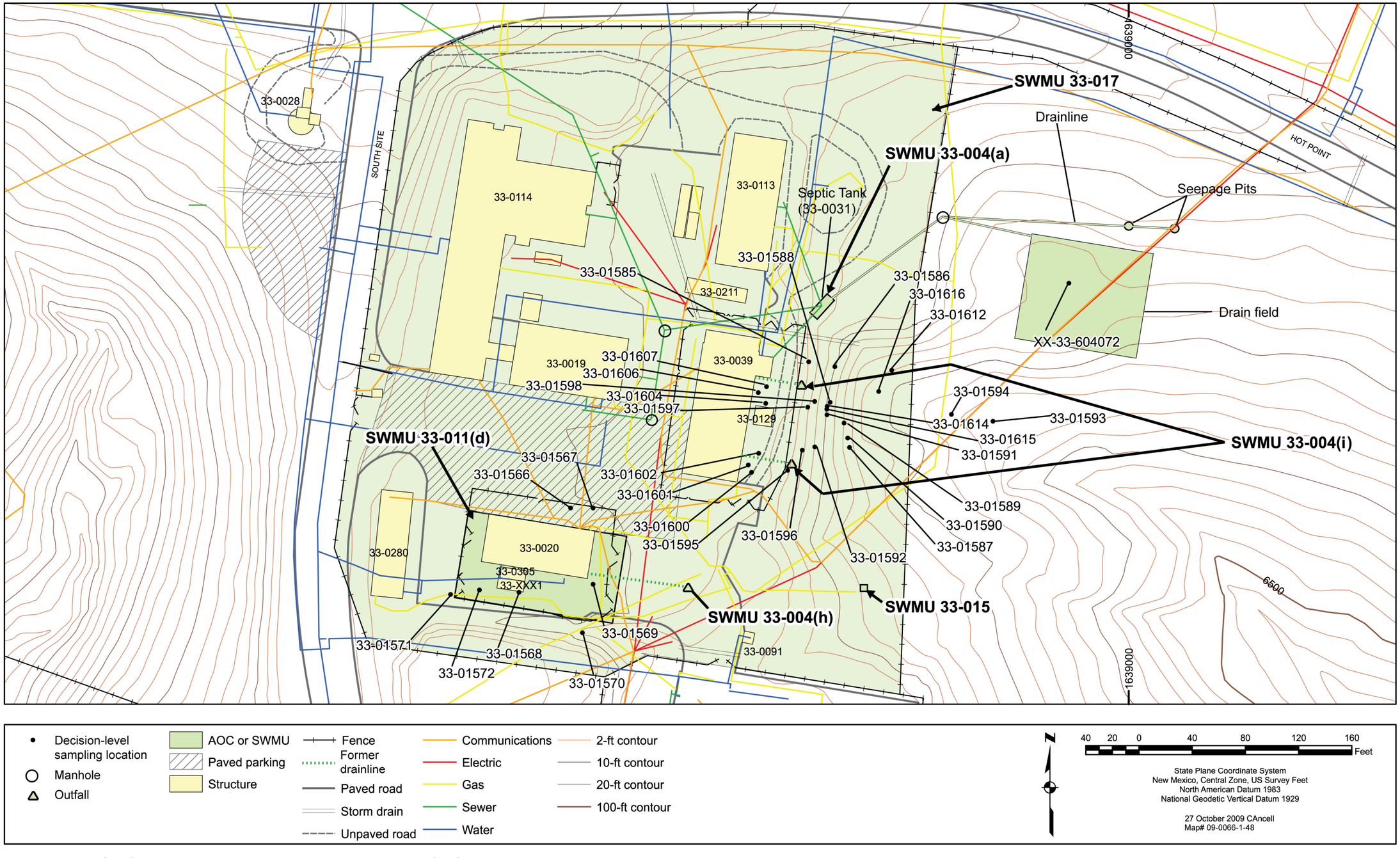


Figure 4.1-9 Site features and decision-level sampling locations for Consolidated Unit 33-004(a)-00

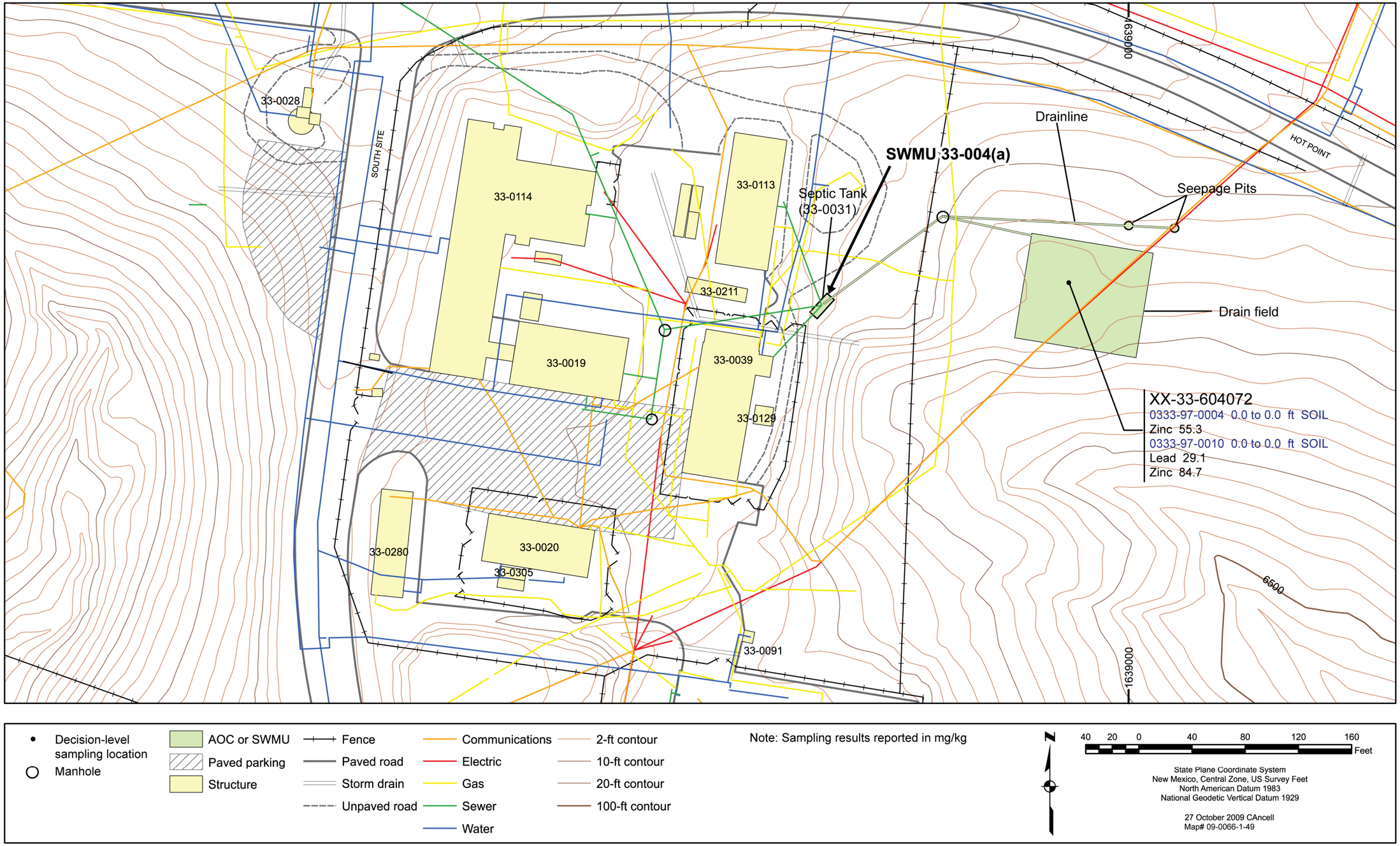


Figure 4.1-10 Inorganic chemicals detected above BVs at SWMU 33-004(a)

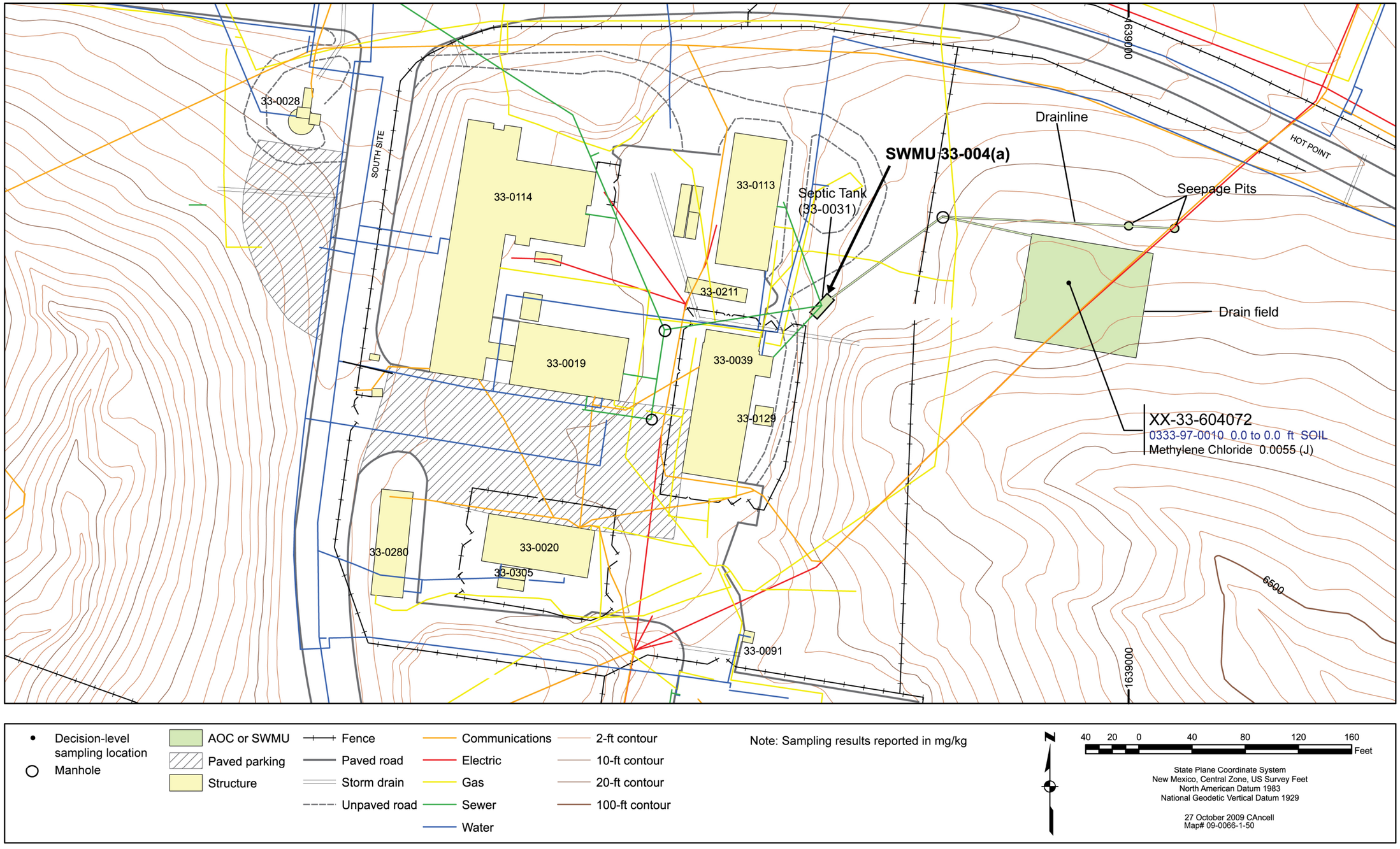


Figure 4.1-11 Organic chemicals detected at SWMU 33-004(a)

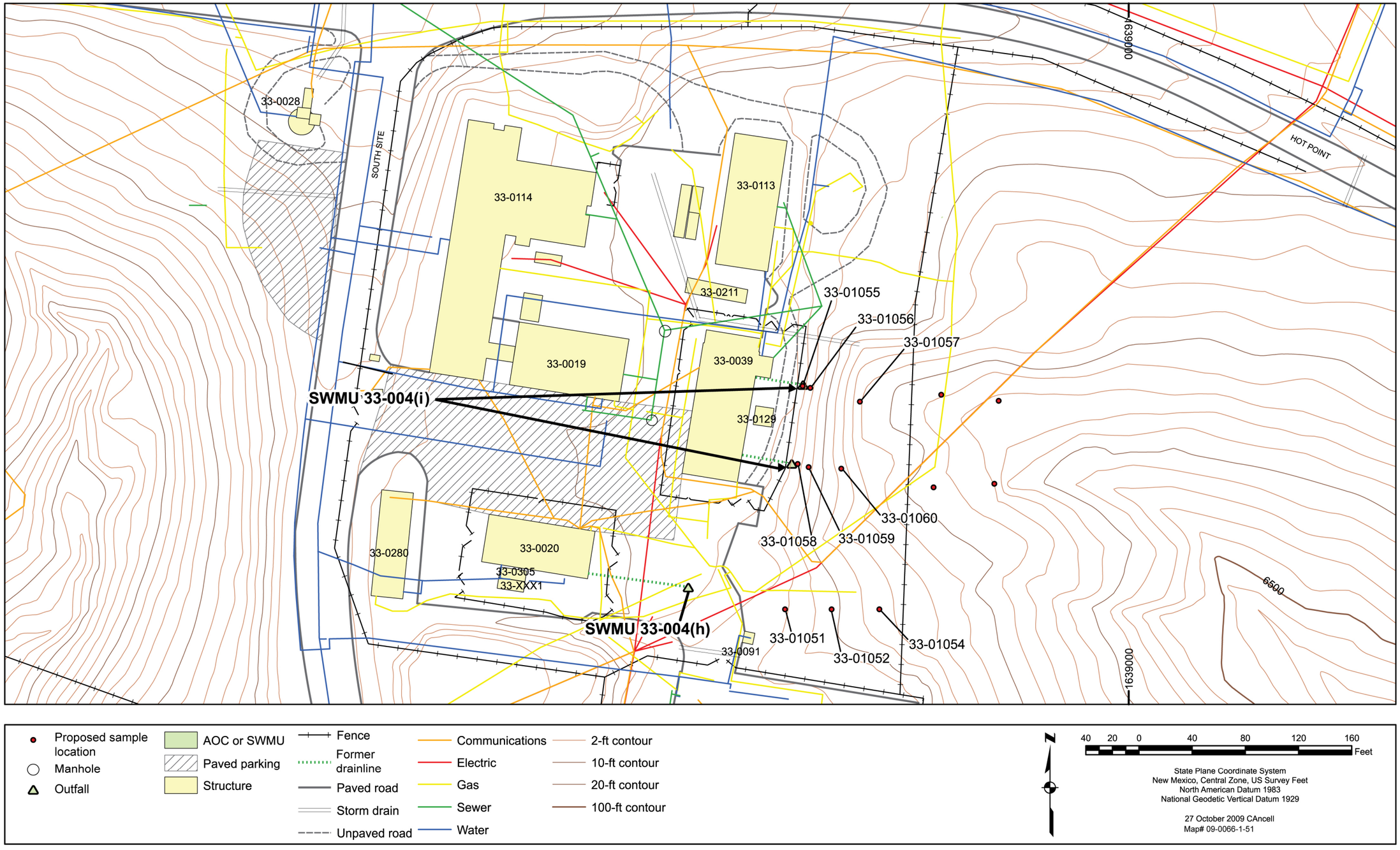


Figure 4.1-12a Proposed sampling locations at SWMUs 33-004(h) and 33-004(i)

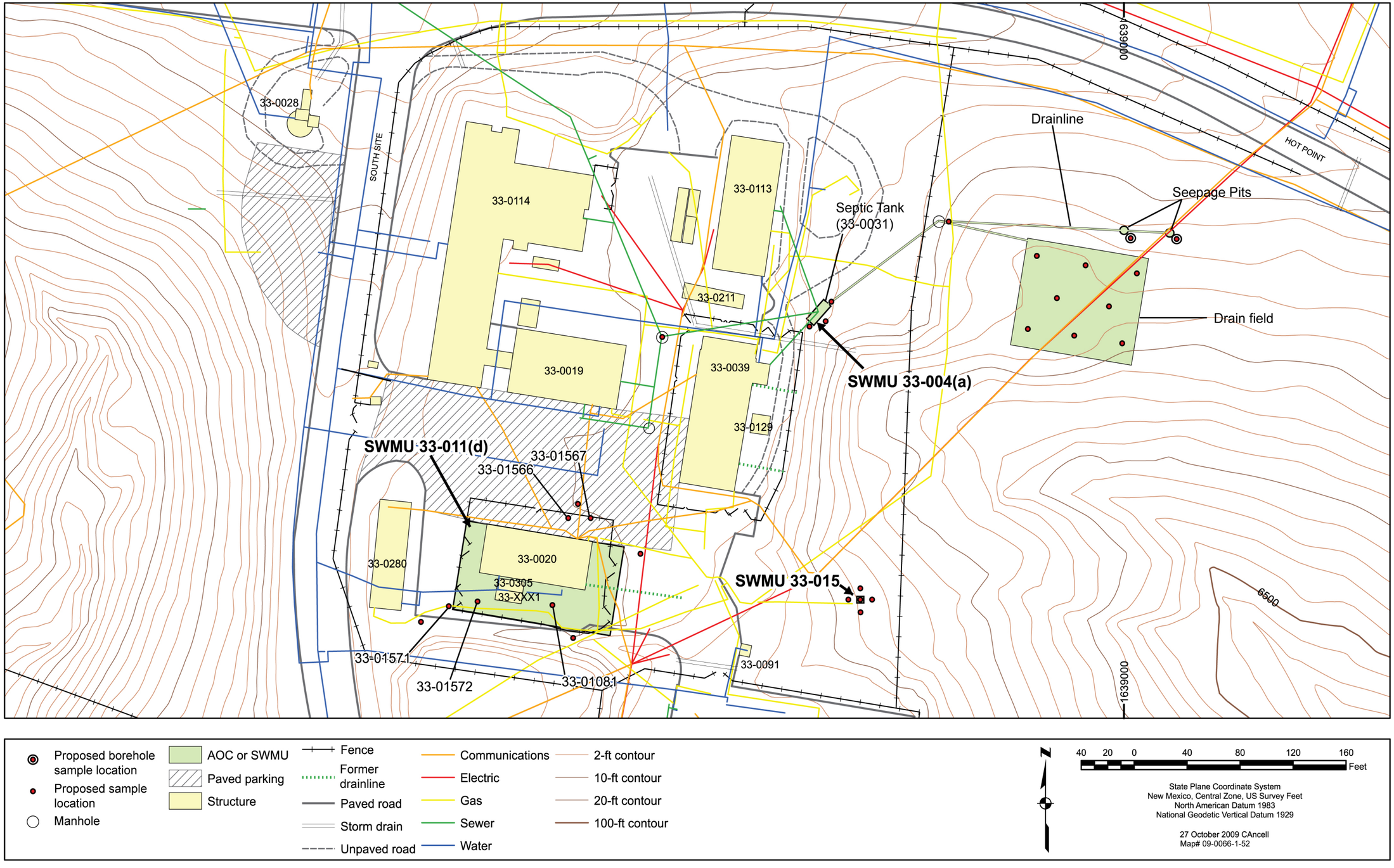


Figure 4.1-12b Proposed sampling locations at SWMUs 33-004(a), 33-011(d), and 33-015

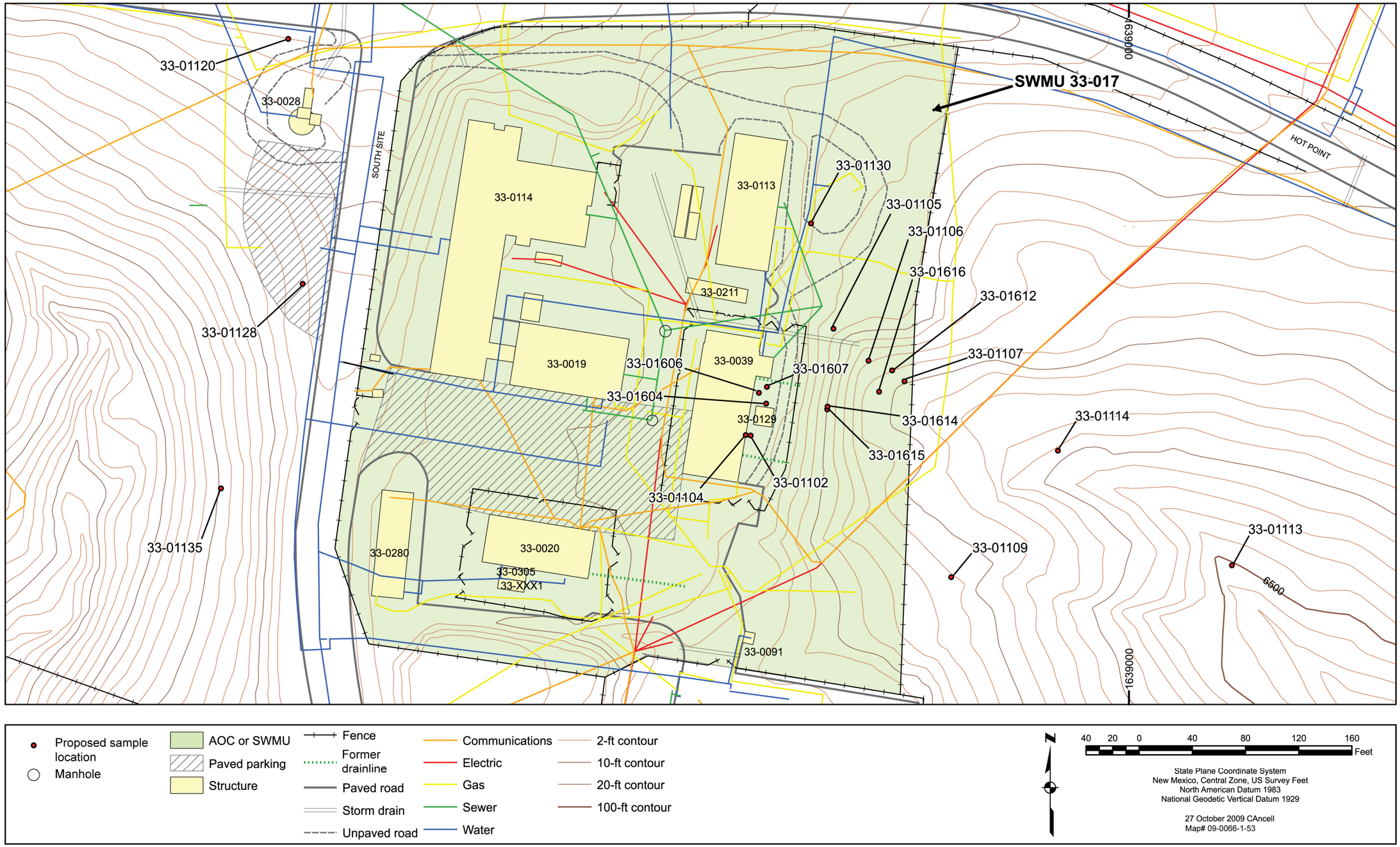


Figure 4.1-12c Nineteen of the twenty-five proposed sampling locations at SWMU 33-017

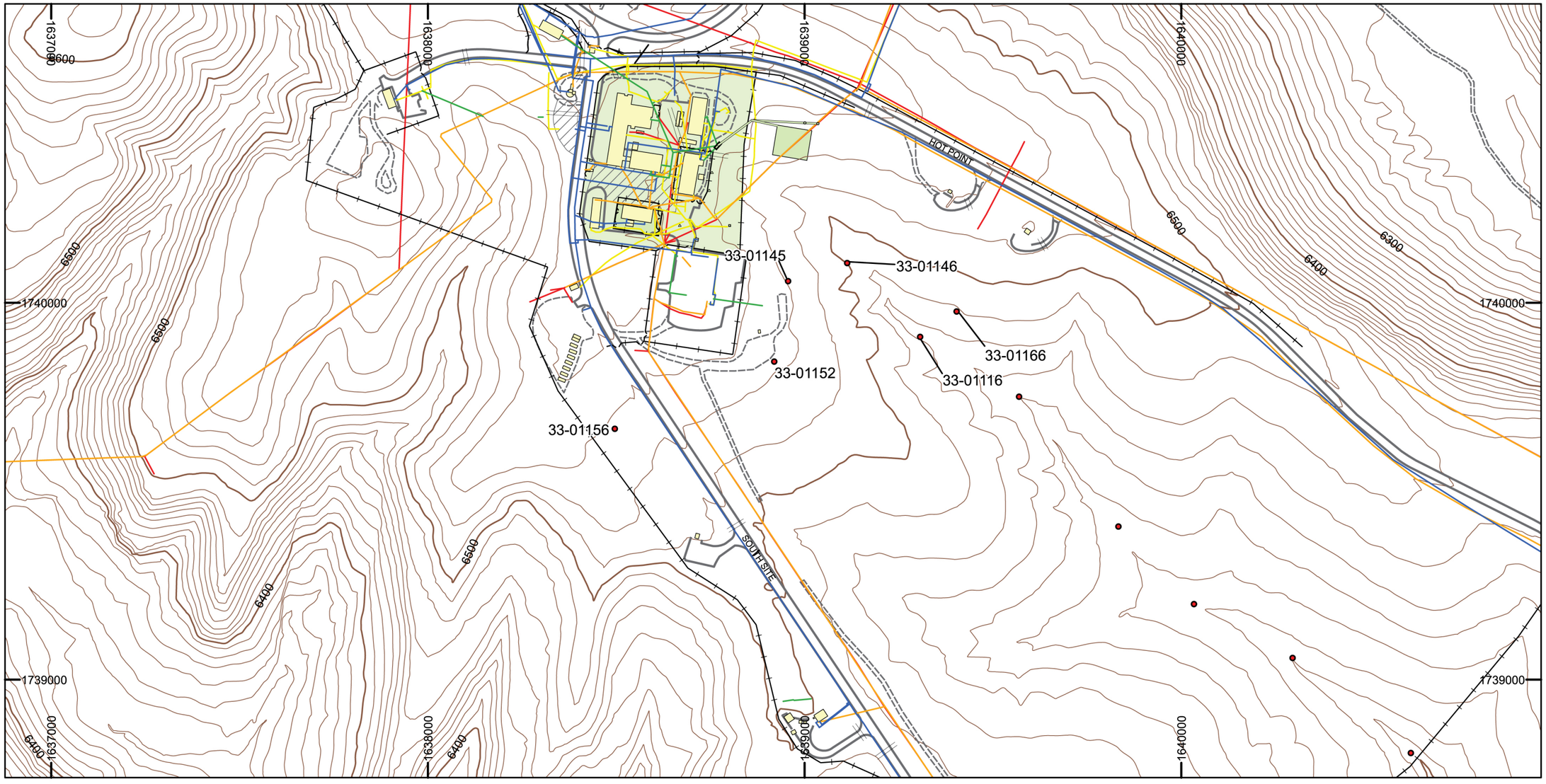


Figure 4.1-13 Six of the twenty-five proposed sampling locations at SWMU 33-017 and proposed drainage sampling locations at Consolidated Unit 33-004(a)-00

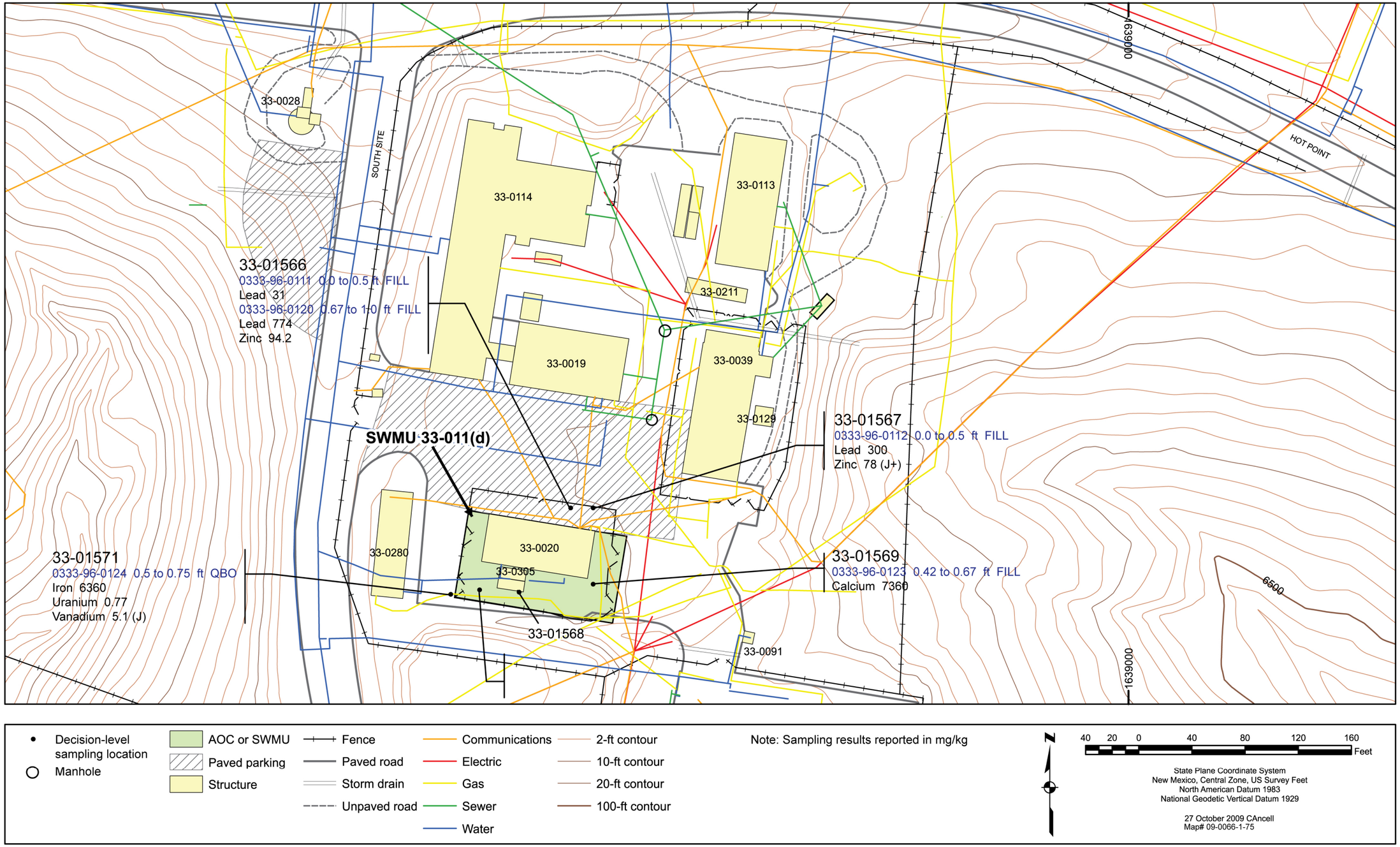


Figure 4.1-14 Inorganic chemicals detected above BVs at SWMU 33-011(d)

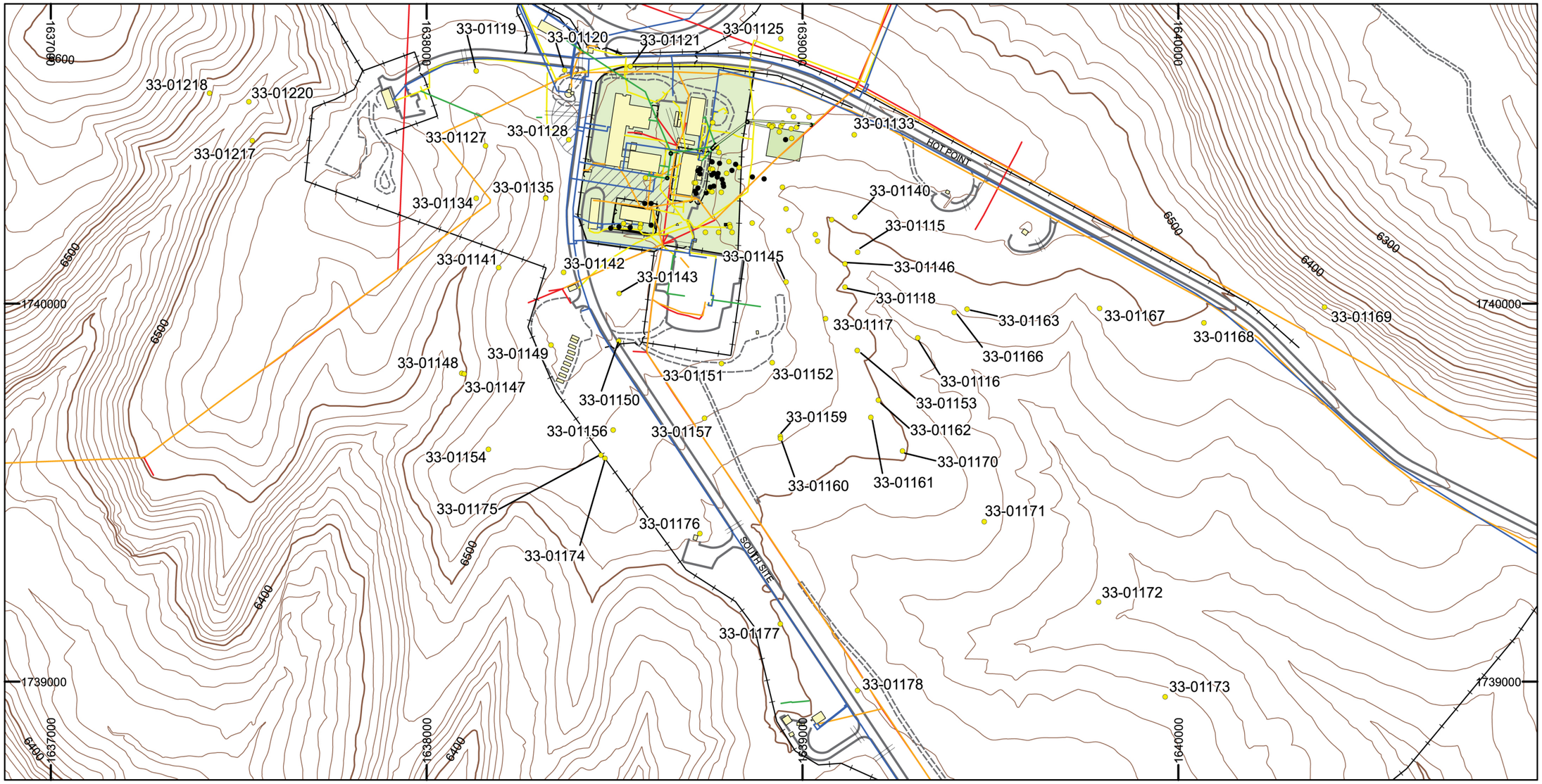


Figure 4.1-15 Site features and historical drainage sampling locations for Consolidated Unit 33-004(a)-00

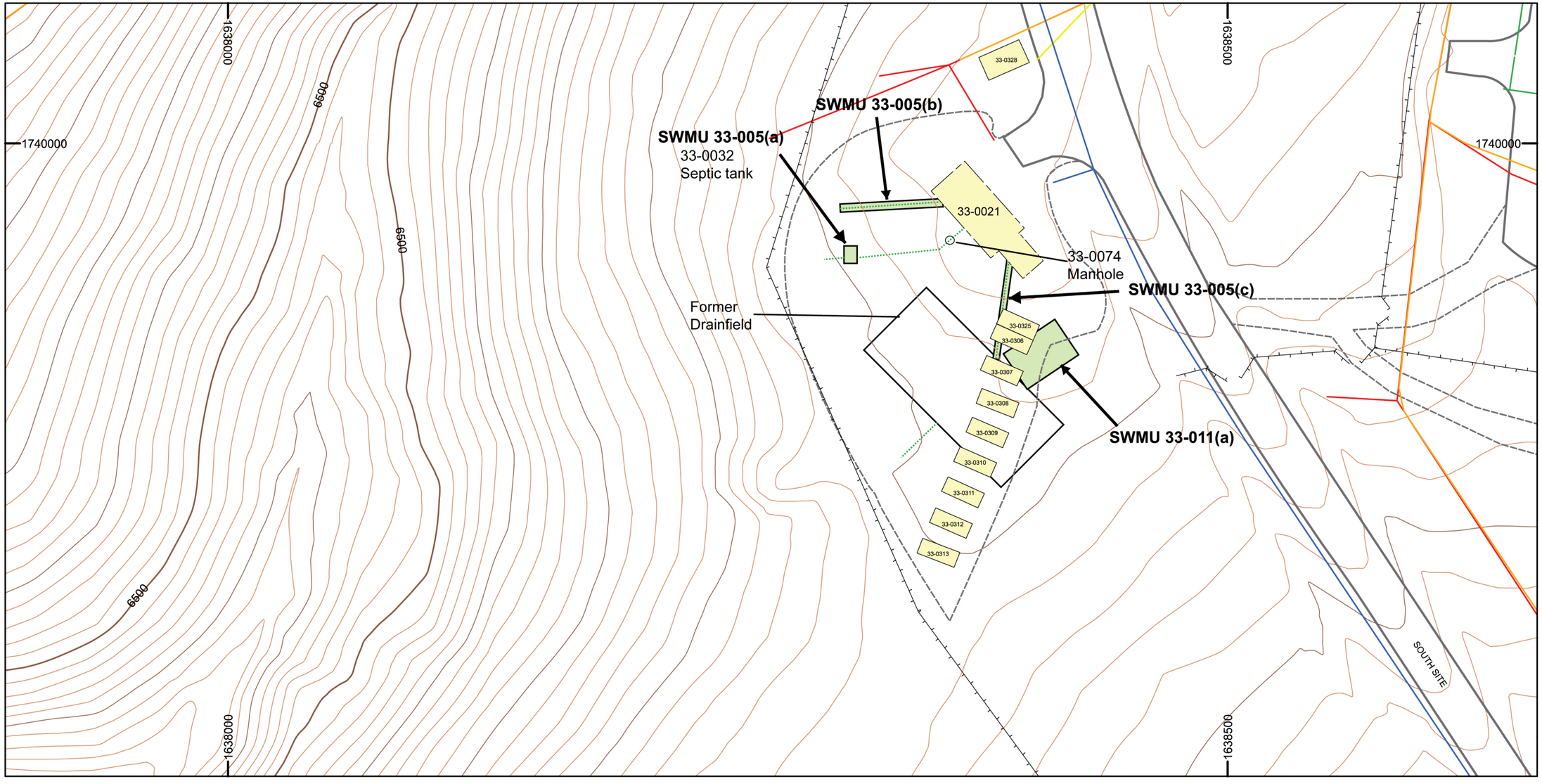


Figure 4.1-16 Site features for Consolidated Unit 33-005(a)-00

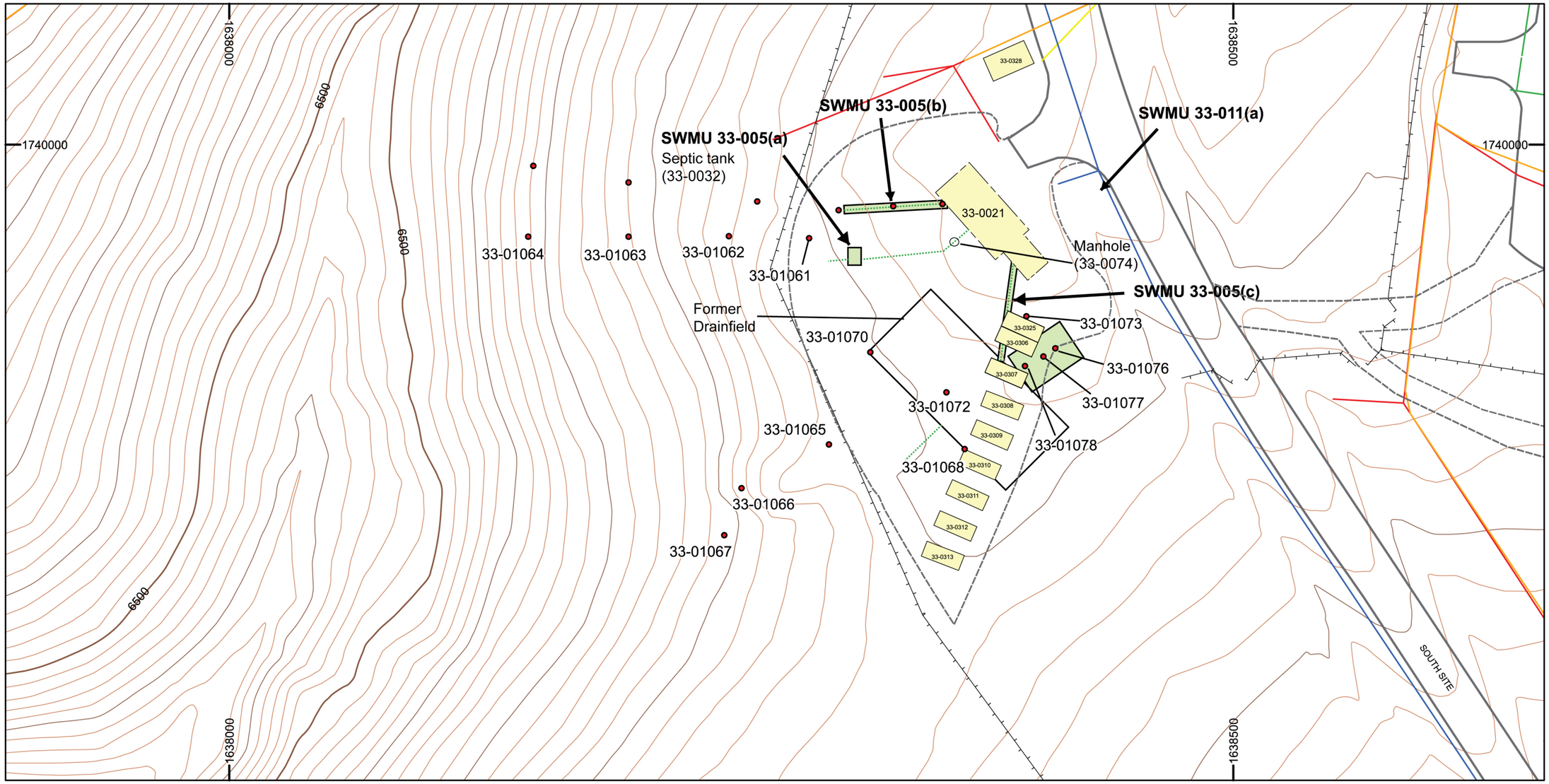


Figure 4.1-17 Proposed sampling locations at Consolidated Unit 33-005(a)-00

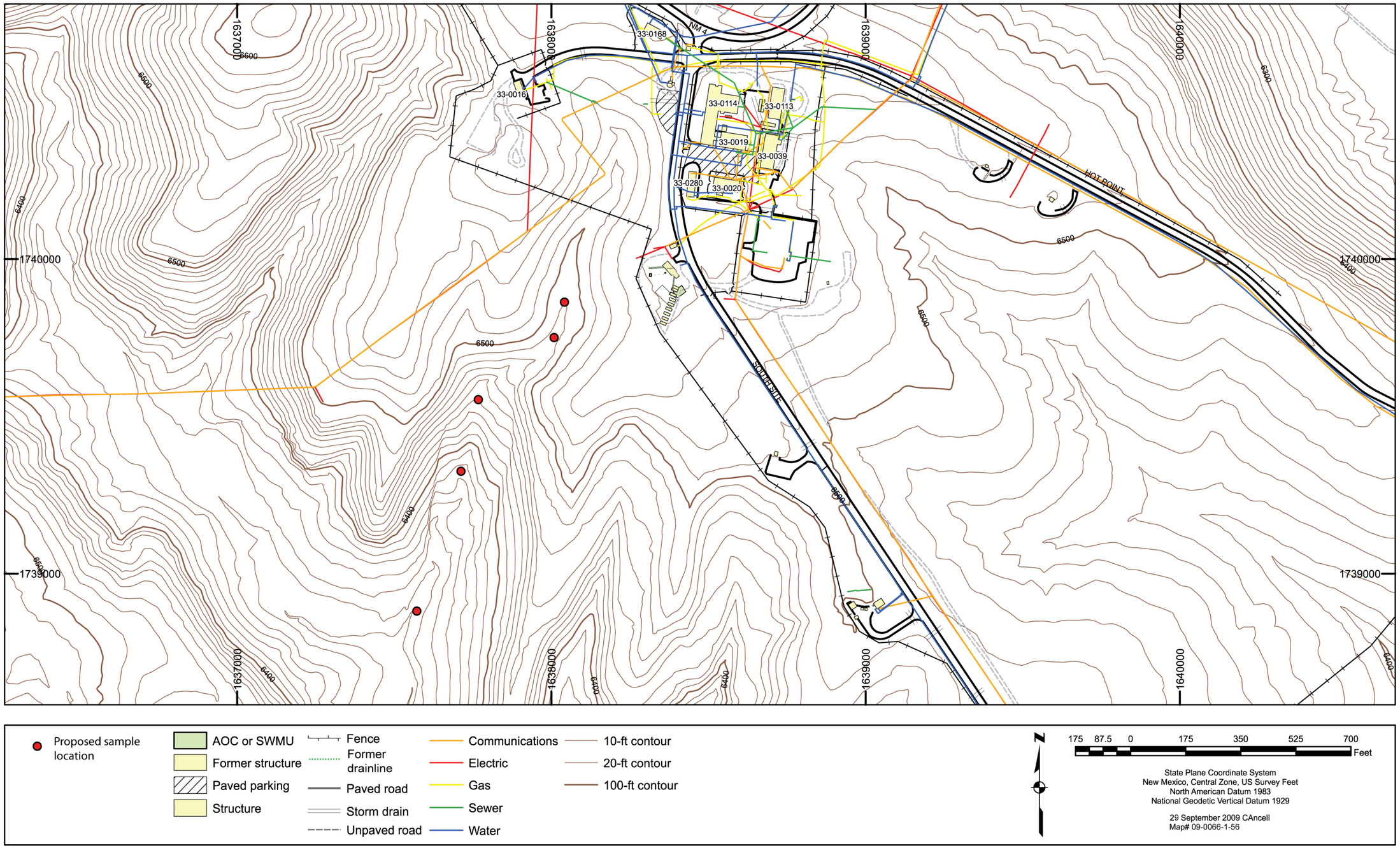


Figure 4.1-18 Proposed drainage sampling locations at Consolidated Unit 33-005(a)-00

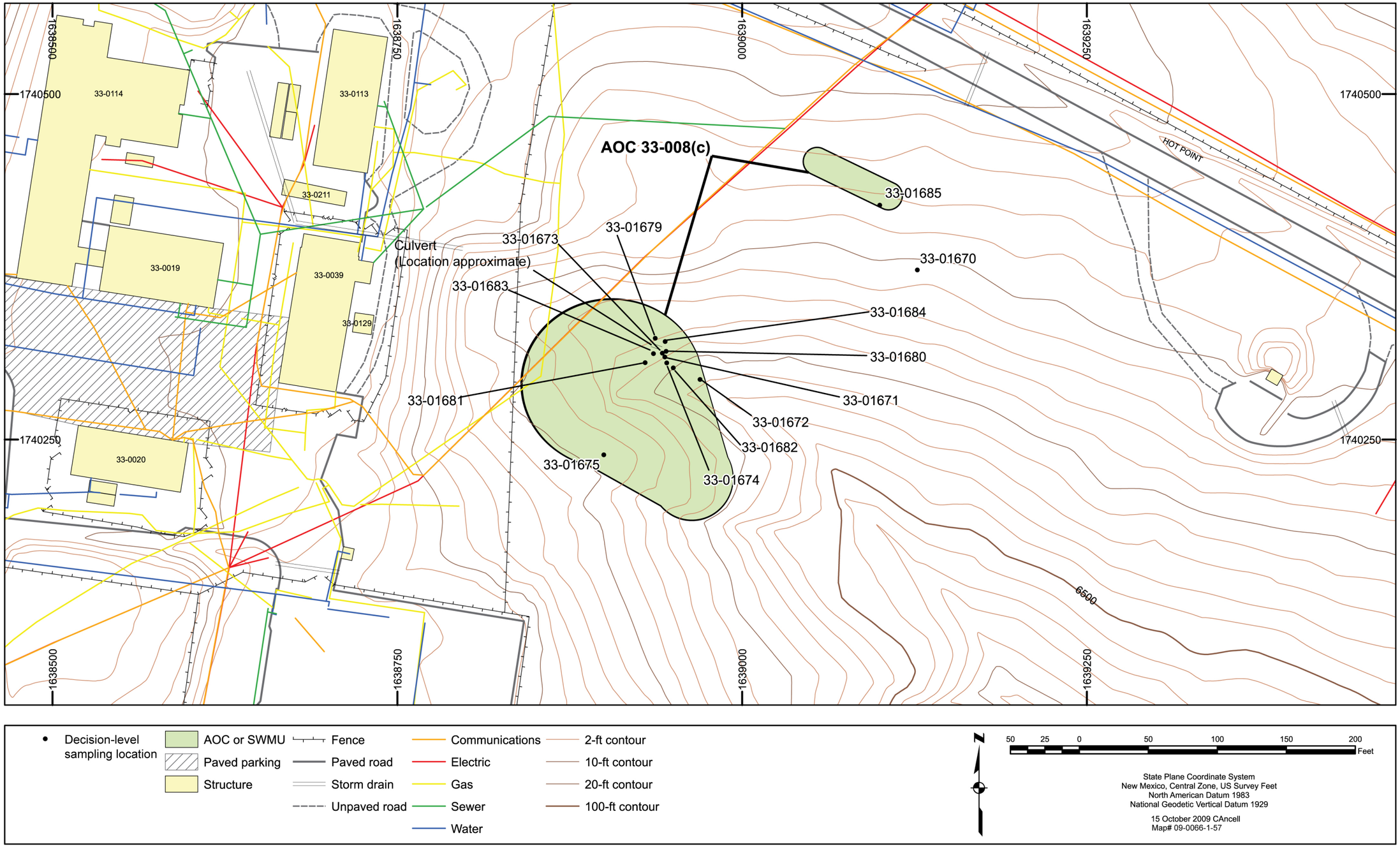


Figure 4.1-19 Site features and decision-level sampling locations for AOC 33-008(c)

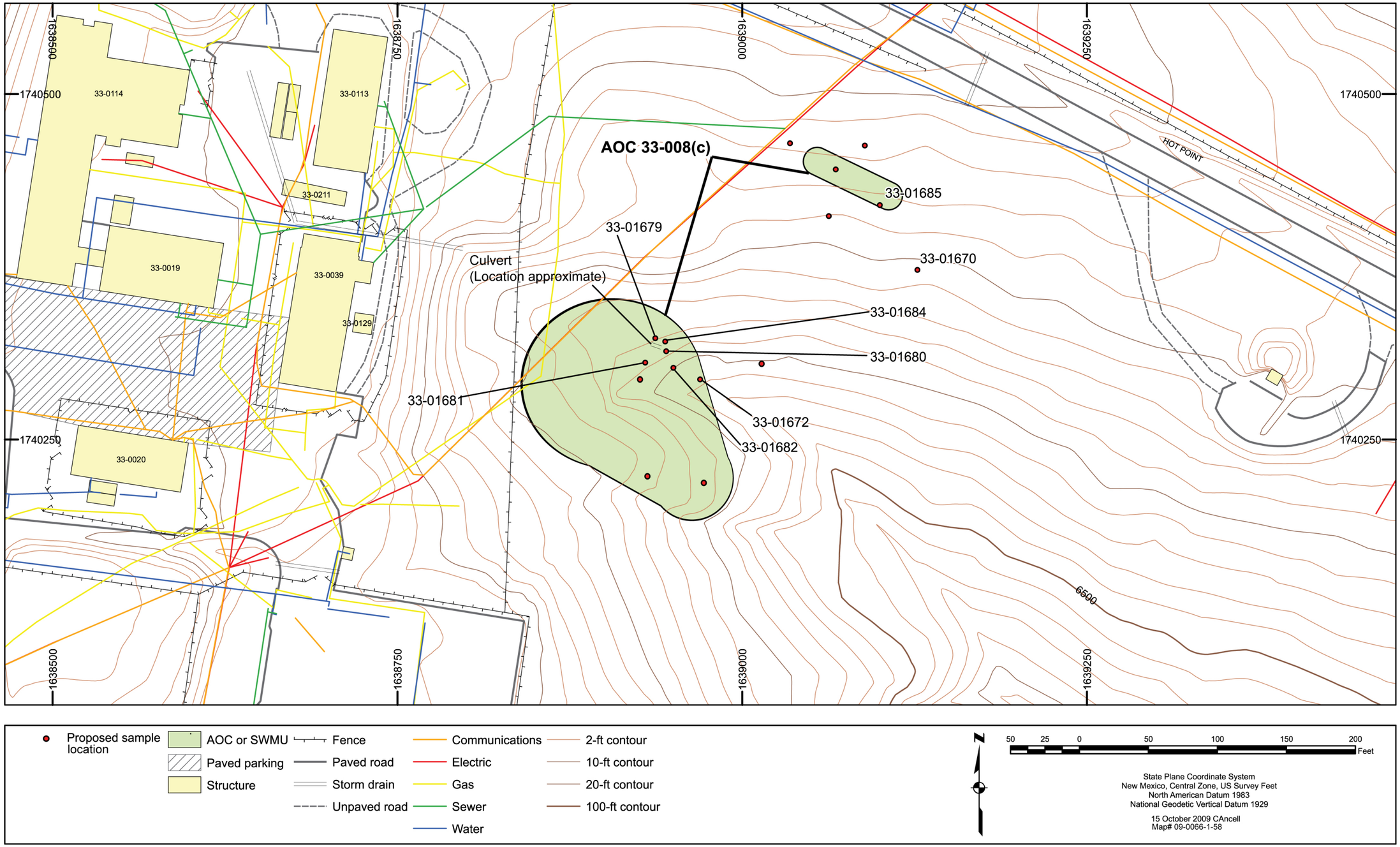


Figure 4.1-20 Proposed sampling locations at AOC 33-008(c)

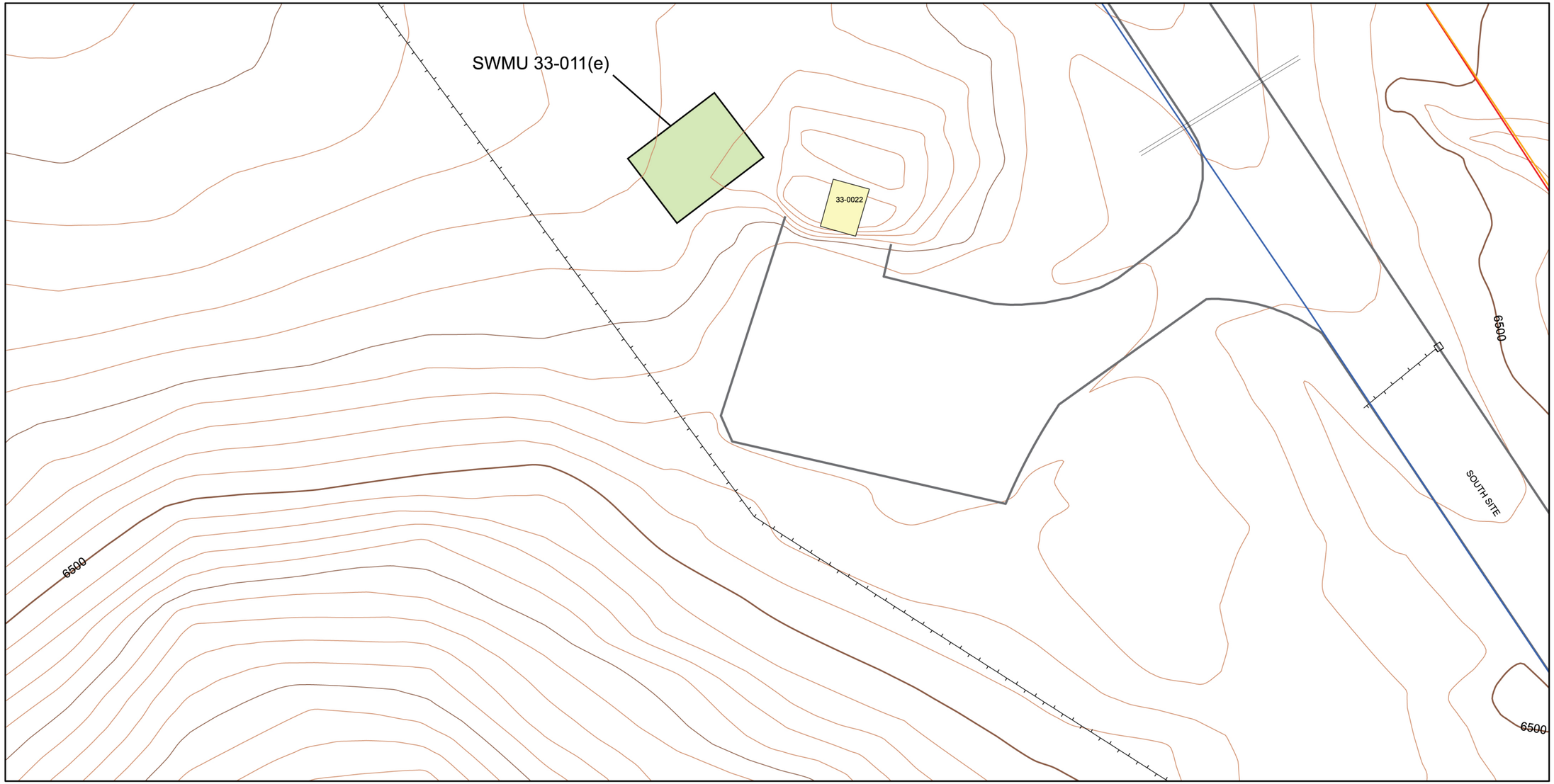


Figure 4.1-21 Site features for SWMU 33-011(e)

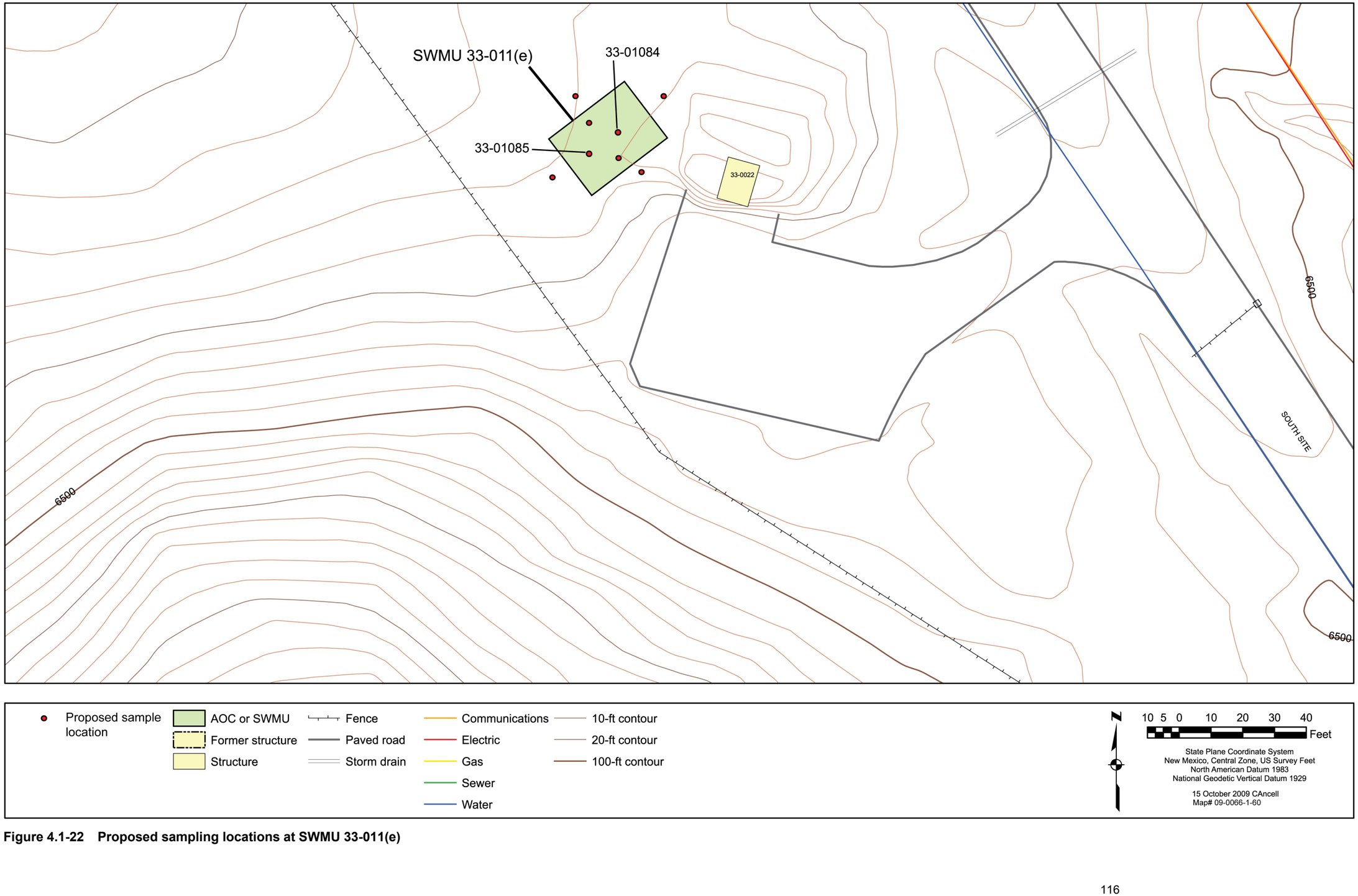


Figure 4.1-22 Proposed sampling locations at SWMU 33-011(e)