LETTER REPORT FOR THE RESULTS OF ANALYTICAL SAMPLING FOR VOLATILE ORGANIC COMPOUNDS AT MATERIAL DISPOSAL AREA B

INTRODUCTION

This letter report provides the analytical results for samples collected at Material Disposal Area (MDA) B at Technical Area 21 (TA-21) between September 9 and 12, 2014. In its approval with modifications of the investigation/remediation report for MDA B, dated July 8, 2014, the New Mexico Environment Department (NMED) directed Los Alamos National Laboratory (LANL or the Laboratory) to submit a work plan proposing sampling and analysis appropriate for demonstrating that volatile organic compounds (VOCs) are below residential soil screening levels at the site (LANL 2013, 243675; NMED 2014, 525003).

DRILLING AND SAMPLING

Twenty-two boreholes were drilled to collect undisturbed samples for VOC analyses in accordance with the NMED-approved work plan (LANL 2014, 260201; NMED 2014, 525180). Figure 1 shows the location of the boreholes, and Figures 2 through 23 are the borehole logs. At each borehole, a sample was collected below the clean fill/tuff (Qbt 3) interface of the former excavated trenches at depths between 6 and 12 in.

The boreholes were drilled using a hollow-stem auger with a split-spoon sampler lined with brass sleeves. The sleeve representing the target sample depths was capped on each end and retained for VOC analysis (U.S. Environmental Protection Agency Method 8260B). Per the approved work plan, the brass sleeve ends were covered with a sheet of Teflon tape, capped, and duct-taped before they were submitted to the Laboratory's Sample Management Office.

RESULTS

Table 1 shows the samples collected and field-screening results. All the analytical data are provided in Attachment 1 on CD submitted with this letter report.

VOCs were not detected in any of the samples collected in 2014. Therefore, the Laboratory has demonstrated that VOC concentrations from samples collected at the site are below residential soil screening levels (SSLs).

REFERENCES

The following list includes all documents cited in this report. 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.

LANL (Los Alamos National Laboratory), June 2013. “Investigation/Remediation Report for Material Disposal Area B, Solid Waste Management Unit 21-015, Revision 2,” Los Alamos National Laboratory document LA-UR-13-24556, Los Alamos, New Mexico. (LANL 2013, 243675)

LANL (Los Alamos National Laboratory), August 2014. “Drilling Work Plan for Material Disposal Area B Volatile Organic Compound Sampling,” Los Alamos National Laboratory document LA-UR-14-26305, Los Alamos, New Mexico. (LANL 2014, 260201)

NMED (New Mexico Environment Department), July 8, 2014. “Investigation/Remediation Report for Material Disposal Area B, Solid Waste Management Unit 21-015, Revision 2, Approval with Modifications,” New Mexico Environment Department letter to P. Maggiore (DOE-NA-LA) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2014, 525003)

NMED (New Mexico Environment Department), September 16, 2014. “Approval, Drilling Work Plan for Material Disposal Area B Volatile Organic Compound Sampling,” New Mexico Environment Department letter to P. Maggiore (DOE-NA-LA) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2014, 525180)

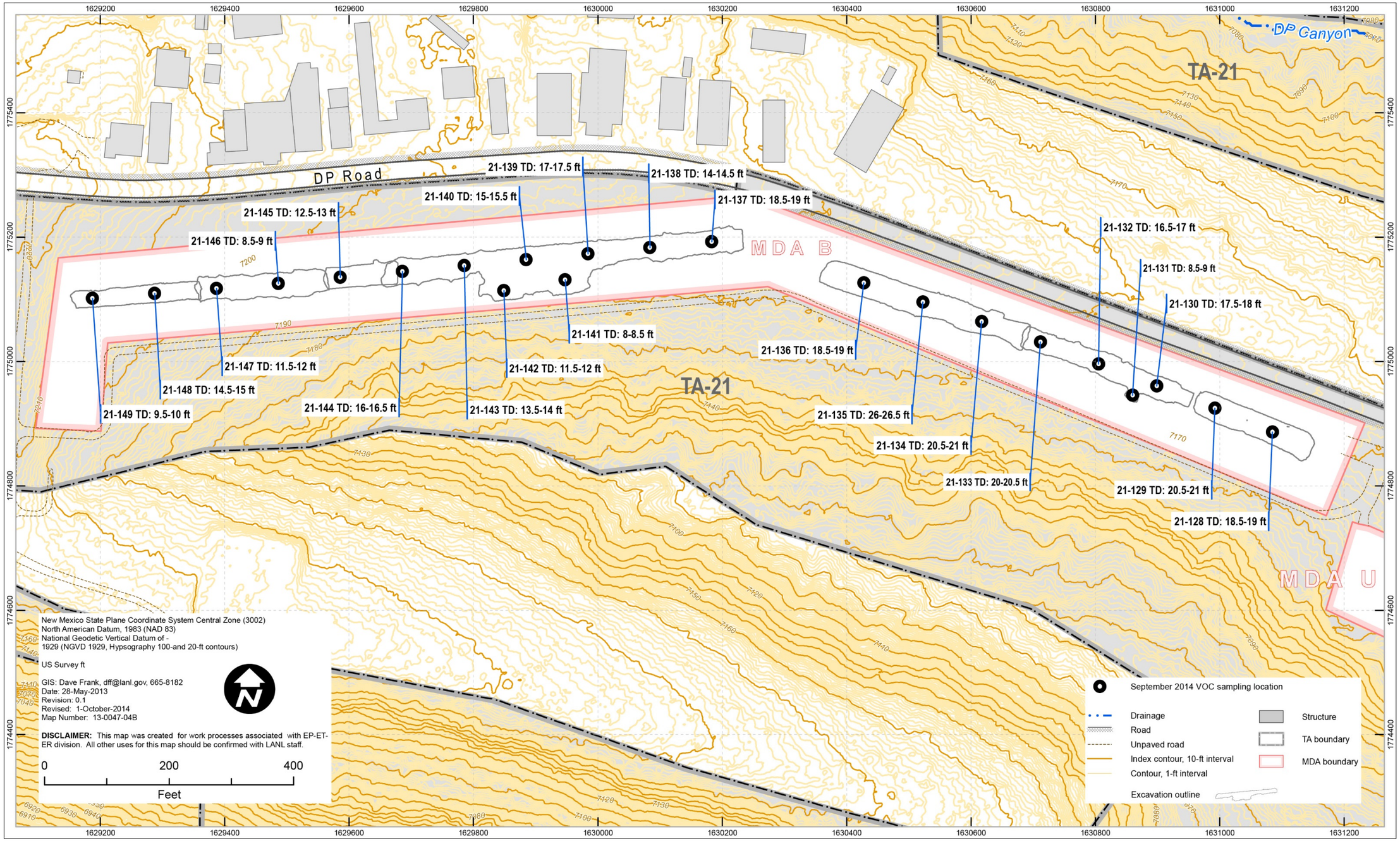

Figure 1 Borehole locations at MDA B

Borehole ID: 21-128	TA: 21	Drill Depth: 19 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/09/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 34 dpm, β/γ: 1484 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 17.5 ft bgs
18				**Bandelier Tuff:**		
18.5	100%	PID= 0.9	MD21-14-86033	AFT: Gray to light purple, moderately welded,		Sample interval 18.5–19 ft bgs
19		α= 21		crystal-rich, minor lithics and pumice-poor.		
19.5		β/γ= 1941				
20						
20.5						
21						
21.5						
22						

Figure 2 Borehole log for location 21-128

Borehole ID: 21-129	TA: 21	Drill Depth: 21 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/09/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 34 dpm / β/γ: 1484 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 20 ft bgs
20.5	100%	PID= 0.0	MD21-14-86034	**Bandelier Tuff:**		Sample interval 20.5–21 ft bgs
21		α= 26		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor lithics and pumice-poor. Clay-filled, 1 cm thick, oxidized vertical fracture present.		
21.5		β/γ= 1984				
22						
22.5						

Figure 3 Borehole log for location 21-129

Borehole ID: 21-130	TA: 21	Drill Depth: 18 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/09/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 34 dpm / β/γ: 1484 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**		
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8					Fill	
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 17 ft bgs
17.5	100%	PID= 0.7	MD21-14-86035	**Bandelier Tuff:**		Sample interval 17.5–18 ft bgs
18		α= 47		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		**Note:** Field Duplicate MD21-14-86055 collected at this location
18.5		β/γ= 2170				
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 4 Borehole log for location 21-130

Borehole ID: 21-131	TA: 21	Drill Depth: 9 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/10/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 29 dpm / β/γ: 1598 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 8 ft bgs
8.5	100%	PID= 0.1	MD21-14-86036	**Bandelier Tuff:**		Sample interval 8.5–9 ft bgs
9		α= 52		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor. Minor reddish brown oxidized staining and clay-filled vein present		
9.5		β/γ= 2030				
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 5 Borehole log for location 21-131

Borehole ID: 21-132	TA: 21	Drill Depth: 17 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/10/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 29 dpm / β/γ: 1598 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 16 ft bgs
16.5	100%	PID= 0.1	MD21-14-86037	**Bandelier Tuff:**		Sample interval 16.5–17 ft bgs
17		α= 21		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
17.5		β/γ= 2100				
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 6 Borehole log for location 21-132

Borehole ID: 21-133	TA: 21	Drill Depth: 20.5ft	Total Pages: 1 of 1	
Drillers: T. Rose and D. Toney		Date: 9/10/14	Background Radiological Screening	
Drilling Company: Precision		Equipment: CME-75	α: 29 dpm	β/γ: 1598 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton	

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 19.5 ft bgs
20	100%	PID= 0.0	MD21-14-86038	**Bandelier Tuff:**		Sample interval 20–20.5 ft bgs
20.5		α= 21		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
21		β/γ= 1920				
21.5						
22						
22.5						

Figure 7 Borehole log for location 21-133

Borehole ID: 21-134	TA: 21	Drill Depth: 21 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/10/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 29 dpm / β/γ: 1598 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 20 ft bgs
20.5	100%	PID= 0.0	MD21-14-86039	**Bandelier Tuff:**		Sample interval 20.5–21 ft bgs
21		α= 57		AFT: Gray to light purple, poorly welded, crystal-rich, minor mafics and pumice-poor.		
21.5		β/γ= 2210				
22						
22.5						

Figure 8 Borehole log for location 21-134

Borehole ID: 21-135	TA: 21	Drill Depth: 26.5 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/10/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 29 dpm / β/γ: 1598 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
Break in Scale						
15					Fill	
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						
23						
23.5						
24						
24.5						
25						
25.5				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 25.5 ft bgs
26	100%	PID= 0.0	MD21-14-86040	**Bandelier Tuff:**		Sample interval 26–26.5 ft bgs
26.5		α= 57		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
27		β/γ= 2110				
27.5						
28						
28.5						
29						
29.5						
30						
30.5						
31						
31.5						

Figure 9 Borehole log for location 21-135

Borehole ID: 21-136	TA: 21	Drill Depth: 19 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 18 ft bgs
18.5	100%	PID= 0.0	MD21-14-86041	**Bandelier Tuff:**		Sample interval 18.5–19 ft bgs
19		α= 26		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
19.5		β/γ= 1997				
20						
20.5						
21						
21.5						
22						
22.5						

Figure 10 Borehole log for location 21-136

Borehole ID: 21-137	TA: 21	Drill Depth: 19 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 18 ft bgs
18.5	100%	PID= 0.0	MD21-14-86042	**Bandelier Tuff:**		Sample interval 18.5–19 ft bgs
19		α= 26		AFT: Gray to light purple, poorly to moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
19.5		β/γ= 2020				
20						
20.5						
21						
21.5						
22						
22.5						

Figure 11 Borehole log for location 21-137

Borehole ID: 21-138	TA: 21	Drill Depth: 14.5 ft	Total Pages: 1 of 1	
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening	
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm	β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton	

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 13.5 ft bgs
14	100%	PID= 0.1	MD21-14-86043	**Bandelier Tuff:**		Sample interval 14–14.5 ft bgs
14.5		α= 42		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor. Weathered fractures present.		
15		β/γ= 2210				
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 12 Borehole log for location 21-138

Borehole ID: 21-139	TA: 21	Drill Depth: 17.5 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 16.5 ft bgs
17	100%	PID= 0.0	MD21-14-86044	**Bandelier Tuff:**		Sample interval 17–17.5 ft bgs
17.5		α= 42		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
18		β/γ= 2240				
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 13 Borehole log for location 21-139

Borehole ID: 21-140	TA: 21	Drill Depth: 15.5 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14				**Unit 3 of the Tschirege Member of the Bandelier Tuff:**	Qbt 3	Tuff contact at 14 ft bgs
14.5						
15	100%	PID= 0.0	MD21-14-86045	AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		Sample interval 15–15.5 ft bgs
15.5		α= 47				
16		β/γ= 2770				
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 14 Borehole log for location 21-140

Borehole ID: 21-141	TA: 21	Drill Depth: 8.5 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 7 ft bgs
7.5				**Bandelier Tuff:**		
8	100%	PID= 0.0	MD21-14-86046	AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		Sample interval 8–8.5 ft bgs
8.5		α= 73				
9		β/γ= 2390				
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 15 Borehole log for location 21-141

Borehole ID: 21-142	TA: 21	Drill Depth: 12.5 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 11 ft bgs
11.5	100%	PID= 0.0	MD21-14-86047	**Bandelier Tuff:**		Sample interval 11.5–12 ft bgs
12		α= 21		AFT: Gray to light purple, poorly welded, crystal-rich, minor mafics and pumice-poor.		
12.5		β/γ= 2670				
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 16 Borehole log for location 21-142

Borehole ID: 21-143	TA: 21	Drill Depth: 14 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/11/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 21 dpm / β/γ: 1529 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 13 ft bgs
13.5	100%	PID= 0.0	MD21-14-86048	**Bandelier Tuff:**		Sample interval 13.5–14 ft bgs
14		α= 121		AFT: Gray to light purple, very well-welded, crystal-rich, minor mafics and pumice-poor.		
14.5		β/γ= 2140				
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 17 Borehole log for location 21-143

Borehole ID: 21-144	TA: 21	Drill Depth: 16.5 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/12/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 22 dpm / β/γ: 1481 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 15.5 ft bgs
16	100%	PID= 0.0	MD21-14-86049	**Bandelier Tuff:**		Sample interval 16–16.5 ft bgs
16.5		α= 31		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
17		β/γ= 2230				
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 18 Borehole log for location 21-144

Borehole ID: 21-145	TA: 21	Drill Depth: 13 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/12/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 22 dpm / β/γ: 1481 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 12 ft bgs
12.5	100%	PID= 0.0	MD21-14-86050	**Bandelier Tuff:**		Sample interval 12.5–13 ft bgs
13		α= 47		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor. Moderate oxidized staining present.		
13.5		β/γ= 2010				
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 19 Borehole log for location 21-145

Borehole ID: 21-146	TA: 21	Drill Depth: 9 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/12/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 22 dpm / β/γ: 1481 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 8 ft bgs
8.5	100%	PID= 0.0	MD21-14-86051	**Bandelier Tuff:**		Sample interval 8.5–9 ft bgs
9		α= 274		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		
9.5		β/γ= 2430				
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 20 Borehole log for location 21-146

Borehole ID: 21-147	TA: 21	Drill Depth: 12 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/12/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 22 dpm / β/γ: 1481 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 11 ft bgs
11.5	100%	PID= 0.0	MD21-14-86052	**Bandelier Tuff:**		Sample interval 11.5–12 ft bgs
12		α= 31		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor. Moderate oxidized staining present.		
12.5		β/γ= 2150				
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 21 Borehole log for location 21-147

Borehole ID: 21-148	TA: 21	Drill Depth: 15 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/12/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 22 dpm / β/γ: 1481 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9						
9.5						
10						
10.5						
11						
11.5						
12						
12.5						
13						
13.5						
14				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 14 ft bgs
14.5	100%	PID= 0.0	MD21-14-86053	**Bandelier Tuff:**		Sample interval 14.5–15 ft bgs
15		α= 68		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor. Minor oxidized staining present.		
15.5		β/γ= 2210				
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 22 Borehole log for location 21-148

Borehole ID: 21-149	TA: 21	Drill Depth: 10 ft	Total Pages: 1 of 1
Drillers: T. Rose and D. Toney		Date: 9/12/14	Background Radiological Screening
Drilling Company: Precision		Equipment: CME-75	α: 22 dpm / β/γ: 1481 dpm
Sampling Equipment: 2.5" ID 2.5' Length Brass Sleeve Lined Split Core-Barrel			Logged By: A. Stocker, A. Tosh and S. Muggleton

DEPTH (ft bgs)	RECOVERY (%)	FIELD SCREENING RESULTS: PID (ppm)/gross-alpha, -beta, -gamma (dpm)	SAMPLE ID	LITHOLOGICAL DESCRIPTION	LITHOLOGICAL UNIT	NOTES
0				**Construction Fill:**	Fill	
0.5				Fill: Unconsolidated silty pebble gravel with fine to coarse sand, detritus of mixed volcanic (dacite, black-orange vitrophyre) and exotic quartzite and granite (indicating base-coarse gravel)		
1						
1.5						
2						
2.5						
3						
3.5						
4						
4.5						
5						
5.5						
6						
6.5						
7						
7.5						
8						
8.5						
9				**Unit 3 of the Tschirege Member of the**	Qbt 3	Tuff contact at 9 ft bgs
9.5	100%	PID= 0.0	MD21-14-86054	**Bandelier Tuff:**		Sample interval 9.5–10 ft bgs
10		α= 68		AFT: Gray to light purple, moderately well-welded, crystal-rich, minor mafics and pumice-poor.		**Note:** Field Duplicate MD21-14-86056 collected at this location
10.5		β/γ= 2160				
11						
11.5						
12						
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16						
16.5						
17						
17.5						
18						
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						

Figure 23 Borehole log for location 21-149

Table 1
Samples Collected at MDA B during September 2014 and Corresponding Field-Screening Results

Field Sample ID	Location ID	Sample Depth (ft)	Media	Purpose	Collection Date	Fill/Tuff Contact (ft)	Alpha Field Screening Background (dpm[a])	Alpha Field Screening (dpm)	Beta/Gamma Field Screening Background (dpm)	Beta/Gamma Field Screening (dpm)	PID[b] Field Screening Background (ppm)	PID Field Screening (ppm)
MD21-14-86033	21-128	18.5–19.0	QBT3[c]	REG[d]	9/9/2014	17.5	34	21	1484	1941	0	0.9
MD21-14-86034	21-129	20.5–21.0	QBT3	REG	9/9/2014	20	34	26	1484	1984	0	0
MD21-14-86035	21-130	17.5–18.0	QBT3	REG	9/9/2014	17	34	47	1484	2170	0	0.7
MD21-14-86036	21-131	8.5–9.0	QBT3	REG	9/10/2014	8	29	52	1598	2030	0	0.1
MD21-14-86037	21-132	16.5–17.0	QBT3	REG	9/10/2014	16	29	21	1598	2100	0	0.1
MD21-14-86038	21-133	20.0–20.5	QBT3	REG	9/10/2014	19.5	29	21	1598	1920	0	0
MD21-14-86039	21-134	20.5–21.0	QBT3	REG	9/10/2014	20	29	57	1598	2210	0	0
MD21-14-86040	21-135	26.0–26.5	QBT3	REG	9/10/2014	25.5	29	57	1598	2110	0	0
MD21-14-86041	21-136	18.5–19.0	QBT3	REG	9/11/2014	18	21	26	1529	1997	0	0
MD21-14-86042	21-137	18.5–19.0	QBT3	REG	9/11/2014	18	21	26	1529	2020	0	0
MD21-14-86043	21-138	14.0–14.5	QBT3	REG	9/11/2014	13.5	21	42	1529	2210	0	0.1
MD21-14-86044	21-139	17.0–17.5	QBT3	REG	9/11/2014	16.5	21	42	1529	2040	0	0
MD21-14-86045	21-140	15.0–15.5	QBT3	REG	9/11/2014	14	21	47	1529	2770	0	0
MD21-14-86046	21-141	8.0–8.5	QBT3	REG	9/11/2014	7	21	73	1529	2390	0	0
MD21-14-86047	21-142	11.5–12.0	QBT3	REG	9/11/2014	11	21	21	1529	2670	0	0
MD21-14-86048	21-143	13.5–14.0	QBT3	REG	9/11/2014	13	21	121	1529	2140	0	0
MD21-14-86049	21-144	16–16.5	QBT3	REG	9/12/2014	15.5	22	31	1481	2230	0	0
MD21-14-86050	21-145	12.5–13.0	QBT3	REG	9/12/2014	12	22	47	1481	2010	0	0
MD21-14-86051	21-146	8.5–9.0	QBT3	REG	9/12/2014	8	22	274	1481	2430	0	0
MD21-14-86052	21-147	11.5–12.0	QBT3	REG	9/12/2014	11	22	31	1481	2150	0	0
MD21-14-86053	21-148	14.5–15.0	QBT3	REG	9/12/2014	14	22	68	1481	2210	0	0
MD21-14-86054	21-149	9.5–10.0	QBT3	REG	9/12/2014	9	22	68	1481	2160	0	0

Table 1 (continued)

Field Sample ID	Location ID	Sample Depth (ft)	Media	Purpose	Collection Date	Fill/Tuff Contact (ft)	Alpha Field Screening Background (dpm[a])	Alpha Field Screening (dpm)	Beta/Gamma Field Screening Background (dpm)	Beta/Gamma Field Screening (dpm)	PID[b] Field Screening Background (ppm)	PID Field Screening (ppm)
MD21-14-86055	21-130	17.5–18.0	QBT3	FD[e]	9/9/2014	17	34	47	1484	2170	0	0.7
MD21-14-86056	21-149	9.5–10.0	QBT3	FD	9/12/2014	9	22	68	1481	2160	0	0
MD21-14-86057	n/a[f]	n/a	n/a	FTB[g]	9/11/2014	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MD21-14-86058	n/a	n/a	n/a	FTB	9/10/2014	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MD21-14-87107	n/a	n/a	n/a	FTB	9/12/2014	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[a] dpm = Disintegrations per minute.

[b] PID = Photoionization detector.

[c] QBT3 = Tuff.

[d] REG = Regular investigation sample.

[e] FD = Field duplicate.

[f] n/a = Not applicable.

[g] FTB = Field trip blank.

Attachment 1

Analytical Data