

APPENDIX A SUMMARY OF DRILLING ADDITIVES

Appendix A
Drilling Additives Used in Boreholes 16P, 24P, 27P, 28P, and 29P

Well Name	Activity	Date	Depth (feet below ground surface)	Material	Quantity ^a	Comments
16P	Drilling	12/14/02	550-1140	Max Gel ^{® b}	3 bags (mixed)	Two to five "shots" injected at each joint to stabilize hole.
		12/16/02	1140-1735		3 bags (mixed)	
		1/8/03	1735-1840		3 bags (mixed)	
		1/9/03	1840-2900		3 bags (mixed)	
24P	Drilling	7/17/03	80	Max Gel (dry)	4 bags	Used to condition borehole.
				FSF Super Foam Plus ^{® c}	10 gallons	
		7/22/03	100	Max Gel	13 gallons	
				FSF Super Foam Plus	5 gallons	
				Pac R ^{® d}	1 cup	
				Kwik Plug ^{® e}	1 bag	
		7/22/03	115	Max Gel	13 gallons	
			155		19.5 gallons	
			160	Max Gel (dry)	1 bag	
		7/23/03	197.5	Max Gel	13 gallons	
					13 gallons	
			200	Max Gel (dry)	1 bag	
					13 gallons	
			220	Max Gel	26 gallons	
				FSF Super Foam Plus	2 gallons	
			240	Max Gel	4 gallons	
				FSF Super Foam Plus	1 cup	
				Kwik Plug	1 gallon	
			260	Max Gel	26 gallons	
				FSF Super Foam Plus	1 cup	
		7/24/03	280	Max Gel	52 gallons	
				FSF Super Foam Plus	3 gallons	
				Kwik Plug	4 gallons	
				Pac R	32 oz	
		7/25/03	320	Max Gel	400 gallons	
				Super Plug ^{® f}	200 gallons	
				FSF Super Foam Plus	1 gallon	
			357.5	FSF Super Foam Plus	3 gallons	
			400		2 gallons	
			400	Super Plug (dry)	5 bags	

Appendix A

Drilling Additives Used in Boreholes 16P, 24P, 27P, 28P, and 29P

Well Name	Activity	Date	Depth (feet below ground surface)	Material	Quantity ^a	Comments	
27P	Drilling	11/21/02	160	Max Gel	108 gallons	Used to condition borehole.	
		11/22/02	215		242 gallons		
			245		400 gallons		
			320		400 gallons		
		11/23/02	320		400 gallons		
			335	Max Gel (dry)	1 bag		
		11/25/02	625	Max Gel	300 gallons	Two to five "shots" injected at each joint to stabilize hole.	
			645		15 gallons		
		12/2/02	700		96 gallons		
		12/3/02	1010-1100		2 bags (mixed)		
		12/4/02	1100-1340		3 bags (mixed)		
		12/5/02	1340-1660		3 bags (mixed)		
		12/6/02	1660-1900		3 bags (mixed)		
28P	Drilling	10/22/02	101.44	Max Gel	96 gallons	Used to condition borehole.	
		10/23/02	380.7		48 gallons		
		10/31/02	1270		400 gallons		
		11/3/02	1225-1270	Polyplus 2000 [®] g	2800 gallons	Used to drill through borehole collapse.	
			1281.97-1460		100.5 gallons		
		11/4/02	1460	Max Gel	800 gallons	Injected to keep borehole stabilized.	
				Polyplus 2000	3 gallons		
				Max Gel	400 gallons		
		11/5/02	1540	Max Gel	200 gallons	Used to condition borehole.	
					1540-1620		200 gallons
					1660		200 gallons
				Polyplus 2000	1 gallon		
				1710	Max Gel		200 gallons
					Polyplus 2000		1 gallon
				1715	Max Gel		400 gallons
					Polyplus 2000		1 gallon
		11/6/02	1760	Max Gel	100 gallons		
				Polyplus 2000	0.25 gallons		
			1860	Max Gel	300 gallons		
				Polyplus 2000	0.75 gallons		
			1870	Max Gel	300 gallons		
		Polyplus 2000		1 gallon			

Appendix A Drilling Additives Used in Boreholes 16P, 24P, 27P, 28P, and 29P

Well Name	Activity	Date	Depth (feet below ground surface)	Material	Quantity ^a	Comments
28P	Drilling	11/7/02	1950	Max Gel	400 gallons	Used to condition borehole.
				Polyplus 2000	1 gallon	
			1960	Max Gel	400 gallons	
				Polyplus 2000	0.25 gallons	
		11/12/02	1960	Max Gel	400 gallons	
				Polyplus 2000	0.25 gallons	
			1960-2040	Max Gel	400 gallons	
				Polyplus 2000	0.25 gallons	
			2040-2060	Max Gel	400 gallons	
				Polyplus 2000	0.25 gallons	
11/13/02	2060-2080	Max Gel	400 gallons			
		Polyplus 2000	0.25 gallons			
29P	Drilling	6/26/03	80	Max Gel	117 gallons	Used to condition borehole
		6/27/03	120		26 gallons	
			157.5		26 gallons	
			180		13 gallons	
		6/28/03	220		13 gallons	
			247.5		26 gallons	
			280		26 gallons	
			85 gallons			
		6/29/03	340	Polyplus 2000	10 gallons	
				FSF Super Foam Plus	1 gallon	
				Pac R	32 ounces	
			Plugging	7/1/03	790	
	7/10/03	717		240 gallons		
		700.81		150 gallons		
		7/11/04		697.19	350 gallons	
	695.85			350 gallons		
	695.11			350 gallons		

^a Material mixed with variable volume of water.

^b Max Gel: Sodium bentonite coated with polymer.

^c FSF Super Foam Plus: Oil well drilling fluid additive containing surfactant, water, and isopropyl alcohol.

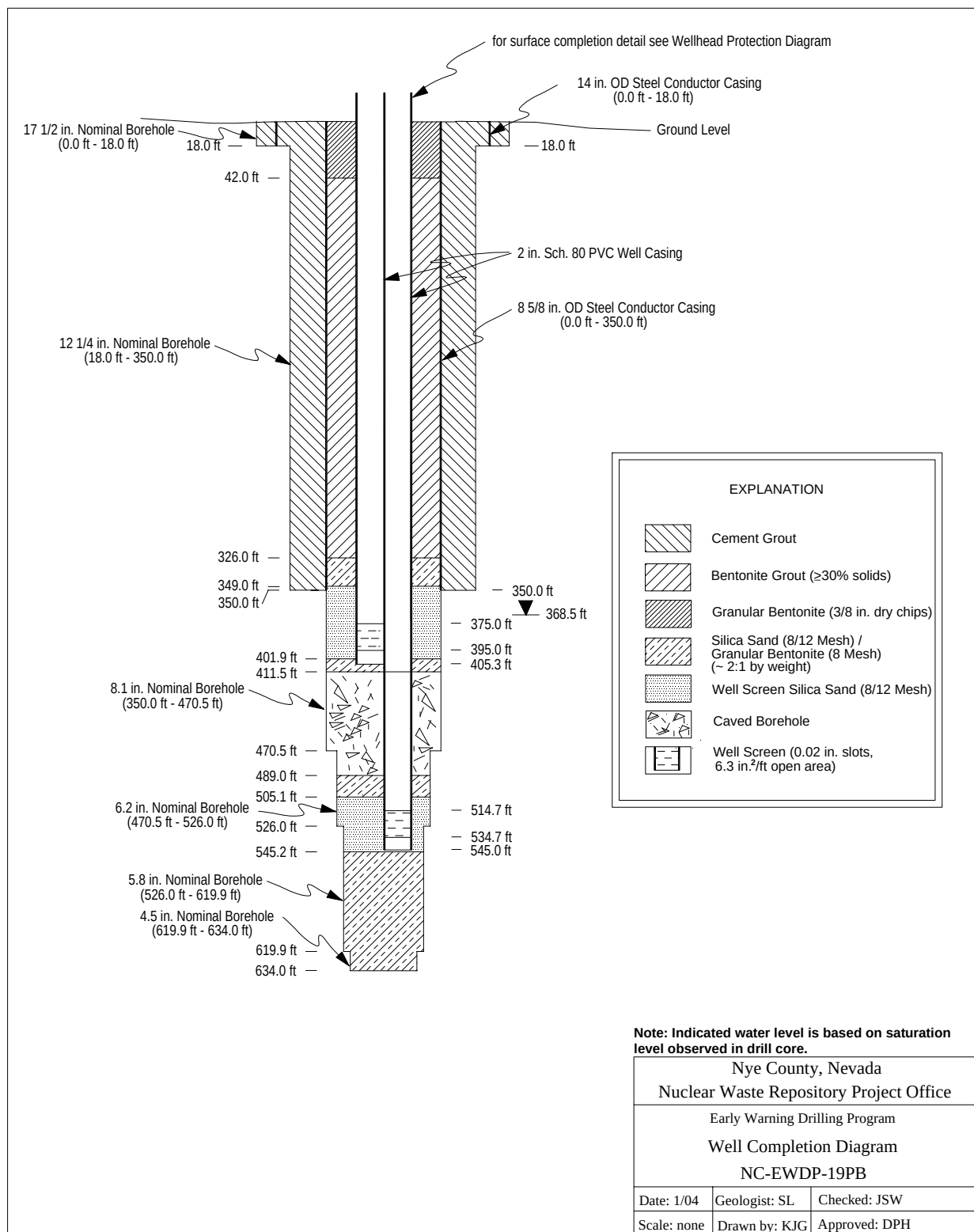
^d Pac R: Oil well drilling fluid additive consisting of carboxymethylcellulose and sodium salt.

^e Kwik Plug: Untreated ground sodium bentonite chips.

^f Super Plug: Bentonite formulated for plugging holes, as opposed to conditioning a hole during borehole advance.

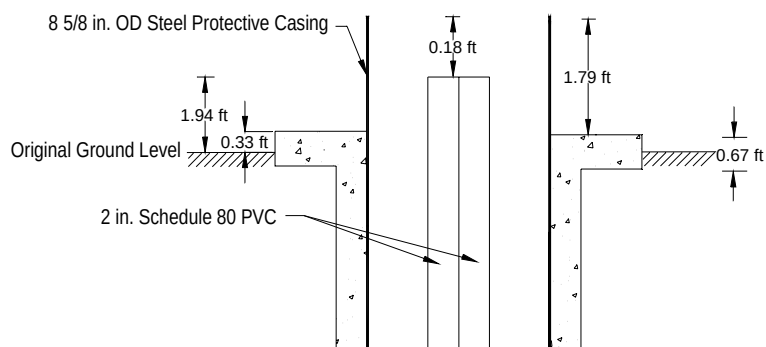
^g Polyplus 2000: Synthetic copolymer.

APPENDIX B WELL COMPLETION AND WELLHEAD PROTECTION DIAGRAMS

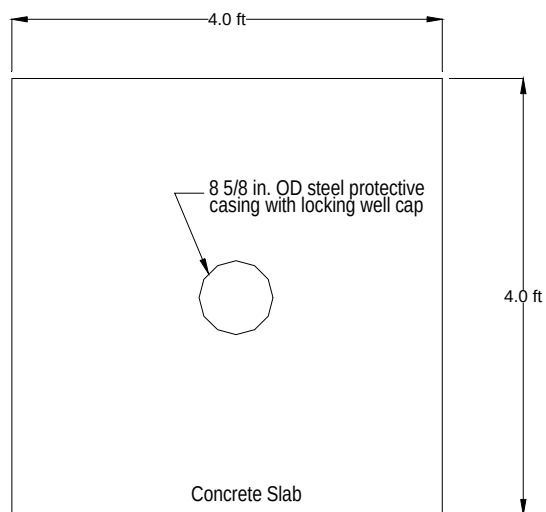


Well Completion Diagram for 19PB

EWDP-19PB Wellhead Protection Detail



ELEVATION



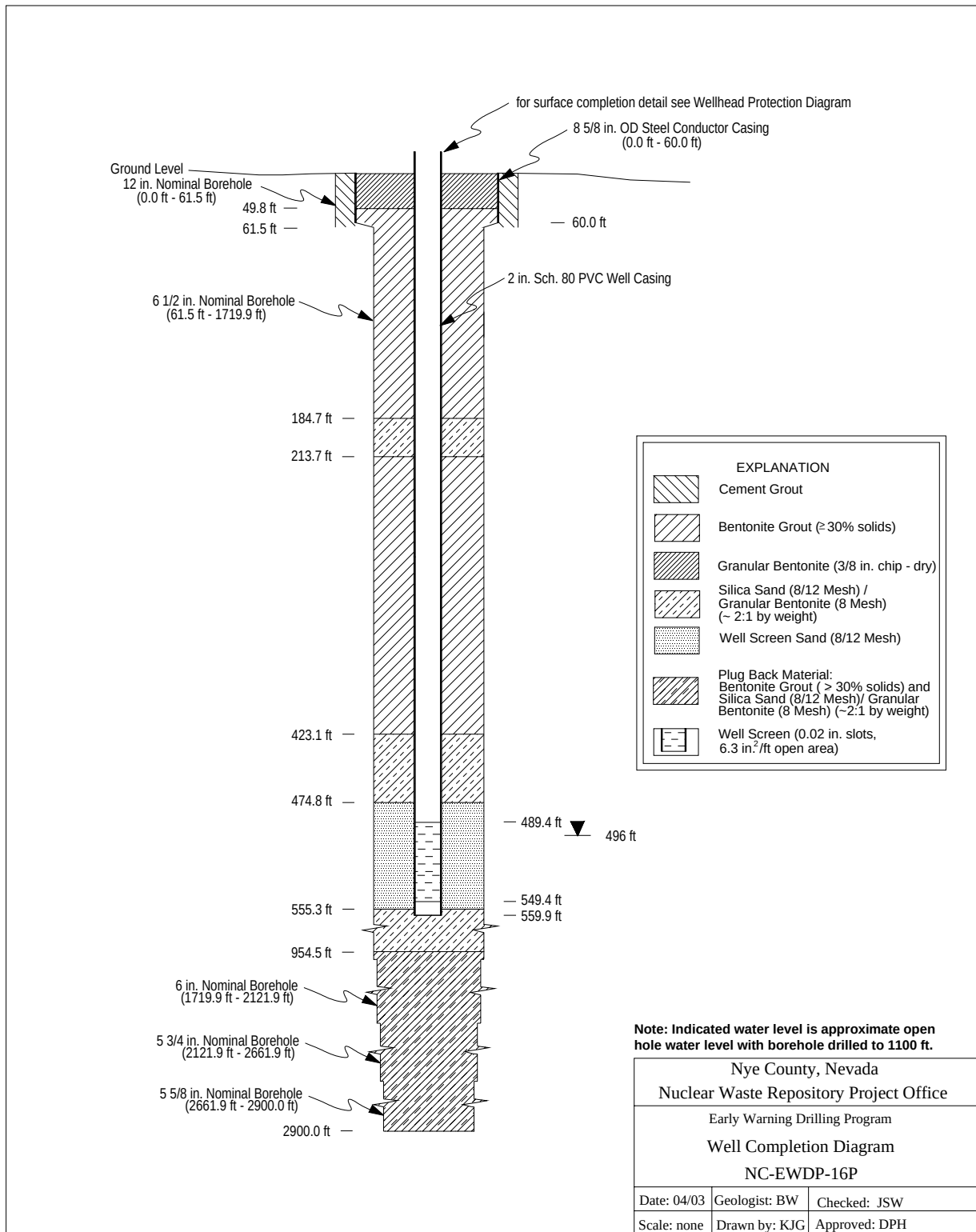
PLAN

Nye County, Nevada
Nuclear Waste Repository Project Office

Early Warning Drilling Program
Wellhead Protection Diagram
NC-EWDP-19PB

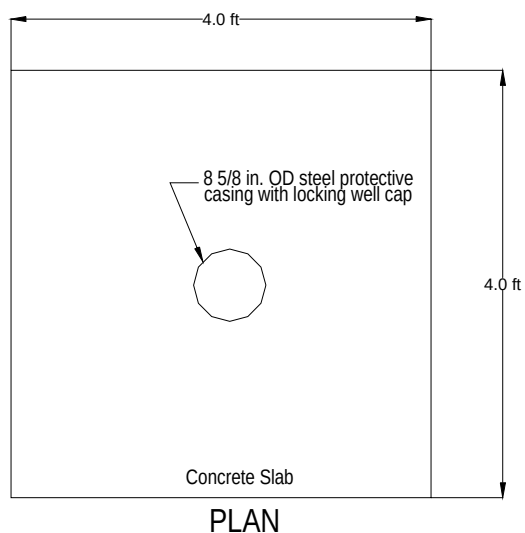
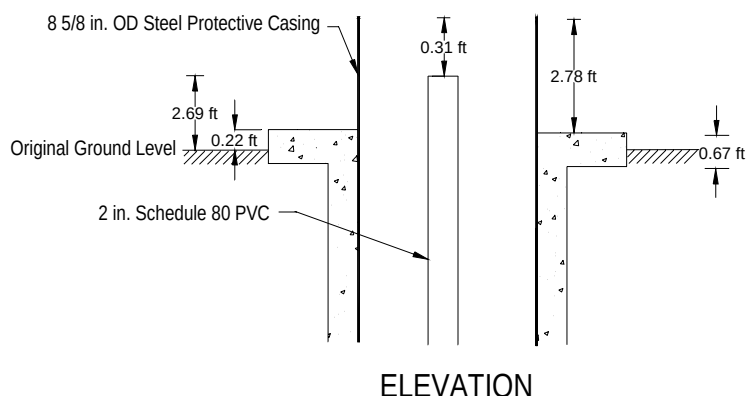
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Wellhead Protection Diagram for 19PB



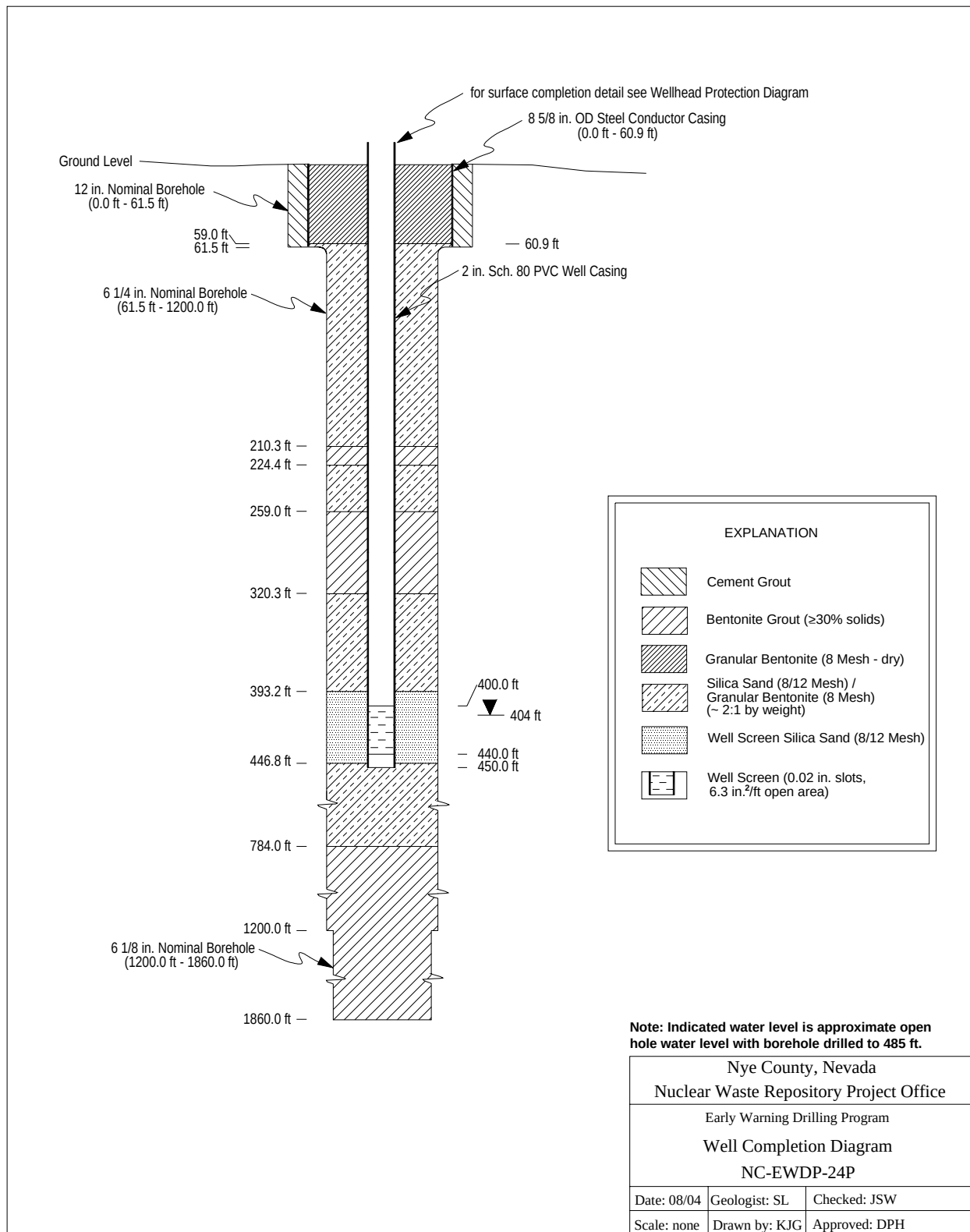
Well Completion Diagram for 16P

EWDP-16P Wellhead Protection Detail

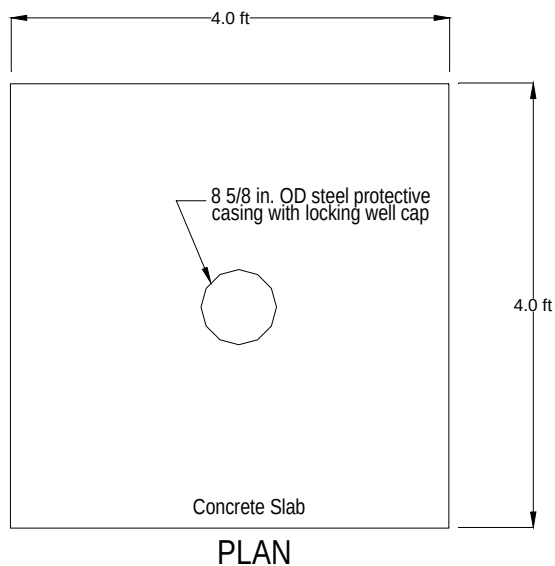
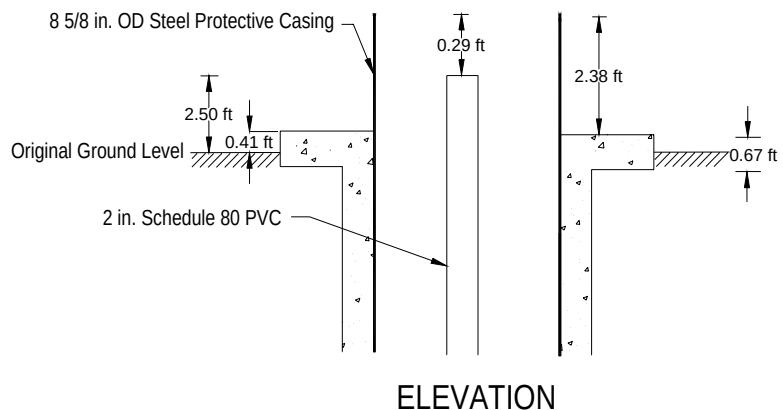


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Nuclear Waste Repository Project Office		
Early Warning Drilling Program		
Wellhead Protection Diagram		
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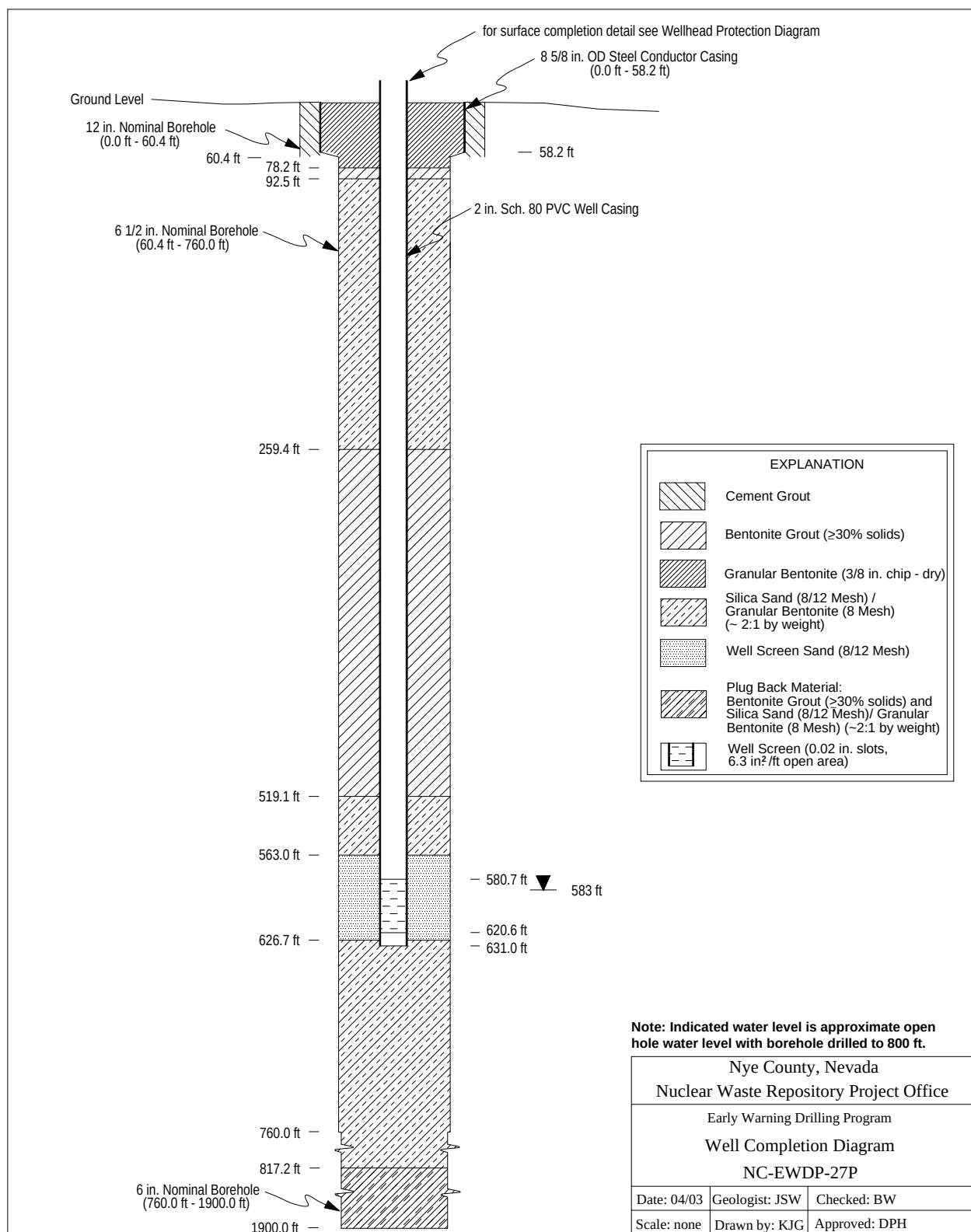


Well Completion Diagram for 24P

EWDP-24P Wellhead Protection Detail

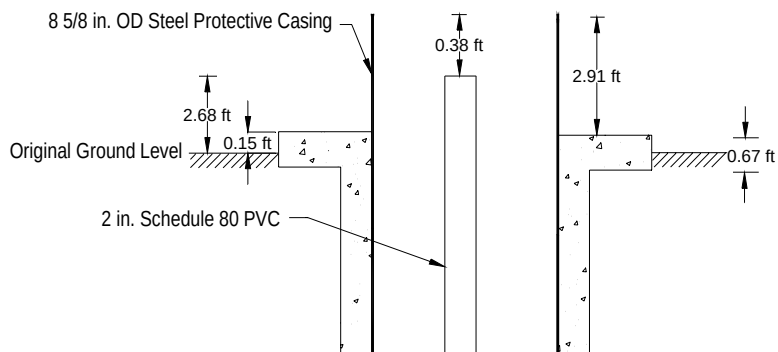
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Wellhead Protection Diagram for 24P

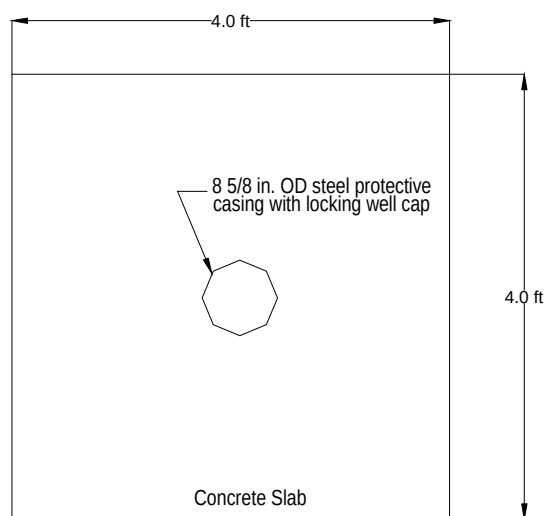


Well Completion Diagram for 27P

EWDP-27P Wellhead Protection Detail



ELEVATION



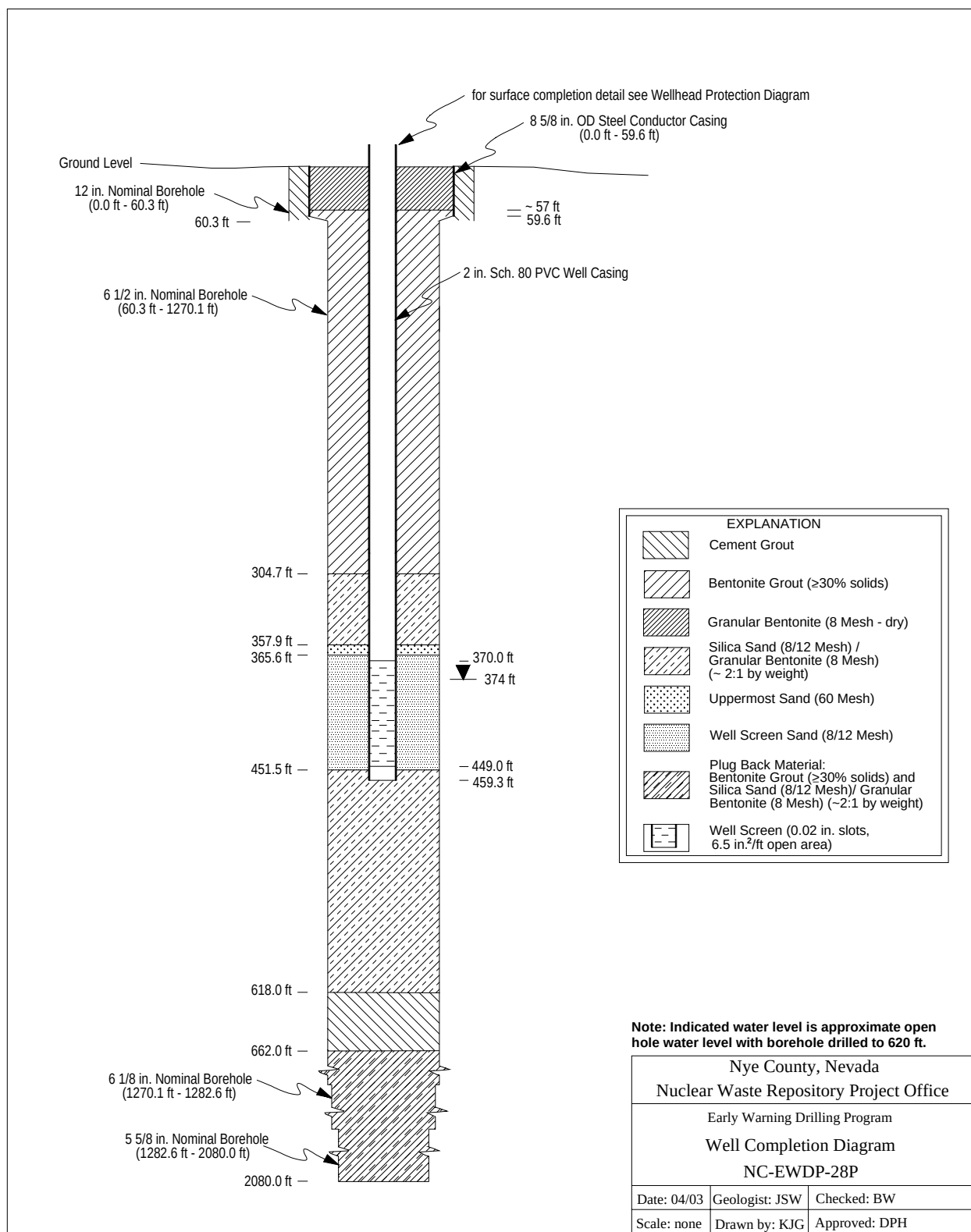
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Nye County, Nevada
Nuclear Waste Repository Project Office

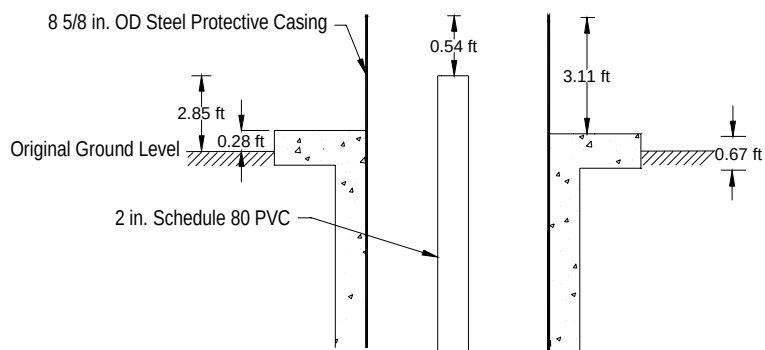
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Wellhead Protection Diagram
NC-EWDP-27P

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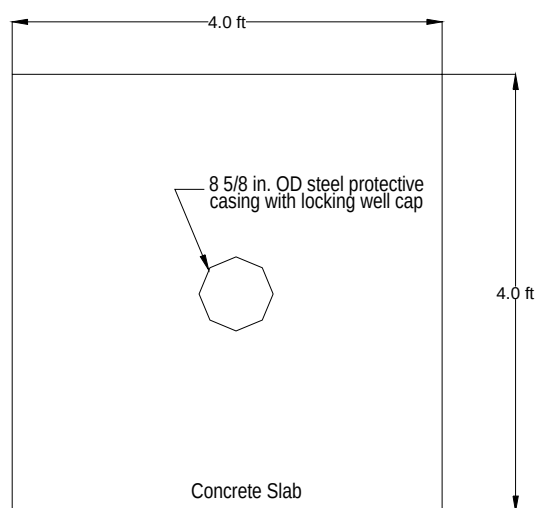
Wellhead Protection Diagram for 27P



Well Completion Diagram for 28P

EWDP-28P Wellhead Protection Detail

ELEVATION



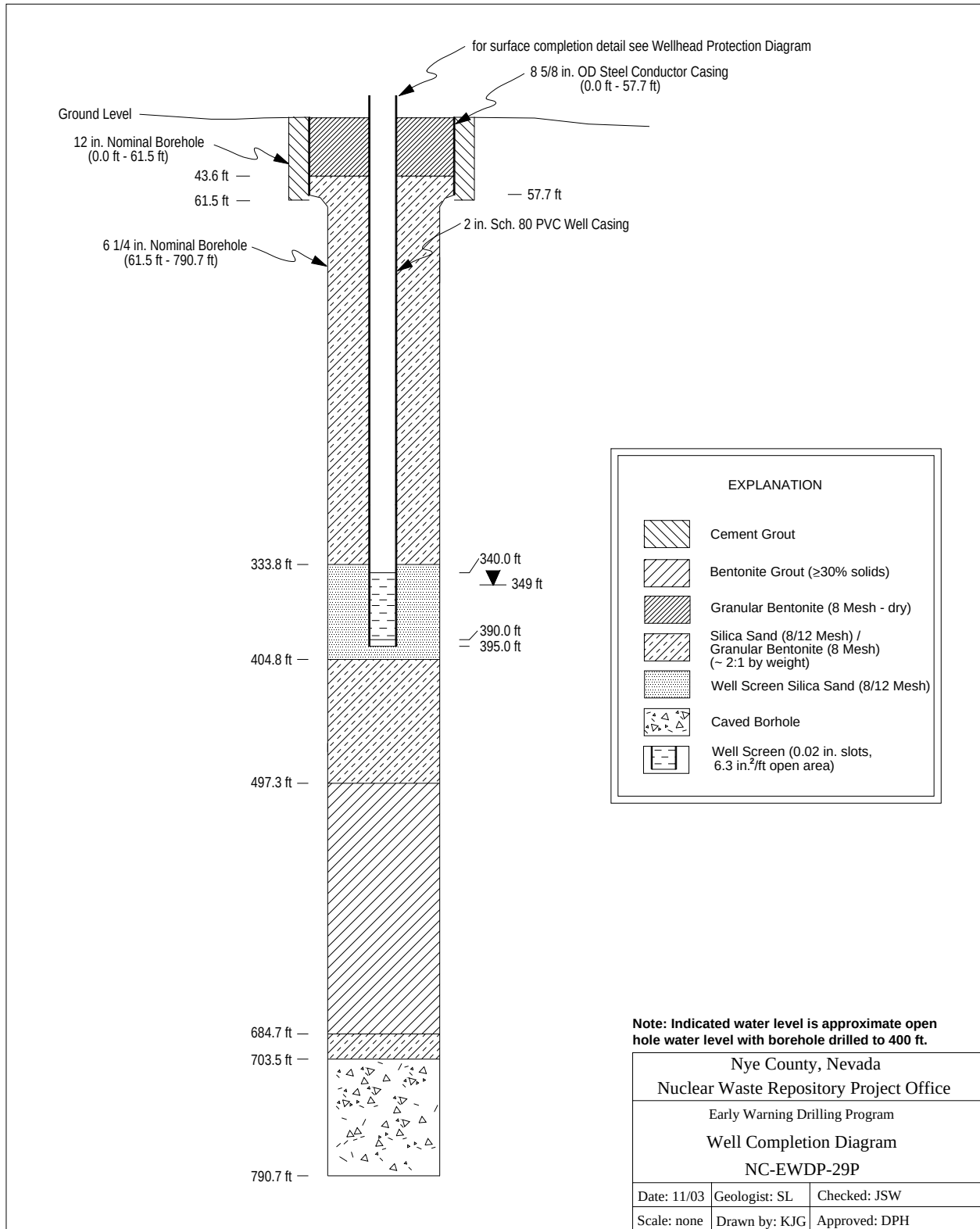
PLAN

Nye County, Nevada
Nuclear Waste Repository Project Office

Early Warning Drilling Program
Wellhead Protection Diagram
NC-EWDP-28P

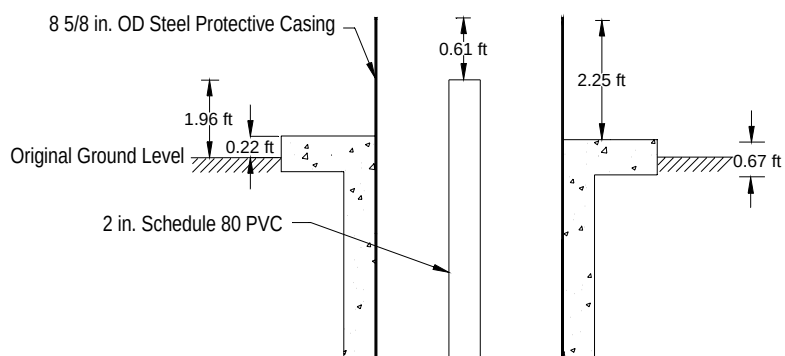
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Wellhead Protection Diagram for 28P

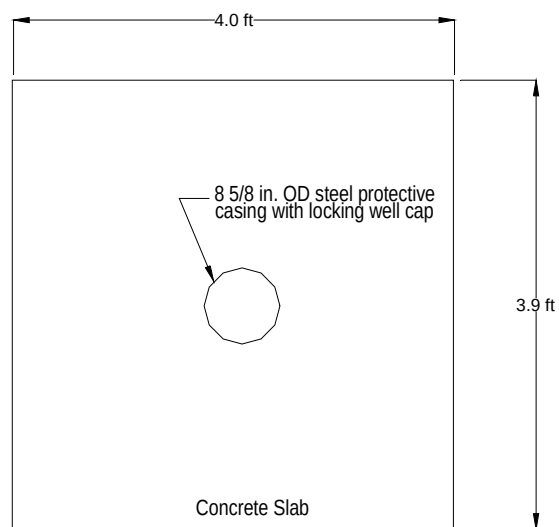


Well Completion Diagram for 29P

EWDP-29P Wellhead Protection Detail



ELEVATION

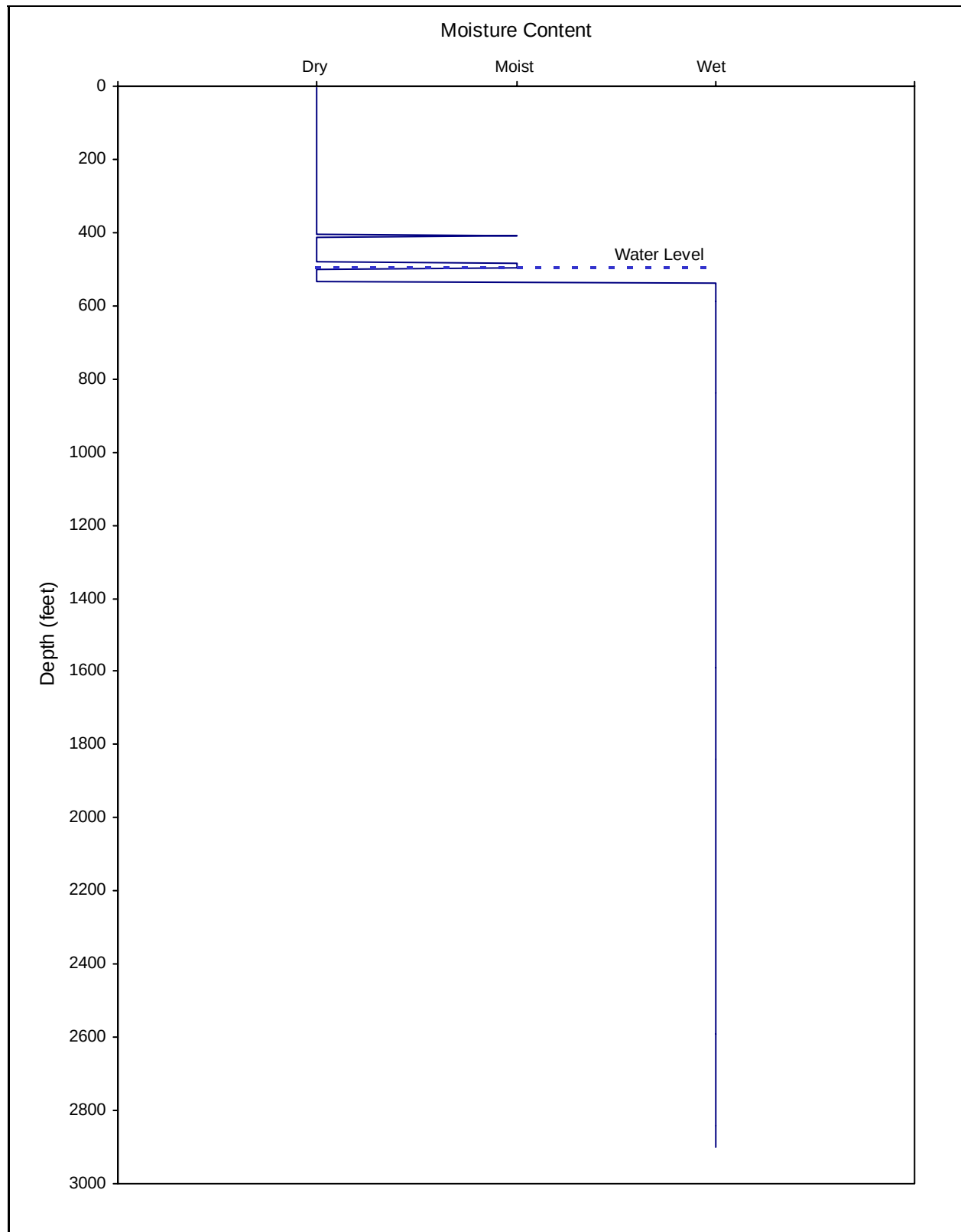


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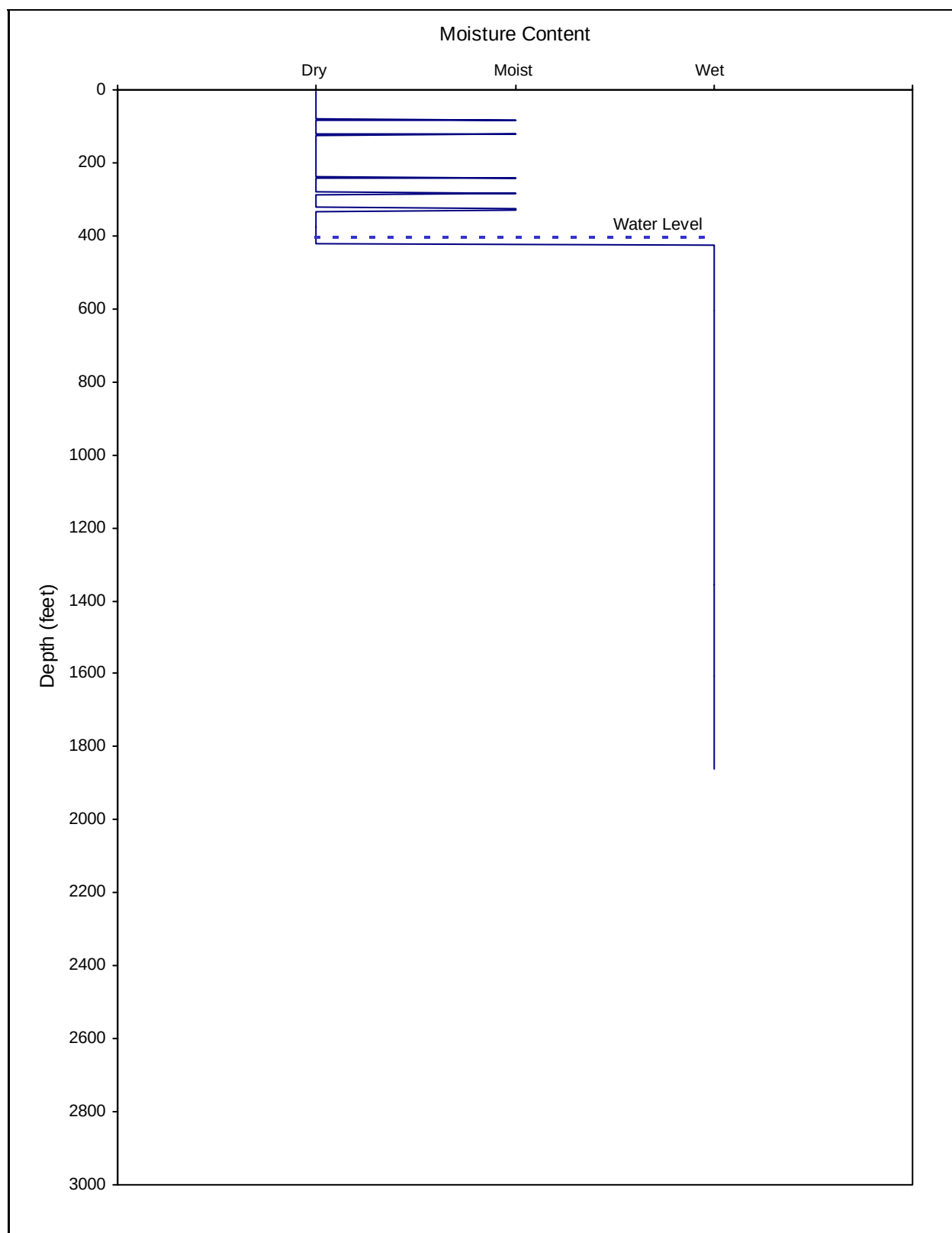
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Early Warning Drilling Program		
Wellhead Protection Diagram		
NC-EWDP-29P		
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Wellhead Protection Diagram for 29P

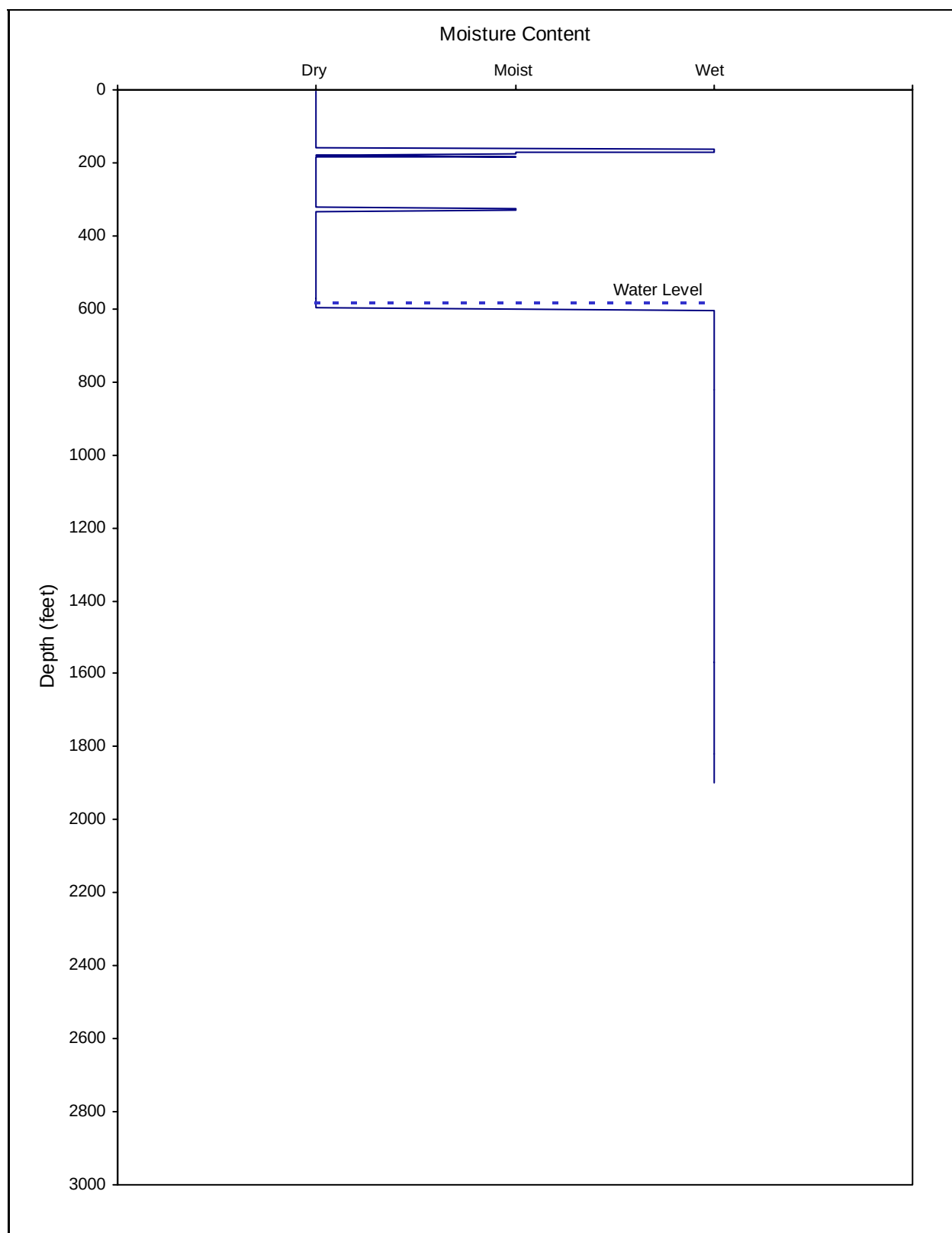
APPENDIX C GEOLOGIC LOGGING PARAMETERS FOR DRILL CUTTINGS



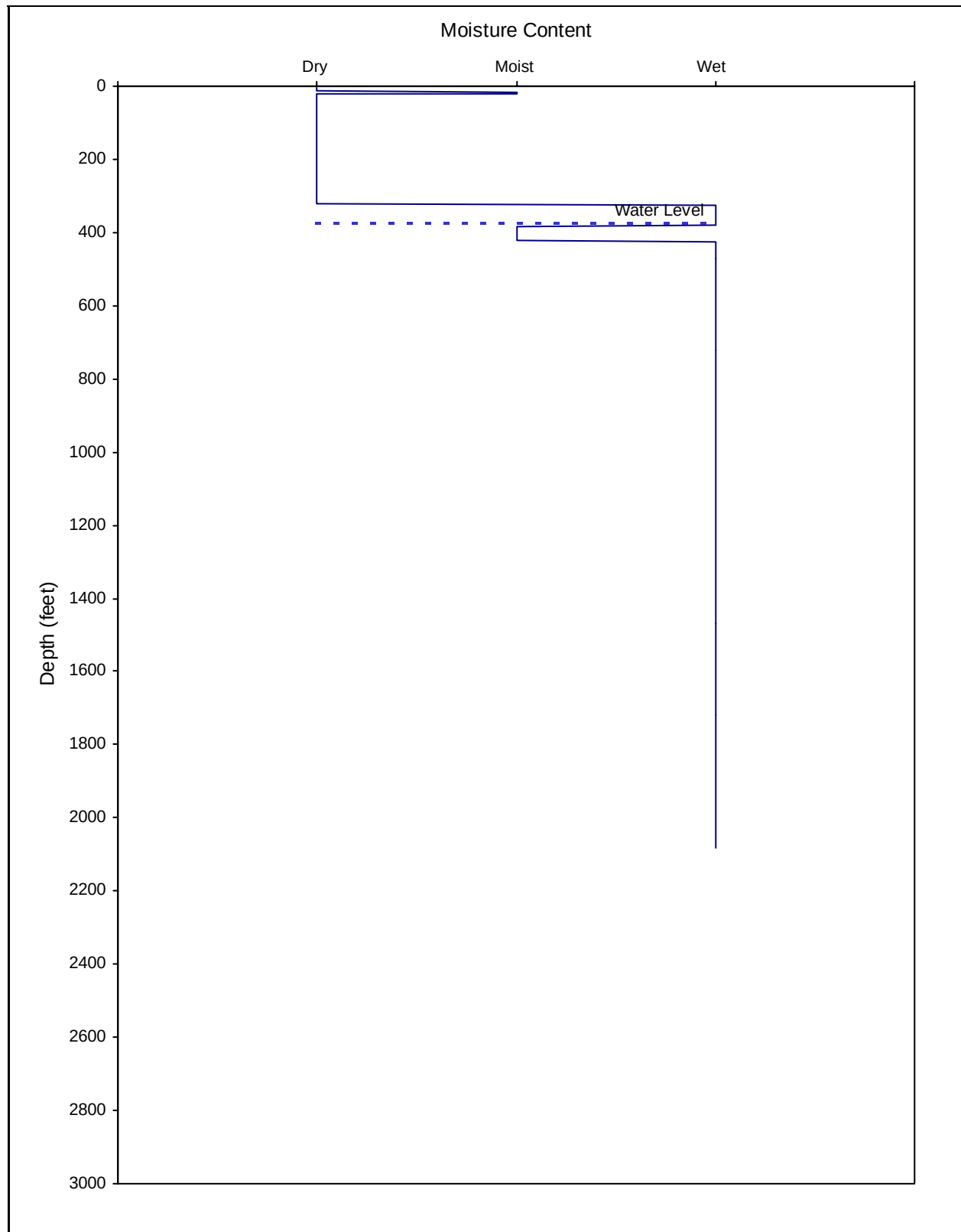
Appendix C-1
Moisture Content vs. Depth of Drill Cuttings in Alluvium and Non-Alluvium for 16P



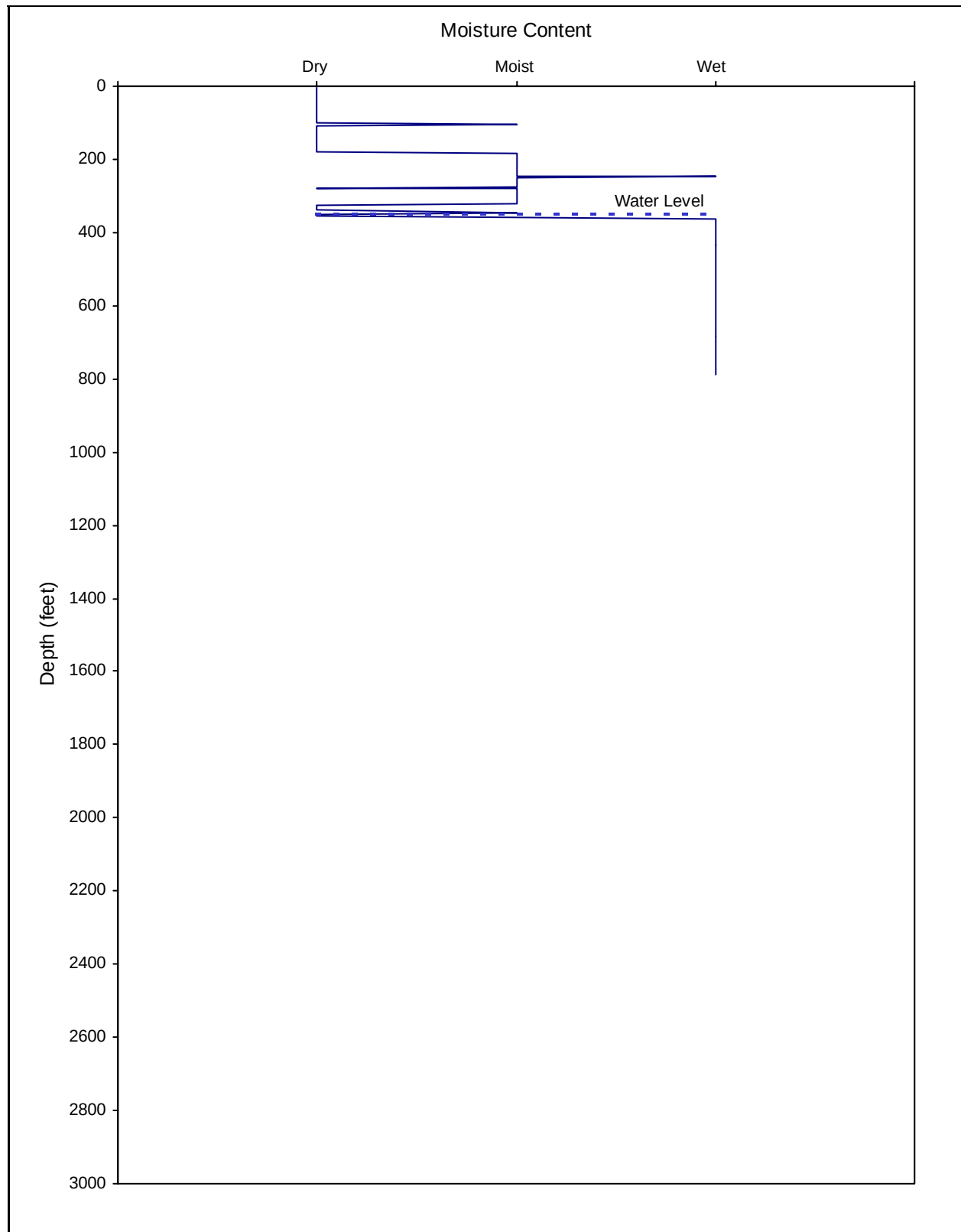
Appendix C-2
Moisture Content vs. Depth of Drill Cuttings in Alluvium and Non-Alluvium for 24P



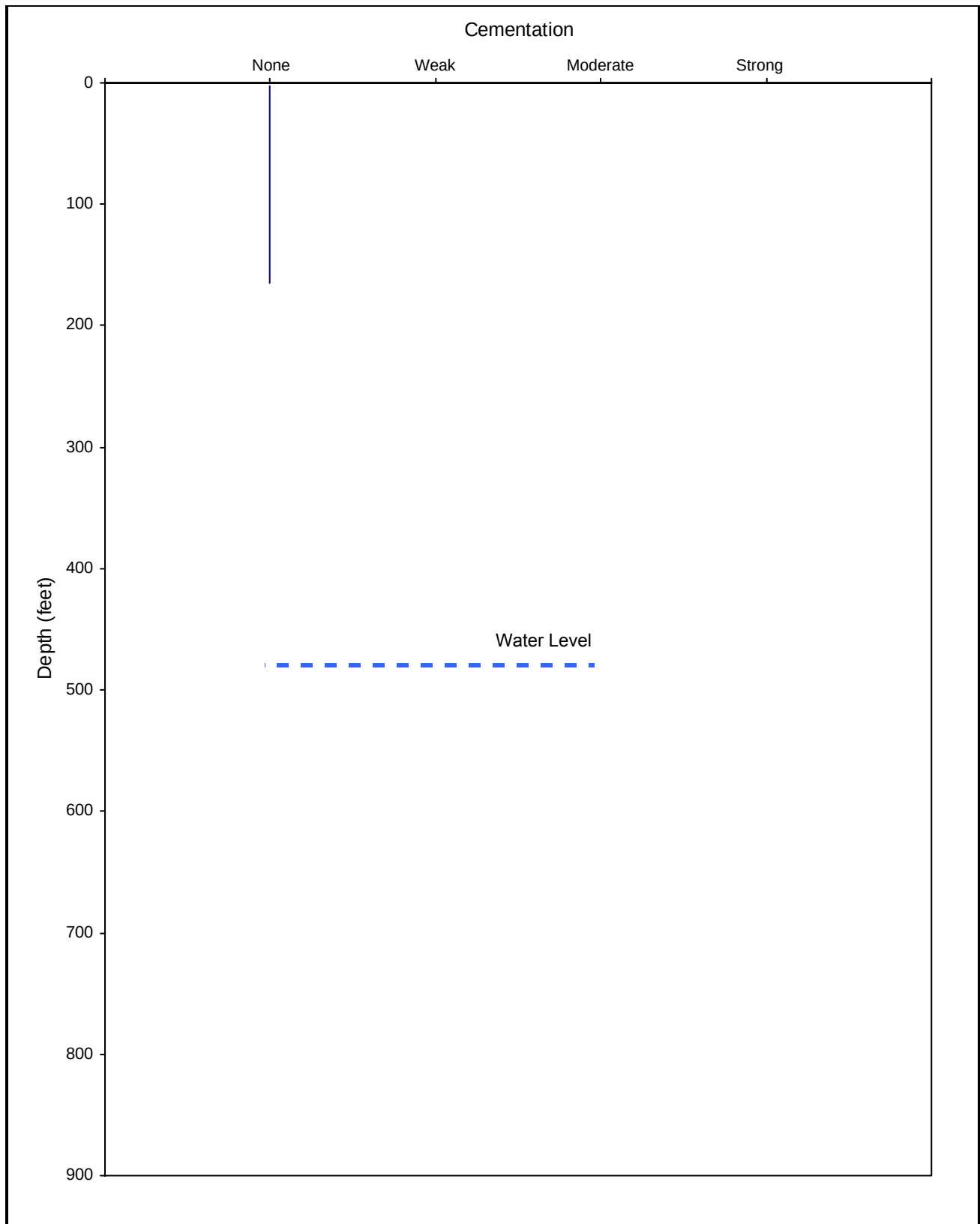
Appendix C-3
Moisture Content vs. Depth of Drill Cuttings in Alluvium and Non-Alluvium for 27P



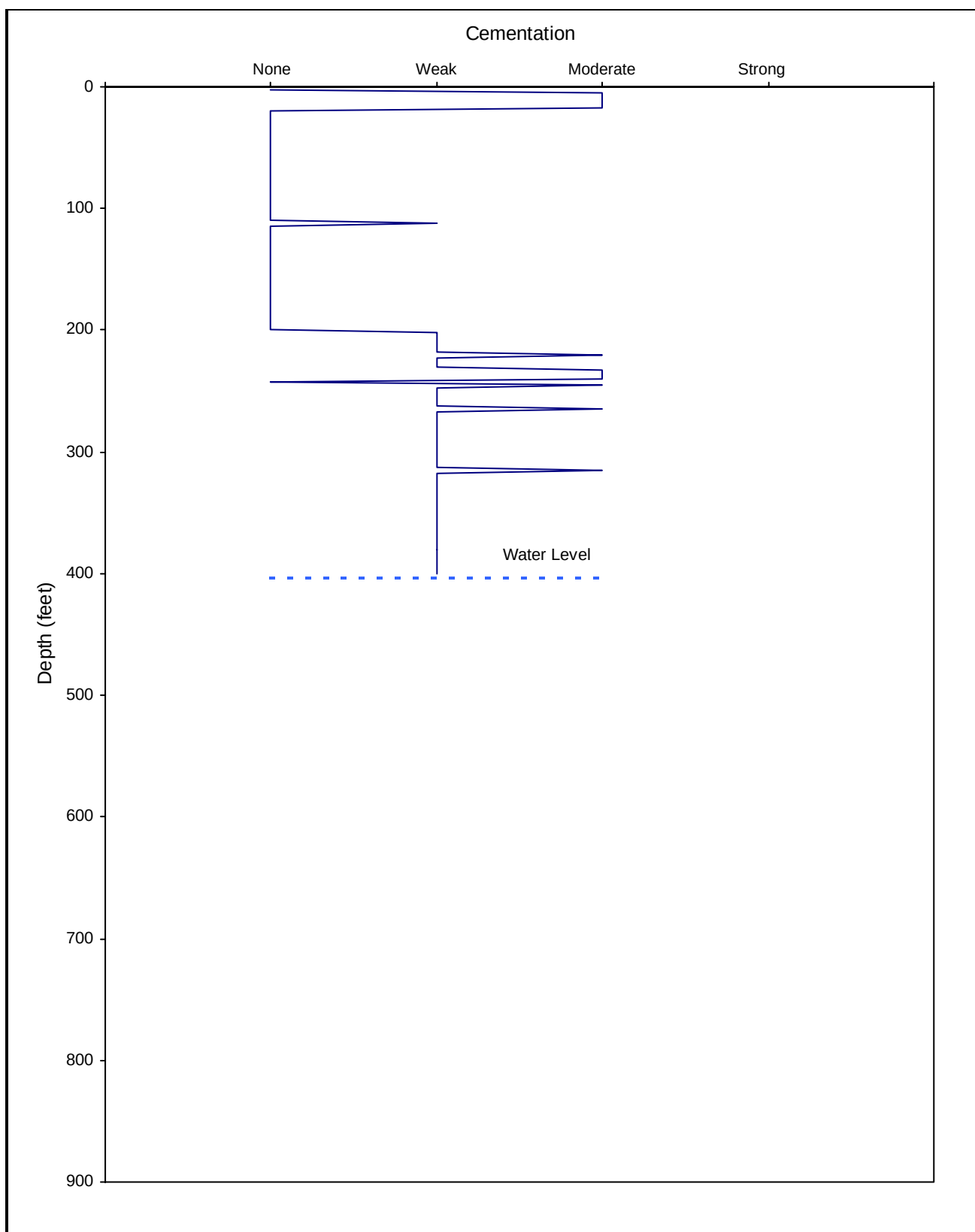
Appendix C-4
Moisture Content vs. Depth of Drill Cuttings in Alluvium and Non-Alluvium for 28P



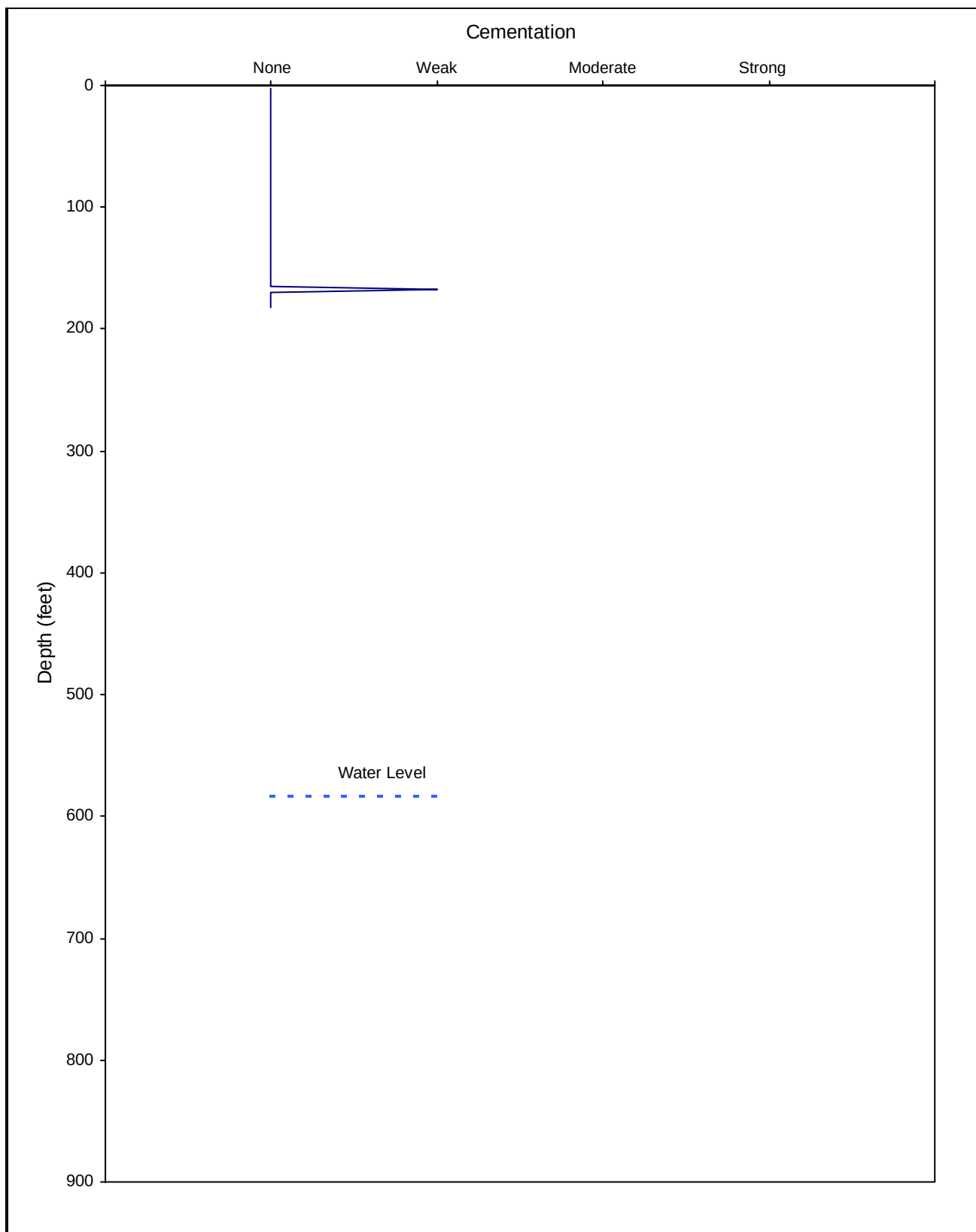
Appendix C-5
Moisture Content vs. Depth of Drill Cuttings in Alluvium and Non-Alluvium for 29P



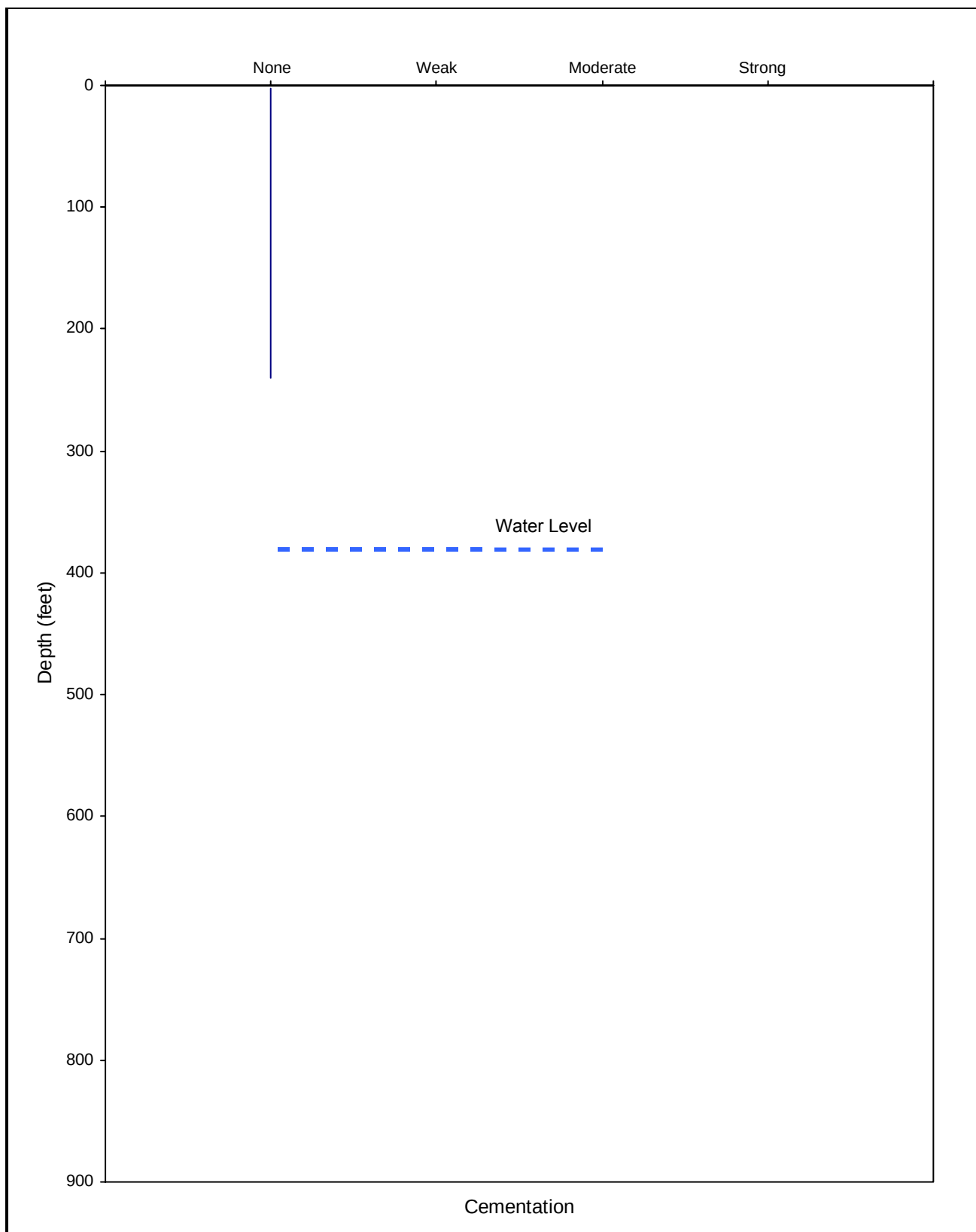
Appendix C-6
Cementation vs. Depth of Drill Cuttings in Alluvium for 16P



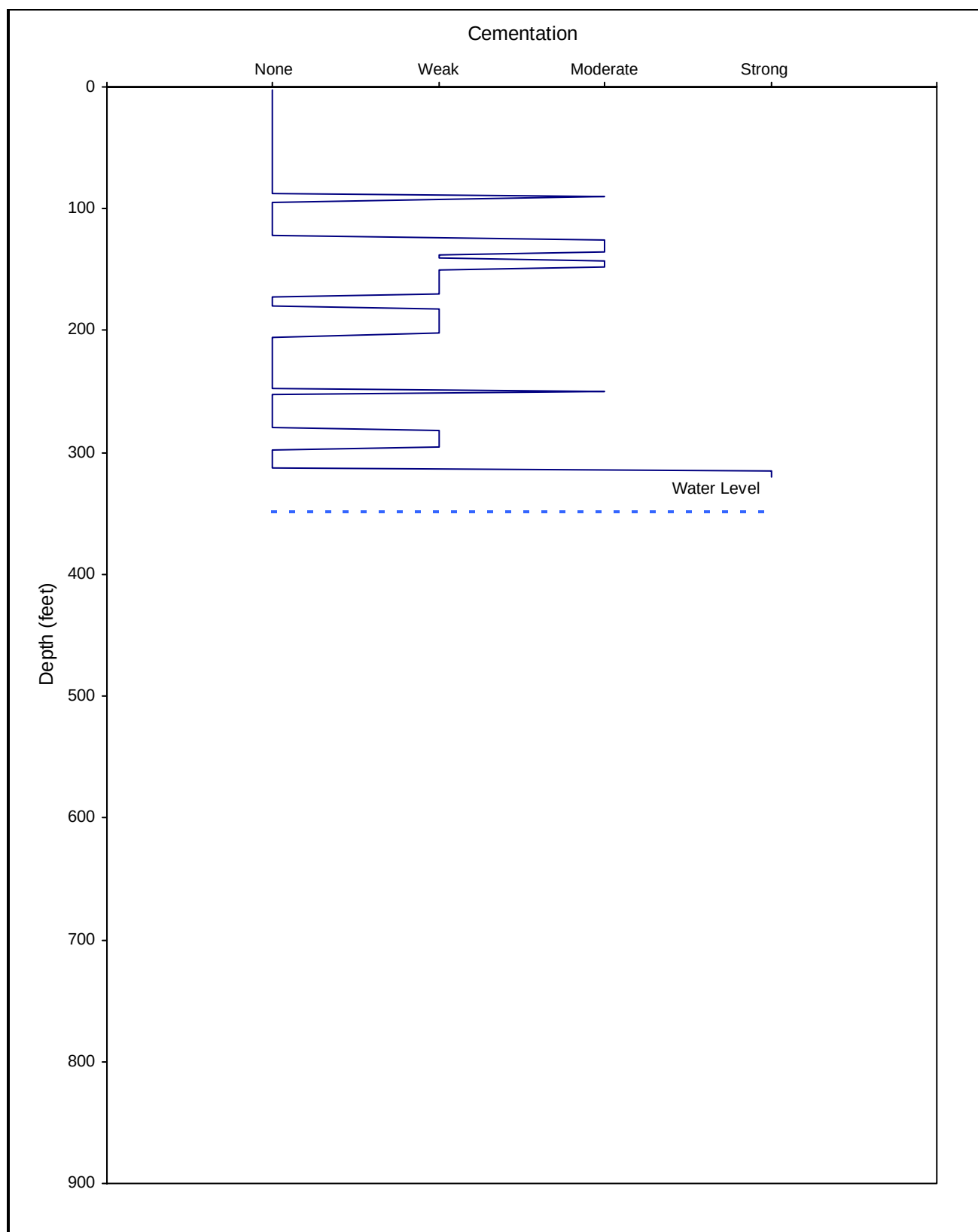
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Cementation vs. Depth of Drill Cuttings in Alluvium for 24P



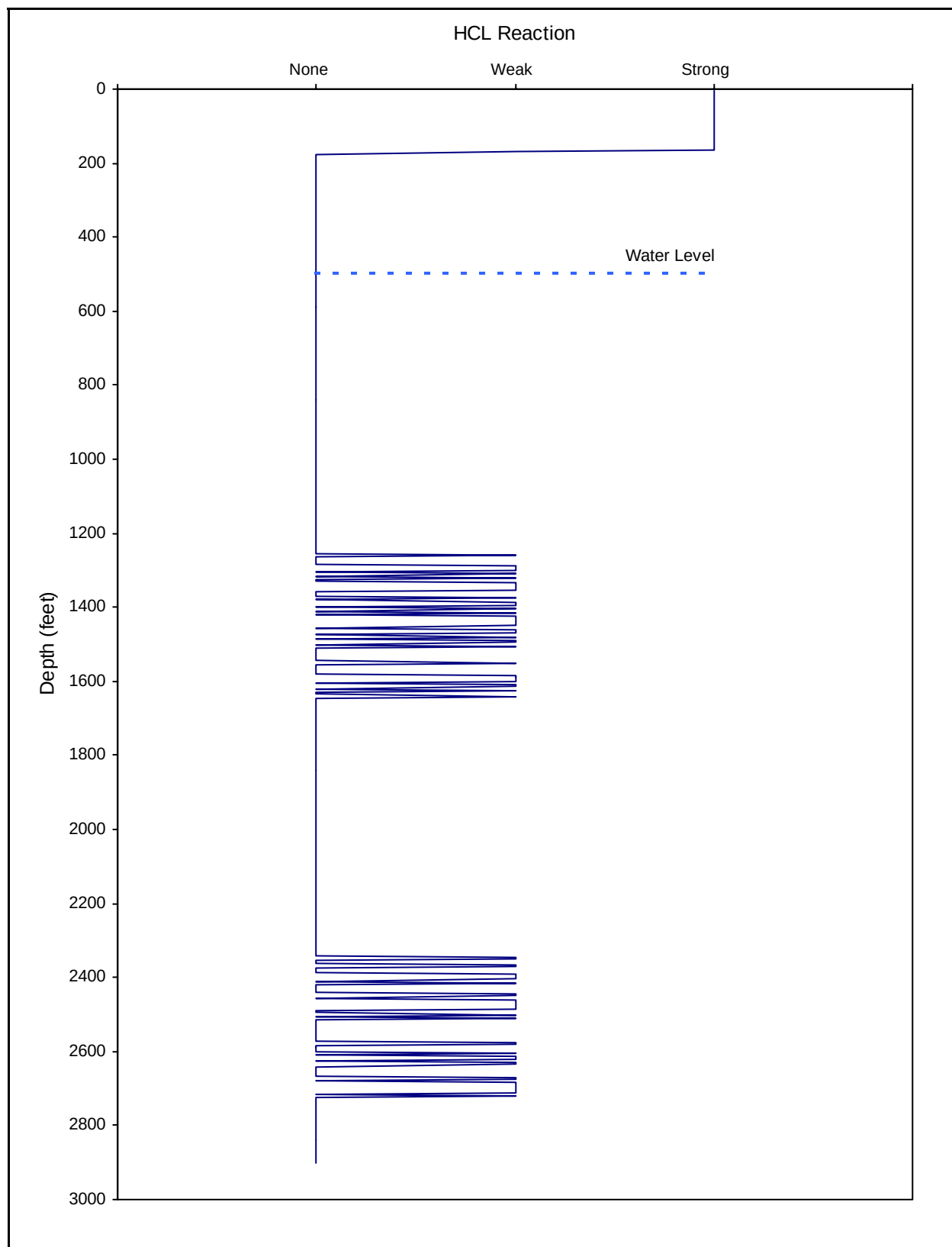
Appendix C-8
Cementation vs. Depth of Drill Cuttings in Alluvium for 27P



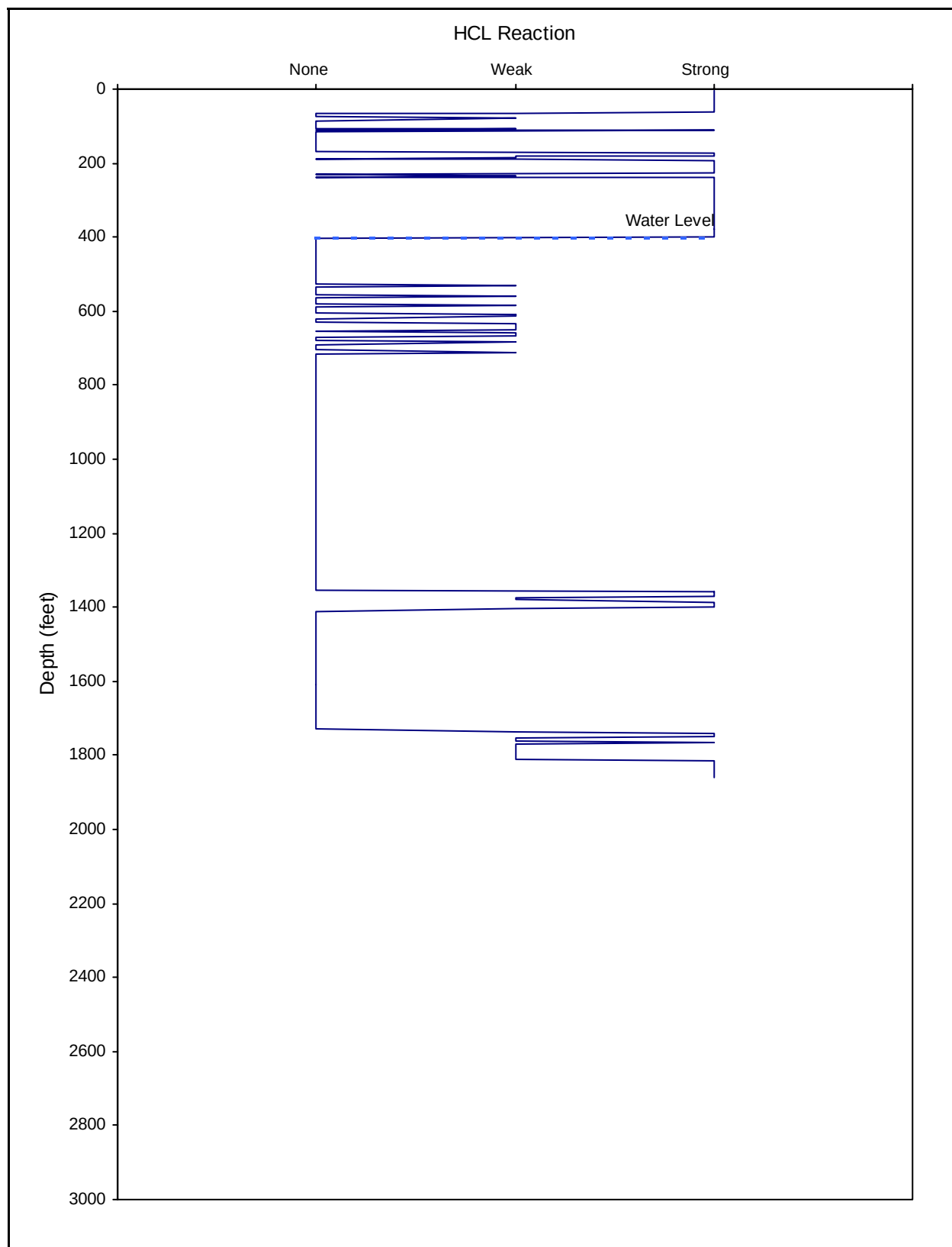
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Cementation vs. Depth of Drill Cuttings in Alluvium for 28P



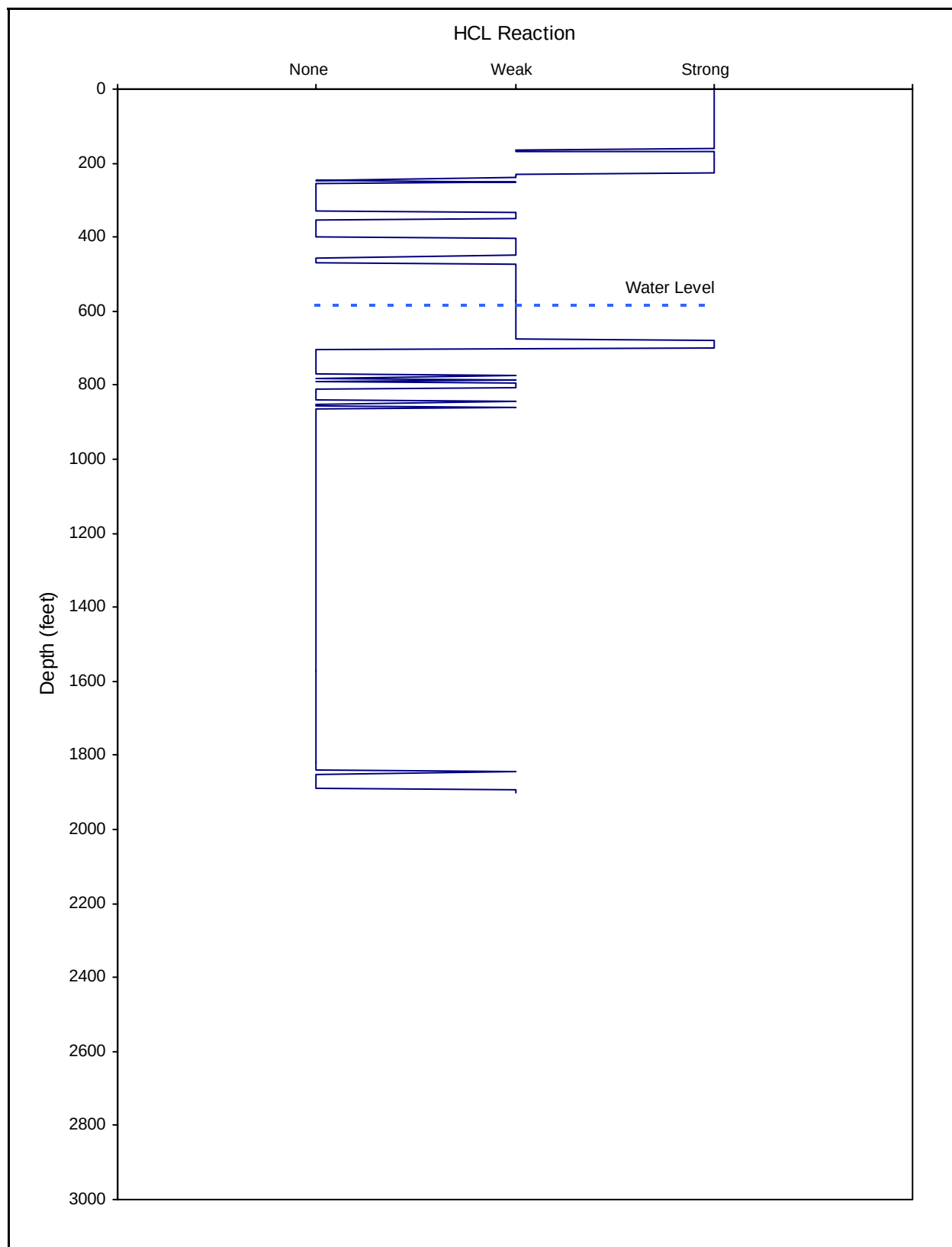
Appendix C-10
Cementation vs. Depth of Drill Cuttings in Alluvium for 29P



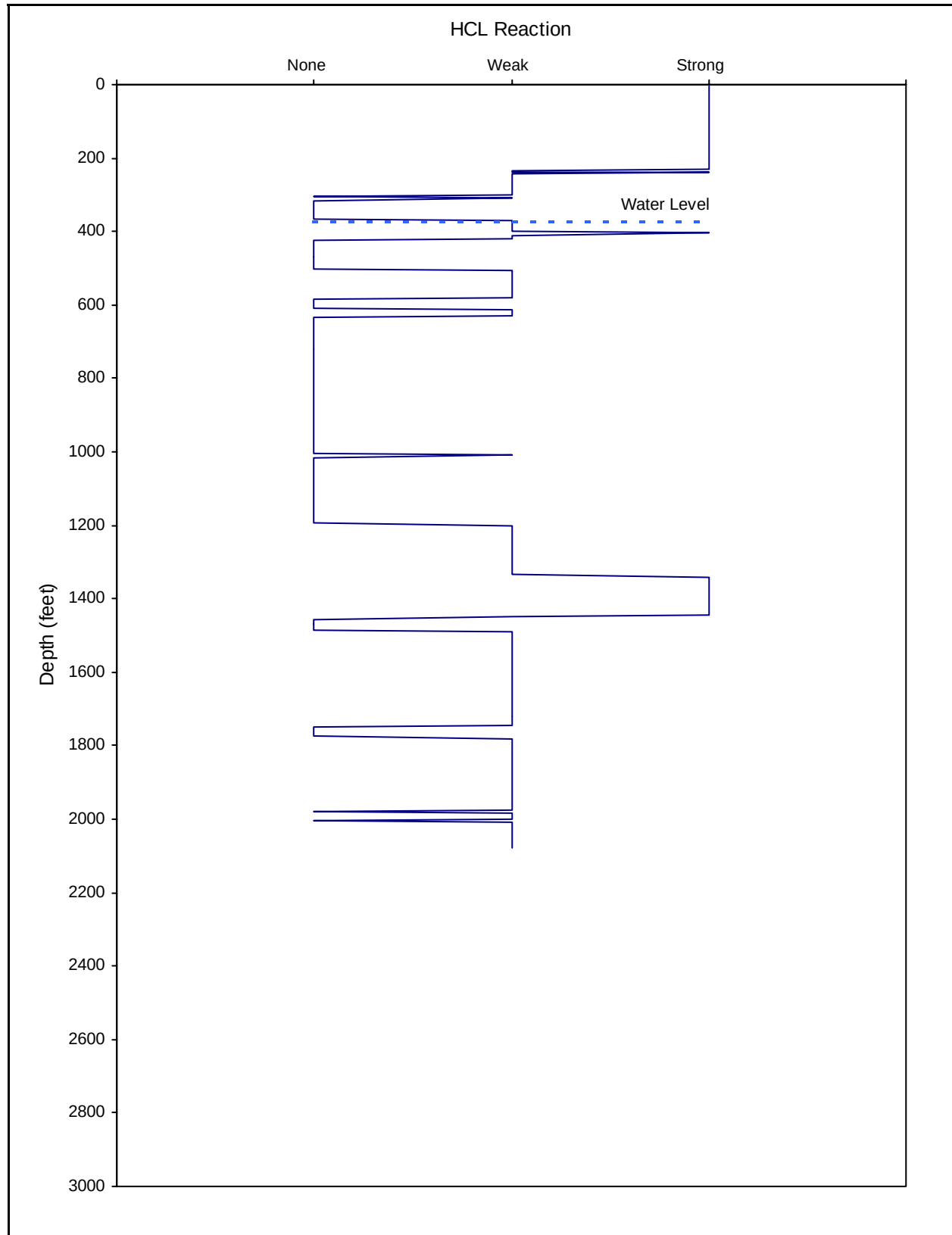
Appendix C-11
HCL Reaction vs. Depth for Drill Cuttings in Alluvium and Non-Alluvium for 16P



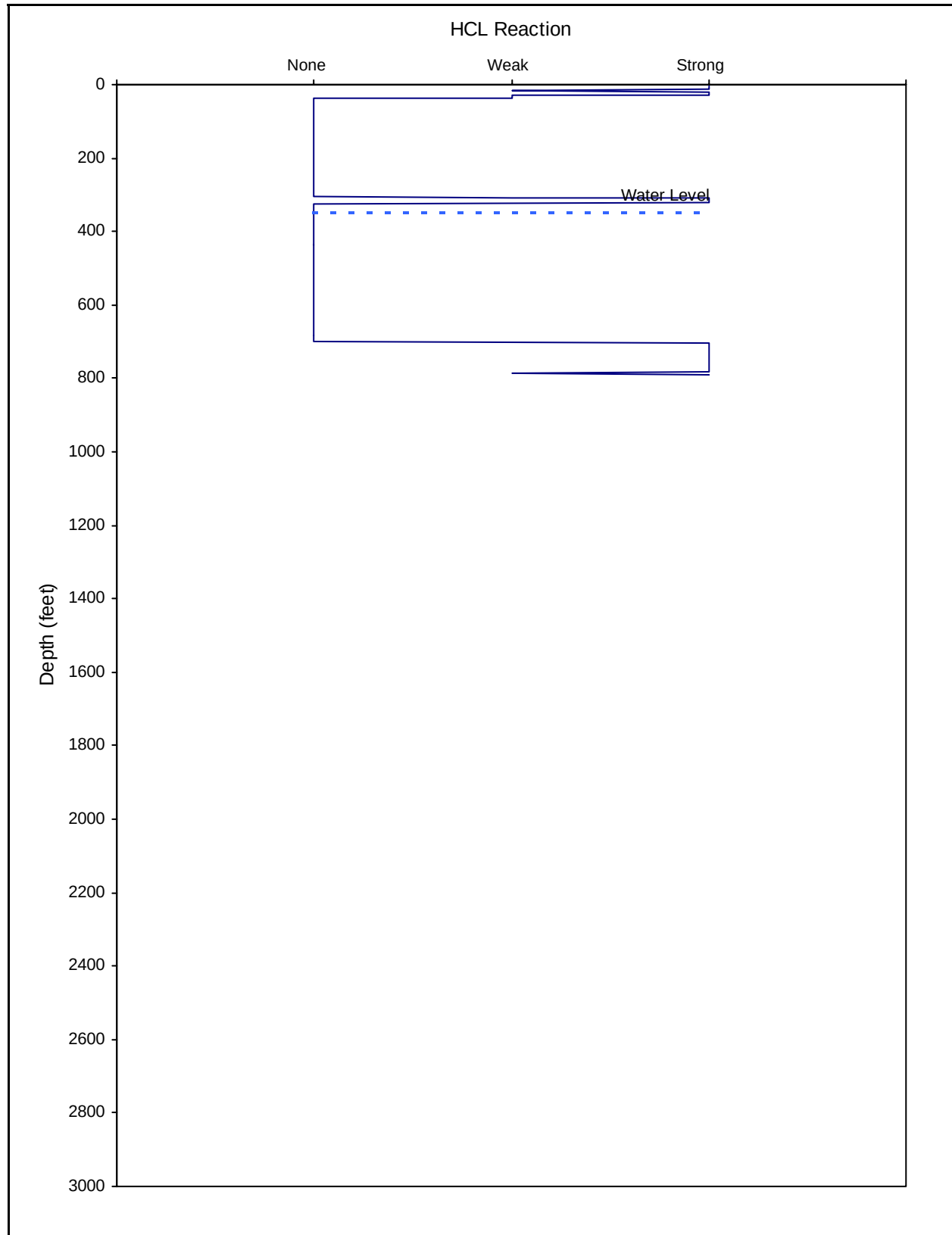
Appendix C-12
HCL Reaction vs. Depth for Drill Cuttings in Alluvium and Non-Alluvium for 24P



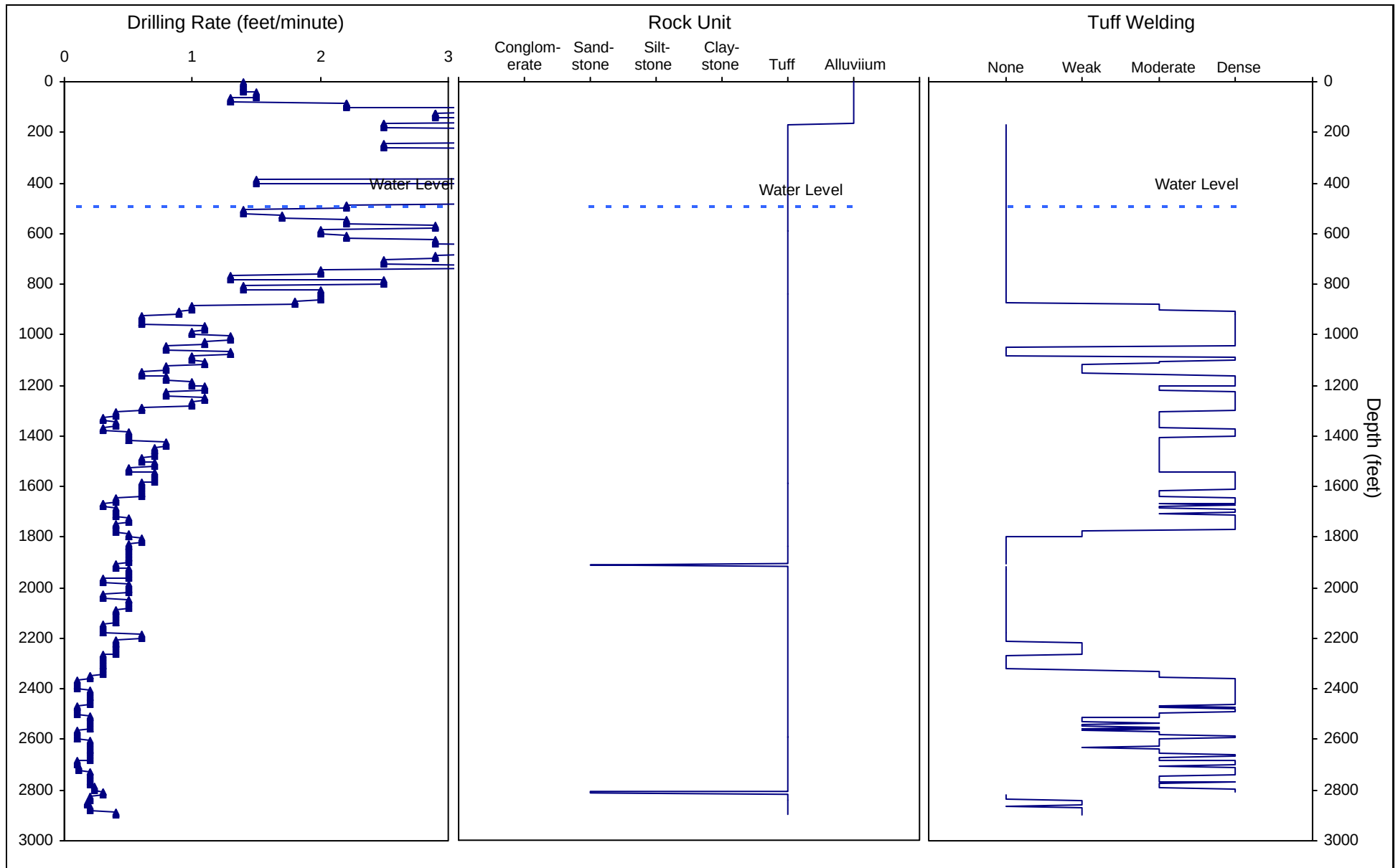
Appendix C-13
HCL Reaction vs. Depth for Drill Cuttings in Alluvium and Non-Alluvium for 27P



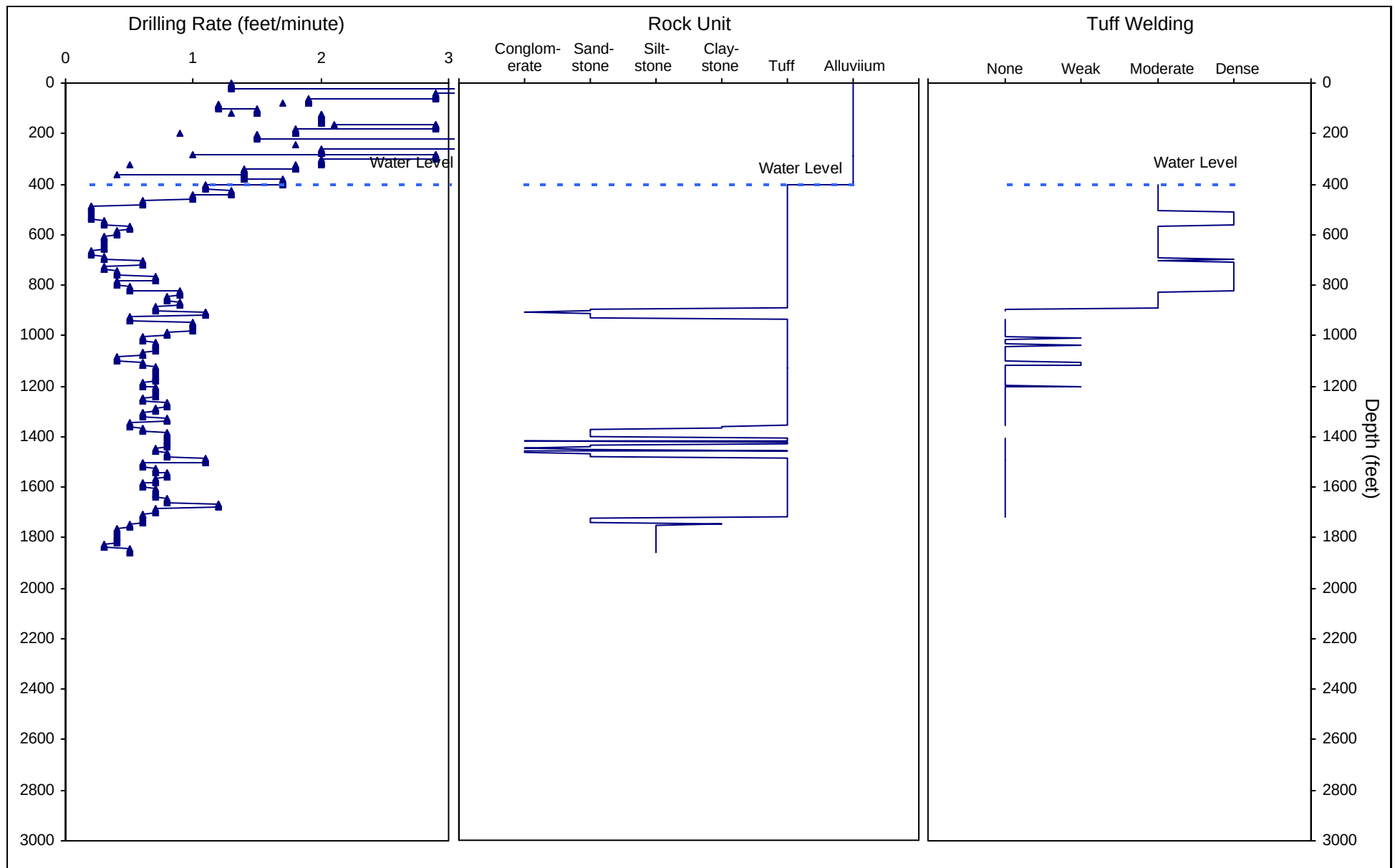
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HCL Reaction vs. Depth for Drill Cuttings in Alluvium and Non-Alluvium for 28P



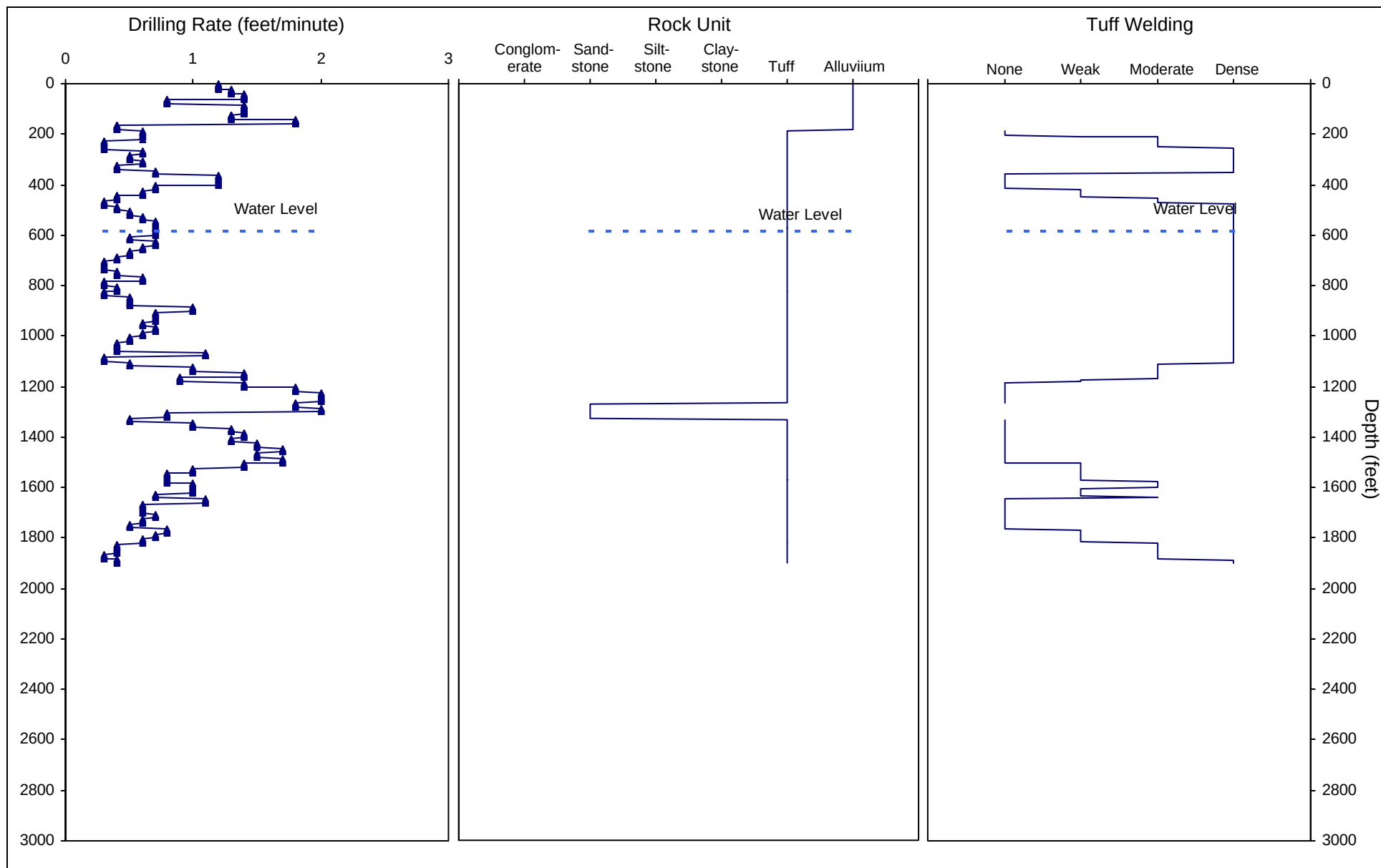
Appendix C-15
HCL Reaction vs. Depth for Drill Cuttings in Alluvium and Non-Alluvium for 29P



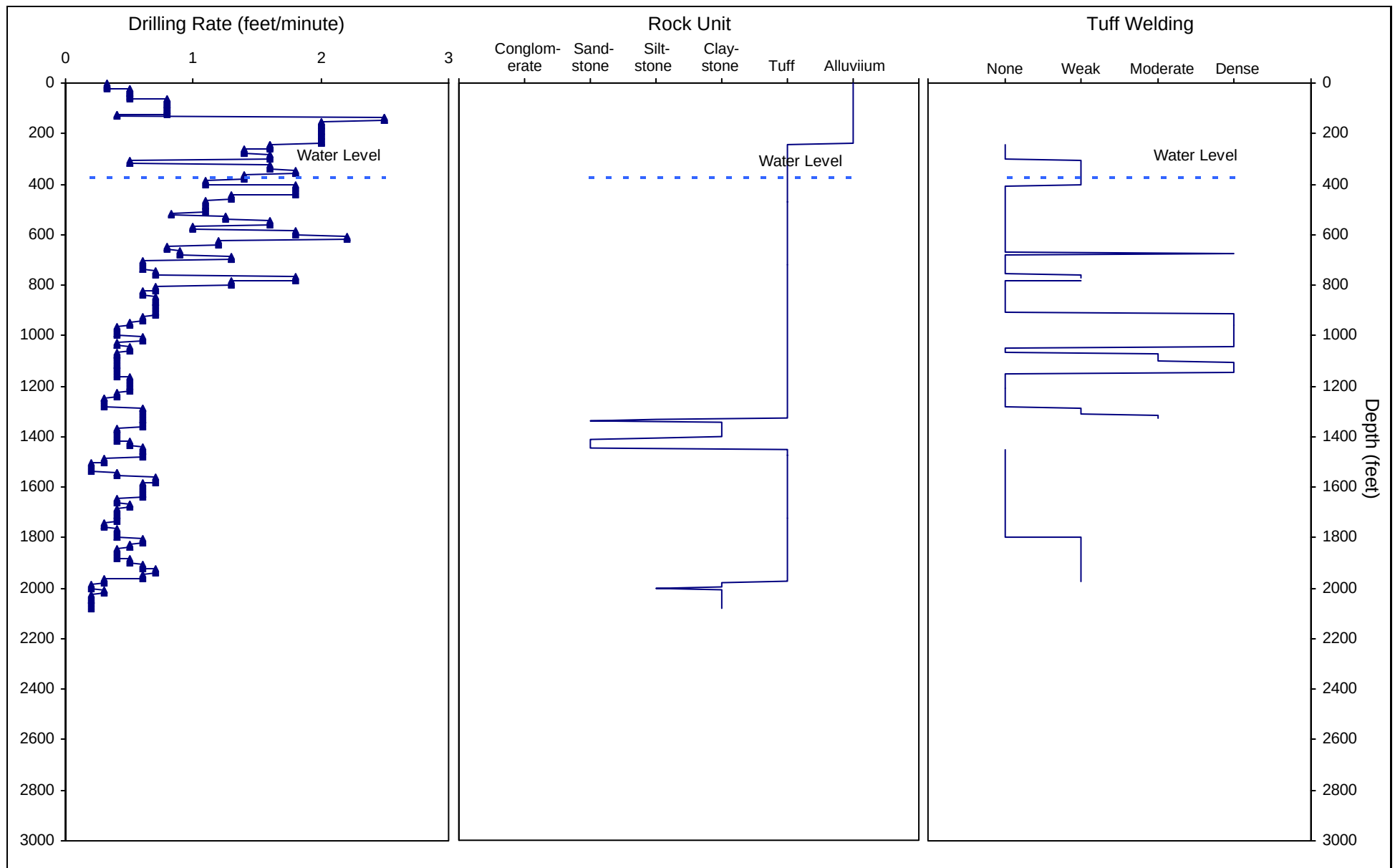
Appendix C-16
Drilling Rate, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 16P



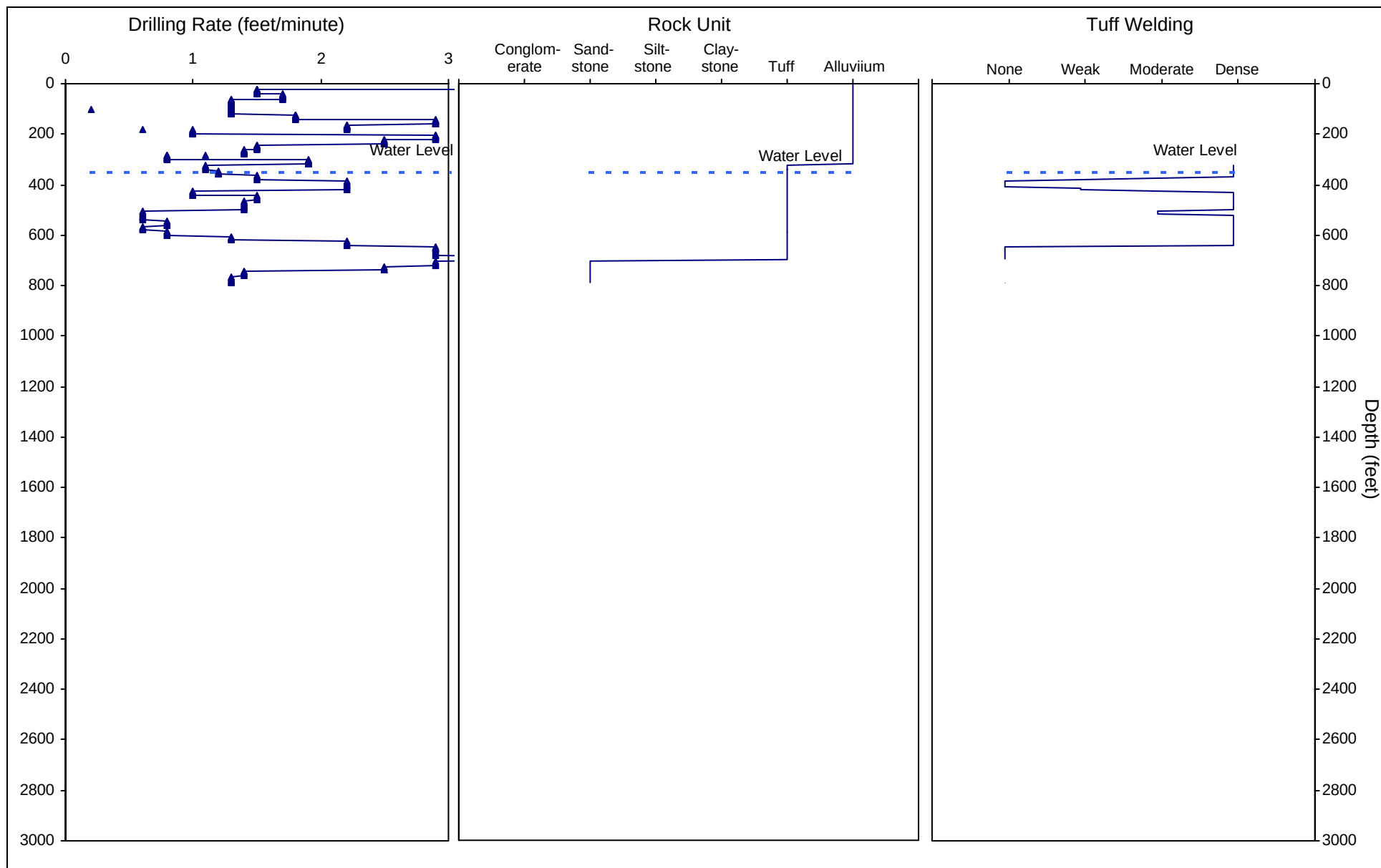
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Drilling Rate, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 24P



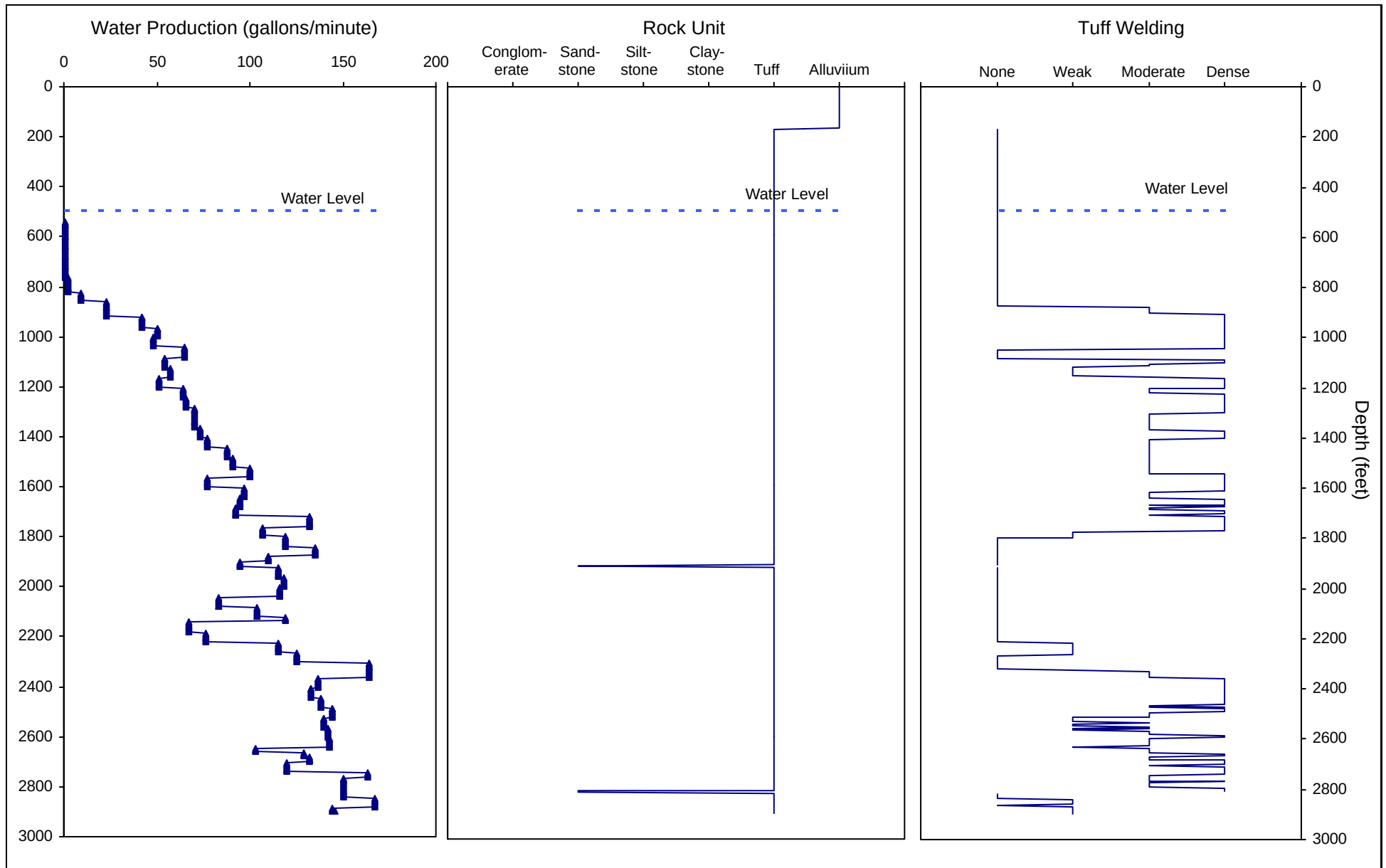
Appendix C-18
Drilling Rate, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 27P



Appendix C-19
Drilling Rate, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 28P

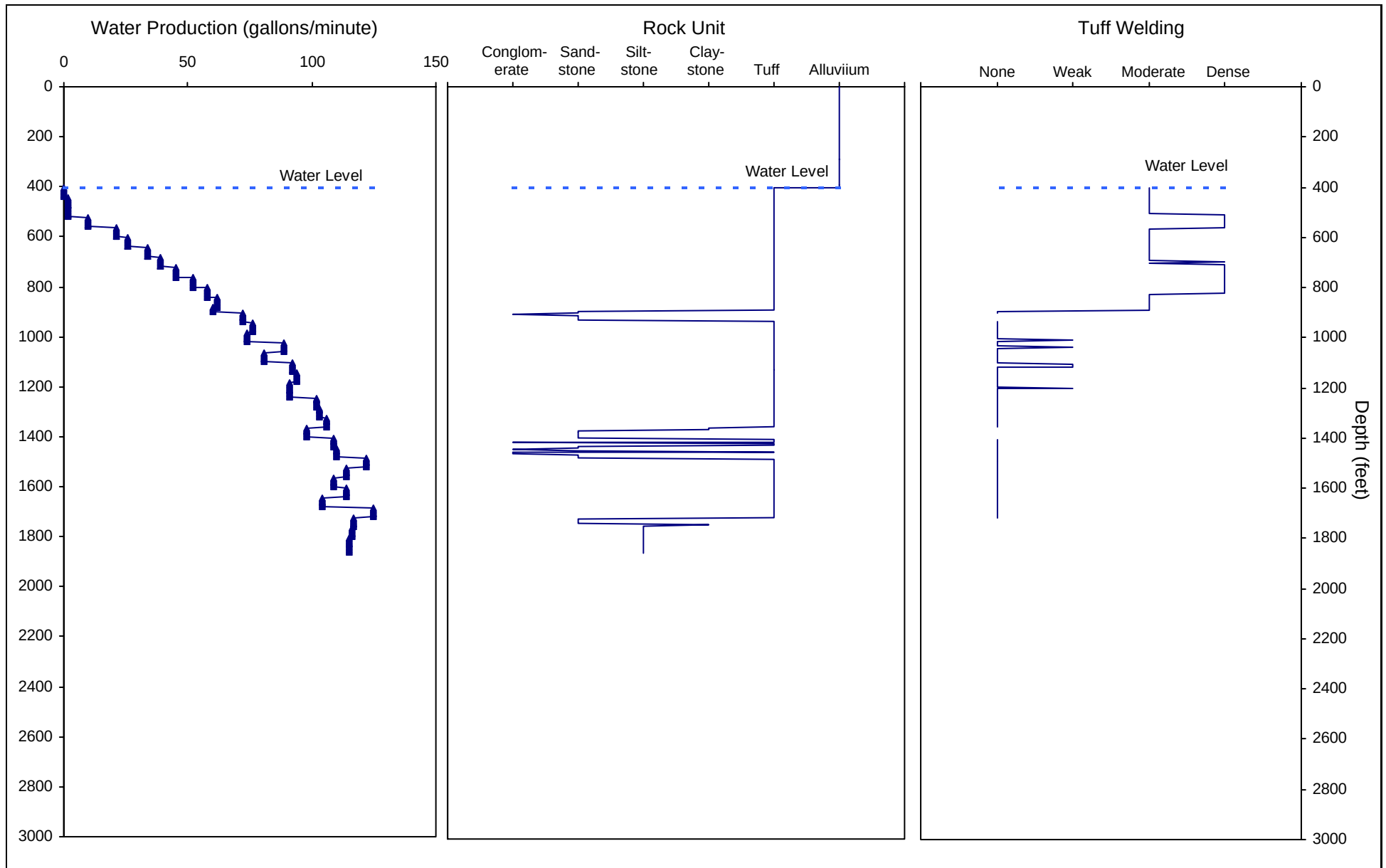


Appendix C-20
Drilling Rate, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 29P



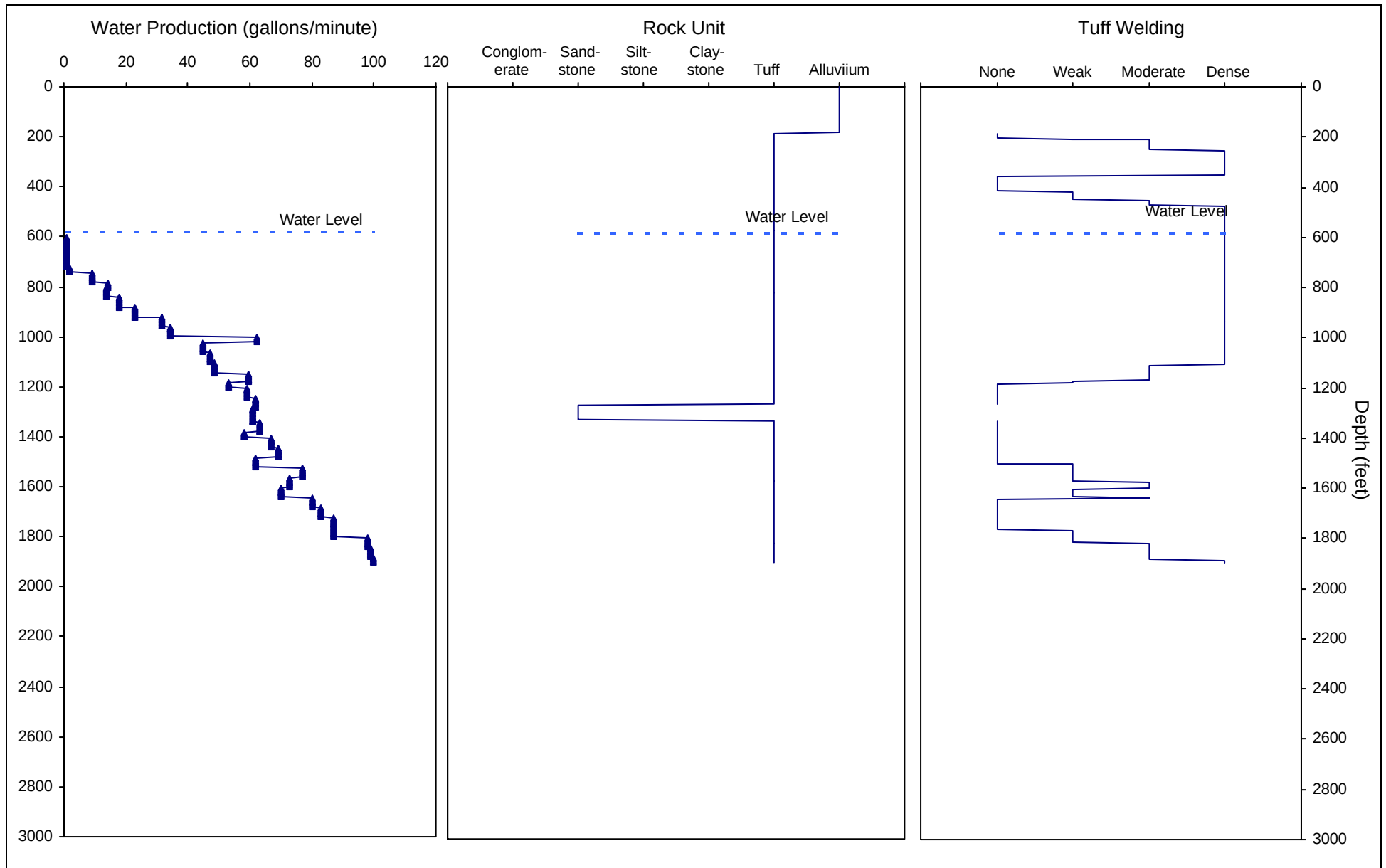
Appendix C-21

Water Production, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 16P



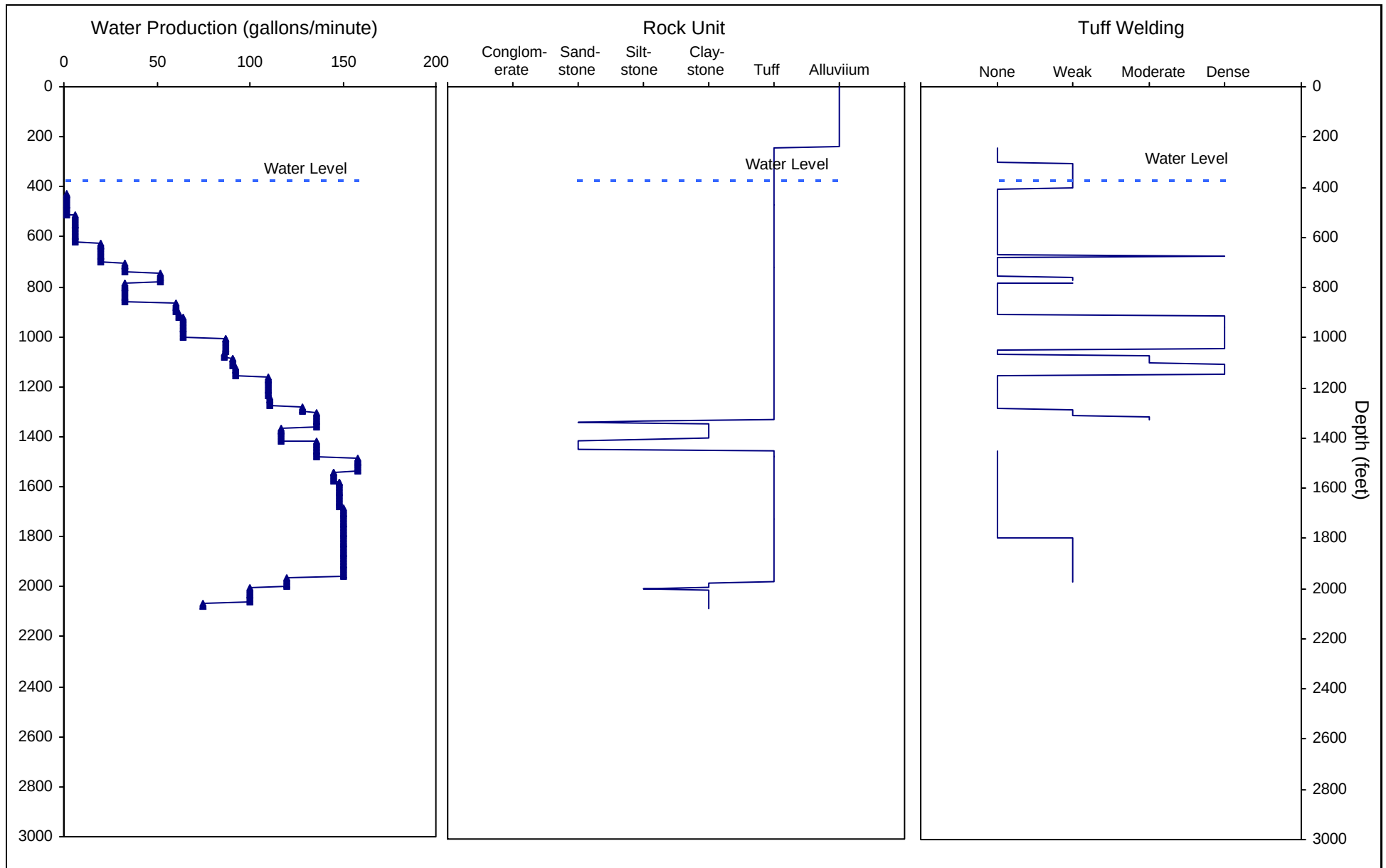
Appendix C-22

Water Production, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 24P

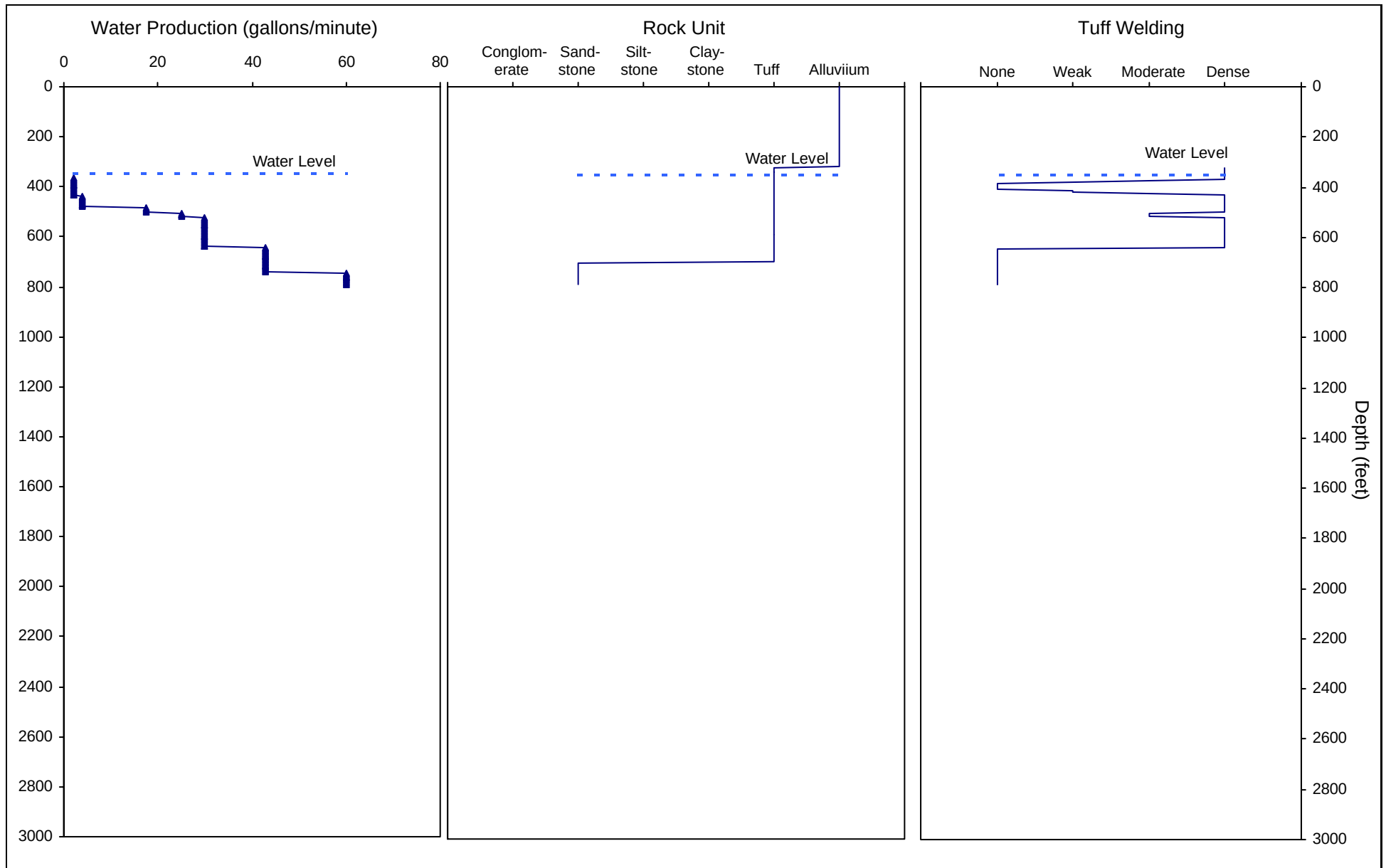


Appendix C-23

Water Production, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 27P



Appendix C-24
Water Production, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 28P



Appendix C-25
Water Production, Rock Unit, and Tuff Welding vs. Depth in Alluvium and Non-Alluvium for 29P

APPENDIX D ALLUVIUM CORE LOGGING FORMS

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP- 24P (Phase 4) Driller/Drilling Company Greg Secrist/Eklund Drilling Co. Drilling Method: Reverse Circulation Air Rotary & Select Drive Core Alluvium Depth (ft bgs): 0 to 400 Start Date: 7/16/2003 End Date: 7/25/2003 Page 1 of 2

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)		
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics
7/17/2003	BW	2/17/2004	JSW	1	F	24P-79.42-80.00-F	79.42	80.00								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
7/17/2003	BW	2/17/2004	JSW	1	L	24P-80.00-80.18-C	80.00	80.18						5YR4/2		☐	☒	☐						☒	☐	☒	☐	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
7/17/2003	BW	2/17/2004	JSW	1	RD	24P-80.00-81.69-C	80.00	81.69	1.7	1.7	4.0	29.85	40.95	11.10		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100			
7/17/2003	BW	2/17/2004	JSW	1	L	24P-80.18-80.43-C	80.18	80.43						5YR 4/2		☐	☒	☐						☒	☐	☒	☐	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
7/17/2003	BW	2/17/2004	JSW	1	L	24P-80.43-80.93-C	80.43	80.93						5YR 4/2		☐	☒	☐						☒	☐	☒	☐	☐	☐		☐	☒	☐	☐	☐	☐	☒	☐	☐	100			
7/17/2003	BW	2/17/2004	JSW	1	L	24P-80.93-81.43-C	80.93	81.43						5YR 4/2		☐	☒	☐						☒	☐	☒	☐	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	100				
7/17/2003	BW	2/17/2004	JSW	1	L	24P-81.43-81.69-C	81.43	81.69						5YR 4/2		☐	☒	☐						☒	☐	☒	☐	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	2	F	24P-119.07-120.13-F	119.07	120.13								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100			
7/22/2003	BW	2/17/2004	JSW	2	L	24P-120.13-120.58-C	120.13	120.58						5YR 4/3		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	2	RD	24P-120.13-121.34-C	120.13	121.34	1.3	1.2	4.0	29.90	40.75	10.85		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	2	L	24P-120.58-121.08-C	120.58	121.08						5YR 4/3		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	2	L	24P-121.08-121.34-C	121.08	121.34						5YR 4/3		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	3	F	24P-159.44-160.00-F	159.44	160.00								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
7/22/2003	BW	2/17/2004	JSW	3	L	24P-160.00-160.12-C	160.00	160.12						5YR 5/6		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	3	RD	24P-160.00-162.13-C	160.00	162.13	2.1	2.1	4.0	29.90	41.15	11.25		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	3	L	24P-160.12-160.62-C	160.12	160.62						5YR 5/6		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	☐	100				
7/22/2003	BW	2/17/2004	JSW	3	L	24P-160.62-160.87-C	160.62	160.87						10YR 5/4		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	100					
7/22/2003	BW	2/17/2004	JSW	3	L	24P-160.87-161.37-C	160.87	161.37						10YR 5/4		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	100					
7/22/2003	BW	2/17/2004	JSW	3	L	24P-161.37-161.87-C	161.37	161.87						10YR 5/4		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	100					
7/22/2003	BW	2/17/2004	JSW	3	L	24P-161.87-162.13-C	161.87	162.13						10YR 5/4		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☐	☐	100					
7/23/2003	BW	2/17/2004	JSW	4	F	24P-198.60-200.87-F	198.60	200.87								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐					
7/23/2003	BW	2/17/2004	JSW	4	L	24P-200.31-200.61-C	200.31	200.61						10YR 5/4		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☐	☐	☐	☐	☐	☒		100				
7/23/2003	BW	2/17/2004	JSW	4	RD	24P-200.31-200.87-C	200.31	200.87	0.9	0.6	4.0	29.90	41.15	11.25		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐					
7/23/2003	BW	2/17/2004	JSW	4	L	24P-200.61-200.87-C	200.61	200.87						10YR 5/4		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☒		100					
7/23/2003	BW	2/17/2004	JSW	5	F	24P-239.48-240.00-F	239.48	240.00								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐					
7/23/2003	BW	2/17/2004	JSW	5	L	24P-240.00-240.23-C	240.00	240.23						10YR 4/3		☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☒		100					
7/23/2003	BW	2/17/2004	JSW	5	RD	24P-																																					

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP- 24P (Phase 4) Driller/Drilling Company Greg Secrist/Eklund Drilling Co. Drilling Method: Reverse Circulation Air Rotary & Select Drive Core Alluvium Depth (ft bgs): 0 to 400 Start Date: 7/16/2003 End Date: 7/25/2003 Page 2 of 2

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)		
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay		Fines (Silt plus Clay)	Well Graded	Poorly Graded	None	Low		Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong
7/23/2003	BW	2/17/2004	JSW	5	L	24P-240.48-240.98-C	240.48	240.98							10YR 4/3	☐	☒	☐							☒	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☒	☐	100		
7/23/2003	BW	2/17/2004	JSW	5	L	24P-240.98-241.48-C	240.98	241.48							10YR 4/3	☐	☒	☐							☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☒	☐	100			
7/23/2003	BW	2/17/2004	JSW	5	L	24P-241.48-241.75-C	241.48	241.75							10YR 4/3	☐	☒	☐							☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☐	☒	☐	100			
7/24/2003	BW	2/17/2004	JSW	6	F	24P-278.73-280.40-F	278.73	280.40								☐	☐	☐							☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐			
7/24/2003	BW	2/17/2004	JSW	6	L	24P-280.40-280.73-C	280.40	280.73							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☒	☐		☐	☒	☐	☐	☐	☐	☒	☐	100		
7/24/2003	BW	2/17/2004	JSW	6	RD	24P-280.40-281.00-C	280.40	281.00	1.0	0.6	4.0	29.90	41.50	11.60		☐	☐	☐							☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐			
7/24/2003	BW	2/17/2004	JSW	6	L	24P-280.73-281.00-C	280.73	281.00							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☒	☐		☐	☒	☐	☐	☐	☐	☐	☐	100		
7/25/2003	BW	2/17/2004	JSW	7	F	24P-320.75-322.50-F	320.75	322.50								☐	☐	☐							☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐			
7/25/2003	BW	2/17/2004	JSW	7	L	24P-322.50-322.75-C	322.50	322.75							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☐	☒		☐	☒	☐	☐	☐	☐	☐	☐	100		
7/25/2003	BW	2/17/2004	JSW	7	RD	24P-322.50-323.44-C	322.50	323.44	0.5	0.9	4.0	32.25	45.55	13.30		☐	☐	☐							☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐			
7/25/2003	BW	2/17/2004	JSW	7	L	24P-322.75-323.25-C	322.75	323.25							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☐	☒		☐	☒	☐	☐	☐	☐	☐	☐	100		
7/25/2003	BW	2/17/2004	JSW	7	L	24P-323.25-323.44C	323.25	323.44							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☐	☒		☐	☒	☐	☐	☐	☐	☐	☐	100		
7/25/2003	BW	2/17/2004	JSW	8	F	24P-358.02-360.00-F	358.02	360.00								☐	☐	☐							☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐			
7/25/2003	BW	2/17/2004	JSW	8	L	24P-360.00-360.02-C	360.00	360.02							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☐	☒		☒	☐	☐	☐	☐	☐	☐	☐	100		
7/25/2003	BW	2/17/2004	JSW	8	RD	24P-360.00-360.71-C	360.00	360.71	0.4	0.7	4.0	32.35	44.70	12.35		☐	☐	☐							☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐			
7/25/2003	BW	2/17/2004	JSW	8	L	24P-360.02-360.52-C	360.02	360.52							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☐	☒		☒	☐	☐	☐	☐	☐	☐	☐	100		
7/25/2003	BW	2/17/2004	JSW	8	L	24P-360.52-360.71-C	360.52	360.71							7.5YR 6/4	☐	☒	☐							☒	☐	☐	☐	☐	☒		☒	☐	☐	☐	☐	☐	☐	☐	100		

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP- 29P (Phase 4) Driller/Drilling Company Greg Secrist/Eklund Drilling Co. Drilling Method: Reverse Circulation Air Rotary & Select Drive Core Alluvium Depth (ft bgs): 0 to 320 Start Date: 6/26/2003 End Date: 6/28/2003 Page 1 of 1

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Munsell Color Symbol	Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)										
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)		Wet	Most	Dry	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other						
6/26/2003	BW			1	L	29P-100.00-100.25-C	100.00	100.25							5YR 5/6	☐	☒	☐							☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☒	☐	☐	100												
6/26/2003	BW			1	RD	29P-100.00-102.27-C	100.00	102.27	0.2	2.3	4.0	29.75	41.05	11.30	5YR 5/6	☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☒	☐	☐	☒	☐	☐	100													
6/26/2003	BW			1	L	29P-100.25-100.50-C	100.25	100.50							5YR 5/6	☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☐	☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
6/26/2003	BW			1	L	29P-100.50-101.00-C	100.50	101.00							5YR 5/6	☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☐	☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6/26/2003	BW			1	L	29P-101.00-101.50-C	101.00	101.50							5YR 5/6	☐	☒	☐						☒	☐	☐	☒	☐	☐		☐	☐	☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6/26/2003	BW			1	L	29P-101.50-102.00-C	101.50	102.00							5YR 5/6	☒	☐	☐						☒	☐	☒	☐	☐		☐	☒	☐	☐	☒	☐	☐	100														
6/26/2003	BW			1	L	29P-102.00-102.27-C	102.00	102.27							5YR 5/6	☒	☐	☐						☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	100										
6/27/2003	BW			2	F	29P-178.86-180.00-F	178.86	180.00								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐														
6/27/2003	BW			2	L	29P-180.00-180.36-C	180.00	180.36							5YR 5/2	☐	☒	☐						☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	100										
6/27/2003	BW			2	RD	29P-180.00-181.13-C	180.00	181.13	0.6	1.1	4.0	29.75	40.95	11.20		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐														
6/27/2003	BW			2	L	29P-180.36-180.86-C	180.36	180.86							5YR 5/2	☐	☒	☐						☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	100										
6/27/2003	BW			2	L	29P-180.86-181.13-C	180.86	181.13							5YR 5/2	☐	☒	☐						☒	☐	☐	☒	☐		☐	☐	☐	☒	☐	☐	☐	☐	100													
6/28/2003	BW			3	L	29P-279.98-280.09-C	279.98	280.09							5YR 5/2	☐	☒	☐						☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐			☐	☐	☐	100							
6/28/2003	BW			3	RD	29P-279.98-282.11-C	279.98	282.11	1.1	2.1	4.0	29.70	41.25	11.55		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐														
6/28/2003	BW			3	L	29P-280.09-280.34-C	280.09	280.34							5YR 5/2	☐	☒	☐						☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	100	100									
6/28/2003	BW			3	L	29P-280.34-280.84-C	280.34	280.84							5YR 5/2	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐															
6/28/2003	BW			3	L	29P-280.84-281.34-C	280.84	281.34							5YR 5/6	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐															
6/28/2003	BW			3	L	29P-281.34-281.84-C	281.34	281.84							5YR 5/2	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	100														

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 1 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Most	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																												
12/2/2003	JSW	12/2/2003	DPH	1	D	19PB-350.8-351.9-SC	350.80	351.90			6.2	0.20	12.20	12.00	5YR 5/6	☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 2 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity			USCS Group Symbol	Gravel/Sand Grain Shape				Cementation			HCL Reaction			Major Rock Type (%)					
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpn)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)	Well Graded	Poorly Graded	None	Low	Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other
12/3/2003	BW			5	D	19PB-363.1-365.0-SC	363.10	365.00			6.2	0.20	23.60	23.40		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/3/2003	BW			5	R	19PB-363.1-367.0-SC	363.10	367.00	1.0	4.0						☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/3/2003	BW			5	L	19PB-364.6-364.9-SC	364.60	364.90						5YR 5/6		☐	☒	☐						☐	☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☒	☐	☐	☐	100		
12/3/2003	BW			5	L	19PB-364.9-366.7-SC	364.90	366.70						5YR 4/4		☐	☒	☐						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☒	☐	☐	☐	100		
12/3/2003	BW			5	D	19PB-365.0-367.0-SC	365.00	367.00			6.2	0.20	23.60	23.40		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/3/2003	BW			5	LX	19PB-366.7-367.0-SC	366.70	367.00						5YR 5/4		☐	☒	☐						☐	☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	100		
12/3/2003	BW			6	LX	19PB-367.0-368.5-SC	367.00	368.50						5YR 4/4		☐	☒	☐						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	100			
12/3/2003	BW			6	D	19PB-367.0-368.8-SC	367.00	368.80			6.2	0.20	24.20	24.00		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			6	R	19PB-367.0-371.1-SC	367.00	371.10	1.6	4.0						☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			6	L	19PB-368.5-369.9-SC	368.50	369.90						5YR 5/4		☐	☐	☒						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☒	☐	☐	☐	100		
12/3/2003	BW			6	D	19PB-368.8-371.0-SC	368.80	371.00			6.2	0.20	28.60	28.40		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			6	LX	19PB-369.9-371.0-SC	369.90	371.00						5YR 5/6		☐	☐	☒						☐	☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☒	☐	100			
12/3/2003	BW			6	LC	19PB-371.0-371.1-SC	371.00	371.10								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			7	LX	19PB-371.0-372.9-SC	371.00	372.90						5YR 5/6		☐	☐	☒						☐	☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☒	☐	100			
12/3/2003	BW			7	D	19PB-371.0-373.6-SC	371.00	373.60			6.2	0.20	29.20	29.00		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			7	R	19PB-371.1-375.4-SC	371.10	375.40	0.9	4.4						☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			7	L	19PB-372.9-373.6-SC	372.90	373.60						5YR 5/2		☐	☐	☒						☐	☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☒	☐	100			
12/3/2003	BW			7	L	19PB-373.6-374.6-SC	373.60	374.60						5YR 5/6		☐	☐	☒						☐	☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☒	☐	100			
12/3/2003	BW			7	D	19PB-373.6-375.4-SC	373.60	375.40			6.2	0.20	22.20	22.00		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			7	LX	19PB-374.6-375.4-SC	374.60	375.40						10YR 4/2		☐	☐	☒						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☒	☐	100			
12/3/2003	BW			7	LC	19PB-375.4-375.7-SC	375.40	375.70								☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			8	D	19PB-375.7-376.5-SC	375.70	376.50			6.2	0.20	14.75	14.55		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			8	LX	19PB-375.7-377.1-SC	375.70	377.10						5YR 6/4		☐	☐	☒						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	100				
12/3/2003	BW			8	R	19PB-375.7-380.0-SC	375.70	380.00	0.8	2.7						☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			8	D	19PB-376.5-378.4-SC	376.50	378.40			6.2	0.20	20.95	20.75		☐	☐	☐						☐	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/3/2003	BW			8	L	19PB-377.1-377.4-SC	377.10	377.40						5YR 6/6		☐	☐	☒						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	100			
12/3/2003	BW			8	L	19PB-377.4-378.1-SC	377.40	378.10						10YR 6/6		☐	☐	☒						☒	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	100			
12/3/2003	BW			8	LX	19PB-378.1-378.4-SC	378.10	378.40						5YR 5/6		☐	☐	☒						☐	☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☐	☐	100				

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 3 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity			USCS Group Symbol	Gravel/Sand Grain Shape				Cementation			HCL Reaction			Major Rock Type (%)					
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpn)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)	Well Graded	Poorly Graded	None	Low	Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other
12/3/2003	BW			8	LC	19PB-378.4-380.0-SC	378.40	380.00								☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/4/2003	BW			9	F	19PB-379.3-380.0-C	379.30	380.00								☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/4/2003	BW			9	LX	19PB-380.00-380.50-C	380.00	380.50						5YR 4/2		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☒	☐	☐	☐	100			
12/4/2003	BW			9	RD	19PB-380.00-381.31-C	380.00	381.31	0.2	1.0	4.0	28.90				☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			9	LX	19PB-380.50-381.00-C	380.50	381.00						5YR 6/6		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			9	LC	19PB-381.00-381.31-C	381.00	381.31								☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	LX	19PB-381.3-382.4-SC	381.30	382.40						5YR 5/4		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	D	19PB-381.3-382.8-SC	381.30	382.80			6.2	0.20	19.45	19.25		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	R	19PB-381.3-386.1-SC	381.30	386.10	1.1	4.8						☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	L	19PB-382.4-383.7-SC	382.40	383.70						5YR 5/6		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	D	19PB-382.8-384.4-SC	382.80	384.40			6.2	0.20	20.70	20.50		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	LX	19PB-383.7-386.1-SC	383.70	386.10						5YR 6/6		☐	☐	☒						☐	☐	☐	☐	☒		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			10	D	19PB-384.4-386.1-SC	384.40	386.10			6.2	0.20	19.35	19.15		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	LX	19PB-386.1-387.2-SC	386.10	387.20						5YR 6/8		☐	☐	☒						☐	☐	☐	☐	☒		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	D	19PB-386.1-387.6-SC	386.10	387.60			6.2	0.20	20.50	20.30		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	R	19PB-386.1-396.1-SC	386.10	396.10	1.1	10.0						☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	L	19PB-387.2-388.9-SC	387.20	388.90						5YR 5/6		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	D	19PB-387.6-389.3-SC	387.60	389.30			6.2	0.20	21.45	21.25		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	L	19PB-388.9-394.1-SC	388.90	394.10						5YR 5/6		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	D	19PB-389.3-390.9-SC	389.30	390.90			6.2	0.20	18.80	18.60		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	D	19PB-390.9-392.7-SC	390.90	392.70			6.2	0.20	20.10	19.90		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	D	19PB-392.7-394.4-SC	392.70	394.40			6.2	0.20	21.35	21.15		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	L	19PB-394.1-395.4-SC	394.10	395.40						5YR 5/6		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	D	19PB-394.4-396.1-SC	394.40	396.10			6.2	0.20	23.25	23.05		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/4/2003	BW			11	LX	19PB-395.4-396.1-SC	395.40	396.10						5YR 5/6		☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				
12/5/2003	BW			12	LC	19PB-396.1-396.3-SC	396.10	396.30								☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/4/2003	BW			12	D	19PB-396.3-396.8-SC	396.30	396.80			6.2	0.20	7.50	7.30		☐	☐	☐						☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/5/2003	BW			12	LX	19PB-396.3-397.1-SC	396.30	397.10						5YR 5/6		☐	☐	☒						☒	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐				

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Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 4 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity			USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay		Fines (Silt plus Clay)	Well Graded	Poorly Graded		None	Low	Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
12/4/2003	BW			12	R	19PB-396.3-406.1-SC	396.30	406.10	1.6	9.8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 5 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
12/5/2003	BW			13	LX	19PB-415.7-416.1-SC	415.70	416.10							5YR 5/6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		</

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 6 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)		
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics
12/6/2003	BW			16	L	19PB-431.9-432.4-SC	431.90	432.40							5YR 6/6	☐	☐	☒						☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	100			
12/6/2003	BW			16	LX	19PB-432.4-434.1-SC	432.40	434.10							5YR 6/6	☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/5/2003	BW			16	D	19PB-432.8-434.1-SC	432.80	434.10			6.2	0.20	16.25	16.05		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
12/6/2003	BW			16	LC	19PB-434.1-435.2-SC	434.10	435.20								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	LC	19PB-435.2-435.5-SC	435.20	435.50								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	D	19PB-435.5-436.1-SC	435.50	436.10			6.2	0.20	6.00	5.80		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	LX	19PB-435.5-437.2-SC	435.50	437.20							5YR 6/6	☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/6/2003	BW			17	R	19PB-435.5-445.3-SC	435.50	445.30	1.0	9.3						☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	D	19PB-436.1-437.8-SC	436.10	437.80			6.2	0.20	20.15	19.95		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	L	19PB-437.2-441.2-SC	437.20	441.20							5YR 6/6	☐	☐	☒						☒	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/6/2003	BW			17	D	19PB-437.8-439.6-SC	437.80	439.60			6.2	0.20	21.85	21.65		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	D	19PB-439.6-441.6-SC	439.60	441.60			6.2	0.20	21.75	21.55		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	L	19PB-441.2-442.9-SC	441.20	442.90							5YR 6/6	☐	☐	☒						☒	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/6/2003	BW			17	D	19PB-441.6-443.4-SC	441.60	443.40			6.2	0.20	22.30	22.10		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	LX	19PB-442.9-445.1-SC	442.90	445.10							5YR 5/6	☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/6/2003	BW			17	D	19PB-443.4-445.1-SC	443.40	445.10			6.2	0.20	20.45	20.25		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			17	LC	19PB-445.1-445.3-SC	445.10	445.30								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			18	D	19PB-445.3-446.2-SC	445.30	446.20			6.2	0.20	10.65	10.45		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			18	LX	19PB-445.3-447.9-SC	445.30	447.90							7.5YR 5/4	☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/6/2003	BW			18	R	19PB-445.3-448.4-SC	445.30	448.40	1.0	2.6						☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			18	D	19PB-446.2-447.9-SC	446.20	447.90			6.2	0.20	20.20	20.00		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/8/2003	BW			19	F	19PB-447.60-449.09-C	447.60	449.09								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/6/2003	BW			18	LC	19PB-447.9-448.4-SC	447.90	448.40								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/8/2003	BW			19	LC	19PB-448.37-449.09-C	448.37	449.09								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/8/2003	BW			19	LX	19PB-449.09-449.40-C	449.09	449.40							5YR 6/3	☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/8/2003	BW			19	RD	19PB-449.09-450.59-C	449.09	450.59	0.5	0.6	4.0	28.90	38.15	9.25		☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			
12/8/2003	BW			19	LX	19PB-449.40-449.70-C	449.40	449.70							5YR 6/3	☐	☐	☒						☐	☐	☐	☒	☐		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	100			
12/8/2003	BW			19	LC	19PB-449.70-450.59-C	449.70	450.59								☐	☐	☐						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 7 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																								
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12/8/2003	BW			20	D	19PB-450.6-452.4-SC	450.60	452.40			6.2	0.20	20.20	20.00																																																																																																																																																																																																																			<

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Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity			USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)			
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay		Fines (Silt plus Clay)	Well Graded	Poorly Graded		None	Low	Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak
12/8/2003	BW			22	L	19PB-469.0-470.5-SC	469.00	470.50						7.5YR 5/3	☐	☐	☒							☐	☐	☒	☐	☐		☐	☐	☒	☐	☐	☐	☒	☐	☐	100		
12/8/2003	BW			22	D	19PB-469.4-471.2-SC	469.40	471.20			6.2	0.20	22.85	22.65	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/8/2003	BW			22	L	19PB-470.5-474.3-SC	470.50	474.30						7.5YR 5/4	☐	☐	☒							☐	☐	☒	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/8/2003	BW			22	D	19PB-471.2-473.1-SC	471.20	473.10			6.2	0.20	22.35	22.15	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/8/2003	BW			22	D	19PB-473.1-474.8-SC	473.10	474.80			6.2	0.20	19.05	18.85	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/8/2003	BW			22	L	19PB-474.3-475.1-SC	474.30	475.10						7.5YR 5/1	☐	☐	☒							☒	☐	☒	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/8/2003	BW			22	D	19PB-474.8-476.2-SC	474.80	476.20			6.2	0.20	18.50	18.30	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/8/2003	BW			22	LX	19PB-475.1-476.2-SC	475.10	476.20						7.5YR 6/4	☐	☐	☒							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/8/2003	BW			22	LC	19PB-476.2-476.4-SC	476.20	476.40							☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			23	LX	19PB-476.4-476.6-SC	476.40	476.60						7.5YR 5/4	☐	☐	☒							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/9/2003	BW			23	D	19PB-476.4-478.0-SC	476.40	478.00			6.2	0.20	22.10	21.90	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			23	R	19PB-476.4-478.2-SC	476.40	478.20	0.5	1.6					☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			23	LX	19PB-476.6-478.0-SC	476.60	478.00						7.5YR 6/4	☐	☐	☒							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/9/2003	BW			23	LC	19PB-478.0-478.2-SC	478.00	478.20							☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			24	D	19PB-478.2-479.0-SC	478.20	479.00			6.2	0.20	9.90	9.70	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/9/2003	BW			24	LX	19PB-478.2-481.9-SC	478.20	481.90						5YR 5/4	☐	☐	☒							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			24	R	19PB-478.2-482.9-SC	478.20	482.90	0.4	3.7					☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			24	D	19PB-479.0-480.5-SC	479.00	480.50			6.2	0.20	16.50	16.30	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			24	D	19PB-480.5-481.9-SC	480.50	481.90			6.2	0.20	15.50	15.30	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			25	D	19PB-481.9-482.3-SC	481.90	482.30			6.2	0.20	4.70	4.50	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			24	LC	19PB-481.9-482.9-SC	481.90	482.90							☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			25	LX	19PB-481.9-484.4-SC	481.90	484.40						7.5YR 5/6	☐	☐	☒							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/9/2003	BW			25	D	19PB-482.3-483.9-SC	482.30	483.90			6.2	0.20	17.25	17.05	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			25	R	19PB-482.9-489.6-SC	482.90	489.60	0.4	7.4					☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			25	D	19PB-483.9-485.4-SC	483.90	485.40			6.2	0.20	14.50	14.30	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			25	L	19PB-484.4-486.0-SC	484.40	486.00						7.5YR 6/6	☒	☐	☐							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		
12/9/2003	BW			25	D	19PB-485.4-486.7-SC	485.40	486.70			6.2	0.20	13.25	13.05	☐	☐	☐							☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
12/9/2003	BW			25	L	19PB-486.0-487.2-SC	486.00	487.20						7.5YR 5/6	☒	☐	☐							☐	☐	☐	☒	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	100		

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 9 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity			USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Most	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None		Low	Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
12/9/2003	BW			25	D	19PB-486.7-487.9-SC	486.70	487.90			6.2	0.20	14.35	14.15																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 10 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																							
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																			
12/10/2003	BW			28	D	19PB-502.4-504.0-SC	502.40	504.00			6.2	0.20	19.90	19.70																																																																																																																																																																																																																		</

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 11 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Gra- ding	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Most	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
12/10/2003	BW			30	D	19PB-521.1-522.7-SC	521.10	522.70			6.2	0.20	17.50	17.30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 12 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)								
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Most	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other				
12/12/2003	BW			35	D	19PB-534.4-536.0-SC	534.40	536.00			4.7	0.20	10.70	10.50																																			
12/12/2003	BW			35	R	19PB-534.4-543.3-SC	534.40	543.30	0.6	8.7																																							
12/12/2003	BW			35	L	19PB-535.2-538.2-SC	535.20	538.20						5YR 5/4																												100							
12/12/2003	BW			35	D	19PB-536.0-537.5-SC	536.00	537.50			4.7	0.20	11.45	11.25																																			
12/12/2003	BW			35	D	19PB-537.5-539.0-SC	537.50	539.00			4.7	0.20	10.40	10.20																																			
12/12/2003	BW			35	L	19PB-538.2-540.7-SC	538.20	540.70						7.5YR 5/4																												100							
12/12/2003	BW			35	D	19PB-539.0-540.3-SC	539.00	540.30			4.7	0.20	7.35	7.15																																			
12/12/2003	BW			35	D	19PB-540.3-541.7-SC	540.30	541.70			4.7	0.20	10.20	10.00																												100							
12/12/2003	BW			35	L	19PB-540.7-541.7-SC	540.70	541.70						7.5YR 5/4																												100							
12/12/2003	BW			35	D	19PB-541.7-543.1-SC	541.70	543.10			4.7	0.20	8.10	7.90																												100							
12/12/2003	BW			35	LX	19PB-541.7-543.1-SCA	541.70	543.10						7.5YR 5/4																												100							
12/12/2003	BW			35	LC	19PB-543.1-543.3-SC	543.10	543.30																																									
12/12/2003	BW			36	LX	19PB-543.3-543.5-SC	543.30	543.50						7.5YR 5/4																												100							
12/12/2003	BW			36	D	19PB-543.3-544.5-SC	543.30	544.50			4.7	0.20	10.00	9.80																																			
12/12/2003	BW			36	R	19PB-543.3-546.7-SC	543.30	546.70	0.4	2.4																																100							
12/12/2003	BW			36	L	19PB-543.5-544.7-SC	543.50	544.70						7.5YR 6/4																												100							
12/12/2003	BW			36	D	19PB-544.5-545.7-SC	544.50	545.70			4.7	0.20	9.60	9.40																												100							
12/12/2003	BW			36	LX	19PB-544.7-545.7-SC	544.70	545.70						7.5YR 5/4																												100							
12/12/2003	BW			36	LC	19PB-545.7-546.7-SC	545.70	546.70																																									

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 13 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity			USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay		Fines (Silt plus Clay)	Well Graded	Poorly Graded		None	Low	Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
12/12/2003	BW			38	D	19PB-550.7-551.9-SC	550.70	551.90			4.7	0.20	9.50	9.30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 14 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation		HCL Reaction			Major Rock Type (%)											
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay		Fines (Silt plus Clay)	Well Graded	Poorly Graded	None	Low		Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other					
12/16/2003	EJH	1/9/2004	BW	42	R	19PB-563.3-565.9-SC	563.30	565.90	1.0	2.5																																								
12/16/2003	EJH	1/9/2004	BW	42	LX	19PB-564.2-565.9-SC	564.20	565.90						7.5YR 5/4																							100													
12/16/2003	EJH	1/9/2004	BW	42	D	19PB-564.5-565.9-SC	564.50	565.90			4.7	0.20	7.95	7.75																																				
12/16/2003	EJH	1/9/2004	BW	43	D	19PB-565.9-567.1-SC	565.90	567.10			4.7	0.20	8.95	8.75																																				
12/16/2003	EJH	1/9/2004	BW	43	LX	19PB-565.9-567.1-SCA	565.90	567.10						7.5YR 6/4																					100															
12/16/2003	EJH	1/9/2004	BW	43	R	19PB-565.9-568.4-SC	565.90	568.40	0.3	1.3																																								
12/16/2003	EJH	1/9/2004	BW	43	LC	19PB-567.1-568.4-SC	567.10	568.40																																										
12/16/2003	EJH	1/9/2004	BW	44	D	19PB-568.4-568.6-SC	568.40	568.60			4.7	0.20	1.25	1.05																																				
12/16/2003	EJH	1/9/2004	BW	44	LX	19PB-568.4-568.6-SCA	568.40	568.60						7.5YR 4/8																				100																
12/16/2003	EJH	1/9/2004	BW	44	R	19PB-568.4-571.7-SC	568.40	571.70	0.7	2.6																																								
12/16/2003	EJH	1/9/2004	BW	44	L	19PB-568.6-568.8-SC	568.60	568.80						7.5YR 3/2																				100																
12/16/2003	EJH	1/9/2004	BW	44	D	19PB-568.6-569.8-SC	568.60	569.80			4.7	0.20	11.15	10.95																																				
12/16/2003	EJH	1/9/2004	BW	44	L	19PB-568.8-569.0-SC	568.80	569.00						7.5YR 4/3																				100																
12/16/2003	EJH	1/9/2004	BW	44	L	19PB-569.0-569.4-SC	569.00	569.40						7.5YR 5/4																				100																
12/16/2003	EJH	1/9/2004	BW	44	L	19PB-569.4-570.1-SC	569.40	570.10						5YR 5/4																				100																
12/16/2003	EJH	1/9/2004	BW	44	D	19PB-569.8-570.9-SC	569.80	570.90			4.7	0.20	9.45	9.25																																				
12/16/2003	EJH	1/9/2004	BW	44	LX	19PB-570.1-570.9-SC	570.10	570.90						5YR 5/6																			100																	
12/16/2003	EJH	1/9/2004	BW	44	LC	19PB-570.9-571.7-SC	570.90	571.70						5YR 5/6																																				
12/16/2003	EJH	1/9/2004	BW	45	LX	19PB-571.7-572.2-SC	571.70	572.20						10YR 5/3																			100																	
12/16/2003	EJH	1/9/2004	BW	45	D	19PB-571.7-572.6-SC	571.70	572.60			4.7	0.20	5.60	5.40																																				
12/16/2003	EJH	1/9/2004	BW	45	R	19PB-571.7-578.3-SC	571.70	578.30	1.9	6.6																																								
12/16/2003	EJH	1/9/2004	BW	45	L	19PB-572.2-574.4-SC	572.20	574.40						10YR 5/8																																				

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 15 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay	Fines (Silt plus Clay)		Well Graded	Poorly Graded	None	Low	Moderate		High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
12/16/2003	EJH	1/9/2004	BW	45	D	19PB-576.8-578.3-SC	576.80	578.30			4.7	0.20	0.35	0.15																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

Appendix D
Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

Key for Sample Number: SC = Sonic core; C = Drive core. Key for Sample Type: L = Logging; D = Density; F = Fill; LC = Lost core; R = Entire run; X = End of run (overlaps with next run).

Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 16 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity				USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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12/17/2003	EJH	1/9/2004	BW	49	LX	19PB-591.9-592.5-SC	591.90	592.50							5YR 5/8	☐	☐	☒						☐	☐	☐																				100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
12/17/2003	EJH	1/9/2004	BW	49	D	19PB-591.9-593.0-SC	591.90	593.00			4.7	0.20	7.60	7.40		☐	☐	☐						☐	☐	☐																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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12/17/2003	EJH	1/9/2004	BW	49	L	19PB-593.0-593.6-SC	593.00	593.60							5YR 6/4	☐	☐	☒						☐	☐	☐	☒	☐	☐																												100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
12/17/2003	EJH	1/9/2004	BW	49	D	19PB-593.0-594.5-SC	593.00	594.50			4.7	0.20	10.25	10.05		☐	☐	☐						☐	☐	☐	☐	☐																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</

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Alluvium Core Logging Form - Nye County Nuclear Waste Repository Project Office

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Borehole ID: NC-EWDP-19PB (Phase 4) Driller/Drilling Company Shawn Cain/Boart Longyear Drilling Method: Sonic Coring Alluvium Depth (ft bgs): 350.8 to 633.8 Start Date: 12/2/2003 End Date: 12/18/2003 Page 17 of 18

Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data			Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
							From	To	Drilling/Coring Rate (feet/min)	Sample Recovery (feet)	Core Diameter (inches) (gpm)	Tare Weight (kg)	Sample Plus Tare Weight (kg)	Sample Weight (kg)	Munsell Color Symbol	Dry	Moist	Wet	Gravel	Sand	Silt	Clay		Fines (Silt plus Clay)	Well Graded	Poorly Graded	None	Low		Moderate	High	Angular	Subangular	Subrounded	Rounded	None	Weak	Moderate	Strong	None	Weak	Strong	Volcanics	Carbonates	Other																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
12/17/2003	EJH	1/9/2004	BW	51	D	19PB-605.2-606.4-SC	605.20	606.40			4.7	0.20	7.75	7.55																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			</

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Date Logged	Logged By (Initials)	Date Checked	Checked By (Initials)	Core Run Number	Sample Type	Sample Number	Depth Interval (feet bgs)		Coring Data			Sample Density Data				Moisture Content			Particle Size Distribution (%)					Grading	Estimated Plasticity					USCS Group Symbol	Gravel/Sand GrainShape				Cementation			HCL Reaction			Major Rock Type (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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12/18/2003	EJH	1/9/2004	BW	53	L	19PB-620.25-620.75-C	620.25	620.75							7.5YR 5/4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		

APPENDIX E LABORATORY ANALYSES OF DRIVE CORE SAMPLES

Appendix E-1
Results of Analyses by the NWRPO Testing Laboratory on Drive Core from Phase IV Well 19PB
(Blanks indicate unmeasured parameters.)

Sample Number	Dry Bulk Density (g/cm ³)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Saturated Hydraulic Conductivity (cm/s)	Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
		Field	Saturated			3-inch Sieve	1½-inch Sieve	¾-inch Sieve	¾-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes		
															Largest Particle Passing (mm)	Percent Pass-ing	Largest Particle Passing (mm)	Percent Pass-ing	Largest Particle Passing (mm)	Percent Pass-ing	Largest Particle Passing (mm)	Percent Pass-ing	Largest Particle Passing (mm)	Percent Pass-ing	
19PB-380.00-380.50-C	1.95	0.258	0.307	2.59	4.2E-06	100	51	42	36	30	22	12	9	7	0.0316	7.0	0.0207	6.2	0.0122	5.5	0.0073	4.7	0.0046	3.8	
19PB-380.50-381.00-C	1.74	0.328	0.424	2.53	2.3E-06	100	100	95	89	79	64	32	20	16	0.0346	15.8	0.0219	13.8	0.0129	12.5	0.0075	11.2	0.0047	9.2	
19PB-449.10-449.40-C	1.82	0.208	0.276	2.58	Censored	100	70	58	53	47	36	17	9	7	0.0355	6.8	0.0226	5.9	0.0132	5.1	0.0077	4.3	0.0048	3.0	
19PB-449.40-449.70-C	1.97	0.252	0.290	2.53		100	63	54	43	35	28	18	11	7	0.0326	9.1	0.0213	8.1	0.0125	7.0	0.0074	6.0	0.0046	4.9	
19PB-527.61-528.11-C	1.94	0.238	0.257	2.53	1.4E-05	100	90	76	65	54	42	28	18	16	0.0316	14.9	0.0204	13.6	0.0122	11.9	0.0071	10.6	0.0045	8.8	
19PB-528.11-528.61-C	1.97	0.218	0.247	2.55	7.0E-07	100	94	78	68	57	42	27	18	16	0.0300	15.1	0.0201	13.5	0.0119	11.9	0.0071	10.2	0.0045	8.6	
19PB-562.07-562.57-C	1.86	0.252	0.276	2.51	7.6E-06	100	100	83	69	57	42	22	13	10	0.0349	9.3	0.0223	8.5	0.0131	7.2	0.0077	6.0	0.0048	4.3	
19PB-562.57-563.07-C	1.93	0.235	0.257	2.54	1.1E-06	100	100	97	91	77	52	26	17	13	0.0349	11.9	0.0223	10.4	0.0131	8.9	0.0077	6.8	0.0048	5.3	
19PB-620.75-621.25-C	1.85	0.305	0.380	2.56	1.7E-05	100	93	83	74	63	47	27	17	13	0.0338	12.3	0.0219	11.4	0.0129	10.4	0.0076	9.0	0.0047	7.6	
19PB-621.25-621.75-C	1.84	0.280	0.302	2.56	5.3E-07	100	100	87	77	66	51	29	17	13	0.0353	11.8	0.0224	10.8	0.0131	9.8	0.0077	8.3	0.0048	6.7	

Appendix E-2

Results of Analyses by Nevada GeoTech, Inc., on Drive Core from Phase IV Wells 24P and 29P
(Blanks indicate unmeasured parameters.)

Well Name	Sample Number		Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
			From	To		Field Sample	Saturated Sample			Gravel	Sand	Fines	Silt	Clay	Total Sand	
24P	24P-120.13-120.58-C	Core	120.13	120.58	0.068	0.129	0.255	2.59	1.88	31	58	11	6	6	58	2.8E-03
	24P-120.58-121.08-C	Core	120.58	121.08	0.075	0.140	0.252	2.59	1.85	30	60	10	4	6	60	2.6E-03
	24P-121.08-121.34-C	Shoe Core	121.08	121.34						24	60	16	9	6	60	
	24P-160.87-161.37-C	Core	160.87	161.37	0.283	0.458	0.505	2.56	1.62	39	55	6	3	3	55	1.8E-03
	24P-161.37-161.87-C	Core	161.37	161.87	0.087	0.164	0.278	2.56	1.89	28	53	9	5	5	53	2.4E-03
	24P-161.87-162.13-C	Shoe Core	161.87	162.13						34	52	14	4	9	52	
	24P-200.31-200.61-C	Core	200.31	200.61	0.078	0.179	0.278	2.58	2.30	28	59	13	7	6	59	6.5E-06
	24P-200.61-200.87-C	Shoe Core	200.61	200.87						28	62	10	6	5	62	
	24P-240.48-240.98-C	Core	240.48	240.98	0.065	0.129	0.156	2.59	1.98	32	64	4	1	2	64	3.0E-02
	24P-240.98-241.48-C	Core	240.98	241.48	0.059	0.112	0.262	2.59	1.90	24	64	12	6	6	64	3.2E-03
	24P-241.48-241.75-C	Shoe Core	241.48	241.75						21	66	13	6	7	66	
	24P-280.40-280.73-C	Core	280.40	280.73	0.141	0.271	0.312	2.6	1.92	25	56	19	8	10	56	1.7E-05
	24P-280.73-281.00-C	Shoe Core	280.73	281.00						19	56	25	12	14	56	
	24P-322.50-322.75-C	Core	322.50	322.75	0.087	0.189	0.228	2.63	2.16	32	49	19	10	9	49	1.7E-05
	24P-322.75-323.25-C	Core	322.75	323.25	0.078	0.160	0.208	2.63	2.05	29	50	21	9	13	50	1.2E-04
	24P-323.25-323.44-C	Shoe Core	323.25	323.44						25	40	35	15	19	40	
	24P-360.00-360.02-C	Core	360.00	360.02	0.106	0.000	0.000	2.54	0.00	33	47	20	10	10	47	0.0E+00
	24P-360.02-360.52-C	Core	360.02	360.52	0.086	0.149	0.266	2.54	1.74	35	49	16	9	7	49	5.1E-03
	24P-360.52-360.71-C	Shoe Core	360.52	360.71						49	33	18	9	8	33	
	24P-80.43-80.93-C	Core	80.43	80.93	0.052	0.102	0.193	2.54	1.97	29	61	10	6	4	61	4.9E-04
	24P-80.93-81.43-C	Core	80.93	81.43	0.060	0.116	0.212	2.54	1.93	29	60	11	6	6	60	2.2E-03
	24P-81.43-81.69-C	Shoe Core	81.43	81.69						24	62	14	6	8	62	
29P	29P-100.50-101.00-C	Core	100.50	101.00	0.122	0.232	0.259	2.52	1.90	36	48	16	8	8	48	8.4E-06
	29P-101.00-101.50-C	Core	101.00	101.50	0.094	0.192	0.212	2.52	2.03	54	34	12	6	6	34	9.6E-06
	29P-102.00-102.27-C	Core Shoe	102.00	102.27						50	36	14	6	8	36	
	29P-180.00-180.36-C	Core	180.00	180.36	0.155	0.225	0.253	2.58	1.45	47	39	14	Censored	Censored	Censored	1.8E-05
	29P-180.36-180.86-C	Core	180.36	180.86	0.061	0.125	0.216	2.58	2.04	54	34	12	6	6	34	5.0E-05
	29P-180.86-181.13-C	Core Shoe	180.86	181.13						48	38	14	4	10	39	
	29P-280.84-281.34-C	Core	280.84	281.34	0.119	0.224	0.269	2.56	1.88	43	42	15	5	10	42	4.4E-05
	29P-281.34-281.84-C	Core	281.34	281.84	0.094	0.183	0.319	2.56	1.94	55	31	14	6	8	31	1.4E-05
	29P-281.84-282.11-C	Core Shoe	281.84	282.11						41	39	20	7	13	39	

**APPENDIX F
LABORATORY ANALYSES OF SONIC
REPACKED AND GRAB CORE SAMPLES**

Appendix F-1
Results of NWRPO Laboratory Analyses of Sonic Core from 19PB
Repacked to Target Density at Air-Dried and Optimum Water Contents
(Blanks indicate unmeasured parameters)

Sample Number	Dry Bulk Density (g/cm ³)	Saturated Volumetric Water Content (cm ³ /cm ³)	Saturated Hydraulic Conductivity (cm/s)	Specific Gravity (g/cm ³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)									Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
					Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	¼-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing
19PB-388.9-394.1-SCR	1.76	0.310	8.8E-04	2.57	32	26	6	63	63	58	46	36	25	12	5	3	0.0311	8.0	0.0203	7.3	0.0120	6.5	0.0072	5.5	0.0045	4.5
19PB-401.1-405.0-SCR	1.74	0.317	3.1E-03	2.54	32	26	6	100	88	81	69	57	42	21	13	10	0.0322	11.6	0.0207	10.8	0.0123	9.1	0.0072	8.2	0.0045	6.5
19PB-406.3-408.5-SCR	1.76	0.309	4.4E-03	2.58	33	18	15	100	98	86	69	53	36	18	11	8	0.0322	10.1	0.0208	8.7	0.0124	7.3	0.0073	6.2	0.0046	5.1
19PB-437.8-441.2-SCR	1.75	0.317	8.8E-04	2.53				100	100	96	90	81	60	25	12	9	0.0355	9.8	0.0226	8.6	0.0132	7.4	0.0077	6.2	0.0048	5.0
19PB-450.3-455.1-SCR	1.73	0.317	3.9E-03	2.55	35	25	10	100	100	85	72	59	44	24	15	13	0.0306	13.5	0.0202	12.2	0.0119	10.9	0.0070	9.6	0.0044	8.3
19PB-457.2-460.7-SCR	1.79	0.295	3.0E-04	2.55	29	24	5	100	91	78	65	55	40	24	16	13	0.0321	11.8	0.0207	10.2	0.0122	8.6	0.0072	7.4	0.0045	6.1
19PB-478.2-481.9-SCR	1.69	0.331	7.3E-04	2.54	31	26	5	100	100	82	72	61	48	30	20	17	0.0300	18.8	0.0199	16.9	0.0118	15.4	0.0070	13.4	0.0044	11.4
19PB-481.9-484.4-SCR	1.65	0.342	2.1E-03	2.53	44	32	12	100	86	74	66	55	42	22	15	13	0.0316	15.3	0.0201	14.1	0.0119	12.8	0.0070	11.5	0.0044	10.3
19PB-512.1-514.2-SCR	1.74	0.324	9.8E-04	2.59																						
19PB-517.3-519.4-SCR	1.69	0.336	2.1E-03	2.54	40	33	7	100	95	88	75	62	44	20	13	10	0.0341	9.4	0.0220	8.0	0.0128	7.6	0.0075	6.7	0.0046	6.3
19PB-519.4-522.1-SCR	1.68	0.346	5.4E-03	2.53	30	20	10	100	92	78	63	52	37	21	14	12	0.0326	11.3	0.0207	10.2	0.0121	9.5	0.0072	8.3	0.0045	6.8
19PB-547.6-553.3-SCR	1.73	0.329	3.0E-04	2.58	29	22	7	100	88	79	71	62	50	33	23	19	0.0319	16.9	0.0206	15.9	0.0121	14.3	0.0072	12.3	0.0045	10.7
19PB-553.7-557.8-SCR	1.73	0.313	1.2E-04	2.56	30	23	7	100	100	97	89	77	63	36	24	20	0.0334	16.8	0.0216	15.5	0.0127	14.2	0.0075	12.3	0.0047	10.4
19PB-598.7-602.9-SCR	1.67	0.326	1.8E-04	2.52	31	29	2	100	100	96	88	76	59	30	20	16	0.0345	13.1	0.0220	11.4	0.0129	10.3	0.0076	8.6	0.0047	8.0
19PB-618.9-624.9-SCR	1.70	0.336	2.3E-04	2.55	34	25	9	100	100	94	86	74	57	32	22	18	0.0338	15.8	0.0218	14.7	0.0127	13.5	0.0075	11.7	0.0047	10.0
19PB-406.3-408.5-SCRM	1.90	0.251	6.9E-05																							
19PB-457.2-460.7-SCRM	1.90	0.262	4.3E-05																							
19PB-478.2-481.9-SCRM	1.90	0.253	7.9E-06																							
19PB-481.9-484.4-SCRM	1.90	0.244	2.5E-05																							
19PB-519.4-522.1-SCRM	1.90	0.261	1.2E-04																							
19PB-553.7-557.8-SCRM	1.90	0.265	1.0E-05																							
19PB-618.9-624.9-SCRM	1.90	0.237	5.2E-07																							

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	⅝-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-350.8-352.4-SC		225																								
19PB-352.4-352.9-SC		391	2.57				100	100	100	97	89	72	44	28	23	0.0326	22.2	0.0215	19.6	0.0125	17.8	0.0074	15.2	0.0046	12.6	
19PB-352.9-353.3-SC		476					100	47	42	39	37	34	24	13	11											
19PB-353.3-353.6-SC		352					100	100	98	93	89	82	54	29	22											
19PB-353.7-354.3-SC		878					100	100	91	88	83	75	44	23	17											
19PB-354.3-355.0-SC		252					100	100	95	88	76	56	32	18	14											
19PB-355.0-356.6-SC		1068					100	100	100	96	81	54	23	10	7											
19PB-356.6-356.9-SC		399					100	73	73	60	49	37	24	16	13											
19PB-356.9-357.9-SC		275					100	100	92	82	69	50	25	14	11											
19PB-357.9-359.3-SC		351	2.51				100	100	78	72	63	52	34	23	19	0.0341	16.0	0.0215	14.1	0.0127	12.1	0.0075	10.1	0.0047	8.2	
19PB-359.3-360.0-SC		975					100	100	87	76	62	46	23	12	9											
19PB-360.0-361.7-SC		326	2.55				100	100	72	60	51	41	21	11	8	0.0341	8.7	0.0217	7.9	0.0128	6.7	0.0075	5.6	0.0047	4.4	
19PB-361.7-362.0-SC		470					100	68	63	51	42	32	20	14	11											
19PB-362.0-363.1-SC		270					100	81	74	69	62	47	29	19	16											
19PB-363.1-364.6-SC		405		28	21	7	100	100	96	84	69	50	27	16	13											
19PB-364.6-364.9-SC		326					100	84	79	72	62	50	29	15	13											
19PB-364.9-366.7-SC		261					100	100	92	79	62	46	27	16	13											
19PB-366.7-367.0-SC		465		23	17	6	100	100	91	81	72	60	44	31	27											
19PB-367.0-368.5-SC		455	2.55				100	100	87	77	64	47	28	19	15	0.0326	12.5	0.0208	11.2	0.0124	9.5	0.0074	7.4	0.0046	6.1	
19PB-368.5-369.9-SC	0.088		2.53	27	21	6	100	72	64	48	39	28	16	11	8	0.0341	7.2	0.0222	6.4	0.0130	5.3	0.0076	4.6	0.0047	3.9	
19PB-369.9-371.0-SC	0.128		2.54	28	23	5	100	100	87	79	64	49	28	18	18	0.0332	13.3	0.0212	11.5	0.0126	9.8	0.0075	8.0	0.0047	6.7	
19PB-371.0-372.9-SC	0.128						100	68	59	51	43	31	19	13	12											
19PB-372.9-373.6-SC	0.081			26	20	6	34	34	28	24	21	17	12	7	6											
19PB-373.6-374.6-SC	0.110						100	100	75	62	49	38	25	18	15											
19PB-374.6-375.4-SC	0.090						100	82	69	63	53	43	29	20	17											

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	⅝-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-375.7-377.1-SC	0.132			29	23	6	100	89	75	63	53	38	18	12	10											
19PB-377.1-377.4-SC	0.144						100	100	88	79	67	54	32	22	18											
19PB-377.4-378.1-SC	0.108		2.58				100	100	90	79	65	45	19	13	11	0.0332	10.6	0.0218	9.3	0.0129	8.1	0.0076	6.4	0.0047	5.6	
19PB-378.1-378.4-SC	0.111						Censored	Censored	Censored	Censored	Censored	Censored	Censored	Censored	Censored											
19PB-381.3-382.4-SC	0.122						50	34	27	23	19	14	8	4	3											
19PB-382.4-383.7-SC	0.168			35	26	9	100	76	64	57	50	37	18	12	9											
19PB-383.7-386.1-SC	0.121		2.38				100	81	66	56	46	37	21	14	12	0.0300	12.3	0.0199	11.4	0.0119	9.7	0.0071	8.4	0.0044	7.7	
19PB-386.1-387.2-SC	0.113			34	23	11	100	100	70	61	51	39	22	14	12											
19PB-387.2-388.9-SC	0.193		2.52				100	100	97	86	76	61	36	24	20	0.0295	20.9	0.0196	18.7	0.0117	16.0	0.0070	13.3	0.0044	11.7	
19PB-388.9-394.1-SC	0.111		2.57				100	94	79	67	58	47	30	21	17	0.0295	15.9	0.0198	14.2	0.0117	12.5	0.0070	10.8	0.0044	9.0	
19PB-394.1-395.4-SC	0.090		2.56				64	52	52	42	35	26	14	9	7	0.0311	8.1	0.0203	7.2	0.0121	6.0	0.0072	4.8	0.0046	3.9	
19PB-395.4-396.1-SC	0.122			29	23	6	100	60	55	46	36	25	12	8	6											
19PB-396.3-397.1-SC	0.122						100	100	84	67	53	39	20	12	9											
19PB-397.1-398.2-SC	0.112			32	22	10	100	64	49	40	33	25	17	12	10											
19PB-398.2-398.7-SC	0.160						100	100	96	93	82	54	18	8	6											
19PB-398.7-399.8-SC	0.144			34	23	11	100	79	69	61	51	36	18	11	9											
19PB-399.8-401.1-SC	0.154		2.49				100	100	98	94	84	54	24	14	10	0.0326	13.0	0.0213	11.5	0.0125	10.0	0.0074	8.5	0.0046	7.6	
19PB-401.1-406.1-SC	0.112		2.60				100	65	50	39	32	25	14	9	7	0.0307	8.6	0.0196	7.7	0.0117	6.7	0.0069	5.8	0.0043	5.1	
19PB-406.3-407.5-SC	0.098						100	52	40	35	28	20	9	5	3											
19PB-407.5-407.9-SC	0.145						100	81	71	60	46	30	13	6	4											
19PB-407.9-408.5-SC	0.106						100	81	48	32	25	17	7	2	1											
19PB-408.5-409.9-SC	0.161		2.55				100	100	97	86	69	47	26	15	13	0.0337	12.5	0.0216	11.3	0.0127	9.5	0.0074	8.3	0.0046	7.2	
19PB-409.9-411.9-SC	0.101		2.57				100	70	50	44	37	29	17	10	8	0.0291	10.3	0.0195	9.2	0.0116	8.1	0.0069	6.7	0.0043	5.9	
19PB-411.9-413.1-SC	0.141			31	21	10	100	100	83	72	59	42	23	15	11											
19PB-413.1-413.9-SC	0.104						100	43	33	29	24	19	11	6	4											

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	¾-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-413.9-414.4-SC	0.151			38	24	14	100	100	94	86	68	57	27	16	12											
19PB-414.4-415.7-SC	0.088						100	65	57	49	40	32	18	9	7											
19PB-415.7-416.1-SC	0.150						100	82	80	69	61	47	27	17	14											
19PB-416.2-416.8-SC	0.122						100	84	82	59	44	32	18	8	6											
19PB-416.8-418.4-SC	0.084						Cen-sored	Cen-sored	Cen-sored	Cen-sored	Cen-sored	Cen-sored	Cen-sored	Cen-sored	Cen-sored											
19PB-418.4-419.6-SC	0.092						100	100	86	71	57	40	23	12	10											
19PB-419.6-421.2-SC	0.081						100	67	47	44	39	30	18	11	9											
19PB-421.2-422.5-SC	0.098		2.56				100	100	78	70	57	45	26	17	15	0.0307	18.4	0.0195	16.9	0.0116	15.4	0.0068	13.9	0.0043	12.3	
19PB-422.5-424.4-SC	0.077		2.57				50	32	28	23	19	14	8	5	3	0.0307	6.8	0.0198	6.2	0.0117	5.6	0.0069	5.0	0.0043	4.4	
19PB-424.6-428.7-SC	0.059		2.55				55	36	33	29	25	20	13	9	7	0.0275	9.3	0.0185	8.4	0.0110	7.6	0.0066	6.7	0.0041	6.1	
19PB-428.7-429.3-SC	0.116			36	19	17	100	100	78	70	59	44	27	19	16											
19PB-429.3-431.0-SC	0.134			42	20	22	100	100	89	80	71	54	32	22	19											
19PB-431.0-431.9-SC	0.146						100	51	48	38	31	24	13	8	7											
19PB-431.9-432.4-SC	0.142			37	20	17	100	100	92	82	69	49	28	19	16											
19PB-432.4-434.1-SC	0.197		2.57				100	100	95	90	82	66	42	29	24	0.0307	22.4	0.0196	19.9	0.0118	16.8	0.0070	14.3	0.0044	12.4	
19PB-435.5-437.2-SC	0.147		2.54				100	100	88	76	67	53	29	15	11	0.0350	14.5	0.0227	11.4	0.0133	9.3	0.0077	7.1	0.0048	6.1	
19PB-437.2-441.2-SC	0.148		2.54				100	100	96	89	79	62	26	14	10	0.0341	10.7	0.0223	9.0	0.0130	7.9	0.0076	6.7	0.0048	5.0	
19PB-441.2-442.9-SC	0.138			30	23	7	100	100	89	78	68	53	26	15	12											
19PB-442.9-445.1-SC	0.061		2.55				100	70	56	48	40	30	15	9	7	0.0311	9.1	0.0203	8.2	0.0121	7.1	0.0072	5.9	0.0045	5.1	
19PB-445.3-447.9-SC	0.130			30	22	8	100	85	71	62	54	43	27	19	16											
19PB-450.6-453.0-SC	0.141		2.54				100	82	67	58	50	39	23	15	13	0.0290	13.3	0.0193	12.2	0.0115	10.8	0.0068	9.3	0.0042	8.6	
19PB-453.0-455.1-SC	0.118		2.53				100	63	45	35	29	20	11	5	4	0.0306	7.8	0.0200	6.9	0.0119	5.9	0.0070	5.2	0.0044	4.5	
19PB-455.1-455.5-SC	0.122						100	63	56	51	46	37	23	16	13											
19PB-455.5-456.6-SC	0.150			36	26	10	100	100	100	94	85	62	26	15	13											
19PB-456.6-457.2-SC	0.131						100	87	72	67	53	38	19	12	10											

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	⅝-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-457.2-460.7-SC	0.134		2.54				100	83	69	60	50	37	21	13	11	0.0290	12.6	0.0193	11.2	0.0116	9.6	0.0069	8.3	0.0043	6.9	
19PB-460.7-461.8-SC	0.161						100	100	94	86	70	52	27	17	13											
19PB-461.8-463.4-SC	0.127		2.55				100	47	42	37	31	24	15	9	7	0.0305	8.9	0.0200	7.8	0.0121	6.7	0.0072	5.6	0.0045	4.9	
19PB-463.4-464.5-SC	0.114						100	100	84	65	50	38	22	14	11											
19PB-464.5-465.6-SC	0.122						100	60	47	39	34	27	16	9	7											
19PB-465.6-466.3-SC	0.118						100	50	45	35	30	24	15	9	7											
19PB-466.5-468.1-SC	0.143		2.53				100	59	50	39	30	21	11	5	3	0.0337	6.2	0.0215	5.5	0.0128	4.7	0.0076	3.8	0.0047	3.2	
19PB-468.1-469.0-SC	0.154		2.55				100	100	100	92	82	61	24	12	8	0.0322	18.5	0.0210	16.2	0.0125	14.0	0.0074	11.8	0.0046	10.6	
19PB-469.0-470.5-SC	0.110						100	70	60	49	40	28	13	8	6											
19PB-470.5-474.3-SC	0.115		2.54				100	82	72	60	49	36	19	12	10	0.0367	5.9	0.0232	5.2	0.0135	4.5	0.0080	3.5	0.0049	2.8	
19PB-474.3-475.1-SC	0.118		2.59				100	75	50	33	25	17	9	4	3	0.0367	8.3	0.0234	7.3	0.0136	6.2	0.0080	5.2	0.0049	4.1	
19PB-475.1-476.2-SC	0.126			32	24	8	100	100	95	81	61	42	22	14	11											
19PB-476.4-476.6-SC	0.083						100	100	95	82	67	47	25	14	11											
19PB-476.6-478.0-SC	0.109						100	61	40	34	29	21	10	5	4											
19PB-478.2-481.9-SC	0.112		2.53				100	90	72	64	56	45	27	17	15	0.0283	18.4	0.0191	16.3	0.0114	14.7	0.0068	13.0	0.0043	10.9	
19PB-481.9-484.4-SC	0.170						100	76	69	60	51	39	21	15	13											
19PB-484.4-486.0-SC	0.138			44	23	21	100	100	96	90	81	64	38	27	24											
19PB-486.0-487.2-SC	0.069		2.56				100	86	61	52	43	33	20	14	12	0.0300	12.7	0.0196	11.4	0.0115	10.8	0.0069	9.5	0.0043	8.6	
19PB-487.2-488.8-SC	0.131			42	23	19	100	100	93	84	71	55	31	23	19											
19PB-488.8-489.4-SC	0.067						100	67	48	37	31	25	15	8	6											
19PB-489.6-490.6-SC	0.089		2.56				100	85	70	53	42	32	19	12	10	0.0283	13.0	0.0191	11.8	0.0113	10.9	0.0067	9.7	0.0042	8.8	
19PB-490.6-492.0-SC	0.119			39	21	18	100	91	87	75	62	48	33	24	21											
19PB-492.0-493.6-SC	0.111			34	20	14	100	74	60	55	49	42	29	22	18											
19PB-493.6-494.6-SC	0.105						100	47	41	35	30	24	16	10	8											
19PB-495.2-496.7-SC	0.149		2.53				100	49	39	35	29	22	11	6	5	0.0319	7.2	0.0206	6.6	0.0123	5.7	0.0072	5.1	0.0045	4.5	

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	⅝-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-496.7-499.0-SC	0.084		2.54				100	76	63	53	45	35	21	15	12	0.0302	13.1	0.0195	12.1	0.0117	10.8	0.0069	9.8	0.0043	8.9	
19PB-500.1-501.5-SC	0.157			36	25	11	100	100	85	77	66	48	26	18	15											
19PB-501.5-503.4-SC	0.121		2.53				100	100	82	73	63	48	30	21	17	0.0319	15.3	0.0204	14.0	0.0120	12.7	0.0071	11.4	0.0044	10.1	
19PB-503.4-506.0-SC	0.122		2.52				100	88	77	69	59	43	22	14	11	0.0334	11.3	0.0212	10.5	0.0125	9.3	0.0074	8.2	0.0046	7.0	
19PB-506.0-506.6-SC	0.178			37	25	12	100	73	66	60	55	44	25	17	14											
19PB-506.6-508.1-SC	0.205			43	30	13	100	100	98	96	86	61	25	17	14											
19PB-508.1-509.1-SC	0.139			45	27	18	100	100	92	78	63	46	25	17	15											
19PB-509.1-510.0-SC	0.142		2.53				100	56	43	33	26	20	10	5	4	0.0319	7.4	0.0201	7.0	0.0120	6.2	0.0071	5.6	0.0044	4.9	
19PB-510.0-510.3-SC	0.118						100	100	85	74	61	44	21	13	11											
19PB-510.3-512.1-SC	0.166			41	25	16	100	100	85	77	68	51	25	15	12											
19PB-512.1-514.2-SC	0.159						100	100	93	78	62	44	24	16	13											
19PB-514.2-515.3-SC	0.187		2.52				100	100	97	90	79	61	28	16	13	0.0326	13.9	0.0213	12.8	0.0125	11.1	0.0074	9.5	0.0046	8.9	
19PB-515.3-517.3-SC	0.185		2.55				100	81	67	59	51	38	21	14	11	0.0311	10.9	0.0205	9.8	0.0121	8.8	0.0072	7.4	0.0045	6.7	
19PB-517.3-519.4-SC	0.198						100	100	93	84	72	53	26	18	15											
19PB-519.4-519.7-SC	0.131			35	22	13	100	100	77	63	48	30	12	7	6											
19PB-519.7-522.1-SC	0.137			30	19	11	100	57	43	37	31	22	11	7	5											
19PB-522.1-522.7-SC	0.145						Censored	Censored	Censored	Censored	Censored	Censored	Censored	Censored	Censored											
19PB-524.4-526.1-SC	0.086		2.51				100	100	97	83	72	56	35	25	20	0.0316	18.3	0.0204	16.2	0.0122	14.1	0.0071	12.6	0.0045	10.5	
19PB-526.1-527.1-SC	0.092		2.52				100	100	91	85	73	50	23	12	10	0.0332	13.2	0.0214	11.8	0.0126	10.0	0.0074	9.0	0.0046	8.1	
19PB-528.8-530.4-SC	0.148		2.52				100	100	87	78	64	48	27	15	12	0.0316	14.8	0.0206	13.0	0.0126	9.6	0.0074	8.3	0.0046	7.0	
19PB-530.4-531.1-SC	0.112		2.51				100	100	100	94	83	72	47	28	24	0.0274	28.5	0.0183	25.9	0.0110	22.7	0.0066	19.5	0.0042	17.5	
19PB-533.0-534.1-SC	0.116			25	19	6	100	65	58	54	45	34	18	10	8											
19PB-534.4-535.2-SC	0.114						100	65	55	49	43	32	18	10	8											
19PB-535.2-538.2-SC	0.144		2.54				100	100	100	88	75	54	31	22	18	0.0306	17.5	0.0196	16.0	0.0117	14.0	0.0069	12.1	0.0043	10.6	
19PB-538.2-540.7-SC	0.132		2.54	35	20	15	100	64	57	48	42	35	24	17	14	0.0274	14.7	0.0182	13.4	0.0110	11.8	0.0066	10.1	0.0042	8.8	

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	⅜-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-540.7-541.7-SC	0.133			33	20	13	100	100	90	81	62	47	29	21	19											
19PB-541.7-543.1-SC	0.127						100	87	66	60	54	48	34	25	22											
19PB-543.3-543.5-SC	0.135		2.53				100	100	62	55	43	34	22	14	12	0.0321	14.5	0.0209	12.9	0.0123	11.2	0.0073	9.5	0.0045	8.4	
19PB-543.5-544.7-SC	0.156		2.55				100	100	90	82	73	58	33	21	18	0.0306	17.0	0.0202	14.9	0.0119	13.3	0.0071	11.2	0.0044	10.1	
19PB-544.7-545.7-SC	0.137			34	20	14	100	100	87	71	57	46	28	19	16											
19PB-545.9-546.1-SC	0.158						100	100	52	46	37	29	18	12	10											
19PB-546.1-547.2-SC	0.154			41	23	18	100	100	100	98	88	70	35	24	20											
19PB-547.2-547.6-SC	0.166						100	100	73	65	56	45	28	20	17											
19PB-547.6-549.6-SC	0.131			34	20	14	100	100	93	84	74	60	40	30	25											
19PB-550.7-553.3-SC	0.135			37	21	16	100	100	98	90	81	66	42	30	26											
19PB-553.7-554.8-SC	0.150			34	20	14	100	100	90	78	69	58	34	22	18											
19PB-554.8-555.2-SC	0.143						100	100	96	85	74	59	36	24	20											
19PB-555.2-557.8-SC	0.110		2.57				100	100	92	83	75	63	40	27	22	0.0319	18.9	0.0207	17.2	0.0121	16.1	0.0072	13.8	0.0045	12.1	
19PB-559.6-559.8-SC	0.080						100	100	100	99	93	72	36	22	19											
19PB-559.8-560.4-SC	0.050						100	100	70	62	55	48	39	31	27											
19PB-563.3-564.2-SC	0.173		2.56				100	100	86	73	65	54	38	27	22	0.0282	21.2	0.0190	19.3	0.0113	17.8	0.0067	15.8	0.0042	14.4	
19PB-564.2-565.9-SC	0.137		2.55				100	100	94	87	73	59	41	29	23	0.0299	21.3	0.0195	19.7	0.0116	18.0	0.0069	15.3	0.0043	13.7	
19PB-565.9-567.1-SC	0.145			34	19	15	100	100	96	87	76	60	39	28	24											
19PB-568.4-568.6-SC	0.136						100	100	100	80	62	46	28	20	17											
19PB-568.6-568.8-SC	0.114						100	100	100	86	62	41	22	17	14											
19PB-568.8-569.0-SC	0.148		2.52				100	100	100	97	88	74	54	43	38	0.0315	36.5	0.0206	33.1	0.0122	29.8	0.0072	26.4	0.0045	24.1	
19PB-569.0-569.4-SC	0.148		2.51				100	100	82	69	58	45	28	20	17	0.0299	16.8	0.0198	15.1	0.0117	13.8	0.0071	10.7	0.0045	9.4	
19PB-569.4-570.1-SC	0.154						100	100	98	94	84	60	30	21	17											
19PB-570.1-570.9-SC	0.114						100	100	76	57	51	46	31	23	20											
19PB-571.7-572.2-SC	0.127						100	100	100	100	83	69	44	30	25											

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	¾-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-572.2-574.4-SC	0.142						100	100	100	92	82	66	34	21	17											
19PB-574.4-576.5-SC	0.167		2.51				100	100	91	75	63	48	27	17	14	0.0315	14.0	0.0213	11.3	0.0126	9.5	0.0075	7.7	0.0046	6.8	
19PB-576.5-576.7-SC	0.142		2.52				100	100	92	88	77	61	43	30	23	0.0330	23.6	0.0213	21.1	0.0124	19.4	0.0073	16.9	0.0046	14.3	
19PB-576.7-578.3-SC	0.118						100	86	68	60	51	40	25	17	14											
19PB-578.3-578.7-SC	0.125		2.52				100	100	100	96	81	55	27	17	13	0.0330	12.5	0.0215	11.5	0.0127	10.0	0.0075	8.0	0.0047	7.0	
19PB-578.7-579.2-SC	0.176						100	100	100	93	86	74	40	20	14											
19PB-579.2-580.3-SC	0.108						100	100	100	89	80	70	52	44	41											
19PB-580.3-581.1-SC	0.131						100	100	74	66	59	51	39	27	21											
19PB-581.1-581.8-SC	0.131						100	57	57	48	41	33	21	14	12											
19PB-581.9-582.9-SC	0.109		2.51				100	73	70	63	57	47	29	20	17	0.0315	16.5	0.0206	14.5	0.0123	12.0	0.0073	10.5	0.0045	9.0	
19PB-582.9-584.1-SC	0.113		2.49				100	100	95	79	61	43	22	14	12	0.0330	11.2	0.0213	10.0	0.0125	8.8	0.0074	7.6	0.0046	6.0	
19PB-584.1-587.4-SC	0.114						100	80	75	67	59	47	30	22	19											
19PB-588.3-589.8-SC	0.116						100	100	99	87	74	55	30	20	17											
19PB-589.8-590.2-SC	0.158		2.52				100	100	100	95	87	75	45	29	25	0.0315	23.3	0.0201	22.0	0.0119	19.9	0.0070	17.8	0.0044	15.8	
19PB-590.2-591.7-SC	0.119		2.52				100	100	87	79	71	59	37	26	22	0.0299	21.3	0.0196	19.1	0.0116	17.4	0.0069	15.3	0.0043	13.6	
19PB-591.9-592.5-SC	0.169						100	100	92	84	74	60	34	23	19											
19PB-592.5-593.0-SC	0.157						100	100	100	97	94	82	46	27	22											
19PB-593.0-593.6-SC	0.054						100	100	75	70	59	46	29	20	17											
19PB-593.6-594.6-SC	0.178		2.55				100	100	100	100	97	76	42	27	21	0.0330	19.4	0.0213	17.4	0.0125	15.3	0.0074	13.2	0.0046	11.8	
19PB-594.6-595.2-SC	0.204		2.56				100	100	93	86	80	70	45	26	21	0.0330	18.1	0.0211	16.8	0.0123	15.5	0.0073	13.5	0.0045	11.6	
19PB-595.2-596.2-SC	0.175		2.56				100	100	99	93	83	70	48	32	24	0.0330	18.8	0.0211	16.9	0.0123	15.6	0.0073	13.6	0.0045	12.3	
19PB-596.2-596.9-SC	0.152						100	100	92	72	65	54	35	25	20											
19PB-596.9-598.2-SC	0.178						100	100	100	98	89	70	33	22	19											
19PB-598.2-598.7-SC	0.159						100	100	99	85	73	57	34	23	19											
19PB-598.7-601.0-SC	0.147		2.52	41	22	19	100	100	91	83	74	60	30	19	15	0.0330	13.8	0.0217	12.2	0.0127	11.1	0.0075	8.9	0.0047	7.7	

Appendix F-2
Results of NWRPO Laboratory Analyses of Sonic Core Grab Samples from 19PB
(Blanks indicate unmeasured parameters)

Sample Number	Gravimetric Water Content (g/g)	Electrical Conductivity of Soil/Water Extract (µmhos/cm)	Specific Gravity (g/cm³)	Atterberg Limits			Wet Sieve Particle Size Analysis (Percent Passing)										Hydrometer Particle Size Analysis									
																	2 Minutes		5 Minutes		15 Minutes		45 Minutes		120 Minutes	
				Liquid Limit	Plastic Limit	Plasticity Index	3-inch Sieve	1½-inch Sieve	¾-inch Sieve	⅝-inch Sieve	No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 100 Sieve	No. 200 Sieve	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	Largest Particle Passing (mm)	Percent Passing	
19PB-601.9-602.9-SC	0.156						100	100	98	88	75	59	35	22	18											
19PB-602.9-603.6-SC	0.130						100	100	75	65	59	50	34	23	19											
19PB-603.6-604.2-SC	0.109		2.50				100	100	95	79	64	52	36	27	23	0.0299	18.6	0.0198	17.1	0.0119	14.6	0.0071	12.6	0.0045	10.6	
19PB-604.2-605.2-SC	0.131		2.51				100	100	99	82	71	58	41	31	27	0.0345	24.0	0.0220	20.9	0.0129	18.8	0.0076	15.7	0.0047	12.5	
19PB-605.2-605.6-SC	0.139						100	100	100	92	77	54	25	15	12											
19PB-605.6-606.4-SC	0.160						100	100	91	88	77	56	30	19	16											
19PB-606.4-607.0-SC	0.107						100	100	90	69	53	34	17	11	8											
19PB-607.0-608.1-SC	0.145		2.53				100	100	100	87	74	53	32	21	17	0.0315	17.3	0.0203	15.3	0.0120	13.9	0.0071	11.9	0.0045	10.4	
19PB-608.1-608.7-SC	0.128		2.51				100	100	100	90	78	55	21	11	8	0.0359	7.4	0.0230	6.4	0.0135	5.4	0.0079	4.4	0.0048	4.0	
19PB-608.7-609.8-SC	0.068						100	79	60	47	39	30	16	10	8											
19PB-609.8-611.1-SC	0.081		2.52				100	88	81	68	55	39	16	8	6	0.0368	5.3	0.0235	4.6	0.0138	3.9	0.0080	3.2	0.0050	2.8	
19PB-611.1-612.7-SC	0.124		2.53	24	21	3	100	91	88	79	69	52	28	17	13	0.0353	8.6	0.0233	7.1	0.0136	6.2	0.0080	5.2	0.0049	4.3	
19PB-612.7-613.2-SC	0.093		2.53				100	100	92	80	68	54	35	23	17	0.0353	16.6	0.0224	14.5	0.0131	13.1	0.0077	11.1	0.0048	9.7	
19PB-613.2-615.3-SC	0.143		2.53	38	21	17	100	100	95	89	81	67	43	27	21	0.0338	17.7	0.0216	15.9	0.0126	14.7	0.0075	12.8	0.0046	11.6	
19PB-615.3-616.2-SC	0.176						100	100	96	90	82	65	38	23	19											
19PB-616.2-618.9-SC	0.134			41	19	22	100	100	98	91	78	62	41	30	25											
19PB-618.9-619.9-SC	0.125						100	100	97	91	84	71	49	41	39											
19PB-622.0-622.5-SC	0.153						100	100	91	85	72	56	33	20	16											
19PB-622.5-624.0-SC	0.120		2.53				100	100	96	91	81	65	38	28	27	0.0338	15.4	0.0219	14.3	0.0129	13.1	0.0076	11.3	0.0047	10.1	
19PB-624.0-624.9-SC	0.126		2.53				100	100	86	76	68	58	42	36	35	0.0306	21.3	0.0198	19.7	0.0118	17.6	0.0071	14.9	0.0045	12.8	
19PB-624.9-627.1-SC	0.145			40	18	22	100	90	81	71	59	49	35	26	22											
19PB-627.1-627.9-SC	0.133						100	100	87	84	76	63	37	25	21											
19PB-628.4-629.7-SC	0.155						100	100	94	83	62	39	29	24	20											
19PB-629.7-631.1-SC	0.127						100	100	85	75	65	52	33	22	19											
19PB-631.1-633.8-SC	0.127		2.52				100	100	92	86	76	62	38	26	22	0.0323	19.9	0.0208	17.7	0.0123	16.0	0.0073	13.7	0.0046	12.0	

**APPENDIX G
REPACKING AND WATER CONTENT/DENSITY
DATA FOR 19PB SONIC CORE**

Appendix G-1 Core Repacking Specifications and Data Sheet for 19PB

Lab ID	Sample Number	Core Input Data					Calculated Data				Lift Weight (g)				Repacked Core Data		
		Target Density	Gravimetric Water Content (g/g)	Target Core Diameter (cm)	Target Core Length (cm)	Lift Height (cm)	Core Volume (cm ³)	Total Oven-dried Sample Weight (g)	Total Moist Sample Weight (g)	Moist Sample Weight per Lift (g)	1	2	3	4	Total Moist Sample Weight (g)	Total Oven-dried Weight (g)	Dry Bulk Density (g/cm ³)
1	19PB-406.3-408.5-SCR	1.85	0.027	15.30	30.48	7.62	5,604	10,367	10,645	2,661	2,520	2,480	2,580	2,560	10,140	9,875	1.76
2	19PB-450.3-455.1-SCR	1.85	0.011	15.30	30.48	7.62	5,604	10,367	10,480	2,620	2,434	2,502	2,529	2,358	9,823	9,717	1.73
3	19PB-519.4-522.1-SCR	1.85	0.016	15.30	30.48	7.62	5,604	10,367	10,534	2,633	2,464	2,432	2,644	2,052	9,592	9,440	1.68
4	19PB-401.1-405.0-SCR	1.83	0.015	15.30	30.48	7.62	5,604	10,227	10,379	2,595	2,442	2,515	2,633	2,317	9,907	9,762	1.74
5	19PB-437.8-441.2-SCR	1.83	0.010	15.30	30.48	7.62	5,604	10,227	10,328	2,582	2,562	2,522	2,389	2,454	9,927	9,830	1.75
6	19PB-457.2-460.7-SCR	1.83	0.008	15.30	30.48	7.62	5,604	10,227	10,314	2,578	2,468	2,505	2,559	2,607	10,139	10,054	1.79
7	19PB-481.9-484.4-SCR	1.83	0.013	15.30	30.48	7.62	5,604	10,255	10,388	2,597	2,256	2,219	2,456	2,440	9,371	9,251	1.65
8	19PB-512.1-514.2-SCR	1.83	0.013	15.30	30.48	7.62	5,604	10,255	10,388	2,597	2,515	2,447	2,464	2,453	9,879	9,752	1.74
9	19PB-478.2-481.9-SCR	1.83	0.015	15.30	30.48	7.62	5,604	10,255	10,413	2,603	2,330	2,382	2,577	2,349	9,638	9,492	1.69
10	19PB-517.3-519.4-SCR	1.83	0.010	15.30	30.48	7.62	5,604	10,255	10,357	2,589	2,300	2,406	2,425	2,439	9,570	9,475	1.69
11	19PB-388.9-394.1-SCR	1.80	0.009	15.30	30.48	7.62	5,604	10,087	10,179	2,545	2,363	2,676	2,396	2,511	9,946	9,856	1.76
12	19PB-598.7-602.9-SCR	1.80	0.009	15.30	30.48	7.62	5,604	10,087	10,173	2,543	2,480	2,351	2,349	2,280	9,460	9,380	1.67
13	19PB-553.7-557.8-SCR	1.80	0.013	15.30	30.48	7.62	5,604	10,087	10,218	2,555	2,463	2,410	2,436	2,526	9,835	9,709	1.73
14	19PB-547.6-553.3-SCR	1.80	0.010	15.30	30.48	7.62	5,604	10,087	10,184	2,546	2,457	2,332	2,540	2,439	9,768	9,675	1.73
15	19PB-618.9-624.9-SCR	1.80	0.008	15.30	30.48	7.62	5,604	10,087	10,163	2,541	2,375	2,268	2,579	2,376	9,598	9,526	1.70
101	19PB-406.3-408.5-SCRM	1.90	0.110	15.31	30.48	7.62	5,611	10,661	11,834	2,959	2,956	2,954	2,954	2,956	11,820	10,649	1.90
103	19PB-519.4-522.1-SCRM	1.90	0.110	15.31	30.48	7.62	5,611	10,661	11,834	2,959	2,956	2,956	2,956	2,952	11,820	10,649	1.90
106	19PB-457.2-460.7-SCRM	1.90	0.110	15.31	30.48	7.62	5,611	10,661	11,834	2,959	2,955	2,955	2,955	2,955	11,820	10,649	1.90
107	19PB-481.9-484.4-SCRM	1.90	0.125	15.31	30.48	7.62	5,611	10,661	11,994	2,998	2,997	2,999	2,993	2,995	11,984	10,652	1.90
109	19PB-478.2-481.9-SCRM	1.90	0.125	15.31	30.48	7.62	5,611	10,661	11,994	2,998	2,997	2,995	2,993	2,999	11,984	10,652	1.90
113	19PB-553.7-557.8-SCRM	1.90	0.120	15.31	30.48	7.62	5,611	10,661	11,941	2,985	2,980	2,981	2,984	2,983	11,928	10,650	1.90
115	19PB-618.9-624.9-SCRM	1.90	0.110	15.31	30.48	7.62	5,611	10,661	11,834	2,959	2,955	2,955	2,955	2,955	11,820	10,649	1.90

Appendix G-2
Results of Water Content vs. Density Compaction Tests for Selected 19PB Sonic Core Samples

Lab ID	Sample Number	Target Gravimetric Water Content (g/g)	Pre-Repacking Air-Dry Sample Weight (g)	Weight of Empty Liner Plus Add-Ons (g)	Weight of Repacked Liner Plus Add-Ons (g)	Weight of Repacked Sample (g)	Inside Diameter of Liner (cm)	Length of Repacked Sample (cm)	Volume of Repacked Sample (cm ³)	Post-Repacking Air-Dry Sample Weight	Calculated Oven Dry Weight	Gravimetric Water Content of Repacked Sample (g/g)	Dry Bulk Density (g/cm ³)
1	19PB-406.3-407.5-SCR1	0.070	9,919	1,832	12,280	10,448	15.3	31.2	5,727	9,925	9,807	0.065	1.712
7	19PB-481.9-484.4-SCR1	0.070	9,252	1,824	11,600	9,776	15.3	29.6	5,433	9,242	9,132	0.070	1.681
15	19PB-618.9-624.9-SCR1	0.070	9,623	1,818	11,980	10,162	15.3	30.0	5,510	9,582	9,468	0.073	1.718
1	19PB-406.3-407.5-SCR2	0.100	9,925	1,832	12,580	10,748	15.3	27.9	5,128	9,901	9,784	0.099	1.908
7	19PB-481.9-484.4-SCR2	0.100	9,242	1,823	11,820	9,997	15.3	27.8	5,107	9,213	9,104	0.098	1.782
15	19PB-618.9-624.9-SCR2	0.100	9,582	1,834	12,220	10,386	15.3	27.1	4,988	9,551	9,438	0.100	1.892
1	19PB-406.3-407.5-SCR3	0.130	9,901	1,831	12,780	10,949	15.3	28.0	5,155	9,839	9,722	0.126	1.886
7	19PB-481.9-484.4-SCR3	0.130	9,213	1,822	12,060	10,238	15.3	26.4	4,856	9,196	9,087	0.127	1.871
15	19PB-618.9-624.9-SCR3	0.130	9,551	1,818	12,420	10,602	15.3	28.0	5,148	9,510	9,397	0.128	1.825
1	19PB-406.3-407.5-SCR4	0.110	11,087	1,832	13,903	12,071	15.3	30.5	5,604	11,087	10,956	0.102	1.955
7	19PB-481.9-484.4-SCR4	0.125	10,593	1,824	13,520	11,696	15.3	30.5	5,604	10,593	10,467	0.117	1.868
15	19PB-618.9-624.9-SCR4	0.110	10,648	1,819	13,536	11,717	15.3	30.5	5,604	10,648	10,522	0.114	1.878
7	19PB-481.9-484.4-SCR5	0.160	9,196	1,823	12,280	10,457	15.3	27.9	5,133	9,180	9,071	0.153	1.767

APPENDIX H LABORATORY ANALYSES OF DRILL CUTTINGS SAMPLES

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
16P	BCS00042502	2.5	5	0.029					509	29	57	13				
16P	BCS00042504	7.5	10	0.038					929	27	61	12				
16P	BCS00042506	12.5	15	0.025					403	30	56	15				
16P	BCS00042508	17.5	20	0.019					261	31	54	15				
16P	BCS00042510	22.5	25	0.044					304	36	51	13				
16P	BCS00042512	27.5	30	0.021					234	32	55	13				
16P	BCS00042514	32.5	35	0.033					285	30	59	11	Censored	Censored	Censored	
16P	BCS00042516	37.5	40	0.022					257	28	56	16				
16P	BCS00042518	42.5	45	0.05					294	13	50	38				
16P	BCS00042520	47.5	50	0.051					592	14	46	40				
16P	BCS00042522	52.5	55	0.056					563	30	54	16				
16P	BCS00042524	57.5	60	0.038					614	38	48	14	Censored	Censored	Censored	
16P	BCS00042526	62.5	65	0.066					874	35	51	14				
16P	BCS00042528	67.5	70	0.058					926	6	43	50				
16P	BCS00042530	72.5	75	0.076					937	5	40	55	25	27	39	
16P	BCS00042532	77.5	80	0.061					1040	12	45	42				
16P	BCS00042534	82.5	85	0.061					821	21	51	28	Censored	Censored	Censored	
16P	BCS00042536	87.5	90	0.032					709	18	54	28				
16P	BCS00042538	92.5	95	0.072					787	18	51	31				
16P	BCS00042540	97.5	100	0.028					735	24	53	23				
16P	BCS00042542	102.5	105	0.028					739	18	55	27				
16P	BCS00042544	107.5	110	0.029					602	13	52	35				
16P	BCS00042546	112.5	115	0.041					668	14	49	36	16	15	52	
16P	BCS00042548	117.5	120	0.051					738	16	49	35				
16P	BCS00042550	122.5	125	0.032					645	18	54	27				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
16P	BCS00042552	127.5	130	0.028					596	22	52	27				
16P	BCS00042554	132.5	135	0.031					575	15	56	29				
16P	BCS00042556	137.5	140	0.034					529	20	52	28				
16P	BCS00042558	142.5	145	0.039					483	23	55	22	13	10	Censored	
16P	BCS00042560	147.5	150	0.029					514	24	51	25				
16P	BCS00042562	152.5	155	0.052						22	55	23				
16P	BCS00042564	157.5	160	0.033					701	20	54	26				
16P	BCS00042566	162.5	165	0.055					553	17	57	26				
16P	BCS00042567	165	170	0.047												
16P	BCS00042569	175	180	0.05												
16P	BCS00042571	185	190	0.046												
16P	BCS00042573	195	200	0.043												
16P	BCS00042575	205	210	0.039												
16P	BCS00042577	215	220	0.031												
16P	BCS00042579	225	230	0.02												
16P	BCS00042581	235	240	0.016												
16P	BCS00042583	245	250	0.028												
16P	BCS00042585	255	260	0.032												
16P	BCS00042587	265	270	0.041												
16P	BCS00042589	275	280	0.03												
16P	BCS00042591	285	290	0.028												
16P	BCS00042593	295	300	0.037												
16P	BCS00042595	305	310	0.025												
16P	BCS00042597	315	320	0.022												
16P	BCS00042599	325	330	0.038												

Appendix H
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(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
16P	BCS00042601	335	340	0.045												
16P	BCS00042603	345	350	0.044												
16P	BCS00042605	355	360	0.033												
16P	BCS00042607	365	370	0.056												
16P	BCS00042609	375	380	0.052												
16P	BCS00042611	385	390	0.04												
16P	BCS00042613	395	400	0.054												
16P	BCS00042615	405	410	0.061												
16P	BCS00042617	415	420	0.063												
16P	BCS00042619	425	430	0.067												
16P	BCS00042621	435	440	0.051												
16P	BCS00042623	445	450	0.06												
16P	BCS00042625	455	460	0.044												
16P	BCS00042627	465	470	0.062												
16P	BCS00042629	475	480	0.064												
16P	BCS00042631	485	490	0.066												
16P	BCS00042633	495	500	0.065												
16P	BCS00042635	505	510	0.075												
16P	BCS00042637	515	520	0.039												
16P	BCS00042639	525	530	0.044												
24P	24P-2.5-5	2.5	5	0.024					489	30	58	12				
24P	24P-7.5-10	7.5	10	0.03					1176	28	61	11				
24P	24P-12.5-15	12.5	15	0.02					741	27	63	10				
24P	24P-17.5-20	17.5	20	0.02					569	30	60	10				
24P	24P-22.5-25	22.5	25	0.04					360	27	61	12				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
24P	24P-27.5-30	27.5	30	0.03					325	29	61	10				
24P	24P-32.5-35	32.5	35	0.029					179	28	62	10				
24P	24P-37.5-40	37.5	40	0.025					123	9	76	15				
24P	24P-42.5-45	42.5	45	0.02					109	32	62	6				
24P	24P-47.5-50	47.5	50	0.019					108	10	62	28	14	12	60	
24P	24P-52.5-55	52.5	55	0.018					73	29	60	11				
24P	24P-57.5-60	57.5	60	0.023					65	11	68	21				
24P	24P-62.5-65	62.5	65	0.019					475	47	47	6				
24P	24P-67.5-70	67.5	70	0.015					329	43	51	6				
24P	24P-72.5-75	72.5	75	0.018					171	42	53	5				
24P	24P-77.5-80	77.5	80	0.019					326	33	60	7				
24P	24P-82.5-85	82.5	85	0.064					472	28	62	10				
24P	24P-87.5-90	87.5	90	0.032					155	30	60	10				
24P	24P-92.5-95	92.5	95	0.023					135	43	46	11				
24P	24P-97.5-100	97.5	100	0.023					155	33	61	6				
24P	24P-102.5-105	102.5	105	0.02					219	47	43	10				
24P	24P-107.5-110	107.5	110	0.023					295	33	61	6				
24P	24P-112.5-115	112.5	115	0.038					278	28	63	9				
24P	24P-117.5-120	117.5	120	0.022					229	30	63	7				
24P	24P-122.5-125	122.5	125	0.049					262	30	60	10				
24P	24P-127.5-130	127.5	130	0.034					209	33	59	8				
24P	24P-132.5-135	132.5	135	0.03					237	33	60	7				
24P	24P-137.5-140	137.5	140	0.027					147	34	63	3				
24P	24P-142.5-145	142.5	145	0.027					149	31	62	7	6	5	61	
24P	24P-147.5-150	147.5	150	0.026					174	34	60	6				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
24P	24P-152.5-155	152.5	155	0.032					183	27	65	8				
24P	24P-157.5-160	157.5	160	0.015					230	39	57	4				
24P	24P-162.5-165	162.5	165	0.026					221	45	51	4				
24P	24P-167.5-170	167.5	170	0.027					142	42	51	7				
24P	24P-172.5-175	172.5	175	0.026					211	34	58	8				
24P	24P-177.5-180	177.5	180	0.037					222	36	53	11				
24P	24P-182.5-185	182.5	185	0.03					181	45	50	5				
24P	24P-187.5-190	187.5	190	0.027					169	37	52	11				
24P	24P-192.5-195	192.5	195	0.03					189	40	52	8				
24P	24P-197.5-200	197.5	200	0.027					271	38	49	13				
24P	24P-202.5-205	202.5	205	0.04					557	40	52	8				
24P	24P-207.5-210	207.5	210	0.031					535	36	59	5				
24P	24P-212.5-215	212.5	215	0.028					236	23	61	16	9	8	59	
24P	24P-217.5-220	217.5	220	0.03					184	24	64	12				
24P	24P-222.5-225	222.5	225	0.044					180	16	69	15				
24P	24P-227.5-230	227.5	230	0.044					186	17	78	5				
24P	24P-232.5-235	232.5	235	0.043					195	21	65	14				
24P	24P-237.5-240	237.5	240	0.053					220	23	65	12				
24P	24P-242.5-245	242.5	245	0.03					249	33	62	5				
24P	24P-247.5-250	247.5	250	0.023					226	25	55	20				
24P	24P-252.5-255	252.5	255	0.039					309	23	60	17				
24P	24P-257.5-260	257.5	260	0.02					270	12	71	17				
24P	24P-262.5-265	262.5	265	0.022					171	12	69	19				
24P	24P-267.5-270	267.5	270	0.029					266	10	73	17				
24P	24P-272.5-275	272.5	275	0.043					285	14	67	19				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
24P	24P-277.5-280	277.5	280	0.06					379	6	58	36				
24P	24P-282.5-285	282.5	285	0.054					339	25	55	20				
24P	24P-287.5-290	287.5	290	0.034					275	17	58	25				
24P	24P-292.5-295	292.5	295	0.036					262	18	58	24				
24P	24P-297.5-300	297.5	300	0.039					249	19	57	24				
24P	24P-302.5-305	302.5	305	0.034					214	19	55	26				
24P	24P-307.5-310	307.5	310	0.031					180	33	53	14	7	10	55	
24P	24P-312.5-315	312.5	315	0.044					243	20	55	25				
24P	24P-317.5-320	317.5	320	0.033					231	27	58	15				
24P	24P-322.5-325	322.5	325	0.065					370	17	51	32	13	19	52	
24P	24P-327.5-330	327.5	330	0.05					262	22	51	27				
24P	24P-332.5-335	332.5	335	0.027					192	21	58	21				
24P	24P-337.5-340	337.5	340	0.034					190	22	55	23				
24P	24P-342.5-345	342.5	345	0.027					188	22	58	20				
24P	24P-347.5-350	347.5	350	0.029					196	17	59	24				
24P	24P-352.5-355	352.5	355	0.024					176	20	63	17				
24P	24P-357.5-360	357.5	360	0.026					209	24	59	17				
24P	24P-362.5-365	362.5	365	0.03					231	22	62	16				
24P	24P-367.5-370	367.5	370	0.029					198	24	63	13				
24P	24P-372.5-375	372.5	375	0.033					191	18	55	27				
24P	24P-377.5-380	377.5	380	0.031					205	17	62	21				
24P	24P-382.5-385	382.5	385	0.034					196	18	61	21				
24P	24P-387.5-390	387.5	390	0.047					201	21	53	26	14	11	51	
24P	24P-392.5-395	392.5	395	0.036					218	22	60	18				
24P	24P-397.5-400	397.5	400	0.039					208	21	60	19				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
24P	24P-405-410	405	410	0.059						Censored	Censored	Censored				
24P	24P-415-420	415	420	0.054						Censored	Censored	Censored				
27P	BCS00040451	2.5	5	0.01					328	10	76	14				
27P	BCS00040453	7.5	10	0.013					1365	42	52	6				
27P	BCS00040455	12.5	15	0.028					904	19	73	8				
27P	BCS00040457	17.5	20						369	37	56	7				
27P	BCS00040459	22.5	25	0.016					209	28	66	6	2	3	65	
27P	BCS00040461	27.5	30	0.015					262	27	61	12				
27P	BCS00040463	32.5	35	0.012					306	26	58	16				
27P	BCS00040465	37.5	40	0.016					283	30	60	10				
27P	BCS00040467	42.5	45	0.01					324	28	61	11				
27P	BCS00040469	47.5	50	0.016					341	25	62	13				
27P	BCS00040471	52.5	55	0.013					346	28	59	13				
27P	BCS00040473	57.5	60	0.013					356	27	58	15				
27P	BCS00040475	62.5	65	0.021					418	24	63	13				
27P	BCS00040477	67.5	70	0.017					332	26	61	13	5	3	55	
27P	BCS00040479	72.5	75	0.022					428	25	55	20				
27P	BCS00040481	77.5	80	0.026					419	26	51	23				
27P	BCS00040483	82.5	85	0.023					394	20	59	21	10	10	57	
27P	BCS00040485	87.5	90	0.022					363	9	67	24				
27P	BCS00040487	92.5	95	0.019					371	12	65	23				
27P	BCS00040489	97.5	100	0.018					345	20	64	16				
27P	BCS00040491	102.5	105	0.011					347	23	60	17				
27P	BCS00040493	107.5	110	0.023					334	22	59	19				
27P	BCS00040495	112.5	115	0.057					419	18	51	31				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
27P	BCS00040497	117.5	120	0.062					489	17	41	42	26	15	43	
27P	BCS00040499	122.5	125	0.042					640	19	57	24				
27P	BCS00040501	127.5	130	0.069					777	15	46	39				
27P	BCS00040503	132.5	135	0.087					505	15	35	50	15	24	43	
27P	BCS00040505	137.5	140	0.04					438	18	43	39				
27P	BCS00040507	142.5	145	0.034					502	20	42	38				
27P	BCS00040509	147.5	150	0.029					465	19	61	20				
27P	BCS00040511	152.5	155	0.026					561	13	48	39				
27P	BCS00040513	157.5	160	0.033					739	11	67	22	Censored	Censored	Censored	
27P	BCS00040515	162.5	165	0.058					479	10	64	26				
27P	BCS00040517	167.5	170	0.054					991	18	58	24				
27P	BCS00040519	172.5	175	0.042					992	14	55	31				
27P	BCS00040521	177.5	180	0.037					736	12	64	24				
27P	BCS00040524	185	190	0.019												
27P	BCS00040526	195	200	0.004												
27P	BCS00040528	202.5	207.5	0.017												
27P	BCS00040530	212.5	220	0.026												
27P	BCS00040532	225	230	0.032												
27P	BCS00040534	235	240	0.028												
27P	BCS00040536	245	250	0.021												
27P	BCS00040538	255	260	0.018												
27P	BCS00040540	265	270	0.014												
27P	BCS00040542	275	280	0.026												
27P	BCS00040544	285	290	0.014												
27P	BCS00040546	295	300	0.018												

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
27P	BCS00040548	305	310	0.016												
27P	BCS00040550	315	320	0.008												
27P	BCS00040552	325	330	0.034												
27P	BCS00040554	335	340	0.033												
27P	BCS00040556	345	350	0.018												
27P	BCS00040558	355	360	0.01												
27P	BCS00040560	365	370	0.022												
27P	BCS00040562	375	380	0.018												
27P	BCS00040564	385	390													
27P	BCS00040566	395	400	0.004												
27P	BCS00040568	405	410	0.086												
27P	BCS00040570	415	420	0.007												
27P	BCS00040572	425	430	0.007												
27P	BCS00040574	435	440	0.023												
27P	BCS00040576	445	450	0.021												
27P	BCS00040578	455	460	0.017												
27P	BCS00040580	465	470	0.018												
27P	BCS00040582	475	480	0.015												
27P	BCS00040584	485	490	0.016												
27P	BCS00040586	495	500	0.02												
27P	BCS00040588	505	510	0.015												
27P	BCS00040590	515	520	0.012												
27P	BCS00040592	525	530	0.018												
27P	BCS00040594	535	540	0.022												
27P	BCS00040596	545	550	0.019												

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
27P	BCS00040598	555	560	0.021												
27P	BCS00040600	565	570	0.022												
27P	BCS00040602	575	580	0.019												
27P	BCS00040604	585	590	0.03												
27P	BCS00040606	595	600	0.04												
28P	BCS00040901	2.5	5	0.021					502	35	46	19				
28P	BCS00040903	7.5	10	0.022					1181	31	61	8				
28P	BCS00040905	12.5	15	0.033					582	28	59	13				
28P	BCS00040907	17.5	20	0.056					392	26	58	16				
28P	BCS00040909	22.5	25	0.028					152	32	62	6				
28P	BCS00040911	27.5	30	0.031					190	31	62	7				
28P	BCS00040913	32.5	35	0.027					153	29	63	8				
28P	BCS00040915	37.5	40	0.037					225	25	57	18				
28P	BCS00040917	42.5	45	0.018					165	35	60	5				
28P	BCS00040919	47.5	50	0.029					187	28	64	8				
28P	BCS00040921	52.5	55	0.02					183	26	64	10	6	7	61	
28P	BCS00040923	57.5	60	0.026					208	34	56	10				
28P	BCS00040925	62.5	65	0.019					206	36	55	9				
28P	BCS00040927	67.5	70	0.021					196	29	61	10				
28P	BCS00040929	72.5	75	0.018					233	34	49	17				
28P	BCS00040931	77.5	80	0.036					223	32	50	18				
28P	BCS00040933	82.5	85	0.055					333	25	56	19				
28P	BCS00040935	87.5	90	0.042					353	21	60	19				
28P	BCS00040937	92.5	95	0.038					386	39	49	12				
28P	BCS00040939	97.5	100	0.036					562	10	48	42				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
28P	BCS00040941	102.5	105	0.039					584	10	42	48	26	27	39	
28P	BCS00040943	107.5	110	0.022					483	11	44	45				
28P	BCS00040945	112.5	115	0.059					424	11	55	34				
28P	BCS00040947	117.5	120	0.041					349	12	66	22	11	13	64	
28P	BCS00040949	122.5	125	0.034					345	21	63	16				
28P	BCS00040951	127.5	130	0.045					314	8	63	29				
28P	BCS00040953	132.5	135	0.041					319	20	53	27				
28P	BCS00040955	137.5	140	0.044					493	14	55	31				
28P	BCS00040957	142.5	145	0.044					626	16	58	26				
28P	BCS00040959	147.5	150	0.034					486	13	60	27	Censored	Censored	Censored	
28P	BCS00040961	152.5	155	0.035					539	20	57	23				
28P	BCS00040963	157.5	160	0.044					386	31	62	7				
28P	BCS00040965	162.5	165	0.04					456	34	52	14				
28P	BCS00040967	167.5	170	0.043					412	9	70	21				
28P	BCS00040969	172.5	175	0.054					471	13	72	15	Censored	Censored	Censored	
28P	BCS00040971	177.5	180	0.037					498	18	49	33				
28P	BCS00040973	182.5	185	0.045					406	16	55	29				
28P	BCS00040975	187.5	190	0.034					441	32	52	16				
28P	BCS00040977	192.5	195	0.035					313	31	62	7				
28P	BCS00040979	197.5	200	0.028					317	31	63	6				
28P	BCS00040981	202.5	205	0.036					437	20	68	12	9	6	68	
28P	BCS00040983	207.5	210	0.035					378	19	64	17				
28P	BCS00040985	212.5	215	0.031					355	17	57	26				
28P	BCS00040987	217.5	220	0.03					386	14	57	29				
28P	BCS00040989	222.5	225	0.032					368	21	50	29				

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Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
28P	BCS00040991	227.5	230	0.045					461	18	55	27				
28P	BCS00040993	232.5	235	0.052					335	20	53	27				
28P	BCS00040995	237.5	240	0.037					253	18	60	22				
28P	BCS00040997	242.5	245	0.03												
28P	BCS00040999	247.5	250	0.025												
28P	BCS00041001	252.5	255	0.026												
28P	BCS00041003	257.5	260	0.031												
28P	BCS00041005	262.5	265	0.025												
28P	BCS00041007	267.5	270	0.024												
28P	BCS00041009	272.5	275	0.023												
28P	BCS00041011	277.5	280	0.029												
28P	BCS00041013	282.5	285	0.035												
28P	BCS00041014	285	290	0.041												
28P	BCS00041016	295	300	0.036												
28P	BCS00041018	305	310	0.023												
28P	BCS00041034	385	390	0.039												
28P	BCS00041036	395	400	0.025												
28P	BCS00041038	405	410	0.026												
28P	BCS00041020	315 ^a	320	0.022												
29P	29P-2.5-5	2.5	5	0.024					477	13	79	8				
29P	29P-7.5-10	7.5	10	0.014					1238	32	64	5				
29P	29P-12.5-15	12.5	15	0.022					742	23	64	13				
29P	29P-17.5-20	17.5	20	0.018					580	25	68	7				
29P	29P-22.5-25	22.5	25	0.015					0	5	88	6				
29P	29P-27.5-30	27.5	30	0.021					318	28	67	5				

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Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
29P	29P-32.5-35	32.5	35	0.023					166	16	78	6				
29P	29P-37.5-40	37.5	40	0.017					131	26	70	4				
29P	29P-42.5-45	42.5	45	0.014					118	28	67	6				
29P	29P-47.5-50	47.5	50	0.016					104	29	65	7				
29P	29P-52.5-55	52.5	55	0.02					84	31	62	7				
29P	29P-57.5-60	57.5	60	0.021					88	28	62	10				
29P	29P-62.5-65	62.5	65	0.024					182	47	46	7				
29P	29P-67.5-70	67.5	70	0.027					93	28	62	10	2	6	61	
29P	29P-72.5-75	72.5	75	0.027					179	23	68	9				
29P	29P-77.5-80	77.5	80	0.018					81	32	62	6				
29P	29P-82.5-85	82.5	85	0.031					226	33	55	11				
29P	29P-87.5-90	87.5	90	0.038					174	23	66	11				
29P	29P-92.5-95	92.5	95	0.035					155	40	50	10				
29P	29P-97.5-100	97.5	100	0.044					141	15	72	13				
29P	29P-102.5-105	102.5	105	0.043					324	32	57	11				
29P	29P-107.5-110	107.5	110	0.027					134	30	59	11				
29P	29P-112.5-115	112.5	115	0.046					137	37	53	10				
29P	29P-117.5-120	117.5	120	0.023					155	42	50	8				
29P	29P-122.5-125	122.5	125	0.038					182	35	56	9				
29P	29P-127.5-130	127.5	130	0.048					125	21	63	16	4	8	66	
29P	29P-132.5-135	132.5	135	0.036					159	40	46	13				
29P	29P-137.5-140	137.5	140	0.048					142	33	53	14				
29P	29P-142.5-145	142.5	145	0.038					100	31	55	14				
29P	29P-147.5-150	147.5	150	0.043					88	33	59	8				
29P	29P-152.5-155	152.5	155	0.037					92	34	51	14				

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Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
29P	29P-157.5-160	157.5	160	0.034					87	34	55	11				
29P	29P-162.5-165	162.5	165	0.033					138	27	54	19	Censored	Censored	Censored	
29P	29P-167.5-170	167.5	170	0.043					99	32	57	11				
29P	29P-172.5-175	172.5	175	0.045					73	28	60	12				
29P	29P-177.5-180	177.5	180	0.038					87	43	47	10				
29P	29P-182.5-185	182.5	185	0.039					92	31	50	19	Censored	Censored	Censored	
29P	29P-187.5-190	187.5	190	0.037					76	31	55	14				
29P	29P-192.5-195	192.5	195	0.026					120	28	59	13				
29P	29P-197.5-200	197.5	200	0.036					68	37	52	10				
29P	29P-202.5-205	202.5	205	0.033					91	26	59	15				
29P	29P-207.5-210	207.5	210	0.067					150	31	54	15				
29P	29P-212.5-215	212.5	215	0.052					77	38	52	10				
29P	29P-217.5-220	217.5	220	0.077					66	37	56	7				
29P	29P-222.5-225	222.5	225	0.029					125	26	59	14				
29P	29P-227.5-230	227.5	230	0.045					91	36	56	8				
29P	29P-232.5-235	232.5	235	0.062					83	30	62	7	Censored	Censored	Censored	
29P	29P-237.5-240	237.5	240	0.047					86	26	56	18				
29P	29P-242.5-245	242.5	245	0.05					73	38	51	11				
29P	29P-247.5-250	247.5	250	0.069					87	34	51	15				
29P	29P-252.5-255	252.5	255	0.057					126	38	50	12				
29P	29P-257.5-260	257.5	260	0.05					66	47	43	10				
29P	29P-262.5-265	262.5	265	0.046					207	32	58	10				
29P	29P-267.5-270	267.5	270	0.044					86	26	57	16				
29P	29P-272.5-275	272.5	275	0.018					98	36	51	13				
29P	29P-277.5-280	277.5	280	0.03					68	35	48	17				

Appendix H
Results of Analyses by Nevada GeoTech, Inc., on Drill Cuttings
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Depth Interval (feet bgs)		Gravimetric Water Content (g/g)	Volumetric Water Content (cm ³ /cm ³)		Specific Gravity (g/cm ³)	Dry Bulk Density (g/cm ³)	Electrical Conductivity of Soil-Water Extract (μmhos/cm)	Wet Sieve (%)			Hydrometer (%)			Saturated Hydraulic Conductivity (cm/sec)
		From	To		Field Sample	Saturated Sample				Gravel	Sand	Fines	Silt	Clay	Total Sand	
29P	29P-282.5-285	282.5	285	0.06					132	38	42	19	7	8	62	
29P	29P-287.5-290	287.5	290	0.049					103	40	47	13				
29P	29P-292.5-295	292.5	295	0.101					128	35	54	11				
29P	29P-297.5-300	297.5	300	0.085					162	33	53	14				
29P	29P-302.5-305	302.5	305	0.061					166	27	59	15				
29P	29P-307.5-310	307.5	310	0.057					171	25	60	15				
29P	29P-312.5-315	312.5	315	0.066					284	37	50	14				
29P	29P-317.5-320	317.5	320	0.094					291	39	46	15				
29P	29P-325-330	325	330	0.078												
29P	29P-335-340	335	340	0.073												
29P	29P-345-350	345	350	0.054												
29P	29P-355-360	355	360	0.046												

^aWet sample - 320 - 380 feet due to injection water.

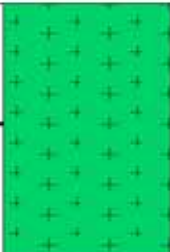
APPENDIX I SUMMARY LITHOLOGIC LOGS

Summary Lithologic Log for Borehole 27P

NWRRPO-2004-04

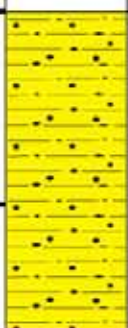
Depth	LITHOLOGY	DESCRIPTION
(in feet)		
0		(0 to 45 feet [ft]) WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC): The interval consists almost totally of layers of well-graded sand with silt, clay and gravel (SW-SM/SC). Fines display no plasticity. Gravel clasts are volcanic in origin, with grain shape predominantly subrounded and locally subangular. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish brown (10YR 5/4). No cementation is observed. Sediments react strongly to 10 percent (%) hydrochloric acid (HCl). All samples are dry.
100		(45 to 182.5 ft) SILTY, CLAYEY SAND WITH GRAVEL (SM/SC): The interval consists primarily of layers of silty, clayey sand with gravel (SM/SC). A layer of sandy clay with gravel (CL) occurs from 132.5 to 135 ft. Fines display no plasticity from 45 to 170 ft, and no to moderate plasticity from 170 to 182.5 ft. Gravel clasts are volcanic in origin and predominantly rounded. A zone of subrounded to subangular gravel clasts is observed from 50 to 57.5 ft. Sediment colors range from predominantly yellowish red (5YR 5/6) to reddish brown (5YR 5/4), reddish gray (5YR 5/2), dark grayish brown (10YR 4/2), and yellowish brown (10YR 5/4). No cementation is observed. Sediments react strongly to 10% HCl. Samples are dry from 45 to 160 and 175 to 180 ft, moist from 170 to 175 and 180 to 182.5 ft, and wet from 160 to 170 ft.
200		(182.5 to 202.5 ft) ASH-FALL TUFF (RAINIER MESA TUFF): The tuff is moderate orange pink (5YR 8/4), nonwelded, and vitric with an open/porous matrix. The unit appears slightly weathered throughout the interval. The upper section from 182.5 to 195 ft may be intercalated with alluvium. The tuff contains 40 to 50% light brown (5YR 5/6) glassy pumice clasts up to 12 millimeters (mm) in diameter, 2% grayish brown (5YR 3/2) lithic clasts up to 3 mm in diameter, 5% very light gray (N8) quartz phenocrysts up to 3 mm in long, 5% pale greenish yellow (5Y 8/1) feldspar phenocrysts up to 3 mm long, and 2 to 4% black (N1) biotite phenocrysts up to 2 mm long. The tuff unit is an unconsolidated, ash-rich air fall that may be a pre-Rainier Mesa tuff unit. The base lies in sharp contact with the underlying ash-flow tuff.
300		(202.5 to 355 ft) ASH-FLOW TUFF (TIVA CANYON TUFF): Tuff colors range from grayish brown (5YR 3/2) to medium gray (N5) to dark yellowish orange (10YR 6/6). The tuff is nonwelded to densely welded and devitrified. The tuff is slightly weathered from 202.5 to 212.5 ft. The matrix is dense/nonporous, except for the nonwelded base from 350 to 355 ft, which has an open/porous matrix. Three zones are distinguished and defined by the degree of welding and devitrification. The color changes correspond closely with the zones, which are as follows: 202.5 to 339 ft (LOWER NONLITHOPHYSAL ZONE): The zone is grayish brown (5YR 3/2), weakly to moderately welded, and devitrified. The zone contains 0 to 1% light gray (N7) pumice clasts up to 2 mm in diameter, up to 5% light gray (N7) lithic clasts up to 2 mm in diameter, up to 2% colorless quartz phenocrysts up to 2 mm in diameter, decreasing with depth, up to 3% colorless and light gray (N3) feldspar phenocrysts, predominantly sanidine, and 1 to 3% mafic minerals, mostly altered bronze biotite. The base of the zone from 325 to 339 ft is spherulitic and grades into the underlying densely welded vitrophyre. 339 to 349 ft (BASAL VITROPHYRE): The zone is medium gray (N5), densely welded, vitric, and displays perlitic textures. The unit contains 1% medium light gray (N6) feldspar. No pumice or lithic fragments are observed. A thin, blackish-brown clay zone is present from 348.5 to 349 ft. 349 to 355 ft (NONWELDED BASAL ZONE): The zone is dark yellowish orange (10YR 6/6), nonwelded, and devitrified. The unit is crystal- and fragment-poor, has a devitrified, ashy matrix, and contains "root beer bottle" glass shards. This zone lies in sharp contact with the underlying ash-fall tuff.
400		(355 to 400 ft) ASH-FALL TUFF (PRE-TIVA CANYON TUFF): The tuff is dark yellowish orange (10YR 6/6) from 355 to 375 ft and dusky yellow (5Y 6/4) from 375 to 400 ft. The unit is nonwelded and vitric with an open/porous matrix. The upper section from 355 to 375 ft is pumice-rich and contains 50% light yellowish gray (5Y 8/1) pumice clasts up to 20 mm in diameter. At 375 ft, pumice content and size decrease to 10% and 3 mm in diameter, respectively. The unit contains 1 to 3% light gray (N6) lithic clasts in the upper pumiceous section, up to 2% quartz phenocrysts up to 2 mm in diameter, some opalescent, 1 to 3% greenish gray (5GY 5/1) mafic minerals, and up to 2% colorless feldspar phenocrysts. Lithics become highly variable in color below 375 ft. This unit lies in sharp contact with the underlying ash-flow tuff.
500		(400 to 1,180 ft) ASH-FLOW TUFF (TOPOPAH SPRING TUFF): Six zones are identified in this unit and defined primarily by degree of vapor-phase alteration, degree of devitrification, and presence or absence of lithophysae. The matrix is dense/nonporous, except for the interval from 400 to 415 ft, which has an open/porous matrix. Samples are wet beyond 600 ft. Individual zones and colors are described below. 400 to 600 ft (UPPER NONLITHOPHYSAL ZONE): The zone color is variable and appears to be related to the degree of welding in the rock. Colors vary from light brownish gray (5YR 6/1) in the nonwelded top from 400 to 415 ft, to brownish gray (5YR 4/1) in the weakly and moderately welded section from 415 to 470 ft, to moderate brown (5YR 4/4) in the densely welded section from 470 to 600 ft. The zone is devitrified, except at 470 and 495 ft, where minor vapor-phase alteration is present. At 485 ft, calcite coatings appear on cooling joint faces. Pumice is largely absent except at 485 ft, where a few clasts appear that also contain trace biotite. There are 1 to 2% black (N1) and grayish black (N2) lithics from 400 to 500 ft. At 465 ft, pink reaction halos surround the lithic clasts. No lithic clasts are observed below 500 ft. The zone is crystal-poor, with 1% feldspar phenocrysts, trace quartz phenocrysts, and 1% mafics from 470 to 535 ft. 600 to 665 ft (UPPER LITHOPHYSAL ZONE): The zone colors range from moderate brown (5YR 4/4) to grayish red (10R 4/2) to pale brown (5YR 5/2) and contain 15 to 20% light gray (N8) to pinkish gray (10R 8/2) vapor-phase alteration as spots and rims on lithophysae. Lithophysae content varies from 10 to 15% throughout most the interval and decreases to 5% near the base, and are typically less than 10 mm long in drill cuttings. The zone is densely welded, contains no pumice or lithics, and is crystal-poor, with 1% quartz, 1% sanidine feldspar, and no mafics. A few sanidine phenocrysts are enveloped by vapor-phase mineralization. The lower contact is gradational with the underlying nonlithophysal zone. 665 to 740 ft (MIDDLE NONLITHOPHYSAL ZONE): The zone is pale brown (5YR 5/2), densely welded, and devitrified. Some clasts display spherulitic texture. Vapor-phase alteration and lithophysae are rare to absent. The zone contains no pumice, no lithics, and is crystal-poor, with 1% quartz, 1% mafics, and 1% feldspar. Fractures are typically smooth and planar and a few have a thin, 1-mm calcite coating. The lower contact is sharp with the underlying lithophysal zone. 740 to 1,015 ft (LOWER LITHOPHYSAL ZONE): The zone is mottled moderate brown (5YR 3/4), yellowish brown (10YR 5/2) and densely welded. Vapor-phase alteration comprises 20% of the zone and is present as very light gray (N7) to pale grayish red (10R 6/1) spots, streaks, veinlets, fracture surfaces, and lithophysal cavity coatings. Lithophysae comprise less than 5% of the zone and are elongate, with major axes typically less than 10 mm in drill cuttings. During borehole advancement in this zone, the driller reported numerous cavities up to 2 ft wide. Pumice is absent and small lithic clasts less than 5 mm long comprise less than 1% of the rock and have black (N1), glassy textures. Very light gray (N7) reaction rims surround a few lithic clasts and extend into the matrix 3 to 5 mm. The zone is crystal-poor with 1% anhedral quartz, rare biotite, and 1% feldspar. Euhedral sanidine is the predominant feldspar and is less than 3 mm long. Fractures are smooth and planar. The lower contact of the zone is gradational with the underlying nonlithophysal zone. 1,015 to 1,062 (LOWER NONLITHOPHYSAL ZONE): The zone grades downward from moderate brown (5YR 3/4) to a mottled light brown (5YR 5/6) and grayish brown (5YR 3/2) below 1,045 ft. The tuff is densely welded and devitrified. A remnant shard texture occurs throughout and is best preserved in the upper section where mottling has not obscured it. Vapor-phase mineralization is present in minor amounts and occurs as very thin, less than 1 mm veinlets and small, diffuse blebs. The rock tends to break along the veinlets. Pumice and lithic clasts are absent. Phenocrysts comprise 1% of the rock and consist of sanidine feldspar and quartz. Fractures are rough and irregular. The lower contact is sharp with the underlying zone. 1,062 to 1,180 ft (BASAL VITROPHYRE): Three subunits are distinguished in this zone and defined by degree of welding and devitrification. From 1,062 to 1,082 ft, the rock is composed of densely welded, dark gray (N3) and black (N1) glass. From 1,082 to 1,142 ft the rock is devitrified, moderate brown (5YR 3/4), and moderately welded. Devitrified, moderate orange pink (10R 7/4) pumice clasts begin appearing in this middle subunit, which contains up to 10% lithics composed of devitrified, crystal-poor volcanic clasts that are medium dark gray (N4) from 1,082 to 1,100 ft and varied in color from 1,100 to 1,142 ft. From 1,142 to 1,180 ft, the rock is devitrified, light brown (5YR 6/4), and nonwelded. Pumice clasts are undeformed in this lower subunit. Phenocrysts were observed only from 1,075 to 1,080 ft, where trace sanidine and rare biotite phenocrysts occur. The rock breaks along smooth irregular fractures, a few of which have thin coatings of pale-blue vapor-phase mineralization. The lower contact is sharp with the underlying ash-flow tuff.
600		
700		
800		
900		
1000		
1100		
1200		(1,180 to 1,355 ft) REWORKED ASH-FLOW TUFF, VOLCANICLASTIC SANDSTONE, AND ASH-FLOW TUFF (PRE-TOPOPAH SPRING BEDDED TUFF): The formation is light brown (5YR 6/4, 5/6) and becomes orange pink (5YR 8/4) and pale orange (10 YR 8/3) below 1,315 ft. Volcanic units are nonwelded, with an open/porous matrix. The formation is comprised of three units: an upper, reworked ash-flow sequence from 1,180 to 1,265 ft, a middle, immature volcaniclastic conglomeratic sandstone from 1,265 to 1,315 ft that grades downward into volcaniclastic sandstone from 1,315 to 1,325 ft, and an altered, basal, reworked ash-flow tuff from 1,325 to 1,355 ft. The formation is highly weathered and the ashy matrix material is argillic and poorly recovered. The upper units from 1,180 to 1,325 ft are compositionally related and represent volcaniclastic reworking of a felsic pumice- and

Summary Lithologic Log for Borehole 27P

1300		lithic-rich ash-flow sequence. The textural and compositional maturity of the sedimentary units increases with depth. The upper reworked tuff from 1,180 to 1,265 ft is phenocryst-poor and contains 10 to 25% variably colored lithic clasts, including glassy porphyritic lava flow fragments. The matrix ash is essentially non-recovered. The reworked tuff grades into volcanoclastic conglomeratic sandstone at approximately 1,265 ft. The matrix material becomes clastic, well-sorted, and rounded. The volcanoclastic sandstone consists of well-sorted, sand-sized grains of reworked phenocrysts of quartz and feldspar, pumice, and lithic clasts. The basal unit from 1,325 to 1,355 ft consists of an argillically altered reworked tuff with poor recovery of an altered ashy component. The reworked tuff contains 10% white (N9) pumice clasts up to 3 mm in diameter, 5% variably colored lithic clasts up to 2 mm in diameter, 5% light gray (N7) quartz phenocryst up to 1 mm in diameter, 2% white (N9) feldspar phenocrysts, and 1% grayish black (N2) biotite phenocrysts. The rock is in sharp contact with the underlying ash-flow tuff.
1400		(1,355 to 1,765 ft) ASH-FLOW TUFF (PROW PASS TUFF): The tuff ranges in color from grayish orange pink (5YR 7/2) from 1,355 to 1,500 ft, light brownish gray (5YR 6/1) from 1,500 to 1,585 ft, light gray (N7) from 1,585 to 1,630 ft, pinkish gray (5YR 6/1) from 1,630 to 1,645 ft, reddish pink (5YR 6/4, 7/4) from 1,645 to 1,655 ft, grayish orange (10YR 8/3, 7/3) from 1,655 to 1,760 ft and reddish brown (10YR 4/6) from 1,760 to 1,765 ft. The tuff is nonwelded from 1,355 to 1,500 ft, weakly to moderately welded from 1,500 to 1,640 ft, and nonwelded below 1,640 ft. The tuff is devitrified throughout the interval, with weakly developed vapor-phase alteration from 1,400 to 1,415 ft and 1,450 to 1,455 ft. The tuff unit is moderately weathered from 1,355 to 1,400 ft, slightly weathered from 1,400 to 1,500 ft and unweathered from 1,500 to 1,760 ft. The basal contact zone from 1,760 to 1,765 ft is highly weathered and oxidized. The tuff matrix is open/porous except from 1,635 to 1,675 ft, where it displays a dense/nonporous matrix due to zeolitic alteration. Based on color, phenocrysts, lithic clast type, and geophysical response (i.e. gamma, resistivity, sonic, and density), the tuff is divided into an upper ash-flow unit from 1,355 to 1,630 ft and a lower ash-flow unit from 1,630 to 1,765 ft. The upper unit is generally pumice-poor, with up to 1% light gray (N7) and pinkish gray (5YR 8/1) pumice clasts up to 8 mm in diameter. Two sections are pumice-rich. From 1,400 to 1,440 ft, the upper unit has 5 to 30% light gray (N7) pumice clasts up to 15 mm in diameter and from 1,560 to 1,630 ft the unit has 5 to 15 % pinkish gray (5YR 8/1) and pale orange (10YR 8/2) pumice clasts up to 10 mm in diameter. The upper unit contains 1 to 25% variably colored, mostly dark gray (N3) and brown (5YR 6/1) lithic clasts up to 15 mm in diameter and locally distinctive dark red (5R 2/6) siltstone lithic clasts up to 25 mm in diameter. The upper unit is generally phenocryst-poor and contains 1% colorless and very light gray (N8) quartz phenocrysts up to 3 mm in diameter from 1,480 to 1,520 ft, up to 2% colorless, predominantly sanidine, feldspar up to 3 mm long, and locally up to 2% grayish black (N2) and bronze biotite up to 3 mm long. The lower unit from 1,630 to 1,765 ft is pumice- and lithic-rich, which imparts a distinctive punky texture that is especially well-developed between 1,660 and 1,720 ft. The lower unit contains 5 to 30% variably colored pumice clasts, predominantly grayish yellow (5Y 8/4) and yellowish orange (10YR 8/6) up to 12 mm in diameter, and 5 to 40% variably colored brown (5YR) and reddish brown (5R) lithic clasts, including siltstone, up to 10 mm in diameter. The lower unit also contains 1% colorless and very light gray (N8) quartz phenocrysts up to 2 mm in diameter from 1,640 to 1,670 ft and 1,700 to 1,735 ft, 2 to 5% colorless feldspar phenocrysts up to 3 mm long, and locally 1% grayish black (N2) biotite up to 1 mm long. Zeolitic alteration in the upper section of the lower unit from 1,645 to 1,655 ft replaces pumice clasts and matrix and imparts a reddish pink (5R 3/4, 5R 8/4) color to the zone. The basal zone from 1,760 to 1,765 ft is strongly oxidized and reddish brown (10YR 7/3, 10YR 4/6). The lower contact with the underlying ash-flow tuff is sharp.
1500		
1600		
1700		
1800		(1,765 to 1,900 ft Total Depth) ASH-FLOW TUFF (BULLFROG TUFF): This tuff ranges in color from light brownish gray (5YR 6/1) from 1,765 to 1,855 ft to moderate brown (5YR 3/4) below 1,855 ft. The tuff is weakly welded from 1,765 to 1,815 ft, moderately welded from 1,815 to 1,885 ft, and densely welded from 1,885 to 1,900 ft. The tuff matrix is devitrified, with weak vapor-phase alteration beginning at 1,800 ft and increasing with depth. The tuff is unweathered, except for a slightly weathered 5-ft interval from 1,765 to 1,770 ft at the top of the unit. The tuff has an open/porous matrix from 1,765 to 1,815 ft and a dense/nonporous matrix below 1,815 ft. The tuff can be informally divided into an upper lithic-rich and crystal-poor zone from 1,765 to 1,830 ft and a lower crystal-rich zone from 1,830 to 1,900 ft. The tuff contains 1% light brownish gray (5YR 6/1) to grayish red (5R 4/2) to light gray (N7) pumice clasts up to 10 mm in diameter from 1,800 to 1,855 ft; 1 to 3% black (N2) and brown (5YR 3/4) lithic clasts up to 5 mm in diameter; 1 to 2% light gray (N8) to dark gray (N4) quartz phenocrysts up to 2 mm in diameter from 1,775 to 1,900 ft; 1 to 2% colorless feldspar, mostly sanadine, phenocrysts up to 3 mm long from 1,765 to 1,830 ft, increasing to 8 to 10% beyond 1,830 ft; and 1 to 3% black (N2) and bronze biotite up to 4 mm long. Scattered weak reaction to 10% HCl is observed from 1,840 to 1,845 ft and 1,890 to 1,900 ft.
1900		

Summary Lithologic Log for Borehole 16P

NW/PO-2004-04

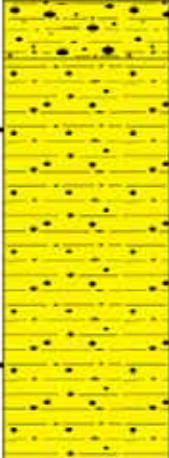
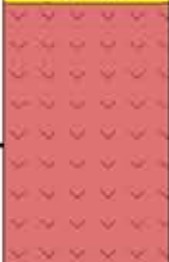
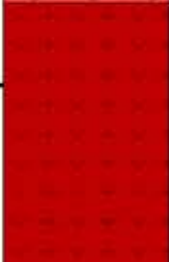
Depth	LITHOLOGY	DESCRIPTION
1in/100ft		
0		(0-166 feet [ft]) SILTY, CLAYEY SAND WITH GRAVEL (SM/SC): The interval consists primarily of layers of silty, clayey sand with gravel (SM/SC) with a layer of sandy clay (CL) from 67.5 to 75 ft. Fines typically display no plasticity. Gravel clasts are volcanic in origin and subangular to angular from 0 to 5 ft, and rounded to subrounded from 5 to 166 ft. Sediment color is predominantly yellowish brown (10YR 5/4) to reddish brown (5YR 4/4), very dark gray (N3), dark gray (N4), and dark grayish brown (10YR 4/2). No cementation is observed. Sediments react strongly with 10 percent (%) hydrochloric acid (HCl). All samples are dry.
100		
200		(166 to 395 ft) ASH-FLOW TUFF (PRE-AMMONIA TANKS TUFF): The tuff is light brown (5YR 5/6) from 166 to 240 ft, dark yellowish orange (10YR 6/6) from 240 to 360 ft, and moderate orange pink (5YR 8/4) from 360 to 395 ft. The tuff is nonwelded, devitrified, and has an open/porous matrix. The unit is moderately weathered from 166 to 200 ft, slightly weathered from 200 to 240 ft, unweathered from 240 to 300 ft, and slightly weathered from 300 ft to 395 ft. The tuff contains 0 to 3% white (N9), orange pink (5YR 8/4), and pale orange (10YR 8/2) pumice clasts up to 20 millimeters (mm) in diameter with a pumice-rich (i.e., up to 50% pumice) zone from 360 to 370 ft and 1 to 5% reddish brown (10R 3/4) and dusky yellowish brown (10YR 2/2) lithic clasts up to 12 mm in diameter from 165 to 300 ft. The tuff is lithic-rich from 300 to 360 ft, with 5 to 20% variably colored clasts, mostly dusky yellowish brown (10YR 2/2), probably Paintbrush Tuff, up to 20 mm in diameter and up to 3% variably colored lithic clasts up to 10 mm in diameter from 360 to 395 ft. The tuff is phenocryst-poor with up to 1% colorless sanidine, including chatoyant sanidine, up to 3 mm long, up to 1% colorless quartz up to 3 mm in diameter. The interval from 200 to 300 ft contains 1% black and bronze biotite up to 3 mm long. A weak reaction to 10% HCl is observed in the first 5 feet of the unit. All samples are dry. The lower contact is gradational with the underlying ash-flow tuff.
300		
400		(395 to 720 ft) ASH-FLOW TUFF (RAINIER MESA TUFF): The tuff is light brownish gray (5YR 6/1) from 395 to 535 ft and medium light gray to very light gray (N6 to N8) below 535 ft. The tuff is nonwelded, devitrified, and has an open/porous matrix. The upper 5 ft from 395 to 400 ft is argillic and highly weathered; otherwise, the tuff is unweathered. The tuff contains up to 10% light brownish gray (5YR 6/1) to very pale orange (10YR 8/2) to medium light gray (N6) and very light gray (N8) angular and partially vitric pumice up to 12 mm in diameter, and 1 to 5% predominantly moderate brown (5YR 3/4) to grayish black (N2) lithic clasts up to 20 mm long. The unit is phenocryst-poor and has less than 2% feldspar, 1% quartz, and rare biotite. Samples show no reaction to 10% HCl. Moisture is noted from 405 to 410 and 480 to 495 ft. All samples are wet after 535 ft. The base of the unit is in sharp contact with the underlying ash-flow tuff.
500		
600		
700		
800		(720 to 876 ft) ASH-FLOW TUFF (RAINIER MESA TUFF): The tuff unit is composed of 3 subunits. Overall, the tuff is moderately weathered from 720 to 760 ft, highly weathered from 760 to 780 ft, moderately to slightly weathered from 780 to 795 ft, and fresh below 795 ft. The upper subunit from 720 to 762 ft is dark yellowish brown (10YR 2/2) to light brown (5YR 5/6) and nonwelded with an open/porous, altered matrix. Pumice clasts are replaced by cryptocrystalline silica. The upper subunit also contains 20% light brownish gray (5YR 6/1) pumice up to 20 mm in diameter, up to 5% variably colored lithic clasts up to 3 mm in diameter, 1% feldspar phenocrysts up to 2 mm long, 1% quartz phenocrysts up to 3 mm in diameter, and no mafic minerals. The middle subunit from 762 to 780 ft is pale reddish brown (10R 5/4) and consists of a clayey, matrix-supported, crystal ash tuff with no observed pumice or lithic clasts. It contains 15 to 20% feldspar phenocrysts up to 5 mm long and 15 to 20% quartz phenocrysts up to 2 mm in diameter. The matrix is intensely clay altered or argillized, and this subunit may represent a paleosol horizon. The lower subunit from 780 to 876 ft is a pale yellowish brown (10YR 6/2), homogeneous, nonwelded, devitrified, pumiceous tuff, with most of the pumice and lithic clasts completely to partially weathered out, imparting the tuff with a distinctive porous texture. This subunit also has an open, porous matrix. The lower section is phenocryst-poor, with no observed feldspar, 1% quartz phenocrysts, and rare mafics. Samples show no reaction to 10% HCl. The lower contact is sharp with the underlying ash-flow tuff.
900		(876 to 1,065 ft) ASH-FLOW TUFF (TIVA CANYON TUFF): The tuff color ranges from grayish brown (5YR 3/2) to moderate brown (5YR 3/4). Color changes correspond approximately with changes in the degree of welding and the presence or absence of vapor-phase alteration. The tuff unit has a dense/non-porous matrix and a generally fresh and unweathered appearance. The zones are as follows: 876 to 900 ft (UPPER LITHOPHYSAL ZONE): The zone is grayish brown (5YR 3/2), moderately welded, vapor-phase altered, and crystal-poor. The zone contains 1% predominantly sanidine feldspar phenocrysts, rare quartz phenocrysts, 1% bronze biotite, and rare very pale orange (10YR 8/2) pumice clasts up to 4 mm in diameter. Vapor-phase mineralization fills lithophysal cavities and coats grain surfaces. 900 to 1,000 ft (MIDDLE NONLITHOPHYSAL ZONE): The zone is olive gray (5Y 4/1) to moderate brown (5YR 3/4), densely welded, devitrified, and crystal-poor. The zone contains 1% feldspar phenocrysts, rare quartz phenocrysts, and trace mafic minerals; rare medium light gray (N6) lithics clasts that are less than 4 mm in diameter, and no observed pumice clasts. 1,000 to 1,020 ft (LOWER LITHOPHYSAL ZONE): The zone is moderate brown (5YR 3/4), densely welded, vapor-phase altered, and crystal-poor. The zone contains 1% feldspar phenocrysts, rare medium light gray (N6) pumice clasts up to 20 mm in diameter, no observed quartz phenocrysts or mafic minerals, and no observed lithic clasts. Vapor-phase alteration occurs as thick grain coatings. Lithophysae are poorly developed. 1,020 to 1,045 ft (BASAL VITROPHYRE): The zone is moderate brown (5YR 3/4), densely welded, and vitric with spherulitic texture below 1,026 ft. Phenocrysts are rare and pumice clasts are vitric. The contact between the overlying devitrified zone and this vitric zone is gradational with the matrix becoming more vitric with depth. This lower vitric zone is poorly developed. The dark translucent glass typical of vitrophyres is altered and appears to be incipiently devitrified. 1,045 to 1,065 ft (NONWELDED BASAL ZONE): The zone is moderate brown (5YR 3/4), nonwelded, devitrified, and crystal-poor, with rare feldspar phenocrysts, no observed quartz phenocrysts, and no mafic minerals. The lower interval in this zone is similar in texture and color to the nonwelded basal zone at 27P from 349 to 355 ft, but lacks the well-developed glass shards. The lower contact is sharp with the underlying ash-fall tuff.
1000		
1100		(1,065 to 1,080 ft) ASH-FALL TUFF (PRE-TIVA CANYON TUFF): The tuff is moderate yellowish brown (10YR 5/4), nonwelded, vitric, weathered, and has an open/porous matrix. The tuff contains up to 30% yellowish gray (5Y 7/2) to moderate orange pink (5YR 8/4) pumice clasts less than 3 mm in diameter, 1% dusky brown (5YR 2/2) angular lithic clasts 5 to 10 mm long, and 1% sanidine feldspar. Quartz phenocrysts and mafic minerals are not observed. The rock is in sharp contact with the underlying ash-flow tuff.
1200		(1,080 to 1,810 ft) ASH-FLOW TUFF (TOPOPAH SPRING TUFF): The tuff color is variable and related to changes in the degree of welding and presence or absence of vapor-phase alteration. The degree of welding and vapor-phase alteration defines each subzone. The unit is predominantly devitrified, with zones of intense vapor-phase alteration. The matrix is dense, and nonporous except in the nonwelded zones. The zones are as follows: 1,080 to 1,085 ft (UPPER NONWELDED ZONE): The zone is moderate yellowish brown (10YR 5/4), nonwelded, pumice-rich with 10% altered, white (N9) pumice clasts, and lithic-poor with 1% multi-colored lithic clasts. 1,085 to 1,115 ft (CAPROCK ZONE): The zone is composed of dark reddish brown (10R 3/4), densely welded, and devitrified glass and contains 30% white (N9) to moderate orange pink (10R 7/4) pumice clasts less than 3 mm long, 15 to 20% feldspar phenocrysts up to 2 mm long, 15 to 20% quartz phenocrysts, and sparse biotite. 1,115 to 1,175 ft (UPPER NONLITHOPHYSAL ZONE): The zone is pale brown (5YR 5/2) in the upper section and grades downward to light brown (5YR 5/6) below 1,150 ft. Welding increases with depth from weak to moderate at 1,150 ft to dense at 1,155 ft. The upper section from 1,115 to 1,150 ft is crystal- and pumice-poor; the lower section from 1,150 to 1,175 ft is crystal-rich with 5% feldspar phenocrysts up to 2 mm long and 2% quartz phenocrysts up to 2 mm in diameter. 1,175 to 1,330 ft (UPPER LITHOPHYSAL ZONE): The zone is light brown (5YR 5/6), moderate to densely welded, and devitrified. Lithics and pumice are absent, except in the lower part of the interval from 1,300 to 1,330 ft, which contains 1% moderate brown (5YR 3/4) lithic clasts up to 5 mm in diameter. The zone is crystal-poor, with less than 2% combined feldspar and quartz phenocrysts. The zone is intensely vapor-phase altered. Vapor-phase mineralization coats cavities, alters pumice clasts, and extends outward into the groundmass. Lithophysae are not observed in drill cuttings. 1,330 to 1,400 ft (MIDDLE NONLITHOPHYSAL ZONE): The zone is grayish orange pink (5YR 7/2), moderately to densely welded, and crystal-poor. There is little to no pumice present and vapor-phase alteration is absent to minor (i.e., less than 1%). 1,400 to 1,595 ft (LOWER LITHOPHYSAL ZONE): The zone is mottled moderate brown (5YR 4/4) and medium gray (N5), moderately to densely welded, and crystal-poor. The interval is intensely vapor-phase altered. The tuff contains rare altered pumice the same color as the matrix; rare medium gray (N5) angular lithic clasts up to 4 mm long, a few of which are glassy; 1% feldspar phenocrysts with sanidine predominating; and 1% quartz phenocrysts from 1,400 to 1,440 ft. Quartz phenocrysts are absent below 1,440 ft. Lithophysae are absent; the zone is defined by the presence of intense vapor-phase alteration similar to that noted in the upper lithophysal zone. 1,595 to 1,723 ft (LOWER NONLITHOPHYSAL ZONE): The zone is mottled moderate brown (5YR 4/4) and light brown (5YR 4/6), moderate to densely welded, and crystal-poor. The zone contains rare grayish black (N2) to brownish black (5YR 2/1) lithic clasts up to 6 mm long, less than 1% feldspar phenocrysts, rare quartz phenocrysts, and no observed pumice or mafic minerals. Vapor-phase alteration is present as grain coatings, but lithophysae are not observed. The contact between the lower lithophysal and lower nonlithophysal zones is gradational and based principally on the style of alteration of the groundmass. Below the contact, the matrix appears to be finer grained or massive. 1,723 to 1,773 ft (BASAL VITROPHYRE): The zone alternates between black (N1) and moderate brown (5YR 5/6) and is densely welded and predominantly vitric, with subordinate incipient devitrified zones. The zone is aphanitic, with no observed pumice fragments, phenocrysts, or lithic fragments. Devitrified zones are partially argillically altered and possibly zeolitized. The highest degree of vitrification occurs in the middle of the zone from 1,755 to 1,760 ft.
1300		
1400		
1500		

July 2005

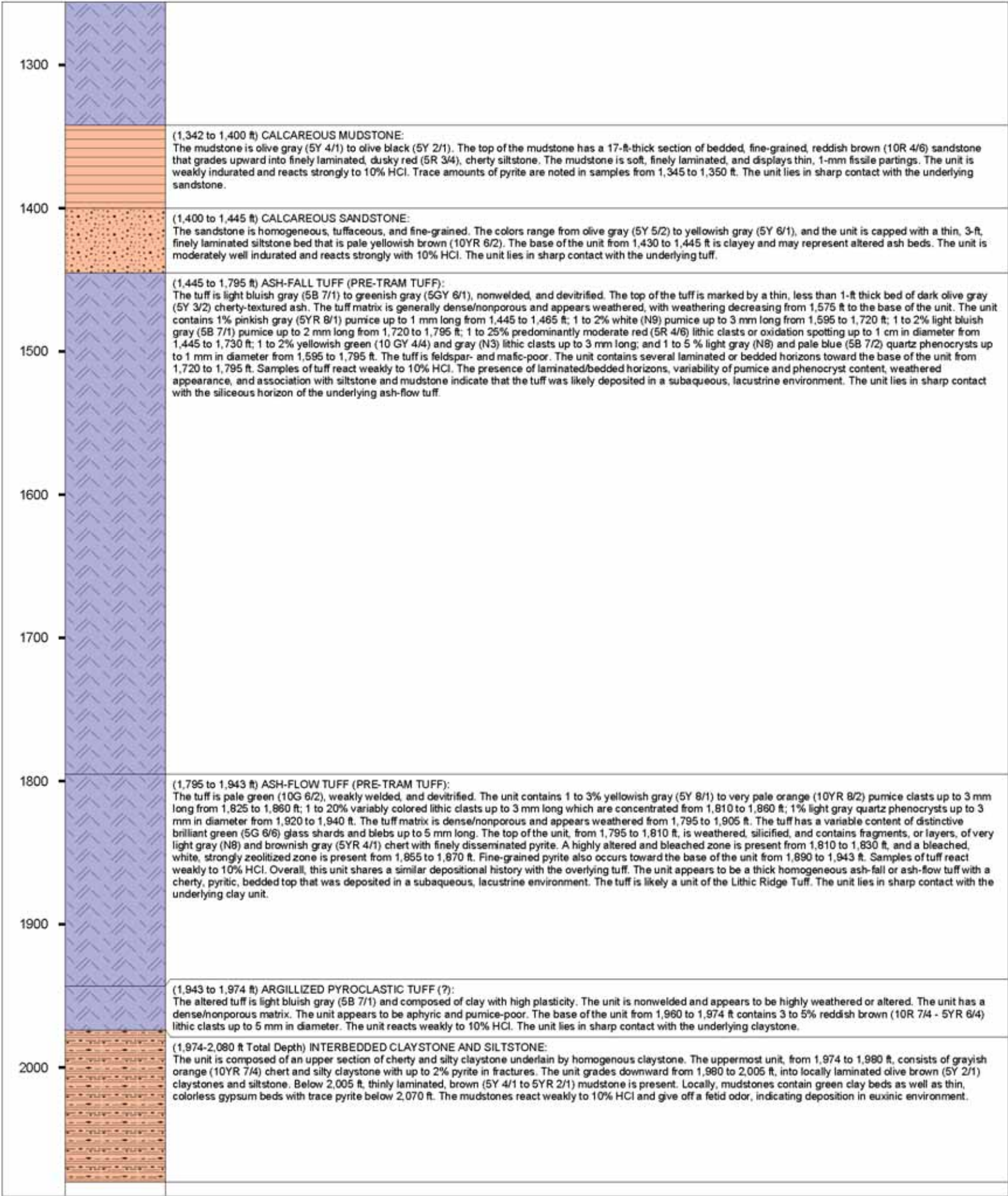
Summary Lithologic Log for Borehole 16P



Summary Lithologic Log for Borehole 28P

Depth ft. 80 ft	LITHOLOGY	DESCRIPTION
0		(0 to 45 feet (ft)) INTERBEDDED WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC) AND SILTY, CLAYEY SAND WITH GRAVEL (SM/SC). The interval consists of layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 12.5 ft thick interbedded with layers of silty, clayey sand with gravel (SM/SC) up to 7.5 ft thick. A thin layer of well-graded sand with gravel (SW) occurs from 42.5 to 45 ft. Fines display no plasticity. Gravel clasts are volcanic in origin, subangular from 0 to 17.5 ft, and subrounded from 17.5 to 45 ft. Sediment color is reddish brown (5YR 4/4). No cementation is observed. Sediments react strongly to 10 percent (%) hydrochloric acid (HCl). Samples are dry from 0 to 12.5 and 20 to 45 ft, and moist from 12.5 to 20 ft.
100		(45 to 70 ft) WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC). The interval consists primarily of layers of well-graded sand with silt, clay and gravel (SW-SM/SC). Fines display no plasticity. Gravel clasts are volcanic in origin and subrounded to subangular. Sediment color is reddish brown (5YR 4/4). No cementation is observed. Sediments react strongly with 10% HCl. All samples are dry. (70 to 240 ft) SILTY, CLAYEY SAND WITH GRAVEL (SM/SC). The interval consists primarily of silty, clayey sand with gravel (SM/SC). A uniform layer of silty, clayey sand without gravel (SM/SC) occurs from 97.5 to 117.5 ft. Fines display no to high plasticity. Gravel clasts are volcanic in origin and typically rounded to subangular. Sediment colors range from predominantly reddish brown (5YR 4/4) to yellowish red (5YR 5/6), light reddish brown (5YR 6/4), yellowish brown (10YR 5/4), dark grayish brown (10YR 4/2), very pale brown (10YR 7/4), and light brownish gray (10YR 6/2). No cementation is observed. Sediments typically react strongly to 10% HCl, however, a zone of weak reaction to 10% HCl is observed from 232.5 to 237.5 ft. All samples are dry.
200		
300	 	(240 to 405 ft) ASH-FLOW TUFF (AMMONIA TANKS TUFF). The tuff colors are highly variable and range from pale yellowish brown (10YR 6/2) to grayish orange (10YR 7/4), very pale orange (10YR 8/2), light gray (N7), light brownish gray (5YR 6/1), pinkish gray (5YR 8/1), and pale yellowish brown (10YR 6/2). The tuff is non to weakly welded, displays vitric textures from 240 to 300 ft, and is devitrified from 300 to 405 ft. The tuff has an open/porous matrix and contains 5 to 10% pinkish gray (5YR 8/1) and light gray (N8) pumice clasts up to 1 centimeter (cm) in diameter, 1% dark grayish red (10R 3/4) lithic clasts up to 1 cm in diameter from 240 to 300 ft, and no observed lithic clasts from 300 to 405 ft. The unit also contains 15 to 20% feldspar phenocrysts up to 0.5 millimeter (mm) long, with sanidine predominating, including chatoyant sanidine; 5% quartz phenocrysts up to 0.5 mm in diameter, a few displaying bipyramidal crystal habits, and up to 1% mafic minerals up to 1 mm long. Most samples display a weak reaction to 10% HCl. Samples are wet from 320 to 380 ft, due to injection water, and moist from 380 to 405 ft. Below 405 ft, all samples are wet. The unit lies in sharp contact with a possible paleosol developed on the underlying tuff.
400		(405 to 660 ft) ASH-FLOW TUFF (POST-RAINIER MESA TUFF). The tuff is predominantly light brown (5YR 6/4) to moderate reddish orange (10R 6/6), displays nonwelded textures, is vitric from 405 to 500 ft, and is devitrified from 500 to 660 ft. The tuff has an open/porous matrix and contains 20 to 30% grayish orange pink (10R 8/2) and yellowish gray (5Y 8/1) pumice clasts 2 to 5 mm in diameter, 15% moderate brown (5YR 3/4) to moderate reddish brown (10R 4/6) to dark reddish brown (10R 3/4) lithic fragments 2 to 5 mm in diameter, 15 to 20% feldspar phenocrysts, predominantly sanidine, up to 0.5 mm long, less than 5% quartz phenocrysts up to 0.5 mm in diameter, and 1% mafic minerals up to 0.5 mm long. Samples display a weak reaction to 10% HCl from 405 to 420, 500 to 580, and 610 to 630 ft. Several dark yellowish orange (10YR 6/6) and moderate reddish orange (10R 6/6) horizons are present at 405 to 415, 575 to 590, and 630 to 645 ft, which appear weathered and oxidized, display well-sorted clasts, have some clay alteration especially from 575 to 590 ft, and could represent paleosols. The unit contains large, grayish black (N2) lithic clasts up to 2 cm in diameter from 600 to 625 ft. The unit lies in sharp contact with a possible paleosol developed in the underlying tuff.
500		
600		
700		(660 to 765 ft) ASH-FLOW TUFF (RAINIER MESA TUFF). The tuff is grayish red (10R 4/2) to grayish orange pink (5YR 7/2), and light brownish gray (5YR 6/1), and is nonwelded and devitrified. The tuff has an open/porous matrix and contains 1% yellowish gray (5Y 8/1) pumice clasts up to 2 mm in diameter, less than 2% grayish black (N2) lithic fragments up to 2 mm in diameter, 15 to 30% feldspar phenocrysts, predominantly sanidine, up to 2 mm long that decrease to 3% at the base from 720 to 765 ft, 5% quartz up to 1 mm in diameter that includes bipyramidal quartz, and 1% mafic minerals. No reaction to 10% HCl is observed. The top of the unit from 660 to 665 ft contains a possible paleosol that is clayey and grayish red (10R 4/2). A well-sorted pumice fallout is present from 690 to 700 ft, with 50 to 60% pumice. The unit lies in sharp contact with a possible paleosol in the underlying ash-flow tuff.
800		
900		(765 to 920 ft) ASH-FLOW TUFF (POST-TIVA CANYON TUFF). The tuff is very pale orange (10YR 8/2), nonwelded, and devitrified. The tuff has an open/porous matrix and contains 1% moderate orange pink (10R 7/4) to moderate reddish orange (10R 6/6) pumice clasts up to 2 mm in diameter, 1% grayish black (N2) and dark reddish brown (10R 3/4) lithic clasts up to 1 cm in diameter from 765 to 835 ft that increase to 5% from 835 ft to the base of the unit at 920 ft, 1 to 3% feldspar phenocrysts generally 1 mm long, 5% quartz phenocrysts less than 1 mm in diameter, and 1% mafic minerals. No reaction to 10% HCl is observed. The upper 10 ft of the unit contains a deeply weathered pale reddish purple (5RP 6/2) clay-rich zone that is possibly a paleosol. The unit lies in sharp contact with the underlying tuff.
1000		(920 to 1,035 ft) ASH-FLOW TUFF (TIVA CANYON TUFF). The tuff is moderate brown (5YR 3/4) to a slightly lighter moderate brown (5YR 4/4), light brown (5YR 5/6), moderate yellowish brown (10YR 5/4), and grayish red (5R 4/2). The unit is densely welded and devitrified, has a dense/nonporous matrix, and contains 1 to 2% very light gray (N8) to white (N9) pumice clasts up to 1 mm in diameter. The unit is lithic-poor and contains 1 to 2% feldspar phenocrysts 1 to 3 mm long, less than 1% mafic minerals, and no quartz phenocrysts. No reaction to 10% HCl is observed. From 985 to 1,000 ft there are silica coatings (i.e., drusy quartz) on smooth planar fractures imparting a sparkling texture to the rock. The unit lies in sharp contact with the underlying tuff.
1100	 	(1,035 to 1,065 ft) ASH-FALL TUFF (PRE-TIVA CANYON TUFF). The tuff is moderate yellowish brown (10YR 5/4), nonwelded, and devitrified. It has an open/porous matrix and contains 10% grayish yellow (5Y 8/4) to light greenish gray (5GY 8/1) pumice up to 8 mm in diameter and 15% light brown (5YR 5/6) lithic clasts up to 3 mm in diameter. The unit is generally phenocryst-poor and contains 1 to 2% feldspar phenocrysts up to 0.5 mm long, no quartz phenocrysts, and no mafic minerals. No reaction to 10% HCl is observed. The top of the unit from 1,035 to 1,040 ft is orange (10R 6/6), oxidized and weathered, and possibly represents a paleosol. The tuff unit is weakly oxidized and possibly reworked. The base of the unit is in sharp contact with the underlying tuff. (1,065 to 1,145 ft) ASH-FLOW TUFF (TOPOPAH SPRING TUFF). The tuff is moderate yellowish brown (10YR 5/4) to light brown (5YR 5/6) to grayish red (5R 4/2). The unit is moderately welded from 1,065 to 1,100 ft, densely welded from 1,100 to 1,145 ft, devitrified throughout, and weakly argillic and weathered below 1,115 ft. The tuff is pumice- and lithic-poor and contains 1 to 2% feldspar phenocrysts up to 0.5 mm long, no observed quartz phenocrysts, and 1% mafic minerals. No reaction to 10% HCl is observed. A poorly developed vitric zone is present from 1,120 to 1,130 ft and contains black feldspar-porphyrific glass. The unit is in unconformable contact with the underlying weathered tuff.
1200		(1,145 to 1,342 ft) ASH-FLOW TUFF (PRE-TRAM TUFF). The tuff colors range from grayish orange (10YR 7/4) to grayish orange pink (10R 8/2), pale greenish yellow (10Y 8/2), light brown (5YR 6/4), pinkish gray (5YR 8/1), dusky red (5R 3/4) and grayish yellow (5Y 8/4). The unit is non to weakly welded, devitrified, and moderately to highly weathered to clay. Zeolitic alteration is also present locally. The unit contains 30 to 50% white (N9) to pinkish gray (5YR 8/1) pumice clasts that range in size from 5 to 10 mm, 1 to 15% reddish brown (10R 4/6) and light brown (5YR 5/6) lithic clasts up to 1 cm in diameter, 1 to 2% feldspar phenocrysts up to 0.5 mm long, no quartz, and a trace of mafic minerals. Samples react weakly to 10% HCl below 1,195 ft. The base of the unit lies in sharp contact with the underlying sedimentary rock.

Summary Lithologic Log for Borehole 28P



Summary Lithologic Log for Borehole 24P

Depth	LITHOLOGY	DESCRIPTION
ft/120ft		
0		(0 to 60 feet [ft]) INTERBEDDED WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC) AND SILTY, CLAYEY SAND WITH GRAVEL (SM/SC). The interval consists of layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 12.5 feet thick interbedded with thinner layers of silty, clayey sand with gravel (SM/SC). Fines in the SW-SM/SC layers typically display no plasticity, and fines in the SM/SC layers typically display no to low plasticity. Gravel clasts are volcanic in origin and subangular. Sediment colors range from predominantly yellowish brown (10YR 5/4) to brown (7.5YR 4/4, 5/2), gray (5YR 5/1) and light reddish brown (5YR 6/3). Cementation is observed to be moderate from 0 to 17.5 ft. No cementation is observed from 17.5 to 60 ft. Sediments reacted strongly to 10 percent (%) hydrochloric acid (HCl). All samples are dry.
100		(60 to 245 ft) WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC). The interval consists primarily of layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 17.5 ft thick. Lesser layers of well-graded sand with gravel (SW) and silty, clayey sand with gravel (SM/SC) are present, with the proportion of the latter increasing toward the base of the interval. Fines typically display no to low plasticity, with a zone of moderate plasticity from 200 to 210 ft. Gravel clasts are volcanic in origin and subrounded to subangular. Sediment colors range from predominantly reddish brown (5YR 4/3, 5/4) to light reddish brown (5YR 6/3), dark reddish brown (5YR 4/2), yellowish brown (10YR 5/6, 5/4), yellowish red (5YR 5/6), dark yellowish brown (10YR 4/4), brown (10YR 4/3), and grayish brown (10YR 5/2). No cementation is observed. Typically, sediments do not react to 10% HCl from 60 to 170 ft, and react strongly from 170 to 245 ft. Samples of drill cuttings are dry. Moisture is observed in drive core samples from 80, 120, 160, 200 and 240 ft.
200		
300		(245 to 400 ft) SILTY, CLAYEY SAND WITH GRAVEL (SM/SC). The interval consists primarily of layers of silty, clayey sand with gravel (SM/SC). Fines typically display low plasticity from 245 to 272.5 feet, and moderate to high plasticity from 272.5 to 400 ft. Gravel clasts are volcanic in origin and typically subangular to angular. Sediment colors range from predominantly light brown (7.5YR 6/4) to grayish brown (10YR 5/2), reddish brown (5YR 5/3, 5/4), and brown (7.5YR 5/4). Weak cementation is observed. Sediments react strongly to 10% HCl. Samples of drill cuttings are dry. Moisture is observed in drive core samples from 280, 320, and 360 ft.
400		
500		(400 to 890 ft) ASH-FLOW TUFF (BULLFROG TUFF). The tuff is moderate brown (5YR 3/4) to light brown (5YR 5/6), devitrified, and variably welded, with moderate welding from 400 to 505 ft, dense welding from 505 to 560 ft, moderate welding from 560 to 690 ft and 825 to 890 ft, and dense welding from 690 to 825 ft. A weak zone of spherulitic development occurs from 535 to 540 ft. The tuff matrix is open and porous from 400 to 440 ft and dense/nonporous from 440 to 890 ft. The tuff contains 10-20% very pale orange (10YR 8/2) pumice clasts up to 5 millimeters (mm) in diameter from 695 to 730 ft, and 1% pale yellowish orange (10YR 8/6) pumice clasts from 870 to 885 ft, 1 to 5% grayish brown (5YR 3/2) to black (N1) lithic clasts from 2 to 10 mm in diameter from 400 to 545 ft. Locally, from 545 to 890 ft, the tuff contains 2 to 10% light grey (N3-N8) lithic clasts from 3 to 15 mm in diameter. The tuff also contains 1 to 3% colorless feldspars up to 2 mm long, 2 to 5% light grey (N7) to colorless quartz phenocrysts up to 2 mm in diameter from 400 to 830 ft, 1% light grey (N7) to colorless quartz phenocrysts from 830 to 890 ft, and 1 to 5% greenish black (5GY 2/1) and black (N1) biotite up to 3 mm long and trace hornblende from 480 to 890 ft. Reaction with 10% HCl is observed where white calcite fills open fractures in samples from 525 to 530, 555 to 560, 580 to 585, 605 to 615, 655 to 665, 680 to 685, and 705 to 710 ft. The lower contact is sharp with the underlying sedimentary rock.
600		
700		
800		
900		(890 to 933 ft) SANDSTONE (PRE-BULLFROG TUFF SEDIMENTARY ROCKS). The interval consists of dark reddish brown (5YR 3/2 to 5YR 5/6) conglomeratic sandstone from 890 to 915 ft, grading into light brown (10YR 5/4) fine volcaniclastic sandstone from 915 to 933 ft. The conglomeratic section contains 15 to 85% gray (N4) and reddish brown (5YR 3/2) rounded volcanic pebbles and rare reddish brown (5YR 3/4) siltstone fragments. The sandstone is argillic, or zeolitic, and weathered. The lower contact is gradational with the underlying ash-flow tuff.
1000		(933 to 1,356 ft) ASH-FLOW TUFF (TRAM TUFF). The tuff is variable in color and ranges from pale orange (10YR 8/2) from 933 to 1,035 ft, reddish brown (10R 6/4) from 1,035 to 1,135 ft, light brown (5YR 5/6) from 1,135 to 1,200 ft, and grayish orange (5YR 7/2) from 1,200 to 1,356 ft. The tuff is devitrified, has an open/porous matrix, and is generally nonwelded, except for zones of weak welding at 1,005 to 1,010 ft, 1,030 to 1,040 ft and 1,100 to 1,115 ft. From 933 to 985 ft, the tuff is locally weakly to moderately weathered. From 985 to 1,356 ft, the tuff is unweathered. The tuff contains 10 to 20% moderate orange pink (5YR 8/4) to greenish grey (5GY 6/4) pumice clasts from 5 to 8 mm in diameter from 940 to 1,190 ft, 1 to 2% orange pink (5YR 8/4) to light brown (5YR 8/2) pumice clasts from 1 to 5 mm in diameter from 1,190 to 1,356 ft, 2 to 20% reddish brown (5YR 3/4) to gray (N5) lithic clasts from 2 to 10 mm in diameter from 933 to 1,190 ft, and 2 to 25% reddish brown (10R 4/6) to black (N1) lithic clasts from 2 to 10 mm in diameter from 1,190 to 1,356 ft. From 940 to 955, 1,120 to 1,190, and 1,220 to 1,240 ft, lithic clasts can comprise up to 25% of the tuff. The tuff also contains 1 to 2% colorless feldspars up to 2 mm long from 935 to 1,065 ft and 1,190 to 1,355 ft, 1 to 2% light gray (N5 to N8) to colorless quartz phenocrysts up to 3 mm in diameter, 1 to 3% greenish black (5GY 2/1) to black (N1) biotite up to 2 mm long from 933 to 1,140 ft, and 1% black (N1) biotite up to 1 mm long from 1,140 to 1,356 ft. No reaction to 10% HCl is observed. The lower contact is sharp with the underlying sedimentary rocks.
1100		
1200		
1300		
1400		(1,356 to 1,400 ft) VOLCANICLASTIC SEDIMENTARY ROCK (PRE-TRAM TUFF SEDIMENTARY ROCKS). The interval consists of variably colored calcareous volcaniclastic siltstone, claystone, and fine sandstones. The colors range from red (10R 4/6) from 1,356 to 1,366 ft to pale olive (10Y 6/2 to 5/4) from 1,366 to 1,400 ft. The sequence consists of an upper section of red siltstones and claystones from 1,356 to 1,359 ft overlying olive-colored, fine sandstones with siltstone beds from 1,366 to 1,400 ft. Typically, the sequence reacts strongly to 10% HCl.
1500		(1,400 to 1,480 ft) REWORKED TUFF (LITHIC RIDGE TUFF). The tuff is light olive (10Y 5/4) to olive gray (5T 3/2) from 1,400 to 1,425 ft, greenish yellow (10Y 7/4) from 1,425 to 1,430 ft, olive brown (5Y 4/4) from 1,430 to 1,455 ft, and dark yellowish orange (10YR 6/6) from 1,455 to 1,480 ft. The tuff is devitrified, nonwelded, has an open/porous matrix, and is moderately weathered from 1,400 to 1,430 ft. The tuff contains 1 to 3% yellowish green (10Y 6/6) pumice clasts up to 3 mm in diameter from 1,400 to 1,420 ft, 8 to 10% greenish yellow (5Y 8/4) pumice clasts up to 3 mm in diameter from 1,450 to 1,480 ft, 2 to 10% pale brown (5YR 5/2) to gray (N5) lithic clasts from 2 to 20 mm in diameter from 1,400 to 1,455 ft, and 10 to 50% gray (N5) to brownish black (5YR 2/1) lithic clasts from 6 to 20 mm in diameter from 1,455 to 1,480 ft. The tuff also contains up to 1% colorless feldspar phenocrysts up to 2 mm long from 1,400 to 1,455 ft, up to 10% light gray (N8) quartz phenocrysts up to 2 mm in diameter from 1,400 to 1,420 ft, and 1 to 2% black (N1) mafic minerals up to 1 mm long from 1,400 to 1,480 ft. The rock has no reaction to 10% HCl. The lower contact is gradational with the underlying ash-flow tuff, suggesting that the unit is a reworked tuff derived from the underlying unit.
1600		(1,480 to 1,722 ft) ASH-FLOW TUFF (LITHIC RIDGE TUFF). The tuff is highly variable in color, from dark yellowish orange (10YR 6/6) from 1,480 to 1,540 ft, moderate red (5R 5/4) from 1,540 to 1,600 ft, greyish orange (10YR 7/4) to moderate red (5R 5/4) from 1,600 to 1,655 ft, and moderate orange pink (10YR 7/4) from 1,655 to 1,722 ft. The tuff is devitrified, nonwelded, with an open/porous matrix. The tuff is moderately weathered from 1,480 to 1,500 ft, slightly weathered from 1,480 to 1,505 ft, and fresh from 1,505 to 1,722 ft. The tuff contains 10 to 20% pale brown (5Y 3/4) to pale orange (10Y 8/2) pumice clasts from 2 to 5 mm in diameter from 1,480 to 1,540 ft, 1 to 5% greenish yellow (10Y 8/2-7/4) pumice clasts to 4 mm in diameter from 1,540 to 1,722 ft decreasing in size and content with depth, and 5 to 10% moderate brown (5YR 4/4) to gray (N4, N5) lithic clasts up to 10 mm in diameter throughout the interval, with concentrations of 10 to 20% from 1,520 to 1,550 ft and 20 to 50% from 1,600 to 1,722 ft. The tuff also contains 1% and, locally, up to 5% light gray (N7) to colorless quartz phenocrysts up to 2 mm in diameter, 1% colorless feldspar phenocrysts from 1,510 to 1,710 ft, and 1 to 4% black (N1) mafic minerals up to 2 mm long from 1,480 to 1,722 ft. No reaction to 10% HCl is observed. The lower contact is gradational with the underlying weathered, clayey, sedimentary rocks.
1700		
1800		(1722 to 1860 ft Total Depth) CLAYSTONE, SILTSTONE, AND SANDSTONE (PRE-LITHIC RIDGE TUFF SEDIMENTARY ROCKS). The interval consists of a variably colored sequence of claystone, siltstone, and sandstone. The rocks are brown (5YR 6/4, 3/2 and 10YR 5/4, 3/4) from 1,722 to 1,795 ft and moderate brown (5YR 3/4) from 1,795 to 1,860 ft. From 1,722 to 1,760 ft, the interval consists predominantly of fine-grained volcaniclastic sandstone and layers of claystone, grading downward into predominantly finely laminated siltstones at 1,760 ft. Reaction to 10% HCl is variable with no reaction from 1,722 to 1,730 ft, weak reaction from 1,730 to 1,735 ft, strong reaction from 1,735 to 1,750 ft, weak reaction from 1,750 to 1,810 ft and strong reaction from 1,810 to 1,860 ft at the total depth. Trace amounts of gypsum are observed with the cuttings from 1,800 to 1,805 ft and 1,830 to 1,835 ft.

Summary Lithologic Log for Borehole 29P

Depth Feet	LITHOLOGY	DESCRIPTION
0		(0 to 125 feet [ft]) WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC) The interval consists primarily of layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 52.5 feet thick. Thin layers of well-graded sand with gravel (SW) occur from 7.5 to 10, 27.5 to 30, and 37.5 to 40 ft. Fines display low to moderate plasticity. Gravel clasts are volcanic in origin, rounded from 0 to 47.5 ft, and subrounded from 47.5 to 125 ft. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish red (5YR 5/6), reddish brown (5YR 4/4, 5/3), and dark reddish gray (5YR 4/2). Cementation ranges from none to moderate. Sediments react strongly to 10 percent (%) hydrochloric acid (HCl) from 0 to 35 ft, and display no reaction from 35 to 125 ft. All drill cuttings samples are dry. Moisture is observed in a drive core sample from 100 ft.
100		(125 to 265 ft) INTERBEDDED SILTY, CLAYEY SAND WITH GRAVEL (SM/SC) AND WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC). The interval consists of layers of silty, clayey sand with gravel (SM/SC) up to 17.5 ft thick interbedded with layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 7.5 ft thick. Fines display low to moderate plasticity. Gravel clasts are volcanic in origin, subangular from 125 to 180 ft, and subrounded from 180 to 265 ft. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish red (5YR 5/6), and brown (7.5YR 5/3). Cementation ranges from none to moderate. Sediments display no reaction to 10% HCl. Samples of drill cuttings are dry from 125 to 180 ft, and moist from 180 to 265 ft. Moisture is observed in a drive core sample from 180 ft.
200		(265 to 320 ft) SILTY, CLAYEY SAND WITH GRAVEL (SM/SC): The interval consists of a uniform sequence of silty, clayey sand with gravel (SM/SC). Fines display low to high plasticity. Gravel clasts are volcanic in origin, subangular from 265 to 312.5 ft, and angular from 312.5 to 320 ft. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish red (5YR 5/6), reddish brown (5YR 5/3), and light brown (7.5YR 6/4). Strong cementation is observed from 312.5 to 320 ft, with the remainder of the interval exhibiting no to weak cementation. Sediments display no reaction to 10% HCl from 265 to 305 ft, and display a weak to strong reaction from 305 to 320 ft. All samples are moist.
300		(320 to 378 ft) ASH-FLOW TUFF (TIVA CANYON TUFF): The tuff is dark brown (10YR 4/2), devitrified and densely welded from 320 to 370 ft, and moderately welded from 370 to 378 ft. The tuff is slightly weathered from 320 to 325 ft, unweathered from 325 to 375 ft, and moderately weathered from 375 to 378 ft. The tuff matrix is dense/nonporous from 325 to 365 ft and open/porous from 365 to 378 ft. The tuff contains 1% gray brown (10YR 6/2) pumice clasts up to 4 millimeters (mm) in diameter from 320 to 355 ft and 2 to 5% brown (5YR 3/4) pumice clasts 2 to 4 mm in diameter from 355 to 380 ft. The tuff is generally lithic poor, except from 335 to 345 ft, where there are 1% gray brown (10YR 6/4) lithic fragments up to 3 mm in diameter. The tuff also contains 1% colorless feldspar up to 3 mm long, 1 to 2% colorless to white (N9) quartz phenocrysts up to 3 mm in diameter from 340 to 360 and 370 to 378 ft, and 1 to 2% dark green (5GY 3/2) euhedral biotite phenocrysts up to 3 mm in diameter from 320 to 360 ft. Samples are dry to 355 ft, moist from 355 to 360 ft, and wet beyond 360 ft. The lower contact is sharp with the underlying ash-fall tuff.
400		(378 to 410 ft) ASH-FALL TUFF (PRE-TIVA CANYON TUFF): The tuff is light brown (10YR 5/4) from 378 to 400 ft and reddish brown (10R 5/4) from 400 to 410 ft. The tuff is nonwelded, devitrified, slightly weathered, and displays an open/porous matrix. The tuff is probably poorly consolidated. The tuff is pumiceous, with 5 to 20% light to dark brown (10YR 5/4-4/2) pumice clasts up to 12 mm in diameter and 2% olive gray (10Y 6/2) and dark brown (5YR 3/4) pumice clasts up to 4 mm in diameter. The tuff contains 2 to 5% colorless and chatoyant feldspar phenocrysts up to 4 mm long, 1% colorless quartz phenocrysts up to 3 mm long, and 1% dark brown (10YR 2/2) biotite crystals. The lower contact appears to be gradational with the underlying ash-flow tuff from 408 to 412 ft.
500		(410 to 640 ft) ASH-FLOW TUFF (TOPOPAH SPRING TUFF): The tuff ranges from reddish brown (10R 4/6) to black (N1) to moderate brown (5YR 3/4, 4/4). The tuff is generally densely welded, devitrified and has widely spaced zones of weak vapor-phase alteration that may correspond to lithophysal zones. The upper and lower vitrophyre zones are well represented. The zones are as follows: 410 to 425 ft (UPPER MODERATELY WELDED ZONE): The zone is reddish brown (10R 4/6), vitric, and weakly to moderately welded with an open/porous matrix. The zone contains 1 to 3% colorless feldspar phenocrysts up to 4 mm long, up to 1% colorless to very light gray (N8) quartz phenocrysts, and up to 2% olive green (10Y 5/4) biotite up to 3 mm long. Welding increases toward the sharp contact with the underlying vitrophyre. 425 to 503 ft (UPPER VITROPHYRE): The zone is comprised of a black (N1), densely welded, glassy tuff with a dense/nonporous matrix. The zone contains 3 to 8% colorless feldspar up to 4 mm long and 1% black (N1) biotite from 460 to 465 ft. Locally, feldspars are chatoyant or opalescent. The vitrophyre is interlayered with soft, zeolitized material from 465 to 495 ft. The lower contact is gradational with the underlying welded tuff. 503 to 600 ft (MIDDLE NONLITHOPHYSAL ZONE): The zone is moderate brown (10YR 3/4) from 503 to 595 ft and dark brown (10YR 2/2) from 595 to 600 ft. The tuff is moderately welded from 503 to 515 ft, densely welded from 515 to 600 ft, devitrified, and displays a dense/nonporous matrix. Traces of vapor-phase alteration occur at 520 to 525, 550 to 555, 565 to 570, and 585 to 595 ft. Weak spherulitic development is observed from 570 to 575 ft. The tuff contains 2 to 3% colorless feldspar phenocrysts up to 3 mm long, 1% very light gray (N8, N9) to colorless quartz phenocrysts to 3 mm in diameter from 500 to 560 and 585 to 595 ft, and 1% bronze biotite up to 1 mm long from 505 to 525, 535 to 540, and 575 to 595 ft. The tuff also contains 1 to 2% medium gray (N5) lithic clasts up to 8 mm in diameter from 505 to 555 and 565 to 595 ft. Welding increases beyond 585 ft toward the gradational contact with the underlying basal vitrophyre. 600 to 611 ft (BASAL VITROPHYRE): The zone is comprised of a black (N1), densely welded, glassy tuff with a dense/nonporous matrix. No phenocrysts or lithic clasts are observed. The rock is granular due to grinding from the drill bit. The lower contact is sharp with the underlying vitroclastic tuff. 611 to 640 ft (LOWER MODERATELY WELDED ZONE): The zone is light brown (5YR 4/4) and densely to moderately welded with a dense/nonporous matrix. A distinctive vitroclastic texture is evident, with stretched shards of "root beer bottle" glass up to 4 mm long. The tuff contains 1% colorless feldspar up to 3 mm long and 1 to 2% greenish yellow (5Y 8/4) to grayish pink (5YR 7/2) pumice clasts up to 10 mm in diameter. The contact with the underlying ash-fall tuff is sharp.
600		(640 to 700 ft) ASH-FALL TUFF (PRE-TOPOPAH SPRING TUFF AND PRE-WAHMONIE FORMATION BEDDED TUFF): The tuff is brown (5YR 3/4) to grayish orange brown (10YR 7/4), nonwelded, devitrified, and has an open/porous matrix. The tuff appears slightly weathered throughout. The tuff contains 1 to 2% brown (5YR 7/2) pumice clasts up to 4 mm in diameter from 640 to 655 ft, 1% colorless feldspar phenocrysts up to 2 mm long, 1 to 10% very light gray (N7, N9) quartz phenocrysts 2 to 4 mm in diameter that are concentrated toward the base of the unit from 680 to 695 ft, and 2 to 5% black biotite up to 4 mm long. Bedding is inferred in the unit based on the variation in colors observed. The lower contact is sharp with the underlying volcanoclastic sandstone.
700		(700 to 790.7 ft Total Depth) VOLCANICLASTIC SANDSTONE (PRE-WAHMONIE FORMATION BEDDED TUFF): The sandstone is dark to light brown (10YR 4/2 - 5YR 5/6) and consists of well-sorted and well-rounded grains of fine quartz, feldspar, volcanic glass, and biotite that represent epiclastic/volcanoclastic reworking of unwelded tuffs. The sandstone is cemented with coarse, greater than 2 centimeter, sparry calcite throughout much of the interval; however, sections are uncemented and the borehole produces abundant sand, especially in the interval from 700 to 720 ft. It is also likely that seams of uncemented sand occur within the sandstone below 720 ft. The borehole was stopped in this unit due to drilling problems as a result of flowing sand.

Summary Lithologic Log for Corehole 19PB

Depth	LITHOLOGY	DESCRIPTION
18.1308		
340		(0 to 350.8 feet (ft)) UNDIFFERENTIATED ALLUVIUM This interval consists of unsaturated zone alluvium, unlogged and not sampled. Sonic coring begins at 350.8 feet, and continues to the end of the borehole.
350		(350.8 to 371.0 ft) WELL-GRADED SAND WITH CLAY (SW-SC) AND POORLY GRADED SAND WITH CLAY (SP-SC) In this interval, layers of SW-SC up to 3.3 ft thick and SP-SC up to 3.6 ft thick predominate. Lesser amounts of silty sand with gravel (SM), clayey sand with gravel (SC), well-graded gravel with clay and sand (GW-GC), and poorly graded gravel with clay and sand (GP-GC) occur in roughly equal proportions. Fines in SM and SC layers range from no to moderate plasticity. Gravel clasts are volcanic in origin and subangular to subrounded. Colors range from predominantly yellowish red (5YR 5/6) to reddish brown (5YR 4/4). No cementation or reaction with 10 percent (%) hydrochloric acid (HCl) is observed. All samples are moist.
360		
370		(371.0 to 408.5 ft) POORLY GRADED GRAVEL WITH CLAY (GP-GC) AND WELL-GRADED GRAVEL WITH SILT (GW-GM) In this interval, layers of poorly graded gravel with clay (GP-GC) up to 2.4 ft thick and well-graded gravel with silt (GW-GM) up to 5.0 ft thick predominate. Lesser amounts of well-graded gravel (GW), poorly graded gravel (GP), well-graded gravel with clay (GW-GC), clayey gravel (GC), clayey sand (SC), poorly graded sand with clay (SP-SC), and well-graded sand with clay (SW-SC) occur in roughly equal proportions. Fines range from low to moderate plasticity. Gravel clasts are volcanic in origin and subrounded. Colors range from predominantly reddish gray (5YR 5/2) to light reddish brown (5YR 6/4) and dark yellowish orange (10YR 6/6). No cementation is observed. Typically no reaction with 10% HCl is observed, but weak reaction is observed from 371 to 375 ft. All samples are wet.
380		
390		
400		
410		(408.5 to 428.7 ft) WELL-GRADED GRAVEL WITH CLAY (GW-GC) AND POORLY GRADED SAND WITH CLAY (SP-SC) In this interval, layers of well-graded gravel with clay (GW-GC) up to 4.1 ft thick and poorly graded sand with clay (SP-SC) up to 1.4 ft thick predominate. Lesser well-graded gravel (GW), poorly graded gravel (GP), poorly graded gravel with clay (GP-GC), and well-graded sand with clay (SW-SC) occur in roughly equal proportions. Fines range from low to moderate plasticity. Gravel clasts are volcanic in origin and subrounded. Colors range from predominantly light reddish brown (5YR 6/4) to yellowish red (5YR 5/6), reddish yellow (5YR 6/6), and reddish brown (5YR 4/4). No cementation is observed from 408.5 to 416.1 ft. Weak cementation is observed from 416.1 to 428.7 ft. No reaction to 10% HCl is observed. All samples are wet.
420		
430		(428.7 to 442.9 feet) CLAYEY SAND (SC) AND WELL-GRADED SAND WITH CLAY (SW-SC) In this interval, layers of clayey sand (SC) up to 1.7 ft thick and well-graded sand with clay (SW-SC) up to 4.0 ft thick predominate. Lesser well-graded gravel with clay (GW-GC) also occurs within this interval. Fines range from low to moderate plasticity. Gravel clasts are volcanic in origin and subrounded. Colors range from predominantly reddish yellow (5YR 6/6) to yellowish red (5YR 5/6). Weak cementation is observed throughout the interval; however, no reaction to 10% HCl is observed. All samples are wet.
440		
450		(442.9 to 484.4 ft) POORLY GRADED GRAVEL WITH SILT (GP-GM) AND WELL-GRADED GRAVEL WITH CLAY (GW-GC) In this interval, layers of poorly graded gravel with silt (GP-GM) up to 3.5 ft thick and well-graded gravel with clay (GW-GC) up to 2.2 ft thick predominate. Lesser well-graded gravel with silt (GW-GM), clayey gravel (GC), well-graded gravel (GW), poorly graded gravel (GP), poorly graded gravel with clay (GP-GC), poorly graded sand with clay (SP-SC), poorly graded sand with silt (SP-SM), and well-graded sand with clay (SW-SC) occur in roughly equal proportions. Fines have low plasticity. Clasts are volcanic in origin and subrounded. Colors range from predominantly yellowish red (5YR 5/6) to reddish yellow (5YR 6/6), reddish brown (5YR 5/4), and brown (7.5YR 5/4). Weak cementation is observed from 442.9 to 449.7 ft. No cementation is observed from 449.7 to 484.4 ft. No reaction to 10% HCl is observed. All samples are wet.
460		
470		
480		
490		(484.4 to 503.4 ft) CLAYEY SAND (SC) AND POORLY GRADED GRAVEL WITH CLAY (GP-GC) In this interval, layers of clayey sand (SC) up to 1.9 ft thick and poorly graded gravel with clay (GP-GC) up to 2.3 ft thick predominate. Lesser well-graded gravel with clay (GW-GC), clayey gravel (GC), well-graded gravel (GW) and silty sand (SM) occur in roughly proportional amounts. Fines have low plasticity. Gravel clasts are volcanic in origin and subrounded. Colors range from predominantly reddish yellow (5YR 6/6) to reddish brown (5YR 5/4), strong brown (7.5YR 5/6), and reddish yellow (7.5YR 5/6). Weak cementation is observed throughout the interval. No reaction to 10% HCl is observed. All samples are wet.
500		
510		(503.4 to 530.4 ft) POORLY GRADED SAND WITH CLAY (SP-SC) AND POORLY GRADED SAND WITH SILT (SP-SM) In this interval, layers of poorly graded sand with clay (SP-SC) up to 2.6 ft thick and poorly graded sand with silt (SP-SM) up to 2.1 ft thick predominate. Lesser poorly graded gravel with silt (GP-GM), poorly graded gravel with clay (GP-GC), poorly graded gravel (GP), well-graded gravel with clay (GW-GC), well-graded sand with clay (SW-SC) and clayey sand (SC) occur in roughly proportional amounts. Fines have low plasticity. Gravel clasts are volcanic in origin and subrounded to subangular, with the percentage of subangular clasts increasing toward the base of the interval. Colors range from predominantly strong brown (7.5YR 5/6) to reddish yellow (7.5YR 6/6). Weak cementation is observed throughout the interval. No reaction with 10% HCl is observed. All samples are wet.

Summary Lithologic Log for Corehole 19PB

