Table 1.3-1
Survey Coordinates and Well Completion Information

Well Name	Drilling Duration		Total Depth (feet bgs[a])	Yucca Mountain Project Survey Coordinates		Ground Elevation[b] (feet amsl[c])	Approximate Open-Hole Water Level at End of Drilling (feet bgs)	Screened Interval (feet bgs)		Sandpack Interval (feet bgs)		Lithology at Sandpack Interval	Well Casing Total Depth[d] (feet bgs)
	Start	Completion		North Latitude	West Longitude			To	From	To	From		
16P	12/13/02	1/27/03	2900.0	36° 43' 29.089"	116° 29' 22.219"	2888.9	496	489.4	549.4	474.8	555.3	Tertiary Tuff	559.9
24P	7/16/03	8/19/03	1860.0	36° 42' 16.775"	116° 26' 52.756"	2789.8	404	400.0	440.0	393.2	446.8	Tertiary Tuff	450.0
27P	11/20/02	12/12/02	1900.0	36° 44' 02.072"	116° 29' 51.436"	2973.4	583	580.7	620.6	563.0	626.7	Tertiary Tuff	631.0
28P	10/21/02	11/20/02	2080.0	36° 42' 28.386"	116° 29' 19.390"	2767.2	374	370.0	449.0	365.6	451.5	Tertiary Tuff	459.3
29P	6/25/03	7/15/03	790.7	36° 40' 57.297"	116° 26' 52.884"	2724.3	349	340.0	390.0	333.8	404.8	Tertiary Tuff	395.0
19PB	12/2/03	12/18/03	634.0	36° 40' 15.440"	116° 26' 55.593"	2688.4	368	375.5	395.0	350.0	401.9	Alluvium	405.3
								514.7	534.7	505.1	545.2	Alluvium	545.0

[a]Below ground surface.
[b]Ground elevations provided by the Yucca Mountain Project and based on a Global Positioning System. The elevations are not known to be precise to one-tenth of a meter.
[c]Above mean sea level.
[d]PVC blank well casing and screen with 2⅜-inch outside diameter.

Table 1.6-1
Phase IV Quality Assurance Documents

Type	Number	Revision	Title	Date
Work Plan	WP-5	3	Early Warning Drilling Program Phase IV Drilling and Well Construction Work Plan	7/31/02
	WP-6	1	Early Warning Drilling Program Geophysical Logging Work Plan	5/31/01
	WP-8	3	Sample Management Plan	7/30/02
Technical Procedure	TP-7.0	3	Drill Site Management	9/30/02
	TP-8.0	4	Field Logging and Handling of Borehole Samples	10/28/02
		5		11/15/03
Test Plan	TPN-5.1	0	Construction of Sonic Corehole NC-EWDP-19PB	11/15/03
	TPN-8.1	0	Constant Head Saturated Hydraulic Conductivity Measurements on Repacked Core Samples	4/1/04

Table 2.1-1
Summary of Drilling Equipment Used in Reverse-Circulation Boreholes

Well Name	Drilling Method			Dual-Wall Pipe Specifications			Drill Bit Assembly			
	Type	Depth Interval (feet)		Diameter (inches)	Depth Interval (feet)		Type	Diameter (inches)	Depth Interval (feet)	
		From	To		From	To			From	To
29P	AR-RC[a]	0	180	4.5	0	708	Tricone center return	6.25	0	180
	APH-RC[b]	180	203	4.75	708	788	Hammer bit reverse circulation	6.25	180	203
	AR-RC	203	280				Tricone center return	6.25	203	280
	APH-RC	280	303				Hammer bit reverse circulation	6.25	280	303
	AR-RC	303	791				Tricone center return	6.25	303	791
24P	AR-RC	0	80	4.5	0	1778	Tricone center return	6.25	0	80
	APH-RC	80	100	4.75	1778	1858	Hammer bit reverse circulation	6.25	80	100
	AR-RC	100	1860				Tricone center return	6.25	100	1200
								6.125	1200	1860
16P	AR-RC	0	2900	4.5	0	2858	Tricone center return	6.5	0	1720
				4.75	2858	2898		6	1720	2122
								5.75	2122	2662
								5.625	2662	2900
27P	AR-RC	0	1900	4.5	0	1858	Tricone center return	6.5	0	760
				4.75	1858	1898		6	760	1900
28P	AR-RC	0	2080	4.5	0	2038	Tricone center return	6.5	0	1270
				4.75	2038	2078		6.125	1270	1283
								5.625	1283	2080

[a]Air-rotary dual-wall reverse circulation.
[b]Air-percussion-hammer dual-wall reverse circulation.

Table 2.2-1
Summary of Drill Cuttings Sampling, Splitting, and Testing

Borehole Name	Geologic Material	Drilling Method	Drill Cuttings Sample Interval (feet)	Total Number of Drill Cuttings Samples	Number of Drill Cuttings Samples[a]						
					Split (5-lb bag)			Nuclear Waste Repository Project Office (NWRPO) Laboratory Analysis			
					NWRPO/ SMF[b] Split	DOE YMP[c] SMF Split	NWRPO Laboratory Split	Gravimetric Water Content[d]	Soil Water Extract Electrical Conductivity[d]	Wet Sieve	Hydrometer
16P	Alluvium[e]	AR-RC[f]	2.5	66	66	66	33	33	33	33	6
	Non-alluvium		5	547	547	547	37	37	0	0	0
24P	Alluvium	AR-RC	2.5	151	151	151	78	78	78	78	6
	Alluvium	APH-RC[g]	2.5	8	8	8	4	4	4	4	0
	Non-alluvium	AR-RC	5	292	292	292	0	0	0	0	0
27P	Alluvium	AR-RC	2.5	73	73	73	36	36	36	36	6
	Non-alluvium		5	344	344	344	42	42	0	0	0
28P	Alluvium	AR-RC	2.5	96	96	96	48	48	48	48	6
	Non-alluvium		5	377	377	377	16	16	0	0	0
29P	Alluvium	AR-RC	2.5	110	110	110	56	56	56	56	4
	Alluvium	APH-RC	2.5	18	18	18	6	8	8	8	2
	Non-alluvium	AR-RC	5	94	94	94	4	4	0	0	0
TOTAL				2,176	2,176	2,176	362	362	263	263	30

[a]Density-related field measurements made on selected samples. Measurements not made on samples below the water table, or where water was used as a drilling fluid.
[b]Sample Management Facility.
[c]U.S. Department of Energy Yucca Mountain Project.
[d]Not conducted on samples below the water table.
[e]All unconsolidated sediments.
[f]Air-rotary dual-wall reverse circulation.
[g]Air-percussion-hammer dual-wall reverse circulation.

Table 2.2-2
Summary of Drive Core Sampling, Splitting, and Testing

Borehole Name	Geologic Material	Coring Method	Number of Core Runs per Borehole	Number of Density-Related Field Measure-ments	Number of Drive Core Samples							
					Split (6- and 3-inch liners and drive shoe)			Nuclear Waste Repository Project Office (NWRPO) Laboratory Analysis				
					NWRPO SMF[a] Subsamples	DOE YMP[b] SMF Subsamples	NWRPO Laboratory Subsamples	Volumetric Water Content	Grain and Bulk Density	Wet Sieve	Hydrometer	Saturated Hydraulic Conductivity
24P	Alluvium – unsaturated zone	APH-DC[c]	8	8	16	4	22	14	14	22	22	14
29P	Alluvium – unsaturated zone	APH-DC	3	3	2	4	9	6	6	9	9	6
19PB	Alluvium – saturated zone	SC-DC[d]	5	5	3	6	10	10	10	10	10	10
TOTAL			16	16	21	14	41	30	30	41	41	30

[a] Sample Management Facility.
[b] U.S. Department of Energy Yucca Mountain Project.
[c] Air-percussion-hammer drive core.
[d] Sonic drive core.

Table 2.2-3
Summary of Sonic Core Sampling, Splitting, and Testing

Sample Type	Total Number of Samples	Density-Related Field Measure-ments	Number of Assigned Samples			Number of Nuclear Waste Repository Project Office (NWRPO) Laboratory Analyses								
			DOE YMP SMF[a]	NWRPO Laboratory	Outside Researchers[b]	Gravimetric Water Content	Soil Water Extract EC[c]	Wet Sieve	Saturated Volumetric Water Content	Saturated Hydraulic Conductivity	Hydrometer	Atterberg Limits	Specific Gravity	Dry Bulk Density
Grab sample (water content split)	219	NA[d]	0	199	0	199	19	0	0	0	0	0	0	0
Grab sample	199	NA	0	199	55	0	0	199	0	0	75	45	75	0
Sonic core segment[e]	180	180	180	35[f]	0	35	0	14	22	22	15	15	15	35
TOTAL	598	NA	180	433	55	234	19	213	22	22	90	60	90	35

[a]U.S. Department of Energy Yucca Mountain Project Sample Management Facility.
[b]Samples provided as a split of NWRPO laboratory grab samples when sufficient sample was available to U.S. Geological Survey and Center for Nuclear Waste Regulatory Analyses.
[c]Electrical conductivity analyses, not conducted on samples below the water table.
[d]Not applicable.
[e]Samples were repacked to target densities for saturated volumetric water content and hydraulic conductivity analyses.
[f]Selected core segments were transferred to the NWRPO laboratory from DOE/YMP sonic core segments.

Table 2.4-1
Summary of Laboratory Tests on Geologic Samples

Type	Drilling/Coring Method	Sample Type	Number of Samples Tested									
			Saturated Hydraulic Conductivity	Saturated Volumetric Water Content	Volumetric Water Content	Gravimetric Water Content	Specific Gravity (Grain Density)	Dry Bulk Density	Soil Water Extract Electrical Conductivity	Wet Sieve	Hydrometer	Atterberg Limits
Reverse-circulation (RC) borehole	AR-RC[a]	Drill cuttings	0	0	0	350	0	0	251	251	28	0
	APH-RC[b]		0	0	0	12	0	0	12	12	2	0
	APH-DC[c]	Drive core	20	20	20	20	20	20	0	31	31	0
Sonic (SC) borehole	SC[d]	Textural layer grab samples	0	0	0	199	75	0	19	199	75	45
	SC	Sonic core segment[e]	22	22	0	35	15	35	0	14	15	15
	SC-DC[f]	Drive core	10	10	10	10	10	10	0	10	10	10
TOTAL			52	52	30	626	120	65	282	517	161	70

[a]Air-rotary dual-wall reverse circulation.
[b]Air-percussion-hammer dual-wall reverse circulation.
[c]Air-percussion-hammer dual-wall drive core.
[d]Sonic core.
[e]Samples were repacked to target densities for saturated volumetric water content and hydraulic conductivity analyses.
[f]Sonic drive core.

Table 2.4-2
Laboratory Test Methods

Laboratory Test	Laboratory Method	
	Nevada Geotech, Inc.[a]	Nuclear Waste Repository Project Office Testing Laboratory
Volumetric Water Content	ASTM D-2216-92. Method for laboratory determination of water (moisture content) of soil, rock, and soil-aggregate mixtures. In: *1996 Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.	Gardner, W.H. 1986, "Water Content." In: Klute, A. (ed), *Methods of Soil Analysis,* Part 1, Physical and Mineralogical Methods (2nd ed.), American Society of Agronomy, Chapter 21, pp. 493–507 (specifically page 506).[b]
Dry Bulk Density	Blake, G.R. and K.H. Hartge. 1986. "Bulk Density." In: Klute, A. (ed), *Methods of Soil Analysis,* Part 1, Physical and Mineralogical Methods (2nd ed.), American Society of Agronomy, Chapter 13, pp. 363-367.	Blake, G.R. and K.H. Hartge. 1986. "Bulk Density." In: Klute, A. (ed), *Methods of Soil Analysis,* Part 1, Physical and Mineralogical Methods (2nd ed.), American Society of Agronomy, Chapter 13, pp. 363-367.[b]
Specific Gravity (grain density)	ASTM D-854-92. Standard test method for specific gravity of soils. In: *1996 Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.	ASTM D-854-02. Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer. In: 2003 *Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.
Saturated Hydraulic Conductivity (constant head method)	Klute, A. , and C. Dirksen, 1986. "Hydraulic Conductivity and Diffusivity: Laboratory Methods." In: Klute, A. (ed), *Methods of Soil Analysis,* Part 1, Physical and Mineralogical Methods (2nd ed.), American Society of Agronomy, Chapter 28, pp. 694-700.	Klute, A., and C. Dirksen, 1986. "Hydraulic Conductivity Diffusivity: Laboratory Methods." In: Klute, A. (ed), *Methods of Soil Analysis,* Part 1, Physical and Mineralogical Methods (2nd ed.), American Society of Agronomy, Chapter 28, pp. 687-700.[b]
Atterberg Limits	Not applicable.	ASTM D-4318-00. Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils. In: 2003 *Annual Book of ASTM Standards*, Vol. 04.08, American Society for Testing and Materials.
Soil Extract Electrical Conductivity	Rhoades, J.D. 1986. Soluble salts—Electrical conductivity of saturation extract. In: Page, A.L. (ed), *Methods of Soil Analysis,* Part 2, Chemical and Microbiological Properties (2nd ed.), American Society of Agronomy, pp. 172-173.	Rhoades, J.D. 1982. Soluble Salts—Extracts at Soil/Water Ratios of 1:1 and 1:5, Electrical conductivity of saturation extract. In: Page, A.L. (ed), *Methods of Soil Analysis,* Part 2, Chemical and Microbiological Properties (2nd ed.), American Society of Agronomy, Chapter 10, pp. 169-170 and 172-173.
Gravimetric Water Content	ASTM D-2216-92. Method for laboratory determination of water (moisture content) of soil, rock, and soil-aggregate mixtures. In: *1996 Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.	ASTM D-2216-98. Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass. In: 2003 *Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.
Wet Sieve Analysis	ASTM D-1140-97. Standard test method for amount of material in soil finer than the No. 200 (75 um) sieve (Method B for wet sieve analysis). In: *1997 Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.	ASTM D-1140-00. Standard Test Methods for Amount of Material in Soil Finer Than the No. 200 (75 um) Sieve (Method B for wet sieve analysis). In: 2003 *Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.
Hydrometer Analysis (silt/clay break)	ASTM D-422. Standard method for Particle Size Analysis of Soils. In: *1996 Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.	ASTM D-422-63 (Re-approved 1998). Standard Test Method for Particle Size Analysis of Soils. In: 2003 *Annual Book of ASTM Standards,* Vol. 04.08, American Society for Testing and Materials.

[a]Contract testing laboratory.

[b]For repacked sonic core samples, detailed methods to repack samples and to measure saturated volumetric water content, saturated hydraulic conductivity, and dry bulk density are given in TPN-8.1, *Constant Head Saturated Hydraulic Conductivity Measurements on Repacked Samples*.

Table 2.5-1
Description of Types and Applications of Geophysical Logs

Log Name	Suite	Description	Application
Caliper	Open-hole	Borehole diameter	Provides borehole correction (e.g., wash-out zones) for other logs, borehole volume for well completions, and possible identification of fractures and contacts.
Density	Drill-string, open-hole, and well completion	Tool output altered by formation materials[a]	Yields density information on adjacent borehole wall formation material; identifies washout zones.
Deviation	Drill-string, open-hole, and well completion	Deviation of borehole from vertical	Permits calculation of true elevations for lithologic contacts, well screens, water levels, and other borehole depth measurements.
Fluid Resistivity	Open-hole	Borehole fluid resistivity and conductivity	Estimates relative amount of dissolved salts in borehole fluid and may provide an indication of inflow in open boreholes.
Fluid Temperature (Temperature)	Drill-string, open-hole, and well completion	Borehole fluid temperature	Helps identify locations of inflow/outflow in open boreholes, and geothermal gradient in cased boreholes.
Gamma (Natural Gamma)	Drill-string, open-hole, and well completion	Gamma radiation from natural sources in formation and in borehole drilling fluids	Helps identify lithology and stratigraphic unit correlation; may respond to differences in clay content.
Magnetic Susceptibility	Open-hole and well completion	Ferromagnetism and conductivity in rocks	Indicates presence of magnetic minerals; may indicate deposition of magnetic minerals within porous media.
Neutron (Moisture)	Drill-string, open-hole, and well completion	Tool output altered by water in formation and borehole[b]	Identifies moisture content changes in the unsaturated zone and/or indicates porosity changes in the saturated zone.
Optical Televiewer	Open-hole	360° image of reflection of borehole wall via prism mirror and camera	May help detect fractures, thin beds, and bedding dip; provides caliper and deviation data.
Resistivity (Formation) (R8, R16, R32, or R64)	Open-hole	Apparent formation resistivities at different distances from the borehole	Helps identify lithology and stratigraphic unit correlation; indicates relative changes in water quality.
Single-Point Resistivity (SPR)	Open-hole	Resistivity of borehole fluids and adjacent formation	Helps identify lithology and changes in borehole fluid composition.
Sonic (Acoustic Velocity)	Open-hole	Compressional wave velocity through fluids and formations	Helps define changes in porosity and lithology; indicates of fractures.
Spectral Gamma	Drill-string, open-hole, and well completion	Radiation emitted by uranium, thorium and potassium	Can help identify minerals containing uranium, thorium and potassium.
Spontaneous Potential	Open-hole	Electrical potential between fluids in borehole and adjacent formation	Helps identify lithology, clay, and shale content and relative changes in formation water quality.

Source: Modified from Keys (1990) and Telford and others (1990).

[a]Geophysical Logging Services density tool contains no radioactive source; Century Geophysical tool uses a cesium-137 source.

[b]Geophysical Logging Services moisture tool contains no radioactive source; Century Geophysical tool uses a directed americium beryllium source

Table 2.5-2
Summary of Phase IV Geophysical Logs

Well Name	Date	Suite	Interval Logged (feet)		Log Name													Record Identification Desigation (RID) Number	Company Name	Comments
					Gamma (Natural Gamma)	Density	Spectral Gamma	Neutron (Moisture)	Fluid Temperature	Resistivity (SPR, R8-R64)	Fluid Resistivity	Spontaneous Potential	Caliper	Acoustic Velocity (Sonic)	Magnetic Susceptibility	Optical Televiewer	Deviation			
16P	1/20/03	Open-hole	1,980	2,898	X	X	X	X	X		X	X		X				5482	Geophysical Logging Services (GLS)	Run in 6.5- to 5.625-inch borehole with 61.5 feet of 12-inch surface casing.
	1/20/03	Drill-string	0	2,880	X				X		X						X	5481	GLS	Run in 4.5-inch dual-wall drill pipe in 6.5- to 5.625-inch borehole with 61.5 feet of 12-inch surface casing.
	1/8/04	Well-completion	0	559.9	X	X	X	X							X		X	6035	GLS	Run in 2-inch Schedule 80 PVC well casing with 61.5 feet of 12-inch surface casing.
	3/4/04		0	560					X									6209	GLS	Run in 2-inch Schedule 80 PVC well casing with 61.5 feet of 12-inch surface casing.
	1/10/03 to 11/03	Open-hole	0	2,121	X	X		X	X	X	X		X		X		X	5485	GLS	Run in 6.5- to 5.75-inch borehole with 61.5 feet of 12-inch surface casing.
28P	11/2/02	Open-hole	0	1,196.5												X		5340	GLS	Run in 6.5- to 6.125-inch borehole.
	11/2/02		0	1,196.5	X	X	X	X	X	X	X		X	X	X		X	5341	GLS	Run in 6.5- to 6.125-inch borehole.
	11/13/02		1,120	2,064	X		X		X	X	X		X					5321	GLS	Run in 6.5- to 5.625-inch borehole.
	11/13/02	Drill-string	1,120	2,050	X	X	X	X	X	X							X	5337	GLS	Run in 4.5-inch dual-wall drill pipe in 6.5- to 5.625-inch borehole.
	1/8/04	Well-completion	0	459.3	X	X	X	X							X		X	6034	GLS	Run in 2-inch Schedule 80 PVC well casing.
	3/4/04		0	459					X									6213	GLS	Run in 2-inch Schedule 80 PVC well casing.

Table 2.5-2
Summary of Phase IV Geophysical Logs

Well Name	Date	Suite	Interval Logged (feet)		Log Name													Record Identification Desigation (RID) Number	Company Name	Comments
					Gamma (Natural Gamma)	Density	Spectral Gamma	Neutron (Moisture)	Fluid Temperature	Resistivity (SPR, R8-R64)	Fluid Resistivity	Spontaneous Potential	Caliper	Acoustic Velocity (Sonic)	Magnetic Susceptibility	Optical Televiewer	Deviation			
27P	1/8/04	Well-completion	0	630.3	X	X	X	X							X		X	6036	GLS	Run in 2-inch Schedule 80 PVC well casing with 60.4 feet of 12-inch surface casing.
	3/4/04		0	631					X									6212	GLS	Run in 2-inch Schedule 80 PVC well casing with 60.4 feet of 12-inch surface casing.
	12/7/02 to /8/02	Open-hole	0	1,897.7	X	X		X	X	X	X	X	X	X	X		X	5536	GLS	Run in 6.5- to 6-inch borehole with 60.4 feet of 12-inch surface casing.
	12/7/02 to 12/8/02		0	1,880												X		5484	GLS	Run in 6.5- to 6-inch borehole with 60.4 feet of 12-inch surface casing.
29P	7/9/03	Open-hole	0	702	X	X		X	X	X	X		X	X	X		X	5746	GLS	Run in 5-inch steel casing inside 6.25-inch borehole to total depth with 61.5 feet of 12-inch surface casing. Inductive resistivity and inductive conductivity logs run as a test in the unsaturated zone.
	7/9/03		0	700												X		5745	GLS	Run in 6.25-inch borehole with 61.5 feet of 12-inch surface casing.
	7/10/03	Drill-string	0	695.4	X			X										5767	Century Geophysical (Century)	Run in 5-inch steel casing inside 6.25-inch borehole with 61.5 feet of 12-inch surface casing.
	7/10/03		0	695.4	X	X												5766	Century	Run in 5-inch steel casing inside 6.25-inch borehole with 61.5 feet of 12-inch surface casing.
	1/8/04	Well-completion	0	395	X	X	X	X							X		X	6032	GLS	Run in 2-inch Schedule 80 PVC well casing with 61.5 feet of 12-inch surface casing.
	3/4/04		0	395					X								X	6214	GLS	Run in 2-inch Schedule 80 PVC well casing with 61.5 feet of 12-inch surface casing.

Table 2.5-2
Summary of Phase IV Geophysical Logs

Well Name	Date	Suite	Interval Logged (feet)		Log Name													Record Identification Desigation (RID) Number	Company Name	Comments
					Gamma (Natural Gamma)	Density	Spectral Gamma	Neutron (Moisture)	Fluid Temperature	Resistivity (SPR, R8-R64)	Fluid Resistivity	Spontaneous Potential	Caliper	Acoustic Velocity (Sonic)	Magnetic Susceptibility	Optical Televiewer	Deviation			
24P	8/8/03	Drill-string	0	1,840	X	X	X	X	X	X							X	5831	GLS	Run in 4.5-inch dual-wall drill pipe inside 6.25- to 6.125-inch borehole with 61.5 feet of 12-inch surface casing.
	8/9/03		0	1,658.4	X			X										5830	Century	Run in 5-inch steel casing inside 6.25- to 6.125-inch borehole with 61.5 feet of 12-inch surface casing.
	8/9/03		0	1,659.1	X	X												5829	Century	Run in 5-inch steel casing inside 6.25- to 6.125-inch borehole with 61.5 feet of 12-inch surface casing.
	8/10/03	Open-hole	0	1,733					X	X	X		X	X				6031	GLS	Run in 6.25- to 6.125-inch borehole with 61.5 feet of 12-inch surface casing.
	8/10/03		728	1,550												X	X	6062	GLS	Run in 6.25- to 6.125-inch borehole with 61.5 feet of 12-inch surface casing.
	1/9/04	Well-completion	0	450	X	X		X							X		X	6037	GLS	Run in 2-inch Schedule 80 PVC well casing with 61.5 feet of 12-inch surface casing.
	3/4/04		0	450					X									6211	GLS	Run in 2-inch Schedule 80 PVC well casing with 61.5 feet of 12-inch surface casing.
19PB	11/22/03	Open-hole	0	350													X	6269	GLS	Run in 10.625-inch borehole with 18 feet of 17.5-inch surface casing above the water table.
	12/18/03	Drill-string	0	634	X	X	X	X	X								X	6270	GLS	Run in sonic coring casings within multiple telescoping casings and 18 feet of 17.5-inch surface casing.
	12/19/03		0	619.6	X	X		X			X							6102	Century	Run in 5.5-inch steel casing within multiple telescoping casings and 18 feet of 17.5-inch surface casing.
19PB (deep)	1/9/04	Well-completion	0	545	X	X	X	X							X		X	6038	GLS	Run in 2-inch Schedule 80 PVC within multiple telescoping casings and 18 feet of 17.5-inch surface casing.
	3/4/04		0	545					X									6210	GLS	Run in 2-inch Schedule 80 PVC within multiple telescoping casings and 18 feet of 17.5-inch surface casing.

Table 3.1-1
Summary of Well Elevations and Water Levels

Well Name	Top of Casing Elevation[a] (feet amsl[b])	Original Ground Surface Elevation[c] (feet amsl)	Water Level Measurement Date	Groundwater Elevation[d] (feet amsl)	Depth to Water[d] (feet)
16P	2891.6	2888.9	7/23/04	2393.0	498.6
24P	2792.2	2789.8	7/23/04	2385.6	406.7
27P	2976.1	2973.4	7/23/04	2390.5	585.6
28P	2770.1	2767.2	7/23/04	2392.9	377.2
29P	2726.2	2724.3	7/23/04	2378.0	348.1
19PB Shallow	2690.3	2688.4	7/23/04	2321.0	369.4
19PB Deep	2690.3	2688.4	7/23/04	2323.0	367.3

[a]Elevations provided by the Yucca Mountain Project and based on a Global Positioning System. The elevations are not known to be precise to one-tenth of a meter.
[b]Above mean sea level.
[c]Based on GPS survey elevation at top of casing, minus casing stickup.
[d]Groundwater elevation and depth-to-water data have not been corrected for borehole deviation.

Table 4.1-1
Summary of Censored Geologic Data

Well Name	Sample Type	Field Logging Data Depth Interval (feet below ground surface [bgs])		Laboratory Test Data Depth Interval (feet bgs)						
		PSD and USCS Group Symbol[a]	Sample Bulk-Density-Related[b]	EC[c]	GWC[c]	Wet Sieve PSD[d]	Hydrometer PSD[e]	Dry Bulk Density[f]	Porosity[f]	Saturated Hydraulic Conductivity[f]
16P	Drill Cuttings	0-165	0-165				32.5-35			
							57.5-60			
							82.5-85			
19PB	Sonic Core Grab Sample	350.8-633.8				378.1-378.4				
						416.8-418.4				
						522.1-522.7				
	Drive Core Run	380.00-381.00								
		449.09-449.66								
		527.05-528.80								
		561.74-563.34								
		619.99-622.02								
	Drive Core Segment									449.10-449.40
24P	Drill Cuttings	0-400	0-400	405-410	405-410	405-410[g]				
				415-420	415-420	415-420[g]				
	Drive Core Run	80.18-81.69								
		120.13-121.34								
		160.00-162.13	160.00-162.13							
		200.31-200.87								
		240.00-241.75								
		280.40-281.00								
		322.50-323.44								
		360.00-360.71								
27P	Drill Cuttings	0-182.5	0-182.5				157.5-160			
28P	Drill Cuttings	0-240	0-240				147.5-150			
							172.5-175			
29P	Drill Cuttings	0-320	0-320				162.5-165			
							182.5-185			
							232.5-235			
	Drive Core Run	100.00-102.27								
		180.00-181.13								
		279.98-282.11								
	Drive Core Segment						180.00-180.36	180.00-180.36	180.00-180.36	

[a] Field estimates of particle size distribution (PSD) and Unified Soil Classification System (USCS) group symbol data differ significantly from laboratory measurements.
[b] A significant amount of sample was not collected and weighed over drill run intervals.
[c] Electrical conductivity (EC) of soil-water extract and gravimetric water content (GWC) data obtained from alluvium drill cuttings are applicable to regions above the water table only.
[d] Data included a negative percent value for one or more of the smallest size fractions, likely from using separate sample splits to obtain air dry water contents.
[e] Hydrometer silt plus clay percent differed significantly from wet sieve fines percent.
[f] Core samples tested were observed to be loosely packed in their liners and obviously disturbed from in situ conditions.
[h] Wet sieve measurements not applicable to bedrock units beginning at approximately 400 feet bgs.

Table 4.2-1
Drive Core Recovery and Density Data

Well Name	Coring Method	Core Run Number	Depth (feet)		Recovery (feet)			Core Diameter (inches)	Sample Weight[a] (kilograms)	Average Sample Gravimetric Water Content (grams/gram [g/g])	Calculated Oven Dry Sample Weight (g)	Sample Volume (cubic centimeter [cm^3])	Dry Bulk Density[b] (g/cm^3)
			From	To	Core	Fill	Total Length						
24P	APH-DC[c]	1	80.18	81.69	1.51	0.76	2.27	3.9	11.1	0.056	10510	5330	1.97
		2	120.13	121.34	1.21	1.06	2.27	3.9	10.85	0.072	10130	5330	1.90
		3	160.00	162.13	2.13	0.56	2.69	3.9	11.25	0.185	9490	6320	1.50[d]
		4	200.31	200.87	0.56	1.71	2.27	3.9	11.25	0.078	10440	5330	1.96
		5	240.00	241.75	1.75	0.52	2.27	3.9	11.2	0.062	10550	5330	1.98
		6	280.40	281.00	0.60	1.67	2.27	3.9	11.6	0.141	10170	5330	1.91
		7	322.50	323.44	0.94	1.75	2.69	3.9	13.3	0.083	12290	6320	1.94
		8	360.00	360.71	0.71	1.98	2.69	3.9	12.35	0.096	11270	6320	1.78
												Average	1.92
29P	APH-DC	1	100.00	102.27	2.27	0	2.27	3.9	11.3	0.108	10200	5330	1.91
		2	180.00	181.13	1.13	1.14	2.27	3.9	11.2	0.108	10110	5330	1.90
		3	279.98	282.11	2.13	0	2.13	3.9	11.55	0.107	10440	5000	2.09
												Average	1.97
19PB	SC-DC[e]	9	380.00	381.00	1.00	0.70	1.70	3.9	ND[f]	NA[g]	NA	NA	NA
		19	449.09	449.66	0.57	1.49	2.06	3.9	9.25	0.130	8190	4860	1.69
		32	527.05	528.80	1.75	0.94	2.69	3.9	13.0	0.148	11320	6320	1.79
		41	561.74	563.34	1.60	0.68	2.28	3.9	11.45	0.173	9760	5360	1.82
		53	619.99	622.02	2.03	0.14	2.17	3.9	11.25	0.152	9770	5100	1.92
												Average	1.81

[a]Sample weight includes core and fill.
[b]Density of core plus fill assuming average water content of core equals that of fill.
[c]Air-percussion hammer drive core.
[d]Sample composed primarily of coring-related crushed gravel and cobbles. Density value not considered representative and not used in average calculation.
[e]Sonic drive core.
[f]Not determined.
[g]Not applicable.

Table 4.2-2
Saturated Formation Dry Bulk Density Data for 19PB Sonic Core Runs

Core Barrel Diameter (inches)	Core Run Number	Depth Interval (feet below ground surface)		Average Dry Bulk Density (grams per cubic centimeter [g/cm^3])		Lost Core (feet)
		From	To	All Core Runs	Core Runs with Less than 0.2 Feet of Lost Core[a]	
6.16	7	371.0	375.4	1.78		0.3
	8	375.7	378.4	1.98		0.6
	10	381.3	386.1	1.85	1.85	0.0
	11	386.1	396.1	1.85	1.85	0.0
	12	396.3	406.1	1.74	1.74	0.2
	13	406.3	416.1	1.84	1.84	0.0
	14	416.2	424.4	1.80	1.80	0.1
	15	424.6	429.3	1.78	1.78	0.2
	16	429.3	434.1	1.81		1.1
	17	435.5	445.1	1.76		1.9
	18	445.3	447.9	1.77		0.5
	20	450.6	460.7	1.85	1.85	0.0
	21	460.7	466.3	1.66	1.66	0.2
	22	466.5	476.2	1.93	1.93	0.2
	23	476.4	478.0	2.11	2.11	0.2
	24	478.2	481.9	1.78		1.0
	25	481.9	489.4	1.57	1.57	0.2
	26	489.6	494.6	1.85		1.6
	27	495.2	499.0	1.72		0.7
	28	500.1	510.0	1.67		0.4
	29	510.0	519.4	1.57	1.57	0.0
	30	519.4	522.7	1.75		1.7
Average Dry Bulk Density				**1.79**	**1.80**	
4.5	31	524.4	527.1	1.75	1.75	0.0
	33	528.8	531.1	2.24		0.9
	34	533.0	534.1	2.34		1.3
	35	534.4	543.1	1.85	1.85	0.2
	36	543.3	545.7	2.23		1.0
	37	545.9	549.6	1.83		1.9
	38	550.7	553.3	1.79		1.0
	39	553.7	557.8	2.17		2.0
	40	559.6	560.4	2.95		0.5
	42	563.3	565.9	1.60	1.60	0.0
	43	565.9	567.1	2.04		1.3
	44	568.4	570.9	2.39		0.8
	45[b]	571.7	578.3	1.78	1.78	0.0
	46	578.3	581.8	2.15	2.15	0.1
	47	581.9	587.4	1.71		0.9
	48	588.3	591.7	1.86	1.86	0.2
	49	591.9	601.0	1.88		0.9
	50	601.9	605.2	1.86	1.86	0.0
	51	605.2	615.3	1.85	1.85	0.0
	52	615.3	619.9	1.64	1.64	0.0
	54	622.0	627.9	1.72		0.5
	55	628.4	633.8	1.81	1.81	0.2
Average Dry Bulk Density				**1.97**	**1.82**	

[a]Shading indicates excluded core run.

[b]Last core segment deleted from density calculation due to field error in mass.

Table 5.1-1
Laboratory Analysis Data for 19PB, 24P, and 29P Drive Core Samples
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Sample Type	Volumetric Water Content (cm^3/cm^3)		Calculated Porosity (cm^3/cm^3)	Density (g/cm^3)		Wet Sieve (%)			Hydrometer (%)		Saturated Hydraulic Conductivity (cm/sec)
			Field Sample	Saturated Sample		Specific Gravity	Dry Bulk Density	Gravel	Sand	Fines	Silt	Clay	
19PB	19PB-380.00-380.50-C	Core	0.33	0.38	0.27	2.59	1.95	70	23	7		4	4.2E-06
19PB	19PB-380.50-381.00-C	Core	0.38	0.48	0.33	2.53	1.74	21	63	16		9	2.3E-06
19PB	19PB-449.10-449.40-C	Core	0.21	0.28	0.30	2.58	1.82	53	40	7		3	Censored
19PB	19PB-449.40-449.70-C	Core	0.25	0.29	0.22	2.53	1.97	65	28	7		5	
19PB	19PB-527.61-528.11-C	Core	0.29	0.31	0.25	2.53	1.94	46	38	16		9	1.4E-05
19PB	19PB-528.11-528.61-C	Core	0.29	0.32	0.26	2.55	1.97	43	41	16		9	7.0E-07
19PB	19PB-562.07-562.57-C	Core	0.32	0.34	0.28	2.51	1.86	43	47	10		4	7.6E-06
19PB	19PB-562.57-563.07-C	Core	0.31	0.33	0.27	2.54	1.93	23	64	13		5	1.1E-06
19PB	19PB-620.75-621.25-C	Core	0.38	0.45	0.31	2.56	1.85	37	50	13		8	1.7E-05
19PB	19PB-621.25-621.75-C	Core	0.35	0.37	0.31	2.56	1.84	34	53	13		7	5.3E-07
24P	24P-120.13-120.58-C	Core	0.13	0.26	0.27	2.59	1.88	31	58	11	6	6	2.8E-03
24P	24P-120.58-121.08-C	Core	0.14	0.25	0.29	2.59	1.85	30	60	10	4	6	2.6E-03
24P	24P-121.08-121.34-C	Shoe Core						24	60	16	9	6	
24P	24P-160.87-161.37-C	Core	0.46	0.51	0.37	2.56	1.62	39	55	6	3	3	1.8E-03
24P	24P-161.37-161.87-C	Core	0.16	0.28	0.26	2.56	1.89	28	53	9	5	5	2.4E-03
24P	24P-161.87-162.13-C	Shoe Core						34	52	14	4	9	

Table 5.1-1
Laboratory Analysis Data for 19PB, 24P, and 29P Drive Core Samples
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Sample Type	Volumetric Water Content (cm^3/cm^3)		Calculated Porosity (cm^3/cm^3)	Density (g/cm^3)		Wet Sieve (%)			Hydrometer (%)		Saturated Hydraulic Conductivity (cm/sec)
			Field Sample	Saturated Sample		Specific Gravity	Dry Bulk Density	Gravel	Sand	Fines	Silt	Clay	
24P	24P-200.31-200.61-C	Core	0.18	0.28	0.11	2.58	2.30	28	59	13	7	6	6.5E-06
24P	24P-200.61-200.87-C	Shoe Core						28	62	10	6	5	
24P	24P-240.48-240.98-C	Core	0.13	0.16	0.24	2.59	1.98	32	64	4	1	2	3.0E-02
24P	24P-240.98-241.48-C	Core	0.11	0.26	0.27	2.59	1.90	24	64	12	6	6	3.2E-03
24P	24P-241.48-241.75-C	Shoe Core						21	66	13	6	7	
24P	24P-280.40-280.73-C	Core	0.27	0.31	0.26	2.60	1.92	25	56	19	8	10	1.7E-05
24P	24P-280.73-281.00-C	Shoe Core						19	56	25	12	14	
24P	24P-322.50-322.75-C	Core	0.19	0.23	0.18	2.63	2.16	32	49	19	10	9	1.7E-05
24P	24P-322.75-323.25-C	Core	0.16	0.21	0.22	2.63	2.05	29	50	21	9	13	1.2E-04
24P	24P-323.25-323.44-C	Shoe Core						25	40	35	15	19	
24P	24P-360.00-360.02-C	Core				2.54		33	47	20	10	10	
24P	24P-360.02-360.52-C	Core	0.15	0.27	0.32	2.54	1.74	35	49	16	9	7	5.1E-03
24P	24P-360.52-360.71-C	Shoe Core						49	33	18	9	8	
24P	24P-80.43-80.93-C	Core	0.10	0.19	0.22	2.54	1.97	29	61	10	6	4	4.9E-04
24P	24P-80.93-81.43-C	Core	0.12	0.21	0.24	2.54	1.93	29	60	11	6	6	2.2E-03
24P	24P-81.43-81.69-C	Shoe Core						24	62	14	6	8	

Table 5.1-1
Laboratory Analysis Data for 19PB, 24P, and 29P Drive Core Samples
(Blanks indicate unmeasured parameters)

Well Name	Sample Number	Sample Type	Volumetric Water Content (cm^3/cm^3)		Calculated Porosity (cm^3/cm^3)	Density (g/cm^3)		Wet Sieve (%)			Hydrometer (%)		Saturated Hydraulic Conductivity (cm/sec)
			Field Sample	Saturated Sample		Specific Gravity	Dry Bulk Density	Gravel	Sand	Fines	Silt	Clay	
29P	29P-100.50-101.00-C	Core	0.23	0.26	0.25	2.52	1.90	36	48	16	8	8	8.4E-06
29P	29P-101.00-101.50-C	Core	0.19	0.21	0.19	2.52	2.03	54	34	12	6	6	9.6E-06
29P	29P-102.00-102.27-C	Shoe Core						50	36	14	6	8	
29P	29P-180.00-180.36-C	Core	0.23	0.25	Censored	2.58	Censored	47	39	14	Censored	Censored	1.8E-05
29P	29P-180.36-180.86-C	Core	0.13	0.22	0.21	2.58	2.04	54	34	12	6	6	5.0E-05
29P	29P-180.86-181.13-C	Shoe Core						48	38	14	4	10	
29P	29P-280.84-281.34-C	Core	0.22	0.27	0.27	2.56	1.88	43	42	15	5	10	4.4E-05
29P	29P-281.34-281.84-C	Core	0.18	0.32	0.24	2.56	1.94	55	31	14	6	8	1.4E-05
29P	29P-281.84-282.11-C	Shoe Core						41	39	20	7	13	

Table 5.1-2
Mean Dry Bulk Density and Saturated Hydraulic Conductivity Data for Drive Core Samples

Well Name	Sample Number	Dry Bulk Density Arithmetic Mean (g/cm^3)	Saturated Hydraulic Conductivity (cm/sec)		
			Core Value	Geometric Mean	Arithmetic Mean
19PB	19PB-380.00-380.50-C	1.89	4.2E-06	3.0E-06	5.9E-06
	19PB-380.50-381.00-C		2.3E-06		
	19PB-527.61-528.11-C		1.4E-05		
	19PB-528.11-528.61-C		7.0E-07		
	19PB-562.07-562.57-C		7.6E-06		
	19PB-562.57-563.07-C		1.1E-06		
	19PB-620.75-621.25-C		1.7E-05		
	19PB-621.25-621.75-C		5.3E-07		
24P	24P-80.43-80.93	1.94	4.9E-04	6.50E-04	3.90E-03
	24P-80.93-81.43		2.2E-03		
	24P-120.13-120.58		2.8E-03		
	24P-120.58-121.08		2.6E-03		
	24P-160.87-161.37		1.8E-03		
	24P-161.37-161.87		2.4E-03		
	24P-200.31-200.61		6.5E-06		
	24P-240.48-240.98		3.0E-02		
	24P-240.98-241.48		3.2E-03		
	24P-280.40-280.73		1.7E-05		
	24P-322.50-322.75		1.7E-05		
	24P-322.75-323.25		1.2E-04		
	24P-360.02-360.52		5.1E-03		
29P	29P-100.50-101.00	1.96	8.4E-06	1.9E-05	2.4E-05
	29P-101.00-101.50		9.6E-06		
	29P-180.36-180.86		1.8E-05		
	29P-180.00-180.36		5.0E-05		
	29P-280.84-281.34		4.4E-05		
	29P-281.34-281.84		1.4E-05		

Table 5.1-3
Laboratory Particle Size Distribution Data,
Summary Statistics for 24P and 29P Drive Core Samples

Well Name	Depth Interval Containing Data (feet)		Number of Samples in Depth Interval	Wet Sieve Parameter	Minimum (%)	Maximum (%)	Average (%)	Standard Deviation	Coefficient of Variation
24P	80.43	360.71	22	Gravel	19	49	30	6	22
				Sand	33	66	55	8	15
				Fines	4	35	15	7	46
29P	100.5	282.11	9	Gravel	36	55	48	7	14
				Sand	31	48	38	5	13
				Fines	12	20	15	2	17

Table 5.1-4
Laboratory Particle Size Distribution Data,
Summary Statistics for 19PB Sonic Grab Core Samples

Parameter	Depth Interval Containing Data (feet)		Number of Samples in Depth Interval	Minimum	Maximum	Average	Standard Deviation	Coefficient of Variation
Wet Sieve Gravel (%)	352.4	631.1	199	3.4	83.4	40.0	18.0	45
Wet Sieve Sand (%)	352.4	631.1	199	14.8	75.6	45.6	14.2	31
Wet Sieve Fines (%)	352.4	631.1	197	0.6	41.3	14.6	6.9	47

Table 5.1-5
Summary of Laboratory Analyses of 19PB Sonic Core Grab Samples
Repacked to Target Densities at Air-Dried and Optimum Water Contents
(Blanks indicate unmeasured parameters)

Sample Number	Density (g/cm^3)		Calculated Porosity (cm^3/cm^3)	Saturated Volumetric Water Content (cm^3/cm^3)	Saturated Hydraulic Conductivity (cm/sec)	Atterberg Limits Fines Classification	Particle Size Analysis (Percent))				
							Wet Sieve				Hydrometer
	Dry Bulk Density	Specific Gravity					Cobbles	Gravel	Sand	Fines	Clay
19PB-388.9-394.1-SCR	1.76	2.57	0.315	0.310	8.8E-04	ML	37	27	33	3	5
19PB-401.1-405.0-SCR	1.74	2.54	0.315	0.317	3.1E-03	ML	0	43	47	10	7
19PB-406.3-408.5-SCR	1.76	2.58	0.318	0.309	4.4E-03	CL	0	47	45	8	5
19PB-437.8-441.2-SCR	1.75	2.53	0.308	0.317	8.8E-04		0	19	72	9	5
19PB-450.3-455.1-SCR	1.73	2.55	0.322	0.317	3.9E-03	ML	0	41	46	13	9
19PB-457.2-460.7-SCR	1.79	2.55	0.298	0.295	3.0E-04	ML	0	45	42	13	6
19PB-478.2-481.9-SCR	1.69	2.54	0.335	0.331	7.3E-04	ML	0	39	44	17	12
19PB-481.9-484.4-SCR	1.65	2.53	0.348	0.342	2.1E-03	ML	0	45	42	13	11
19PB-512.1-514.2-SCR	1.74	2.59	0.328	0.324	9.8E-04						
19PB-517.3-519.4-SCR	1.69	2.54	0.335	0.336	2.1E-03	ML	0	38	52	10	6
19PB-519.4-522.1-SCR	1.68	2.53	0.336	0.346	5.4E-03	CL	0	48	40	12	7
19PB-547.6-553.3-SCR	1.73	2.58	0.329	0.329	3.0E-04	CL-ML	0	38	43	19	11
19PB-553.7-557.8-SCR	1.73	2.56	0.324	0.313	1.2E-04	ML	0	23	57	20	11
19PB-598.7-602.9-SCR	1.67	2.52	0.337	0.326	1.8E-04	ML	0	24	60	16	8
19PB-618.9-624.9-SCR	1.70	2.55	0.333	0.336	2.3E-04	ML	0	26	56	18	10
19PB-406.3-408.5-SCRM	1.90		0.264	0.251	6.9E-05						
19PB-457.2-460.7-SCRM	1.90		0.255	0.262	4.0E-05						
19PB-478.2-481.9-SCRM	1.90		0.252	0.253	7.9E-06						
19PB-481.9-484.4-SCRM	1.90		0.252	0.244	1.6E-05						
19PB-519.4-522.1-SCRM	1.90		0.249	0.261	7.6E-05						
19PB-553.7-557.8-SCRM	1.90		0.258	0.265	1.0E-05						
19PB-618.9-624.9-SCRM	1.90		0.255	0.237	5.2E-07						

Table 5.1-6
Mean Saturated Hydraulic Conductivity Data for 19PB Drive Core Samples and Repacked Laboratory Samples

Sample Number	Core Type	Saturated Hydraulic Conductivity (cm/sec)		
		Core Value	Geometric Mean	Arithmetic Mean
19PB-380.00-380.50-C	Drive Core	4.20E-06	3.0E-06	5.9E-06
19PB-380.50-381.00-C		2.30E-06		
19PB-527.61-528.11-C		1.40E-05		
19PB-528.11-528.61-C		7.00E-07		
19PB-562.07-562.57-C		7.60E-06		
19PB-562.57-563.07-C		1.10E-06		
19PB-620.75-621.25-C		1.70E-05		
19PB-621.25-621.75-C		5.30E-07		
19PB-406.3-408.5-SCR	Repacked Core at Air-Dried Water Content	4.4E-03	8.4E-04	1.9E-03
19PB-457.2-460.7-SCR		3.0E-04		
19PB-478.2-481.9-SCR		7.3E-04		
19PB-481.9-484.4-SCR		2.1E-03		
19PB-519.4-522.1-SCR		5.4E-03		
19PB-553.7-557.8-SCR		1.2E-04		
19PB-618.9-624.9-SCR		2.3E-04		
19PB-406.3-408.5-SCRM	Repacked Core at Optimum Water Content	6.90E-05	1.7E-05	3.9E-05
19PB-457.2-460.7-SCRM		4.00E-05		
19PB-478.2-481.9-SCRM		7.90E-06		
19PB-481.9-484.4-SCRM		1.60E-05		
19PB-519.4-522.1-SCRM		7.60E-05		
19PB-553.7-557.8-SCRM		1.00E-05		
19PB-618.9-624.9-SCRM		5.20E-07		

Table 5.1-7
Comparison of Particle Size Distribution Data for 19PB Sonic Grab Core Samples and Repacked Laboratory Sample Splits

Grab Sample							Repacked Laboratory Sample Split			
Sample Number	Field Split			Weighted Average of Field Split			Sample Number	Gravel (%)	Sand (%)	Fines (%)
	Gravel (%)	Sand (%)	Fines (%)	Gravel (%)	Sand (%)	Fines (%)				
19PB-388.9-394.1-SC	42	41	17	NA	NA	NA	19PB-388.9-394.1-SCR	27	33	3
19PB-401.1-406.1-SC	68	25	7	NA	NA	NA	19PB-401.1-405.0-SCR	43	47	10
19PB-406.3-407.5-SC	72	25	3	69	28	3	19PB-406.3-408.5-SCR	47	45	8
19PB-407.5-407.9-SC	54	42	4							
19PB-407.9-408.5-SC	75	24	1							
19PB-437.2-441.2-SC	21	69	10	NA	NA	NA	19PB-437.8-441.2-SCR	19	72	9
19PB-450.0-455.1-SC	71	25	4	NA	NA	NA	19PB-450.3-455.1-SCR	41	46	13
19PB-457.2-460.7-SC	50	37	11	NA	NA	NA	19PB-457.2-460.7-SCR	45	42	13
19PB-478.2-481.9-SC	44	41	15	NA	NA	NA	19PB-478.2-481.9-SCR	39	44	17
19PB-481.9-484.4-SC	49	38	13	NA	NA	NA	19PB-481.9-484.4-SCR	45	42	13
19PB-512.1-514.2-SC	38	49	13	NA	NA	NA	19PB-512.1-514.2-SCR			
19PB-517.3-519.4-SC	28	57	15	NA	NA	NA	19PB-517.3-519.4-SCR	38	52	10
19PB-519.4-519.7-SC	52	43	6	67	28	5	19PB-519.4-522.1-SCR	48	40	12
19PB-519.7-522.1-SC	69	26	5							
19PB-547.6-549.6-SC	26	49	25	22	52	26	19PB-547.6-553.3-SCR	38	43	19
19PB-550.7-553.3-SC	19	55	26							
19PB-553.7-554.8-SC	31	50	18	27	53	21	19PB-553.7-557.8-SCR	23	57	20
19OB-554.8-555.2-SC	26	53	20							
19PB-555.2-557.8-SC	25	54	22							
19PB-598.7-601.0-SC	26	59	15	25	59	16	19PB-598.7-602.9-SCR	24	60	16
19PB-601.9-602.9-SC	25	57	18							
19PB-618.9-619.9-SC	16	46	39	22	47	30	19PB-618.9-624.9-SCR	26	56	18
19PB-622.0-622.5-SC	28	56	16							
19PB-622.5-624.0-SC	19	53	27							
19PB-624.0-624.9-SC	32	34	35							

Table 5.2-1
Laboratory Particle Size Distribution Data,
Summary Statistics for 16P, 27P, and 28P Drill Cuttings Samples

Well Name	Depth Interval Containing Data (feet)		Number of Samples in Depth Interval	Wet Sieve Parameter	Summary Statistics				
	From	To			Minimum (%)	Maximum (%)	Average (%)	Standard Deviation (%)	Coefficient of Variation
16P	2.5	165	33	Gravel	5	38	21.8	8.3	38
				Sand	40	61	52.3	4.5	9
				Fines	11	55	25.8	11.2	43
27P	2.5	180	36	Gravel	9	42	20.9	7.6	36
				Sand	35	76	57.7	8.8	15
				Fines	6	50	21.4	11.1	52
28P	2.5	240	48	Gravel	8	39	23	8.7	38
				Sand	42	72	57.4	6.6	11
				Fines	5	48	19.6	10.6	54

Table 5.2-2
Laboratory Particle Size Distribution Data,
Summary Statistics for 24P and 29P Drill Cuttings Samples

Well Name	Number of Samples in Depth Interval	Depth Interval Containing Data (feet)		Wet Sieve Parameter	Summary Statistics				
		From	To		Minimum (%)	Maximum (%)	Average (%)	Standard Deviation (%)	Coefficient of Variation
24P	82	2.5	420	Gravel	6.0	47.0	26.6	9.7	36
				Sand	43.0	78.0	59.3	6.3	11
				Fines	3.0	36.0	14.1	7.4	53
29P	64	2.5	320	Gravel	5.0	47.0	31.2	7.6	24
				Sand	42.0	88.0	57.5	8.7	15
				Fines	4.0	19.0	11.3	3.7	33

Table 5.3-1
Hydraulic Conductivity Data from Constant Head Tests in 19PB Piezometers

19PB Piezometer	Test (Sandpack) Interval (feet below ground surface)		Test Number	Water Injection Rate (gallons/ minute)	Test Interval Length (feet)	Head of Water Acting on Test Interval[a] (feet)	Radius of Borehole (feet)	Hydraulic Conductivity (centimeters/ second)	Average Hydraulic Conductivity (centimeters/ second)
	From	To							
Deep	505.1	545.2	1	12.8	40.1	43.6	0.34	3.9E-04	4.8E-04
			2	28.6	40.1	82.9	0.34	5.1E-04	
			3	35.3	40.1	110.8	0.34	5.0E-04	
			4	20.7	40.1	54.3	0.34	5.2E-04	
Shallow	350.0	401.9	1	2.3	51.9	155.6	0.25	2.0E-05	2.0E-05
			2	2.3	51.9	151.0	0.25	2.0E-05	

[a]Head is calculated as the applied head above the water table and assumes that the test interval is below the water table. However, the upper approximately 20 feet of the test interval in the shallow screen is above the water table. This fact was ignored in the calculation of applied head on the shallow screen test interval.

Table 5.3-2
Laboratory Particle Size Distribution Data,
Summary Statistics for 19PB Sonic Core Grab Samples
from both Shallow and Deep Piezometer Sandpack Intervals

19PB Piezometer	Number of Samples in Depth Interval	Depth Interval Containing Data (feet)		Wet Sieve Parameter	Summary Statistics				
		From	To		Minimum (%)	Maximum (%)	Average (%)	Standard Deviation (%)	Coefficient of Variation
Deep	27	506.0	544.7	Gravel	13.9	73.5	40.8	14.8	36
				Sand	22.5	72.2	45.8	12.5	27
				Fines	3.9	23.5	13.4	4.8	36
Shallow	42	352.4	401.1	Gravel	10.7	80.6	42.9	18.0	42
				Sand	14.8	75.6	44.7	15.5	35
				Fines	3.0	26.5	12.4	5.1	41

Table 5.3-3
Summary of Average Saturated Hydraulic Conductivity vs. Measurement Scale Data for Site 19 Core and In Situ Tests

Type of Measurement	Well Name	Material Tested	Number of Samples/ Tests	Depth Interval Covered by Tests (feet bgs		Average Density (g/cm^3)	Average Porosity (cm^3/cm^3)	Average Volume (Scale Volume) (m^3)	Relative Measurement Scale	Average Saturated Hydraulic Conductivity (m/sec)	
				From	To					Arithmetic Mean	Geometric Mean
Laboratory constant head test on drive core samples	19PB	Alluvium drive core (4 inches in diameter by 6 inches long)	6	389.00	563.07	1.9	0.28	1.1E-03	Smallest	5.0E-08	3.0E-08
Laboratory constant head test on repacked core with an average density of 1.7 g/cm^3	19PB	Alluvium repacked at air dry water content (6 inches in diameter by 12 inches long)	13	388.9	557.8	1.7	0.32	5.6E-03	Small	1.9E-05	1.2E-05
Laboratory constant head test on repacked core with an average density of 1.9 g/cm^3	19PB	Alluvium repacked at optimum water content (6 inches in diameter by 12 inches long)	6	406.3	557.8	1.9	0.26	5.6E-03	Small	3.7E-07	2.5E-07
Field piezometer constant head injection test in shallow and deep screens	19PB	Alluvium formation with volume equal to injected water divided by porosity	2	350.0	545.2	1.9[a]	0.26	5.6E+00	Intermediate	2.5E-06	9.8E-07
Field 48-hour aquifer constant rate pump test with all screens open (analysis done on upper two screens)	19D	Alluvium formation with volume equal to pumped water divided by porosity	1	408.5	519.0	1.9[a]	0.26	5.2E+02	Large	2.7E-05	2.7E-05

[a]Estimated from borehole geophysical logs.

Table 6.2-1
Summary of Censored Geophysical Logs

Well Name	Record Index Designator (RID) Number	Log Type	Interval (feet)		Reason for Censoring
			From	To	
16P	5482	Acoustic Velocity (Sonic)	880	2898	Tool does not seem to respond properly, or data are over-filtered.
		Moisture	1980	2898	Moisture data are suspect; tool is possibly not functioning properly.
	5485	Density	0	2121	Density data are suspect; tool is possibly not functioning properly.
		Caliper	1300	2121	Tool is not responding properly - possibly dragging on the borehole wall.
28P	5341	Moisture	0	1196.5	Moisture data are suspect; tool is possibly not functioning properly or data are over-filtered.
	5337	Moisture	1120	2050	Moisture data are suspect; tool is possibly not functioning properly or data are over-filtered.
		Density	1120	2050	Density data are suspect; tool is possibly not functioning properly or data are over-filtered.
27P	5536	Moisture	0	1897.7	Moisture data are suspect; tool is possibly not functioning properly or data are over-filtered.
		Density	0	1897.7	Density data are suspect; tool is possibly not functioning properly or data are over-filtered.
		Acoustic Velocity (Sonic)	607	612	Negative travel times are not possible - tool was not functioning properly over this interval.
			622	626	Negative travel times are not possible - tool was not functioning properly over this interval.
29P	5746	Conductivity	345	702	Data unreliable below the water table, as tool was calibrated for the 0 - 15 ohm*m scale.
		Inductive Resistivity	345	702	Data unreliable below the water table, as tool was calibrated for the 0 - 15 ohm*m scale.
		Resistivity (SPR, R8 - R64)	0	702	Data are unreliable.
		Resistivity (R32) - repeat	380	585	Negative resistivity values occur due to tool being run on the "high" scale.
		Resistivity (R64) - repeat	380	585	Negative resistivity values occur due to tool being run on the "high" scale.
		Acoustic Velocity (Sonic)	378	400	Negative travel times are not possible - tool was not functioning properly over this interval.
24P	6031	Acoustic Velocity (Sonic)	465	1595	Sonic data are suspect; tool is possibly not functioning properly.