Open-file report
75-410

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TABLE 3 -- LOG OF DRILL HOLE U8a5

Location: N. 884,010; E. 665,698

Surface elevation: 4,603.6

Date drilled: 9/13/65-9/24/65

Date compiled: 5/1/66

Logged by: W. J. Carr

EXPLANATION

Ash-flow tuff
Spacing of lines indicates degree of welding. Solid lines indicate vitric (glassy) zones, dashed lines devitrified zones. Solid black indicates vitrophyre (densely welded glass)

Bedded tuff, vitric

Bedded tuff or tuffaceous sedimentary rocks

Volcanic breccia or lithic-rich tuff

Silicic lava

Colluvium-alluvium

Limestone

Dolomite

Shale

Quartzite

Highly fractured rock

	Relative strength of rock 1/	Field estimate of unconfined compressive strength (psi)	Examples of rock types
1	Very weak	< 5,000	Friable to very friable bedded tuff and alluvium
2	Weak	5,000-10,000	Altered bedded tuff, compacted non-welded tuff, indurated alluvium
3	Intermediate	10,000-15,000	Moderately to slightly welded tuff, indurated bedded tuff
4	Strong	15,000-25,000	Densely welded tuff, vitrophyre
5	Very strong	>25,000	Dense basalt, fresh granite, Paleozoic carbonate rocks, quartzite

CORES

Conventional core taken from depth of to feet; -foot recovery.

Sidewall core taken at depth of feet.

CHART SYMBOLS

Density (g /cc)
Db--Bulk
Dg--Grain
Dn--Natural State
Velocity (kFPS)
Vp--P-wave
Vs--Shearwave
ΔT --Travel time (10^{-6} sec/ft)
CVL--Continuous velocity log
3-DVL--Three-dimensional velocity log
Db x V--Acoustic impedence (gm/cc x K-feet/sec)

ϕ --Porosity (%)
SW--Saturation water (%)
K--Magnetic susceptibility (x 10^6 cgs units)
Elastic constants (x 10^6 psi)
E--Young's modulus
B--Bulk modulus
G--Shear modulus
σ--Poisson's ratio

GEOPHYSICAL LOGS 2/ (WELEX)

Geophysical logs

Caliper Log: Hole Diameter (inches) 10 18 26

Electric Logs: SP (MV) -140+; Normal (Ohm M/M) 0 500 5000; Lateral (Ohm M²/M) 0 500 5000

Radioactivity Logs: Gamma API GR-Units 0 500 1000; Neutron API N-Units 5000 2000 0; Density Photon Rate (counts per sec) 190 40

Velocity Log: Δt

PHYSICAL PROPERTIES

Stratigraphy and lithology	Unit thickness (feet)	Depth (feet)	Core c	Core sw	Strength 1/	Elevation (feet)
						4,604
Alluvium Gravel and sand with scattered boulders; mainly boulders from 340 to 370 feet. C 369-372.	485	100 200 300 400			2	
Sandstone, tuffaceous Sandstone, tuffaceous, light tan, medium grained, friable.		485				4,119
Timber Mountain Tuff Rainier Mesa Member Tuff, ash-flow, tan, nonwelded to partly welded in lower part, vitric to partly vitric; contains black glassy shards and vitric white pumice, quartz, feldspar and biotite. C 607-615.	95 40	500 580 600			1 3	4,024 3,984
Tuff, vitrophyre, black to brownish-black; densely to moderately welded with abundant crystals of feldspar and biotite, but little quartz. Dip about 10°. C 660-666.	70	620 690			4	3,914
Tuff, ash-flow, purplish gray, grading to pink in lower 30 feet; densely to moderately welded and devitrified in upper 110 feet, contains quartz, feldspar, biotite; in lower 30 feet, nonwelded, vitric.	140	700 800 830			3	3,774
Bedded tuff Tuff, bedded, upper 20 feet white, rest tan to white, lower 50 feet contains fine to coarse pumice and locally abundant small purplish lithic grains; some tuffaceous sandstone and minor swelling clay. C 869-877.	70 70	900 970			1 1	3,704 3,634
Indian Trail Formation Bedded tuff associated with the Grouse Canyon Member Tuff, bedded(?), light gray to tan, mostly vitric, crystal-poor.	220	1000			3	
Bedded and ash-flow tuff Tuff, bedded(?) in upper 20 feet, tan to light gray and light yellow, contains a few small crystals of biotite, feldspar and quartz, zeolitic; lower 170 feet mostly ash-flow(?) tuff, light yellow, nonwelded; contains about 10 percent crystals (plagioclase 50 percent, alkali feldspar 40 percent, quartz 10 percent, and biotite 2 percent) lithics 5 percent; clayey and zeolitic. C 1059-1063.	80	1100 1190 1200			3	3,414
Tuff of Redrock Valley Tuff, ash-flow, light gray, moderately welded from 1,190 to 1,225 feet, fine grained, argillized, contains about 4 percent crystals (68 percent plagioclase, 15 percent alkali feldspar, 6 percent green hornblende, 5 percent biotite.). C 1213-1221.	25 215	1,270 1,295 1300 1400			4 4	3,354 3,309
Dolomite Dolomite, gray, fine grained, highly brecciated and sheared with veinlets of clay, carbonate, and quartz; fault gouge(?) at about 1,272 feet. C 1270-1278, 1282-1290		1500				
Eleana Formation Argillite, mostly shiny black, sparse detrital quartz silt, mostly shreds of chlorite-clay mineral and quartz; veinlets of carbonate and quartz. C 1325-1333, C 1361-1369.	155	1,510 1600			5	3,094
Dolomite Dolomite, gray to dark gray grading down to light tannish-gray, fine to medium crystalline, some microbreccia, sparse veinlets of carbonate and quartz. C 1513-1521, C 1647-1652.		1,665 1700				2,939

Caliper Log: Hole Diameter (inches)	Electric Logs: SP (MV)	Normal (Ohm M/M)	Lateral (Ohm M²/M)	Radioactivity Logs: Gamma API GR-Units	Neutron API N-Units	Density Photon Rate (counts per sec)	Velocity Log: Δt
		18"	18'8"			All Values are D_p	All Values are V_p
		64"					
	10	65					
						4000 Level SW% 2000	
	0	35				2.21	
	0	35				2.22	5.9 ?
	20	125-250				1.72	5.8?
	20	200-375				2.33	<13.3
	5	50				1.82	6.8
	10	45				1.85	6.7
	20	60				1.66	5.9
		60				1.95	8.3
	0						
	20	30-250				2.08	10.0
	0						
	20	150				2.58	9.1?
						1.95-2.63	13.3
	10	200					
	70	>5,000				2.89	18.2

Derived from Geophysical Logs 2/ 3/ DbxVp (CVL)	Vs	E	φ
13?	<4.0	<1.0	>65?
10?	<4.0	<1.0	>65?
<3.1	<8.1	<4.8	13
12	4.6	1.0	57
12	4.5	<1.0	58
10	<4.0	<1.0	>65
16	5.4	1.6	40
21	6.3	2.4	28
24?	5.9?	1.9?	34?
26-	8.1	4.8	13
53	10.4	9.7	1

Laboratory Analysis of Core 4/

Vp	Vs	E	B	G	σ	Dn	Db	Dg	Db (Sw 100%)	φ Total	Sw by wt	k
15.6	9.2	6.70	4.15	2.72	.231	2.38	2.35	2.52	2.42	6.75	1.18	854.0
						1.66	1.41	2.46	1.84	42.68	14.94	246.0
						1.77	1.37	2.40	1.80	42.92	22.34	94.0
9.1	5.8	1.95	1.04	0.82	.186	2.05	1.81	2.51	2.09	27.89	11.89	199.0
23.0	12.5	15.3	12.15	5.94	.29	2.81	2.80	2.86	2.82	2.10	28	7.2
						2.59 2.65	2.49 2.59	2.83 2.73	2.61 2.64	12.01 5.13	.10 2.96	5.5 30.0
						2.58	2.51	2.75	2.60	8.73	2.78	30.0
24.0	12.8	16.22	13.73	6.23	.303	2.81	2.81	2.86	2.83	1.75	0.00	0.00
22.7	12.7	15.57	11.43	6.12	.273	2.82	2.82	2.85	2.83	1.05	0.00	0.00

Elastic Constants Calculation 3/ (Welex)

Intervals (feet) and number of data points	Vp	Vs	E	B	G	σ	Db
624-690,17	9.5	5.3	2.45	1.93	0.97	0.26	2.52
692-828,22	6.9	4.4	1.23	0.58	0.53	0.14	2.03
824-968,16	6.6	4.3	1.10	0.51	0.48	0.13	1.94
972-1188,55	8.0	4.9	1.62	0.92	0.68	0.19	2.07
1192-1268,20	8.4	5.0	1.95	1.21	0.79	0.20	2.32
1272-1292,6	8.2	4.9	2.14	1.33	0.88	0.20	2.64
1296-1508,54	11.8	6.7	3.89	2.76	1.55	0.25	2.54
1512-1652,36	16.5	8.3	7.21	7.32	2.72	0.32	2.91

2/ Numerical values are averaged throughout the indicated interval.

3/ From empirical graphs by R. D. Carroll, U. S. Geological Survey, Denver, Colorado.

4/ E. D. Seals and E. F. Monk, U. S. Geological Survey, Denver, Colorado.

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