Thermal Power Company

GL01968

CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANNEL

DATE JUNE 22, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
527'-534'	1/1	7'/7.8'	112%	includes 4" slough, full circulation
534'-536'	2/1	2'/1.2'	58%	partial returns/circulation
536'-539½'	3/1&2	3½'/4.3'	124%	recovered core lost from Run #2, lose returns
539½'-539¾'	4/2	2+"/4"	≈200%	water level @ ≈ 20'
539¾'-545.5'	5/2&3	5.75'/5.75'	100%	static water level remains near top of hole. LCM added intermittently, mud visc. varied – NO RETURNS
545.5'-556'	6/3&4	10.5'/10.5'	100%	
556'-562'	7/4	6'/6'	100%	
562'-571'	8/5	9'/9'	100%	
571'-579'	9/5	8'/1½'	19%	6½ feet lost
579'-587'	10/6	8'/8'	100%	
587'-588'	11/6&7	1'/1.25'	125%	
588'-588.5'	12/7	6"/4"	67%	
588.5'-594.5'	13/7	6'/7'	117%	1 foot of slough recovered following Bit Run
594.5'-597.5'	14/7&8	3'/3'	100%	
597.5'-603'	15/8	5½'/5½'	100%	
603'-610.5'	16/8&9	7½'/2½'	33%	5 feet of rubble and ash lost
610.5'-615'	17/9	4½'/3½'	78%	1' of " " " "
615'-616'	18/9	1'/9"	75%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) MCDANNEL/GOODWIN

DATE JUNE 23, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
616'-626'	19/9,10	10'/10'	100%	H_2O level remains at top of hole (rods in hole)
626'-636'	20/10,11	10'/10'	100%	most of rock is dense, well-consolidated
636'-646'	21/11,12	10'/10'	100%	
646'-656'	22/12,13	10'/9'	90%	Lost 1' of rubble
656'-663'	23/13,14	7'/6'	85%	Loss ~1'
663'-670'	24/14	7'/4'	57%	Loss ~3' in rubble/cinder @ bottom of hole
670'-675'	25/14	5'/2'	40%	Loss ~3' (in rubble...)

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN
DATE JUNE 24, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
675'-683'	26/15	8'/1'	1'- 13%	7' Rubble/cinders washed away
685'-689'	27/15	6'/4½'	75%	1½' " " " " at top of interval
689'-694'	28/15,16	5'/5'	100%	
694'-696'	29/16	2'/2'	100+%	6" Cindery Slough at start of interval
696'- 703'	30/16,17	7'/7'	100+%	Cinder Slough Recovered at beginning of run
703'- 709'	31/17	6'/5.2'	86 %	
709' - 715'	32/17,18	6'/3.5'	60%	MRTs read 69°, 70°; Mud In: 61°; Air: 43°
715' - 719'	33/18	4'/3.3'	80%	cordery/scoriaceous slough 719'-723'
719' - 723'	34/18	4'/1'	25%	
723' - 733'	35/18	10'/2'	20%	
733' - 743'	36/19	10'/10'	100%	
743' - 746'	37/20	3'/3.75	125%	~3" slough
746'- 756'	38/20,21	10'/10'	100%	
756'- 766.5'	39/21,22	10.5'/10.5'	100%	
766.5'- 774'	40/22,23	7.5'/6.5'	87%	lost ~1' ash & cinders
774' - 784.5'	41/23	10.5'/5.5'	52%	lost ~5' ash & cinders and scoria

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADE/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JUNE 25, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
784.5'-788.5'	42/23,24	4'/2½'	63%	½' slough also recovered at start of run
788.5'-792.5'	(43)/24	4'/2½'	63%	Core Returns V. Fractured/Rubbly 788.5' to
792.5'-795'	44/24	2½'/1½'	60%	
795'-799'	45/24	4'/2'	50%	
799'-806'	46/24,25	7'/7'	100%	
806'-814'	47/25,26	8'/8'	100%	
814'-815'	48/26	1'/1'	100%	v. rubbly
815'-825'	49/26,27	10'/10'	100%	
825'-835'	50/27,28	10'/7½	75%	unconsol. sandy matrix washing @ bottom hole
835'-840'	51/28,29	5'/3½'	70%	" " " " " " "
840'-844'	52/29	4'/3½'	88%	" " " "
844'-846.5'	53/29	2½'/2'	80%	" " " "
846.5'-848'	54/29	1½'/1¼'	50%	" " " "
848'-854'	55/29,30	6'/5'	83%	" " " "
854'-859'	56/30	5'/1'	20%	" " " " , mislatch-dropped
859'-864'	57/30,31	5'/5'	100%	Core during retrieval @ 859', Change Bit #2 → #3

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JUNE 26, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT / RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
864'-866.5'	58/31	25'/2.0'	80%	
866.5'-867'	59/31	0.5'/0.4'	80%	blocky & fractured - minor mud from above ~~the~~ hole?
867'-871.5'	59/31	4.5'/0.5'	11%	regained (~1½') some of lost intervals when rods tripped
871.5'-874'	60/31	2.5'/0.25'	10%	top 6" is slough from higher in hole
874'-876.5'	61/31	2.5'/2.5'	100%	
876.5'-878'	62/32	1.5'/1.5'	100%	
878'-880'	63/32,33	2'/2'	100%	remains very fractured, broken
880'-888'	64/33,34	8'/8'	100%	↓
888'-898.5'	65/34	10.5'/9'	86%	1½ feet lost at clayey bottom
898.5'-908.5'	66/34,35	10'/10'	100%	
908.5'-913'	67/35	4.5'/4.5'	100%	
913'-918'	68/36	5'/8'	100%	3' slough consisting of dacite & clay recovered when pulled 15' off bottom, 45 min. required to cor thru slough
918'-922'	69/36,37	4'/4'	100%	
922'-932'	70/37,38	10'/10'	100%	
932'-934.5'	71/38	2.5'/2'2"	86%	
934.5'-940'	72/38,39	5.5'/5.5'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JUNE 27, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
940'-944.5'	73/39	4.5'/2'	45%	Rubbley, fractured, clayey ← washed away?
944.5'-947'	74/39	2.5'/1.9	75%	
947'-953.5'	75/39,40	6.5'/4.8'	75%	
953.5'-962.5'	76/40,41	9'/9'	100%	
962.5'-968'	77/41,42	5.5'/5'	91%+	2' slough recovered after Bit Run, Add Bit #3
968'-977½'	78/42,43	9.5'/10'	100%+	6" slough recovered
977½'-987	79/43,44	9.5'/9.5'	100%+	Mnr. slough at every interval
987- 997	80/44,45	10'/10'	100%+	
997- 1007	81/45,46	10'/10'	100%+	
1007-1017	82/46,47	10'/10'	100%+	
1017-1027	83/47,48	10'/10'	100%+	
1027-1037	84/48,49	10'/10'	100%+	
1037-1047	85/49,50	10'/10'	100%+	
1047-1057	86/50,51	10/10'	100%+	
1057-1067	87/51,5253	10'/10'	100%+	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN
DATE JUNE 28, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT / RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
1067'- 1073'	88/53	6'/6'	100%	
1073'- 1083'	89/53,54,55	10'/10'	100%	
1083'-1093'	90/55,56	10'/10'	100%	
1093'- 1103'	91/56,57	10'/10'	100%	
1103'- 1113'	92/57,58	10'/10'	100%	Rock type changes from DIORITE/DACITE to Ashy Lahar @ ~ 1110'
1113'- 1123'	93/58,59	10'/10'	100%	
1123'- 1131'	94/59,60	8'/6.5'	81%	
1131'- 1141'	95/60,61	10'/10'+	100%+	
1141'- 1151'	96/61,62	10'/10'	100%	
1151'- 1161'	97/62,63	10'/10'	100%	
1161'- 1171'	98/63,64	10'/10'	100%	
1171'- 1180'	99/64,65	10/10	100%	
1180'- 1190'	100/65,66	10'/10'	100%	
1190'- 1200'	101/66,67	10'/10'	100%	
1200'- 1210'	102/67,68	10'/10'	100%	
1210'- 1220'	103/68,69	10'/10'	100%	
1220'- 1230'	104/69,70	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN
DATE JUNE 29, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE FOOTAGE CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
1230'-1240.5'	105/70,71	10.5'/10.5'	100%	
1240.5'-1250.5'	106/71,72	10'/10'	100%	
1250.5'-1261'	107/72,73	10.5'/10.5'	100%	
1261'-1271'	108/74,75	10'/10'	100%	
1271'-1276'	109/75,	5'/4½'	90%	
1276'-1286'	110/75,76	10'/10½'	100+%	recovered loss of previous run
1286'-1296'	111/76,77	10'/10'	100%	
1296'-1306'	112/77,78	10'/10'	100%	
1306'-1316'	113/78,79, 80	10'/10'	100%	
1316'-1324'	114/80	8'/7'	88%	
1324'-1331'	115/80,81	7'/7'	100%	recovered loss of previous run
1331'-1338'	116/81,82	7'/5½'	80%	clays + rubble washed away
1338'-1348'	117/82,83	10'/10'	100%	
1348'-1356'	118/83,84	8'/8'	100%	
1356'-1366'	119/84,85	10'/10'	100%	
1366'-1376'	120/85,86	10'/10'	100%	
1376'-1386'	121/86,87	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANIEL

DATE 7/1/86

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
1386'-1396'	122/87,88,89	10'/10'	100%	rock is generally very fractured w/ high clay content.
1396'-1406'	123/89,90	10/10'	100%	
1406'-1414'	124/90,91	8'/8'	100%	
1414'-1423'	125/91,92	9'/9'	100%	
1423'-1433'	126/92,93	10'/10'	100%	
1433'-1443'	127/93,94	10'/10'	100%	
1443'-1453'	128/94,95	10'/10'	100%	
1453'-1461'	129/95,96	8'/7½'	94%	
1461'-1471'	130/96,97	10'/10'	100%	
1471'-1481'	131/97,98	10'/10'	100%	
1481'-1491'	132/98,99	10'/10'	100%	
1491'-1501'5	133/99,100	10.5/10.2	~100%	
1501'5-1512'	134/100,101	10.5/10.2	~100%	
1512'-1522'	135/102,103	10'/10'	100%	
1522'-1532'	136/103,104	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) A.MCDANIEL / D.GOODWIN

DATE JULY 2, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
1532' - 1537'	137/104	5'/5'	100%	
1537' - 1547'	138/104, 105	10'/10'	100%	
1547' - 1557'	139/105, 106	10'/8'	80%	Dropped 2 feet of core from barrel
1557' - 1565'	140/106, 107	8/10'	120%	Recovered 2 feet of core dropped on previous run.
1565' - 1575'	141/107, 108, 109	10'/10'	100%	
1575' - 1585'	142/109, 110	10'/10'	100%	
1585' - 1595'	143/110, 111	10'/10'	100%	
1595' - 1605'	144/111, 112	10'/10'	100%	
1605' - 1615'	145/112, 113	10/10'	100%	
1615' - 1619'	146/113	4'/4'	100%	
1619' - 1629'	147/113, 114	10'/10'	100%	
1629' - 1639'	148/114, 115	10'/10'	100%	
1639' - 1649'	149/116, 117	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANIEL

DATE JULY 3, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
1649' – 1659'	150/117,118	10'/10'	100%	
1659' – 1669'	151/118,119	10'/10'	100%	
1669' – 1679'	152/119,120	10'/10'	100%	
1679' – 1689'	153/120,121	10'/10'	100%	
1689' – 1697'	154/121,122	8'/8'	100%	
1697' – 1698'	155/122	1'/6"	50%	Rubble w/ vertical fracture wedging core in tube
1698' – 1708'	156/122,123	10'/10'	100%	
1708' – 1711'	157/123	3'/3'	100%	
1711' – 1716'	158/124	5'/5'	100%	
1716' – 1719'	159/124	3'/3'	100%	
1719' – 1721'	160/124,	2'/2'	100%	Very fractured core causing short runs
1721 – 1725	161/125,	4'/4'	100%	
1725 – 1727	162/125,	2'/2'	100%	
1727 – 1734	163/125,126	7'/7'	100%	
1734 – 1742	164/126,127	8'/8'	100%	

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CORE RECOVERY LOG

HOLE CTGH #1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 4, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
1742'-1751'	165/127,128	9'/9'	100%	Rock fractured @ 45° every 1"-4" causing wedging of fragments in inner tube and short runs
1751'-1756'	166/128,129	5'/5'	100%	
1756'-1761'	167/129	5'/5'	100%	
1761'-1762'	168/129	1'/4"	33%	
1762'-1765'	169/129,130	3'/3'	100%	
1765'-1766'	170/130	1'/2"	17%	
1766'-1775'	171/130	9'/ 0' before POH 4' after POH	0%/40%	1775 Trip rods to recover core in outer barrel, core was dropped/lost because tube hadn't properly latched before start of run
1775'-1779'	172/130	4'/3.2	75%	1779 Trip rods - tube mislatched after being pulled to recover slough material bellow 560', replacement tube didn't properly latch... this wasn't recognized until rods drilled to bottom and 4' of hole cored) Core recovery (75%) includes minor slough.
1779'-1788'	173/131	9'/9'	100%	
1788'-1798'	174/132	10'/10'	100%	
1798'-1808'	175/133,134	10'/10'	100%	
1808'-1818'	176/134,135	10'/10'	100%	
1818'-1828'	177/135,136	10'/8'	80%	
1828'-1836'	178/136,137	8'/10'	125%	Recovered loss of previous run
1836'-1846'	179/137,138	10'/10'	100%	
1846'-1856'	180/138,139	10'/10'	100%	
1856'-1866'	181/139,140	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH 1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 7, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
1866'-1876'	182/140,141	10'/10'	100%	
1876'- 1886'	183/141,142	10'/10'	100%	
1886'- 1896'	184/142,143	10'/10'	100%	
1896' – 1906'	185/143,144	10'/10'	100%	
1906' – 1915'	186/144,145	9'/9'	100%	
1915' - 1917'	187/145	2'/2'	100%	Vertical fractures causing wedging of rocks in tubing
1917' – 1927'	188/145,146	10'/10'	100%	
1927'– 1929'	189/146,147	2'/2'	100%	
1929' - 1939'	190/147,148	10'/10'	100%	
1939' - 1943'	191/148	4'/3½'	88%	
1943' - 1946'	192/148	3'/3'	100%	brecciated core at 1946'
1946' - 1956'	193/149	10'/10'	100%	
1956' - 1966'	194/150,151	10'/10'	100%	
1966' – 1976'	195/151,152	10'/10'	100%	
1976' - 1981'	196/152	5'/5'	100%	
1981' - 1991'	197/152, 153	10'/10'	100%	1986'-1990'-rubbly
1991' – 1998'	198/153, 154	7'/7'	100%	50% of interval rubbly

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GODWIN

DATE JULY 8, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
1998' - 2006'	199/154,155	8'/8'	100%	1999'-2001' - rubbly
2006' - 2010'	200/155	4'/4'	100%	entire interval rubbly
2010' - 2013'	201/156	3'/3'	100%	"
2013' - 2016'	202/156	3'/3'	100%	"
2016' - 2021'	203/156, 157	5'/5'	100%	"
2021' - 2025'	204/157	4'/3½	88%	"
2025' - 2030'	205/157	5'/4¾	95%	
2030' - 2037'	206/158	7'/5¼	75%	"
2037' - 2043'	207/158,159	7'/7'	100%	
2043' - 2053'	208/159,160	10'/10'	100%	
2053' - 2063'	209/160,161	10'/10'	100%	
2063' - 2073'	210/161,162	10'/10'	100%	
2073' - 2083'	211/162,163	10'/10'	100%	
2083' - 2093'	212/163,164	10'/10'	100%	17' piece of unfractured core ... Wow!
2093' - 2103'	213/164,165	10'/10'	100%	2 breaks in 10' - v. sucrc frac's.
2103' - 2113'	214/165,166	10'/10'	100%	@2111' vert fracture in cindery B.A. takes drop in pump pres
2113' - 2120'	215/166,167	7'/7'	100%	
2120' - 2130'	216/167,168	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANNEL

DATE JULY 10, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT (OUT / RETURN)	AMOUNT RECOVERED (%)	COMMENTS
2130' - 2140'	217/168,169	10'/10'	100%	v. few fractures ↓
2140' - 2150.5	218/169,170	10.5'/10.5'	100%	
2150.5 2161'	219/170,171	10.5'/10.5'	100%	
2161' - 2171'	220/172,173	10'/10'	100%	
2171' - 2181'	221/173,174	10'/10'	100%	
2181' - 2191'	222/174,175	10'/10'	100%	
2191' - 2201.5'	223/175,176	10½'/10½'	100%	
2201.5' - 2212'	224/176,177	10½'/10½'	100%	
2212' - 2222½'	225/177,178	10½'/10½'	100%	
2222½' - 2233'	226/178,179	10½'/10½'	100%	
2233' - 2243'	227/179,180	10'/10'	100%	
2243' - 2253'	228/180,181	10'/10'	100%	
2253' - 2263'	229/181,182	10'/10'	100%	
2263' - 2267'	230/182,183	4'/4'	≤100%	v. rubbly - lost intra last days
2267' - 2277'	231/183,184	10'/10'	100%	
2277' - 2286'	232/184, 185	9'/8½'	94%	
2286' - 2291'	233/185,	5'/5'	100%	

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CORE RECOVERY LOG

HOLE CTGH1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 12, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
2291'-2296'	234/185,186	5'/5'	100%	
2296'-2306'	235/186,187	10'/10'	100%	
2306'-2316'	236/187,188	10'/10'	100%	
2316'-2326	237/188,189	10'/10'	100%	
2326'-2336'	238/189,190	10'/10'	100%	
2336'-2342'	239/190,191	6'/5½'	92%	
2342'-2352'	240/191,192	10'/9½'	95%	
2352'-2362'	241/192,193	10'/10'	100%	intermittent wobbly intervals
2362'-2368'	242/193,194	6'/6'+	100%	
2368'-2375'	243/194,195	7'/7'	100%	
2375'-2385'	244/195,196	10'/10'	100%	
2385'-2395'	245/196,197	10'/10'	100%	
2395'-2405'	246/197,198	10'/10'	100%	
2405'-2415	247/198,199	10'/10'	100%	
2415'-2425'	248/199,200	10'/10'	100%	
2425'-2434'	249/200,201	9'/9'	100%	
2434'-2444'	250/201,202	10'/10'	100%	
2444'-2446	251/202	2'/2'	100%	

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Form 3

CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANNEL

DATE JULY 14, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT CUT/RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
2446'-2456'	252/202,203	10'/10'	100%	
2456'-2466'	253/203,204	10'/10'	100%	
2466'-2476'	254/204,205	10'/10'	100%	
2476'-2486'	255/205,206	10'/10'	100%	
2486'-2495'	256/207,	9'/9'	100%	
2495'-2505'	257/208,209	10'/10'	100%	
2505'-2515'	258/209,210	10'/10'	100%	
2515'-2525'	259/210,211	10'/10'	100%	
2525'-2535'	260/211,212	10'/10'	100%	
2535'-2544'	261/212,213	9'/9'	100%	
2544'-2553'	262/213,214	9'/9'	100%	
2553'-2562'	263/214,215	9'/9+'	100%	
2562'-2570'	264/215,216	8'/8'	100%	
2570'-2574'	265/216	4'/4'	100%	
2574'-2584'	266/216,217	10'/10'	100%	
2584'-2594'	267/217,218	10'/10'	100%	
2594'-2603'	268/218,219	9'/10'+	100+%	adjusting footage to reflect accurate BH depth
2603'-2613'	269/219,220	10'/10'	100%	
2613'-2623'	270/220,221	10'/10'	100%	
2623'-2633'	271/221,222	10'/10'	100%	

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Form 3

CORE RECOVERY LOG

HOLE CTGH 1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 17, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
2633' - 2643'	272/222,223	10'/10'	100%	
2643' - 2653'	273/223,224	10'/10'	100%	
2653' - 2663'	274/224,225	10'/10'	100%	
2663' - 2673'	275/225,226	10'/10'	100%	
2673' - 2683'	276/226,227 228	10'/10'	100%	
2683' - 2693'	277/228,229	10'/10'	100%	
2693 - 2703'	278/229,230	10'/10'	100%	
2703 - 2713'	279/230,231	10'/10'	100%	
2713' - 2723'	280/231,232	10'/10'	100%	
2725' - 2733'	281/232,233	10'/10'	100%	
2733' - 2743'	282/233,234	10'/10'	100%	
2743' - 2753	283/234,235	10'/10'	100%	
2753 - 2762	284/235,236	9'/9'	100%	
2762 - 2772	285/237,236	10'/10'	100%	
2772 - 2782	286/238,237	10'/10'	100%	
2782 - 2792	287/238,239	10'/10'	100%	
2792 - 2802	288/239,240	10'/10'	100%	
2802 - 2809	289/240,241	7'/7'	100%	

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CORE RECOVERY LOG

HOLE CTGH 1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 18, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
2809'-2816'	240/241,242	7'/7'	100%	rock has splintery fracture @ 20° (subvertical) causing wedging in the inner tube & shorter runs
2816'-2823'	241/242	7'/7'	100%	
2823'-2831'	242/243	8'/8'	100%	
2831'-2841'	243/243,244	10'/10'	100%	
2841'-2851'	244/244,245	10'/9'	90%	dropped 1' core
2851'-2860'	245/245,246	9'/10'	110%	recovered core (from above run)
2860'-2870'	246/246,	10'/10'	100%	
2870'-2880'	247/248	10'/10'	100%	
2880'-2890'	248/249,250	10'/10'	100%	
2890'-2900'	249/250,251	10'/6.5'	65%	dropped 3.5' core
2900'-2907'	300/251	7'/10+'	140+%	retrieved 10' core & moved core block 2900' to correct position
2907'-2916'	301/251,252	9'/9'	100%	
2916'-2923'	302/252,253	7'/7'	100%	
2923'-2933'	303/253,254	10'/10'	100%	
2933'-2942'	304/254,255	9'/9'	100%	
2942'-2951'	305/255,256	9'/9'	100%	
2951'-2961'	306/256,257	10'/10'	100%	
2961'-2970'	307/257,258	9'/8'	89%	dropped core - rock is fractured.

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Form 3

CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/McDANNEL

DATE JULY 20, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
2970' - 2980'	308/258,259	10'/6.5'	65%	dropped core → may (also) be some problem grinding it up inside barrel when drilling
2980' - 2988'	309/259,260	8'/10.5'	131%	← moved core block ~2980' 2+', to correct for core recovered from last run #308
2988' - 2998'	310/260,261	10'/10'	100%	
2998' - 3008'	311/261,262	10'/10'	100%	
3008' - 3018'	312/262,263	10'/10'	100%	
3018' - 3028'	313/263,264	10'/10'	100%	
3028' - 3038'	314/265,266	10'/10'	100%	
3038' - 3048.5'	315/266,267	10.5'/10.5'	100%	+0.5 to catch up w/actual drilled depth (core barrel is 2" > 10' on each run)
3048.5' - 3059'	316/267,268	10.5'/10.5'	100%	
3059' - 3069'	317/268,269	10'/10'	100%	v. rubbly
3069' - 3079'	318/269,270	10'/10'	100%	" towards base of interval
3079' - 3089'	319/270,271	10'/10'	100%	
3089' - 3099'	320/271,272	10'/10'	100%	
3099' - 3109'	321/272,273	10'/10'	100%	
3109' - 3119	322/273,274	10'/10'	100%	
3119 - 3129	323/274,275	10'/10'	100%	

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Form 3

CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) MCDANNEL, GOODWIN

DATE JULY 22, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
3129'- 3139'	324/275, 276	10'/10'	100%	
3139'- 3149'	325/276,277	10'/10'	100%	
3149'-3159'	326/277,278	10'/10'	100%	
3159' - 3169'	327/278,279, 280	10'/10'	100%	
3169' - 3179'	328/280,281	10'/10'	100%	
3179' - 3189'	329/281,282	10'/10'	100%	
3189' - 3199'	330/282,283	10'/10'	100%	
3199' - 3209'	331/283,284	10'/10'	100%	
3209' - 3219'	332/284,285	10'/10'	100%	
3219' - 3229'	333/285,286	10/10'	100%	
3229' - 3239'	334/286,287	10'/10'	100%	
3239'- 3249'	335/287,288	10'/10'	100%	
3249'- 3259'	336/288,289	10'/10'	100%	
3259'- 3269.5'	337/289,290	10.5'/10.5'	100%	
3269½'- 3280'	338/290,291, 292	10.5'/10.5'	100%	
3280' - 3290'	339/292,293	10'/10'	100%	
3290' - 3300'	340/293,294	10'/10'	100%	
3300' - 3310'	341/294,295	10'/10'	100%	
3310' - 3320'	342/295,296	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 25, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
3320' - 3330'	343/296,297	10'/10'	100%	
3330' - 3340'	344/297,298	10'/10'	100%	
3340' - 3350'	345/298,299	10'/10'	100%	
3350' - 3360'	346/299,300	10'/10'	100%	
3360' - 3370'	347/300,301	10'/10'	100%	
3370' - 3380'	348/301,302	10'/10'	100%	
3380' - 3390'	349/302,303	10'/10'	100%	
3390' - 3400'	350/303,304	10'/10'	100%	
3400' - 3410½'	351/304,305	10½'/10½'	100%	
3410½' - 3421'	352/305,306	10½'/10½'	100%	
3421' - 3431'	353/307,308	10'/10'	100%	
3431' - 3441'	354/308,309	10'/10'	100%	
3441' - 3451'	355/309,310	10'/10'	100%	
3451' - 3461'	356/310,311	10'/10'	100%	
3461' - 3471'	357/311,312	10'/10'	100%	
3471' - 3481'	358/312,313	10'/10'	100%	
3481' - 3491'	359/313,314	10'/10'	100%	
3491' - 3501½'	360/314,315	10½'/10½'	100%	
3501½ - 3512	361/315,316	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 26, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
3512'- 3522'	362/316,317	10'/10'	100%	
3522'- 3532'	363/317,318	10'/10'	100%	
3532'- 3542'	364/318,319	10'/10'	100%	
3542'- 3552'	365/319,320	10'/10'	100%	
3552' - 3562'	366/320,321	10'/10'	100%	
3562' - 3572'	367/321,322	10'/10'	100%	
3572' - 3582'	368/322,323, 324	10'/10'	100%	
3582' - 3592½'	369/324,325	10½'/10½'	100%	
3592½' - 3603'	370/325,326	10½'/10½'	100%	
3603' - 3613'	371/326,327	10'/10'	100%	
3613' - 3621'	372/327,328	10'/10'	100%	
3621' - 3631'	373/328,329	10'/10'	100%	
3631' - 3641'	374/329,330	10'/10'	100%	
3641' - 3651'	375/330,331	10'/10'	100%	
3651' - 3661'	376/331,332	10'/10'	100%	
3661' - 3671'	377/332,333	10'/10'	100%	
3671'- 3681'	378/333,334	10'/10'	100%	
3681'- 3691'	379/334,335	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH 1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) McDANNEL/GOODWIN

DATE JULY 28, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
3691' - 3701'	380/335,336	10'/10'	100%	
3701' - 3711'	381/336,337	10'/10'	100%	
3711' - 3721'	382/337,338	10'/10'	100%	
3721' - 3723'	383/338,	2'/2'	100%	
3723' - 3733'	384/338,339	10'/10'	100%	
3733' - 3743'	385/340,341	10'/10'	100%	
3743' - 3753'	386/341,342	10'/10'	100%	
3753' - 3763'	387/342,343	10'/10'	100%	
3763' - 3773'	388/343,344	10'/10'	100%	
3773' - 3783'	389/344,345	10'/10'	100%	
3783' - 3793'	390/345,346	10'/10'	100%	
3793' - 3801'	391/346,347	8'/8'	100%	
3801' - 3811'	392/347,348	10'/10'	100%	
3811' - 3821'	393/348,349	10'/10'	100%	
3821' - 3831'	394/349,350	10'/10'	100%	
3831' - 3841'	395/350,351	10'/10'	100%	
3841' - 3851'	396/351,352	10'/10'	100%	
3851' - 3861'	397/352,353	10'/10'	100%	
3861' - 3871'	398/354	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN, McDANNEL

DATE JULY 31, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
3871'-3881'	399/355, 356	10'/10'	100%	
3881'-3891'	400/356, 357	10'/10'	100%	
3891'-3901'	401/357, 358	10'/10'	100%	
3901'-3911'	402/358, 359	10'/10'	100%	
3911'-3921'	403/359, 360	10'/10'	100%	
3921'-3931½'	404/360, 361	10½'/10½	100%	
3931½'-3942'	405/361, 362	10½/10½	100%	
3942'-3952'	406/362, 363	10'/10'	100%	
3952'-3962'	407/363, 364	10'/10'	100%	
3962'-3972	408/364, 365	10'/10'	100%	
3972'-3982'	409/365, 366	10'/10'	100%	
3982'-3992'	410/367, 368	10'/10'	100%	
3992'-4002'	411/368, 369	10'/10'	100%	
4002'-4012'	412/369, 370	10'/10'	100%	
4012'-4022'	413/370, 371	10'/10'	100%	
4022'-4032'	414/371, 372	10'/10'	100%	
4032'-4042'	415/372, 373	10'/10'	100%	
4042'-4052'	416/373, 374	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) MCDANNEL/GOODWIN

DATE AUG. 2, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
4052' - 4062'	417/374,375	10'/10'	100%	
4062' - 4072.5'	418/375,376	10.5'/10.5'	100%	
4072.5' - 4083'	419/376,377	10.5'/10.5'	100%	
4083' - 4093'	420/377,378	10'/10'	100%	
4093' - 4103'	421/378,379	10'/10'	100%	
4103' - 4113'	422/379,380 381	10'/10'	100%	
4113' - 4123'	423/381,382	10'/10'	100%	
4123' - 4133'	424/382,383	10'/10'	100%	
4133' - 4143'	425/383,384	10'/10'	100%	
4143' - 4153'	426/384,385	10'/10'	100%	
4153' - 4163'	427/385,386	10'/10'	100%	
4163' - 4173'	428/386,387	10'/10'	100%	
4173' - 4183'	429/387,388	10'/10'	100%	
4183' - 4193'	430/388,389	10'/10'	100%	
4193 - 4203	431/389,390	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANIEL

DATE AUG. 4, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
4203'- 4206'	432/390,	3'/2'	66%	DROPPED CORE?
4206- 4216'	433/390,391	10'/10'	100%	DRILLING W/NXROD
4216 - 4226'	434/391,392	10'/10'	100%	
4226' - 4236'	435/392,393, 394	10'/10'	100%	
4236'- 4246'	436/394, 395	10'/10'	100%	
4246'- 4256'	437/395,396	10'/10'	100%	
4256'- 4266'	438/396,397	10'/10'	100%	
4266'- 4276'	439/397,398	10'/10'	100%	
4276'- 4286'	440/398,399	10'/10'	100%	
4286'- 4296'	441/399,400	10'/10'	100%	
4296'- 4303'	442/400,401	7'/10'	143%	Adjusted footage to reflect accurately T.D., all NX core markers maybe off by a systematic error of 0.3'/10' run(?) beginning @ 4206'
4303'- 4313'	443/401,402	10'/10'	100%	
4313' - 4323'	444/402,403	10'/10'	100%	
4323'- 4333'	445/403,404	10'/10'	100%	
4333'- 4343'	446/404,405	10'/10'	100%	
4343'- 4353'	447/405,406	10'/10'	100%	
4353' - 4363'	448/406,407	10'/10'	100%	
4363'- 4373'	449/407,408	10'/10'	100%	

Thermal Power Company

CORE RECOVERY LOG

HOLE CTGH1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) MCDANNEL/GOODWIN

DATE August 13, 1986

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT CUT / RECOVERED	AMOUNT RECOVERED (%)	COMMENTS
4373'-4383'	450/408,409	10'/10' *(7')	100%	*lost 3' of core (pulled off stick left in hole)
4383'-4390'	451/409,410	7'/6½' (9½')	93%	recovered 3' lost in last run (moved core block to correct position)
4390'-4400'	452/410,411	10'/10'	100%	
4400'-4410'	453/411,412	10'/10'	100%	
4410'-4420'	454/412,413	10'/10'	100%	
4420'-4430'	455/413,414	10'/10'	100%	
4430'-4440'	456/414,415	10'/10'	100%	
4440'-4450'	457/415,416	10'/10'	100%	
4450'-4460'	458/416,417	10'/10'	100%	
4460'-4470'	459/417,418	10'/10'	100%	
4470'-4480'	460/418,419	10'/10'	100%	
4480'-4490'	461/419,420 H25	10'/10'	100%	
4490'-4500'	462/421,422	10'/10'	100%	
4500'-4510'	463/422,423	10'/10'	100%	
4510'-4520'	464/423,424	10/10'	100%	
4520'-4530'	465/424,425	10'/10'	100%	
4530'-4540'	466/425,426	10'/10'	100%	
4540'-4550'	467/426,427	10'/10'	100%	
4550'-4560'	468/427,428	10'/10'	100%	

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Thermal Power Company

CORE RECOVERY LOG

HOLE CTGH1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) MCDANNEL/GOODWIN

DATE 8/15/86

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
4560'-4570'	469/428,429	10'/10'	100%	
4570'-4580'	470/429,430	10'/10'	100%	
4580'-4590'	471/430,431	10'/10'	100%	
4590'-4600'	472/431,432	10'/10'	100%	
4600'-4610'	473/432,433	10'/10'	100%	
4610'-4620'	474/433,434	10'/10'	100%	
4620'-4630'	475/434,435	10'/10'	100%	
4630'-4640'	476/435,436	10'/10'	100%	
4640'-4650'	477/436,437	10'/10'	100%	
4650'-4660'	478/437,438	10'/10'	100%	
4660'-4670'	479/438,439	10'/10'	100%	
4670'-4680'	480/439,440	10'/10'	100%	
4680'-4690'	481/440,441	10'/10'	100%	
4690'-4700'	482/441,442,443	10'/10'	100%	
4700'-4710'	483/443,444	10'/10'	100%	
4710'-4720'	484/444,445	10'/10'	100%	
4720'-4730'	485/445,446	10'/10'	100%	
4730'-4740'	486/446,447	10'/10'	100%	

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CORE RECOVERY LOG

HOLE CTGH-1 FIELD CASCADES/CLACKAMAS GEOLOGIST (S) GOODWIN/MCDANNEL

DATE 8/17/86

DEPTH INTERVAL CORED (ft)	RUN/BOX NUMBER	CORE BARREL MEASUREMENT	AMOUNT RECOVERED (%)	COMMENTS
4740'-4750'	487/447,448	10'/10'	100%	
4750'-4760'	488/448,449	10'/10'	100%	
4760'-4770'	489/449,450	10'/10'	100%	
4770'-4780'	490/450,451	10'/10'	100%	
4780'-4790'	491/451,452	10'/10'	100%	
4790'-4800'	492/452,453	10'/10'	100%	
4800'				

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Thermal Power Company

Form 1

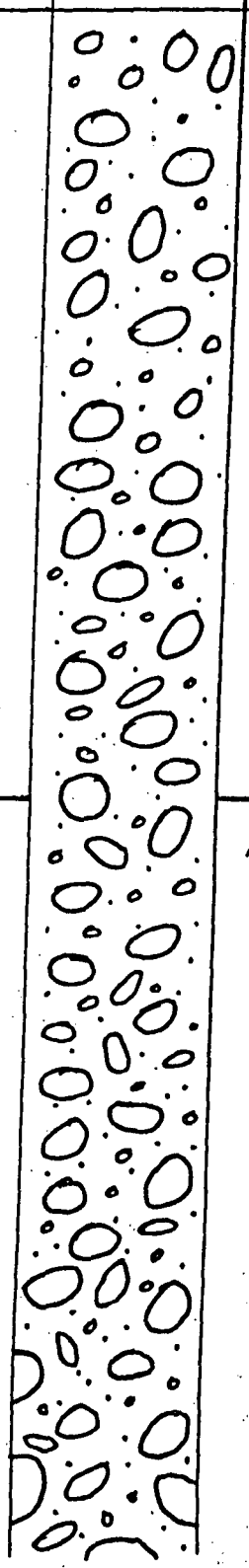
CUTTING DESCRIPTION

HOLE CTGH-1

FIELD CASCADES / CLACKAMAS

GEOLOGIST (S) GOODWIN / McDANNEL

BASIS BIN. MICROSCOPE ID DATE 6/86

DEPTH INTERVAL	1" = 5' LITHOLOGY	LITHOLOGIC DESCRIPTION
0-20'		Qal: BOULDERS & COBBLES OF BASALT (GLACIAL TILL) MED GRY → MD. LT. GRY, MINOR REDDISH OXIDATIO SPARSELY PORPHYRITIC TO APHYRIC. (PHENOS: PLAG, PYX, OL) ALTERATION: WEATHERING & SURFICIAL OXIDATION
20'-40'		As Above

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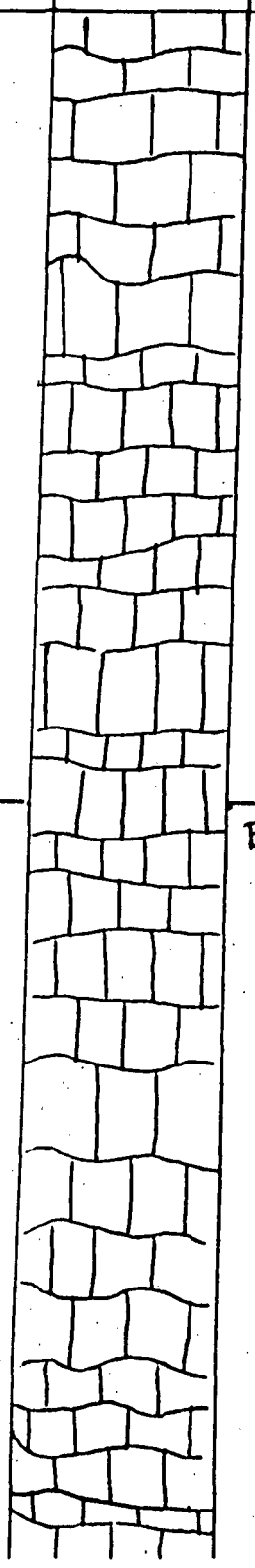
Thermal Power Company

Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	1" = 5' LITHOLOGY	LITHOLOGIC DESCRIPTION
40'-60'		BASALT/BASALTIC ANDESITE: APHYRIC TO SPARSELY PORPHYRITIC MED GRY TO LT. MED. GRY, MINOR REDDISH BRN. PHENOS TYPICALLY MICROSCOPIC: PLAG, OL, CPX, {50'-60' 75% of INTERVAL IS CINDERY (FLOW BOUNDARY?) ALTERATION: MINOR BROWN CLAY, FeOx, MINOR WHT CLAY (PLAG → CLAY)
60'-80'		BASALT/BASALTIC ANDESITE: AS ABOVE {70'-80' - 50% SMALL VESICLES ALTERATION: AS ABOVE + (FeOx) HEMATITE (COMMON)

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Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	1" = 5'	LITHOLOGIC DESCRIPTION
80'-100'	LITHOLOGY	BASALT/BASALTIC ANDESITE: MEDIUM GREY TO LT. MED. GRY & MED. REDDISH BRN. APHYRIC TO SPARSELY PORPHYRITIC @ 80'-90': APHYRIC BASALT, BASALTIC ANDESITE 80% WEATHERED TO BROWN CLAYS, HEMATITIC ALTERATION @ 90'-100': 30% RED, OXIDIZED (WEATHERED?), VESICULAR BASALT/BASALTIC ANDESITE; 40% LT. MED GRY MICROPORPHYRITIC BASALT/BASALTIC ANDESITE W/RESORBED OL PHENOS; 30% BLACK, APHYRIC BASALT/BASALTIC ANDESITE ALTERATION: WEATHERING, FeOx, MNR BRN-RED CLAY
100'-120'		BASALT/BASALTIC ANDESITE: ~~SPH~~ APHYRIC TO SPARSELY PORPH MED GREY TO DARK GREY, MINOR REDDISH GREY 100'-110': 70% LT. RED BRN + RED DUE TO WEATHERING & OXIDATION, 30% BLACK, DENSE; VESICULAR 110'-120': 60% OXIDIZED & VESICULAR, 40% DARK GREY & DENSE ALTERATION: MINOR FeOx & BROWN CLAY, MINOR WHITE CLAY IN VESICLES

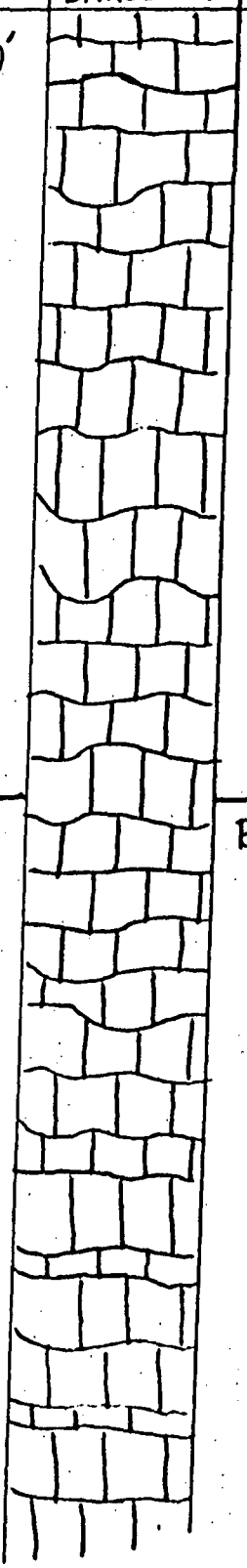
Diamond Shamrock
Thermal Power Company

Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL / GOODWIN

FIELD CASCADES / CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	1"=5' LITHOLOGY	LITHOLOGIC DESCRIPTION
120'–140'		BASALT / BASALTIC ANDESITE: MED. GREY – DUSKY RED APHYRIC TO SPARSELY PORPHYRITIC (CPX) ROCK IS DENSE & UNALTERED
140'–160'		BASALT / BASALTIC ANDESITE: AS ABOVE {140'-150' W/RESORBING PLAG, OL ALTERATION: TR. HEMATITE, CLAY, 140'–160' TR. DISSEMINATED SULFIDES (?)

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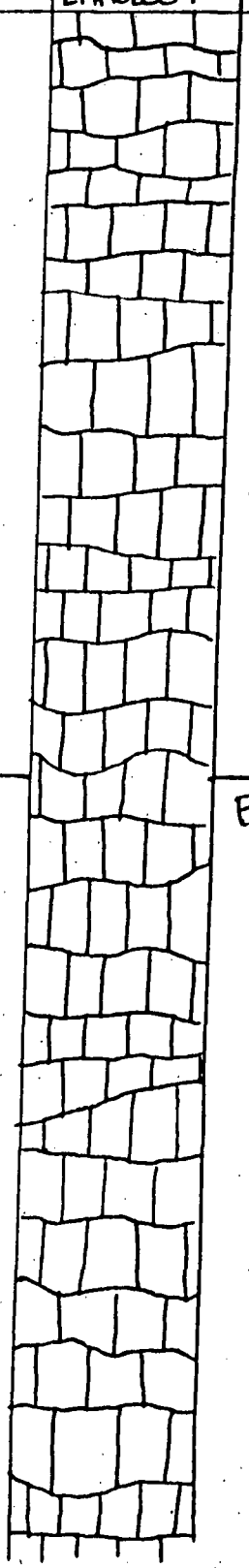
CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	1"=5' LITHOLOGY	LITHOLOGIC DESCRIPTION
160'-180'		BASALT/BASALTIC ANDESITE: AS ABOVE. DARK GREY → REDDISH BROWN {170'-180': RARE BLACK PYX PHENOS, OL ALTERATION: (MODERATE) LIMONITE, PINKISH CLAY IN VUGS
180'-200'		BASALT/BASALTIC ANDESITE: AS ABOVE {190'-200': ≤15% FRAGMENTS OF BLACK, GLASSY ROCK = CHILLED FLOW MARGIN? ALTERATION: AS ABOVE

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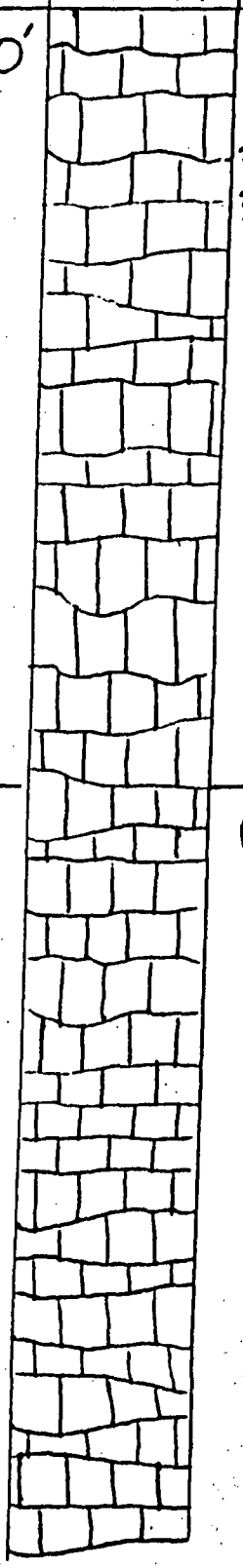
CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/McDANNEL

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	1"=5' LITHOLOGY	LITHOLOGIC DESCRIPTION
200'-220'		BASALT/BASALTIC ANDESITE: (AS ABOVE) APHYRIC TO SPARSELY PORPHYRITIC MEDIUM DK GREY → DUSKY RED 200-210' ≤1% RESORBING OLIVINE, ≤2% PLAG PHENOS, 210'-220' TR BROWN PYX BLACK, GLASSY FRAGMENTS = CHILLED FLOW MARGIN/TOP ALTERATION: MNR. HEMATITE MNR BROWN & WHITE CLAY IN VOIDS, (FILLING & COATING) → WEATHERING
220'-240'		BASALT/BASALTIC ANDESITE: AS ABOVE ALTERATION: INCREASED FeOx (WEATHERING)

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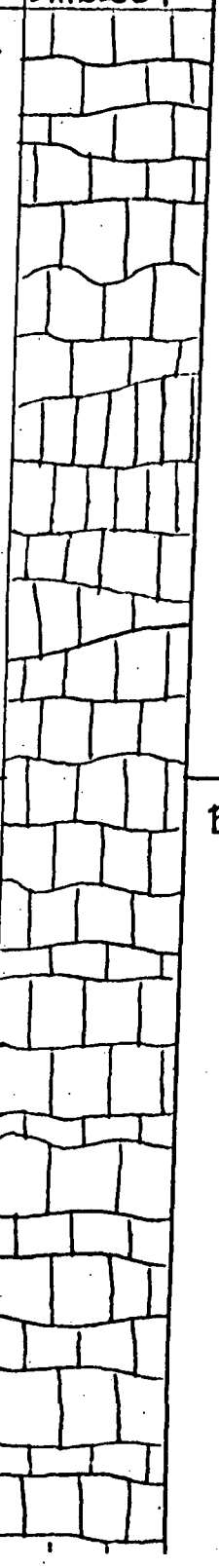
Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	1" = 5' LITHOLOGY	LITHOLOGIC DESCRIPTION
240'-260'		BASALT/BASALTIC ANDESITE: (AS ABOVE) APHYRIC TO SPARSELY PORPHYRITIC. MED. DK GREY → MINOR RED 250'-260' - BLACK GLASSY FRAGMENTS — CHILLED MARGINS? ALTERATION: MINOR FeOx, CLAYS IN SMALL VESICLES
260'-280'		BASALT/BASALTIC ANDESITE: (AS ABOVE) (W/ONLY MINOR DUSKY RED) 260'-270' - PREDOMINATELY MICROPORPHYRITIC SAMPLE 270'-280' - FRESHER, LESS VESICULAR & LESS WEATHERED THAN PREVIOUS 20' ALTERATION: V. MINOR FeOx

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Thermal Power Company

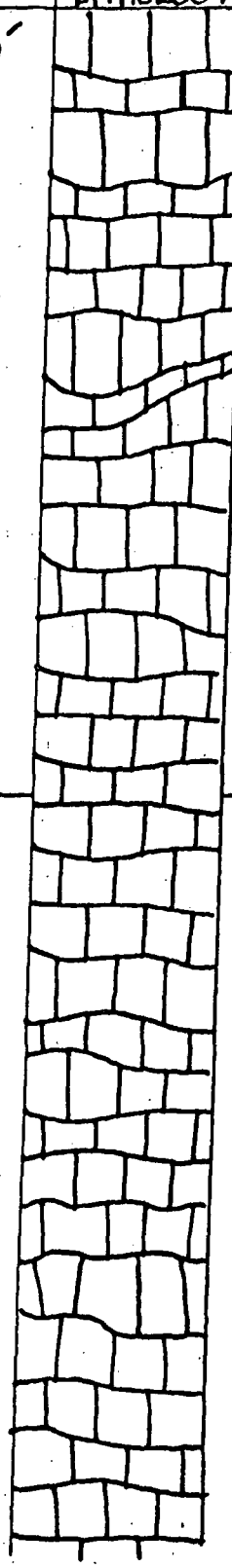
Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
	LITHOLOGY
280'-300'	BASALT/BASALTIC ANDESITE: GREYISH BLACK TO BROWNISH GREY SPARSELY PORPHYRITIC - PHENOS OF PLAG + OL 290'-300' - INCREASED VESICULARITY (CONTACT?) ALTERATION: MINOR CLAY(S) IN VESICLES √RARE LIMONITE, FeOx METALLIC COATING ON WHITE CLAY (?) 280'-290'
300'-320'	BASALT/BASALTIC ANDESITE · (AS ABOVE) + MINOR BLACK, GLASSY FRAGS → CHILLED CONTACT/MARGIN ALTERATION: TR → COMMON WHITE CLAY (?) IN GROUNDMASS TR LIMONITE ON GLASSY FRAGS



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CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BIND. MICROSCOPE ID. DATE 6/86

EPTH INTERVAL	LITHOLOGIC DESCRIPTION
	LITHOLOGY
20'-340'	BASALT/BASALTIC ANDESITE: MED. GRY → DUSKY RED APHYRIC TO SPARSELY PORPHYRITIC PHENOS OF PLAG, OL, PYX (YELLOW OPX?) GLASSY, BLACK, FRAGS = CHILLED CONTACT/MARGIN ALTERATION: CONCENTRATED IN SCORIACEOUS FRAGS & VESICULAR FRAGS. COMMON EARTHY HEMATITE, LIMONITE, FeOx. TR. WHITE CLAY(?) IN SMALL VEINLETS
340'-360'	BASALT/BASALTIC ANDESITE: (AS ABOVE) INCREASE TO 50% DUSKY RED COLOR ALTERATION: AS ABOVE, + WHITE, AMORPHOUS (CLAY?) MAT'L (COAT) IN VESICLES

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CUTTING DESCRIPTION

OLE CTGH-1 GEOLOGIST (S) GOODWIN / McDANNEL

FIELD CASCADES / CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
360'-380'	LITHOLOGY BASALT / BASALTIC ANDESITE : PREDOM. APHYRIC, LESS COMMON SPARSELY PORPH. BRN GRY – DARK GREY, DUSKY RED (~20%) PHENOS : PLAG, OL, BLACK PYX ALTERATION: 370'-400' PERVASIVE. FeOx, SOFT, AMORPH. WHITE MAT'L (CLAY?). HEMATITE & LIMONITE COMMON TR. SULFIDE(?)
380'-400'	BASALT / BASALTIC ANDESITE : (AS ABOVE) ALTERATION: AS ABOVE

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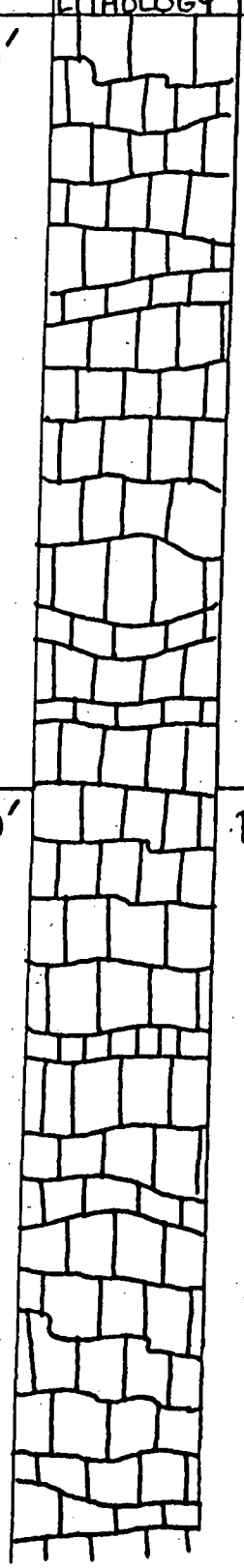
CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
	LITHOLOGY
400'-420'	BASALT/BASALTIC ANDESITE: GRAYISH RED – APHYRIC - SPARSELY PORPHYRITIC GRAYISH BRN PHENOS OF PLAG & OL ALTERATION: PERVASIVE FeOx. MINOR HEMATITE & CLAYS. TR WHITE, SOFT, AMORPHOUS MAT'L (CLAY?) IN VEINLETS.
420'-440'	BASALT/BASALTIC ANDESITE: AS ABOVE MED. DK GREY – BROWNISH GREY ALTERATION: AS ABOVE, BUT LESS PERVASIVE



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Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSCOPE ID. DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
440'-460'	BASALT/BASALTIC ANDESITE; MED DK GREY TO BRICK RED FINELY PORPHYRITIC: PLAG & OL 450-460'- PREDOM. RED OXIDIZED GROUNDMASS INCREASE IN PHENOCRYST CONTENT. (MAY BE ILLUSION DUE TO RED GM) FLOW BOUNDARY? PHENOS MAY APPEAR AS FREE CRYSTALS (<5%) ALTERATION: PERVASIVELY Fe OXIDIZED ALTERED GROUNDMASS → MINOR CLAY, LIMONITE
460'-480'	BASALT/BASALTIC ANDESITE: MED. DK. GREY → BRICK RED 460'-470': 50% MED. DK. GREY, 50% BRICK RED APHYRIC TO → SPARSELY PORPHYRITIC PLAG, OL MORE VESICULAR & MORE OXIDATION THAN ABOVE → FLOW BOUNDARY? ALTERATION: PERVASIVE FeO_x; LIMONITE, HEMATITE TR. WHT, AMORPHOUS, SOFT MATL (CLAY?)

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Thermal Power Company

Form 1

CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) GOODWIN/McDANNEL
BASIS BIN. MICROSCOPE ID. DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
	LITHOLOGY
480'-500'	BASALT / BASALTIC ANDESITE! MED. DK GREY to BRICK RED APHYRIC TO SPARSELY PORPHYRITIC PHENOS: PLAG, OL, ± PYX {480'-490' - SLIGHTLY MORE Fe OXIDIZED THAN 490'-500' INTERVAL ALTERATION: FeOx & MINOR CLAYS (PINKISH, ORANGE, WHT) ↳ COATS VOIDS
500'-520'	BASALT / BASALTIC ANDESITE: AS ABOVE {510'-517' - INCREASED FeOx ALTERATION: SAME AS ABOVE {517'-520' - CONTAMINATED SAMPLE (RUBBER, METAL, SLOUGH, LCMS)

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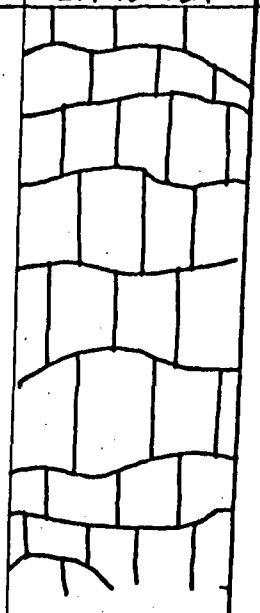
Form 1

CUTTING DESCRIPTION

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BIN. MICROSLOPE ID. DATE 6/22/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
	LITHOLOGY
520'-527'	BASALT / BASALTIC ANDESITE :



MED. DK. GRAY to BRICK RED
APHYRIC to SPARSELY PORPHYRITIC
PHENOS : PLAG., OL, ± PYX.

{ 520'-527' CONTAMINATED SAMPLE (RUBBER, CEMENT, METAL, SLOUGH, & LCMS = 75% of SAMPLE)

ALTERATION : FeO_x & MINOR CLAYS COAT VOIDS (PINKISH, ORANGE, WHITE)

—— END OF CUTTING DESCRIPTION ——

HOLE DESCRIPTION CONTINUES with PAGE 1 CORE DESCRIPTION (FORM 2)

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) GOODWIN/MCDANNEL
BASIS BIN. MICROSCOPE/DATE June 22, 1986

DEPTH INTERVAL	DESCRIPTION	lithology
527'	527' BASALT/BASALTIC ANDESITE Med Lt gry to med gry, finely porphyritic <10% phenos, all ≤ 3mm : plag, ol, cpx glomerocrysts of plag, ol, ± cpx Vertical to 25° fractures common, fracture surfaces have light to moderate coating of white to yellowish and pinkish clays. @ 540'-545', 548'-549': fracturing intensifies - core pieces 1"-5". @ 549': oxidized to reddish-gry Predominately rubble, w/well consolidated intervals. Becomes vesicular. Voids up to 3 cm @ 556': clay increases (lt. yellow & dk red) @560': ashy intervals	
547'		
567'		

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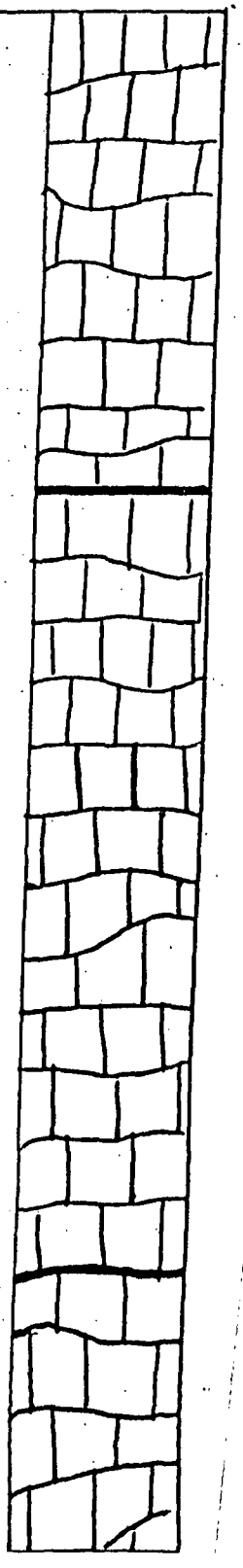
Form 2

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADE/CLACKAMAS BASIS BIN. MICROSCOPE DATE 6/22/86

DEPTH INTERVAL	DESCRIPTION
567'	AS ABOVE (rubbly, vesicular basalt/basaltic andesite w/clay & minor ash/scoria)
	579' - approximate flow boundary
580'	BASALT/BASALTIC ANDESITE med gry, finely porphyritic ~8% phenos, ≤ 3mm glomerocrysts of plag, ol, pyx Fractures common: vertical to 10° & approximately horizontal & coincident with stretched/smeared/elongated vesicles Small vesicles pervasive & decrease w/depth Vesicles & fractures coated w/lt. yellow & purplish clays
587'	
	604' - approximate flow boundary vesicles pervasive and decrease with depth below oxidized, brick red horizon 1' thick marking rubbly contact
607'	



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Form 2

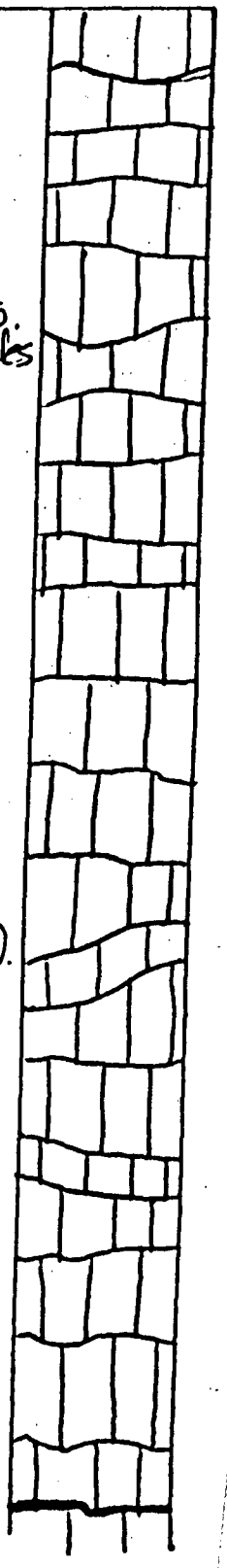
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADE/CLACKAMAS BASIS BIN. MICROSCOPE DATE 6/23/86

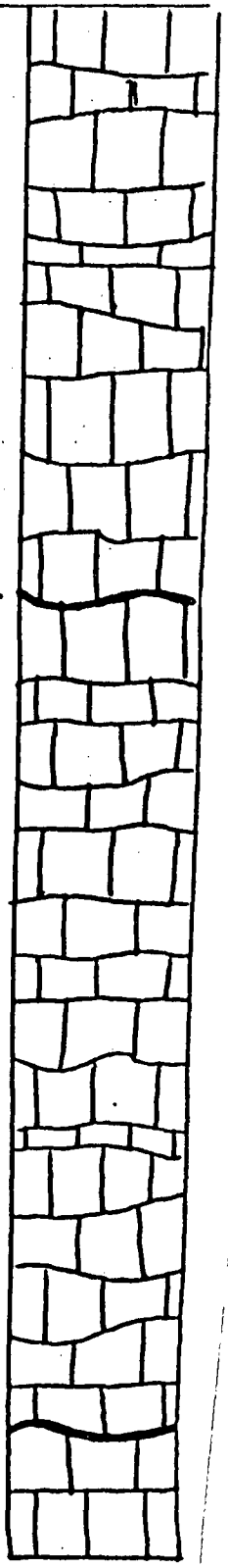
DEPTH INTERVAL	DESCRIPTION
607'	607' BASALT/BASALTIC ANDESITE med. dK gray, finely porphyritic ~8% phenocrysts, ≤ 5mm glomerocrysts of ol., plag., ± R. pyx.? rubbly, w/ minor red scoria & ash until 616'. Large vesicles 612-615. 616' - consolidated Pinkish clays fill vesicles
627'	629'-634' vesicular interval 632'-639' fractured - predominately small (3") pieces. fractures are vertical to sub-vertical (15°). 2ndary set is horizontal to sub-horizontal
647'	646.5': flow boundary? Marked by ash/cinder/scoria zone (until 648)



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADE/CLACKAMAS BASIS MICROSCOPE ID DATE 6/23/86

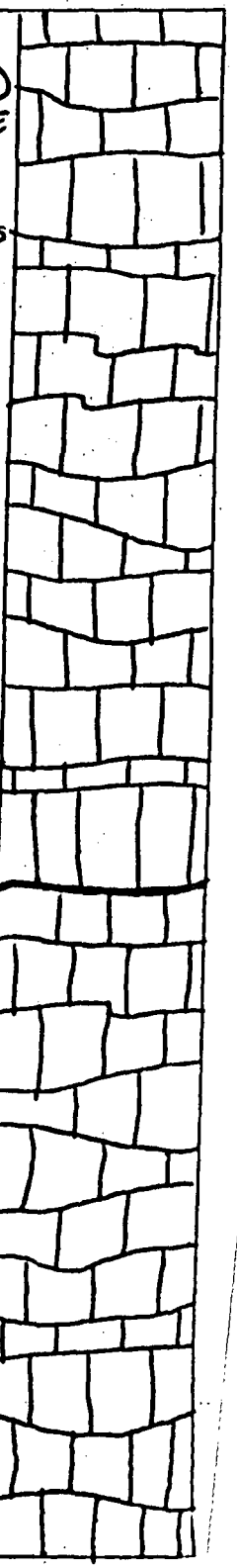
DEPTH INTERVAL	DESCRIPTION
647'	AS ABOVE (BASALT - BASALTIC ANDESITE)
	653': flow becomes denser, less vesicular fractures common — 0-25°, less commonly ~60° — producing 2"-4" pieces of rock
	660': ash & cinder zone FLOW BOUNDARY?
	663': rock becomes better consolidated, vesicular zones of rubble persist to 684'
667'	683-687': Well consolidated scoriaceous zone - flow breccia. Flow boundary.
687'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL/GOODWIN
FIELD CASCADE/CLACKAMAS BASIS MICROSCOPE ID DATE 6/24/86

DEPTH INTERVAL	DESCRIPTION
687'	687': BASALT/BASALTIC ANDESITE (A/A) MED TO MED DK GRY, PORPHYRITIC (2-5% PHENOS) PHENOS ≤ 2mm: PLAG, OL, PYX. OL→IDDINGSITE fractures 0°-30°, locally vesicular pnk, white, lt. brn. clays on fracture surfaces & filling some vesicles 693'-696': very fractured (A/A) & dense 5-10% vesicles (<1-30mm)
707'	710': brick red, scoriaceous, flow breccia. APPROX. FLOW BOUNDARY ashy & poorly consolidated
	719': BASALTIC ANDESITE. med. dk grey, porphyritic (2-3%) phenos ≤ 2mm: plag, cpx, ol. subtle red tint to groundmass light coating of clays on fracture surfaces fractures 0-30°, (intense fracturing 720'-738') (less common horizontal
727'	

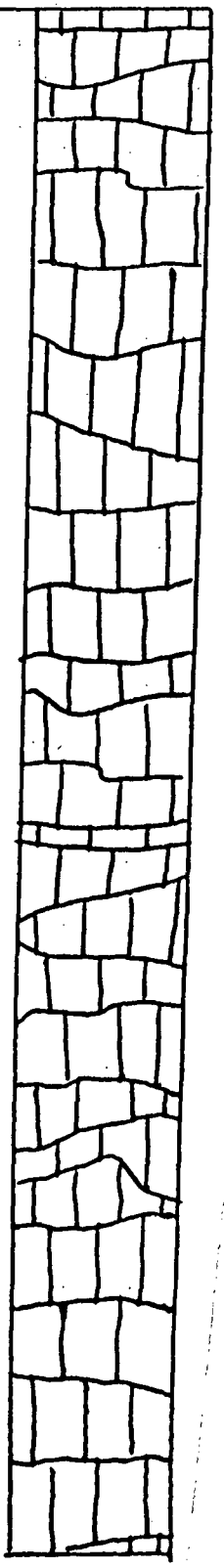


CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN / MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS MICROSCOPE ID DATE 6/24/86

DEPTH INTERVAL	DESCRIPTION
727'	BASALTIC ANDESITE A/A
	733'-739': SLIGHTLY SCORIACEOUS/ASHY LT. RED
747'	750': BASALTIC ANDESITE lt. med. gray (unusually lt.) to med. dk. gray, dense, massive, sparsely porphyritic to aphyric, gen'ly < 1% plag., ol., pyx., rarely fractured (1X/5' @ 30° ∢ to ℄) lt. brn clays coat fractures, < 1% vesicles
767'	



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PAGE 1 OF 1

Form 2

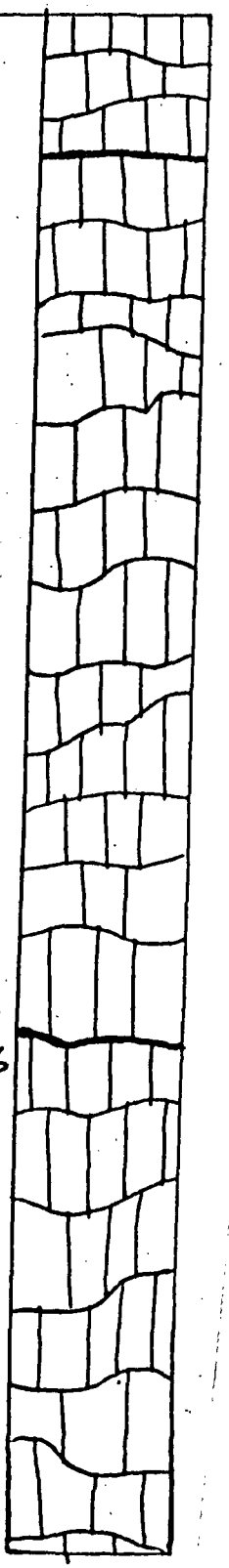
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS BIN. MICROSCOPE DATE 6/25/86

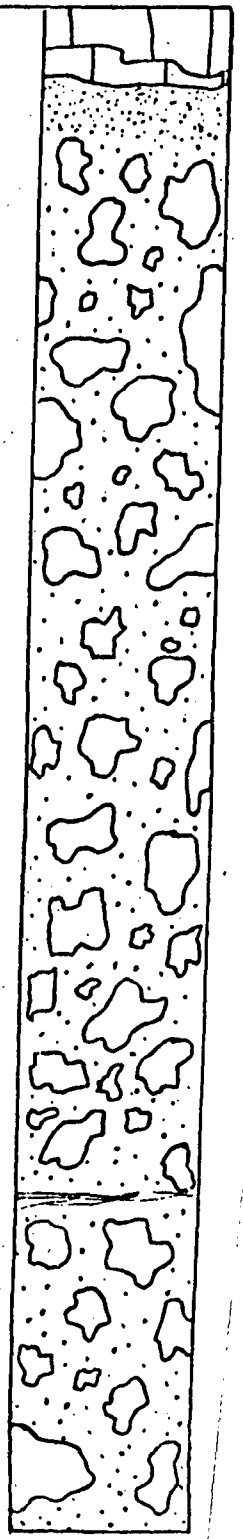
DEPTH INTERVAL	DESCRIPTION
767'	BASALTIC ANDESITE (A/A) 770'-771' increasing vesicularity 771' FLOW BOUNDARY 771'-779' rubble: brick red, vesicular, locally scoriaceous, ashy 779': BASALTIC ANDESITE med. dk. gray, sparsely porphyritic (2-4%) phenos. < 2mm; plag., ol. vesicles 5-15%, decreasing with depth 779'-781' subhorizontal stretching & concentration of vesicles in narrow bands clays: tan, wht, pink in < 20% of vesicles and ptlly. coating fractures 788.5'-792.5' Rubbly
787'	
	792.5'-795' FLOW BOUNDARY: Rubbly med. dk. gry vesicular basaltic andesite and clayey-ashy flow breccia - common med. brn clay filling interbreccia clast voids - tan & lt. brn clays fill fractures and ~10% of vesicles (i.e. 90% are void) 795'-800' Rubbly, vesicular b.a. 800' Common fractures, often @ 7° to ⊄ heavier clays, thick coatings on fracture surfaces. Lt. pink clay is the predominate clay.
807'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/McDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 6/25/86

DEPTH INTERVAL	DESCRIPTION
807'	BASALTIC ANDESITE (A/A)
	809' VOLCANIC BRECCIA Sub-angular to sub-rounded lapilli & blocks of basaltic to silicic (less common) rock fragments in a yellowish brn matrix of ash, crystals & ash size rock fragments. Silicic fragments are more common near bottom of unit & appear to be same lithology as underlying unit (@ 854'). Crystals in matrix include biotite, feldspar, opx, cpx, qtz(?). Rock is matrix-supported & moderately to well indurated. Top 18 cm of unit is composed of dk grey ash & ash sz rock fragments. Unit has only minor fracturing & lw/no preferred orientation. Minor limonite stain.
827'	826.5' matrix poorly consolidated – mainly mud & rock fragments collected from core barrel
	839' - ~4 cm of fine laminations which contain v. small scale crossbeds.
911'	



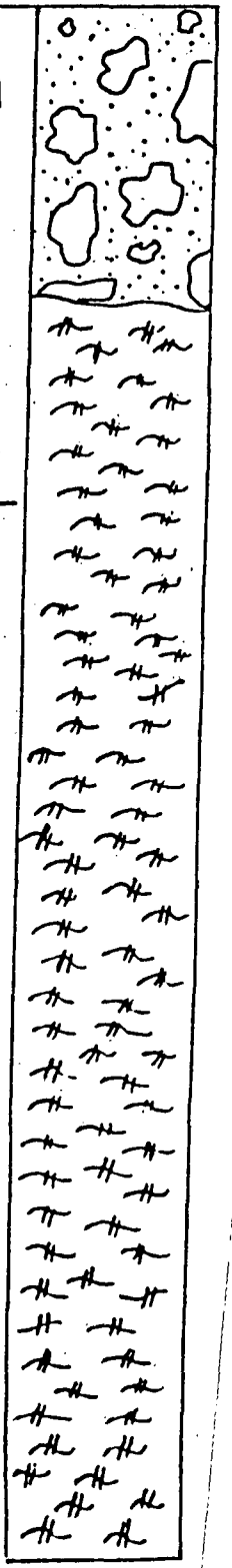
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE 6/26/86

DEPTH INTERVAL	DESCRIPTION
847'	VOLCANIC BRECCIA (A/A) 844'-854' contact w/underlying unit is marked by zone of boulders of underlying unit & less matrix than above. Transition may represent regolith & soil ?
854'	DACITE Med gry, porphyritic. 4-10% phenocrysts of plag, cpx, opx. Slightly "glassy" appearance to fractures. Much of unit is intensely fractured w/ predominate direction 75°-80°; generally closely spaced (1-10cm)-producing platy fracture. Uncommon vertical fractures. Light brn, pinkish clay on fracture surfaces; FeO or MnO? on many fracture surfaces.
867'	
887'	



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Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) GOODWIN/MCDANNEL
BASIS BINOC. MICRO DATE 6/26/86

DEPTH INTERVAL	DESCRIPTION
887'	DACITE (A/A)
	894'-899' fractured & sheared. Heavy brn. clay (~10°)
	905'-906.5' - intensely fractured
907'	908'-913.5' - intensely fractured, light clays
	917.5'-918.5' - rubble, <1"ϕ fragments
	922'-923' - fractured, w/heavy brn. clay (25%)
971'	

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Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE 6/27/86

DEPTH INTERVAL	DESCRIPTION
927'	DACITE (A/A @ 854')
	930'-931' - intensely fractured
	934'-935.5' " "
	937'-948' - " "
	939'-939' - breccia, angular to sub-angular rock fragments (½"-6") in matrix of lt. tan (consolidated) clay, sand size rock frags, xtls
947'	
	963'-965': brecciated zone, increase in clay
	960' - slight change in rock texture. Appears less porphyritic, fewer (+smaller) plag phenos. Strongly resorbed hornblende xtls → feldspar, cpx, opx
967'	

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS _____ DATE 10/28/86

DEPTH INTERVAL	DESCRIPTION
967'	DACITE (A/A @ 854')
	967' - minute aggregates of lt grn-yel. to clr. flaky min. on frac. surfaces
	972' - clr. flaky min. a/a ; minor cpx & g.mass } oxidation (reddish)
	974' - R. flaky min. & clays have decreased
987'	
	991' - fracturing intensifies, 70°-90°
	1000' - 6"-8" heavy clay (30%) & breccia
	1,001' - 21" " " " "
1007'	

Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL / GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. micro. DATE 6/28/86

DEPTH INTERVAL	DESCRIPTION
1007'	DACITE (A/A @ 854') 1010' - 8-10" fractured zone w/ heavy pinkish tan clay.
	1020'-1022' fractured interval (vertical fractures) heavy clay (pinkish) 1023' green clay on surface w/ reniform texture *groundmass darkening, suggesting changing (i.e. more mafic) composition w/depth, texture is more homogeneous & equigranular
1027'	1028'-1039' fractured interval (vertical to sub-vertical & horizontal to 70° to ℄) w/ heavy brn clay at base of interval
	1040'-1049' Less fractured, less clay and alteration
1047'	1047' lt. coating of grn clay/flaky min. on fracture

CORE DESCRIPTION

40 FOOT INTERVAL

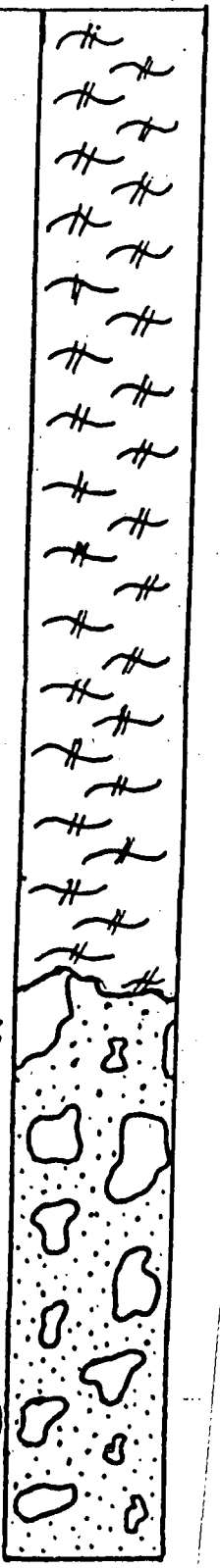
HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 6/29/86

DEPTH INTERVAL	DESCRIPTION
1047'	DACITE (A/A @ 854') 1047' R specks black iron mineral (hematite?), v. fine, scattered through groundmass, rare larger hematite blebs 1049.5'-1050' intensely fractured 1052'-1063' heavy clay (med. brn color)
	1057'-1075' - splintery, high angle fracture
1067'	1066'-1081' fracturing - moderate to intense, distinctive conjugate joint set @ 15° to ℄ w/splintery fracture locally lt. limonite to 1109'
	below 1075' subtle increase in phenocryst %: @ 1076' 6-8% → 8-12% (locally) coexisting hematite (metallic) and FeOx (earthy) near fractures
	1081'-1090' fractures @ 45° to ℄ ± sinuous vertical fracture >> fracture ⊥ to ℄ (90°) darker color than upper part of unit 1081'-1083' heavy clay, med.-lt. brn & grayish orange pink w/R+ pyrolusite associated
1087'	

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 6/29/86

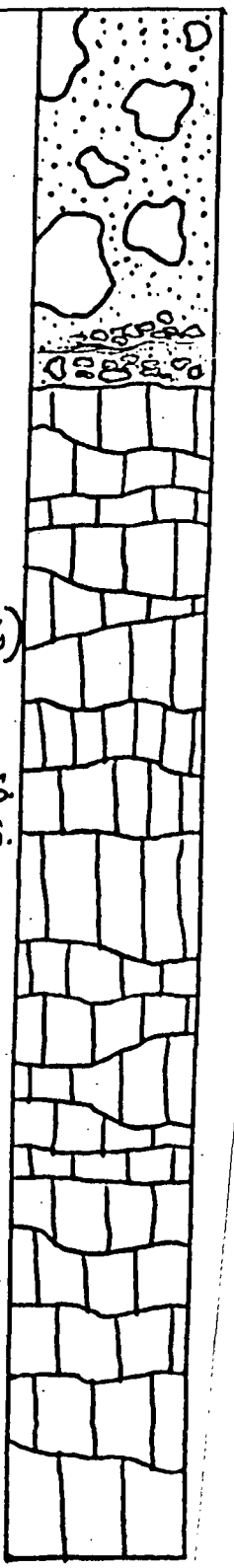
DEPTH INTERVAL	DESCRIPTION
1087'	DACITE (A/A @ 864') 1087'-1090' fractures @ 45° ∠ to ℄ ± Sinuous vertical fracture, fewer ⊥ to ℄
	1101'-1103' Vertical fractures with heavy clay (lt. brn) 1105'-1109' Small miarolitic voids appearing, irregular shapes, small increase in % pyx.
1107'	1109' Intense clay alteration, 6" inclusion (dark gray) reacting w/ dacite (being digested) 1110' Contact: intense clay alteration but no signs of baking. Lt gry. Appears brecciated & gradational w/ underlying unit, w/ pebbles & boulders of dacite in clay matrix, becoming heterolithologic
	1112': VOLCANIC BRECCIA (SURGE DEPOSIT?) Angular to sub-angular lapilli & block size basalt-basaltic andesite (many from underlying unit) &, less commonly, silicic rock fragments. Clayey matrix (from ash?) of ash sz rock fragments & crystals. 1114' Small lapilli- to ash-size, rounded clay clasts are wht to tan & contain hornblende & biotite, suggestive of devitrified pumice. Discontinuous laminae & v. dark gry-brn gry, thin discontinuous beds w/ small lapilli-ash sz rock frags suggest surge origin. Oxidized slightly disrupted basaltic material near contact with
1127'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/McDANNEL
FIELD CASCADES/CLACKAMAS BASIS binocular microscope DATE 6/30/86

DEPTH INTERVAL	DESCRIPTION
1127'	(cont'd) VOLCANIC BRECCIA (A/A) underlying basalt flow suggests deposition while partially molten.
	1137.5' Thin, irregular beds of ash to lapilli-sz, commonly oxidized, rock fragments w/subtle small scale cross bedding.
	1138': BASALT med-med dk gry to lt brnish gry, porphyritic (~7%-12%) w/phenos of plag, cpx, ol, w/rare sieve textured mineral clots 3-15 mm diameter.
1147'	Ol → iddingsite; maint plag → clay, particularly near fractures. Lt orange & pinkish clay coating on most frac. surfaces. ± rare tourmaline, pyrolusite, earthy hematite
	1139'-1142' - horizontal to 40° fracturing
	1143'-1144' - vertical to 15° fracturing - v. fractured. heavier pinkish brn clay.
	1149'-1152' - frac. predom 15° or less, secondary 40-60° - horizontal
1167'	



Diamond Shamrock
Thermal Power Company

Form 2

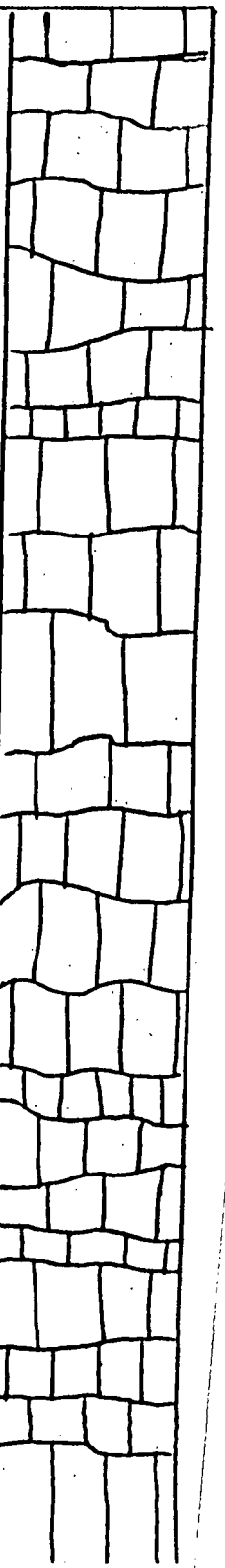
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 6/30/86

DEPTH INTERVAL	DESCRIPTION
1167'	BASALT (A/A)
	1181'-1185' - Three 5"-8" zones of heavy clay w/ brecciated rock
	1186'-1229' - color: med lt gry - lt brnish gry (to 1201')
1187'	1186'-1215' - common fractures: vertical & sinuous, ±45°
	1197'-1200' - hairline incipient fractures, partly dissolved/etched, @ 60°
1207'	

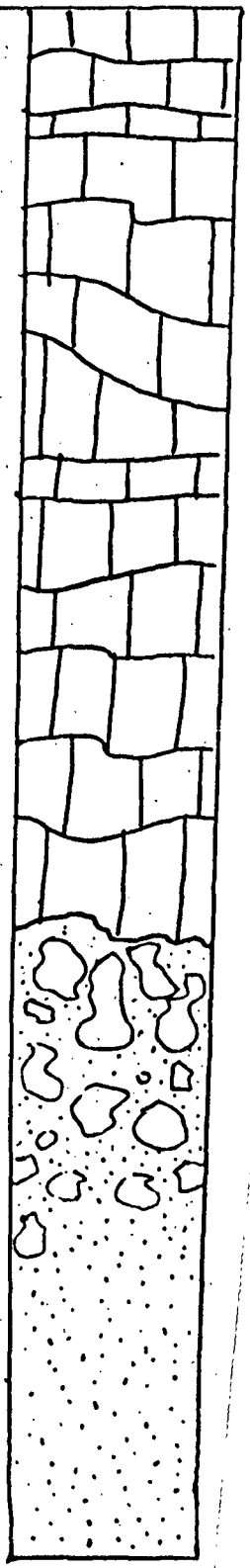


Diamond Shamrock
Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE 6/30/86

DEPTH INTERVAL	DESCRIPTION
1207'	BASALT (A/A)
	1215'-1229' - ~80° fracture common; continuous vertical fracture
	1223' - black, secondary mineral (MnO_2?)(FeO?) rimming phenos on fracture surfaces
1227'	1229' - flow becomes oxidized (brick red) & brecciated but well consolidated. Grades into red clay matrix w/clasts of basalt and cinder & plag xtls. Grades into underlying unit.
	1230' VOLCANIC BRECCIA (surge &/or air-fall origin?) Red-orange-brn. sub-angular to sub-rounded lapilli- & block-size fragments of dk. gry & red brn (oxidized) basalt & basaltic andesite. [basaltic frags of above unit at top of volcanic breccia unit] in Matrix of ash (→ clay), ash-size rock fragments, crystals. Unit is not uniform but has sub-units (16cm-1.3m) based on variable clast size, clast to matrix ratio, laminated intervals. Contacts between these units is gradational to abrupt. Unit becomes more uniform @ 1261'. Laminations in matrix are commonly disrupted & drape around lapilli/blocks.
1247'	



Diamond Shamrock
Thermal Power Company

Form 2

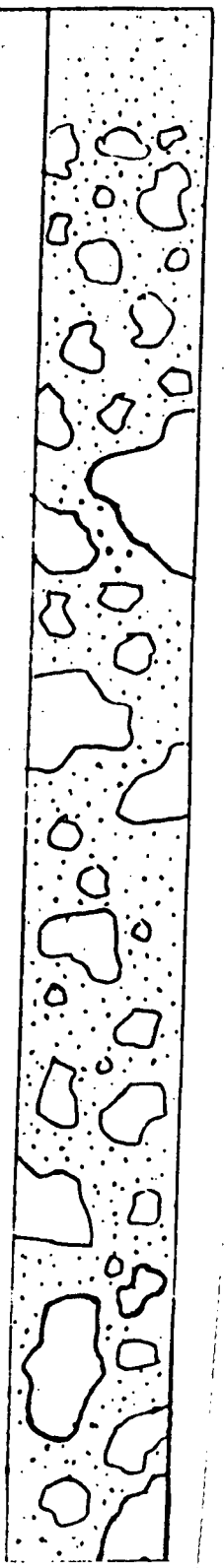
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE 6/30/86

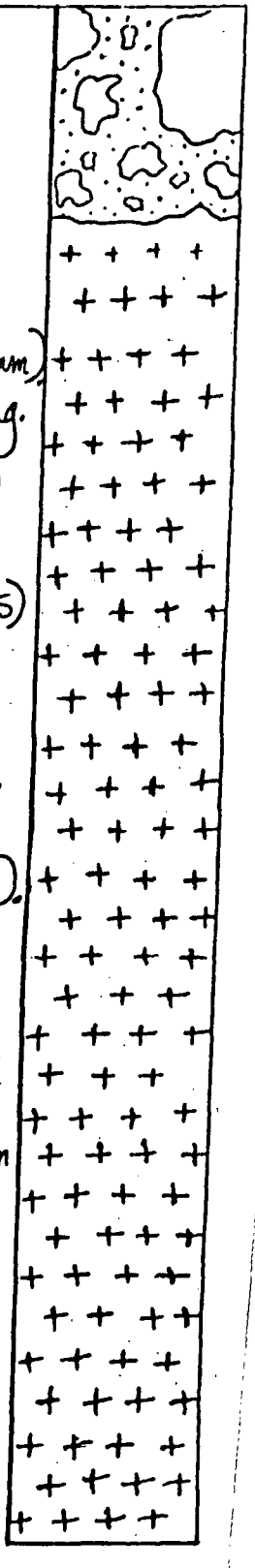
DEPTH INTERVAL	DESCRIPTION
1247'	VOLCANIC BRECCIA (A/A)
	1254.5'-1255': Rubbly interval
	1260'-1261' Rubbly interval. First appearance of sheared? clasts from underlying andesite unit.
1267'	
	1270'-1271 Rubbly interval
	1278'-1292' Rubbly interval
	1280'- clasts in breccia are predominately angular lapilli of underlying, sheared andesite.
1287'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 7/1/86

DEPTH INTERVAL	DESCRIPTION
1287'	VOLCANIC BRECCIA (A/A)
	1291' ANDESITE
	Pale mod brn (1300-1306) to med dk gry, sparsely porphyritic (3-5%) w/phenos of plag, opx, cpx, hblde, & common open textured crystal clots (≤4mm). Mnr plag alteration → clay; amphibole is resorbing. Common pale orange-pink clay coating & filling fractures. R MnO or FeO (black). Clear-white tabular mineral (associated w/small mafic mineral (secondary?) in thin veinlets & coating fracture surfaces) is probably zeolite. Pervasive vertical to 25° anastamosing, thin, closely spaced (≤ 0.5cm) veinlets of yellowish brn clay & zeolite (a/a) appear to be formed along shears(?). R dark, platy, metallic mineral on fracture surfaces.
1307'	Top part of flow is very broken & clayey (yel brn, a/a). ~0.3m red brn ash 1297'-1298', may indicate association of top of andesite unit w/VOLCANIC BRECCIA above.
	1312-1315' - rubbly = rock fragments w/clay containing smell (<1cm)
	1318' - very fractured w/heavy, red brn clay. Fracture has no preferential orientation. Anastamosing yel brn clay veinlets/shear (a/a) not as prominent.
	1325'-1335' - zones of intensely fractured rock interspersed w/consolidated zones. Fracture orientation 35°-45°.
1327'	



Diamond Shamrock
Thermal Power Company

Form 2

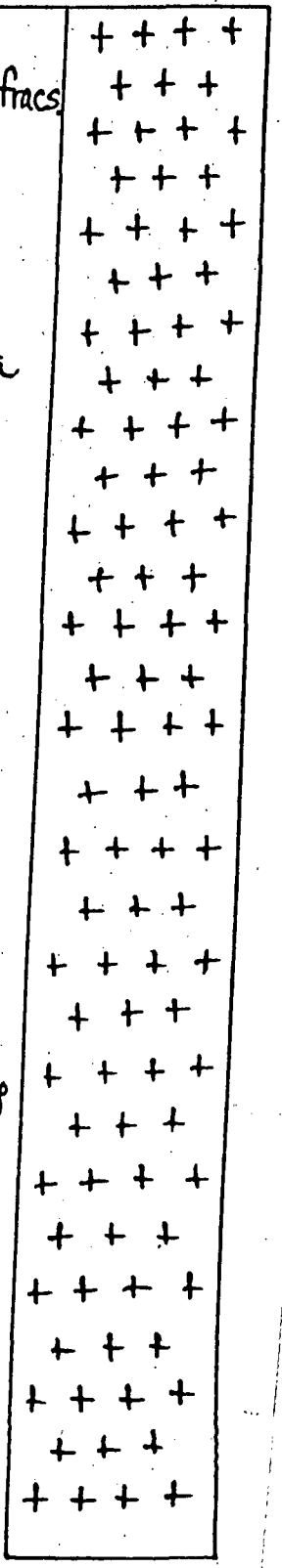
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7/2/86

DEPTH INTERVAL	DESCRIPTION
1327'	ANDESITE (A/A) med. dk. gray, sparsely porphyritic, intense pervasive vertical fracs w/ anastomosing v. thin veinlets of yellow-brn clay filling fractures
	1335' - fracturing persists but is not as intense a/a
1347'	
	1352' - 1387' - frac. orientation: predom. ~10°, also 45°-70°
1367'	



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE 7/2/86

DEPTH INTERVAL	DESCRIPTION
1367'	ANDESITE (A/A)
	1380'-1387' Vertical fractures predominate over horizontal fractures
1387'	1387'-1402' Fractures generally ~45° ± to ± & less commonly vertical
	1402': frac. orientation most commonly ~45°, ± horizontal commonly B vertical. Breccia & heavy clay.
	1406': yellowish tint on frac. surf.
1407'	

Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/KLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE 7/2/86

DEPTH INTERVAL	DESCRIPTION
1407'	ANDESITE (A/A) 1404'-1412' sinuous conjugate fracture set @ ≥45° ∡ to ℄ 1412'-1418' conjugate fracture set @ 30° ∡ to ℄, rubbly interval w/ heavy clay 1415'-1420' - breccia w/ heavy clay. Prominent yellow stain rims brecciated rock fragments, more subtle stain continues to 1445' adjacent baby-filled fractures - no mineral observed, just staining 1421'-1438' Intermittent vertical sinuous fractures (≤ 15mm wide) filled w/ clays ± clayey breccia, locally rubbly
1427'	
	1438'-1445' Light fracturing w/ orientation @ 15° ∡ to ℄, often as conjugate joint sets
1447'	below 1445' sinuous vertical fractures w/ clay coating/staining continue

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE 7/2/86

DEPTH INTERVAL	DESCRIPTION
1447'	ANDESITE (A/A) med.gry, locally rubbly & intensely fractured w/ mod.–heavy clay filling fractures, R+ pyrolusite also on clays/fracture surfaces, plag → clay (wht) adjacent to fractures, seams of clays commonly v. pale orange and mod. brn; plag., pyx., and less common hbl phens a/a : 1–3% (sparse) Clear, tabular mineral abundant on frac. surfaces. +R platy dark metallic mineral 1454'-1455' Intraformational breccia zone (30+mm thick) w/ heavy clay (tectonic breccia) @1457' 10mm clay-filled fracture @ 45° to ℄ below 1450' : Subhorizontal banding on scale of 1-5mm continues as subtle mod.grn yellow stain (w/ associated v.lt.clay alteration & R+ pyrolusite) interbanded w/ med.gry unaltered andesite. Milky to clear tabular & acicular zeolites in small voids.
1467'	1462'-1464' Fractured interval w/ heavy clay : seams ≤30mm wide 1466'-1466½' Heavy fracturing w/ lt. clay 1471'-1472' A/A w/ heavy clay
	1476½'-1485' Less fractured interval, occasional irregular break ⊥ to & along subhorizontal "incipient platy fracture" partings*, 1476'-1482' : clayey breccia seams w/ mod grn yellow alteration/stain (sim. to that above @1445') no mins. visible * i.e. rock unbroken though partings provide planes of weakness for separation
1487'	1485'- fracturing – 4"-8" lengths. Orientation variable but vertical to 10° (predominant) is prominent.

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTG1-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7/2/86

DEPTH INTERVAL	DESCRIPTION
1487'	ANDESITE (A/A) w/hornblende becoming more abundant pheno phase
	1491' - 8" vertical clay seam, ~10 mm diam. brecciated appearance: angular clay pieces in lighter clay matrix.
	1494': fracture attitude most commonly 30° & horizontal.
	1500': increase in horizontal "incipient fractures", as marked by thin clay filled joints. ≤2cm - 7cm apart
	1503' - highly fractured. Brecciated. Fracture orientations vertical to 10°, 30°, & ~horizontal. Brecciated rock frags in clay seam ~1.5 cm wide, 12 cm long.
1507'	
	1513': less fractured. Strong horizontal jointing. Thin, 1-6 cm apart. Yellow stain & clay fill emphasize joints.
	1515': Increase in amount of dark, platy, metallic mineral. Found in conjunction w/ previously described clear (to white) tabular mineral (dusty on some frac. surfaces). Yellow stain assoc. w/ this mineral on some fracture surfaces.
1527'	

CORE DESCRIPTION
40 FOOT INTERVAL

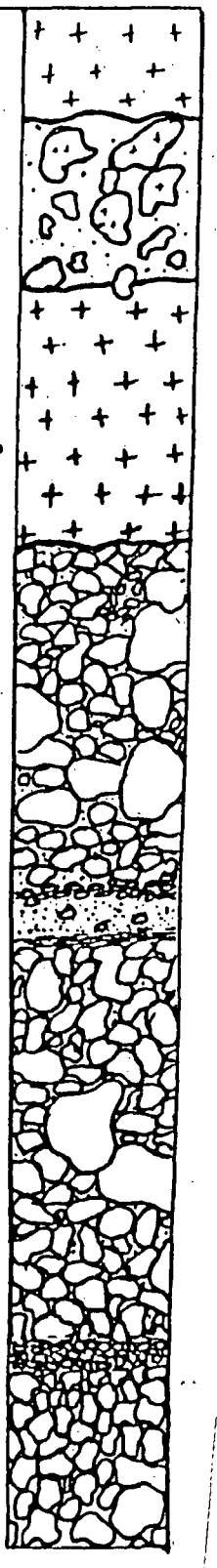
HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7/2/86

DEPTH INTERVAL	DESCRIPTION
1527'	ANDESITE (A/A)
	1522'-1524.5': breccia w/clay seams up to 1 cm thick
	1526'-1529': breccia w/clay, A/A
	1530': unit is slightly more porphyritic at this depth than at shallower levels -- largely due to increase in hornblende? Color is med. lt gry
	1530'-1536'- short intermittent fractured & brecciated zones w/heavy clay.
	1536'-1547'- Horizontal clay-filled joints (incipient fractures) become rare & rock is less fractured. Clay diminishes. MnO dendrites prominent.
1547'	1547'-1557'- fracturing resumes. Oriented 30°, 75°, less commonly 45°. Vertical clay seams (1546' 8mm long; 1548' 10 cm long, 4mm wide) contain brecciated rock fragments.
	1557'- intense fracturing resumes
	1564'
	1561'-1564'- breccia, heavy brown clay
	1560'-1570'- Fine-scale color banding of matrix: 2-15mm bands @ 70° & to ℄, med. lt. gry & med. dk. gry, long axes of phenos. also oriented in same plane @ 70° & to core length, 5cm rounded xenoliths com. @ base of interval
1567'	

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL / GOODWIN
FIELD CLACKAMAS / CASCADES BASIS BINOC. MICROSCOPE DATE 7/3/86

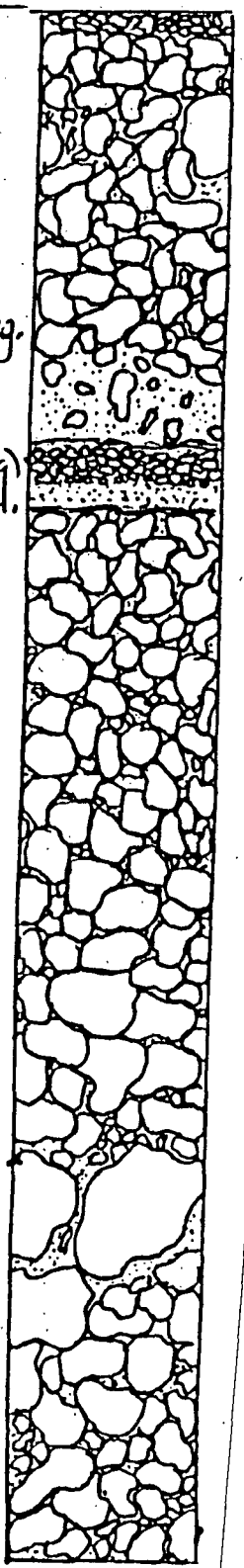
DEPTH INTERVAL	DESCRIPTION
1567'	ANDESITE (A/A)
	1570 VOLCANIC BRECCIA Med dk gry & gry brn. sub-angular to sub-rounded lapilli and block sz rock fragments of mafic-intermediate lavas in gnysh brn matrix of ash sz rock fragments, clay (from ash?), & crystals of plag., pyx, hbde. Unit changes character throughout its thickness: thin, cross-bedded, laminated intervals of ash sz rock fragments, intervals w/palagonite common, intervals w/ disrupted/irregular margins on basaltic andesite clast suggesting molten deposition. Pyroclastic & surge origin is suggested by much of these characteristics. Generally, unit is clast supported. Voids may occur between small lapilli. Pale blue to med bluish gry clay coats fractured surfaces. Fine, clear, acicular to prismatic (?) mineral on broken surfaces & in voids is probably zeolite. Tr pyrite → FeOx.
1587'	Upper part of unit is transitional w/ andesite unit above 1570'. 1570 - 1573.5 Volcanic breccia contains predominately lapilli & large blocks of andesite (a/a) in ashy matrix w/ mnr clay. 1575' - 1583' return to dense, andesite flow a/a (may be large block in breccia?) 1590' - small lapilli interval grades into thinly bedded - laminated, lt brn interval of ash sz rock frags (~15 cm thick). 1592' - 8 cm of rhythmically thin bedded & laminated ash sz rock fragments & ash (→ clay). Top of this interval marked by erosional contact overlain by small lapilli supported by yel brn palagonitic, ashy matrix. (Suggests surge/hydroclastic possible deposit.)
1607'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CLACKAMAS/CASCADES BASIS BINOC. MICROSCOPE DATE 7/3/86

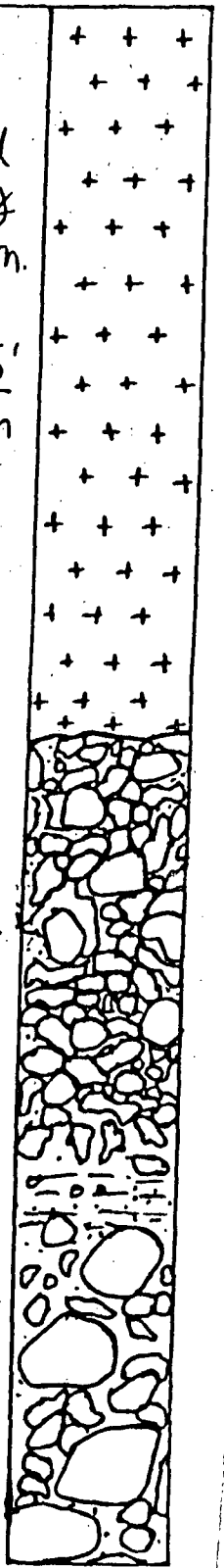
DEPTH INTERVAL	DESCRIPTION
1607'	VOLCANIC BRECCIA (A/A) 1594' - unit becomes abruptly coarser & darker gry. predom. lapilli size material (rock frags) 1597' - abrupt contact w/interval of ash-sm lapilli sz fragments in ash matrix w/palagonite 1522' Coarser & darker (gry) a/a @ 1594'. Change in ratio of clasts: matrix, clast size creates subtle bedding. 1610'-1617' - this interval is more "tuffaceous" than above intervals, as there is an increase in ash & pumice. Thin ashy (→ clay)/laminae mark end of this interval @ 1618'. Suggest larger percentage of air-fall (pyroclastic) material. 1619' - clast supported interval of small lapilli to ash sz rock fragments & palagonite. Grades into interval of ash sz fragments & 4 cm of small scale, cross-bedded ash → clay. 1627'-1629' - unit becomes unconsolidated
1627'	1630'-1639' - marked change in character. Dk grey, vesicular to dense blocks &, less commonly, lapilli of basaltic andesite w/irregular margins, some disrupted, suggesting deposition while molten & plastic. Clasts are 60%-50% of interval. Matrix of dk yel brn - brn gry to olive gry, fine ash w/ash size rock frags. Mnr. lamination in matrix between clasts. 1644'-1646' - Matrix becomes red brn. Lapilli (no blocks) of grey-red brn - olive rock frags. 1646'-1647' - Vesicular, basaltic andesite/andesite boulders w/olive & reddish clays filling vesicles. Grades into andesite unit below.
1647'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GODDWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7-3-86

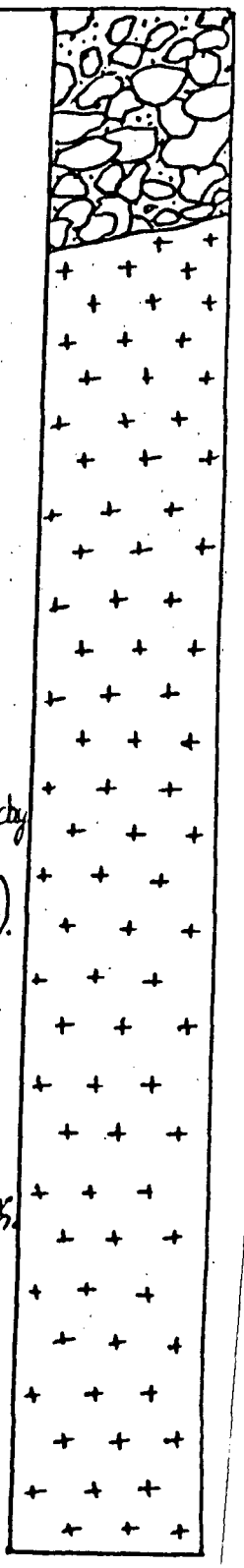
DEPTH INTERVAL	DESCRIPTION
1647'	1647' - BASALTIC ANDESITE/ANDESITE lt olivegry, lt. med. gry., and lorngry; sparsely porphyritic (≤ 1%) phenocrysts: plagioclase, pyroxene (?) altered to clay. Small aligned vesicles 0.5-2.0 cm apart +/- secondary clay define banding @ 60° to ⊥. Fractures are most commonly @ 45°. Clay coatings are lt. brn. dk. grngry, and mod. orange pink. Minor limonite present adjacent to fractures. Tr. pyrolusite, psilomelane? Moderate amt. fracturing. @1655' clear, elongate tabular secondary mineral/zeolite? forms drusy coating on fracture surface. 1658.5'-1659.5' Intense fracturing @1662' Yellow-staining (FeOx?) adjacent to clay- and pyrolusite-coated fracture Irregular, sharp basal contact
1667'	1666.5'-1694' VOLCANIC BRECCIA Mottled coloration: dk to mod. red brn, red gry, med. dk gry, olivegry, lorngry, pinkgry. Angular to subrounded lapilli-sz to sm. block-sz. heterolithologic (aphyric to finely porphyritic dense to vesicular, composition predominately mafic to intermediate but includes v. lt. gry to wht. clasts suggestive of more silicic composition) volcanic rock fragments. Some clasts may have been molten, appear plastically deformed, and have irregular, disrupted margins. Laminations of fine ashy material are typically discontinuous, disrupted, & have small-scale crossbedding. % matrix variable. Comm. fracture clay shearing. Minr. fracturing with variable attitude. Tr. fine, clr. drusy zeolites on fractures. Lt. amt. 2ndary clay, limonite. @1675' Tr finely disseminated tabular Fe? sulfide in clay 1677'-1682.5' Reddish brn to mod. brn; angular to subrounded lapilli-sz volcanic clasts in ashy (to clayey) matrix, crude thin bedding @ 1681' composed of sm. lapilli- & ash-sz r.f.s., waxy clays, clasts oriented @ 45°. @1682.5' Increase in size & % of andesite blocks from underlying unit.
1687'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDannel/Goodwin
FIELD CASCADES/CLACKAMAS BASIS _____ DATE _____

DEPTH INTERVAL	DESCRIPTION
1687'	VOLCANIC BRECCIA (A/A) 1687' soft brn clay partially filling void, sticky core
	1694' sharp 45° ∠ contact w/underlying unit
1694'	ANDESITE Med gry to dk grey to brownish gry. Porphyritic (1-3%) Phenos: plag + pyx. Pyx → clays. Secondary clays coat (lt. to mod) fracture surfaces: lt brn, lt grn gry, pale blue, reddish brn, minr mod yel. Pyrolusite on frac. surfaces. Groundmass matrix altered to clay. Generally, unit is very fractured w/ zones (~.6 m) of consolidated rock. Incipient fracture marked by hairline cracks, which may be filled w/ clays. Most prominent frac. direction ~45°, less prominent 70° ∠ ~ vertical.
1707'	1694'-1702' Intervals (0.5-10cm) of mod or. pink, mod brn, lt. brn gry lams. ash + clay
	1708' abrupt color change to brnish gry. Rock is v. fractured (~1m). Dendritic MnO or FeO (black).
	1716': green clay alteration of matrix changes to reddish yellow clay.
	1721': plag phenos decrease
	1728'-1731': splintery, vertical fracture predominates; pheno content appears to decrease @ 1728'
1727'	



Diamond Shamrock
Thermal Power Company

Form 2

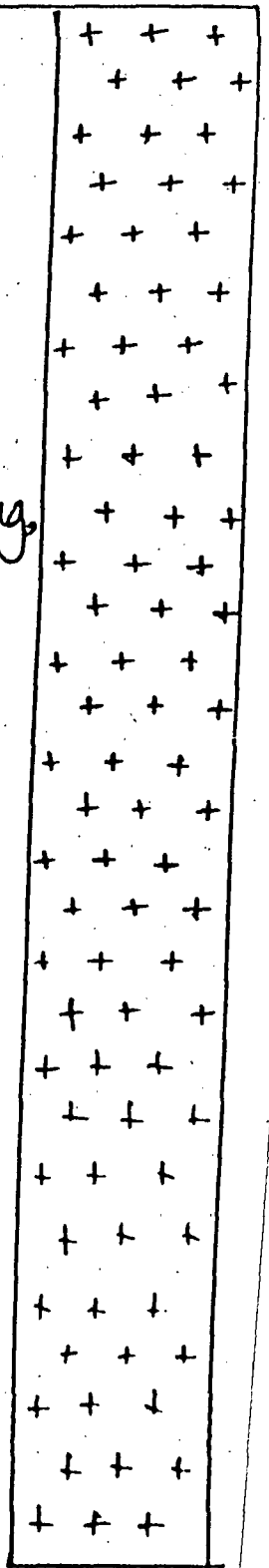
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANIEL

FIELD CASCADES/CLACKAMAS BASIS hand. microscope DATE July 4th, 1986

DEPTH INTERVAL	DESCRIPTION
1727'	ANDESITE (a/a)
	1737': mafic phenos (pyx) replaced by green clay rather than reddish yellow clay a/a. Green clay alteration in groundmass, also. Platy, 45° fracturing, rare vertical fractures.
1747'	1745': dk greenish gry & minor pale blue coating on fracture surfaces is most prominent alteration. Other clays are minor.
1767'	

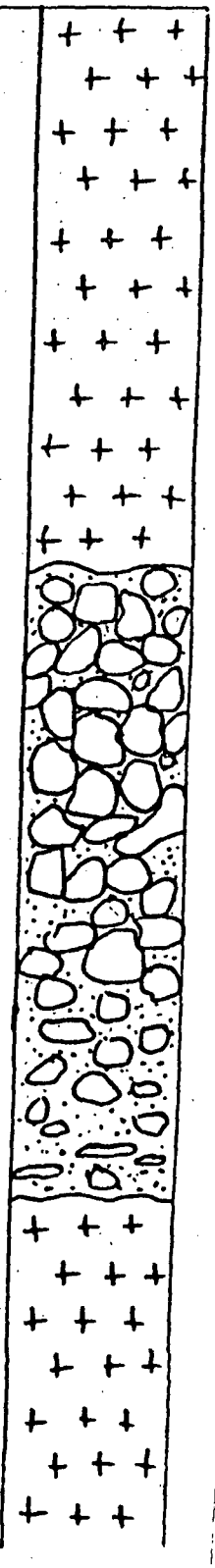


CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc: microscope DATE July 6, 1986

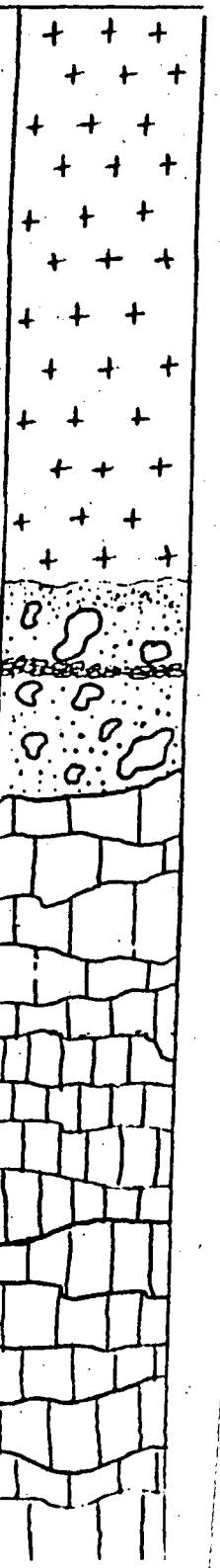
DEPTH INTERVAL	DESCRIPTION
1767'	ANDESITE (A/A)
	1781½' Contact is mod. reddish brn & contains angular rock fragments
1781½'	VOLCANIC BRECCIA (predominately pyroclastic frag.) moderate reddish brn, lapilli-and blocke-sz andesite scoria and, less commonly, med gry andesite rock fragments in a sparse ashy to clayey matrix. Comm. shear on fracture surfaces. Matrix ash-sz clasts includes mafics → clay & FeOx & plag. → clay. Frac. clays are ltgrngry +/- lt. to mod. FeOx. Sparse 3-15mm voids have lam's v. pale brn, lt. brn, red brn clays which may drape around clasts. Clr. drusy zeolite also present on fracs. Top of unit has agglomerate appearance. 1796'-1798' color changes to med. dk gry, matrix % increases slightly. Elongated clasts are horizontal 1' above basal contact.
1787'	
1798'	ANDESITE brngry to medgry, v. sparsely porphyritic (≤1%): plag & pyx → clay & FeOx (≤5mm), commonly vesicular w/ gry-grn clay filling ≤50%, 2ndary wht, lt brn, & gry-grn clays commonly coat fractures, & clear prismatic zeolite? occurring A/A
	1803'-1806' Common irregular, elongated vesicles (1-5mm voids) with variable amounts
1807'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANIEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7/6/86

DEPTH INTERVAL	DESCRIPTION
1807'	ANDESITE (A/A) 1809'-1810': ≥ 30 mm clay seam assoc. w/sinuous frac @ 30° to ℄ @ 1814': microfractures & aligned small voids (@ 0.5-1 cm interval) @ 90° ± 10° to ℄ 20% filled w/thin mod brn or grn gry clay seams 1817'-1820': heavy fracturing & clay above 4" breccia & oxidation horizon (pinkish red)
1820'	VOLCANIC BRECCIA Mod. dk yel, orng brn, red brn. Coarse ash sz & lapilli sz heterolithologic rock fragments & minor very lt. grey dense pumice (often containing hornblende, ± magnetite) Commonly flattened, in a tuffaceous matrix which includes glass, hornblende, ash. Unit has slight changes every 2-6 cm -- i.e. change in color, clast: matrix ratio, clast size -- which gives a crudely bedded appearance. Minor shear visible on fracture surfaces. (Much of unit appears to be pyroclastic airfall mat'l.)
1827'	1826'-~10 cm of ash & ash sz rock frags w/o clasts 1825'-1826' - reddish orng waxy matrix (from ash?)
1826'	BASALTIC ANDESITE Dk gry to grnish blk, rare microphenos of plag. Pilotaxitic texture. Brecciated (tectonically) intervals are typically consolidated. Dk grnish clay on surfaces of fractures & filling many vesicles. No predominate fracture angle/direction, generally 40°-vertical. Mnr white clay in some vesicles. 1826'-1835' volcanic "breccia" is at top of this unit composed of dk gry vesicular blocks of basaltic andesite described above, w/irregular boundaries/margins suggesting fluidal/molten deposition. Matrix (~30%) of lt olive, olive & dk yel brn ashy material.
1847'	

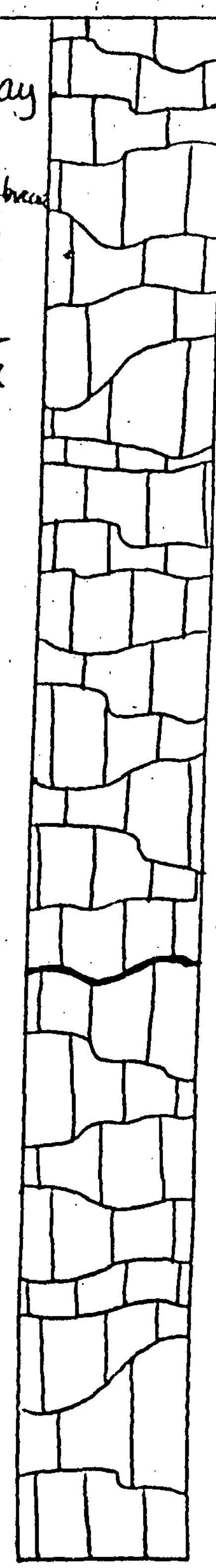


Diamond Shamrock
Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE: CTGH 1
FIELD: CASCADES/CLACKAMAS
GEOLOGIST (S): GOODWIN/MCDANNEL
BASIS: BINOC. MICROSCOPE DATE: 7/7/86

DEPTH INTERVAL	DESCRIPTION
1847′	BASALTIC ANDESITE (A/A) 1836′-1845′ (Tectonic) Breccia zone, well consolidated. Dk grn clay in fractures. 1851′- increase in vesicularity (1851′-1872′ flow transition through pyroclastic breccia) 1853′ & [1869′] a/a @ 1826′, (vesicular to dense blocks & lapilli of basaltic andesite, irregular margins, in mnr dk yel brn & olive gry matrix). 1869′ Matrix becomes red brn w/vesicular mafic fragments common & increase in ash component of matrix (suggests pyroclastic origin). Zeolites occur in voids between some fragments.
1867′	
1872′	BASALTIC ANDESITE Dk gry, v. finely & sparsely porphyritic (<1%). Phenos (<2mm): plag, cpx. Mod. amt. dk grnish gry to grnish black &, less common, pale blue clays on fracture surfaces. ± minor, subtle grnish clay in groundmass. Phenos show little to no alteration & rock appears fresh. Fracturing is not pervasive & varies in intensity & fracture angle; 45° & ~ vertical ∡ often predominate. 1871½′-1890′: mnr platy partings @ 45° & 60° ℄, + dk gn clay: controls fracturing.
1887′	



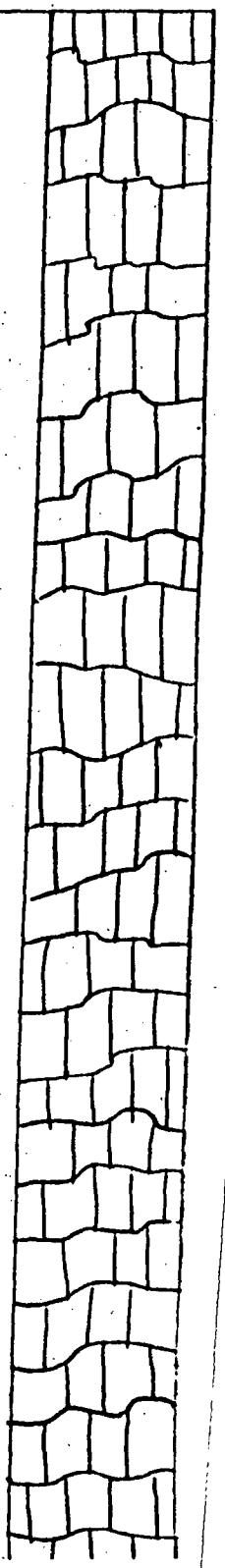
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 7, 1986

DEPTH INTERVAL	DESCRIPTION
1887'	BASALTIC ANDESITE dK gry, finely porphyritic (1%), phenos: (<2mm) plag. & cpx., mod. amt gray, green, & lt. blue clays, ± minor subtle greenish clay also in groundmass; phenos. show little to no alteration. Fracturing is light/not widespread, mainly 45°-50° to ℄ & minor subvertical & 30°-often with light coating of brn, blk, dK gry grn clay
1907'	1910'-1917' Common intersecting sinuous vertical fractures with brn & blk clays coating fractures
1917'	

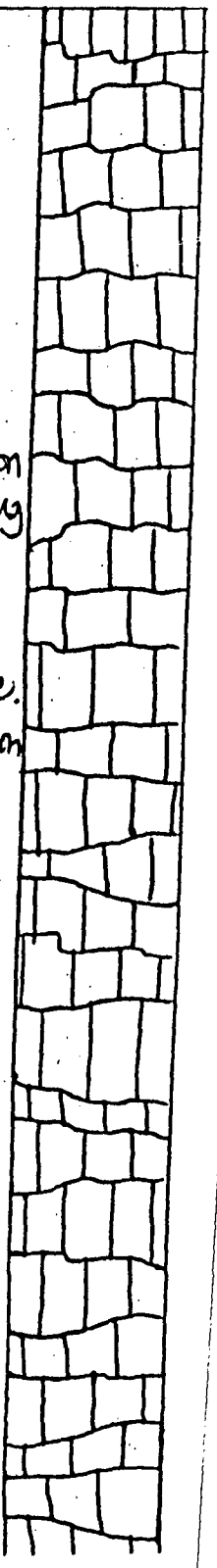


CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE July 8, 1986

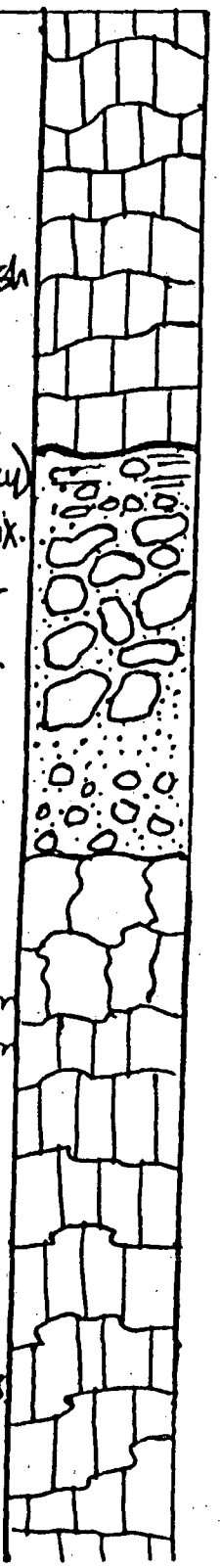
DEPTH INTERVAL	DESCRIPTION
1917'	BASALTIC ANDESITE (A/A) @ 1917' rock fracs. fairly easily along preexisting parting planes @ 30°, 45° & ± sinuous vertical
	1927' 1' zone of intensely fractured/rubbly core
	1928' moderately fractured. Predominate fracture direction is 45°, less commonly ~75° & vertical. Thin, dk green clay seam along vertical fracture @ ~1936'
	1937' - fracturing increases. Rock somewhat rubbly @ 1940'-1945'. High angle (~ vertical) & 45° predominate.
1937'	1945-1947' - angular brecciated clasts, in place w/thin clay veinlets.
	1948': rock becomes well consolidated & has few fractures. Fracture tends to be ~horizontal.
1957	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 8, 1986

DEPTH INTERVAL	DESCRIPTION
1957	BASALTIC ANDESITE (A/A)
	1967'-1969' Contact - rock becomes brecciated and color changes to grayish black with minor reddish brown
1969'	VOLCANIC BRECCIA
	1969'-1970.5' Angular to subrounded lapilli- to coarse ash-sized rock frags. of mafic to silicic composition in a fine red brn. matrix of ash→clay (waxy) & mnr. ash-sz r.f.s. Crude bedding defined by clast size & variation in % matrix.
	1970.5'-1979' Lt. med gry to olive gry, commonly vesicular, basaltic andesite blocks (predominate) & lapilli in a sparse matrix of fine yel. brn ash. B.A. blocks may have dark (chilled?) or irregular (disrupted?) margins suggesting deposition in a plastic/molten state. Shear is common on fracture surfaces. Gradational basal contact.
1977	
1979'	BASALTIC ANDESITE
	brngry to gry brn, v. finely & sparsely porphyritic (~1%) to aphyric, phenos: plag, pyx→clays & limonite, ol? →clay, common lt. alteration of matrix to clay (esp. adjacent & within fractured intervals), common brecciation, mod-mod+ clays filling in many vesicles + coating all fracs. & filling all voids (mod brn, dk grngry, lt gry, pale blue, wht, orange brn...), R clear soft zeolite? occuring as drusy void coating & individual sm. xtals, vesicles to 1986'
	1979'-1984' Vesicular chilled-edged boulders w/ brn secondary? clays @ edges (MAY BE PART OF UPPER V.C. unit) = flowtop breccia
	1979' & below intermittent lt. grn clay in tiny pill-shaped grains irregularly aggregate in fractures & vesicles
	1986'-1990' intense fracturing & brecciation, 50% rubble of smaller than 1"x1" frags.. fracs @ 15° to & filled with thin
1997	



Diamond Shamrock
Thermal Power Company

Form 2

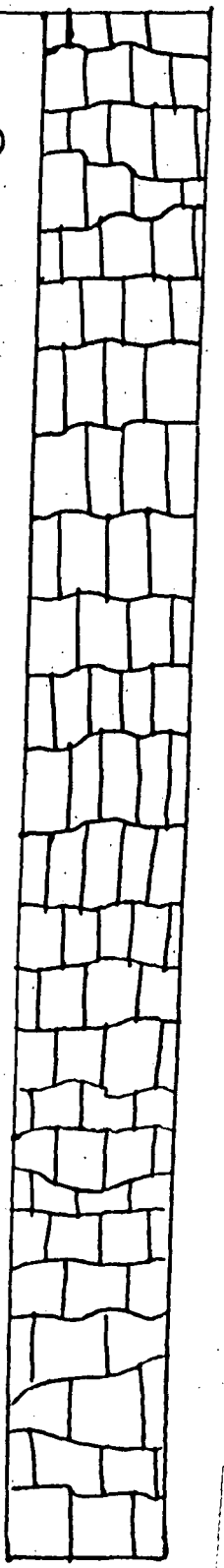
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) MCDANNEL/GOODWIN
BASIS binoc. microscope DATE July 8, 1986

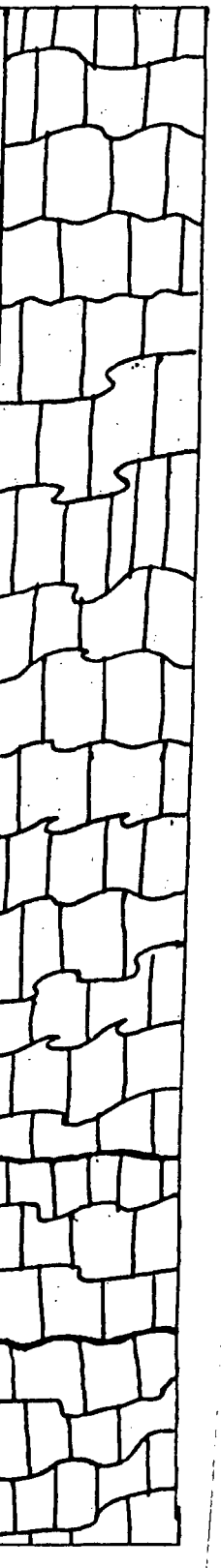
DEPTH INTERVAL	DESCRIPTION
1997'	BASALTIC ANDESITE (A/A) 1990' (cont.) dk brn, mod. brn, dk grn gry clay 1992½'-2000½' Intensely brecciated, 50% rubble, fracs @ 45° to ℄, mostly dk gry grn & brn clays as coatings/fill 2004'-2030' Intensely brecciated, fracs @ 40°, 80° rubbly, overall color is greyish green to dusky green. abundant clay.
2017'	
	2030'-2035' - color changes to dk yel brn. Rock remains rubbly.
	2035' - ~1' mod. red brn clay - CONTACT
2037'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS hand. microscope DATE JULY 9, 1986

DEPTH INTERVAL	DESCRIPTION
2037'	2036'- BASALTIC ANDESITE grnish blk to dk grnish gry to grnish brn. Mnr grnish red aphyric. grn. includes plag, pyx. Pervasive dusky grn - dk grn & grnish blk clay alteration. Vesicles (up to 1.5 cm) common but not abundant, lined w/clear drusy zeolite mineral (vapor phase?) & filled w/clay → pale blue to dk grn. Mnr. veinlets of wht clay. Minor disseminated to drusy coating of clear secondary mineral on fracture surfaces. Heavy fracturing locally, 45° predominate ↗, sinuous vertical to sub-vertical less common. Brecciation common to 2064'
	2040'-2057' well consolidated breccia.
	2055'-2065' Pale brn - clay alteration lt. to mod. w/ clear zeolite? A/A, R earthy hematite & limonite
2057'	clay colors predominately brn & grn gry; wht, red brn, pale blue also present
	2067' Contact: 3" limonite-stained interval between dk gry vesicular basaltic andesite flows
	2072'-2074' Contact A/A with rock color altered to mod brn
	2076'-2079' Fracturing @ 15° is sinuous & vertical, increase in zeolite vnlets (≤3mm wide) & clay (brn), mod. brecciation lenticular consolidation is good, color: mod brn, 40mm drusy vesicle
2077'	

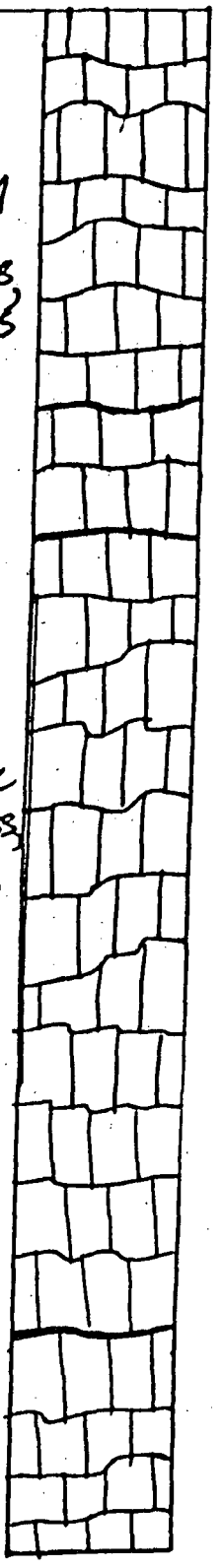


CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE July 9, 1986

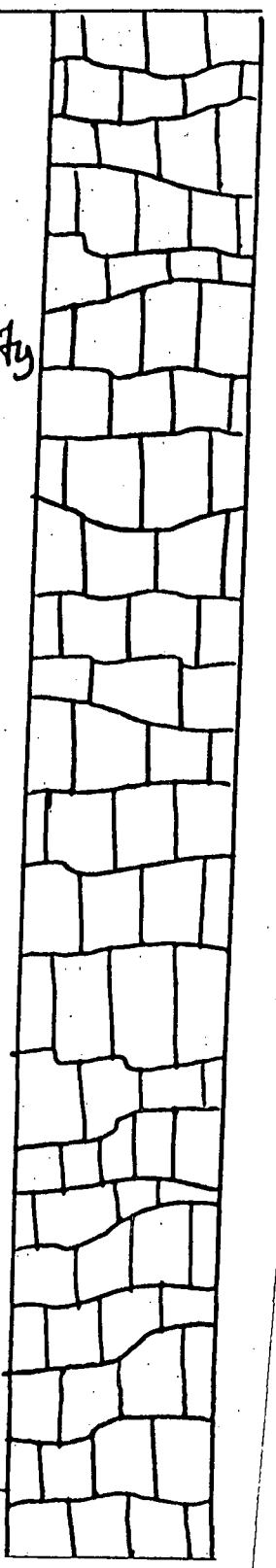
DEPTH INTERVAL	DESCRIPTION
2077'	BASALTIC ANDESITE (A/A)
	2083'-2103' unfractured interval w/ fewer zeolites, particularly below 2094' where vesicles become less common, two zeolites present: 1 clr, as drusy fill & finely dissem. xtals in fracs & voids, 2 pale yellow (less common) at base of interval as finely dissem xtals
	2088' Contact: red-brn oxidation zone 3" wide w/ basal leached halo 3" wide
	2091' Contact A/A
2091'	2095'-2101' intermittent coarsening of grainsize, locally w/ appearance of brecciated v. finely porphyritic gabbro in basaltic andesite matrix, sharp to diffuse-edged xenoliths?, ¼" - 10" across, mild clay alteration (6-15 mm wide) adjacent to rare fractures, intermittent fine web of wht zeolite vnlets
	2103' heavy limonite, R+ clr drusy zeolite?, & lt clay on frac. @ 30° to ℄
	2107'-2111' Increase in clay alteration: rock brnish color
	2111'-2117' Contact? red brn, increase in vesicularity, one large sinuous vertical crack begins at contact, filled with drusy zeolites (clr), heavy clay, common hematite (earthy)
2117'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/McDANNEL
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 10, 1986

DEPTH INTERVAL	FRACTURE DENSITY	DESCRIPTION
2117	# fractures per 1' interval (Edges filled w/ secondary mins)	BASALTIC ANDESITE (A/A)
		2120' - seam of horizontal brn clay ~6cm thick
		2122'-2124' - one 8mm wide ~0.3in ~vertical fracture filled w/white mineral → clay & numerous smaller veinlets
		2124' - rock becomes brn gry. Increase in vesicularity up to ~15%
		2126'-2126.5' - rock becomes red brn. Flattened vesicles
		2126.5 - return to brn gry color
		2127.5-2128 - vertical fracture filled w/white mineral → clay. Less prominent, thinner, variably oriented veinlets.
2137		2131' - return to homogeneous dk gry color
		2137'-2139' - 1 continuous vertical fracture, less prominent (minor) 45° & horizontal fractures
		2148'-2159' gry/sh red to mod reddish brn, SH. increase in fracs & wht veinlets (=clay & drusy mineral), vesicles 2-15% mostly filled with wht, lt brn, or pale yel-orange clay, zeolites completely fill vesicles occasionally, common hematite, rare limonite, common clay alteration, (vesicles ≤ 20mm, vns ≤ 5mm)
	0	
	2@15°,F	
	2@subvert,F	
	0	
	0	
	1@70°	
2152	0	



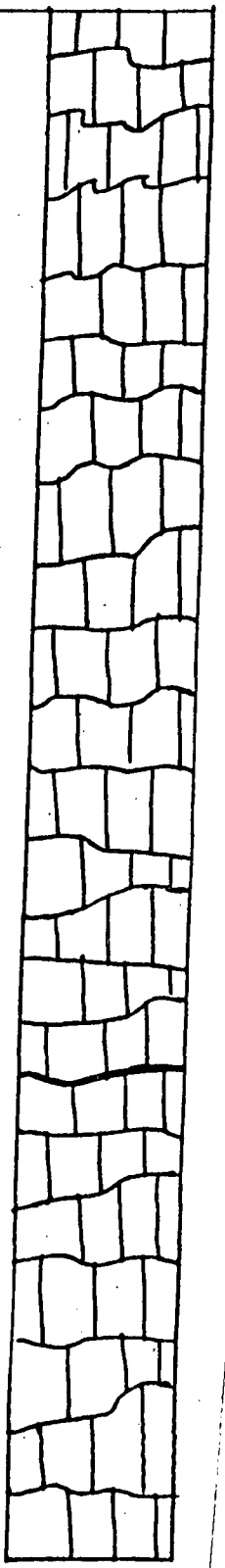
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE July 11, 1986

DEPTH INTERVAL	fracture intensity	DESCRIPTION
2151'	0	BASALTIC ANDESITE (A/A)
	2	
	1F	
	1F vert.	
	2F@15°	
	1F vert.	2159'-2164' sparse vesicles
	1F@15°	
	2F@15°	
	1F@vert.	
	1F@vert.	
	0	
	0	
	0	2171'-2181' dK grngry color, intermittent coarsening of matrix grain size to v. finely porphyritic with contact between porphyritic & aphyric sharp to diffuse, phenos: plag, ol, pyx (ol → iddingsite), few vesicles, increase in matrix alteration adjacent to fractures in coarser-grained intervals, unfractured exc. tiny veinlets A/A
	0	
	0	
	0	
	2	
	1@20°	
2177'	0	
	1@70°	
	0	
	0	
	0	
	2F@15° 1@90°	
	0	
	0	2184'-2185' Contact: bright orange brn, normally graded volcanic seds./tuff(?): 3" fine clayey ash abruptly changes to poorly-sorted xtal poor lapilli tuff w/ 2-3% plag (euhedral & sparkling) + pyx → clay in clay (devitrified ash?) matrix w/ sparse rounded to subangular red brn (→ clay) mafic to silicic lapilli-sz rock fragments & 1 or 2 pumice clasts → clay
	0	
	0	
	0	
	0	
	0	
	1@20°	
	>5	2185'-2200' BASALTIC ANDESITE A/A, consolidated flowtop breccia: grngry to lt brn, ± amygdular (w/ zeolites ± clay), local heavy hematite alteration @ 2192' to 2195½' (minor metallic pyrite → hematite in matrix), common fractures with brown clay & fairly coarse-grained drusy zeolites, v. sparse matrix material → lt brn clay ± hematite
	1	
	0	
	1@vert.	
	3	
	3@45°	
2197'	1	



Diamond Shamrock
Thermal Power Company

Form 2

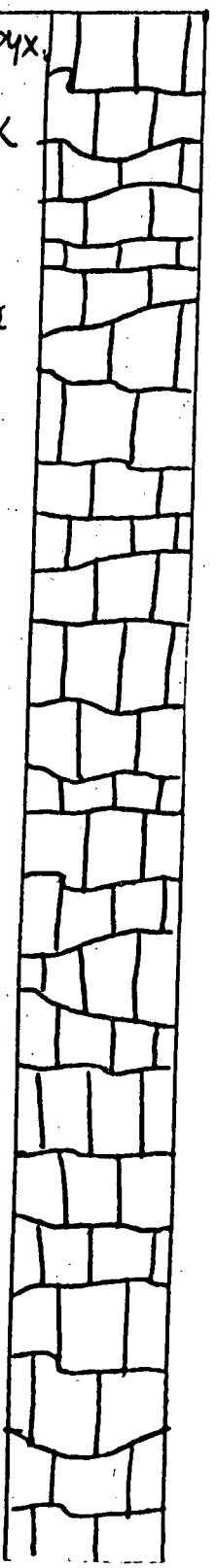
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 11, 1986

DEPTH INTERVAL	# Feet/1' Interval	DESCRIPTION
2197'	0	BASALTIC ANDESITE, aphyric w/g.m. ol → iddingsite, plag, pyx. dk gm gry, 2200'-2224' local brecciation but rock well consolidated, fine grn gry clay ± clr zeolite veinlets, unfractured core w/ irreg. break
		2205½' 3cm drusy-lined irreg. cavity & v. lt. wht clay
		2208' fine, wht, acicular zeolite in fractures fracturing remains minor, predom. along 45°-55° ∡
2217'	Lt.	2224'-2230' red brn. Mnr flow? breccia (12cm) passes into vesicular rock (Basaltic Andesite as described above), vesicles filled w/ clays & ultr zeolites(?) White zeolites fill fracture (vein) @ ~20°. Probable contact
		2230' - rock becomes greenish grey with same appearance as described at top of page.
2237'		



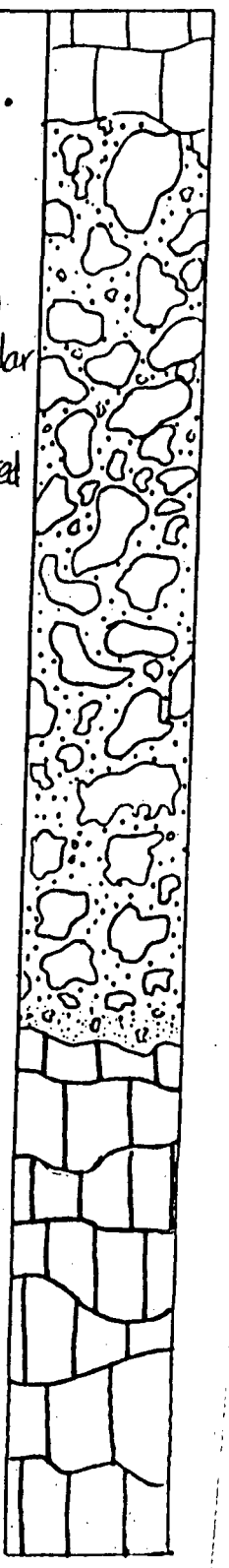
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN / McDANNEL

FIELD CASCADES / CLACKAMAS BASIS BINOC. SCOPE DATE JULY 11, 1986

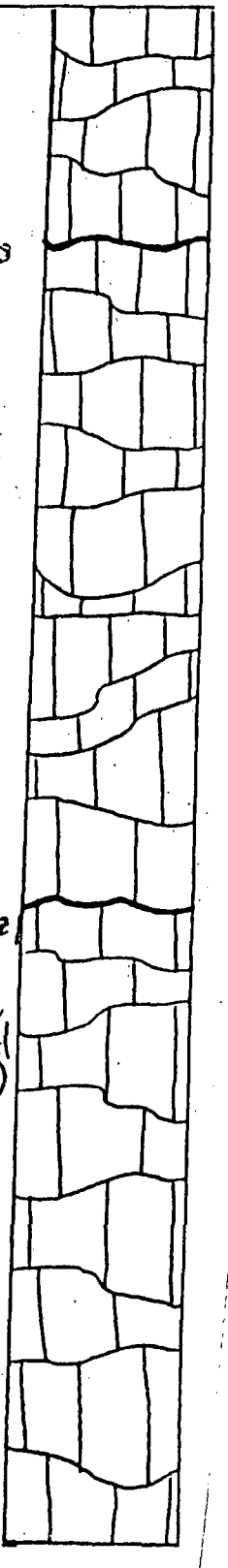
DEPTH INTERVAL	Fracturing intensity ↓ L: light M: moderate H: heavy I: intense A: absent	DESCRIPTION
2237'	L↓M H M L	**BASALTIC ANDESITE (A/A)** 2237' rock is brecciated (tectonically) but well consolidated. V. minor matrix of dk grn clay. 2238' increase in vesicles. Clay & wht. zeolite fill vesicles 2239'-2241' very fractured. Waxy shear surfaces. 2240' - **VOLCANIC BRECCIA** (pyroclastic origin) Lapilli & blocks, rounded to irregularly shaped, dense to vesicular basaltic andesite in a minor matrix of mod brn clay, ash sz rock fragments & crystals (predom. plag.). Numerous small voids & vesicles filled w/ white zeolite & clays (pale blue & dk grn). Sheared waxy fracture surfaces. Predom. fracture direction 20°-35°. 2253' matrix increases; fracturing increases & rock becomes v. broken & rubbly. Shear on surfaces. Larger clasts in breccia have yel brn oxidized rims; other clasts have rims darker than remainder of clasts (chilling?). Fracture remains intense until 2259'.
2257'	H↓M↓H↓M↓H↓M	2259' angular to sub-rounded lapilli sz rock fragments of med-dk grey mafic lavas in red brn to gry brn matrix of clay (from ash?), ash sz rock fragments, xtls. Some of fragments have convoluted, disrupted margins — suggesting deposition while in a molten/plastic state. 2263' - 7 cm mod rd brn clay w/ predom. ash sz rock frags. (AIRFALL?)
	H↓I↓M↓H↓M↓L↓M↓L↓A↓M	2264' **BASALTIC ANDESITE** Dk grn gry - mod red brn, aphyric. Brecciated (tectonically) but consolidated w/ lt-dk grn gry matrix. Vesicles contain clear drusy zeolite ± white, pale blue clays; uncommon veinlets of same. Short intervals of red brn (oxidized) volcanic breccia of basaltic andesite lapilli — some indicate deposition while molten/plastic. Pyroclastic origin appears most likely. Rare, finely disseminated pyrite → limonite/hematite. Intermittent shear on fracture surfaces.
2277'		



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTG11-1 GEOLOGIST (S) MCDANNEL / GOODWIN
FIELD CASCADES / CLACKAMAS BASIS BINOC. SCOPE DATE 7/12/86

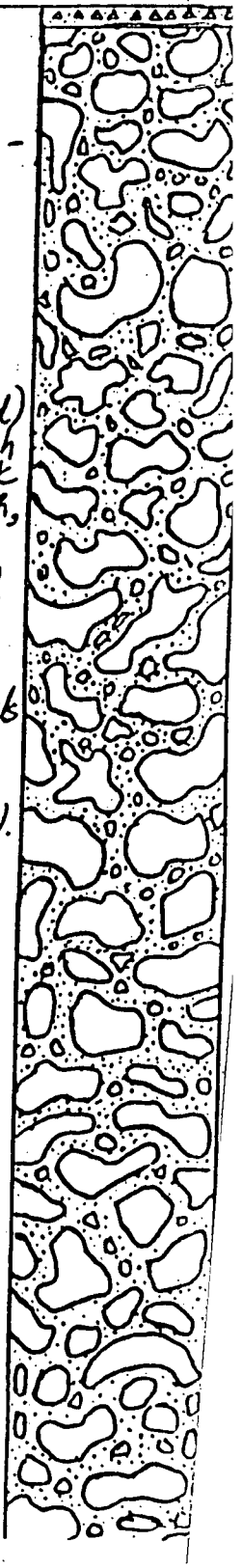
DEPTH INTERVAL	DESCRIPTION
2277'	BASALTIC ANDESITE (A/A) 2277-2280' - hvy brn clay + tr limonite associated w/dk gry vesicular volcanic blocks (flow edge?) 2284'-2286' - gry brn - red brn vd. breccia: lapilli sz rock frags in ashy matrix (flow boundary?). Much of matrix is clay. Mnr shearing on fracture surfaces. Zeolites on fractures in trace amnts. 2286'-2288' - no brecciation of rock a/a (@ 2264'). Rock is blue grn color. 2288' - 7 cm red brn clay seam w/rock frags, offset ~4cm in shear zone. (description similar to 2284' above) 2294-2295' - vertical fracture w/heavy waxy (clay) shear. + seam of soft clay w/rock frags.
2297'	2298'-2300' - mod brn, brecciated, w/ fractures @ 30°-45°. Clay along fractures, mod. shearing, pervasive clay alteration, 2301'-2305' volcanic breccia: mod red brn to mod brn: lapilli sz, often vesicular, basaltic andesite(?) clasts in matrix of clay (frm ash), ash sz rock frags, xtls. Lt shear, tr. zeolites. Pyroclastic origin. Contact? 2305'-2317.5' - Interval above grades into basaltic andesite, as described @ 2264'. Color is blue green. Rock is brecciated (tectonically) but consolidated.
2317'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) MCDANIEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binocular microscope DATE JULY 13, 1986

DEPTH INTERVAL	Fracturing A=abundant L=light M=moderate H=heavy I=intense	DESCRIPTION
2317'	L	2317' Minor red brn oxidation marks flow boundary
	M	
	M	2317.5' LAPILLI TUFF
	H	16 cm thick interval: pale yel org to mod yel brn. <1mm -
	H	5mm elongated clay clasts (appear to have been pumice
	M	lapilli, collapsed) & ≤ 5 cm (angular lt. gry rock fragments
	H	of intermediate composition. (Some frags are irregularly shaped
	I	& have oxidized rims). In minor mod yel-dk yel brn clay
	M	matrix w/xtls of plag & pyx. Percentage of rock fragments in
	M	unit increases w/depth, grading into unit below:
	M	2318' VOLCANIC BRECCIA (well consolidated)
	M	Dk grn gry, med dk gry, gryish red, mod red brn to brnish
	H	gry. Lt-med gry angular to subangular lapilli- to block-size rock
		frags of matic to intermediate composition in matrix of ash,
	M	smaller (to ≤ 1mm) rock fragments (l/a), sparse xtls, & dk
		grn clay. Frequent, intermittent intervals of mod red brn
		& blk flow banded (+ stringers & blebs) lava → clay, ± minor
		vesicular/rarely scoriaceous, rounded blk to brn to red brn
	H	lapilli-sz fragments. (Flow banding, stringers & blebs
	M	suggest material was molten at deposition). Also, intervals
2337'	L	of brnish gry basaltic andesite (typically, aphyric) w/
	H	more homogeneous texture & occasional subtle breccia.
	L	(Breccia as described above ~~may be~~ Probably of explosive origin).
	M	Minor clay, concentrated on fractured & often waxy,
	H	sheared surfaces of dk grn gry breccia. V. minor
	M	white veinlets & fracture coating of zeolites. (Clays
	H	are predom. dk grn, w/less pale blue & red brn). Fractures @ ~45°.
	L	2319.5' - rare laminations
		2318' - 2325' - intermittent lt yel brn zones (~15cm - 1m)
		w/lighter colored (intermed - silicic) lapilli-sz volcanic
		fragments (i.e. rock fragments) + more tuffaceous matrix
		than most of unit.
	L	2349 - 2351 - breccia has dk grn gry color.
2357'		



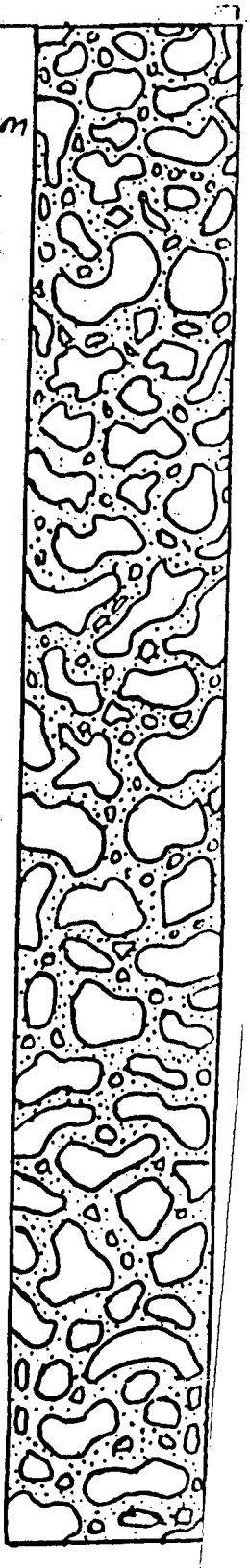
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL / GOODWIN

FIELD CASCADES / CLACKAMAS BASIS BINOC. SCOPE DATE July 14, 1986

DEPTH INTERVAL	Fracturing L=light M=moderate H=heavy A=absent I=intense	DESCRIPTION
2357'	L↓MHIMHI	VOLCANIC BRECCIA (A/A) 2359'-2372' - red brn → blk, brn gry. Flow banding common @ angles of 30°-45°. FeOx (limonite), rare clear zeolite. Much of interval is rubbly. 2372'-2379' - grn gry breccia (consolidated), less matrix.
2377'	LAMIHLHIHLA	2379'-2385' - red brn, med-dk gry. Flow banding 45°-80°, locally rubbly. 2385'-2387' - grn gry breccia (a/a) 2387'-2391' grayish red, rounded, ± vesicles, basaltic and. blebs, minor bands. Sheared frac. surfaces. 2391-2401 brn gry (w/mnr red gry). Texture is subtle: med gry to dk red grey rounded frags. in red gry lava matrix
2401'		



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANIEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS bi'noc. microscope DATE July 14, 1986

DEPTH INTERVAL	Fracture	DESCRIPTION
2397'	A L A L H	VOLCANIC BRECCIA (A/A) 2401'-2412' - grn grey breccia, as described above, often w/ little matrix between rock fragments.
	H ↓ M L	
	M L M I L ↓	
	M	2412' dk red brn matrix, w/ blk, rounded, vesicular rock fragments & irregularly shaped blebs. Zeolites in vesicles. 2416' red color intensifies & flow banding prominent.
2417'		
	H M	2419' grades into red gry & becomes more homogeneous lava by 2422
	↓ H A M	2425' grn grey breccia, a/a. Pale blue clay & gry grn clay on wavy, sheared, fracture surfaces.
	@45°	
	H	2434'-2438' Brn, blk & red brn breccia "dike" threads its way through H. gry breccia w/ angular blocks & lapilli separated by thin clay seams suggesting little movement relative to "dike" (attitude 15° to // to ¢). Dike may have been fluid and is composed of ash-sized volcanic fragments with disrupted margins.
	↓ M	
2437'	↓	

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CLACKAMAS (CASCADES) BASIS hand. microscope/DATE 7-15-86

DEPTH INTERVAL	DESCRIPTION
2437'	VOLCANIC BRECCIA (A/A) 2440'-2441' red brn & dk gry breccia, w/ streaked & convoluted bands (~ flow banding). Red ashy matrix. 2441'-2448' increase in matrix (dk grn gry), angular to rounded lapilli & small block sz basaltic andesite w/ intermittent intervals (up to 15 cm thick) of red brn & blk banding a/a, w/ sparse lapilli-sz rock. Dk grn waxy shear surfaces (2444'-2448': increase in pale blue clay on fractures) 2448'-2453' CRYSTAL TUFF? (very fine ash matrix, lg's altered to clay) Dk yel brn, waxy, sheared clay w/ abundant xtls of plag & pyx → clay. Minor coarse ash-lapilli sz rock fragments (of intermed. composition) & porphyritic clay clasts. Unit becomes slightly less waxy & altered w/ depth (~2453') & is marked by disrupted black bands of basaltic material. 2453' ANDESITE med dk gry to v. lt. gry, porphyritic andesite ~10% phenos of plag, cpx & opx → All show clay alteration.
2457'	
	2453'-2469' bomb- & lapilli-sz gry blk - dk gry porph. andesite commonly flattened/elongated, in dk org brn clayey matrix of coarse ash-sz rock fragments & xtls of plag & pyx. (Flow breccia?)
	2469'-2476.5' above grades into med dk gry porphyritic andesite @ 2469'. Phenos replaced by wht clay w/ minor pale blue cores.
	2476.5 color changes to lt gry - v. lt. gry. Cpx phenos repl. by dk grn clay. Pale blue & pale grn clay pervasive throughout rock.
2477'	

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/McDANNEL

FIELD CASCADES/CLACKAMAS BASIS _____ DATE 7-15-86

DEPTH INTERVAL	DESCRIPTION
2477'	ANDESITE (A/A)
	2485'-2488' rock takes on subtle pinkish cast which becomes pronounced by 2488'. Pheno sites have rims of oxidized red brn-mod red iron w/ light blue clay (rather than dk grn clay) repl. phenos.
	2487' ~12 cm zone intense fracturing, increased yel brn clay
	2490' pervasive lt grn gry clay, mnr lt gry brn clay. Veinlets of wht clay (zeolite?).
2497'	2495' rock becomes tectonically brecciated w/ minor dk grn gry matrix of finer rock frags & clay. Rock remains well consolidated. Mnr zeolite veinlets. (Brecciation is 2ndary feature)
	2504'-2512' brecciation intensifies. Zeolite veinlets 5°-15° ¢ (acicular zeolite — natrolite?)
	2512'-2516' Light fracturing. Rock color is lt. brn gray adjacent to fractures, otherwise lt gry. Light grn clay coats fractures.
	2515' 8 cm drusy cavity with several different zeolites successively coating light grn clay cavity wall (resinous tightly fitting stumpy columns → radiating blades → very fine acicular xtals, all ~clear in color)
2517'	

Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN

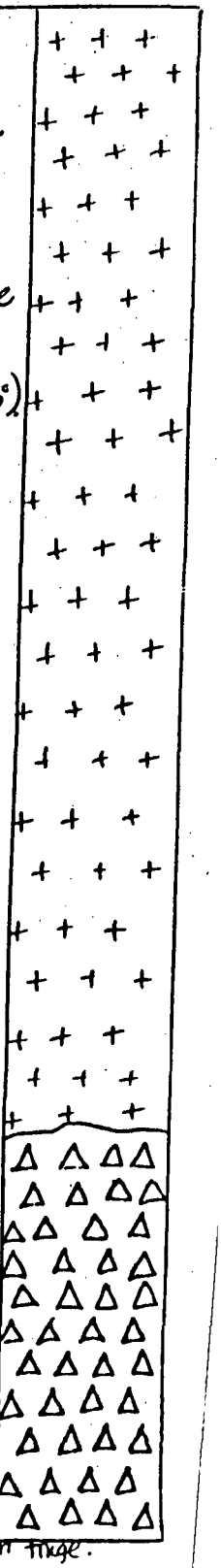
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 16, 1986

DEPTH INTERVAL	Fracturing	DESCRIPTION
2511'	A ↓ L A	ANDESITE (A/A)
	L M	2526'-2532½' (2ndary) Brecciation increases. Minor dk grn gray clay vnlets ± clear zeolites coat fractures. Fracture altitude variable, 30°-45° to ℄ most common. Rock remains well consolidated.
	L ↓ A	2532½'-2539' Base of flow marked by a change in color: rock is mainly brn gry, w/ pink brn & med. gray related to incomplete mixing with the lower unit and chilling, respectively.
2537'		2539'-2552½' Volcanic breccia – (agglomeratic by 2543') Red brn & gray lapilli & blocks of andesite in an orange brn matrix of clay/ash & common free plag. & pyx. xtals. From 2543' to 2545 lapilli are flattened horizontally. Local fracture @ 15° to ℄ w/ lt. clay shearing. Minor zeolites in vesicles ± clay (± quartz (?) @ 2548'). (Pyroclastic breccia between flows)
	L A ↓ M A ↓ L	@ 2550' matrix changes color to moderate brn. Amphibole appears. Suggests contact w/ unit below @ 2259'.
	A ↓ L	@ 2552½' ½ cm brn clay seam on fracture @ 45° ℄ to ℄ marks contact with breccia of different character
2557'	↓	2552½'-2559' Indistinctly banded, brecciated but consolidated andesite; wispy bands of pale yellowish brn, moderate yellow & red brn xtal-rich matrix (clay, + amphibole ≤5mm), pyx → red brn clay,

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 7/16/86

DEPTH INTERVAL	DESCRIPTION
2557'	ANDESITE (A/A) (continued from p. 51) (& plag) w/med dk gry unaltered blocks. Banding may be a primary flow feature or related to alteration & fracturing.
	2259' ANDESITE (see 2550') finely porphyritic; 2-3% phenos of amphibole, pyx, plag. Med dk gry. Fractures most common @ 20°. White clay on fracture. Light clay alteration of matrix.
	2566'-2569': intense shearing, vertical to high angle (15°) Forms rubble.
	2573'-2575'- intense shearing & rubble. Vertical & 45° Waxy shear surfaces.
2577'	2579'- hairline fractures (w/v. lt. clay @ 45°.
	2580-2586'- volcanic breccia — basal breccia. Lapilli & small blocks of andesite in ashy matrix. Groundmass minerals altering to clays, pyx → hematite & clay. Common gry grn & white clay veinlets.
	2586' CRYSTAL-LAPILLI TUFF (airfall?) Overall color is lt. gry. Lt gry, med gry & red brn fine gr. intermediate to mafic lapilli of volcanic rock fragments in a matrix of ash sz rock fragments, abundant crystals (plag, pyx, amphibole?). Minor flattened pumice → clay. Ash is sparse. Subtle bedding defined by size variations in matrix & lapilli.
	2586'-2584'- orange brn, ashy matrix. Oxidized by overlying andesite flow.
	2514'-2595'- poorly consolidated. Dk green & pale blue secondary clays common.
2597'	2511.- grn clay seam along 30° fracture; below this point is lt. gry/grn rock color to base of unit



Diamond Shamrock
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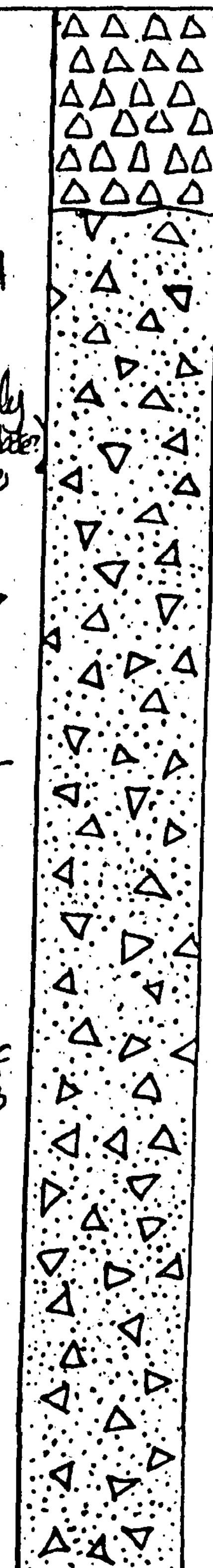
CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 17, 1986

DEPTH INTERVAL	DESCRIPTION
2597'	Crystal-Lapilli Tuff (A/A)
	2602.5 Lapilli Tuff (Ash-flow origin?)
	Lt gry angular to sub-rounded lapilli sz rock fragments & black glass (FRESH) in med gry to dk med gry matrix of ash sz rock fragments, xtls & glomeroxts of plag, opx & magnetite, glass fragments, mnr clay. Rock fragments are predominately porphyritic andesite but include rare gabbroic samples (cumulate?) Elongated, black, fine textured features are common & are reminiscent of collapsed pumice, but may be depositional feature. Unit is mod. well-consolidated & predominately massive. Bedding & sorting are present but uncommon → suggests possible surge deposition, in part.
	2604 ~0.3 m well sorted thin beds of coarse to fine ash sz material.
2617'	2605 rare blocks & larger lapilli in uppermost part of flow disappear by this interval. Small lapilli only are now present.
	2612 - decrease in lapilli sz rock fragments to ~≤3% throughout remainder of unit
	2624' - lapilli sz frags almost absent
	2630.5'-2642' unit is poorly consolidated/friable in much of this interval
2637'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc · microscope DATE July 17, 1986

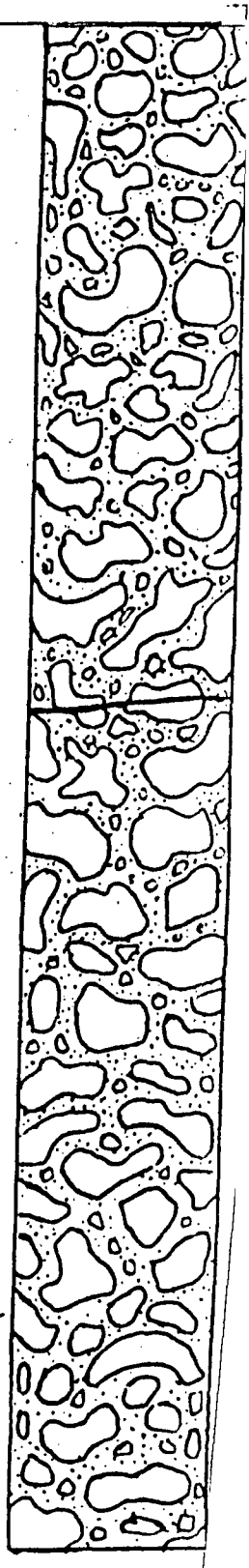
DEPTH INTERVAL	finding	DESCRIPTION
2657'	L	LAPILLI TUFF (A/A)
	H	
	IM	
	A	
	L	
	I	
	L	2654½' Unit becomes lt. grey & horizontally-flattened lapilli (v. lt. grey, = fiamme?) increase
		2656½' A 6cm thick well-sorted layer of lt. gray coarse ash - to sm. lapilli-sized rock fragments with common wht & grn clay alteration followed by a 14cm thick bed of lt. gry consolidated ash size fragments w/ sparse vesicular andesite lapilli.
	A	
2657'		2657' ANDESITE BRECCIA med to med dk gry angular to subrounded lapilli & blocks (≤4') of porphyritic andesite (pyx → dk grn gry clay, ± plag. ; 2-4%), in lt. yel brn to lt. olive brn to lt. red brn matrix of ash-size 17% mnr. xtals w/ common voids. Unit is a series of intervals of primary breccia (i.e. vol. breccia) (with vesicular lapilli & matrix) interspersed w/ blocks (v. thin flows?) unvesiculated andesite w/ mnr. secondary/tectonic? fracturing (and may represent a margin sample of thin flows) Mnr wht clay in vesicles.
	M	
	I	
	M	
	L	
	A	
		2657'-2675' Zeolites commonly form drusy linings on intergranular voids & vesicles, cementing the rock together & suggesting laterally extensive interconnected fractures.
		2657'-2659' Rapid decrease in matrix fraction. Below top 2' breccia is clast-supported.
		below 2675' Decrease in matrix voids & zeolites (clr/wht)
2677'		

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTG-H1 GEOLOGIST (S) MCDANIEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 19, 1986

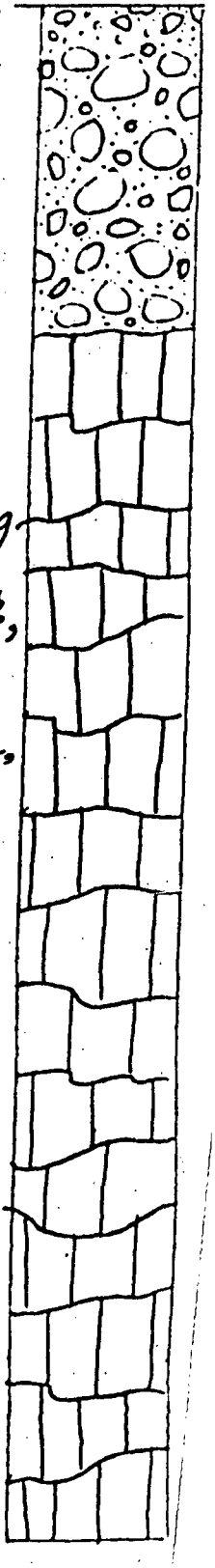
DEPTH INTERVAL	DESCRIPTION
2677'	ANDESITE BRECCIA (A/A)
	2690'-2694' Notable increase in vesicularity & veside size (≤4cm) in scoriaceous blocks. Light amt. drusy zeolites and +/- pale grn gry / wht clay in voids. Contact marked by 23cm of (overall) brn grey coarse ash-size red brn, med gry, & dk. gry rock fragments, xtals & mnr. ash(?). Interval is normally graded & crudely bedded/laminated @ 70°.
2694'	2694' VOLCANIC BRECCIA
	Lt. olive gry to dk yellowish brn, lt. to med. gry blocks & lapilli-sz r.f.s. of mafic to intermediate composition in a matrix of ash-sz r.f.s., xtals (mnr.), dusky yellow to dk yellow palagonite, & v. fine ash(?). Minor localized crude bedding (thin beds) in matrix. Matrix --> clay
	@ 2694' contact marked by ~23 cm of ash sz rock fragments, it's bedded & laminated, ~70° angle. (BLAST DEPOSIT?) & minor ash. Interval is normally graded & crudely
	2710' Percentage of rock fragments in unit decreases
	2712'-2718½' Small lapilli-to coarse ash-sz dk gry to dk. gry brn rock fragments in matrix of dk. yellow orange palagonite and mnr. xtals. R.f.s often appear elongated & disrupted, as if deposited in a partially molten state. Subtle bedding based on clast size & matrix % variations. Blast deposit origin? Palagonite tuff?
2717	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 16, 1986

DEPTH INTERVAL	DESCRIPTION
2717'	A ↓ L A ↓ L ↓ A
	VOLCANIC BRECCIA (A/A)
	2718' 12cm of dusky yellow to lt. olive lam v. fine ash-sz. f s and Xtals. Palagonitic? Rare lapilli-sz. clasts.
	2718.5' - Volcanic Breccia A/A @ 2694' with slight increase in clasts, mainly from b.a. unit beginning @ 2726'. Matrix color changes from dusky yellow to med. dk gry by 2719'. Rare clr. zeolite veins.
2726'	BASALTIC ANDESITE
	A
	MED DK GRY, V. Finely porphyritic (7-8%). PHENOS: PLAG, PHX → CLAY, OL? LIGHT-MOD fracturing. Long (0.3m+) vertical to 20° fractures coated w/ pale grn & grysh grn, waxy clay. fracture surfaces show minor shearing
	2726'-2736.5' - flow top breccia: dk gry - gry brn - red brn porphyritic basaltic andesite (25cm - 1cm) fragments, often elongated/banded & disrupted, in mod red brn clayey matrix w/xtls, subtle banding.
2732'	2736.5'-2748' rock becomes pale red brn, less breccia, mnr cavities w/ drusy zeolite. Zeolites also fill hairline fractures.
	2748' - rock becomes med dk gry as described above.
	H A L A L A L ↓ A L ↓ M ↓ H
2757'	



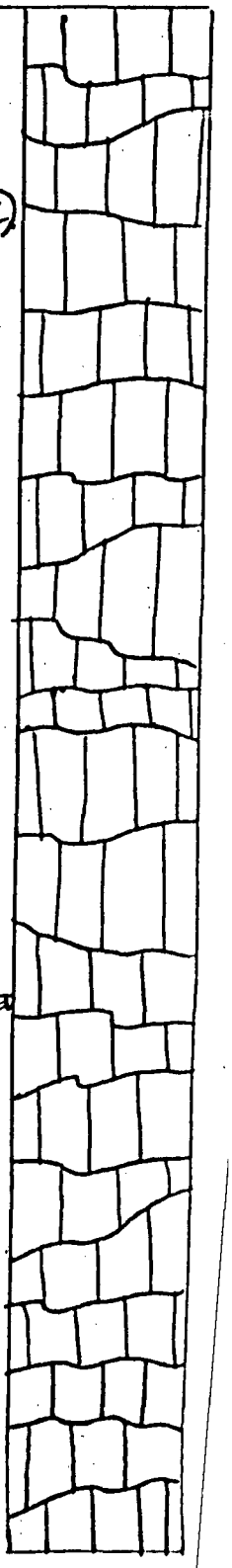
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOSDWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE JULY 18, 1986

DEPTH INTERVAL	DESCRIPTION
2757'	BASALTIC ANDESITE (A/A) (MED DK GRY, FINELY PORPHYRITIC: PHENOS OF PLAG, PYX, OL? FRACTURING LIGHT TO MODERATE, 20° TO VERTICAL. PALE GRN & DK GRYISH GRN CLAYS ON FRACTURE SURFACES, TYPICALLY SHOWING MNR SHEAR)
2777'	2782'-2786' ROCK BECOMES BRECCIATED (TECTONIC), BUT IS WELL CONSOLIDATED. BRECCIA FRAGMENTS ARE ANGULAR, CLOSELY SPACED, & SLIGHTLY ELONGATE (DUE TO FRACTURE DIRECTION) ALONG VERTICAL-SUBVERTICAL AXIS. NOT MUCH MOVEMENT ALONG FRACTURES. MNR CAVITIES W/ ZEOLITE. MNR MATRIX BETWEEN FRAGS OF DK GRYISH GRN CLAY, & LESS COMMONLY, WHT ZEOLITE. FORMING ≤ ½ CM seams on 30° to 45° joints with waxy shear (minor) towards base of interval.
2797'	



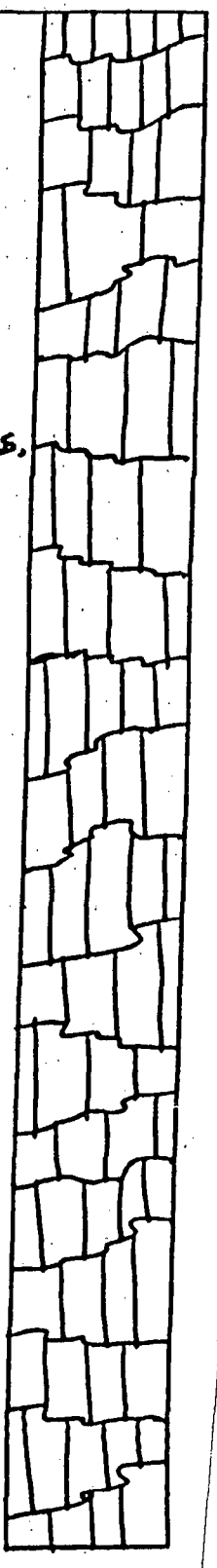
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE JULY 19, 1986

DEPTH INTERVAL	DESCRIPTION
2797'	BASALTIC ANDESITE (A/A) (med dk gry, finely porphyritic, phenos: pyx, plag, & ol.? light to moderate fracturing, most commonly 20° to 45° to & with local sinuous vertical fracture. Pale grn & wht clays on fracture surfaces (often slightly waxy), typically showing minor shearing. V. short intermittent brecciated but consolidated intervals w/ clay vnlets ± rare zeolites (clr). 2806'-2810' Intensely fractured @ 30° ± to & to vertical, splintery rock fragments <1"-6" long, heavy waxy shear ± clear zeolite ± pale grn/wht clay on sinuous to planar fracs.
2817'	
2837'	



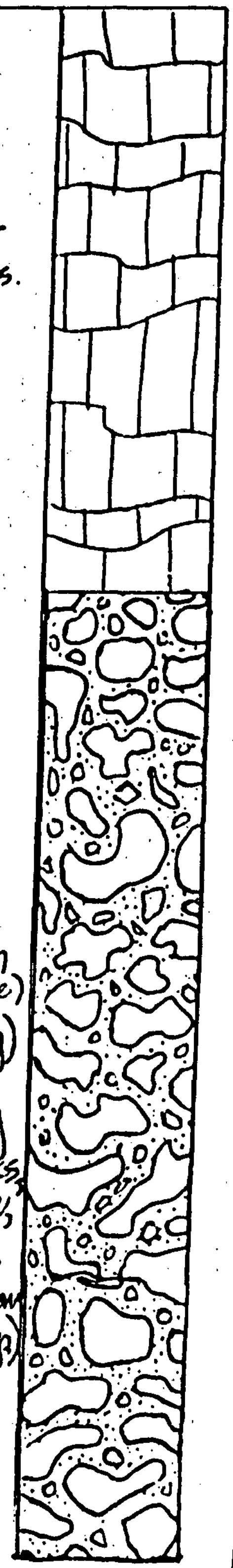
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE: CTGH 1
FIELD: CASCADES/CLACKAMAS

GEOLOGIST (S): MCDANNEL/GOODWIN
BASIS: binoc. microscope
DATE: July 19, 1986

DEPTH INTERVAL	DESCRIPTION
2837'	BASALTIC ANDESITE (A/A) 2838' flow becomes oxidized & grayish red. Flow breccia appears by 2840.5. Decrease in fracturing & clays 2841.25'-2844': very fractured/broken. Vertical to sub-vertical fracture angle predominate. Drusy zeolites. 2842' VOLCANIC BRECCIA (explosive origin?) Rock changes character, often over short intervals, but is predominately composed of angular to sub-rounded lapilli &, less commonly, blocks, of md gry to dk gry mafic-intermediate lavas in a dk gry - brn gry to gry red matrix of smaller rock fragments a/a v.fine material → clay, & xtls. Clasts are typically heterolithologic. Unit varies from clast to matrix supported. Short intervals of dk gry basaltic andesite(?) showing evidence of deposition while still in a plastic, partially molten state (juvenile) (i.e. disrupted margins, flattening, stringers, mnr banding) in oxidized (primary) reddish brn matrix. Near top of unit there is crude, subtle, discontinuous bedding in matrix. Rare zeolites filling hairline fractures/cracks, mnr drusy coatings on frac. surfaces. Fracture variable, but most often at high angle or ~45°. gen. light.
2857'	2860.75'-2863' dk gry porph basaltic andesite, predom lapilli sz, showing plastic deformation (see above descrip) in fine pale brn matrix → clay + smaller basaltic andesite frags. 2863.5' - heterolithologic clasts predom. mafic to intermed composition but include lt gry, silicic? & altered porphyritic lt grnish green & finely banded (rextalized?). Some
2877'	



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CT611-1 GEOLOGIST (S) GOODWIN/MCDANIEL
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 19, '86

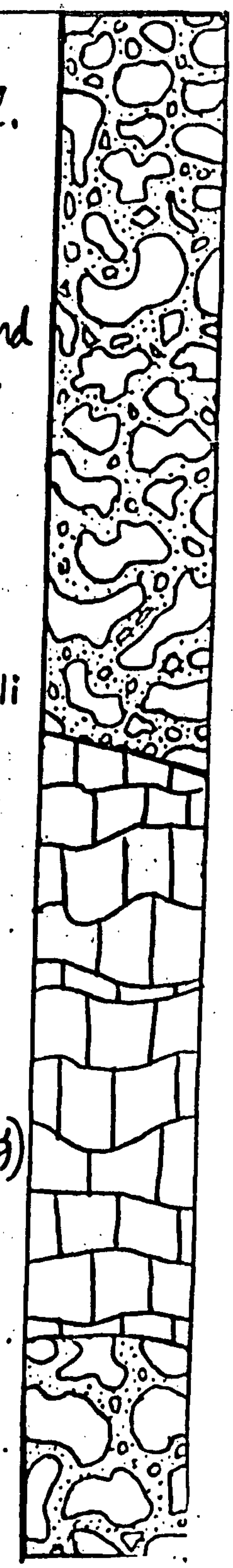
DEPTH INTERVAL	Fracturing	DESCRIPTION
2877'		VOLCANIC BRECCIA (A/A)
		2863.5' cont'd: clasts show plastic deformation. Oxidized reddish matrix shows minr banding (as if deposited in molten state)
		2876' - sheared & broken. Sheared, waxy surfaces. Variable shear/fracture angles.
		2877.5'-2879' small lapilli sz gry & dk red brn rock frags (heterolithologic) in minor matrix of dusky yel-dk yel org clay (palagonitic?). Thin bedding, laminations @ 2876-2877.
		2878'-2880' unit v. sheared & broken, predominately along short high angle fractures. waxy, sheared surfaces
		2880'-2897' dk yel brn to dk yel orange matrix, interval characterized by two interbedded units grading into one another repeatedly: (1) a lapilli-rich interval w/ 2-25 mm rounded lapilli, mainly dk. yel. brn & altered to clay & (2) larger more angular lapilli of mafic & intermed. comp. in a matrix of v. fine ± palagonitized rfs & clay (wht) w/ minr xtals pyx, plag., FeOx (blk min). Rare frac @ 30° to ℄ w/ lt. shearing of clays & v. rare zeolites
2897'		2896'-2903' sinuous subvertical fracture & poorly developed 30° conjugate fracture set (locally), lower ℄ is rubbly, common shearing on fractures, v. lt. wht & grn gry clay
		below 2897'-2955': matrix color dusky yellow grn, change in Fe oxidation state?
		2906'-2907' thin interval with characteristics of hot deposition: blk & reddish gry matrix w/ v.f. palagonitized rfs & smaller lapilli among larger basaltic andesite lapilli/blocks
		2909'-2916½' Several rubble zones (≤ 2' thick) in interval, matrix color: dirty brn, rock has v. irreg. break & is sometimes friable, probably shear-related condition. y. lt. clays & zeolites in fracs (v. rough conj. frac set @ 35°)
2917'		

Diamond Shamrock
Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc microscope DATE July 20, 1986

DEPTH INTERVAL	Fracturing	DESCRIPTION
2917'	L A L ↓ M H M ↓ H L ↓ A M H I H M L	VOLCANIC BRECCIA (A/A) 2916½ matrix color varying from dusky yel. grn to dk yel. brn w/ both matrix & clast-supported intervals 2925' matrix color: dk yel. brn, matrix appears to flow around larger constituents in matrix-supported interval; hot & fluid deposition suggested 2930'-2933' Vertical fracture present w/ rubble at base of interval 2935' reverse graded base of breccia unit: ash-sized & lapilli rf.s, lightly sheared @ 45° to ¢ w/ brn clay vn along shear (= fault contact?), crudely bedded @ 90° to ¢
2937'	I L ↓ A L A ↓ A ↓ L M ↓ I ↓	2934'-3935' laminae & thin beds of predominately ash sized rock fragments. Bedding is horizontal to ~45° ∡ ¢. 2935' BASALTIC ANDESITE Md gry to dk md gry, finely & sparsely porphyritic (≤1%), phenos: plag, pyx. Rock has mottled grey appearance, grades into oxidized mod (@2939) red & med gry: flattened, elongated, irregular disrupted margins of med dk gry basaltic andesites in oxidized basaltic andesite. (Pyroclastic mat.l) 2951.5' VOLCANIC BRECCIA (see following page)
2957'		

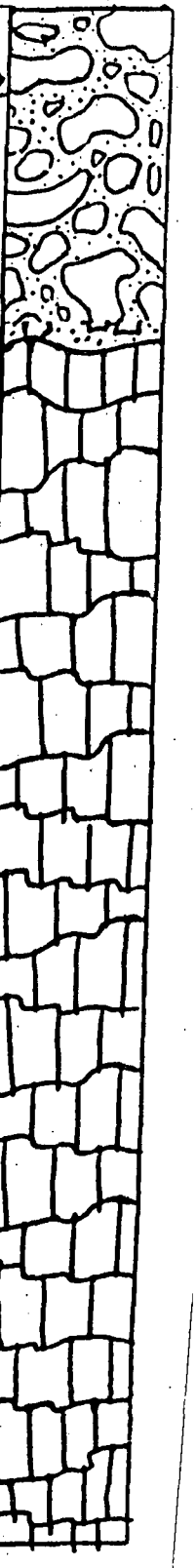


CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. MicroscopeDATE July 20, 1986

DEPTH INTERVAL	fracturing	DESCRIPTION
2957'	I	VOLCANIC BRECCIA (A/A) Angular to sub-angular lapilli sz clasts of porphyritic-aphyric mafic to intermediate lavas ⅓, less commonly, ltgry to v.lt. gry clasts (some now clay) which may be more silicic. Mtrix is greenish blk coarse to fine ash sz rock frags. a/a. Unit is predominately clast supported. Graded bedding at 2954' & 2956'. Unit is v. fractured, usually along subvertical to 30° ⅔ Polished, sheared surfaces. Minor pale grn & pale blue clays on frac. surfaces.
	M	
	H	
	I	
2965.5'	L	BASALTIC ANDESITE med gry to dk gry to brngry, finely & commonly sparsely porphyritic (2-5%), phenos: plag pl wht clay, pyx → grn clay, common mottled appearance, due to brecciated but consolidated rock: dk gry to brnish gry sm. blocks & lapilli-sized B.A. frags. (orange brn to red brn) (w/generally disaggregating boundaries) blend into matrix of ash sz B.A. frags, xtals plag & pyx, & bright orange, wht, & red brn clays. Mottling is more subtle and matrix is sparse above 2979'. Below 2979' matrix increases to 20%-50% and fine fracturing of lapilli w/ sm. vnlets wht clay is common. Pervasive mod. matrix clay alteration. Fractured intervals w/ shear surfaces, typically 30°-45° ⅔. V. Mnr gry grn clay on surfaces.
2977'	M	
	H	
	I	
	M	
	L	2979½'-2984' intermittent rubble, 30°-45° fracs most common w/ irreg breaks ⊥ to ⅔
		2994'-2998½' basaltic andesite interval, unbrecciated- w/ soft lt. gry clay in vertical fracture at 2994', mod. clr drusy (& coating) zeolite on fractures
2997'		



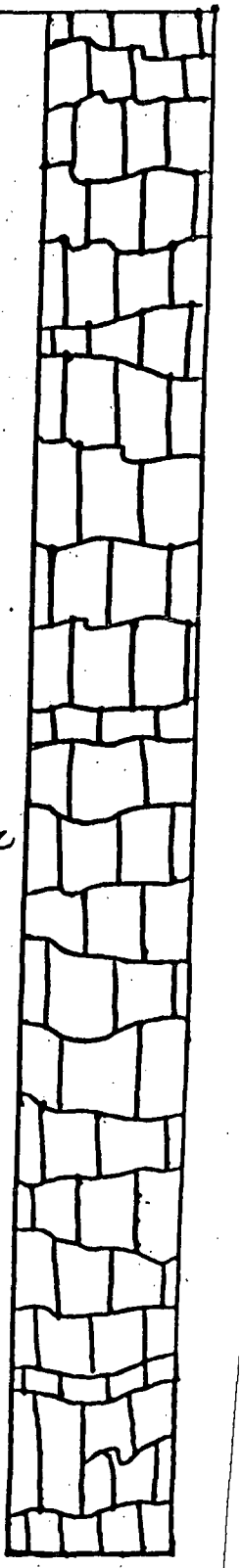
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE July 20, '86

DEPTH INTERVAL	Fracturing	DESCRIPTION
2991'	L	**BASALTIC ANDESITE (A/A)**
	M	below 2998½' mottled appearance, brn gry & dk gry B.A. lapilli sized frags. in orange brn to red brn matrix a/a, sparsely porphyritic (fewer pyx.) (This feature ends ~3001', when flow becomes med. dk grey.) (Pyroclastic breccia)
	L	3003' rock appears more open textured. Increase in vesicles. Clays (grn gry, white, pale blue, gry grn) fill vesicles & intergranular voids.
	M	
	L	
	A	
	L	
	H	
	M	3014' - begin to find yellowish grn - gry grn inclusions (2-4 cm) composed of pyroxene & minor plagioclase + clay (green).
	H	
3017'	L	3016½' rock becomes slightly scoriaceous & becomes increasingly scoriaceous by 3018', showing red brn oxidation. Rock is slightly less consolidated & breaks easily. (Pyroclastic breccia interval)
	M	
	L	
	M	
	L	
	M	
	M	
3037'	H	



Diamond Shamrock
Thermal Power Company

Form 2

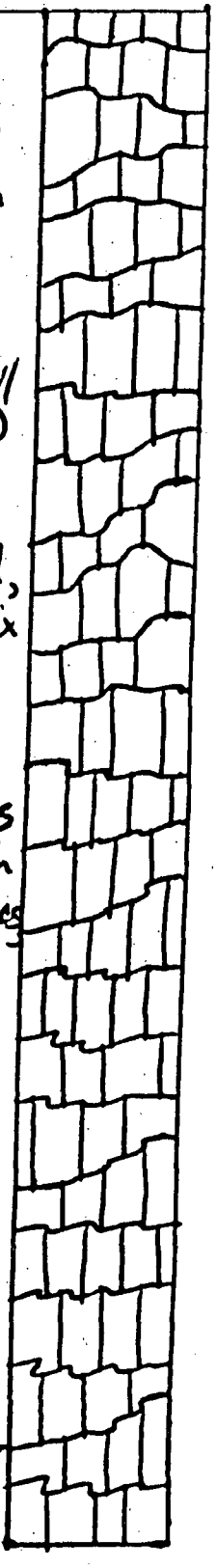
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE JULY 21, 1986

DEPTH INTERVAL	fracturing	DESCRIPTION
3037'	M L ↓ M L	**BASALTIC ANDESITE (A/A)** rock fragments commonly porous & scoriaceous, fractures easily, brecciated but consolidated, most common frac. @ 45° w/ no shearing, v. lt. pale blue & dk grygrn clay in frac's., common unfilled vesicles (≤ 1.5cm) overall v. little alteration exc. lt. clay alteration of matrix & pyx → clay 3047½'-3048½' Rubbly interval, several vertical fracs. w/ one continuing to 3051', mod. brn clay (easily washed away) 3054'-3069' Scoriaceous rock absent through interval, @ 3054' rock becomes matrix-supported w/ increase matrix
3057'	I ↓ M L A ↓ L L H I ↓ H ↓ I ↓ H M L ↓ A M ↓ A L ↓ I	3057'-3067' unbrecciated med. gry basaltic andesite, commonly rubbly w/ sinuous vertical-subvertical fractures & frac @ 40°, light clay (pale blue, dk grygrn) on fracs which often have irreg. break, v. light drusy zeolite in voids/fracs pervasive light matrix clay alteration (grygrn) @ 3067' return to brecciated but consolidated blocks & lapilli-sz b.a. in red brn matrix (A/A), commonly scoriaceous, little alteration exc. light clay alteration of matrix, frac @ subvertical & 45° w/ no or v. light pale blue & grygrn clay 3068½'-3072½' 8" intensely oxidized red brn scoria followed by brn gry → med gry unbrecciated b.a. A/A (contact?)
3077'		



Diamond Shamrock
Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

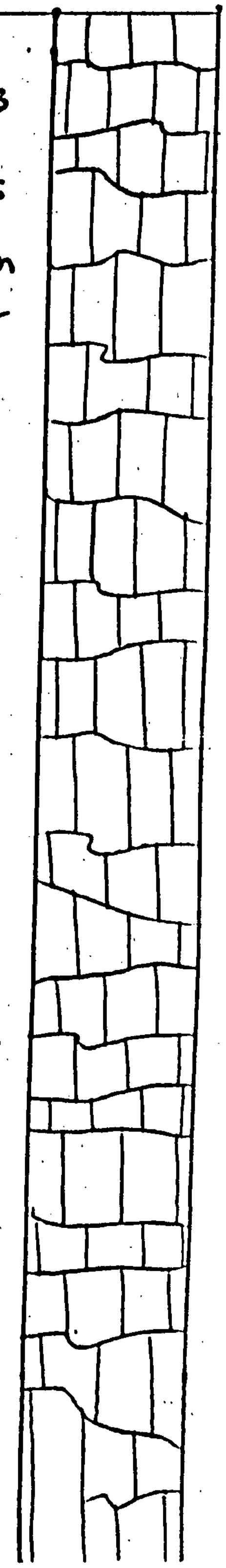
HOLE: CTGH 1
FIELD: CASCADES/CLACKAMAS
GEOLOGIST (S): McDANNEL/GOODWIN
BASIS: binoc. microscope
DATE: JULY 22, 1986

DEPTH INTERVAL	Fracturing	DESCRIPTION
3077' – 3117' (3097')	I ↓ L A L ↓ I L ↓ I L ↓ A L ↓ A A L I M ↓ A L I L I L ↓ M ↓ L M H	see below

BASALTIC ANDESITE (A/A)
brecciated but consolidated b.a. blocks (much less common) & lapilli-sz r.f.s in med brn to red brn matrix a/a, generally light fracturing (often irregular), light pale blue & dk gry grn clays in vesicles and coating fractures, common scoriaceous texture, locally rubbly, v. light clr zeolite in vesicles, pervasive lt. matrix clay alteration
3076'-3079' : rubbly, vertical frac intersecting irreg break ⊥ to ℄ in fragile/scoriaceous interval, slt. increase brn clay
3087'-3088' rubbly

3107' - ROCK BECOMES LT-MED GRY, DENSE — i.e. NO LONGER SCORIACEOUS. FRACTURING PREDOMINATELY VERTICAL, LESS COMMONLY 45°

3114' - FRACTURING INTENSIFIES, GRAYISH GREEN CLAY V. COMMON ON FRACTURE SURFACES & IN CRACKS & SMALL VOIDS. FRACTURING PREDOMINATELY VERTICAL TO SUB-VERTICAL, LESS COMMONLY 45°.



Diamond Shamrock
Thermal Power Company

Form 2

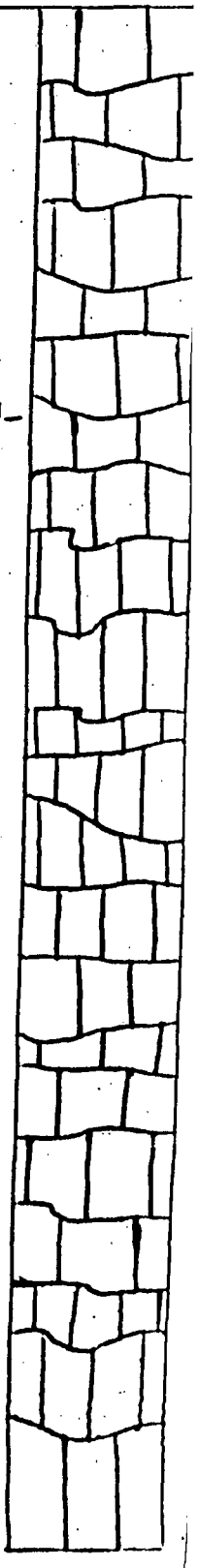
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) GOODWIN/MCDANNEL
BASIS BINOC SCOPE DATE JULY 22nd, '86

DEPTH INTERVAL	DESCRIPTION
3117'	BASALTIC ANDESITE (A/A)
	3122' - FRACTURING & CLAY DECREASE
	3126' - VOLCANIC BRECCIA ROCK RESUMES PREVIOUS COLOR (MED DK GRY-DK GRY) & BECOMES SCORIACEOUS AGAIN - MNR RD BRN SCORIA IN BASALTIC ANDESITE LAVA. MNR PALE BLUE CLAY.
3137'	3140' - ROCK BECOMES LT-MED GRY, DENSE; INTENSIFIED FRACTURING W/GRYISH GRN & GREENISH GRY CLAYS (AS ABOVE @ 3114-3126).
	3146' - AS ABOVE @ 3126'
	3148' - COATING OF BOTRYOIDAL SILICA ON FRACTURE/VOID WITH WHT CLAY INTERLAM'S PTLLY FILLING VOID
3157'	@ 3154' conjugate fracture set @ 15° & to ℄ & sinuous vertical fracture, slt. increase clay, consolidated v. poorly



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. scope DATE JULY 23, '86

DEPTH INTERVAL	*Fracturing	DESCRIPTION
3157'	LMI↓HML↓ALA↓LML↓AA↓LML↓AA↓LMI↓ALA↓LML↓H	**BASALTIC ANDESITE (A/A)** 3157'-3161.5' med dk gry, unbrecciated dense, sparsely porphyritic (plag & pyx phenos.), pilotaxitic g.m., often intensely frac'd., common lt. coating pale blue gry (dry) & wht (& dk gry grn (wet)) clay on fracs & coating vesicles, rare vnlets clay + quartz, clay commonly botryoidal, most common fracs @ 30° & ~vertical 3161.5'-3173' brecciated & consolidated lapilli- & blk-sz ± scoriaceous b.a. in or- to red-brn matrix a/a, clast-supported except at boundaries of interval where matrix% exceeds 50%, decrease in fracturing & clays 3173'-3177' dense & unbrecciated, frothy top w/ decrease in vesicles w/ depth, lt. frac. w/ predom. fracs @ 30° & 60°, lt. clays a/a (@ 3157'), 2cm breccia seam in middle of unit, rare plag-pyx clots (≤0.5cm) Unit may represent a single thin flow. 3177' 3177'-3181.5' brecciated but consolidated (same as 3161.5') finely scoriaceous l.f.s 3181.5'-3184.5' dense basaltic andesite, fracs @ 15°-45° near basal rubbly zone 3184.5'-3189.5' brecciated but consolidated, no scoria, botryoidal pale blue clay in voids (light), rare vertical veinlets w/ clr zeolites, increase in gry grn matrix clay in basal ½ of unit, lt. shearing of 1-45° frac 3189.5'-3197' dense, generally unbrecciated, local alignment of sm pits filled w/ clay @ ~45° = incipient platy parting?, fracs variable: sinuous subvertical most common w/ lt. amt. wht/pale blue clay (botryoidal), large (≤2") angular voids basal 1½' of unit, partially filled w/ wht botryoidal silica (= clay + silica), minr silica vnlets
3197'		

*Fracturing: A=absent L=light M=moderate H=heavy I=intense

Diamond Shamrock
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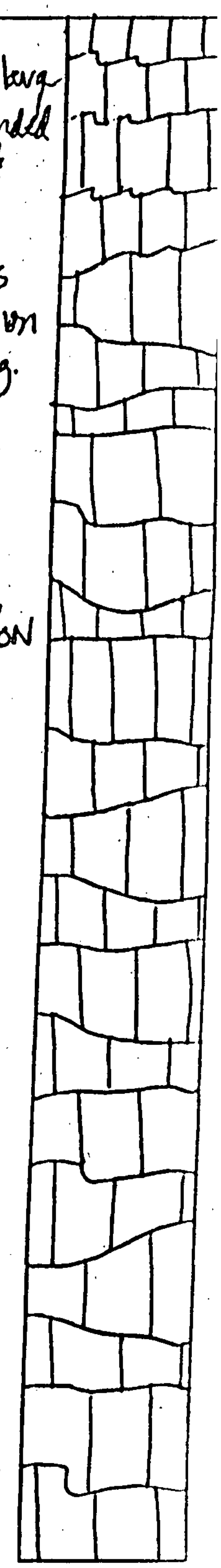
CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7/28/86

DEPTH INTERVAL	Fracturing	DESCRIPTION
3197'	H M A ↓ L A M L ↓ M ↓ L M L ↓ L ↓ A ↓	BASALTIC ANDESITE (A/A) a series of thin (3'-15') layers of massive med gry porphyritic lava & brecciated but consolidated intervals of commonly med gry subrounded lapilli-sz r.f.s of b.a. in a red brn to med brn matrix of ash sz r.f.s & xtals of plag & pyx. 3197' subtly brecciated but cons. b.a. a/a, common scoriaceous rfs, v. lt. amt. pale blue/wht (dry) clay on fracs & in voids, common lt. matrix clay alt., frac. & most common = vertical (sinuous & irreg. break) 3205.5' ZEOLITES COMMON AS DRUSY COATING OVER/ON BLUISH GREY CLAY ON FRACTURE SURFACES & IN VOIDS 3214'-3240' VOIDS UP TO 5 CM COMMON W/ THIN CLAY COATINGS, ± ZEOLITES.
3217'		
3237'	L M	



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1

FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) GOODWIN/MCDANNEL

BASIS BINOC. MICROSCOPE DATE 7/23/86

DEPTH INTERVAL	DESCRIPTION
3237'	BASALTIC ANDESITE (A/A)
	3244' - 1 vein opalescent pale blue qtz in frac previously coated w/ clay s/a
	3246' - 3248.5' ~VERTICAL TO 45° FRACTURE
	3248' - TR DISSEMINATED V. FINE, THIN, SOFT, GOLD-COLORED MINERAL ON FRACTURE W/ ZEOLITE & BLUISH GRY CLAY
	3252.5'-3257.5' irregular sub vertical & 30° fractures w/ botryoidal ltgry to ltbluegry to pale grn clay (± v.lt. zeolite - less common), rubbly @ 3254'-3255' (in dense lava unit)
3257'	3257.5'-3263': consolidated breccia w/ finely scoriaceous r.f.s. (≤ 1.5 cm voids) w/ v. light amt. clay (exc. pervasive matrix clay alteration - mod. amt.)
	3263'-3267' dense lava, common fracturing w/ increased amt. clays (but still v. light): wht & pale grn & pale blue (± pale grn/clear zeolite) coating fractures, R opalescent quartz in vn @ 3265', vesicles & pits intermittently ptlly to completely filled w/ clay s/a
	3274'-3279' dense lava, commonly frac'd @ 30°-45°, very light amt. clay for dense lava interval; no intense fracturing
3277'	

LAVA FLOW MARGIN / LAVA FLOW MARGIN

Diamond Shamrock
Thermal Power Company

Form 2

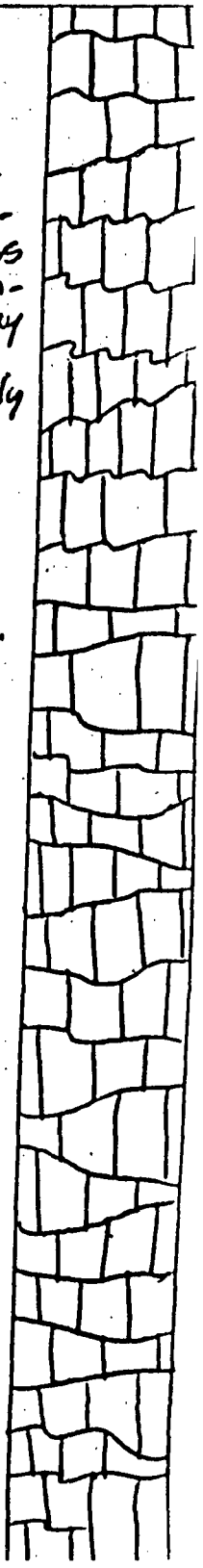
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 7/24/86

DEPTH INTERVAL	DESCRIPTION
3277'	**BASALTIC ANDESITE (A/A)**
	A series of thin (3'-15') layers of massive dense porphyritic lava and consolidated breccia intervals (breccia (pyroclastic) intervals commonly consist of med gry subrounded lapilli sz lava rock fragments in a red brn to mod. brn matrix of ash sz r.f.s and xtals of pyx & plag). Brecciated intervals are commonly thicker, less fractured, & often have less secondary mineral deposition in available voids. The breccia is commonly porous but pervasive lt. to mod. matrix clay alteration may result in less permeability than the dense lava which has less porosity (though it is commonly vesicular at borders) but is usually lightly to moderately fractured. Apparently the interconnection of these fractures is fairly good. Light amounts of clay (a/a) & zeolites & rare quartz veins are found in the unbrecciated but fractured dense lava intervals.
	3279'-3289' breccia a/a, unfrac'd w/common scoriaceous r.f.s, lt-mod. lt. gry to mod brn clay, intermittent ptl to complete filling of vesicles by clay.
	3289'-3293' dense lava w/lt. amt lt. gry to lt. blue gray clay ± v. lt. amt lt. grn/clr botryoidal zeolite on clay
3297'	
	3293'-3302' same as 3279'-3289' - volcanic breccia
	3302'-3308' dense lava, platy frac. @ 75° to ℄ and less common vertical fracture with lt. amt. lt. blue gry & gry grn clays
	3308'-3334½' Volcanic Breccia
3317'	



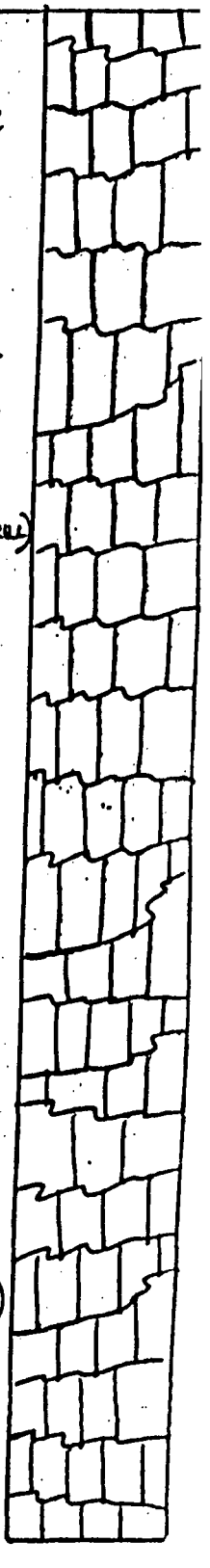
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. scope DATE 7/24/86

DEPTH INTERVAL	DESCRIPTION
3317'	BASALTIC ANDESITE (A/A)
	3319' microscopic, thin, malleable plates of copper-colored metallic mineral
	3324' ℟ botryoidal silica in void w/ lrn gry clay, vertical fracture at this interval w/ coating of botryoidal dusky yellowish grn clay overlain(?) by dusky grn clay w/ drusy coating of soft, clr, microxtalline (zeolite?) mineral. common pale blue clay. ℟ v. fine disseminated phyllosilicate - dk. grn to dk grey ... chlorite?? (SUPERFICIAL MATERIAL WASHED INTO DRILL HOLE, ACCOMPANIED BY FINE SAND.)
	3329' ℟ copper-colored mineral occurring as @ 3319', lt. shear of fracs @ 15°-30° w/ lt. to mod. amt lt gry to lt. blue gry clay
3331'	3335'-3337.5' dense lava, @ 3335' (≤ 2cm voids) w/ clr. silica ptlly filling voids on top of botryoidal gry-grn clay (± zeolite?)
	3337.5'-3339' brecciated a/a, no unusual mineralization
	3339'-3352' dense lava w/ pilotaxitic grn texture, plag & pyx phenos., unit v. frac'd to 3347' w/ fracs @ subvert. to 75°, lt. blk to gry-grn clay (w/ shear) on fracs, orange & yellow oxides form films on fracs. and (≤ 6") halos in unfrac'd rock below 3345'
	3350' microscopic, thin, irregular golden flecks (tarnished w/ lt. grn) - unidentified metallic min. occurring as v. finely disseminated grains on fracture surface w/ clays. (NATIVE COPPER)
3357'	



Diamond Shamrock
Thermal Power Company

Form 2

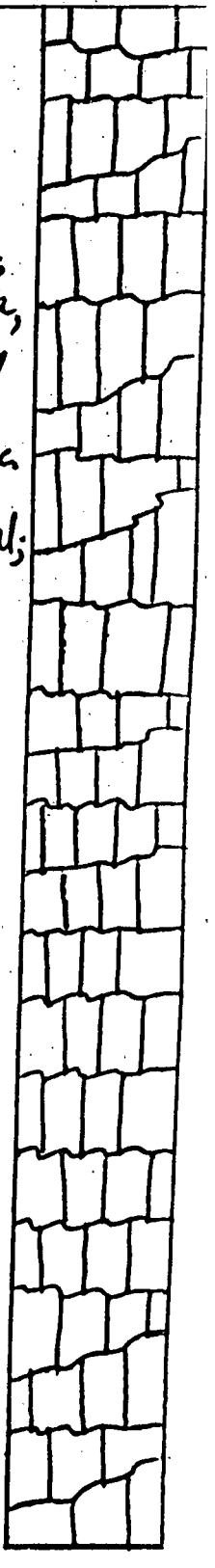
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. scope DATE 7/24/86

DEPTH INTERVAL		DESCRIPTION
3357'	L ↓ M H L A	BASALTIC ANDESITE (A/A) 3356.5'-3360' dense flow w/ local platey parting, vesicular top, frac. variable, most common subvert. & irreg., lt. gmt. botryoidal pale blue gry to v. lt. gry zeolite? and clay on fracs. (v. soft coating) 3360'-3373' brecciated but consolidated, common sconaceous r.f.s, v. lt. amt clay-zeolite botryoidal frac./vesicle coating a/a, v.f. clr drusy zeolite coating frac. @ 3373', vesicles commonly filled ptlly w/ mod. brn to gry grn clays 3373'-3379.5 gry-grn clay coating fracs., rarely sheared, frac. attitude commonly subvert to 75°, local yellow and orange oxide forms films adjacent to fracs & on fracs. in this dense flow interval; @ 3379.5' silica vn in assoc. w/ pale blue gry to wht clay in subvertical fracture
3377'	M ↓ H L L M L	
	A M L	3383'-3395' dense lava, rare v.f. disseminated copper-colored metallic flakes on botryoidal frac. coating of (zeolite?) + pale blue clay. Grayish blue grn, waxy clay & v. pale blue clay coat fracture surfaces, fill fractures & small voids. Mnr dusky yel grn clay, also. Mnr dusky yel ("limonitic") & red brn oxidation stains follow hairline fractures. Microscopic, irridescent spots on fracture surface appear to be metallic, but are soft & break easily into small, thin plates of yel org color. Vertical-sub-vertical &, less commonly, 60-70° fractures pervasive.
	↓ M	
	M I H M	
3391'		



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANIEL

FIELD CLACKAMAS/CASCADES BASIS BINOC SCOPE DATE JULY 25, '86

DEPTH INTERVAL	(fracturing)	DESCRIPTION
3397'	L A L A L A L A L A L A L M A L M M L A	**BASALTIC ANDESITE (A/A)** (pyroclastic) 3395'-3421'- Return to volcanic breccia- lapilli & blocks of scoriaceous/vesicular/dense basaltic andesite in basaltic andesite matrix. Vertical to sub-vertical fracture persists, w/lesser 60°-70°, but is not as intense as above. Common pale blue to v. pale blue clays on fracture surfaces & loosy intergran voids. Less common grayish blue grn clay (a/a), & gry blu grn & gry grn. Clays(?) often have fine botryoidal form & may or may not be coated by v. fine, drusy coating of soft clear mineral (zeolite?). Also, clear botryoidal mineral on frac. surfaces. Mnr silica. Sequence of clays lining voids: lt blue, green, clear mineral (a/a). Mnr copper mineral 3399.5'- very soft, clear foliated mineral in small voids on cut surface of core = gypsum? Trace amounts. ↓ (zeolite)
3417'		3421'-3434.6'- return to dense, med gry, b.a. lava. Plag, pyx, ol? Most of mafic minerals → clay. Mnr flow banding produces fracture ~ 75°-80°. Silica veinlets ~ horizontal. Silica appears to be increasing on fracture surfaces, in voids & ≤1cm veins, often in botryoidal-mammillary form. Lt. blue & gry blue grn on fracs & in vessicles, voids. Less common gry grn clay. Trace copper colored mineral as described above (3385'-3395') occurs as thin, malleable flakes & as flat wire-like form.
3437'		

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CLACKAMAS/CASCADES BASIS BINOC SCOPE DATE 7/25/86

DEPTH INTERVAL	DESCRIPTION
3437'	**BASALTIC ANDESITE (A/A)**
	3434'-3443' Return to volcanic breccia a/a, common pale yellow gry and very pale grn clay ptlly to completely filling 50-70% of sm. vesicles, larger vesicles (3-15mm) often contain clr zeolites as drusy coatings on lt. blue gry to lt gry botryoidal clay, opalescent silica is less common except in the largest cavities (≤2½cm) where it is selectively deposited, often in close association w/ wht clay eg. 3438' & 3441'. At 3438' silica fills a 1½cm cavity and 6" away a 2½cm cavity contains only botryoidal clay & the clr drusy zeolite.
	3443'-3451' Return to dense med gry b.a. lava, fracs. commonly @ ~75° & subvertical (& sinuous), clays occur a/a, silica restricted to 1 vein @ 3448' (2mm x 40mm, sinuous & subhorizontal), rare microscopic copper-colored metallic min. occurs as v.f. disseminated flakes on clays in fractures. Limonite min'n @ 3451'.
	3451'-3455' volcanic breccia w/ clays a/a, @ base of interval silica occurs in fracture above a 1mm layer of grn gry clay & below a 3mm layer of wht clay. Silica is 1mm layer & all are horizontal in partially-filled void.
3457'	3455'-3459' dense lava; platy partings @ 60° in middle of interval, lt. clay on fractures a/a, rare v. finely disseminated microscopic copper-colored min. occurring a/a; blue gry to milky silica as short veins (≤1½cm x ≤2mm) & filling vesicles & associated w/ lt. blue gry and grn gry clays on fractures. Common botryoidal clr zeolite on dk gry grn clay in other vesicles. Clays >> silica > zeolite. Silica assted w/ subvertical fracture through this thin unit.
	3459'-3480½ Return to breccia; mod brn & gry grn clays in vesicles a/a, to 3471' intermittent v. lt. blue botryoidal silica assoc. w/ wht clay on frac & in larger (≤2cm) vesicles on top of gry grn clay, milky & pale blue varieties are commonly horizontally banded (1-5mm bands) in ptly filled cavities, many voids remain v. lightly mineralized w/ gry-grn clays & drusy clr zeolite w/o silica, below 3469' subtle increase in clay content of matrix (gry grn) & in zeolites
3477'	

ALTERED

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PAGE 10 of [illegible]

Form 2

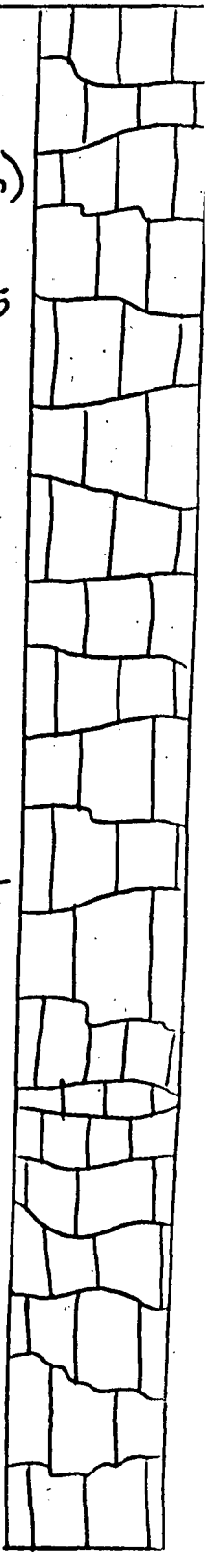
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) GOODWIN/McDANNEL

FIELD CLACKAMAS/CASCADES BASIS binoc. 'scope DATE 7/26/86

DEPTH INTERVAL		DESCRIPTION
3477'	A ↓ M ↓ H L	BASALTIC ANDESITE (A/A) 3480½' - 3492' Return to dense lava (finely porphyritic bsa. w/ 5% plag & pyx → gry grn clay, pilotaxitic g.m.) increasing silica (pale blue & milky) in voids and as (≤ 5mm thick x ≤ 30cm) vns filling common sinuous subvertical fractures, some of pale blue silica has botryoidal/mammillary texture and is hydrated/opalescent. Clay adjacent to silica in large (≤ 3-5 mm) vesicles is silicified (ptlly). @ 3481' clr zeolite forms microstalactites in void above silica pooled at base of narrow 5" fracture, both form on top of grn clay 3492' - 3517' Return to VOLCANIC BRECCIA 3488' ROCK BECOMES VESICULAR & PASSES INTO VOLCANIC BRECCIA ~ 3492. (VOLCANIC BRECCIA COMPOSED OF LAPILLI & BLOCKS OF BASALTIC ANDESITE, COMMONLY SCORIACEOUS OR VESICULAR & MAY SHOW SUBTLE RED BRN OXIDATION, IN MATRIX OF BASALTIC ANDESITE), VESICLES FILLED W/ GRY BLUE GRN CLAY & PALE BLUE CLAY*, MNR WHITE CLAY. BLUE & GRN CLAYS MAY BE BOTRYOIDAL (NOT AS COMMON IN THIS INTERVAL AS ABOVE) & COATED W/ CLEAR, FINE, ZEOLITE*/PALE BLUE CLAY OFTEN COATS GRY BLUE GRY). MNR SILICA IN VOIDS & SUB-VERTICAL VEINLETS. TR. V. SOFT FOLIATED MINERAL. TR COPPER CLAYS IN THIS INTERVAL APPEAR TO BE LESS THAN INTERVALS ABOVE (i.e. ~3385')
3497'	M A L A	
	M ↓ A L	
3517'		



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE: CTGH-1
FIELD: CLACKAMAS/CASCADES
GEOLOGIST (S): GOODWIN/MCDANNEL
BASIS: BINOC. SCOPE (20X MAX)
DATE: 7/26/86

DEPTH INTERVAL	Fracturing	DESCRIPTION
3517'	A L H L ↓ A M L M ↓ H ↓ M L A ↓ L A ↓ L ↓ A L M L A ↓ L ↓ A ↓ L	BASALTIC ANDESITE

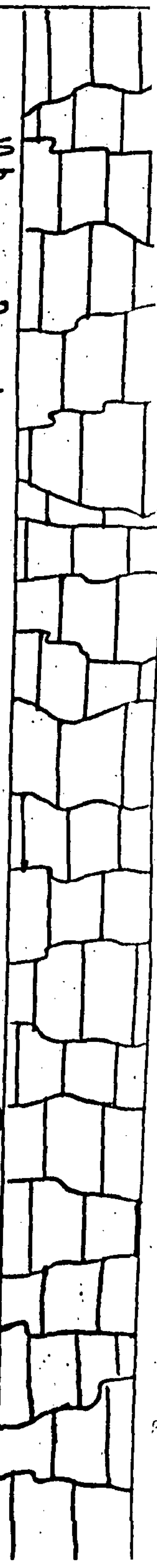
3517'-3532' RETURN TO DENSE BASALTIC ANDESITE LAVA: FINELY & SPARSELY PORPHYRITIC. PHENOS OF PLAG, PYX, OL? (IDENTICAL TO PREVIOUS LAVAS SINCE 2965'6). INCREASE IN FRACTURING & CLAY OVER PREVIOUS INTERVAL (3438'-3517'). FRACTURING PREDOM. SUB-VERTICAL &, LESS COMMONLY, 45°. FRACTURE SURFACES HAVE LIGHT CLAY COATING: GRY BLU GRN, GRY GRN, PALE BLUE, WHT. PALE BLUE USUALLY COATS UNDERLYING GRY BLU GRN & MAY IN TURN HAVE A DRUSY COATING OF FINE ZEOLITES. CLAYS MAY EXHIBIT BOTRYOIDAL FORM. SiO_2 FORMS SHORT VEINLETS & OCCURS AS BLUE GRN IN VOIDS. V. RARE COPPER. MINOR SHEAR ON FRAC. SURFACES.

3532'-3538' VOLCANIC BRECCIA AS ABOVE IN 3438'-3517'. THIS INTERVAL CONTAINS GREATER RED BRN OXIDATION (PRIMARY). RARE FRACTURES @ 45° to ℄ w/ LT. SHEARING OF CLAY. COMMON PALE GRY GRN CLAY in FINE VESICLES w/ CLR, DRUSY, SLIGHTLY BOTRYOIDAL ZEOLITE ON TOP OF CLAY (Both < 1mm thick coatings), est. 10% of ROCK is VOIDSPACE w/ ~80% filled w/ CLAY & ZEOLITES in this interval. This is well above the average % of filled VOIDS

3537'

3538'-3546' VOLCANIC BRECCIA changes character: fractured dense dk gry b.a. (pilotaxitic g.m., sparsely & finely porphyritic w/ plag >> pyx + ol? phenos) with gry-grn clay ± ptlly silicified wht to bluish gry clay filling in the irreg, angular (≤1") cavities between r.f.s (that often fit together across the fracs - indicating less relative movement of r.fs than upper unit @ 3532'). Inter r.f. material commonly is 2ndary. Irregular frac attitudes w/ cmn. sinuous break. Drusy zeolites on clay a/a. Rare microscopic copper colored min. a/a. @ 3542' grn clay is covered by pale blue clay which is covered by a platy clr zeolite & an opaque wht spherulitic? or botryoidal zeolite in a ≤1cm vesicle. Uncommon 2-3mm wht silica vnlets. Overall lt. silica < zeolites < clays (which are v. lt on fracs. & lt to mod. as void fillings)

3557'



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL / GOODWIN

FIELD CASCADES / CLACKAMAS BASIS BIN. MICROSCOPE DATE JULY 21, 1986

DEPTH INTERVAL	DESCRIPTION
3557'	BASALTIC ANDESITE (A/A)

3546'-3559' Return to Volcanic Breccia w/ 3532' character except red-brn matrix is less abundant. (Above 3549') interval is matrix-supported w/ common gry grn coloration (due to ≤3" thick layers of fine ash-sz rfs (altering) --> grn gry clay more commonly) light amt clr platy zeolite on fracs, botryoidal pale gry due to lt gry clay + zeolite? in cavities (<2cm). Intermittent wht silica in ≤2mm vesicles (less common than clays, zeolites).

3559'-3561½' Amygdular b.a. w/ gry-grn clay >> wht silica as vesicle filling material. Silica clearly postdates clay.

3561½'-3571' consolidated breccia a/a, relatively unfracd w/ fracs @ 45°-75° w/ lt. clay shear locally, increase in clr zeolite abundance in available sm. vesicles (≤1mm) but still light amt. rare silica (5mm vn) @ base of interval. Fracs occurring w/ or w/o clay a/a. This is notably lighter than clay occurrence 100' uphole.

3571'-3576½' dense b.a. flow, fracs @ 30°-45° w/ lt. to no clay a/a. Lt. gry clay & zeol? in vesicles are common. Localized lt. to mod. wht silica (up to 30% of vesicles in one 1' interval). Common gry-grn clay filling vesicles & v. light amt. on fracs. Local mild clay silicification. V. Rare microscopic v.f. dissem. copper min.

3576½'-3577½' breccia w/ v. common clr zeol. & local sm silica veinlets

3577½'-3580' dense flow, lg. subvert. frac. (8" long) in mid-interval w/ lams grn-gry clay below turquoise-colored clay below clr drusy zeol. below opalescent to wht silica. Zeolite most abundant & lt. coatings of all overall (<<1mm).

3580'-3600.5 consolidated breccia a/a, lt. frac w/ most common @ 45°. Cmn. lt. amt. lt. gry botryoidal zeol/clay coating ≤4cm vesicles. @ 3581': start 1' rubbly interval. @ 3586' wht 1mm spheroidal silica w/ clay or fairly hard zeolite in frac. Local pH. clay silicification (grn-gry & mod brn in vesicles). Overall zeolites more abundant (lt-mod) on fracs than clays. Rock still has plenty of open pore space for fluid movement (5-8% = ½ of available space before any 2ndary min deposition).

3577'

3597'

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CLACKAMAS/CASCADES GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CTGH-1 BASIS BINOC. SCOPE DATE JULY 27, 1986

DEPTH INTERVAL

DESCRIPTION

3597'

BASALTIC ANDESITE (A/A)

3600.5'-3609.5' breccia grades into Basaltic andesite lava [lava is v. similar to those lavas described between volcanic breccias since 2965.6': med to med dk gry, finely & sparsely porphyritic, w/phenos of plag, pyx, ol?] fracture increases over that of previous interval. Prominent direction is vertical/sub-vertical, w/ less common 45°-75° fractures. Pale blue, gry grn, gry blue grn clays thinly coat fracture surfaces, form thin veinlets, fill vesicles & voids. Gry brn & wht clays are less common & are found in vesicles & voids. Gry brn is the last clay to fill voids & is softer than the others. SiO_2 also fills vesicles, voids, & forms veinlets — color ranges from wht to the blues of the above described clays, & may replace some of the clays. Fine, clear zeolites may coat clays in voids. Clay may be botryoidal

3609.5'-3723' Volcanic breccia (a/a @ 3546'). Intergrain voids are small (generally ≤ 2mm) & are filled w/gry blue grn & gry grn clays, typically botryoidal. Clays may be silicified; white & blue silica common. Wht clay coats blue grn when both are present. Clear zeolite typically as drusy coatings on clays, rare on fracture surfaces. 3 cm void filled w/: grn clay at bottom, overlain by lt. blue, & topped w/silica (white-v. pale blue). Short interval (3613'-3615') of dense basaltic andesite lava (a/a @ 3607') is more fractured than breccia & has more vesicles/voids & has more 2ndary silica than does breccia. Rare, fine plate of copper. Fracturing is minor, most commonly @ 30°-45°. Irregular break ~⊥ to & is more common and occasionally has soft lt gry clay seams. Silica occurs intermittently - usually in intermed. sz vesicles (1-8mm) in a 6" to 18" thick band (assoc. w/clays or by itself). Intermittent = every 2' to 10' for silica occurrence.

3630' 2cm thick brn gry clay seam (soft) & 2mm coating on opposite fracture wall of clr zeolite and wht clay; surface of zeolite disturbed/resorbed

3636½'-3638½' matrix color becomes gry grn as clays of same color increase in voids of r.f.s & vesicles, clr zeolite

3617'

3637'

Diamond Shamrock
Thermal Power Company

Form 2

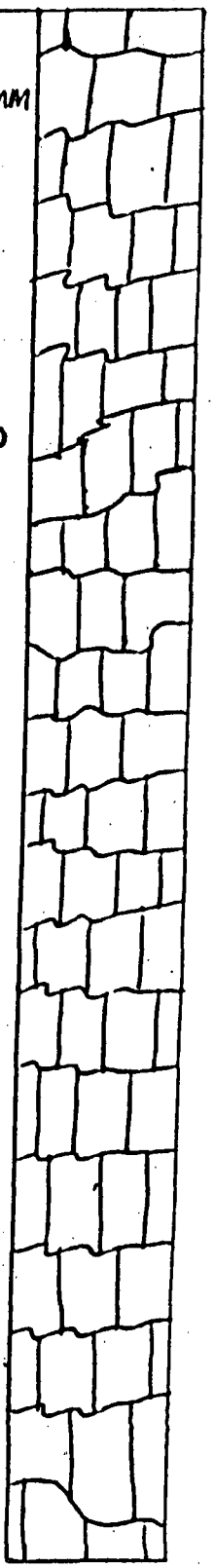
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BNDC SCOPE DATE JULY 28, 1986

DEPTH INTERVAL	DESCRIPTION
3637'	BASALTIC ANDESITE (A/A)
	3639' Wht botryoidal zeolite coats grngry clay in 5-10mm vesicles. Soft ltgray brn clay partially fills void interior.
	3646' grngry clay less common over 1'-2' interval, lt. blue clay is predominate with vulets, vesicles filling, & sm. frac. coating occurrence. Occasionally lt. blue clay is coated w/ very thin film of clr zeolite? / wht clay.
3657'	
3677'	



Diamond Shamrock
Thermal Power Company

Form 2

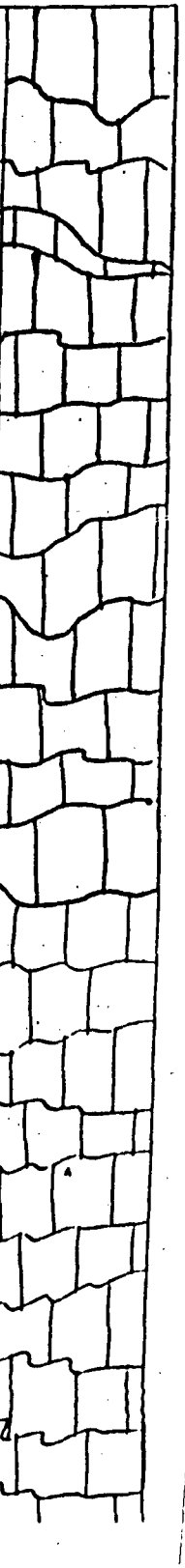
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE JULY 28, 1986

DEPTH INTERVAL	DESCRIPTION
3677'	BASALTIC ANDESITE (A/A) Volcanic breccia continues. Rock is well indurated & generally dense with smaller & fewer intergran voids than observed @ 3600'. Small (≤2cm) pervasive vesicles & vugs filled w/ waxy "clays" of variable hardness & include gry grn, gry blue grn (to turquoise), pale blue. Soft brn gry to gry brn common. Clays typically fill vugs from rim to interior in this order: gry grn → pale blue, and may have drusy coating of fine clear zeolite or silica. Cross section of this sequence is microscopically banded w/ fine undulations. Soft brn gry-gry brn clay is the most recent. Botryoidal form in clay is common. Clay & silica occur also, as short veinlets. Silica commonly fills vugs/vesicles. Rock has a tendency to break horizontally.
3697'	3690' - increase in fracturing? / breaking, forming discs (horizontal break) of variable thickness.
	3687' - slight increase in gry brn clay, coating break/fracture surfaces @ 3693.6'-3695' forming clay seams ≤ 1cm.
	3699' several ≤10mm vesicles w/ from rim to interior: pale gry grn clay, lt. blue gry botryoidal clay/zeolite?, clustered wht radiating 1mm fibers (open into void interior) = zeolite
	3701' clr zeolite microstalactites drip from top of ≤15mm vesicles w/ lt. blue gry botryoidal & drusy zeolite coating & pool @ bottom
	3703' - 30mm cavity w/ sparse ≤1mm copper flakes on top of clr drusy zeolite
	3704' heavy soft gry brn clay in narrow vuggy zone (3")
3717'	3714' >60mm cavity lined w/ gry grn clay, clr drusy zeolite,



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) MCDANNEL/GOODWIN
BASIS Binoc Scope DATE JULY 29, 1986

DEPTH INTERVAL	DESCRIPTION
3717'	BASALTIC ANDESITE (A/A) lt. blue clay is predominate in small (≤2mm) vesicles, silica and silicification of clays is sporadic (10' between occurrences) and diminishes with depth. Silica occurs in (≤10mm) larger vesicles only and no veins. Otherwise rock is as described @ 3677'. Soft brn clay occurs fairly commonly in ∓2mm vesicles and in seams where the rock has broken irregularly, often @ 90° to ℄. 3715'-3721' slight increase in size & # of vesicles. wht, lt. blue grn gry clay & clr drusy zeolite in vesicles, as @ 3677'. Clays are commonly laminated in larger vesicles w/ the zeolite occurring at the top of the void on occasion (last in the sequence). 3721'-3723½' ruddy, many fractures barren or v. lt. amt. lt. gry/clr zeolite & grygrn clay, silica rare/absent below 3720' 3723'-3727½' med gray dense, vesicular b.a. lava, fracs. @ subvert & 45°, lt. amt clays & lt. gry zeolite on fracs & in vesicles
3731'	3727½'-3743' Volcanic breccia continues as @ 3677', overall v. light amt grn gry clay & clr. drusy zeolite in vesicles & fractures, lt. blue clay becomes rare & overall alteration is decreasing. 3743'-3745½' dense b.a. lava w/ mod. amt. wht clay in ≤1mm vesicles. Lesser amt. waxy lt. blue & grygrn clays & clr. zeolite
	3745½'-3760' Volcanic breccia, a/a @ 3727½. microscopic copper (~3757) in vugs w/ botryoidal - mammillary lt blue to milky opaline (?) material that forms v. small stalagtites. Clay coating on broken surfaces is very light.
3757'	

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE JULY 30, 1986

DEPTH INTERVAL	DESCRIPTION
3757'	BASALTIC ANDESITE (A/A)
	3758.5 ~35° fracture w/minor shear on frac. surface
	3761'-3763' denser interval = basaltic andesite lava fewer voids ∴ there is less clay than in breccia interval(s). Minor silica as void filling & forming thin (~2mm) vertical veinlet in green clay-lined fracture (3763').
	3763'-3796' return to volcanic breccia per above description @ 3745'; white clays in vesicles & voids. Green clays less common
	3769' - 30-40° fracture (1) w/ 0.5cm gry clay on frac. surface
	3772'-3773' - broken, less consolidated (slightly) interval.
3777'	
	3782'-3783' - rubble zone
	3783' - 3787.5' - many of vesicles & voids are not lined or filled w/clay
	3789'-3790' - rubble zone - predom. vertical - sub-vertical fracturing
	3792'-3796' - matrix of breccia is red brn due to primary oxidation.
	3796'-3803' rock is denser, not oxidized a/a @ 3792'. Basaltic andesite lava a/a @ 3761' (& numerous preceding flows) near vertical fracture @ 3796.5' is coated w/green & white moderately hard, brittle, (thin) deposit - silicate?
3797'	

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS
GEOLOGIST (S) GOODWIN/MCDANNEL
BASIS BINOC SCOPE DATE JULY 30, '86

DEPTH INTERVAL	DESCRIPTION
3797'	BASALTIC ANDESITE (A/A)
	3796'-3803' (cont.) mod. to intense fracturing w/fracs @ subvertical, 30°, & 70°; light amt. secondary mins on fracs: discontinuous film admixed blue & grygrn clay ± clear drusy/film zeolite on top of clays or by itself; sparse vesicle filling by clays of same color + minr. wht clay on interior of vesicles lined w/ grygrn clay; sparse ltgry silica & local clay silicification
	3803'-3813½' return to volcanic breccia as @ 3745', finely scoriaceous lapilli sz r.f.s to 3806, locally matrix clay alteration increases (grygrn clay & coloration of rock), intermittent very fine white acicular zeolite in voids on clr zeolite, radiating needles suggests Natrolite eg 3807½' & 3814½', minr soft brn clay in larger (>10mm) vesicles
	3813½'-3819' return to dense med. gray finely & sparsely porphyritic basaltic andesite lava, mod frac. @ 45° & 70° w/ frac. alt. a/a @ 3803', minr local silica vns (2x25mm max.), zeolites including natrolite as @ 3803'
3817'	
	3819'-3826½' return to volcanic breccia as @ 3745' common open voids w/ light amt. secondary clays & zeolite: vesicles >2mm generally have a rim of grn gry clay & an interior of clr drusy zeolite (No natrolite), smaller vesicles are empty or filled w/ grygrn clay, silica, &/or soft brn clay
	3826½'-3829' return to dense basaltic andesite lava, vesicles filled w/ wht, grygrn clays, &/or silica. Clays locally/adjacent to vns silicified, minr natrolite? as @ 3803'
	3829'-3835' return to volcanic breccia, very lt. amt. secondary mins. as @ 3819'
3837'	

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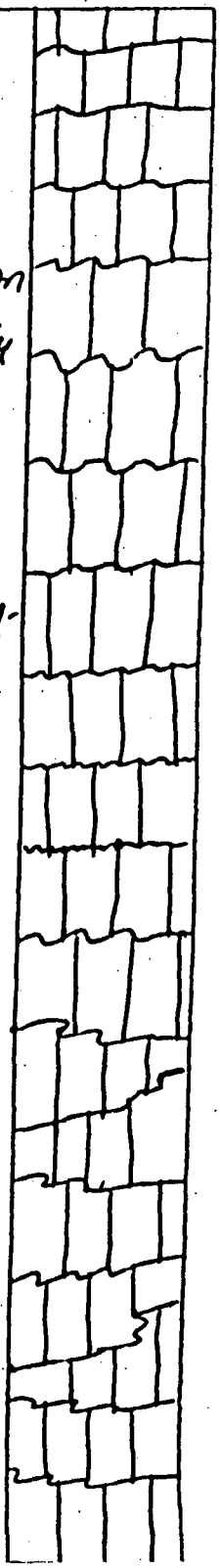
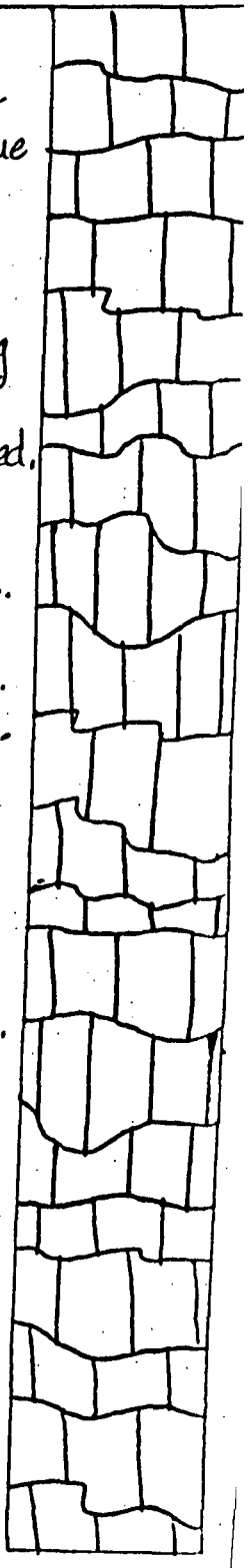


CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE JULY 31, 1986

DEPTH INTERVAL	DESCRIPTION
3837'	BASALTIC ANDESITE (A/A)
	a/a @ 3813', 3826.5'
	3835'-3839' Basaltic andesite lava. Top 1.5' vesicular w/silica the predominate vesicle fill. Silica is white to blue & typically fills upper part of vesicle & is underlain by lt blue grn clay which typically has been silicified. In other vesicles grn clay overlies grn gry clay. Less common, soft, brn gry clay may fill vesicle or be at center of vesicle lined by other clays. V. light coating of blue grn & gry grn clays on frac. surfaces. V. minor fracture ~15°, 80°. 3838' is (tectonically) brecciated but consolidated.
	3839'-3852' Volcanic breccia a/a @ 3829' blue grn, pale grn, gry grn, white fill vesicles & voids. Minr. brn gry (soft) clay, also. Clays form minor veinlets. Vesicles are often layered from bottom to top: dk grn → blue grn → lt blue/white. (No silica found). ₹ zeolite. 3848-3850 - Rock is fractured & broken = mod. rubbly. Sheared surfaces. Fracture direction most commonly ~25°-30°.
3857'	3851' silica fills vugs
	3852'-3860' Basaltic andesite lava a/a @ 3835' Brecciated (2ndary - i.e. tectonic) but consolidated. Little to no movement occured between breccia fragments. Gry grn & dk blue grn clay fill narrow spaces between breccia fragments. Brecciation decreases by 3857' Broken frac. surfaces show minor shearing. Clays appear more abundant in this interval over the above vol. breccia interval. Grn clays (as described numerous times above), white clays, & minor silica occur as vein & void fill. Clays v. common on fracture surfaces. Red brn - orange red & dusky yellow Fe oxide stains(?) are common in this interval.
2077'	3860'-3867' Volcanic breccia, a/a @ 3834'. Clays as described above + zeolite.

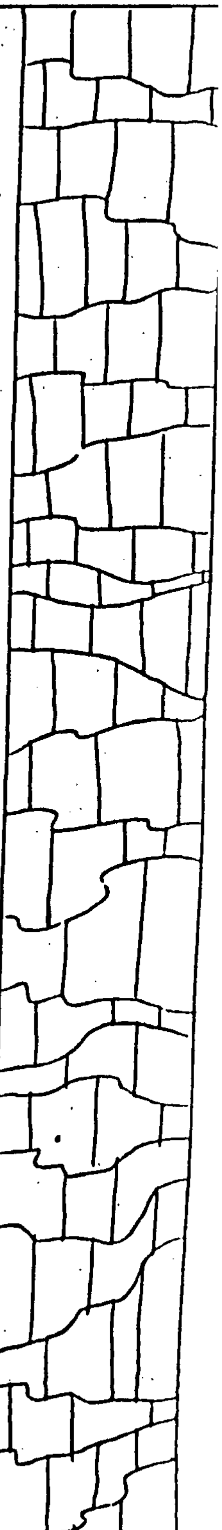


Diamond Shamrock
Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) MCDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE JULY 31, 1986

DEPTH INTERVAL	DESCRIPTION
3877'	BASALTIC ANDESITE (A/A)
	3860'-3873' Return to Basaltic andesite lava [a/a @ 3852']. Increased fracturing, typically at high angle 0-15°, less commonly ~45° & 80°. Mnr shear on fracture surfaces. Abundant blue grn (waxy) clay & white clay on frac. surfaces, mnr pale blue. V. common red brn-orange red & dusky yellow oxidation -- usually follow small cracks/fractures.
	3873'-3896' Volcanic breccia, a/a @ 3839'. secondary minerals/clays a/a w/ gry grn & mod blue most common, sequence from rim to interior on vesicles is typically gry grn → mod. blue → lt. blue → soft gry brn clay, a lt. amount of clr drusy zeolite commonly occurs on clay in cavities; rubbley @ 3889'-3891' & 6" interval at base of unit, v. minor fracturing, core breaks irregularly @ 90°
3897'	3896'-3902' Return to basaltic andesite lava [a/a 3852'] fracturing increases w/ common fracs @ subvert & 30°, clays on fracs are lt. w/ waxy wht & gry grn colors predom. over mod blue & pale blue & pale blue grn, rare limonite? yellow & orange oxides as @ 3873'
	3902'-3915' Volcanic breccia, a/a @ 3839' from 3903' to 3907' a notable increase in the variety of clays & zeolites occurs, a common sequence rimming vesicles towards the interior are blk, gry grn, mod blue, gryish olive grn & wht clays followed by a clear zeolite w/ rare matted or acicular v. fine wht zeolites last deposited. All clays are <<1mm laminations. pale blue silica vns (<6.5mm) & vesicle fill occurs intermittently w/ overall lt. amt., microscopic round plates of copper also occur on fracs. (rare concentration)



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binocular microscope DATE August 1, 1986

DEPTH INTERVAL	DESCRIPTION
3917'	BASALTIC ANDESITE (A/A)
	3915'-3922½' Return to basaltic andesite lava, most common fracs @ 30° & 90° in mod. frac. interval, rock commonly frac'd but unbroken w/ thin vnlets wht & grngry clay & clr. zeolites. Lt. brn clay also present but less common in vnlets & fracs., local lt. clay ptl. silicification.
	3922½'-3959' Volcanic breccia (a/a @ 3902). Fracturing decreases from above lava. Light amt of clays fill voids & mnr vnlets. Blue grn, gry grn clays commonly overlain by pale blue clay which may be coated by drusy zeolite (v. fine). Blue clay in vods is often botryoidal. Soft, gry brn clay common in voids. Mnor white clay. V. fine acicular to fibrous zeolite(s) (natrolite?) also in vugs/voids ± clay. Small amt. of foliated, clear mineral cleaves into v. thin sheets (@ 3924.5'). No silica. Thin, med brn coating of FeOx(?) common on many fracture surfaces & predates clays. Mnr orng oxidation (local).
3937'	
3971'	

Diamond Shamrock
Thermal Power Company

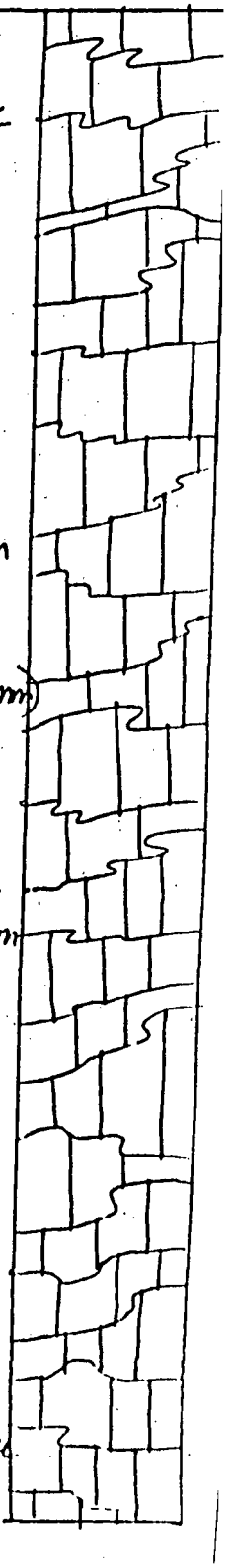
Form 2

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CLACKAMAS/CASCADES BASIS BINOC. SCOPE DATE AUG. 1, 1986

DEPTH INTERVAL		DESCRIPTION
3957'	LILLA LMIL A L HM	BASALTIC ANDESITE Cont'd VOLCANIC BRECCIA, A/A. 3958'-3959' subtle change in matrix character: med. ash size rock fragments are equigranular with a v. minor fraction of smaller material. Color is gry grn due to common alteration of v. f.s → clay of same color. 3959'-3961' dense b.a. lava, light amt. vesicle filling clays a/a @ 3922½', clr silica also fills vesicles 3961'-3965' Return to Volcanic Breccia with matrix character as @ 3958' 3965'-3982' Dense b.a. lava, commonly fracd @ 50°-70° with very lt. amt grn gry & lt. blue clays ± pale blue (botryoidal) silica on clays (below 3972' rock is finely fracd by tectonic brecciation @ 45° to subvert. most commonly, thin vns (<3mm) & vnlets are common through 3982') lt. amt. vesicle filling med. blue grn, olive grn & gry grn clays above 3972' (base of zone of horizontally flattened (<8mm) vesicles which also contain lt. amt. pale blue/wht silica & or a white zeolite which is occasionally acicular & v. finely fibrous (natrolite?) on rim clays) 3977'
		3982'-3984' Return to Volcanic Breccia, no fracs, lt. blue & gry grn clays in vesicles & cavities (± wht zeolite) 3984'-3999.5' Dense basaltic andesite lava, vesicular to 3989½' with gry grn, pale blue clays & clr silica & white zeolite (natrolite?) in cavities & vesicles, local v. lt. FeOx staining adjacent to fractures, minr clays a/a (in vesicles) on fracs plus v. lt. amt soft brn gry clay, fracs. commonly @ 60° & 20°. From 3991'-3999.5': fine (tectonic) fracturing w/ vn & vnlets silica & gry grn clay. From 3997.5'-3999.5': increase in zeolites with increase in vesicles aligned @ 45° (stretched) at unit base



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE August 2, 1986

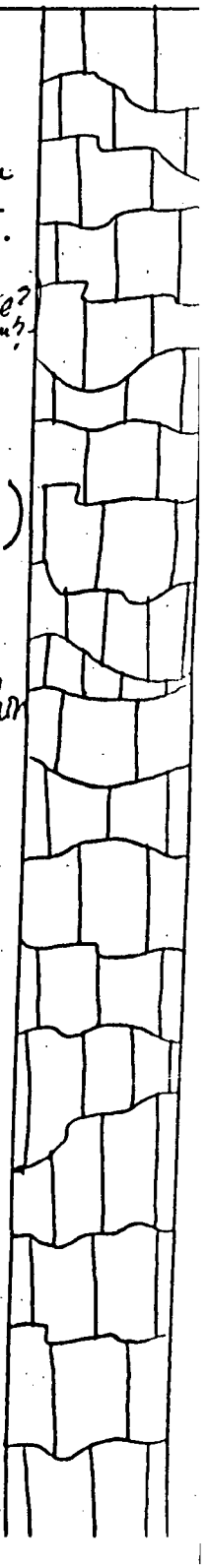
DEPTH INTERVAL	DESCRIPTION
3997'	BASALTIC ANDESITE (A/A)

3999.5'-4010' Return to basaltic andesite breccia, matrix appears finer & denser than most preceding breccias of this kind. Small voids (≤1mm) are filled w/ clays (greens, wht, gry) & zeolites. Clay is common but not abundant. Wht clay & zeolites precipitated after the dk green & blue grn clays. Foliated, clear mineral also in voids (zeolite? gypsum?) (Fibrous & acicular zeolites, less commonly fine, rectangular? form)

4010'- 4029' BASALTIC ANDESITE LAVA (a/a @ 3984) Generally v. fractured—subvertical, ~40° & 75°-80°. Fracture surfaces show shear. Thin green & blue green "clays" on surface are harder & more brittle than most clays but have no form (i.e. amorphous) & are accompanied by thin brittle, clear coating of unidentified material. When scratched the coatings (green & clear) effervesce slightly w/HCl. Silica fills in voids & forms veins in fractures. Veins/voids may be lined w/ blue grn or dk grn "clay," which may have become silicified! (Veins are most often vertical-sub-vertical in orientation). Other veins show green "clays" layered w/ silica in fractures.

4017'

4029'-4044.5 volcanic breccia a/a @ 3999.5'. Same features & secondary mineralogy a/a. (See following page, also).



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICRO. DATE AUG 2, '86

DEPTH INTERVAL	DESCRIPTION
4037'	HALLALMLMHMLHMLALALT — BASALTIC ANDESITE (A/A)

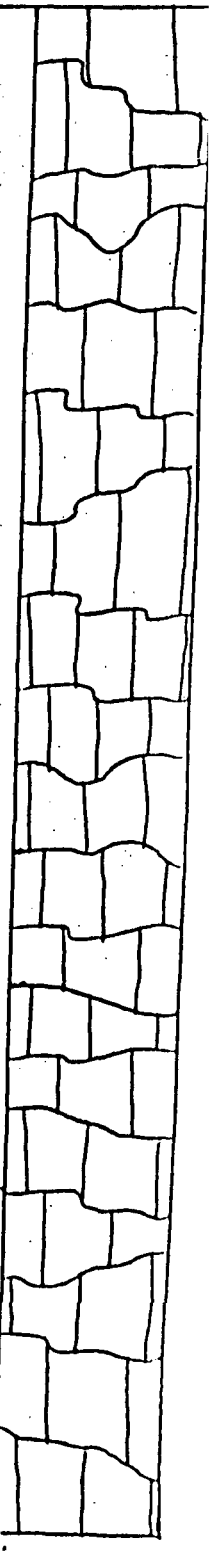
Cont'd VOLCANIC BRECCIA from 4029' to 4044.5
voids, vesicles filled w/ grn clays, zeolites, wht clay & brn gry clay. Voids are often thinly lined w/med grn clay & then coated w/ very fine zeolite(s). DK gry grn "waxy" clay in matrix. Less blue grn clay in this interval than previous ones.

4044.5 - 4068' BASALTIC ANDESITE LAVA
dk gry, v. sparsely porphyritic with 1% plag & ¼ (pyx → clay), dense, fine grained & brittle, moderate & locally heavy fracturing, most commonly at 45° & vertical with lt. to v. lt. dmt 2ndary mins. deposited as thin surface films & less commonly seams. From rim to interior of fracture, a common sequence is: gry grn clay (most common) → lt. blue clay (rare) → wht bacicular radiating fiber clusters (a zeolite = Natrolite?). From 4058'-4062.5' grn gry clays decrease & a thin coat of wht clay ± pale blue clay is predominate. At 4058' a waxy brn clay appears & continues to base of interval. Vesicles are uncommon & v. small (< 1mm) with gry grn clay fillings. Clr silica vns are rare & also intermittent yel. & orange FeOx/limonite is rare adjacent to fracs. Mn/clay shear is intermittent. Moderate Red clay is sparse & begins @ 4063' as vesicle fill & frac. coating material. @ unit base a film of pale blue botryoidal silica on gry grn clay is present as fracture filling material.

4057'

4068'-4072' Return to Volcanic Breccia, dense & unfractured, vesicles (< 2mm) ptlly filled w/ thin lam gry grn clay covered w/ drusy clr zeolite ± wht fibrous (Natrolite?) zeolite

4072'-4081' BASALTIC ANDESITE LAVA
same as @ 4044.5' w/ less fractures & vesicular top 3', 4072'-4073' has common vert.-subvert. fracs w/ silica vns, lower fracs are @ 45° & vertical, silica ≥ = or > gry grn clay in common vns (< 4mm



CORE DESCRIPTION
40 FOOT INTERVAL

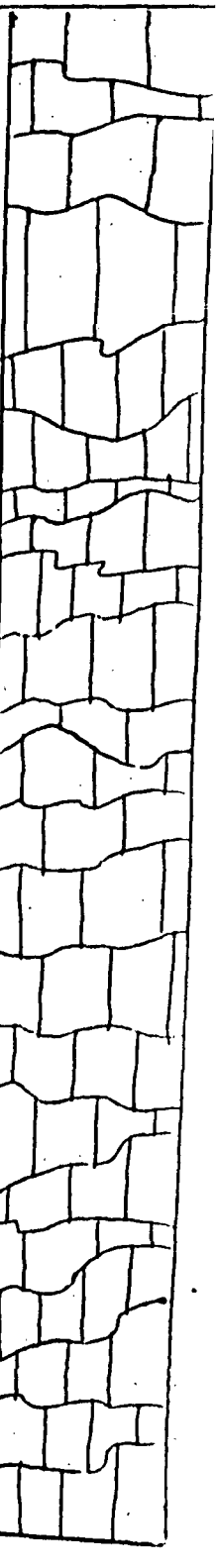
HOLE CTGH 1 GEOLOGIST (S) McDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope DATE 8/2/86

DEPTH INTERVAL	DESCRIPTION
4077'	BASALTIC ANDESITE (A/A)
	4072'-4081' (cont.) BASALTIC ANDESITE LAVA
	silicified gry grn and rarer lt. blue clays. Vesicles @ top of interval also contain a finely acicular wht fibrous zeolite (natrolite?). A notable increase in vn/fracture coating silica & decrease in clay occurs in this interval.
	4081'-4089' Return to Volcanic Breccia a/a @ 4068', very lt. or no fracture, lt. amt. 2ndary mins in vesicles, gry grn clay in small (<1mm) more common vesicles & clr fibrous zeolite in larger (2-5mm) relatively sparse vesicles on ± gry grn clay (thin coating)
	4089'- 4105' BASALTIC ANDESITE LAVA (a/a @ 4072') Rock is fractured but generally consolidated, with broken/fractured intervals. Fractures are commonly filled w/ grn blue "clay" & gry grn "clay" or silica, & are oriented in vertical to sub-vertical direction (i.e. high angle to core length). Clays & silica are also in small voids & silica appears to replace some clay. Fracture surfaces have thin coating of above grn clays, plus a translucent whitish coating
4097'	that is relatively soft, thin & brittle. HCl causes weak effervescence of green/blue grn "clays." Darker grn clays were deposited first, followed by blue green, then silica or translucent whitish material described above. Mnr. shear on fracture surfaces. (wht clay also present on frac. surf.)
	4105'- 4122' BASALTIC ANDESITE VOLCANIC BRECCIA (A/A @ 4081') Rare fractures: 0°-20° & ~75°. Vesicles & small voids filled predominately w/white zeolites & wht clay. Lesser blue grn, gry brn clays. Gry Grn also v. common. Veins filling fractures are commonly gry green clay (thin coating) along walls, w/a drusy lining of very fine zeolites, & filled w/white clay (from zeolites). Wht clay dissolves
4117'	

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/McDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICED. DATE AUG. 3, '86

DEPTH INTERVAL	DESCRIPTION
4117'	BASALTIC ANDESITE (A/A) 4105'- 4122' VOLCANIC BRECCIA (cont'd) 4122'-4125.5' - BASALTIC ANDESITE LAVA [A/A @ 4072'] Clays & silica form small veins following fracture. Fracture predominately vertical & subvertical, but includes near horizontal & 45° orientations. Clays are predom. blue grn. White clay less common. Clays & silica also fill voids (vesicles). Some clay appears to have been silicified/replaced by silica. 4125.5'-4139' VOLCANIC BRECCIA [A/A @ 4105'] med gray to dk gray, ± vesicular (<10mm w/ common 2mm voids) r.f.s. in basaltic andesite matrix of grayish blue ± reddish matrix a/a, irreg-break ⊥ to ∠ w/ v. few fracs, v. lt. amt 2ndary mins w/ many empty vesicles, vesicles commonly (larger <2mm) rimmed by gry grn clay then either clr/lt gry drusy zeolites &/or wht acicular radiating fibers in spheroidal clusters (natrolite) = a zeolite, smaller vesicles commonly filled w/ clay of one color or horizontally laminated sequence of clays, e.g.: med brn - blk - blue grn - lt blue clay & clr/wht drusy zeolite &/- soft bn gry clay. Clays are locally silicified though no silica was observed. Rare microscopic copper flakes on zeolites or clays in larger open vesicles. The rare fracs have gry grn clay & wht fibrous zeolite. 4139'-4143' BASALTIC ANDESITE LAVA [A/A @ 4122'] relatively unfracd w/ irreg ⊥ break, rare fracs w/ coatings gry grn clay ± clr/lt gry drusy zeo. ± wht fibrous zeo., vesicles coated w/ same materials as fracs + lt blue clay & soft bn gry clay, sparse silica vns (+ vesicle fillings) also are present (<5mm x <30mm, pale blue) 4143'-4147' [illegible]
4137'	



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

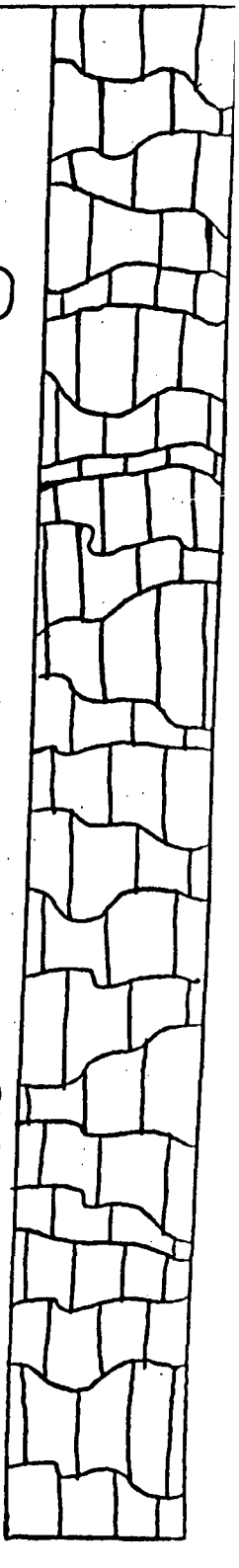
GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binocular microscope DATE 8/4/86

DEPTH INTERVAL		DESCRIPTION
4157'	LALMLA	BASALTIC ANDESITE (A/A) 4143'-4175' continued Volcanic Breccia: common red-brn & lt. brn as well as grayish matrix, unfrac'd exc. irreg. break @ 0°+90°, soft brn gry clay common in larger vesicles & break-zones, 2ndary material in cavities & sm. (<2mm) vesicles is v. lt. amt. Many cavities have only v. thin coatings. The most common vesicle rim→interior sequence is: gry grn clay →+/- clr drusy zeolite →+/- wht fibrous zeolite →+/- soft brn clay. Also present are pale grn yel, olive grn, & blue grn clays as vesicle fill in mnr amts. Mnr amt gry grn botryoidal drusy zeolite is also present in larger vesicles.
4177'	L	4175'-4210' BASALTIC ANDESITE LAVA Breccia (above) passes into vesicular top (~4') of basaltic andesite lava. Vesicles filled w/ blue grn clay, dk gry grn clay (which underlies blue grn clay in some vesicles), silica, &/or zeolites. Dk gry grn to dusky blue grn clay most common & is pervasive throughout rock. Silica is wht to lt. blue & may replace blue grn clays. Zeolites include v. fine drusy crystal coating, acicular & radiating fibrous habits. (Medium hard botryoidal coating may also be silica). Zeolite may coat silica (which coats clays) in some vesicles. Fracture is generally light & 55° or 75°-80° &. 4183'-4187' rock is brecciated (tectonically) slightly, w/ dusky blue grn clay & less commonly, silica filling fractures. 4185'-4188' ~50° fracture angle common, 30° less common. slight shearing on fracture surfaces 4188'-4190.5' increase in vesicularity = increase in clays & silica

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS binoc. microscope/ DATE 8/10/86

DEPTH INTERVAL	DESCRIPTION
4197'	BASALTIC ANDESITE (A/A) 4193'-4201'- silica fills increased void space
4202	
	(BASALTIC ANDESITE) 4210'- 4217.5' VOLCANIC BRECCIA (a/a @ 4148') Voids are generally only coated/filled w/clays, mnr zeolite. Silica is present only in trace amounts. This is in contrast to above lava unit.
4207	
4212	
4217'	4217.5'- 4232' BASALTIC ANDESITE (LAVA FLOW) Med gray - med dk gry - med bluish gry. Sparsely porphyritic w/ phenos of plag, mafic phenos ox.→ red clay. Unit is brecciated (tectonic/secondary brecciation) between 4217.5'- 4224', but consolidated. Unit is lightly to mod. fractured w/ most common direction 30°, less commonly vertical. Mnr shear on fracture surfaces. Grayish blue grn to dusky blue grn "clay" is pervasive throughout rock, most noticeably on fracture surfaces & between breccia fragments. Wht clay is common & typically overlies grn clays. Secondary FeOx (± hydrous FeOx) yel brn & red brn common on fracture surfaces & as linear stains throughout core, typically following hairline fractures. No silica found in this unit.
4222	
4227	
4232	
4237	
4247'	



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS
GEOLOGIST (S) MCDANNEL/GOODWIN
BASIS binoc. microscope DATE 8/11/86

DEPTH INTERVAL	DESCRIPTION
4237'	BASALTIC ANDESITE (cont'd)
	4232'–4255' VOLCANIC BRECCIA
	Dk gry to dk grnish gry, vesicular to dense blocks & lapilli of basaltic andesite in basaltic andesite matrix (which is v. ashy from 4232'–4236'). At 4236' breccia becomes mottled dk gry – med gry & red brn & less ashy. Dusky gry grn clay common in small voids/vesicles. Blue grn clays less common, generally. Zeolites commonly fill voids lined by clays & have drusy, fibrous (± radiating) & foliated habits; clear to white in color. Tr silica
	4239'–4241' increase in vesicles w/lava (a/a @ 4217.5) common. Vesicles may be as high as 10–15% of the rock. This interval is marked by an increase in clays a/a, zeolites, & silica. Also dk yellowish grn clay common as vesicle coating in this interval. Rare pyrite.
4257'	4251'–4255' increase in red brn ashy matrix
	4255'–4267' BASALTIC ANDESITE LAVA
	dense, med gry to med dk gry, v. sparsely porphyritic, 1% phenos plag & pyx → gry grn clay (≤1mm); lt. amt. matrix alt → gry grn clay & FeOx (red brn) mixed w/clay; lt. to mod. fracturing most commonly @ 20°–55°, common micro frac/unbroken fracs. @ subvertical with clay seams/coatings (<1mm thick); fracs commonly coated w/ v.f. amt. gry grn clay (+/- lt. waxy sheen) +/- gry yellow soft clay +/- yel. & red limonite stain +/- hint powdery or botryoidal zeolite (latest 2ndary min. deposited); v. few vesicles
4271'	4267'–4271' VOLCANIC BRECCIA
	same A/A @ 4232'
4277'	4271'–4282' BASALTIC ANDESITE LAVA
	med gry, sparsely porphyritic · increasing to 4274' fracs to 4268'

Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH1
FIELD CASCADES/CLACKAMAS
GEOLOGIST (S) MCDANNEL/GOODWIN
BASIS binoc. microscope DATE 8/12/86

DEPTH INTERVAL	DESCRIPTION
4277'	BASALTIC ANDESITE (continued)
	4271'-4282' BASALTIC ANDESITE LAVA
	basal 2' with mnr 2ndary alt. relative to top of unit, fracs lt. @ 30°-45° w/ v.lt. grn gry clay, 2ndary material common in vesicles: a common sequence includes lams. (horizontal) or rim → interior of 2-3 of the following: gry grn clay → med. blue grn clay → pale blue botryoidal silica → clr-foliated drusy zeolite → gry yellow soft clay → wht fibrous zeolite +/- soft brn gry clay. These materials plly (most common) or completely fill the ≤20 mm vesicles. Towards the center of unit silica mins increase. (≤8mm x 40mm).
	4282'-4287' VOLCANIC BRECCIA
11242	same as above at 4232', unfractured, v.lt. amt. 2ndary material in v.f. vesicles: gry grn clay +/- pale blue silica +/- wht fibrous zeolite
	4287'-4298' BASALTIC ANDESITE LAVA
4297'	same as above at 4271', common fractures at subvertical & 60° w/ v.lt. amt. secondary mins: gry gry clay ± orange & yellow FeOx stain (mixed cr/clay) ± botryoidal pale blue silica (also present in mnr vns); clay locally yel gry & waxy
	4298'-4300' VOLCANIC BRECCIA a/a @ 4282'
	(rim → interior) v.lt./No matrix, v.lt. amt 2ndary mins in vesicular v.f.s.: yel gry clay +- clr/pale blue silica +- wht fibrous (-radiating) zeolite
	4300'-4325' BASALTIC ANDESITE LAVA
	a/a @ 4287', vesicular to 4302½', v.lt. 2ndary material in vesicles (≤5mm): pale blue botryoidal silica +- gry grn clay ± wht fibrous zeolite; mnr blue gry & olive gry clays also present.
	4325'-4329' VOLCANIC BRECCIA
	a/a @ 4298', unfrac'd, com. vesicles w/ v.lt. amt 2ndary material: rim → gry gry clay ± pale blue botryoidal zeolite ± foliated clr drusy zeolite ± wht fibrous zeolite, common 10mm cavities at base of unit w/ only film of zeolite on walls
4317'	4329'-4314' BASALTIC ANDESITE LAVA

LAVA FLOW

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 8/12/86

DEPTH INTERVAL	DESCRIPTION
4317'	BASALTIC ANDESITE (A/A)
	4309'-4314' (Cont'd) BASALTIC ANDESITE LAVA Moderately fractured. Brecciated (tectonically) but breccia is consolidated. Fracture direction predominately vertical-sub-vertical; less commonly 45°. Grn clays (as described above @ 4300') are predominate 2ndary alteration/mineralization. Clay & silica & zeolites form veinlets & fill small voids. (Botryoidal & fibrous zeolites). Shear is common on fracture surfaces.
	4314'-4315.5' VOLCANIC BRECCIA (A/A, @ 4305') gry to red brn matrix & lapilli.
	4315'-4321½ BASALTIC ANDESITE LAVA (A/A @ 4309') (all lavas & breccias in this unit are sparsely & finely porphyritic w/ plag. & mafics which have altered to clay → commonly dusky green). Lava is very vesicular (25%) to 4318.5'. Vesicles filled w/ green clays (as described @ 4300' & previously.) & zeolites, silica, with clays deposited prior to silica &/or zeolites.
4337'	4321½'-4330' VOLCANIC BRECCIA med dk gry & minor red brn. Unit is relatively dense. Grn clays predominate as 2ndary mineral. (Still have slight effervescence w/ HCl). White zeolite, most commonly fibrous. Trace of small yel brn-orng feox, often at site of magnetic sulfide. Habit is tabular to flow layer; bronze color (On fracture surfaces. May be superficial material washed into hole).
	4330'-4338' BASALTIC ANDESITE LAVA (A/A) Secondary mineralization: grn & blue clays/zeolites/silica/trace of metallic % @ 4335'. Unit is very fractured, predominately vertical to sub-vertical; less commonly horizontal. V. minor shear on surfaces.
	4338'-4379' VOLCANIC BRECCIA med. dk gry & minor red brn. Dense & few fractures. Most common frac. is irregular subvertical break with very light or no 2ndary mineralization, most commonly dusky grn clay. Small (≤ 6mm) vesicles have ft. amt. to mod. amt. 2ndary material - most commonly dusky grn clay and/or fibrous zeolite (± radiating). 2ndary material in vesicles
4357'	

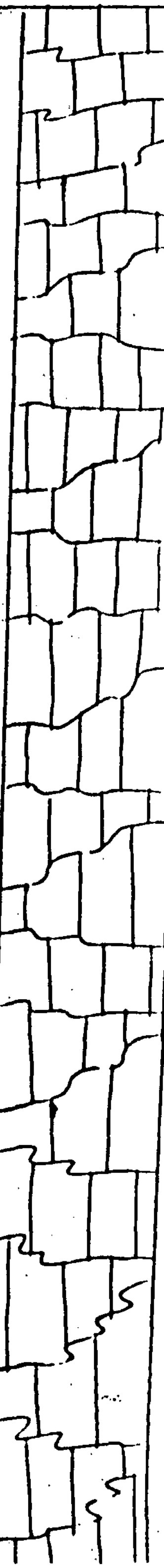
L A L M M H H L A L A L A I

Diamond Shamrock Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS
GEOLOGIST (S) McDANNEL/GOODWIN
BASIS binoc. microscope DATE 8/13/86

DEPTH INTERVAL	DESCRIPTION
4357'	BASALTIC ANDESITE (continued) (A/A) 4338'-4379' VOLCANIC BRECCIA (continued) include many possible combinations from rim to interior of the following material/minerals: dusky grn clay (less common are dusky blue grn & yellow gry clays) +/- pale blue botryoidal zeolite +/- clr drusy (+/- botryoidal) zeolite +/- wht radiating v.f. acicular fibrous zeolite --> wht clay. The fibrous zeolite is intermittently very common over 6" to 12" intervals. Less common is intermittent fracture & vesicle fill of pale blue (+/- botryoidal) silica (eg. of occurrence in vesicles within dense lava block from 4349' to 4353'). 4369' to 4376' is gradational to lower lava flow with common vesicular blocks with larger (≤1cm) cavities than upper unit, most of which have v. mnr 2ndary mins. @4348.5' microscopic native copper flakes are present on zeolites/clays coating fracture. 4376'-4390½' BASALTIC ANDESITE LAVA
4377'	med. dk gry, aphyric to v. sparsely porphyritic (<1% pheno's plag, +/- pyx → FeOx and/or gry grn clay), v. lt. amt 2ndary mins. in dense unit w/ lt. (generally) fracturing @ variable attitude (15°, 45°, 80°). Vesicles absent. Fracture fill/veinlets include gry grn clay rims +/- pale blue (+/- botryoidal) silica. 4376'-4384' lt. amt. tectonic brecciation (but rock remains (consolidated) unbroken) with clay-silica in v. thin veinlets with subvertical attitude. Lt. amt. FeOx (lt. olive brn & med red) mixed w/ clay near base of interval adjacent to fractures. 4390½'-4399½' VOLCANIC BRECCIA same as above @ 4338', med. dk gray, dense with sparse to moderate small (≤5mm) vesicles, vesicles filled ptlly to completely w/ lt. amt. +/- grayish blue grn clay +/- gry grn clay +/- clr to wht/v. pale blue botryoidal zeolite +/- soft moderate brn clay, unit is unfractured.
4397'	



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 8/13/86

DEPTH INTERVAL	DESCRIPTION
4317'	BASALTIC ANDESITE (A/A)
	4319.5' - 4426' BASALTIC ANDESITE LAVA Med - med dk gry dense basaltic andesite. Sparsely porphyritic. Phenos ≤ 2mm of plag, pyx → clay. Light to moderate and locally heavy fracturing; variably oriented fracture. Unit is brecciated (tectonically) with short (1'-2') unbrecciated intervals (rare). Blue grn & dusky grn "clay" is predominate 2ndary mineral/alteration. Clay, silica & fibrous zeolites fill fractures & voids. Clay common on fracture surfaces.
4417'	4426-4442' VOLCANIC BRECCIA. (ABRUPT CONTACT) DK gry - med gry w/ Red brn. VESICULAR TO DENSE (LUNAR SCORIA) LAPILLI & LESS COMMONLY, BLOCKS OF BASALTIC ANDESITE IN LUNAR ASHY MATRIX. WELL INDURATED. VOIDS & VESICLES LINED OR FILLED BY LT BLUE TO LT BLUE GRN CLAY, BOTRYOIDAL WHT ZEOLITE, FOLIATED WHT-CLEAR ZEOLITE. DUSKY GREEN & GRY GREEN "CLAY" (BRITTLE) ON FRACTURE SURFACES; ± WHT ZEOLITE (FOLIATED) WITH DEPTH A FINELY RECIC'LAR RADIATING ZEOLITE ALSO APPEARS IN VESICLES. THE PREDOMINATE 2ndary MATERIAL IN INTERVAL ARE GRY/GREEN CLAY & FOLIATED WHT-CLEAR ZEOLITE. VESICLES are rarely 10mm and commonly ≤ 2mm. FRACTURING IS V. LT. through INTERVAL with irregular breakage @ 15°-30° & 70°-90°. 6" rubble zone occurs at base of unit.
4437'	

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1 GEOLOGIST (S) MCDANNEL/GOODWIN
FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 8/14/86

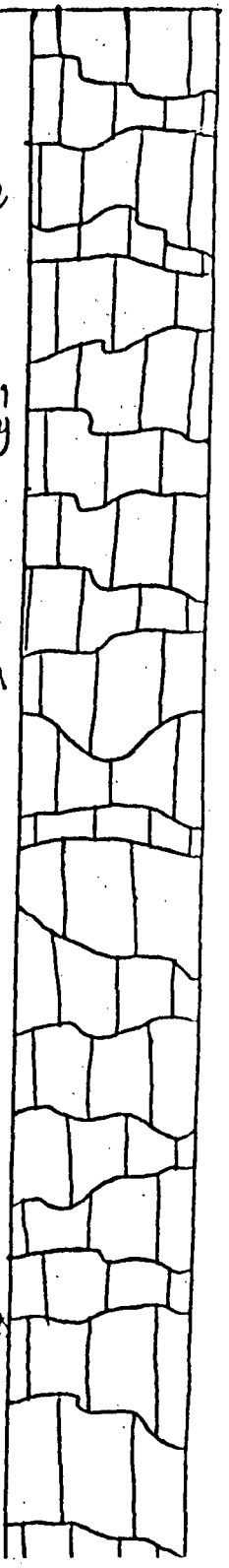
DEPTH INTERVAL	DESCRIPTION
4437'	BASALTIC ANDESITE (A/A)
	4426'-4442' VOLCANIC BRECCIA
	4442'-4445½' BASALTIC ANDESITE LAVA med dk gry, dense, aphyric, 8-15% 5-30mm commonly horizontally stretched vesicles with lt. to mod. 2ndary mins. Cavities & vesicles commonly lined with gry olive grn clay (less commonly gry yel grn or dusky yel. brn), ± a clr foliated zeolite ± pale blue (± botryoidal) silica. Core breaks commonly with irregular surface @ 45°-70°. A film of dk brn ± grn gry clay is often present on break surface.
	4445½'- 4449' VOLCANIC BRECCIA A/A @ 4426' with 2ndary vesicle-filling material consisting of gry grn clay ± clr drusy zeolite ± pale blue botryoidal silica
	4449'- 4451½' BASALTIC ANDESITE LAVA A/A @ 4442' with rubbly top 1'. 2ndary mins in vesicles and veins are dominated by pale blue botryoidal silica & include gry grn & pale blue clays ± opalescent pale blue silica ± wht acicular radiating zeolite.
4457'	
	4451½'- 4454' VOLCANIC BRECCIA A/A @ 4445½' with 2ndary mins commonly lining vesicles in the following sequence: gry grn clay ± lt. blue clay ± pale blue botryoidal silica ± wht radiating acicular zeolite (a good example is @ 4451½' in a large cavity)
	4454'- 4463.5' BASALTIC ANDESITE LAVA A/A @ 4449', irreg. fracture @ 45° to 70°, 2ndary material confined to vesicles & consists of dusky grn (less com. brn) clay ± pale blue botryoidal silica (predominate material) ± wht radiating acicular zeolite (also v. common) ± (less common) soft mod. brn clay. Interval is 8-10% ≤ 10 mm vesicles with common ptl. to complete 2ndary fill. Silica vns also present but less common.
	4463.5'- 4477.5' VOLCANIC BRECCIA Gradational contact into volcanic breccia from above unit. Med dk gry w/ mnr red brn near contact. Unit is generally
4477'	

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANIEL
FIELD CASCADES/CLACKAMAS BASIS BINOC. SCOPE DATE 8/14/86

DEPTH INTERVAL	DESCRIPTION
4477'	BASALTIC ANDESITE (A/A) (cont'd from pg. 99) & less commonly, clear druzy zeolites fill voids & vesicles 4477'-4490' BASALTIC ANDESITE FLOW gradational with above unit. Med gry. dense. Sparse flattened vesicles near top of flow are filled w/clays & silica. Dusky green & blue grn clays line vesicles, or fill bottom of vesicles, and are overlain by silica. Minor fractures (vertical) filled w/ grn clays & silica. Fracture surfaces may have FeOx red brn stain or minor red brn clay. Yell brn "limonite" stain less common. Lt grn clay less common than above clays. Predom. frac. direction 25°-30°.
4490	4490'-4495' VOLCANIC BRECCIA med dk gry & v. minor red brn. Lt/pale blue clays (may be bentonitic) & green clays fill vesicles & voids. Zeolites also fill vesicles/voids & include clear druzy, clear foliated, & white fibrous habits. Fibrous one coats or covers others & silica, when present. Silica common.
4497'	4495'-4563.5' BASALTIC ANDESITE FLOW gradational contact into vesicular, med dk gry-med gry basaltic andesite flow. stretched/flattened vesicles filled w/ blue gru & gry grn clay, zeolites (a/a). No predom. fracture direction. Shear is visible along most fracture surfaces, forming hard brittle coating from above clays. Red brn FeOx stains common on fractures. Rare orange FeOx specks on fracture surf. suggesting oxidation of iron mineral.
4517'	4563.5'-4515' VOLCANIC BRECCIA Dk gry, blk, red brn. More grn textured than previous vol. breccia. Lt blue & bluish white clays predominate as void & vesicle fill.



Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) McDANNEL / GOODWIN

FIELD CASCADES / CLACKAMAS BASIS BINOC. MICROSCOPE DATE Aug. 14, '86

DEPTH INTERVAL	DESCRIPTION
4517'	4515' – 4519' BASALTIC ANDESITE FLOW Dk gry–med gry, coarse. Gradational contact with above unit. aphyric. Sparse ≤20mm vesicles (stretched @ 0° to 45°) in top 1'. Lt. to mod. frac.–irreg. @ 45° to 90° w/ lt. shear film of red brn FeOx +/– dk gry grn clay. Parting @ 90° + 0° w/ inlets of frac.–fill material. In ≥5mm cavities pale blue silica predominate. In smaller vesicles lt. grn clay +/– silica. Base is sparsely porphyritic w/ 2–3% plag. phenos. Sharp brecciated contact.
	4519' – 4529' VOLCANIC BRECCIA (BASALTIC ANDESITE) brn gry & med gry b.a. lava lapilli- and less commonly, block-sized r.f. in mod. red brn ash-sized matrix of b.a. r.fs., common grn tinge due to abundant gry grn clay in common sm. (≤1mm) irreg. matrix vesicles. Fracs. lt. to absent with most common at 45°–70° with red brn FeOx stain. Vesicles are commonly ≤5mm and lined with clay, zeolites, and silica. Partial to complete vesicle fillings from rim → interior include: v. lt. gry/clr botryoidal (+/– drusy) zeolite +/– dk olive grn/blue grn/gry gry clays +/– v. fine disseminated grn stumpy zeolite w/ prismatic habit +/– clr (locally brn stain) foliated zeolite +/– rare wht acicular zeolite +/– pale blue (+/– botryoidal) silica +/– yel gry clay. Clays → foliated zeolite + wht acicular zeolite, or clays → silica are most common linings/fillings.
4537'	4529' – 4553' BASALTIC ANDESITE LAVA med dk gry, aphyric. Top 13' is transitional, with intermittent narrow breccia intervals. Commonly vesicular to 4548' (2–15% vesicles, 1–15mm, commonly hor. elongate, 2–15%) with increase in 2ndary mins due to available pore space increasing. Pkl. to complete vesicle and cavity fillings of gry gry clay + pale blue silica + wht acicular zeolite are most common. 2ndary material in linings & horizontal bands includes: clays (gry gry, blue gry, olive gry, yel gry, blk) +/– clr foliated zeolite +/– pale blue botryoidal silica +/– wht radiating fine needle zeolite. Silica is most abundant 2ndary material. Rare limonite (yellow to red) oxidation bands (2mm wide) in matrix adjacent to fracs. Fracs. v. lt. with variable & but 45° most common. Mnr film FeOx brn +/– gry grn clay w/ lt. shear on fracs. @ 4532': nice silica stalactites. @ 4540'–4542' nice acicular & foliated zeolites w/ 2mm xtals (big!).
4557'	4553' – 4565' VOLCANIC BRECCIA (BASALTIC ANDESITE)

Diamond Shamrock
Thermal Power Company

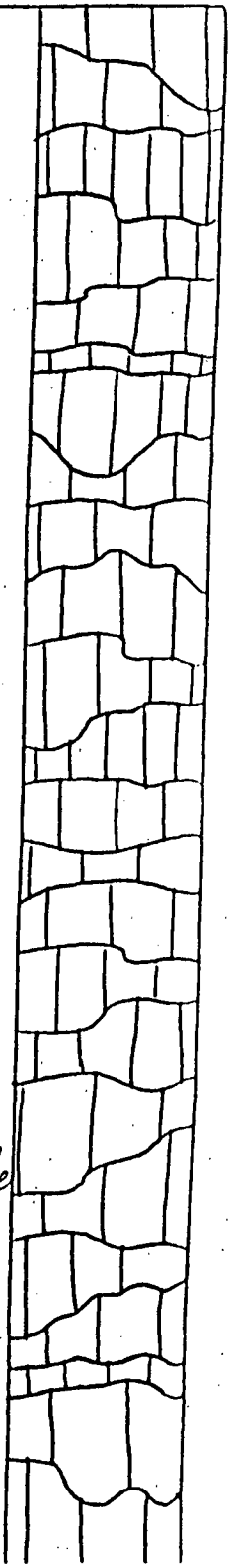
Form 2

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN / MCDANNEL

FIELD CASCADES / CLACKAMAS BASIS BINOC. MICROSCOPE DATE Aug. 15, '86

DEPTH INTERVAL	DESCRIPTION
4557'	BASALTIC ANDESITE (A/A)
	4553'-4565' VOLCANIC BRECCIA (cont'd)
	Dense, med to dk gry. Blocks & lapilli of aphyric - sparsely porphyritic, dense to vesicular basaltic andesite in minor matrix of basaltic andesite lava. Green & blue green clays commonly line vesicle walls & are overlain by zeolites (clear drusy, v. pale blue botryoidal, fibrous). Fibrous, white zeolite is last 2nd day mineral to be deposited. Silica fills vesicles locally. Black (actually v. deep green when disaggregated) clay fills vesicles lined by green clay beginning @ 4559'.
	4565'-4571' BASALTIC ANDESITE (LAVA FLOW)
	Gradational contact w/above unit. Lava is aphyric, med to med dk gry. Vesicular near top but quickly becomes dense. Vesicles are lined or filled w/grn & blue grn clays, & commonly may be overlain by zeolite (drusy, fibrous) or silica. Lt. coating of blue grn clay on fracture surfaces. Fracturing generally is light & is oriented vertically, horizontally & rarely 30°. ("Black" clay, a/a, also common).
4577'	
	4571'-4591.5' VOLCANIC BRECCIA
	a/a @ 4553', but w/ larger number of vesicles/void spaces. Grn clays, a/a, fill or coat vesicle walls. Clay generally is light in this interval. Zeolites common, particularly white fibrous one (is dominate). Appearance of gry clay & grey blue clay, typically thin brittle coating. Grey blue may be botryoidal. Fracture is horizontal ~ sub-horizontal.
	4591'-4596' - BASALTIC ANDESITE (LAVA FLOW)
	Gradational contact w/above unit. Flow is dense, aphyric. Sparse vesicles lined/filled w/green + "black" clay; typically accompanied by white zeolite or silica
4597'	



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Thermal Power Company

Form 2

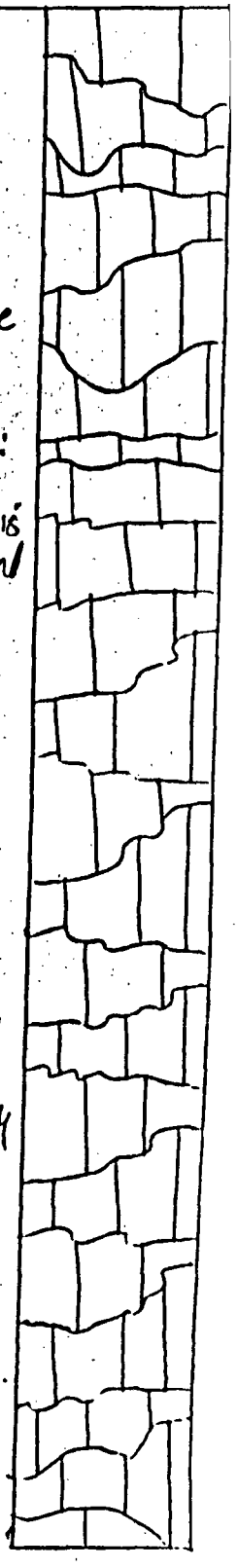
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTG11-1 GEOLOGIST (S) MCDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BINX. SLOPE DATE Aug 15, 1986

DEPTH INTERVAL	DESCRIPTION
4597'	**BASALTIC ANDESITE (A/A)**
	4596'-4616' VOLCANIC BRECCIA
4602	Med-dk gry, red brn. Breccia is vesicular & has a more open texture than breccia @ 4553'. Secondary mineralization light & includes grn & blue grn clays, wht zeolite (fibrous). Fracturing is uncommon with mnr and @ ~45° (sinuous) without 2ndary min. deposition. Vesicles are ≤ 6mm in size and commonly ≤ 3mm and rarely completely filled except when silica is the most recent cavity filling. All vesicles/cavities generally have a light coating of gry grn clay +/- the following materials toward the interior: +/- lt. tanned blue clay +/- gry botryoidal zeolite +/- clr drusy zeolite +/- wht radiating acicular zeolite. The wht zeolite is predominate in this sequence. Silica rarely occurs with any zeolite except the wht acicular zeolite and is also common.
	4616' - 4620' BASALTIC ANDESITE LAVA
4617'	med dk gry, dense, aphyric to v. sparsely porphyritic with plag & pyx. phenos. Rare fracturing is @ 45° and irregular. No 2ndary material is present on fractures. Vesicles are ≤ 10 mm in size and commonly < 1mm. Again clays initially rim vesicles followed by zeolites and/or silica. Silica and the wht acicular zeolite (Natrolite?) are predominate and overall 2ndary mineralization is greater than preceding breccia though still light. A common rim → interior sequence of vesicle filling materials is: gry grn clay +/- lt. blue clay +/- pale blue botryoidal zeolite (more opaque than the commonly opalescent silica) +/- pale blue botryoidal silica +/- clr drusy zeolite +/- wht acicular (radiating) zeolite (locally chalky).
	4620'-4630' VOLCANIC BRECCIA
	A/A @ 4596'. Fracs virtually absent w/ mnr FeOx red brn stain. Cavities, as in the preceding lava, are ≤ 10mm with ≤ 2mm vesicles more common. Cavities and vesicles are commonly partially filled w/ linings or bands of 2ndary mins as described above @ 4616'. Silica may completely fill vesicles but zeolites rarely do. Clays include gry grn, blue gry, blk, & rel. gry. Alteration remains light.
4637'	4630'-4636' BASALTIC ANDESITE LAVA



Diamond Shamrock Thermal Power Company

CORE DESCRIPTION
40 FOOT INTERVAL

HOLE: CTGH 1 — GEOLOGIST (S): MCDANNEL/GOODWIN

FIELD: CASCADES/CLACKAMAS — BASIS: binoc microscope — DATE: 8/16/86

DEPTH INTERVAL		DESCRIPTION
4637'	A	BASALTIC ANDESITE (A/A)

4630'-4636' BASALTIC ANDESITE LAVA (continued) ±.5mm clay.
med. dk gry, aphyric, dense, lt. frac. @70° w/dk red brn film/stain, fracs less common @ 30° & 45°. 2ndary mins. concentrated in top 1½', vesiculated lava. Vesicles rarely 10mm, commonly ≤3mm, 4-10% above 4632'. Silica is predominate. Linings include yel gry, grygrn, & blue gry clays, clr drusy zeolite & pale blue (½ botryoidal) silica.

4636'-4649' VOLCANIC BRECCIA
Gradational contact w/above unit. Med-dk gry. Dense, few lapilli w/vesicles. Alteration is pervasive but light. Clays & zeolites fill small (<2mm) voids. Clays are predominate & include grn, blue grn & lt blue (may be botryoidal) & black (actually is very dark grn). Most common zeolite is white, fibrous

L

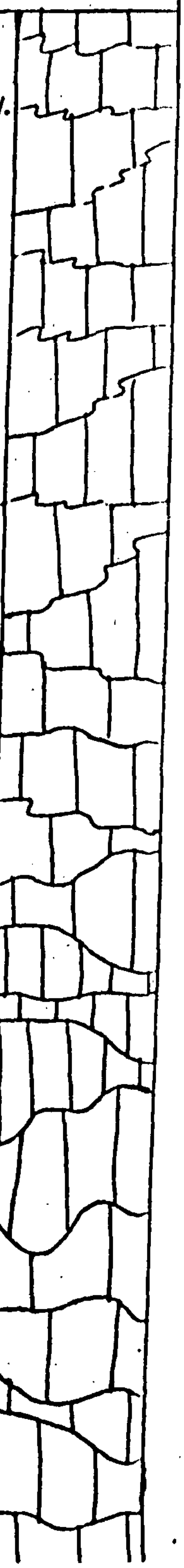
4649'-4658.5 BASALTIC ANDESITE (FLOW)
Gradational contact. Lava is dense, aphyric. Green clays common throughout rock & often replace mafic minerals. Sparse, small (≤5mm) vesicles are lined with clay, which may be coated with silica. ~3cm void near contact filled w/ v. pale blue silica. Mnr, sometimes brittle, grn & blue "clay" on fracture surfaces, & may show minor shear. Dusky red "hematitic clay" also on fracture surfaces & becomes common by 4652', accompanying blue & grn clays. Lt. green, shiny, soft clay on shear surface. Fracturing is low angle (horizontal to 75°) &, less commonly, vertical.

4657' — A L A L A L

4658.5-4694.5' VOLCANIC BRECCIA
Gradational w/above unit. Med gry-red brn. Generally dense (minor vesicular lapilli). Lt blue clay appears most common secondary mineral but is not abundant. Alteration light. Grn clays, blue grn clays; foliated drusy, & fibrous zeolites. Vesicles commonly lined/filled in this order (vesicle wall → interior): dk grn or blue grn clay / lt green/drusy or foliated zeolite / fibrous zeolite. Mnr. black clay; mnr silica (more common with depth) mnr

M A L A

4677'



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) MCDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 8/17/86

DEPTH INTERVAL	DESCRIPTION
4677'	BASALTIC ANDESITE (A/A)

4658.5'-4694.5' VOLCANIC BRECCIA (continued)

soft brngry clay. Vesicles are commonly ≤2mm. Cavities are intermittent and ≤ 20mm. Cavity filling is similar to vesicles exc. pale blue (±botryoidal) silica is common on clays lining voids. The white fibrous (radiating) zeolite is the most common cavity fill material and generally occurs on the interior except @ 4688' where reddish yel grn v. fine spheroidal clay?/zeolite? is present. While cavities are partially filled, vesicles (≤2mm) range from completely filled to barren & often are partially filled - most commonly with gry grn clay, giving the rock a grnish tinge. Basal contact is gradational.

4694.5'-4707' BASALTIC ANDESITE LAVA

med. dk. gry, aphyric to v. finely phaneritic, dense, intermittent vesicles (0-15%, ≤ 25mm & commonly <2mm) above 4703', below 4703' rock is dense w/ incipient partings @ 45° @ 4704' and platey fracture @ 4704½' for 6" interval. Below platey fracture @ 90°, common fracture attitude is @ 15° to 45°. In the fractured interval FeOx-stained, lightly-sheared clays (mod. red brn, lt. olive brn + intermittently waxy) are present in v. lt. amts on fracs. (& in matrix/groundmass same color clays are present in v. lt. amts, unsheared). In upper unit fracs. are less common and irregular, most commonly @ vertical (sinuous) & 45°. These fracs. have v. lt to mod. amts. v. pale grn clay or dk gry grn clay ± pale blue silica (as inlets & vns to 6x60 mm max.) vesicles contain pale grn, dk gry grn, lt blue, gry olive grn clays ± clr to pale blue silica ± clr drusy zeolite ± wht fibrous (locally chalky) zeolite ± gry grn botryoidal clay?, silica and clays are the predominate cavity/vesicle fillings. Contact is gradational in frac'd interval and overall 2ndary material is light.

4697'

4707'-4730.5' VOLCANIC BRECCIA

A/A @ 4658.5', fractures are rare @ 60°-80° with v. dk red brn stain ± gry grn clay. Rock is dense with fine (<½mm) matrix voids and commonly vesicular r.f.s. Vesicles/cavities are filled

4717'

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH1

FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANNEL / GOODWIN

BASIS Binoc. Microscope DATE 8/17/86

DEPTH INTERVAL	DESCRIPTION
4717'	BASALTIC ANDESITE (A/A)
	4707' - 4730.5' VOLCANIC BRECCIA
	partially to completely with clays, zeolites and silica. Clays are predominate in the < 2mm voids and silica & the white fibrous zeolite in the cavities. A common rim → interior cavity lining sequence is: dusky blue grn +/- grn gry +/- lt. blue +/- dk. olive gry clays → clr. foliated zeolite or pale blue botryoidal silica (opalescent) → wht radiating fibrous zeolite. 2ndary mineralization is commonly light and rock alteration very minor. Silica is much less common than zeolites.
	4730.5' - 4732' BASALTIC ANDESITE (LAVA FLOW)
	Gradational contact w/above unit. Lava flow is thin & very vesicular. Typically voids are lined w/ lt blue grn clay; w/dusky grn clay filling bottom of void (vesicle) & zeolite or silica overlying clays.
4731'	
	4732' - 4738' VOLCANIC BRECCIA (A/A @ 4707')
	Gradational contact. Dense. Secondary mineralogy same as breccia @ 4707'
	4738' - 3742' BASALTIC ANDESITE (FLOW)
	Gradational contact. Upper 3' of unit are vesicular. Vesicles filled w/dusky green clays. Blue grn clay less common & may thinly line vesicle walls. Clays are typically overlain by wht zeolite or silica, with silica predominate. Minor v. fine clear druzy zeolite lines some vesicle walls. Unit is fractured but consolidated w/silica filling fractures & voids. Less commonly, grn clay in fractures.
	3742' - 3767½' VOLCANIC BRECCIA.
4757'	med to dk gry lapilli-size r.f.s (with rare blocks) in red brn clay r.f. matrix - all basaltic andesite. Local common grn tinge from grn gry clays filling common sm. vesicles in r.f.s & sm. matrix voids (< 1mm). Rare fractures (eg @ 4758' with frac's @ 0° to 15° & lt. and. 2ndary coatings of gry grn clay +/- med blue gry botry-

Diamond Shamrock
Thermal Power Company

Form 2

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1 GEOLOGIST (S) MCDANNEL/GOODWIN

FIELD CASCADES/CLACKAMAS BASIS BINOC. MICROSCOPE DATE 8/18/84

DEPTH INTERVAL		DESCRIPTION
4757'	AHALALMAMIM	BASALTIC ANDESITE (A/A) 4742'-4767½' VOLCANIC BRECCIA (continued) and 2idary min. deposition in fracs & voids light. Clays are predominate material in <1mm voids (vesicles & matrix) & wht fibrious radiating zeolite is most abundant in >1mm vesicles & cavities. Cavities (≤40mm) contain clays (gry grn, lt. blue, med olive grn, blue gry) +/- minr. pale blue silica +/- med. blue gry finely spheroidal zeolite?/clay? +/- clr drusy zeolite +/- wht brittle film (=silica+ clay?) +/- wht fibrious zeolite +/- soft brn gry clay. From 4763'-4765½': dense brn. block w/ minr. breccia texture, <1mm. frac @ 45° w/ grn+brn clays +/- wht brittle film. Contact is gradational. 4767½'-4784' BASALTIC ANDESITE LAVA DK gry to med. dk gry, aphyric, dense, & brittle. Top 2' has vesicles & cavities stretched along sinuous subvertical planes (≤50mm, commonly <5mm, 5-15%). These voids are ptlly lined or completely filled (smaller voids only) with gry grn clay +/- clr (or stained yellow by FeOx) drusy zeolite +/- minr. pale blue silica +/- soft brn gry clay. Below 4769½', unit is dense & brittle w/o vesicles. Fracs. are common with a variable & but most commonly @ 40°-70° (+ local sinuous subvertical frac.). Fracs. are stained by red brn FeOx and coated w/ gry grn & mod. yel. brn (waxy) clays. FeOx stains in bands (≤40mm) and spots (mod red brn, dusky yellow, dusky red) become common below 4775' and may also color clays. Sharp irregular contact @ base.
4777'		4784'-4790' VOLCANIC BRECCIA Dk gry-red brn. Abrupt but transitional contact w/ above unit. Breccia is slightly scoriaceous. Secondary mineralization is light. Green & blue green clays are most common secondary material. Light amt of zeolites (as described above). Silica is present in v. light amounts & rarely forms well terminated quartz crystals as fine drusy lining on voids. Clays & zeolites occur in small (commonly ≤1mm, but up to 5mm) voids. 4790-4796' BASALTIC ANDESITE (LAVA FLOW) Med gry, aphyric, vesicular. Vesicles & voids are typically flattened & may be as large as 5cm. Smaller vesicles filled w/ clay & commonly silica or zeolites is above clay. (Clays are grn, blue grn, y/c). Larger voids filled by silica. Rare botryoidal silica. Fills fractures also. Alteration decreases w/ depth as unit becomes denser @ 4794.5'
11797'		

Form 2

Diamond Shamrock
Thermal Power Company

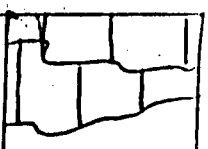
CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1 GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS BASIS BINOCULAR MICROSCOPE DATE 8/18/86

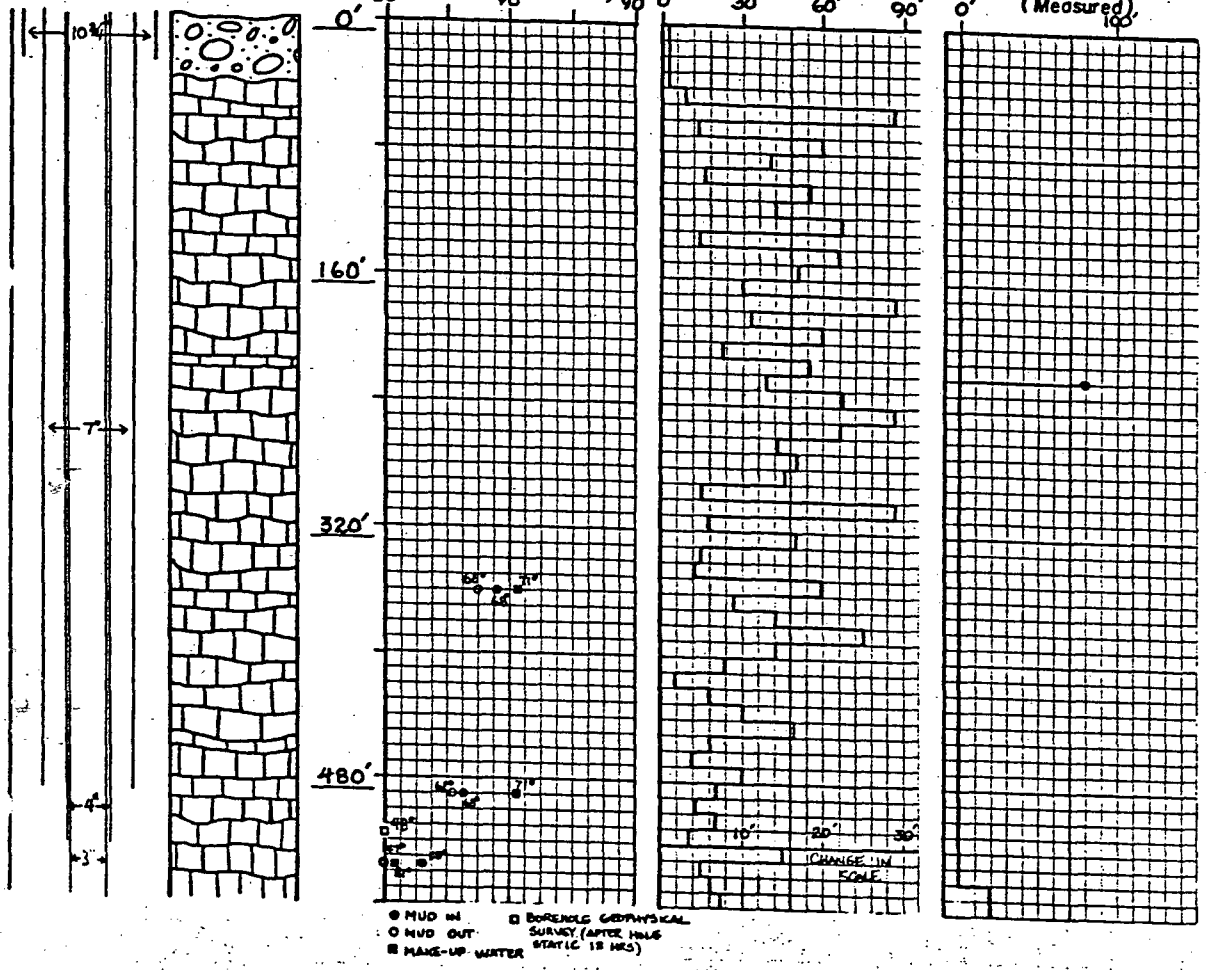
DEPTH INTERVAL	DESCRIPTION
4797	BASALTIC ANDESITE (A/A)
	4796- VOLCANIC BRECCIA (a/a @ 4784') Med gry – med dk gry. V. light Zn clay mineralization Green clays & zeolites a/a.
4817	



11Q71

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 SPUD DATE 6/7/86 COMPLETION DATE _____ TOTAL DEPTH _____
FIELD CASCADE/CLACKAMAS COUNTY MARION STATE OREGON TOTAL VERTICAL DEPTH _____
LOCATION T8S, R8E, SEC. 28 ELEVATION ~3840' ☐ KB of ____ ☒ GL BOTTOM HOLE LOCATION _____
CONTRACTOR / RIG BOYLES BROS. / 882 GEOLOGIST (S) GOODWIN, McDANNEL DATE



LOST CIRCULATION ZONES

220' (rods in hole) Fluid level=80' after 12 hours of no activity. ~300 gal returned level to zero. 6/11. 7:30.

400' Partial loss (~10%) =100 gpm. 1000 gal. loss. LCM brought full returns. 6/11. 16:00-17:00

425' Total loss. 100 gpm. 3000 gal. loss. LCM brought full returns. 6/11. 10:00. Decrease in mud viscosity suggests small H_2O entry @ 425'.

536' Partial loss. ~50% 116 gpm = 450 gal loss 5:10 am 6/22

540' Total loss. 825 gpm 6 a.m. 6/22 Static water level ~20 below surface

LITHOLOGIC DESCRIPTION

0'-40': Qal. Basaltic boulders and cobbles (till).

40': BASALT/BASALTIC ANDESITE LAVAS dk-med gry, minor red/brn. Aphyric to sparsely porph: phenos of plag, ol, pyx

Alteration: most of rock is fresh. Minor FeOx, clays; limonite, hematite 140'-150' tr. sulfide?

COMMENTS

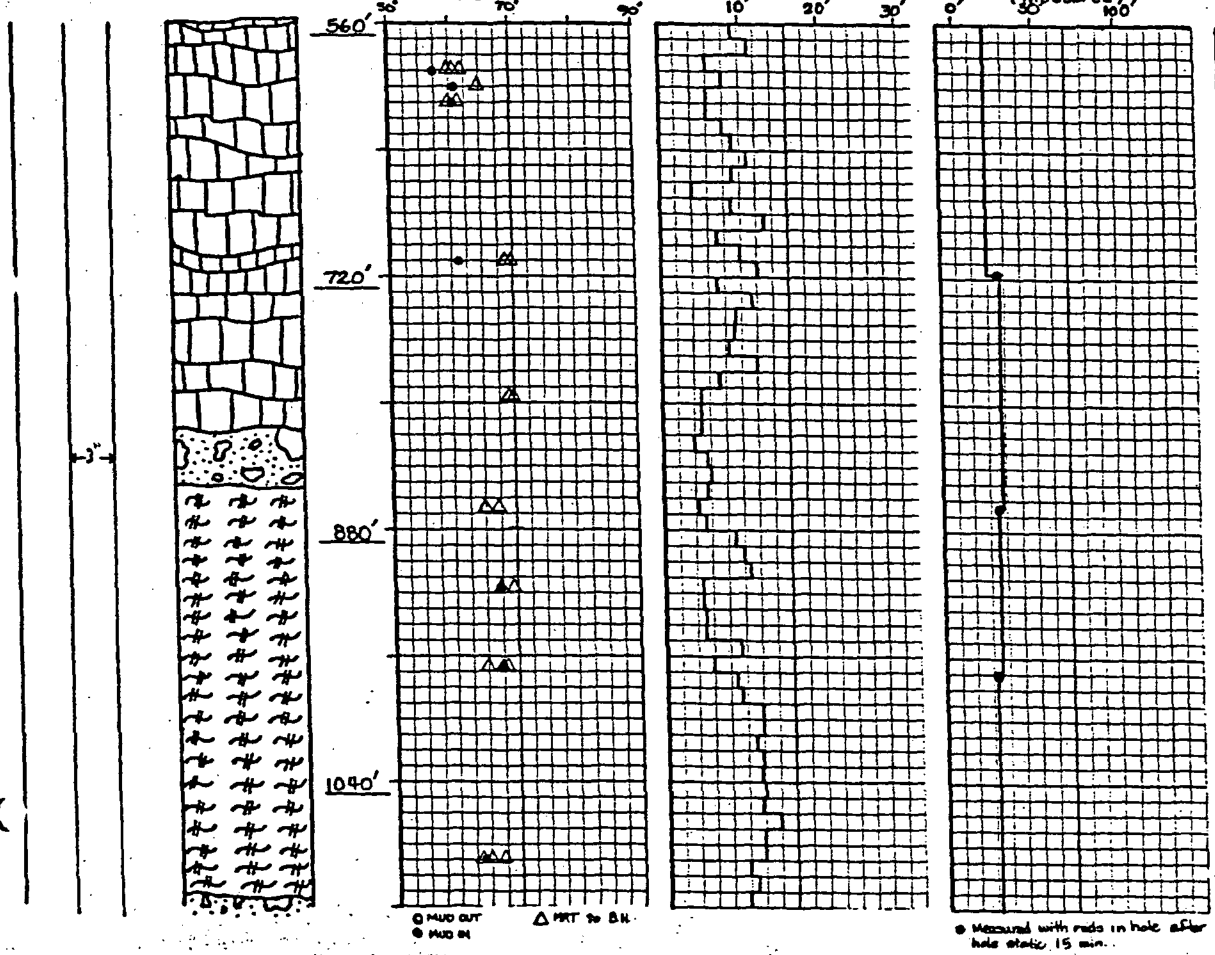
ROTARY DRILLING
0'-35' 12¼" rock bit
10¾" casing
35'-517' 8¾" button bit (Smith F3)
150' inclination survey: ½° @
220' inclination survey: ½° @
527' completed rotary drilling. began coring
517' inclination survey: 2° @
Set 7" casing 0'-488'
borehole geophysical survey: resistivity, temperature, density, caliper, deviation, SP

BOP installed + tested

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 | SPUD DATE 6/7/86 | COMPLETION DATE ____ | TOTAL DEPTH ____
FIELD CASCADES/CLACKAMAS | COUNTY MARION | STATE OREGON | TOTAL VERTICAL DEPTH ____
LOCATION T8S, R8E, SEC. 28 | ELEVATION ~3840′ | ☐ KB of ____ ☐ GL | BOTTOM HOLE LOCATION ____
CONTRACTOR / RIG BOYLES BROS. / 882 | GEOLOGIST (S) GOODWIN / McDANNEL | DATE ____

CASING PROFILE | LITHOLOGY | DEPTH | DRILLING TEMPERATURE TYPE ____ | PENETRATION RATE | WATER LEVEL (Measured)



LOST CIRCULATION ZONES

Total loss continues. LCM added 545′-579′ Pump rate varies: 7-15 gpm. (400-1,000 gal/hr)

730′ pulled up to 540′ added LCM bomb. No returns.

LITHOLOGIC DESCRIPTION

BASALT / BASALTIC ANDESITE (as above) med lt gry-med gry finely porphyritic, ~10% phenos & glomerocrysts: plag, ol, px. White & pink clays coat frac. surfaces & vesicles. Zones of rubble, scoria, ash mark flow boundaries @ 579′, 604′, 688′, 707′, 771′, 792′

809′ VOLCANIC BRECCIA
Lapilli & blocks of basaltic to silicic rock fragments supported in a yellowish brn matrix of ash, crystals & ash sz rock fragments. Silicic fragments are more common near bottom of unit & appear to be from underlying dacite. Top 18 cm of unit is dk gry ash & ash sz rock fragments. Unit contains light to moderate amount of pink & brown clays, minor limonite stain.

854′ DACITE Med lt gry fine gr. porphyritic. Phenos of plag, cpx, opx; groundmass of plag, pyx, black iron bearing mineral. Unit is moderately fractured. 75-80°, vertical. Clay on fracture surfaces (pink, brn), locally heavy pyrolusite, red FeOx, mnr plag → clay, tr. limonite, localized tr. chlorite.

1112′ VOLCANIC BRECCIA
Lapilli & block sz mafic & silicic (less common) rock fragments in clayey matrix of ash sz rock fragments & crystals. Thin irregular beds & laminae of ash sz & lapilli fragments.

1138′ - BASALT. med-med dk gry. 7-12% phenos: plag, cpx, olivine. Lt. orange & pinkish clay coat fracture surfaces, pyrolusite, hematite, rare limonite. Locally plag → clay.

COMMENTS

527′ Bit #1. HQ core bit. Christensen gray impreg. (3937)

0-527′: 4″ casing hung from 7″ casing.

core drilling w/ bentonite + polymers

589′ - Bit #2 (same specs as #1) Bridge @ 575′ on RIH

793′ - Directional survey 2.5° S&E

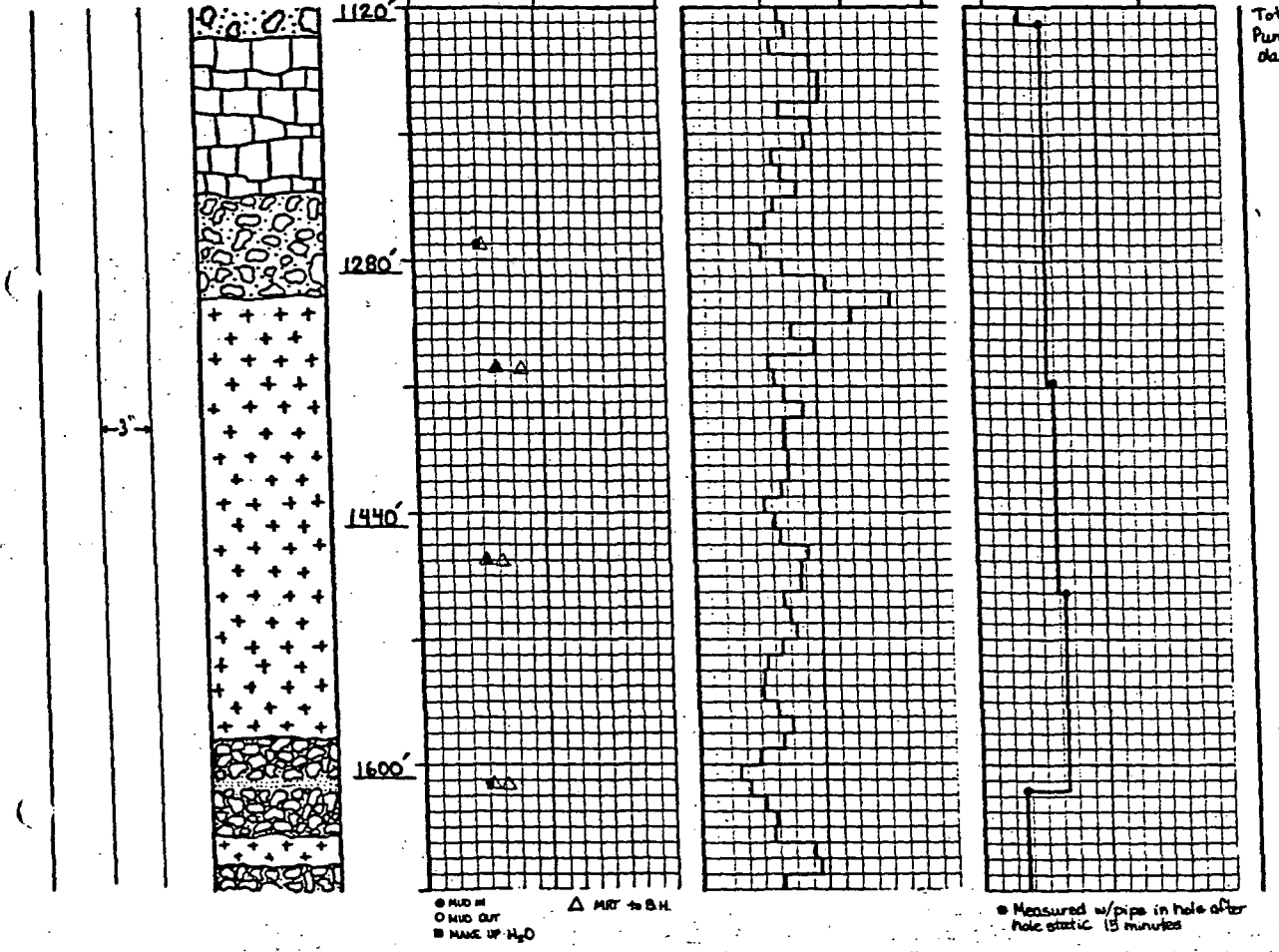
859′ - Bit #3 (same specs as #1)

947′ - Tripped to grease rods to alleviate rod chatter. Bridge @ ~600′ on RIH. Core barrel sanded in. Tripped rods. Bridge @ ~600′ on RIH.

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 SPUD DATE 6/7/86 COMPLETION DATE _____ TOTAL DEPTH _____
FIELD CASCADES/CLACKAMAS COUNTY MARION STATE OREGON TOTAL VERTICAL DEPTH _____
LOCATION Sec. 28, T8S, R8E ELEVATION 3840' ☐ KB of ____ ☒ GL BOTTOM HOLE LOCATION _____
CONTRACTOR / RIG BOYLES BROS / 882 GEOLOGIST (S) GOODWIN/McDANNEL DATE

CASING PROFILE | LITHOLOGY | DEPTH | DRILLING TEMPERATURE TYPE °F (50°–90°) | PENETRATION RATE (feet/hr) (10–30) | WATER LEVEL (Measured) (0'–60') | LOST CIRCULATION ZONES | LITHOLOGIC DESCRIPTION | COMMENTS



Total Fluid loss continuous
Pump rate varies:
daily average 10-14gpm

1230' VOLCANIC BRECCIA
Red-gry-brn. Lapilli to block size rock fragments of mafic lava(s) in matrix of ash (altering to clay), ash sz rock frags, & crystals. Variable clast size, clast:matrix ratio, & laminated intervals from 1/8cm-1.5m subunits. Origin of unit may be surge & airfall deposits. Numerous rubbly intervals. Pale org-pnk clay, locally heavy. Tr FeOx/MnO.

1291' ANDESITE med brn to dk gry; 2-4% phenos: plag, opx, cpx, hbl (glime). Mnr plag → clay. Pale orange pink clay commonly coats fractures, forms seams. Tr pyrolusite, tr platy metallic min, hematite, clear to white tabular mineral (v. fine) in veinlets & on fracture surfaces. Intense fracturing, predom. vertical; more variable w/depth: 30°, 45°

1570' VOLCANIC BRECCIA
Md dk gry & gry brn. Lapilli & block sz rock fragments of mafic-intermediate lavas in matrix of ash sz rock fragments, clay (from ash?) & crystals. Unit changes character throughout its thickness: thin, cross-bedded, laminated intervals; palagonitic intervals; intervals of basaltic andesite lapilli & blocks w/features suggesting deposition while molten/plastic. Pyroclastic & surge origin is suggested by most of unit characteristics. Pale blue-blu gry clay on fractures, fine, clear acicular zeolite. FeOx.

1647' ANDESITE olive gry, md gry, brn gry. ≤1% phenos: plag, hbl. Platy frac. @ 45°. Lt brn, dk brn gry clays coat frac. Pale-lt grn clay (ala). Tr limonite, MnO (pyrolusite) on fracture surf.

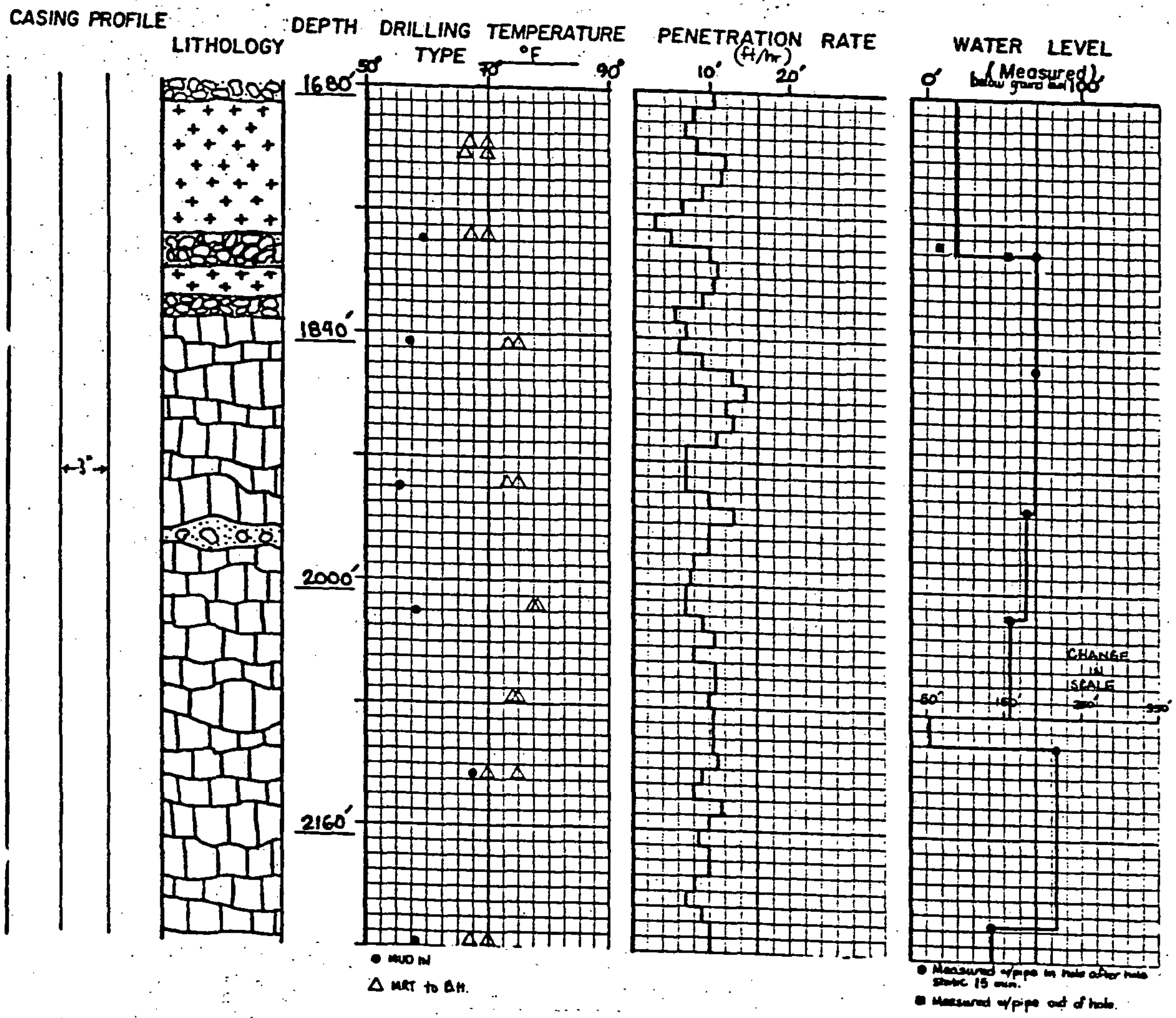
1666.5' VOLCANIC BRECCIA
Lapilli-small block sz heterolithologic volcanic rock fragments; lava-ashy to clayey matrix. Unit varies based on fragment size, matrix:clast ratio, laminated cross-bedded intervals. Some mafic lava fragments appear to have been deposited while molten/plastic. Pyroclastic origin suggested for unit. Fractures mstly w/variable direction. Trace fine, clear drusy zeolites on fractures.

1271' - Bit #3. Same specs as bit #1. On RIH cons @ 600', 880', 920'

1620' Directional survey: ½° N39E

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS
LOCATION Sec 28, T8S, R8E
CONTRACTOR / RIG Boyles Bros. / 882
SPUD DATE 6/7/86
COUNTY Marion
ELEVATION 3840'
COMPLETION DATE
STATE Oregon
☐ KB of ___ ☐ GL
GEOLOGIST (S) McDannel / Goodwin
TOTAL DEPTH
TOTAL VERTICAL DEPTH
BOTTOM HOLE LOCATION
DATE



LOST CIRCULATION ZONES

Total fluid loss continues. Pump rate varies: daily average 10-14 gpm

2111' pump pressure dropped to zero (while pumping ~13 gpm) @ vertical fracture near flow contact. Subsequent H_2O level measurements indicate an initial 170'+ drop in hole fluid column followed by a slow rise over following days.

LITHOLOGIC DESCRIPTION

1694' ANDESITE. Med to dk gry to brn gry, porphyritic 1-3% phenos: plag, pyx. Lt-mod clay on fracture surfaces. Tr MnO. Pyx → clay. Generally very frac. Most prominent frac. 45°.

1781.5' VOLCANIC BRECCIA
Med rd brn - med dk gry. Lapilli & blocks of scoria & andesite rock fragments in a sparse matrix of ash & clay. Pale brn, lt brn, brn red, & lt gry grn clays fill vesicles & lightly coat fractures. Clear, drusy zeolite on fractures. Unit has pyroclastic origin.

1798' ANDESITE. Brn gry to med gry. Sparsely porphyritic ≤1% plag, pyx. Plag & pyx → clay. Vesicles common. Clay (grn gry) on frac. surfaces & filling vesicles. Tr zeolite (?)

1820' VOLCANIC BRECCIA
Med dk gel, orng brn, red brn. Coarse ash & lapilli sz heterolithologic rock fragments & minor lt gry pumice in a matrix of ash, glass fragments, & xtls. Changes in color, clast: matrix ratio, clast size gives crudely bedded appearance to unit. Minr shear on fracture surfaces. Origin of unit appears to be pyroclastic airfall.

1826' BASALTIC ANDESITE
Dk gry, finely porphyritic (2%). Phenos: plag, cpx. Mod. clays; 40°-50° prominent fracture direction. Few fractures.

1969' VOLCANIC BRECCIA
to 1971: red brn. Lapilli to coarse ash sz rock frags of intermediate to silicic composition in fine matrix of ash, & less commonly, ash sz rock frags. Crude bedding 4° @ 1920' to 1979: basaltic andesite blocks & lapilli, often vesicular & apparently deposited while plastic, in mnr matrix of rd brn ash. Shear common on frac. surfaces.

1979' BASALTIC ANDESITE
brn gry - gry brn, finely & sparsely porphyritic, commonly brecciated. Phenos: plag, pyx, ol? Mod.-heavy clays. Clear drusy zeolite coats fracture surfaces. Much of unit is intensely fractured & brecciated & has greyish grn to dusky grn color. Fracture angles: 15°, 40°, 80°

2036' BASALTIC ANDESITE
Grnsh blk - dk grn gry - grnish brn, mnr red brn. Aphanitic to sparsely porphyritic. Fracture

COMMENTS

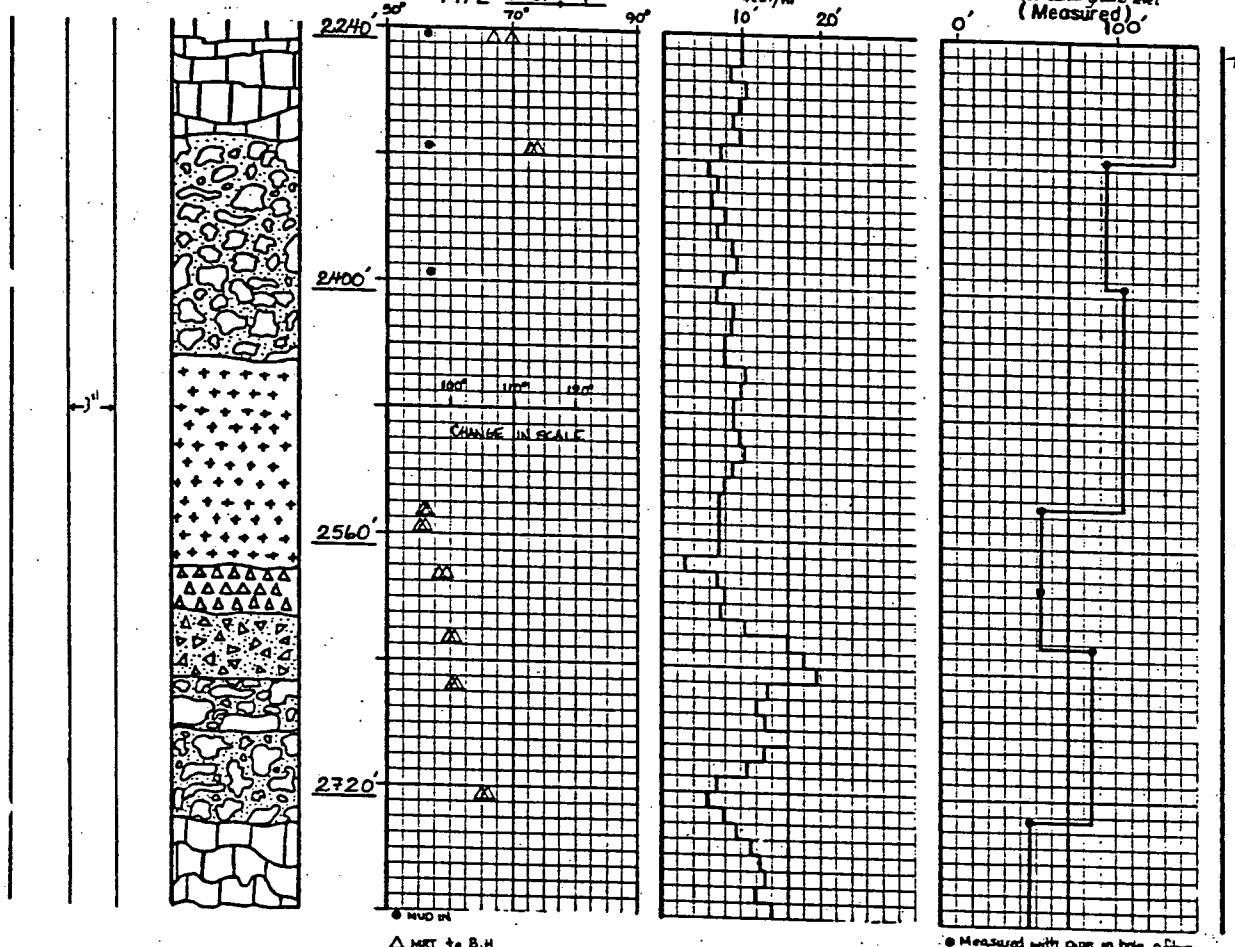
1775' - Bit #5. Same specs as bit #1. On RIH encountered cave @ 615', 675', 2' fill @ BH.

Lithology cont'd:
locally heavy. Predominately 45°, vertical. Clays coat fracture surfaces. Zeolites in fractures & coating surfaces. Breccia common. Series of flows w/contacts (~: 2067', 2074', 2088', 2091, 2111', 2185', 2241) marked by oxidation & vesicles.

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 SPUD DATE 6/7/86 COMPLETION DATE _____ TOTAL DEPTH _____
FIELD CASCADES/CLACKAMAS COUNTY MARION STATE OREGON TOTAL VERTICAL DEPTH _____
LOCATION SEC. 28, T8S, R8E ELEVATION ~3840' ☐ KB of ____ ☐ GL BOTTOM HOLE LOCATION _____
CONTRACTOR / RIG BOYLES BROS / 882 GEOLOGIST (S) GOODWIN/MCDANNEL DATE

CASING PROFILE | LITHOLOGY | DEPTH | DRILLING TEMPERATURE TYPE MRT °F | PENETRATION RATE feet/hr | WATER LEVEL ft below ground level (Measured) | LOST CIRCULATION ZONES | LITHOLOGIC DESCRIPTION | COMMENTS



Total loss continues, n/a.

2317' VOLCANIC BRECCIA
Dk grn gry, md dk gry, gry red, md red brn to brnish gry. Lt-med grn angular to subangular lapilli- to block sz rock fragments of mafic to intermediate lavas in a matrix of ash sz rock fragments, ash, mnr crystals. Dk grn clay. Frequent intervals of red & black flow banded lava, often with irregular, disrupted margins suggesting molten deposition. Most of unit appears to have pyroclastic origin. Mnr intervals of homogeneous aphyric basaltic andesite. Mnr clay, predominately green, on fracture surfaces. Irregular fracture, often w/waxy, sheared surfaces. Mnr zeolites.

2455' ANDESITE
Md dk gry-v. lt gry, porphyritic. 10% phenos: plag, cpx, opx. Phenos are altering to clays. Localized fracturing/brecciation. Pervasive pale blue & pale green clay.

2550' ANDESITE
Md dk gry-red brn. Sparsely & finely porphyritic. 2-3% phenos: plag, hbld, cpx. Lt clay alteration. Grn gry & wht clay veinlets. Localized, intense fracturing.

2586' CRYSTAL-LAPILLI TUFF
Lt-md gry, red brn lapilli sz rock fragments, mnr lt gry collapsed pumice lapilli in crms brn to lt brn matrix of predom ash sz, v coarse ash sz rock frags. Unit is not welded, but is consolidated. Origin is probably air fall. Lt shearing, dk grn & pale blue clay on fractures.

2602.5 LAPILLI TUFF
Lt gry angular to sub-rounded lapilli sz rock fragments, mean block, glass, collapsed pumice?, in med gry-dk gry matrix of ash sz rock frags, ash, xtls & glomerocrysts of plag, cpx, magnetite. Mnr clay, Mnr sorting/bedding. Ash-flow origin?

2651' ANDESITE BRECCIA
Unit is a series of volcanic breccia (pyroclastic origin, in part) & dense flow intervals. Breccia is consolidated but contains inter-grain voids. Mnr wht & pale grn clay, zeolites in vesicles & voids. Mnr. fracturing.

2694' VOLCANIC BRECCIA
Lt-md gry black & lapilli sz rock

2386' Bit #6 (same specs as bit #1). On RIH bridges @ 880' & 1140'

2486' Directional survey: 4¼°, N12E

(Lithology cont'd)
fragments of mafic-intermediate lavas in a fine matrix of ash sz rock frags, mnr crystals, palagonite, calc. mnr, localized, thin-bedded beds. Unit is predom. matrix supported. Origin is probably pyroclastic & may be in part hydroclastic or surge deposit. Intervals of lapilli-coarse ash fragments plastically deformed & w/disrupted margins suggest deposition while molten.

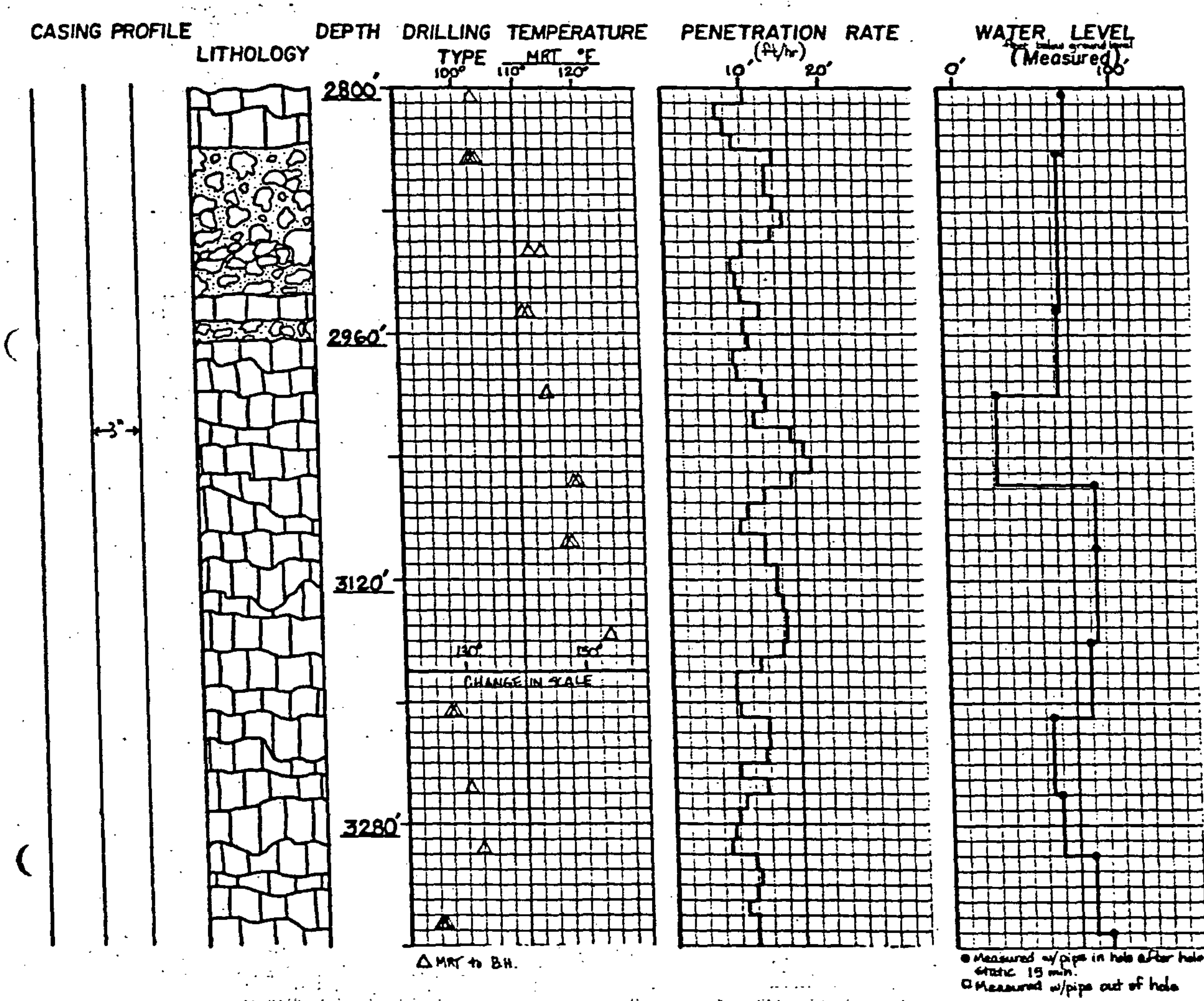
2726' BASALTIC ANDESITE
Md dk gry, v. finely porphyritic, 7-8% phenos: plag, pyx (to clay), ol? Tectonically brecciated intervals w/mnr dk gry grn clay. Minor movement in brecciated intervals. Lt-mod fracturing. Pale grn & gry grn clays.

△ MRT to B.H.

● Measured with pipe in hole after hole static 15 min.

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 SPUD DATE 6/7/86 COMPLETION DATE ______ TOTAL DEPTH ______
FIELD CASCADES/CLACKAMAS COUNTY MARION STATE OREGON TOTAL VERTICAL DEPTH ______
LOCATION Sec 28, T8S, R8E ELEVATION 3840' ☐ KB of ____ ☐ GL BOTTOM HOLE LOCATION ______
CONTRACTOR / RIG BOYLES BROS. / BB2 GEOLOGIST (S) GOODWIN/MCDANNEL DATE ______



LOST CIRCULATION ZONES

Total loss continues. 7-14 gpm.

LITHOLOGIC DESCRIPTION

VOLCANIC BRECCIA
2842' Angular to sub-rounded lapilli & mnr blocks of mafic-intermediate lavas in dk gry-brn gry-gry red matrix of smaller rock frags, xtls, clay. Unit varies from clast to matrix supported. Intervals of basaltic andesite w/elongated, disrupted margins in oxidized reddish brn matrix suggest deposition while molten. Mnr discontinuous grading forms bedding in matrix. Rare zeolites in fracs & mnr drusy coatings on surfaces. Light, varied fracture.

2935 BASALTIC ANDESITE
Med dk gry-med red, finely & sparsely porphyritic, ≤1% phenos: plag, pyx

2951.5 VOLCANIC BRECCIA
As above in 2842, but predom. clast supported.

2965.5 BASALTIC ANDESITE
Med-dk gry-brn gry, finely & sparsely porphyritic (2-5%) Phenos: plag, pyx; both → clay. Much of unit is pyroclastic breccia, often as thick deposits: dk gry-brnish gry blocks & lapilli of basaltic andesite fragments in grey-red matrix of basaltic andesite lava. Mnr agglomerate. Overall fracturing is light and is much more common in dense lavas than in breccia. Most common fracture directions vertical & 45°, rarely 30° & 60°. Waxy "clays" common: dk gry grn, gry blue grn, bluish gry, pale blue. Other less common clays: wht & gry brn, gry. Clay may take botryoidal form, particularly in voids. Zeolites common (2995') often as drusy coating. Silica appears @ 3195' as veinlets & void fill. Often white & blue, & may replace "clays". Native copper as small plates & thin wire (microscopic) appears @ 3248'.

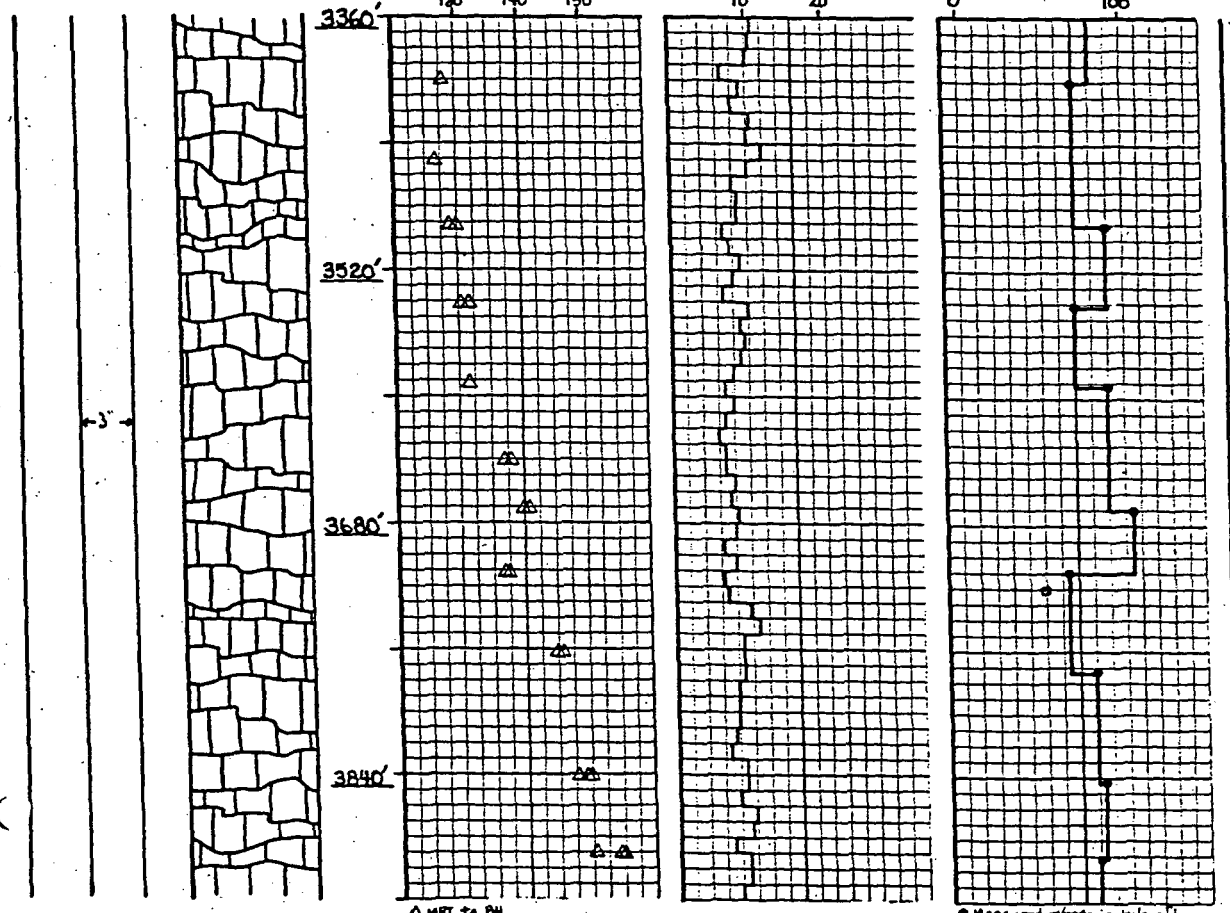
COMMENTS

3300' Directional survey 3/4° N16W

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 | SPUD DATE 6/7/86 | COMPLETION DATE _____ | TOTAL DEPTH _____
FIELD CASCADES/CLACKAMAS | COUNTY MARION | STATE OREGON | TOTAL VERTICAL DEPTH _____
LOCATION SE 28, T8S, R8E | ELEVATION ~3840' | ☐ KB of ____ ☐ GL | BOTTOM HOLE LOCATION _____
CONTRACTOR / RIG BOYLES BROS/882 | GEOLOGIST (S) McDANNEL/GOODWIN | DATE

CASING PROFILE | LITHOLOGY | DEPTH | DRILLING TEMPERATURE TYPE MRT °F (120° 140° 150°) | PENETRATION RATE (ft/hr) (10' 20') | WATER LEVEL (feet below ground level) (Measured) (0' 100')



LOST CIRCULATION ZONES

Total loss continues 7-14 gpm

LITHOLOGIC DESCRIPTION

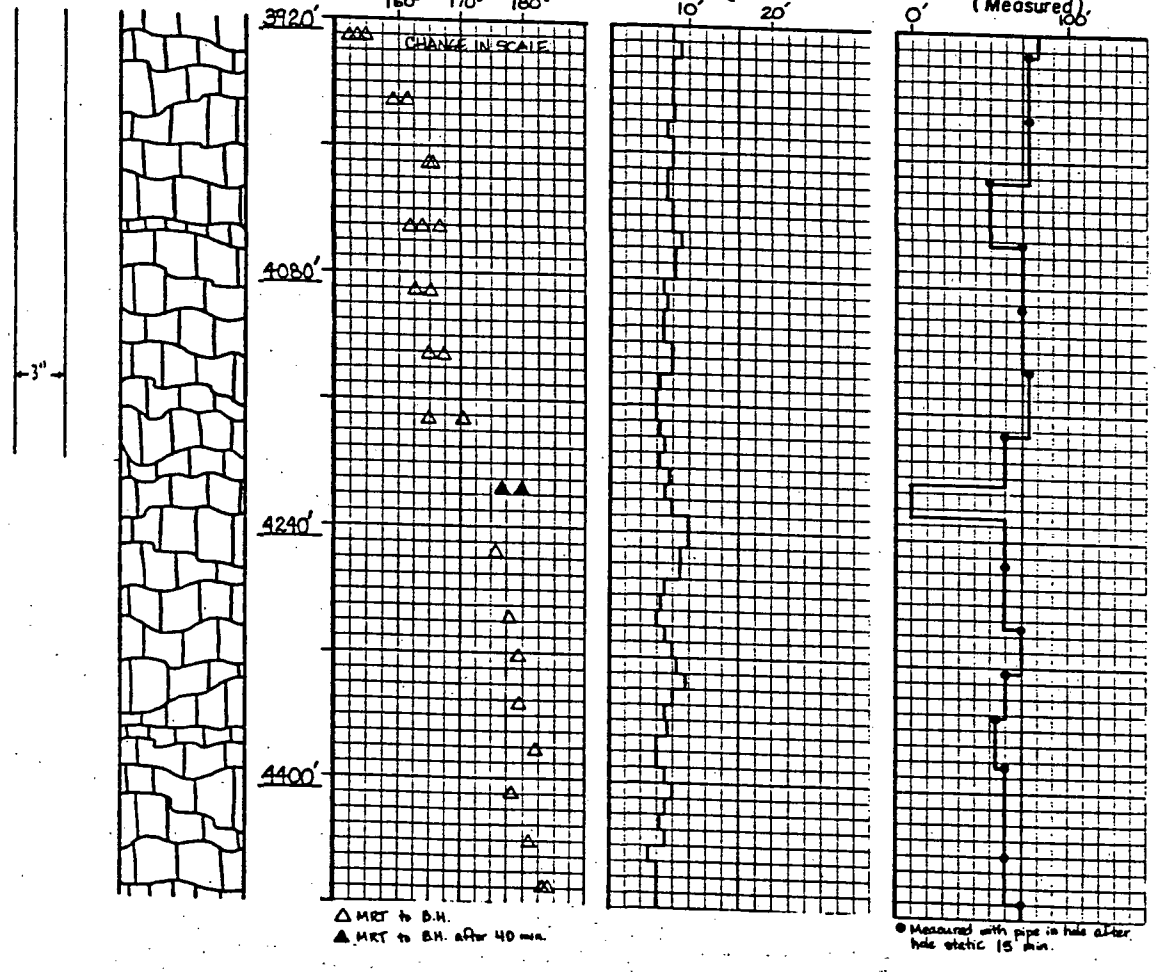
BASALTIC ANDESITE as above @ 2965.5, cont'd: Thin (2'-10') dense flows of sparsely & finely porphyritic basaltic andesite interlayered with thicker intervals (2'-25') of basaltic andesite volcanic breccia. Fracturing is light to moderate, w/local heavy fracture zones, & is more common in flows than breccia. Fracture direction is variable, but vertical - sub-vertical direction is most common. Green & blue "clays" common, filling voids & coating fracture surfaces. Dark grn & blue grn "clays" effervesce (lightly) w/HCl. White & gry brn clays are less abundant & were deposited subsequent to grn & blue clays (Light blue clays subsequent to dk grn, gry grn, blue grn). Silica fills voids, fractures & may replace some clay. Silica more common in lava flows than breccia. Zeolites occur as very fine crystals (clear) forming drusy coatings on grn & blue clays; acicular & fibrous varieties are common in voids & may coat grn/blue clays. Silica & zeolites deposited subsequent to grn & blue clays. Microscopic native copper 3248-3700'. Minor yellow & orange resin clasts.

COMMENTS

3721 Bit #7 (same specs as core bit #1). Cave between 800'-1,000' on RIH.

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1 SPUD DATE 6/7/86 COMPLETION DATE _____ TOTAL DEPTH _____
FIELD CASCADES/CLACKAMAS COUNTY MARION STATE OREGON TOTAL VERTICAL DEPTH _____
LOCATION SEC 28, T8S, R8E ELEVATION ~3840' ☐ KB of ____ ☐ GL BOTTOM HOLE LOCATION _____
CONTRACTOR / RIG BOYLES BROS/BB2 GEOLOGIST (S) GOODWIN/McDANNEL DATE _____



LOST CIRCULATION ZONES

Total loss continues. 7-14 gpm

4206'-4226' full returns.

4226' Total circulation loss resumes. 7-14 gpm

LITHOLOGIC DESCRIPTION

BASALTIC ANDESITE (as above)
Dense flows of sparsely & finely porphyritic lavas of basaltic andesite interlayered with volcanic breccia of same composition. Lavas are slightly thicker (up to 14'-20') and breccias thinner (6'-8') than above. Fracturing is light to moderate, and is more common in lava flows than breccias. Fracture direction variable; it is commonly high angle (0°-20°). Green & blue "clays" common, filling voids & coating fracture surfaces. Dark grn & blue grn clays effervesce lightly w/HCl. White & brown clays less abundant. Silica fills voids, fractures & may replace some clay. Silica most common in lavas. Zeolites are common & fill voids lined by clay. Minor yellow & orange FeOx stains follow fractures. Order of deposition of clays & secondary minerals: Dk green clay, light green & blue green clay, ± silica, ± zeolites, ± brn & wht clays.

COMMENTS

4206' Twisted off @ 823' below ground level. Entered H-rods w/NX rods to retrieve inner core barrel. Returned into H-rods w/NX rods & bit #8 (Christiansen grey tungsten 2.93"), drilled out H-bit (#7) & proceeded drilling to 4226'.

4226' Tripped out of hole. RIH w/bit #9 (same specs as #8)

Diamond Shamrock
Thermal Power Company

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS
LOCATION SEC 28, T8S, R8E
CONTRACTOR / RIG BOYLES BROS/882

SPUD DATE 6/7/86
COUNTY MARION
ELEVATION ~3840'

COMPLETION DATE
STATE OREGON
☐ KB of ___ ☐ GL
GEOLOGIST (S)

TOTAL DEPTH
TOTAL VERTICAL DEPTH
BOTTOM HOLE LOCATION
DATE

CASING PROFILE

LITHOLOGY

DEPTH

DRILLING TEMPERATURE
TYPE MRT °F
180 190 200

PENETRATION RATE
(feet/hour)
10' 20'

WATER LEVEL
(feet below ground)
(Measured)
0' 100'

LOST CIRCULATION ZONES

~4480' pump rate increased to 75 gpm due to high torque.

LITHOLOGIC DESCRIPTION

BASALTIC ANDESITE
(as above)
Dense flows of sparsely & finely porphyritic to aphanic basaltic andesite interlayered with volcanic (pyroclastic) breccia. In the lower 500-400' of the unit breccias are generally thicker than flows. Flows are often as thin as 4-6'. Fracturing is generally light & concentrated in the flows. Grn & blue clays common as void fill & fracture coatings (light). Silica fills voids & fractures & is much more common in lavas than breccias. Zeolites are common, particularly in breccias. Clays typically precede zeolites & silica. Silica (hydrous) may coat some zeolites. Mnr gelles & orange FeOx stains & edges along fractures; these are typically localized in their occurrence. Fracture surfaces are typically sheared & may have thin serpentine & hematite

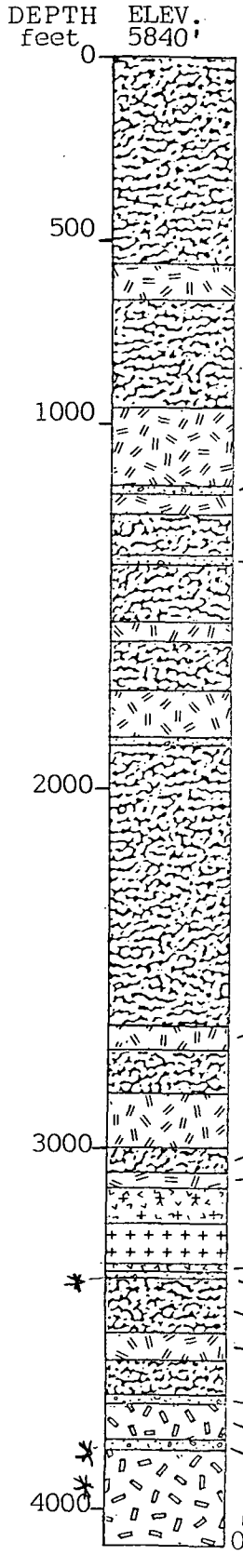
COMMENTS

4480'
4640'
4800'
4960'

△ MRT TO B.H.
✡ MRT TO B.H. AFTER HOLE STATIC 4 HRS

● Measured with pipe in hole, after hole static 15 min.

GEO-NEWBERRY N-1

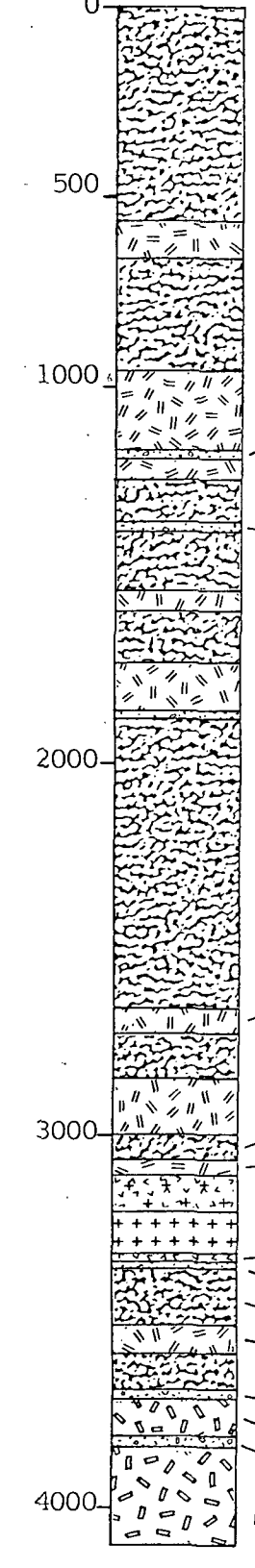


UNIT INTERVAL	LITHOLOGIC DESCRIPTION
0-564	Basalt Flows olive-blk to dk grey, vesicular
564-662	Andesite Flows grey, vesicular
662-963	Basalt Flows euh 1-5mm plag pheno.
963-1172	Andesite Flows euh 1-5mm plag pheno
1172-1188	Lithic-crystal Tuff Rhyodacite, red-brn, 2mm plag.
1188-1248	Andesite Flow 1-3mm plag, red to grey.
1248-1363	Basaltic Andesite Flows few 2mm plag pheno.
1363-1384	Lithic Tuff andesitic, 7cm lithics, ash matrix.
1384-1544	Basalt Flows and Intraflow Breccias aphyric
1544-1594	Andesite Flow abundant plag pheno to 5mm.
1594-1732	Basalt Flows aphyric
1732-1860	Andesite Flows 2mm plag pheno, grnish-blk.
1860-1876	Lithic Tuff bedded pumice with clay matrix.
1876-2654	Basalt and Basaltic-Andesite Flows with 2-6' thick Dacitic ash at 1982, 2052 and 2167. Several thin basalt dikes and dikes2209-2252 & 2300-2335'.
2654-2725	Andesite Flows, Flow Breccia and Cinders.
2725-2850	Basalt Flow poikilitic pyrx, ash-cinders 2823-50.
2850-3002	Andesite Flows with interbedded ash & cinders.
3002-3069	Basalt Flow grey-brn, plag xls to 3mm
3069-3113	Andesite Flow med. grey, 3mm plag pheno.
3113-3211	Dacitic Cinders & Ash red-brn, 5' tuff at top.
3211-3332	Dacite Flow hyalo-ophitic, 2% 1mm xls.
3332-3349	Volcanic Breccia red-brn angular blocks, Andesitic.
3349-3365	Lapilli Tuff Rhyodacitic, welded, 2' clay alt top.
3365-3522	Basaltic Andesite Flows, Cinders & Ash, tuff 3416-40.
3522-3595	Andesite Flows med. grey, aphyric.
3595-3691	Basaltic Andesite Flows with lithic tuff 3662-64.
3691-3714	Lithic Crystal Tuff pumice & lithic lapilli, welded.
3714-3811	Rhyodacite Flow or Dome 4% 2mm plag pheno.
3811-3840	Ash Flow Tuff welded, vitric, fault contacts.
3840-4176	Rhyodacite Flow or Dome 4% 2mm xls, glass matrix.

0 10 20 30 40C

0 10 20 30 40 50 60 70 80 90°C

GEO-NEWBERRY N-1



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1363-1384	Lithic Tuff andesitic, 7cm lithics, ash matrix.
1384-1544	Basalt Flows and Intraflow Breccias aphyric
1544-1594	Andesite Flow abundant plag pheno to 5mm.
1594-1732	Basalt Flows aphyric
1732-1860	Andesite Flows 2mm plag pheno, grnish-blk.
1860-1876	Lithic Tuff bedded pumice with clay matrix.
1876-2654	Basalt and Basaltic-Andesite Flows with 2-6' thick Dacitic ash at 1982, 2052 and 2167. Several thin basalt dikes and dikes2209-2252 & 2300-2335'.
2654-2725	Andesite Flows, Flow Breccia and Cinders.
2725-2850	Basalt Flow poikilitic pyrx, ash-cinders 2823-50.
2850-3002	Andesite Flows with interbedded ash & cinders.
3002-3069	Basalt Flow grey-brn, plag xls to 3mm
3069-3113	Andesite Flow med. grey, 3mm plag pheno.
3113-3211	Dacitic Cinders & Ash red-brn, 5' tuff at top.
3211-3332	Dacite Flow hyalo-ophitic, 2% 1mm xls.
3332-3349	Volcanic Breccia red-brn angular blocks, Andesitic.
3349-3365	Lapilli Tuff Rhyodacitic, welded, 2' clay alt top.
3365-3522	Basaltic Andesite Flows, Cinders & Ash, tuff 3416-40.
3522-3595	Andesite Flows med. grey, aphyric.
3595-3691	Basaltic Andesite Flows,with lithic tuff 3662-64.
3691-3714	Lithic Crystal Tuff pumice & lithic lapilli, welded.
3714-3811	Rhyodacite Flow or Dome 4% 2mm plag pheno.
3811-3840	Ash Flow Tuff welded, vitric, fault contacts.
3840-4176	Rhyodacite Flow or Dome 4% 2mm xls, glass matrix.

CORE LOG

PROJECT Newberry, Oregon HOLE NUMBER N-1 LOCATION 3600'W.& 2750'N.of SE Cor.Sec. 25 T 22S.R 12E.

COMPANY GEO Operator Corporation LOGGED BY Michael Johnson & Eugene V. Ciancanelli DATE 9/85-11/85 GR.ELEV. 5840'

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
			410					
			420					
			430					
			440					
			450					
			460					
			470					
			480		487'-564': BASALTIC ANDESITE, olv blk to med dk grey with lt brnsh-gry mottling. Rare anhd-subhd Ol phen (<1mm). Com to abd dissem Mag. Ves fr 562'-564'.		493.5' and 497': Clay, limonite in micro fractures.	Core recovery begins at 487'
1	100		490			50°		
2	100		500			40°		

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY Michael Johnson & Eugene V. Ciancanelli DATE 9/85-11/85 GR. ELEV. 5840'

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
2	100					85°		
3	100		510			80°		
4	100		520		Col chg bel 521', ranges fr med. lt grey to dk grey, cont to base of flow.	60° 50°		
5	100		530					
6	100		540			0°		547'-550': driller notes cavity.
7	100		550			75° 60°		
8	0 83 91 0 61	<100° at 570'	560			15°-20° 60°		
9	88		570					
10	96 100		580		564'-601.5': BASALTIC ANDESITE (?), med lt grey to lt br grey to med. dk. gry, fnly xln to glassy. Rare subhd Ol phen (< 1mm), fnly dissem Mag. Oxd dk. rd-brn fr 564'-579'. Ves throughout (< 0.5 mm diam.). Planar flow structure dips 10-25°.			
11	100		590					
12			600					

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
12	100 / 83				601.5'-662': BASALTIC ANDESITE, dk gry occ Ol phen (≤1mm),			
13	33 / 75 / 92 / 75		610		rare Plag phen in v fn xln grnd, fn dissem Mag; ves fr			
	100 / 100				601.5'-614'. Planar flow structure dips 20-30°.			
14	100 / 95		620			70° 80° 90°		
15	95		630			75° 60°		
16	100		640			50° 50°		
17	100		650			20° 40° 70° 70° 50°		
18	57		660			45° 35° 60° 50° 40°		
19	100 / 67 / 51	<100° at 668'	670		662'-825': BASALTIC ANDESITE, dk gry to med dk gry. Occ Ol phen (≤1mm) and rare Plag micphen in v. fn xln to glassy grnd. Ves, prt oxd fr 662'-677'.			
20	100 / 69 / 85		680		Intraflow breccia fr 685'-686', oxd gry-rd to dk rd-brn; ves.	35°		
21	82 / 75		690		Fault at 683', Fe Ox, slks	20°		
22	88		700		Intraflow breccia fr 691'-703', oxd gry-rd to dk rd-brn; ves.			

CORE LOG

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COMPANY GEOOC LOGGED BY Michael Johnson & Eugene V. Ciancanelli DATE GR.ELEV. 5840'

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
22								
23	100		710		Intraflow breccia fr 707'-716', oxd gry-rd to dk rd-brn; ves.	60°		
24	86 100		720					
25	100		730			25° 10°		
26	100 0		740		Intraflow breccia fr 741'-749', oxd gry-rd to dk. rd-brn; ves.			
27	100 93		750					
28	83		760		754'-784': ves zone, brn-gry, ves elong, 0.5 cm. Flow banding dips ~30°	20° 35° 20° 70°		
29	100		770					
30	100	<100° at 779'	780					
31	92 55		790			50°		792'-799': driller reports 3' core groun up.
32	43		800		Intraflow breccia fr 792'-800', oxd dk rd-brn; ves.			

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
32	96					40° / 65°		
33	100		810					
	100							
34	0		820		Basal breccia (?) fr 821'-825', prt oxd.			
	33							
	80		830		825'-856': BASALTIC ANDESITE (?), med dk gry; rare Ol (< 1mm)			
35	94				and Plag micphen; vfn xln to glassy grnd. Crude flow banding			
			840		dips 0-25°.			
36	93							
			850		ves fr 854'-856'.			
37	70							
			860		856'-963': BASALTIC ANDESITE, med dk gry, abd subhd to euhd			
38	70	<100° at 870'			Plag phen (1-5 mm), abd subhd Ol phen (1mm); dissem Mag;			
			870		vf xln to glassy grnd.			
	30							
39	100		880		Flow top breccia fr 856'-883', oxd.			
40	100							
			890					
	66					60°		
41	100		900					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
41	100					70°		
42	100		910			80° 60°		
43	100		920			60° 60°		
44	100		930			80°		
45	72				Ves fr 937'-963'; oxd gry-rd to brn-gry			
	57		940					
46	100		950					
47	100		960		6" ashy soil zone (?) at 963'			
48	30		970		963'-1172': BASALT, dk gry to gry-blk, abd subhd to euhd Plag phen (1-5mm), abd subhd to euhd Ol phen (1-2mm). Occ glomeroporphyritic Ol + Plag. Dissem Mag throughout.	60°	979'-1046' Fe Ox on fracture surfaces	
	100							
	100		980					
49	100							
	89	<100° at 999.6'	990		Flow top brec fr 963'-975', oxd.			
50	55							
	60		1000					

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
51	63					55° 70°		
	78		1010		fnly ves fr 979'-1046'; prt oxd	80° 20°		
52	83					45° 35°		
	50					70° 25°		
	50		1020			60° 60°		
53	66					15° 60°		
	40					80° 50°		
	72		1030			60° 40°		
	81					25°		
54	71		1040		Col chg bel 1046' to lt brn-gry			
55	95		1050			70° 20°		
56	95		1060			50° 40° 75°		
57	100		1070			80°		
58	100		1080			45°		
59	100		1090		Flow banding fr 1097'-1117', 1mm thick, 2-5 cm apart, dip 50°	30°		
60	100		1100			50°		

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
60	98							
61	98		1110			25° 70°		
62	96		1120			25° 70°		
63	100		1130			25°		
64	100		1140			20°		
65	98		1150		1172'-1188': ~~LITHIC CRYSTAL TUFF~~ ash flow, rd-brn to olv blk to brn-blk,	10° 50° 70°		
66	100		1160		with abd lith frags (andesite?) (up to 2 cm) and abd broken subhd to anhd Plag xls (1-2 mm). Mat grades from olv blk glass to clay. Unit poorly sorted.	10° 20° 5° 30°		
67	93		1170			20° 10° 5°		
68	82		1180		Slightly welded zone with black glass fiamme fr 1172.2'-1184', lt brn to mod brn. Fiamme are 1-2 mm thick, up to 3 cm long, compacted horiz.			
69	83		1190					
70	64				1188'-1248': BASALTIC ANDESITE, Med gry with mod rd to			
71	79		1200					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
71	100	<100° at 1201'	1210		v dk rd mottling, sps Plag phen, rare Ol phen. Flow top breccia fr 1188'-1201'.		Fe Ox coating fractures	
72	88				Bel 1208', com anhd Plag phen (1-3 mm).	60° 30°		
73	100		1220		fnly ves (ves < 1mm dia)	10°		
74	84		1230			75°		
75	90		1240		Unit grades to dusky rd cinders fr 1244'-1248'.	25° 35°		
76	45 70 45		1250		1248'-1294': BASALTIC ANDESITE, med dk gry, sps Ol, Plag, Px phen. Ol, Px disappear with depth, Plag becomes com.			
77	40 56		1260		Unit is fnly ves to nonves.			
78	100		1270		Flow top brec fr 1248'-1261'.	30° 80°		
79	100		1280			90° 10°		
80	65 22		1290		1294'-1312': NO SAMPLE	45°		1301'-13 Rods was in witho rotation
			1300					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
80	0	< 100° at 1325'	1310					
	56		1320		1312'-1318': ASH, olv blk, fn-med gry sand-size, glassy fragments, grds downward to mod brn slt to clay size particles (soil horizon?).			1318'-1319.5' driller reports washout-no sampl
81	86							
	62		1330					
	79				1318'-1319.5': NO SAMPLE			
82	94		1340					
83	100				1319.5'-1363': BASALTIC ANDESITE, med dk gry, sps subhd Ol phen, rare anhd Plag phen (2 mm), both become com with depth.	80° 70° 30°		
			1350					
84	95							
			1360		Flow top brec fr 1319.5'-1331'. Loc ves (up to 5 mm dia) fr 1319.5'-1355', com ves bel 1355'			
85	9		1370					
					1363'-1384': LITHIC TUFF, lt brn to mod brn, lithics up to 7 cm long (andesite?) in a clay to Slt-size ashy Mat.		Limonite fracture coatings	
86	75		1380					
	100					50°		
87	63		1390		1384'-1424': BASALTIC ANDESITE, med gry to med dk gry, sps Plag phen (1-2 mm) and rare Ol phen.		Fe Ox fracture coatings	
88	70		1400					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
88	100 / 65	65° at 1408'	1410		Intraflow(?) brec fr 1393'-1401' and 1403'-1405'; ves, oxd gry-rd to dusky rd.	20°, 70°, 5°	Fe Ox mottling and webbing - deuteric	-
89	100							
90	76		1420		1424'-1511': ANDESITE, brn-gry to med gry, aphyric to rare Plag and Ol phen. Flow top brec fr 1424'-1430'.	50°, 25°		
91	50 / 100		1430			35°		
92	70		1440		Ves fr 1430'-1439'.			
93	58 / 48 / 100		1450		Intraflow brec fr 1441'-1450'.	30°, 60°		
94			1460			50°, 30°		
95	94 / 58		1470		Ves (1-5 mm dia) fr 1475'-1481'.	50°, 50°		
96	100		1480				Fe Ox coats fracture surfaces.	
97	89 / 83		1490		Intraflow brec fr 1494'-1496'; ves, oxd dk red brn	70°, 30°, 40°		
98	84		1500					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
98	84	54° at 1512'	1510			50° 20° 30°	Minor Fe Ox coats fracture surfaces	
99	79					50°		
100	82		1520		1511'-1544': BASALT, dk gry, mainly aphyric, with rare subhd Ol phen (1-2 mm dia). Flow top brec fr 1511'-1521'; ves, oxd dk rd-brn.	20° 50°		
101	93		1530			60° 50° 70°		
102	95		1540			60°		
103	77		1550		1544'-1677': BASALTIC ANDESITE, med gry to gry-blk, abd euhd to anhd Plag phen. (up to 5 mm), com yel-gr Ol phen.			
104	70		1560					
105	44 61		1570			10°		
106	86 95		1580			60° 30° 20° 30°		
107	84		1590		Bel 1594', Plag phen decline.	60° 55° 70°	Abd Fe Ox coats fracture surfaces	
108	100		1600			80° 10° 50°		

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY Michael C. Hagood DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
109	100	54° at 1612'	1610			50°, 90°, 30°	1600'-1642': Abd or Fe Ox coats fracture surfaces	
110	76		1620			45°		
111	98				Local phen-rich zone fr 1625'-1626': abd Plag phen (up to 2mm).	50°, 35°		
112			1630			75°		
113	97		1640		Bel 1626', aphyric, rare Ol phen.	25°, 70°		
114	80		1650		Ves fr 1645'-1648', elong horiz.	30°, 65°	1642'-1788': Com Fe Ox coats ffac-ture surfaces	
115	83, 81		1660		Ves fr 1660'-1672', elong, horiz.	35°, 15°		
116	89		1670			15°		
117	67, 43		1680		rd-br ashy soil horizon (?) fr 1677'-1678'.			
118	85, 22, 53		1690		1678'-1732': BASALT, dk gry, aphyric, slightly to com. ves, flow banding com subhoriz; flow top brec fr 1678'-1682'.	30°, 70°		
			1700					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
119	53	55° at 1712'			Intraflow brec fr 1699'-1706'	70°, 40°, 20°	Or Fe Ox stains on flow tops and fracture surfaces	
	91		1710					
120	79					30°		
	69		1720			30°		
121	81		1730		Basal brec fr 1727'-1730'.			
122	79							
	29							
	8		1740		1732'-1815': BASALT, grnsh-blk to dk gry, sps Plag phen (up to 2mm), rare Ol phen (< 1mm). Flow top brec fr 1732'-1749'.			
	20							
	31							
	96		1750		Ves sps to com, up to 2 cm dia.	45°		
123	78							
	24					30°		
	94		1760			30°	Orange Fe - Ox stains on fracture surfaces; greenish-gray to yellow clay along fracture surfaces	
124	88					70°		
			1770			60°		
125	100					30°		
			1780		V fn gr to glassy fr 1782'-1784'	65°, 45°		
126	81					25°		
			1790			60°, 25°		
127	98					10°		
128			1800			20°		

CORE LOG

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COMPANY GEOOC LOGGED BY Michael C. Hagood DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
128	98	54° at 1817'	1810		Basal brec fr 1807'-1811'.	60°	1800'-1860': yel, red Fe Ox staining on fracture surfaces	Fluid lev at 1000'
129	84, 100							
130	77, 93		1820		1815'-1860': BASALT, dk gry, sps Plag phen (< 3mm), rare Ol phen; fn gr grnd, fnly ves; flow banding subhoriz. Flow top brec fr 1815'-1822'.			
131	100		1830			60° 80°		
132	80, 83, 63		1840		Intraflow brec fr 1832'-1840'.	20°		
133	80, 78, 65		1850		Intraflow brec fr 1842'-1857'.	40°		
134	82		1860		1860'-1876': LITHIC TUFF, Yel-gry to lt olv gry clay fragments up to 2 cm length with lesser basalt, cinder and pumice clasts, in clay mat. Fng upward of clast size noted. Base of unit in contact with intrusive: glassy, med gry, fr 1876'-1877', intrudes at angle of 50°, abd Plag & Ol phen.	45°		
135	96		1870			80° 40°		
136	73, 63, 56		1880			30° 50° 70°		
137	100		1890		1877'-1915': BASALT, med dk gry, com Plag & Ol phen; flow top brec fr 1877'-1887'; Intraflow brec fr 1892'-1895'.	10° 30° 85°		
138	87		1900					

CORE LOG

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
138	87	55° at 1900'				80°		
139	75		1910		Basal brec fr 1905'-1915', oxd.	70°		
	186							
140			1920		1915'-1919': LITHIC TUFF, clasts of pumice & cinder up to	45°		
	90				1 cm in clay mat; fng upward seq noted; bake zone fr 1915'-			
141			1930		1918', oxd mod rdsh-br to lt br.	60°		Fluid level fluctuates between 1200' and 1800'.
	65					50° 50°		
	100							
142	76		1940		1919'-1982': BASALT, med dk gry to dk gry, com Plag &	60°		
	69				Ol phen (< 1mm). Ves (1mm-3cm), elong, subhoriz. to 45°,	70°		
	42		1950		fr 1919'-1969'.			
143	63					50°		
	72							
	83		1960		Intraflow brec fr 1943'-1960'	45°		
144	64							
	93		1970			45°		
145								
	92		1980		1982'-2010': BASALTIC ASH & CINDERS, v dk rd to mod rd ash	70°		
146					and sand-size part fr 1982'-1987', mainly alt. to clay,			
	88		1990		oxd, fng upward seq noted. Grades downward to cinder and			
147					basalt clasts (up to 1 cm in length) in a clay matrix.			
148	85		2000			45°		

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BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
148	85	54° at 2002'	2010		2010'-2162': BASALT, med dk gry, sps Plag & Ol phen (< 1mm in length), com fractures dip 35-70°, spaced 10-50 cm apart.	60°; 10° 70°; 40°; 10° 70°; 45°; 35° 70°; 60°; 30°; 90° 25°; 40°; 30°; 60°; 75°	2016'-2020': Abd or Fe Ox staining on fracture surfaces.	Fluid leve at 1700'
149	87							
150	91		2020					
151	92		2030					
152	94		2040					
153	96		2050		Intrusives fr 2039'-2044' and 2063'-2071' (?): basalt (?), blk, aphyric, with glassy chill margins up to 4mm wide. Intrusives appear to be mainly along fractures, which dip 35°-70°. Ves trains, subvert, noted.			
154	83		2060					
155	93		2070					
156	100		2080					
157	100		2090					
158	98		2100					
159	97							

CORE LOG

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COMPANY GEOOC LOGGED BY Michael C. Hagood DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
159	97	55° at 2108'	2110		Intrusives fr 2103'-2105', 2122'-2126', 2142'-2145', 2179'-2182', 2189'-2190': basalt (?), blk, aphyric, chill margins (up to 2mm wide) noted, contacts dip 60°-70°, ves up to 3mm dia align 60°-70°.	60° 30° 40° 20° 45° 70° 75° 20° 60° 30° 60° 30° 60° 25° 20° 80° 20° 60° 60° 60° 30°	Grnsh-yel Fe-Ox + Clay(?) fills fractures. Yel-or Fe Ox on fracture surfaces Yel-or Fe-Ox + clay (?) in fractures	Fluid le at 1400'
160	100		2120					
161	100		2130					
162	100		2140					
163	100		2150					
164	100		2160					
165	100		2170					
166	63		2180					
167	96		2190					
168	86		2200					
169	93							
170	98							
	100							

CORE LOG

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COMPANY GEOOC LOGGED BY Michael Johnson DATE _____ GR.ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
170	100	<100° at 2207'	2210			20° 60°	Or-yel Fe-Ox + clay (?) lines fractures	
171	100							
172	100		2220		Intrusive(?) fr 2209'-2252' (?), grysh-rd, sps to com anhd Plag phen (up to 2mm); chill margin occurs at top, but not detected at lower contact. 4 cm thick black aphyric basalt(?) intrusive noted at lower contact.	70° 30°		Fluid le fluctuat fr 1400' 1700'
173	100		2230			60°		
174	100					30° 60°		
175	100		2240					
176	94		2250		2252'-2300': BASALTIC ANDESITE(?), grysh-rd to med gry, v abd anhd Plag phen up to 4mm in length. Abd ves fr 2252'-2267' up to 2cm dia.	70°		
177	86		2260				Ves lined with botryoidal red Fe-Ox	
178	96		2270			60°		
179	98		2280		Intrusives fr 2269'-2270' and 2278'-2279', basalt(?) black, aphyric.	60°		
180	89		2290		Basal brec fr 2288'-2295'.			
181	58		2300					
	93							
	82							

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY Michael Johnson & B. Sibbett DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
181	82	<100° at 2308'	2310		Intrusives, fr 2300'-2335' and 2351'-2358': BASALTIC ANDESITE (?), med dk gry, fn gr, sps Plag phen, rare Ol phen, fnly dissem Mag; upper contact dips 85°; lower contact shows chill margin. Intrusive contact at 2351' dips 30°, and contact at 2358' dips 60°.	30°, 53°, 10°, 40°, 60°, 45°, 20°, 20°	Clear, rounded flat min in fractures of intrusives. Fe-Ox stains fracture surfaces.	Fluid level at 1600'
182	100							
183	100		2320					
184	97		2330					
185	94		2340		2335'-2421': ANDESITE(?), med gry, sps Plag phen (up to 2mm length), sps Ol phen, abd fnly dissem Mag. Ol incr with depth, altered to iddingsite(?). With incr. depth, xl boundaries become indist; appear to coarsen; unit takes on grnsh-blk tint. Flow banding irreg to vert. Fractures parallel to flow banding.	30°, 30°, 30°, 10°, 60°, 30°	Green, glassy min at basal contact of dike (2335'). Olivine altered to Idding site(?)	
186			2350					
187	98		2360					
188	100		2370					
189	100					10°, 15°, 20°	2359': Calcite fills vugs. Fe-Ox stains vugs.	
190	96		2380					
191	95	<100° at 2398'	2390			60°		
192	100		2400					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY Michael Johnson & B. Sibbett DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
192	100					40°		
193	100		2410			60° 20°		
194	96		2420		2421'-2501': BASALT , dk gry, sps Plag phen, fn mafics			
	46				(magnetite?) oxd to hematite(?). Unit is fn gr but coarsens			Fluid level at 1600'
195	92		2430		with depth. Phen have indist bnd, Plag up to 3mm in length.			
196	94				Flow top brec mixed with ash, oxd, fr 2421'-2431'.	30° 80°		
			2440				$CaCO_3$(?) spars in vugs; lesser grnsh-br clay(?) in vugs.	
197	95					20°		
			2450					
198	100							
			2460			70°		
199	97					30°		
			2470			45°	sps euhd qtz xls (2mm in length) on fracture surfaces. green clay in fractures	
200	100					40°		
			2480					
201	100					30° 20°		
			2490					
202	100						$CaCO_3$(?) in vugs.	
203			2500			30°		

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor Sec. 25 T22S. R12E.

COMPANY GEOOC LOGGED BY Michael Johnson DATE GR.ELEV. 5840'

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
203	100	<100° at 2502'	2510		2501'-2541': ASH & CINDERS, grysh-rd to mod rdsh-br fr 2501'-2516', grades to med gry beneath 2516'. Cinder frags up to 5 cm dia in an ash mat.	30°	rare white spherical to flat min on fracture surfaces	Fluid level at 1600'
204	93							
205	100		2520					
206	96		2530					
207	100		2540					
208	98		2550		2541'-2616': BASALTIC ANDESITE, med gry, rare anhd Plag phen.		2551': dusky blue powder on fracture surfaces.	
209	100		2560					
210	100		2570			75° 30°	Fe-Ox on fracture surfaces.	
211	100		2580			10°		
212	97		2590		Ves zone fr 2589'-2599'	70°	2616': clear 'cubic' min fills vugs, H-3	
213	100		2600		Brec fr 2589'-2593'			

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W.&2750'N. of SE Cor. Sec. 25 T22S. R12E.

COMPANY GEOOC LOGGED BY Michael Johnson DATE _____ GR.ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
214	100	<100° at 2602'	2610		Basal brec, ves, fr 2612'-2616'	20° 60°	Clear 'cubic' min in vugs, H~3.	Fluid lev fluctuat fr 1600'. 1800'.
215	95							
216	83		2620		2616'-2625': ASH & CINDERS, mod br to grysh rd, ash grades downward to cinders in ash mat.	10°	Chlorite(?) on fracture surfaces	
217	96		2630		2625'-2651': BASALTIC ANDESITE(?), med gry, aphyric.	10°		
218	98		2640				2668'-2673': lt blsh-gry to pale bl powder lines vesicles.	
219	98		2650			10° 30° 50°		
220	100		2660		2651'-2677': BASALTIC ANDESITE(?), med dk gry, sps to com Plag phen , sps Ol phen. Mod rd ash & cinders fr 2651'-2654'.	30°		
221	90		2670		Flow top brec fr 2654'-2667', ves, oxd.			
222	92		2680		2677'-2689': ASH & CINDERS, basaltic(?) cinders and basalt fragments in lt olv br to grysh rd clay to sand size mat,	70° 80° 15°	Clear to white min (H~3) fills vugs.	
223	92		2690			85°	Green clay(?) fills fractures.	
224	100							
	98		2700					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY Michael Johnson DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
225	98				2689'-2725': BASALTIC ANDESITE(?), med dk gry, sps to com		Pale green botryoidal min in fractures (H~4)	
	93		2710		Plag phen, sps Ol phen, rare Px phen. Flow banding horiz to	10° 30°		
226	100	<60° at 2712'			subhoriz. Basal brec fr 2719'-2725'.	70°		
			2720					
227	96				2725'-2731': TUFF, mod br to lt br, coarse sand-size volcanic	15°		Fluid level at 1600'
			2730		frags and lesser Plag, Qtz(?) and Mafic phen in clay mat;	60°		
228	88				appears to become finer downward; color banding coincides			
			2740		with bedding; color bands are 2-5 cm thick; Ves basalt frags			
229	78				up to 7 cm dia are incorp within unit. Base of unit has			
			2750		numerous basalt clasts incorp (up to 4 cm dia). Beds dip 0-15°.	10°		
230	67					40°		
	95					50°		
231	77		2760		2731'-2823': BASALTIC ANDESITE(?), med dk gry, com Plag phen,			
	91				sps to com Ol phen, sps glomeroporphyrocrysts of Plag & Ol. Unit	10°		
232			2770		is fn-gr but becomes more coarsely xln with depth. Minor	70°		
	100				mafics (Mag?) oxd (to Hematite?) rd. Gr bnd indist with depth		White min, H~5, fills smaller vesicles	
233			2780		indist flow banding subhoriz.			
	96							
234			2790		Flow top brec fr 2731'-2761', rubbly, ves.			
	100							
235			2800					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T22S. R12E.

COMPANY GEOOC LOGGED BY Michael Johnson DATE GR. ELEV.

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
235								
236	100		2810			20°	green clay(?) on fracture surfaces	
237	98	<60° at 2820'	2820					
238	97				2823'-2850': ASH & CINDERS, angular frags of ves basalt(?)			
			2830		up to 5 cm dia, tan to lt gry volcanic lithics up to 1 cm dia,			Fluid lev at 1600'
239	93				in a mod rdsh-br to dk rdsh-br ash mat. Rare Plag xls also			
			2840		occur surrounded by ash mat. Upper contact sharp. Col	30°		
240	82				becomes dk rdsh br with depth, cinders more abd, mat less abd.	50°		
			2850					
241	100				2850'-2880.5': BASALTIC ANDESITE(?), med dk gry, com Plag	45°		
			2860		phen, sps Ol phen	60°		
242	96					70°		
			2870		Ves fr 2861'-2878', elong ves up to 3 cm long.		2888': green transluc. Min	
243	94							
			2880				rare cream to pale yel botryoidal min in ves, H-3. rare clear 'cuboc' min in ves	
244	98				2880.5'-2890': TUFF:, mod rdsh-br to 2888', grds to mod or-			
245		64° at 2890'	2890		pink below 2888'; mainly ash with sps glassy to ves. volcanic			
246	98				frags, angular, com 1cm, but up to 5 cm dia. Appears			
			2900					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T22S, R 12E.

COMPANY GEOOC LOGGED BY Michael Johnson, William J. Dansart DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
246					to be weakly bedded			
247	89		2910			50°		
248	100		2920		2890'-2901': ASH & CINDERS, dk gry cinders in dk gry ash mat.	50°		
249	100 93		2930		2901'-2944': BASALTIC ANDESITE(?), med dk gry, abd anhd Plag phen (~ 2mm dia), rare to sps Ol and Px(?) phen, Tr dissem Mag. Lower contact abrupt; chill margin?	60°		Fluid lev at 1600'
250	86		2940					
251	93		2950		2944'-2956': ASH & CINDERS, rd-brn ash and ves rd-brn to med gry cinders (up to 20 cm long).		2943.5': Poss K-spar & secondary biotite in hairline fracture.	
252	81		2960					
253	57 55		2970		2956'-3002': BASALT(?), dk gry, sps anhd Plag phen (~ 2mm dia), abd ves fr 2956'-2983'. Brec fr 2956'-2969'.	40°		
254	61							
255	81		2980					
256	92	< 60° at 2996'	2990					
257	97		3000					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY William J. Dansart DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
257	97				3002'-3069': BASALTIC ANDESITE(?), gry-brn to dk gry, abd		Calcite fills vugs, fractures.	
258	97		3010		subhd to anhd Plag phen (~3mm dia).			
					Oxd, ves fr 3002'-3012'.	80°		
259	97		3020			40°		
260	98		3030					Fluid level at 1600'
261	95		3040			50°		
262	100		3050					
263	92		3060					
264			3070		3069'-3114': ANDESITE(?), med gry, com subhd to anhd Plag phen (~3mm long), sps Ol phen.			
265	97				Oxd, ves fr 3069'-3073'.		3077': cream-colored botryoidal min fills vugs	
266	92		3080		Ves fr 3073'-3105'.	30°		
267	100	57° at 3098'	3090				Chlorite(?) com fills fractures	
268	100		3100					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY William J. Dansart & Michael Johnson DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
268	100		3110					
269	100							
	100				3114'-3118': LAPILLI TUFF, grnsh-gry, grades downward to med brn; upper portion contains subangular andesite(?) clasts up to 5 cm long. Unit is horiz. bedded fr 3116'-3118'. Coarsening upward sequence noted.	50°		
270	98		3120			40°		
271	98		3130			25°	Green clay(?) in fractures, vugs.	Fluid level at 1600'
272	98		3140		3118'-3211': ASH & CINDERS, mod rdsh-brn to dk rdsh-brn to dk gry cinders up to 25 cm dia in an ash matrix. Unit was invaded by dikes which appear to have been subsequently brecciated. Bel 3124', numerous brec frags of dike material occur, cont to 3211'.	35°		
273	98		3150			50°	Chlorite(?) fills fractures.	
274	78		3160			60°		
275	98		3170		Intrusive fr 3118'-3124', dk gry, sl ves, dips 50°	30°	white finely radiating needles in fractures.	
276	100		3180			55°		
277	86		3190			60°	3180': white anhd min, H3-4.	
278	80		3200			40°		

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY William J. Dansart & Michael Johnson DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
279	93	58° at 3208'	3210		3211'-3332': ANDESITE(?), med dk gry, occ Plag & Ol phen. Abd hairline fractures, com spaced 1-3 cm apart, dip 50-70°. Sps high angle veins (>70°), 1 to 5 mm thick, cross cut the earlier hairline fractures.	60° 10° 45° 55° 50° 70° 50° 20° 70° 30° 50° 60° 80° 70° 80°	3227': green chlorite(?) on fracture surfaces. larger fractures filled with calcite Feldspar(?) and chlorite. Poss chlorite envelope (1-2mm thick) around veins	Fluid level at 1600'
280	90		3220					
281	95		3230					
282	100		3240					
283	100		3250					
284	100		3260					
285	91 / 71		3270					
286	95		3280					
287	89		3290					
288	100		3300					
289	100							

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOQC LOGGED BY William J. Dansart DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
290	100	82° at 3312'	3310			70° 80°	Calcite(?) & chabazite(?) fill vesicles.	
291	100		3320			60° 80° 70°		
292	100		3330		3332'-3349': ASH & CINDERS, dk rdsh-brn to brnsh-blk ang to subang volcanic rock frags (andesitic?) up to 15 cm in dia in an ash matrix.			Fluid level at 1600'
293	93		3340					
294	95		3350		3349'-3365': LAPILLI-ASH FLOW TUFF, grysh-ol to lt brnsh-gry, abd clasts of pumice to flattened pumice, volcanic frags and obsidian frags up to 3 cm dia. Unit shows fining downward sequence. Crude horiz. bedding throughout, loss of larger clasts with depth. Ash has been clay altered.			
295	99		3360					
296	98		3370					
297	98		3380					
298	97		3390		3365'-3384': CINDERS & ASH, grysh blk to dk rdsh-brn, cinders up to 15 cm dia in ash mat.			
299	85		3400					
300								

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R12E.

COMPANY GEOOC LOGGED BY William J. Dansart & Michael Johnson DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
300								
301	100	60° at 3411'	3410		3384'-3416': ANDESITE(?), dk rdsh-brn to grysh-blk to med gry, Occ Plag & Ol phen (< 1mm dia) in fn gr mat. Flow basal brec fr 3411'-3416'.		Minor calcite(?) fills open spaces	
302	73		3420					
	100				3416'-3440': LAPILLI TUFF, dk rdsh-brn to dk grnsh-gry to			Fluid level at 1600'
303	100		3430		olv blk, clay-altered, compacted. Abd subang volcanic rock			
304	96		3440		frags up to 8 cm dia bel 3428' and cont to 3440'. Upper portion of unit shows crude horiz bedding. Whole unit appears			
305	95		3450		to exhibit fining upward. Poss small slks at 3434'.			
306	88		3460		3440'-3461': ANDESITE(?), med gry, ves fr 3440'-3450',		tr chlorite(?)	
307	63				Crude flow bands fr 3456'-3461' dip 30-60°. Fractures are			
	36		3470		horiz., give platy effect.			
308	90		3480		3461'-3473': ASH & CINDERS, brec, dk gry to dk rdsh-brn.	25° 15°		
309	88				3474'-3487': ANDESITE(?) med lt gry, aphyric, massive.	10°		
310	90		3490		3487'-3492': ASH & CINDERS, med dk gry to dk rdsh-brn.			
311	100		3500		3492'-3538': ANDESITE(?), med gry, com to abd.			

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T22S, R12E.

COMPANY GEOOC LOGGED BY Michael Johnson DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
311	100	95° at 3518'	3510		anhd Plag phen (approx 2mm dia). Rare flow bands dip 10-15°. Horiz to subhoriz fractures are com to abd. Intraflow brec fr 3520'-3525', ves, oxd.	50°	veinlets filled with white mineral, H~4. 3520'-3538': veinlets of chlorite & calcite(?) surrounded by chlorite selvages up to 3mm thick	Fluid level at 1600'
312	98							
313	86		3520					
314	82		3530			50° 60° 50° 75° 20°		
	100							
315	95		3540		3538'-3566': BASALTIC ANDESITE(?), med gry to dk gry, com fn subhd Plag phen in upper portion of unit. Ves fr 3539'-3563'; minor mod rdsh-brn ash at upper contact.			
	43							
316	100		3550					
317	98		3560				Minor calcite + white Mineral in vugs.	
318	95		3570		3566'-3621': BASALTIC ANDESITE(?), med gry to med dk gry, aphyric. Ves fr 3566'-3616'. Ash & cinders fr 3566'-3569'; brec fr 3568'-3571'. Flow bands at base of flow are subhoriz.	30° 40°		
319	98		3580					
320	96		3590			30°	Chlorite(?) coats fracture surfaces	
	82				fault, minor at 3595', minor brec, slks(?)			
321	97		3600					

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T 22S. R 12E.

COMPANY GEOOC LOGGED BY Michael Johnson DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
322	97	97° at 3615'	3610				Abd chlorite(?) in fractures, fills open spaces.	
323	97					15°		
	81		3620		3621'-3662'; ANDESITE(?), med gry, brec fr 3621'-3630'.		White to pale yel min in vesicles	
324	67				Ves fr 3621'-3634'.			
	53		3630					Fluid level at 1600'
325	100							
	100		3640					
326	100						White to translu radiating min in fractures, open spaces.	
			3650					
327	95	138° at 3672' after 12 hours build-up				40° 70°		
			3660		3662'-3664'; LITHIC TUFF, mod rdsh-brn, com glassy lithic	60°		
328	97				frags (up to 3 cm dia) in abd ash mat, clay altered. Crude			
			3670		horiz bedding noted. Blk, flattened glass frags rare.			
329	98						pale blue powder lines vugs, fractures.	
			3680		3664'-3691'; ANDESITE(?), med gry, rare Plag phen.	60° 30°		
330					Ves locally, elong to rounded (up to 1 cm dia).			
331	97		3690				White vein min, H 4.	
					3691'-3714'; LITHIC CRYSTAL TUFF, dusky rd to olv blk.	10° 50°		
332	96		3700					

CORE LOG

PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. & 2750'N. of SE Cor. Sec. 25 T22S. R12E.

COMPANY GEOOC LOGGED BY Michael Johnson & William J. Dansart DATE _____ GR. ELEV. _____

BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
332	96				togrnsh gry to dk grnsh gry; abd ang to subang andesite(?)			
333	100		3710		clasts (up to 2 cm dia) and com Feldsp phen in a clay mat.			
					Clasts decrease in abudance with depth. 10 cm thick zone of		Chlorite(?) on fracture surfaces, calcite in vugs.	Fluid lev at 1600'
334	85		3720		100% clay occurs fr 3703'-3703.5'. Black glassy zones fr	50° 35°		
					3693.5'-3696' and 3708'-3712'.			
335	100	114° at 3732'	3730			40°		
					3714'-3811': DACITE(?), med gry, glassy appearance, abd Plag			
336	100		3740		phen. Sps flow bands dip 60-90°. Hairline fractures dip up		Pale blue-green powder on fracture surfaces.	
					to 20°, angle decrease to subhoriz toward flow base; com			
337	100		3750		spaced 1-3 cm apart. Bel 3804', Plag phen become abd;			
					Flow banding becomes chaotic.			
338	81		3760		Poss intrusive fr 3708'-3712'; very glassy, no chill margins			
	87				observed.		Cream-colored min fills fractures.	
339	98		3770					
340	100		3780					
341	88		3790				Chlorite(?) calcite in hairline fractures.	
342	98		3800					

CORE LOG

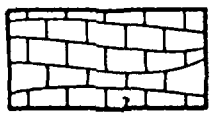
PROJECT Newberry, OR HOLE NUMBER N-1 LOCATION 3600'W. &2750'N. of SE Cor. Sec. 25 T 22S R 12E.

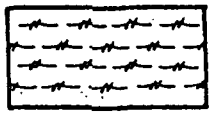
COMPANY GEOOC LOGGED BY Michael Johnson DATE _____ GR.ELEV. _____

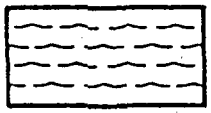
BOX NUMBER	CORE RECOVERY (PERCENT)	TEMP. °F (BHT)	DEPTH FT.	LITHOLOGY	LITHOLOGIC DESCRIPTION	FRACTURES	ALTERATION	DRILLING INFORMATION
343	98	128° at 3804'	3810		3811'-3840': TUFF, mod rdsh-brn to grnsh-gry, shows bedding (? - may be flow banding), at 3812', dipping 30°; minor volcanic lithic frags; primarily ash altered to clay. Blocks of overlying unit up to 2 m thick have been incorp into this unit. Minor slks at base of unit, poss fault dips 50-70°.			
344	100							
345	97		3820					
346	97		3830					
347	81		3840		3840'-4176': DACITE(?), med gry to pale rd to grysh-rd, abd subhd Plag phen, com Px(?) with depth; glassy to fn-gr, becomes med-gr with incr depth.	55° 60°	Chlorite(?) & calcite in fractures	
348	78	124° at 3854'	3850			60°		
349	95		3860					
350	100	138° at 3864'	3870			90° 60°	Plag appears slightly altered	
351	100		3880					
352	87		3890			75° 35°		
353	100		3900			60°		

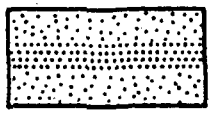
GEO N-1 HQ CORE HOLE
LITHOLOGIC LOG

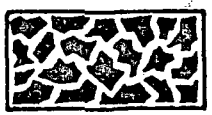
Explanation

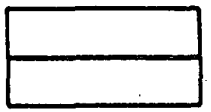

Basalt or Basaltic Andesite

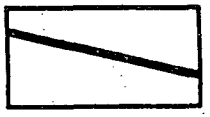

Andesite


Dacite or Rhyodacite

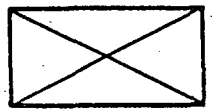

Tuff or Ash & Cinders


Brecciated or Fragmented Zone


Contact


Fault


Intrusive


No Sample

GEOOC 1-86