

October 10, 1986

RECEIVED

OCT 14 1986

TPC - Santa Rosa



Mr. Joe Iovenitti
Thermal Power Company
601 California Street
San Francisco, CA 94108

Dear Joe:

Enclosed is a copy of the **temperature depth log** from the deep hole in the Cascades. It looks pretty similar to the one that you showed at the meeting. I have enclosed a listing of temperatures for the hole at 5 meter intervals in both english and metric units. Thermal gradient appears to be basically conductive below a depth of about 350 meters or 1200 feet. There are small irregularities in the curve that are related to losses of circulation during drilling. Similarly the wiggles in the upper part of the curve relate to areas of fluid loss during drilling, and the bump at 300 meters (1000 feet) would apparently be related to a fairly significant loss of fluid at that point. However, these effects are all relatively minor. The gradient is quite uniform at about 4.6°F/100 feet. As you pointed out in your paper this ratio is significantly above the background observed at the edge of the high and western Cascades and suggest that either heat flow is higher along the Cascades access or that there is an anomaly in the vicinity of this particular hole such as the existance of geothermal aquifer at greater depth. Obviously there is no way to resolve this situation without additional exploration information.

Also enclosed in this letter is the key to the drill hole. The temperature log from the hole is good enough that I don't think there is any need to relog it this year. We will want to get a final equilibrium log with our equipment at the start of next summer. Until then this data should be satisfactory for various kinds of analyses.

Sincerely yours,

Joe

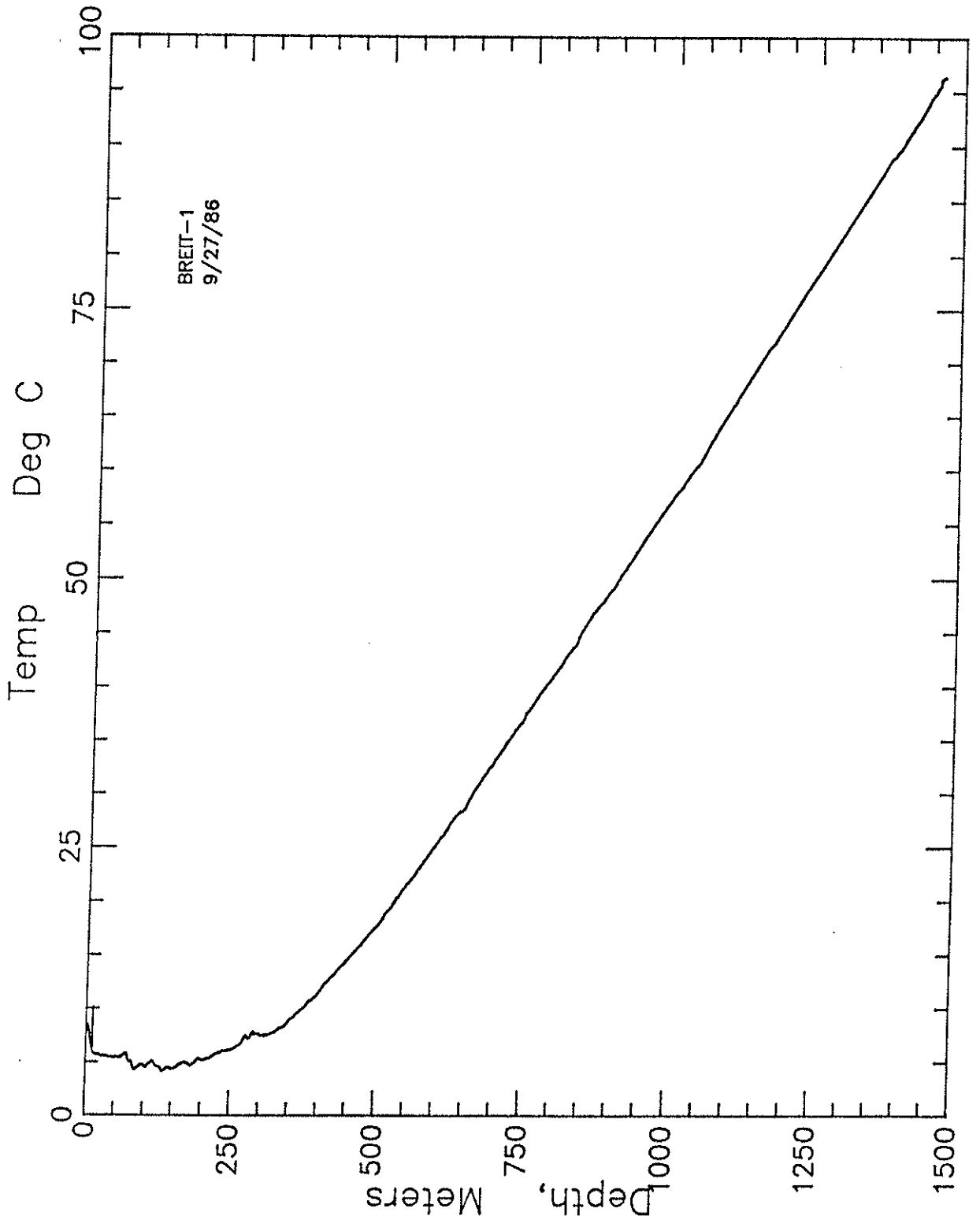
David D. Blackwell

DDB/mw

Enclosure



DEPARTMENT OF GEOLOGICAL SCIENCES / 214 • 692-2750
SOUTHERN METHODIST UNIVERSITY / DALLAS, TEXAS 75275



LOCATION: BREITENBUSH THERMAL POWR
T/R-S: 8S/ 8E-28
HOLE NAME: BREIT-1
DATE MEASURED: 9/27/86

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT		I	DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT	I			DEG C	DEG F	DEG C/KM	DEG F/100
5.0	16.4	8.025	46.45	0.0	0.0	I	210.0	689.0	5.336	41.60	21.8	1.2
10.0	32.8	6.415	43.55	-322.0	-17.7	I	215.0	705.4	5.404	41.73	13.6	0.7
15.0	49.2	5.776	42.40	-127.8	-7.0	I	220.0	721.8	5.564	42.02	32.2	1.8
20.0	65.6	5.653	42.18	-24.6	-1.4	I	225.0	738.2	5.743	42.34	35.6	2.0
25.0	82.0	5.649	42.17	-0.9	-0.1	I	230.0	754.6	5.861	42.55	23.7	1.3
30.0	98.4	5.601	42.08	-9.6	-0.5	I	235.0	771.0	5.964	42.74	20.6	1.1
35.0	114.8	5.553	42.00	-9.5	-0.5	I	240.0	787.4	6.059	42.91	18.9	1.0
40.0	131.2	5.524	41.94	-5.8	-0.3	I	245.0	803.8	6.109	43.00	10.0	0.5
45.0	147.6	5.487	41.88	-7.6	-0.4	I	250.0	820.2	6.157	43.08	9.7	0.5
50.0	164.0	5.457	41.82	-5.8	-0.3	I	255.0	836.6	6.245	43.24	17.4	1.0
55.0	180.4	5.461	41.83	0.8	0.0	I	260.0	853.0	6.413	43.54	33.7	1.8
60.0	196.9	5.469	41.84	1.6	0.1	I	265.0	869.4	6.596	43.87	36.7	2.0
65.0	213.3	5.605	42.09	27.2	1.5	I	270.0	885.8	6.830	44.29	46.7	2.6
70.0	229.7	5.826	42.49	44.1	2.4	I	275.0	902.2	7.333	45.20	100.6	5.5
75.0	246.1	5.073	41.13	-150.7	-8.3	I	280.0	918.6	7.257	45.06	-15.2	-0.8
80.0	262.5	5.014	41.02	-11.8	-0.6	I	285.0	935.0	7.434	45.38	35.3	1.9
85.0	278.9	4.272	39.69	-148.3	-8.1	I	290.0	951.4	7.890	46.20	91.1	5.0
90.0	295.3	4.524	40.14	50.3	2.8	I	295.0	967.8	7.709	45.88	-36.1	-2.0
95.0	311.7	4.757	40.56	46.7	2.6	I	300.0	984.3	7.589	45.66	-24.1	-1.3
100.0	328.1	4.753	40.56	-0.8	0.0	I	305.0	1000.7	7.525	45.55	-12.7	-0.7
105.0	344.5	4.561	40.21	-38.4	-2.1	I	310.0	1017.1	7.524	45.54	-0.3	0.0
110.0	360.9	4.871	40.77	62.0	3.4	I	315.0	1033.5	7.577	45.64	10.6	0.6
115.0	377.3	5.069	41.12	39.5	2.2	I	320.0	1049.9	7.680	45.82	20.7	1.1
120.0	393.7	4.812	40.66	-51.2	-2.8	I	325.0	1066.3	7.763	45.97	16.6	0.9
125.0	410.1	4.602	40.28	-42.2	-2.3	I	330.0	1082.7	7.929	46.27	33.2	1.8
130.0	426.5	4.501	40.10	-20.2	-1.1	I	335.0	1099.1	8.155	46.68	45.0	2.5
135.0	442.9	4.140	39.45	-72.2	-4.0	I	340.0	1115.5	8.257	46.86	20.5	1.1
140.0	459.3	4.392	39.91	50.5	2.8	I	345.0	1131.9	8.440	47.19	36.6	2.0
145.0	475.7	4.544	40.18	30.3	1.7	I	350.0	1148.3	8.760	47.77	64.1	3.5
150.0	492.1	4.383	39.89	-32.3	-1.8	I	355.0	1164.7	9.041	48.27	56.2	3.1
155.0	508.5	4.426	39.97	8.8	0.5	I	360.0	1181.1	9.240	48.63	39.8	2.2
160.0	524.9	4.573	40.23	29.3	1.6	I	365.0	1197.5	9.548	49.19	61.6	3.4
165.0	541.3	4.815	40.67	48.4	2.7	I	370.0	1213.9	9.774	49.59	45.1	2.5
170.0	557.7	4.968	40.94	30.7	1.7	I	375.0	1230.3	9.998	50.00	44.9	2.5
175.0	574.1	4.978	40.96	1.9	0.1	I	380.0	1246.7	10.283	50.51	56.8	3.1
180.0	590.6	4.788	40.62	-38.0	-2.1	I	385.0	1263.1	10.624	51.12	68.4	3.8
185.0	607.0	4.804	40.65	3.2	0.2	I	390.0	1279.5	10.820	51.48	39.2	2.2
190.0	623.4	4.979	40.96	34.9	1.9	I	395.0	1295.9	11.044	51.88	44.7	2.5
195.0	639.8	5.342	41.62	72.6	4.0	I	400.0	1312.3	11.305	52.35	52.2	2.9
200.0	656.2	5.260	41.47	-16.3	-0.9	I	405.0	1328.7	11.648	52.97	68.5	3.8
205.0	672.6	5.227	41.41	-6.7	-0.4	I	410.0	1345.1	12.103	53.79	91.0	5.0

LOCATION: BREITENBUSH THERMAL POWR PAGE 2
 T/R-S: 85/ 8E-28
 HOLE NAME: BREIT-1
 DATE MEASURED: 9/27/86

DEPTH		TEMPERATURE		GEOTHERMAL GRADIENT		I	DEPTH		TEMPERATURE		GEOTHERMAL GRADIENT	
METERS	FEET	DEG C	DEG F	DEG C/KM	DEG F/100 FT		METERS	FEET	DEG C	DEG F	DEG C/KM	DEG F/100
415.0	1361.5	12.426	54.37	64.6	3.5	I	620.0	2034.1	26.684	80.03	89.8	4.9
420.0	1378.0	12.664	54.80	47.7	2.6	I	625.0	2050.5	27.253	81.06	113.8	6.2
425.0	1394.4	12.995	55.39	66.1	3.6	I	630.0	2066.9	27.625	81.72	74.4	4.1
430.0	1410.8	13.260	55.87	53.1	2.9	I	635.0	2083.3	27.961	82.33	67.3	3.7
435.0	1427.2	13.585	56.45	64.9	3.6	I	640.0	2099.7	28.232	82.82	54.1	3.0
440.0	1443.6	13.994	57.01	61.9	3.4	I	645.0	2116.1	28.378	83.08	29.2	1.6
445.0	1460.0	14.150	57.47	51.2	2.8	I	650.0	2132.5	28.672	83.61	59.0	3.2
450.0	1476.4	14.498	58.10	69.5	3.8	I	655.0	2149.0	29.269	84.68	119.4	6.6
455.0	1492.8	14.791	58.62	58.8	3.2	I	660.0	2165.4	29.735	85.52	93.2	5.1
460.0	1509.2	15.100	59.18	61.8	3.4	I	665.0	2181.8	30.270	86.49	107.0	5.9
465.0	1525.6	15.362	59.65	52.3	2.9	I	670.0	2198.2	30.668	87.20	79.6	4.4
470.0	1542.0	15.714	60.29	70.5	3.9	I	675.0	2214.6	31.101	87.98	86.6	4.8
475.0	1558.4	15.980	60.76	53.1	2.9	I	680.0	2231.0	31.524	88.74	84.6	4.6
480.0	1574.8	16.361	61.45	76.3	4.2	I	685.0	2247.4	31.928	89.47	80.7	4.4
485.0	1591.2	16.666	62.00	61.0	3.3	I	690.0	2263.8	32.410	90.34	96.4	5.3
490.0	1607.6	16.978	62.56	62.5	3.4	I	695.0	2280.2	32.601	90.68	38.3	2.1
495.0	1624.0	17.293	63.13	63.0	3.5	I	700.0	2296.6	33.182	91.73	116.1	6.4
500.0	1640.4	17.580	63.64	57.3	3.1	I	705.0	2313.0	33.546	92.38	72.9	4.0
505.0	1656.8	17.843	64.12	52.6	2.9	I	710.0	2329.4	33.957	93.12	82.2	4.5
510.0	1673.2	18.269	64.88	85.3	4.7	I	715.0	2345.8	34.376	93.88	83.8	4.6
515.0	1689.6	18.789	65.82	104.0	5.7	I	720.0	2362.2	34.814	94.66	87.5	4.8
520.0	1706.0	19.074	66.33	57.0	3.1	I	725.0	2378.6	35.183	95.33	73.9	4.1
525.0	1722.4	19.386	66.89	62.4	3.4	I	730.0	2395.0	35.609	96.10	85.3	4.7
530.0	1738.8	19.916	67.85	106.0	5.8	I	735.0	2411.4	36.050	96.89	88.2	4.8
535.0	1755.2	20.272	68.49	71.2	3.9	I	740.0	2427.8	36.399	97.52	69.9	3.8
540.0	1771.7	20.615	69.11	68.6	3.8	I	745.0	2444.2	36.689	98.04	57.9	3.2
545.0	1788.1	21.108	70.00	98.7	5.4	I	750.0	2460.6	37.271	99.09	116.4	6.4
550.0	1804.5	21.478	70.66	73.9	4.1	I	755.0	2477.0	37.737	99.93	93.4	5.1
555.0	1820.9	21.760	71.17	56.5	3.1	I	760.0	2493.4	38.065	100.52	65.5	3.6
560.0	1837.3	22.080	71.74	64.0	3.5	I	765.0	2509.8	38.464	101.24	79.8	4.4
565.0	1853.7	22.447	72.41	73.4	4.0	I	770.0	2526.2	38.893	102.01	85.8	4.7
570.0	1870.1	22.933	73.28	97.2	5.3	I	775.0	2542.7	39.329	102.79	87.1	4.8
575.0	1886.5	23.227	73.81	58.8	3.2	I	780.0	2559.1	39.689	103.44	72.1	4.0
580.0	1902.9	23.670	74.61	88.6	4.9	I	785.0	2575.5	40.045	104.08	71.1	3.9
585.0	1919.3	24.029	75.25	71.8	3.9	I	790.0	2591.9	40.377	104.68	66.5	3.6
590.0	1935.7	24.387	75.90	71.5	3.9	I	795.0	2608.3	40.748	105.35	74.1	4.1
595.0	1952.1	24.825	76.68	87.6	4.8	I	800.0	2624.7	41.166	106.10	83.6	4.6
600.0	1968.5	25.178	77.32	70.7	3.9	I	805.0	2641.1	41.538	106.77	74.4	4.1
605.0	1984.9	25.591	78.06	82.6	4.5	I	810.0	2657.5	41.863	107.35	65.1	3.6
610.0	2001.3	25.987	78.78	79.2	4.3	I	815.0	2673.9	42.340	108.21	95.4	5.2
615.0	2017.7	26.235	79.22	49.6	2.7	I	820.0	2690.3	42.820	109.08	96.0	5.3

LOCATION: BREITENBUSH THERMAL POWR PAGE 3
 T/R-S: 8S/ 8E-28
 HOLE NAME: BREIT-1
 DATE MEASURED: 9/27/86

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT		I	DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT				DEG C	DEG F	DEG C/KM	DEG F/100
825.0	2706.7	43.207	109.77	77.4	4.2	I	1030.0	3379.3	59.672	139.41	78.4	4.3
830.0	2723.1	43.573	110.43	73.2	4.0	I	1035.0	3395.7	60.047	140.09	75.0	4.1
835.0	2739.5	43.812	110.86	47.8	2.6	I	1040.0	3412.1	60.371	140.67	64.8	3.6
840.0	2755.9	44.420	111.96	121.7	6.7	I	1045.0	3428.5	60.666	141.20	58.9	3.2
845.0	2772.3	45.022	113.04	120.3	6.6	I	1050.0	3444.9	61.172	142.11	101.2	5.6
850.0	2788.7	45.475	113.86	90.7	5.0	I	1055.0	3461.3	61.701	143.06	105.7	5.8
855.0	2805.1	45.950	114.71	95.0	5.2	I	1060.0	3477.7	62.231	144.02	106.2	5.8
860.0	2821.5	46.364	115.46	82.8	4.5	I	1065.0	3494.1	62.714	144.88	96.4	5.3
865.0	2837.9	46.804	116.25	88.0	4.8	I	1070.0	3510.5	63.167	145.70	90.8	5.0
870.0	2854.3	47.125	116.83	64.2	3.5	I	1075.0	3526.9	63.655	146.58	97.5	5.4
875.0	2870.7	47.469	117.44	68.8	3.8	I	1080.0	3543.3	64.121	147.42	93.2	5.1
880.0	2887.1	47.755	117.96	57.2	3.1	I	1085.0	3559.7	64.561	148.21	87.9	4.8
885.0	2903.5	48.109	118.60	70.8	3.9	I	1090.0	3576.1	65.020	149.04	91.8	5.0
890.0	2919.9	48.507	119.31	79.6	4.4	I	1095.0	3592.5	65.434	149.78	82.9	4.6
895.0	2936.4	48.909	120.04	80.4	4.4	I	1100.0	3608.9	65.884	150.59	89.9	4.9
900.0	2952.8	49.160	120.49	50.1	2.7	I	1105.0	3625.3	66.270	151.29	77.2	4.2
905.0	2969.2	49.631	121.34	94.3	5.2	I	1110.0	3641.7	66.747	152.14	95.3	5.2
910.0	2985.6	50.098	122.18	93.3	5.1	I	1115.0	3658.1	67.213	152.98	93.4	5.1
915.0	3002.0	50.576	123.04	95.6	5.2	I	1120.0	3674.5	67.637	153.75	84.7	4.6
920.0	3018.4	50.885	123.59	61.9	3.4	I	1125.0	3690.9	68.065	154.52	85.6	4.7
925.0	3034.8	51.321	124.38	87.1	4.8	I	1130.0	3707.3	68.493	155.29	85.6	4.7
930.0	3051.2	51.695	125.05	74.9	4.1	I	1135.0	3723.8	68.945	156.10	90.3	5.0
935.0	3067.6	52.148	125.87	90.5	5.0	I	1140.0	3740.2	69.402	156.92	91.5	5.0
940.0	3084.0	52.572	126.63	84.8	4.7	I	1145.0	3756.6	69.833	157.70	86.3	4.7
945.0	3100.4	52.979	127.36	81.4	4.5	I	1150.0	3773.0	70.277	158.50	88.8	4.9
950.0	3116.8	53.451	128.21	94.3	5.2	I	1155.0	3789.4	70.691	159.24	82.9	4.5
955.0	3133.2	53.854	128.94	80.8	4.4	I	1160.0	3805.8	71.137	160.05	89.2	4.9
960.0	3149.6	54.227	129.61	74.6	4.1	I	1165.0	3822.2	71.517	160.73	75.9	4.2
965.0	3166.0	54.671	130.41	88.8	4.9	I	1170.0	3838.6	71.763	161.17	49.4	2.7
970.0	3182.4	55.075	131.13	80.6	4.4	I	1175.0	3855.0	72.144	161.86	76.1	4.2
975.0	3198.8	55.419	131.75	68.8	3.8	I	1180.0	3871.4	72.605	162.69	92.1	5.1
980.0	3215.2	55.856	132.54	87.5	4.8	I	1185.0	3887.8	73.010	163.42	81.0	4.4
985.0	3231.6	56.259	133.27	80.5	4.4	I	1190.0	3904.2	73.443	164.20	86.6	4.8
990.0	3248.0	56.657	133.98	79.6	4.4	I	1195.0	3920.6	73.869	164.96	95.2	4.7
995.0	3264.4	57.019	134.63	72.4	4.0	I	1200.0	3937.0	74.333	165.80	92.7	5.1
1000.0	3280.8	57.481	135.47	92.4	5.1	I	1205.0	3953.4	74.759	166.57	85.2	4.7
1005.0	3297.2	57.819	136.07	67.6	3.7	I	1210.0	3969.8	75.179	167.32	84.2	4.6
1010.0	3313.6	58.121	136.62	60.5	3.3	I	1215.0	3986.2	75.613	168.10	86.7	4.8
1015.0	3330.1	58.397	137.12	55.2	3.0	I	1220.0	4002.6	76.056	168.90	88.6	4.9
1020.0	3346.5	58.877	137.98	95.9	5.3	I	1225.0	4019.0	76.497	169.69	88.2	4.8
1025.0	3362.9	59.280	138.70	80.6	4.4	I	1230.0	4035.4	76.915	170.45	83.5	4.6

LOCATION: BREITENBUSH THERMAL POWR PAGE 4
 T/R-S: 8S/ 8E-28
 HOLE NAME: BREIT-1
 DATE MEASURED: 9/27/86

DEPTH		TEMPERATURE		GEOTHERMAL GRADIENT		I	DEPTH		TEMPERATURE		GEOTHERMAL GRADIENT	
METERS	FEET	DEG C	DEG F	DEG C/KM	DEG F/100 FT		METERS	FEET	DEG C	DEG F	DEG C/KM	DEG F/100
1235.0	4051.8	77.324	171.18	81.8	4.5	I	1355.0	4445.5	87.171	188.91	81.3	4.5
1240.0	4068.2	77.741	171.93	83.5	4.6	I	1360.0	4461.9	87.603	189.68	86.4	4.7
1245.0	4084.6	78.142	172.66	80.3	4.4	I	1365.0	4478.3	88.035	190.46	86.4	4.7
1250.0	4101.0	78.543	173.38	80.1	4.4	I	1370.0	4494.8	88.467	191.24	86.5	4.7
1255.0	4117.5	78.939	174.09	79.3	4.4	I	1375.0	4511.2	88.894	192.01	85.3	4.7
1260.0	4133.9	79.368	174.86	85.7	4.7	I	1380.0	4527.6	89.111	192.40	43.5	2.4
1265.0	4150.3	79.785	175.61	83.4	4.6	I	1385.0	4544.0	89.455	193.02	68.7	3.8
1270.0	4166.7	80.191	176.34	81.2	4.5	I	1390.0	4560.4	89.713	193.48	51.6	2.8
1275.0	4183.1	80.616	177.11	85.1	4.7	I	1395.0	4576.8	90.101	194.18	77.6	4.3
1280.0	4199.5	81.045	177.88	85.9	4.7	I	1400.0	4593.2	90.577	195.04	95.3	5.2
1285.0	4215.9	81.427	178.57	76.4	4.2	I	1405.0	4609.6	91.010	195.82	86.6	4.8
1290.0	4232.3	81.838	179.31	82.2	4.5	I	1410.0	4626.0	91.407	196.53	79.4	4.4
1295.0	4248.7	82.244	180.04	81.1	4.5	I	1415.0	4642.4	91.870	197.37	92.5	5.1
1300.0	4265.1	82.693	180.85	89.8	4.9	I	1420.0	4658.8	92.239	198.03	73.8	4.1
1305.0	4281.5	83.063	181.51	74.1	4.1	I	1425.0	4675.2	92.647	198.77	81.7	4.5
1310.0	4297.9	83.488	182.28	85.0	4.7	I	1430.0	4691.6	93.193	199.75	109.1	6.0
1315.0	4314.3	83.889	183.00	80.1	4.4	I	1435.0	4708.0	93.652	200.57	91.9	5.0
1320.0	4330.7	84.299	183.74	82.0	4.5	I	1440.0	4724.4	94.149	201.47	99.3	5.4
1325.0	4347.1	84.698	184.46	79.8	4.4	I	1445.0	4740.8	94.587	202.26	87.7	4.8
1330.0	4363.5	85.111	185.20	82.7	4.5	I	1450.0	4757.2	95.005	203.01	83.5	4.6
1335.0	4379.9	85.526	185.95	83.1	4.6	I	1455.0	4773.6	95.418	203.75	82.6	4.5
1340.0	4396.3	85.939	186.69	82.3	4.5	I	1460.0	4790.0	96.208	205.17	158.0	8.7
1345.0	4412.7	86.350	187.43	82.4	4.5	I	1465.0	4806.4	96.359	205.45	30.3	1.7
1350.0	4429.1	86.764	188.17	82.8	4.5							