

Open File Report #80

An accurate equilibrium temperature log
in AEC #8, a drill test in the vicinity
of the proposed Carlsbad Disposal site.

Arthur Mansure & Marshall Reiter

Open File Report No. 80

An accurate equilibrium temperature log in AEC No. 8, a drill test in the vicinity of the proposed Carlsbad Disposal site.

by

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On February 24, 1977 an accurate, equilibrium log was run in drill test AEC #8, which is in the vicinity of the Carlsbad disposal site. The log was run from 50 feet to 4810 feet. Temperature data were taken at varying depth intervals with the sonde continuously moving. At 50 ft, 1000 ft, 2000 ft, 3000 ft, 4000 ft, 4500 ft, and 4810 ft the sonde was stopped to examine tool response and wellbore stability. The sonde is a thermistor device which is connected to Mueller bridge electronics at the surface. The measurements are believed to be accurate to $\pm .03^{\circ}\text{F}$. Data are printed out in this report and shown graphically.

From the graph it is evident that there are three distinct gradient zones. They are approximately: 1) 50 ft to 1035 ft, 2) 1056 ft to 4247 ft, and 3) 4306 ft to 4810 ft. The temperature gradients in these zones are respectively: 1) $.85^{\circ}\text{F}/100\text{ ft}$, 2) $.43^{\circ}\text{F}/100\text{ ft}$, and 3) $.91^{\circ}\text{F}/100\text{ ft}$.

Sandia Lab supplied thermal conductivity data (taken by Russel U. Acton, Sandia Lab tech. doc. in prep.) applicable to the middle gradient zone. The apparent average of these values is $5.5\text{ W/M-}^{\circ}\text{K}$ or $13.7\text{ mcal/cm-sec-}^{\circ}\text{C}$. The product of the temperature gradient and the thermal conductivity mean in the middle zone yields an estimate of the geothermal heat flux at AEC #8; this is $1.07\mu\text{ cal/cm}^2\text{-sec}$.

Acknowledgments

AEC #8 is under the supervision of Sandia Laboratories. The cooperation of Dennis Powers in arranging the logging of the well is appreciated. The temperature logs were done with equipment and field support sponsored by NSF grant GI 32482, the New Mexico Energy Research and Development Program and the New Mexico Bureau of Mines and Mineral Resources.

AEC #8, 24FEB77, S11/T22SR31E, ELE3533

DEPTH		* GRAD *	TEMPERATURE		* *
FEET	METERS	DEG C/KM	DEG C	DEG F	
50.0	15.2	24.984	19.417	66.950	
149.0	45.4	8.035	20.171	68.307	
163.0	49.7	12.529	20.205	68.369	
181.0	55.2	15.085	20.274	68.493	
196.0	59.7	14.183	20.343	68.617	
212.0	64.6	13.399	20.412	68.742	
229.0	69.8	13.437	20.481	68.867	
246.0	75.0	16.427	20.551	68.992	
260.0	79.2	15.379	20.621	69.118	
275.0	83.8	16.545	20.691	69.245	
289.0	88.1	17.868	20.762	69.372	
302.0	92.0	11.652	20.833	69.499	
322.0	98.1	12.999	20.904	69.627	
349.0	106.4	13.820	21.011	69.820	
366.0	111.6	13.894	21.082	69.948	
383.0	116.7	14.458	21.154	70.078	
420.0	128.0	13.782	21.318	70.372	
433.0	132.0	14.100	21.372	70.470	
450.0	137.2	17.686	21.445	70.601	
467.0	142.3	16.779	21.537	70.766	
485.0	147.8	15.991	21.629	70.932	
504.0	153.6	14.558	21.721	71.099	
525.0	160.0	15.349	21.815	71.266	
545.0	166.1	13.134	21.908	71.435	
562.0	171.3	17.199	22.002	71.604	
580.0	176.8	16.365	22.097	71.774	
599.0	182.6	18.411	22.191	71.944	
616.0	187.8	18.511	22.287	72.116	
633.0	192.9	17.560	22.383	72.289	
651.0	198.4	10.950	22.479	72.462	
680.0	207.3	18.238	22.576	72.636	
694.0	211.5	19.690	22.653	72.776	
707.0	215.5	16.073	22.731	72.917	
723.0	220.4	14.365	22.810	73.058	
741.0	225.9	9.614	22.889	73.200	
768.0	234.1	13.019	22.968	73.342	
783.0	238.7	25.123	23.027	73.449	
796.0	242.6	28.732	23.127	73.628	
812.0	247.5	22.044	23.267	73.881	
827.0	252.1	14.475	23.368	74.062	
850.0	259.1	18.531	23.469	74.245	
868.0	264.6	13.439	23.571	74.428	
893.0	272.2	8.440	23.674	74.612	
933.0	284.4	14.273	23.777	74.798	
952.0	290.2	14.597	23.859	74.947	
966.0	294.4	10.805	23.921	75.059	
985.0	300.2	7.770	23.984	75.171	
1000.0	304.8	0.0	24.020	75.235	

1001.0	305.1	10.723	24.020	75.235
1035.0	315.5	9.867	24.131	75.435
1056.0	321.9	7.991	24.194	75.549
1082.0	329.8	8.018	24.257	75.663
1108.0	337.7	7.207	24.321	75.777
1137.0	346.6	6.987	24.384	75.892
1167.0	355.7	8.269	24.448	76.007
1184.0	360.9	7.826	24.491	76.084
1202.0	366.4	8.307	24.534	76.161
1219.0	371.6	8.319	24.577	76.239
1236.0	376.7	7.456	24.620	76.316
1255.0	382.5	7.472	24.663	76.394
1274.0	388.3	8.369	24.707	76.472
1291.0	393.5	7.918	24.750	76.550
1309.0	399.0	7.517	24.793	76.628
1328.0	404.8	7.949	24.837	76.707
1346.0	410.3	8.434	24.881	76.785
1363.0	415.4	7.982	24.924	76.864
1381.0	420.9	8.472	24.968	76.943
1398.0	426.1	8.507	25.012	77.022
1415.0	431.3	8.531	25.056	77.101
1432.0	436.5	9.682	25.100	77.181
1447.0	441.0	13.235	25.145	77.260
1458.0	444.4	8.102	25.189	77.340
1476.0	449.9	7.306	25.233	77.420
1496.0	456.0	9.149	25.278	77.500
1512.0	460.9	9.174	25.323	77.581
1528.0	465.7	9.189	25.367	77.661
1544.0	470.6	9.205	25.412	77.742
1560.0	475.5	9.224	25.457	77.823
1576.0	480.4	9.243	25.502	77.904
1592.0	485.2	7.823	25.547	77.985
1611.0	491.0	8.277	25.592	78.066
1629.0	496.5	9.949	25.638	78.148
1644.0	501.1	7.479	25.683	78.230
1664.0	507.2	6.813	25.729	78.312
1686.0	513.9	7.907	25.775	78.394
1705.0	519.7	10.752	25.820	78.477
1719.0	524.0	10.771	25.866	78.559
1733.0	528.2	13.740	25.912	78.642
1744.0	531.6	7.572	25.958	78.725
1764.0	537.7	7.228	26.004	78.808
1785.0	544.1	6.610	26.051	78.891
1808.0	551.1	8.039	26.097	78.975
1827.0	556.9	8.511	26.144	79.058
1845.0	562.4	9.035	26.190	79.142
1862.0	567.5	8.544	26.237	79.227
1880.0	573.0	7.342	26.284	79.311
1901.0	579.4	7.359	26.331	79.396
1922.0	585.8	7.740	26.378	79.480

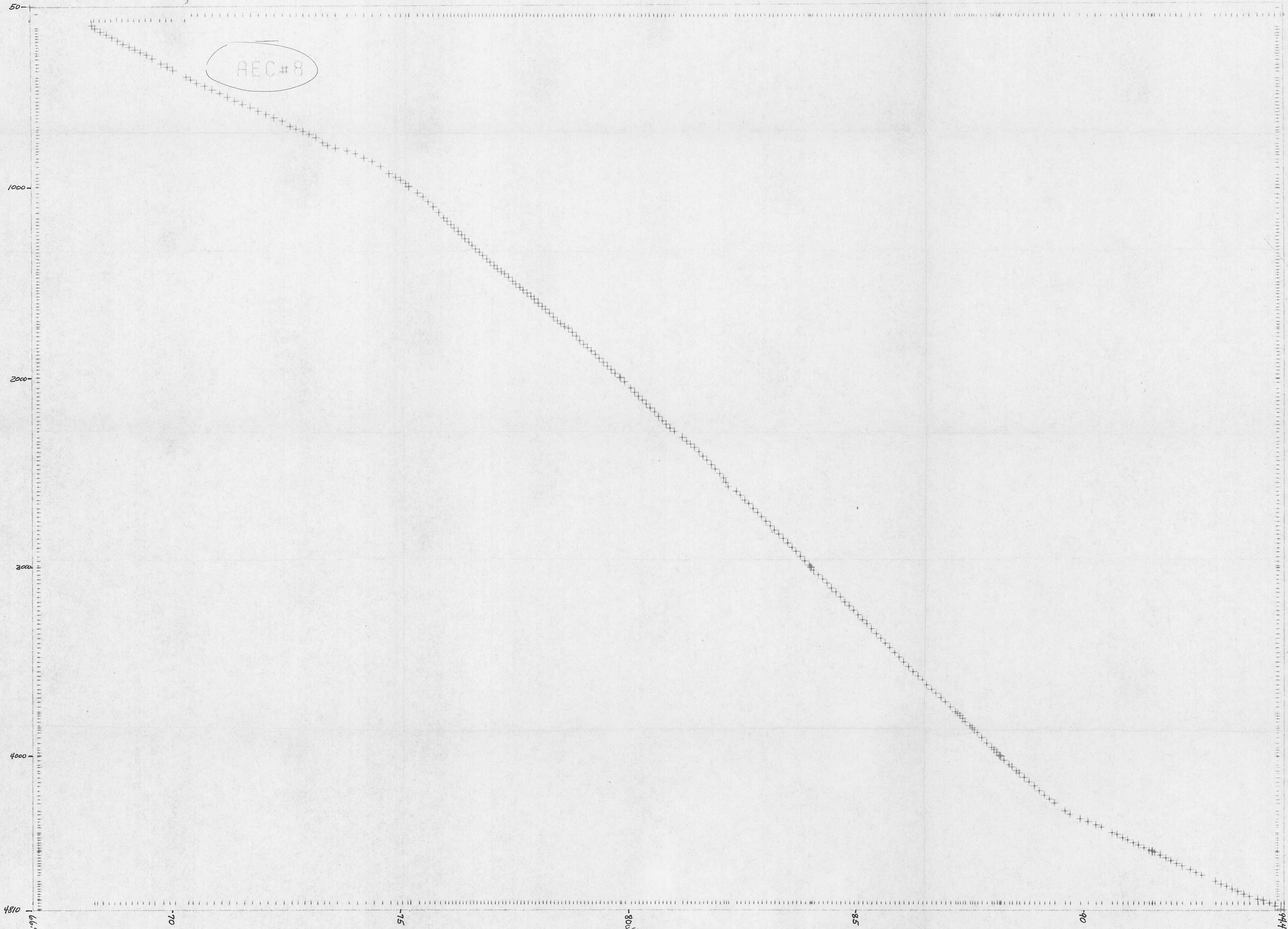
1942.0	591.9	8.622	26.425	79.565
1960.0	597.4	8.181	26.473	79.651
1979.0	603.2	9.018	26.520	79.736
2000.6	609.8	11.484	26.579	79.843
2004.0	610.3	7.442	26.591	79.864
2025.0	617.2	7.141	26.639	79.950
2058.0	627.3	7.168	26.711	80.079
2080.0	634.0	7.905	26.759	80.166
2100.0	640.1	7.914	26.807	80.252
2120.0	646.2	7.216	26.855	80.339
2142.0	652.9	7.957	26.904	80.426
2162.0	659.0	7.970	26.952	80.514
2182.0	665.1	6.390	27.001	80.601
2207.0	672.7	7.624	27.049	80.689
2228.0	679.1	8.445	27.098	80.777
2247.0	684.9	7.657	27.147	80.865
2268.0	691.3	8.964	27.196	80.953
2286.0	696.8	10.460	27.245	81.041
2317.0	706.2	7.748	27.344	81.219
2338.0	712.6	10.867	27.394	81.309
2353.0	717.2	9.075	27.443	81.398
2371.0	722.7	7.122	27.493	81.488
2394.0	729.7	7.135	27.543	81.577
2417.0	736.7	7.833	27.593	81.667
2438.0	743.1	7.167	27.643	81.758
2461.0	750.1	7.507	27.693	81.848
2483.0	756.8	6.632	27.744	81.939
2508.0	764.4	6.940	27.794	82.030
2532.0	771.8	3.791	27.845	82.121
2554.0	778.5	3.633	27.870	82.167
2577.0	785.5	14.561	27.896	82.213
2600.0	792.5	7.309	27.998	82.396
2623.0	799.5	7.019	28.049	82.489
2647.0	806.8	8.438	28.101	82.581
2667.0	812.9	7.052	28.152	82.674
2691.0	820.2	7.707	28.204	82.767
2713.0	826.9	7.392	28.255	82.860
2736.0	833.9	7.111	28.307	82.953
2760.0	841.2	7.789	28.359	83.047
2782.0	848.0	7.468	28.411	83.141
2805.0	855.0	7.487	28.464	83.235
2828.0	862.0	7.505	28.516	83.329
2851.0	869.0	7.862	28.569	83.424
2873.0	875.7	7.535	28.622	83.519
2896.0	882.7	7.901	28.674	83.614
2918.0	889.4	6.968	28.727	83.709
2943.0	897.0	6.983	28.780	83.805
2968.0	904.6	7.290	28.834	83.901
2992.0	912.0	6.596	28.887	83.997
3000.0	914.4	8.786	28.903	84.026

3004.0	915.6	6.290	28.914	84.045
3018.0	919.9	7.666	28.941	84.093
3041.0	926.9	8.035	28.994	84.190
3063.0	933.6	7.705	29.048	84.287
3086.0	940.6	7.397	29.102	84.384
3110.0	947.9	7.742	29.156	84.482
3133.0	954.9	7.436	29.211	84.579
3157.0	962.3	6.388	29.265	84.677
3185.0	970.8	9.438	29.320	84.775
3204.0	976.6	7.486	29.374	84.874
3228.0	983.9	7.526	29.429	84.972
3252.0	991.2	6.970	29.484	85.071
3278.0	999.1	8.649	29.539	85.171
3299.0	1005.5	7.005	29.595	85.270
3325.0	1013.5	7.020	29.650	85.370
3351.0	1021.4	7.622	29.706	85.470
3375.0	1028.7	7.337	29.762	85.571
3400.0	1036.3	7.662	29.817	85.671
3424.0	1043.6	7.089	29.874	85.772
3450.0	1051.6	7.389	29.930	85.873
3475.0	1059.2	7.427	29.986	85.975
3500.0	1066.8	7.449	30.043	86.077
3525.0	1074.4	7.184	30.099	86.179
3551.0	1082.3	7.799	30.156	86.281
3575.0	1089.7	9.878	30.213	86.384
3594.0	1095.5	6.968	30.271	86.487
3621.0	1103.7	8.199	30.328	86.590
3644.0	1110.7	8.595	30.385	86.694
3666.0	1117.4	8.615	30.443	86.797
3688.0	1124.1	7.920	30.501	86.901
3712.0	1131.4	7.647	30.559	87.006
3737.0	1139.0	7.371	30.617	87.111
3763.0	1147.0	9.632	30.675	87.216
3773.0	1150.0	8.738	30.705	87.268
3784.0	1153.4	6.017	30.734	87.321
3800.0	1158.2	6.023	30.763	87.374
3816.0	1163.1	8.781	30.793	87.427
3838.0	1169.8	9.667	30.852	87.533
3848.0	1172.9	6.923	30.881	87.586
3862.0	1177.1	6.465	30.911	87.639
3877.0	1181.7	7.477	30.940	87.692
3903.0	1189.6	6.959	30.999	87.799
3931.0	1198.2	8.500	31.059	87.906
3954.0	1205.2	7.552	31.118	88.013
3967.0	1209.1	7.559	31.148	88.067
3980.0	1213.1	6.154	31.178	88.121
3996.0	1218.0	9.849	31.208	88.175
4000.0	1219.2	9.316	31.220	88.196
4000.6	1219.4	5.993	31.229	88.212
4022.0	1225.9	8.600	31.268	88.283

4045.0	1232.9	9.011	31.329	88.392
4056.0	1236.3	8.632	31.359	88.446
4079.0	1243.3	9.043	31.419	88.555
4090.0	1246.6	9.667	31.450	88.609
4113.0	1253.6	8.689	31.510	88.719
4136.0	1260.7	9.111	31.571	88.828
4158.0	1267.4	8.048	31.632	88.938
4183.0	1275.0	8.782	31.694	89.049
4206.0	1282.0	10.133	31.755	89.160
4226.0	1288.1	9.674	31.817	89.271
4247.0	1294.5	9.948	31.879	89.382
4288.0	1307.0	11.379	32.003	89.606
4306.0	1312.5	17.132	32.066	89.718
4330.0	1319.8	23.899	32.191	89.944
4343.0	1323.7	16.433	32.286	90.114
4362.0	1329.5	17.413	32.381	90.286
4374.0	1333.2	14.470	32.445	90.400
4403.0	1342.0	21.055	32.573	90.631
4413.0	1345.1	14.084	32.637	90.746
4428.0	1349.7	16.297	32.701	90.862
4441.0	1353.6	14.191	32.766	90.978
4456.0	1358.2	19.415	32.831	91.095
4467.0	1361.5	15.301	32.896	91.212
4481.0	1365.3	15.343	32.961	91.330
4495.0	1370.1	19.375	33.026	91.448
4500.0	1371.6	53.966	33.056	91.501
4500.4	1371.7	17.321	33.063	91.513
4506.0	1373.4	15.430	33.092	91.566
4520.0	1377.7	14.438	33.158	91.684
4535.0	1382.3	16.713	33.224	91.803
4548.0	1386.2	14.541	33.290	91.922
4563.0	1390.8	15.662	33.357	92.042
4577.0	1395.1	16.500	33.423	92.162
4597.0	1401.2	14.725	33.524	92.343
4612.0	1405.7	15.815	33.591	92.465
4626.0	1410.0	17.551	33.659	92.586
4657.0	1419.5	13.989	33.828	92.891
4673.0	1424.3	18.760	33.897	93.014
4685.0	1428.0	17.364	33.965	93.138
4698.0	1432.0	17.418	34.034	93.261
4711.0	1435.9	15.135	34.103	93.386
4726.0	1440.5	18.982	34.172	93.510
4738.0	1444.1	26.379	34.242	93.635
4751.0	1448.1	32.766	34.346	93.823
4758.0	1450.2	17.745	34.416	93.949
4771.0	1454.2	15.436	34.487	94.076
4786.0	1458.8	13.667	34.557	94.203
4803.0	1464.0	19.675	34.628	94.330
4810.1	1466.1	0.0	34.671	94.407

TEMPERATURE - DEGREES C

DEPTH - FEET



TEMPERATURE - DEGREES F

DEPTH - METERS