



1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	08-May-16				
Rig Bit Number	2				
Bit Size (in)	8.500				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	1,933.98				
Log End Depth (TVD, ft)	6,726.97				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	05-May-16 15:00				
Drill/Wipe End Date and Time	07-May-16 22:00				
Min Inc (deg) @ Depth (TVD, ft)	0.38 @ 2,623.94				
Max Inc (deg) @ Depth (TVD, ft)	92.23 @ 6,725.60				
Bit TFA(in2) / Bit Type	2.00 / PDC				
Flow Rate (gpm)	599.71				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Diesel Mud Base				
Density (ppg) / Viscosity (spqt)	9.18 / 40.00				
Filtrate CL (ppm)	32,500.00				
pH / Fluid Loss (mptm)	N/A / 0				
PV (cP) / YP (lbf2)	9 / 6.00				
% Solids / % Sand	7.30 / 0				
% Oil / Oil:Water Ratio	68.00 / 71:29				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Max Tool Temp (degF) @ Depth (ft)	200.70 @ 2,623.94				

Max Tool Temp (degF) / Source	238.70 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Brian Neu				
Customer Representative	Johnny Sanchez				

SENSOR INFORMATION

REMARKS

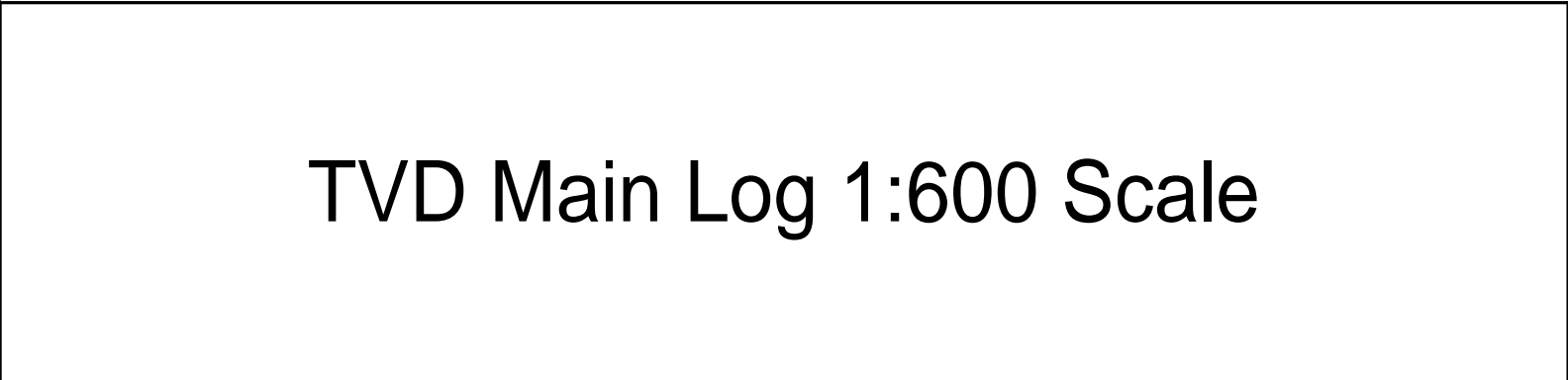
1. All depths are calibrated to driller's pipe tally and are true vertical depths from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. The following smoothing parameters have been applied to the data:

Main Log 1:600 (2"):
(ROPA - Avg Rate of Penetration)
Interval: 1.0 ft, Coercion Distance: 3.0 ft, Gap fill: 5.0 ft
(PGRC - Gamma Ray Cor)
Interval: 1.0 ft, Coercion Distance: 3.0 ft, Gap fill: 5.0 ft

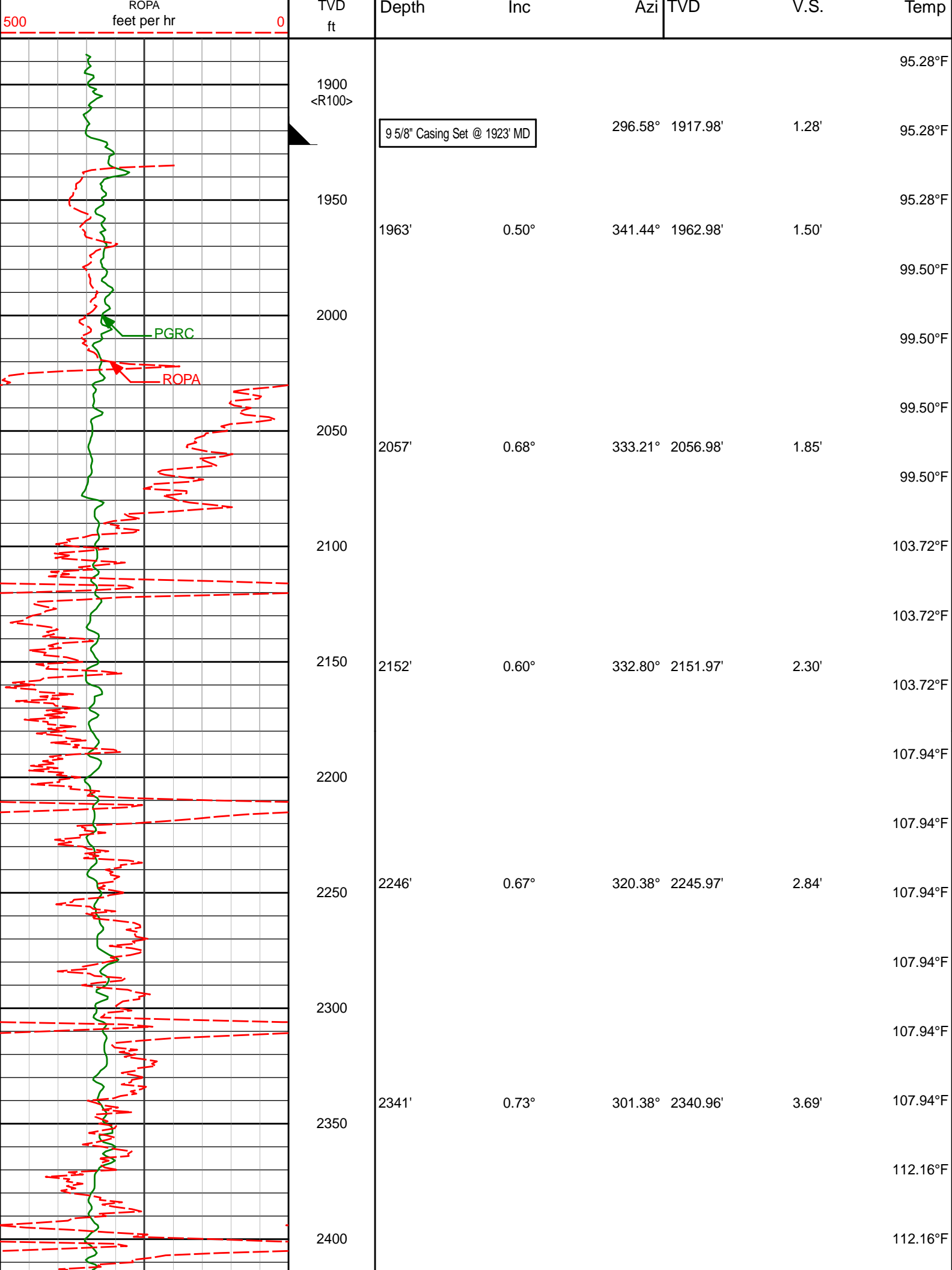
Detail Log 1:240 (5"):
(ROPA - Avg Rate of Penetration)
Interval: 0.5 ft, Coercion Distance: 1.2 ft, Gap fill: 3.0 ft
(PGRC - Gamma Ray Cor)
Interval: 0.5 ft, Coercion Distance: 0.6 ft, Gap fill: 3.0 ft
5. Surveys corrected by Surcon starting at 1963 ft.

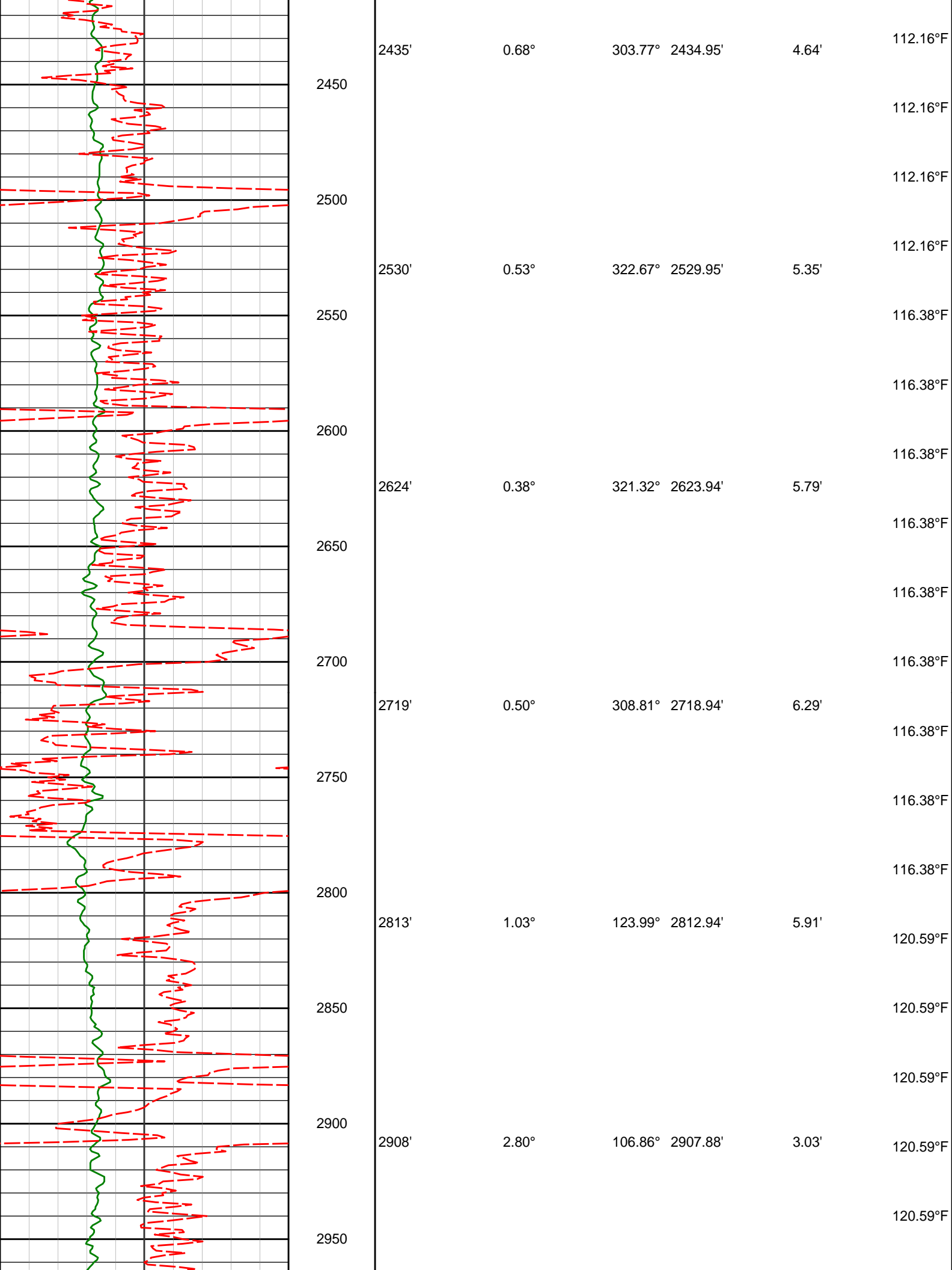
WARRANTY

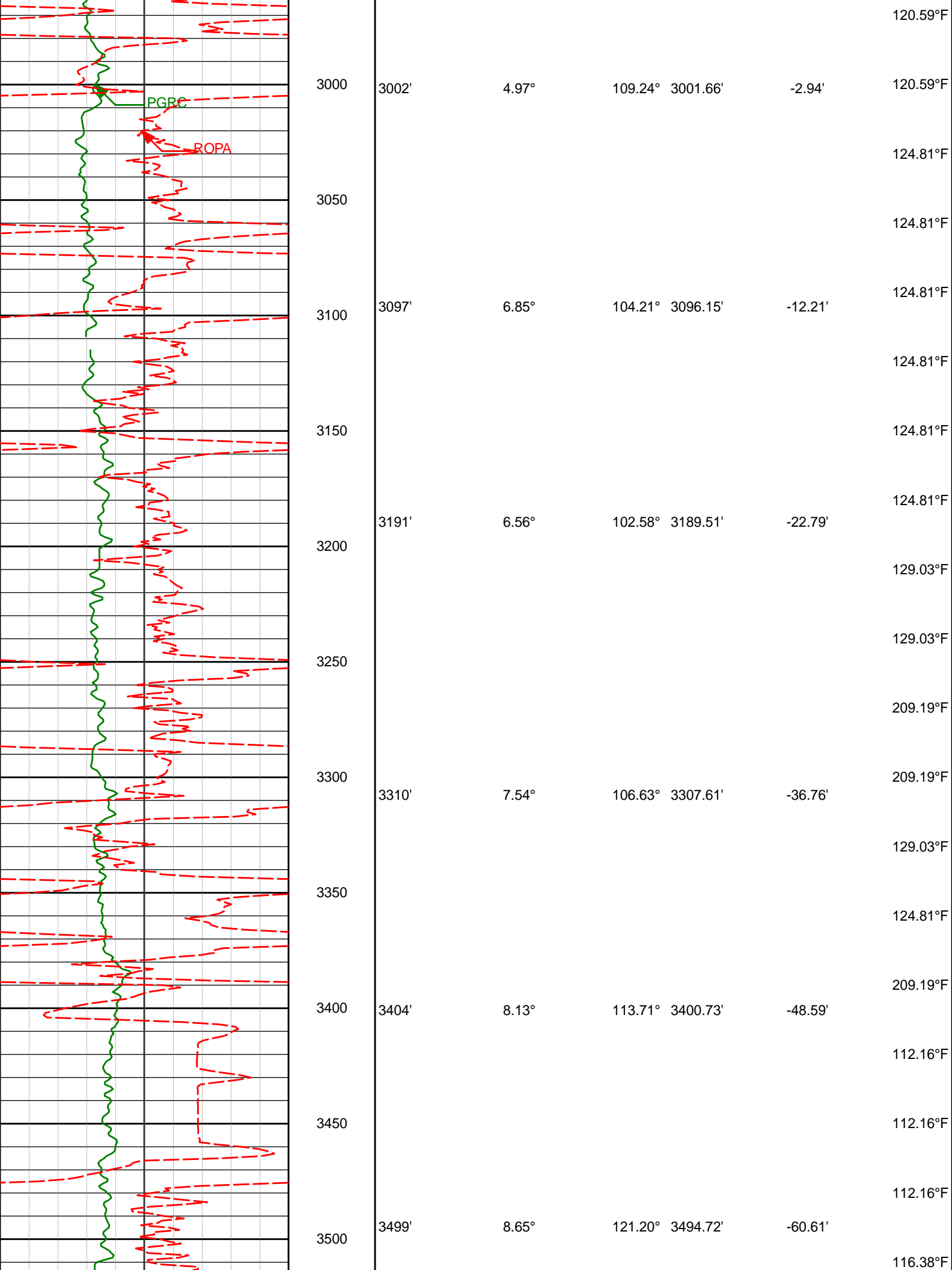
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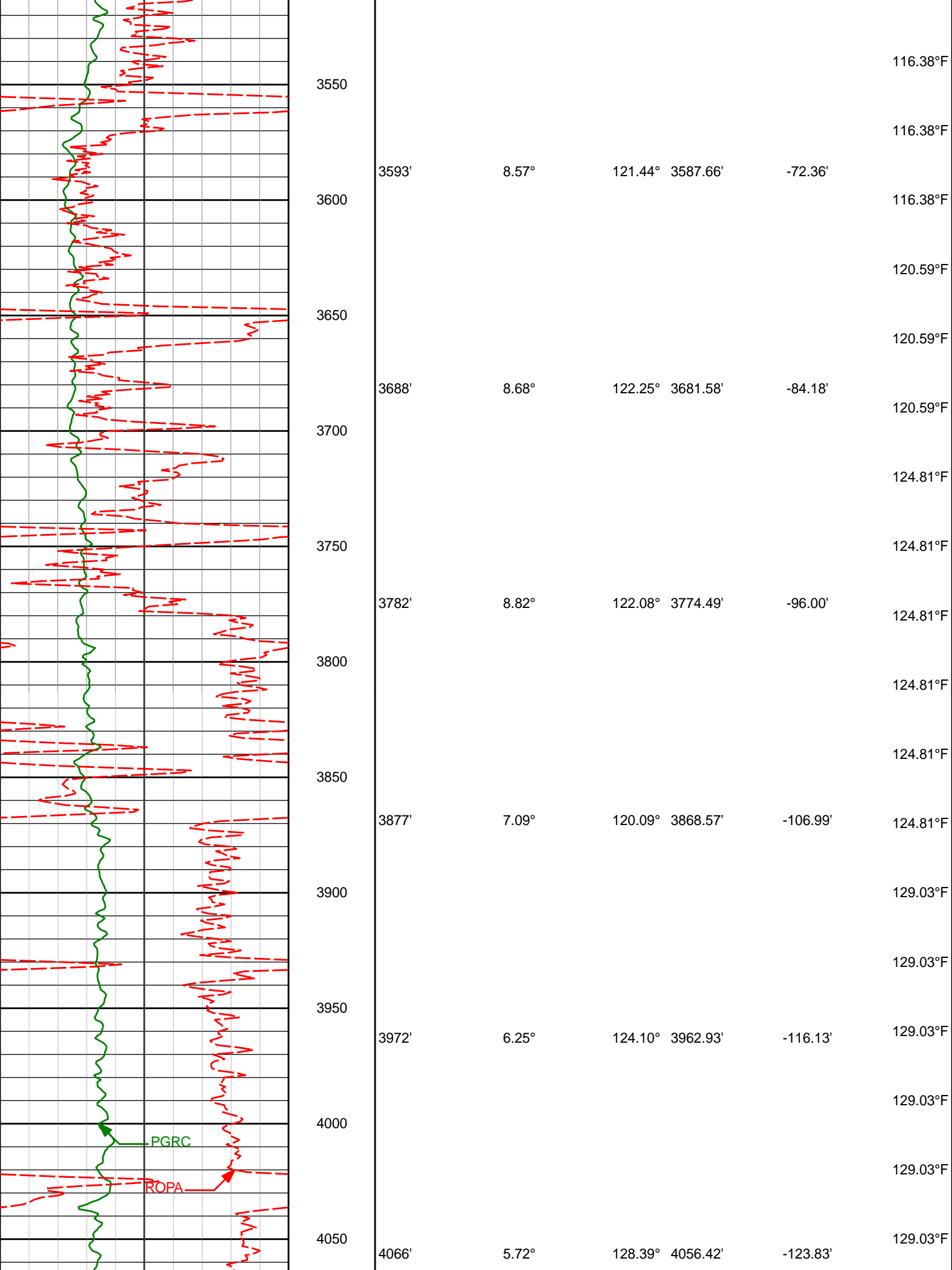


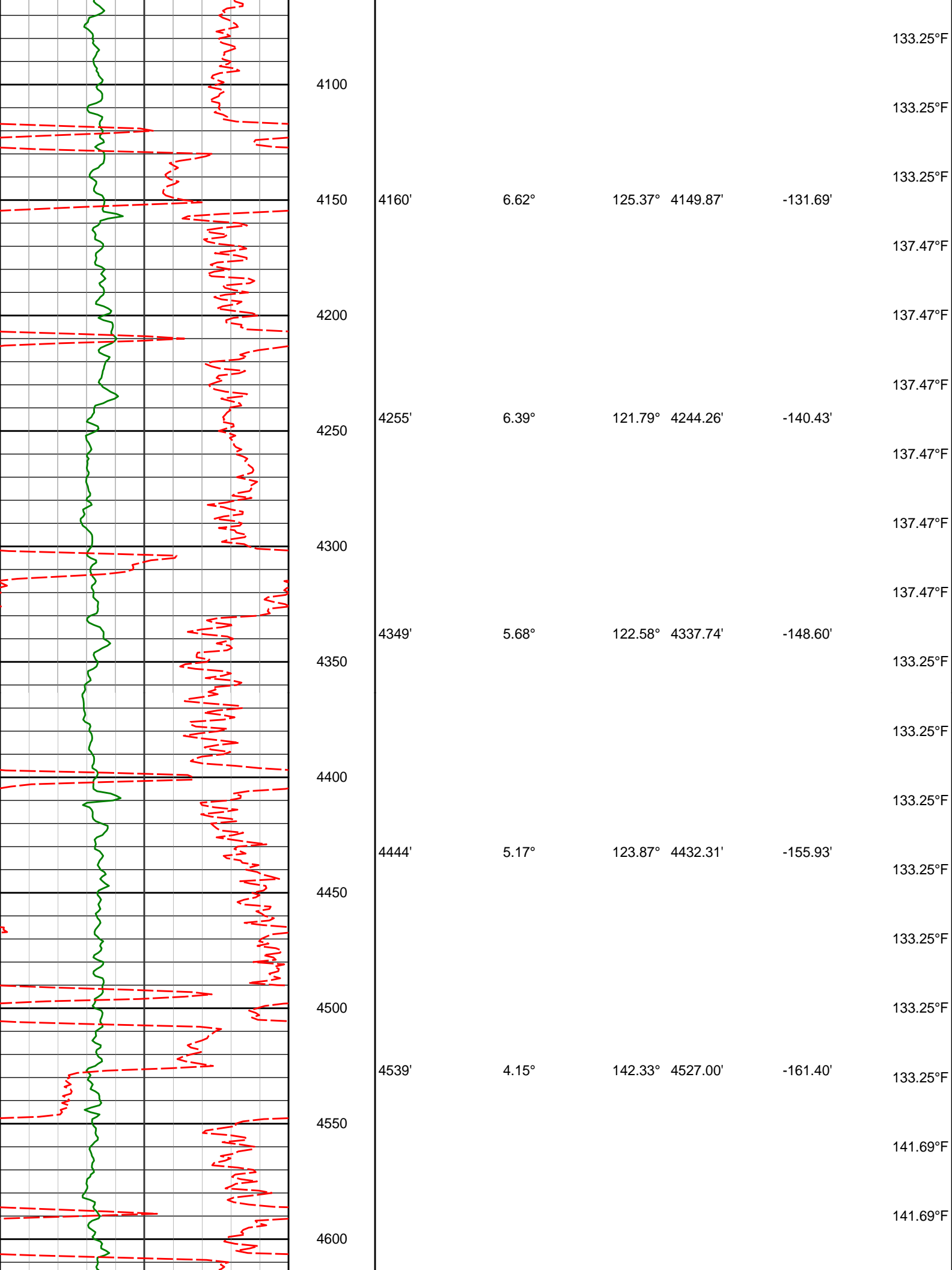
Gamma Ray Cor PGRC api	0	300
Avg Rate of Penetration	Depth	

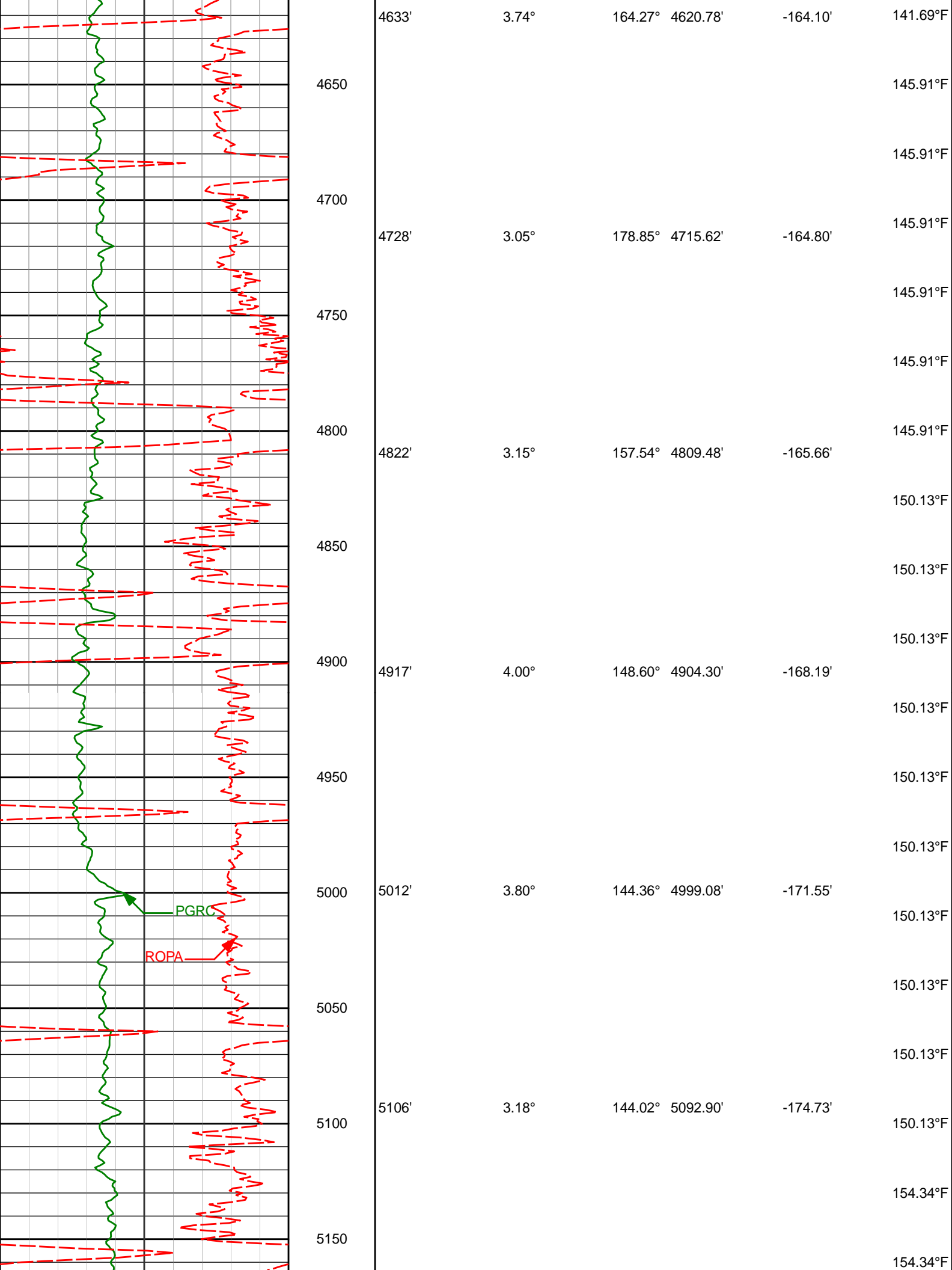


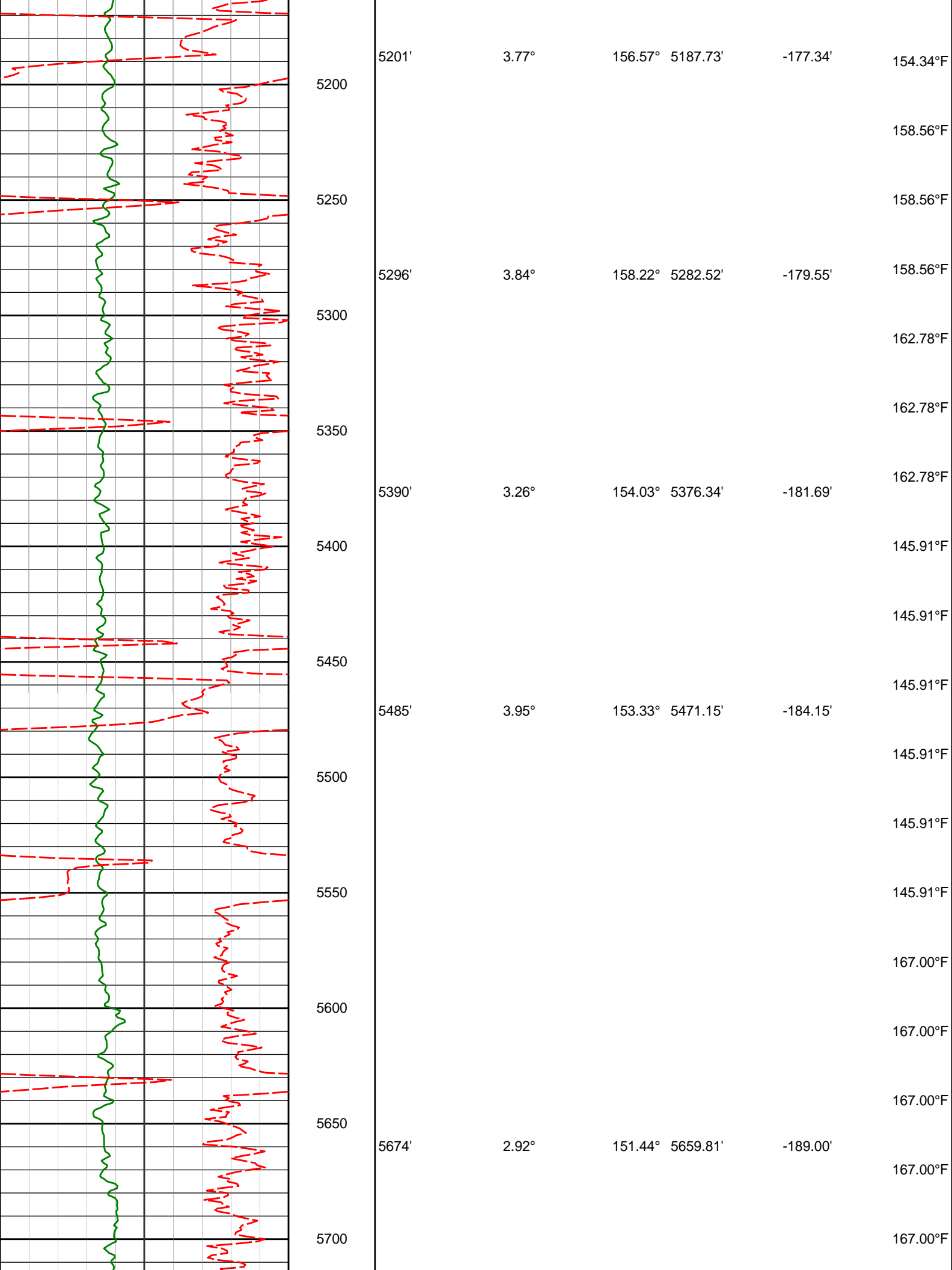


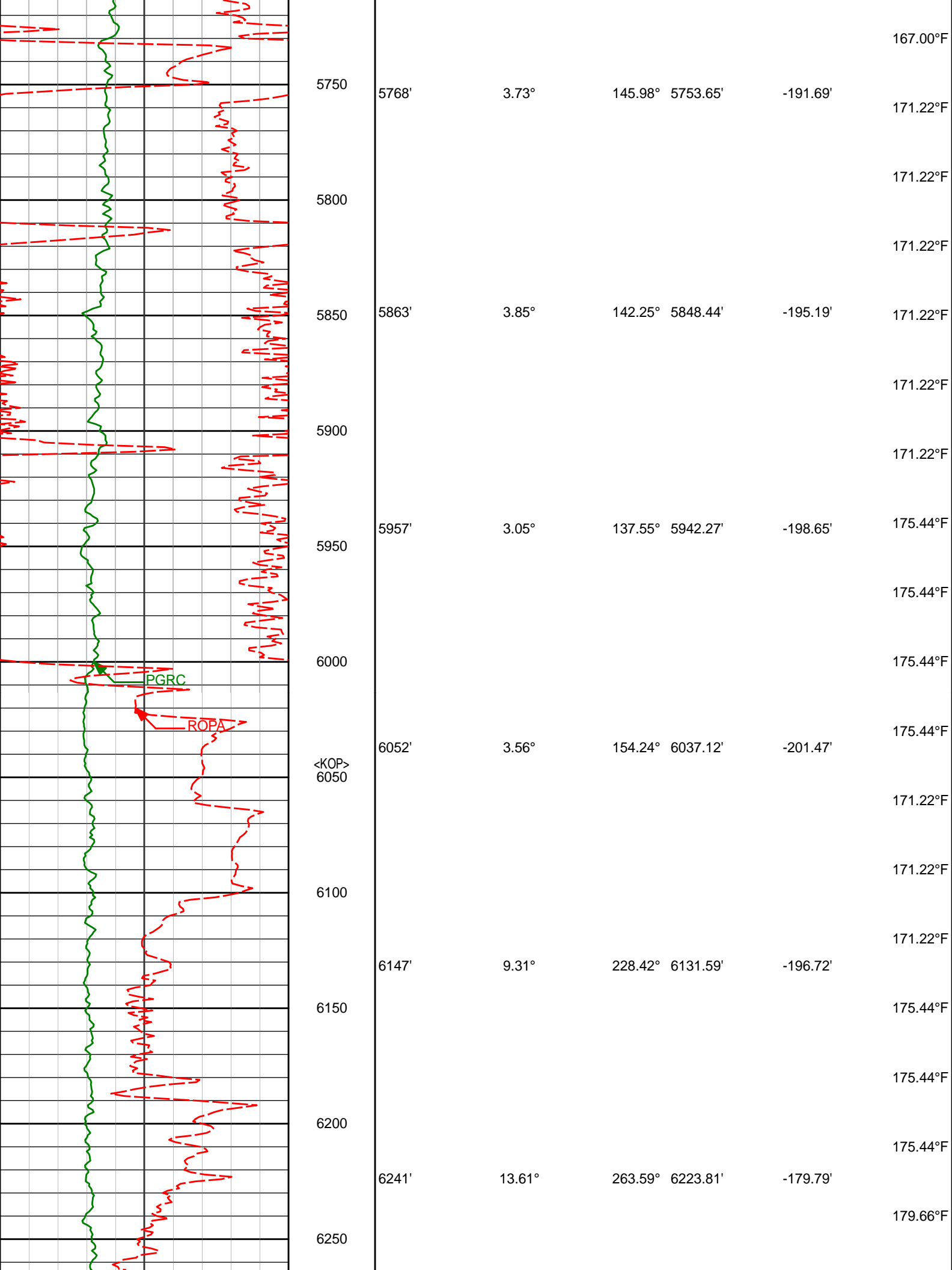


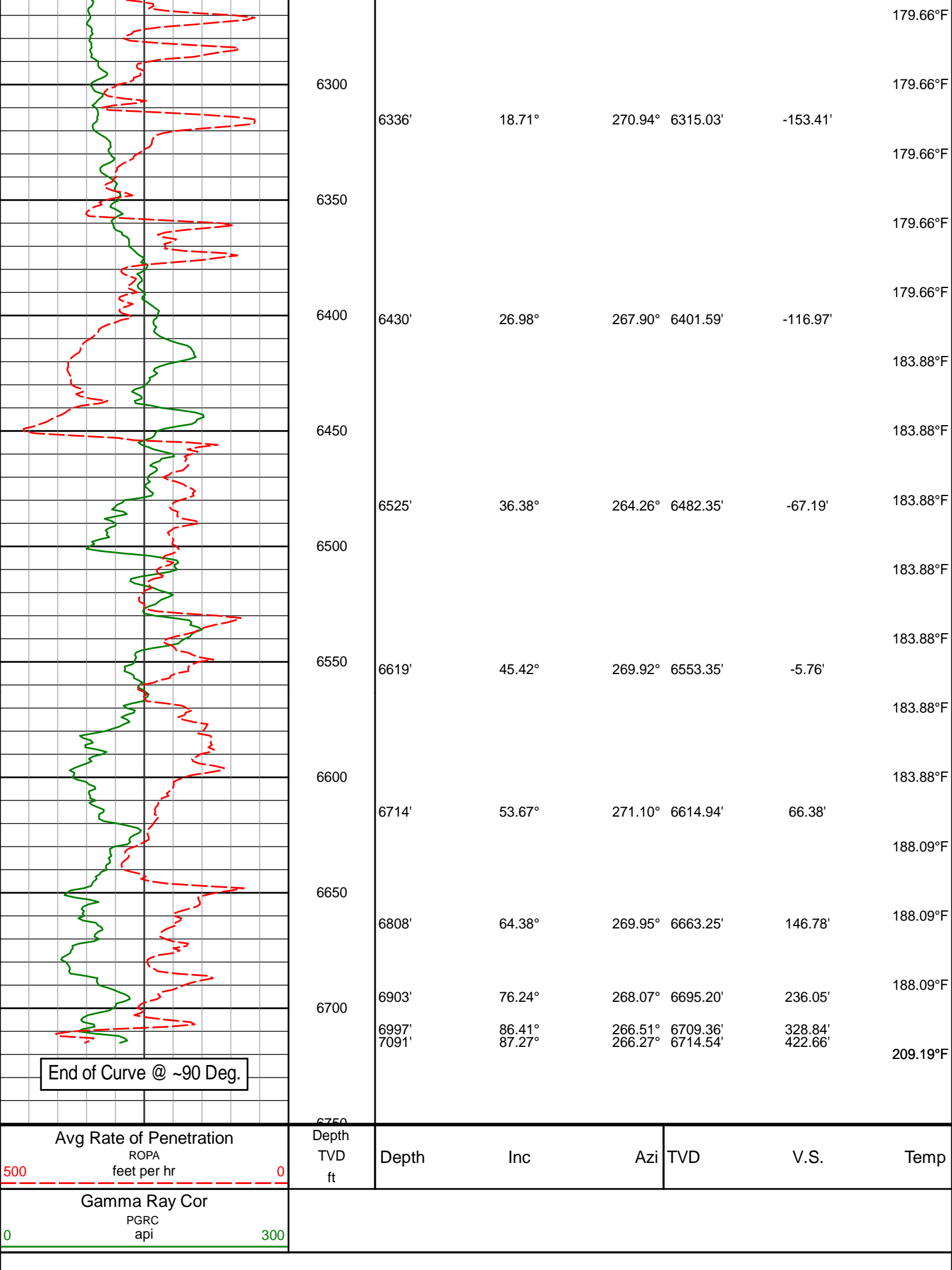






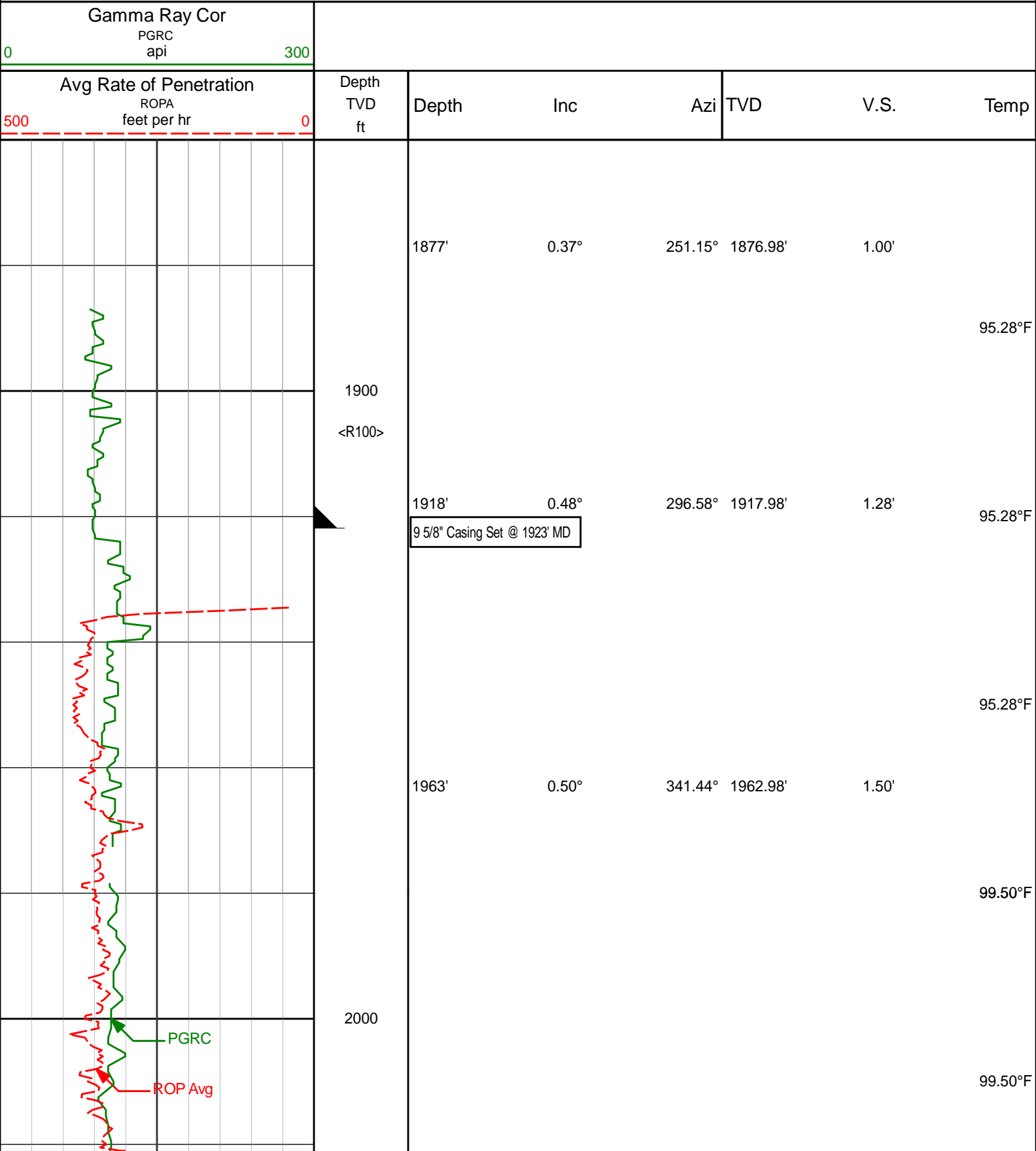


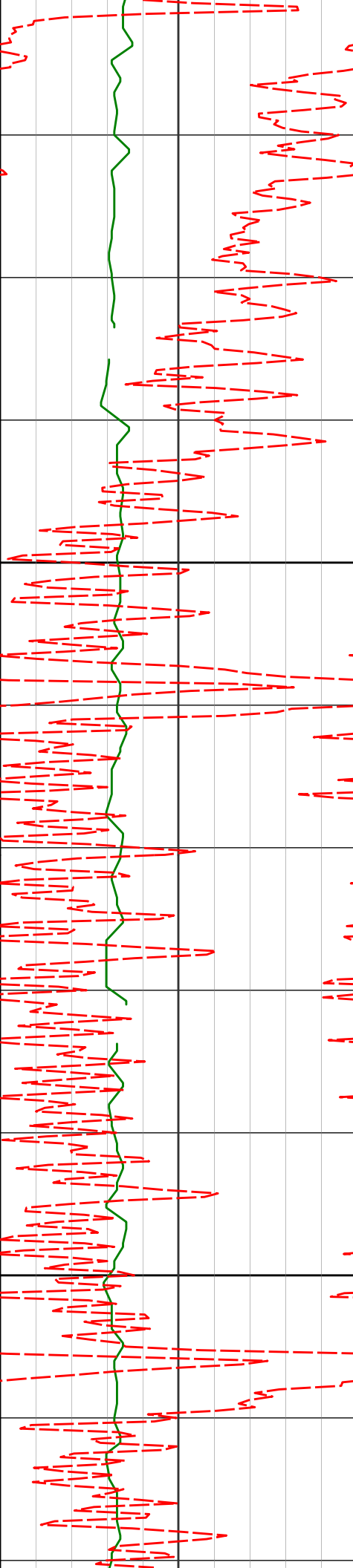




Avg Rate of Penetration	
ROPA	
feet per hr	
500	0
Gamma Ray Cor	
PGRC	
api	
0	300

TVD Detail Log 1:240 Scale





2100

2200

2057'

0.68°

333.21° 2056.98'

1.85'

2152'

0.60°

332.80° 2151.97'

2.30'

99.50°F

99.50°F

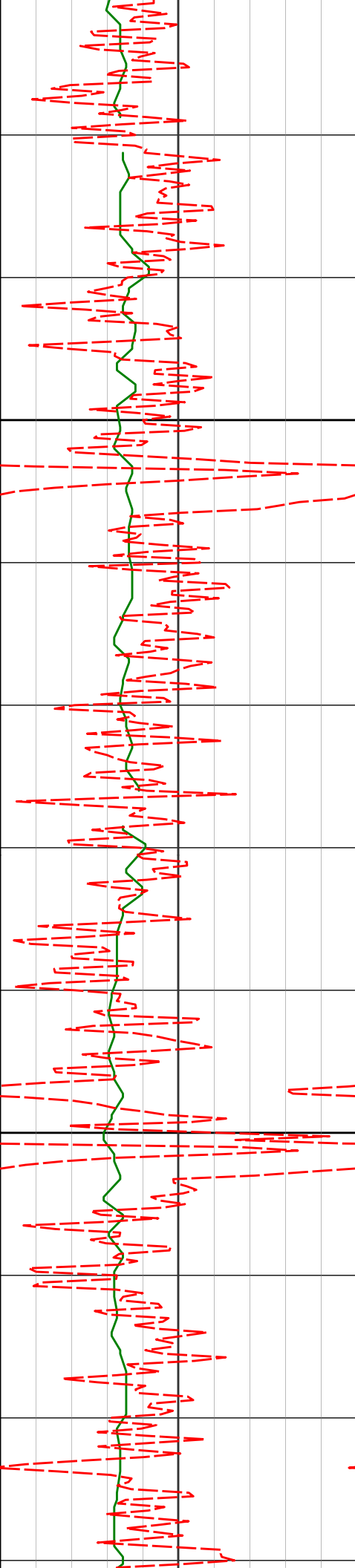
103.72°F

103.72°F

103.72°F

107.94°F

107.94°F



2300

2400

2246'

0.67°

320.38° 2245.97'

2.84'

107.94°F

107.94°F

107.94°F

2341'

0.73°

301.38° 2340.96'

3.69'

107.94°F

112.16°F

112.16°F

112.16°F

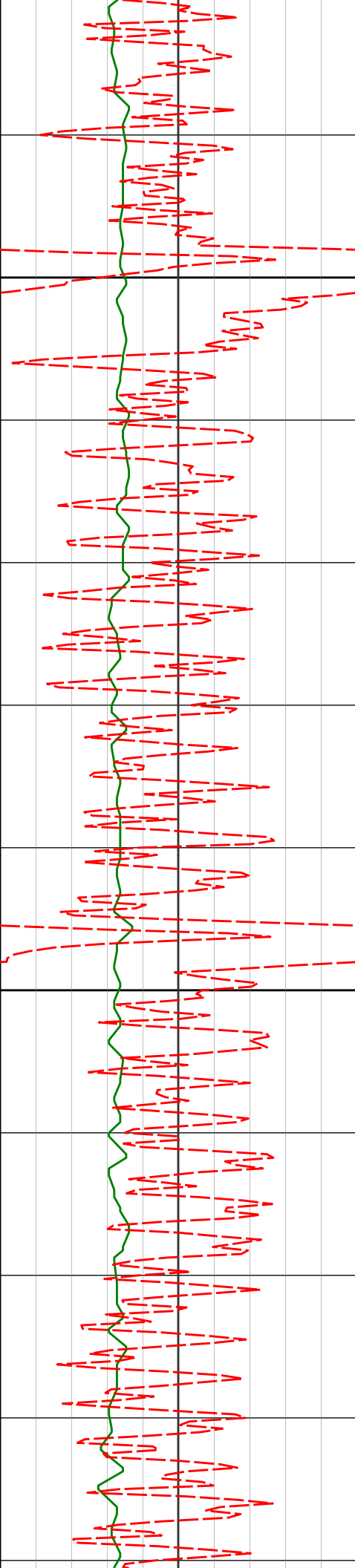
2435'

0.68°

303.77° 2434.95'

4.64'

112.16°F



2500

2530'

0.53°

322.67° 2529.95'

5.35'

2600

2624'

0.38°

321.32° 2623.94'

5.79'

112.16°F

112.16°F

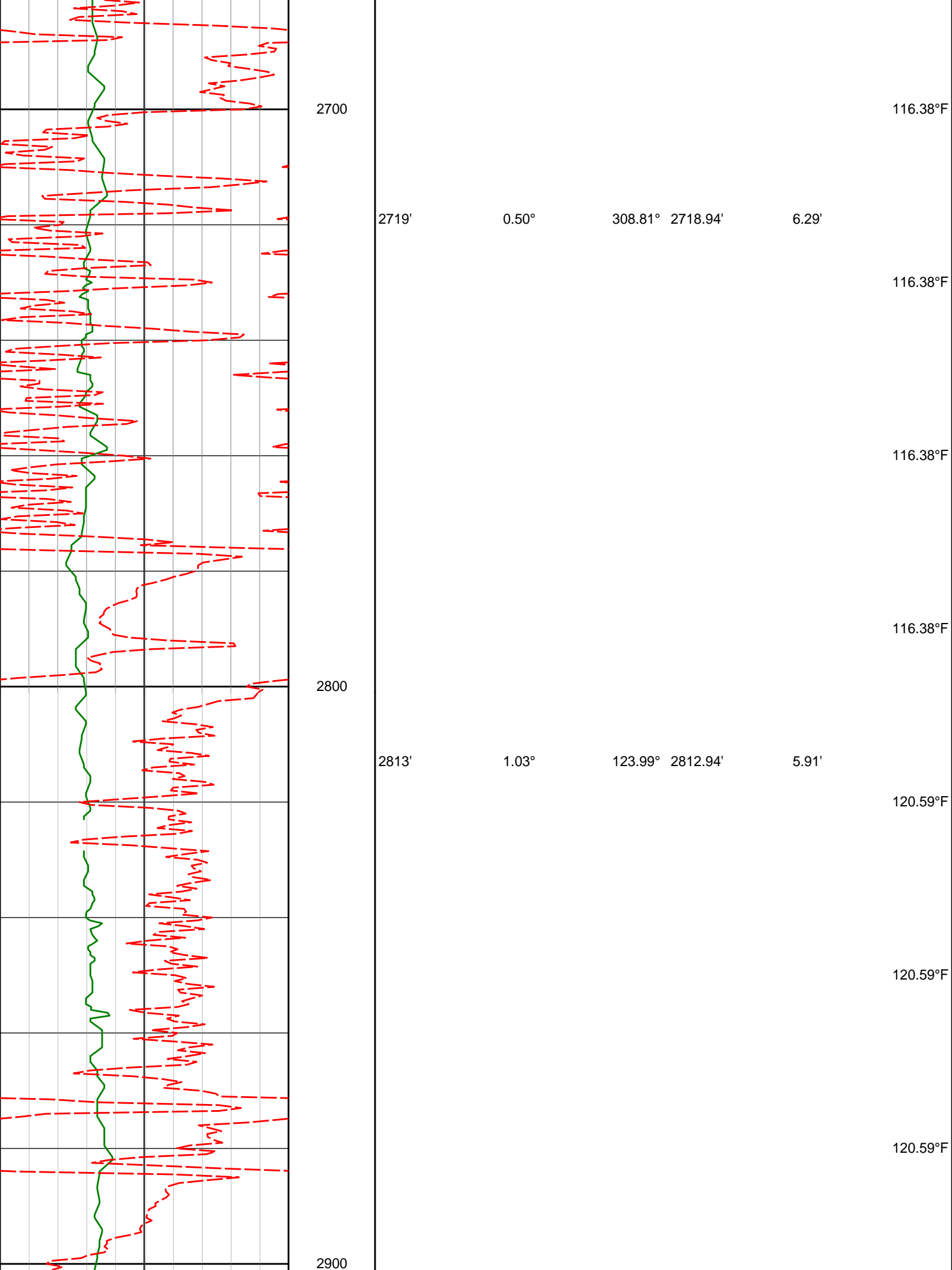
116.38°F

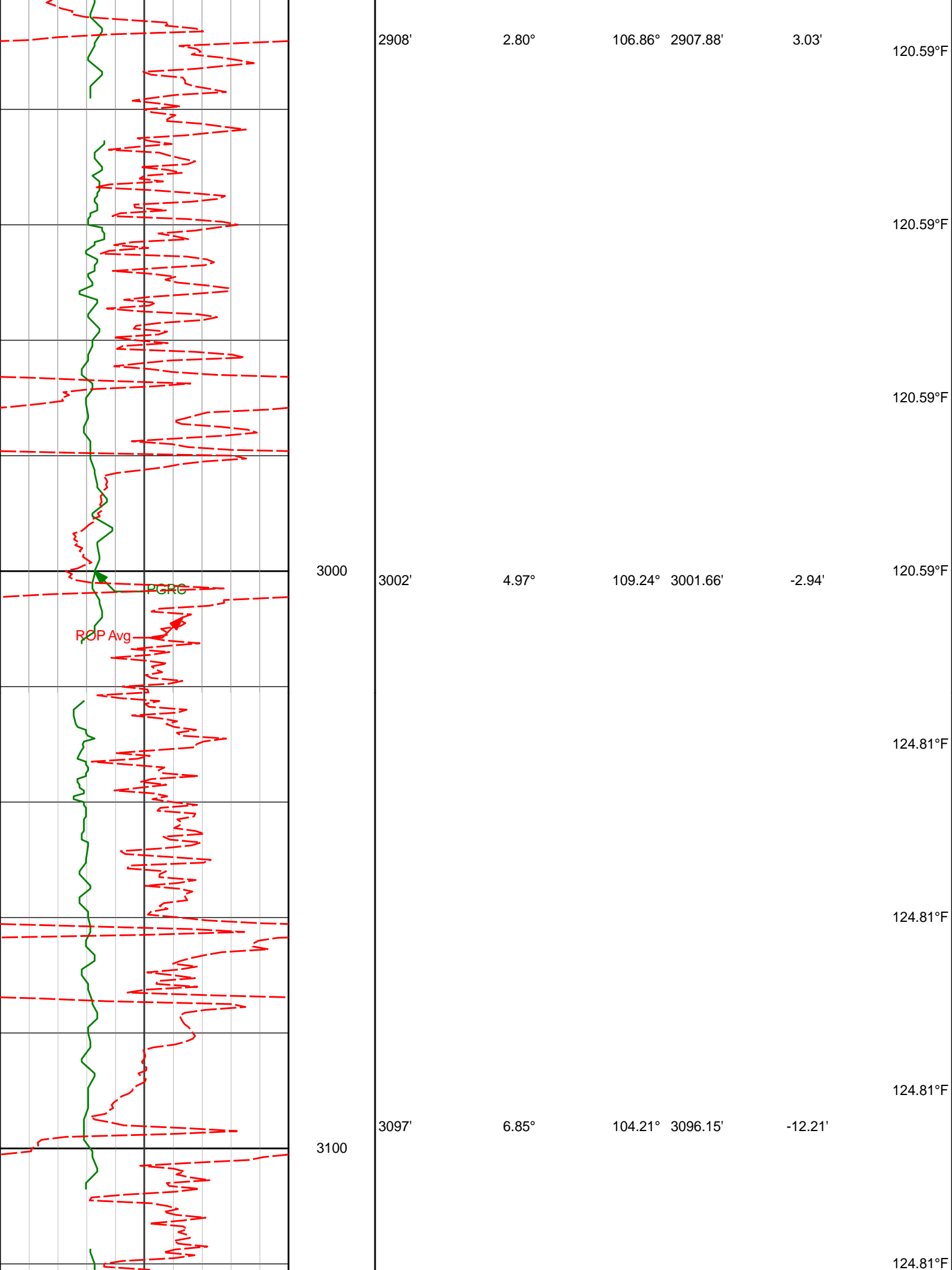
116.38°F

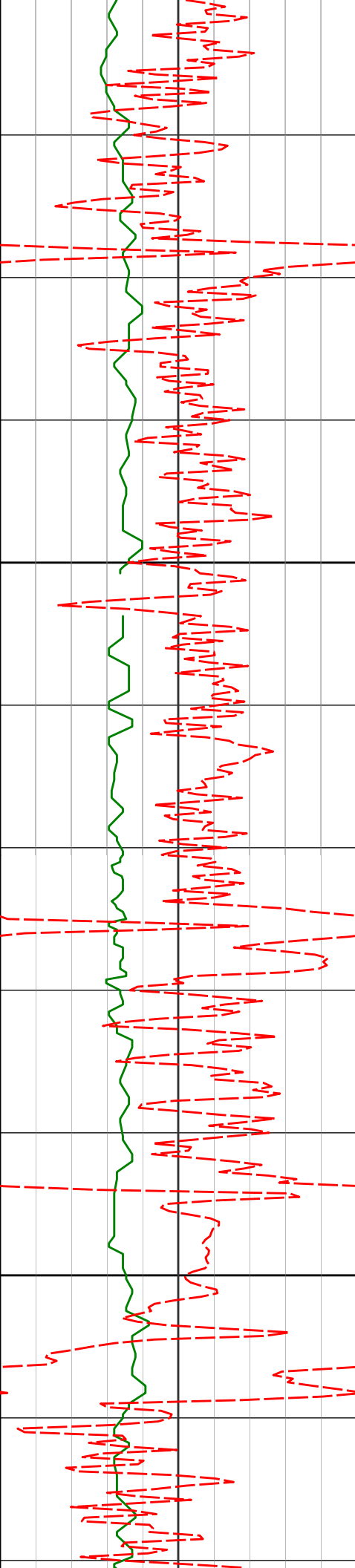
116.38°F

116.38°F

116.38°F







3200

3300

3191'

6.56°

102.58° 3189.51'

-22.79'

3310'

7.54°

106.63° 3307.61'

-36.76'

124.81°F

124.81°F

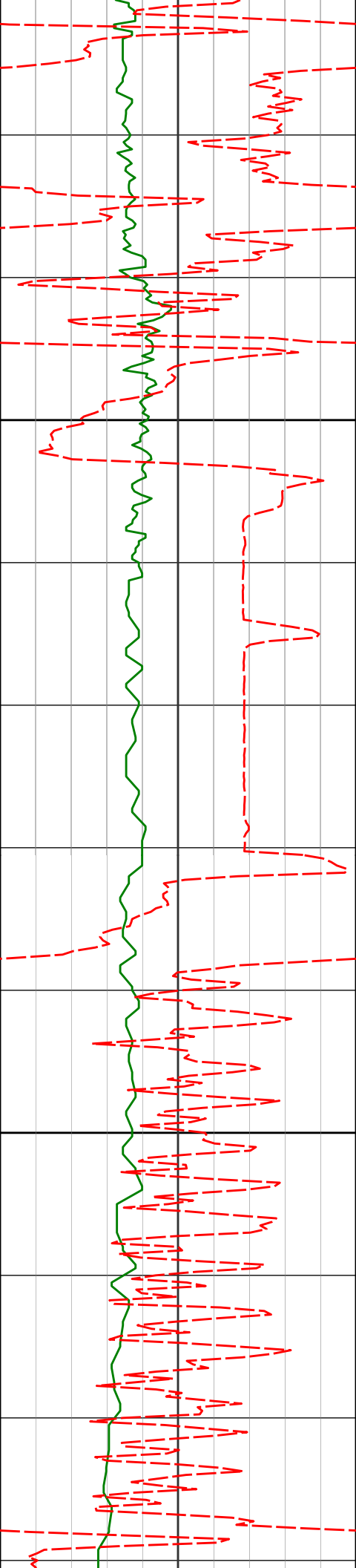
129.03°F

129.03°F

209.19°F

209.19°F

129.03°F



3400

3404'

8.13°

113.71° 3400.73'

-48.59'

3500

3499'

8.65°

121.20° 3494.72'

-60.61'

124.81°F

209.19°F

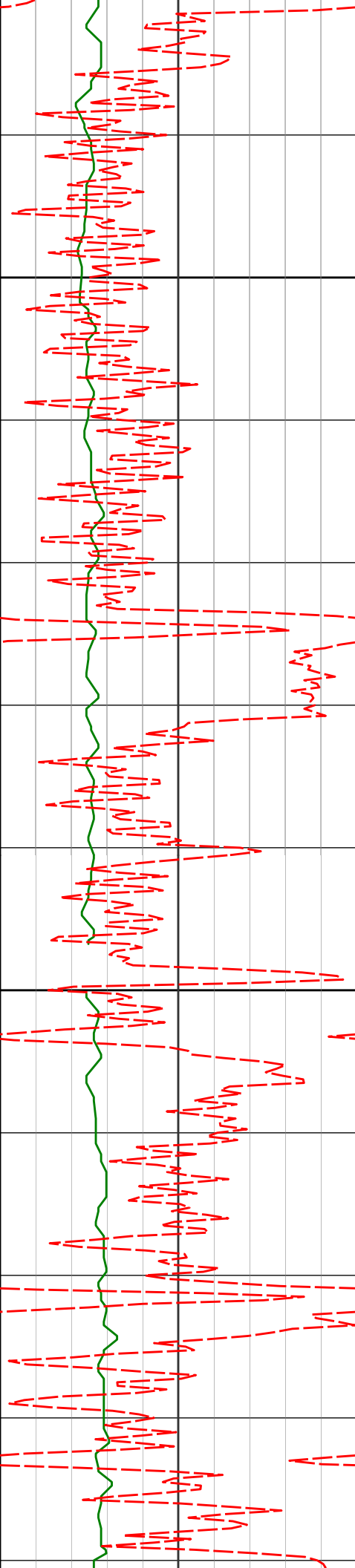
112.16°F

112.16°F

112.16°F

116.38°F

116.38°F



3600

3700

3593'

8.57°

121.44° 3587.66'

-72.36'

3688'

8.68°

122.25° 3681.58'

-84.18'

3782'

8.82°

122.08° 3774.49'

-96.00'

116.38°F

116.38°F

120.59°F

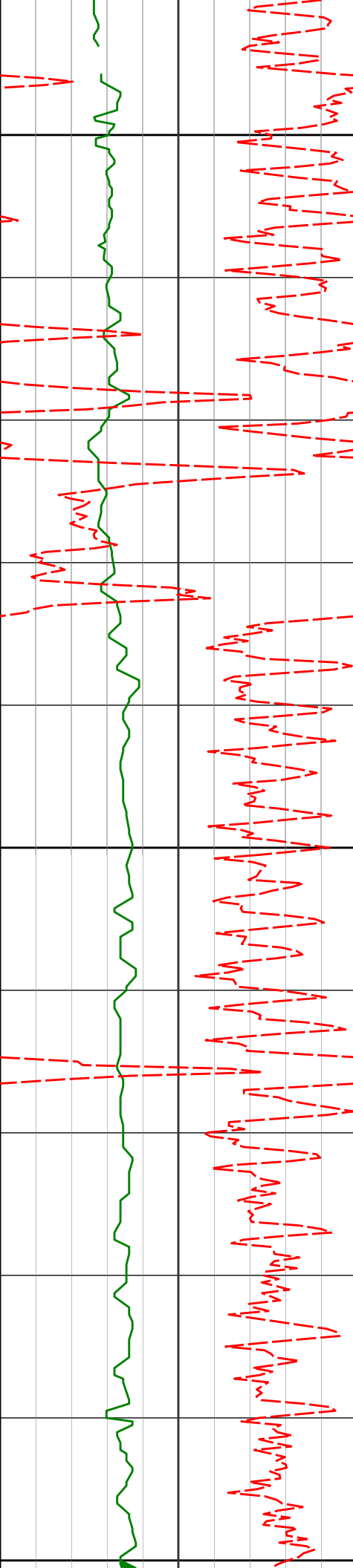
120.59°F

120.59°F

124.81°F

124.81°F

124.81°F



3800

124.81°F

124.81°F

3877'

7.09°

120.09° 3868.57'

-106.99'

124.81°F

3900

129.03°F

129.03°F

3972'

6.25°

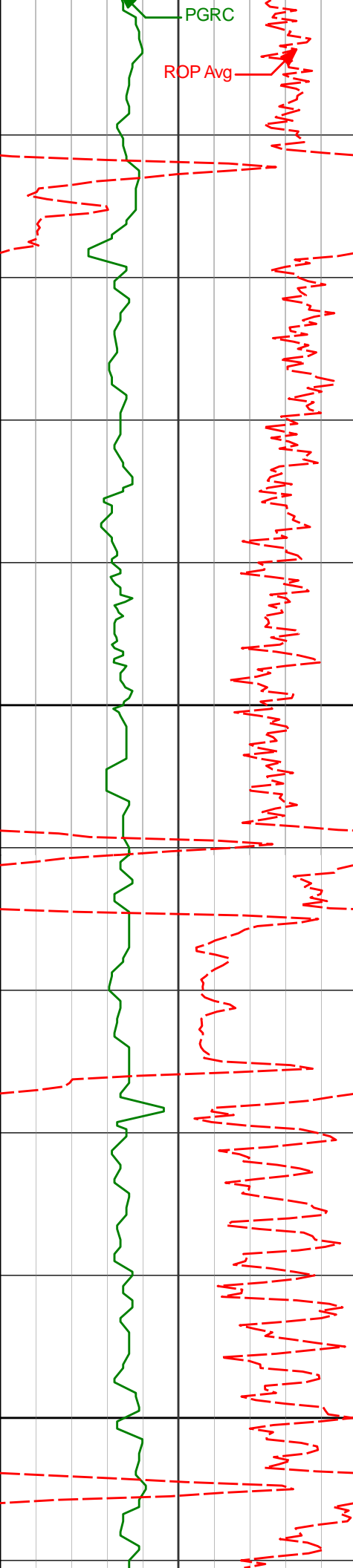
124.10° 3962.93'

-116.13'

129.03°F

129.03°F

4000



4100

4200

4066'

5.72°

128.39°

4056.42'

-123.83'

4160'

6.62°

125.37°

4149.87'

-131.69'

129.03°F

129.03°F

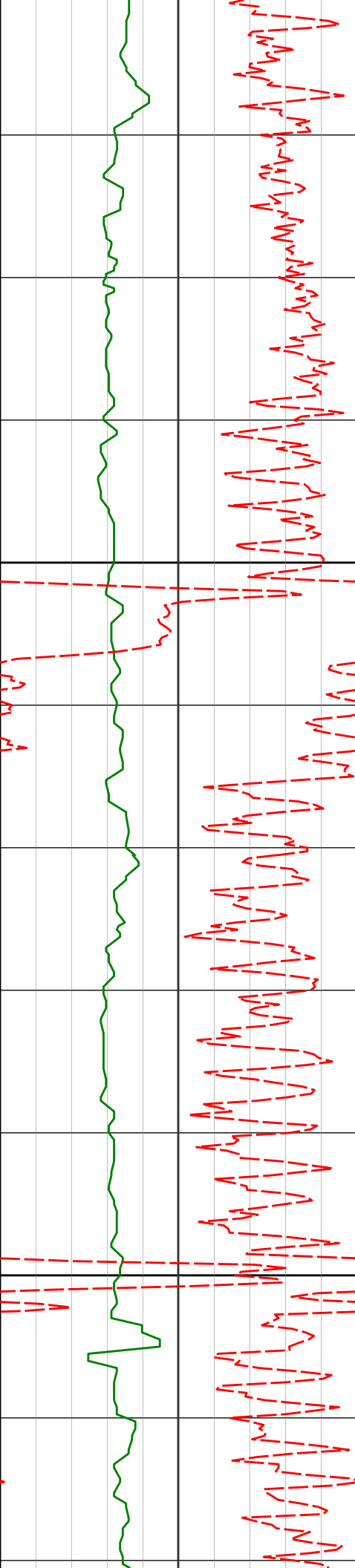
133.25°F

133.25°F

133.25°F

137.47°F

137.47°F



4300

4400

4255'

4349'

4444'

6.39°

5.68°

5.17°

121.79°

122.58°

123.87°

4244.26'

4337.74'

4432.31'

-140.43'

-148.60'

-155.93'

137.47°F

137.47°F

137.47°F

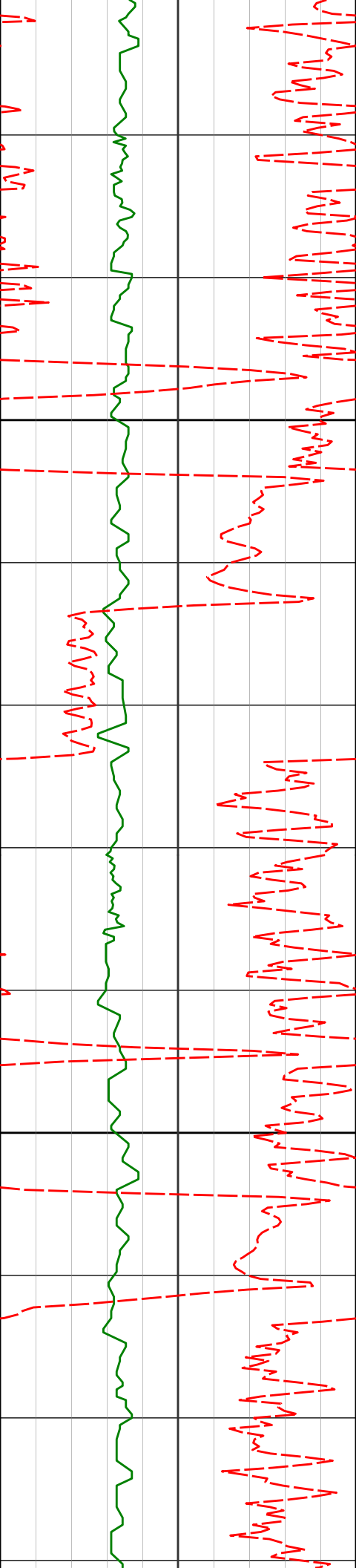
137.47°F

133.25°F

133.25°F

133.25°F

133.25°F



4500

4600

4539'

4633'

4.15°

3.74°

142.33° 4527.00'

164.27° 4620.78'

-161.40'

-164.10'

133.25°F

133.25°F

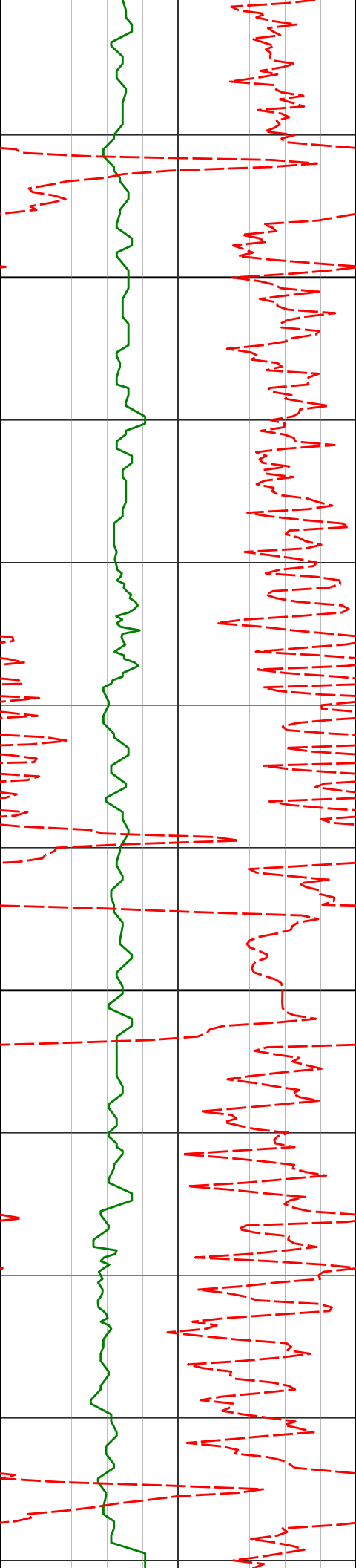
133.25°F

141.69°F

141.69°F

141.69°F

145.91°F



4700

4800

4728'

4822'

3.05°

3.15°

178.85°

157.54°

4715.62'

4809.48'

-164.80'

-165.66'

145.91°F

145.91°F

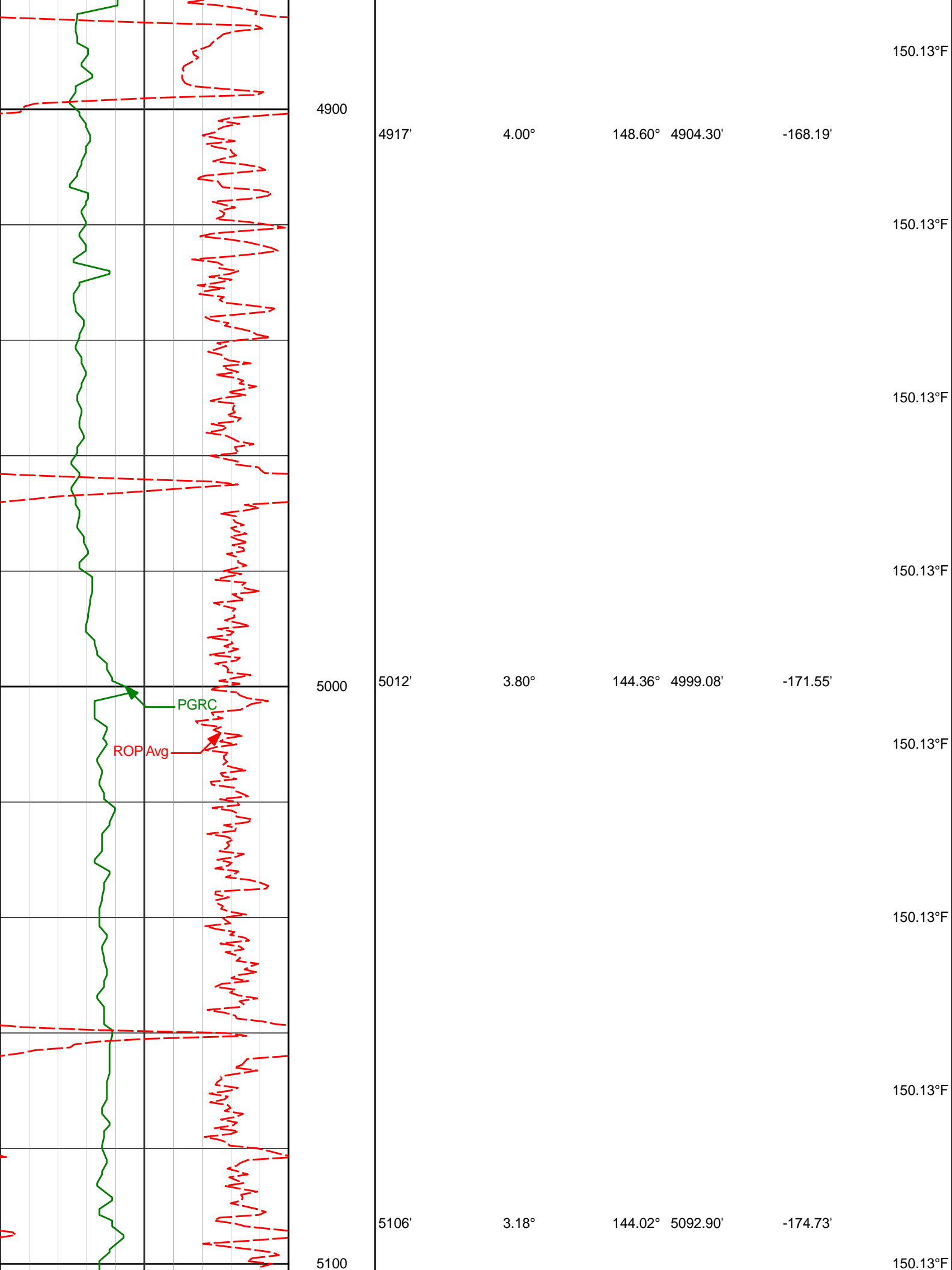
145.91°F

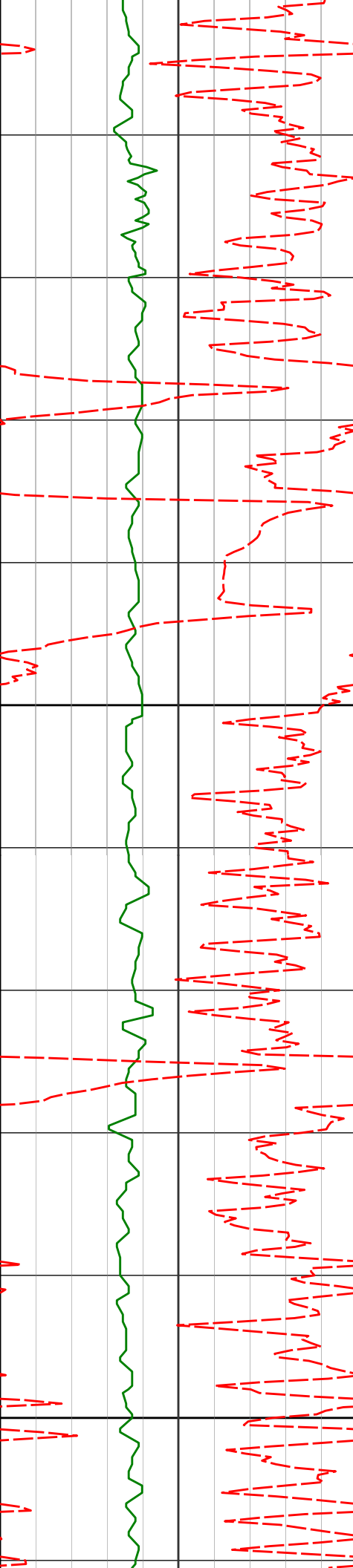
145.91°F

145.91°F

150.13°F

150.13°F





5200

5300

5201'

3.77°

156.57° 5187.73'

-177.34'

5296'

3.84°

158.22° 5282.52'

-179.55'

154.34°F

154.34°F

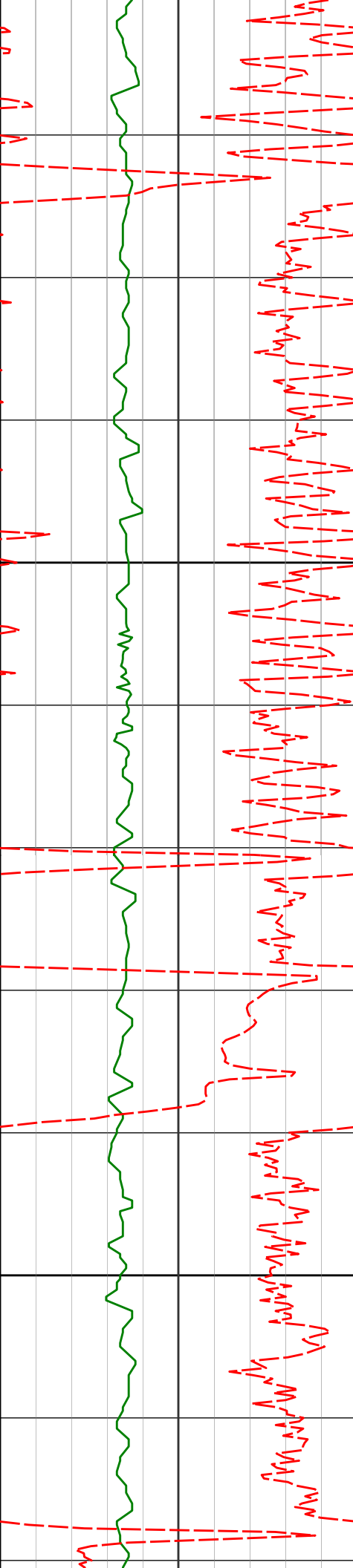
154.34°F

158.56°F

158.56°F

158.56°F

162.78°F



5400

5500

5390'

3.26°

154.03° 5376.34'

-181.69'

5485'

3.95°

153.33° 5471.15'

-184.15'

162.78°F

162.78°F

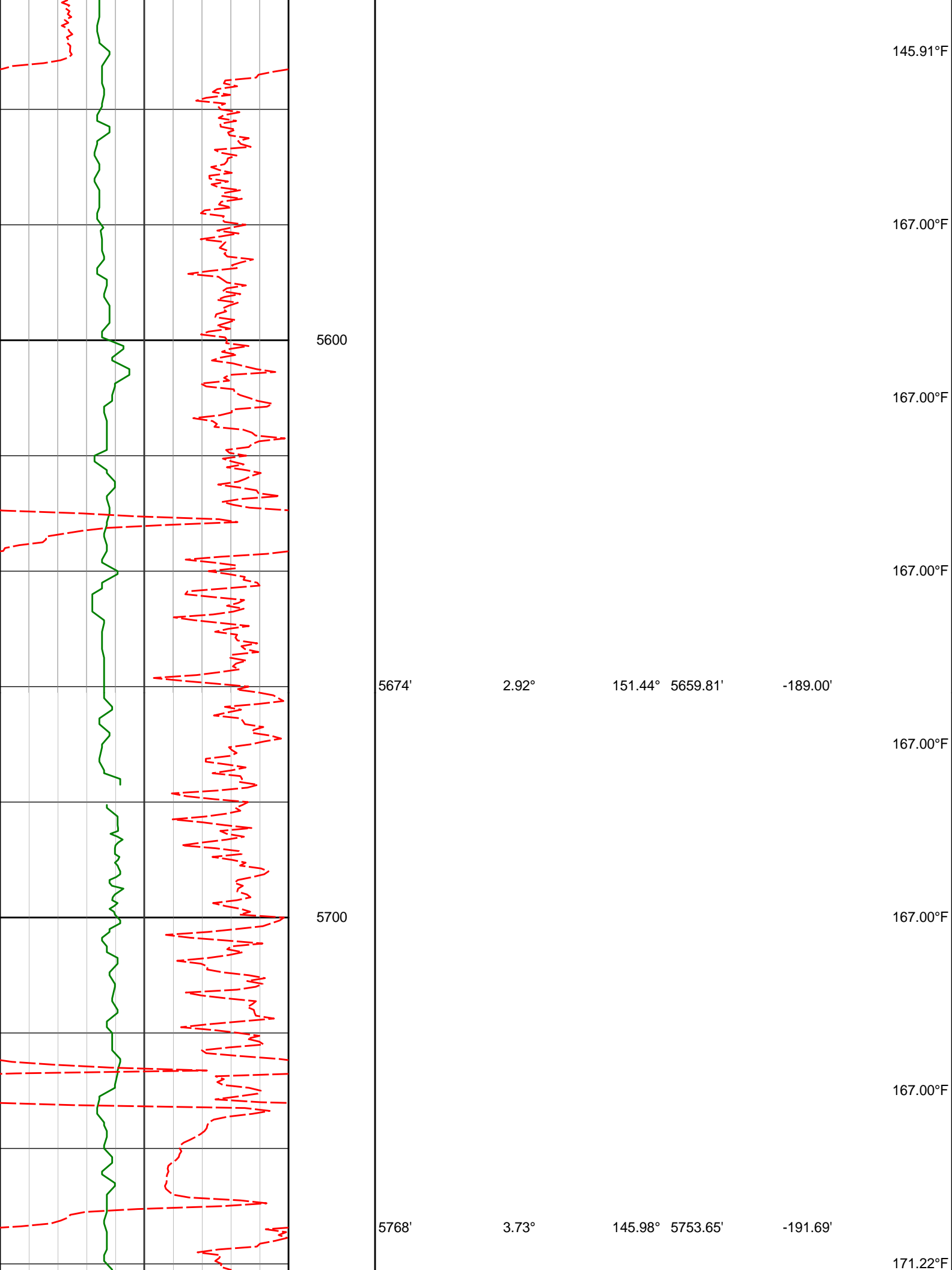
145.91°F

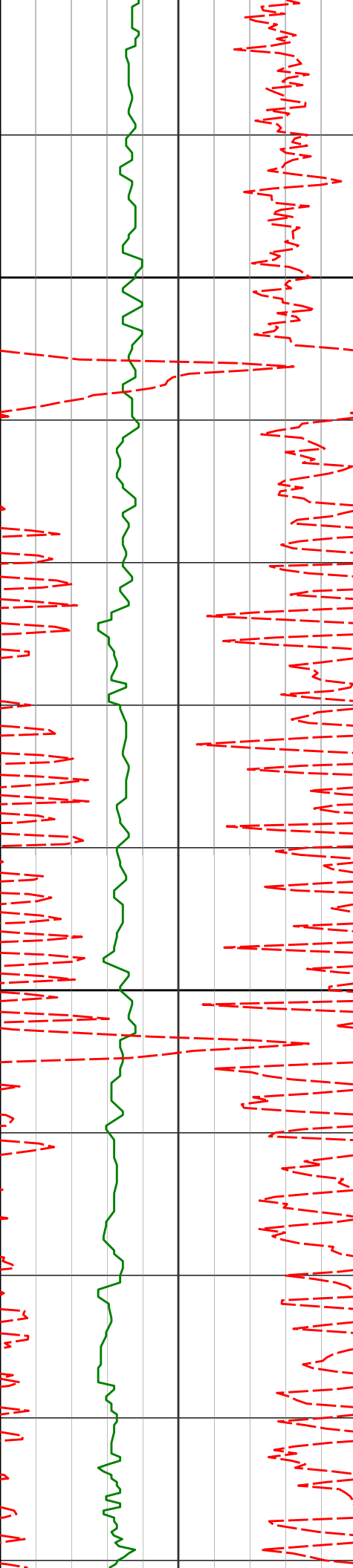
145.91°F

145.91°F

145.91°F

145.91°F





5800

5863'

3.85°

142.25° 5848.44'

-195.19'

5900

5957'

3.05°

137.55° 5942.27'

-198.65'

171.22°F

171.22°F

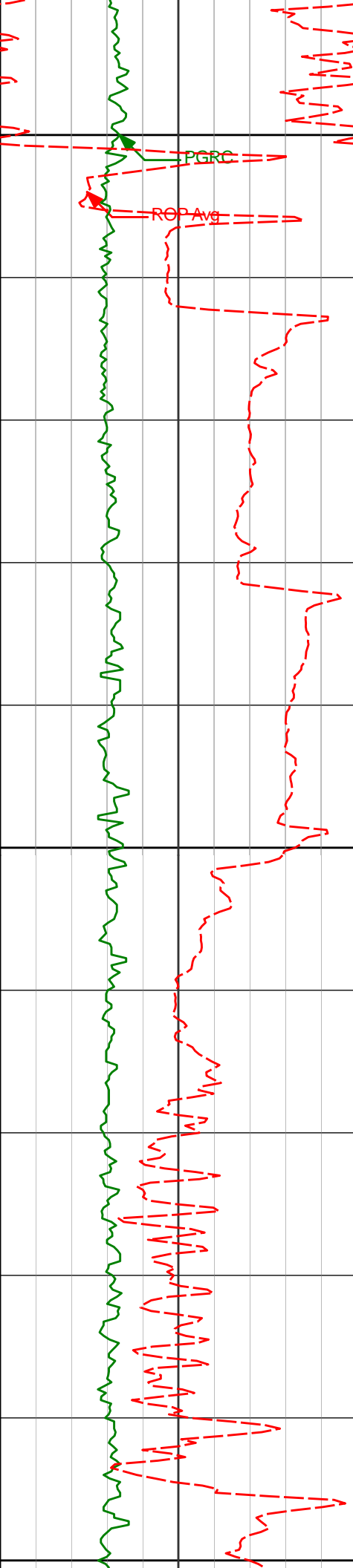
171.22°F

171.22°F

171.22°F

175.44°F

175.44°F



6000

175.44°F

PGRC

ROP Avg

175.44°F

<KOP>

6052'

3.56°

154.24° 6037.12'

-201.47'

171.22°F

171.22°F

6100

171.22°F

6147'

9.31°

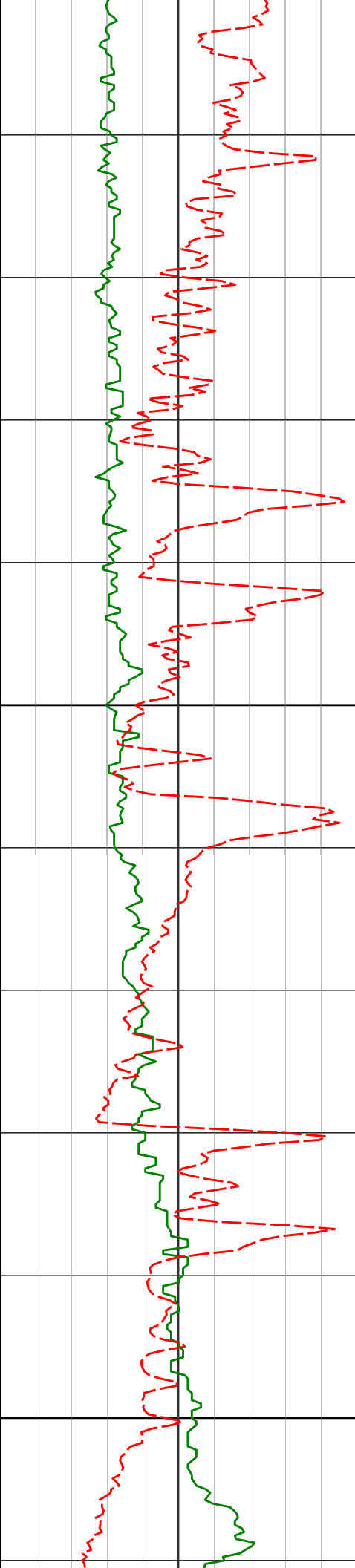
228.42° 6131.59'

-196.72'

175.44°F

175.44°F

6200



6300

6400

6241'

6336'

6430'

13.61°

18.71°

26.98°

263.59°

270.94°

267.90°

6223.81'

6315.03'

6401.59'

-179.79'

-153.41'

-116.97'

175.44°F

179.66°F

179.66°F

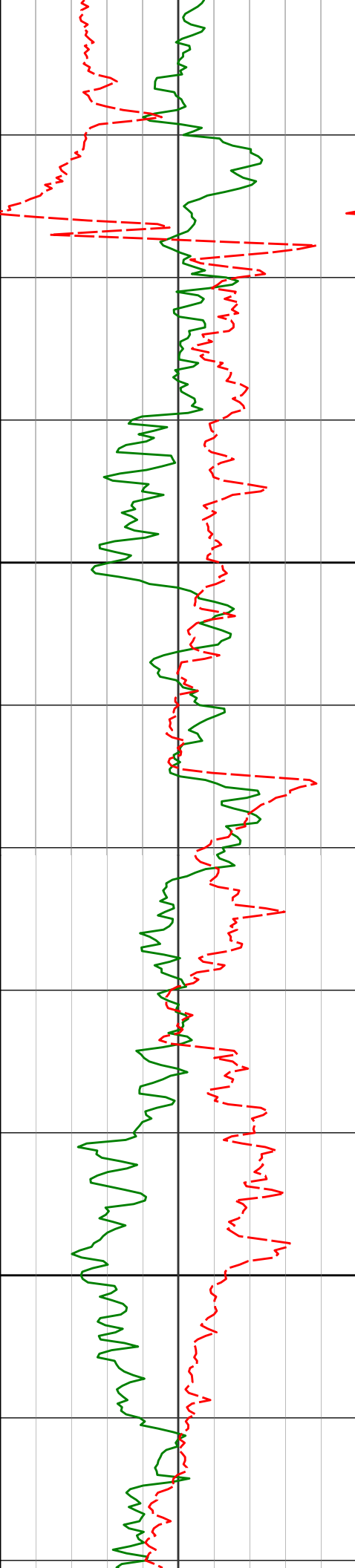
179.66°F

179.66°F

179.66°F

179.66°F

183.88°F



6500

6600

6525'

6619'

6714'

36.38°

45.42°

53.67°

264.26°

269.92°

271.10°

6482.35'

6553.35'

6614.94'

-67.19'

-5.76'

66.38'

183.88°F

183.88°F

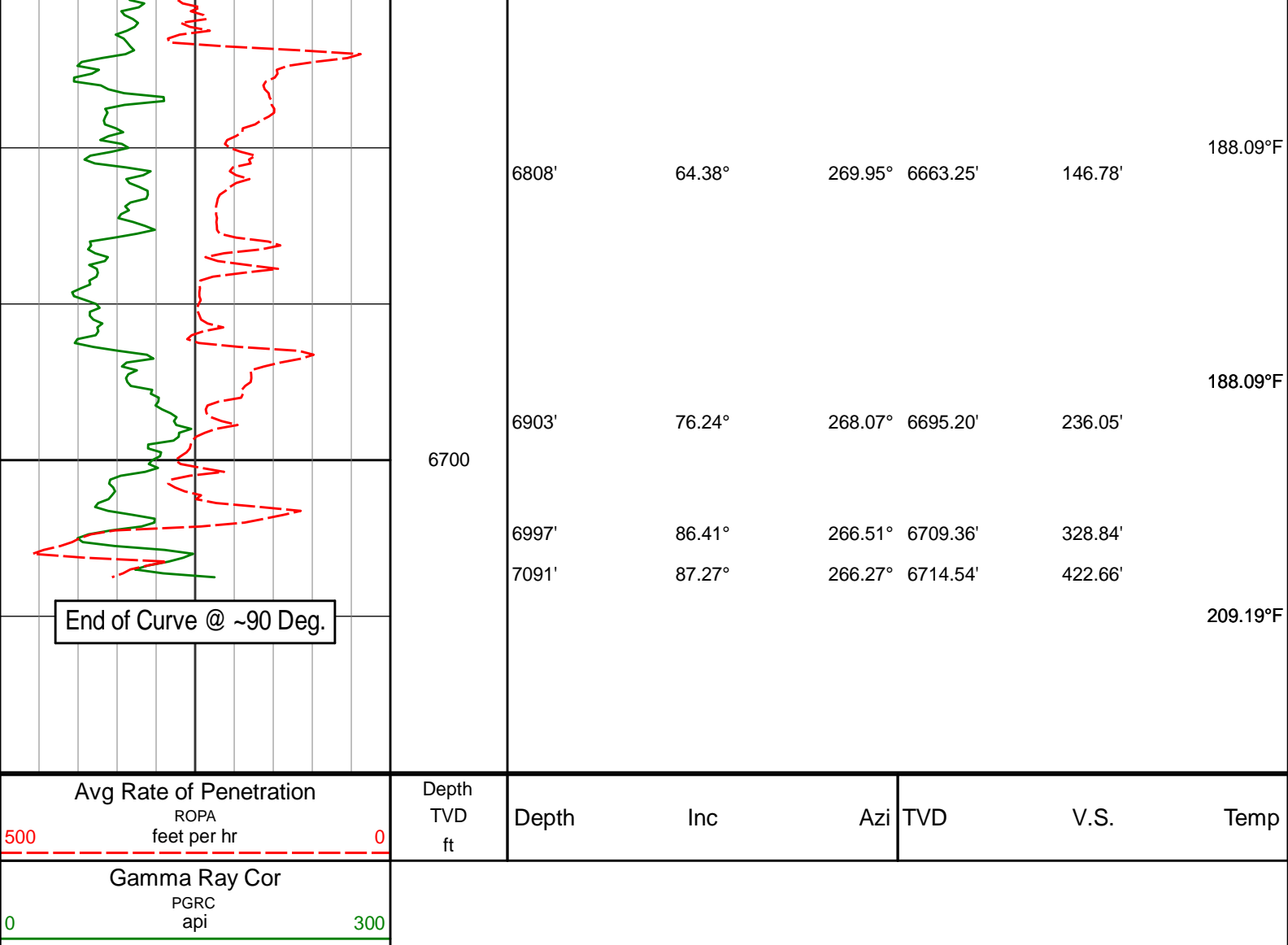
183.88°F

183.88°F

183.88°F

183.88°F

188.09°F



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DIRECTIONAL SURVEY REPORT

Noble Energy
Shadow State A26-614
Wattenberg
Weld Colorado
USA
CA-XX-0903288401

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
78.00	0.03	330.60	78.00	0.02 N	0.01 W	0.01	0.04
172.00	0.37	16.96	172.00	0.33 N	0.07 E	-0.08	0.37
270.00	0.46	22.75	270.00	0.99 N	0.31 E	-0.35	0.10
365.00	0.19	193.16	365.00	1.19 N	0.42 E	-0.47	0.68
459.00	0.13	73.91	459.00	1.07 N	0.49 E	-0.53	0.30
554.00	0.33	62.52	553.99	1.23 N	0.84 E	-0.88	0.21
648.00	0.37	87.49	647.99	1.37 N	1.38 E	-1.43	0.17
743.00	0.14	323.31	742.99	1.47 N	1.62 E	-1.67	0.49
837.00	0.29	338.53	836.99	1.79 N	1.46 E	-1.52	0.17
932.00	0.03	235.28	931.99	1.99 N	1.35 E	-1.42	0.31
1026.00	0.08	234.67	1025.99	1.94 N	1.28 E	-1.35	0.05
1121.00	0.15	216.62	1120.99	1.80 N	1.15 E	-1.21	0.08
1215.00	0.09	278.68	1214.99	1.72 N	1.00 E	-1.07	0.14
1310.00	0.09	216.97	1309.99	1.67 N	0.89 E	-0.94	0.10

1404.00	0.44	295.12	1403.99	1.76 N	0.51 E	-0.58	0.46
1499.00	0.21	324.63	1498.99	2.06 N	0.08 E	-0.16	0.29
1593.00	0.07	329.94	1592.99	2.25 N	0.05 W	-0.04	0.15
1688.00	0.21	209.42	1687.99	2.15 N	0.16 W	0.08	0.27
1782.00	0.40	232.54	1781.99	1.80 N	0.51 W	0.44	0.24
1877.00	0.37	251.15	1876.98	1.50 N	1.06 W	1.00	0.13
1918.00	0.48	296.58	1917.98	1.53 N	1.34 W	1.28	0.84
1963.00	0.50	341.44	1962.98	1.80 N	1.57 W	1.50	0.83
2057.00	0.68	333.21	2056.98	2.69 N	1.95 W	1.85	0.21
2152.00	0.60	332.80	2151.97	3.64 N	2.43 W	2.30	0.08
2246.00	0.67	320.38	2245.97	4.50 N	3.01 W	2.84	0.16
2341.00	0.73	301.38	2340.96	5.24 N	3.88 W	3.69	0.25
2435.00	0.68	303.77	2434.95	5.86 N	4.85 W	4.64	0.06
2530.00	0.53	322.67	2529.95	6.52 N	5.59 W	5.35	0.26
2624.00	0.38	321.32	2623.94	7.11 N	6.05 W	5.79	0.16
2719.00	0.50	308.81	2718.94	7.62 N	6.57 W	6.29	0.16
2813.00	1.03	123.99	2812.94	7.40 N	6.19 W	5.91	1.63
2908.00	2.80	106.86	2907.88	6.25 N	3.26 W	3.03	1.94
3002.00	4.97	109.24	3001.66	4.24 N	2.79 E	-2.94	2.31
3097.00	6.85	104.21	3096.15	1.50 N	12.16 E	-12.21	2.05
3191.00	6.56	102.58	3189.51	1.05 S	22.84 E	-22.79	0.37
3310.00	7.54	106.63	3307.61	4.76 S	36.95 E	-36.76	0.92
3404.00	8.13	113.71	3400.73	9.20 S	48.95 E	-48.59	1.20
3499.00	8.65	121.20	3494.72	15.60 S	61.21 E	-60.61	1.27
3593.00	8.57	121.44	3587.66	22.92 S	73.23 E	-72.36	0.09
3688.00	8.68	122.25	3681.58	30.43 S	85.33 E	-84.18	0.17
3782.00	8.82	122.08	3774.49	38.05 S	97.44 E	-96.00	0.15
3877.00	7.09	120.09	3868.57	44.86 S	108.68 E	-106.99	1.84
3972.00	6.25	124.10	3962.93	50.69 S	118.04 E	-116.13	1.01
4066.00	5.72	128.39	4056.42	56.47 S	125.95 E	-123.83	0.74
4160.00	6.62	125.37	4149.87	62.52 S	134.04 E	-131.69	1.02
4255.00	6.39	121.79	4244.26	68.47 S	143.00 E	-140.43	0.49
4349.00	5.68	122.58	4337.74	73.73 S	151.36 E	-148.60	0.76
4444.00	5.17	123.87	4432.31	78.65 S	158.88 E	-155.93	0.55
4539.00	4.15	142.33	4527.00	83.76 S	164.53 E	-161.40	1.90
4633.00	3.74	164.27	4620.78	89.40 S	167.44 E	-164.10	1.65
4728.00	3.05	178.85	4715.62	94.91 S	168.33 E	-164.80	1.16
4822.00	3.15	157.54	4809.48	99.80 S	169.37 E	-165.66	1.22
4917.00	4.00	148.60	4904.30	105.04 S	172.09 E	-168.19	1.07
5012.00	3.80	144.36	4999.08	110.42 S	175.66 E	-171.55	0.37
5106.00	3.18	144.02	5092.90	115.06 S	179.00 E	-174.73	0.66
5201.00	3.77	156.57	5187.73	120.06 S	181.79 E	-177.34	1.01
5296.00	3.84	158.22	5282.52	125.88 S	184.21 E	-179.55	0.14
5390.00	3.26	154.03	5376.34	131.21 S	186.55 E	-181.69	0.68
5485.00	3.95	153.33	5471.15	136.56 S	189.20 E	-184.15	0.73
5674.00	2.92	151.44	5659.81	146.61 S	194.43 E	-189.00	0.55
5768.00	3.73	145.98	5753.65	151.24 S	197.28 E	-191.69	0.92
5863.00	3.85	142.25	5848.44	156.33 S	200.96 E	-195.19	0.29
5957.00	3.05	137.55	5942.27	160.67 S	204.58 E	-198.65	0.90
6052.00	3.56	154.24	6037.12	165.19 S	207.57 E	-201.47	1.14
6147.00	9.31	228.42	6131.59	172.96 S	203.10 E	-196.72	9.48
6241.00	13.61	263.59	6223.81	179.25 S	186.39 E	-179.79	8.52
6336.00	18.71	270.94	6315.03	180.25 S	160.03 E	-153.41	5.77
6430.00	26.98	267.90	6401.59	180.79 S	123.58 E	-116.97	8.88
6525.00	36.38	264.26	6482.35	184.40 S	73.90 E	-67.19	10.09
6619.00	45.42	269.92	6553.35	187.24 S	12.53 E	-5.76	10.39
6714.00	53.67	271.10	6614.94	186.55 S	59.69 W	66.38	8.74
6808.00	64.38	269.95	6663.25	185.86 S	140.16 W	146.78	11.44
6903.00	76.24	268.07	6695.20	187.46 S	229.42 W	236.05	12.62
6997.00	86.41	266.51	6709.36	191.86 S	322.12 W	328.84	10.94
7091.00	87.27	266.27	6714.54	197.77 S	415.79 W	422.66	0.95
7186.00	89.46	268.06	6717.25	202.47 S	510.62 W	517.60	2.98
7280.00	91.41	269.62	6716.54	204.37 S	604.60 W	611.58	2.66
7375.00	89.86	268.90	6715.49	205.60 S	699.58 W	706.55	1.80
7469.00	90.73	268.72	6715.00	207.55 S	793.56 W	800.53	0.95
7563.00	89.21	269.68	6715.05	208.86 S	887.54 W	894.51	1.91
7658.00	89.55	269.33	6716.08	209.69 S	982.53 W	989.47	0.51
7752.00	88.51	269.82	6717.67	210.38 S	1076.52 W	1083.41	1.22
7847.00	88.81	270.07	6719.89	210.47 S	1171.49 W	1178.33	0.41
7942.00	89.64	270.08	6721.18	210.35 S	1266.48 W	1273.25	0.87
8036.00	89.52	268.25	6721.87	211.72 S	1360.46 W	1367.22	1.95
8131.00	90.39	267.63	6721.94	215.13 S	1455.40 W	1462.22	1.12
8226.00	91.37	267.29	6720.48	219.34 S	1550.29 W	1557.21	1.09
8320.00	89.83	268.28	6719.50	222.98 S	1644.22 W	1651.20	1.95
8415.00	90.41	268.05	6719.30	226.02 S	1739.17 W	1746.19	0.66

8509.00	91.34	268.04	6717.86	229.23 S	1833.10 W	1840.18	0.99
8604.00	89.74	268.64	6716.97	231.98 S	1928.05 W	1935.17	1.80
8699.00	89.67	269.47	6717.46	233.54 S	2023.04 W	2030.15	0.88
8793.00	90.48	269.23	6717.33	234.61 S	2117.03 W	2124.12	0.90
8888.00	91.49	268.81	6715.70	236.23 S	2212.00 W	2219.09	1.15
8983.00	89.46	269.31	6714.91	237.79 S	2306.98 W	2314.06	2.20
9077.00	88.78	269.39	6716.36	238.86 S	2400.96 W	2408.02	0.73
9172.00	90.04	268.93	6717.34	240.25 S	2495.94 W	2502.99	1.41
9266.00	91.46	268.98	6716.11	241.97 S	2589.92 W	2596.97	1.51
9361.00	90.14	270.12	6714.78	242.71 S	2684.90 W	2691.92	1.84
9456.00	90.44	270.95	6714.30	241.83 S	2779.90 W	2786.82	0.93
9550.00	89.30	271.18	6714.51	240.08 S	2873.88 W	2880.67	1.24
9645.00	89.24	270.51	6715.72	238.68 S	2968.86 W	2975.54	0.71
9739.00	90.19	270.10	6716.19	238.18 S	3062.85 W	3069.46	1.10
9834.00	88.41	270.06	6717.35	238.04 S	3157.84 W	3164.38	1.87
9929.00	88.44	269.79	6719.96	238.17 S	3252.81 W	3259.29	0.29
10023.00	88.84	270.71	6722.19	237.76 S	3346.78 W	3353.18	1.07
10118.00	89.70	269.99	6723.40	237.18 S	3441.77 W	3448.09	1.18
10212.00	89.70	269.47	6723.90	237.62 S	3535.77 W	3542.04	0.55
10307.00	89.09	268.03	6724.90	239.69 S	3630.73 W	3637.02	1.65
10401.00	88.65	267.45	6726.75	243.40 S	3724.64 W	3731.00	0.77
10496.00	89.30	267.65	6728.45	247.46 S	3819.54 W	3825.99	0.72
10590.00	89.98	267.41	6729.04	251.51 S	3913.45 W	3919.98	0.77
10685.00	90.97	267.09	6728.25	256.07 S	4008.34 W	4014.97	1.10
10780.00	92.23	267.02	6725.60	260.95 S	4103.17 W	4109.92	1.33
10874.00	90.84	268.76	6723.08	264.41 S	4197.07 W	4203.88	2.37
10969.00	90.44	269.43	6722.02	265.91 S	4292.05 W	4298.85	0.82
11064.00	89.55	268.89	6722.03	267.30 S	4387.04 W	4393.83	1.10
11158.00	90.20	270.17	6722.24	268.07 S	4481.03 W	4487.79	1.53
11253.00	89.03	268.16	6722.87	269.46 S	4576.01 W	4582.76	2.45
11347.00	88.78	266.04	6724.67	274.21 S	4669.87 W	4676.73	2.27
11442.00	90.04	267.19	6725.65	279.82 S	4764.70 W	4771.69	1.80
11537.00	89.30	265.52	6726.20	285.86 S	4859.50 W	4866.65	1.92
11632.00	89.95	265.56	6726.82	293.25 S	4954.21 W	4961.57	0.69
11821.00	89.45	267.42	6727.81	304.82 S	5142.84 W	5150.50	1.02

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 267.93 DEGREES (GRID)
A TOTAL CORRECTION OF 7.65 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 11821.00 FEET
IS 5151.87 FEET ALONG 266.61 DEGREES (GRID)**

Surveys corrected by Surcon starting at 1963 ft.

Final survey is a projection to TD.