



WELL INFORMATION					
MWD Run Number	100				
Date run completed	05-Oct-15				
Rig Bit Number	0100				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	638.00				
Log End Depth (TVD, ft)	6,496.60				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	03-Oct-15 23:15				
Drill/Wipe End Date and Time	05-Oct-15 02:00				
Min Inc (deg) @ Depth (TVD, ft)	0.13 @ 738.00				
Max Inc (deg) @ Depth (TVD, ft)	86.64 @ 6,492.94				
Bit TFA(in2) / Bit Type	1.04 / PDC				
Flow Rate (gpm)	586.68				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Native/Spud Mud				
Density (ppg) / Viscosity (spqt)	8.85 / 26.00				
Filtrate CL (ppm)	400.00				
pH / Fluid Loss (mptm)	11.60 / 14				
PV (cP) / YP (lhf2)	2 / 3.00				
% Solids / % Sand	3.8 / .35				
% Oil / Oil:Water Ratio	N/A / N/A				
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	125.50 / 738.00				

Max Tool Temp (degF) / Source	165.58 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Brian Neu				
Customer Representative	Johnny Sanchez				

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11342302				
Insert Serial Number	11400842				
Date and Time Initialized	02-Oct-15 21:50				
Date and Time Read	05-Oct-15 07:28				
ECMB SW Version	N/A				

### Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	68.00				
Software Version	6.33				
Sub Serial Number	11342302				
Sonde Serial Number	11902092				
Sensor ID Number	N/A				
Toolface Offset (deg)	202.70				

### Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	61.08				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11342302				
Insert/Sonde Serial Number	11681061				

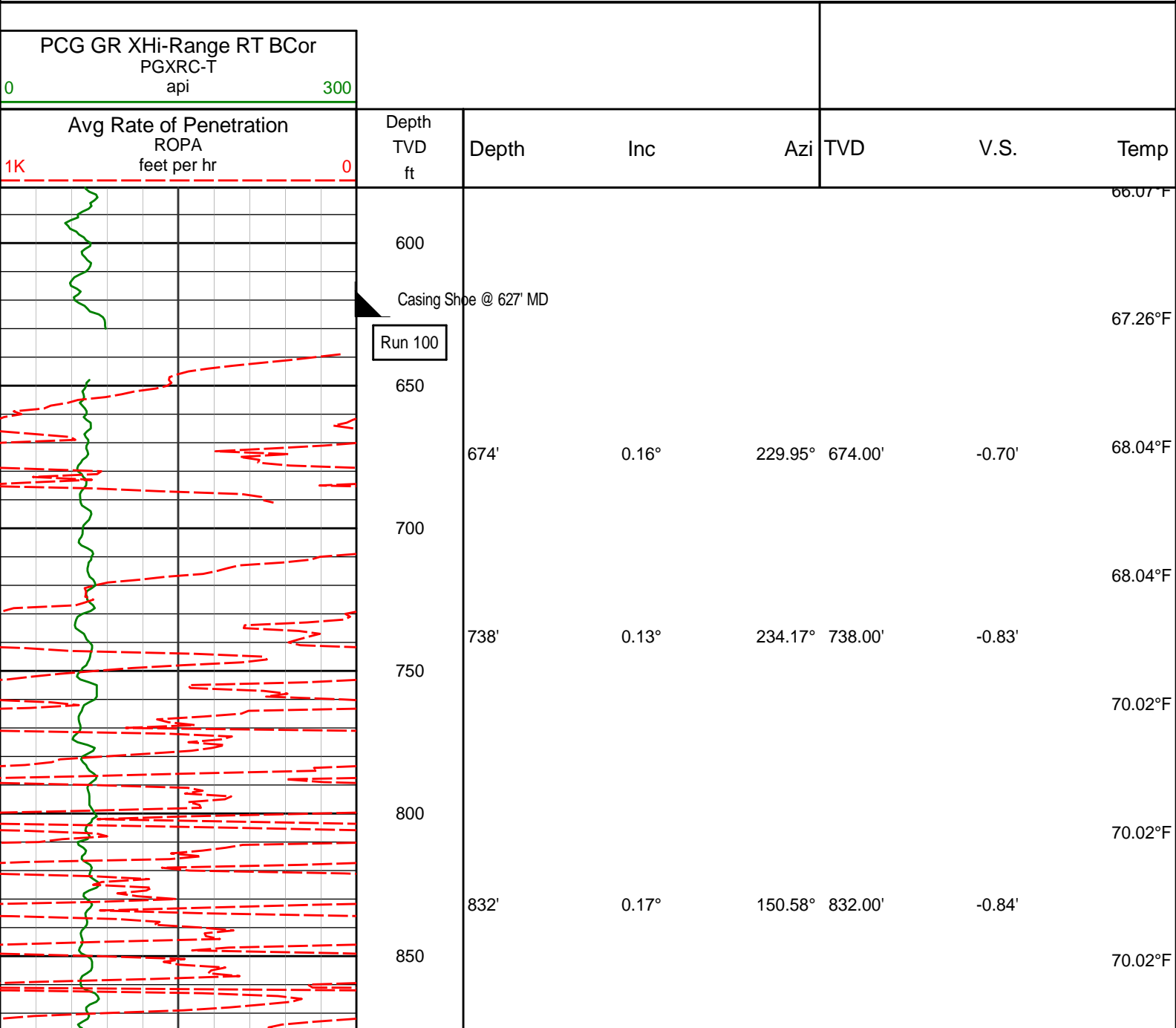
## REMARKS

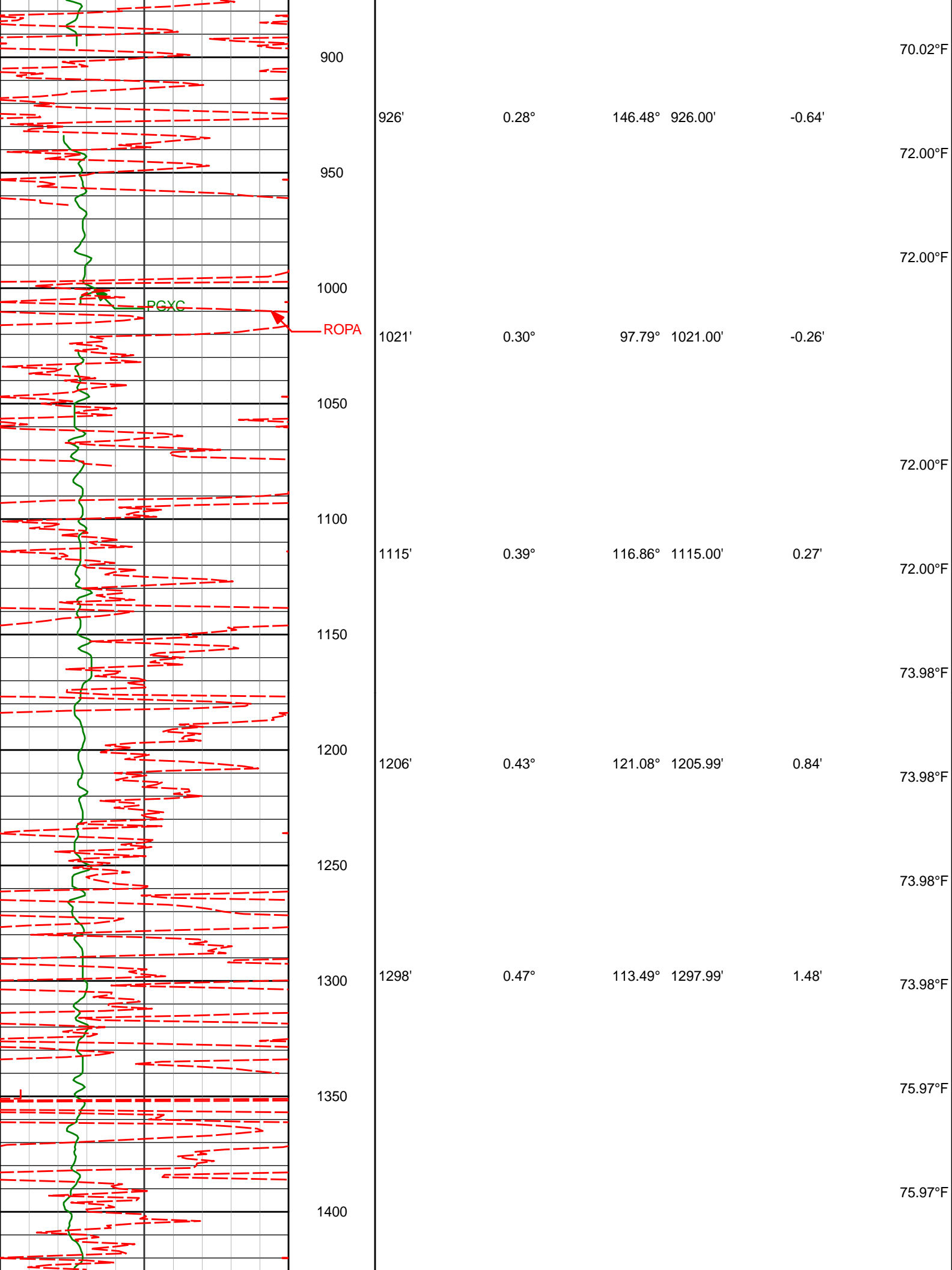
1. All depths are calibrated to driller's pipe tally and are total vertical depth from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. Environmental parameters used in gamma and resistance processing:  
Hole Size: 8.75"  
Mud Density: 9.9-11.0
5. The following smoothing parameters have been applied to the data:  
1: 600 (2"):  
Interval: 1.0 ft  
Coercion Distance: 3.0 ft (ROPA)  
Interval: 1.0 ft  
Coercion Distance: 3.0 ft (Gamma Ray)  
1: 240 (5")  
Interval: 0.5 ft  
Coercion Distance: 1.2 ft (ROPA)  
Interval: 0.5 ft  
Coercion Distance: 0.6 ft (Gamma Ray)

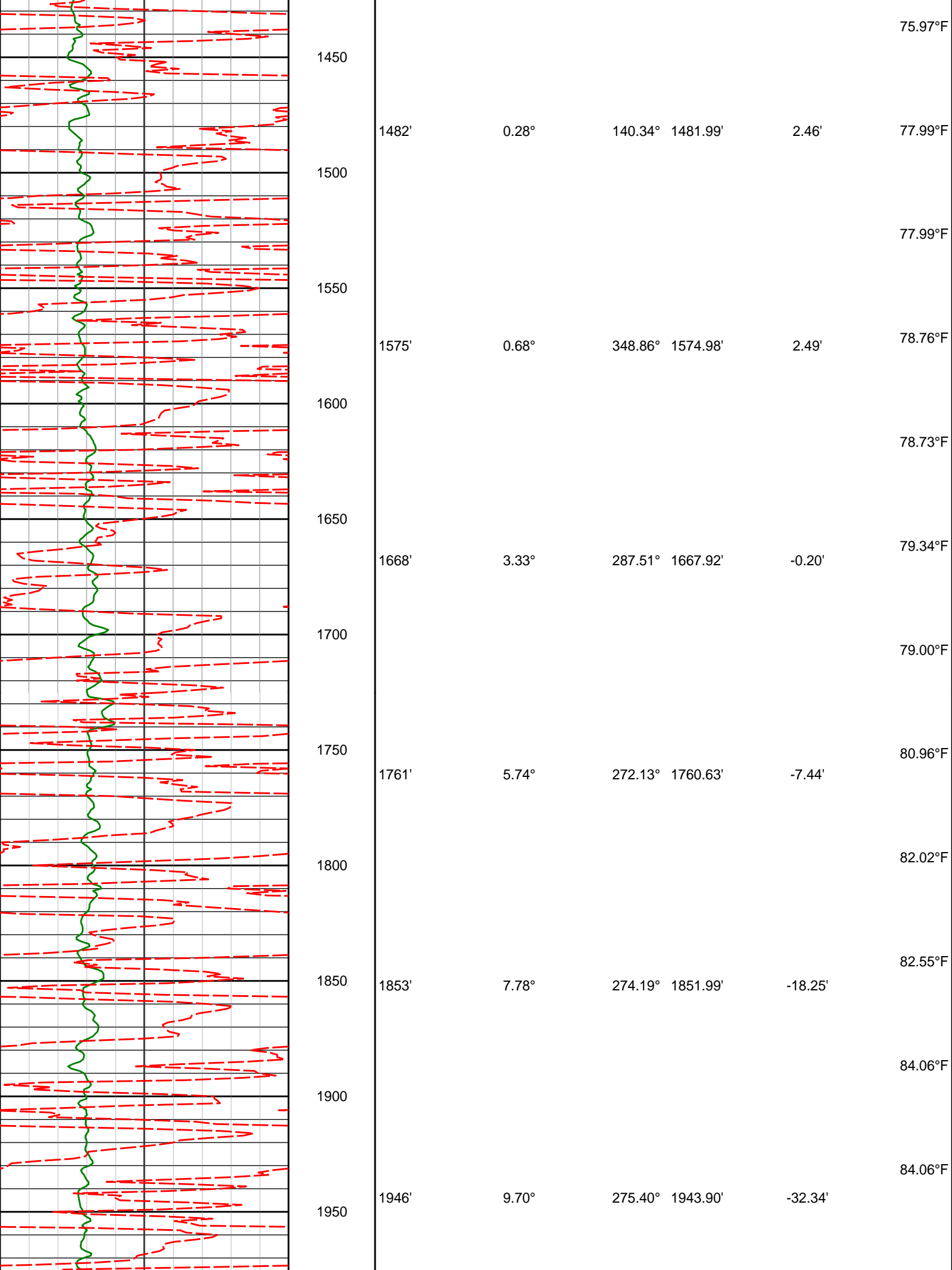
## WARRANTY

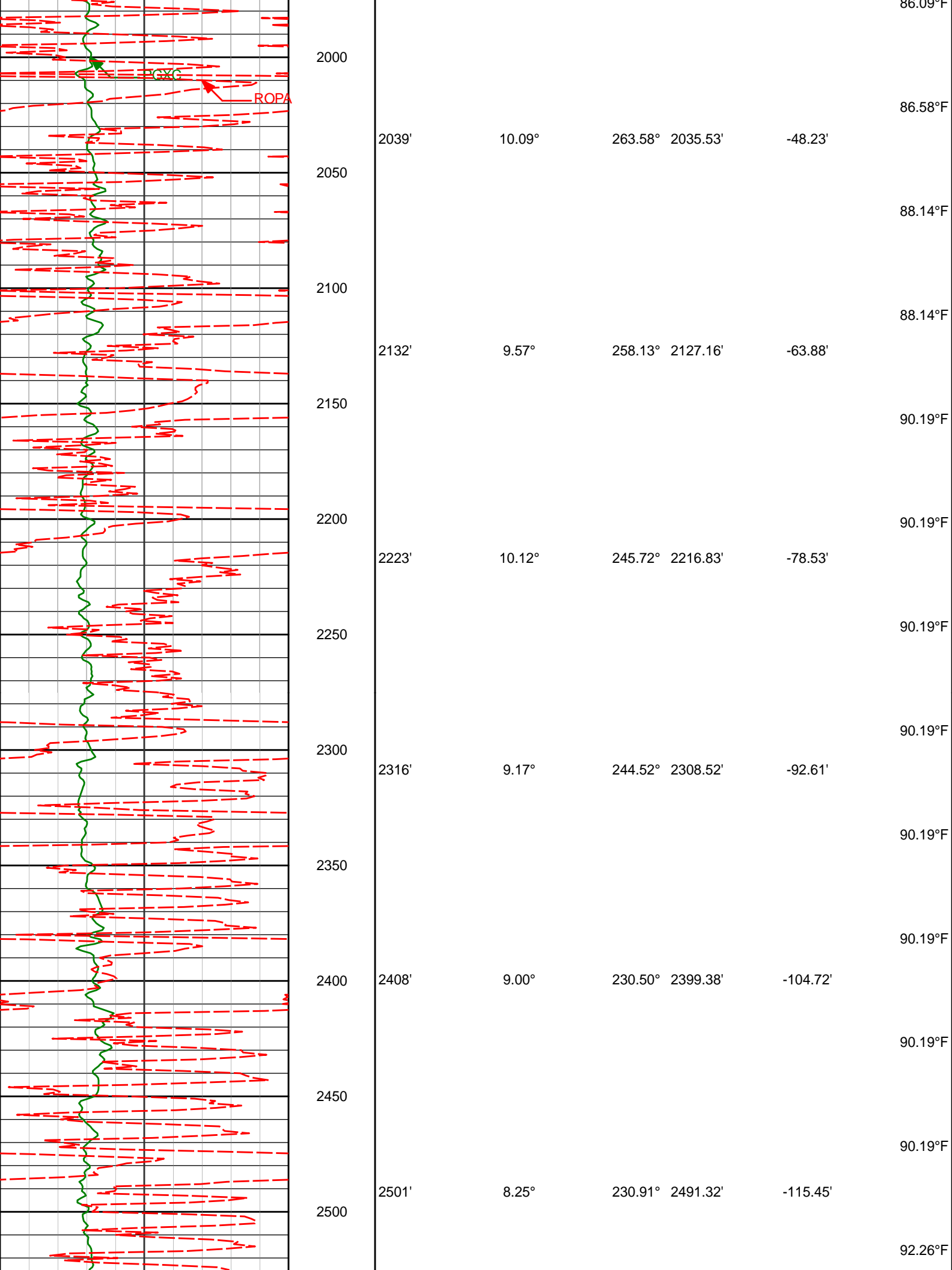
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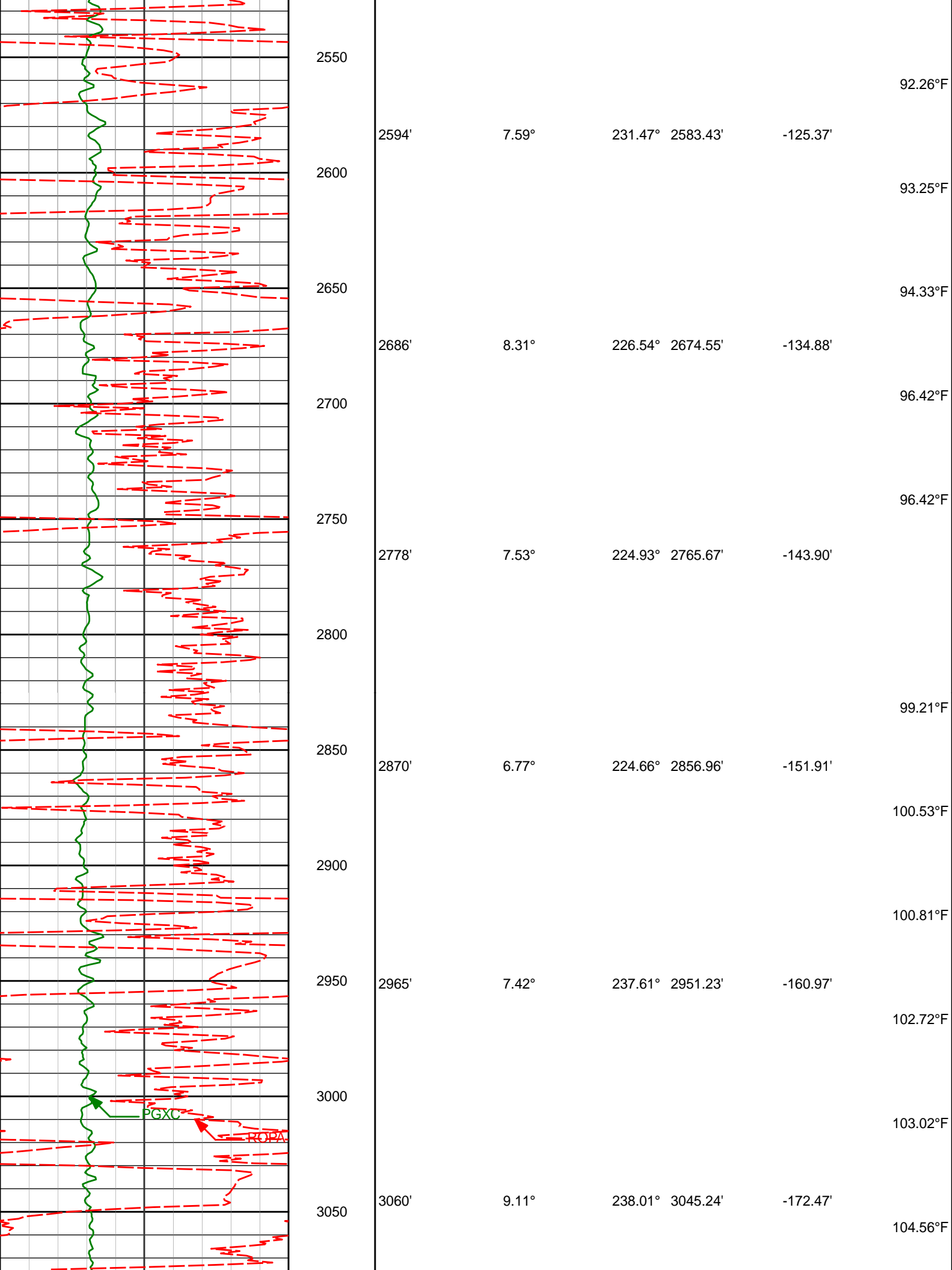
# TVD Detail 1:600 Scale

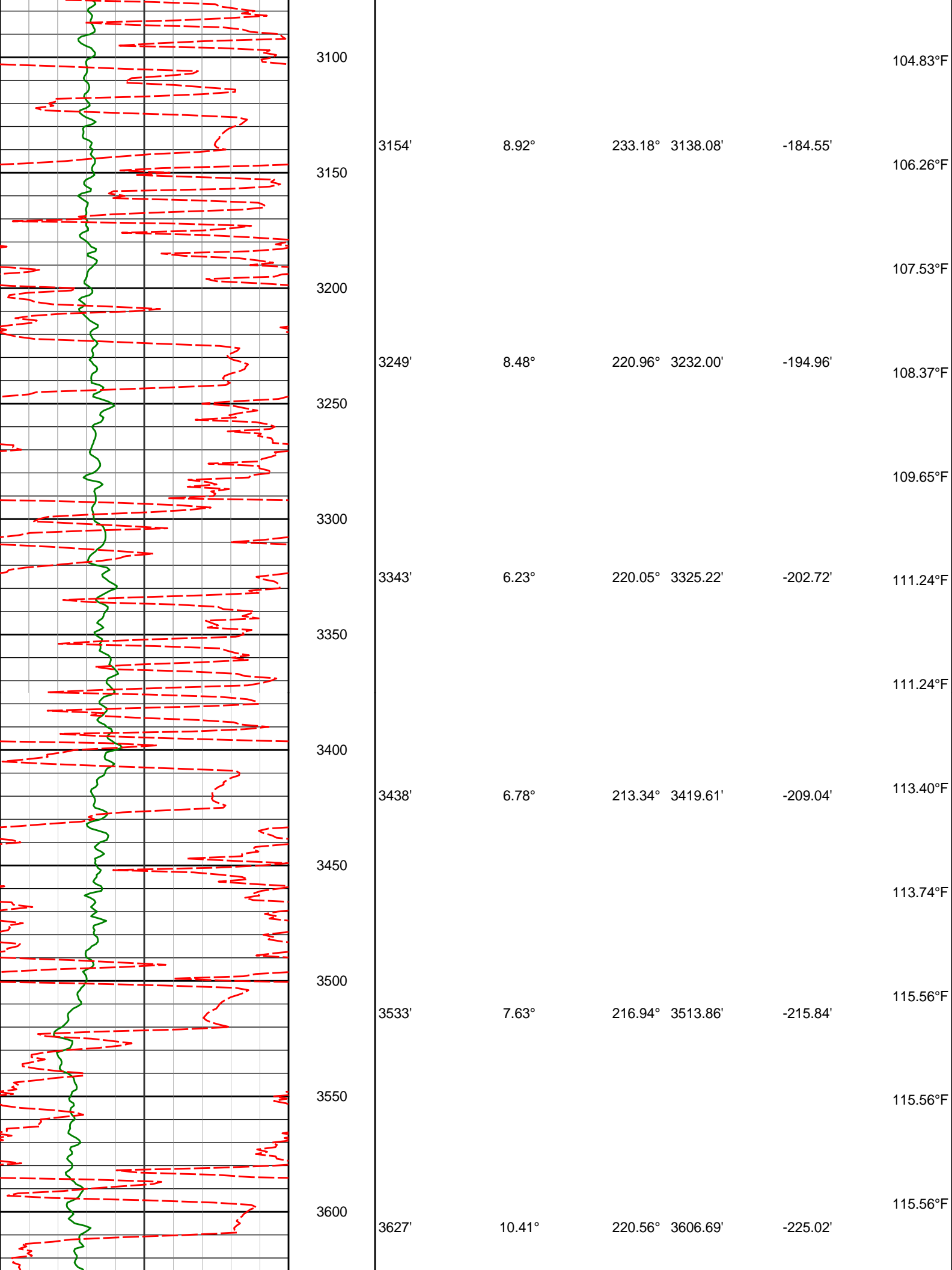




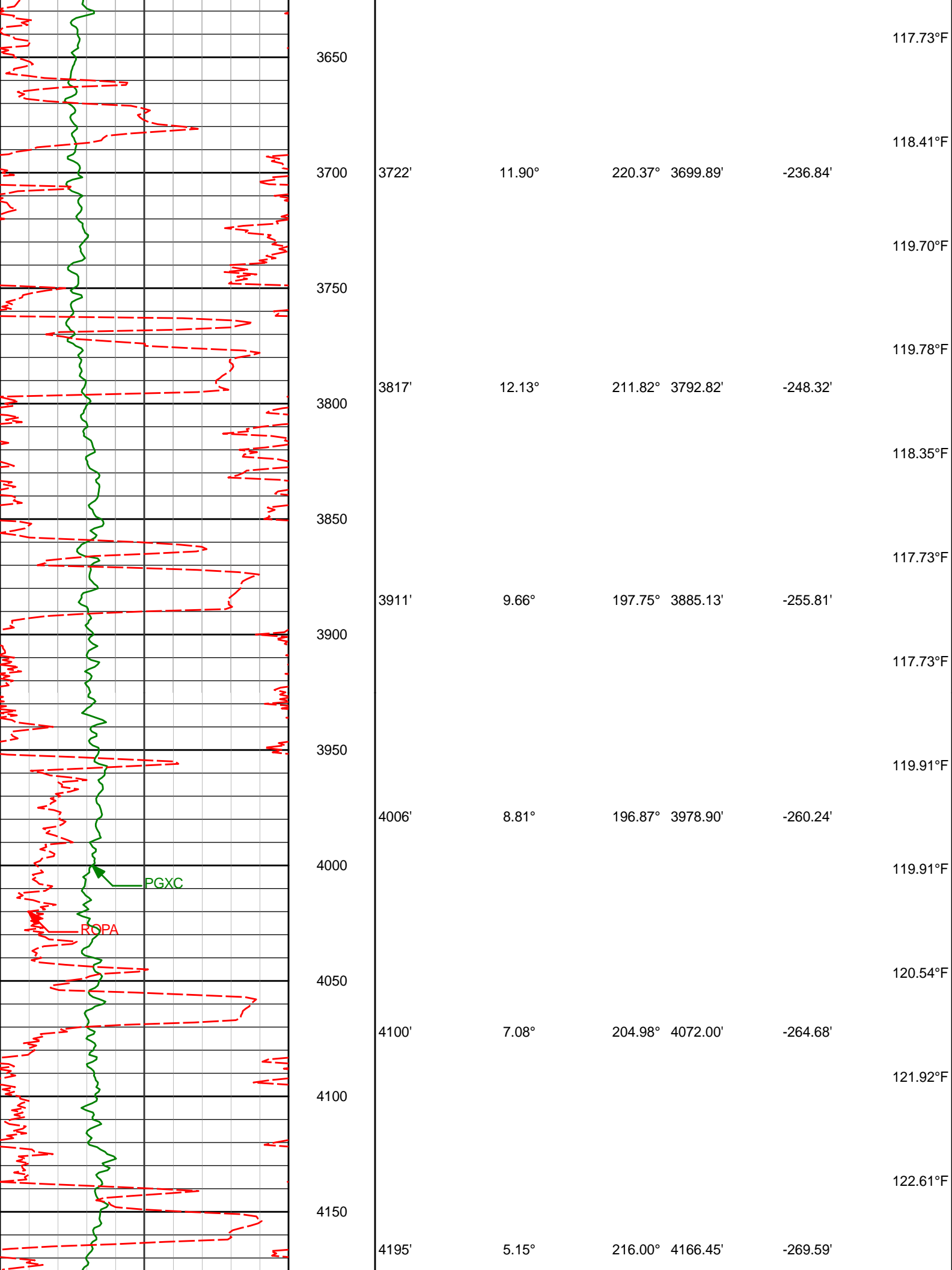


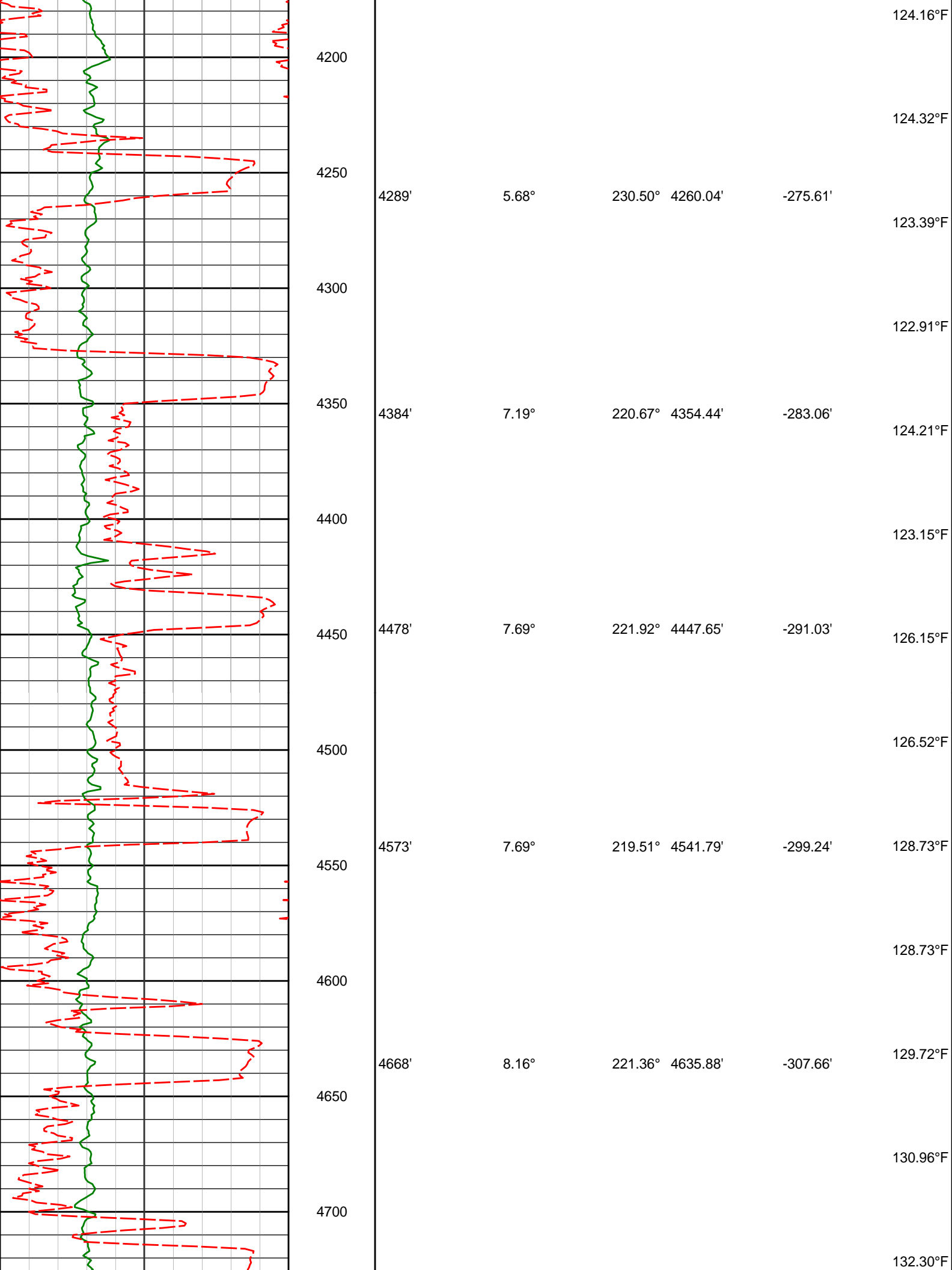


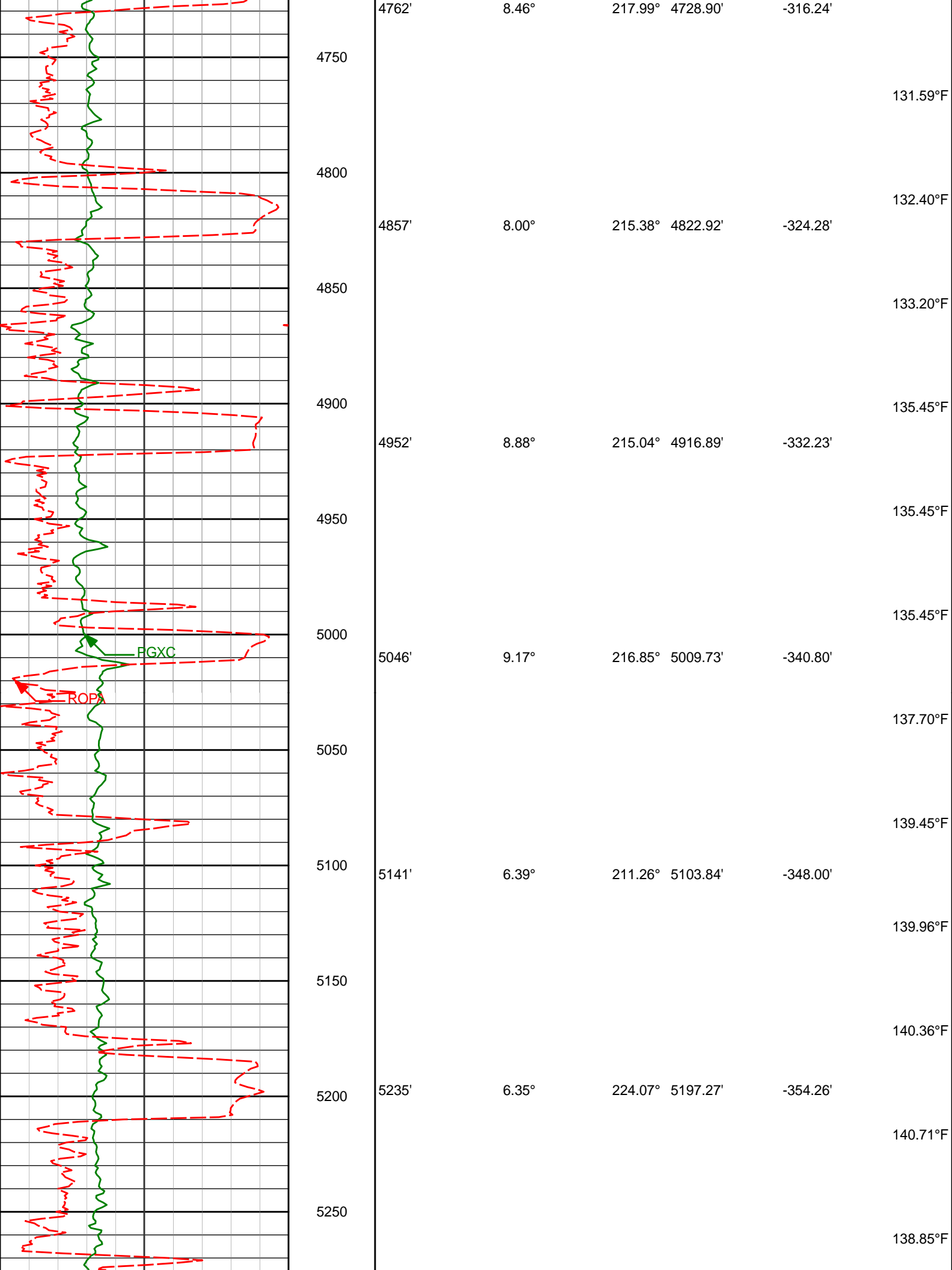


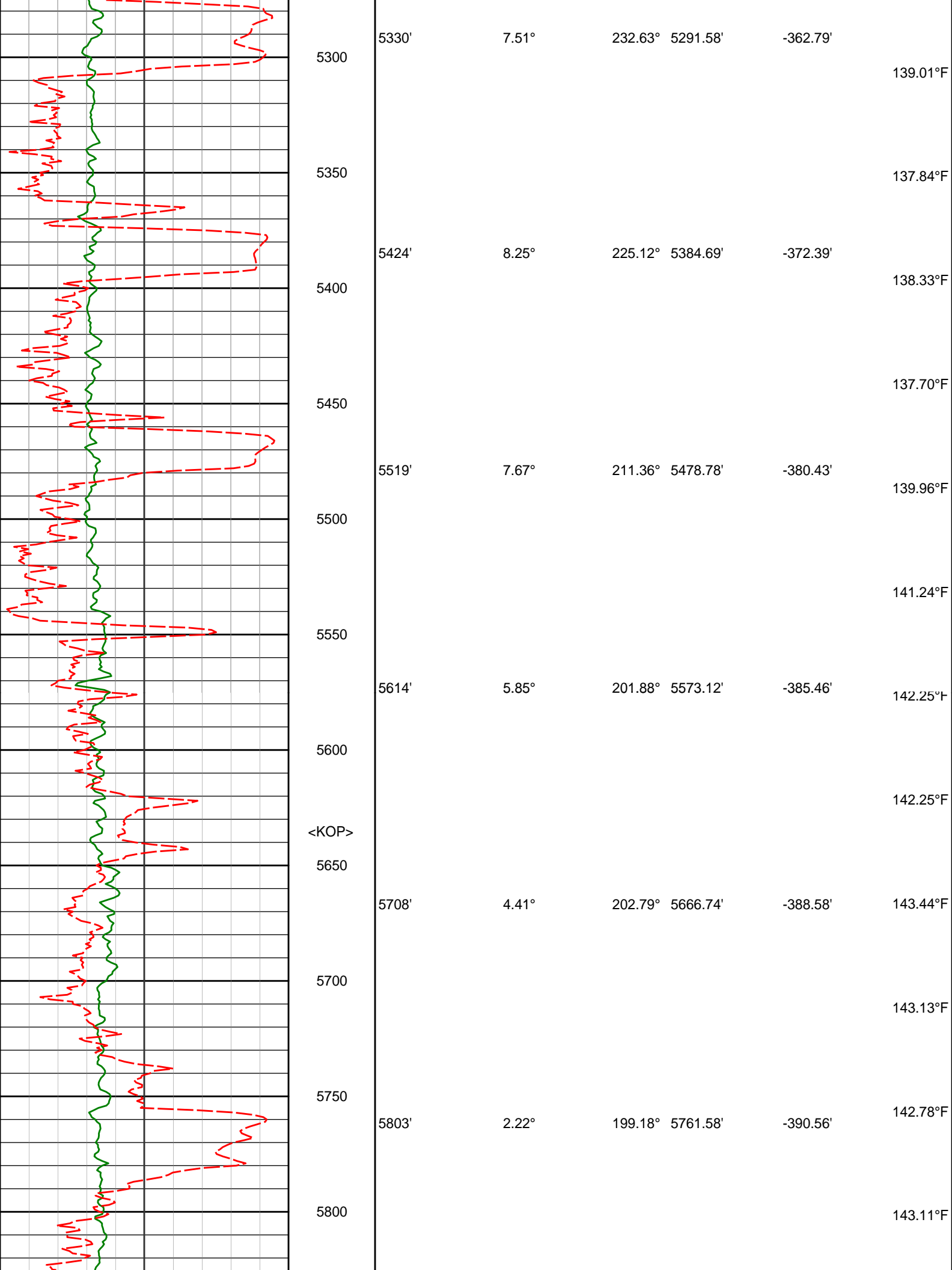


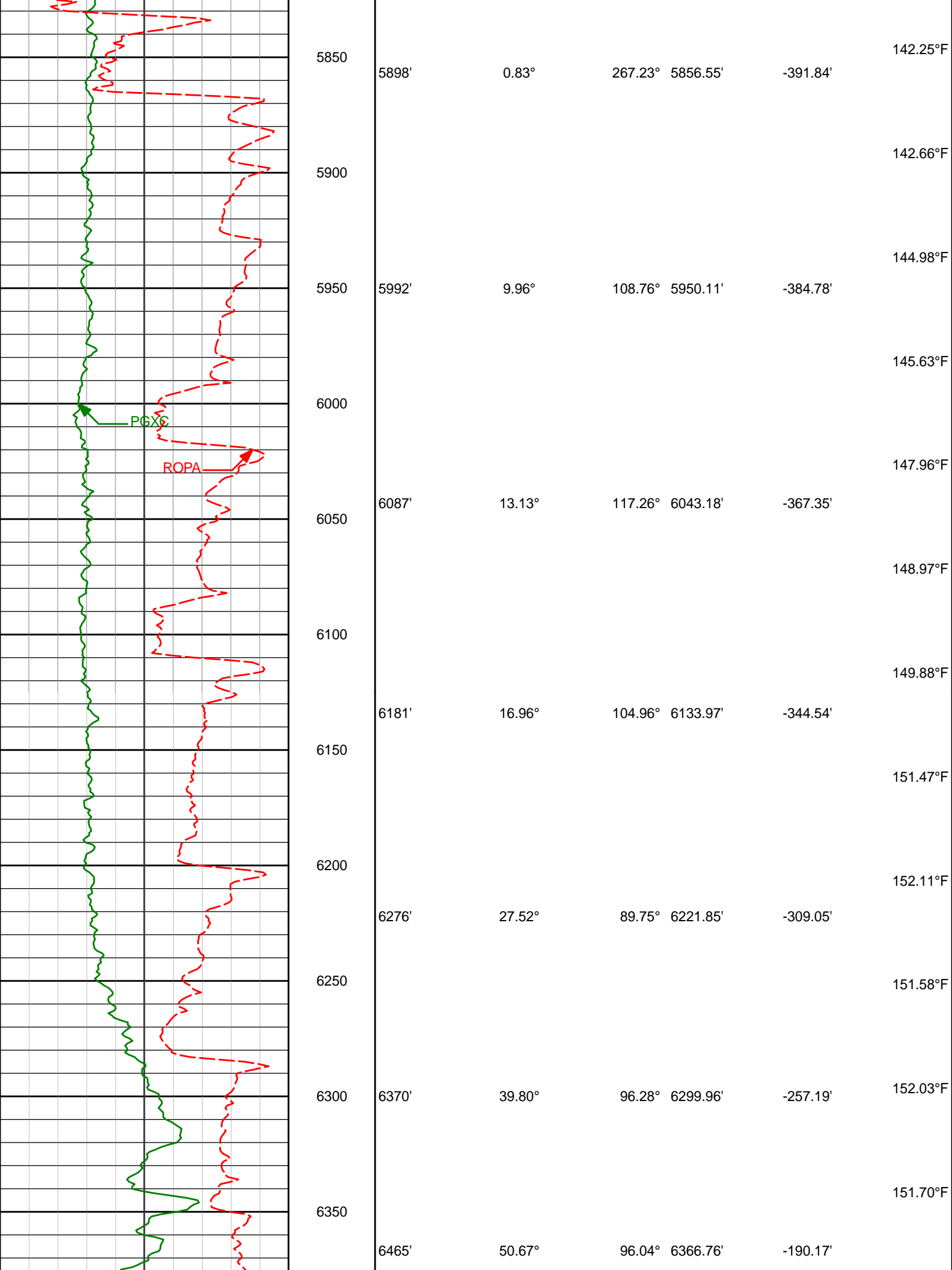


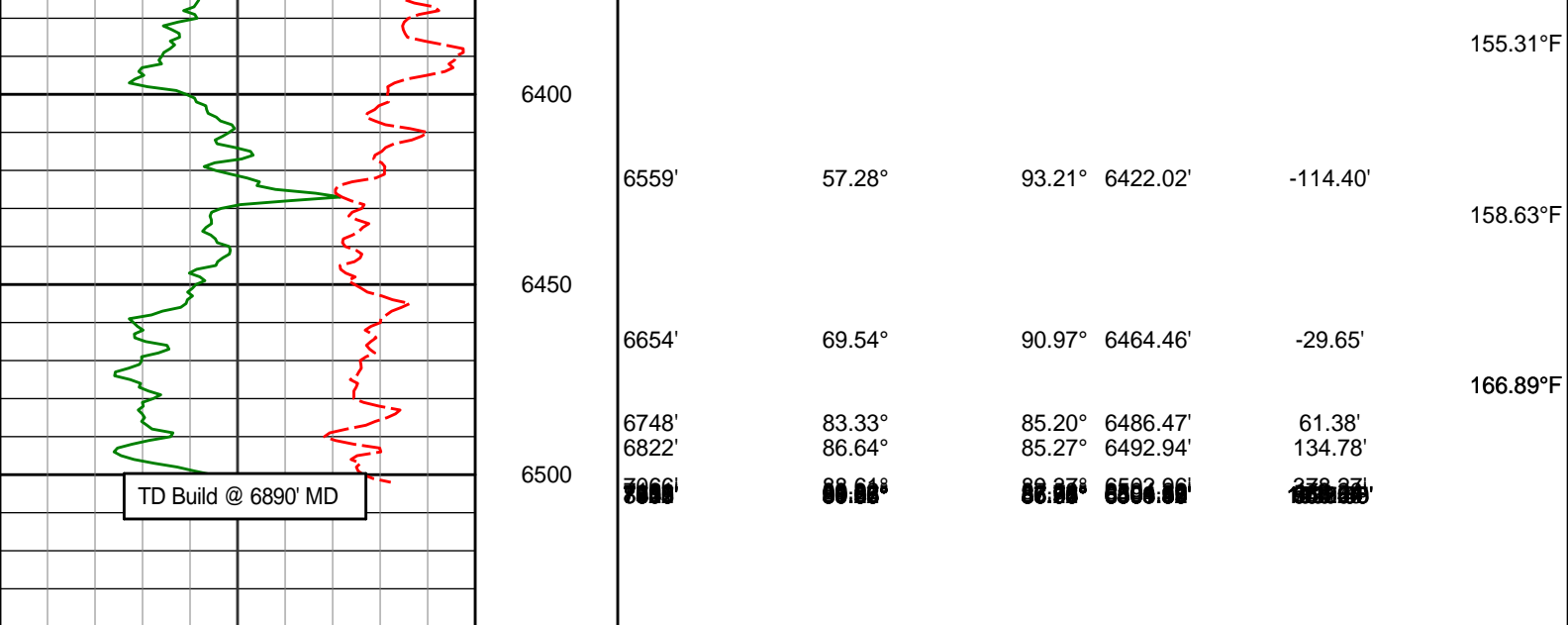






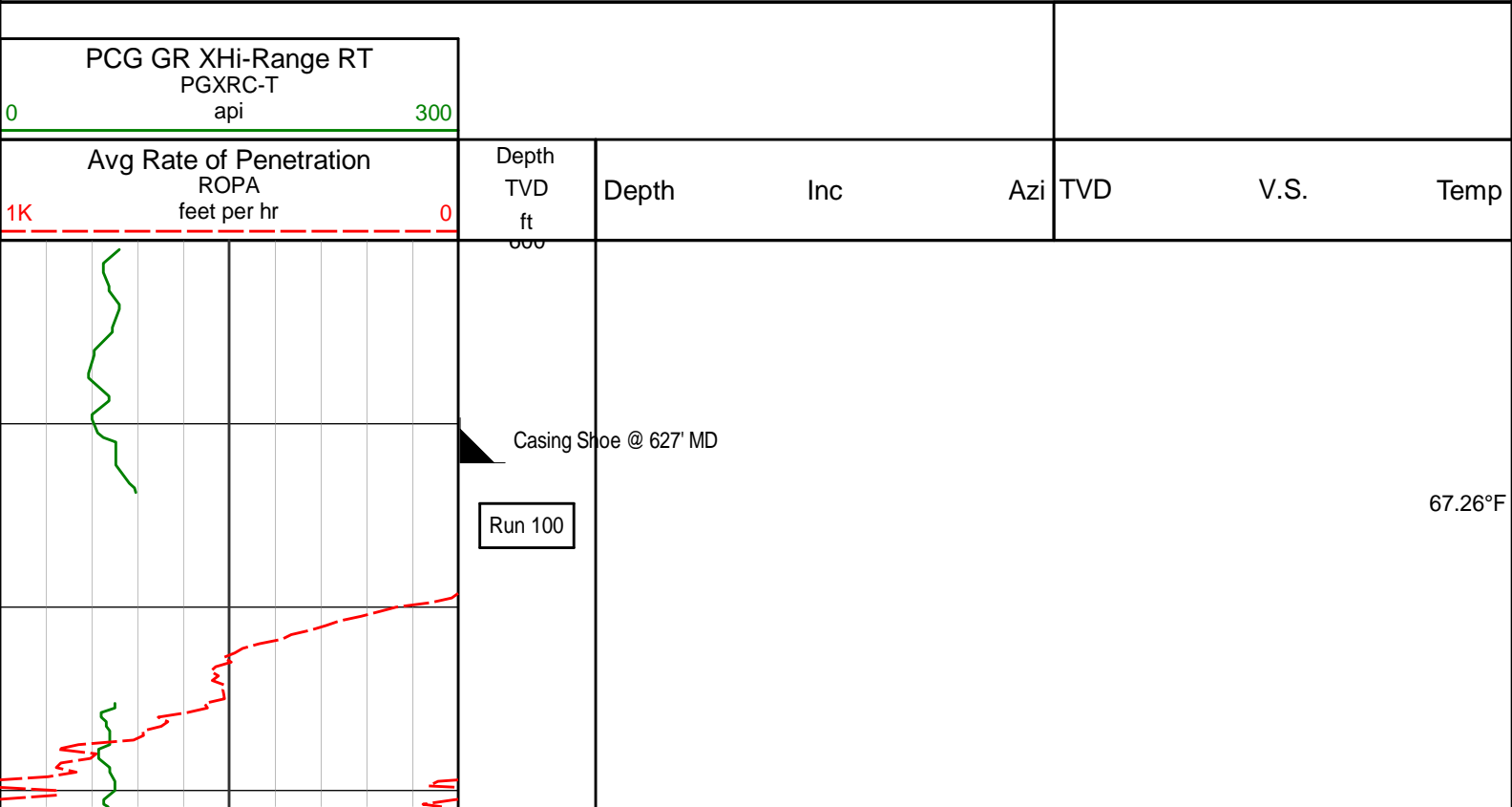


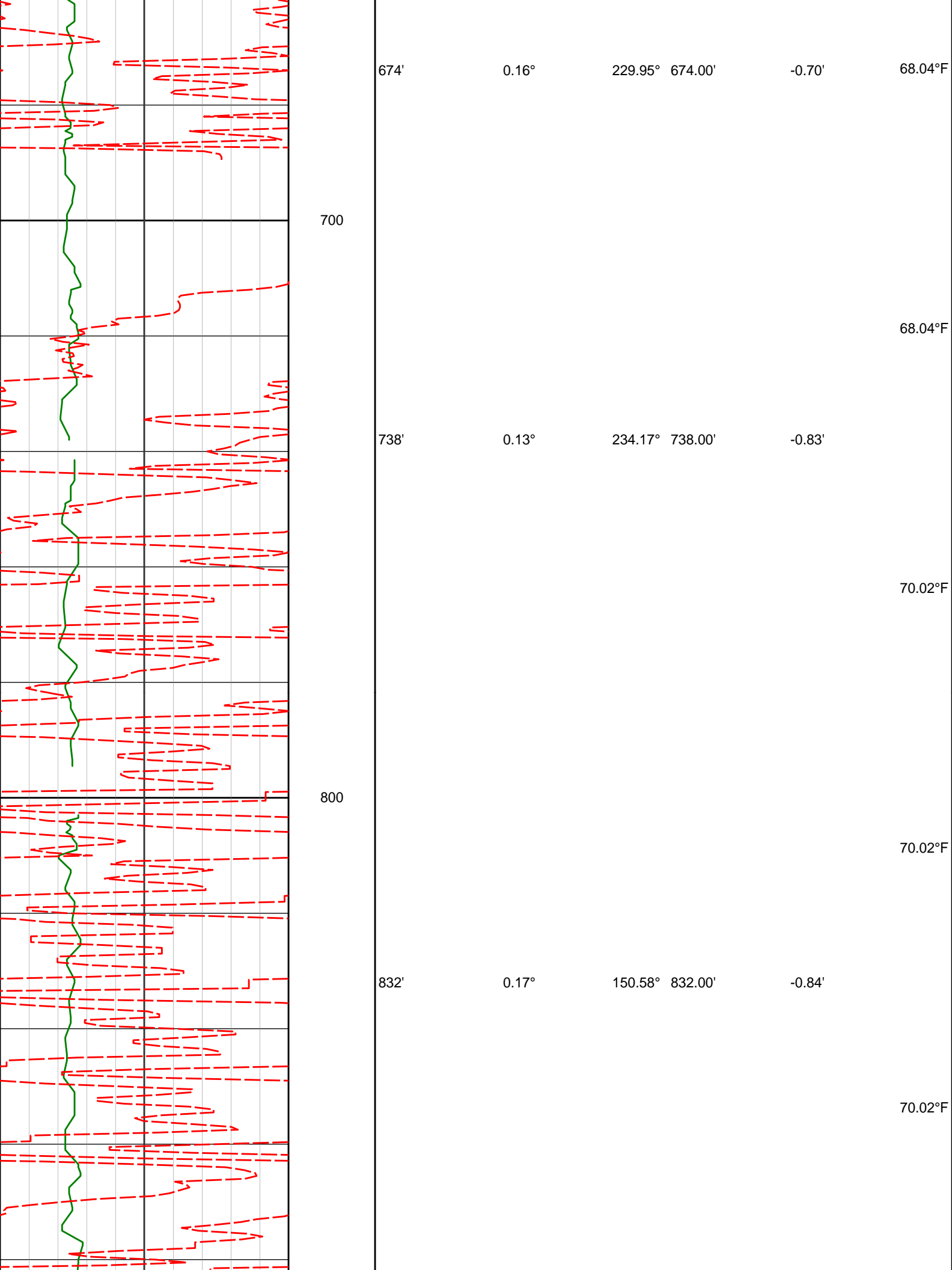


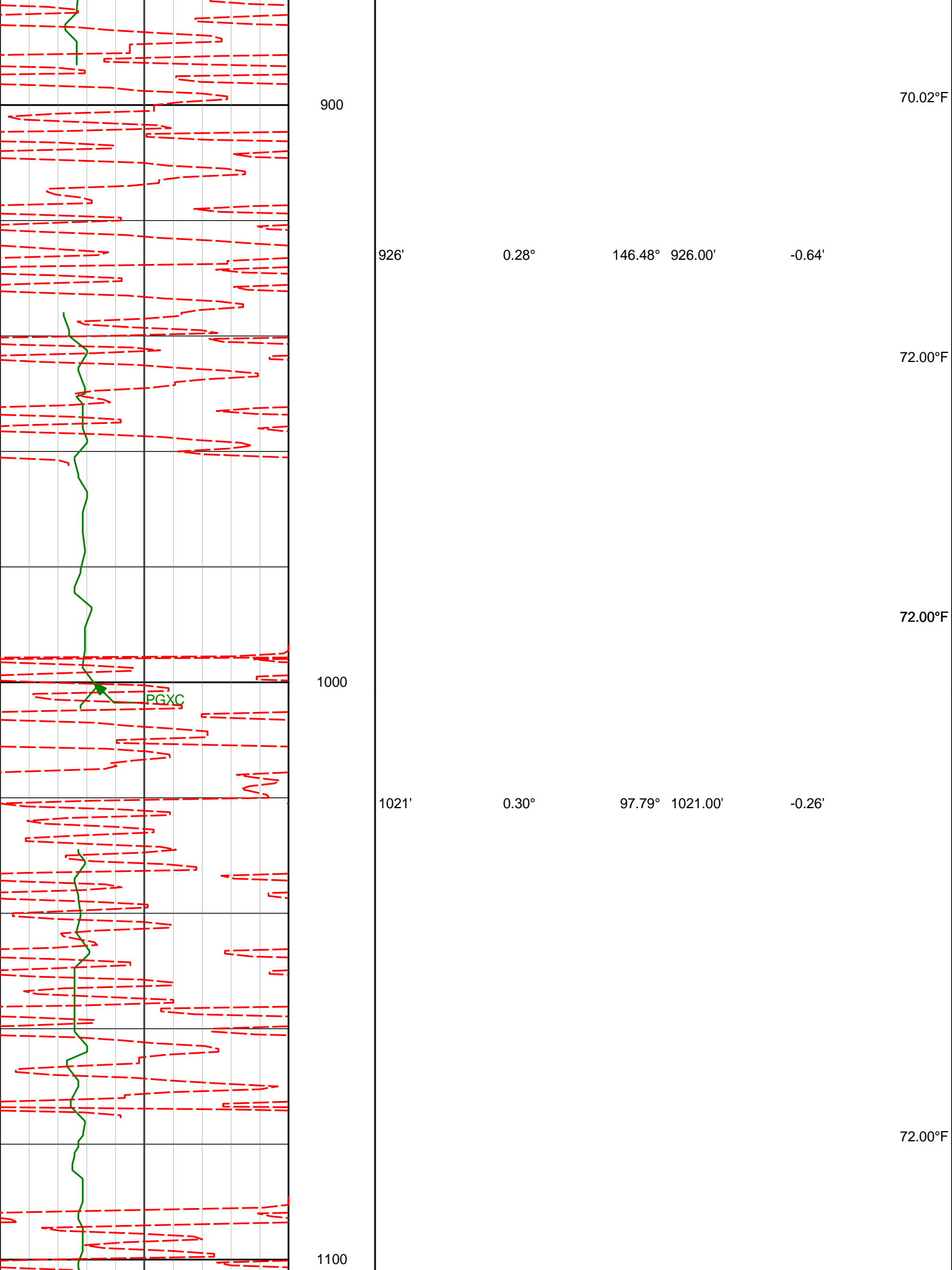


Avg Rate of Penetration ROPA feet per hr		Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
1K 0								
PCG GR XHi-Range RT BCor PGXRC-T api								
0 300								

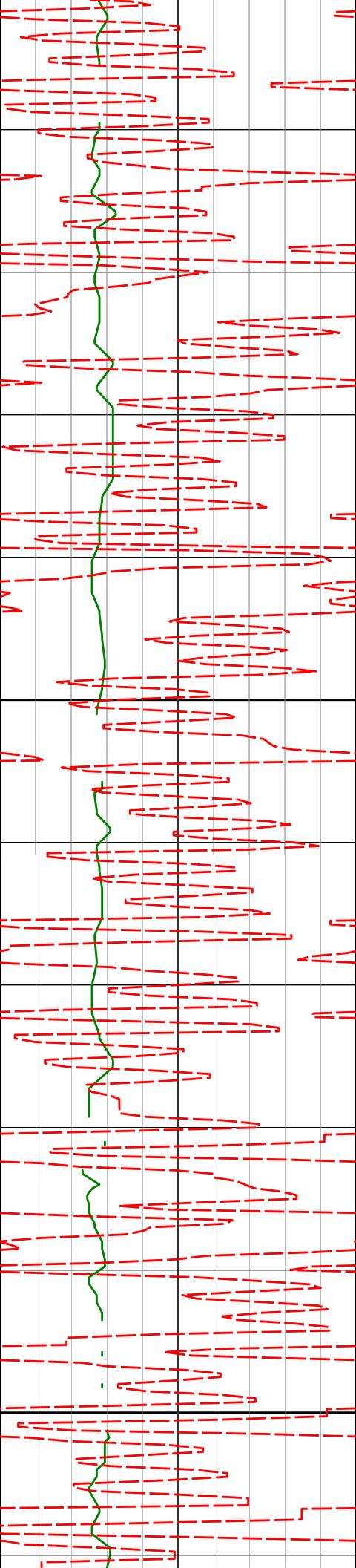
TVD Detail 1:240 Scale











1115'

0.39°

116.86°

1115.00'

0.27'

72.00°F

73.98°F

1200

1206'

0.43°

121.08°

1205.99'

0.84'

73.98°F

73.98°F

1300

1298'

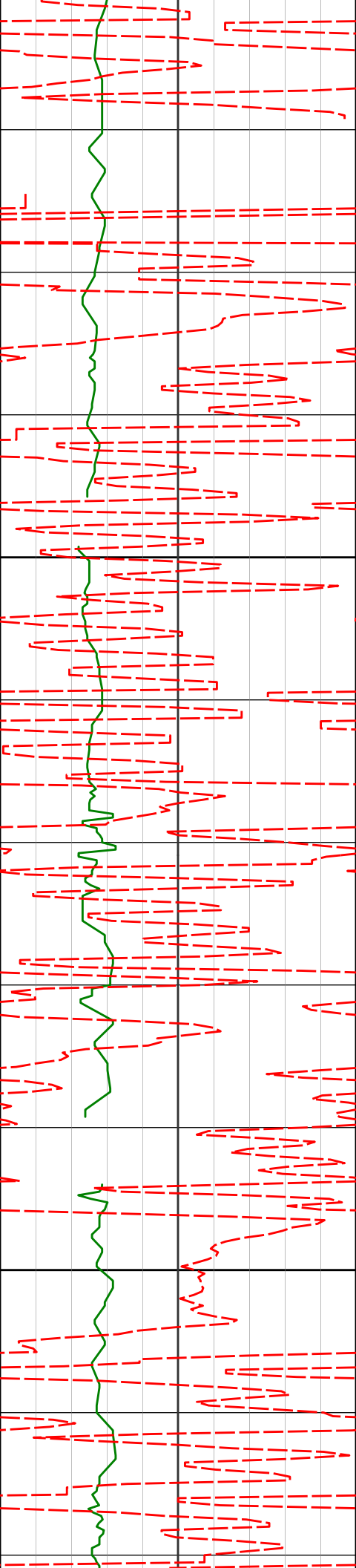
0.47°

113.49°

1297.99'

1.48'

73.98°F



1400

1482'

1500

0.28°

140.34° 1481.99'

2.46'

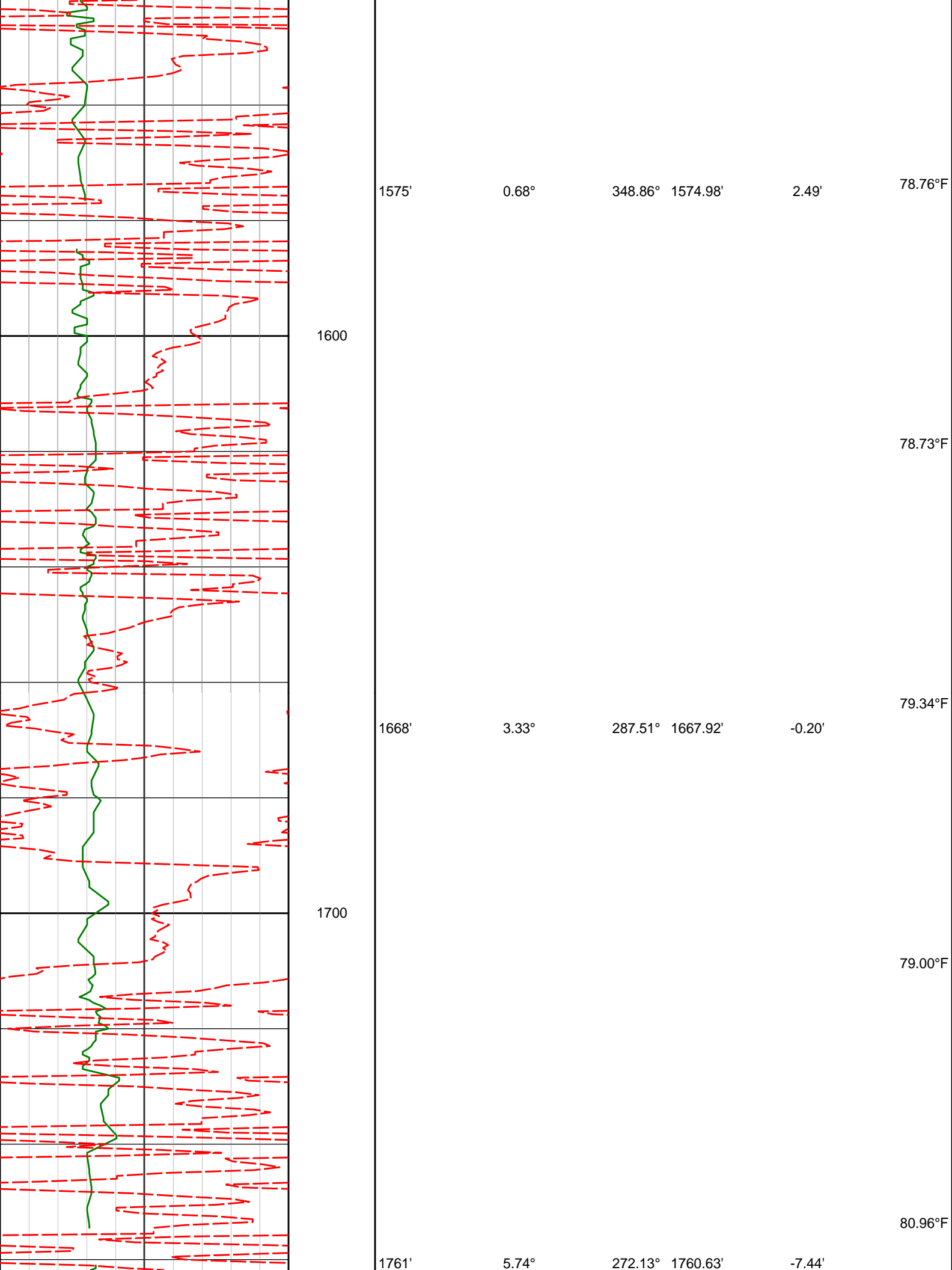
75.97°F

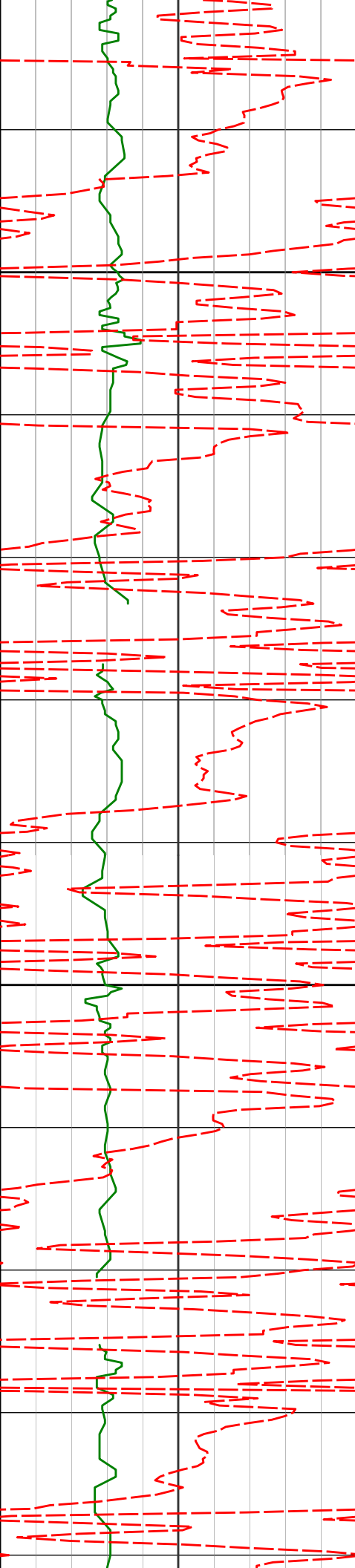
75.97°F

75.97°F

77.99°F

77.99°F





1800

82.02°F

1853'

7.78°

274.19°

1851.99'

-18.25'

82.55°F

1900

84.06°F

1946'

9.70°

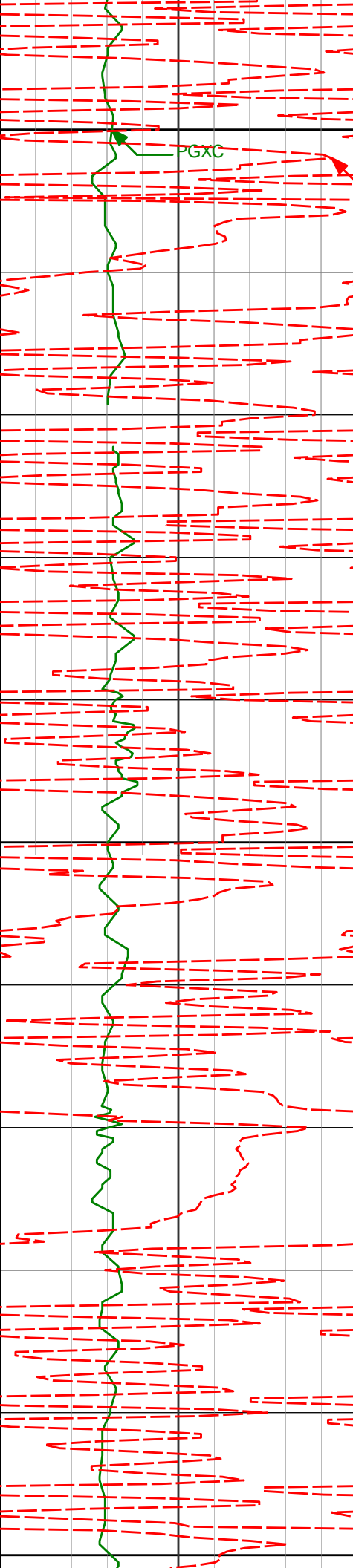
275.40°

1943.90'

-32.34'

84.06°F

86.09°F



2000

PGXC

ROPA

86.58°F

2039'

10.09°

263.58°

2035.53'

-48.23'

88.14°F

2100

88.14°F

2132'

9.57°

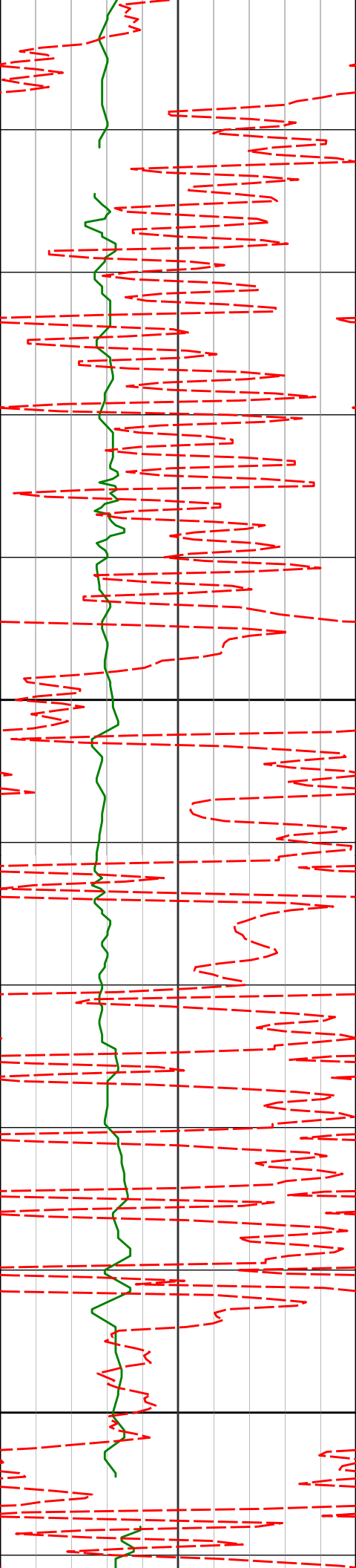
258.13°

2127.16'

-63.88'

90.19°F

2200



2300

2400

2223'

2316'

2408'

10.12°

9.17°

9.00°

245.72°

244.52°

230.50°

2216.83'

2308.52'

2399.38'

-78.53'

-92.61'

-104.72'

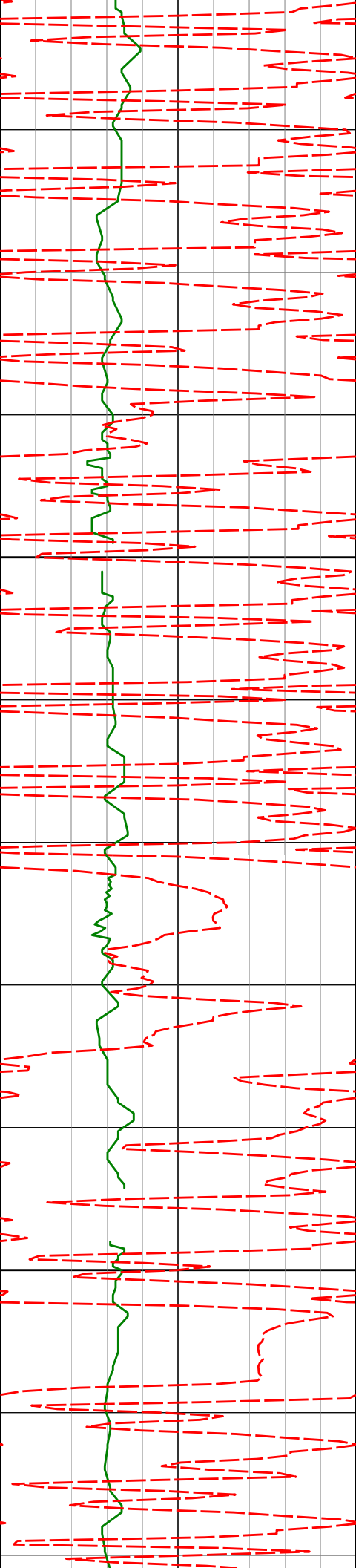
90.19°F

90.19°F

90.19°F

90.19°F

90.19°F



2500

2600

2501'

8.25°

230.91° 2491.32'

-115.45'

2594'

7.59°

231.47° 2583.43'

-125.37'

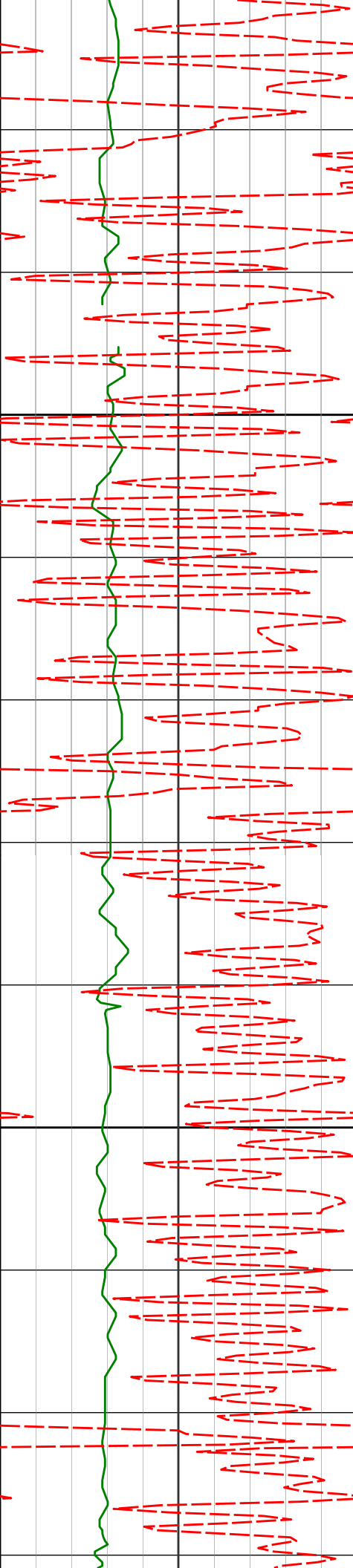
90.19°F

90.19°F

92.26°F

92.26°F

93.25°F



2700

2800

2686'

2778'

2870'

8.31°

7.53°

6.77°

226.54°

224.93°

224.66°

2674.55'

2765.67'

2856.96'

-134.88'

-143.90'

-151.91'

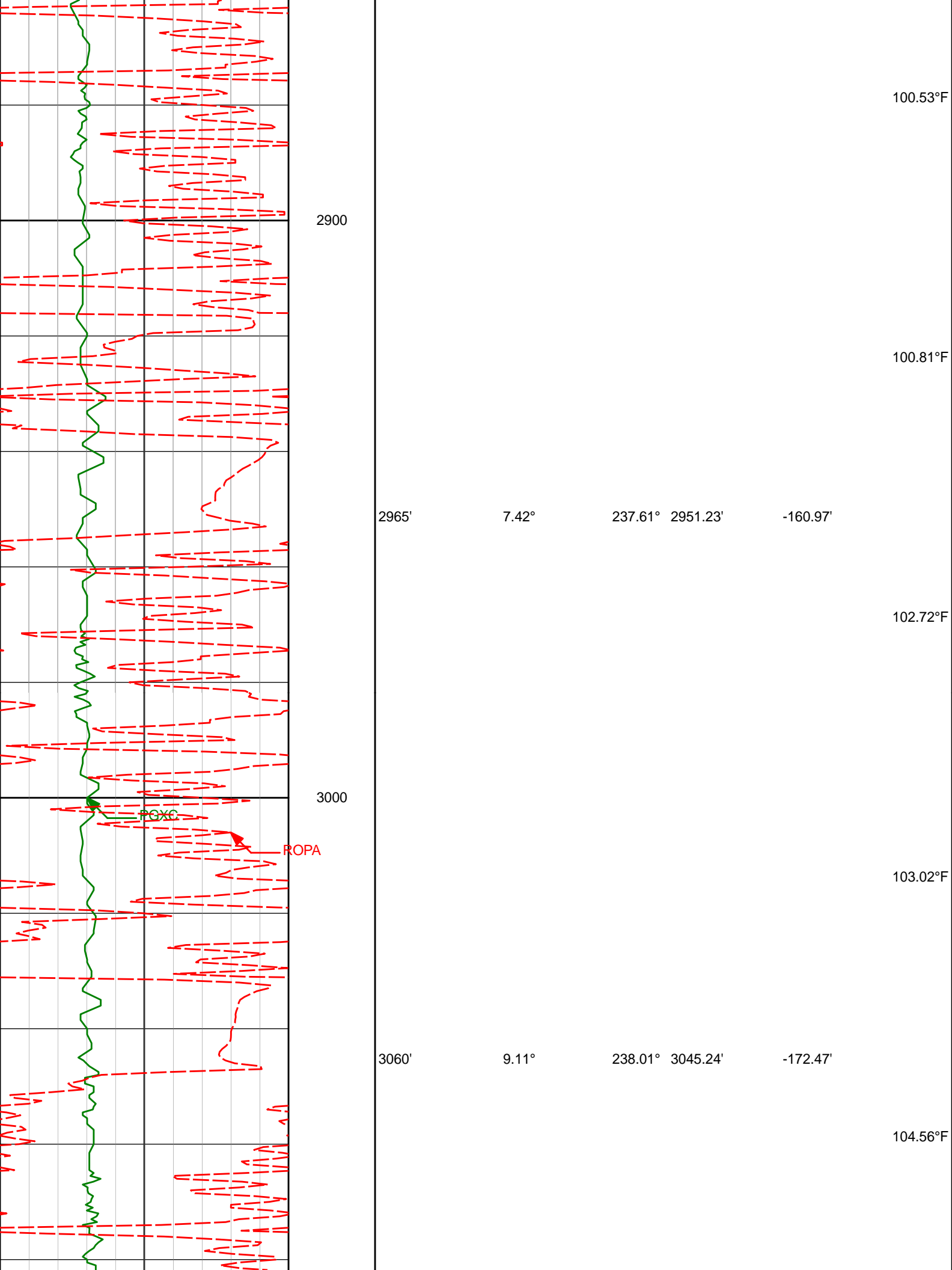
94.33°F

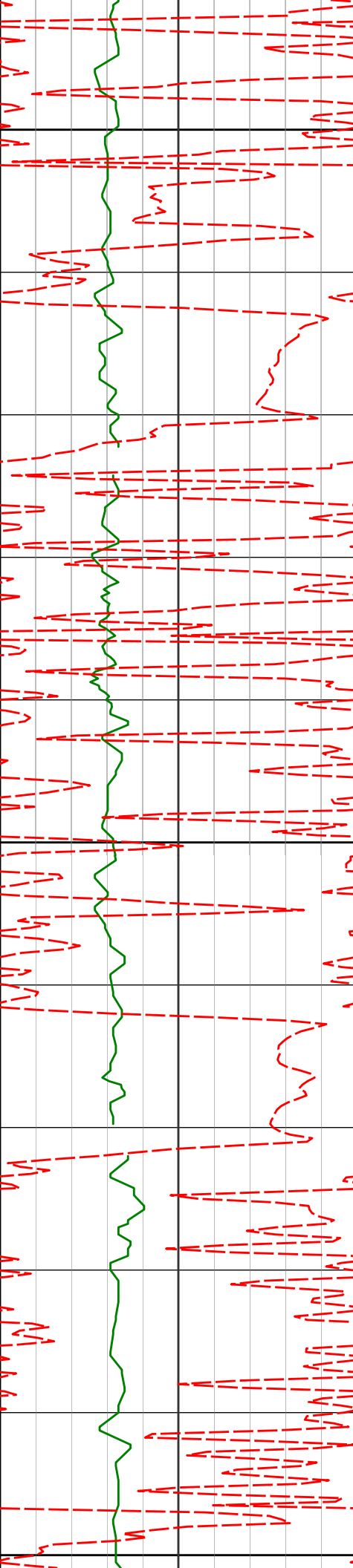
96.42°F

96.42°F

99.21°F







3100

104.83°F

3154'

8.92°

233.18°

3138.08'

-184.55'

106.26°F

3200

107.53°F

3249'

8.48°

220.96°

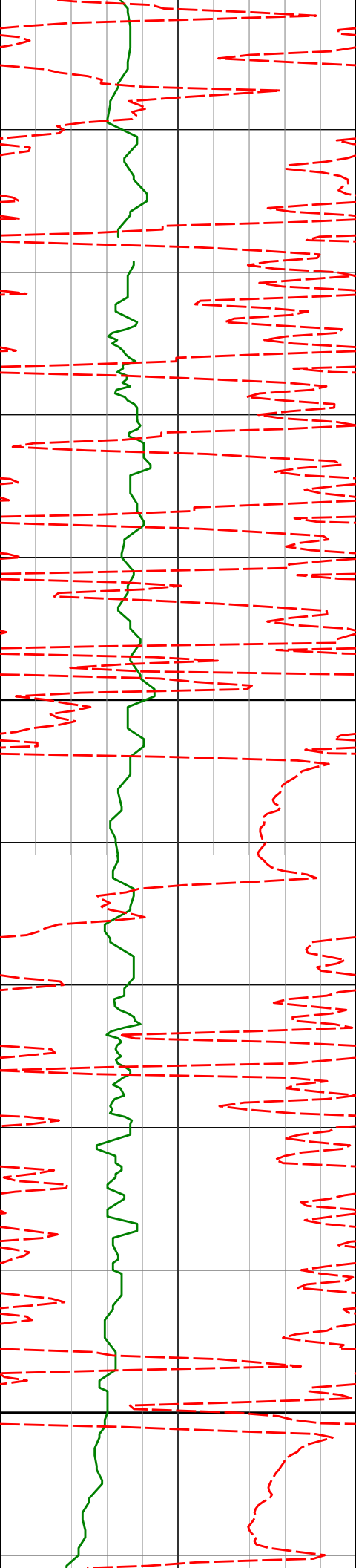
3232.00'

-194.96'

108.37°F

109.65°F

3300



3343'

6.23°

220.05° 3325.22'

-202.72'

111.24°F

3400

3438'

6.78°

213.34° 3419.61'

-209.04'

113.40°F

3500

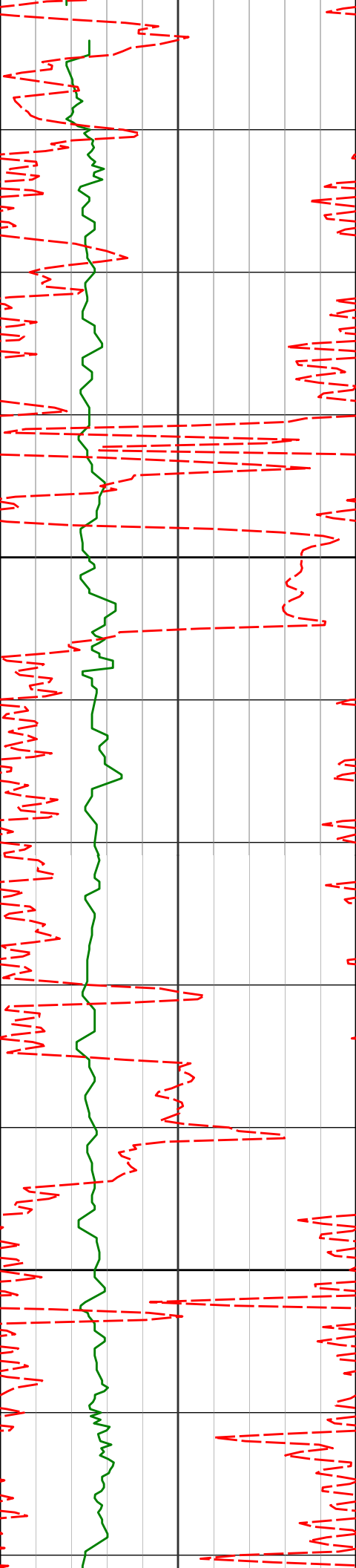
3533'

7.63°

216.94° 3513.86'

-215.84'

115.56°F



3600

3627'

10.41°

220.56°

3606.69'

-225.02'

115.56°F

115.56°F

117.73°F

118.41°F

3700

3722'

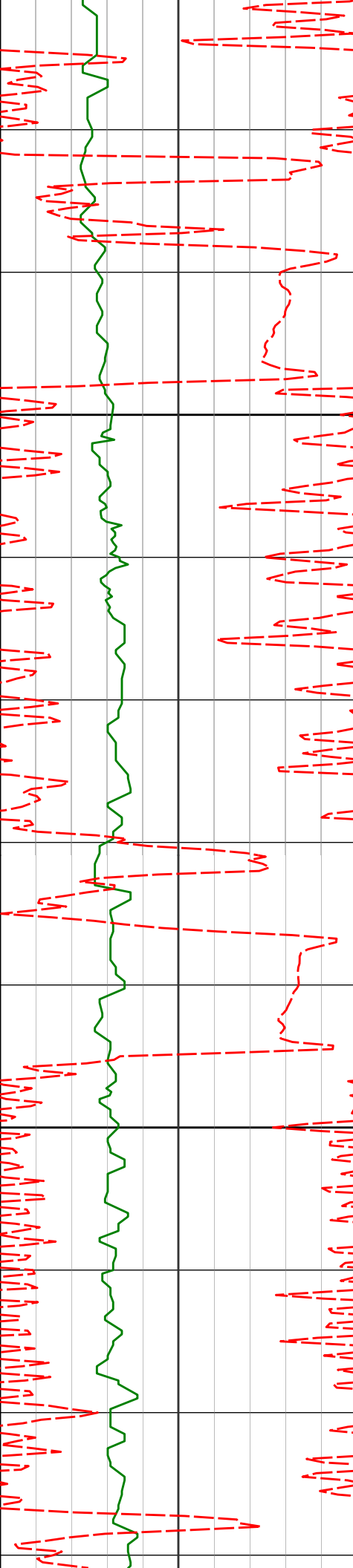
11.90°

220.37°

3699.89'

-236.84'

119.70°F



3800

3900

3817'

12.13°

211.82° 3792.82'

-248.32'

3911'

9.66°

197.75° 3885.13'

-255.81'

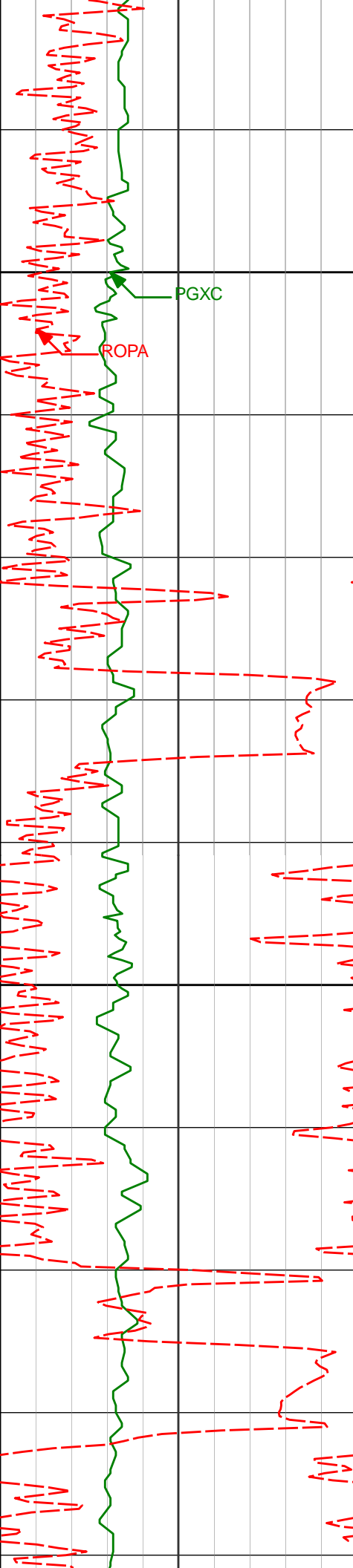
119.78°F

118.35°F

117.73°F

117.73°F

119.91°F



4000

4100

4006'

4100'

4195'

8.81°

7.08°

5.15°

196.87° 3978.90'

204.98° 4072.00'

216.00° 4166.45'

-260.24'

-264.68'

-269.59'

PGXC

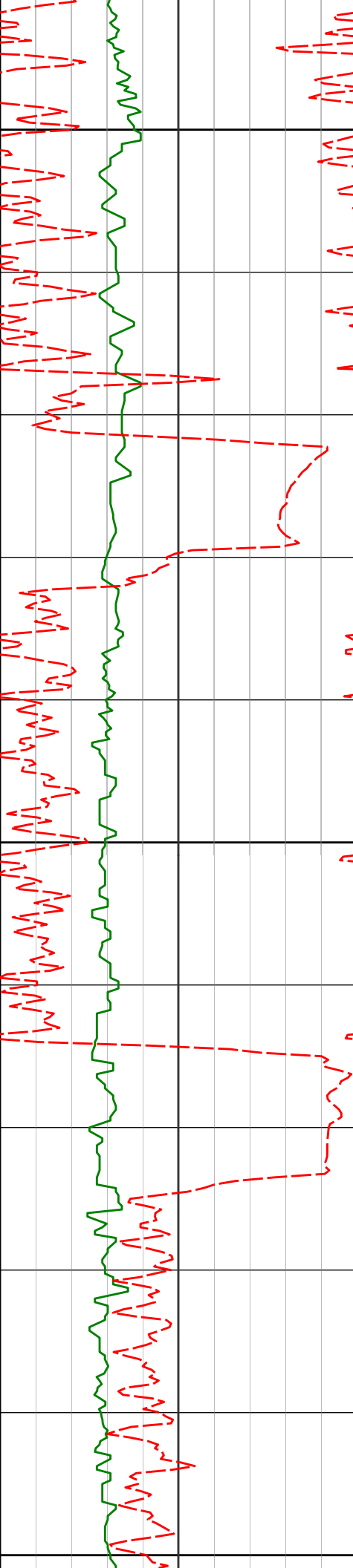
ROPA

119.91°F

120.54°F

121.92°F

122.61°F



4200

4289'

5.68°

230.50°

4260.04'

-275.61'

4300

4384'

7.19°

220.67°

4354.44'

-283.06'

4400

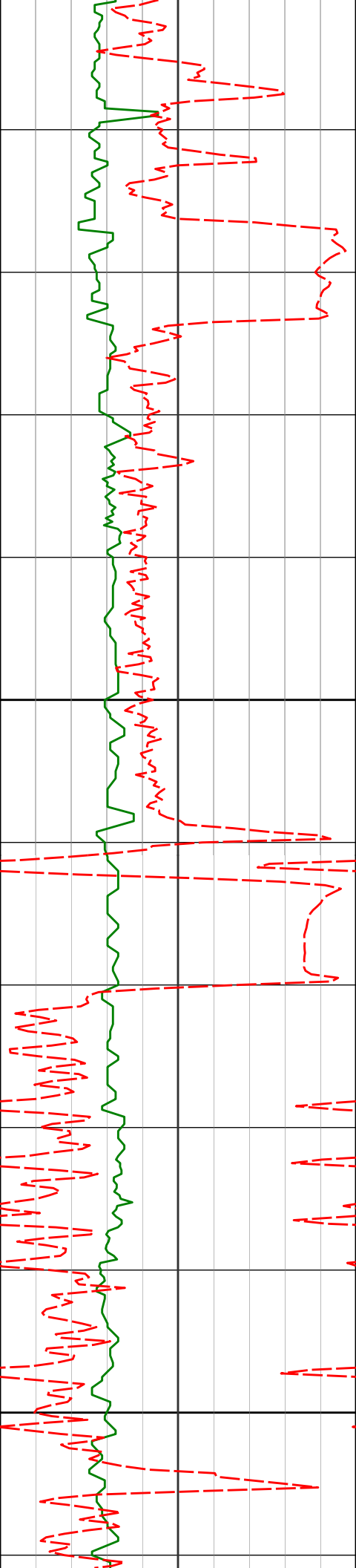
124.16°F

124.32°F

123.39°F

122.91°F

124.21°F



4500

4600

4478'

7.69°

221.92°

4447.65'

-291.03'

4573'

7.69°

219.51°

4541.79'

-299.24'

123.15°F

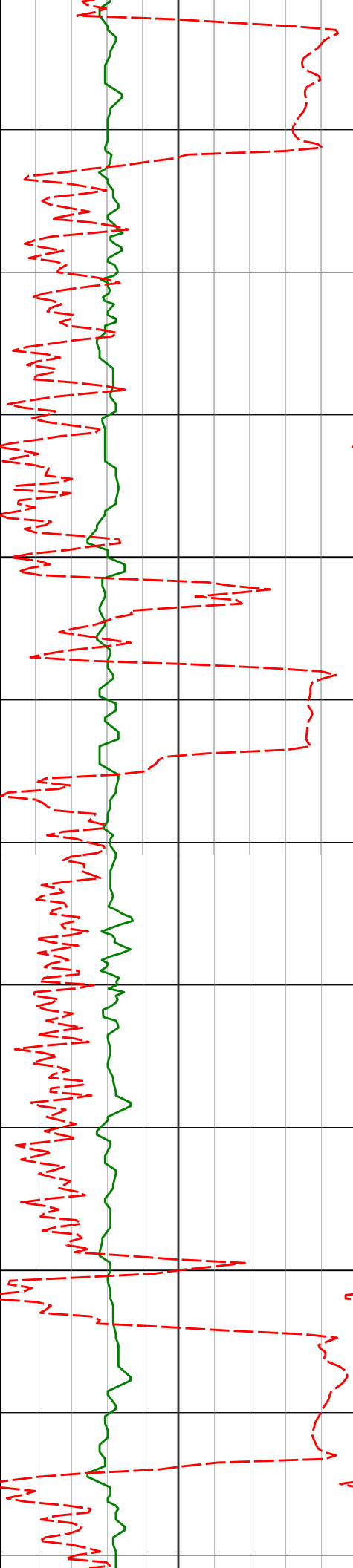
126.15°F

126.52°F

128.73°F

128.73°F





4700

4800

4668'

8.16°

221.36°

4635.88'

-307.66'

129.72°F

4762'

8.46°

217.99°

4728.90'

-316.24'

132.30°F

4857'

8.00°

215.38°

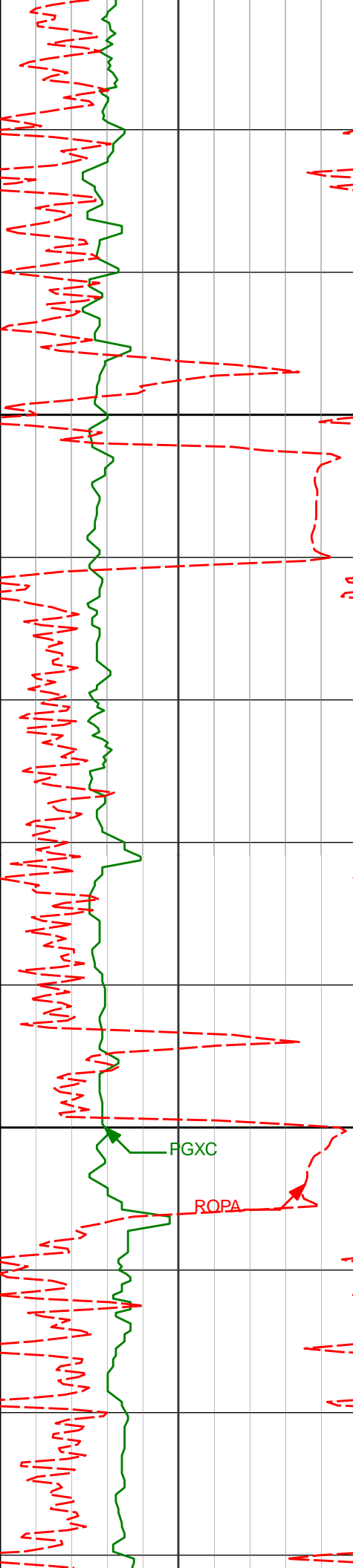
4822.92'

-324.28'

132.40°F

130.96°F

131.59°F



4900

4952'

8.88°

215.04°

4916.89'

-332.23'

5000

5046'

9.17°

216.85°

5009.73'

-340.80'

PGXC

ROPA

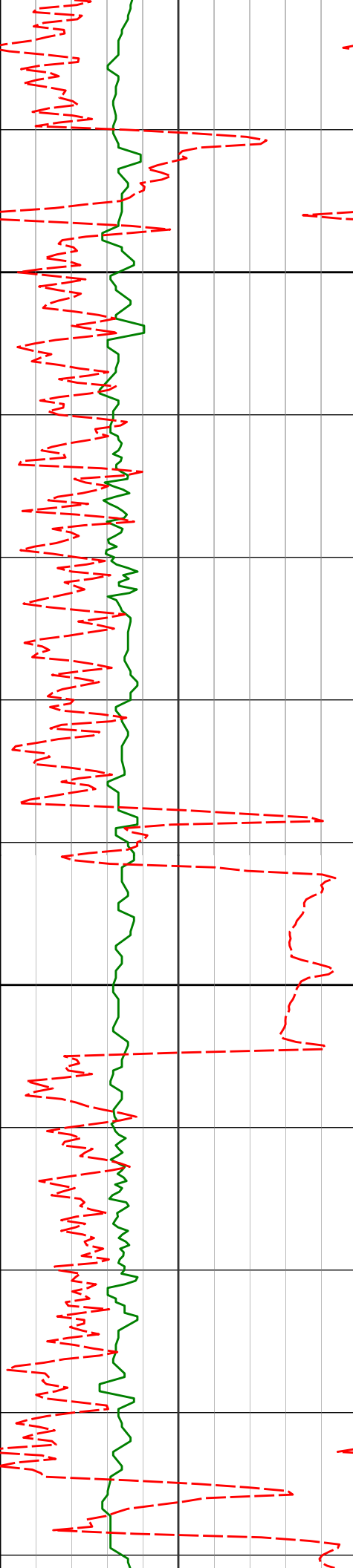
133.20°F

135.45°F

135.45°F

135.45°F

137.70°F



5100

5200

5141'

5235'

6.39°

6.35°

211.26°

224.07°

5103.84'

5197.27'

-348.00'

-354.26'

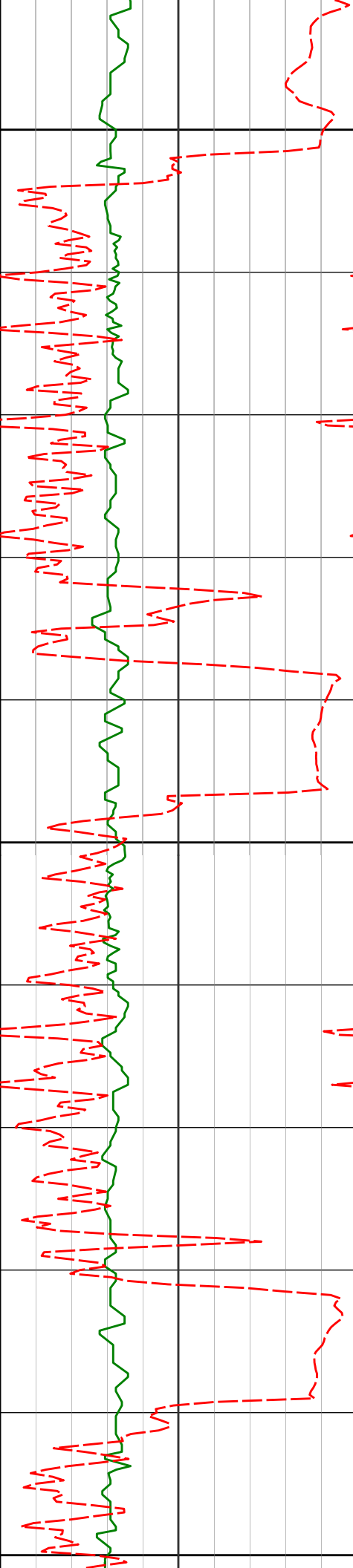
139.45°F

139.96°F

140.36°F

140.71°F

138.85°F



5300

5400

5500

5330'

7.51°

232.63° 5291.58'

-362.79'

139.01°F

137.84°F

5424'

8.25°

225.12° 5384.69'

-372.39'

138.33°F

137.70°F

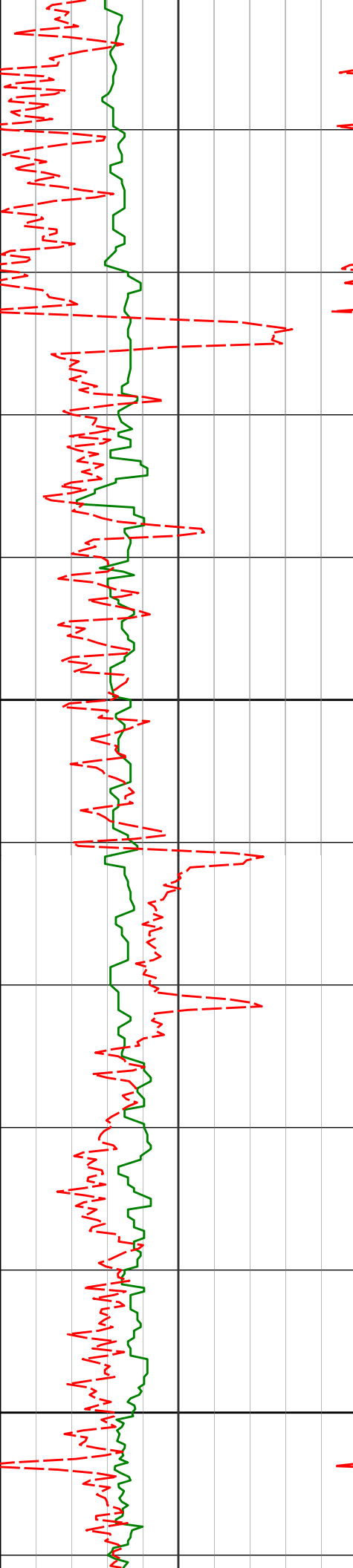
5519'

7.67°

211.36° 5478.78'

-380.43'

139.96°F



<KOP>

5614'

5.85°

201.88° 5573.12'

-385.46'

5600

5700

5708'

4.41°

202.79° 5666.74'

-388.58'

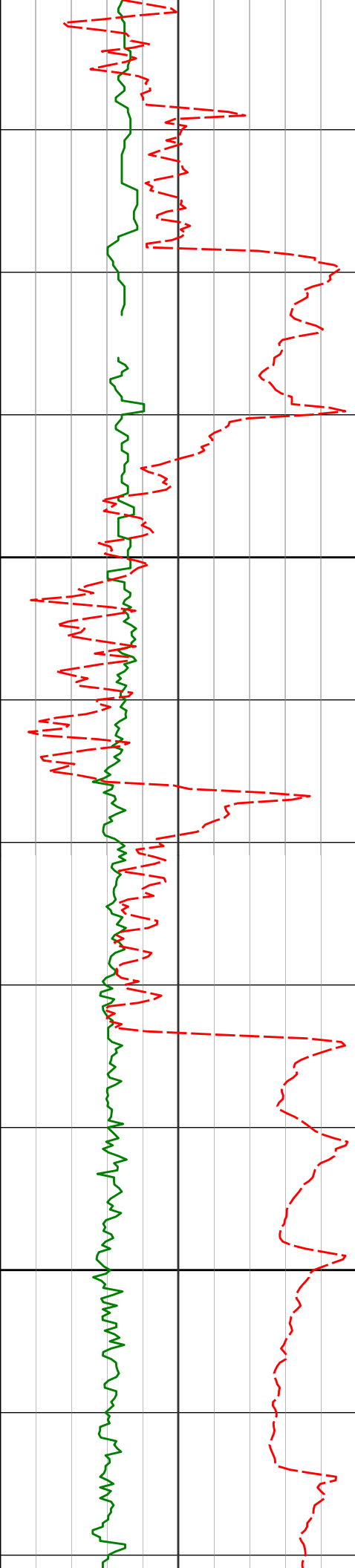
141.24°F

142.25°F

142.25°F

143.44°F

143.13°F



5803'

2.22°

199.18° 5761.58'

-390.56'

142.78°F

5800

143.11°F

5898'

0.83°

267.23° 5856.55'

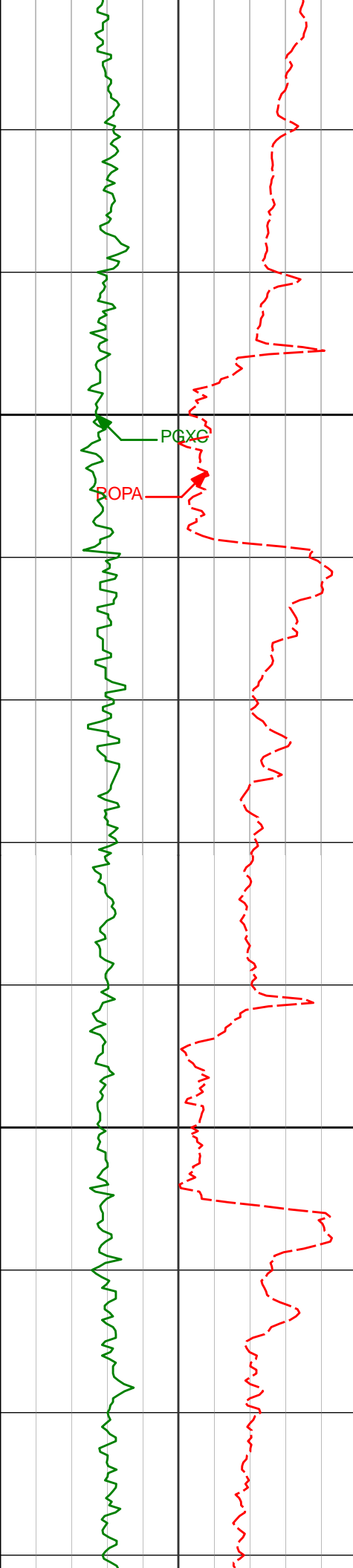
-391.84'

142.25°F

5900

142.66°F

144.98°F



6000

6100

5992'

9.96°

108.76° 5950.11'

-384.78'

145.63°F

6087'

13.13°

117.26° 6043.18'

-367.35'

147.96°F

148.97°F

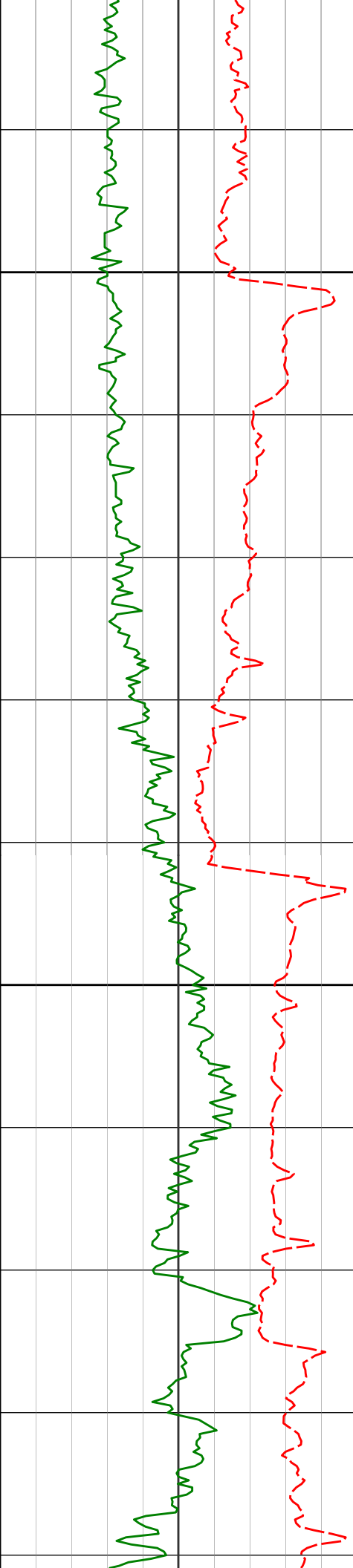
6181'

16.96°

104.96° 6133.97'

-344.54'

149.88°F



6200

6276'

27.52°

89.75°

6221.85'

-309.05'

152.11°F

151.58°F

6300

6370'

39.80°

96.28°

6299.96'

-257.19'

152.03°F

151.70°F

6465'

50.67°

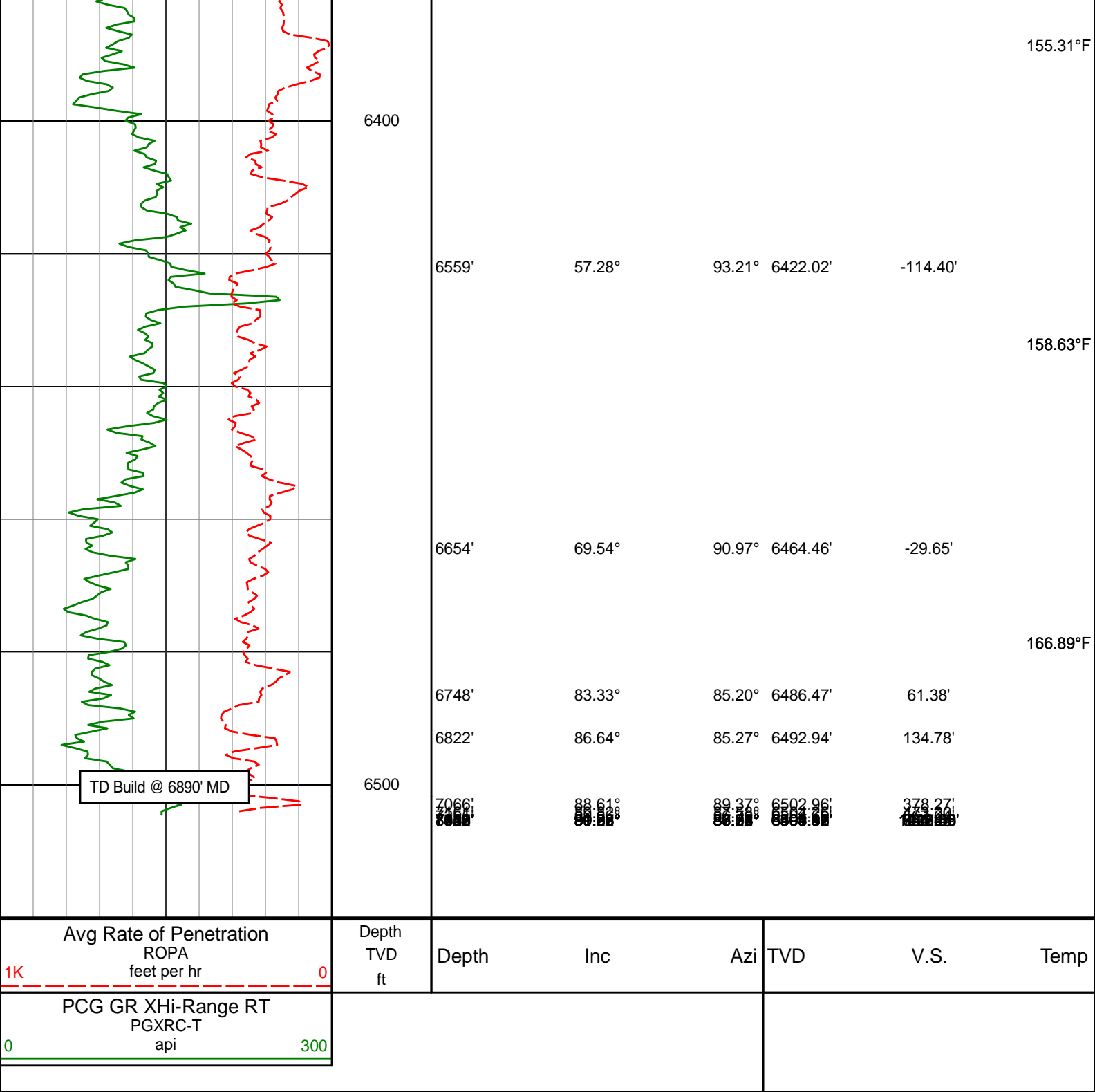
96.04°

6366.76'

-190.17'

151.47°F





**HALLIBURTON**

**DIRECTIONAL SURVEY REPORT**

Noble Energy  
Wells Ranch AE32-675  
Wattenburg  
Weld Colorado  
USA  
CA-XX-0902771583

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
674.00	0.16	229.95	674.00	0.59 S	0.71 W	-0.70	0.02
738.00	0.13	234.17	738.00	0.69 S	0.83 W	-0.83	0.05
832.00	0.17	150.58	832.00	0.87 S	0.85 W	-0.84	0.21
926.00	0.28	146.48	926.00	1.18 S	0.65 W	-0.64	0.13
1021.00	0.30	97.79	1021.00	1.42 S	0.27 W	-0.26	0.26
1115.00	0.39	116.86	1115.00	1.59 S	0.25 E	0.27	0.15
1206.00	0.43	121.08	1205.99	1.91 S	0.82 E	0.84	0.06
1298.00	0.47	113.49	1297.99	2.24 S	1.46 E	1.48	0.08
1482.00	0.28	140.34	1481.99	2.88 S	2.44 E	2.46	0.14
1575.00	0.68	348.86	1574.98	2.51 S	2.47 E	2.49	1.00
1668.00	3.33	287.51	1667.92	1.15 S	0.21 W	-0.20	3.30
1761.00	5.74	272.13	1760.63	0.17 S	7.44 W	-7.44	2.87
1853.00	7.78	274.19	1851.99	0.46 N	18.25 W	-18.25	2.24
1946.00	9.70	275.40	1943.90	1.66 N	32.33 W	-32.34	2.07
2039.00	10.09	263.58	2035.53	1.48 N	48.22 W	-48.23	2.22
2132.00	9.57	258.13	2127.16	1.02 S	63.89 W	-63.88	1.15
2223.00	10.12	245.72	2216.83	5.86 S	78.57 W	-78.53	2.40
2316.00	9.17	244.52	2308.52	12.41 S	92.71 W	-92.61	1.04
2408.00	9.00	230.50	2399.38	20.14 S	104.88 W	-104.72	2.41
2501.00	8.25	230.91	2491.32	28.98 S	115.68 W	-115.45	0.80
2594.00	7.59	231.47	2583.43	37.01 S	125.66 W	-125.37	0.72
2686.00	8.31	226.54	2674.55	45.37 S	135.24 W	-134.88	1.08
2778.00	7.53	224.93	2765.67	54.21 S	144.33 W	-143.90	0.88
2870.00	6.77	224.66	2856.96	62.34 S	152.40 W	-151.91	0.82
2965.00	7.42	237.61	2951.23	69.61 S	161.52 W	-160.97	1.81
3060.00	9.11	238.01	3045.24	76.88 S	173.08 W	-172.47	1.78
3154.00	8.92	233.18	3138.08	85.19 S	185.22 W	-184.55	0.83
3249.00	8.48	220.96	3232.00	94.90 S	195.71 W	-194.96	2.00
3343.00	6.23	220.05	3325.22	104.04 S	203.54 W	-202.72	2.40
3438.00	6.78	213.34	3419.61	112.67 S	209.94 W	-209.04	0.99
3533.00	7.63	216.94	3513.86	122.39 S	216.81 W	-215.84	1.02
3627.00	10.41	220.56	3606.69	133.84 S	226.08 W	-225.02	3.01
3722.00	11.90	220.37	3699.89	147.82 S	238.01 W	-236.84	1.57
3817.00	12.13	211.82	3792.82	163.76 S	249.62 W	-248.32	1.89
3911.00	9.66	197.75	3885.13	179.67 S	257.23 W	-255.81	3.84
4006.00	8.81	196.87	3978.90	194.23 S	261.77 W	-260.24	0.91
4100.00	7.08	204.98	4072.00	206.37 S	266.31 W	-264.68	2.18
4195.00	5.15	216.00	4166.45	215.13 S	271.29 W	-269.59	2.37
4289.00	5.68	230.50	4260.04	221.50 S	277.36 W	-275.61	1.56
4384.00	7.19	220.67	4354.44	229.01 S	284.86 W	-283.06	1.96
4478.00	7.69	221.92	4447.65	238.15 S	292.90 W	-291.03	0.56
4573.00	7.69	219.51	4541.79	247.79 S	301.20 W	-299.24	0.34
4668.00	8.16	221.36	4635.88	257.75 S	309.69 W	-307.66	0.56
4762.00	8.46	217.99	4728.90	268.21 S	318.36 W	-316.24	0.61
4857.00	8.00	215.38	4822.92	279.10 S	326.49 W	-324.28	0.63
4952.00	8.88	215.04	4916.89	290.49 S	334.52 W	-332.23	0.93
5046.00	9.17	216.85	5009.73	302.43 S	343.18 W	-340.80	0.43
5141.00	6.39	211.26	5103.84	313.01 S	350.47 W	-348.00	3.04
5235.00	6.35	224.07	5197.27	321.21 S	356.80 W	-354.26	1.51
5330.00	7.51	232.63	5291.58	328.76 S	365.39 W	-362.79	1.64
5424.00	8.25	225.12	5384.69	337.25 S	375.05 W	-372.39	1.34
5519.00	7.67	211.36	5478.78	347.47 S	383.17 W	-380.43	2.09
5614.00	5.85	201.88	5573.12	357.37 S	388.28 W	-385.46	2.24
5708.00	4.41	202.79	5666.74	365.15 S	391.46 W	-388.58	1.53
5803.00	2.22	199.18	5761.58	370.25 S	393.48 W	-390.56	2.32
5898.00	0.83	267.23	5856.55	372.02 S	394.77 W	-391.84	2.17
5992.00	9.96	108.76	5950.11	374.68 S	387.74 W	-384.78	11.42
6087.00	13.13	117.26	6043.18	382.26 S	370.37 W	-367.35	3.78
6181.00	16.96	104.96	6133.97	390.70 S	347.62 W	-344.54	5.29
6276.00	27.52	89.75	6221.85	394.19 S	312.16 W	-309.05	12.57
6370.00	39.80	96.28	6299.96	397.40 S	260.32 W	-257.19	13.61
6465.00	50.67	96.04	6366.76	404.61 S	193.36 W	-190.17	11.45
6559.00	57.28	93.21	6422.02	410.66 S	117.63 W	-114.40	7.44
6654.00	69.54	90.97	6464.46	413.66 S	32.90 W	-29.65	13.08
6748.00	83.33	85.20	6486.47	410.48 S	58.16 E	61.38	15.82
6822.00	86.64	85.27	6492.94	404.35 S	131.61 E	134.78	4.47

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 90.45 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.31 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6822.00 FEET  
IS 425.23 FEET ALONG 161.97 DEGREES (GRID)

Final survey is a projection to the bit at TD.

Date Printed:06 October 2015