

PCDC- Pressure Case Directional

PCGK - Pressure Case Gamma



Country : USA				
Field : Wattenburg				
Location : Lat: 40° 24' 6.70" North Long: 104° 27' 12.28" West				
Well : 70 Ranch State BB18-675				
Company : Noble Energy				
Rig : H&P 321				
LOCATION		Company : Noble Energy		
		Rig : H&P 321		
Latitude : 40° 24' 6.70" North Longitude : 104° 27' 12.28" West		Well : 70 Ranch State BB18-675		
		Field : Wattenburg		
UTM Easting = 3,291,471.390 ft UTM Northing = 1,390,958.050 ft		Country : USA		
		API Number : 05-123-41532		
Permanent Datum : Ground Level		Elevation : 4680.00 ft		
Log Measured From : Drill Floor		30.00 ft Above Permanent Datum		
Drilling Measured From : Drill Floor		MD LOG		
Depth Logged : 775.00 ft To 15,870.00 ft		Unit No. : 11210424		
Date Logged : 18-Jul-15 To 24-Jul-15		Job No. :CA-XX-0902563262		
Total Depth MD : 15,870.00 ft TVD: 6,570.66 ft		Plot Type : Final		
Spud Date : 17-Jul-15		Plot Date : 24-Jul-15		
Run No.	Borehole Record (MD)		Casing Record (MD)	
	Size From To	Size From To	Weight From To	Weight From To
100	8.750 in 775.00 ft	6.985.00 ft 9.625 in	36.00 lbpf SURFACE	765.00 ft
200	6.125 in 6,985.00 ft	15,870.00 ft 7.000 in	25.70 lbpf SURFACE	6,975.00 ft
	</			

WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	28-Jun-15	24-Jul-15			
Rig Bit Number	2	3			
Bit Size (in)	8.750	6.125			
Tool Nominal OD (in)	6.890	4.800			
Log Start Depth (MD, ft)	821.00	6,985.00			
Log End Depth (MD, ft)	7,042.00	15,870.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	27-Jun-15 04:31	21-Jul-15 08:27			
Drill/Wipe End Date and Time	28-Jun-15 14:15	24-Jul-15 00:25			
Min Inc (deg) @ Depth (MD, ft)	0.13 @ 1,945.00	87.97 @ 13,508.00			
Max Inc (deg) @ Depth (MD, ft)	71.31 @ 6,980.00	92.00 @ 12,372.00			
Bit TFA(in2) / Bit Type	0.98 / PDC	0.98 / PDC			
Flow Rate (gpm)	589.88	313.66			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	9.75 / 35.00	9.25 / 33.00			
Filtrate CL (ppm)	1,700.00	2,500.00			
pH / Fluid Loss (mptm)	11.00 / 10	9.50 / 9			
PV (cP) / YP (lhf2)	7 / 6.00	5 / 4.00			
% Solids / % Sand	3.00 / 0.25	5.00 / 0.15			
% Oil / Oil:Water Ratio	N/A / N/A	1.00 / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			

Max Tool Temp (degF) / Source	175.40 / PCM	247.20 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 175.40	N/A @ 247.20			
Lead MWD Engineer	Matt Busche	Matt Busche			
Customer Representative	Jeremy Stolz	Jeremy Stolz			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11404267	12310745			
Insert Serial Number	11680727	11400838			
Date and Time Initialized	26-Jun-15 15:07	20-Jul-15 15:28			
Date and Time Read	28-Jun-15 21:27	24-Jul-15 13:41			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	56.00	68.00			
Software Version	6.33	6.33			
Sub Serial Number	11404267	12310745			
Sonde Serial Number	11478122	11478073			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	157.90	68.40			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	48.95	71.23			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11404267	12310745			
Insert/Sonde Serial Number	11680921	11681026			

## REMARKS

1. All depths are calibrated to driller's pipe tally and are measured depth from the Drill Floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Brigham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:
  - 1:600 Log  
PGRC (Gamma CG) and ROPA (Average Rate of Penetration)  
Interval Resolution: 1.0 ft  
Interval Distance: 3.0 ft
  - 1:240 Log  
PGRC (Gamma CG):  
Interval Resolution: 0.5 ft  
Interval Distance: 0.6 ft
  - ROPA (Average Rate of Penetration):  
Interval Resolution: 0.5 ft

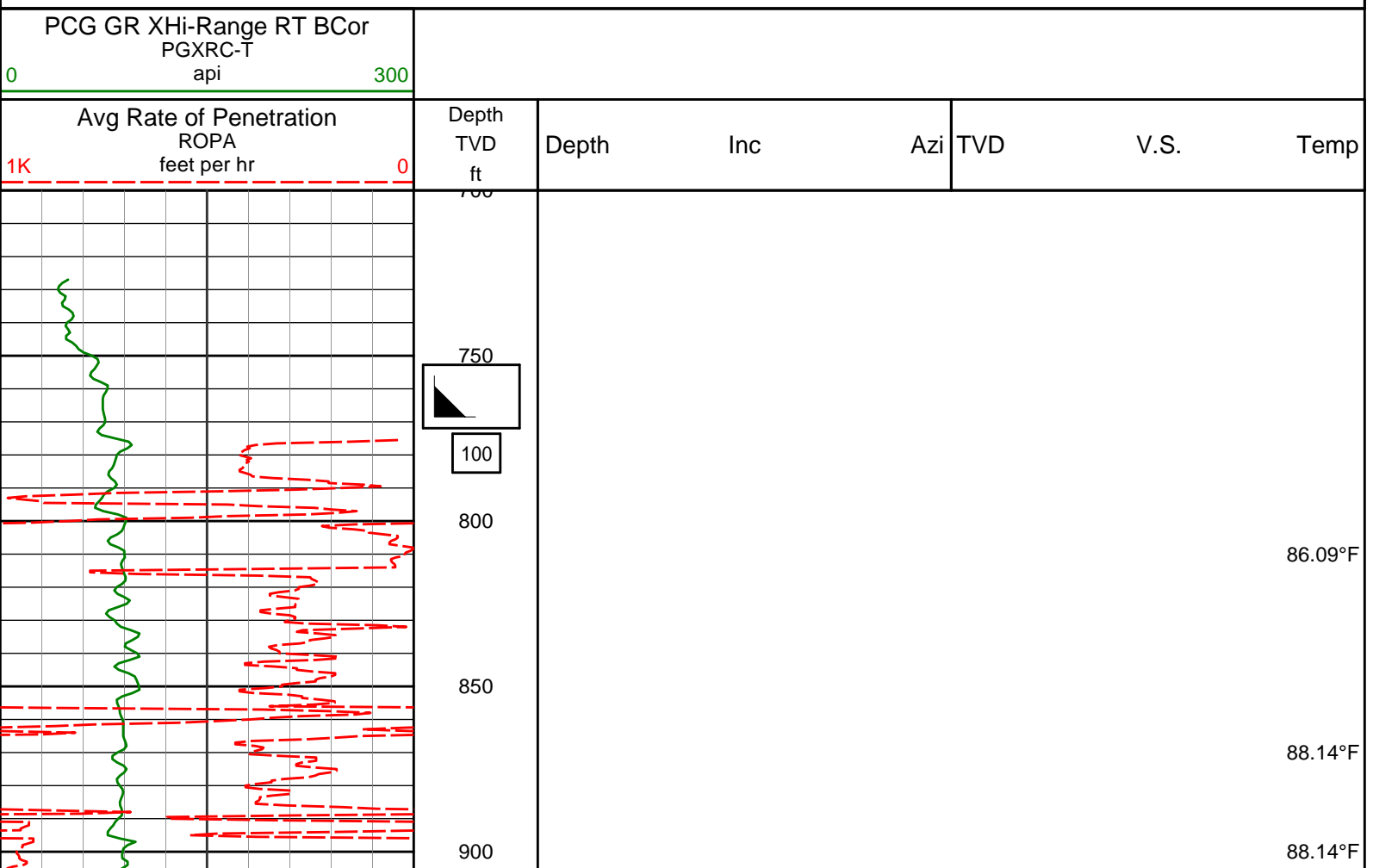
Interval Resolution: 1.2 ft

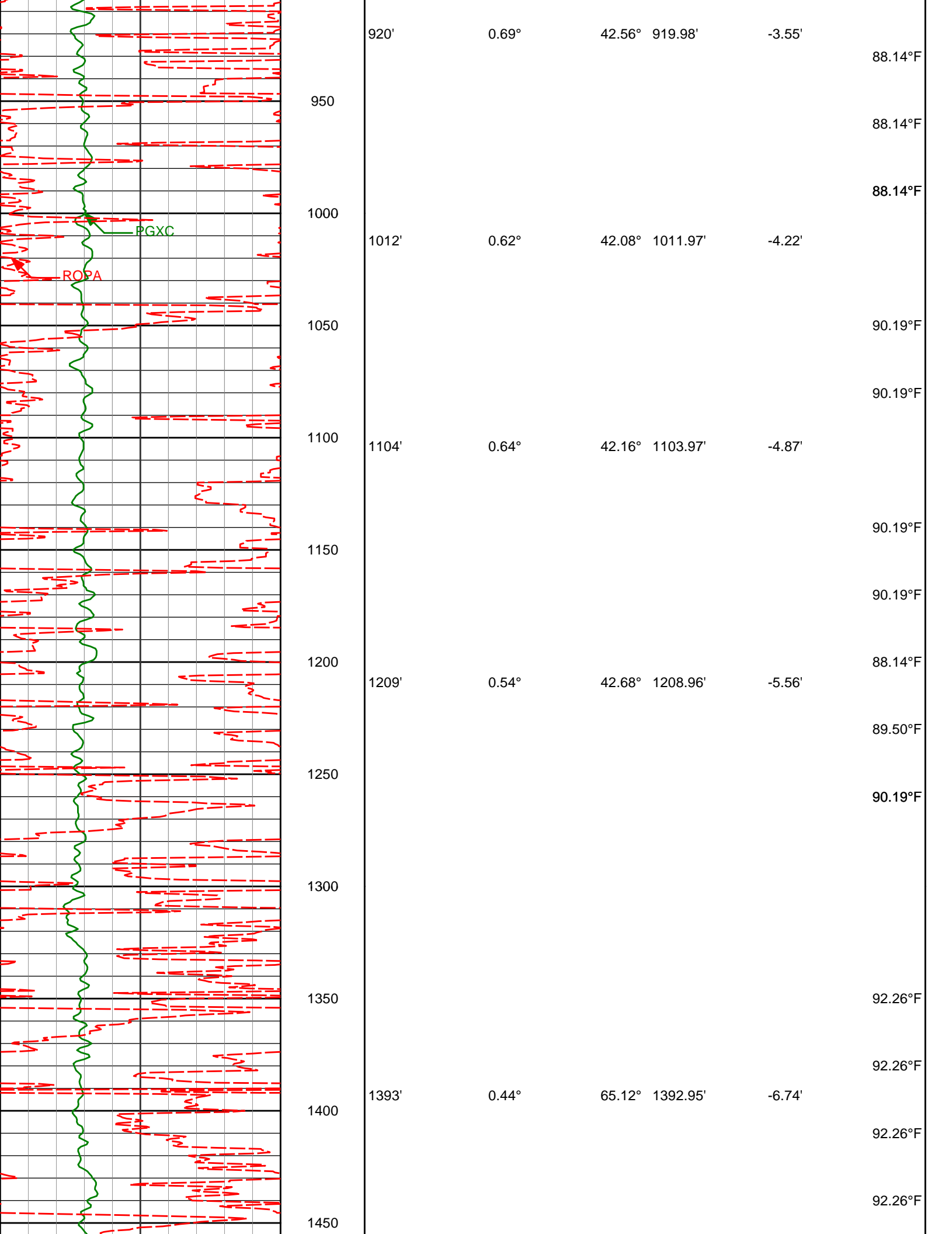
6. Insite Version v8.1.10

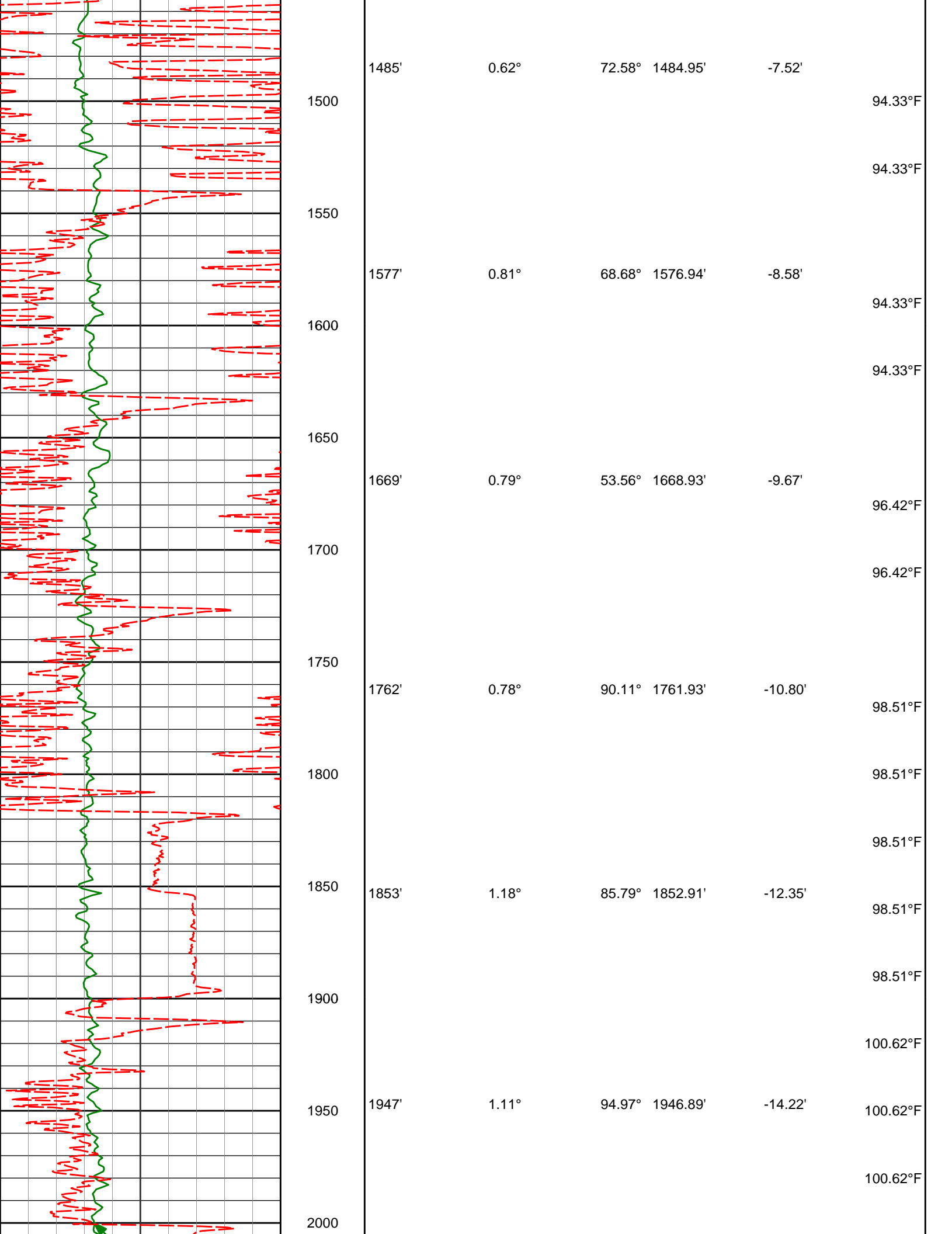
## WARRANTY

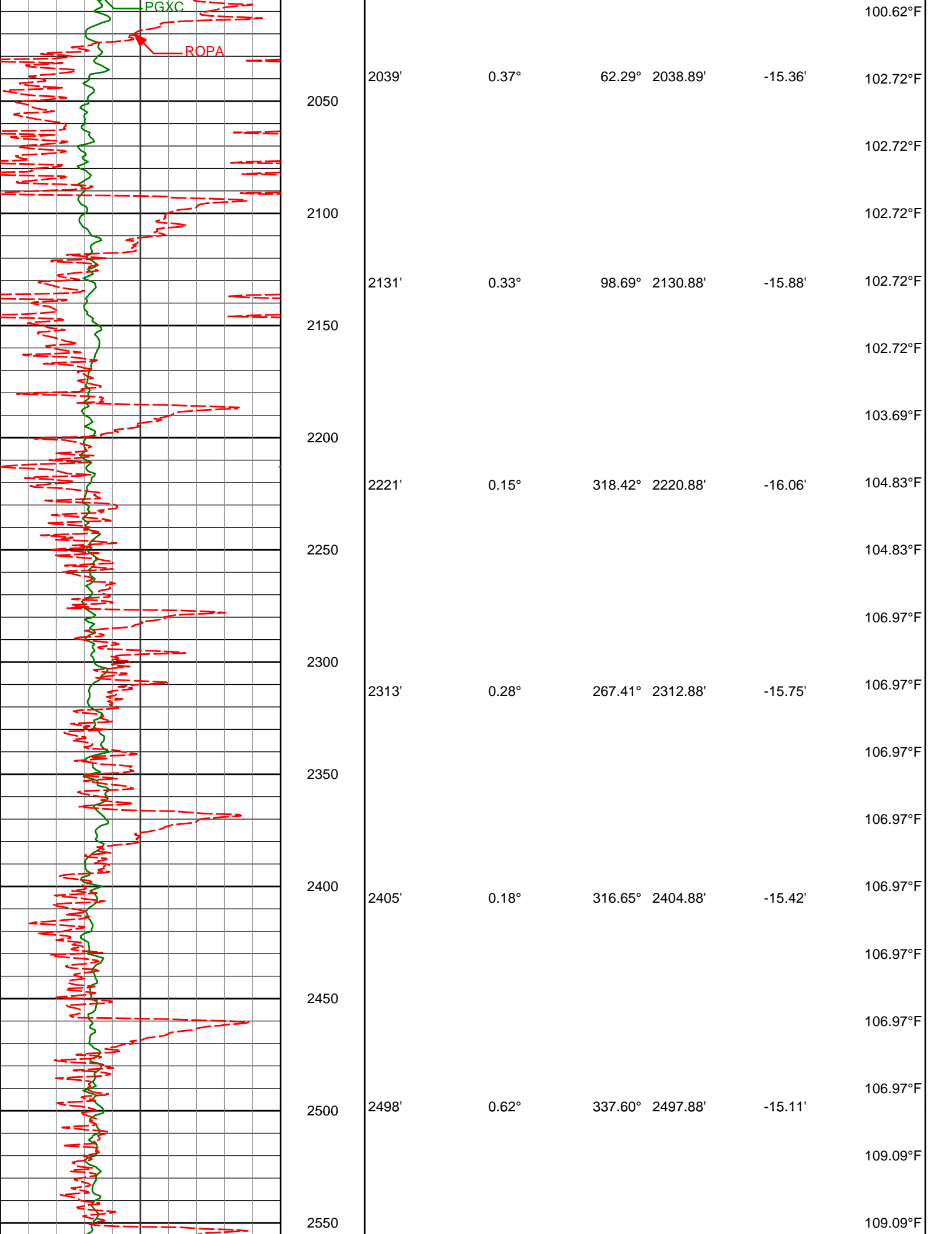
HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

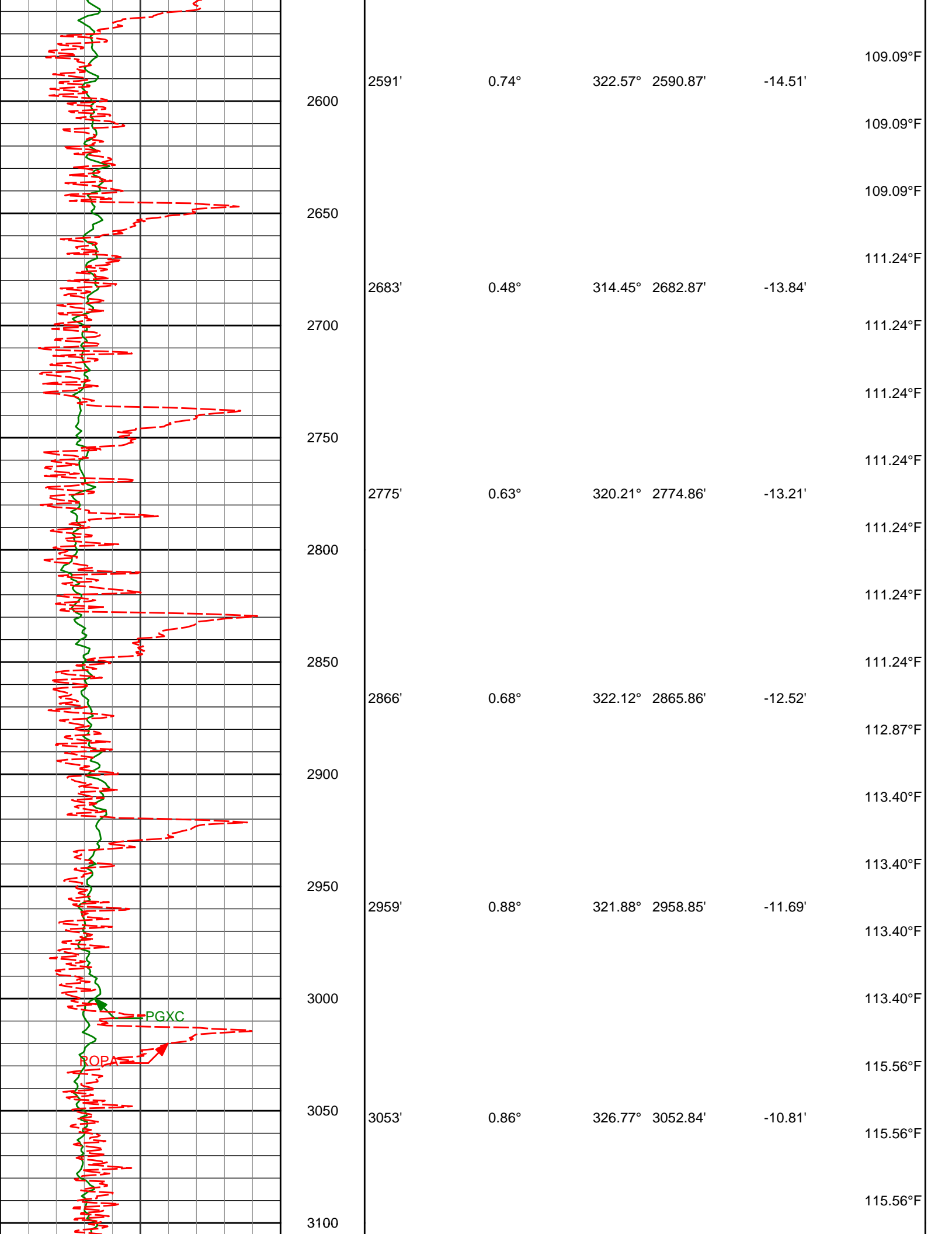
# MD Detail 1:600 Scale

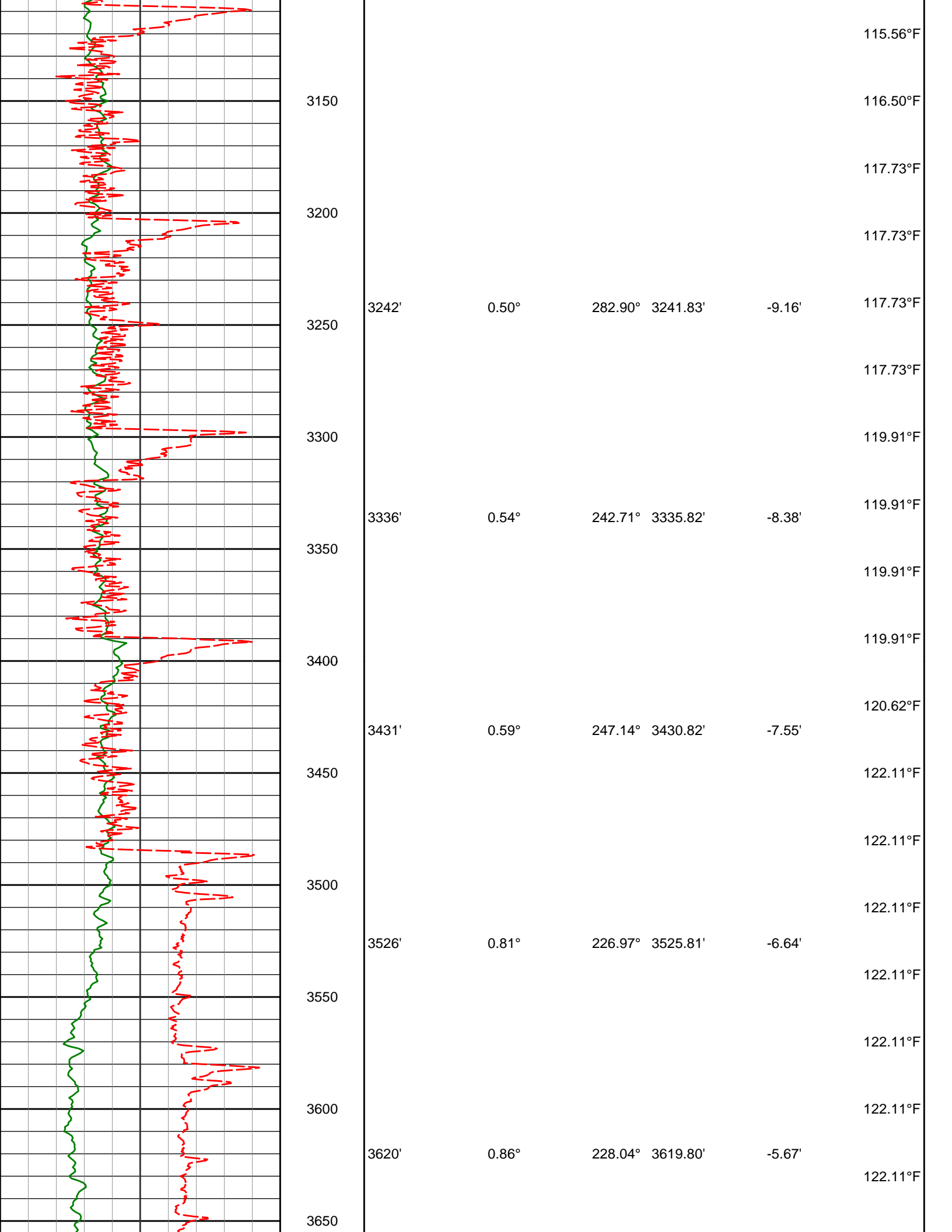




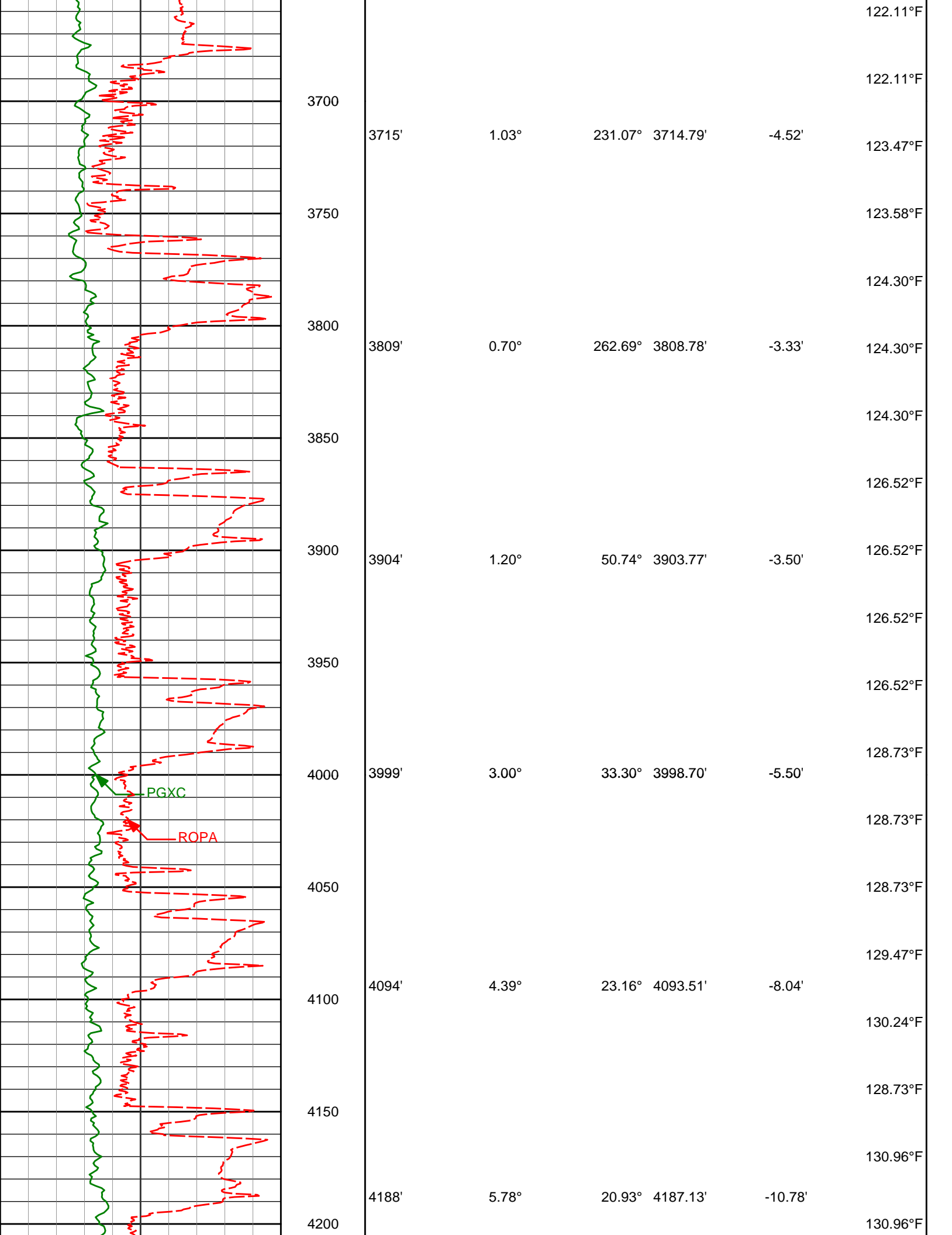


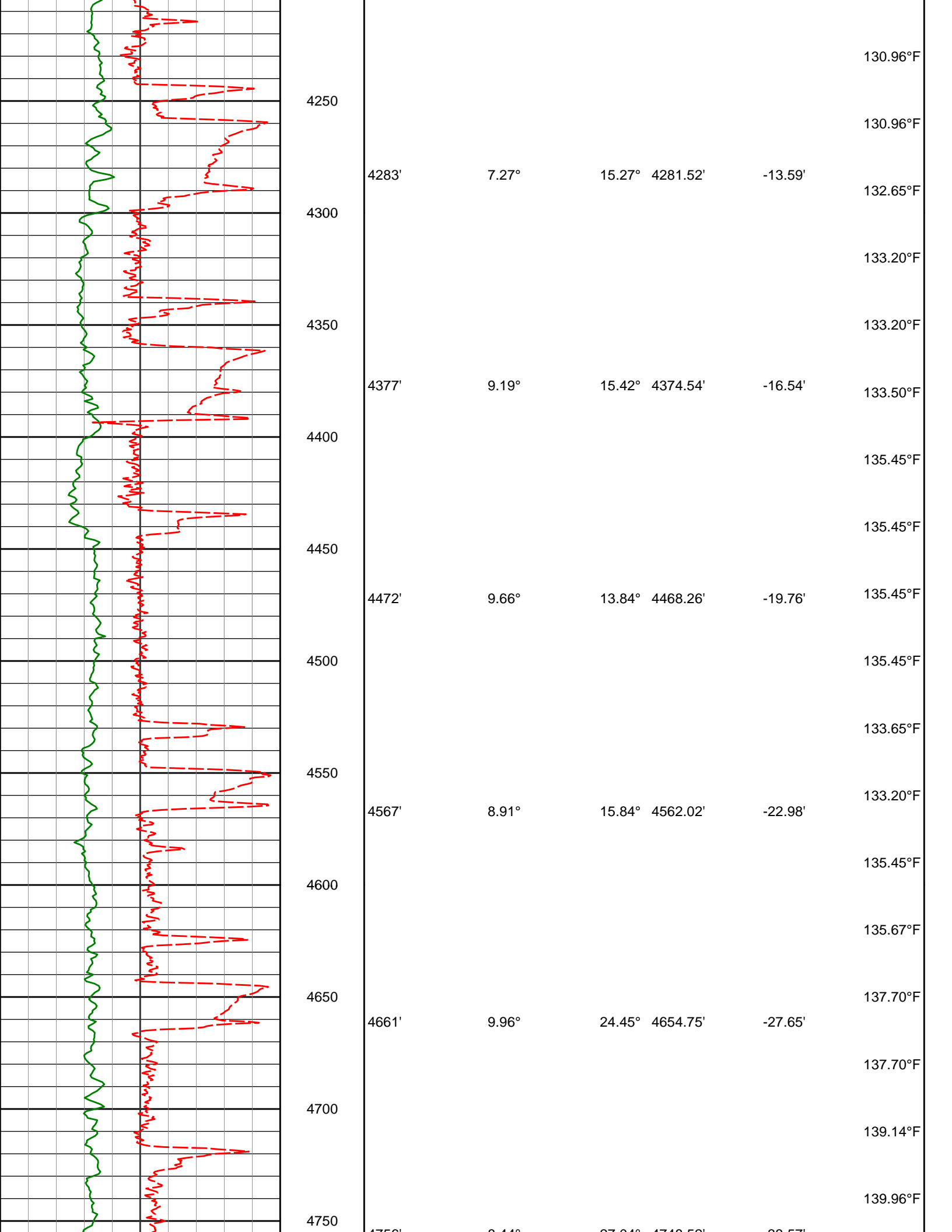


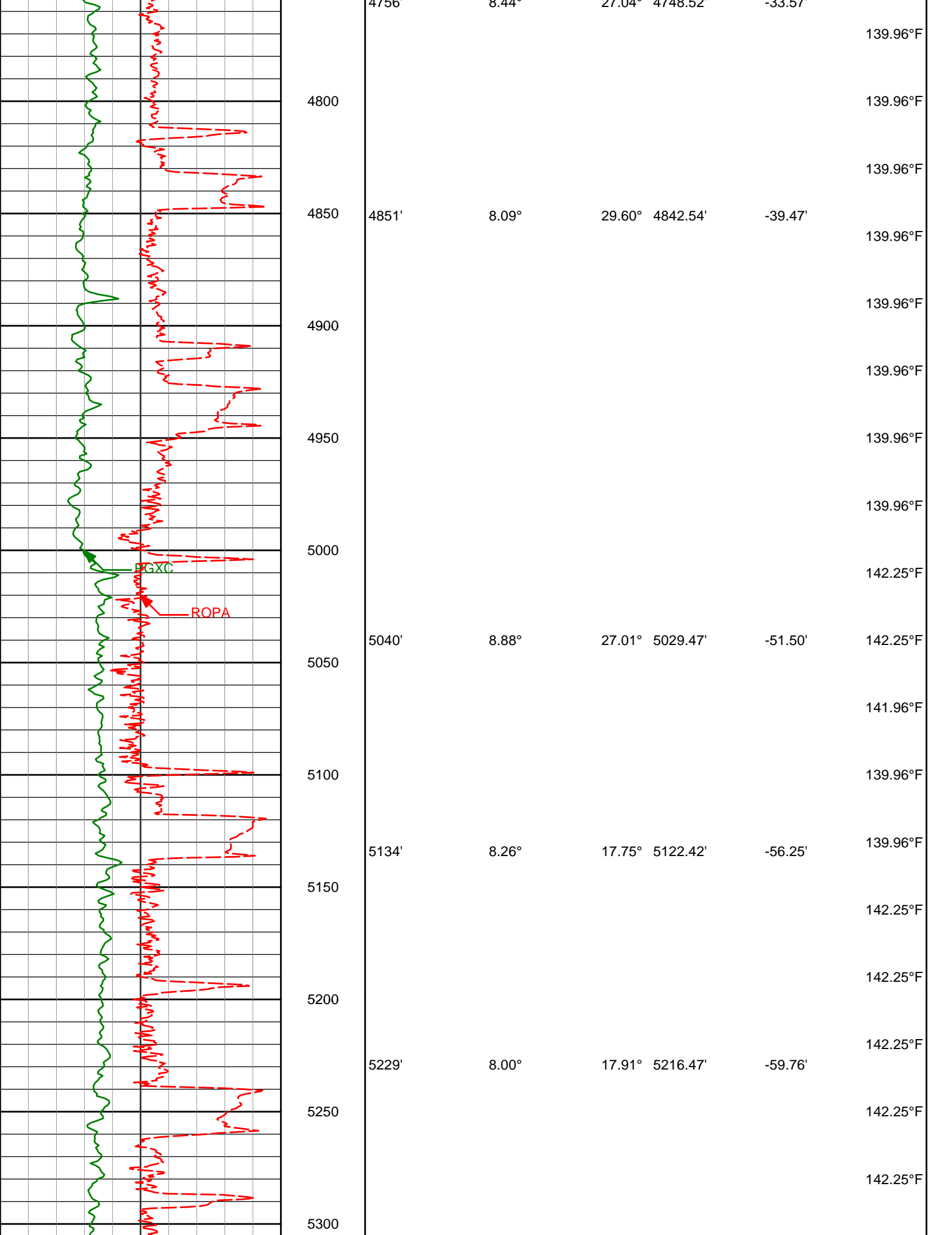


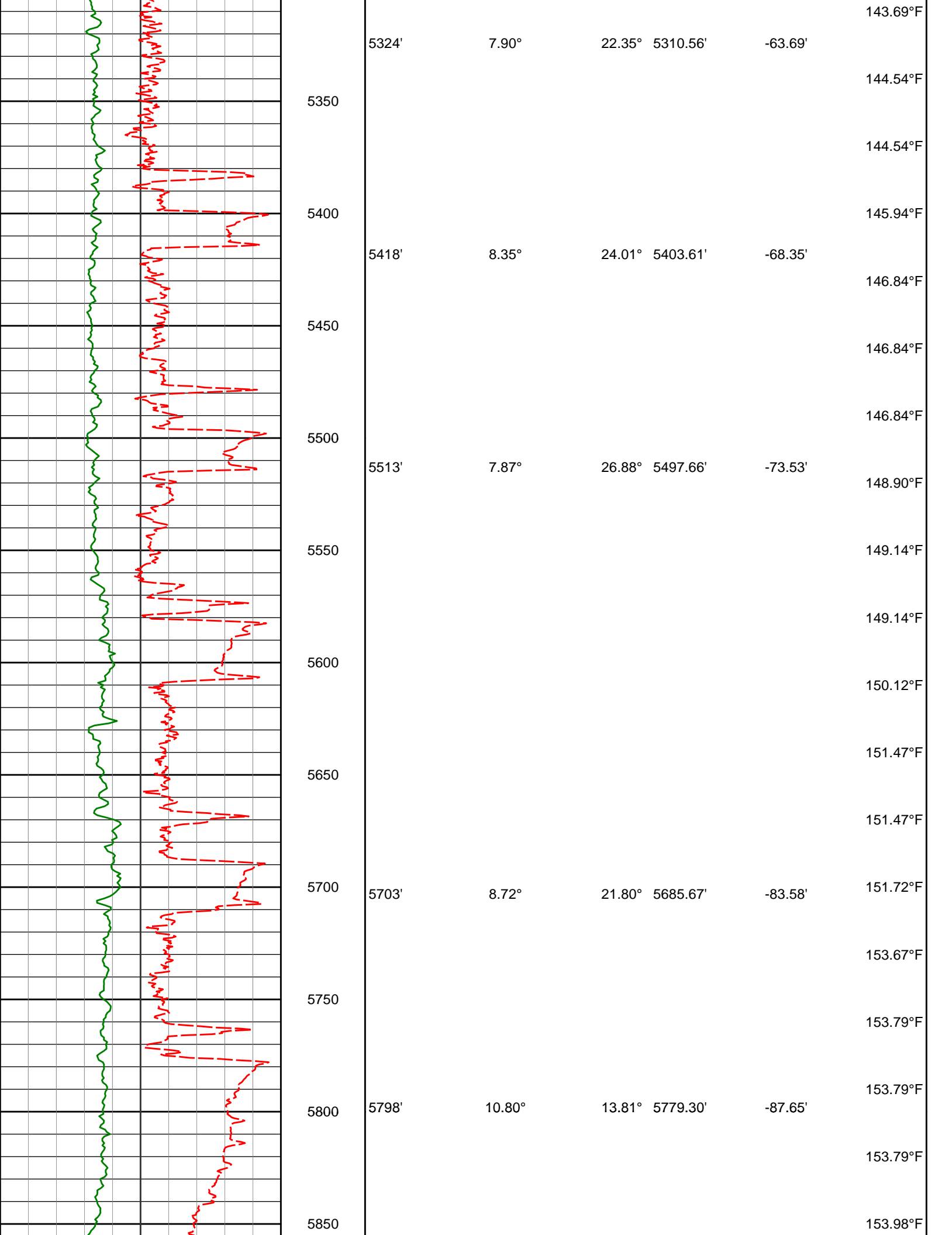


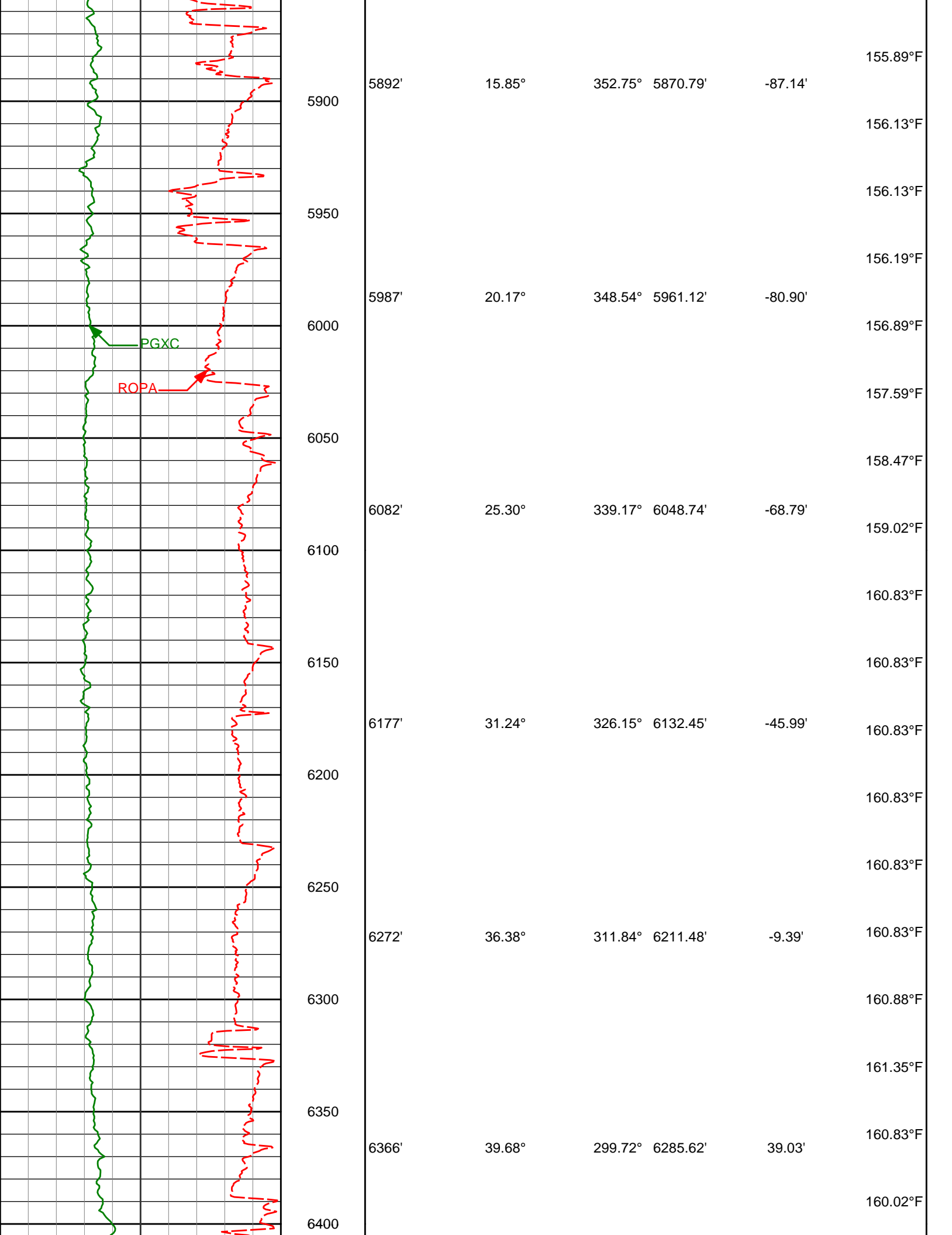


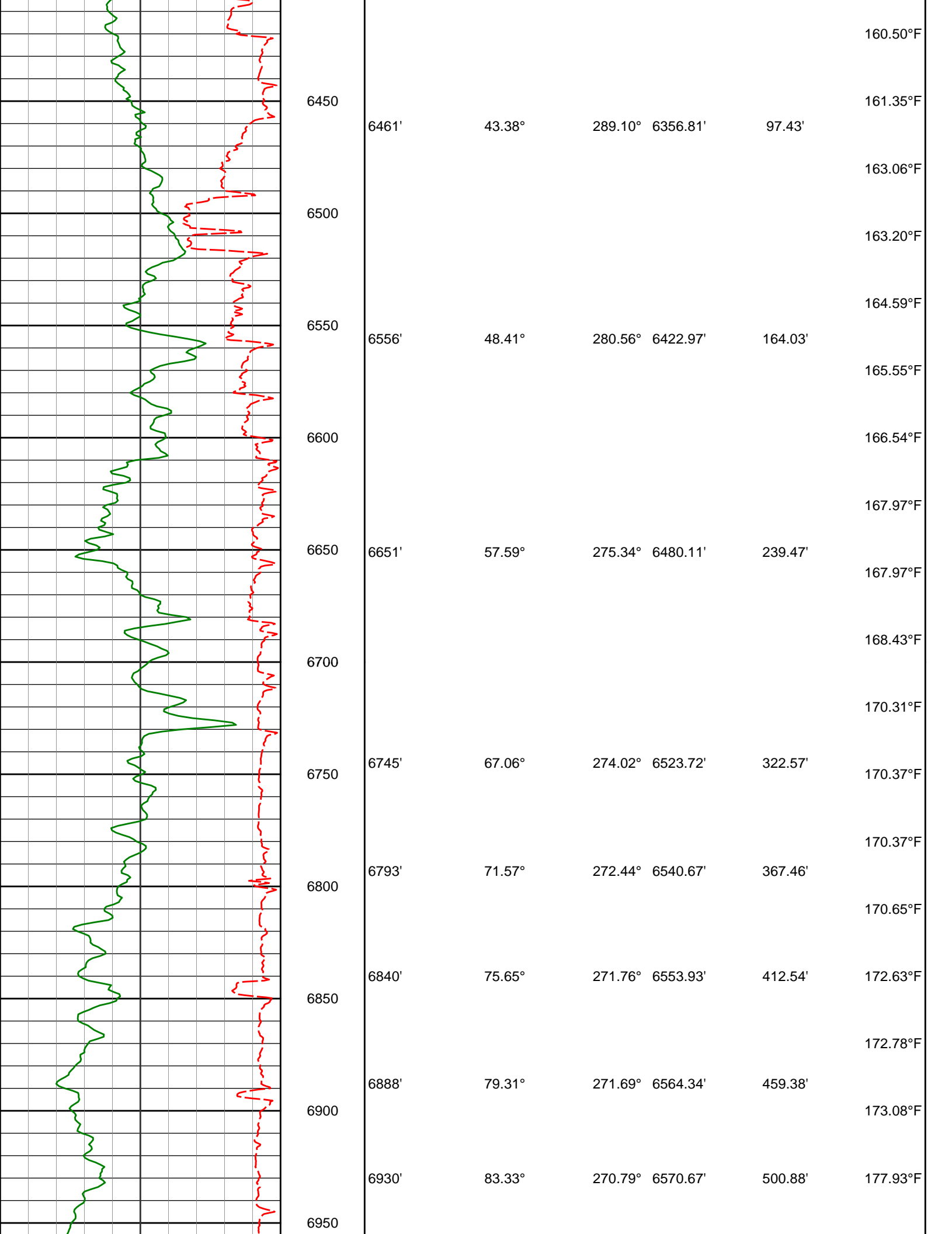


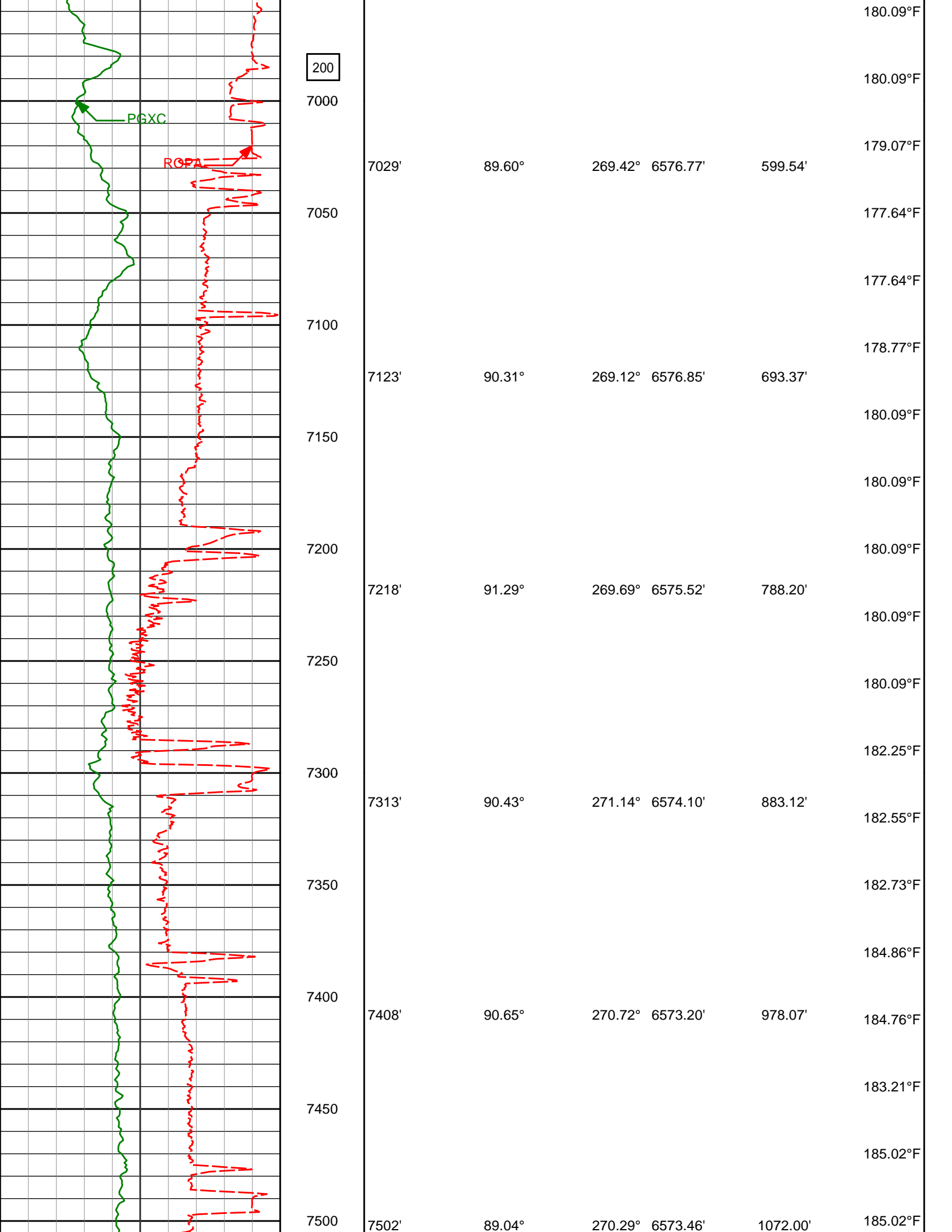


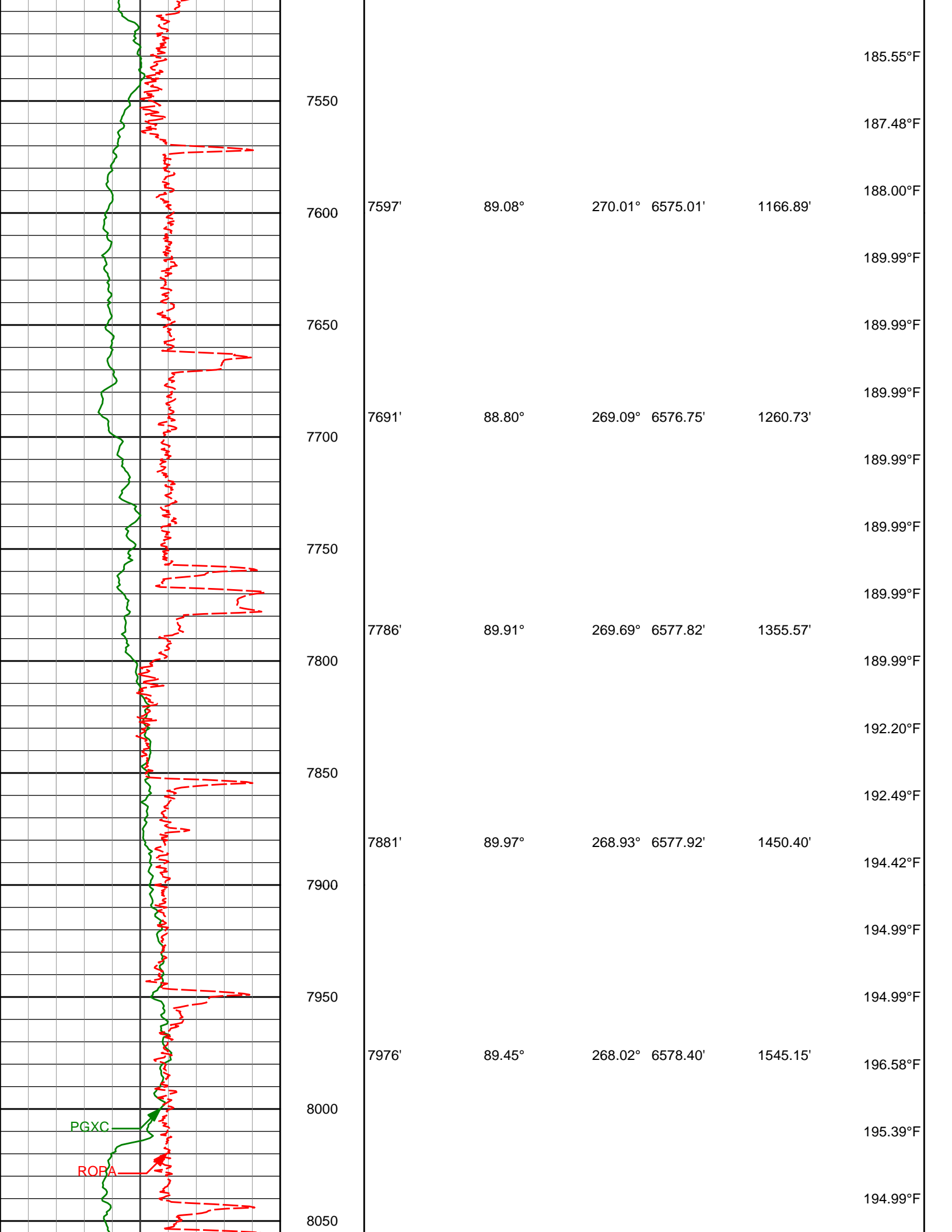




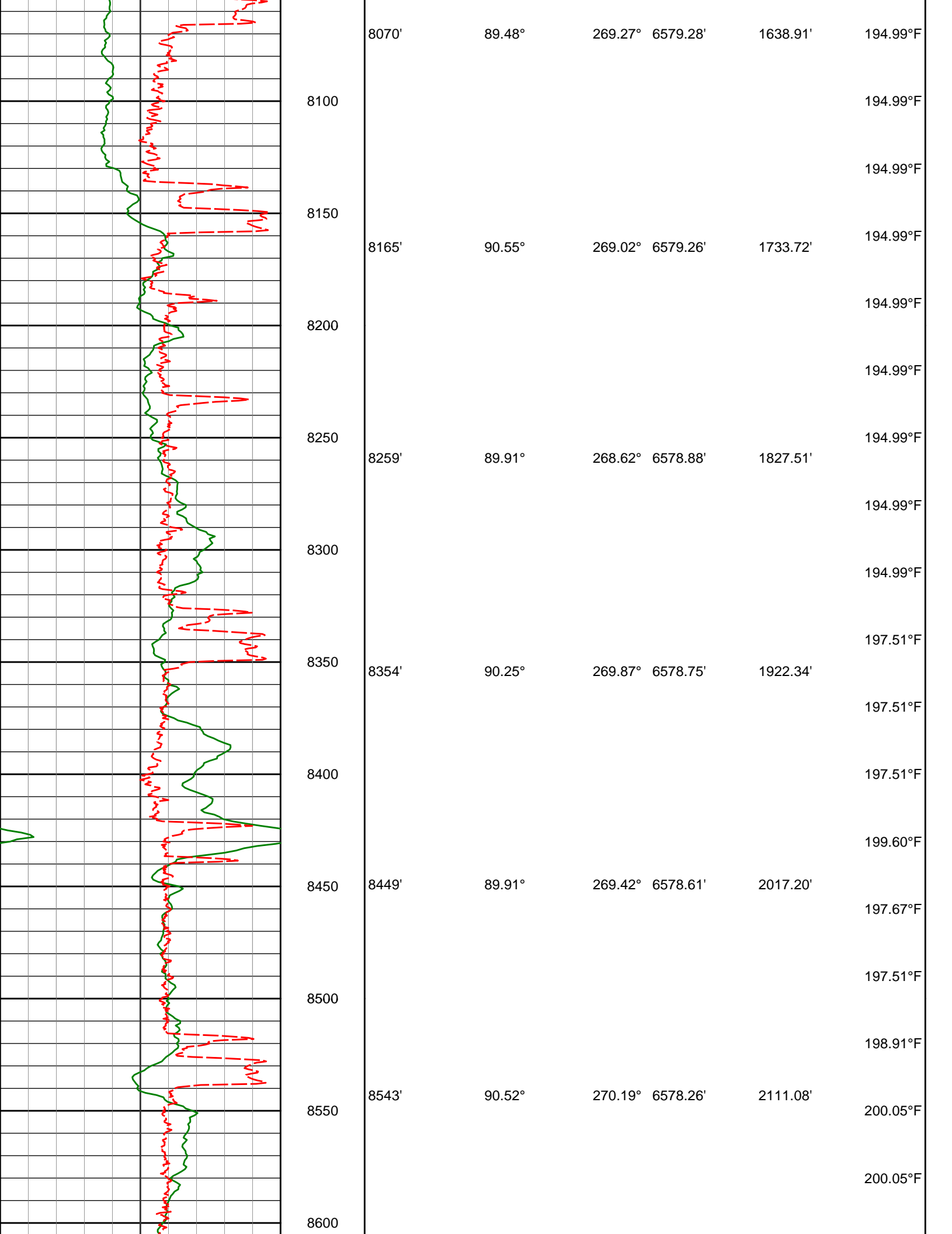


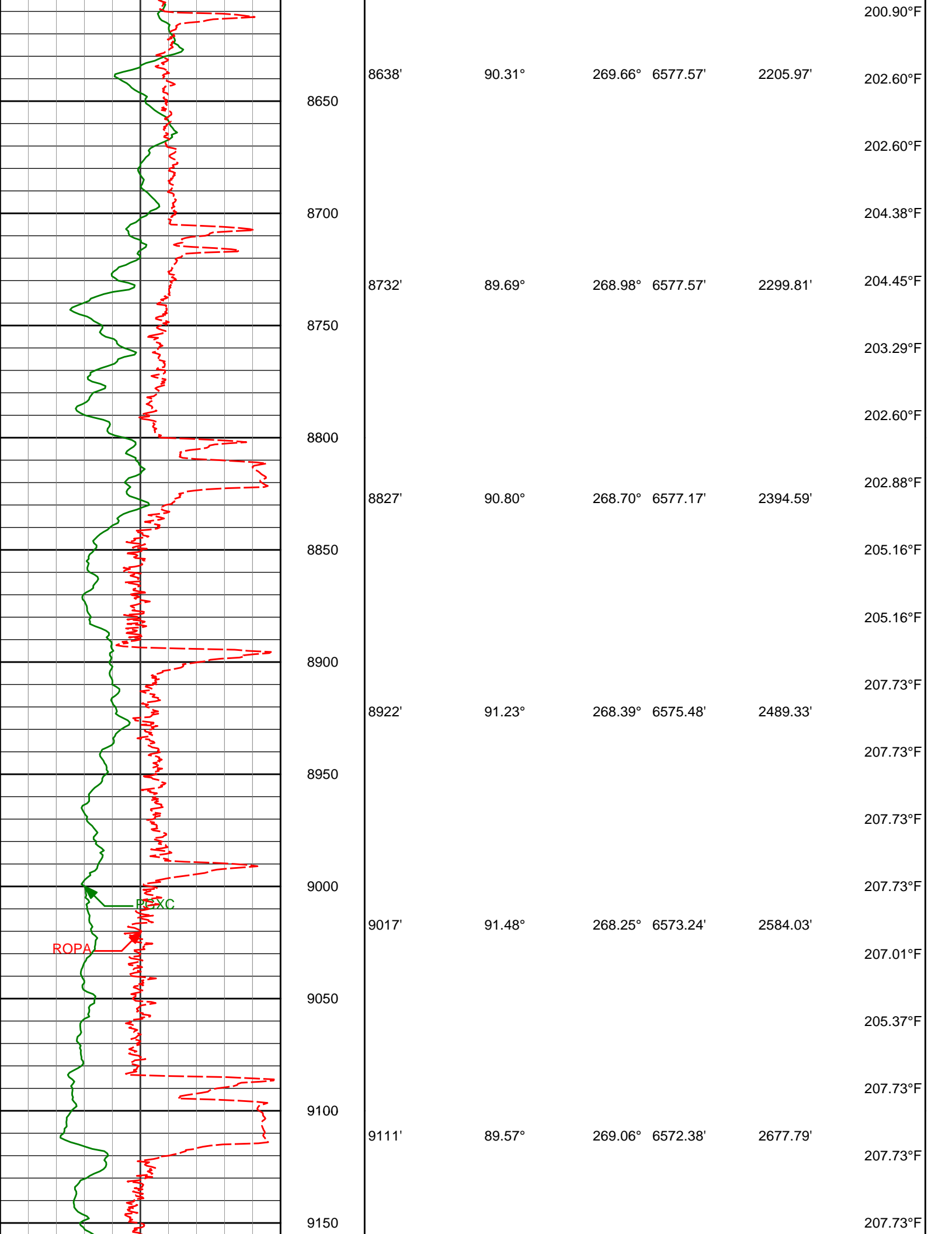


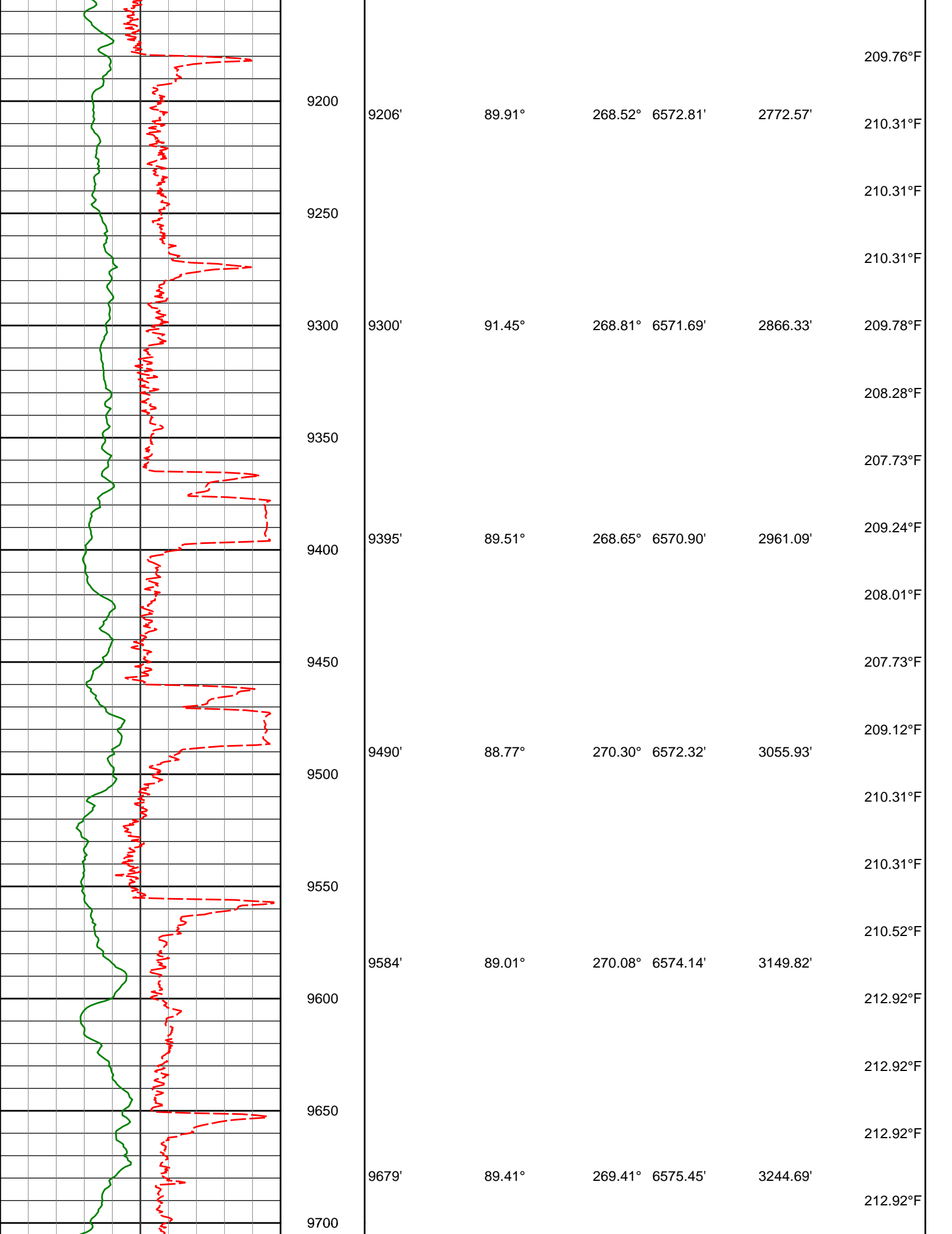


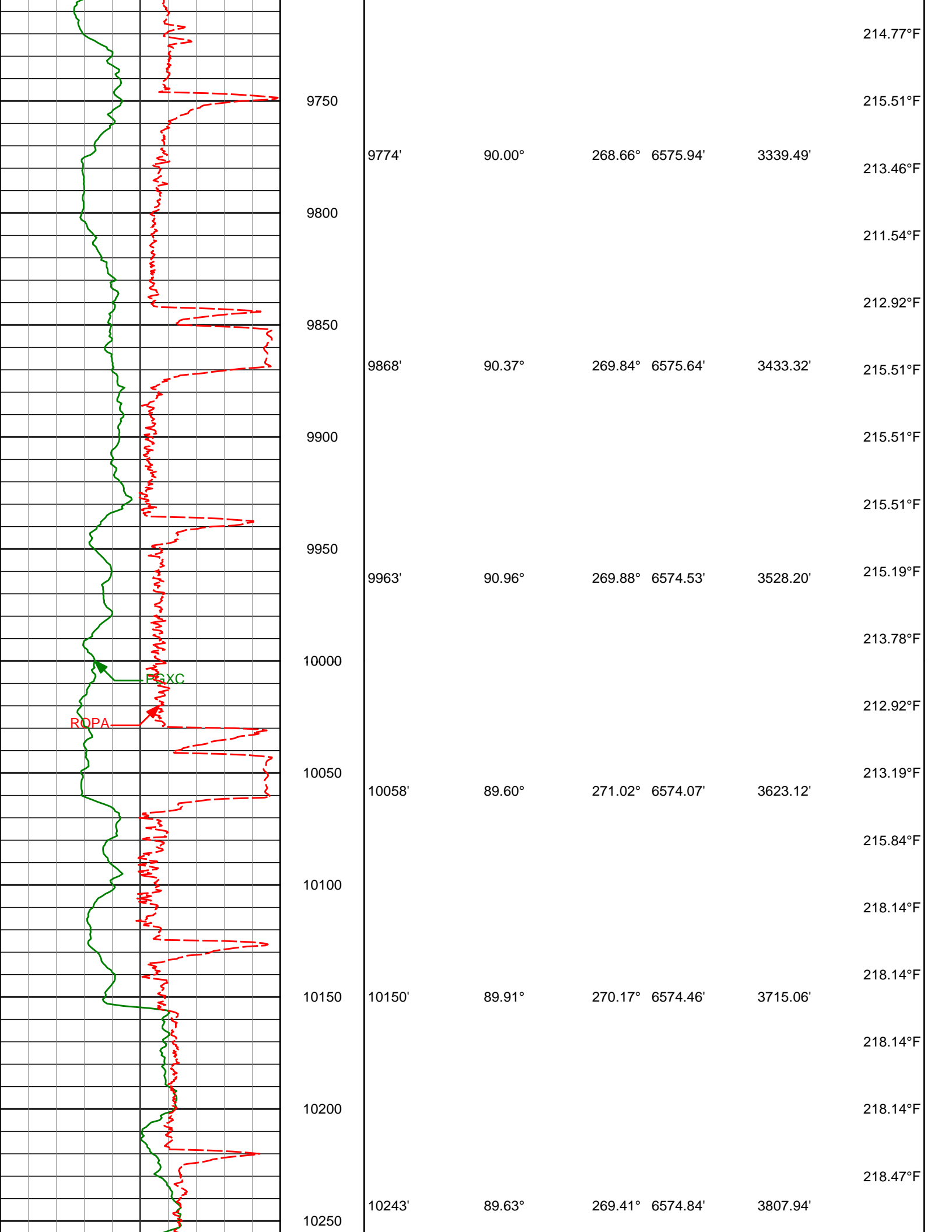


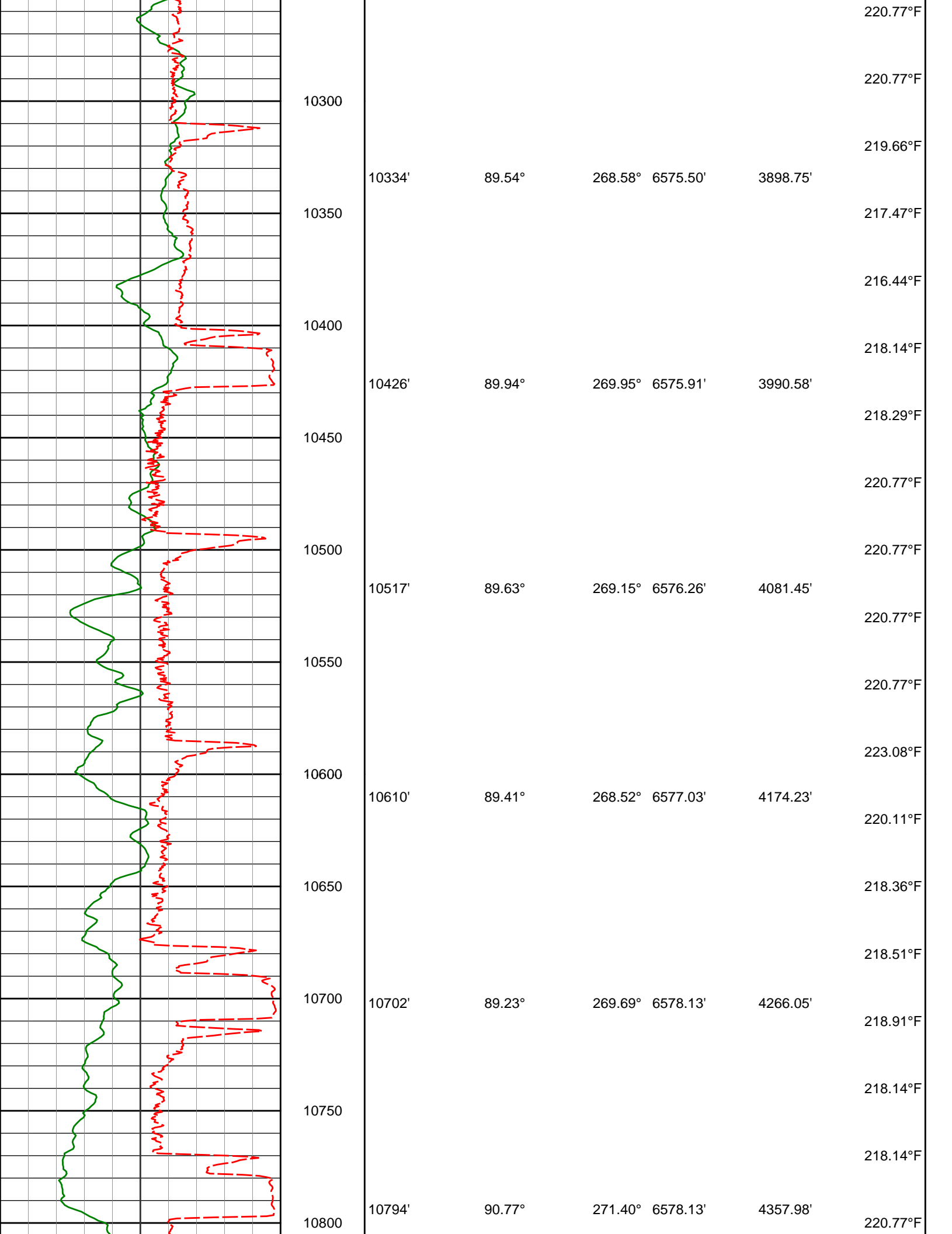


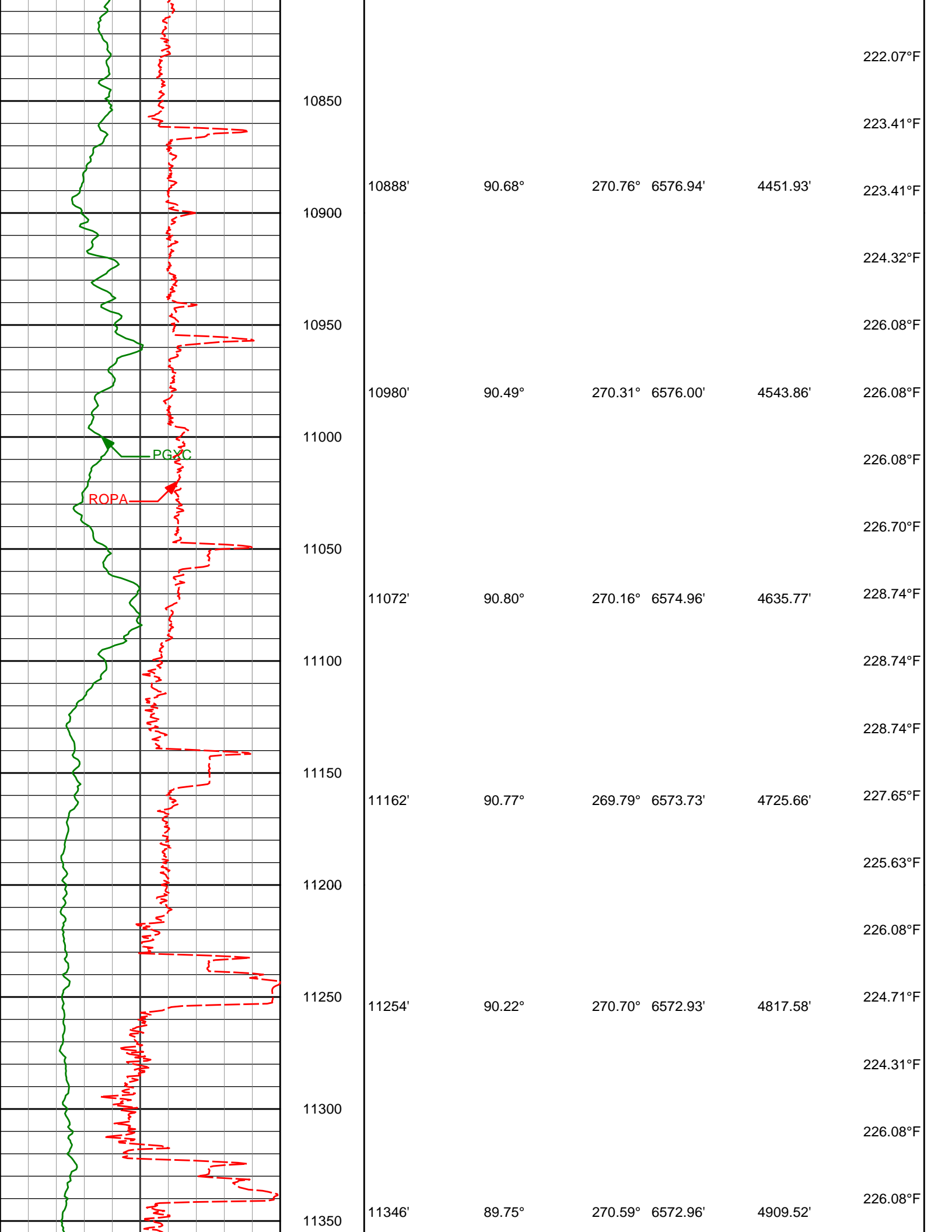


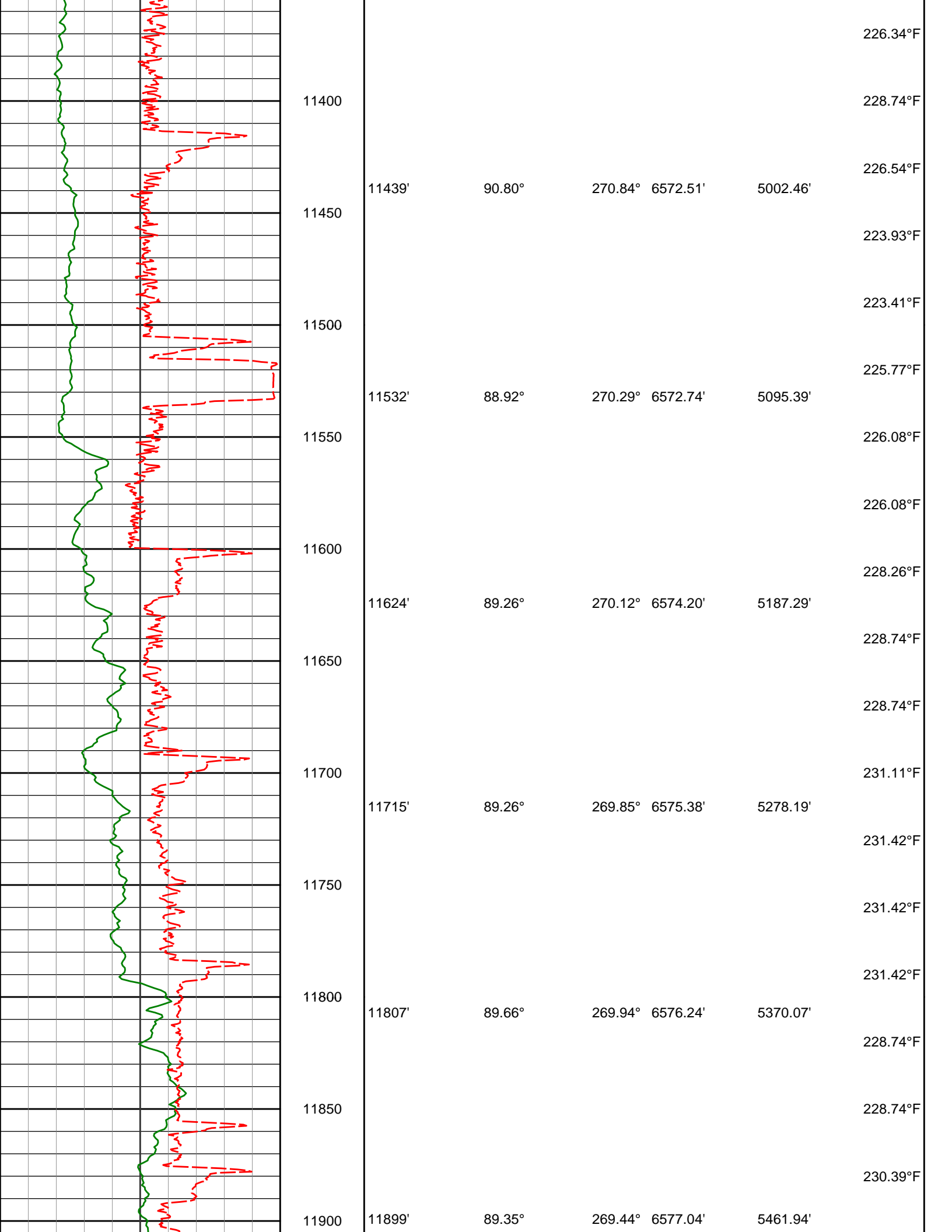


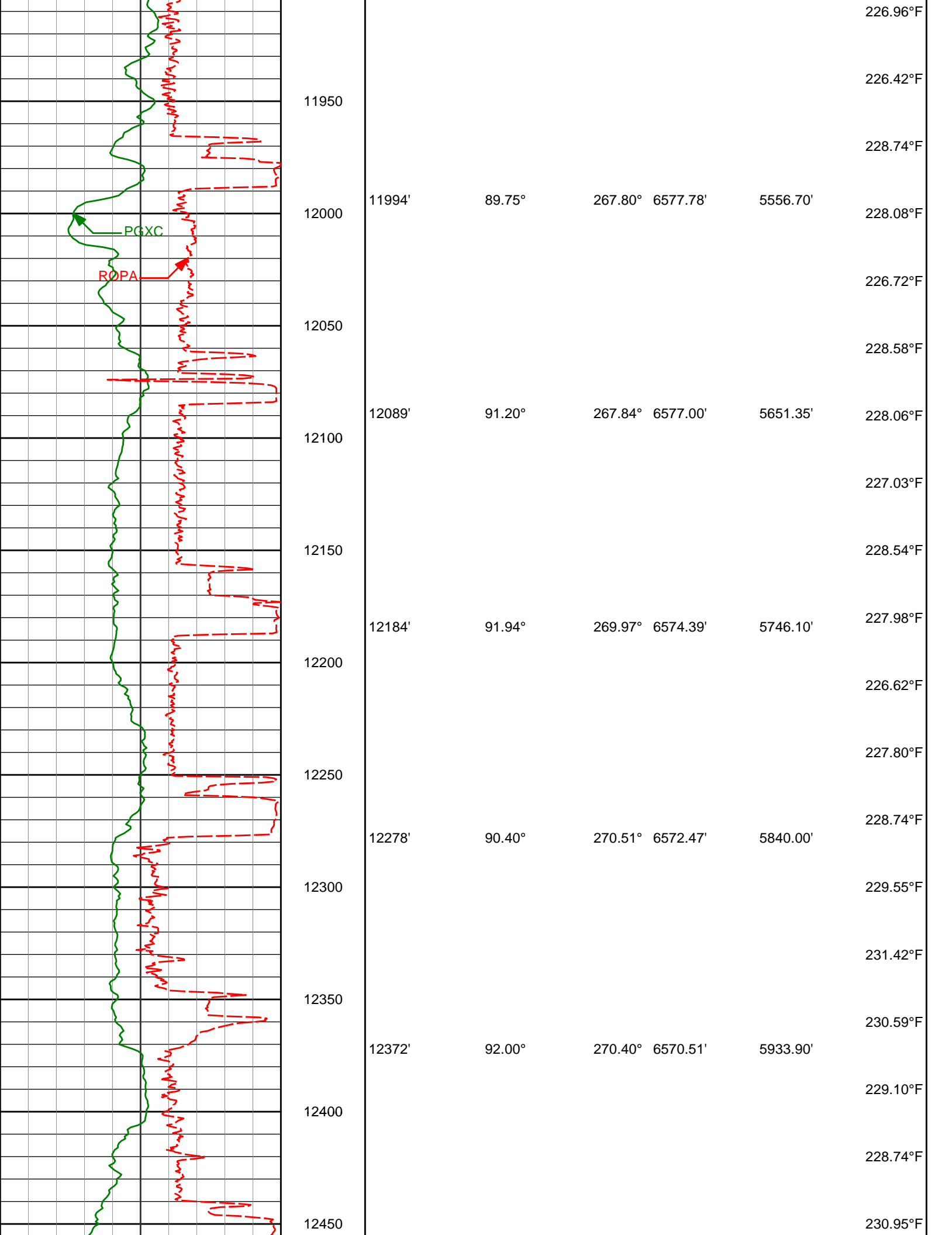




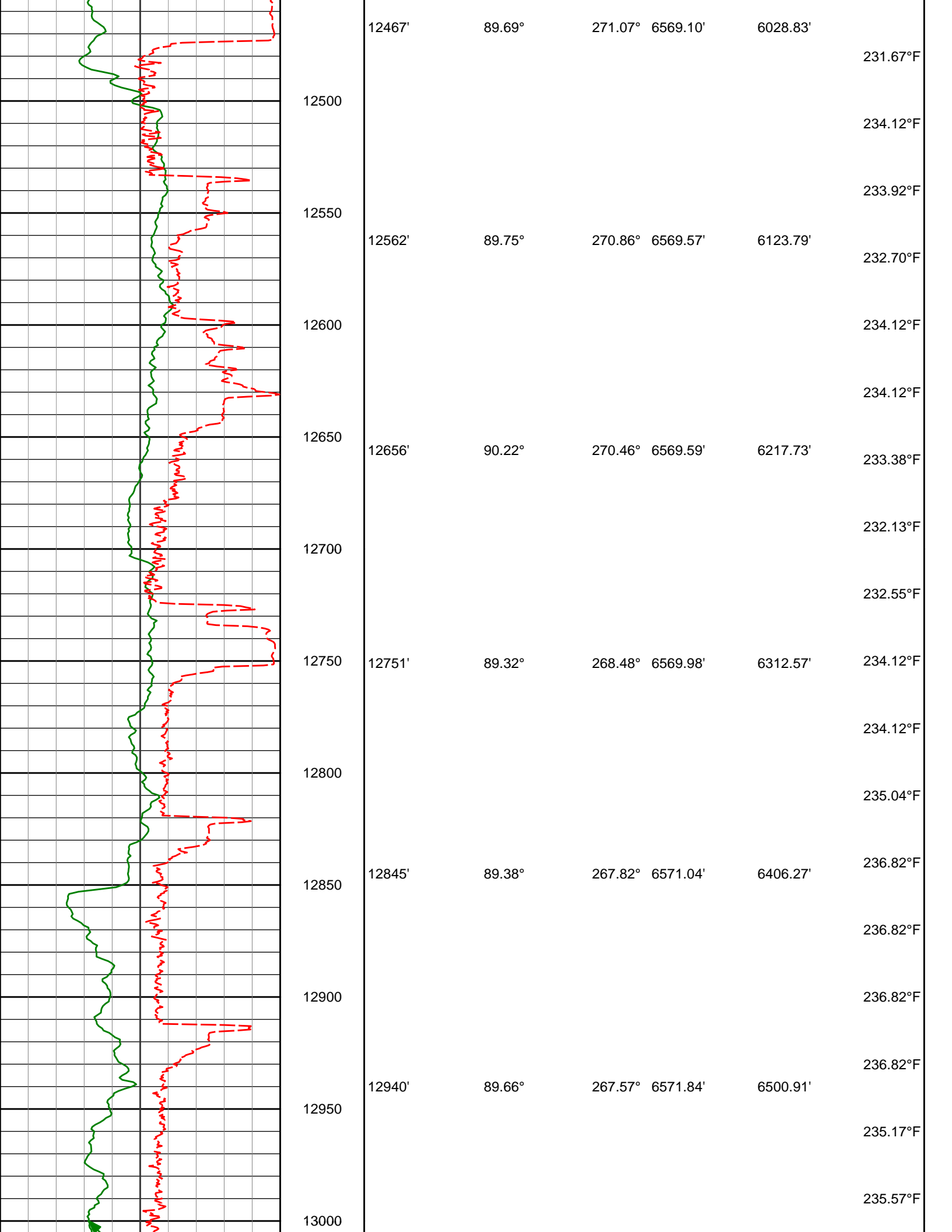


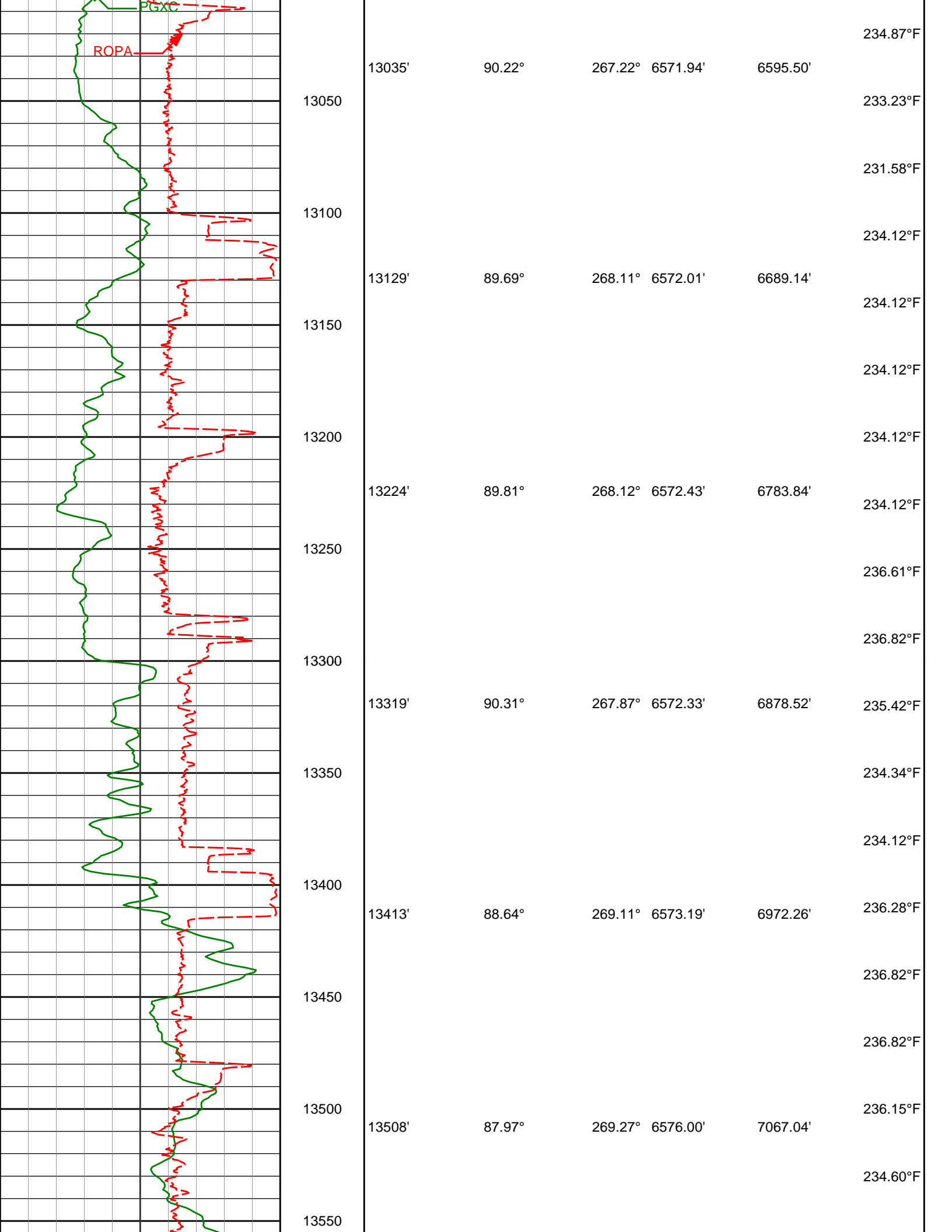


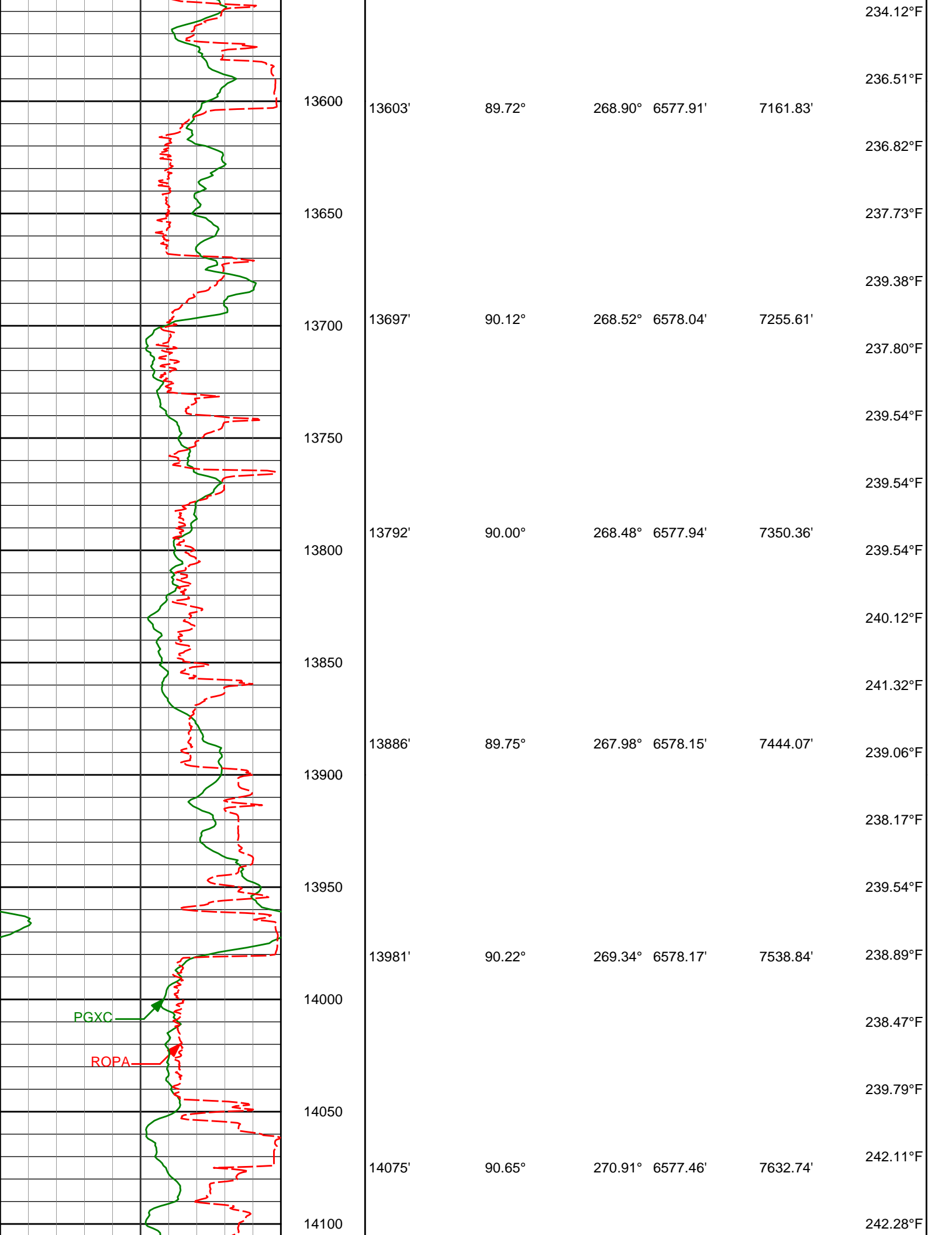


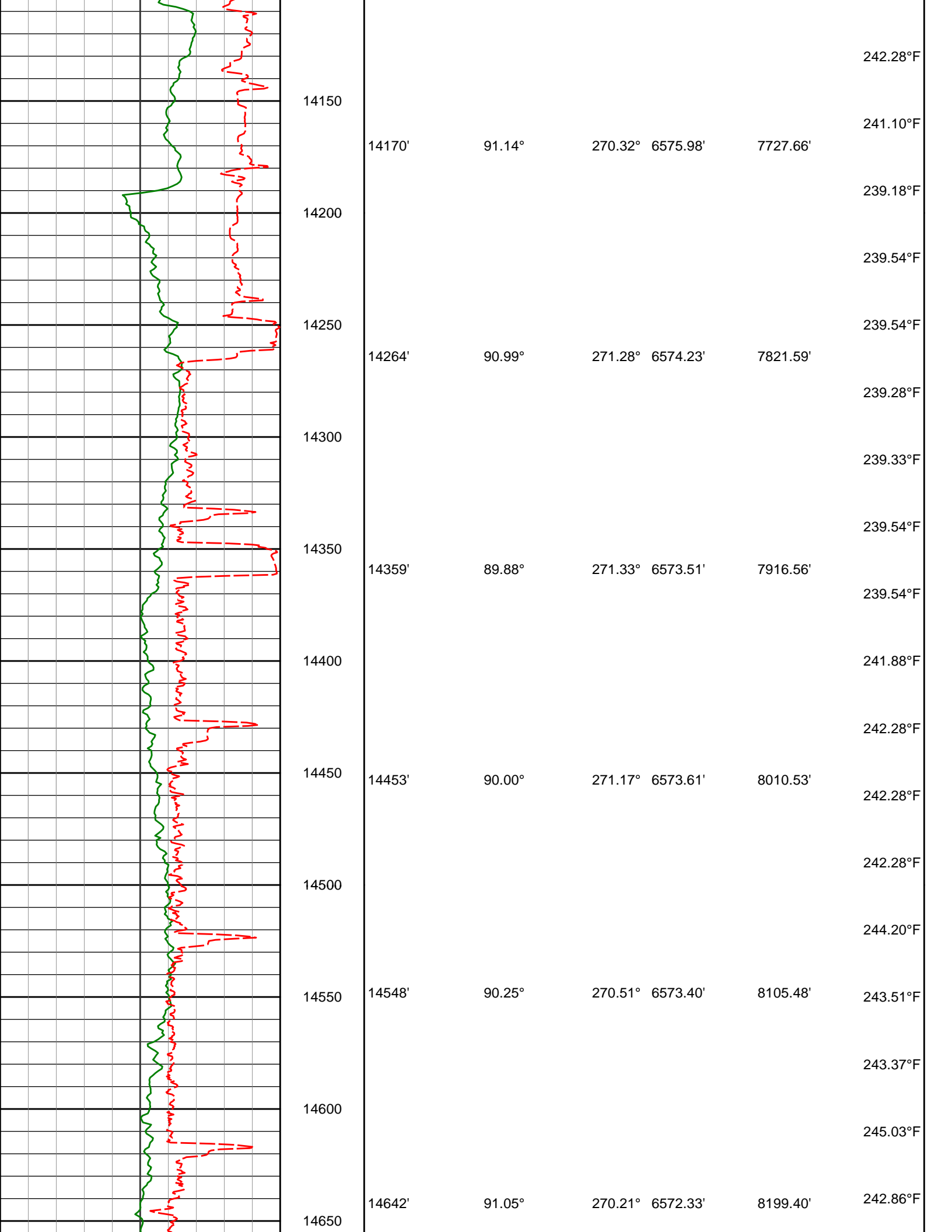


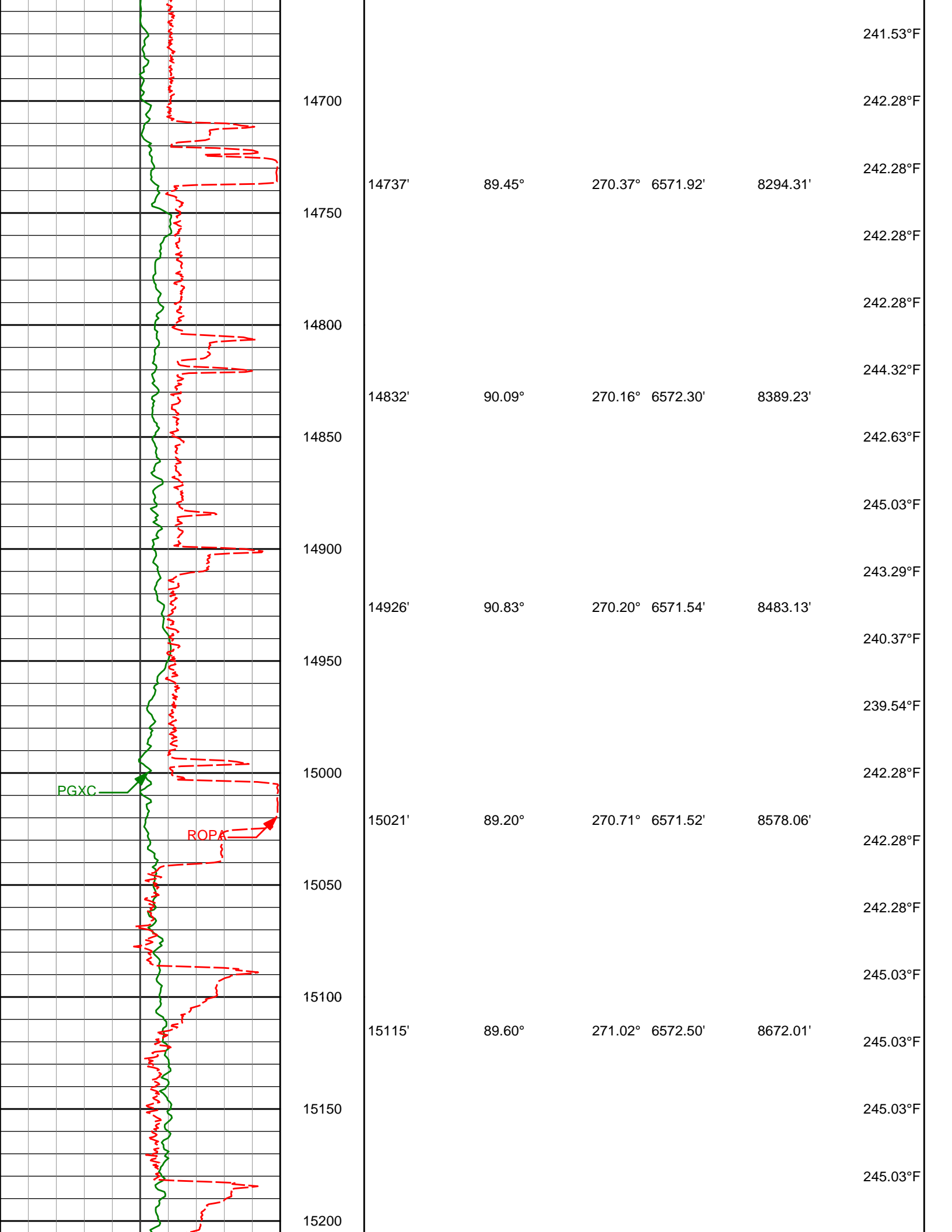


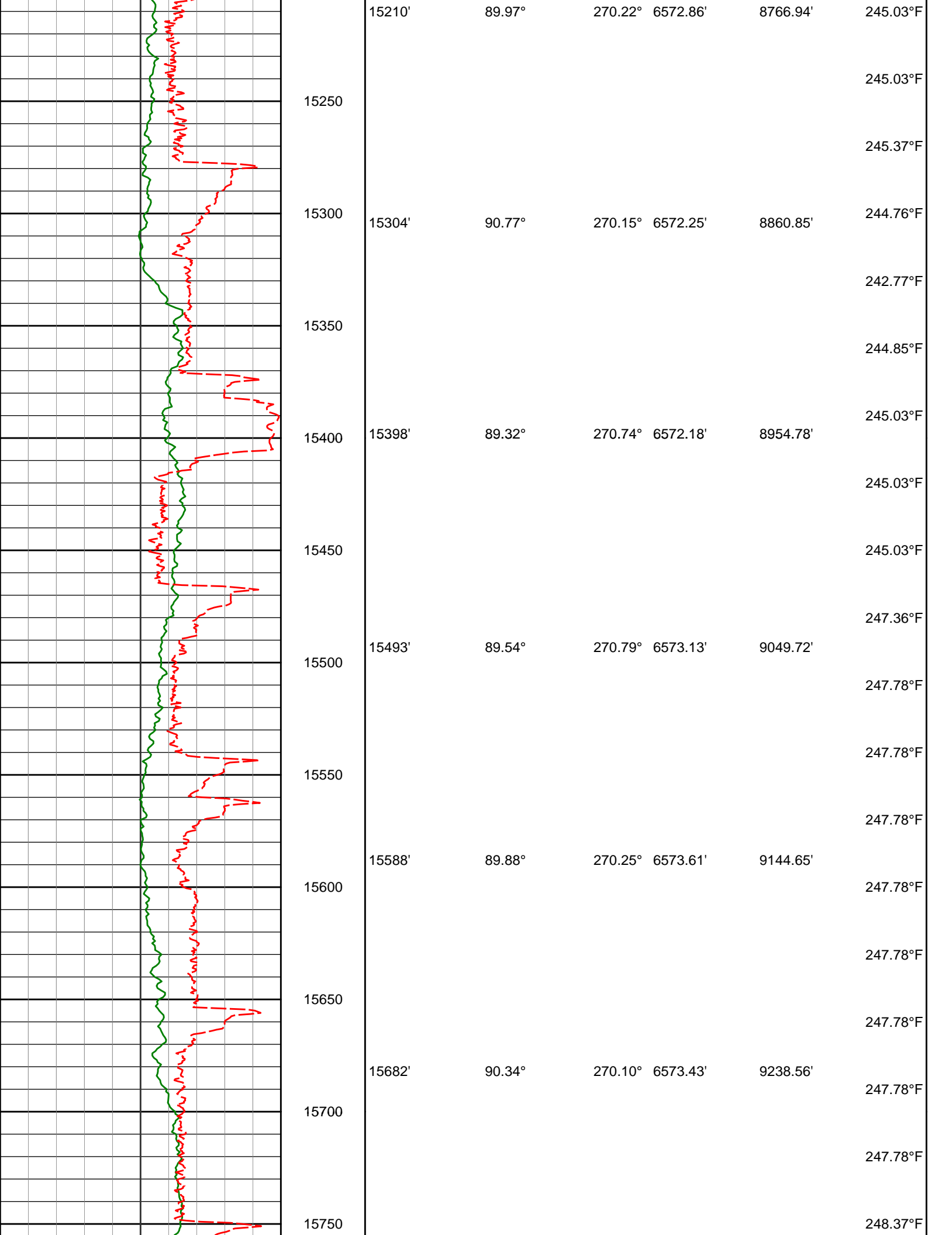


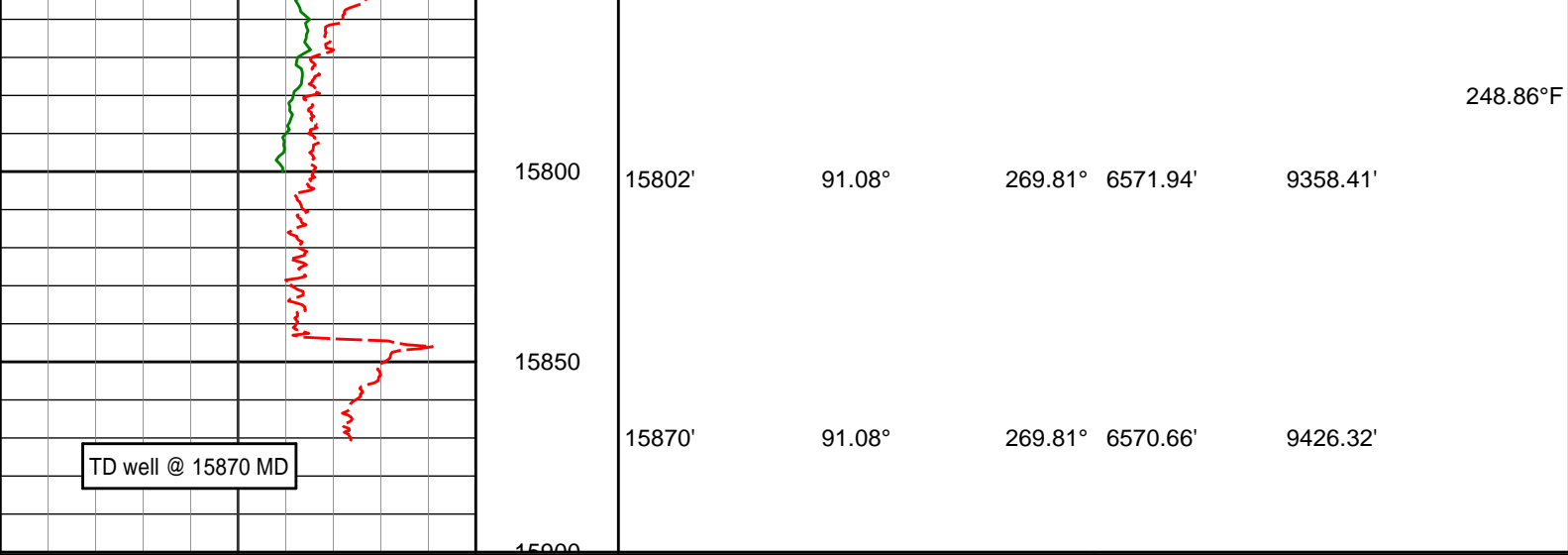








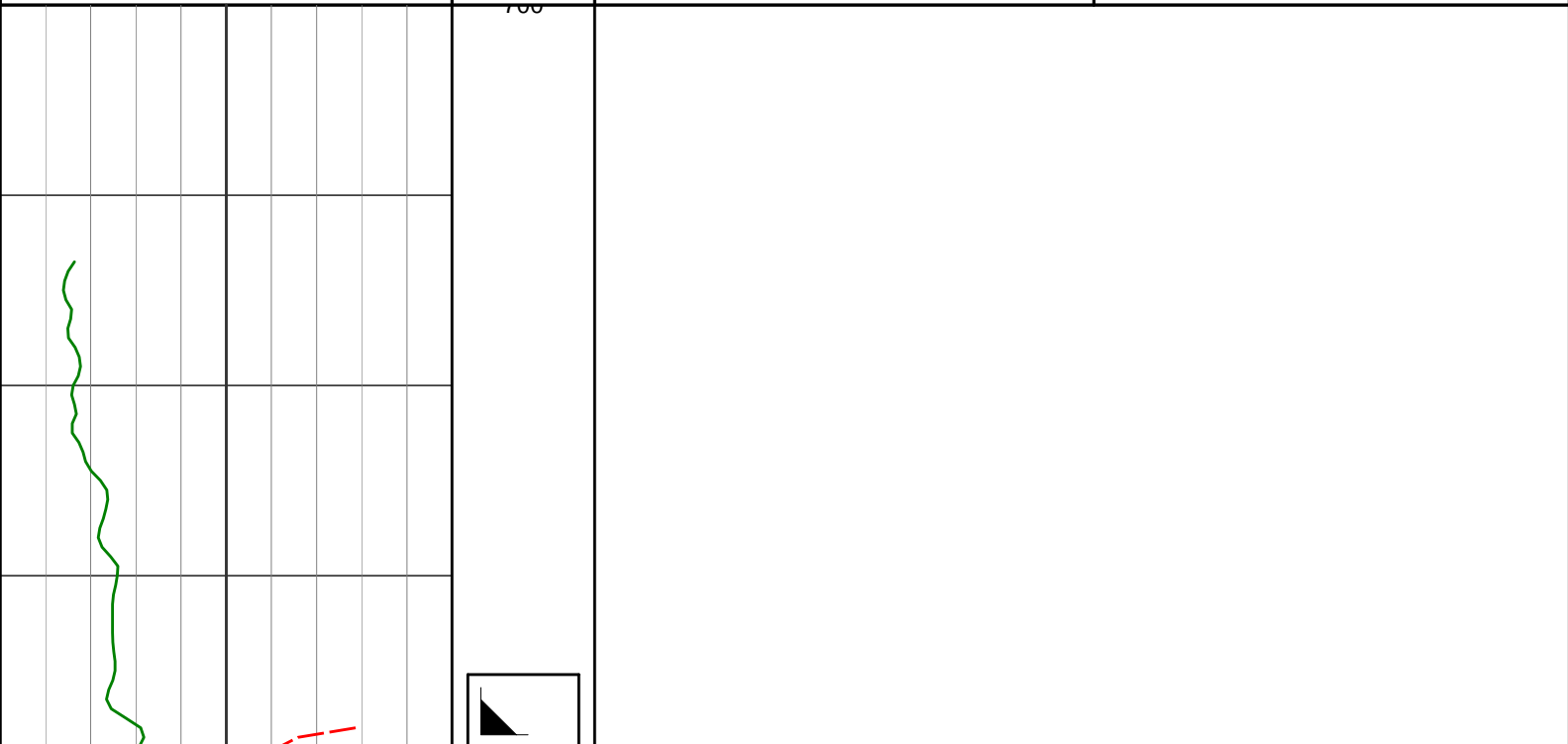


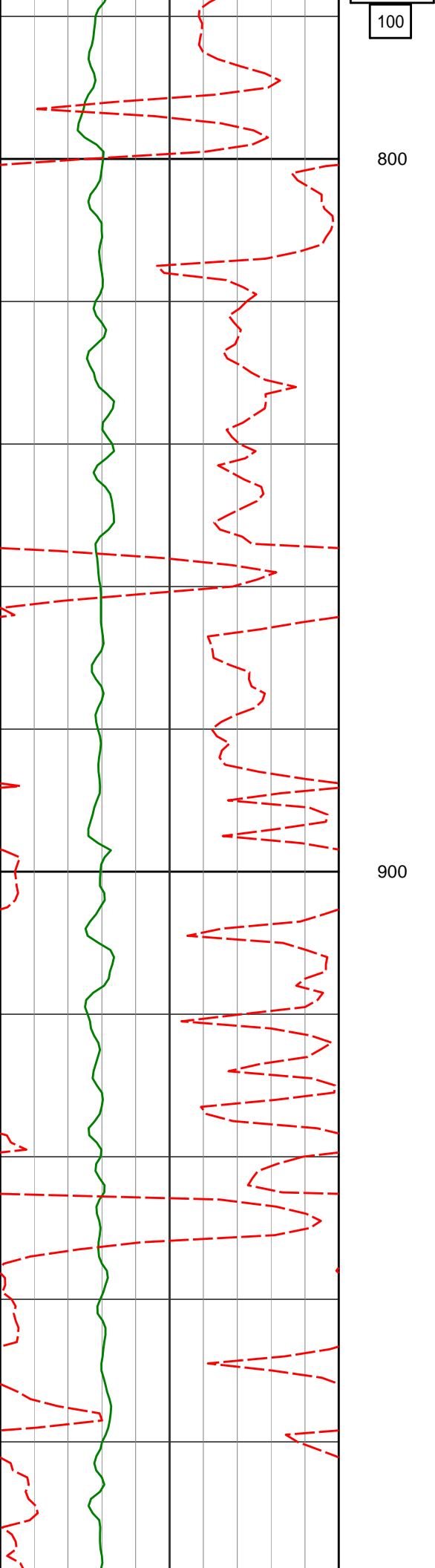


Avg Rate of Penetration ROPA feet per hr		Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
1K-----0								
PCG GR XHi-Range RT BCor PGXRC-T api								
0-----300								

MD Detail 1:240 Scale

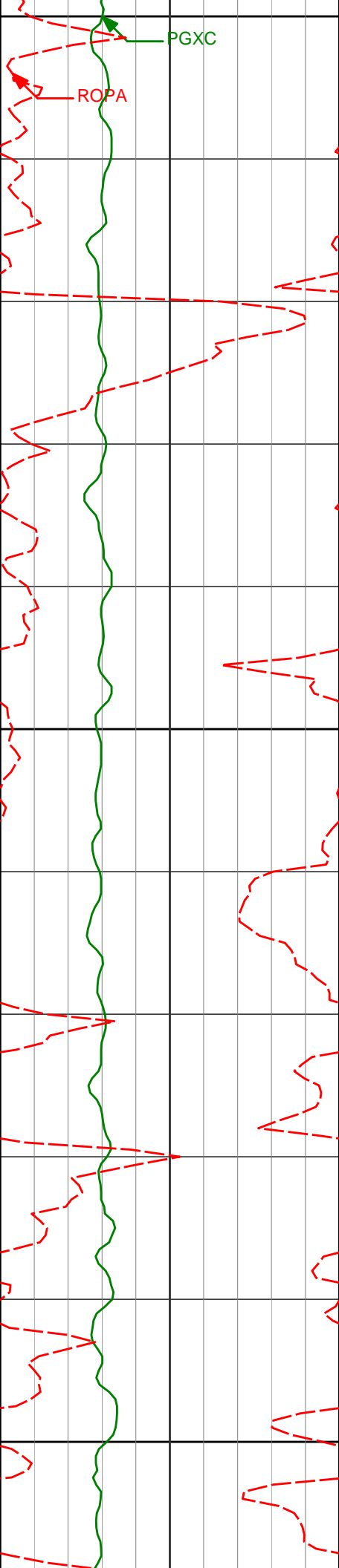
PCG GR XHi-Range RT BCor PGXRC-T api								
0-----300								
Avg Rate of Penetration ROPA feet per hr		Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
1K-----0								





					86.09°F
					88.14°F
					88.14°F
920'	0.69°	42.56°	919.98'	-3.55'	
					88.14°F
					88.14°F
					88.14°F





1000

1012'

0.62°

42.08°

1011.97'

-4.22'

90.19°F

90.19°F

1100

1104'

0.64°

42.16°

1103.97'

-4.87'

90.19°F

90.19°F

1200

1209'

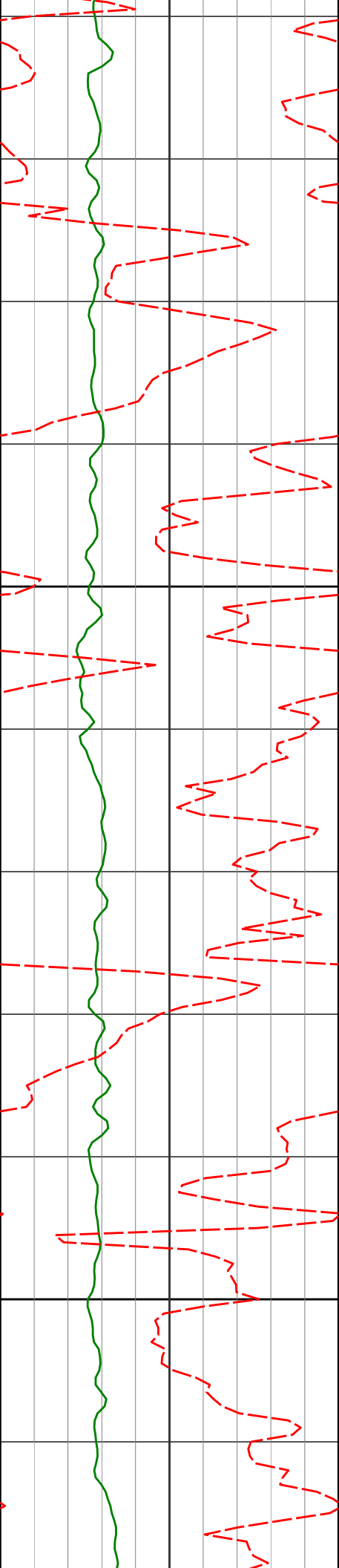
0.54°

42.68°

1208.96'

-5.56'

88.14°F



1300

1400

1393'

0.44°

65.12°

1392.95'

-6.74'

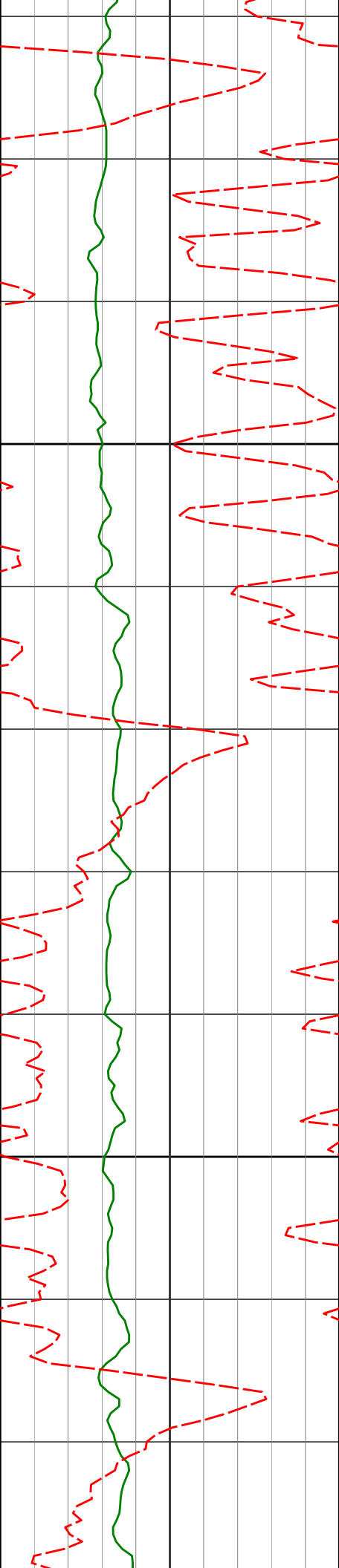
89.50°F

90.19°F

92.26°F

92.26°F

92.26°F



1485'

0.62°

72.58°

1484.95'

-7.52'

1500

94.33°F

94.33°F

1577'

0.81°

68.68°

1576.94'

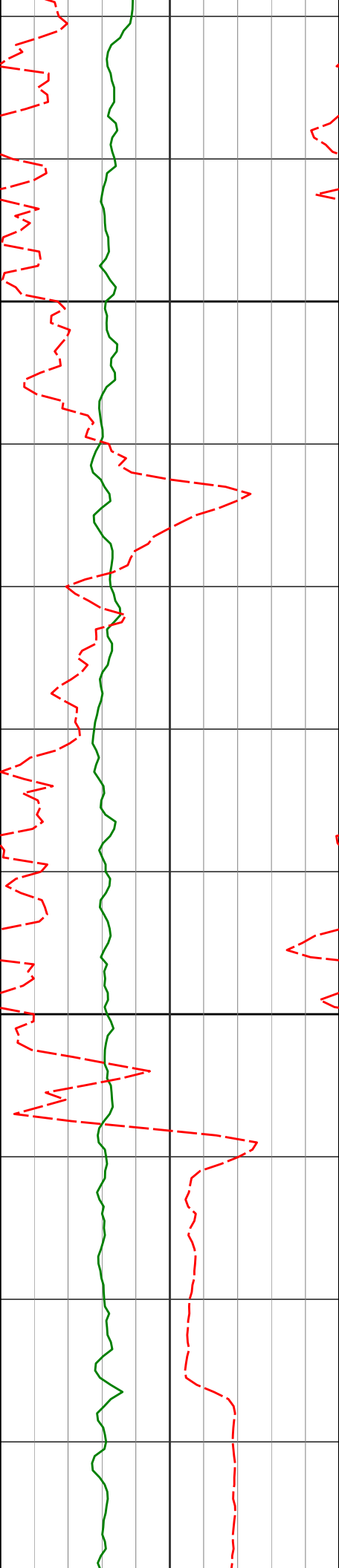
-8.58'

1600

94.33°F

94.33°F

92.26°F



1700

1800

1669'

0.79°

53.56°

1668.93'

-9.67'

96.42°F

96.42°F

1762'

0.78°

90.11°

1761.93'

-10.80'

98.51°F

98.51°F

98.51°F

1853'

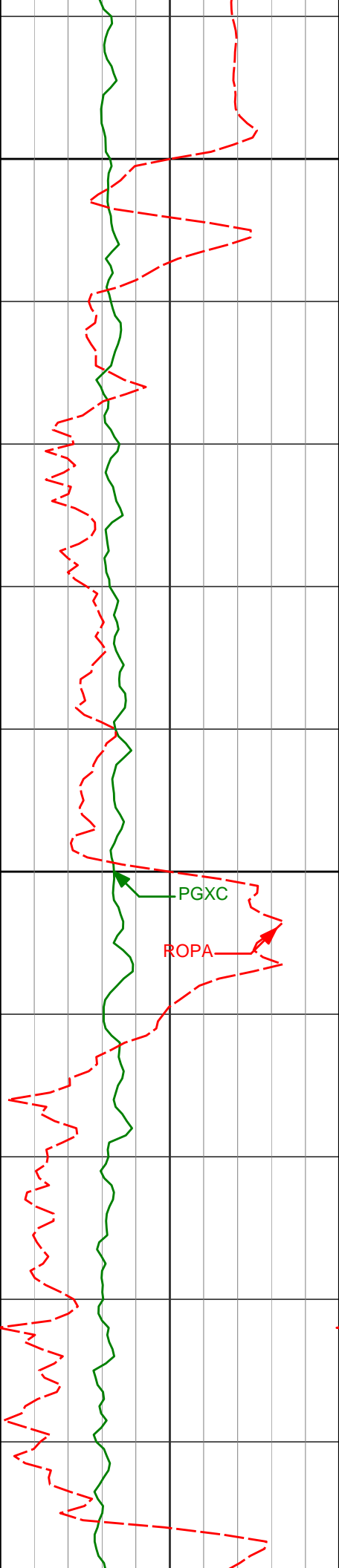
1.18°

85.79°

1852.91'

-12.35'

98.51°F



1900

1947'

2000

2039'

1.11°

0.37°

94.97°

62.29°

1946.89'

2038.89'

-14.22'

-15.36'

98.51°F

100.62°F

100.62°F

100.62°F

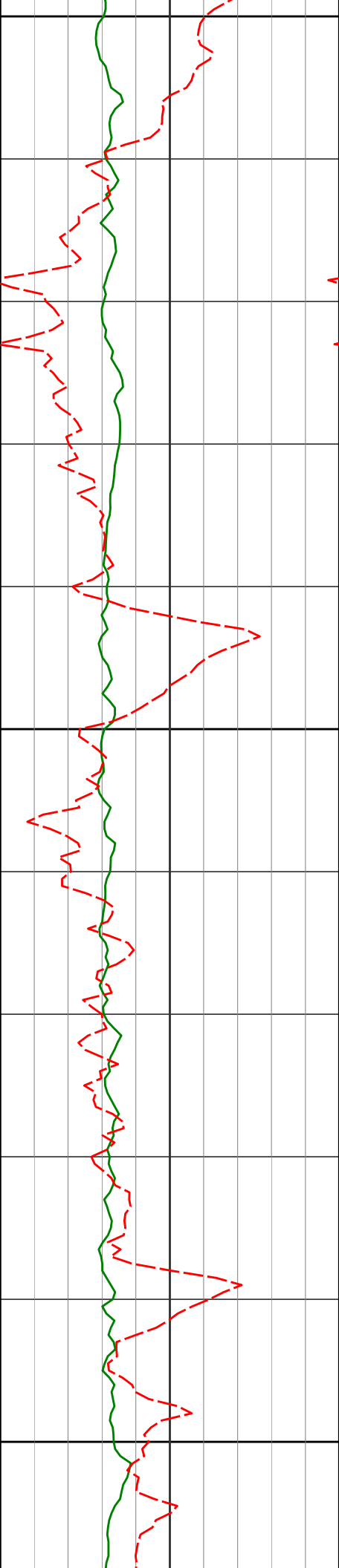
100.62°F

102.72°F

102.72°F

PGXC

ROPA



2100

2131'

0.33°

98.69° 2130.88'

-15.88'

102.72°F

102.72°F

102.72°F

103.69°F

2200

2221'

0.15°

318.42° 2220.88'

-16.06'

104.83°F

104.83°F

106.97°F

2300

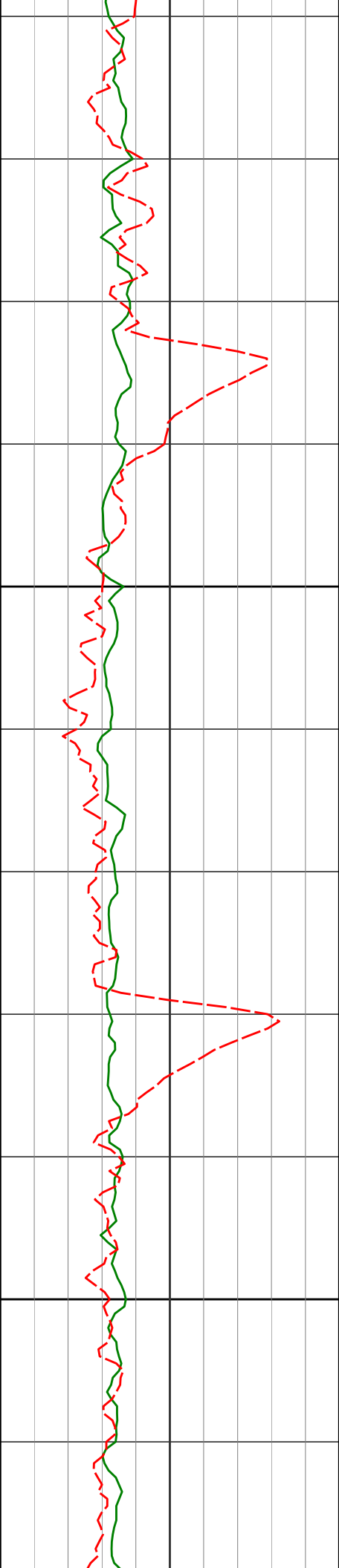
2313'

0.28°

267.41° 2312.88'

-15.75'

106.97°F



2400

2405'

0.18°

316.65° 2404.88'

-15.42'

106.97°F

106.97°F

106.97°F

106.97°F

106.97°F

106.97°F

2500

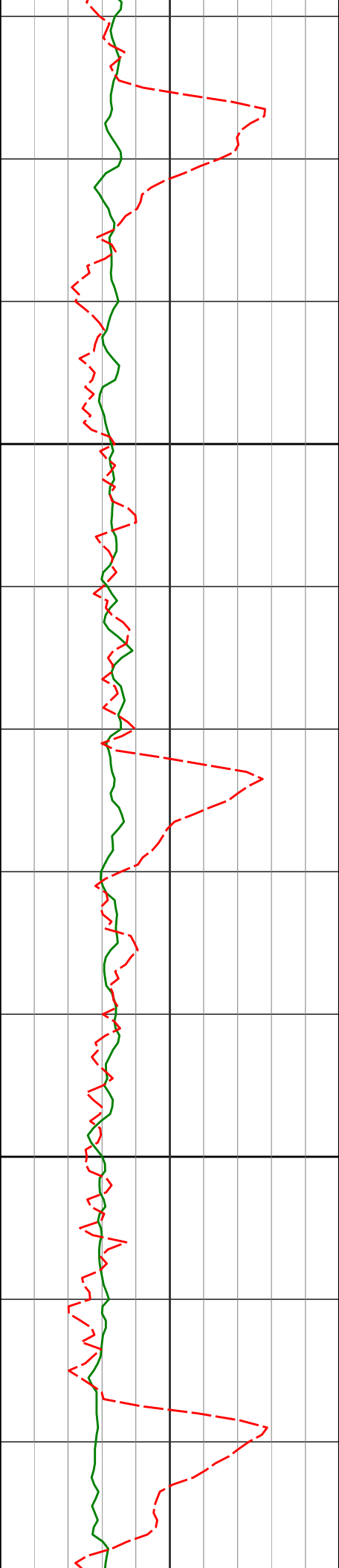
2498'

0.62°

337.60° 2497.88'

-15.11'

109.09°F



2600

2700

2591'

0.74°

322.57°

2590.87'

-14.51'

2683'

0.48°

314.45°

2682.87'

-13.84'

109.09°F

109.09°F

109.09°F

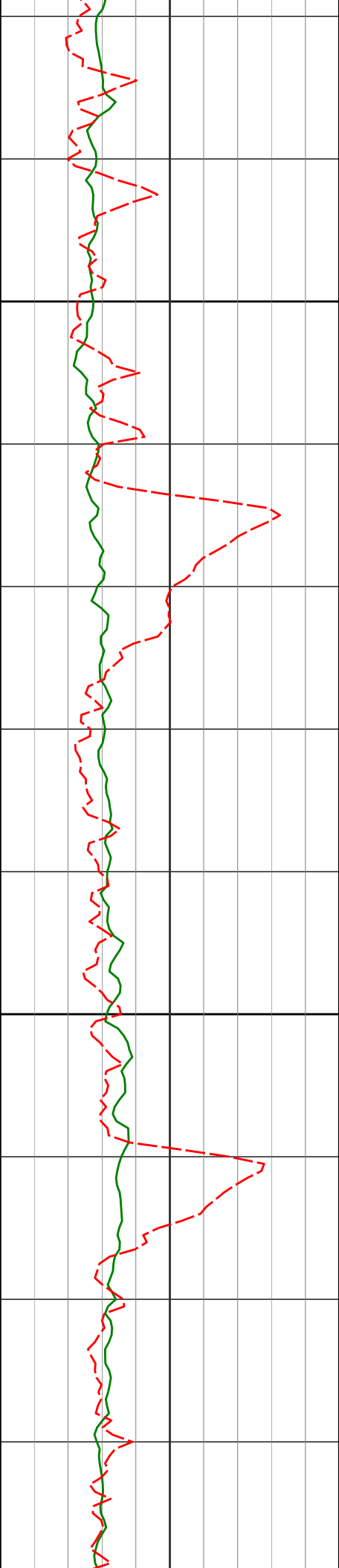
109.09°F

111.24°F

111.24°F

111.24°F





2775'

0.63°

320.21° 2774.86'

-13.21'

2800

2866'

0.68°

322.12° 2865.86'

-12.52'

2900

2959'

0.88°

321.88° 2958.85'

-11.69'

111.24°F

111.24°F

111.24°F

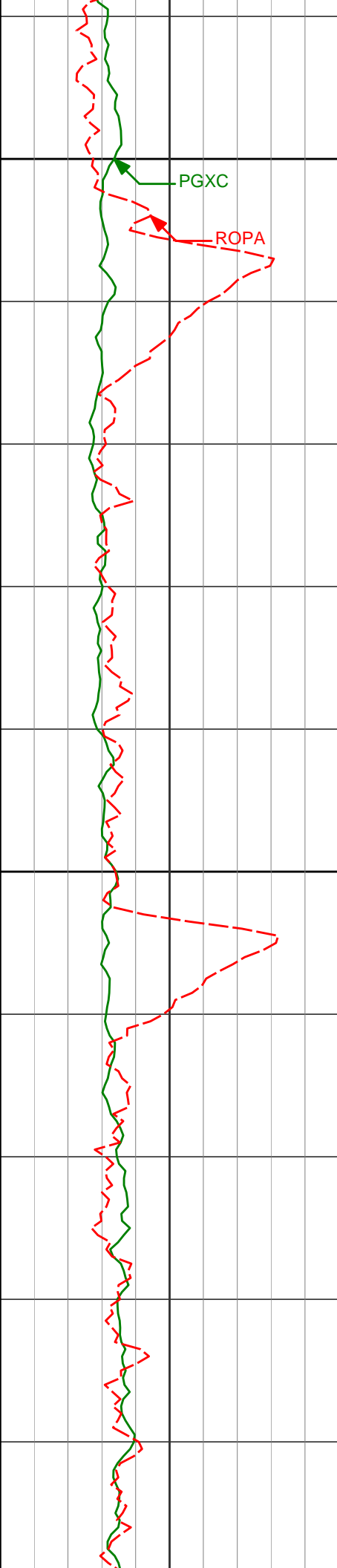
111.24°F

112.87°F

113.40°F

113.40°F

113.40°F



3000

PGXC

ROPA

113.40°F

115.56°F

3053'

0.86°

326.77°

3052.84'

-10.81'

115.56°F

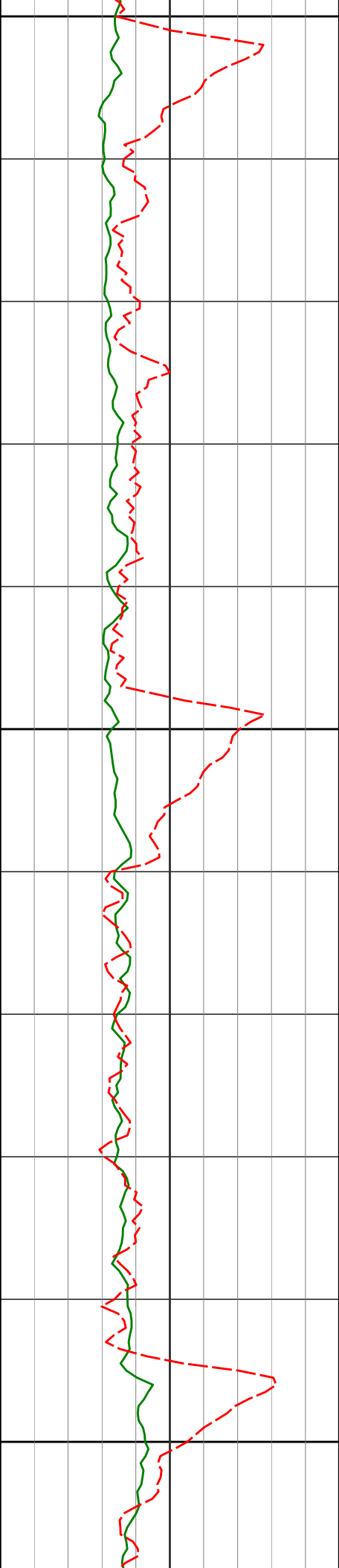
115.56°F

3100

115.56°F

116.50°F

117.73°F



3200

117.73°F

3242'

0.50°

282.90°

3241.83'

-9.16'

117.73°F

117.73°F

3300

119.91°F

3336'

0.54°

242.71°

3335.82'

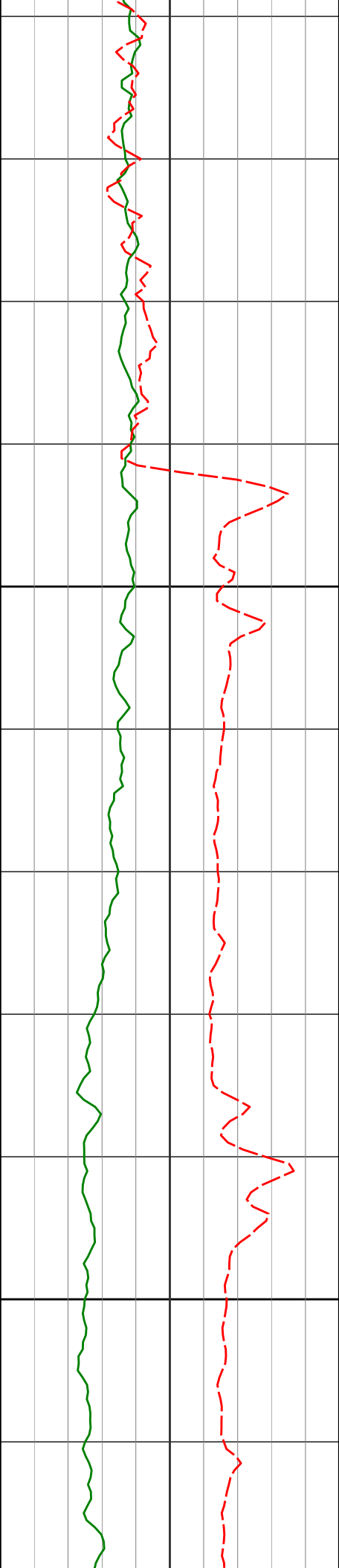
-8.38'

119.91°F

119.91°F

119.91°F

3400



3431'

0.59°

247.14°

3430.82'

-7.55'

120.62°F

122.11°F

122.11°F

3500

122.11°F

3526'

0.81°

226.97°

3525.81'

-6.64'

122.11°F

122.11°F

3600

122.11°F

3620'

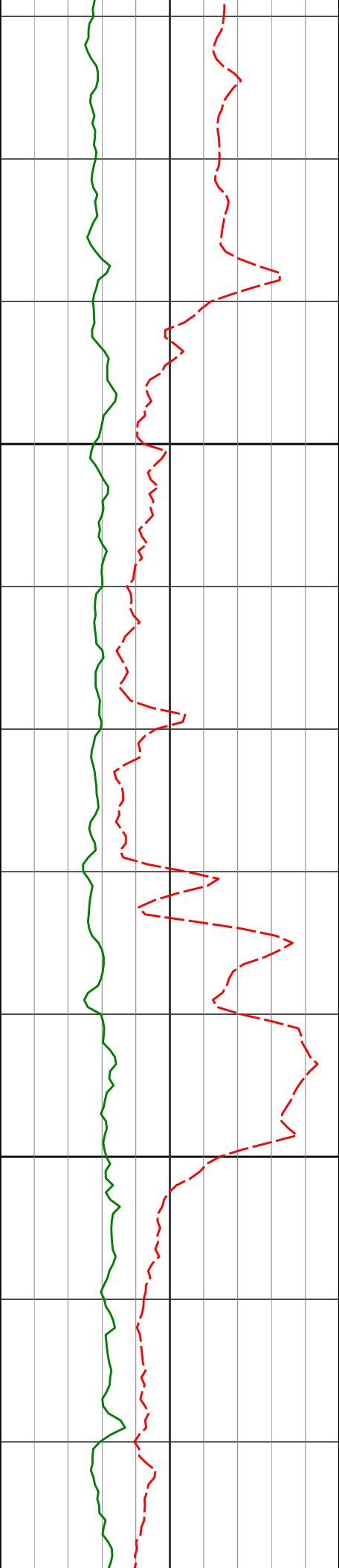
0.86°

228.04°

3619.80'

-5.67'

122.11°F



3700

3800

3715'

3809'

1.03°

0.70°

231.07°

262.69°

3714.79'

3808.78'

-4.52'

-3.33'

122.11°F

122.11°F

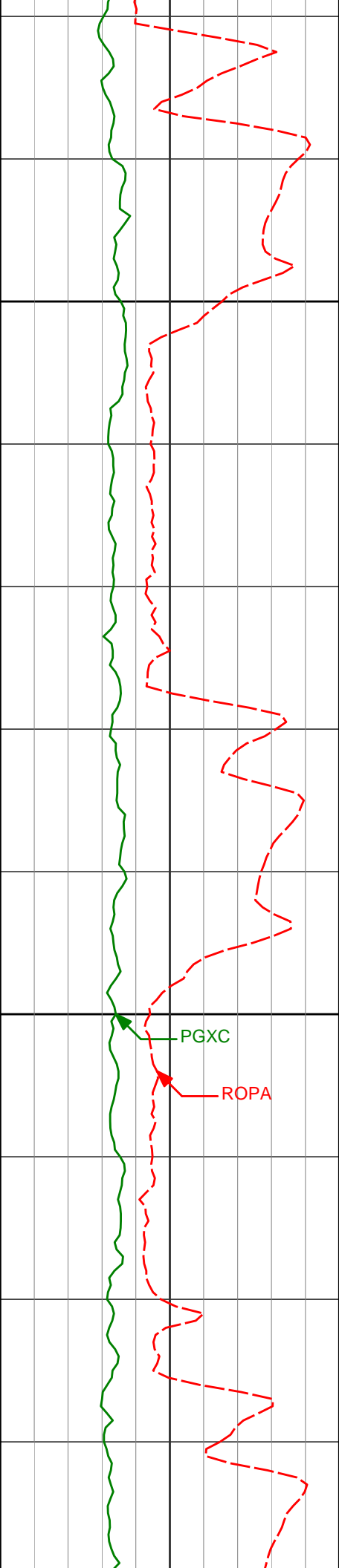
123.47°F

123.58°F

124.30°F

124.30°F

124.30°F



3900

3904'

1.20°

50.74°

3903.77'

-3.50'

4000

3999'

3.00°

33.30°

3998.70'

-5.50'

126.52°F

126.52°F

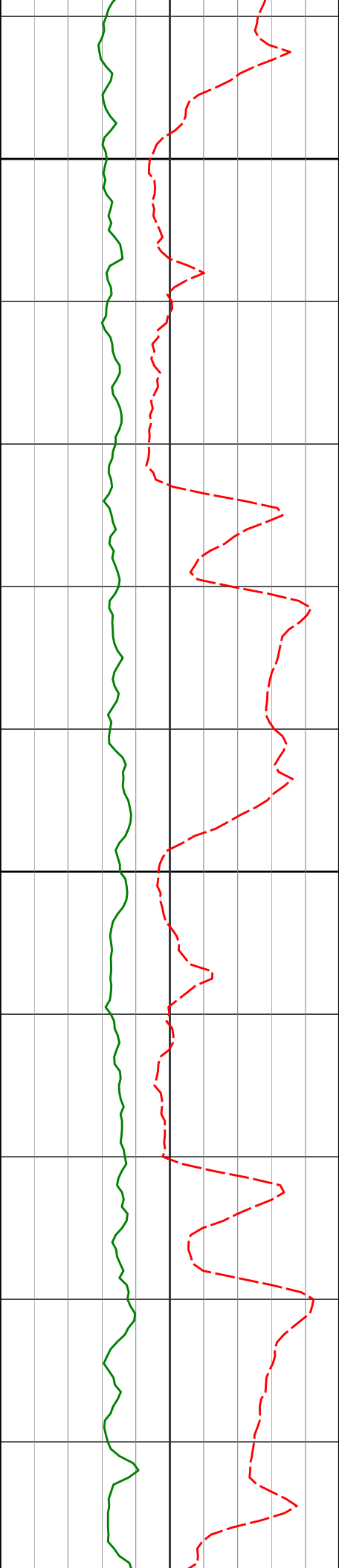
126.52°F

126.52°F

128.73°F

128.73°F

128.73°F



4100

4200

4094'

4188'

4283'

4.39°

5.78°

7.27°

23.16°

20.93°

15.27°

4093.51'

4187.13'

4281.52'

-8.04'

-10.78'

-13.59'

129.47°F

130.24°F

128.73°F

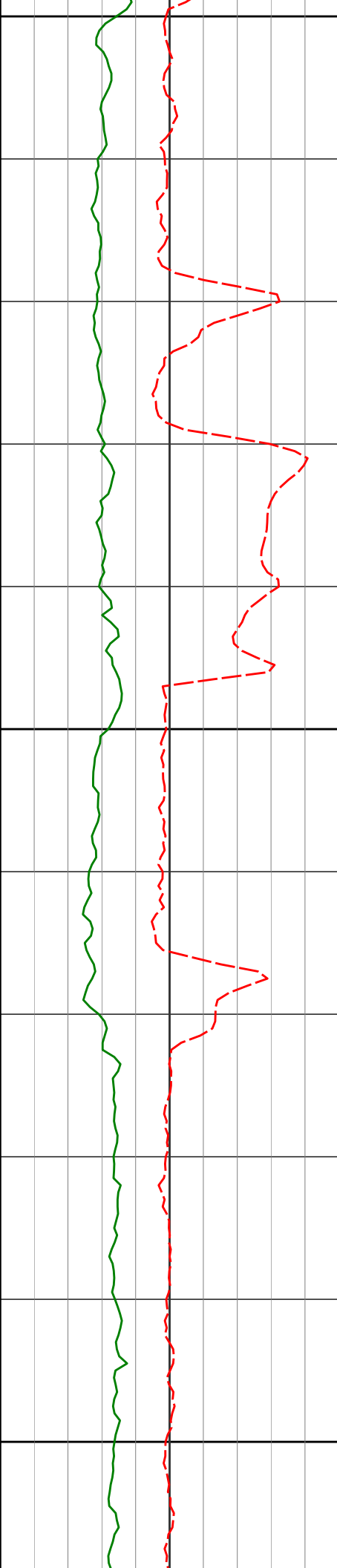
130.96°F

130.96°F

130.96°F

130.96°F

132.65°F



4300

133.20°F

133.20°F

4377'

9.19°

15.42°

4374.54'

-16.54'

133.50°F

4400

135.45°F

135.45°F

4472'

9.66°

13.84°

4468.26'

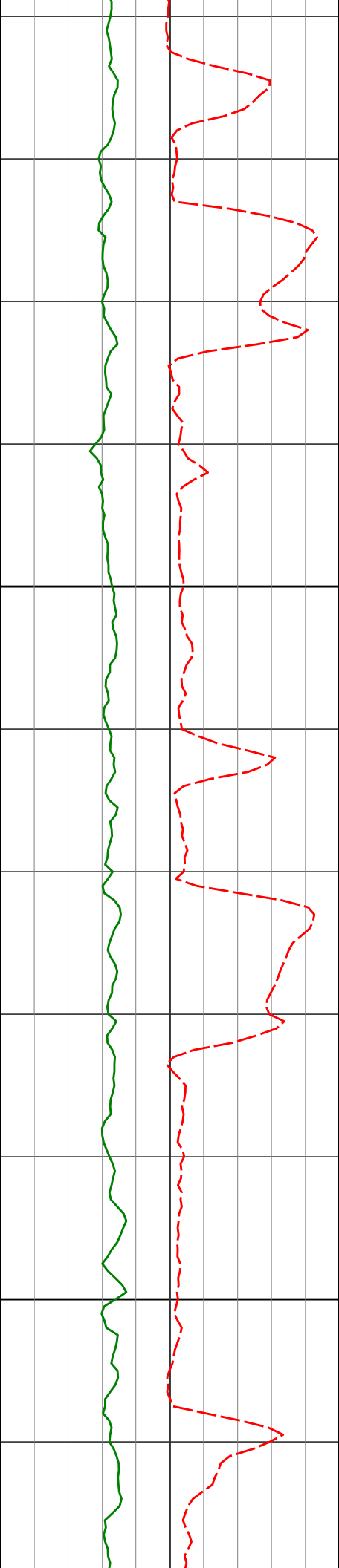
-19.76'

135.45°F

4500

135.45°F





4600

4700

4567'

4661'

8.91°

9.96°

15.84°

24.45°

4562.02'

4654.75'

-22.98'

-27.65'

133.65°F

133.20°F

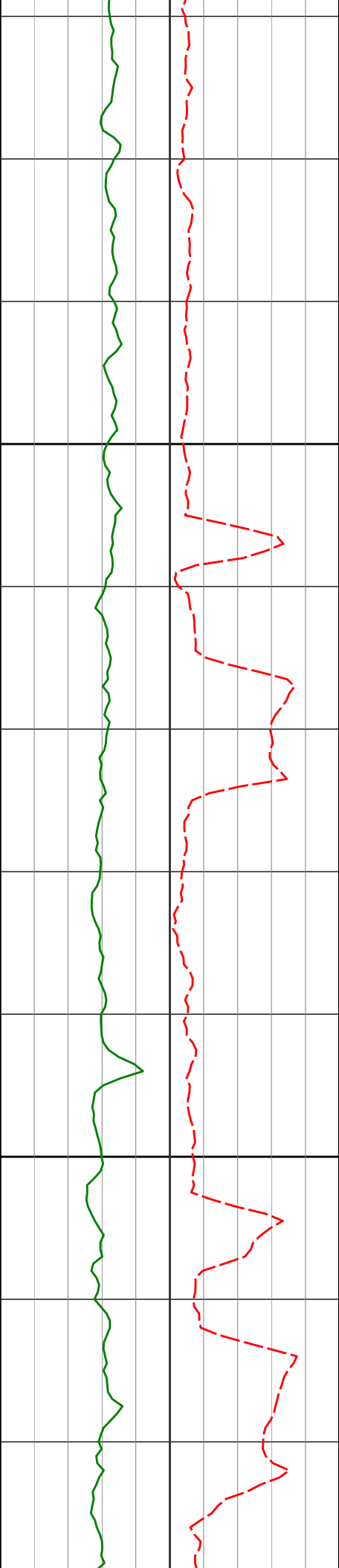
135.45°F

135.67°F

137.70°F

137.70°F

139.14°F



4800

4900

4756'

4851'

8.44°

8.09°

27.04°

29.60°

4748.52'

4842.54'

-33.57'

-39.47'

139.96°F

139.96°F

139.96°F

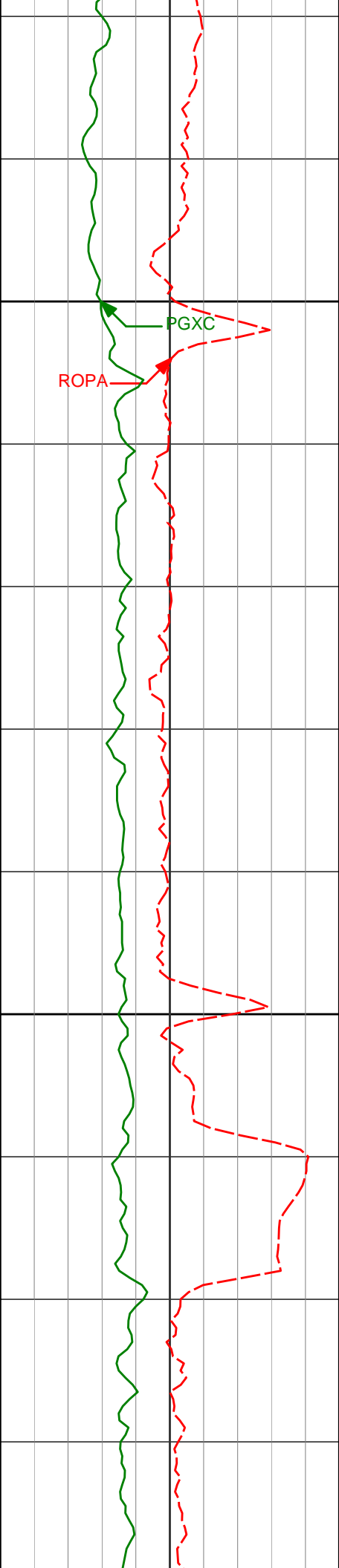
139.96°F

139.96°F

139.96°F

139.96°F

139.96°F



5000

5040'

5100

5134'

8.88°

8.26°

27.01°

17.75°

5029.47'

5122.42'

-51.50'

-56.25'

139.96°F

142.25°F

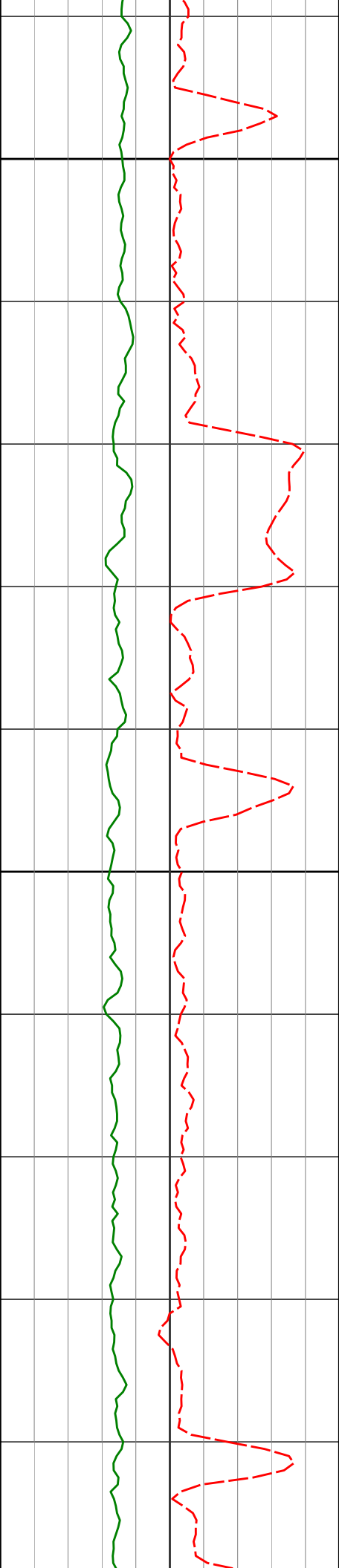
142.25°F

141.96°F

139.96°F

139.96°F

142.25°F



5200

5300

5229'

8.00°

17.91°

5216.47'

-59.76'

5324'

7.90°

22.35°

5310.56'

-63.69'

142.25°F

142.25°F

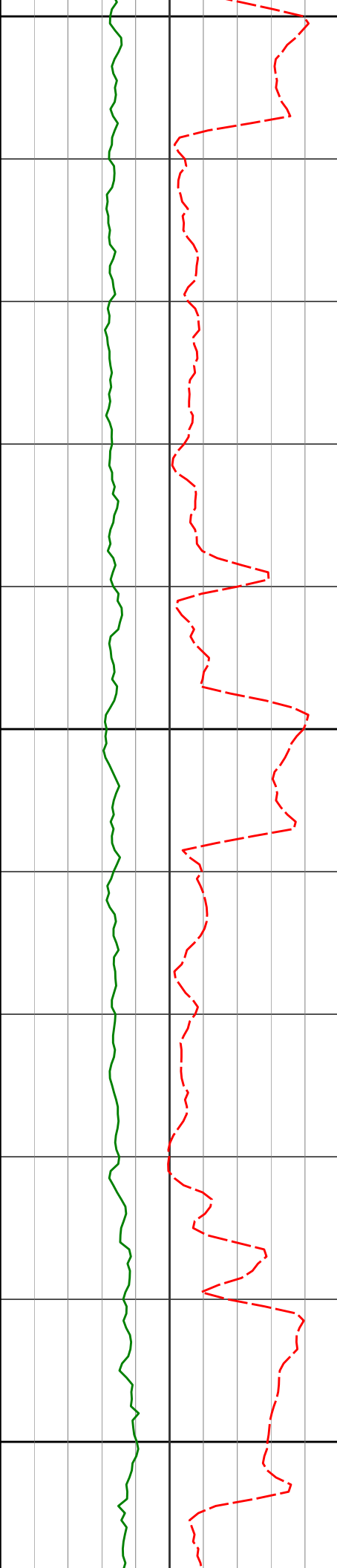
142.25°F

142.25°F

143.69°F

144.54°F

144.54°F



5400

5418'

8.35°

24.01°

5403.61'

-68.35'

145.94°F

146.84°F

146.84°F

146.84°F

5500

5513'

7.87°

26.88°

5497.66'

-73.53'

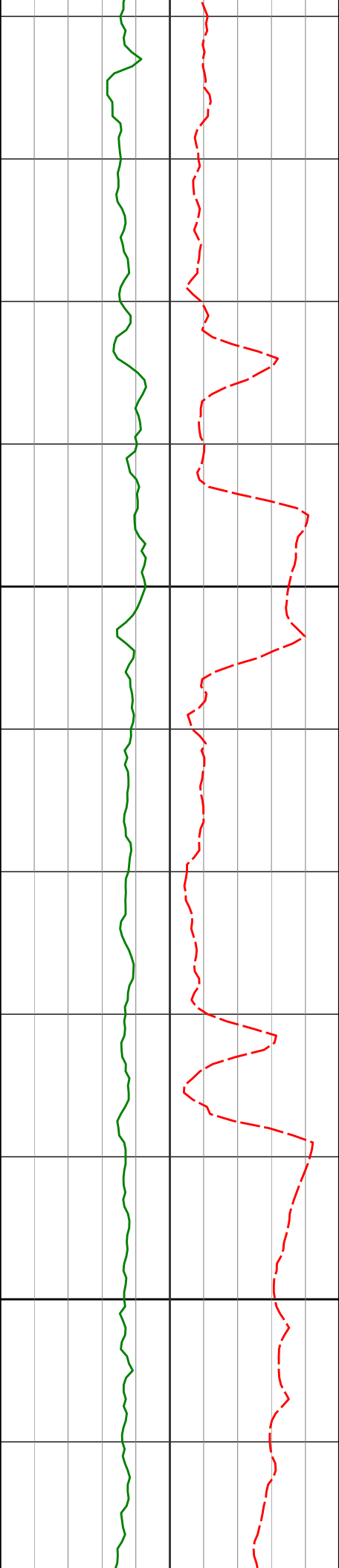
148.90°F

149.14°F

149.14°F

5600

150.12°F



5700

5800

5703'

5798'

8.72°

10.80°

21.80°

13.81°

5685.67'

5779.30'

-83.58'

-87.65'

151.47°F

151.47°F

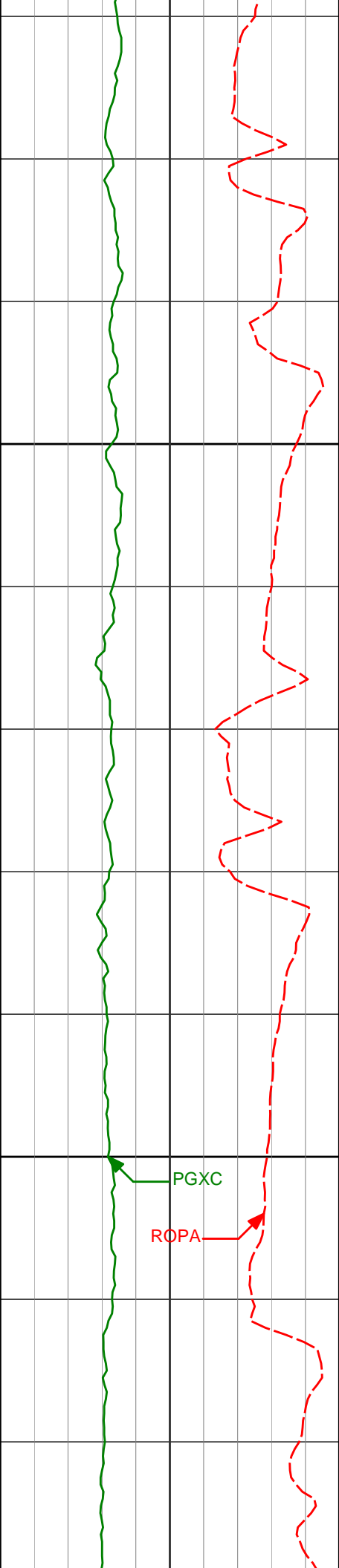
151.72°F

153.67°F

153.79°F

153.79°F

153.79°F



5900

6000

5892'

5987'

15.85°

20.17°

352.75° 5870.79'

348.54° 5961.12'

-87.14'

-80.90'

153.98°F

155.89°F

156.13°F

156.13°F

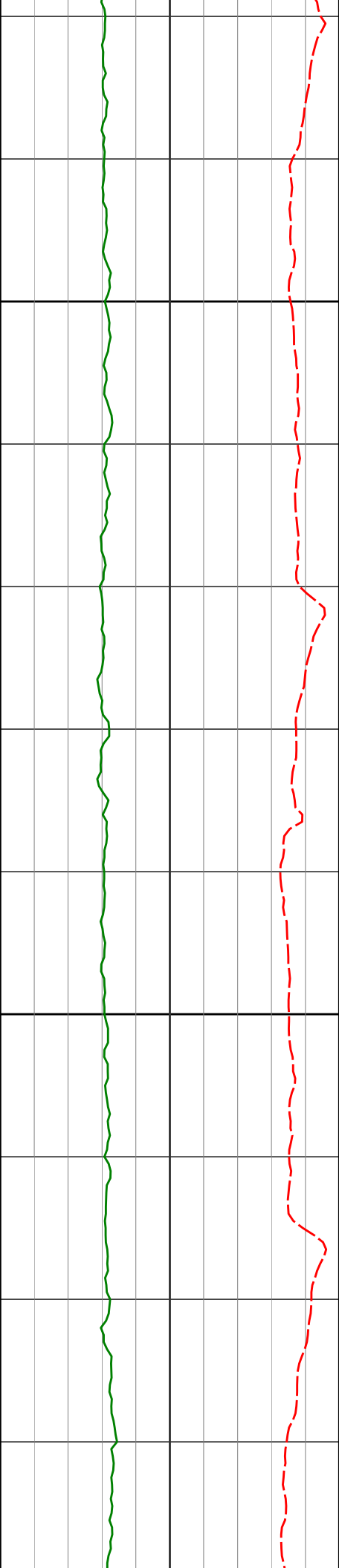
156.19°F

156.89°F

157.59°F

PGXC

ROPA



6100

6082'

25.30°

339.17°

6048.74'

-68.79'

159.02°F

160.83°F

160.83°F

6177'

31.24°

326.15°

6132.45'

-45.99'

160.83°F

6200

160.83°F

160.83°F

6272'

36.38°

311.84°

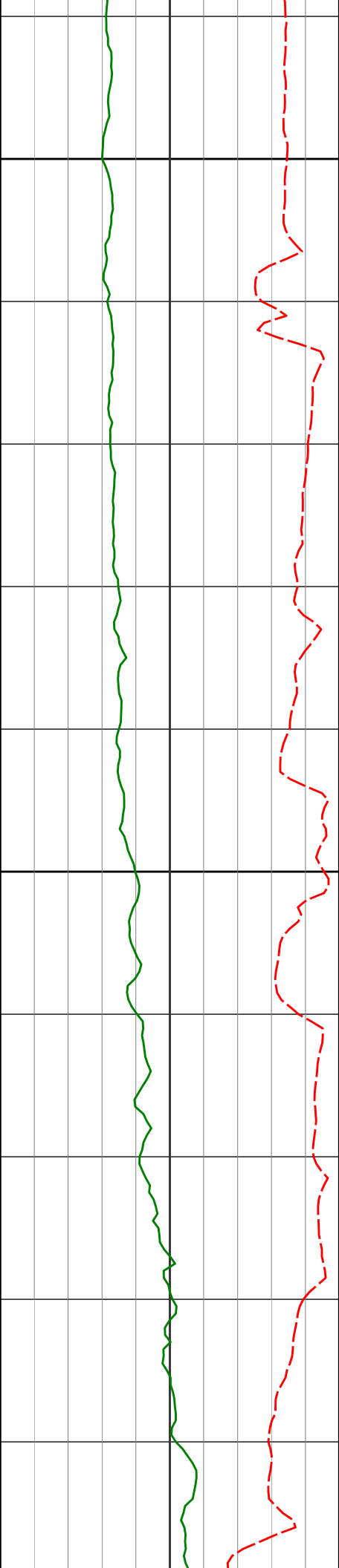
6211.48'

-9.39'

160.83°F

158.47°F





6300

160.88°F

161.35°F

160.83°F

6366'

39.68°

299.72°

6285.62'

39.03'

160.02°F

6400

160.50°F

161.35°F

6461'

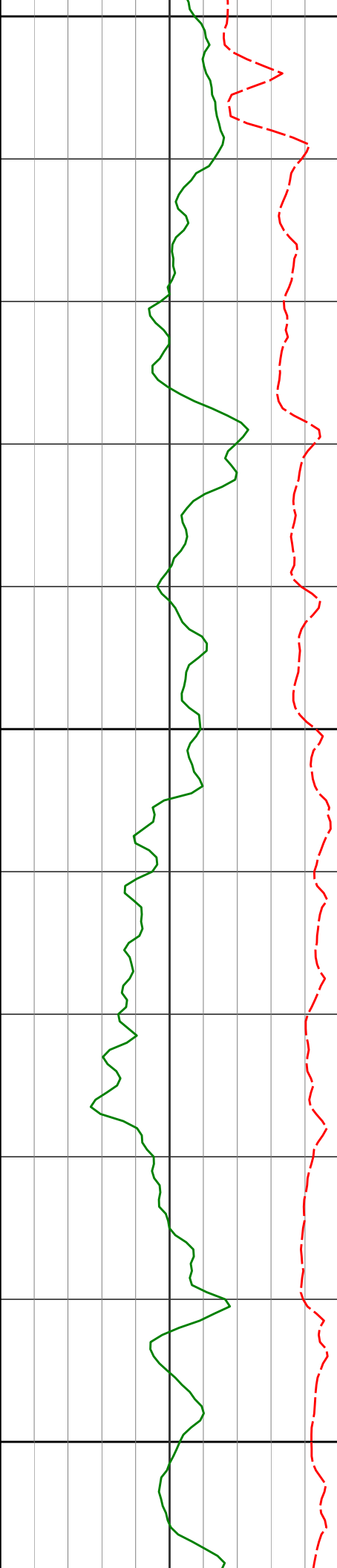
43.38°

289.10°

6356.81'

97.43'

163.06°F



6500

6600

6700

6556'

6651'

48.41°

57.59°

280.56°

275.34°

6422.97'

6480.11'

164.03'

239.47'

163.20°F

164.59°F

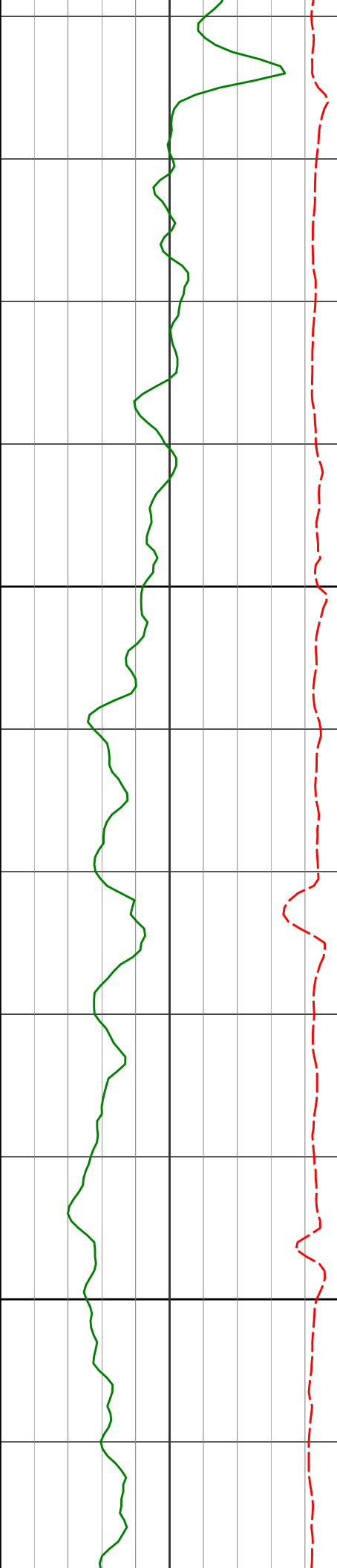
165.55°F

166.54°F

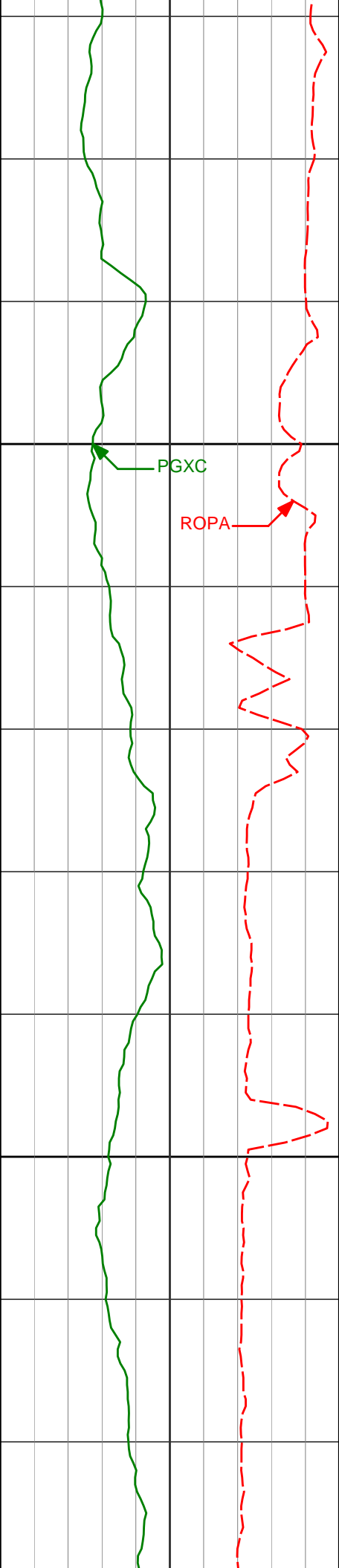
167.97°F

167.97°F

168.43°F



						170.31°F
	6745'	67.06°	274.02°	6523.72'	322.57'	170.37°F
						170.37°F
6800	6793'	71.57°	272.44°	6540.67'	367.46'	170.65°F
	6840'	75.65°	271.76°	6553.93'	412.54'	172.63°F
						172.78°F
	6888'	79.31°	271.69°	6564.34'	459.38'	
6900						173.08°F
	6930'	83.33°	270.79°	6570.67'	500.88'	177.93°F



200

7000

7100

7029'

89.60°

269.42° 6576.77'

599.54'

7123'

90.31°

269.12° 6576.85'

693.37'

180.09°F

180.09°F

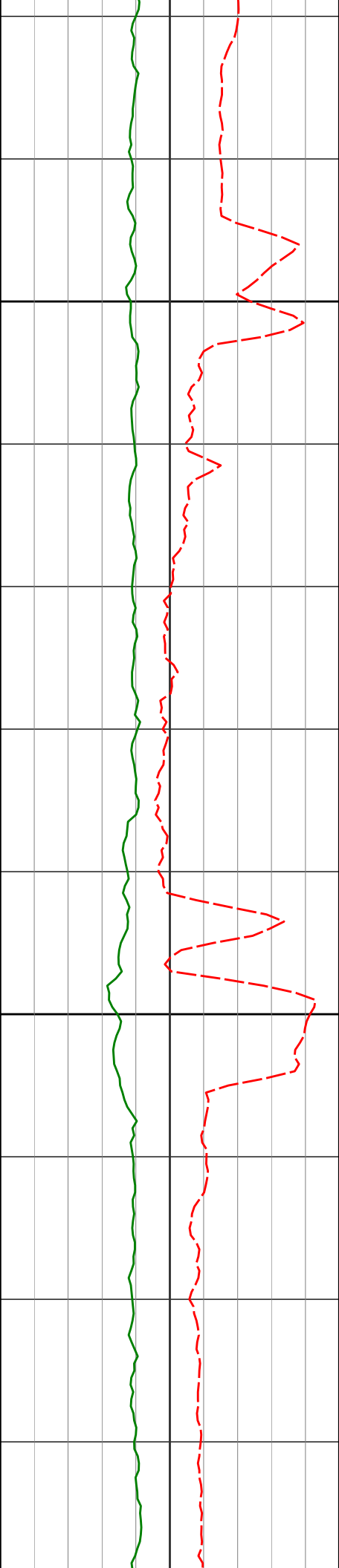
179.07°F

177.64°F

177.64°F

178.77°F

180.09°F



7200

7300

7218'

91.29°

269.69°

6575.52'

788.20'

7313'

90.43°

271.14°

6574.10'

883.12'

180.09°F

180.09°F

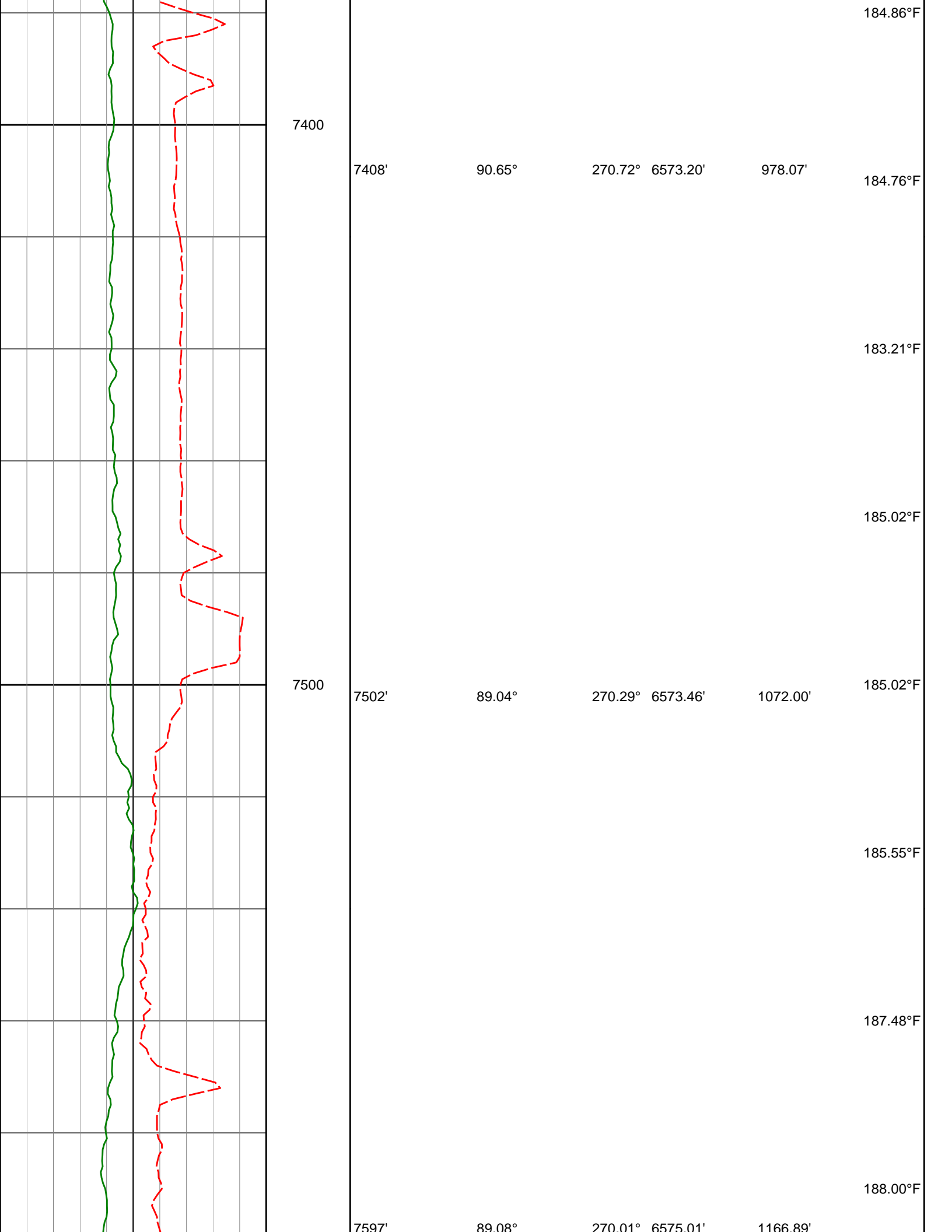
180.09°F

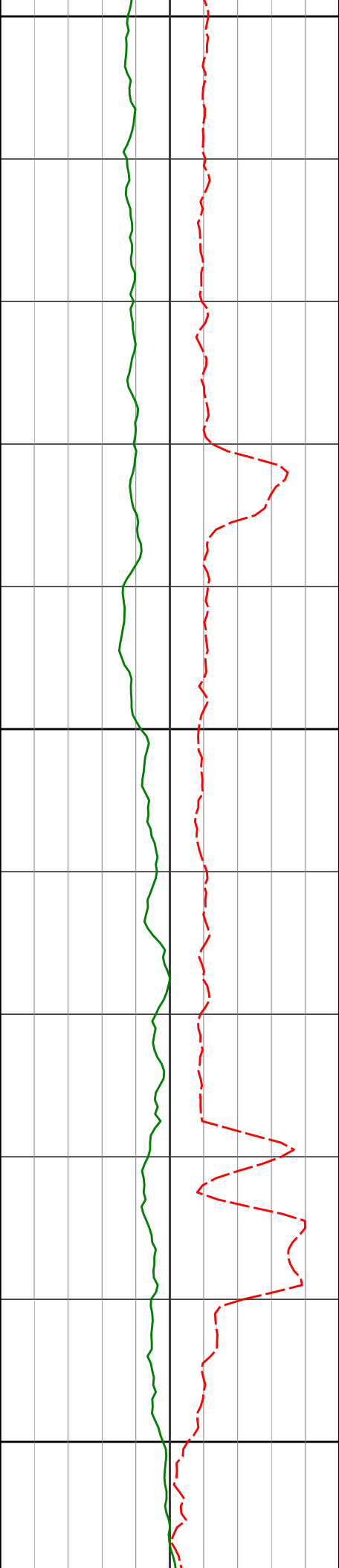
180.09°F

182.25°F

182.55°F

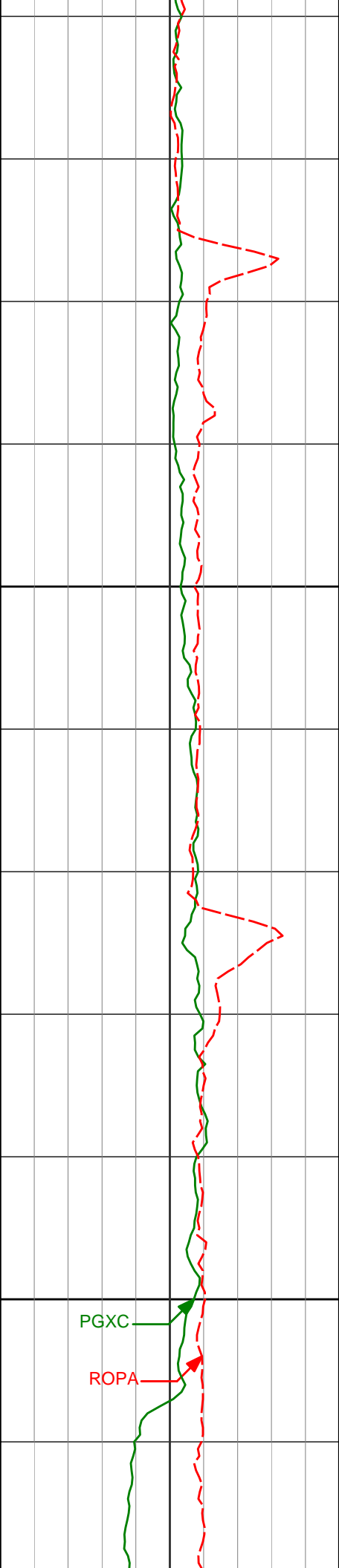
182.73°F





7600

7691'	88.80°	269.09°	6576.75'	1260.73'	189.99°F
					189.99°F
					189.99°F
					189.99°F
7700					189.99°F
					189.99°F
					189.99°F
					189.99°F
					189.99°F
7786'	89.91°	269.69°	6577.82'	1355.57'	189.99°F
					189.99°F
7800					189.99°F



7881'

89.97°

268.93°

6577.92'

1450.40'

7900

7976'

89.45°

268.02°

6578.40'

1545.15'

8000

PGXC

ROPA

192.20°F

192.49°F

194.42°F

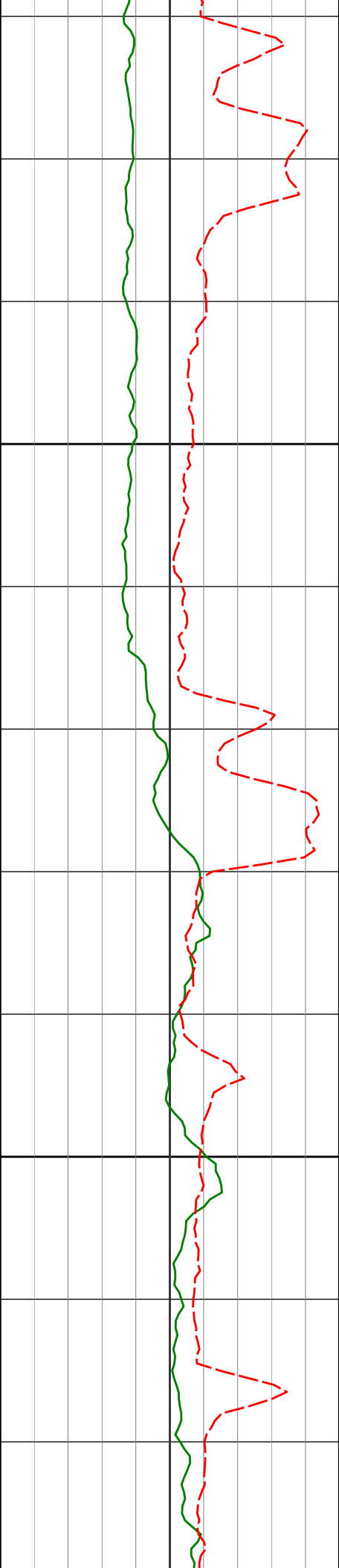
194.99°F

194.99°F

196.58°F

195.39°F





8100

8200

8070'

8165'

89.48°

90.55°

269.27°

269.02°

6579.28'

6579.26'

1638.91'

1733.72'

194.99°F

194.99°F

194.99°F

194.99°F

194.99°F

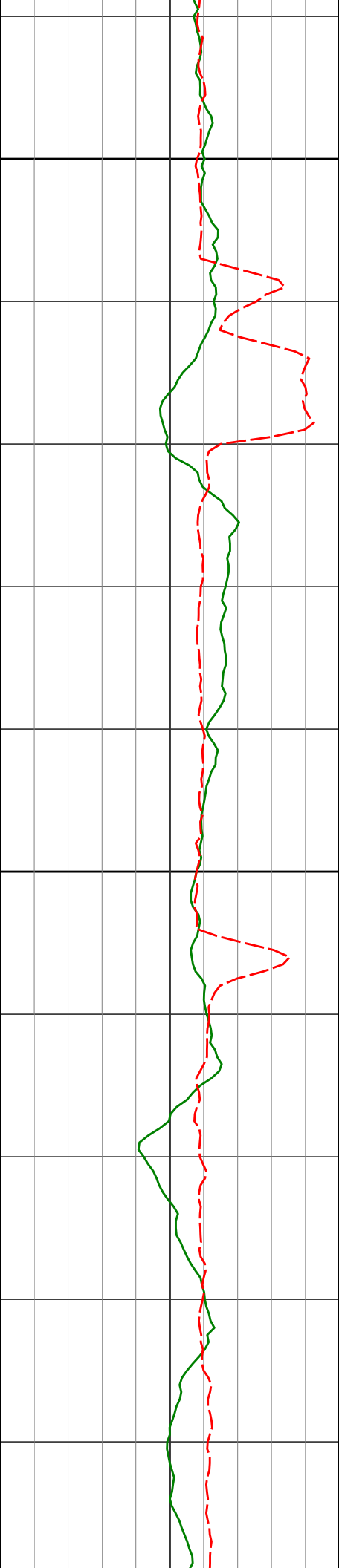
194.99°F

194.99°F

194.99°F



Distance (ft)	Temperature (°C)	Temperature (°F)	Salinity (ppt)	Depth (ft)
8259'	89.91°	194.99°F	268.62°	6578.88'
				1827.51'
				194.99°F
				197.51°F
8354'	90.25°	197.51°F	269.87°	6578.75'
				1922.34'
				197.51°F
				197.51°F
				199.60°F
8449'	89.91°	197.67°F	269.42°	6578.61'
				2017.20'



8500

8543'

90.52°

270.19°

6578.26'

2111.08'

8600

8638'

90.31°

269.66°

6577.57'

2205.97'

197.51°F

198.91°F

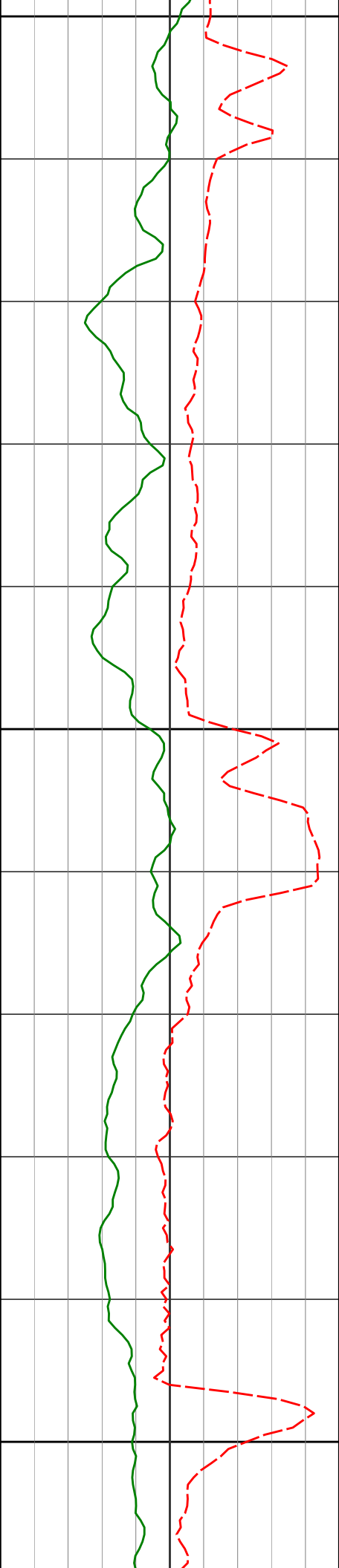
200.05°F

200.05°F

200.90°F

202.60°F

202.60°F



8700

8732'

89.69°

268.98° 6577.57'

2299.81'

204.38°F

204.45°F

203.29°F

202.60°F

8800

8827'

90.80°

268.70° 6577.17'

2394.59'

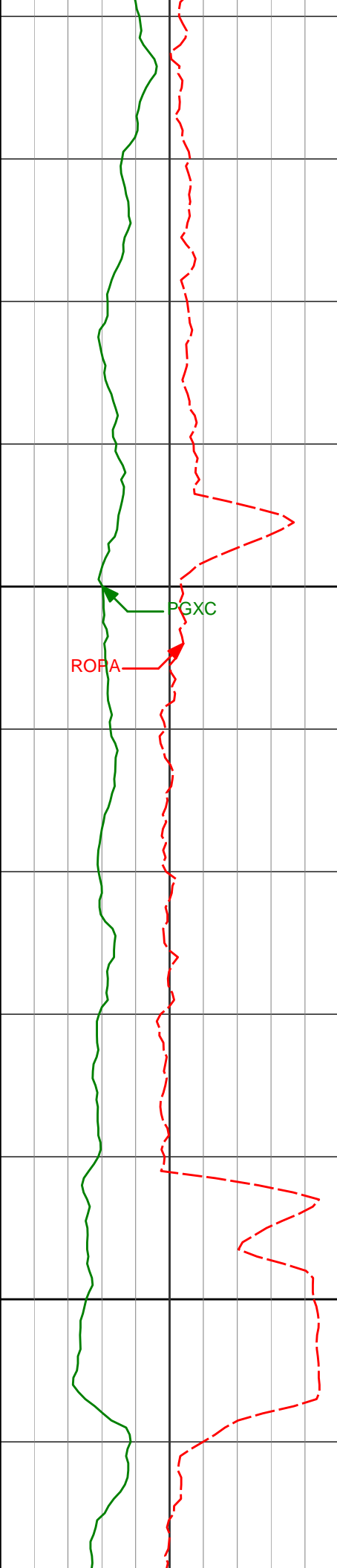
202.88°F

205.16°F

205.16°F

8900

207.73°F



8922'

91.23°

268.39°

6575.48'

2489.33'

207.73°F

207.73°F

9000

207.73°F

9017'

91.48°

268.25°

6573.24'

2584.03'

207.01°F

205.37°F

9100

207.73°F

9111'

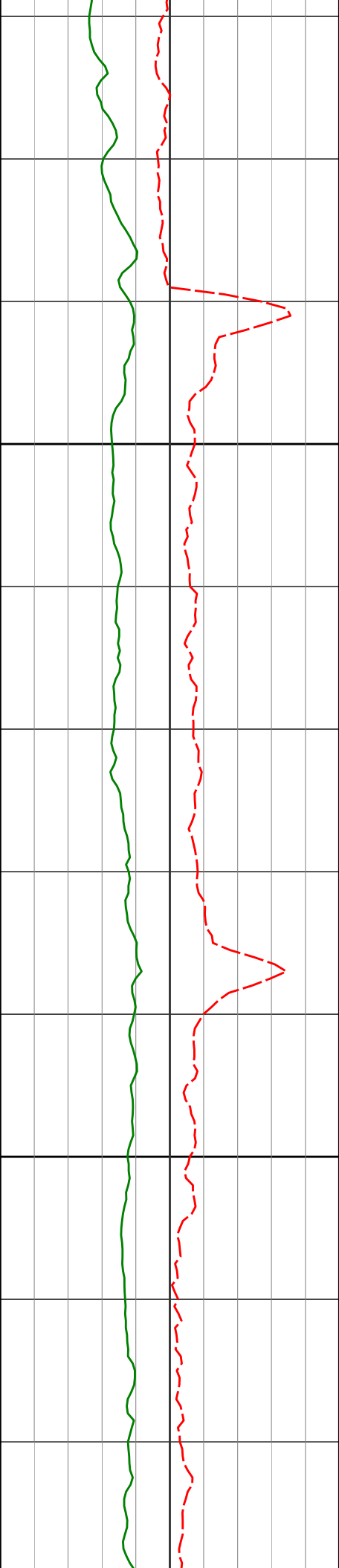
89.57°

269.06°

6572.38'

2677.79'

207.73°F



9200

9206'

89.91°

268.52°

6572.81'

2772.57'

207.73°F

209.76°F

210.31°F

210.31°F

210.31°F

9300

9300'

91.45°

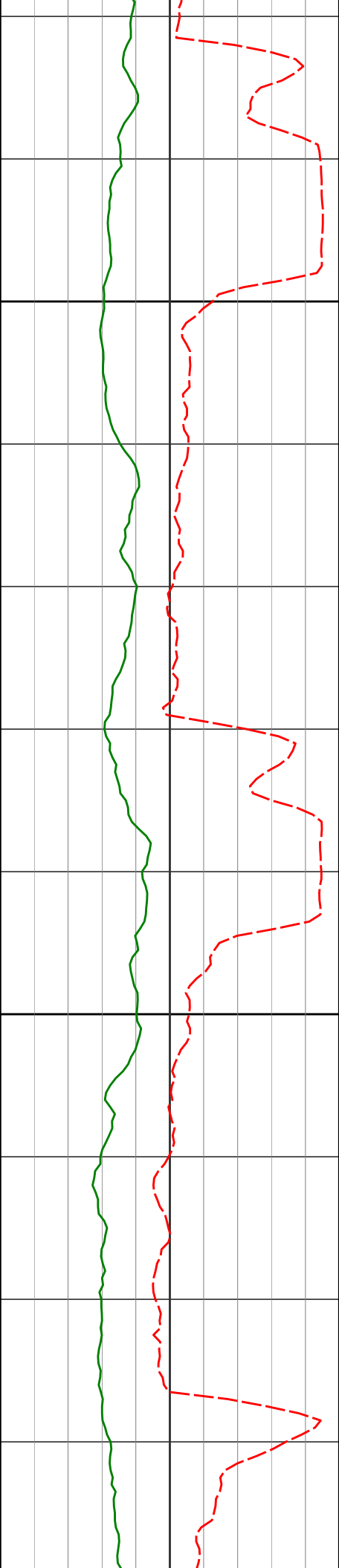
268.81°

6571.69'

2866.33'

209.78°F

208.28°F



9400

9500

9395'

89.51°

268.65° 6570.90'

2961.09'

9490'

88.77°

270.30° 6572.32'

3055.93'

207.73°F

209.24°F

208.01°F

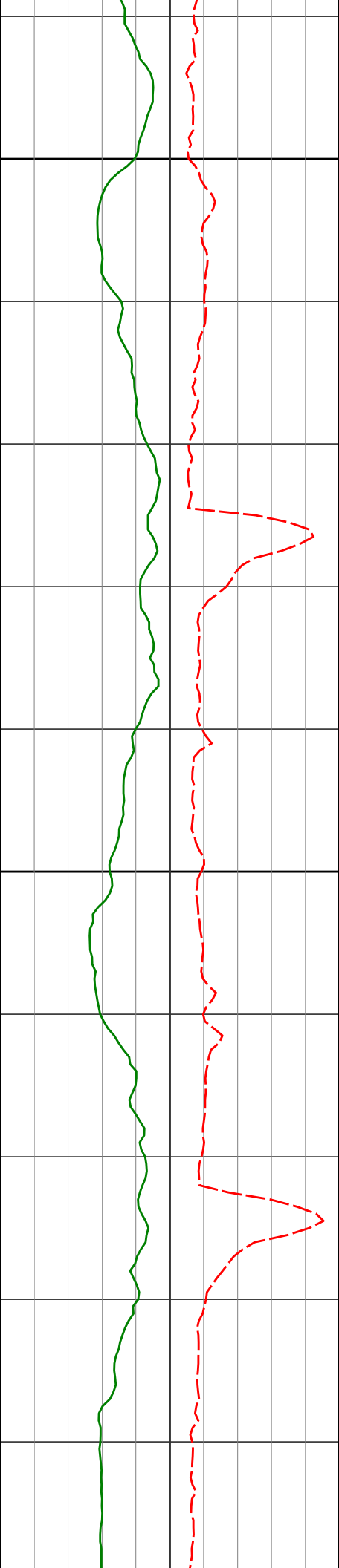
207.73°F

209.12°F

210.31°F

210.31°F

210.52°F



9584'

89.01°

270.08° 6574.14'

3149.82'

9600

212.92°F

212.92°F

212.92°F

9679'

89.41°

269.41° 6575.45'

3244.69'

9700

212.92°F

214.77°F

215.51°F

9774'

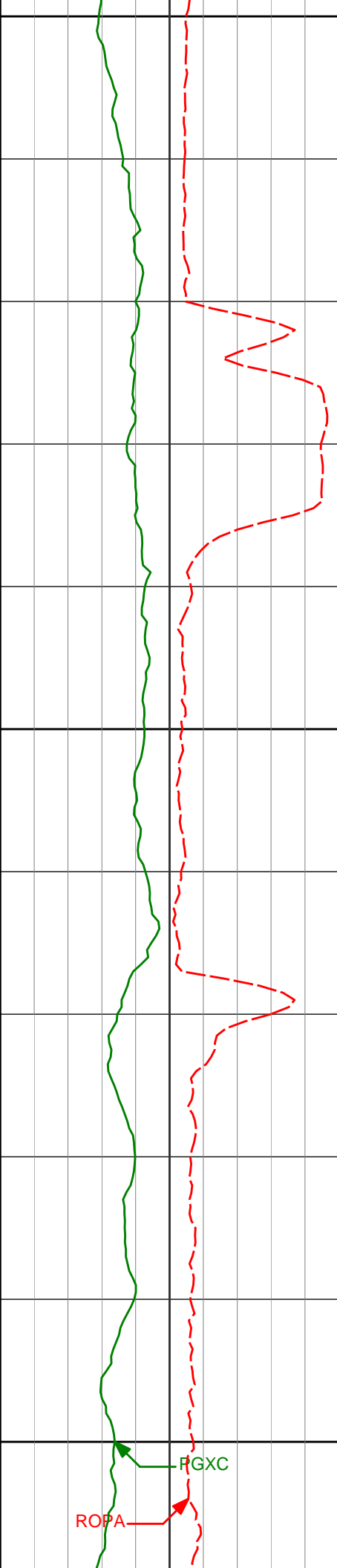
90.00°

268.66° 6575.94'

3339.49'

213.46°F





9800

211.54°F

212.92°F

9868'

90.37°

269.84°

6575.64'

3433.32'

215.51°F

9900

215.51°F

215.51°F

9963'

90.96°

269.88°

6574.53'

3528.20'

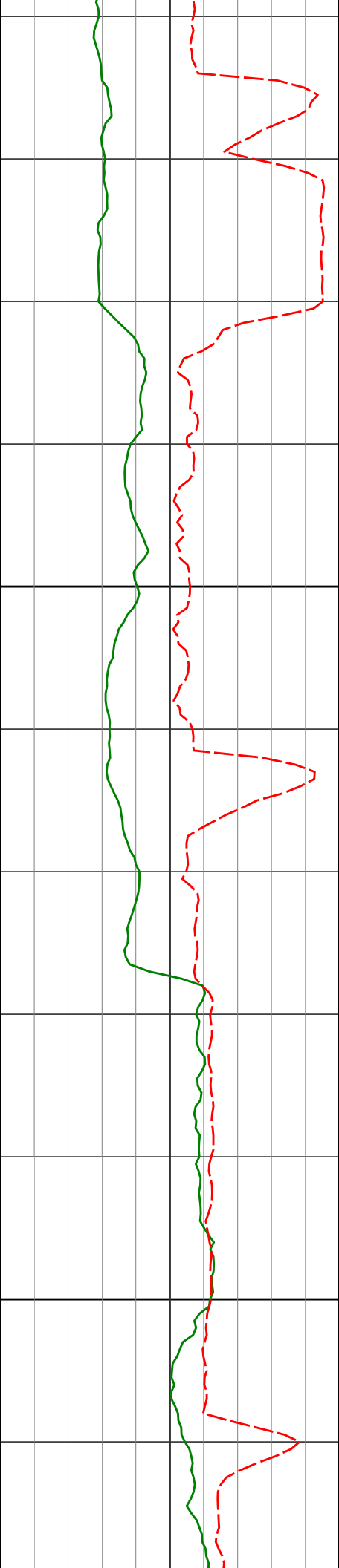
215.19°F

213.78°F

10000

FGXC

ROPA



10100

10200

10058'

10150'

89.60°

89.91°

271.02° 6574.07'

270.17° 6574.46'

3623.12'

3715.06'

212.92°F

213.19°F

215.84°F

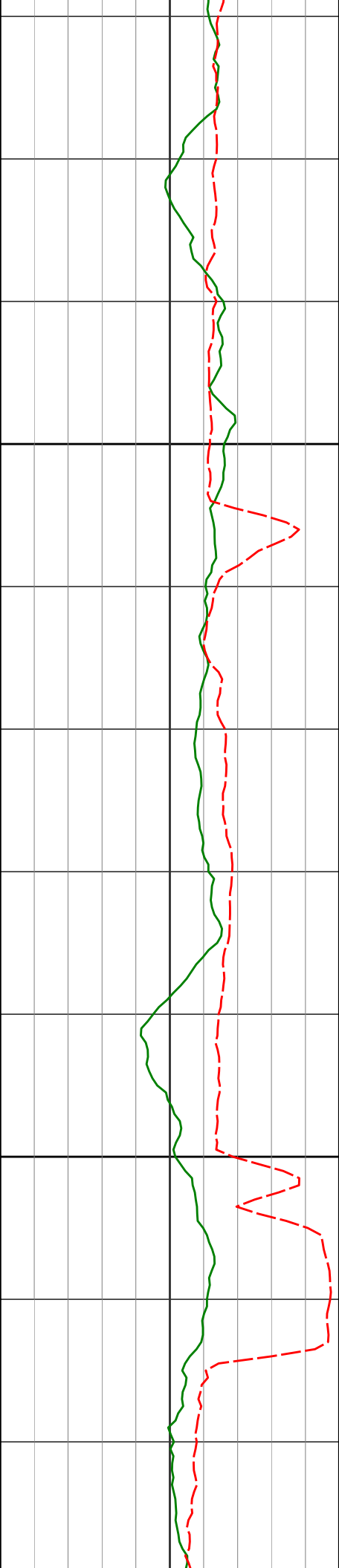
218.14°F

218.14°F

218.14°F

218.14°F

218.47°F



10243'

89.63°

269.41° 6574.84'

3807.94'

10300

10334'

89.54°

268.58° 6575.50'

3898.75'

10400

10426'

89.94°

269.95° 6575.91'

3990.58'

220.77°F

220.77°F

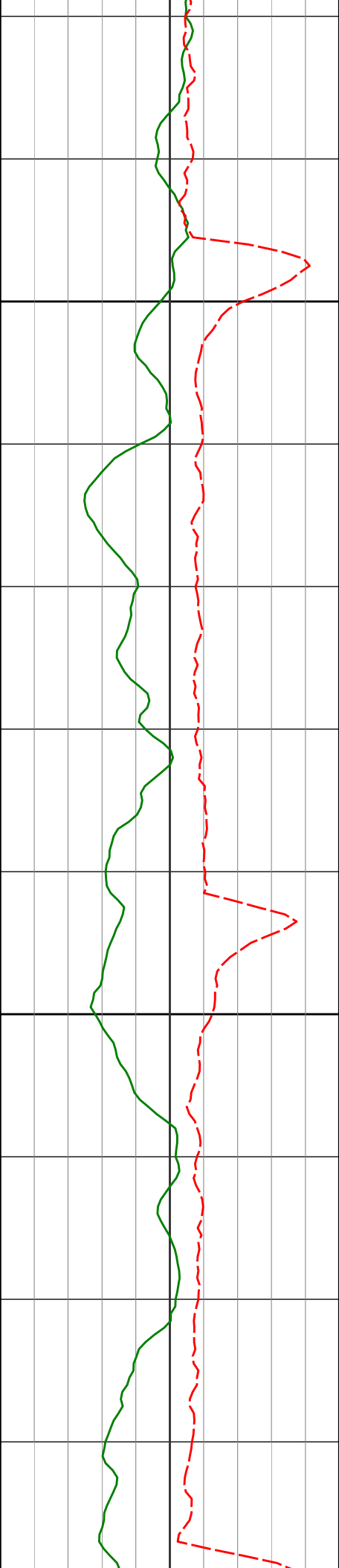
219.66°F

217.47°F

216.44°F

218.14°F

218.29°F



10500

10600

10517'

10610'

89.63°

89.41°

269.15° 6576.26'

268.52° 6577.03'

4081.45'

4174.23'

220.77°F

220.77°F

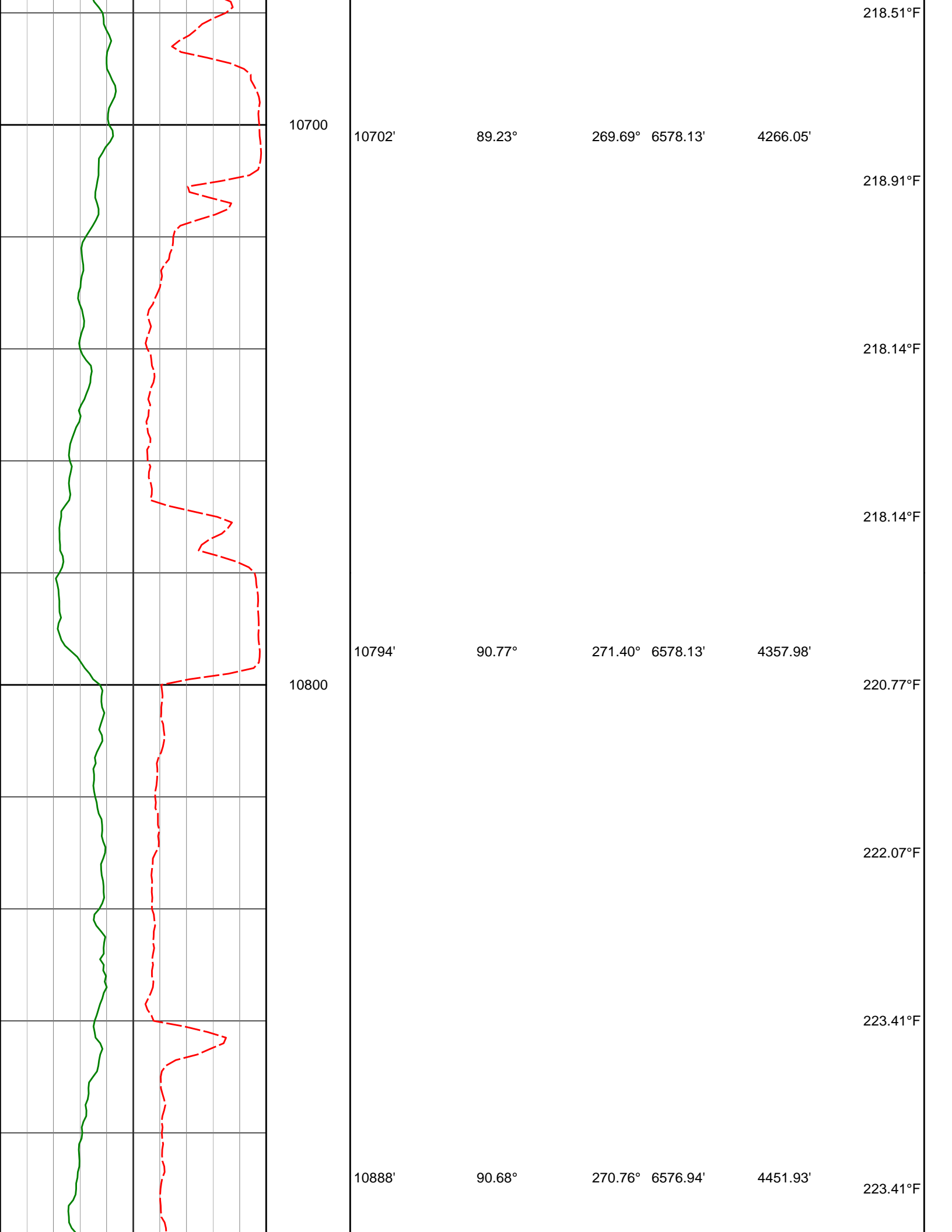
220.77°F

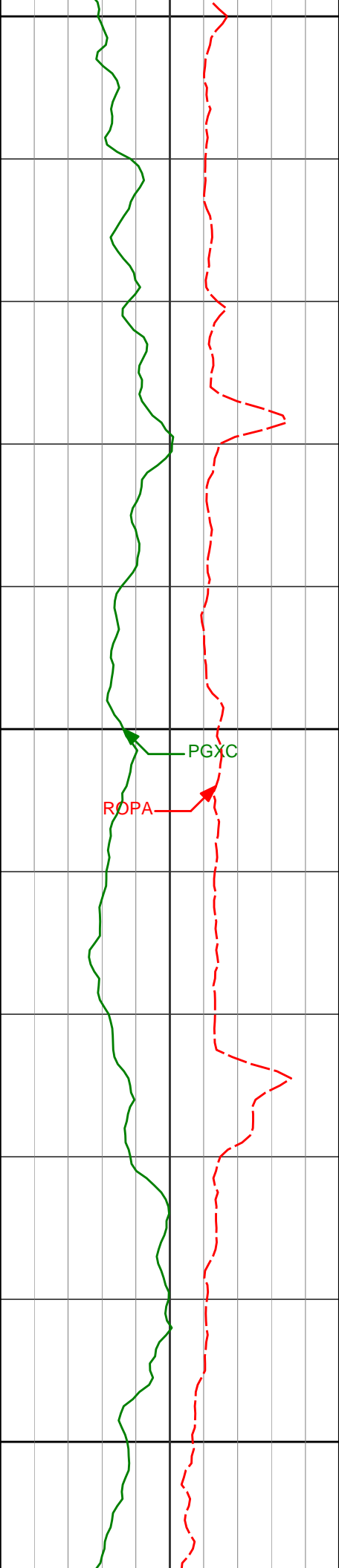
220.77°F

223.08°F

220.11°F

218.36°F





10900

224.32°F

226.08°F

10980'

90.49°

270.31° 6576.00'

4543.86'

226.08°F

11000

226.08°F

226.70°F

11072'

90.80°

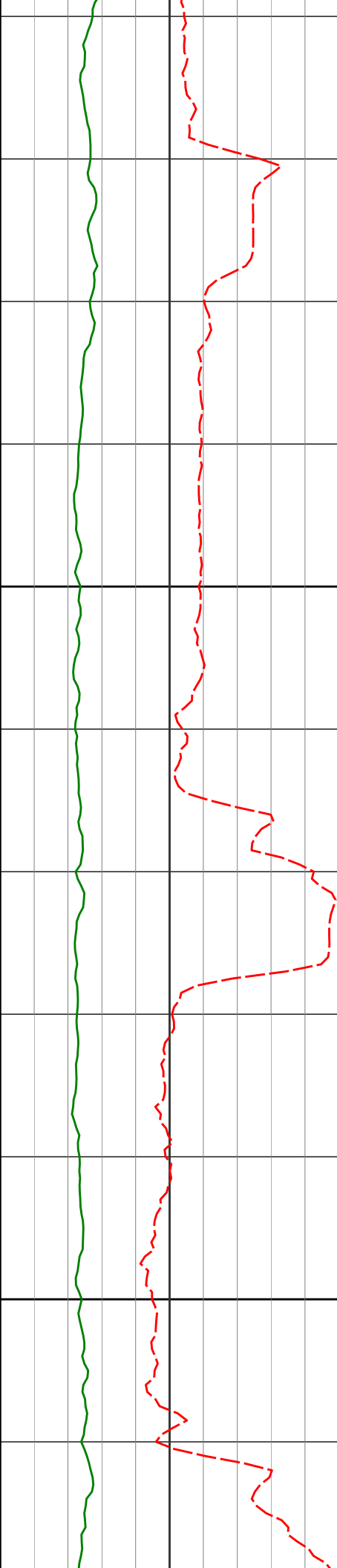
270.16° 6574.96'

4635.77'

228.74°F

11100

228.74°F



11200

11300

11162'

90.77°

269.79°

6573.73'

4725.66'

11254'

90.22°

270.70°

6572.93'

4817.58'

228.74°F

227.65°F

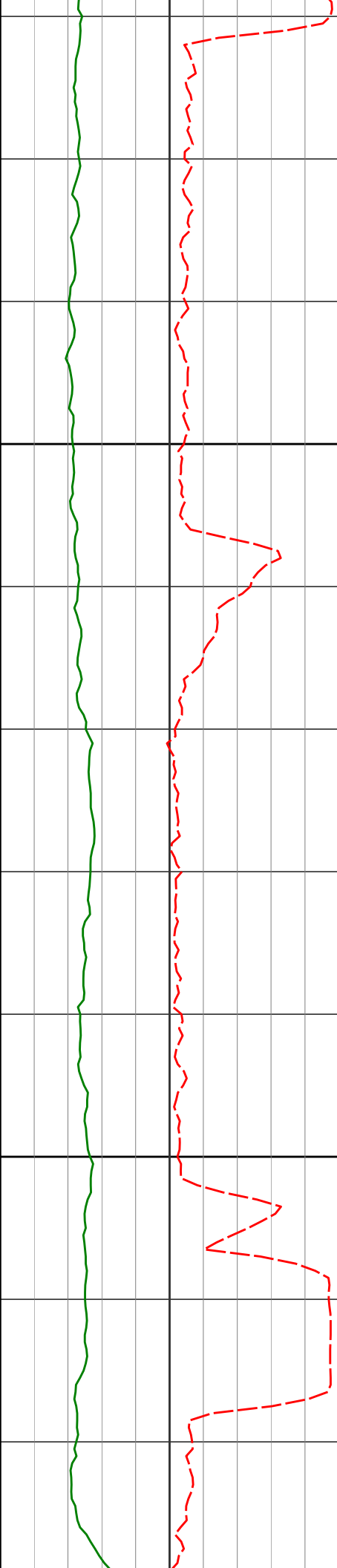
225.63°F

226.08°F

224.71°F

224.31°F

226.08°F



11346'

89.75°

270.59° 6572.96'

4909.52'

11400

11439'

90.80°

270.84° 6572.51'

5002.46'

11500

11532'

88.92°

270.29° 6572.74'

5095.39'

226.08°F

226.34°F

228.74°F

226.54°F

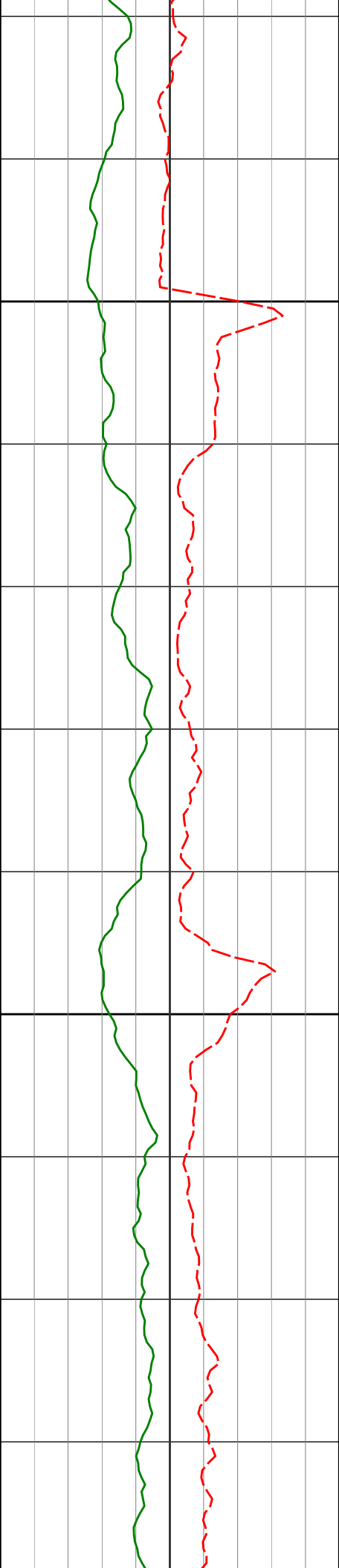
223.93°F

223.41°F

225.77°F

226.08°F





11600

11624'

89.26°

270.12°

6574.20'

5187.29'

11700

11715'

89.26°

269.85°

6575.38'

5278.19'

226.08°F

228.26°F

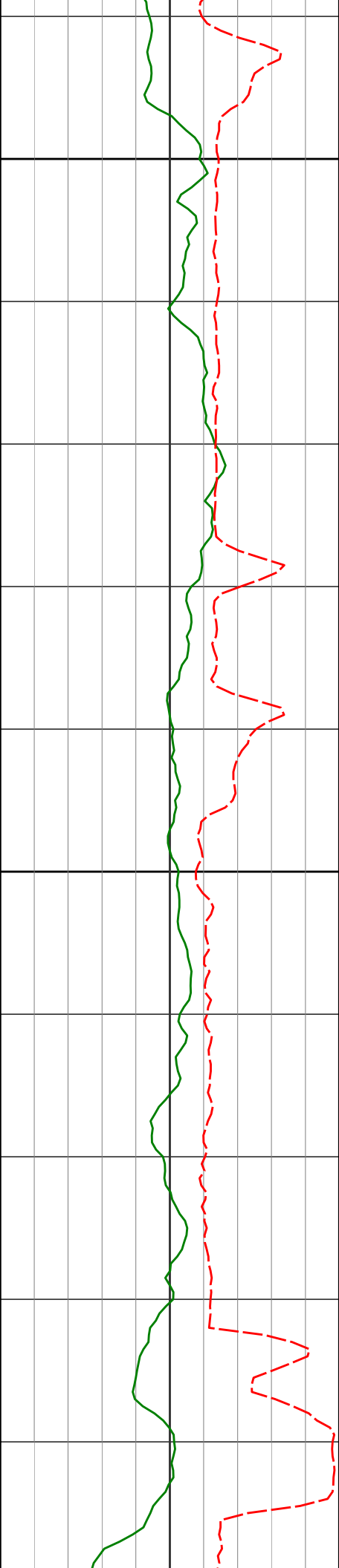
228.74°F

228.74°F

231.11°F

231.42°F

231.42°F



11800

11807'

89.66°

269.94° 6576.24'

5370.07'

231.42°F

228.74°F

228.74°F

230.39°F

11900

11899'

89.35°

269.44° 6577.04'

5461.94'

226.96°F

226.42°F

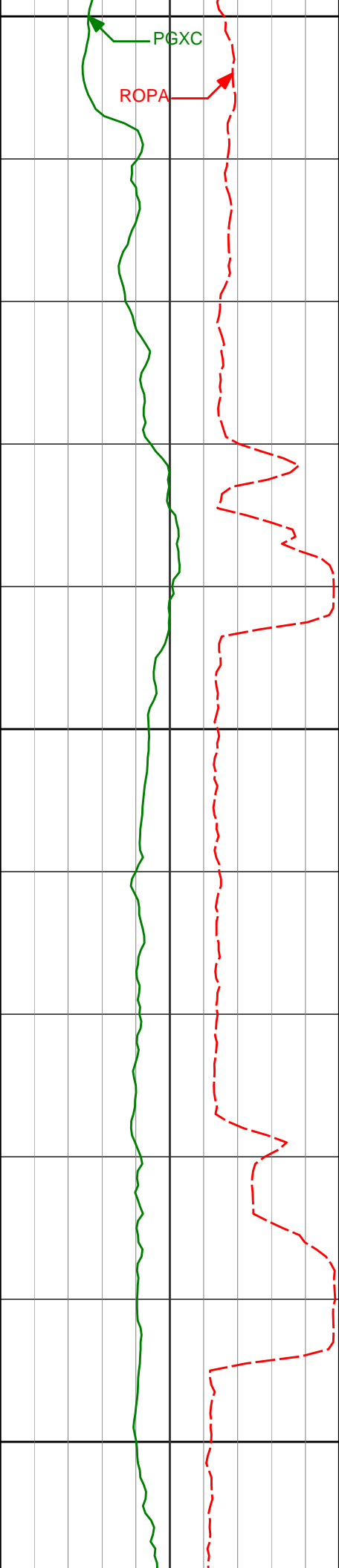
228.74°F

11994'

89.75°

267.80° 6577.78'

5556.70'



12000

228.08°F

226.72°F

228.58°F

12089'

91.20°

267.84° 6577.00'

5651.35'

228.06°F

12100

227.03°F

228.54°F

12184'

91.94°

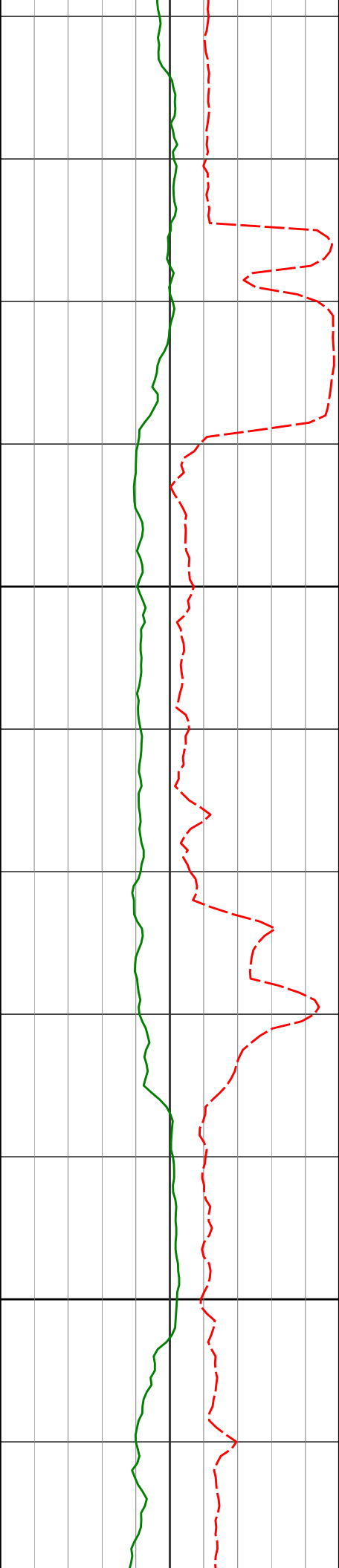
269.97° 6574.39'

5746.10'

227.98°F

12200

226.62°F



12300

12278'

90.40°

270.51° 6572.47'

5840.00'

12372'

92.00°

270.40° 6570.51'

5933.90'

12400

227.80°F

228.74°F

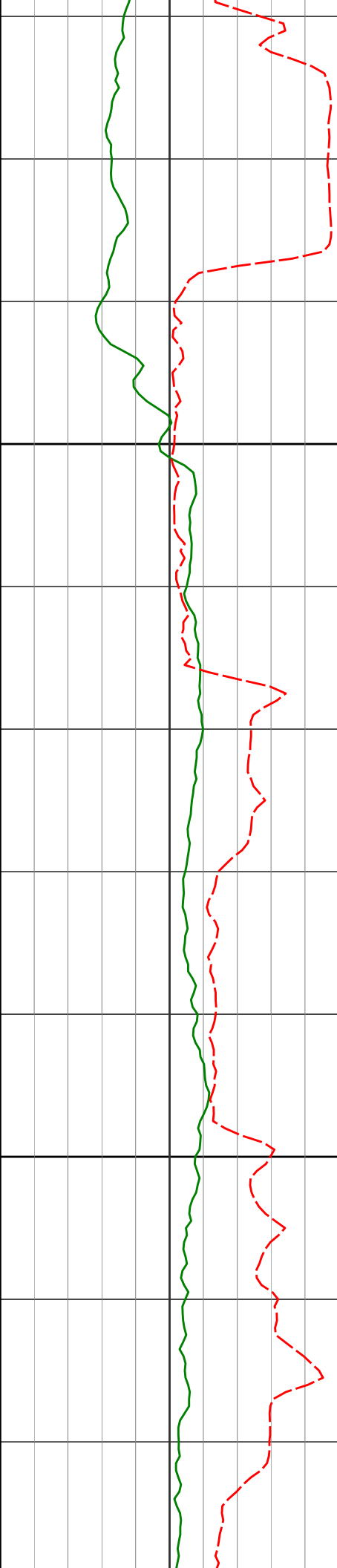
229.55°F

231.42°F

230.59°F

229.10°F

228.74°F



12467'

89.69°

271.07°

6569.10'

6028.83'

12500

12562'

89.75°

270.86°

6569.57'

6123.79'

12600

12656'

90.22°

270.46°

6569.59'

6217.73'

230.95°F

231.67°F

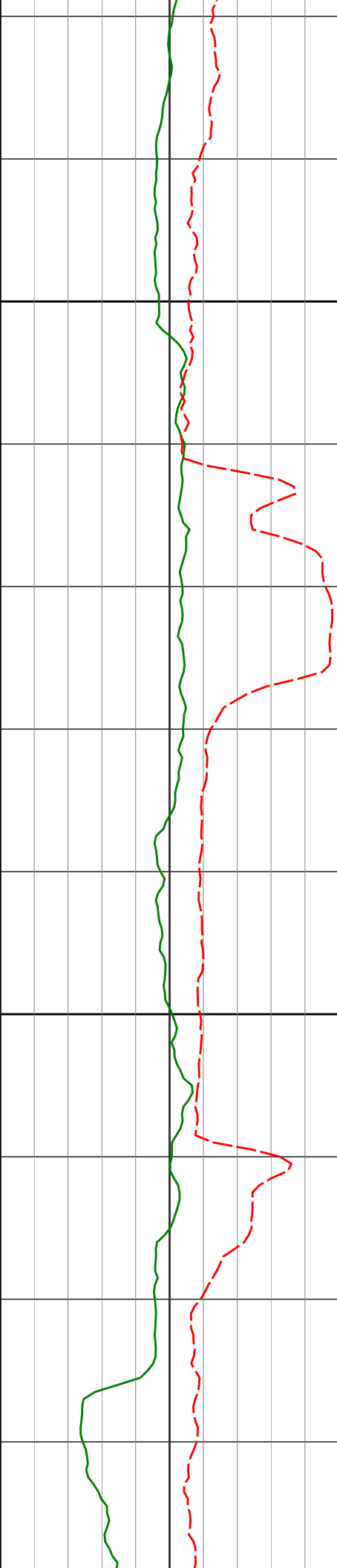
234.12°F

233.92°F

232.70°F

234.12°F

234.12°F



12700

12751'

12800

12845'

89.32°

268.48°

6569.98'

6312.57'

89.38°

267.82°

6571.04'

6406.27'

233.38°F

232.13°F

232.55°F

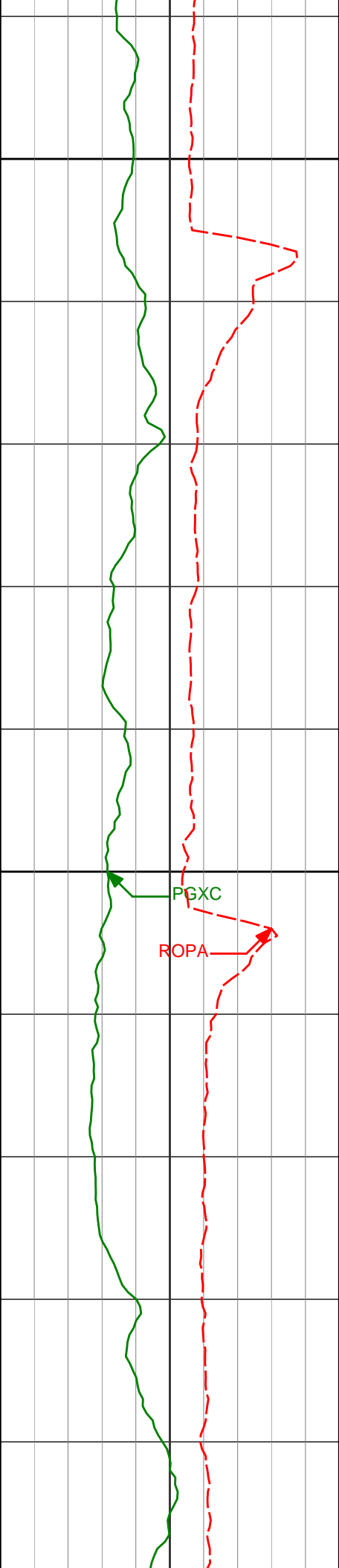
234.12°F

234.12°F

235.04°F

236.82°F

236.82°F



12900

236.82°F

236.82°F

12940'

89.66°

267.57°

6571.84'

6500.91'

235.17°F

235.57°F

13000

PGXC

ROPA

234.87°F

13035'

90.22°

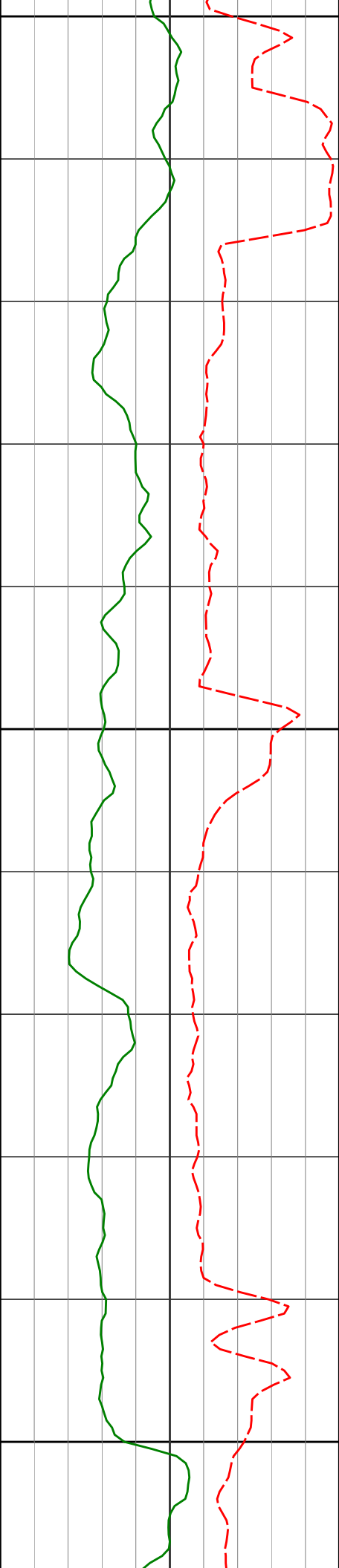
267.22°

6571.94'

6595.50'

233.23°F

231.58°F



13100

13129'

89.69°

268.11° 6572.01'

6689.14'

13200

13224'

89.81°

268.12° 6572.43'

6783.84'

13300

234.12°F

234.12°F

234.12°F

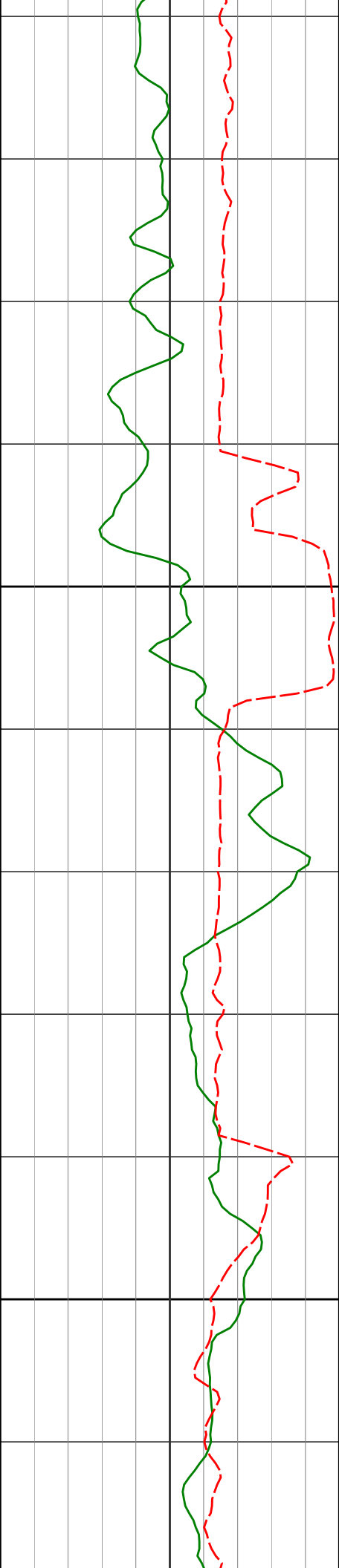
234.12°F

234.12°F

236.61°F

236.82°F

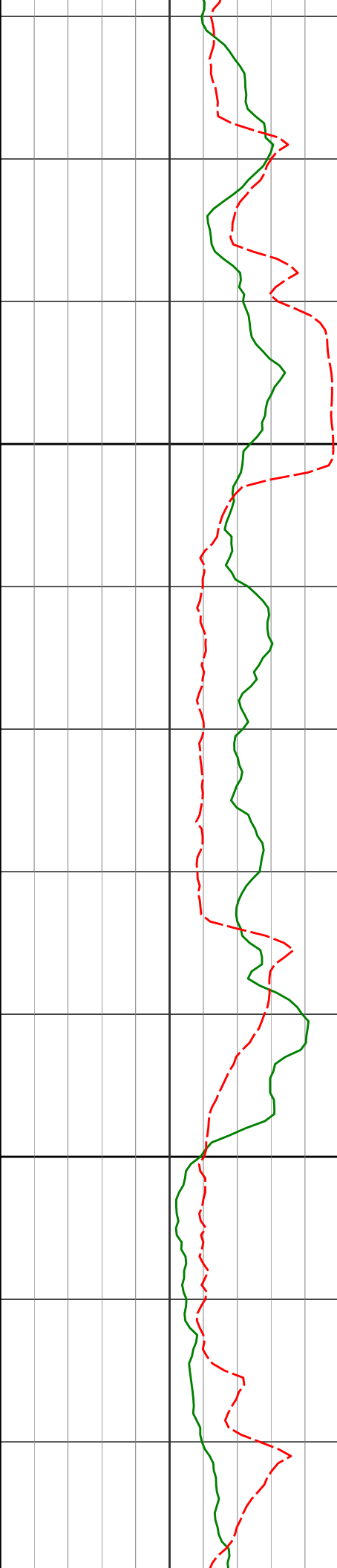




13400

13500

13319'	90.31°	267.87°	6572.33'	6878.52'	235.42°F
					234.34°F
					234.12°F
					236.28°F
13413'	88.64°	269.11°	6573.19'	6972.26'	236.82°F
					236.82°F
					236.15°F
13508'	87.97°	269.27°	6576.00'	7067.04'	234.60°F



13600

13700

13603'

13697'

89.72°

90.12°

268.90°

268.52°

6577.91'

6578.04'

7161.83'

7255.61'

234.12°F

236.51°F

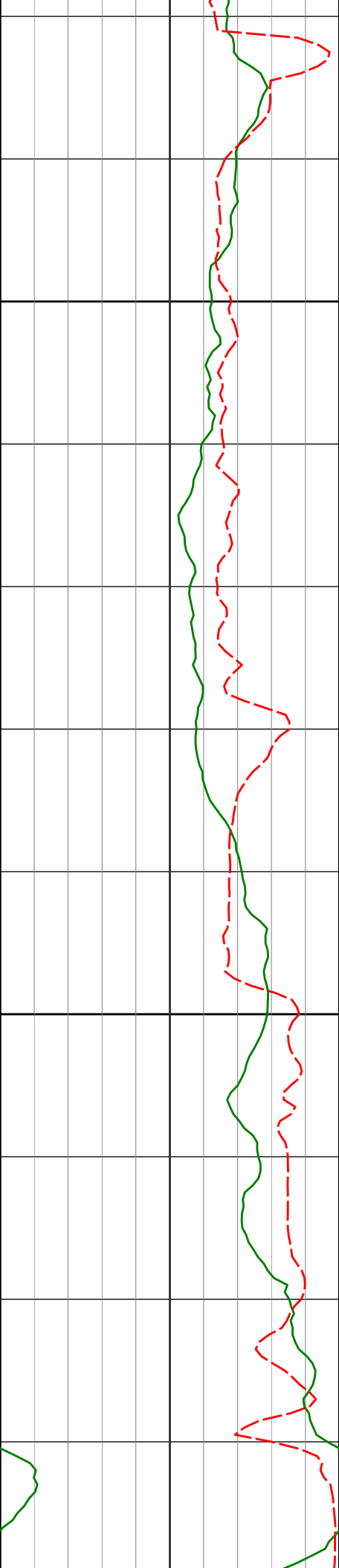
236.82°F

237.73°F

239.38°F

237.80°F

239.54°F



13800

13900

13792'

13886'

90.00°

89.75°

268.48°

267.98°

6577.94'

6578.15'

7350.36'

7444.07'

239.54°F

239.54°F

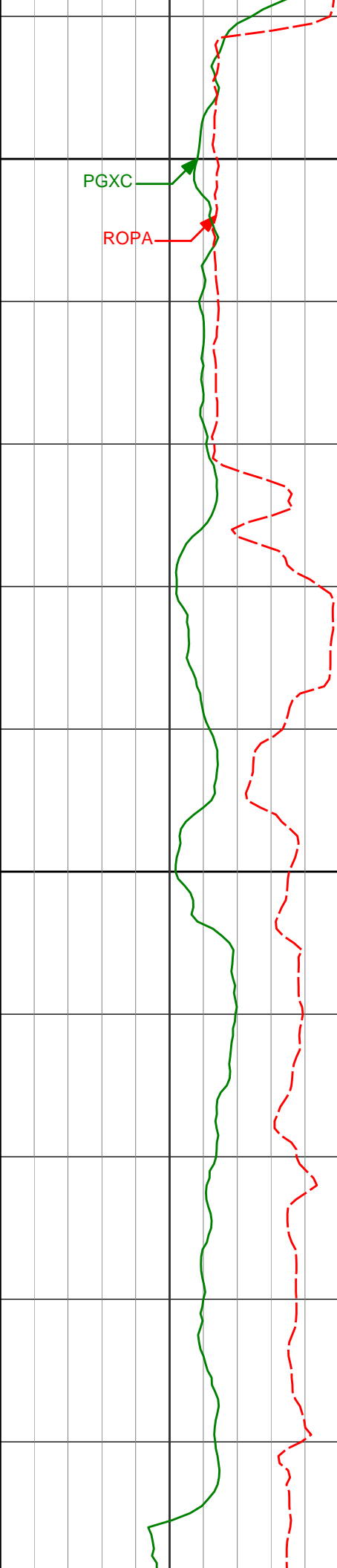
240.12°F

241.32°F

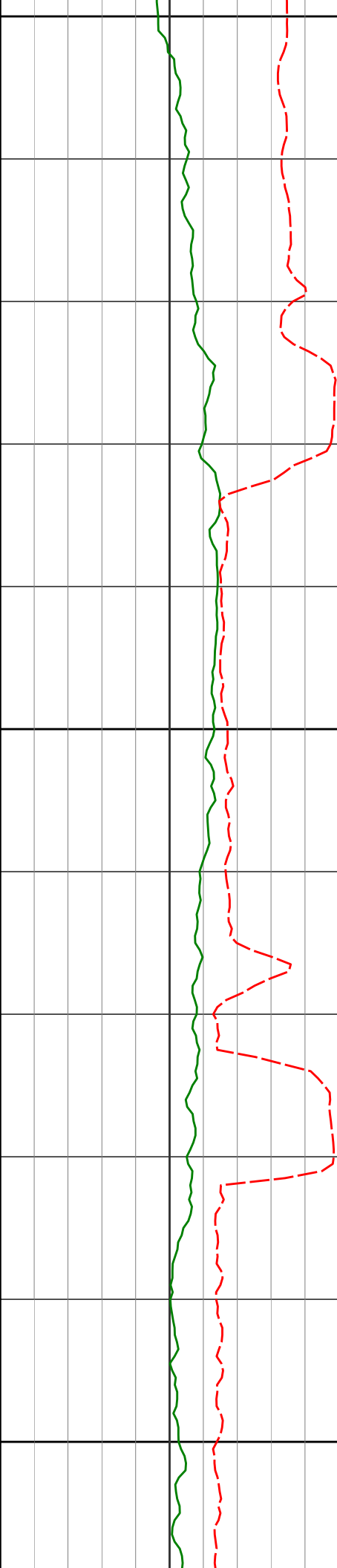
239.06°F

238.17°F

239.54°F



13981'	90.22°	269.34°	6578.17'	7538.84'	238.89°F
14000					238.47°F
					239.79°F
					242.11°F
14075'	90.65°	270.91°	6577.46'	7632.74'	
14100					242.28°F
					242.28°F
					241.10°F
14170'	91.14°	270.32°	6575.98'	7727.66'	
					239.18°F



14200

239.54°F

239.54°F

14264'

90.99°

271.28° 6574.23'

7821.59'

239.28°F

14300

239.33°F

239.54°F

14359'

89.88°

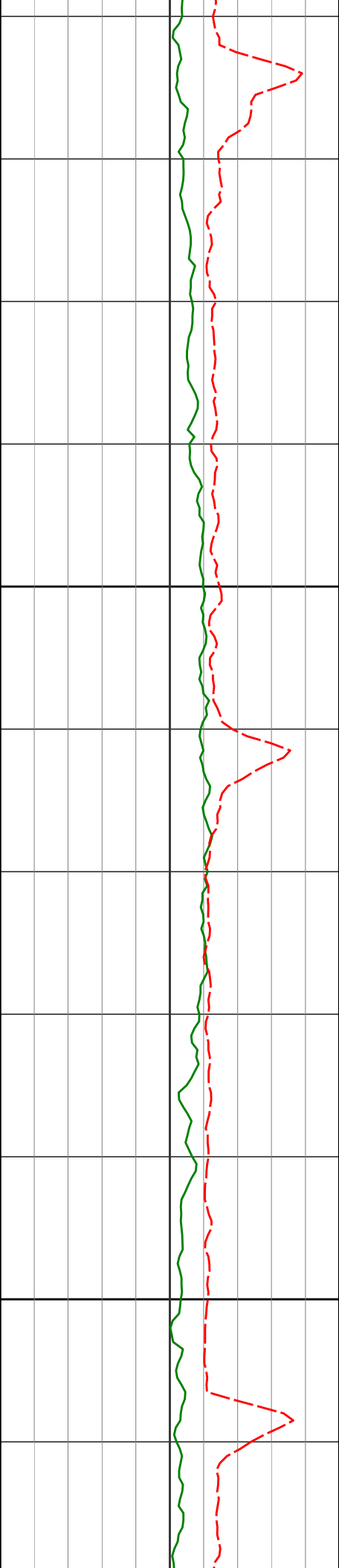
271.33° 6573.51'

7916.56'

239.54°F

14400

241.88°F



14500

14600

14453'

90.00°

271.17°

6573.61'

8010.53'

14548'

90.25°

270.51°

6573.40'

8105.48'

242.28°F

242.28°F

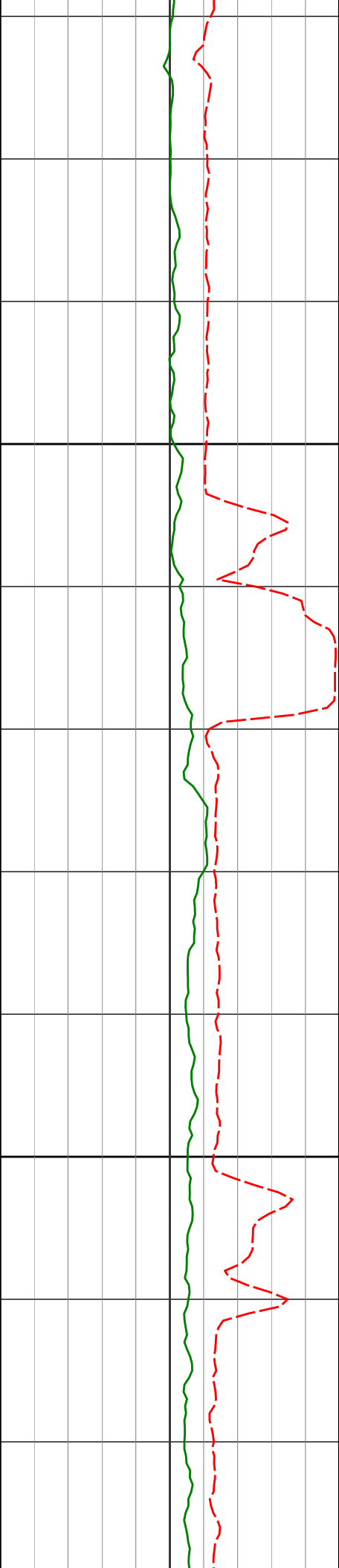
242.28°F

244.20°F

243.51°F

243.37°F

245.03°F



14700

14800

14642'

14737'

14832'

91.05°

89.45°

90.09°

270.21°

270.37°

270.16°

6572.33'

6571.92'

6572.30'

8199.40'

8294.31'

8389.23'

242.86°F

241.53°F

242.28°F

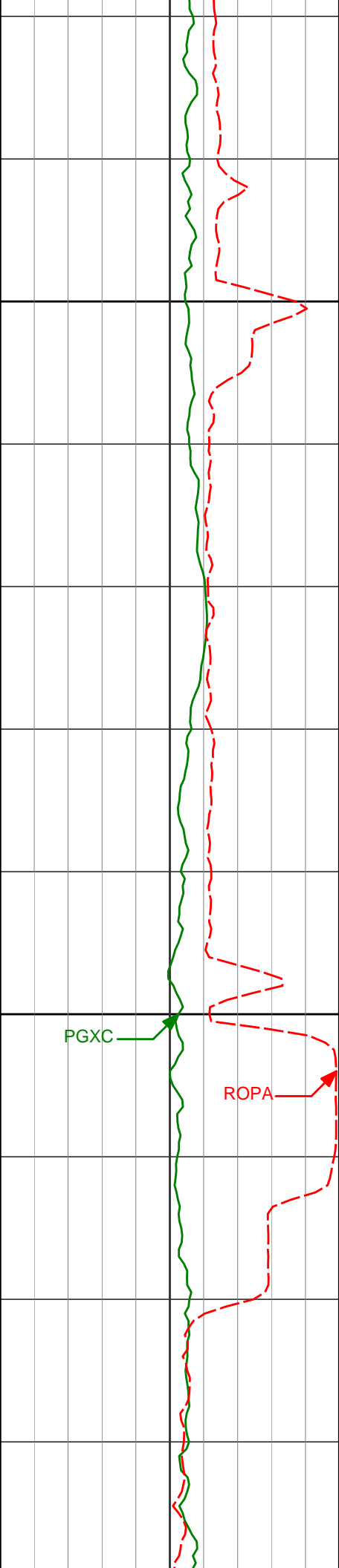
242.28°F

242.28°F

242.28°F

244.32°F

242.63°F



14900

15000

14926'

15021'

90.83°

89.20°

270.20°

270.71°

6571.54'

6571.52'

8483.13'

8578.06'

245.03°F

243.29°F

240.37°F

239.54°F

242.28°F

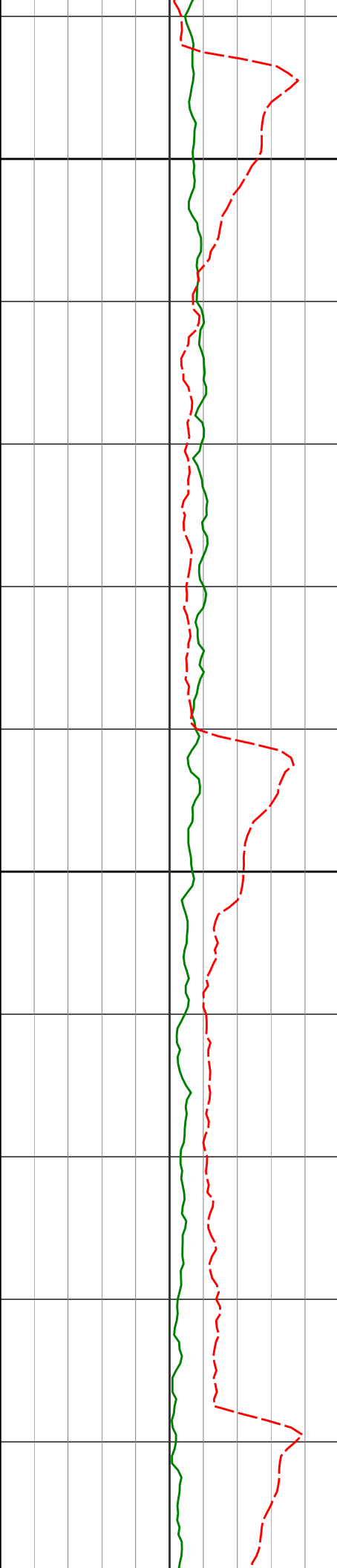
242.28°F

242.28°F

PGXC

ROPA





15100

15115'

89.60°

271.02° 6572.50'

8672.01'

245.03°F

245.03°F

245.03°F

245.03°F

15200

15210'

89.97°

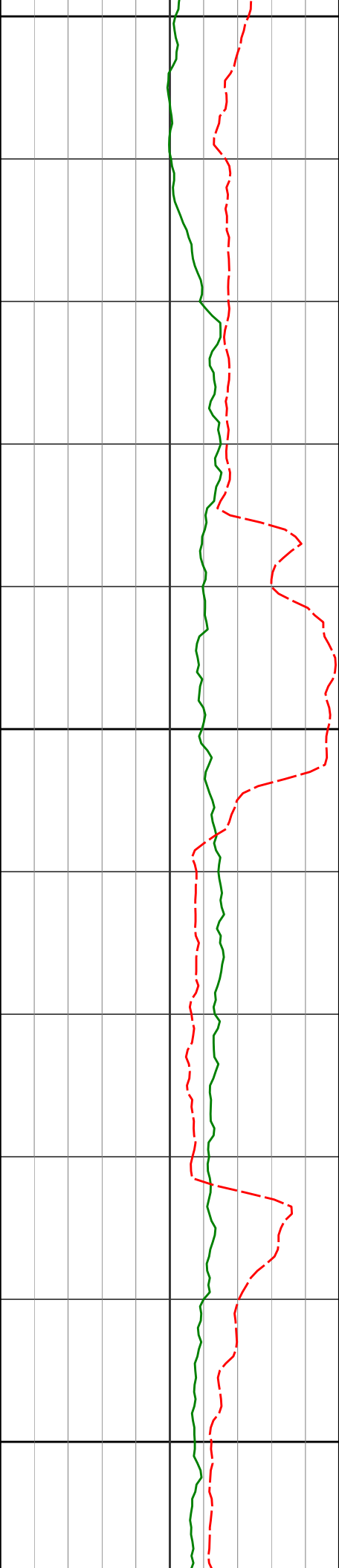
270.22° 6572.86'

8766.94'

245.03°F

245.03°F

245.37°F



15300

15304'

90.77°

270.15° 6572.25'

8860.85'

244.76°F

242.77°F

244.85°F

245.03°F

15400

15398'

89.32°

270.74° 6572.18'

8954.78'

245.03°F

245.03°F

247.36°F

15500

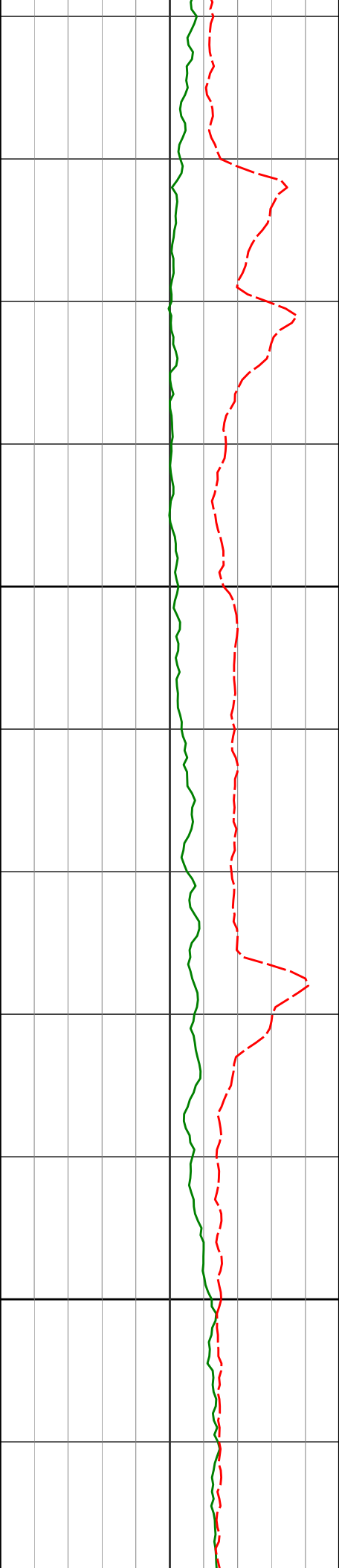
15493'

89.54°

270.79° 6573.13'

9049.72'

247.78°F



15600

15700

15588'

15682'

89.88°

90.34°

270.25°

270.10°

6573.61'

6573.43'

9144.65'

9238.56'

247.78°F

247.78°F

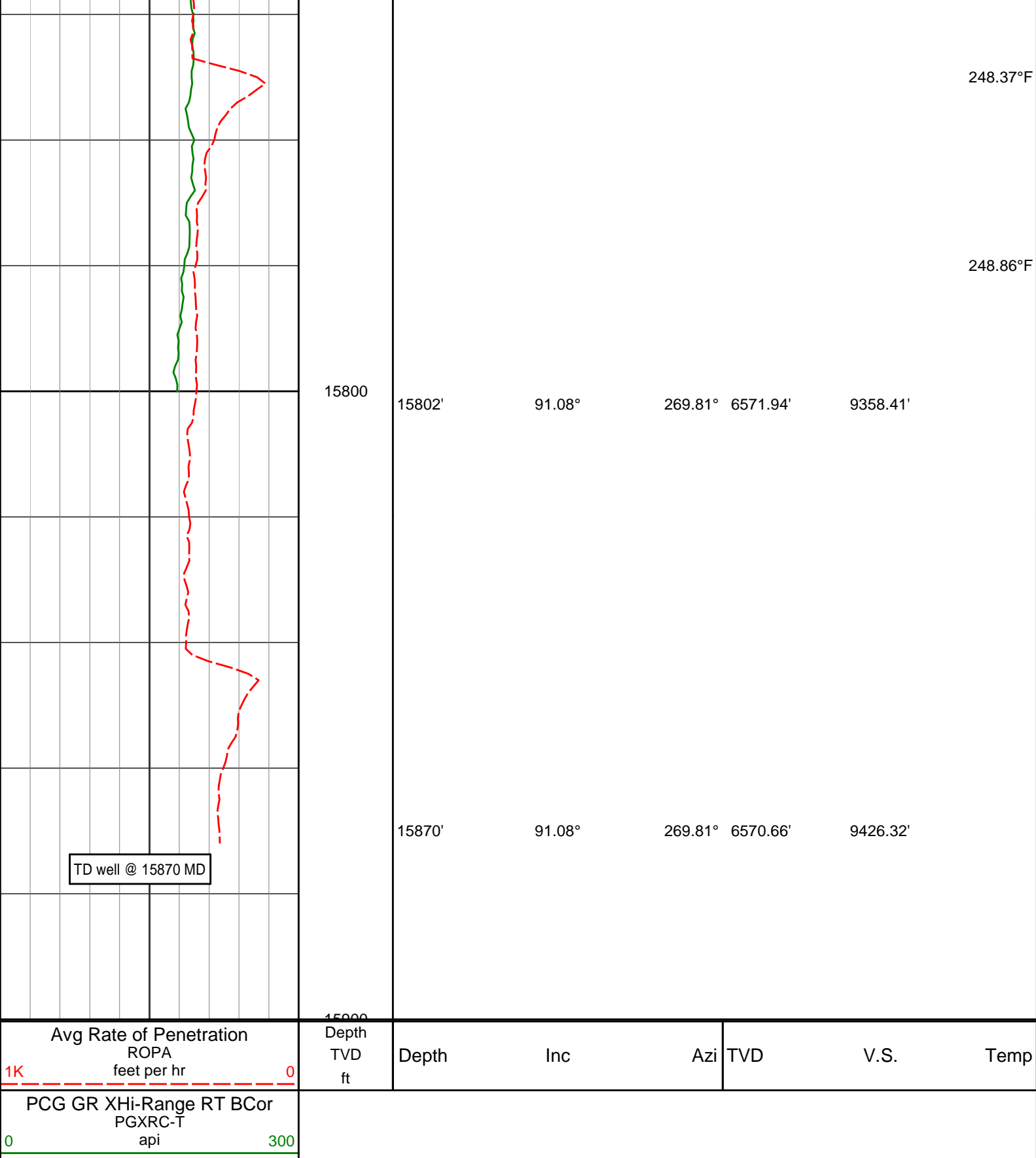
247.78°F

247.78°F

247.78°F

247.78°F

247.78°F



**HALLIBURTON**

**DIRECTIONAL SURVEY REPORT**

**Noble Energy  
70 Ranch State BB18-675  
Wattenburg  
Weld Colorado**

**USA**  
**CA-XX-0902563262**  
**Tied in @ Surface**

Final survey projected to bit.

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
920.00	0.69	42.56	919.98	4.08 N	3.75 E	-3.55	0.07
1012.00	0.62	42.08	1011.97	4.86 N	4.46 E	-4.22	0.08
1104.00	0.64	42.16	1103.97	5.61 N	5.13 E	-4.87	0.02
1209.00	0.54	42.68	1208.96	6.41 N	5.86 E	-5.56	0.10
1393.00	0.44	65.12	1392.95	7.34 N	7.09 E	-6.74	0.12
1485.00	0.62	72.58	1484.95	7.64 N	7.89 E	-7.52	0.21
1577.00	0.81	68.68	1576.94	8.02 N	8.97 E	-8.58	0.21
1669.00	0.79	53.56	1668.93	8.64 N	10.08 E	-9.67	0.23
1762.00	0.78	90.11	1761.93	9.02 N	11.23 E	-10.80	0.53
1853.00	1.18	85.79	1852.91	9.08 N	12.79 E	-12.35	0.45
1947.00	1.11	94.97	1946.89	9.08 N	14.66 E	-14.22	0.21
2039.00	0.37	62.29	2038.89	9.14 N	15.81 E	-15.36	0.89
2131.00	0.33	98.69	2130.88	9.24 N	16.33 E	-15.88	0.24
2221.00	0.15	318.42	2220.88	9.28 N	16.51 E	-16.06	0.51
2313.00	0.28	267.41	2312.88	9.36 N	16.21 E	-15.75	0.24
2405.00	0.18	316.65	2404.88	9.46 N	15.88 E	-15.42	0.23
2498.00	0.62	337.60	2497.88	10.03 N	15.59 E	-15.11	0.49
2591.00	0.74	322.57	2590.87	10.97 N	15.03 E	-14.51	0.23
2683.00	0.48	314.45	2682.87	11.71 N	14.40 E	-13.84	0.30
2775.00	0.63	320.21	2774.86	12.37 N	13.80 E	-13.21	0.17
2866.00	0.68	322.12	2865.86	13.18 N	13.15 E	-12.52	0.06
2959.00	0.88	321.88	2958.85	14.18 N	12.37 E	-11.69	0.22
3053.00	0.86	326.77	3052.84	15.34 N	11.54 E	-10.81	0.08
3242.00	0.50	282.90	3241.83	16.71 N	9.96 E	-9.16	0.32
3336.00	0.54	242.71	3335.82	16.60 N	9.16 E	-8.38	0.38
3431.00	0.59	247.14	3430.82	16.20 N	8.31 E	-7.55	0.07
3526.00	0.81	226.97	3525.81	15.55 N	7.37 E	-6.64	0.34
3620.00	0.86	228.04	3619.80	14.63 N	6.36 E	-5.67	0.06
3715.00	1.03	231.07	3714.79	13.62 N	5.17 E	-4.52	0.19
3809.00	0.70	262.69	3808.78	13.01 N	3.94 E	-3.33	0.60
3904.00	1.20	50.74	3903.77	13.57 N	4.13 E	-3.50	1.93
3999.00	3.00	33.30	3998.70	16.28 N	6.27 E	-5.50	1.99
4094.00	4.39	23.16	4093.51	21.70 N	9.07 E	-8.04	1.61
4188.00	5.78	20.93	4187.13	29.43 N	12.17 E	-10.78	1.49
4283.00	7.27	15.27	4281.52	39.69 N	15.46 E	-13.59	1.71
4377.00	9.19	15.42	4374.54	52.67 N	19.03 E	-16.54	2.04
4472.00	9.66	13.84	4468.26	67.72 N	22.95 E	-19.76	0.56
4567.00	8.91	15.84	4562.02	82.54 N	26.86 E	-22.98	0.86
4661.00	9.96	24.45	4654.75	96.94 N	32.22 E	-27.65	1.87
4756.00	8.44	27.04	4748.52	110.63 N	38.79 E	-33.57	1.66
4851.00	8.09	29.60	4842.54	122.65 N	45.26 E	-39.47	0.53
5040.00	8.88	27.01	5029.47	147.21 N	58.45 E	-51.50	0.46
5134.00	8.26	17.75	5122.42	160.11 N	63.81 E	-56.25	1.61
5229.00	8.00	17.91	5216.47	172.90 N	67.92 E	-59.76	0.27
5324.00	7.90	22.35	5310.56	185.23 N	72.43 E	-63.69	0.65
5418.00	8.35	24.01	5403.61	197.44 N	77.67 E	-68.35	0.54
5513.00	7.87	26.88	5497.66	209.54 N	83.42 E	-73.53	0.66
5703.00	8.72	21.80	5685.67	234.52 N	94.65 E	-83.58	0.59
5798.00	10.80	13.81	5779.30	249.85 N	99.45 E	-87.65	2.61
5892.00	15.85	352.75	5870.79	271.16 N	99.93 E	-87.14	7.37
5987.00	20.17	348.54	5961.12	300.10 N	95.03 E	-80.90	4.75
6082.00	25.30	339.17	6048.74	335.16 N	84.55 E	-68.79	6.59
6177.00	31.24	326.15	6132.45	374.66 N	63.57 E	-45.99	8.98
6272.00	36.38	311.84	6211.48	414.00 N	28.78 E	-9.39	9.95
6366.00	39.68	299.72	6285.62	447.53 N	18.13 W	39.03	8.67
6461.00	43.38	289.10	6356.81	473.28 N	75.39 W	97.43	8.36
6556.00	48.41	280.56	6422.97	490.50 N	141.25 W	164.03	8.34
6651.00	57.59	275.34	6480.11	500.77 N	216.29 W	239.47	10.61
6745.00	67.06	274.02	6523.72	507.51 N	299.17 W	322.57	10.15

6793.00	71.57	272.44	6540.67	510.03 N	343.99 W	367.46	9.89
6840.00	75.65	271.76	6553.93	511.68 N	389.04 W	412.54	8.79
6888.00	79.31	271.69	6564.34	513.09 N	435.87 W	459.38	7.63
6930.00	83.33	270.79	6570.67	513.98 N	477.37 W	500.88	9.80
7029.00	89.60	269.42	6576.77	514.16 N	576.13 W	599.54	6.48
7123.00	90.31	269.12	6576.85	512.96 N	670.12 W	693.37	0.82
7218.00	91.29	269.69	6575.52	511.98 N	765.10 W	788.20	1.19
7313.00	90.43	271.14	6574.10	512.67 N	860.09 W	883.12	1.77
7408.00	90.65	270.72	6573.20	514.21 N	955.07 W	978.07	0.50
7502.00	89.04	270.29	6573.46	515.04 N	1049.06 W	1072.00	1.77
7597.00	89.08	270.01	6575.01	515.28 N	1144.05 W	1166.89	0.30
7691.00	88.80	269.09	6576.75	514.55 N	1238.03 W	1260.73	1.02
7786.00	89.91	269.69	6577.82	513.54 N	1333.01 W	1355.57	1.33
7881.00	89.97	268.93	6577.92	512.39 N	1428.01 W	1450.40	0.80
7976.00	89.45	268.02	6578.40	509.86 N	1522.97 W	1545.15	1.10
8070.00	89.48	269.27	6579.28	507.64 N	1616.94 W	1638.91	1.33
8165.00	90.55	269.02	6579.26	506.22 N	1711.93 W	1733.72	1.16
8259.00	89.91	268.62	6578.88	504.29 N	1805.91 W	1827.51	0.80
8354.00	90.25	269.87	6578.75	503.03 N	1900.90 W	1922.34	1.36
8449.00	89.91	269.42	6578.61	502.45 N	1995.89 W	2017.20	0.59
8543.00	90.52	270.19	6578.26	502.13 N	2089.89 W	2111.08	1.05
8638.00	90.31	269.66	6577.57	502.00 N	2184.89 W	2205.97	0.60
8732.00	89.69	268.98	6577.57	500.89 N	2278.88 W	2299.81	0.98
8827.00	90.80	268.70	6577.17	498.96 N	2373.86 W	2394.59	1.21
8922.00	91.23	268.39	6575.48	496.55 N	2468.81 W	2489.33	0.56
9017.00	91.48	268.25	6573.24	493.77 N	2563.74 W	2584.03	0.30
9111.00	89.57	269.06	6572.38	491.56 N	2657.71 W	2677.79	2.21
9206.00	89.91	268.52	6572.81	489.55 N	2752.69 W	2772.57	0.67
9300.00	91.45	268.81	6571.69	487.36 N	2846.65 W	2866.33	1.67
9395.00	89.51	268.65	6570.90	485.26 N	2941.62 W	2961.09	2.05
9490.00	88.77	270.30	6572.32	484.39 N	3036.60 W	3055.93	1.90
9584.00	89.01	270.08	6574.14	484.70 N	3130.58 W	3149.82	0.35
9679.00	89.41	269.41	6575.45	484.28 N	3225.57 W	3244.69	0.82
9774.00	90.00	268.66	6575.94	482.68 N	3320.56 W	3339.49	1.00
9868.00	90.37	269.84	6575.64	481.45 N	3414.55 W	3433.32	1.32
9963.00	90.96	269.88	6574.53	481.21 N	3509.54 W	3528.20	0.62
10058.00	89.60	271.02	6574.07	481.96 N	3604.53 W	3623.12	1.87
10150.00	89.91	270.17	6574.46	482.92 N	3696.53 W	3715.06	0.98
10243.00	89.63	269.41	6574.84	482.57 N	3789.52 W	3807.94	0.87
10334.00	89.54	268.58	6575.50	480.98 N	3880.51 W	3898.75	0.92
10426.00	89.94	269.95	6575.91	479.80 N	3972.49 W	3990.58	1.55
10517.00	89.63	269.15	6576.26	479.08 N	4063.49 W	4081.45	0.94
10610.00	89.41	268.52	6577.03	477.19 N	4156.47 W	4174.23	0.72
10702.00	89.23	269.69	6578.13	475.76 N	4248.45 W	4266.05	1.29
10794.00	90.77	271.40	6578.13	476.63 N	4340.44 W	4357.98	2.50
10888.00	90.68	270.76	6576.94	478.40 N	4434.41 W	4451.93	0.69
10980.00	90.49	270.31	6576.00	479.26 N	4526.40 W	4543.86	0.53
11072.00	90.80	270.16	6574.96	479.64 N	4618.40 W	4635.77	0.37
11162.00	90.77	269.79	6573.73	479.60 N	4708.39 W	4725.66	0.41
11254.00	90.22	270.70	6572.93	479.99 N	4800.38 W	4817.58	1.16
11346.00	89.75	270.59	6572.96	481.03 N	4892.38 W	4909.52	0.52
11439.00	90.80	270.84	6572.51	482.19 N	4985.37 W	5002.46	1.16
11532.00	88.92	270.29	6572.74	483.11 N	5078.36 W	5095.39	2.11
11624.00	89.26	270.12	6574.20	483.43 N	5170.35 W	5187.29	0.41
11715.00	89.26	269.85	6575.38	483.41 N	5261.34 W	5278.19	0.30
11807.00	89.66	269.94	6576.24	483.24 N	5353.33 W	5370.07	0.45
11899.00	89.35	269.44	6577.04	482.74 N	5445.33 W	5461.94	0.64
11994.00	89.75	267.80	6577.78	480.46 N	5540.29 W	5556.70	1.78
12089.00	91.20	267.84	6577.00	476.84 N	5635.22 W	5651.35	1.53
12184.00	91.94	269.97	6574.39	475.03 N	5730.16 W	5746.10	2.37
12278.00	90.40	270.51	6572.47	475.42 N	5824.14 W	5840.00	1.74
12372.00	92.00	270.40	6570.51	476.17 N	5918.11 W	5933.90	1.71
12467.00	89.69	271.07	6569.10	477.39 N	6013.09 W	6028.83	2.53
12562.00	89.75	270.86	6569.57	478.99 N	6108.07 W	6123.79	0.23
12656.00	90.22	270.46	6569.59	480.07 N	6202.06 W	6217.73	0.66
12751.00	89.32	268.48	6569.98	479.19 N	6297.05 W	6312.57	2.29
12845.00	89.38	267.82	6571.04	476.16 N	6391.00 W	6406.27	0.70
12940.00	89.66	267.57	6571.84	472.34 N	6485.92 W	6500.91	0.40
13035.00	90.22	267.22	6571.94	468.02 N	6580.82 W	6595.50	0.70
13129.00	89.69	268.11	6572.01	464.19 N	6674.74 W	6689.14	1.10
13224.00	89.81	268.12	6572.43	461.06 N	6769.69 W	6783.84	0.13
13319.00	89.34	267.87	6572.33	457.74 N	6864.63 W	6878.52	0.59

13319.00	90.31	267.87	6572.33	457.74 N	6864.63 W	6876.32	0.59
13413.00	88.64	269.11	6573.19	455.26 N	6958.59 W	6972.26	2.21
13508.00	87.97	269.27	6576.00	453.92 N	7053.54 W	7067.04	0.73
13603.00	89.72	268.90	6577.91	452.40 N	7148.50 W	7161.83	1.88
13697.00	90.12	268.52	6578.04	450.29 N	7242.48 W	7255.61	0.59
13792.00	90.00	268.48	6577.94	447.80 N	7337.44 W	7350.36	0.13
13886.00	89.75	267.98	6578.15	444.90 N	7431.40 W	7444.07	0.59
13981.00	90.22	269.34	6578.17	442.67 N	7526.37 W	7538.84	1.51
14075.00	90.65	270.91	6577.46	442.88 N	7620.36 W	7632.74	1.73
14170.00	91.14	270.32	6575.98	443.90 N	7715.35 W	7727.66	0.81
14264.00	90.99	271.28	6574.23	445.21 N	7809.32 W	7821.59	1.03
14359.00	89.88	271.33	6573.51	447.37 N	7904.29 W	7916.56	1.17
14453.00	90.00	271.17	6573.61	449.42 N	7998.27 W	8010.53	0.21
14548.00	90.25	270.51	6573.40	450.82 N	8093.26 W	8105.48	0.74
14642.00	91.05	270.21	6572.33	451.41 N	8187.25 W	8199.40	0.91
14737.00	89.45	270.37	6571.92	451.89 N	8282.24 W	8294.31	1.69
14832.00	90.09	270.16	6572.30	452.33 N	8377.24 W	8389.23	0.71
14926.00	90.83	270.20	6571.54	452.62 N	8471.24 W	8483.13	0.79
15021.00	89.20	270.71	6571.52	453.38 N	8566.23 W	8578.06	1.80
15115.00	89.60	271.02	6572.50	454.80 N	8660.21 W	8672.01	0.54
15210.00	89.97	270.22	6572.86	455.82 N	8755.21 W	8766.94	0.93
15304.00	90.77	270.15	6572.25	456.13 N	8849.20 W	8860.85	0.85
15398.00	89.32	270.74	6572.18	456.86 N	8943.20 W	8954.78	1.67
15493.00	89.54	270.79	6573.13	458.13 N	9038.18 W	9049.72	0.24
15588.00	89.88	270.25	6573.61	458.99 N	9133.18 W	9144.65	0.67
15682.00	90.34	270.10	6573.43	459.28 N	9227.18 W	9238.56	0.51
15802.00	91.08	269.81	6571.94	459.18 N	9347.17 W	9358.41	0.66
15870.00	91.08	269.81	6570.66	458.96 N	9415.15 W	9426.32	0.00

**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 272.68 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.55 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 15870.00 FEET  
IS 9426.33 FEET ALONG 272.79 DEGREES (GRID)**