

### PCGC-Pressure Case Gamma

# 1:240

[illegible]

## WELL INFORMATION

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MWD Run Number	100	200			
Date run completed	01-Jan-20	03-Jan-20			
Rig Bit Number	0100	0200			
Bit Size (in)	8.750	8.500			
Tool Nominal OD (in)	6.750	6.500			
Log Start Depth (MD, ft)	1,620.00	12,740.00			
Log End Depth (MD, ft)	12,740.00	21,610.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	30-Dec-19 03:00	01-Jan-20 23:20			
Drill/Wipe End Date and Time	01-Dec-20 12:30	03-Jan-20 05:55			
Min Inc (deg) @ Depth (MD, ft)	0.00 @ 0.00	88.77 @ 12,727.00			
Max Inc (deg) @ Depth (MD, ft)	91.18 @ 12,310.00	90.74 @ 18,248.00			
Bit TFA(in2) / Bit Type	0.74 / PDC	0.74 / PDC			
Flow Rate (gpm)	650.00	630.00			
Max AV (fpm) / CV (fpm) @ MWD	566.0 / 301.0	536.0 / 291.0			
Fluid Type	Mineral Oil Bas	Diesel Mud Base			
Density (ppg) / Viscosity (spqt)	9.70 / 42.00	9.85 / 44.00			
Filtrate CL (ppm)	41,500.00	42,000.00			
pH / API Filtrate (mptm)	N/A / 17	N/A / 17			
PV (cP) / YP (Ihf2)	14 / 8.00	19 / 10.00			
% Solids / % Sand	11.50 / 0.00	12.25 / 0			
% Oil / Oil:Water Ratio	68.50 / 77:23	66.75 / 76:24			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			

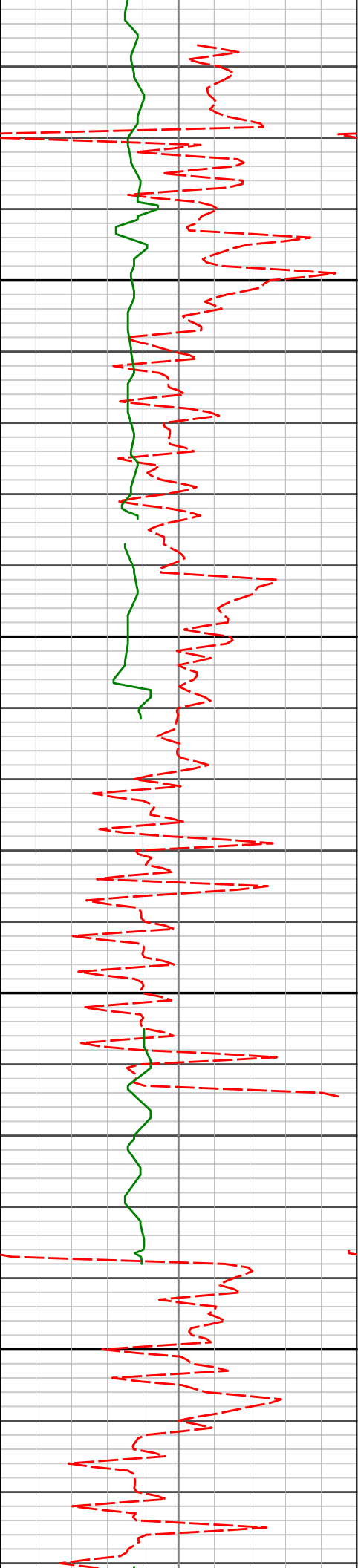
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (degF) / Source	287.00 / EMT	262.00 / Icruiise			
Rm @ Max Tool Temp (degF)	N/A @ 287.00	N/A @ 262.00			
Lead MWD Engineer	Willie Melenka	Willie Melenka			
Customer Representative	N/A	N/A			
SENSOR INFORMATION					
Downhole Processor Information					
Tool Type	EMT-DTU	EMT-DTU			
Software Version	4.48	8.12A			
Sub Serial Number					
Insert Serial Number					
Date and Time Initialized	N/A	N/A			
Date and Time Read	N/A	N/A			
ECMB SW Version	N/A	N/A			
Directional Sensor Information					
Tool Type	PCDC	iCruise DM			
Distance From Bit (ft)	50.00	17			
Software Version	6.43	3.7			
Sub Serial Number	123456				
Sonde Serial Number					
Sensor ID Number	N/A				
Toolface Offset (deg)	56.70				
Gamma Ray Sensor Information					
Tool Type	PCG	iCruise GM			
Distance From Bit (ft)	52.79	12			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	3.06			
Sub Serial Number	123456				
Insert/Sonde Serial Number	11579760				
Rotary Steerable Information					
Tool Type		iCruise			
Distance From Bit (ft)		6.15			
Software Version		3.44			
Sub Serial Number					
REMARKS					
1. All depths are calibrated to the driller's pipe tally and are measured depth measured from the drill floor. 2. No depth corrections have been made for pipe stretch or compression. 3. All data presented is recorded (Tool memory data) unless otherwise stated. 4. Environmental parameters used to process gamma ray are as follows:  Hole Size: 8.75 in and 8.50 in. Mud weight: 9.6 - 9.9 ppm  5. The following smoothing parameters have been applied to the data:  Main Log 1:240 (5"):					

- 6. Gaps in gamma data are from detection issues
- 7. Gaps in ROP are from Block Height Calibration.
- 7. Insite version 9.2.0

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## 5" MD Log (1:240)

[illegible]



1650'

1700'

1750'

1800'

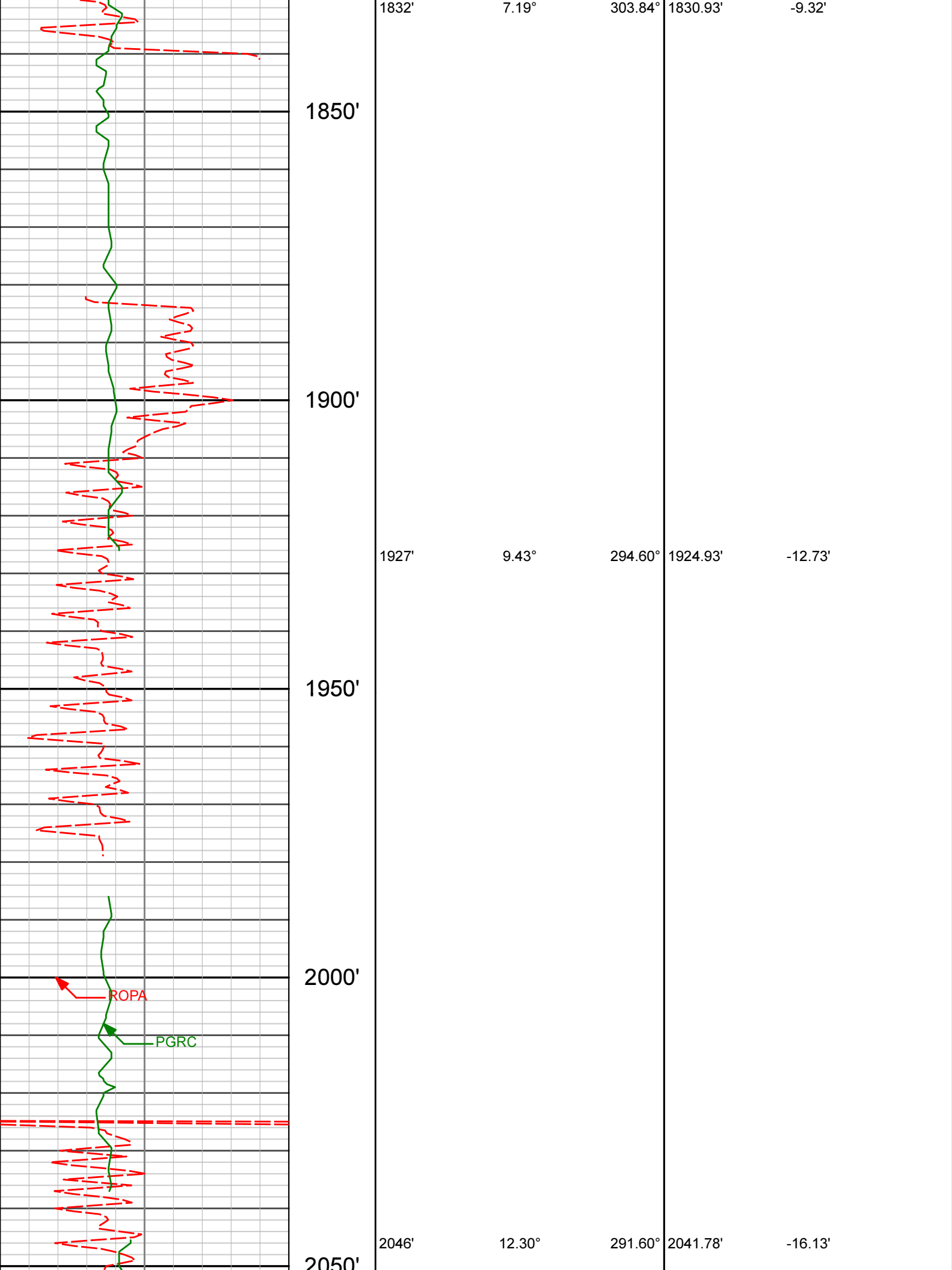
1736'

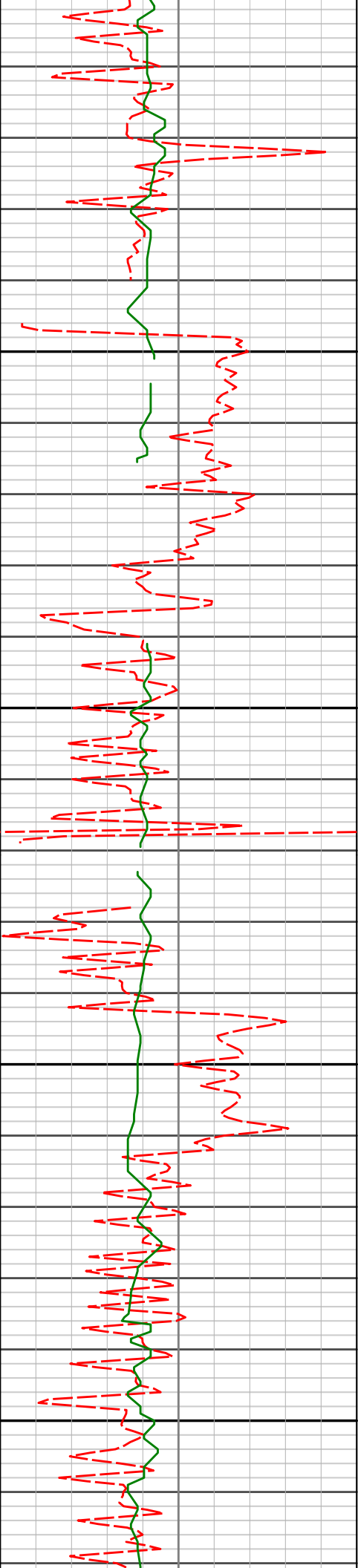
4.16°

286.57°

1735.40'

-7.16'





2000'

2100'

2150'

2200'

2250'

2142'

15.95°

293.07°

2134.87'

-19.48'

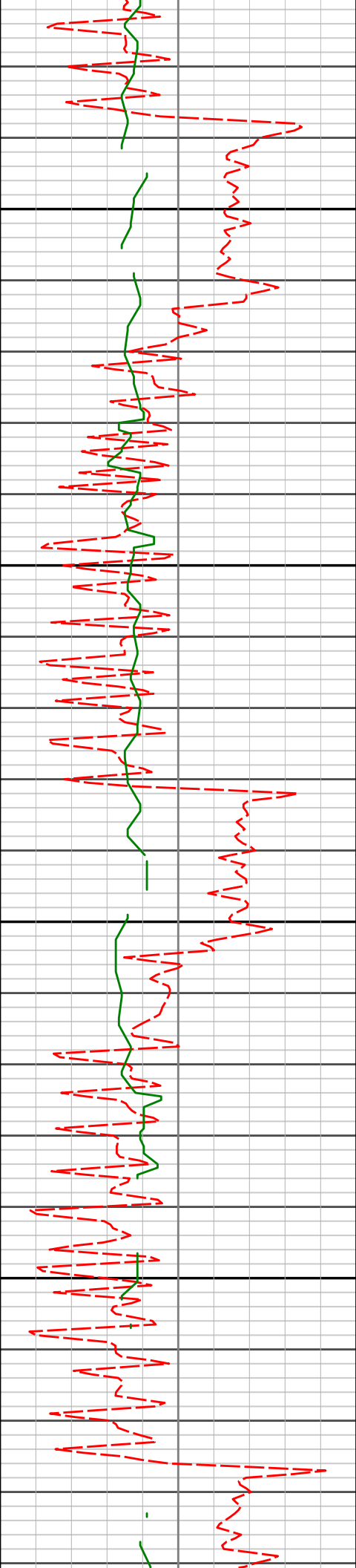
2236'

16.68°

292.92°

2225.08'

-23.53'



2300'

2350'

2400'

2450'

2331'

19.19°

295.45°

2315.46'

-28.65'

2427'

21.58°

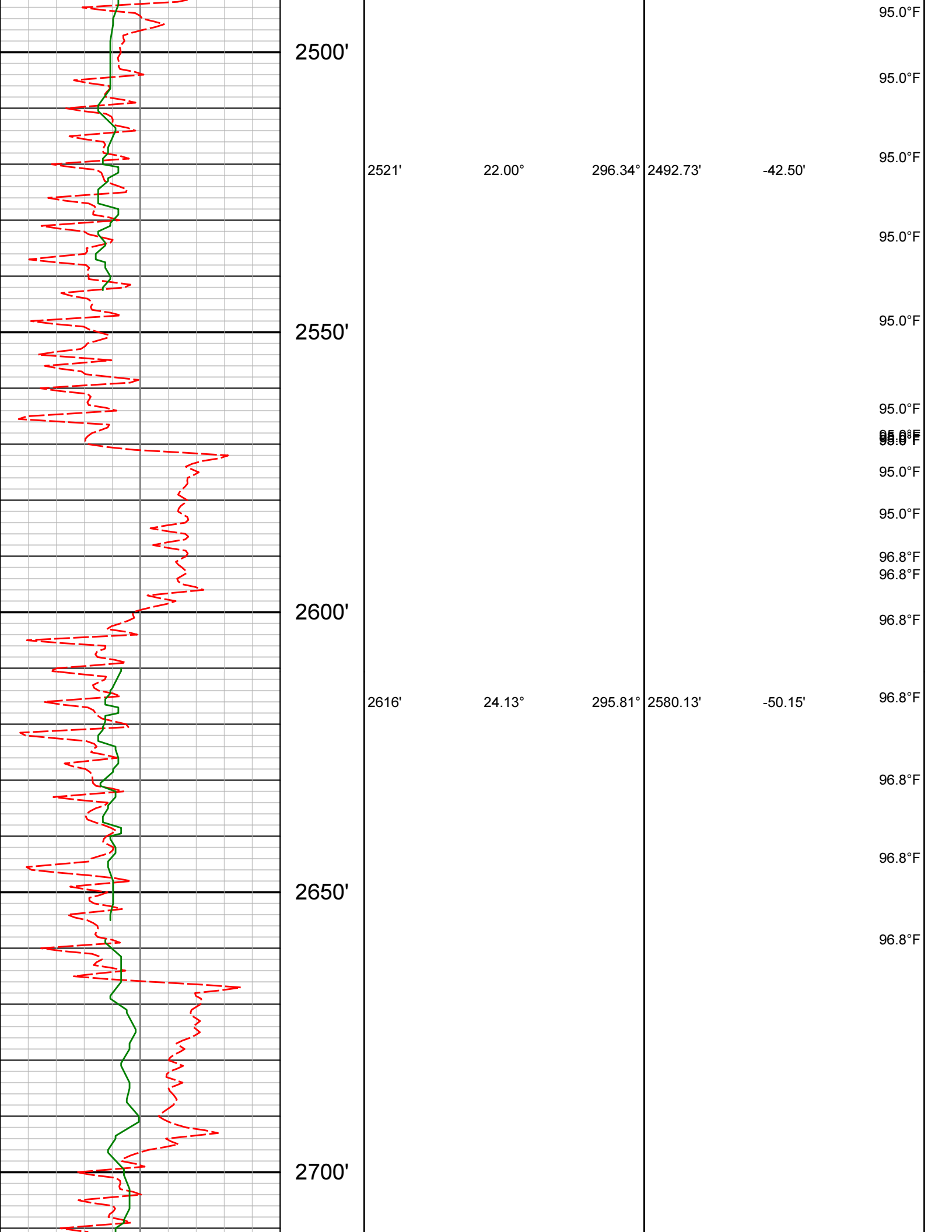
295.85°

2405.44'

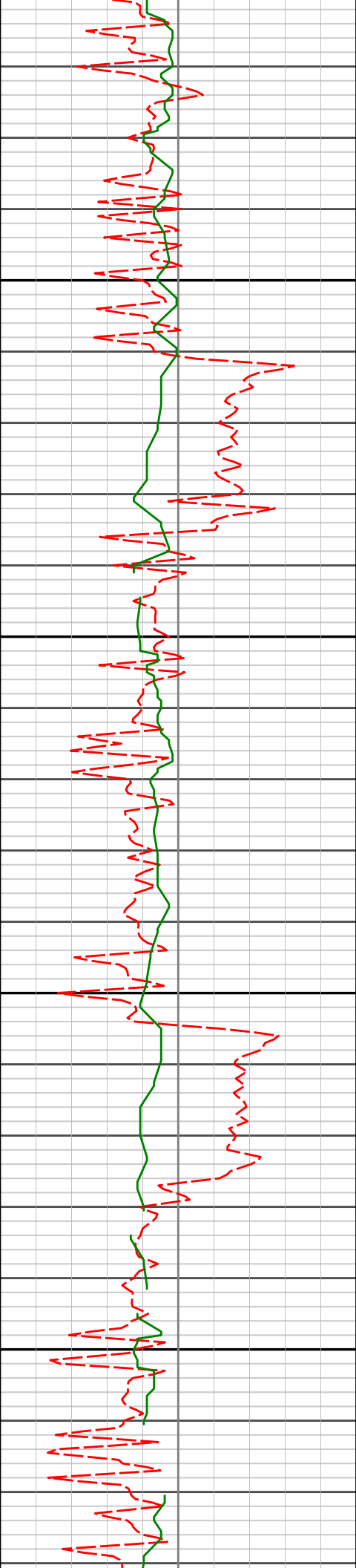
-35.30'

95.0°F  
95.0°F

93.2°F  
95.0°F







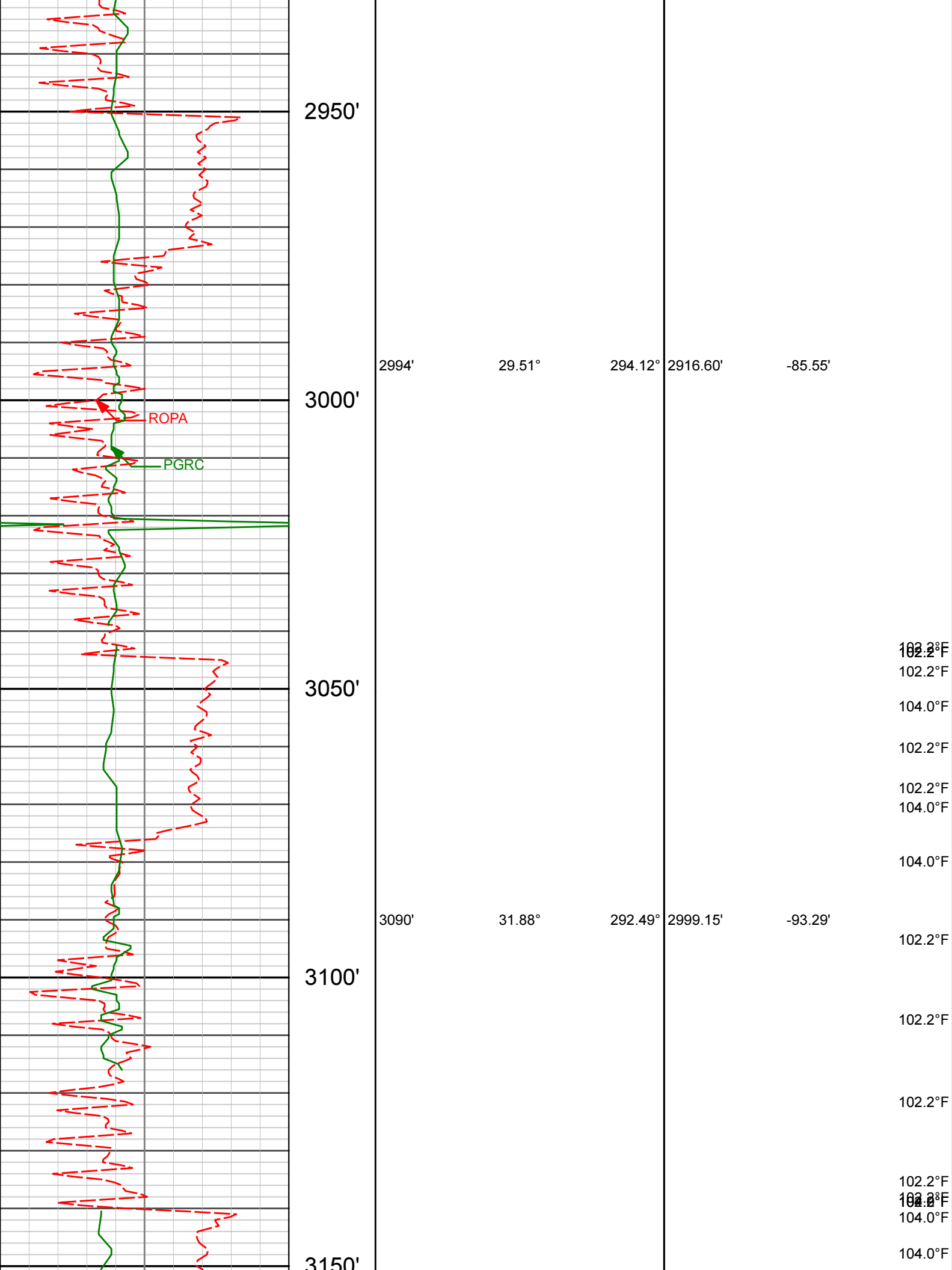
2750'

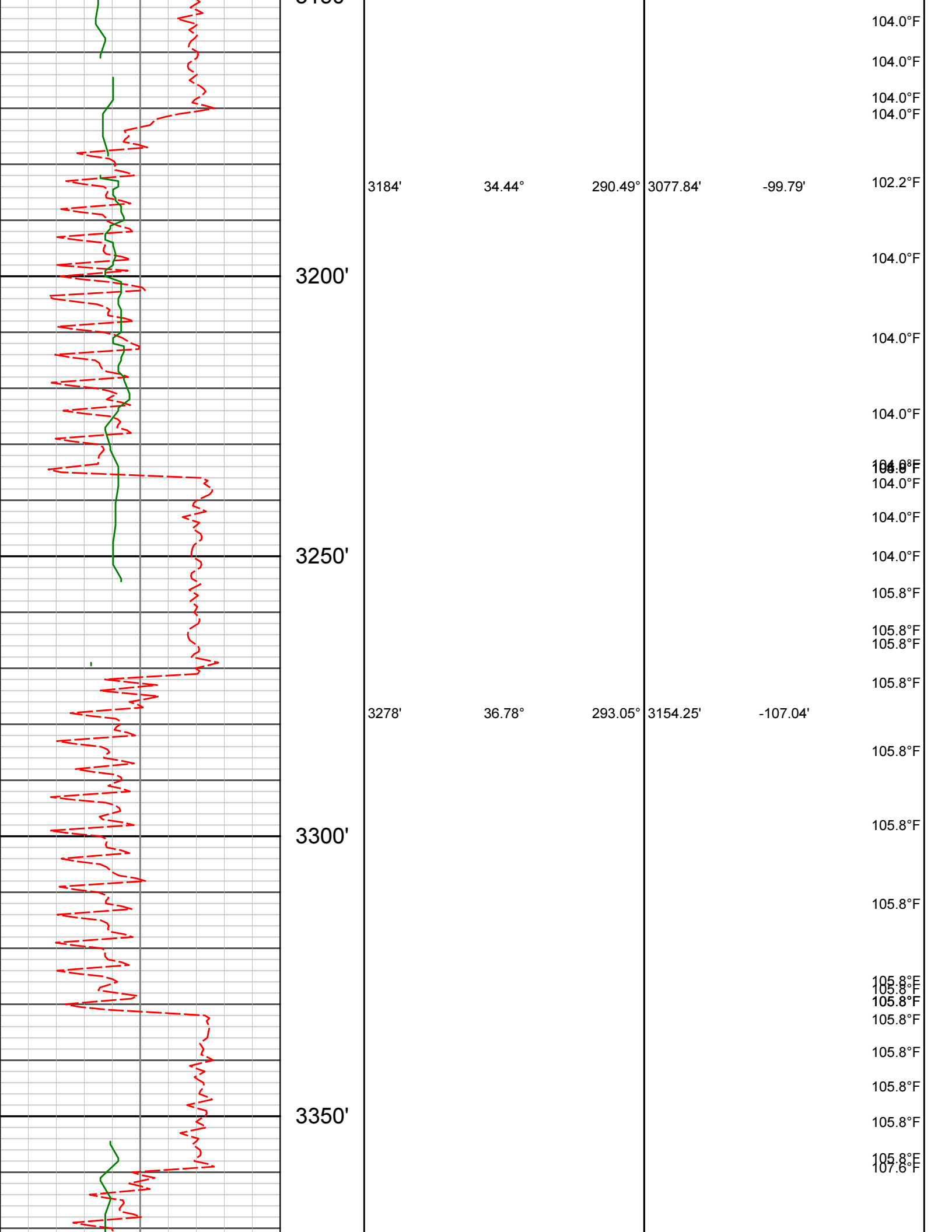
2800'

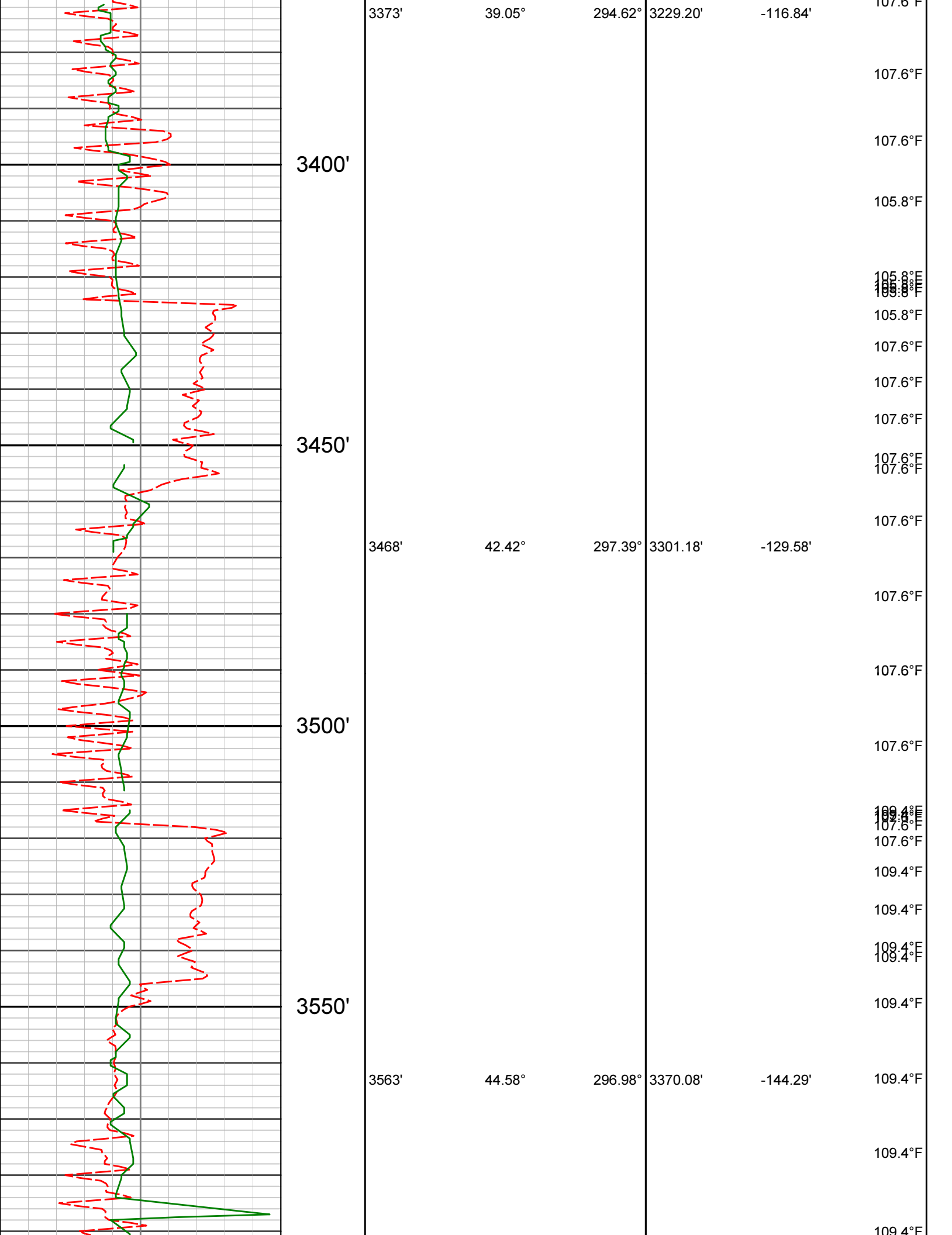
2850'

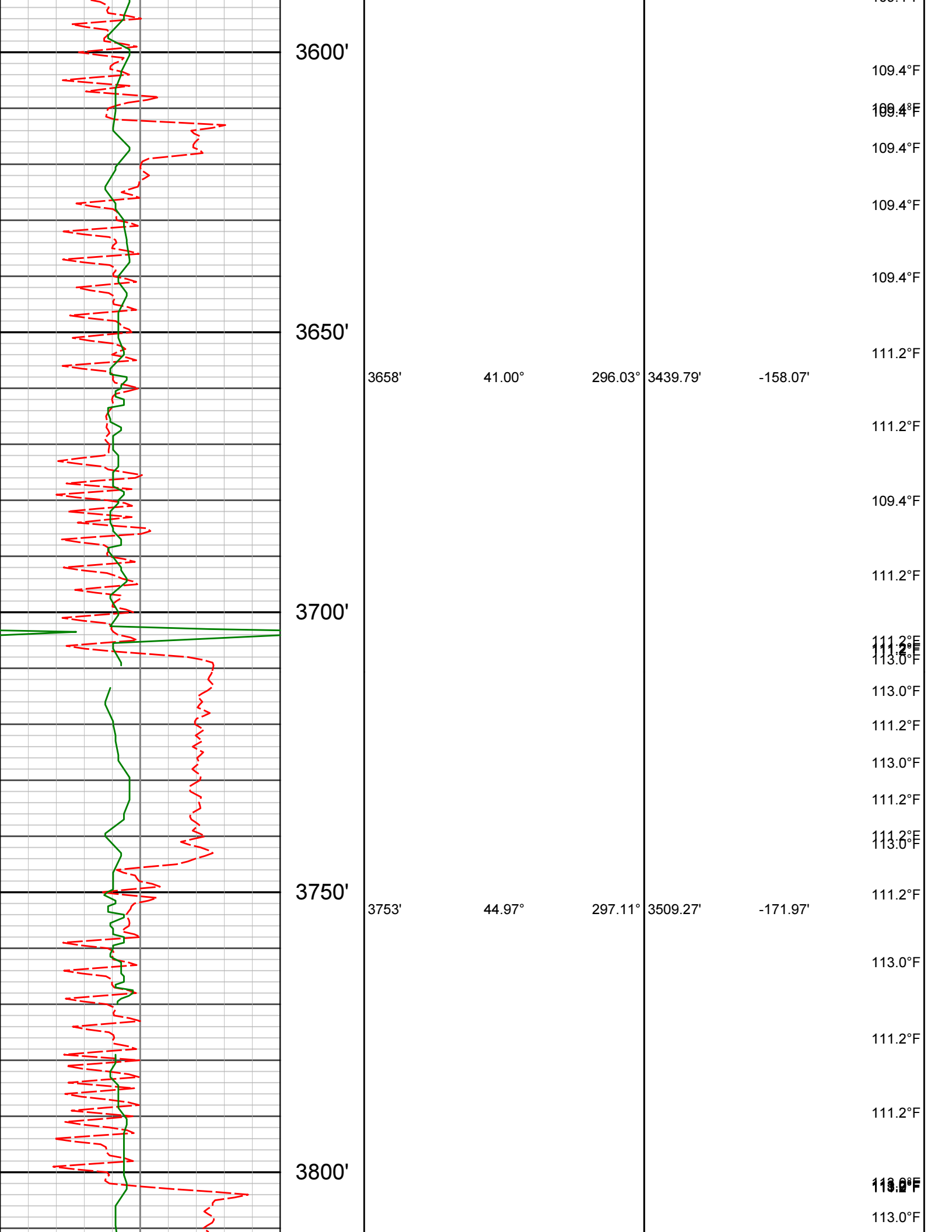
2900'

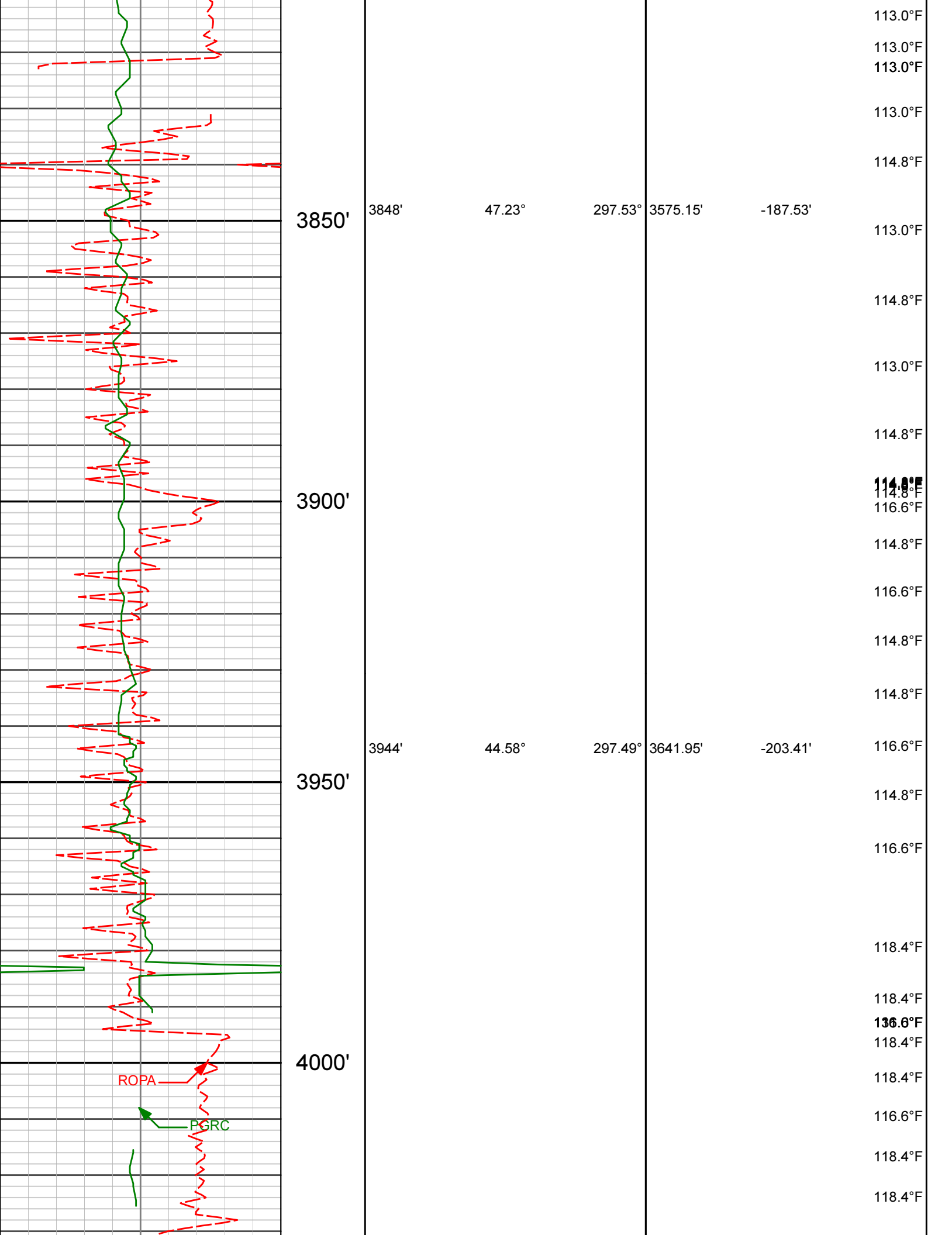
2712'	25.31°	298.44°	2667.33'	-59.16'
2807'	27.76°	295.81°	2752.32'	-68.62'
2900'	28.43°	295.30°	2834.36'	-77.25'

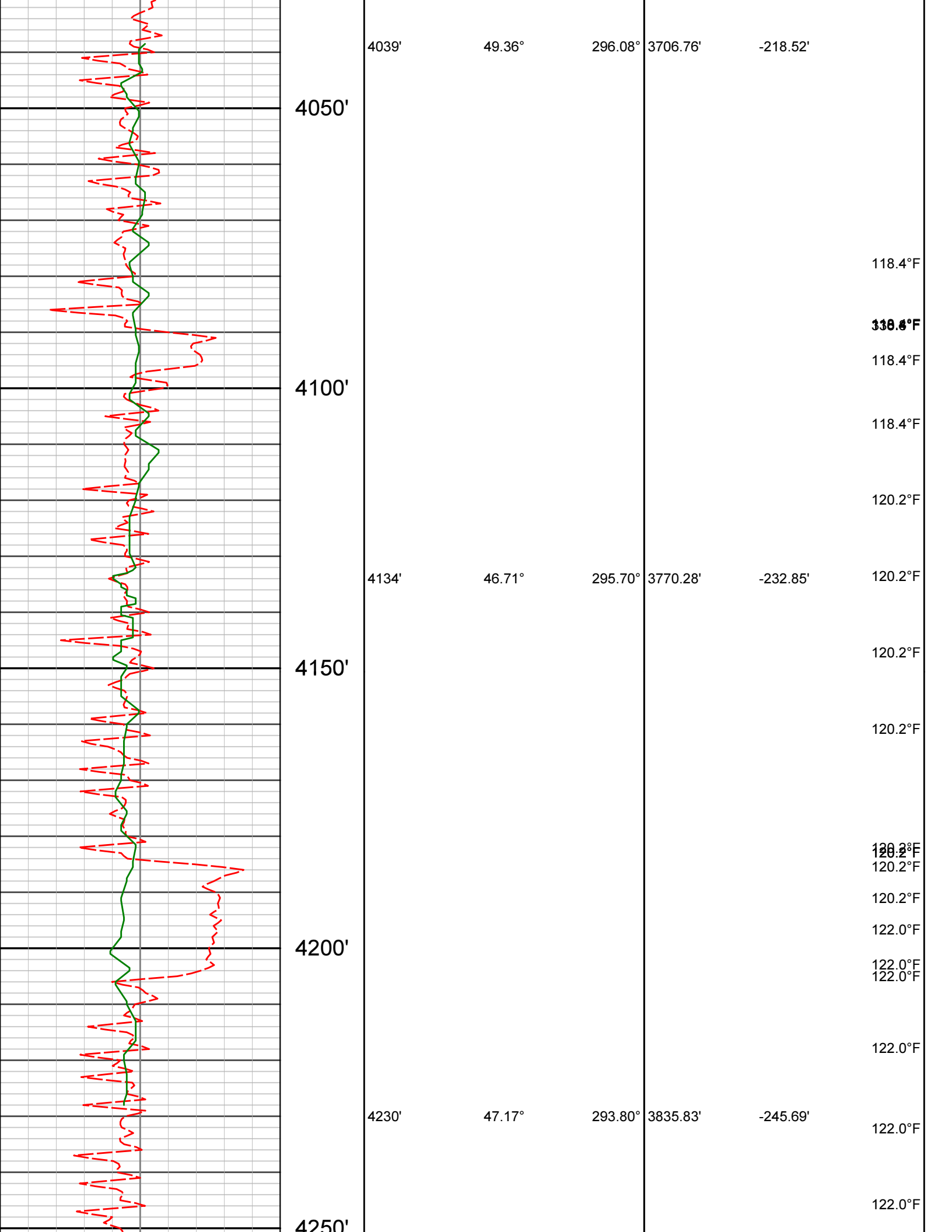


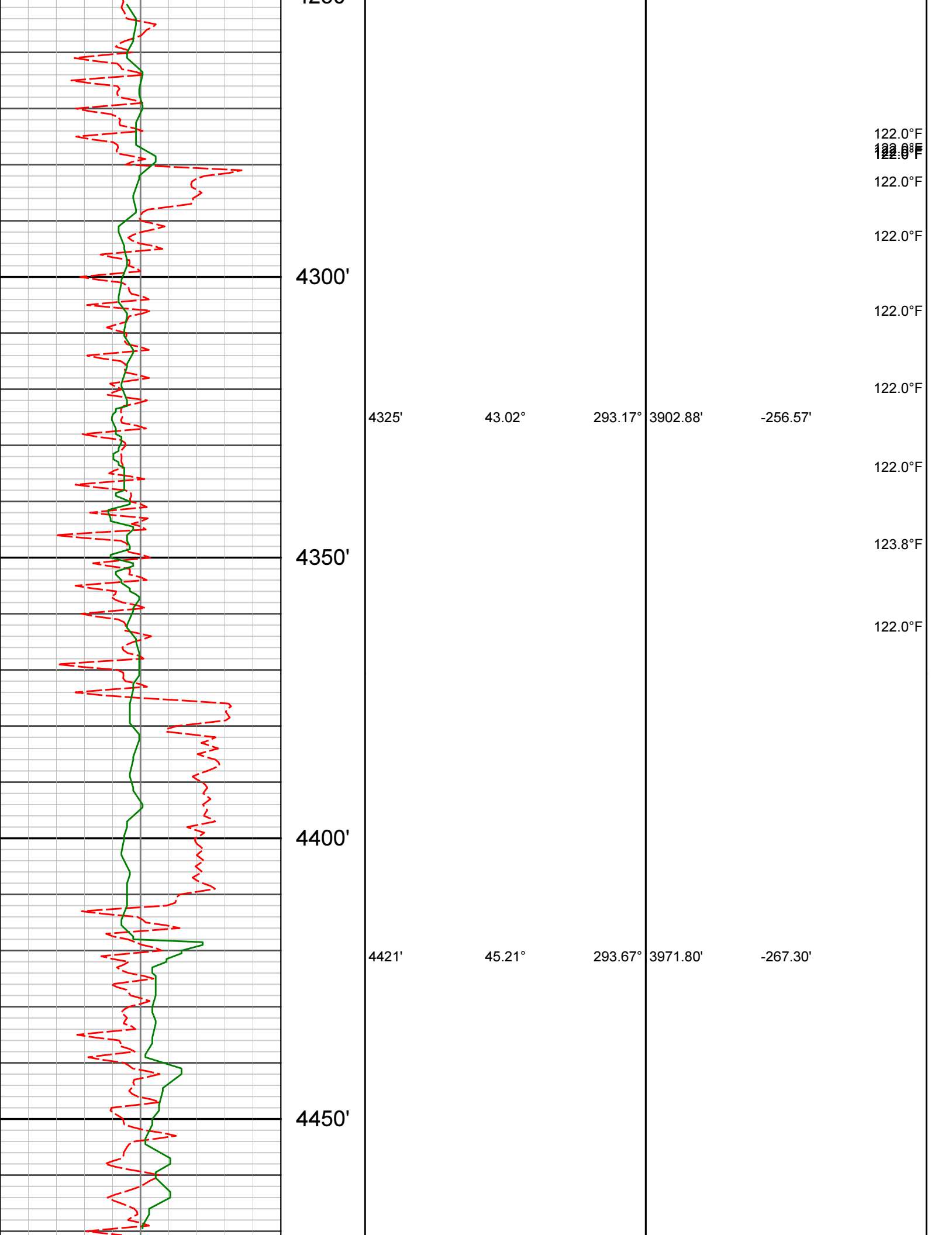




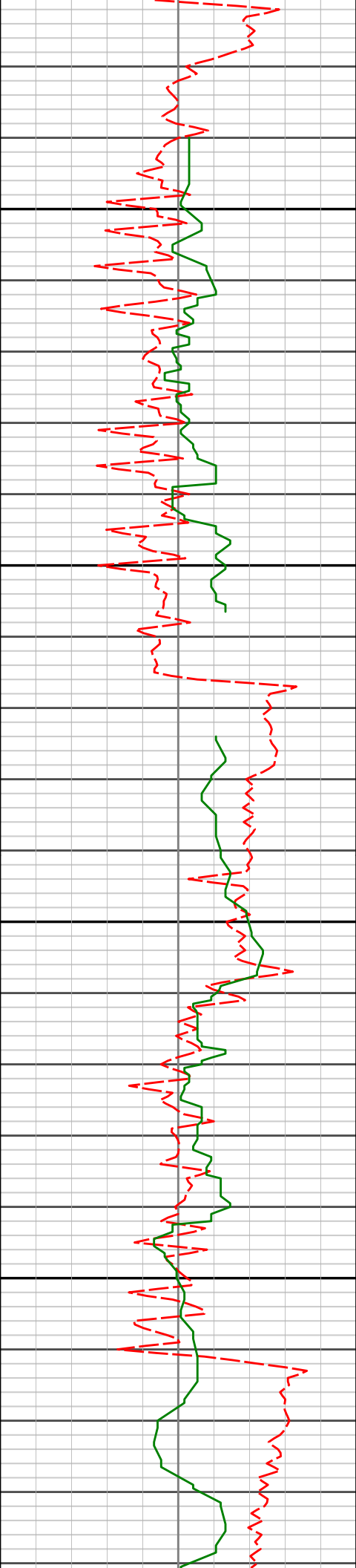












4500'

4516'

41.89°

293.53°

4040.64'

-278.00'

91.4°F

4550'

4600'

4611'

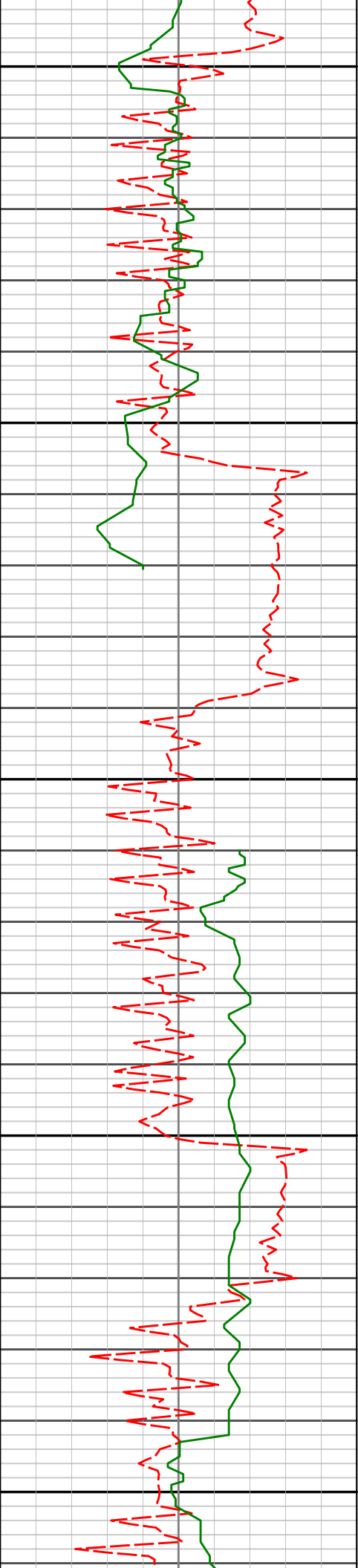
42.34°

296.92°

4111.12'

-290.20'

4650'



4700'

4707'

45.92°

296.92°

4180.02'

-304.93'

4750'

4800'

4802'

47.08°

293.86°

4245.42'

-318.29'

4850'

4900'

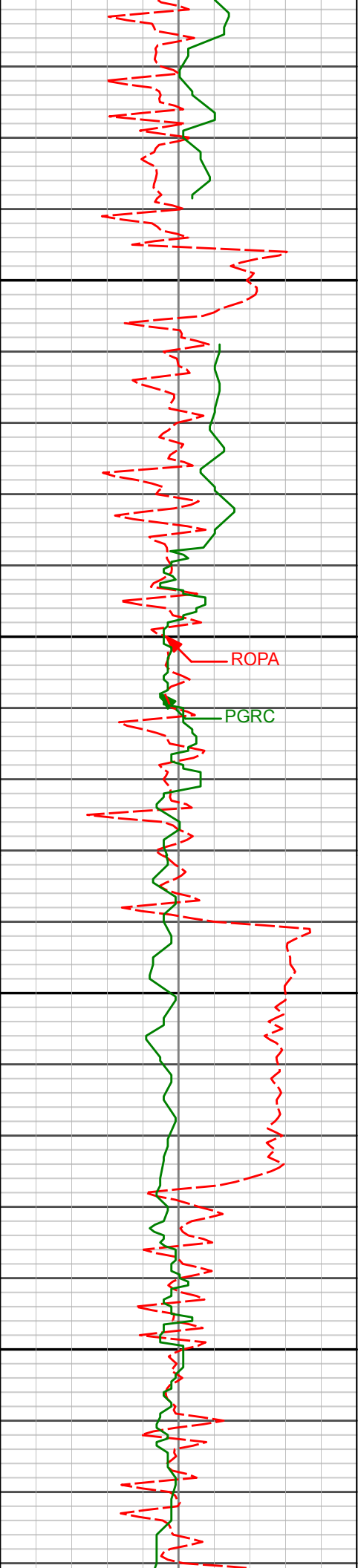
4897'

46.99°

294.57°

4310.17'

-330.39'



4950'

5000'

5050'

5100'

ROPA

PGRC

4992'

43.29°

294.02°

4377.17'

-342.22'

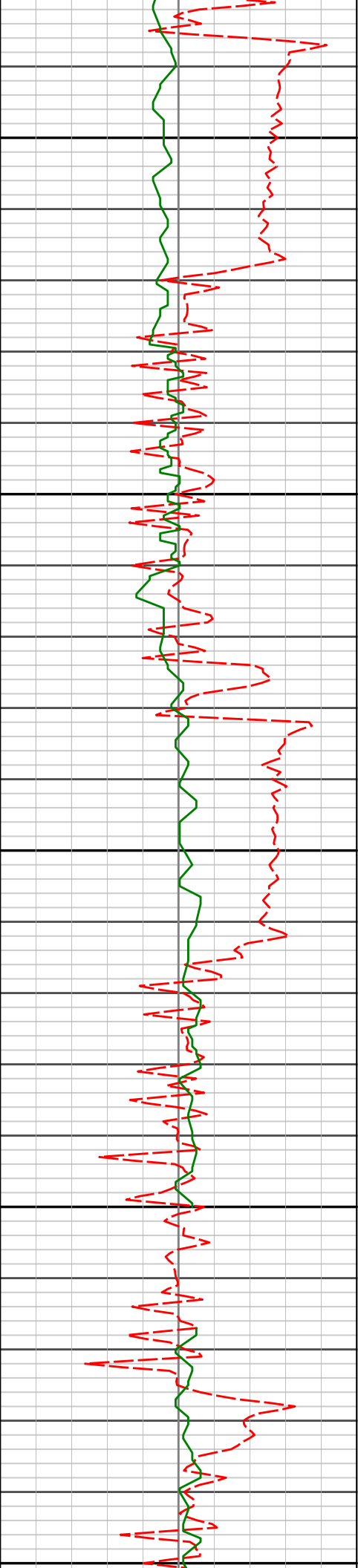
5087'

44.59°

296.82°

4445.58'

-355.08'



5150'

5182'

46.51°

297.37°

4512.10'

-370.23'

5200'

5250'

5276'

48.02°

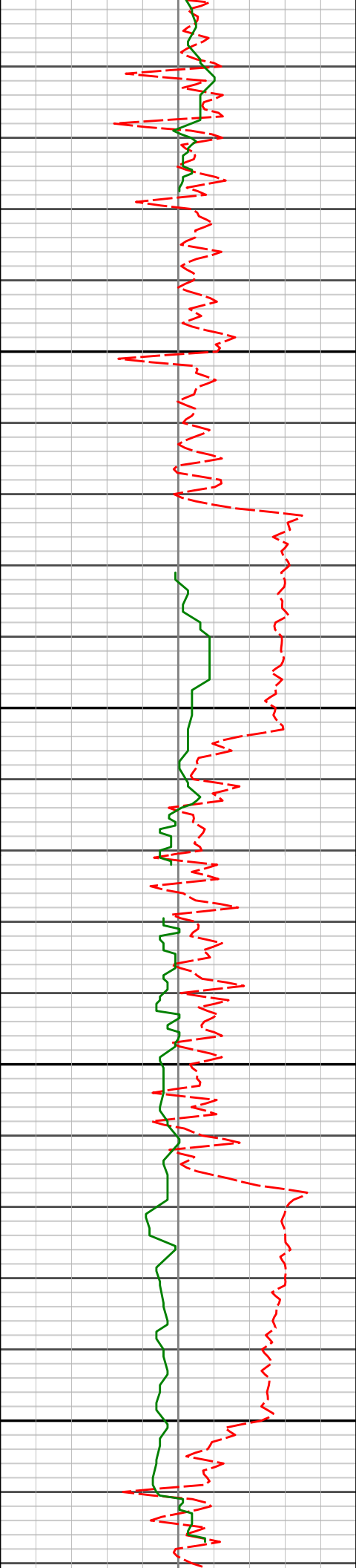
295.48°

4575.89'

-384.85'

5300'

5350'



5371'

5400'

5450'

5500'

5550'

5371'

44.43°

294.65°

4641.61'

-397.80'

5465'

45.34°

292.43°

4708.21'

-408.56'

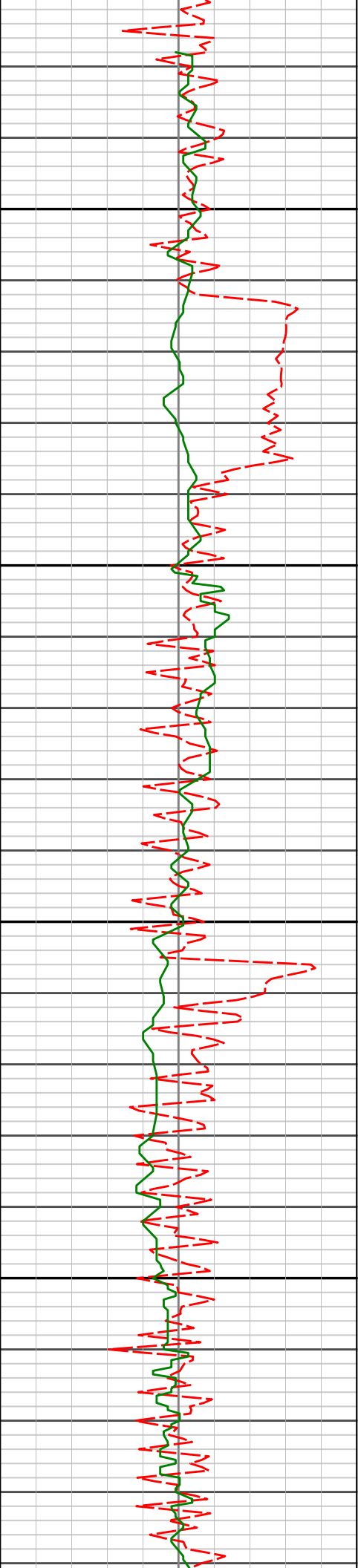
5560'

47.46°

292.29°

4773.72'

-418.34'



5600'

5650'

5700'

5750'

5655'

47.63°

292.84°

4837.85'

-428.56'

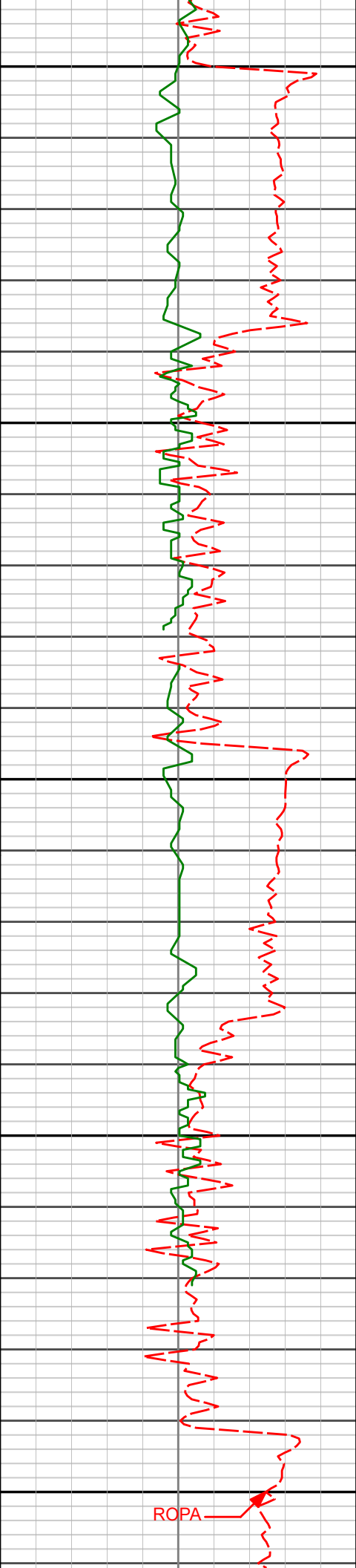
5750'

43.44°

289.26°

4904.39'

-436.73'



5800'

5850'

5900'

5950'

6000'

5845'

43.57°

292.27°

4973.31'

-444.22'

5939'

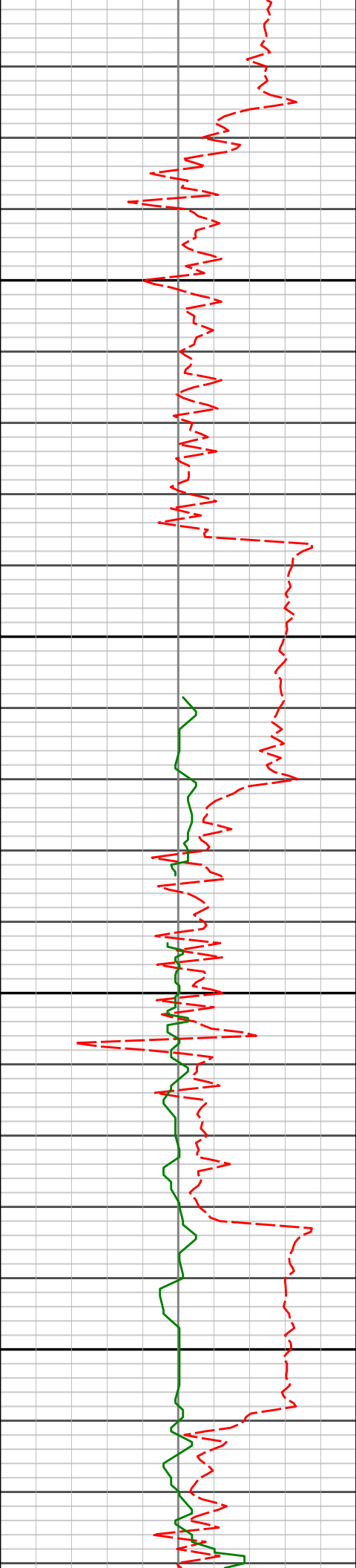
44.99°

296.65°

5040.62'

-455.95'

ROPA



6034'

46.76°

298.71°

5106.76'

-471.88'

6050'

6100'

6129'

49.02°

298.97°

5170.46'

-489.71'

6150'

6200'

6224'

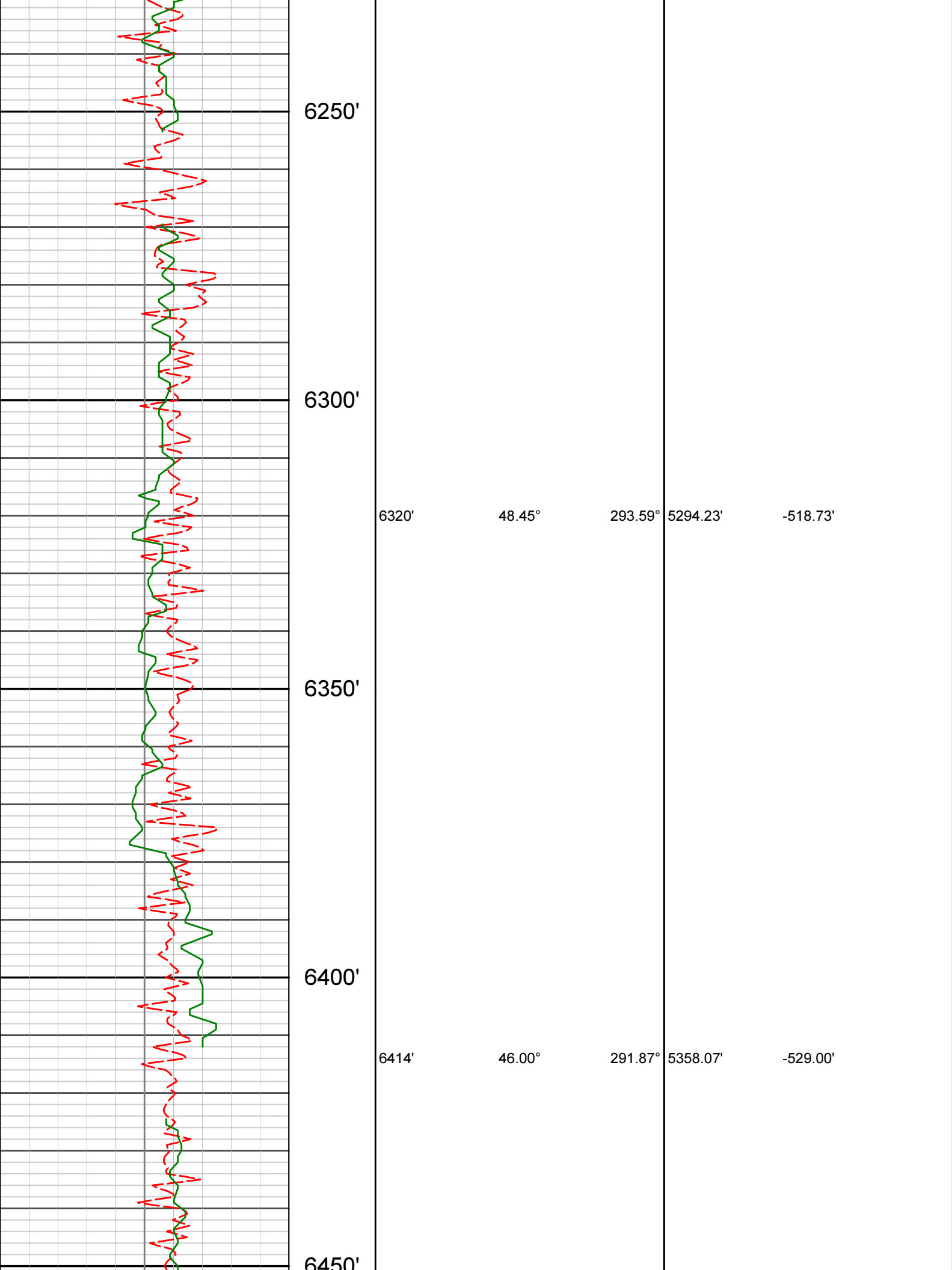
50.50°

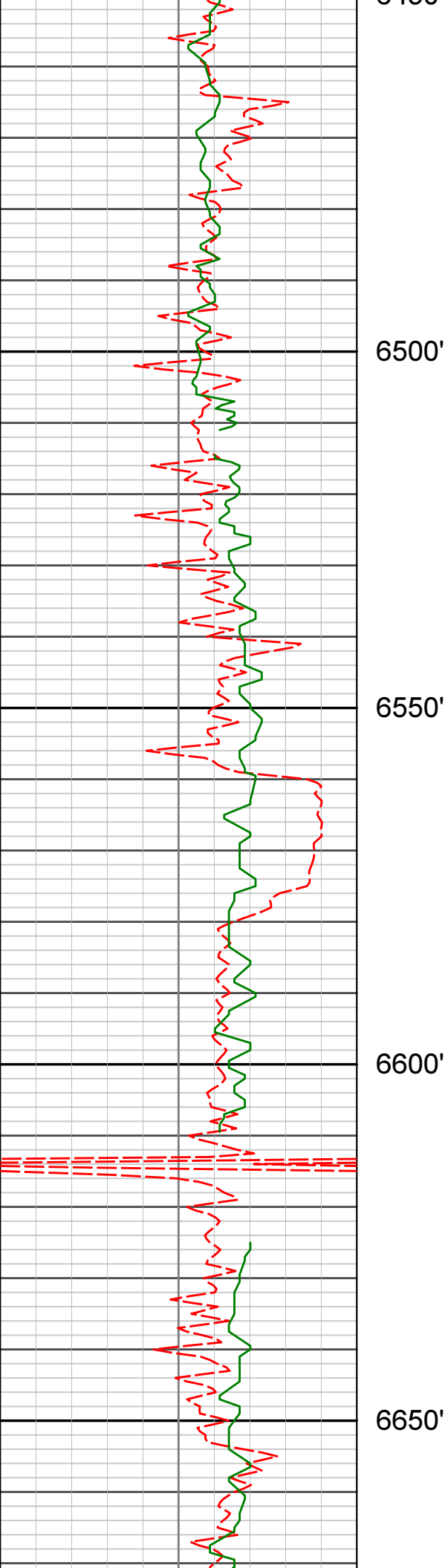
295.15°

5231.85'

-505.83'







6509'

42.53°

290.56°

5426.09'

-537.13'

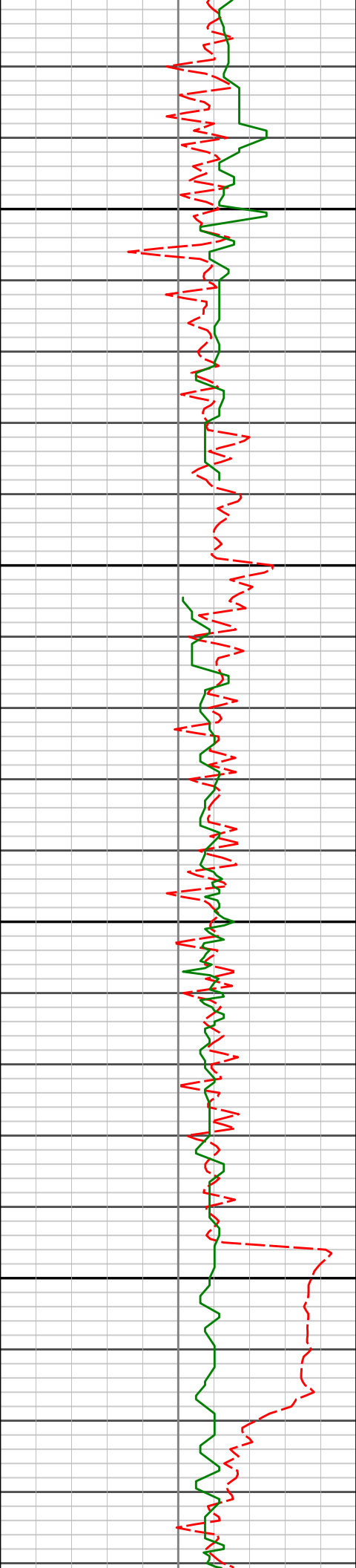
6604'

39.75°

293.73°

5497.63'

-545.72'



6700'

6750'

6800'

6850'

6699'

6794'

6889'

36.04°

33.66°

28.24°

292.60°

292.27°

293.78°

5572.59'

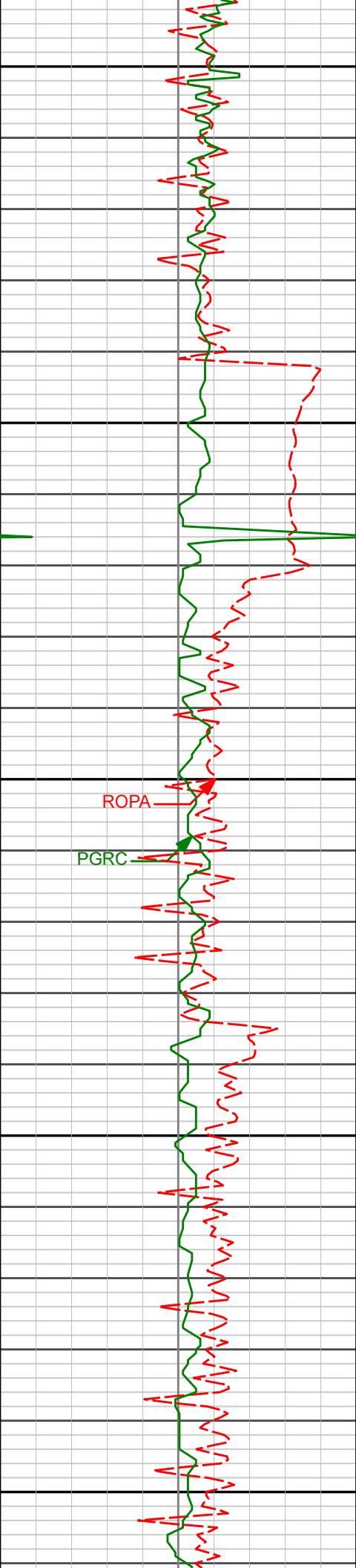
5650.54'

5731.99'

-554.85'

-562.64'

-570.09'



6900'

6950'

7000'

7050'

7100'

6984'

22.08°

296.52°

5817.93'

-577.65'

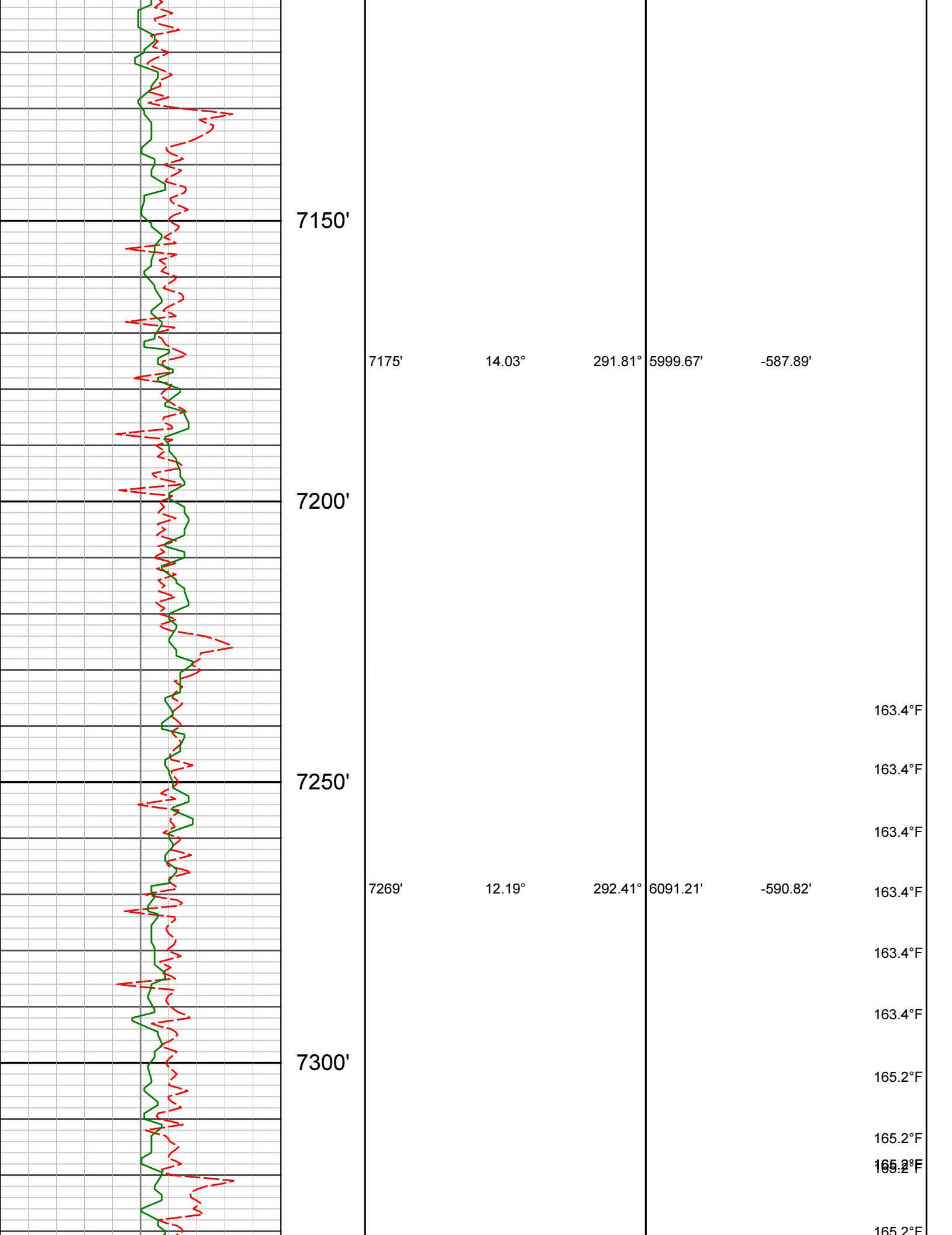
7079'

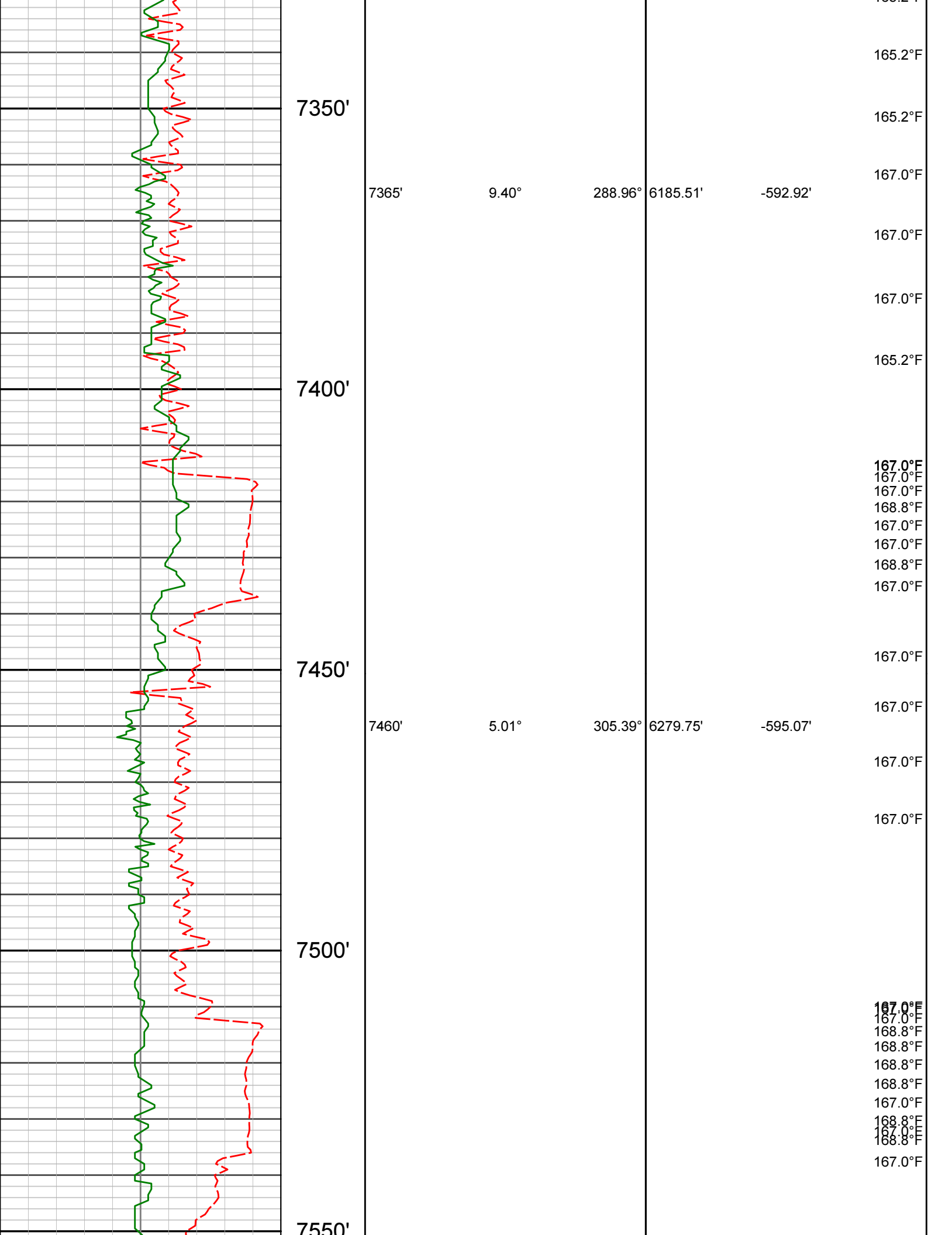
17.52°

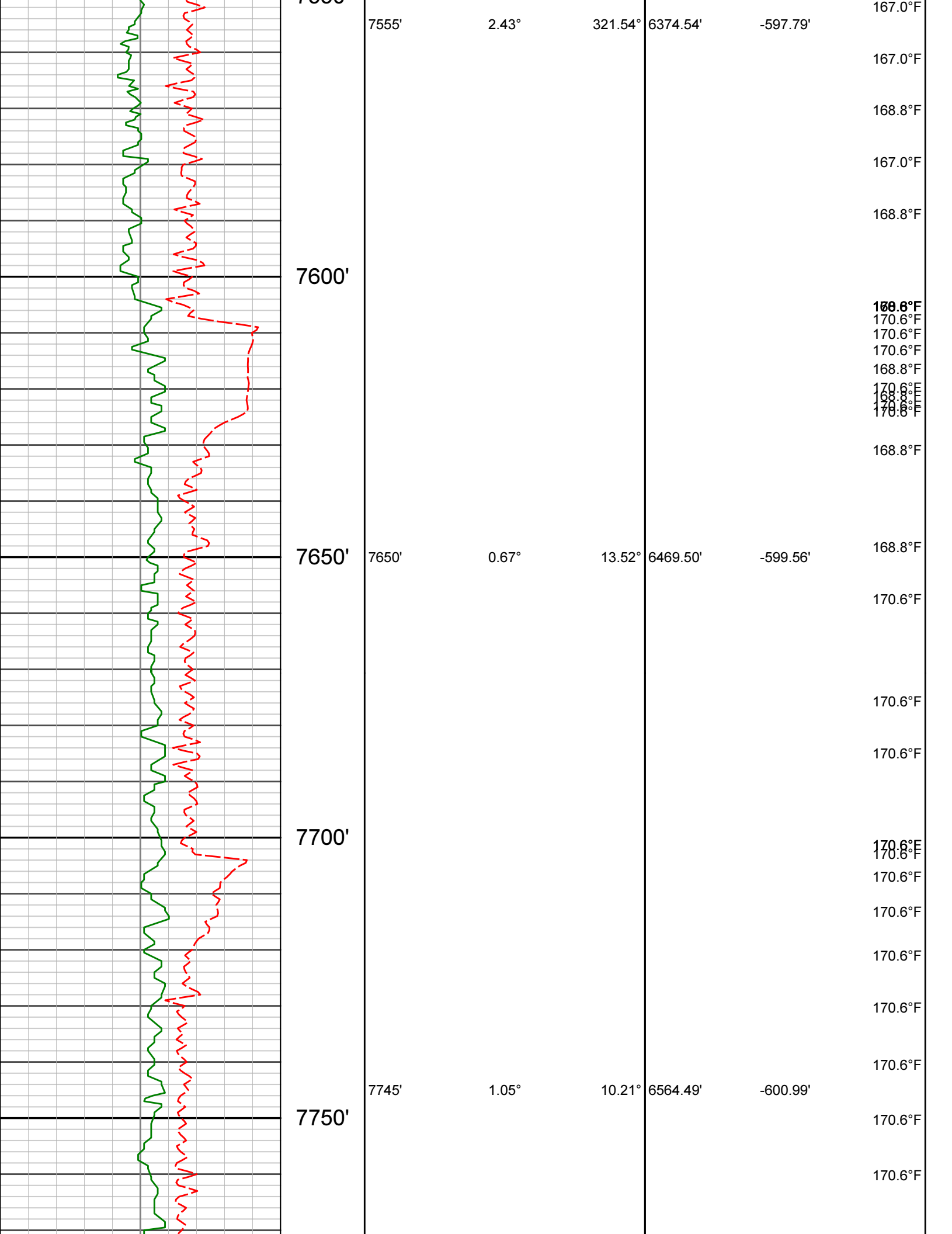
293.94°

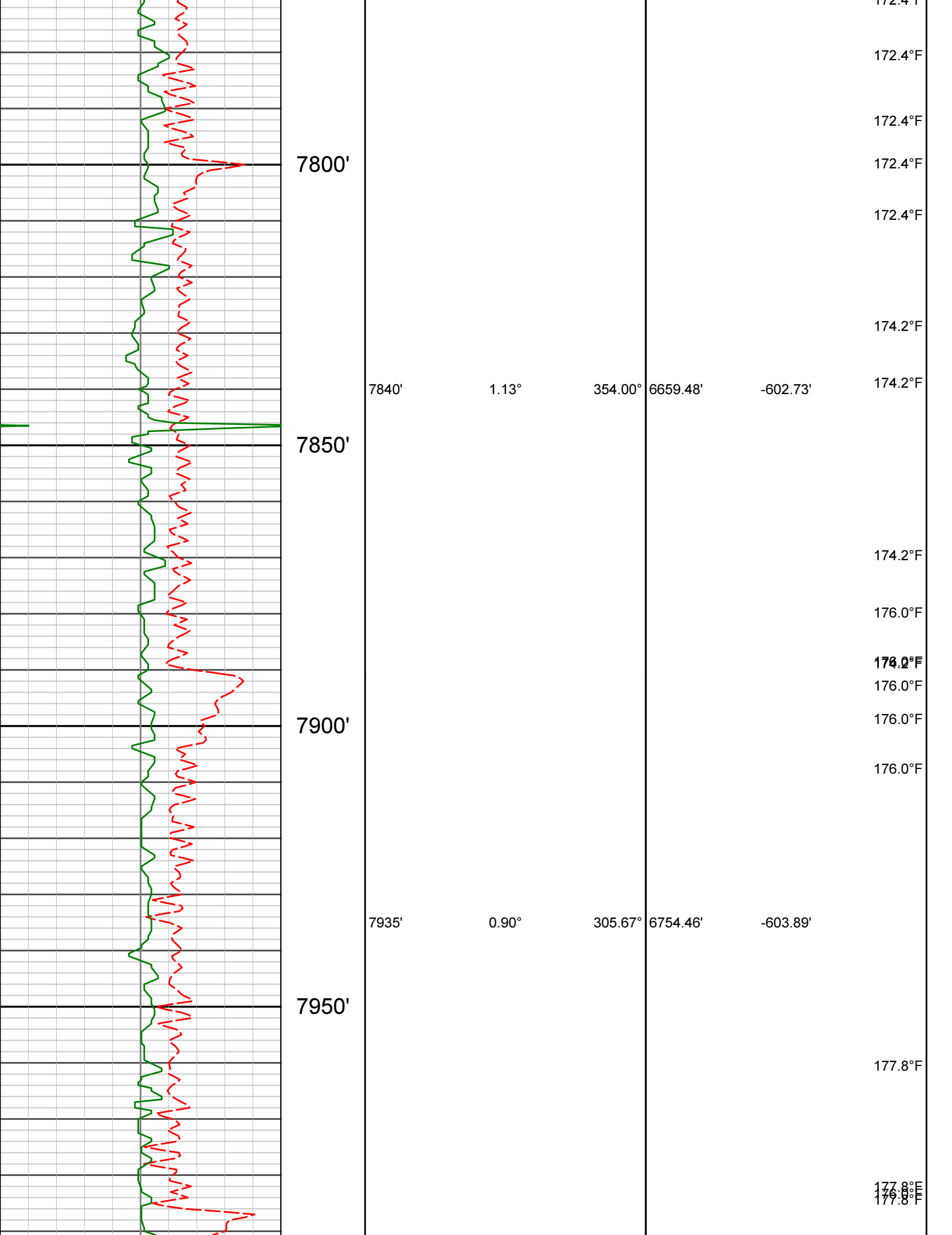
5907.30'

-583.89'

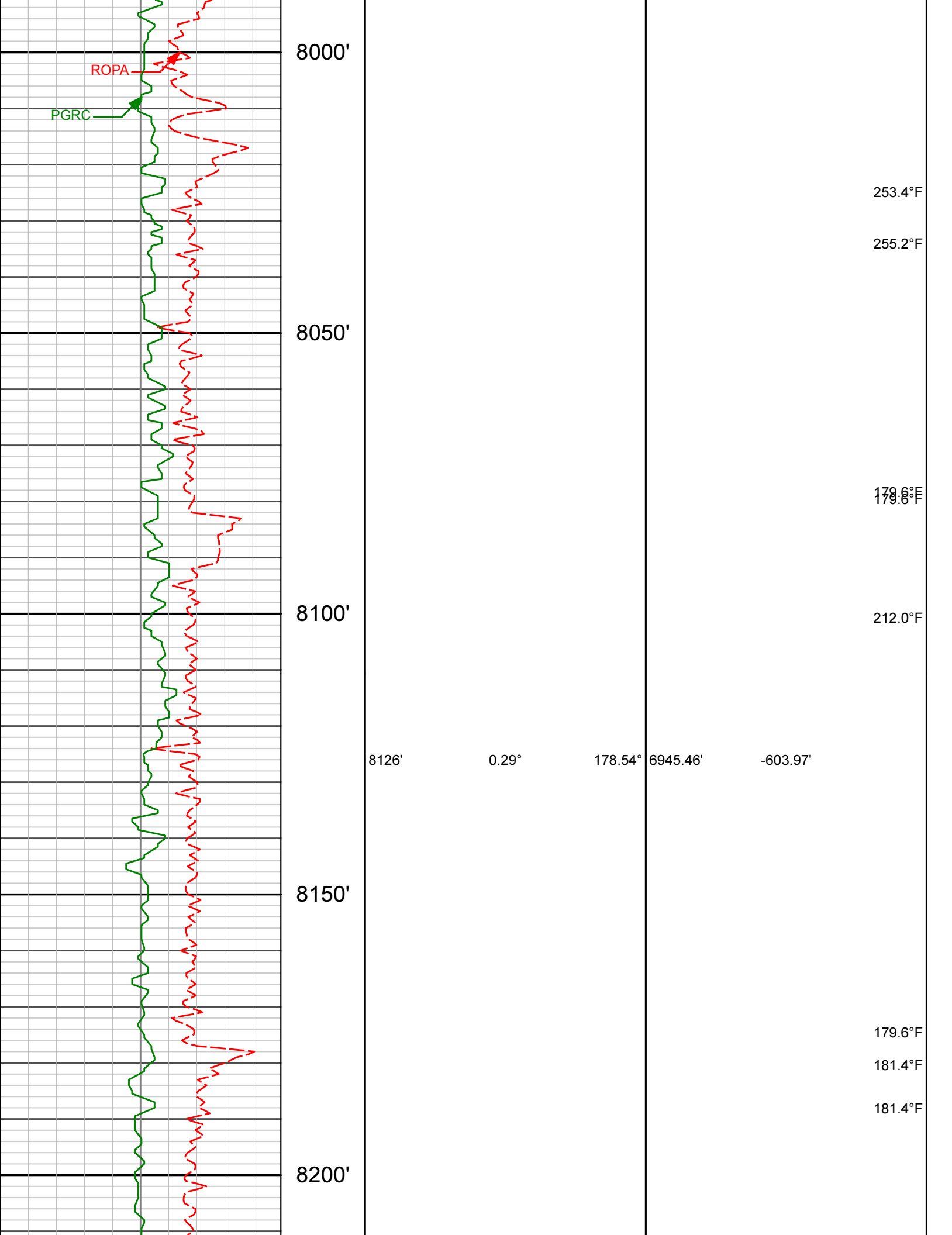


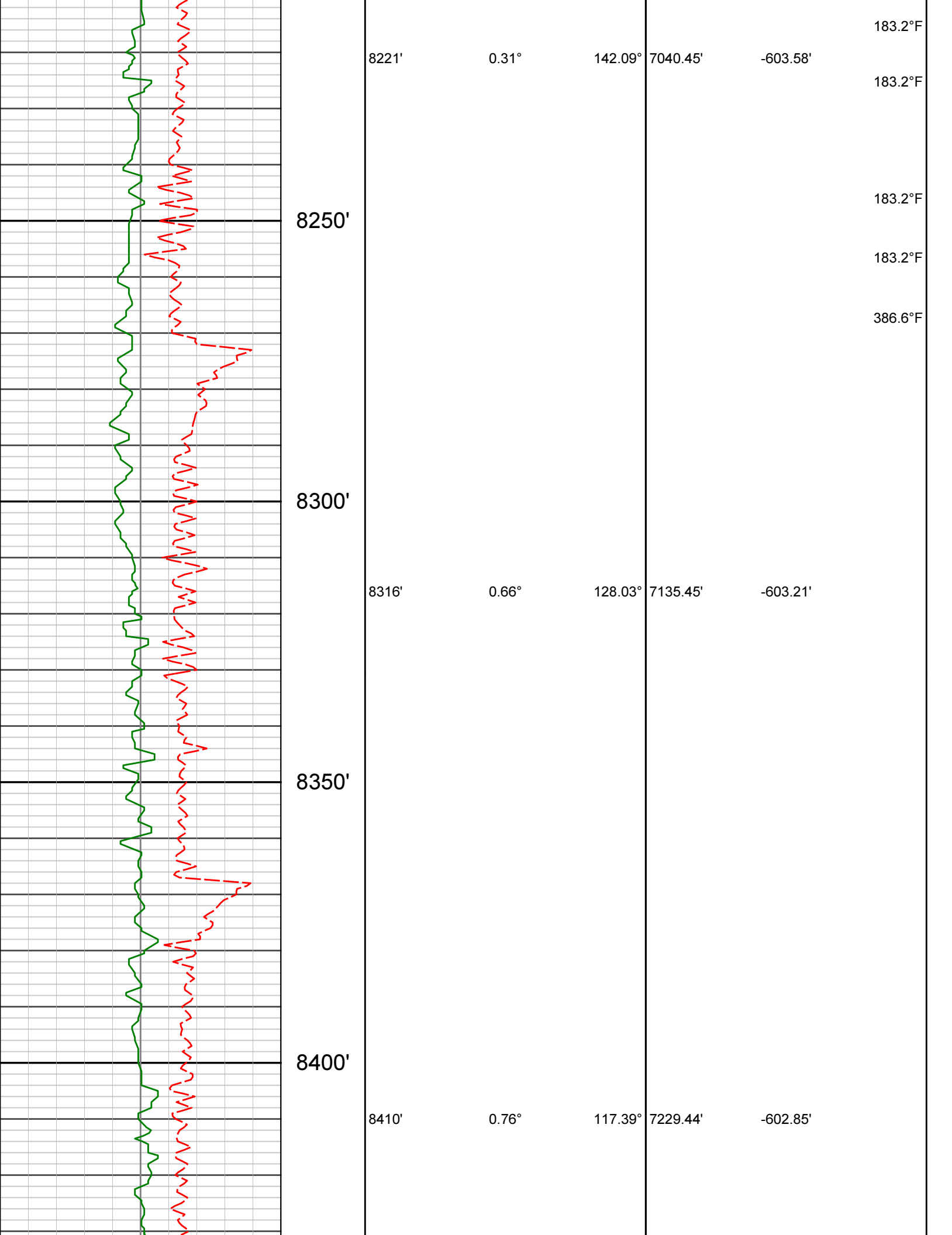


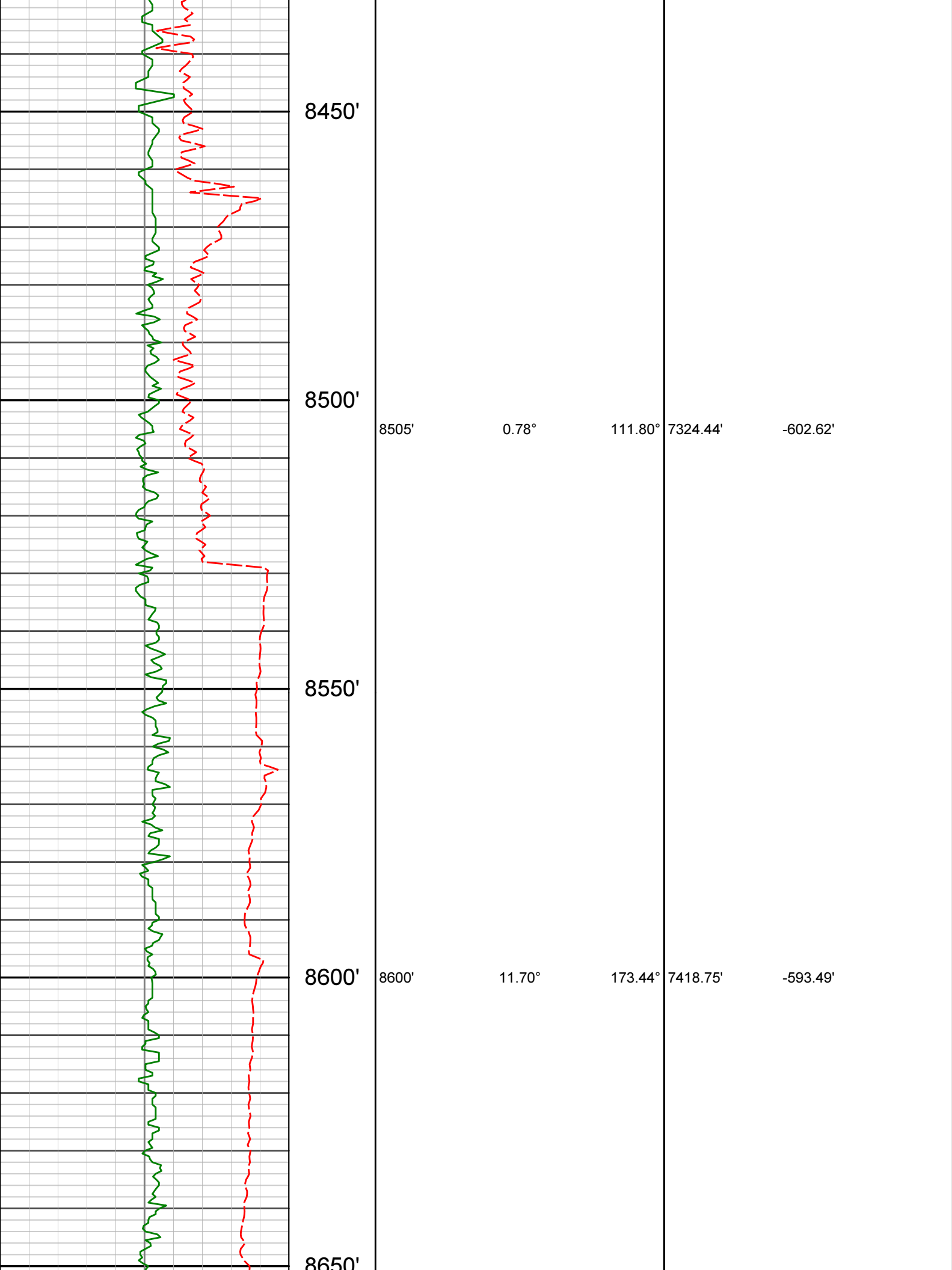


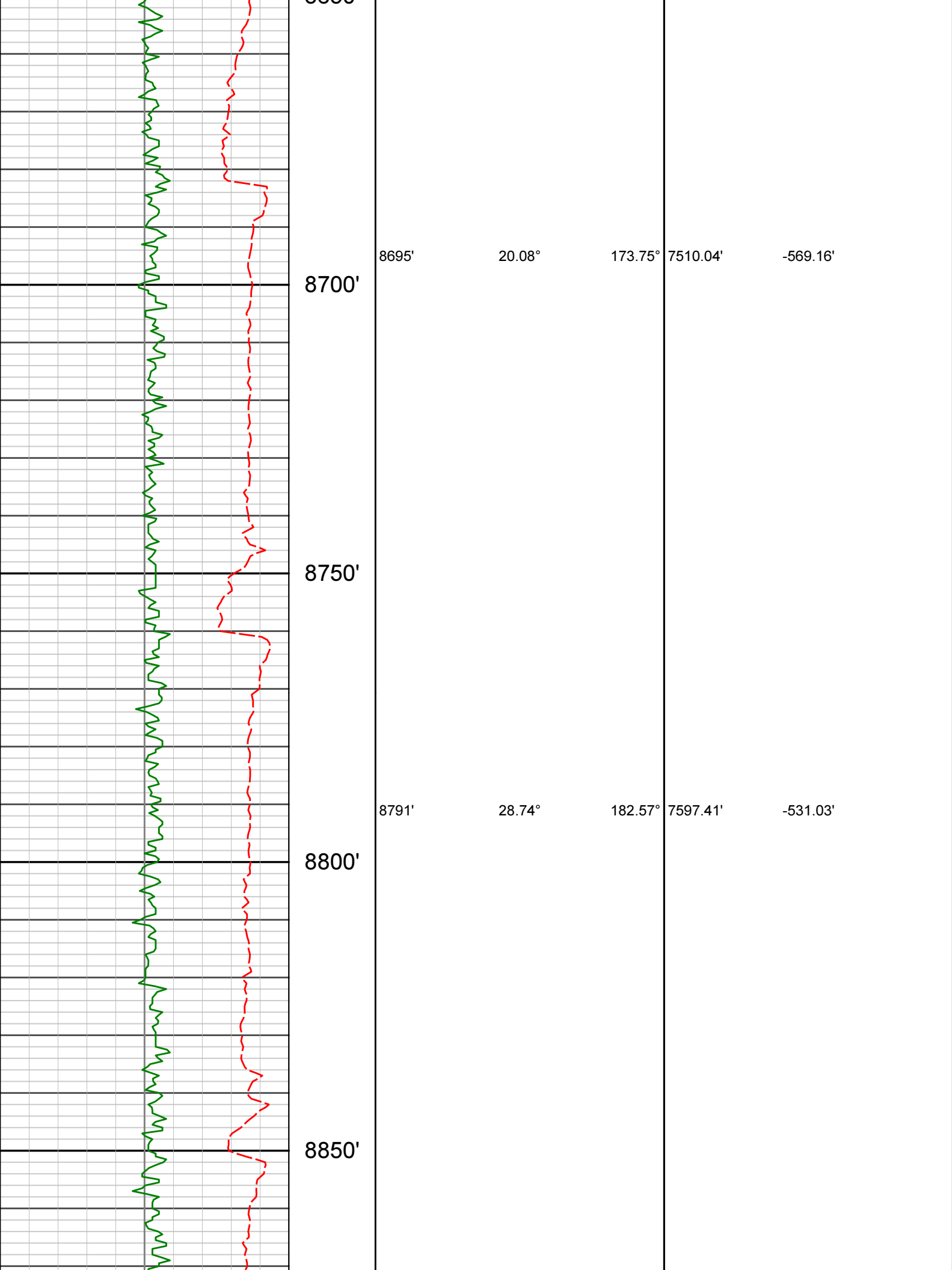


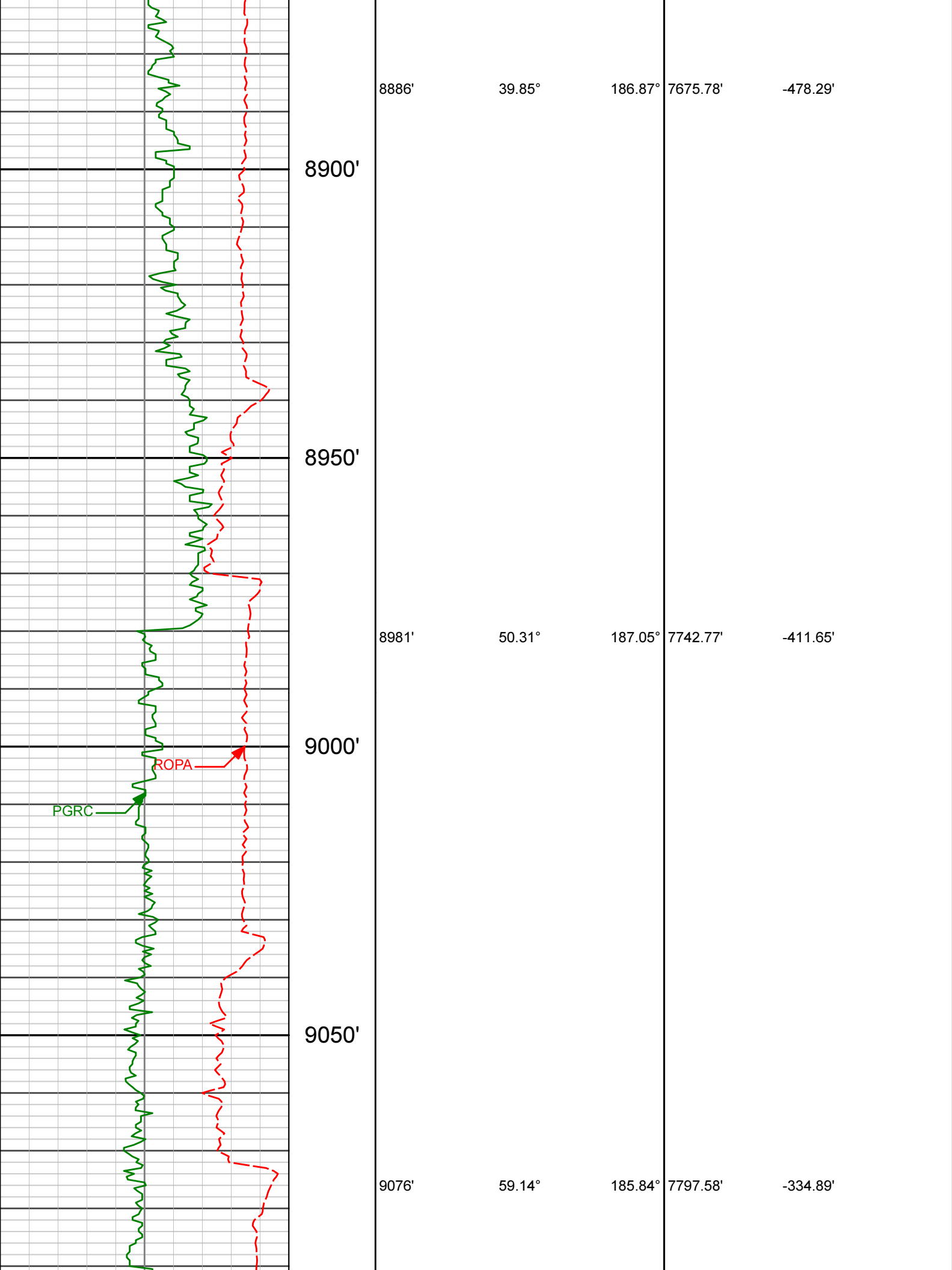


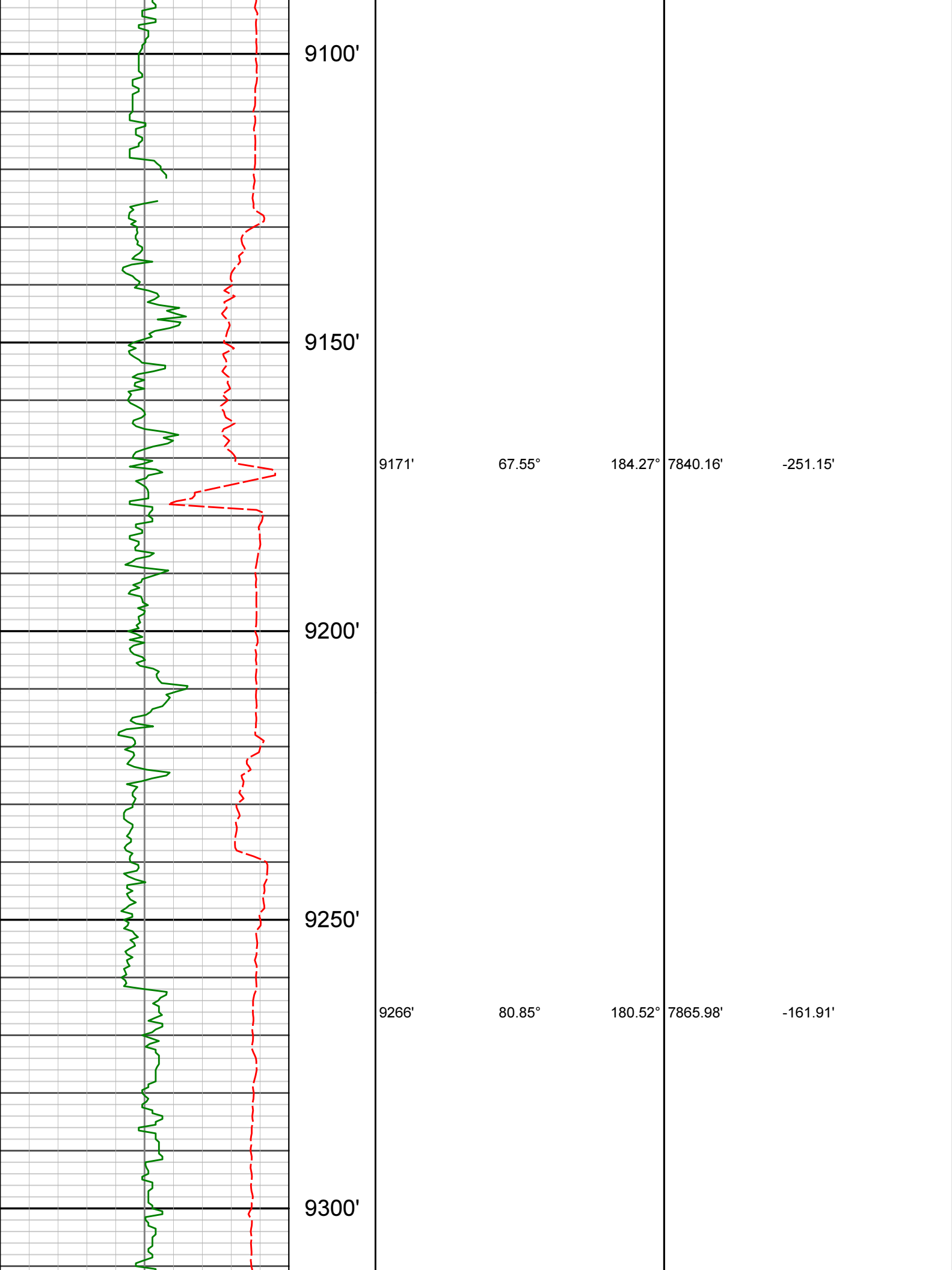


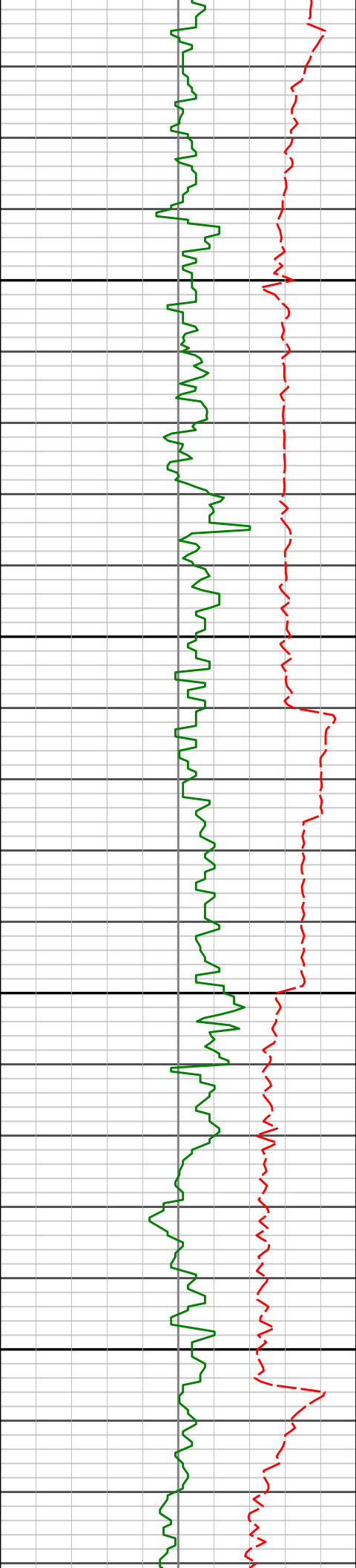












9350'

9361'

91.04°

178.49°

7872.69'

-70.36'

9400'

9450'

9456'

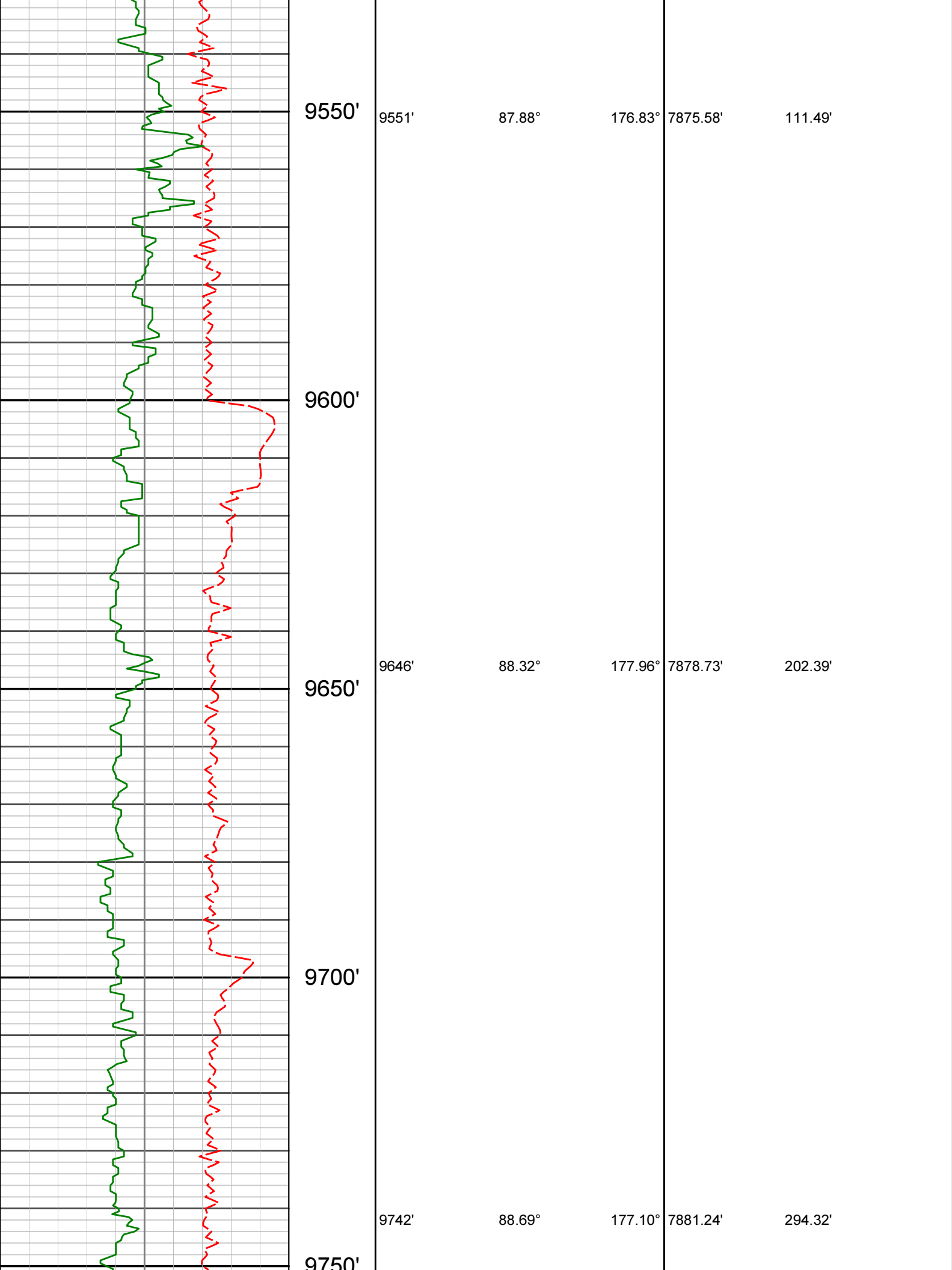
88.79°

177.15°

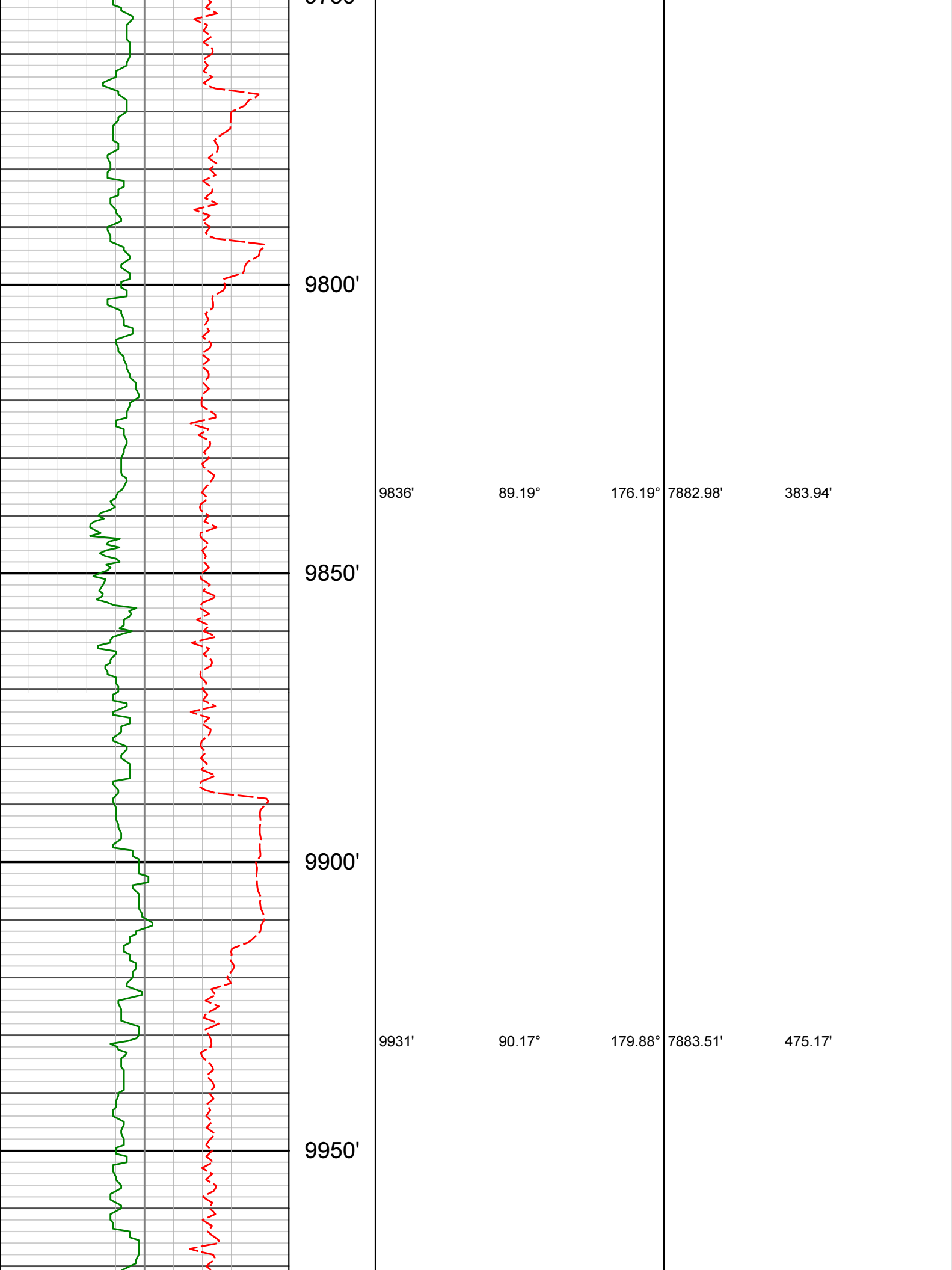
7872.83'

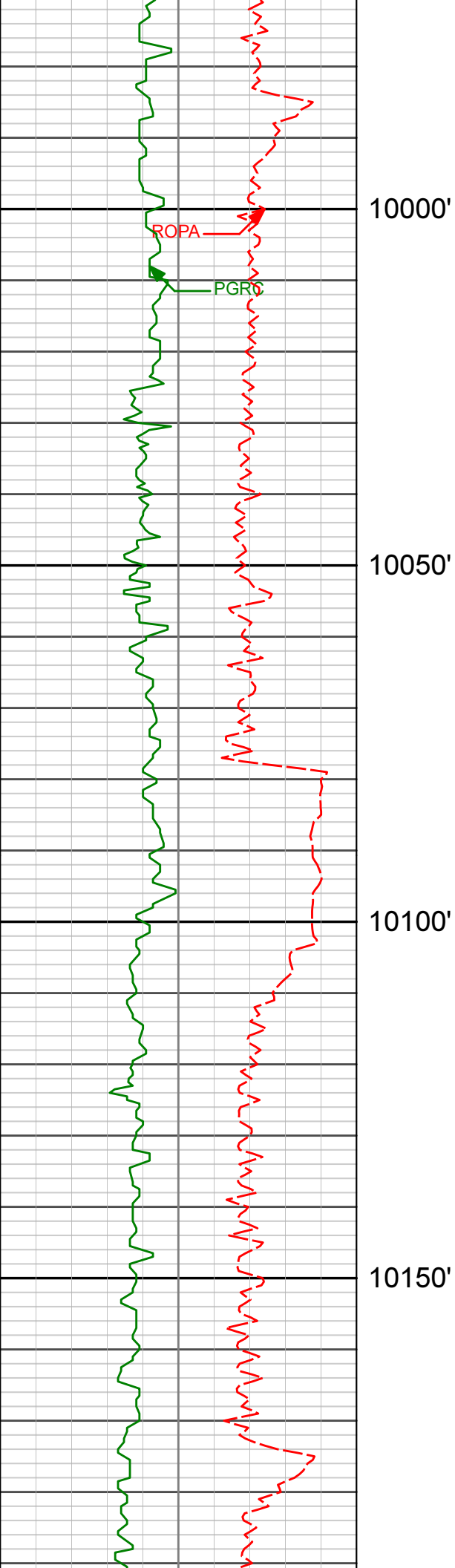
20.78'

9500'

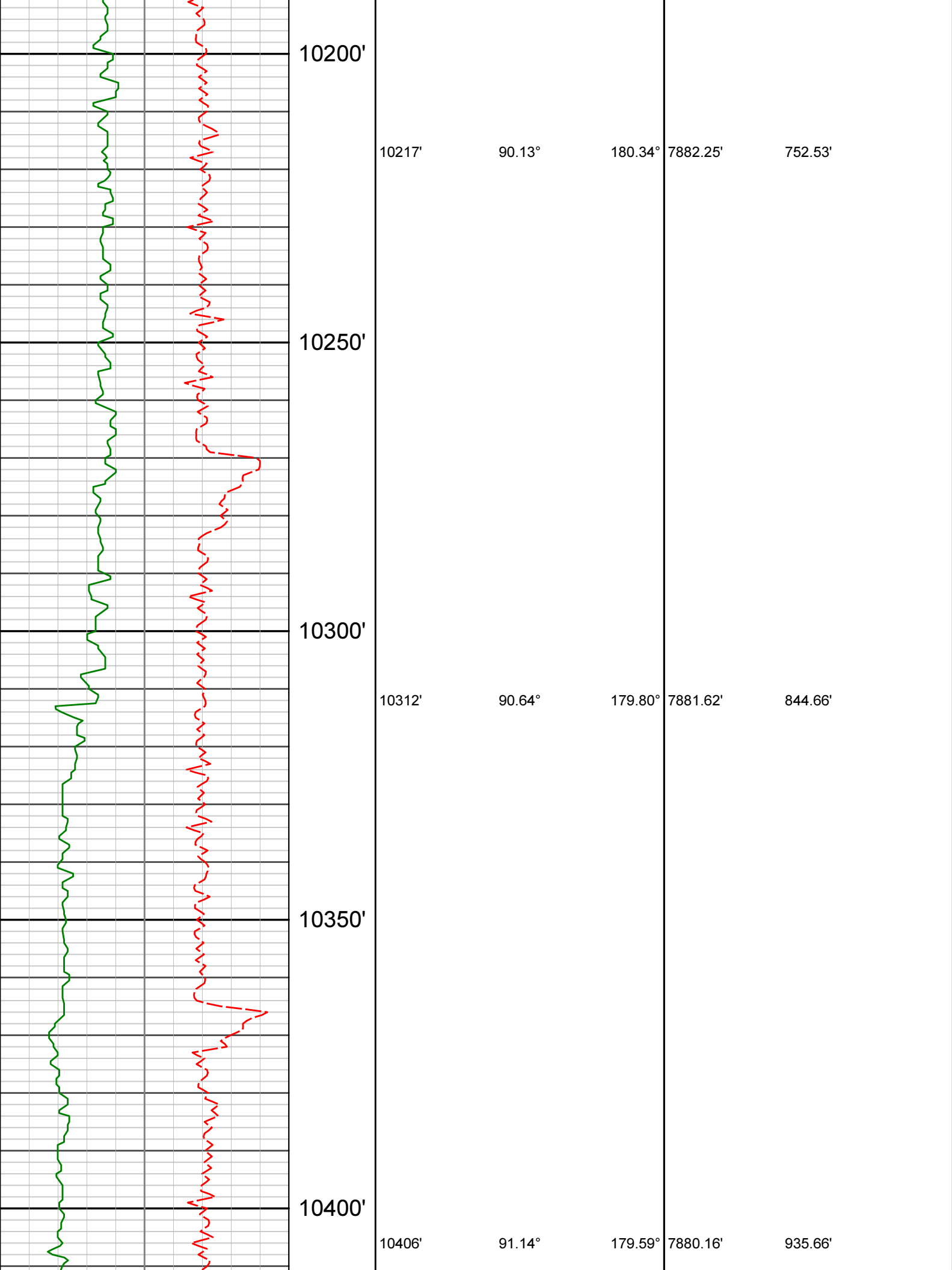


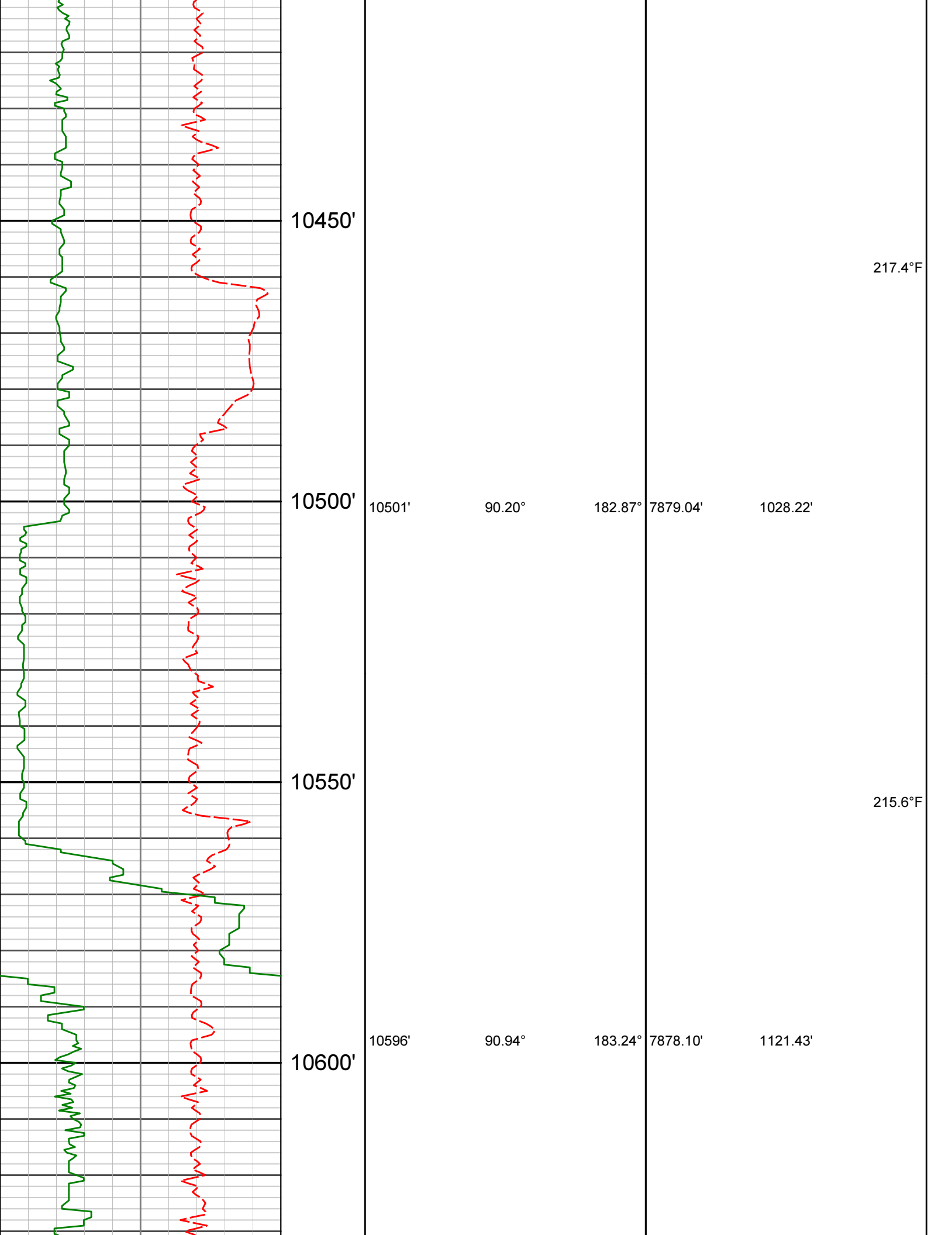


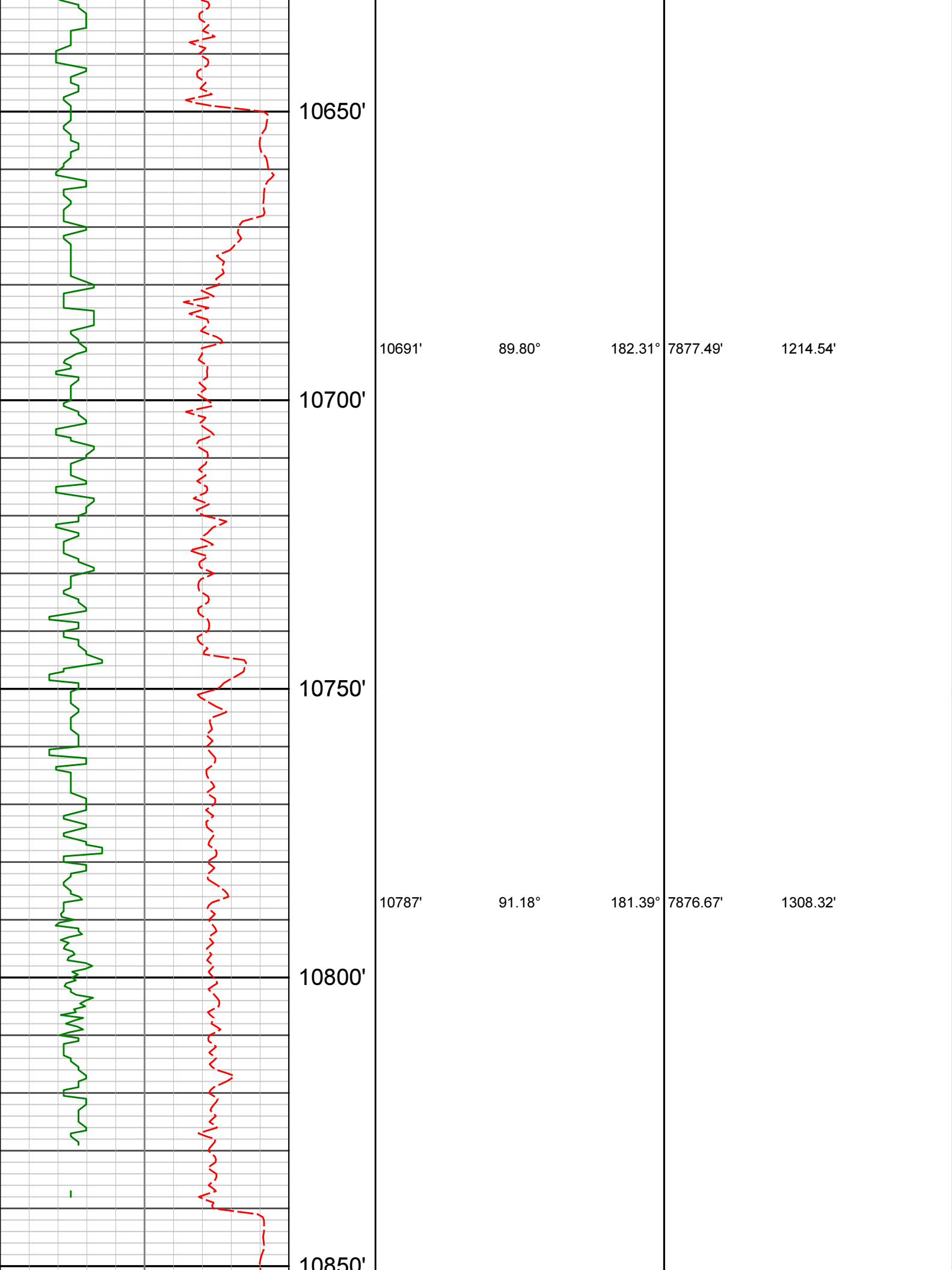


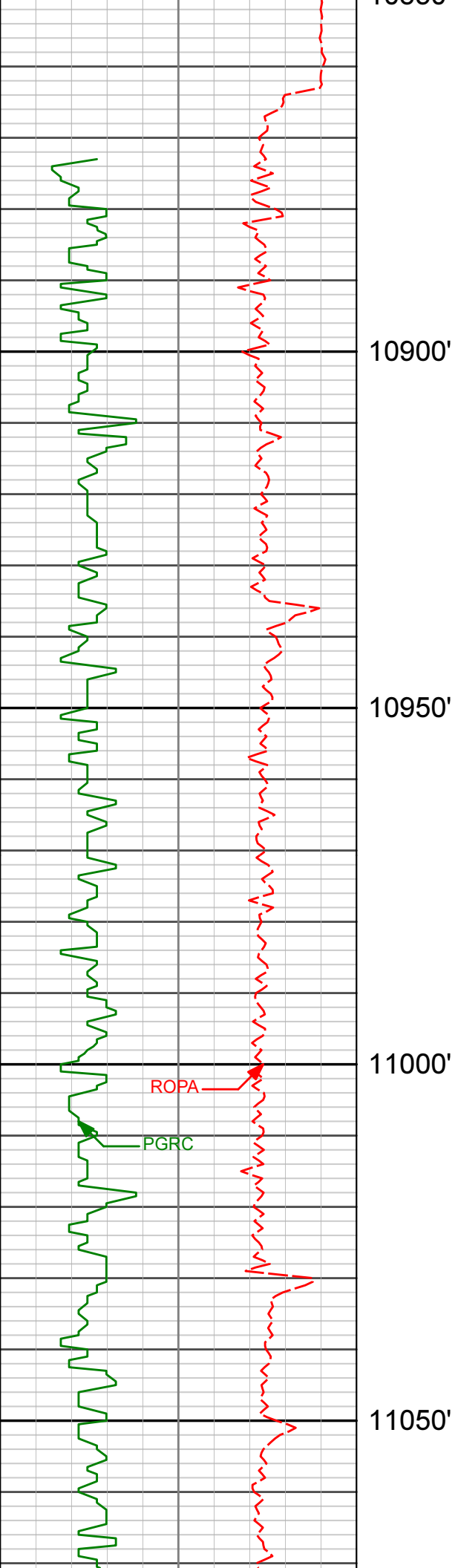


10026'	90.97°	178.78°	7882.57'	566.98'
10122'	89.63°	181.43°	7882.06'	660.09'









10882'

88.62°

178.76°

7876.84'

1400.43'

10900'

10950'

10976'

88.46°

179.81°

7879.23'

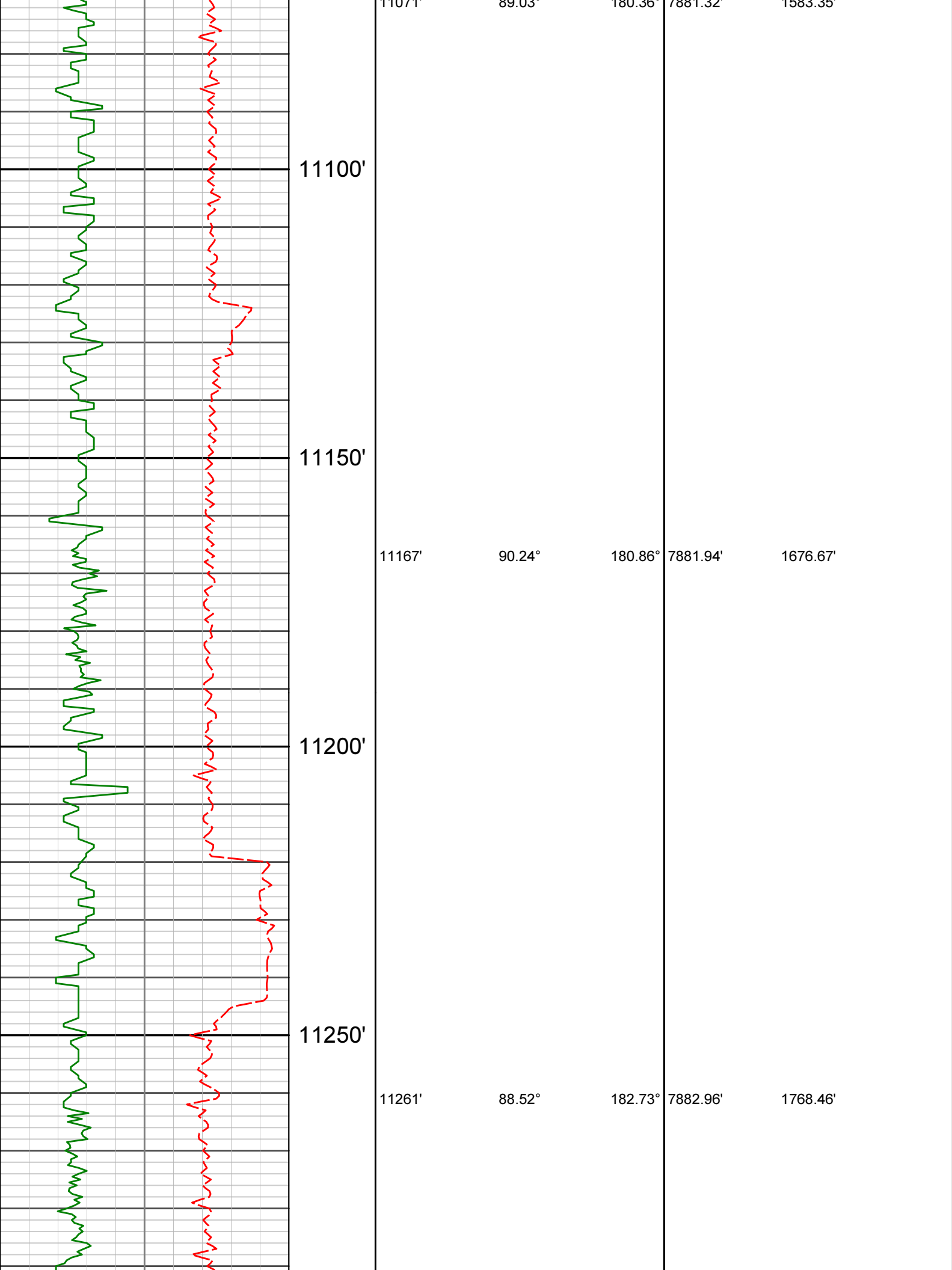
1491.24'

11000'

ROPA

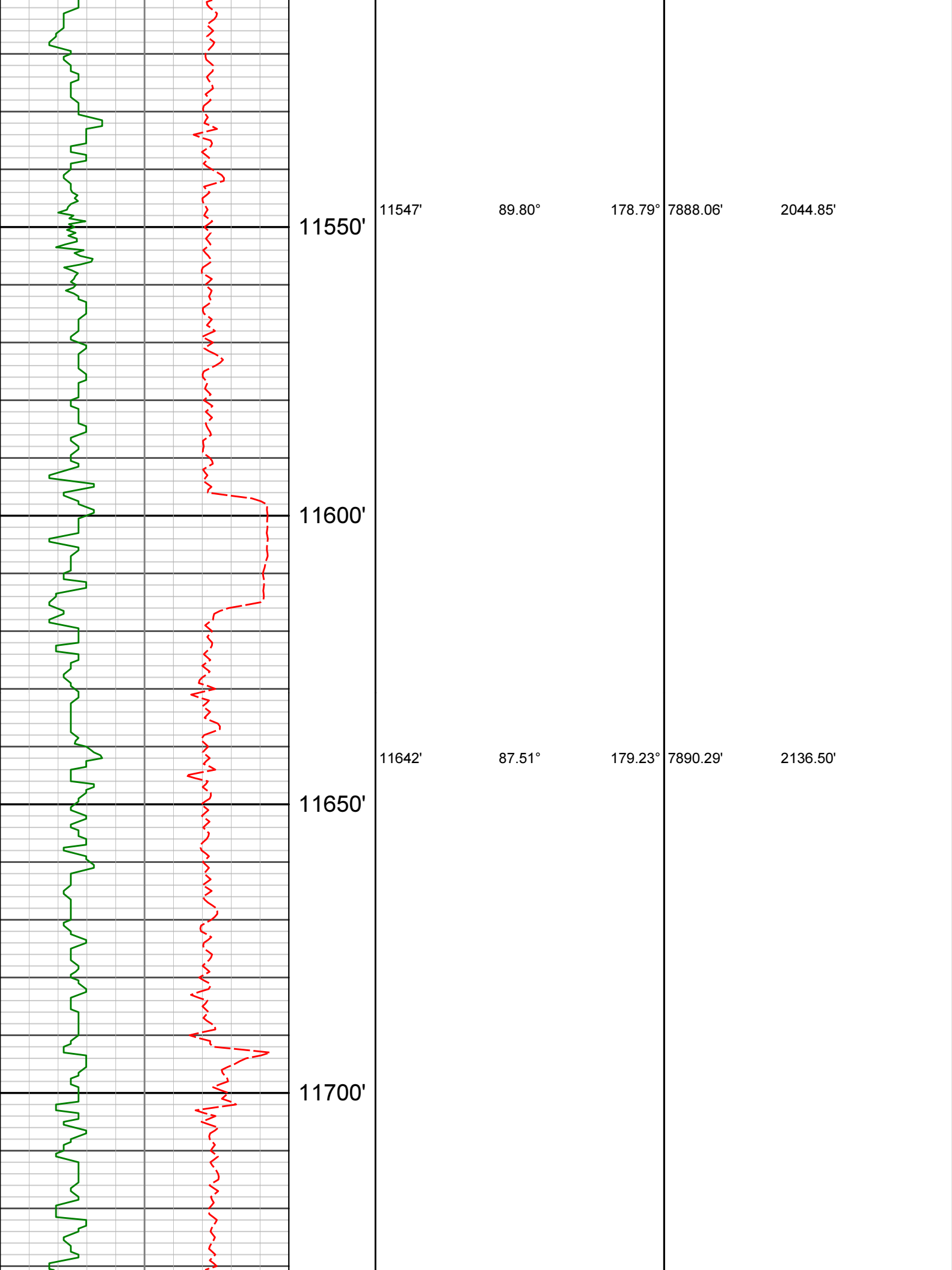
PGRC

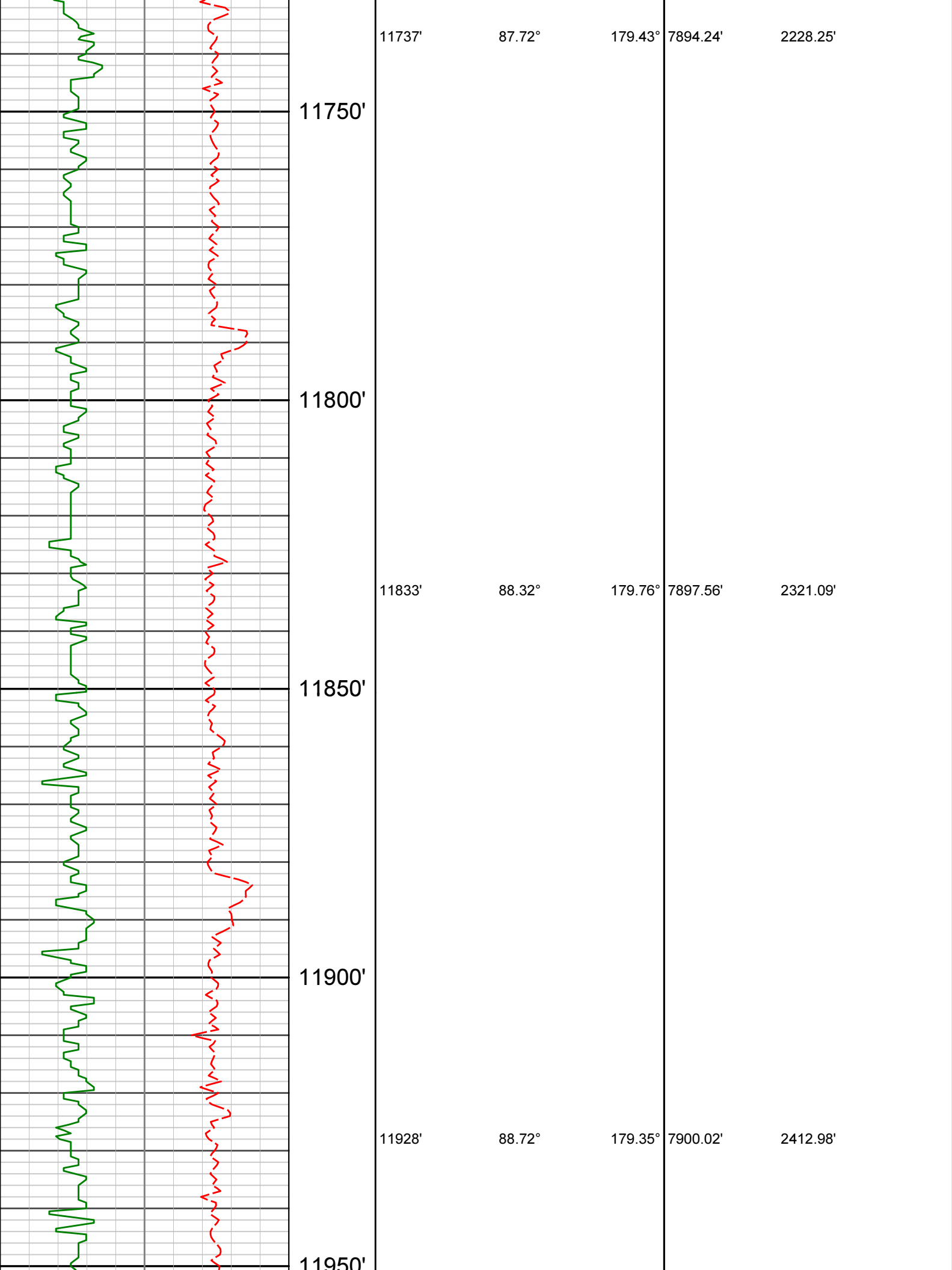
11050'

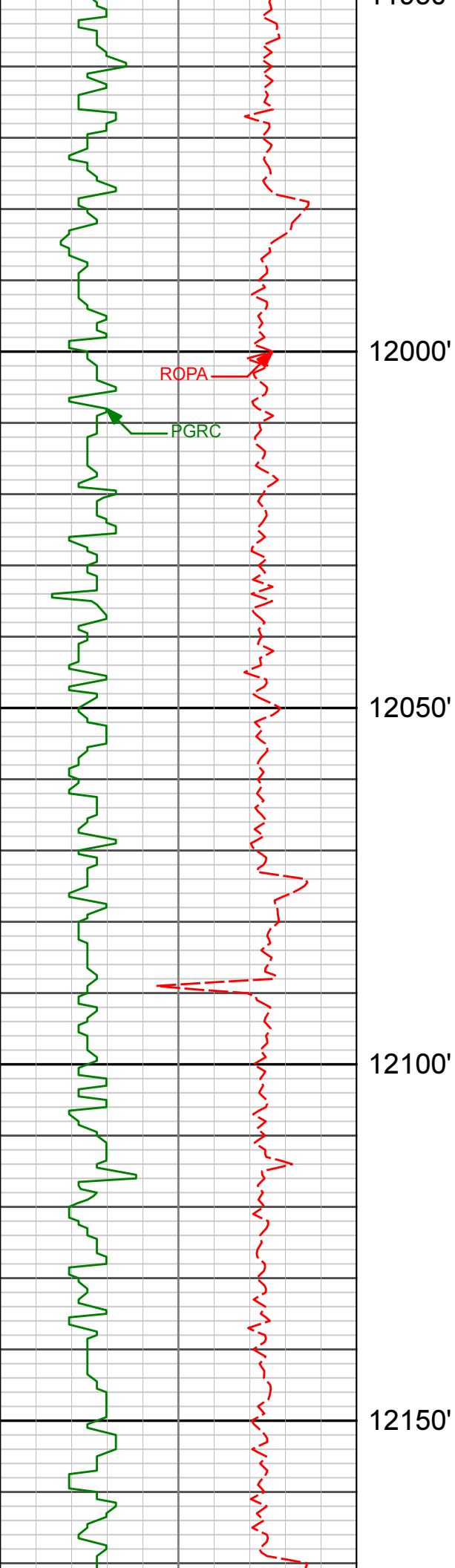






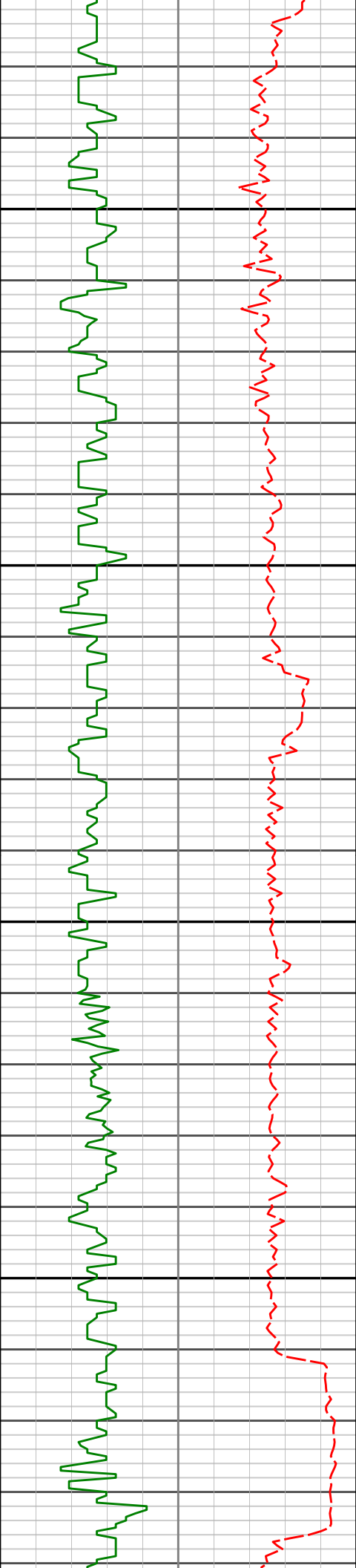






12023'	89.49°	178.98°	7901.50'	2504.72'
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12119'	89.87°	178.95°	7902.03'	2597.35'
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12200'

12214'

90.60°

178.00°

7901.64'

2688.80'

12250'

12300'

12310'

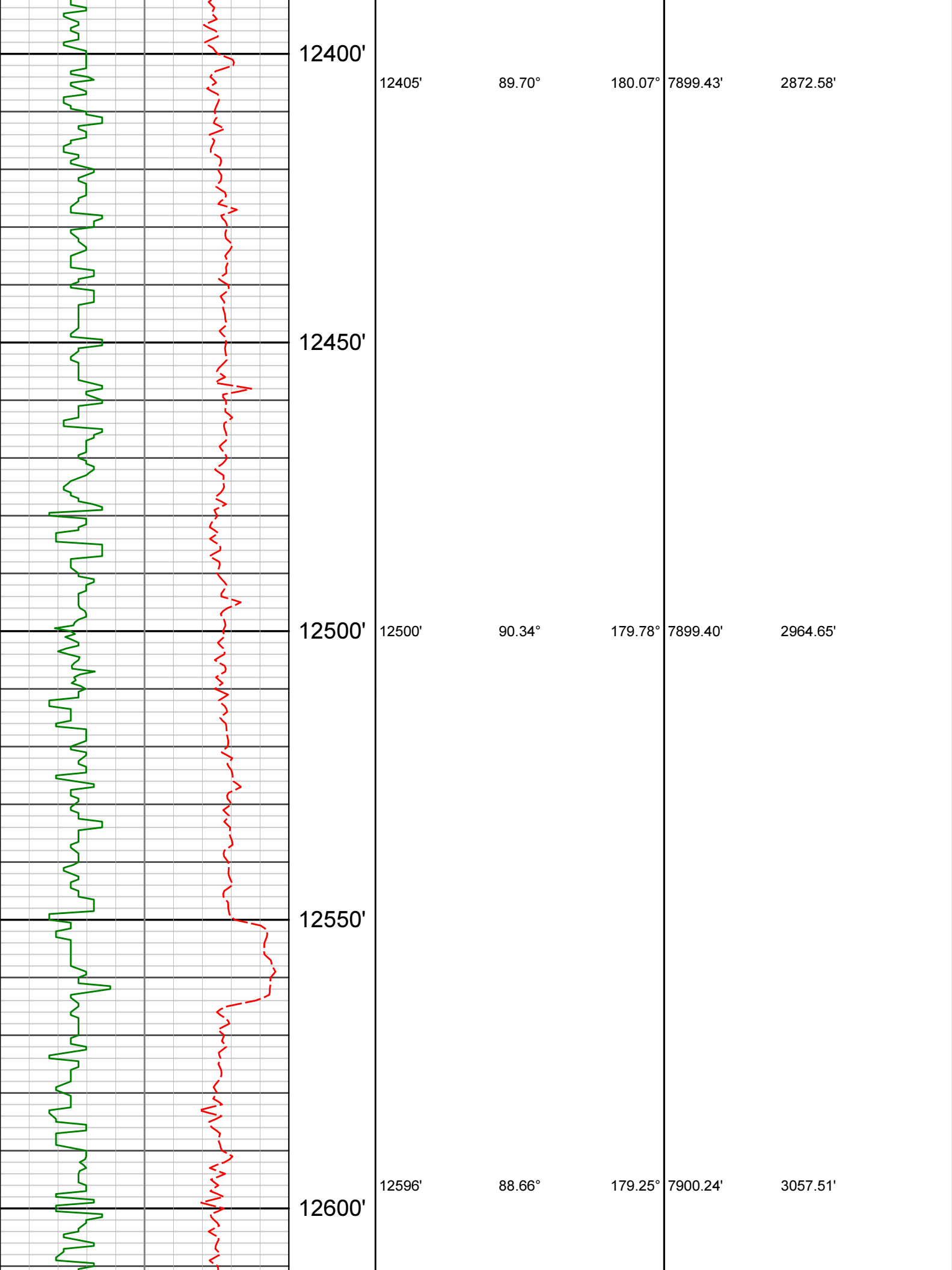
91.18°

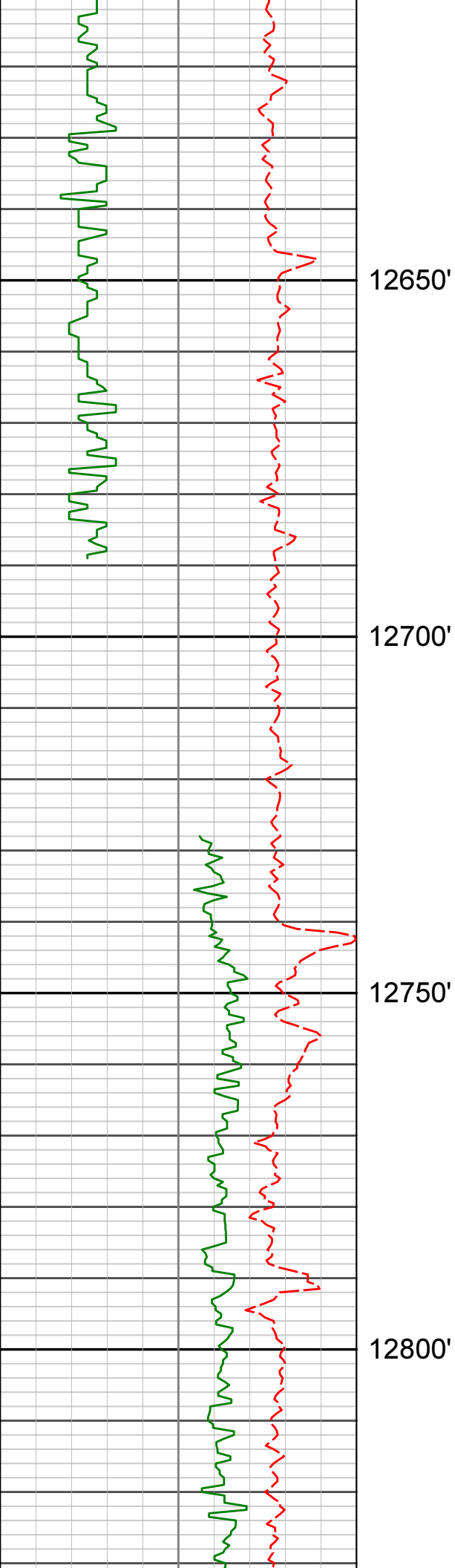
177.82°

7900.15'

2780.94'

12350'





12727'

88.77°

179.43°

7903.19'

3184.11'

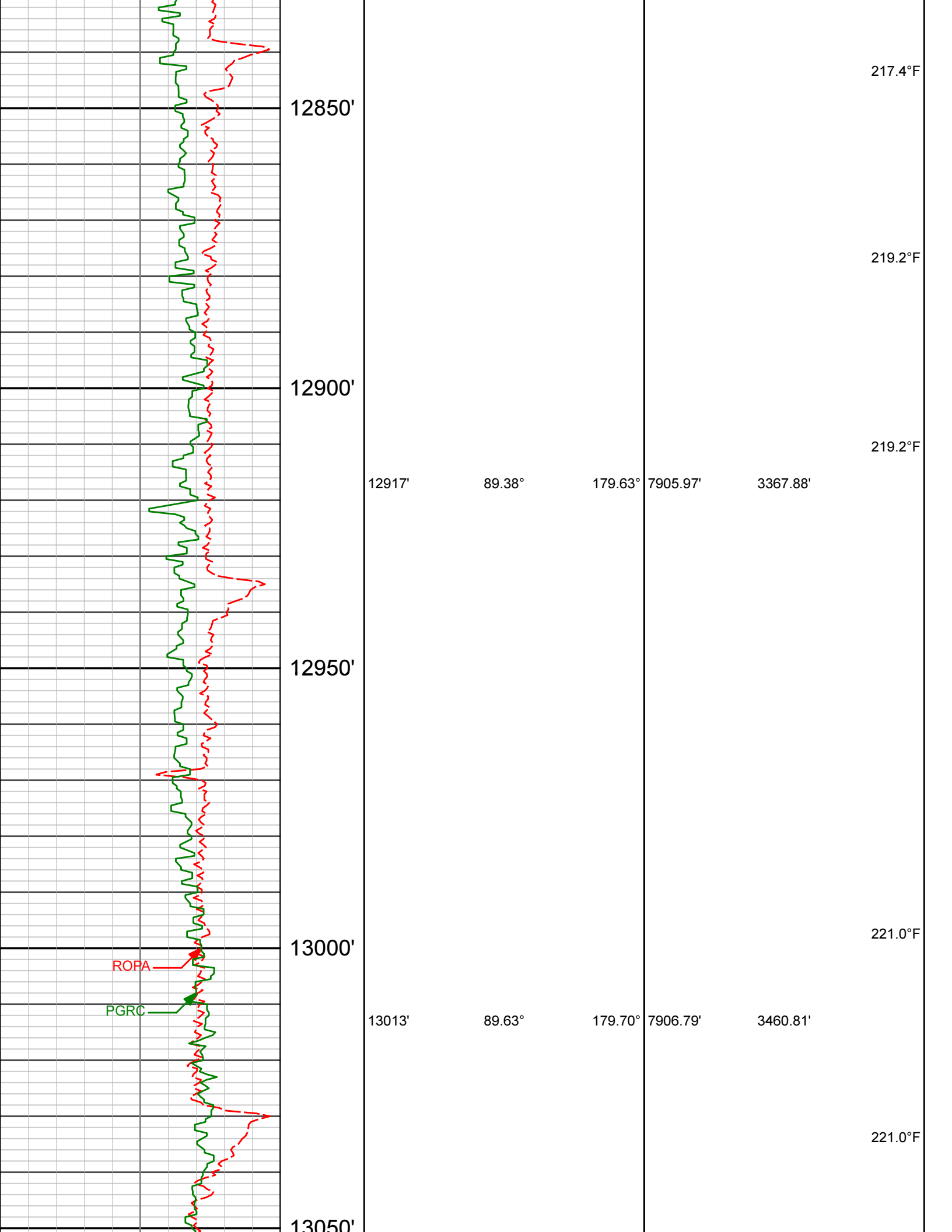
12824'

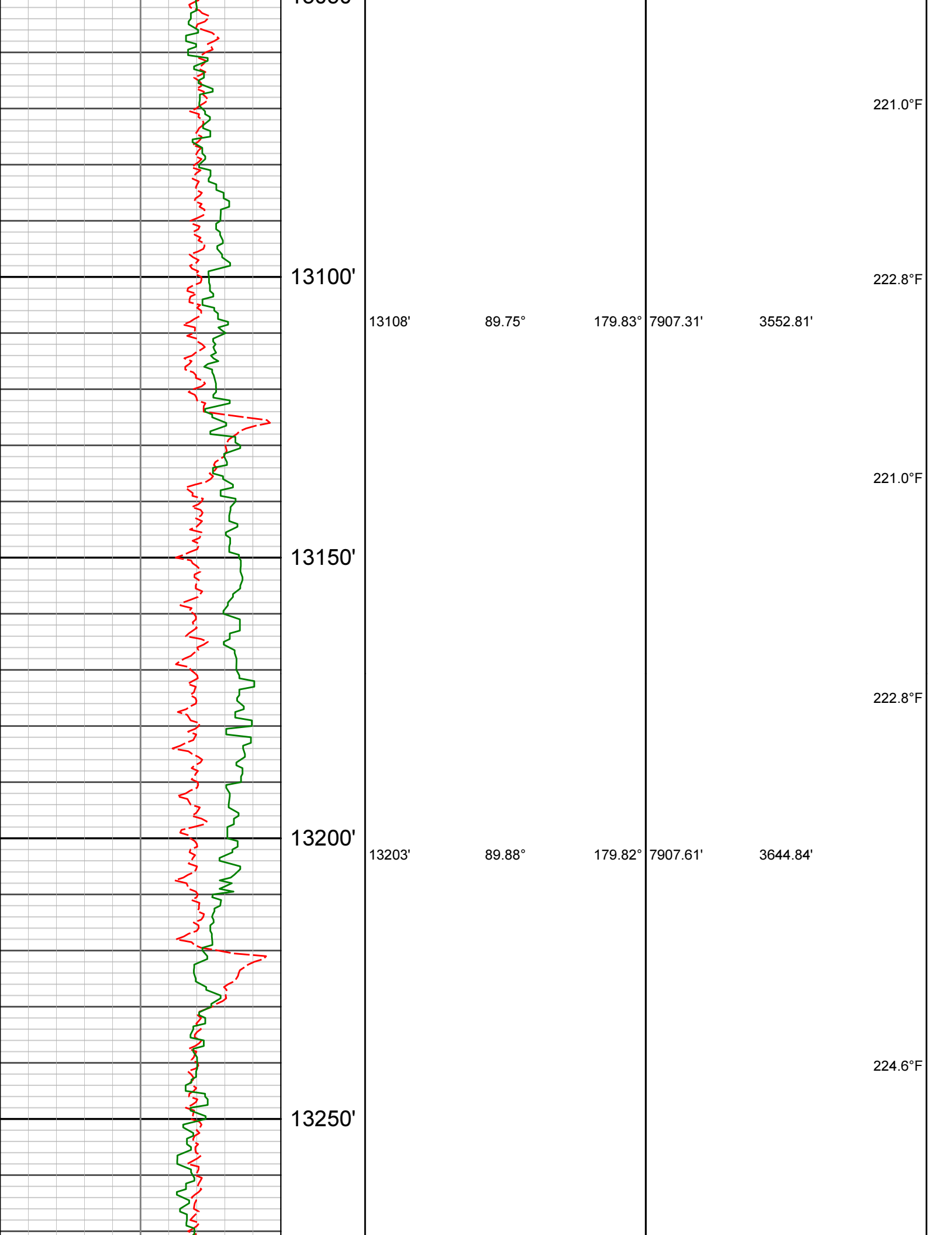
89.26°

179.48°

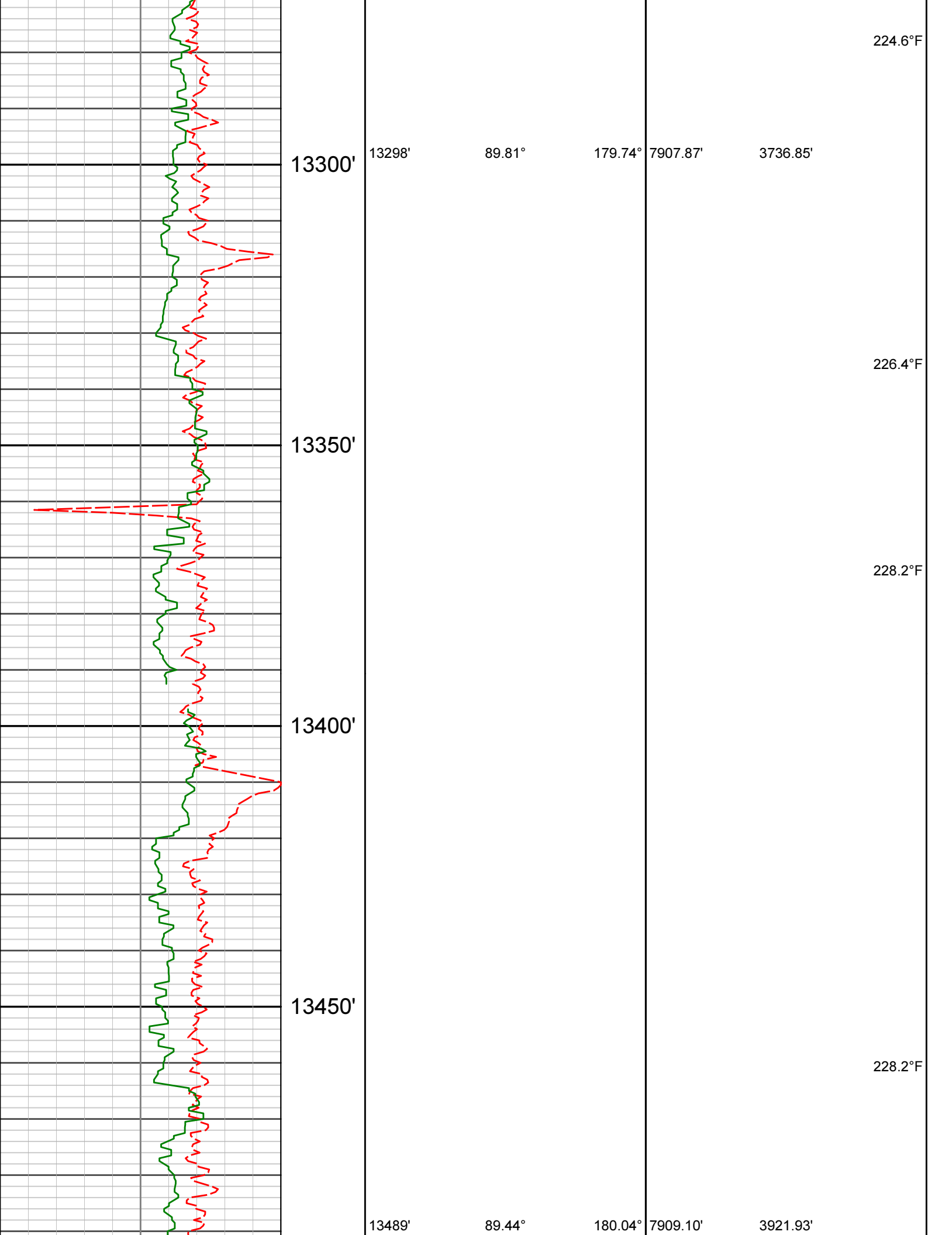
7904.86'

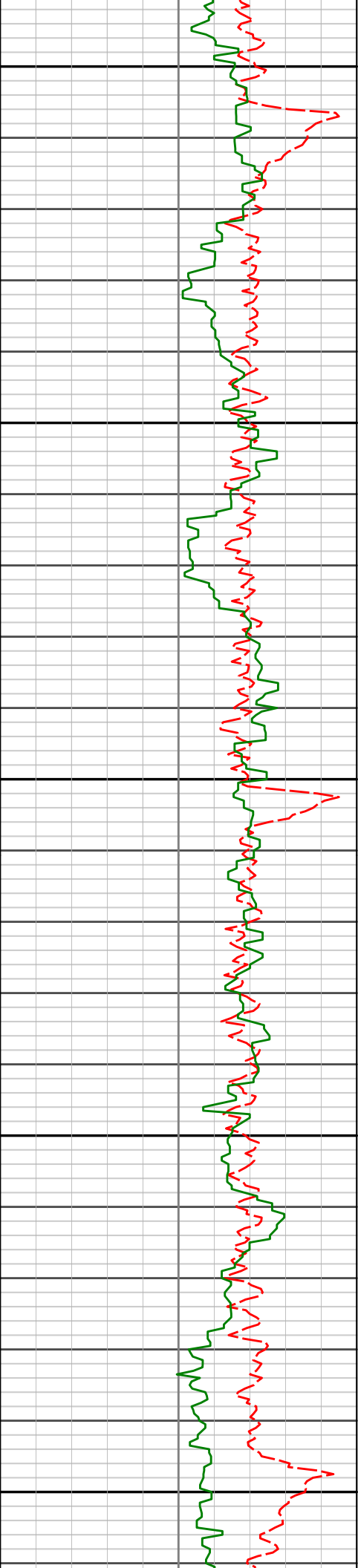
3277.90'











13500'

13550'

13600'

13650'

13700'

13585'

13680'

90.00°

90.00°

180.16°

180.18°

7909.57'

7909.57'

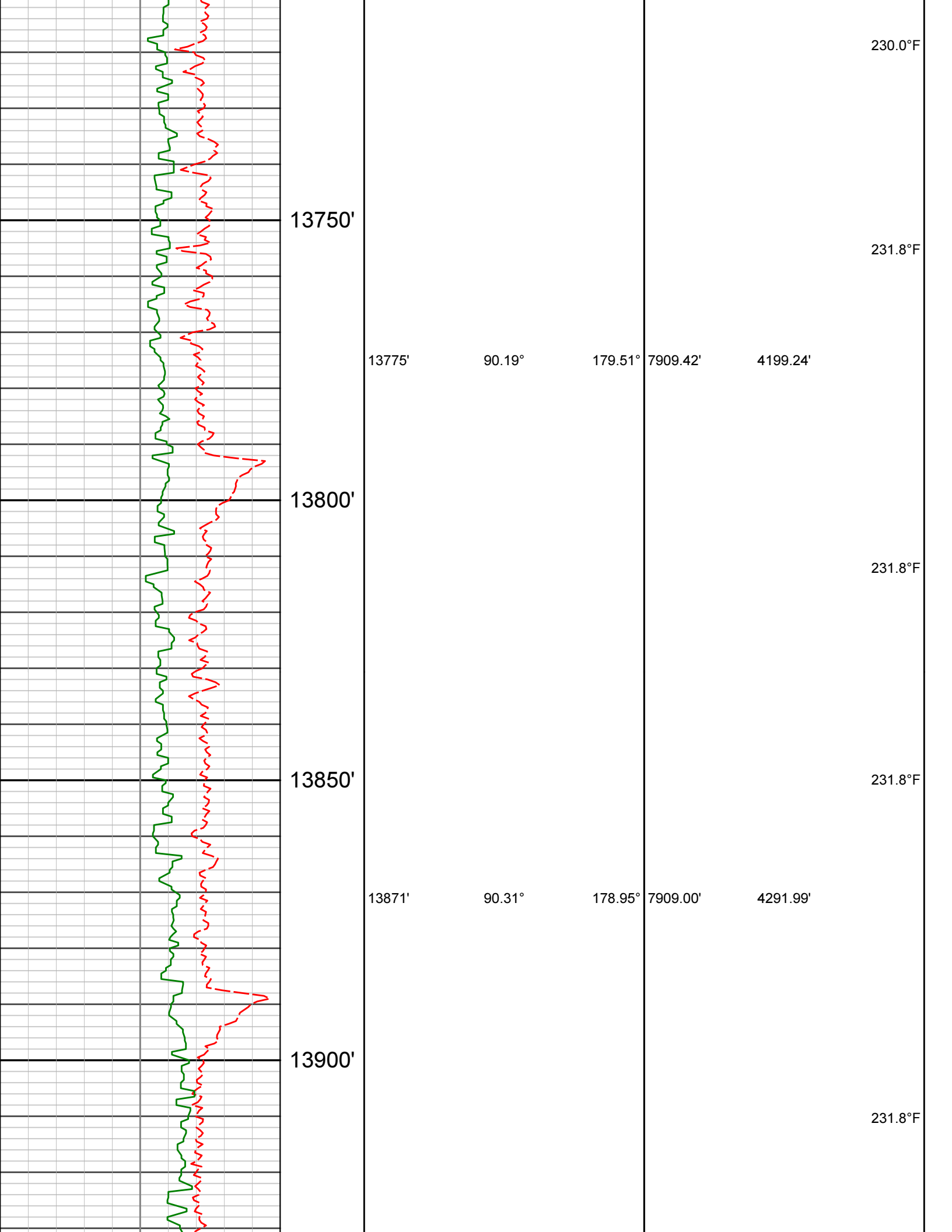
4015.04'

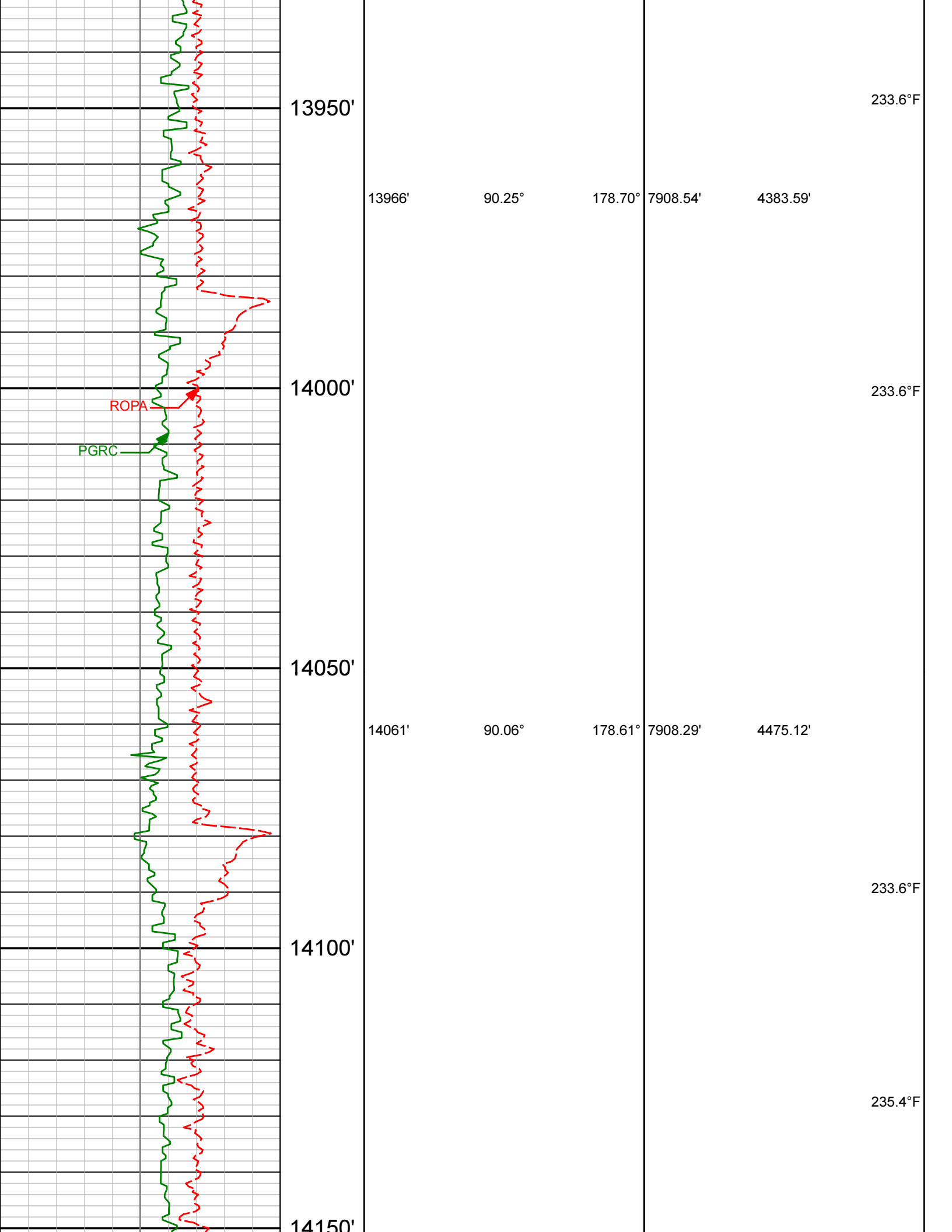
4107.21'

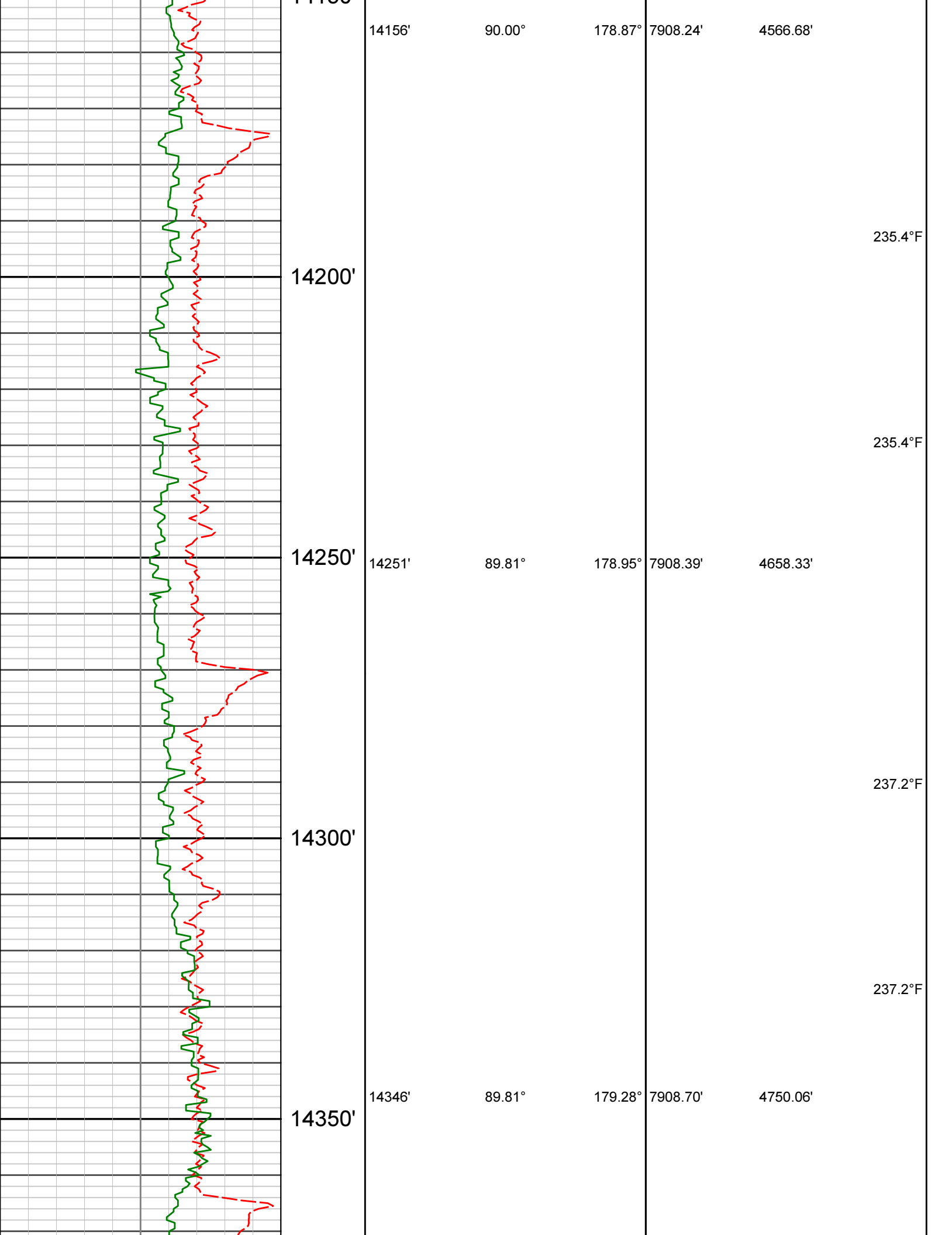
228.2°F

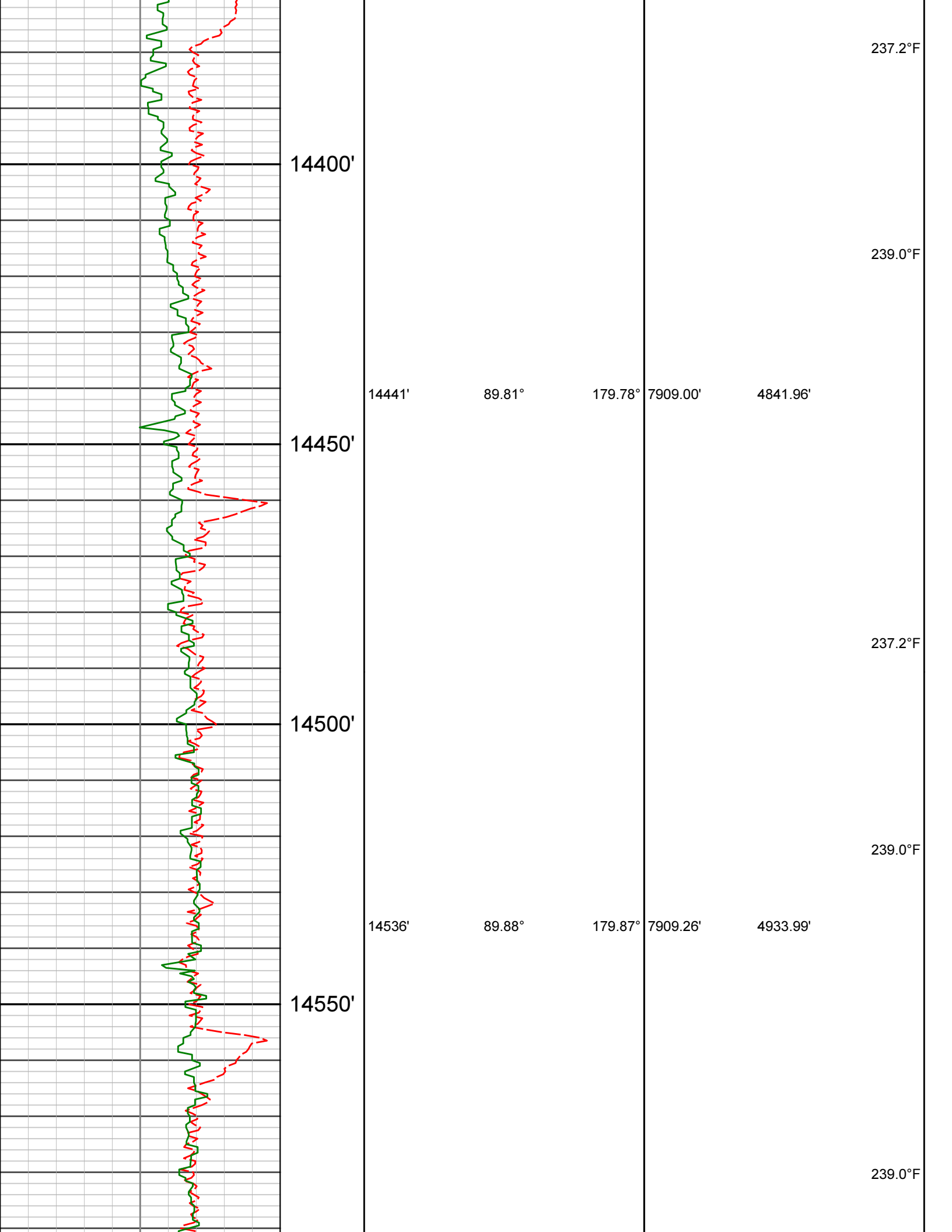
230.0°F

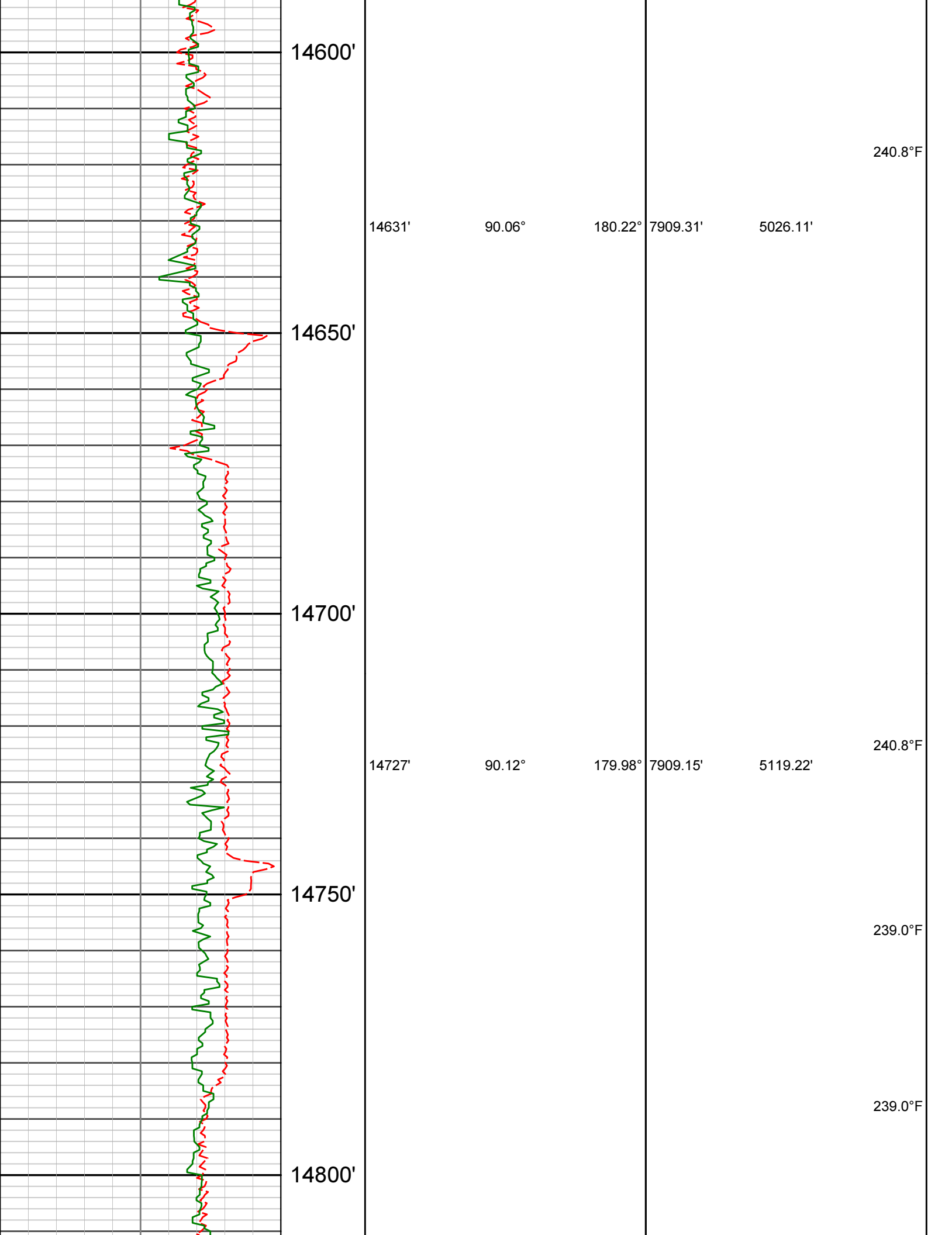
230.0°F

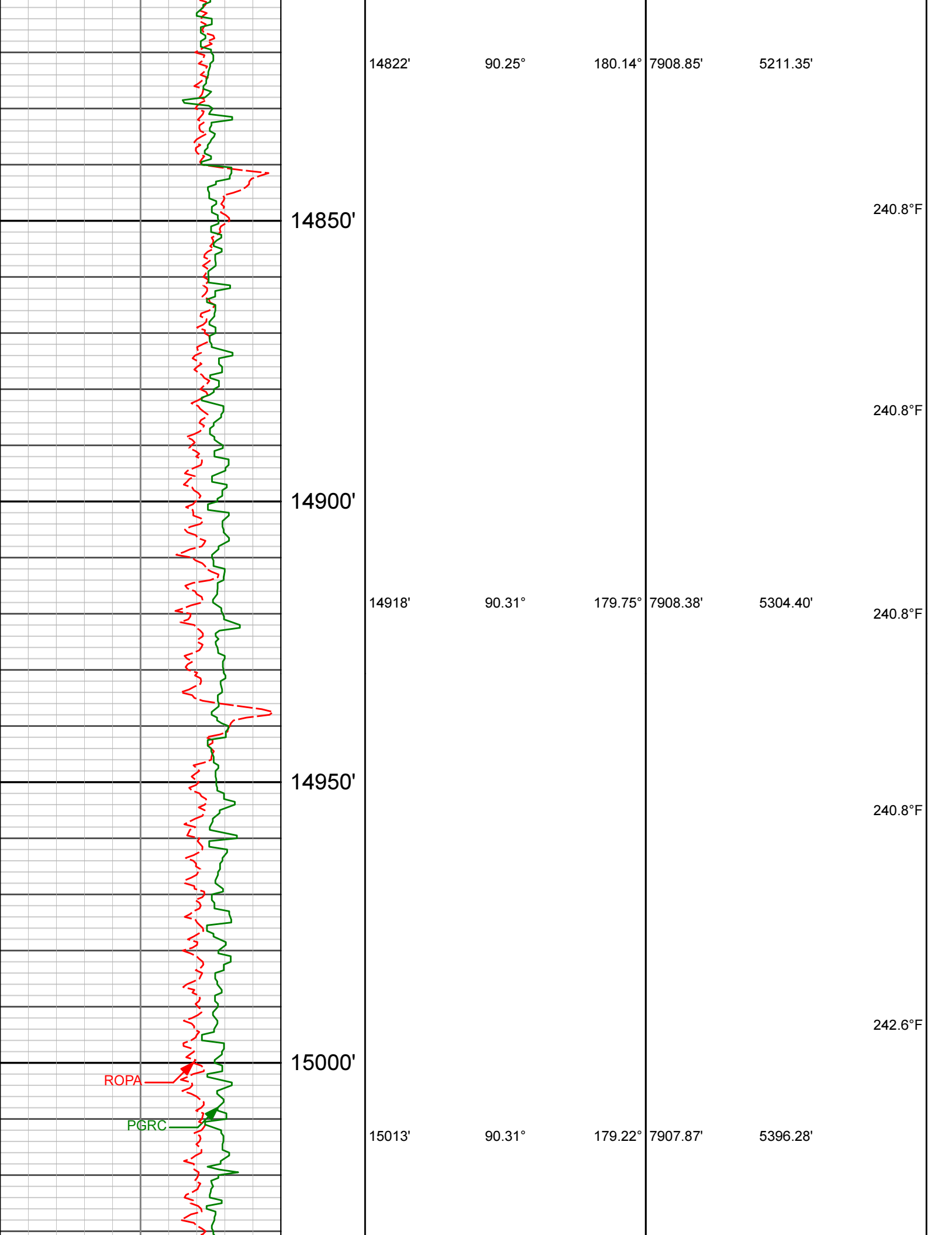




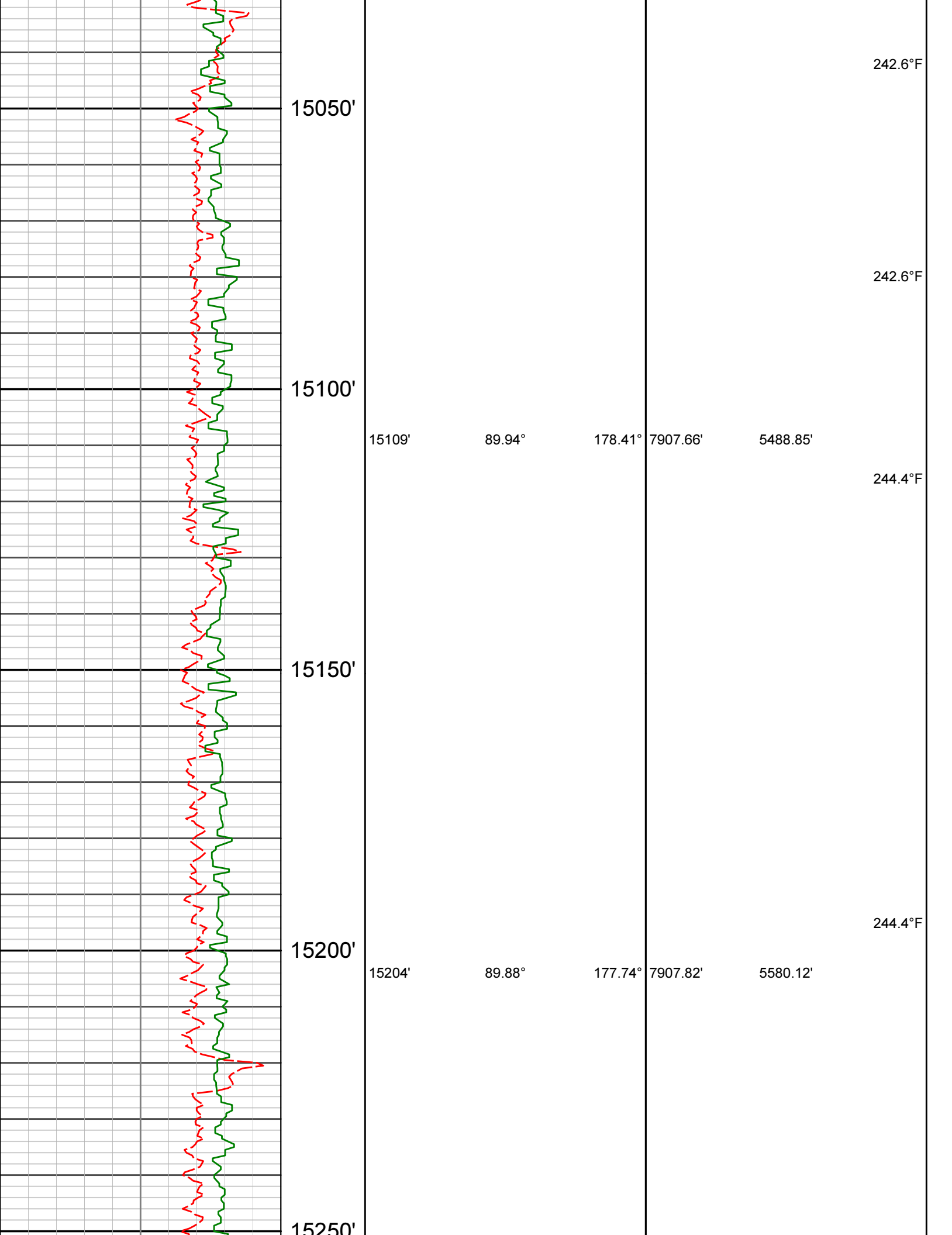


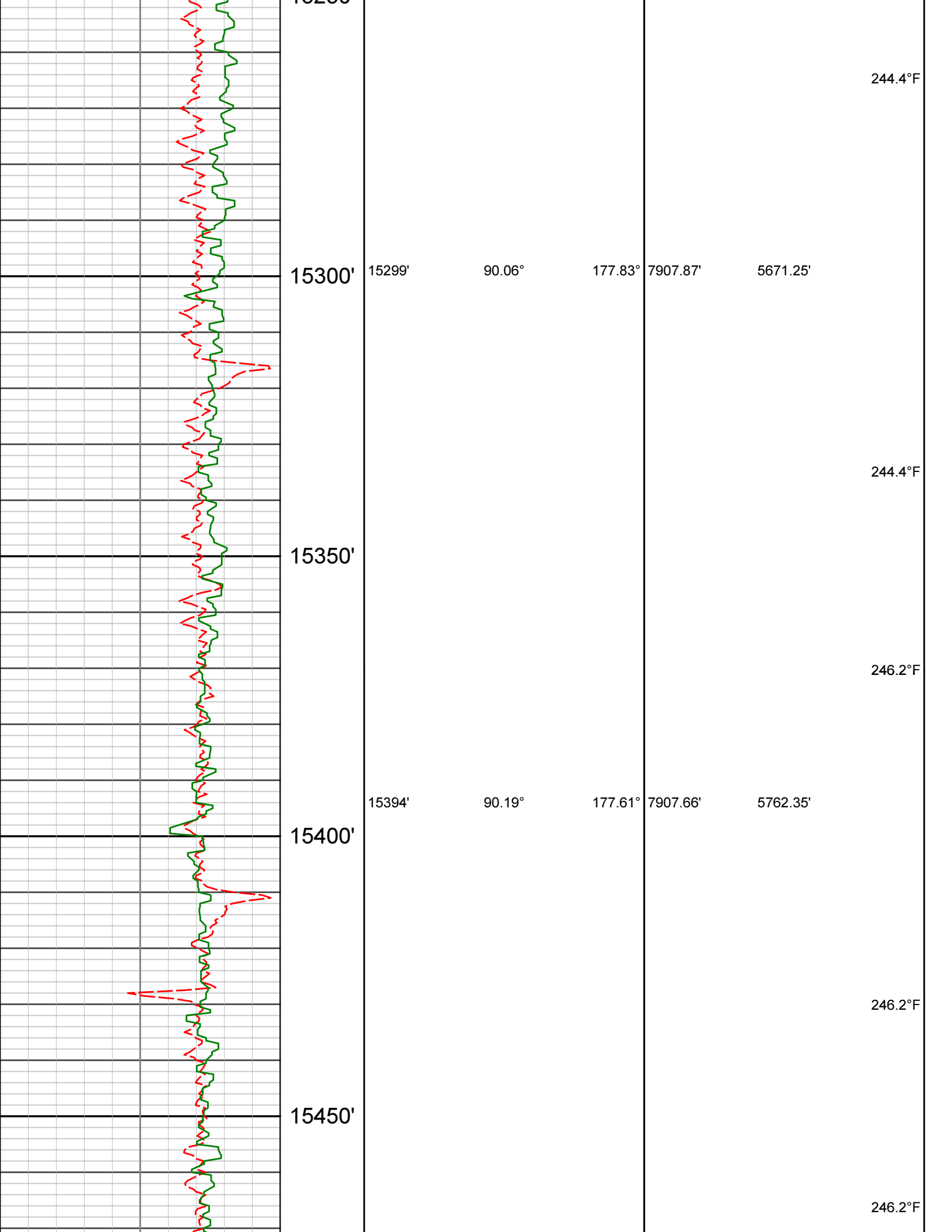


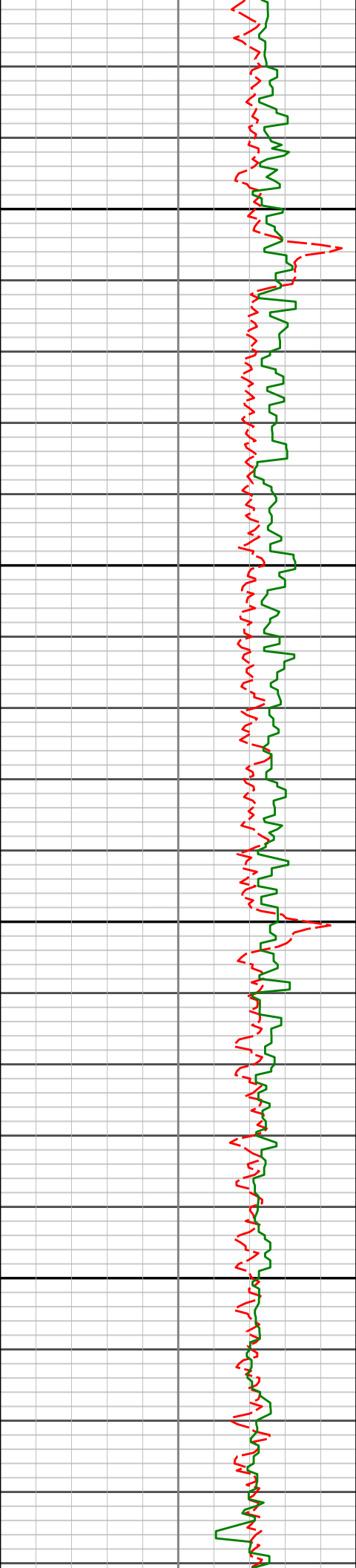












15490'

90.25°

177.93°

7907.30'

5854.44'

15500'

246.2°F

15550'

248.0°F

15585'

90.25°

177.51°

7906.89'

5945.54'

15600'

15650'

248.0°F

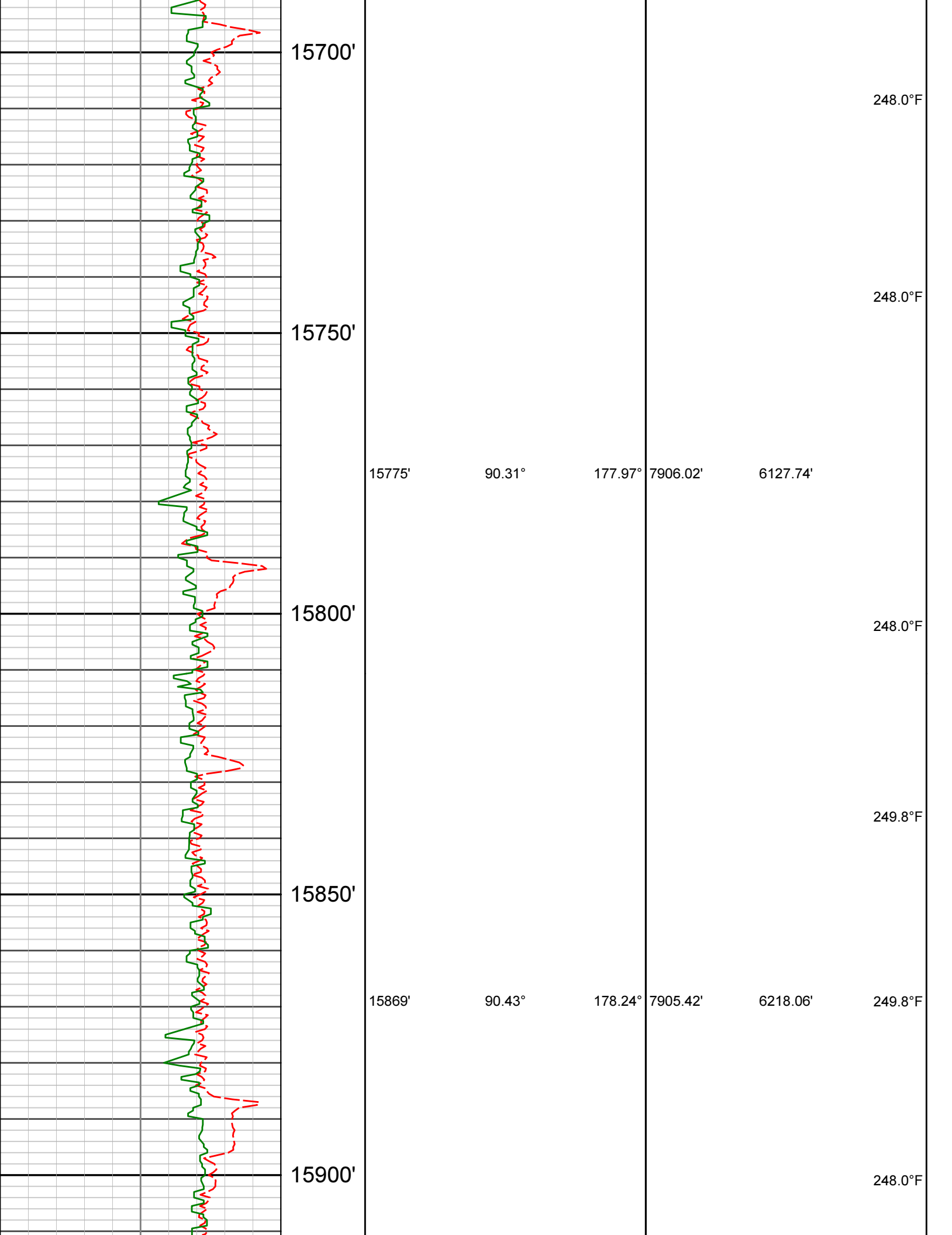
15680'

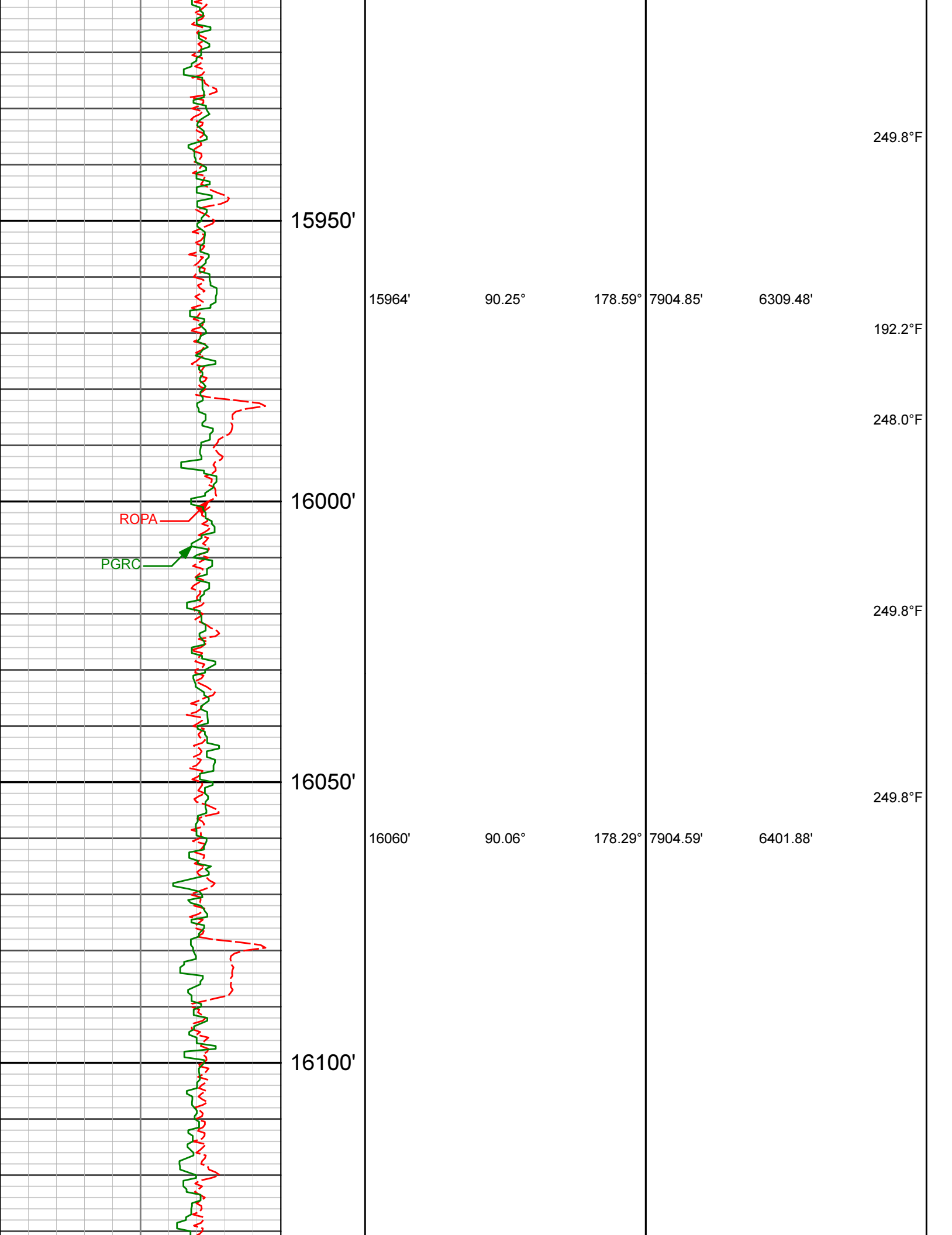
90.25°

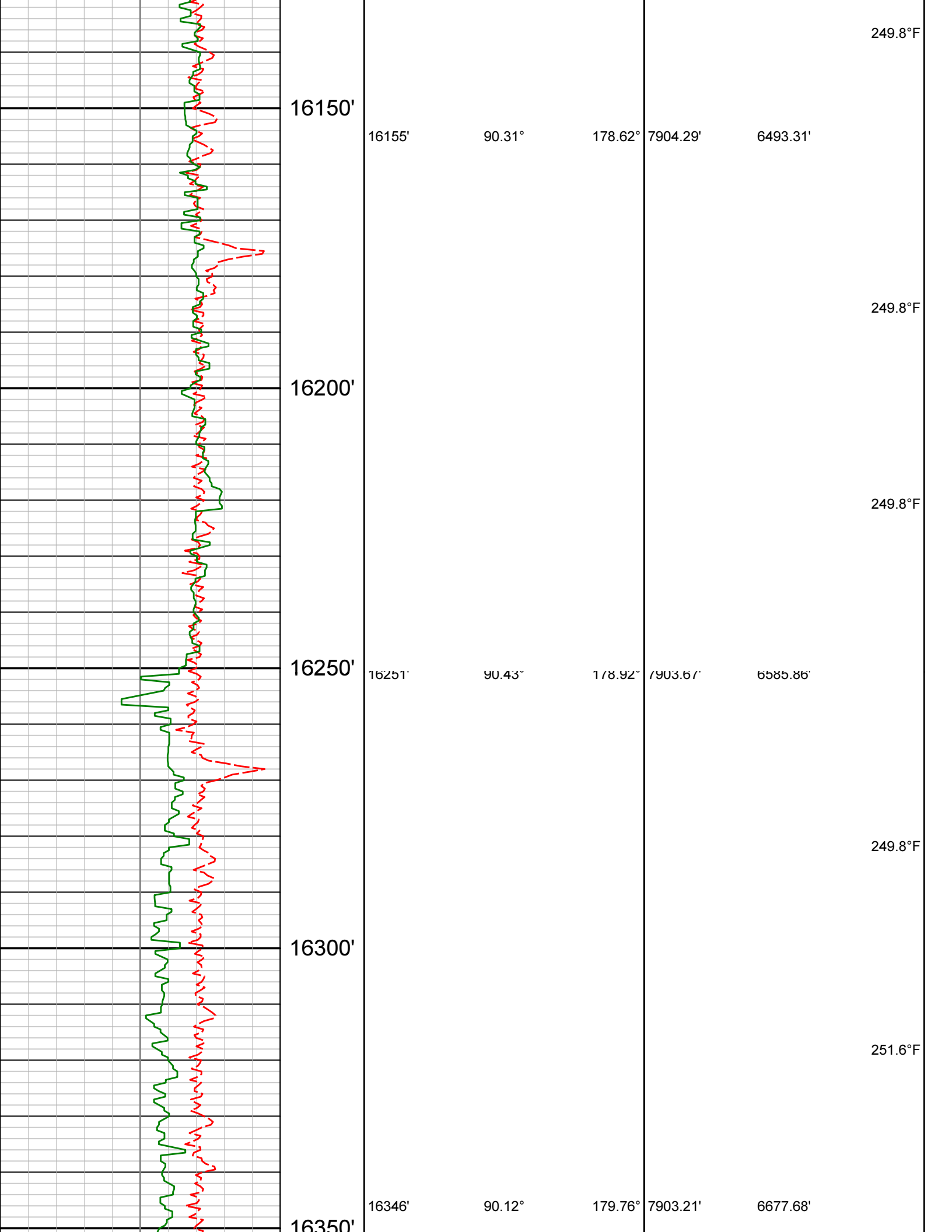
177.71°

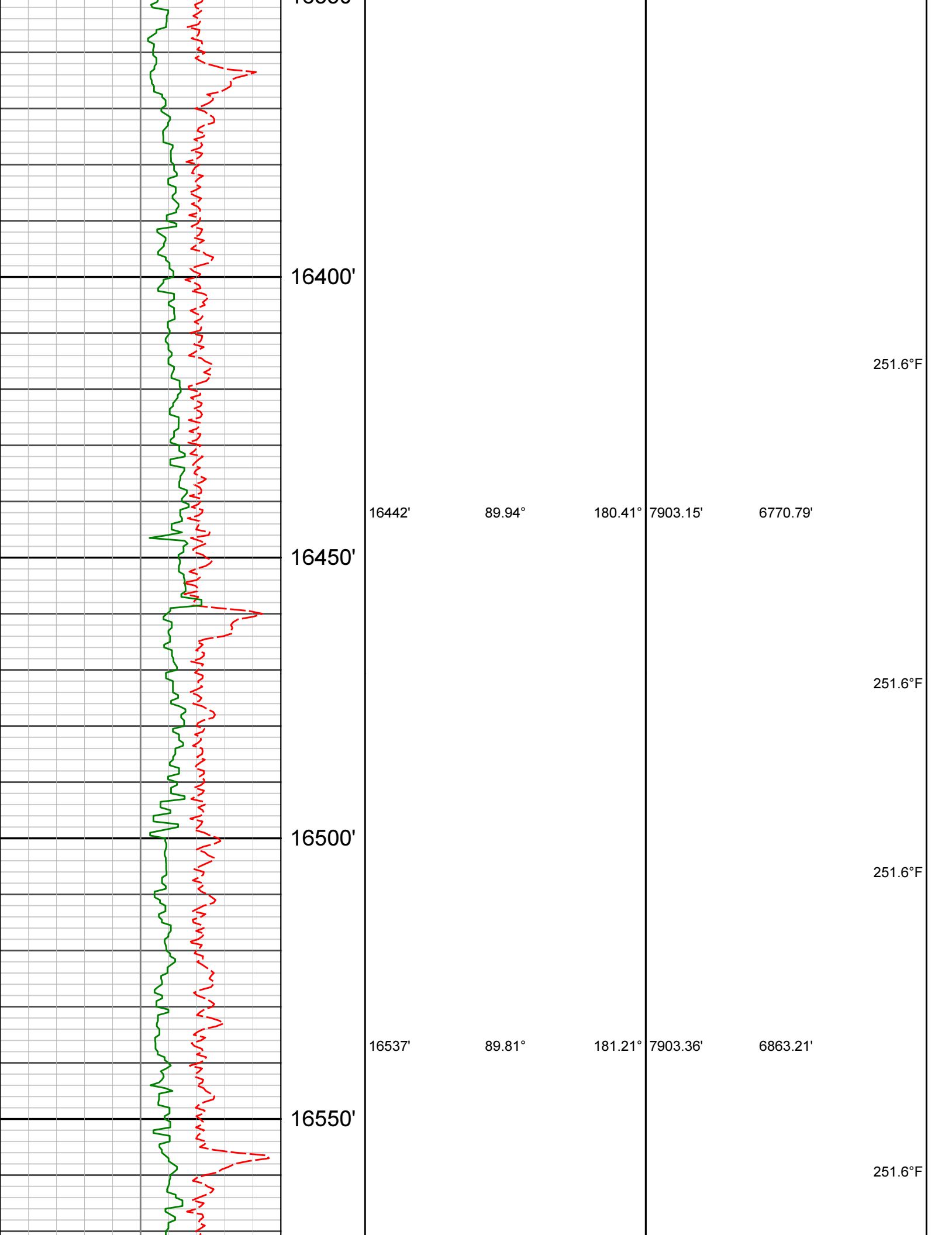
7906.48'

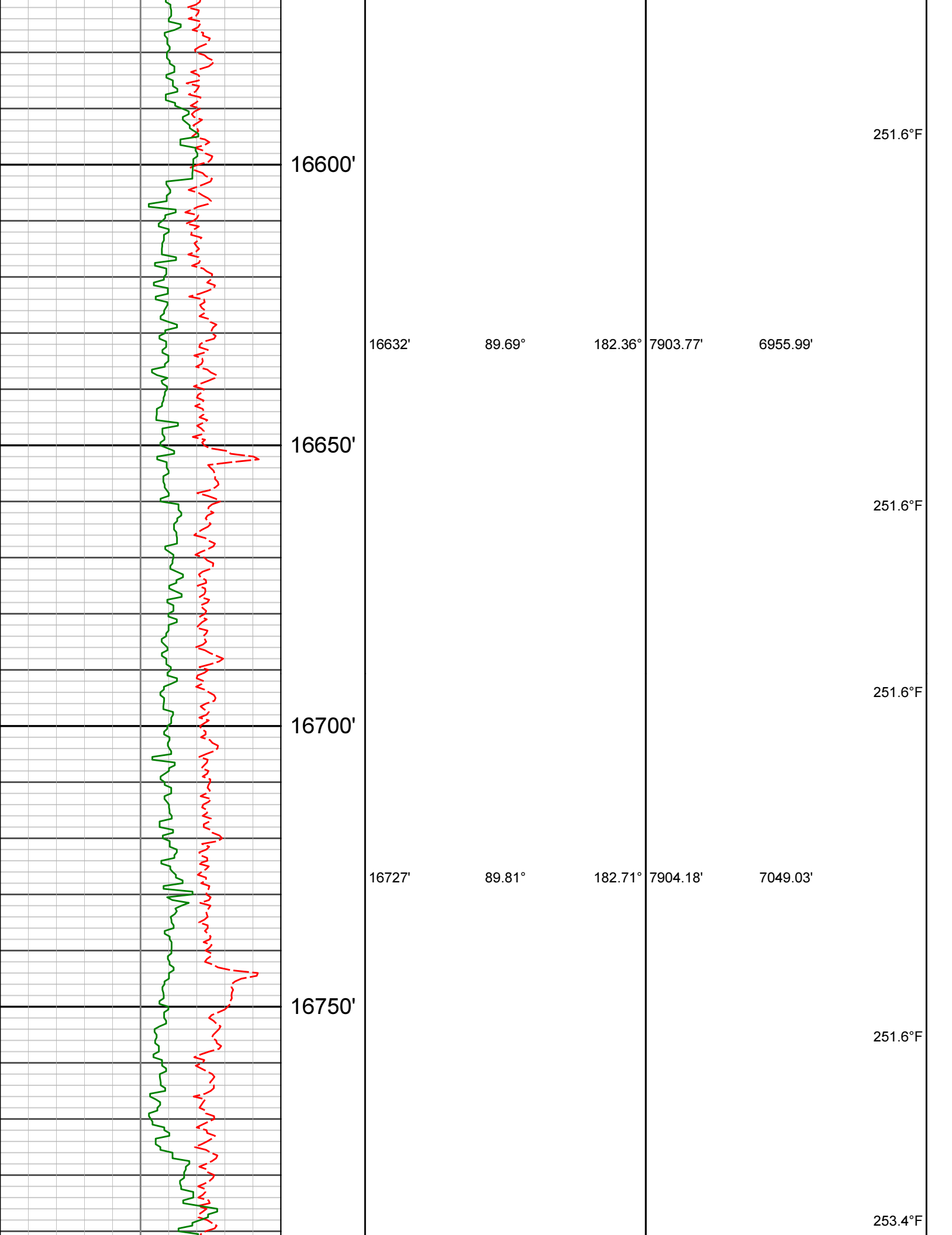
6036.59'



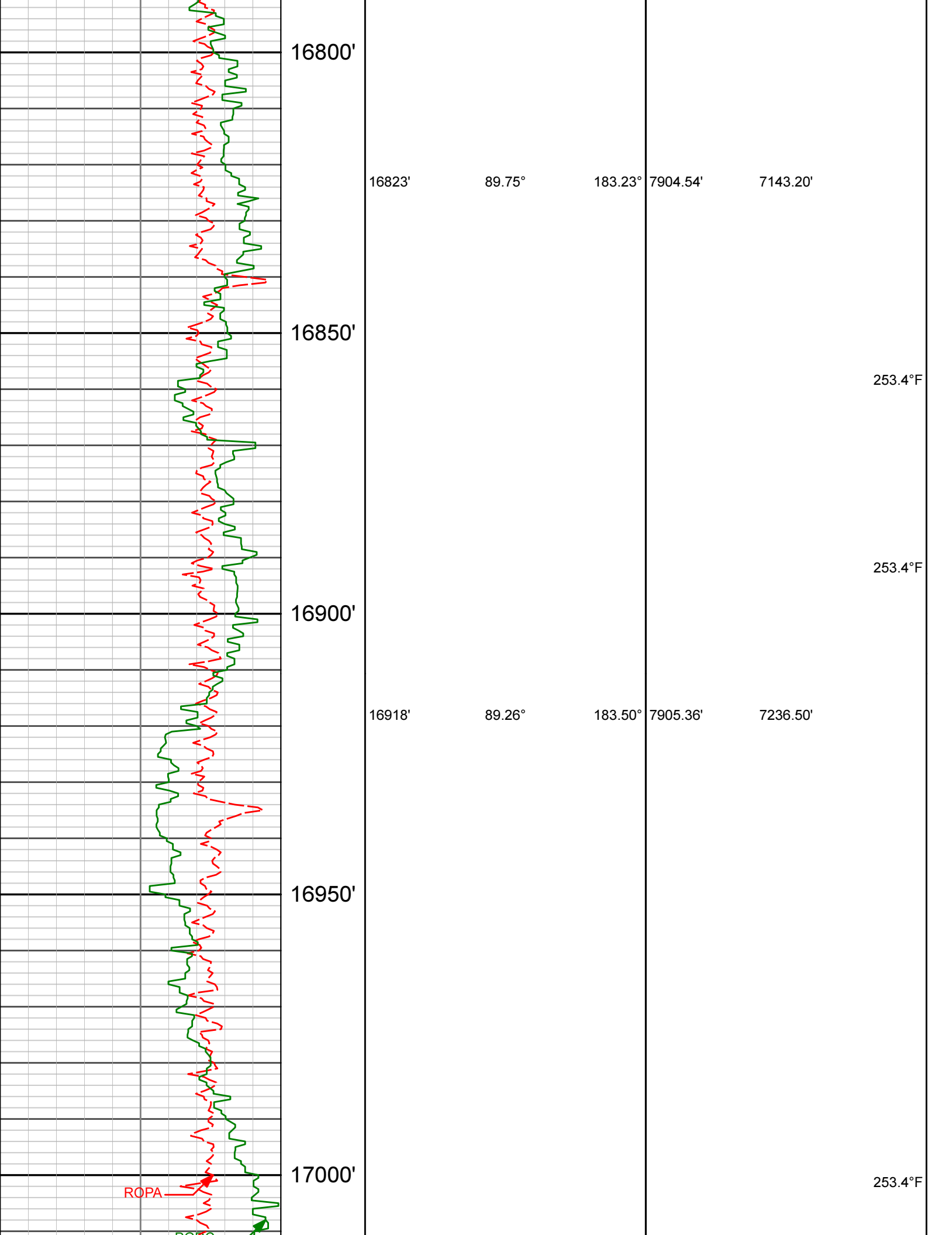


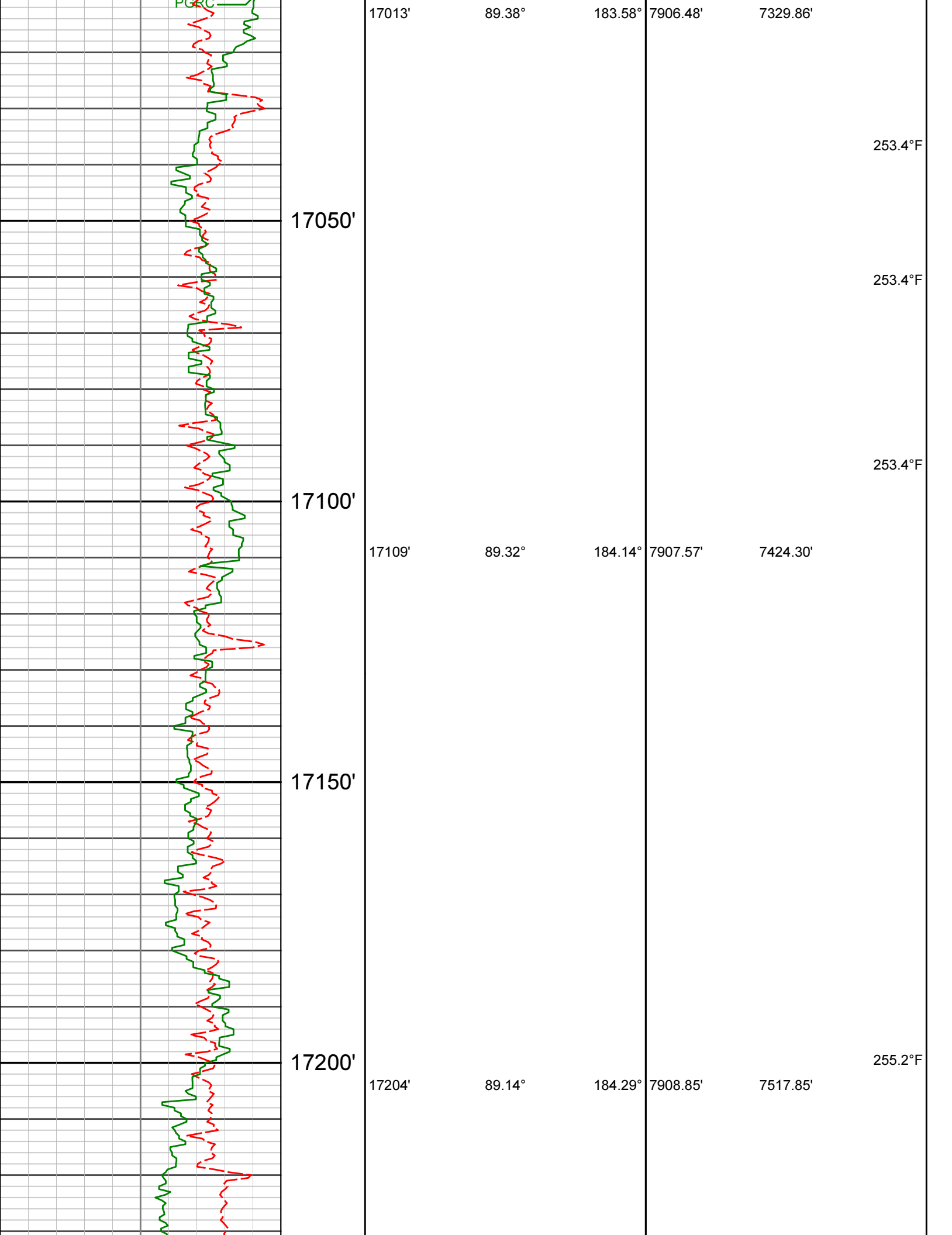


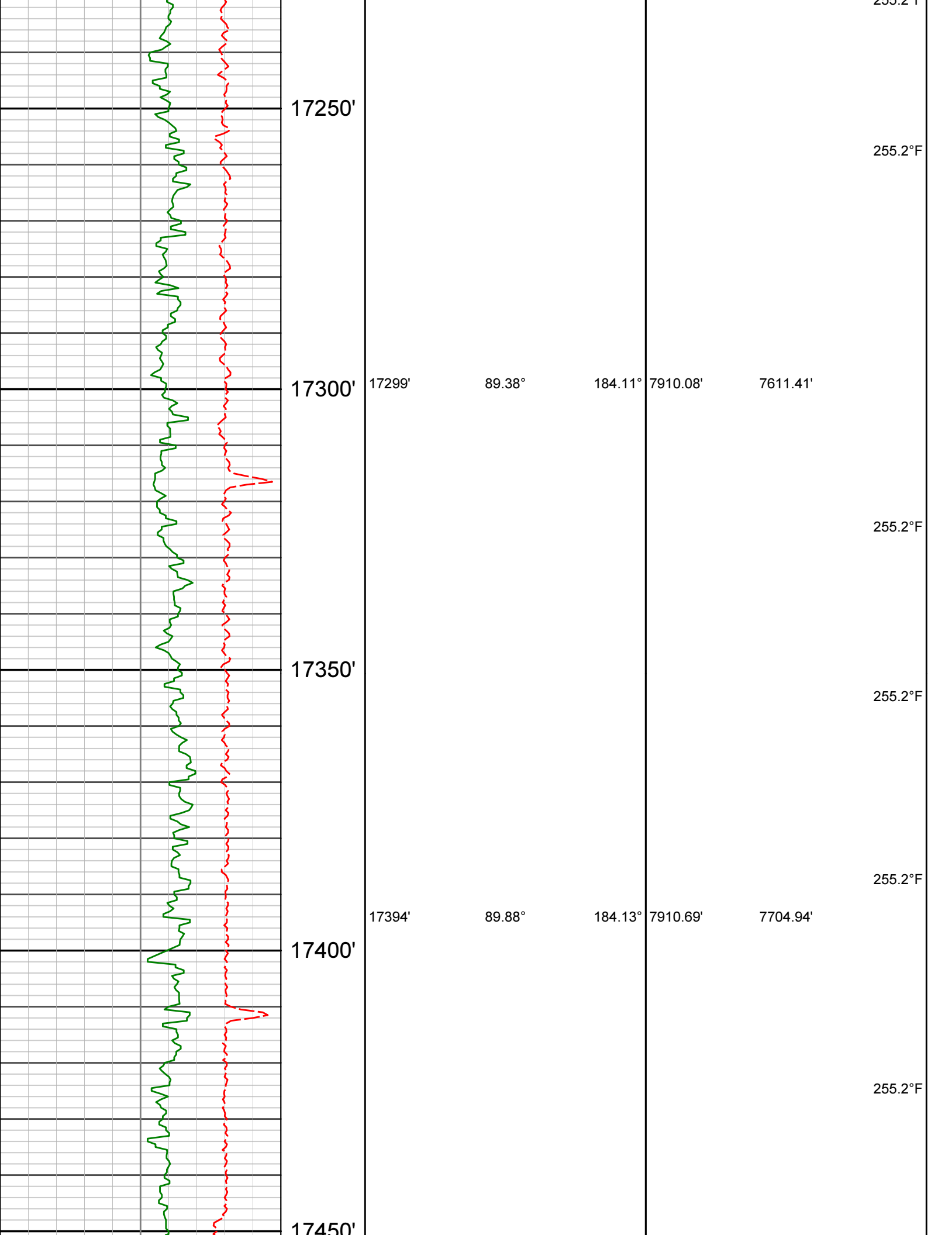


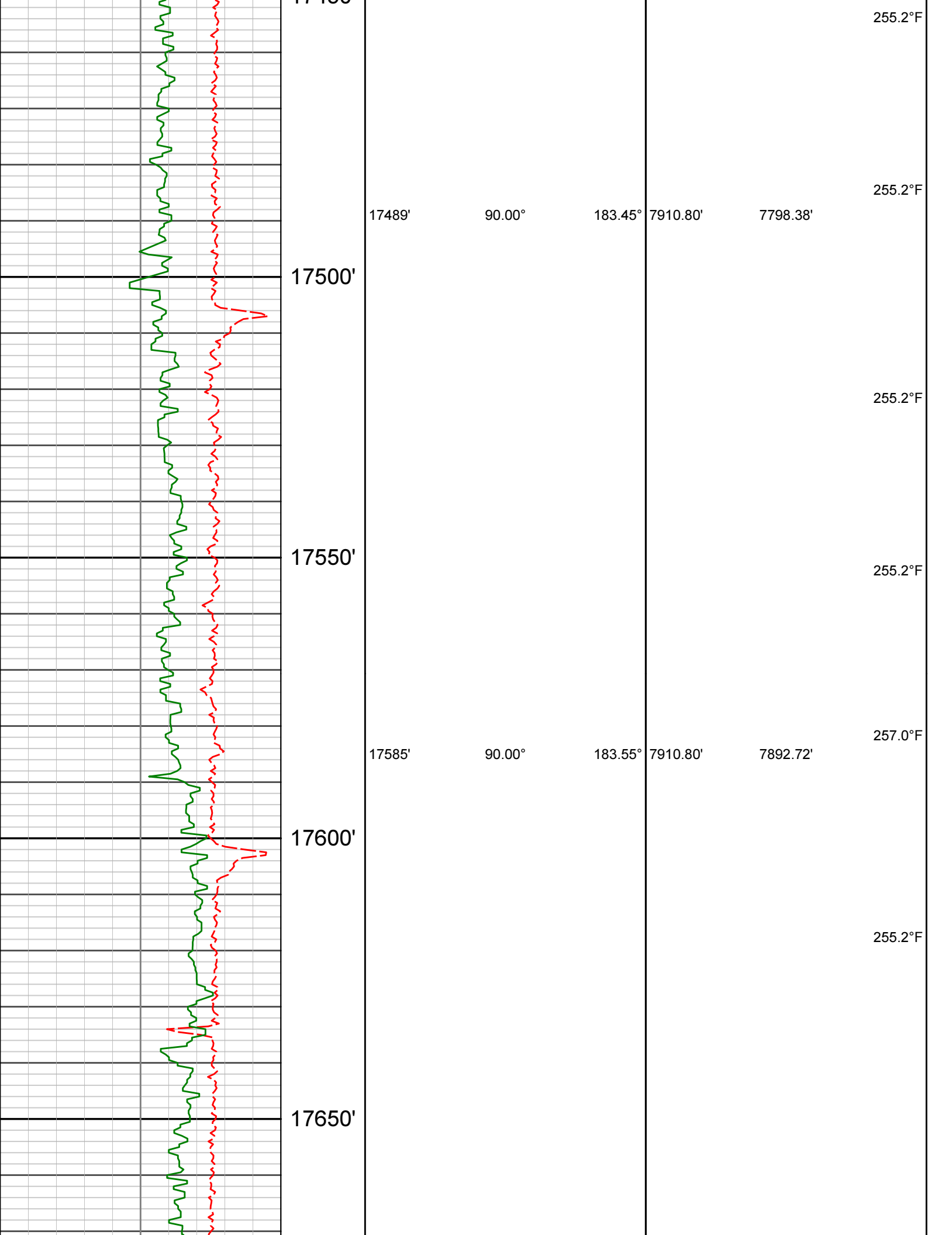


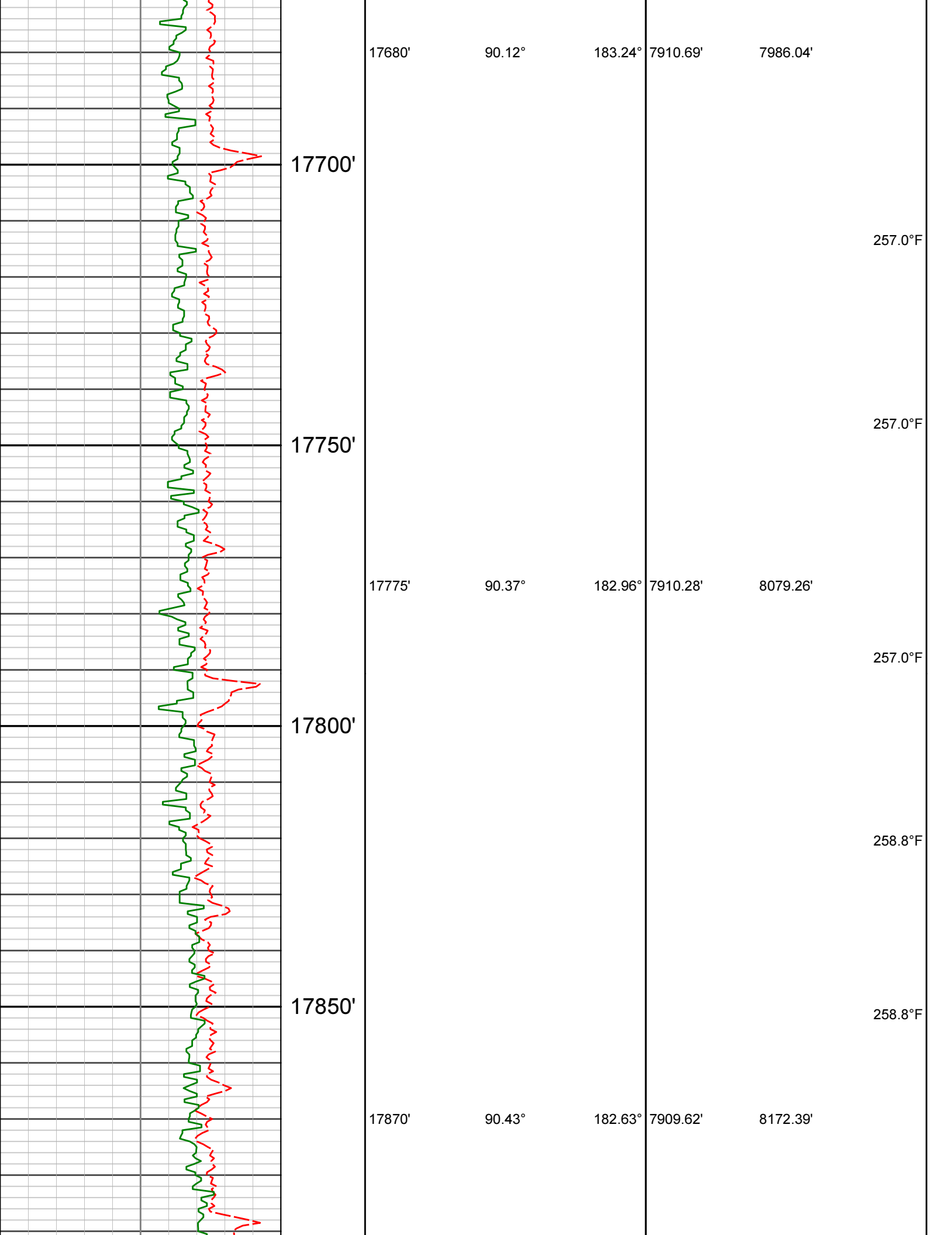


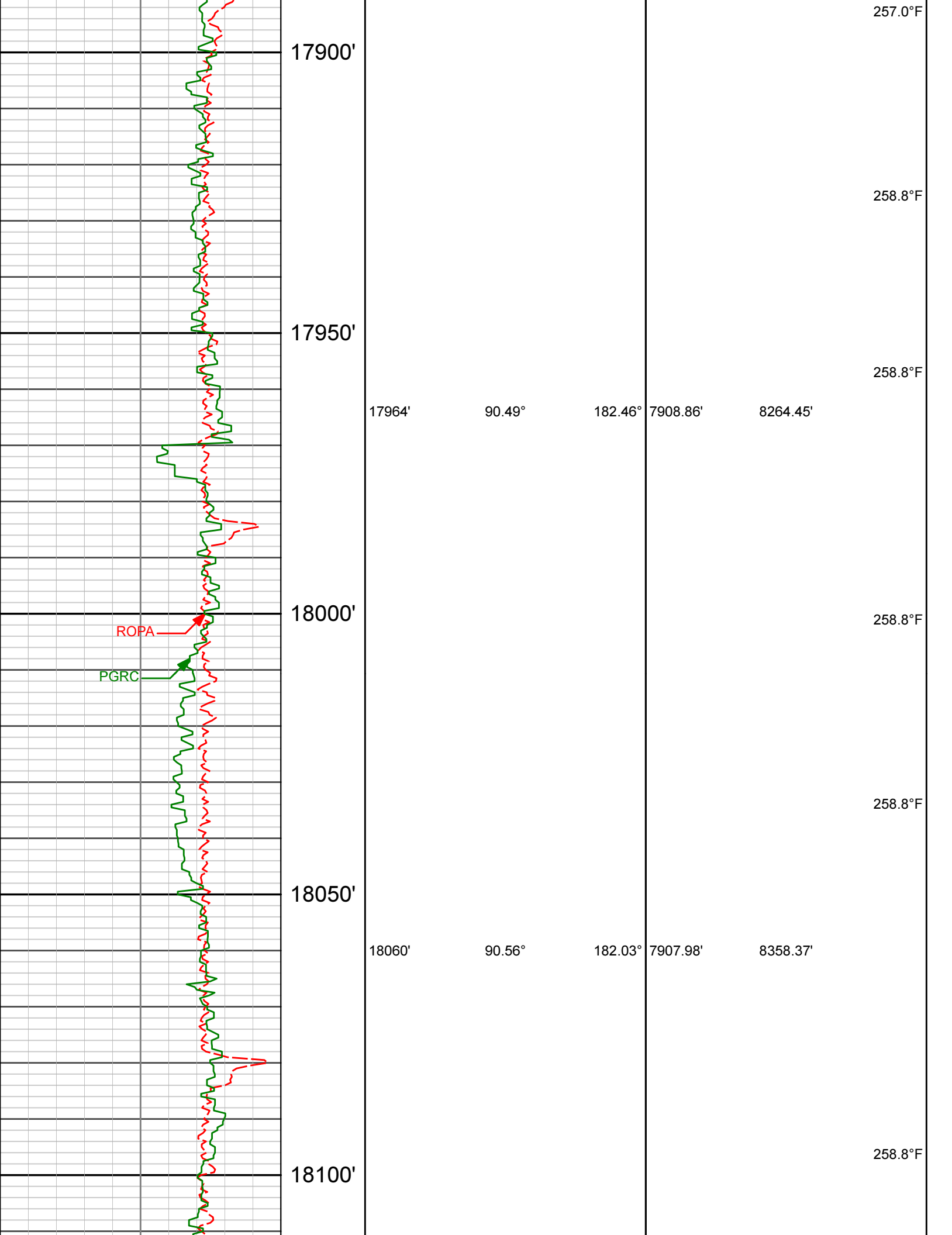


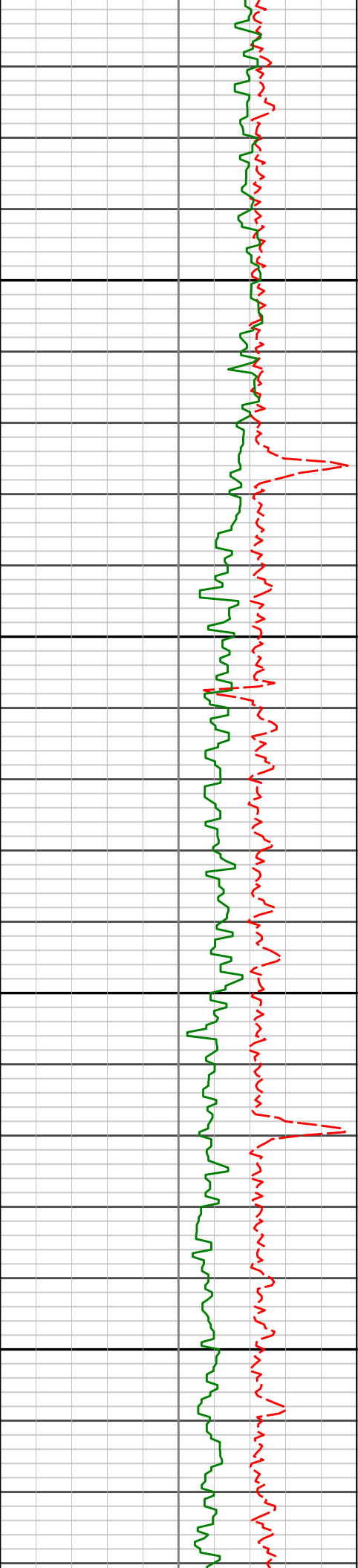












18150'

18154'

90.68°

181.30°

7906.97'

8450.12'

258.8°F

18200'

18250'

18248'

90.74°

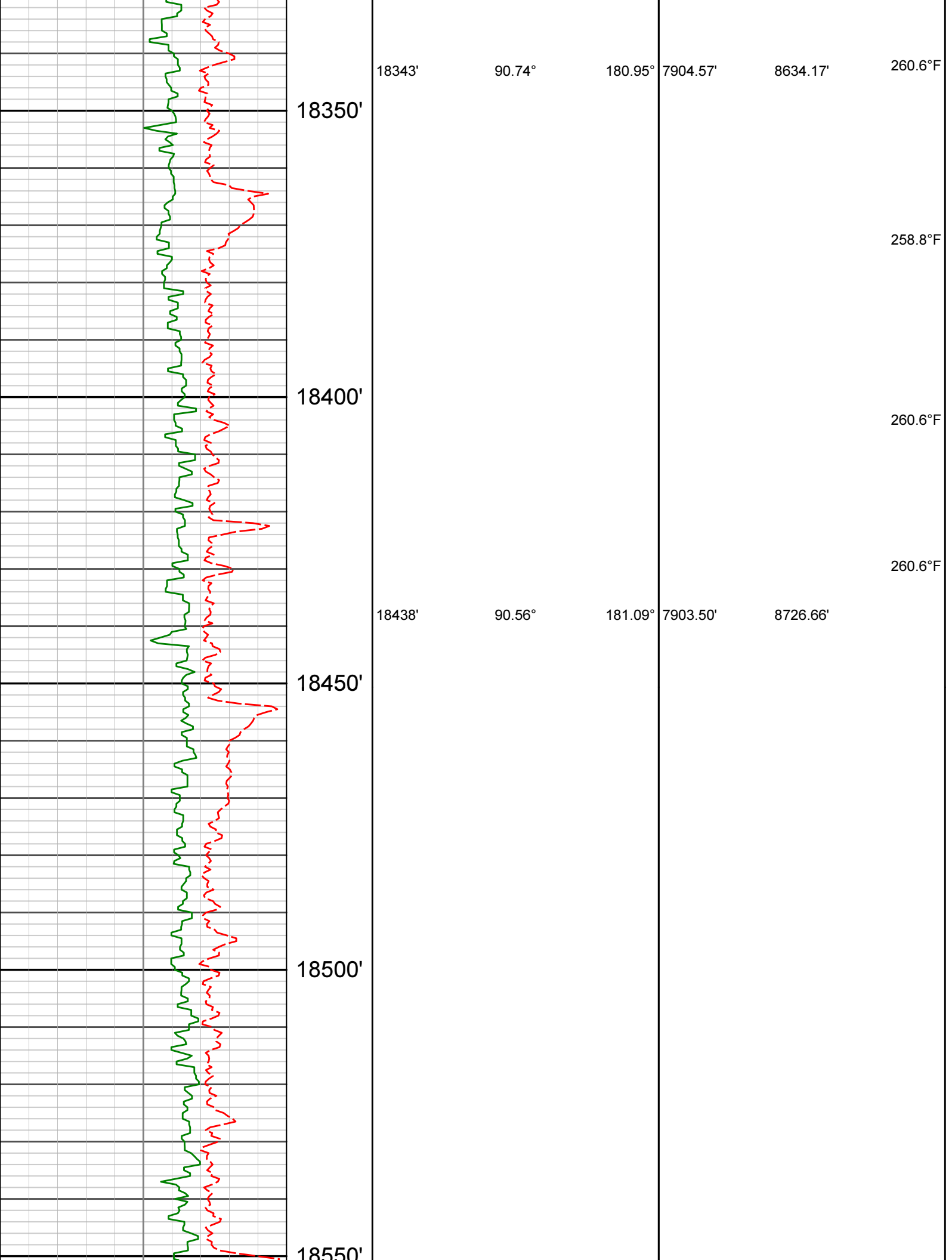
181.00°

7905.80'

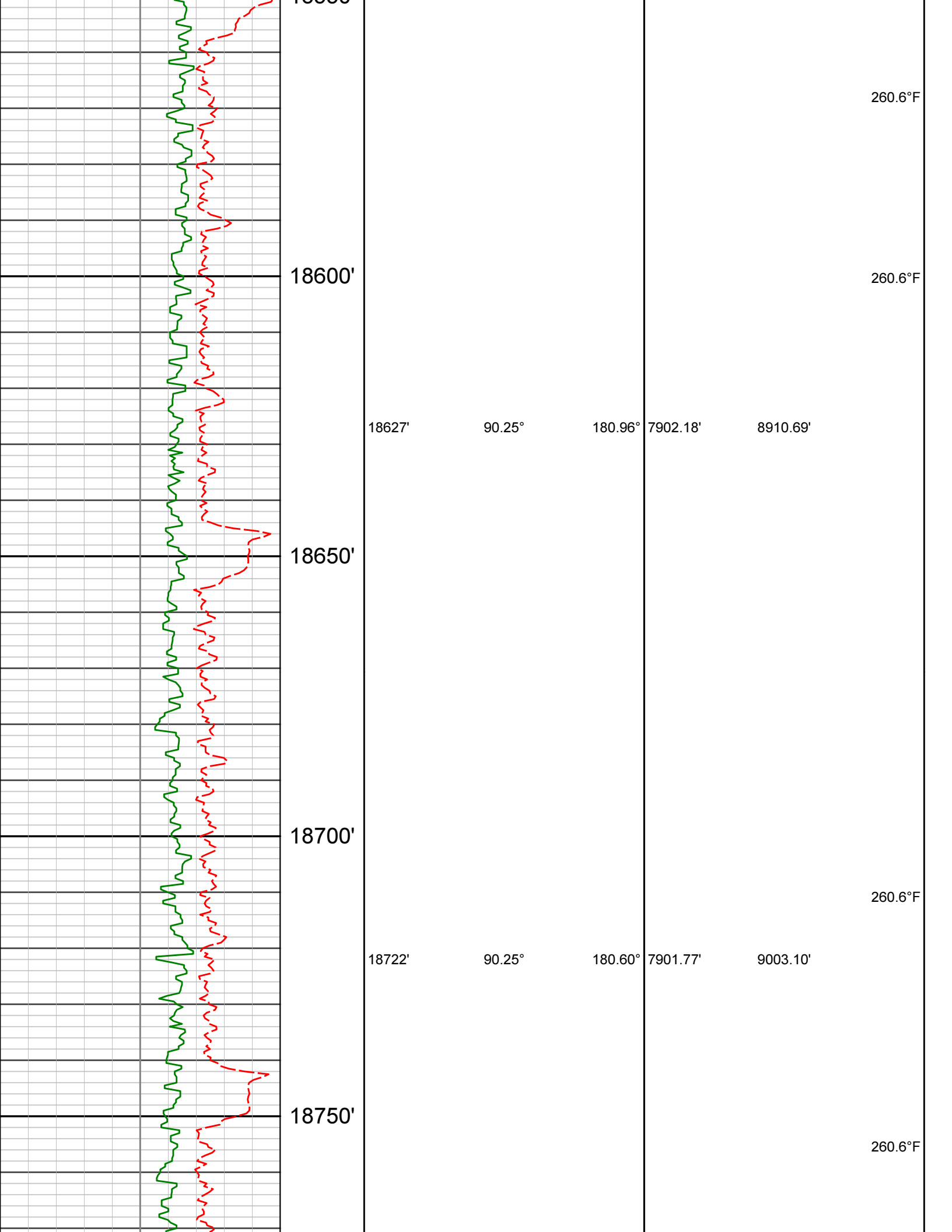
8541.69'

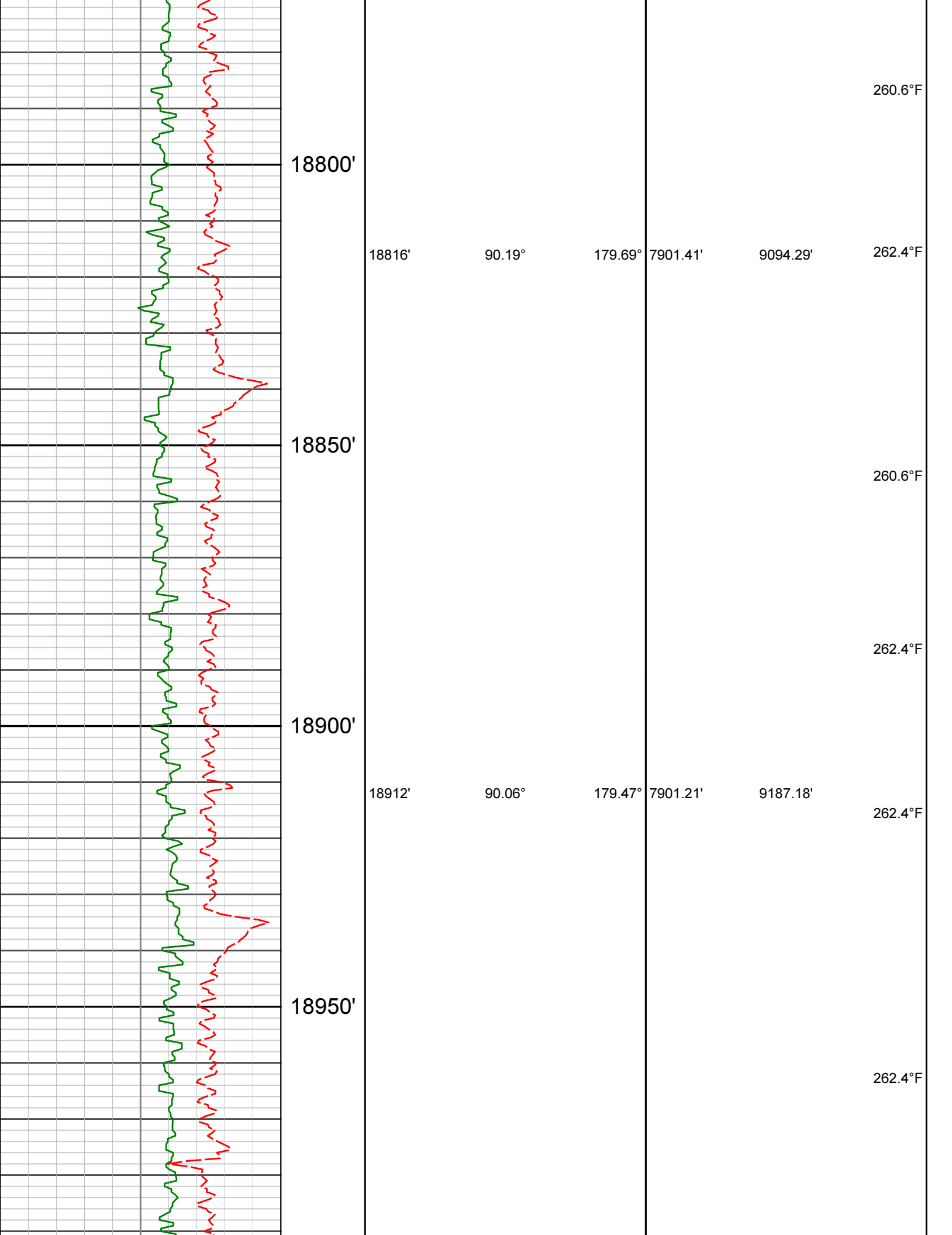
260.6°F

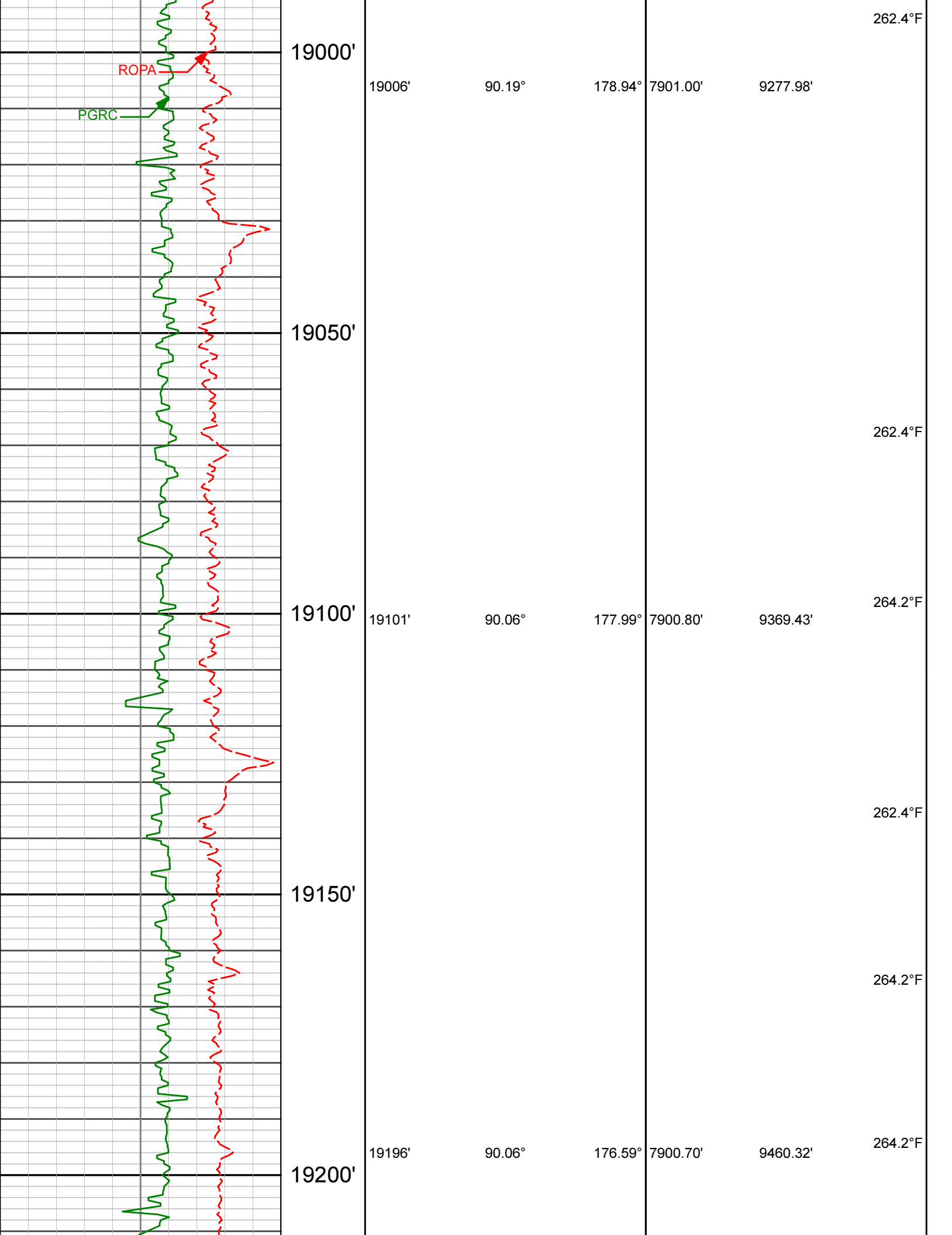
18300'

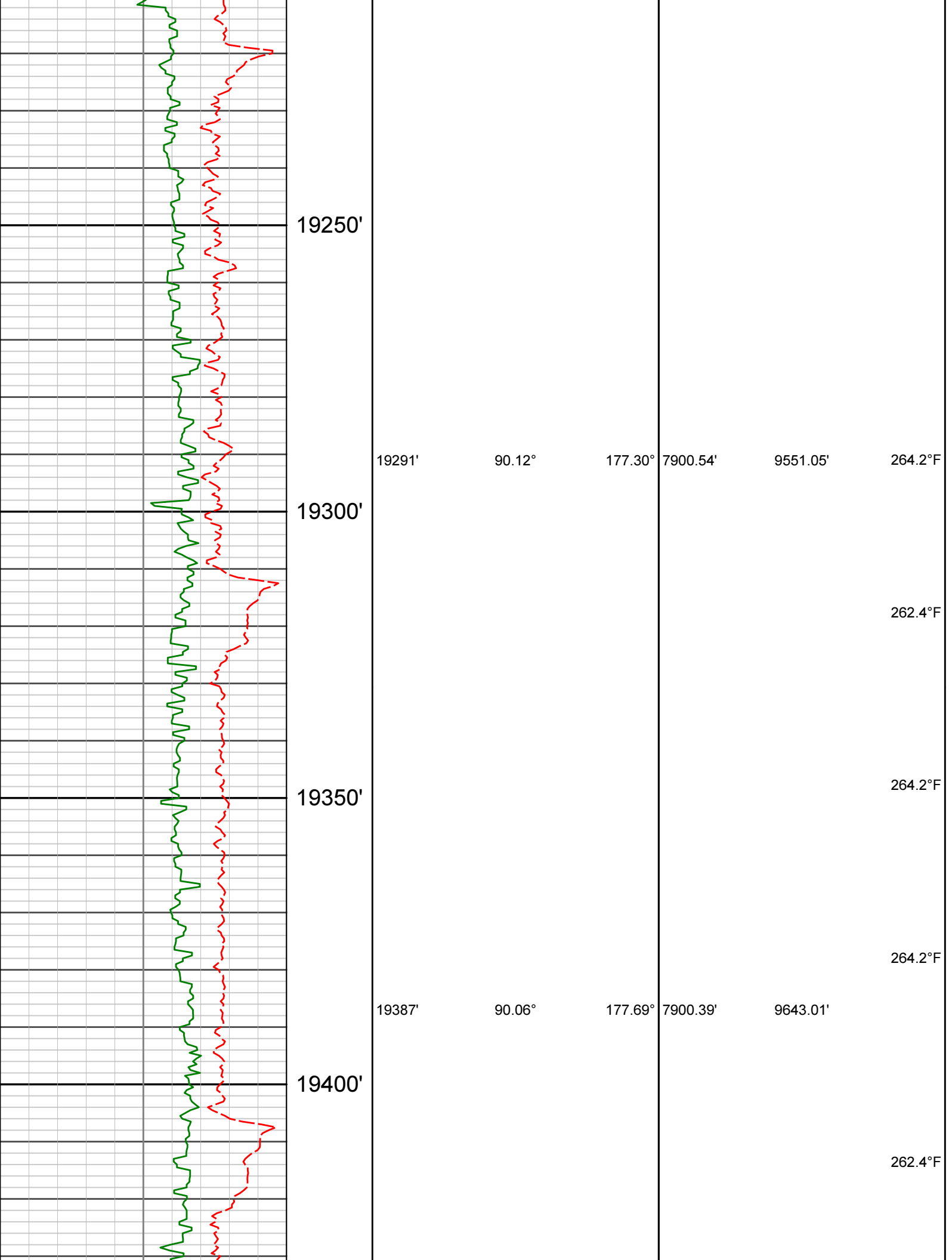


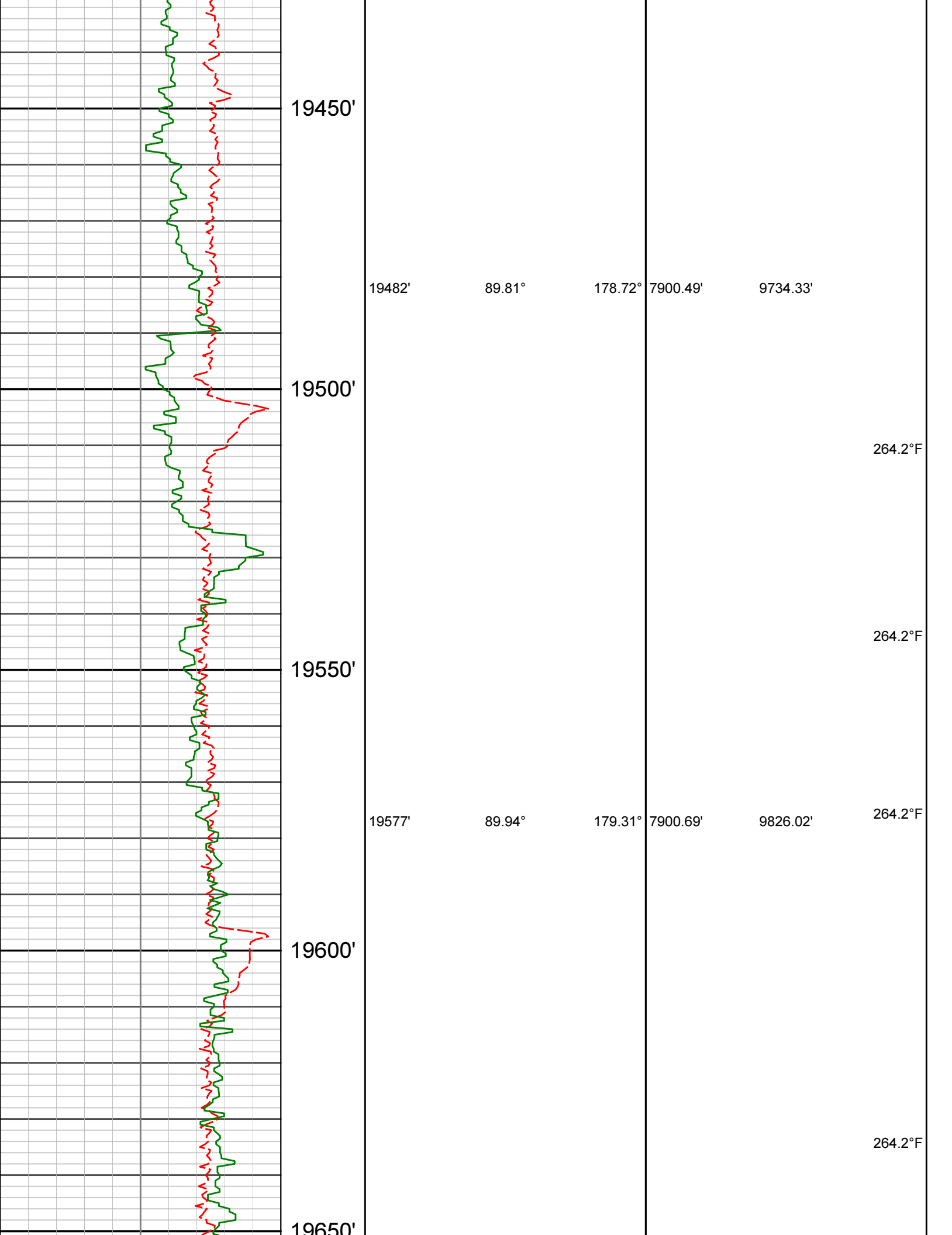


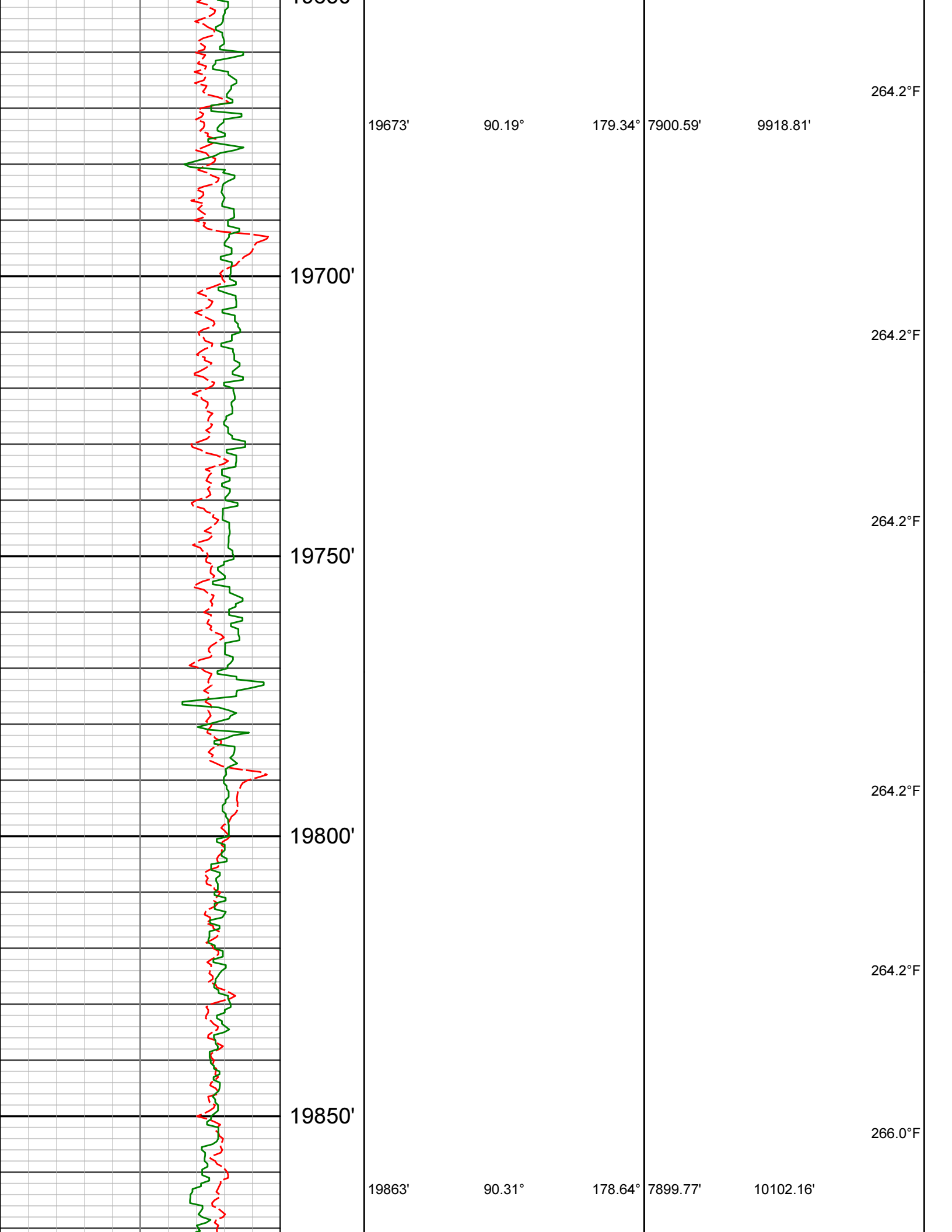


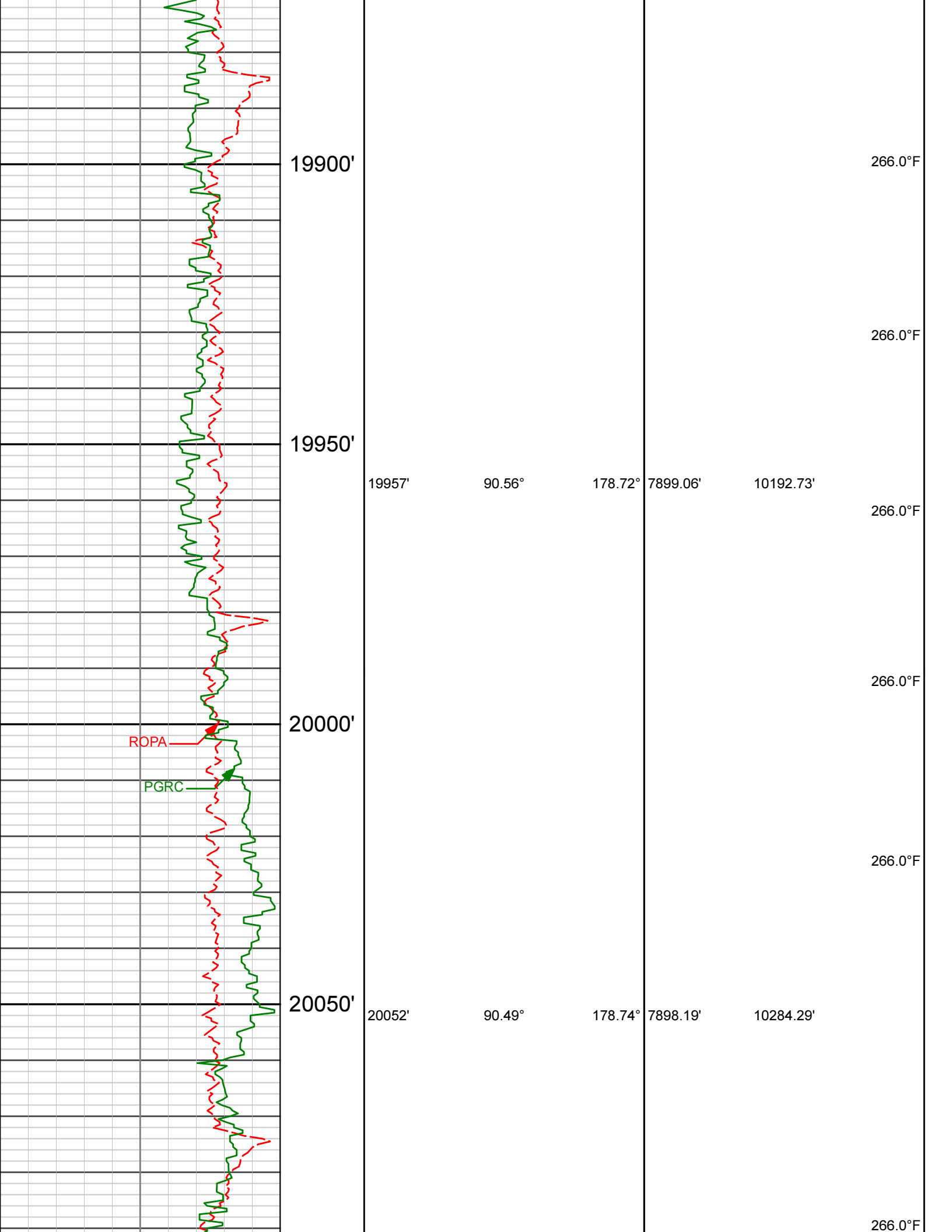


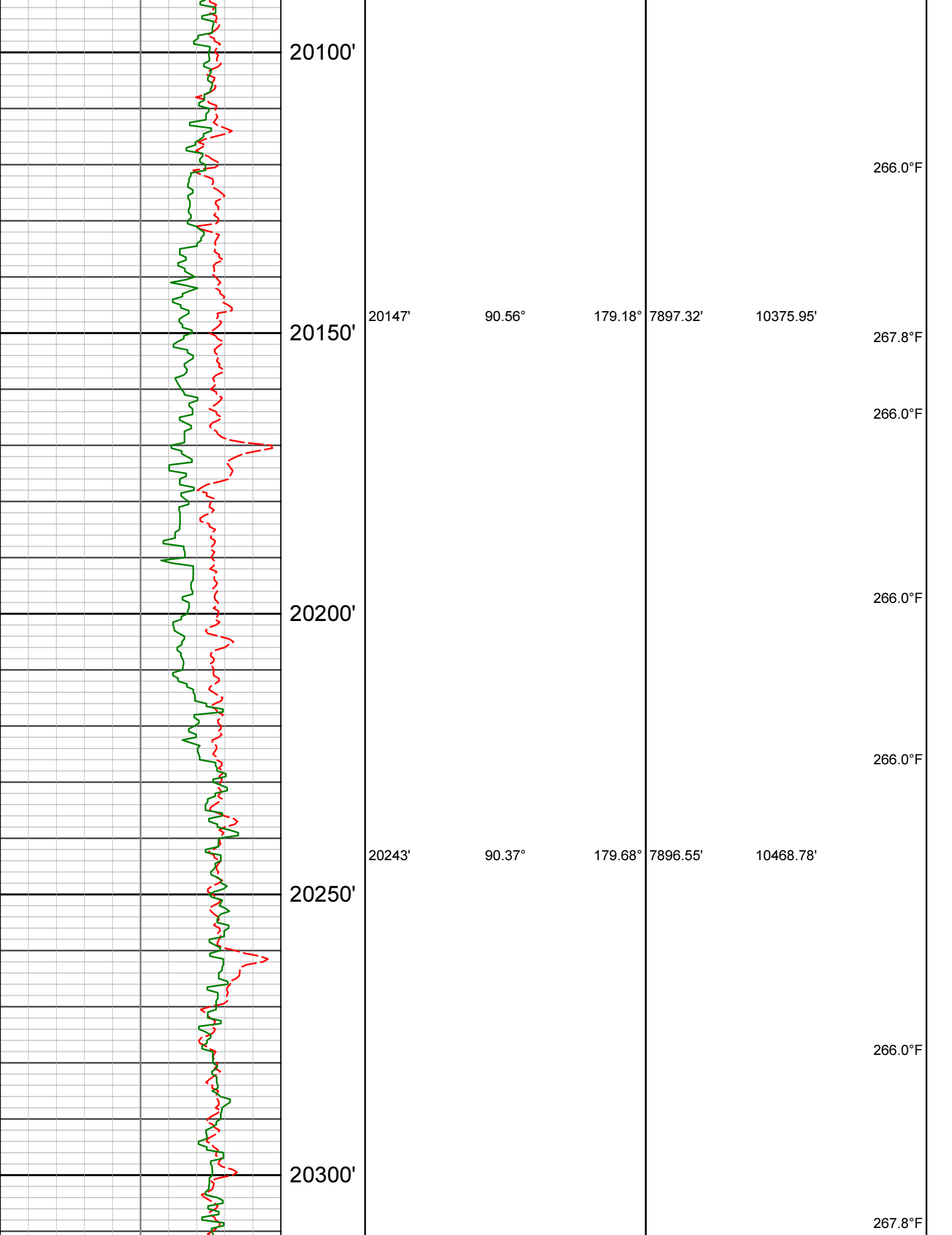




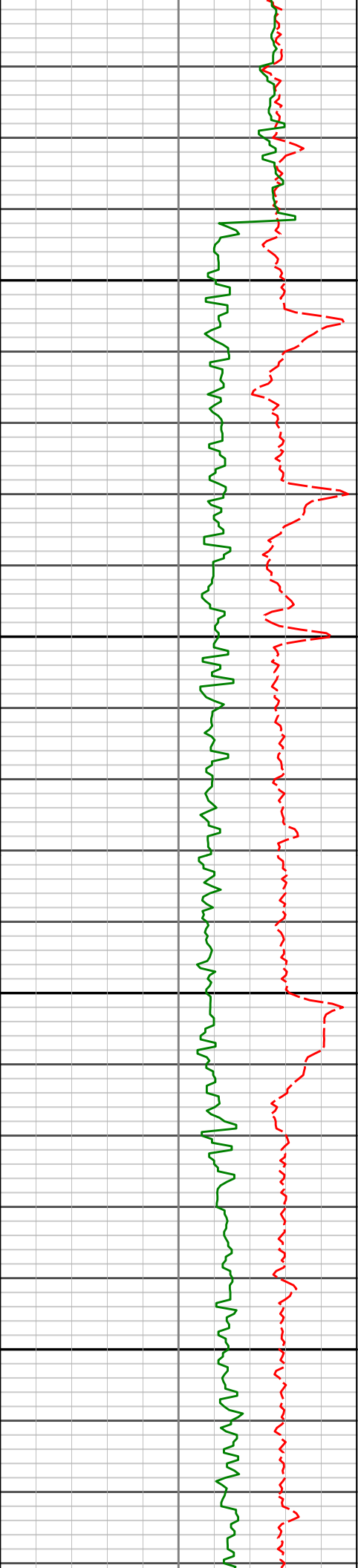












20338'

90.37°

180.27°

7895.93'

10560.87'

20350'

266.0°F

266.0°F

20400'

267.8°F

20434'

90.43°

180.04°

7895.26'

10654.00'

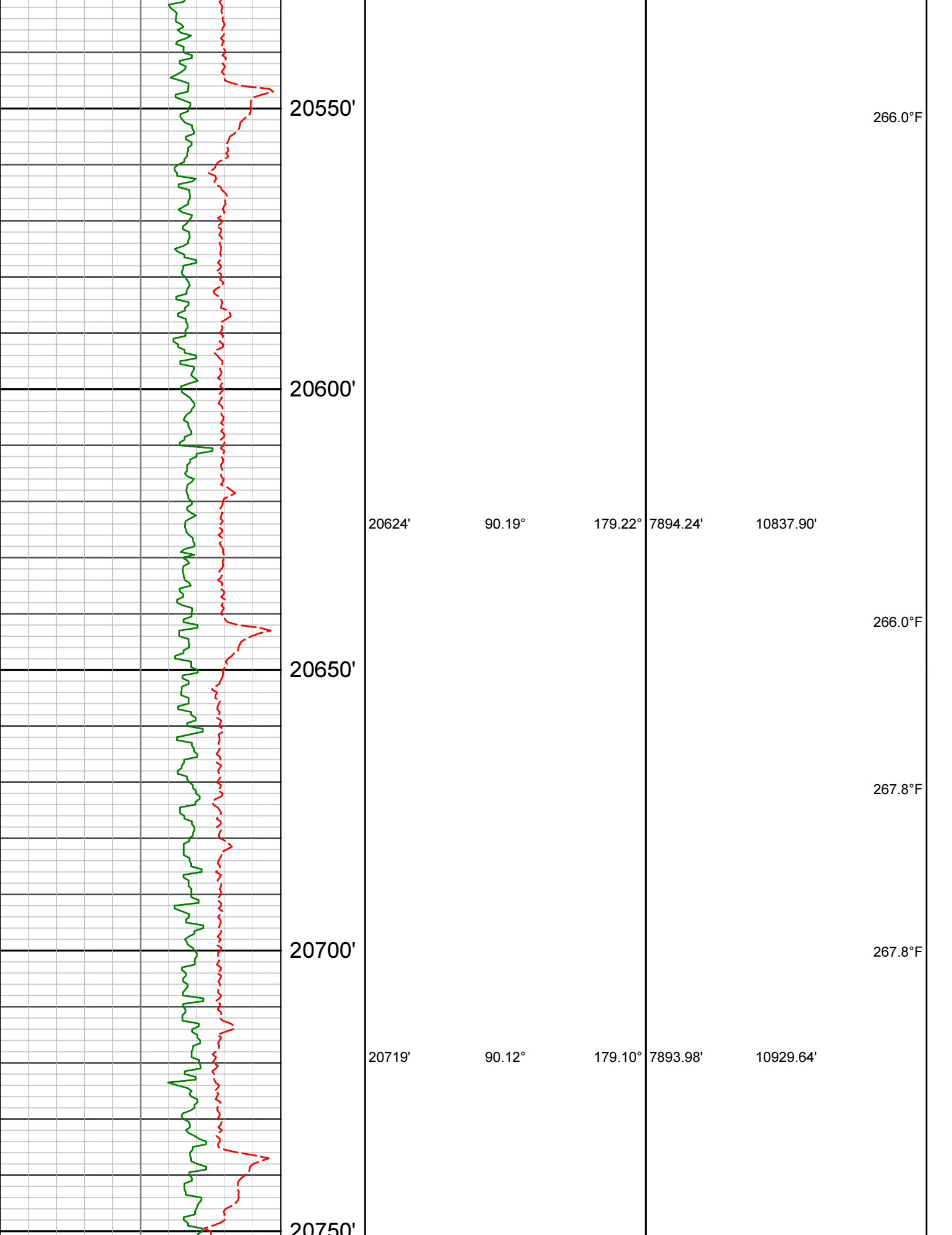
20450'

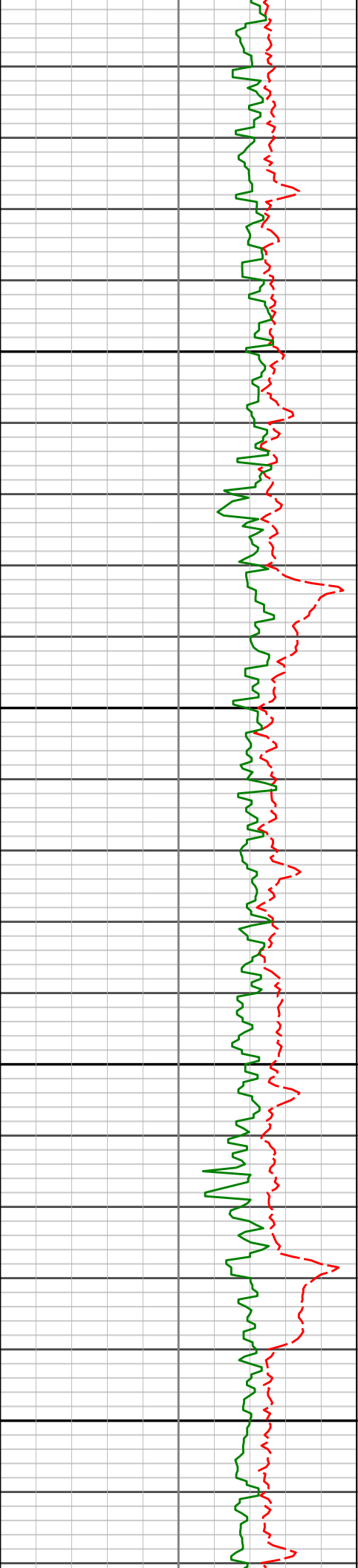
266.0°F

267.8°F

20500'

267.8°F





20700'

20800'

20850'

20900'

20950'

20815'

90.19°

178.60°

7893.72'

11022.22'

20909'

90.12°

178.57°

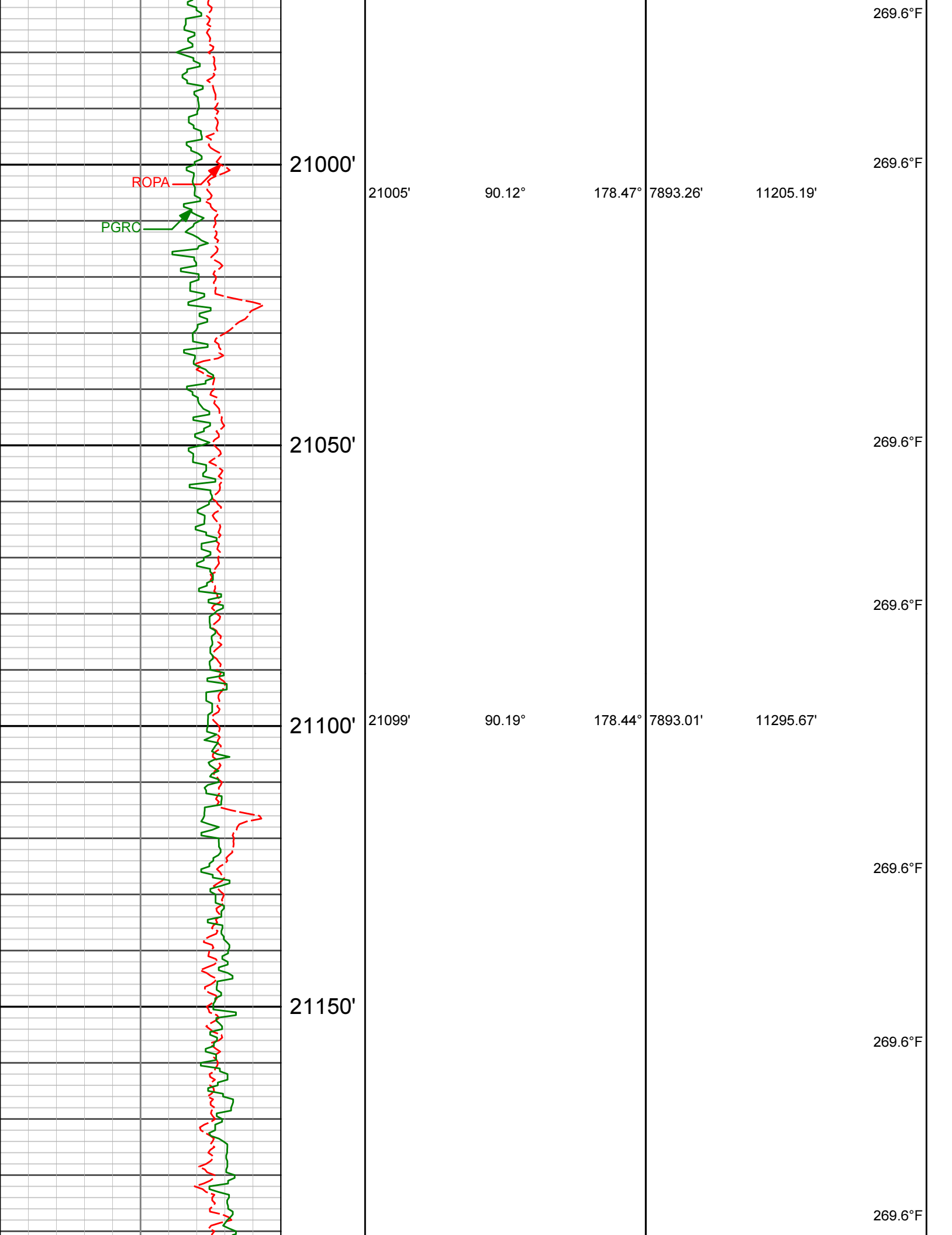
7893.47'

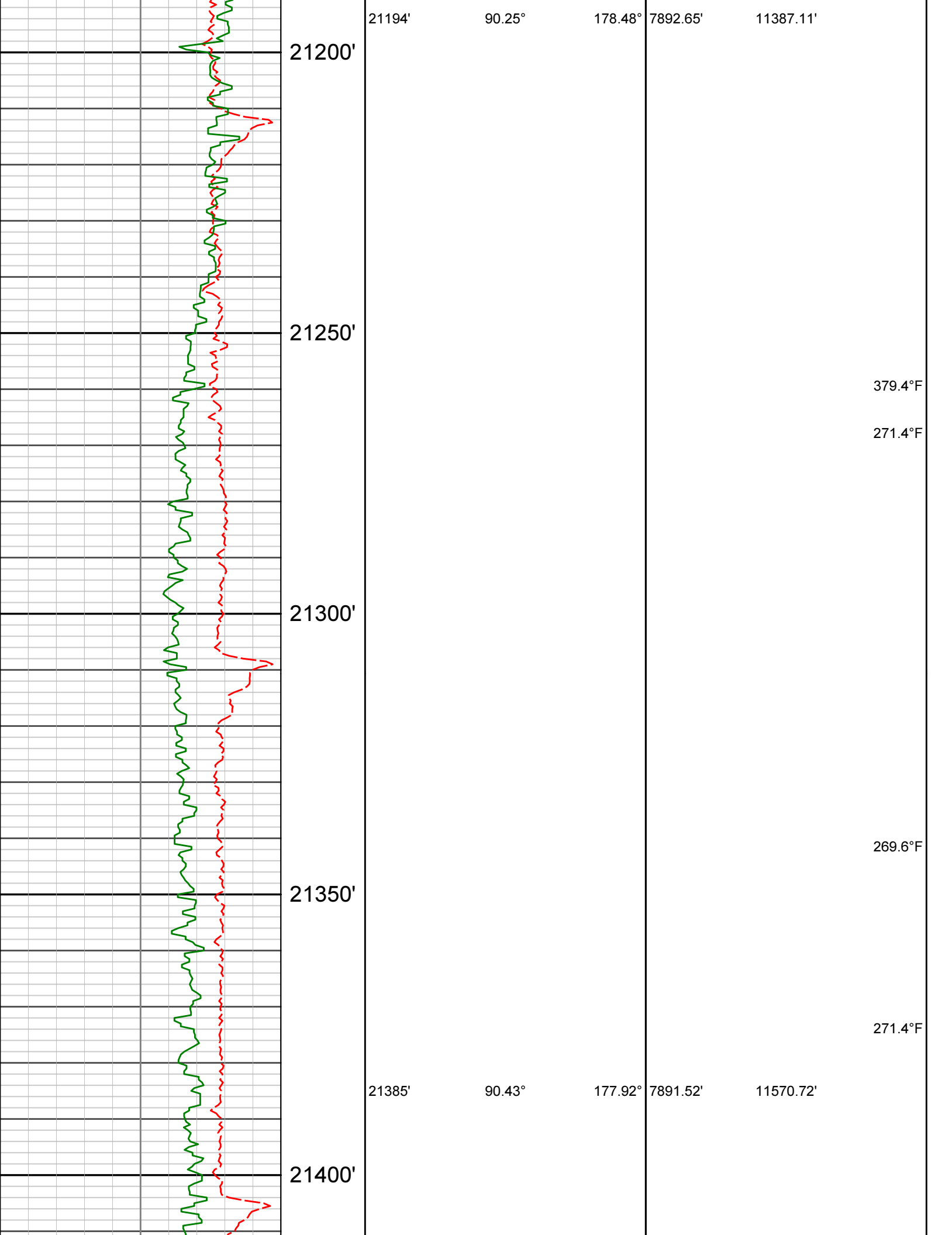
11112.76'

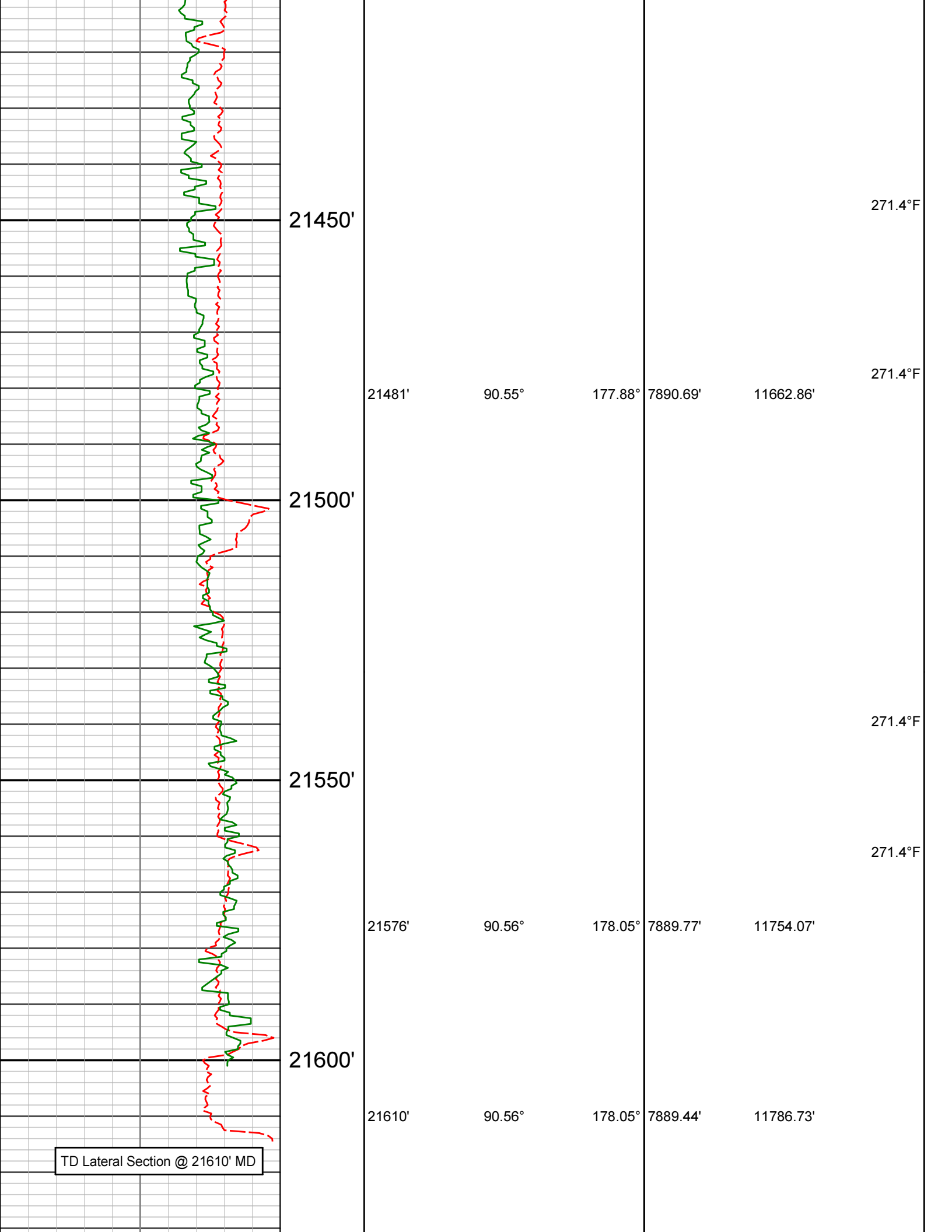
269.6°F

269.6°F

269.6°F







TD Lateral Section @ 21610' MD

[illegible]**HALLIBURTON**

## DIRECTIONAL SURVEY REPORT

Extraction Oil \_Gas  
NORTHWEST A S20-25-12N  
Wattenberg  
Broomfield Colorado  
USA  
CA-XX-0906084549  
Surveys from 131' to 1550' are 3rd party surveys.  
First Sperry survey at 1736'.

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
131.00	0.27	100.92	131.00	0.06 S	0.30 E	-0.02	0.21
223.00	0.40	87.44	223.00	0.09 S	0.84 E	-0.12	0.16
314.00	0.49	93.04	314.00	0.09 S	1.54 E	-0.29	0.11
403.00	0.35	92.64	402.99	0.12 S	2.19 E	-0.42	0.16
492.00	0.53	93.48	491.99	0.16 S	2.88 E	-0.55	0.20
582.00	0.40	95.11	581.99	0.22 S	3.61 E	-0.68	0.15
672.00	0.57	82.02	671.98	0.18 S	4.36 E	-0.89	0.22
761.00	0.80	94.93	760.98	0.17 S	5.42 E	-1.16	0.31
851.00	0.35	16.89	850.97	0.04 N	6.12 E	-1.54	0.89
940.00	0.44	347.66	939.97	0.63 N	6.13 E	-2.11	0.24
1029.00	0.40	336.60	1028.97	1.25 N	5.93 E	-2.67	0.10
1118.00	0.27	333.42	1117.97	1.72 N	5.72 E	-3.07	0.15
1208.00	0.44	347.00	1207.97	2.25 N	5.54 E	-3.54	0.21
1297.00	0.53	347.83	1296.96	2.98 N	5.38 E	-4.21	0.10
1386.00	0.66	346.25	1385.96	3.88 N	5.17 E	-5.03	0.15
1475.00	2.03	292.31	1474.93	4.98 N	3.59 E	-5.71	1.94
1550.00	3.67	290.94	1549.84	6.34 N	0.12 E	-6.18	2.19
1736.00	4.16	286.57	1735.40	10.39 N	11.91 W	-7.16	0.31
1832.00	7.19	303.84	1830.93	14.74 N	20.24 W	-9.32	3.59
1927.00	9.43	294.60	1924.93	21.29 N	32.26 W	-12.73	2.74
2046.00	12.30	291.60	2041.78	30.01 N	52.91 W	-16.13	2.45
2142.00	15.95	293.07	2134.87	38.95 N	74.56 W	-19.48	3.82
2236.00	16.68	292.92	2225.08	49.27 N	98.87 W	-23.53	0.78
2331.00	19.19	295.45	2315.46	61.29 N	125.53 W	-28.65	2.76
2427.00	21.58	295.85	2405.44	75.76 N	155.66 W	-35.30	2.49
2521.00	22.00	296.34	2492.73	91.11 N	187.00 W	-42.50	0.49
2616.00	24.13	295.81	2580.13	107.47 N	220.43 W	-50.15	2.25
2712.00	25.31	298.44	2667.33	125.78 N	256.14 W	-59.16	1.68
2807.00	27.76	295.81	2752.32	145.09 N	293.92 W	-68.62	2.85

## NORTHWEST A S20-25-12N

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
2900.00	28.43	295.30	2834.36	163.98 N	333.43 W	-77.25	0.77
2994.00	29.51	294.12	2916.60	183.00 N	374.80 W	-85.55	1.29
3090.00	31.88	292.49	2999.15	202.36 N	419.80 W	-93.29	2.62
3184.00	34.44	290.49	3077.84	221.17 N	467.65 W	-99.79	2.97
3278.00	36.78	293.05	3154.25	241.50 N	518.45 W	-107.04	2.95
3373.00	39.05	294.62	3229.20	265.10 N	571.83 W	-116.84	2.59
3468.00	42.42	297.39	3301.18	292.32 N	627.51 W	-129.58	4.03
3563.00	44.58	296.98	3370.08	322.19 N	685.68 W	-144.29	2.29
3658.00	41.00	296.03	3439.79	351.00 N	743.41 W	-158.07	3.83
3753.00	44.97	297.11	3509.27	379.99 N	801.32 W	-171.97	4.25
3848.00	47.23	297.53	3575.15	411.41 N	862.12 W	-187.53	2.40
3944.00	44.58	297.49	3641.95	443.25 N	923.26 W	-203.41	2.76
4039.00	49.36	296.08	3706.76	474.50 N	985.25 W	-218.52	5.15
4134.00	46.71	295.70	3770.28	505.34 N	1048.78 W	-232.85	2.80
4230.00	47.17	293.80	3835.83	534.70 N	1112.48 W	-245.69	1.52
4325.00	43.02	293.17	3902.88	561.52 N	1174.18 W	-256.57	4.40
4421.00	45.21	293.67	3971.80	588.09 N	1235.49 W	-267.30	2.31
4516.00	41.89	293.53	4040.64	614.29 N	1295.46 W	-278.00	3.49
4611.00	42.34	296.92	4111.12	641.44 N	1353.07 W	-290.20	2.44
4707.00	45.92	296.92	4180.02	671.69 N	1412.66 W	-304.93	3.73
4802.00	47.08	293.86	4245.42	701.22 N	1474.90 W	-318.29	2.64
4897.00	46.99	294.57	4310.17	729.73 N	1538.30 W	-330.39	0.56
4992.00	43.29	294.02	4377.17	757.44 N	1599.66 W	-342.22	3.92
5087.00	44.59	296.82	4445.58	785.75 N	1659.18 W	-355.08	2.46
5182.00	46.51	297.37	4512.10	816.65 N	1719.55 W	-370.23	2.06
5276.00	48.02	295.48	4575.89	847.36 N	1781.38 W	-384.85	2.18
5371.00	44.43	294.65	4641.61	876.42 N	1843.50 W	-397.80	3.83
5465.00	45.34	292.43	4708.21	902.90 N	1904.31 W	-408.56	1.93
5560.00	47.46	292.29	4773.72	929.07 N	1967.93 W	-418.34	2.23
5655.00	47.63	292.84	4837.85	955.97 N	2032.65 W	-428.56	0.46
5750.00	43.44	289.26	4904.39	980.38 N	2095.86 W	-436.73	5.16
5845.00	43.57	292.27	4973.31	1003.56 N	2156.99 W	-444.22	2.19
5939.00	44.99	296.65	5040.62	1030.76 N	2216.68 W	-455.95	3.59
6034.00	46.76	298.71	5106.76	1062.45 N	2277.06 W	-471.88	2.43
6129.00	49.02	298.97	5170.46	1096.45 N	2338.78 W	-489.71	2.38
6224.00	50.50	295.15	5231.85	1129.40 N	2403.35 W	-505.83	3.45
6320.00	48.45	293.59	5294.23	1159.52 N	2469.80 W	-518.73	2.47
6414.00	46.00	291.87	5358.07	1186.19 N	2533.42 W	-529.00	2.93
6509.00	42.53	290.56	5426.09	1210.19 N	2595.22 W	-537.13	3.77
6604.00	39.75	293.73	5497.63	1233.70 N	2653.11 W	-545.72	3.66
6699.00	36.04	292.60	5572.59	1256.67 N	2706.73 W	-554.85	3.97
6794.00	33.66	292.27	5650.54	1277.39 N	2756.91 W	-562.64	2.51
6889.00	28.24	293.78	5731.99	1296.44 N	2801.88 W	-570.09	5.77
6984.00	22.08	296.52	5817.93	1313.50 N	2838.46 W	-577.65	6.60
7079.00	17.52	293.94	5907.30	1327.28 N	2867.52 W	-583.89	4.88
7175.00	14.03	291.81	5999.67	1337.47 N	2891.53 W	-587.89	3.69
7269.00	12.19	292.41	6091.21	1345.49 N	2911.28 W	-590.82	1.96
7365.00	9.40	288.96	6185.51	1351.90 N	2928.07 W	-592.92	2.98
7460.00	5.01	305.39	6279.75	1356.83 N	2938.79 W	-595.07	5.05
7555.00	2.43	321.54	6374.54	1360.80 N	2943.42 W	-597.79	2.91
7650.00	0.67	13.52	6469.50	1362.92 N	2944.54 W	-599.56	2.19
7745.00	1.05	10.21	6564.49	1364.32 N	2944.26 W	-600.99	0.39
7840.00	1.13	354.00	6659.48	1366.10 N	2944.20 W	-602.73	0.33
7935.00	0.90	305.67	6754.46	1367.47 N	2944.91 W	-603.89	0.90
8126.00	0.29	178.54	6945.46	1367.86 N	2946.11 W	-603.97	0.57



## NORTHWEST A S20-25-12N

<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>
8221.00	0.31	142.09	7040.45	1367.42 N	2945.95 W	-603.58	0.20
8316.00	0.66	128.03	7135.45	1366.88 N	2945.36 W	-603.21	0.39
8410.00	0.76	117.39	7229.44	1366.27 N	2944.38 W	-602.85	0.17
8505.00	0.78	111.80	7324.44	1365.74 N	2943.22 W	-602.62	0.08
8600.00	11.70	173.44	7418.75	1355.89 N	2941.52 W	-593.49	11.95
8695.00	20.08	173.75	7510.04	1330.07 N	2938.64 W	-569.16	8.82
8791.00	28.74	182.57	7597.41	1290.54 N	2937.88 W	-531.03	9.76
8886.00	39.85	186.87	7675.78	1237.33 N	2942.56 W	-478.29	11.96
8981.00	50.31	187.05	7742.77	1170.65 N	2950.70 W	-411.65	11.01
9076.00	59.14	185.84	7797.58	1093.66 N	2959.35 W	-334.89	9.36
9171.00	67.55	184.27	7840.16	1009.16 N	2966.79 W	-251.15	8.97
9266.00	80.85	180.52	7865.98	918.05 N	2970.50 W	-161.91	14.51
9361.00	91.04	178.49	7872.69	823.42 N	2969.68 W	-70.36	10.94
9456.00	88.79	177.15	7872.83	728.50 N	2966.07 W	20.78	2.77
9551.00	87.88	176.83	7875.58	633.67 N	2961.08 W	111.49	1.01
9646.00	88.32	177.96	7878.73	538.82 N	2956.76 W	202.39	1.28
9742.00	88.69	177.10	7881.24	442.95 N	2952.63 W	294.32	0.97
9836.00	89.19	176.19	7882.98	349.13 N	2947.13 W	383.94	1.11
9931.00	90.17	179.88	7883.51	254.20 N	2943.87 W	475.17	4.02
10026.00	90.97	178.78	7882.57	159.21 N	2942.76 W	566.98	1.43
10122.00	89.63	181.43	7882.06	63.23 N	2942.94 W	660.09	3.09
10217.00	90.13	180.34	7882.25	31.76 S	2944.41 W	752.53	1.26
10312.00	90.64	179.80	7881.62	126.76 S	2944.53 W	844.66	0.78
10406.00	91.14	179.59	7880.16	220.74 S	2944.03 W	935.66	0.58
10501.00	90.20	182.87	7879.04	315.70 S	2946.07 W	1028.22	3.59
10596.00	90.94	183.24	7878.10	410.56 S	2951.13 W	1121.43	0.87
10691.00	89.80	182.31	7877.49	505.45 S	2955.73 W	1214.54	1.55
10787.00	91.18	181.39	7876.67	601.39 S	2958.83 W	1308.32	1.73
10882.00	88.62	178.76	7876.84	696.37 S	2958.95 W	1400.43	3.86
10976.00	88.46	179.81	7879.23	790.33 S	2957.78 W	1491.24	1.13
11071.00	89.03	180.36	7881.32	885.31 S	2957.92 W	1583.35	0.83
11167.00	90.24	180.86	7881.94	981.30 S	2958.94 W	1676.67	1.37
11261.00	88.52	182.73	7882.96	1075.24 S	2961.89 W	1768.46	2.70
11356.00	89.46	179.04	7884.64	1170.20 S	2963.36 W	1860.88	4.01
11452.00	88.32	178.34	7886.50	1266.15 S	2961.17 W	1953.38	1.40
11547.00	89.80	178.79	7888.06	1361.11 S	2958.79 W	2044.85	1.63
11642.00	87.51	179.23	7890.29	1456.06 S	2957.15 W	2136.50	2.45
11737.00	87.72	179.43	7894.24	1550.97 S	2956.04 W	2228.25	0.31
11833.00	88.32	179.76	7897.56	1646.91 S	2955.37 W	2321.09	0.72
11928.00	88.72	179.35	7900.02	1741.87 S	2954.63 W	2412.98	0.60
12023.00	89.49	178.98	7901.50	1836.85 S	2953.25 W	2504.72	0.91
12119.00	89.87	178.95	7902.03	1932.83 S	2951.51 W	2597.35	0.39
12214.00	90.60	178.00	7901.64	2027.80 S	2948.98 W	2688.80	1.26
12310.00	91.18	177.82	7900.15	2123.72 S	2945.47 W	2780.94	0.63
12405.00	89.70	180.07	7899.43	2218.69 S	2943.73 W	2872.58	2.84
12500.00	90.34	179.78	7899.40	2313.69 S	2943.61 W	2964.65	0.74
12596.00	88.66	179.25	7900.24	2409.68 S	2942.79 W	3057.51	1.84
12727.00	88.77	179.43	7903.19	2540.64 S	2941.27 W	3184.11	0.16
12824.00	89.26	179.48	7904.86	2637.62 S	2940.35 W	3277.90	0.51
12917.00	89.38	179.63	7905.97	2730.61 S	2939.63 W	3367.88	0.21
13013.00	89.63	179.70	7906.79	2826.61 S	2939.07 W	3460.81	0.27
13108.00	89.75	179.83	7907.31	2921.61 S	2938.68 W	3552.81	0.19
13203.00	89.88	179.82	7907.61	3016.60 S	2938.39 W	3644.84	0.13
13298.00	89.81	179.74	7907.87	3111.60 S	2938.02 W	3736.85	0.10
13489.00	89.44	180.04	7909.10	3302.60 S	2937.65 W	3921.93	0.25

## NORTHWEST A S20-25-12N

<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>
13585.00	90.00	180.16	7909.57	3398.60 S	2937.81 W	4015.04	0.59
13680.00	90.00	180.18	7909.57	3493.60 S	2938.09 W	4107.21	0.02
13775.00	90.19	179.51	7909.42	3588.60 S	2937.82 W	4199.24	0.73
13871.00	90.31	178.95	7909.00	3684.59 S	2936.53 W	4291.99	0.60
13966.00	90.25	178.70	7908.54	3779.56 S	2934.57 W	4383.59	0.27
14061.00	90.06	178.61	7908.29	3874.54 S	2932.34 W	4475.12	0.22
14156.00	90.00	178.87	7908.24	3969.51 S	2930.25 W	4566.68	0.29
14251.00	89.81	178.95	7908.39	4064.50 S	2928.45 W	4658.33	0.21
14346.00	89.81	179.28	7908.70	4159.48 S	2926.98 W	4750.06	0.34
14441.00	89.81	179.78	7909.00	4254.48 S	2926.20 W	4841.96	0.52
14536.00	89.88	179.87	7909.26	4349.48 S	2925.91 W	4933.99	0.12
14631.00	90.06	180.22	7909.31	4444.48 S	2925.98 W	5026.11	0.41
14727.00	90.12	179.98	7909.15	4540.48 S	2926.14 W	5119.22	0.26
14822.00	90.25	180.14	7908.85	4635.48 S	2926.24 W	5211.35	0.22
14918.00	90.31	179.75	7908.38	4731.48 S	2926.15 W	5304.40	0.41
15013.00	90.31	179.22	7907.87	4826.47 S	2925.30 W	5396.28	0.55
15109.00	89.94	178.41	7907.66	4922.45 S	2923.32 W	5488.85	0.93
15204.00	89.88	177.74	7907.82	5017.40 S	2920.13 W	5580.12	0.71
15299.00	90.06	177.83	7907.87	5112.33 S	2916.46 W	5671.25	0.22
15394.00	90.19	177.61	7907.66	5207.25 S	2912.68 W	5762.35	0.26
15490.00	90.25	177.93	7907.30	5303.18 S	2908.94 W	5854.44	0.34
15585.00	90.25	177.51	7906.89	5398.10 S	2905.16 W	5945.54	0.44
15680.00	90.25	177.71	7906.48	5493.02 S	2901.20 W	6036.59	0.20
15775.00	90.31	177.97	7906.02	5587.95 S	2897.62 W	6127.74	0.29
15869.00	90.43	178.24	7905.42	5681.89 S	2894.51 W	6218.06	0.31
15964.00	90.25	178.59	7904.85	5776.86 S	2891.88 W	6309.48	0.42
16060.00	90.06	178.29	7904.59	5872.82 S	2889.26 W	6401.88	0.37
16155.00	90.31	178.62	7904.29	5967.78 S	2886.70 W	6493.31	0.44
16251.00	90.43	178.92	7903.67	6063.76 S	2884.64 W	6585.86	0.34
16346.00	90.12	179.76	7903.21	6158.75 S	2883.54 W	6677.68	0.94
16442.00	89.94	180.41	7903.15	6254.75 S	2883.69 W	6770.79	0.70
16537.00	89.81	181.21	7903.36	6349.74 S	2885.03 W	6863.21	0.85
16632.00	89.69	182.36	7903.77	6444.69 S	2887.99 W	6955.99	1.21
16727.00	89.81	182.71	7904.18	6539.60 S	2892.19 W	7049.03	0.39
16823.00	89.75	183.23	7904.54	6635.47 S	2897.17 W	7143.20	0.55
16918.00	89.26	183.50	7905.36	6730.30 S	2902.75 W	7236.50	0.59
17013.00	89.38	183.58	7906.48	6825.11 S	2908.62 W	7329.86	0.15
17109.00	89.32	184.14	7907.57	6920.89 S	2915.09 W	7424.30	0.58
17204.00	89.14	184.29	7908.85	7015.62 S	2922.07 W	7517.85	0.25
17299.00	89.38	184.11	7910.08	7110.36 S	2929.03 W	7611.41	0.32
17394.00	89.88	184.13	7910.69	7205.11 S	2935.86 W	7704.94	0.52
17489.00	90.00	183.45	7910.80	7299.90 S	2942.14 W	7798.38	0.73
17585.00	90.00	183.55	7910.80	7395.72 S	2948.00 W	7892.72	0.11
17680.00	90.12	183.24	7910.69	7490.56 S	2953.63 W	7986.04	0.35
17775.00	90.37	182.96	7910.28	7585.41 S	2958.77 W	8079.26	0.39
17870.00	90.43	182.63	7909.62	7680.30 S	2963.40 W	8172.39	0.36
17964.00	90.49	182.46	7908.86	7774.20 S	2967.57 W	8264.45	0.19
18060.00	90.56	182.03	7907.98	7870.13 S	2971.33 W	8358.37	0.45
18154.00	90.68	181.30	7906.97	7964.08 S	2974.06 W	8450.12	0.79
18248.00	90.74	181.00	7905.80	8058.05 S	2975.94 W	8541.69	0.32
18343.00	90.74	180.95	7904.57	8153.03 S	2977.56 W	8634.17	0.05
18438.00	90.56	181.09	7903.50	8248.01 S	2979.24 W	8726.66	0.24
18627.00	90.25	180.96	7902.18	8436.98 S	2982.61 W	8910.69	0.18
18722.00	90.25	180.60	7901.77	8531.97 S	2983.90 W	9003.10	0.37
18816.00	90.19	179.69	7901.41	8625.96 S	2984.14 W	9094.29	0.97

## NORTHWEST A S20-25-12N

<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>
18912.00	90.06	179.47	7901.21	8721.96 S	2983.44 W	9187.18	0.26
19006.00	90.19	178.94	7901.00	8815.95 S	2982.13 W	9277.98	0.58
19101.00	90.06	177.99	7900.80	8910.92 S	2979.58 W	9369.43	1.00
19196.00	90.06	176.59	7900.70	9005.81 S	2975.09 W	9460.32	1.48
19291.00	90.12	177.30	7900.54	9100.67 S	2970.03 W	9551.05	0.75
19387.00	90.06	177.69	7900.39	9196.58 S	2965.84 W	9643.01	0.41
19482.00	89.81	178.72	7900.49	9291.53 S	2962.87 W	9734.33	1.12
19577.00	89.94	179.31	7900.69	9386.52 S	2961.23 W	9826.02	0.63
19673.00	90.19	179.34	7900.59	9482.51 S	2960.10 W	9918.81	0.26
19863.00	90.31	178.64	7899.77	9672.48 S	2956.75 W	10102.16	0.38
19957.00	90.56	178.72	7899.06	9766.45 S	2954.59 W	10192.73	0.28
20052.00	90.49	178.74	7898.19	9861.42 S	2952.48 W	10284.29	0.07
20147.00	90.56	179.18	7897.32	9956.40 S	2950.76 W	10375.95	0.47
20243.00	90.37	179.68	7896.55	10052.40 S	2949.80 W	10468.78	0.56
20338.00	90.37	180.27	7895.93	10147.39 S	2949.77 W	10560.87	0.62
20434.00	90.43	180.04	7895.26	10243.39 S	2950.02 W	10654.00	0.25
20624.00	90.19	179.22	7894.24	10433.38 S	2948.79 W	10837.90	0.45
20719.00	90.12	179.10	7893.98	10528.37 S	2947.39 W	10929.64	0.14
20815.00	90.19	178.60	7893.72	10624.35 S	2945.46 W	11022.22	0.52
20909.00	90.12	178.57	7893.47	10718.32 S	2943.14 W	11112.76	0.07
21005.00	90.12	178.47	7893.26	10814.29 S	2940.66 W	11205.19	0.11
21099.00	90.19	178.44	7893.01	10908.26 S	2938.13 W	11295.67	0.07
21194.00	90.25	178.48	7892.65	11003.22 S	2935.58 W	11387.11	0.07
21385.00	90.43	177.92	7891.52	11194.12 S	2929.57 W	11570.72	0.31
21481.00	90.55	177.88	7890.69	11290.05 S	2926.05 W	11662.86	0.14
21576.00	90.56	178.05	7889.77	11384.99 S	2922.68 W	11754.07	0.18
21610.00	90.56	178.05	7889.44	11418.97 S	2921.52 W	11786.73	0.01

### 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 194.19 DEGREES (TRUE)  
A TOTAL CORRECTION OF 8.24 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 21610.00 FEET  
IS 11786.78 FEET ALONG 194.35 DEGREES (TRUE)

Final survey is a projection to bit.