

PCGC - Pressure Case Gamma
PCDC - Pressure Case Directional

1 : 240 / 1 : 600

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	28-Jan-16	30-Jan-16			
Rig Bit Number	2	3			
Bit Size (in)	8.750	6.125			
Tool Nominal OD (in)	6.750	5.050			
Log Start Depth (MD, ft)	618.00	6,280.00			
Log End Depth (MD, ft)	6,280.00	10,076.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	26-Jan-16 23:00	28-Jan-16 14:04			
Drill/Wipe End Date and Time	28-Jan-16 04:30	28-Jan-16 14:04			
Min Inc (deg) @ Depth (MD, ft)	0.17 @ 618.00	86.76 @ 6,324.00			
Max Inc (deg) @ Depth (MD, ft)	80.25 @ 6,225.00	92.19 @ 8,594.00			
Bit TFA(in2) / Bit Type	1.05 / PDC	0.68 / PDC			
Flow Rate (gpm)	576.35	316.33			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	10.35 / 42.00	10.32 / 38.00			
Filtrate CL (ppm)	1,700.00	2,000.00			
pH / Fluid Loss (mptm)	9.50 / 7	8.60 / 8			
PV (cP) / YP (lbf2)	10 / 11.00	9 / 7.00			
% Solids / % Sand	9.80 / 0.30	9.80 / 0.10			
% Oil / Oil:Water Ratio	N/A / 0:99	N/A / 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 (in F) / S	108.00 / PGM	215.51 / PGM			

Max Tool Temp (degF) / Source	160.83 / PCM	215.51 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Adam Sampson	Adam Sampson			
Customer Representative	Justin Fields	Justin Fields			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11341339	12686428			
Insert Serial Number	11227541	11227541			
Date and Time Initialized	26-Jan-16 18:06	28-Jan-16 15:36			
Date and Time Read	28-Jan-16 13:24	01-Jan-70 00:00			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	55.00	68.00			
Software Version	6.33	6.33			
Sub Serial Number	11341339	12686428			
Sonde Serial Number	11297563	11297563			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	334.52	278.60			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	42.46	55.45			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11341339	12686428			
Insert/Sonde Serial Number	12071507	12071507			

REMARKS

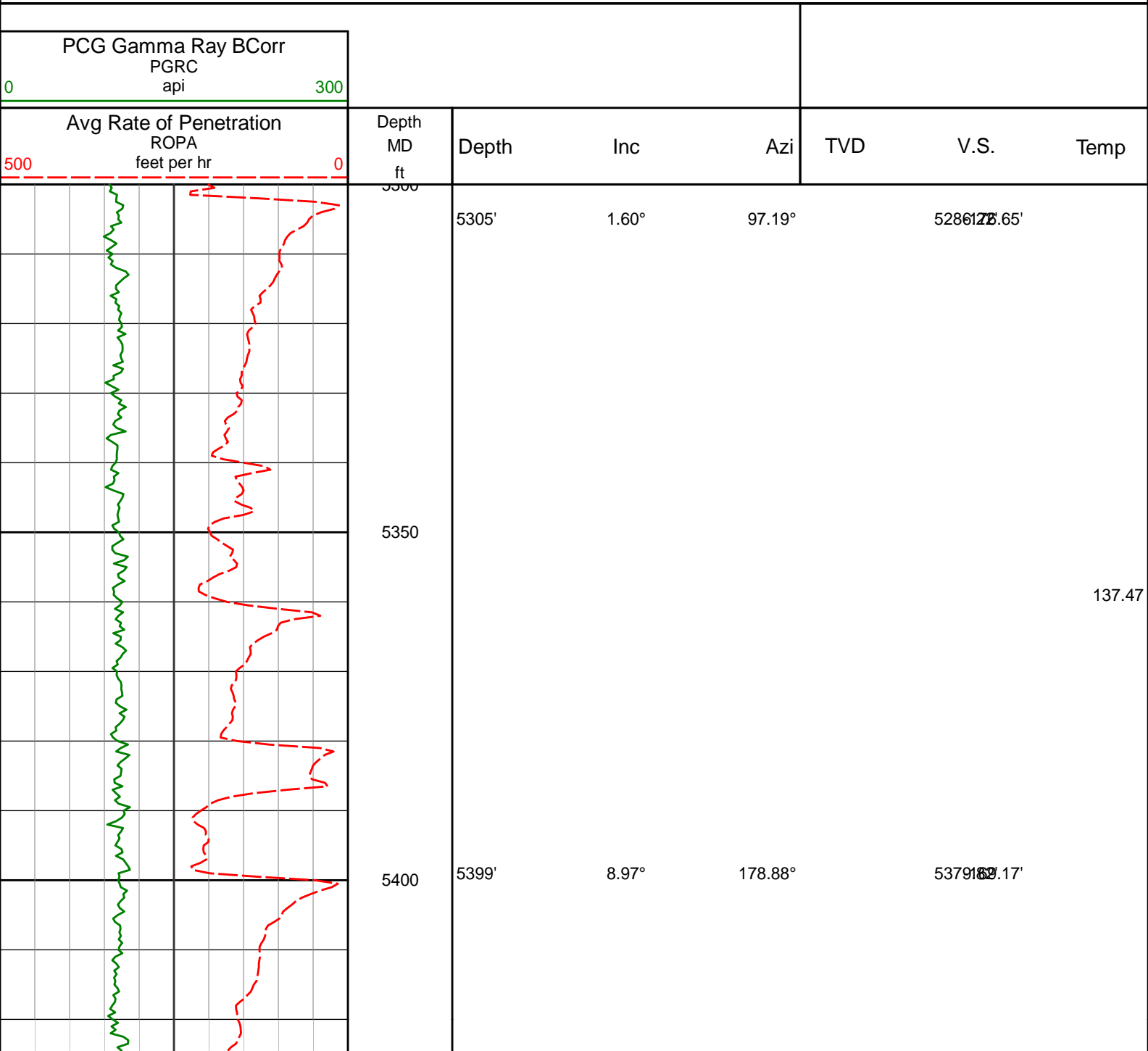
1. All depths are calibrated to the driller's pipe tally and are measured from the Rig drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
 - ROPA: Average Rate of Penetration is real time data.
 - PGRC: Smooth Pressure Case Gamma Ray Borehole corrected is recorded data.
4. The following smoothing parameters have been applied to the data:
 - All ROP in logs - 0.5 ft interval, 1.2 ft coercion distance.
 - Gamma in 2" (1:600) logs - 1 ft interval, 3 ft coercion distance.
 - Gamma in 5" (1:240) logs - 0.5 ft interval, 0.6 ft coercion distance.
5. INSITE version 8.3.0.

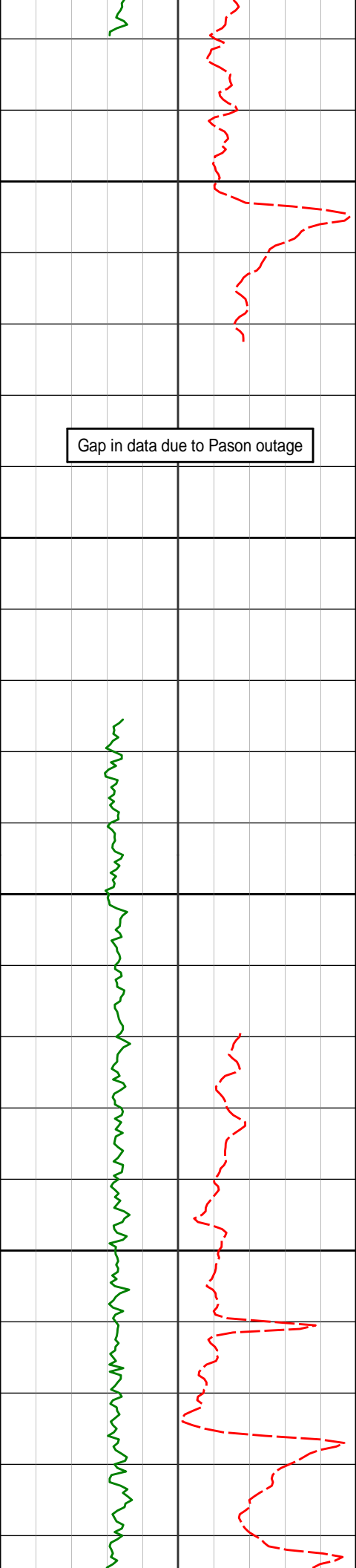
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MD Detail 1:240 Scale





5450

5500

5550

5600

5493'

17.33°

181.37°

54741.81'

5587'

24.70°

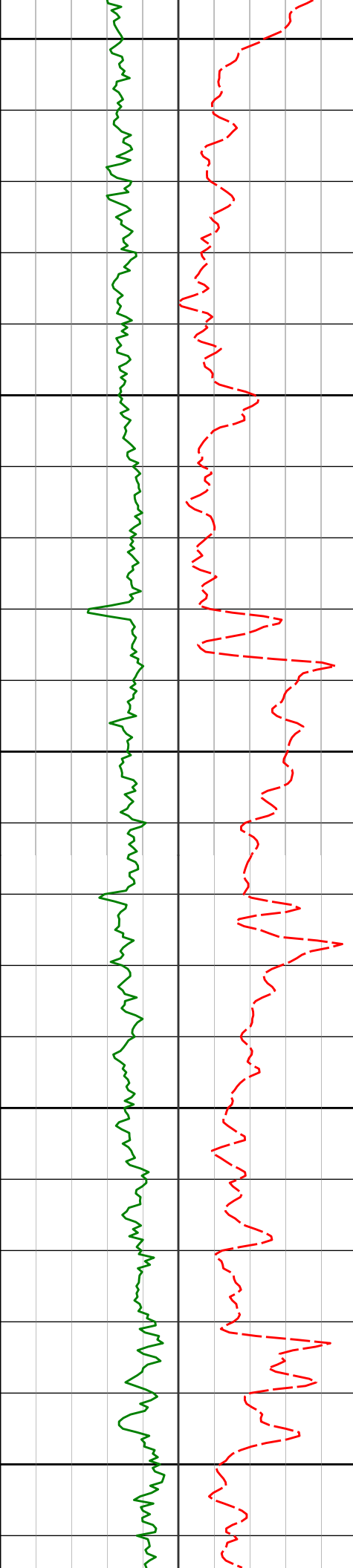
180.48°

55581.12'

141.69
145.91

145.91

145.91



5650

5682'

32.40°

183.28°

5642.35'
5678'

5700

5750

5776'

39.90°

182.27°

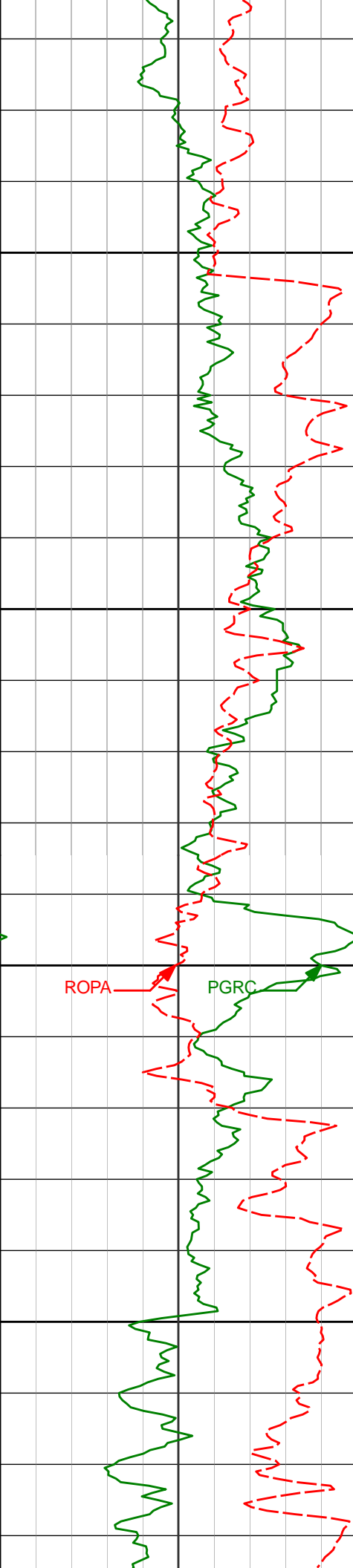
5718.20'
5739'

5800

5850

150.13

154.34



5900

5950

6000

6050

5870'

48.53°

181.52°

5785.52.09'

5964'

57.56°

183.56°

5841197.10'

6058'

65.42°

184.28°

5886289.52'

154.34

150.13

150.13

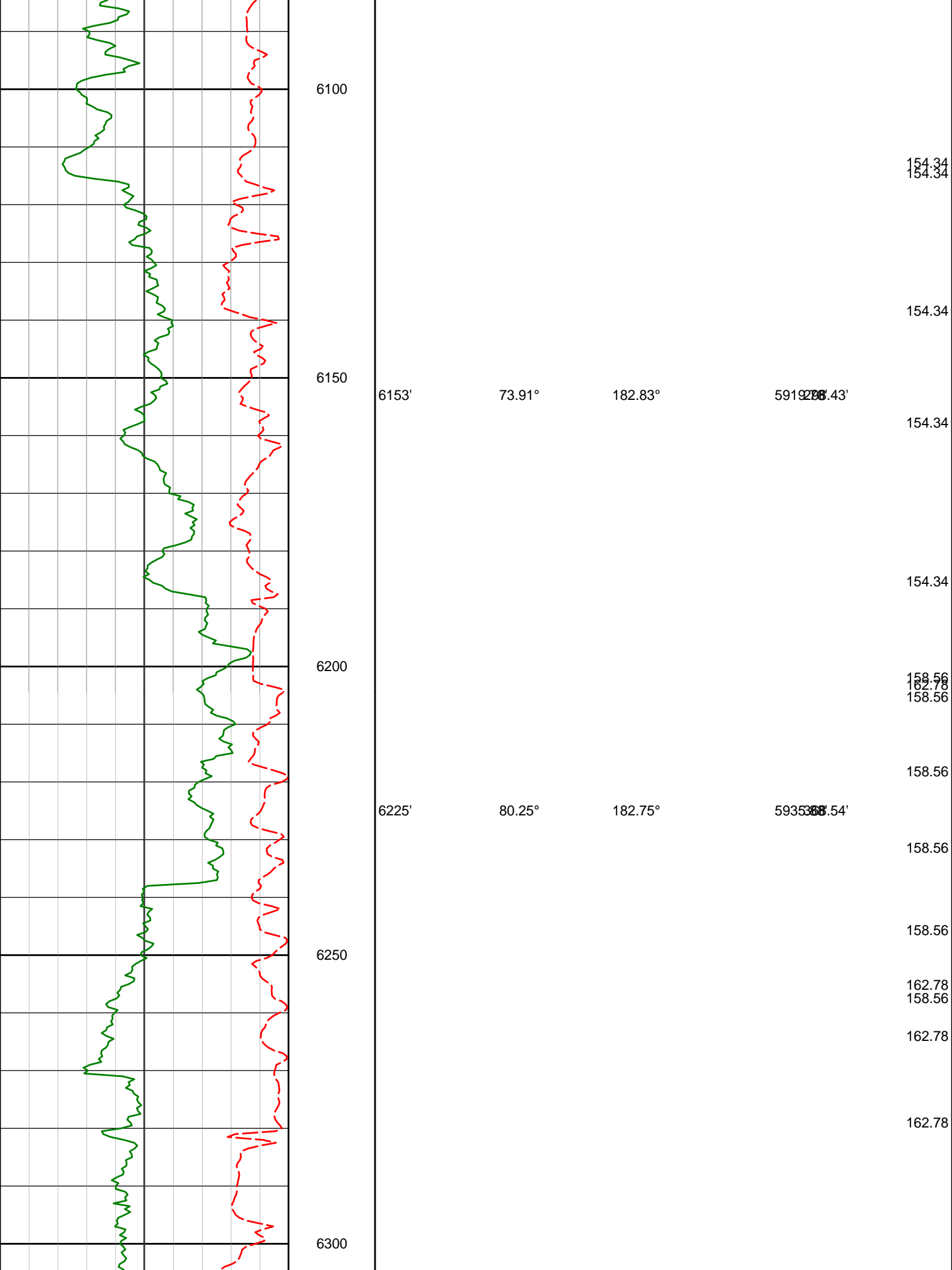
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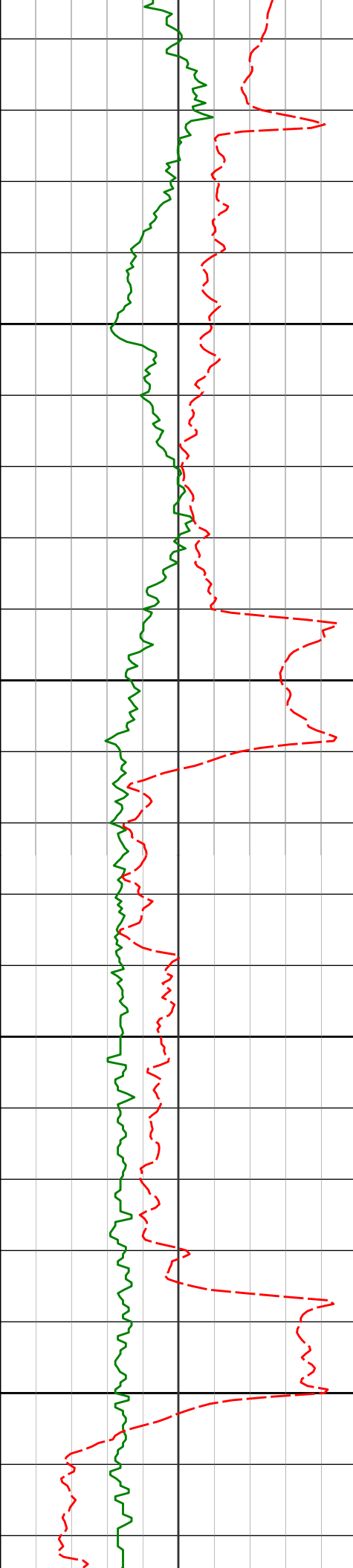
150.13

150.13

150.13

150.13





6350

6400

6450

6500

6324'

86.76°

181.69°

5947465.83'

154.34

6419'

89.51°

181.64°

5950561.77'

162.78

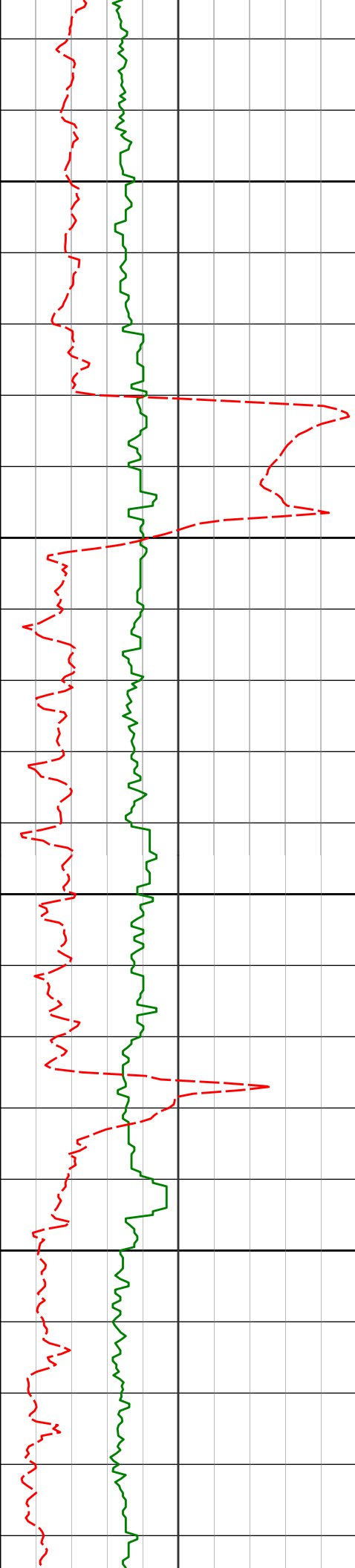
6513'

90.74°

179.42°

5949995.75'

167.00



6550

6600

6650

6700

6608'

89.14°

177.75°

5950756.66'

171.22

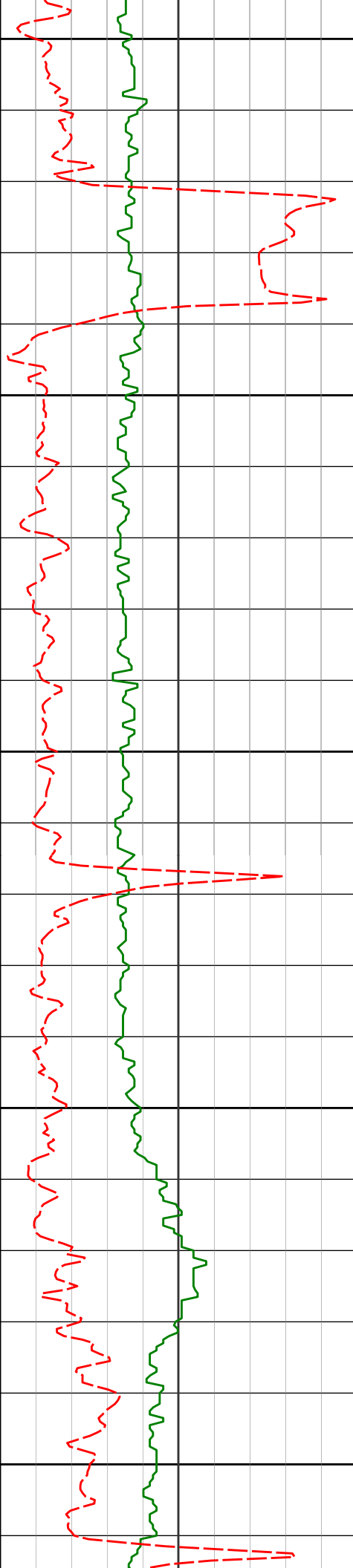
6703'

88.77°

177.29°

5951895.47'

175.44



6750

6800

6850

6900

6950

6797'

91.08°

177.38°

595193.26'

6892'

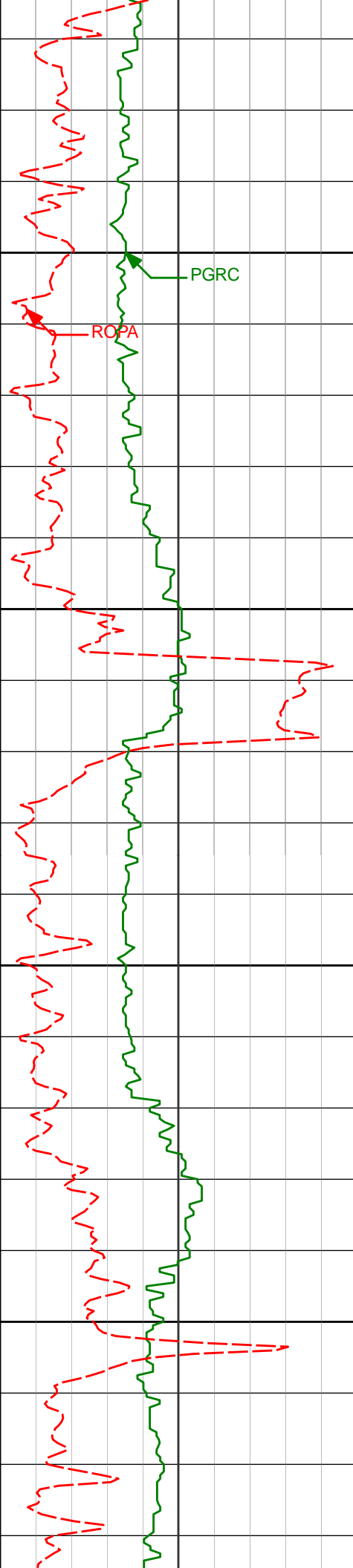
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177.43°

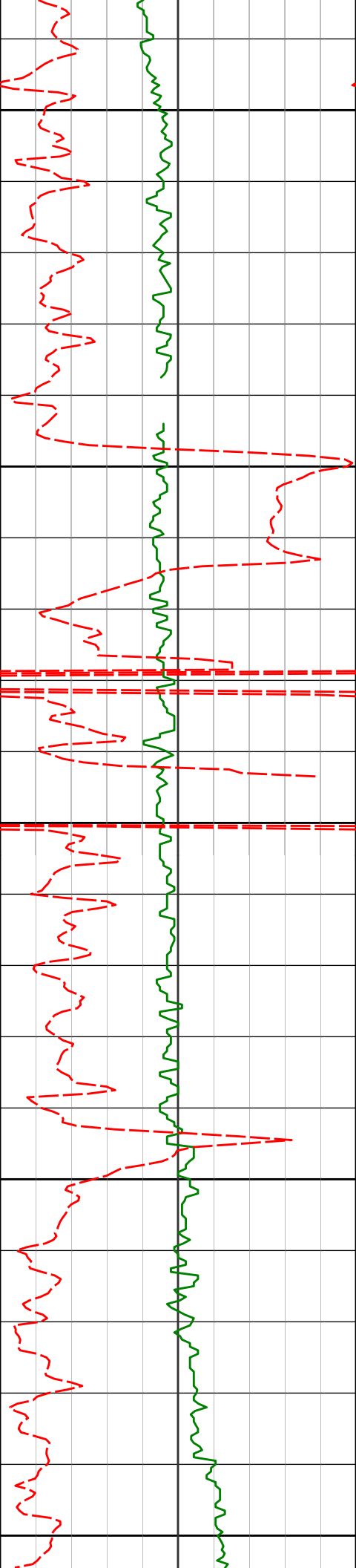
594809.05'

179.66

179.66



6987'	92.16°	176.86°	5947108.79'	
				183.88
7000				
7050				
7081'	91.23°	176.82°	5947122.49'	
				183.88
7100				
7150				
7176'	92.13°	176.95°	5947137.20'	



7200

7250

7300

7350

7400

7271'

90.86°

177.32°

5939405'.95'

7365'

92.00°

177.80°

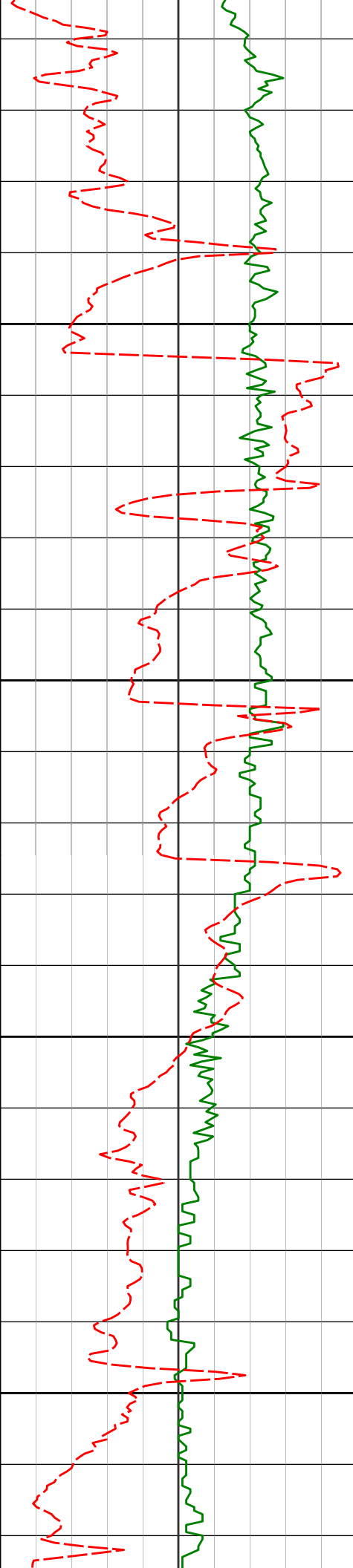
5936565'.74'

188.09

188.09

188.09

188.09



7450

7460'

90.00°

178.79°

593600.61'

7500

7550

7555'

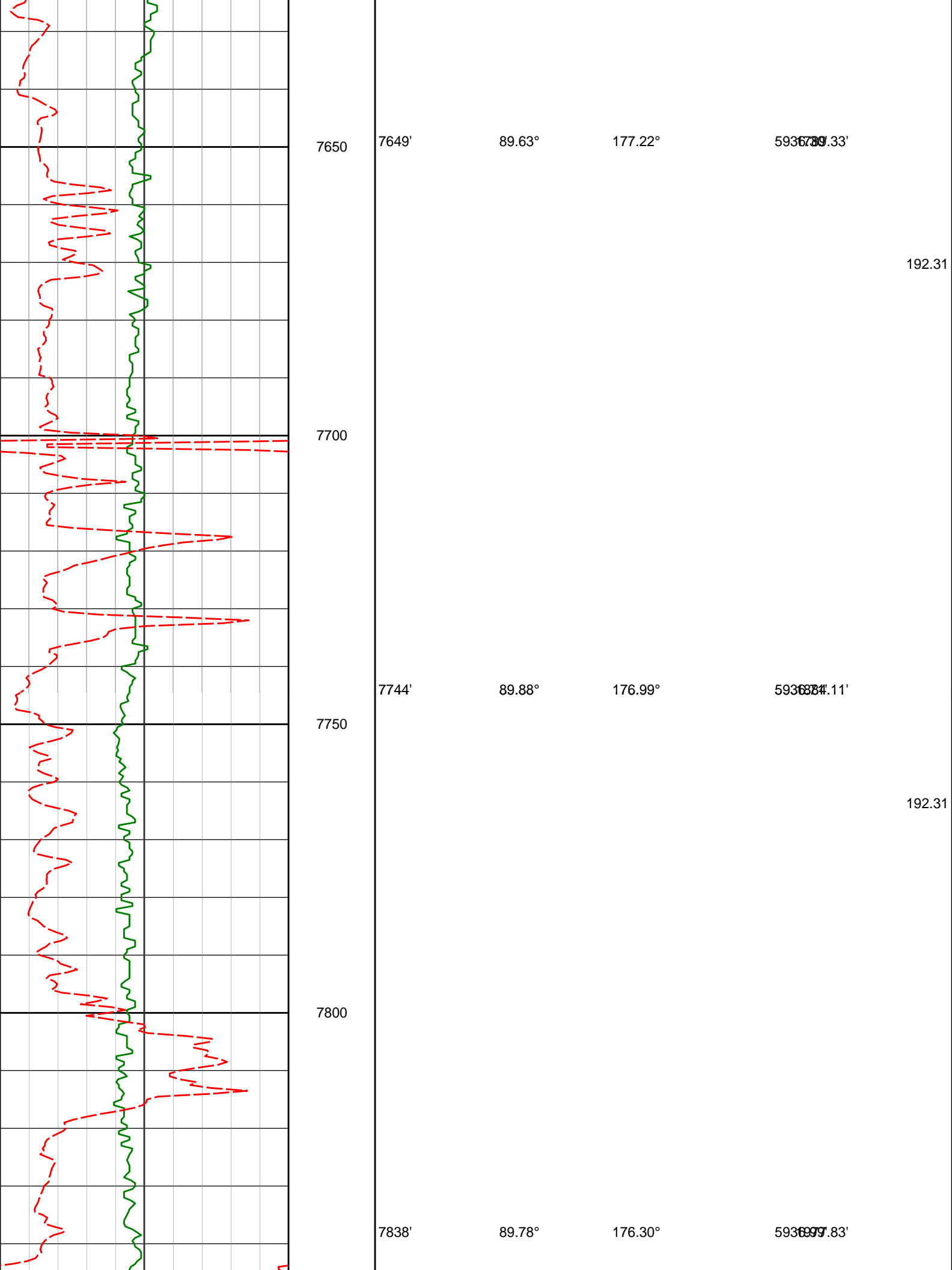
89.41°

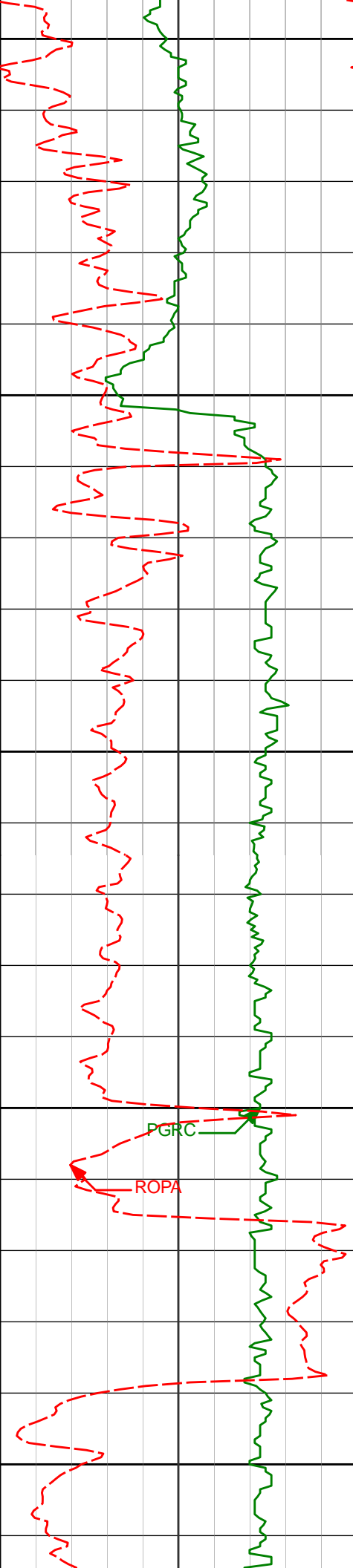
177.96°

593602.51'

7600

188.09





7850

196.53

7900

7933'

89.48°

176.13°

5932.49'

7950

196.53

8000

PGRC

ROPA

8027'

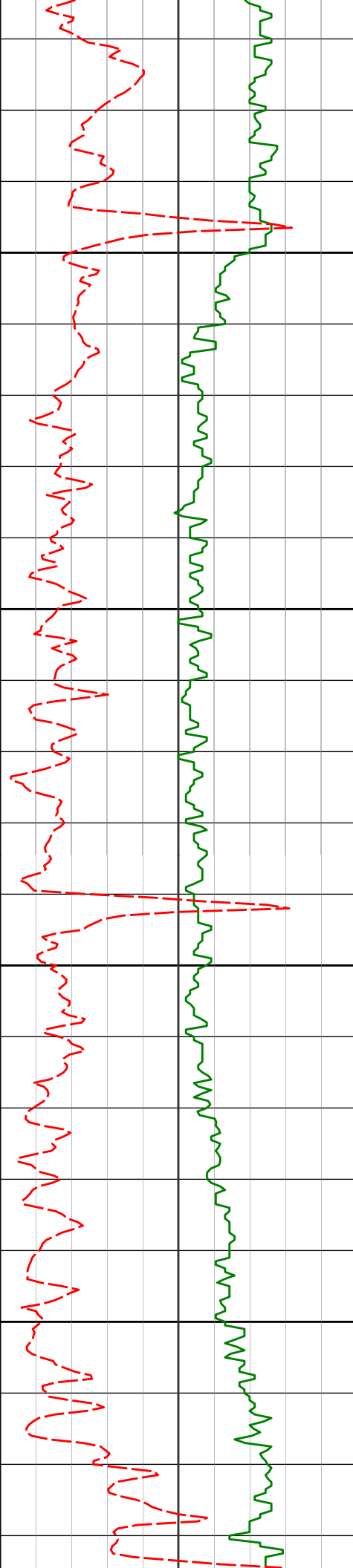
89.91°

177.83°

5932.25'

8050

196.53



8100

8122'

90.49°

178.86°

59327.14'

200.75

8150

8200

8217'

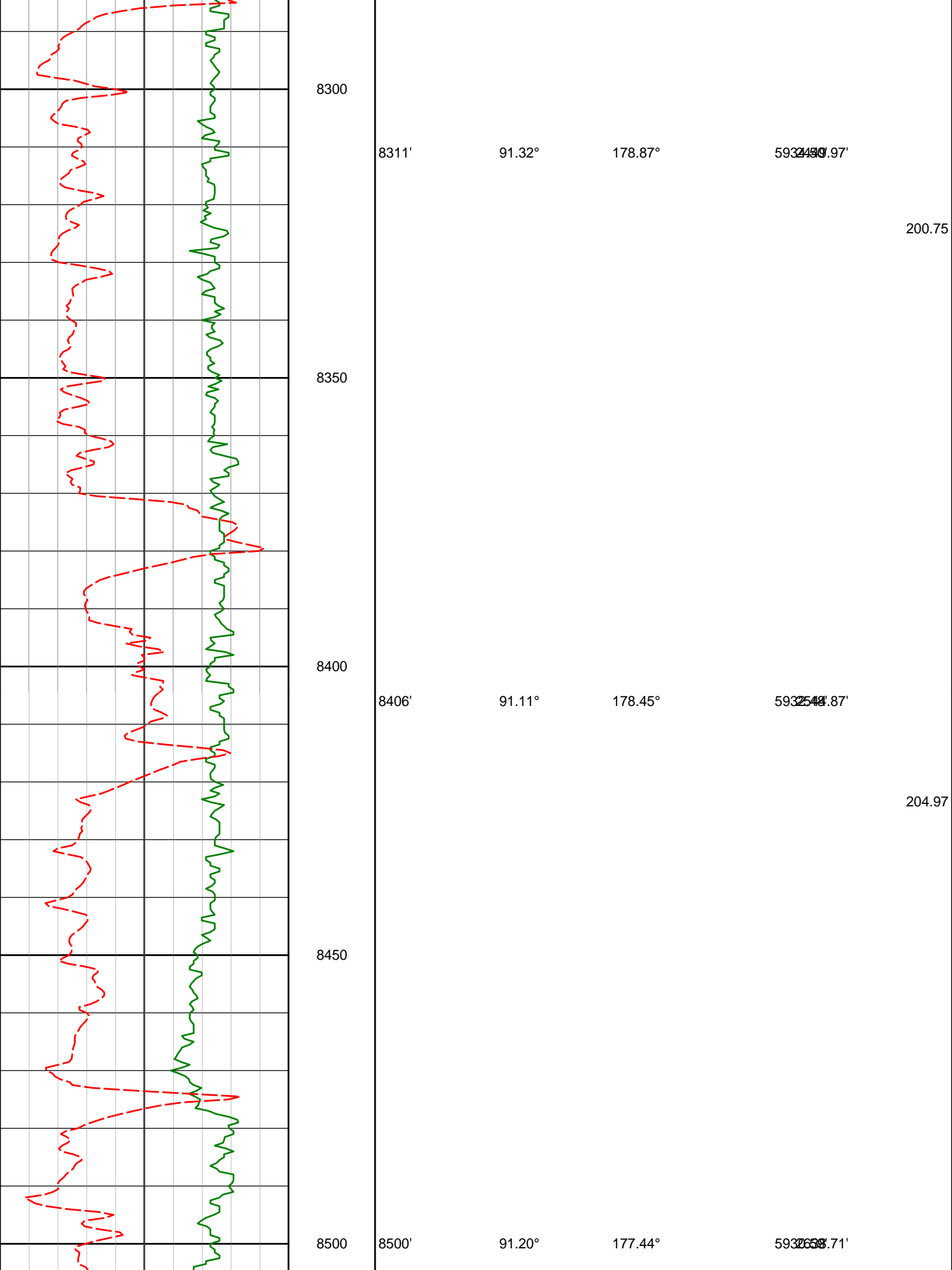
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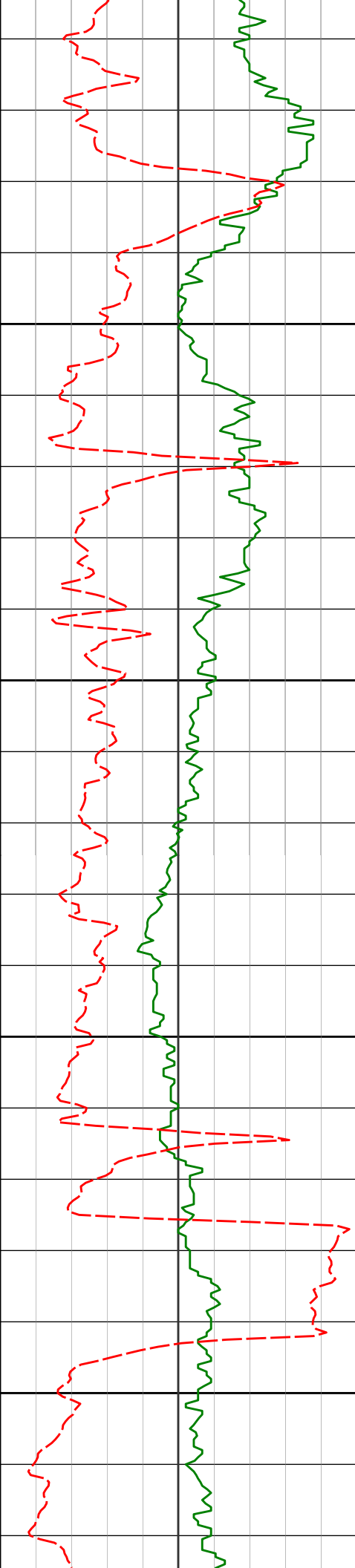
178.79°

59335.06'

200.75

8250





8550

8600

8650

8700

8594'

92.19°

178.12°

592732.52'

8689'

90.77°

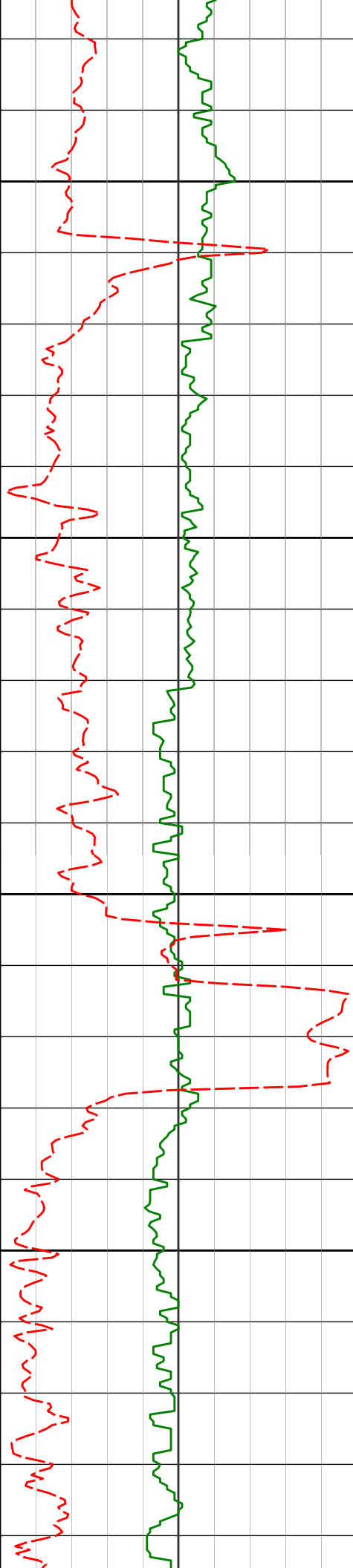
178.83°

592837.39'

204.97

209.19

204.97



8750

8783'

90.92°

178.49°

592296' 29'

8800

209.19

8850

8877'

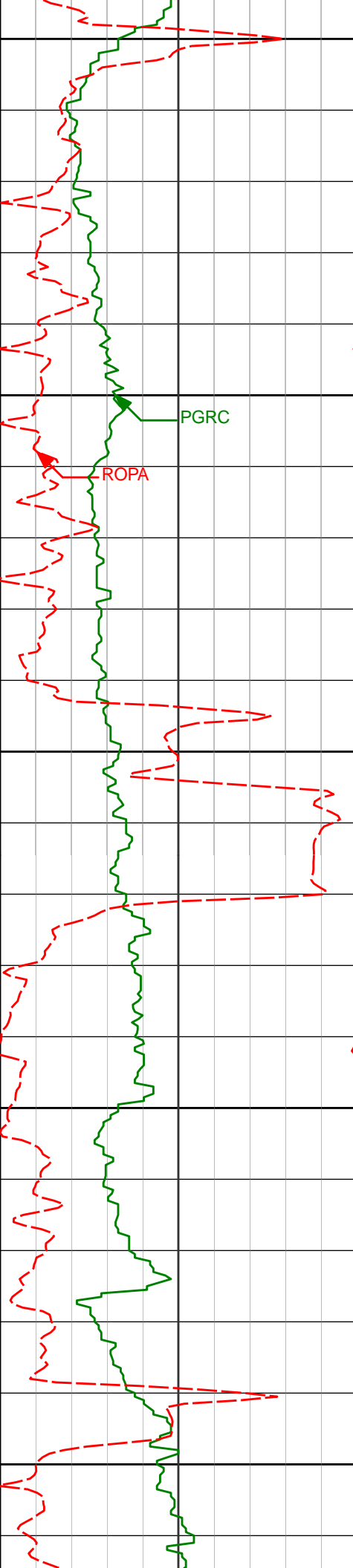
90.65°

180.36°

592305' 24'

8900

204.97



8950

8971'

91.39°

179.95°

5923109.22'

9000

PGRC

ROPA

9050

9066'

89.91°

179.85°

5913204.19'

9100

9150

9160'

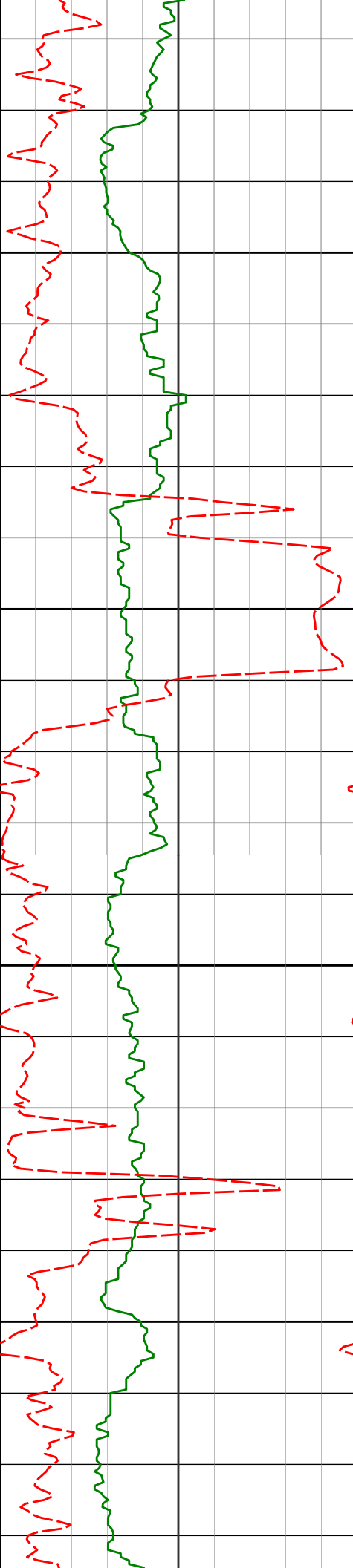
90.99°

180.26°

5913208.17'

209.19

204.97



9200

9250

9300

9350

9254'

9348'

89.26°

89.69°

180.04°

179.17°

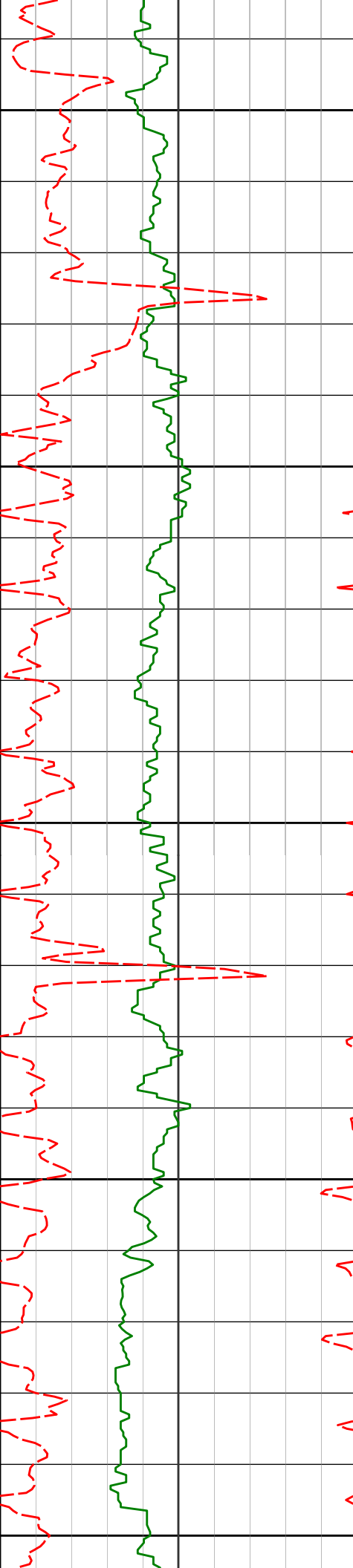
5913.92'

5913.85'

209.19

204.97

209.19



9400

9450

9500

9550

9600

9442'

90.12°

178.29°

5928.04'

9536'

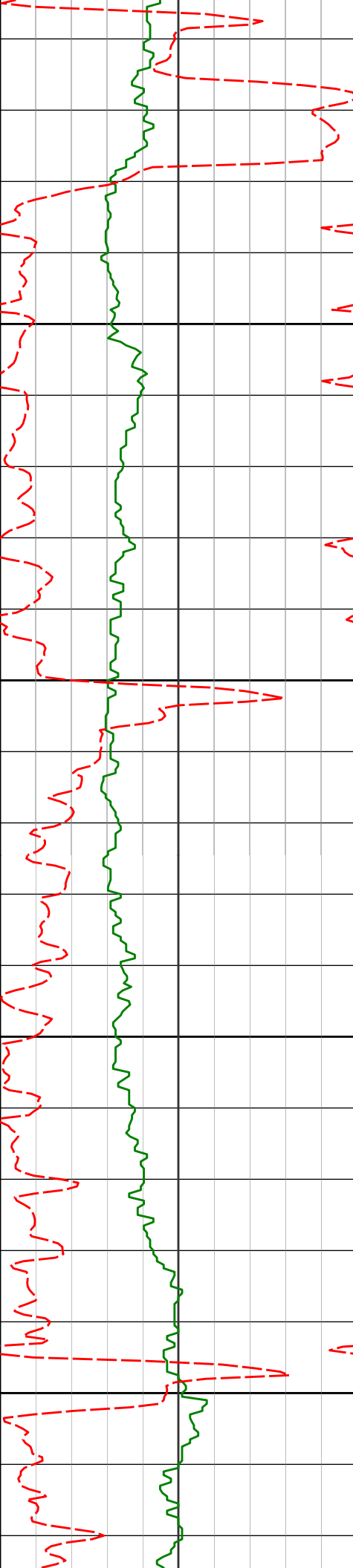
90.71°

177.78°

5913.91'

209.19

213.41



9631'

89.78°

177.97°

5913.76'

9650

209.19

9700

9725'

90.15°

178.36°

5913.65'

9750

213.41

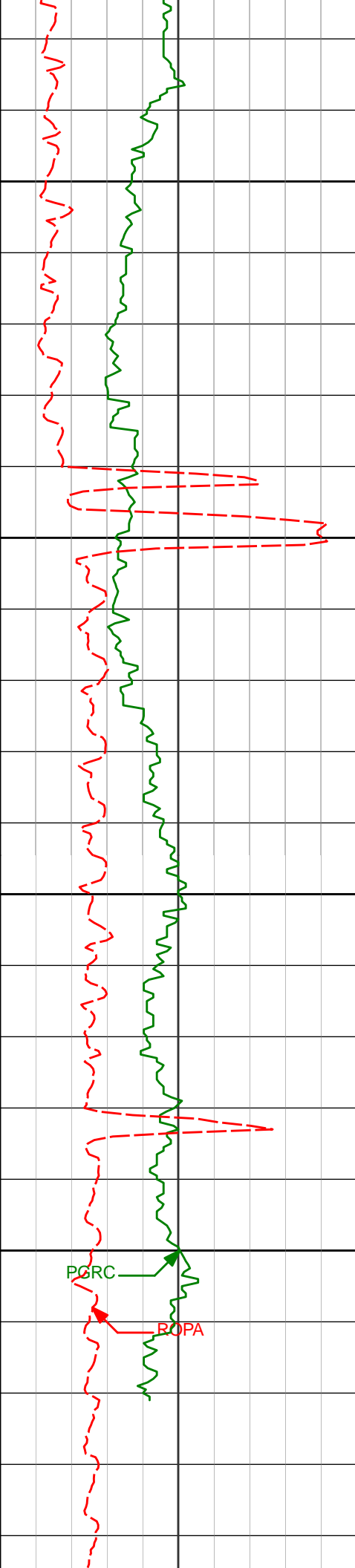
9800

9819'

90.68°

177.40°

5913.50'



9850

9900

9950

10000

9913'

90.83°

176.98°

591454.28'

213.41

213.41

10008'

91.42°

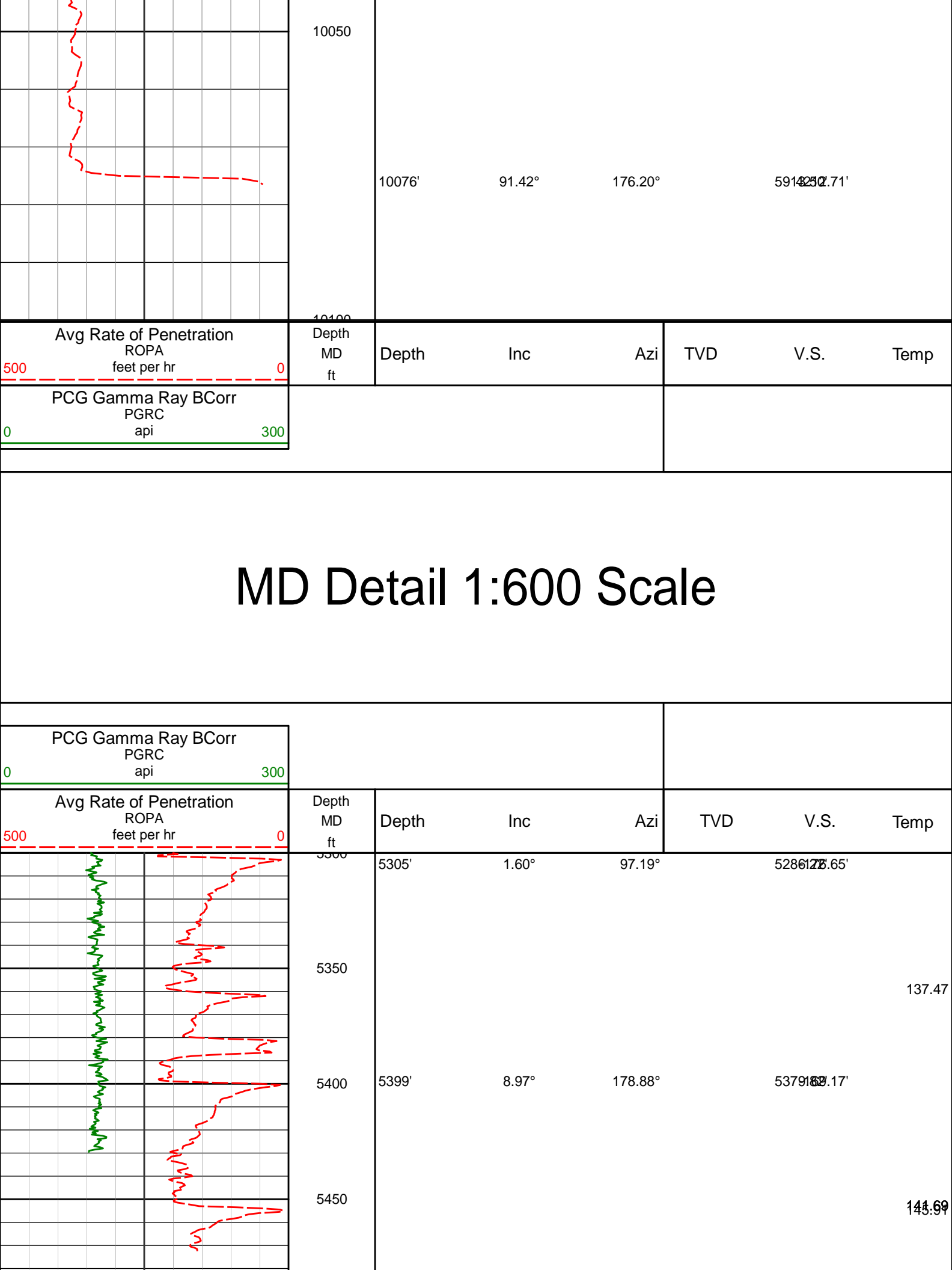
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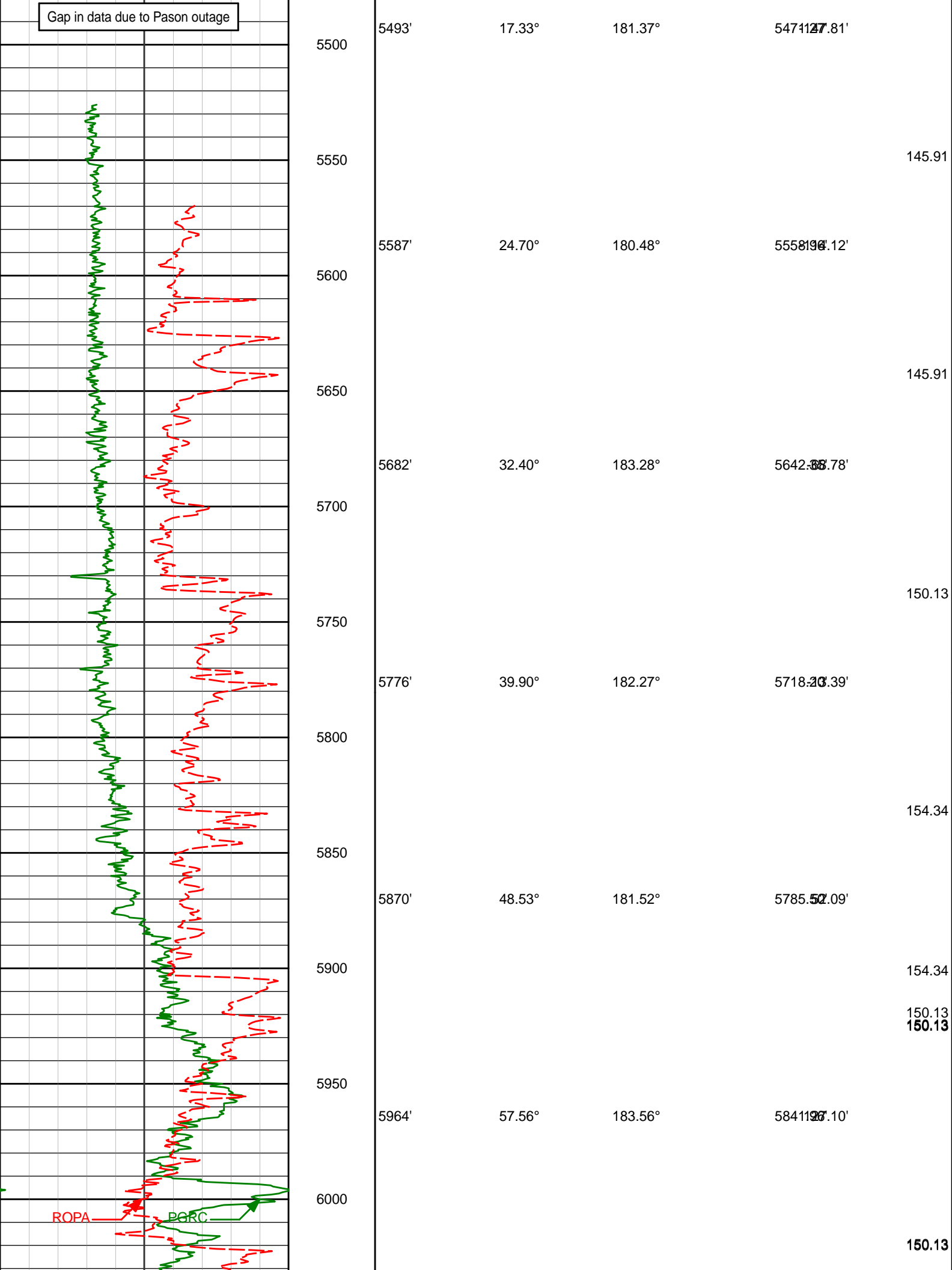
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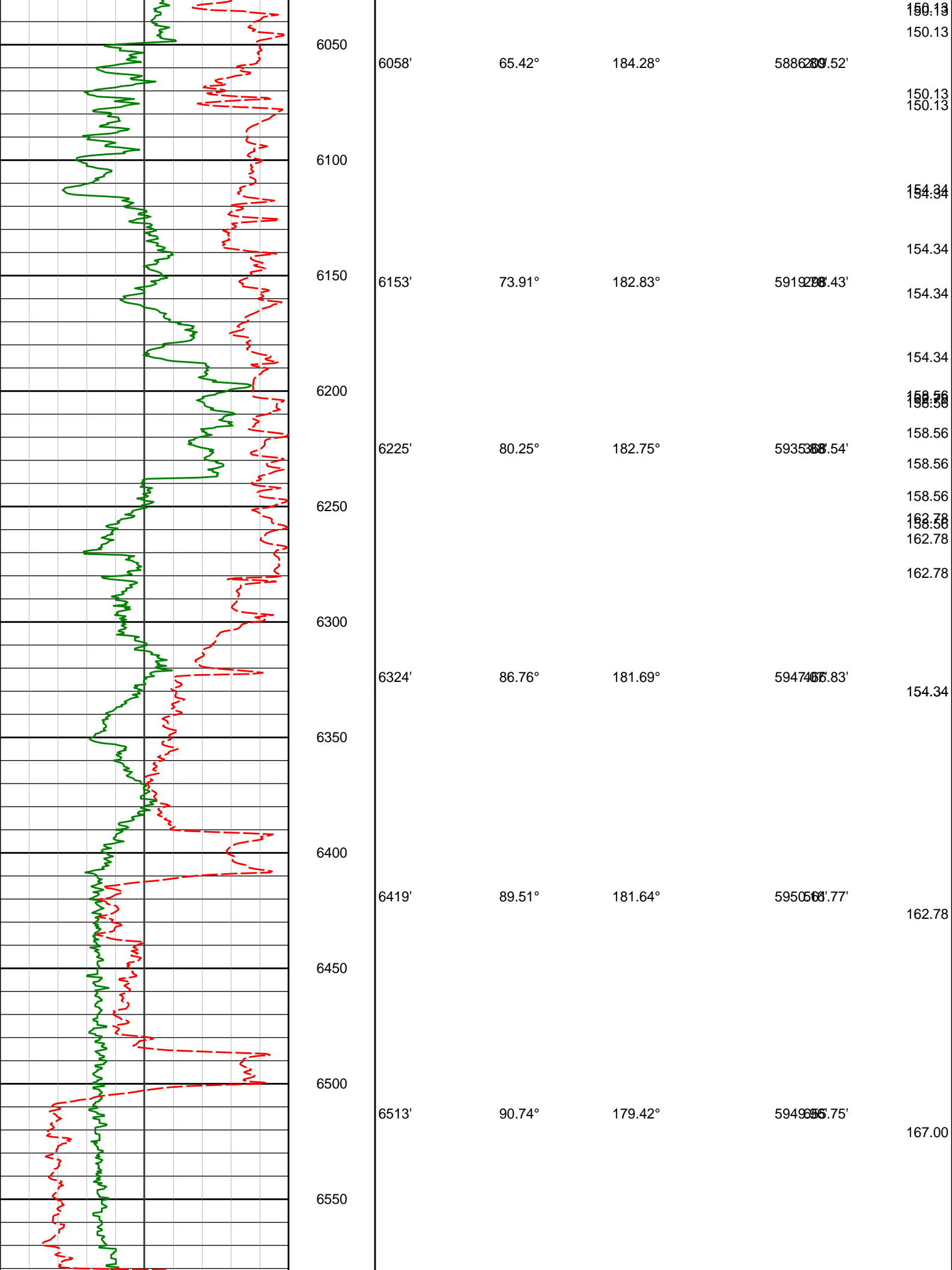
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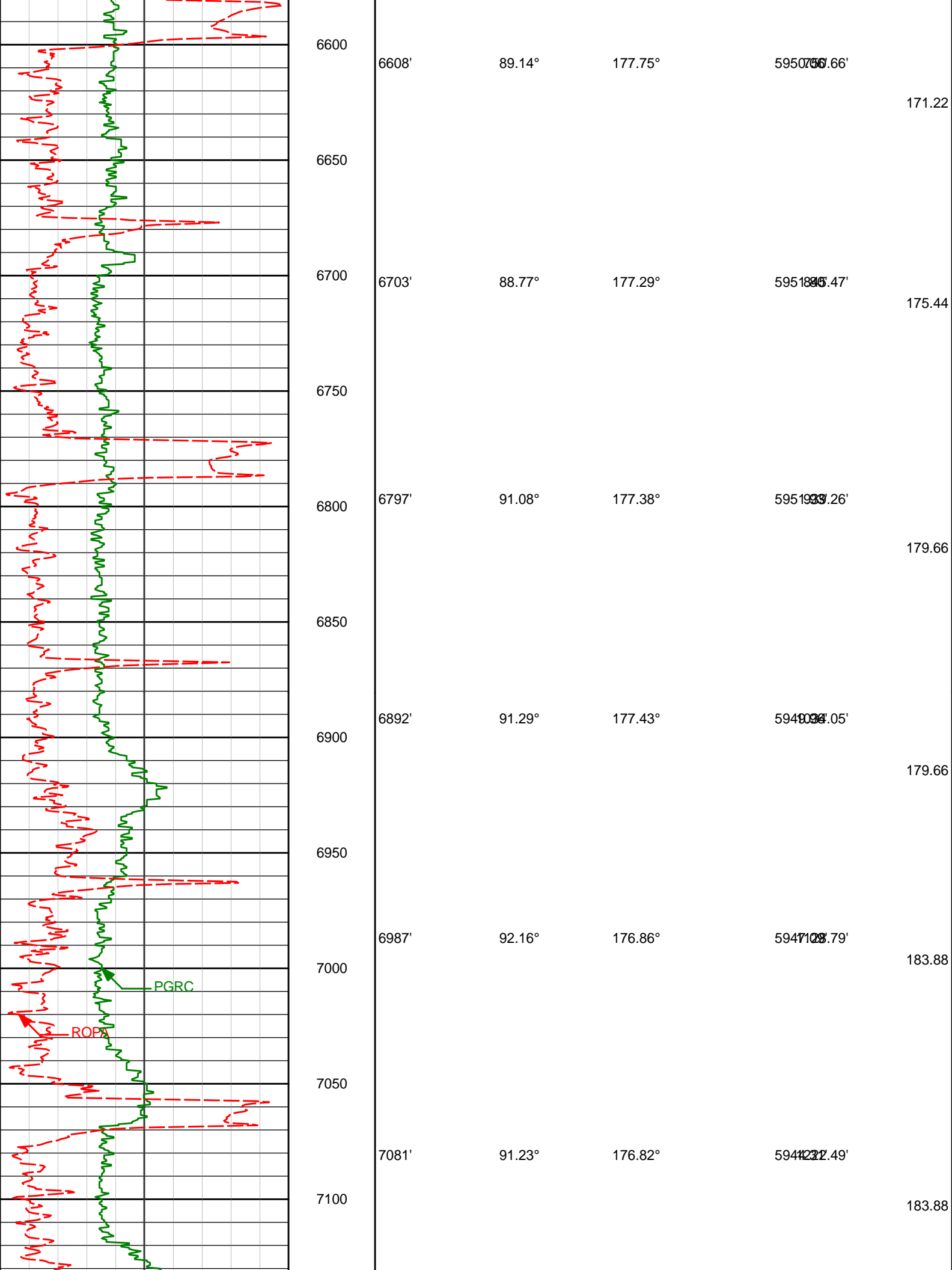
PGR

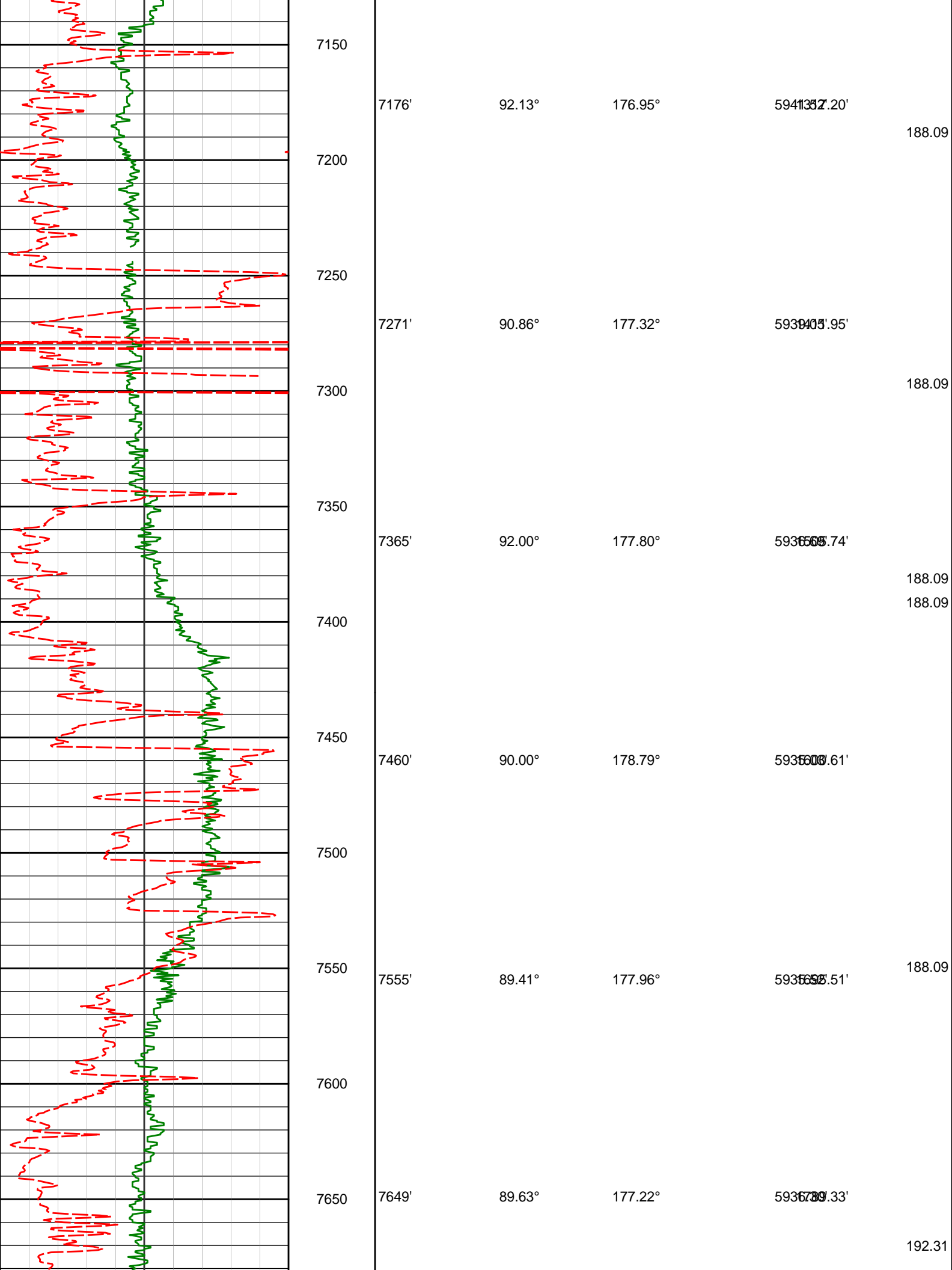
ROPA

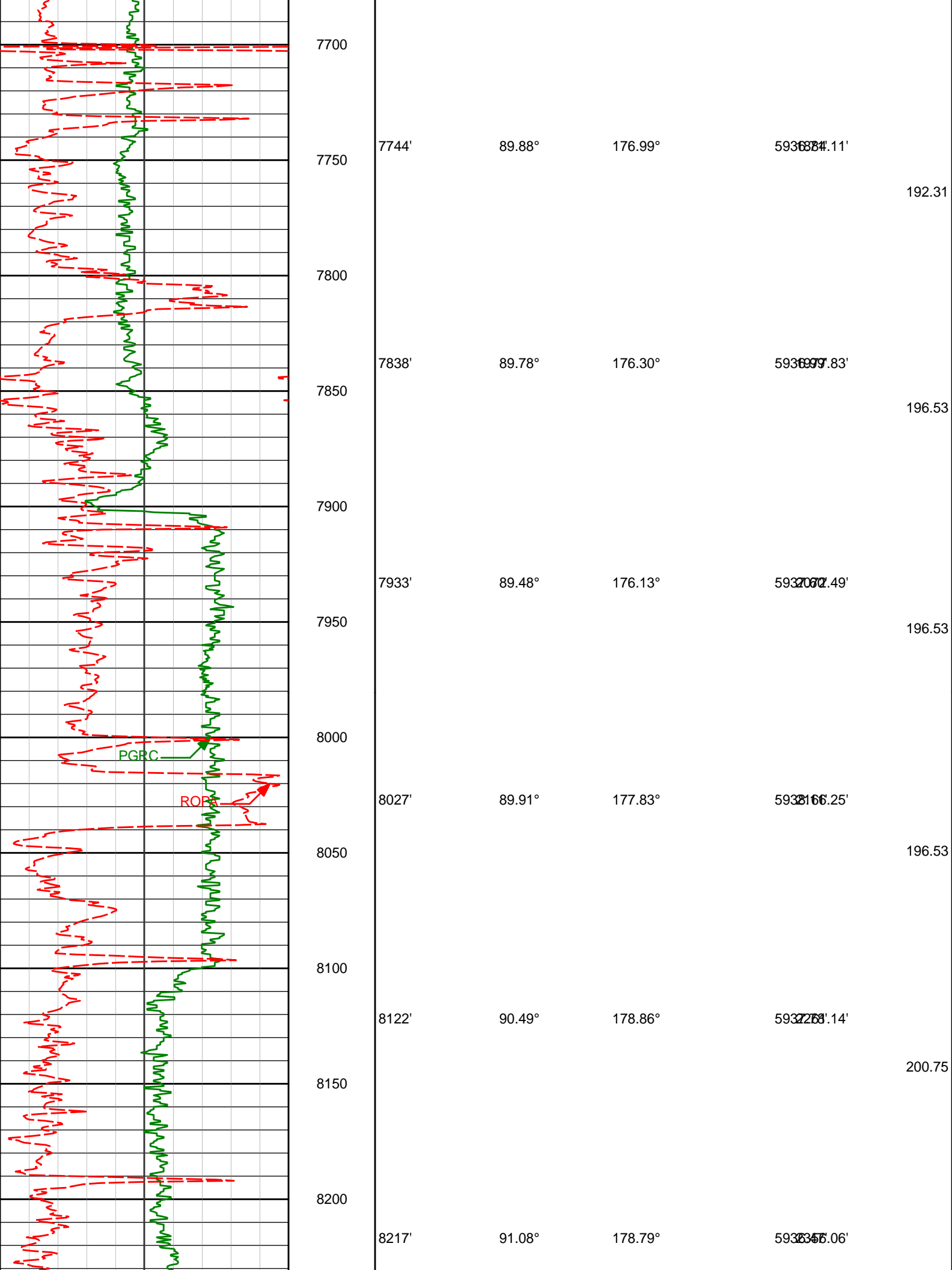


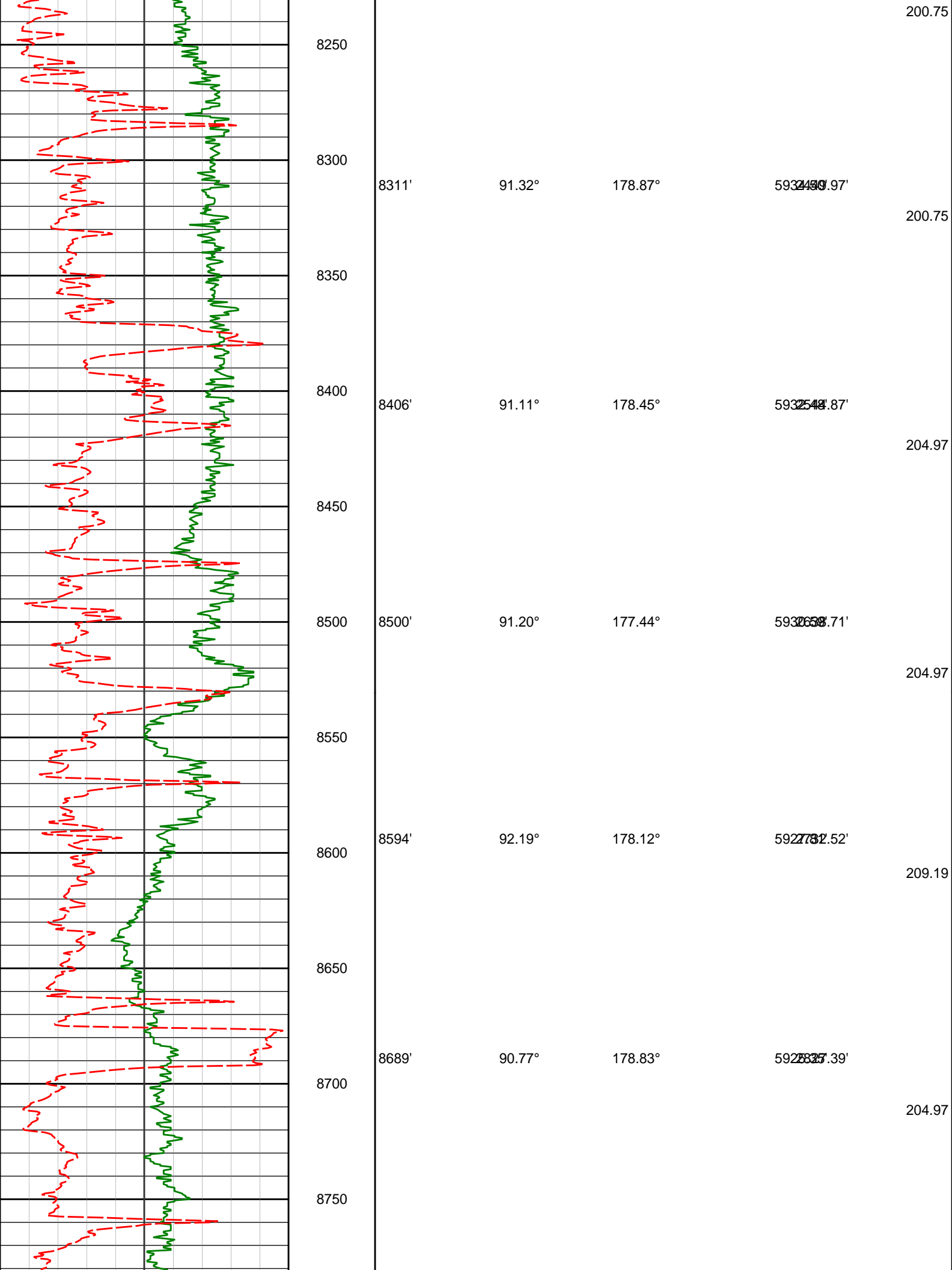


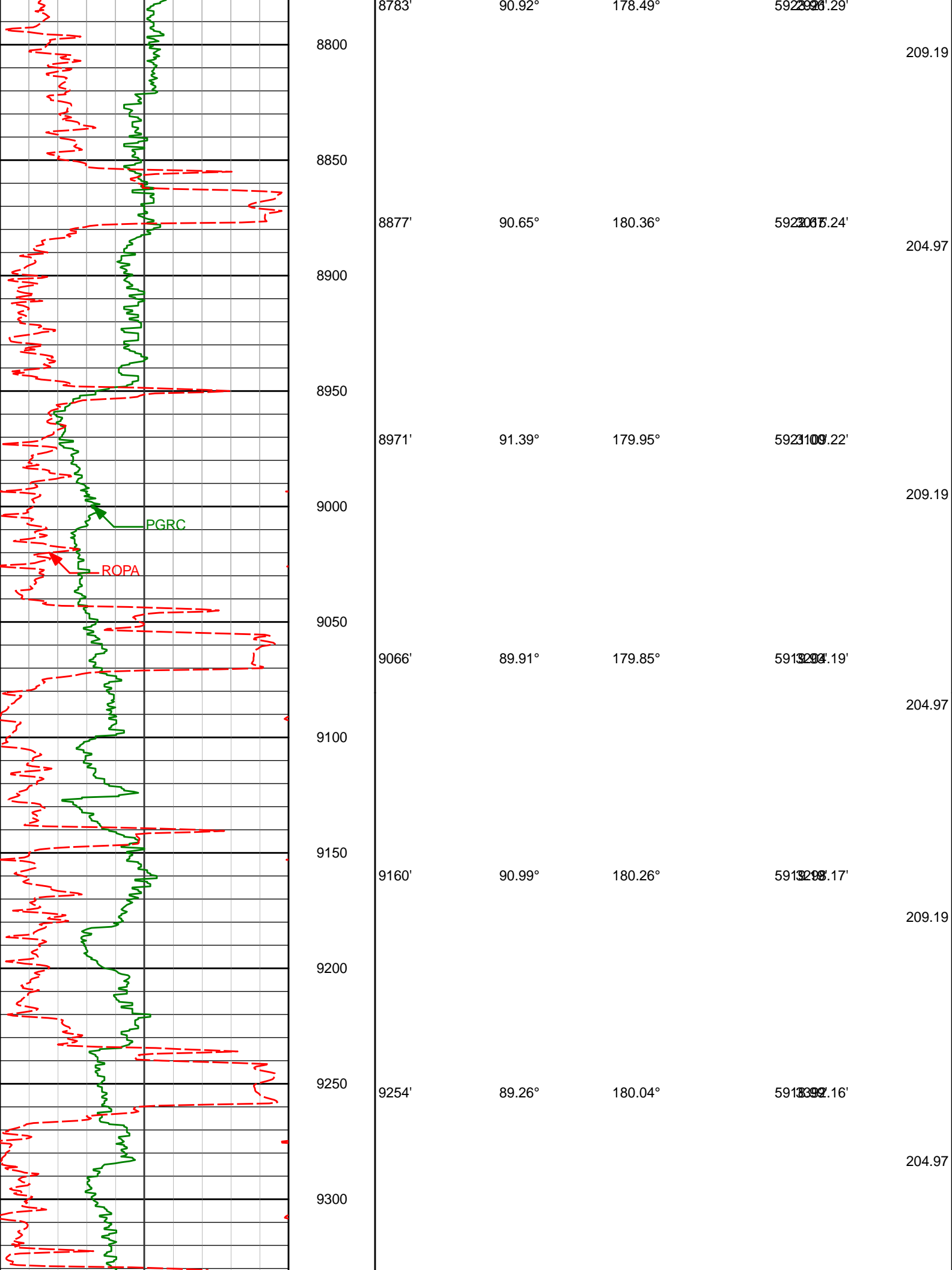


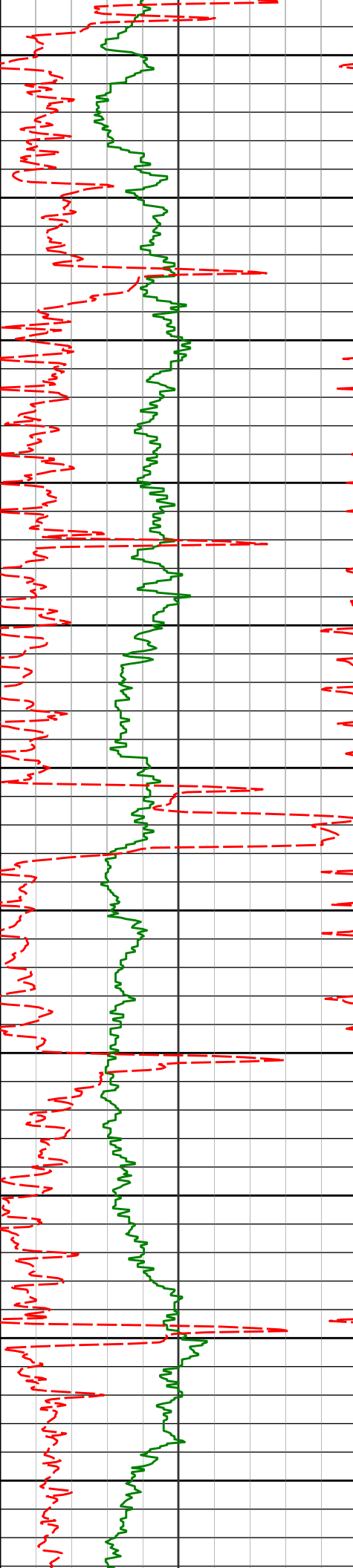












9350

9348'

89.69°

179.17°

5913485.12'

209.19

9400

9450

9442'

90.12°

178.29°

5913580.04'

209.19

9500

9550

9536'

90.71°

177.78°

5913632.91'

213.41

9600

9650

9631'

89.78°

177.97°

5913706.70'

209.19

9700

9750

9725'

90.15°

178.36°

5913802.65'

213.41

9800

9850

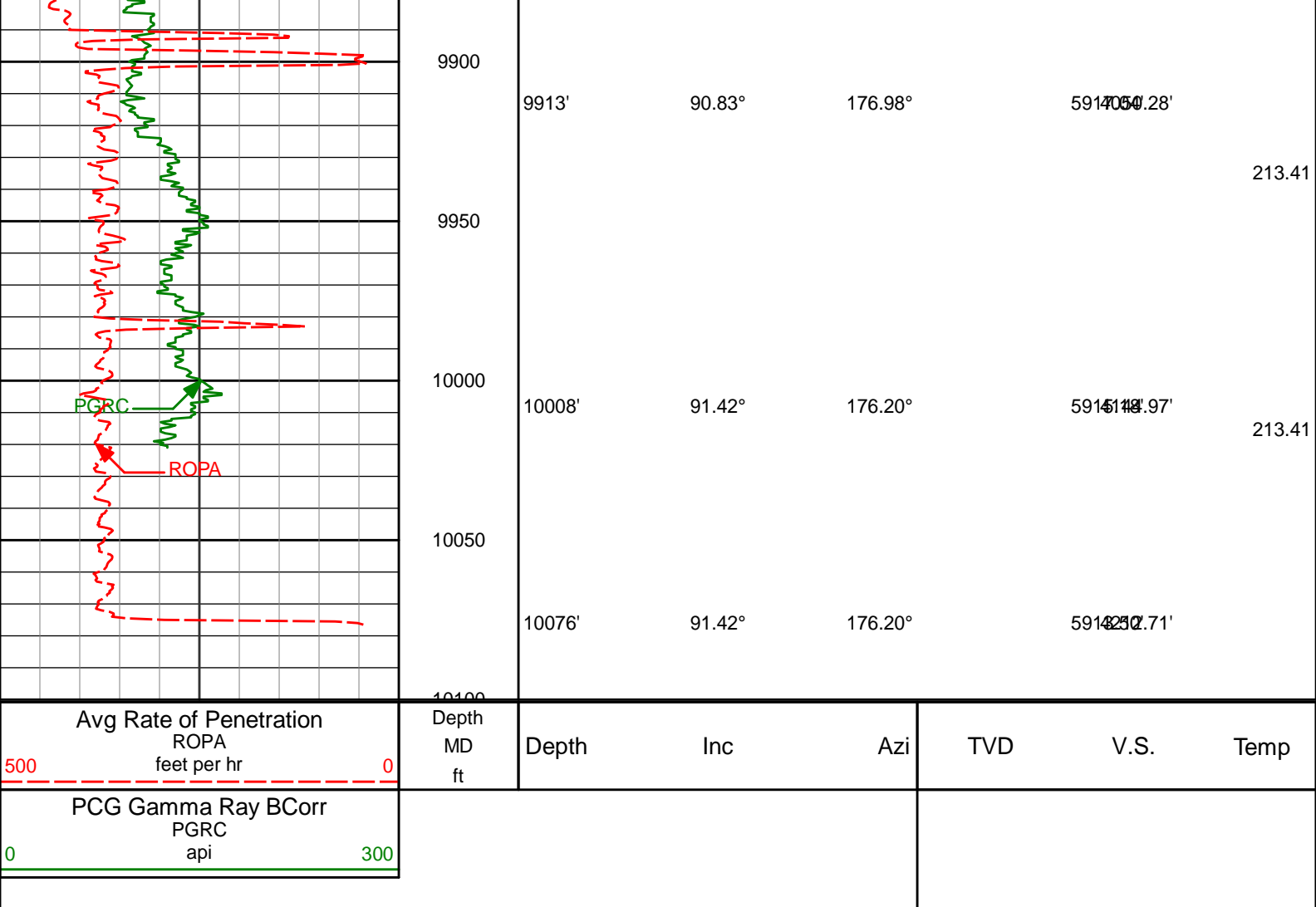
9819'

90.68°

177.40°

5913925.50'

213.41



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Remora LC34-735
Wattenberg
Weld Colorado
USA
CA-XX-0902986601

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
250.00	0.07	107.42	250.00	0.05 S	0.15 E	0.04	0.03
500.00	0.13	107.42	500.00	0.18 S	0.56 E	0.17	0.02
618.00	0.17	107.42	618.00	0.27 S	0.86 E	0.25	0.03
631.00	0.17	107.42	631.00	0.28 S	0.89 E	0.26	0.03
726.00	0.21	143.88	726.00	0.46 S	1.13 E	0.44	0.13
820.00	0.31	165.78	820.00	0.85 S	1.30 E	0.83	0.15
1008.00	0.83	164.87	1007.99	2.67 S	1.78 E	2.63	0.28
1103.00	0.92	148.09	1102.98	3.98 S	2.36 E	3.93	0.28
1194.00	1.10	6.34	1193.97	3.73 S	2.84 E	3.68	2.09
1378.00	1.77	350.94	1377.91	0.82 N	2.59 E	-0.87	0.42
1470.00	1.89	336.56	1469.87	3.61 N	1.76 E	-3.65	0.52
1561.00	2.04	331.67	1560.81	6.42 N	0.40 E	-6.43	0.25
1652.00	1.96	332.30	1651.76	9.22 N	1.10 W	-9.20	0.10
1744.00	3.23	324.66	1743.66	12.73 N	3.33 W	-12.67	1.43
1836.00	5.40	322.25	1835.39	18.28 N	7.48 W	-18.14	2.36
1927.00	8.14	319.26	1925.75	26.54 N	14.31 W	-26.28	3.03
2018.00	9.67	314.86	2015.66	36.52 N	24.21 W	-26.08	3.10

2018.00	9.87	311.66	2013.66	58.32 N	24.21 W	-38.08	2.10
2109.00	9.86	305.70	2105.34	46.17 N	36.23 W	-45.51	1.17
2201.00	9.91	304.03	2195.97	55.20 N	49.19 W	-54.30	0.32
2293.00	8.00	306.25	2286.85	63.42 N	60.91 W	-62.30	2.11
2385.00	7.62	314.01	2378.00	71.44 N	70.46 W	-70.15	1.22
2476.00	8.83	318.38	2468.06	80.85 N	79.44 W	-79.40	1.50
2568.00	10.33	321.08	2558.78	92.54 N	89.31 W	-90.91	1.70
2660.00	10.89	321.20	2649.20	105.73 N	99.94 W	-103.90	0.62
2751.00	10.82	320.67	2738.57	119.04 N	110.74 W	-117.01	0.13
2846.00	10.91	319.38	2831.87	132.76 N	122.24 W	-130.52	0.27
2940.00	8.84	316.09	2924.48	144.72 N	133.04 W	-142.28	2.27
3035.00	7.63	312.78	3018.50	154.26 N	142.74 W	-151.64	1.37
3130.00	7.04	309.32	3112.72	162.23 N	151.87 W	-159.45	0.77
3224.00	4.40	304.14	3206.24	167.91 N	159.31 W	-164.99	2.86
3319.00	4.09	303.07	3300.98	171.80 N	165.17 W	-168.77	0.33
3414.00	2.47	292.15	3395.82	174.42 N	169.91 W	-171.31	1.82
3508.00	2.03	239.04	3489.76	174.33 N	173.21 W	-171.16	2.18
3697.00	1.45	208.03	3678.68	170.49 N	177.21 W	-167.25	0.57
3792.00	1.36	215.66	3773.65	168.51 N	178.44 W	-165.25	0.22
3887.00	1.09	214.30	3868.63	166.85 N	179.60 W	-163.56	0.28
3982.00	1.00	235.44	3963.61	165.63 N	180.80 W	-162.32	0.42
4076.00	0.79	231.69	4057.60	164.76 N	181.98 W	-161.43	0.24
4171.00	0.93	232.08	4152.59	163.88 N	183.11 W	-160.53	0.15
4265.00	0.62	237.42	4246.58	163.14 N	184.13 W	-159.77	0.34
4360.00	0.59	285.18	4341.57	162.99 N	185.03 W	-159.61	0.51
4455.00	0.74	295.30	4436.57	163.38 N	186.06 W	-159.98	0.20
4549.00	1.08	332.08	4530.56	164.42 N	187.02 W	-161.00	0.70
4739.00	2.14	44.86	4720.49	168.52 N	185.35 W	-165.13	1.10
4833.00	1.78	54.35	4814.44	170.62 N	182.92 W	-167.27	0.51
4927.00	1.85	62.50	4908.39	172.17 N	180.38 W	-168.87	0.28
5022.00	1.69	33.23	5003.35	174.05 N	178.25 W	-170.79	0.96
5116.00	1.92	39.51	5097.30	176.43 N	176.49 W	-173.19	0.32
5210.00	1.72	34.61	5191.25	178.80 N	174.69 W	-175.60	0.27
5305.00	1.60	97.19	5286.22	179.81 N	172.56 W	-176.65	1.82
5399.00	8.97	178.88	5379.82	172.31 N	171.12 W	-169.17	9.44
5493.00	17.33	181.37	5471.27	150.95 N	171.31 W	-147.81	8.92
5587.00	24.70	180.48	5558.96	117.26 N	171.81 W	-114.12	7.84
5682.00	32.40	183.28	5642.35	71.94 N	173.43 W	-68.78	8.22
5776.00	39.90	182.27	5718.20	16.59 N	176.07 W	-13.39	8.01
5870.00	48.53	181.52	5785.50	48.87 S	178.20 W	52.09	9.20
5964.00	57.56	183.56	5841.96	123.82 S	181.60 W	127.10	9.76
6058.00	65.42	184.28	5886.80	206.16 S	187.26 W	209.52	8.39
6153.00	73.91	182.83	5919.78	294.98 S	192.75 W	298.43	9.06
6225.00	80.25	182.75	5935.88	365.04 S	196.17 W	368.54	8.80
6324.00	86.76	181.69	5947.07	463.28 S	199.98 W	466.83	6.67
6419.00	89.51	181.64	5950.16	558.18 S	202.74 W	561.77	2.89
6513.00	90.74	179.42	5949.96	652.17 S	203.62 W	655.75	2.70
6608.00	89.14	177.75	5950.06	747.13 S	201.28 W	750.66	2.44
6703.00	88.77	177.29	5951.80	842.03 S	197.17 W	845.47	0.62
6797.00	91.08	177.38	5951.93	935.92 S	192.80 W	939.26	2.46
6892.00	91.29	177.43	5949.96	1030.80 S	188.50 W	1034.05	0.24
6987.00	92.16	176.86	5947.09	1125.64 S	183.77 W	1128.79	1.09
7081.00	91.23	176.82	5944.31	1219.45 S	178.59 W	1222.49	0.99
7176.00	92.13	176.95	5941.52	1314.27 S	173.43 W	1317.20	0.95
7271.00	90.86	177.32	5939.05	1409.12 S	168.69 W	1411.95	1.39
7365.00	92.00	177.80	5936.69	1503.00 S	164.69 W	1505.74	1.32
7460.00	90.00	178.79	5935.03	1597.94 S	161.86 W	1600.61	2.35
7555.00	89.41	177.96	5935.52	1692.90 S	159.16 W	1695.51	1.07
7649.00	89.63	177.22	5936.30	1786.81 S	155.21 W	1789.33	0.81
7744.00	89.88	176.99	5936.71	1881.69 S	150.41 W	1884.11	0.36
7838.00	89.78	176.30	5936.99	1975.53 S	144.91 W	1977.83	0.74
7933.00	89.48	176.13	5937.60	2070.32 S	138.64 W	2072.49	0.37
8027.00	89.91	177.83	5938.11	2164.18 S	133.69 W	2166.25	1.86
8122.00	90.49	178.86	5937.78	2259.14 S	130.94 W	2261.14	1.25
8217.00	91.08	178.79	5936.47	2354.11 S	129.00 W	2356.06	0.62
8311.00	91.32	178.87	5934.50	2448.07 S	127.08 W	2449.97	0.27
8406.00	91.11	178.45	5932.48	2543.02 S	124.86 W	2544.87	0.50
8500.00	91.20	177.44	5930.59	2636.94 S	121.48 W	2638.71	1.07
8594.00	92.19	178.12	5927.81	2730.83 S	117.85 W	2732.52	1.28
8689.00	90.77	178.83	5925.35	2825.76 S	115.32 W	2827.39	1.67
8783.00	90.92	178.49	5923.96	2919.72 S	113.12 W	2921.29	0.40
8877.00	90.65	180.36	5922.67	3013.70 S	112.17 W	3015.24	2.01
8971.00	91.39	179.95	5921.00	3107.69 S	112.43 W	3109.22	0.90
9066.00	89.91	179.85	5919.93	3202.68 S	112.27 W	3204.19	1.56
9160.00	90.99	180.26	5919.19	3296.68 S	112.35 W	3298.17	1.23

9254.00	89.26	180.04	5918.99	3390.67 S	112.59 W	3392.16	1.85
9348.00	89.69	179.17	5919.85	3484.66 S	111.94 W	3486.12	1.03
9442.00	90.12	178.29	5920.00	3578.64 S	109.86 W	3580.04	1.04
9536.00	90.71	177.78	5919.32	3672.58 S	106.64 W	3673.91	0.82
9631.00	89.78	177.97	5918.91	3767.51 S	103.11 W	3768.76	0.99
9725.00	90.15	178.36	5918.96	3861.46 S	100.10 W	3862.65	0.57
9819.00	90.68	177.40	5918.28	3955.40 S	96.62 W	3956.50	1.16
9913.00	90.83	176.98	5917.04	4049.27 S	92.01 W	4050.28	0.48
10008.00	91.42	176.20	5915.18	4144.09 S	86.35 W	4144.97	1.03
10076.00	91.42	176.20	5913.50	4211.92 S	81.84 W	4212.71	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 181.04 DEGREES (GRID)
A TOTAL CORRECTION OF 7.03 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10076.00 FEET
IS 4212.71 FEET ALONG 181.11 DEGREES (GRID)**

Final survey is a projection to TD