

PCGC : Pressure Case Gamma
PCDC: Pressure Case Directional



1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	13-Dec-14	15-Dec-14			
Rig Bit Number	2	3			
Bit Size (in)	8.750	6.125			
Tool Nominal OD (in)	6.750	4.720			
Log Start Depth (MD, ft)	1,239.00	5,900.00			
Log End Depth (MD, ft)	5,900.00	10,419.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	12-Dec-14 09:00	14-Dec-14 07:30			
Drill/Wipe End Date and Time	13-Dec-14 02:10	15-Dec-14 11:50			
Min Inc (deg) @ Depth (MD, ft)	0.49 @ 1,567.00	86.85 @ 8,241.00			
Max Inc (deg) @ Depth (MD, ft)	86.86 @ 5,846.00	92.25 @ 9,189.00			
Bit TFA(in2) / Bit Type	0.91 / PDC	0.75 / PDC			
Flow Rate (gpm)	581.83	294.72			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	10.30 / 27.00	10.40 / 39.00			
Filtrate CL (ppm)	150.00	175.00			
pH / Fluid Loss (mptm)	8.00 / 0	9.90 / 0			
PV (cP) / YP (lbf2)	17 / 9.00	12 / 7.00			
% Solids / % Sand	5 / .15	10 / .15			
% Oil / Oil:Water Ratio	N/A / N/A	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 (deg F) @	122.00 / 122.00	222.00 / 222.00			

Max Tool Temp (degF) / Source	162.80 / PCM	200.80 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Paul Kock	Paul Kock			
Customer Representative	Dave Nielsen	Dave Nielsen			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11342275	12334786			
Insert Serial Number	11055866	11619999			
Date and Time Initialized	12-Dec-14 04:07	13-Dec-14 17:42			
Date and Time Read	13-Dec-14 06:46	15-Dec-14 20:01			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	51.94	62.25			
Software Version	6.21	6.33			
Sub Serial Number	11342275	12334786			
Sonde Serial Number	12177554	11833216			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	318.36	126.71			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	46.84	46.84			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11342275	12334786			
Insert/Sonde Serial Number	11293319	11579811			

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 2" (1:600) logs - 1 ft. interval, 3 ft. coercion distance.
 - All 5" (1:240) logs - .5 ft. interval, .6 ft. coercion distance.
5. INSITE version 8.0.20
6. Gamma presented inside casing/cement from 5853 ft. MD to 5900 ft. MD.

WARRANTY

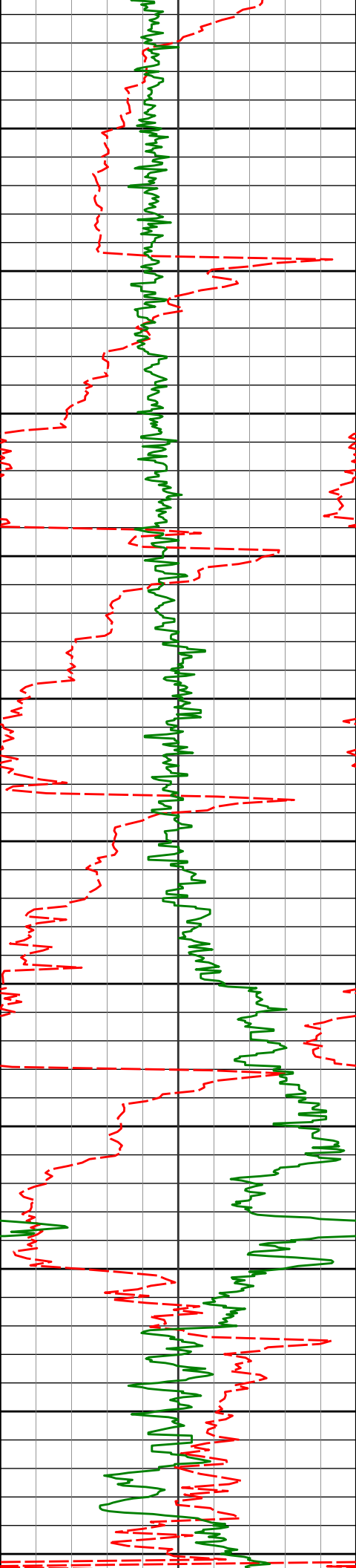
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Sperry Drilling Services

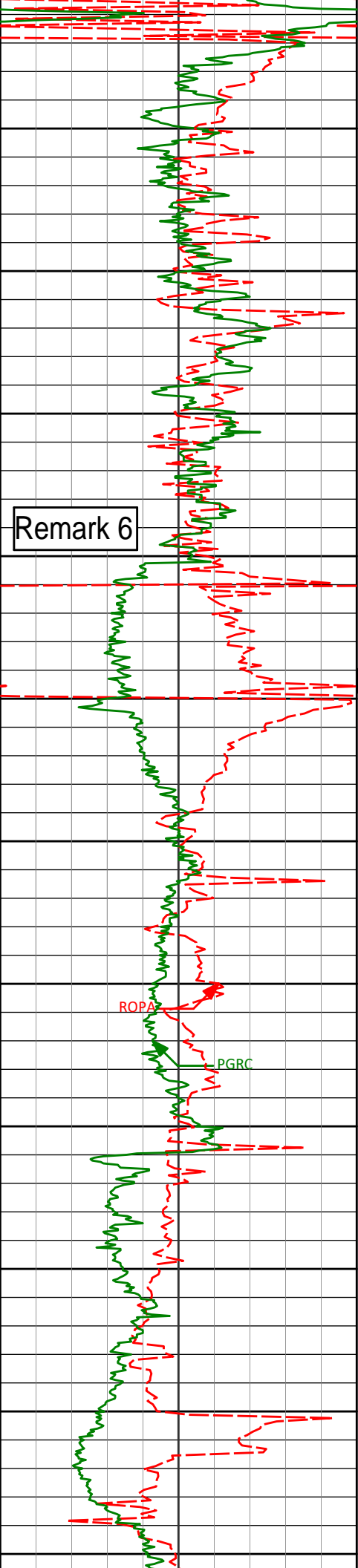
MD Main Log 1:600

Noble Energy, Inc
Nalen State LD12-77-1BHN
H&P 273
T9N R58W





5150	5143'	26.89°	146.25°	5106.45'	88.97'
5200					
5250	5237'	32.25°	157.19°	5188.24'	131.44'
5300					
5350	5332'	39.15°	162.87°	5265.36'	184.88'
5400					
5450	5427'	46.32°	170.32°	5335.14'	248.50'
5500					
5550	5521'	54.44°	178.79°	5395.10'	320.72'
5600					
5650	5616'	63.64°	181.56°	5443.93'	401.79'



5700

5711'

71.80°

182.35°

5479.92'

489.04'

5750

5800

5805'

81.75°

180.79°

5501.40'

579.90'

5850

5846'

86.86°

180.00°

5505.47'

620.52'

5900

<7" casing set at 5893' MD>
<Run 200>

5950

6000

5992'

89.51°

179.31°

5510.10'

766.02'

6050

6100

6085'

90.99°

178.76°

5509.70'

858.83'

6150

6177'

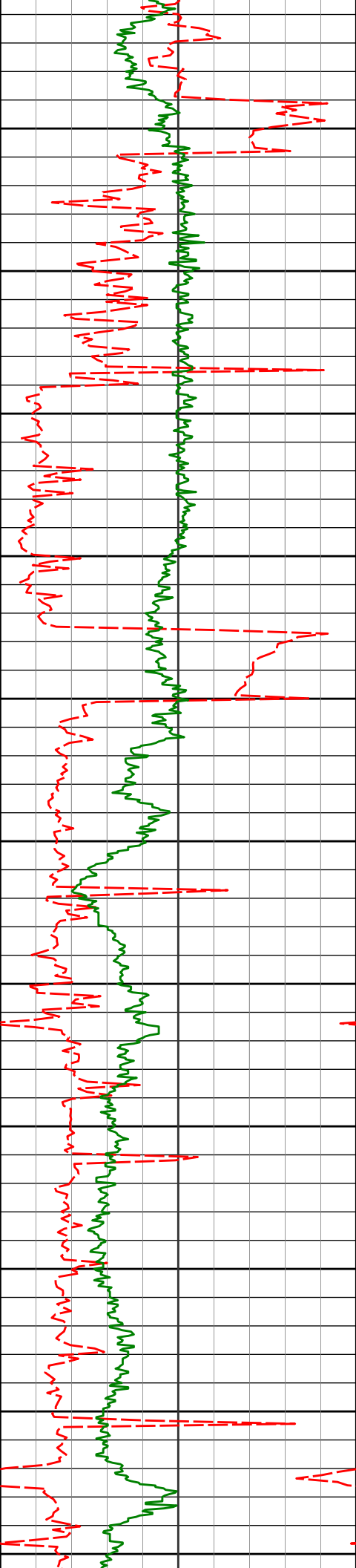
89.91°

178.90°

5508.98'

950.66'

6200



6250

6300

6350

6400

6450

6500

6550

6600

6650

6700

6750

6362'

90.06°

178.95°

5509.03'

1135.30'

6455'

87.04°

179.42°

5511.38'

1228.05'

6548'

87.10°

179.25°

5516.13'

1320.71'

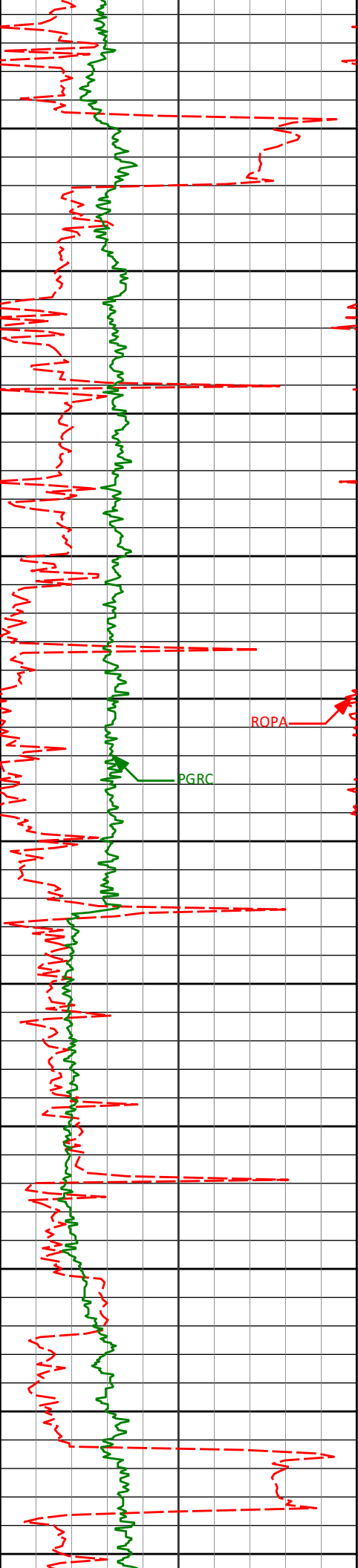
6732'

88.64°

178.42°

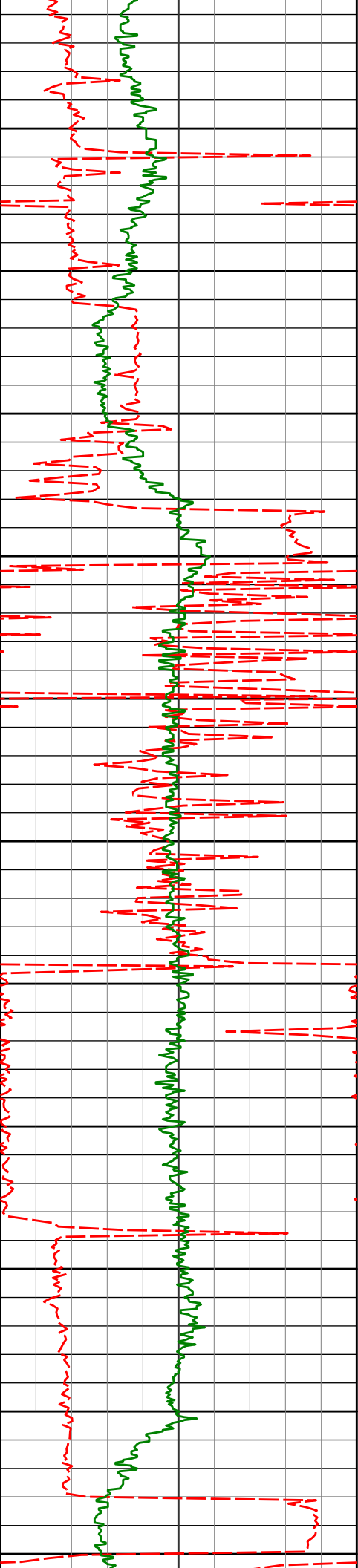
5522.96'

1504.23'



6800
6850
6900
6950
7000
7050
7100
7150
7200
7250
7300

6825'	88.49°	180.88°	5525.28'	1596.94'
7010'	89.94°	180.01°	5527.82'	1781.19'
7105'	90.52°	179.88°	5527.44'	1875.88'
7200'	91.82°	179.89°	5525.50'	1970.56'
7294'	90.15°	180.75°	5523.88'	2064.19'



7350

7389'

90.83°

180.18°

5523.06'

2158.81'

7400

7450

7483'

91.26°

180.21°

5521.34'

2252.46'

7500

7550

7578'

90.22°

179.60°

5520.12'

2347.15'

7600

7650

7673'

90.62°

179.50°

5519.43'

2441.90'

7700

7750

7768'

91.94°

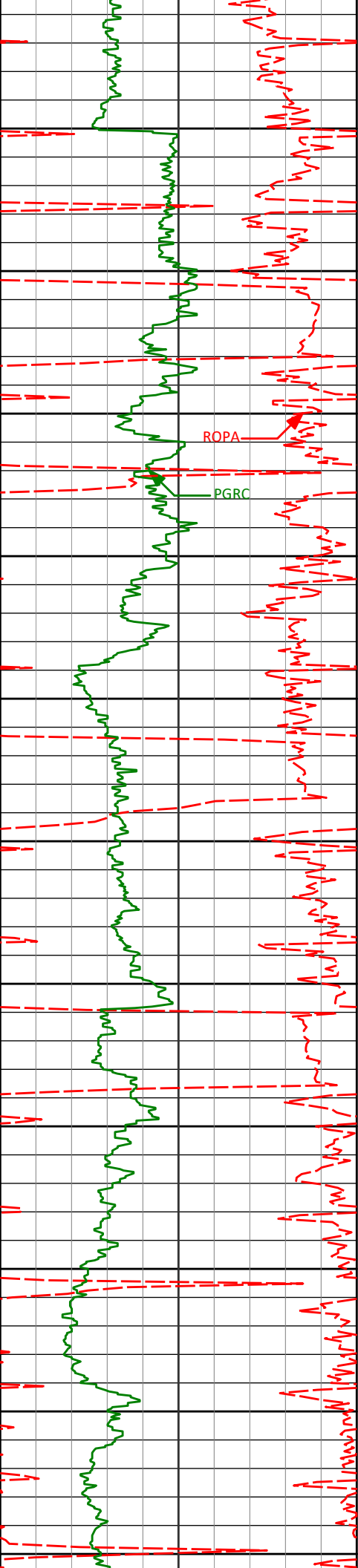
180.97°

5517.30'

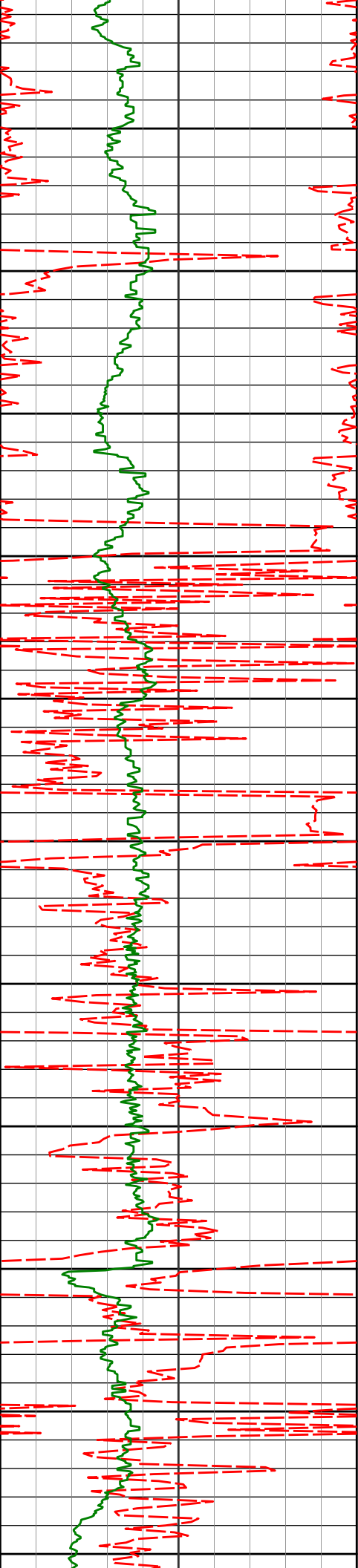
2536.53'

7800

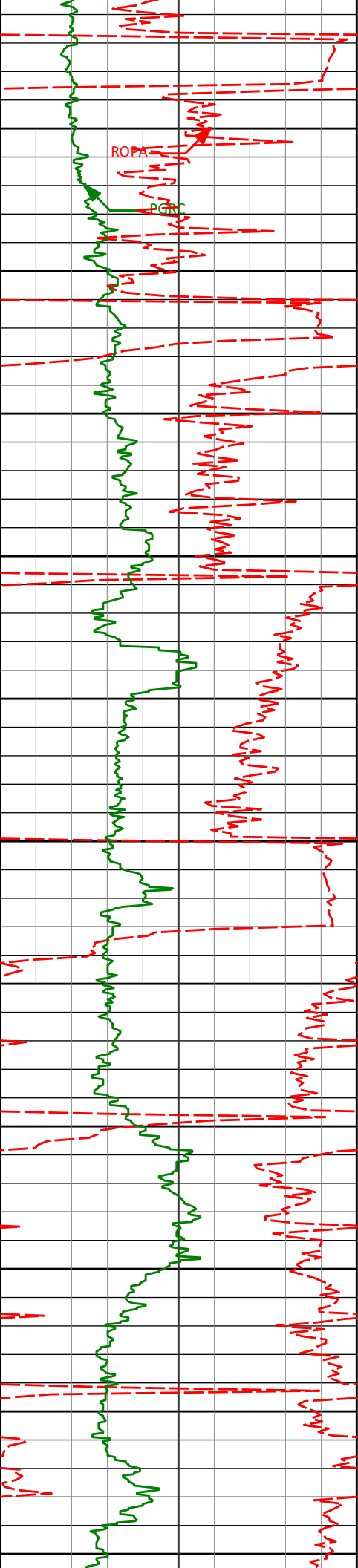
7850



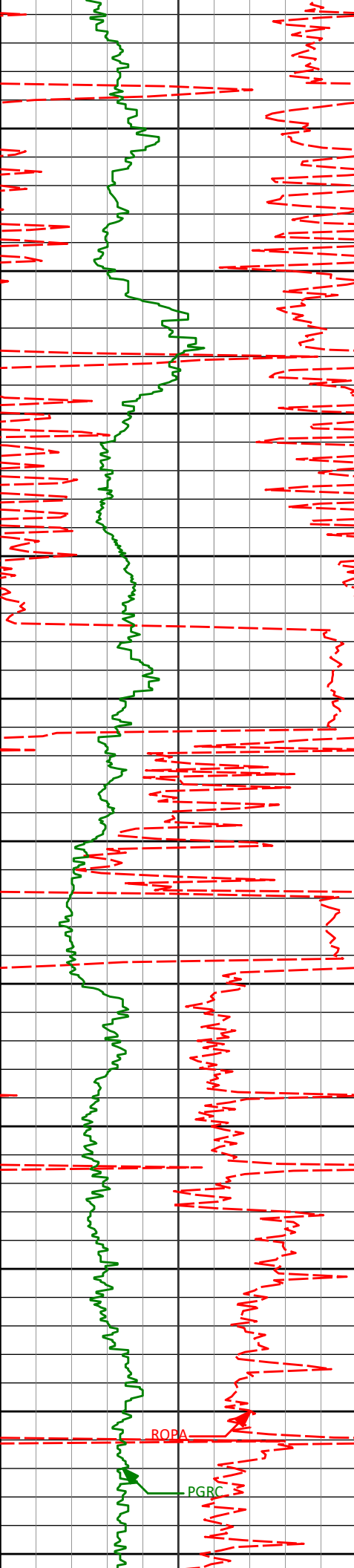
7862'	90.80°	178.93°	5515.05'	2630.19'
7900				
7950				
7957'	90.68°	178.33°	5513.83'	2725.03'
8000				
8051'	88.34°	177.31°	5514.63'	2818.93'
8100				
8146'	87.44°	179.02°	5518.13'	2913.75'
8200				
8241'	86.85°	181.76°	5522.86'	3008.26'
8300				
8336'	87.17°	181.42°	5527.82'	3102.57'
8350				
8400				



8431'	87.90°	180.93°	5531.91'	3196.99'
8450				
8500				
8526'	88.18°	180.55°	5535.15'	3291.51'
8550				
8600				
8621'	88.55°	181.40°	5537.86'	3386.02'
8650				
8700				
8716'	90.49°	182.67°	5538.65'	3480.37'
8750				
8800				
8810'	90.56°	182.86°	5537.79'	3573.58'
8850				
8900				
8905'	91.23°	183.01°	5536.31'	3667.74'
8950				



9000	8999'	91.66°	180.84°	5533.93'	3761.08'
9050					
9100	9093'	90.83°	179.64°	5531.89'	3854.72'
9150					
9200	9189'	92.25°	179.51°	5529.30'	3950.42'
9250					
9300	9283'	89.78°	178.52°	5527.63'	4044.21'
9350					
9400	9378'	89.38°	177.60°	5528.32'	4139.10'
9450					
9500	9472'	89.69°	177.35°	5529.08'	4233.03'



9550
9600
9650
9700
9750
9800
9850
9900
9950
10000
10050

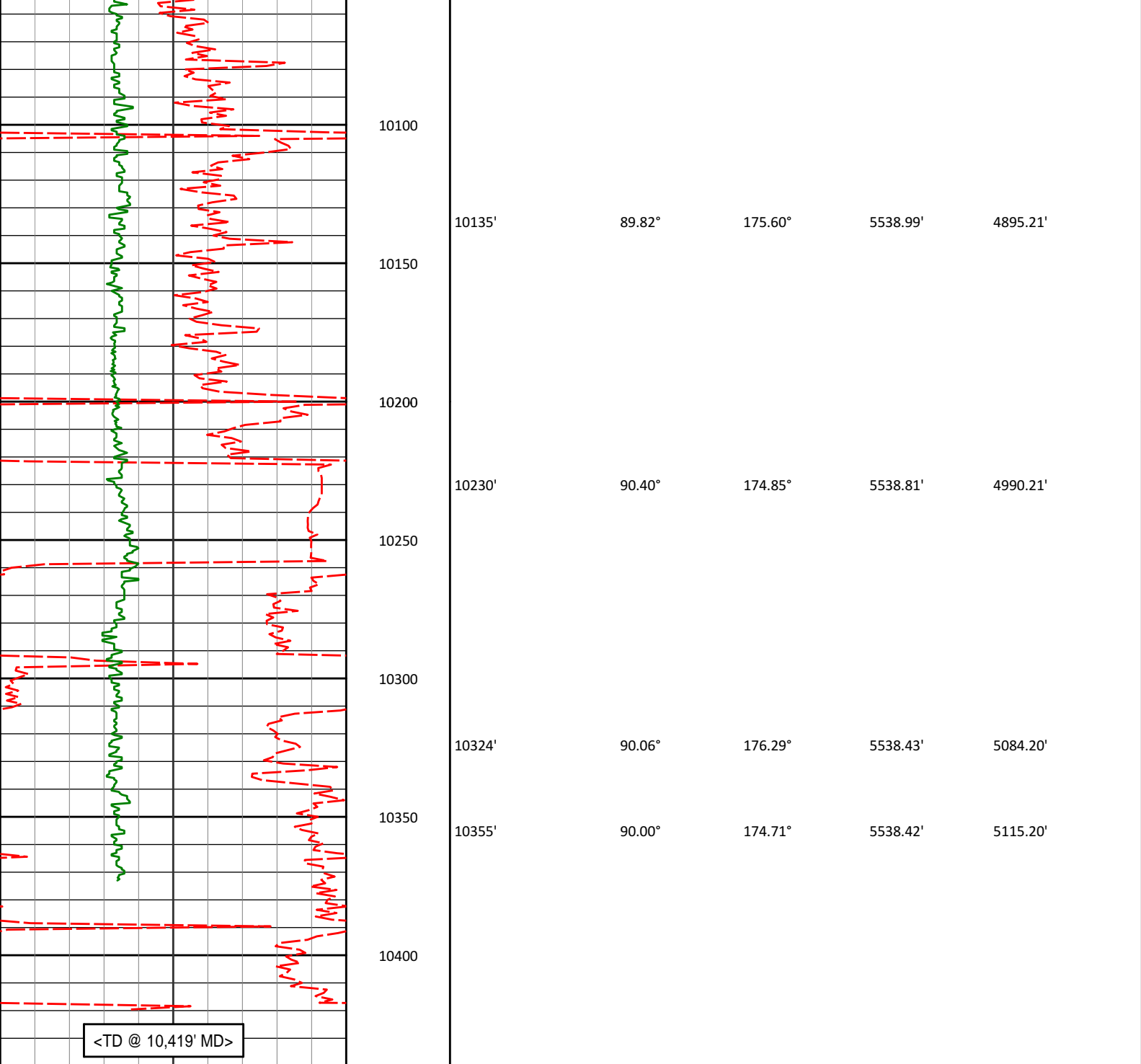
9567'
9662'
9757'
9851'
9945'
10040'

89.48°
89.69°
87.72°
88.18°
88.89°
90.28°

175.72°
175.00°
177.72°
179.50°
178.85°
179.31°

5529.77'
5530.46'
5532.61'
5535.97'
5538.38'
5539.07'

4328.00'
4423.00'
4517.95'
4611.73'
4705.49'
4800.29'



<div><div>Avg Rate of Penetration</div><div>ROPA</div><div>feet per hr</div><div>0500</div></div>	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
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<div><div>PCG Gamma Ray</div><div>PGRC</div><div>api</div><div>0300</div></div>	
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HALLIBURTON

Sperry Drilling Services

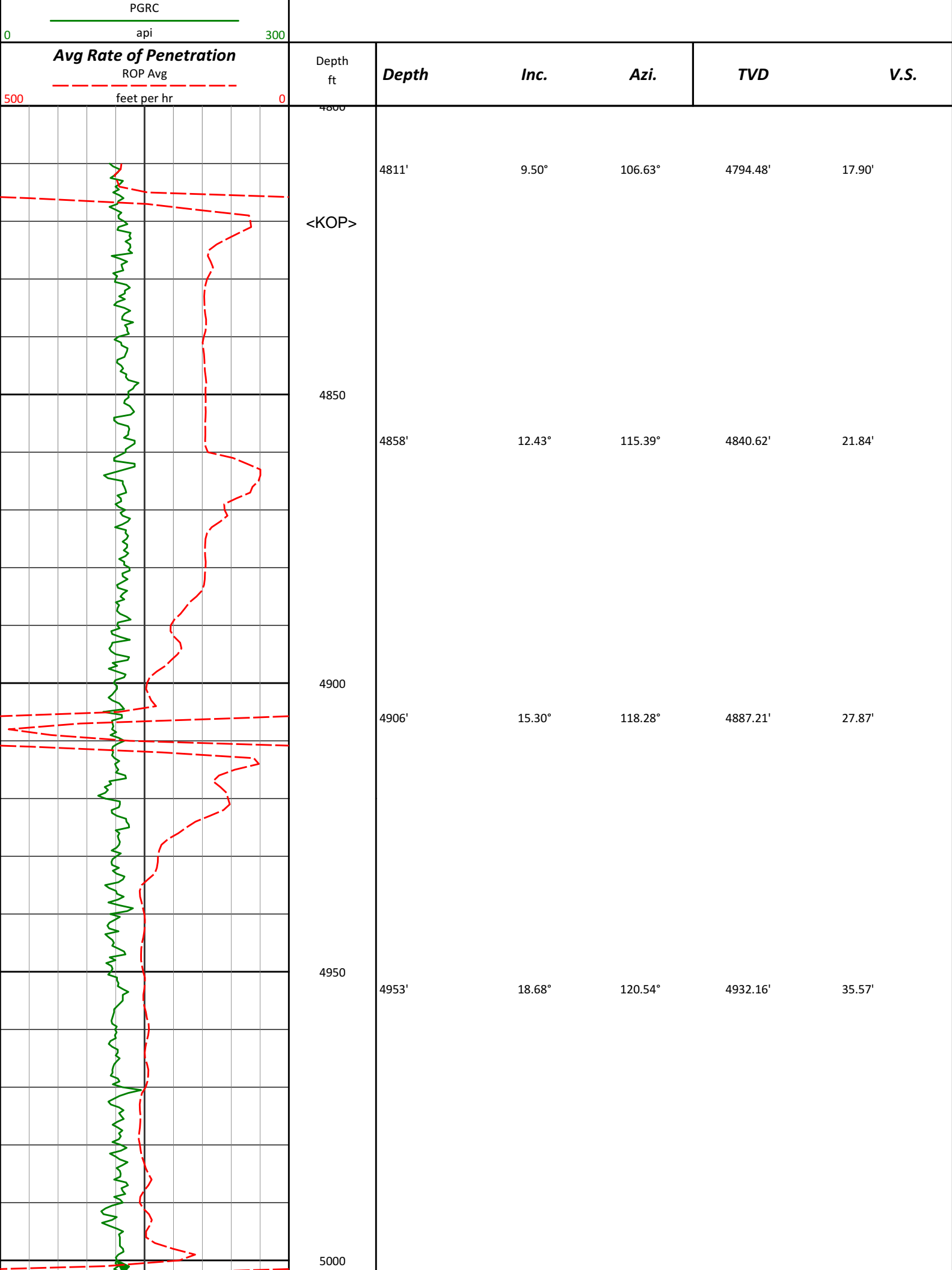
MD Detail Log 1:240

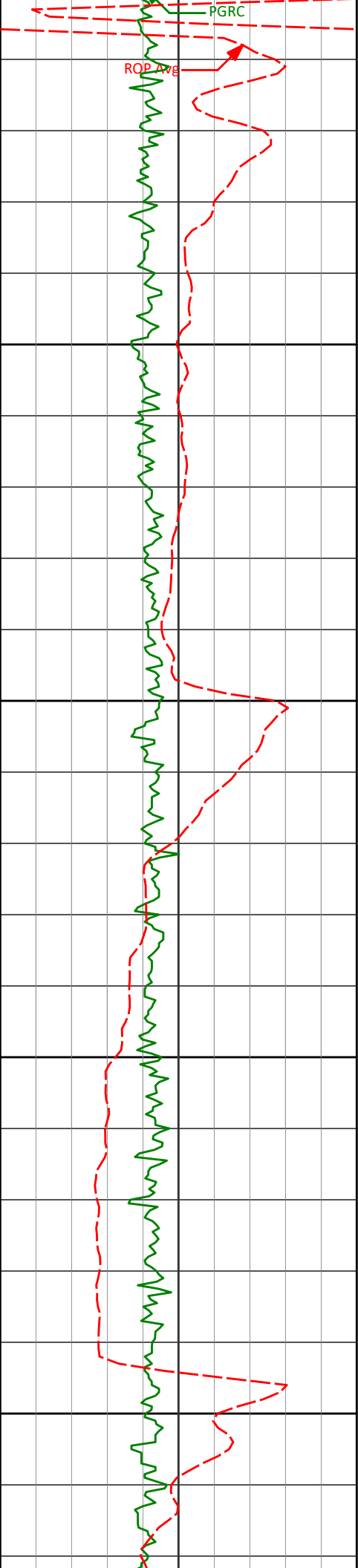
Noble Energy, Inc

Nalen State LD12-77-1BHN

H&P 273

T9N R58W





5050

5100

5150

5200

5048'

24.15°

126.92°

5020.58'

57.25'

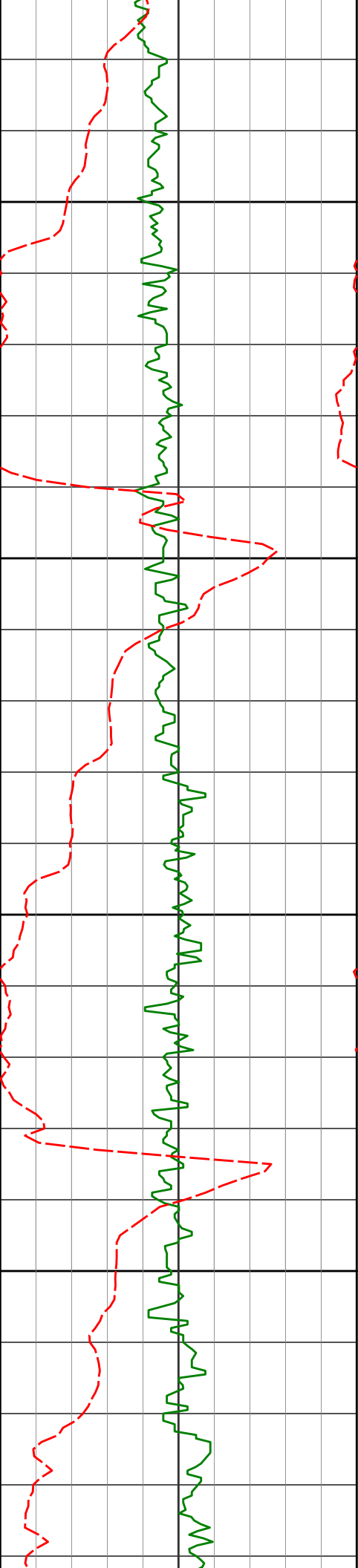
5143'

26.89°

146.25°

5106.45'

88.97'



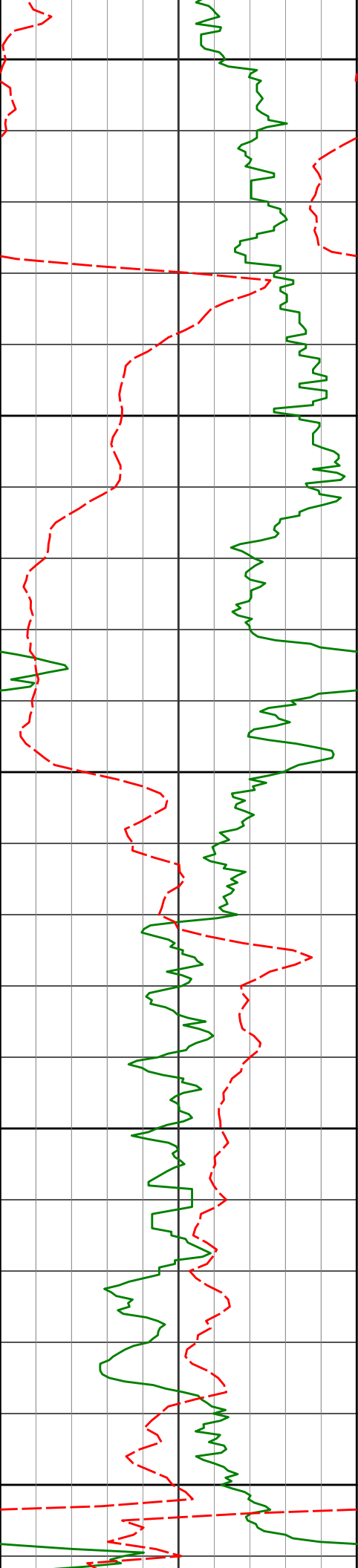
5250

5300

5350

5400

5237'	32.25°	157.19°	5188.24'	131.44'
5332'	39.15°	162.87°	5265.36'	184.88'
5427'	46.32°	170.32°	5335.14'	248.50'



5450

5500

5550

5600

5650

5521'

54.44°

178.79°

5395.10'

320.72'

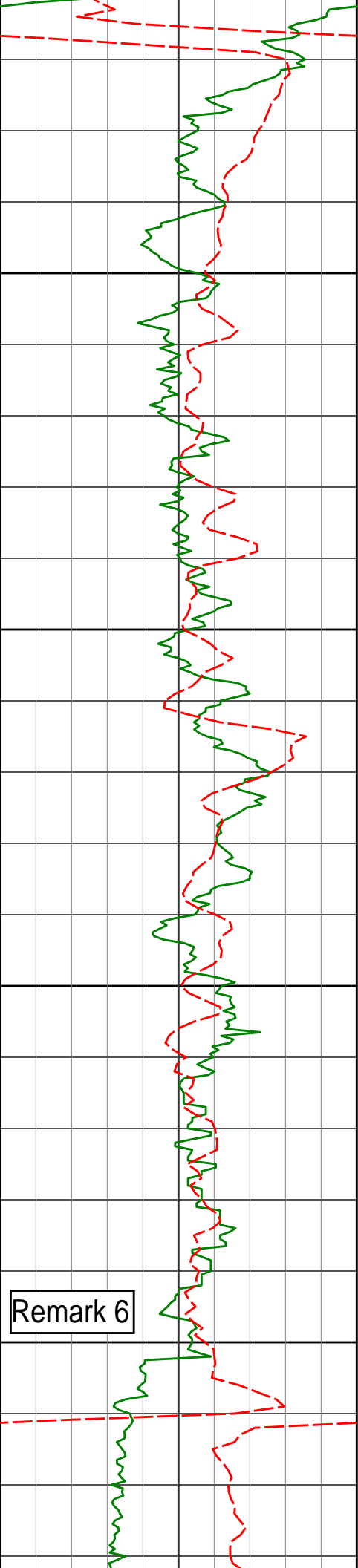
5616'

63.64°

181.56°

5443.93'

401.79'



5700

5711'

71.80°

182.35°

5479.92'

489.04'

5750

5800

5805'

81.75°

180.79°

5501.40'

579.90'

5850

5846'

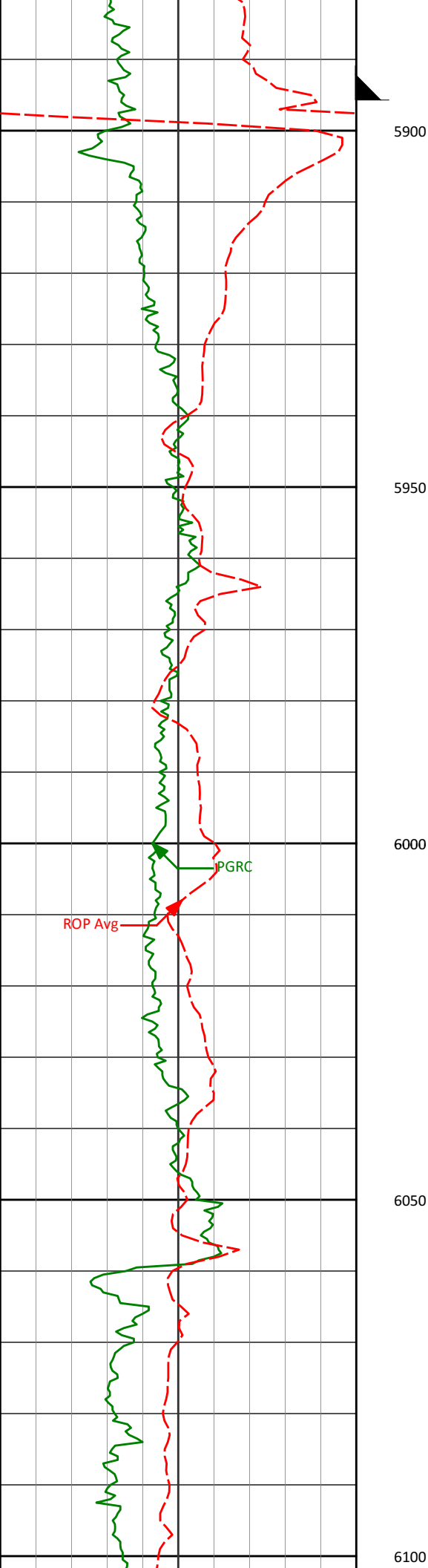
86.86°

180.00°

5505.47'

620.52'

Remark 6



<7" casing set at 5893' MD>

<Run 200>

MD	Angle 1	Angle 2	Distance 1	Distance 2
5992'	89.51°	179.31°	5510.10'	766.02'

6000

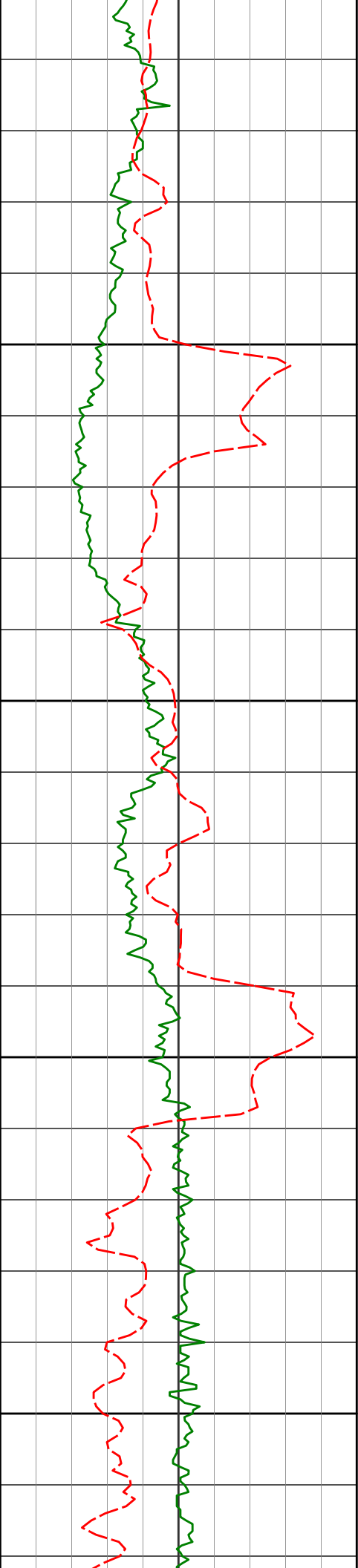
PGRC

ROP Avg

6050

6085'	90.99°	178.76°	5509.70'	858.83'
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6100



6150

6177'

89.91°

178.90°

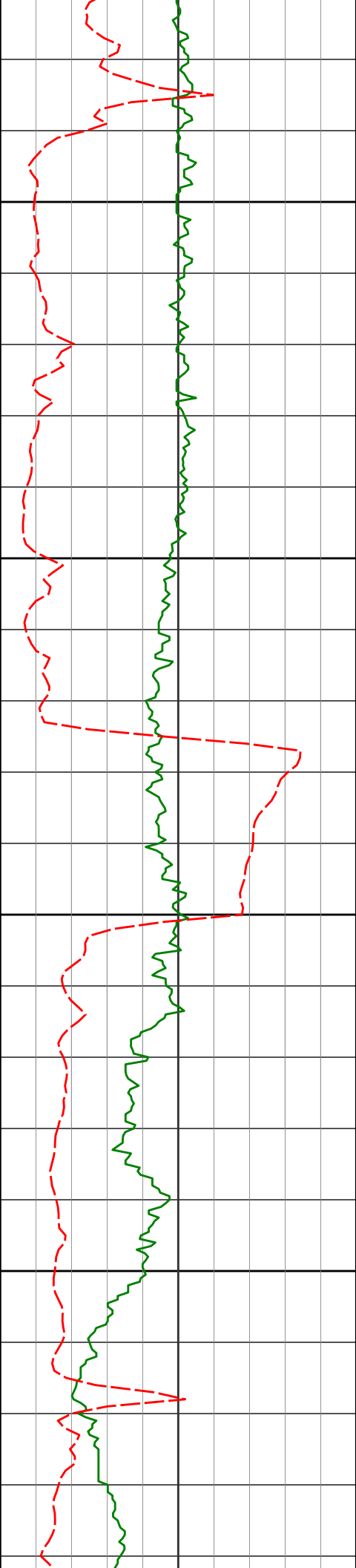
5508.98'

950.66'

6200

6250

6300



6350

6362'

90.06°

178.95°

5509.03'

1135.30'

6400

6450

6455'

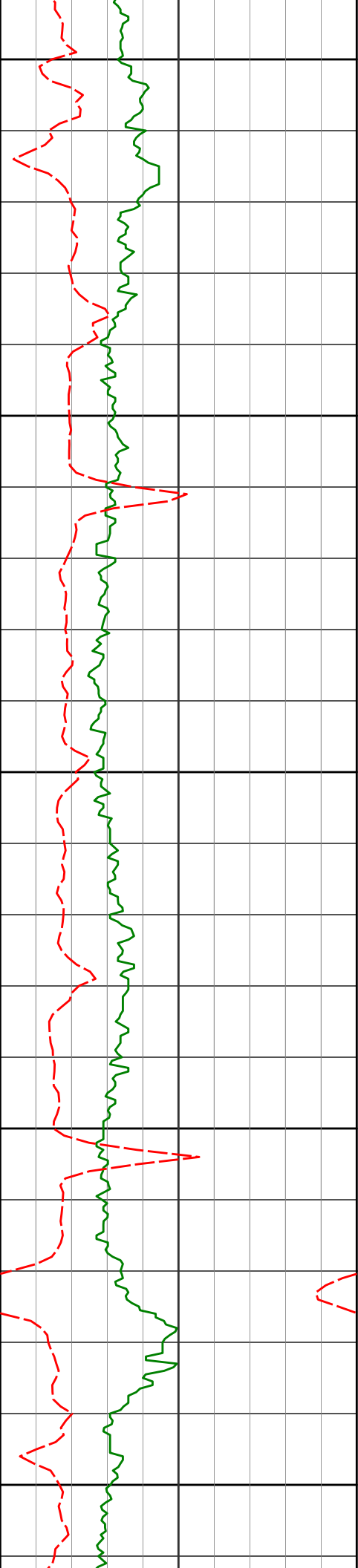
87.04°

179.42°

5511.38'

1228.05'

6500



6550

6600

6650

6700

6750

6548'

87.10°

179.25°

5516.13'

1320.71'

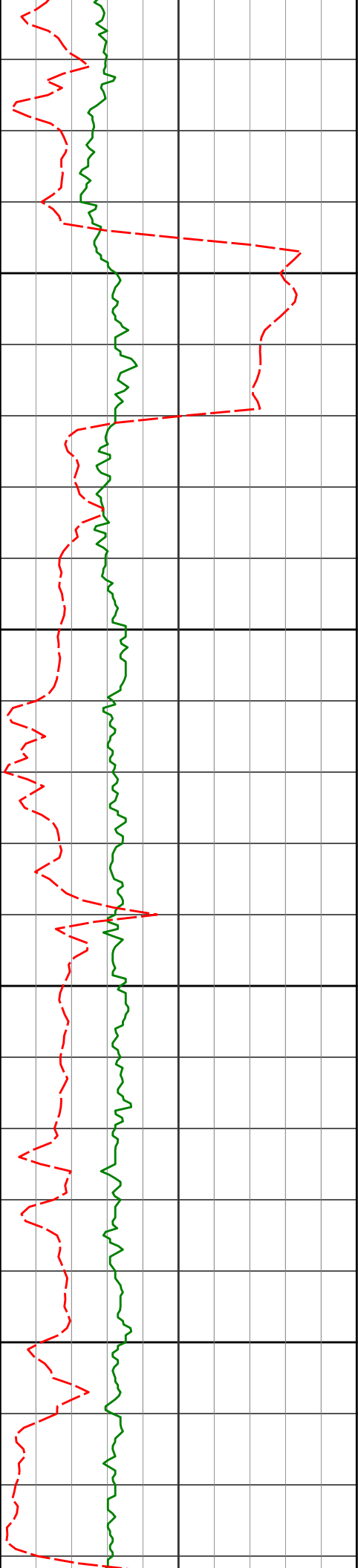
6732'

88.64°

178.42°

5522.96'

1504.23'



6800

6825'

88.49°

180.88°

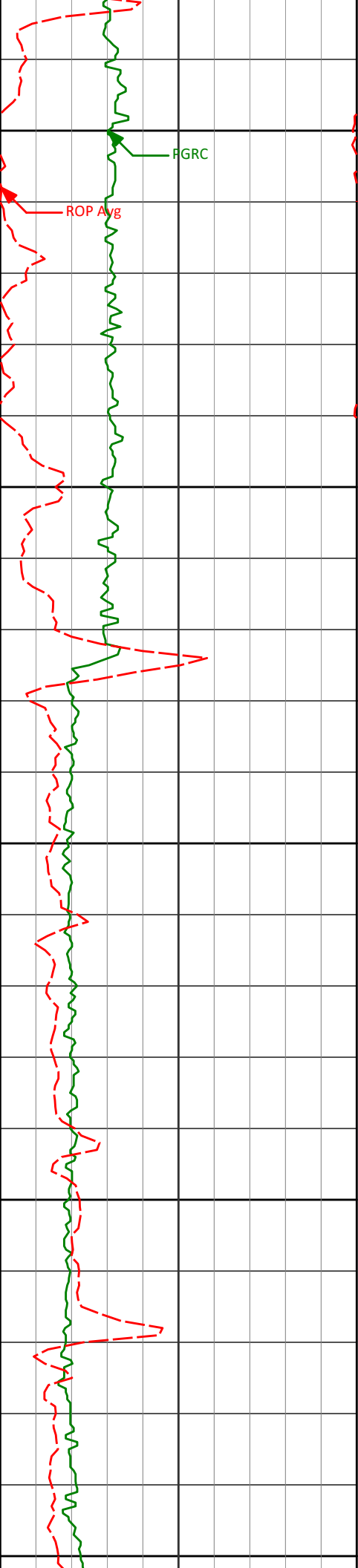
5525.28'

1596.94'

6850

6900

6950



7000

7010'

89.94°

180.01°

5527.82'

1781.19'

7050

7100

7105'

90.52°

179.88°

5527.44'

1875.88'

7150

7200

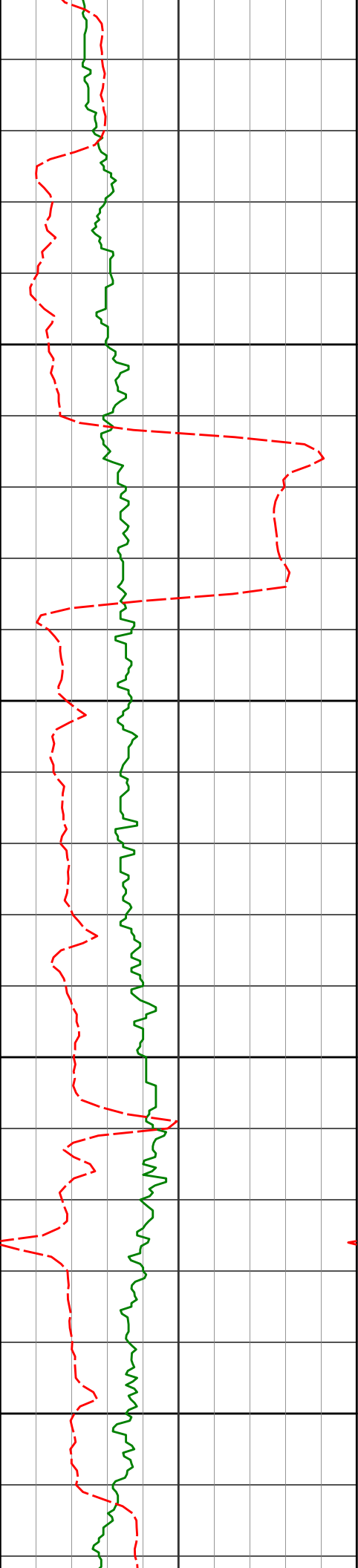
7200'

91.82°

179.89°

5525.50'

1970.56'



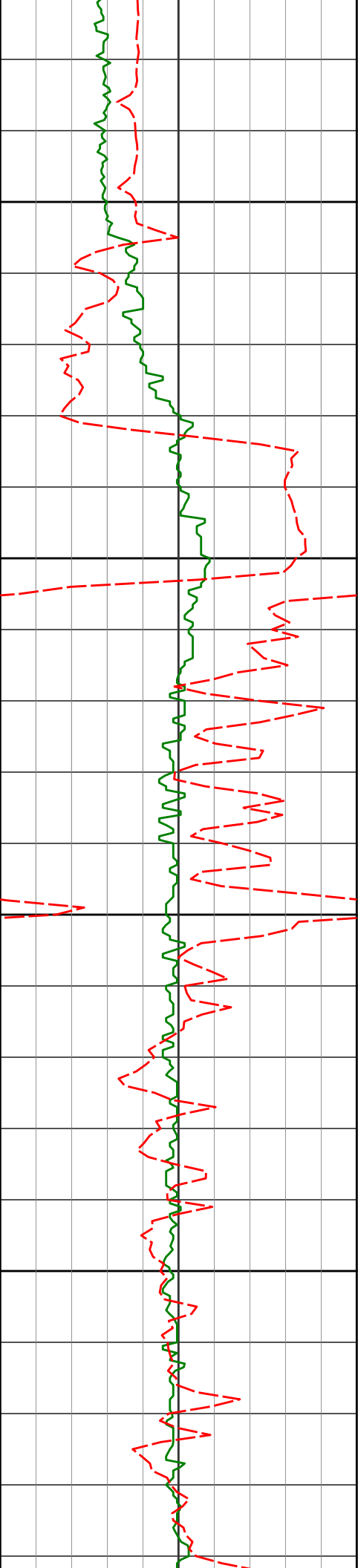
7250

7300

7350

7400

7294'	90.15°	180.75°	5523.88'	2064.19'
7389'	90.83°	180.18°	5523.06'	2158.81'



7450

7483'

91.26°

180.21°

5521.34'

2252.46'

7500

7550

7578'

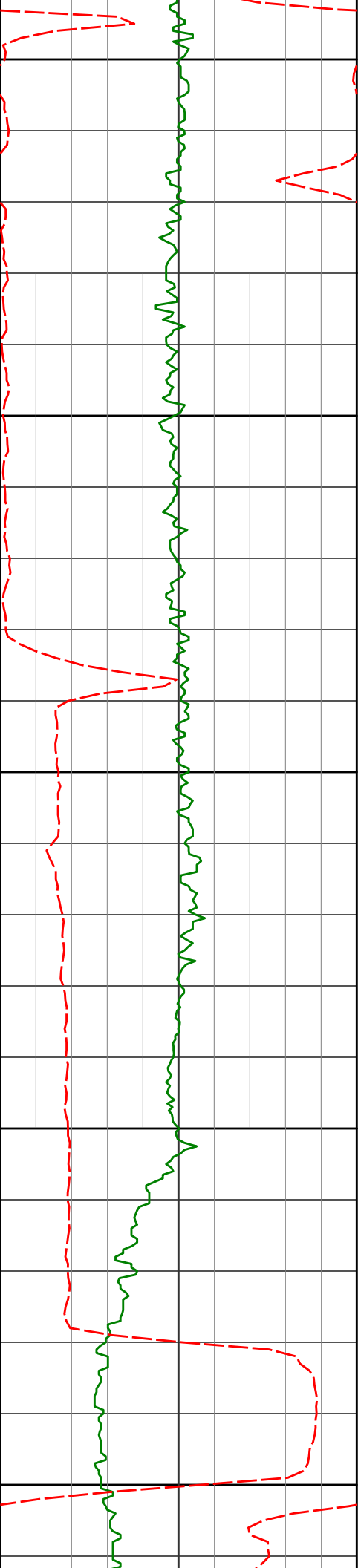
90.22°

179.60°

5520.12'

2347.15'

7600



7650

7673'

90.62°

179.50°

5519.43'

2441.90'

7700

7750

7768'

91.94°

180.97°

5517.30'

2536.53'

7800

7850

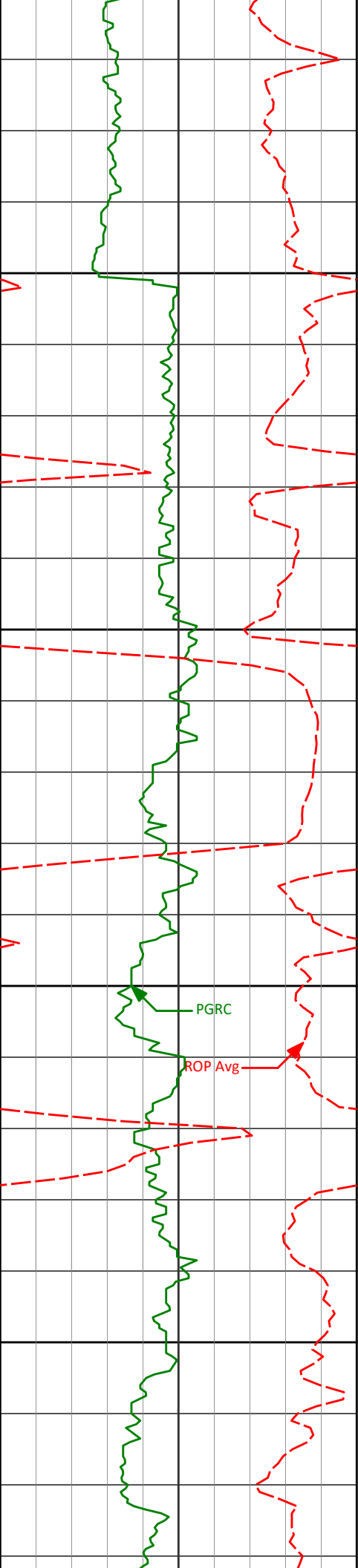
7863'

92.02°

179.03°

5515.05'

2639.12'



7900

7950

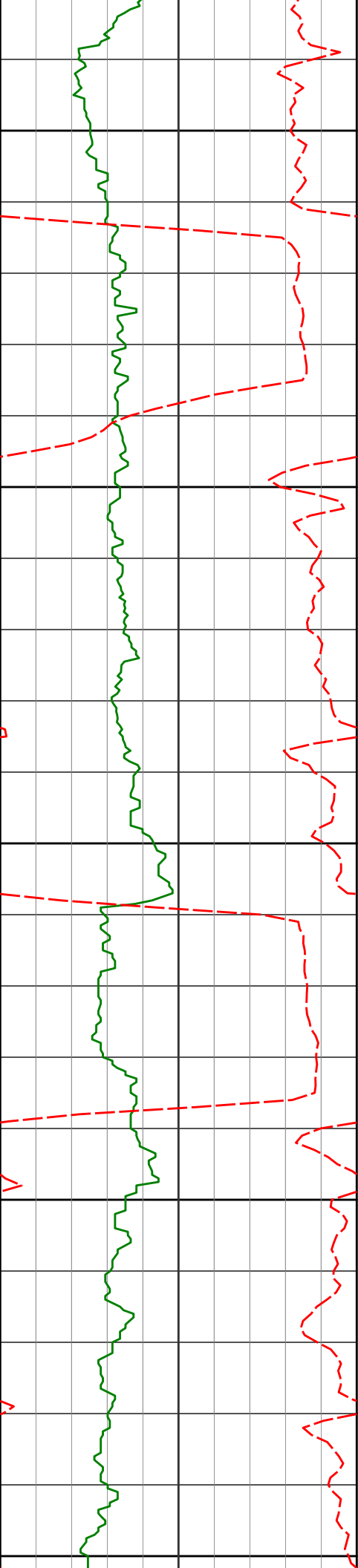
8000

8050

PGRC

ROP Avg

7862'	90.80°	178.93°	5515.05'	2630.19'
7957'	90.68°	178.33°	5513.83'	2725.03'
8051'	88.34°	177.31°	5514.63'	2818.93'



8100

8150

8200

8250

8300

8146'

87.44°

179.02°

5518.13'

2913.75'

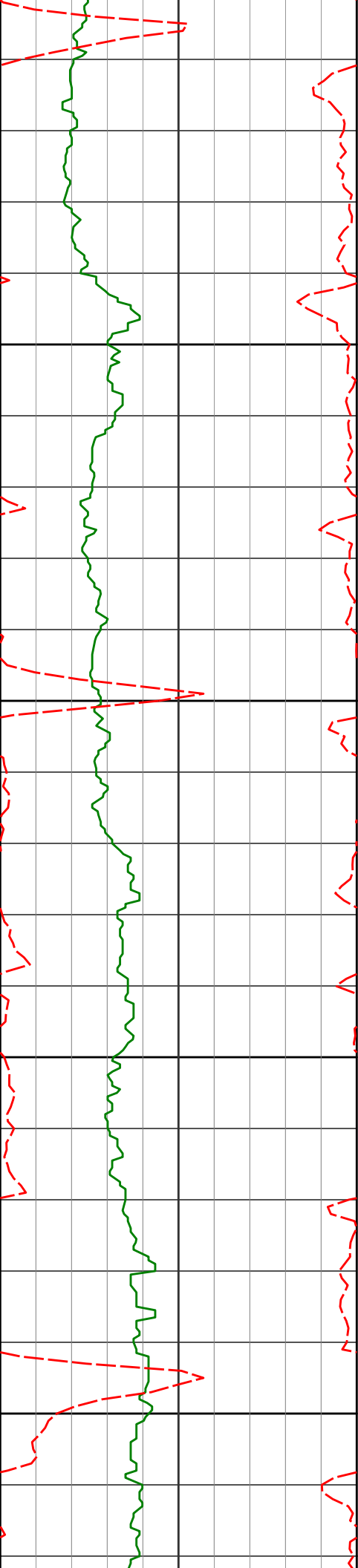
8241'

86.85°

181.76°

5522.86'

3008.26'



8336'

87.17°

181.42°

5527.82'

3102.57'

8350

8400

8431'

87.90°

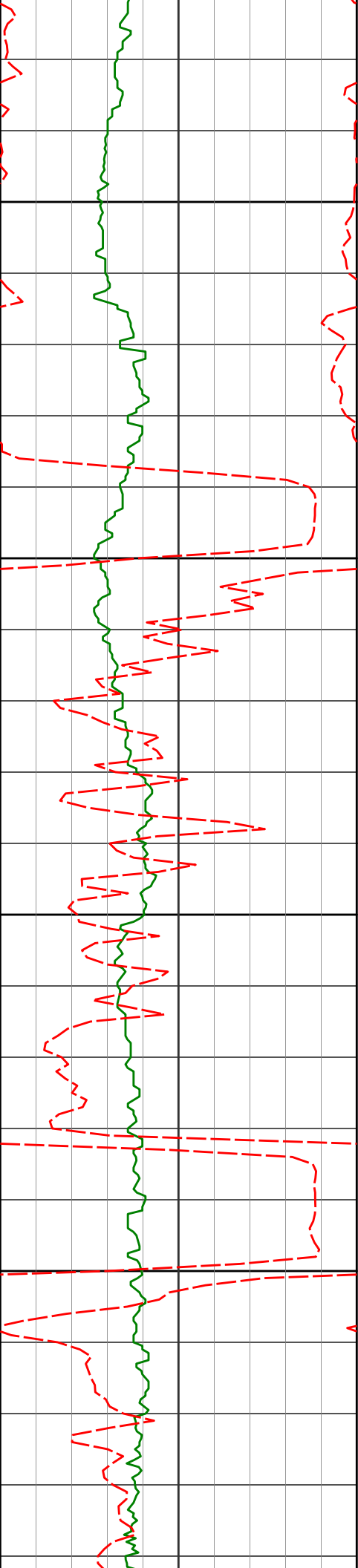
180.93°

5531.91'

3196.99'

8450

8500



8526'

88.18°

180.55°

5535.15'

3291.51'

8550

8600

8621'

88.55°

181.40°

5537.86'

3386.02'

8650

8700

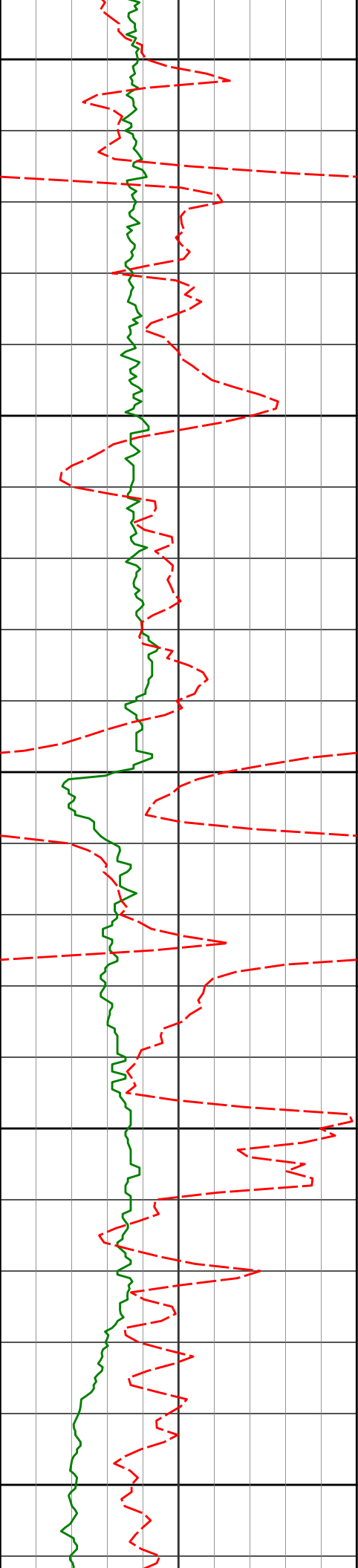
8716'

90.49°

182.67°

5538.65'

3480.37'



8750

8800

8850

8900

8950

8810'

90.56°

182.86°

5537.79'

3573.58'

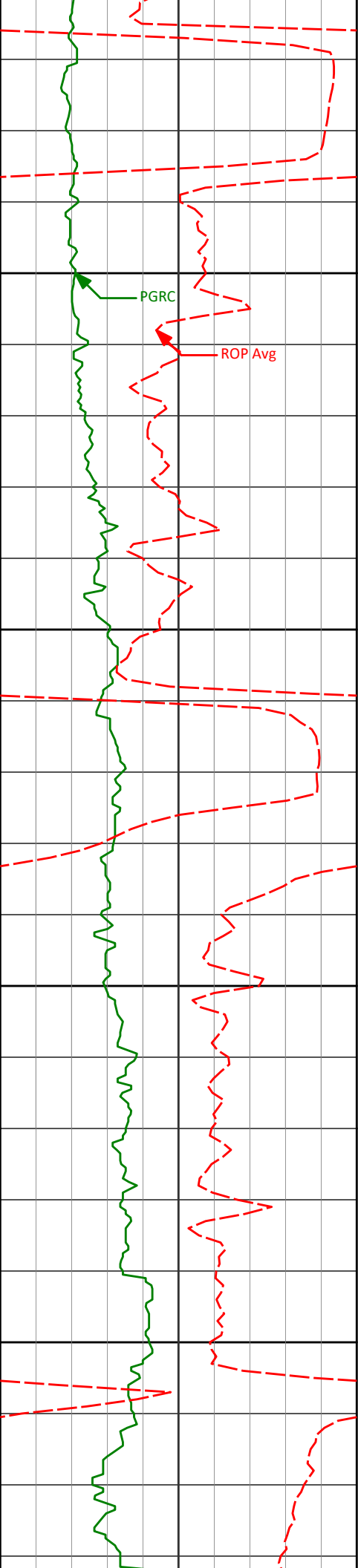
8905'

91.23°

183.01°

5536.31'

3667.74'



9000

8999'

91.66°

180.84°

5533.93'

3761.08'

9050

9093'

90.83°

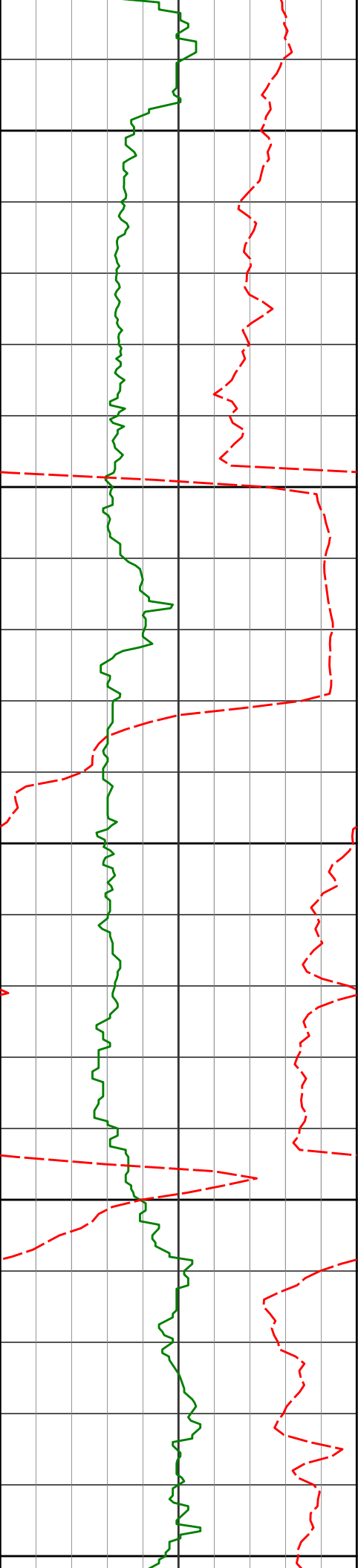
179.64°

5531.89'

3854.72'

9100

9150



9189'

92.25°

179.51°

5529.30'

3950.42'

9200

9250

9283'

89.78°

178.52°

5527.63'

4044.21'

9300

9350

9378'

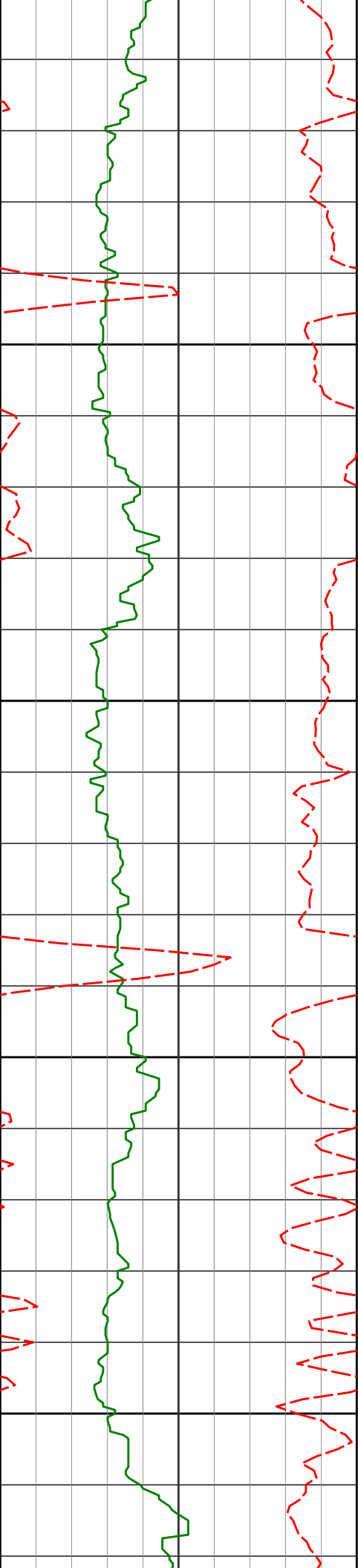
89.38°

177.60°

5528.32'

4139.10'

9400



9450

9472'

89.69°

177.35°

5529.08'

4233.03'

9500

9550

9567'

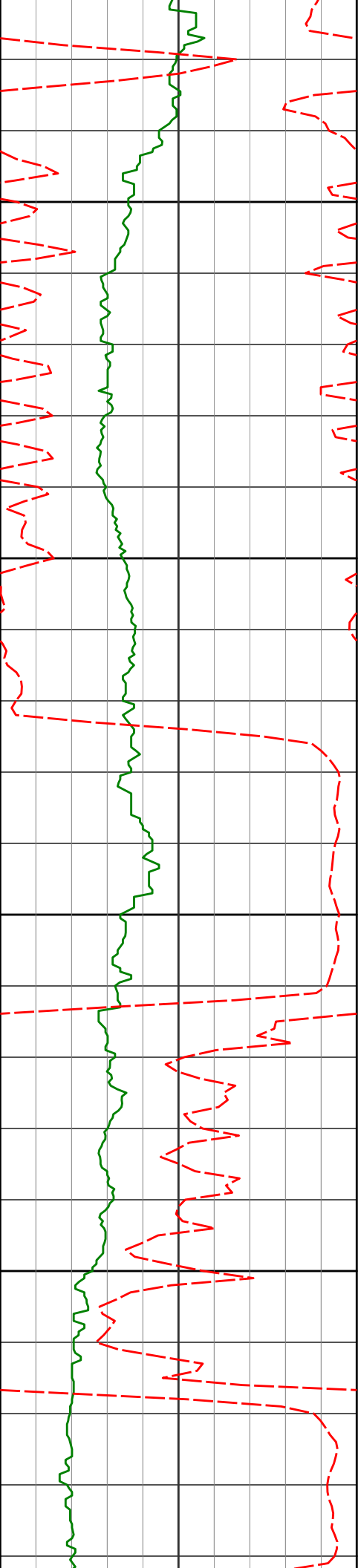
89.48°

175.72°

5529.77'

4328.00'

9600



9650

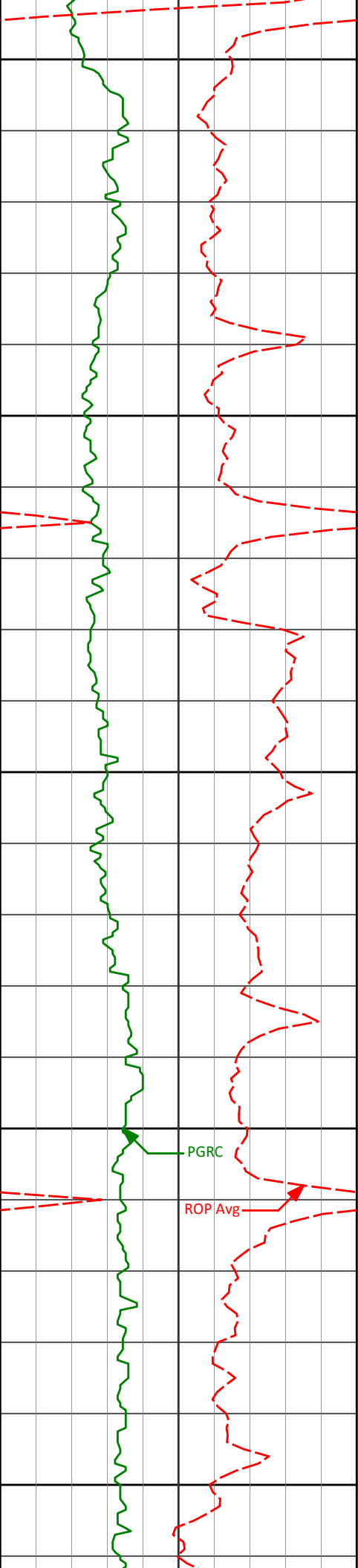
9662'	89.69°	175.00°	5530.46'	4423.00'
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9700

9750

9757'	87.72°	177.72°	5532.61'	4517.95'
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9800



9850

9851'

88.18°

179.50°

5535.97'

4611.73'

9900

9945'

88.89°

178.85°

5538.38'

4705.49'

9950

10000

PGRC

ROP Avg

10040'

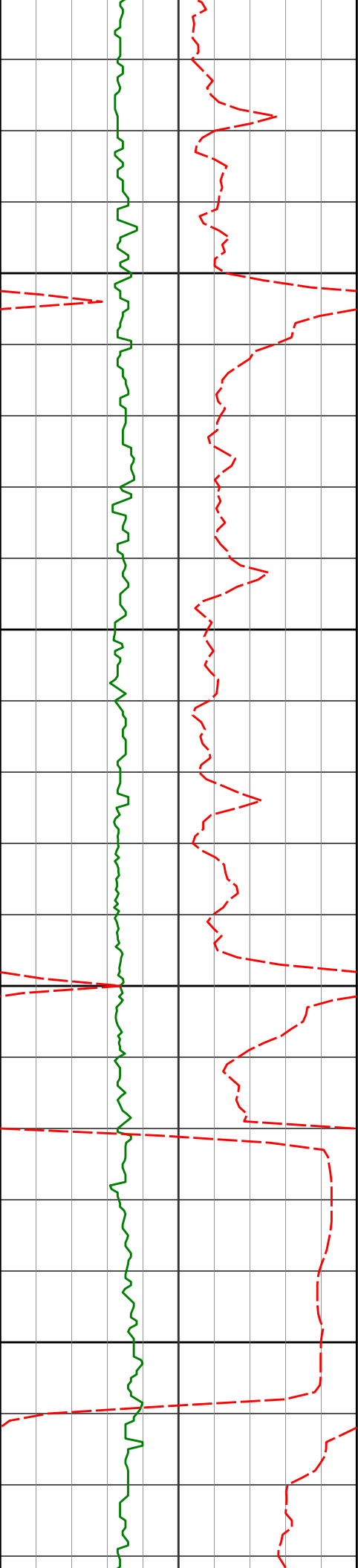
90.28°

179.31°

5539.07'

4800.29'

10050



10100

10135'

89.82°

175.60°

5538.99'

4895.21'

10150

10200

10230'

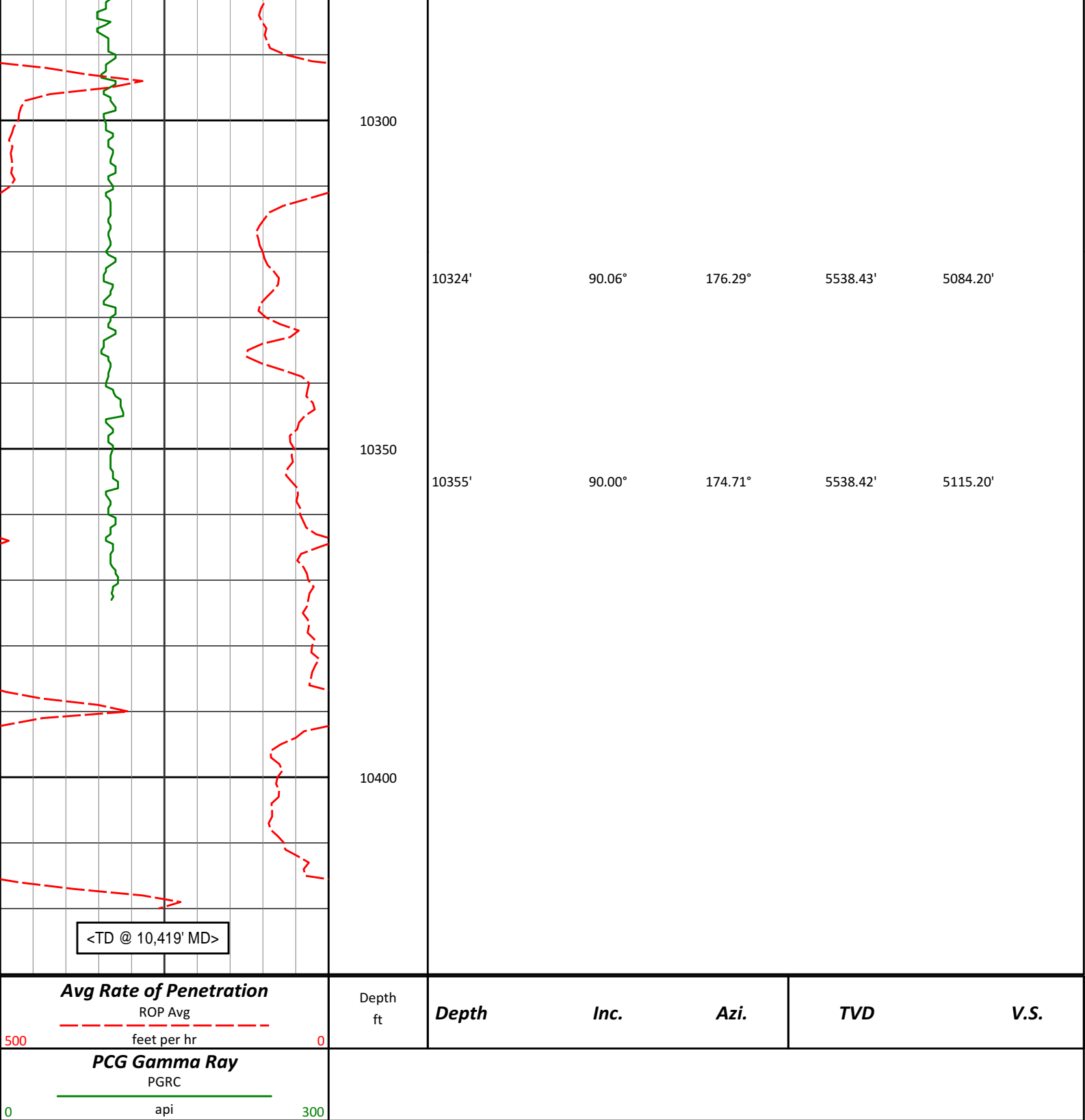
90.40°

174.85°

5538.81'

4990.21'

10250



HALLIBURTON

DIRECTIONAL SURVEY REPORT
Noble Energy
Nalen State LD12-77-1BHN
Wattenberg
Weld Colorado
USA
CA-XX-0901834952

Measured Depth	Inclination	Direction	Vertical Depth	Latitude	Departure	Vertical Section	Dogleg
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(feet)	(degrees)	(degrees)	(feet)	(feet)	(feet)	(feet)	(deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
450.00	0.20	213.31	450.00	0.66 S	0.43 W	0.62	0.04
825.00	0.80	184.31	824.98	3.81 S	0.99 W	3.72	0.17
1290.00	0.56	256.02	1289.96	7.60 S	3.43 W	7.30	0.18
1382.00	0.66	234.00	1381.95	8.02 S	4.29 W	7.64	0.27
1474.00	0.50	238.51	1473.95	8.54 S	5.06 W	8.10	0.18
1567.00	0.49	285.80	1566.94	8.64 S	5.78 W	8.14	0.42
1659.00	1.56	70.22	1658.94	8.11 S	4.98 W	7.68	2.15
1844.00	1.48	58.23	1843.87	6.00 S	0.58 W	5.93	0.18
2124.00	1.07	56.25	2123.80	2.64 S	4.68 E	3.01	0.15
2217.00	1.40	47.93	2216.78	1.39 S	6.25 E	1.89	0.40
2495.00	1.55	45.54	2494.69	3.52 N	11.45 E	-2.58	0.06
2681.00	1.63	43.67	2680.61	7.19 N	15.07 E	-5.95	0.05
2773.00	1.52	46.03	2772.58	8.99 N	16.86 E	-7.60	0.14
2867.00	3.38	69.90	2866.49	10.81 N	20.36 E	-9.13	2.21
2962.00	4.72	83.52	2961.25	12.22 N	26.88 E	-10.00	1.73
3057.00	5.90	88.19	3055.84	12.81 N	35.65 E	-9.89	1.32
3152.00	6.14	87.46	3150.32	13.19 N	45.60 E	-9.46	0.26
3246.00	6.78	94.10	3243.73	13.02 N	56.16 E	-8.43	1.05
3341.00	8.10	95.82	3337.92	11.94 N	68.40 E	-6.37	1.41
3436.00	8.68	94.96	3431.91	10.64 N	82.20 E	-3.96	0.63
3531.00	8.53	95.37	3525.84	9.36 N	96.36 E	-1.54	0.17
3625.00	8.10	97.04	3618.85	7.90 N	109.88 E	1.02	0.52
3720.00	7.57	94.99	3712.96	6.53 N	122.76 E	3.42	0.63
3815.00	7.82	87.12	3807.11	6.31 N	135.45 E	4.66	1.14
3910.00	7.52	81.88	3901.26	7.52 N	148.07 E	4.49	0.80
4005.00	7.27	86.66	3995.47	8.75 N	160.23 E	4.24	0.70
4100.00	6.93	92.22	4089.74	8.87 N	171.96 E	5.06	0.81
4195.00	6.17	87.23	4184.12	8.90 N	182.78 E	5.92	1.00
4290.00	7.02	88.01	4278.49	9.35 N	193.68 E	6.35	0.90
4384.00	7.81	94.18	4371.71	9.08 N	205.79 E	7.60	1.19
4479.00	6.77	90.08	4465.94	8.60 N	217.83 E	9.04	1.22
4574.00	7.76	91.08	4560.17	8.48 N	229.84 E	10.14	1.05
4668.00	7.94	91.47	4653.29	8.19 N	242.67 E	11.47	0.20
4763.00	9.84	105.93	4747.16	5.79 N	257.04 E	15.02	3.08
4811.00	9.50	106.63	4794.48	3.53 N	264.78 E	17.90	0.76
4858.00	12.43	115.39	4840.62	0.25 N	273.07 E	21.84	7.15
4906.00	15.30	118.28	4887.21	4.96 S	283.31 E	27.87	6.16
4953.00	18.68	120.54	4932.16	11.73 S	295.26 E	35.57	7.33
5048.00	24.15	126.92	5020.58	31.15 S	323.93 E	57.25	6.24
5143.00	26.89	146.25	5106.45	60.74 S	351.45 E	88.97	9.18
5237.00	32.25	157.19	5188.24	101.60 S	373.01 E	131.44	8.07
5332.00	39.15	162.87	5265.36	153.69 S	391.70 E	184.88	8.05
5427.00	46.32	170.32	5335.14	216.34 S	406.33 E	248.50	9.23
5521.00	54.44	178.79	5395.10	288.27 S	412.87 E	320.72	11.07
5616.00	63.64	181.56	5443.93	369.63 S	412.53 E	401.79	9.99
5711.00	71.80	182.35	5479.92	457.41 S	409.52 E	489.04	8.63
5805.00	81.75	180.79	5501.40	548.77 S	407.04 E	579.90	10.71
5846.00	86.86	180.00	5505.47	589.55 S	406.76 E	620.52	12.61
5992.00	89.51	179.31	5510.10	735.46 S	407.64 E	766.02	1.88
6085.00	90.99	178.76	5509.70	828.44 S	409.21 E	858.83	1.70
6177.00	89.91	178.90	5508.98	920.42 S	411.09 E	950.66	1.18
6362.00	90.06	178.95	5509.03	1105.39 S	414.56 E	1135.30	0.09
6455.00	87.04	179.42	5511.38	1198.34 S	415.88 E	1228.05	3.29
6548.00	87.10	179.25	5516.13	1291.21 S	416.95 E	1320.71	0.19
6732.00	88.64	178.42	5522.96	1475.04 S	420.69 E	1504.23	0.95
6825.00	88.49	180.88	5525.28	1568.00 S	421.26 E	1596.94	2.65
7010.00	89.94	180.01	5527.82	1752.97 S	419.83 E	1781.19	0.91
7105.00	90.52	179.88	5527.44	1847.97 S	419.93 E	1875.88	0.63
7200.00	91.82	179.89	5525.50	1942.95 S	420.13 E	1970.56	1.36
7294.00	90.15	180.75	5523.88	2036.93 S	419.61 E	2064.19	1.99
7389.00	90.83	180.18	5523.06	2131.92 S	418.83 E	2158.81	0.93
7483.00	91.26	180.21	5521.34	2225.90 S	418.51 E	2252.46	0.46
7578.00	90.22	179.60	5520.12	2320.89 S	418.68 E	2347.15	1.28
7673.00	90.62	179.50	5519.43	2415.89 S	419.42 E	2441.90	0.43
7768.00	91.94	180.97	5517.30	2510.86 S	419.03 E	2536.53	2.08
7862.00	90.80	178.93	5515.05	2604.82 S	419.11 E	2630.19	2.49
7957.00	90.68	178.33	5513.83	2699.79 S	421.38 E	2725.03	0.65
8051.00	88.34	177.31	5514.63	2793.71 S	424.95 E	2818.93	2.72
8146.00	87.44	179.02	5518.13	2888.59 S	428.00 E	2913.75	2.03

8241.00	86.85	181.76	5522.86	2983.46 S	427.36 E	3008.26	2.95
8336.00	87.17	181.42	5527.82	3078.30 S	424.73 E	3102.57	0.48
8431.00	87.90	180.93	5531.91	3173.19 S	422.78 E	3196.99	0.94
8526.00	88.18	180.55	5535.15	3268.12 S	421.56 E	3291.51	0.49
8621.00	88.55	181.40	5537.86	3363.07 S	419.94 E	3386.02	0.97
8716.00	90.49	182.67	5538.65	3458.00 S	416.57 E	3480.37	2.44
8810.00	90.56	182.86	5537.79	3551.89 S	412.03 E	3573.58	0.22
8905.00	91.23	183.01	5536.31	3646.75 S	407.16 E	3667.74	0.73
8999.00	91.66	180.84	5533.93	3740.66 S	404.00 E	3761.08	2.35
9093.00	90.83	179.64	5531.89	3834.63 S	403.60 E	3854.72	1.56
9189.00	92.25	179.51	5529.30	3930.59 S	404.31 E	3950.42	1.48
9283.00	89.78	178.52	5527.63	4024.56 S	405.92 E	4044.21	2.83
9378.00	89.38	177.60	5528.32	4119.50 S	409.14 E	4139.10	1.06
9472.00	89.69	177.35	5529.08	4213.40 S	413.28 E	4233.03	0.42
9567.00	89.48	175.72	5529.77	4308.23 S	419.02 E	4328.00	1.73
9662.00	89.69	175.00	5530.46	4402.91 S	426.71 E	4423.00	0.79
9757.00	87.72	177.72	5532.61	4497.68 S	432.73 E	4517.95	3.54
9851.00	88.18	179.50	5535.97	4591.59 S	435.01 E	4611.73	1.95
9945.00	88.89	178.85	5538.38	4685.55 S	436.37 E	4705.49	1.02
10040.00	90.28	179.31	5539.07	4780.53 S	437.89 E	4800.29	1.54
10135.00	89.82	175.60	5538.99	4875.42 S	442.11 E	4895.21	3.94
10230.00	90.40	174.85	5538.81	4970.09 S	450.01 E	4990.21	1.01
10324.00	90.06	176.29	5538.43	5063.81 S	457.27 E	5084.20	1.57
10355.00	90.00	174.71	5538.42	5094.71 S	459.71 E	5115.20	5.09
10419.00	90.00	174.71	5538.42	5158.44 S	465.61 E	5179.20	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 175.36 DEGREES (GRID)
A TOTAL CORRECTION OF 6.91 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10419.00 FEET
IS 5179.41 FEET ALONG 174.84 DEGREES (GRID)**

Surface surveys at 450 ft and 825 ft have had azimuths corrected to grid north, but were not taken by Halliburton.

Last survey is a projection from 10355 ft MD to TD at 10419 ft MD.