

**PCG Pressure Case Gamma Ray**  
**PCDC Pressure Case Directional**

Country		: USA					
Field		: Redtail					
Location		: Lat: 40° 48' 31.14" North Long: 103° 50' 55.35" West					
Well		: Razor 27J-3411A					
Company		: Whiting Oil and Gas					
Rig		: Frontier 26					
LOCATION		Company : Whiting Oil and Gas					
		Rig : Frontier 26					
		Well : Razor 27J-3411A					
		Field : Redtail					
		Country : USA					
		API Number : 05-123-38061					
		Other Services					
		Directional Drilling					
		Latitude : 40° 48' 31.14" North Longitude : 103° 50' 55.35" West					
		UTM Easting = 3,457,103.103 ft UTM Northing = 1,541,694.418 ft					
Permanent Datum		: Ground Level	Elevation : 4767.00 ft	Elev.	KB N/A		
Log Measured From		: Drill Floor	22.00 ft Above Permanent Datum		DF 22.00 ft GL 4767.00 ft WD N/A		
Drilling Measured From		: Drill Floor	MD LOG				
Depth Logged		: 81.00 ft To 13,185.00 ft	Unit No. : Command Centedlob No. :CA-XX-0901620723				
Date Logged		: 19-Oct-14 To 27-Oct-14	Plot Type : Final				
Total Depth MD		: 13,185.00 ft TVD: 5,650.03 ft	Plot Date : 27-Oct-14				
Spud Date		: 19-Oct-14					
Run No.	Borehole Record (MD)		Run No.	Borehole Record (MD)			
	Size	From		To	Size	From	To
	0100	13,500 in		81.00 ft	1,600.00 ft		
	0200	8,750 in		1,600.00 ft	6,080.00 ft		
	0300	6,000 in		6,080.00 ft	13,185.00 ft		
			Size	Casing Record (MD)			
				Weight	From	To	
		9.625 in	36.00 lbpf	SURFACE	1,588.00 ft		
		7.000 in	29.00 lbpf	SURFACE	6,069.00 ft		

## WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	20-Oct-14	22-Oct-14	27-Oct-14		
Rig Bit Number	0100	0200	0300		
Bit Size (in)	13.500	8.750	6.000		
Tool Nominal OD (in)	6.750	6.750	4.750		
Log Start Depth (MD, ft)	80.00	1,600.00	6,080.00		
Log End Depth (MD, ft)	1,600.00	6,080.00	13,185.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	19-Oct-14 16:08	20-Oct-14 19:55	23-Oct-14 01:45		
Drill/Wipe End Date and Time	19-Oct-14 22:22	21-Oct-14 23:00	26-Oct-14 14:00		
Min Inc (deg) @ Depth (MD, ft)	0.46 @ 176.00	1.55 @ 5,089.00	86.33 @ 6,089.00		
Max Inc (deg) @ Depth (MD, ft)	16.25 @ 1,531.00	85.03 @ 6,033.00	93.27 @ 12,838.00		
Bit TFA(in2) / Bit Type	1.53 / PDC	0.88 / PDC	0.53 / PDC		
Flow Rate (gpm)	732.80	505.12	254.97		
Max AV (fpm) / CV (fpm) @ MWD	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0		
Fluid Type	Native/Spud Mud	Polymer	Polymer		
Density (ppg) / Viscosity (spqt)	8.50 / 32.00	10.00 / 48.00	10.10 / 50.00		
Filtrate CL (ppm)	0.00	2,000.00	1,800.00		
pH / Fluid Loss (mptm)	8.00 / 0	9.00 / 0	7.50 / 6		
PV (cP) / YP (lbf2)	1 / 1.00	15 / 21.00	21 / 19.00		
% Solids / % Sand	10 / 0.25	12 / .25	11.00 / 0.25		
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	5.00 / N/A		
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Max Tool Temp (in F) / S	168.50 / PDM	175.04 / PDM	220.00 / PDM		

Max Tool Temp (degF) / Source	126.52 / PCM	175.21 / PCM	226.08 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ 126.52	N/A @ 175.21	N/A @ 226.08		
Lead MWD Engineer	Cody Wurdeman	Cody Wurdeman	Cody Wurdeman		
Customer Representative	Kennith Wilkerson	Kennith Wilkerson	Kennith Wilkerson		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.93	5.93	5.93		
Sub Serial Number	11404299	7464564	12463931		
Insert Serial Number	11227504	11400994	11227504		
Date and Time Initialized	19-Oct-14 06:50	20-Oct-14 13:32	22-Oct-14 17:41		
Date and Time Read	20-Oct-14 07:24	22-Oct-14 08:53	27-Oct-14 09:48		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	53.53	45.29	41.04		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11404299	11404299	12463931		
Sonde Serial Number	11638567	11297622	11638567		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	44.72	56.69	229.64		

### Gamma Ray Sensor Information

Tool Type		PCG	PCG		
Distance From Bit (ft)		50.24	35.74		
Recorded Sample Period (sec)		10	10		
Software Version		8.15	8.15		
Sub Serial Number		11404299	12463931		
Insert/Sonde Serial Number		11681054	11681029		

## REMARKS

1. All depths are measured bit depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.

2. No depth corrections have been made for pipe stretch or compression.

3. Critical annular velocities are calculated using the "Power Law" for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.

4. All data is stored data unless otherwise specified.

5. The following smoothing parameters have been applied to the data:

PCG Gamma Ray BCorr (PGRC)  
Interval Resolution: .5  
Interval Distance: .6  
Gap Fill: 3

Average Rate of Penetration (ROPA)  
Interval Resolution: .5  
Interval Distance: 1.2  
Gap Fill: 3

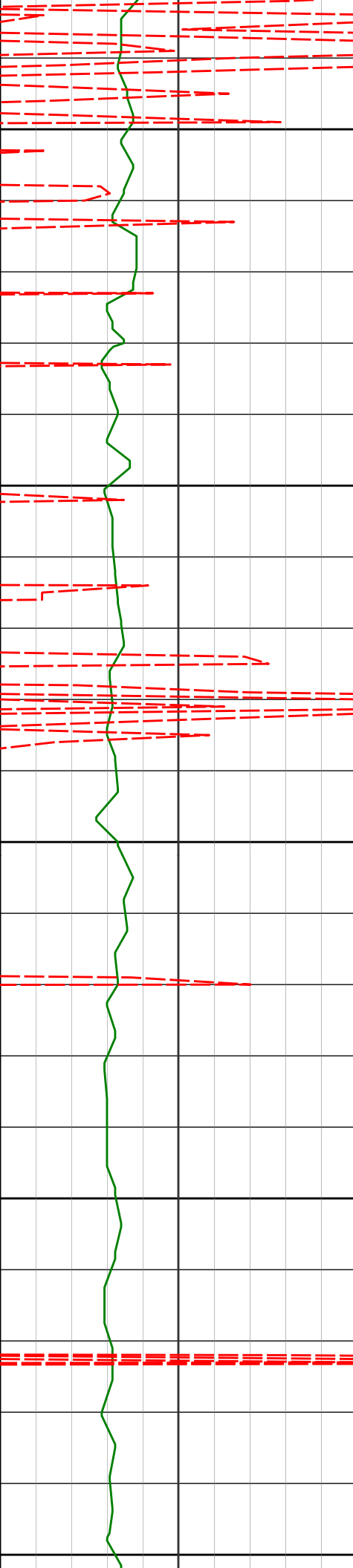
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HALLIBURTON  
Sperry Drilling Services  
MD Main Log 1:240

Whiting Oil and Gas  
Razor 27J-3411A  
Frontier 26  
Sec. 27-T10N-R58W

PCG Gamma Ray BCorr PGRC 0 300 api						
Avg Rate of Penetration ROPA 500 0 feet per hr		Depth ft	Depth	Inc.	Azi.	TVD V.S.
<div><div>PGRC</div><div>ROPA</div></div>		1600 Run 200				
		1641'	16.63°	16.78°	1619.47'	-193.31'
		1650				



1700

1750

1800

1850

1900

1732'

14.65°

13.06°

1707.10'

-216.75'

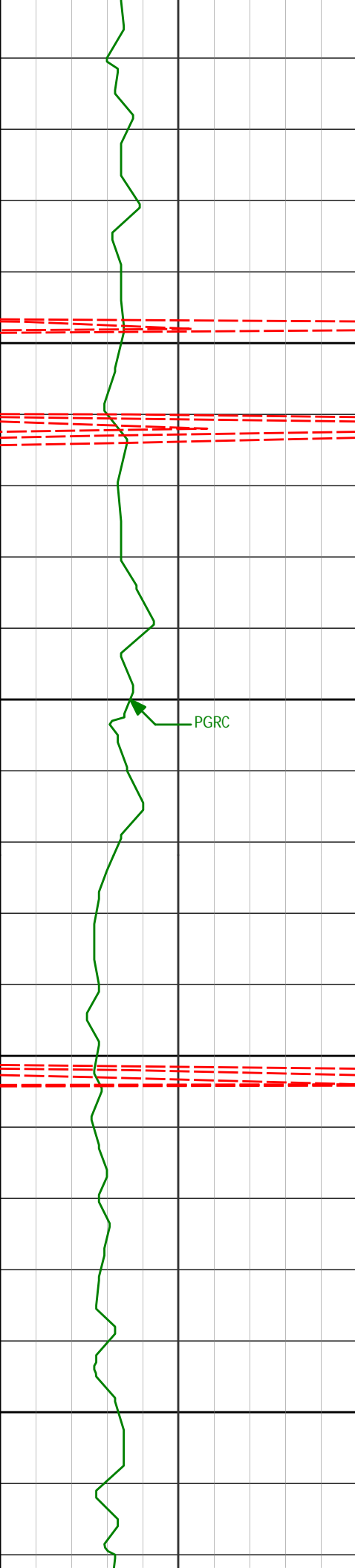
1824'

13.17°

10.66°

1796.40'

-238.21'



1915'

12.00°

10.65°

1885.21'

-257.56'

1950

2000

PGRC

2007'

10.99°

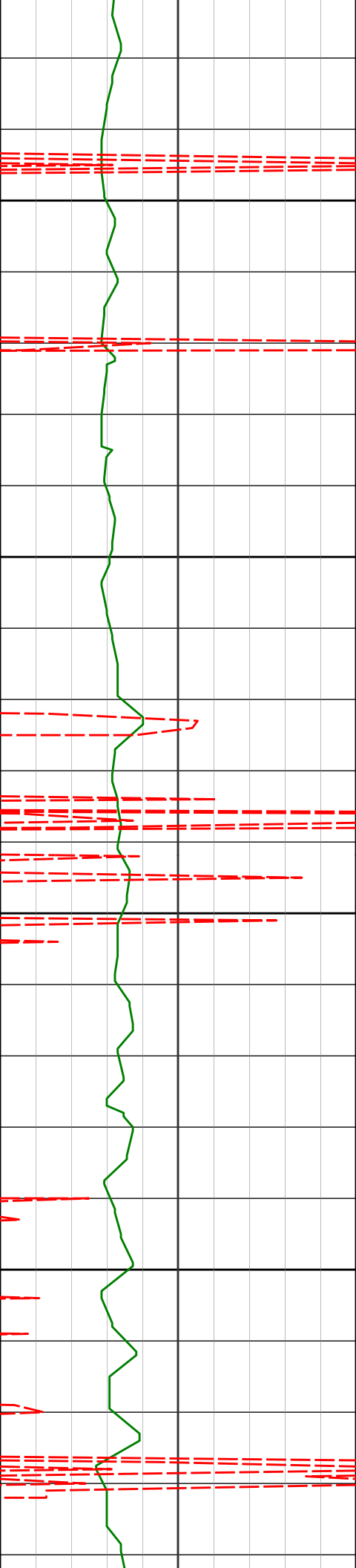
9.94°

1975.37'

-275.47'

2050

2100



2150

2200

2250

2300

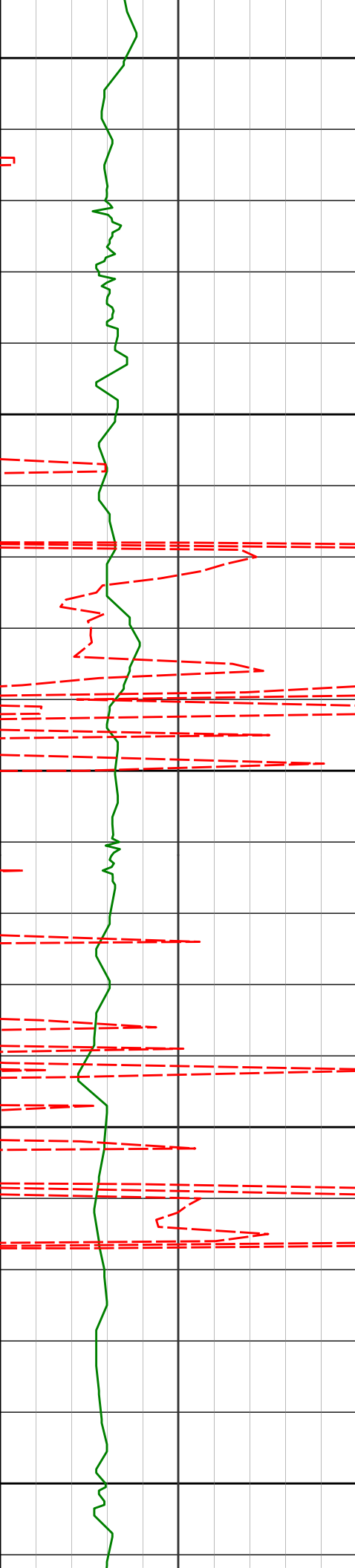
2190'

10.21°

6.28°

2155.24'

-308.59'



2350

2373'

8.89°

2.27°

2335.71'

-338.74'

2400

2450

2465'

10.49°

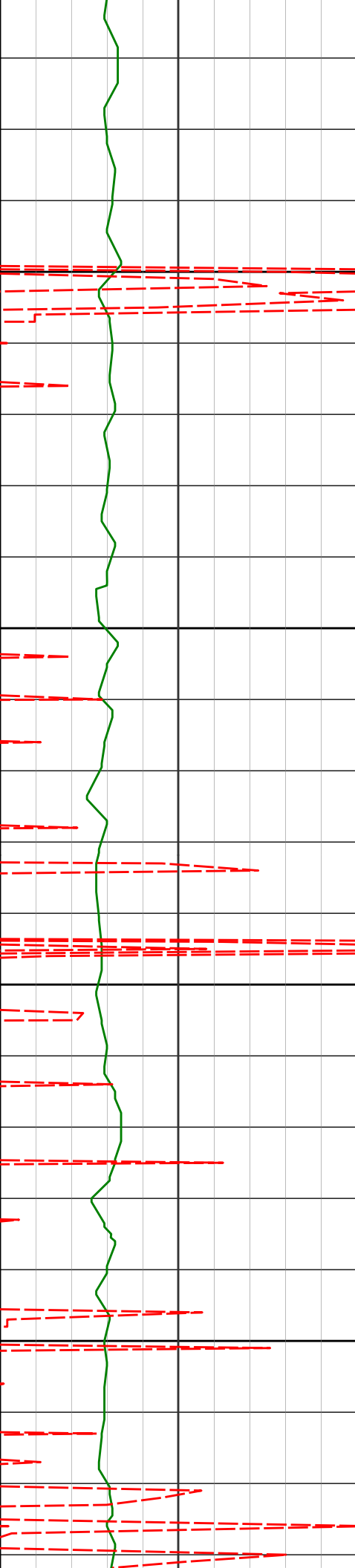
19.12°

2426.41'

-353.65'

2500

2550



2600

2650

2700

2750

2647'

11.58°

16.85°

2605.04'

-386.39'

2739'

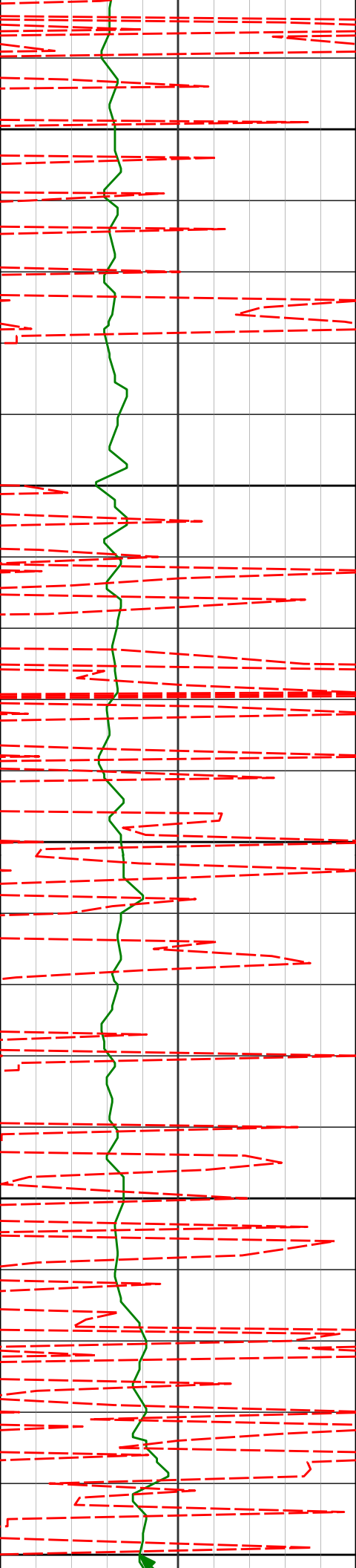
11.42°

17.49°

2695.19'

-403.71'





2800

2830'

10.83°

17.64°

2784.48'

-420.26'

2850

2900

2921'

9.66°

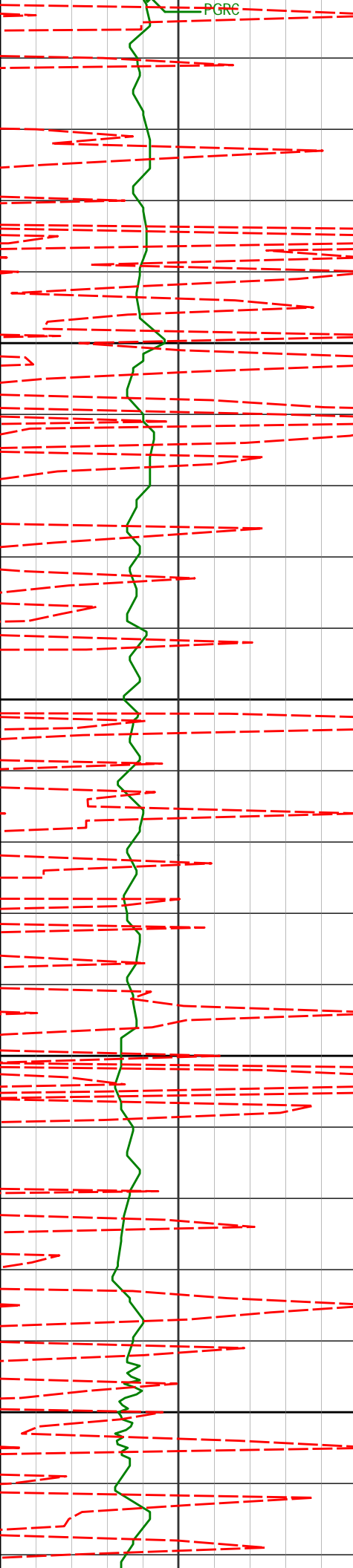
17.10°

2874.03'

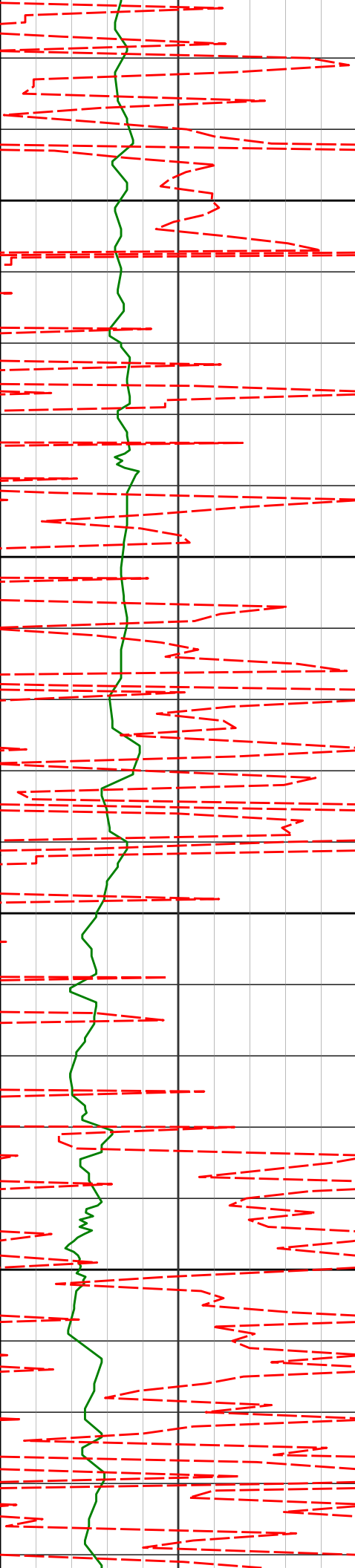
-435.53'

2950

3000



3013'	9.48°	12.09°	2964.75'	-450.17'
3050				
3100				
3105'	8.45°	14.01°	3055.63'	-464.01'
3150				
3196'	7.76°	13.81°	3145.72'	-476.35'
3200				



3250

3288'

8.56°

21.75°

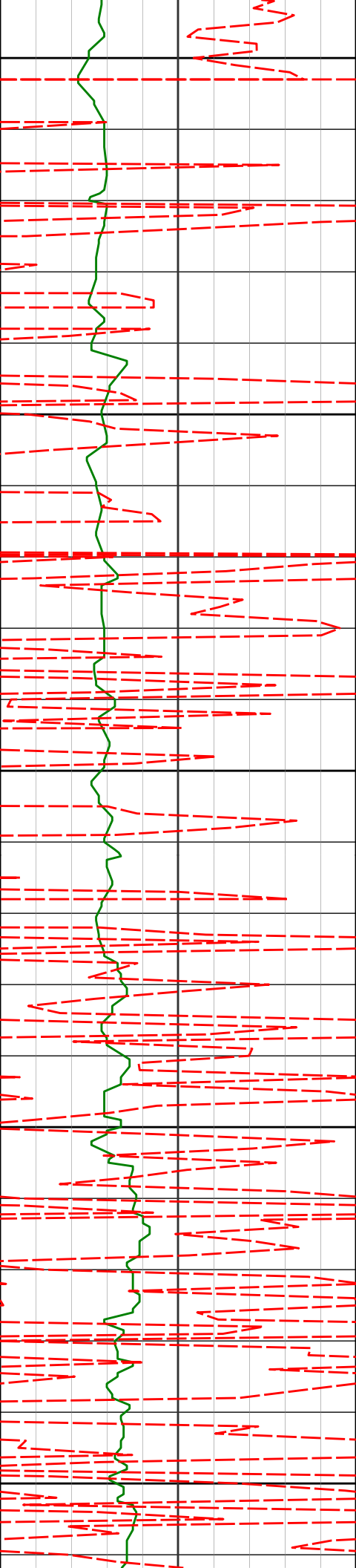
3236.79'

-488.60'

3300

3350

3400



3450

3471'

8.77°

29.46°

3417.71'

-512.96'

3500

3550

3600

3650

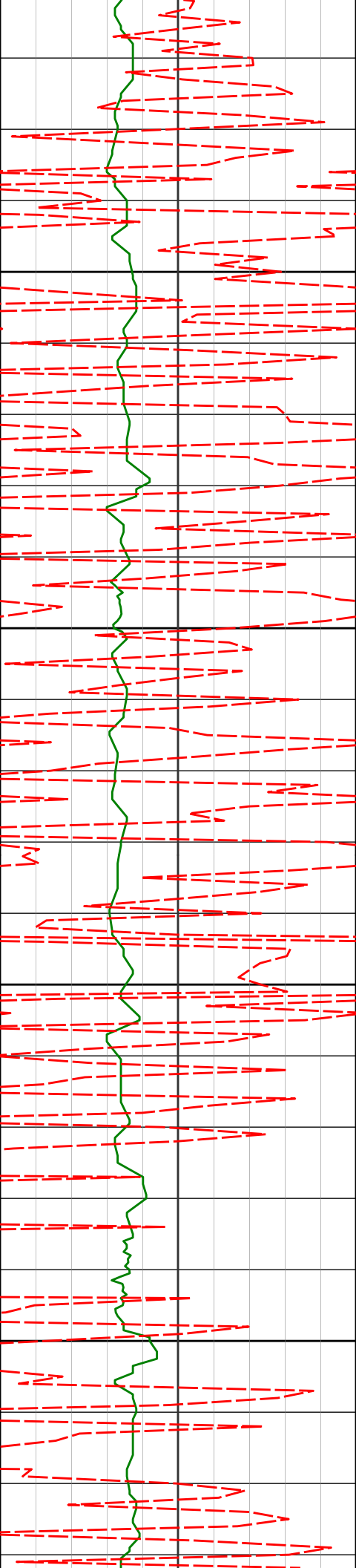
3655'

8.32°

27.95°

3599.66'

-536.46'



3700

3750

3800

3850

3746'

7.36°

25.69°

3689.81'

-547.33'

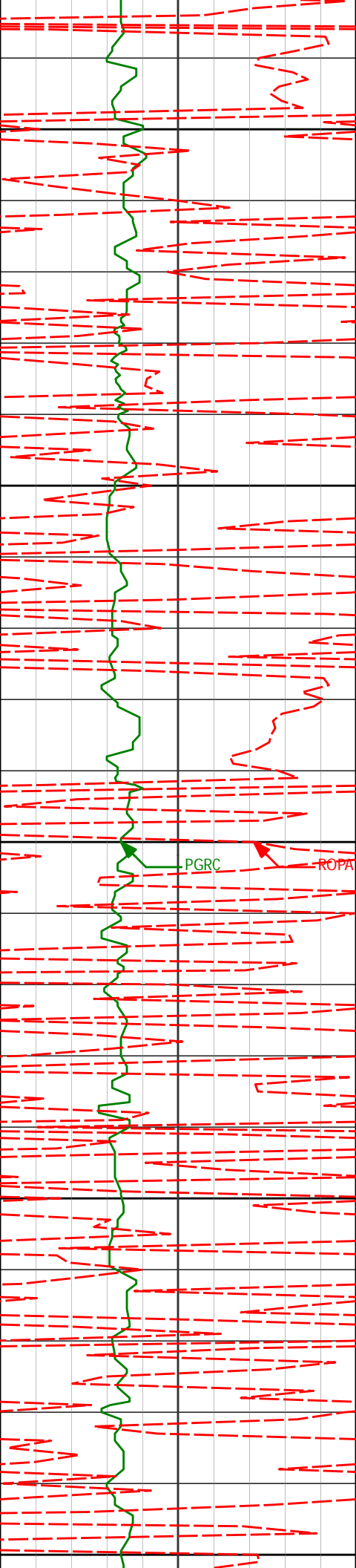
3837'

6.93°

28.70°

3780.11'

-557.21'



3900

3929'

7.77°

34.42°

3871.35'

-566.99'

3950

4000

PGRC

ROPA

4020'

10.08°

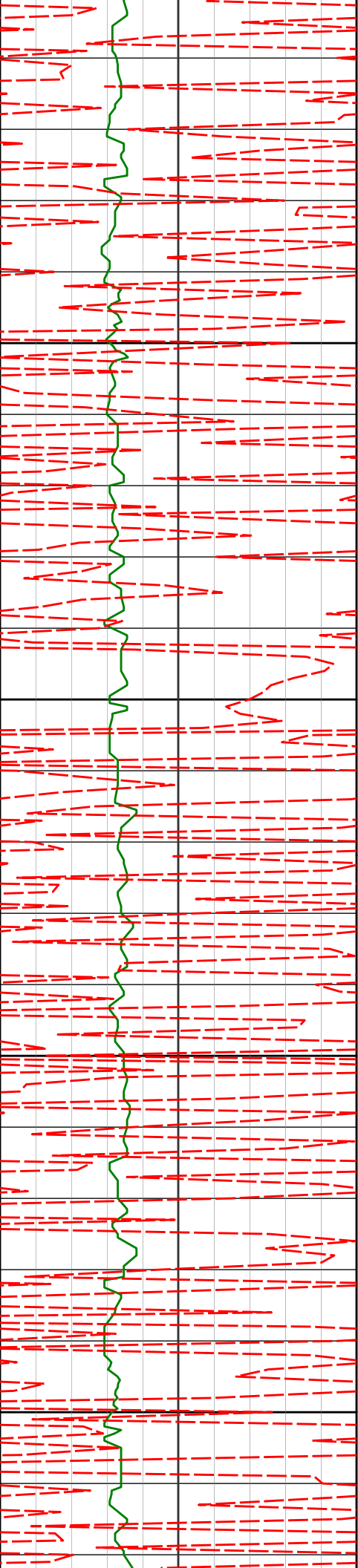
33.09°

3961.24'

-578.46'

4050

4100



4112'

9.13°

32.26°

4051.95'

-591.08'

4150

4200

4250

4294'

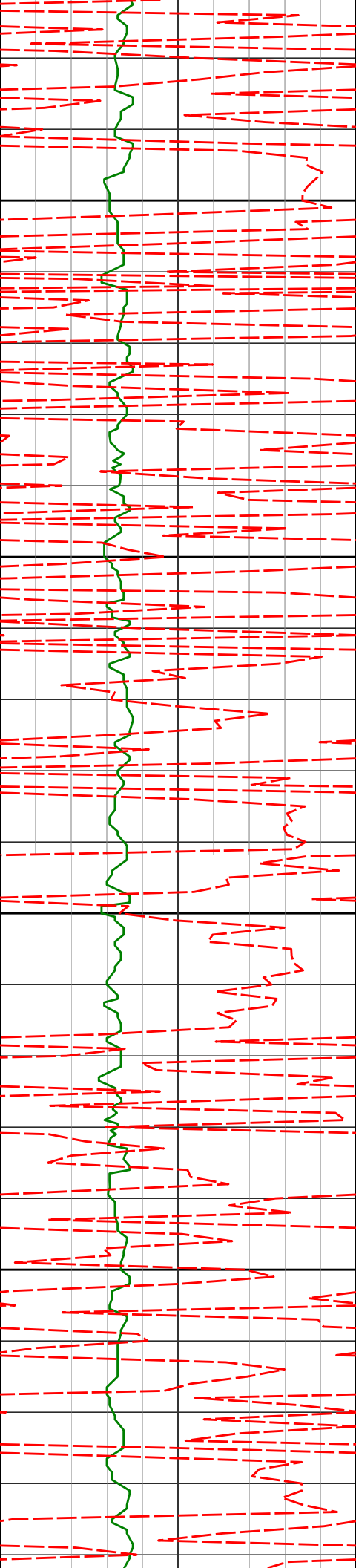
9.75°

33.67°

4231.49'

-615.53'

4300



4350

4385'

10.11°

32.07°

4321.12'

-628.41'

4400

4450

4478'

10.37°

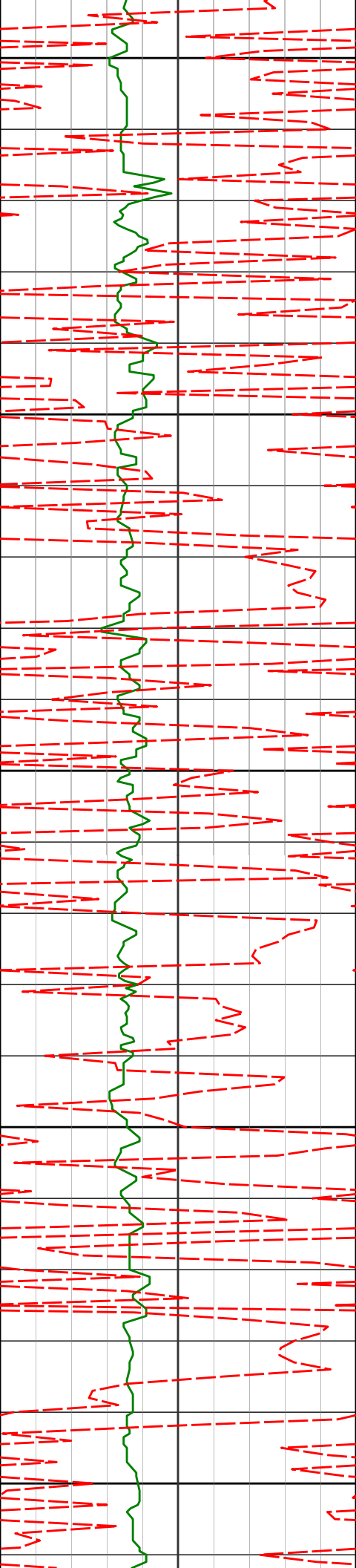
30.30°

4412.64'

-642.24'

4500





4550

4568'

10.01°

27.26°

4501.22'

-655.91'

4600

4650

4660'

8.86°

20.46°

4591.98'

-669.44'

4700

4750

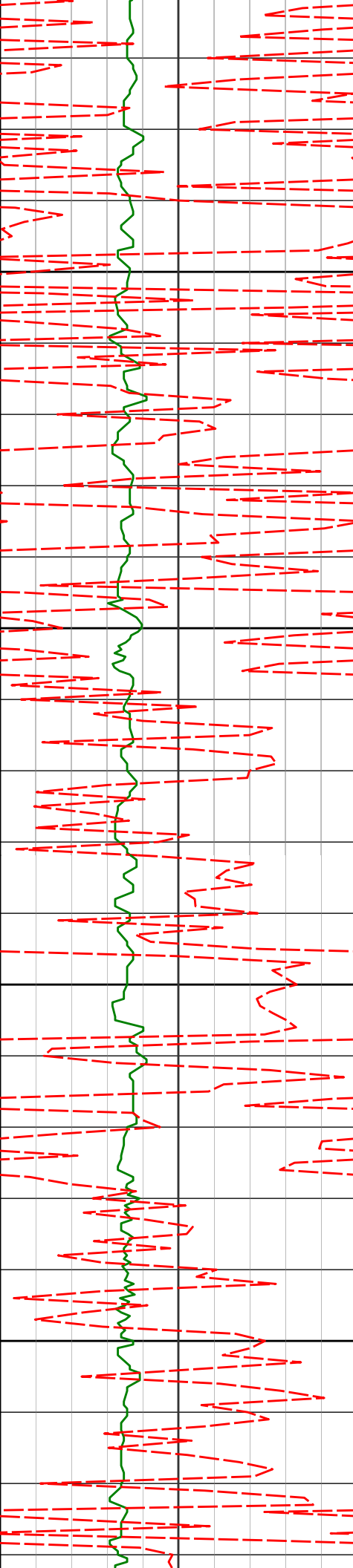
4752'

8.93°

16.94°

4682.87'

-682.74'



4800

4850

4900

4950

4844'

7.44°

14.67°

4773.93'

-695.20'

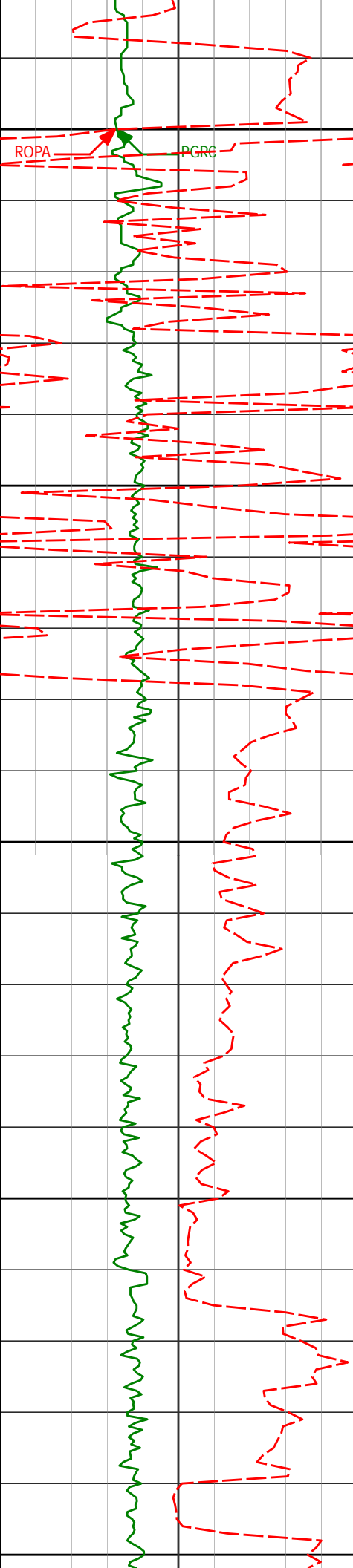
4935'

4.88°

18.10°

4864.40'

-704.48'



5000

ROPA

PGRC

5027'

2.08°

21.89°

4956.22'

-709.68'

5050

5058'

2.03°

22.49°

4987.20'

-710.70'

5089'

1.55°

114.61°

5018.19'

-711.01'

5100

KOP 5105' MD

5119'

5.96°

154.60°

5048.12'

-709.40'

5150

5150'

12.55°

168.52°

5078.71'

-704.59'

5181'

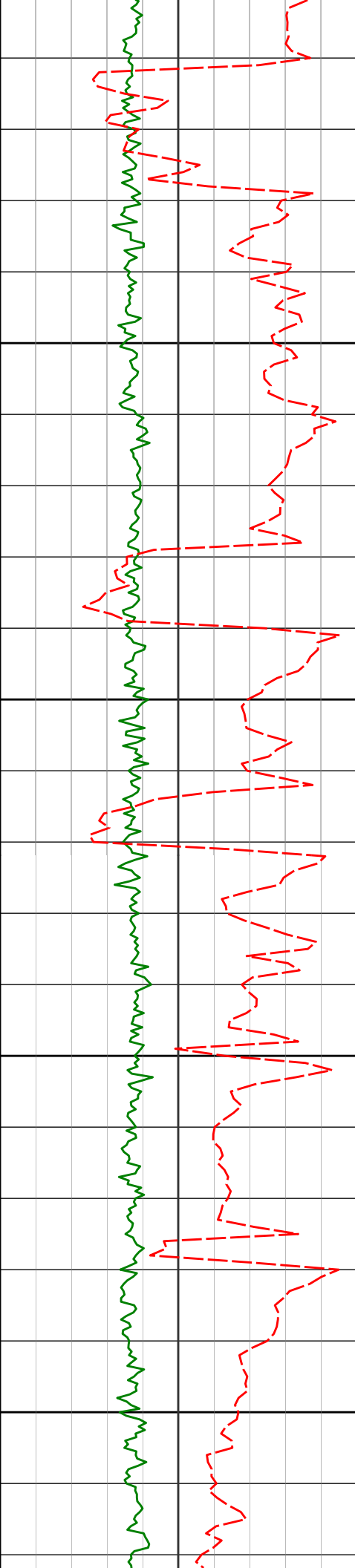
14.09°

168.75°

5108.87'

-697.55'

5200



5250

5300

5350

5400

5211'

14.35°

170.00°

5137.95'

-690.26'

5242'

13.94°

171.51°

5168.01'

-682.75'

5273'

15.90°

174.82°

5197.97'

-674.79'

5303'

17.21°

174.83°

5226.72'

-666.26'

5334'

18.70°

171.60°

5256.21'

-656.74'

5364'

21.78°

173.58°

5284.36'

-646.41'

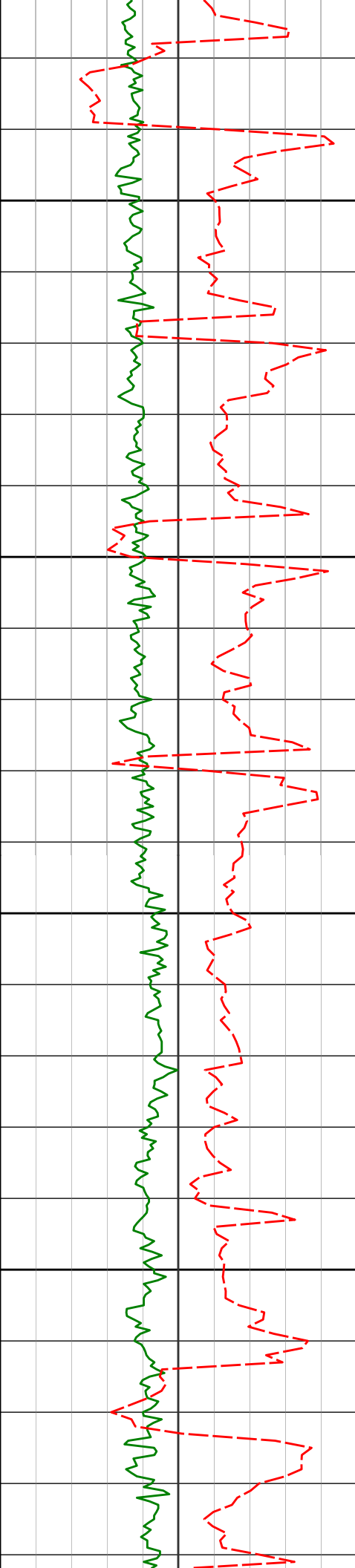
5394'

24.32°

177.99°

5311.96'

-634.68'



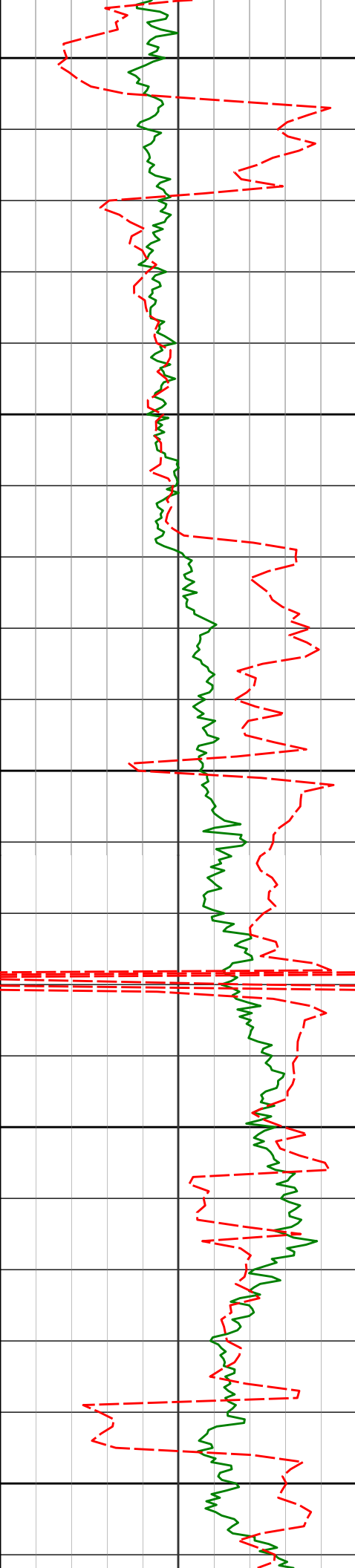
5450

5500

5550

5600

5425'	29.26°	182.82°	5339.63'	-620.74'
5456'	31.34°	184.84°	5366.39'	-605.18'
5486'	34.75°	186.34°	5391.54'	-588.97'
5517'	38.44°	185.29°	5416.42'	-570.67'
5548'	42.36°	186.23°	5440.03'	-550.76'
5578'	48.55°	186.73°	5461.06'	-529.63'
5610'	53.95°	183.60°	5481.09'	-504.88'



5650

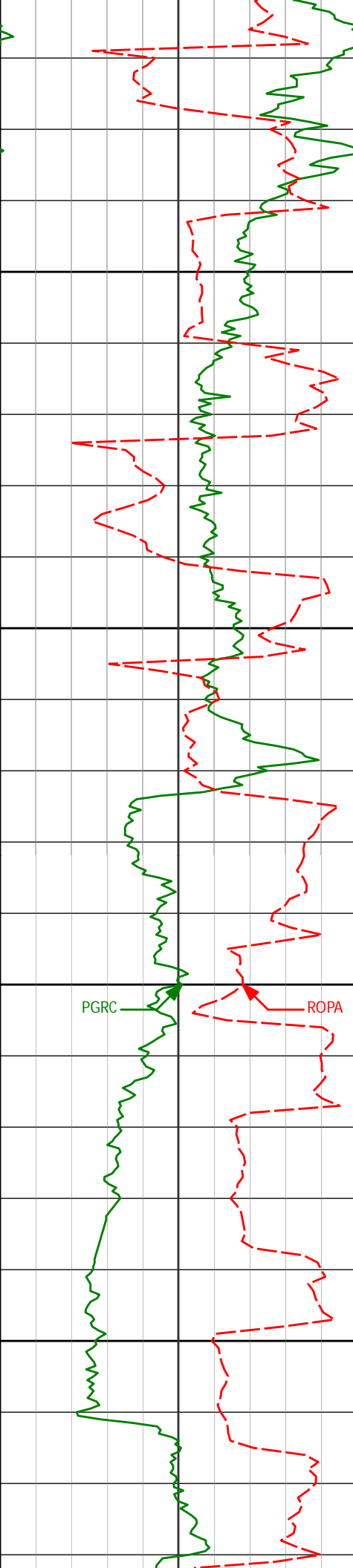
5700

5750

5800

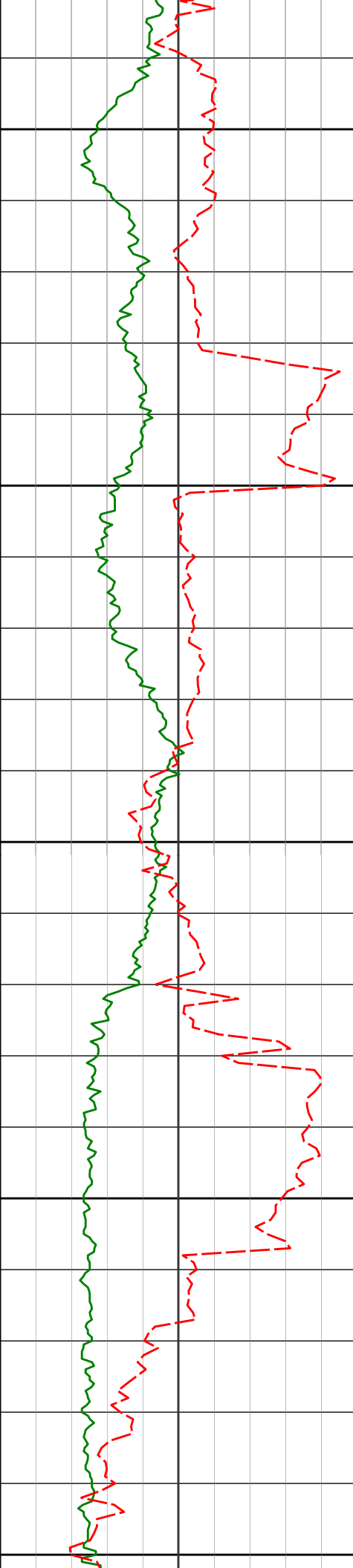
5850

5642'	56.52°	182.61°	5499.33'	-476.70'
5674'	56.89°	182.94°	5516.90'	-452.04'
5705'	56.78°	182.69°	5533.86'	-426.18'
5737'	59.59°	182.84°	5550.72'	-399.09'
5768'	62.48°	181.75°	5565.74'	-372.04'
5800'	65.79°	181.36°	5579.69'	-343.31'
5832'	69.46°	183.09°	5591.87'	-313.81'



	5863'	73.53°	182.39°	5601.71'	-284.52'
	5895'	76.59°	180.92°	5609.96'	-253.66'
5900					
	5926'	77.35°	180.11°	5616.95'	-223.49'
5950					
	5958'	78.78°	179.54°	5623.57'	-192.20'
	5989'	82.37°	178.94°	5628.64'	-161.63'
6000					
	6033'	85.03°	178.98°	5633.47'	-117.91'
6050					

Casing at 6069' MD



Run 300

6100

6150

6200

6250

6300

6089'

86.33°

177.50°

5637.69'

-62.07'

6183'

88.18°

177.04°

5642.19'

31.81'

6278'

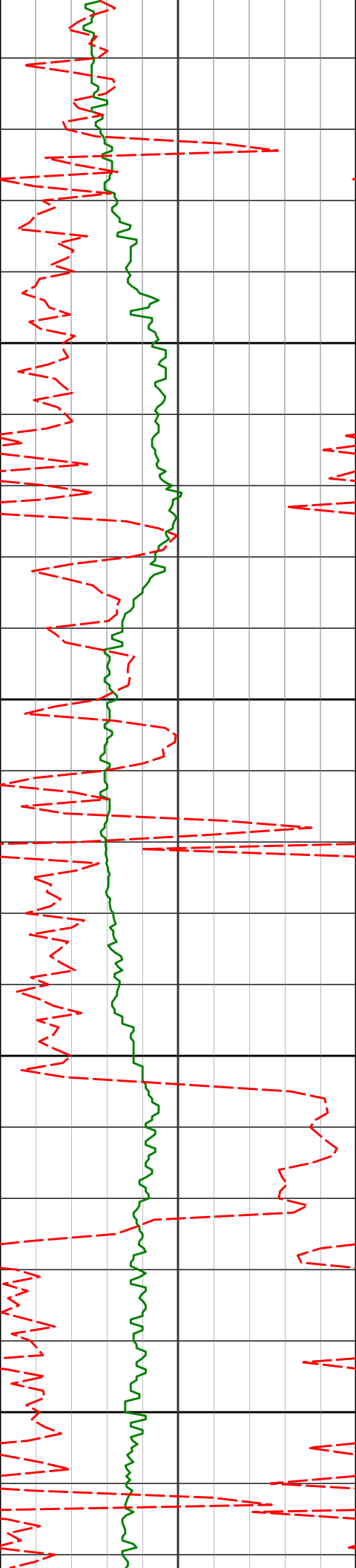
90.43°

180.15°

5643.34'

126.78'





6350

6373'

91.60°

179.79°

5641.66'

221.71'

6400

6450

6467'

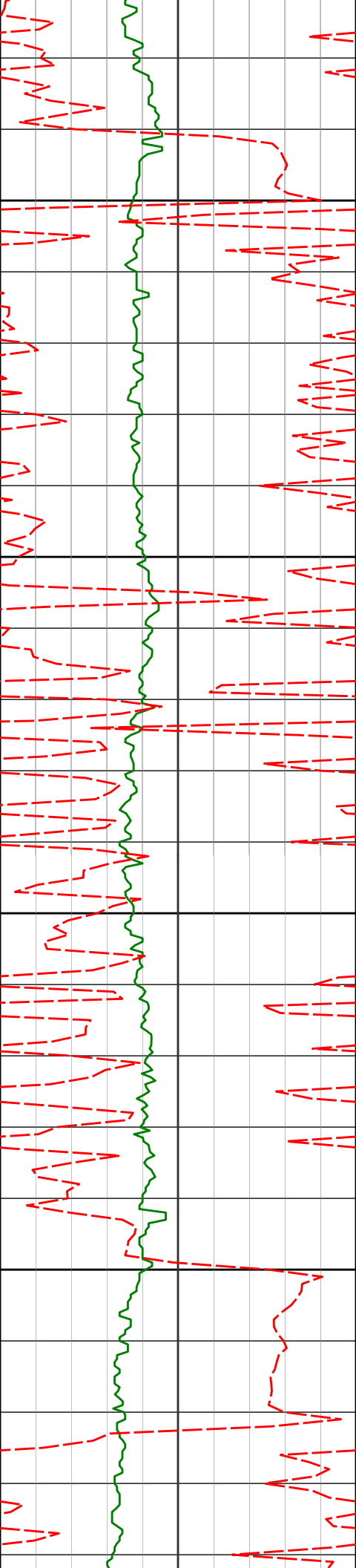
92.00°

181.07°

5638.71'

315.57'

6500



6550

6562'

90.25°

179.13°

5636.84'

410.48'

6600

6650

6656'

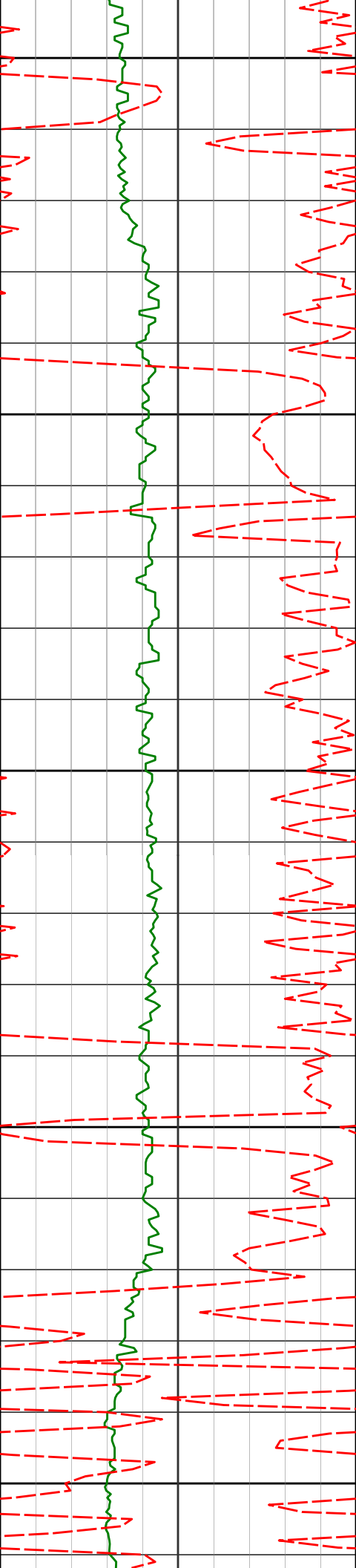
89.35°

177.21°

5637.17'

504.48'

6700



6750

6751'

90.00°

179.64°

5637.71'

599.47'

6800

6850

6846'

89.04°

178.59°

5638.51'

694.44'

6900

6950

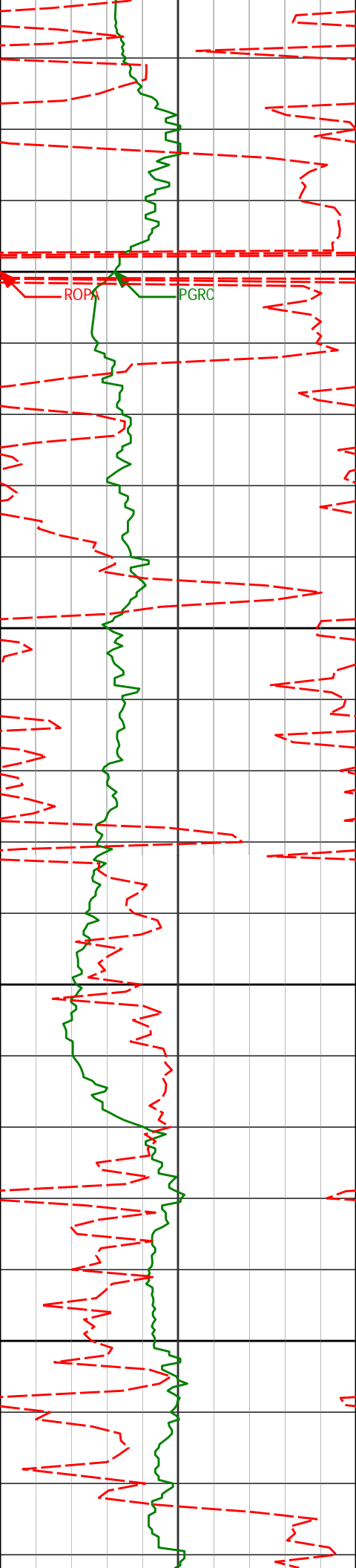
6940'

88.89°

182.36°

5640.20'

788.32'



7000

7035'

86.79°

181.32°

5643.78'

883.04'

7050

7100

7129'

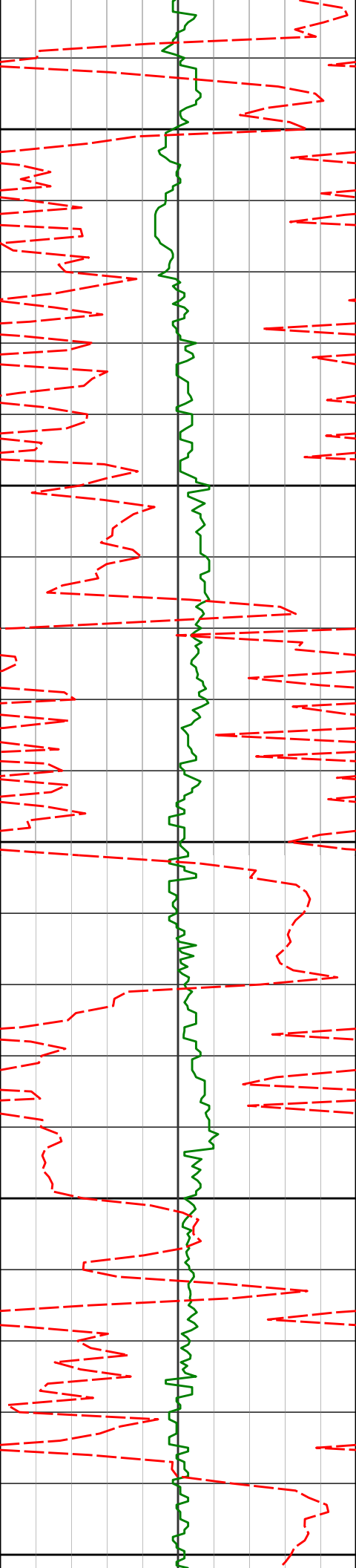
86.33°

180.14°

5649.42'

976.76'

7150



7200

7224'

87.41°

180.14°

5654.61'

1071.55'

7250

7300

7318'

88.89°

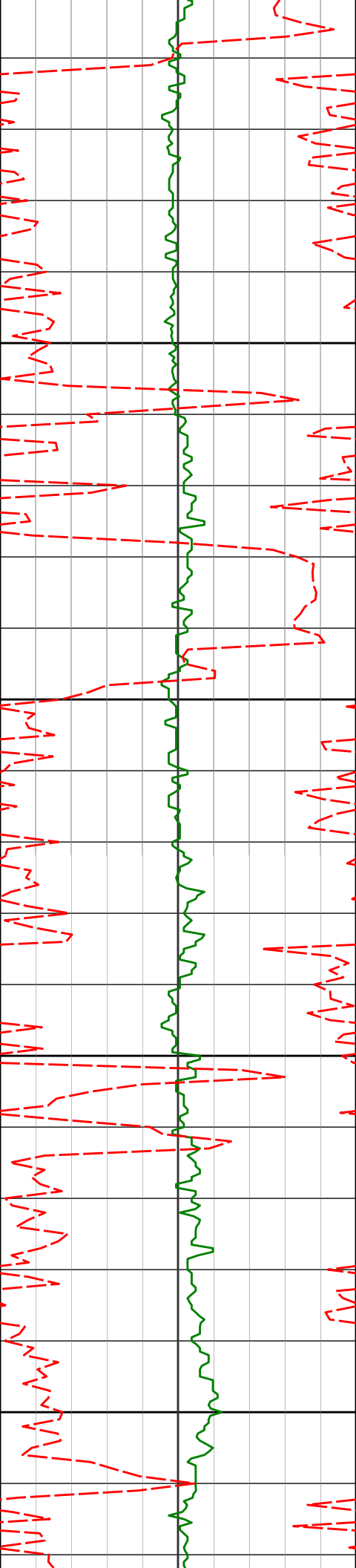
178.98°

5657.65'

1165.46'

7350

7400



7413'

89.32°

178.98°

5659.13'

1260.43'

7450

7500

7508'

91.51°

179.53°

5658.44'

1355.40'

7550

7600

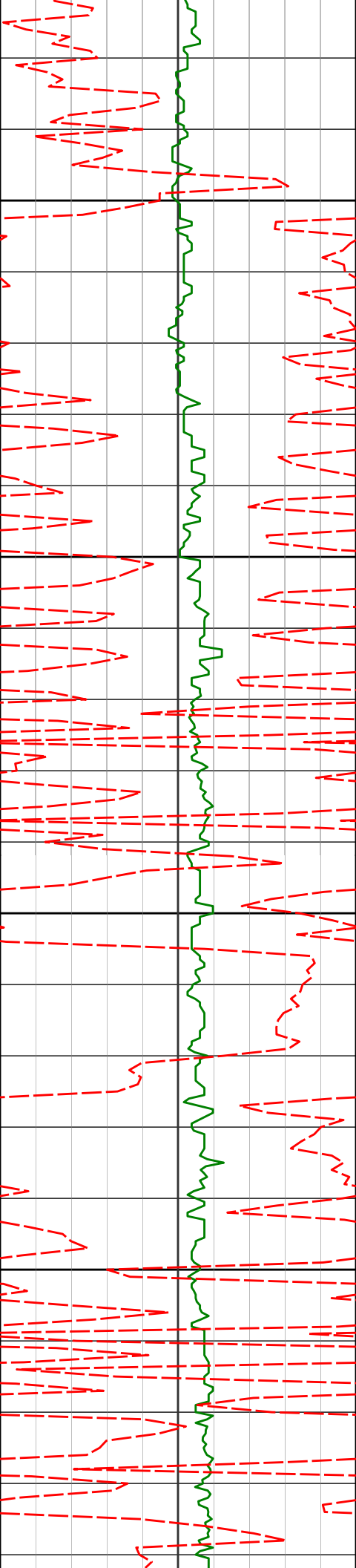
7602'

91.29°

179.14°

5656.15'

1449.35'



7650

7697'

91.48°

178.56°

5653.85'

1544.31'

7700

7750

7791'

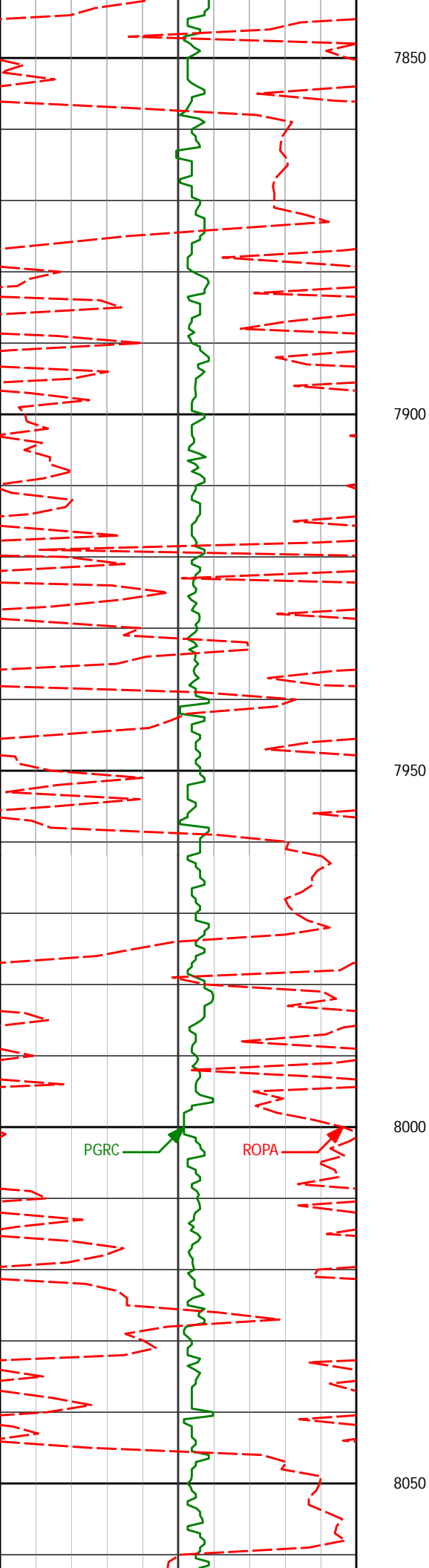
88.95°

178.01°

5653.50'

1638.30'

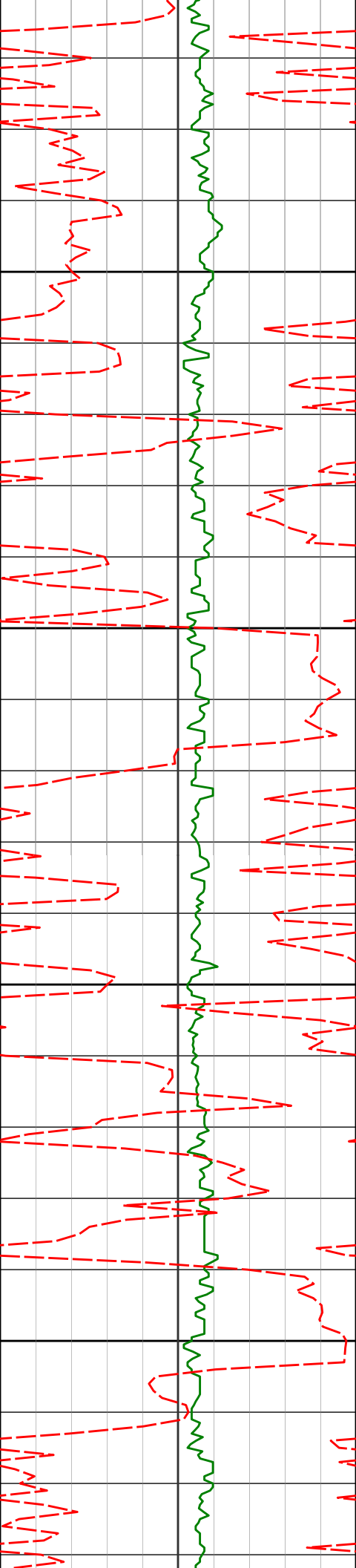
7800



7886'	89.85°	178.99°	5654.49'	1733.29'
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7981'	89.69°	178.88°	5654.87'	1828.28'
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8076'

90.09°

179.49°

5655.06'

1923.26'

8100

8150

8168'

89.88°

180.55°

5655.08'

2015.20'

8200

8250

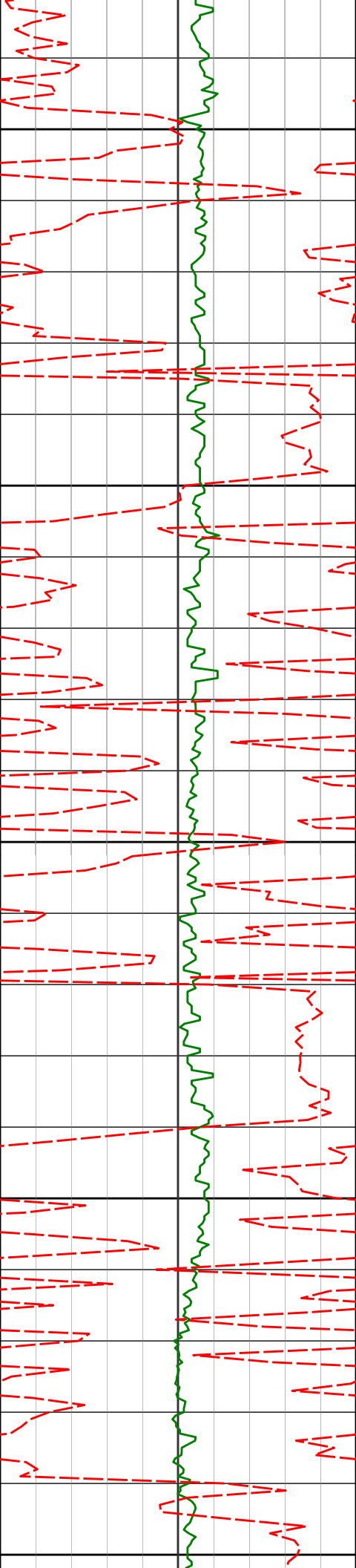
8263'

90.65°

179.75°

5654.64'

2110.13'



8300

8350

8400

8450

8500

8354'

90.31°

178.38°

5653.88'

2201.11'

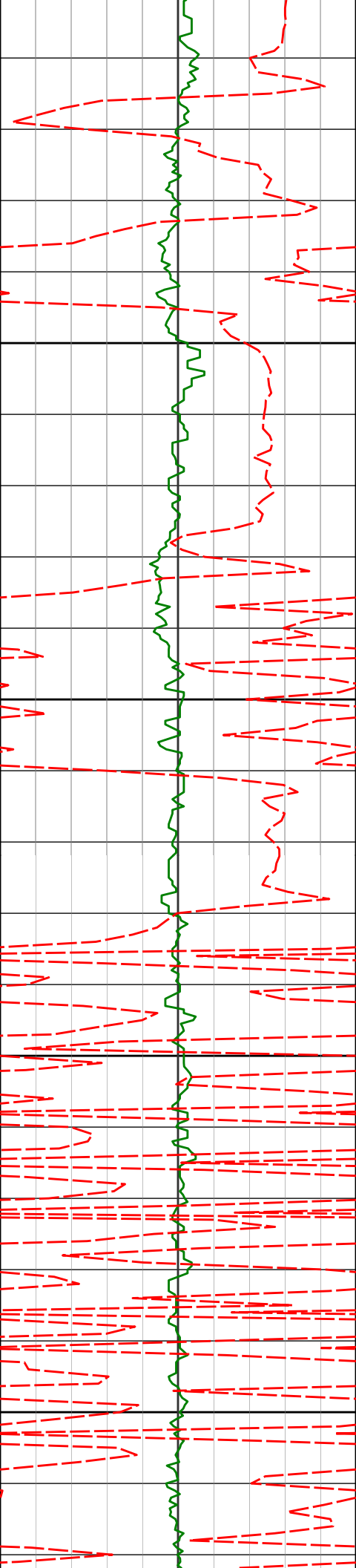
8446'

90.80°

179.19°

5652.99'

2293.09'



8537'

91.91°

180.90°

5650.83'

2384.00'

8550

8600

8628'

89.66°

181.96°

5649.59'

2474.83'

8650

8700

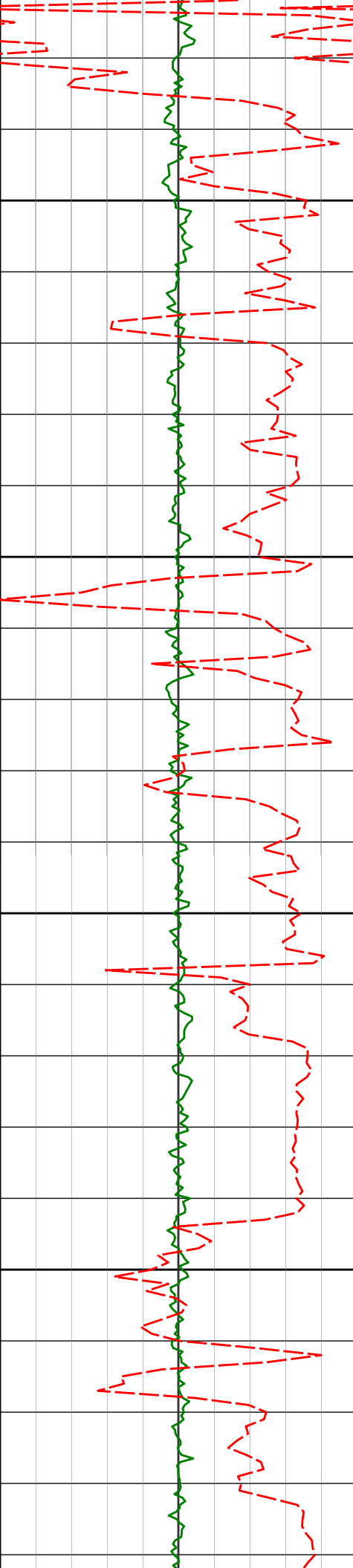
8719'

90.09°

182.29°

5649.79'

2565.59'



8750

8800

8850

8900

8810'

89.85°

178.95°

5649.83'

2656.48'

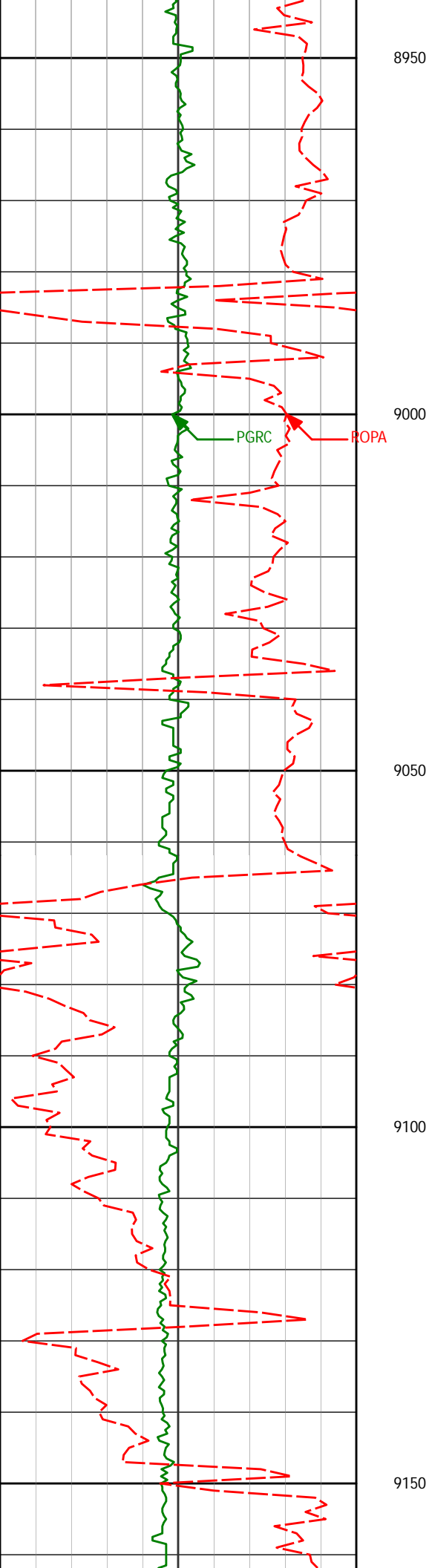
8901'

90.31°

175.38°

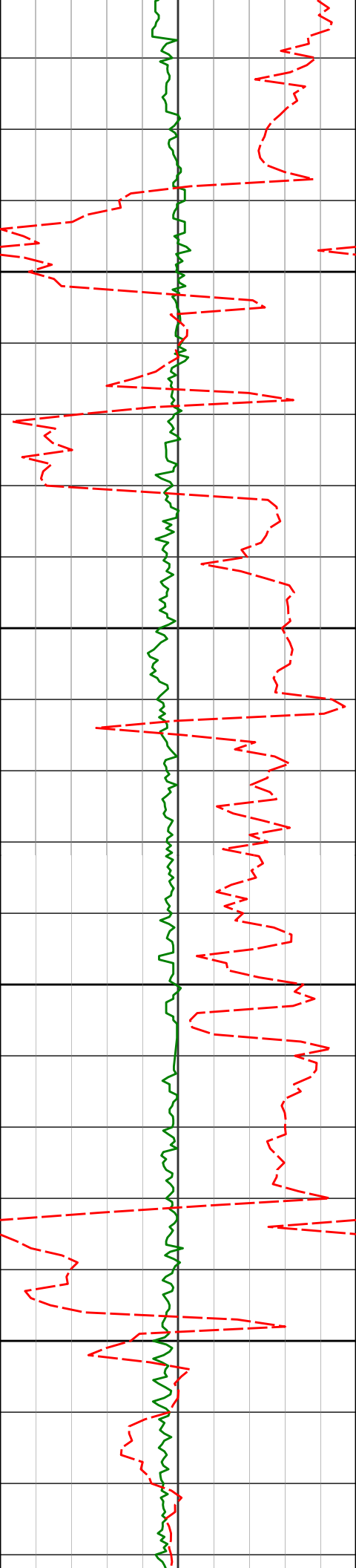
5649.71'

2747.46'



8992'	90.15°	178.27°	5649.34'	2838.43'
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9083'	89.82°	178.97°	5649.37'	2929.42'
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9175'

90.74°

181.08°

5648.92'

3021.36'

9200

9250

9266'

90.40°

179.93°

5648.01'

3112.26'

9300

9350

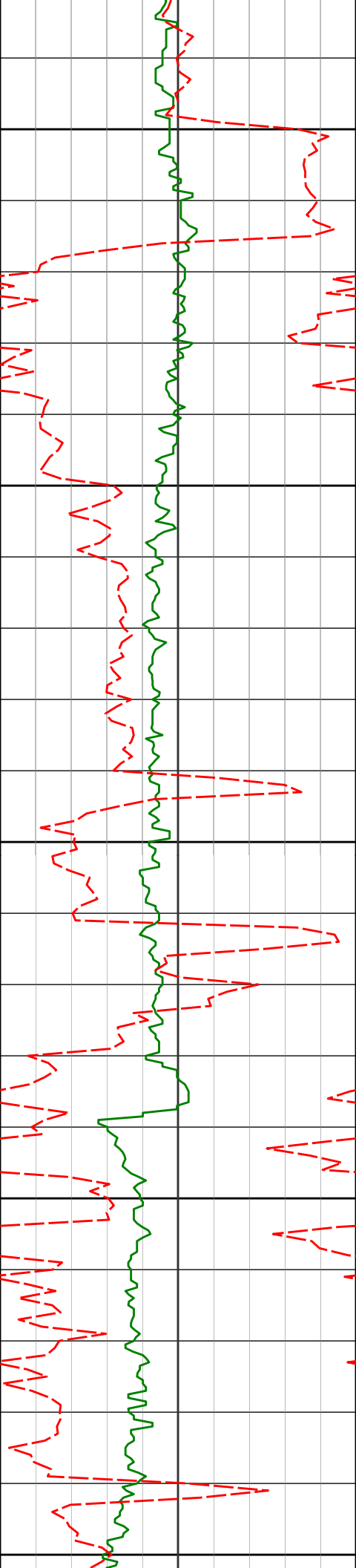
9358'

89.66°

181.28°

5647.96'

3204.17'



9400

9450

9500

9550

9600

9450'

91.42°

181.97°

5647.10'

3295.97'

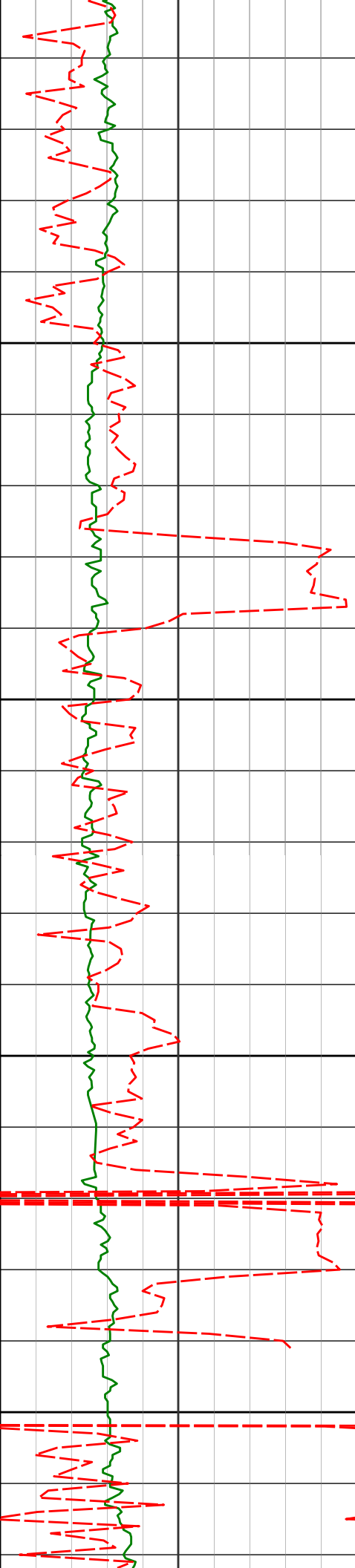
9541'

90.99°

181.29°

5645.18'

3386.77'



9632'

91.36°

181.24°

5643.32'

3477.60'

9650

9700

9722'

89.12°

181.08°

5042.41'

3507.40'

9750

9800

9813'

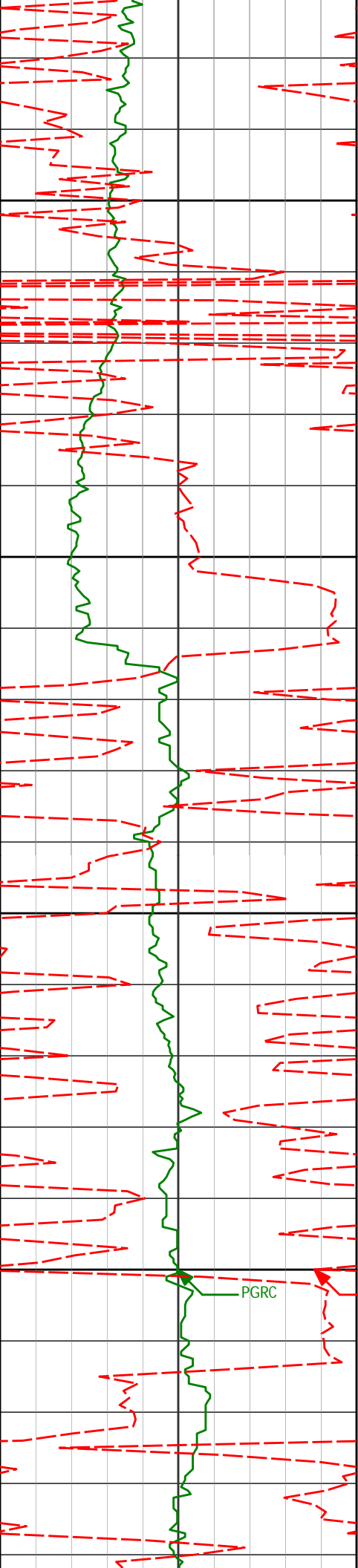
87.84°

179.84°

5644.41'

3658.35'





9850

9900

9950

10000

9905'

9997'

88.00°

87.75°

179.61°

178.11°

5647.74'

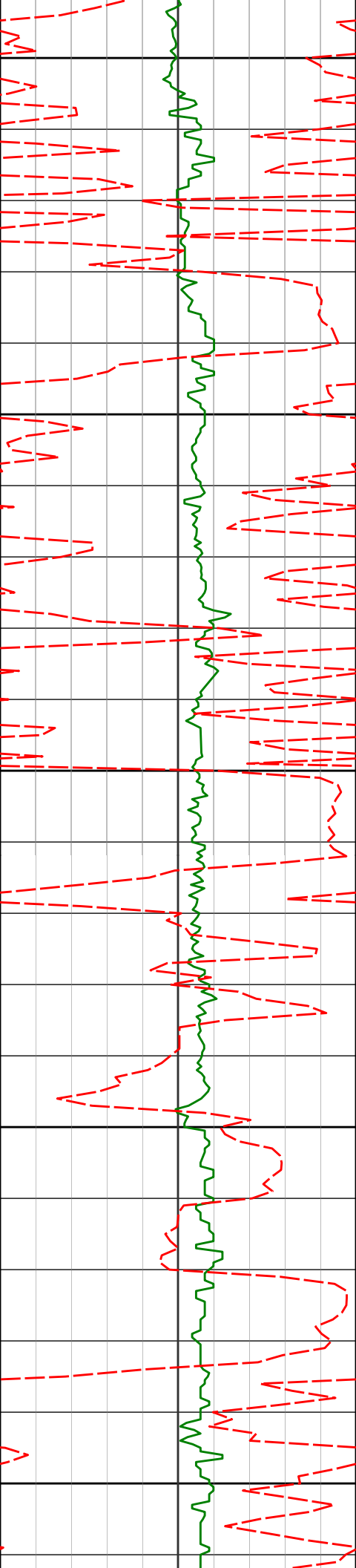
5651.16'

3750.25'

3842.17'

PGRC

ROPA



10050

10088'

89.63°

179.79°

5653.24'

3933.13'

10100

10150

10180'

90.71°

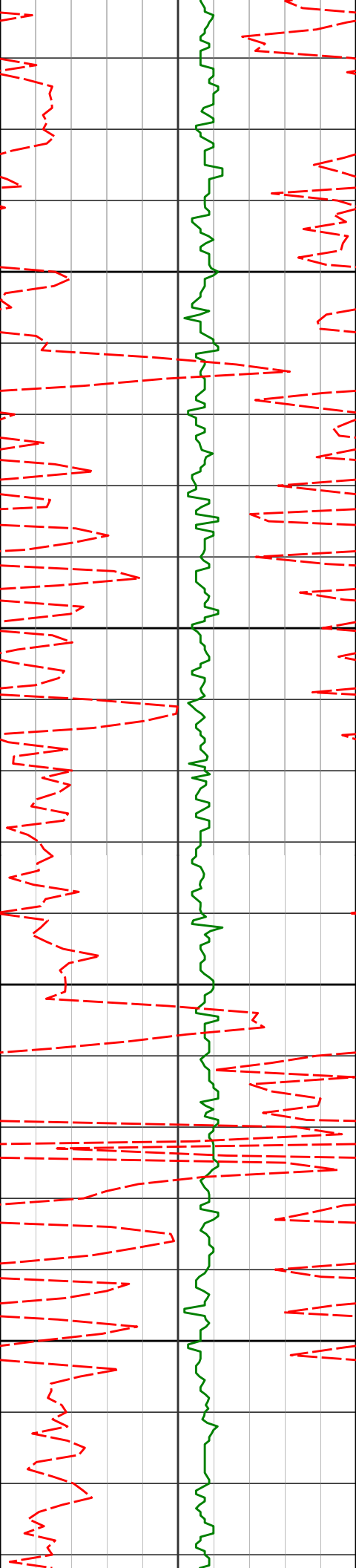
179.82°

5652.96'

4025.08'

10200

10250



10271'

90.18°

179.85°

5652.26'

4116.03'

10300

10350

10363'

89.97°

179.77°

5652.14'

4207.98'

10400

10450

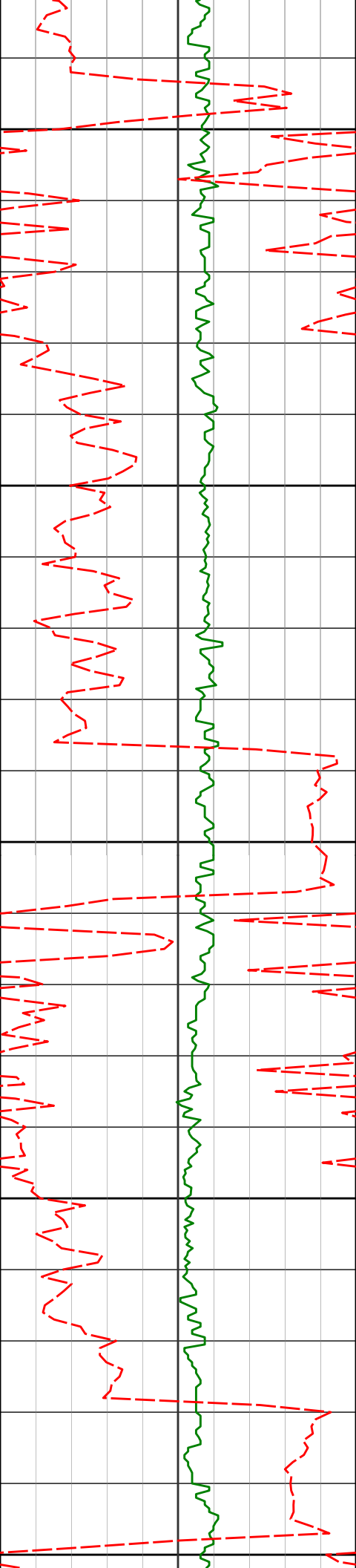
10454'

90.09°

180.25°

5652.09'

4298.93'



10500

10550

10600

10650

10700

10546'

89.17°

179.49°

5652.68'

4390.87'

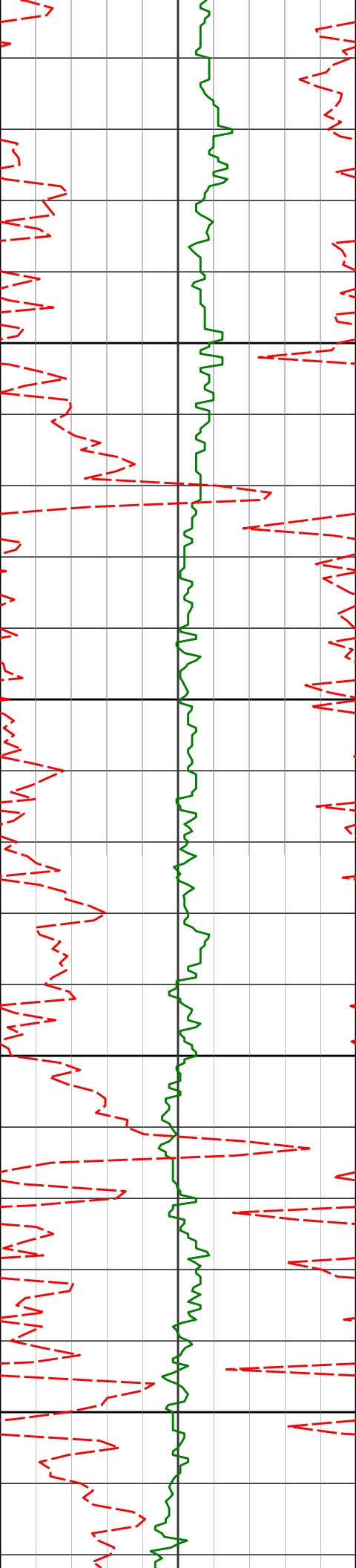
10637'

89.14°

180.16°

5654.03'

4481.82'



10729'

91.39°

181.69°

5653.60'

4573.69'

10750

10800

10820'

91.14°

181.58°

5651.59'

4664.48'

10850

10900

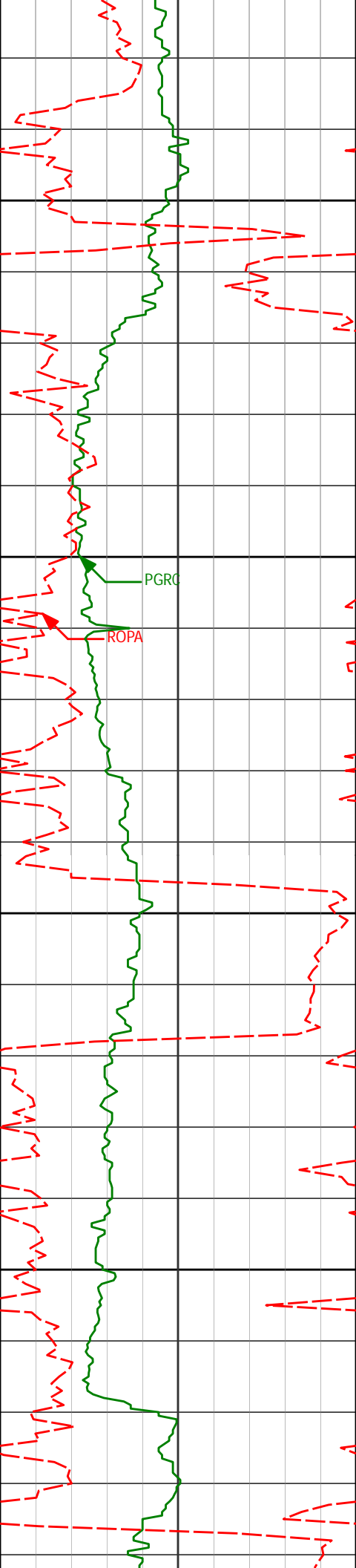
10911'

90.98°

180.88°

5649.91'

4755.32'



10950

11000

11050

11100

PGRC

ROPA

11003'

91.05°

179.58°

5648.28'

4847.24'

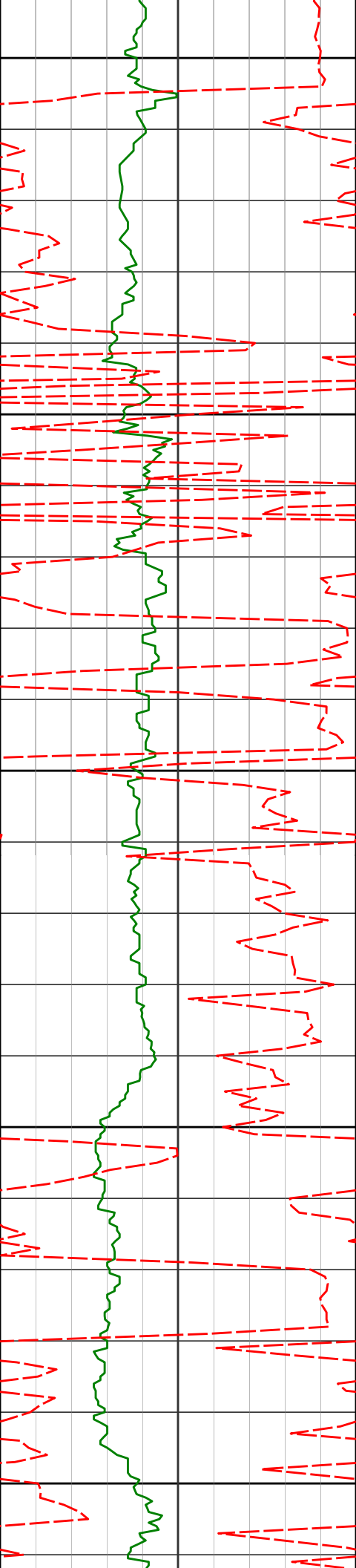
11095'

91.32°

181.38°

5646.38'

4939.13'



11150

11186'

89.94°

181.65°

5645.37'

5029.95'

11200

11250

11277'

89.04°

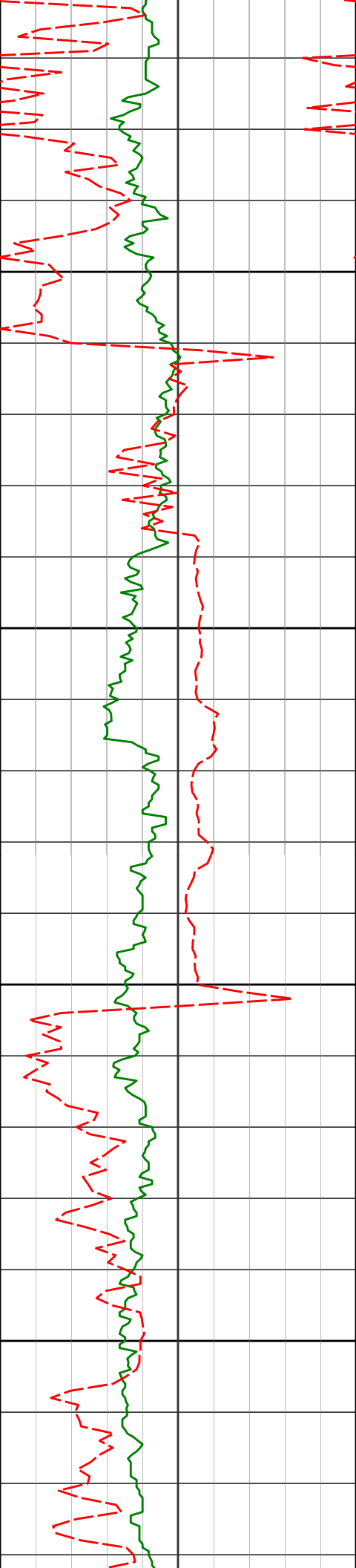
181.64°

5646.18'

5120.76'

11300

11350



11370'

87.75°

182.25°

5648.79'

5213.50'

11400

11450

11460'

87.81°

181.75°

5652.28'

5303.21'

11500

11550

11557'

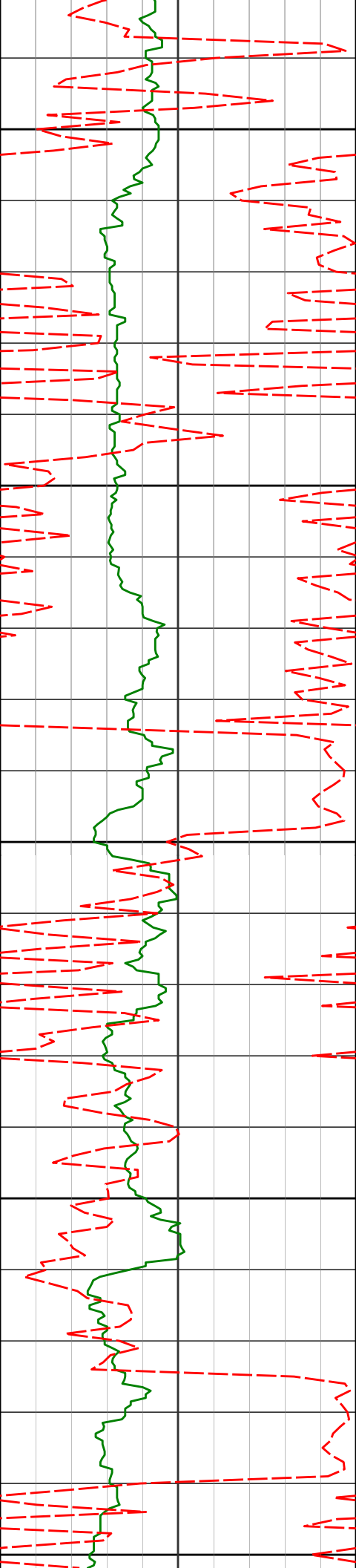
88.43°

181.57°

5655.46'

5399.96'





11600

11650

11700

11750

11800

11644'

88.80°

181.43°

5657.56'

5486.77'

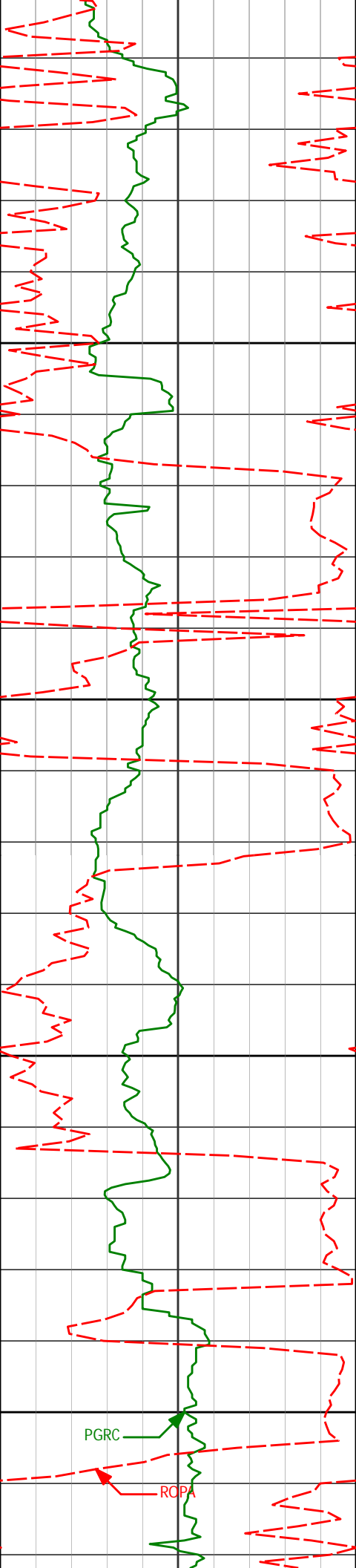
11736'

91.48°

180.85°

5657.34'

5578.63'



11828'	92.25°	180.81°	5654.34'	5670.47'
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11850

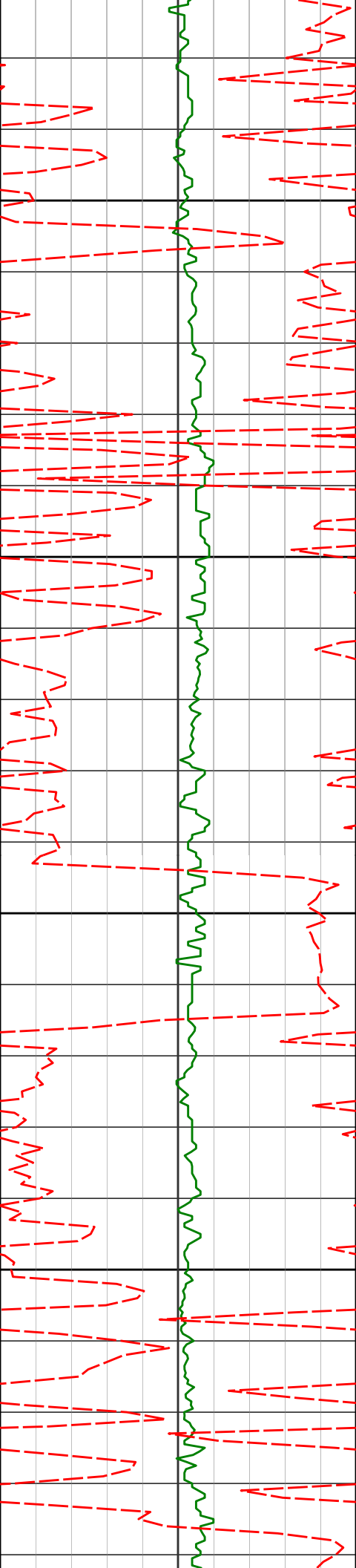
11900

11919'	91.05°	180.12°	5651.72'	5761.34'
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11950

12000

12012'	87.90°	178.90°	5652.57'	5854.29'
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12050

12100

12150

12200

12103'

87.81°

177.28°

5655.98'

5945.22'

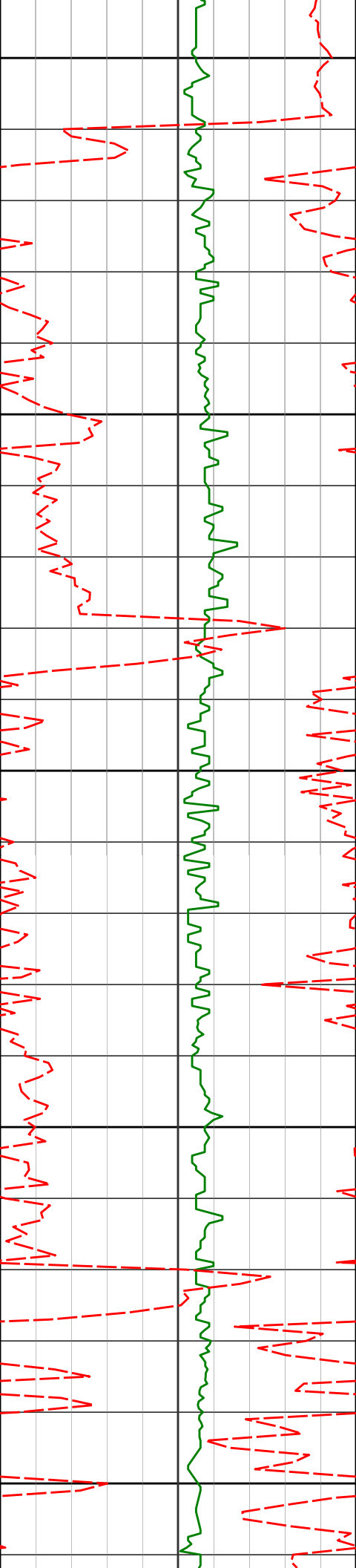
12195'

88.86°

177.38°

5658.65'

6037.18'



12250

12286'

89.42°

178.49°

5660.02'

6128.17'

12300

12350

12379'

88.77°

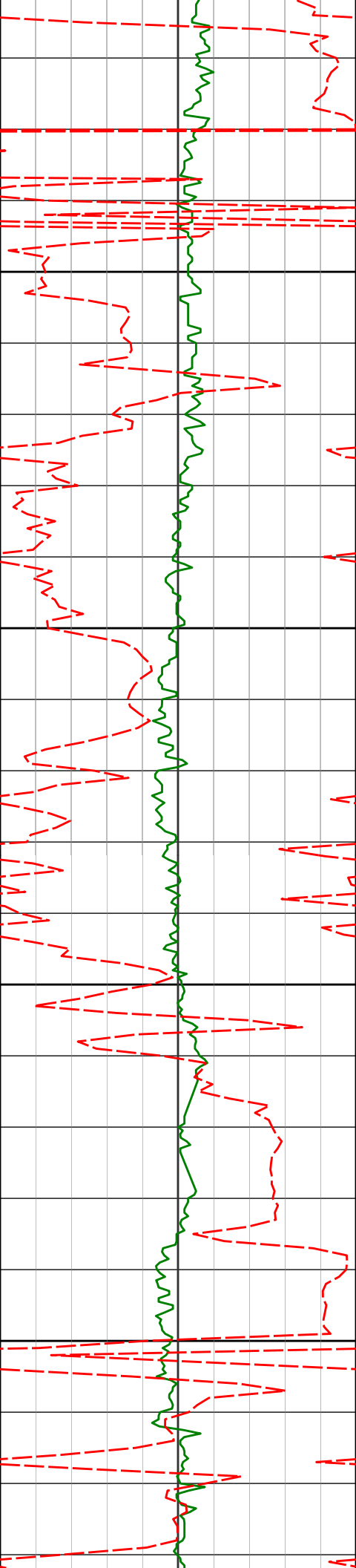
178.49°

5661.49'

6221.15'

12400

12450



12471'

89.63°

179.08°

5662.77'

6313.13'

12500

12550

12563'

89.75°

180.21°

5663.27'

6405.09'

12600

12650

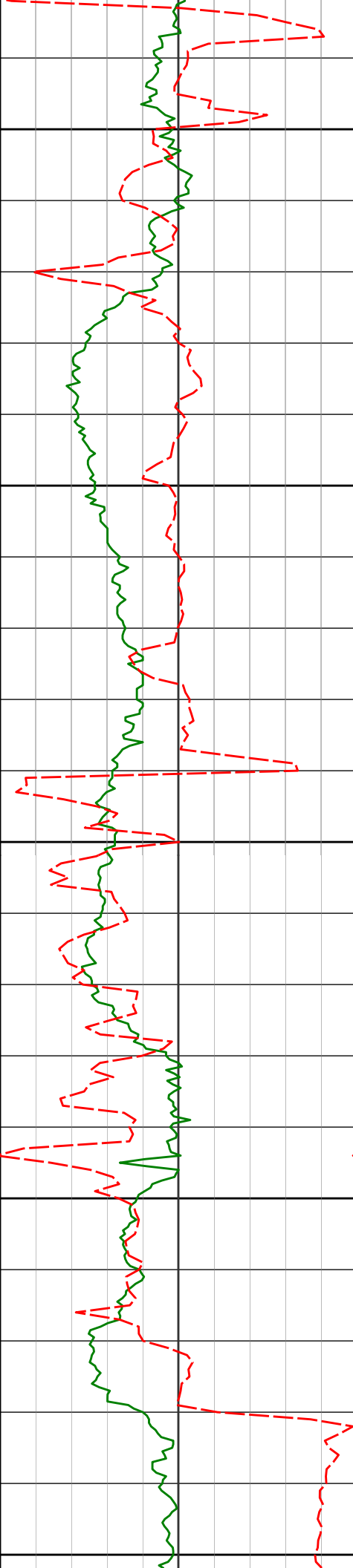
12654'

90.92°

180.35°

5662.74'

6496.02'



12700

12750

12800

12850

12900

12746'

91.94°

179.81°

5660.44'

6587.92'

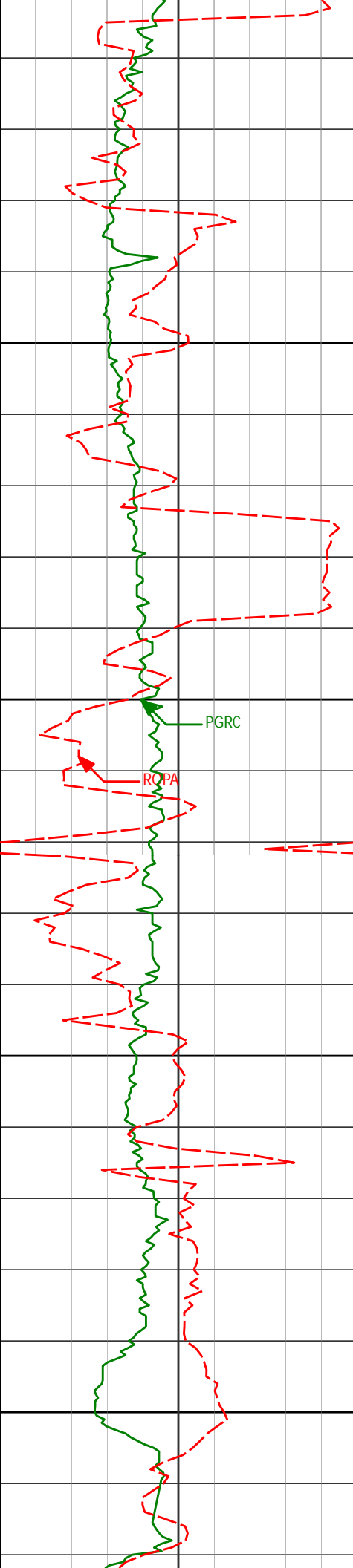
12838'

93.27°

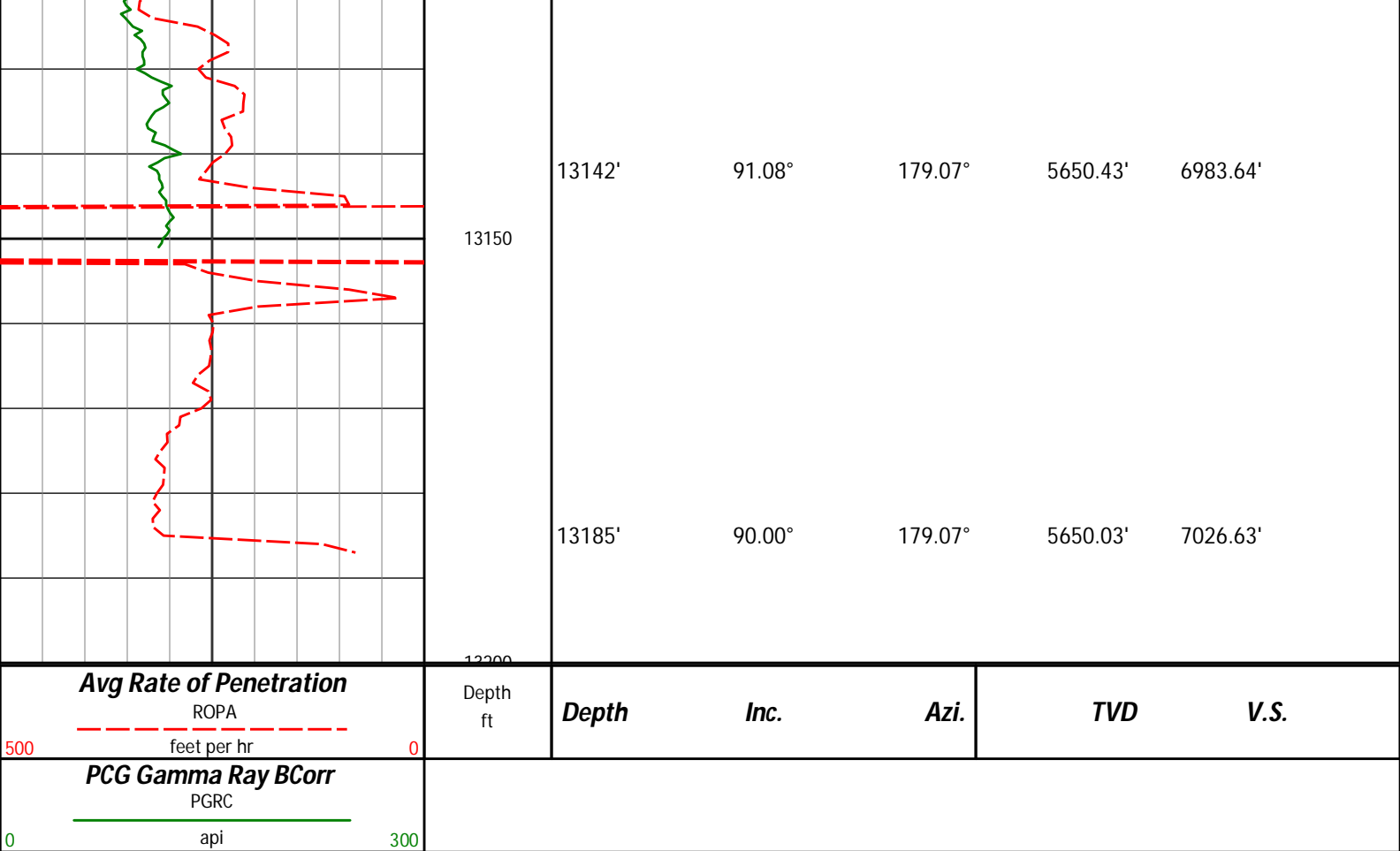
179.56°

5656.26'

6679.79'



12929'	90.80°	178.21°	5653.03'	6770.71'
12950				
13000				
13020'	90.31°	179.76°	5652.15'	6861.69'
13050				
13100				
13112'	91.11°	179.31°	5651.01'	6953.65'



## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Whiting Oil and Gas  
Razor 27-J-3411 A  
Redtail  
Weld Colorado  
USA  
CA-XX-0901620723  
Surveys are Sag, IFR and MS corrected.

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
176.00	0.46	275.88	176.00	0.07 N	0.70 W	-0.10	0.26
267.00	1.26	276.89	266.99	0.23 N	2.06 W	-0.30	0.88
358.00	1.65	275.43	357.96	0.47 N	4.36 W	-0.63	0.43
450.00	0.55	299.53	449.94	0.82 N	6.06 W	-1.03	1.27
543.00	1.46	13.24	542.93	2.19 N	6.18 W	-2.40	1.51
634.00	4.01	20.49	633.82	6.30 N	4.80 W	-6.46	2.82
726.00	6.27	21.13	725.44	14.00 N	1.86 W	-14.06	2.46
818.00	7.85	22.08	816.74	24.51 N	2.31 E	-24.41	1.72
910.00	9.25	14.79	907.72	37.48 N	6.56 E	-37.23	1.92
1002.00	9.66	15.14	998.47	52.08 N	10.47 E	-51.68	0.45
1093.00	10.66	13.80	1088.04	67.63 N	14.47 E	-67.08	1.13
1185.00	11.85	12.87	1178.27	85.10 N	18.60 E	-84.40	1.31
1277.00	13.08	14.51	1268.10	104.39 N	23.31 E	-103.51	1.39
1461.00	15.07	17.19	1446.57	147.40 N	35.60 E	-146.07	1.14
1531.00	16.25	17.47	1513.97	165.44 N	41.23 E	-163.90	1.69
1641.00	16.63	16.78	1619.47	195.19 N	50.40 E	-193.31	0.39
1732.00	14.65	13.06	1707.10	218.87 N	56.76 E	-216.75	2.44
1824.00	13.17	10.66	1796.40	240.50 N	61.32 E	-238.21	1.73
1915.00	12.00	10.65	1885.21	259.99 N	64.99 E	-257.56	1.29
2007.00	10.99	9.94	1975.37	278.02 N	68.27 E	-275.47	1.11



2190.00	10.21	6.28	2155.24	311.33 N	73.06 E	-308.59	0.56
2373.00	8.89	2.27	2335.71	341.58 N	75.39 E	-338.74	0.81
2465.00	10.49	19.12	2426.41	356.60 N	78.42 E	-353.65	3.52
2647.00	11.58	16.85	2605.04	389.74 N	89.14 E	-386.39	0.64
2739.00	11.42	17.49	2695.19	407.26 N	94.55 E	-403.71	0.22
2830.00	10.83	17.64	2784.48	424.00 N	99.85 E	-420.26	0.65
2921.00	9.66	17.10	2874.03	439.45 N	104.69 E	-435.53	1.29
3013.00	9.48	12.09	2964.75	454.23 N	108.54 E	-450.17	0.93
3105.00	8.45	14.01	3055.63	468.20 N	111.77 E	-464.01	1.17
3196.00	7.76	13.81	3145.72	480.65 N	114.85 E	-476.35	0.76
3288.00	8.56	21.75	3236.79	493.05 N	118.87 E	-488.60	1.50
3471.00	8.77	29.46	3417.71	517.84 N	130.78 E	-512.96	0.64
3655.00	8.32	27.95	3599.66	541.82 N	143.92 E	-536.46	0.27
3746.00	7.36	25.69	3689.81	552.89 N	149.53 E	-547.33	1.11
3837.00	6.93	28.70	3780.11	562.95 N	154.70 E	-557.21	0.63
3929.00	7.77	34.42	3871.35	572.95 N	160.88 E	-566.99	1.21
4020.00	10.08	33.09	3961.24	584.70 N	168.70 E	-578.46	2.55
4112.00	9.13	32.26	4051.95	597.62 N	176.99 E	-591.08	1.04
4294.00	9.75	33.67	4231.49	622.65 N	193.25 E	-615.53	0.36
4385.00	10.11	32.07	4321.12	635.84 N	201.76 E	-628.41	0.50
4478.00	10.37	30.30	4412.64	649.98 N	210.31 E	-642.24	0.44
4568.00	10.01	27.26	4501.22	663.93 N	217.98 E	-655.91	0.72
4660.00	8.86	20.46	4591.98	677.67 N	224.12 E	-669.44	1.74
4752.00	8.93	16.94	4682.87	691.14 N	228.68 E	-682.74	0.60
4844.00	7.44	14.67	4773.93	703.74 N	232.27 E	-695.20	1.66
4935.00	4.88	18.10	4864.40	713.12 N	234.96 E	-704.48	2.84
5027.00	2.08	21.89	4956.22	718.39 N	236.80 E	-709.68	3.05
5058.00	2.03	22.49	4987.20	719.41 N	237.22 E	-710.70	0.18
5089.00	1.55	114.61	5018.19	719.75 N	237.81 E	-711.01	8.38
5119.00	5.96	154.60	5048.12	718.17 N	238.85 E	-709.40	16.25
5150.00	12.55	168.52	5078.71	713.41 N	240.21 E	-704.59	22.30
5181.00	14.09	168.75	5108.87	706.41 N	241.62 E	-697.55	4.97
5211.00	14.35	170.00	5137.95	699.17 N	242.98 E	-690.26	1.34
5242.00	13.94	171.51	5168.01	691.69 N	244.20 E	-682.75	1.78
5273.00	15.90	174.82	5197.97	683.77 N	245.13 E	-674.79	6.89
5303.00	17.21	174.83	5226.72	675.25 N	245.90 E	-666.26	4.37
5334.00	18.70	171.60	5256.21	665.77 N	247.04 E	-656.74	5.78
5364.00	21.78	173.58	5284.36	655.48 N	248.37 E	-646.41	10.52
5394.00	24.32	177.99	5311.96	643.77 N	249.21 E	-634.68	10.23
5425.00	29.26	182.82	5339.63	629.81 N	249.06 E	-620.74	17.40
5456.00	31.34	184.84	5366.39	614.21 N	248.00 E	-605.18	7.47
5486.00	34.75	186.34	5391.54	597.94 N	246.40 E	-588.97	11.69
5517.00	38.44	185.29	5416.42	579.55 N	244.54 E	-570.67	12.07
5548.00	42.36	186.23	5440.03	559.57 N	242.51 E	-550.76	12.80
5578.00	48.55	186.73	5461.06	538.33 N	240.10 E	-529.63	20.67
5610.00	53.95	183.60	5481.09	513.49 N	237.88 E	-504.88	18.52
5642.00	56.52	182.61	5499.33	487.24 N	236.46 E	-478.70	8.42
5674.00	56.89	182.94	5516.90	460.53 N	235.16 E	-452.04	1.44
5705.00	56.78	182.69	5533.86	434.61 N	233.89 E	-426.18	0.76
5737.00	59.59	182.84	5550.72	407.45 N	232.58 E	-399.09	8.79
5768.00	62.48	181.75	5565.74	380.35 N	231.49 E	-372.04	9.82
5800.00	65.79	181.36	5579.69	351.58 N	230.71 E	-343.31	10.40
5832.00	69.46	183.09	5591.87	322.01 N	229.56 E	-313.81	12.51
5863.00	73.53	182.39	5601.71	292.66 N	228.16 E	-284.52	13.30
5895.00	76.59	180.92	5609.96	261.76 N	227.27 E	-253.66	10.54
5926.00	77.35	180.11	5616.95	231.56 N	227.00 E	-223.49	3.53
5958.00	78.78	179.54	5623.57	200.25 N	227.09 E	-192.20	4.80
5989.00	82.37	178.94	5628.64	169.67 N	227.50 E	-161.63	11.74
6033.00	85.03	178.98	5633.47	125.95 N	228.29 E	-117.91	6.05
6089.00	86.33	177.50	5637.69	70.14 N	230.01 E	-62.07	3.51
6183.00	88.18	177.04	5642.19	23.64 S	234.48 E	31.81	2.03
6278.00	90.43	180.15	5643.34	118.59 S	236.81 E	126.78	4.04
6373.00	91.60	179.79	5641.66	213.57 S	236.86 E	221.71	1.29
6467.00	92.00	181.07	5638.71	307.52 S	236.15 E	315.57	1.43
6562.00	90.25	179.13	5636.84	402.49 S	235.99 E	410.48	2.75
6656.00	89.35	177.21	5637.17	496.44 S	238.99 E	504.48	2.26
6751.00	90.00	179.64	5637.71	591.39 S	241.60 E	599.47	2.65
6846.00	89.04	178.59	5638.51	686.38 S	243.07 E	694.44	1.50
6940.00	88.89	182.36	5640.20	780.34 S	242.29 E	788.32	4.01
7035.00	86.79	181.32	5643.78	875.22 S	239.24 E	883.04	2.47
7129.00	86.33	180.14	5649.42	969.04 S	238.04 E	976.76	1.35
7224.00	87.41	180.14	5654.61	1063.90 S	237.81 E	1071.55	1.14
7318.00	88.89	178.98	5657.65	1157.84 S	238.53 E	1165.46	2.00
7413.00	89.32	178.98	5659.13	1252.81 S	240.23 E	1260.43	0.45
7508.00	90.74	178.88	5660.44	1347.83 S	241.43 E	1355.43	2.28

7508.00	91.51	179.53	5658.44	1347.80 S	241.46 E	1355.40	2.38
7602.00	91.29	179.14	5656.15	1441.76 S	242.55 E	1449.35	0.48
7697.00	91.48	178.56	5653.85	1536.72 S	244.46 E	1544.31	0.64
7791.00	88.95	178.01	5653.50	1630.66 S	247.27 E	1638.30	2.75
7886.00	89.85	178.99	5654.49	1725.62 S	249.76 E	1733.29	1.40
7981.00	89.69	178.88	5654.87	1820.61 S	251.52 E	1828.28	0.20
8076.00	90.09	179.49	5655.06	1915.60 S	252.87 E	1923.26	0.77
8168.00	89.88	180.55	5655.08	2007.60 S	252.84 E	2015.20	1.17
8263.00	90.65	179.75	5654.64	2102.59 S	252.59 E	2110.13	1.17
8354.00	90.31	178.38	5653.88	2193.58 S	254.08 E	2201.11	1.55
8446.00	90.80	179.19	5652.99	2285.55 S	256.03 E	2293.09	1.03
8537.00	91.91	180.90	5650.83	2376.52 S	255.96 E	2384.00	2.24
8628.00	89.66	181.96	5649.59	2467.47 S	253.69 E	2474.83	2.73
8719.00	90.09	182.29	5649.79	2558.41 S	250.31 E	2565.59	0.60
8810.00	89.85	178.95	5649.83	2649.39 S	249.33 E	2656.48	3.68
8901.00	90.31	175.38	5649.71	2740.27 S	253.83 E	2747.46	3.96
8992.00	90.15	178.27	5649.34	2831.12 S	258.87 E	2838.43	3.18
9083.00	89.82	178.97	5649.37	2922.09 S	261.06 E	2929.42	0.85
9175.00	90.74	181.08	5648.92	3014.08 S	261.02 E	3021.36	2.50
9266.00	90.40	179.93	5648.01	3105.07 S	260.22 E	3112.26	1.32
9358.00	89.66	181.28	5647.96	3197.07 S	259.25 E	3204.17	1.67
9450.00	91.42	181.97	5647.10	3289.02 S	256.64 E	3295.97	2.05
9541.00	90.99	181.29	5645.18	3379.96 S	254.05 E	3386.77	0.88
9632.00	91.36	181.24	5643.32	3470.92 S	252.04 E	3477.60	0.41
9722.00	89.72	181.08	5642.47	3560.90 S	250.22 E	3567.46	1.83
9813.00	87.84	179.84	5644.41	3651.87 S	249.49 E	3658.35	2.47
9905.00	88.00	179.61	5647.74	3743.80 S	249.93 E	3750.25	0.30
9997.00	87.75	178.11	5651.16	3835.72 S	251.76 E	3842.17	1.65
10088.00	89.63	179.79	5653.24	3926.67 S	253.43 E	3933.13	2.77
10180.00	90.71	179.82	5652.96	4018.67 S	253.74 E	4025.08	1.17
10271.00	90.18	179.85	5652.26	4109.67 S	254.00 E	4116.03	0.58
10363.00	89.97	179.77	5652.14	4201.67 S	254.31 E	4207.98	0.24
10454.00	90.09	180.25	5652.09	4292.67 S	254.29 E	4298.93	0.54
10546.00	89.17	179.49	5652.68	4384.66 S	254.50 E	4390.87	1.30
10637.00	89.14	180.16	5654.03	4475.65 S	254.78 E	4481.82	0.74
10729.00	91.39	181.69	5653.60	4567.63 S	253.29 E	4573.69	2.96
10820.00	91.14	181.58	5651.59	4658.57 S	250.70 E	4664.48	0.30
10911.00	90.98	180.88	5649.91	4749.53 S	248.74 E	4755.32	0.79
11003.00	91.05	179.58	5648.28	4841.52 S	248.37 E	4847.24	1.41
11095.00	91.32	181.38	5646.38	4933.49 S	247.60 E	4939.13	1.98
11186.00	89.94	181.65	5645.37	5024.45 S	245.20 E	5029.95	1.55
11277.00	89.04	181.64	5646.18	5115.41 S	242.59 E	5120.76	0.99
11370.00	87.75	182.25	5648.79	5208.32 S	239.43 E	5213.50	1.53
11460.00	87.81	181.75	5652.28	5298.19 S	236.29 E	5303.21	0.56
11557.00	88.43	181.57	5655.46	5395.10 S	233.48 E	5399.96	0.67
11644.00	88.80	181.43	5657.56	5482.04 S	231.21 E	5486.77	0.45
11736.00	91.48	180.85	5657.34	5574.02 S	229.38 E	5578.63	2.98
11828.00	92.25	180.81	5654.34	5665.96 S	228.05 E	5670.47	0.84
11919.00	91.05	180.12	5651.72	5756.92 S	227.31 E	5761.34	1.52
12012.00	87.90	178.90	5652.57	5849.89 S	228.10 E	5854.29	3.63
12103.00	87.81	177.28	5655.98	5940.78 S	231.13 E	5945.22	1.78
12195.00	88.86	177.38	5658.65	6032.64 S	235.42 E	6037.18	1.15
12286.00	89.42	178.49	5660.02	6123.57 S	238.70 E	6128.17	1.37
12379.00	88.77	178.49	5661.49	6216.52 S	241.15 E	6221.15	0.70
12471.00	89.63	179.08	5662.77	6308.49 S	243.10 E	6313.13	1.13
12563.00	89.75	180.21	5663.27	6400.49 S	243.67 E	6405.09	1.24
12654.00	90.92	180.35	5662.74	6491.48 S	243.22 E	6496.02	1.29
12746.00	91.94	179.81	5660.44	6583.45 S	243.09 E	6587.92	1.25
12838.00	93.27	179.56	5656.26	6675.35 S	243.60 E	6679.79	1.47
12929.00	90.80	178.21	5653.03	6766.27 S	245.37 E	6770.71	3.09
13020.00	90.31	179.76	5652.15	6857.25 S	246.98 E	6861.69	1.79
13112.00	91.11	179.31	5651.01	6949.24 S	247.73 E	6953.65	1.00
13142.00	91.08	179.07	5650.43	6979.23 S	248.15 E	6983.64	0.81
13185.00	90.00	179.07	5650.03	7022.22 S	248.85 E	7026.63	2.51

**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 178.00 DEGREES (TRUE)  
A TOTAL CORRECTION OF 7.51 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 13185.00 FEET  
IS 7026.63 FEET ALONG 177.97 DEGREES (TRUE)

Tie onto surface at 0' MD  
Final survey is a projection to the bit at TD

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