

Pressure Cased Gamma (PCGK)



1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	19-May-14	20-May-14			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (TVD, ft)	809.90	6,242.23			
Log End Depth (TVD, ft)	6,242.23	6,942.62			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	18-May-14 16:20	20-May-14 00:00			
Drill/Wipe End Date and Time	19-May-14 14:10	20-May-14 12:20			
Min Inc (deg) @ Depth (TVD, ft)	0.14 @ 5,998.25	1.02 @ 6,243.23			
Max Inc (deg) @ Depth (TVD, ft)	9.58 @ 3,821.11	84.78 @ 6,942.62			
Bit TFA(in2) / Bit Type	1.74 / PDC	1.74 / PDC			
Flow Rate (gpm)	587.09	571.90			
Max AV (fpm) / CV (fpm) @ MWD	N/A	N/A			
Fluid Type	Polymer	Polymer			
Density (ppg) / Viscosity (spqt)	9.20 / 32.00	10.50 / 41.00			
Filtrate CL (ppm)	2,000.00	2,100.00			
pH / API Filtrate (mptm)	9.00 / 9	9.20 / 9			
PV (cP) / YP (lbf2)	4 / 5.00	11 / 13.00			
% Solids / % Sand	1.7 / 1.50	9.2 / 1.00			
% Oil / Oil:Water Ratio	N/A	0.00 / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (deg F) @ 10	122.63 / PDM	170.87 / PDM			

Max Tool Temp (degF) / Source	162.80 / PCM	170.37 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Christopher Sorensen	Christopher Sorensen			
Customer Representative	Martin Suarez	Martin Suarez			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11254959	11254959			
Insert Serial Number	11620295	11620295			
Date and Time Initialized	17-May-14 23:29	17-May-14 23:29			
Date and Time Read	20-May-14 19:12	20-May-14 19:06			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	54.22	52.07			
Software Version	6.21	6.21			
Sub Serial Number	11254959	11254959			
Sonde Serial Number	11297574	11297574			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	45.00	246.01			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.22	47.07			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11254959	11254959			
Insert/Sonde Serial Number	11293380	11293380			

REMARKS

1. All depths are true vertical depths, referenced from 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. All data presented is recorded (memory data) unless otherwise stated.
- ROPA: Average Rate of Penetration is real time data.

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

PGRC (PCG Corrected Gamma Ray):

Interval resolution: 0.5 ft

Interval distance: 0.6 ft

Gap fill: 3.0 ft

ROPA (Average rate of penetration):

Interval resolution: 0.5 ft

Interval distance: 1.2 ft

Gap fill: 3.0 ft

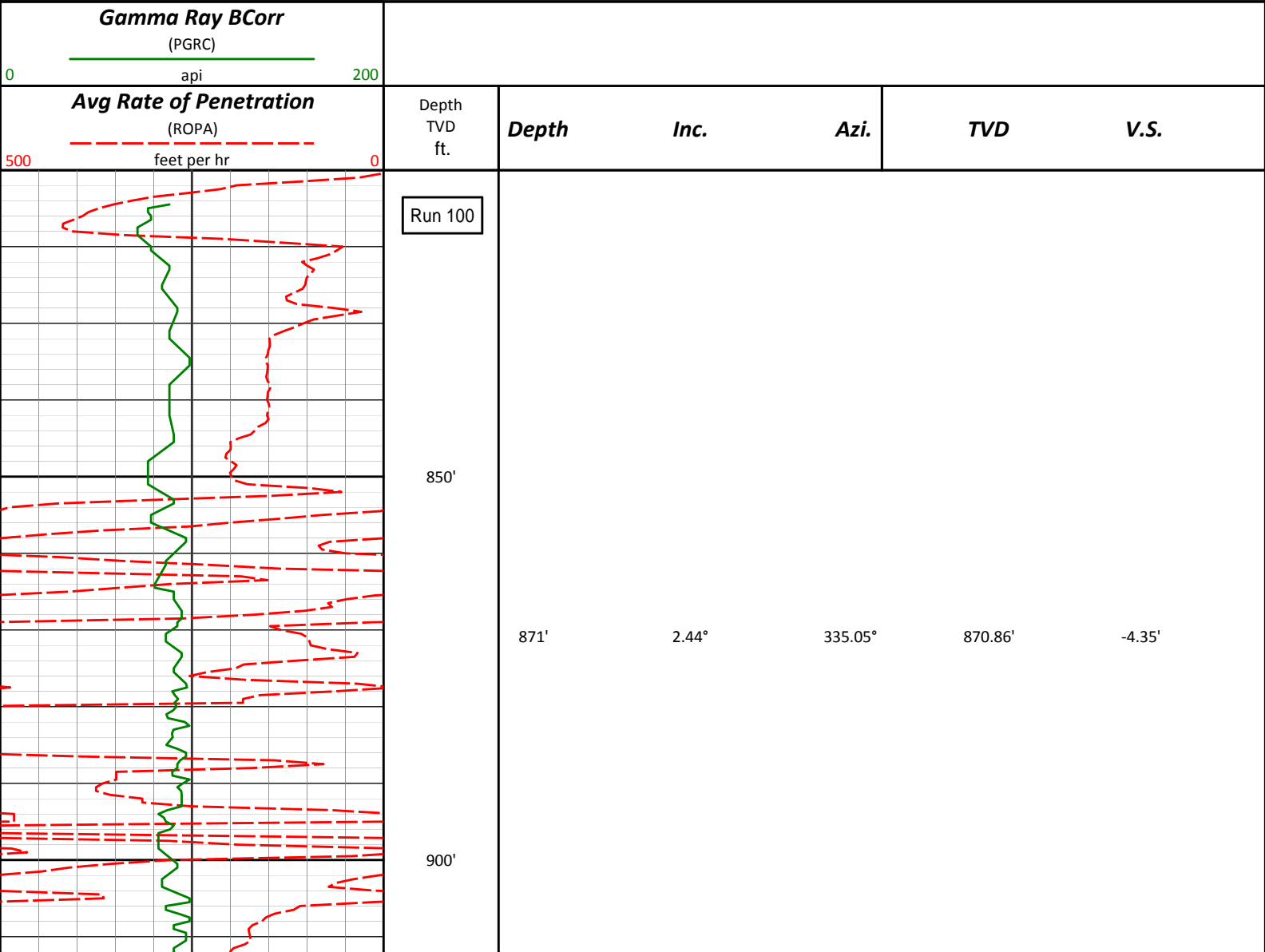
5. INSITE version 8.5.0 Build 10

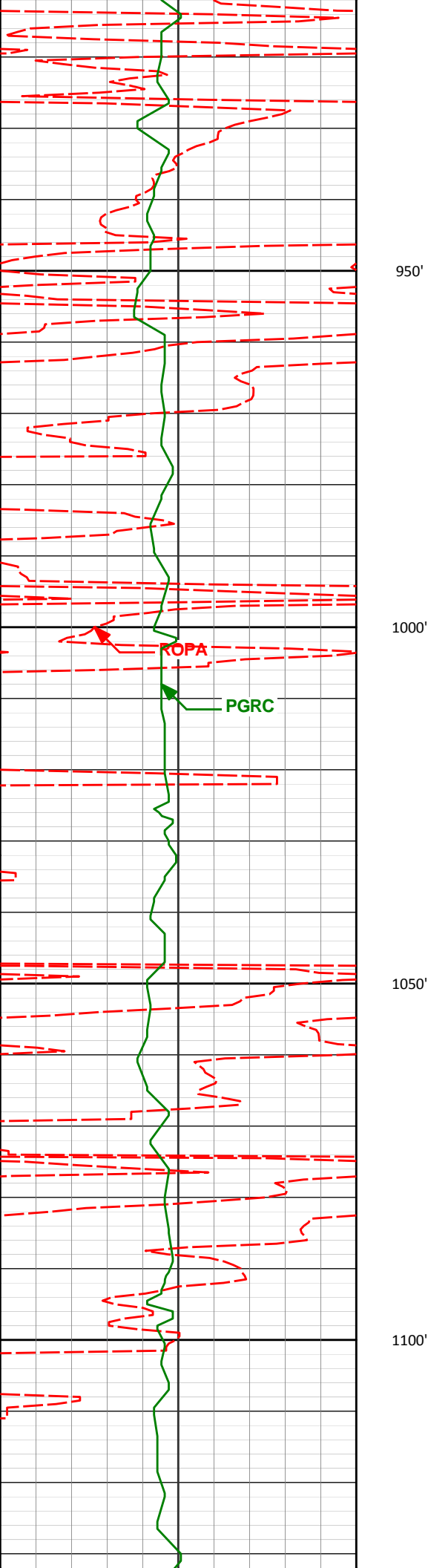
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Sperry Drilling Services

TVD Detail Log 1:240





993'

1.57°

10.15°

992.79'

-8.34'

1000'

ROPA

PGRC

1050'

1086'

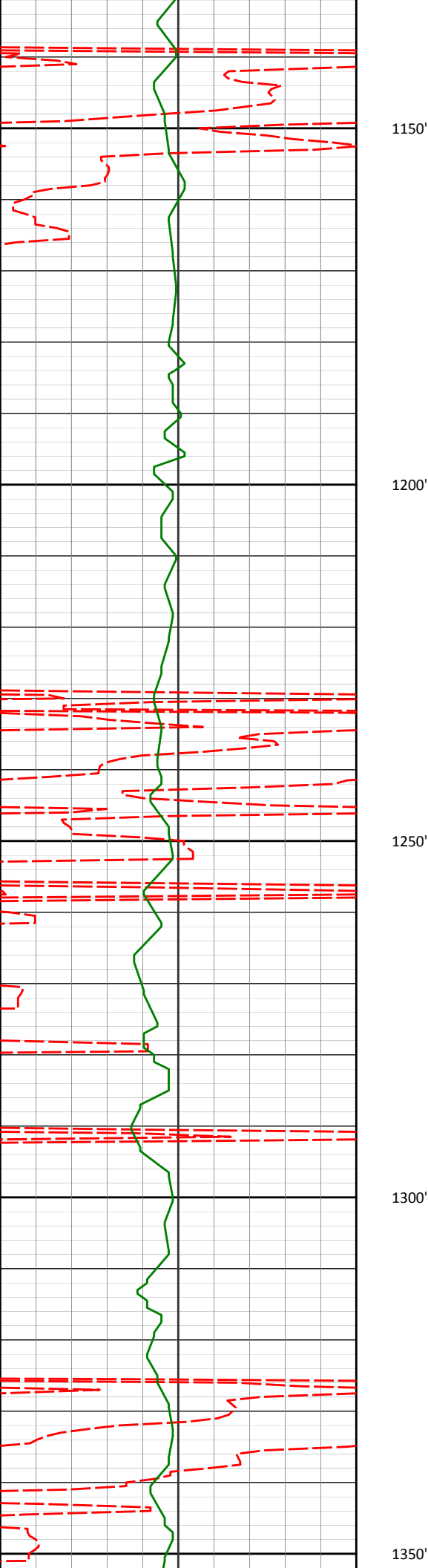
1.69°

9.21°

1085.75'

-10.96'

1100'



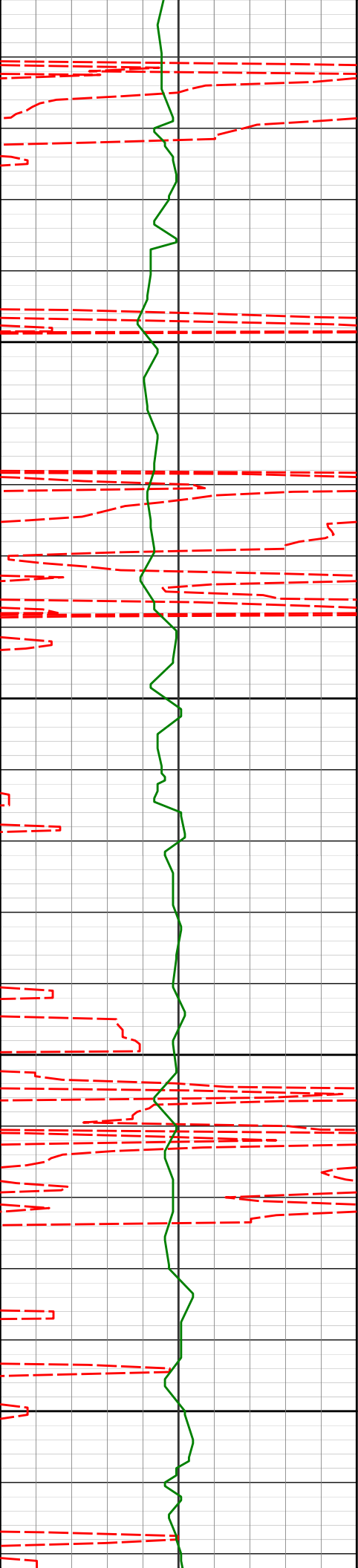
1273'

1.64°

3.10°

1272.67'

-16.37'



1400'

1450'

1500'

1550'

1457'

2.00°

13.18°

1456.58'

-22.13'

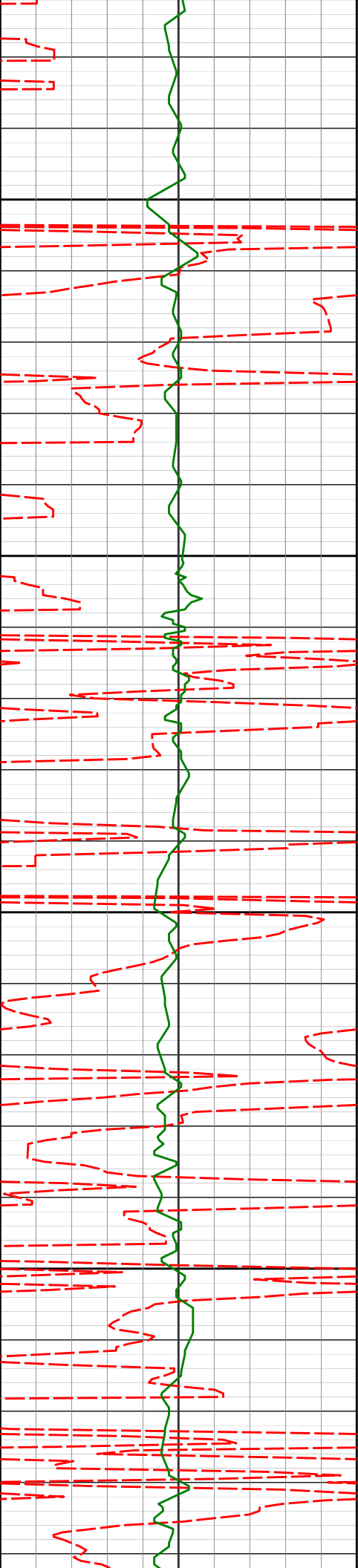
1552'

1.97°

12.40°

1551.52'

-25.35'



1600'

1650'

1700'

1750'

1647'

1.77°

12.87°

1646.47'

-28.38'

1742'

0.68°

97.88°

1741.45'

-29.74'



1837'

0.70°

152.10°

1836.45'

-29.16'

1932'

1.02°

165.89°

1931.43'

-27.83'



2050'

2100'

2150'

2200'

2027'

1.54°

178.78°

2026.41'

-25.74'

2122'

1.23°

183.71°

2121.38'

-23.44'

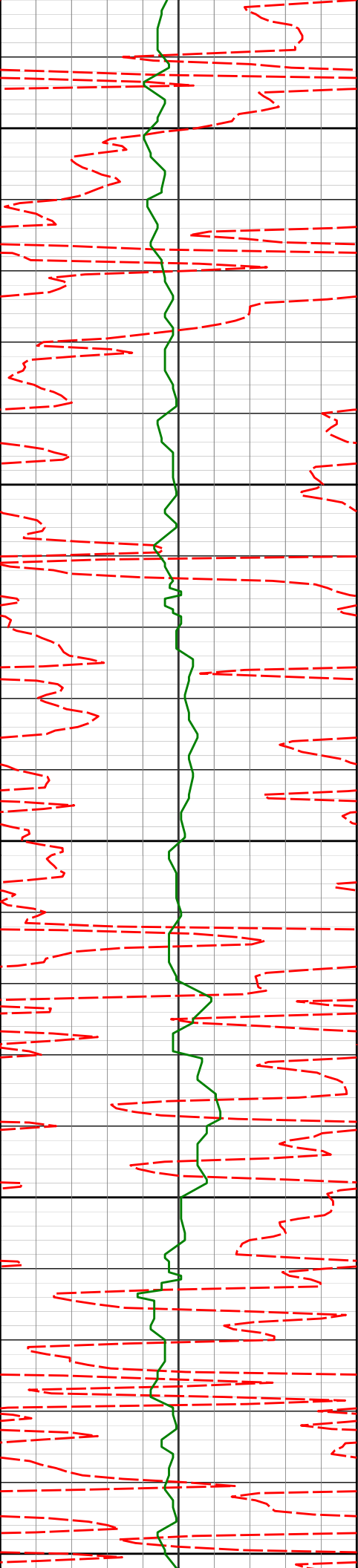
2217'

1.24°

174.82°

2216.36'

-21.39'



2250'

2300'

2350'

2400'

2450'

2312'

1.42°

205.83°

2311.34'

-19.30'

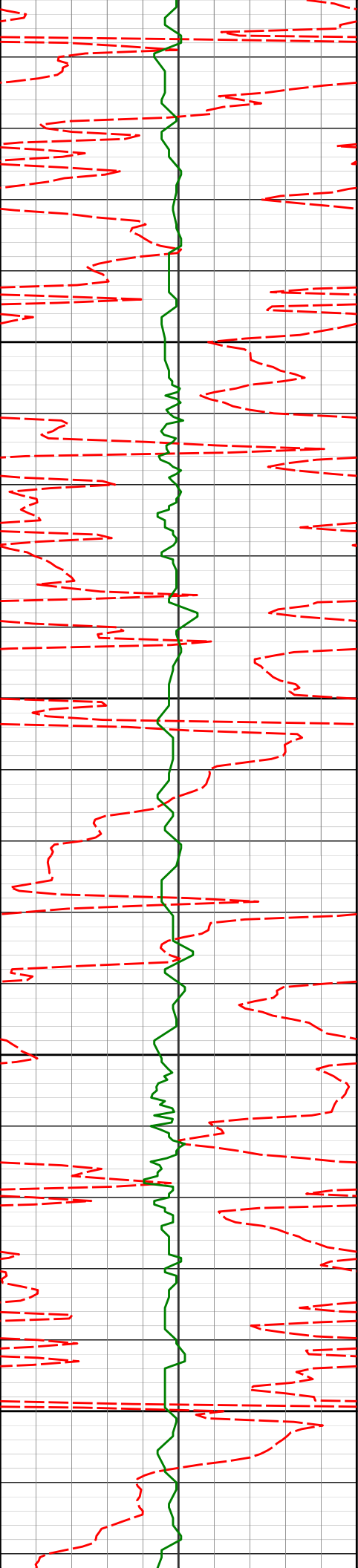
2407'

1.25°

179.54°

2406.31'

-17.20'



2500'

2502'

1.00°

193.68°

2501.29'

-15.36'

2550'

2600'

2650'

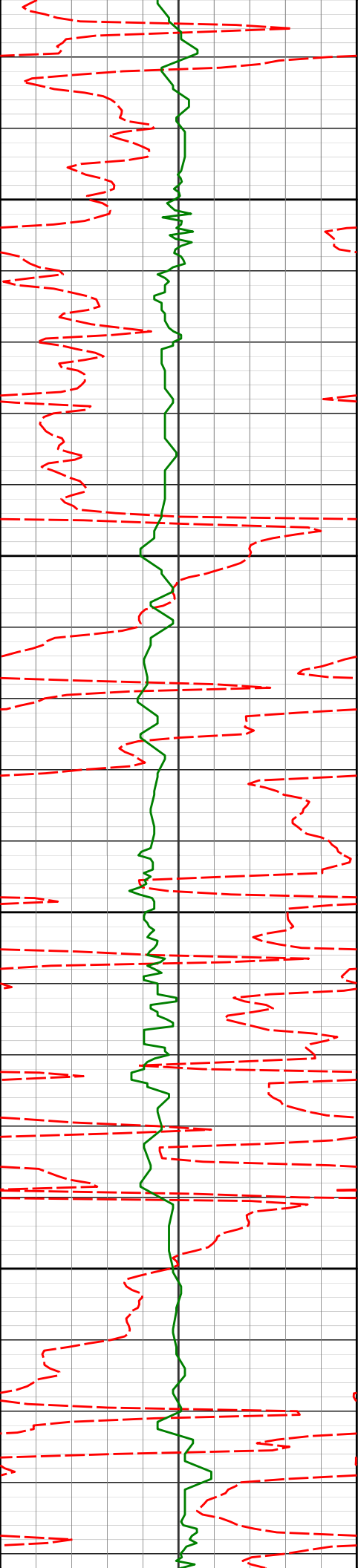
2596'

1.32°

269.76°

2595.28'

-14.54'



2691'

3.23°

295.06°

2690.20'

-15.61'

2700'

2750'

2800'

2850'

2786'

3.80°

307.65°

2785.02'

-18.59'

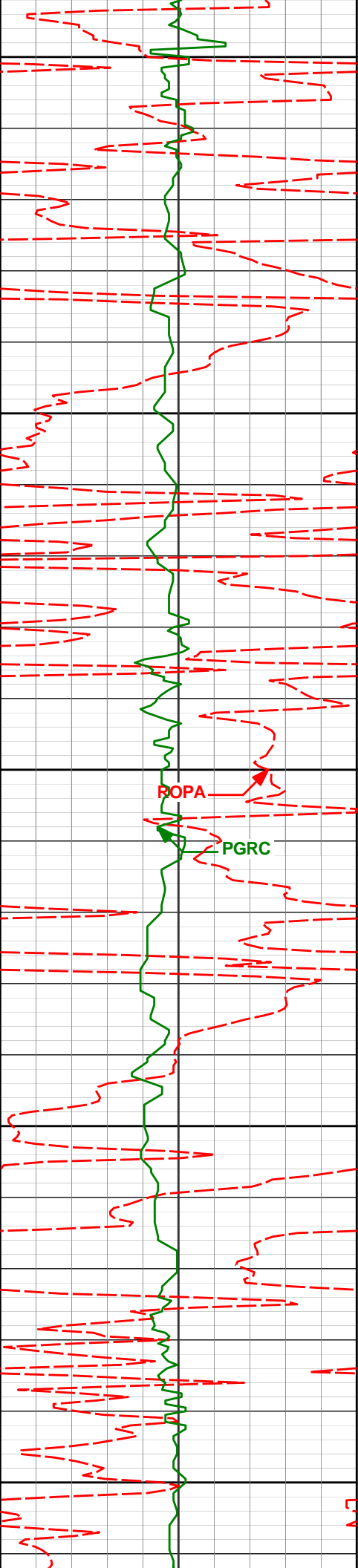
2881'

5.59°

322.44°

2879.70'

-24.10'



2900'

2950'

2976'

7.12°

320.90°

2974.12'

-32.23'

3000'

ROPA

PGRC

3050'

3071'

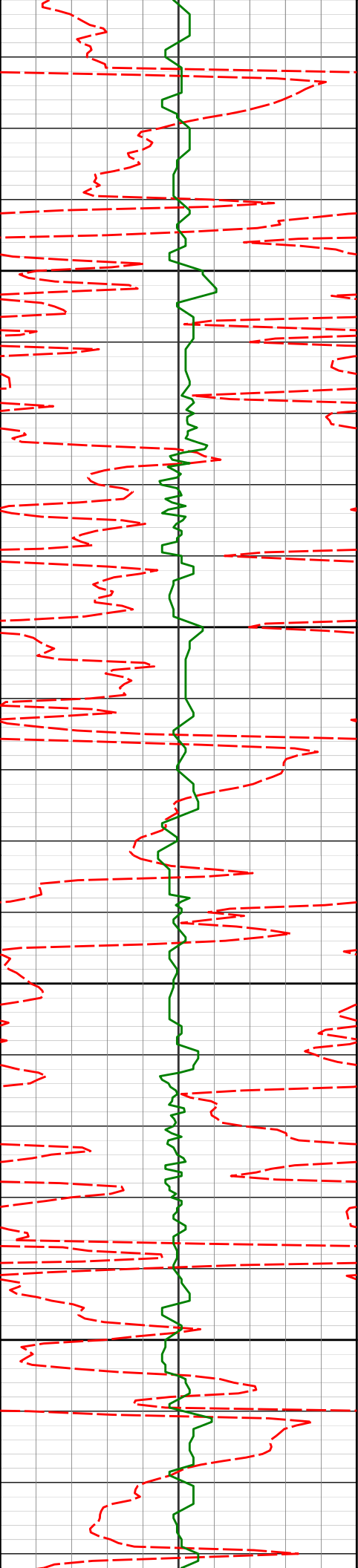
8.03°

331.80°

3068.29'

-42.54'

3100'



3150'

3166'

7.77°

338.47°

3162.39'

-54.28'

3200'

3250'

3261'

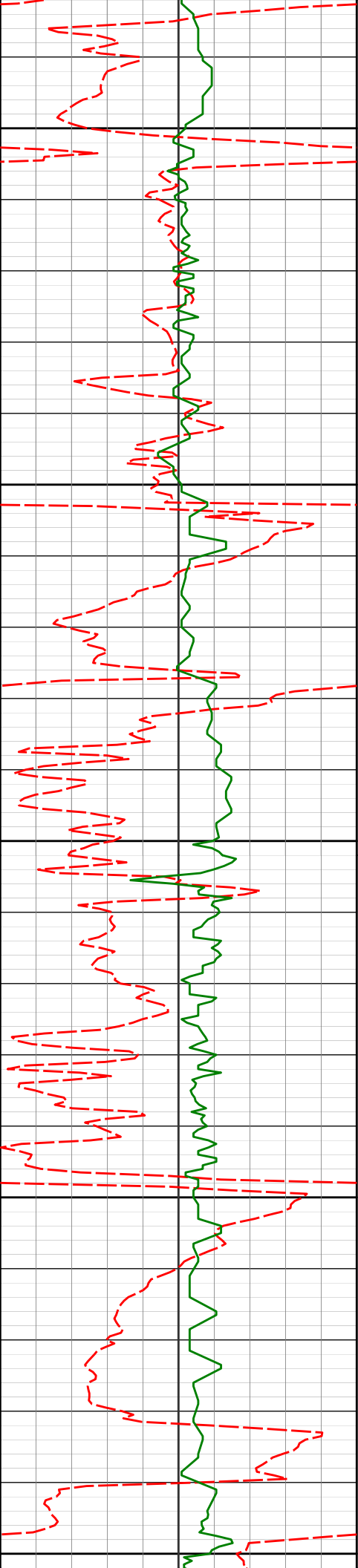
7.83°

341.46°

3256.51'

-66.31'

3300'



3350'

3356'

7.25°

347.14°

3350.69'

-78.24'

3400'

3450'

3500'

3451'

5.89°

345.35°

3445.07'

-88.76'

3546'

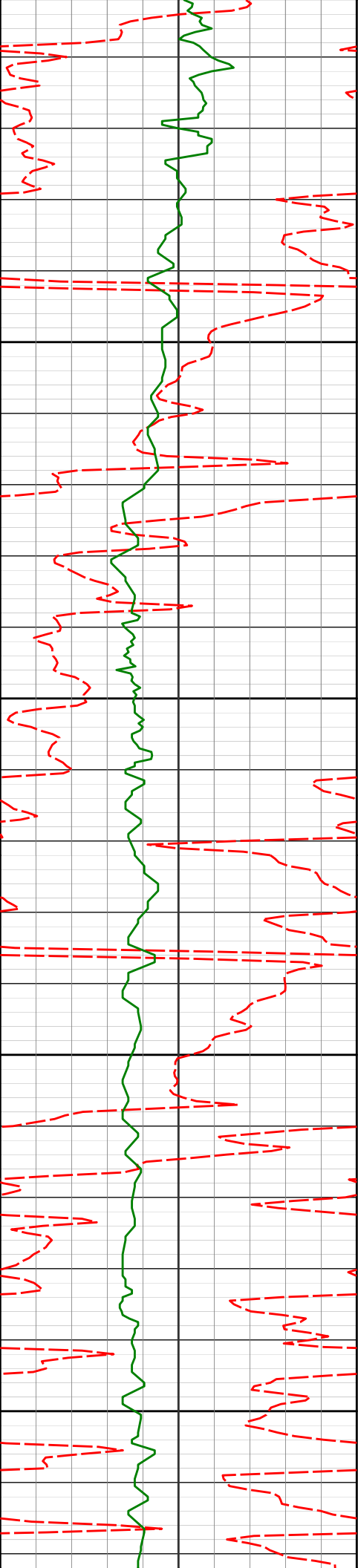
7.67°

354.73°

3539.40'

-99.76'

3550'



3600'

3641'

8.27°

346.61°

3633.48'

-112.68'

3650'

3700'

3736'

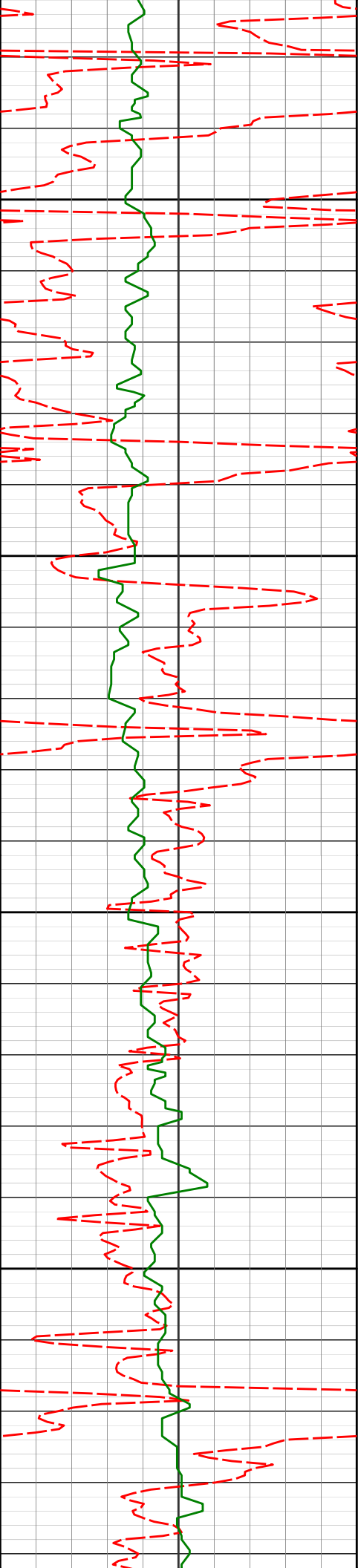
9.23°

335.99°

3727.38'

-126.21'

3750'



3800'

3831'

9.58°

335.58°

3821.11'

-140.26'

3850'

3900'

3926'

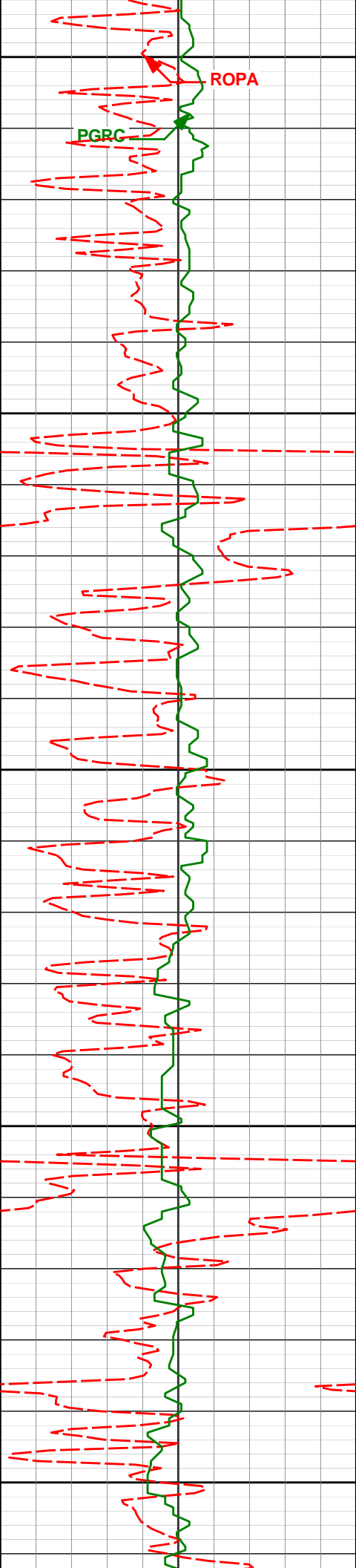
9.56°

337.00°

3914.79'

-154.61'

3950'



4000'

4021'

8.99°

336.50°

4008.54'

-168.59'

4050'

4100'

4115'

7.64°

335.78°

4101.55'

-180.93'

4150'

4200'

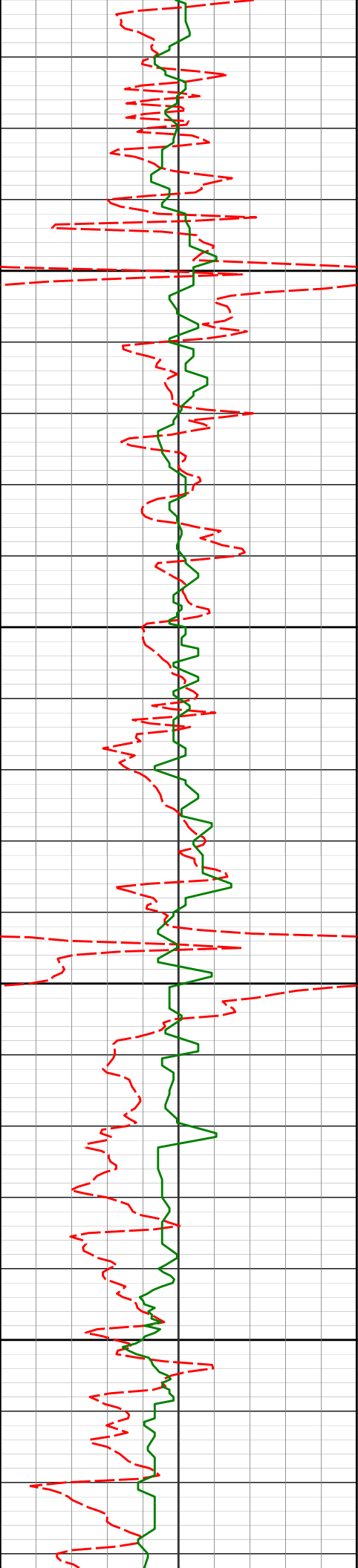
4210'

6.33°

339.09°

4195.84'

-191.52'



4250'

4305'

5.63°

336.94°

4290.33'

-200.64'

4300'

4350'

4400'

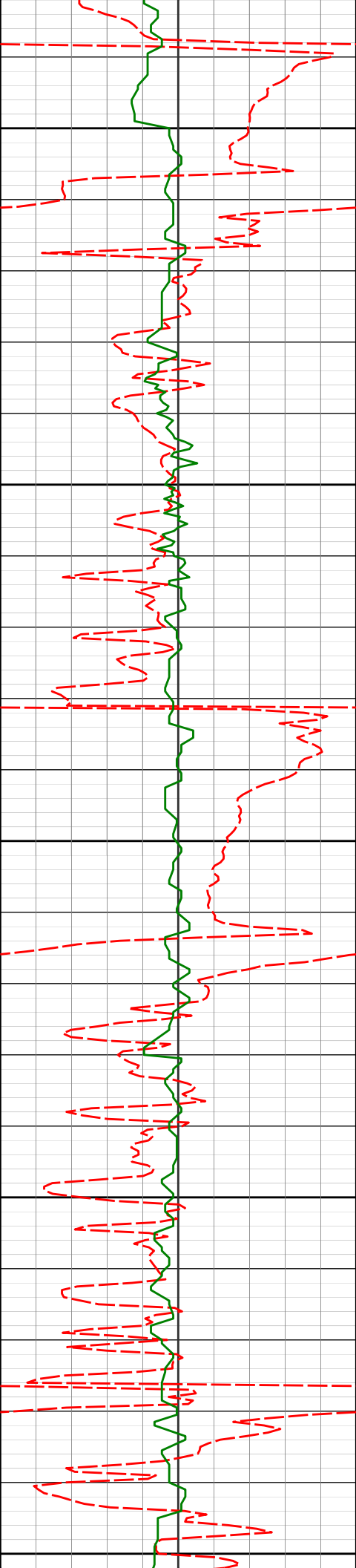
3.95°

332.59°

4384.99'

-207.77'

4400'



4450'

4495'

3.07°

329.72°

4479.81'

-212.82'

4500'

4550'

4590'

1.07°

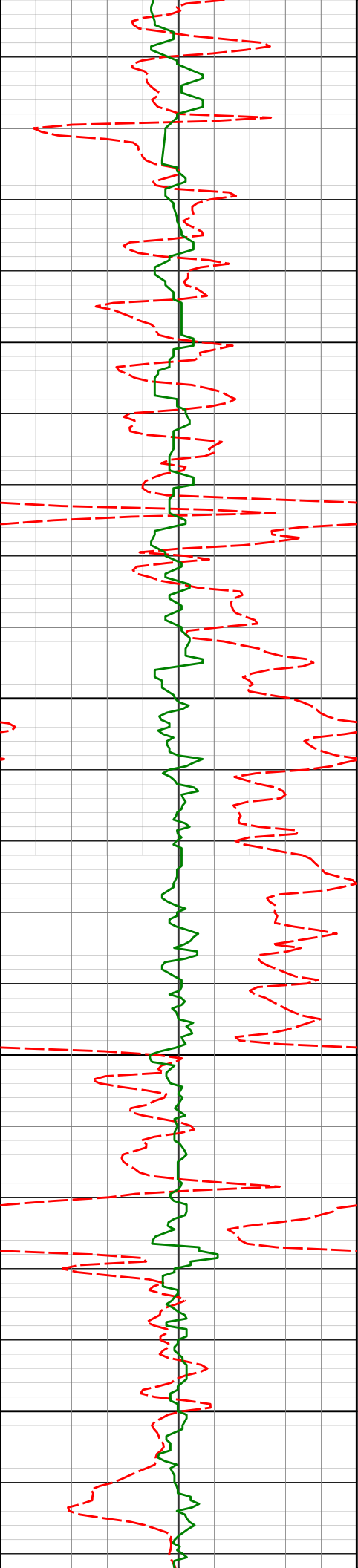
337.86°

4574.75'

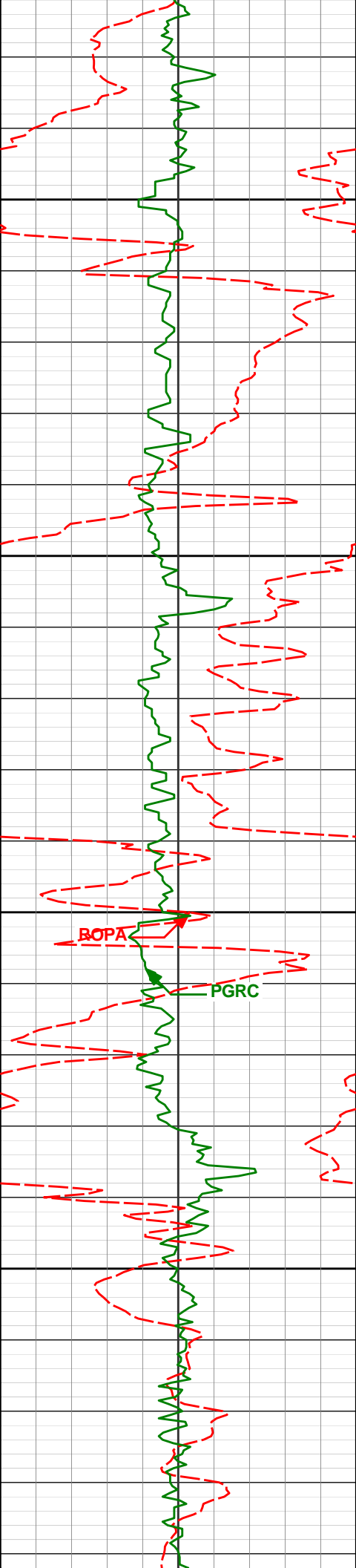
-215.82'

4600'

4650'



4685'	1.47°	6.69°	4669.72'	-217.85'
4700'				
4750'				
4780'	2.14°	0.91°	4764.68'	-220.83'
4800'				
4850'				
4875'	3.02°	15.18°	4859.58'	-225.03'



4900'

4950'

5000'

5050'

4970'

1.28°

7.58°

4954.51'

-228.51'

5064'

0.97°

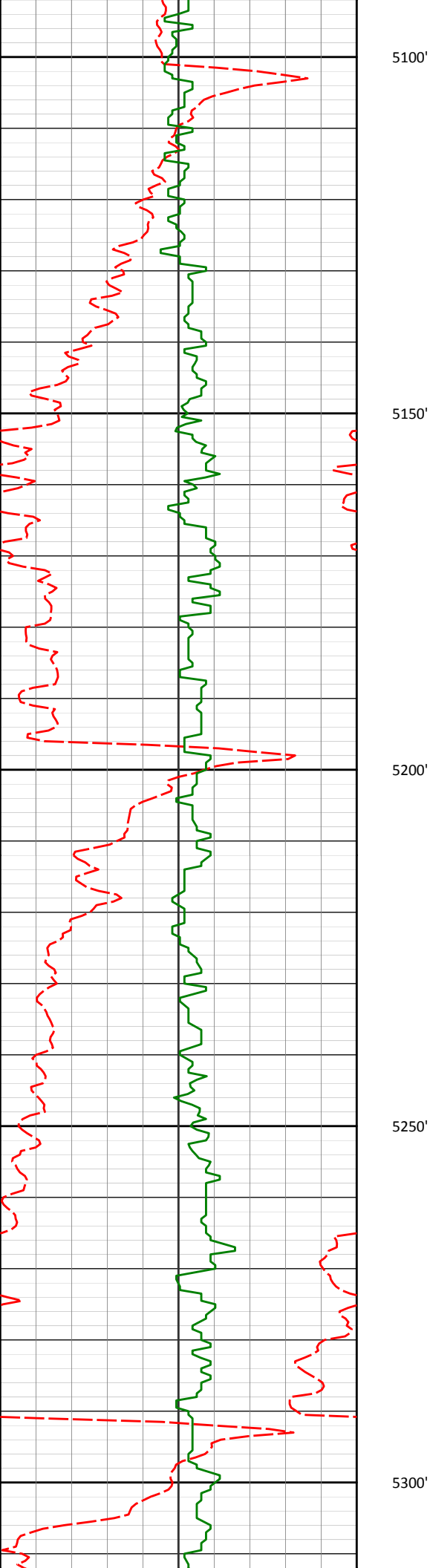
10.57°

5048.49'

-230.33'

ROPA

PGRC



5159'

1.25°

15.73°

5143.47'

-232.13'

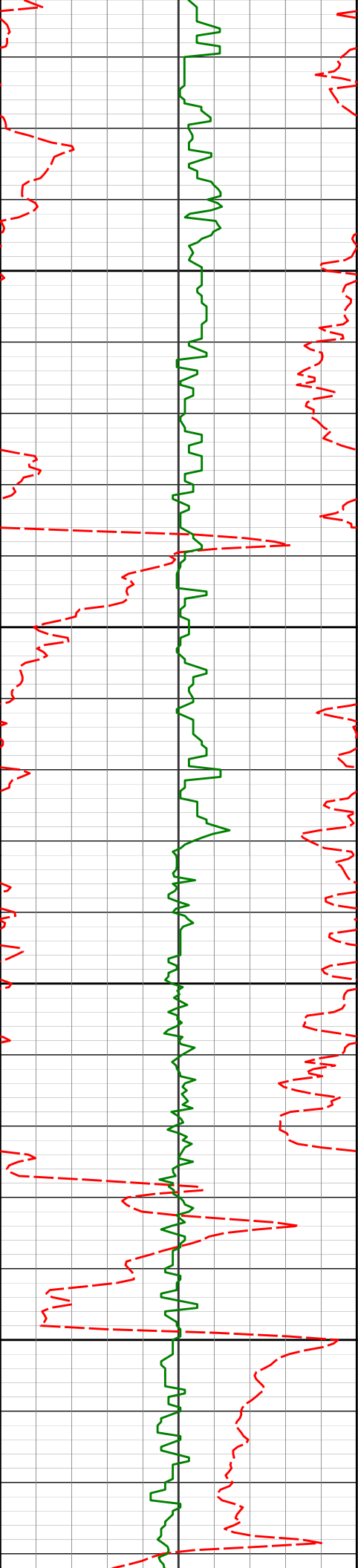
5254'

1.50°

354.06°

5238.45'

-234.37'



5350'

5400'

5444'

5450'

5500'

5539'

2.09°

348.26°

5428.35'

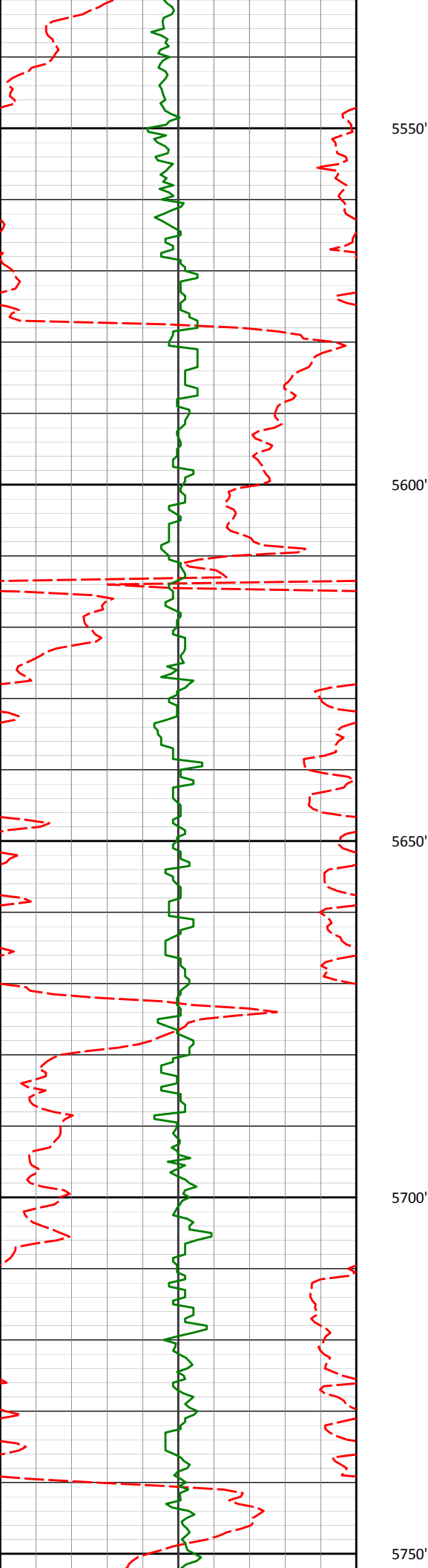
-240.22'

2.54°

273.51°

5523.29'

-242.00'



5634'

0.35°

1.68°

5618.26'

-242.39'

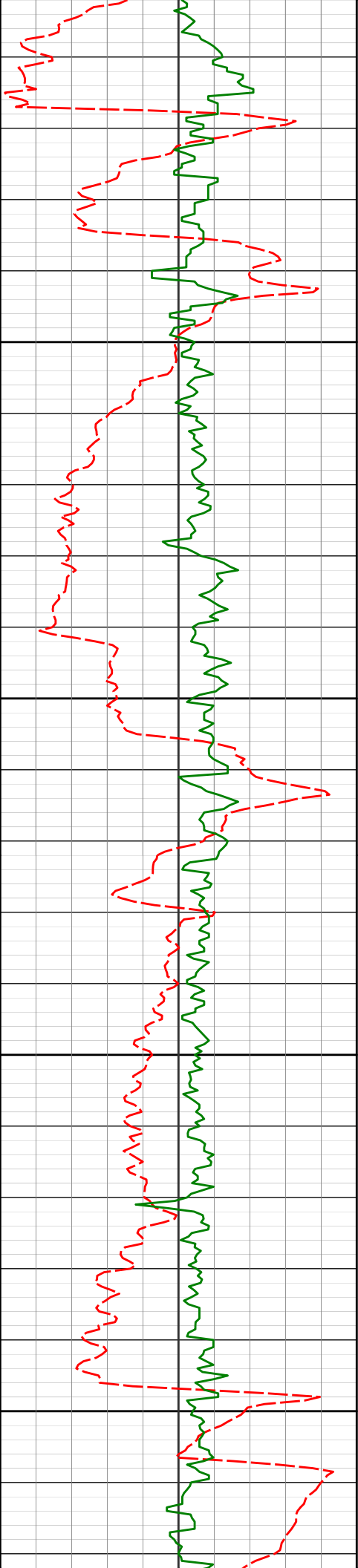
5729'

0.17°

169.49°

5713.26'

-242.54'



5800'

5824'

0.72°

359.16°

5808.26'

-243.00'

5850'

5900'

5919'

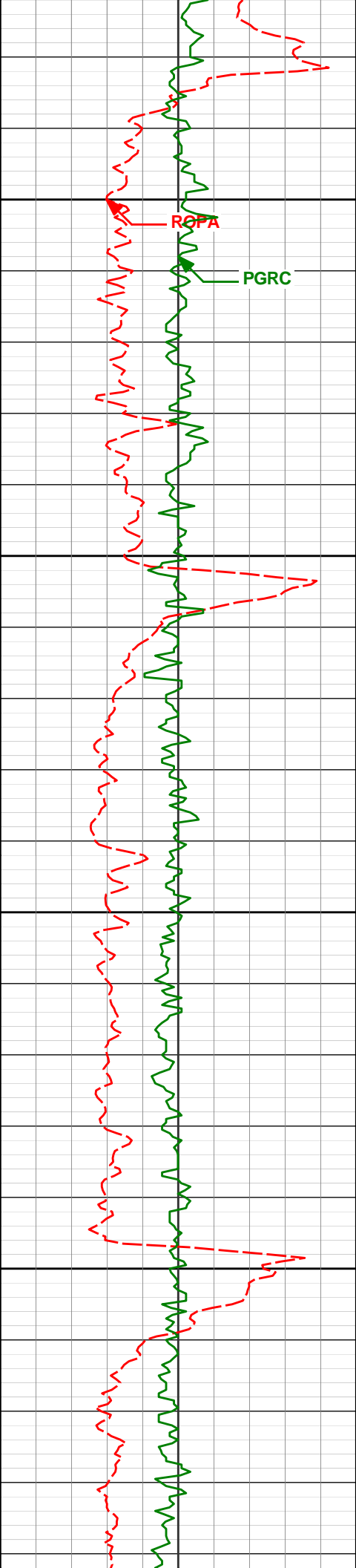
0.87°

350.63°

5903.25'

-244.30'

5950'



6000'

6014'

0.14°

68.71°

5998.25'

-245.06'

ROPA

PGRC

6050'

6100'

6150'

6109'

0.45°

283.62°

6093.25'

-245.18'

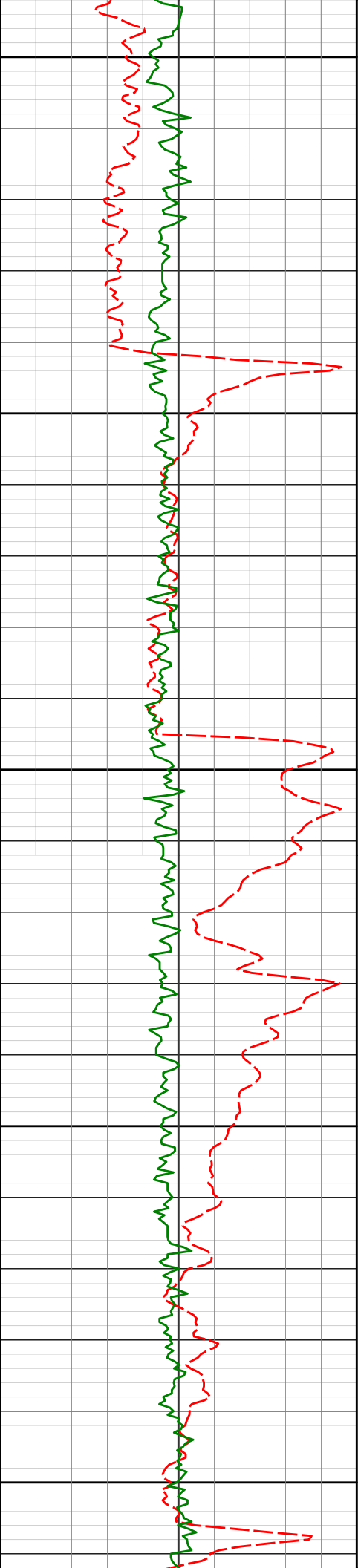
6202'

0.77°

315.87°

6186.24'

-245.71'



6200'

Run 200

6250'

KOP

6300'

6350'

6400'

6259'

1.02°

321.98°

6243.23'

-246.37'

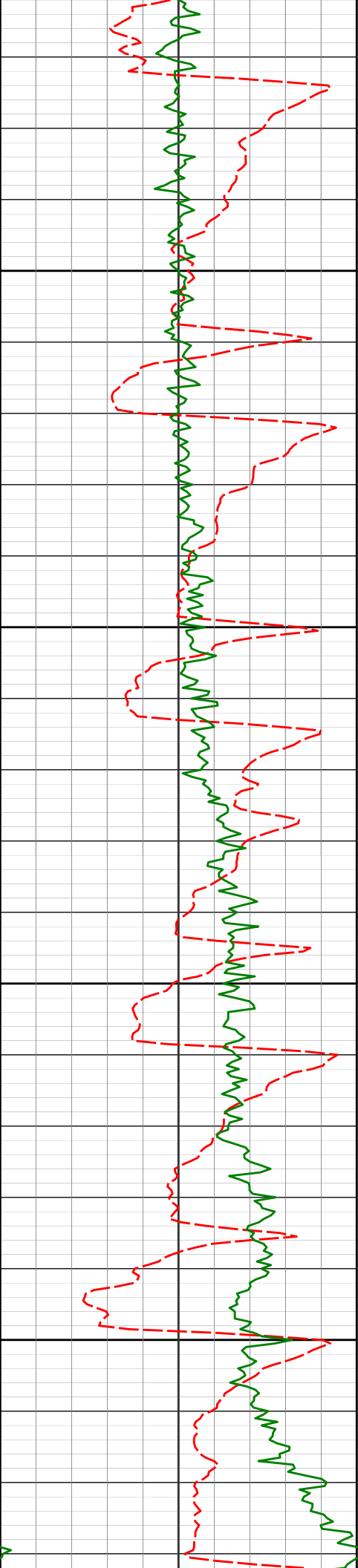
6388'

7.25°

172.39°

6371.92'

-239.20'



6450'

6500'

6550'

6600'

6436'

11.91°

165.59°

6419.24'

-231.42'

6483'

16.89°

169.58°

6464.75'

-220.04'

6531'

21.78°

172.52°

6510.03'

-204.38'

6578'

24.91°

175.70°

6553.18'

-185.90'

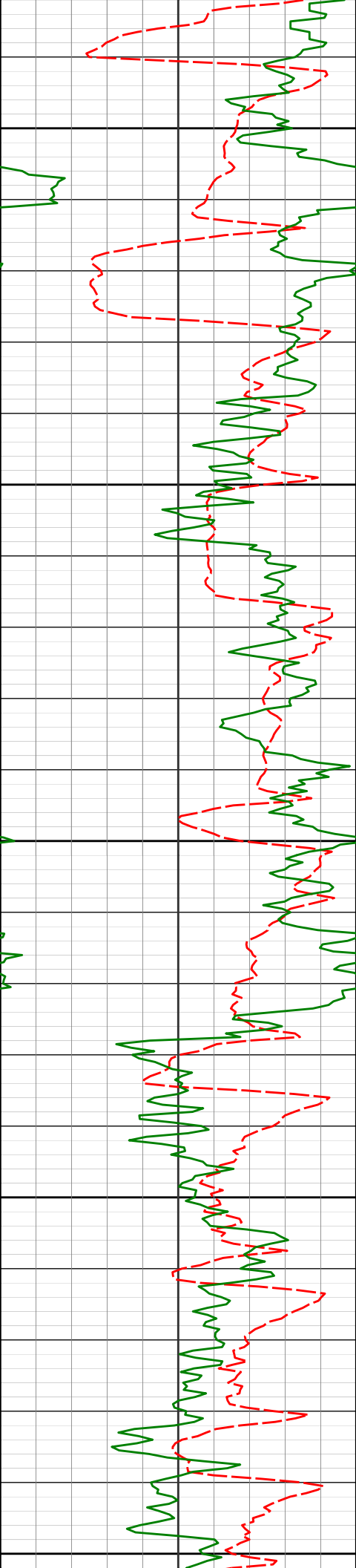
6626'

29.29°

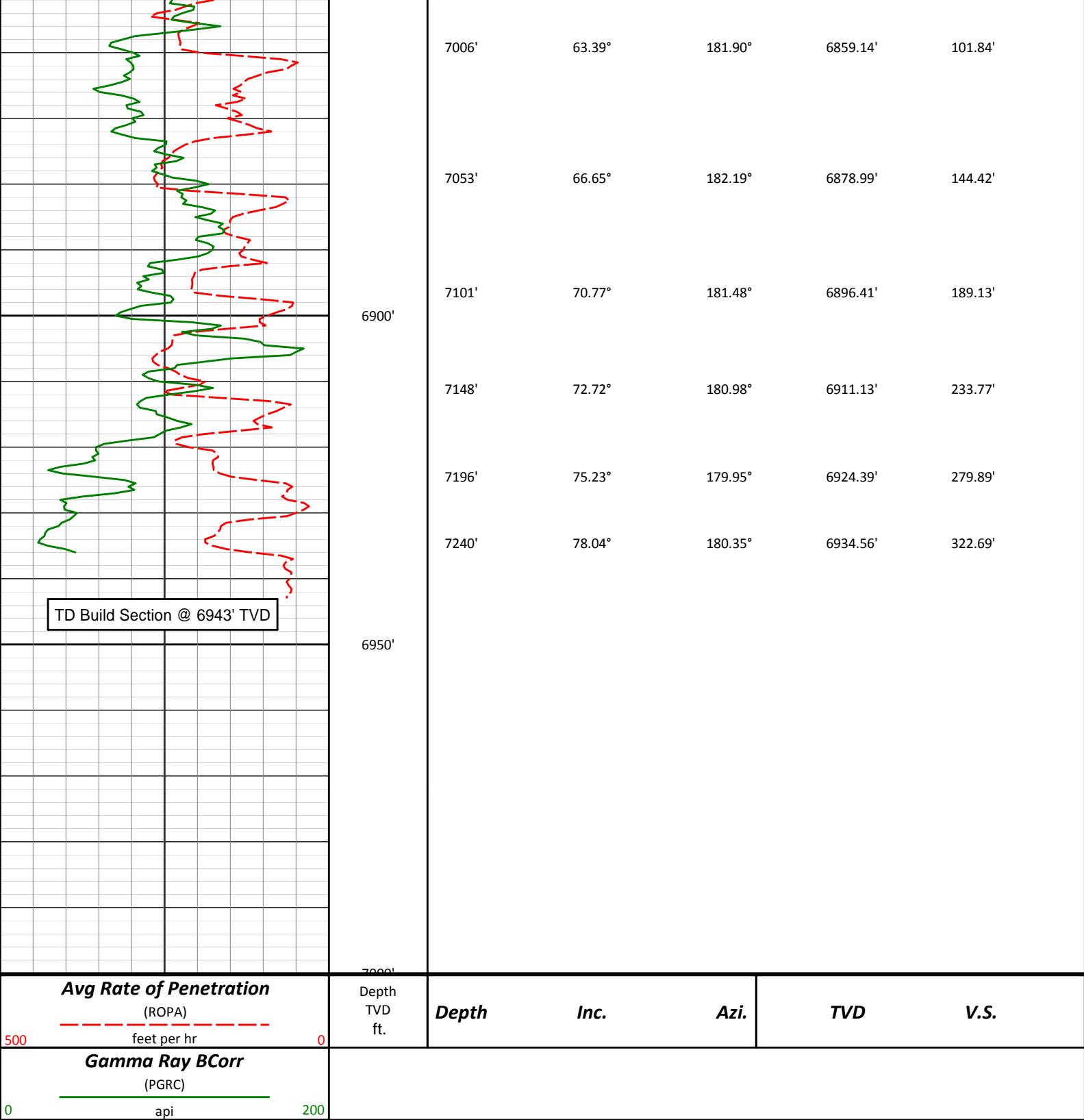
177.33°

6595.90'

-164.10'



6673'	34.38°	181.01°	6635.82'	-139.34'
6721'	37.50°	184.06°	6674.68'	-111.19'
6768'	38.60°	181.59°	6711.70'	-82.24'
6816'	42.90°	180.97°	6748.05'	-50.92'
6863'	48.35°	180.83°	6780.91'	-17.33'
6911'	54.60°	181.93°	6810.79'	20.20'
6958'	59.70°	182.84°	6836.28'	59.66'



HALLIBURTON

DIRECTIONAL SURVEY REPORT
Noble Energy
Storis E24-73HC
Wattenberg
Weld Colorado
USA
CA-XX-0901173067

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
235.00	0.80	289.46	234.99	0.55 N	1.55 W	-0.52	0.34
480.00	0.60	300.06	479.97	1.76 N	4.27 W	-1.69	0.10
765.00	1.70	269.96	764.91	2.50 N	9.79 W	-2.34	0.43
871.00	2.44	335.05	870.86	4.55 N	12.32 W	-4.35	2.18
993.00	1.57	10.15	992.79	8.56 N	13.12 W	-8.34	1.20
1086.00	1.69	9.21	1085.75	11.17 N	12.67 W	-10.96	0.13
1273.00	1.64	3.10	1272.67	16.57 N	12.09 W	-16.37	0.10
1457.00	2.00	13.18	1456.58	22.32 N	11.21 W	-22.13	0.26
1552.00	1.97	12.40	1551.52	25.52 N	10.49 W	-25.35	0.04
1647.00	1.77	12.87	1646.47	28.54 N	9.81 W	-28.38	0.21
1742.00	0.68	97.88	1741.45	29.89 N	8.93 W	-29.74	1.93
1837.00	0.70	152.10	1836.45	29.30 N	8.10 W	-29.16	0.66
1932.00	1.02	165.89	1931.43	27.96 N	7.62 W	-27.83	0.40
2027.00	1.54	178.78	2026.41	25.86 N	7.38 W	-25.74	0.62
2122.00	1.23	183.71	2121.38	23.56 N	7.42 W	-23.44	0.35
2217.00	1.24	174.82	2216.36	21.52 N	7.40 W	-21.39	0.20
2312.00	1.42	205.83	2311.34	19.43 N	7.82 W	-19.30	0.77
2407.00	1.25	179.54	2406.31	17.33 N	8.32 W	-17.20	0.66
2502.00	1.00	193.68	2501.29	15.50 N	8.51 W	-15.36	0.39
2596.00	1.32	269.76	2595.28	14.70 N	9.78 W	-14.54	1.54
2691.00	3.23	295.06	2690.20	15.83 N	13.30 W	-15.61	2.23
2786.00	3.80	307.65	2785.02	18.89 N	18.22 W	-18.59	1.01
2881.00	5.59	322.44	2879.70	24.48 N	23.53 W	-24.10	2.26
2976.00	7.12	320.90	2974.12	32.72 N	30.07 W	-32.23	1.62
3071.00	8.03	331.80	3068.29	43.14 N	36.92 W	-42.54	1.79
3166.00	7.77	338.47	3162.39	54.97 N	42.41 W	-54.28	1.00
3261.00	7.83	341.46	3256.51	67.08 N	46.83 W	-66.31	0.43
3356.00	7.25	347.14	3350.69	79.06 N	50.22 W	-78.24	0.99
3451.00	5.89	345.35	3445.07	89.62 N	52.79 W	-88.76	1.44
3546.00	7.67	354.73	3539.40	100.66 N	54.60 W	-99.76	2.20
3641.00	8.27	346.61	3633.48	113.62 N	56.77 W	-112.68	1.34
3736.00	9.23	335.99	3727.38	127.23 N	61.45 W	-126.21	1.97
3831.00	9.58	335.58	3821.11	141.38 N	67.82 W	-140.26	0.37
3926.00	9.56	337.00	3914.79	155.84 N	74.17 W	-154.61	0.25
4021.00	8.99	336.50	4008.54	169.91 N	80.21 W	-168.59	0.61
4115.00	7.64	335.78	4101.55	182.35 N	85.70 W	-180.93	1.44
4210.00	6.33	339.09	4195.84	193.00 N	90.17 W	-191.52	1.44
4305.00	5.63	336.94	4290.33	202.19 N	93.86 W	-200.64	0.78
4400.00	3.95	332.59	4384.99	209.37 N	97.19 W	-207.77	1.81
4495.00	3.07	329.72	4479.81	214.48 N	99.98 W	-212.82	0.94
4590.00	1.07	337.86	4574.75	217.50 N	101.60 W	-215.82	2.13
4685.00	1.47	6.69	4669.72	219.53 N	101.79 W	-217.85	0.78
4780.00	2.14	0.91	4764.68	222.51 N	101.62 W	-220.83	0.73
4875.00	3.02	15.18	4859.58	226.70 N	100.94 W	-225.03	1.14
4970.00	1.28	7.58	4954.51	230.17 N	100.14 W	-228.51	1.86
5064.00	0.97	10.57	5048.49	231.98 N	99.86 W	-230.33	0.34
5159.00	1.25	15.73	5143.47	233.77 N	99.43 W	-232.13	0.32
5254.00	1.50	354.06	5238.45	236.01 N	99.28 W	-234.37	0.60
5444.00	2.09	348.26	5428.35	241.88 N	100.24 W	-240.22	0.32
5539.00	2.54	273.51	5523.29	243.70 N	102.70 W	-242.00	2.98
5634.00	0.35	1.68	5618.26	244.12 N	104.79 W	-242.39	2.69
5729.00	0.17	169.49	5713.26	244.27 N	104.75 W	-242.54	0.55
5824.00	0.72	359.16	5808.26	244.73 N	104.74 W	-243.00	0.94
5919.00	0.87	350.63	5903.25	246.04 N	104.86 W	-244.30	0.20
6014.00	0.14	68.71	5998.25	246.79 N	104.87 W	-245.06	0.90
6109.00	0.45	283.62	6093.25	246.92 N	105.13 W	-245.18	0.60
6202.00	0.77	315.87	6186.24	247.46 N	105.93 W	-245.71	0.49
6259.00	1.02	321.98	6243.23	248.13 N	106.51 W	-246.37	0.46
6388.00	7.25	172.39	6371.92	240.95 N	106.13 W	-239.20	6.31
6436.00	11.91	165.59	6419.24	233.14 N	104.50 W	-231.42	9.97
6483.00	16.89	169.58	6464.75	221.72 N	102.05 W	-220.04	10.79
6531.00	21.78	172.52	6510.03	206.03 N	99.63 W	-204.38	10.39
6578.00	24.91	175.70	6553.18	187.51 N	97.75 W	-185.90	7.18
6626.00	29.29	177.33	6595.90	165.69 N	96.45 W	-164.10	9.25
6673.00	34.38	181.01	6635.82	140.92 N	96.15 W	-139.34	11.60
6721.00	37.50	184.06	6674.68	112.78 N	97.42 W	-111.19	7.49
6768.00	38.60	181.59	6711.70	83.86 N	98.84 W	-82.24	3.99
6816.00	42.90	180.97	6748.05	52.54 N	99.53 W	-50.92	9.01
6863.00	48.35	180.83	6780.91	18.96 N	100.06 W	-17.33	11.58

6911.00	54.60	181.93	6810.79	18.56 S	100.98 W	20.20	13.16
6958.00	59.70	182.84	6836.28	58.00 S	102.63 W	59.66	10.97
7006.00	63.39	181.90	6859.14	100.15 S	104.37 W	101.84	7.86
7053.00	66.65	182.19	6878.99	142.72 S	105.89 W	144.42	6.97
7101.00	70.77	181.48	6896.41	187.42 S	107.32 W	189.13	8.69
7148.00	72.72	180.98	6911.13	232.04 S	108.28 W	233.77	4.27
7196.00	75.23	179.95	6924.39	278.17 S	108.65 W	279.89	5.61
7240.00	78.04	180.35	6934.56	320.97 S	108.76 W	322.69	6.47
7294.00	84.78	179.80	6942.62	374.33 S	108.83 W	376.05	12.52

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 180.93 DEGREES (GRID)
A TOTAL CORRECTION OF 7.86 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7294.00 FEET
IS 389.83 FEET ALONG 196.21 DEGREES (GRID)**

Surface surveys at 235 ft, 480 ft and 765 ft have had azimuths corrected to grid north, but were not taken by Halliburton.

Last survey is a projection from 7240 ft MD to bit at 7294 ft MD.

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