

PCGC - Pressure Case Gamma
PCDC - Pressure Case Directional

1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	25-Nov-13				
Rig Bit Number	1				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (MD, ft)	1,252.00				
Log End Depth (MD, ft)	8,048.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	22-Nov-13 14:30				
Drill/Wipe End Date and Time	25-Nov-13 00:00				
Min Inc (deg) @ Depth (MD, ft)	0.04 @ 1,287.00				
Max Inc (deg) @ Depth (MD, ft)	88.13 @ 8,048.00				
Bit TFA(in2) / Bit Type	N/A / PDC				
Flow Rate (gpm)	571.28				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Native/Spud Mud				
Density (ppg) / Viscosity (spqt)	8.97 / 41.00				
Filtrate CL (ppm)	1,300.00				
pH / Fluid Loss (mptm)	9.00 / 4				
PV (cP) / YP (lbf2)	13 / 12.00				
% Solids / % Sand	8.50 / 1.25				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Max Tool Temp (degF) @ Depth (MD, ft)	175.01 @ 8,048.00				

Max Tool Temp (degF) / Source	175.21 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 175.21				
Lead MWD Engineer	Matt Busche				
Customer Representative	Sam Taylor				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.84				
Sub Serial Number	11404283				
Insert Serial Number	11400908				
Date and Time Initialized	22-Nov-13 09:48				
Date and Time Read	25-Nov-13 09:16				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	44.94				
Software Version	6.21				
Sub Serial Number	11404283				
Sonde Serial Number	11477984				
Sensor ID Number	N/A				
Toolface Offset (deg)	332.82				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	49.89				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404283				
Insert/Sonde Serial Number	11579809				

REMARKS

1. All depths are true vertical depths, referenced to the Driller's pipe tally and

are measured from the Kelly Bushing, unless otherwise specified.

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

3. All data presented is recorded data unless otherwise specified.

4. The final survey is projection at bit

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

PGRC (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

Insite version: 8.0

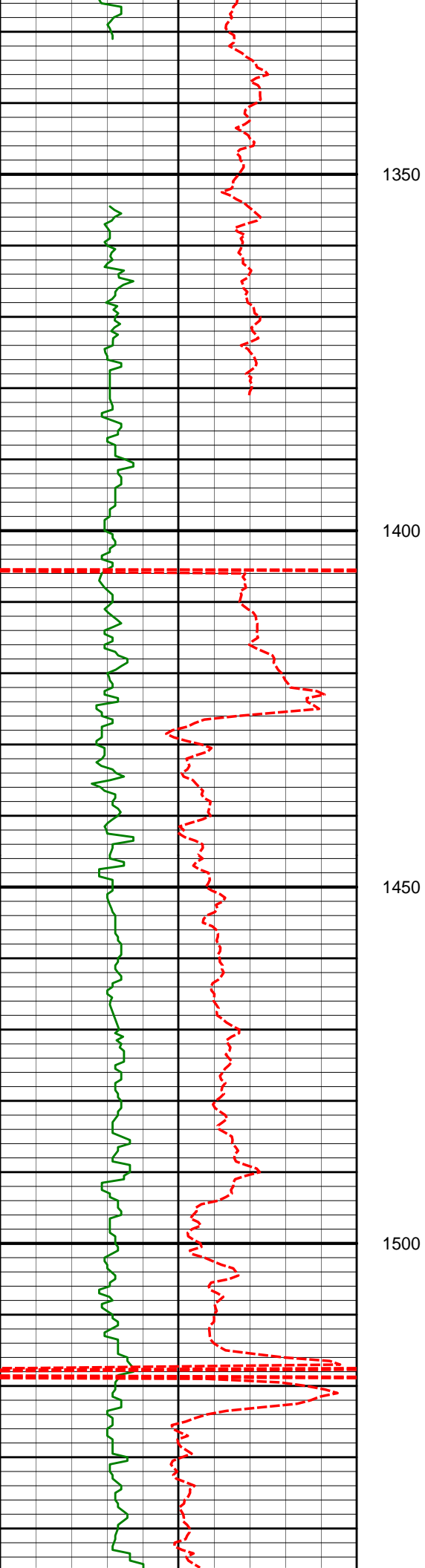
WARRANTY

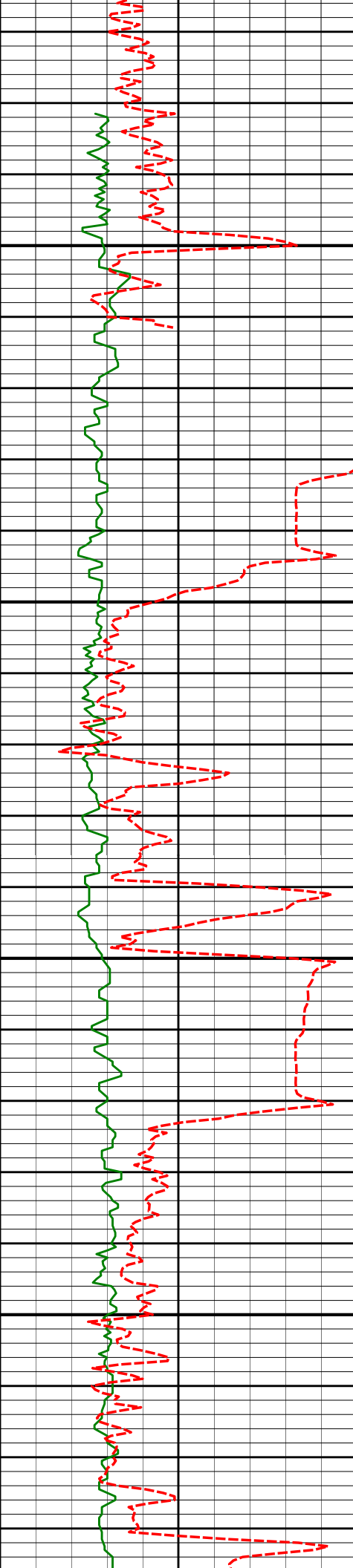
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HALLIBURTON

TVD Main Log 1:240

PCG Gamma Ray BCorr (PGRC) api0300					
Average Rate of Penetration (ROPA) feet per hr1K0		Depth			
		Depth	Inc	Azi	TVDV/S
		9.625" Casing Shoe @ 1245' MD / 1244.98' TVD			
		1250			
		1287'	0.04°	175.53°	1286.98'-5.64'
		1300			





1800

1850

1900

1950

1843'

0.93°

45.61°

1842.97'

-6.70'

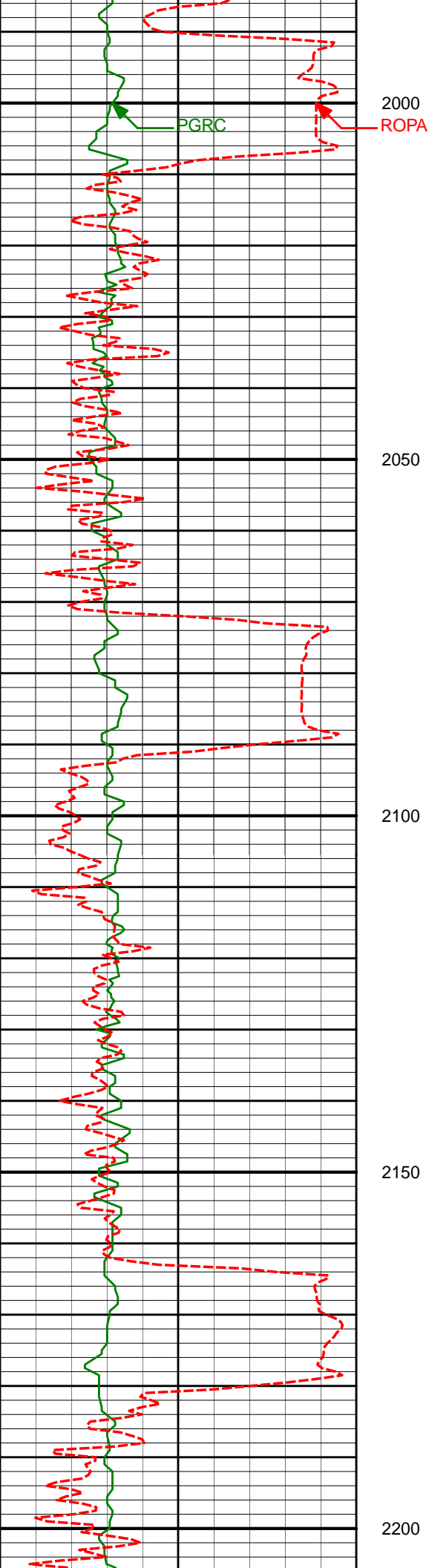
1934'

3.77°

46.59°

1933.88'

-9.26'



2026'

5.42°

47.99°

2025.59'

-14.24'

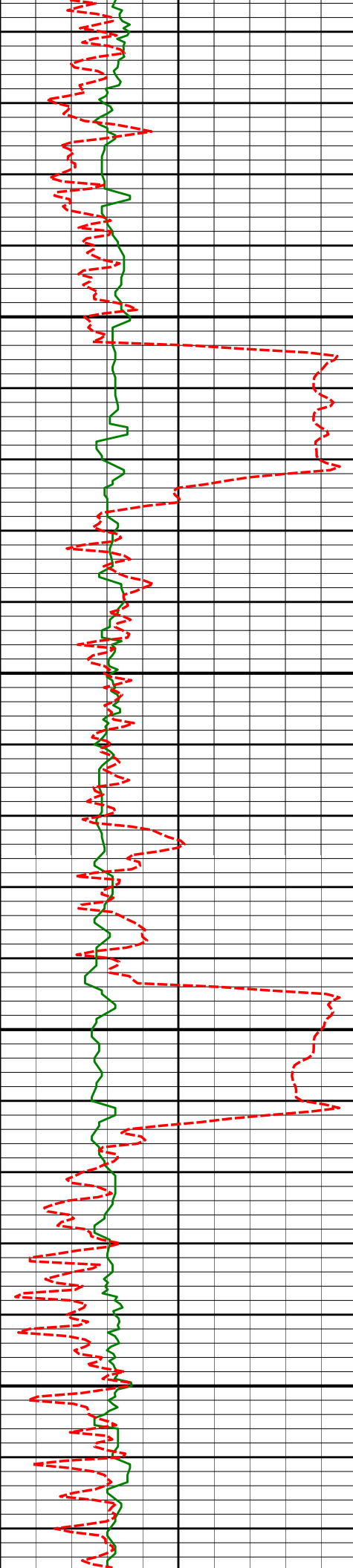
2118'

7.14°

48.84°

2117.03'

-20.89'



2250

2300

2350

2400

2210'

8.42°

43.03°

2208.18'

-29.56'

2302'

10.06°

44.39°

2298.99'

-40.20'

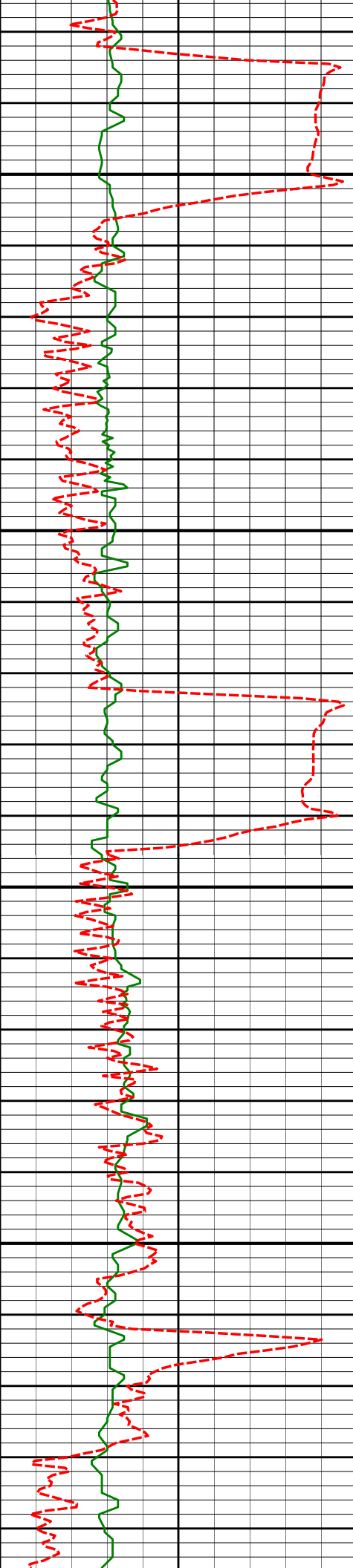
2393'

11.51°

46.96°

2388.38'

-52.04'



2450

2484'

12.69°

46.63°

2477.35'

-65.07'

2500

2550

2576'

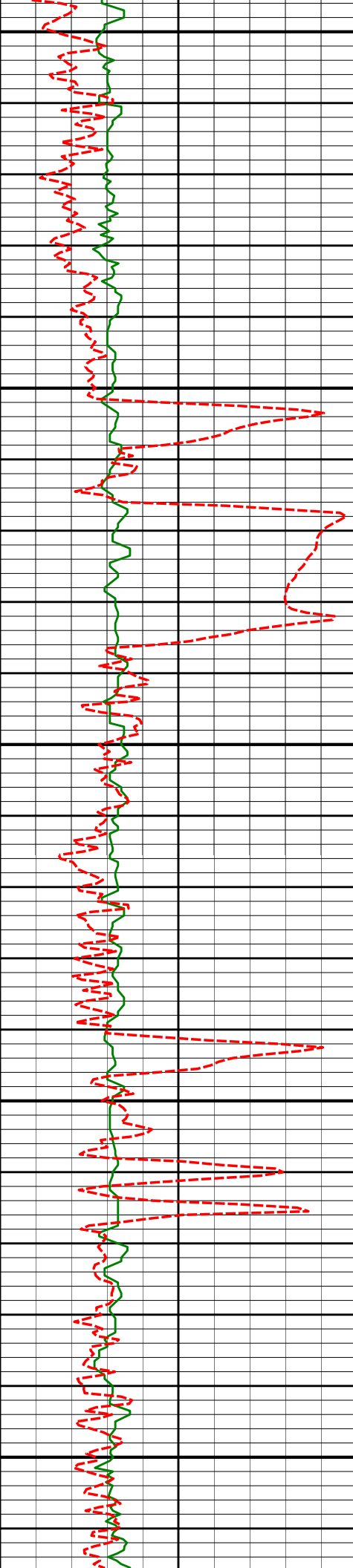
13.69°

46.49°

2566.93'

-79.47'

2600



2650

2668'

11.98°

46.24°

2656.62'

-93.53'

2700

2759'

13.80°

50.56°

2745.33'

-106.92'

2750

2800

2851'

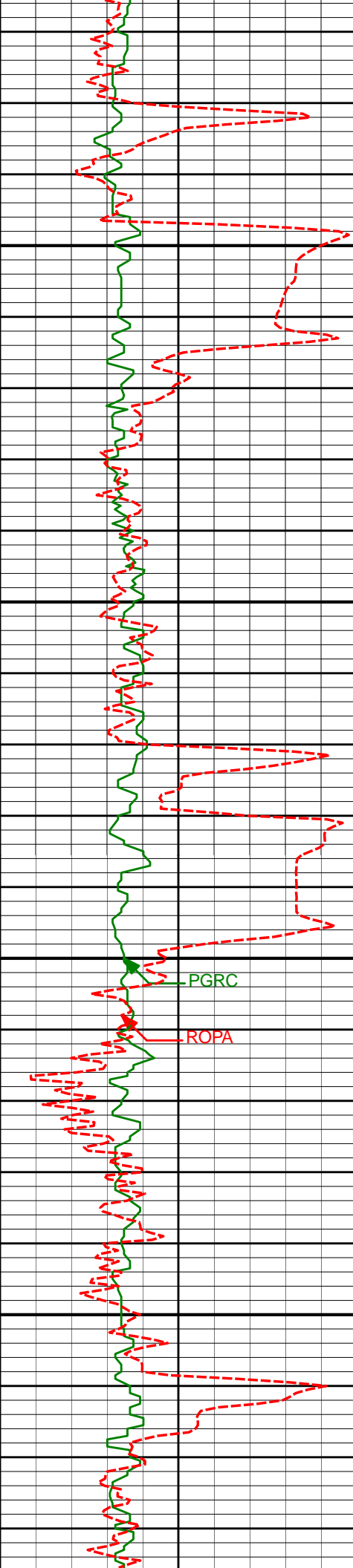
12.22°

48.33°

2834.96'

-120.33'

2850



2900

2943'

12.85°

51.27°

2924.77'

-133.17'

2950

3000

PGRC

ROPA

3035'

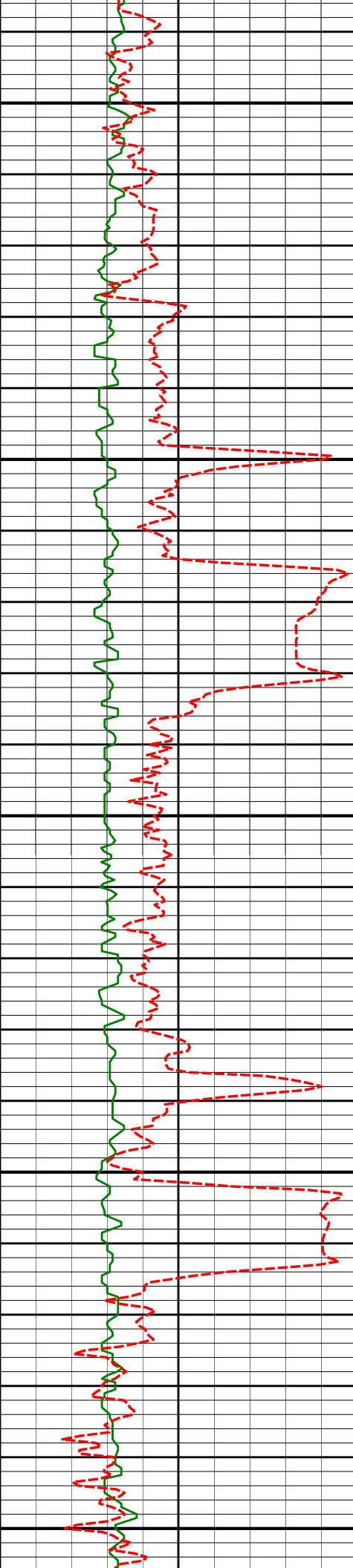
14.26°

51.18°

3014.21'

-146.63'

3050



3100

3126'

12.48°

50.67°

3102.74'

-159.85'

3150

3218'

14.10°

49.93°

3192.27'

-173.32'

3200

3250

3310'

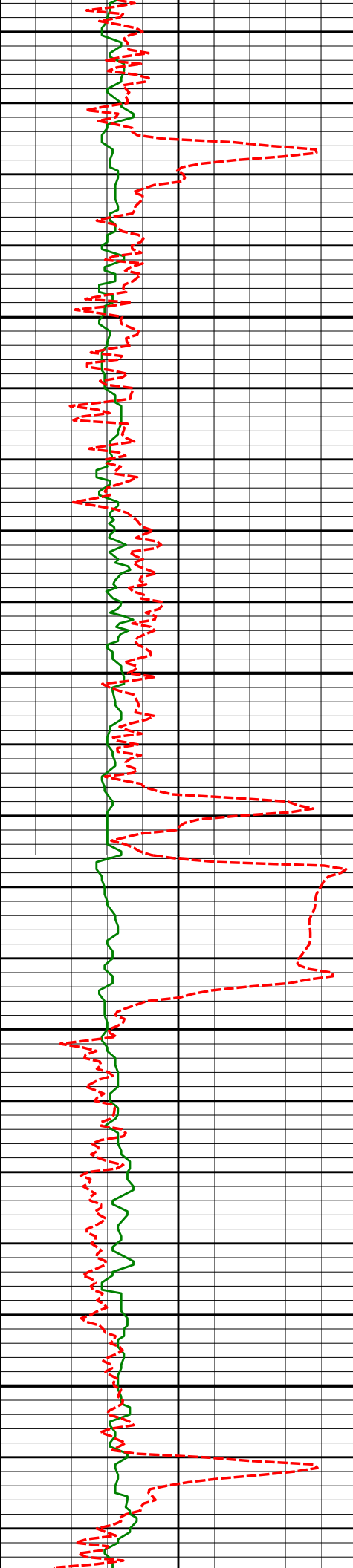
14.83°

49.53°

3281.35'

-188.14'

3300



3350

3405'

13.52°

47.78°

3373.46'

-203.45'

3400

3450

3500'

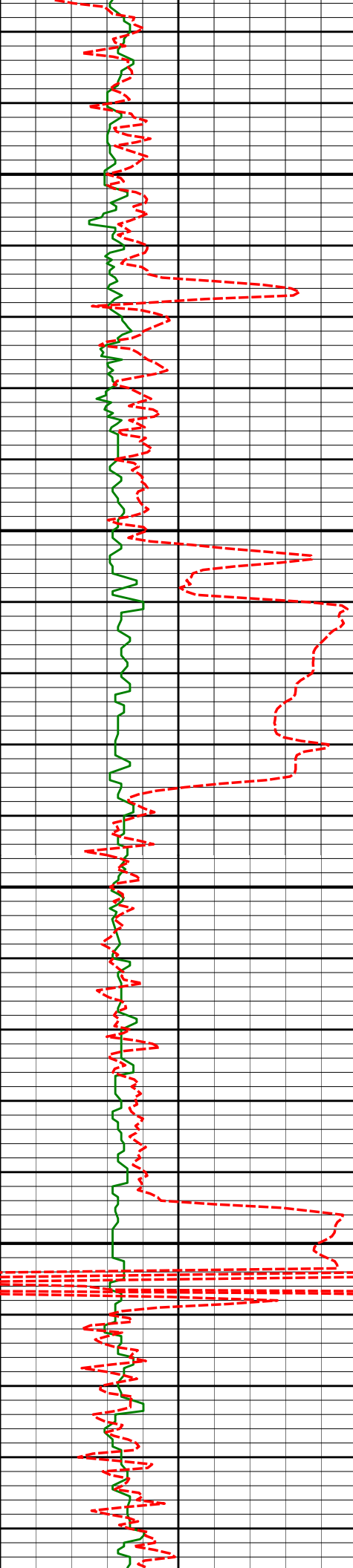
14.80°

48.60°

3465.57'

-218.89'

3500



3550

3595'

12.74°

45.19°

3557.84'

-234.26'

3600

3650

3691'

14.14°

51.49°

3651.21'

-248.98'

3700

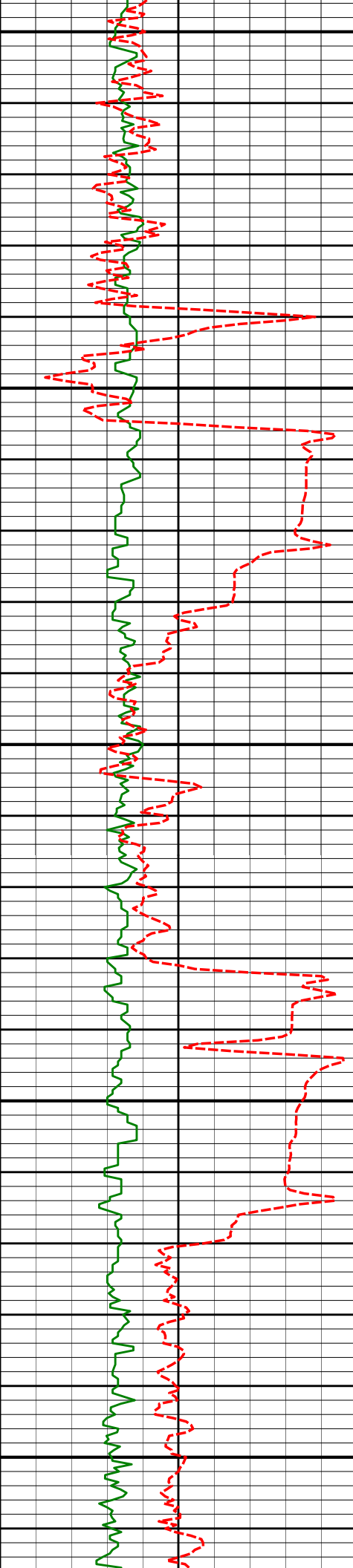
3786'

13.48°

48.12°

3743.47'

-263.56'



3750

3800

3850

3900

3950

3881'

13.00°

44.49°

3835.94'

-278.53'

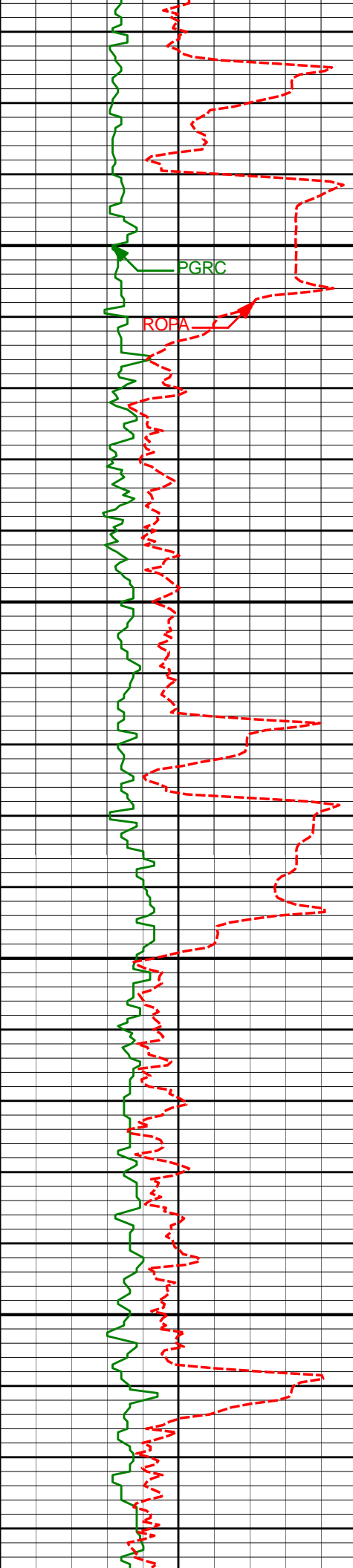
3976'

14.39°

48.83°

3928.24'

-293.89'



4000

PGRC

ROPA

4050

4100

4150

4071'

14.60°

48.13°

4020.22'

-309.61'

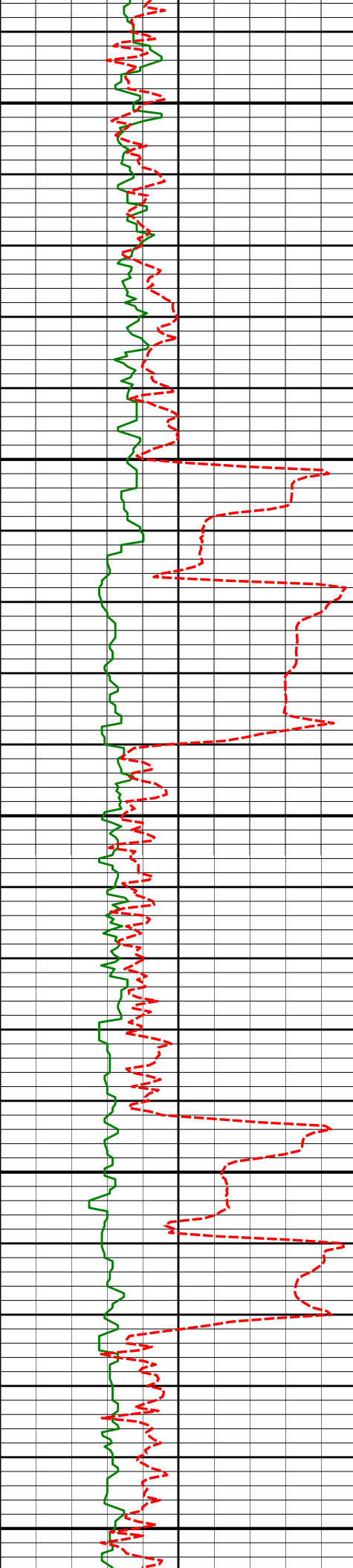
4166'

15.34°

47.74°

4111.99'

-326.01'



4200

4261'

13.08°

43.92°

4204.08'

-342.16'

4250

4300

4356'

14.86°

43.15°

4296.27'

-358.75'

4350

4400

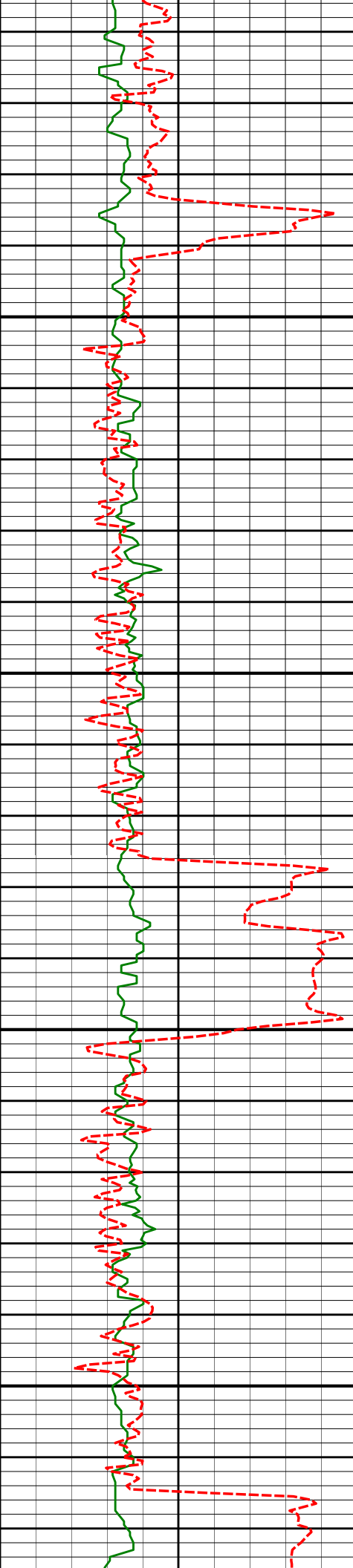
4451'

15.66°

44.67°

4387.92'

-376.72'



4450

4545'

14.12°

43.88°

4478.76'

-393.96'

4500

4550

4640'

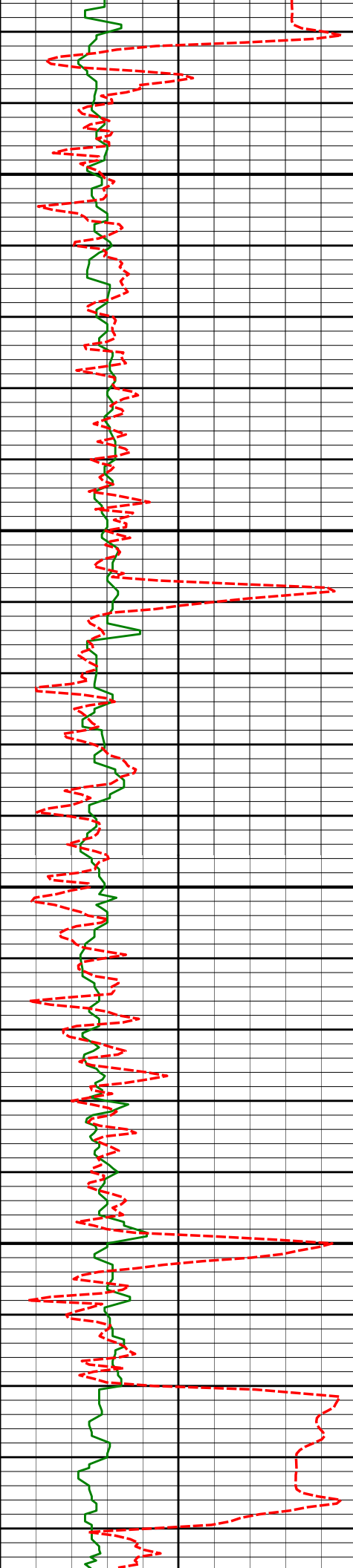
13.82°

44.27°

4570.95'

-410.40'

4600



4650

4736'

15.26°

46.99°

4663.87'

-427.19'

4700

4750

4831'

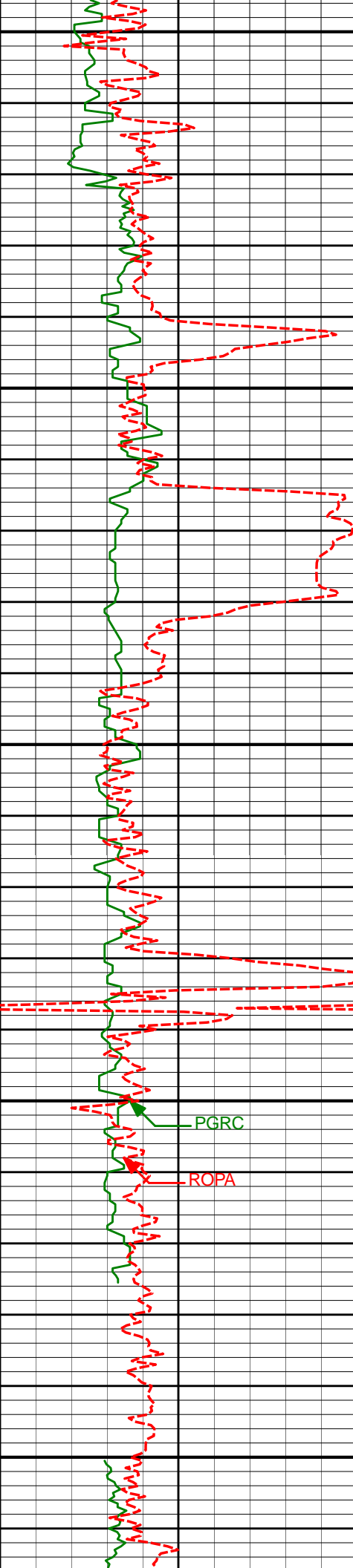
13.54°

43.46°

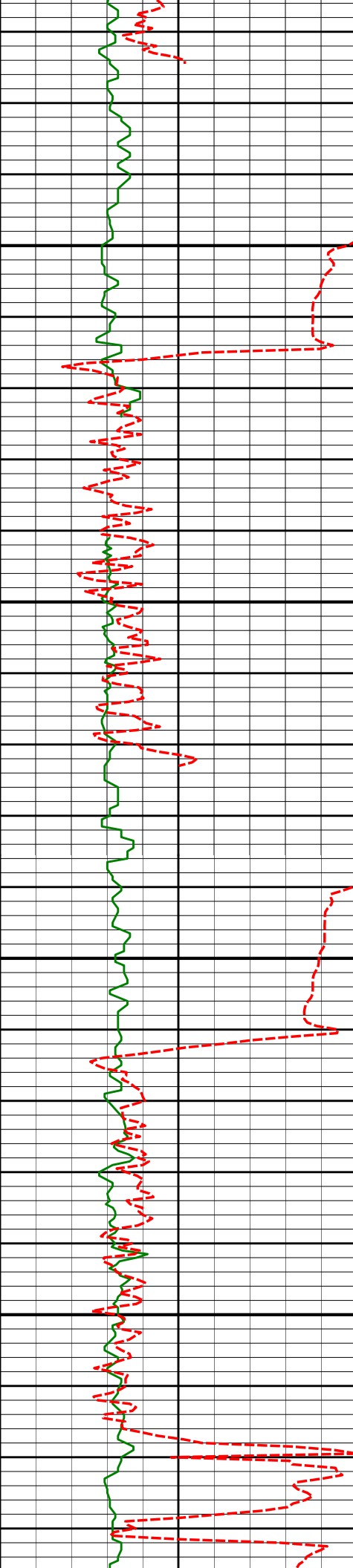
4755.89'

-443.75'

4800



4850	4926'	14.40°	44.72°	4848.08'	-460.18'
4900					
4950	5021'	15.13°	43.37°	4939.94'	-477.54'
5000					
5050	5116'	13.85°	42.15°	5031.92'	-494.95'



5100

5211'

13.75°

43.32°

5124.17'

-511.55'

5150

5200

5306'

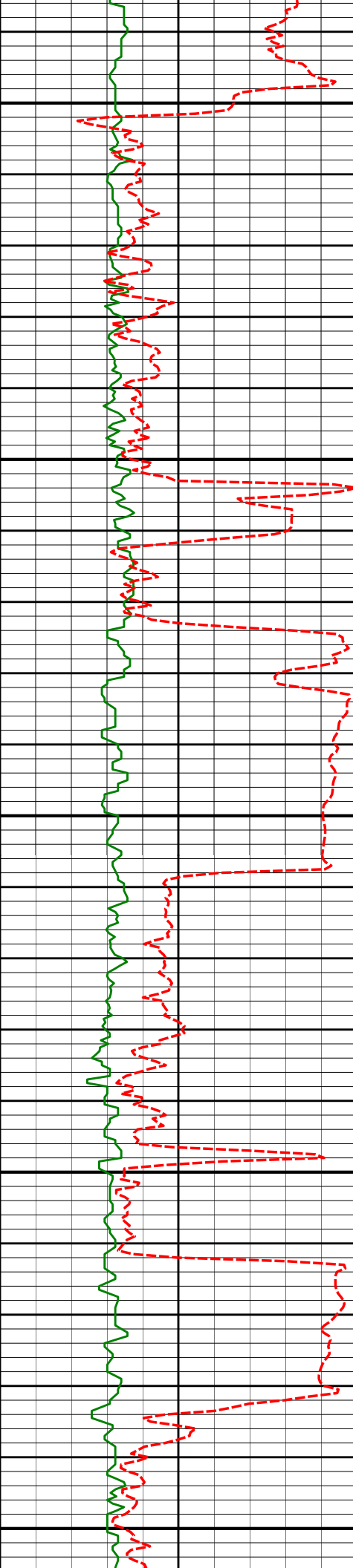
14.57°

47.00°

5216.29'

-527.88'

5250



5300

5401'

13.08°

47.04°

5308.53'

-543.31'

5350

5400

5496'

14.22°

46.16°

5400.85'

-558.68'

5450

5500

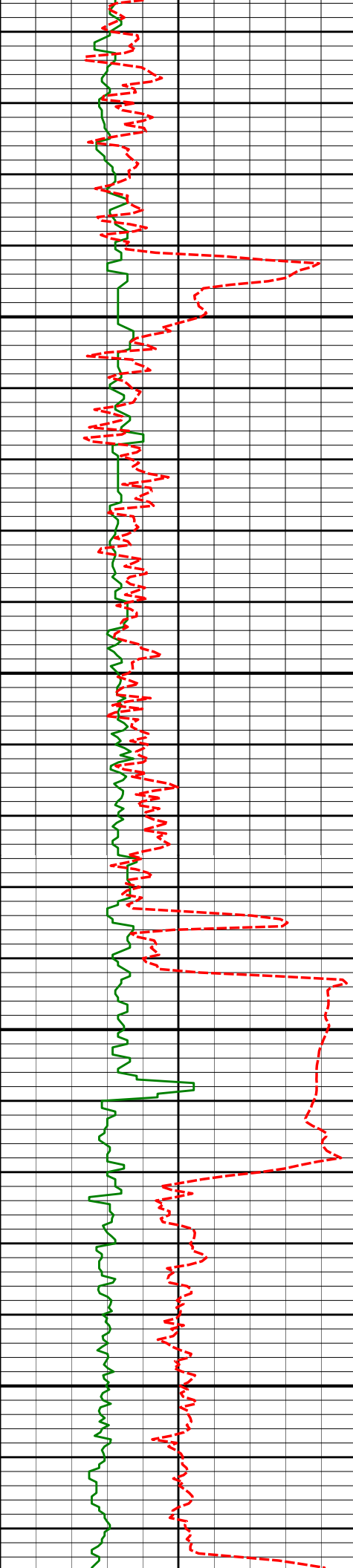
5592'

15.33°

47.74°

5493.67'

-575.34'



5550

5687'

12.20°

46.85°

5585.93'

-590.61'

5600

5650

5782'

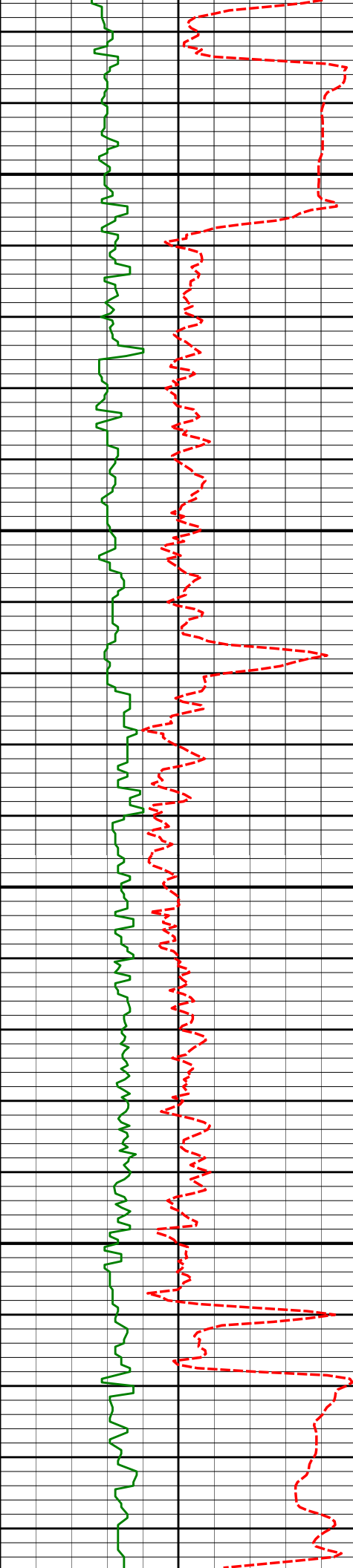
14.01°

51.99°

5678.46'

-604.52'

5700



5750

5877'

15.75°

50.30°

5770.27'

-619.79'

5800

5850

5972'

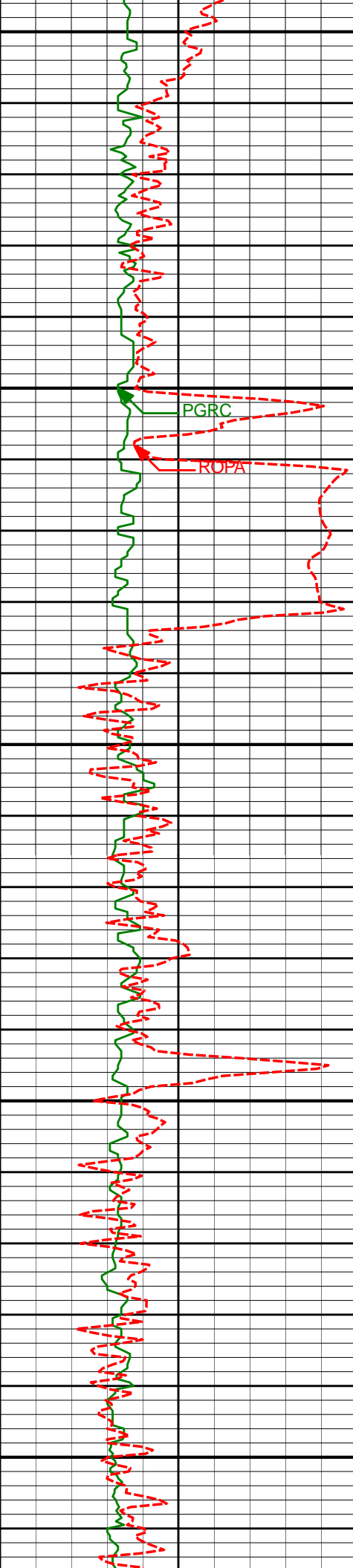
12.97°

46.54°

5862.30'

-635.32'

5900



5950

6067'

13.23°

47.84°

5954.82'

-649.91'

6000

PGRC

ROPA

6050

6162'

13.20°

48.11°

6047.31'

-664.41'

6100

6150

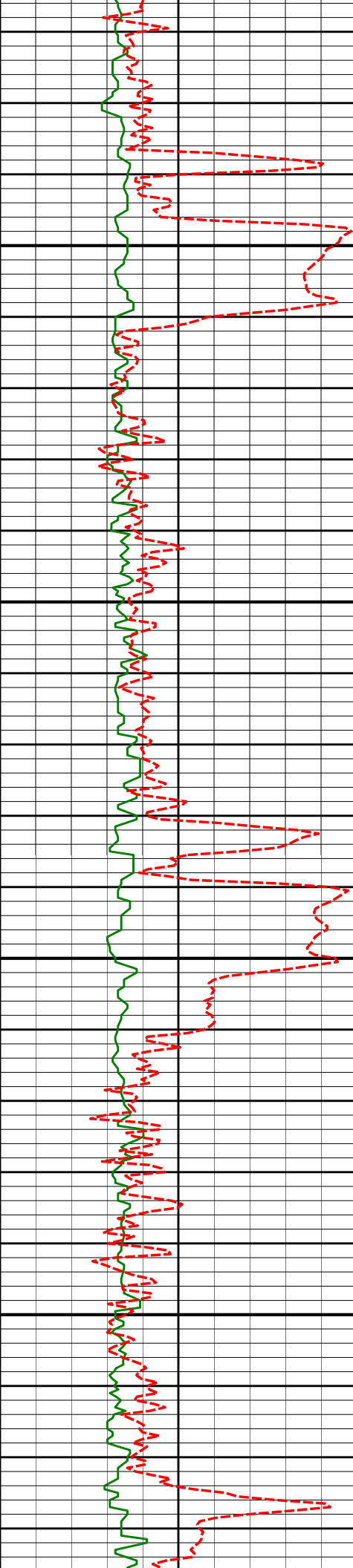
6257'

10.10°

42.50°

6140.34'

-677.76'



6200

6250

6300

6350

6353'

8.79°

40.59°

6235.04'

-689.52'

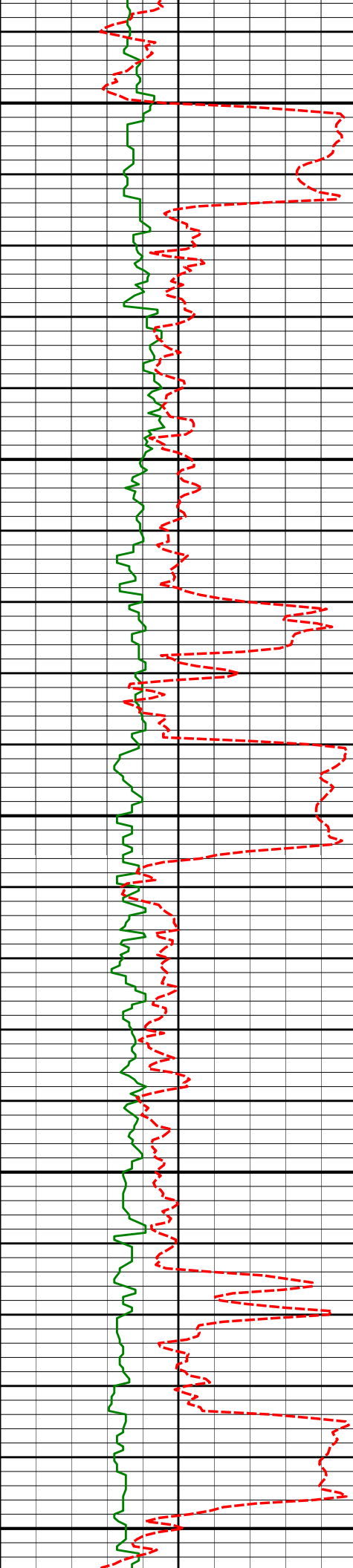
6448'

8.15°

41.28°

6329.00'

-700.07'



6400

6543'

7.13°

43.47°

6423.16'

-709.38'

6450

6500

6638'

5.21°

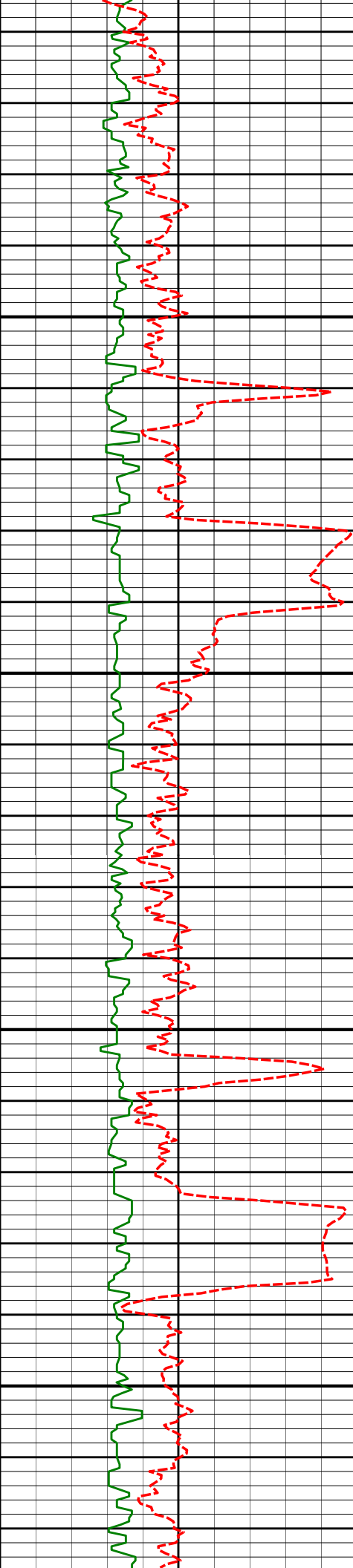
55.96°

6517.61'

-716.06'

6550

6600



6650

6700

6750

6800

6733'

3.67°

73.57°

6612.32'

-719.32'

6828'

1.63°

65.33°

6707.22'

-720.73'

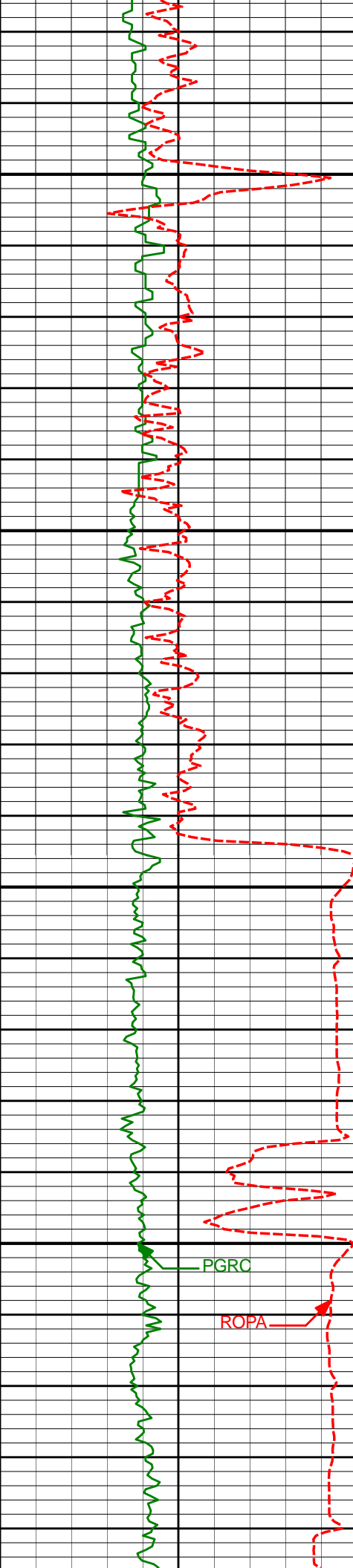
6923'

0.33°

30.32°

6802.20'

-721.53'



6850

6900

6950

7000

7018'

0.40°

8.48°

6897.20'

-722.09'

7066'

0.57°

174.79°

6945.20'

-722.02'

7113'

4.60°

182.30°

6992.14'

-719.90'

7161'

8.94°

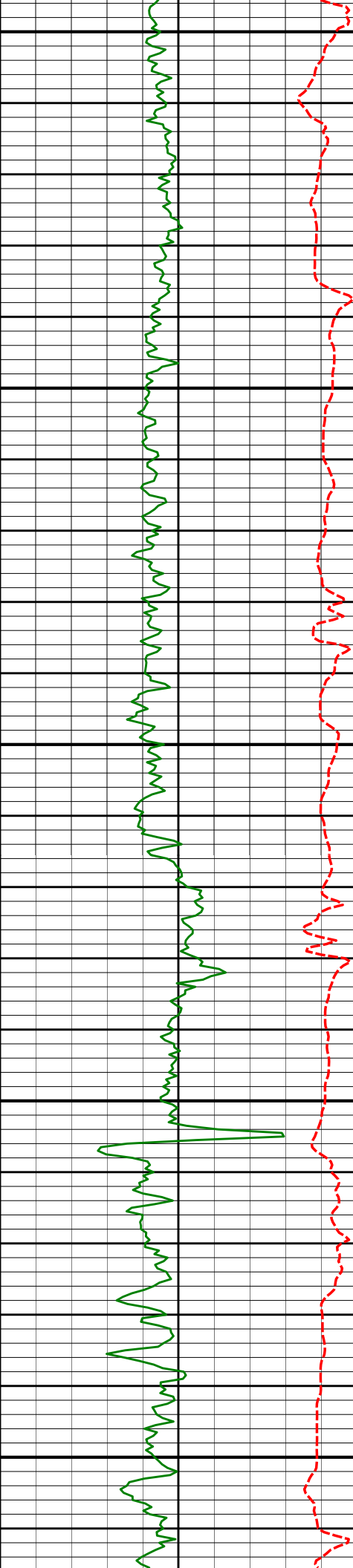
181.00°

7039.80'

-714.25'

PGRC

ROPA



7050

7100

7150

7200

7250

7209'

7257'

7304'

7352'

7399'

13.90°

18.83°

22.73°

27.45°

33.35°

180.64°

177.08°

175.48°

174.85°

175.88°

7086.83'

7132.87'

7176.81'

7220.27'

7260.79'

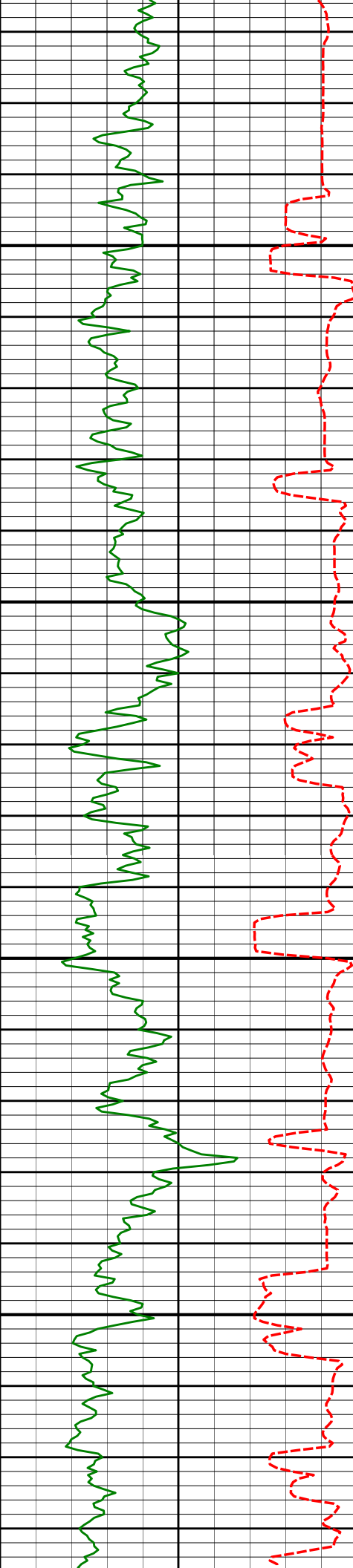
-704.75'

-691.24'

-674.60'

-654.32'

-630.62'



7300

7447'

37.77°

176.90°

7299.83'

-602.77'

7350

7494'

43.01°

176.02°

7335.61'

-572.38'

7400

7589'

51.35°

177.62°

7400.14'

-502.89'

7450

7637'

57.76°

178.50°

7427.96'

-463.82'

7684'

61.86°

180.16°

7451.59'

-423.21'

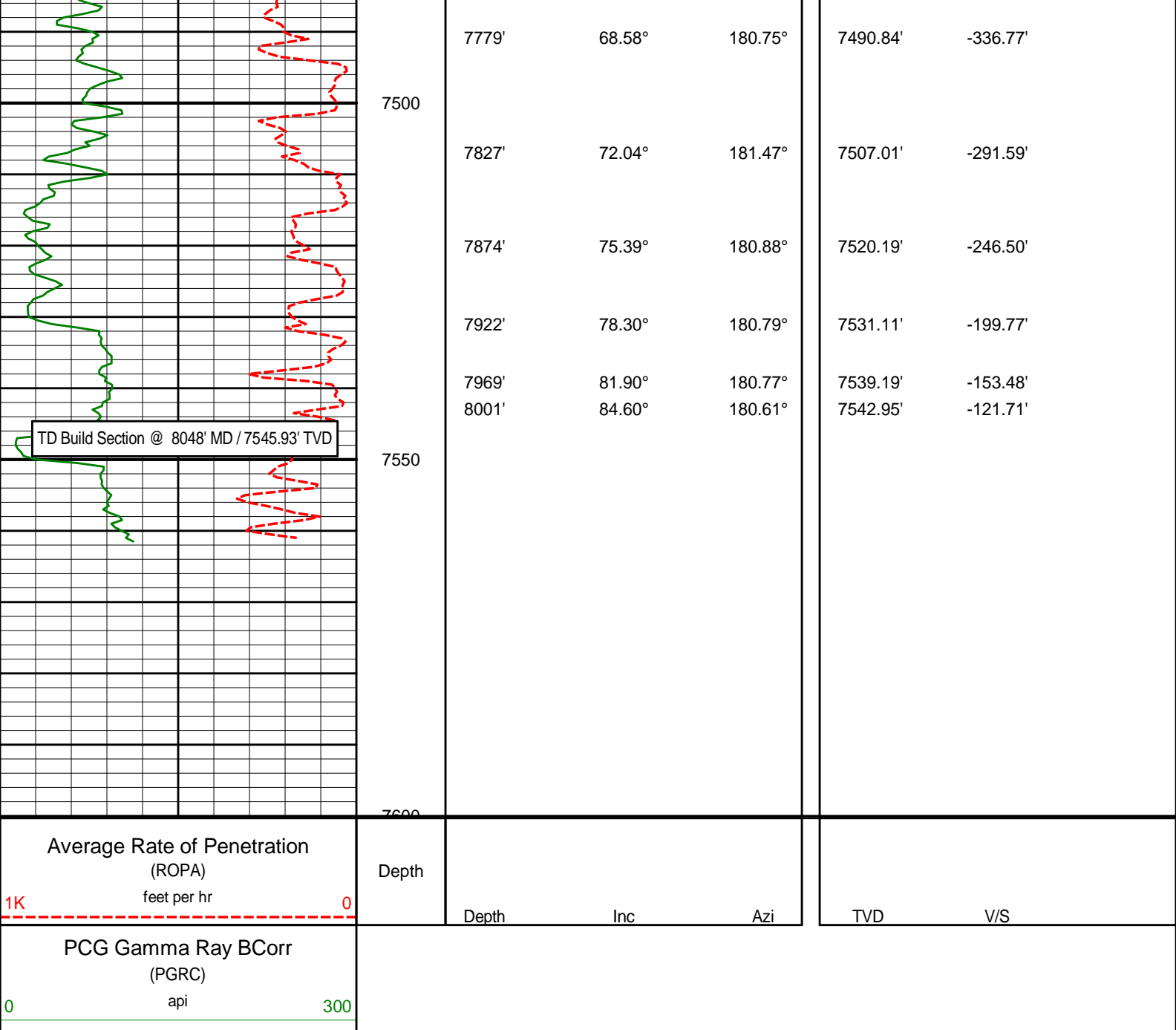
7732'

65.98°

180.99°

7472.69'

-380.11'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corporation
Highway 160 16C-2HZ
Wattenberg
Weld Colorado
USA
CA-XX-0900582949

2210.00	8.42	43.03	2208.18	29.61 N	22.72 E	-29.56	1.63
2302.00	10.06	44.39	2298.99	40.28 N	32.94 E	-40.20	1.80
2393.00	11.51	46.96	2388.38	52.15 N	45.14 E	-52.04	1.68
2484.00	12.69	46.63	2477.35	65.22 N	59.04 E	-65.07	1.30
2576.00	13.69	46.49	2566.93	79.65 N	74.28 E	-79.47	1.09
2668.00	11.98	46.24	2656.62	93.75 N	89.07 E	-93.53	1.86
2759.00	13.80	50.56	2745.33	107.18 N	104.28 E	-106.92	2.26
2851.00	12.22	48.33	2834.96	120.62 N	120.03 E	-120.33	1.80
2943.00	12.85	51.27	2924.77	133.50 N	135.28 E	-133.17	0.97
3035.00	14.26	51.18	3014.21	147.00 N	152.09 E	-146.63	1.53
3126.00	12.48	50.67	3102.74	160.26 N	168.43 E	-159.85	1.96
3218.00	14.10	49.93	3192.27	173.78 N	184.69 E	-173.32	1.77
3310.00	14.83	49.53	3281.35	188.63 N	202.23 E	-188.14	0.80
3405.00	13.52	47.78	3373.46	203.99 N	219.70 E	-203.45	1.45
3500.00	14.80	48.60	3465.57	219.47 N	237.03 E	-218.89	1.36
3595.00	12.74	45.19	3557.84	234.88 N	253.56 E	-234.26	2.33
3691.00	14.14	51.49	3651.21	249.64 N	270.25 E	-248.98	2.11
3786.00	13.48	48.12	3743.47	264.26 N	287.57 E	-263.56	1.10
3881.00	13.00	44.49	3835.94	279.28 N	303.31 E	-278.53	1.01
3976.00	14.39	48.83	3928.24	294.67 N	319.68 E	-293.89	1.82
4071.00	14.60	48.13	4020.22	310.43 N	337.48 E	-309.61	0.29
4166.00	15.34	47.74	4111.99	326.88 N	355.70 E	-326.01	0.79
4261.00	13.08	43.92	4204.08	343.07 N	372.46 E	-342.16	2.57
4356.00	14.86	43.15	4296.27	359.70 N	388.25 E	-358.75	1.88
4451.00	15.66	44.67	4387.92	377.71 N	405.59 E	-376.72	0.94
4545.00	14.12	43.88	4478.76	395.00 N	422.46 E	-393.96	1.65
4640.00	13.82	44.27	4570.95	411.47 N	438.41 E	-410.40	0.33
4736.00	15.26	46.99	4663.87	428.30 N	455.66 E	-427.19	1.66
4831.00	13.54	43.46	4755.89	444.91 N	472.45 E	-443.75	2.03
4926.00	14.40	44.72	4848.08	461.37 N	488.41 E	-460.18	0.96
5021.00	15.13	43.37	4939.94	478.78 N	505.24 E	-477.54	0.85
5116.00	13.85	42.15	5031.92	496.22 N	521.38 E	-494.95	1.39
5211.00	13.75	43.32	5124.17	512.86 N	536.76 E	-511.55	0.31
5306.00	14.57	47.00	5216.29	529.23 N	553.24 E	-527.88	1.28
5401.00	13.08	47.04	5308.53	544.70 N	569.85 E	-543.31	1.57
5496.00	14.22	46.16	5400.85	560.11 N	586.13 E	-558.68	1.22
5592.00	15.33	47.74	5493.67	576.81 N	604.03 E	-575.34	1.23
5687.00	12.20	46.85	5585.93	592.13 N	620.65 E	-590.61	3.30
5782.00	14.01	51.99	5678.46	606.08 N	637.04 E	-604.52	2.26
5877.00	15.75	50.30	5770.27	621.40 N	656.02 E	-619.79	1.89
5972.00	12.97	46.54	5862.30	636.97 N	673.68 E	-635.32	3.09
6067.00	13.23	47.84	5954.82	651.60 N	689.48 E	-649.91	0.41
6162.00	13.20	48.11	6047.31	666.14 N	705.61 E	-664.41	0.07
6257.00	10.10	42.50	6140.34	679.52 N	719.32 E	-677.76	3.47
6353.00	8.79	40.59	6235.04	691.30 N	729.78 E	-689.52	1.40
6448.00	8.15	41.28	6329.00	701.87 N	738.94 E	-700.07	0.68
6543.00	7.13	43.47	6423.16	711.21 N	747.44 E	-709.38	1.12
6638.00	5.21	55.96	6517.61	717.91 N	755.07 E	-716.06	2.45
6733.00	3.67	73.57	6612.32	721.18 N	761.57 E	-719.32	2.15
6828.00	1.63	65.33	6707.22	722.61 N	765.71 E	-720.73	2.18
6923.00	0.33	30.32	6802.20	723.41 N	767.08 E	-721.53	1.45
7018.00	0.40	8.48	6897.20	723.97 N	767.26 E	-722.09	0.16
7066.00	0.57	174.79	6945.20	723.90 N	767.31 E	-722.02	2.01
7113.00	4.60	182.30	6992.14	721.78 N	767.26 E	-719.90	8.59
7161.00	8.94	181.00	7039.80	716.13 N	767.11 E	-714.25	9.05
7209.00	13.90	180.64	7086.83	706.63 N	766.98 E	-704.75	10.33
7257.00	18.83	177.08	7132.87	693.12 N	767.31 E	-691.24	10.48
7304.00	22.73	175.48	7176.81	676.48 N	768.42 E	-674.60	8.38
7352.00	27.45	174.85	7220.27	656.21 N	770.14 E	-654.32	9.85
7399.00	33.35	175.88	7260.79	632.51 N	772.04 E	-630.62	12.60
7447.00	37.77	176.90	7299.83	604.66 N	773.79 E	-602.77	9.29
7494.00	43.01	176.02	7335.61	574.27 N	775.68 E	-572.38	11.21
7542.00	47.21	176.10	7369.48	540.36 N	778.01 E	-538.45	8.75
7589.00	51.35	177.62	7400.14	504.80 N	779.95 E	-502.89	9.14
7637.00	57.76	178.50	7427.96	465.74 N	781.26 E	-463.82	13.44
7684.00	61.86	180.16	7451.59	425.12 N	781.72 E	-423.21	9.24
7732.00	65.98	180.99	7472.69	382.02 N	781.29 E	-380.11	8.72
7779.00	68.58	180.75	7490.84	338.68 N	780.63 E	-336.77	5.55
7827.00	72.04	181.47	7507.01	293.50 N	779.75 E	-291.59	7.35
7874.00	75.39	180.88	7520.19	248.40 N	778.83 E	-246.50	7.23
7922.00	78.30	180.79	7531.11	201.67 N	778.15 E	-199.77	6.07
7969.00	81.90	180.77	7539.19	155.38 N	777.52 E	-153.48	7.66
8001.00	84.60	180.61	7542.95	123.61 N	777.13 E	-121.71	8.45
8047.00	88.58	180.70	7545.68	77.71 N	776.61 E	-75.81	8.65
8138.00	94.43	180.43	7545.68	4.23 S	775.98 E	-75.43	8.53

8129.00	91.42	180.18	7545.68	4.28 S	775.98 E	6.18	3.52
8199.00	91.29	179.59	7544.03	74.26 S	776.12 E	76.16	0.86
8295.00	91.02	178.82	7542.09	170.23 S	777.45 E	172.13	0.85
8390.00	90.96	178.04	7540.45	265.18 S	780.05 E	267.09	0.82
8484.00	90.96	180.02	7538.88	359.15 S	781.65 E	361.06	2.11
8579.00	88.61	179.69	7539.23	454.14 S	781.89 E	456.05	2.50
8675.00	89.63	180.55	7540.71	550.13 S	781.69 E	552.04	1.39
8770.00	89.44	180.09	7541.48	645.13 S	781.15 E	647.03	0.52
8865.00	89.88	179.99	7542.04	740.12 S	781.09 E	742.03	0.47
8960.00	90.25	179.07	7541.94	835.12 S	781.87 E	837.03	1.04

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 179.86 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.53 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 8960.00 FEET
IS 1144.00 FEET ALONG 136.89 DEGREES (TRUE)**

All directional surveys tied on to the last gyro survey at 1138.00' MD. Final survey is a straight-line projection to the bit.