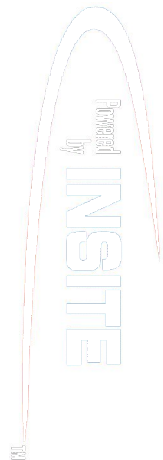


**PCGK - Pressure Case Gamma  
PCDC - Pressure Case Directional**

**1 : 240**

Country : USA	
Field : Wattenberg	
Location : Lat: 40° 5' 8.51" North Long: 104° 44' 25.13" West	
Well : Highway 160 38N-2HZ	
Company : Anadarko Petroleum Corporation	
Rig : Ensign 132	
LOCATION	<div> Company : Anadarko Petroleum Corporation  Rig : Ensign 132  Well : Highway 160 38N-2HZ  Field : Wattenberg  Country : USA  API Number : 05-123-38027 </div>
Latitude : 40° 5' 8.51" North Longitude : 104° 44' 25.13" West UTM Easting = 3,212,558,749 ft UTM Northing = 1,274,974,742 ft	Other Services <b>Directional Drilling</b>
Permanent Datum : Ground Level Log Measured From : Kelly Bushing Drilling Measured From : Kelly Bushing	Elevation : 5102.00 ft 13.00 ft Above Permanent Datum <b>TVD LOG</b>
Depth Logged : 13.00 ft To 7,133.70 ft Date Logged : 12-Nov-13 To 16-Nov-13 Total Depth MD : 7,905.00 ft TVD : 7,330.47 ft Spud Date : 12-Nov-13	Unit No. : 11210429 Job No. :CA-XX-0900754414 Plot Type : Final Plot Date : 21-Nov-13
Run No. : 0100 Size : 8.750 in From : 1,254.96 ft To : 6,711.26 ft Borehole Record (TVD)	Run No. : 0200 Size : 8.750 in From : 6,711.26 ft To : 7,330.29 ft Borehole Record (TVD)
Size : 9.625 in Weight : 0.00 lbpf From : SURFACE To : 1,249.96 ft Casing Record (TVD)	

**WELL INFORMATION**

MWD Run Number	100	200		
Date run completed	15-Nov-13	16-Nov-13		
Rig Bit Number	0100	0200		
Bit Size (in)	8.750	8.750		
Tool Nominal OD (in)	6.750	6.750		
Log Start Depth (TVD, ft)	1,254.96	6,711.26		
Log End Depth (TVD, ft)	6,711.26	7,330.29		
Drill or Wipe	Drill	Drill		
Drill/Wipe Start Date and Time	13-Nov-13 06:15	14-Nov-13 22:00		
Drill/Wipe End Date and Time	14-Nov-13 20:20	14-Nov-13 22:00		
Min Inc (deg) @ Depth (TVD, ft)	0.31 @ 6,705.26	1.57 @ 6,752.26		
Max Inc (deg) @ Depth (TVD, ft)	21.18 @ 4,410.55	90.20 @ 7,330.29		
Bit TFA(in2) / Bit Type	N/A / PDC	N/A / PDC		
Flow Rate (gpm)	562.30	517.65		
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A		
Fluid Type	Other	Other		
Density (ppg) / Viscosity (spqt)	8.50 / 28.00	10.10 / 39.00		
Filtrate CL (ppm)	1,200.00	1,200.00		
pH / Fluid Loss (mptm)	9.00 / 18	9.00 / 4		
PV (cP) / YP (lbf2)	1 / 4.00	12 / 11.00		
% Solids / % Sand	5.50 / 1.00	6.70 / 1.25		
% 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 (degF) / Source	163.20 / PCM	170.37 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Matt Busche	Matt Busche			
Customer Representative					

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.84			
Sub Serial Number	11404283	11404283			
Insert Serial Number	11227549	11400908			
Date and Time Initialized	12-Nov-13 14:46	14-Nov-13 23:28			
Date and Time Read	15-Nov-13 09:33	17-Nov-13 11:02			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	44.73	47.00			
Software Version	6.21	6.21			
Sub Serial Number	11404283	11404283			
Sonde Serial Number	11833053	11477984			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	200.89	350.30			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.68	49.94			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11404283	11404283			
Insert/Sonde Serial Number	11681022	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. From 1650' -2280' data gaps due to high ROP
5. The final survey is projection at bit
6. 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

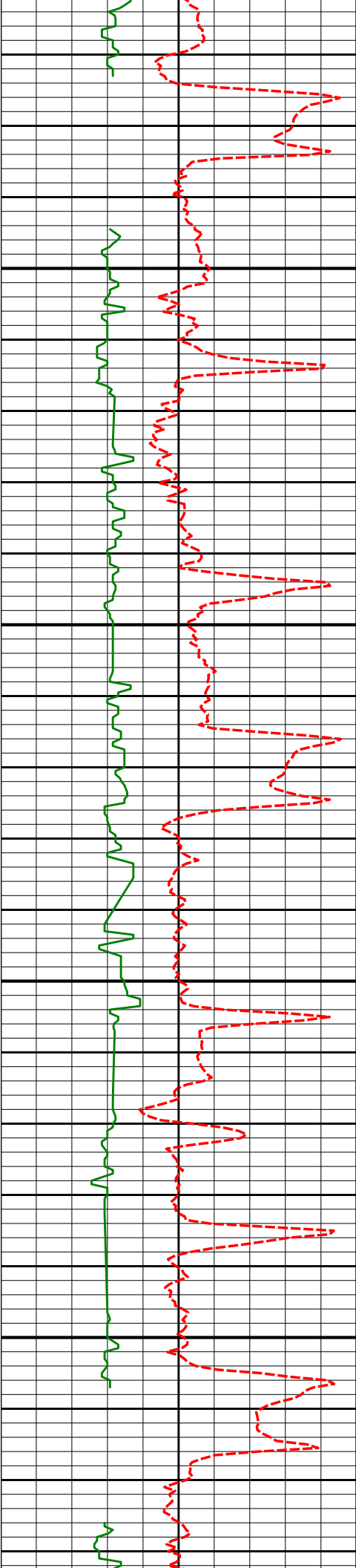
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HALLIBURTON

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
		1650			
		1661'	5.79°	62.20°	1660.46'-8.29'
		1700			



1750

1752'

7.90°

60.97°

1750.80'

-13.23'

1800

1850

1900

1844'

9.83°

62.99°

1841.70'

-19.55'

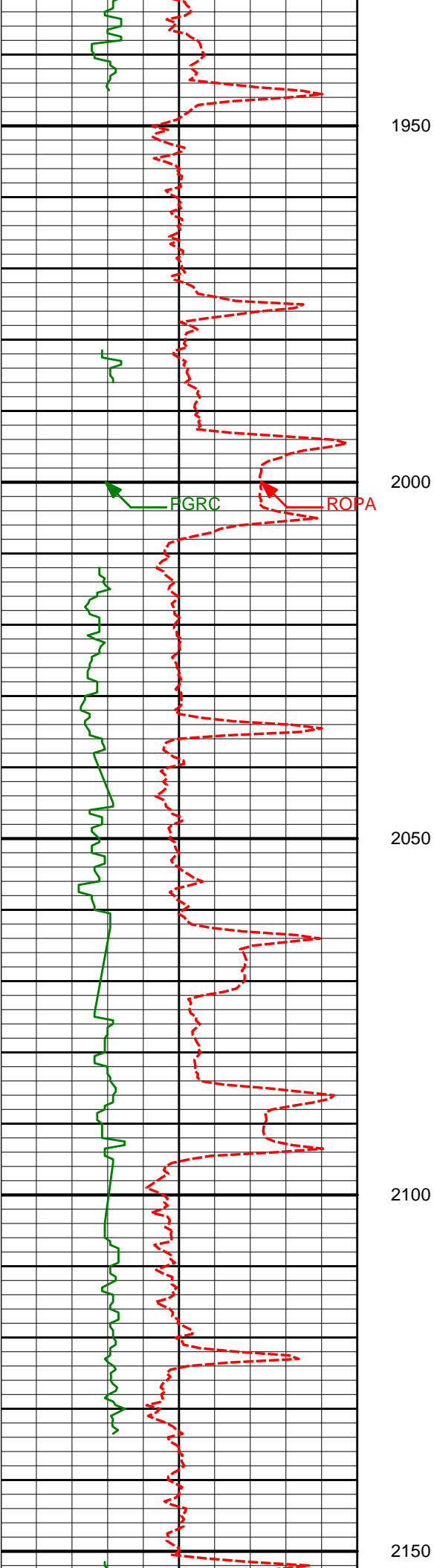
1935'

12.28°

63.11°

1931.00'

-27.07'



2027'

14.55°

59.67°

2020.49'

-36.87'

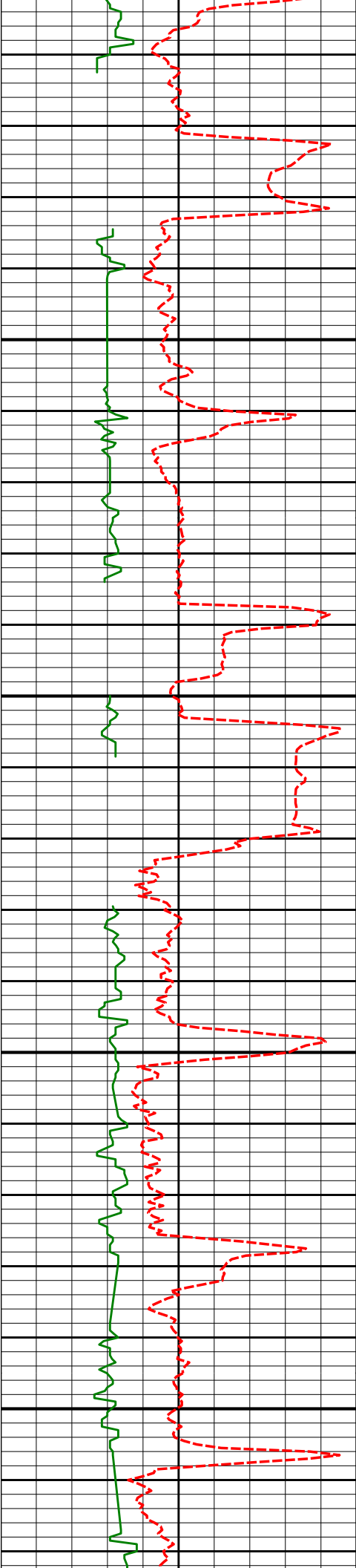
2119'

15.84°

55.37°

2109.28'

-49.33'



2200

2250

2300

2350

2211'

17.36°

57.46°

2197.44'

-63.30'

2303'

17.89°

63.74°

2285.13'

-76.33'

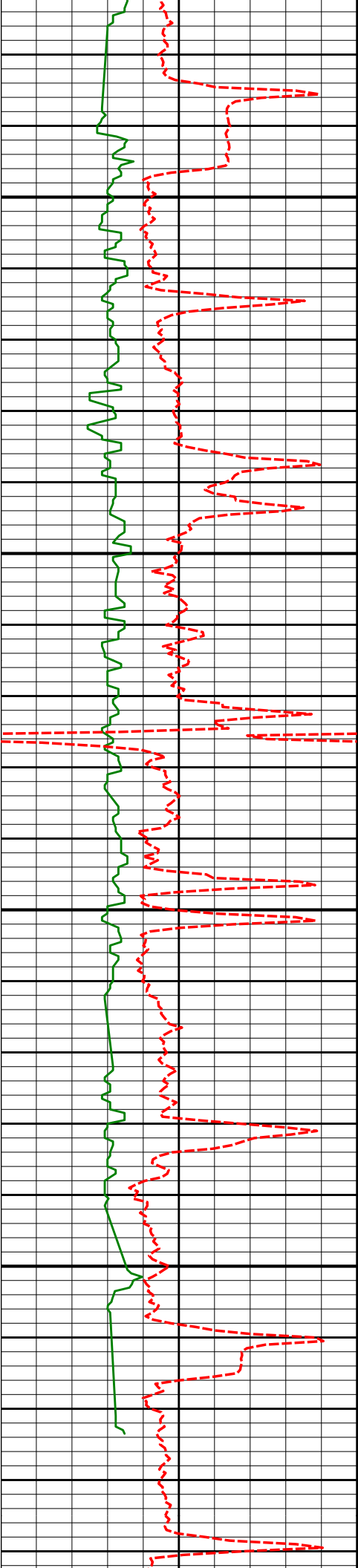
2394'

17.84°

61.30°

2371.74'

-88.59'



2400

2450

2500

2550

2485'

17.87°

61.84°

2458.36'

-101.26'

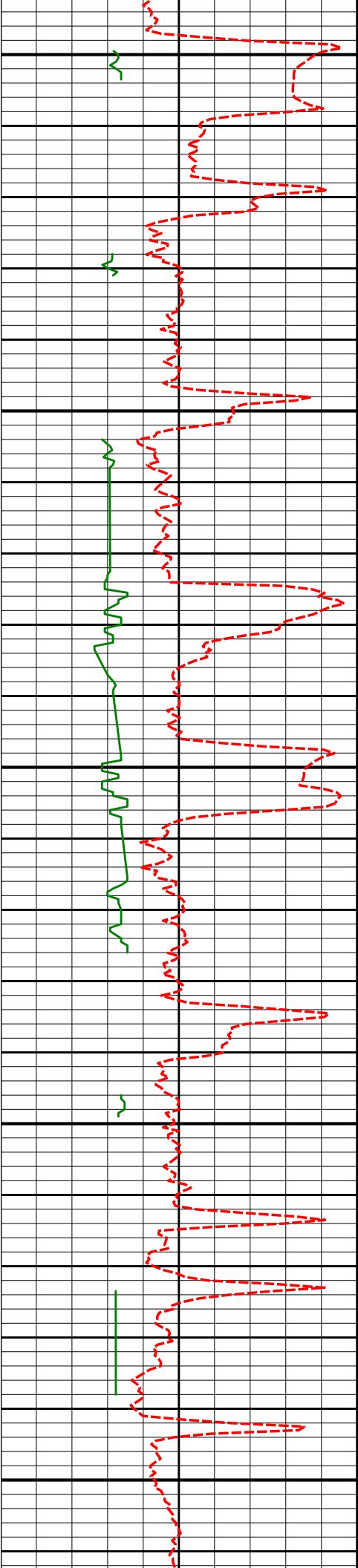
2577'

17.25°

61.71°

2546.07'

-113.77'



2600

2650

2700

2750

2800

2669'

18.61°

64.72°

2633.61'

-125.88'

2760'

19.87°

63.70°

2719.52'

-138.26'

2852'

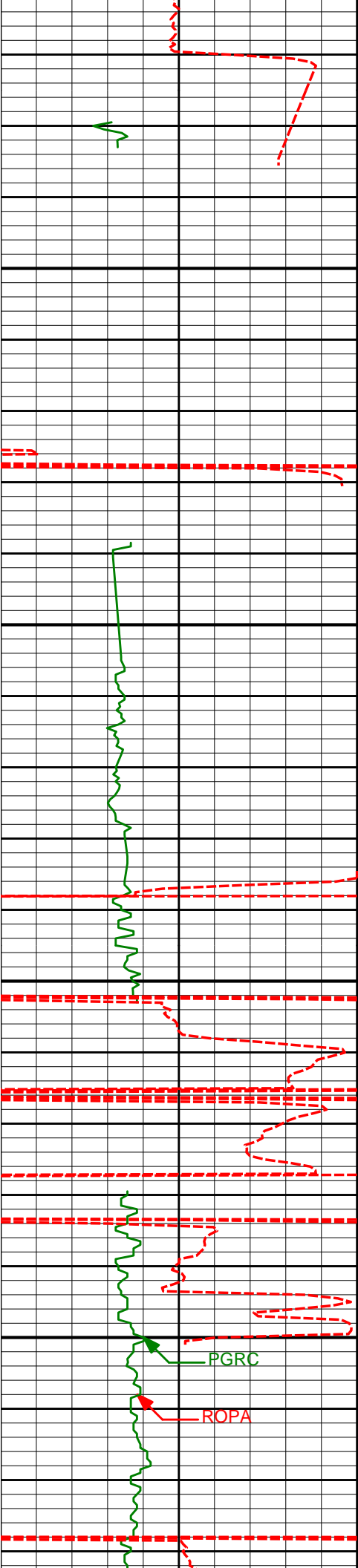
19.39°

63.06°

2806.17'

-151.42'





2850

2900

2950

3000

2944'

18.88°

63.73°

2893.09'

-164.26'

3036'

19.02°

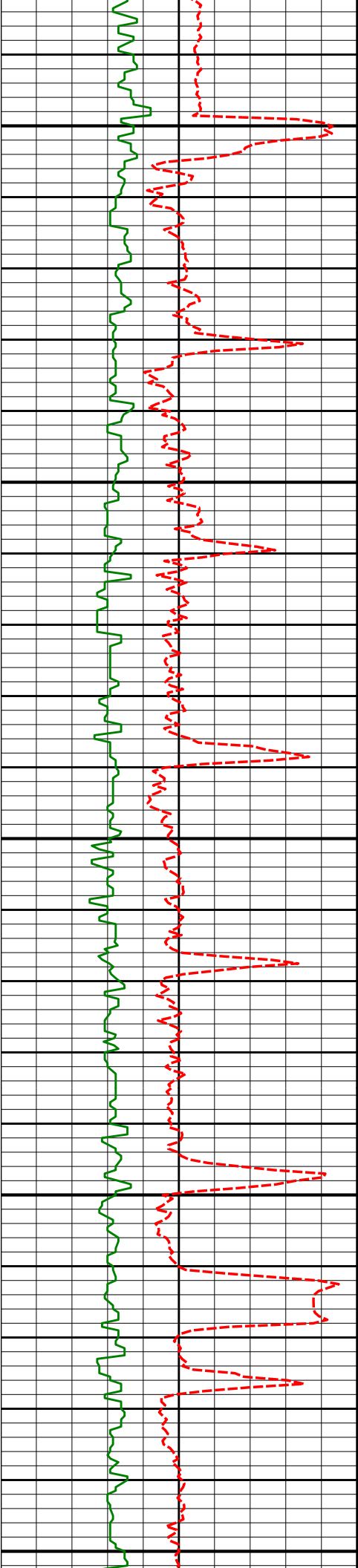
60.73°

2980.11'

-177.51'

PGRC

ROPA



3050

3127'

18.61°

60.80°

3066.24'

-191.21'

3100

3188'

18.41°

60.86°

3124.09'

-200.23'

3150

3249'

18.04°

59.50°

3182.03'

-209.30'

3200

3311'

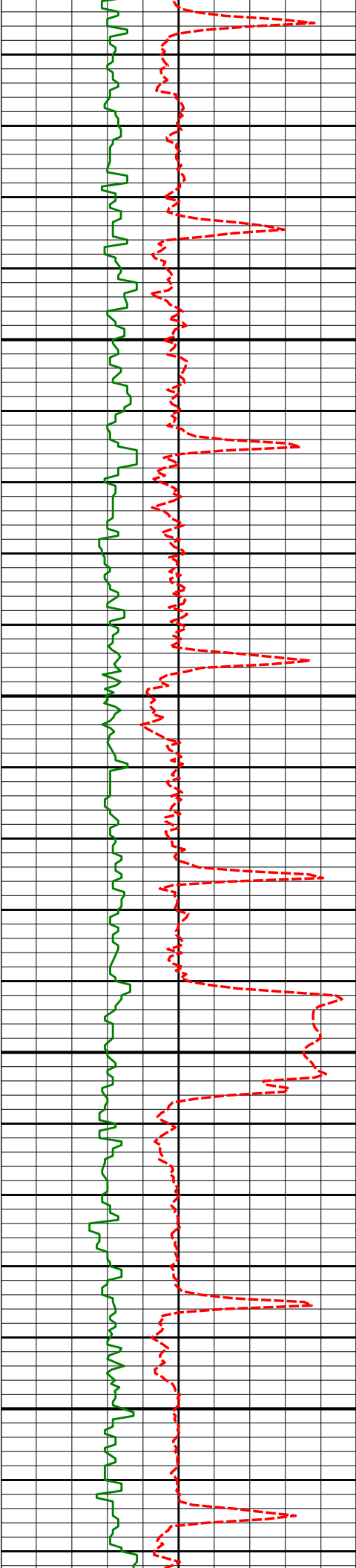
18.64°

58.80°

3240.88'

-218.89'

3250



3300

3350

3400

3450

3406'

17.66°

57.09°

3331.15'

-233.95'

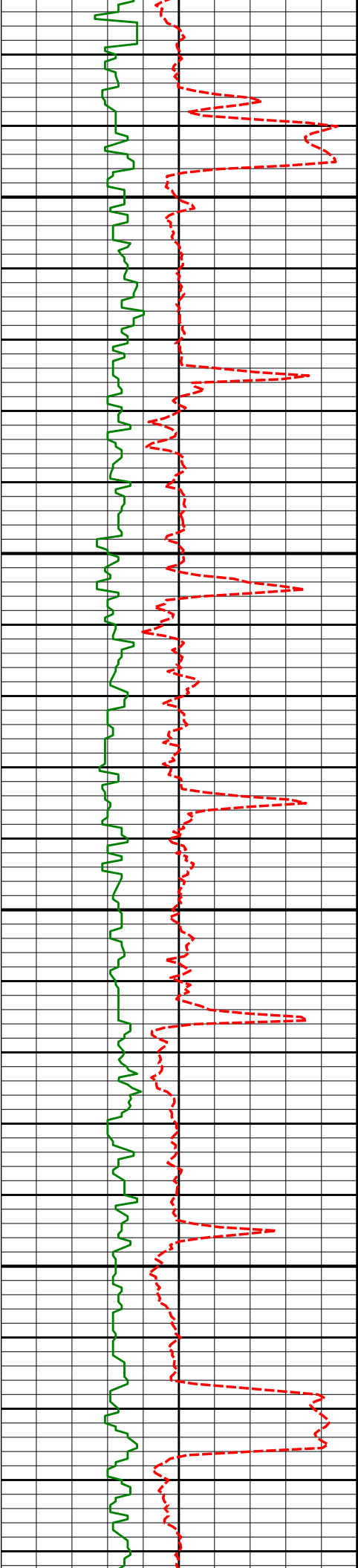
3501'

19.35°

58.26°

3421.24'

-249.43'



3500

3596'

19.65°

59.68°

3510.79'

-265.09'

3550

3600

3691'

18.84°

57.22°

3600.48'

-280.79'

3650

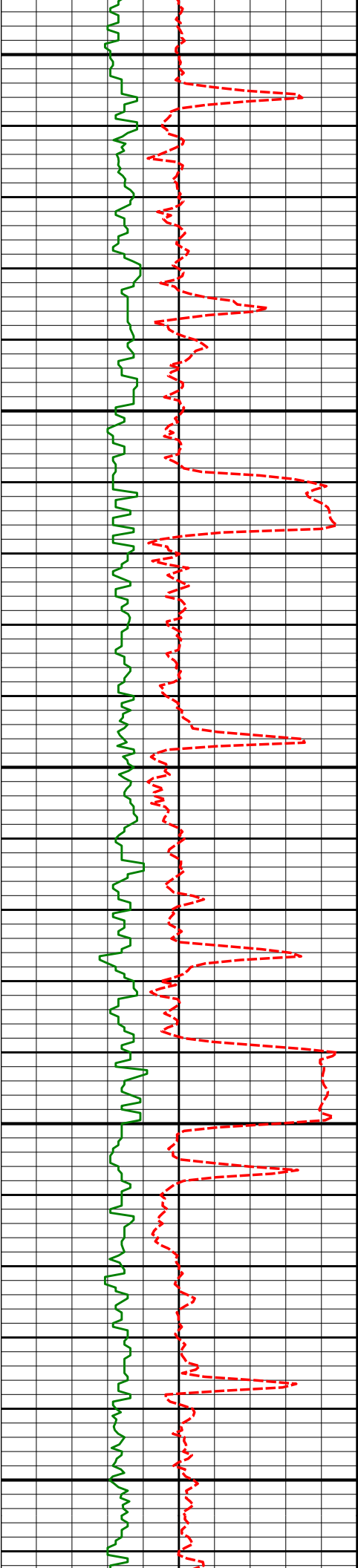
3786'

18.12°

60.12°

3690.59'

-295.81'



3700

3750

3800

3850

3900

3882'

18.27°

58.50°

3781.79'

-310.47'

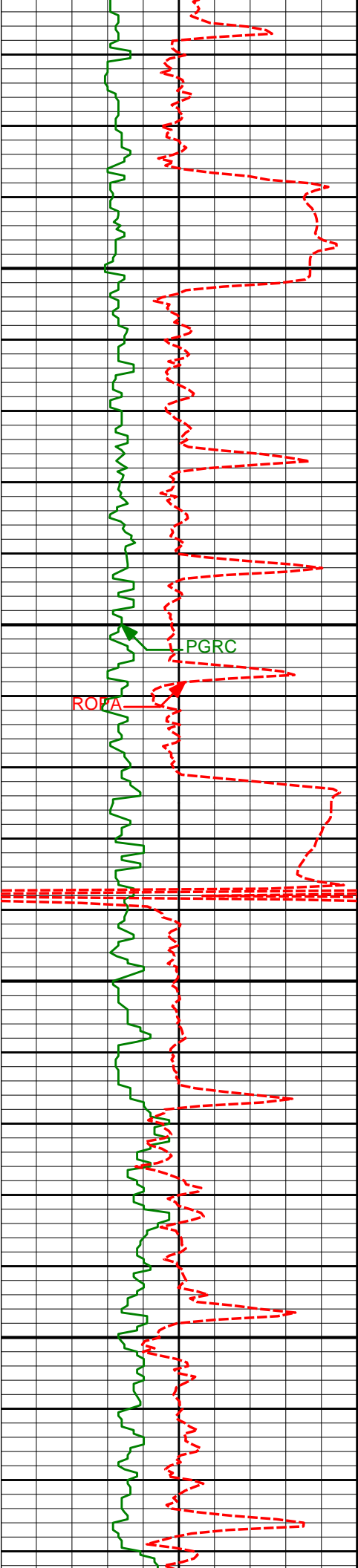
3977'

18.57°

60.05°

3871.92'

-325.16'



3950

4072'

18.69°

59.68°

3961.94'

-339.73'

4000

PGRC

ROFA

4050

4167'

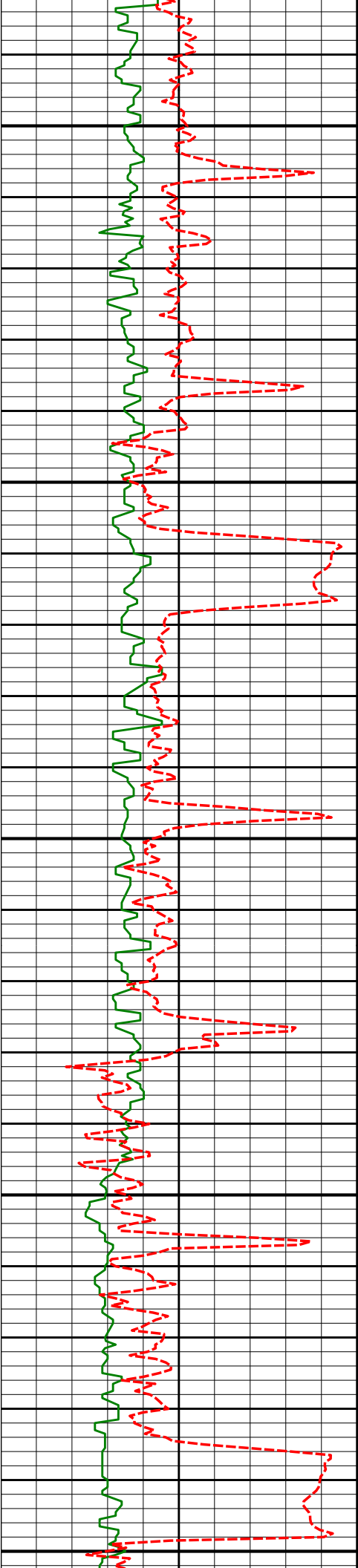
20.44°

59.17°

4051.46'

-355.24'

4100



4150

4200

4250

4300

4350

4262'

19.00°

56.75°

4140.88'

-371.54'

4389'

19.01°

55.40°

4260.96'

-393.77'

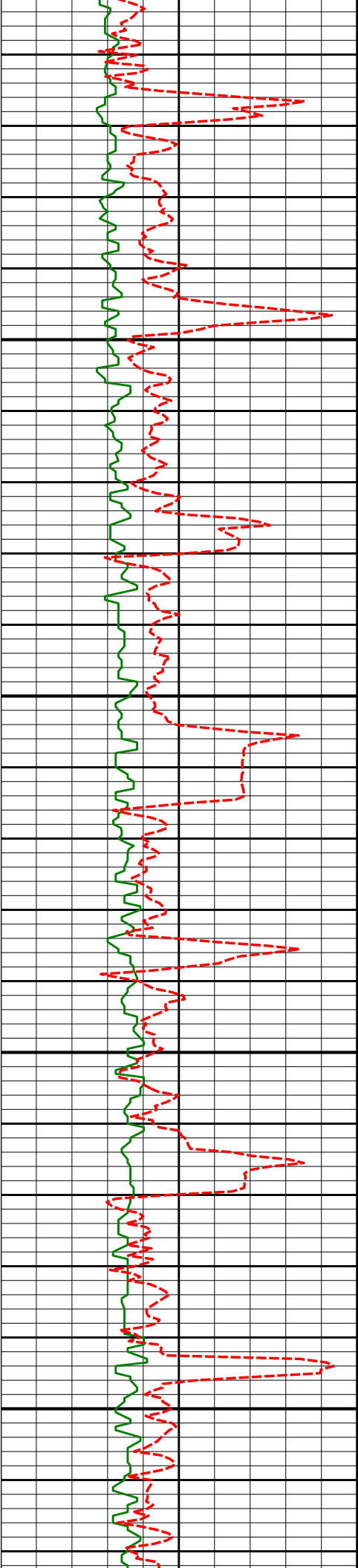
4453'

19.30°

54.44°

4321.42'

-405.41'



4400

4548'

21.18°

57.86°

4410.55'

-422.98'

4450

4500

4643'

19.74°

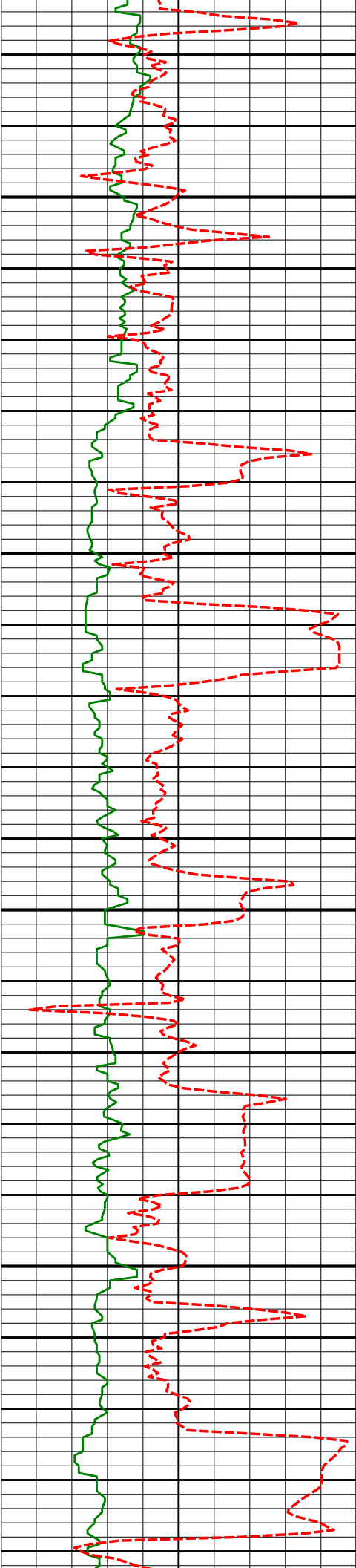
55.98°

4499.56'

-440.39'

4550





4600

4650

4700

4750

4738'

18.25°

53.49°

4589.38'

-457.59'

4834'

17.88°

54.11°

4680.65'

-474.57'

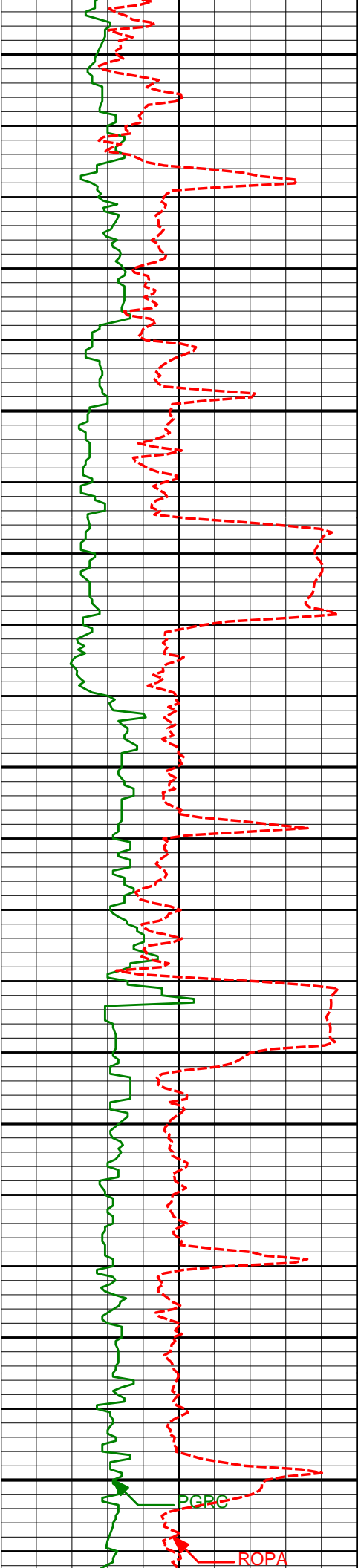
4929'

17.25°

53.67°

4771.22'

-490.89'



4800

4850

4900

4950

5000

5024'

17.27°

57.98°

4861.94'

-506.13'

5119'

18.30°

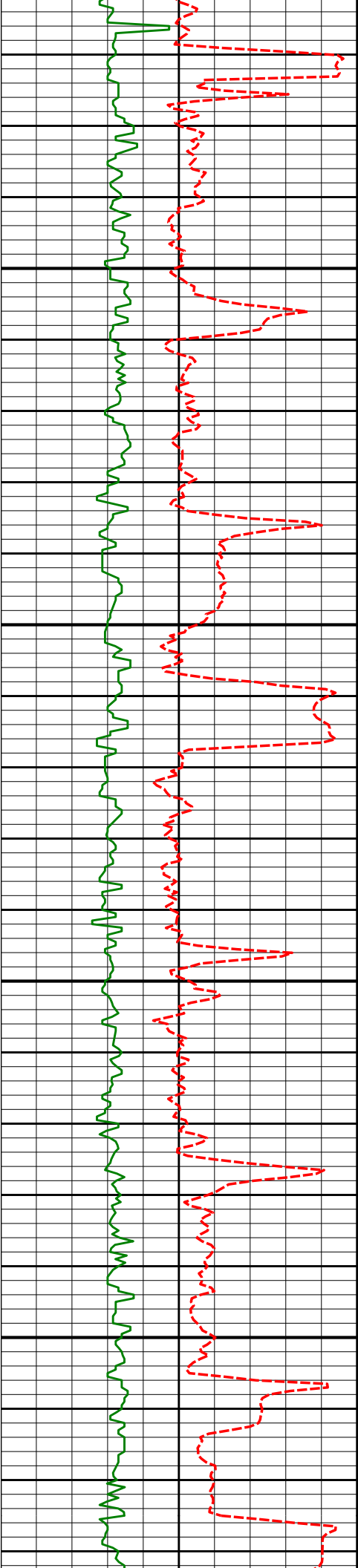
61.57°

4952.40'

-520.08'

PGRC

ROPA



5050

5100

5150

5200

5214'

18.56°

65.23°

5042.53'

-532.85'

5341'

18.13°

62.69°

5163.08'

-549.49'

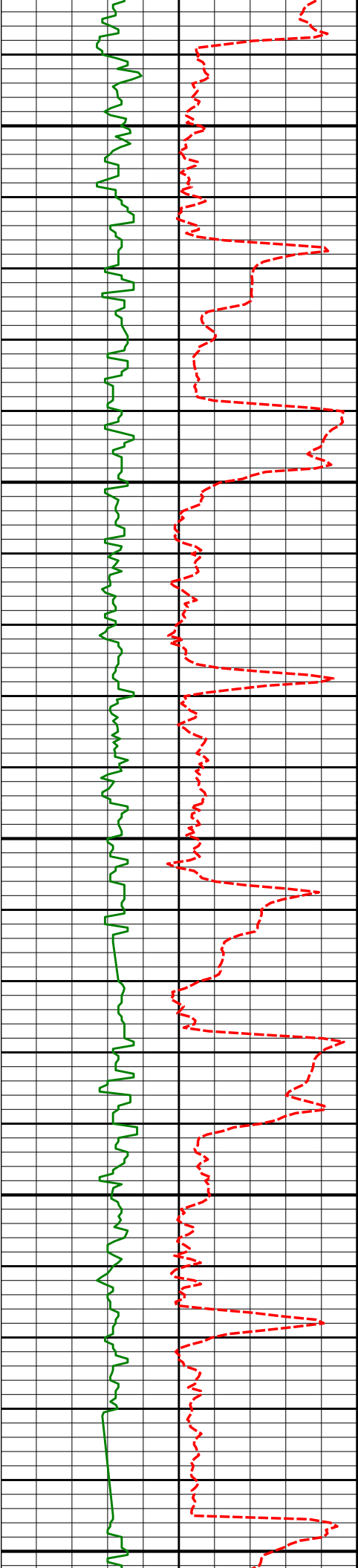
5404'

17.81°

63.77°

5223.01'

-557.81'



5250

5300

5350

5400

5450

5500'

18.30°

65.80°

5314.28'

-569.81'

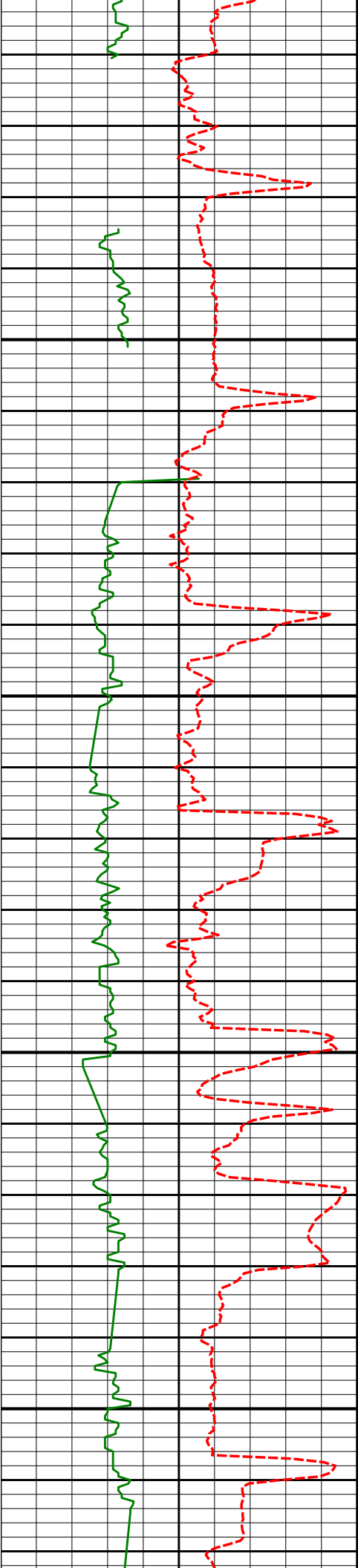
5595'

19.02°

66.46°

5404.29'

-581.41'



5500

5550

5600

5650

5690'

18.44°

66.27°

5494.25'

-592.95'

5785'

16.68°

65.40°

5584.82'

-604.02'

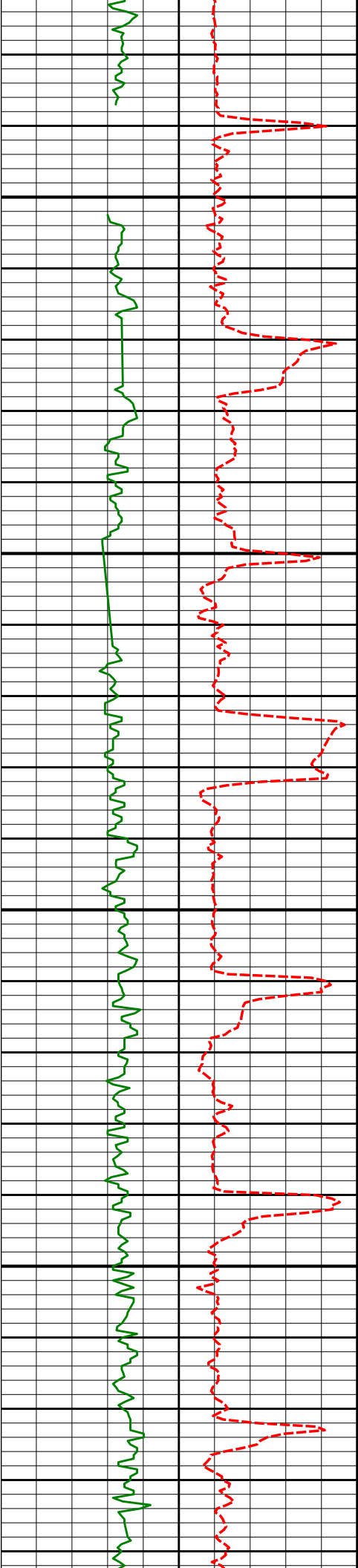
5848'

17.69°

64.14°

5645.01'

-611.54'



5700

5912'

17.00°

62.66°

5706.10'

-619.65'

5750

5975'

16.82°

61.02°

5766.38'

-627.89'

5800

5850

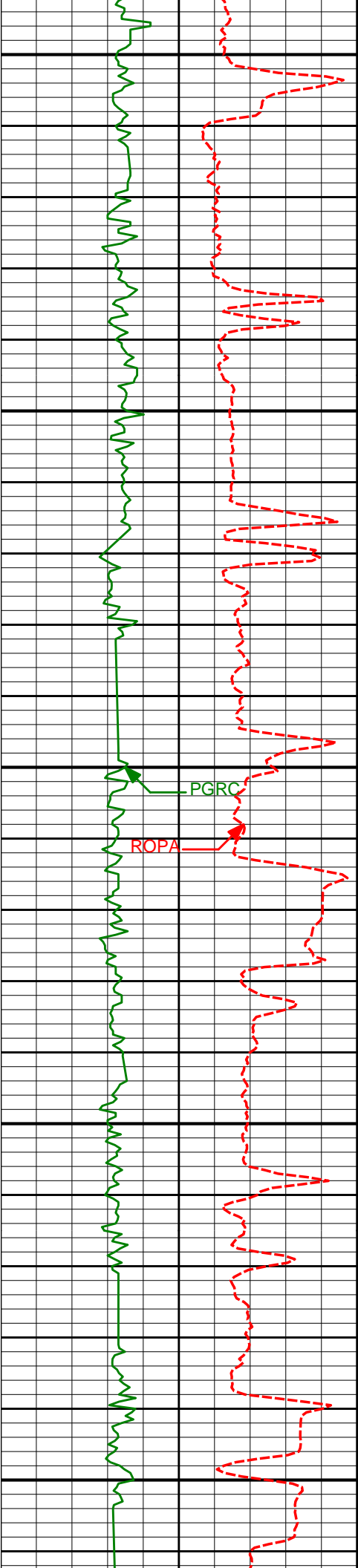
6070'

15.55°

60.58°

5857.61'

-640.23'



5900

5950

6000

6050

6100

6166'

13.34°

55.33°

5950.57'

-652.34'

PGRC

ROPA

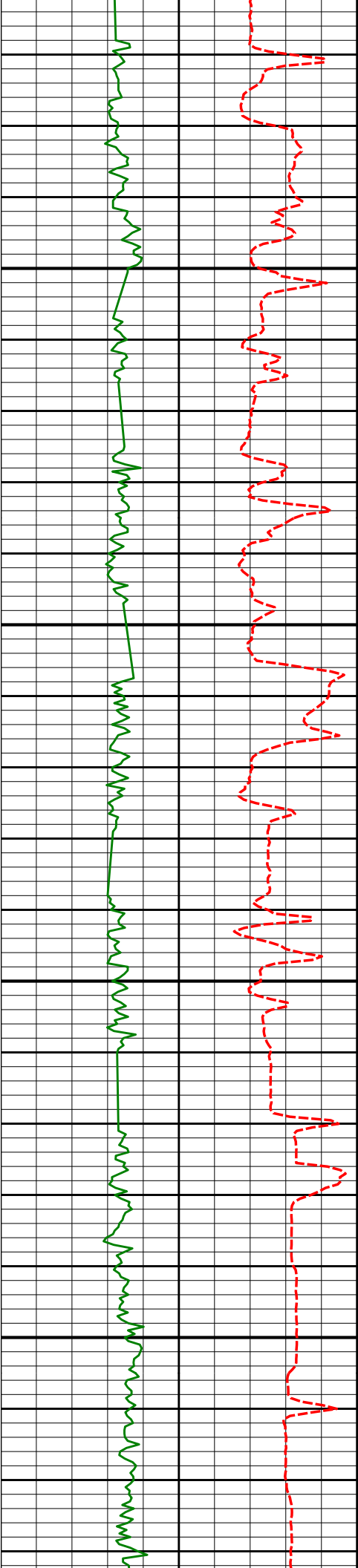
6261'

10.76°

61.34°

6043.48'

-662.41'



6150

6200

6250

6300

6356'

8.99°

56.88°

6137.07'

-670.37'

6451'

6.25°

62.66°

6231.22'

-676.54'

6546'

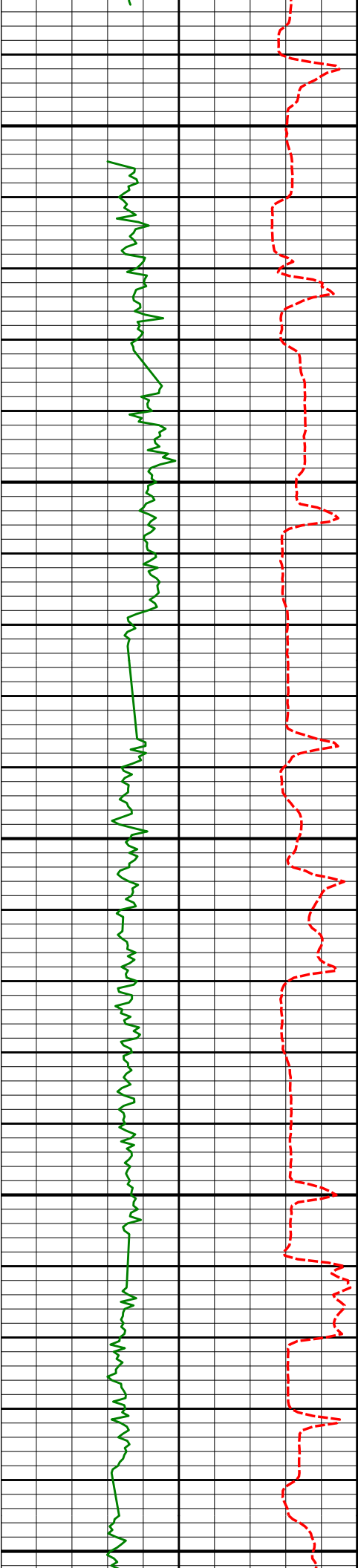
5.05°

54.33°

6325.76'

-681.15'





6350

6400

6450

6500

6550

6641'

4.01°

48.91°

6420.46'

-685.62'

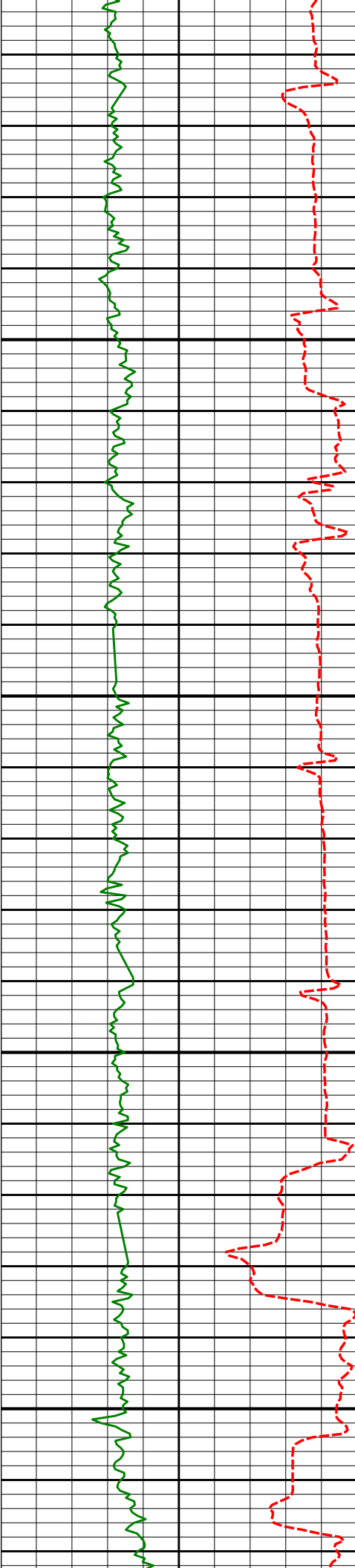
6736'

2.35°

47.64°

6515.31'

-689.02'



6600

6831'

0.93°

52.41°

6610.27'

-690.75'

6650

Run 200

6885'

0.41°

51.04°

6664.26'

-691.13'

6700

6926'

0.31°

21.18°

6705.26'

-691.32'

6750

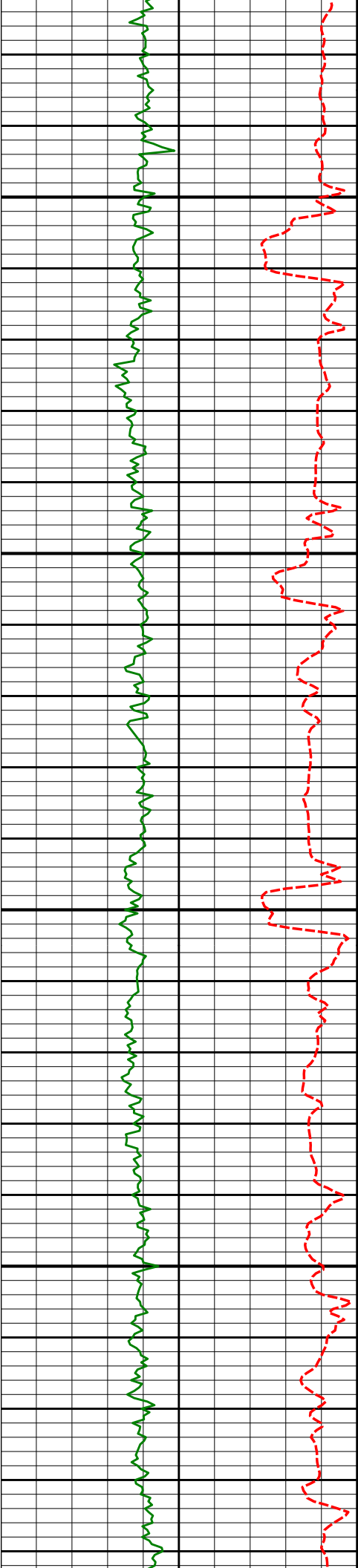
6973'

1.57°

167.10°

6752.26'

-690.81'



6800

7021'

5.37°

174.51°

6800.16'

-687.92'

6850

7068'

8.72°

177.55°

6846.80'

-682.16'

6900

7116'

12.68°

176.26°

6893.96'

-673.26'

6950

7161'

17.19°

175.98°

6937.43'

-661.68'

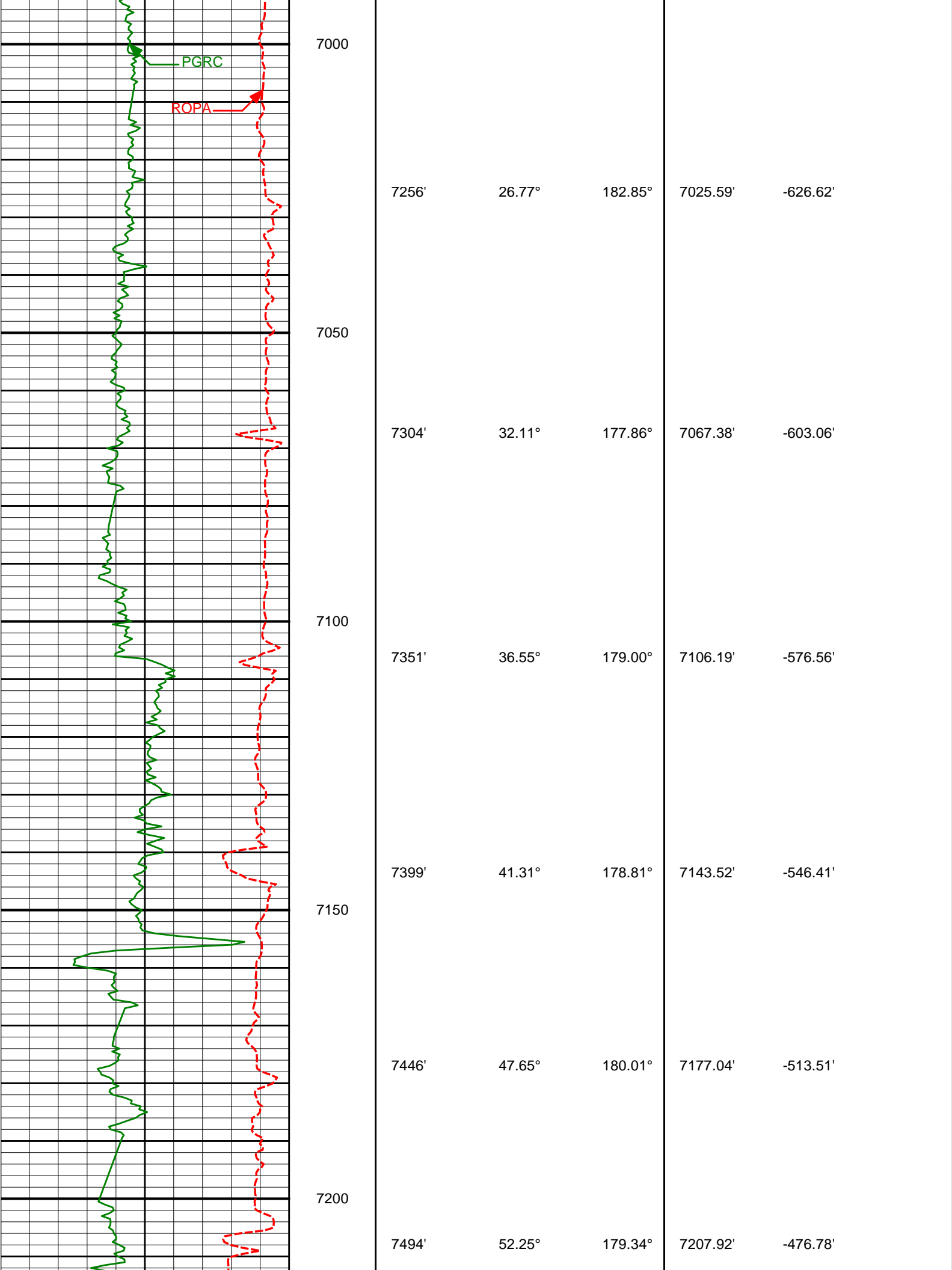
7211'

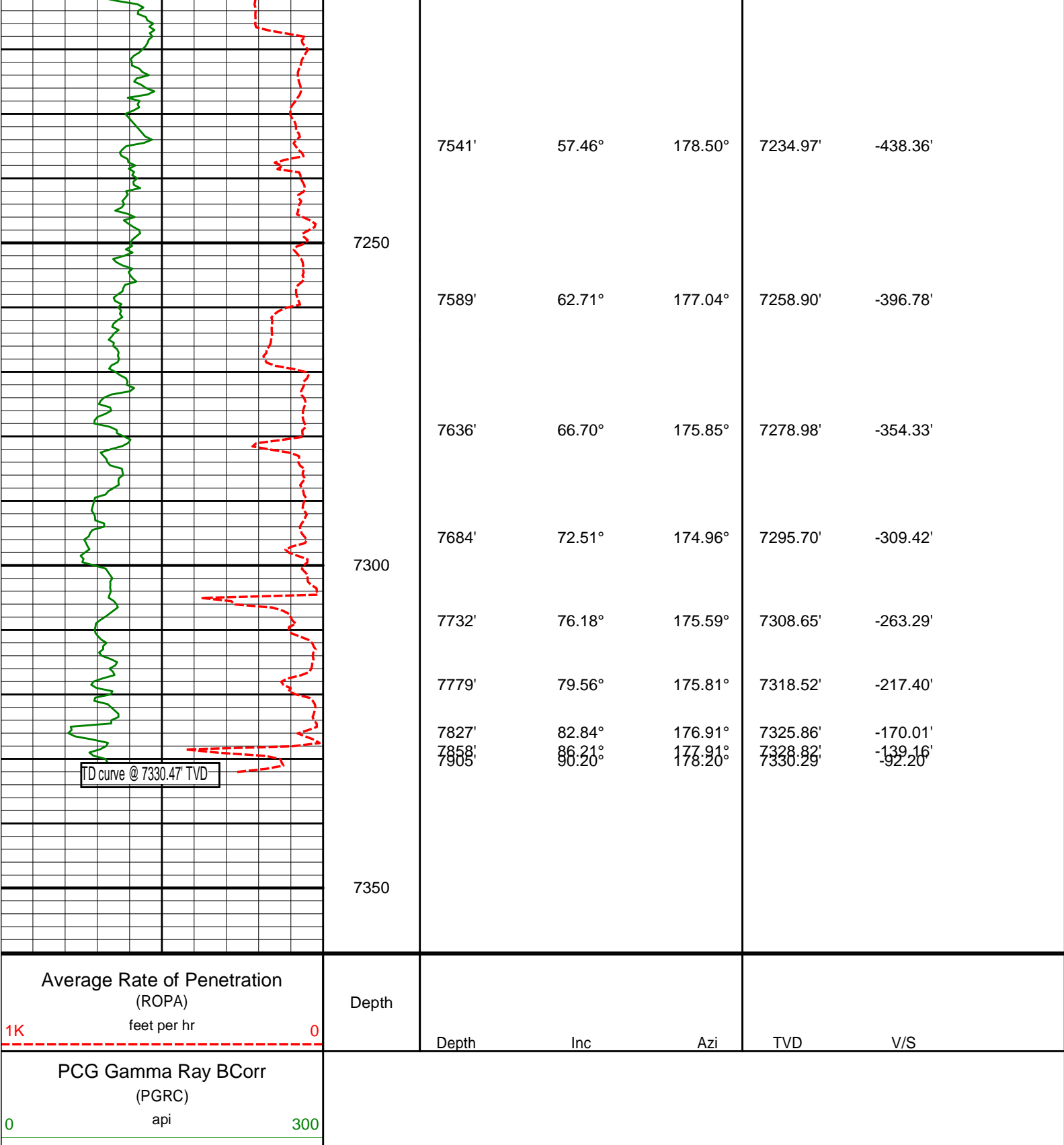
21.69°

179.60°

6984.57'

-645.05'





**HALLIBURTON**

**DIRECTIONAL SURVEY REPORT**

Anadarko Petroleum Corporation  
Highway 160 38N-2HZ  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0900754414

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
1138.00	0.57	68.51	1137.97	2.25 N	6.79 E	-2.08	TIE-IN
1317.00	0.81	70.31	1316.96	3.00 N	8.81 E	-2.78	0.14
1412.00	0.64	86.98	1411.95	3.26 N	9.98 E	-3.01	0.28
1508.00	2.74	70.18	1507.90	4.07 N	12.67 E	-3.75	2.23
1569.00	3.99	66.31	1568.80	5.41 N	15.99 E	-5.02	2.07
1661.00	5.79	62.20	1660.46	8.86 N	23.03 E	-8.29	1.99
1752.00	7.90	60.97	1750.80	14.04 N	32.56 E	-13.23	2.32
1844.00	9.83	62.99	1841.70	20.68 N	45.08 E	-19.55	2.13
1935.00	12.28	63.11	1931.00	28.58 N	60.64 E	-27.07	2.69
2027.00	14.55	59.67	2020.49	38.85 N	79.34 E	-36.87	2.61
2119.00	15.84	55.37	2109.28	51.82 N	99.65 E	-49.33	1.86
2211.00	17.36	57.46	2197.44	66.33 N	121.55 E	-63.30	1.77
2303.00	17.89	63.74	2285.13	79.96 N	145.79 E	-76.33	2.15
2394.00	17.84	61.30	2371.74	92.84 N	170.56 E	-88.59	0.82
2485.00	17.87	61.84	2458.36	106.12 N	195.09 E	-101.26	0.19
2577.00	17.25	61.71	2546.07	119.25 N	219.55 E	-113.77	0.67
2669.00	18.61	64.72	2633.61	131.99 N	244.84 E	-125.88	1.78
2760.00	19.87	63.70	2719.52	145.04 N	271.83 E	-138.26	1.44
2852.00	19.39	63.06	2806.17	158.89 N	299.46 E	-151.42	0.57
2944.00	18.88	63.73	2893.09	172.40 N	326.42 E	-164.26	0.60
3036.00	19.02	60.73	2980.11	186.31 N	352.85 E	-177.51	1.07
3127.00	18.61	60.80	3066.24	200.65 N	378.46 E	-191.21	0.44
3188.00	18.41	60.86	3124.09	210.09 N	395.37 E	-200.23	0.33
3249.00	18.04	59.50	3182.03	219.58 N	411.92 E	-209.30	0.93
3311.00	18.64	58.80	3240.88	229.58 N	428.67 E	-218.89	1.04
3406.00	17.66	57.09	3331.15	245.27 N	453.75 E	-233.95	1.18
3501.00	19.35	58.26	3421.24	261.38 N	479.24 E	-249.43	1.82
3596.00	19.65	59.68	3510.79	277.73 N	506.41 E	-265.09	0.59
3691.00	18.84	57.22	3600.48	294.09 N	533.09 E	-280.79	1.20
3786.00	18.12	60.12	3690.59	309.76 N	558.79 E	-295.81	1.23
3882.00	18.27	58.50	3781.79	325.05 N	584.56 E	-310.47	0.55
3977.00	18.57	60.05	3871.92	340.39 N	610.36 E	-325.16	0.61
4072.00	18.69	59.68	3961.94	355.62 N	636.61 E	-339.73	0.18
4167.00	20.44	59.17	4051.46	371.81 N	664.00 E	-355.24	1.86
4262.00	19.00	56.75	4140.88	388.79 N	691.18 E	-371.54	1.74
4389.00	19.01	55.40	4260.96	411.87 N	725.50 E	-393.77	0.35
4453.00	19.30	54.44	4321.42	423.94 N	742.68 E	-405.41	0.67
4548.00	21.18	57.86	4410.55	442.20 N	769.98 E	-422.98	2.34
4643.00	19.74	55.98	4499.56	460.30 N	797.81 E	-440.39	1.66
4738.00	18.25	53.49	4589.38	478.13 N	823.07 E	-457.59	1.78
4834.00	17.88	54.11	4680.65	495.72 N	847.09 E	-474.57	0.44
4929.00	17.25	53.67	4771.22	512.61 N	870.26 E	-490.89	0.67
5024.00	17.27	57.98	4861.94	528.44 N	893.56 E	-506.13	1.35
5119.00	18.30	61.57	4952.40	543.02 N	918.64 E	-520.08	1.59
5214.00	18.56	65.23	5042.53	556.45 N	945.49 E	-532.85	1.25
5341.00	18.13	62.69	5163.08	573.99 N	981.40 E	-549.49	0.71
5404.00	17.81	63.77	5223.01	582.74 N	998.75 E	-557.81	0.74
5500.00	18.30	65.80	5314.28	595.41 N	1025.67 E	-569.81	0.83
5595.00	19.02	66.46	5404.29	607.71 N	1053.47 E	-581.41	0.79
5690.00	18.44	66.27	5494.25	619.94 N	1081.42 E	-592.95	0.62
5785.00	16.68	65.40	5584.82	631.66 N	1107.57 E	-604.02	1.87
5848.00	17.69	64.14	5645.01	639.60 N	1124.41 E	-611.54	1.71
5912.00	17.00	62.66	5706.10	648.13 N	1141.47 E	-619.65	1.28
5975.00	16.82	61.02	5766.38	656.78 N	1157.62 E	-627.89	0.81
6070.00	15.55	60.58	5857.61	669.69 N	1180.74 E	-640.23	1.35
6166.00	13.34	55.33	5950.57	682.32 N	1201.06 E	-652.34	2.67
6261.00	10.76	61.34	6043.48	692.81 N	1217.86 E	-662.41	3.01
6356.00	8.99	56.88	6137.07	701.12 N	1231.86 E	-670.37	2.04
6451.00	6.25	62.66	6231.22	707.55 N	1242.67 E	-676.54	2.99
6546.00	5.05	54.33	6325.76	712.36 N	1250.66 E	-681.15	1.53
6641.00	4.01	48.91	6420.46	716.98 N	1256.56 E	-685.62	1.18
6736.00	2.35	47.64	6515.31	720.48 N	1260.51 E	-689.02	1.76
6831.00	0.93	52.41	6610.27	722.26 N	1262.55 E	-690.75	1.50
6885.00	0.41	51.04	6664.26	722.65 N	1263.05 E	-691.13	0.95
6926.00	0.31	21.18	6705.26	722.85 N	1263.21 E	-691.32	0.51
6973.00	1.57	167.10	6752.26	722.34 N	1263.40 E	-690.81	3.92
7021.00	5.37	174.51	6800.16	719.46 N	1263.76 E	-687.92	7.95

7068.00	8.72	177.55	6846.80	713.71 N	1264.12 E	-682.16	7.17
7116.00	12.68	176.26	6893.96	704.82 N	1264.62 E	-673.26	8.25
7161.00	17.19	175.98	6937.43	693.25 N	1265.41 E	-661.68	10.03
7211.00	21.69	179.60	6984.57	676.63 N	1265.99 E	-645.05	9.32
7256.00	26.77	182.85	7025.59	658.18 N	1265.55 E	-626.62	11.66
7304.00	32.11	177.86	7067.38	634.62 N	1265.49 E	-603.06	12.24
7351.00	36.55	179.00	7106.19	608.13 N	1266.20 E	-576.56	9.53
7399.00	41.31	178.81	7143.52	577.98 N	1266.78 E	-546.41	9.92
7446.00	47.65	180.01	7177.04	545.07 N	1267.10 E	-513.51	13.60
7494.00	52.25	179.34	7207.92	508.34 N	1267.31 E	-476.78	9.64
7541.00	57.46	178.50	7234.97	469.93 N	1268.05 E	-438.36	11.19
7589.00	62.71	177.04	7258.90	428.38 N	1269.68 E	-396.78	11.25
7636.00	66.70	175.85	7278.98	385.97 N	1272.32 E	-354.33	8.80
7684.00	72.51	174.96	7295.70	341.15 N	1275.93 E	-309.42	12.23
7732.00	76.18	175.59	7308.65	295.09 N	1279.73 E	-263.29	7.74
7779.00	79.56	175.81	7318.52	249.28 N	1283.18 E	-217.40	7.22
7827.00	82.84	176.91	7325.86	201.95 N	1286.18 E	-170.01	7.18
7858.00	86.21	177.91	7328.82	171.12 N	1287.58 E	-139.16	11.35
7905.00	90.20	178.20	7330.29	124.18 N	1289.17 E	-92.20	8.51

**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 178.58 DEGREES (TRUE)  
A TOTAL CORRECTION OF 8.54 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7905.00 FEET  
IS 1295.14 FEET ALONG 84.50 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.**