

PCG-K Pressure Case Gamma



1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	04-May-13				
Rig Bit Number	100				
Bit Size (in)	8.750				
Tool Nominal OD (in)	4.750				
Log Start Depth (MD, ft)	1,082.00				
Log End Depth (MD, ft)	7,691.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	02-May-13 09:30				
Drill/Wipe End Date and Time	04-May-13 16:40				
Min Inc (deg) @ Depth (MD, ft)	.15 @ 1,469.00				
Max Inc (deg) @ Depth (MD, ft)	85.11 @ 7,641.00				
Bit TFA(in2) / Bit Type	.86 / PDC				
Flow Rate (gpm)	563.57				
Max AV (fpm) / CV (fpm) @ MWD	416.0 / N/A				
Fluid Type	Fresh Water Gel				
Density (ppg) / Viscosity (spqt)	9.40 / 50.00				
Filtrate CL (ppm)	1,400.00				
pH / Fluid Loss (mptm)	9.00 / 4				
PV (cP) / YP (lbf2)	21 / 13.00				
% Solids / % Sand	.5 / 7.9				
% 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 Temp (degF) / Min Temp (degF)	170.07 / 20.00				

Max Tool Temp (degF) / Source	170.37 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 170.37				
Lead MWD Engineer	Ryan White				
Customer Representative	Travis Lourence				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.76				
Sub Serial Number	11404300				
Insert Serial Number	11680766				
Date and Time Initialized	29-Apr-13 11:35				
Date and Time Read	04-May-13 23:31				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	48.48				
Software Version	6.21				
Sub Serial Number	11404300				
Sonde Serial Number	11062040				
Sensor ID Number	N/A				
Toolface Offset (deg)	244.74				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	53.43				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404300				
Insert/Sonde Serial Number	11681021				

REMARKS

1. All depths are true vertical 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. All data presented is recorded data unless otherwise specified
4. The following smoothing parameters have been applied to the data:

DGR (Corrected Gamma Ray):
 Interval Resolution: 0.5 ft
 Interval Distance: 0.6 ft
 Gap Fill: 3.0 ft

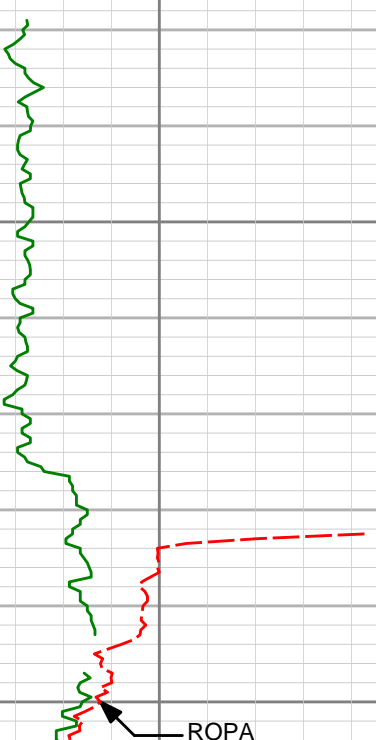
 ROPA (Average Rate of Penetration):
 Interval Resolution: 0.5 ft
 Interval Distance: 1.2 ft
 Gap Fill : 3.0 ft
5. INSITE version 7.4.1

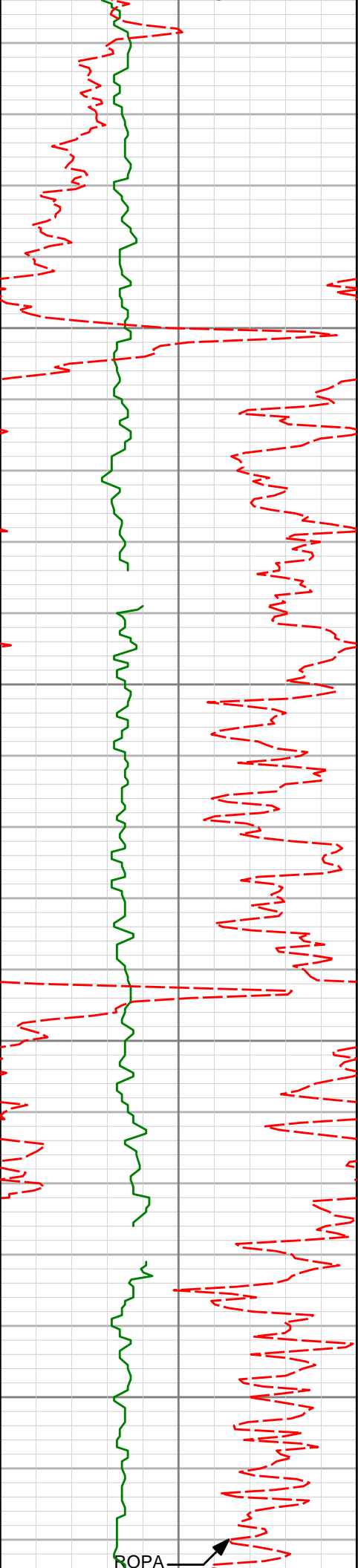
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1:240 TVD Detail Log

Gamma CG Cor (PGRC) api						
0300						
Avg Rate of Penetration (ROPA) feet per hr	TVD ft					
5000		Depth	Inc	Azi	TVD	V/S
	1000					
	1050					
	1100	1101'	0.39°	200.94°	1100.97'	-6.16'



1150

1200

1250

1300

1284'

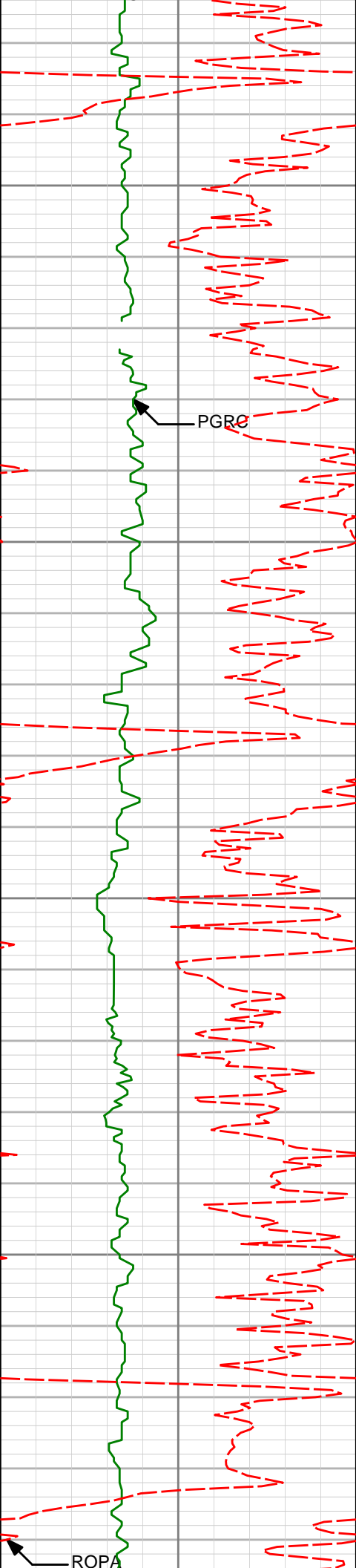
0.34°

129.87°

1283.97'

-5.22'

ROPA



1350

1400

1450

1500

PGRC

ROPA

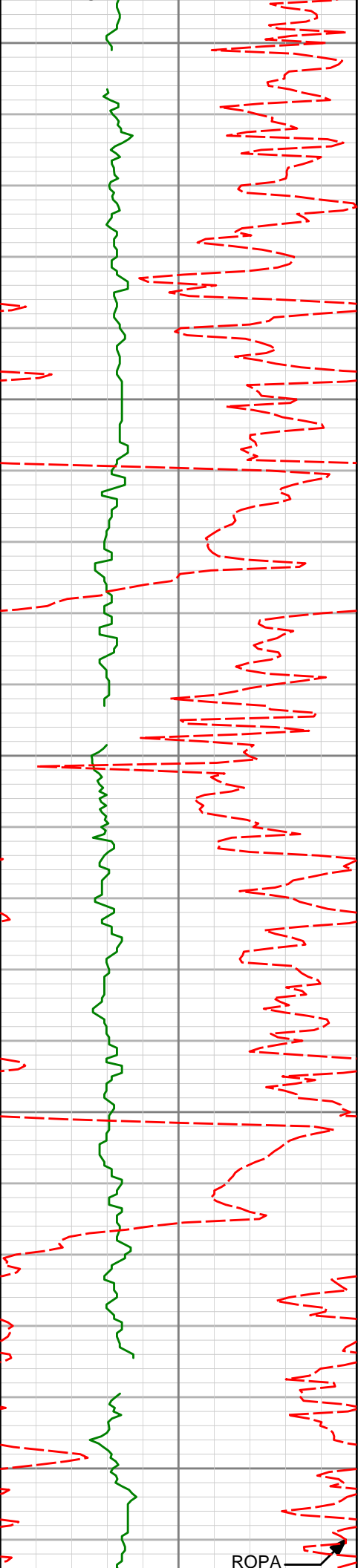
1469'

0.15°

140.01°

1468.96'

-4.69'



1550

1560'

1.96°

270.75°

1559.95'

-4.59'

1600

1650

1652'

3.97°

280.13°

1651.82'

-5.10'

1700

1750

1744'

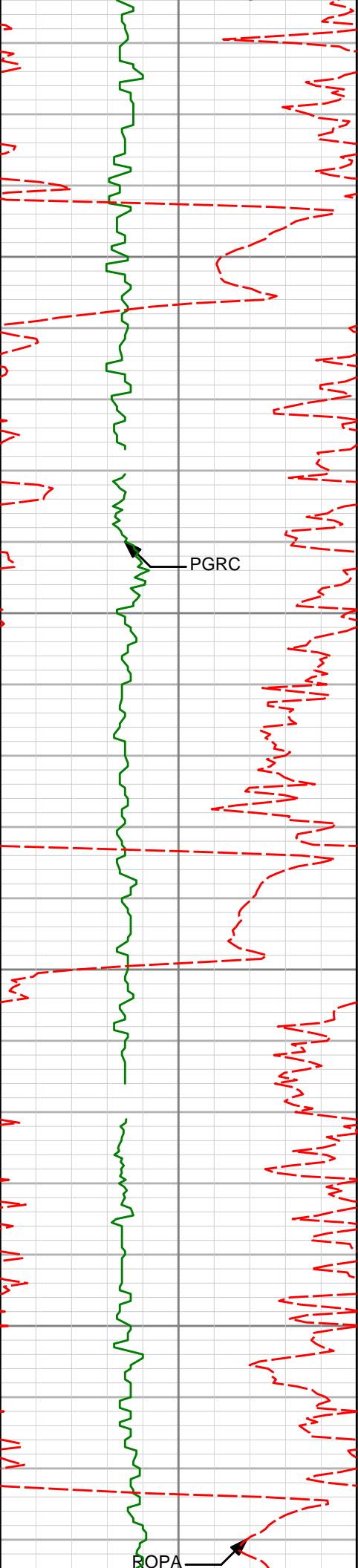
5.91°

284.08°

1743.47'

-6.69'

ROPA



1800

1850

1900

1950

PGRC

BOPA

1836'

7.80°

278.92°

1834.81'

-8.65'

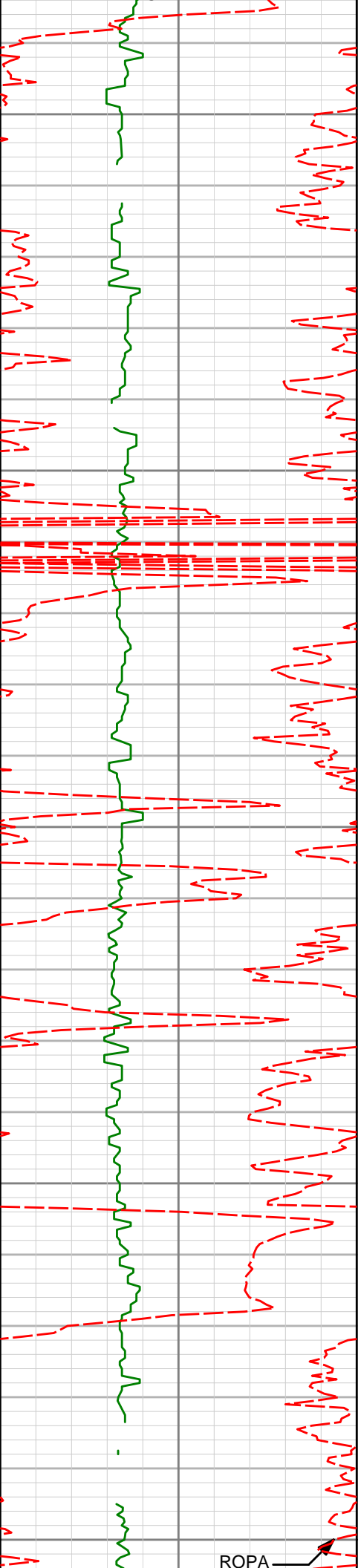
1928'

10.17°

276.53°

1925.68'

-10.32'



2000

2020'

11.17°

272.20°

2016.09'

-11.32'

2050

2100

2111'

10.94°

274.08°

2105.40'

-12.00'

2150

2200

2206'

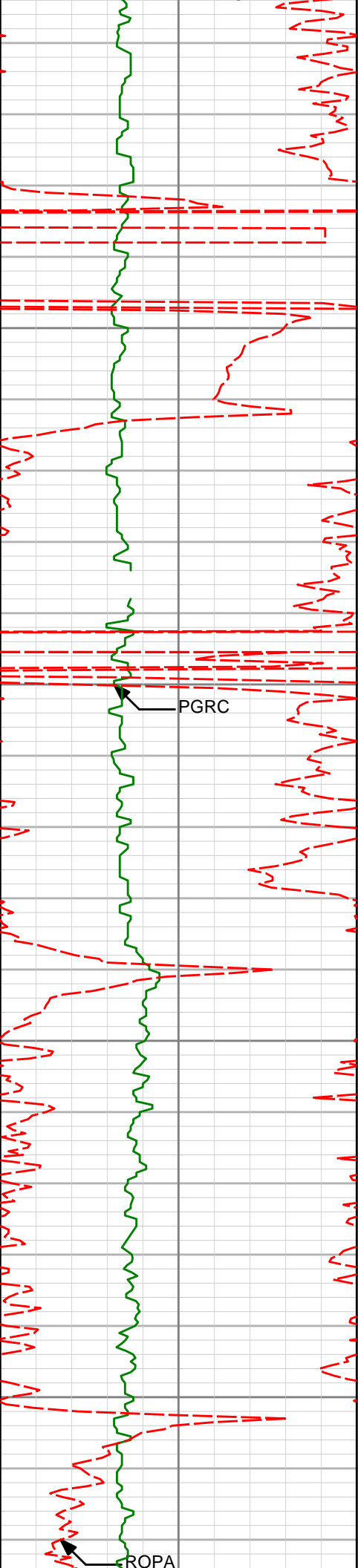
12.50°

273.81°

2198.42'

-13.03'

ROPA



2250

2301'

14.12°

273.54°

2290.86'

-14.09'

2300

PGRC

2350

2396'

12.45°

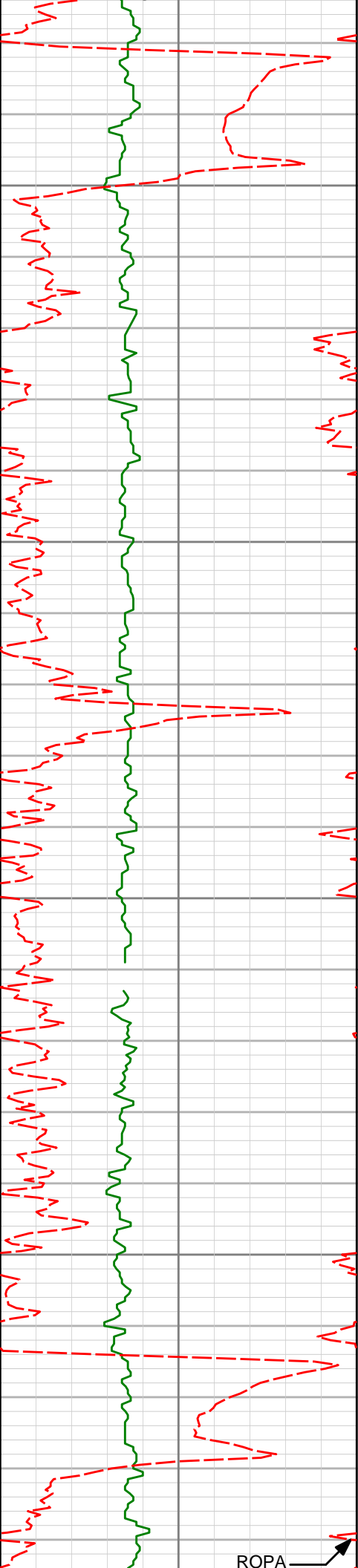
272.17°

2383.32'

-14.85'

2400

ROPA



2450

2490'

15.19°

271.40°

2474.59'

-15.19'

2500

2550

2585'

13.66°

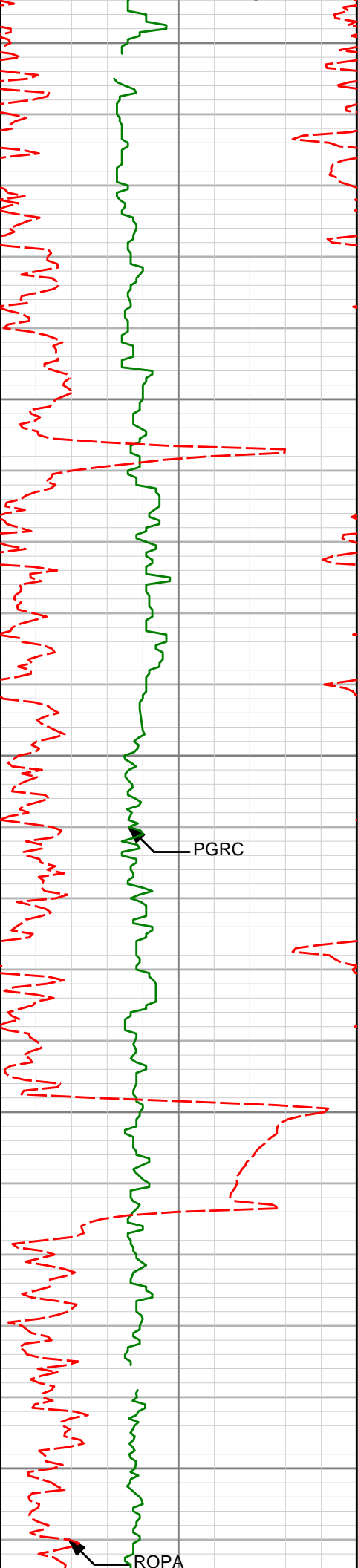
272.75°

2566.59'

-15.66'

2600

ROPA



2650

2680'

14.49°

273.25°

2658.74'

-16.51'

2700

2750

2774'

12.80°

271.14°

2750.08'

-17.04'

PGRC

2800

2850

2869'

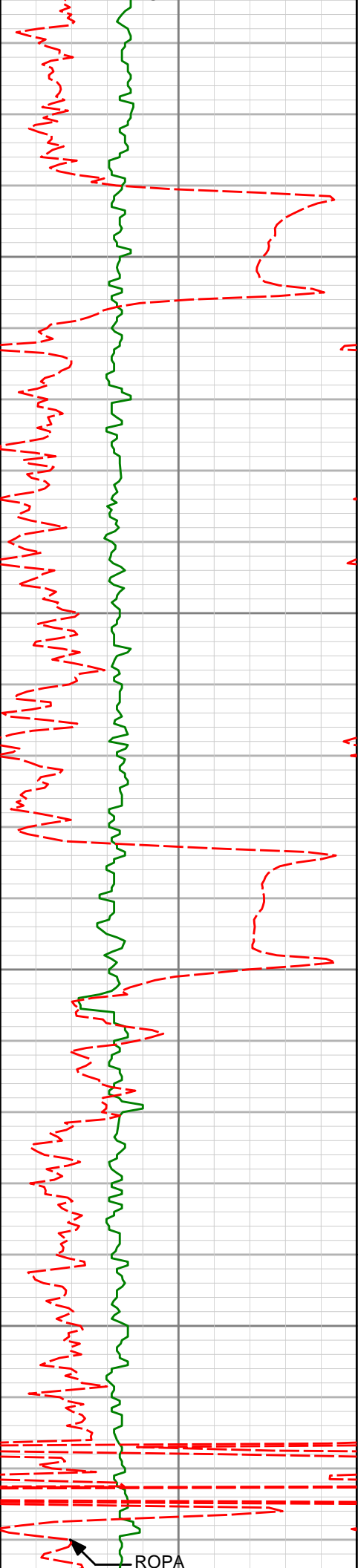
12.98°

272.99°

2842.69'

-17.48'

ROPA



2900

2950

3000

3050

2964'

12.42°

278.91°

2935.37'

-19.30'

3058'

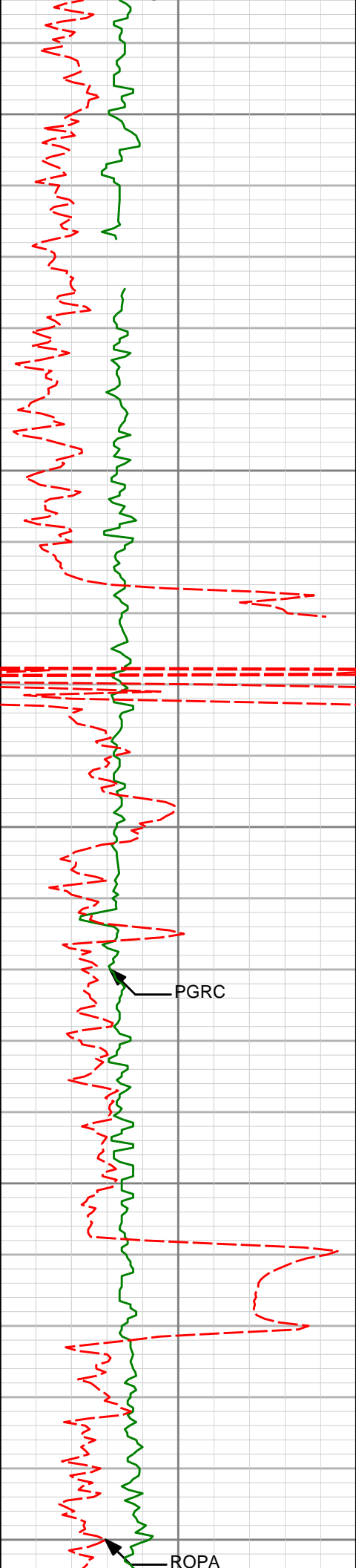
14.13°

283.15°

3026.86'

-23.14'

ROPA



3100

3153'

13.63°

283.52°

3119.08'

-28.05'

3150

3200

3248'

13.06°

282.93°

3211.52'

-32.74'

PGRC

3250

3300

3342'

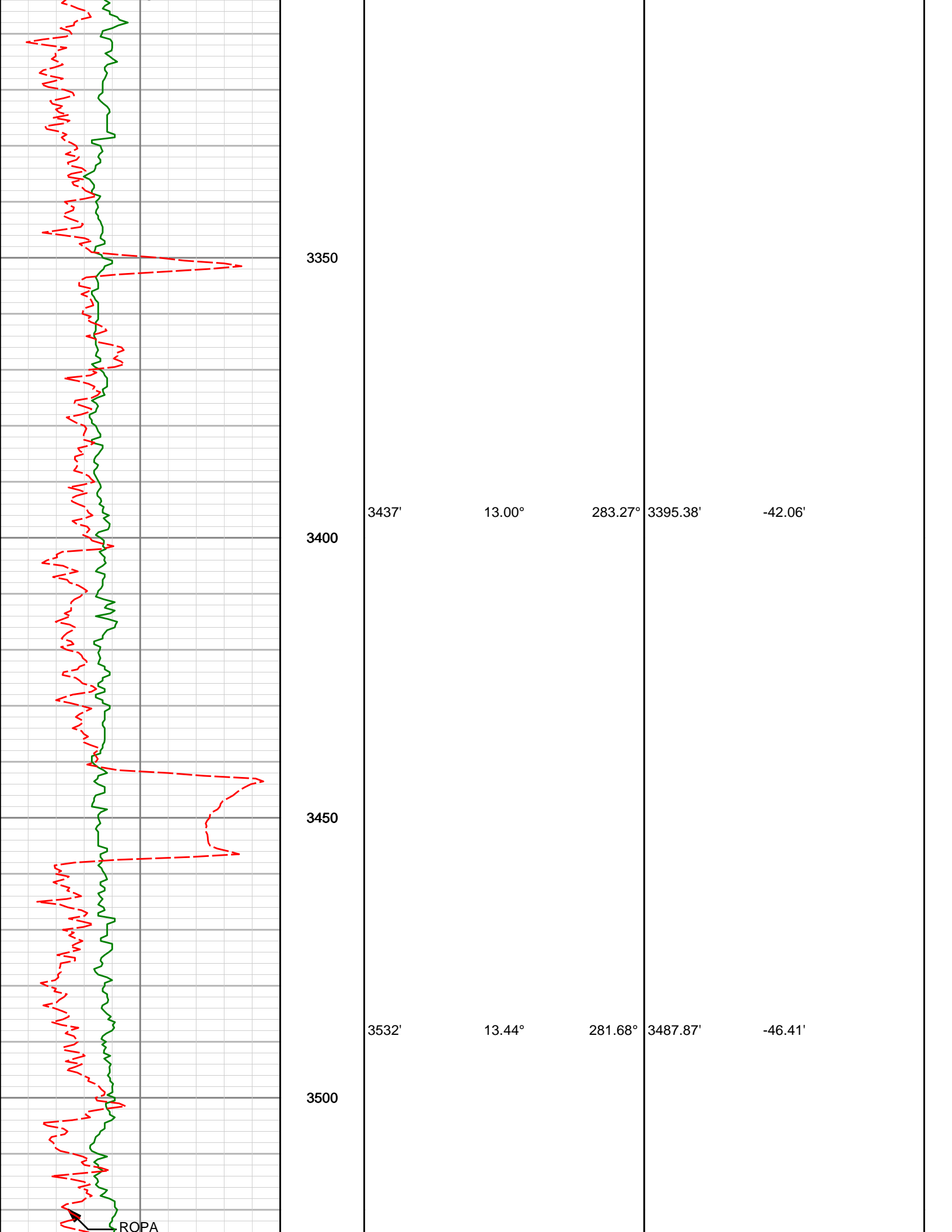
13.74°

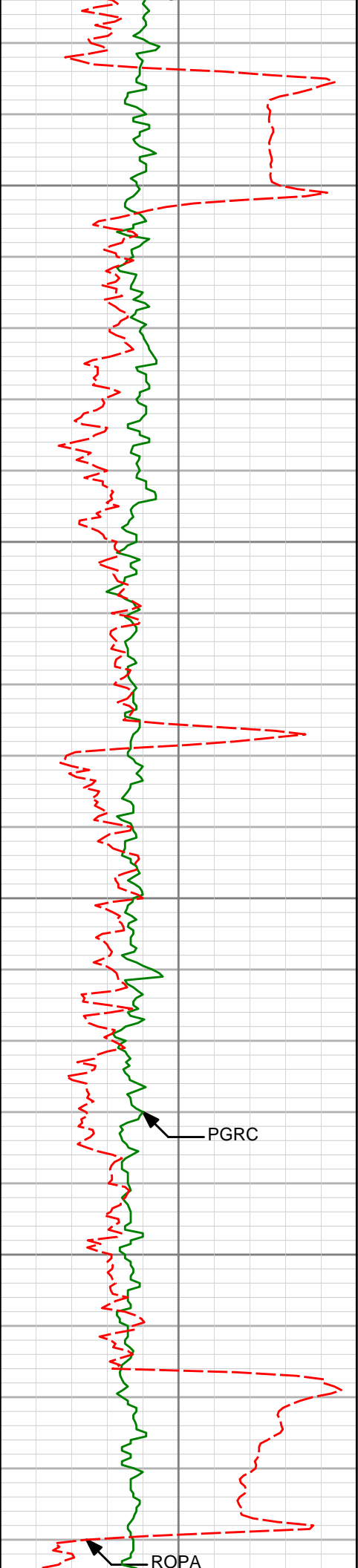
283.27°

3302.96'

-37.35'

ROPA





3550

3600

3650

3700

3626'

13.93°

278.31°

3579.20'

-49.92'

3721'

12.76°

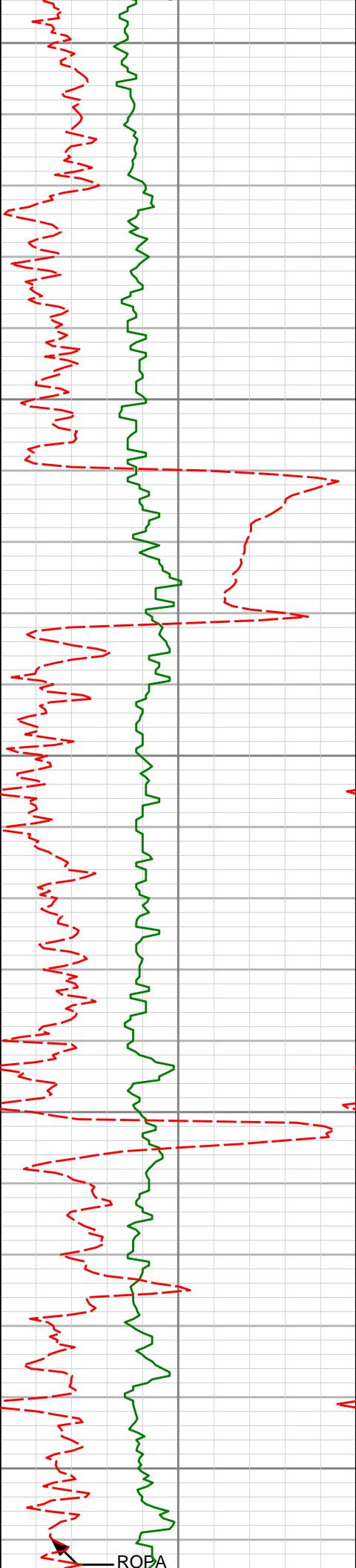
278.89°

3671.63'

-52.86'

PGRC

ROPA



3750

3816'

13.72°

275.58°

3764.11'

-55.24'

3800

3850

3910'

15.36°

275.73°

3855.09'

-57.20'

3900

3950

4005'

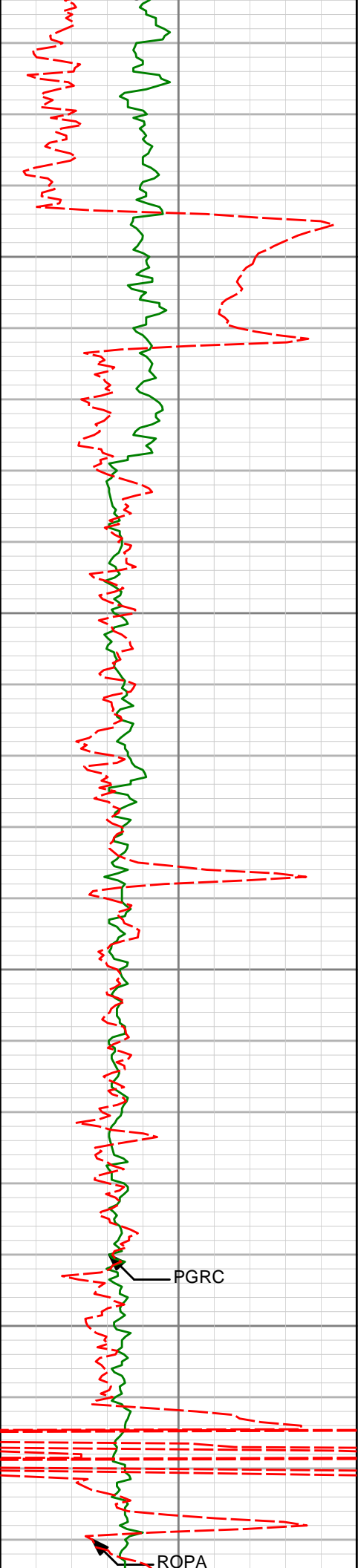
13.59°

273.38°

3947.07'

-58.75'

ROPA



4000

4050

4100

4150

4100'

15.19°

274.61°

4039.09'

-60.04'

4194'

15.53°

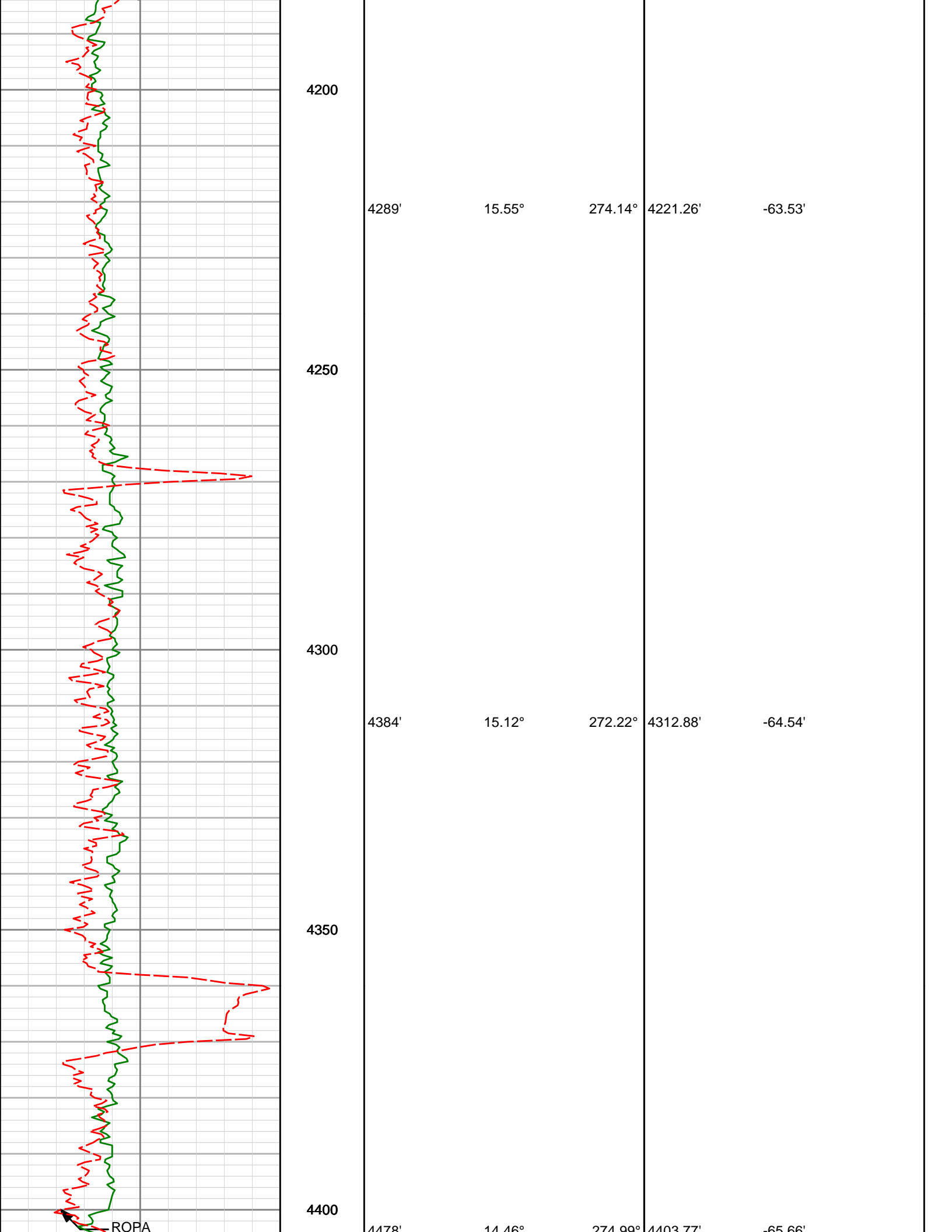
275.36°

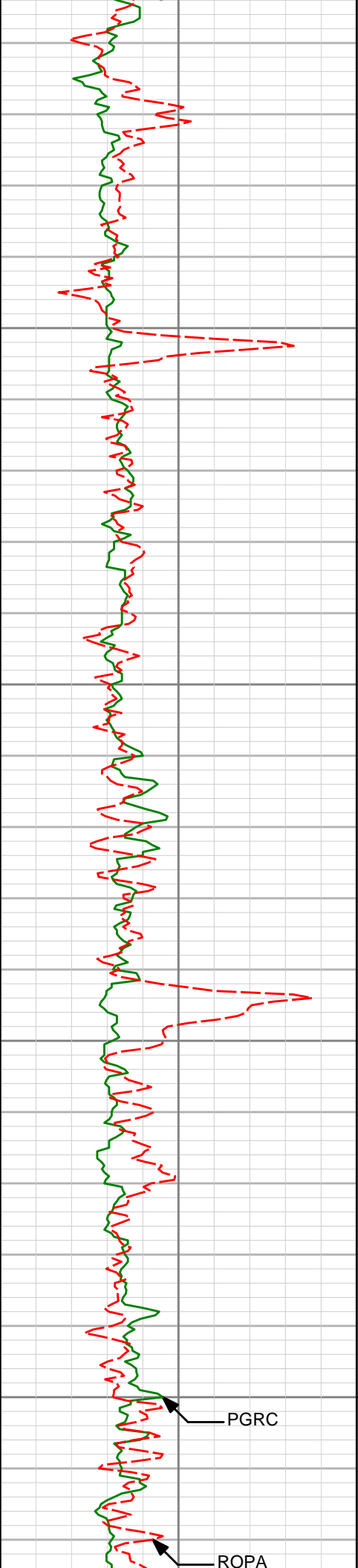
4129.74'

-61.82'

PGRC

ROPA





4450

4500

4550

4600

PGRC

ROPA

4573'

14.37°

275.47°

4495.78'

-67.46'

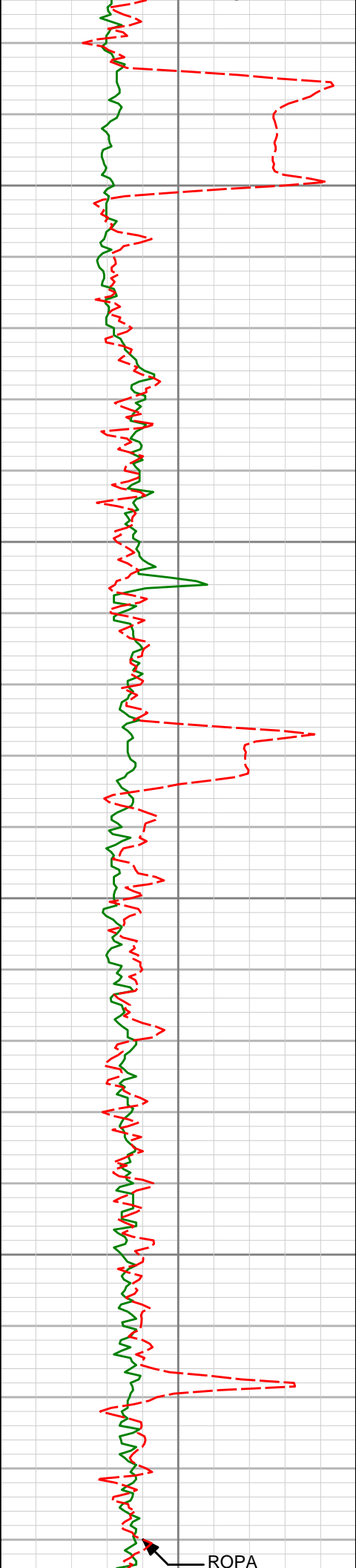
4667'

13.87°

272.29°

4586.94'

-68.66'



4650

4700

4750

4800

4762'

14.85°

277.32°

4678.97'

-70.31'

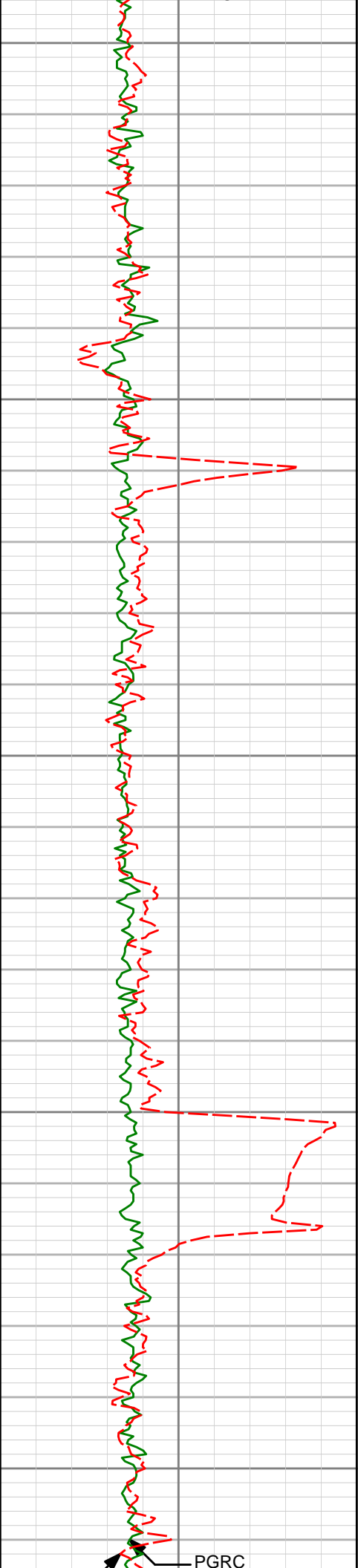
4857'

15.18°

278.54°

4770.73'

-73.32'



4850

4951'

14.55°

275.19°

4861.58'

-75.85'

4900

4950

5046'

13.44°

272.98°

4953.76'

-77.14'

5000

5050

5141'

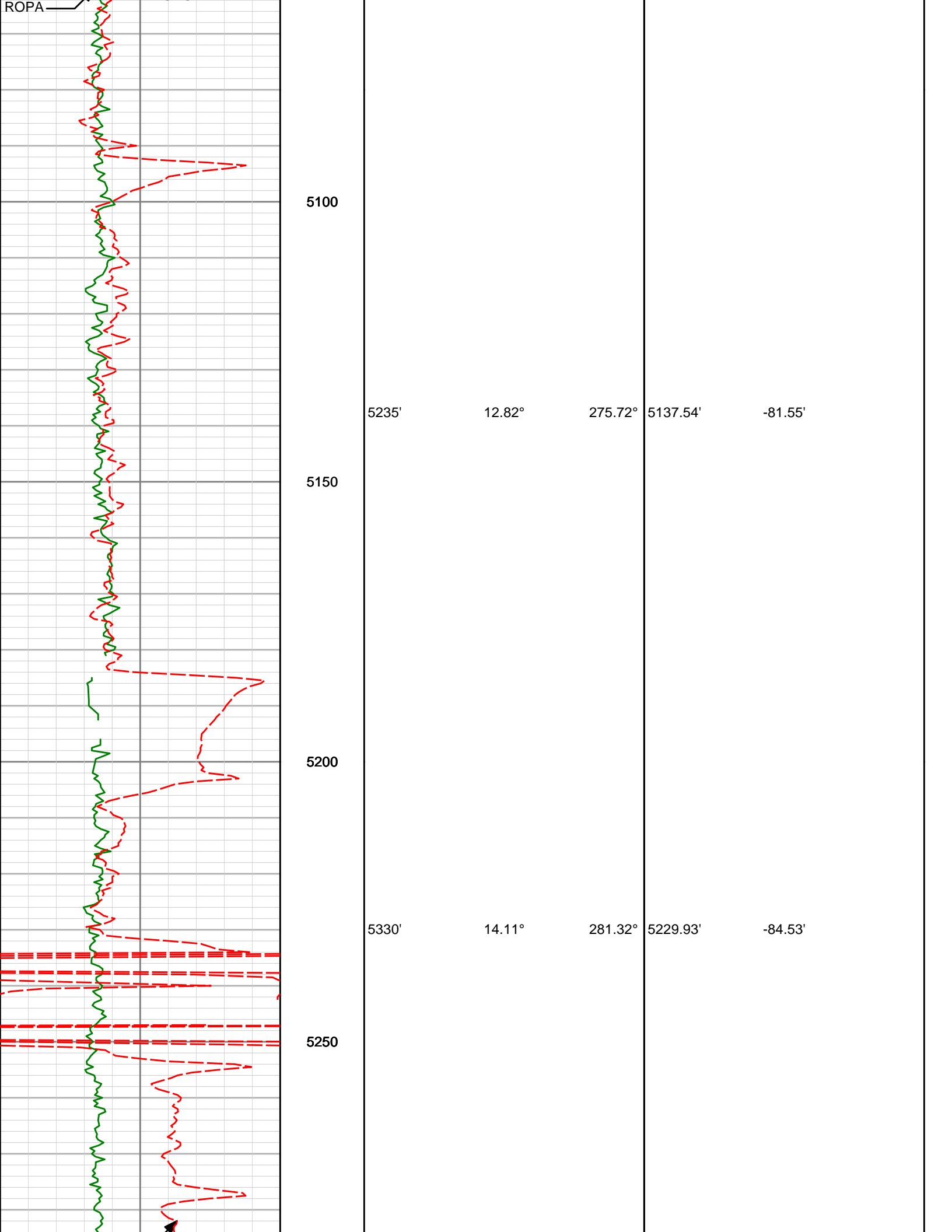
13.87°

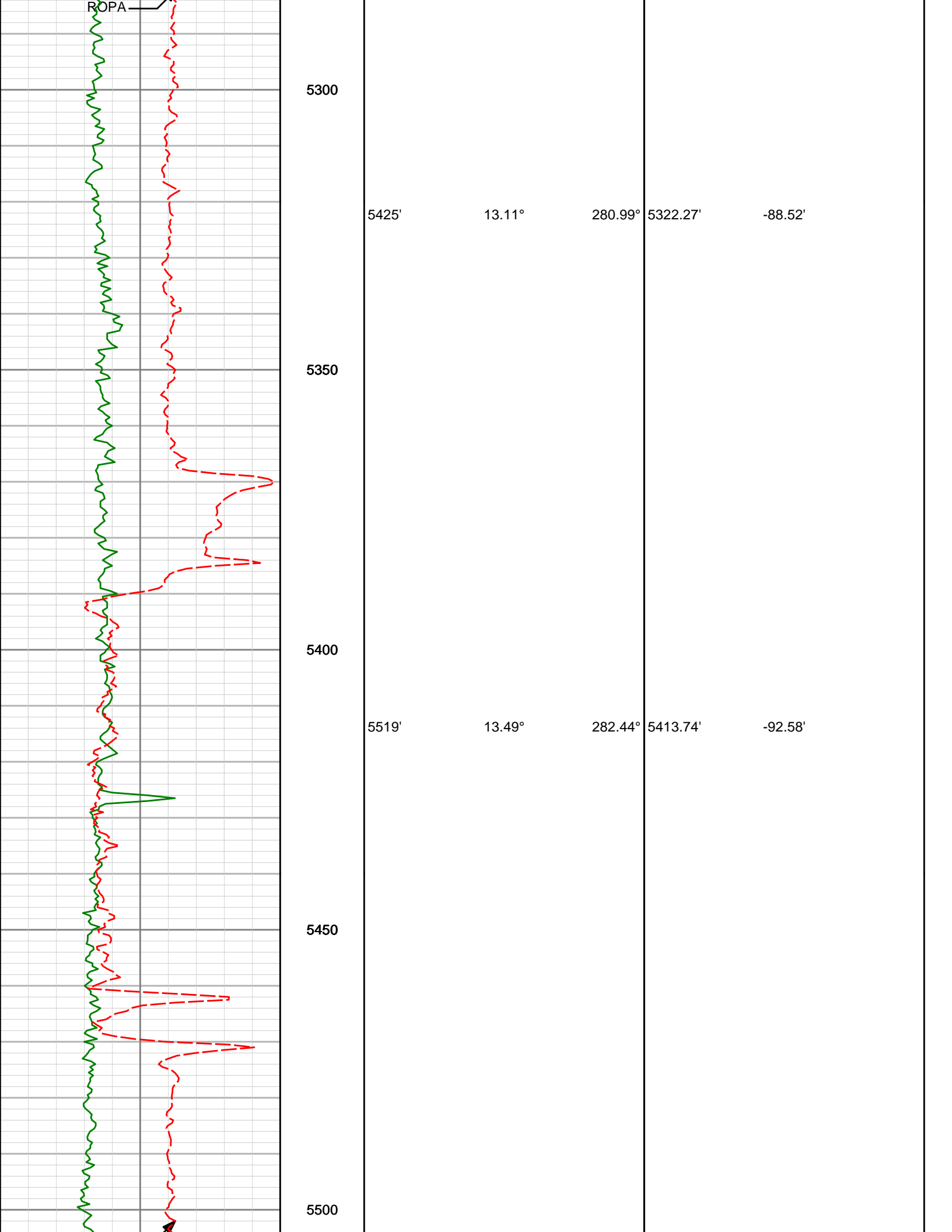
278.82°

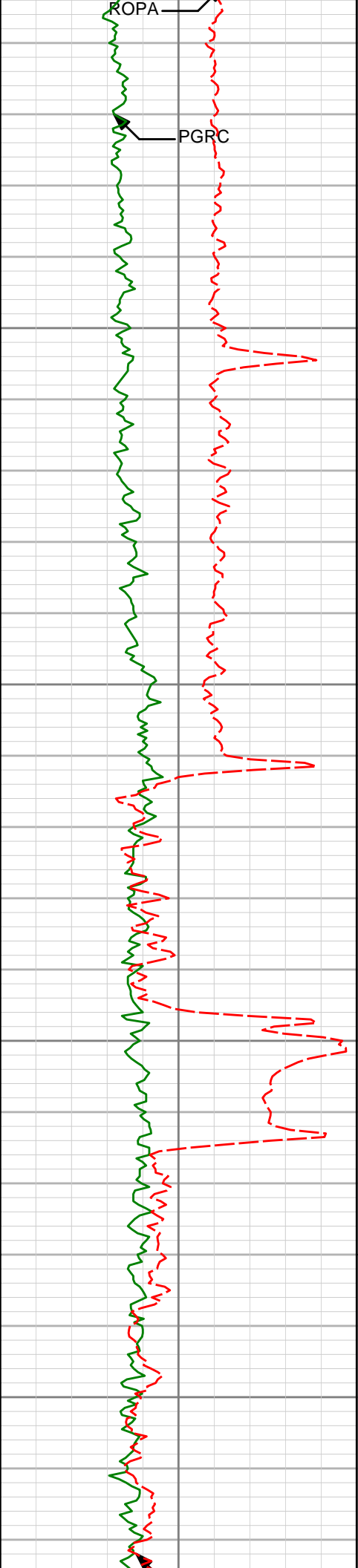
5046.08'

-79.12'

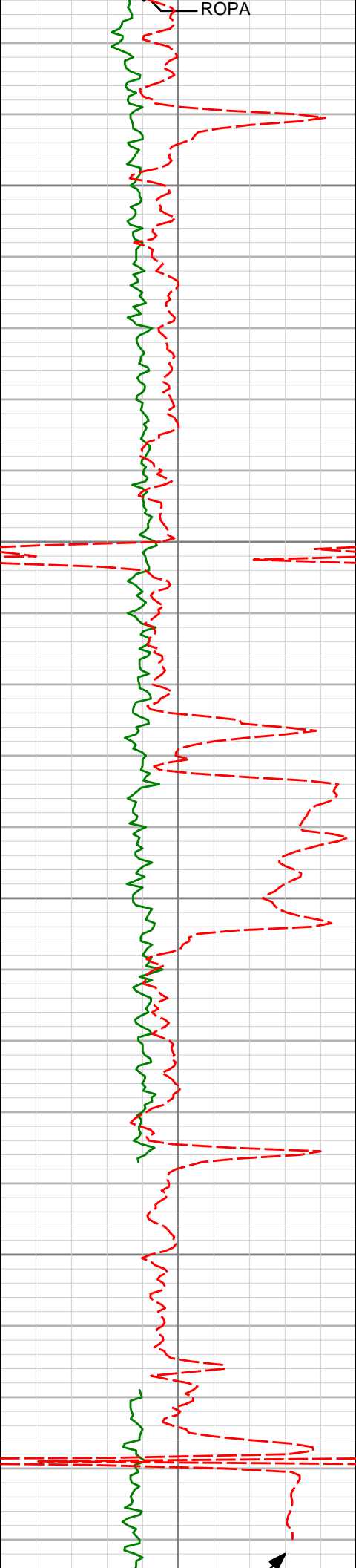
PGRC







	5614'	12.62°	281.62°	5506.29'	-96.73'
5550					
5600	5709'	10.77°	280.70°	5599.31'	-100.18'
5650					
5700	5803'	10.91°	277.43°	5691.64'	-102.69'



5750

5800

5850

5900

5898'

9.19°

276.57°

5785.17'

-104.46'

5993'

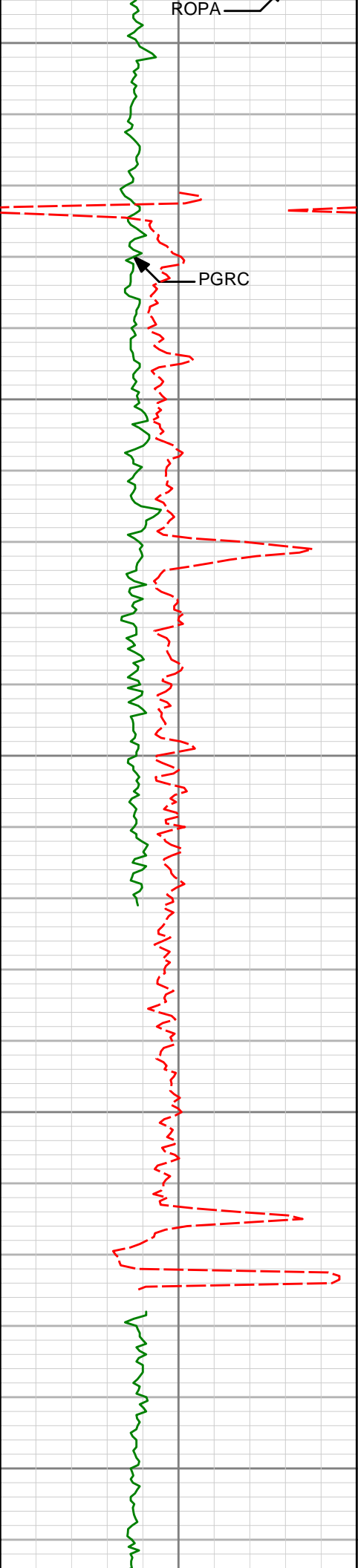
9.30°

279.73°

5878.94'

-106.39'





5950

6088'

9.56°

281.16°

5972.66'

-108.98'

6000

6050

6182'

8.54°

282.14°

6065.48'

-111.73'

6100

6150

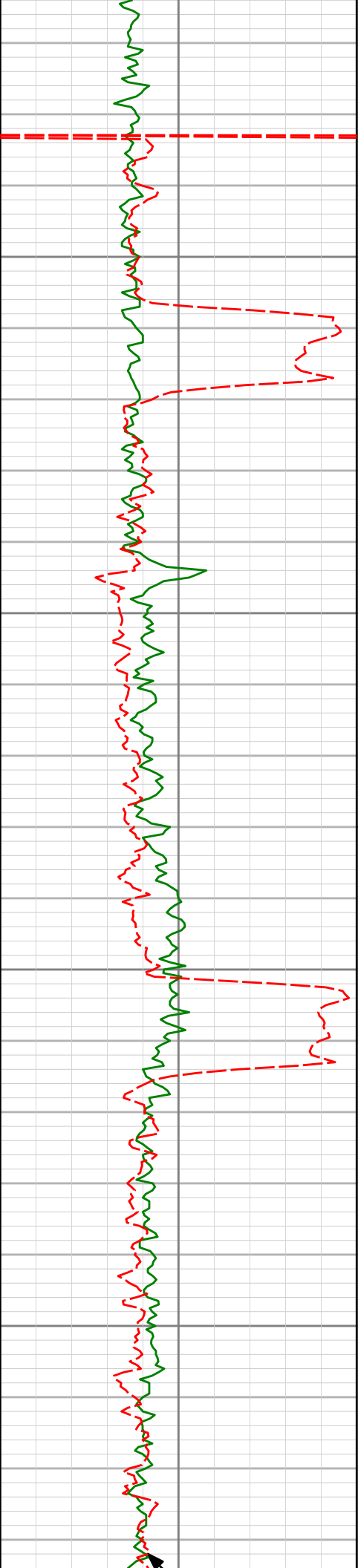
6277'

7.30°

279.65°

6159.58'

-114.03'



6200

6250

6300

6350

6372'

5.40°

273.72°

6253.99'

-115.17'

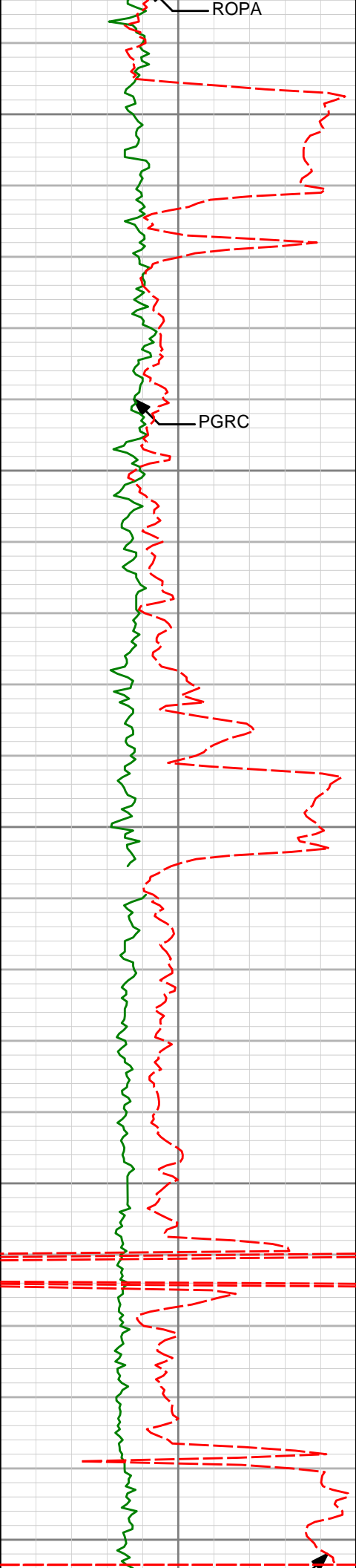
6467'

3.64°

272.64°

6348.69'

-115.48'



6400

6450

6500

6550

6600

6562'

1.77°

274.30°

6443.58'

-115.66'

6657'

1.15°

230.79°

6538.55'

-115.14'

6688'

1.00°

238.37°

6569.55'

-114.79'

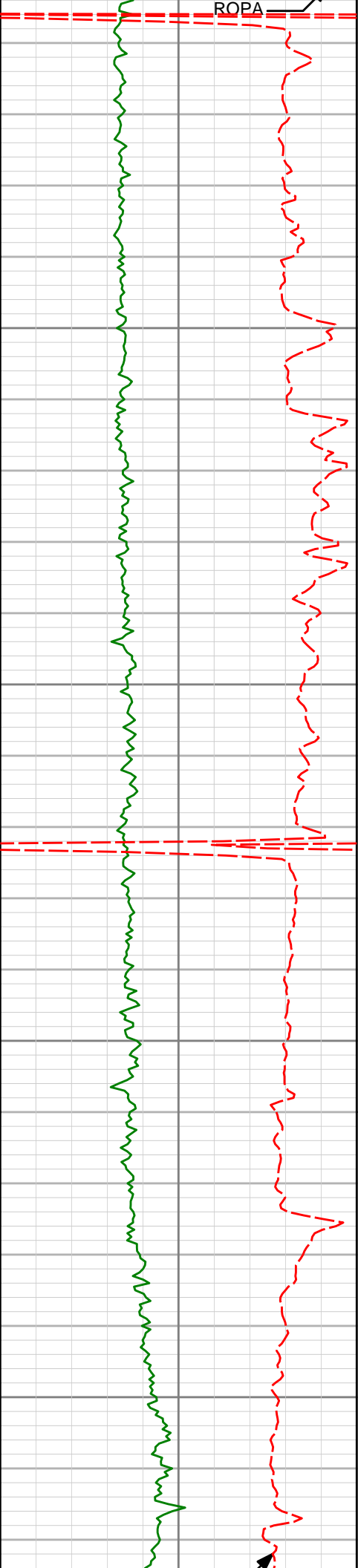
6720'

2.67°

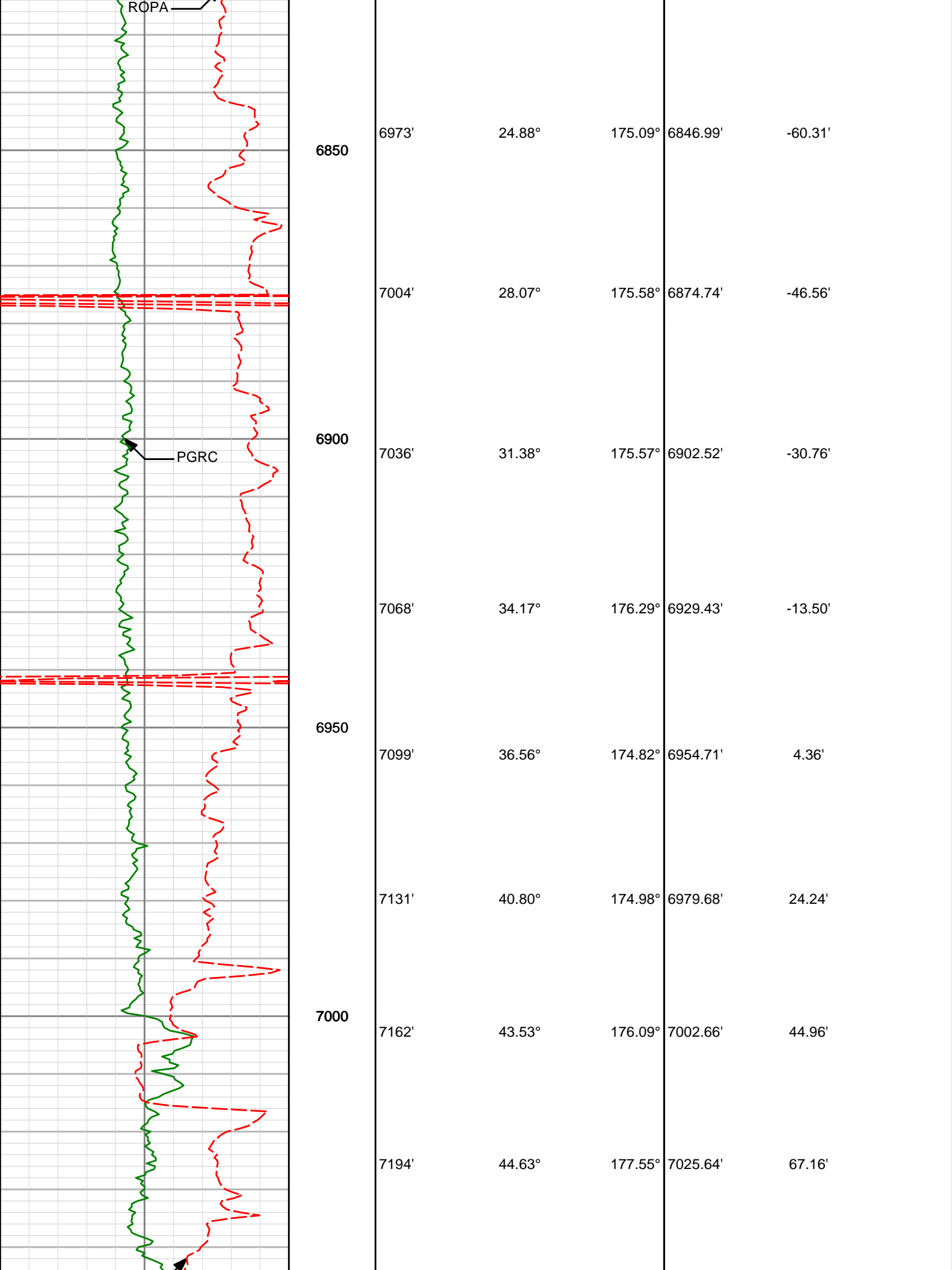
213.22°

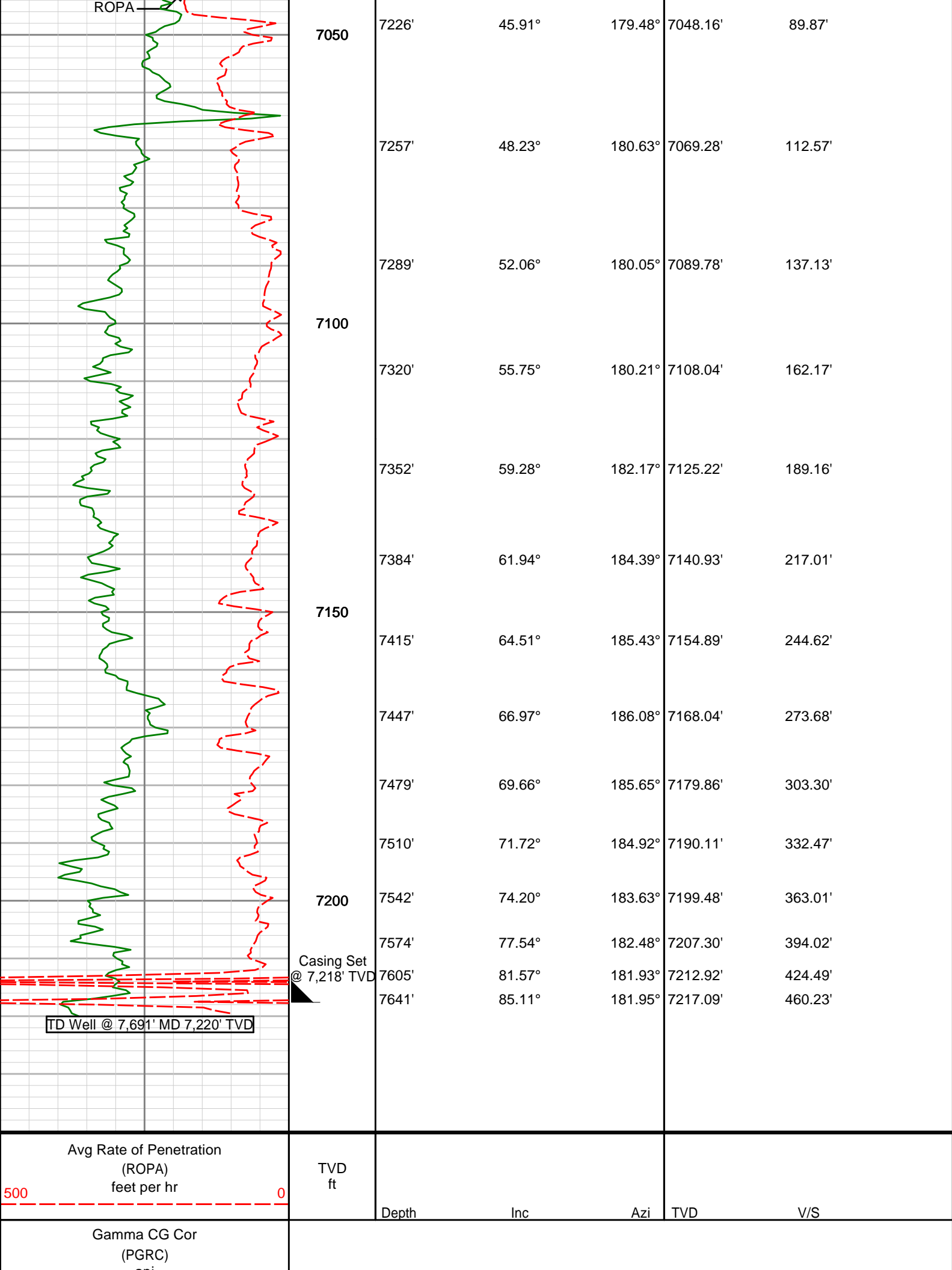
6601.53'

-114.01'



6751'	5.13°	192.52°	6632.46'	-112.04'
6783'	6.36°	191.01°	6664.30'	-108.90'
6815'	8.56°	186.50°	6696.02'	-104.78'
6846'	11.25°	180.73°	6726.56'	-99.46'
6878'	14.65°	174.94°	6757.74'	-92.31'
6909'	17.86°	175.02°	6787.50'	-83.68'
6941'	21.71°	175.64°	6817.60'	-72.90'







HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp
Crowder 15N-18HZ
Wattenburg
Weld Colorado
USA
CA-XX-0900217529

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
990.00	0.29	339.43	989.97	6.23 N	1.28 E	-6.25	TIE-IN
1101.00	0.39	200.94	1100.97	6.14 N	1.05 E	-6.16	0.57
1284.00	0.34	129.87	1283.97	5.21 N	1.25 E	-5.22	0.23
1469.00	0.15	140.01	1468.96	4.66 N	1.83 E	-4.69	0.11
1560.00	1.96	270.75	1559.95	4.59 N	0.36 E	-4.59	2.26
1652.00	3.97	280.13	1651.82	5.17 N	4.35 W	-5.10	2.25
1744.00	5.91	284.08	1743.47	6.88 N	12.08 W	-6.69	2.13
1836.00	7.80	278.92	1834.81	9.00 N	22.85 W	-8.65	2.17
1928.00	10.17	276.53	1925.68	10.89 N	37.09 W	-10.32	2.60
2020.00	11.17	272.20	2016.09	12.16 N	54.06 W	-11.32	1.39
2111.00	10.94	274.08	2105.40	13.11 N	71.48 W	-12.00	0.47
2206.00	12.50	273.81	2198.42	14.44 N	90.73 W	-13.03	1.64
2301.00	14.12	273.54	2290.86	15.84 N	112.55 W	-14.09	1.71
2396.00	12.45	272.17	2383.32	16.94 N	134.35 W	-14.85	1.79
2490.00	15.19	271.40	2474.59	17.62 N	156.78 W	-15.19	2.92
2585.00	13.66	272.75	2566.59	18.47 N	180.43 W	-15.66	1.64
2680.00	14.49	273.25	2658.74	19.68 N	203.51 W	-16.51	0.88
2774.00	12.80	271.14	2750.08	20.55 N	225.66 W	-17.04	1.88
2869.00	12.98	272.99	2842.69	21.32 N	246.83 W	-17.48	0.47
2964.00	12.42	278.91	2935.37	23.45 N	267.58 W	-19.30	1.49
3058.00	14.13	283.15	3026.86	27.63 N	288.74 W	-23.14	2.09
3153.00	13.63	283.52	3119.08	32.88 N	310.92 W	-28.05	0.53
3248.00	13.06	282.93	3211.52	37.90 N	332.26 W	-32.74	0.62
3342.00	13.74	283.27	3302.96	42.84 N	353.47 W	-37.35	0.73
3437.00	13.00	283.27	3395.38	47.88 N	374.85 W	-42.06	0.78
3532.00	13.44	281.68	3487.87	52.57 N	396.06 W	-46.41	0.60
3626.00	13.93	278.31	3579.20	56.42 N	417.95 W	-49.92	0.99
3721.00	12.76	278.89	3671.63	59.69 N	439.63 W	-52.86	1.23
3816.00	13.72	275.58	3764.11	62.41 N	461.22 W	-55.24	1.28
3910.00	15.36	275.73	3855.09	64.74 N	484.70 W	-57.20	1.75
4005.00	13.59	273.38	3947.07	66.65 N	508.36 W	-58.75	1.97
4100.00	15.19	274.61	4039.09	68.31 N	531.91 W	-60.04	1.71
4194.00	15.53	275.36	4129.74	70.47 N	556.71 W	-61.82	0.42
4289.00	15.55	274.14	4221.26	72.58 N	582.07 W	-63.53	0.35
4384.00	15.12	272.22	4312.88	73.98 N	607.15 W	-64.54	0.70
4478.00	14.46	274.99	4403.77	75.48 N	631.10 W	-65.66	1.03
4573.00	14.37	275.47	4495.78	77.63 N	654.65 W	-67.46	0.16
4667.00	13.87	272.29	4586.94	79.20 N	677.52 W	-68.66	0.98
4762.00	14.85	277.32	4678.97	81.20 N	700.97 W	-70.31	1.66
4857.00	15.18	278.54	4770.73	84.60 N	725.35 W	-73.32	0.49
4951.00	14.55	275.19	4861.58	87.50 N	749.28 W	-75.85	1.13
5046.00	13.44	272.98	4953.76	89.15 N	772.19 W	-77.14	1.31
5141.00	13.87	278.82	5046.08	91.47 N	794.47 W	-79.12	1.52
5235.00	12.82	275.72	5137.54	94.23 N	815.98 W	-81.55	1.36
5330.00	14.11	281.32	5229.93	97.56 N	837.82 W	-84.53	1.93
5425.00	13.11	280.99	5322.27	101.88 N	859.75 W	-88.52	1.06
5519.00	13.49	282.44	5413.74	106.28 N	880.93 W	-92.58	0.54
5614.00	12.62	281.62	5506.29	110.76 N	901.91 W	-96.73	0.94
5709.00	10.77	280.70	5599.31	114.49 N	920.80 W	-100.18	1.96
5803.00	10.91	277.43	5691.64	117.27 N	938.25 W	-102.69	0.67
5898.00	9.19	276.57	5785.17	119.31 N	954.70 W	-104.46	1.81
5993.00	9.88	278.78	5879.24	121.47 N	972.24 W	-106.23	2.55

5993.00	9.30	279.73	5878.94	121.47 N	969.81 W	-106.39	0.55
6088.00	9.56	281.16	5972.66	124.30 N	985.12 W	-108.98	0.37
6182.00	8.54	282.14	6065.48	127.27 N	999.60 W	-111.73	1.10
6277.00	7.30	279.65	6159.58	129.77 N	1012.45 W	-114.03	1.35
6372.00	5.40	273.72	6253.99	131.07 N	1022.86 W	-115.17	2.12
6467.00	3.64	272.64	6348.69	131.50 N	1030.34 W	-115.48	1.85
6562.00	1.77	274.30	6443.58	131.75 N	1034.82 W	-115.66	1.97
6657.00	1.15	230.79	6538.55	131.26 N	1037.02 W	-115.14	1.29
6688.00	1.00	238.37	6569.55	130.92 N	1037.49 W	-114.79	0.66
6720.00	2.67	213.22	6601.53	130.15 N	1038.13 W	-114.01	5.67
6751.00	5.13	192.52	6632.46	128.20 N	1038.83 W	-112.04	9.04
6783.00	6.36	191.01	6664.30	125.06 N	1039.48 W	-108.90	3.86
6815.00	8.56	186.50	6696.02	120.95 N	1040.09 W	-104.78	7.12
6846.00	11.25	180.73	6726.56	115.63 N	1040.39 W	-99.46	9.23
6878.00	14.65	174.94	6757.74	108.48 N	1040.07 W	-92.31	11.36
6909.00	17.86	175.02	6787.50	99.84 N	1039.31 W	-83.68	10.36
6941.00	21.71	175.64	6817.60	89.04 N	1038.44 W	-72.90	12.06
6973.00	24.88	175.09	6846.99	76.43 N	1037.41 W	-60.31	9.91
7004.00	28.07	175.58	6874.74	62.66 N	1036.29 W	-46.56	10.33
7036.00	31.38	175.57	6902.52	46.84 N	1035.07 W	-30.76	10.35
7068.00	34.17	176.29	6929.43	29.57 N	1033.84 W	-13.50	8.79
7099.00	36.56	174.82	6954.71	11.68 N	1032.44 W	4.36	8.19
7131.00	40.80	174.98	6979.68	8.24 S	1030.67 W	24.24	13.26
7162.00	43.53	176.09	7002.66	28.98 S	1029.06 W	44.96	9.10
7194.00	44.63	177.55	7025.64	51.20 S	1027.82 W	67.16	4.68
7226.00	45.91	179.48	7048.16	73.93 S	1027.24 W	89.87	5.86
7257.00	48.23	180.63	7069.28	96.62 S	1027.26 W	112.57	7.95
7289.00	52.06	180.05	7089.78	121.18 S	1027.41 W	137.13	12.06
7320.00	55.75	180.21	7108.04	146.23 S	1027.46 W	162.17	11.92
7352.00	59.28	182.17	7125.22	173.21 S	1028.03 W	189.16	12.18
7384.00	61.94	184.39	7140.93	201.04 S	1029.63 W	217.01	10.27
7415.00	64.51	185.43	7154.89	228.62 S	1032.00 W	244.62	8.80
7447.00	66.97	186.08	7168.04	257.64 S	1034.93 W	273.68	7.91
7479.00	69.66	185.65	7179.86	287.22 S	1037.96 W	303.30	8.52
7510.00	71.72	184.92	7190.11	316.35 S	1040.66 W	332.47	7.00
7542.00	74.20	183.63	7199.48	346.85 S	1042.93 W	363.01	8.64
7574.00	77.54	182.48	7207.30	377.84 S	1044.58 W	394.02	11.00
7605.00	81.57	181.93	7212.92	408.29 S	1045.75 W	424.49	13.13
7641.00	85.11	181.95	7217.09	444.03 S	1046.97 W	460.23	9.84

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 180.89 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.61 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7641.00 FEET
IS 1137.23 FEET ALONG 247.02 DEGREES (TRUE)**