

## PCGK - Pressure Case Gamma

1 : 240

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100	200	300		
<b>Date run completed</b>	20-Mar-14	21-Mar-14	24-Mar-14		
<b>Rig Bit Number</b>	2	3	4		
<b>Bit Size (in)</b>	8.750	8.750	6.125		
<b>Tool Nominal OD (in)</b>	6.750	6.750	4.750		
<b>Log Start Depth (MD, ft)</b>	670.00	5,989.00	6,981.00		
<b>Log End Depth (MD, ft)</b>	5,989.00	6,981.00	11,190.00		
<b>Drill or Wipe</b>	Drill	Drill	Drill		
<b>Drill/Wipe Start Date and Time</b>	20-Mar-14 05:05	21-Mar-14 01:54	22-Mar-14 19:24		
<b>Drill/Wipe End Date and Time</b>	20-Mar-14 17:27	21-Mar-14 10:15	24-Mar-14 06:10		
<b>Min Inc (deg) @ Depth (MD, ft)</b>	0.15 @ 5,266.00	0.79 @ 5,981.00	85.46 @ 7,239.00		
<b>Max Inc (deg) @ Depth (MD, ft)</b>	9.65 @ 2,231.00	81.93 @ 6,925.00	92.25 @ 7,619.00		
<b>Bit TFA(in2) / Bit Type</b>	0.91 / PDC	0.98 / PDC	0.46 / PDC		
<b>Flow Rate (gpm)</b>	596.00	587.00	268.00		
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	356.1 / 356.1	356.1 / 356.1	442.9 / 442.9		
<b>Fluid Type</b>	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel		
<b>Density (ppg) / Viscosity (spqt)</b>	8.80 / 28.00	10.50 / 36.50	9.60 / 37.00		
<b>Filtrate CL (ppm)</b>	2,000.00	2,100.00	2,100.00		
<b>pH / Fluid Loss (mptm)</b>	8.70 / N/A	10.00 / N/A	9.80 / N/A		
<b>PV (cP) / YP (lbf2)</b>	1 / 3.50	9 / 9.00	9 / 10.00		
<b>% Solids / % Sand</b>	3.9 / .25	9.7 / .5	6.2 / .25		
<b>% Oil / Oil:Water Ratio</b>	N/A / N/A	N/A / N/A	N/A / N/A		
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A	N/A @ N/A		
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A	N/A @ N/A		
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A	N/A @ N/A		
<b>Max Tool Temp (in F) / S</b>	122.22 / PDM	122.22 / PDM	215.51 / PDM		

Max Tool Temp (degF) / Source	160.83 / PCM	160.83 / PCM	215.51 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	Osahon Igunbor	Osahon Igunbor	Robert Ley		
Customer Representative	Charles Collver	Charles Collver	Charles Collver		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11404289	11404289	12310740		
Insert Serial Number	11620293	11620293	11680106		
Date and Time Initialized	19-Mar-14 19:27	19-Mar-14 19:27	22-Mar-14 00:27		
Date and Time Read	21-Mar-14 16:35	21-Mar-14 16:17	24-Mar-14 16:35		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	59.00	56.00	62.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11404289	11404289	12310740		
Sonde Serial Number	11168934	11168934	11478090		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	55.26	213.16	218.84		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	52.03	49.36	54.94		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11404289	11404289	12310740		
Insert/Sonde Serial Number	11120594	11120594	12071281		

## REMARKS

1. All depths are measured depths and are calibrated to the driller' pipe tally and are measured from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. The Following smoothing parameters have been applied to the data"

PGXR (Gamma Ray CG):  
Interval Resolution: 0.5 feet  
Coercion Distance: 0.6 feet  
Gap Fill: 3.0 feet

ROPA (Rate of Penetration):  
Interval Resolution: 0.5 feet  
Coercion Distance: 1.2 feet

## WARRANTY

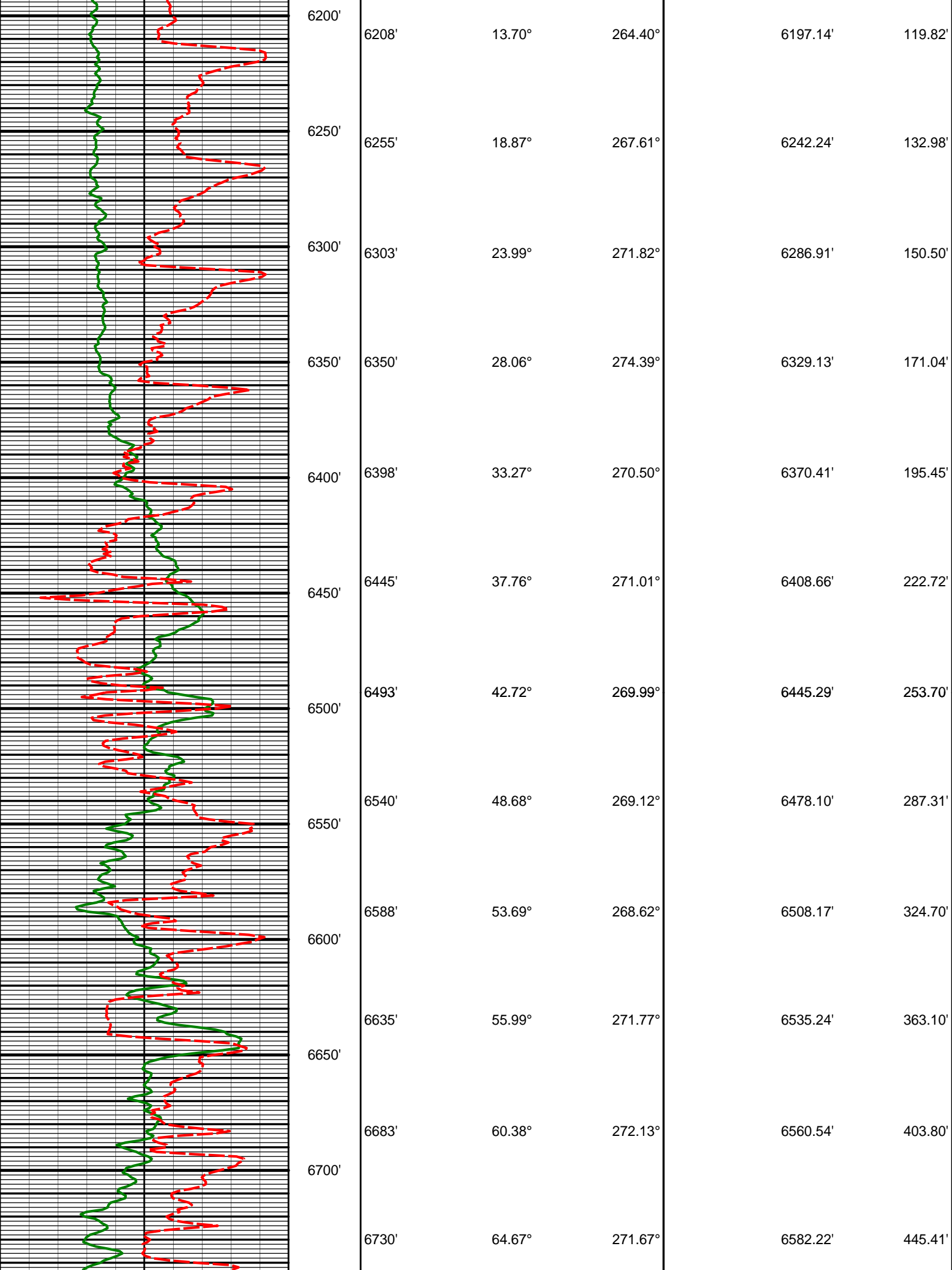
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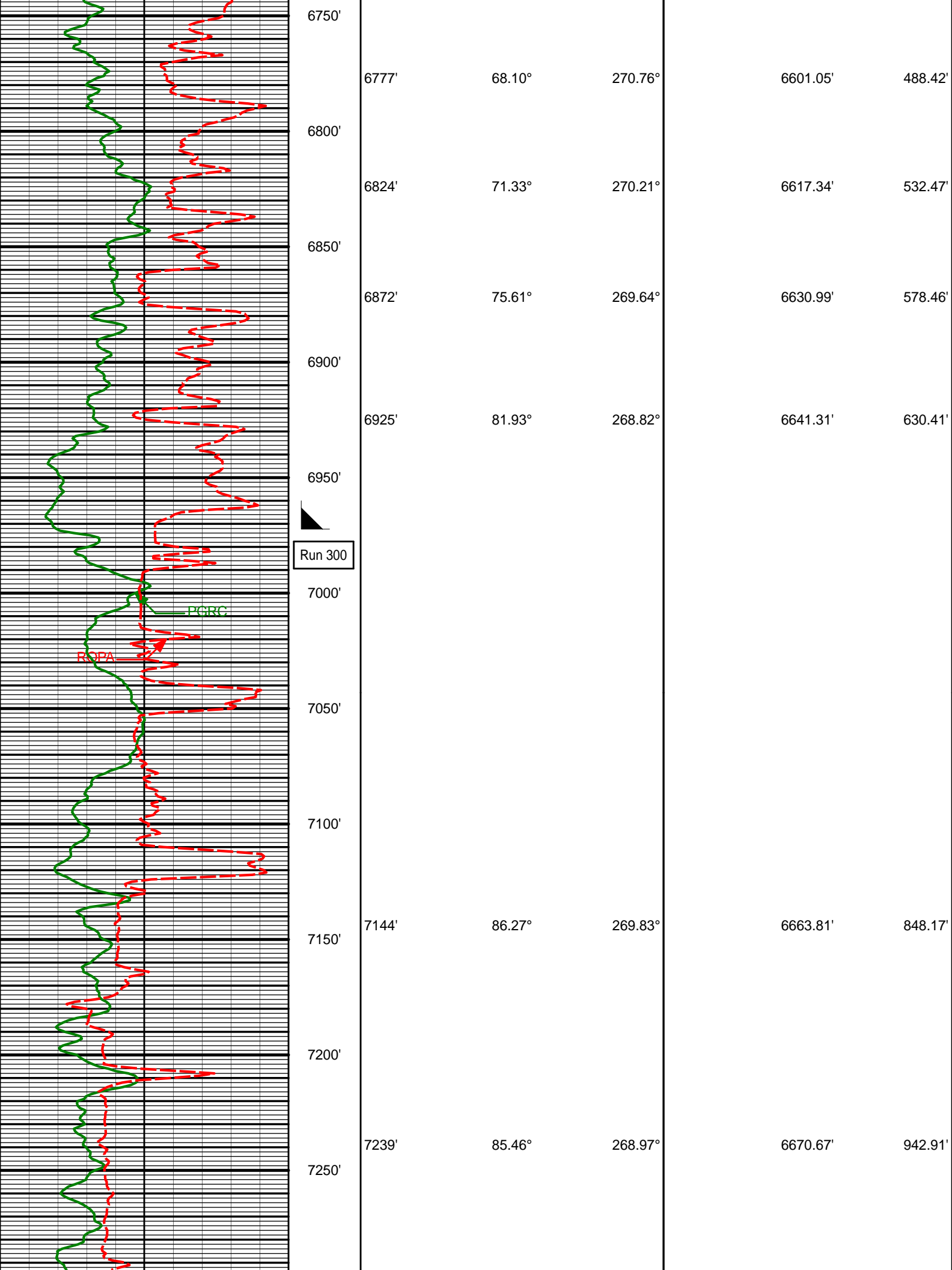
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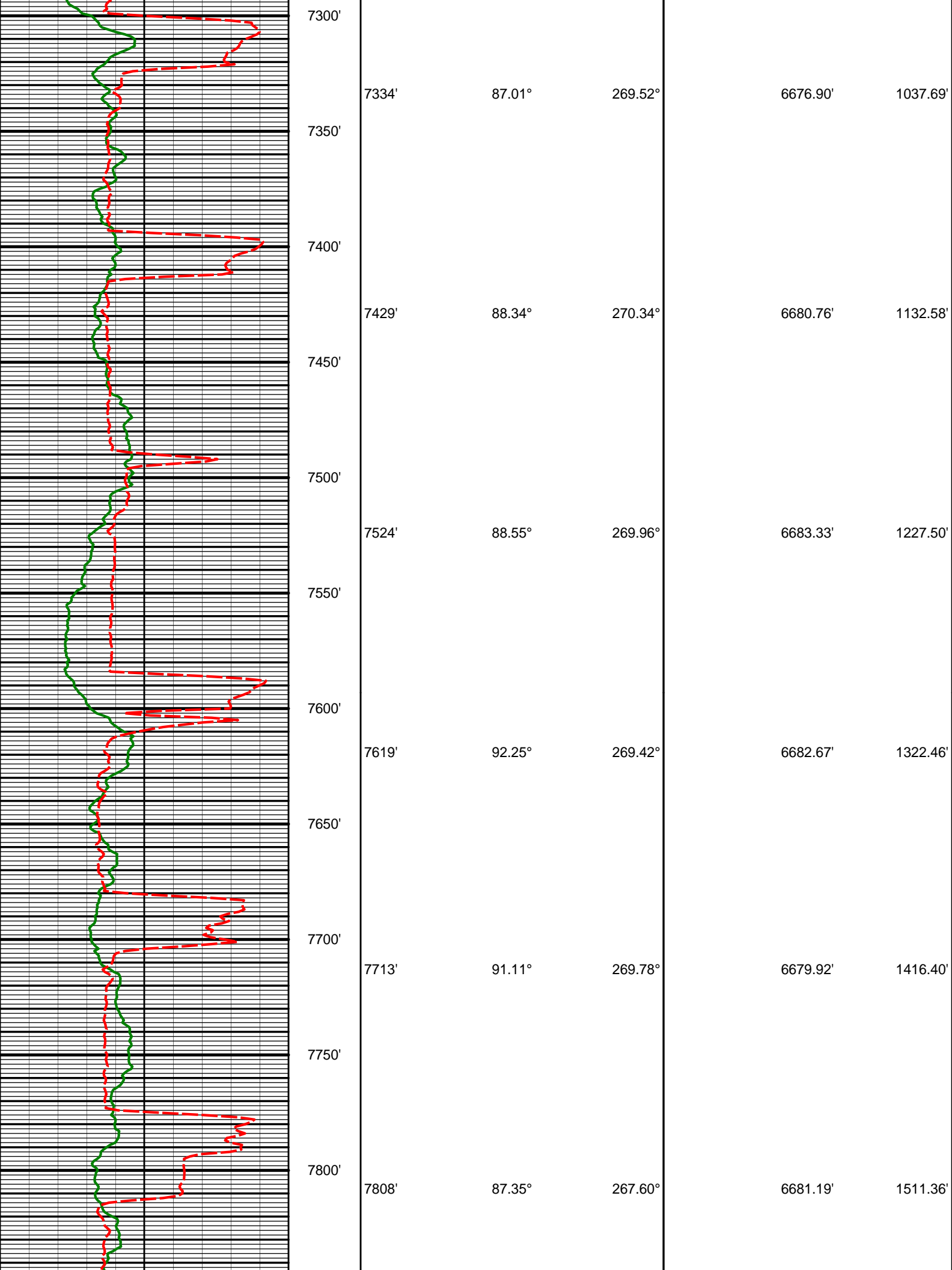
HALLIBURTON

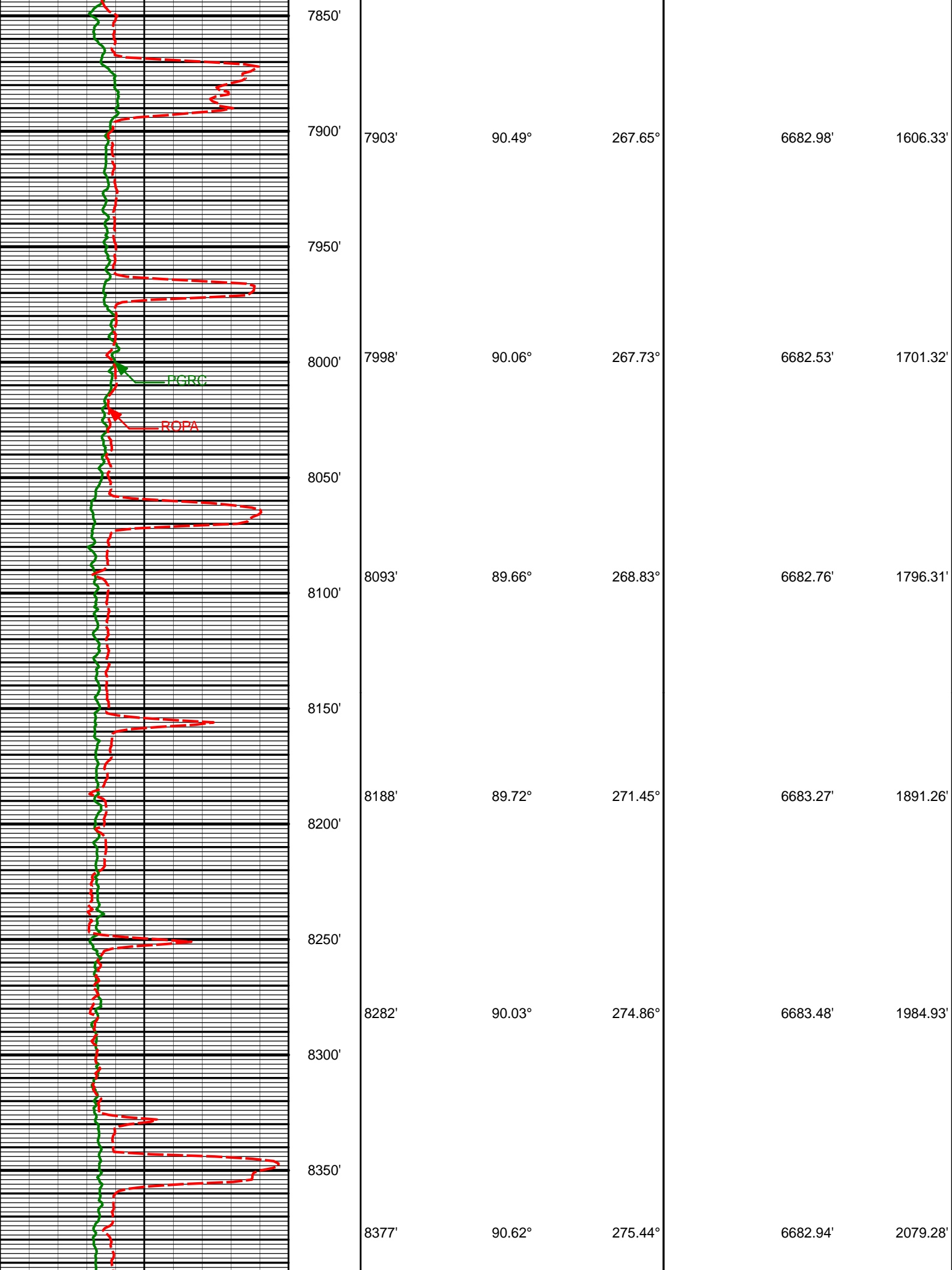
MD Detail Log 1:600

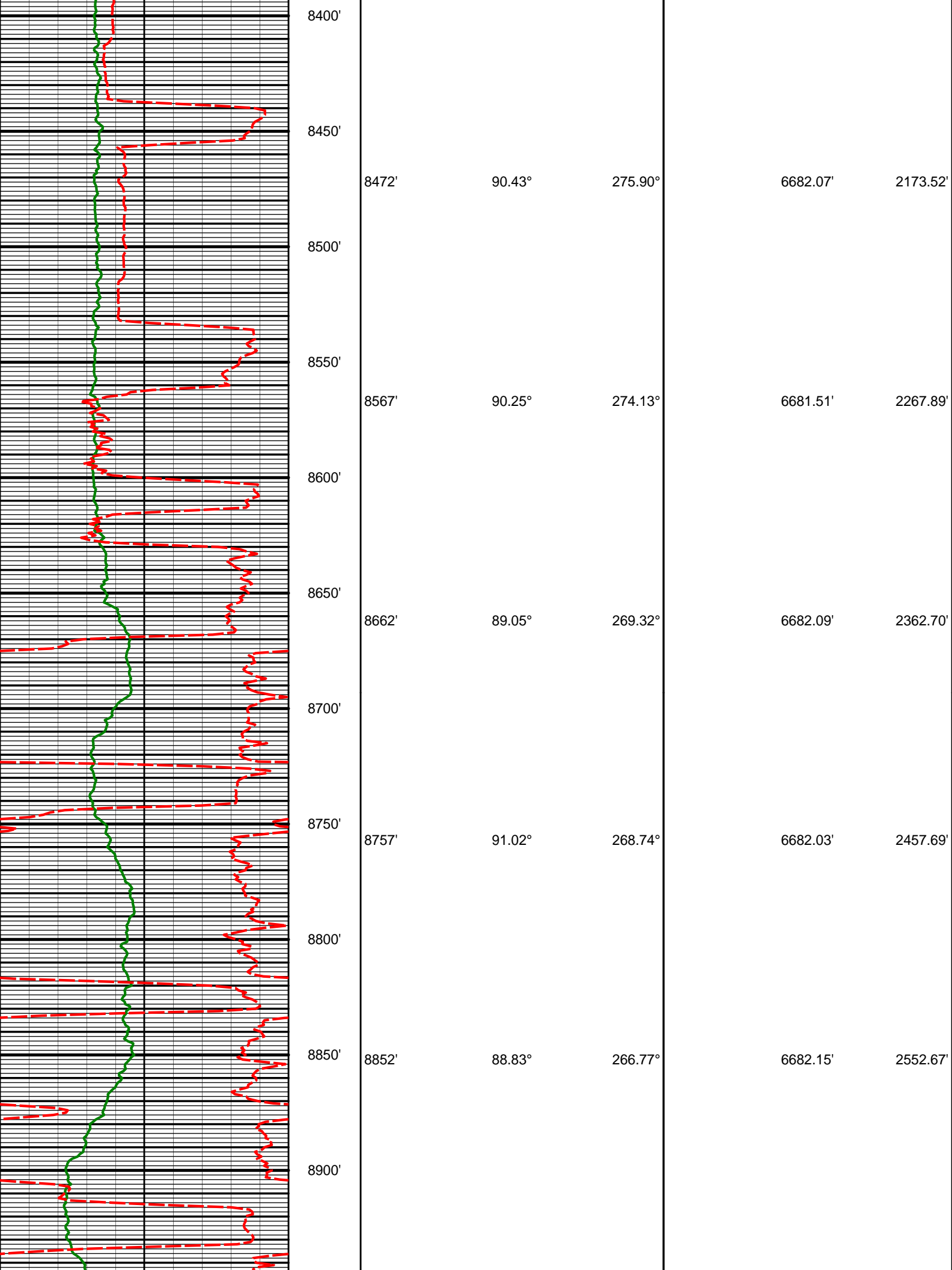
Gamma Ray (PGXC) (Api)						
0300						
Avg Rate of Penetration feet per hr	Feet					
6000		Depth	Inc	Azm	TVD	Vsec
	5950'	5930'	0.46°	225.53°	5920.66'	99.27'
	Run 200	5981'	0.79°	214.73°	5971.66'	99.63'
	6000'					
		6018'	1.09°	215.84°	6008.65'	99.99'
	KOP					
	6050'					
		6065'	2.71°	291.11°	6055.63'	101.29'
	6100'	6113'	6.06°	295.76°	6103.48'	104.59'
	6150'	6160'	8.97°	275.33°	6150.08'	110.43'



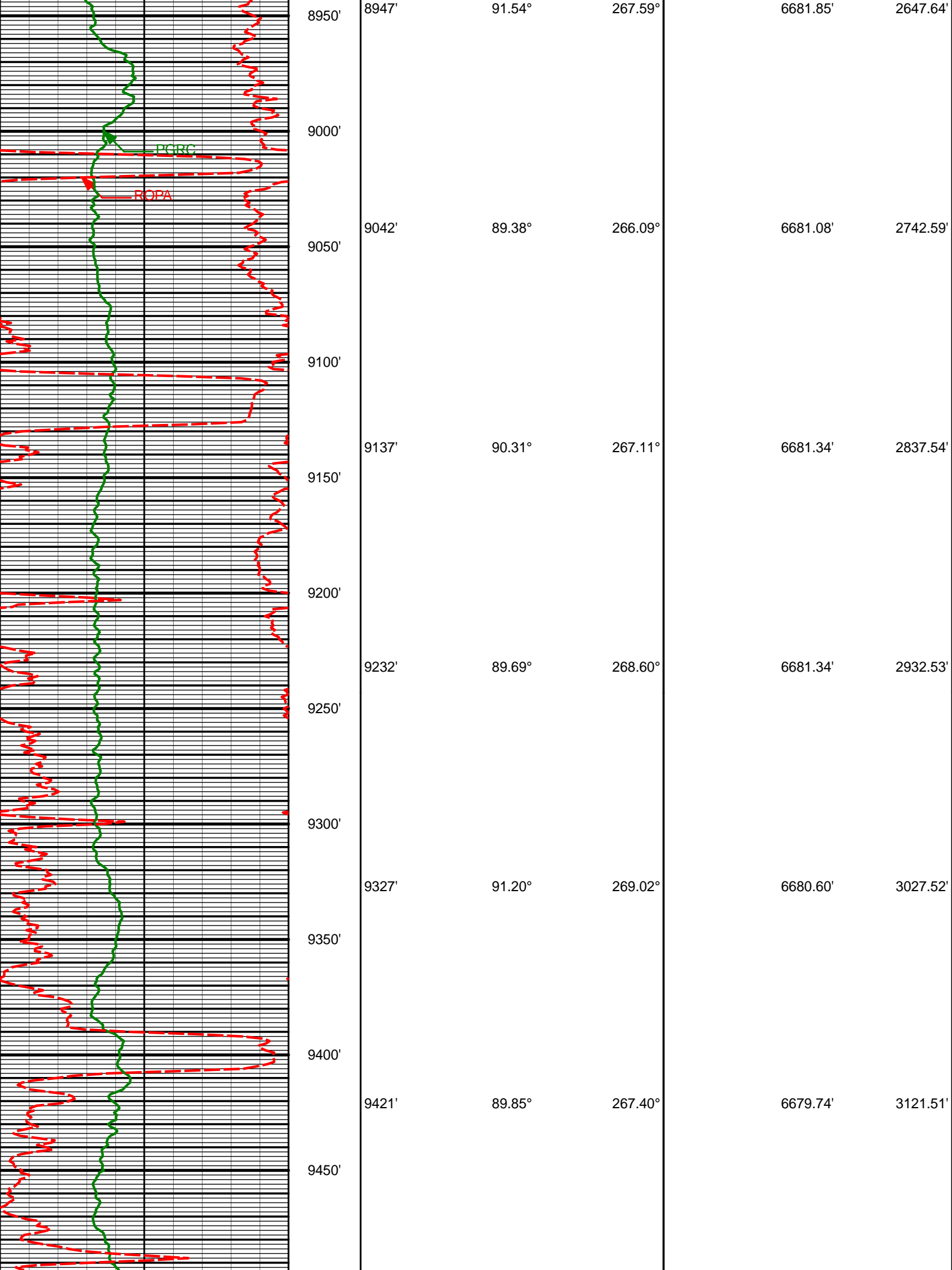


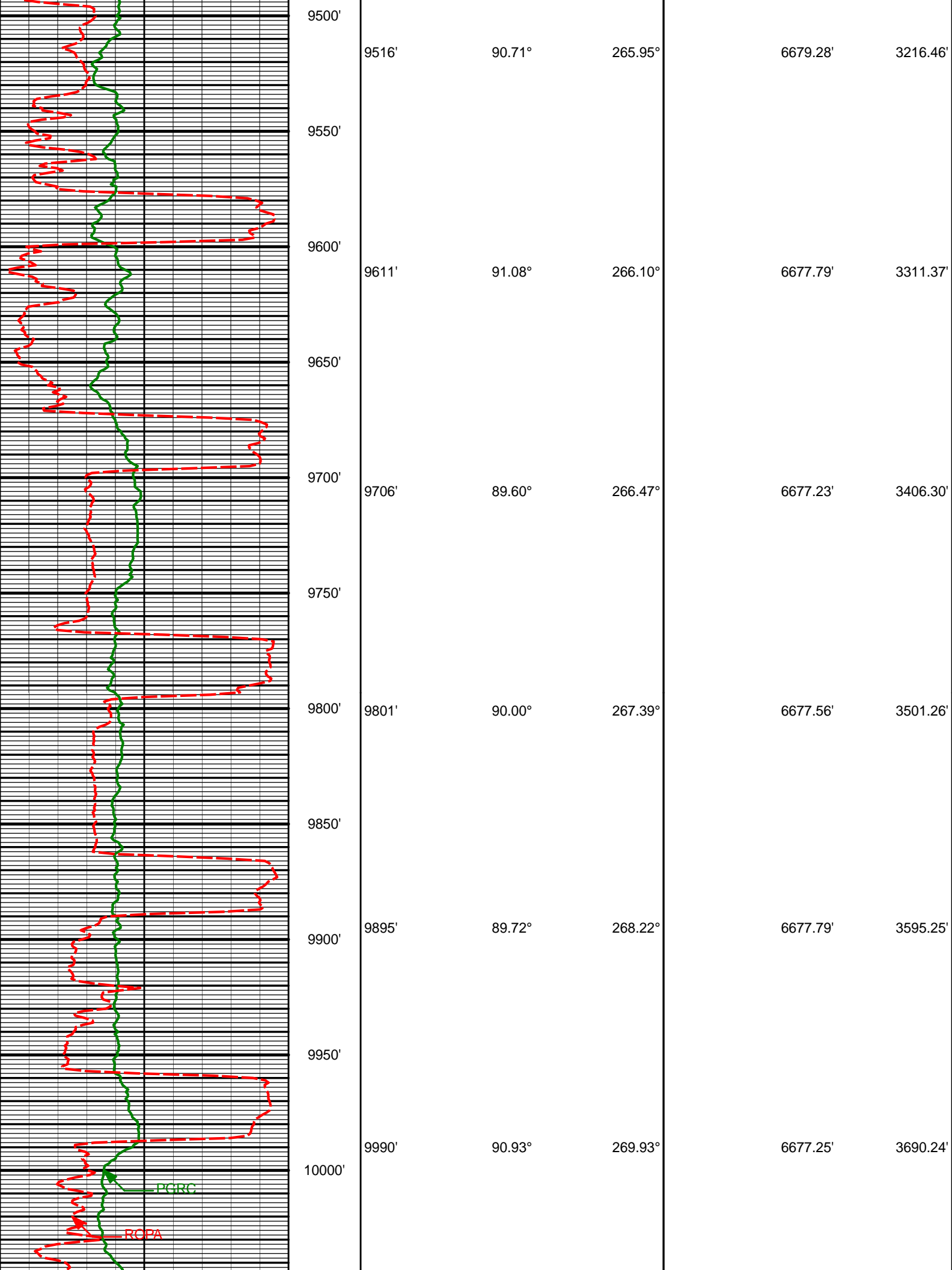


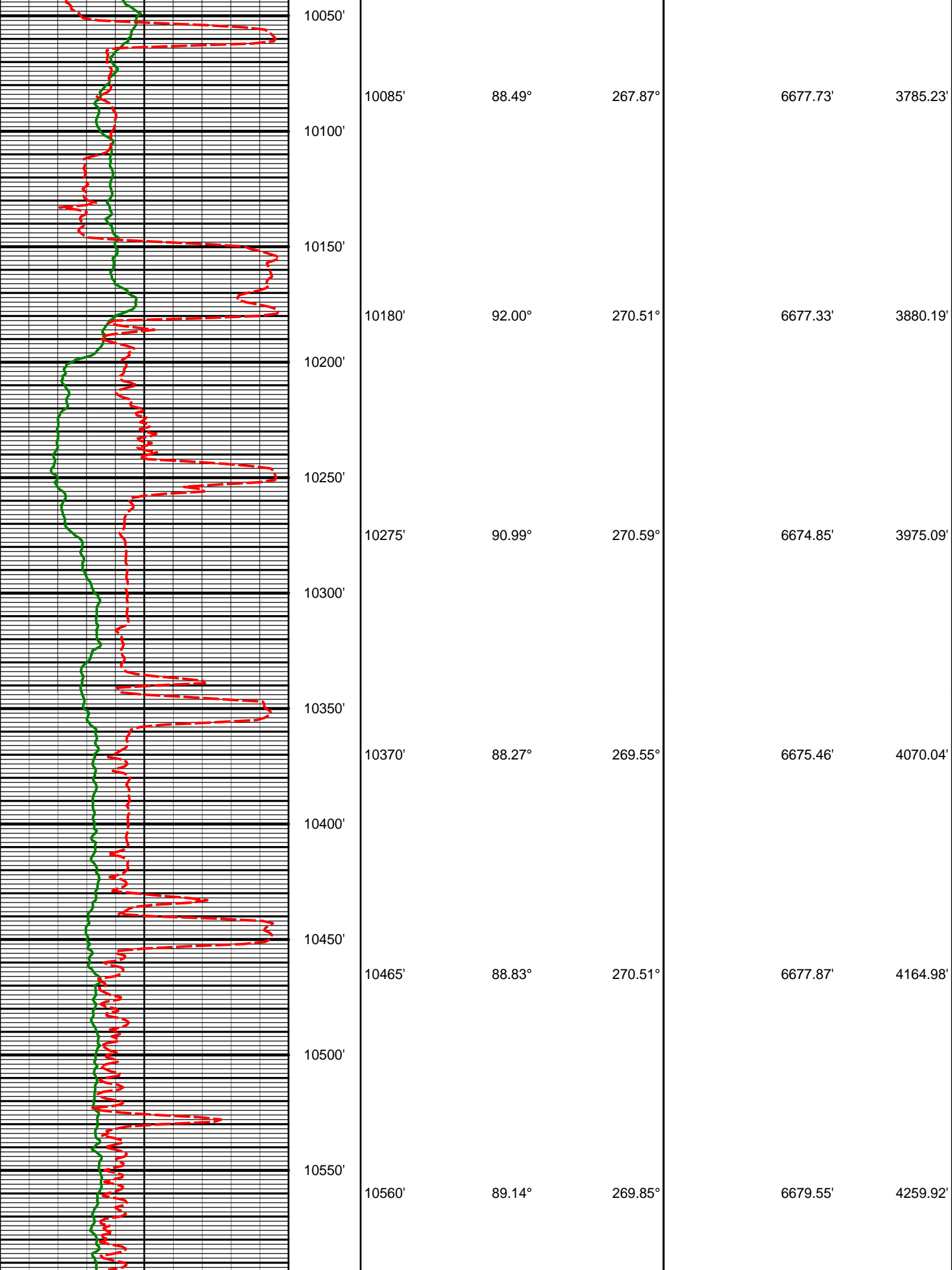


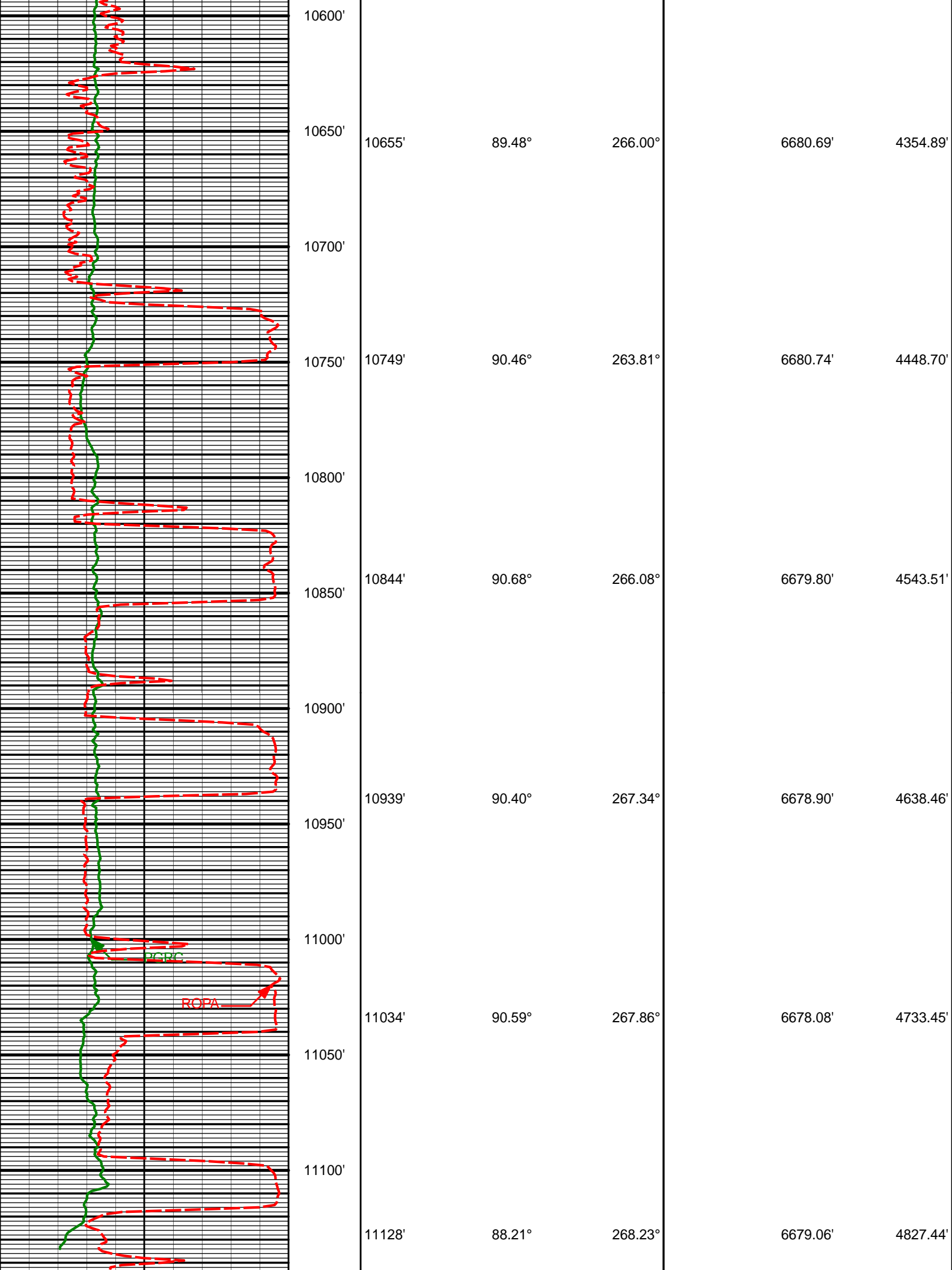


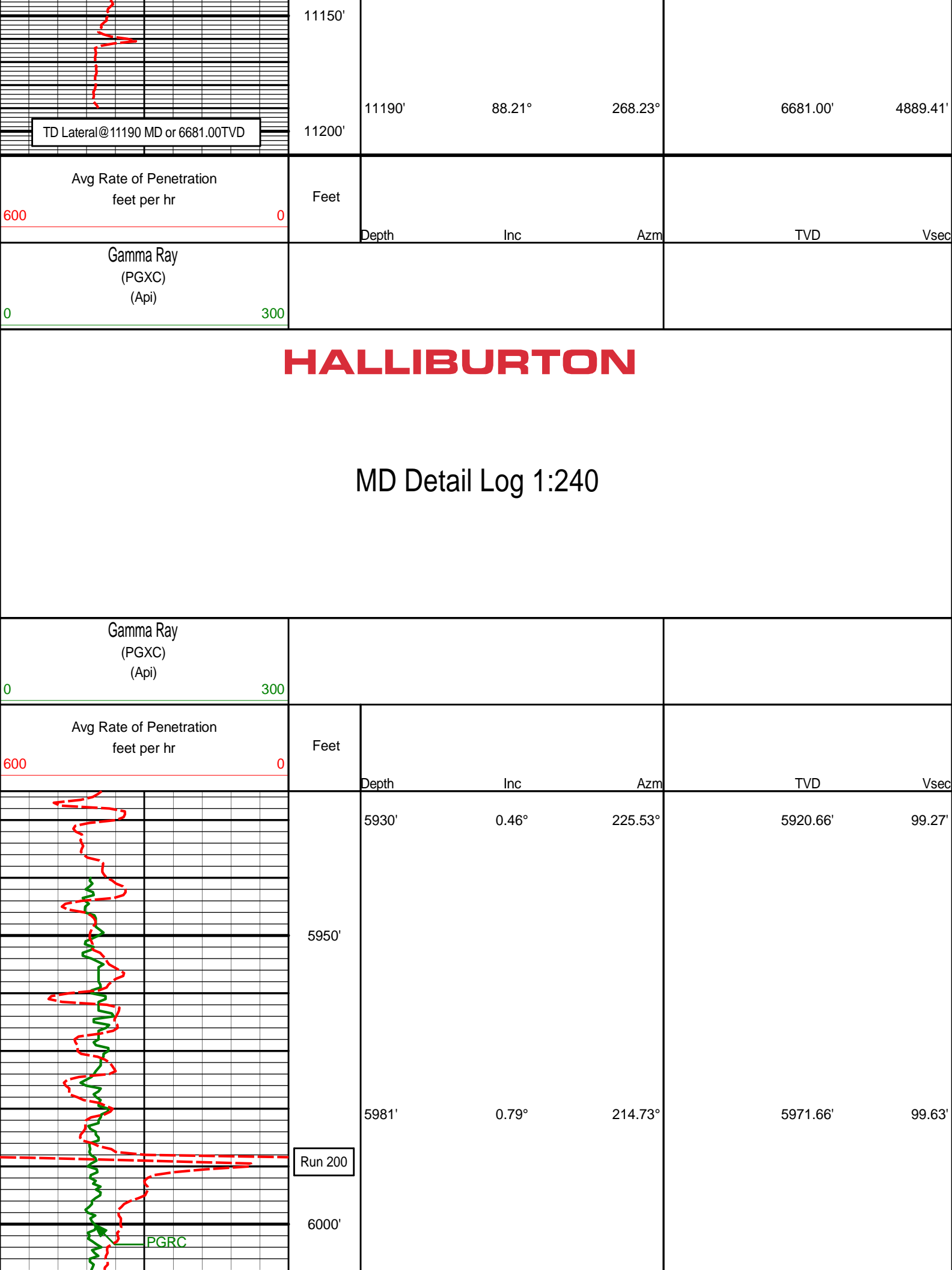


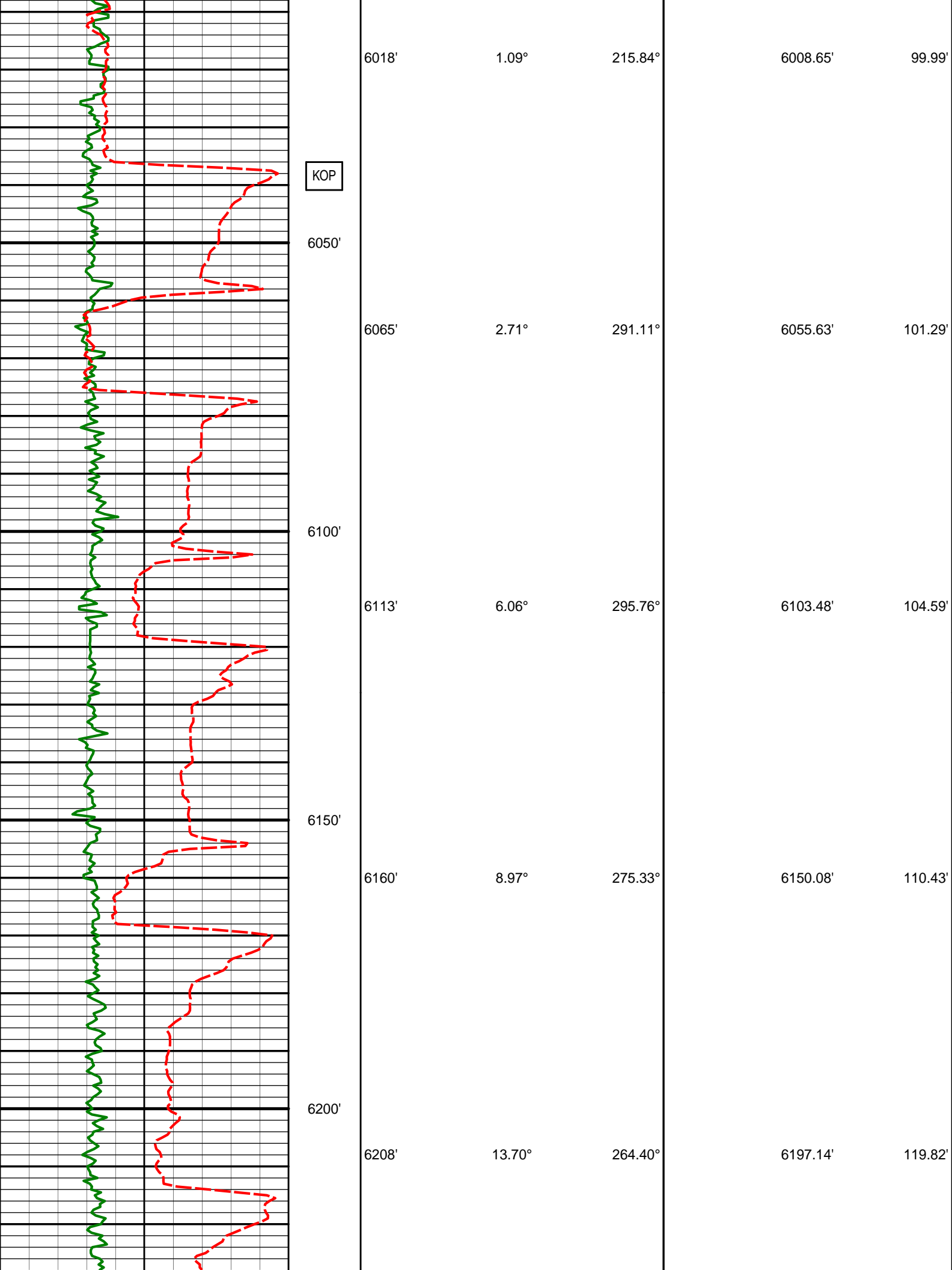


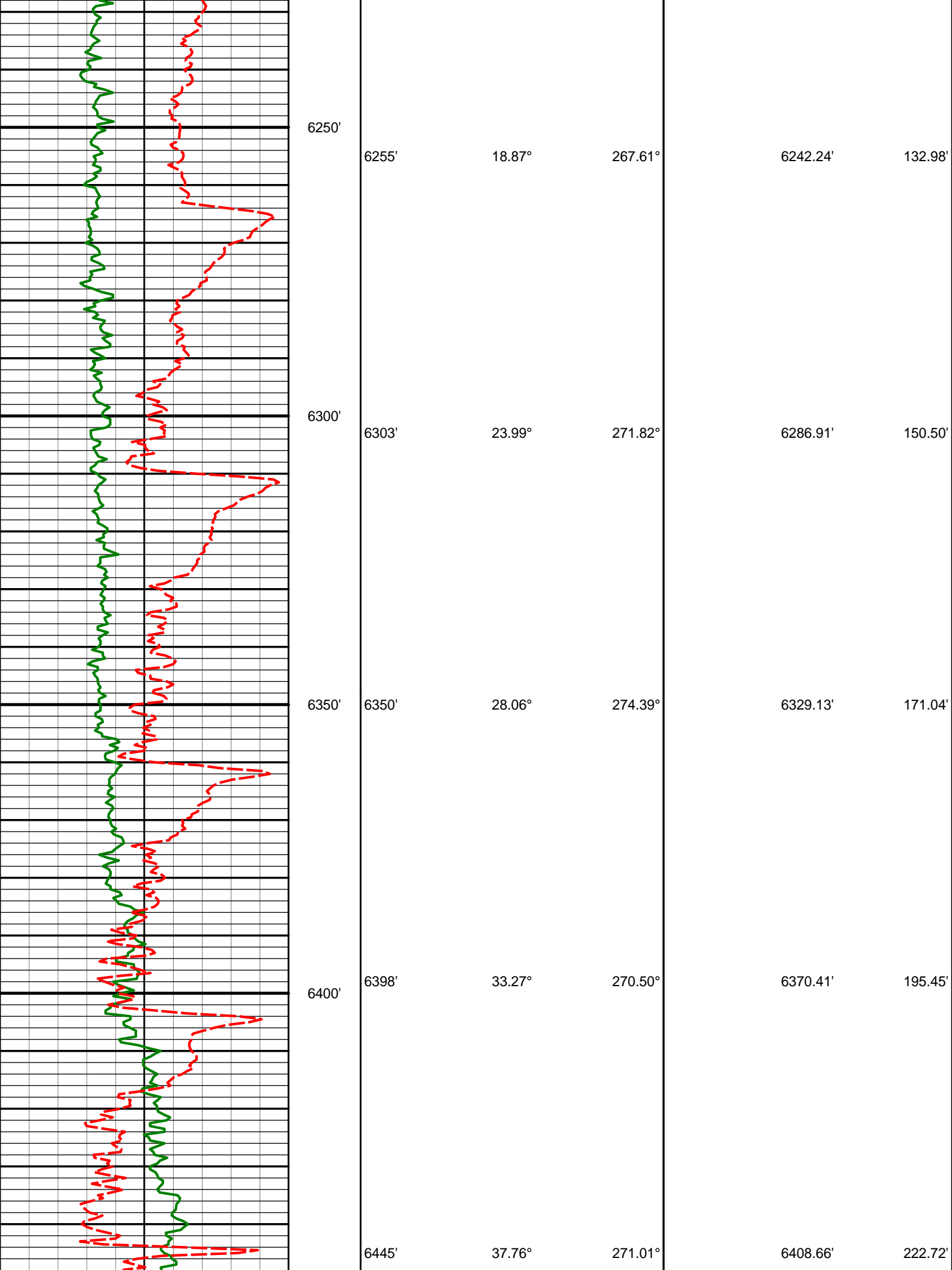


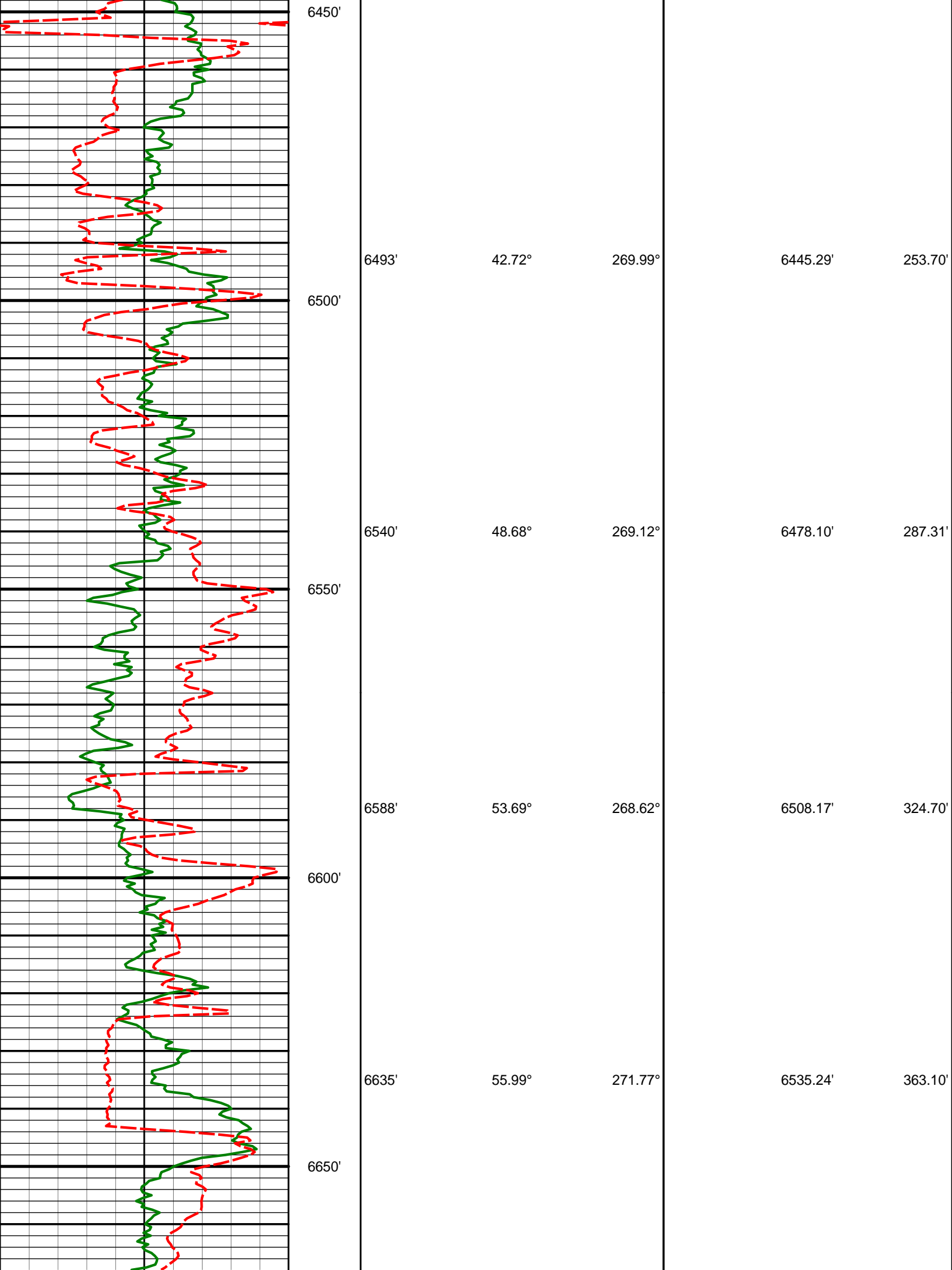




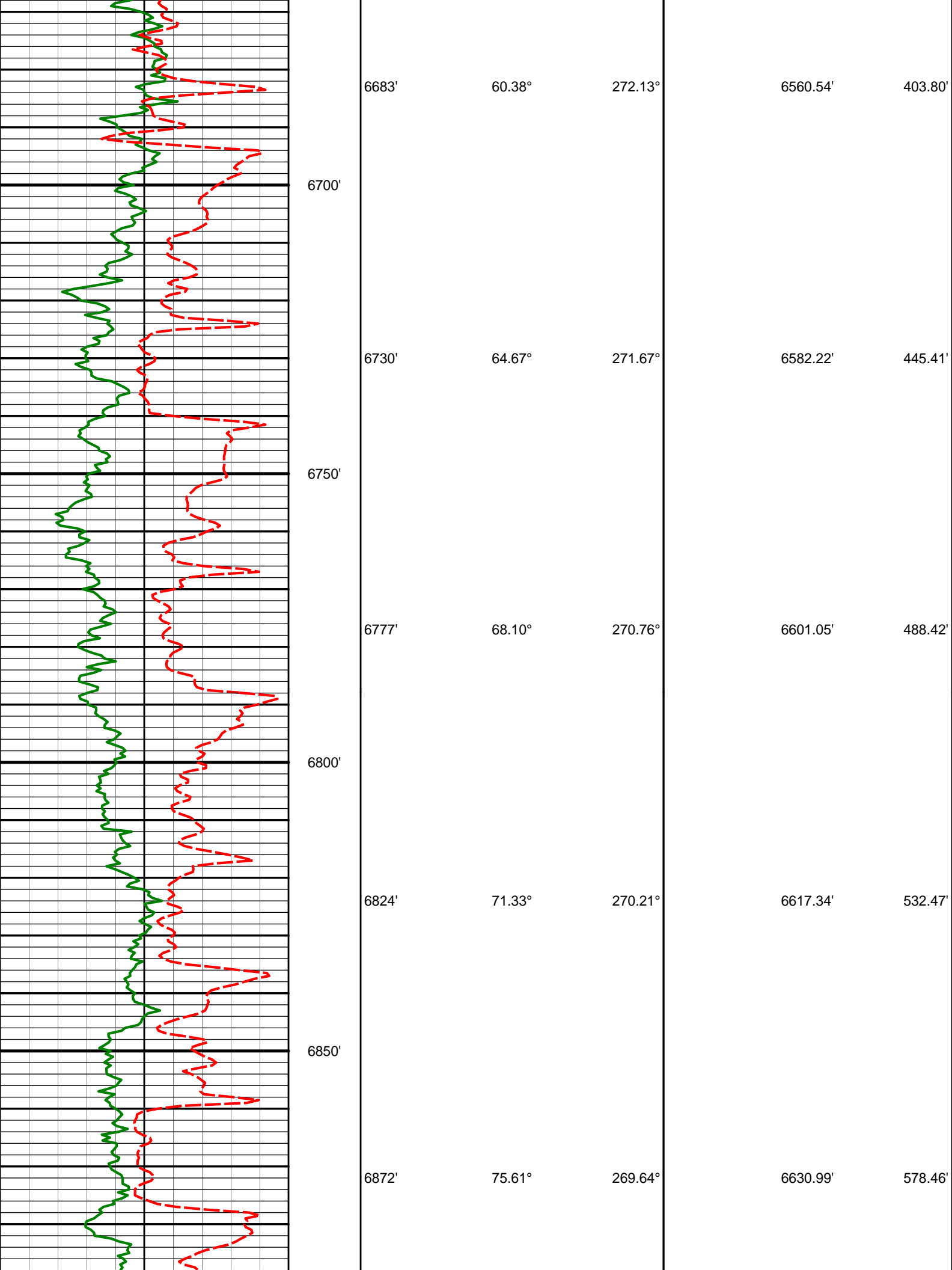


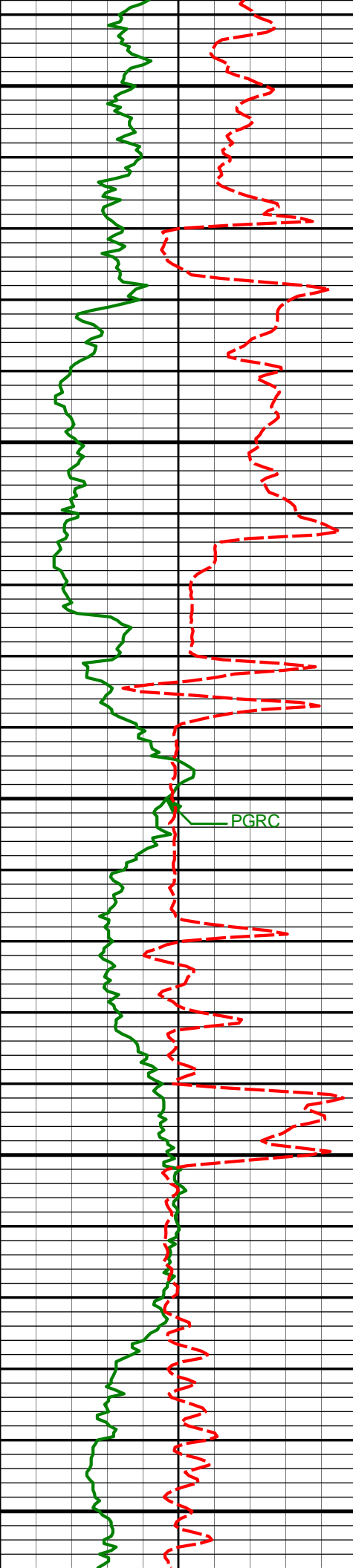












Run 300

PGRC

6900'

6950'

7000'

7050'

7100'

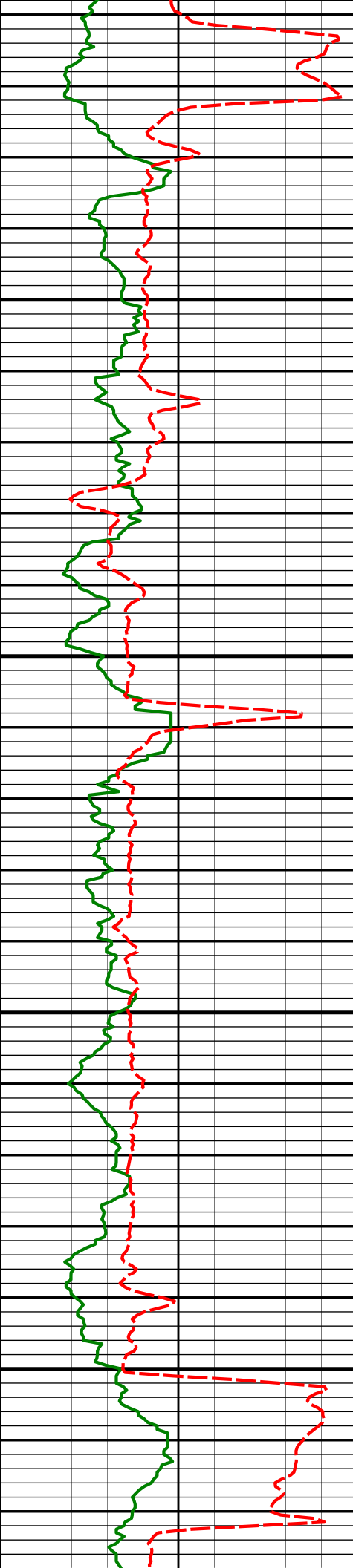
6925'

81.93°

268.82°

6641.31'

630.41'



7144'

86.27°

269.83°

6663.81'

848.17'

7150'

7200'

7239'

85.46°

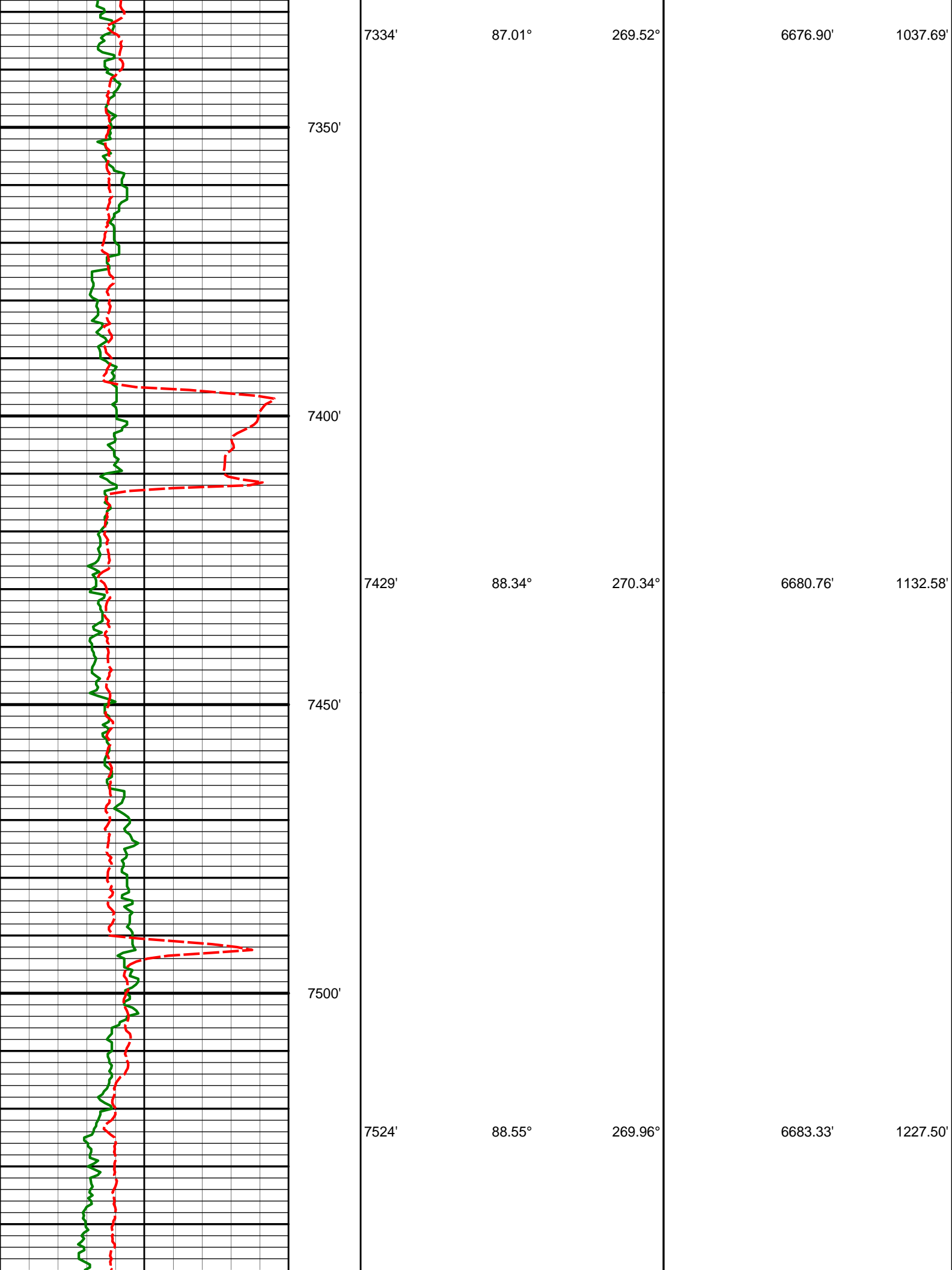
268.97°

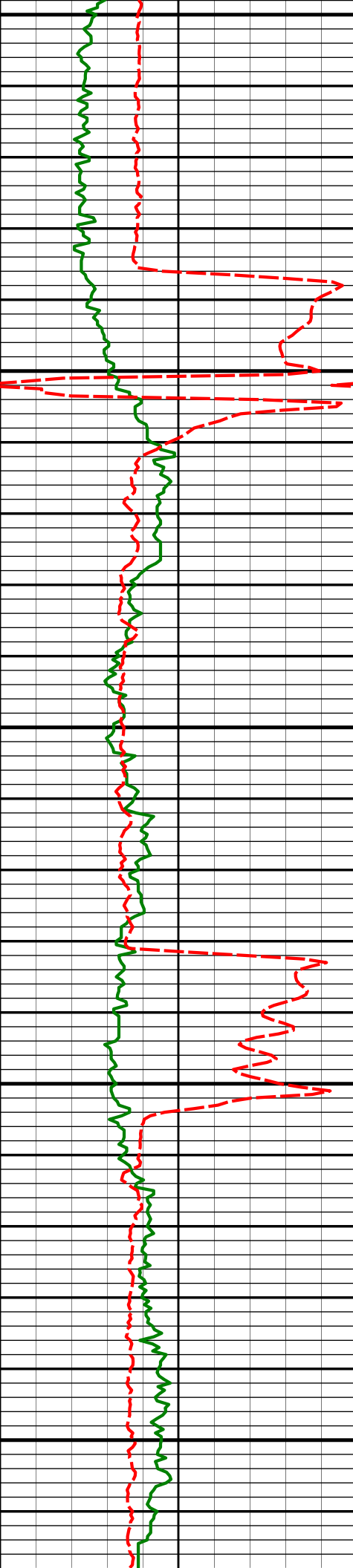
6670.67'

942.91'

7250'

7300'





7550'

7600'

7650'

7700'

7750'

7619'

92.25°

269.42°

6682.67'

1322.46'

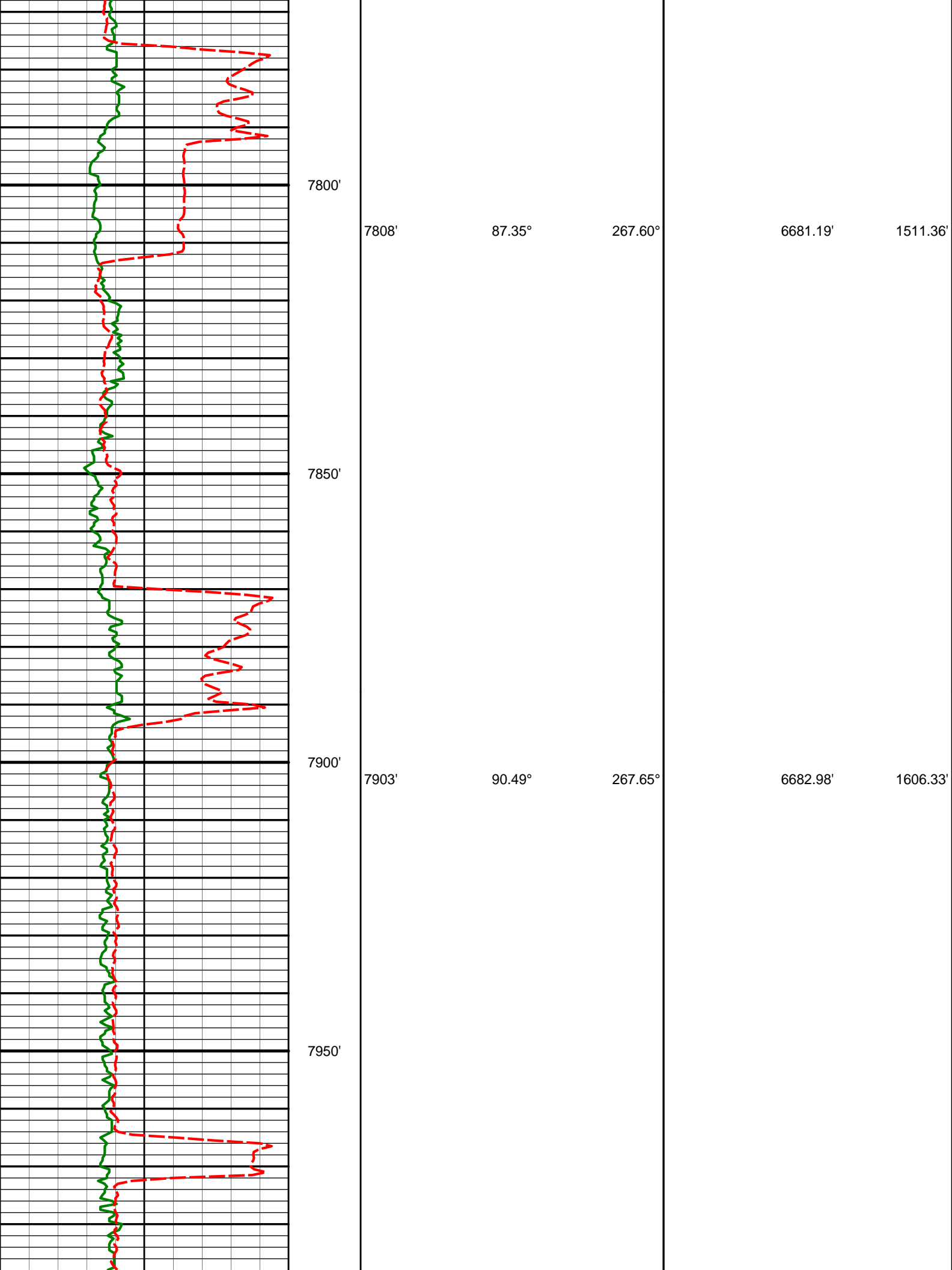
7713'

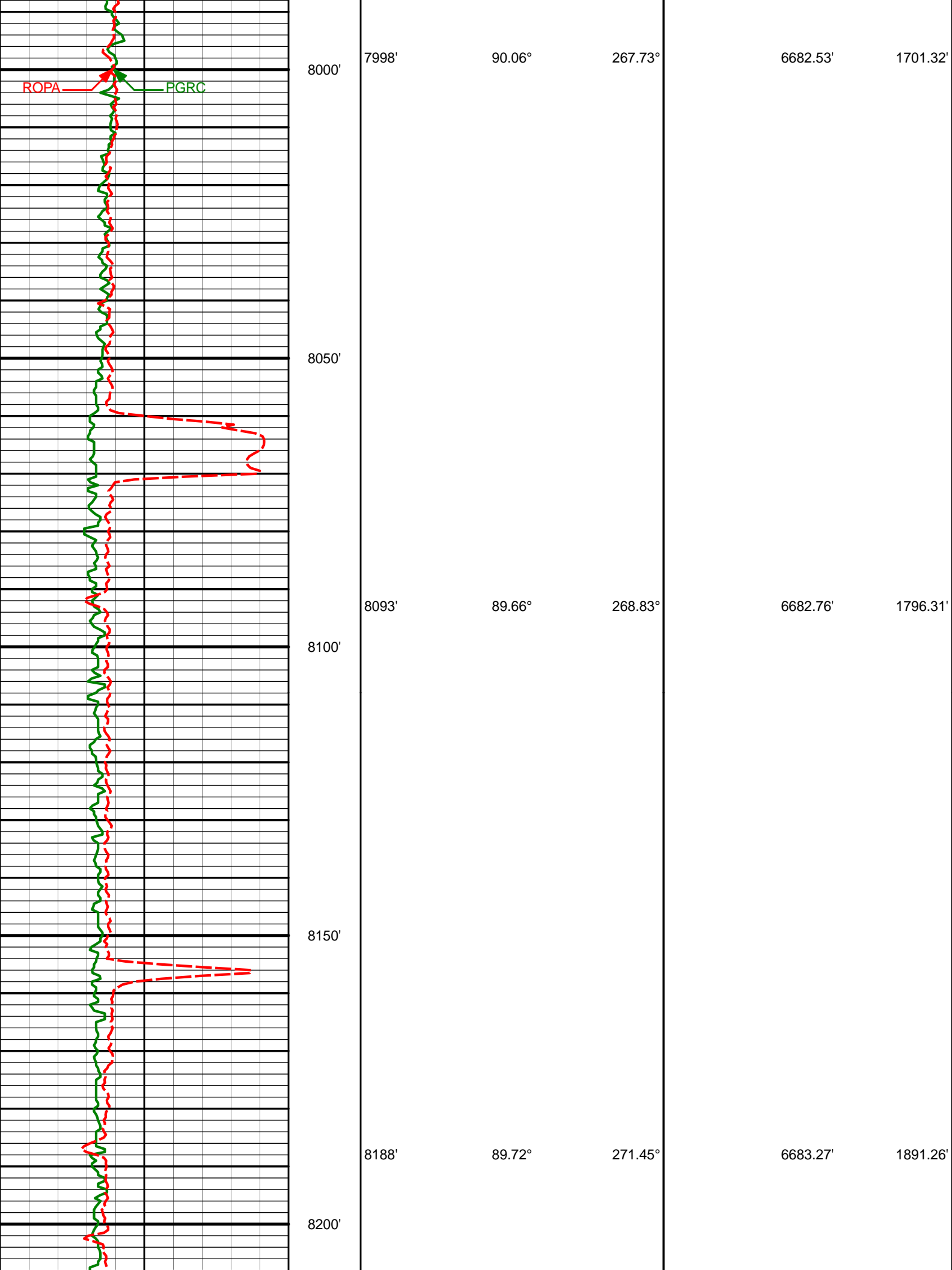
91.11°

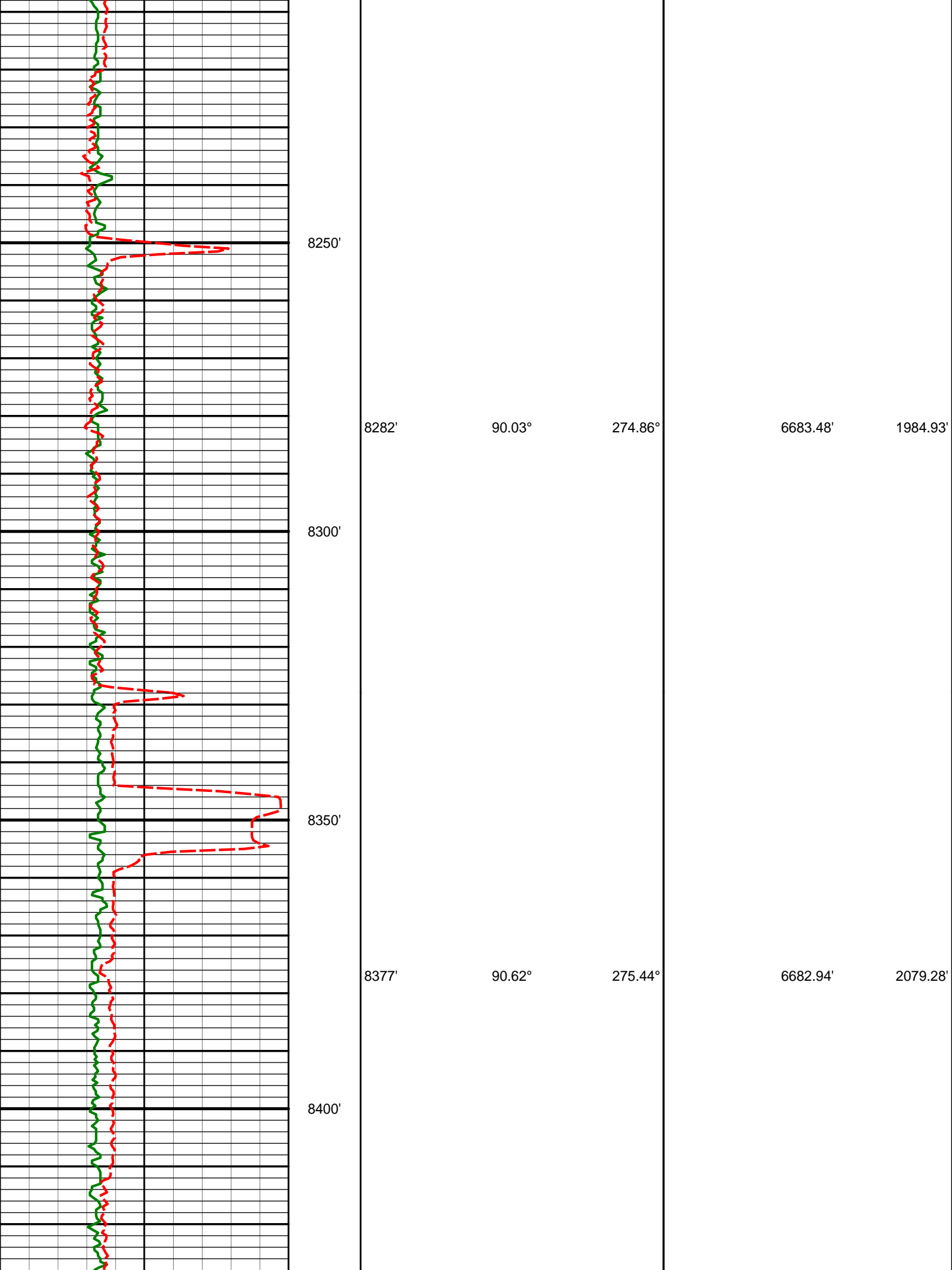
269.78°

6679.92'

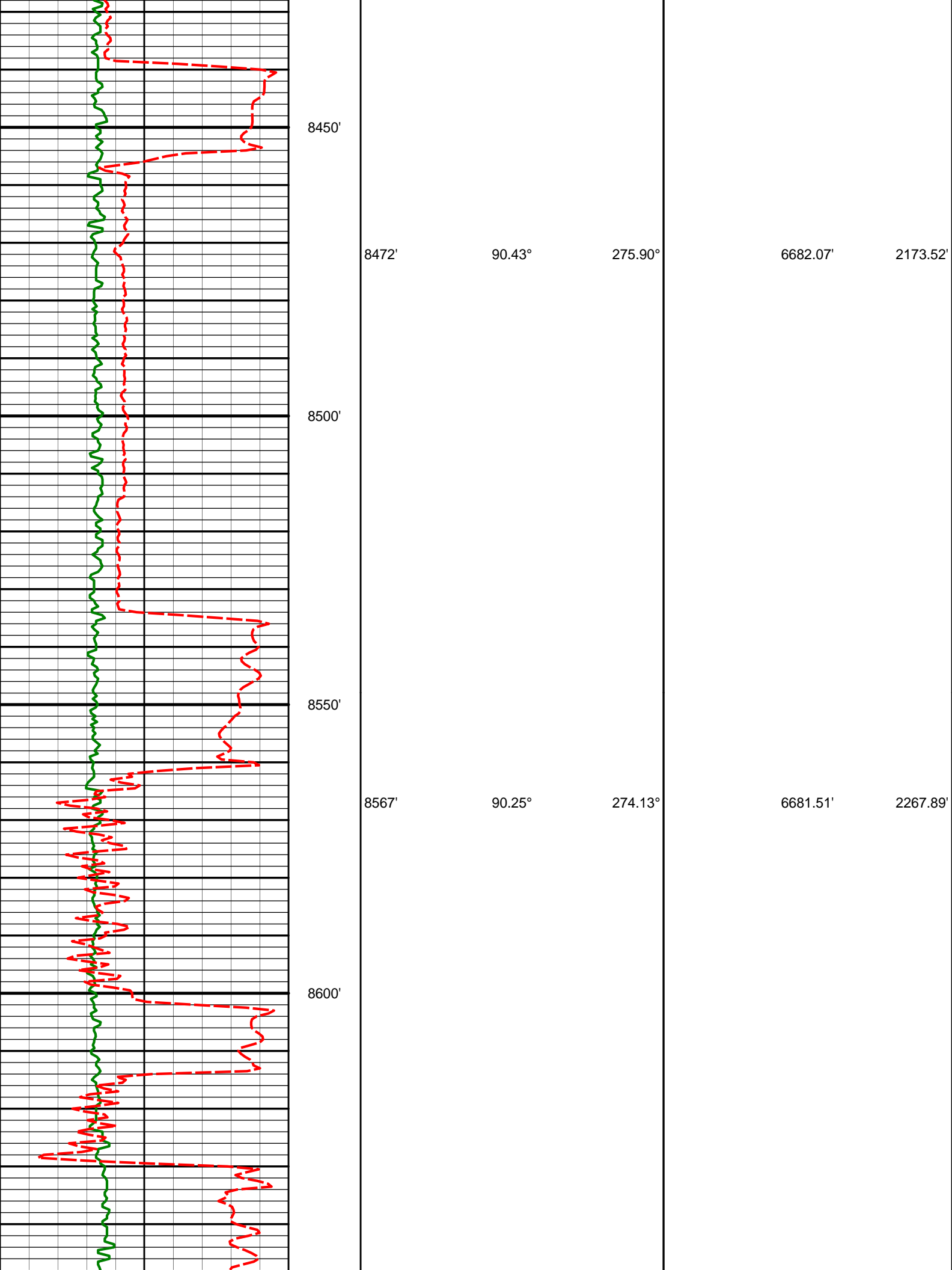
1416.40'

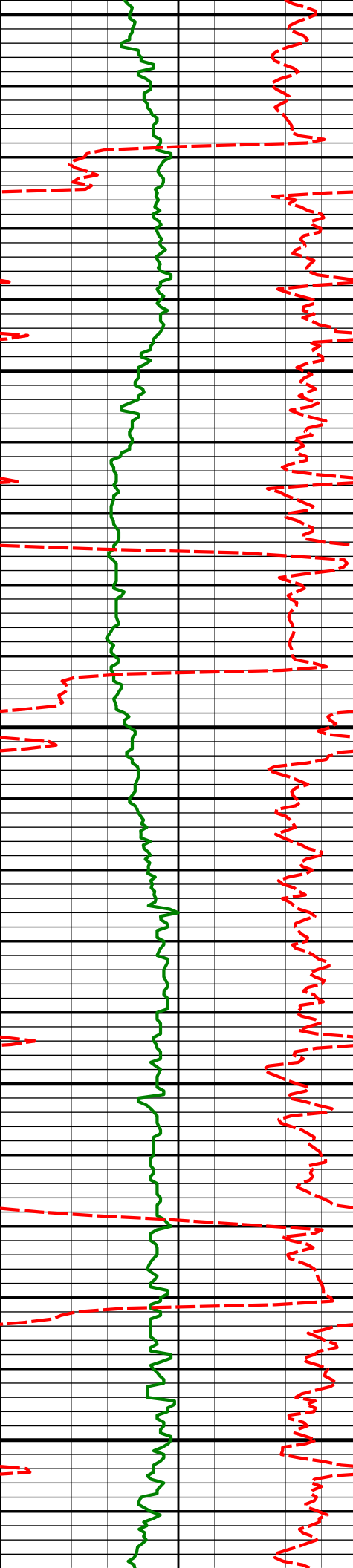












8650'

8662'

89.05°

269.32°

6682.09'

2362.70'

8700'

8750'

8757'

91.02°

268.74°

6682.03'

2457.69'

8800'

8850'

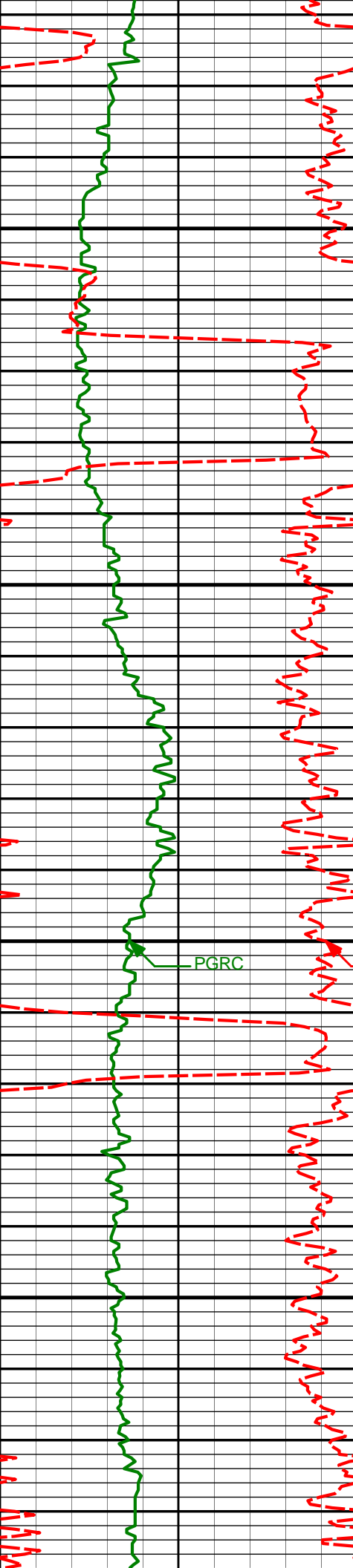
8852'

88.83°

266.77°

6682.15'

2552.67'



8900'

8950'

9000'

9050'

PGRC

ROPA

8947'

91.54°

267.59°

6681.85'

2647.64'

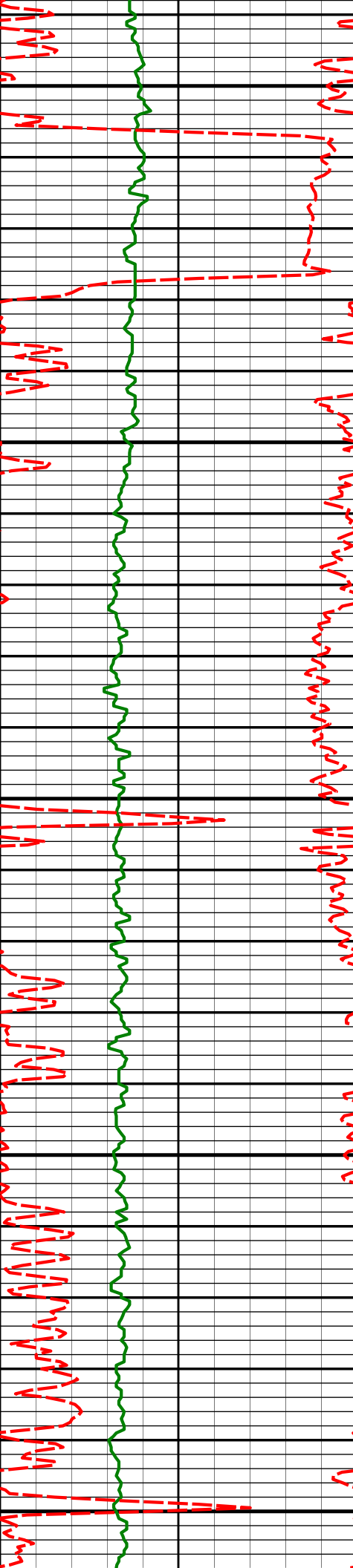
9042'

89.38°

266.09°

6681.08'

2742.59'



9100'

9137'

90.31°

267.11°

6681.34'

2837.54'

9150'

9200'

9232'

89.69°

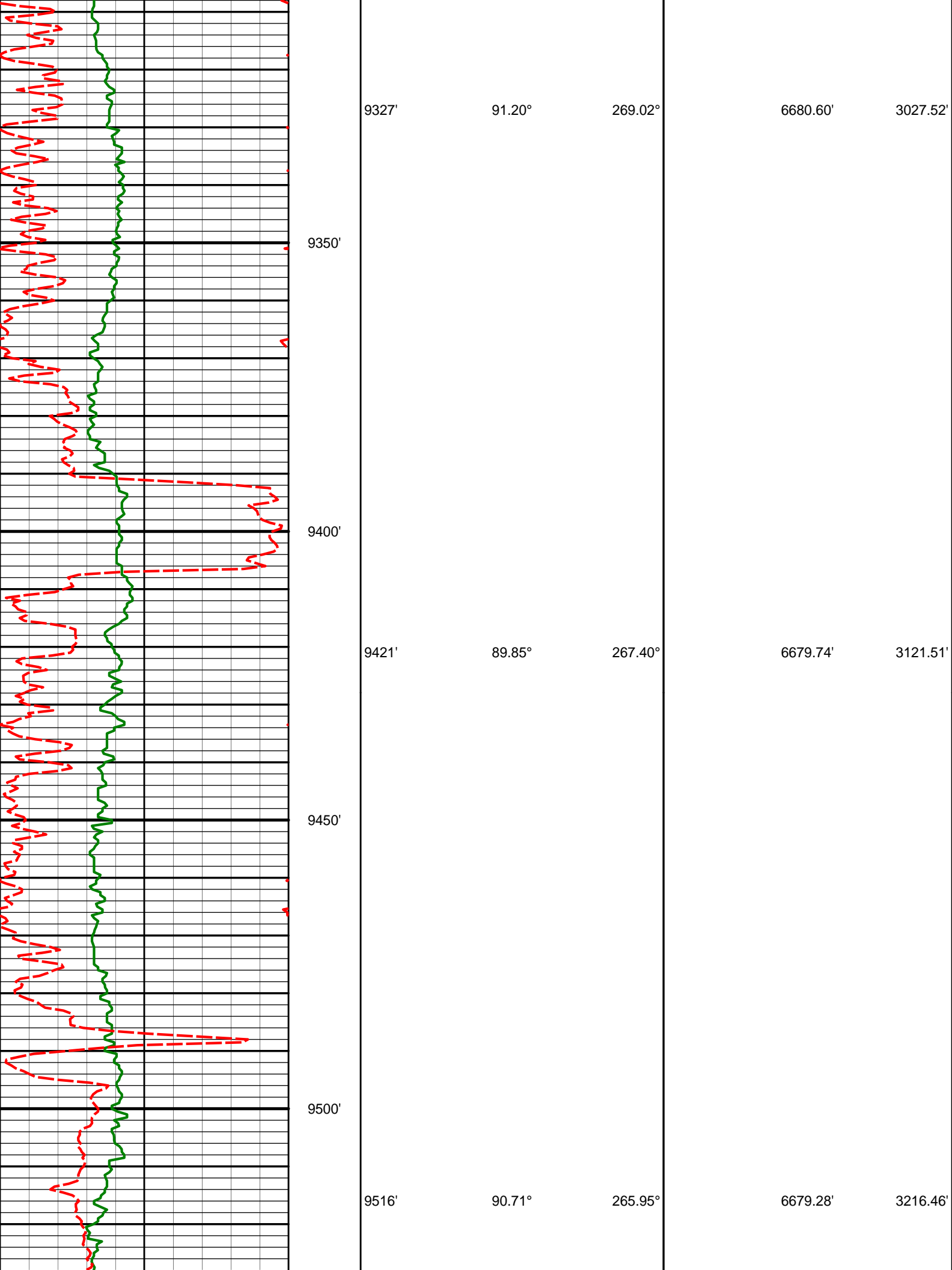
268.60°

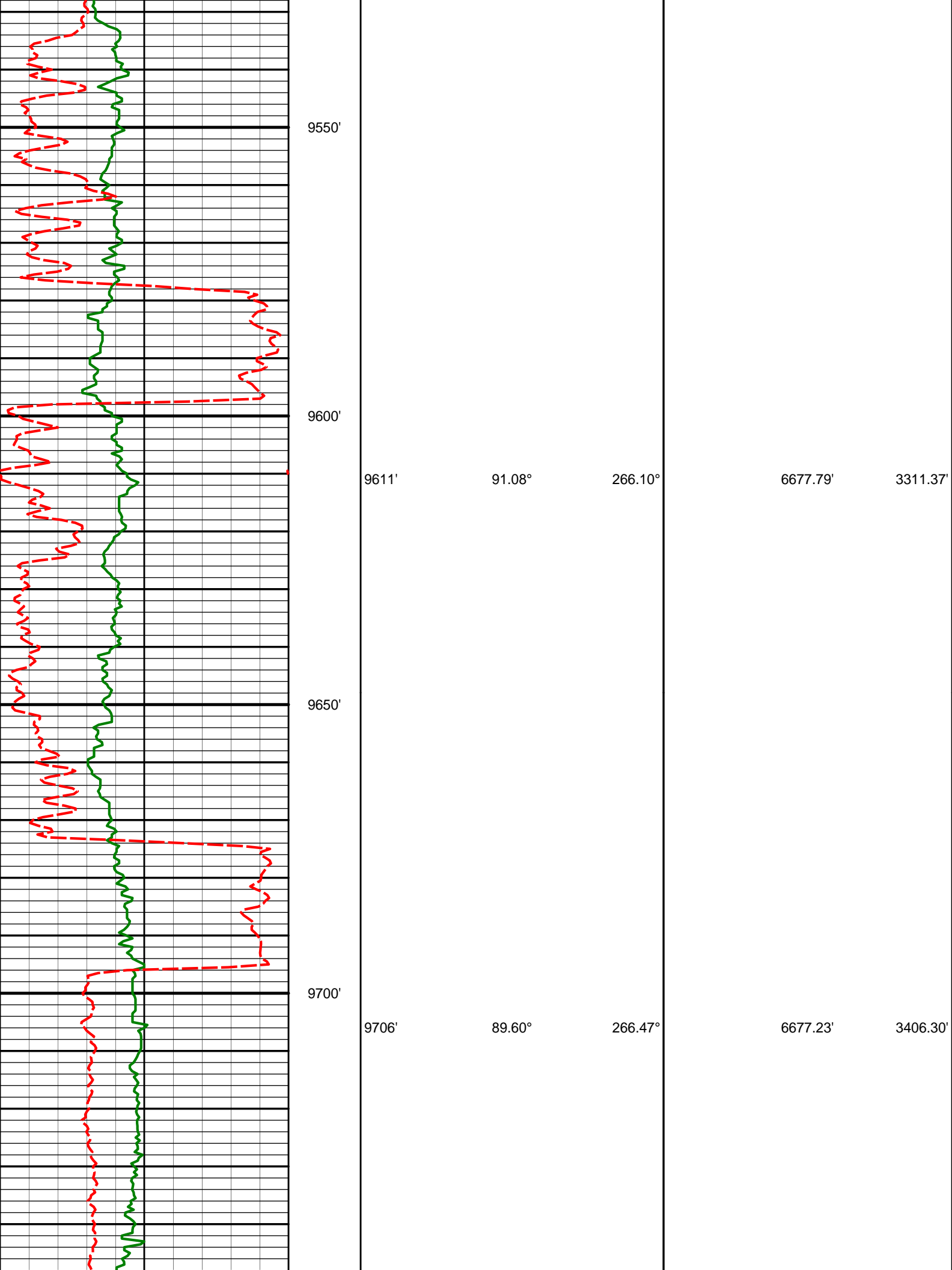
6681.34'

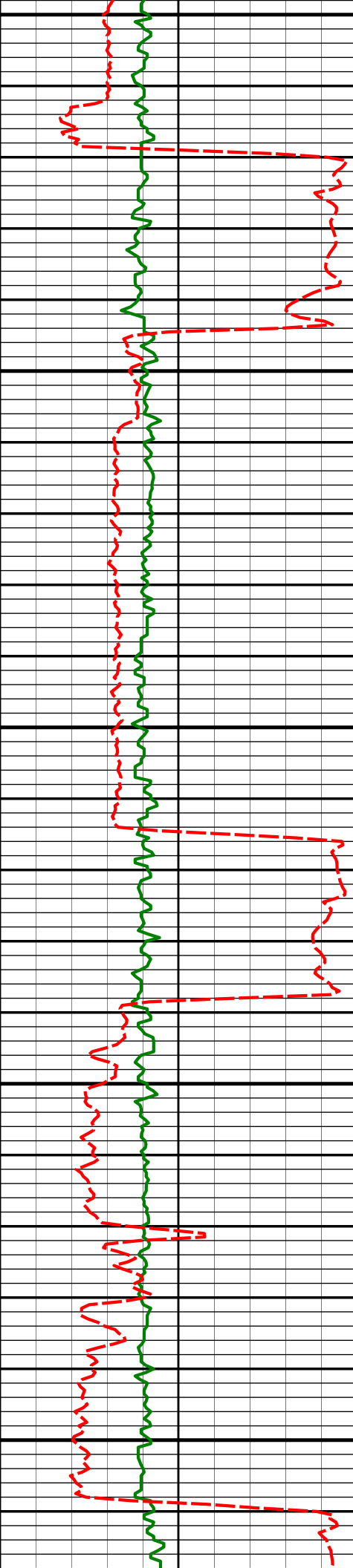
2932.53'

9250'

9300'







9750'

9800'

9850'

9900'

9950'

9801'

9895'

90.00°

89.72°

267.39°

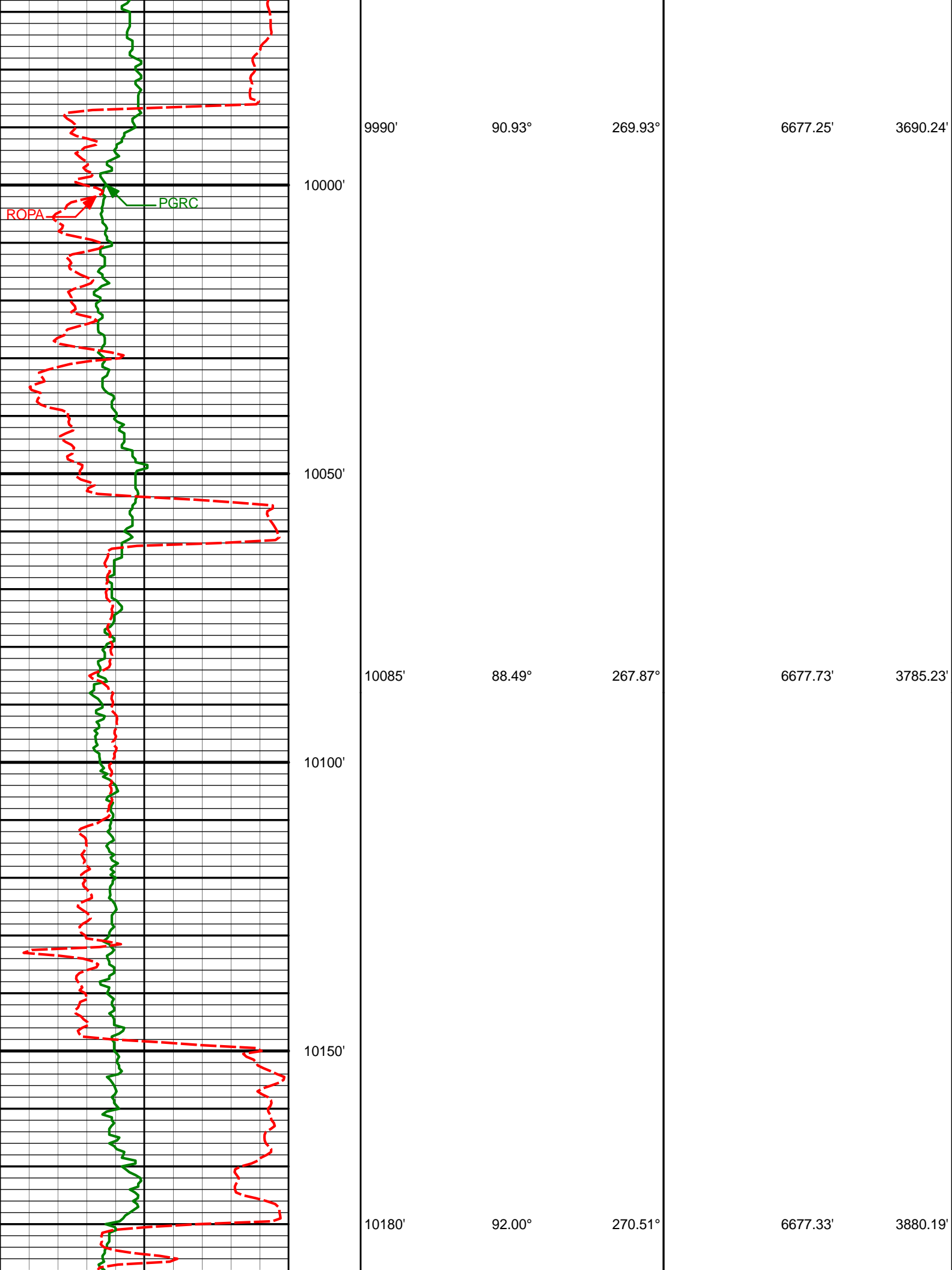
268.22°

6677.56'

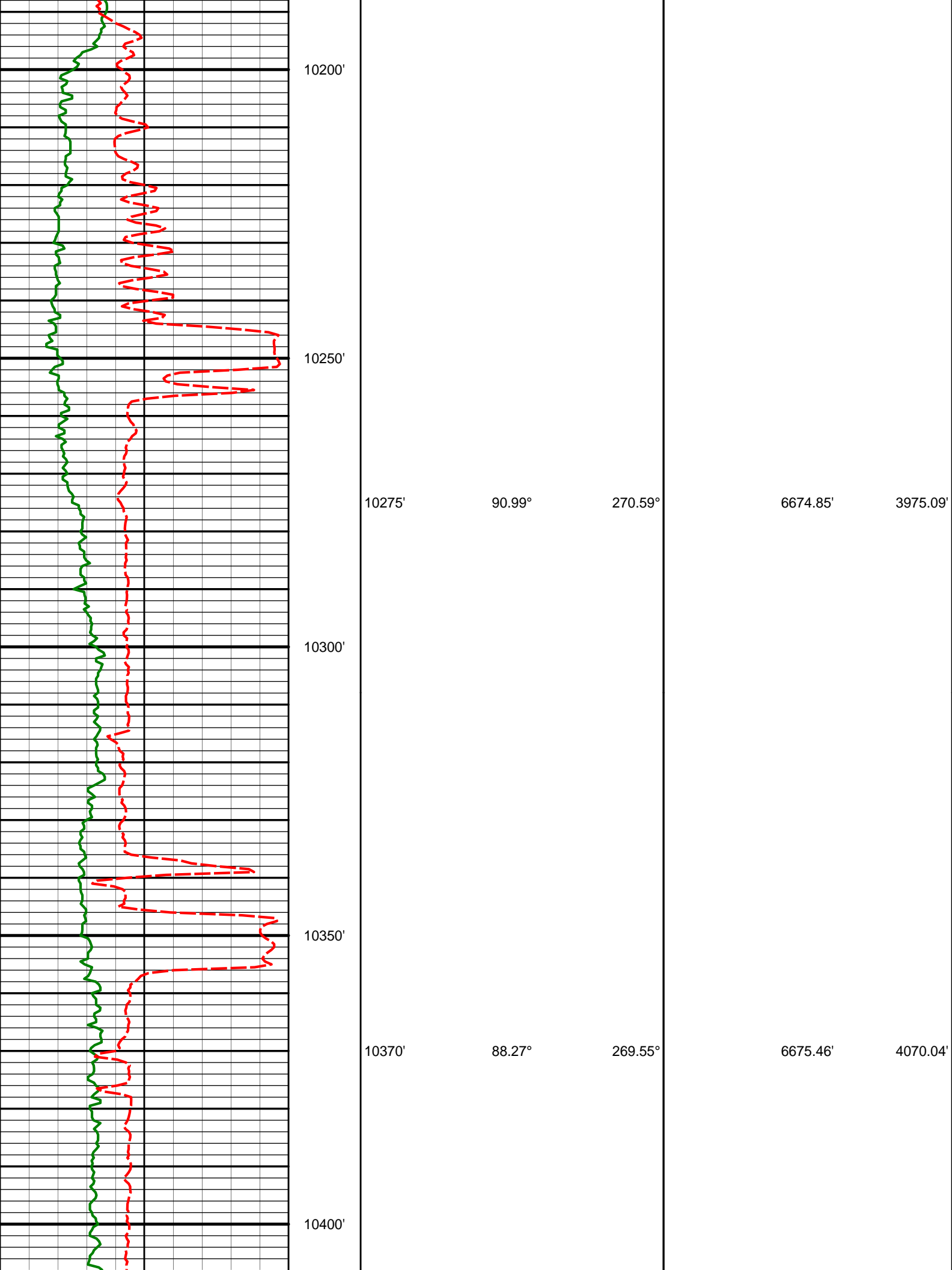
6677.79'

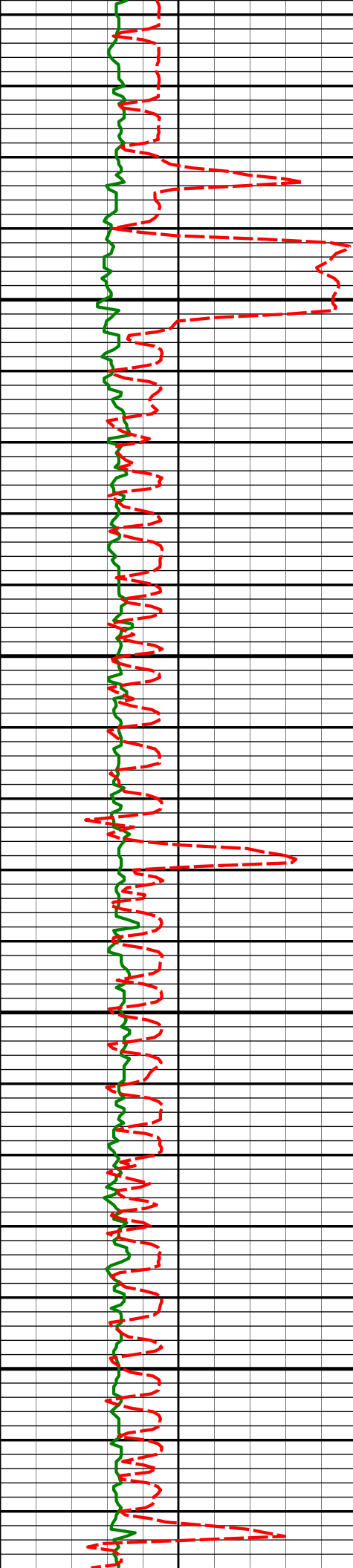
3501.26'

3595.25'









10450'

10465'

88.83°

270.51°

6677.87'

4164.98'

10500'

10550'

10560'

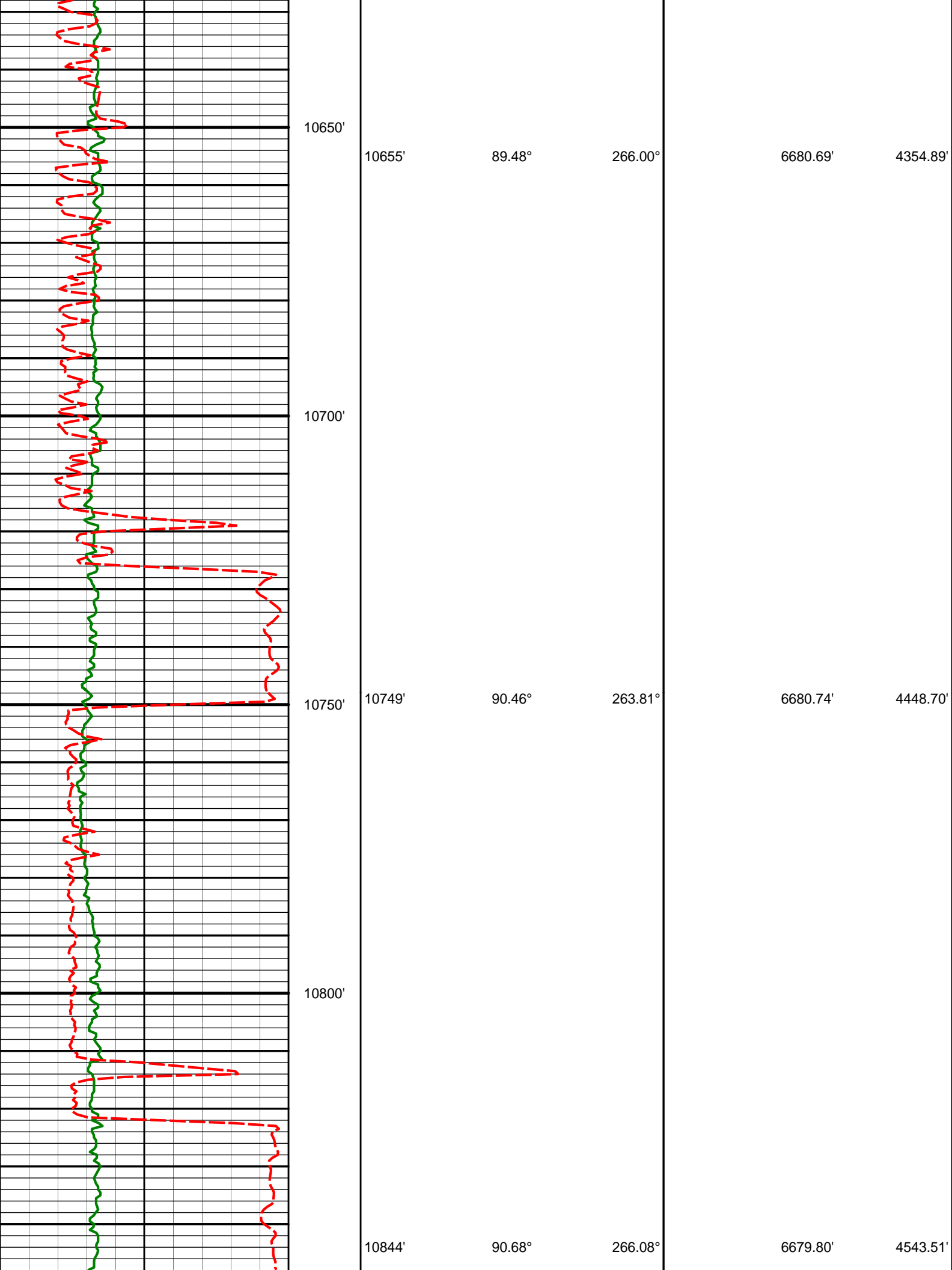
89.14°

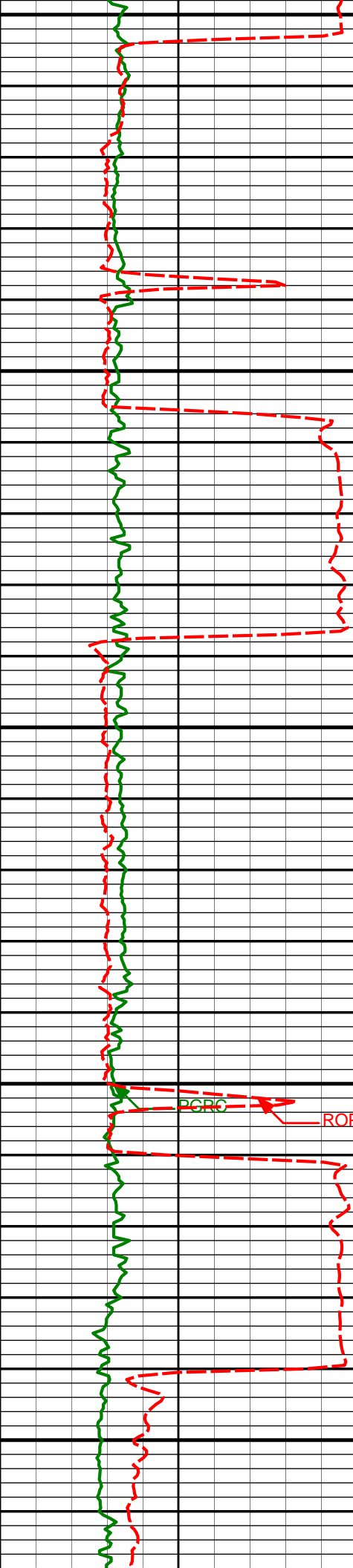
269.85°

6679.55'

4259.92'

10600'





10850'

10900'

10939'

90.40°

267.34°

6678.90'

4638.46'

10950'

11000'

PCRG

ROPA

11034'

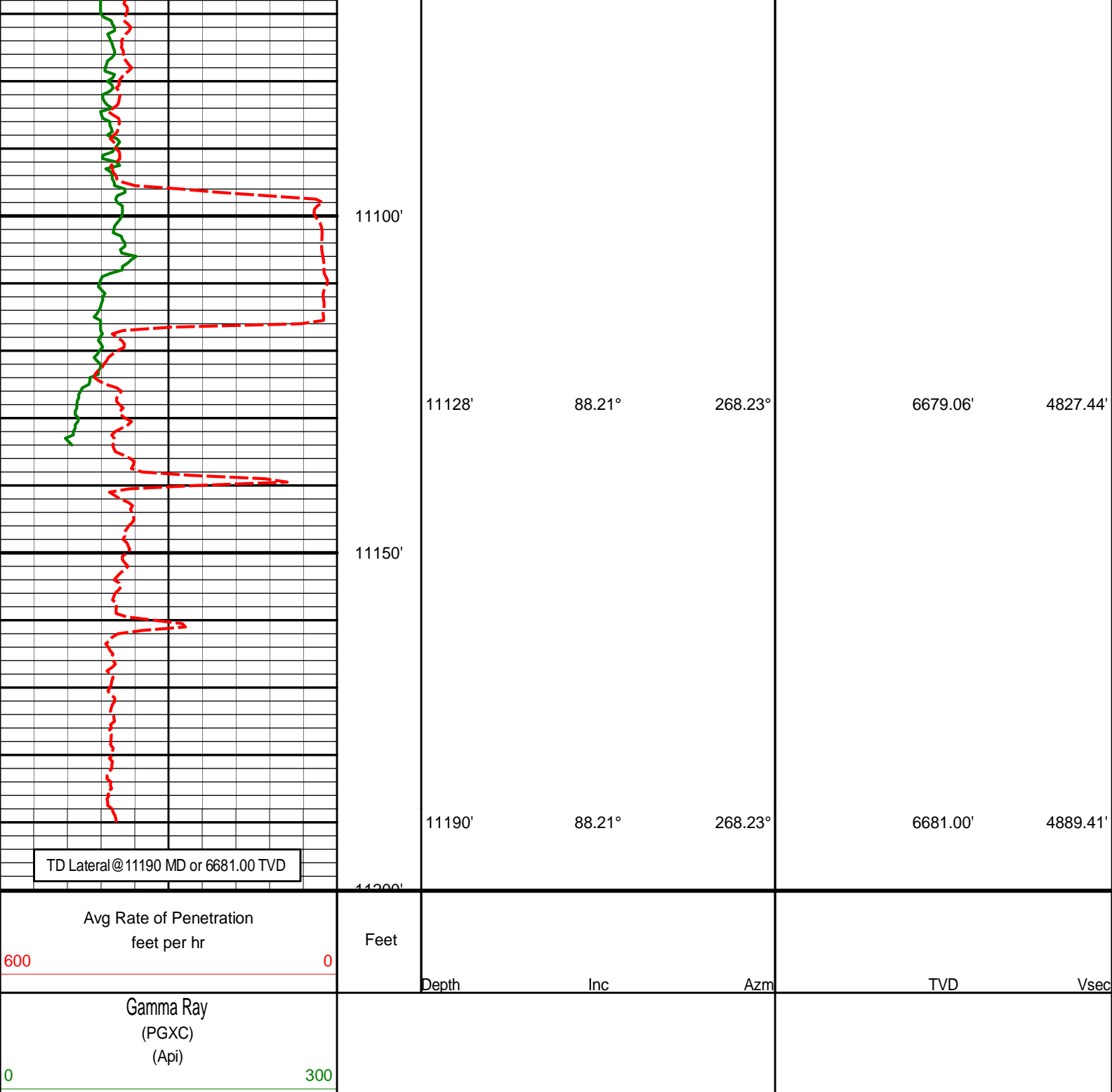
90.59°

267.86°

6678.08'

4733.45'

11050'



## DIRECTIONAL SURVEY REPORT

Noble Energy  
Wells Ranch AA35-66-1AHNC  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0901017393

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
302.00	0.60	110.82	301.99	0.56 S	1.48 E	-1.46	0.20
645.00	0.50	239.02	644.99	1.97 S	1.87 E	-1.82	0.29
729.00	0.59	233.76	728.98	2.42 S	1.21 E	-1.14	0.12
823.00	0.31	239.02	821.98	2.86 S	0.62 E	-0.56	0.20

822.00	0.31	229.08	821.98	2.88 S	0.63 E	-0.36	0.30
915.00	0.46	171.38	914.98	3.40 S	0.50 E	-0.41	0.42
1008.00	0.66	211.04	1007.97	4.22 S	0.28 E	-0.16	0.46
1101.00	0.81	226.86	1100.97	5.13 S	0.48 W	0.62	0.27
1194.00	0.80	199.83	1193.96	6.19 S	1.18 W	1.34	0.40
1287.00	0.90	214.65	1286.95	7.41 S	1.81 W	2.01	0.26
1380.00	1.14	212.23	1379.93	8.79 S	2.72 W	2.96	0.26
1473.00	1.04	212.61	1472.92	10.28 S	3.67 W	3.95	0.11
1568.00	3.73	224.54	1567.83	13.21 S	6.30 W	6.66	2.86
1663.00	5.82	229.86	1662.49	18.52 S	12.15 W	12.65	2.25
1758.00	6.84	233.65	1756.91	24.98 S	20.39 W	21.06	1.16
1852.00	7.60	218.76	1850.17	33.14 S	28.79 W	29.68	2.14
1947.00	8.21	226.36	1944.27	42.72 S	37.63 W	38.78	1.27
2042.00	7.74	219.52	2038.36	52.34 S	46.61 W	48.02	1.11
2137.00	7.68	217.68	2132.50	62.30 S	54.56 W	56.24	0.27
2231.00	9.65	227.38	2225.42	72.61 S	64.20 W	66.16	2.60
2326.00	7.10	229.43	2319.40	81.82 S	74.52 W	76.72	2.70
2421.00	7.63	231.94	2413.62	89.52 S	83.95 W	86.35	0.65
2516.00	6.34	239.93	2507.92	96.04 S	93.45 W	96.03	1.70
2610.00	4.39	238.75	2601.50	100.51 S	101.02 W	103.72	2.08
2705.00	3.97	231.34	2696.25	104.45 S	106.70 W	109.50	0.72
2800.00	3.51	237.27	2791.04	108.08 S	111.71 W	114.61	0.63
2895.00	1.38	243.35	2885.95	110.16 S	115.18 W	118.14	2.26
2990.00	1.04	12.52	2980.94	109.83 S	116.02 W	118.97	2.31
3085.00	0.47	111.81	3075.94	109.14 S	115.47 W	118.40	1.27
3180.00	0.88	143.53	3170.93	109.87 S	114.67 W	117.62	0.57
3274.00	1.47	115.52	3264.91	110.97 S	113.16 W	116.14	0.86
3369.00	1.87	104.07	3359.87	111.87 S	110.55 W	113.56	0.55
3464.00	0.91	83.84	3454.84	112.17 S	108.30 W	111.31	1.12
3558.00	0.20	178.01	3548.84	112.25 S	107.55 W	110.57	1.01
3653.00	0.59	157.30	3643.84	112.87 S	107.36 W	110.39	0.43
3748.00	0.68	202.88	3738.83	113.84 S	107.39 W	110.45	0.53
3843.00	0.79	188.82	3833.82	115.00 S	107.71 W	110.80	0.22
3938.00	0.88	199.83	3928.81	116.34 S	108.06 W	111.18	0.19
4127.00	0.29	135.60	4117.80	118.04 S	108.21 W	111.39	0.42
4223.00	0.31	23.04	4213.80	117.98 S	107.94 W	111.11	0.52
4318.00	1.26	9.16	4308.79	116.71 S	107.67 W	110.81	1.01
4413.00	1.26	37.36	4403.77	114.85 S	106.87 W	109.96	0.65
4603.00	0.73	83.64	4593.74	113.05 S	104.40 W	107.44	0.48
4697.00	0.68	147.74	4687.74	113.46 S	103.51 W	106.56	0.80
4792.00	0.80	113.07	4782.73	114.20 S	102.60 W	105.67	0.48
4886.00	1.46	76.99	4876.71	114.18 S	100.83 W	103.90	1.00
4981.00	1.18	85.81	4971.69	113.84 S	98.67 W	101.74	0.36
5076.00	0.84	55.88	5066.67	113.38 S	97.12 W	100.17	0.65
5171.00	0.48	46.03	5161.67	112.71 S	96.26 W	99.29	0.40
5266.00	0.15	306.58	5256.67	112.36 S	96.07 W	99.10	0.55
5361.00	0.32	22.27	5351.67	112.04 S	96.07 W	99.09	0.33
5456.00	0.25	280.66	5446.66	111.76 S	96.18 W	99.18	0.47
5551.00	0.26	242.06	5541.66	111.82 S	96.57 W	99.58	0.18
5646.00	0.31	316.30	5636.66	111.74 S	96.94 W	99.94	0.36
5741.00	0.32	53.71	5731.66	111.39 S	96.90 W	99.90	0.50
5835.00	0.44	71.03	5825.66	111.12 S	96.35 W	99.34	0.18
5930.00	0.46	225.53	5920.66	111.27 S	96.28 W	99.27	0.92
5981.00	0.79	214.73	5971.66	111.70 S	96.62 W	99.63	0.68
6018.00	1.09	215.84	6008.65	112.20 S	96.97 W	99.99	0.81
6065.00	2.71	291.11	6055.63	112.16 S	98.27 W	101.29	5.64
6113.00	6.06	295.76	6103.48	110.65 S	101.61 W	104.59	7.01
6160.00	8.97	275.33	6150.08	109.23 S	107.50 W	110.43	8.31
6208.00	13.70	264.40	6197.14	109.44 S	116.89 W	119.82	10.78
6255.00	18.87	267.61	6242.24	110.30 S	130.03 W	132.98	11.16
6303.00	23.99	271.82	6286.91	110.31 S	147.55 W	150.50	11.13
6350.00	28.06	274.39	6329.13	109.16 S	168.13 W	171.04	8.98
6398.00	33.27	270.50	6370.41	108.18 S	192.57 W	195.45	11.61
6445.00	37.76	271.01	6408.66	107.81 S	219.87 W	222.72	9.57
6493.00	42.72	269.99	6445.29	107.56 S	250.86 W	253.70	10.42
6540.00	48.68	269.12	6478.10	107.83 S	284.48 W	287.31	12.75
6588.00	53.69	268.62	6508.17	108.57 S	321.86 W	324.70	10.47
6635.00	55.99	271.77	6535.24	108.43 S	360.28 W	363.10	7.35
6683.00	60.38	272.13	6560.54	107.04 S	401.03 W	403.80	9.17
6730.00	64.67	271.67	6582.22	105.66 S	442.70 W	445.41	9.17
6777.00	68.10	270.76	6601.05	104.75 S	485.75 W	488.42	7.51
6824.00	71.33	270.21	6617.34	104.38 S	529.82 W	532.47	6.96
6872.00	75.61	269.64	6630.99	104.44 S	575.83 W	578.46	8.99
6925.00	81.93	268.82	6641.31	105.15 S	627.78 W	630.41	12.02
7144.00	86.27	269.83	6663.81	107.70 S	845.55 W	848.17	2.03

7239.00	85.46	268.97	6670.67	108.70 S	940.30 W	942.91	1.24
7334.00	87.01	269.52	6676.90	109.94 S	1035.08 W	1037.69	1.73
7429.00	88.34	270.34	6680.76	110.06 S	1130.00 W	1132.58	1.64
7524.00	88.55	269.96	6683.33	109.81 S	1224.96 W	1227.50	0.46
7619.00	92.25	269.42	6682.67	110.33 S	1319.94 W	1322.46	3.94
7713.00	91.11	269.78	6679.92	110.98 S	1413.90 W	1416.40	1.27
7808.00	87.35	267.60	6681.19	113.15 S	1508.84 W	1511.36	4.57
7903.00	90.49	267.65	6682.98	117.09 S	1603.73 W	1606.33	3.31
7998.00	90.06	267.73	6682.53	120.92 S	1698.65 W	1701.32	0.46
8093.00	89.66	268.83	6682.76	123.77 S	1793.61 W	1796.31	1.23
8188.00	89.72	271.45	6683.27	123.54 S	1888.60 W	1891.26	2.76
8282.00	90.03	274.86	6683.48	118.36 S	1982.44 W	1984.93	3.64
8377.00	90.62	275.44	6682.94	109.84 S	2077.06 W	2079.28	0.87
8472.00	90.43	275.90	6682.07	100.45 S	2171.59 W	2173.52	0.52
8567.00	90.25	274.13	6681.51	92.15 S	2266.22 W	2267.89	1.87
8662.00	89.05	269.32	6682.09	89.29 S	2361.14 W	2362.70	5.22
8757.00	91.02	268.74	6682.03	90.90 S	2456.13 W	2457.69	2.16
8852.00	88.83	266.77	6682.15	94.62 S	2551.04 W	2552.67	3.10
8947.00	91.54	267.59	6681.85	99.29 S	2645.92 W	2647.64	2.98
9042.00	89.38	266.09	6681.08	104.53 S	2740.76 W	2742.59	2.77
9137.00	90.31	267.11	6681.34	110.16 S	2835.59 W	2837.54	1.45
9232.00	89.69	268.60	6681.34	113.72 S	2930.52 W	2932.53	1.70
9327.00	91.20	269.02	6680.60	115.69 S	3025.50 W	3027.52	1.65
9421.00	89.85	267.40	6679.74	118.63 S	3119.44 W	3121.51	2.24
9516.00	90.71	265.95	6679.28	124.14 S	3214.28 W	3216.46	1.77
9611.00	91.08	266.10	6677.79	130.72 S	3309.04 W	3311.37	0.42
9706.00	89.60	266.47	6677.23	136.88 S	3403.83 W	3406.30	1.61
9801.00	90.00	267.39	6677.56	141.96 S	3498.69 W	3501.26	1.06
9895.00	89.72	268.22	6677.79	145.56 S	3592.62 W	3595.25	0.93
9990.00	90.93	269.93	6677.25	147.10 S	3687.60 W	3690.24	2.20
10085.00	88.49	267.87	6677.73	148.92 S	3782.57 W	3785.23	3.36
10180.00	92.00	270.51	6677.33	150.26 S	3877.54 W	3880.19	4.62
10275.00	90.99	270.59	6674.85	149.35 S	3972.50 W	3975.09	1.07
10370.00	88.27	269.55	6675.46	149.24 S	4067.49 W	4070.04	3.07
10465.00	88.83	270.51	6677.87	149.19 S	4162.46 W	4164.98	1.17
10560.00	89.14	269.85	6679.55	148.89 S	4257.44 W	4259.92	0.77
10655.00	89.48	266.00	6680.69	152.33 S	4352.35 W	4354.89	4.07
10749.00	90.46	263.81	6680.74	160.67 S	4445.98 W	4448.70	2.55
10844.00	90.68	266.08	6679.80	169.04 S	4540.60 W	4543.51	2.40
10939.00	90.40	267.34	6678.90	174.50 S	4635.43 W	4638.46	1.36
11034.00	90.59	267.86	6678.08	178.47 S	4730.35 W	4733.45	0.58
11128.00	88.21	268.23	6679.06	181.68 S	4824.28 W	4827.44	2.56
11190.00	88.21	268.23	6681.00	183.59 S	4886.22 W	4889.41	0.00

**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 268.44 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.62 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 11190.00 FEET  
IS 4889.67 FEET ALONG 267.85 DEGREES (GRID)**

**Tie-In @ Surface**

**Surveys at 302 ft and 645ft, were taken and provided by HP 322 while they were drilling the surface hole and have been converted from magnetic north to grid north.**