

PCGK - Pressure Case Gamma

1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	09-Jan-14	10-Jan-14	14-Jan-14		
Rig Bit Number	2	3	4		
Bit Size (in)	8.750	8.750	6.125		
Tool Nominal OD (in)	6.750	6.750	4.750		
Log Start Depth (MD, ft)	970.00	6,050.00	7,053.00		
Log End Depth (MD, ft)	6,050.00	7,053.00	11,049.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	08-Jan-14 03:30	09-Jan-14 12:50	11-Jan-14 06:32		
Drill/Wipe End Date and Time	08-Jan-14 22:00	10-Jan-14 02:20	13-Jan-14 10:30		
Min Inc (deg) @ Depth (MD, ft)	0.10 @ 737.00	3.41 @ 6,122.00	84.29 @ 7,082.00		
Max Inc (deg) @ Depth (MD, ft)	17.65 @ 3,946.00	78.24 @ 6,995.00	92.16 @ 8,379.00		
Bit TFA(in2) / Bit Type	0.75 / PDC	1.50 / PDC	0.86 / PDC		
Flow Rate (gpm)	584.80	546.10	270.00		
Max AV (fpm) / CV (fpm) @ MWD	477.1 / 477.1	462.9 / 462.9	529.2 / 529.2		
Fluid Type	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.80 / 28.00	9.45 / 36.00	9.65 / 39.00		
Filtrate CL (ppm)	2,100.00	2,900.00	2,700.00		
pH / Fluid Loss (mptm)	8.70 / N/A	10.20 / N/A	10.00 / N/A		
PV (cP) / YP (lbf2)	29 / 2.00	8 / 7.00	9 / 8.00		
% Solids / % Sand	2.9 / .35	6.10 / 0.45	6.70 / 0.15		
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	N/A / N/A		
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Max Tool Temp (deg F) / S	115.00 / 20M	122.00 / 20M	210.11 / 20M		

Max Tool Temp (degF) / Source	145.90 / PCM	162.80 / PCM	218.14 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	Garry Igunbor	Garry Igunbor	Garry Igunbor		
Customer Representative	Jeremy Stolz	Jeremy Stolz	Jeremy Stolz		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11303511	11303511	11768604		
Insert Serial Number	11145509	11145509	12001055		
Date and Time Initialized	07-Jan-14 14:58	07-Jan-14 14:58	10-Jan-14 08:17		
Date and Time Read	10-Jan-14 11:25	10-Jan-14 11:18	13-Jan-14 23:44		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	60.00	58.00	66.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11303511	11303511	11768604		
Sonde Serial Number	11297588	11297588	11833221		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	212.94	118.93	244.29		

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	52.96	50.89	58.84		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11303511	11303511	11768604		
Insert/Sonde Serial Number	11293266	11293266	12071301		

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

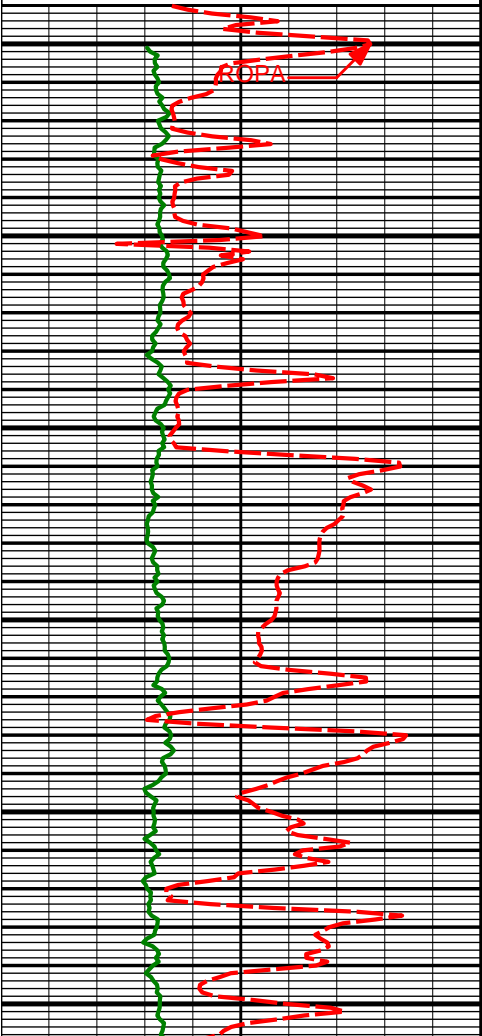
WARRANTY

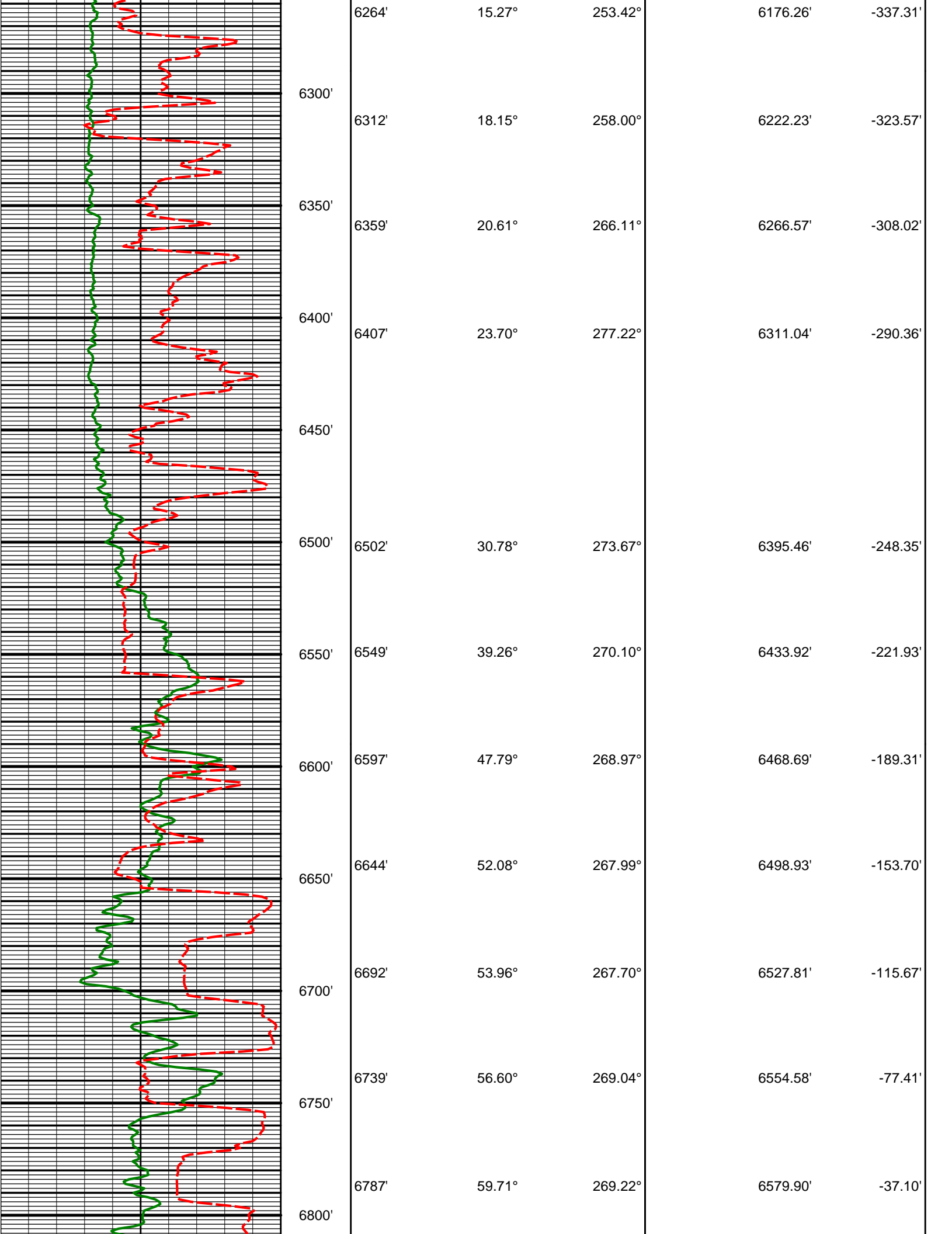
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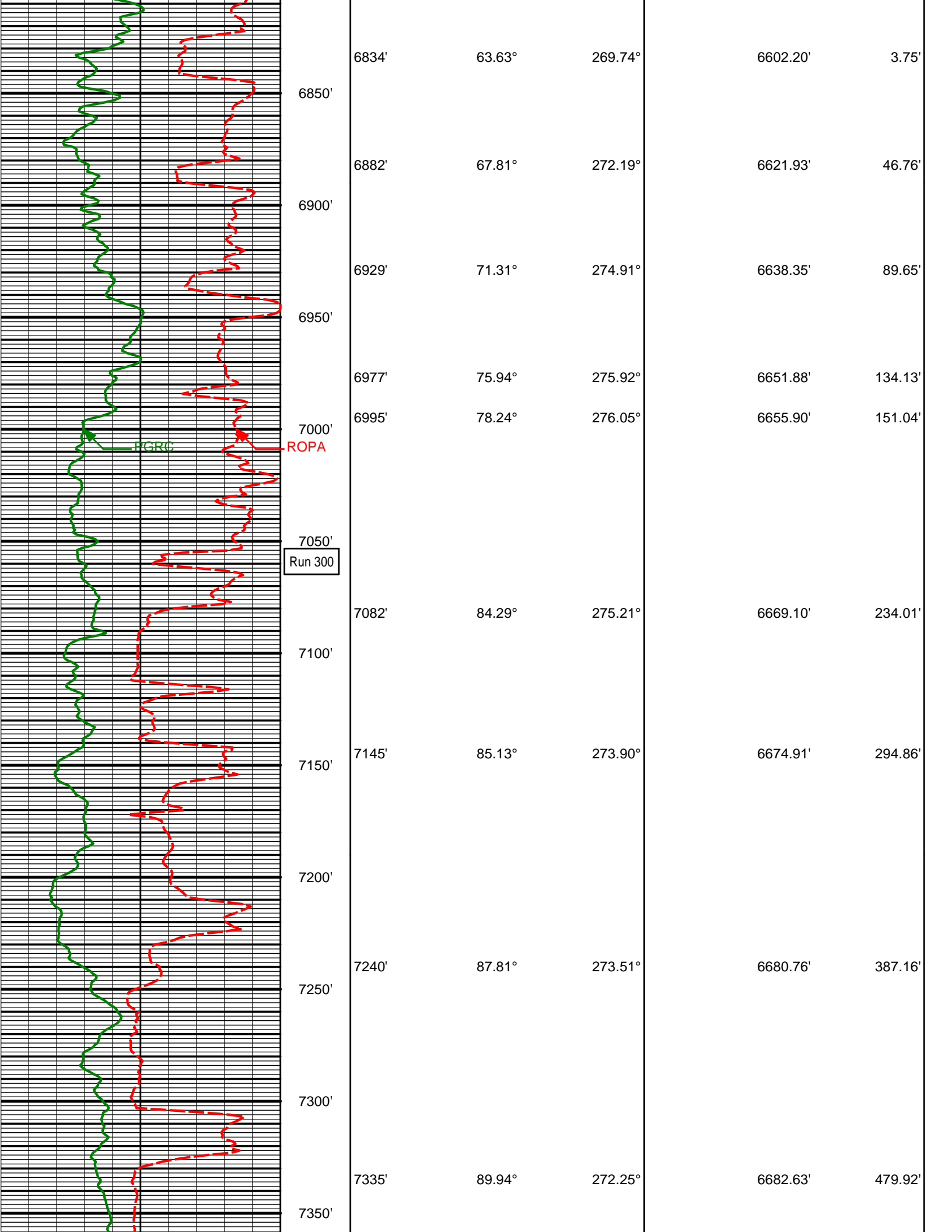
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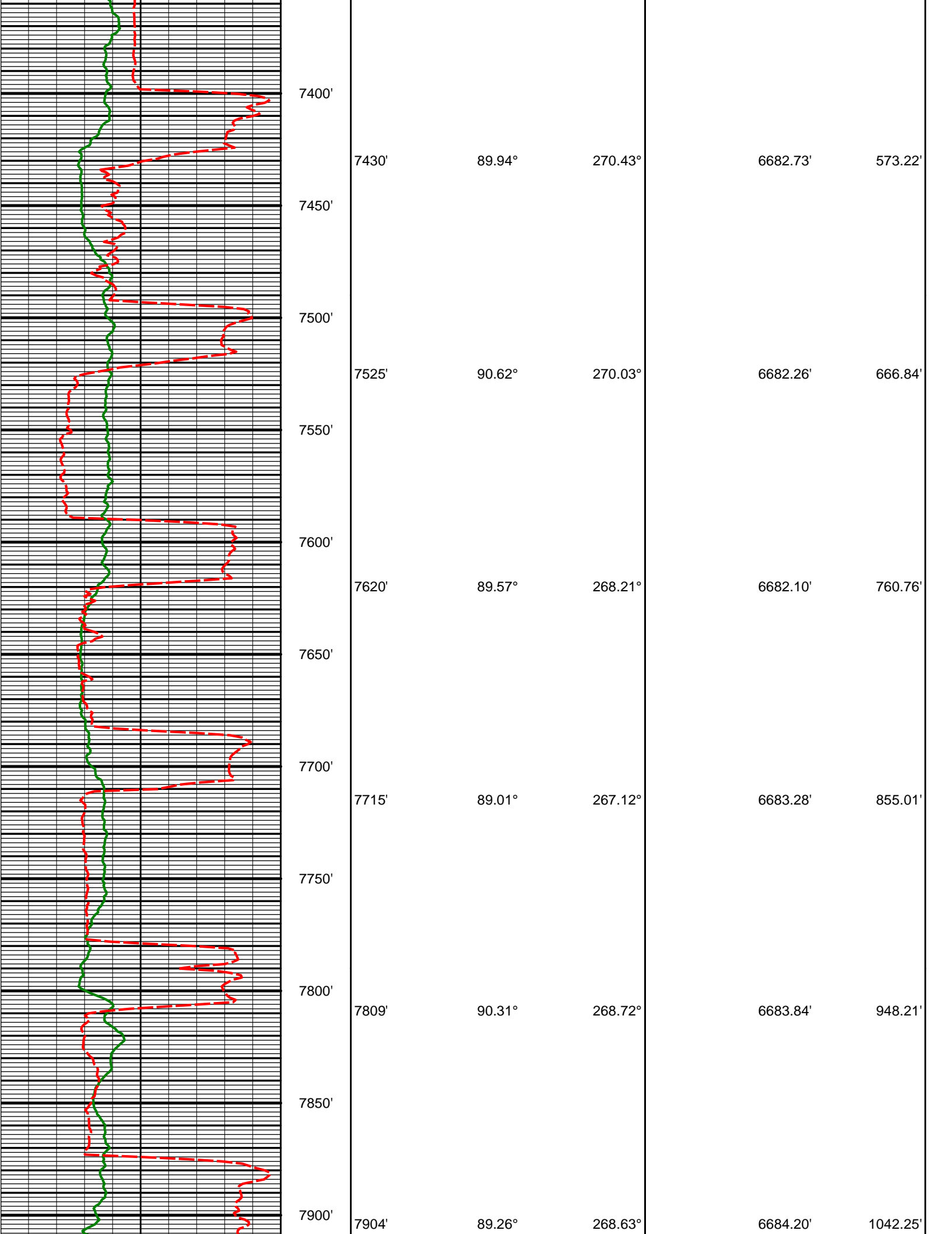
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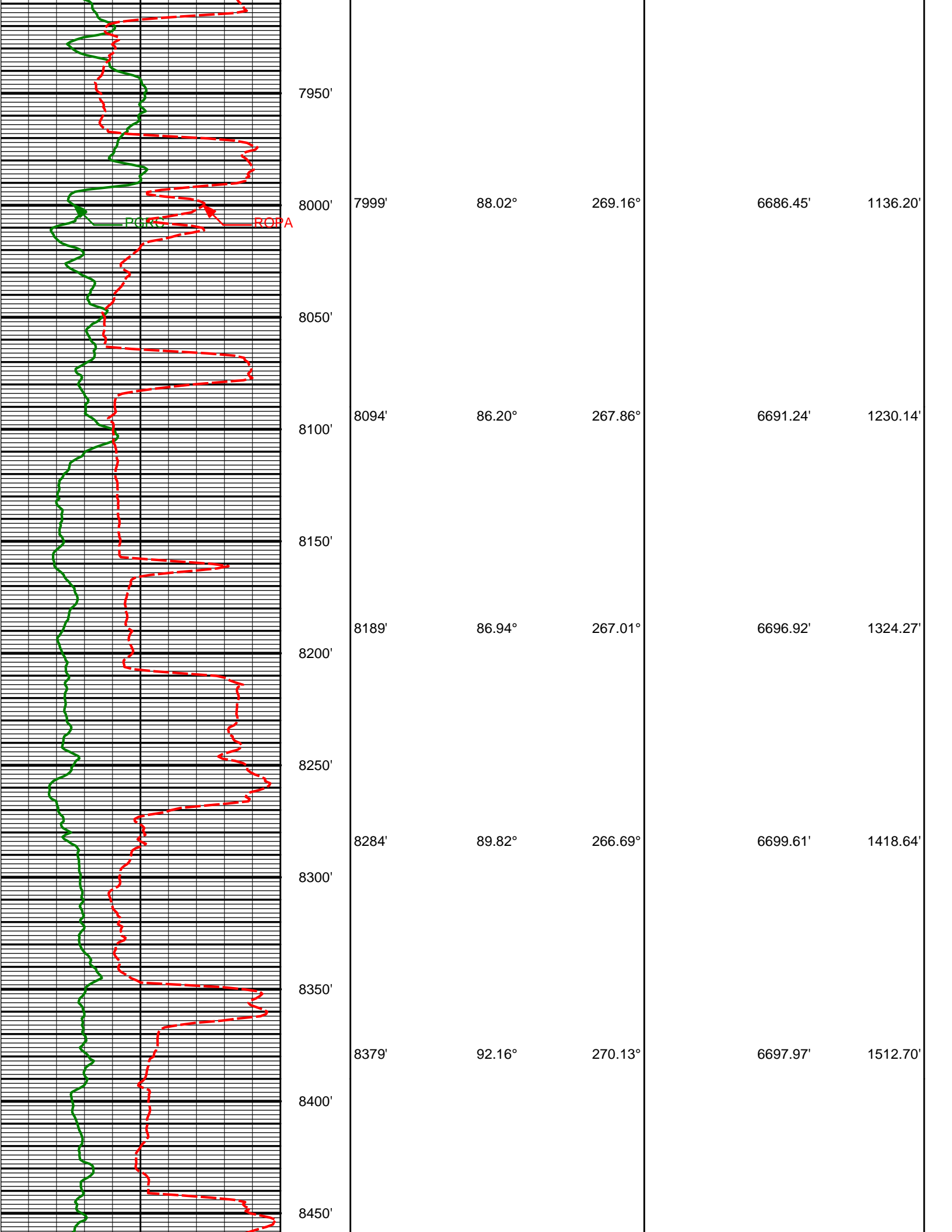
MD Detail Log 1:600

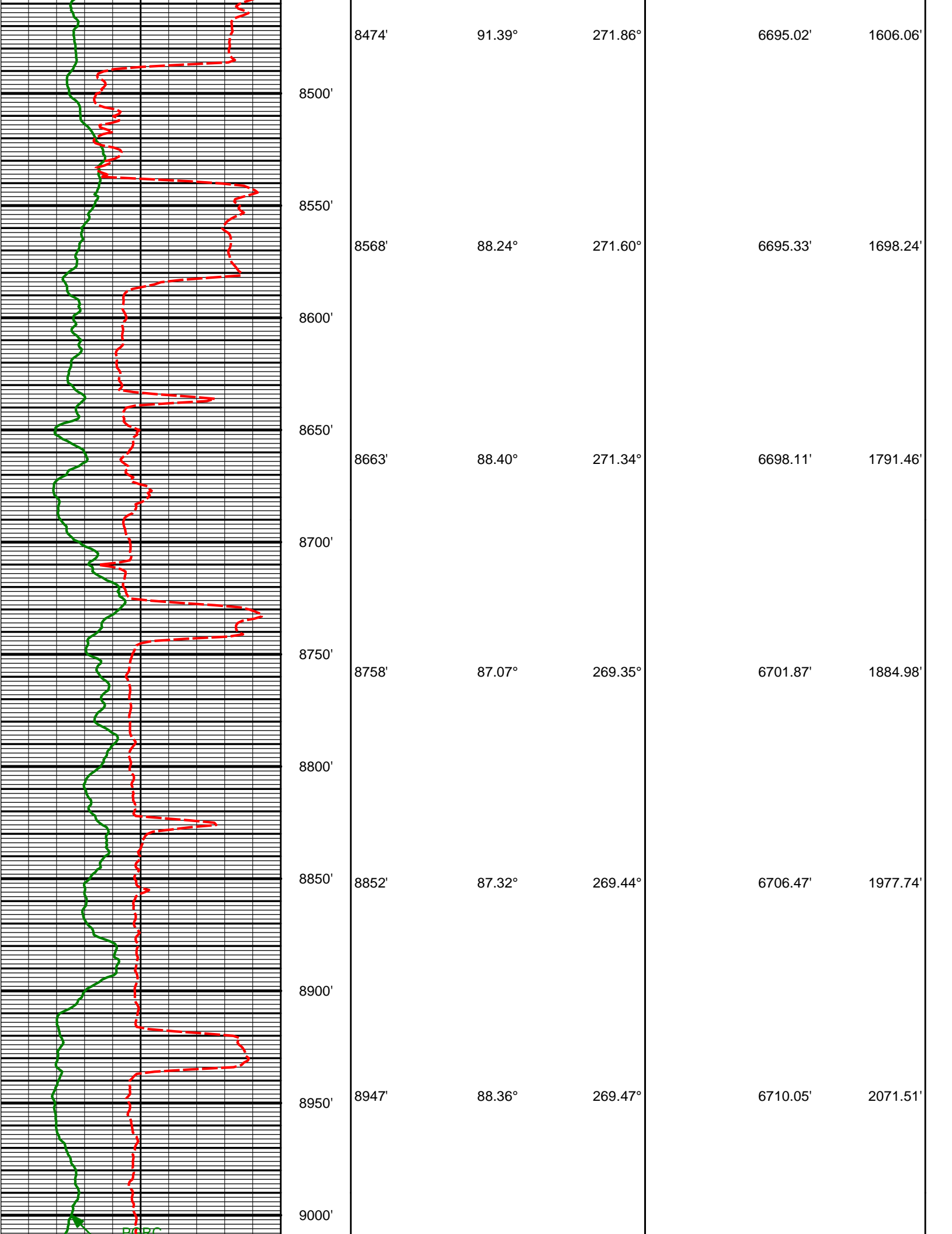
Gamma Ray (PGXC) (Api)					
0300					
Avg Rate of Penetration feet per hr	Feet	Depth	Inc	Azm	TVD
6000	0				
	Run 200	6000'			
	6100'				
	KOP	6122'	3.41°	251.58°	6036.93'
					-363.25'
		6150'			
		6169'	9.59°	258.17°	6083.61'
					-357.96'
		6200'			
		6217'	12.92°	251.85°	6130.68'
					-348.65'
		6250'			

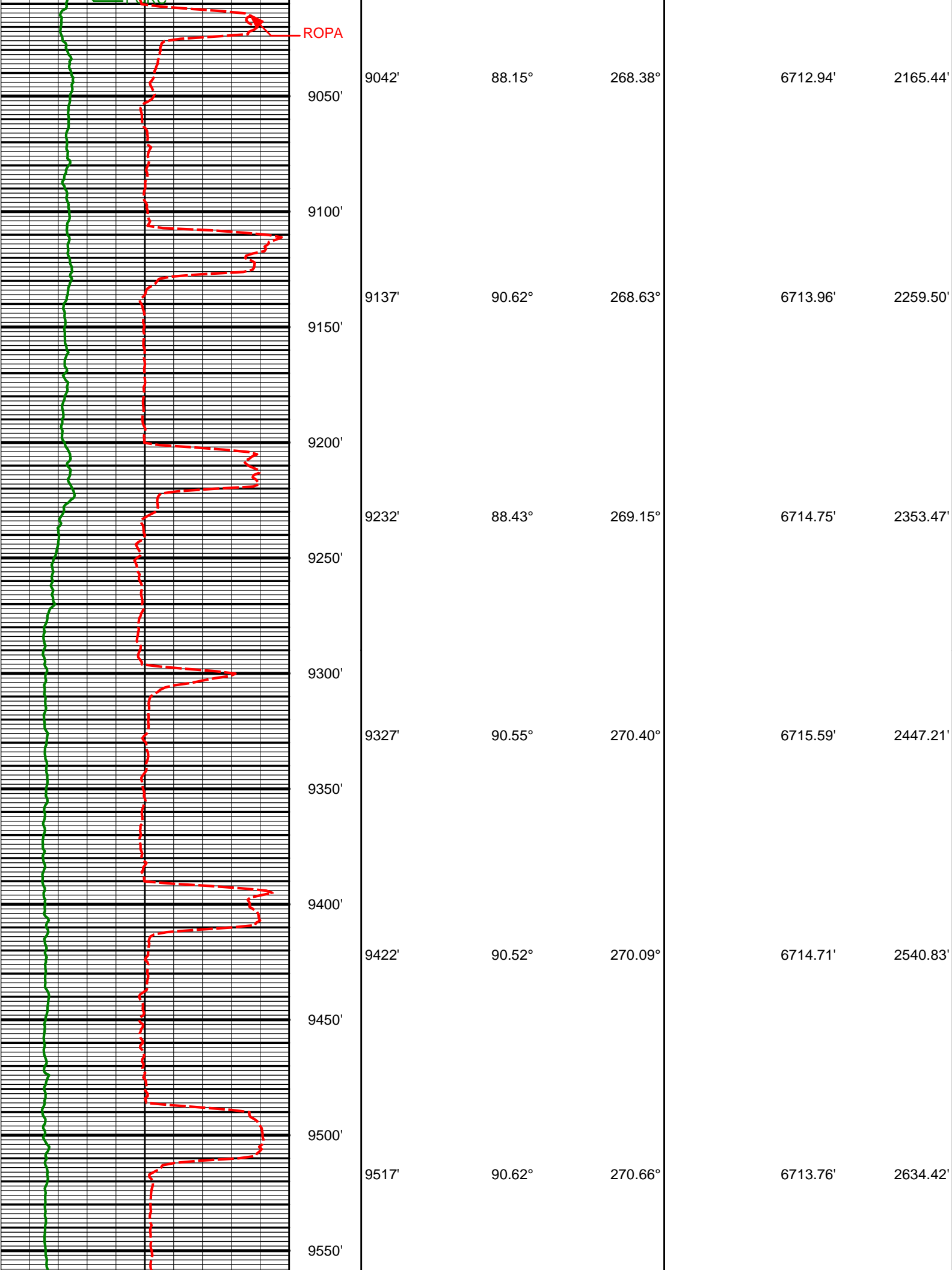


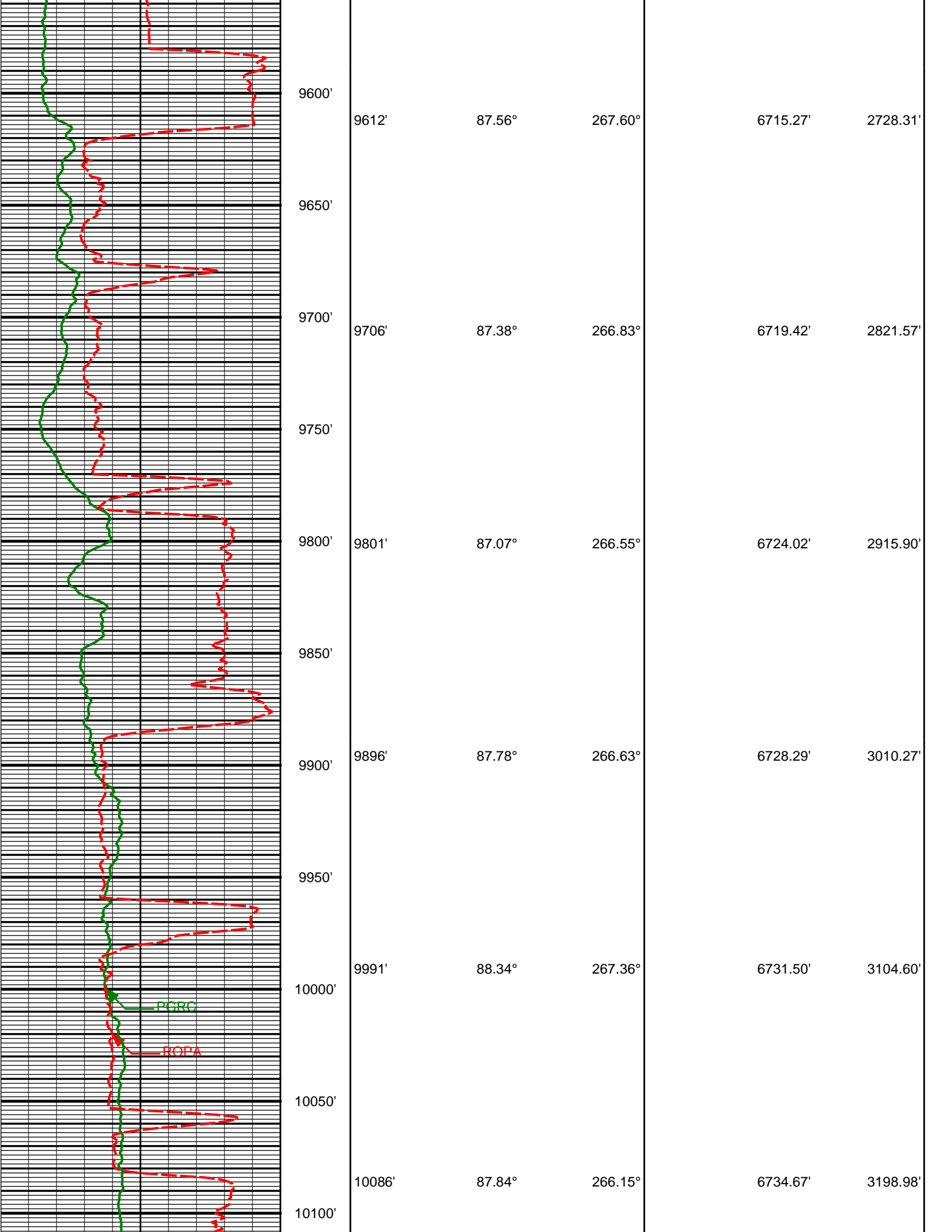


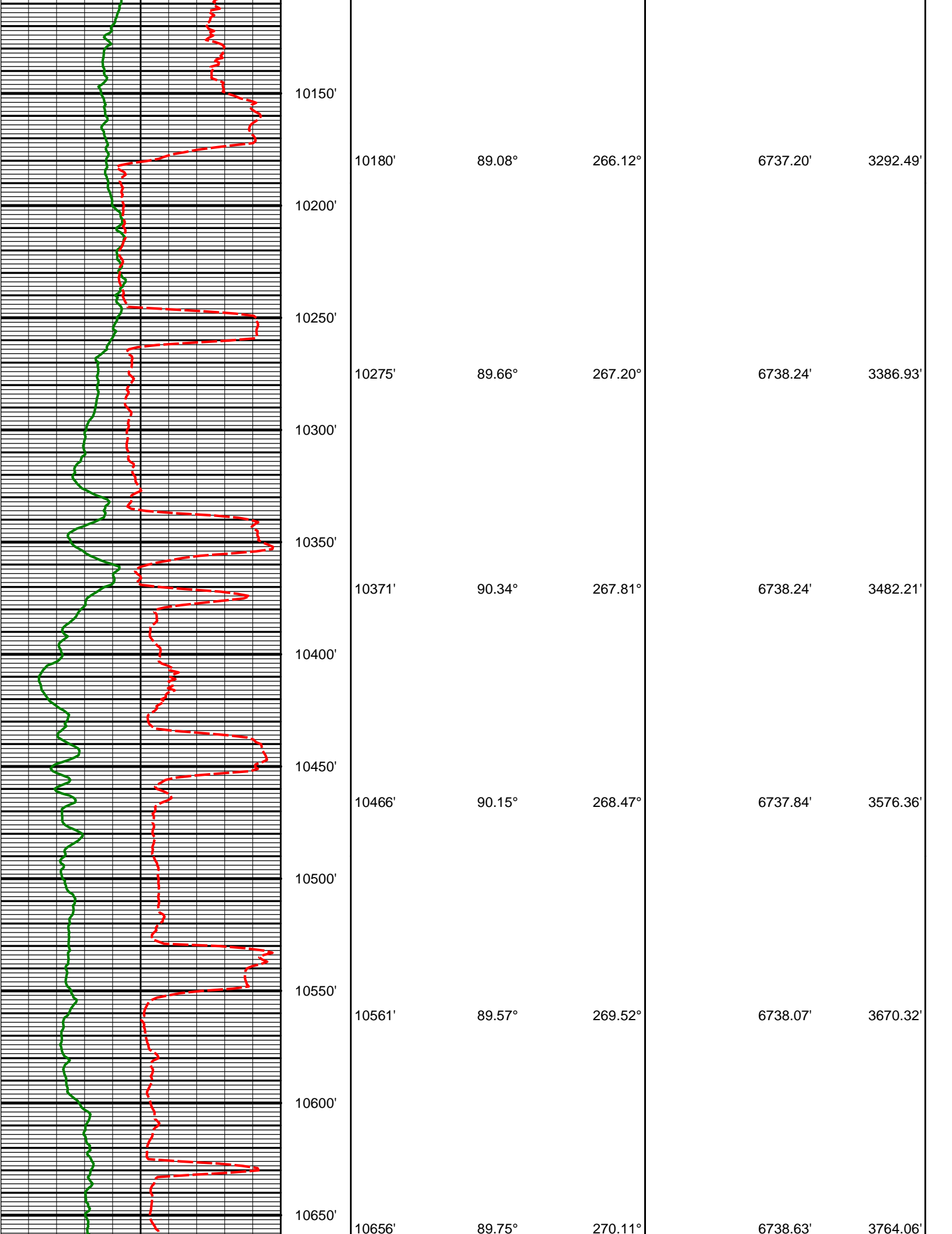


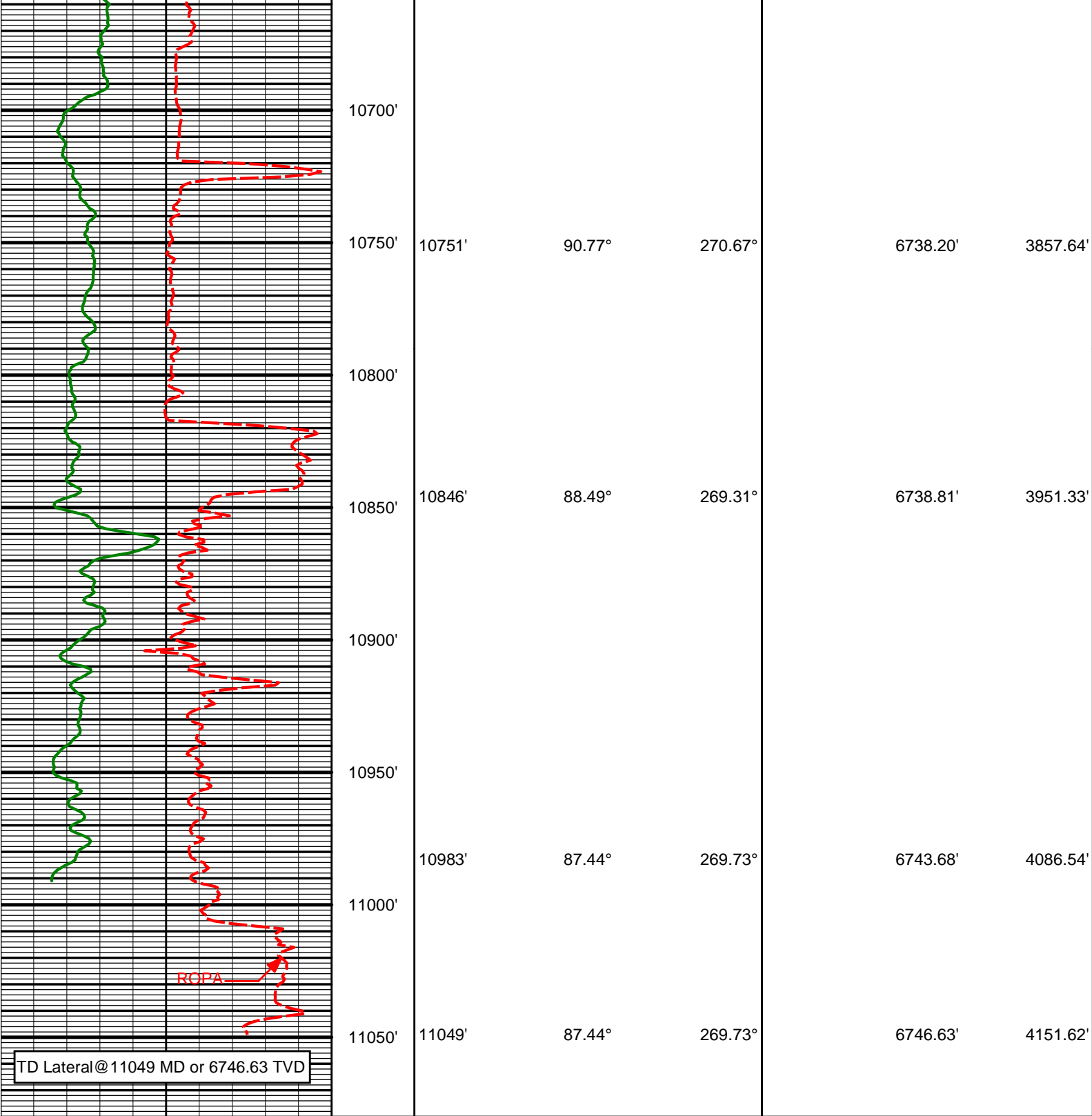








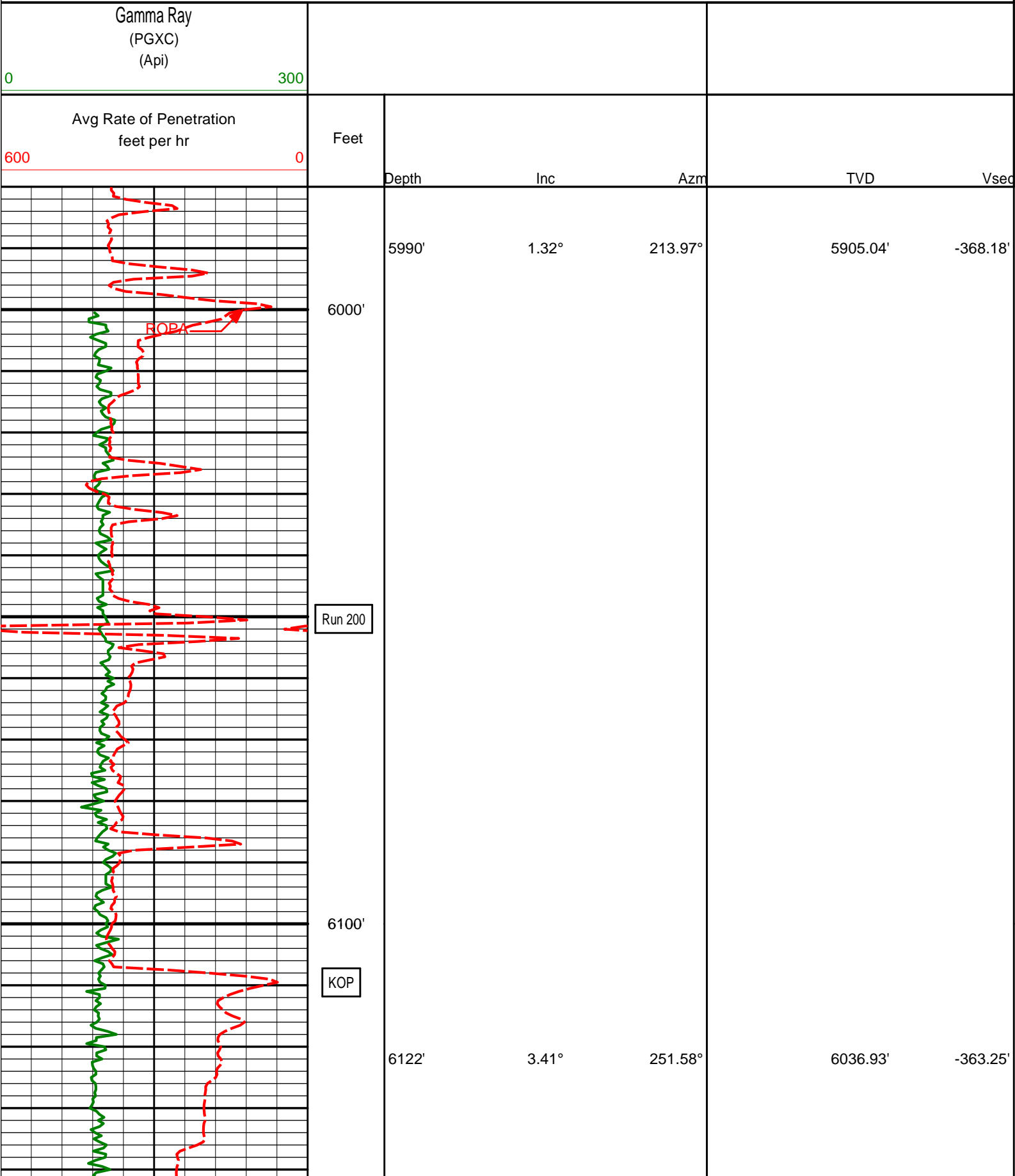


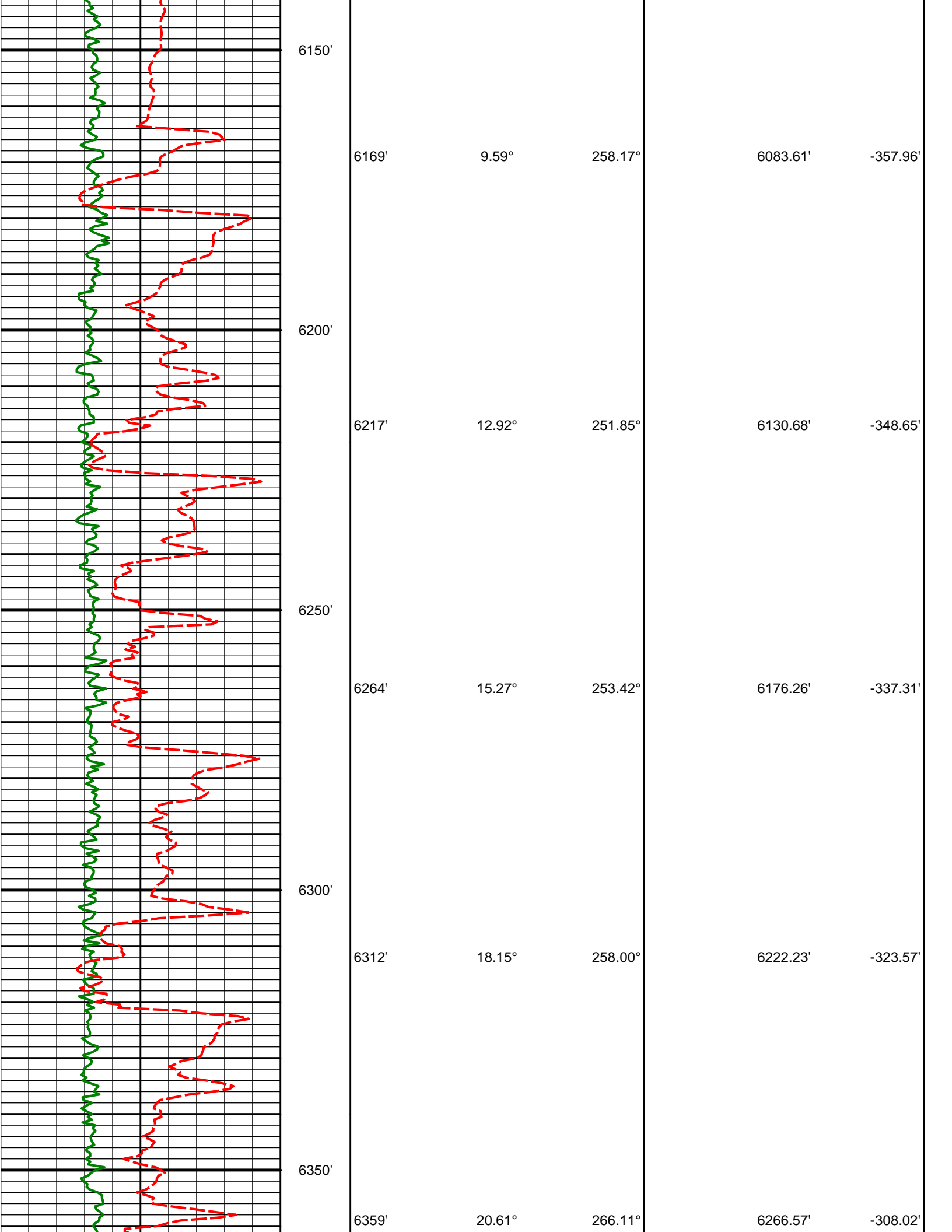


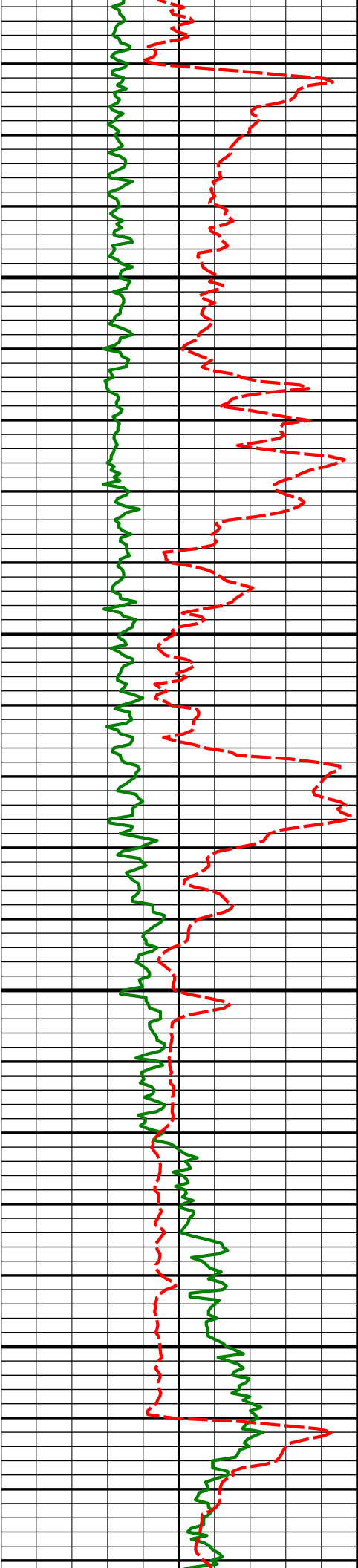
Avg Rate of Penetration feet per hr		Feet		
600	0	Depth	Inc	Azm
Gamma Ray (PGXC) (Api)				TVD
0	300			Vsec

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MD Detail Log 1:240







6400'

6407'

23.70°

277.22°

6311.04'

-290.36'

6450'

6500'

6502'

30.78°

273.67°

6395.46'

-248.35'

6550'

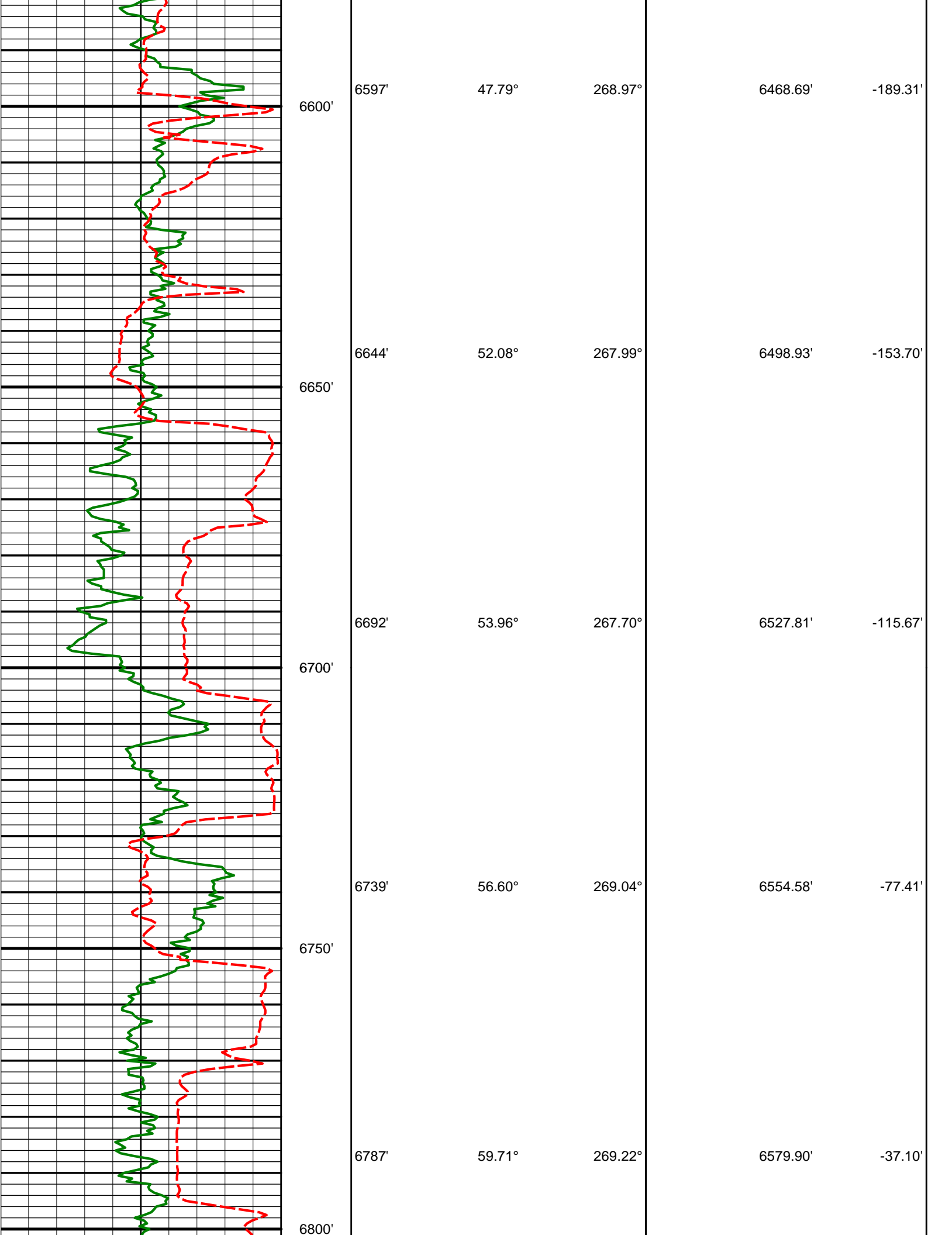
6549'

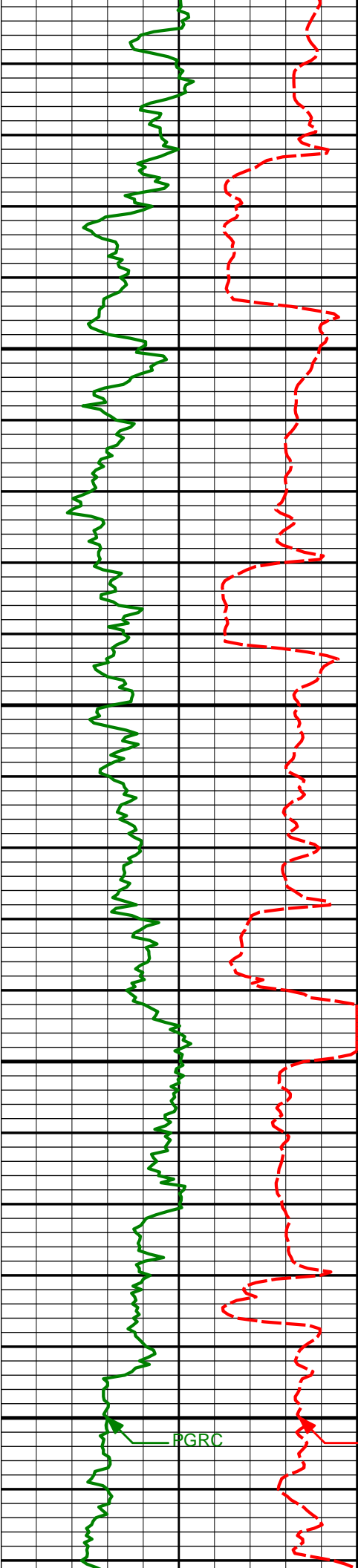
39.26°

270.10°

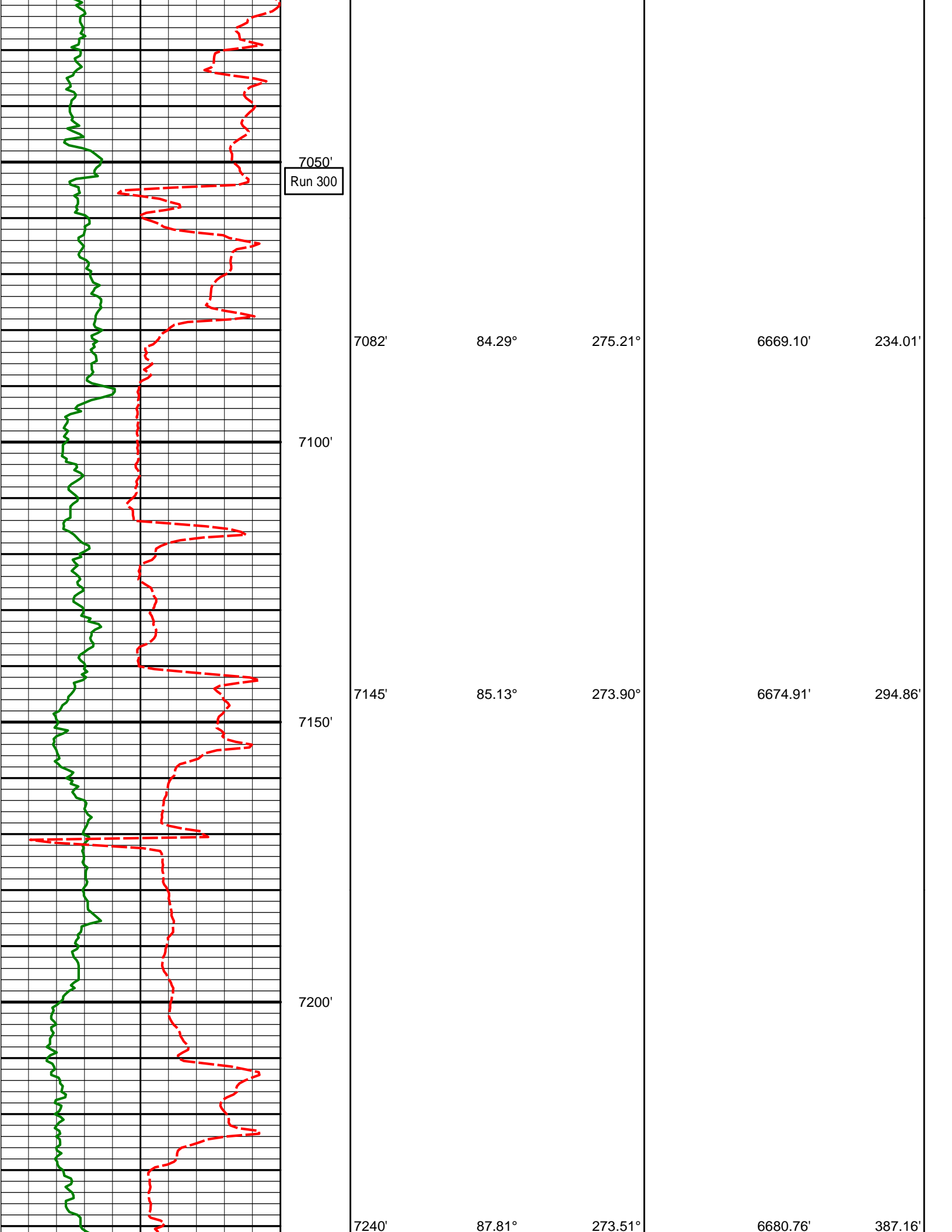
6433.92'

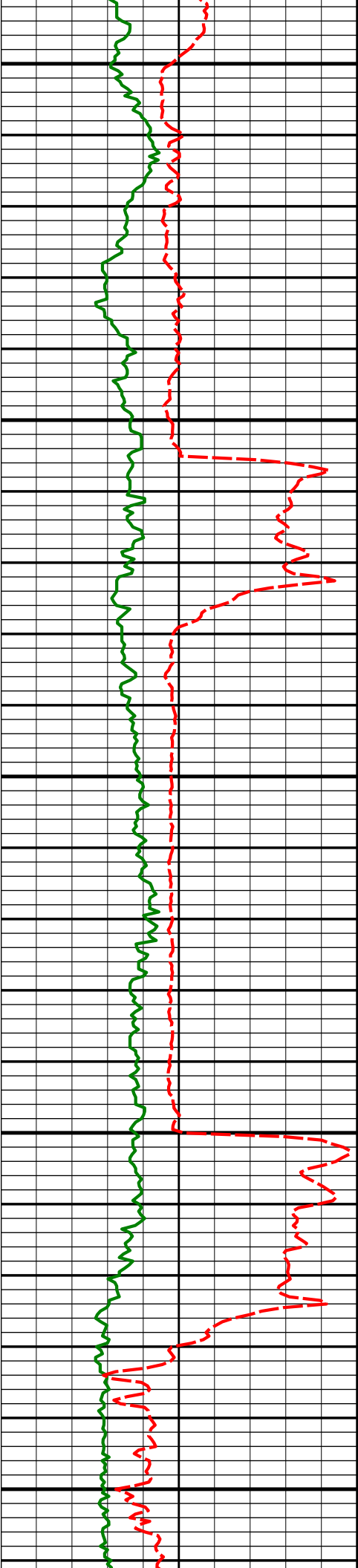
-221.93'





6834'	63.63°	269.74°	6602.20'	3.75'
6850'				
6882'	67.81°	272.19°	6621.93'	46.76'
6900'				
6929'	71.31°	274.91°	6638.35'	89.65'
6950'				
6977'	75.94°	275.92°	6651.88'	134.13'
6995'	78.24°	276.05°	6655.90'	151.04'
7000'				





7250'

7300'

7335'

7350'

7400'

7430'

7450'

89.94°

272.25°

6682.63'

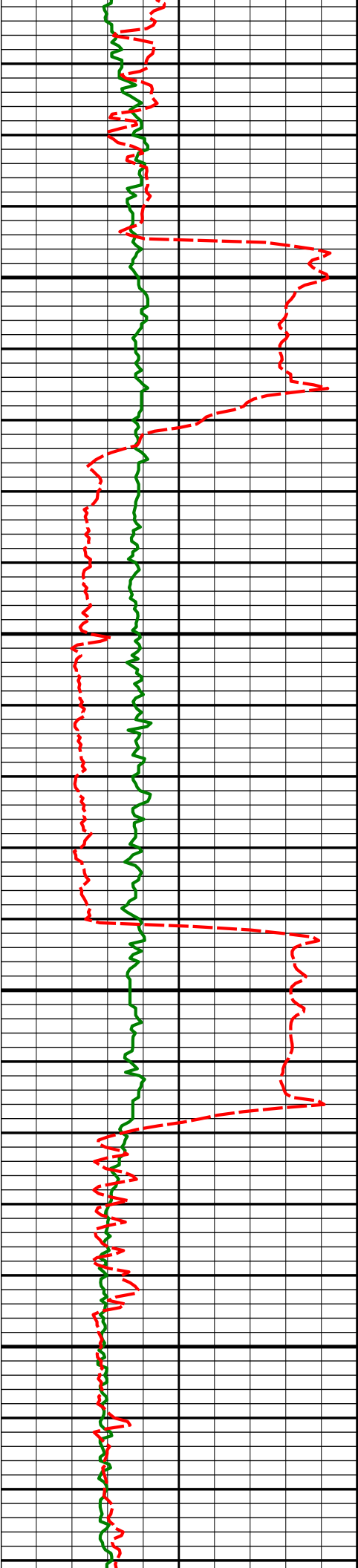
479.92'

89.94°

270.43°

6682.73'

573.22'



7500'

7525'

90.62°

270.03°

6682.26'

666.84'

7550'

7600'

7620'

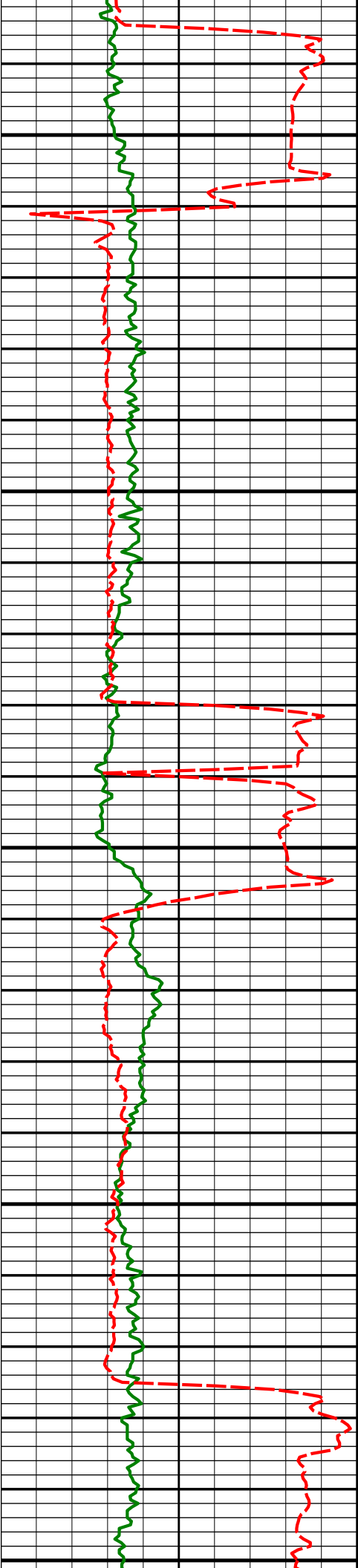
89.57°

268.21°

6682.10'

760.76'

7650'



7700'

7715'

89.01°

267.12°

6683.28'

855.01'

7750'

7800'

7809'

90.31°

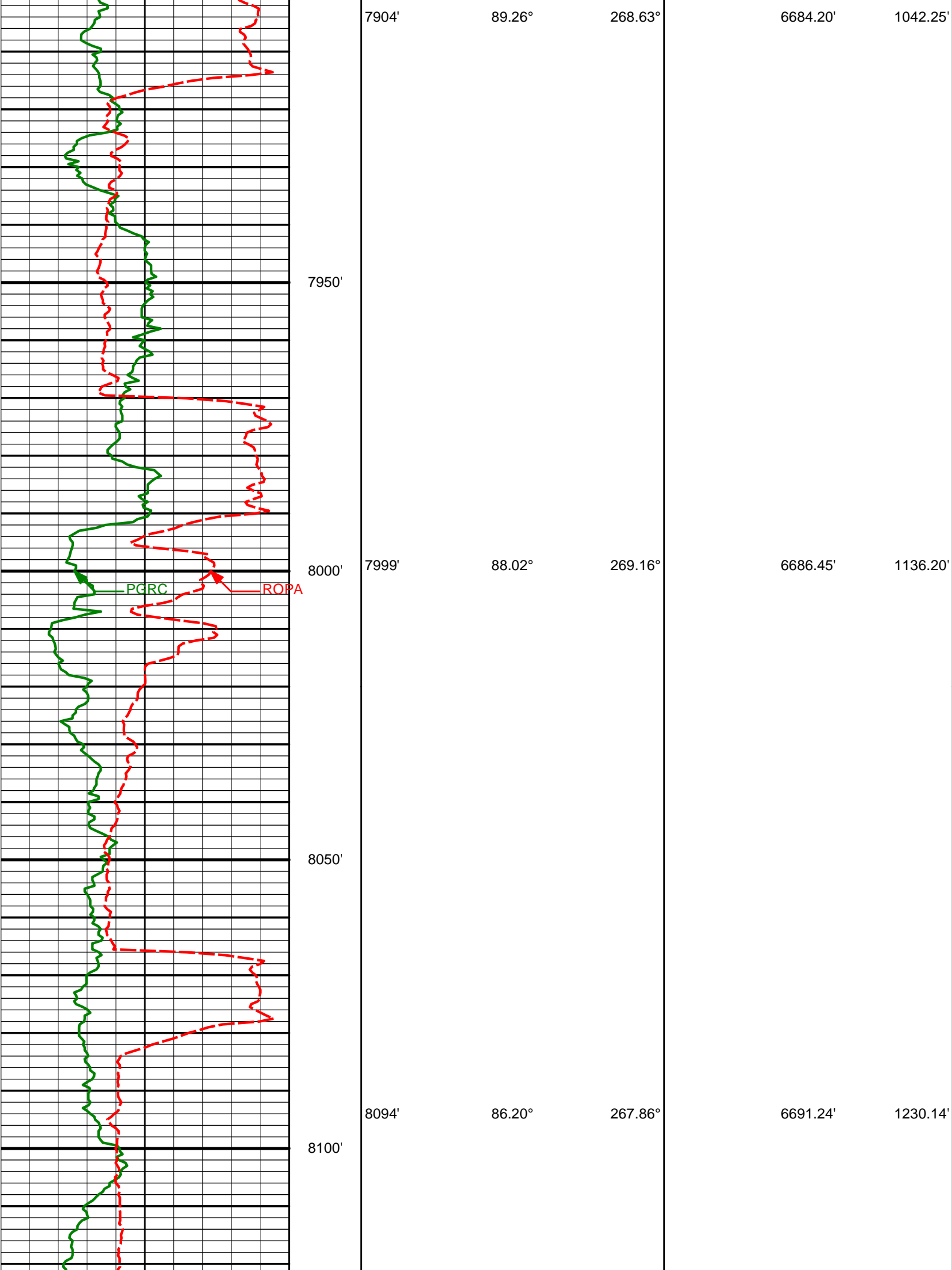
268.72°

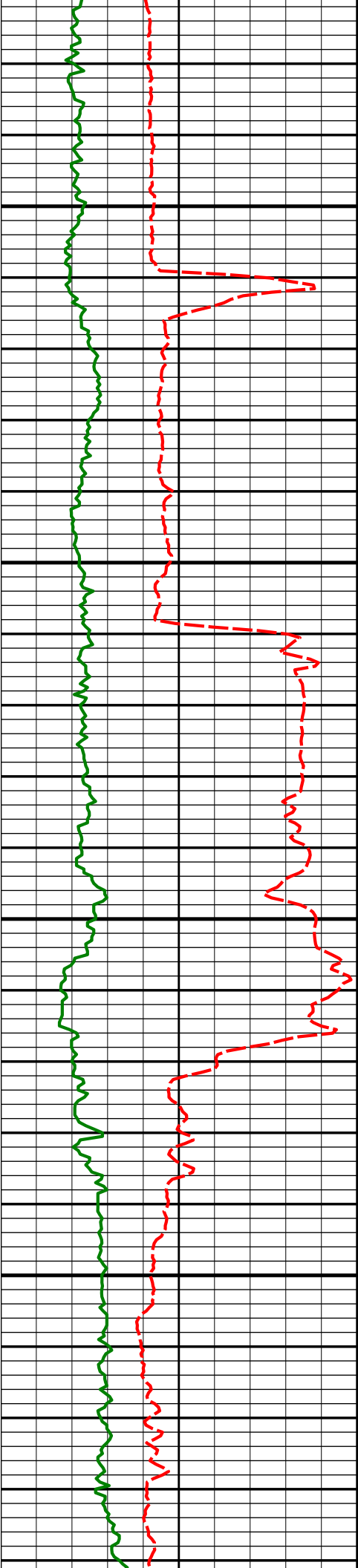
6683.84'

948.21'

7850'

7900'





8150'

8189'

86.94°

267.01°

6696.92'

1324.27'

8200'

8250'

8284'

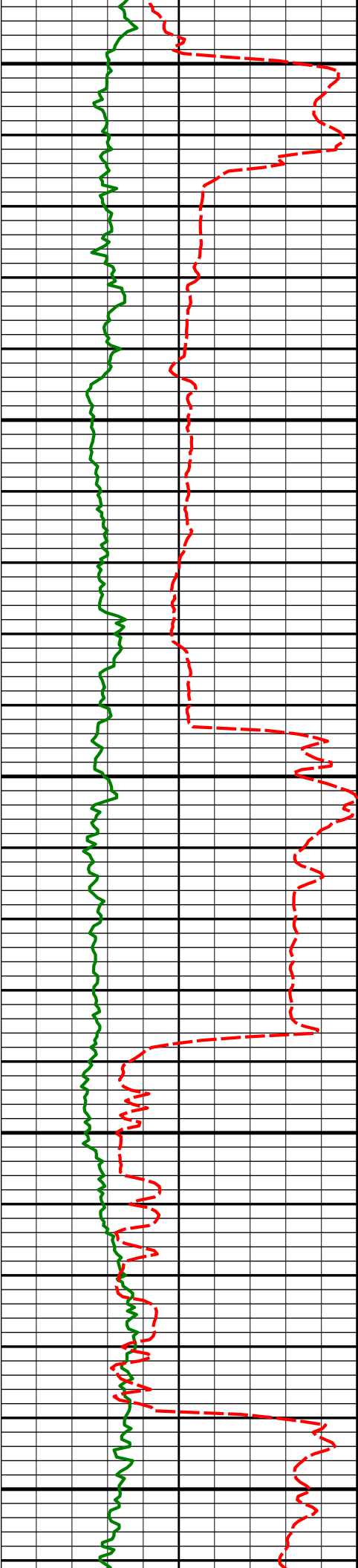
89.82°

266.69°

6699.61'

1418.64'

8300'



8350'

8379'

92.16°

270.13°

6697.97'

1512.70'

8400'

8450'

8474'

91.39°

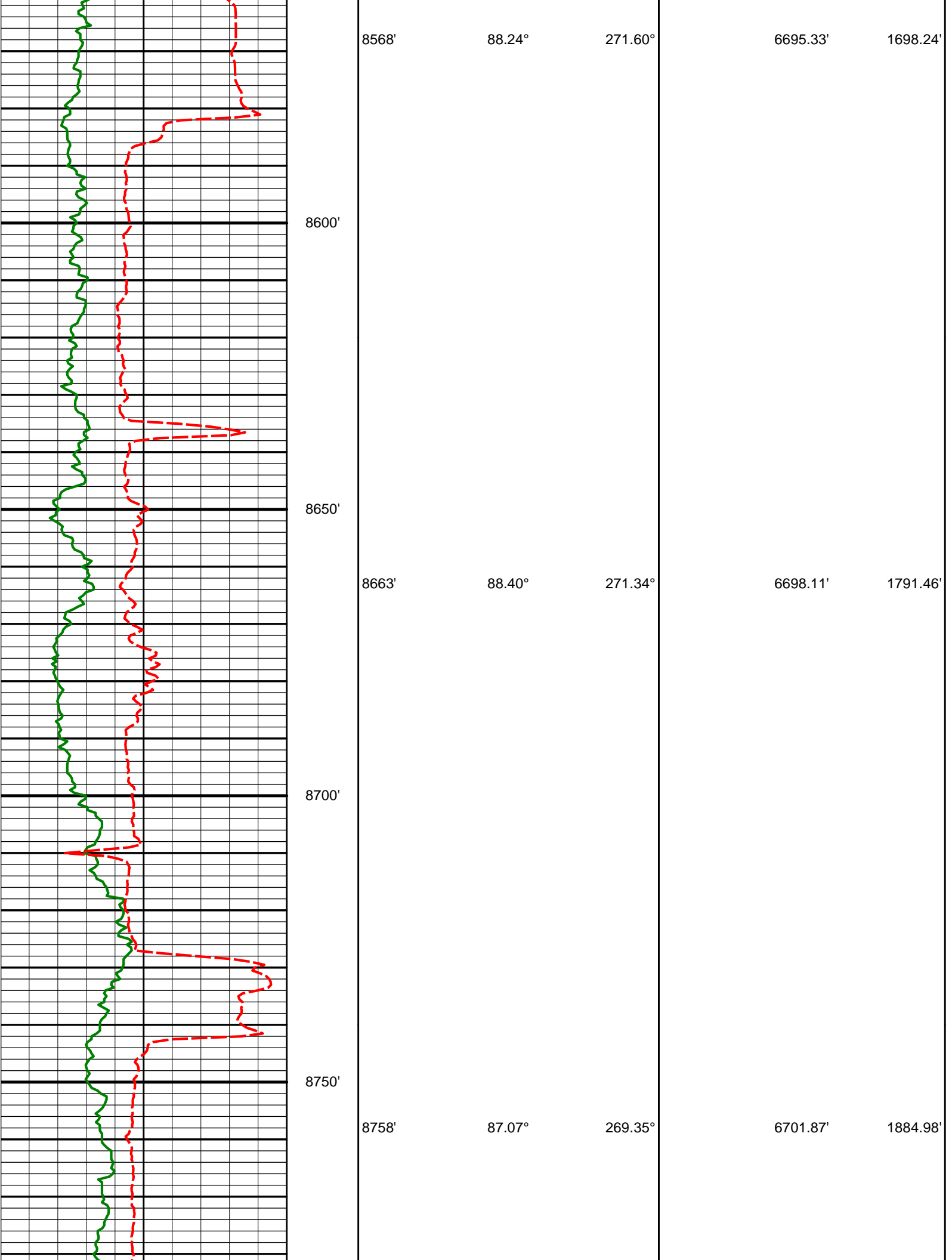
271.86°

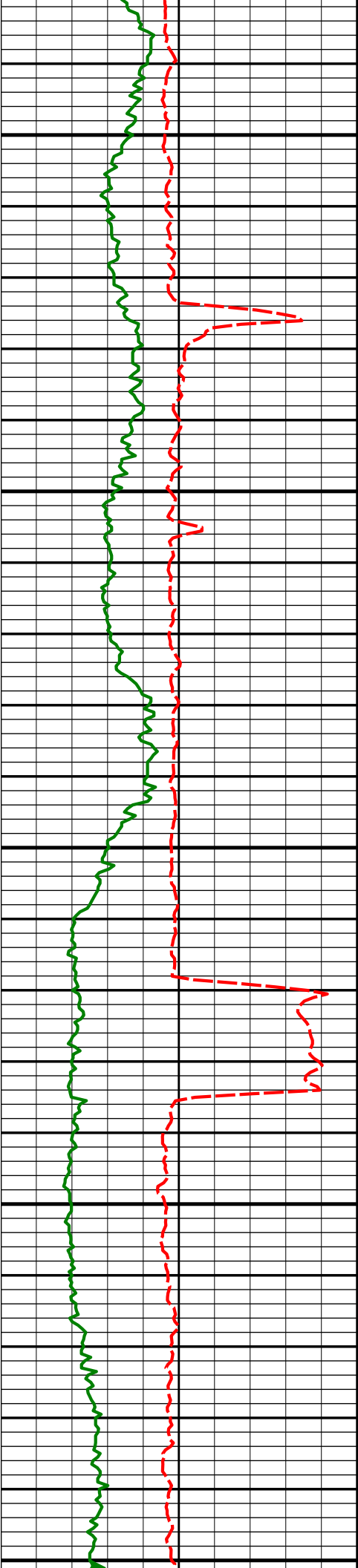
6695.02'

1606.06'

8500'

8550'





8800'

8850'

8900'

8950'

9000'

8852'

87.32°

269.44°

6706.47'

1977.74'

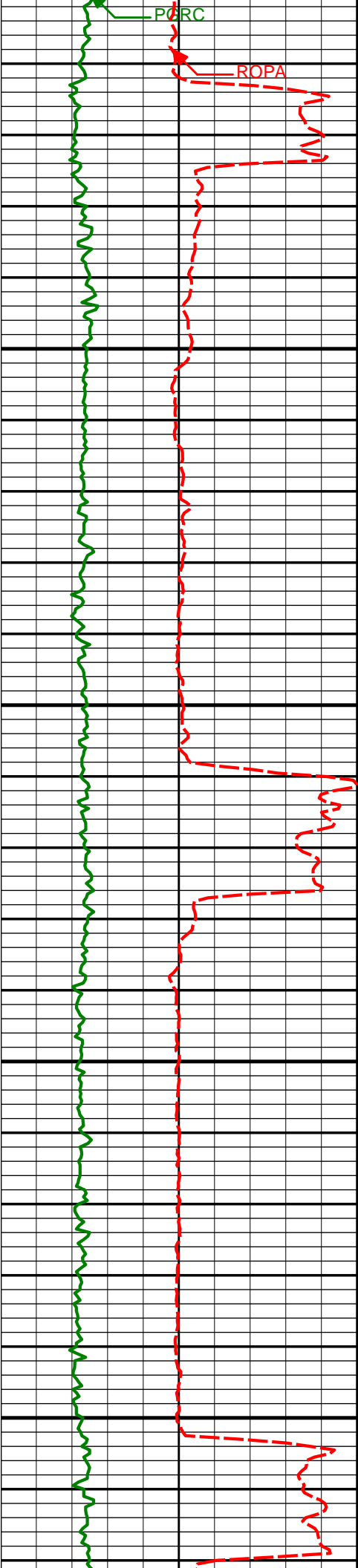
8947'

88.36°

269.47°

6710.05'

2071.51'



9042'

88.15°

268.38°

6712.94'

2165.44'

9050'

9100'

9137'

90.62°

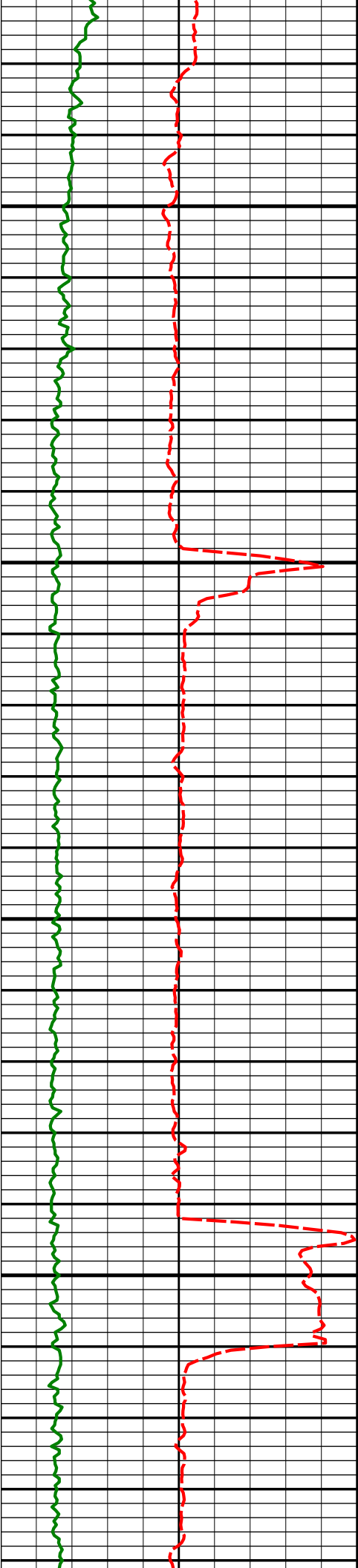
268.63°

6713.96'

2259.50'

9150'

9200'



9250'

9300'

9350'

9400'

9232'

88.43°

269.15°

6714.75'

2353.47'

9327'

90.55°

270.40°

6715.59'

2447.21'

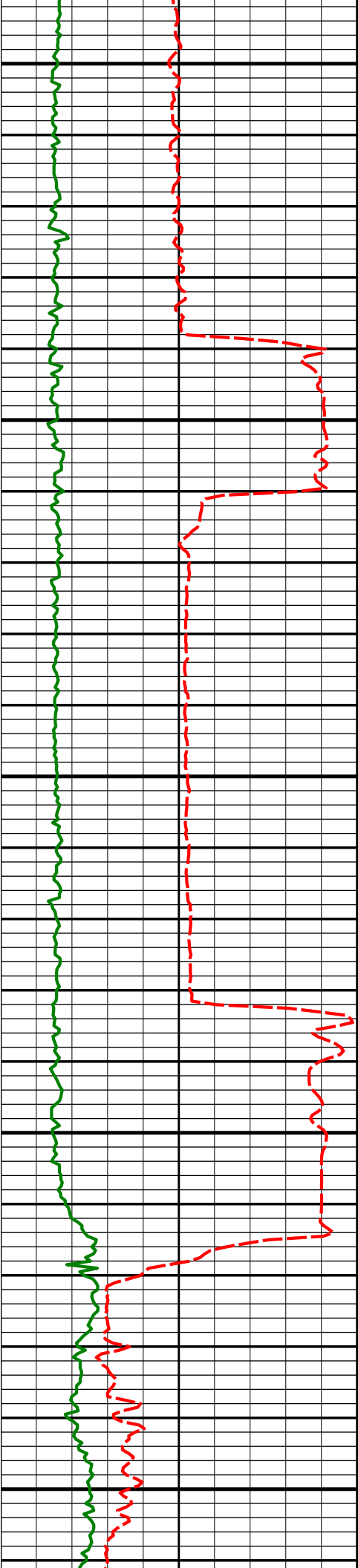
9422'

90.52°

270.09°

6714.71'

2540.83'



9450'

9500'

9550'

9600'

9650'

9517'

90.62°

270.66°

6713.76'

2634.42'

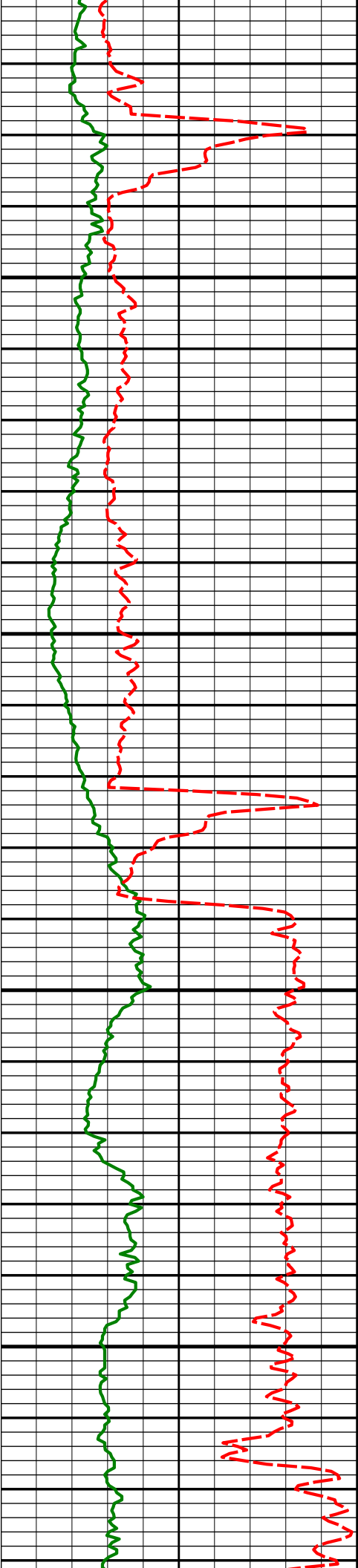
9612'

87.56°

267.60°

6715.27'

2728.31'



9700'

9706'

87.38°

266.83°

6719.42'

2821.57'

9750'

9800'

9801'

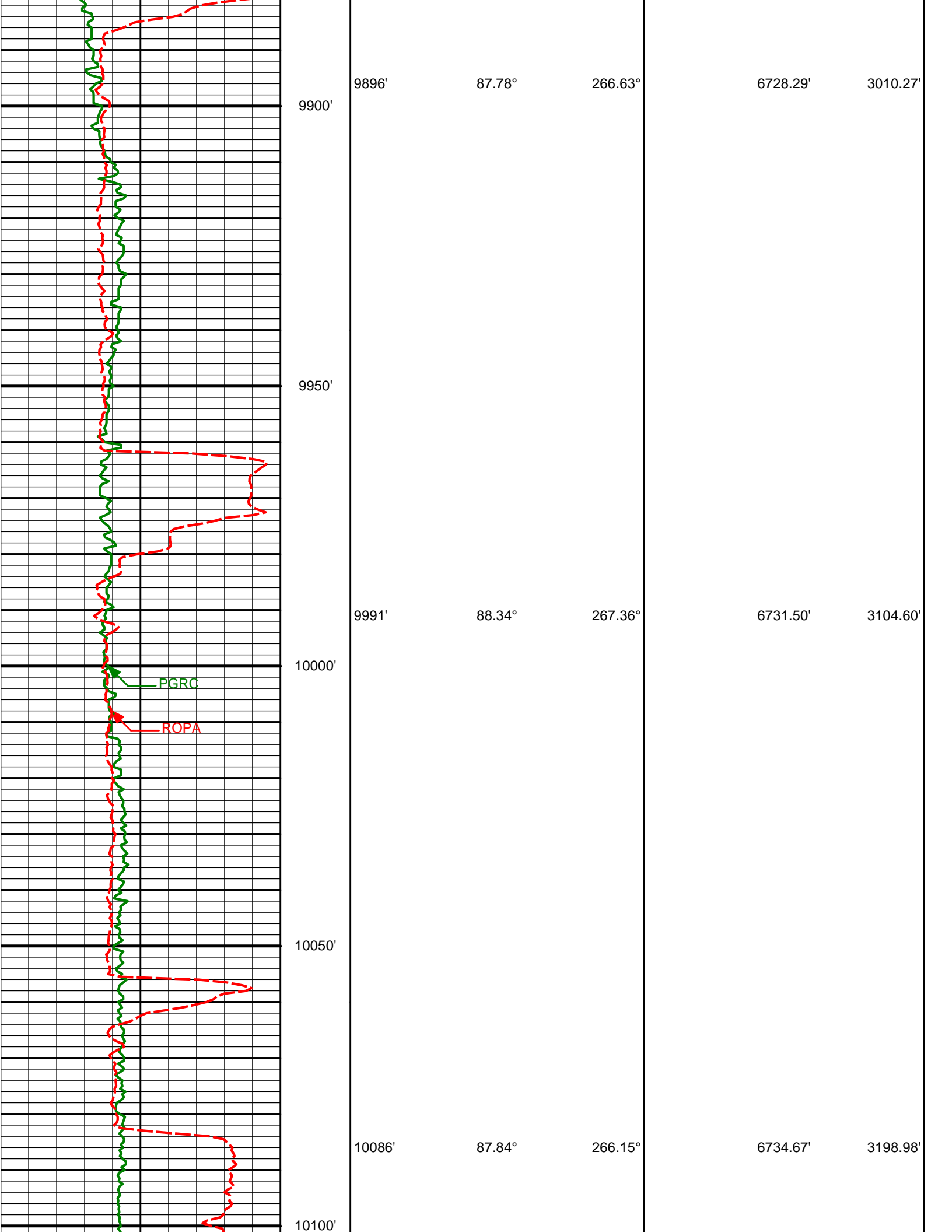
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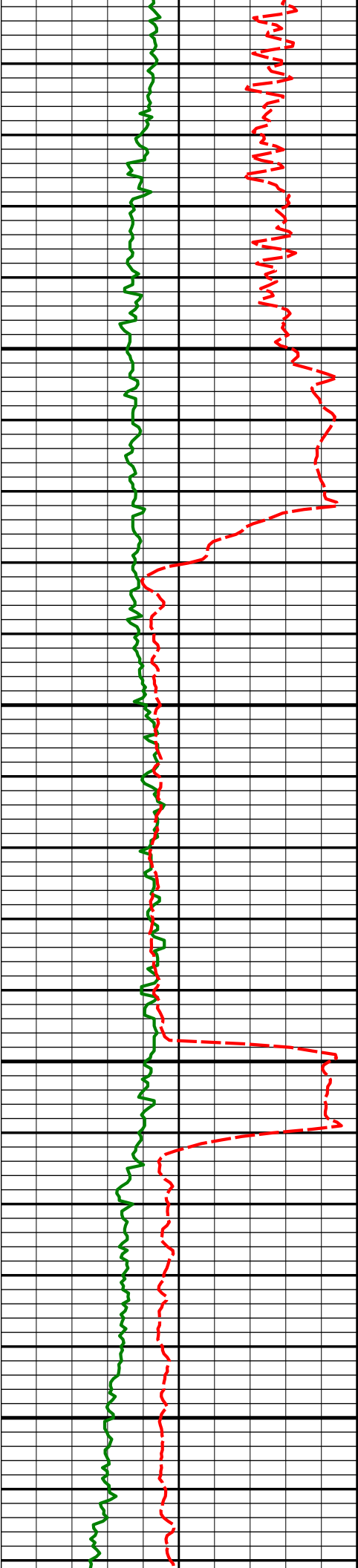
266.55°

6724.02'

2915.90'

9850'





10150'

10180'

89.08°

266.12°

6737.20'

3292.49'

10200'

10250'

10275'

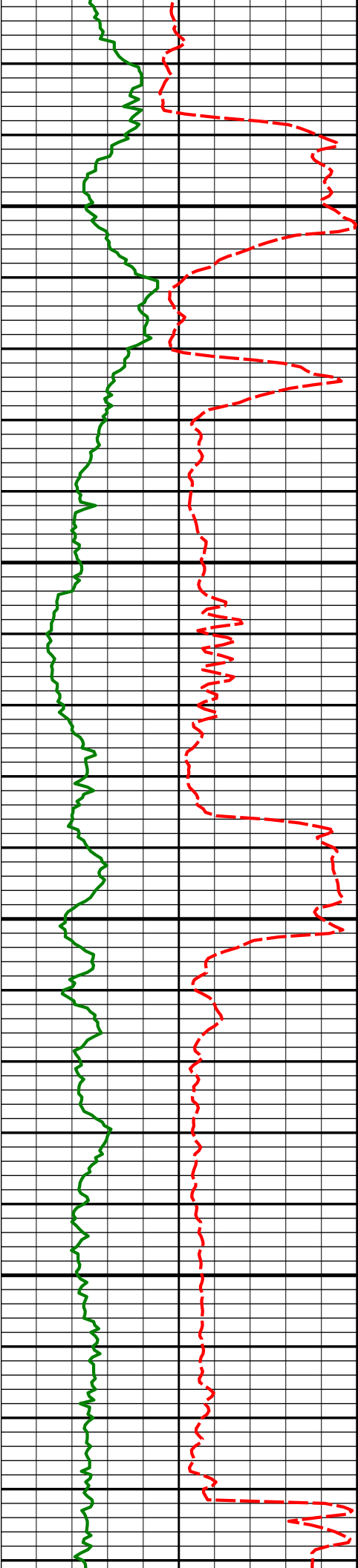
89.66°

267.20°

6738.24'

3386.93'

10300'



10350'

10371'

90.34°

267.81°

6738.24'

3482.21'

10400'

10450'

10466'

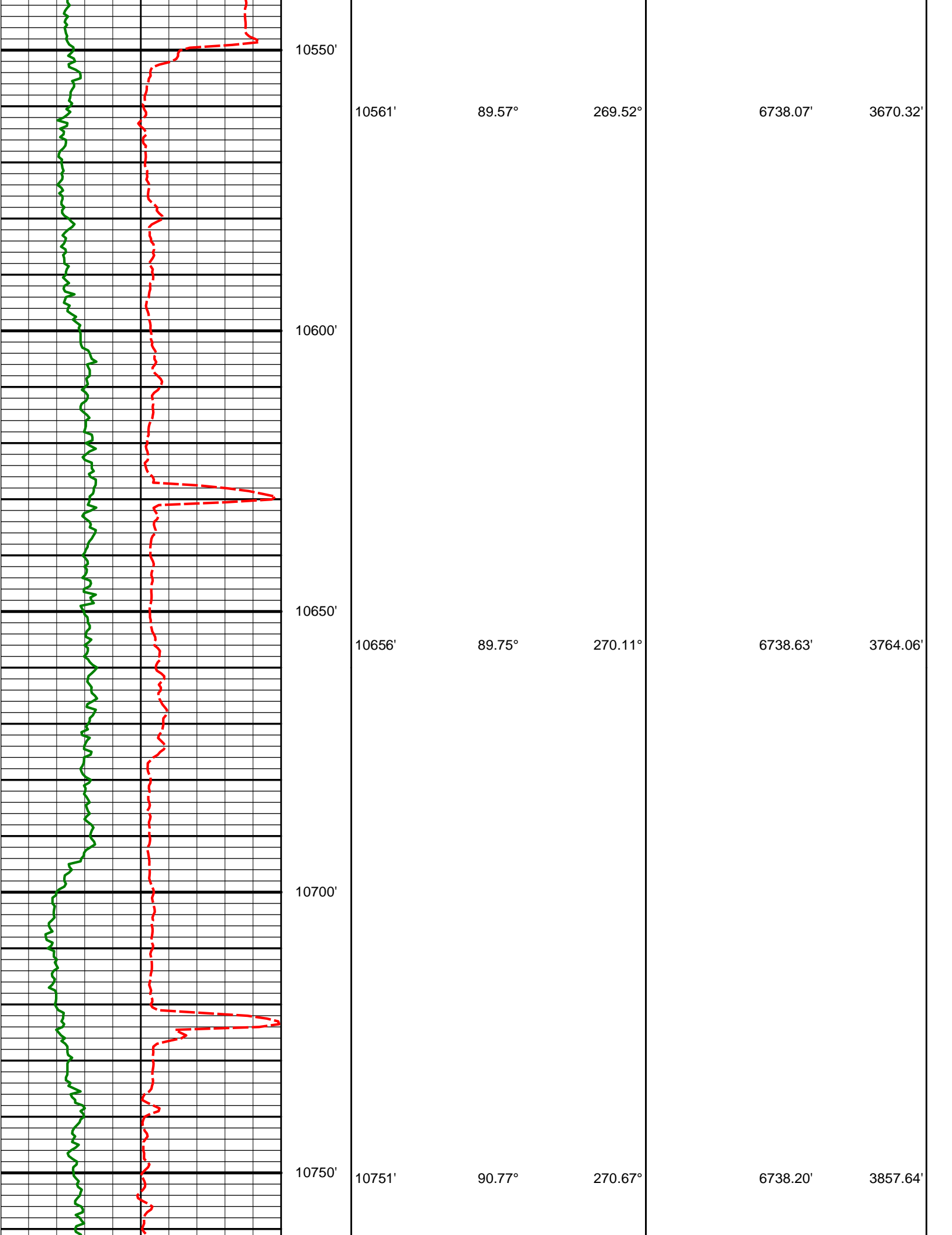
90.15°

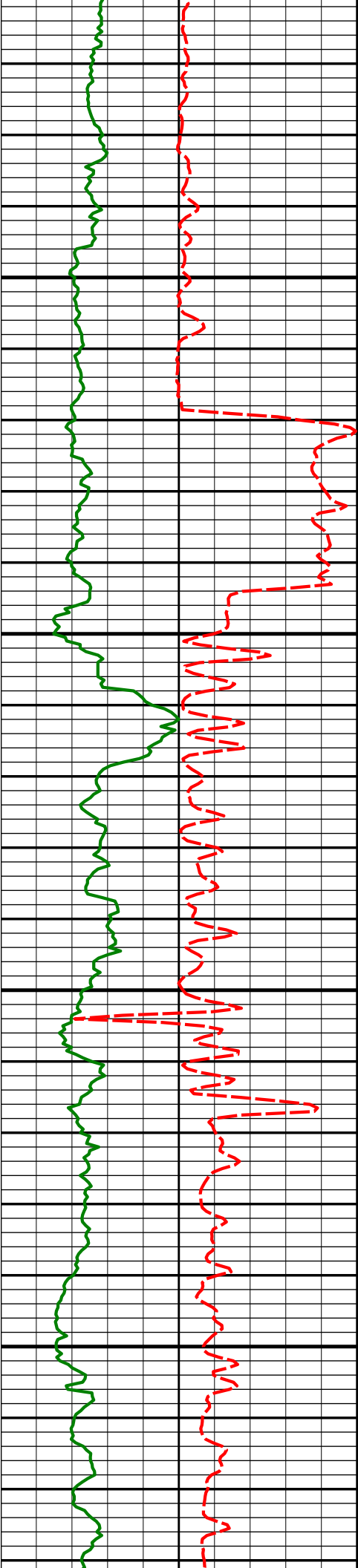
268.47°

6737.84'

3576.36'

10500'





10800'

10850'

10900'

10950'

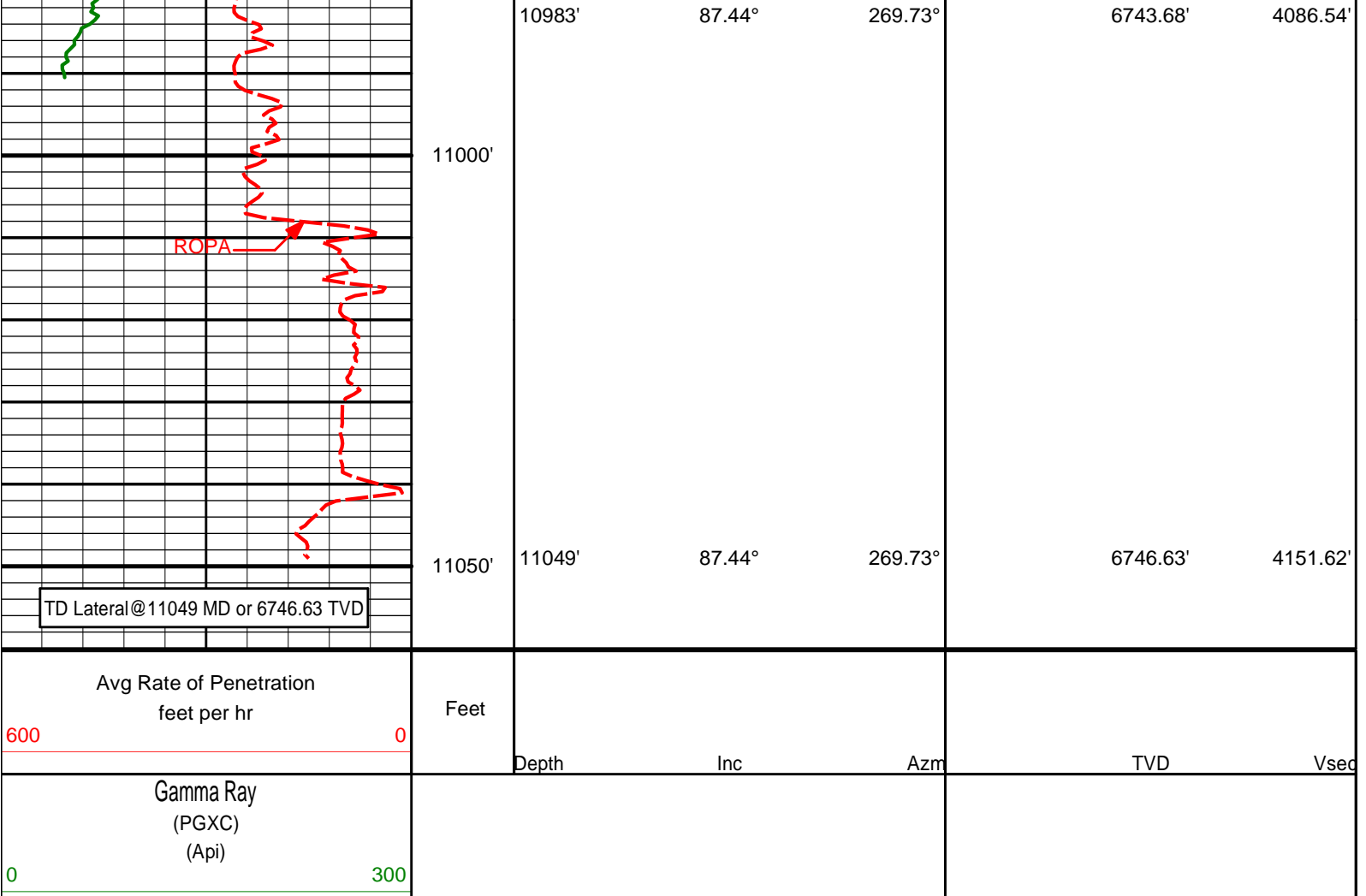
10846'

88.49°

269.31°

6738.81'

3951.33'



DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch State AA21-62-1HN
Wattenberg
Weld Colorado
USA
CA-XX-0900918601

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
234.00	0.30	300.59	234.00	0.31 N	0.53 W	0.47	0.13
483.00	0.50	299.69	482.99	1.18 N	2.03 W	1.81	0.08
737.00	0.10	59.89	736.99	1.84 N	2.80 W	2.46	0.22
912.00	0.10	93.89	911.99	1.91 N	2.52 W	2.17	0.03
1015.00	0.52	36.12	1014.99	2.28 N	2.15 W	1.75	0.46
1107.00	0.59	66.11	1106.98	2.81 N	1.47 W	0.99	0.32
1200.00	0.79	26.93	1199.98	3.57 N	0.75 W	0.15	0.54
1293.00	0.57	339.15	1292.97	4.58 N	0.62 W	-0.14	0.63
1386.00	1.77	128.71	1385.96	4.11 N	0.34 E	-1.01	2.45
1479.00	3.67	154.49	1478.85	0.53 N	2.74 E	-2.79	2.38
1574.00	4.72	150.89	1573.60	5.63 S	5.95 E	-4.94	1.14
1669.00	5.86	160.22	1668.19	13.61 S	9.49 E	-7.11	1.50
1764.00	8.49	148.15	1762.45	24.13 S	14.84 E	-10.64	3.18
1859.00	10.93	137.48	1856.09	36.73 S	24.63 E	-18.22	3.18
1954.00	12.37	137.55	1949.13	50.88 S	37.58 E	-28.66	1.52
2048.00	12.18	133.72	2040.98	65.16 S	51.54 E	-40.07	0.89
2143.00	14.00	140.52	2133.51	80.96 S	66.09 E	-51.81	2.51
2238.00	12.86	135.27	2225.92	97.34 S	80.84 E	-63.65	1.76
2333.00	14.02	138.67	2318.31	113.49 S	95.88 E	-75.81	1.48
2428.00	12.91	134.63	2410.70	129.59 S	111.04 E	-88.10	1.53

2523.00	12.95	141.84	2503.30	145.42 S	125.17 E	-99.42	1.70
2618.00	12.71	151.70	2595.94	162.99 S	136.70 E	-107.89	2.32
2713.00	10.94	148.94	2688.92	179.92 S	146.31 E	-114.57	1.96
2808.00	12.20	150.99	2781.99	196.42 S	155.82 E	-121.23	1.39
2903.00	14.08	152.34	2874.50	215.43 S	166.06 E	-128.18	2.01
2998.00	14.56	154.18	2966.55	236.42 S	176.62 E	-135.14	0.70
3092.00	13.24	152.65	3057.79	256.62 S	186.72 E	-141.75	1.46
3187.00	12.62	151.24	3150.38	275.38 S	196.71 E	-148.51	0.73
3282.00	12.98	147.57	3243.02	293.48 S	207.42 E	-156.08	0.94
3377.00	13.28	147.16	3335.54	311.65 S	219.06 E	-164.56	0.33
3472.00	11.25	148.31	3428.37	328.71 S	229.85 E	-172.38	2.15
3567.00	10.13	139.35	3521.72	342.93 S	240.16 E	-180.20	2.11
3662.00	13.27	134.59	3614.74	356.93 S	253.37 E	-190.92	3.46
3756.00	15.26	134.14	3705.84	373.12 S	269.93 E	-204.57	2.12
3851.00	16.85	132.54	3797.13	391.14 S	289.05 E	-220.45	1.74
3946.00	17.65	135.80	3887.86	410.77 S	309.24 E	-237.12	1.32
4040.00	15.72	139.65	3977.90	430.69 S	327.42 E	-251.76	2.37
4135.00	14.37	141.97	4069.64	449.79 S	343.01 E	-263.99	1.56
4230.00	12.93	140.98	4161.96	467.33 S	356.97 E	-274.85	1.54
4325.00	11.59	142.64	4254.79	483.18 S	369.45 E	-284.54	1.46
4419.00	10.66	145.74	4347.02	497.87 S	380.08 E	-292.59	1.18
4515.00	12.15	146.73	4441.12	513.65 S	390.62 E	-300.38	1.57
4610.00	10.96	149.71	4534.20	529.81 S	400.66 E	-307.62	1.40
4705.00	12.22	143.71	4627.26	545.72 S	411.16 E	-315.35	1.83
4800.00	10.50	140.01	4720.40	560.45 S	422.68 E	-324.27	1.97
4894.00	8.97	137.30	4813.04	572.40 S	433.15 E	-332.63	1.70
4989.00	9.02	134.41	4906.87	583.06 S	443.50 E	-341.07	0.48
5084.00	7.37	138.98	5000.90	592.86 S	452.82 E	-348.64	1.87
5178.00	6.25	138.11	5094.24	601.22 S	460.19 E	-354.53	1.20
5273.00	4.49	142.35	5188.82	608.02 S	465.91 E	-359.05	1.90
5368.00	4.68	139.38	5283.51	613.90 S	470.71 E	-362.81	0.32
5463.00	3.83	130.22	5378.25	618.89 S	475.65 E	-366.86	1.14
5558.00	1.74	123.90	5473.13	621.75 S	479.27 E	-369.96	2.22
5653.00	0.49	170.72	5568.11	622.95 S	480.54 E	-371.01	1.53
5748.00	1.39	203.52	5663.10	624.41 S	480.14 E	-370.38	1.07
5843.00	1.02	183.79	5758.08	626.31 S	479.63 E	-369.56	0.58
5938.00	1.47	194.59	5853.06	628.33 S	479.26 E	-368.86	0.53
5990.00	1.32	213.97	5905.04	629.48 S	478.76 E	-368.18	0.95
6122.00	3.41	251.58	6036.93	631.98 S	474.19 E	-363.25	1.89
6169.00	9.59	258.17	6083.61	633.22 S	469.02 E	-357.96	13.22
6217.00	12.92	251.85	6130.68	635.71 S	460.01 E	-348.65	7.39
6264.00	15.27	253.42	6176.26	639.12 S	449.08 E	-337.31	5.07
6312.00	18.15	258.00	6222.23	642.48 S	435.71 E	-323.57	6.59
6359.00	20.61	266.11	6266.57	644.56 S	420.29 E	-308.02	7.75
6407.00	23.70	277.22	6311.04	643.92 S	402.28 E	-290.36	10.82
6502.00	30.78	273.67	6395.46	639.96 S	359.02 E	-248.35	7.64
6549.00	39.26	270.10	6433.92	639.16 S	332.10 E	-221.93	18.55
6597.00	47.79	268.97	6468.69	639.46 S	299.07 E	-189.31	17.84
6644.00	52.08	267.99	6498.93	640.42 S	263.12 E	-153.70	9.27
6692.00	53.96	267.70	6527.81	641.86 S	224.81 E	-115.67	3.95
6739.00	56.60	269.04	6554.58	642.95 S	186.20 E	-77.41	6.09
6787.00	59.71	269.22	6579.90	643.57 S	145.43 E	-37.10	6.49
6834.00	63.63	269.74	6602.20	643.94 S	104.07 E	3.75	8.40
6882.00	67.81	272.19	6621.93	643.19 S	60.34 E	46.76	9.87
6929.00	71.31	274.91	6638.35	640.45 S	16.39 E	89.65	9.21
6977.00	75.94	275.92	6651.88	636.11 S	29.44 W	134.13	9.85
6995.00	78.24	276.05	6655.90	634.28 S	46.89 W	151.04	12.80
7082.00	84.29	275.21	6669.10	625.85 S	132.42 W	234.01	7.02
7145.00	85.13	273.90	6674.91	620.87 S	194.95 W	294.86	2.46
7240.00	87.81	273.51	6680.76	614.74 S	289.57 W	387.16	2.85
7335.00	89.94	272.25	6682.63	609.97 S	384.42 W	479.92	2.60
7430.00	89.94	270.43	6682.73	607.75 S	479.39 W	573.22	1.92
7525.00	90.62	270.03	6682.26	607.37 S	574.39 W	666.84	0.83
7620.00	89.57	268.21	6682.10	608.83 S	669.37 W	760.76	2.21
7715.00	89.01	267.12	6683.28	612.70 S	764.28 W	855.01	1.29
7809.00	90.31	268.72	6683.84	616.11 S	858.22 W	948.21	2.19
7904.00	89.26	268.63	6684.20	618.30 S	953.19 W	1042.25	1.11
7999.00	88.02	269.16	6686.45	620.14 S	1048.14 W	1136.20	1.42
8094.00	86.20	267.86	6691.24	622.60 S	1142.98 W	1230.14	2.35
8189.00	86.94	267.01	6696.92	626.85 S	1237.72 W	1324.27	1.19
8284.00	89.82	266.69	6699.61	632.06 S	1332.52 W	1418.64	3.05
8379.00	92.92	266.42	6702.37	637.29 S	1427.35 W	1512.53	4.02

8379.00	92.16	270.13	6697.97	634.70 S	1427.45 W	1512.70	4.38
8474.00	91.39	271.86	6695.02	633.05 S	1522.39 W	1606.06	1.99
8568.00	88.24	271.60	6695.33	630.21 S	1616.33 W	1698.24	3.36
8663.00	88.40	271.34	6698.11	627.78 S	1711.26 W	1791.46	0.32
8758.00	87.07	269.35	6701.87	627.21 S	1806.18 W	1884.98	2.52
8852.00	87.32	269.44	6706.47	628.20 S	1900.06 W	1977.74	0.28
8947.00	88.36	269.47	6710.05	629.10 S	1994.99 W	2071.51	1.10
9042.00	88.15	268.38	6712.94	630.88 S	2089.93 W	2165.44	1.17
9137.00	90.62	268.63	6713.96	633.36 S	2184.88 W	2259.50	2.61
9232.00	88.43	269.15	6714.75	635.20 S	2279.85 W	2353.47	2.37
9327.00	90.55	270.40	6715.59	635.57 S	2374.84 W	2447.21	2.59
9422.00	90.52	270.09	6714.71	635.17 S	2469.84 W	2540.83	0.33
9517.00	90.62	270.66	6713.76	634.55 S	2564.83 W	2634.42	0.61
9612.00	87.56	267.60	6715.27	635.99 S	2659.78 W	2728.31	4.55
9706.00	87.38	266.83	6719.42	640.55 S	2753.58 W	2821.57	0.84
9801.00	87.07	266.55	6724.02	646.03 S	2848.31 W	2915.90	0.44
9896.00	87.78	266.63	6728.29	651.67 S	2943.05 W	3010.27	0.75
9991.00	88.34	267.36	6731.50	656.65 S	3037.86 W	3104.60	0.97
10086.00	87.84	266.15	6734.67	662.02 S	3132.65 W	3198.98	1.38
10180.00	89.08	266.12	6737.20	668.36 S	3226.40 W	3292.49	1.32
10275.00	89.66	267.20	6738.24	673.89 S	3321.23 W	3386.93	1.29
10371.00	90.34	267.81	6738.24	678.07 S	3417.14 W	3482.21	0.95
10466.00	90.15	268.47	6737.84	681.16 S	3512.09 W	3576.36	0.72
10561.00	89.57	269.52	6738.07	682.82 S	3607.07 W	3670.32	1.26
10656.00	89.75	270.11	6738.63	683.13 S	3702.07 W	3764.06	0.65
10751.00	90.77	270.67	6738.20	682.48 S	3797.07 W	3857.64	1.22
10846.00	88.49	269.31	6738.81	682.50 S	3892.06 W	3951.33	2.79
10983.00	87.44	269.73	6743.68	683.65 S	4028.96 W	4086.54	0.83
11049.00	87.44	269.73	6746.63	683.96 S	4094.90 W	4151.62	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 260.49 DEGREES (GRID)
A TOTAL CORRECTION OF 7.69 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 11049.00 FEET
IS 4151.62 FEET ALONG 260.52 DEGREES (GRID)**

Tie-In @ Surface

**Surveys at 234 ft, 483 ft, 737 ft, and 912 were taken and provided by HP 322 while they were drilling the surface hole and have been covered
from magnetic north to grid north.**