

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

1 : 240

Country : USA			
Field : Wattenberg			
Location : Lat: 40° 28' 2.53" North Long: 104° 26' 2.90" West			
Well : Wells Ranch State AA28-69HN			
Company : Noble Energy			
Rig : H&P 322			
LOCATION			
Latitude : 40° 28' 2.53" North Longitude : 104° 26' 2.90" West		Other Services Directional Drilling	
UTM Easting = 3296551.217 ft UTM Northing = 1414885.332 ft			
Permanent Datum : Ground Level		Elevation : 4731.00 ft	Elev. KB N/A
Log Measured From : Drill Floor		24.00 ft Above Permanent Datum	DF 4755.00 ft
Drilling Measured From : Drill Floor		MD LOG	GL 4731.00 ft
			WD N/A
Depth Logged : 942.00 ft To 10,958.00 ft		Unit No. : 11210425	
Date Logged : 30-Dec-13 To 30-Dec-13		Job No. : CA-XX-0900918620	
Total Depth MD : 10,958.00 ft TVD: 6,662.09 ft		Plot Type : Final	
Spud Date : 30-Dec-13		Plot Date : 05-Jan-14	
Run No.	Borehole Record (MD)		Run No.
	Size	From	
2	8.750 in	942.00 ft	6,000.00 ft
3	8.750 in	6,000.00 ft	7,016.00 ft
4	6.125 in	7,016.00 ft	10,958.00 ft
		Casing Record (MD)	
		Size	Weight
		From	To
		9.625 in	36.00 lbpf
		7.625 in	26.00 lbpf
		SURFACE	932.00 ft
		SURFACE	7,010.00 ft

WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	01-Jan-14	02-Jan-14	05-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)	942.00	6,000.00	7,016.00		
Log End Depth (MD, ft)	6,000.00	7,016.00	10,958.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	31-Dec-13 10:20	01-Jan-14 13:15	03-Jan-14 14:30		
Drill/Wipe End Date and Time	01-Jan-14 03:30	02-Jan-14 04:15	04-Jan-14 21:10		
Min Inc (deg) @ Depth (MD, ft)	0.19 @ 5,940.00	0.25 @ 6,014.00	84.72 @ 7,051.00		
Max Inc (deg) @ Depth (MD, ft)	15.99 @ 3,757.00	73.19 @ 6,883.00	91.51 @ 8,283.00		
Bit TFA(in2) / Bit Type	0.75 / PDC	0.98 / PDC	0.46 / PDC		
Flow Rate (gpm)	563.24	515.00	270.00		
Max AV (fpm) / CV (fpm) @ MWD	427.3 / 427.3	427.3 / 427.3	442.9 / 442.9		
Fluid Type	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.45 / 27.00	9.35 / 34.00	9.50 / 34.00		
Filtrate CL (ppm)	21.00	1,700.00	1,900.00		
pH / Fluid Loss (mptm)	8.70 / N/A	9.50 / N/A	9.30 / N/A		
PV (cP) / YP (lbf/ft2)	2 / 4.00	6 / 6.00	6 / 7.00		
% Solids / % Sand	4.50 / 0.25	5.70 / 0.35	5.90 / 0.25		
% 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 (degF) / Source	150.10 / PCM	162.80 / PCM	217.60 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	Juan Pablo Centeno	Juan Pablo Centeno	Robret Ley		
Customer Representative	Charles Colver	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	12187587	12187587	11768604		
Insert Serial Number	12001055	12001055	11145509		
Date and Time Initialized	30-Dec-13 15:14	30-Dec-13 15:14	02-Jan-14 18:59		
Date and Time Read	02-Jan-14 10:30	02-Jan-14 10:08	05-Jan-14 07:22		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	60.00	57.00	66.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	12187587	12187587	11768604		
Sonde Serial Number	11833221	11833221	11297588		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	319.37	115.77	40.75		

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	52.32	50.76	58.90		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	12187587	12187587	11768604		
Insert/Sonde Serial Number	12071301	12071301	11293266		

REMARKS

1. All depths are true vertical 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

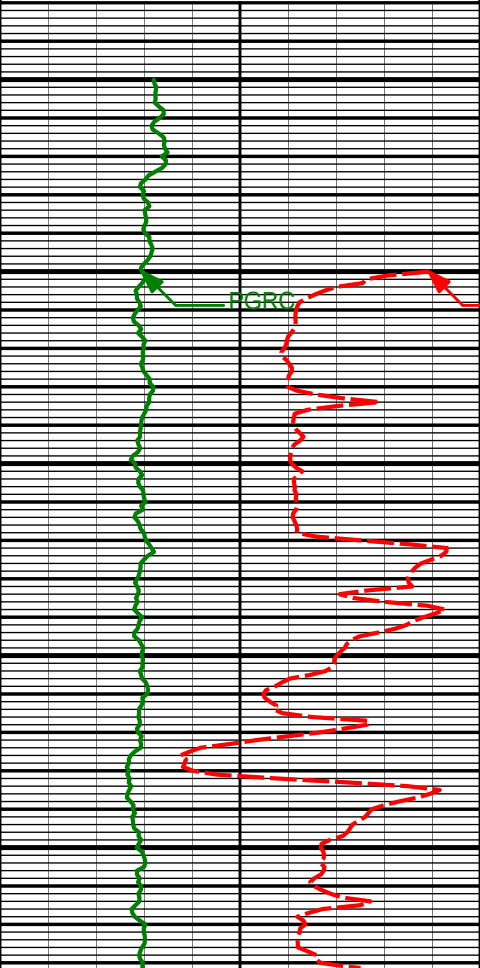
Gap Fill: 3.0 feet

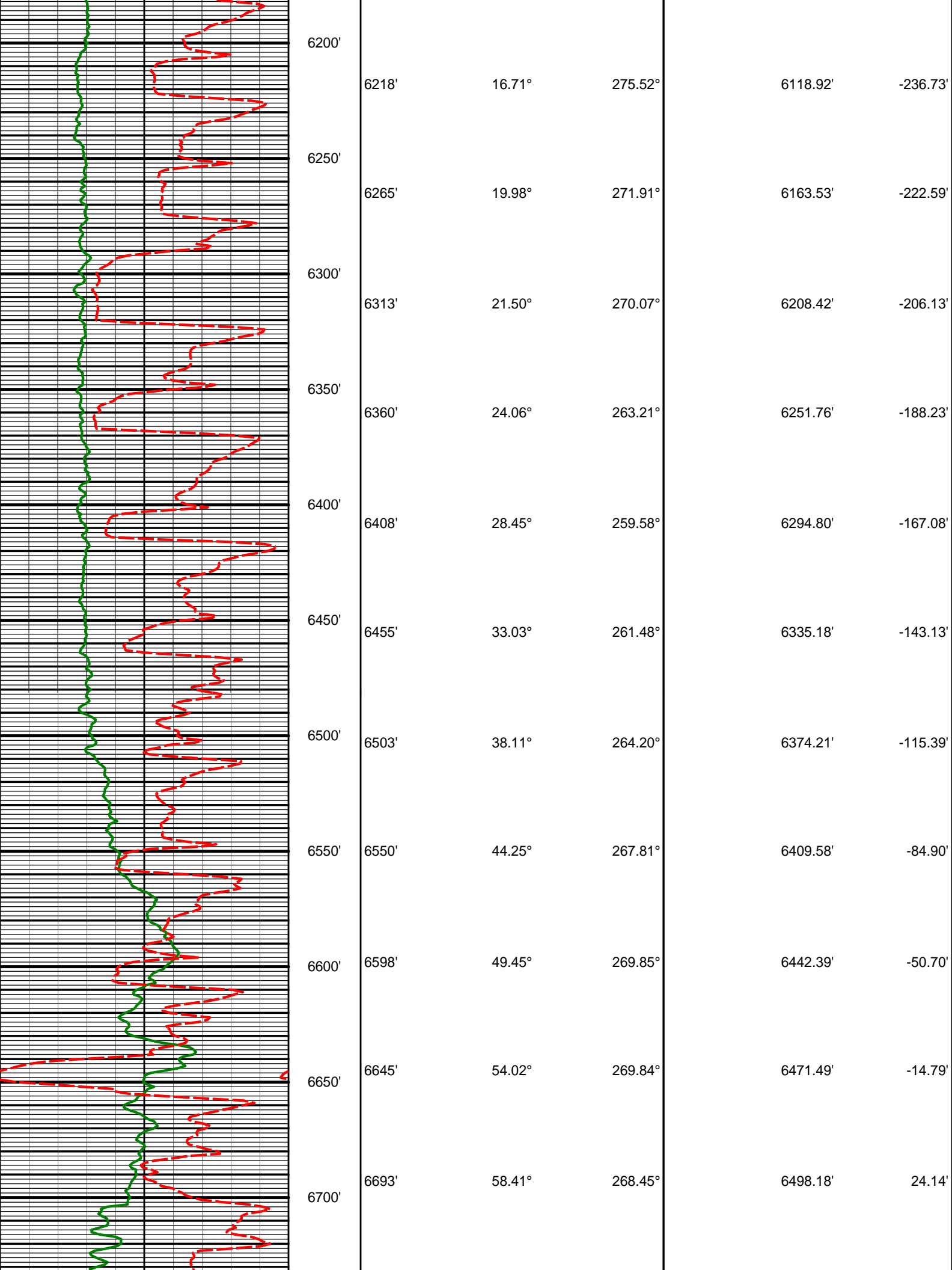
ROPA (Rate of Penetration):

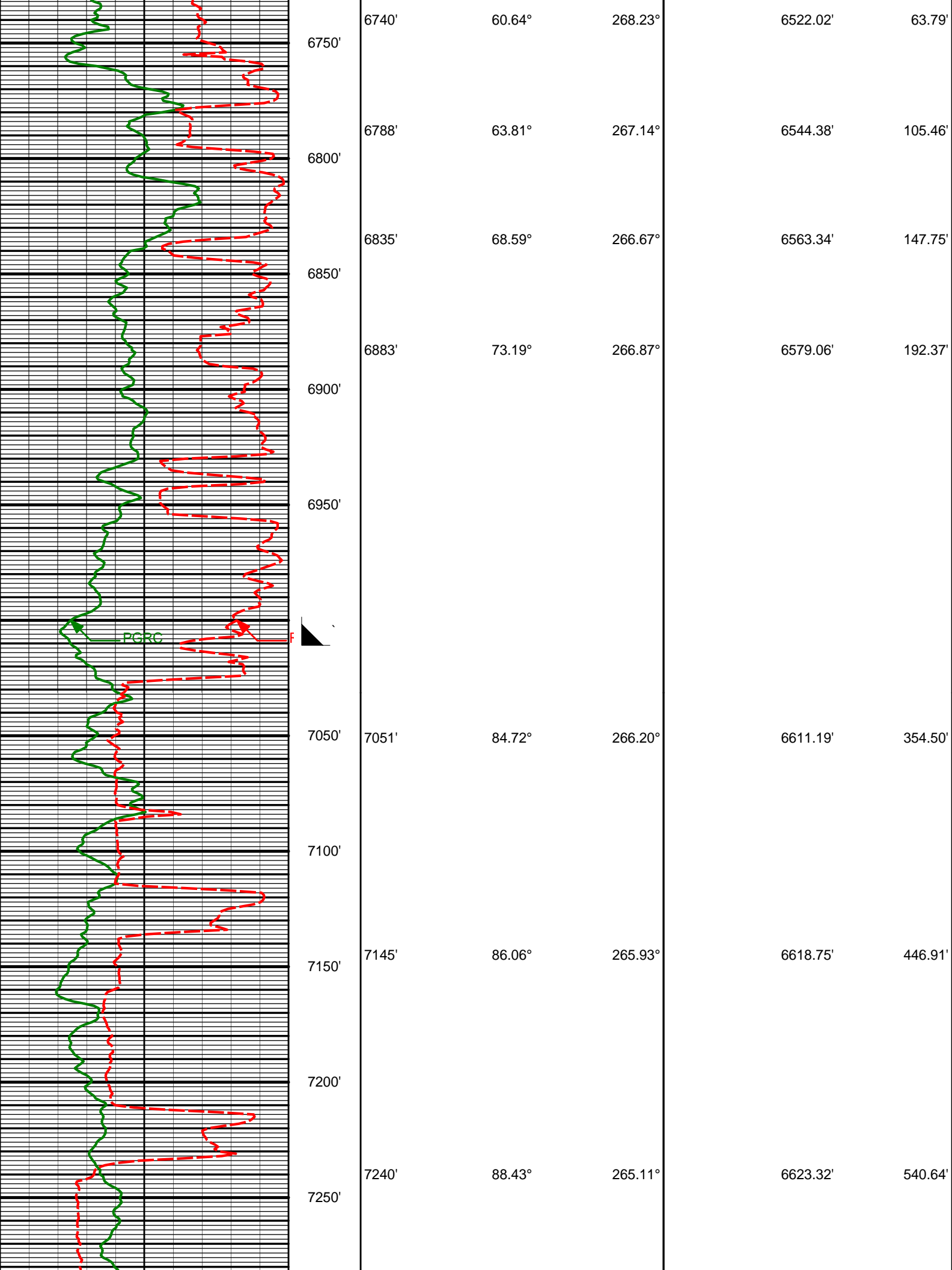
Interval Resolution: 0.5 feet

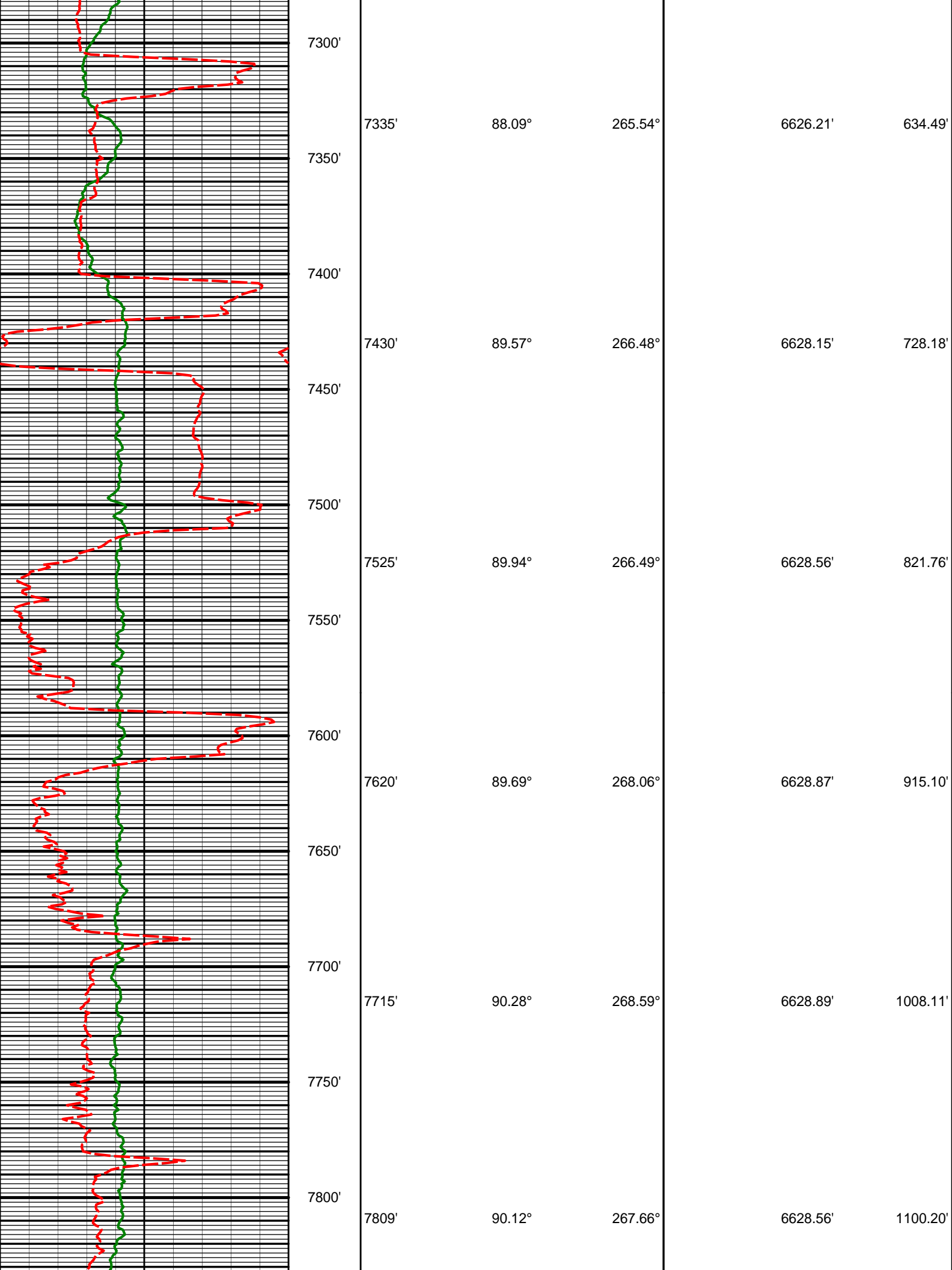
Coercion Distance: 1.2 feet

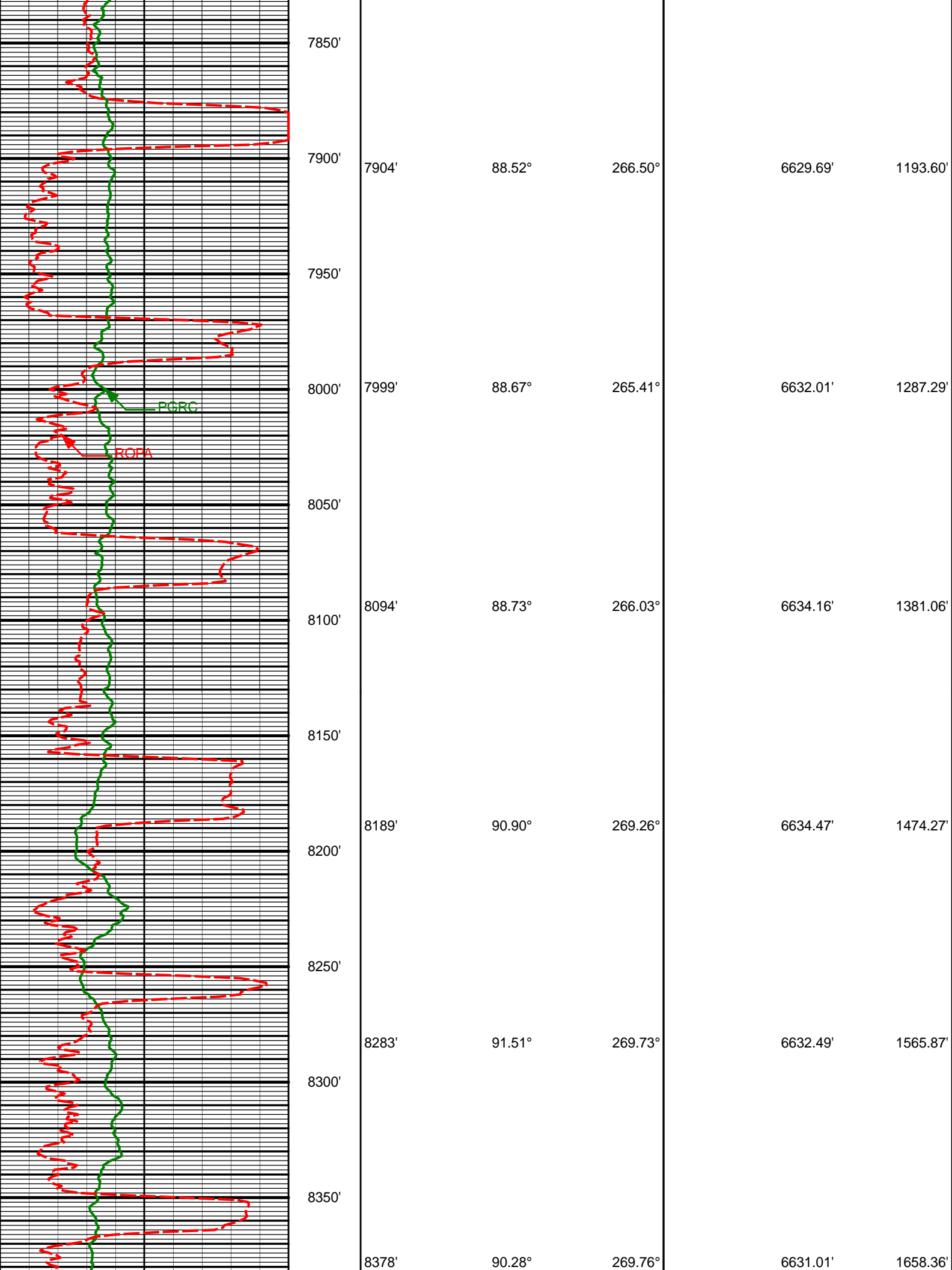
WARRANTY

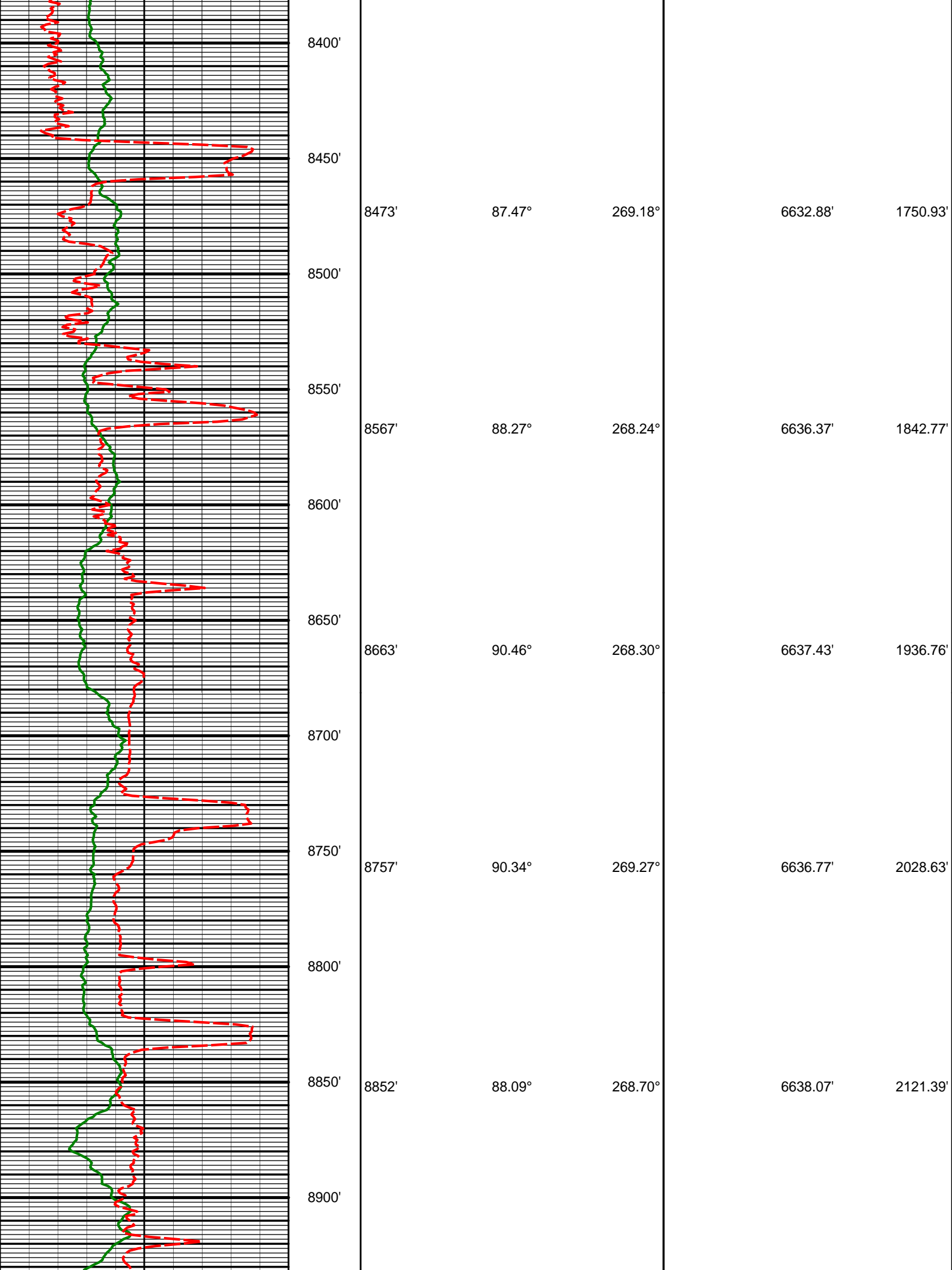
Gamma Ray (PGXC) (Api)									
0300									
Avg Rate of Penetration feet per hr			Feet						
6000				Depth	Inc	Azm	TVD	Vsec	
			5950'	5940'	0.19°	239.96°	5843.27'	-259.39'	
			Run 200	6014'	0.25°	141.15°	5917.27'	-259.34'	
				6029'	0.31°	216.36°	5932.27'	-259.32'	
			6050'						
			KOP	6076'	1.82°	273.83°	5979.26'	-258.51'	
			6100'						
				6123'	7.25°	279.35°	6026.10'	-255.06'	
			6150'						
				6170'	11.94°	279.51°	6072.43'	-247.84'	

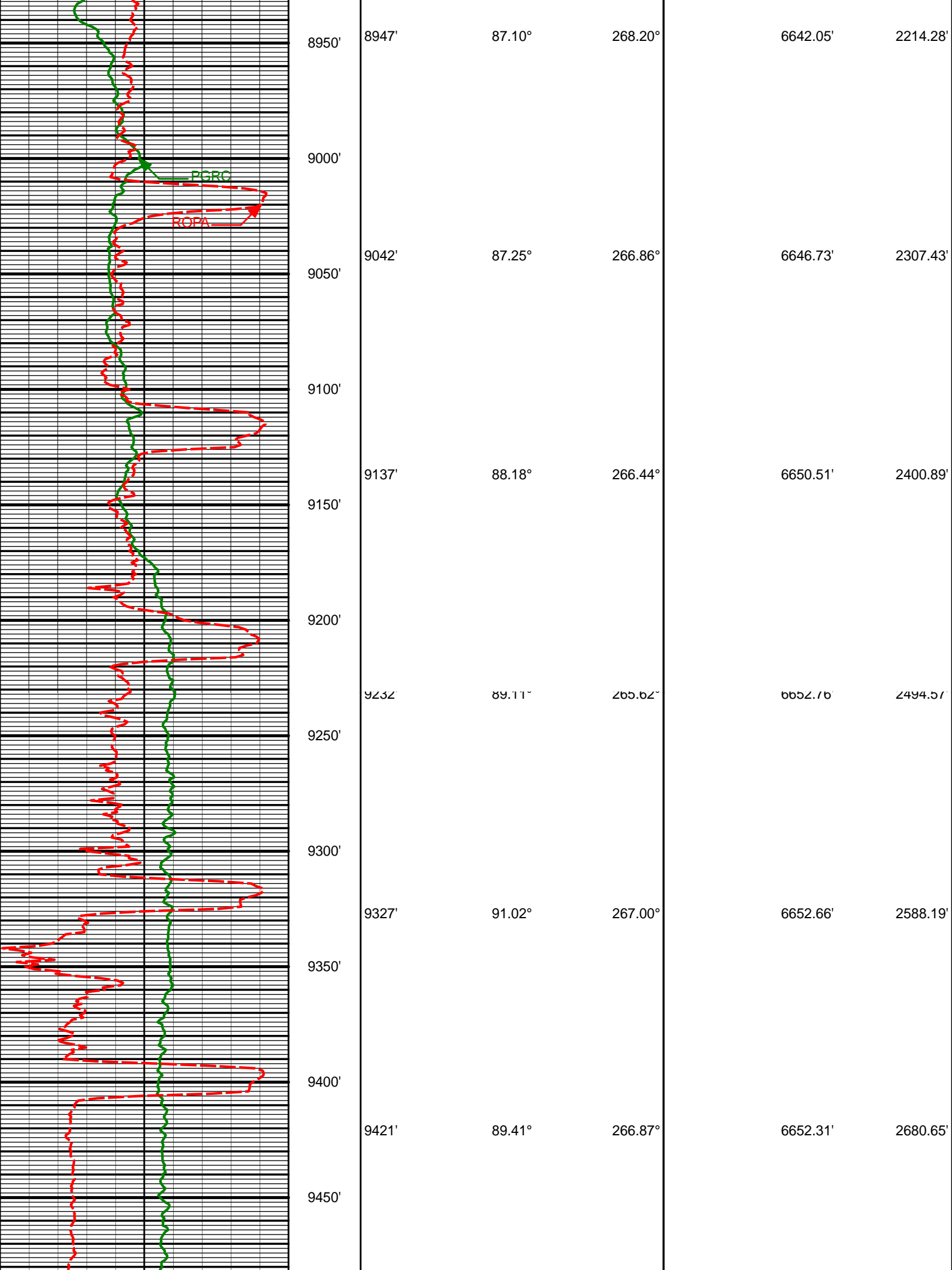


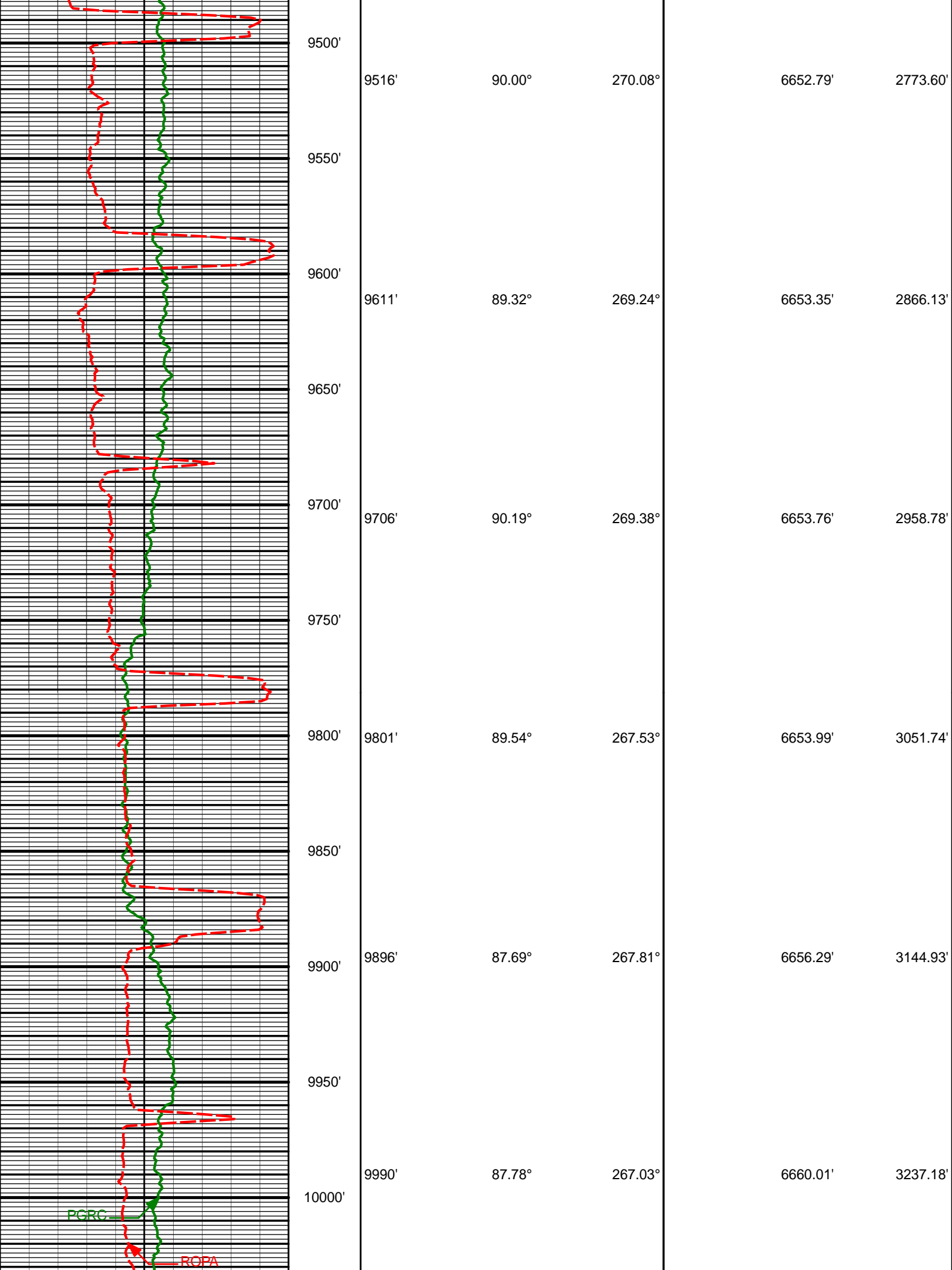


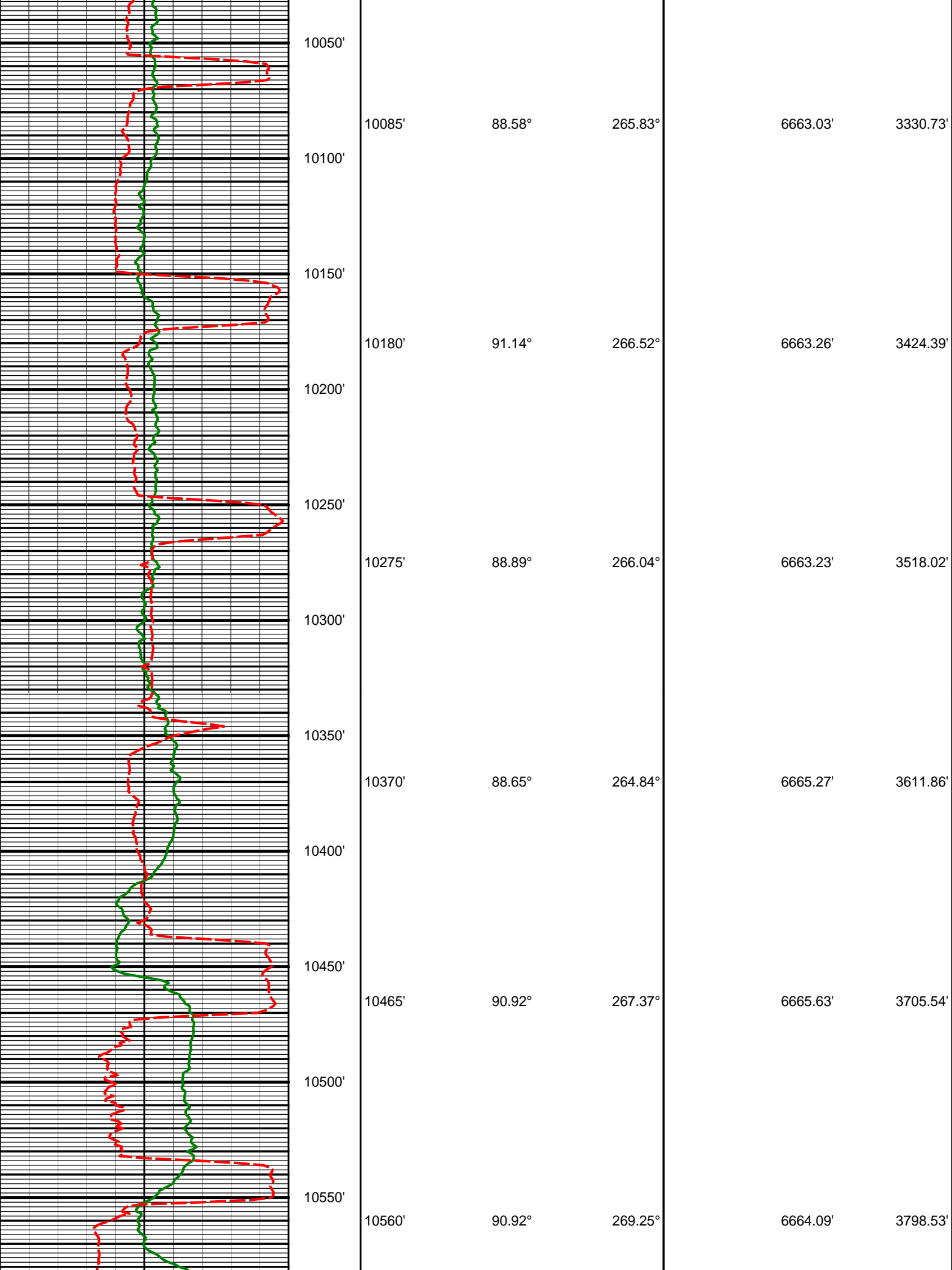


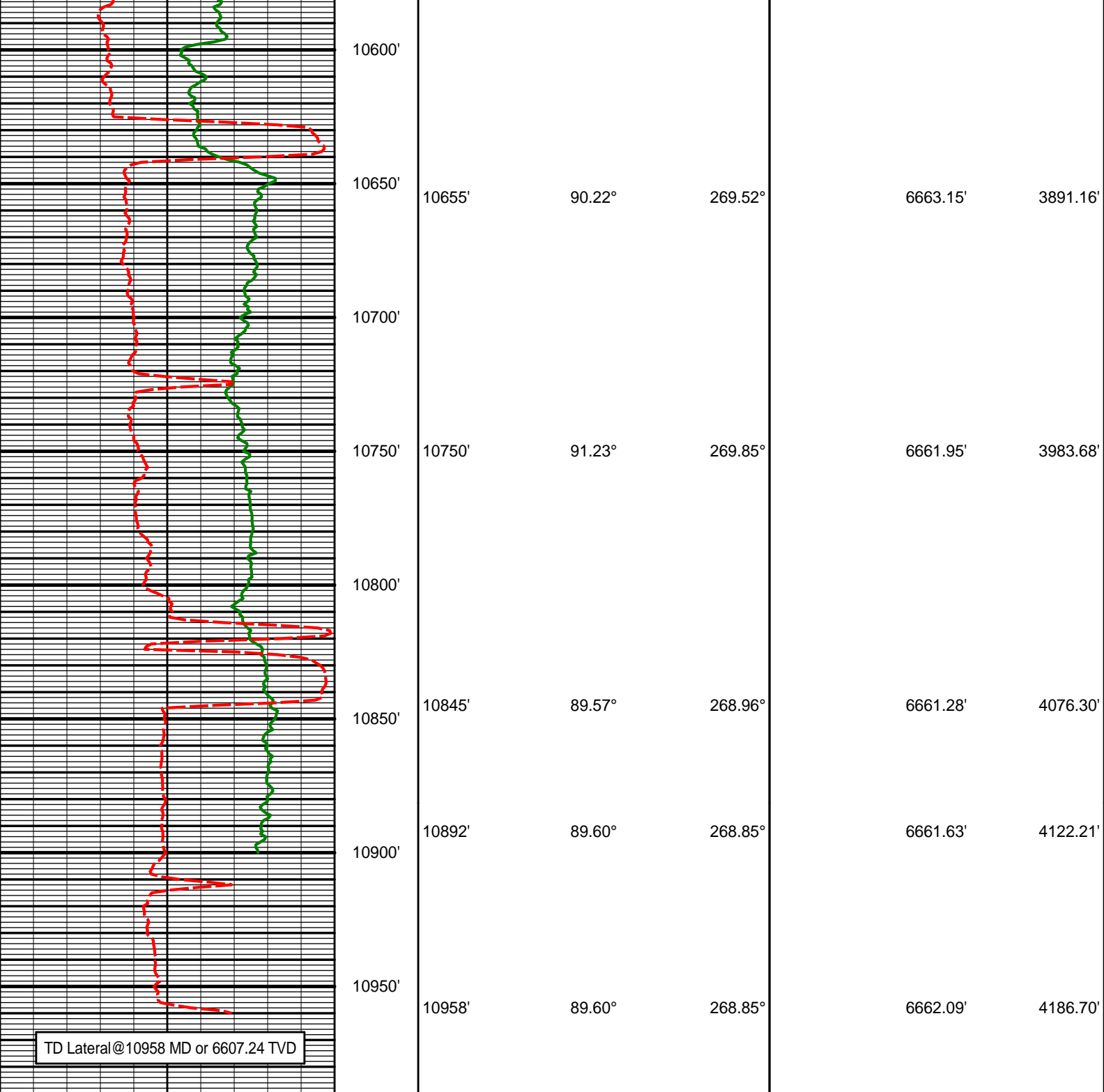








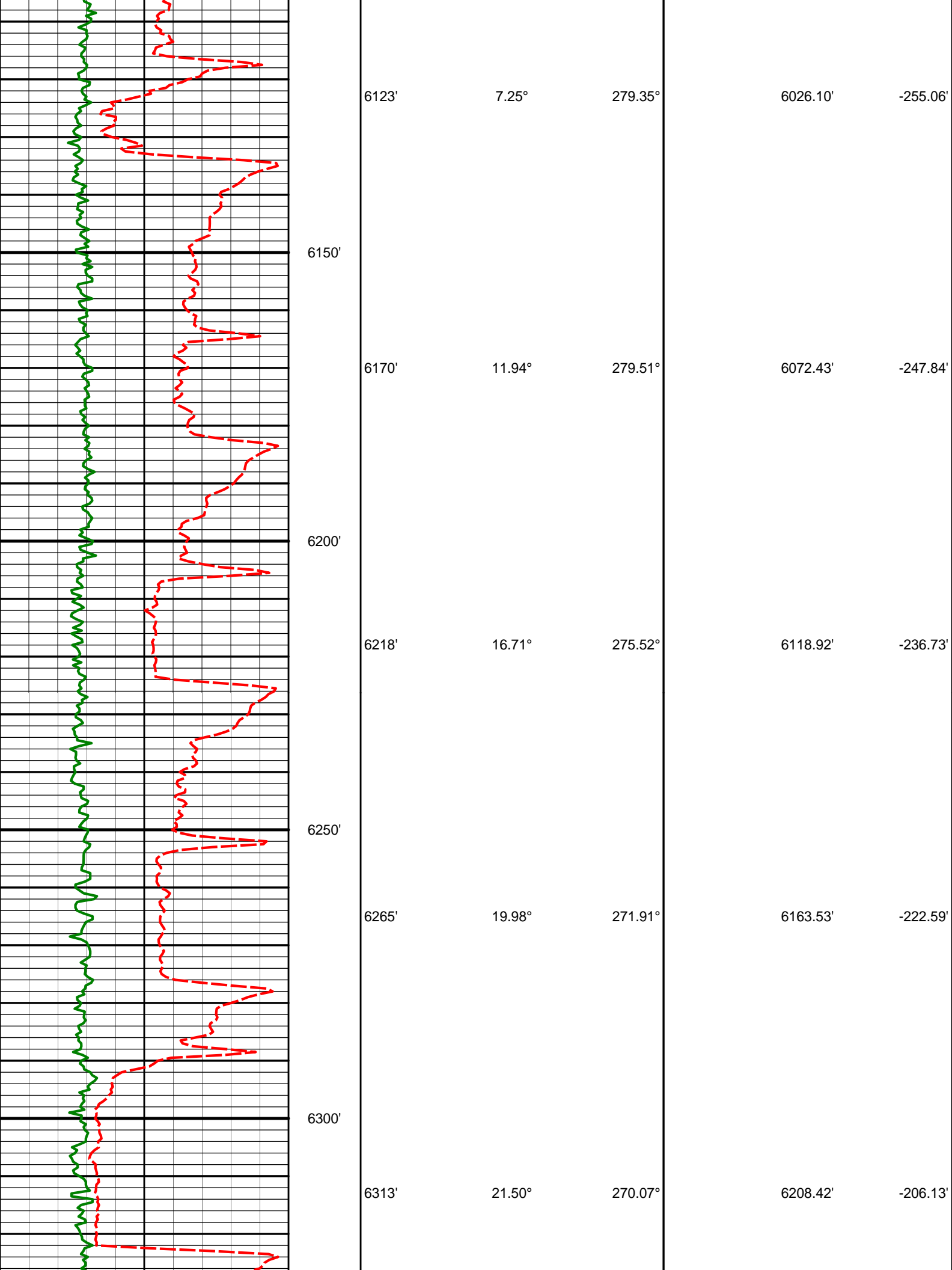


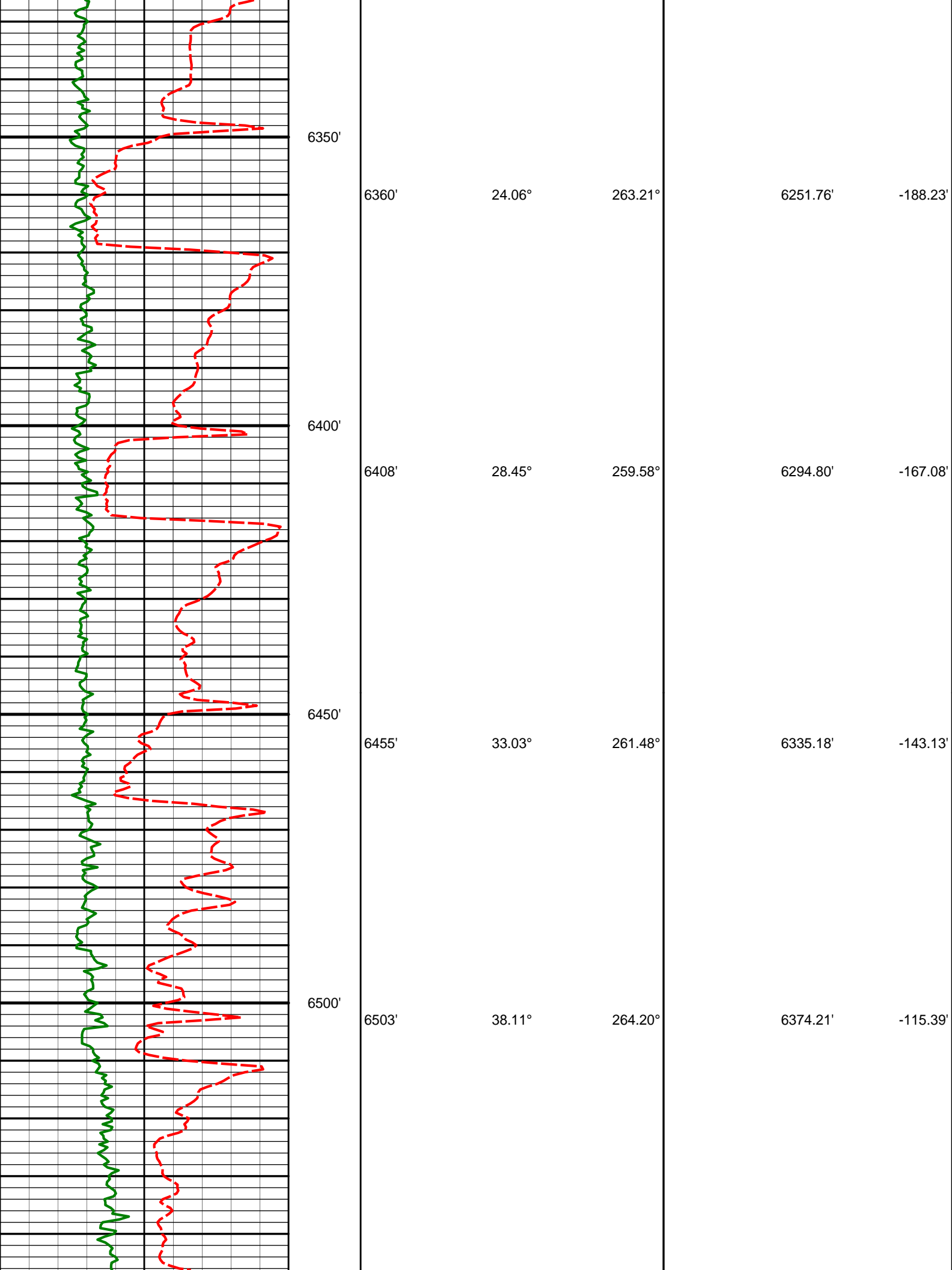


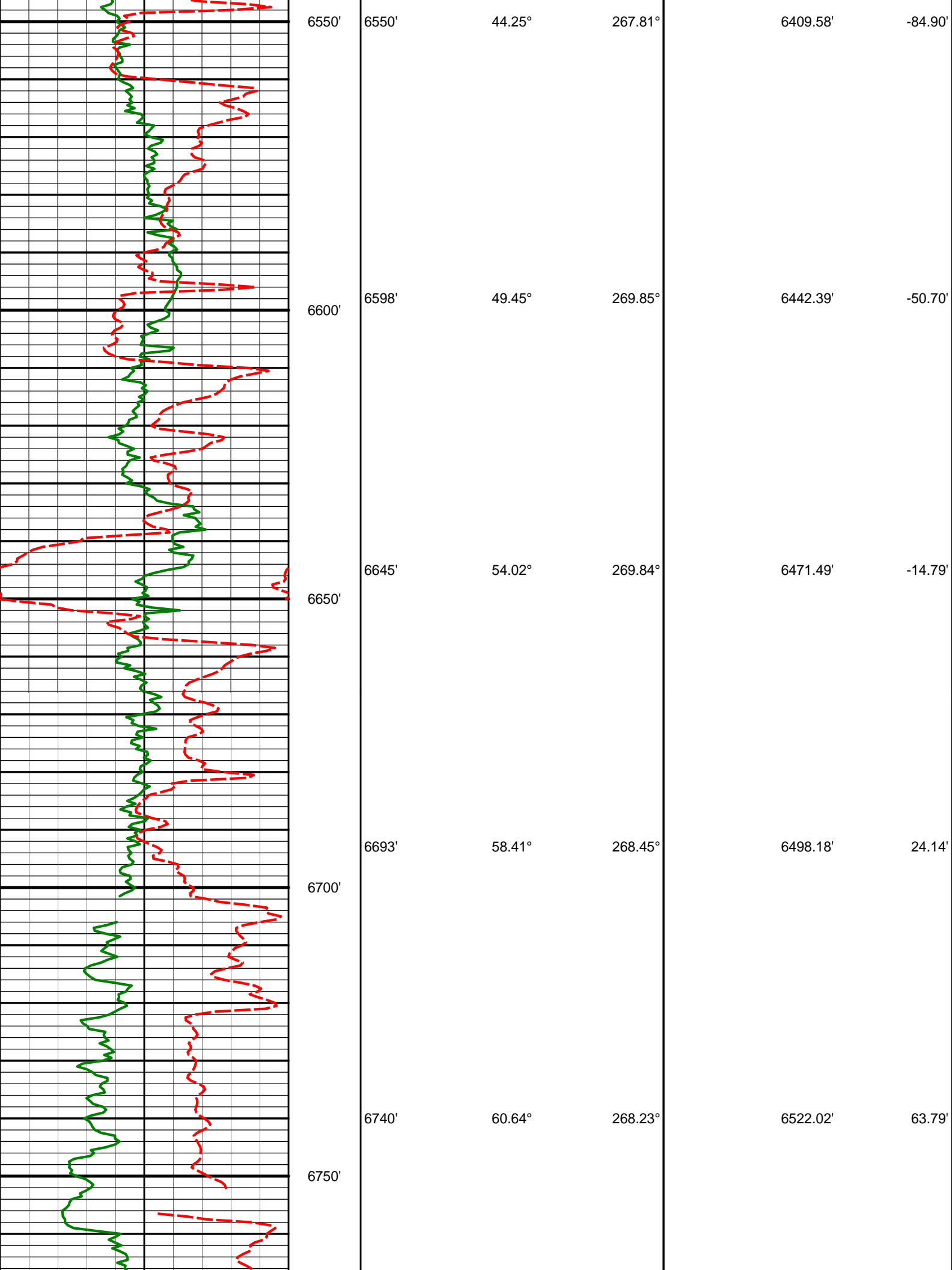
Avg Rate of Penetration feet per hr	Feet				
6000		Depth	Inc	Azm	TVD
					Vsec
Gamma Ray (PGXC) (Api)					
0300					

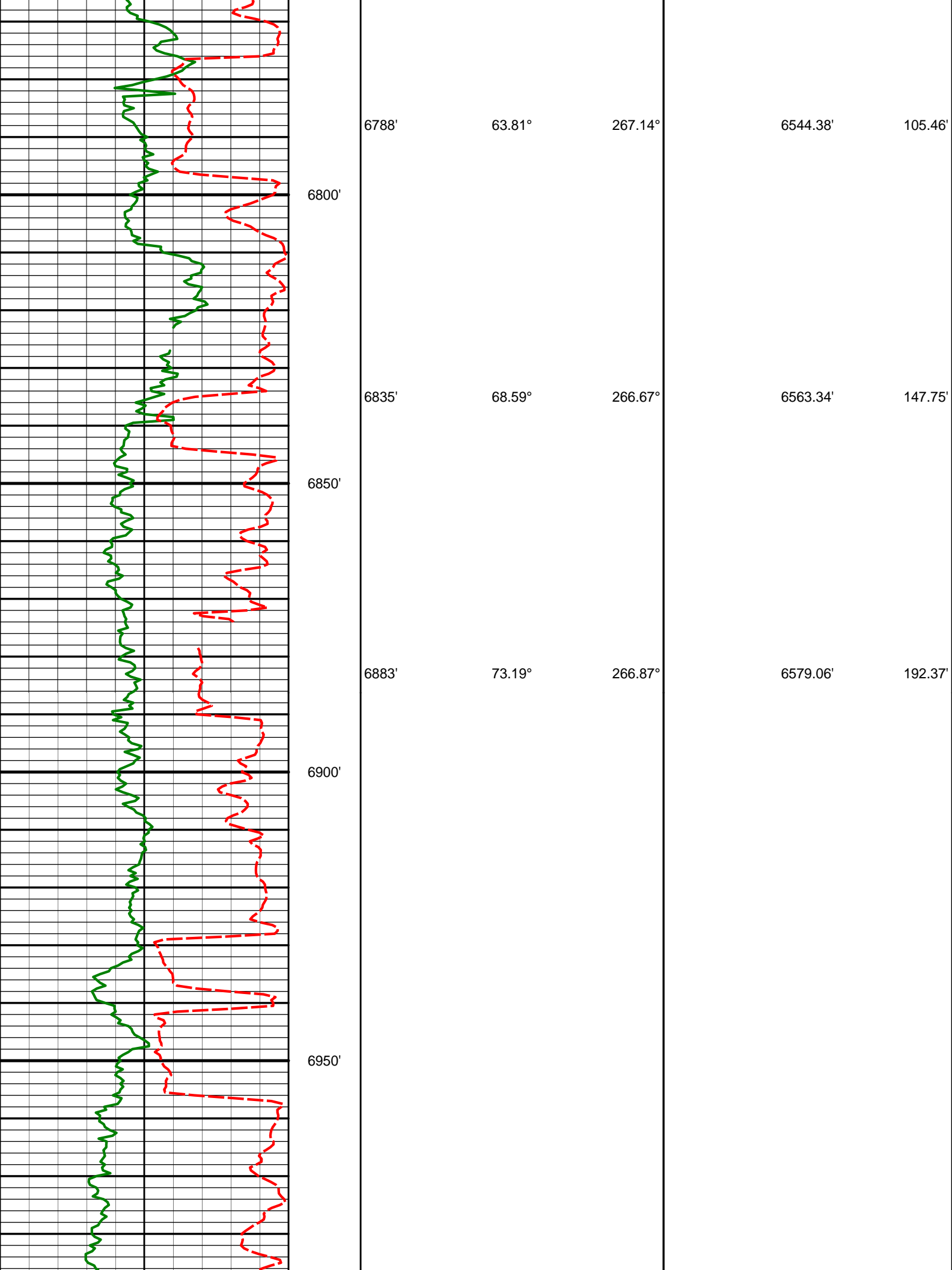
HALLIBURTON

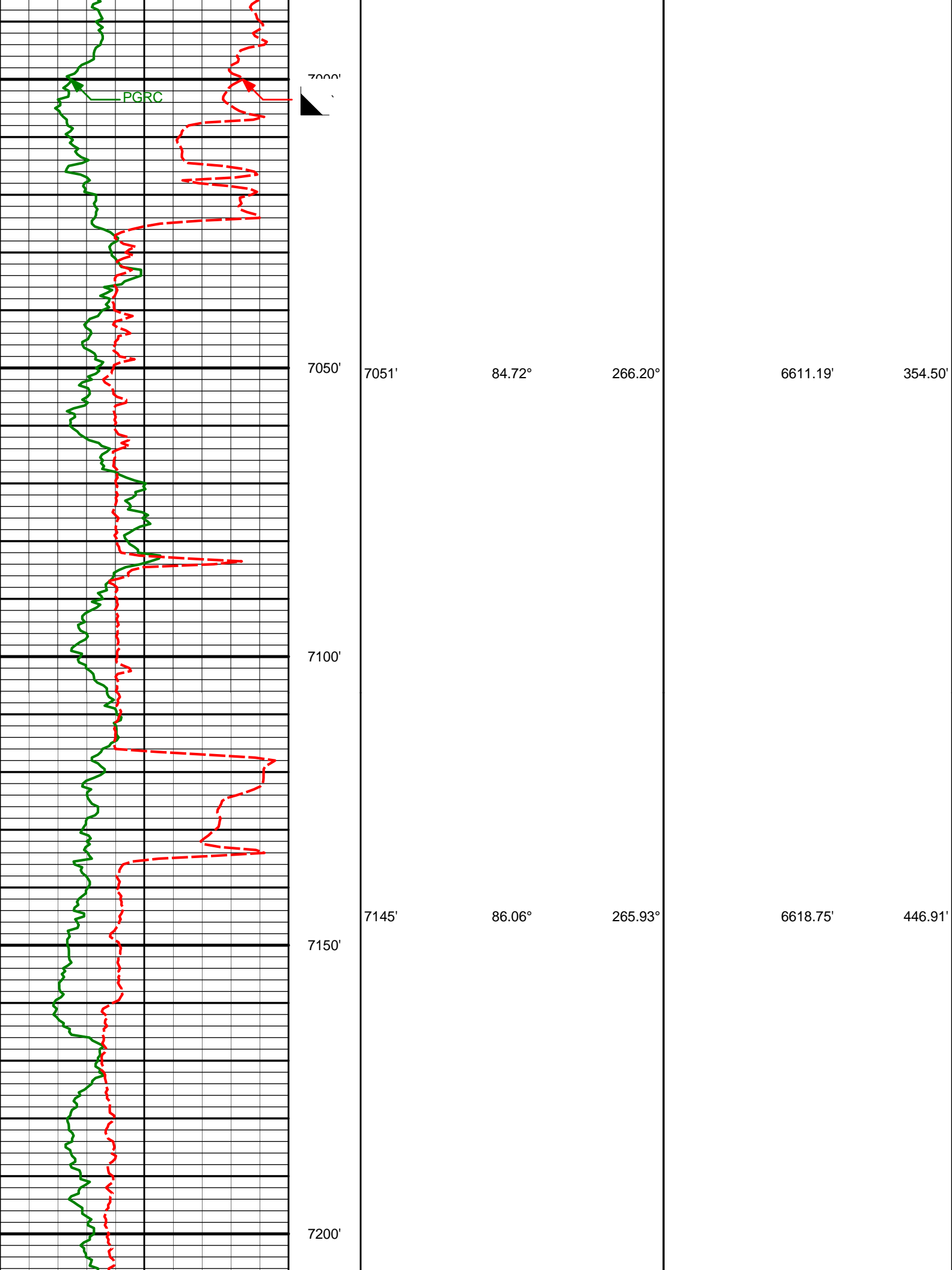
Gamma Ray (PGXC) (Api)		Feet		Depth		Inc		Azm		TVD		Vsec	
0 300				5940		0.19		239.90		5943.27		-259.39	
Avg Rate of Penetration feet per hr				5950'									
600 0				Run 200									
PGRC		BOPA		6014'		0.25°		141.15°		5917.27'		-259.34'	
				6029'		0.31°		216.36°		5932.27'		-259.32'	
				6050'									
				KOP									
				6076'		1.82°		273.83°		5979.26'		-258.51'	
				6100'									

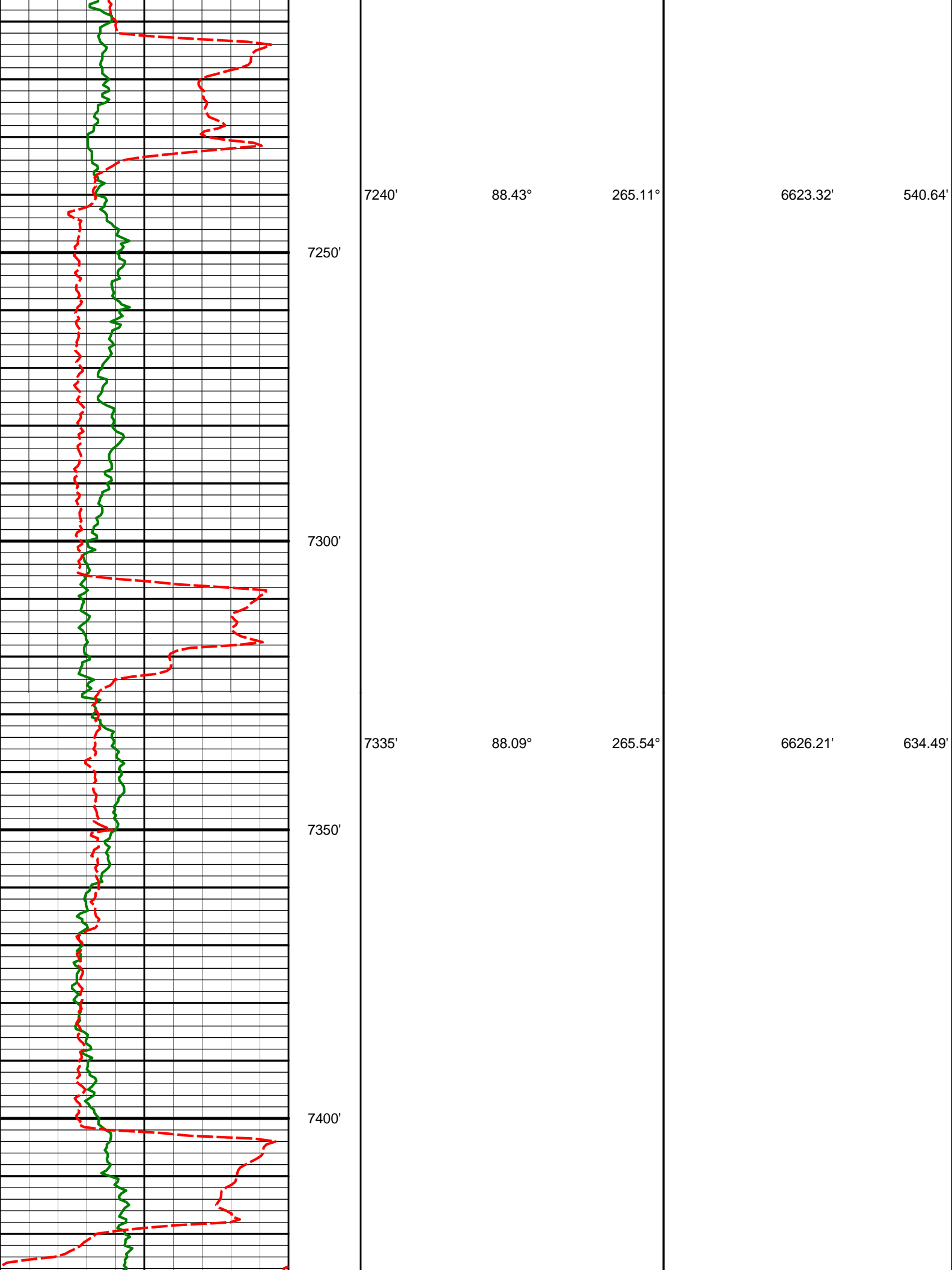


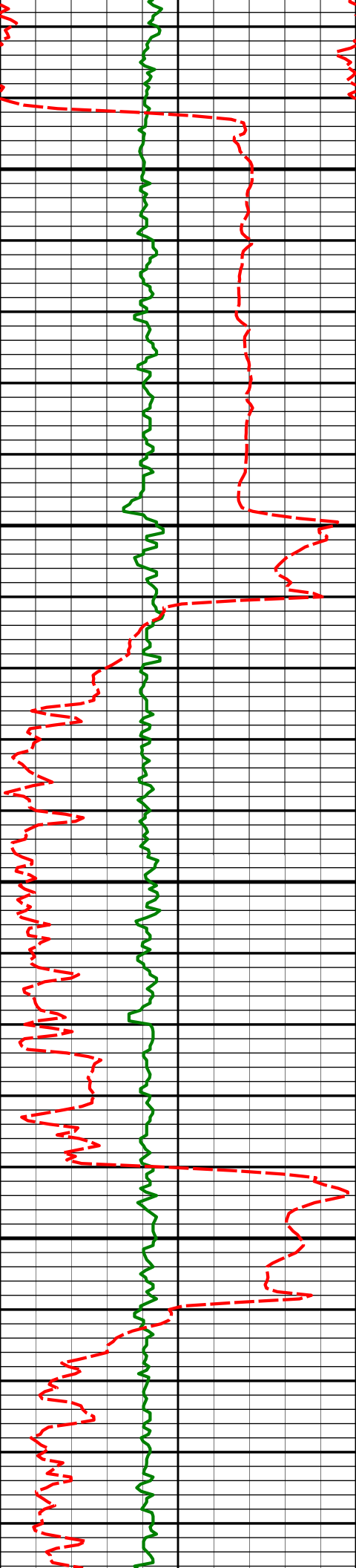












7430'

89.57°

266.48°

6628.15'

728.18'

7450'

7500'

7525'

89.94°

266.49°

6628.56'

821.76'

7550'

7600'

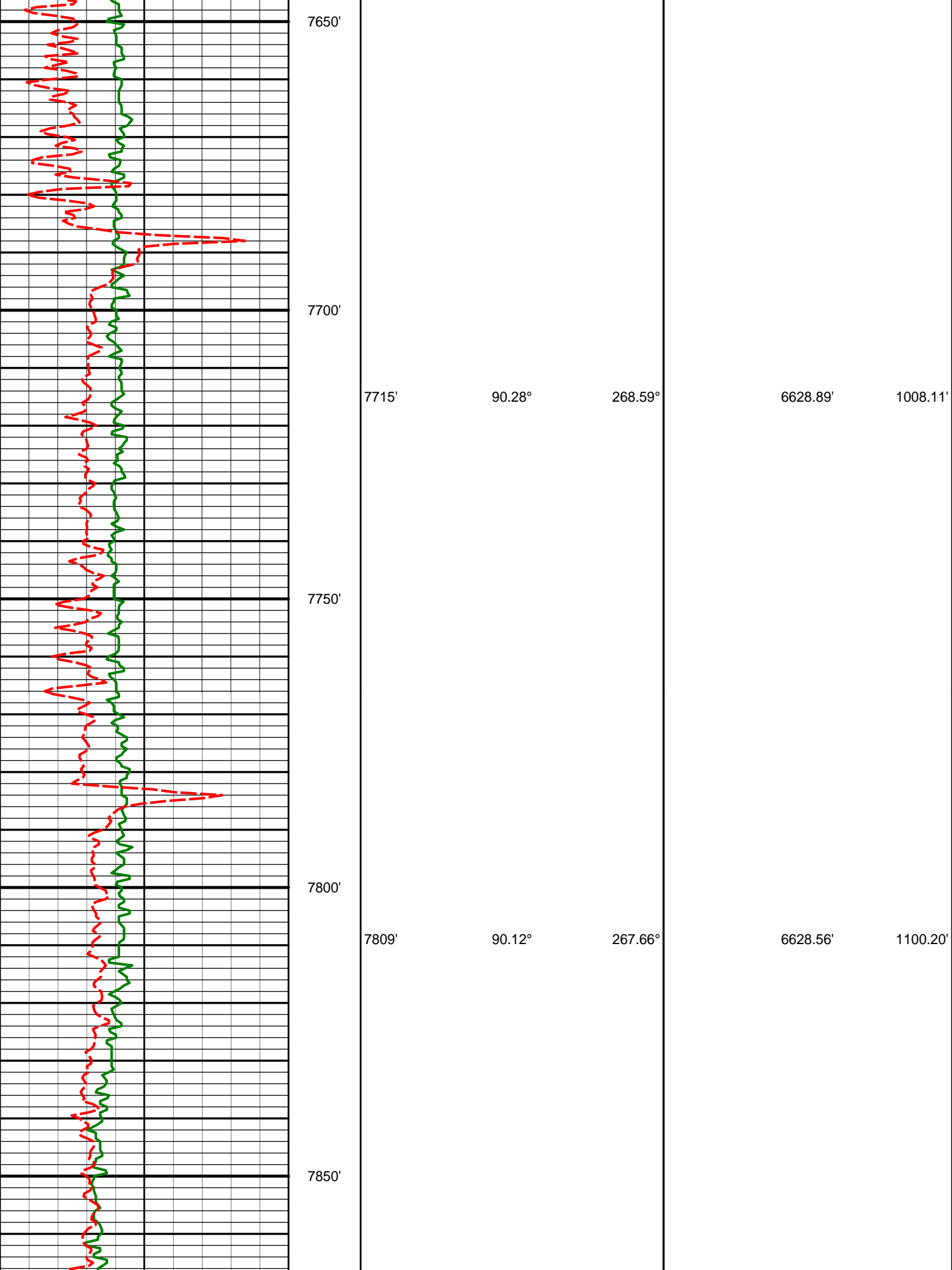
7620'

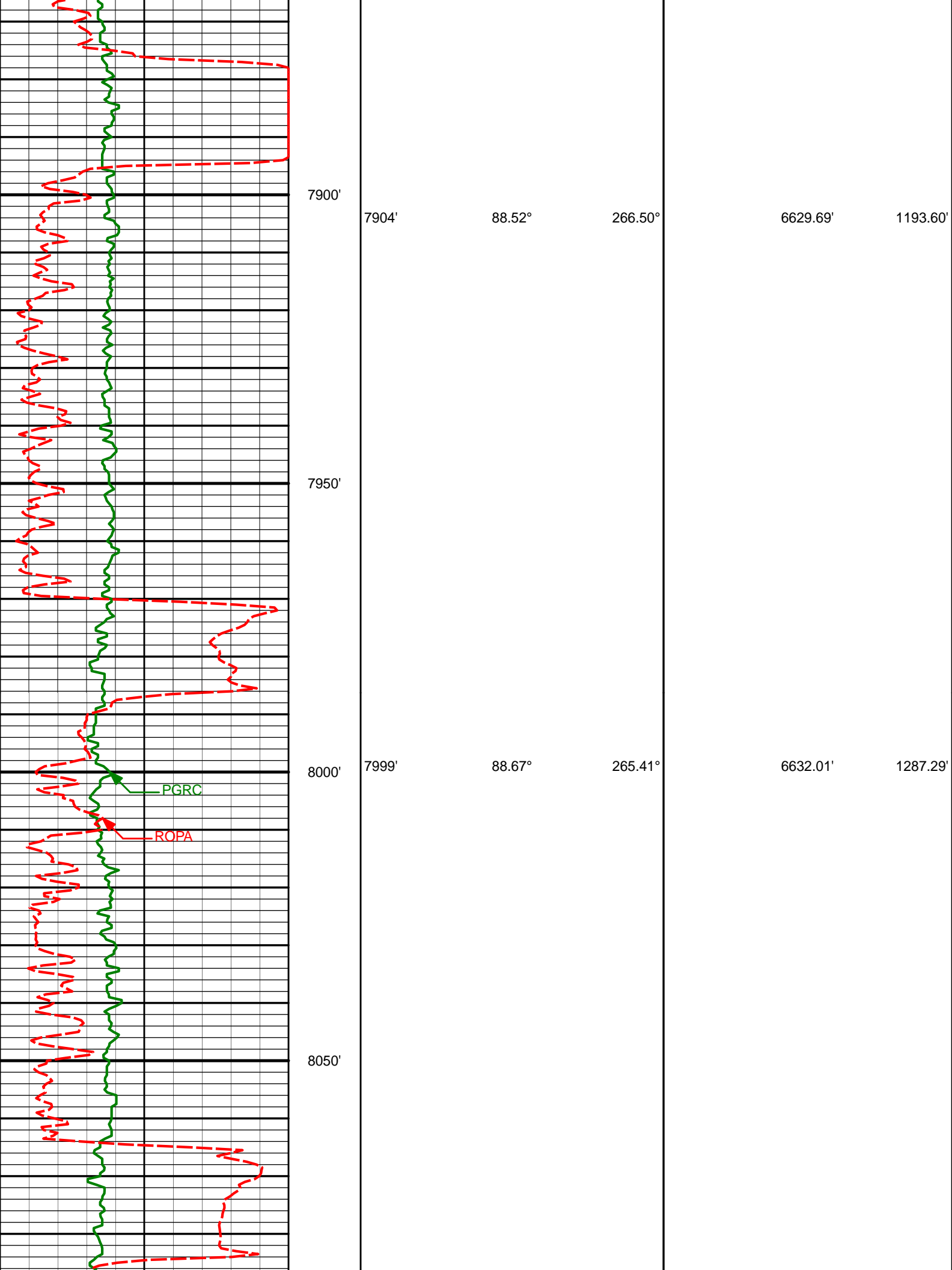
89.69°

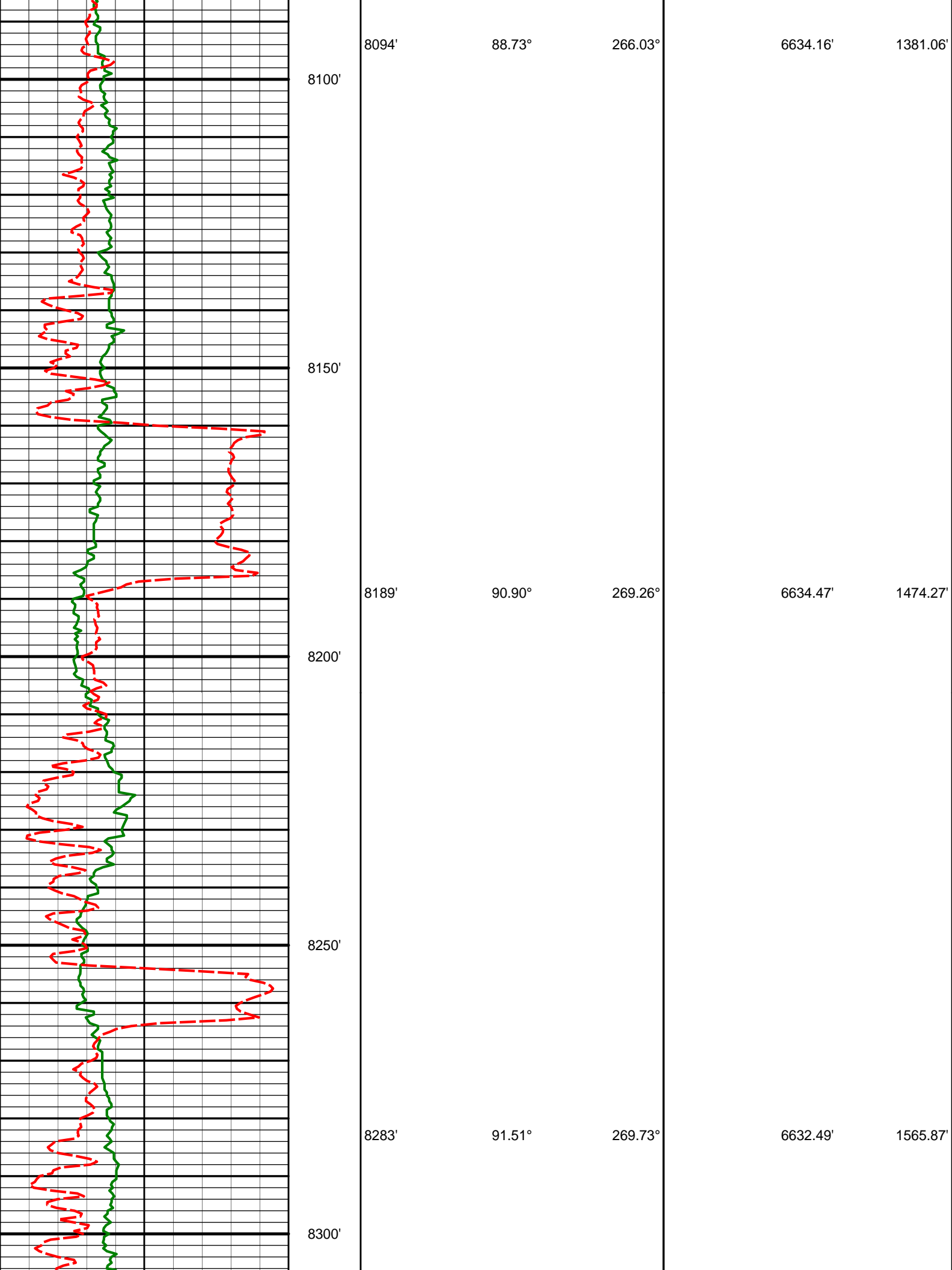
268.06°

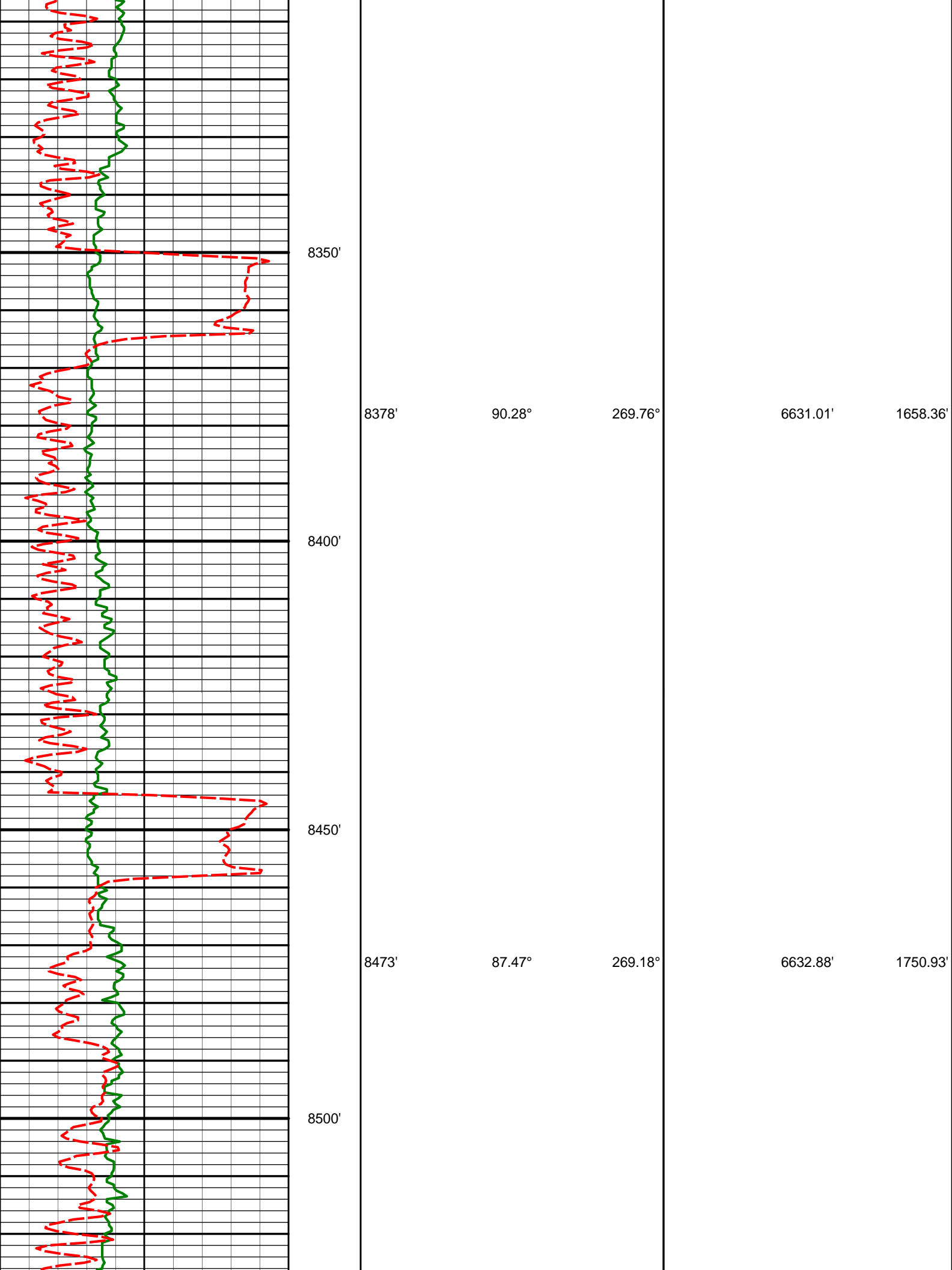
6628.87'

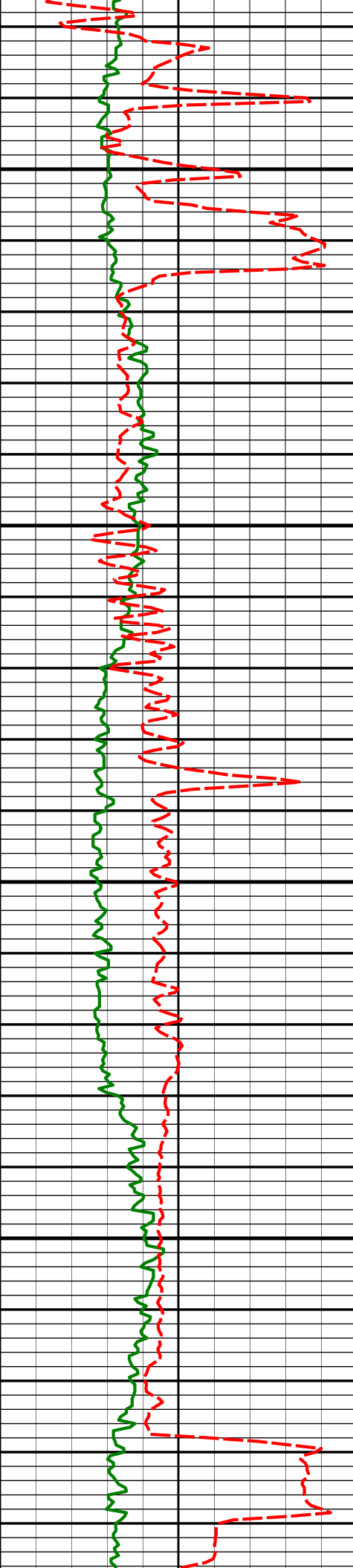
915.10'











8550'

8567'

88.27°

268.24°

6636.37'

1842.77'

8600'

8650'

8663'

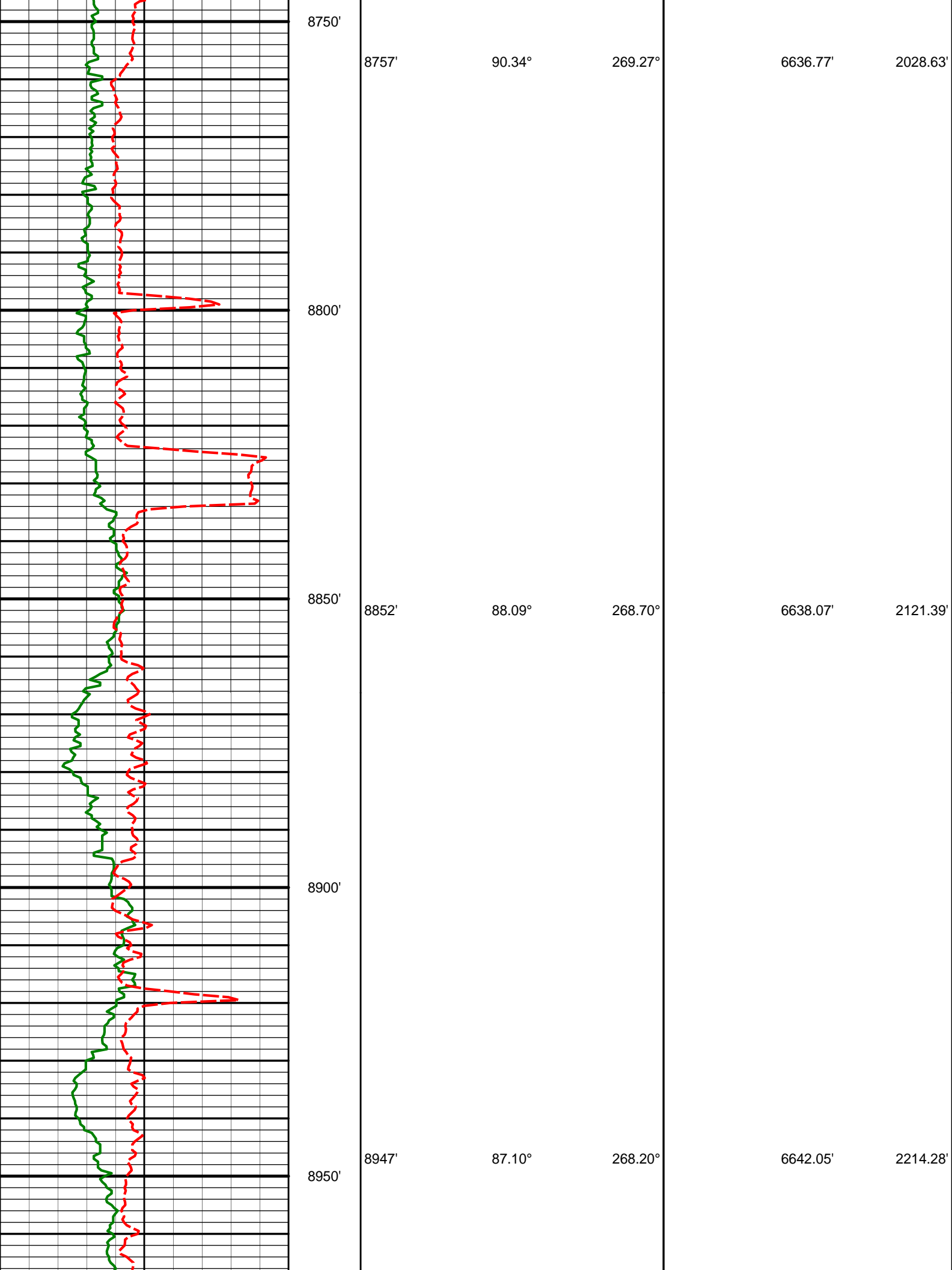
90.46°

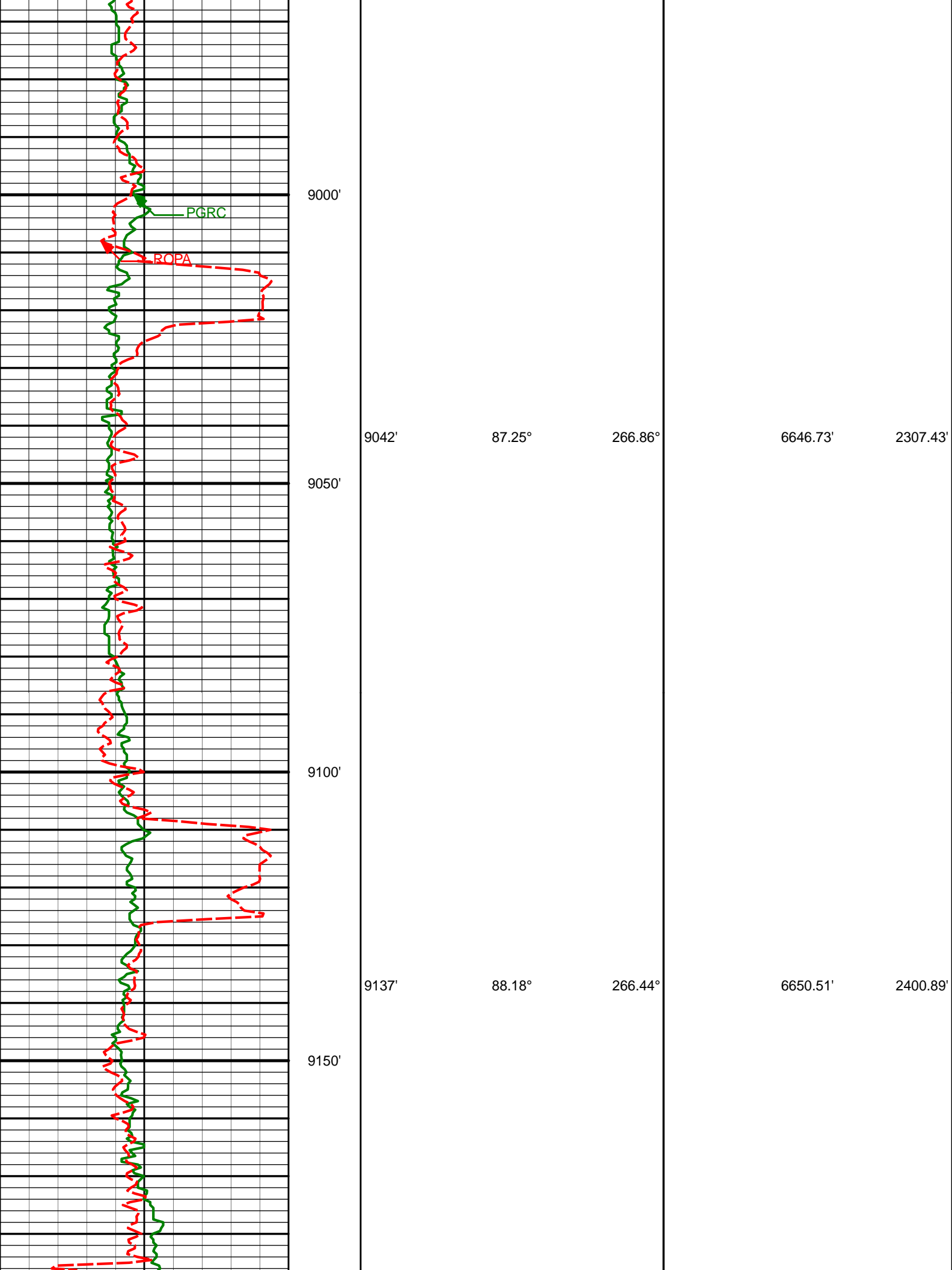
268.30°

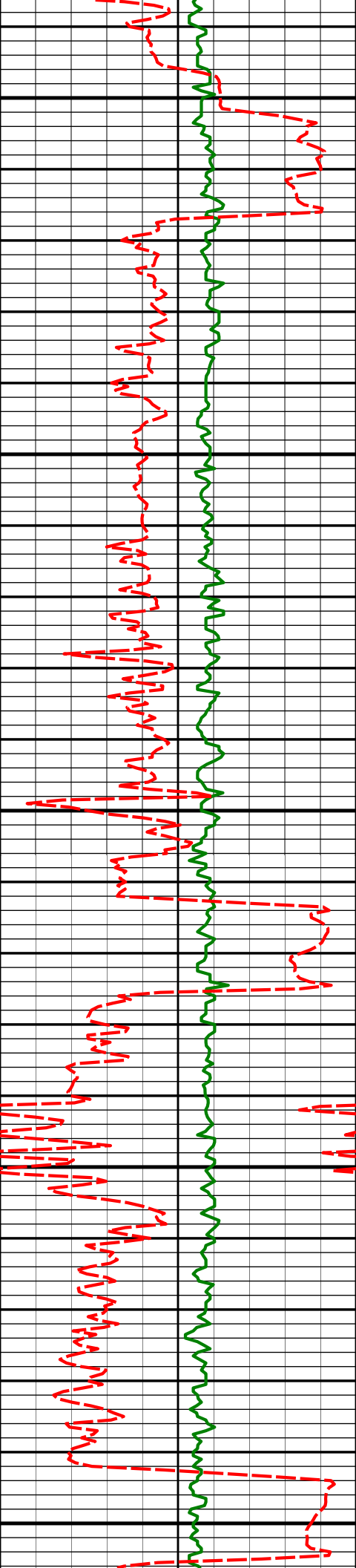
6637.43'

1936.76'

8700'







9200'

9232'

89.11°

265.62°

6652.76'

2494.57'

9250'

9300'

9327'

91.02°

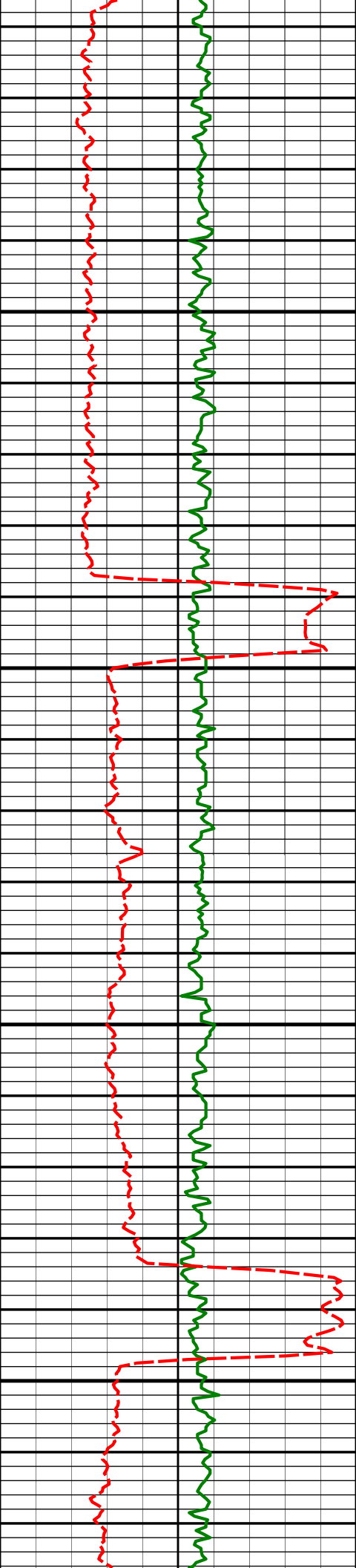
267.00°

6652.66'

2588.19'

9350'

9400'



9421'

89.41°

266.87°

6652.31'

2680.65'

9450'

9500'

9516'

90.00°

270.08°

6652.79'

2773.60'

9550'

9600'

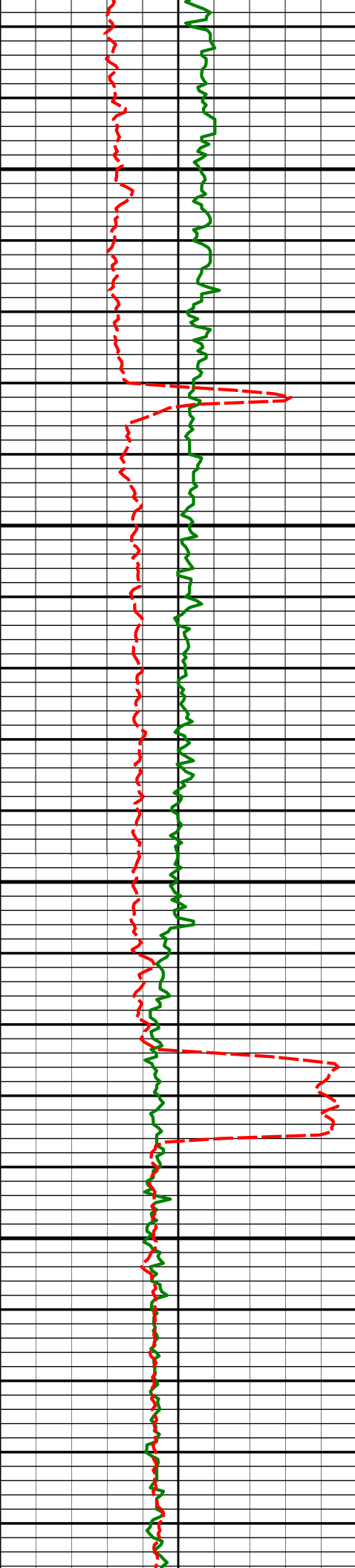
9611'

89.32°

269.24°

6653.35'

2866.13'



9650'

9700'

9750'

9800'

9706'

90.19°

269.38°

6653.76'

2958.78'

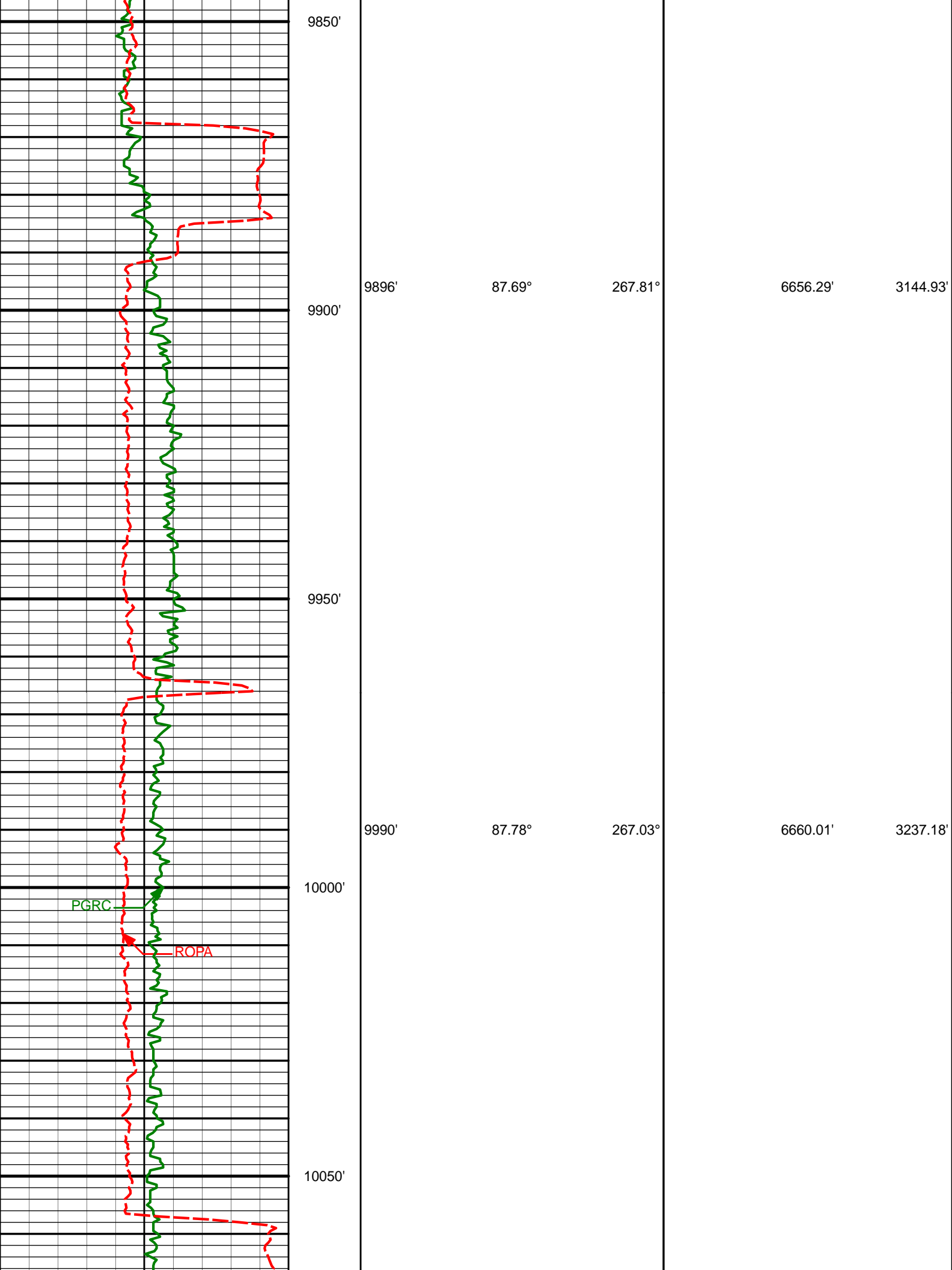
9801'

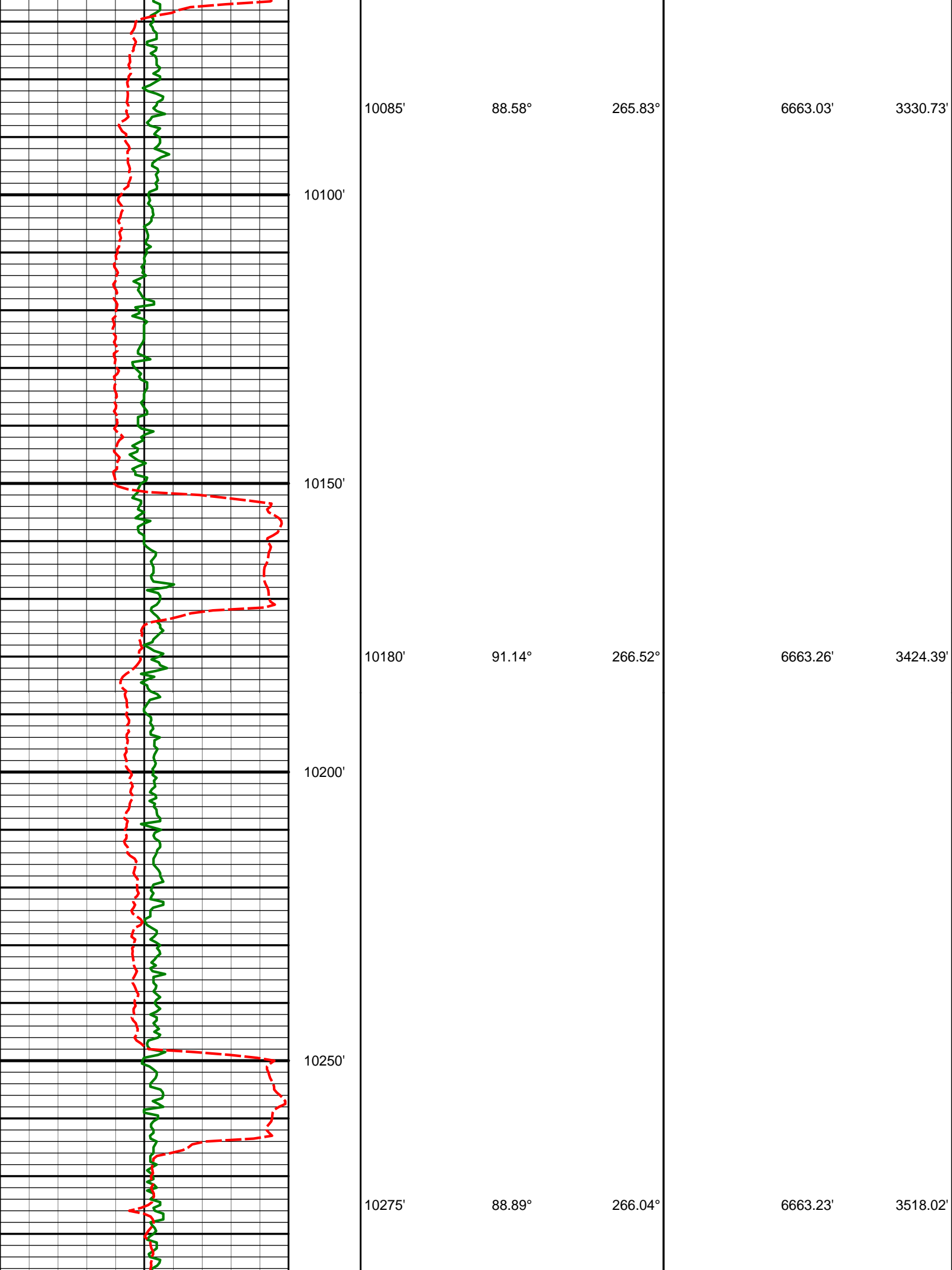
89.54°

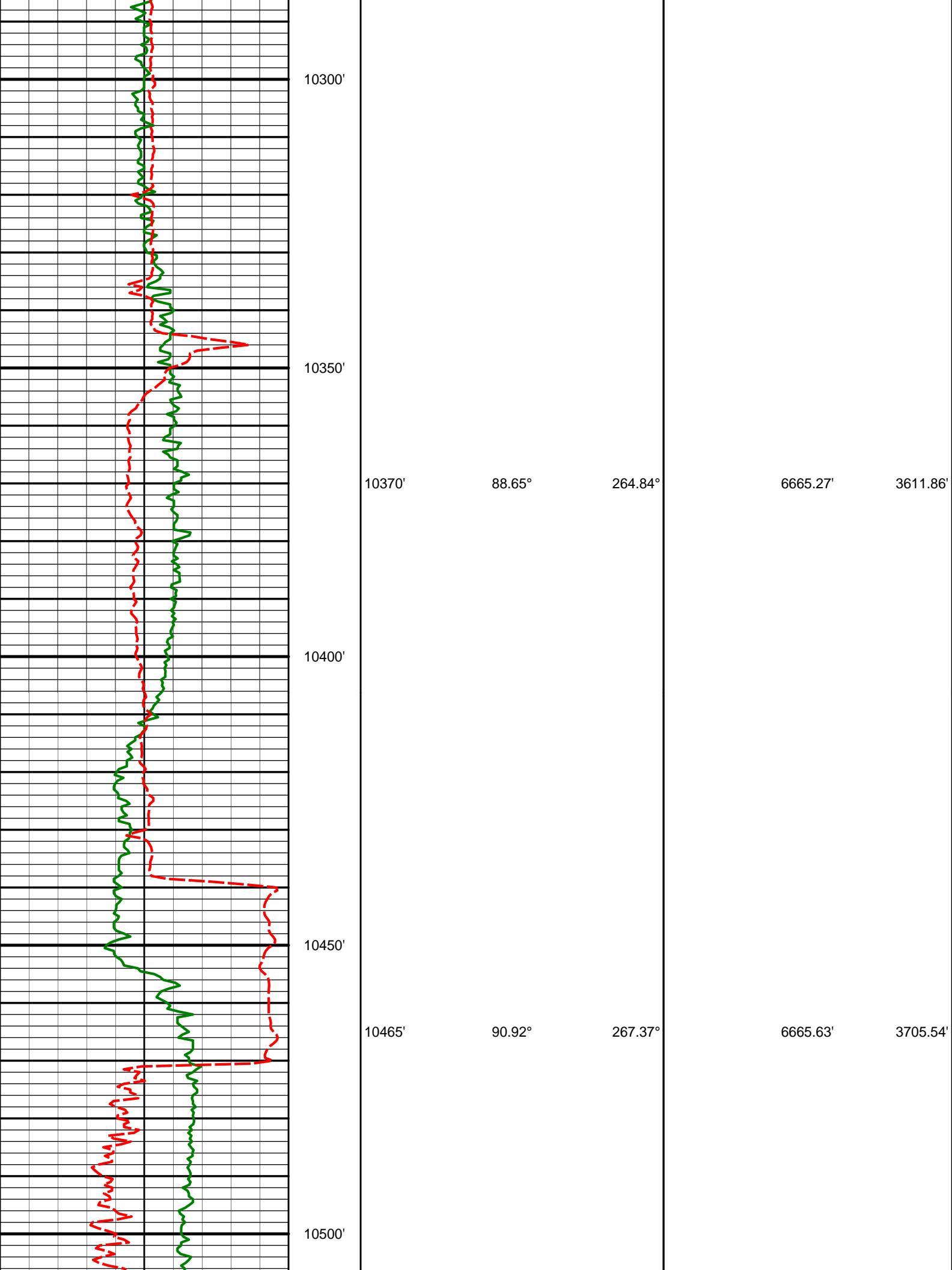
267.53°

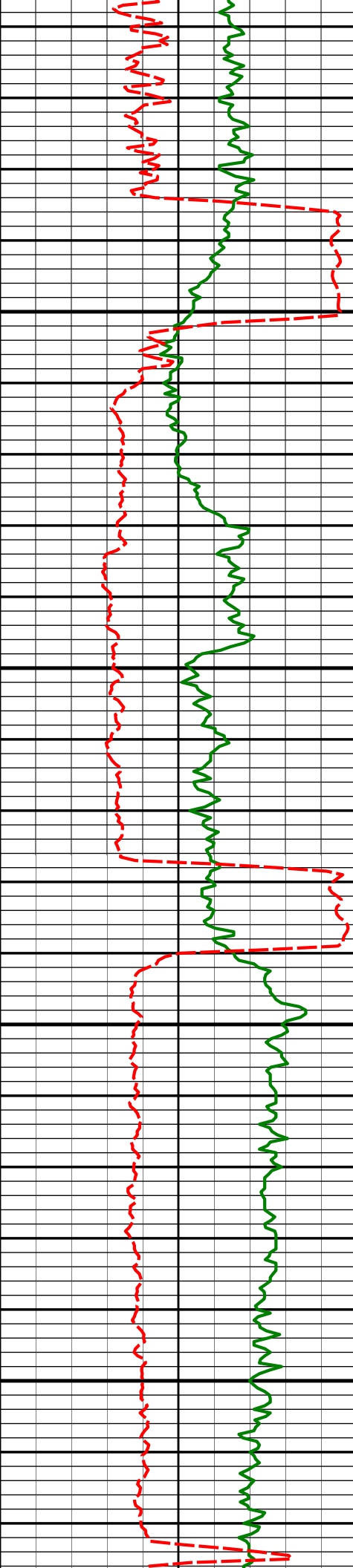
6653.99'

3051.74'









10550'

10560'

90.92°

269.25°

6664.09'

3798.53'

10600'

10650'

10655'

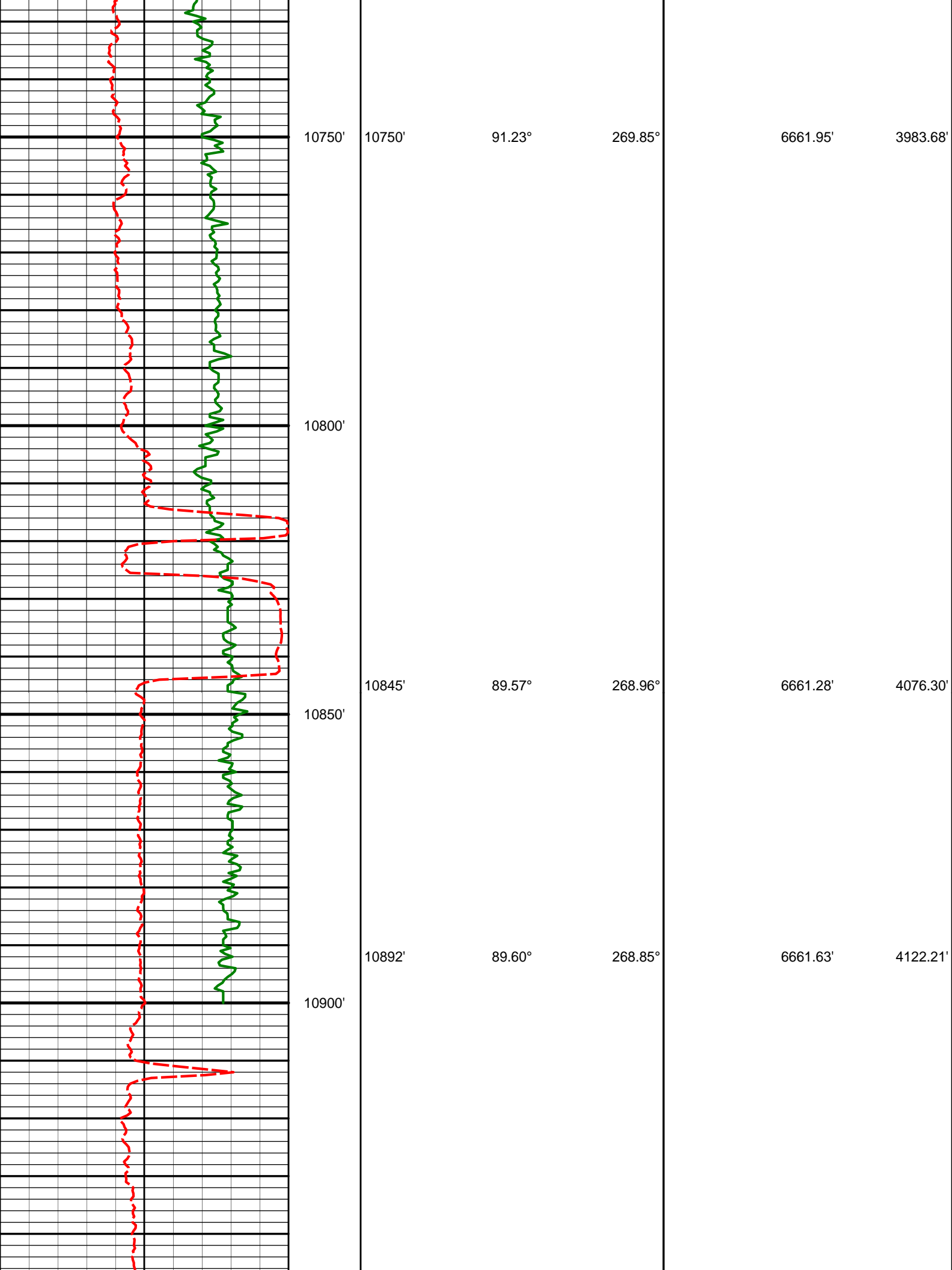
90.22°

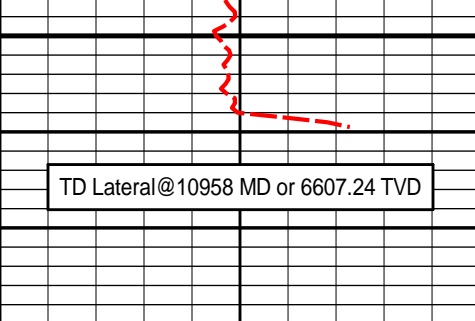
269.52°

6663.15'

3891.16'

10700'



	10950'	10958'	89.60°	268.85°	6662.09'	4186.70'	
TD Lateral@10958 MD or 6607.24 TVD							
Avg Rate of Penetration feet per hr	Feet	Depth		Inc	Azm	TVD	Vsec
600	0						
Gamma Ray (PGXC) (Api)							
0	300						

DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch State AA28-69HN
Wattenberg
Weld Colorado
USA
CA-XX-0900918620

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
242.00	0.50	251.29	242.00	0.34 S	1.00 W	1.05	0.21
487.00	0.40	294.39	486.99	0.33 S	2.79 W	2.79	0.14
756.00	0.20	274.49	755.99	0.10 N	4.11 W	3.98	0.08
922.00	0.50	68.59	921.98	0.38 N	3.73 W	3.54	0.41
1015.00	0.48	274.03	1014.98	0.56 N	3.74 W	3.51	1.03
1108.00	0.38	281.99	1107.98	0.65 N	4.43 W	4.16	0.12
1201.00	2.25	171.86	1200.96	1.09 S	4.47 W	4.60	2.59
1295.00	4.62	150.27	1294.79	6.20 S	2.33 W	3.71	2.83
1387.00	7.37	148.41	1386.27	14.45 S	2.60 E	0.83	2.99
1480.00	9.02	145.60	1478.32	25.54 S	9.84 E	-3.64	1.82
1575.00	11.55	146.49	1571.79	39.61 S	19.29 E	-9.56	2.67
1670.00	13.07	149.11	1664.60	56.76 S	30.06 E	-16.05	1.71
1765.00	12.95	146.97	1757.17	74.90 S	41.37 E	-22.84	0.52
1860.00	13.49	148.73	1849.65	93.30 S	52.92 E	-29.81	0.71
1955.00	13.62	150.57	1942.00	112.51 S	64.17 E	-36.28	0.47
2050.00	11.59	148.39	2034.71	130.38 S	74.67 E	-42.34	2.19
2144.00	12.82	146.55	2126.58	147.12 S	85.37 E	-48.86	1.37
2239.00	13.30	147.50	2219.13	165.13 S	97.05 E	-56.04	0.55
2334.00	12.91	150.67	2311.65	183.60 S	108.12 E	-62.52	0.86
2429.00	12.21	153.68	2404.38	201.85 S	117.77 E	-67.66	1.01
2524.00	13.32	154.59	2497.03	220.75 S	126.92 E	-72.18	1.19
2619.00	13.49	150.33	2589.45	240.26 S	137.10 E	-77.55	1.05
2714.00	13.80	154.31	2681.77	260.09 S	147.49 E	-83.05	1.04
2809.00	13.51	150.60	2774.08	279.97 S	157.85 E	-88.51	0.97
2904.00	14.65	151.31	2866.23	300.18 S	169.07 E	-94.73	1.22
2999.00	13.79	150.41	2958.32	320.56 S	180.43 E	-101.04	0.94
3093.00	12.38	148.91	3049.88	338.93 S	191.16 E	-107.22	1.54
3189.00	13.21	149.08	3143.49	357.15 S	202.11 E	-113.63	0.87
3283.00	11.61	148.34	3235.29	374.42 S	212.59 E	-119.82	1.72
3378.00	11.41	150.77	3328.38	390.75 S	222.20 E	-125.37	0.55
3473.00	11.43	150.87	3421.50	407.18 S	231.37 E	-130.48	0.03
3568.00	12.11	147.33	3514.50	423.79 S	241.34 E	-136.31	1.04
3663.00	14.54	146.46	3606.94	442.12 S	253.31 E	-143.69	2.56
3757.00	15.99	145.86	3697.62	462.67 S	267.09 E	-152.33	1.55
3852.00	15.76	149.21	3789.00	484.58 S	281.04 E	-160.80	1.00
3947.00	15.32	147.74	3880.53	506.27 S	294.34 E	-168.70	0.62
4041.00	12.92	152.60	3971.60	526.40 S	305.64 E	-175.07	2.06

4041.00	12.92	153.60	3971.69	520.19 S	303.64 E	-173.07	2.96
4136.00	12.76	153.35	4064.31	545.08 S	315.07 E	-179.86	0.18
4231.00	12.23	153.72	4157.06	563.48 S	324.23 E	-184.49	0.56
4326.00	12.18	160.16	4249.92	581.93 S	332.09 E	-187.85	1.43
4421.00	11.95	157.83	4342.82	600.46 S	339.20 E	-190.46	0.57
4516.00	13.30	152.80	4435.53	619.28 S	347.90 E	-194.55	1.83
4611.00	12.66	154.78	4528.10	638.41 S	357.33 E	-199.28	0.82
4706.00	12.91	151.40	4620.75	657.15 S	366.85 E	-204.19	0.83
4801.00	12.00	146.53	4713.51	674.71 S	377.38 E	-210.35	1.46
4895.00	11.26	141.51	4805.58	690.05 S	388.48 E	-217.58	1.34
4990.00	11.86	138.52	4898.66	704.62 S	400.71 E	-226.10	0.89
5085.00	11.25	138.66	4991.73	718.89 S	413.30 E	-235.03	0.65
5180.00	8.68	137.96	5085.29	731.17 S	424.22 E	-242.80	2.70
5275.00	6.79	139.98	5179.42	740.80 S	432.63 E	-248.75	2.01
5370.00	5.32	139.52	5273.89	748.45 S	439.11 E	-253.27	1.55
5464.00	4.02	139.12	5367.58	754.26 S	444.09 E	-256.77	1.39
5559.00	3.23	144.73	5462.39	758.96 S	447.82 E	-259.30	0.91
5654.00	1.43	143.27	5557.30	762.10 S	450.07 E	-260.76	1.90
5750.00	0.34	175.18	5653.29	763.34 S	450.81 E	-261.19	1.20
5845.00	1.17	222.26	5748.28	764.34 S	450.18 E	-260.35	1.03
5940.00	0.19	239.96	5843.27	765.14 S	449.39 E	-259.39	1.04
6014.00	0.25	141.15	5917.27	765.33 S	449.38 E	-259.34	0.46
6029.00	0.31	216.36	5932.27	765.39 S	449.38 E	-259.32	2.30
6076.00	1.82	273.83	5979.26	765.44 S	448.56 E	-258.51	3.57
6123.00	7.25	279.35	6026.10	764.91 S	444.88 E	-255.06	11.57
6170.00	11.94	279.51	6072.43	763.63 S	437.16 E	-247.84	9.98
6218.00	16.71	275.52	6118.92	762.14 S	425.38 E	-236.73	10.14
6265.00	19.98	271.91	6163.53	761.22 S	410.62 E	-222.59	7.36
6313.00	21.50	270.07	6208.42	760.94 S	393.63 E	-206.13	3.43
6360.00	24.06	263.21	6251.76	762.06 S	375.50 E	-188.23	7.85
6408.00	28.45	259.58	6294.80	765.29 S	354.52 E	-167.08	9.72
6455.00	33.03	261.48	6335.18	769.21 S	330.83 E	-143.13	9.97
6503.00	38.11	264.20	6374.21	772.65 S	303.14 E	-115.39	11.09
6550.00	44.25	267.81	6409.58	774.75 S	272.28 E	-84.90	13.99
6598.00	49.45	269.85	6442.39	775.43 S	237.29 E	-50.70	11.27
6645.00	54.02	269.84	6471.49	775.53 S	200.40 E	-14.79	9.72
6693.00	58.41	268.45	6498.18	776.14 S	160.52 E	24.14	9.46
6740.00	60.64	268.23	6522.02	777.31 S	120.03 E	63.79	4.75
6788.00	63.81	267.14	6544.38	779.03 S	77.60 E	105.46	6.92
6835.00	68.59	266.67	6563.34	781.36 S	34.68 E	147.75	10.21
6883.00	73.19	266.87	6579.06	783.91 S	10.59 W	192.37	9.58
7051.00	84.72	266.20	6611.19	793.88 S	174.90 W	354.50	6.88
7145.00	86.06	265.93	6618.75	800.31 S	268.37 W	446.91	1.45
7240.00	88.43	265.11	6623.32	807.73 S	362.97 W	540.64	2.64
7335.00	88.09	265.54	6626.21	815.47 S	457.60 W	634.49	0.57
7430.00	89.57	266.48	6628.15	822.08 S	552.35 W	728.18	1.85
7525.00	89.94	266.49	6628.56	827.90 S	647.17 W	821.76	0.39
7620.00	89.69	268.06	6628.87	832.42 S	742.06 W	915.10	1.67
7715.00	90.28	268.59	6628.89	835.19 S	837.02 W	1008.11	0.83
7809.00	90.12	267.66	6628.56	838.26 S	930.97 W	1100.20	1.00
7904.00	88.52	266.50	6629.69	843.10 S	1025.83 W	1193.60	2.08
7999.00	88.67	265.41	6632.01	849.79 S	1120.57 W	1287.29	1.16
8094.00	88.73	266.03	6634.16	856.88 S	1215.28 W	1381.06	0.66
8189.00	90.90	269.26	6634.47	860.78 S	1310.18 W	1474.27	4.09
8283.00	91.51	269.73	6632.49	861.61 S	1404.15 W	1565.87	0.83
8378.00	90.28	269.76	6631.01	862.04 S	1499.14 W	1658.36	1.30
8473.00	87.47	269.18	6632.88	862.92 S	1594.11 W	1750.93	3.01
8567.00	88.27	268.24	6636.37	865.03 S	1688.02 W	1842.77	1.31
8663.00	90.46	268.30	6637.43	867.94 S	1783.96 W	1936.76	2.28
8757.00	90.34	269.27	6636.77	869.93 S	1877.94 W	2028.63	1.05
8852.00	88.09	268.70	6638.07	871.62 S	1972.91 W	2121.39	2.44
8947.00	87.10	268.20	6642.05	874.19 S	2067.79 W	2214.28	1.16
9042.00	87.25	266.86	6646.73	878.28 S	2162.58 W	2307.43	1.42
9137.00	88.18	266.44	6650.51	883.82 S	2257.34 W	2400.89	1.07
9232.00	89.11	265.62	6652.76	890.40 S	2352.08 W	2494.57	1.31
9327.00	91.02	267.00	6652.66	896.52 S	2446.88 W	2588.19	2.48
9421.00	89.41	266.87	6652.31	901.54 S	2540.74 W	2680.65	1.71
9516.00	90.00	270.08	6652.79	904.07 S	2635.70 W	2773.60	3.43
9611.00	89.32	269.24	6653.35	904.63 S	2730.69 W	2866.13	1.14
9706.00	90.19	269.38	6653.76	905.77 S	2825.68 W	2958.78	0.92
9801.00	89.54	267.53	6653.99	908.33 S	2920.64 W	3051.74	2.06
9896.00	87.69	267.81	6656.29	912.19 S	3015.53 W	3144.93	1.97
9990.00	87.78	267.03	6660.01	916.43 S	3109.36 W	3237.18	0.83
10085.00	88.58	265.83	6663.03	922.34 S	3204.13 W	3330.73	1.52
10180.00	91.14	266.52	6663.26	928.68 S	3298.91 W	3424.39	2.80

10275.00	88.89	266.04	6663.23	934.84 S	3393.70 W	3518.02	2.42
10370.00	88.65	264.84	6665.27	942.40 S	3488.38 W	3611.86	1.29
10465.00	90.92	267.37	6665.63	948.85 S	3583.14 W	3705.54	3.58
10560.00	90.92	269.25	6664.09	951.66 S	3678.08 W	3798.53	1.98
10655.00	90.22	269.52	6663.15	952.68 S	3773.07 W	3891.16	0.80
10750.00	91.23	269.85	6661.95	953.21 S	3868.06 W	3983.68	1.13
10845.00	89.57	268.96	6661.28	954.20 S	3963.05 W	4076.30	1.99
10892.00	89.60	268.85	6661.63	955.10 S	4010.04 W	4122.21	0.24
10958.00	89.60	268.85	6662.09	956.43 S	4076.03 W	4186.70	0.01

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 256.57 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 10958.00 FEET
IS 4186.73 FEET ALONG 256.79 DEGREES (GRID)**

Tie-In @ Surface

**Surveys at 242 ft, 487 ft, 742 ft, and 922 were taken and provided by HP 322 while they were drilling the surface hole .
Final survey is a projection to the bit.**