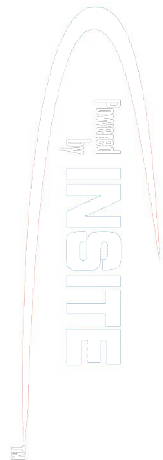


**PCD-C Pressure Case Directional  
PCG-K Pressure Case Gamma**

**1 : 240**

Country : <b>USA</b>			
Field : <b>Wattenberg</b>			
Location : <b>Lat: 40° 49' 7.90" North Long: 103° 47' 38.77" West</b>			
Well : <b>Horsetail 19N-1924M-R</b>			
Company : <b>Whiting</b>			
Rig : <b>Pioneer 54</b>			
LOCATION			
Latitude : <b>40° 49' 7.90" North</b> Longitude : <b>103° 47' 38.77" West</b>			
UTM Easting = <b>11,391,552.789 ft</b> UTM Northing = <b>5,071,194.751 ft</b>			
		Other Services <b>None</b>	
Permanent Datum : <b>Ground Level</b>	Elevation : <b>4748.50 ft</b>		
Log Measured From : <b>Drill Floor</b>	<b>18.50 ft</b> Above Permanent Datum		
Drilling Measured From : <b>Drill Floor</b>			
		<b>TVD LOG</b>	
Depth Logged : <b>0 ft</b>	To <b>8,348.00 ft</b>	Unit No. : <b>1180</b>	Job No. : <b>CA-XX-0901903909</b>
Date Logged : <b>05-Dec-14</b>	To <b>12-Dec-14</b>		
Total Depth MD : <b>8,348.00 ft</b>	TVD : <b>8,329.73 ft</b>		
Spud Date : <b>05-Dec-14</b>	Plot Type : <b>Final</b>		
	Plot Date : <b>15-Jan-15</b>		
Borehole Record (TVD)		Borehole Record (TVD)	
Run No.	Size From To	Run No.	Size From To
0100	13,500 in 0.00 ft 1,609.89 ft		
0200	8,750 in 1,609.89 ft 6,396.84 ft		
0300	8,750 in 6,396.84 ft 8329.73 ft		
		Casing Record (TVD)	
	Size Weight From To		
	9,000 in 45,00 lbpf SURFACE 1,574.89 ft		

**WELL INFORMATION**

MWD Run Number	100	200	300		
Date run completed	06-Dec-14	09-Dec-14	11-Dec-14		
Rig Bit Number	0100	0200	300		
Bit Size (in)	13.500	8.750	8.750		
Tool Nominal OD (in)	6.750	6.750	6.750		
Log Start Depth (TVD, ft)	0.00	1,609.89	6,396.84		
Log End Depth (TVD, ft)	1,609.89	6,396.84	8329.73		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	06-Dec-14 02:00	07-Dec-14 14:00	09-Dec-14 11:00		
Drill/Wipe End Date and Time	06-Dec-14 10:45	09-Dec-14 01:30	11-Dec-14 03:16		
Min Inc (deg) @ Depth (TVD, ft)	0.31 @ 420.99	0.04 @ 4,744.87	0.15 @ 7092		
Max Inc (deg) @ Depth (TVD, ft)	1.29 @ 1,553.90	8.00 @ 3,456.34	0.61 @ 7839		
Bit TFA(in2) / Bit Type	0.90 / PDC	0.90 / PDC	1.20 / PDC		
Flow Rate (gpm)	333.00	575.00	475.00		
Max AV (fpm) / CV (fpm) @ MWD	550.0 / 450.0	475.0 / 550.0	450.0 / 500.0		
Fluid Type	Polymer	Polymer	Polymer		
Density (ppg) / Viscosity (spqt)	8.60 / 20.00	8.70 / 44.00	8.80 / 47.00		
Filtrate CL (ppm)	1,100.00	900.00	1,100.00		
pH / Fluid Loss (mptm)	7.00 / 0	6.80 / 0	9.10 / 0		
PV (cP) / YP (lhf2)	10 / 10.00	4 / 2.00	18 / 23.00		
% Solids / % Sand	3 / 0.02	1 / 0.02	4 / 0.02		
% Oil / Oil:Water Ratio	97 / 97:0	N/A / 0:99	N/A / 0:96		
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	77.99 / PCM	175.21 / PCM	185 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	adam sampson	adam sampson	adam sampson		
Customer Representative	David	David	David		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.93	5.93	5.93		
Sub Serial Number	11404294	11404294	11404294		
Insert Serial Number	11227514	11227514	11227560		
Date and Time Initialized	05-Dec-14 15:57	06-Dec-14 21:23	09-Dec-14 04:23		
Date and Time Read	06-Dec-14 12:51	09-Dec-14 08:31	01-Jan-70 00:00		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	56.00	56.00	56.00		
Software Version	6.21	6.21	6.33		
Sub Serial Number	11404294	11404294	11404294		
Sonde Serial Number	11833233	11833233	11478078		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	291.60	318.70	281.12		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	58.47	58.92	59.11		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11404294	11404294	11404294		
Insert/Sonde Serial Number	11680942	11680942	11579792		

## REMARKS

1. All depths are Measured 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:

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

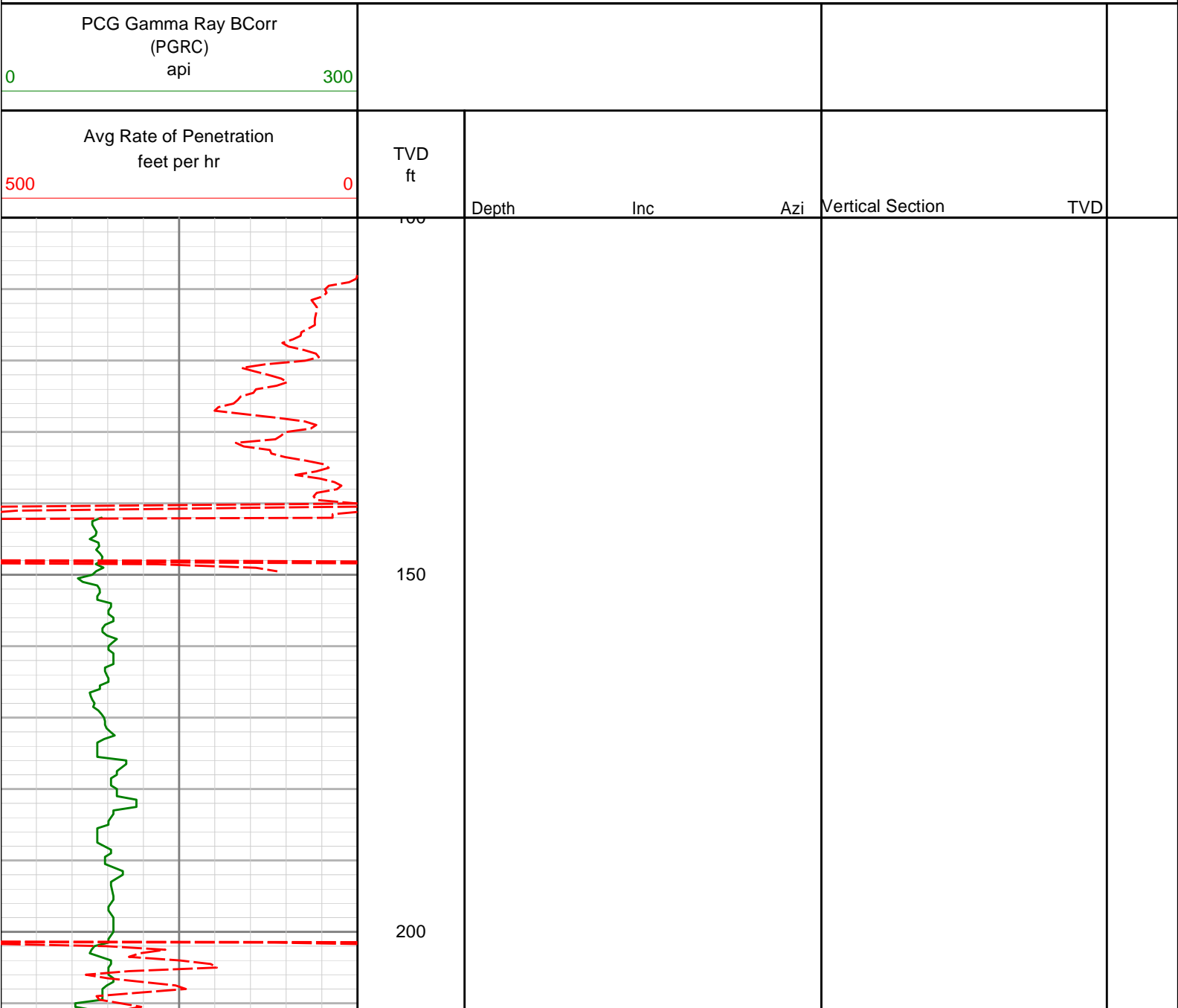
5. INSITE version 8.0.20

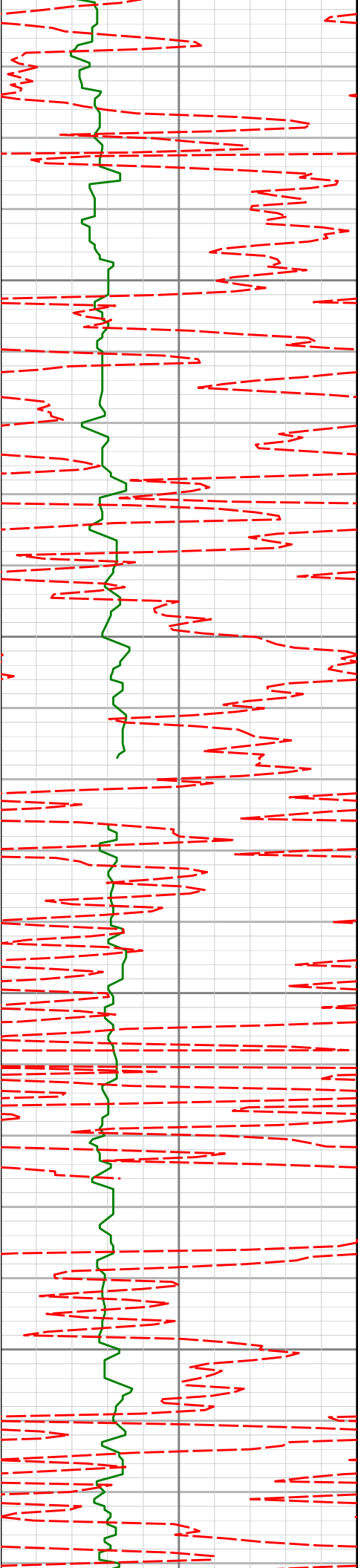
## WARRANTY

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# HALLIBURTON

1:240 TVD Log





237'

0.46°

301.54°

-0.51'

237.00'

250

300

328'

0.41°

291.72°

-0.83'

327.99'

350

400

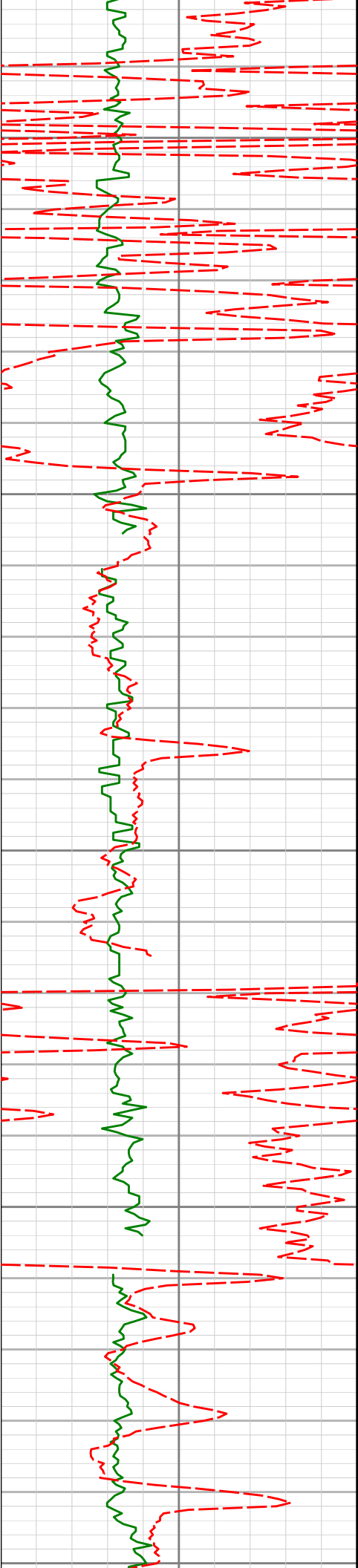
421'

0.31°

336.72°

-1.19'

420.99'



450

500

550

600

650

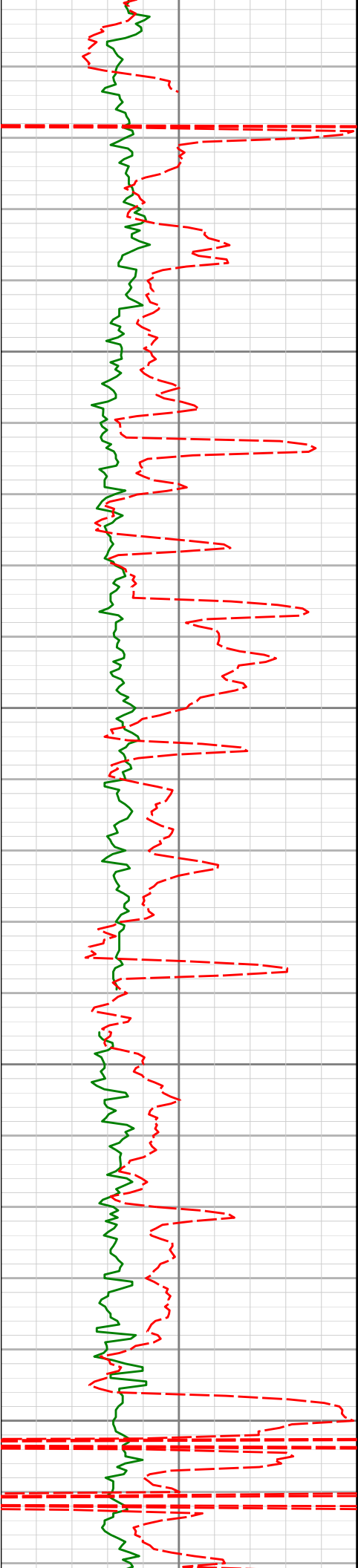
513'

0.48°

359.44°

-1.80'

512.99'

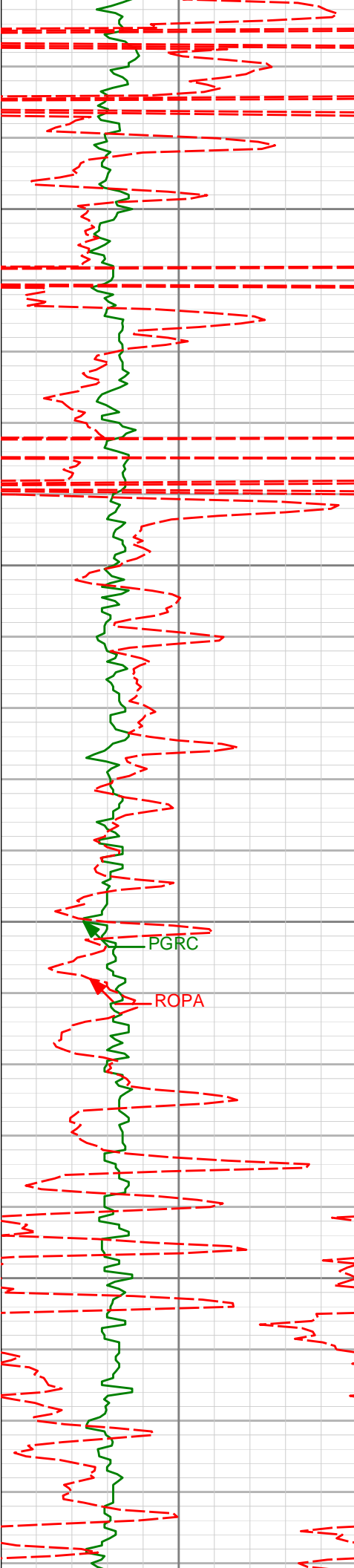


700

750

800

850



900

950

1000

1050

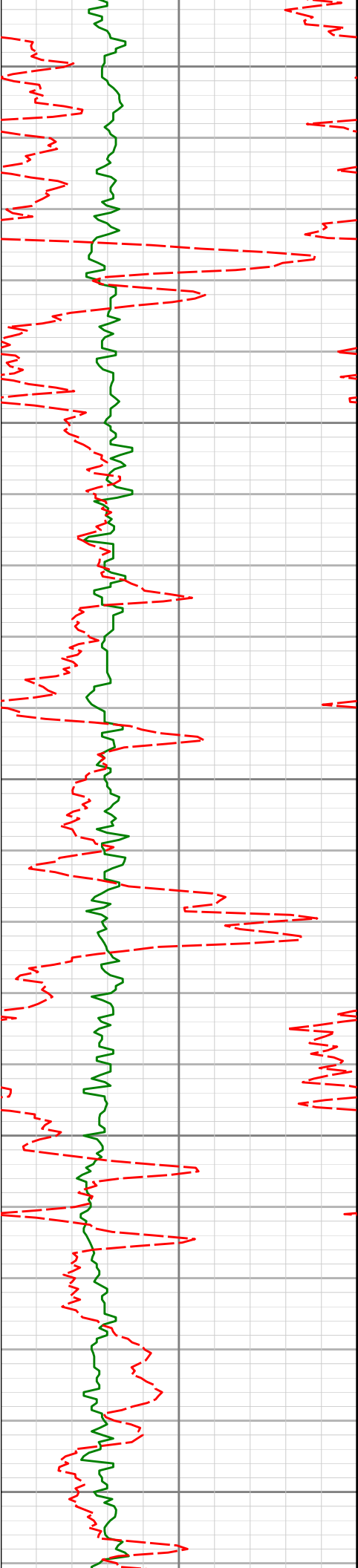
976'

0.66°

296.39°

-4.96'

975.97'



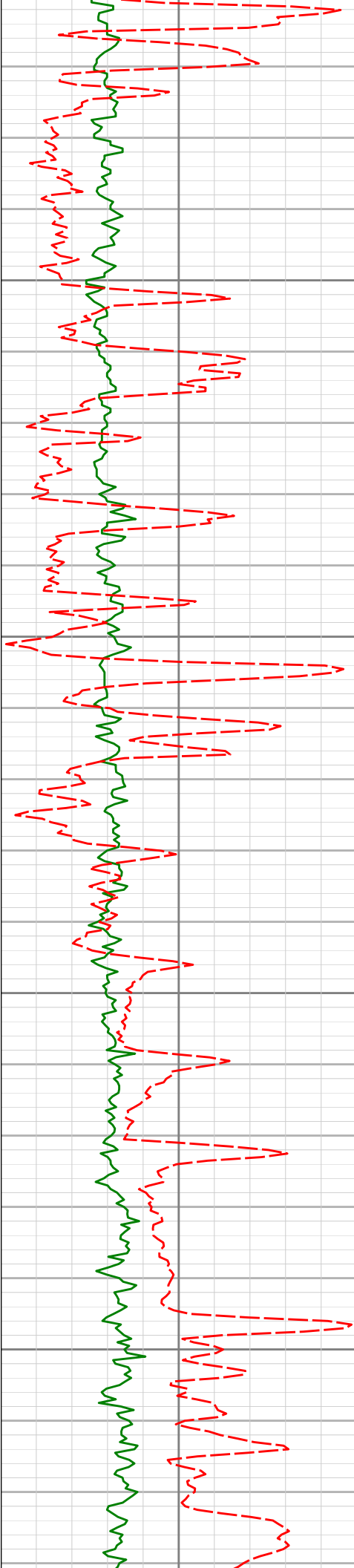
1100

1150

1200

1250

1300



1350

1400

1450

1500

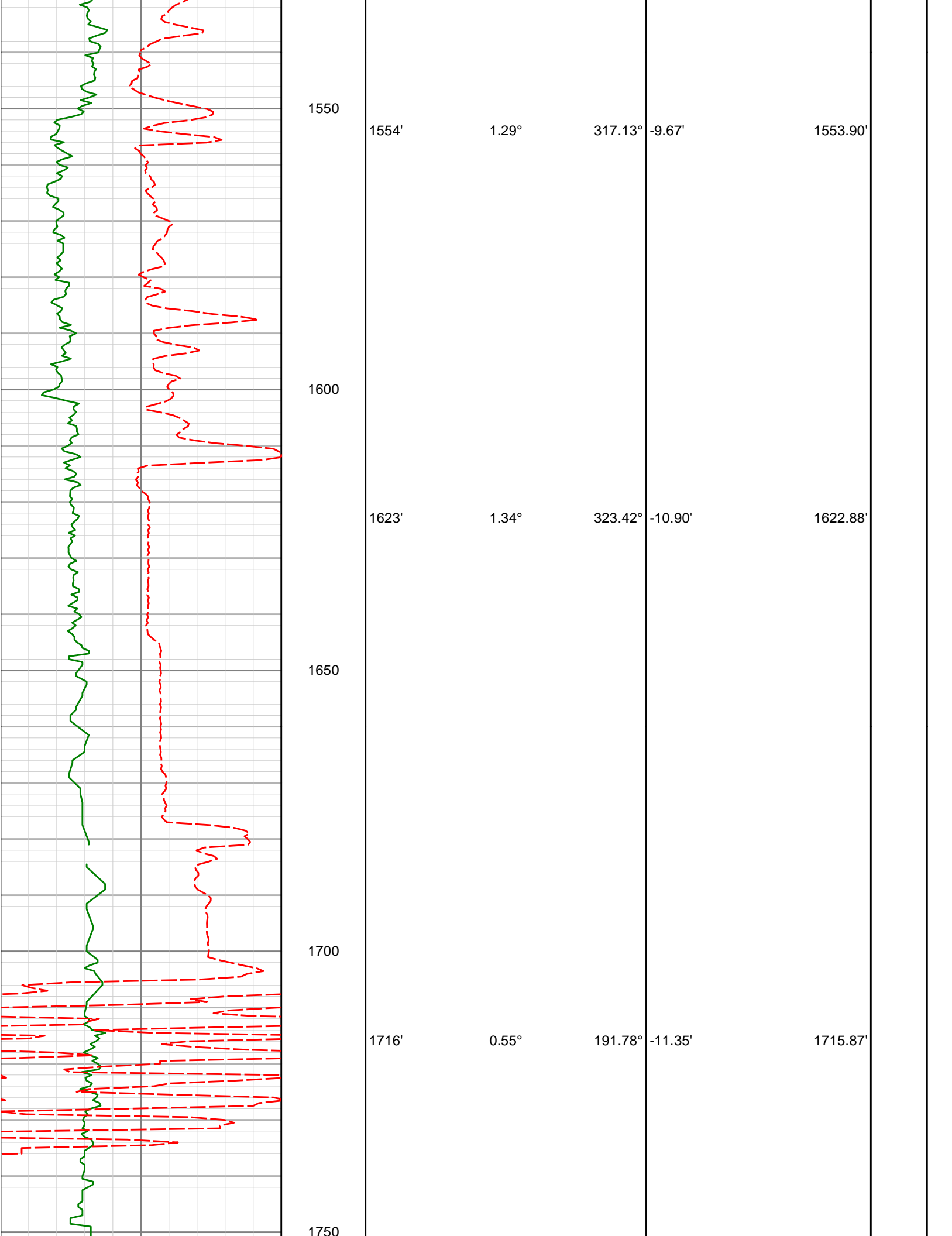
1346'

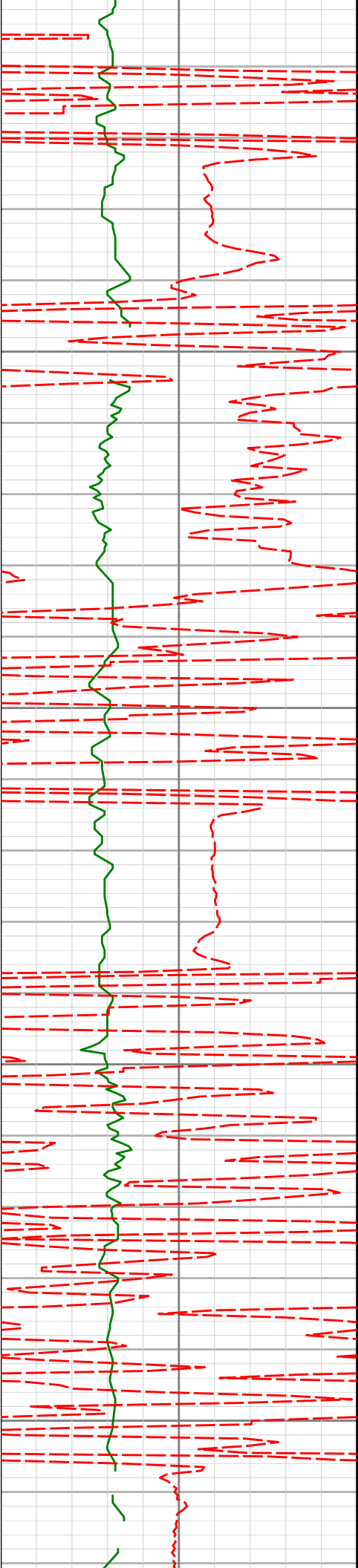
0.90°

295.55°

-7.21'

1345.94'





1800

1850

1900

1950

1808'

1.73°

159.56°

-9.61'

1807.85'

1899'

3.52°

167.01°

-5.59'

1898.76'



2000

2050

2100

2150

1990'

5.18°

174.24°

1.23'

1989.49'

2083'

7.49°

175.66°

11.47'

2081.92'

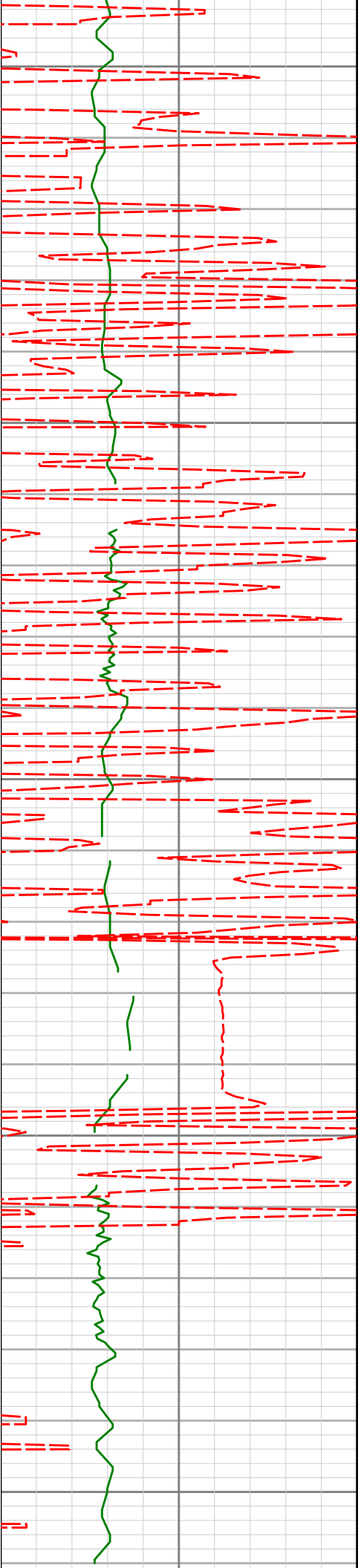
2176'

6.69°

174.89°

22.92'

2174.21'



2200

2250

2300

2350

2400

2267'

5.75°

172.75°

32.73'

2264.67'

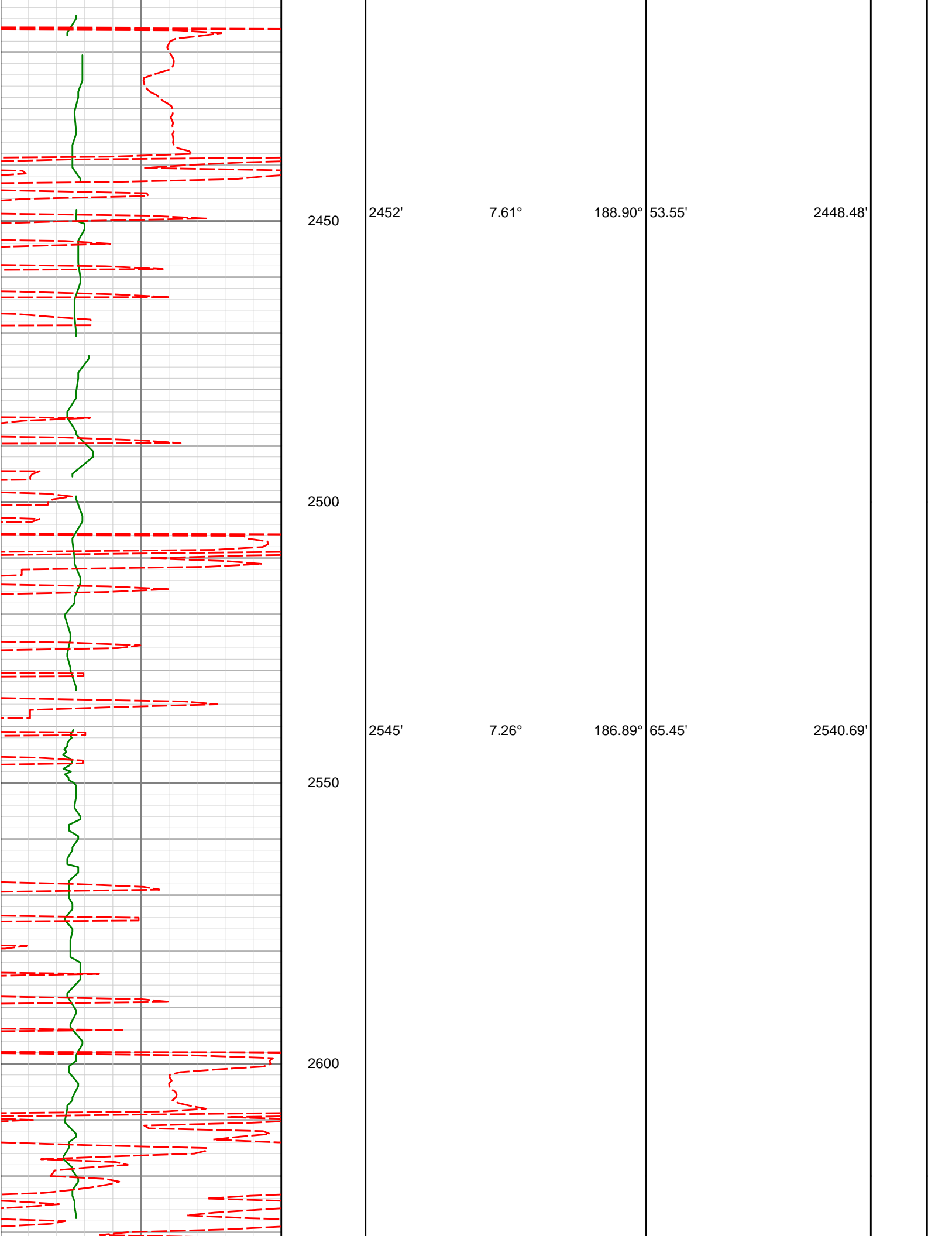
2360'

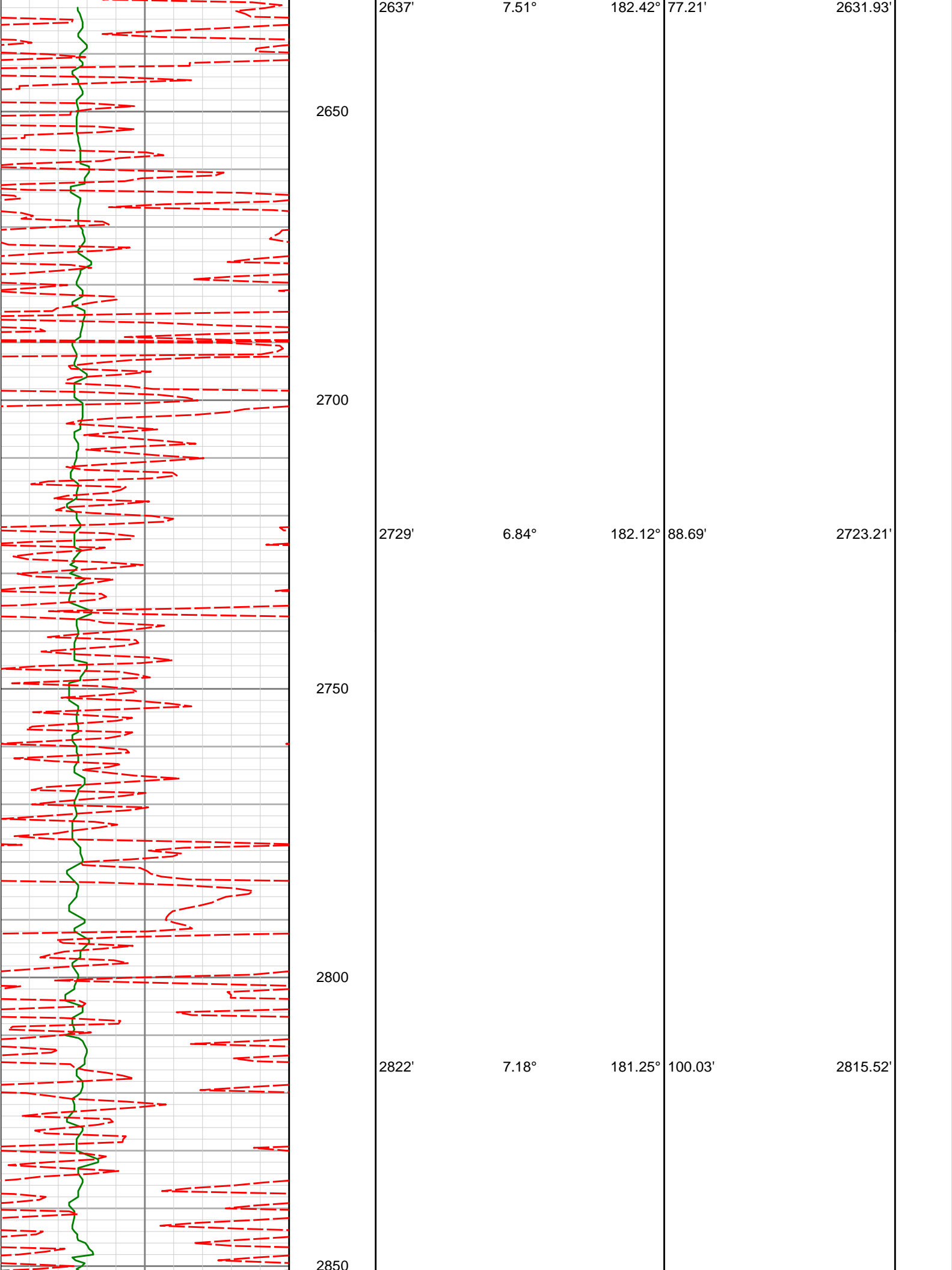
6.32°

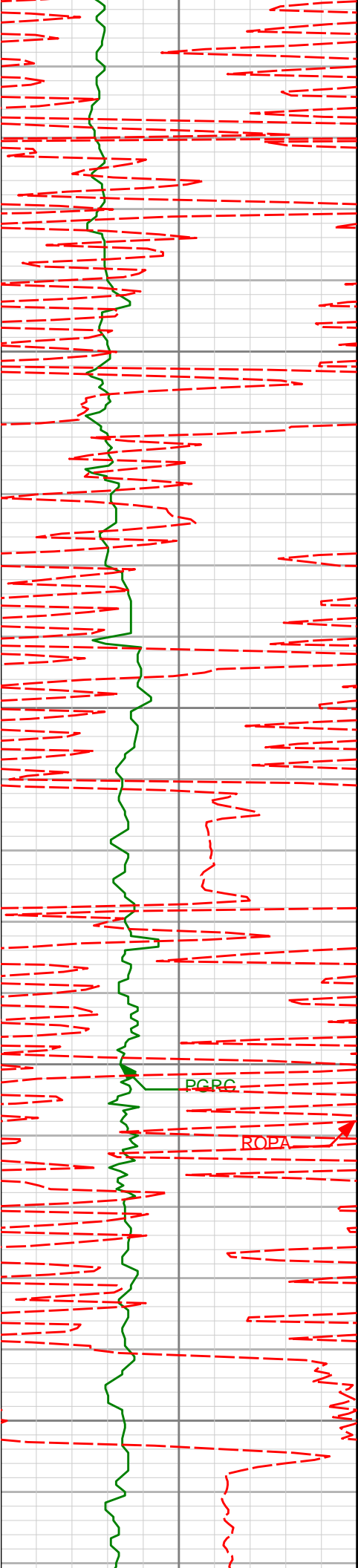
178.92°

42.48'

2357.15'







2900

2950

3000

3050

2914'

6.48°

180.70°

110.96'

2906.86'

3007'

6.40°

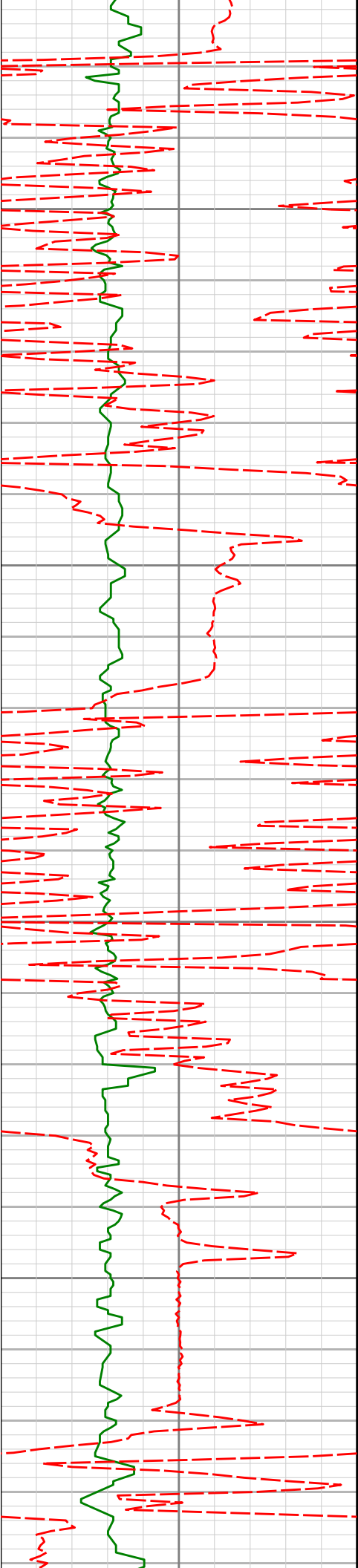
171.46°

121.34'

2999.28'

PCRC

ROPA



3099'

7.17°

177.92°

132.16'

3090.63'

3100

3150

3191'

7.78°

178.66°

144.13'

3181.85'

3200

3250

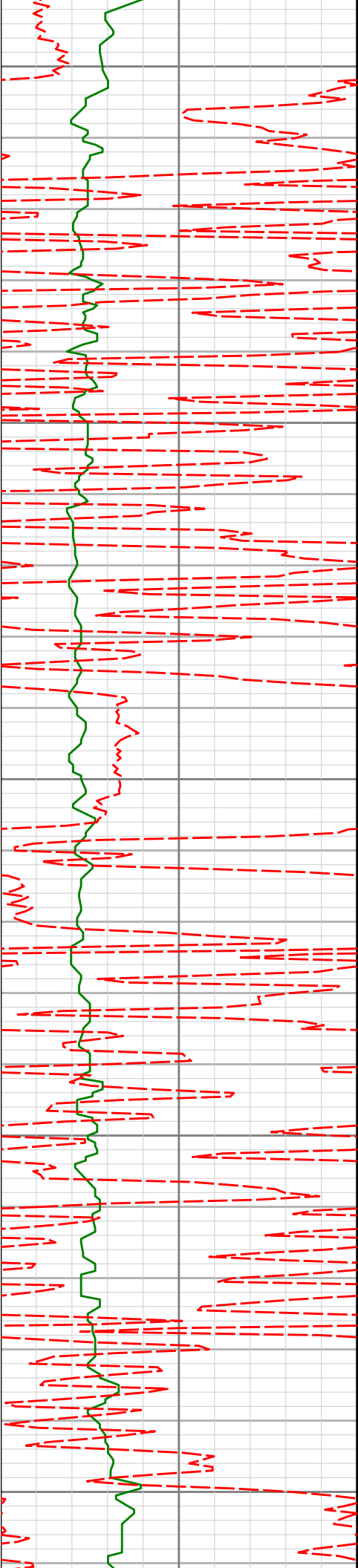
3282'

7.63°

177.46°

156.33'

3272.03'



3300

3350

3400

3450

3500

3375'

7.64°

177.62°

168.68'

3364.21'

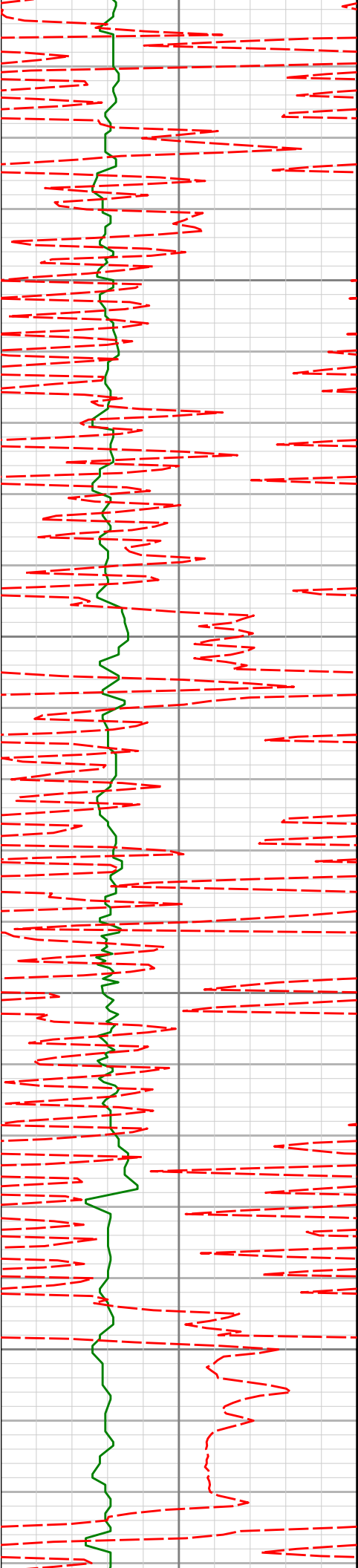
3468'

8.00°

177.76°

181.33'

3456.34'



3550

3600

3650

3700

3560'

3653'

7.37°

6.19°

177.94°

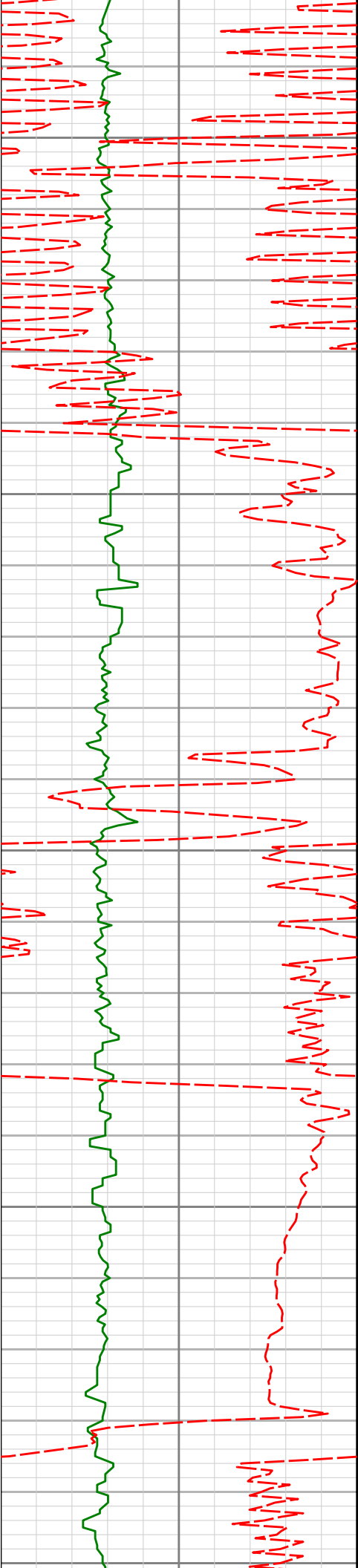
179.67°

193.63'

204.60'

3547.51'

3639.86'



3750

3800

3850

3900

3950

3746'

5.23°

170.38°

213.81'

3732.40'

3837'

5.12°

168.35°

221.89'

3823.03'

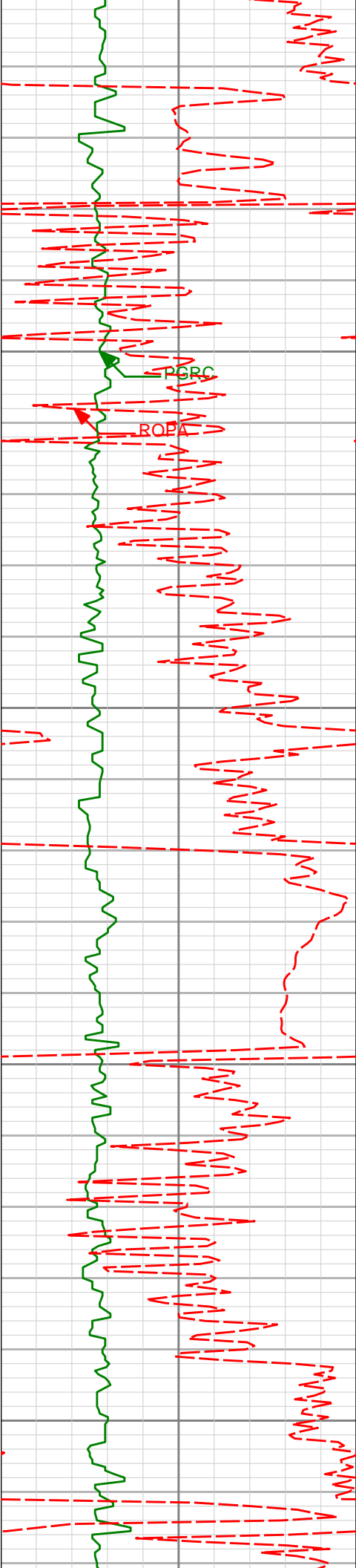
3930'

7.63°

172.49°

232.10'

3915.45'



4000

4050

4100

4150

4023'

7.44°

172.76°

244.21'

4007.65'

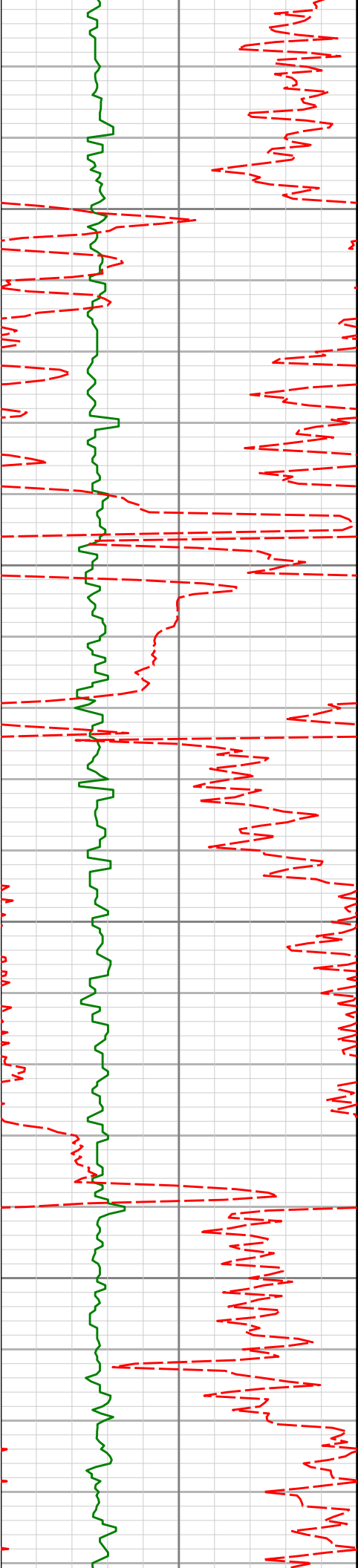
4115'

7.42°

180.89°

256.07'

4098.88'



4207'

6.61°

182.26°

267.29'

4190.19'

4200

4250

4299'

5.83°

184.08°

277.24'

4281.64'

4300

4350

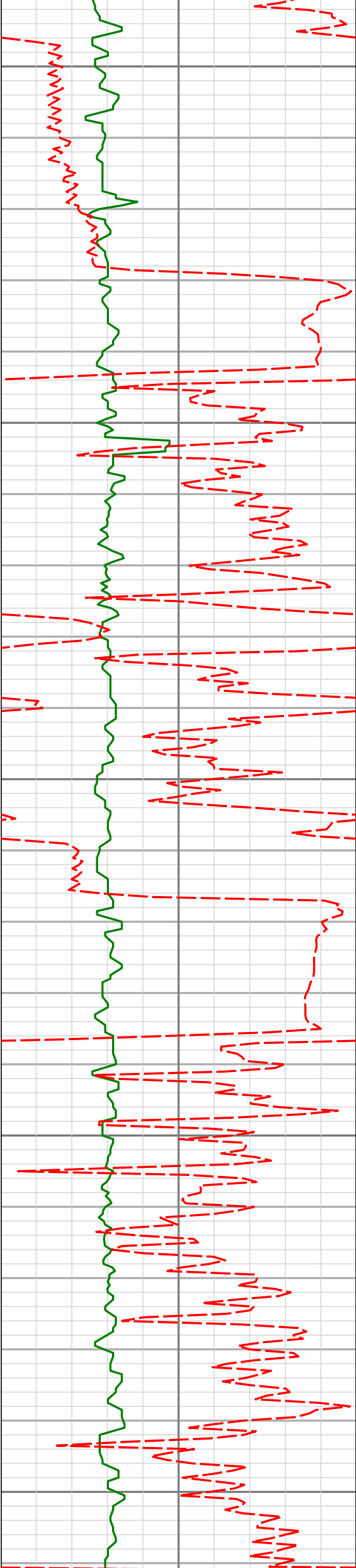
4391'

5.15°

189.40°

285.96'

4373.22'



4400

4450

4500

4550

4600

4485'

3.24°

182.38°

292.76'

4466.97'

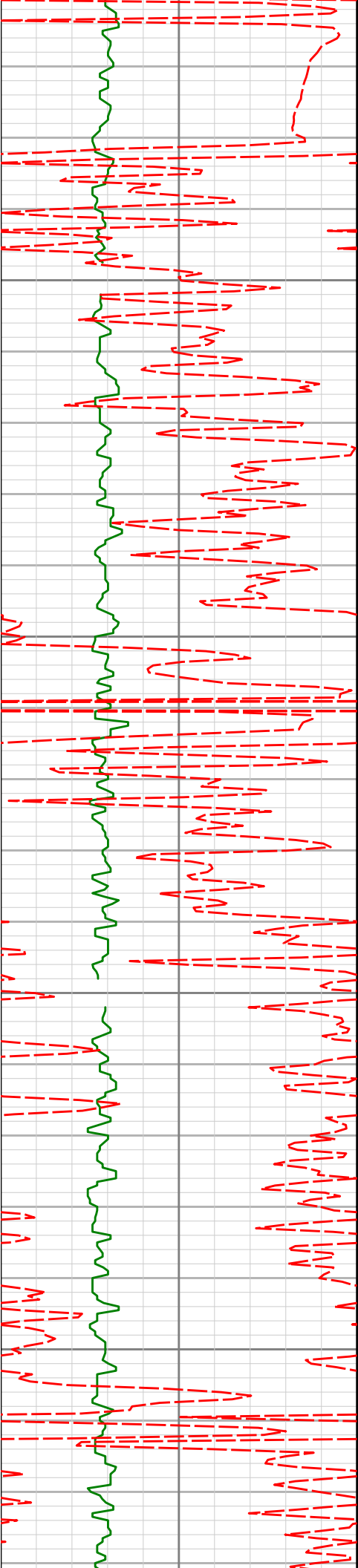
4577'

1.51°

185.19°

296.57'

4558.88'



4650

4669'

0.10°

158.39°

297.85'

4650.87'

4700

4750

4800

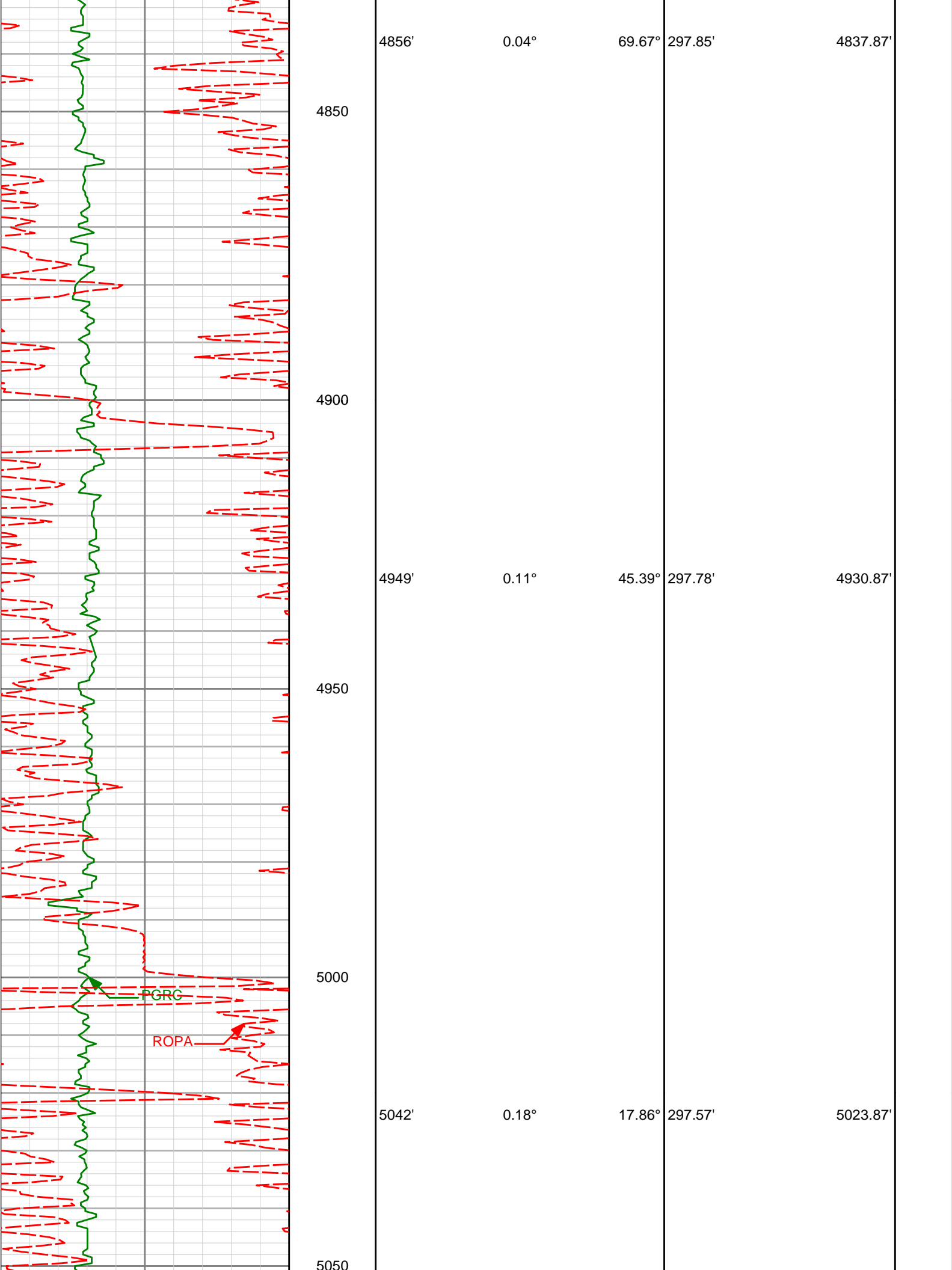
4763'

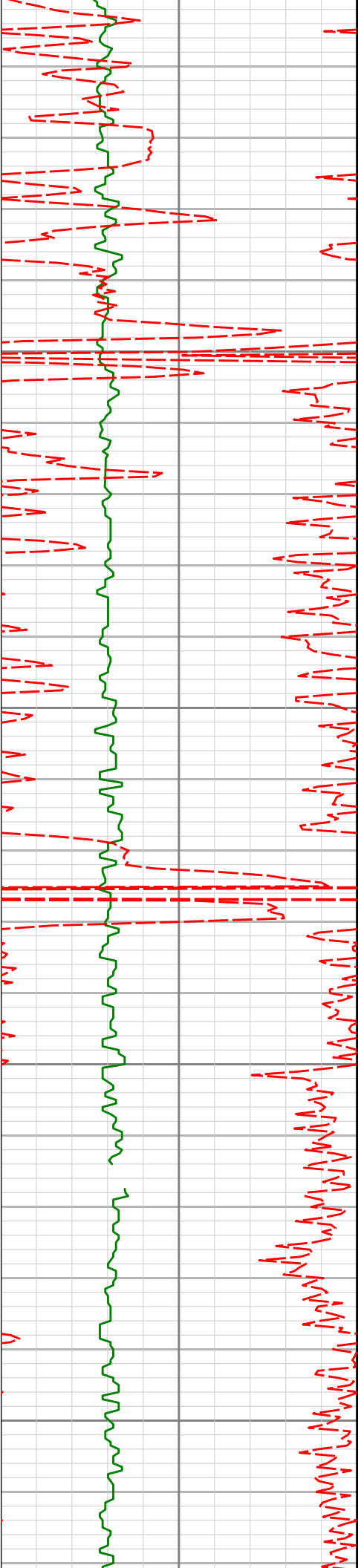
0.04°

352.31°

297.89'

4744.87'





5100

5150

5200

5250

5135'

0.13°

356.43°

297.33'

5116.87'

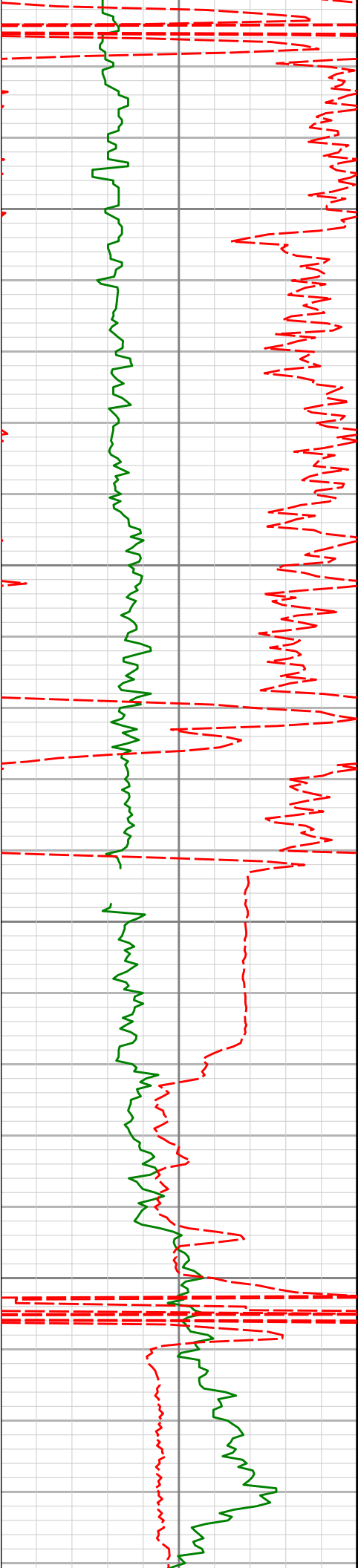
5228'

0.42°

308.13°

297.01'

5209.87'



5300

5322'

0.71°

301.18°

296.49'

5303.87'

5350

5400

5415'

0.54°

285.04°

296.06'

5396.86'

5450

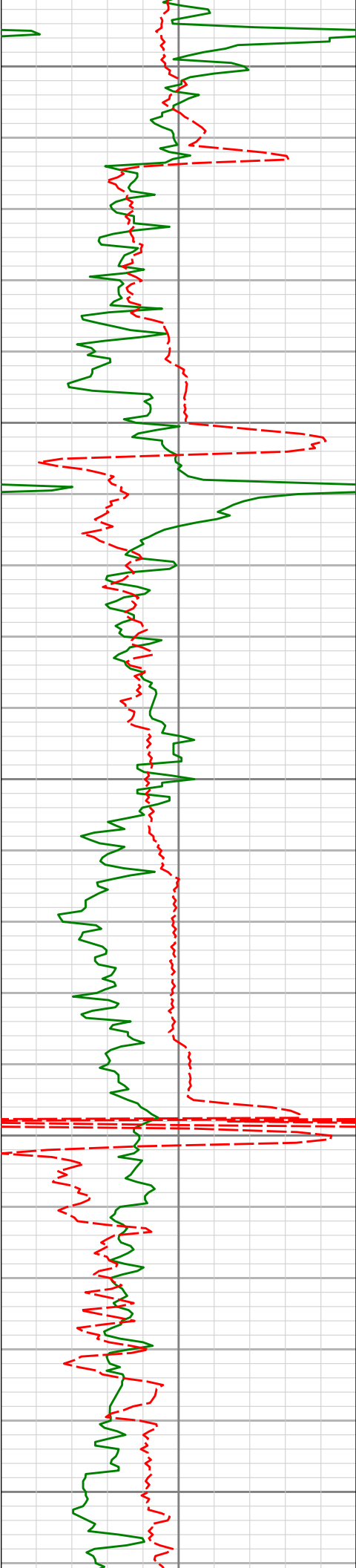
5508'

0.34°

291.23°

295.84'

5489.86'



5500

5550

5600

5650

5700

5601'

0.05°

13.27°

295.70'

5582.86'

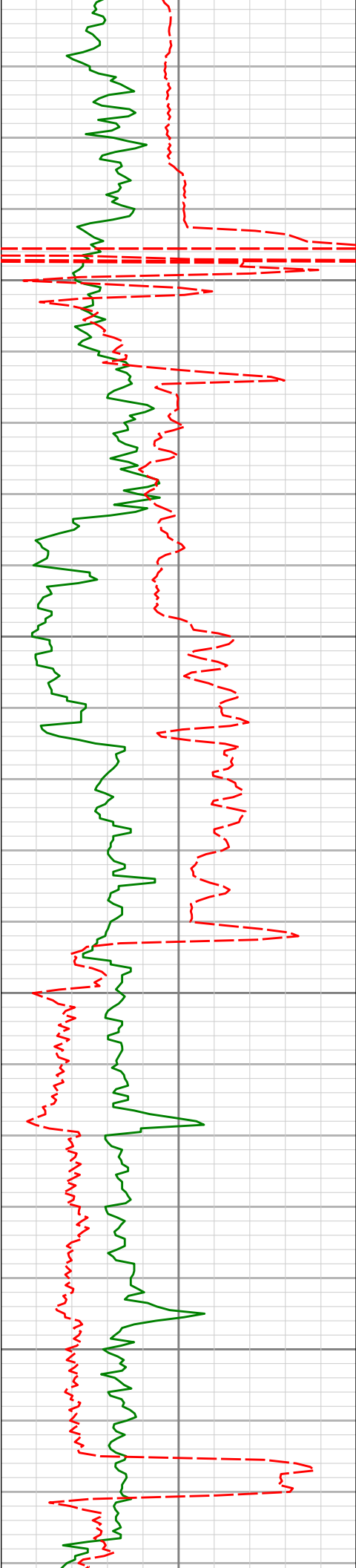
5694'

0.16°

27.65°

295.55'

5675.86'



5750

5787'

0.14°

122.76°

295.49'

5768.86'

5800

5850

5880'

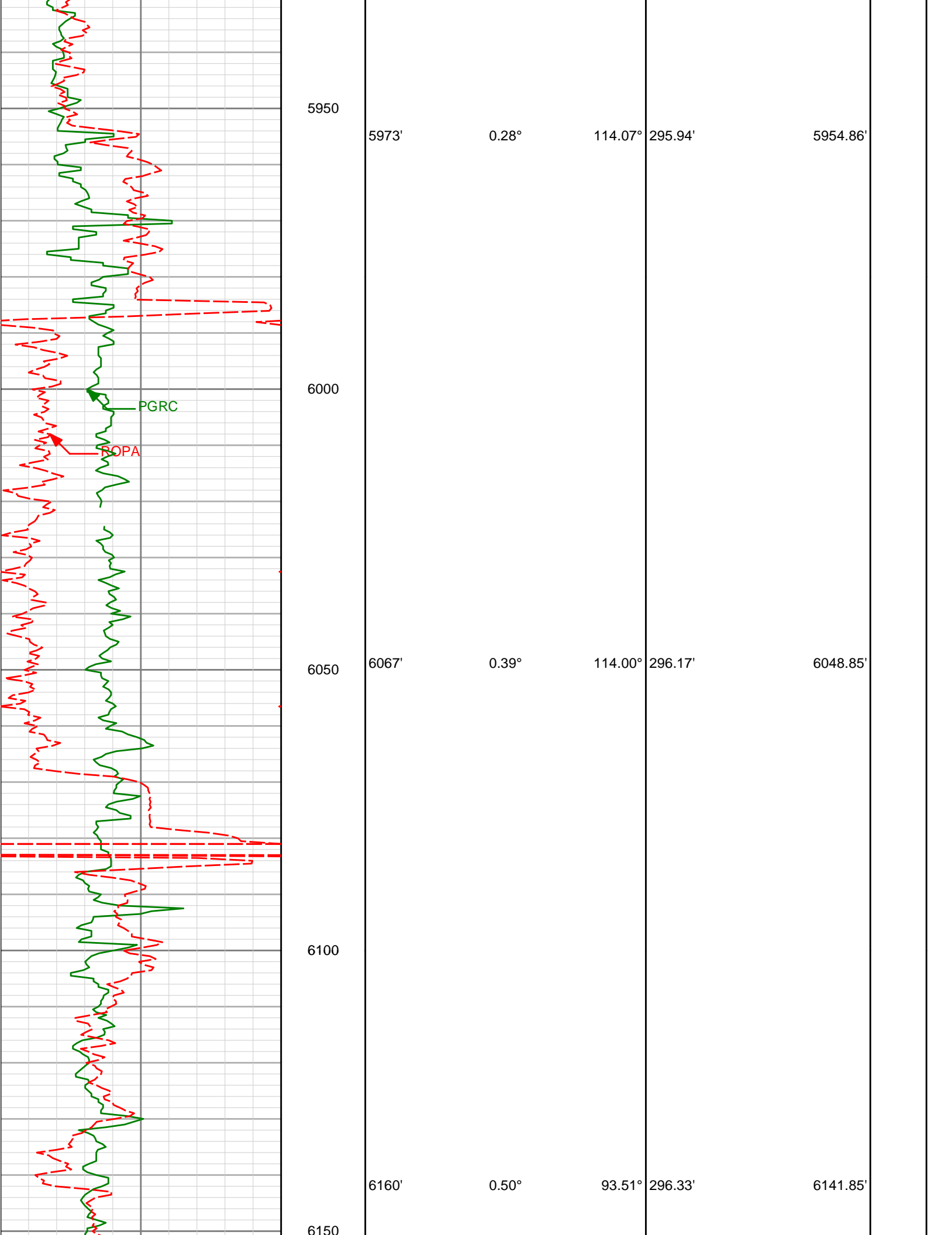
0.26°

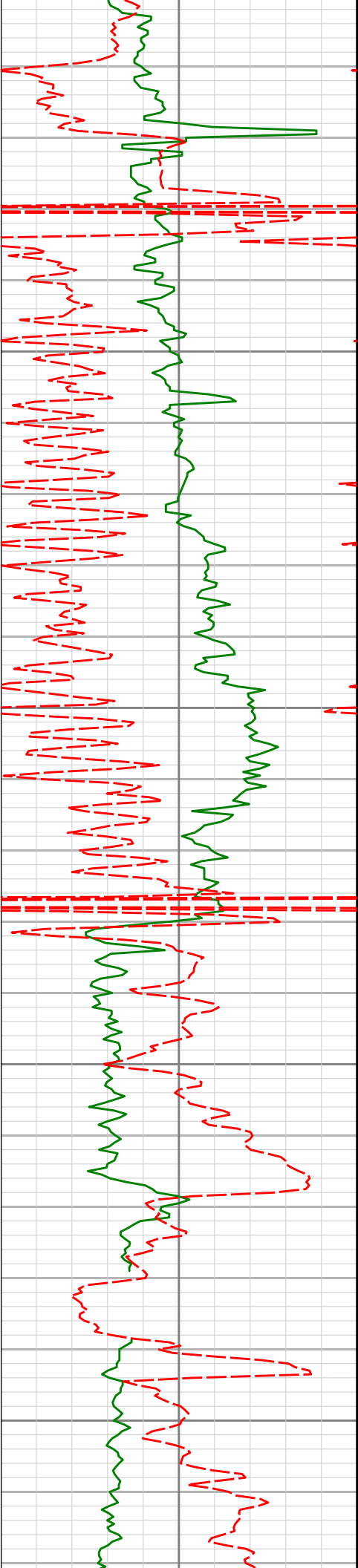
131.68°

295.70'

5861.86'

5900





6200

6250

6300

6350

6253'

0.49°

120.73°

296.57'

6234.85'

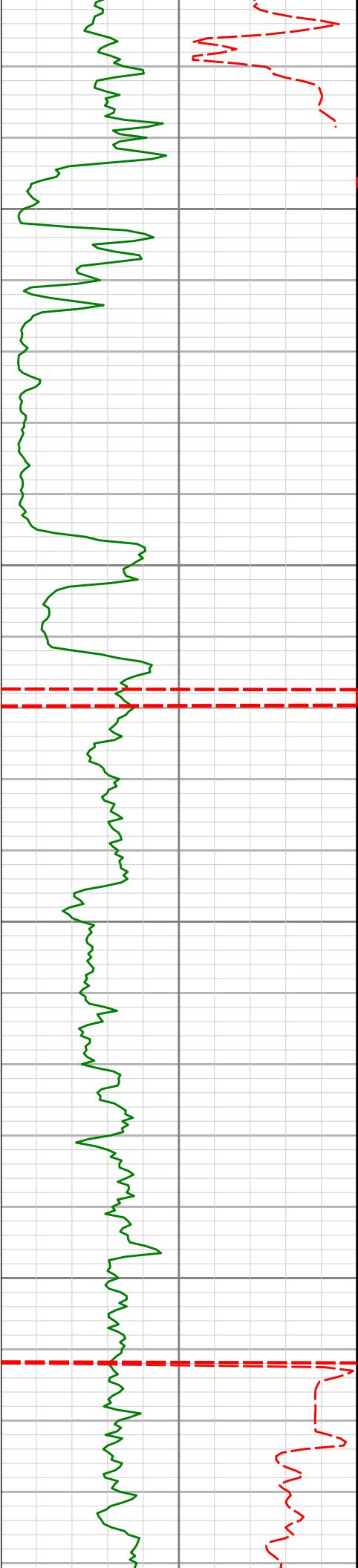
6347'

0.74°

132.27°

297.19'

6328.84'



6400

6450

6500

6550

6440'

0.59°

150.12°

298.02'

6421.84'

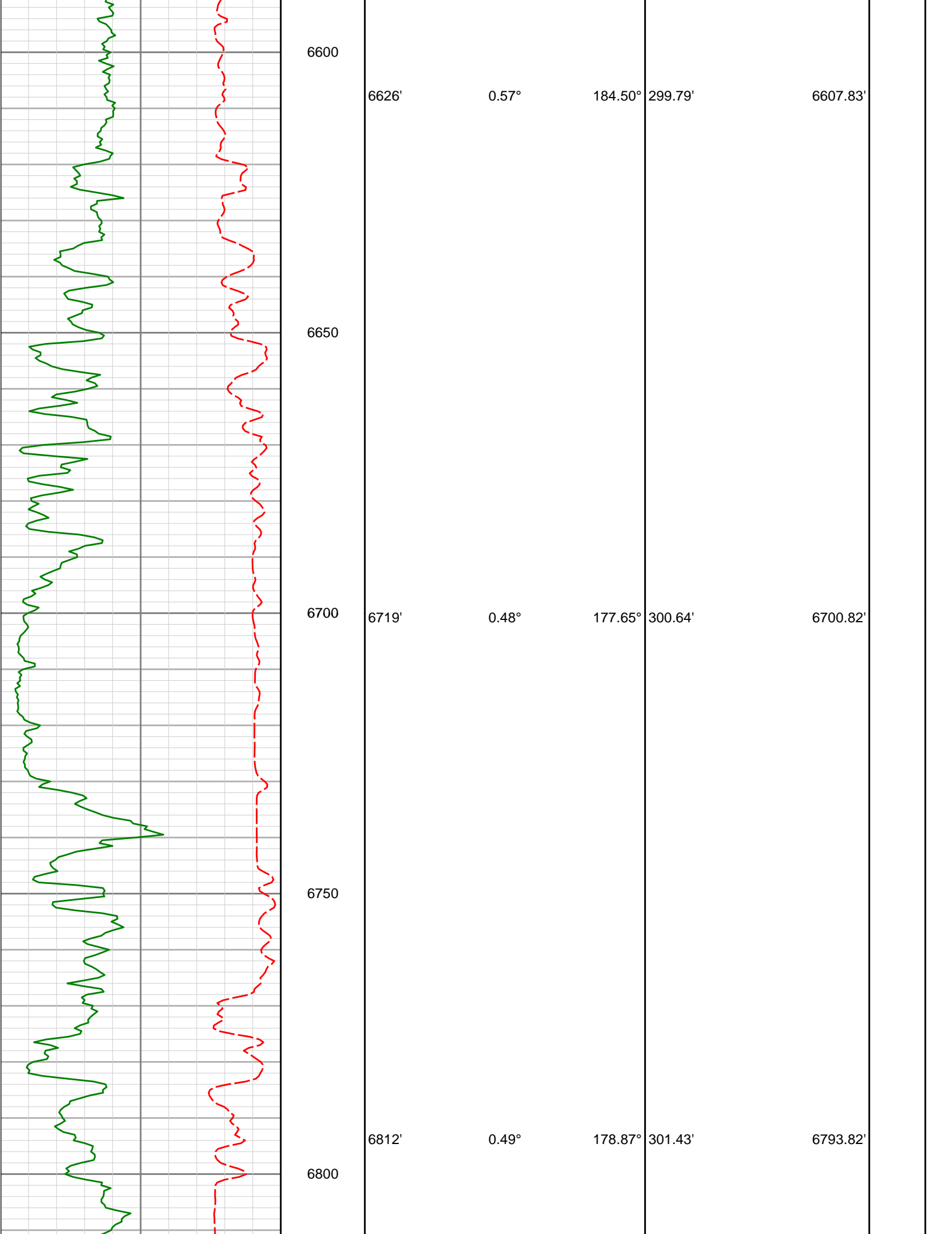
6533'

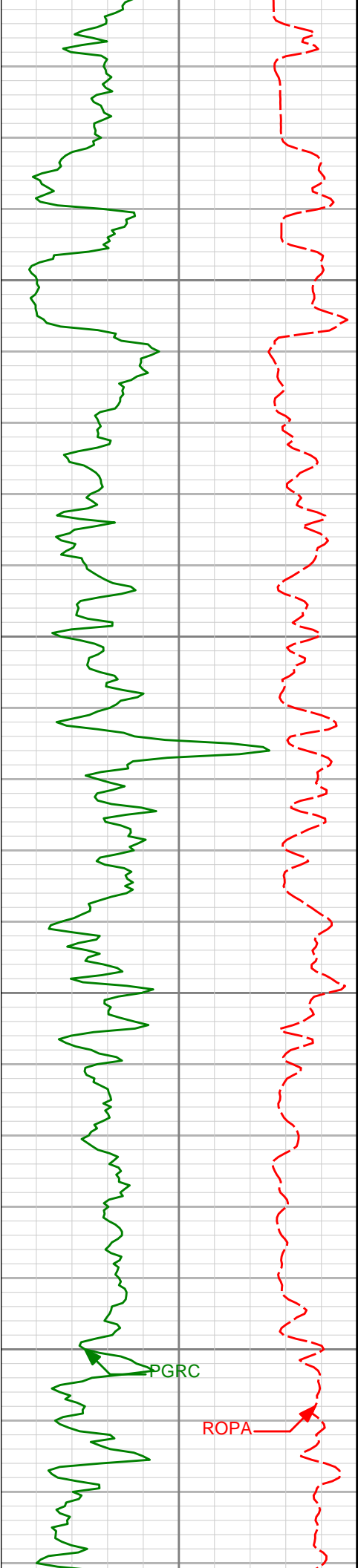
0.56°

169.66°

298.88'

6514.83'





6850

6900

6950

7000

6906'

0.50°

175.30°

302.24'

6887.82'

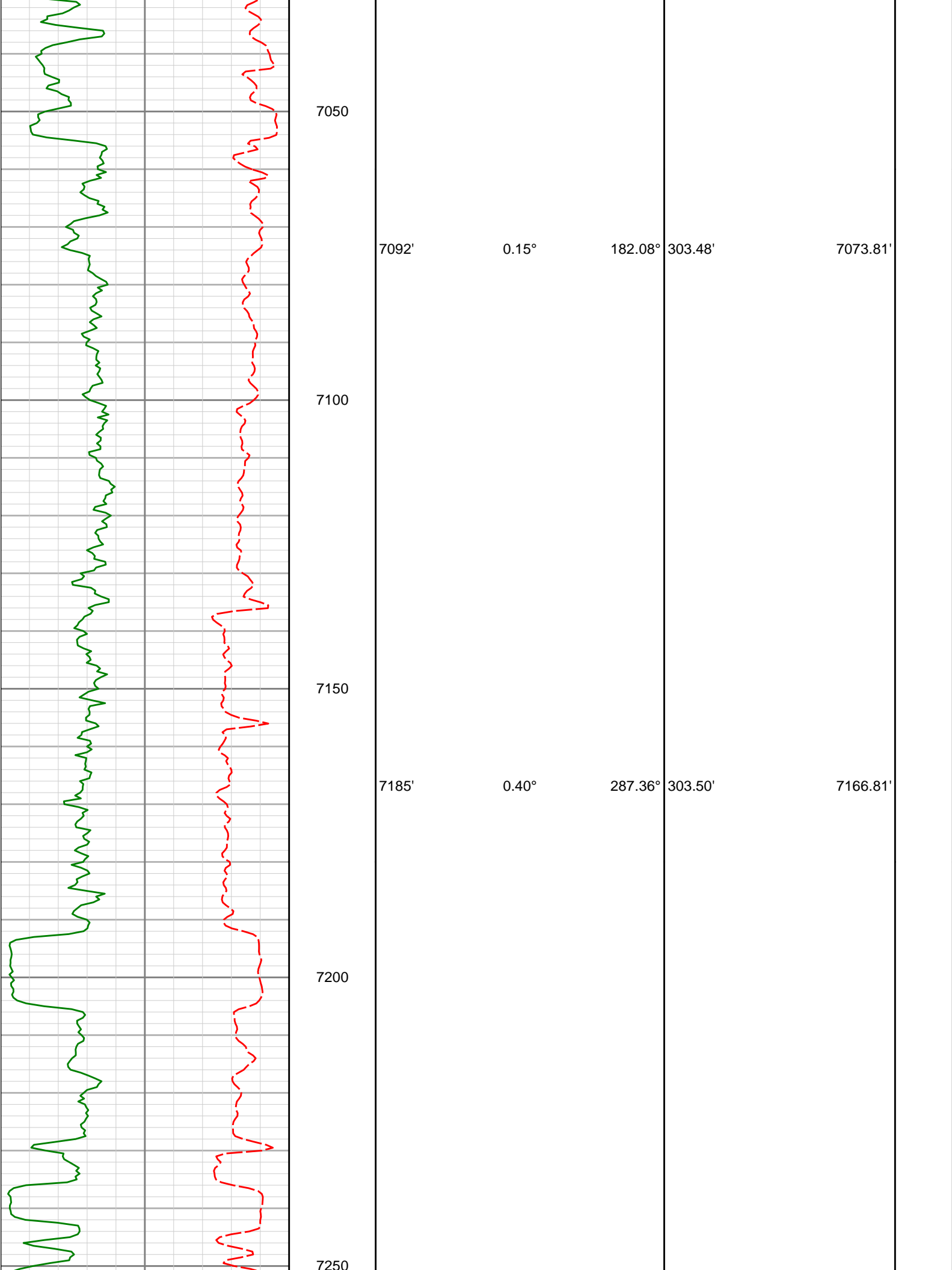
6999'

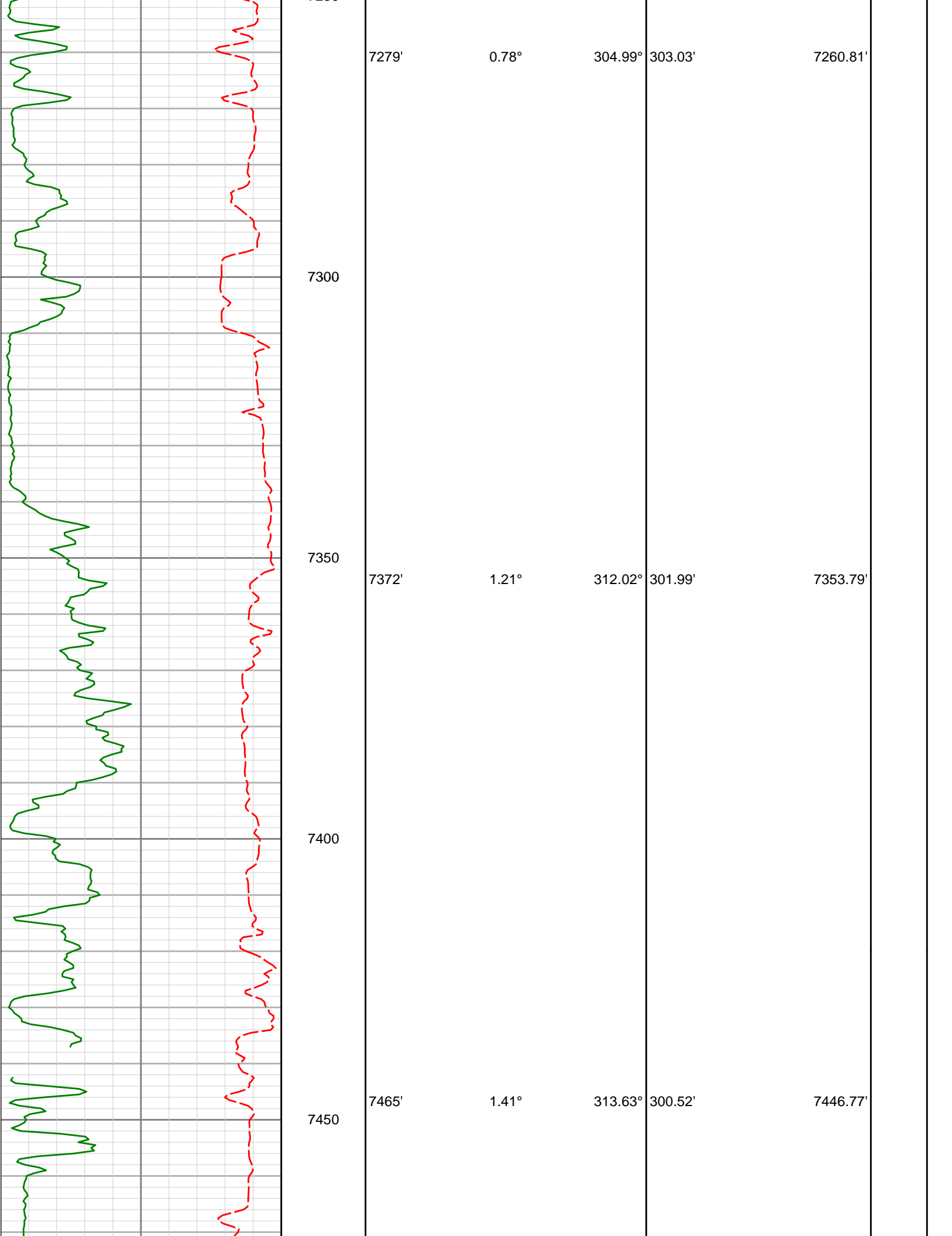
0.44°

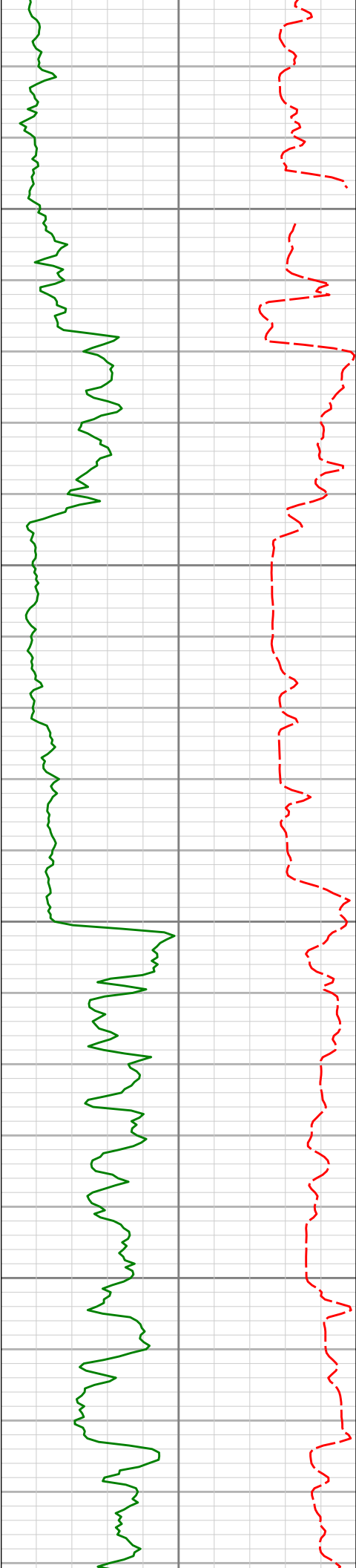
181.59°

303.00'

6980.81'







7500

7550

7600

7650

7559'

0.31°

67.09°

299.62'

7540.76'

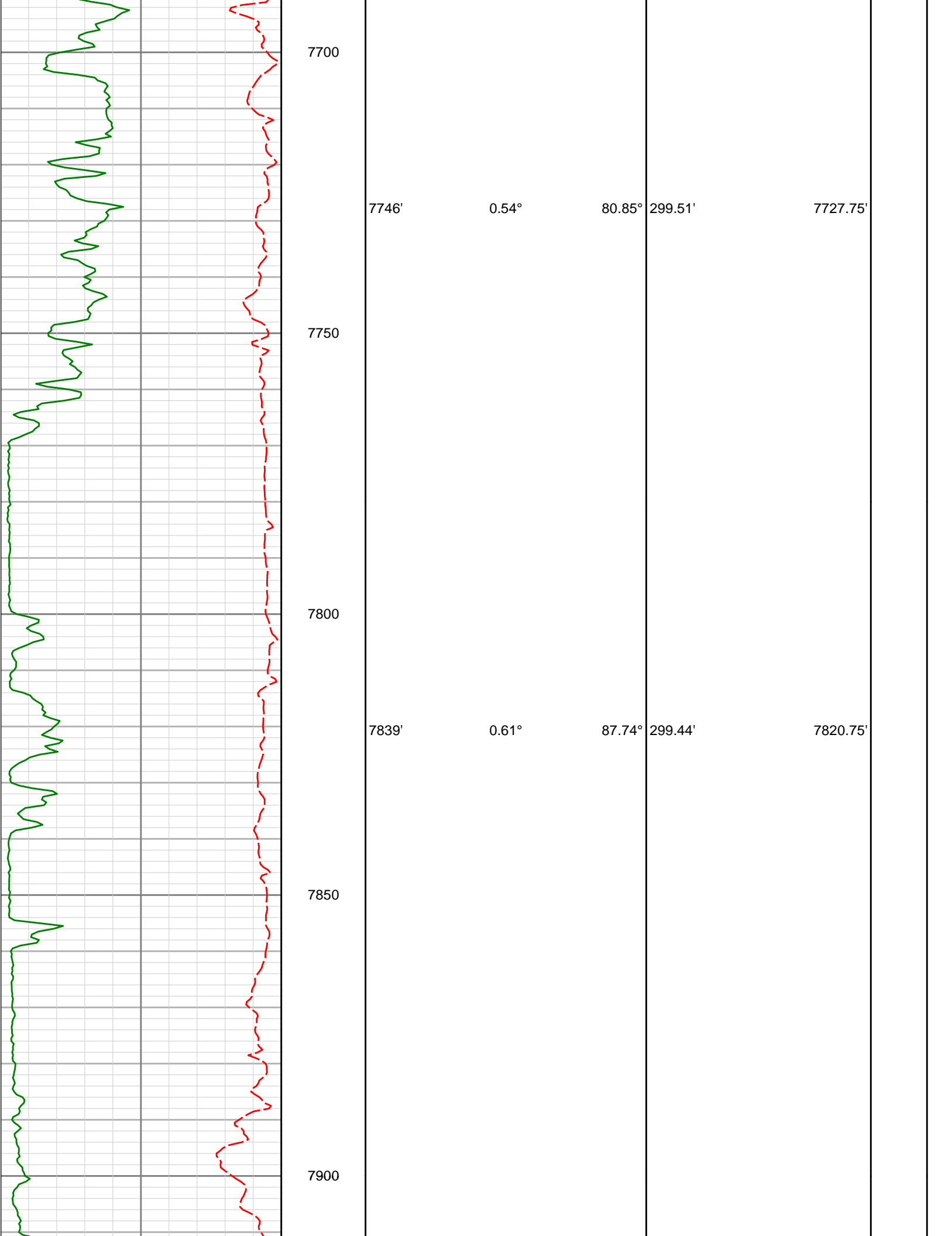
7652'

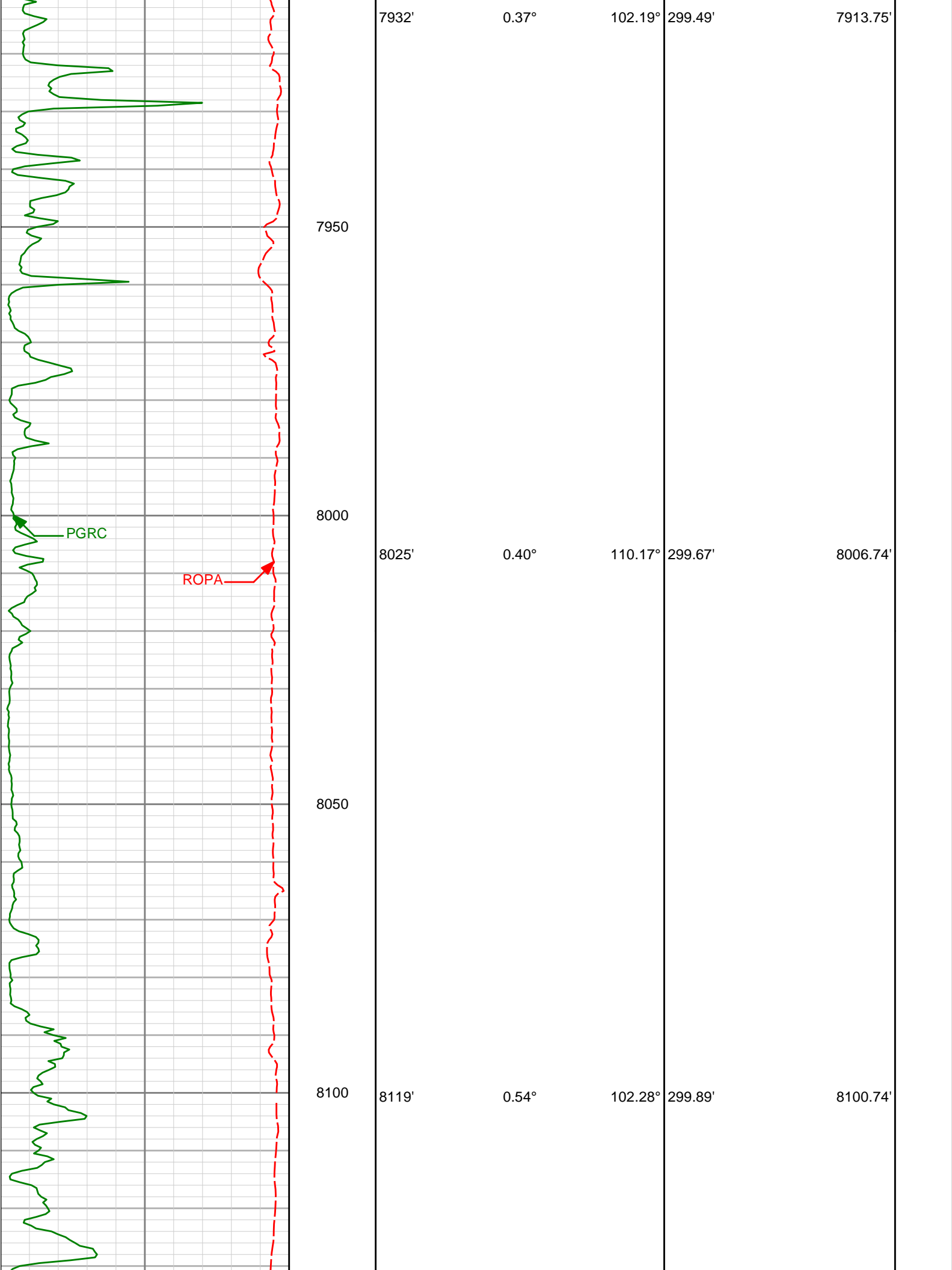
0.42°

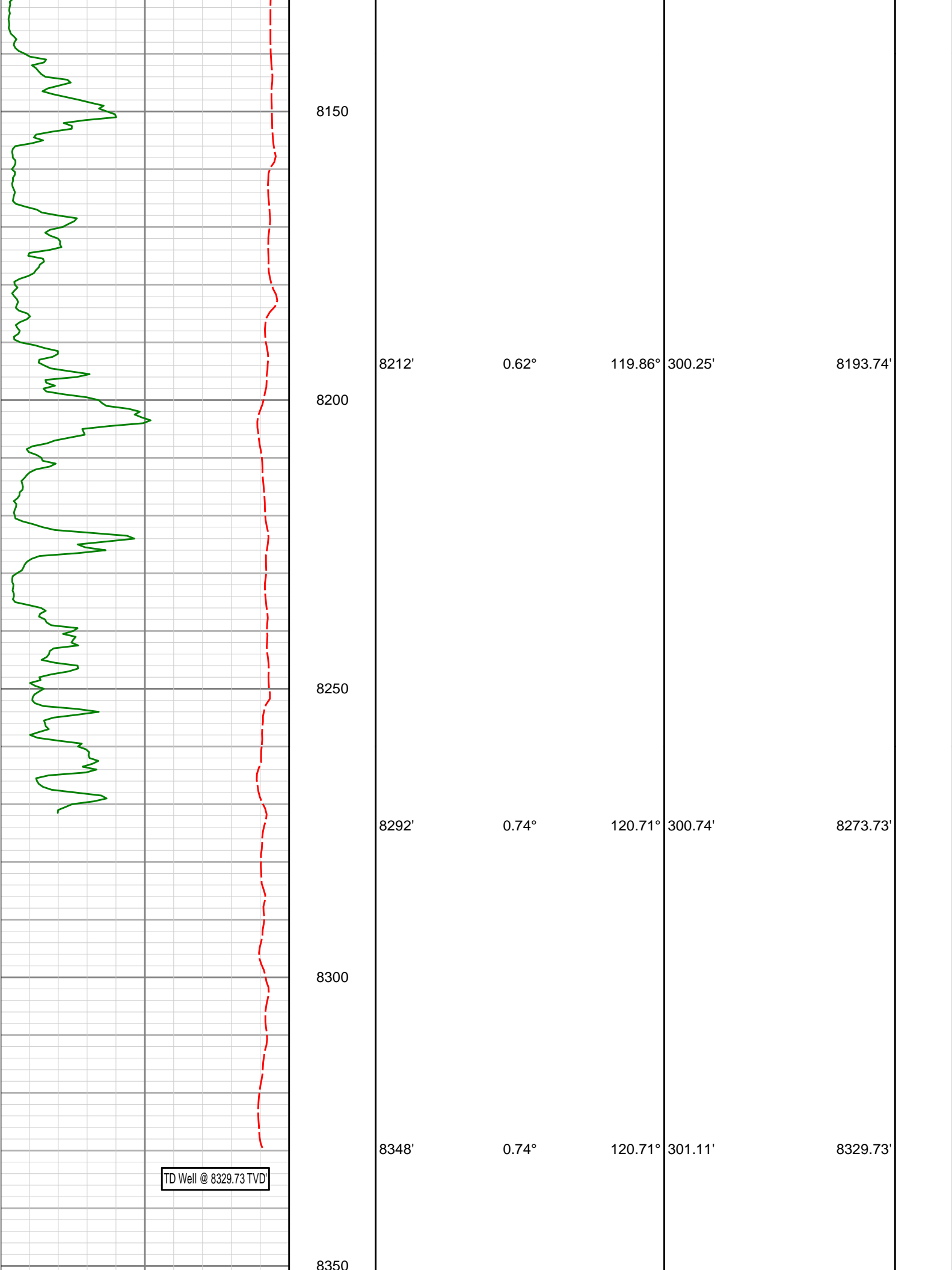
93.88°


299.55'

7633.76'







		<div>2400</div>			
<div> <div>Avg Rate of Penetration feet per hr</div> <div>5000</div> </div>		<div>TVD ft</div>	<div>Depth</div>	<div>Inc</div>	<div>Azi</div>
<div> <div>PCG Gamma Ray BCorr (PGRC) api</div> <div>0300</div> </div>			<div>Vertical Section</div> <div>TVD</div>		

**HALLIBURTON**

## DIRECTIONAL SURVEY REPORT

Whiting  
Horsetail 19N-1924M-R  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0901903909

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
237.00	0.46	301.54	237.00	0.50 N	0.81 W	-0.51	0.19
328.00	0.41	291.72	327.99	0.81 N	1.42 W	-0.83	0.10
421.00	0.31	336.72	420.99	1.16 N	1.83 W	-1.19	0.31
513.00	0.48	359.44	512.99	1.78 N	1.94 W	-1.80	0.25
976.00	0.66	296.39	975.97	4.90 N	4.34 W	-4.96	0.13
1346.00	0.90	295.55	1345.94	7.10 N	8.87 W	-7.21	0.06
1554.00	1.29	317.13	1553.90	9.52 N	11.94 W	-9.67	0.27
1623.00	1.34	323.42	1622.88	10.74 N	12.95 W	-10.90	0.22
1716.00	0.55	191.78	1715.87	11.18 N	13.69 W	-11.35	1.89
1808.00	1.73	159.56	1807.85	9.44 N	13.29 W	-9.61	1.41
1899.00	3.52	167.01	1898.76	5.43 N	12.19 W	-5.59	2.00
1990.00	5.18	174.24	1989.49	1.38 S	11.15 W	1.23	1.92
2083.00	7.49	175.66	2081.92	11.60 S	10.27 W	11.47	2.49
2176.00	6.69	174.89	2174.21	23.04 S	9.32 W	22.92	0.87
2267.00	5.75	172.75	2264.67	32.84 S	8.28 W	32.73	1.06
2360.00	6.32	178.92	2357.15	42.58 S	7.59 W	42.48	0.93
2452.00	7.61	188.90	2448.48	53.66 S	8.44 W	53.55	1.92
2545.00	7.26	186.89	2540.69	65.58 S	10.10 W	65.45	0.47
2637.00	7.51	182.42	2631.93	77.36 S	11.05 W	77.21	0.68
2729.00	6.84	182.12	2723.21	88.84 S	11.51 W	88.69	0.73
2822.00	7.18	181.25	2815.52	100.18 S	11.84 W	100.03	0.38
2914.00	6.48	180.70	2906.86	111.12 S	12.03 W	110.96	0.76
3007.00	6.40	171.46	2999.28	121.50 S	11.32 W	121.34	1.12
3099.00	7.17	177.92	3090.63	132.31 S	10.35 W	132.16	1.18
3191.00	7.78	178.66	3181.85	144.27 S	10.00 W	144.13	0.67
3282.00	7.63	177.46	3272.03	156.46 S	9.58 W	156.33	0.24
3375.00	7.64	177.62	3364.21	168.81 S	9.05 W	168.68	0.03

3468.00	8.00	177.76	3456.34	181.45 S	8.54 W	181.33	0.39
3560.00	7.37	177.94	3547.51	193.74 S	8.08 W	193.63	0.69
3653.00	6.19	179.67	3639.86	204.72 S	7.84 W	204.60	1.29
3746.00	5.23	170.38	3732.40	213.91 S	7.10 W	213.81	1.43
3837.00	5.12	168.35	3823.03	221.98 S	5.59 W	221.89	0.23
3930.00	7.63	172.49	3915.45	232.17 S	3.94 W	232.10	2.74
4023.00	7.44	172.76	4007.65	244.26 S	2.38 W	244.21	0.21
4115.00	7.42	180.89	4098.88	256.11 S	1.72 W	256.07	1.14
4207.00	6.61	182.26	4190.19	267.34 S	2.02 W	267.29	0.90
4299.00	5.83	184.08	4281.64	277.29 S	2.56 W	277.24	0.87
4391.00	5.15	189.40	4373.22	286.03 S	3.57 W	285.96	0.92
4485.00	3.24	182.38	4466.97	292.84 S	4.37 W	292.76	2.10
4577.00	1.51	185.19	4558.88	296.65 S	4.59 W	296.57	1.88
4669.00	0.10	158.39	4650.87	297.93 S	4.67 W	297.85	1.55
4763.00	0.04	352.31	4744.87	297.97 S	4.64 W	297.89	0.15
4856.00	0.04	69.67	4837.87	297.93 S	4.61 W	297.85	0.05
4949.00	0.11	45.39	4930.87	297.86 S	4.52 W	297.78	0.08
5042.00	0.18	17.86	5023.87	297.66 S	4.41 W	297.57	0.10
5135.00	0.13	356.43	5116.87	297.41 S	4.37 W	297.33	0.08
5228.00	0.42	308.13	5209.87	297.10 S	4.65 W	297.01	0.37
5322.00	0.71	301.18	5303.87	296.58 S	5.42 W	296.49	0.32
5415.00	0.54	285.04	5396.86	296.17 S	6.33 W	296.06	0.26
5508.00	0.34	291.23	5489.86	295.96 S	7.01 W	295.84	0.22
5601.00	0.05	13.27	5582.86	295.82 S	7.26 W	295.70	0.36
5694.00	0.16	27.65	5675.86	295.66 S	7.19 W	295.55	0.12
5787.00	0.14	122.76	5768.86	295.61 S	7.04 W	295.49	0.24
5880.00	0.26	131.68	5861.86	295.81 S	6.78 W	295.70	0.13
5973.00	0.28	114.07	5954.86	296.04 S	6.42 W	295.94	0.09
6067.00	0.39	114.00	6048.85	296.27 S	5.92 W	296.17	0.12
6160.00	0.50	93.51	6141.85	296.42 S	5.22 W	296.33	0.21
6253.00	0.49	120.73	6234.85	296.65 S	4.47 W	296.57	0.25
6347.00	0.74	132.27	6328.84	297.26 S	3.68 W	297.19	0.30
6440.00	0.59	150.12	6421.84	298.08 S	3.00 W	298.02	0.27
6533.00	0.56	169.66	6514.83	298.94 S	2.68 W	298.88	0.21
6626.00	0.57	184.50	6607.83	299.85 S	2.63 W	299.79	0.16
6719.00	0.48	177.65	6700.82	300.70 S	2.65 W	300.64	0.12
6812.00	0.49	178.87	6793.82	301.49 S	2.63 W	301.43	0.02
6906.00	0.50	175.30	6887.82	302.30 S	2.59 W	302.24	0.03
6999.00	0.44	181.59	6980.81	303.06 S	2.56 W	303.00	0.08
7092.00	0.15	182.08	7073.81	303.54 S	2.58 W	303.48	0.31
7185.00	0.40	287.36	7166.81	303.56 S	2.89 W	303.50	0.50
7279.00	0.78	304.99	7260.81	303.10 S	3.73 W	303.03	0.44
7372.00	1.21	312.02	7353.79	302.08 S	4.98 W	301.99	0.48
7465.00	1.41	313.63	7446.77	300.63 S	6.54 W	300.52	0.22
7559.00	0.31	67.09	7540.76	299.73 S	7.14 W	299.62	1.66
7652.00	0.42	93.88	7633.76	299.66 S	6.57 W	299.55	0.22
7746.00	0.54	80.85	7727.75	299.61 S	5.79 W	299.51	0.17
7839.00	0.61	87.74	7820.75	299.52 S	4.86 W	299.44	0.11
7932.00	0.37	102.19	7913.75	299.57 S	4.07 W	299.49	0.29
8025.00	0.40	110.17	8006.74	299.74 S	3.47 W	299.67	0.07
8119.00	0.54	102.28	8100.74	299.95 S	2.73 W	299.89	0.16
8212.00	0.62	119.86	8193.74	300.29 S	1.87 W	300.25	0.21
8292.00	0.74	120.71	8273.73	300.77 S	1.05 W	300.74	0.15
8348.00	0.74	120.71	8329.73	301.14 S	0.42 W	301.11	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 179.27 DEGREES (TRUE)  
A TOTAL CORRECTION OF 7.57 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 8348.00 FEET  
IS 301.14 FEET ALONG 180.08 DEGREES (TRUE)

Surveys have been IFR Corrected  
Final Survey is Projected to TD

