

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

**1 : 600 / 1 : 240**

Country		: USA		<div>Company : Noble Energy</div> <div>Rig : H&amp;P 321</div> <div>Well : Wells Ranch AE30-65-1BHNB</div> <div>Field : Wattenburg</div> <div>Country : USA</div> <div>API Number : 05-123-38645</div>			
Field		: Wattenburg					
Location		: Lat: 40° 27' 20.66" North Long: 104° 21' 22.21" West					
Well		: Wells Ranch AE30-65-1BHNB					
Company		: Noble Energy					
Rig		: H&P 321		<div>Other Services</div> <div>Directional Drilling</div>			
LOCATION							
Latitude : 40° 27' 20.66" North Longitude : 104° 21' 22.21" West		UTM Easting = 3,318,297.740 ft UTM Northing = 1,410,919.330 ft					
Permanent Datum		: Ground Level		Elevation : 4757.00 ft		Elev. KB N/A	
Log Measured From		: Drill Floor		30.00 ft Above Permanent Datum		DF 4787.00 ft GL 4757.00 ft WD N/A	
Drilling Measured From		: Drill Floor		MD LOG			
Depth Logged		: 645.00 ft To 11,910.00 ft		Unit No. : 11210424		Job No. :CA-XX-0901176445	
Date Logged		: 02-Apr-14 To 08-Apr-14		Plot Type : Final			
Total Depth MD		: 11,910.00 ft TVD : 6,523.08 ft		Plot Date : 08-Apr-14			
Spud Date		: 02-Apr-14					
Run No.		Borehole Record (MD)		Run No.		Borehole Record (MD)	
Size		From To		Size		From To	
100	8.750 in	636.00 ft	5,828.00 ft				
200	8.750 in	5,828.00 ft	6,889.00 ft				
300	6.125 in	6,889.00 ft	11,910.00 ft				
				Casing Record (MD)			
				Size		From To	
				9.625 in		34.90 lbpf SURFACE	
				7.000 in		26.00 lbpf SURFACE	

Max Tool Temp (degF) / Source	145.90 / PCM	162.80 / PCM	217.60 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ 145.90	N/A @ 162.80	N/A @ 217.60		
Lead MWD Engineer	Kyle Wass	Kyle Wass	Kyle Wass		
Customer Representative	Stetson Nielsen	Stetson Nielsen	Stetson Nielsen		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	245494	245494	11675316		
Insert Serial Number	11400842	11400842	11400842		
Date and Time Initialized	02-Apr-14 22:06	01-Jan-70 00:00	05-Apr-14 18:15		
Date and Time Read	05-Apr-14 10:33	05-Apr-14 10:31	08-Apr-14 12:07		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	57.00	54.00	63.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	245494	245494	11675316		
Sonde Serial Number	11478014	11478014	11478014		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	70.35	50.59	106.11		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	49.60	46.94	66.30		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	245494	245494	11675316		
Insert/Sonde Serial Number	11681051	11681051	11681051		

## REMARKS

1. All depths are calibrated to driller's pipe tally and are measured depth's from the Drill Floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Brigham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:
  - 1:600 Log  
PGRC (Gamma CG) and ROPA (Average Rate of Penetration)  
Interval Resolution: 1.0 ft  
Interval Distance: 3.0 ft
  - 1:240 Log  
PGRC (Gamma CG):  
Interval Resolution: 0.5 ft  
Interval Distance: 0.6 ft
  - ROPA (Average Rate Of Penetration):  
Interval Resolution: 0.5 ft

Interval Resolution: 1.2 ft

6. Insite Version v8.0.10

## WARRANTY

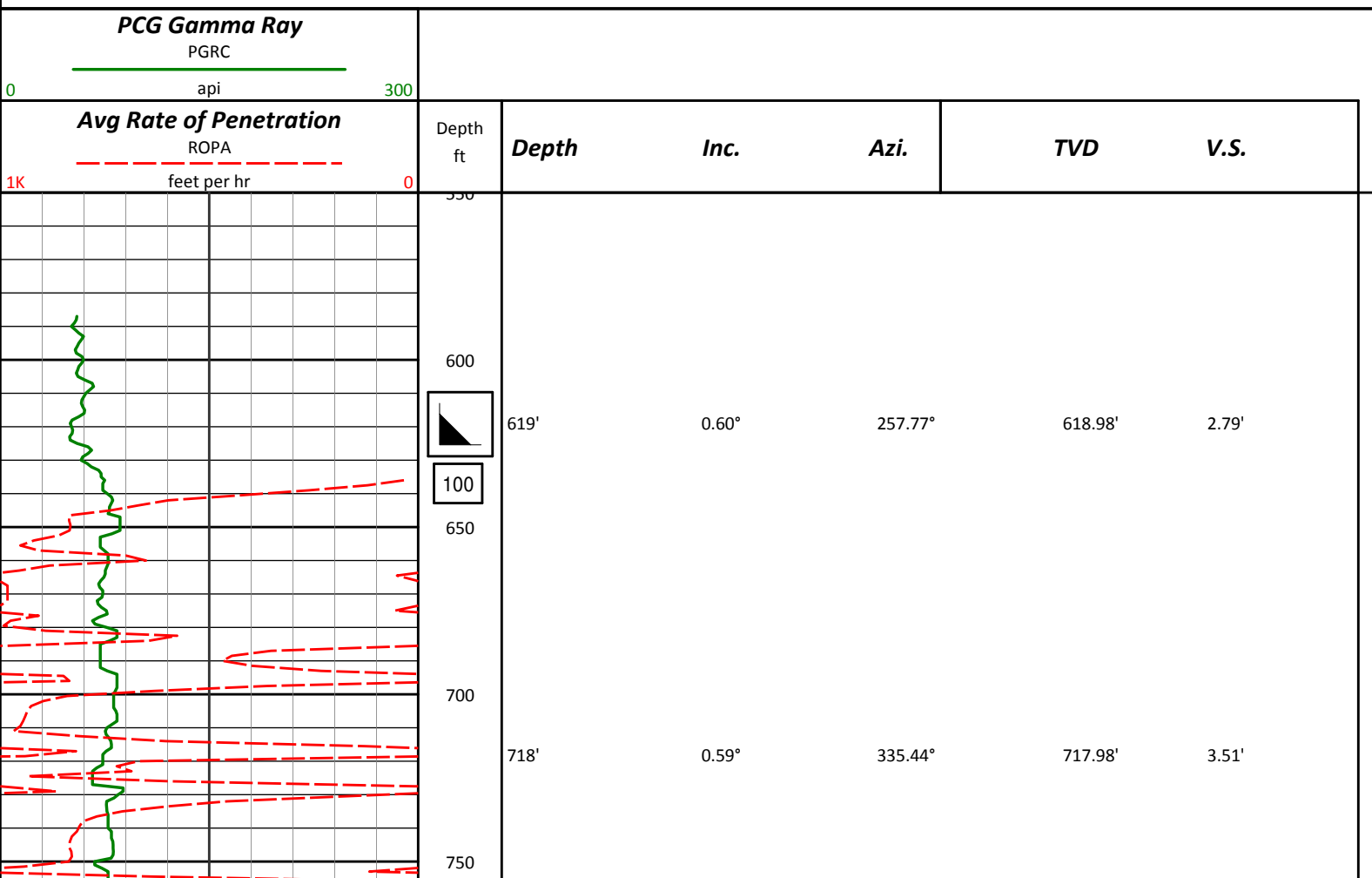
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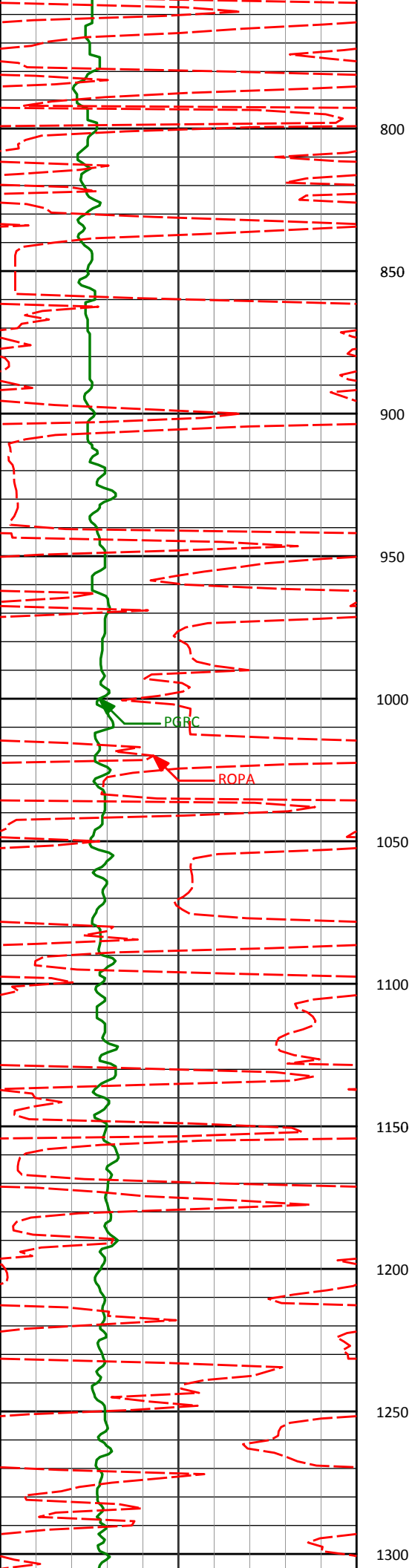
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## Sperry Drilling Services

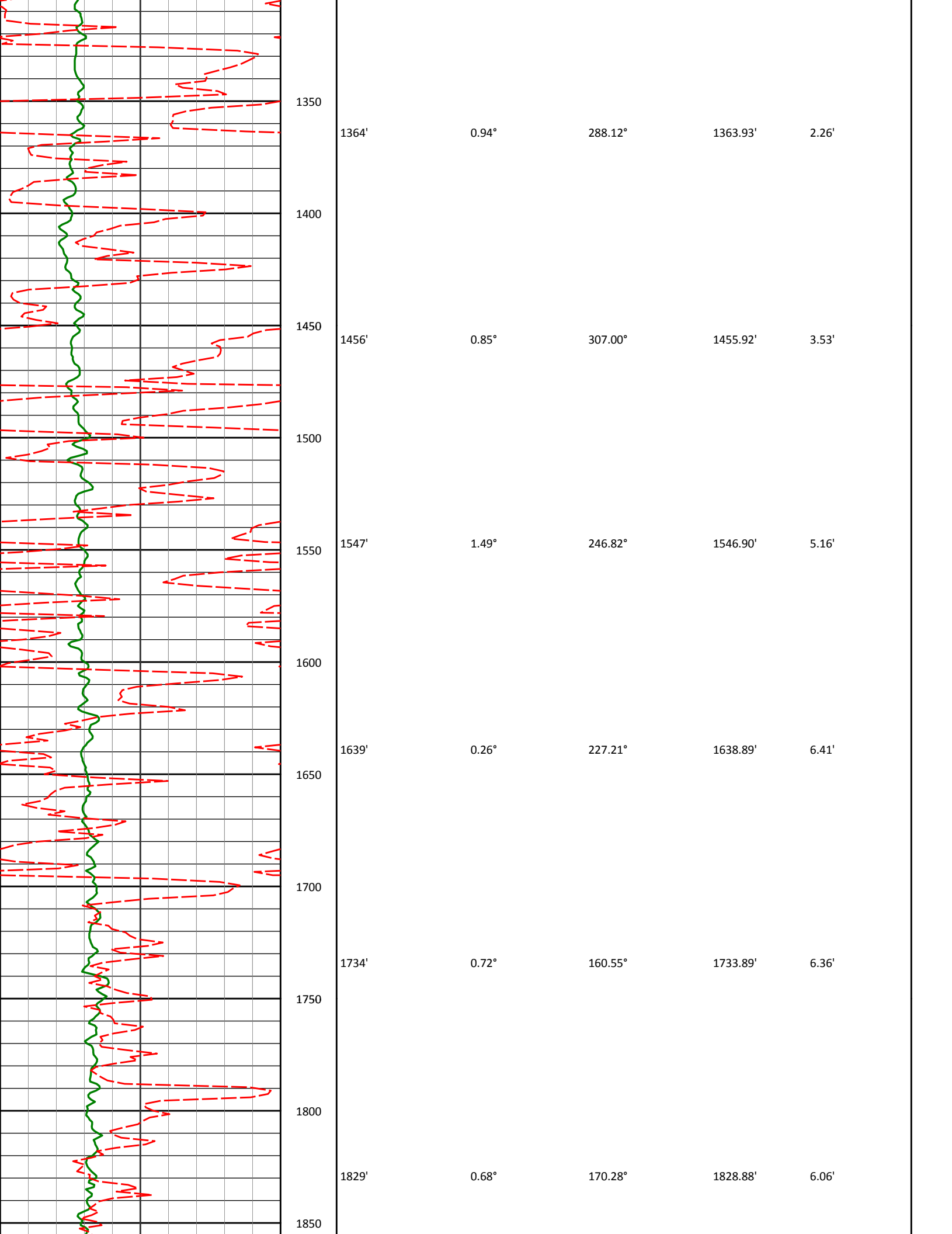
### MD Correlation Log 1:600

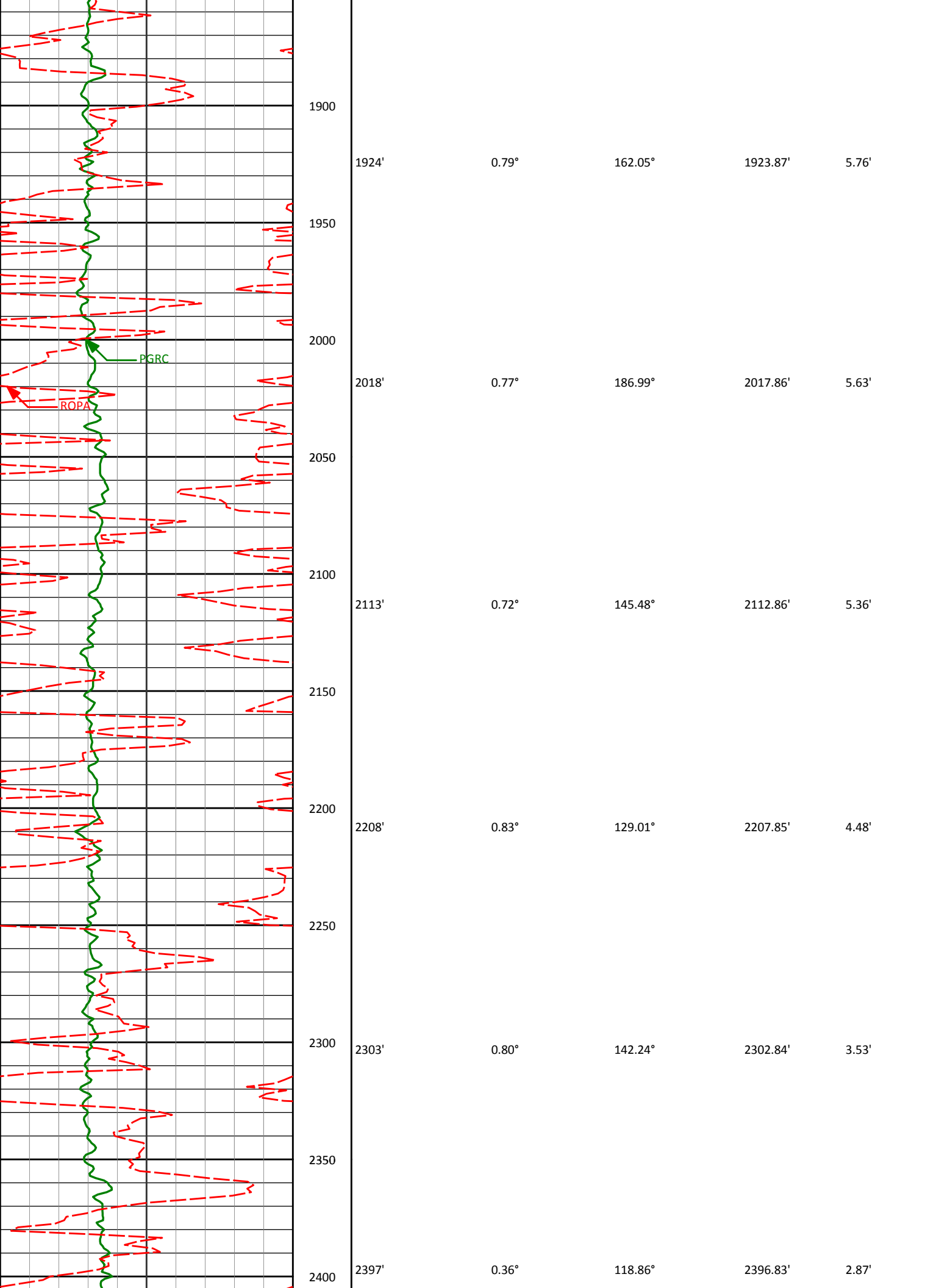
Noble Energy  
Wells Ranch AE30-65-1BHNB  
H&P 321  
Sec. 29-T6N-R62W

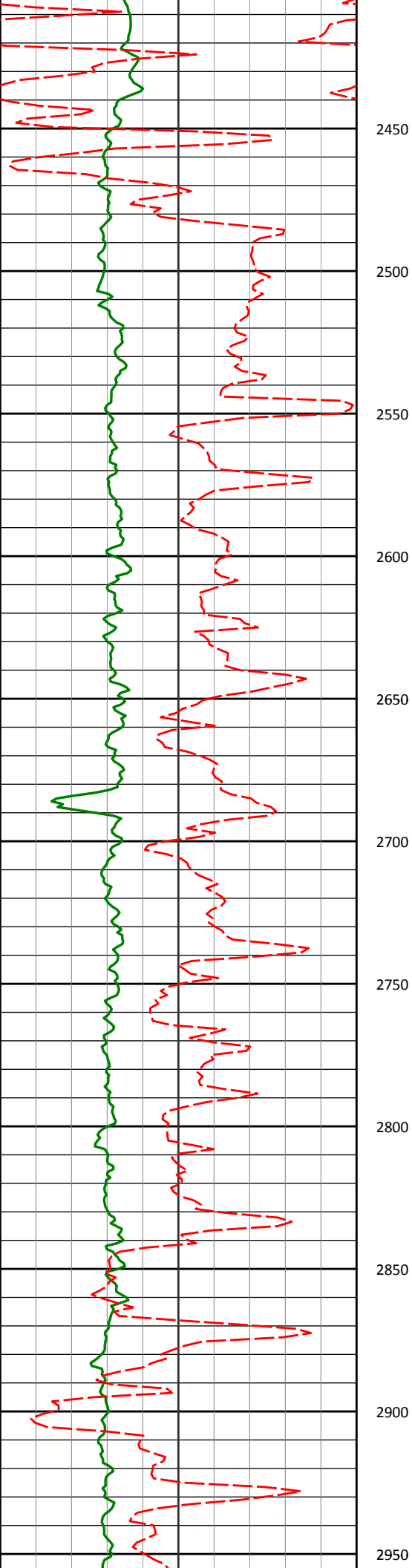




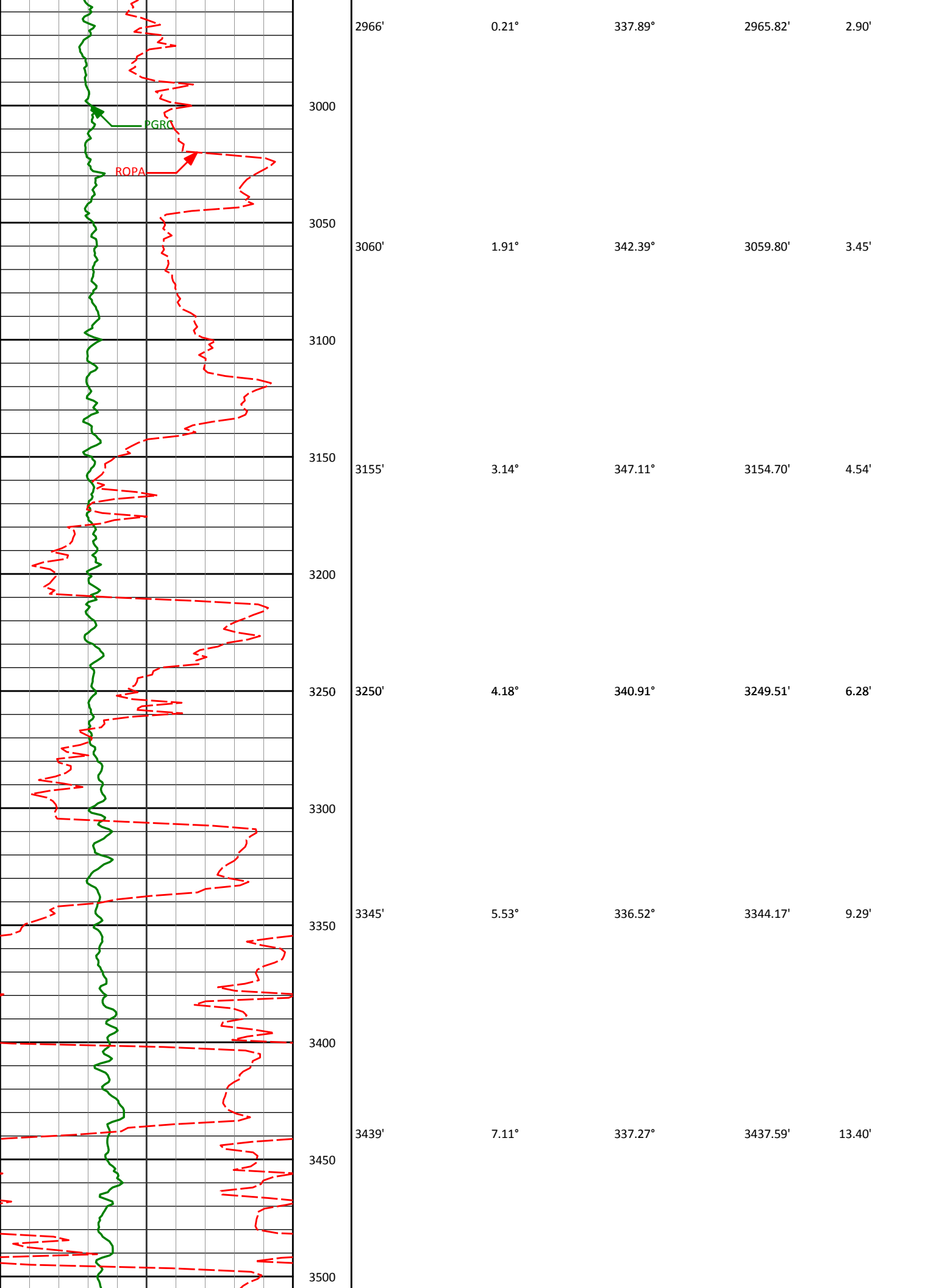
810'	0.47°	337.32°	809.97'	3.86'
850				
900				
950				
994'	0.43°	10.12°	993.97'	4.03'
1000				
1050				
1085'	0.80°	35.96°	1084.96'	3.61'
1100				
1150				
1178'	0.94°	31.76°	1177.95'	2.83'
1200				
1250				
1271'	0.99°	34.17°	1270.94'	1.99'
1300				



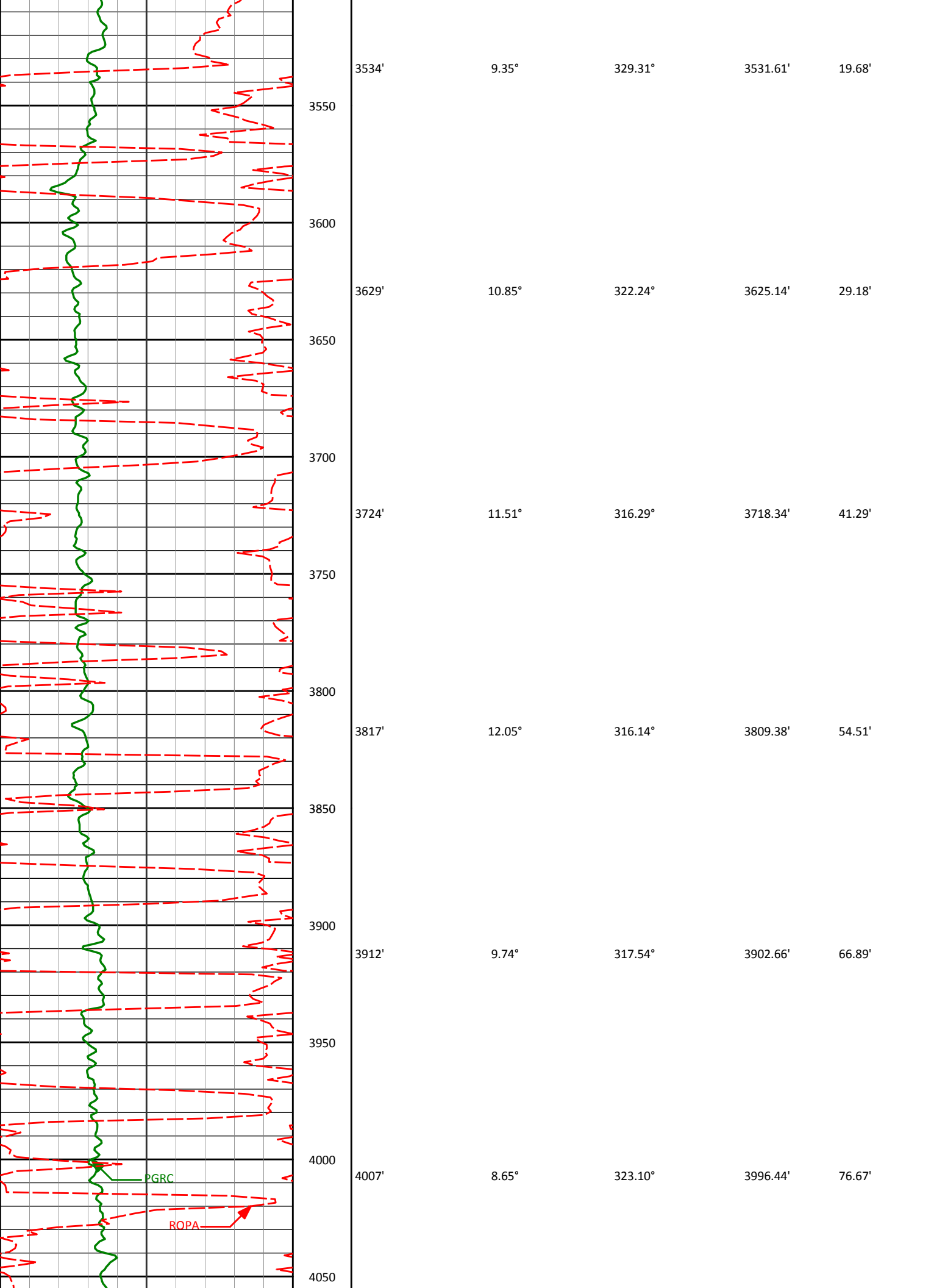


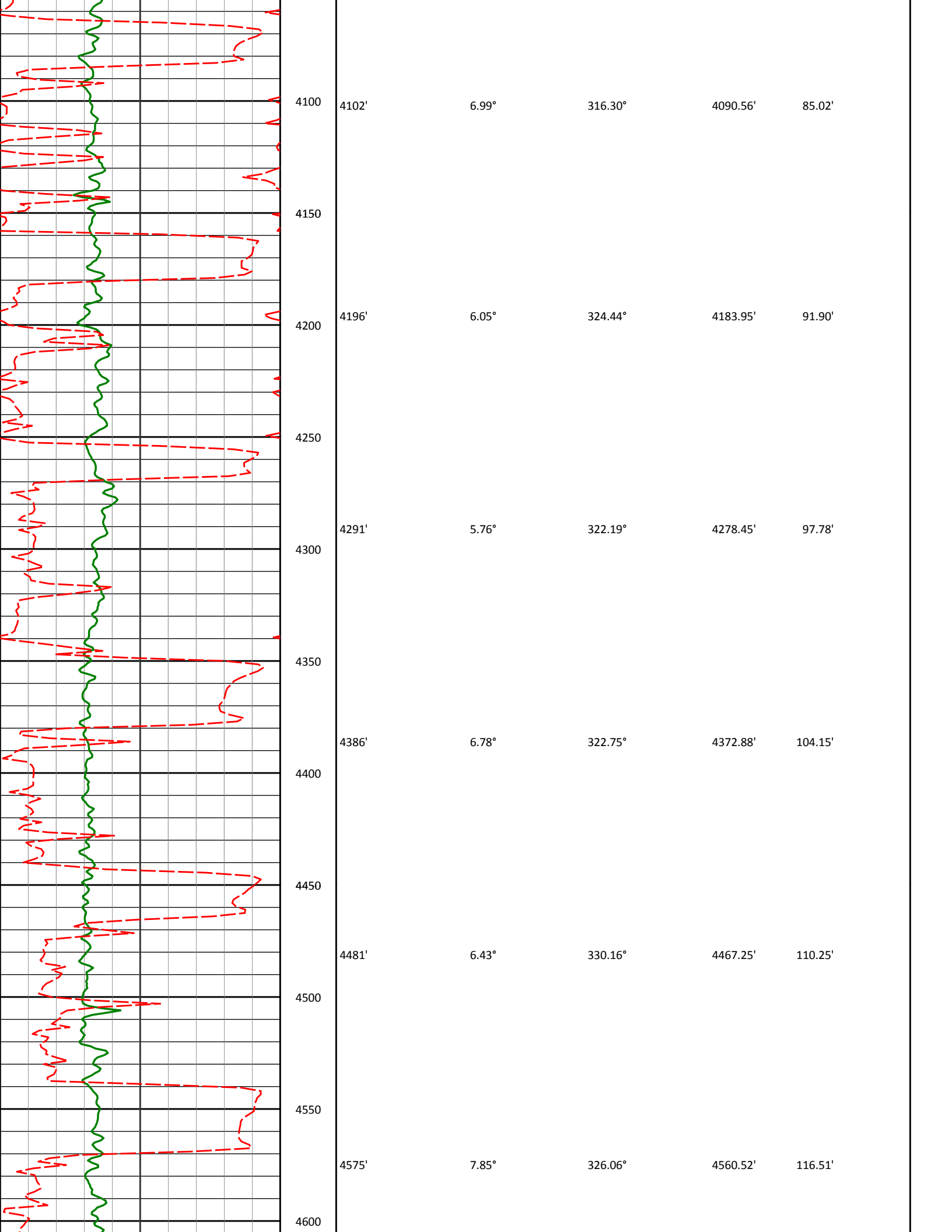


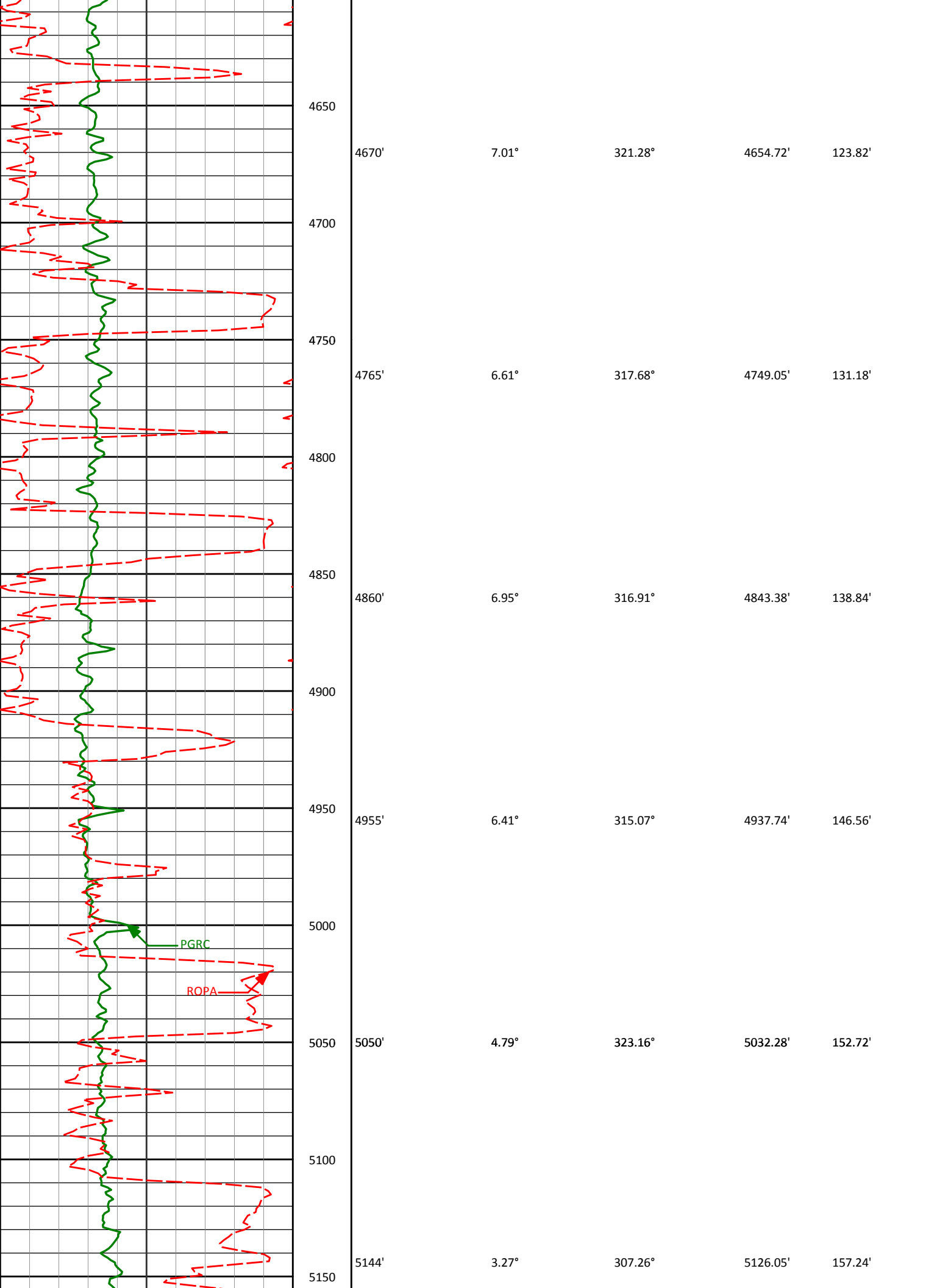
2492'	0.61°	151.69°	2491.83'	2.36'
2587'	0.49°	167.90°	2586.83'	2.03'
2681'	0.53°	171.20°	2680.82'	1.88'
2776'	0.36°	228.71°	2775.82'	2.03'
2871'	0.38°	292.82°	2870.82'	2.55'

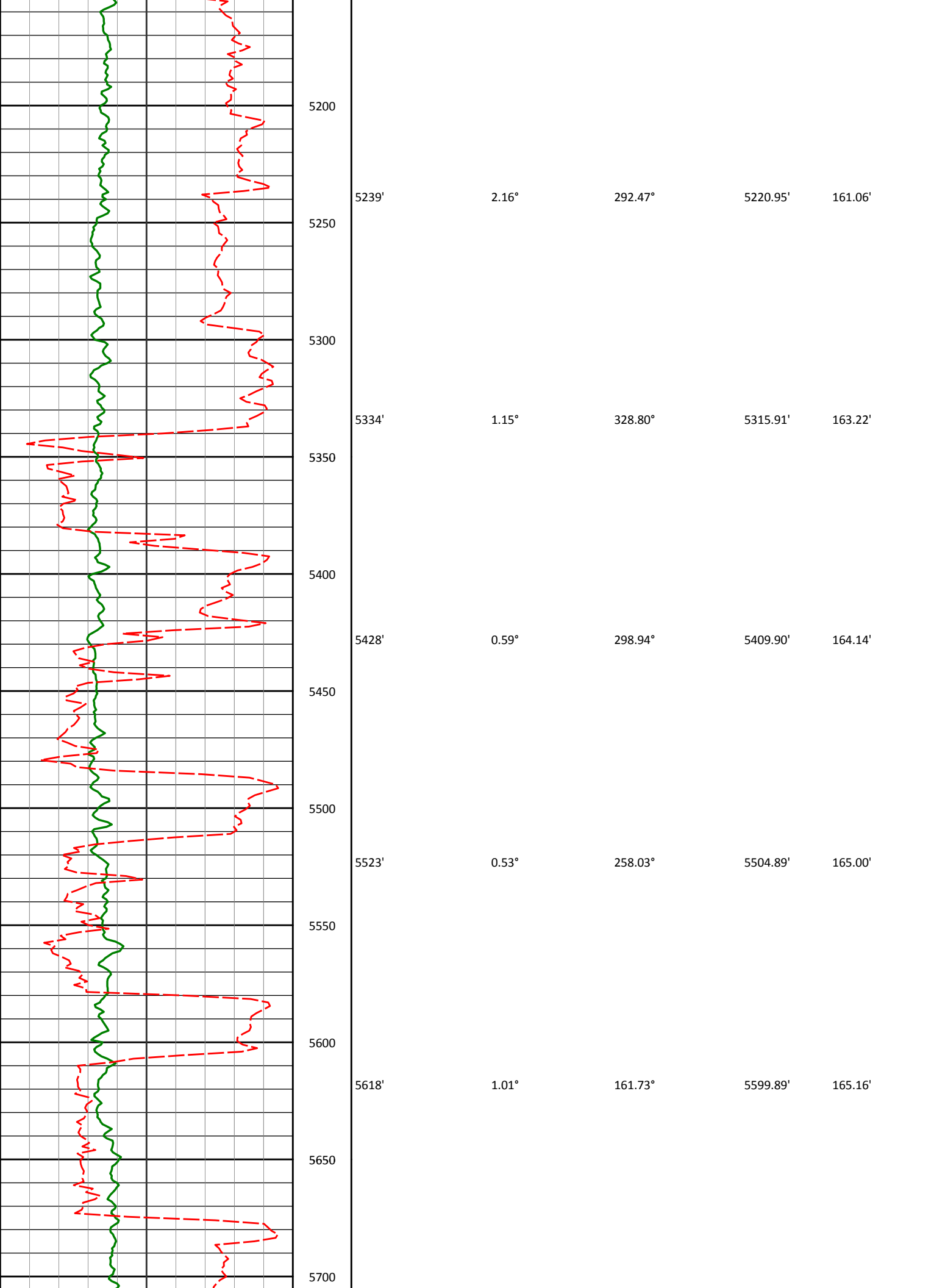


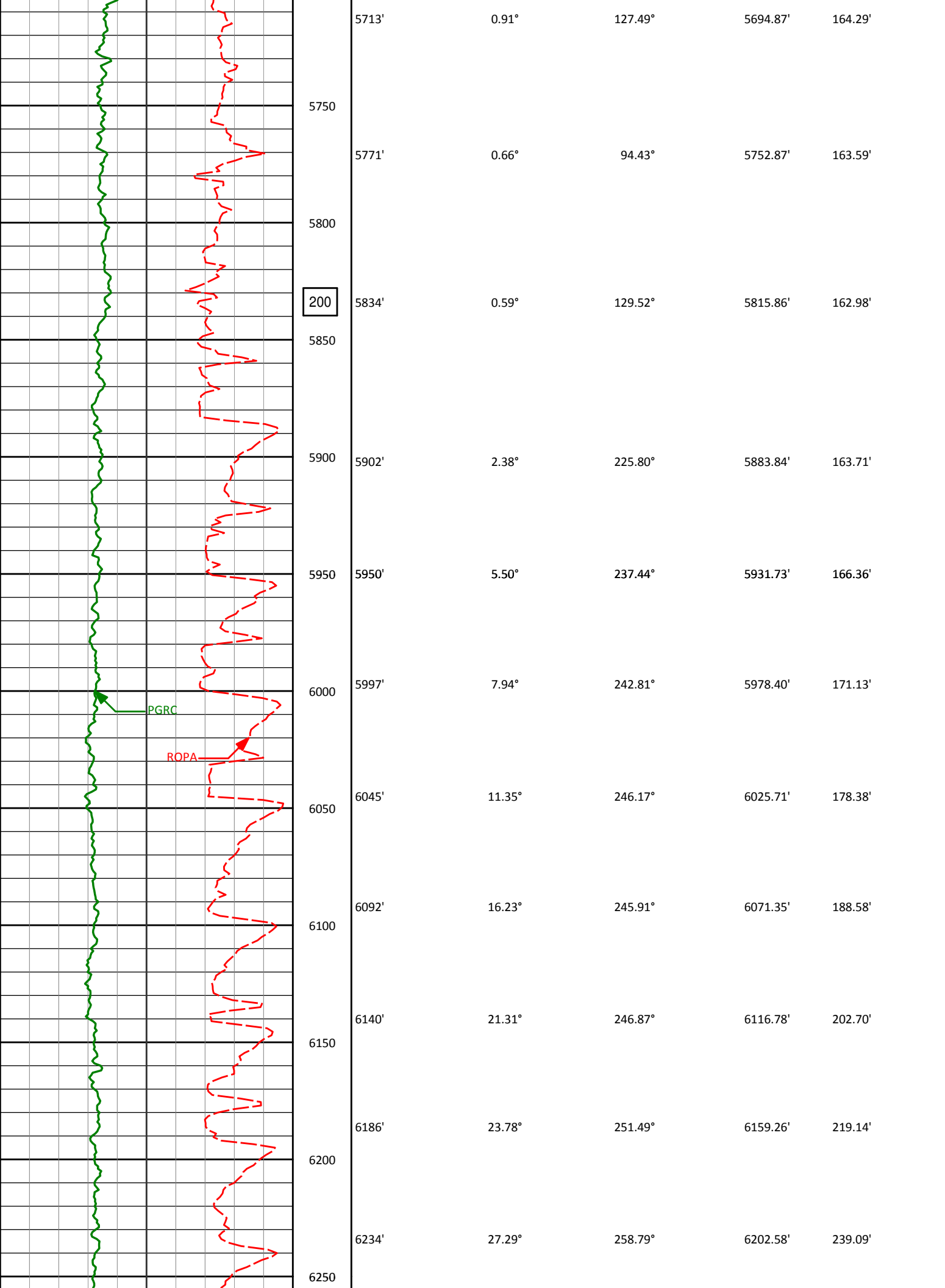


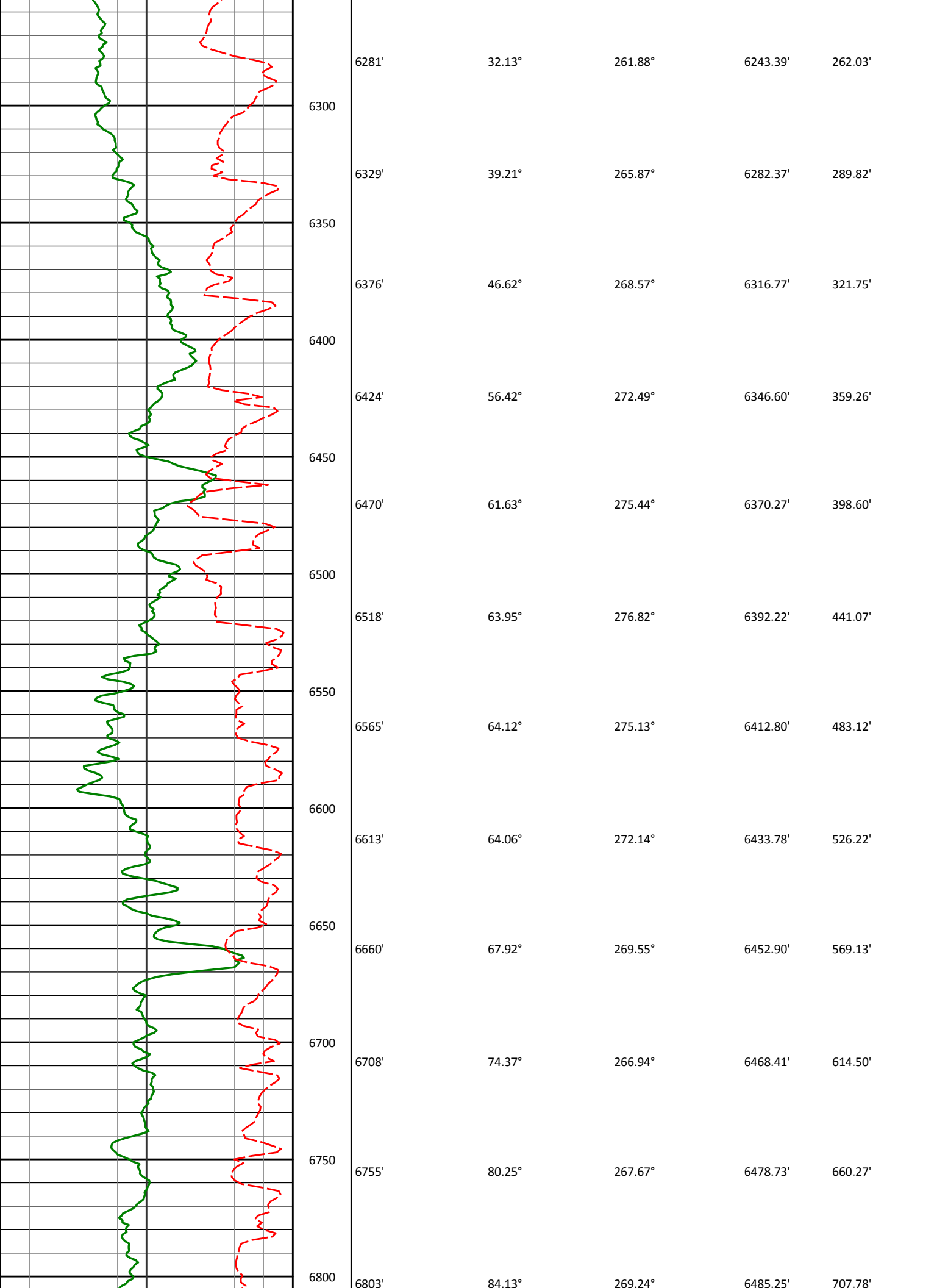


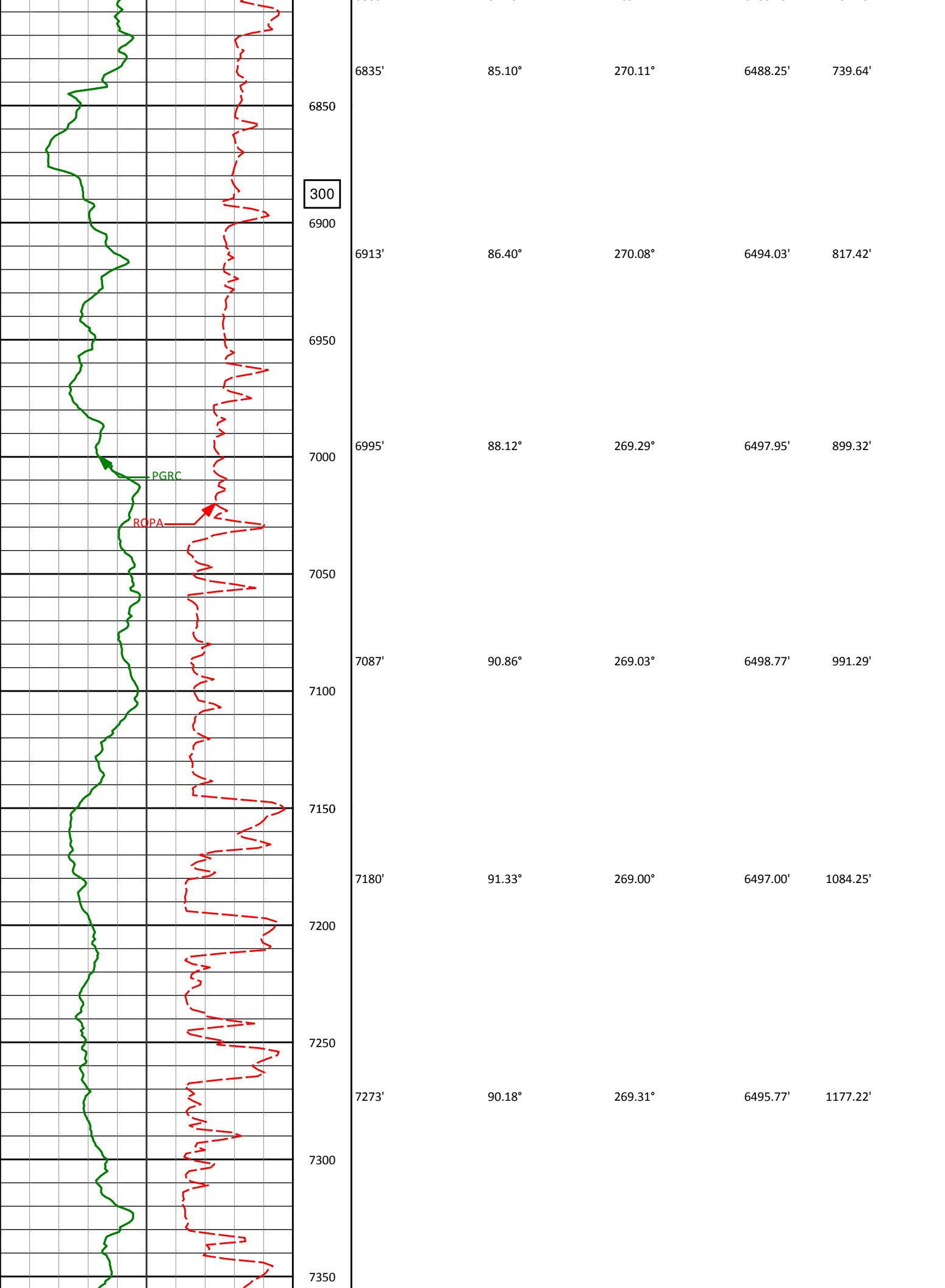


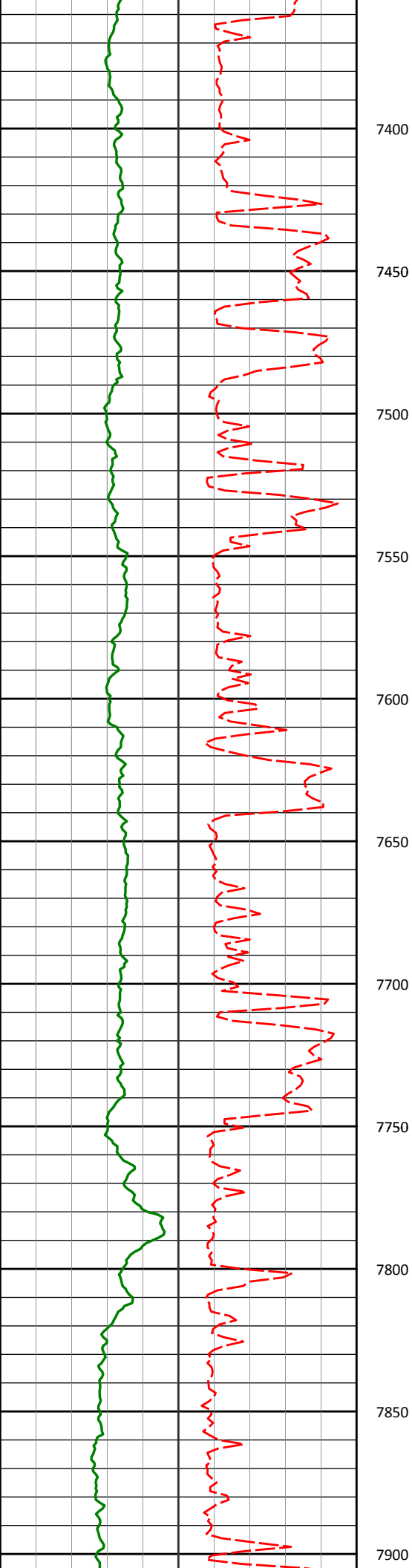






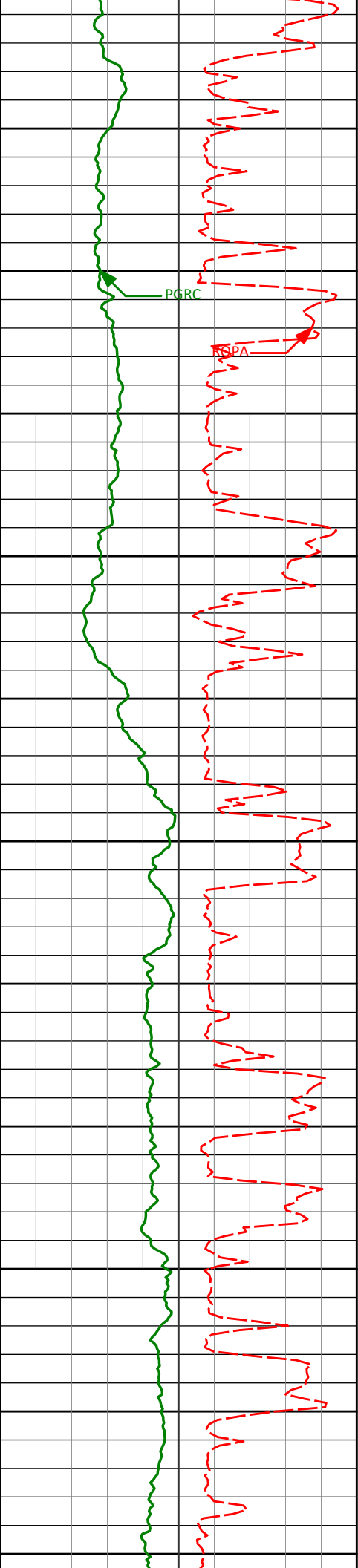




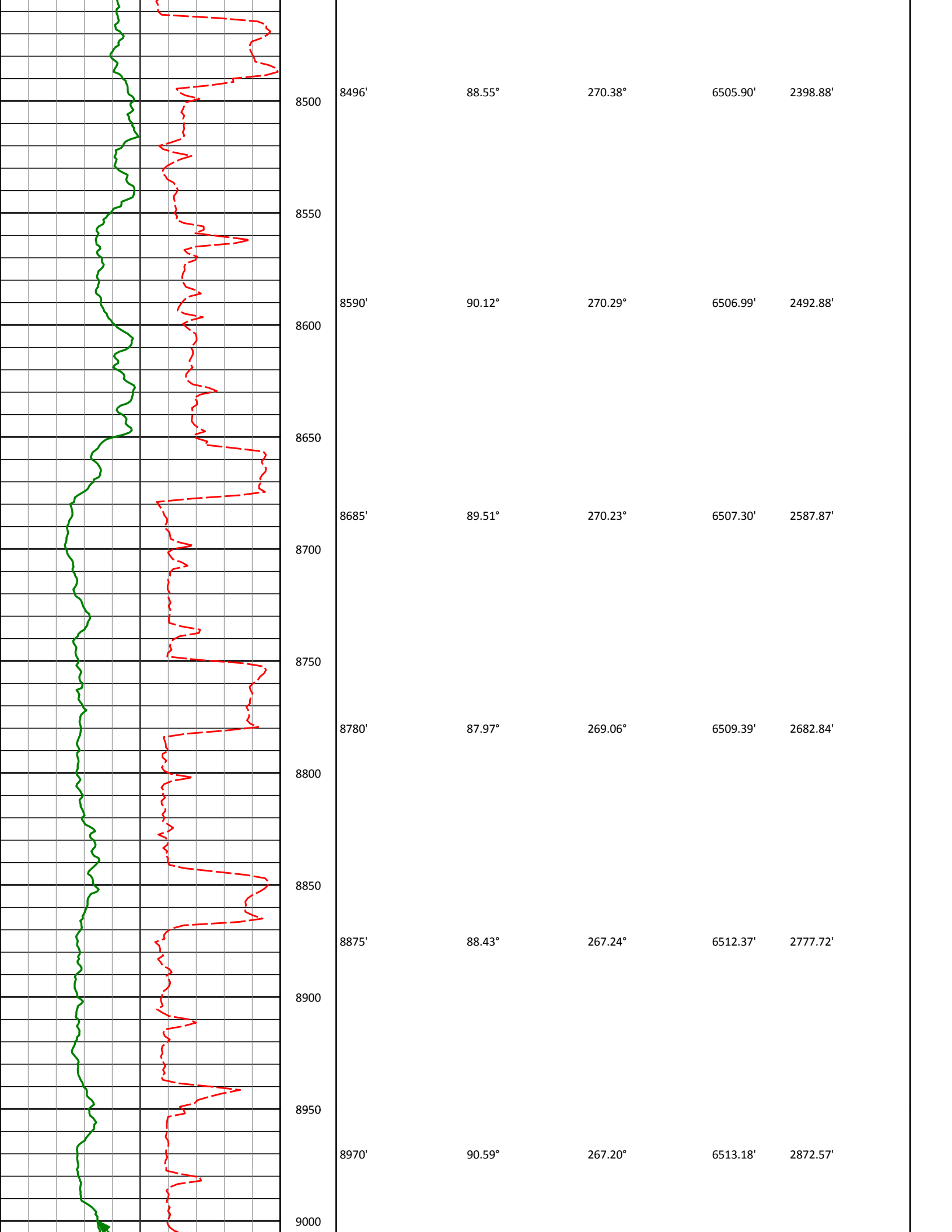


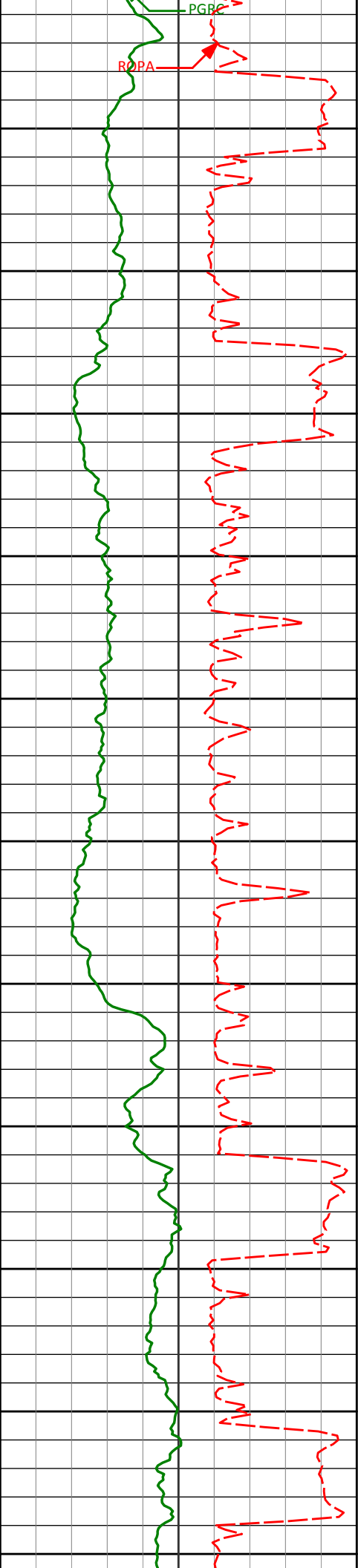
7365'	90.43°	269.42°	6495.28'	1269.20'
7400				
7450				
7457'	90.00°	268.25°	6494.94'	1361.17'
7500				
7550				
7549'	89.63°	268.61°	6495.23'	1453.11'
7600				
7643'	90.22°	268.85°	6495.35'	1547.07'
7650				
7700				
7738'	88.06°	266.65°	6496.78'	1641.96'
7750				
7800				
7832'	89.14°	266.49°	6499.08'	1735.72'
7850				
7900				



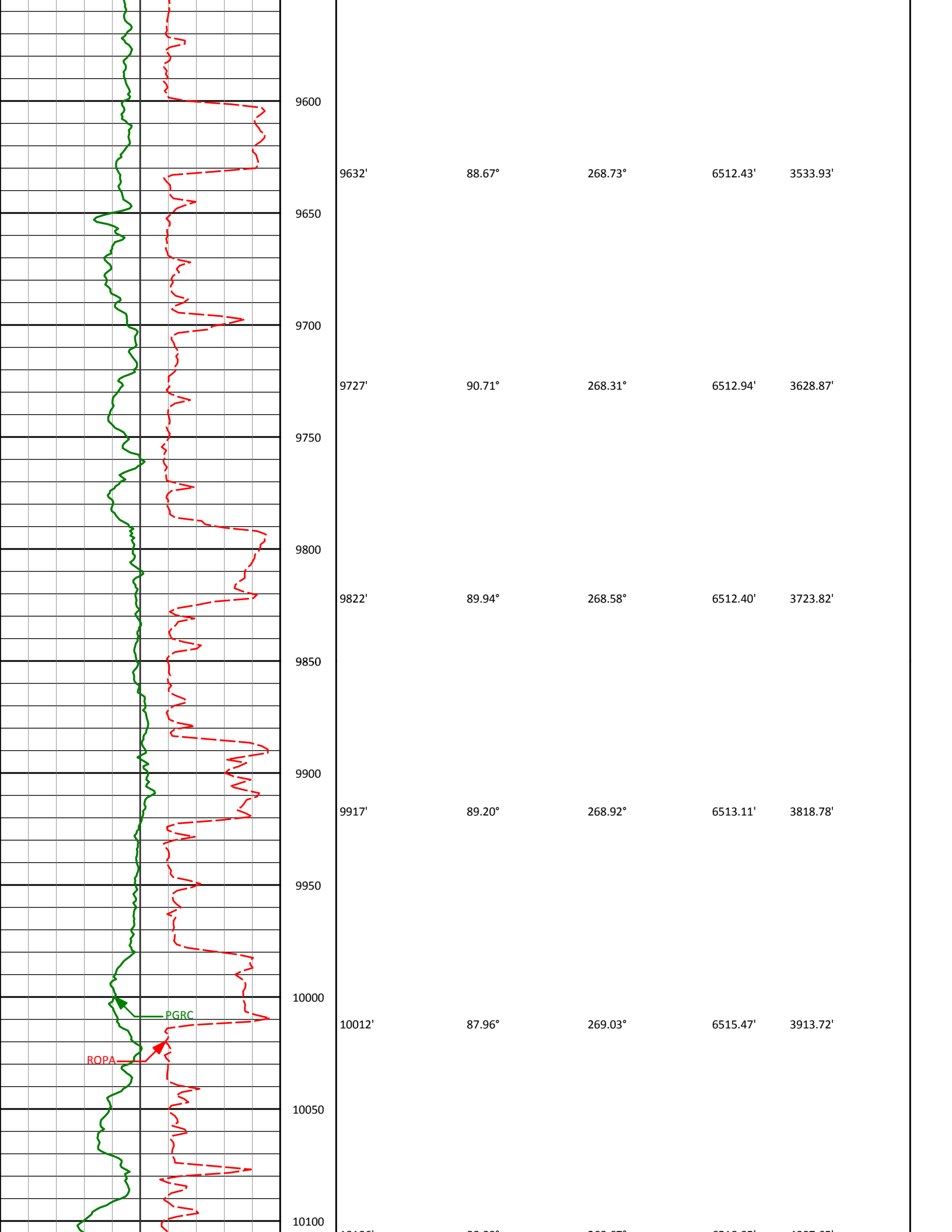


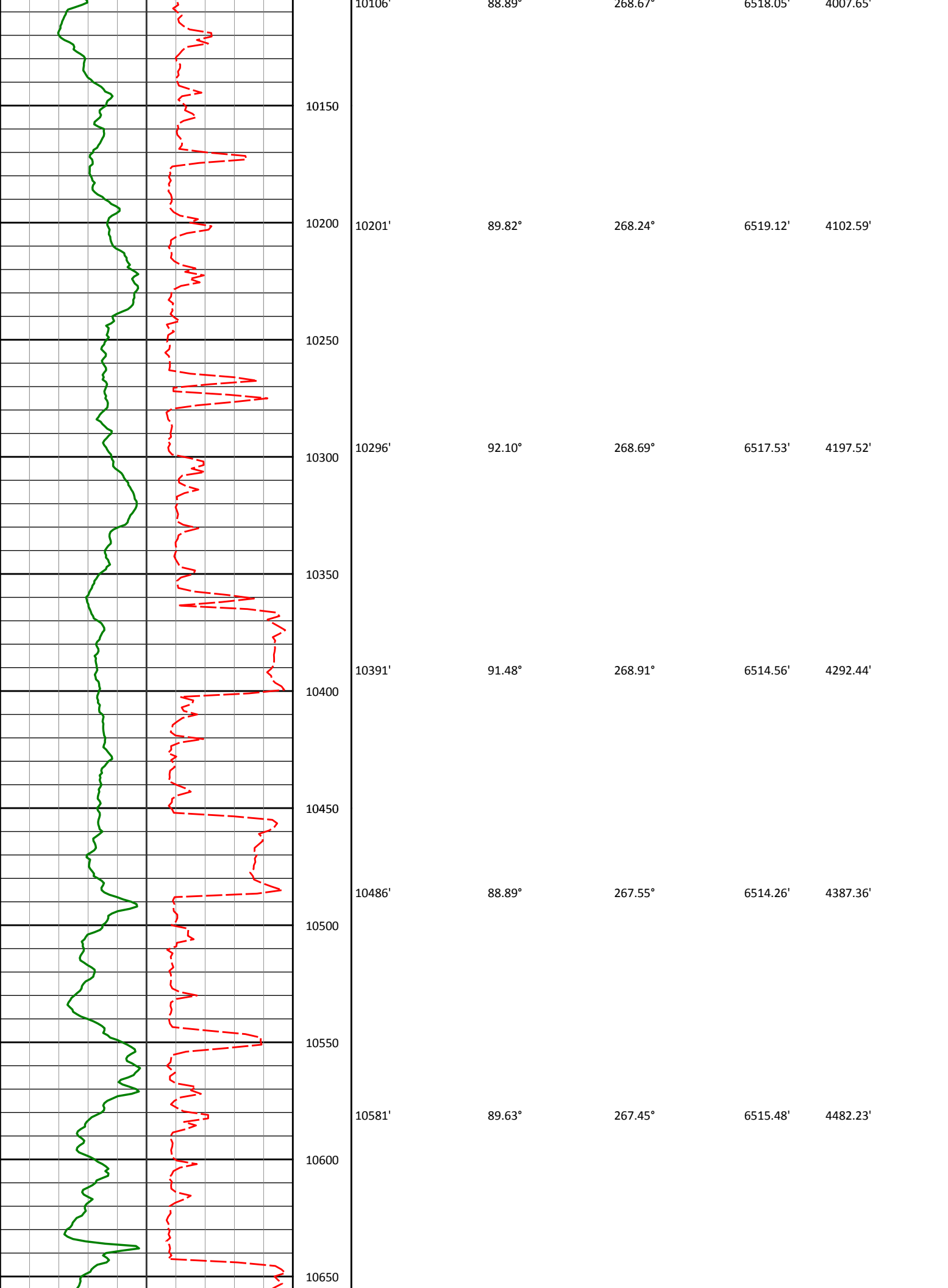
7927'	88.58°	265.89°	6500.97'	1830.45'
7950				
8000				
8022'	90.15°	267.13°	6502.02'	1925.23'
8050				
8100				
8117'	88.92°	266.93°	6502.79'	2020.06'
8150				
8200				
8211'	88.98°	268.21°	6504.51'	2113.93'
8250				
8300				
8306'	90.40°	269.75°	6505.03'	2208.90'
8350				
8400				
8401'	90.00°	269.88°	6504.70'	2303.90'
8450				

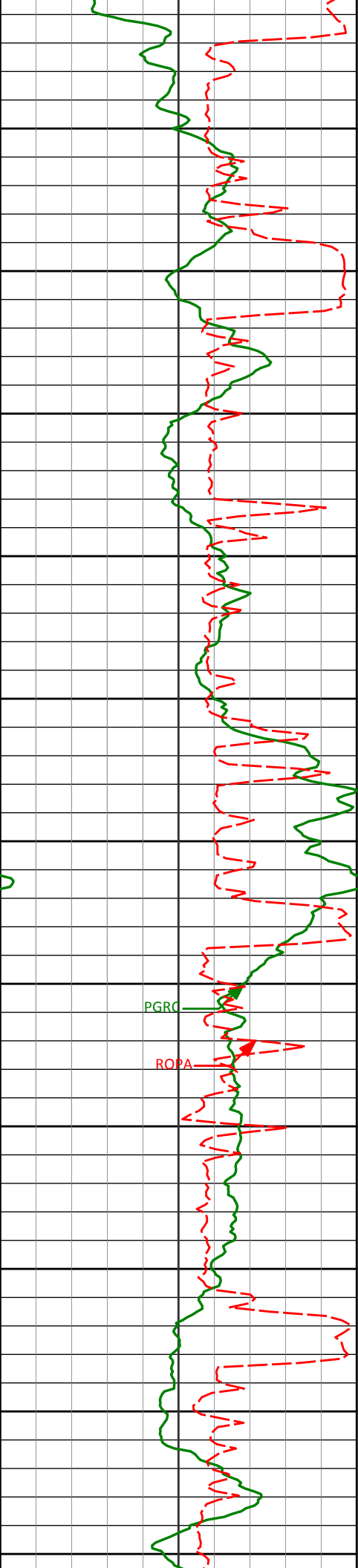




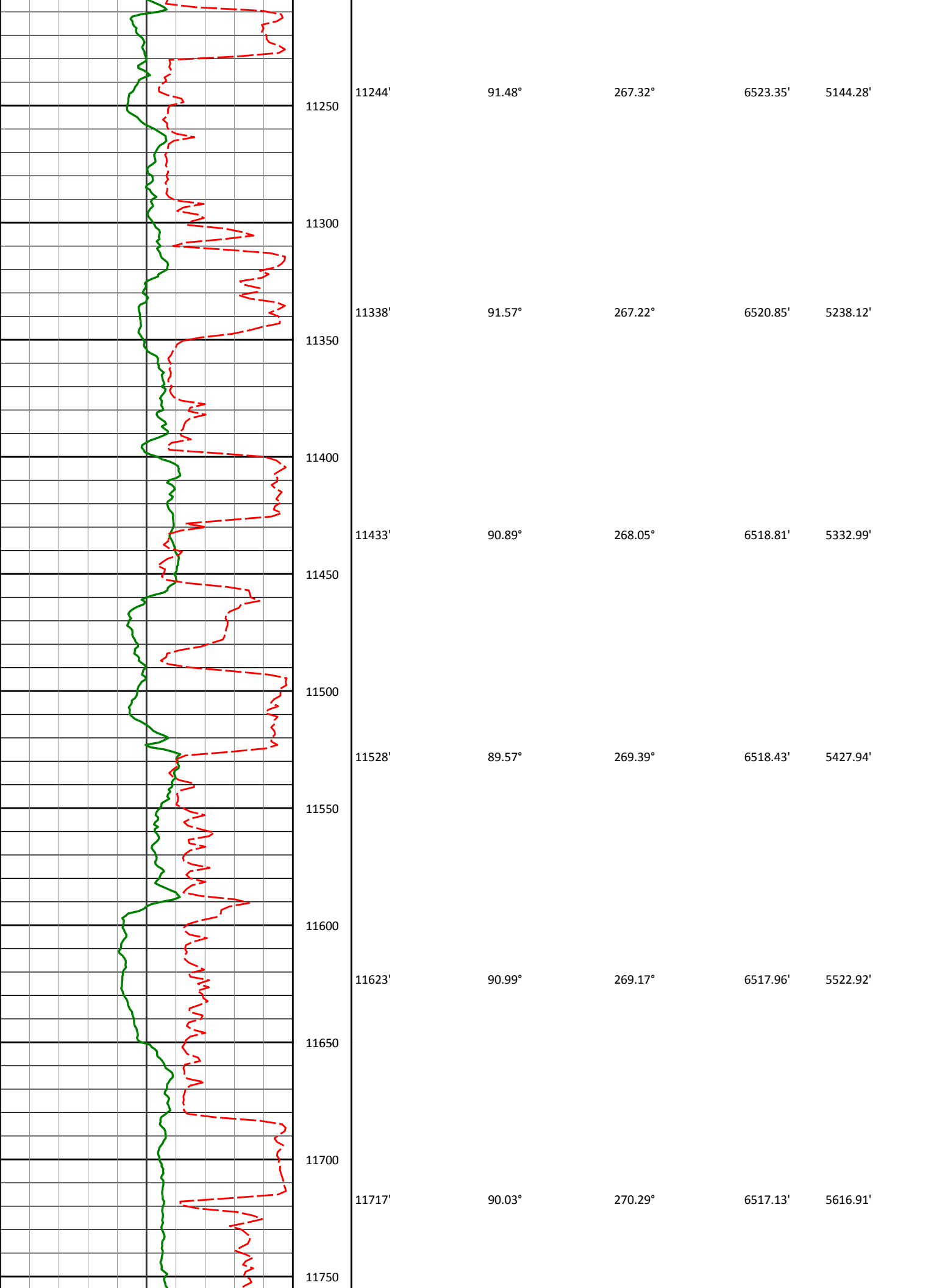
9050					
9064'	90.43°	267.91°	6512.35'	2966.45'	
9100					
9150	9159'	88.92°	268.31°	6512.88'	3061.37'
9200					
9250	9254'	89.94°	268.20°	6513.83'	3156.30'
9300					
9350	9348'	91.48°	267.34°	6512.67'	3250.20'
9400					
9450	9443'	90.43°	267.48°	6511.08'	3345.06'
9500					
9550	9538'	89.63°	268.58°	6511.03'	3439.98'

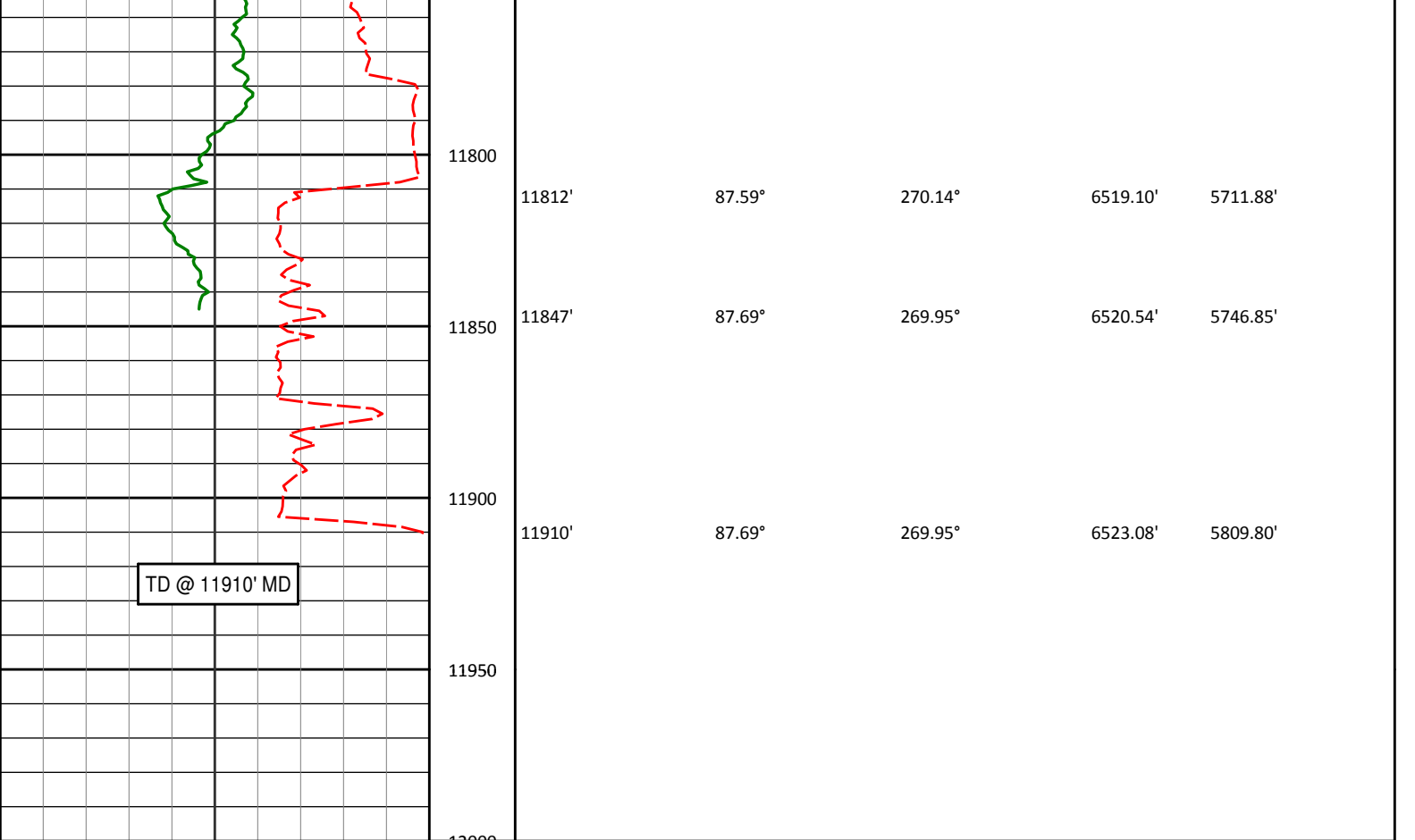






10676'	89.45°	268.82°	6516.25'	4577.16'
10700				
10750				
10771'	87.63°	268.57°	6518.67'	4672.08'
10800				
10850				
10865'	87.90°	267.96°	6522.33'	4765.95'
10900				
10950				
10960'	88.52°	267.46°	6525.30'	4860.80'
11000				
11050				
11054'	90.15°	266.57°	6526.39'	4954.63'
11100				
11150				
11149'	91.02°	267.13°	6525.42'	5049.45'
11200				





<div><div>Avg Rate of Penetration</div><div>ROPA</div><div>feet per hr</div></div>	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
<div><div>PCG Gamma Ray</div><div>PGRC</div><div>api</div></div>						

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Sperry Drilling Services

TVD Detail Log 1:240

Noble Energy

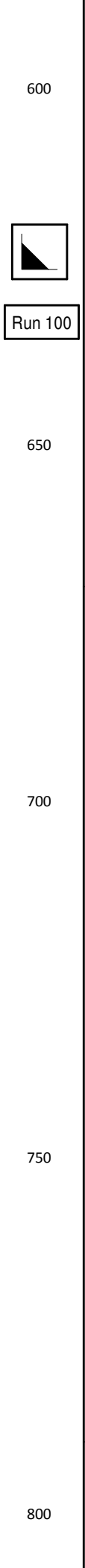
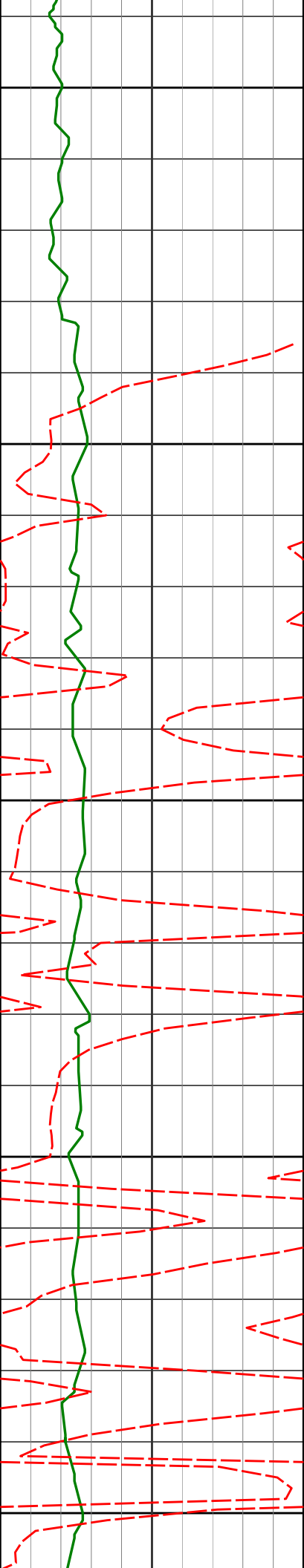
Wells Ranch AE30--65-1BHNB

H&P 321

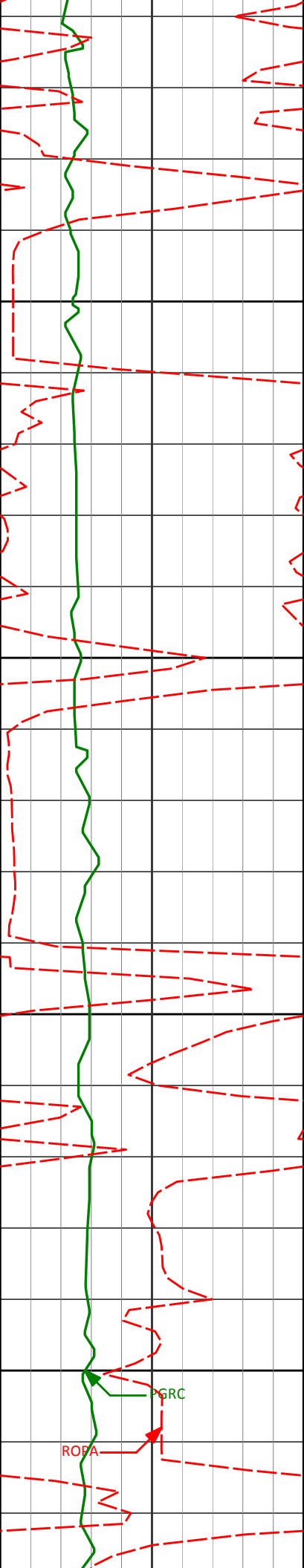
Sec. 29-T6N-R62W

<div><div>PCG Gamma Ray</div><div>PGRC</div><div>api</div></div>						
<div><div>Avg Rate of Penetration</div><div>ROPA</div><div>feet per hr</div></div>	Depth ft	Depth	Inc.	Azi.	TVD	V.S.





619'	0.60°	257.77°	618.98'	2.79'
718'	0.59°	335.44°	717.98'	3.51'



850

900

950

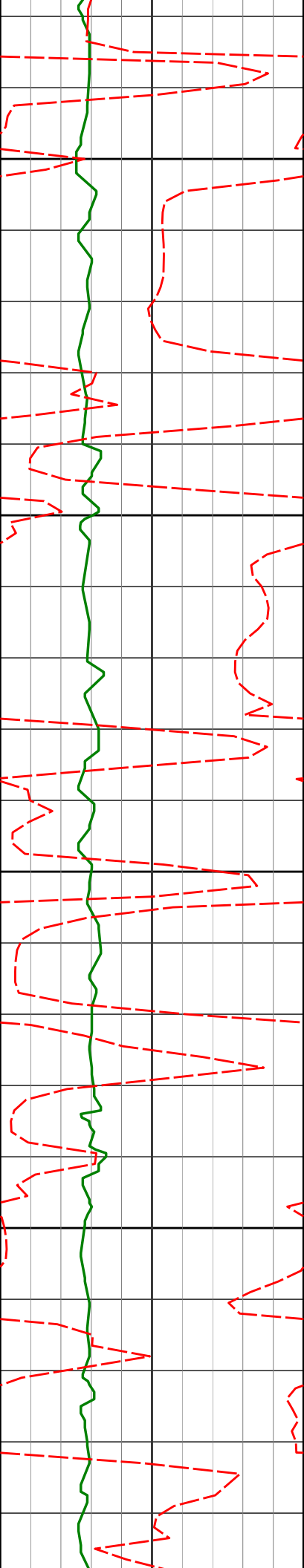
1000

810' 0.47° 337.32° 809.97' 3.86'

994' 0.43° 10.12° 993.97' 4.03'

PGRC

ROPA



1050

1085'

0.80°

35.96°

1084.96'

3.61'

1100

1150

1178'

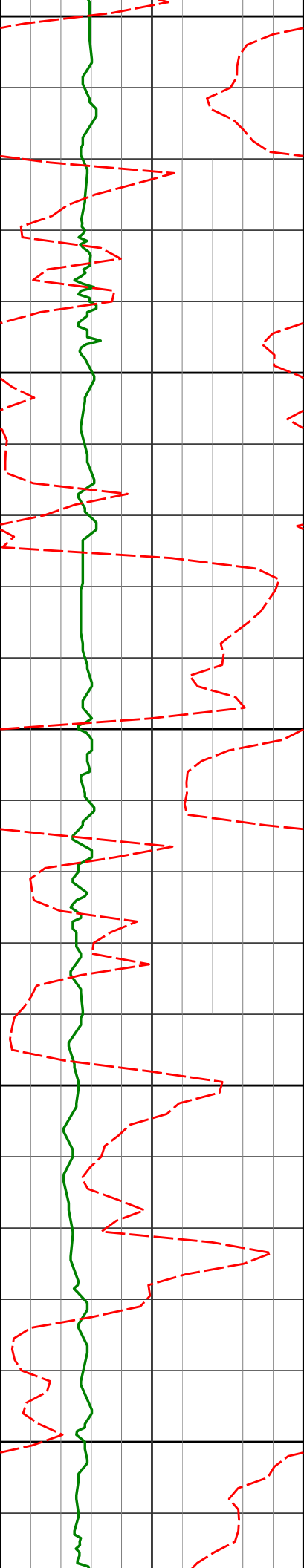
0.94°

31.76°

1177.95'

2.83'

1200



1250

1271'

0.99°

34.17°

1270.94'

1.99'

1300

1350

1364'

0.94°

288.12°

1363.93'

2.26'

1400

1450

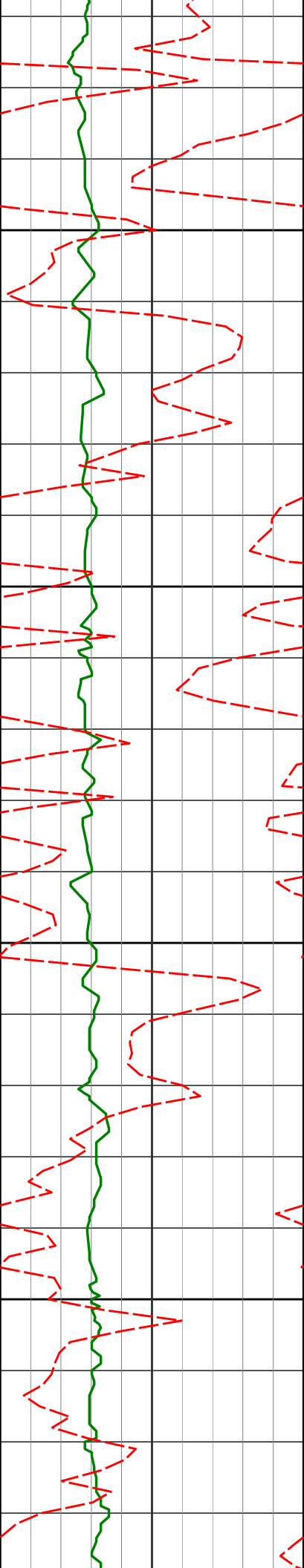
1456'

0.85°

307.00°

1455.92'

3.53'



1500

1550

1600

1650

1547'

1.49°

246.82°

1546.90'

5.16'

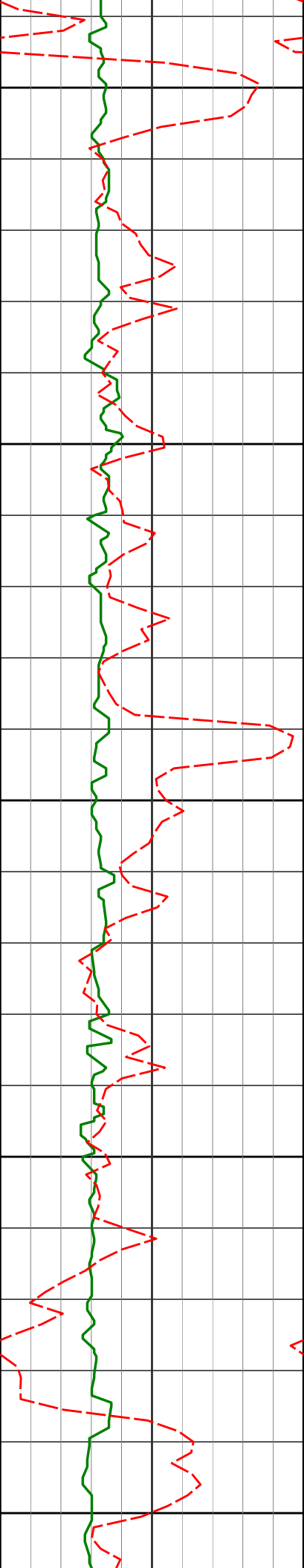
1639'

0.26°

227.21°

1638.89'

6.41'



1700

1734'

0.72°

160.55°

1733.89'

6.36'

1750

1800

1829'

0.68°

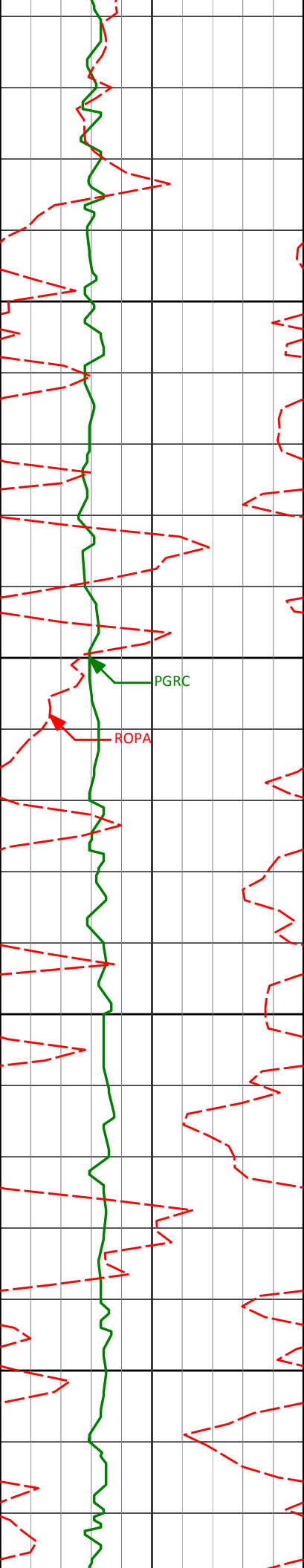
170.28°

1828.88'

6.06'

1850

1900



1950

2000

2050

2100

1924'

0.79°

162.05°

1923.87'

5.76'

2018'

0.77°

186.99°

2017.86'

5.63'

2113'

0.72°

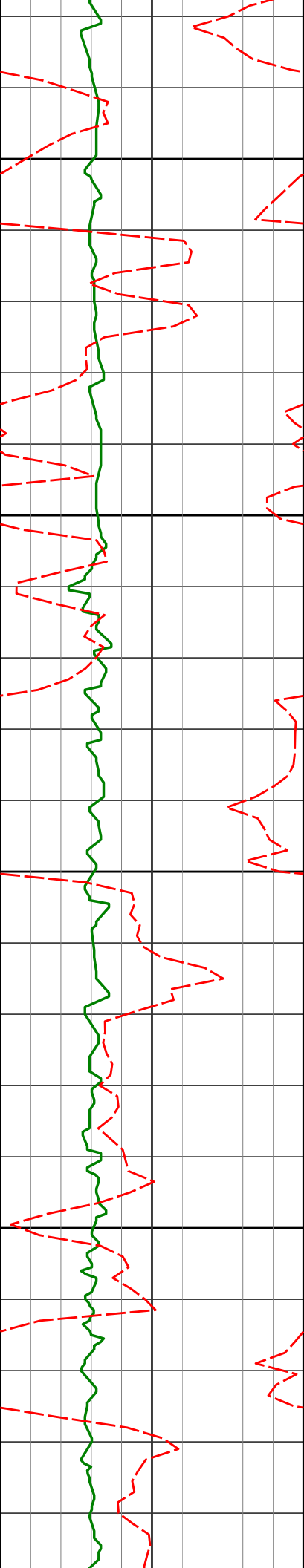
145.48°

2112.86'

5.36'

PGRC

ROPA



2150

2200

2250

2300

2208'

0.83°

129.01°

2207.85'

4.48'

2303'

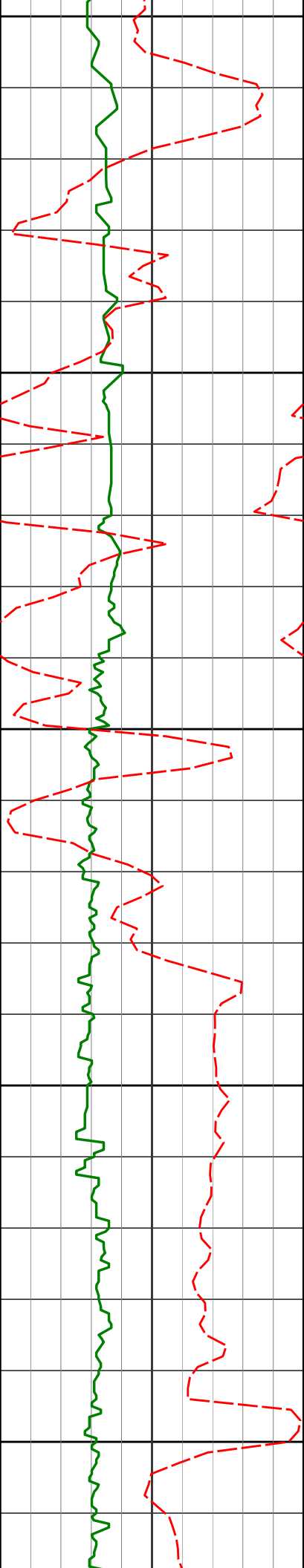
0.80°

142.24°

2302.84'

3.53'





2350

2400

2450

2500

2550

2397'

0.36°

118.86°

2396.83'

2.87'

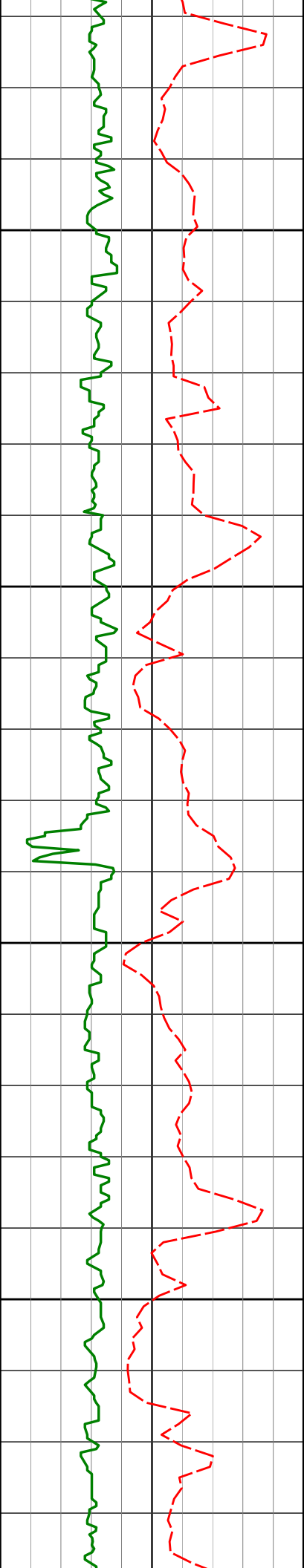
2492'

0.61°

151.69°

2491.83'

2.36'



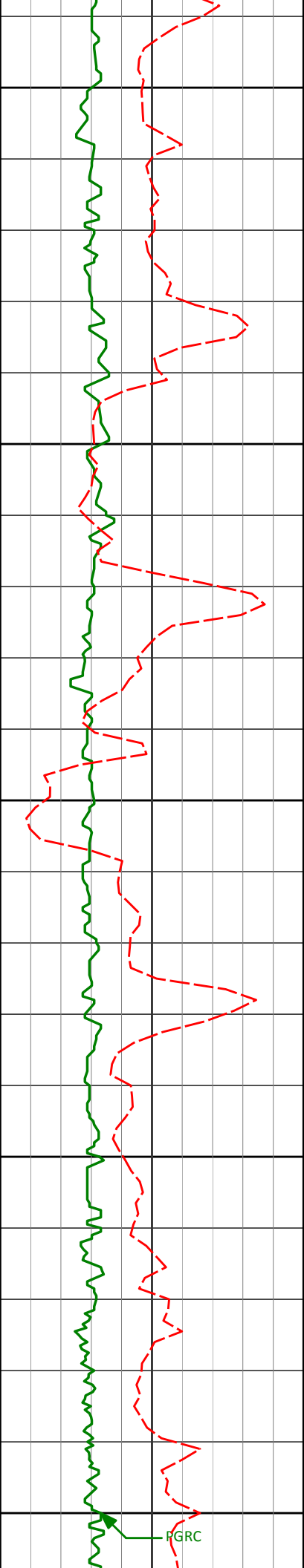
2600

2650

2700

2750

2587'	0.49°	167.90°	2586.83'	2.03'
2681'	0.53°	171.20°	2680.82'	1.88'
2776'	0.36°	228.71°	2775.82'	2.03'



2800

2850

2871'

0.38°

292.82°

2870.82'

2.55'

2900

2950

2966'

0.21°

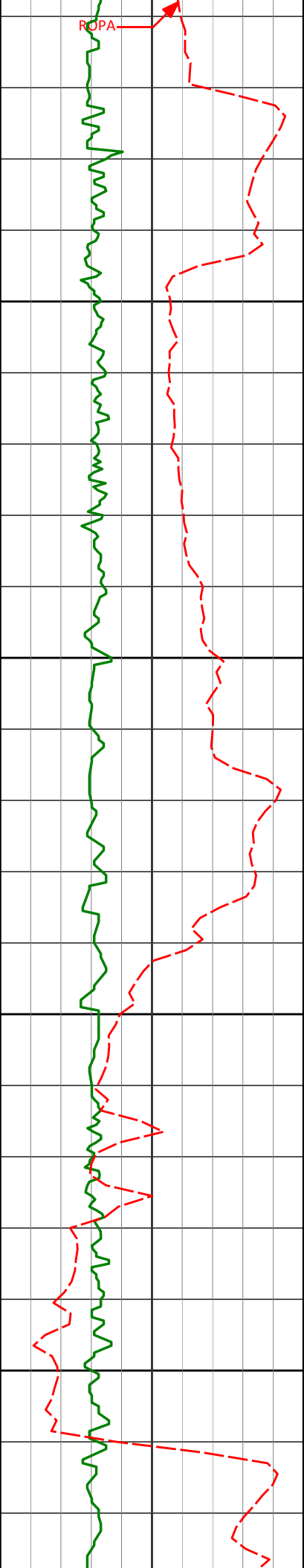
337.89°

2965.82'

2.90'

3000

PGRC



3050

3060'

1.91°

342.39°

3059.80'

3.45'

3100

3150

3155'

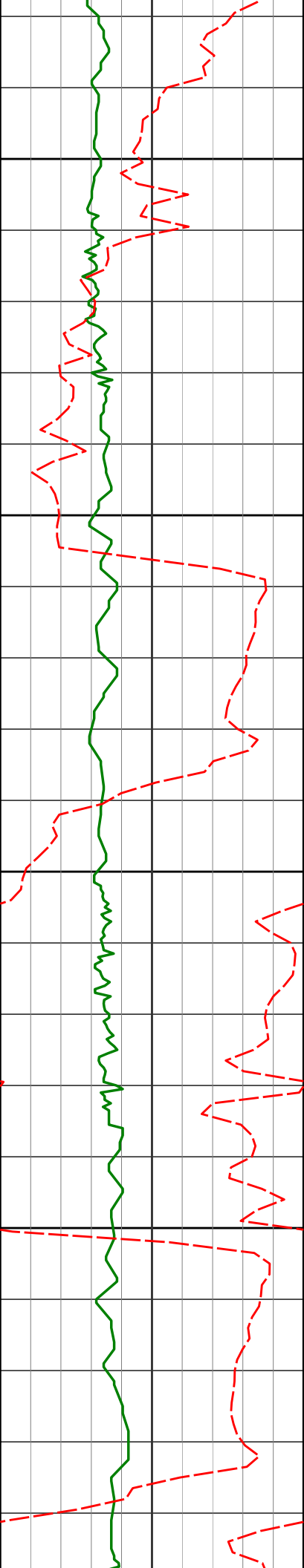
3.14°

347.11°

3154.70'

4.54'

3200



3250

3250'

4.18°

340.91°

3249.51'

6.28'

3300

3350

3345'

5.53°

336.52°

3344.17'

9.29'

3400

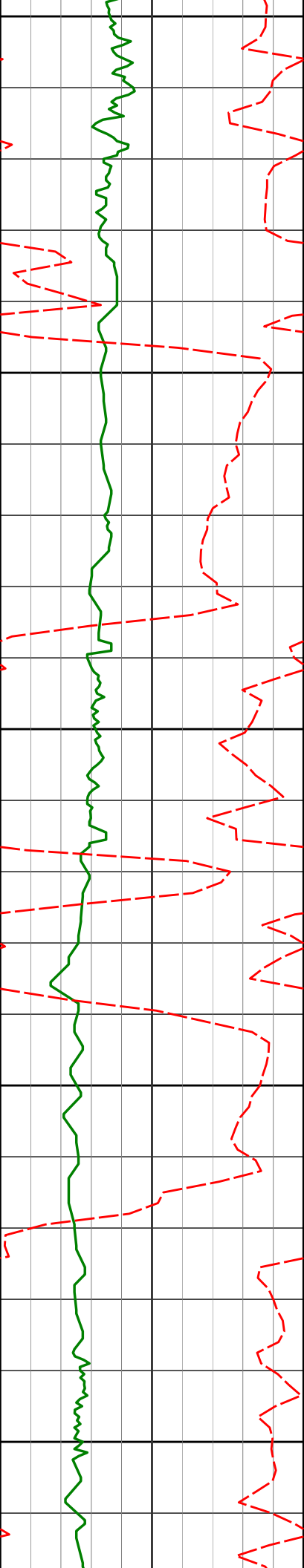
3439'

7.11°

337.27°

3437.59'

13.40'



3450

3500

3550

3600

3650

3534'

9.35°

329.31°

3531.61'

19.68'

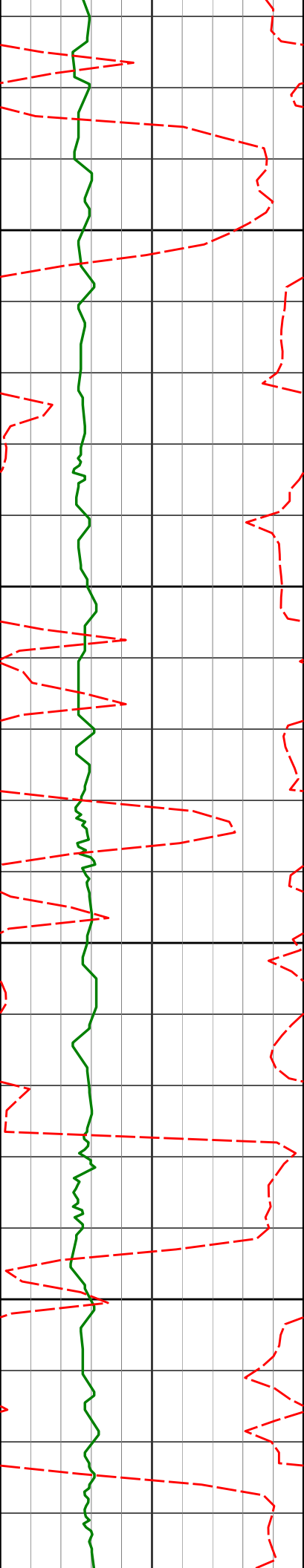
3629'

10.85°

322.24°

3625.14'

29.18'



3700

3724'

11.51°

316.29°

3718.34'

41.29'

3750

3800

3817'

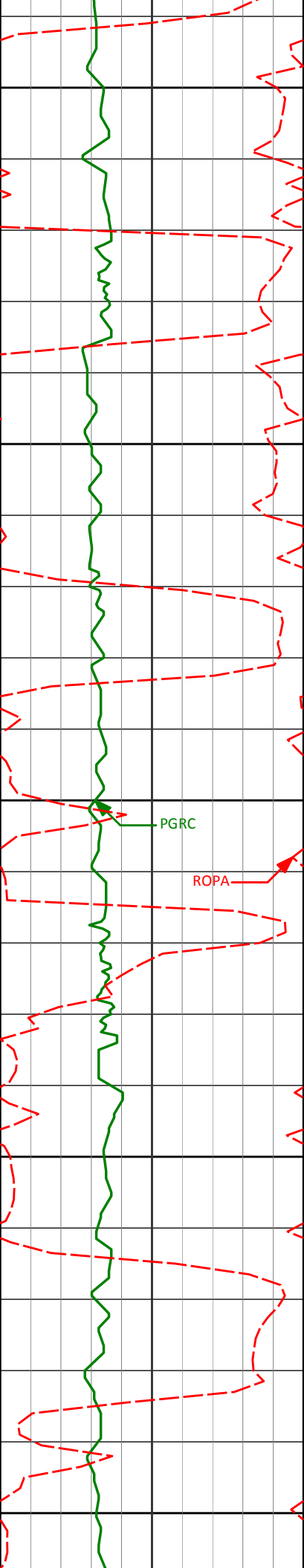
12.05°

316.14°

3809.38'

54.51'

3850



3900

3912'

9.74°

317.54°

3902.66'

66.89'

3950

4000

4007'

8.65°

323.10°

3996.44'

76.67'

4050

4100

4102'

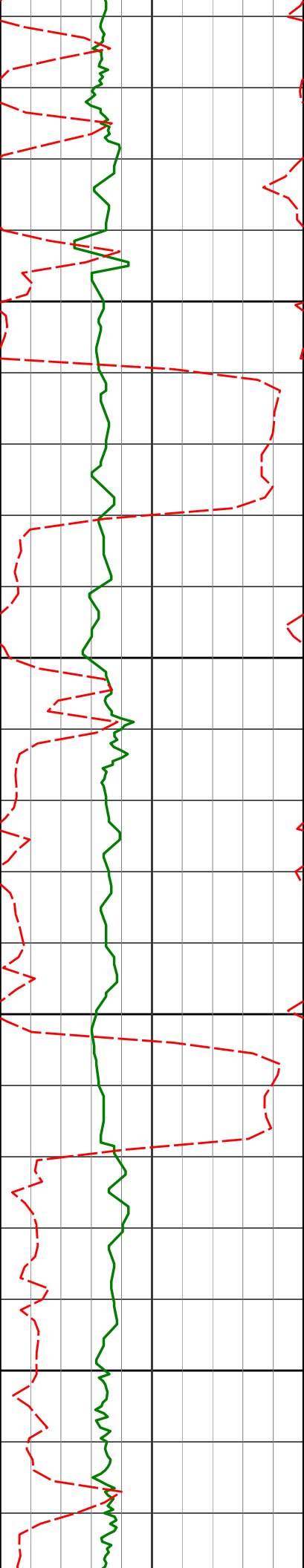
6.99°

316.30°

4090.56'

85.02'





4150

4200

4250

4300

4196'

6.05°

324.44°

4183.95'

91.90'

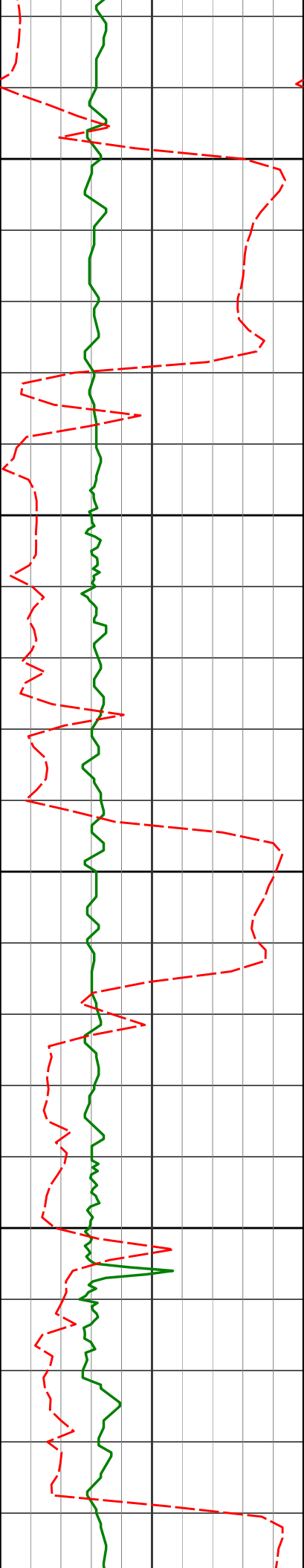
4291'

5.76°

322.19°

4278.45'

97.78'



4350

4386'

6.78°

322.75°

4372.88'

104.15'

4400

4450

4481'

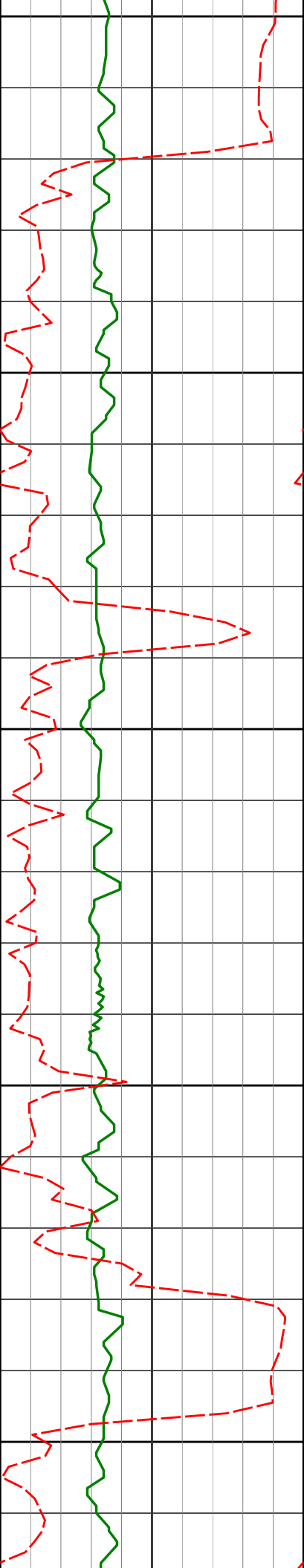
6.43°

330.16°

4467.25'

110.25'

4500



4550

4600

4650

4700

4750

4575'

7.85°

326.06°

4560.52'

116.51'

4670'

7.01°

321.28°

4654.72'

123.82'

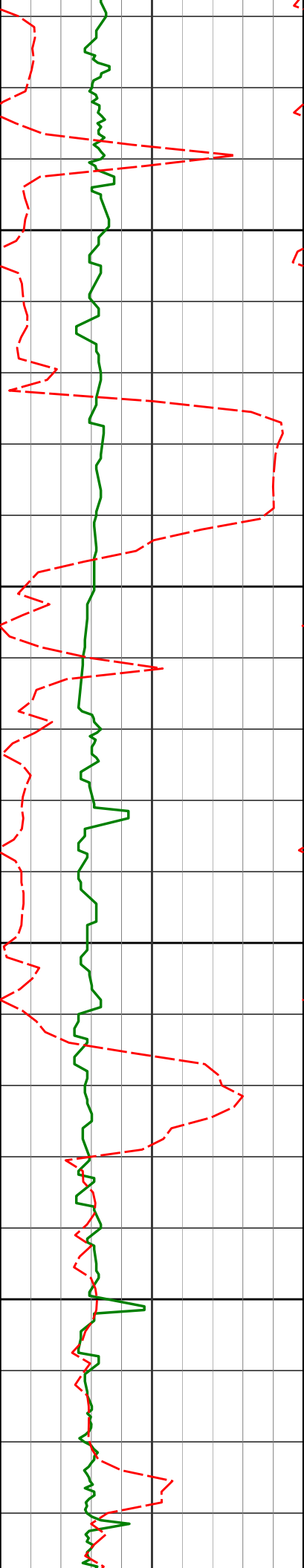
4765'

6.61°

317.68°

4749.05'

131.18'



4800

4850

4900

4950

4860'

6.95°

316.91°

4843.38'

138.84'

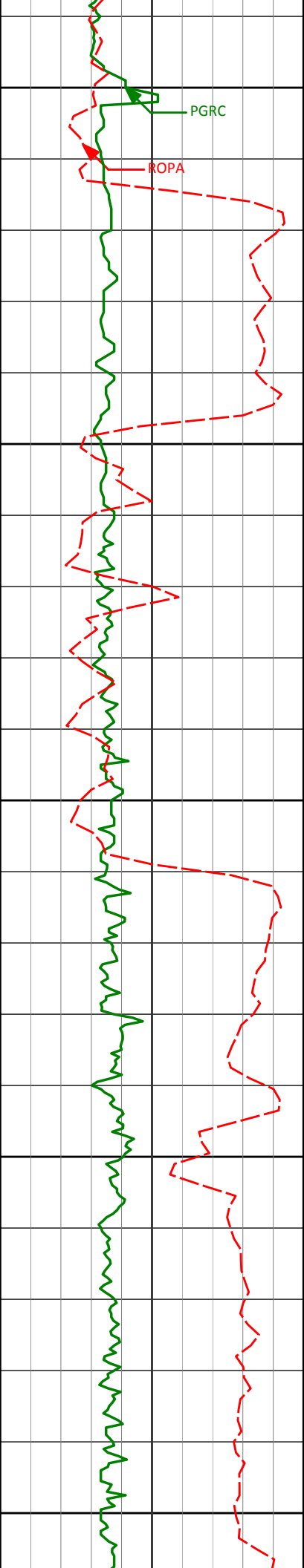
4955'

6.41°

315.07°

4937.74'

146.56'



5000

PGRC

ROPA

5050

5050'

4.79°

323.16°

5032.28'

152.72'

5100

5144'

3.27°

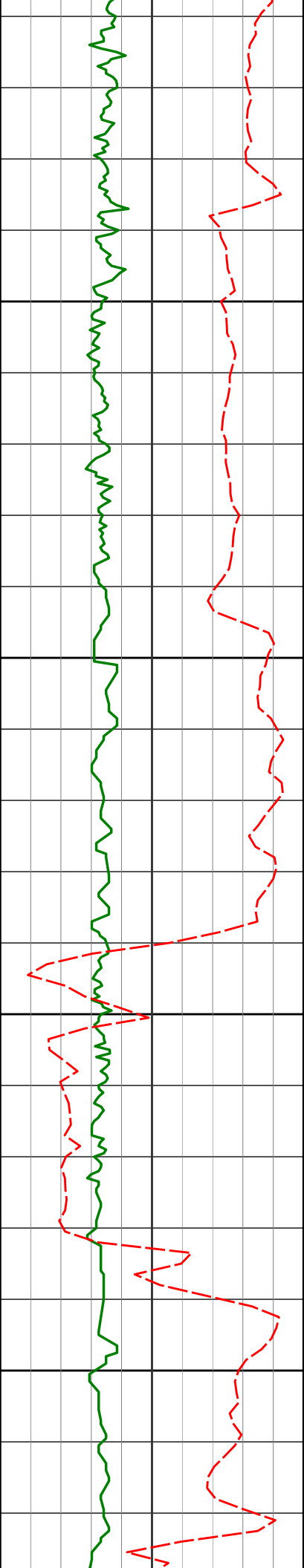
307.26°

5126.05'

157.24'

5150

5200



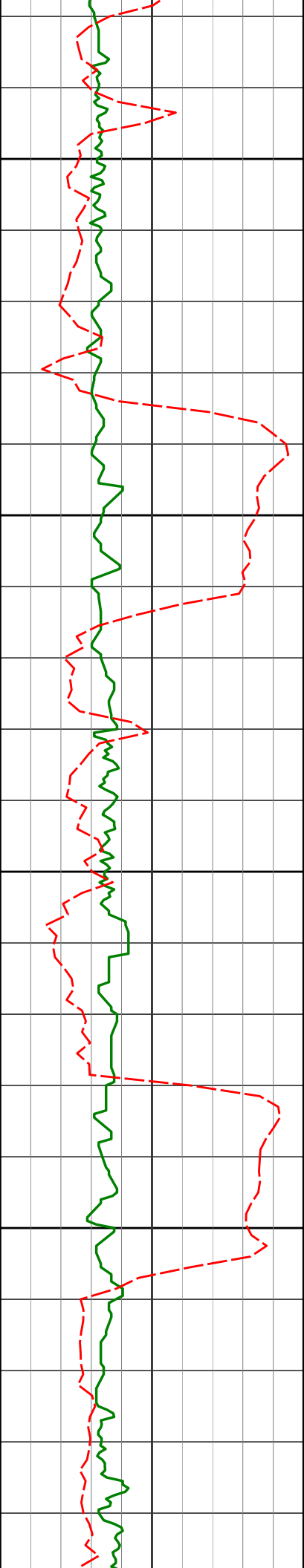
5250

5300

5350

5400

5239'	2.16°	292.47°	5220.95'	161.06'
5334'	1.15°	328.80°	5315.91'	163.22'
5428'	0.50°	328.94°	5409.99'	164.14'



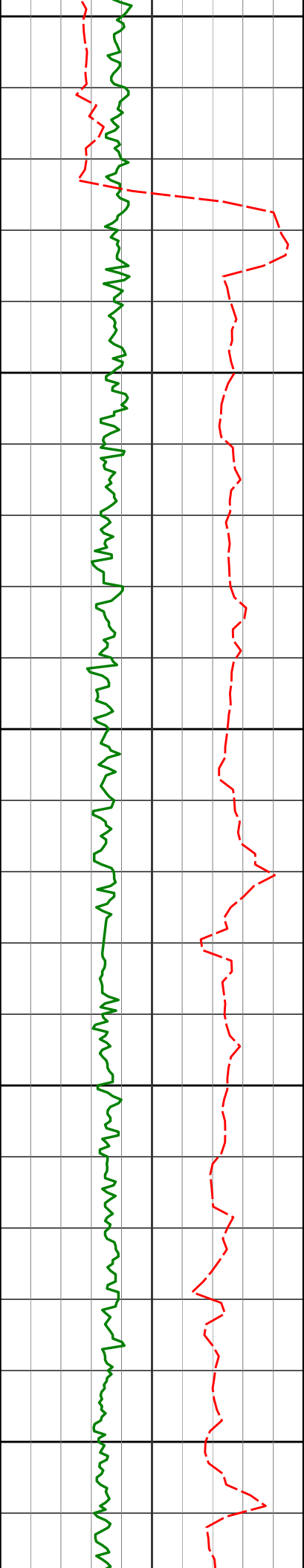
5450

5500

5550

5600

5428'	0.59°	298.94°	5409.90'	164.14'
5523'	0.53°	258.03°	5504.89'	165.00'
5561'	0.53°	258.03°	5504.89'	165.00'
5618'	1.01°	161.73°	5599.89'	165.16'



5650

5700

5750

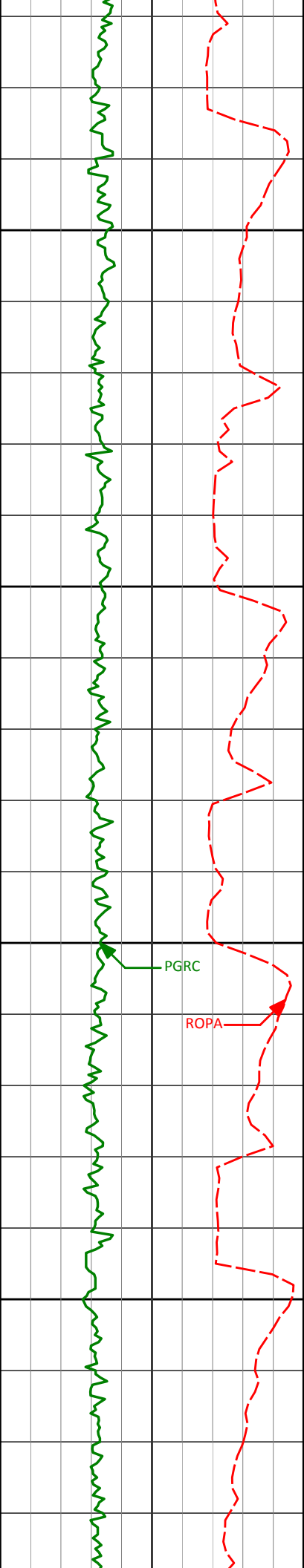
5800

5850

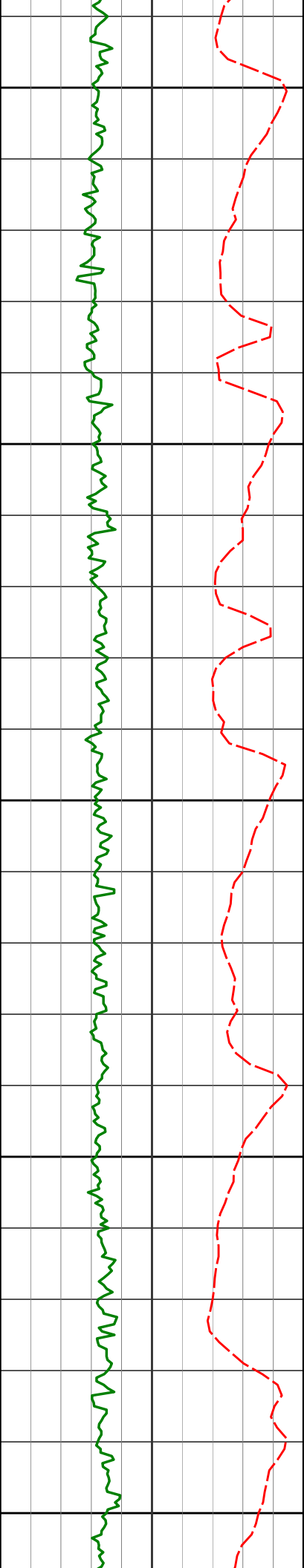
200

5713'	0.91°	127.49°	5694.87'	164.29'
5771'	0.66°	94.43°	5752.87'	163.59'
5834'	0.59°	129.52°	5815.86'	162.98'





5900	5902'	2.38°	225.80°	5883.84'	163.71'
5950	5950'	5.50°	237.44°	5931.73'	166.36'
6000	5997'	7.94°	242.81°	5978.40'	171.13'
6050	6045'	11.35°	246.17°	6025.71'	178.38'



6100

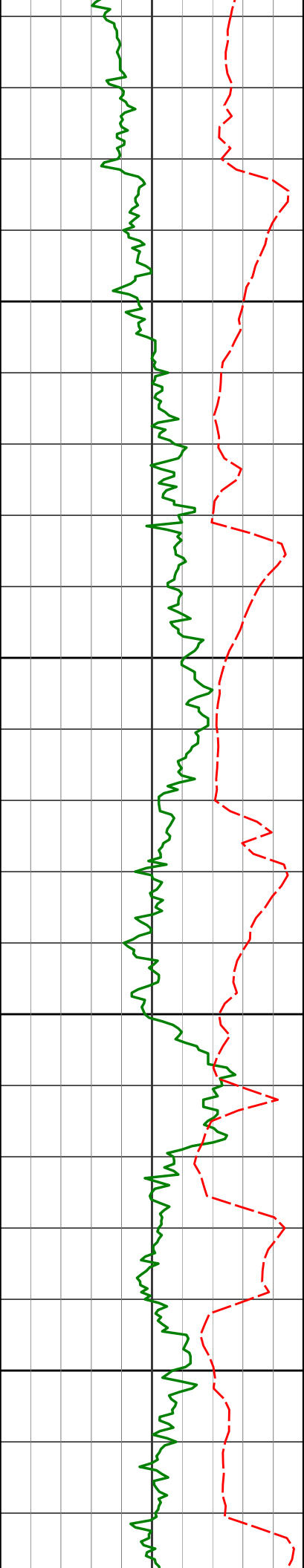
6150

6200

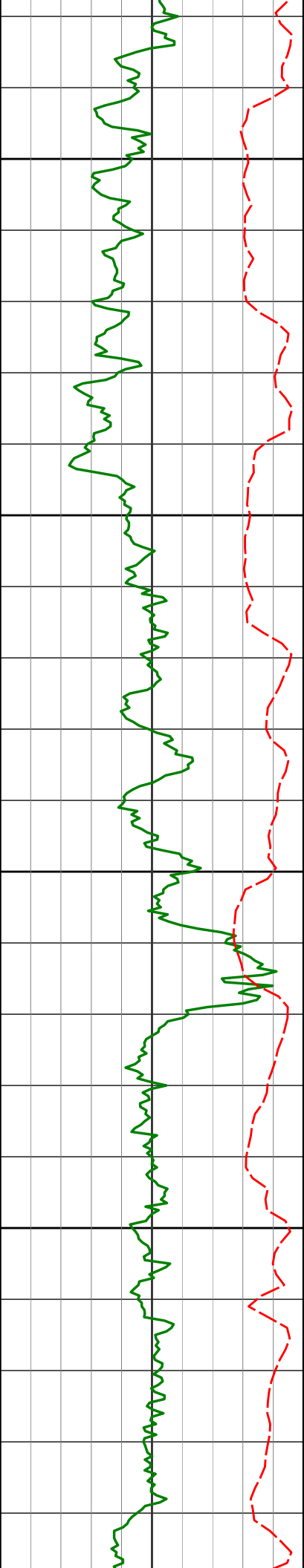
6250

6300

6092'	16.23°	245.91°	6071.35'	188.58'
6140'	21.31°	246.87°	6116.78'	202.70'
6186'	23.78°	251.49°	6159.26'	219.14'
6234'	27.29°	258.79°	6202.58'	239.09'
6281'	32.13°	261.88°	6243.39'	262.03'



6329'	39.21°	265.87°	6282.37'	289.82'
6350				
6376'	46.62°	268.57°	6316.77'	321.75'
6400				
6424'	56.42°	272.49°	6346.60'	359.26'
6450				
6470'	61.63°	275.44°	6370.27'	398.60'
6500				
6518'	63.95°	276.82°	6392.22'	441.07'



6550

6565'

64.12°

275.13°

6412.80'

483.12'

6600

6613'

64.06°

272.14°

6433.78'

526.22'

6650

6660'

67.92°

269.55°

6452.90'

569.13'

6700

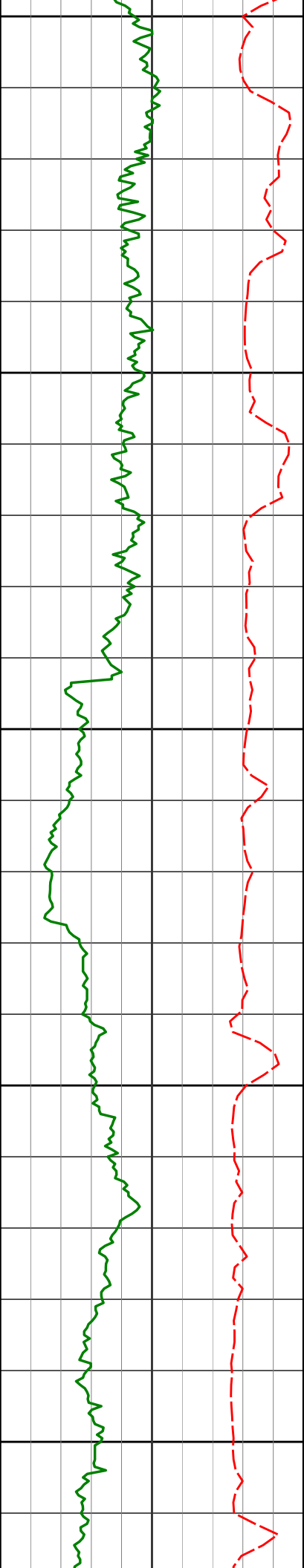
6708'

74.37°

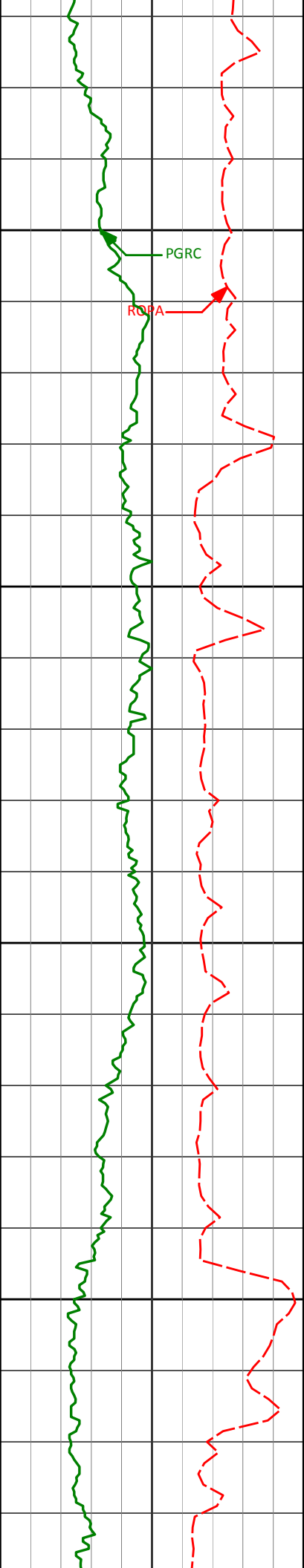
266.94°

6468.41'

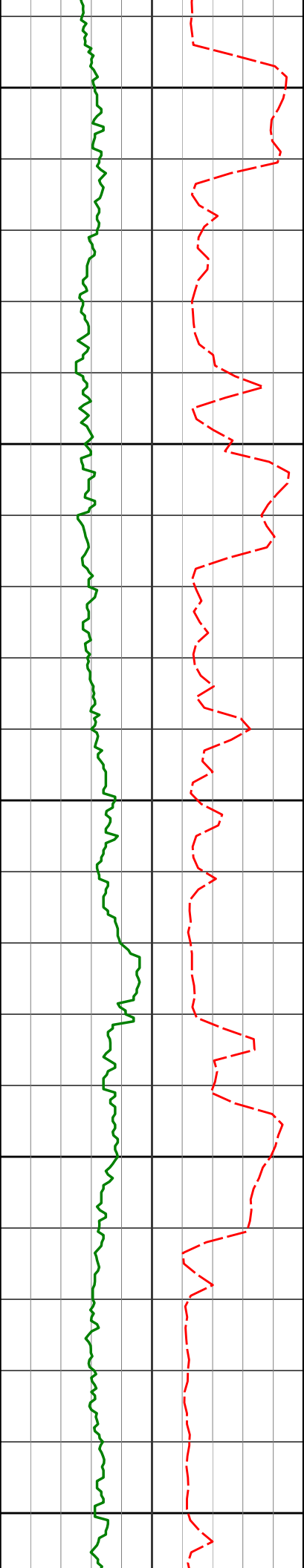
614.50'



6750	6755'	80.25°	267.67°	6478.73'	660.27'
6800	6803'	84.13°	269.24°	6485.25'	707.78'
6850	6835'	85.10°	270.11°	6488.25'	739.64'
300					
6900	6913'	86.40°	270.08°	6494.03'	817.42'
6950					



6995'	88.12°	269.29°	6497.95'	899.32'	
7000					
7050					
7087'	90.86°	269.03°	6498.77'	991.29'	
7100					
7150					
7180'	91.33°	269.00°	6497.00'	1084.25'	



7200

7250

7300

7350

7400

7273'

90.18°

269.31°

6495.77'

1177.22'

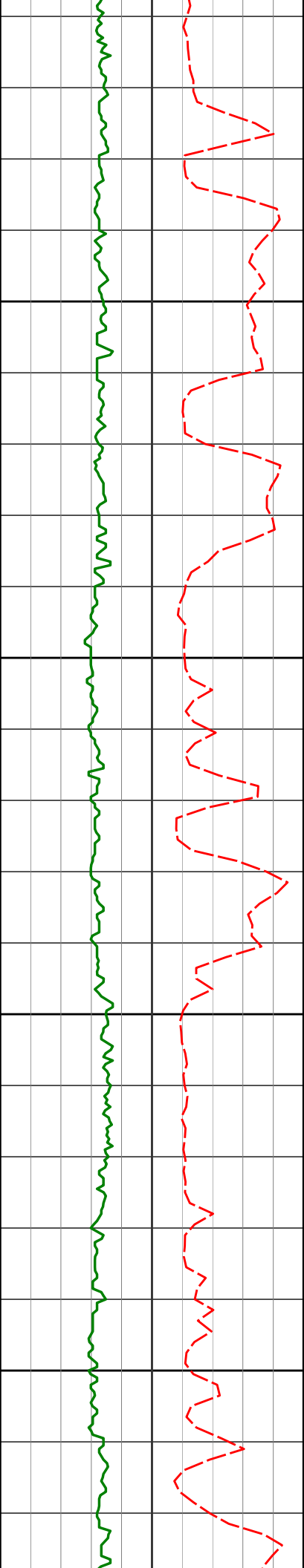
7365'

90.43°

269.42°

6495.28'

1269.20'



7450

7457'

90.00°

268.25°

6494.94'

1361.17'

7500

7550

7549'

89.63°

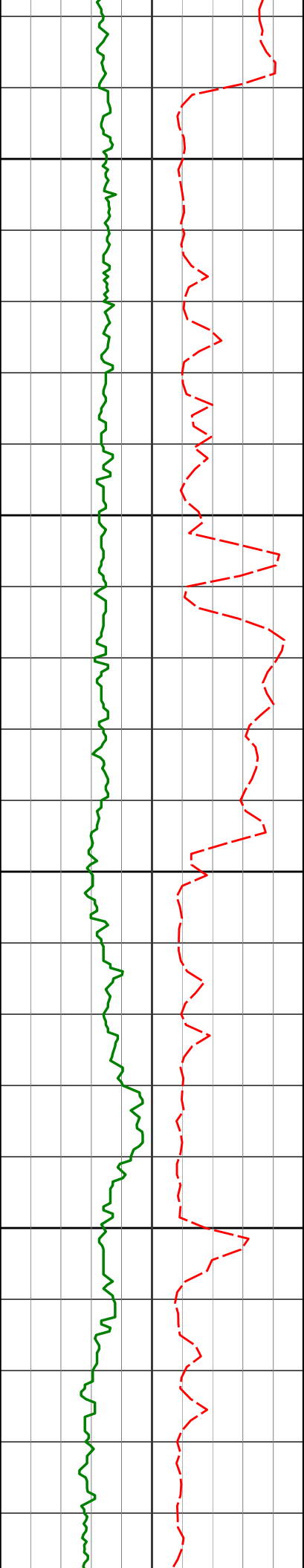
268.61°

6495.23'

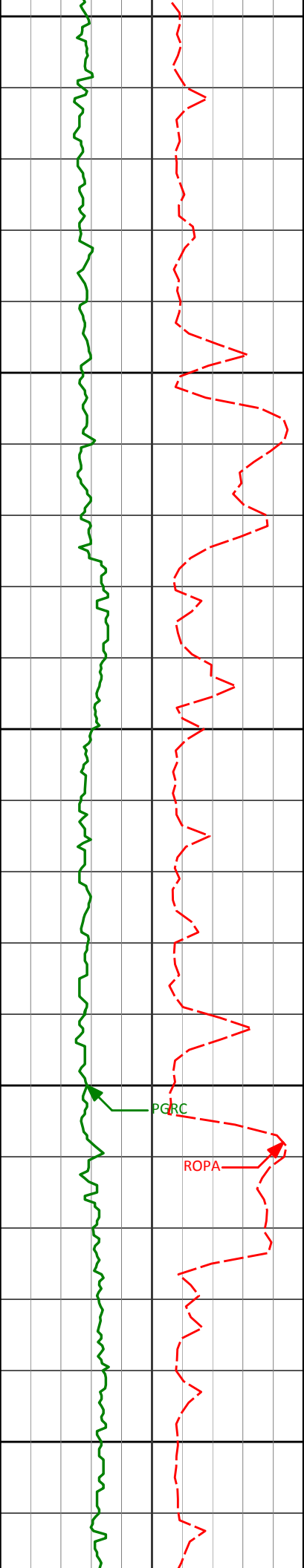
1453.11'

7600





7643'	90.22°	268.85°	6495.35'	1547.07'
7650				
7700				
7738'	88.06°	266.65°	6496.78'	1641.96'
7750				
7800				
7832'	89.14°	266.49°	6499.08'	1735.72'



7850

7900

7950

8000

8050

7927'

88.58°

265.89°

6500.97'

1830.45'

8022'

90.15°

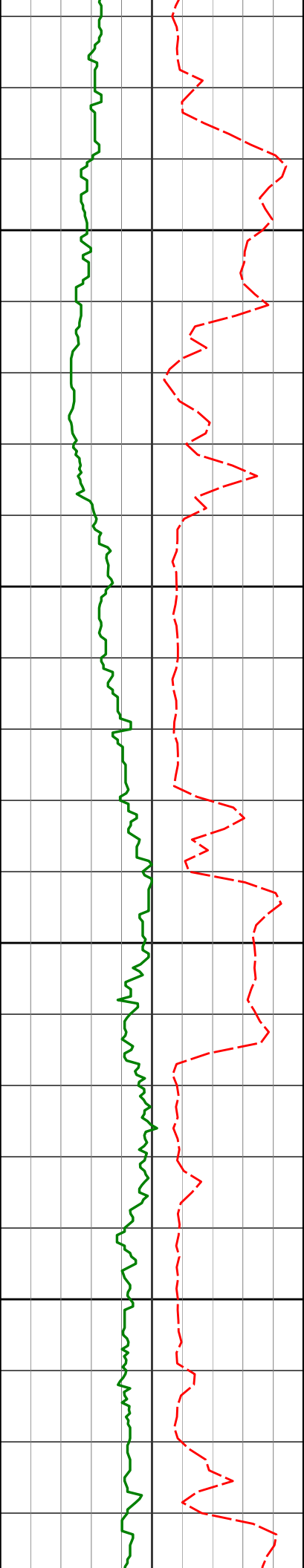
267.13°

6502.02'

1925.23'

PGRC

ROPA



8100

8117'

88.92°

266.93°

6502.79'

2020.06'

8150

8200

8211'

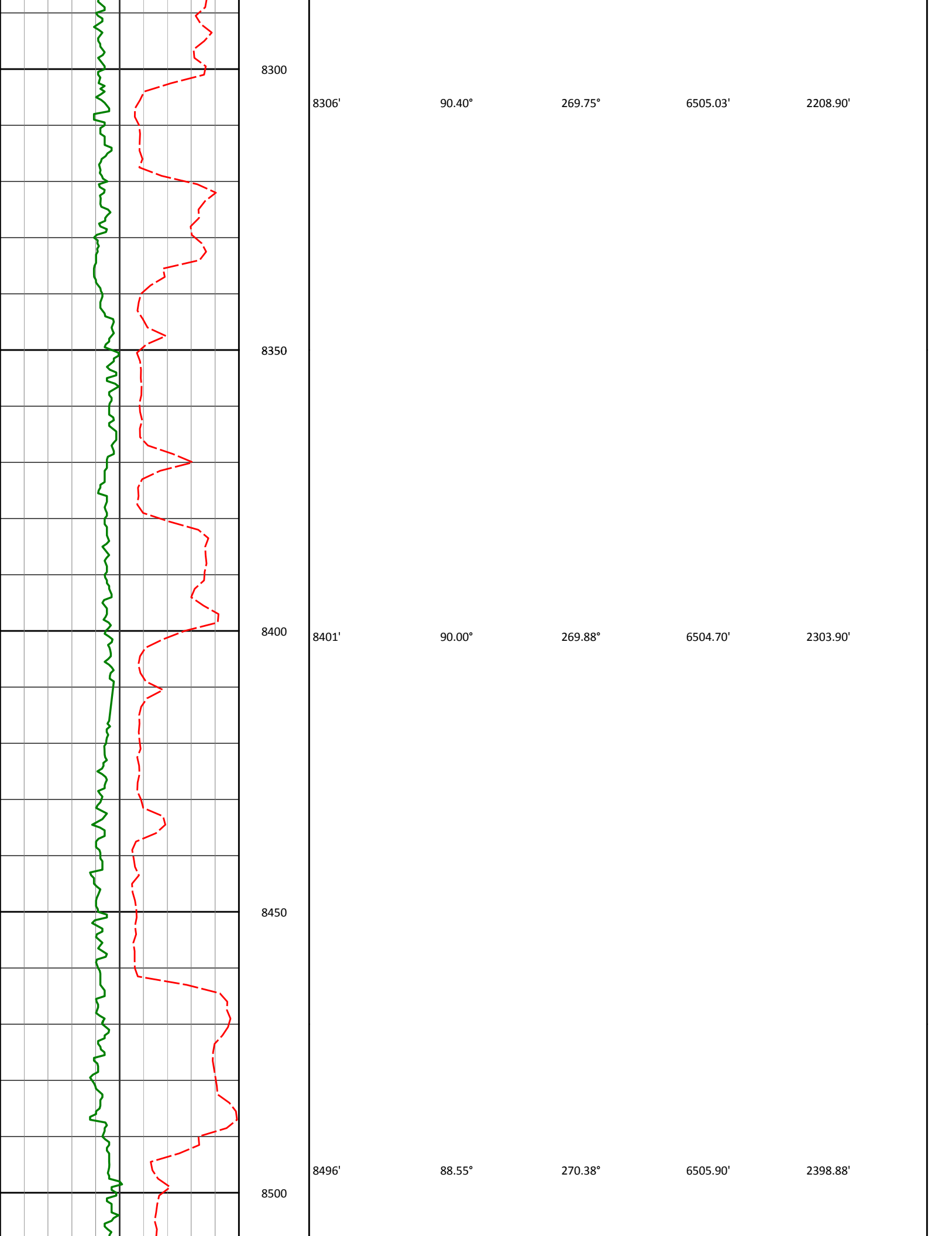
88.98°

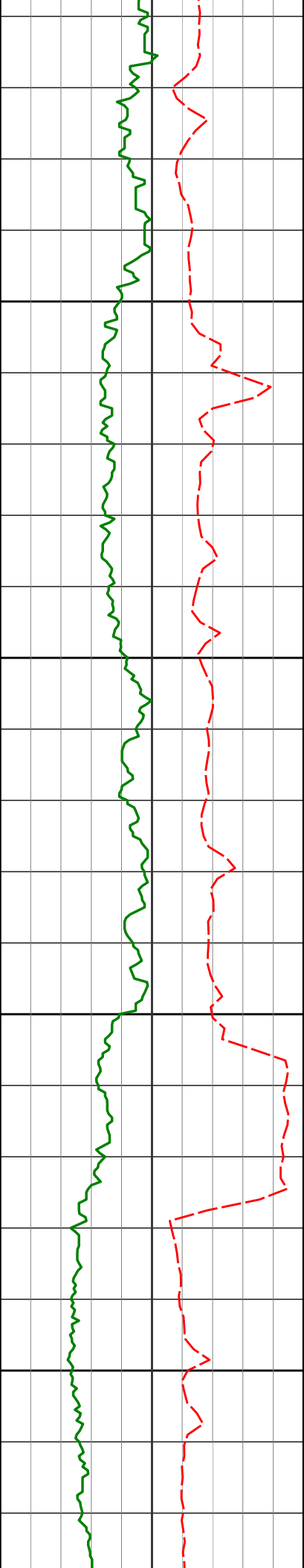
268.21°

6504.51'

2113.93'

8250





8550

8590

90.12°

270.29°

6506.99

2492.88

8600

8650

8685'

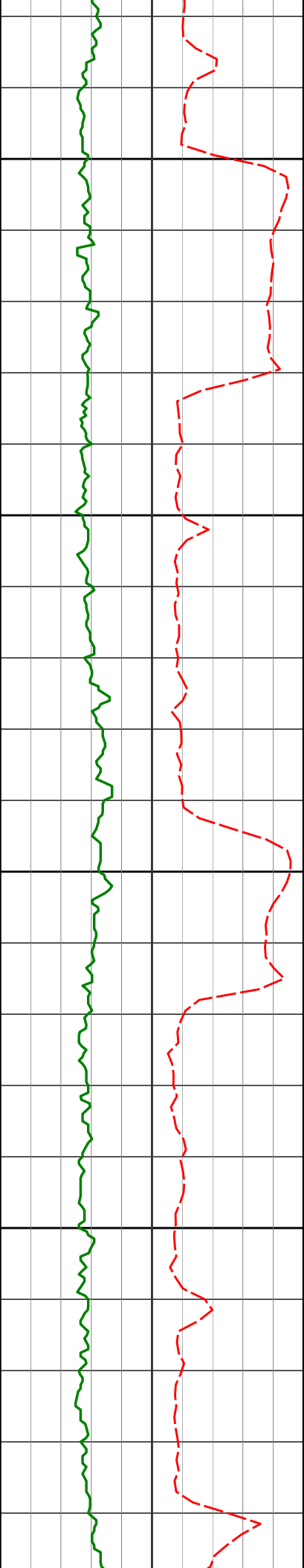
89.51°

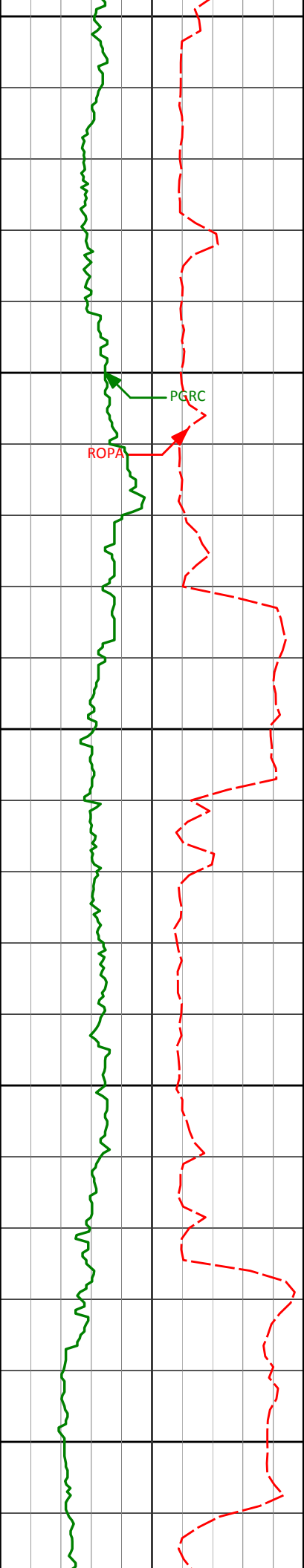
270.23°

6507.30'

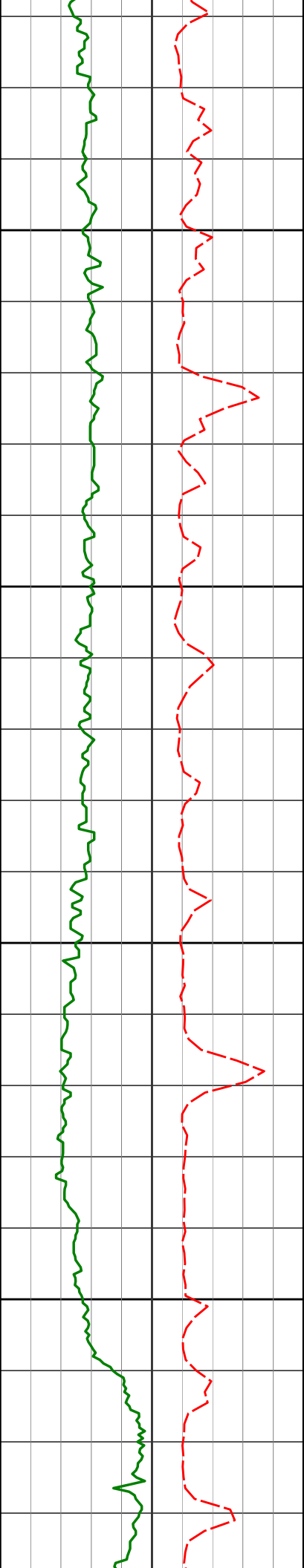
2587.87'

8700



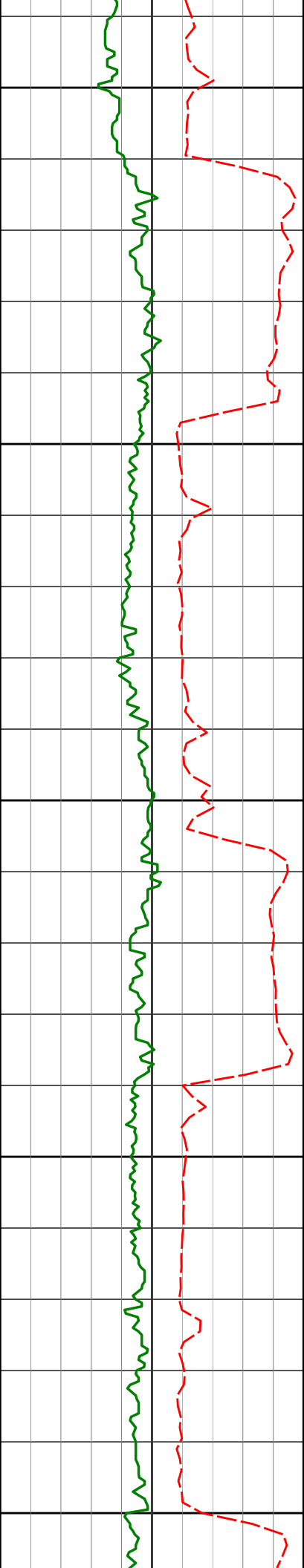


8950				
8970'	90.59°	267.20'	6513.18'	2872.57'
9000				
9050				
9064'	90.43°	267.91'	6512.35'	2966.45'
9100				
9150				
9159'	88.92°	268.31'	6512.88'	3061.37'



9200					
9250	9254'	89.94°	268.20°	6513.83'	3156.30'
9300					
9350	9348'	91.48°	267.34°	6512.67'	3250.20'





9400

9443'

90.43°

267.48°

6511.08'

3345.06'

9450

9500

9538'

89.63°

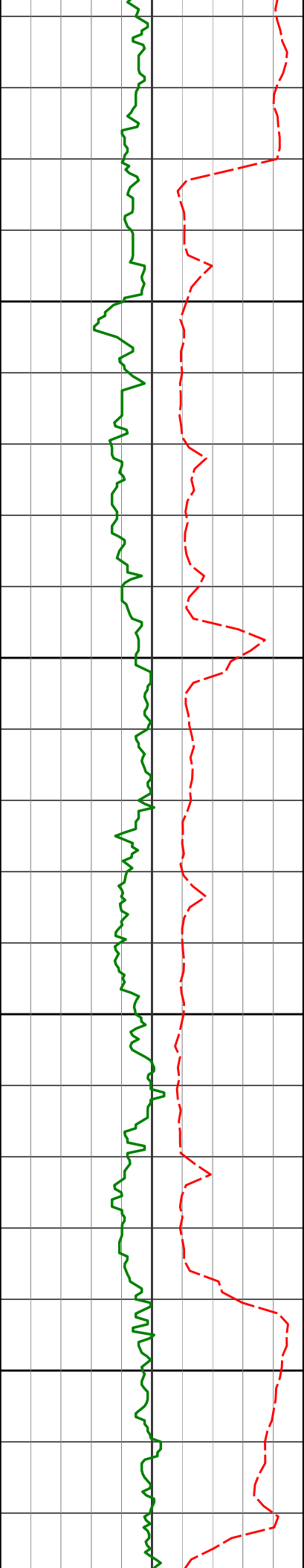
268.58°

6511.03'

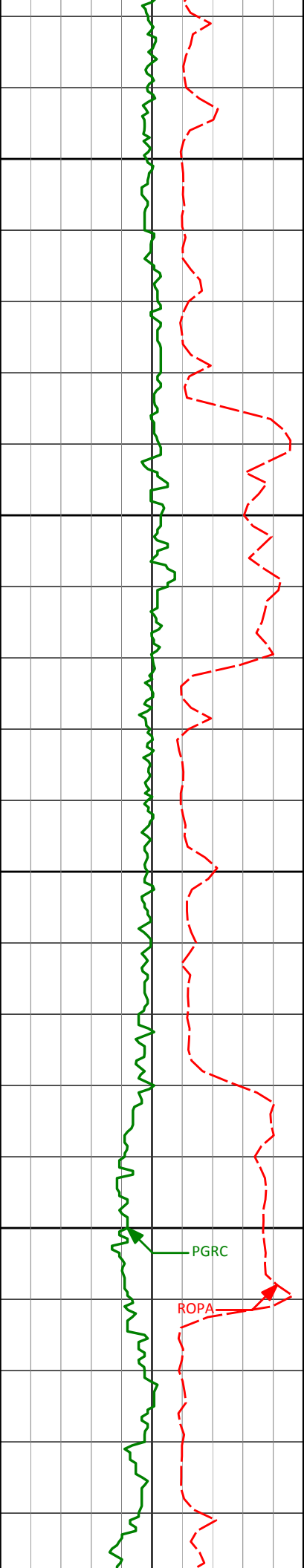
3439.98'

9550

9600



9632'	88.67°	268.73°	6512.43'	3533.93'
9650				
9700				
9727'	90.71°	268.31°	6512.94'	3628.87'
9750				
9800				
9822'	89.94°	268.58°	6512.40'	3723.82'



9850

9900

9950

10000

9917'

89.20°

268.92°

6513.11'

3818.78'

PGRC

ROPA

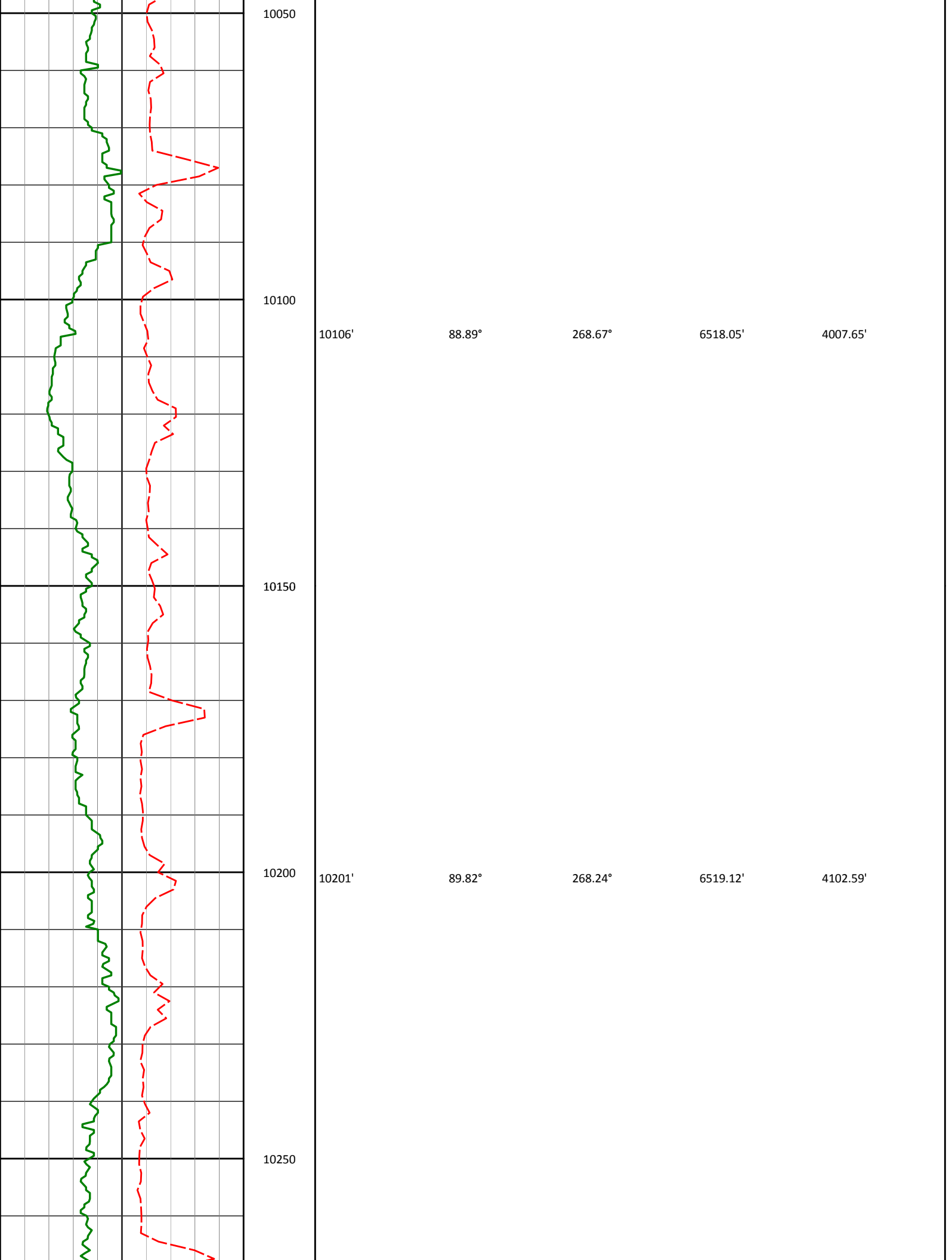
10012'

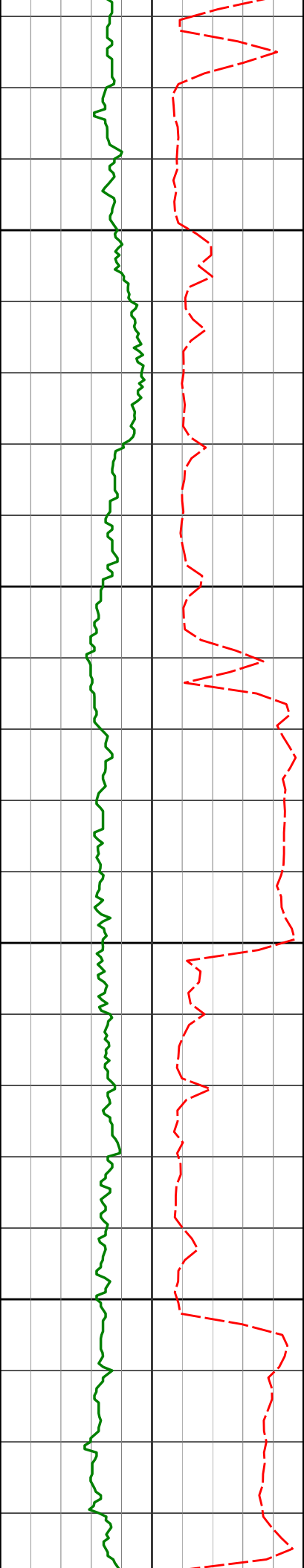
87.96°

269.03°

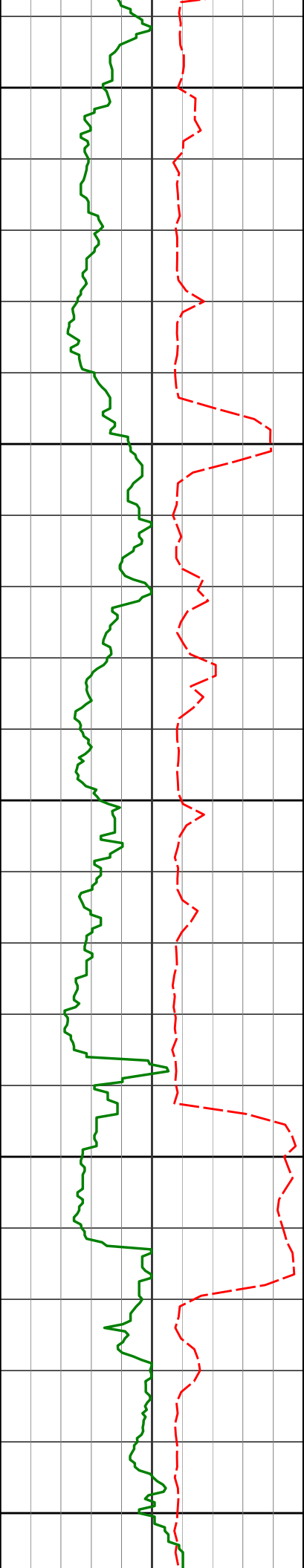
6515.47'

3913.72'





10296'	92.10°	268.69°	6517.53'	4197.52'	
10300					
10350					
10391'	91.48°	268.91°	6514.56'	4292.44'	
10400					
10450					
10486'	88.89°	267.55°	6514.26'	4387.36'	



10500

10550

10600

10650

10700

10581'

89.63°

267.45°

6515.48'

4482.23'

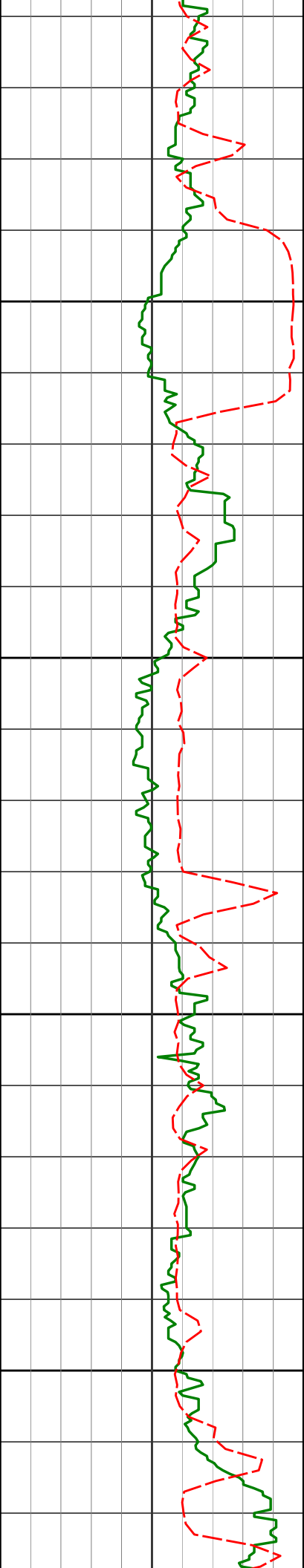
10676'

89.45°

268.82°

6516.25'

4577.16'



10750

10771'

87.63°

268.57°

6518.67'

4672.08'

10800

10850

10865'

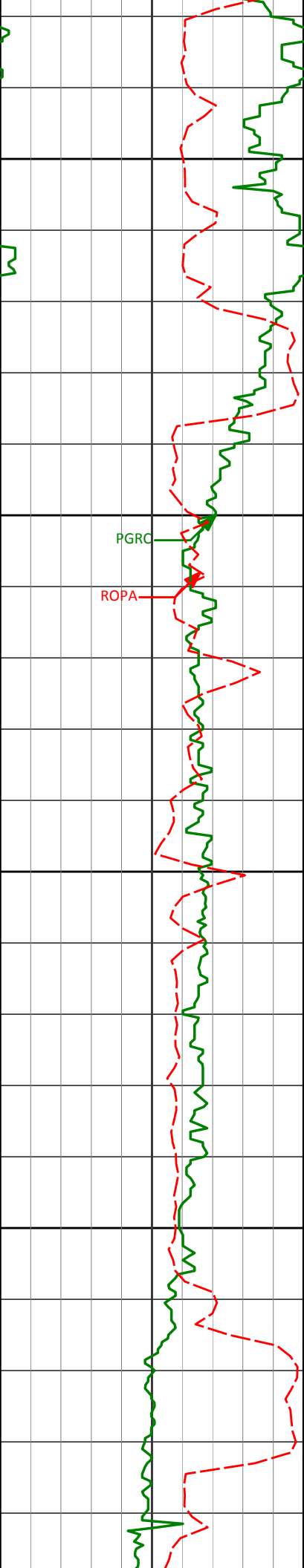
87.90°

267.96°

6522.33'

4765.95'

10900



10950

10960'

88.52°

267.46°

6525.30'

4860.80'

11000

PGRC

ROPA

11050

11054'

90.15°

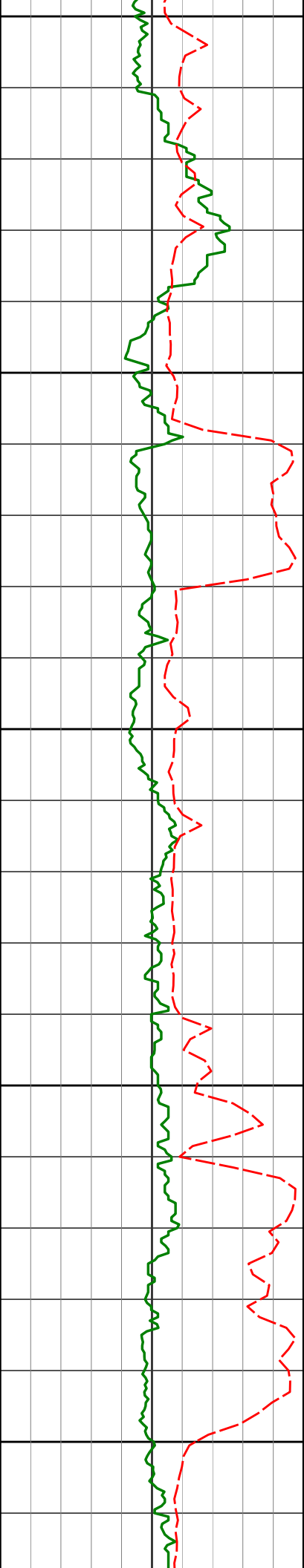
266.57°

6526.39'

4954.63'

11100





11150

11200

11250

11300

11350

11149'

11244'

11338'

91.02°

91.48°

91.57°

267.13°

267.32°

267.22°

6525.42'

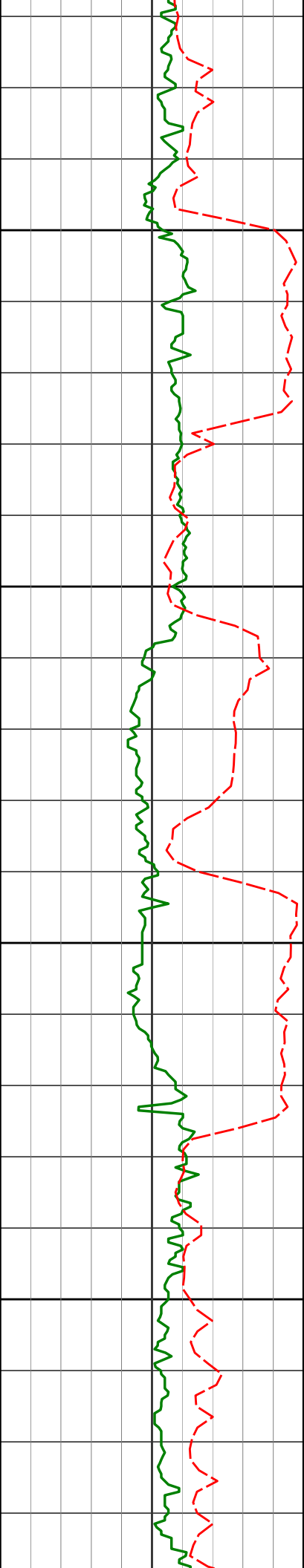
6523.35'

6520.85'

5049.45'

5144.28'

5238.12'



11400

11433'

90.89°

268.05°

6518.81'

5332.99'

11450

11500

11528'

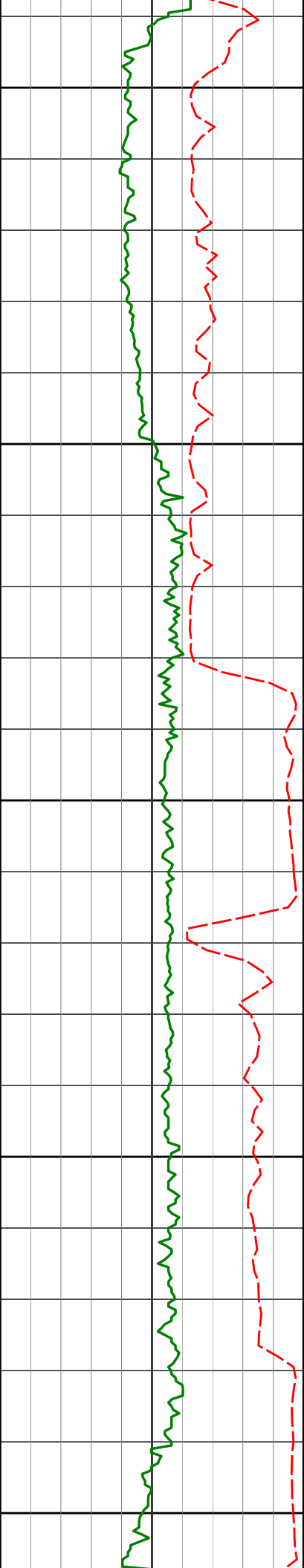
89.57°

269.39°

6518.43'

5427.94'

11550



11600

11623'

90.99°

269.17°

6517.96'

5522.92'

11650

11700

11717'

90.03°

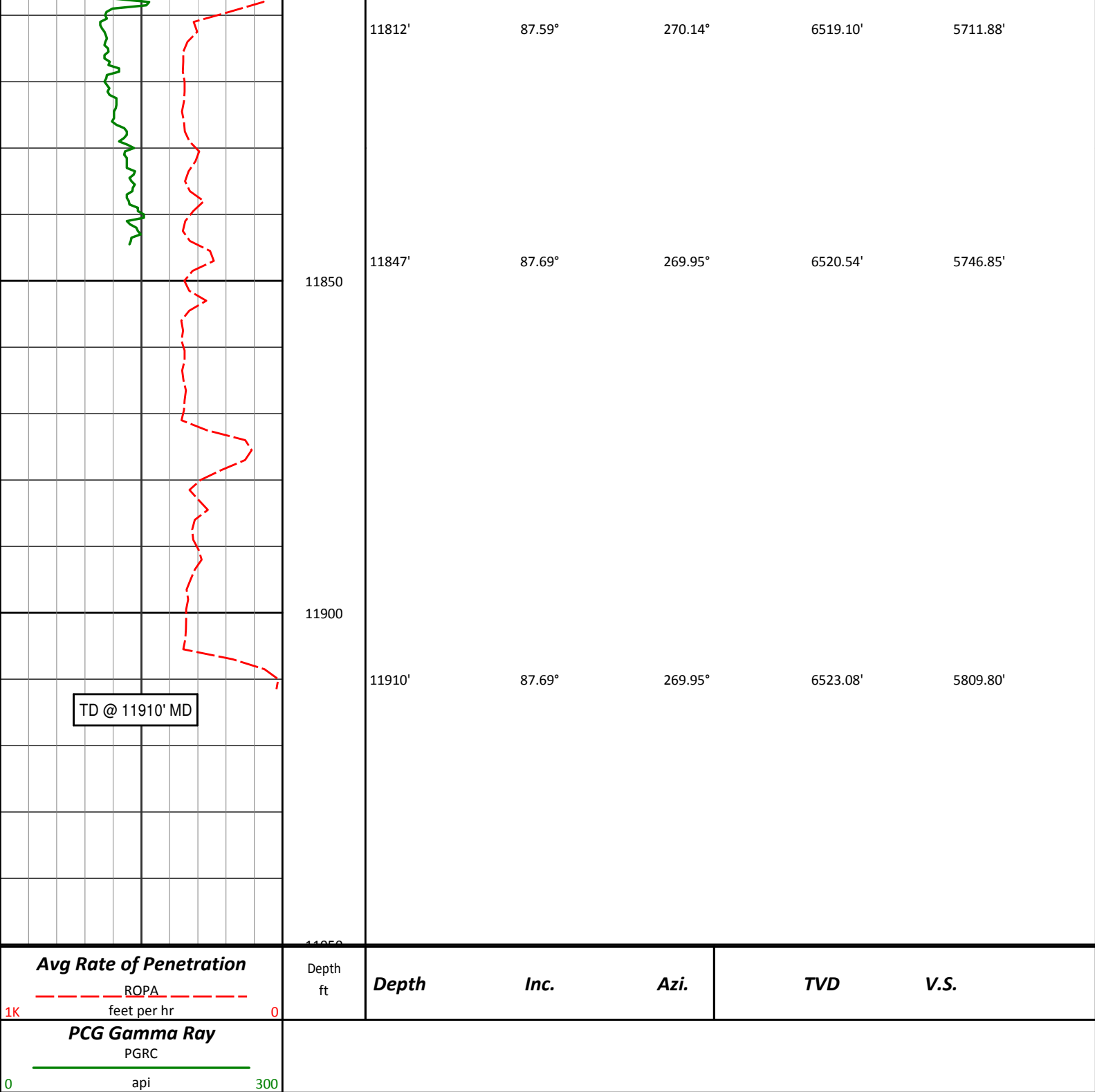
270.29°

6517.13'

5616.91'

11750

11800



**HALLIBURTON**

**DIRECTIONAL SURVEY REPORT**

**Noble Energy**  
**Wells Ranch AE30-65-1BHNB**  
**Wattenburg**  
**Weld Colorado**  
**USA**  
**CA-XX-0901176445**

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
235.00	0.10	38.77	235.00	0.16 N	0.13 E	-0.13	0.04
421.00	0.80	311.97	420.99	1.15 N	0.74 W	0.74	0.43
619.00	0.60	257.77	618.98	1.86 N	2.78 W	2.79	0.33
718.00	0.59	335.44	717.98	2.21 N	3.49 W	3.51	0.75
810.00	0.47	337.32	809.97	2.99 N	3.84 W	3.86	0.13
994.00	0.43	10.12	993.97	4.37 N	4.01 W	4.03	0.14
1085.00	0.80	35.96	1084.96	5.22 N	3.57 W	3.61	0.50
1178.00	0.94	31.76	1177.95	6.39 N	2.79 W	2.83	0.17
1271.00	0.99	34.17	1270.94	7.71 N	1.94 W	1.99	0.07
1364.00	0.94	288.12	1363.93	8.61 N	2.21 W	2.26	1.66
1456.00	0.85	307.00	1455.92	9.25 N	3.47 W	3.53	0.33
1547.00	1.49	246.82	1546.90	9.19 N	5.10 W	5.16	1.43
1639.00	0.26	227.21	1638.89	8.58 N	6.35 W	6.41	1.36
1734.00	0.72	160.55	1733.89	7.87 N	6.31 W	6.36	0.70
1829.00	0.68	170.28	1828.88	6.75 N	6.02 W	6.06	0.13
1924.00	0.79	162.05	1923.87	5.58 N	5.72 W	5.76	0.16
2018.00	0.77	186.99	2017.86	4.33 N	5.60 W	5.63	0.36
2113.00	0.72	145.48	2112.86	3.21 N	5.34 W	5.36	0.56
2208.00	0.83	129.01	2207.85	2.28 N	4.47 W	4.48	0.26
2303.00	0.80	142.24	2302.84	1.32 N	3.53 W	3.53	0.20
2397.00	0.36	118.86	2396.83	0.66 N	2.86 W	2.87	0.52
2492.00	0.61	151.69	2491.83	0.07 N	2.36 W	2.36	0.38
2587.00	0.49	167.90	2586.83	0.77 S	2.04 W	2.03	0.21
2681.00	0.53	171.20	2680.82	1.59 S	1.89 W	1.88	0.05
2776.00	0.36	228.71	2775.82	2.22 S	2.04 W	2.03	0.48
2871.00	0.38	292.82	2870.82	2.30 S	2.56 W	2.55	0.41
2966.00	0.21	337.89	2965.82	2.01 S	2.92 W	2.90	0.29
3060.00	1.91	342.39	3059.80	0.36 S	3.45 W	3.45	1.81
3155.00	3.14	347.11	3154.70	3.68 N	4.51 W	4.54	1.31
3250.00	4.18	340.91	3249.51	9.49 N	6.23 W	6.28	1.17
3345.00	5.53	336.52	3344.17	16.96 N	9.18 W	9.29	1.47
3439.00	7.11	337.27	3437.59	26.48 N	13.24 W	13.40	1.68
3534.00	9.35	329.31	3531.61	38.54 N	19.45 W	19.68	2.64
3629.00	10.85	322.24	3625.14	52.25 N	28.86 W	29.18	2.05
3724.00	11.51	316.29	3718.34	66.17 N	40.89 W	41.29	1.40
3817.00	12.05	316.14	3809.38	79.88 N	54.02 W	54.51	0.58
3912.00	9.74	317.54	3902.66	92.96 N	66.32 W	66.89	2.45
4007.00	8.65	323.10	3996.44	104.60 N	76.04 W	76.67	1.48
4102.00	6.99	316.30	4090.56	114.49 N	84.32 W	85.02	2.00
4196.00	6.05	324.44	4183.95	122.66 N	91.15 W	91.90	1.40
4291.00	5.76	322.19	4278.45	130.50 N	96.99 W	97.78	0.39
4386.00	6.78	322.75	4372.88	138.73 N	103.30 W	104.15	1.08
4481.00	6.43	330.16	4467.25	147.81 N	109.35 W	110.25	0.97
4575.00	7.85	326.06	4560.52	157.70 N	115.55 W	116.51	1.60
4670.00	7.01	321.28	4654.72	167.60 N	122.80 W	123.82	1.10
4765.00	6.61	317.68	4749.05	176.17 N	130.11 W	131.18	0.62
4860.00	6.95	316.91	4843.38	184.41 N	137.71 W	138.84	0.37
4955.00	6.41	315.07	4937.74	192.36 N	145.38 W	146.56	0.61
5050.00	4.79	323.16	5032.28	199.29 N	151.51 W	152.72	1.89
5144.00	3.27	307.26	5126.05	204.05 N	156.00 W	157.24	1.99
5239.00	2.16	292.47	5220.95	206.38 N	159.81 W	161.06	1.37
5334.00	1.15	328.80	5315.91	207.88 N	161.96 W	163.22	1.48
5428.00	0.59	298.94	5409.90	208.92 N	162.87 W	164.14	0.75
5523.00	0.53	258.03	5504.89	209.07 N	163.73 W	165.00	0.42
5618.00	1.01	161.73	5599.89	208.18 N	163.89 W	165.16	1.25
5713.00	0.91	127.49	5694.87	206.93 N	163.03 W	164.29	0.60
5771.00	0.66	94.43	5752.87	206.62 N	162.33 W	163.59	0.87
5834.00	0.59	129.52	5815.86	206.39 N	161.72 W	162.98	0.61
5902.00	2.38	225.80	5883.84	205.18 N	162.46 W	163.71	3.70
5950.00	5.50	237.44	5931.73	203.24 N	165.12 W	166.36	6.68
5997.00	7.94	242.81	5978.40	200.55 N	169.90 W	171.13	5.36
6045.00	11.35	246.17	6025.71	197.12 N	177.18 W	178.38	7.20
6092.00	16.23	245.91	6071.35	192.57 N	187.41 W	188.58	10.38
6140.00	21.31	246.87	6116.78	186.40 N	201.56 W	202.70	10.60
6186.00	23.78	251.49	6159.26	180.17 N	218.05 W	219.14	6.60
6234.00	27.29	258.79	6202.58	174.96 N	238.03 W	239.09	9.81
6281.00	32.13	261.88	6243.39	171.10 N	260.99 W	262.03	10.80
6329.00	39.21	265.87	6282.37	168.20 N	288.79 W	289.82	15.52
6376.00	46.62	268.57	6316.77	166.70 N	320.73 W	321.75	16.24
6424.00	56.42	272.49	6346.60	167.13 N	358.25 W	359.26	21.39
6472.00	65.35	275.11	6376.97	166.55 N	396.55 W	397.57	22.55

6470.00	61.63	275.44	6370.27	169.89 N	397.57 W	398.60	12.59
6518.00	63.95	276.82	6392.22	174.45 N	440.01 W	441.07	5.47
6565.00	64.12	275.13	6412.80	178.85 N	482.03 W	483.12	3.25
6613.00	64.06	272.14	6433.78	181.59 N	525.12 W	526.22	5.60
6660.00	67.92	269.55	6452.90	182.20 N	568.03 W	569.13	9.63
6708.00	74.37	266.94	6468.41	180.79 N	613.41 W	614.50	14.39
6755.00	80.25	267.67	6478.73	178.64 N	659.19 W	660.27	12.60
6803.00	84.13	269.24	6485.25	177.36 N	706.71 W	707.78	8.71
6835.00	85.10	270.11	6488.25	177.18 N	738.57 W	739.64	4.06
6913.00	86.40	270.08	6494.03	177.31 N	816.36 W	817.42	1.67
6995.00	88.12	269.29	6497.95	176.86 N	898.26 W	899.32	2.31
7087.00	90.86	269.03	6498.77	175.51 N	990.23 W	991.29	2.99
7180.00	91.33	269.00	6497.00	173.91 N	1083.20 W	1084.25	0.51
7273.00	90.18	269.31	6495.77	172.54 N	1176.18 W	1177.22	1.28
7365.00	90.43	269.42	6495.28	171.52 N	1268.18 W	1269.20	0.30
7457.00	90.00	268.25	6494.94	169.65 N	1360.15 W	1361.17	1.35
7549.00	89.63	268.61	6495.23	167.13 N	1452.12 W	1453.11	0.56
7643.00	90.22	268.85	6495.35	165.05 N	1546.10 W	1547.07	0.68
7738.00	88.06	266.65	6496.78	161.32 N	1641.00 W	1641.96	3.25
7832.00	89.14	266.49	6499.08	155.70 N	1734.80 W	1735.72	1.16
7927.00	88.58	265.89	6500.97	149.39 N	1829.57 W	1830.45	0.86
8022.00	90.15	267.13	6502.02	143.60 N	1924.39 W	1925.23	2.11
8117.00	88.92	266.93	6502.79	138.68 N	2019.25 W	2020.06	1.31
8211.00	88.98	268.21	6504.51	134.70 N	2113.15 W	2113.93	1.36
8306.00	90.40	269.75	6505.03	133.01 N	2208.13 W	2208.90	2.20
8401.00	90.00	269.88	6504.70	132.70 N	2303.13 W	2303.90	0.44
8496.00	88.55	270.38	6505.90	132.91 N	2398.12 W	2398.88	1.61
8590.00	90.12	270.29	6506.99	133.46 N	2492.11 W	2492.88	1.67
8685.00	89.51	270.23	6507.30	133.90 N	2587.10 W	2587.87	0.65
8780.00	87.97	269.06	6509.39	133.31 N	2682.08 W	2682.84	2.04
8875.00	88.43	267.24	6512.37	130.24 N	2776.97 W	2777.72	1.98
8970.00	90.59	267.20	6513.18	125.63 N	2871.85 W	2872.57	2.27
9064.00	90.43	267.91	6512.35	121.62 N	2965.76 W	2966.45	0.77
9159.00	88.92	268.31	6512.88	118.49 N	3060.71 W	3061.37	1.64
9254.00	89.94	268.20	6513.83	115.60 N	3155.66 W	3156.30	1.08
9348.00	91.48	267.34	6512.67	111.94 N	3249.58 W	3250.20	1.88
9443.00	90.43	267.48	6511.08	107.65 N	3344.46 W	3345.06	1.12
9538.00	89.63	268.58	6511.03	104.38 N	3439.41 W	3439.98	1.43
9632.00	88.67	268.73	6512.43	102.18 N	3533.37 W	3533.93	1.03
9727.00	90.71	268.31	6512.94	99.72 N	3628.33 W	3628.87	2.19
9822.00	89.94	268.58	6512.40	97.15 N	3723.29 W	3723.82	0.86
9917.00	89.20	268.92	6513.11	95.07 N	3818.27 W	3818.78	0.86
10012.00	87.96	269.03	6515.47	93.37 N	3913.22 W	3913.72	1.31
10106.00	88.89	268.67	6518.05	91.49 N	4007.16 W	4007.65	1.06
10201.00	89.82	268.24	6519.12	88.93 N	4102.12 W	4102.59	1.08
10296.00	92.10	268.69	6517.53	86.38 N	4197.07 W	4197.52	2.45
10391.00	91.48	268.91	6514.56	84.39 N	4292.00 W	4292.44	0.69
10486.00	88.89	267.55	6514.26	81.46 N	4386.95 W	4387.36	3.08
10581.00	89.63	267.45	6515.48	77.32 N	4481.85 W	4482.23	0.79
10676.00	89.45	268.82	6516.25	74.22 N	4576.79 W	4577.16	1.45
10771.00	87.63	268.57	6518.67	72.06 N	4671.73 W	4672.08	1.93
10865.00	87.90	267.96	6522.33	69.22 N	4765.62 W	4765.95	0.71
10960.00	88.52	267.46	6525.30	65.42 N	4860.49 W	4860.80	0.84
11054.00	90.15	266.57	6526.39	60.53 N	4954.35 W	4954.63	1.98
11149.00	91.02	267.13	6525.42	55.31 N	5049.21 W	5049.45	1.09
11244.00	91.48	267.32	6523.35	50.71 N	5144.07 W	5144.28	0.52
11338.00	91.57	267.22	6520.85	46.24 N	5237.93 W	5238.12	0.14
11433.00	90.89	268.05	6518.81	42.32 N	5332.83 W	5332.99	1.13
11528.00	89.57	269.39	6518.43	40.19 N	5427.80 W	5427.94	1.98
11623.00	90.99	269.17	6517.96	39.00 N	5522.79 W	5522.92	1.51
11717.00	90.03	270.29	6517.13	38.56 N	5616.78 W	5616.91	1.57
11812.00	87.59	270.14	6519.10	38.91 N	5711.75 W	5711.88	2.57
11847.00	87.69	269.95	6520.54	38.94 N	5746.72 W	5746.85	0.61
11910.00	87.69	269.95	6523.08	38.89 N	5809.67 W	5809.80	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 270.35 DEGREES (GRID)

A TOTAL CORRECTION OF 7.57 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.

HORIZONTAL DISPLACEMENT(CLOSURE) AT 11910.00 FEET

IS 5809.80 FEET ALONG 270.38 DEGREES (GRID)

First Three survey's from 3rd party source (Muulti Shot EMS) and provided by CO-man on location before drilling.

Survey Depth 235 Inc 0.10 Azi 38.77

Survey Depth 421 Inc 0.80 Azi 311.97

Survey Depth 619 Inc 0.60 Azi 257.77

Tied in @ Surface

Magnetic direction of 7.571 has been added to AZI for grid direction correction.

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