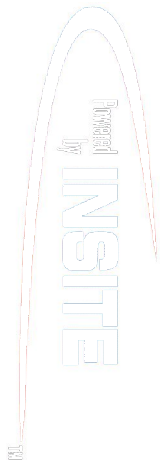


**PCDC - Pressure Case Directional  
PCGK - Pressure Case Gamma**

**1 : 600 / 1 : 240**

Country : USA		
Field : Wattenburg		
Location : Lat: 40° 28' 35.80" North Long: 104° 21' 18.68" West		
Well : Wells Ranch AE20-69HN		
Company : Noble Energy		
Rig : H&P 321		
<b>LOCATION</b> Company : Noble Energy Rig : H&P 321 Well : Wells Ranch AE20-69HN Field : Wattenburg Country : USA API Number : 05-123-37223		
	Latitude : 40° 28' 35.80" North Longitude : 104° 21' 18.68" West	Other Services <b>Directional Drilling</b>
	UTM Easting = 3,318,472.587 ft	
	UTM Northing = 1,418,525.625 ft	
Permanent Datum : Ground Level	Elevation : 4838.00 ft	Elev. KB N/A
Log Measured From : Drill Floor	30.00 ft Above Permanent Datum	DF 4868.00 ft GL 4838.00 ft WD N/A
Drilling Measured From : Drill Floor	<b>TVD LOG</b>	
Depth Logged : 980.98 ft To 6,586.71 ft	Unit No. : 11210424	Job No. :CA-XX-0900829265
Date Logged : 09-Nov-13 To 13-Nov-13	Plot Type : Final	
Total Depth MD : 7,067.00 ft TVD : 6,586.71 ft	Plot Date : 13-Nov-13	
Spud Date : 09-Nov-13		
Run No.	Borehole Record (TVD) Size From To	Run No. Size From To
100	8.750 in 980.98 ft 5,815.51 ft	
200	8.750 in 5,815.51 ft 6,586.71 ft	
		Casing Record (TVD) Size Weight From To
		9.625 36.00 0.00 981.00

**WELL INFORMATION**

MWD Run Number	100	200		
Date run completed	12-Nov-13	13-Nov-13		
Rig Bit Number	2	3		
Bit Size (in)	8.750	8.750		
Tool Nominal OD (in)	6.860	6.860		
Log Start Depth (MD, ft)	990.00	5,892.00		
Log End Depth (MD, ft)	5,892.00	7,067.00		
Drill or Wipe	Drill	Drill		
Drill/Wipe Start Date and Time	11-Nov-13 02:45	12-Nov-13 14:30		
Drill/Wipe End Date and Time	12-Nov-13 02:57	13-Nov-13 09:00		
Min Inc (deg) @ Depth (MD, ft)	0.50 @ 1,090.00	11.58 @ 5,914.00		
Max Inc (deg) @ Depth (MD, ft)	14.06 @ 3,924.00	83.06 @ 7,013.00		
Bit TFA(in2) / Bit Type	0.75 / PDC	1.24 / PDC		
Flow Rate (gpm)	565.42	573.54		
Max AV (fpm) / CV (fpm) @ MWD	NA / 0.0	NA / 0.0		
Fluid Type	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.60 / 32.00	9.90 / 45.00		
Filtrate CL (ppm)	1,900.00	2,300.00		
pH / Fluid Loss (mptm)	10.00 / 17	9.00 / 7		
PV (cP) / YP (Ihf2)	5 / 3.00	14 / 15.00		
% Solids / % Sand	2.00 / 0.50	8.10 / 0.25		
% Oil / Oil:Water Ratio	NA / NA	NA / NA		
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA		
Rmf @ Measured Temp (degF)	NA @ NA	NA @ NA		
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA		

Max Tool Temp (degF) / Source	137.50 / PCM	162.80 / PCM			
Rm @ Max Tool Temp (degF)	NA @ 137.50	NA @ 162.80			
Lead MWD Engineer	Kyle Wass	Kyle Wass			
Customer Representative	Stetson Nielsen	Stetson Nielsen			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11341339	11341339			
Insert Serial Number	11227512	11227512			
Date and Time Initialized	08-Nov-13 13:00	08-Nov-13 13:00			
Date and Time Read	13-Nov-13 14:26	13-Nov-13 14:26			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	56.00	54.00			
Software Version	6.21	6.21			
Sub Serial Number	11341339	11341339			
Sonde Serial Number	11902155	11902155			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	215.67	32.44			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.54	47.29			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11341339	11341339			
Insert/Sonde Serial Number	11293417	11293417			

## REMARKS

1. All depths are calibrated to driller's pipe tally and are true vertical depth 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 Distance: 1.2 ft

6. Insite Version V8.0.0

## WARRANTY

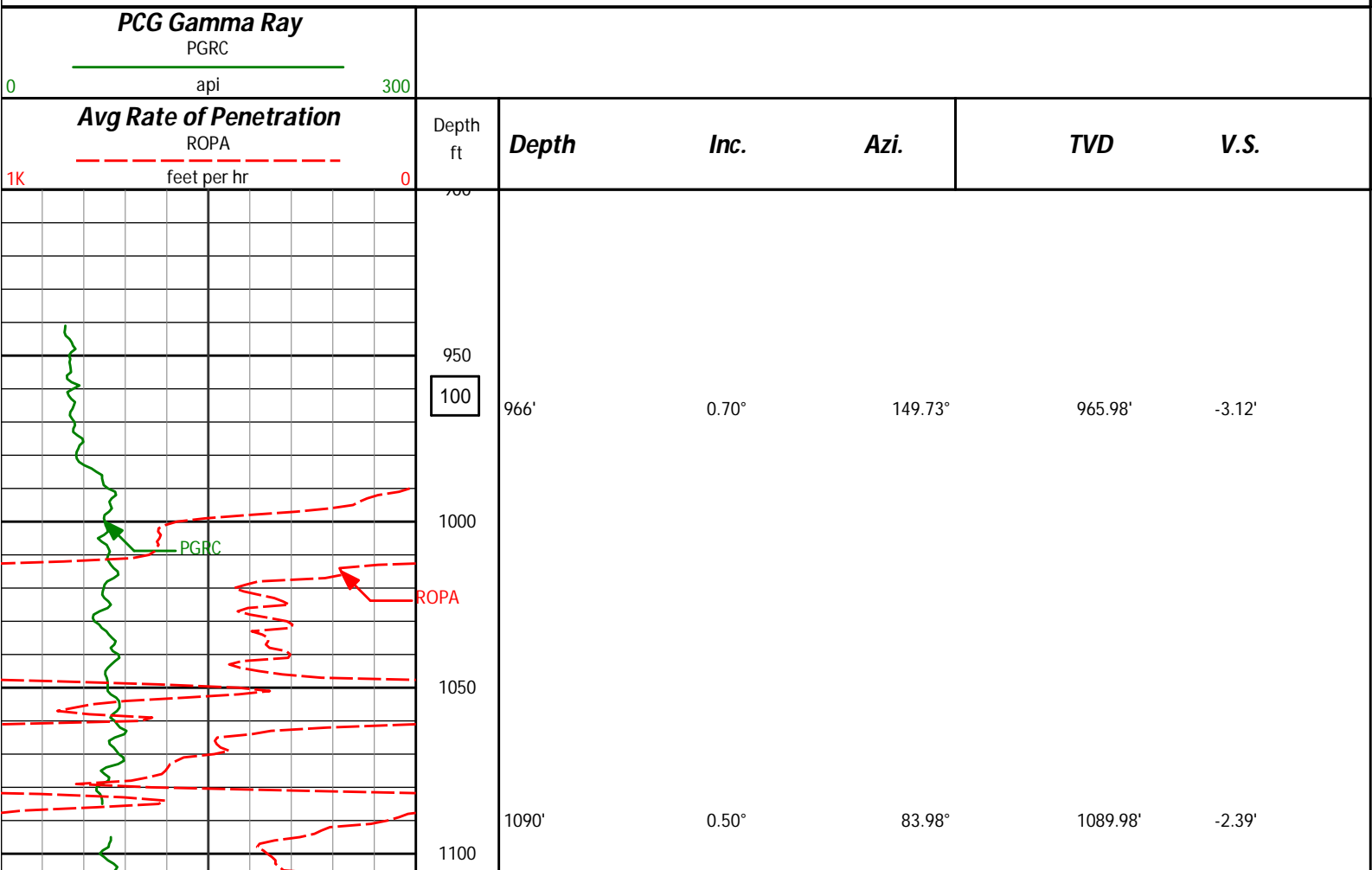
HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

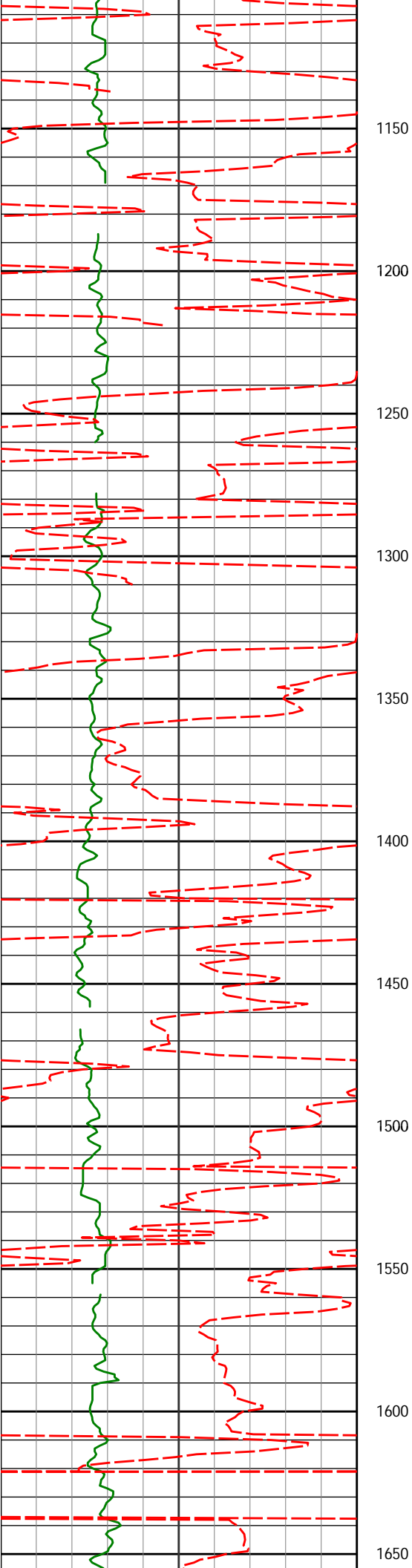
# HALLIBURTON

## Sperry Drilling Services

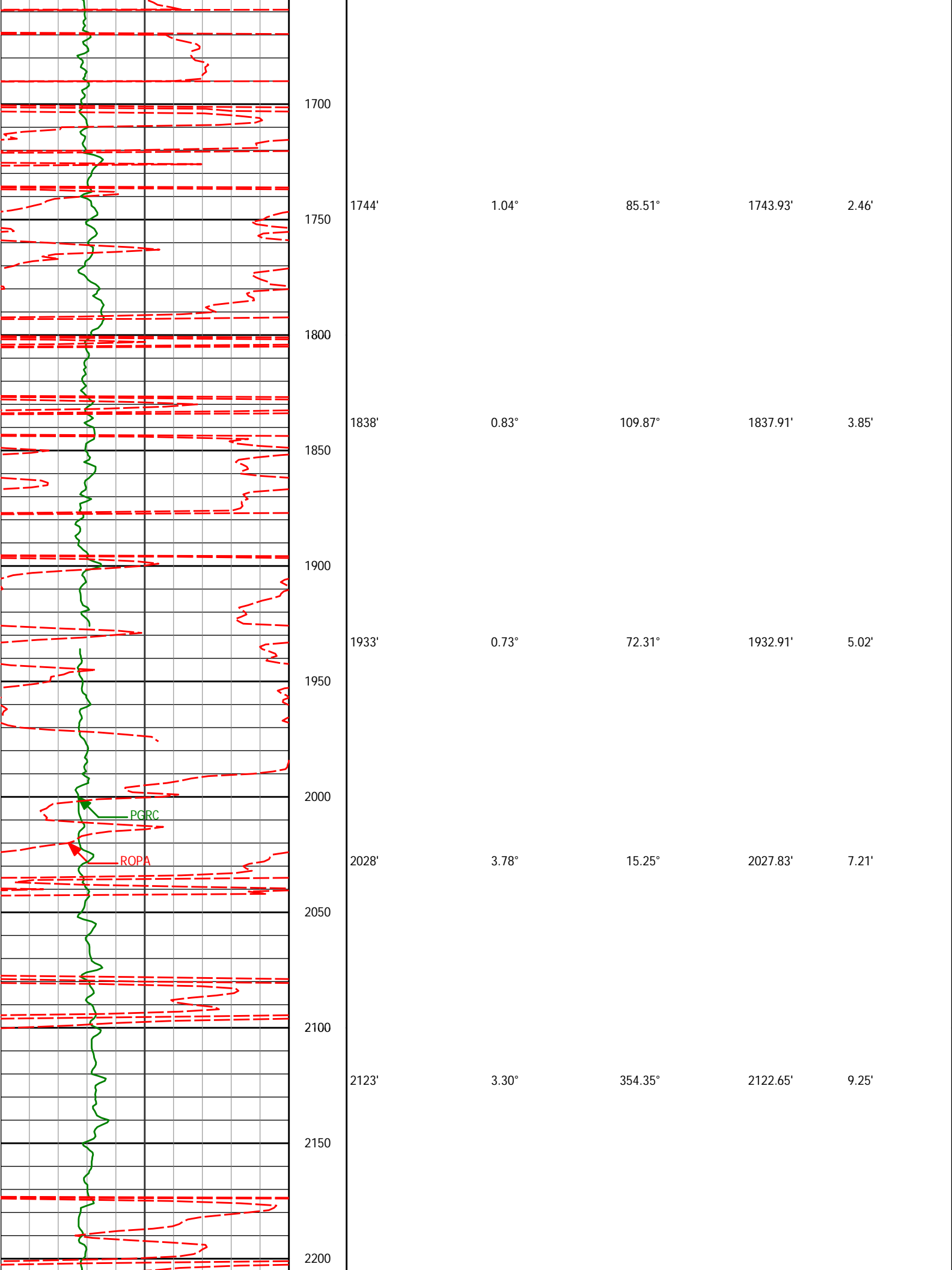
### TVD Correlation Log 1:600

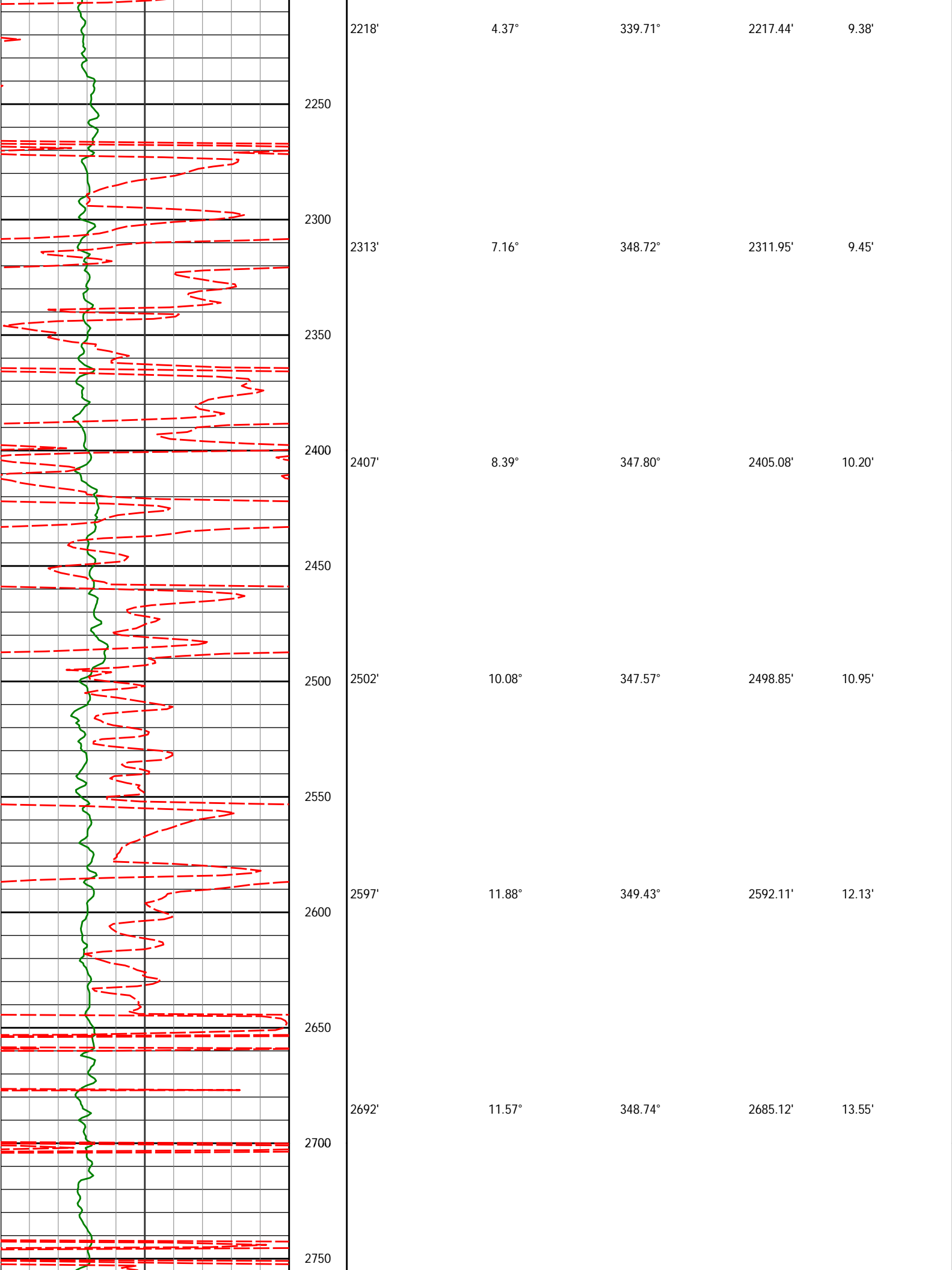
Noble Energy  
Wells Ranch AE20-69HN  
H&P 321  
Sec. 20-T6N-R62W

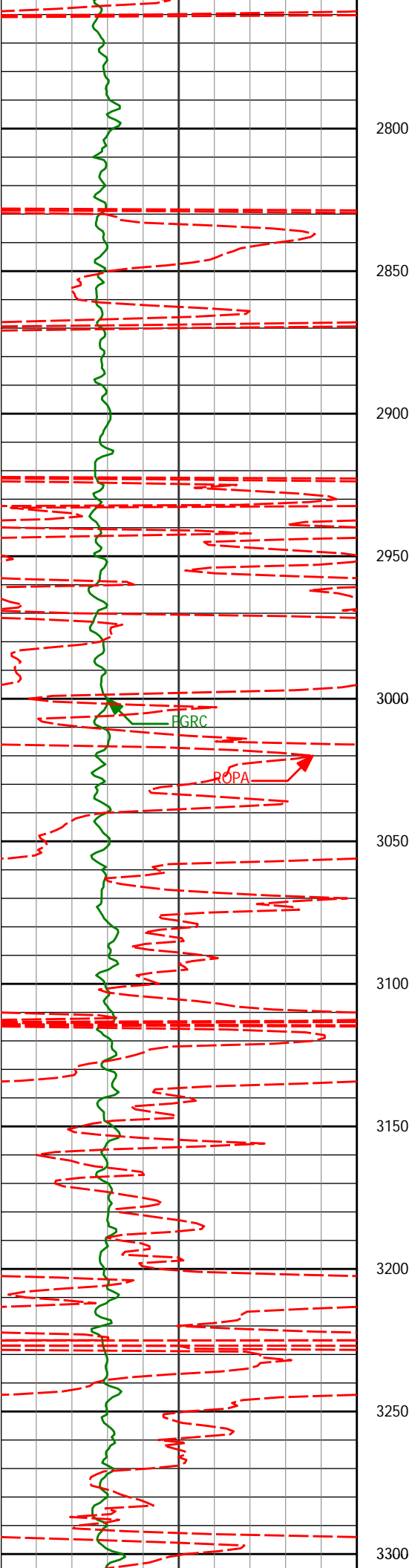




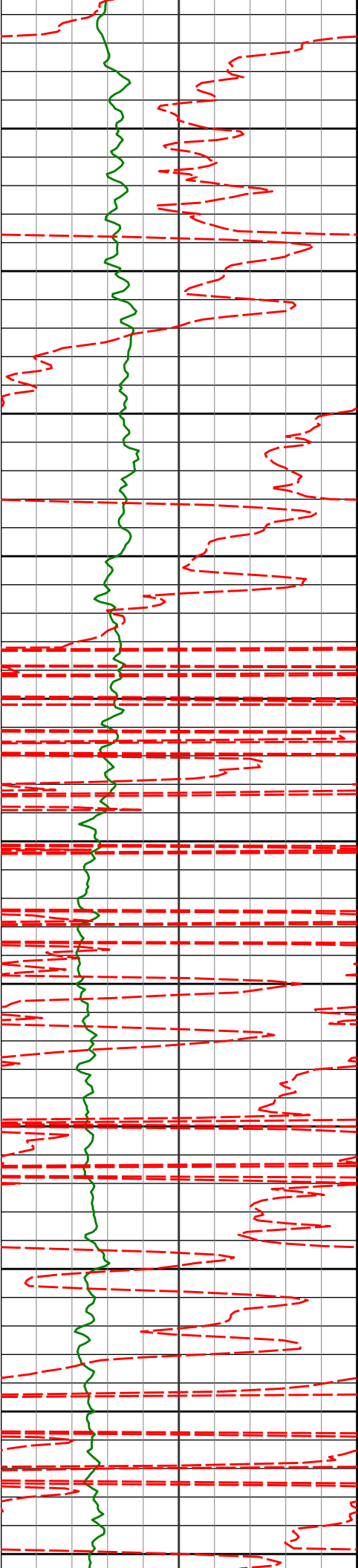
1150				
1182'	0.57°	121.97°	1181.97'	-1.68'
1200				
1274'	0.53°	140.55°	1273.97'	-1.20'
1300				
1367'	0.53°	169.93°	1366.96'	-1.06'
1400				
1459'	0.87°	175.14°	1458.96'	-1.22'
1500				
1554'	1.12°	71.87°	1553.95'	-0.42'
1600				
1650	0.74°	100.69°	1648.94'	1.06'





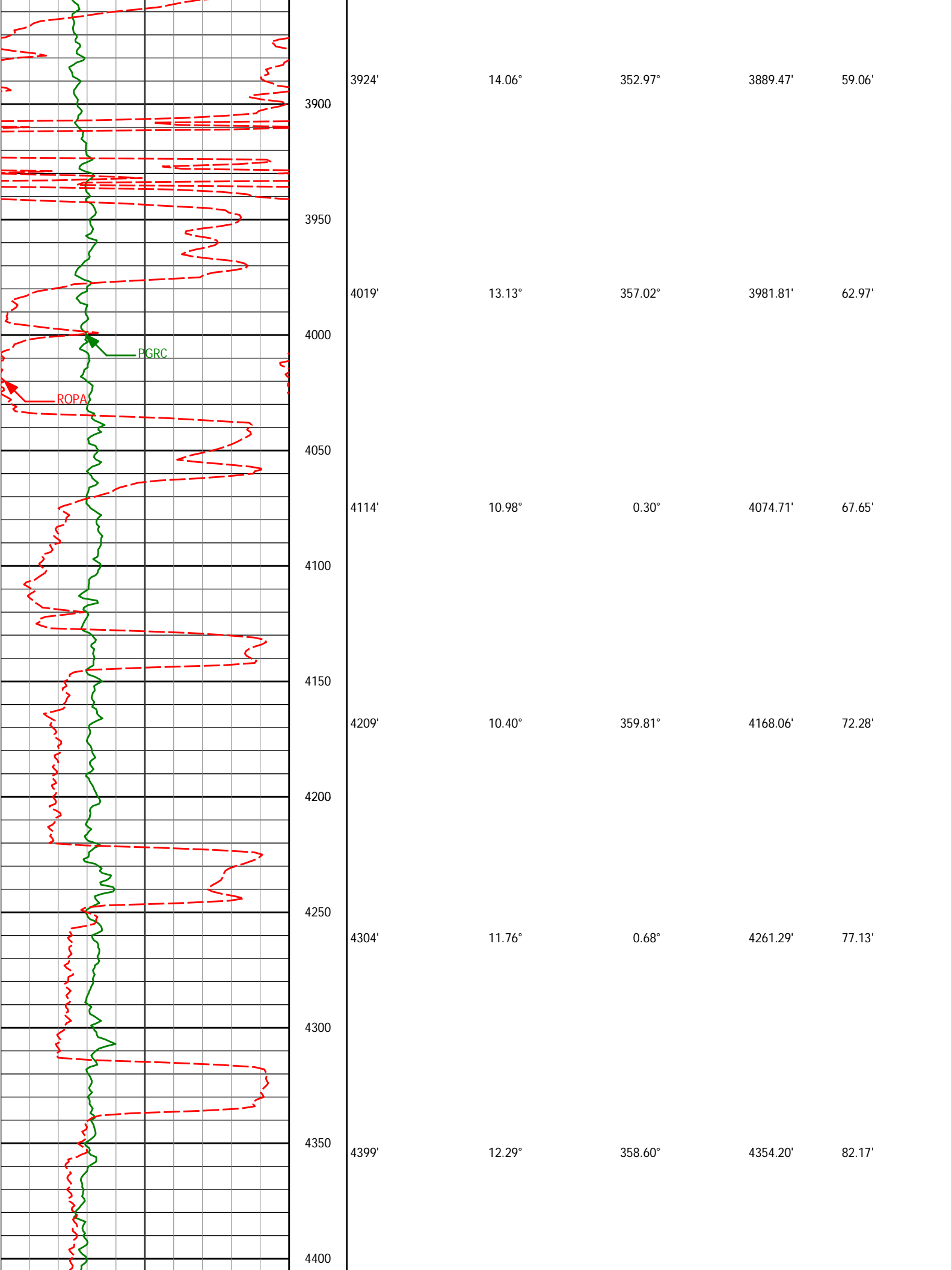


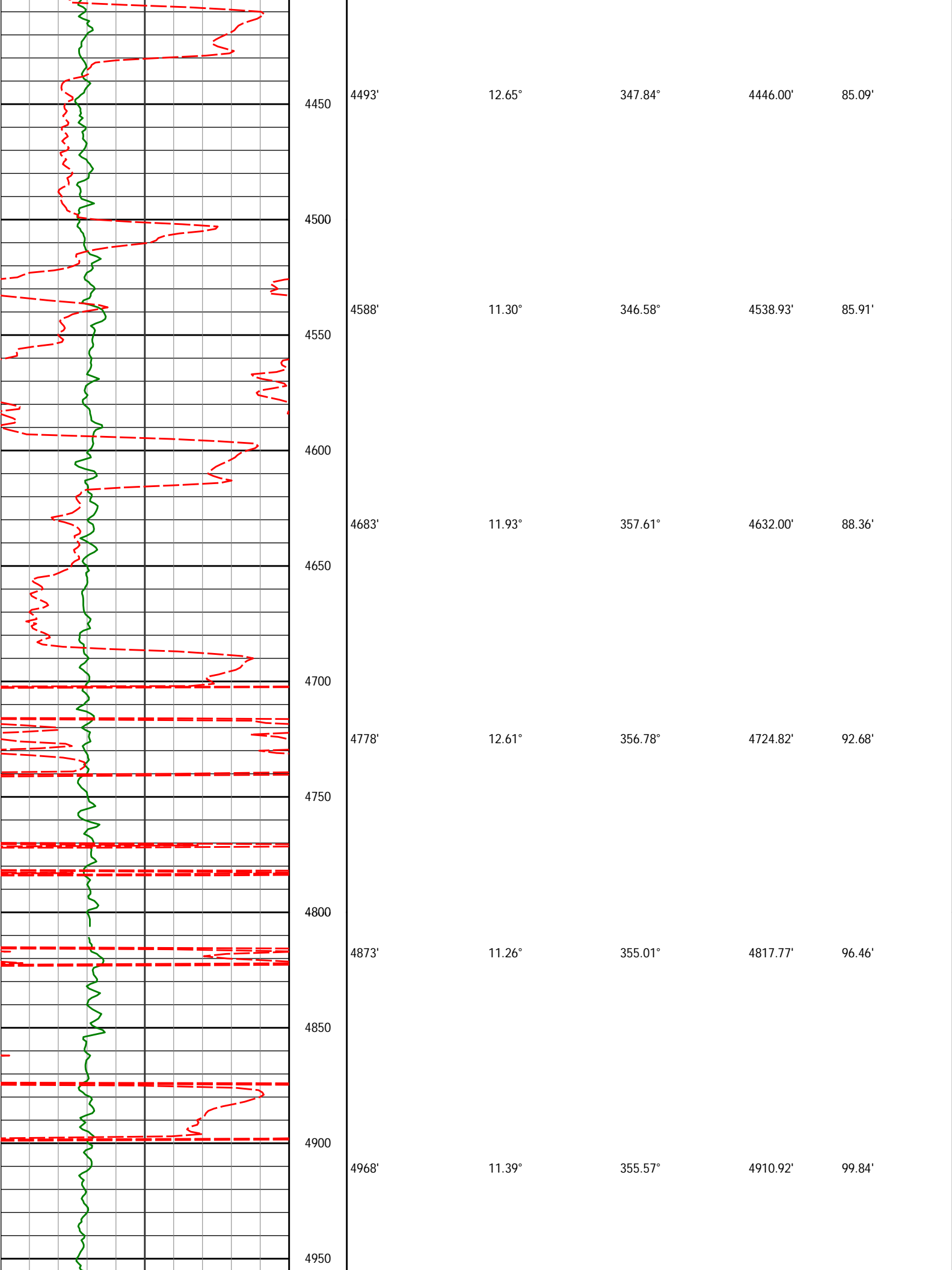
2786'	10.86°	346.01°	2777.33'	14.37'
2800				
2850				
2881'	12.26°	359.34°	2870.42'	17.08'
2900				
2950				
2976'	11.67°	356.21°	2963.35'	21.49'
3000				
3050				
3071'	13.01°	355.14°	3056.16'	25.30'
3100				
3150	12.39°	352.54°	3148.83'	28.57'
3200				
3260'	11.99°	354.61°	3240.71'	31.57'
3250				
3300				

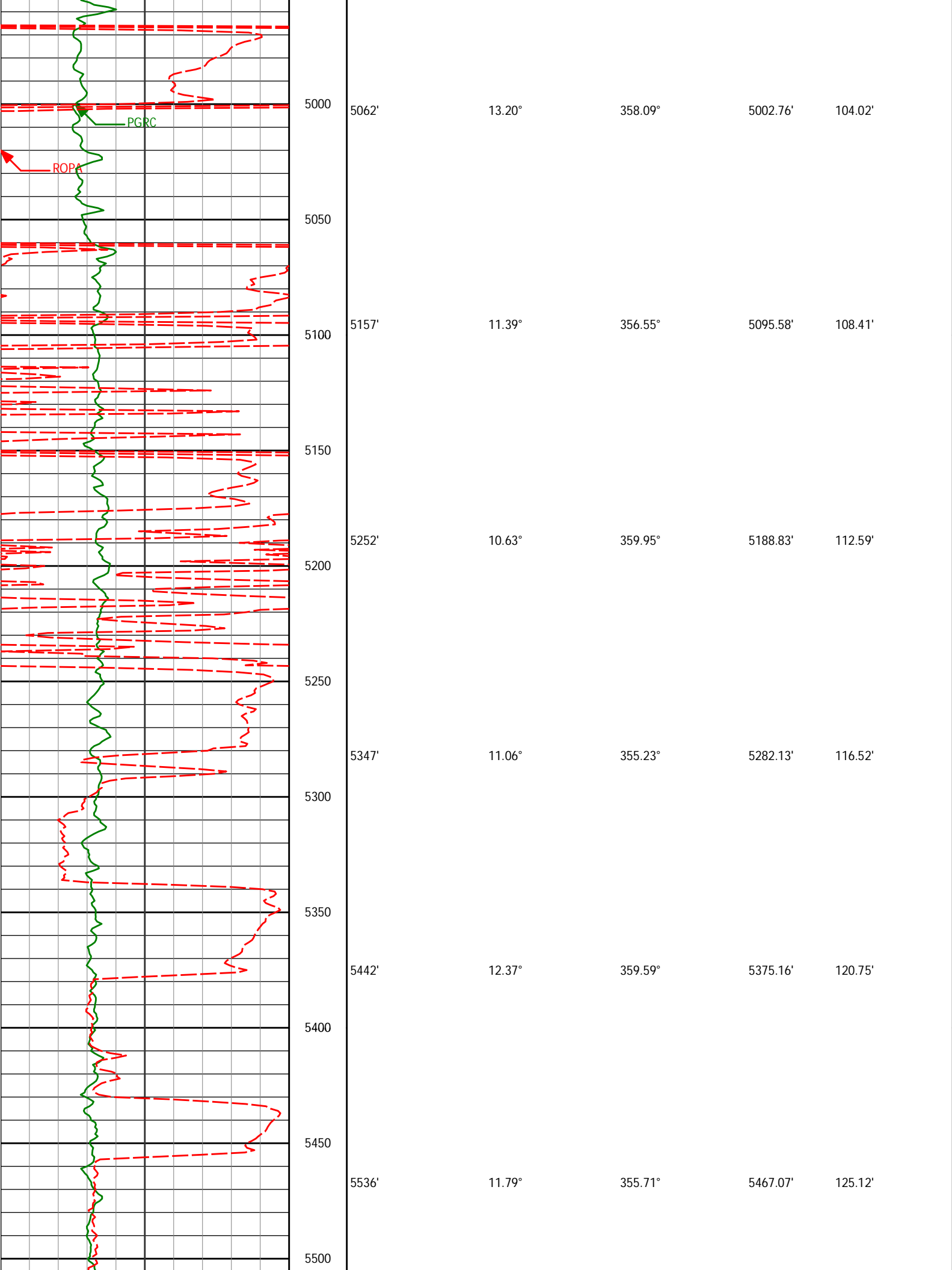


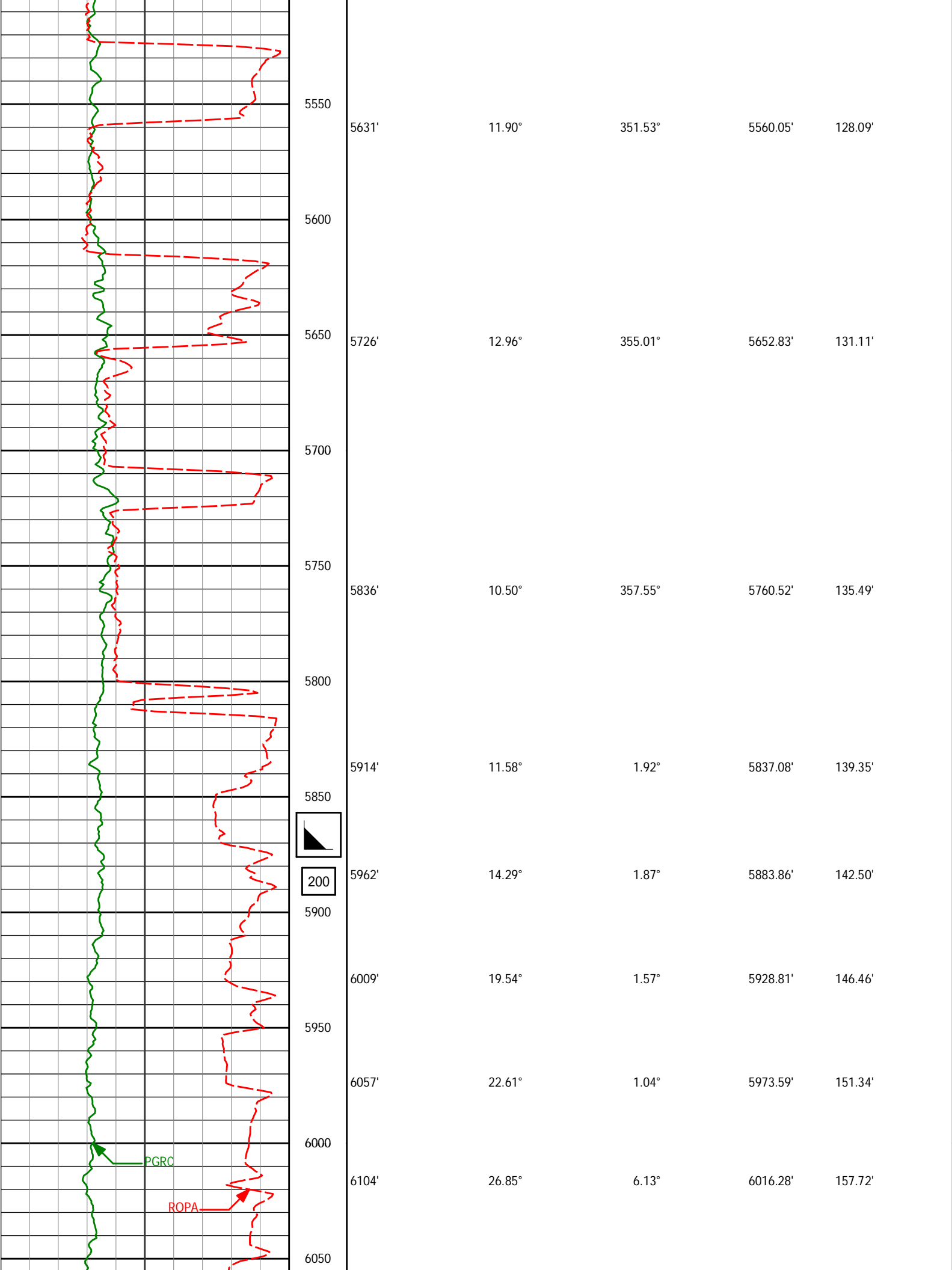
3355'	10.19°	353.93°	3333.94'	34.57'
3350				
3450'	10.94°	355.52°	3427.32'	37.57'
3450				
3544'	12.40°	356.54°	3519.38'	41.27'
3550				
3640'	12.63°	358.12°	3613.10'	45.76'
3650				
3734'	13.20°	0.54°	3704.72'	51.02'
3750				
3829'	13.38°	353.94°	3797.18'	55.70'
3850				

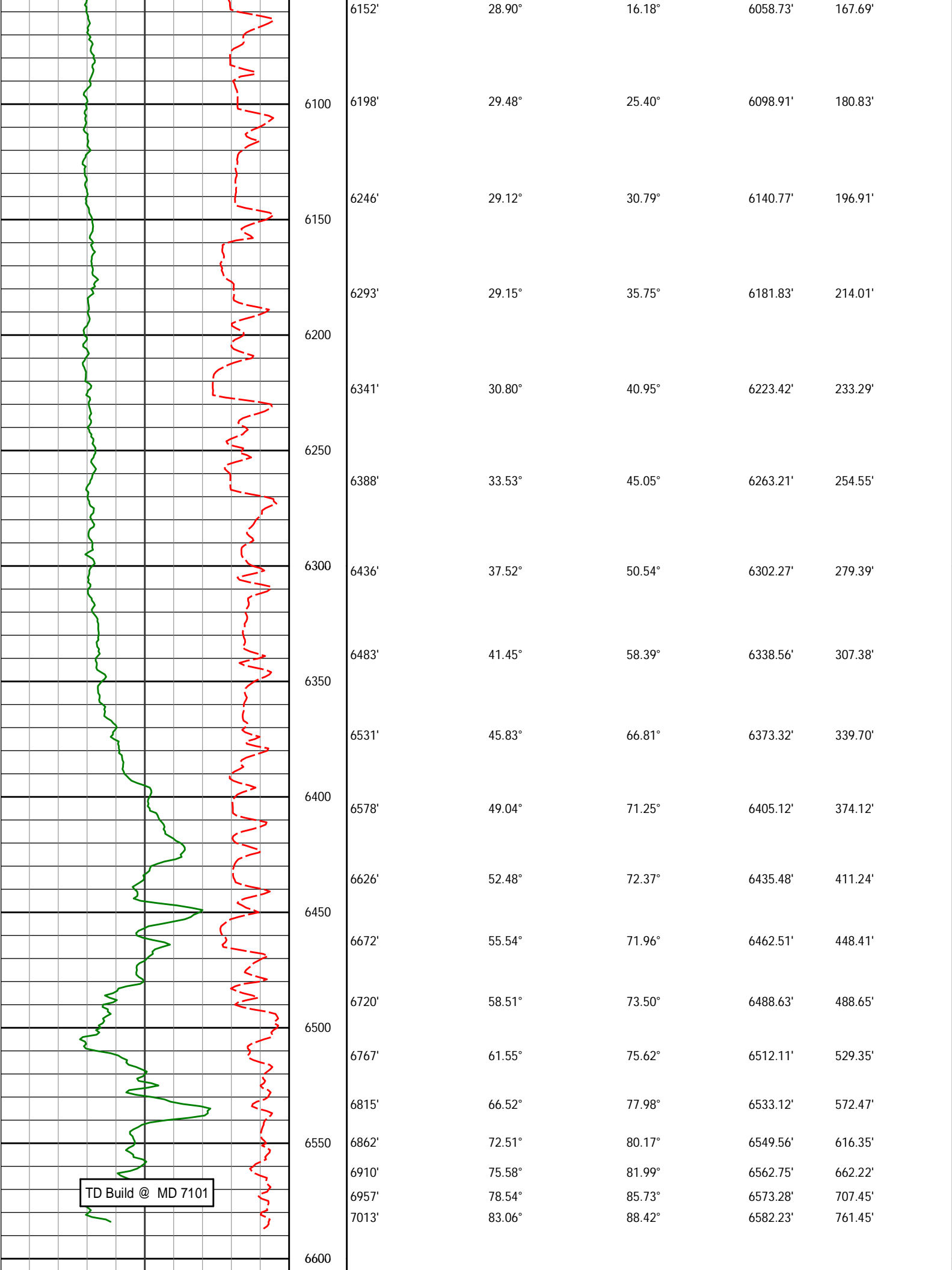


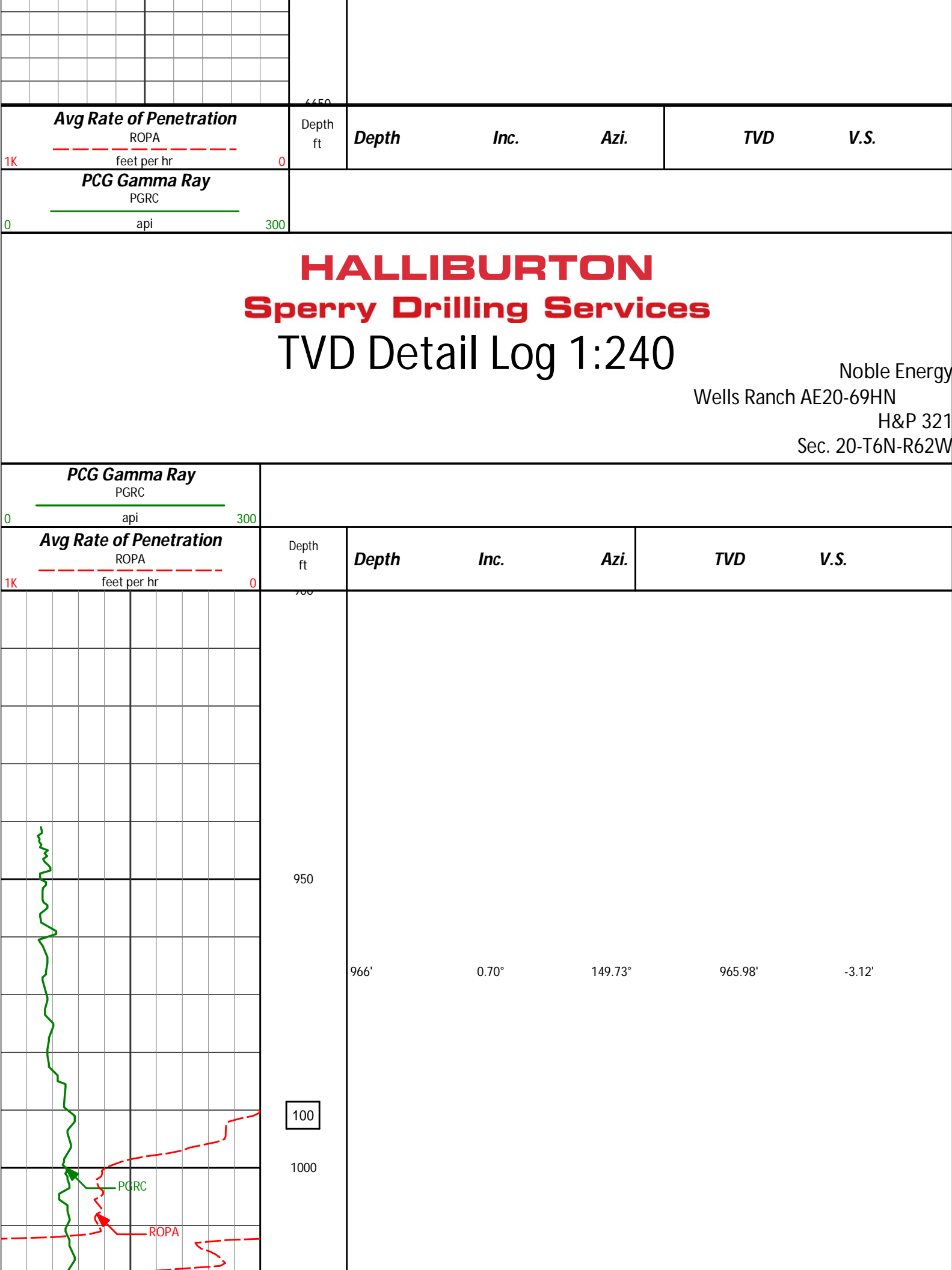


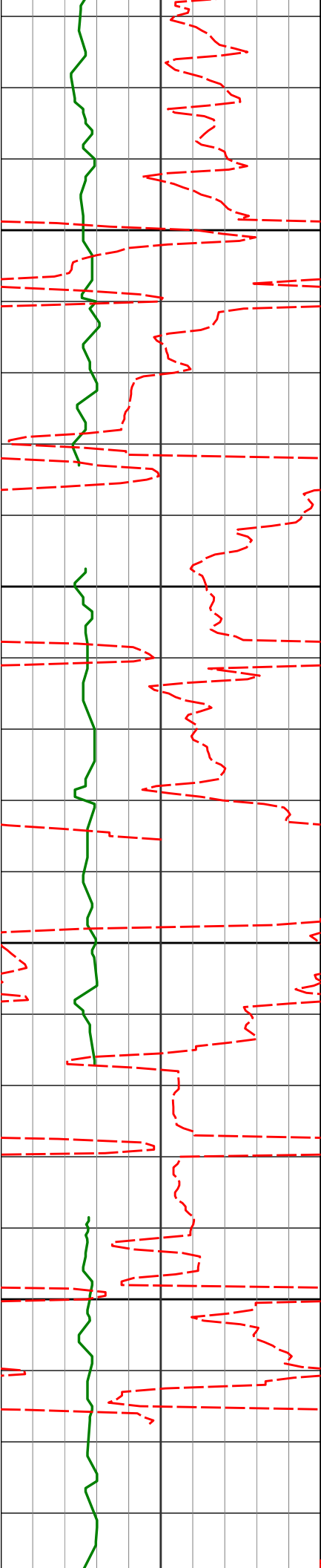












1050

1100

1150

1200

1090'

0.50°

83.98°

1089.98'

-2.39'

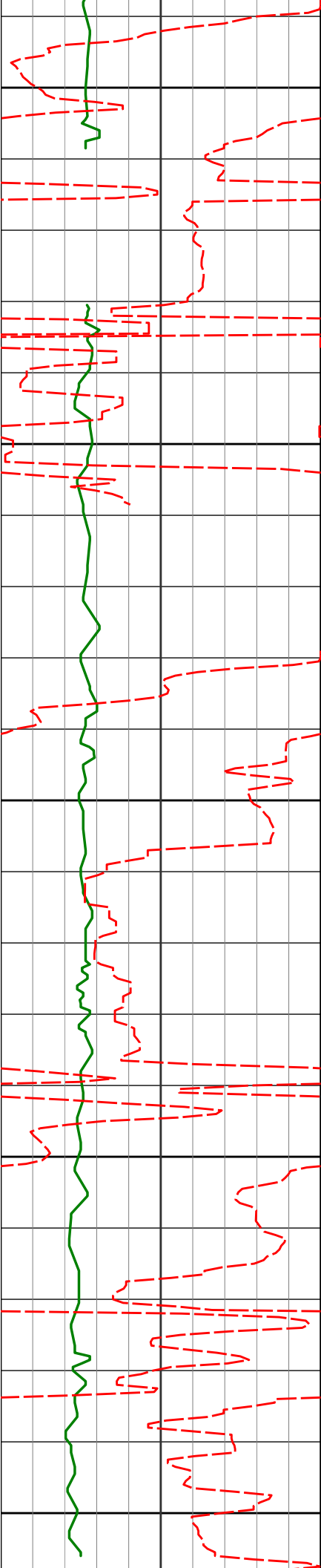
1182'

0.57°

121.97°

1181.97'

-1.68'



1250

1274'

0.53°

140.55°

1273.97'

-1.20'

1300

1350

1367'

0.53°

169.93°

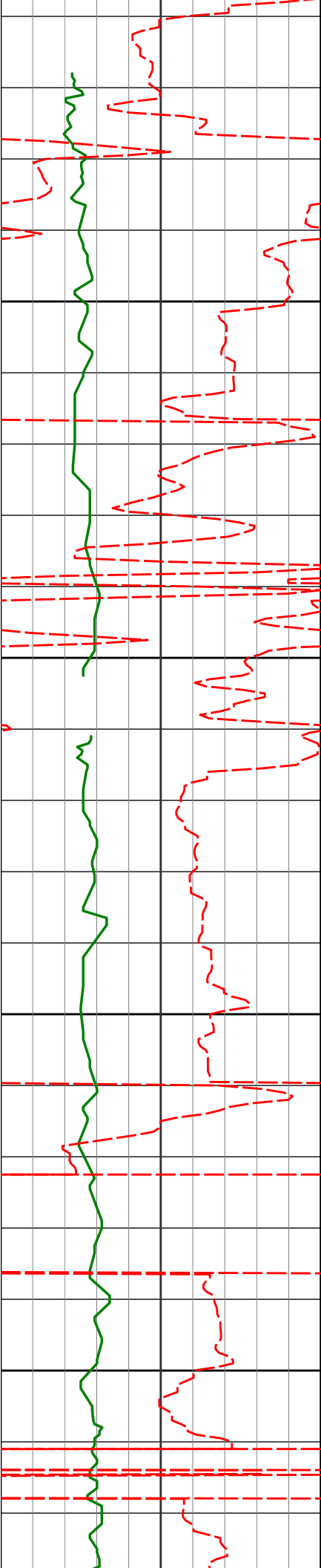
1366.96'

-1.06'

1400

1450





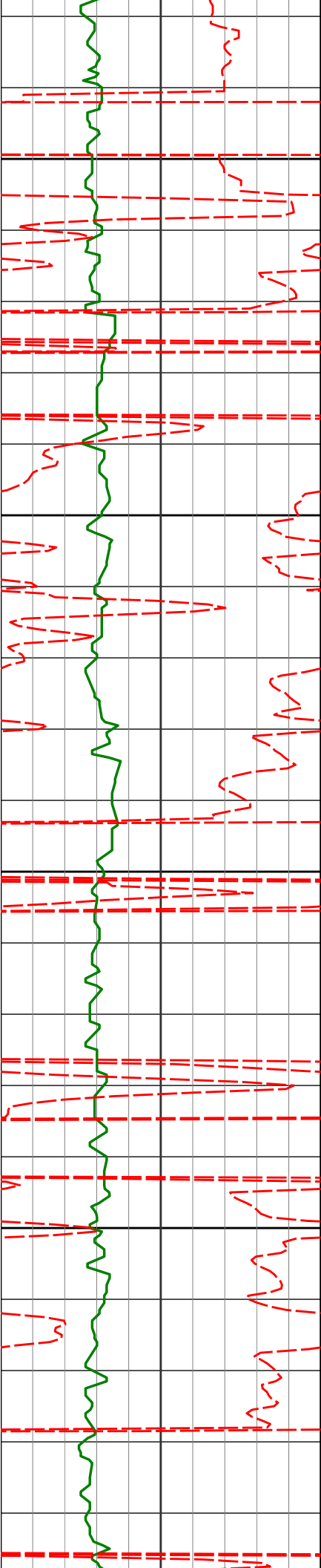
1500

1550

1600

1650

1459'	0.87°	175.14°	1458.96'	-1.22'
1554'	1.12°	71.87°	1553.95'	-0.42'
1649'	0.74°	100.69°	1648.94'	1.06'



1700

1750

1800

1850

1744'

1.04°

85.51°

1743.93'

2.46'

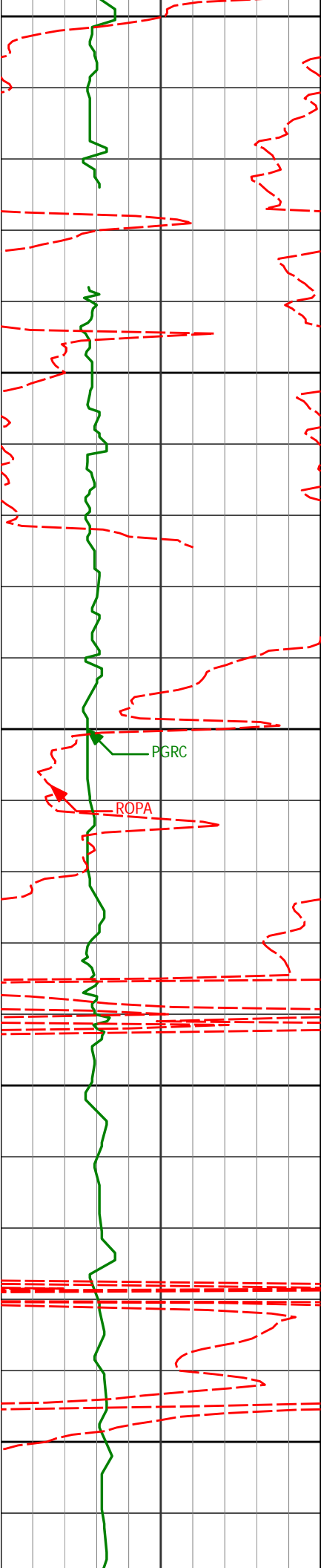
1838'

0.83°

109.87°

1837.91'

3.85'



1900

1933'

0.73°

72.31°

1932.91'

5.02'

1950

2000

PGRC

ROPA

2028'

3.78°

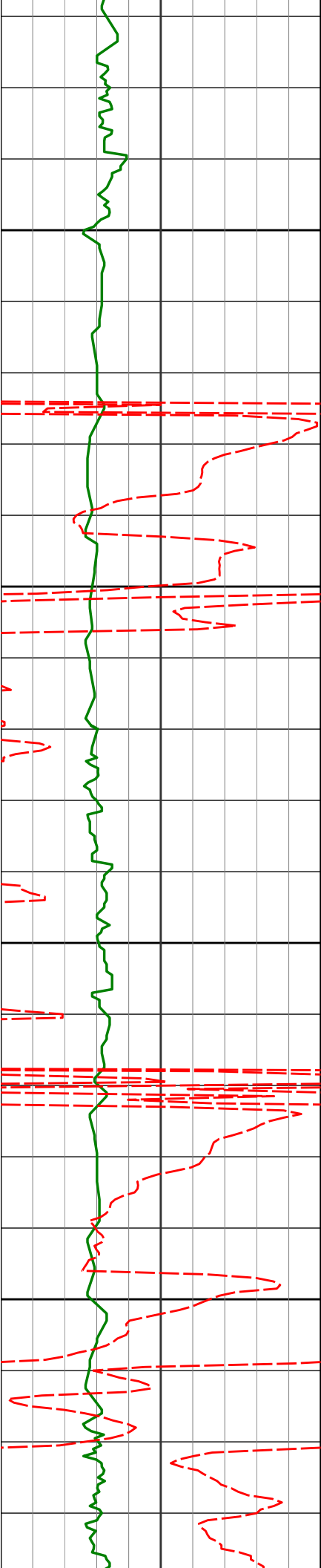
15.25°

2027.83'

7.21'

2050

2100



2150

2200

2250

2300

2123'

3.30°

354.35°

2122.65'

9.25'

2218'

4.37°

339.71°

2217.44'

9.38'

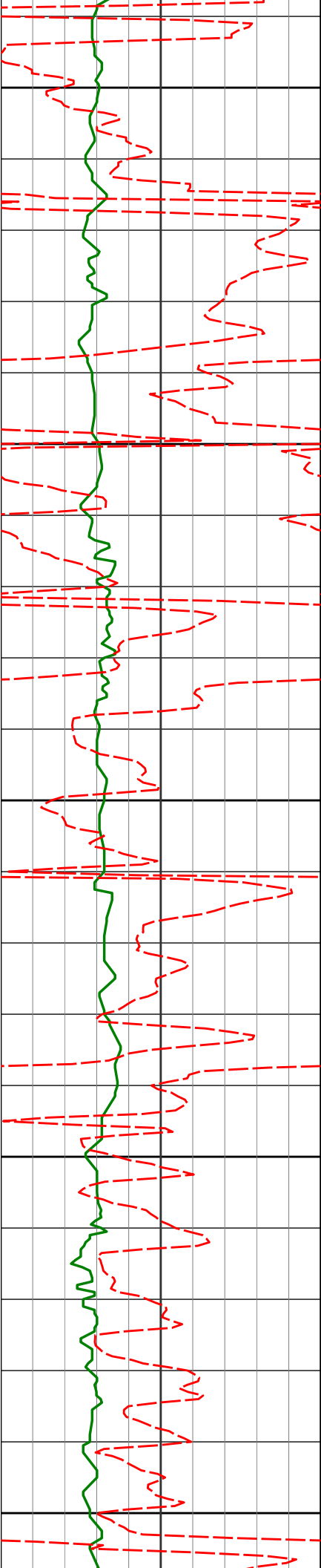
2313'

7.16°

348.72°

2311.95'

9.45'



2350

2400

2450

2500

2550

2407'

8.39°

347.80°

2405.08'

10.20'

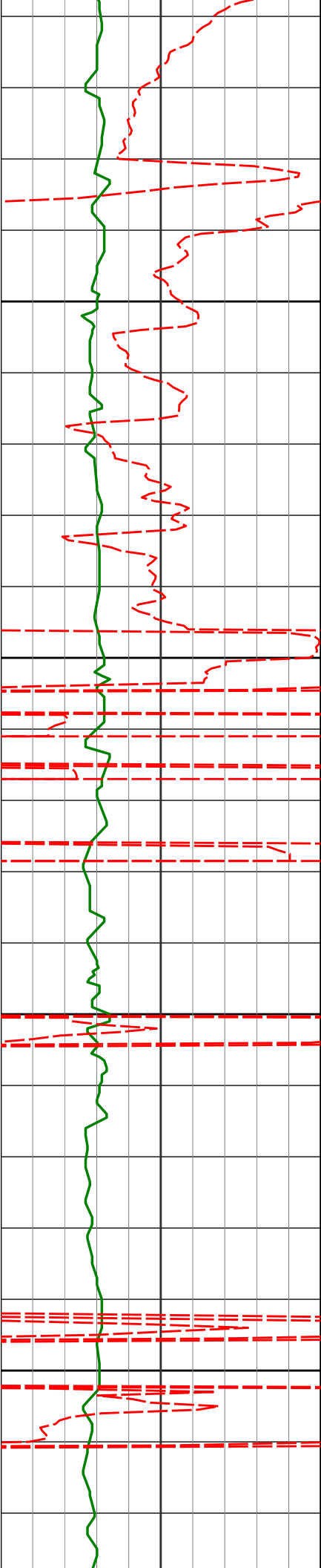
2502'

10.08°

347.57°

2498.85'

10.95'



2600

2650

2700

2750

2597'

11.88°

349.43°

2592.11'

12.13'

2692'

11.57°

348.74°

2685.12'

13.55'

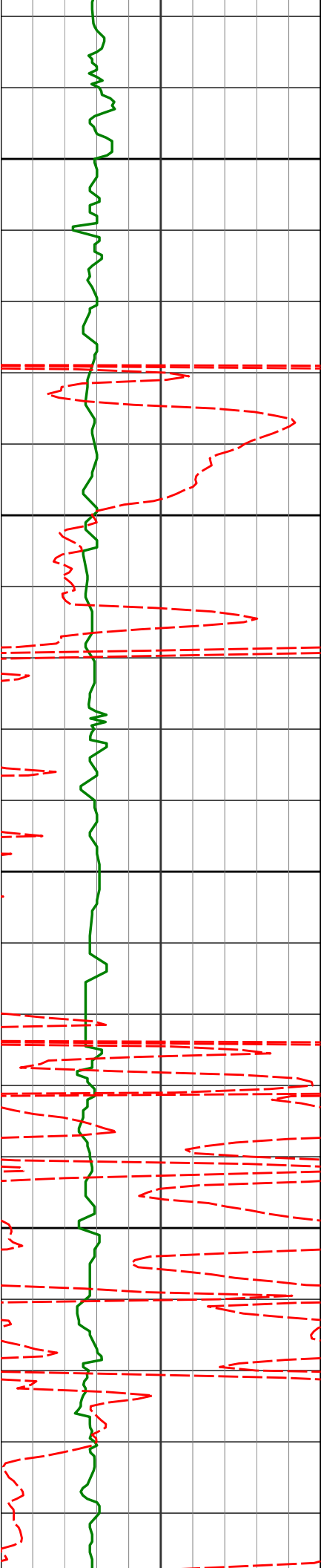
2786'

10.86°

346.01°

2777.33'

14.37'



2800

2850

2900

2950

2881'

12.26°

359.34°

2870.42'

17.08'

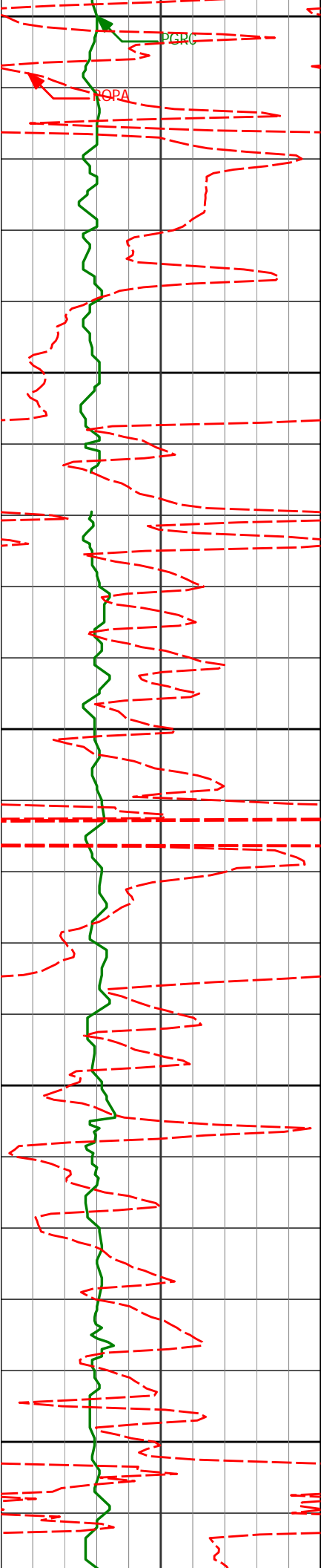
2976'

11.67°

356.21°

2963.35'

21.49'



3000

3050

3100

3150

3200

3071'

13.01°

355.14°

3056.16'

25.30'

3166'

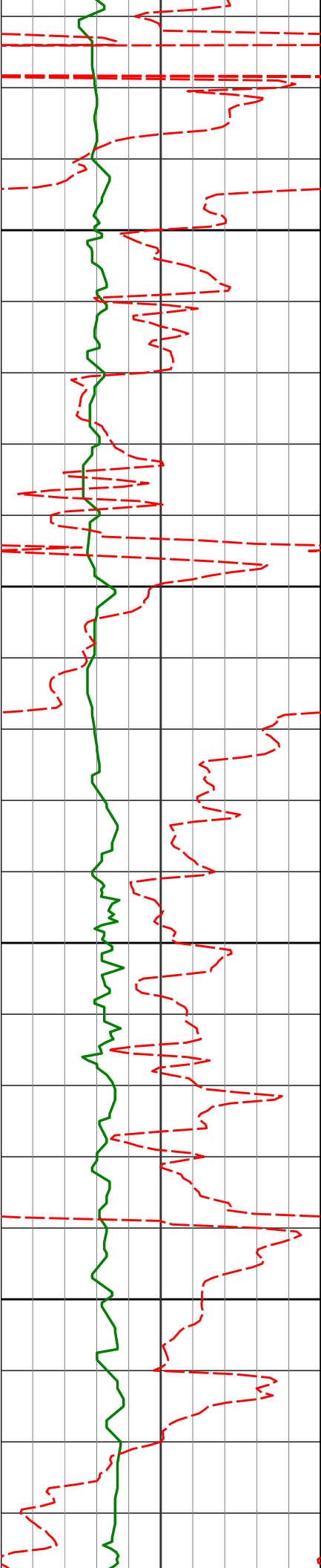
12.39°

352.54°

3148.83'

28.57'





3250

3300

3350

3400

3260'

3355'

3450'

11.99°

10.19°

10.94°

354.61°

353.93°

355.52°

3240.71'

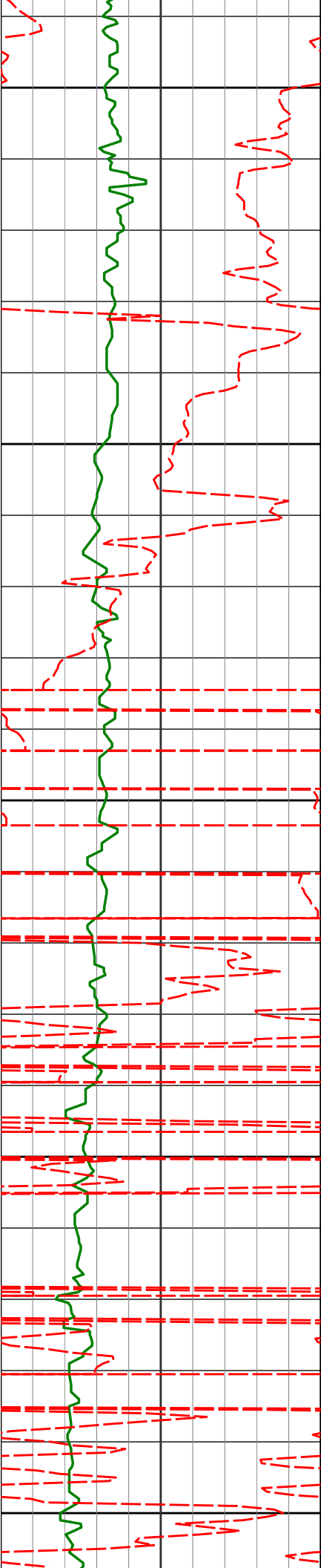
3333.94'

3427.32'

31.57'

34.57'

37.57'



3450

3500

3550

3600

3650

3544'

12.40°

356.54°

3519.38'

41.27'

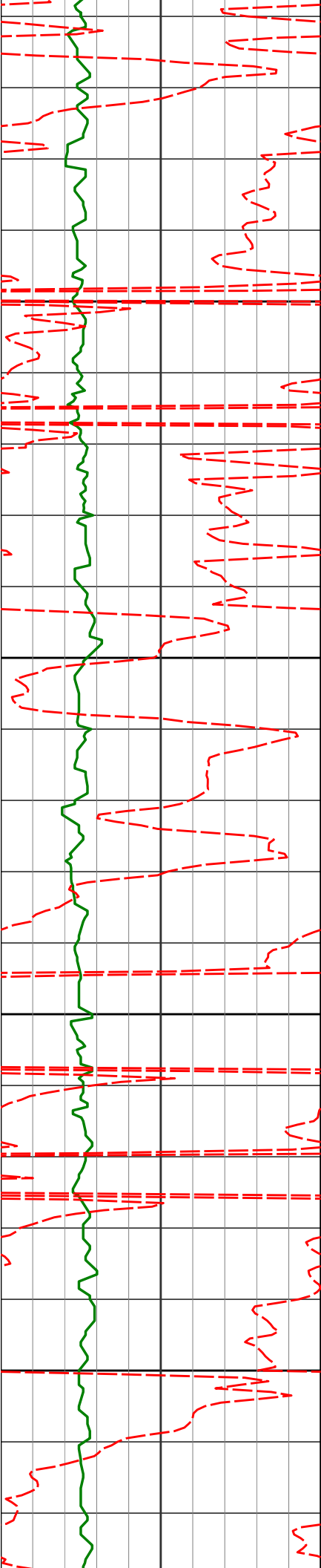
3640'

12.63°

358.12°

3613.10'

45.76'



3700

3734'

13.20°

0.54°

3704.72'

51.02'

3750

3800

3829'

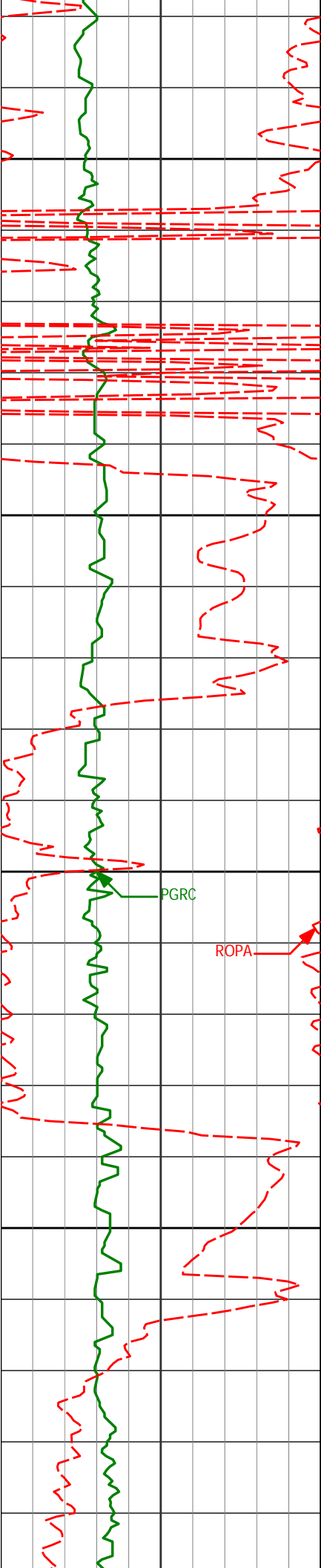
13.38°

353.94°

3797.18'

55.70'

3850



3924'

14.06°

352.97°

3889.47'

59.06'

3900

3950

4019'

13.13°

357.02°

3981.81'

62.97'

4000

PGRC

ROPA

4050

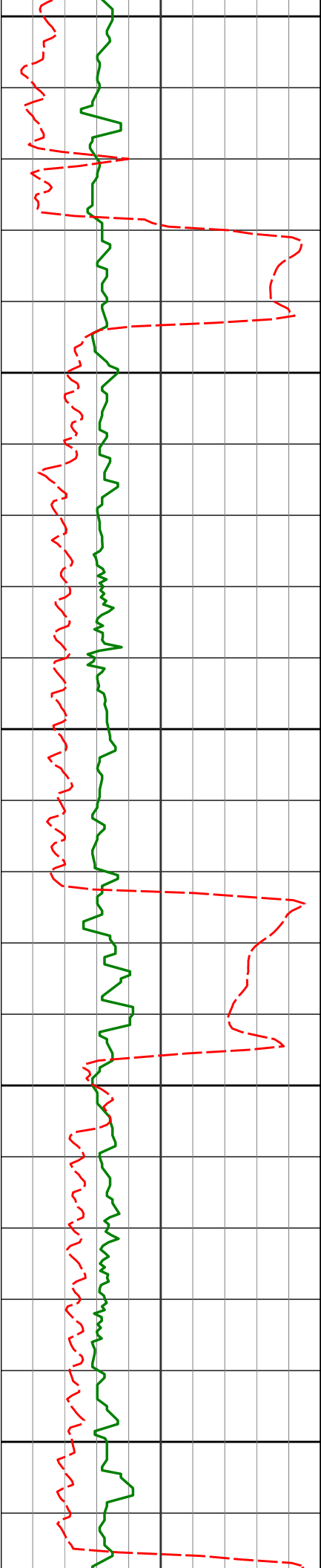
4114'

10.98°

0.30°

4074.71'

67.65'



4100

4150

4200

4250

4300

4209'

10.40°

359.81°

4168.06'

72.28'

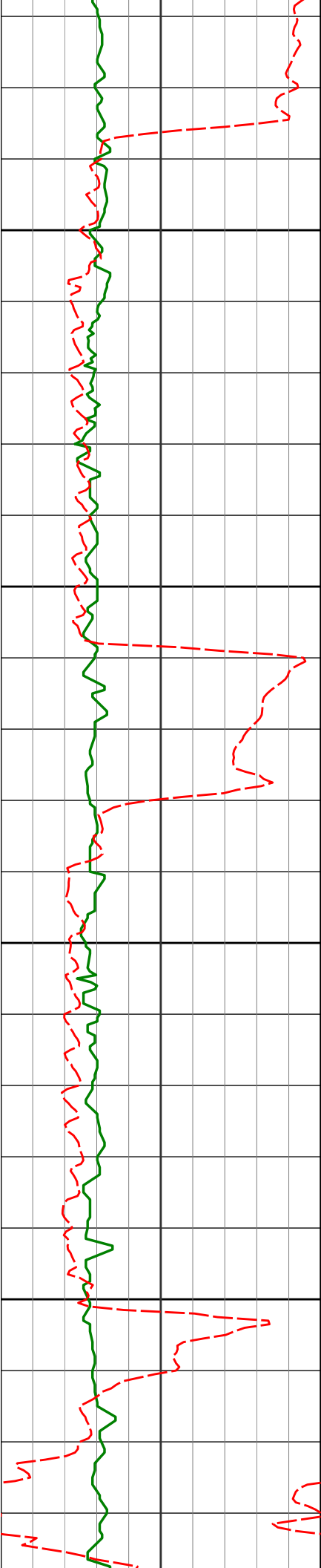
4304'

11.76°

0.68°

4261.29'

77.13'



4350

4399'

12.29°

358.60°

4354.20'

82.17'

4400

4450

4493'

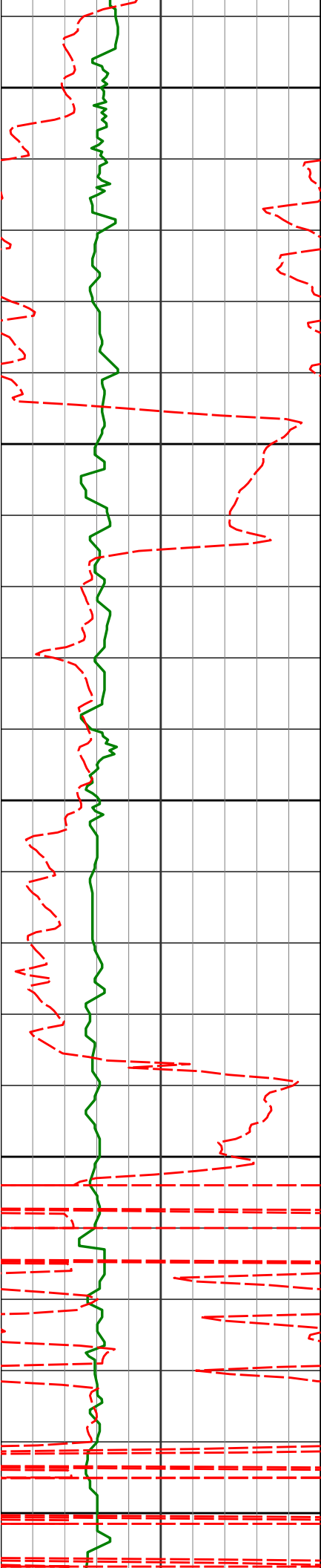
12.65°

347.84°

4446.00'

85.09'

4500



4550

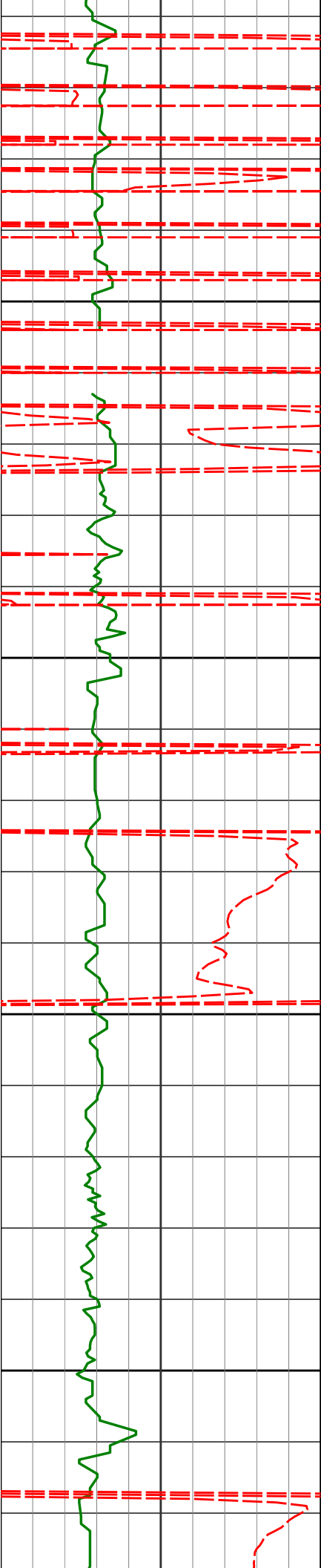
4600

4650

4700

4750

4588'	11.30°	346.58°	4538.93'	85.91'
4683'	11.93°	357.61°	4632.00'	88.36'
4778'	12.61°	356.78°	4724.82'	92.68'



4800

4850

4900

4950

4873'

11.26°

355.01°

4817.77'

96.46'

4968'

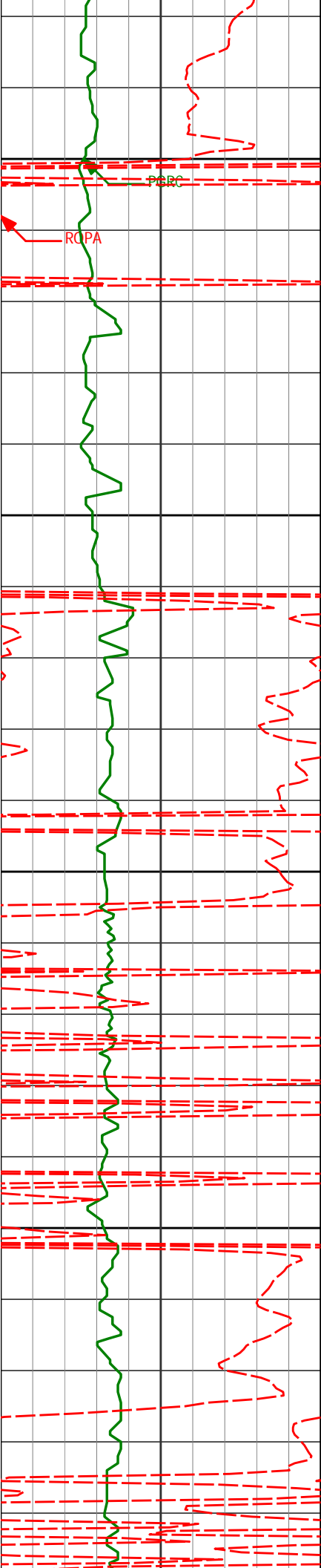
11.39°

355.57°

4910.92'

99.84'





5000

5050

5100

5150

5062'

13.20°

358.09°

5002.76'

104.02'

5157'

11.39°

356.55°

5095.58'

108.41'

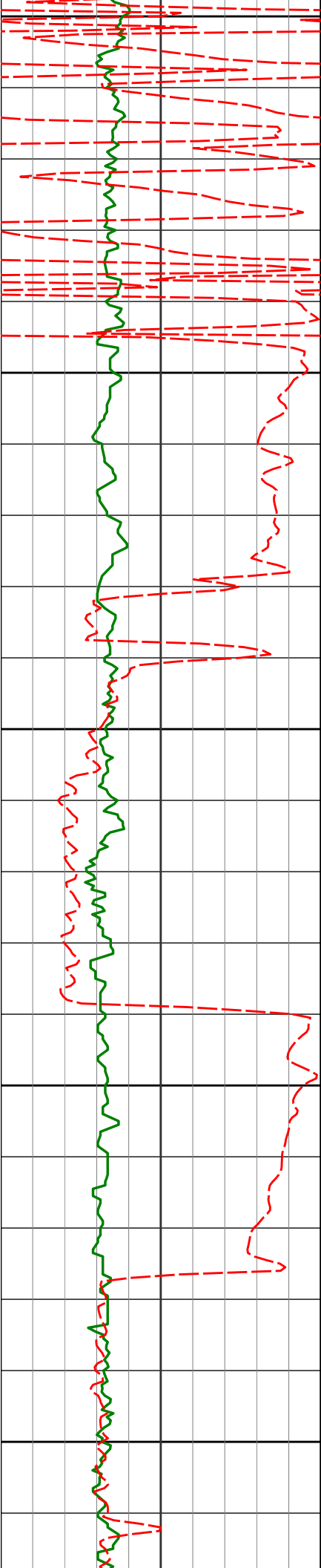
5252'

10.63°

359.95°

5188.83'

112.59'



5200

5250

5300

5350

5400

5347'

11.06°

355.23°

5282.13'

116.52'

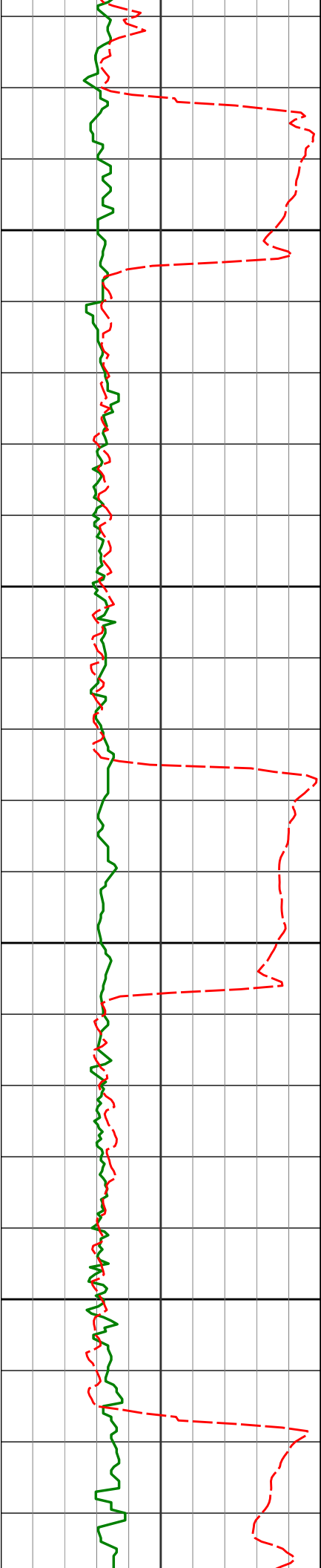
5442'

12.37°

359.59°

5375.16'

120.75'



5450

5536'

11.79°

355.71°

5467.07'

125.12'

5500

5550

5631'

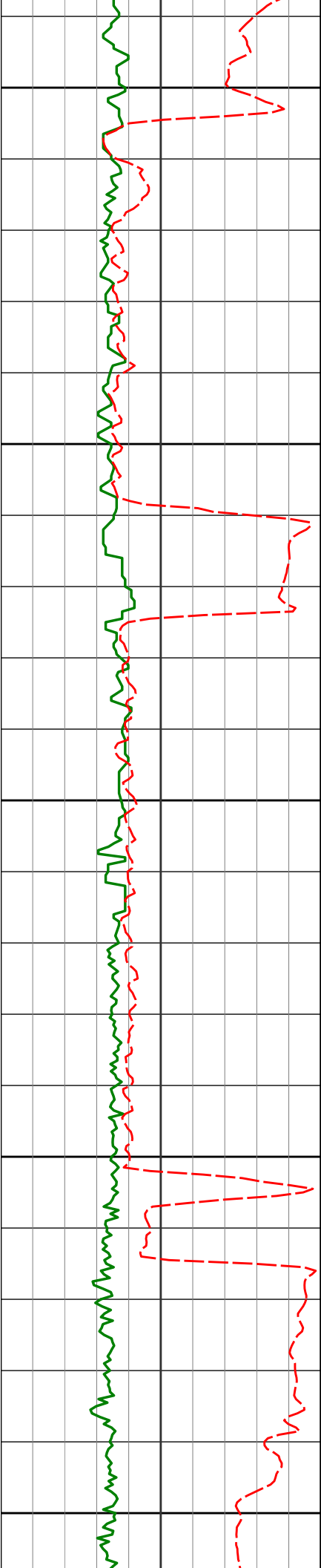
11.90°

351.53°

5560.05'

128.09'

5600



5650

5726'

12.96°

355.01°

5652.83'

131.11'

5700

5750

5836'

10.50°

357.55°

5760.52'

135.49'

5800

5914'

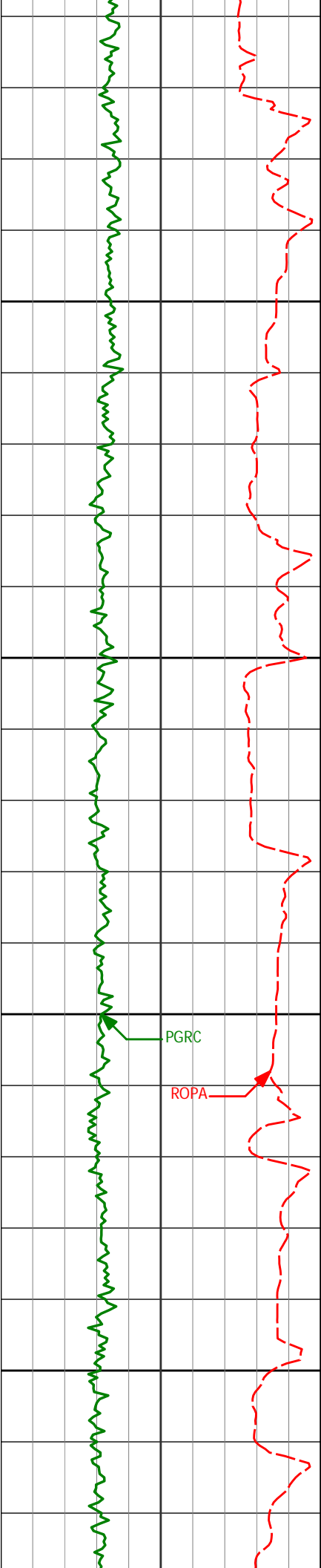
11.58°

1.92°

5837.08'

139.35'

5850



200

5900

5950

6000

6050

5962'

14.29°

1.87°

5883.86'

142.50'

6009'

19.54°

1.57°

5928.81'

146.46'

6057'

22.61°

1.04°

5973.59'

151.34'

6104'

26.85°

6.13°

6016.28'

157.72'

6152'

28.90°

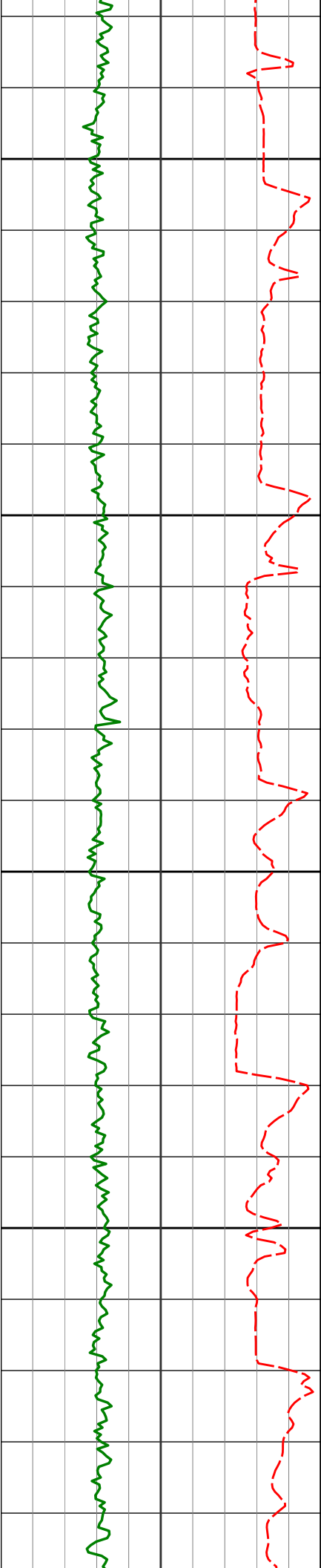
16.18°

6058.73'

167.69'

PGRC

ROPA



6100

6198'

29.48°

25.40°

6098.91'

180.83'

6246'

29.12°

30.79°

6140.77'

196.91'

6150

6293'

29.15°

35.75°

6181.83'

214.01'

6200

6341'

30.80°

40.95°

6223.42'

233.29'

6250

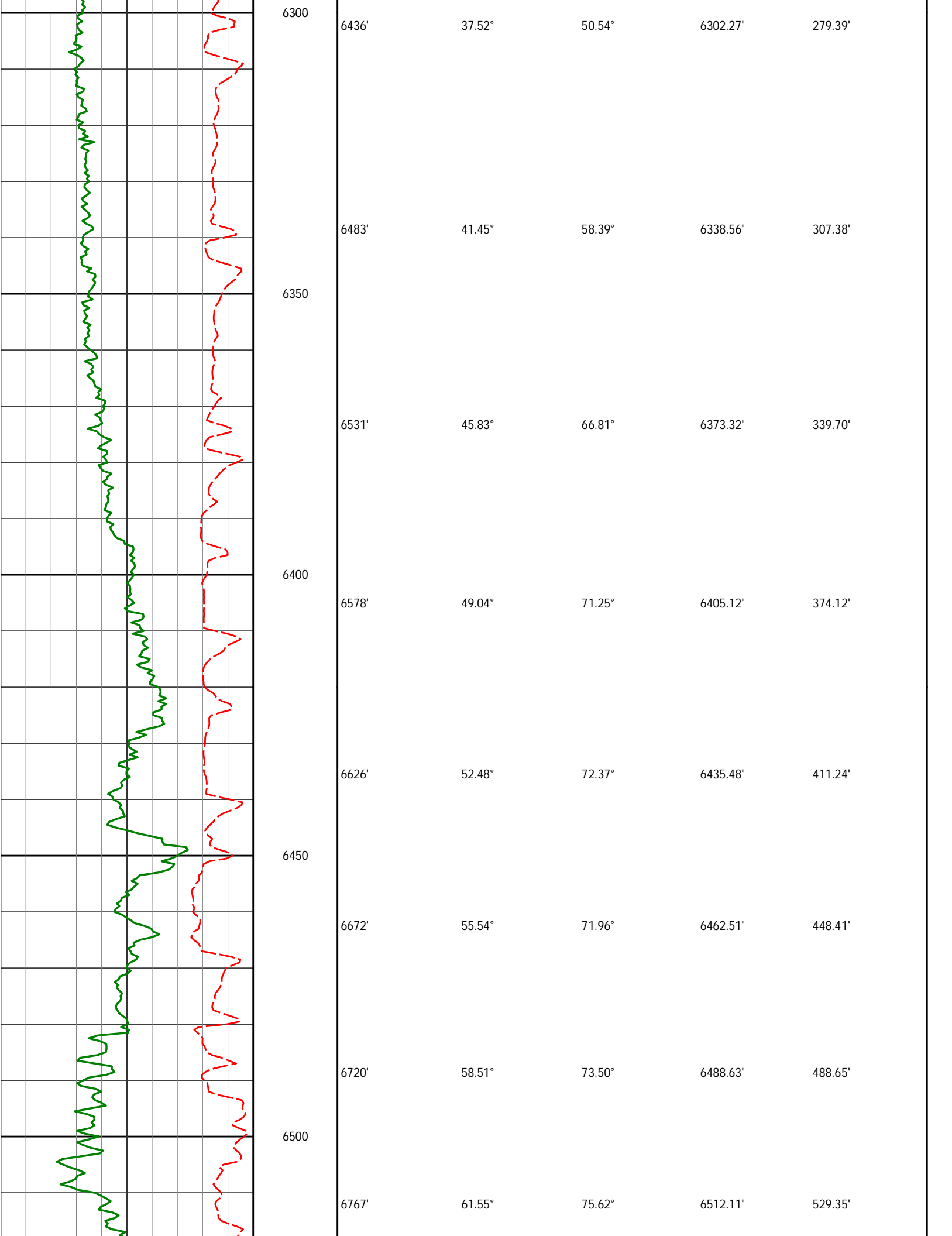
6388'

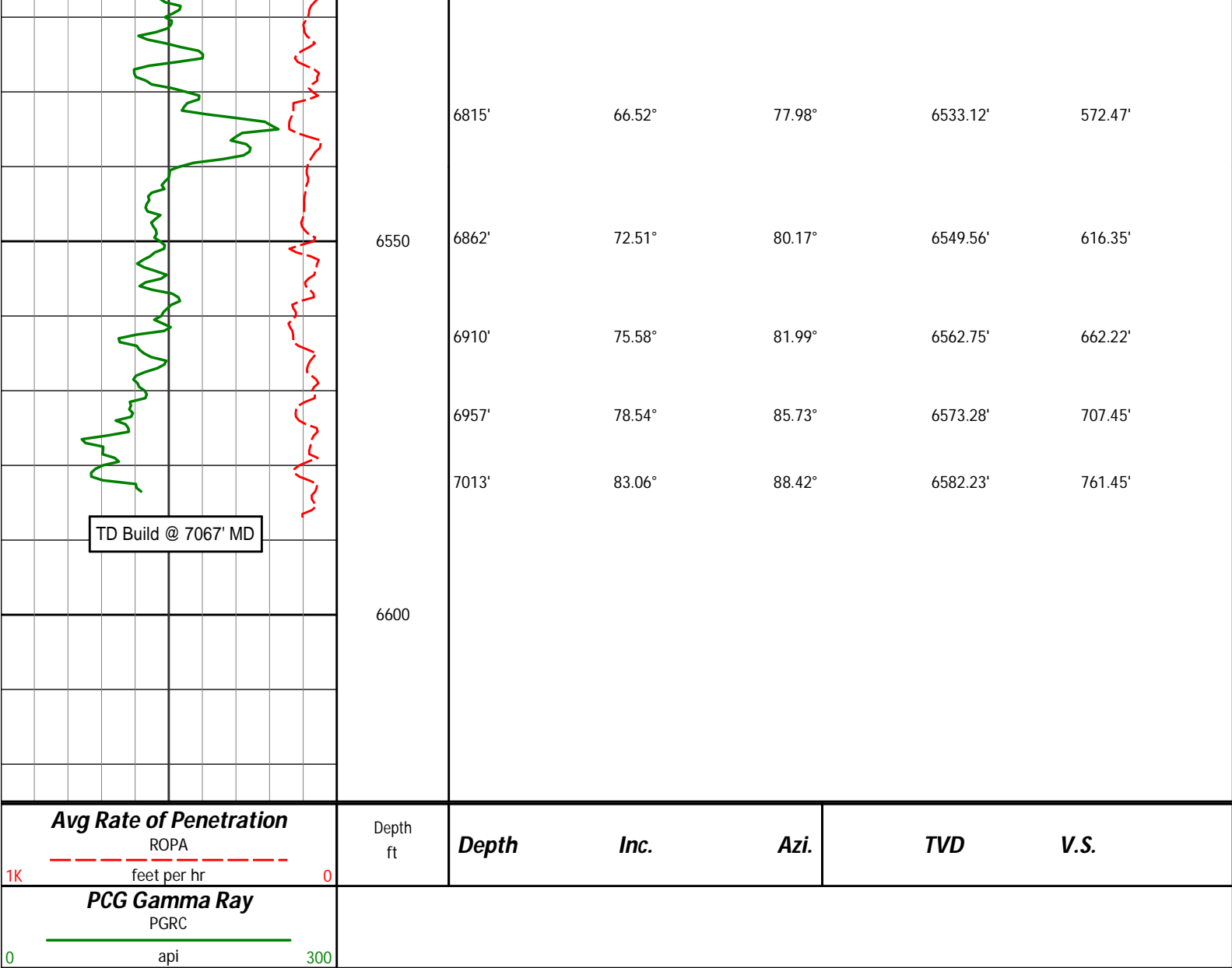
33.53°

45.05°

6263.21'

254.55'





## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Noble Energy  
Wells Ranch AE20-69HN  
Wattenburg  
Weld Colorado  
USA  
CA-XX-0900829265

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
353.00	0.40	209.03	353.00	1.08 S	0.60 W	-0.86	0.11
660.00	0.60	306.23	659.99	1.06 S	2.41 W	-2.61	0.25
966.00	0.70	149.73	965.98	1.73 S	2.76 W	-3.12	0.42
1090.00	0.50	83.98	1089.98	2.33 S	1.84 W	-2.39	0.54
1182.00	0.57	121.97	1181.97	2.53 S	1.06 W	-1.68	0.39
1274.00	0.53	140.55	1273.97	3.10 S	0.40 W	-1.20	0.20
1367.00	0.53	169.93	1366.96	3.86 S	0.05 W	-1.06	0.29
1459.00	0.87	175.14	1458.96	4.97 S	0.08 E	-1.22	0.38
1554.00	1.12	71.87	1553.95	5.40 S	1.03 E	-0.42	1.65
1649.00	0.74	100.69	1648.94	5.23 S	2.51 E	1.06	0.62
1744.00	1.04	85.51	1743.93	5.27 S	3.97 E	2.46	0.40



1744.00	0.84	85.81	1740.98	5.21 E	8.91 E	2.92	0.40
1838.00	0.83	109.87	1837.91	5.44 S	5.46 E	3.85	0.47
1933.00	0.73	72.31	1932.91	5.49 S	6.69 E	5.02	0.54
2028.00	3.78	15.25	2027.83	2.28 S	8.09 E	7.21	3.62
2123.00	3.30	354.35	2122.65	3.46 N	8.64 E	9.25	1.44
2218.00	4.37	339.71	2217.44	9.58 N	7.12 E	9.38	1.52
2313.00	7.16	348.72	2311.95	18.78 N	4.71 E	9.45	3.08
2407.00	8.39	347.80	2405.08	31.23 N	2.11 E	10.20	1.32
2502.00	10.08	347.57	2498.85	46.12 N	1.14 W	10.95	1.78
2597.00	11.88	349.43	2592.11	63.86 N	4.73 W	12.13	1.93
2692.00	11.57	348.74	2685.12	82.81 N	8.38 W	13.55	0.36
2786.00	10.86	346.01	2777.33	100.65 N	12.36 W	14.37	0.94
2881.00	12.26	359.34	2870.42	119.42 N	14.64 W	17.08	3.16
2976.00	11.67	356.21	2963.35	139.10 N	15.39 W	21.49	0.92
3071.00	13.01	355.14	3056.16	159.34 N	16.94 W	25.30	1.43
3166.00	12.39	352.54	3148.83	180.10 N	19.16 W	28.57	0.89
3260.00	11.99	354.61	3240.71	199.82 N	21.39 W	31.57	0.63
3355.00	10.19	353.93	3333.94	218.00 N	23.21 W	34.57	1.90
3450.00	10.94	355.52	3427.32	235.35 N	24.80 W	37.57	0.85
3544.00	12.40	356.54	3519.38	254.31 N	26.11 W	41.27	1.57
3640.00	12.63	358.12	3613.10	275.09 N	27.07 W	45.76	0.43
3734.00	13.20	0.54	3704.72	296.10 N	27.31 W	51.02	0.84
3829.00	13.38	353.94	3797.18	317.87 N	28.37 W	55.70	1.61
3924.00	14.06	352.97	3889.47	340.26 N	30.94 W	59.06	0.76
4019.00	13.13	357.02	3981.81	362.49 N	32.91 W	62.97	1.40
4114.00	10.98	0.30	4074.71	382.31 N	33.43 W	67.65	2.37
4209.00	10.40	359.81	4168.06	399.93 N	33.41 W	72.28	0.62
4304.00	11.76	0.68	4261.29	418.19 N	33.32 W	77.13	1.44
4399.00	12.29	358.60	4354.20	437.98 N	33.45 W	82.17	0.72
4493.00	12.65	347.84	4446.00	458.04 N	35.87 W	85.09	2.50
4588.00	11.30	346.58	4538.93	477.27 N	40.22 W	85.91	1.45
4683.00	11.93	357.61	4632.00	496.13 N	42.79 W	88.36	2.43
4778.00	12.61	356.78	4724.82	516.30 N	43.78 W	92.68	0.74
4873.00	11.26	355.01	4817.77	535.89 N	45.17 W	96.46	1.47
4968.00	11.39	355.57	4910.92	554.48 N	46.70 W	99.84	0.18
5062.00	13.20	358.09	5002.76	574.47 N	47.77 W	104.02	2.01
5157.00	11.39	356.55	5095.58	594.67 N	48.70 W	108.41	1.94
5252.00	10.63	359.95	5188.83	612.80 N	49.27 W	112.59	1.05
5347.00	11.06	355.23	5282.13	630.64 N	50.04 W	116.52	1.04
5442.00	12.37	359.59	5375.16	649.90 N	50.87 W	120.75	1.66
5536.00	11.79	355.71	5467.07	669.55 N	51.66 W	125.12	1.06
5631.00	11.90	351.53	5560.05	688.91 N	53.83 W	128.09	0.91
5726.00	12.96	355.01	5652.83	709.21 N	56.20 W	131.11	1.37
5836.00	10.50	357.55	5760.52	731.52 N	57.70 W	135.49	2.28
5914.00	11.58	1.92	5837.08	746.44 N	57.74 W	139.35	1.75
5962.00	14.29	1.87	5883.86	757.18 N	57.39 W	142.50	5.65
6009.00	19.54	1.57	5928.81	770.85 N	56.98 W	146.46	11.17
6057.00	22.61	1.04	5973.59	788.10 N	56.59 W	151.34	6.41
6104.00	26.85	6.13	6016.28	807.70 N	55.30 W	157.72	10.09
6152.00	28.90	16.18	6058.73	829.63 N	50.90 W	167.69	10.67
6198.00	29.48	25.40	6098.91	850.54 N	42.95 W	180.83	9.85
6246.00	29.12	30.79	6140.77	871.25 N	31.90 W	196.91	5.54
6293.00	29.15	35.75	6181.83	890.36 N	19.36 W	214.01	5.14
6341.00	30.80	40.95	6223.42	909.14 N	4.47 W	233.29	6.41
6388.00	33.53	45.05	6263.21	927.40 N	12.61 E	254.55	7.43
6436.00	37.52	50.54	6302.27	946.07 N	33.29 E	279.39	10.64
6483.00	41.45	58.39	6338.56	963.34 N	57.61 E	307.38	13.50
6531.00	45.83	66.81	6373.32	978.46 N	87.01 E	339.70	15.15
6578.00	49.04	71.25	6405.12	990.81 N	119.32 E	374.12	9.75
6626.00	52.48	72.37	6435.48	1002.41 N	154.64 E	411.24	7.39
6672.00	55.54	71.96	6462.51	1013.81 N	190.06 E	448.41	6.69
6720.00	58.51	73.50	6488.63	1025.75 N	228.51 E	488.65	6.75
6767.00	61.55	75.62	6512.11	1036.58 N	267.75 E	529.35	7.56
6815.00	66.52	77.98	6533.12	1046.41 N	309.76 E	572.47	11.26
6862.00	72.51	80.17	6549.56	1054.73 N	352.97 E	616.35	13.47
6910.00	75.58	81.99	6562.75	1061.88 N	398.55 E	662.22	7.36
6957.00	78.54	85.73	6573.28	1066.77 N	444.08 E	707.45	9.99
7013.00	83.06	88.42	6582.23	1069.58 N	499.27 E	761.45	9.36

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

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7013.00 FEET  
IS 1180.37 FEET ALONG 25.02 DEGREES (GRID)

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

Depth 353 Inc 0.40 Azi 209.03

Depth 660 Inc 0.60 Azi 306.23

Depth 966 Inc 0.70 Azi 149.73

Tied in @ Surface

Magnetic direction of 7.63 has been added to AZI for grid direction correction.

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