



**1 : 600 / 1 : 240**

WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	12-Mar-15	13-Mar-15			
Rig Bit Number	100	200			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.500			
Log Start Depth (TVD, ft)	947.99	5,931.45			
Log End Depth (TVD, ft)	5,931.45	6,719.65			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	11-Mar-15 11:30	12-Mar-15 11:15			
Drill/Wipe End Date and Time	12-Mar-15 03:00	13-Mar-15 01:30			
Min Inc (deg) @ Depth (TVD, ft)	0.19 @ 989.99	1.43 @ 5,961.44			
Max Inc (deg) @ Depth (TVD, ft)	13.15 @ 3,884.62	84.00 @ 6,714.78			
Bit TFA(in2) / Bit Type	1.21 / PDC	1.24 / PDC			
Flow Rate (gpm)	597.96	600.00			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	8.70 / 39.00	10.60 / 37.50			
Filtrate CL (ppm)	2,500.00	2,750.00			
pH / Fluid Loss (mptm)	11.10 / 9	11.20 / 11			
PV (cP) / YP (lbf2)	13 / 13.00	11 / 11.00			
% Solids / % Sand	3.4 / 0.25	5.5 / .2			
% Oil / Oil:Water Ratio	0.80 / N/A	N/A / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (in F) / S	177.04 / PDM	177.04 / PDM			

Max Tool Temp (degF) / Source	177.64 / PCM	177.64 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 177.64	N/A @ 177.64			
Lead MWD Engineer	Kyle Regan	Kyle Regan			
Customer Representative	JW Irvin	JW Irvin			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11404285	11404285			
Insert Serial Number	11680801	11680801			
Date and Time Initialized	11-Mar-15 01:24	01-Jan-70 00:00			
Date and Time Read	13-Mar-15 07:42	13-Mar-15 07:49			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	65.00	63.00			
Software Version	6.33	6.33			
Sub Serial Number	11404285	11404285			
Sonde Serial Number	11297623	11297623			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	329.16	306.21			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	58.69	56.25			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11404285	11404285			
Insert/Sonde Serial Number	11579843	11579843			

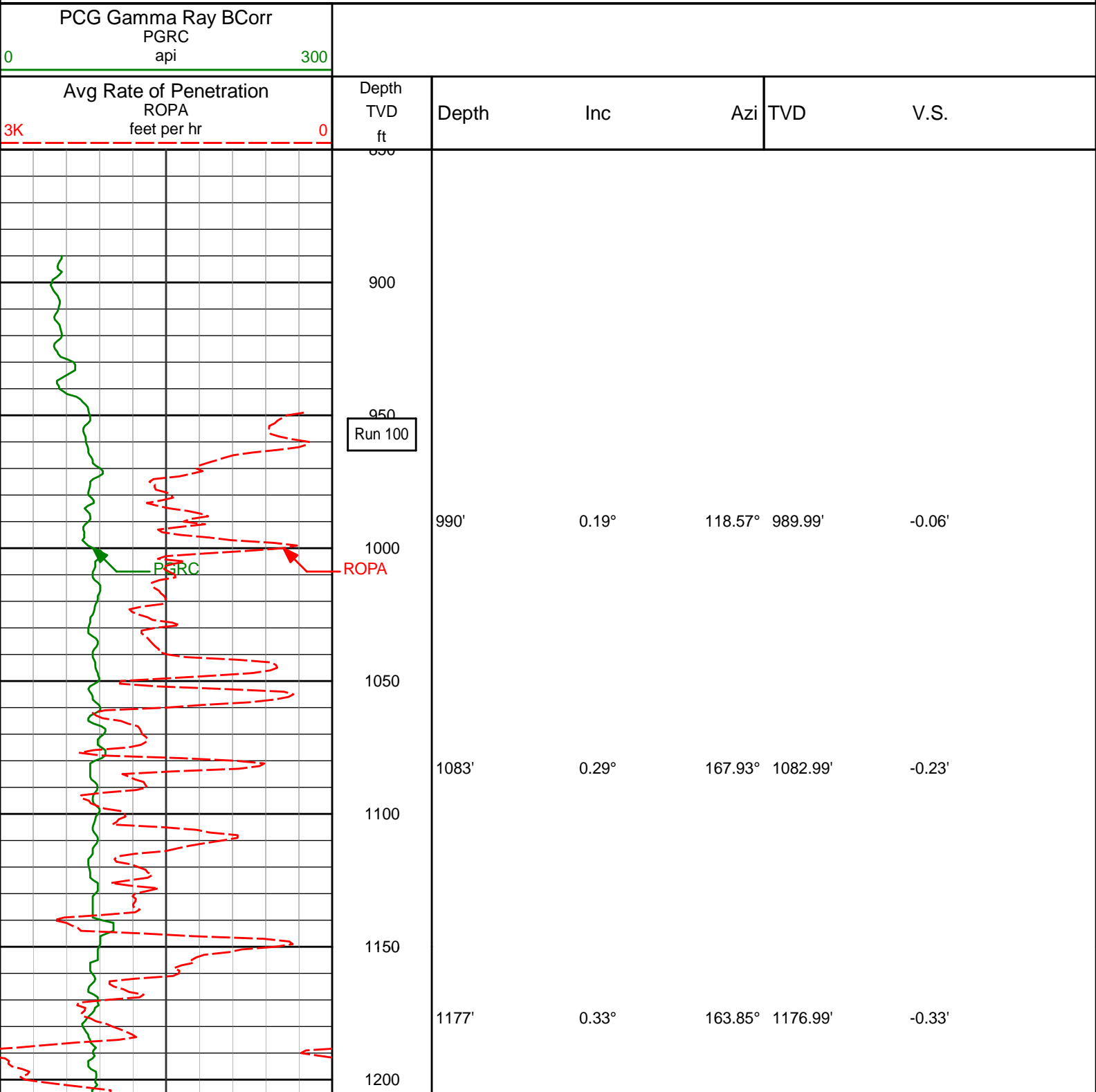
## REMARKS

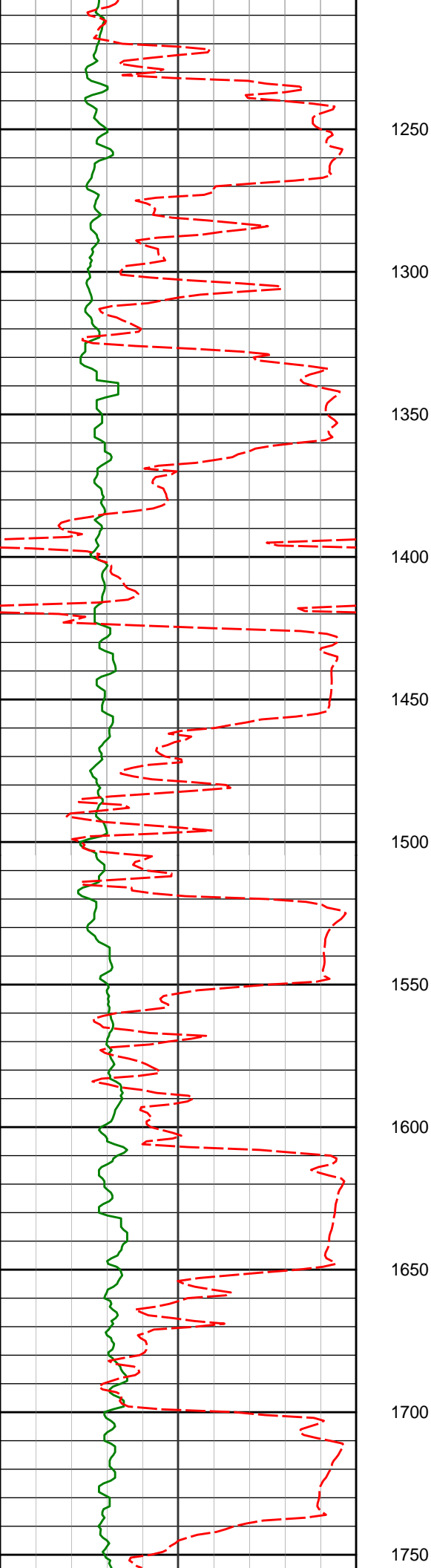
1. All depths are calibrated to driller's pipe tally and are total vertical depth from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. Environmental parameters used in gamma and resistance processing:  
Hole Size: 8.75"  
Mud Density: 9.9-11.0
5. The following smoothing parameters have been applied to the data:  
Interval: 0.5 ft  
Coercion Distance: 1.2 ft (ROPA)  
Interval: 0.5 ft  
Coercion Distance: 0.6 ft (Gamma Ray)

## WARRANTY

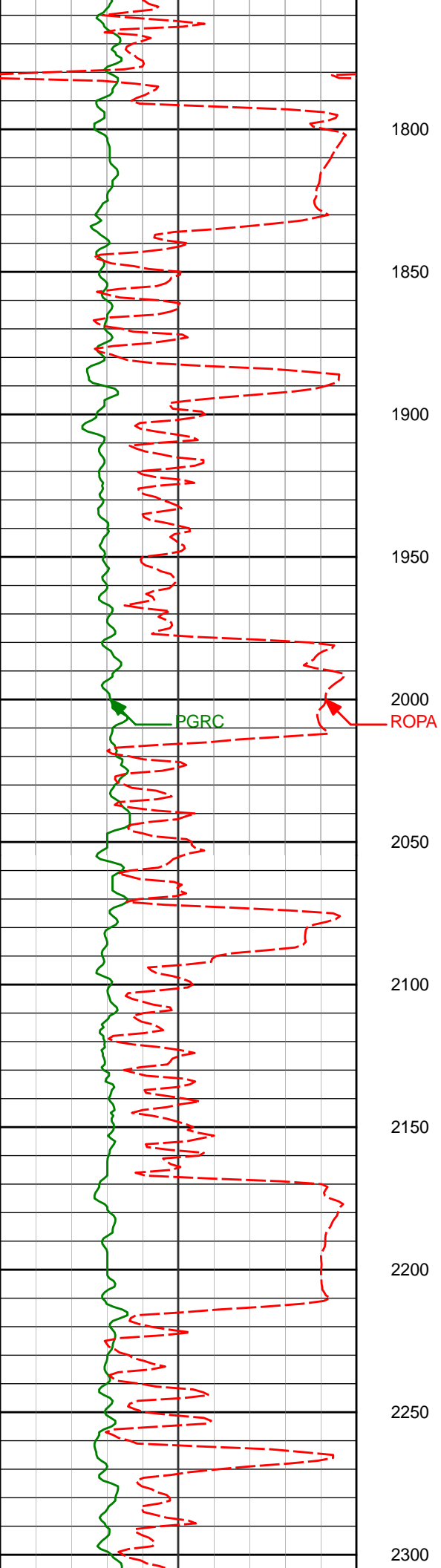
HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES 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

# TVD Detail 1:600 Scale

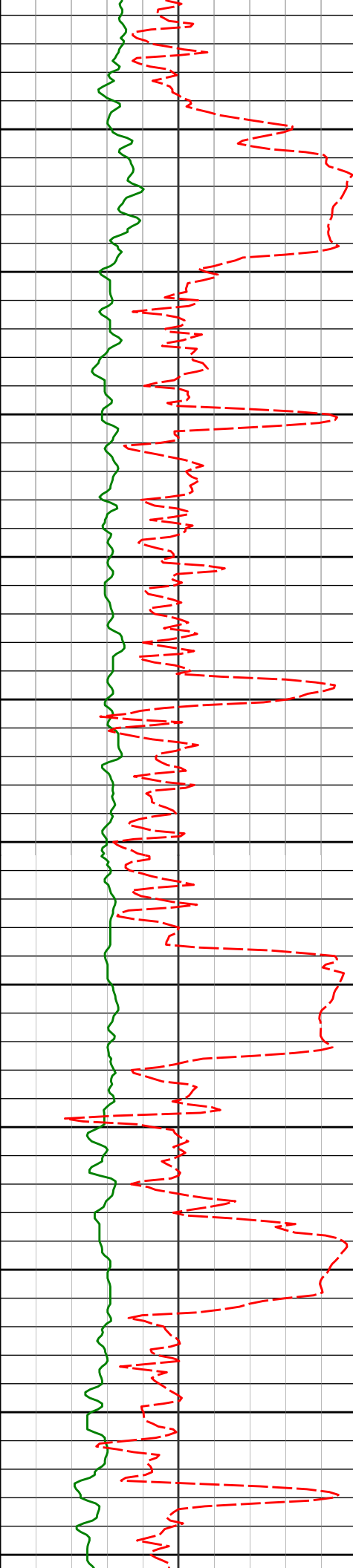




1269'	1.03°	227.17°	1268.98'	0.24'
1362'	2.14°	240.80°	1361.94'	2.44'
1453'	3.24°	237.70°	1452.84'	6.21'
1546'	4.83°	234.53°	1545.61'	11.80'
1639'	6.82°	234.66°	1638.12'	19.77'
1731'	7.99°	235.51°	1729.36'	29.83'



1824'	9.75°	237.70°	1821.24'	42.21'
1920'	8.88°	238.71°	1915.97'	55.82'
2015'	9.19°	244.33°	2009.80'	69.27'
2110'	8.30°	243.98°	2103.69'	82.58'
2206'	9.73°	244.05°	2198.50'	96.42'
2301'	8.94°	243.48°	2292.24'	110.58'



2350

2396'

10.44°

238.25°

2385.89'

124.89'

2400

2450

2491'

9.50°

234.89°

2479.45'

139.07'

2500

2550

2586'

8.47°

234.68°

2573.29'

151.62'

2600

2650

2681'

9.27°

232.13°

2667.15'

163.80'

2700

2750

2776'

9.69°

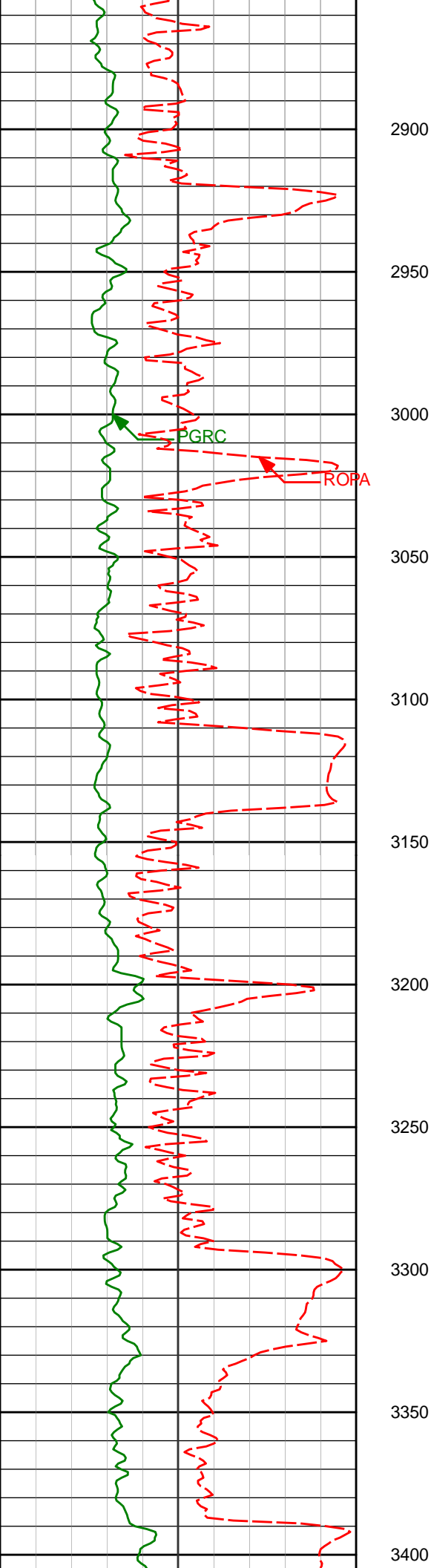
235.88°

2760.85'

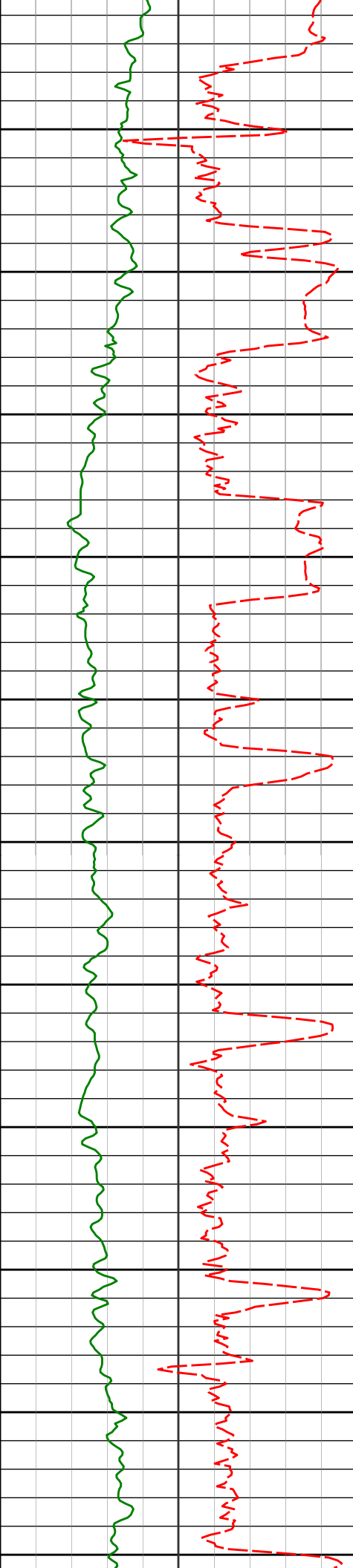
176.92'

2800

2850



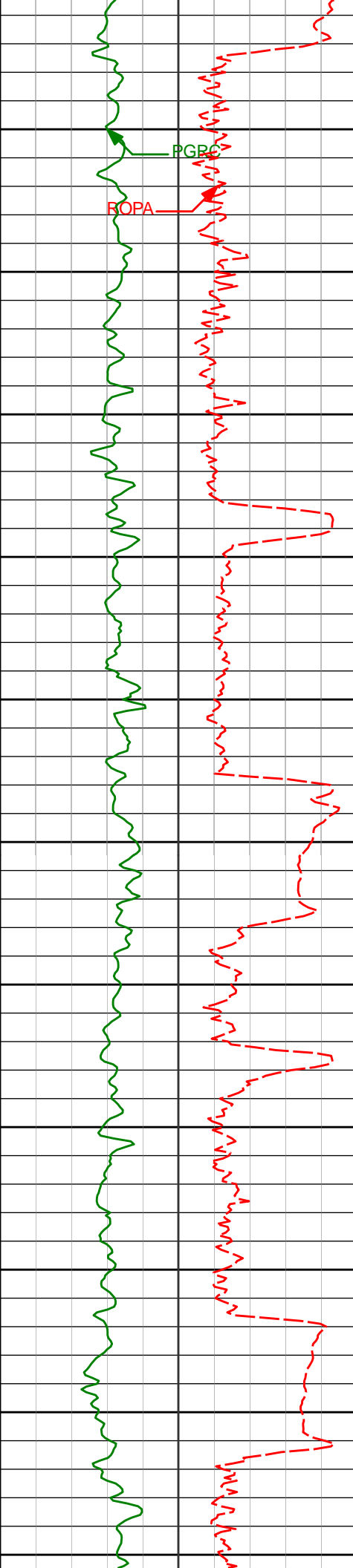
2872'	10.09°	235.34°	2855.43'	190.99'
2900'				
2966'	9.38°	234.40°	2948.07'	204.44'
3000'				
3061'	8.63°	233.76°	3041.90'	216.92'
3100'				
3156'	9.08°	235.63°	3135.77'	229.28'
3200'				
3251'	7.41°	230.92°	3229.78'	240.62'
3300'				
3346'	7.58°	234.37°	3323.97'	250.85'
3400'				



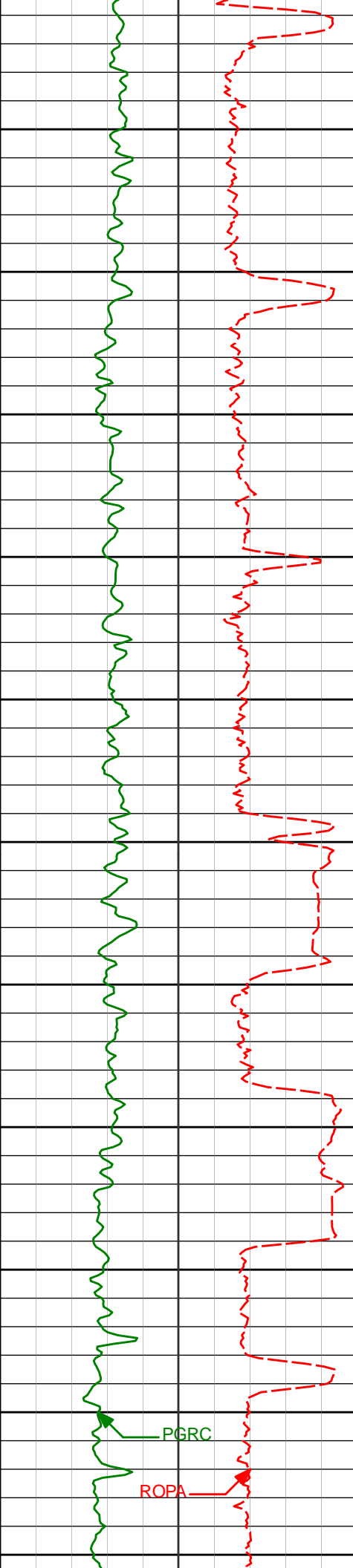
3441'  
3450  
3500  
3536'  
3550  
3600  
3631'  
3650  
3700  
3726'  
3750  
3800  
3821'  
3850  
3900  
3916'  
3950

3441'	8.16°	241.86°	3418.08'	262.22'
3536'	8.49°	240.56°	3512.08'	274.60'
3631'	10.32°	238.42°	3605.80'	288.35'
3726'	11.59°	237.43°	3699.06'	304.12'
3821'	12.46°	237.32°	3791.98'	321.31'
3916'	13.15°	237.41°	3884.62'	339.61'

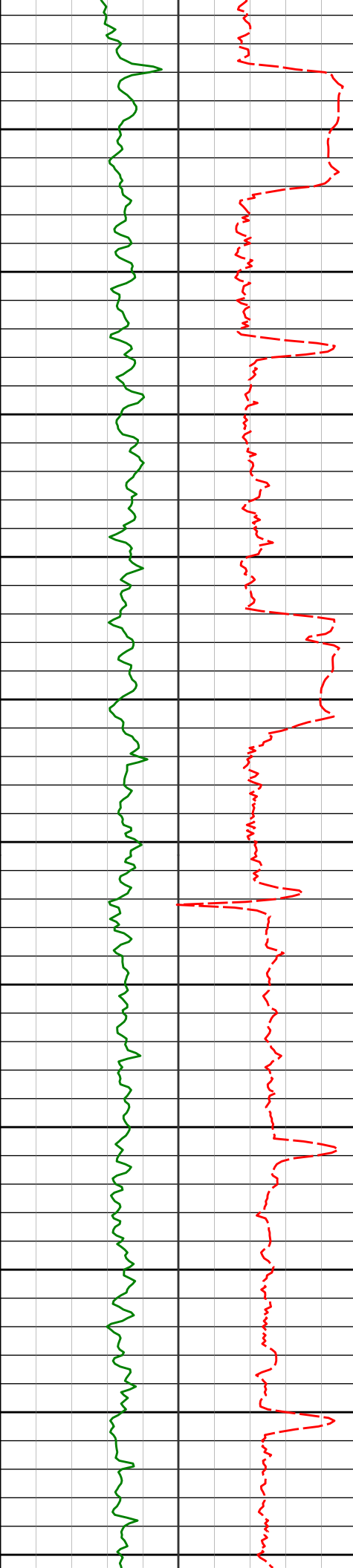




4010'	11.62°	236.90°	3976.43'	357.09'
4000				
4105'	10.49°	236.07°	4069.66'	372.78'
4100				
4200'	8.76°	234.06°	4163.32'	386.26'
4200				
4295'	8.57°	228.54°	4257.24'	397.87'
4300				
4390'	7.71°	226.26°	4351.28'	408.24'
4400				
4486'	8.78°	224.63°	4446.29'	418.52'
4500				



4550	4581'	7.51°	217.04°	4540.33'	427.87'
4600					
4650	4676'	6.14°	202.85°	4634.66'	434.07'
4700					
4750	4771'	5.23°	195.46°	4729.19'	437.65'
4800					
4850	4866'	5.26°	200.08°	4823.80'	440.72'
4900					
4950	4961'	6.12°	212.05°	4918.33'	445.33'
5000					
5050	5056'	5.88°	216.82°	5012.81'	451.35'



5100

5150

5200

5250

5300

5350

5400

5450

5500

5550

5600

5151'

5246'

5341'

5436'

5531'

5626'

5.16°

4.43°

3.16°

2.61°

2.08°

1.57°

232.76°

235.74°

245.08°

248.81°

251.09°

253.22°

5107.38'

5202.04'

5296.83'

5391.71'

5486.63'

5581.58'

458.00'

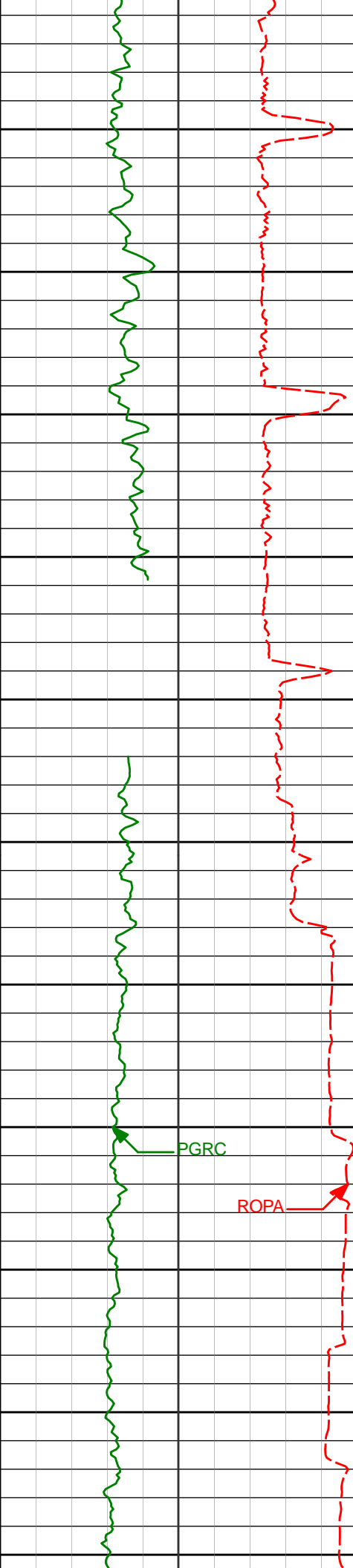
464.66'

470.23'

474.71'

478.42'

481.34'



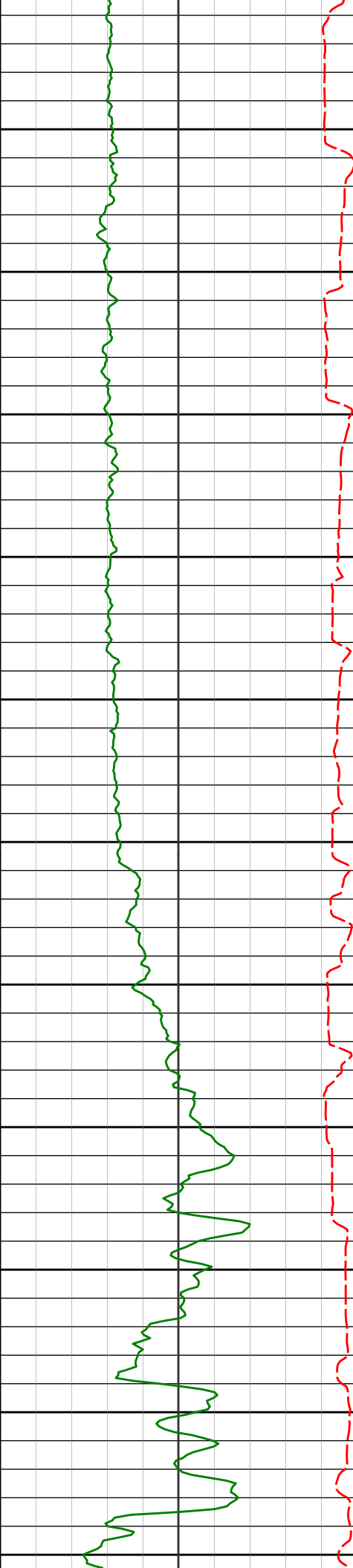
Run 200

5650  
5700  
5750  
5800  
5850  
5900  
5950  
6000  
6050  
6100  
6150

5721'	1.89°	254.85°	5676.54'	484.14'
5816'	1.55°	247.38°	5771.50'	486.88'
5911'	1.35°	257.94°	5866.47'	489.19'
6006'	1.43°	270.51°	5961.44'	491.48'
6100'	9.17°	276.51°	6054.97'	500.05'
6195'	15.76°	267.23°	6147.69'	520.45'

PGRC

ROPA



6200

6290'

19.73°

266.24°

6238.15'

549.39'

6250

6300

6385'

24.71°

272.29°

6326.08'

585.23'

6350

6400

6480'

36.19°

272.05°

6407.84'

633.10'

6450

6575'

45.76°

269.81°

6479.48'

695.18'

6500

6550

6670'

48.33°

269.04°

6544.21'

764.64'

6600

6766'

52.44°

269.21°

6605.41'

838.53'

6650

6861'

64.09°

268.10°

6655.30'

919.15'

6700

6956'

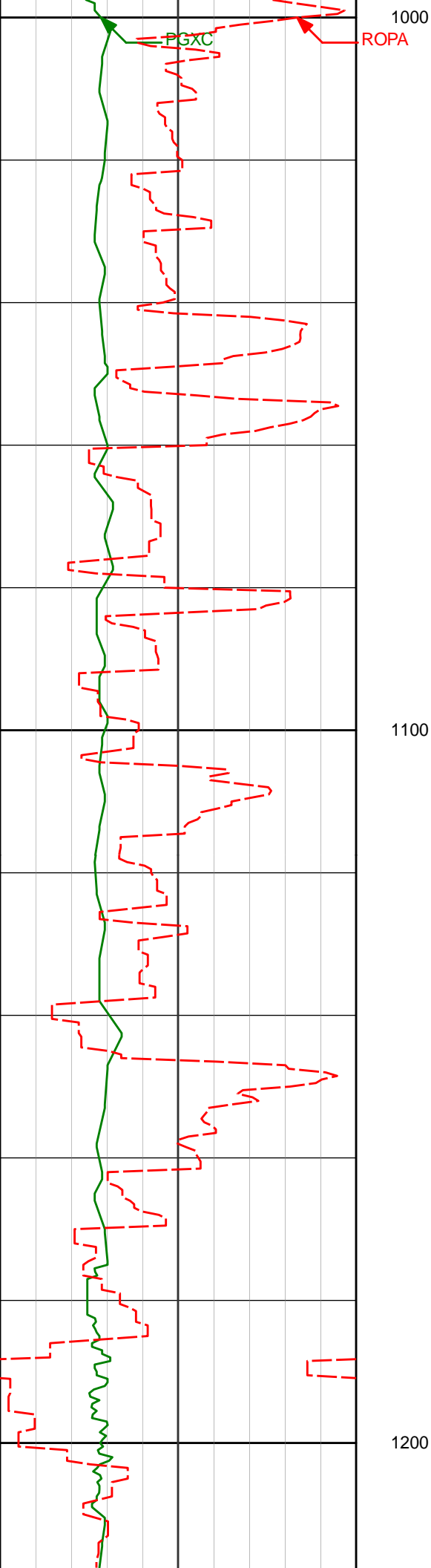
74.69°

268.46°

6688.69'

1007.92'

TD Build @ 7152' MD		6750		7051' 7089'		80.00° 84.00°		269.14° 269.28°		6709.49' 6714.78'		1100.54' 1138.14'	
Avg Rate of Penetration ROPA feet per hr		Depth TVD ft		Depth		Inc		Azi		TVD		V.S.	
PCG Gamma Ray BCorr PGRC api													
3K		0											
0		300											
TVD Detail 1:240 Scale													
PCG GR XHi-Range RT BCor PGXRC-T api													
0		300											
Avg Rate of Penetration ROPA feet per hr		Depth TVD ft		Depth		Inc		Azi		TVD		V.S.	
3K		0											
900		Run 100											
990'		0.19°		118.57°		989.99'		-0.06'					



1083'

0.29°

167.93° 1082.99'

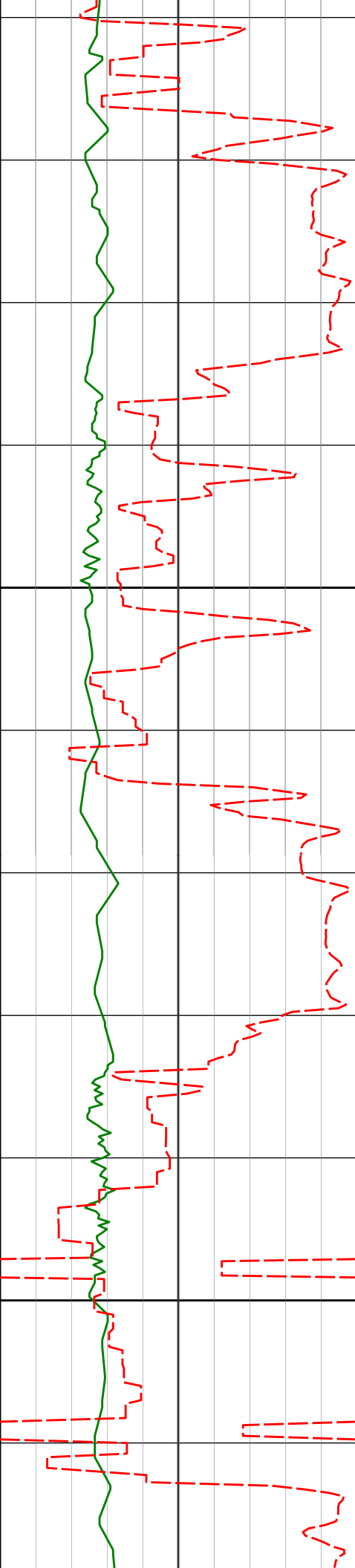
-0.23'

1177'

0.33°

163.85° 1176.99'

-0.33'



1300

1269'

1.03°

227.17°

1268.98'

0.24'

1362'

2.14°

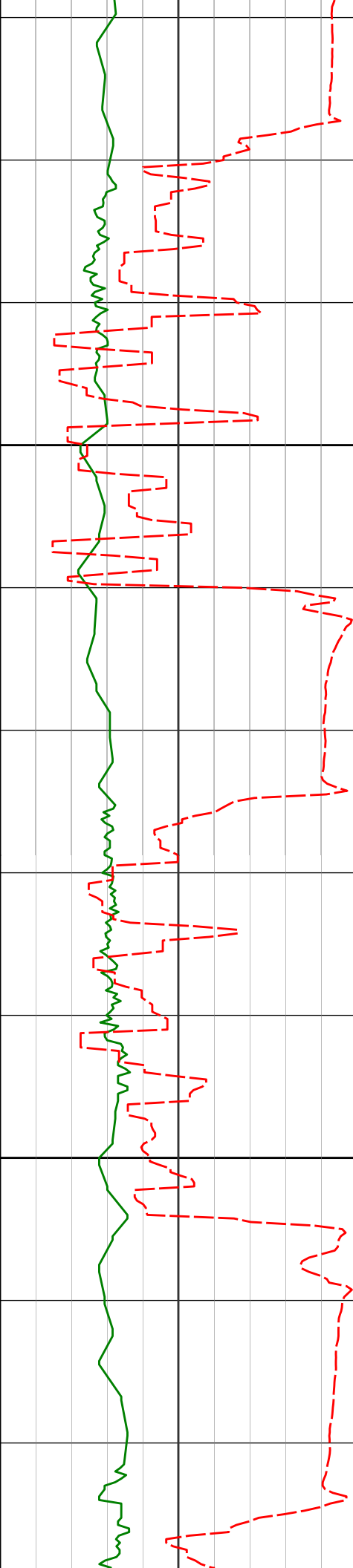
240.80°

1361.94'

2.44'

1400





1500

1600

1453'

3.24°

237.70° 1452.84'

6.21'

1546'

4.83°

234.53° 1545.61'

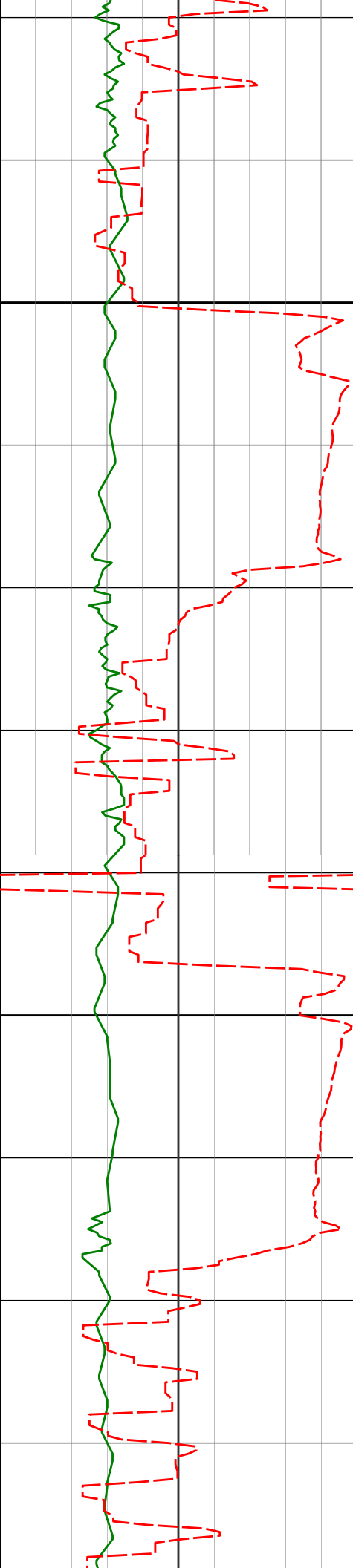
11.80'

1639'

6.82°

234.66° 1638.12'

19.77'



1700

1731'

7.99°

235.51° 1729.36'

29.83'

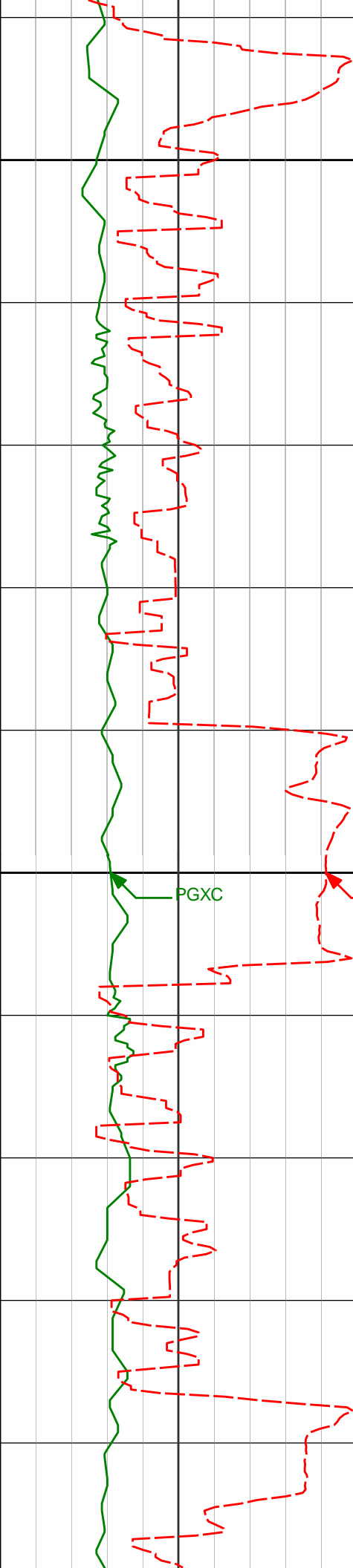
1800

1824'

9.75°

237.70° 1821.24'

42.21'



1900

1920'

8.88°

238.71° 1915.97'

55.82'

2000  
ROPA

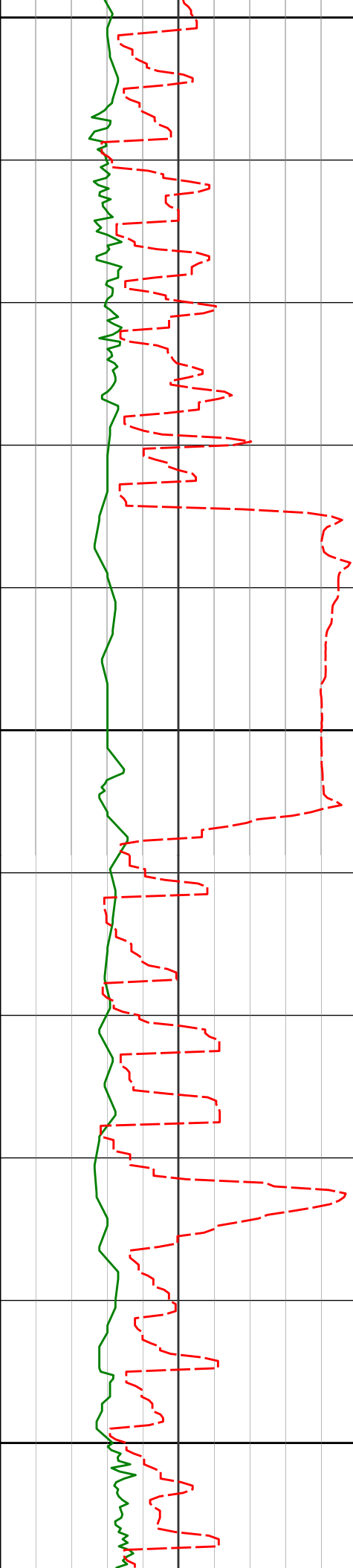
PGXC

2015'

9.19°

244.33° 2009.80'

69.27'



2100

2110'

8.30°

243.98° 2103.69'

82.58'

2200

2206'

9.73°

244.05° 2198.50'

96.42'

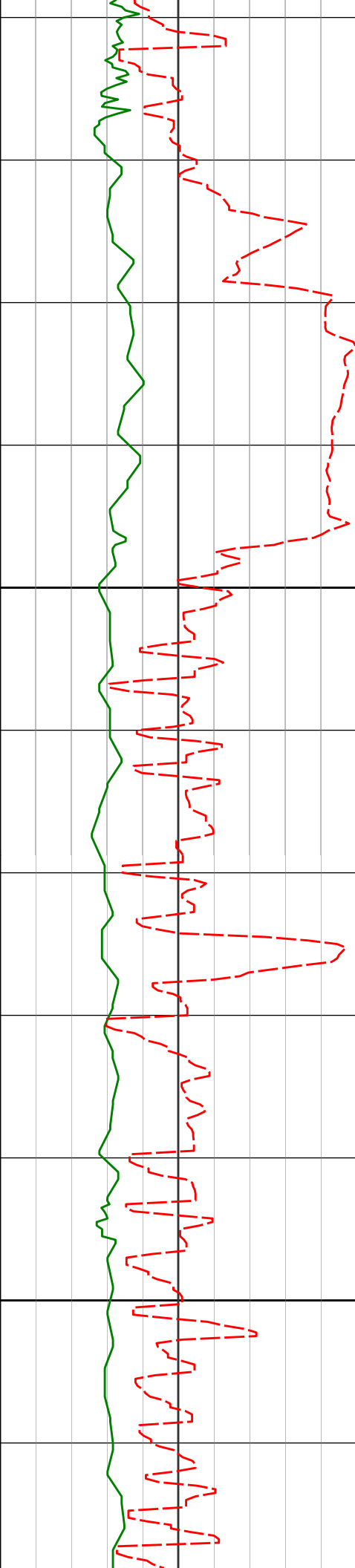
2300

2301'

8.94°

243.48° 2292.24'

110.58'



2400

2500

2396'

10.44°

238.25° 2385.89'

124.89'

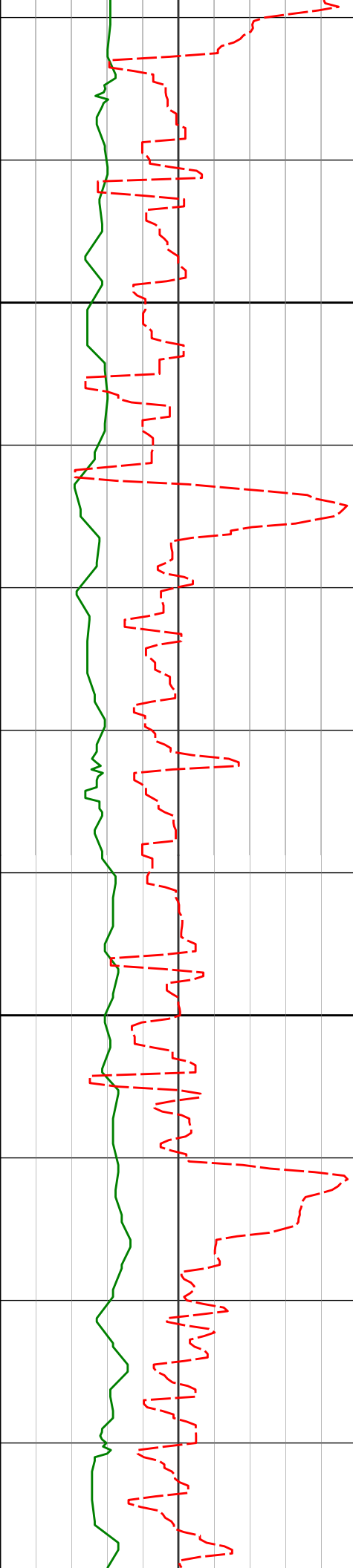
2491'

9.50°

234.89° 2479.45'

139.07'





2800

2900

2776'

9.69°

235.88° 2760.85'

176.92'

2872'

10.09°

235.34° 2855.43'

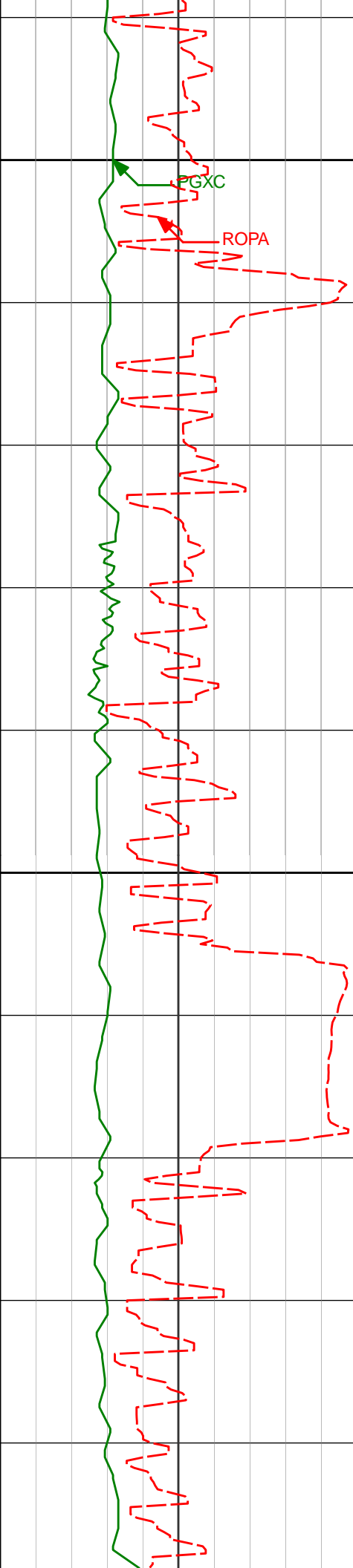
190.99'

2966'

9.38°

234.40° 2948.07'

204.44'



3000

3061'

8.63°

233.76° 3041.90'

216.92'

3100

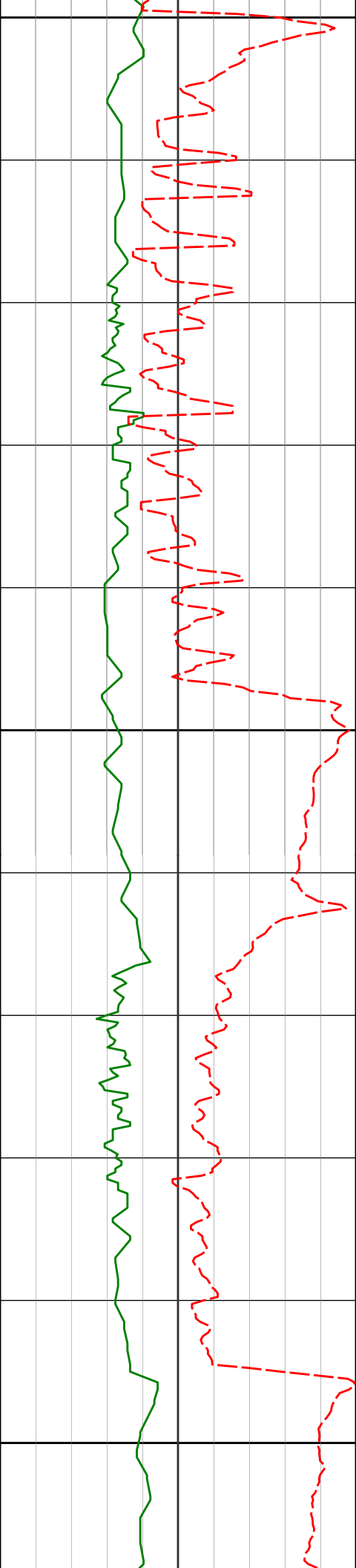
3156'

9.08°

235.63° 3135.77'

229.28'





3200

3251'

7.41°

230.92° 3229.78'

240.62'

3300

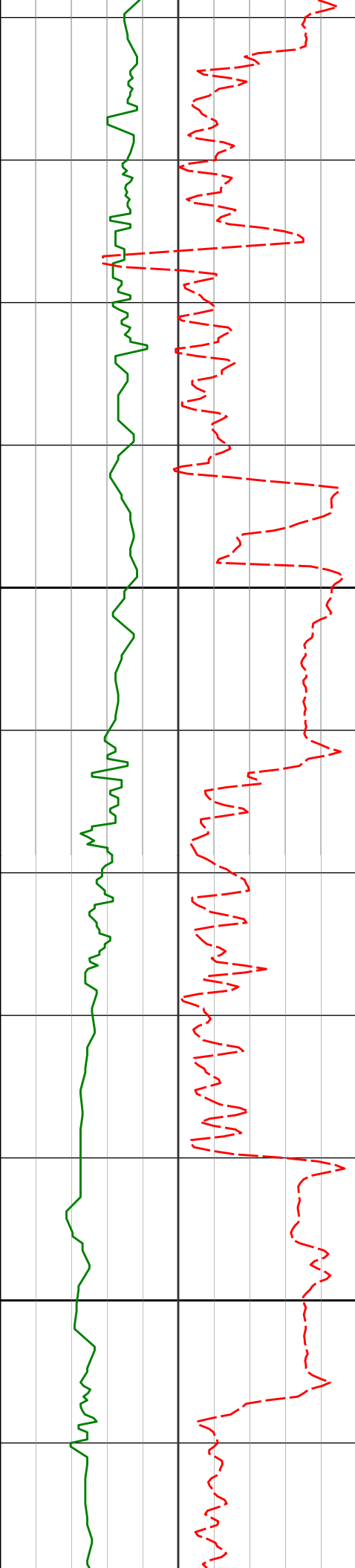
3346'

7.58°

234.37° 3323.97'

250.85'

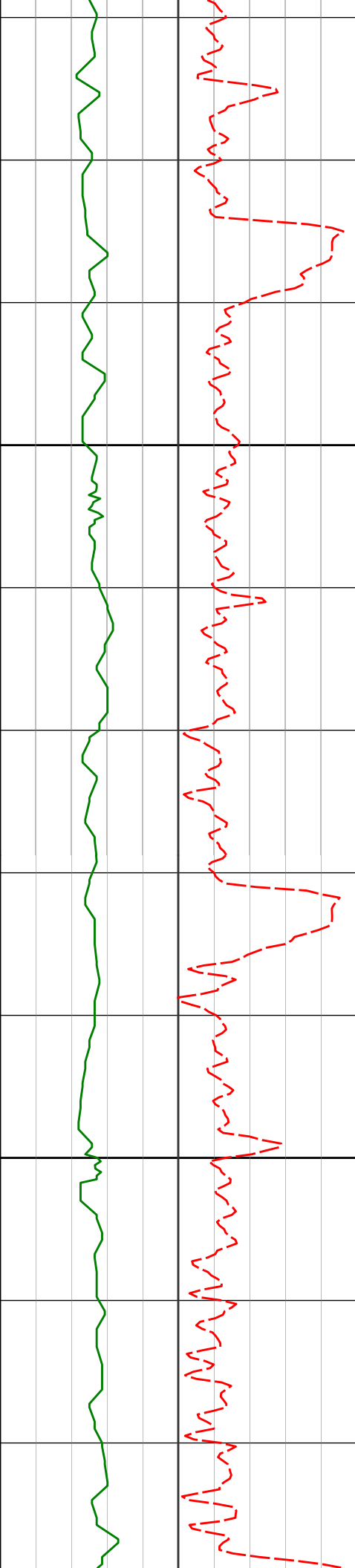
3400



3500

3600

3441'	8.16°	241.86°	3418.08'	262.22'
3536'	8.49°	240.56°	3512.08'	274.60'
3631'	10.32°	238.42°	3605.80'	288.35'



3700

3726'

11.59°

237.43° 3699.06'

304.12'

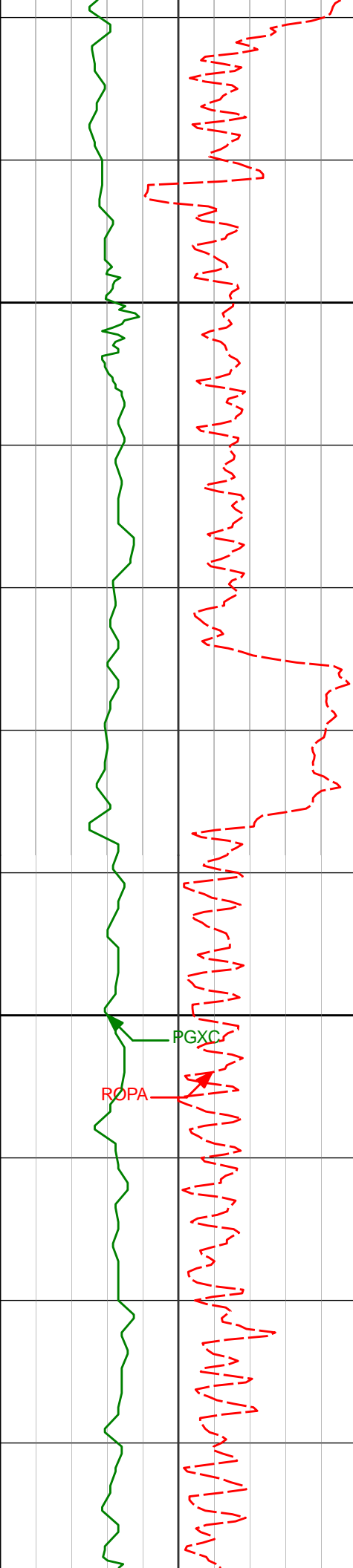
3800

3821'

12.46°

237.32° 3791.98'

321.31'



3900

4000

3916'

13.15°

237.41° 3884.62'

339.61'

4010'

11.62°

236.90° 3976.43'

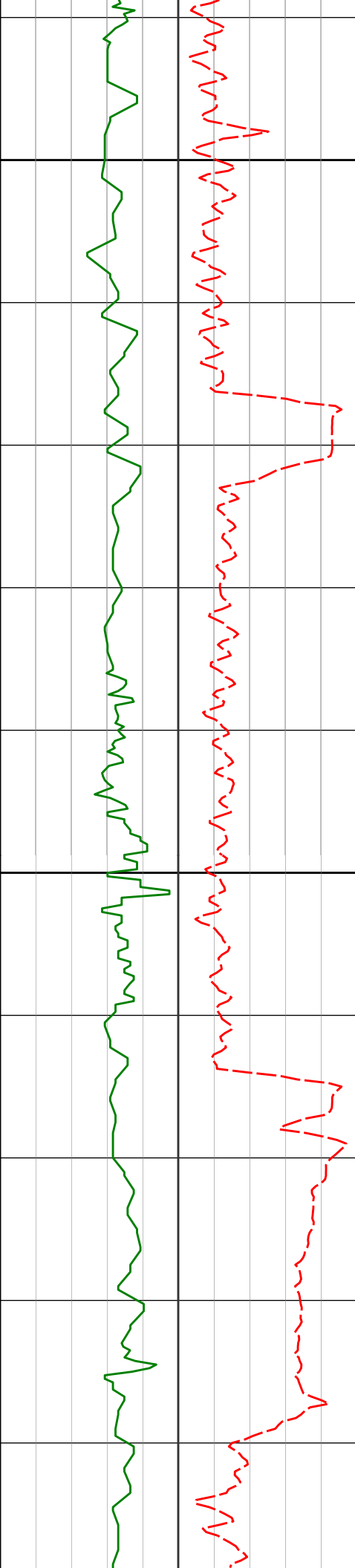
357.09'

4105'

10.49°

236.07° 4069.66'

372.78'



4100

4200'

8.76°

234.06° 4163.32'

386.26'

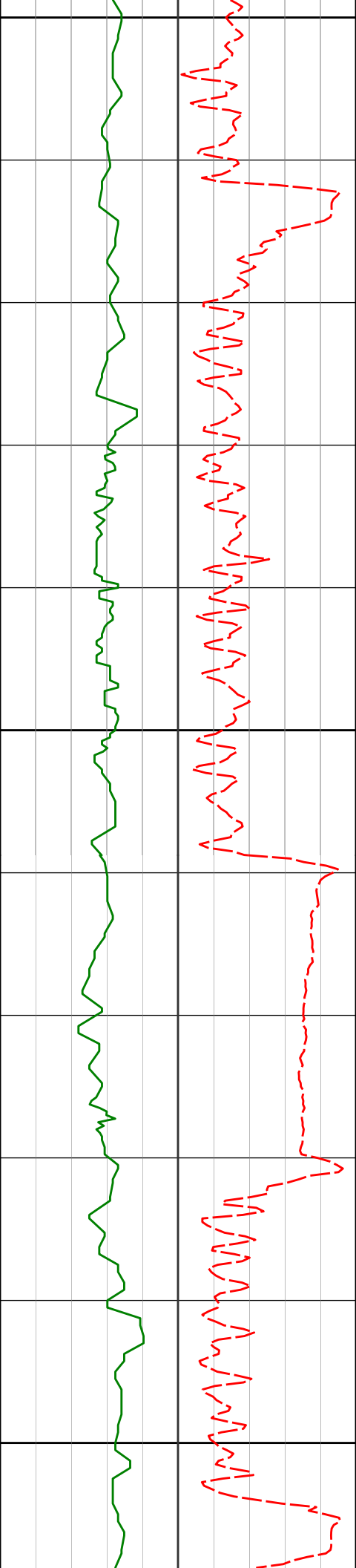
4200

4295'

8.57°

228.54° 4257.24'

397.87'



4300

4390'

7.71°

226.26° 4351.28'

408.24'

4400

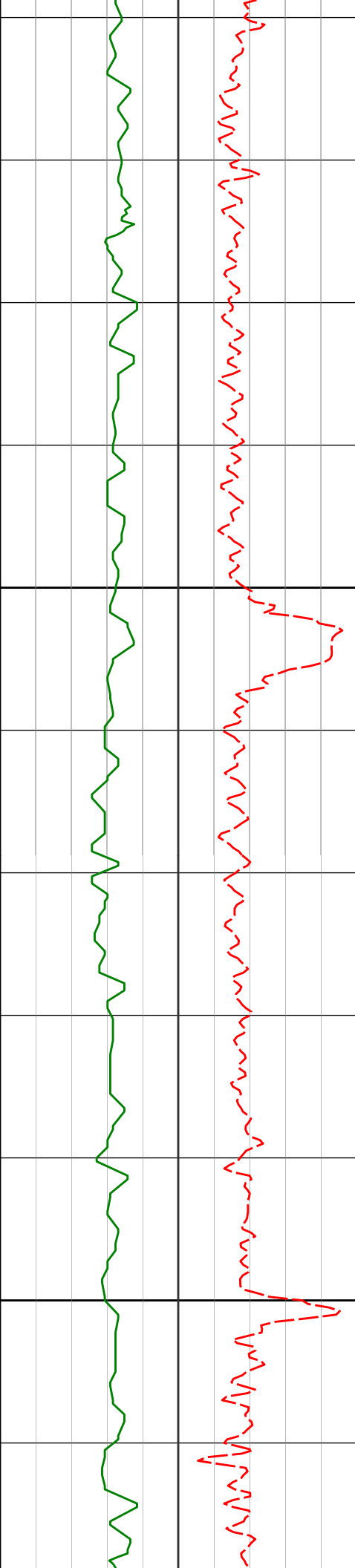
4486'

8.78°

224.63° 4446.29'

418.52'

4500



4600

4700

4581'

7.51°

217.04° 4540.33'

427.87'

4676'

6.14°

202.85° 4634.66'

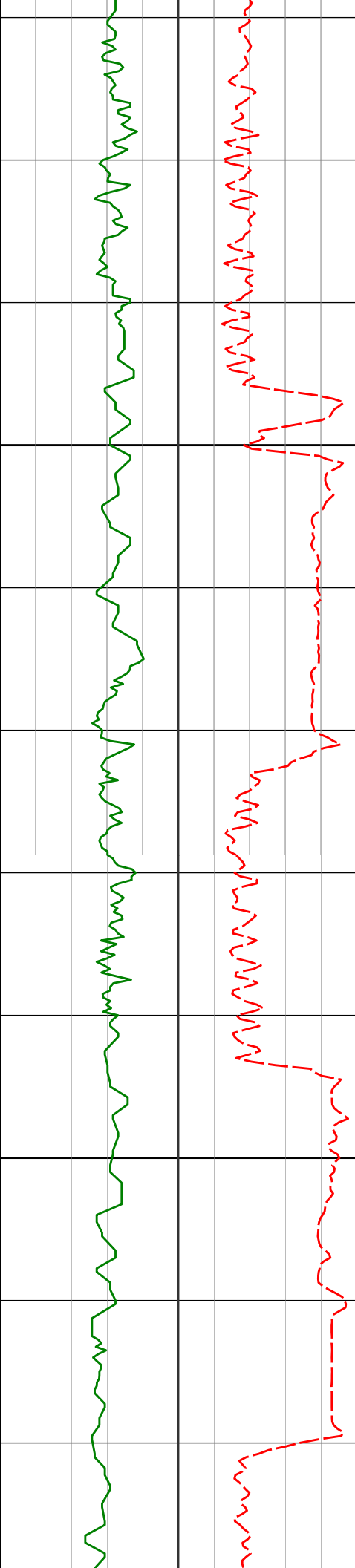
434.07'

4771'

5.23°

195.46° 4729.19'

437.65'



4800

4866'

5.26°

200.08° 4823.80'

440.72'

4900

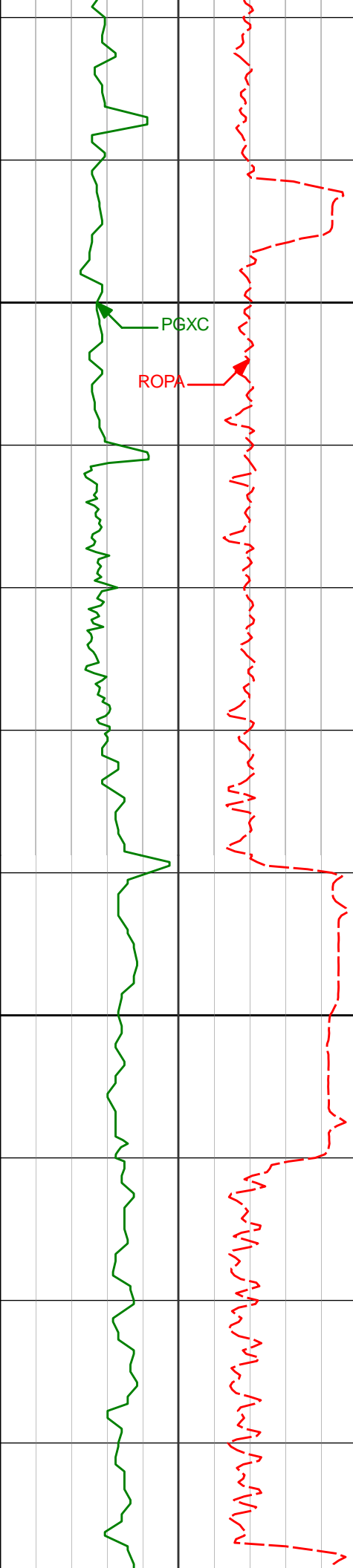
4961'

6.12°

212.05° 4918.33'

445.33'





5000

5056'

5.88°

216.82° 5012.81'

451.35'

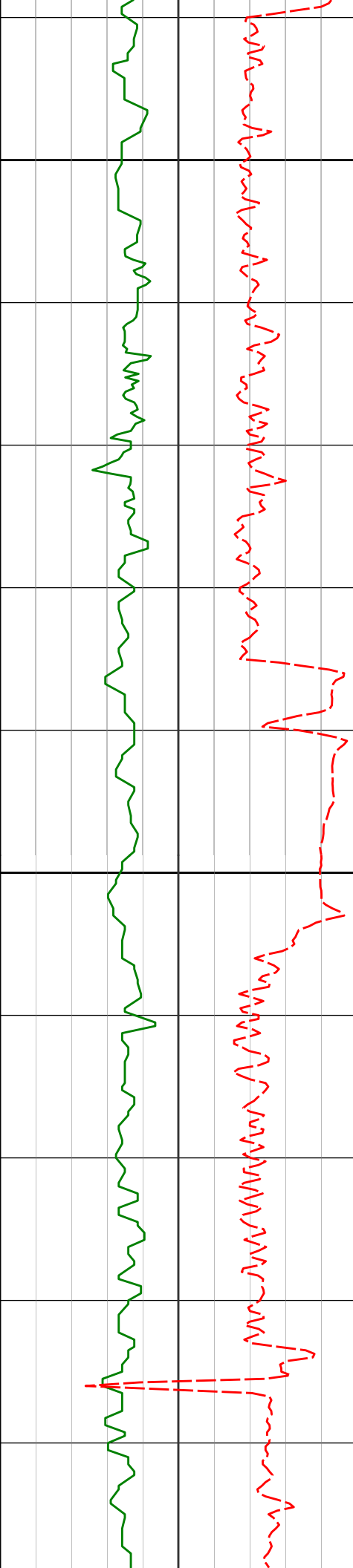
5100

5151'

5.16°

232.76° 5107.38'

458.00'



5200

5246'

4.43°

235.74° 5202.04'

464.66'

5300

5341'

3.16°

245.08° 5296.83'

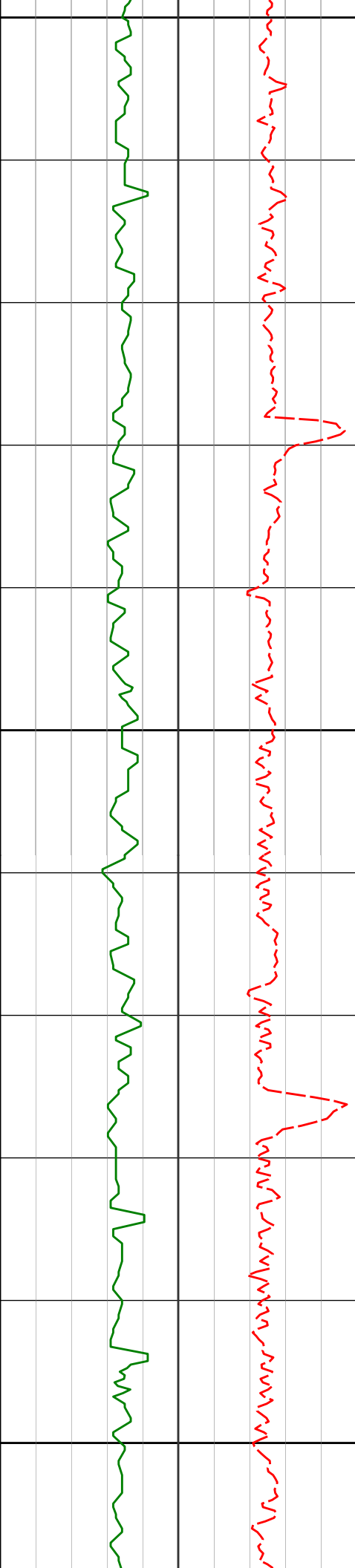
470.23'

5436'

2.61°

248.81° 5391.71'

474.71'



5400

5500

5600

5531'

2.08°

251.09° 5486.63'

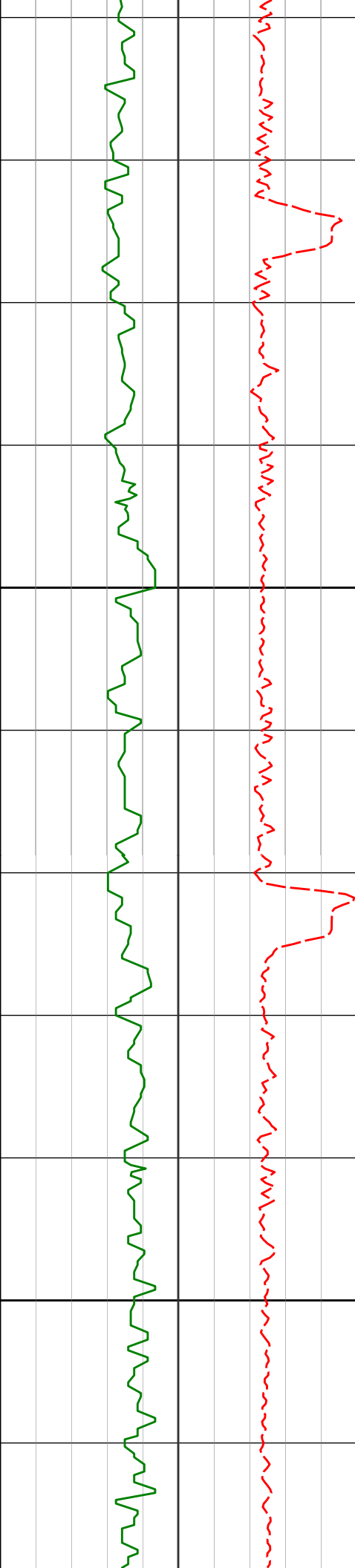
478.42'

5626'

1.57°

253.22° 5581.58'

481.34'



5700

5800

5721'

1.89°

254.85° 5676.54'

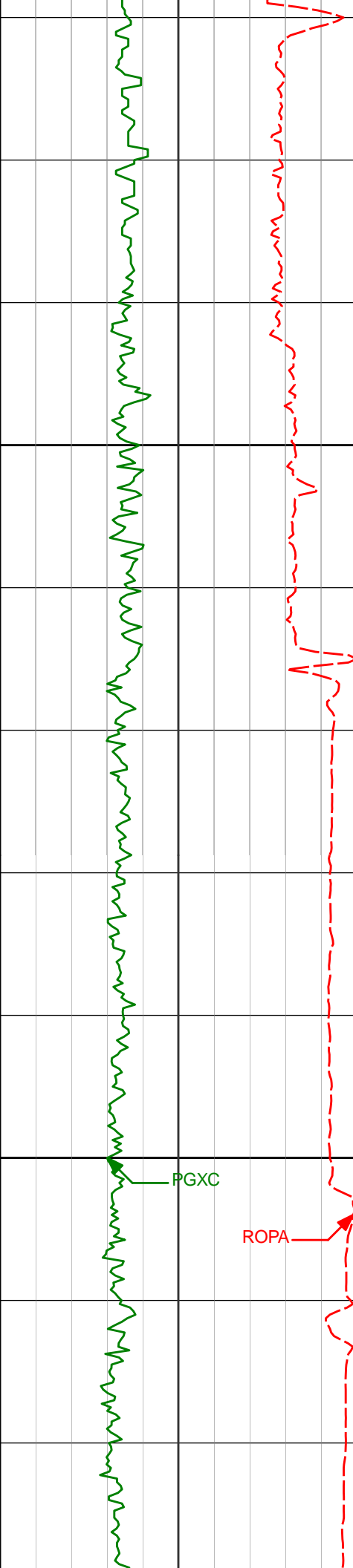
484.14'

5816'

1.55°

247.38° 5771.50'

486.88'



Run 200

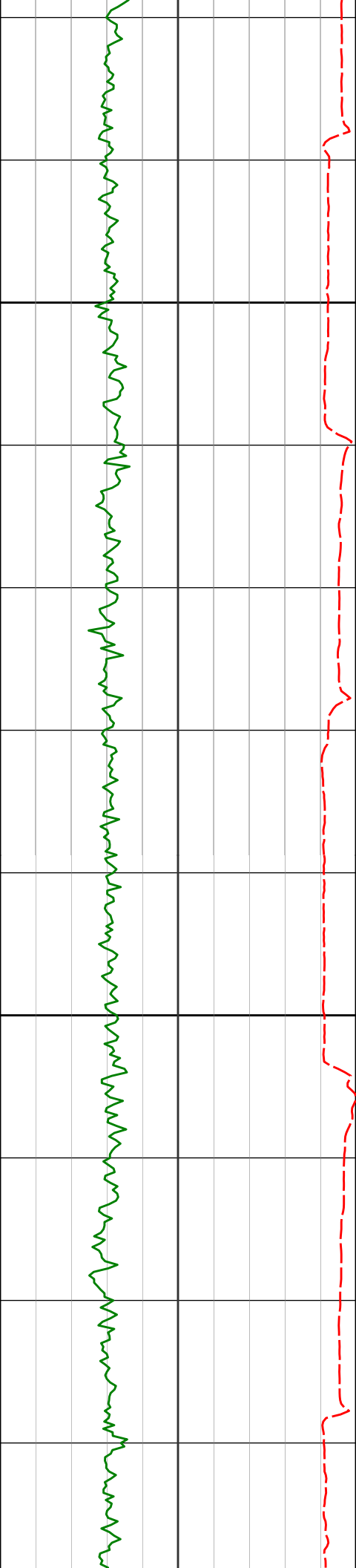
5911'      1.35°      257.94°    5866.47'      489.19'

5900

6006'      1.43°      270.51°    5961.44'      491.48'

6000

6100'      9.17°      276.51°    6054.97'      500.05'



6100

6195'

15.76°

267.23° 6147.69'

520.45'

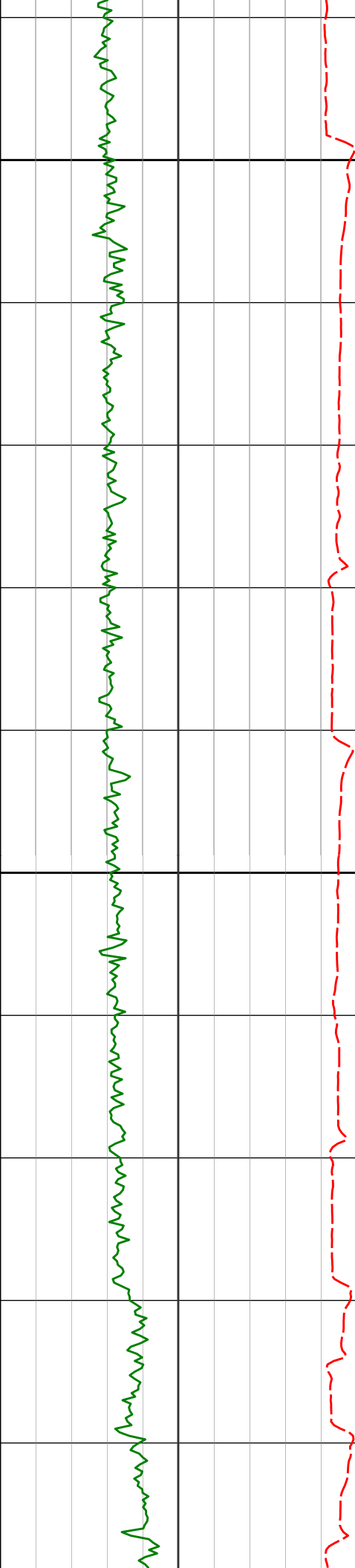
6200

6290'

19.73°

266.24° 6238.15'

549.39'



6300

6385'

24.71°

272.29° 6326.08'

585.23'

6400

6480'

36.19°

272.05° 6407.84'

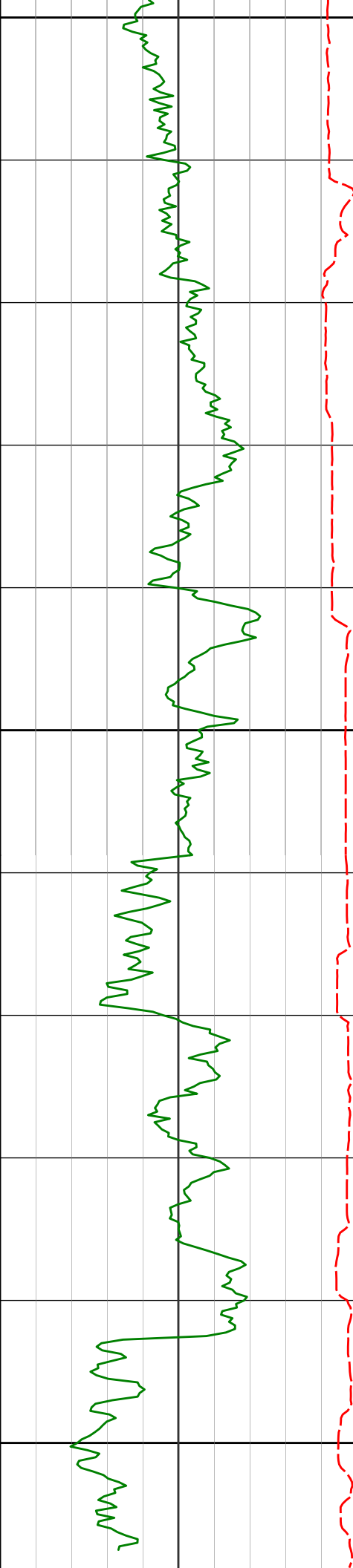
633.10'

6575'

45.76°

269.81° 6479.48'

695.18'



6500

6670'

48.33°

269.04° 6544.21'

764.64'

6600

6766'

52.44°

269.21° 6605.41'

838.53'

6861'

64.09°

268.10° 6655.30'

919.15'

6956'

74.69°

268.46° 6688.69'

1007.92'

6700

7051'

80.00°

269.14° 6709.49'

1100.54'

7089'

84.00°

269.28° 6714.78'

1138.14'



## DIRECTIONAL SURVEY REPORT

Colt A13-611

## Wattenburg

## Weld Colorado

## USA

**CA-XX-0902084378**

**The first two surveys at 374' and 652' are provided by HP**

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
377.00	0.10	235.66	377.00	0.19 S	0.27 W	0.28	0.03
651.00	0.60	358.24	651.00	1.11 N	0.51 W	0.45	0.24
990.00	0.19	118.57	989.99	2.62 N	0.07 W	-0.06	0.21
1083.00	0.29	167.93	1082.99	2.31 N	0.11 E	-0.23	0.24
1177.00	0.33	163.85	1176.99	1.82 N	0.24 E	-0.33	0.05
1269.00	1.03	227.17	1268.98	1.01 N	0.30 W	0.24	1.01
1362.00	2.14	240.80	1361.94	0.41 S	2.43 W	2.44	1.25
1453.00	3.24	237.70	1452.84	2.61 S	6.08 W	6.21	1.22
1546.00	4.83	234.53	1545.61	6.29 S	11.49 W	11.80	1.73
1639.00	6.82	234.66	1638.12	11.76 S	19.19 W	19.77	2.14
1731.00	7.99	235.51	1729.36	18.54 S	28.91 W	29.83	1.28
1824.00	9.75	237.70	1821.24	26.41 S	40.90 W	42.21	1.93
1920.00	8.88	238.71	1915.97	34.60 S	54.10 W	55.82	0.92
2015.00	9.19	244.33	2009.80	41.69 S	67.20 W	69.27	0.98
2110.00	8.30	243.98	2103.69	47.99 S	80.20 W	82.58	0.94
2206.00	9.73	244.05	2198.50	54.58 S	93.73 W	96.42	1.49
2301.00	8.94	243.48	2292.24	61.38 S	107.55 W	110.58	0.84
2396.00	10.44	238.25	2385.89	69.21 S	121.47 W	124.89	1.83
2491.00	9.50	234.89	2479.45	78.25 S	135.21 W	139.07	1.16
2586.00	8.47	234.68	2573.29	86.80 S	147.33 W	151.62	1.08
2681.00	9.27	232.13	2667.15	95.55 S	159.08 W	163.80	0.94
2776.00	9.69	235.88	2760.85	104.73 S	171.74 W	176.92	0.79
2872.00	10.09	235.34	2855.43	114.04 S	185.34 W	190.99	0.43
2966.00	9.38	234.40	2948.07	123.18 S	198.35 W	204.44	0.77
3061.00	8.63	233.76	3041.90	131.90 S	210.39 W	216.92	0.80
3156.00	9.08	235.63	3135.77	140.35 S	222.32 W	229.28	0.56
3251.00	7.41	230.92	3229.78	148.44 S	233.27 W	240.62	1.89
3346.00	7.58	234.37	3323.97	155.96 S	243.12 W	250.85	0.51
3441.00	8.16	241.86	3418.08	162.79 S	254.15 W	262.22	1.24
3536.00	8.49	240.56	3512.08	169.41 S	266.21 W	274.60	0.40
3631.00	10.32	238.42	3605.80	177.32 S	279.56 W	288.35	1.96
3726.00	11.59	237.43	3699.06	186.91 S	294.86 W	304.12	1.35
3821.00	12.46	237.32	3791.98	197.58 S	311.53 W	321.31	0.92
3916.00	13.15	237.41	3884.62	208.94 S	329.26 W	339.61	0.73
4010.00	11.62	236.90	3976.43	219.87 S	346.20 W	357.09	1.63
4105.00	10.49	236.07	4069.66	229.92 S	361.39 W	372.78	1.20
4200.00	8.76	234.06	4163.32	238.99 S	374.42 W	386.26	1.85
4295.00	8.57	228.54	4257.24	247.92 S	385.58 W	397.87	0.90
4390.00	7.71	226.26	4351.28	257.02 S	395.49 W	408.24	0.97
4486.00	8.78	224.63	4446.29	266.68 S	405.29 W	418.52	1.14
4581.00	7.51	217.04	4540.33	276.80 S	414.13 W	427.87	1.75
4676.00	6.14	202.85	4634.66	286.44 S	419.84 W	434.07	2.28
4771.00	5.23	195.46	4729.19	295.29 S	422.97 W	437.65	1.23
4866.00	5.26	200.08	4823.80	303.56 S	425.62 W	440.72	0.45

4961.00	6.12	212.05	4918.33	311.94 S	429.80 W	445.33	1.54
5056.00	5.88	216.82	5012.81	320.13 S	435.40 W	451.35	0.58
5151.00	5.16	232.76	5107.38	326.61 S	441.72 W	458.00	1.78
5246.00	4.43	235.74	5202.04	331.26 S	448.15 W	464.66	0.81
5341.00	3.16	245.08	5296.83	334.43 S	453.56 W	470.23	1.48
5436.00	2.61	248.81	5391.71	336.31 S	457.95 W	474.71	0.61
5531.00	2.08	251.09	5486.63	337.65 S	461.60 W	478.42	0.57
5626.00	1.57	253.22	5581.58	338.59 S	464.48 W	481.34	0.54
5721.00	1.89	254.85	5676.54	339.37 S	467.23 W	484.14	0.34
5816.00	1.55	247.38	5771.50	340.28 S	469.93 W	486.88	0.43
5911.00	1.35	257.94	5866.47	341.00 S	472.21 W	489.19	0.35
6006.00	1.43	270.51	5961.44	341.23 S	474.49 W	491.48	0.33
6100.00	9.17	276.51	6054.97	340.37 S	483.12 W	500.05	8.24
6195.00	15.76	267.23	6147.69	340.13 S	503.55 W	520.45	7.23
6290.00	19.73	266.24	6238.15	341.81 S	532.45 W	549.39	4.19
6385.00	24.71	272.29	6326.08	342.07 S	568.32 W	585.23	5.76
6480.00	36.19	272.05	6407.84	340.26 S	616.35 W	633.10	12.08
6575.00	45.76	269.81	6479.48	339.37 S	678.56 W	695.18	10.19
6670.00	48.33	269.04	6544.21	340.08 S	748.08 W	764.64	2.77
6766.00	52.44	269.21	6605.41	341.20 S	822.01 W	838.53	4.28
6861.00	64.09	268.10	6655.30	343.15 S	902.64 W	919.15	12.30
6956.00	74.69	268.46	6688.69	345.80 S	991.39 W	1007.92	11.16
7051.00	80.00	269.14	6709.49	347.74 S	1084.03 W	1100.54	5.63
7089.00	84.00	269.28	6714.78	348.26 S	1121.65 W	1138.14	10.53
7192.00	89.11	271.43	6720.97	347.61 S	1224.42 W	1240.74	5.38
7287.00	89.66	270.06	6721.99	346.38 S	1319.40 W	1335.53	1.55
7382.00	89.35	269.79	6722.81	346.50 S	1414.40 W	1430.41	0.43
7477.00	89.23	269.46	6723.99	347.13 S	1509.39 W	1525.30	0.37
7572.00	89.75	269.45	6724.83	348.03 S	1604.38 W	1620.21	0.55
7667.00	89.69	269.04	6725.30	349.28 S	1699.37 W	1715.14	0.44
7762.00	90.28	268.57	6725.32	351.26 S	1794.35 W	1810.10	0.79

**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 267.04 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.44 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7762.00 FEET  
IS 1828.41 FEET ALONG 258.92 DEGREES (GRID)**

**Final survey is a straight line projection to TD.**