

PCGK - Pressure Case Gamma



1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	26-Oct-13				
Rig Bit Number	0100				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (MD, ft)	1,041.00				
Log End Depth (MD, ft)	7,921.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	23-Oct-13 00:52				
Drill/Wipe End Date and Time	25-Oct-13 19:40				
Min Inc (deg) @ Depth (MD, ft)	0.17 @ 1,860.00				
Max Inc (deg) @ Depth (MD, ft)	86.52 @ 7,873.00				
Bit TFA(in2) / Bit Type	1.04 / PDC				
Flow Rate (gpm)	571.05				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Fresh Water Gel				
Density (ppg) / Viscosity (spqt)	10.10 / 30.00				
Filtrate CL (ppm)	40.00				
pH / Fluid Loss (mptm)	9.30 / 4				
PV (cP) / YP (lbf2)	15 / 16.00				
% Solids / % Sand	4.00 / 0.01				
% Oil / Oil:Water Ratio	2.00 / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Mud Temp (degF) @ Bit	124 / 123.4				

Max Tool Temp (degF) / Source	124 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Caleb Jones				
Customer Representative	David Cornett				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.76				
Sub Serial Number	11404261				
Insert Serial Number	11680779				
Date and Time Initialized	22-Oct-13 00:07				
Date and Time Read	26-Oct-13 08:18				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	46.35				
Software Version	6.21				
Sub Serial Number	11404261				
Sonde Serial Number	11638628				
Sensor ID Number	N/A				
Toolface Offset (deg)	142.18				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	51.30				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404261				
Insert/Sonde Serial Number	12037413				

REMARKS

1. Depths are Measured Depths, referenced to Driller's pipe tally, and measure from the rig 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 Bingham Plastic model for oil based fluids.
4. All data presented is recorded unless otherwise specified.
5. The following smoothing parameters have been applied to the data:

DGR (Dual Gamma Ray):
Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft
Gap Fill: 3.0 ft

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

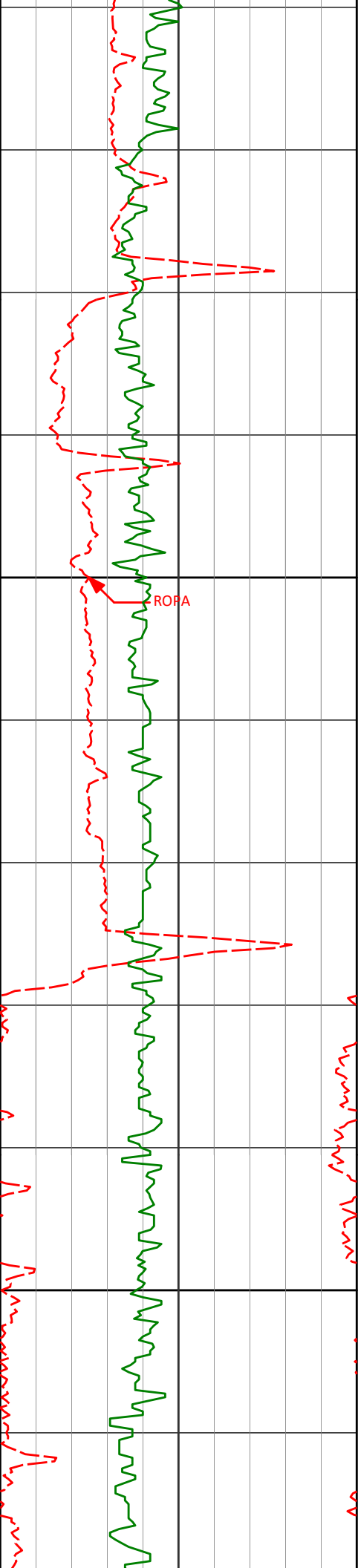
WARRANTY

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HALLIBURTON
 Sperry Drilling Services
 MD Detail Log 1:240

Anadarko Petroleum Company
 Butterball 28C-15HZ
 Xtreme 22
 Weld County, CO

Avg Rate of Penetration							
ROPA							
feet per hr							
500	0						
PCG Gamma Ray		Depth, ft					
api <th>TVD</th> <th colspan="4"></th>		TVD					
0	300		Depth	Inc	Azi	TVD	VS
		1100					
			1107'	1.09°	147.57°	1106.98'	1.45'



1200

1202'

0.90°

143.98°

1201.96'

2.81'

1300

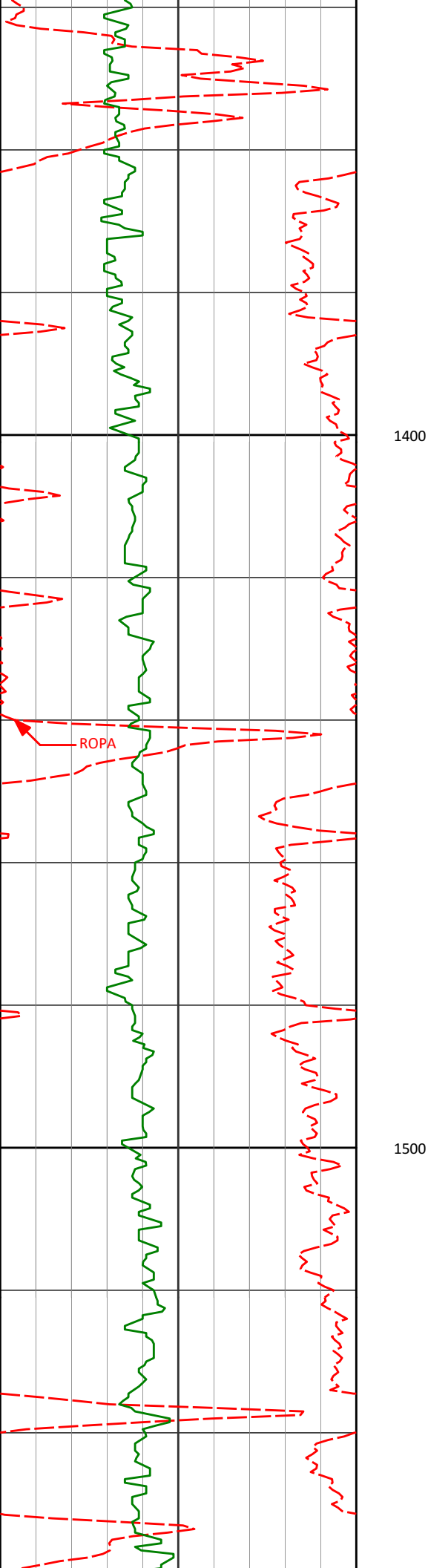
1297'

0.94°

151.09°

1296.95'

4.10'



1392'

0.97°

162.26°

1391.94'

5.55'

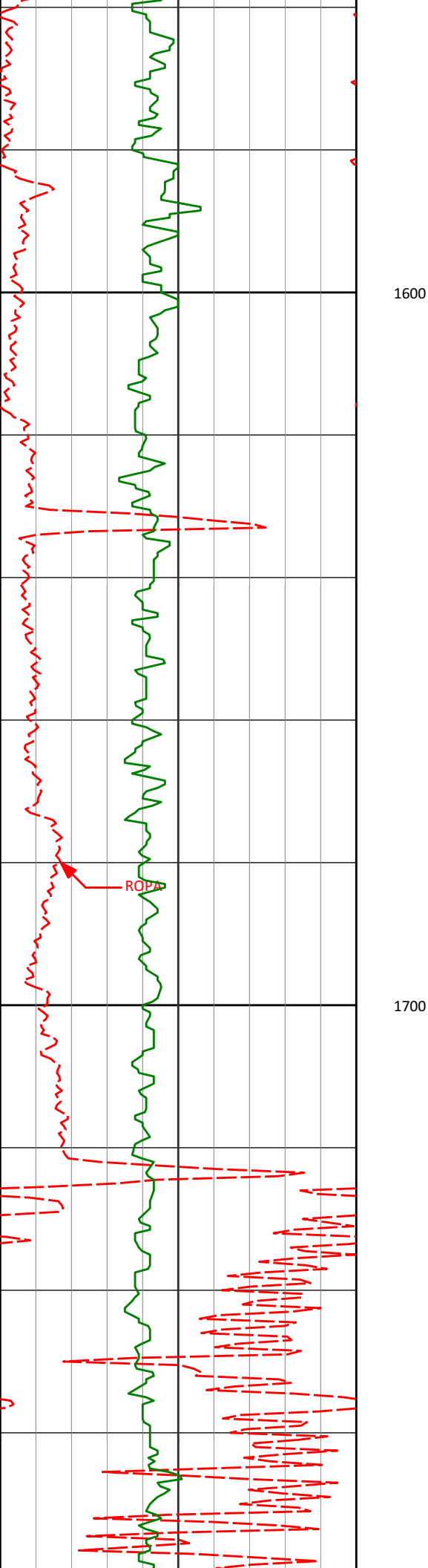
1487'

0.56°

148.70°

1486.93'

6.71'



1580'

0.62°

154.88°

1579.92'

7.56'

1600

1676'

0.46°

138.28°

1675.92'

8.31'

1700

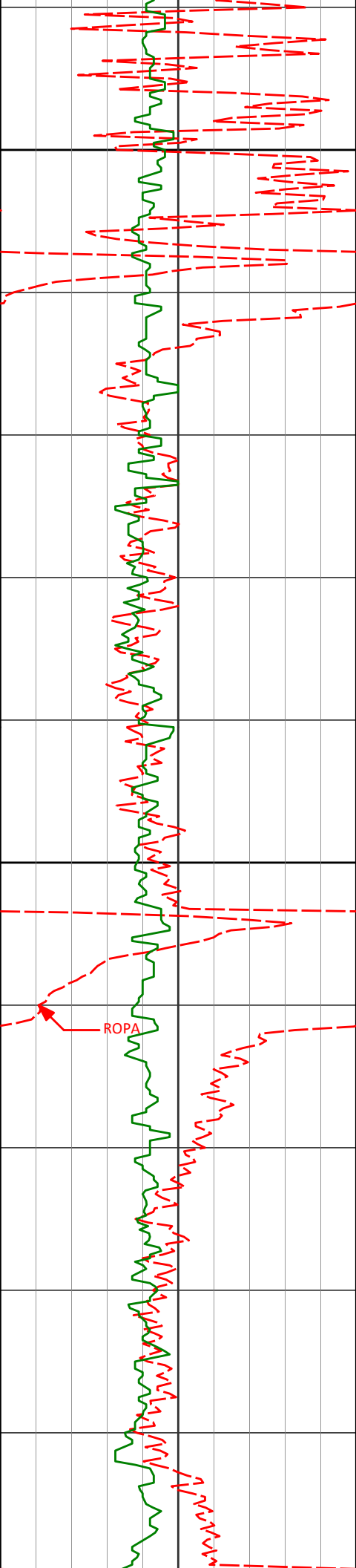
1767'

0.31°

152.37°

1766.92'

8.80'



1800

1860'

0.17°

187.00°

1859.92'

9.16'

1900

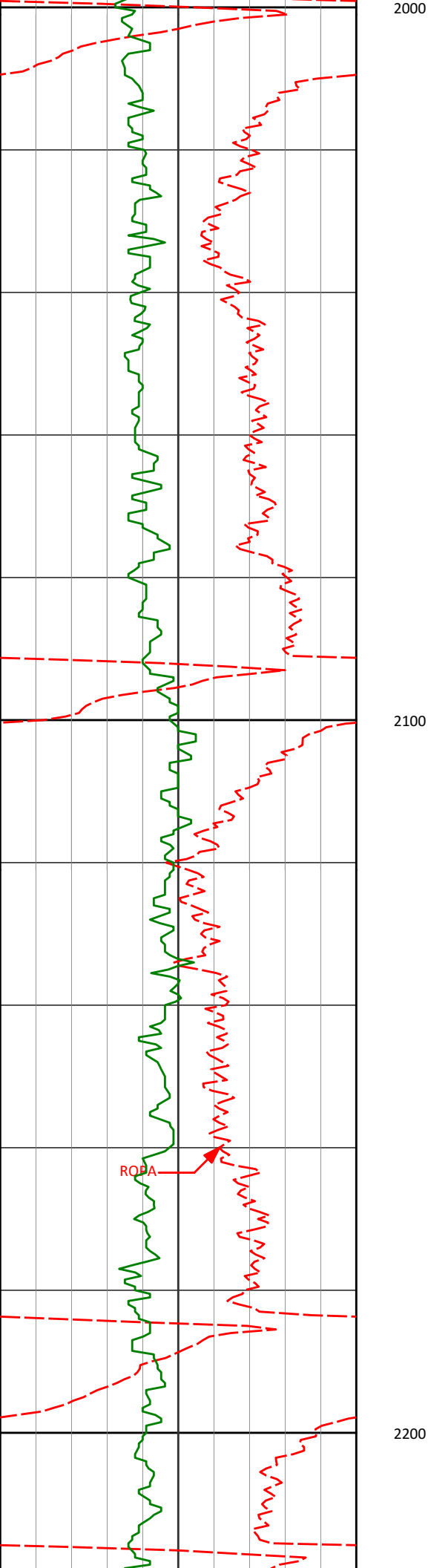
1951'

0.28°

151.19°

1950.91'

9.49'



2044'

0.35°

217.28°

2043.91'

9.92'

2100

2137'

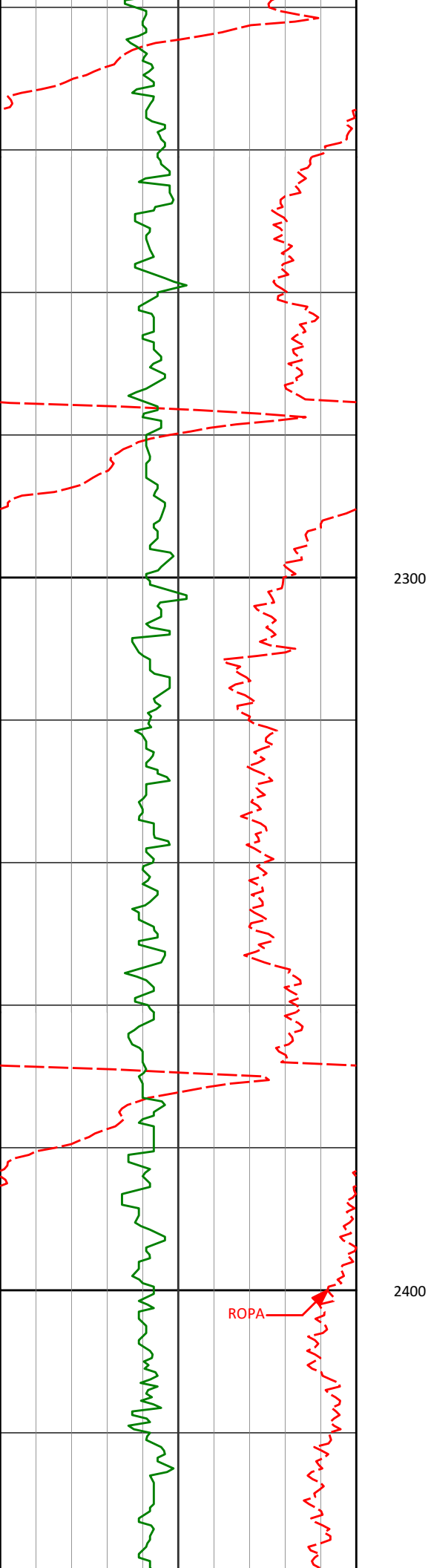
0.75°

216.25°

2136.91'

10.63'

2200



2228'

0.41°

128.40°

2227.91'

11.32'

2300

2320'

0.39°

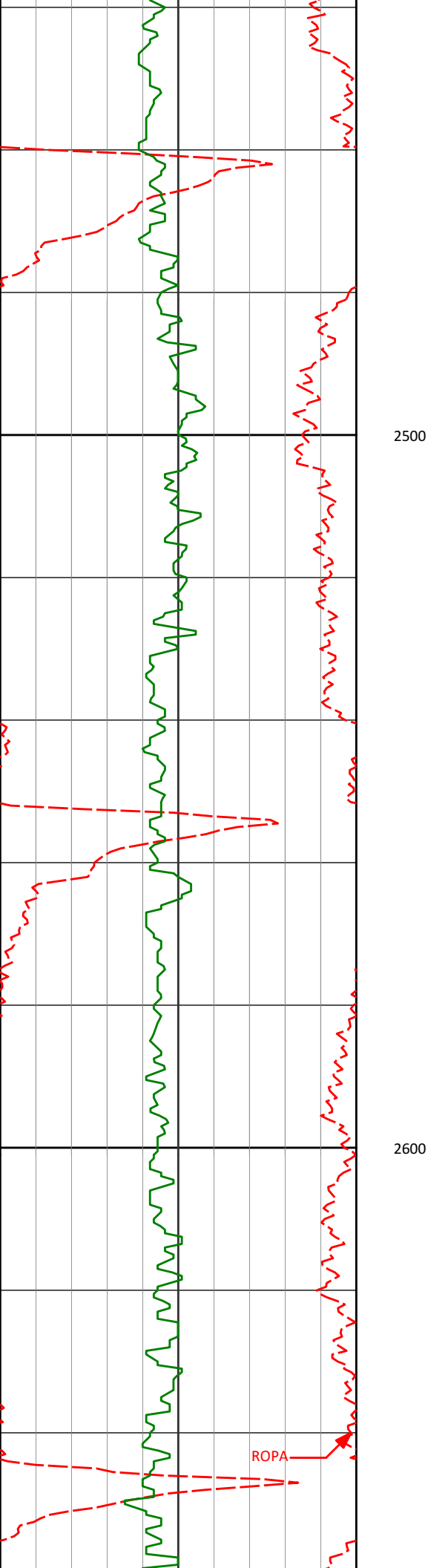
99.25°

2319.90'

11.57'

2400

ROPA



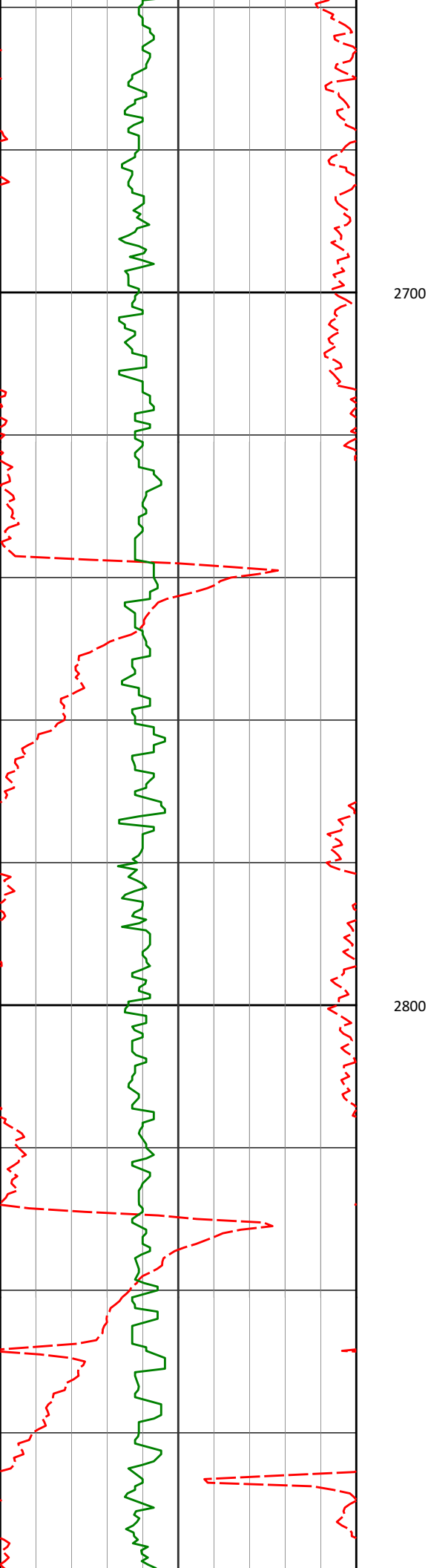
2597'

0.17°

281.28°

2596.90'

11.64'



2780'

0.30°

300.89°

2779.90'

11.34'

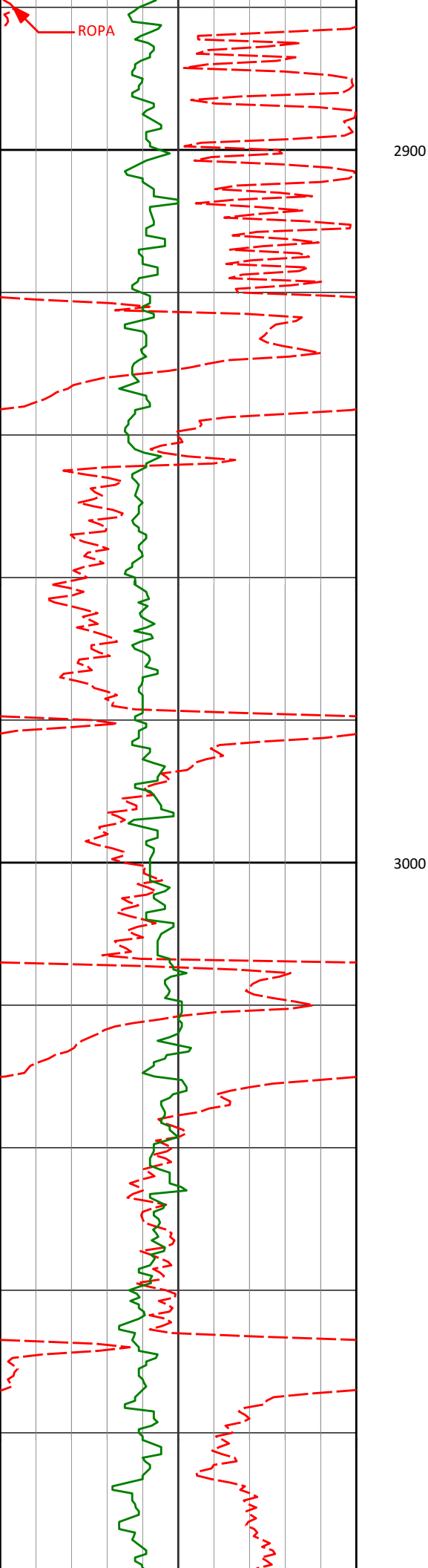
2871'

0.37°

285.31°

2870.90'

11.14'



2963'

0.49°

251.91°

2962.90'

11.19'

3000

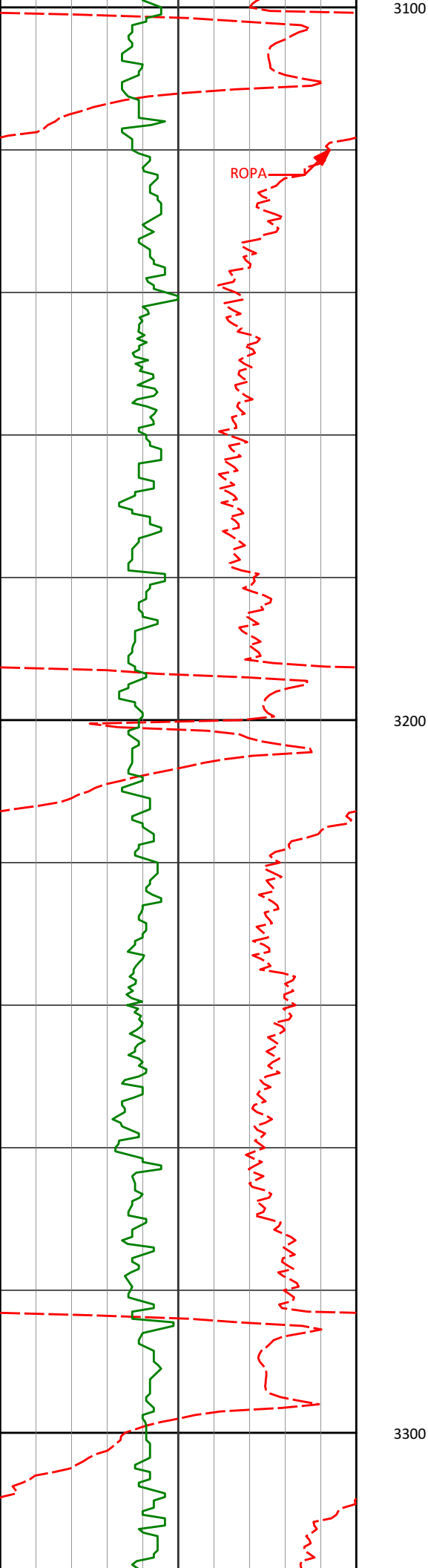
3053'

1.18°

173.03°

3052.89'

12.23'



3100

ROPA

3144'

1.67°

151.57°

3143.86'

14.32'

3200

3236'

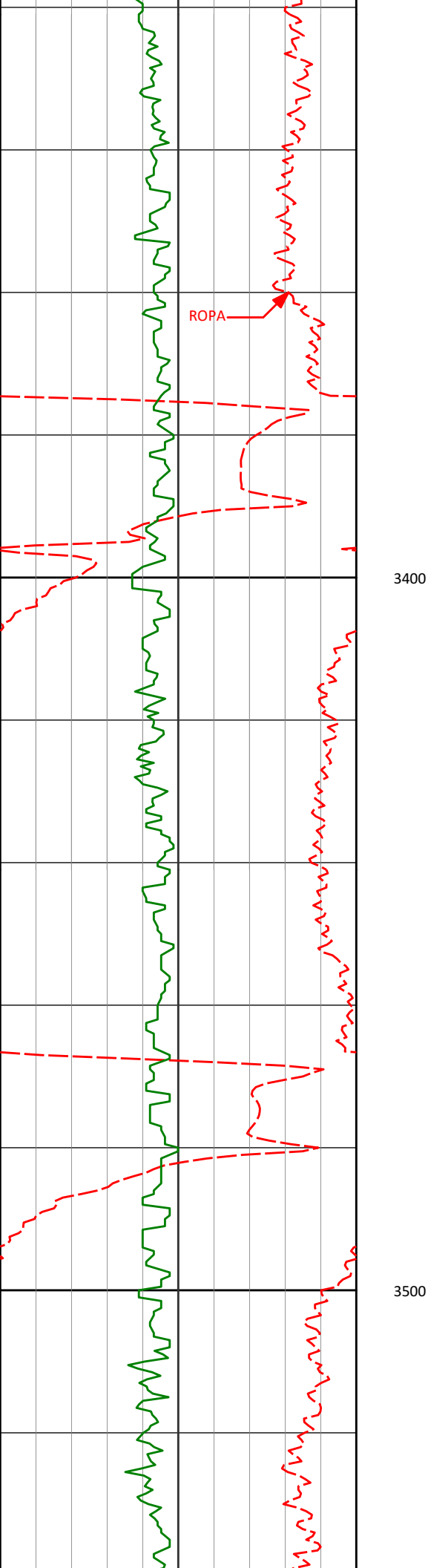
2.35°

142.20°

3235.80'

16.99'

3300



3327'

2.61°

120.19°

3326.72'

19.51'

3400

3418'

4.14°

100.86°

3417.56'

21.17'

3500

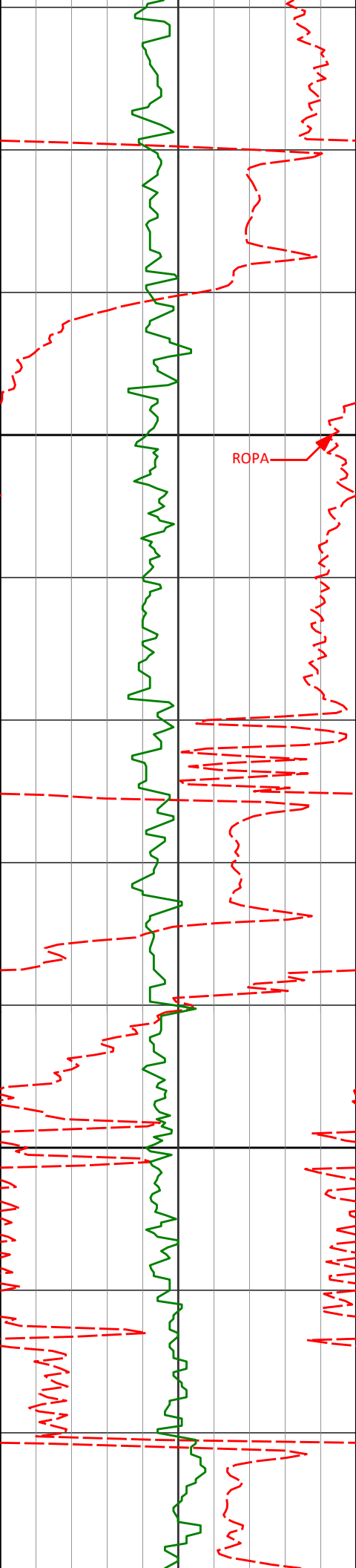
3509'

4.59°

93.93°

3508.30'

22.04'



3600

3601'

5.78°

86.79°

3599.92'

22.03'

3700

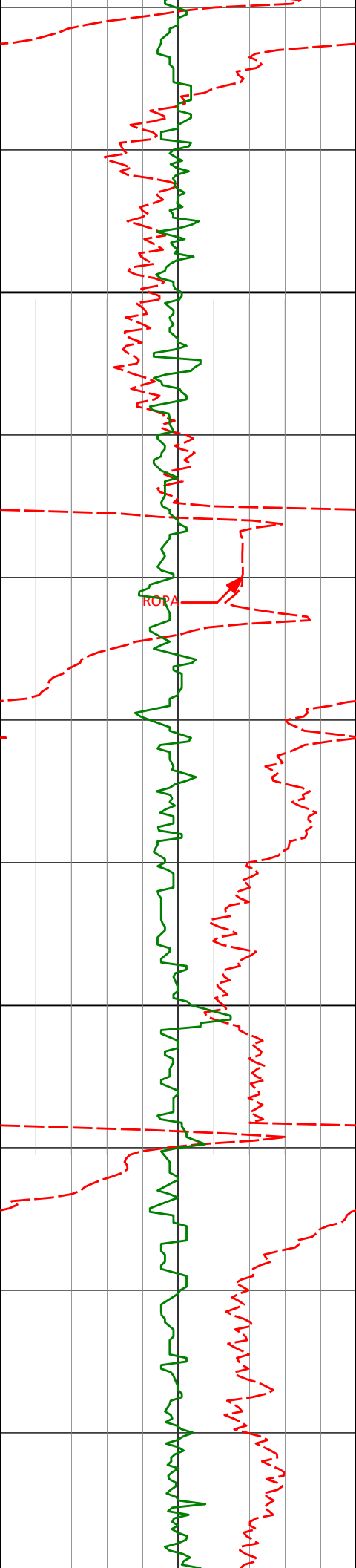
3693'

6.71°

94.24°

3691.38'

22.17'



3800

3900

3784'

8.35°

87.58°

3781.59'

22.28'

3875'

10.31°

86.88°

3871.38'

21.56'

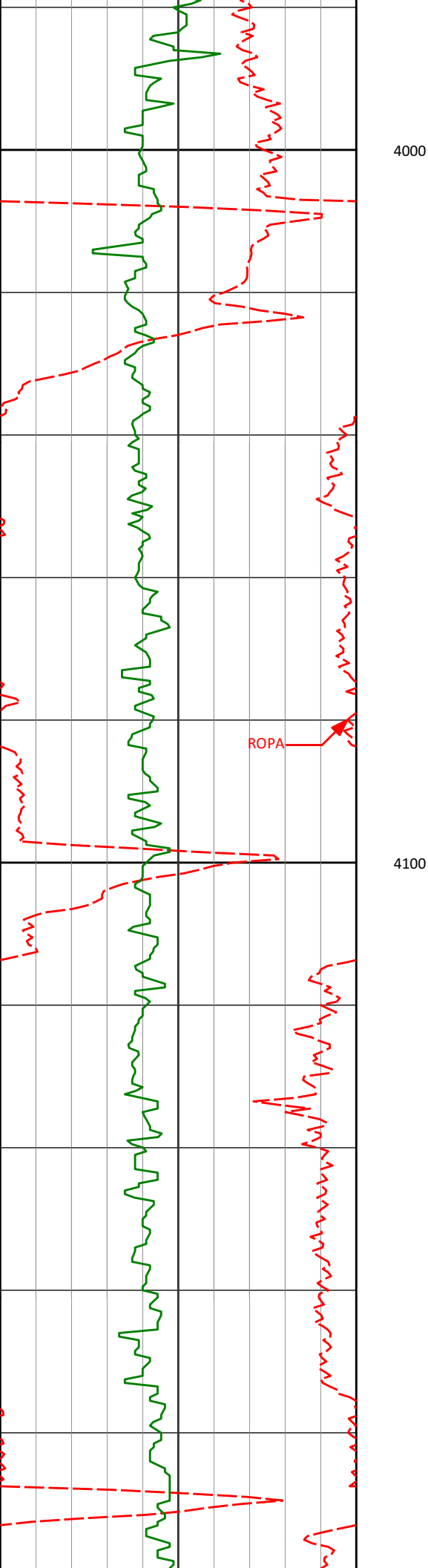
3966'

8.99°

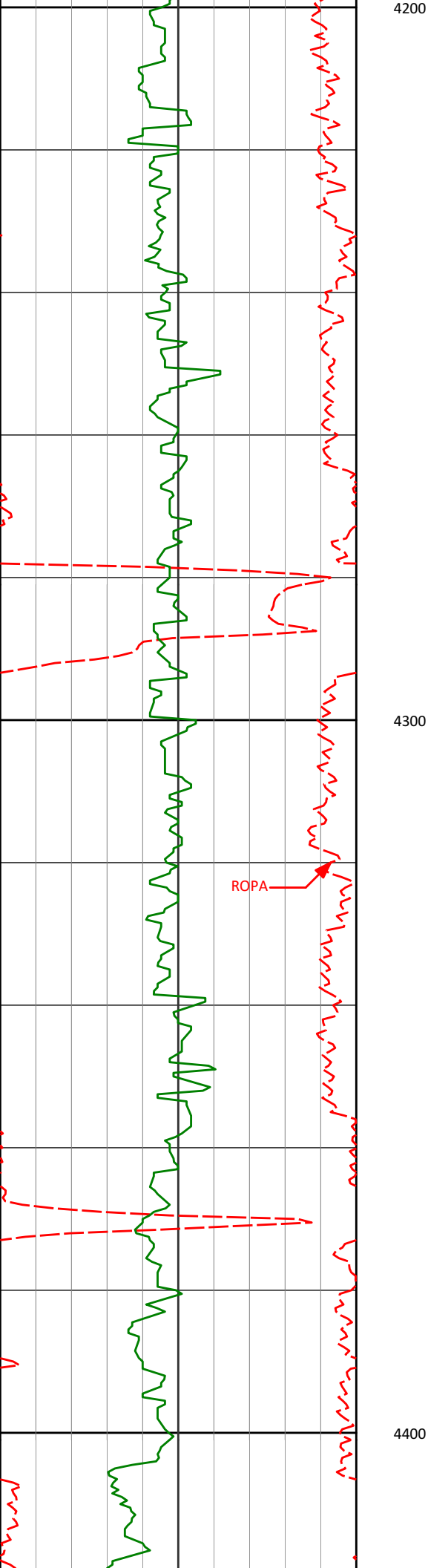
85.90°

3961.09'

20.61'



4000				
4057'	11.03°	85.33°	4050.70'	19.39'
4100				
4148'	10.79°	85.35°	4140.06'	17.99'



4240'

9.86°

85.21°

4230.57'

16.64'

4300

4332'

10.75°

85.42°

4321.08'

15.29'

4400

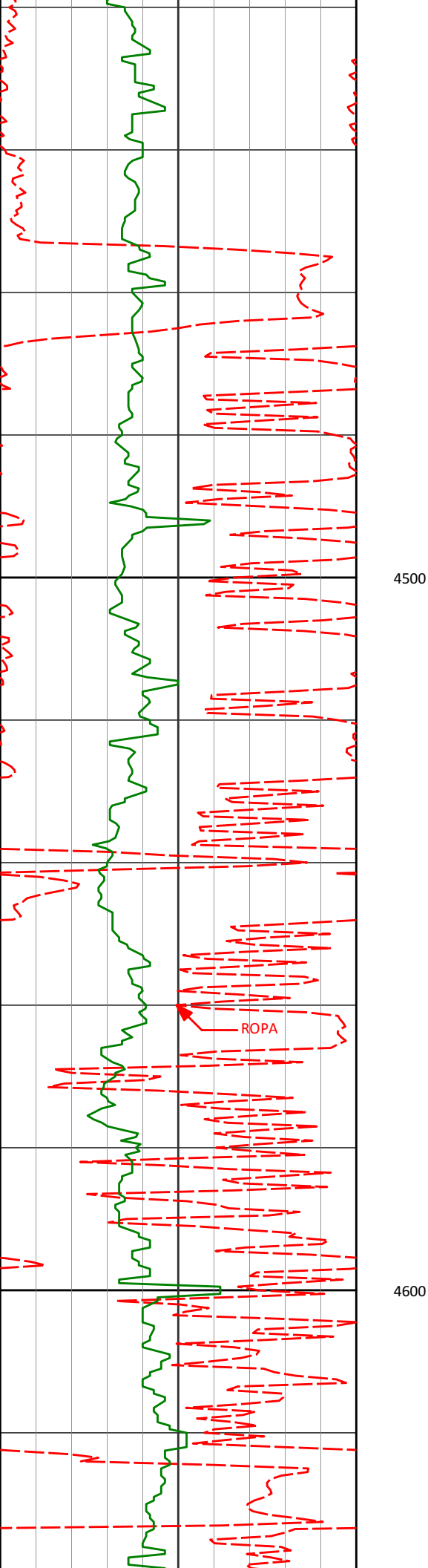
4418'

9.92°

81.81°

4405.69'

13.60'



4503'

10.23°

86.67°

4489.38'

12.12'

4500

4589'

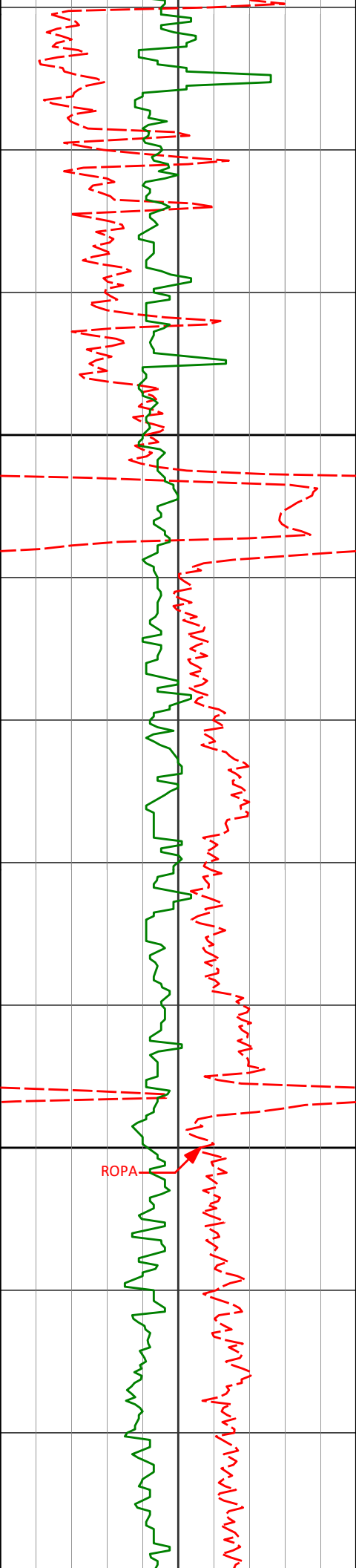
9.74°

86.02°

4574.07'

11.17'

4600



4700

4800

4674'

10.11°

94.09°

4657.81'

11.20'

4760'

9.92°

95.54°

4742.50'

12.45'

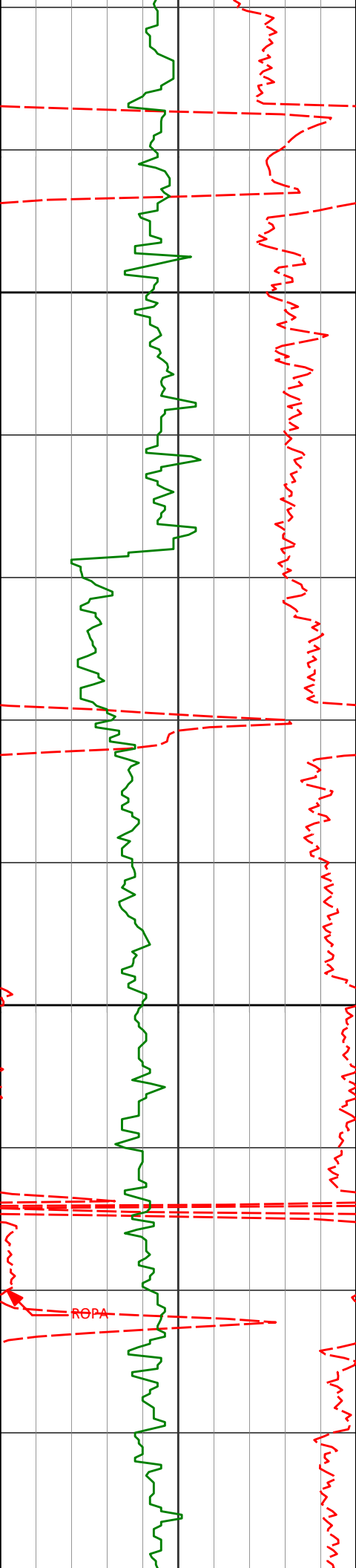
4846'

9.33°

96.23°

4827.29'

13.93'



4900

4931'

10.99°

87.90°

4910.95'

14.38'

5000

5017'

11.16°

86.79°

4995.35'

13.61'

ROPA

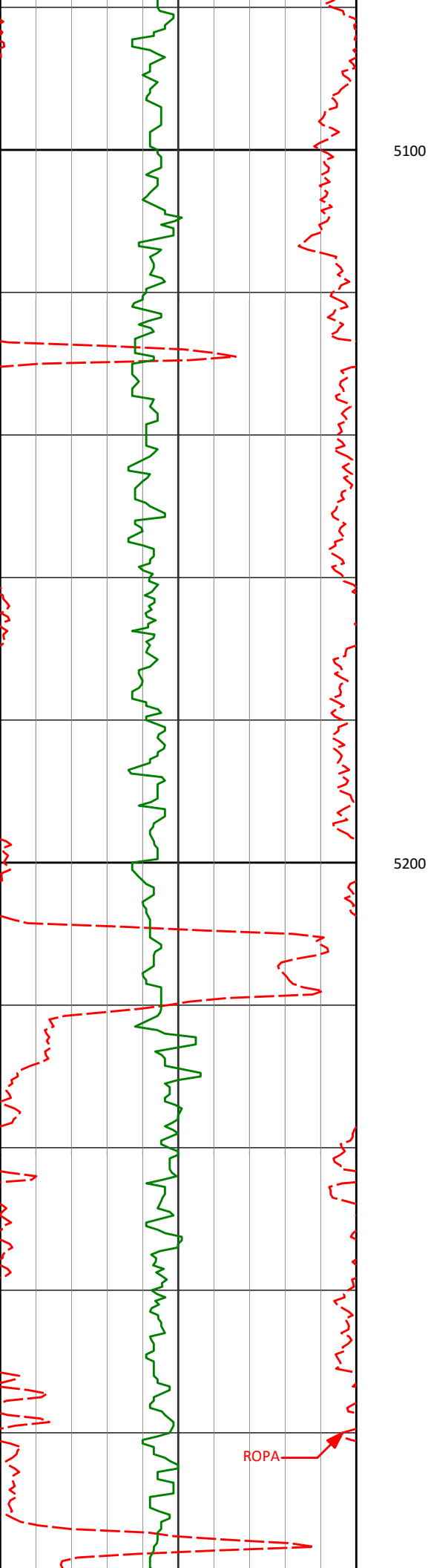
5102'

10.30°

86.48°

5078.87'

12.68'



5102 10.30 85.46 5078.67 12.06

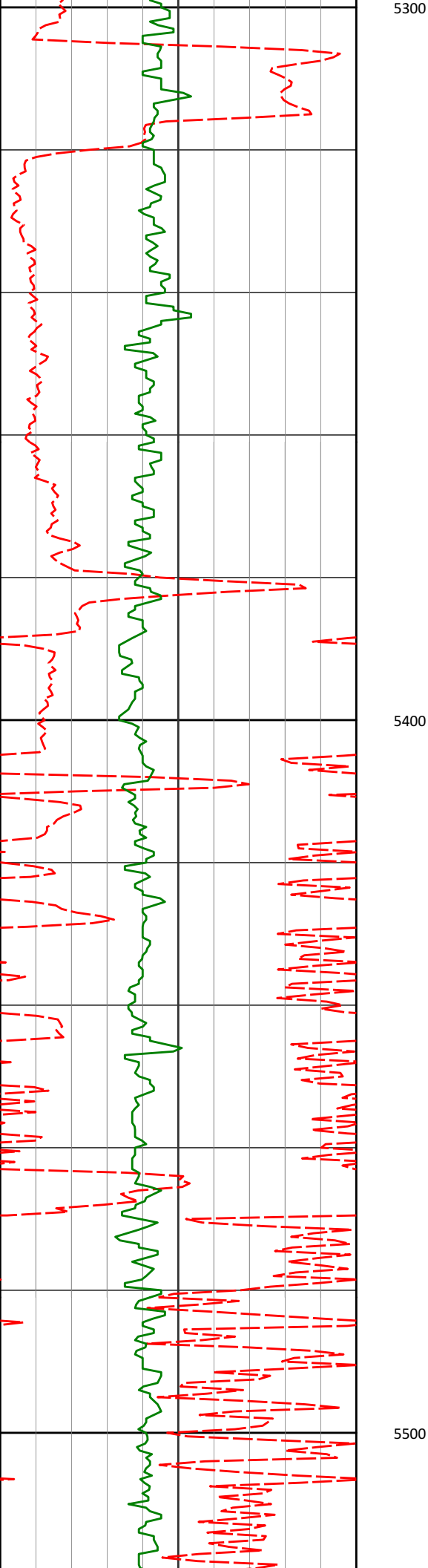
5100

5188' 9.31° 85.16° 5163.61' 11.62'

5200

5274' 8.87° 85.50° 5248.53' 10.52'

ROPA



5359'

7.98°

91.59°

5332.61'

10.17'

5444'

7.43°

89.91°

5416.84'

10.32'

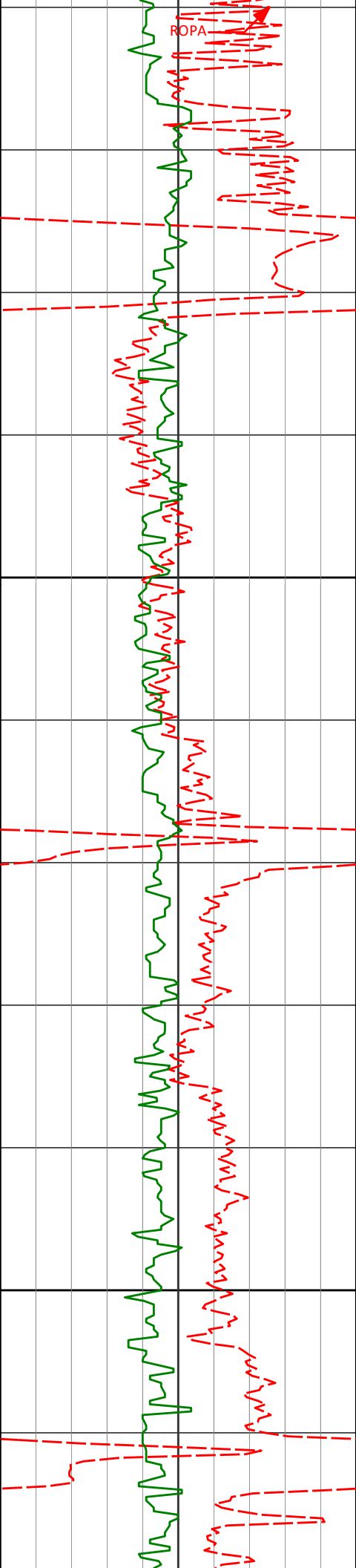
5530'

6.66°

87.37°

5502.19'

10.08'



5616'

7.13°

91.66°

5587.57'

10.01'

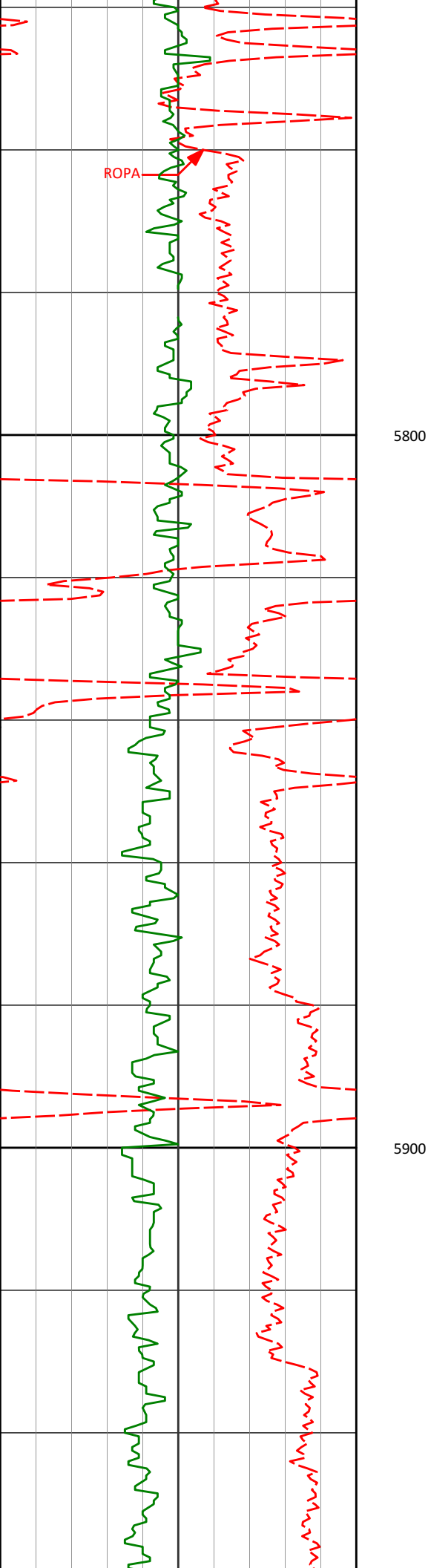
5702'

6.08°

88.21°

5673.00'

10.02'



5787'

5.17°

86.38°

5757.59'

9.64'

5800

5873'

5.17°

98.51°

5843.24'

9.97'

5900

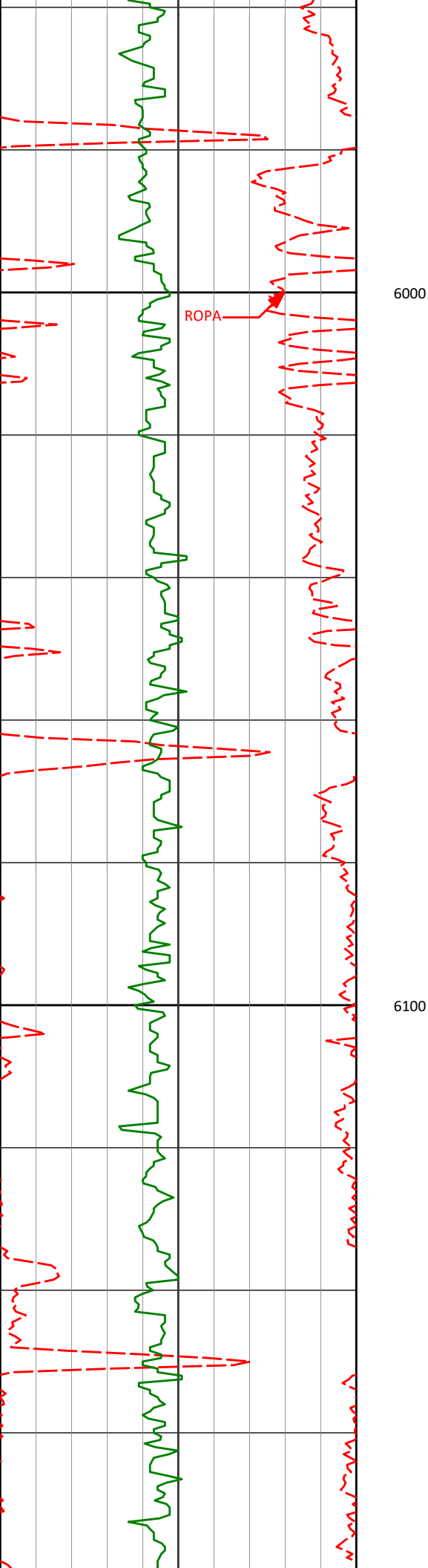
5959'

3.97°

96.17°

5928.97'

10.86'



6044'

3.12°

88.13°

6013.81'

11.10'

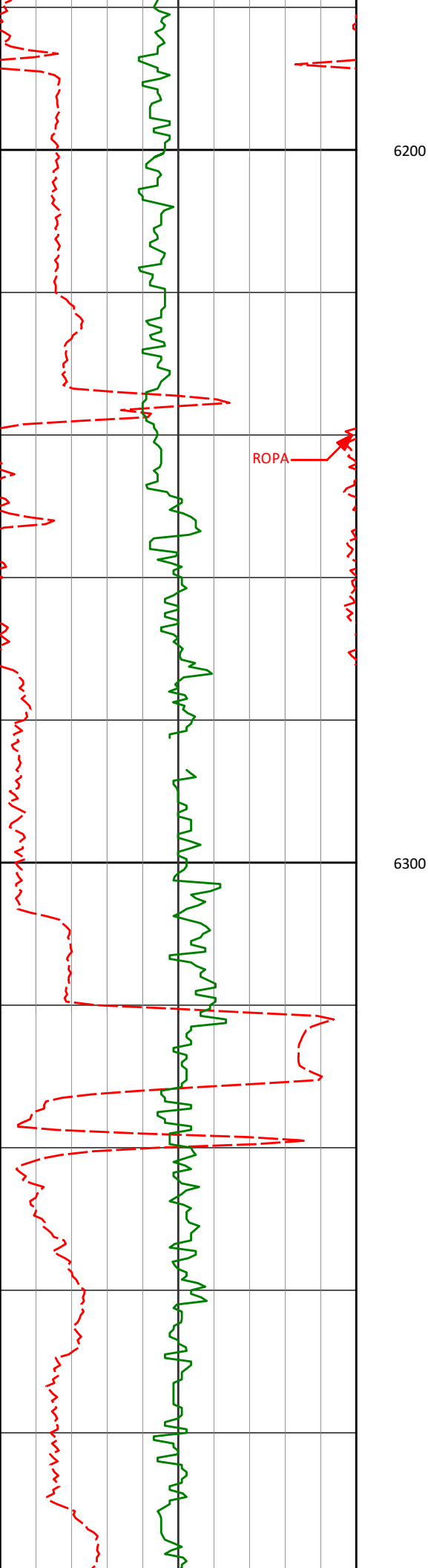
6130'

2.33°

92.22°

6099.71'

11.09'



6216'

1.53°

90.38°

6185.66'

11.17'

6302'

1.22°

87.51°

6271.63'

11.14'

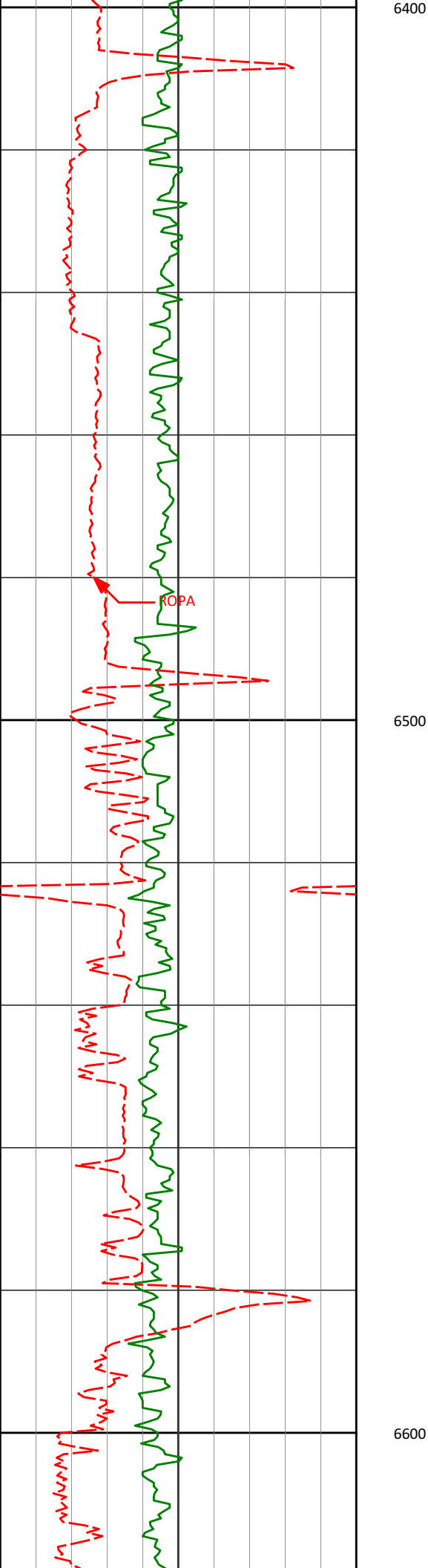
6387'

0.99°

337.69°

6356.63'

10.42'



6473'

0.65°

349.49°

6442.62'

9.25'

6559'

0.48°

346.59°

6528.61'

8.42'

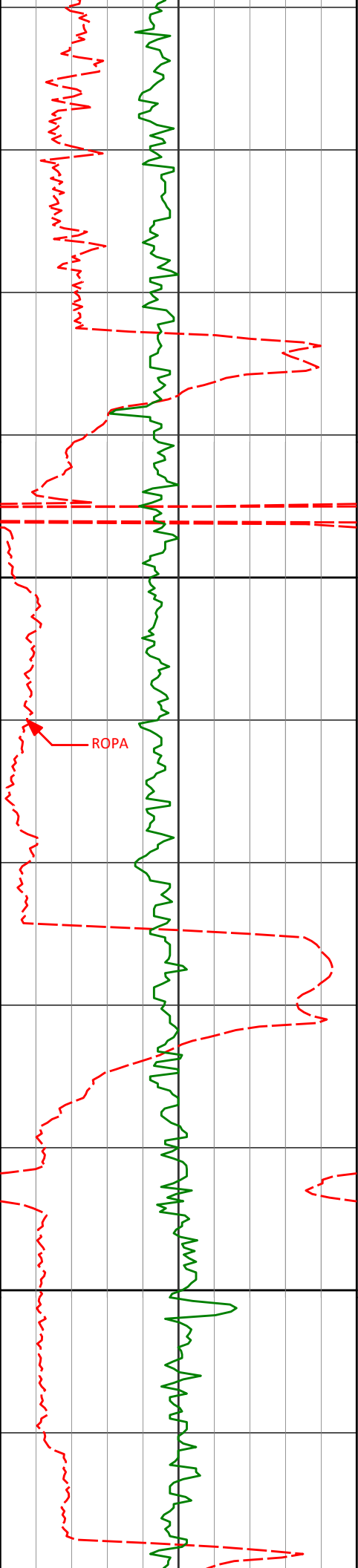
6645'

0.57°

330.60°

6614.61'

7.70'



6700

6730'

0.63°

337.51°

6699.60'

6.90'

6816'

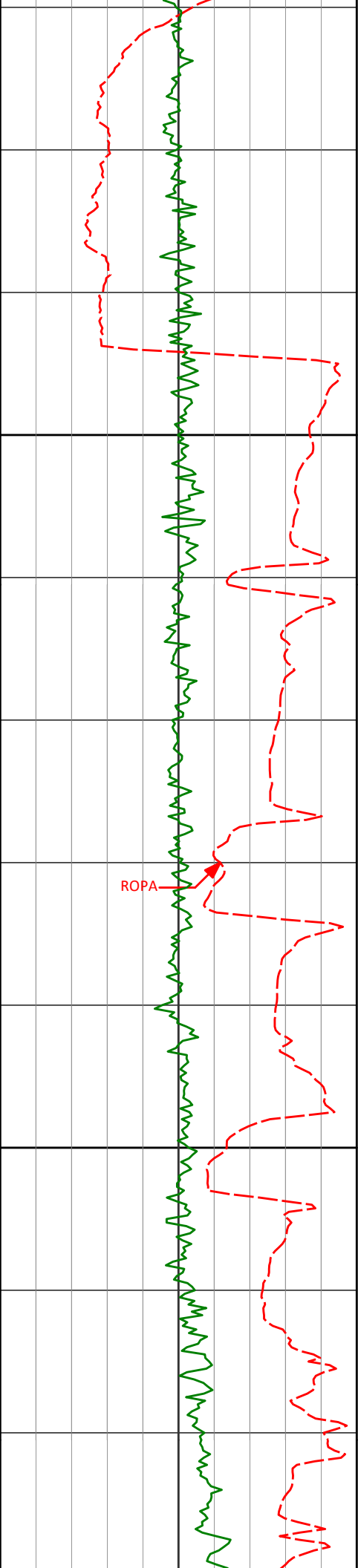
0.67°

125.07°

6785.60'

6.75'

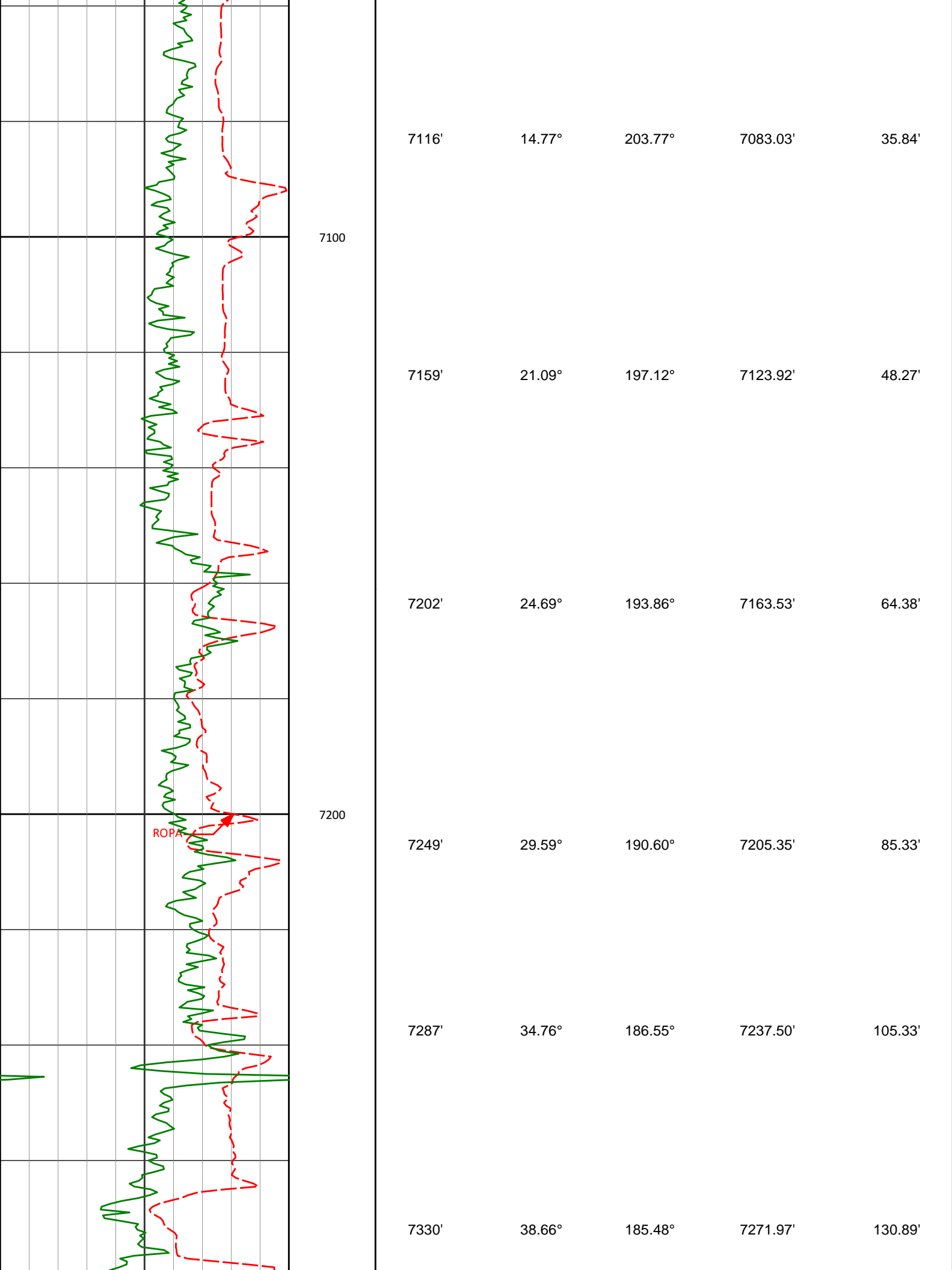
6800

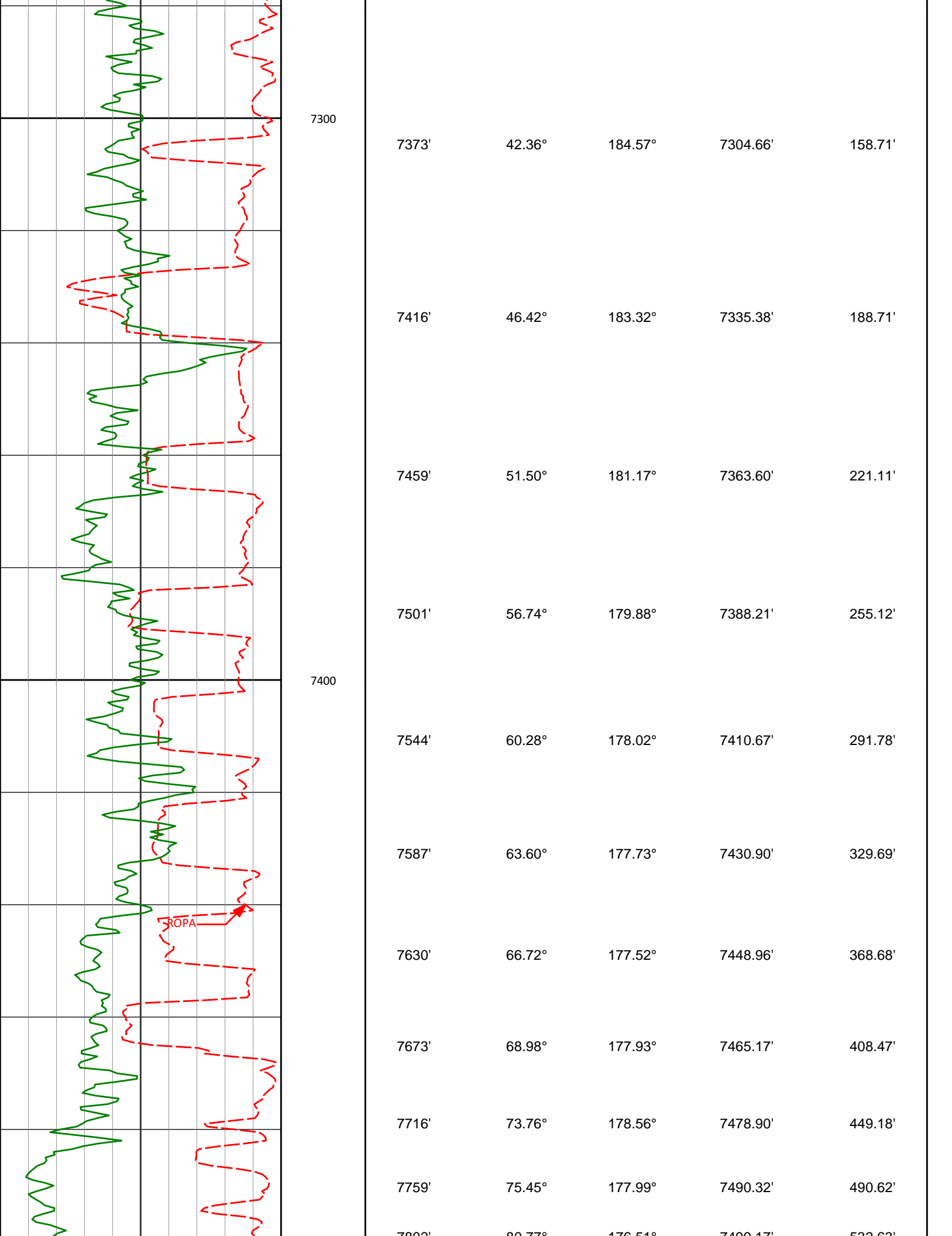


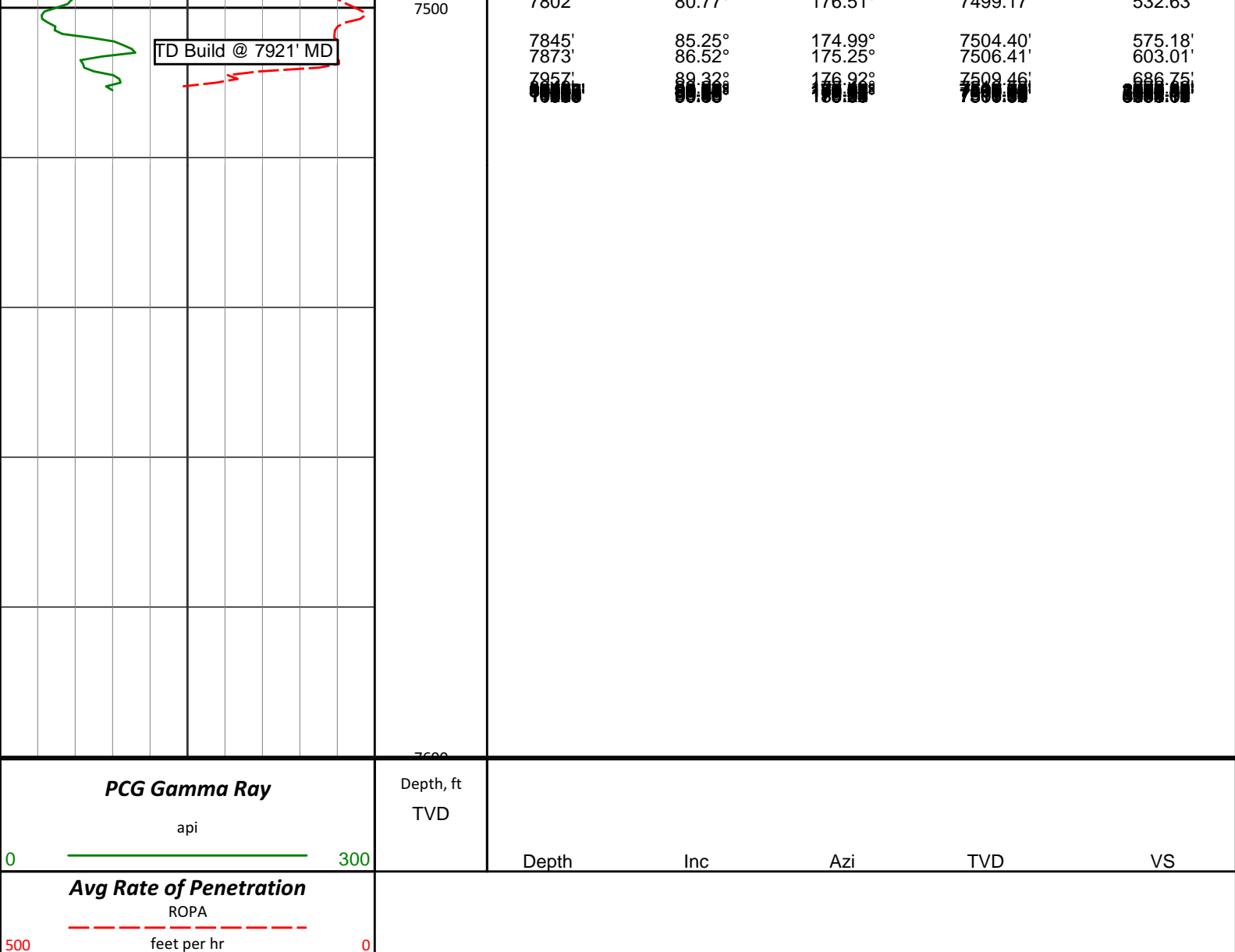
6900

7000

6902'	0.57°	107.25°	6871.60'	7.17'
6945'	4.01°	164.03°	6914.56'	8.68'
6987'	7.90°	180.09°	6956.33'	12.98'
7030'	9.72°	189.82°	6998.82'	19.51'
7073'	11.02°	199.76°	7041.12'	26.95'







HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko PC
Butterball 28C-15HZ
Wattenburg
Weld Colorado
USA
CA-XX-0900752890

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
946.00	0.39	146.38	945.99	0.30 N	2.63 E	-0.30	TIE-IN
1107.00	1.09	147.57	1106.98	1.45 S	3.75 E	1.45	0.43
1202.00	0.90	143.98	1201.96	2.81 S	4.68 E	2.81	0.21
1297.00	0.94	151.09	1296.95	4.10 S	5.49 E	4.10	0.13
1392.00	0.97	162.26	1391.94	5.55 S	6.12 E	5.55	0.20
1487.00	0.56	148.70	1486.93	6.71 S	6.60 E	6.71	0.47
1580.00	0.62	154.88	1579.92	7.56 S	7.05 E	7.56	0.09
1676.00	0.46	138.28	1675.92	8.31 S	7.53 E	8.31	0.23
1767.00	0.31	152.37	1766.92	8.80 S	7.89 E	8.80	0.19
1860.00	0.17	187.00	1859.92	9.16 S	7.99 E	9.16	0.21
1951.00	0.28	151.19	1950.91	9.49 S	8.08 E	9.49	0.19
2044.00	0.35	217.28	2043.91	9.92 S	8.01 E	9.92	0.37
2137.00	0.75	216.25	2136.91	10.62 S	7.48 E	10.62	0.42

2137.00	0.73	216.23	2136.91	10.63 S	7.48 E	10.63	0.43
2228.00	0.41	128.40	2227.91	11.32 S	7.38 E	11.32	0.92
2320.00	0.39	99.25	2319.90	11.57 S	7.95 E	11.57	0.22
2597.00	0.17	281.28	2596.90	11.64 S	8.48 E	11.64	0.20
2780.00	0.30	300.89	2779.90	11.34 S	7.80 E	11.34	0.08
2871.00	0.37	285.31	2870.90	11.14 S	7.31 E	11.14	0.13
2963.00	0.49	251.91	2962.90	11.19 S	6.65 E	11.19	0.30
3053.00	1.18	173.03	3052.89	12.23 S	6.40 E	12.23	1.32
3144.00	1.67	151.57	3143.86	14.32 S	7.14 E	14.32	0.79
3236.00	2.35	142.20	3235.80	16.99 S	8.94 E	16.99	0.82
3327.00	2.61	120.19	3326.72	19.51 S	11.87 E	19.51	1.08
3418.00	4.14	100.86	3417.56	21.17 S	16.89 E	21.17	2.07
3509.00	4.59	93.93	3508.30	22.04 S	23.75 E	22.04	0.76
3601.00	5.78	86.79	3599.92	22.03 S	32.05 E	22.03	1.47
3693.00	6.71	94.24	3691.38	22.17 S	42.03 E	22.17	1.34
3784.00	8.35	87.58	3781.59	22.28 S	53.94 E	22.28	2.04
3875.00	10.31	86.88	3871.38	21.56 S	68.67 E	21.56	2.16
3966.00	8.99	85.90	3961.09	20.61 S	83.90 E	20.61	1.46
4057.00	11.03	85.33	4050.70	19.39 S	99.67 E	19.39	2.24
4148.00	10.79	85.35	4140.06	17.99 S	116.83 E	17.99	0.26
4240.00	9.86	85.21	4230.57	16.64 S	133.27 E	16.64	1.01
4332.00	10.75	85.42	4321.08	15.29 S	149.67 E	15.29	0.97
4418.00	9.92	81.81	4405.69	13.60 S	165.00 E	13.60	1.22
4503.00	10.23	86.67	4489.38	12.12 S	179.78 E	12.12	1.06
4589.00	9.74	86.02	4574.07	11.17 S	194.66 E	11.17	0.58
4674.00	10.11	94.09	4657.81	11.20 S	209.27 E	11.20	1.69
4760.00	9.92	95.54	4742.50	12.45 S	224.18 E	12.45	0.37
4846.00	9.33	96.23	4827.29	13.93 S	238.48 E	13.93	0.70
4931.00	10.99	87.90	4910.95	14.38 S	253.43 E	14.38	2.60
5017.00	11.16	86.79	4995.35	13.61 S	269.93 E	13.61	0.32
5102.00	10.30	86.48	5078.87	12.68 S	285.73 E	12.68	1.01
5188.00	9.31	85.16	5163.61	11.62 S	300.33 E	11.62	1.18
5274.00	8.87	85.50	5248.53	10.52 S	313.87 E	10.52	0.52
5359.00	7.98	91.59	5332.61	10.17 S	326.31 E	10.17	1.48
5444.00	7.43	89.91	5416.84	10.32 S	337.70 E	10.32	0.70
5530.00	6.66	87.37	5502.19	10.08 S	348.24 E	10.08	0.97
5616.00	7.13	91.66	5587.57	10.01 S	358.56 E	10.01	0.81
5702.00	6.08	88.21	5673.00	10.02 S	368.45 E	10.02	1.30
5787.00	5.17	86.38	5757.59	9.64 S	376.77 E	9.64	1.09
5873.00	5.17	98.51	5843.24	9.97 S	384.47 E	9.97	1.27
5959.00	3.97	96.17	5928.97	10.86 S	391.26 E	10.86	1.41
6044.00	3.12	88.13	6013.81	11.10 S	396.50 E	11.10	1.16
6130.00	2.33	92.22	6099.71	11.09 S	400.58 E	11.09	0.95
6216.00	1.53	90.38	6185.66	11.17 S	403.48 E	11.17	0.93
6302.00	1.22	87.51	6271.63	11.14 S	405.54 E	11.14	0.37
6387.00	0.99	337.69	6356.63	10.42 S	406.17 E	10.42	2.13
6473.00	0.65	349.49	6442.62	9.25 S	405.79 E	9.25	0.44
6559.00	0.48	346.59	6528.61	8.42 S	405.62 E	8.42	0.20
6645.00	0.57	330.60	6614.61	7.70 S	405.33 E	7.70	0.20
6730.00	0.63	337.51	6699.60	6.90 S	404.94 E	6.90	0.11
6816.00	0.67	125.07	6785.60	6.75 S	405.17 E	6.75	1.45
6902.00	0.57	107.25	6871.60	7.17 S	405.99 E	7.17	0.25
6945.00	4.01	164.03	6914.56	8.68 S	406.61 E	8.68	8.67
6987.00	7.90	180.09	6956.33	12.98 S	407.01 E	12.98	9.99
7030.00	9.72	189.82	6998.82	19.51 S	406.39 E	19.51	5.46
7073.00	11.02	199.76	7041.12	26.95 S	404.38 E	26.95	5.13
7116.00	14.77	203.77	7083.03	35.84 S	400.78 E	35.84	8.96
7159.00	21.09	197.12	7123.92	48.27 S	396.29 E	48.27	15.43
7202.00	24.69	193.86	7163.53	64.38 S	391.86 E	64.38	8.87
7249.00	29.59	190.60	7205.35	85.33 S	387.37 E	85.33	10.89
7287.00	34.76	186.55	7237.50	105.33 S	384.40 E	105.33	14.73
7330.00	38.66	185.48	7271.97	130.89 S	381.72 E	130.89	9.19
7373.00	42.36	184.57	7304.66	158.71 S	379.28 E	158.71	8.71
7416.00	46.42	183.32	7335.38	188.71 S	377.23 E	188.71	9.66
7459.00	51.50	181.17	7363.60	221.11 S	375.98 E	221.11	12.40
7501.00	56.74	179.88	7388.21	255.12 S	375.68 E	255.12	12.72
7544.00	60.28	178.02	7410.67	291.78 S	376.36 E	291.78	9.02
7587.00	63.60	177.73	7430.90	329.69 S	377.77 E	329.69	7.74
7630.00	66.72	177.52	7448.96	368.67 S	379.39 E	368.68	7.27
7673.00	68.98	177.93	7465.17	408.47 S	380.97 E	408.47	5.33
7716.00	73.76	178.56	7478.90	449.18 S	382.21 E	449.18	11.20
7759.00	75.45	177.99	7490.32	490.62 S	383.46 E	490.62	4.13

7802.00	80.77	176.51	7499.17	532.63 S	385.49 E	532.63	12.82
7845.00	85.25	174.99	7504.40	575.18 S	388.65 E	575.18	10.99
7873.00	86.52	175.25	7506.41	603.01 S	391.03 E	603.01	4.63

<p align="center">CALCULATION BASED ON MINIMUM CURVATURE METHOD</p> <p align="center">SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT</p> <p align="center">VERTICAL SECTION RELATIVE TO WELL HEAD VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 180.00 DEGREES (TRUE) A TOTAL CORRECTION OF 8.62 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED</p> <p align="center">HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD. HORIZONTAL DISPLACEMENT(CLOSURE) AT 7873.00 FEET IS 718.69 FEET ALONG 147.04 DEGREES (TRUE)</p> <p align="center">Directional Surveys Tied onto Gyros @ 946' MD.</p>							
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