

D-C Pressure Case Directional
PCG-K Pressure Case Gamma



1 : 240

Company : Anadarko Petroleum Corp.									
Rig : H&P 308									
Well : Crowder 38N-19HZ									
Field : Wattenburg									
Country : USA									
API Number : 05-123-36720									
LOCATION					Other Services Directional Drilling				
Latitude : 40° 8' 39.85" North Longitude : 104° 42' 1.22" West UTM Easting = 3,223,550.51 ft UTM Northing = 1,296,457.46 ft									
Country : USA		Field : Wattenburg		Well : Crowder 38N-19HZ		Rig : H&P 308		Company : Anadarko Petroleum Corp.	
Location : Lat: 40° 8' 39.85" North Long: 104° 42' 1.22" West		Well : Crowder 38N-19HZ		Company : Anadarko Petroleum Corp.		Rig : H&P 308		Location : Lat: 40° 8' 39.85" North Long: 104° 42' 1.22" West	
Field : Wattenburg		Well : Crowder 38N-19HZ		Company : Anadarko Petroleum Corp.		Rig : H&P 308		Location : Lat: 40° 8' 39.85" North Long: 104° 42' 1.22" West	
Country : USA		Field : Wattenburg		Well : Crowder 38N-19HZ		Rig : H&P 308		Company : Anadarko Petroleum Corp.	
API Number : 05-123-36720		Well : Crowder 38N-19HZ		Company : Anadarko Petroleum Corp.		Rig : H&P 308		Location : Lat: 40° 8' 39.85" North Long: 104° 42' 1.22" West	
Elev. : 25.00 ft		Elev. : 4952.00 ft		Elev. : 4952.00 ft		Elev. : 4952.00 ft		Elev. : 4952.00 ft	
Log Measured From : Drill Floor		Log Measured From : Drill Floor		Log Measured From : Drill Floor		Log Measured From : Drill Floor		Log Measured From : Drill Floor	
Drilling Measured From : Drill Floor		Drilling Measured From : Drill Floor		Drilling Measured From : Drill Floor		Drilling Measured From : Drill Floor		Drilling Measured From : Drill Floor	
Depth Logged : 1,040.00 ft To 16,553.00 ft		Depth Logged : 1,040.00 ft To 16,553.00 ft		Depth Logged : 1,040.00 ft To 16,553.00 ft		Depth Logged : 1,040.00 ft To 16,553.00 ft		Depth Logged : 1,040.00 ft To 16,553.00 ft	
Date Logged : 14-Mar-13 To 26-Mar-13		Date Logged : 14-Mar-13 To 26-Mar-13		Date Logged : 14-Mar-13 To 26-Mar-13		Date Logged : 14-Mar-13 To 26-Mar-13		Date Logged : 14-Mar-13 To 26-Mar-13	
Total Depth MD : 16,553.00 ft TVD : 7,191.25 ft		Total Depth MD : 16,553.00 ft TVD : 7,191.25 ft		Total Depth MD : 16,553.00 ft TVD : 7,191.25 ft		Total Depth MD : 16,553.00 ft TVD : 7,191.25 ft		Total Depth MD : 16,553.00 ft TVD : 7,191.25 ft	
Spud Date : 14-Mar-13		Spud Date : 14-Mar-13		Spud Date : 14-Mar-13		Spud Date : 14-Mar-13		Spud Date : 14-Mar-13	
Run No.		Run No.		Run No.		Run No.		Run No.	
0100		0100		0100		0100		0100	
0200		0200		0200		0200		0200	
Size		Size		Size		Size		Size	
8.750 in		8.750 in		8.750 in		8.750 in		8.750 in	
6.125 in		6.125 in		6.125 in		6.125 in		6.125 in	
7.616.00 ft		7.616.00 ft		7.616.00 ft		7.616.00 ft		7.616.00 ft	
16,553.00 ft		16,553.00 ft		16,553.00 ft		16,553.00 ft		16,553.00 ft	
Unit No. : 11610114		Unit No. : 11610114		Unit No. : 11610114		Unit No. : 11610114		Unit No. : 11610114	
Job No. : CA-XX-0900118961		Job No. : CA-XX-0900118961		Job No. : CA-XX-0900118961		Job No. : CA-XX-0900118961		Job No. : CA-XX-0900118961	
Plot Type : Final		Plot Type : Final		Plot Type : Final		Plot Type : Final		Plot Type : Final	
Plot Date : 03-Apr-13		Plot Date : 03-Apr-13		Plot Date : 03-Apr-13		Plot Date : 03-Apr-13		Plot Date : 03-Apr-13	
Borehole Record (MD)		Borehole Record (MD)		Borehole Record (MD)		Borehole Record (MD)		Borehole Record (MD)	
From		From		From		From		From	
To		To		To		To		To	
Size		Size		Size		Size		Size	
8.750 in		8.750 in		8.750 in		8.750 in		8.750 in	
6.125 in		6.125 in		6.125 in		6.125 in		6.125 in	
7.616.00 ft		7.616.00 ft		7.616.00 ft		7.616.00 ft		7.616.00 ft	
16,553.00 ft		16,553.00 ft		16,553.00 ft		16,553.00 ft		16,553.00 ft	
Casing Record (MD)		Casing Record (MD)		Casing Record (MD)		Casing Record (MD)		Casing Record (MD)	
From		From		From		From		From	
To		To		To		To		To	
Size		Size		Size		Size		Size	
32.00 lbpf		32.00 lbpf		32.00 lbpf		32.00 lbpf		32.00 lbpf	
26.00 lbpf		26.00 lbpf		26.00 lbpf		26.00 lbpf		26.00 lbpf	
SURFACE		SURFACE		SURFACE		SURFACE		SURFACE	
7,606.00 ft		7,606.00 ft		7,606.00 ft		7,606.00 ft		7,606.00 ft	
N/A		N/A		N/A		N/A		N/A	
4977.00 ft		4977.00 ft		4977.00 ft		4977.00 ft		4977.00 ft	
4952.00 ft		4952.00 ft		4952.00 ft		4952.00 ft		4952.00 ft	
N/A		N/A		N/A		N/A		N/A	

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	17-Mar-13	26-Mar-13			
Rig Bit Number	0100	0200			
Bit Size (in)	8.750	6.125			
Tool Nominal OD (in)	6.750	4.750			
Log Start Depth (MD, ft)	1,084.00	7,616.00			
Log End Depth (MD, ft)	7,616.00	16,553.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	14-Mar-13 14:00	20-Mar-13 01:10			
Drill/Wipe End Date and Time	17-Mar-13 11:20	25-Mar-13 08:45			
Min Inc (deg) @ Depth (MD, ft)	.10 @ 1,172.00	87.31 @ 10,750.00			
Max Inc (deg) @ Depth (MD, ft)	86.94 @ 7,566.00	92.56 @ 7,831.00			
Bit TFA(in2) / Bit Type	.86 / PDC	.61 / PDC			
Flow Rate (gpm)	490.00	259.72			
Max AV (fpm) / CV (fpm) @ MWD	441.0 / N/A	N/A / N/A			
Fluid Type	Fresh Water Gel	Diesel Mud Base			
Density (ppg) / Viscosity (spqt)	9.70 / 38.50	9.76 / 46.00			
Filtrate CL (ppm)	1,700.00	16,500.00			
pH / Fluid Loss (mptm)	8.20 / 5	N/A / N/A			
PV (cP) / YP (lbf2)	14 / 11.00	38 / 12.00			
% Solids / % Sand	7.41 / .1	2.6 / .1			
% Oil / Oil:Water Ratio	N/A / N/A	N/A / 71:29			
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 (deg F) @ 100 ft	177.00 / ROM	222.00 / ROM			

Max Tool Temp (degF) / Source	177.64 / PCM	280.00 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 177.64	N/A @ 280.00			
Lead MWD Engineer	Ryan White	Drew Perry			
Customer Representative	Travis Laurence	Travis Laurence			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.76			
Sub Serial Number	11331929	12134695			
Insert Serial Number	11680744	10809551			
Date and Time Initialized	12-Mar-13 14:59	17-Mar-13 14:42			
Date and Time Read	18-Mar-13 13:36	26-Mar-13 14:18			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	50.00	44.16			
Software Version	6.21	6.21			
Sub Serial Number	11331929	12134695			
Sonde Serial Number	11062125	11478107			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	154.44	236.44			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	52.69	49.11			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11331929	12134695			
Insert/Sonde Serial Number	11293276	11681021			

REMARKS

1. All depths are measured bit depths, referenced to the driller's pipe tally and are measured from the drill floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified
5. Gamma Ray values are not present after 15432' MD due to detection issues brought on by limited pump pressure and limited flow rates.
6. The following smoothing parameters have been applied to the data:

PGRC (Corrected Gamma Ray):

Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft
Gap Fill: 3.0 ft

ROPA (Average Rate of Penetration):

Interval Resolution: 0.5 ft
Interval Distance: 1.2 ft
Gap Fill : 3.0 ft


WARRANTY

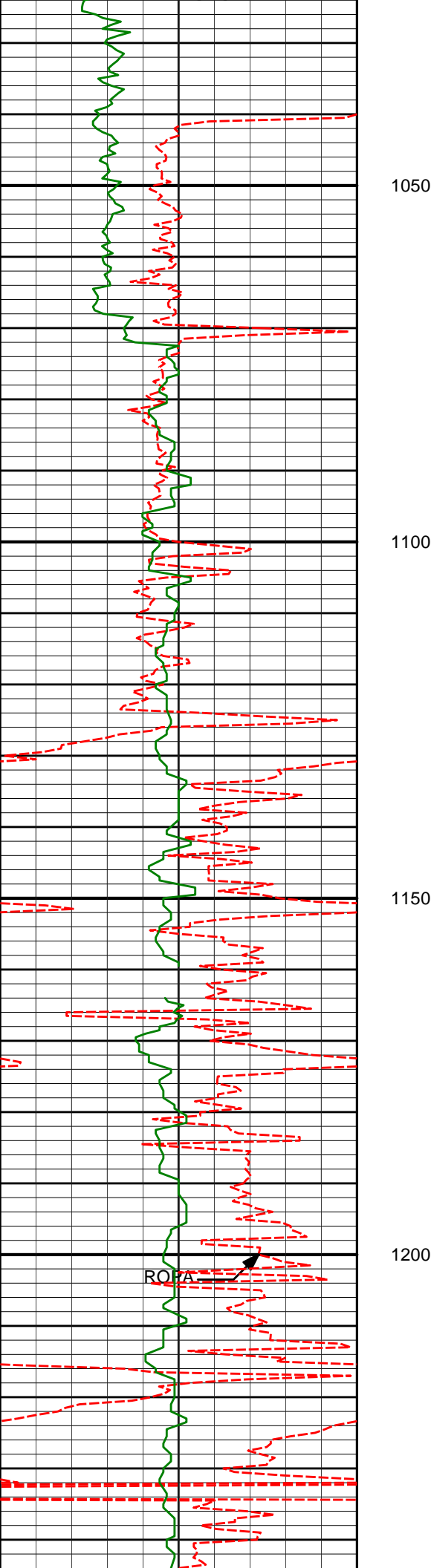
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HALLIBURTON

Sperry Drilling

MD 1:240 Detail Log

Avg Rate of Penetration (ROPA) feet per hr									
<div>5000</div>									
PCG GR XHi-Range RT BCor (PGRC) api			Depth ft 1 : 240	DEPTH		INC	AZI	TVD	VS
<div>0250</div>			950						
<div></div> <div>PGRC</div>			1000						



1050

1100

1150

1200

ROFA

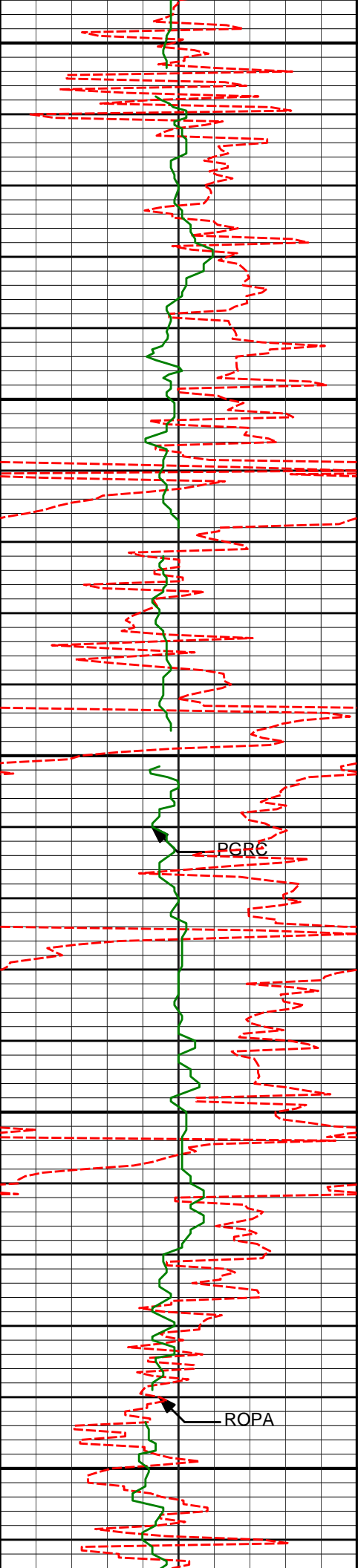
1172'

0.10°

301.06°

1171.97'

-7.63'



1250

1300

1350

1400

1450

1295'

0.25°

303.21°

1294.97'

-7.83'

1356'

0.86°

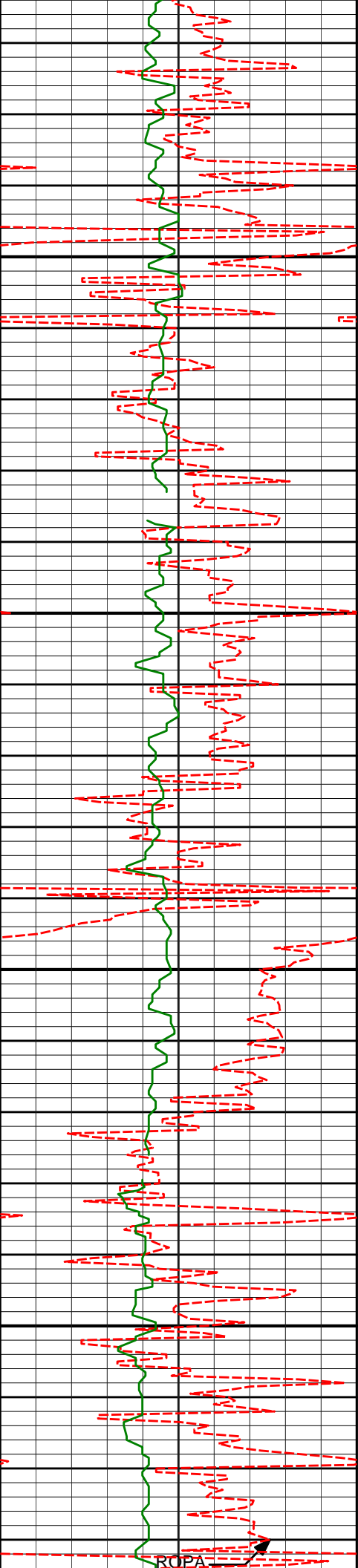
129.19°

1355.97'

-7.61'

PGRC

ROPA



1500

1550

1600

1650

1540'

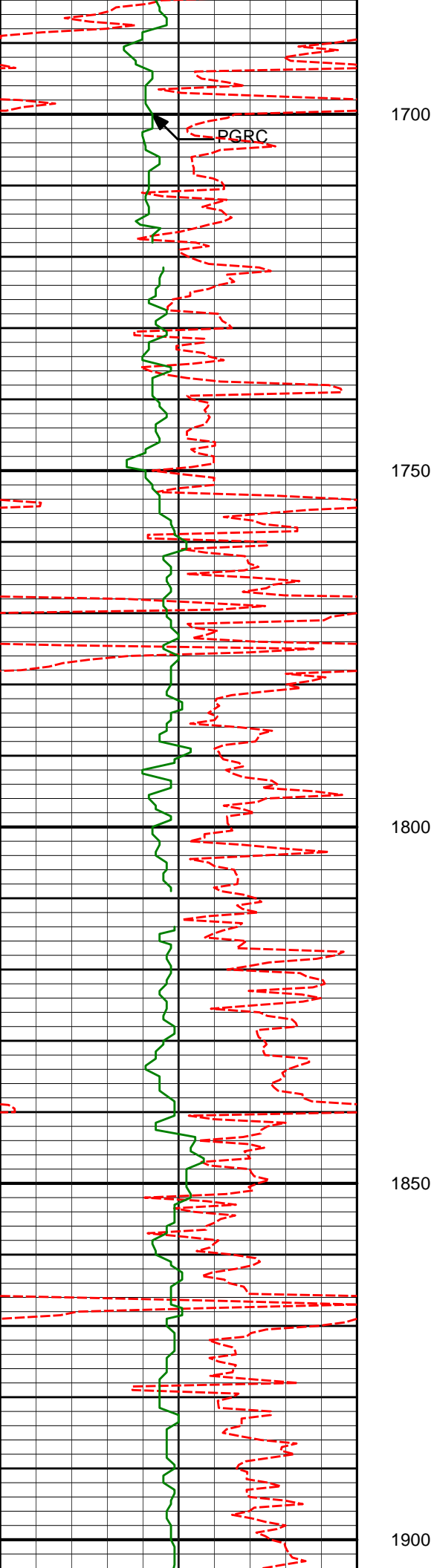
1.49°

128.16°

1539.93'

-5.22'

ROPA



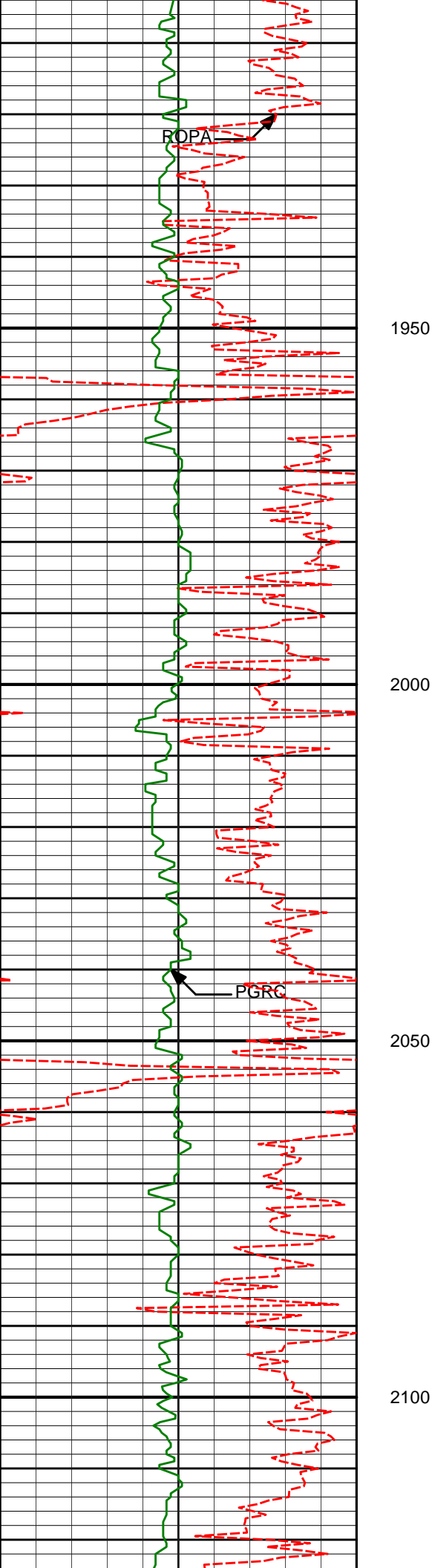
1724'

1.34°

125.48°

1723.87'

-2.44'



1908'

1.11°

125.43°

1907.83'

-0.10'

2002'

0.98°

108.20°

2001.81'

0.70'

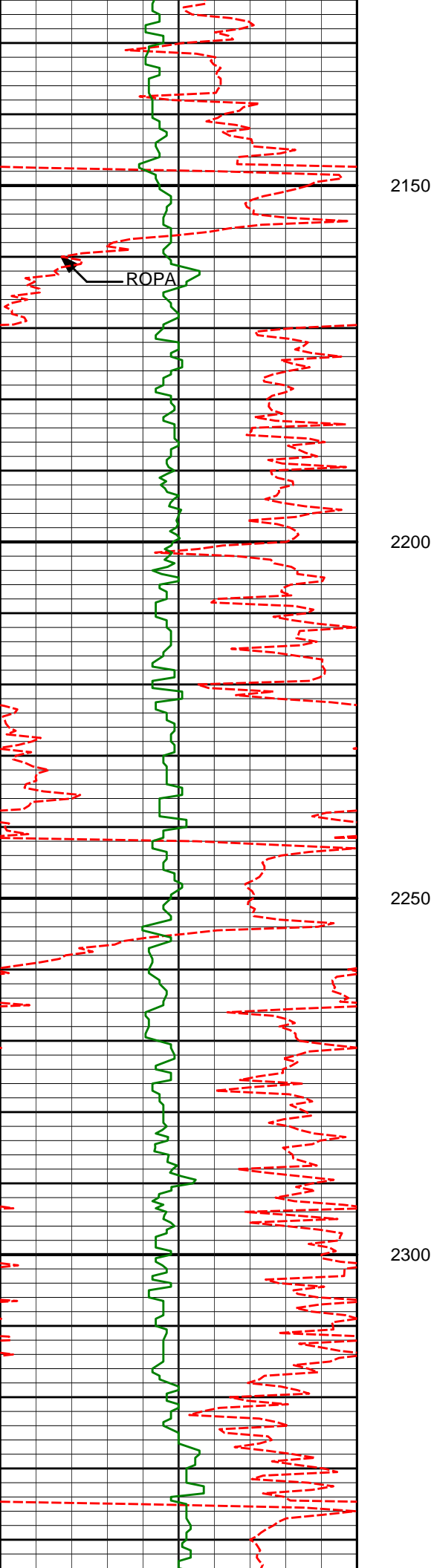
2097'

1.18°

91.16°

2096.80'

1.01'



2191'

1.50°

121.82°

2190.77'

1.71'

2200

2250

2286'

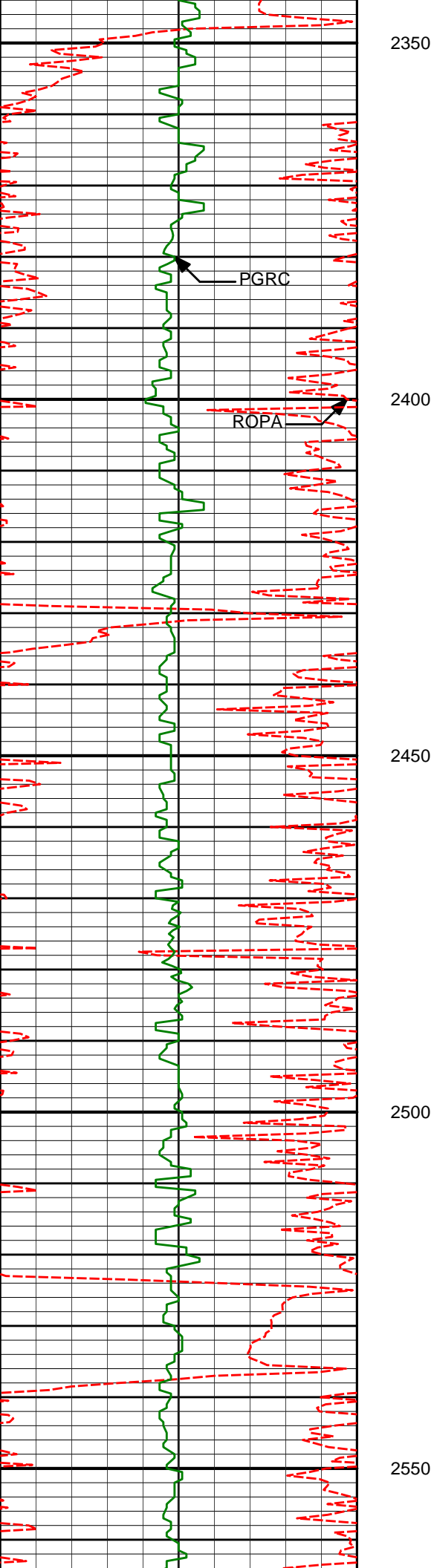
3.38°

123.96°

2285.68'

3.99'

2300



2350

2380'

4.71°

101.34°

2379.45'

6.40'

PGRC

2400

ROPA

2450

2475'

4.56°

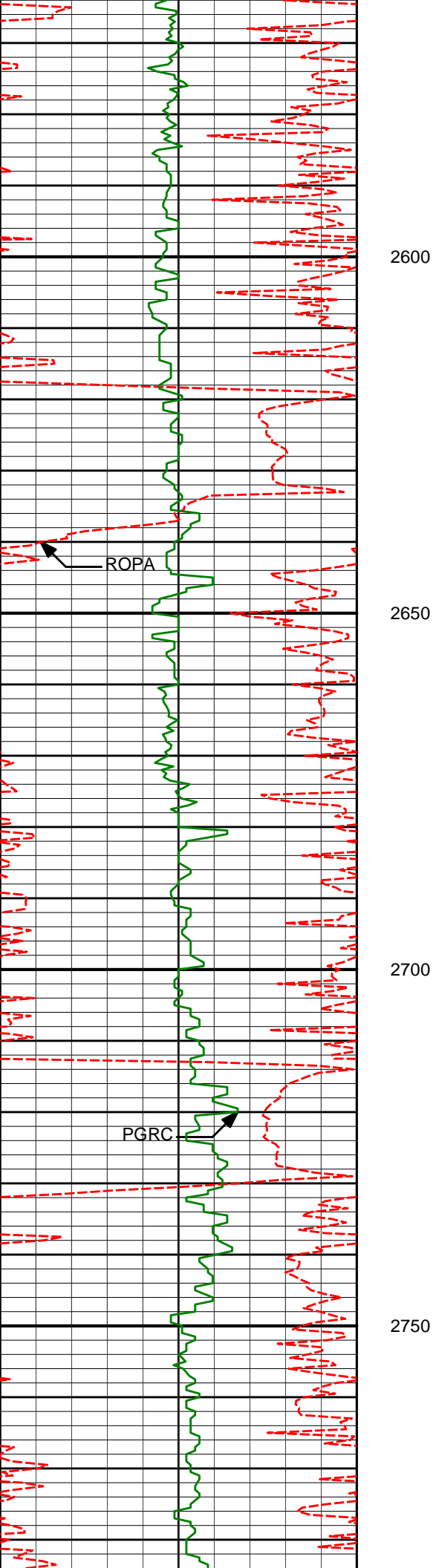
102.41°

2474.14'

8.11'

2500

2550



2570'

5.67°

93.14°

2568.76'

9.32'

2600

2650

2664'

7.05°

91.38°

2662.18'

9.89'

2700

2750

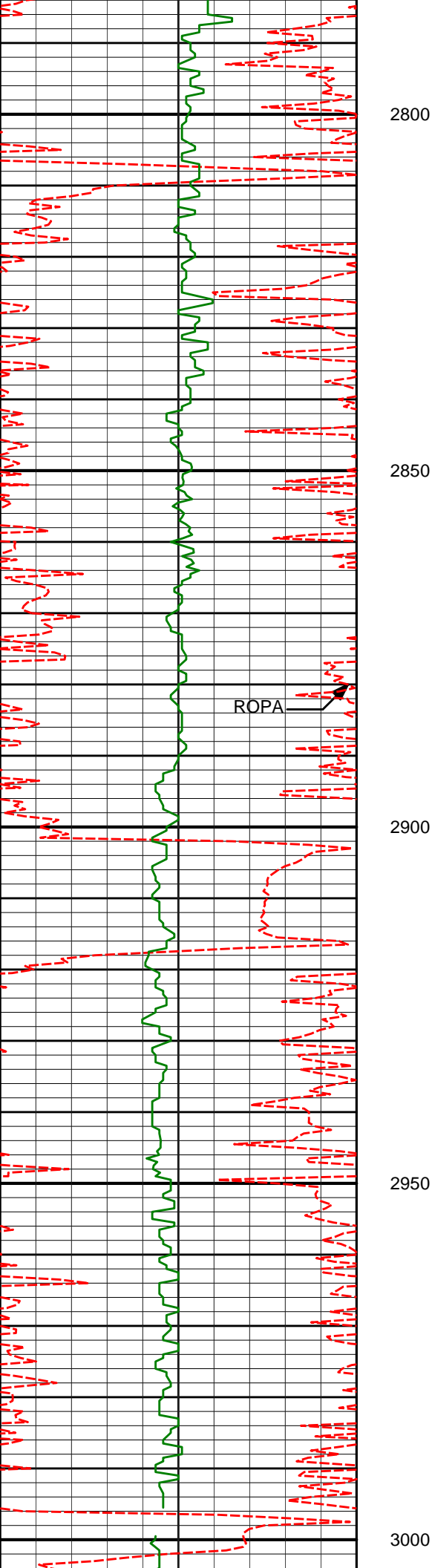
2759'

8.88°

83.28°

2756.26'

9.39'



2800

2850

2900

2950

3000

2854'

7.88°

81.17°

2850.25'

7.76'

ROPA

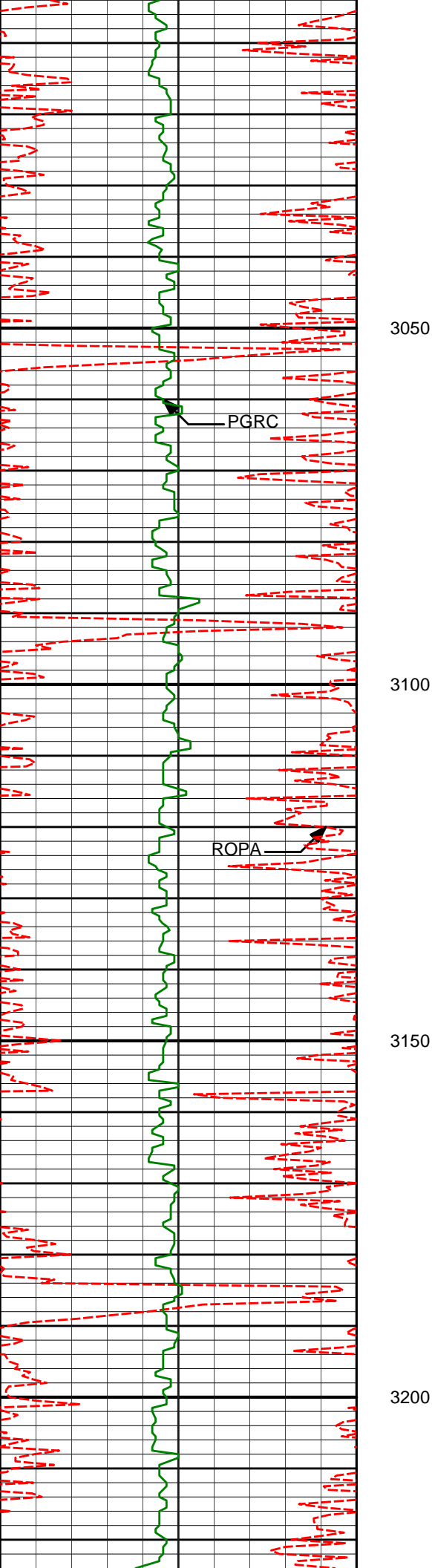
2949'

9.44°

81.34°

2944.16'

5.83'



3043'

8.79°

78.86°

3036.97'

3.53'

3050

PGRC

3100

ROPA

3138'

8.18°

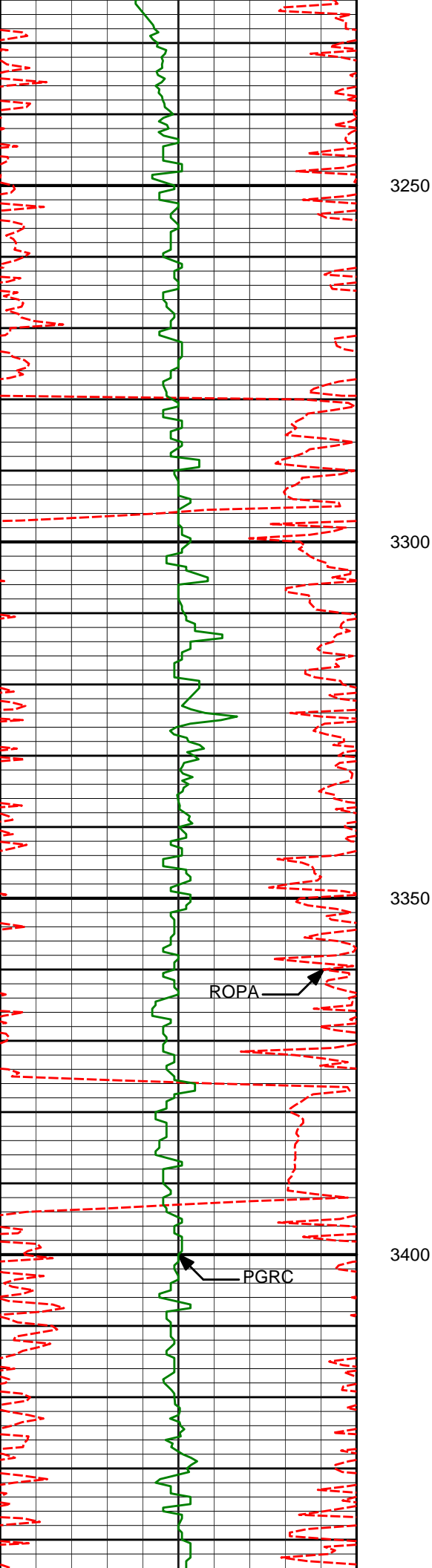
74.47°

3130.93'

0.55'

3150

3200



3233'

7.48°

71.46°

3225.05'

-3.01'

3327'

6.06°

74.64°

3318.39'

-6.10'

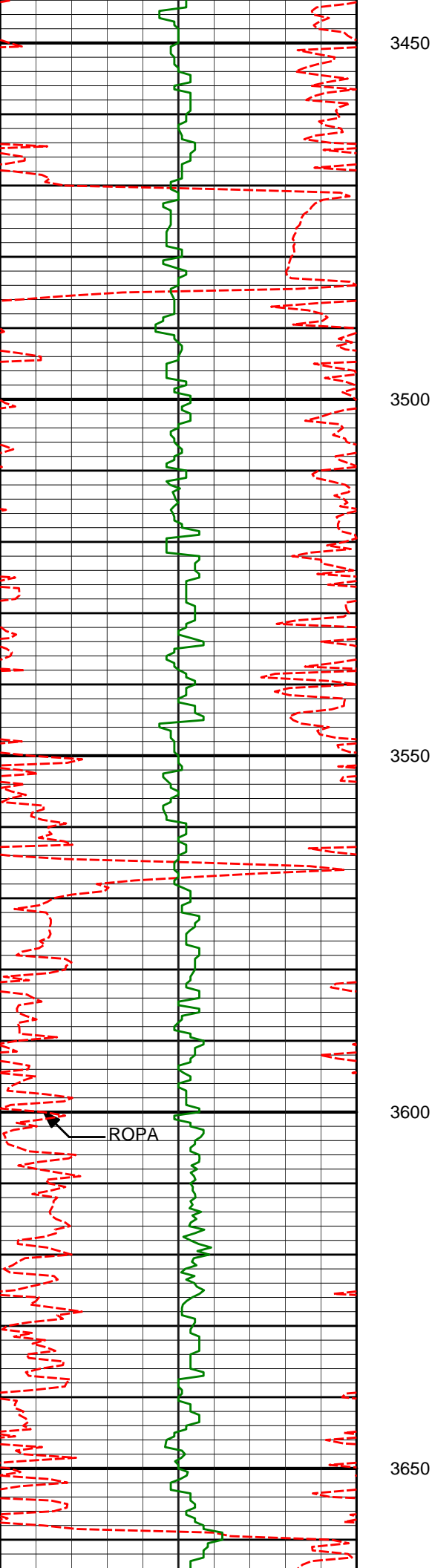
3422'

7.09°

86.40°

3412.77'

-7.61'



3450

3500

3550

3600

3650

3517'

7.21°

98.46°

3507.04'

-6.90'

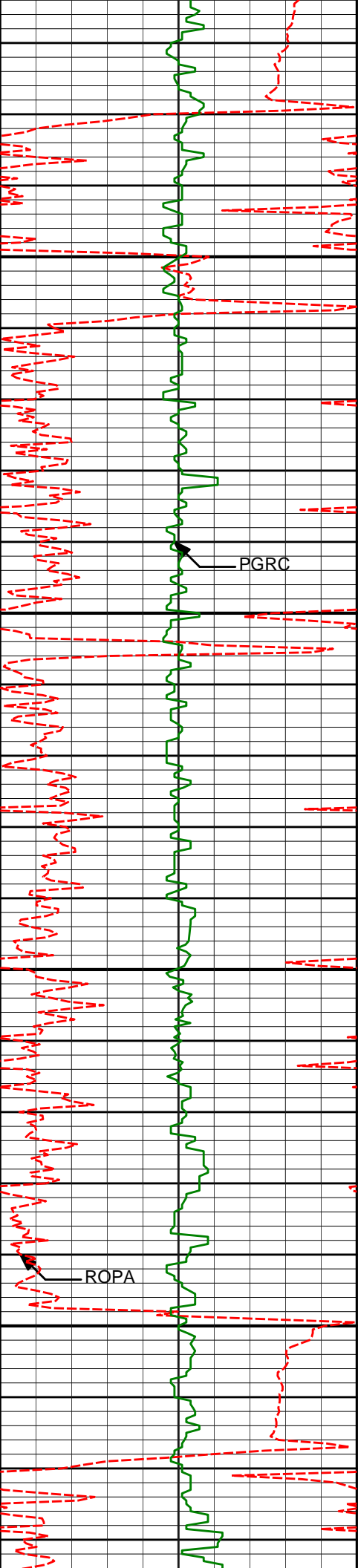
3611'

6.63°

92.66°

3600.35'

-5.59'



3700

3706'

8.30°

97.77°

3694.54'

-4.20'

3750

PGRC

3800

3801'

7.69°

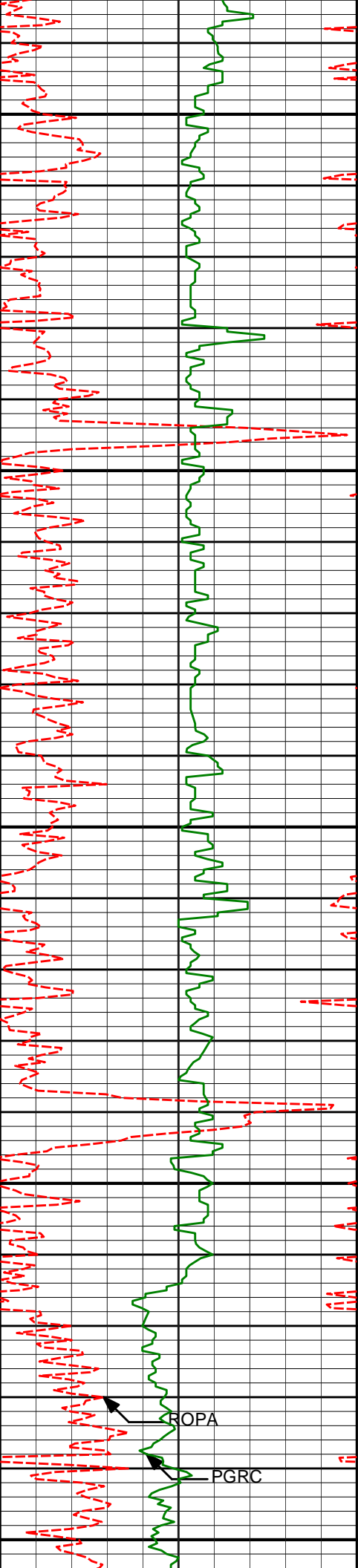
92.60°

3788.62'

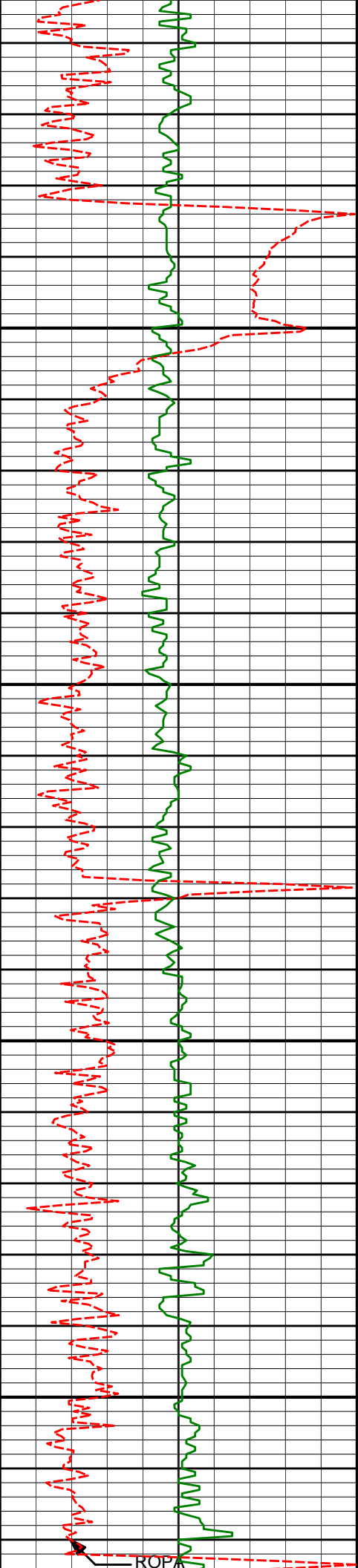
-2.76'

3850

ROPA



3900	3896'	9.24°	88.19°	3882.58'	-2.48'
3950					
4000	3990'	8.41°	81.05°	3975.47'	-3.54'
4050					
4100	4085'	7.96°	78.36°	4069.50'	-5.72'



4150

4200

4250

4300

4179'

9.62°

92.49°

4162.41'

-6.45'

4274'

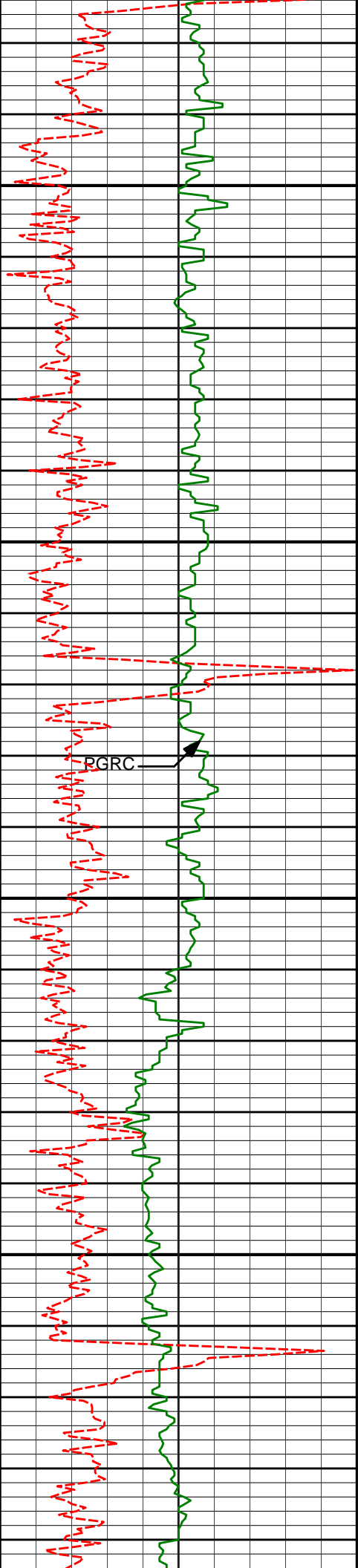
10.11°

91.05°

4256.01'

-5.68'

ROPA



4350

4369'

9.66°

86.96°

4349.60'

-5.68'

4400

RGRC

4450

4463'

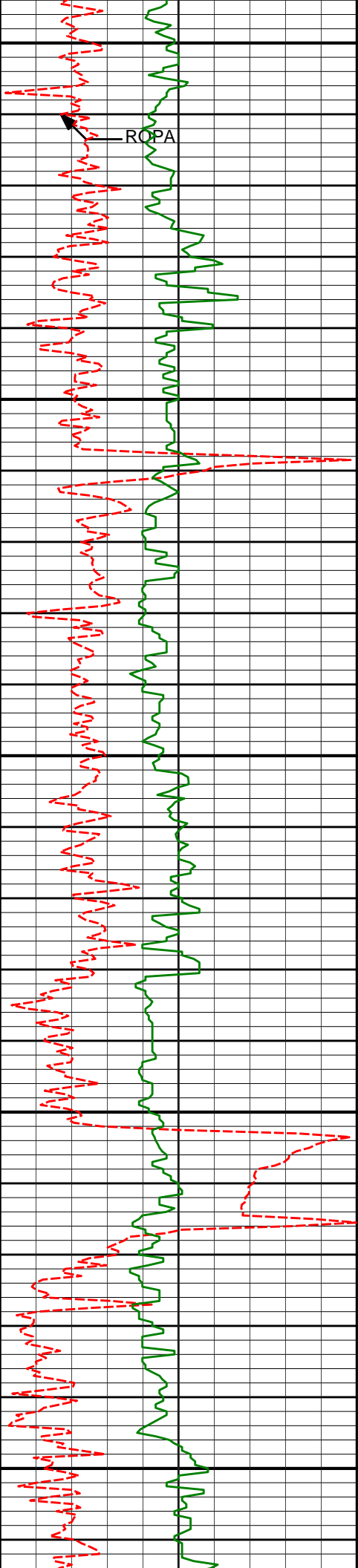
8.06°

81.95°

4442.47'

-6.77'

4500



4550

4558'

8.54°

77.36°

4536.48'

-9.02'

ROPA

4600

4650

4652'

7.84°

74.00°

4629.52'

-12.09'

4700

4750

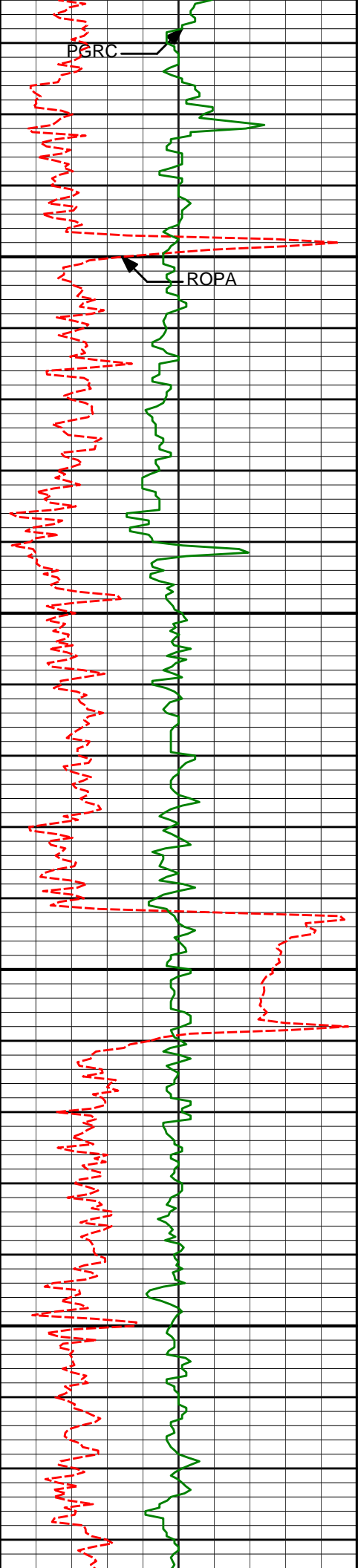
4747'

8.87°

78.29°

4723.51'

-15.14'



4800

4842'

9.11°

78.04°

4817.35'

-17.94'

4850

4900

4936'

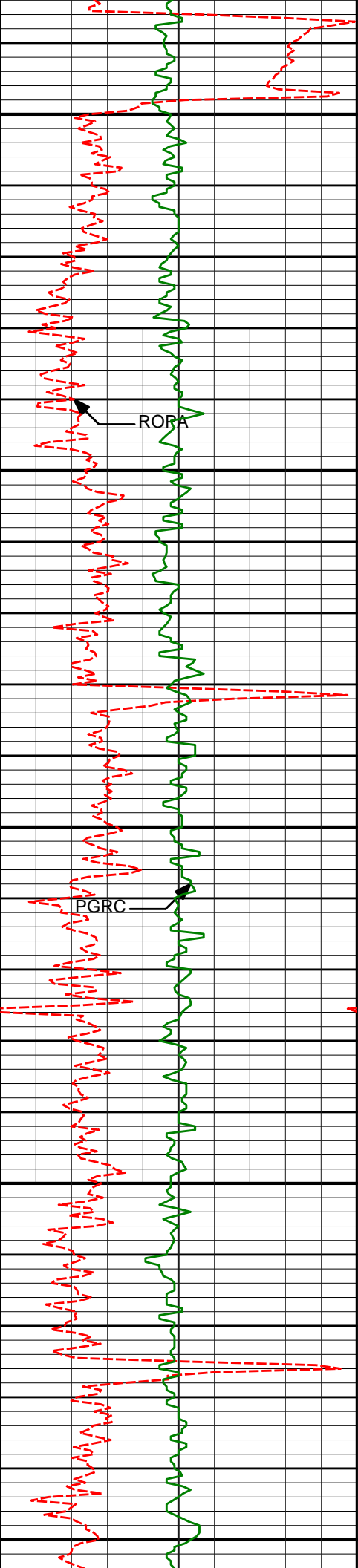
9.31°

88.57°

4910.14'

-19.42'

4950



5000

5031'

9.48°

92.13°

5003.87'

-19.05'

RORA

5050

5100

PGRC

5125'

8.27°

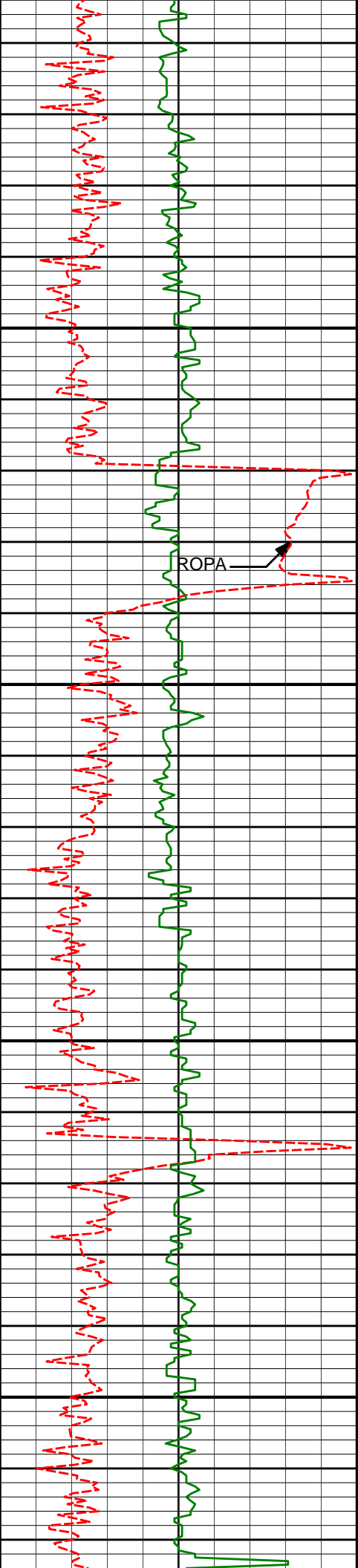
89.94°

5096.74'

-18.53'

5150

5200



5220'

7.15°

84.69°

5190.88'

-18.87'

5250

ROPA

5300

5314'

6.85°

102.65°

5284.19'

-17.99'

5350

5400

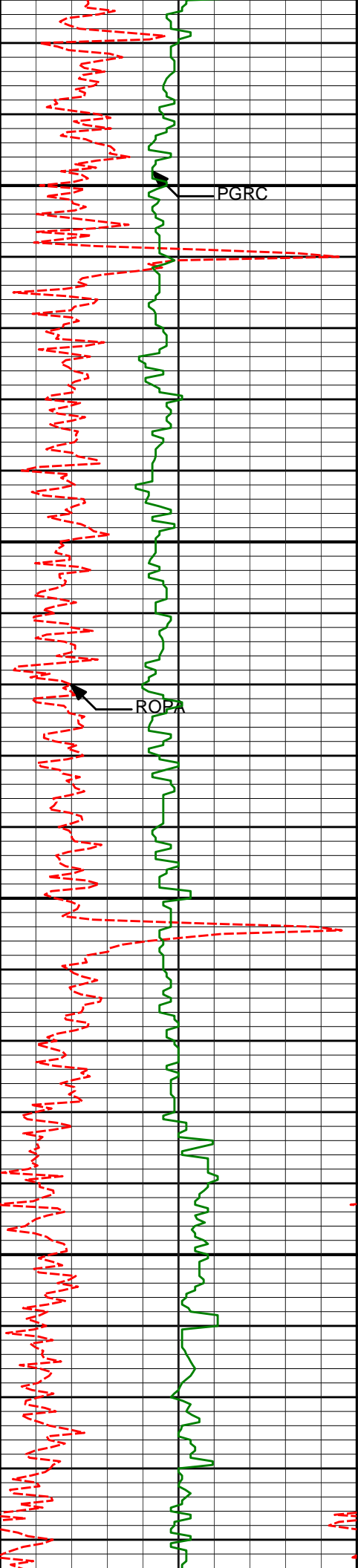
5409'

6.48°

97.85°

5378.55'

-15.83'



5450

PGRC

5500

5503'

6.75°

94.09°

5471.93'

-14.53'

5550

ROPA

5600

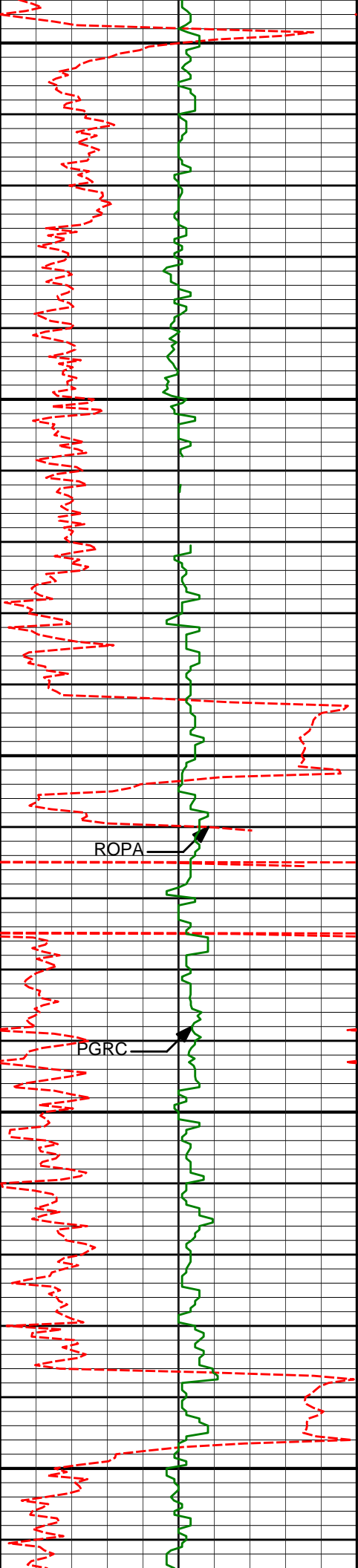
5598'

6.45°

91.97°

5566.30'

-13.77'



5650

5693'

5.97°

88.42°

5660.74'

-13.55'

5700

5750

ROPA

5787'

4.17°

91.43°

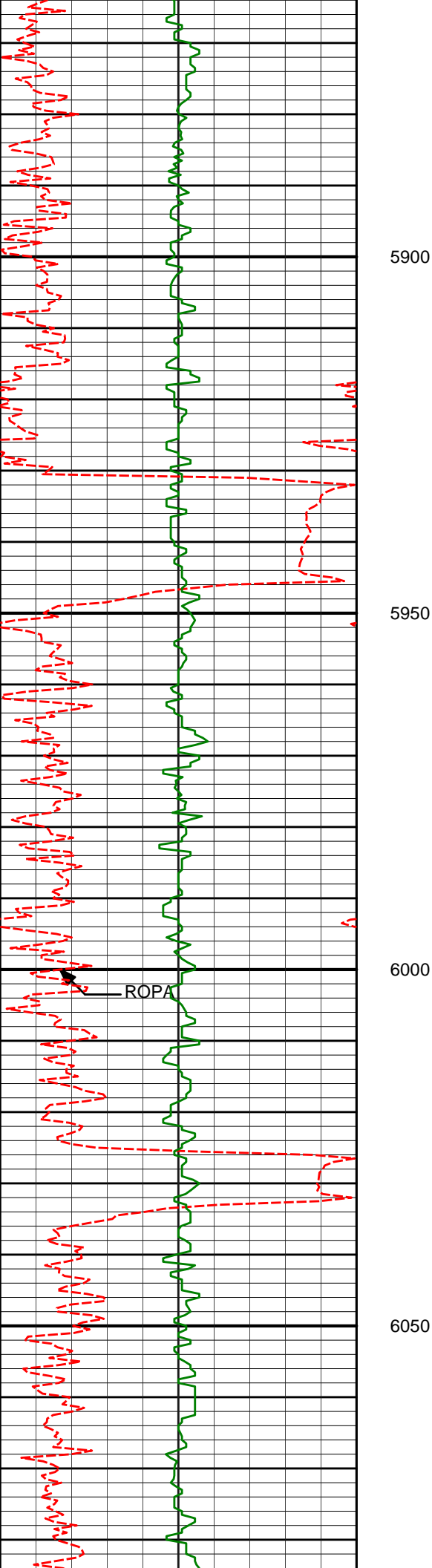
5754.37'

-13.46'

PGRC

5800

5850



5882'

3.41°

100.90°

5849.16'

-12.73'

5900

5950

5976'

1.56°

98.10°

5943.07'

-11.95'

6000

ROPA

6050

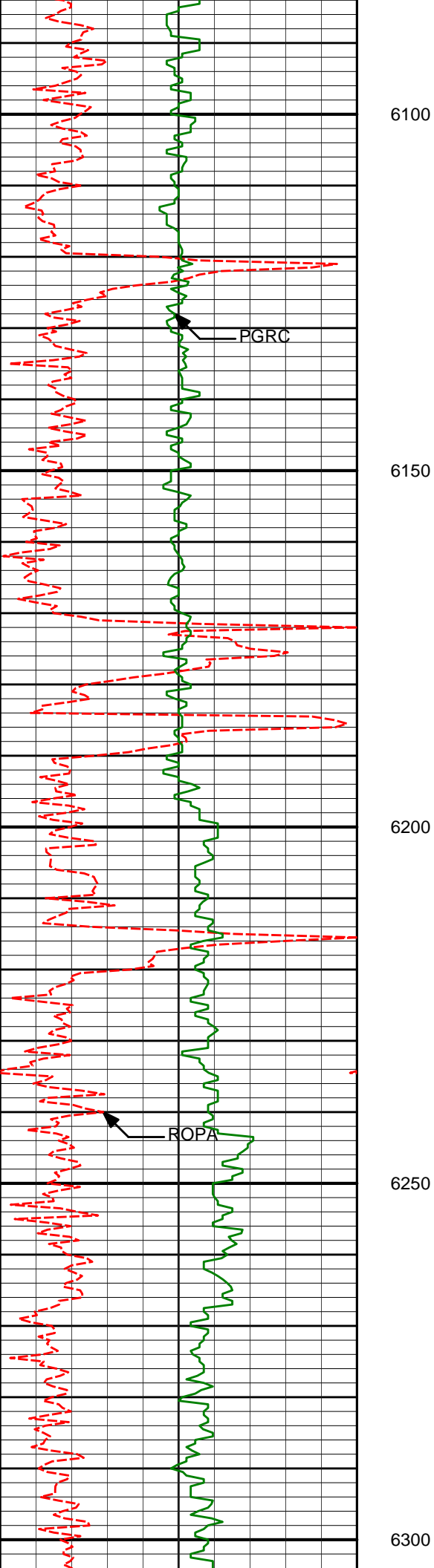
6071'

0.87°

75.02°

6038.05'

-11.92'



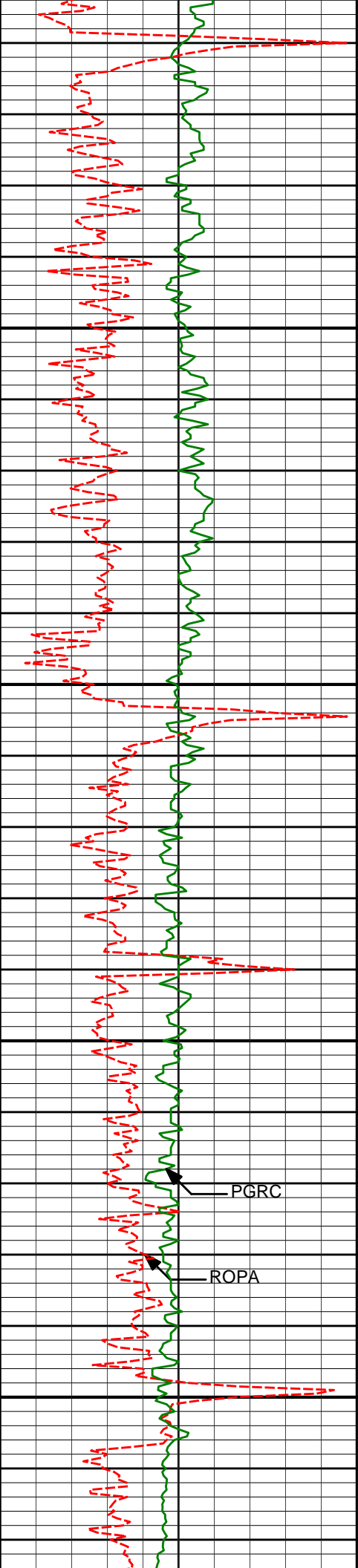
6260'

0.62°

84.44°

6227.03'

-12.35'



6350

6400

6450

6500

PGRC

ROPA

6449'

0.54°

80.64°

6416.02'

-12.56'

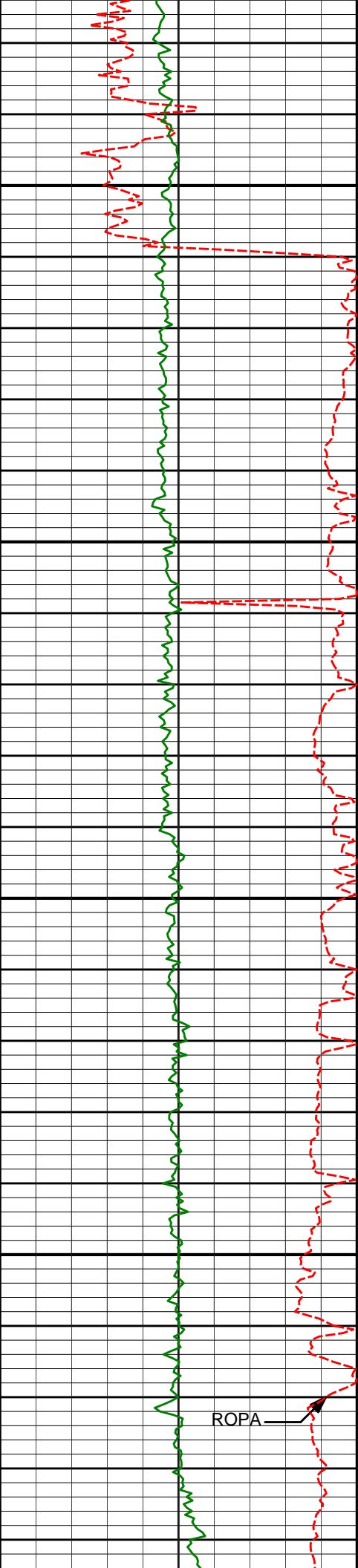
6513'

0.50°

112.02°

6480.02'

-12.50'



6550

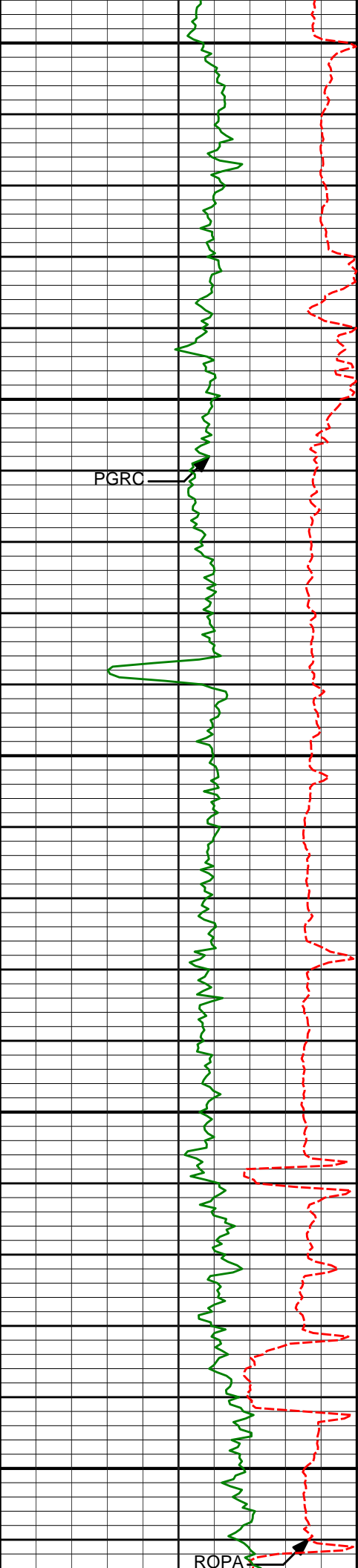
6600

6650

6700

ROPA

6544'	0.47°	129.15°	6511.02'	-12.36'
6576'	1.49°	189.57°	6543.01'	-11.87'
6607'	3.73°	192.33°	6573.98'	-10.49'
6639'	6.04°	197.85°	6605.86'	-7.88'
6670'	8.98°	192.05°	6636.59'	-3.98'
6702'	11.72°	189.41°	6668.07'	1.65'
6733'	14.86°	186.75°	6698.24'	8.69'



6750

6765'

18.23°

185.79°

6728.91'

17.73'

6800

6796'

20.63°

184.54°

6758.14'

27.98'

PGRC

6828'

23.87°

184.09°

6787.75'

40.05'

6850

6860'

28.19°

182.93°

6816.50'

54.04'

6900

6891'

32.38°

182.83°

6843.26'

69.64'

6923'

35.63°

182.24°

6869.79'

87.50'

6950

6954'

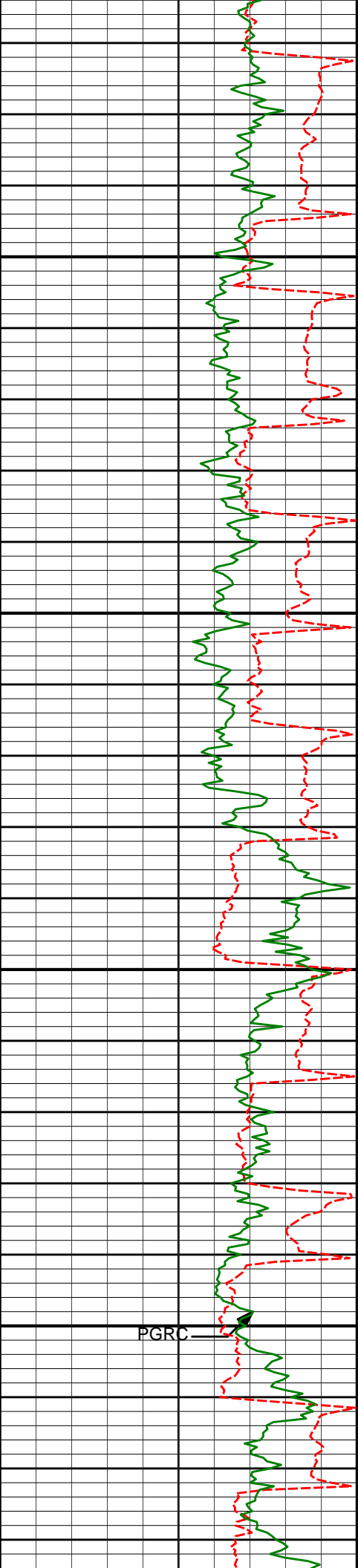
38.33°

181.19°

6894.55'

106.12'

ROPAS



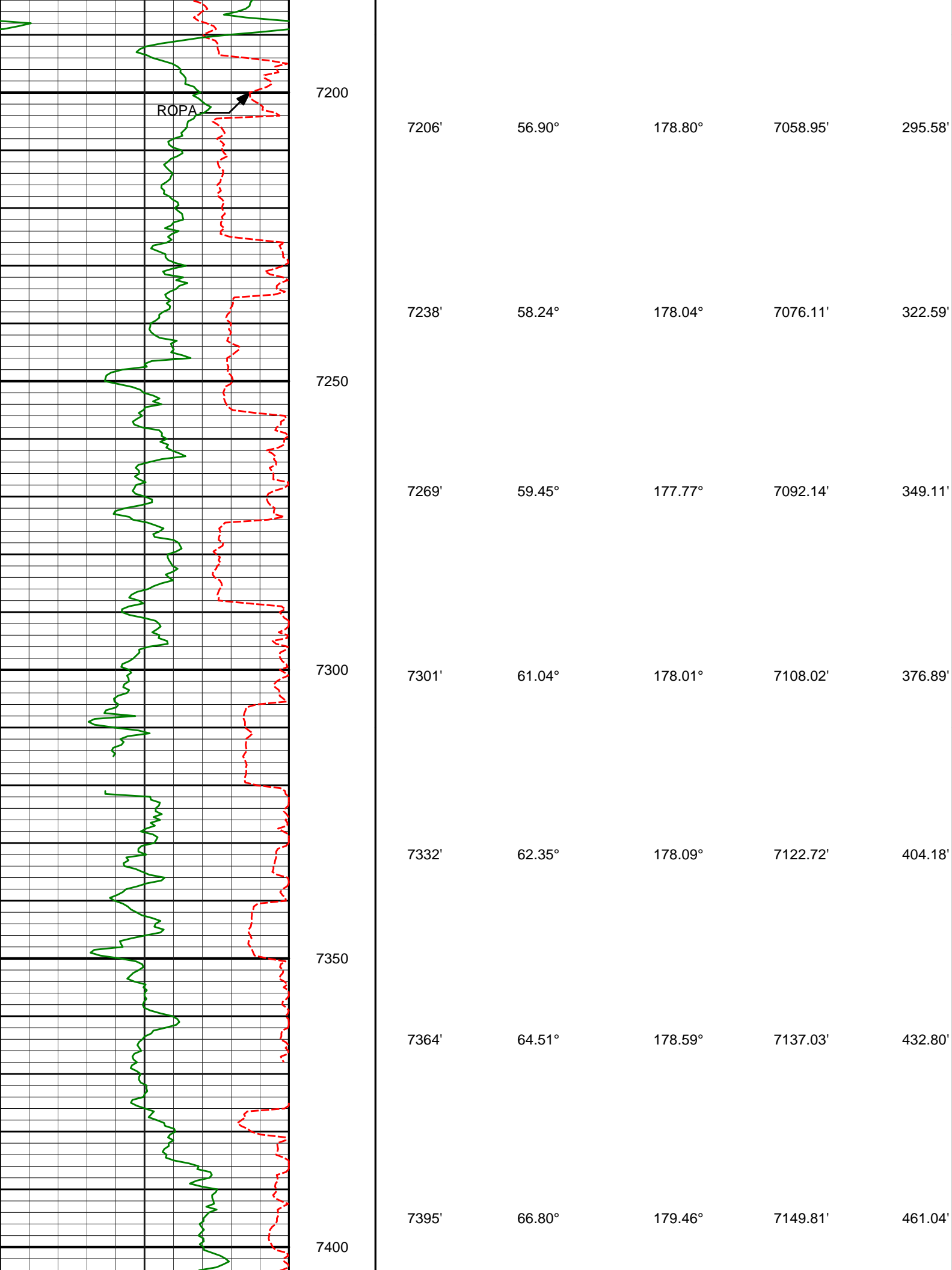
7000

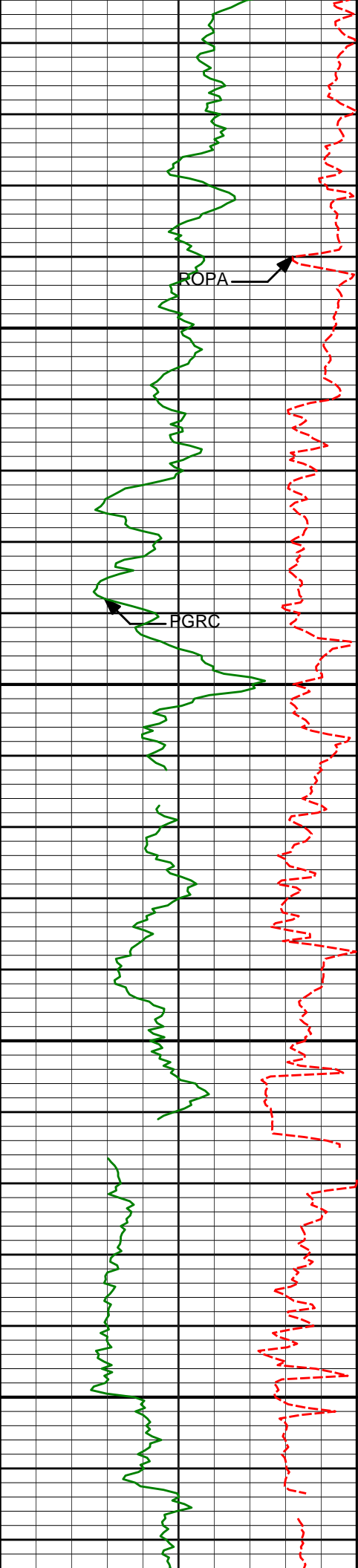
7050

7100

7150

6986'	41.67°	180.57°	6919.06'	126.67'
7017'	44.46°	180.13°	6941.71'	147.83'
7049'	47.23°	179.78°	6964.00'	170.79'
7080'	49.72°	179.15°	6984.55'	193.99'
7112'	52.28°	179.38°	7004.69'	218.86'
7143'	53.89°	178.73°	7023.30'	243.64'
7175'	55.71°	178.45°	7041.75'	269.79'





7427'

70.07°

180.06°

7161.57'

490.79'

ROP

7450

7459'

73.35°

180.46°

7171.61'

521.16'

FGRC

7500

7490'

77.71°

180.02°

7179.36'

551.16'

7522'

82.08°

180.42°

7184.97'

582.65'

7550

7566'

86.94°

180.95°

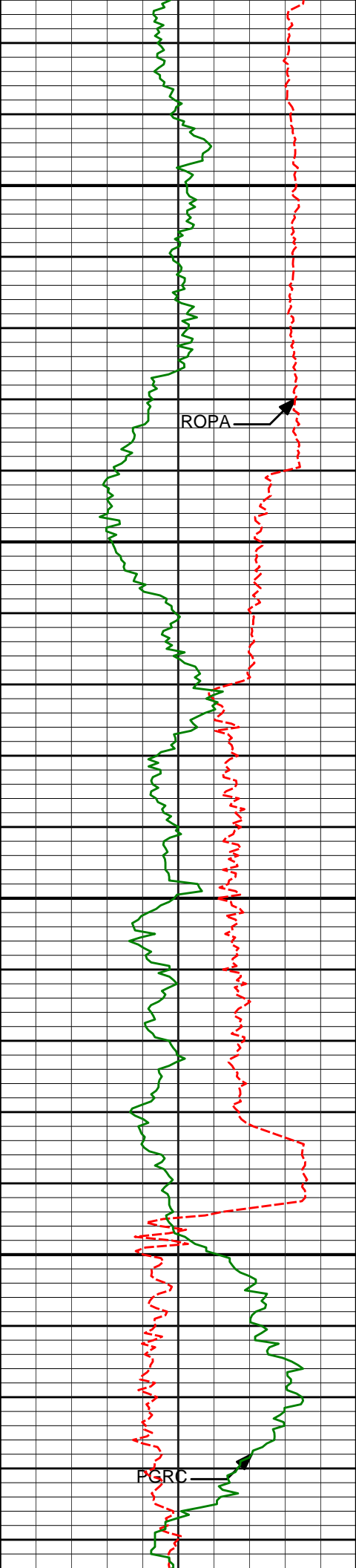
7189.18'

626.42'

7600

Casing set @
7,606 MD'

<Run 200>



7650

7647'

91.21°

180.95°

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707.34'

7700

7739'

92.44°

181.38°

7187.56'

799.23'

7750

7800

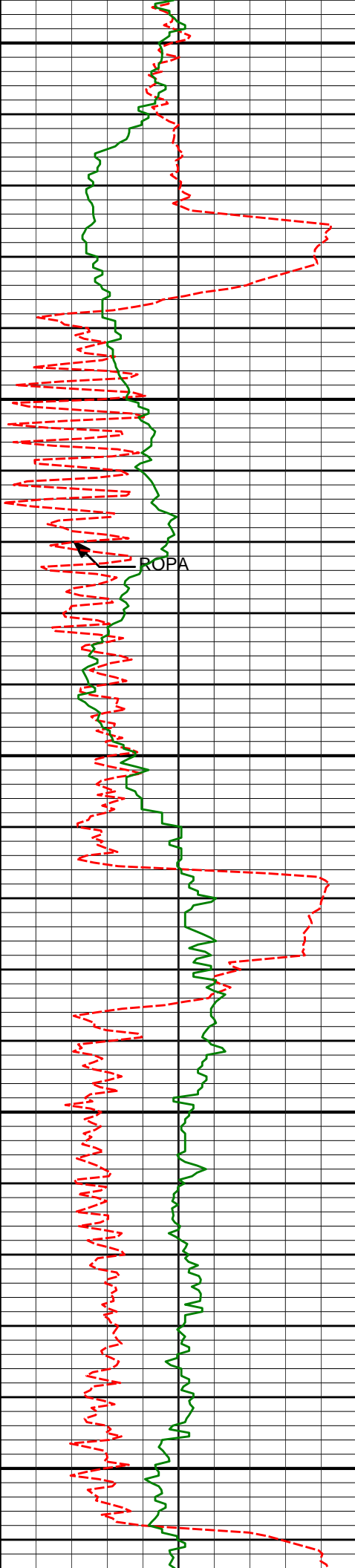
7831'

92.56°

179.63°

7183.55'

891.11'



7850

7900

7950

8000

8050

ROPA

7923'

92.28°

179.94°

7179.66'

983.02'

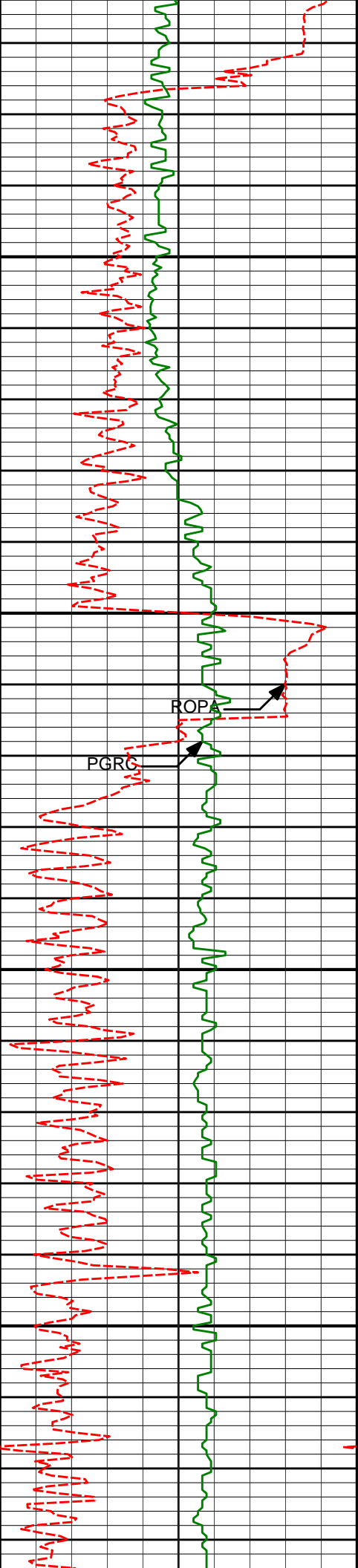
8015'

91.60°

179.80°

7176.54'

1074.96'



8100

8107'

90.52°

179.84°

7174.83'

1166.93'

8150

ROPA

PGRC

8200

8199'

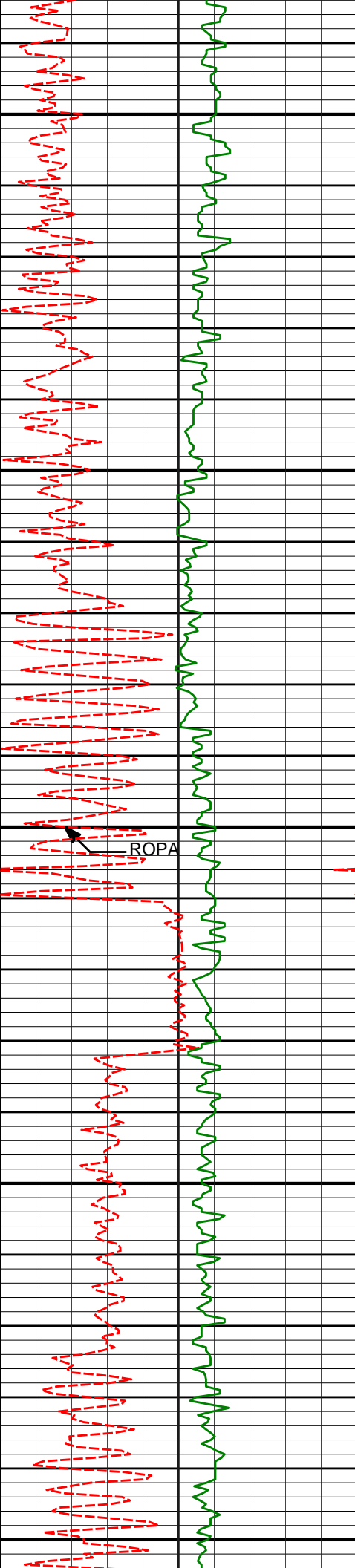
89.85°

179.95°

7174.54'

1258.92'

8250



8291'

89.32°

179.36°

7175.21'

1350.91'

8300

8350

8386'

89.94°

179.50°

7175.82'

1445.91'

8400

8450

8480'

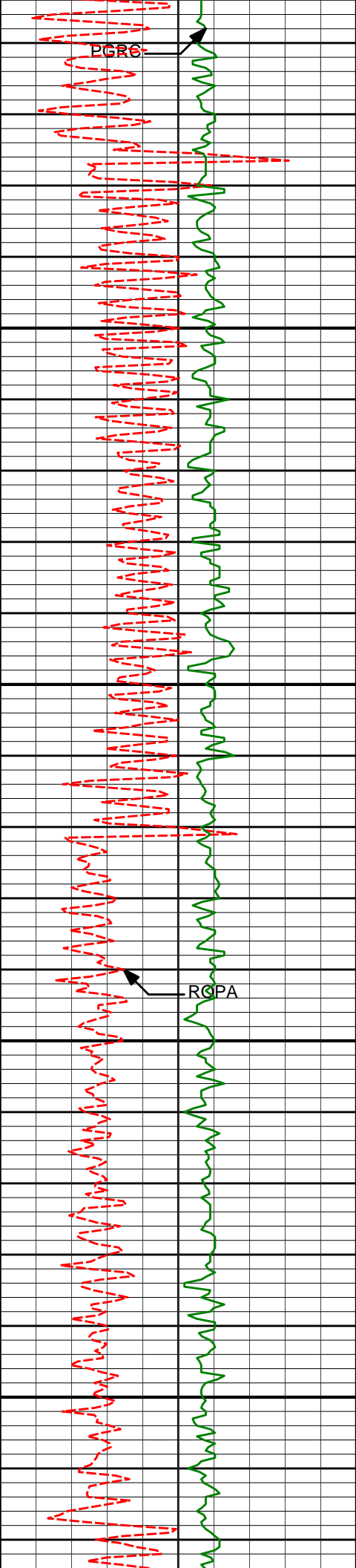
89.81°

179.09°

7176.02'

1539.91'

8500



8550

8575'

89.69°

178.07°

7176.43'

1634.90'

8600

8650

8670'

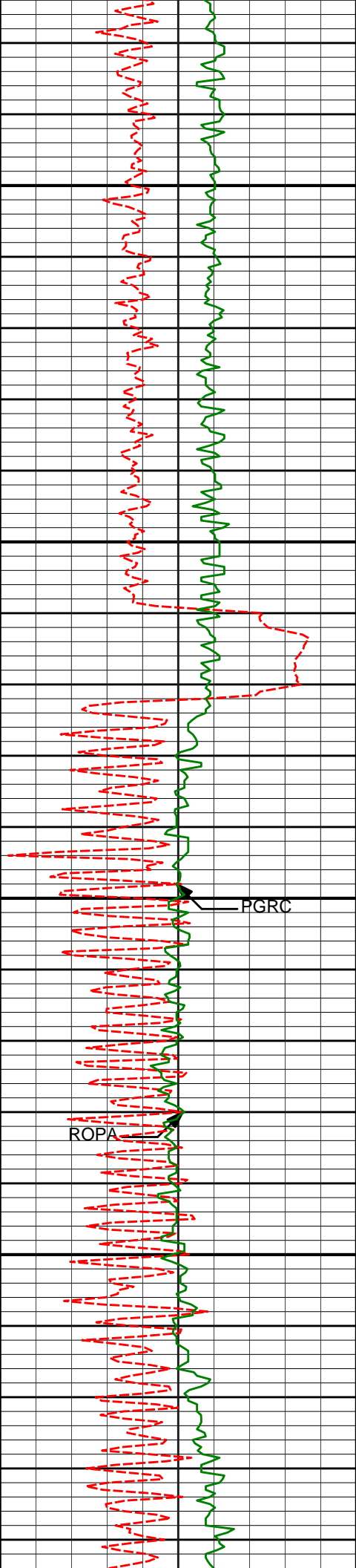
89.54°

178.67°

7177.07'

1729.89'

8700



8750

8764'

89.63°

179.11°

7177.75'

1823.89'

8800

8850

PGRC

8859'

89.23°

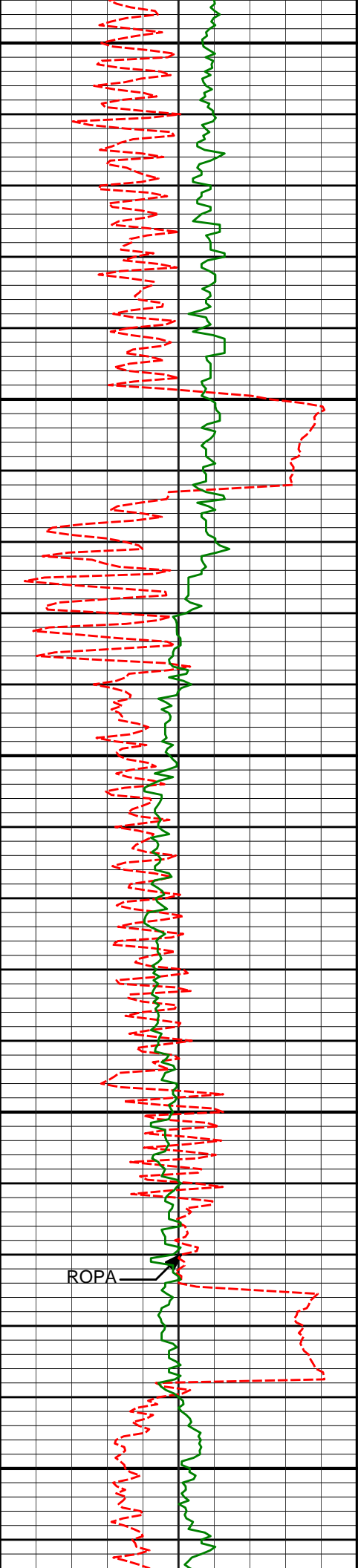
179.69°

7178.70'

1918.88'

ROPA

8900



8950

8953'

90.34°

180.40°

7179.06'

2012.86'

9000

9050

9048'

88.52°

180.19°

7180.00'

2107.83'

9100

9150

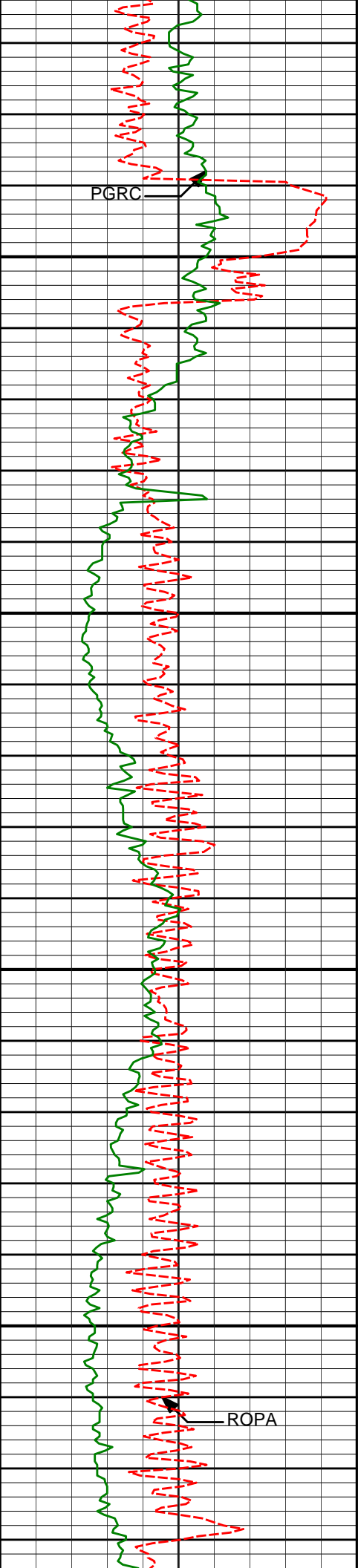
9143'

88.03°

178.88°

7182.86'

2202.78'



PGRC

ROPA

9200

9250

9300

9350

9237'

88.15°

177.65°

7186.00'

2296.72'

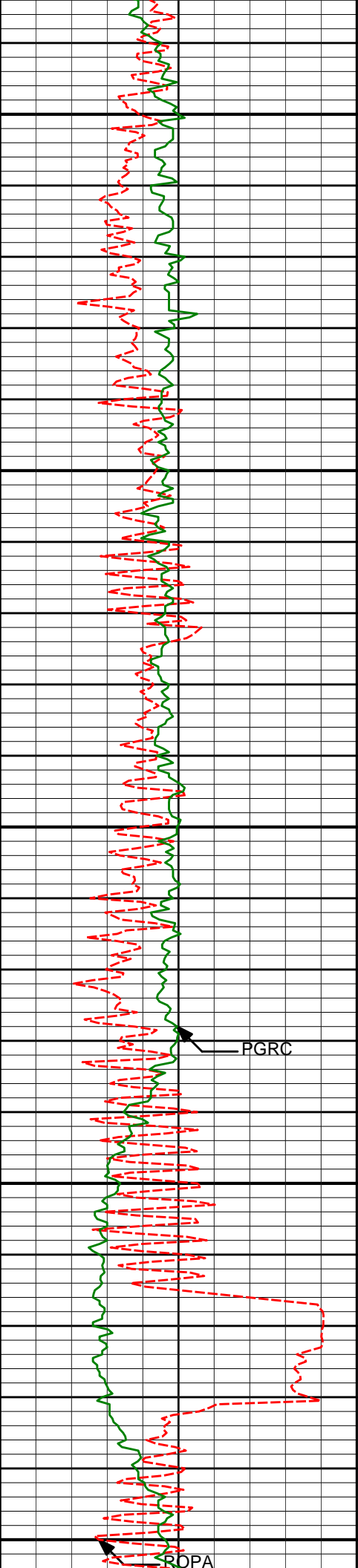
9332'

88.27°

177.68°

7188.96'

2391.65'



9400

9426'

89.11°

177.24°

7191.11'

2485.59'

9450

9500

9521'

91.08°

178.12°

7190.96'

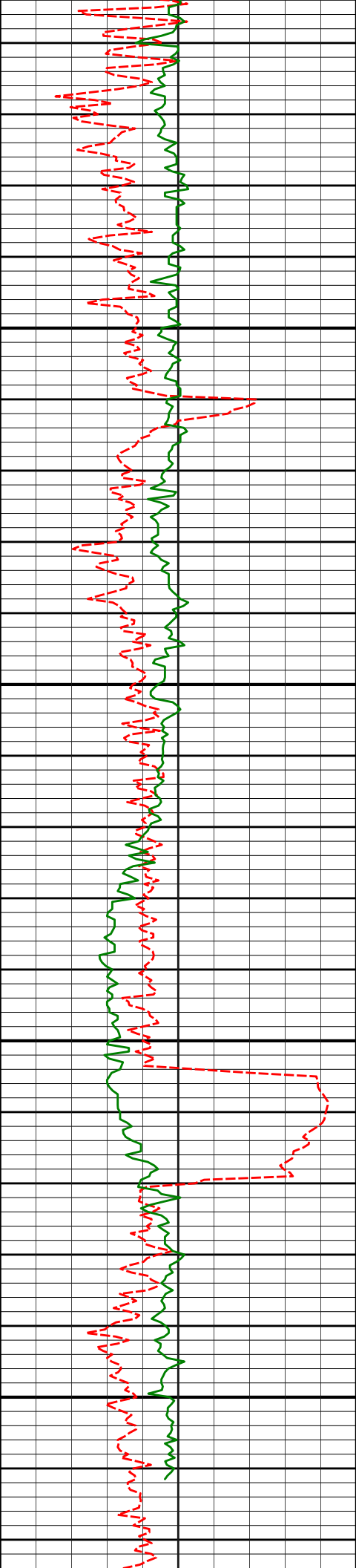
2580.55'

9550

9600

PGRC

ROPA



9616'

88.98°

177.53°

7190.91'

2675.53'

9650

9700

9710'

90.43°

178.27°

7191.39'

2769.50'

9750

9800

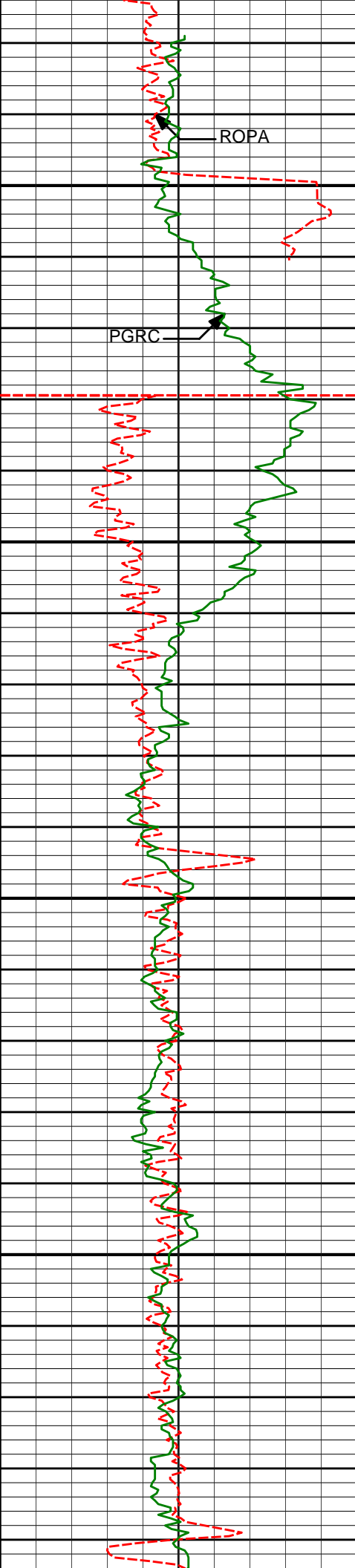
9805'

89.08°

177.85°

7191.79'

2864.49'



9850

PGRC

ROPA

9900

9950

10000

9899'

88.21°

178.32°

7194.02'

2958.45'

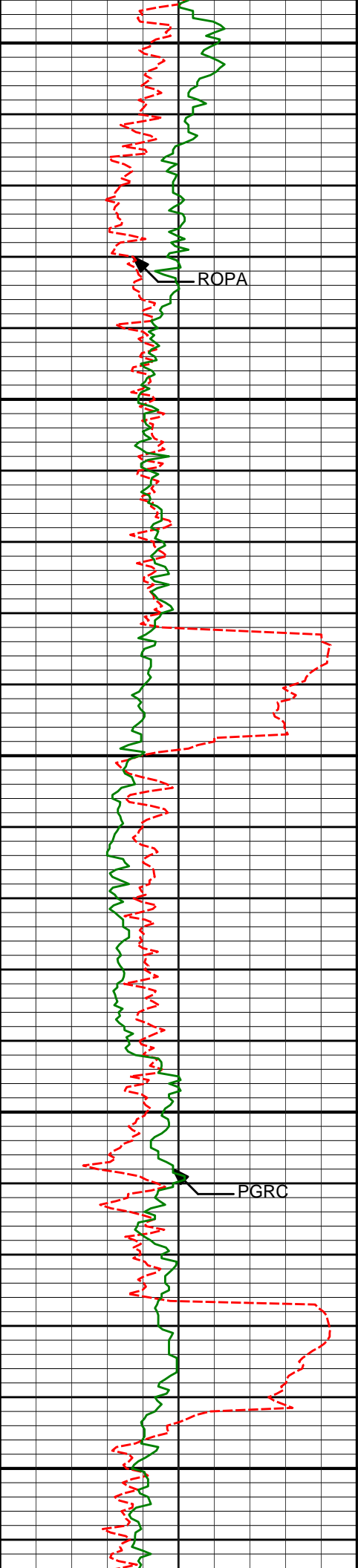
9994'

88.70°

178.65°

7196.58'

3053.41'



10050

10100

10150

10200

10250

ROPA

PGRC

10088'

89.54°

178.43°

7198.02'

3147.39'

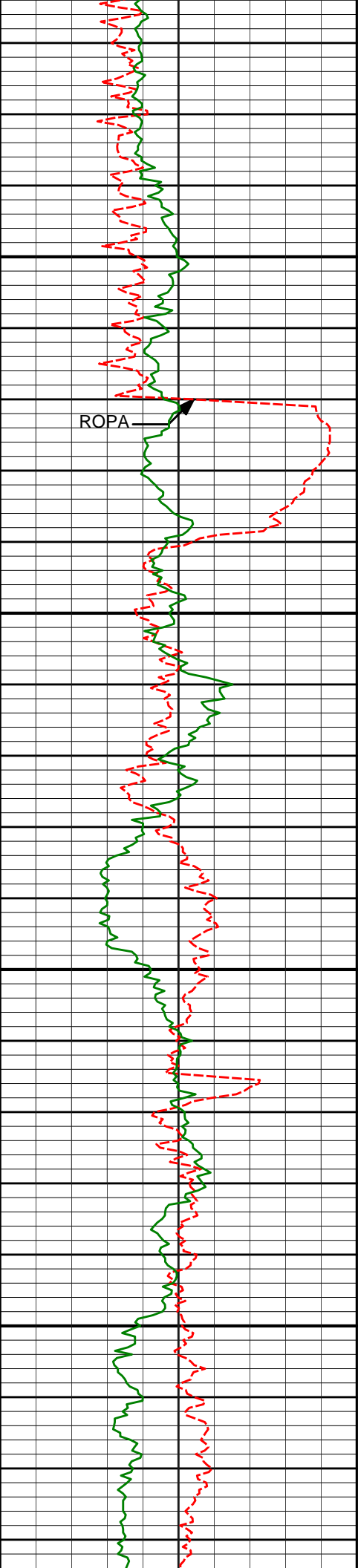
10183'

89.88°

180.89°

7198.51'

3242.38'



10277'	89.20°	179.09°	7199.27'	3336.36'
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10300

ROPA

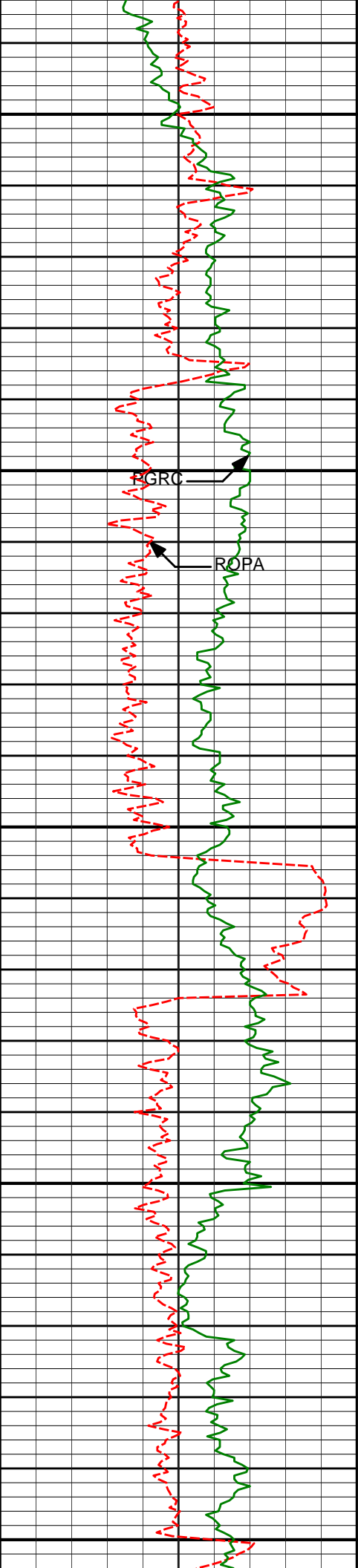
10350

10372'	87.69°	179.40°	7201.85'	3431.32'
--------	--------	---------	----------	----------

10400

10450

10466'	88.05°	179.96°	7205.34'	3525.25'
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10500

10550

10600

10650

10700

RGRC

ROPA

10561'

88.98°

180.91°

7207.80'

3620.19'

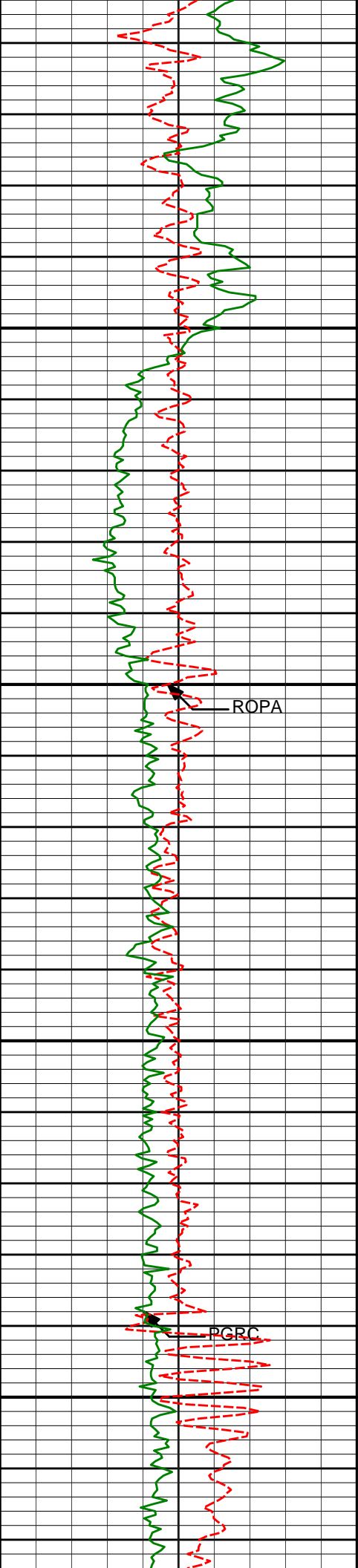
10655'

87.41°

178.71°

7210.76'

3714.12'



10750

10750'

87.31°

178.42°

7215.14'

3809.02'

10800

ROPA

10850

10845'

87.41°

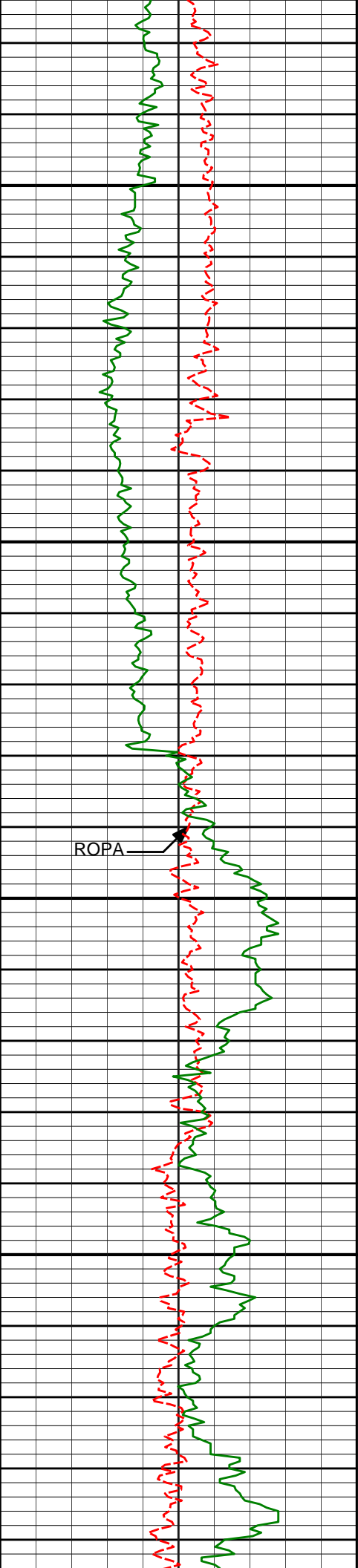
178.69°

7219.51'

3903.91'

10900

PCRC



10950

11000

11050

11100

10939'

88.24°

178.57°

7223.08'

3997.84'

11033'

88.83°

178.60°

7225.49'

4091.81'

11128'

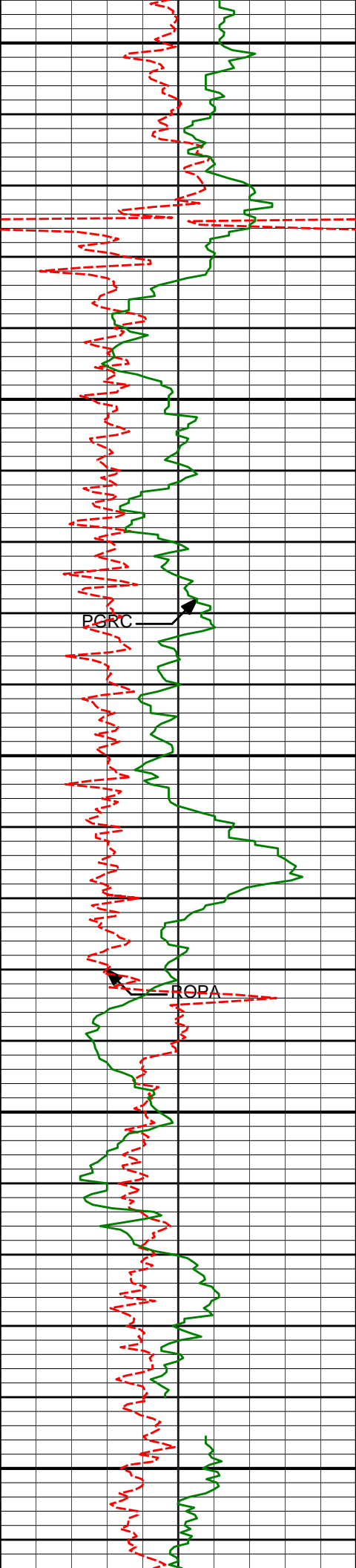
89.75°

178.45°

7226.66'

4186.80'

ROPA



11150

11200

11222'

91.05°

178.14°

7226.00'

4280.78'

PORC

11250

11300

11317'

90.71°

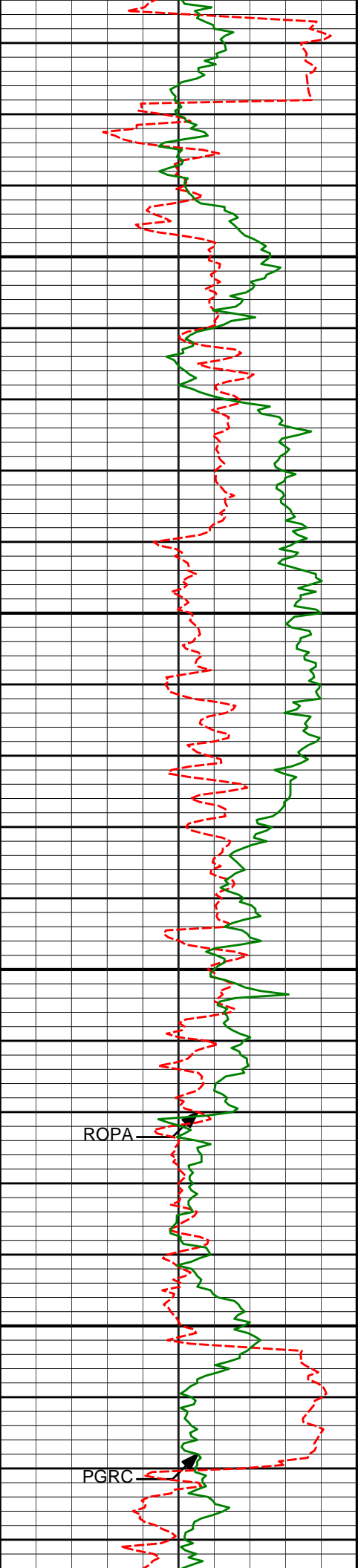
177.33°

7224.55'

4375.75'

ROPA

11350



11400

11412'

89.94°

177.27°

7224.01'

4470.70'

11450

11500

11506'

90.80°

176.84°

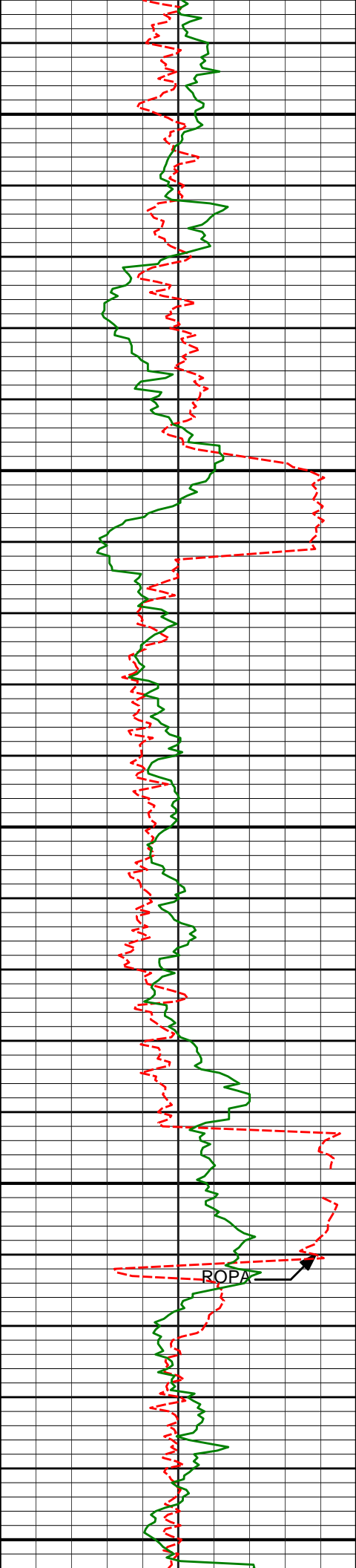
7223.40'

4564.64'

ROPA

11550

PGRC



11600

11601'

90.03°

177.69°

7222.71'

4659.59'

11650

11700

11696'

89.78°

177.62°

7222.86'

4754.57'

11750

ROPA

11800

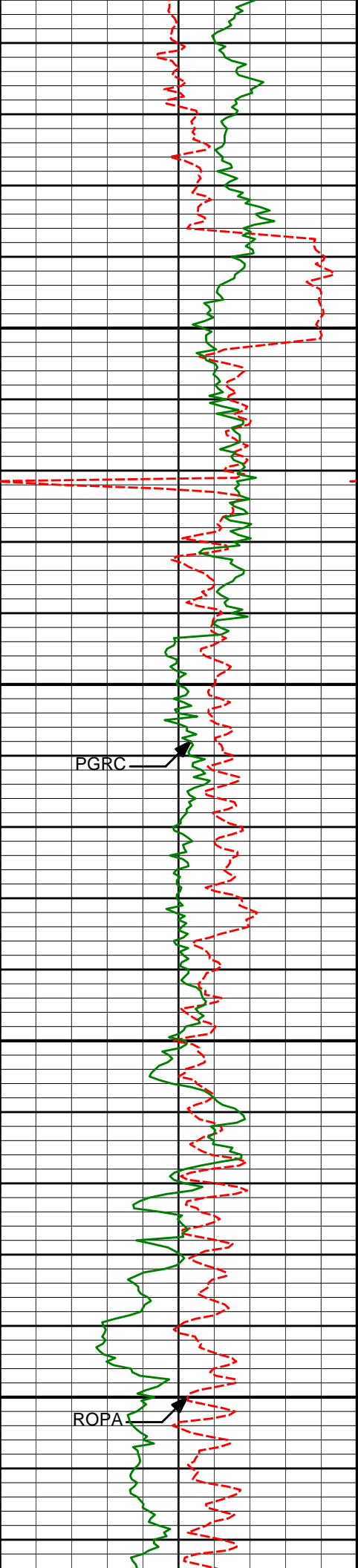
11790'

89.14°

178.33°

7223.75'

4848.55'



11850

11900

11950

12000

PGRC

ROPA

11885'

88.03°

177.86°

7226.10'

4943.50'

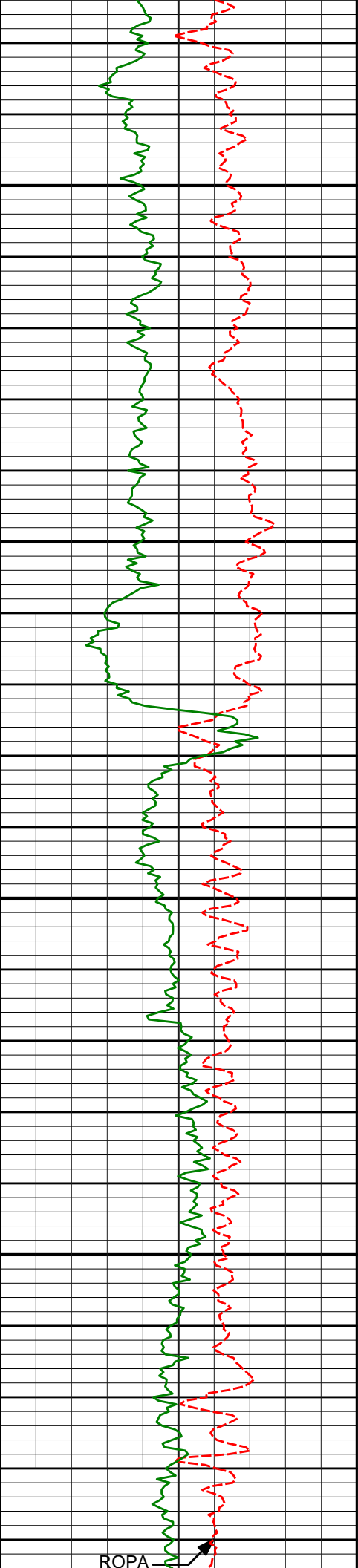
11980'

88.18°

177.69°

7229.24'

5038.43'



12050

12074'

88.52°

176.86°

7231.95'

5132.34'

12100

12150

12169'

89.17°

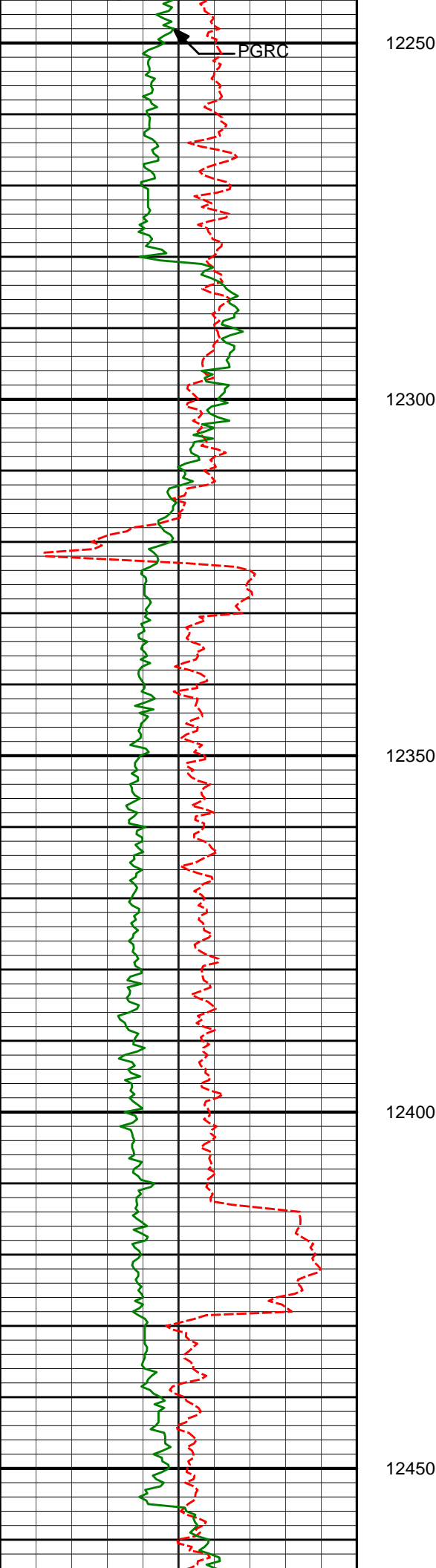
176.99°

7233.87'

5227.26'

12200

ROPA



12250

12300

12350

12400

12450

PGRC

12275'

89.66°

176.94°

7234.95'

5333.18'

12367'

89.94°

177.03°

7235.27'

5425.13'

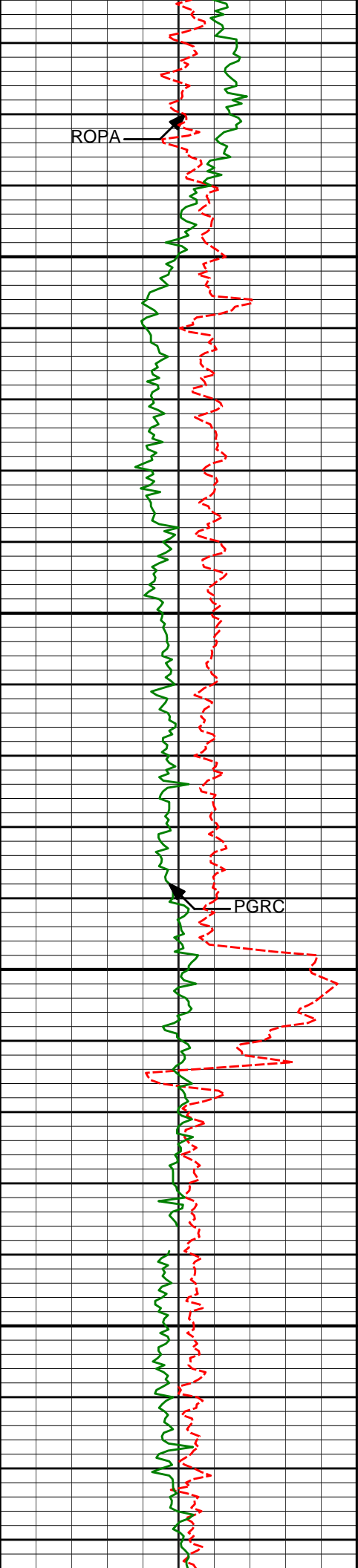
12458'

90.99°

178.42°

7234.54'

5516.10'



ROPA

PGRC

12500

12550

12600

12650

12551'

91.08°

178.17°

7232.86'

5609.07'

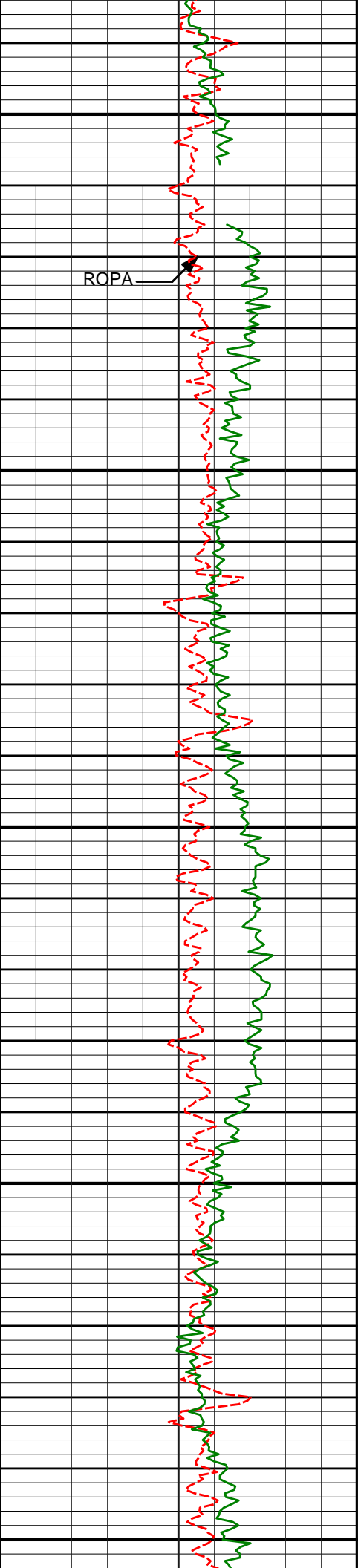
12643'

90.80°

179.14°

7231.36'

5701.06'



ROPA

12700

12750

12800

12850

12900

12737'

90.99°

179.23°

7229.89'

5795.05'

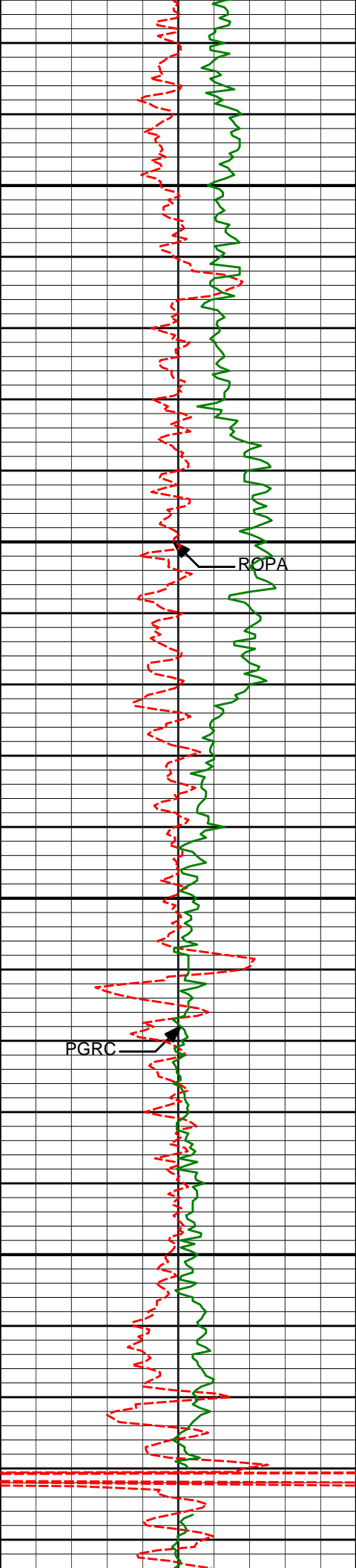
12832'

91.02°

178.99°

7228.22'

5890.03'



13150

13200

13250

13300

13211'

90.96°

178.66°

7221.18'

6268.96'

13305'

91.39°

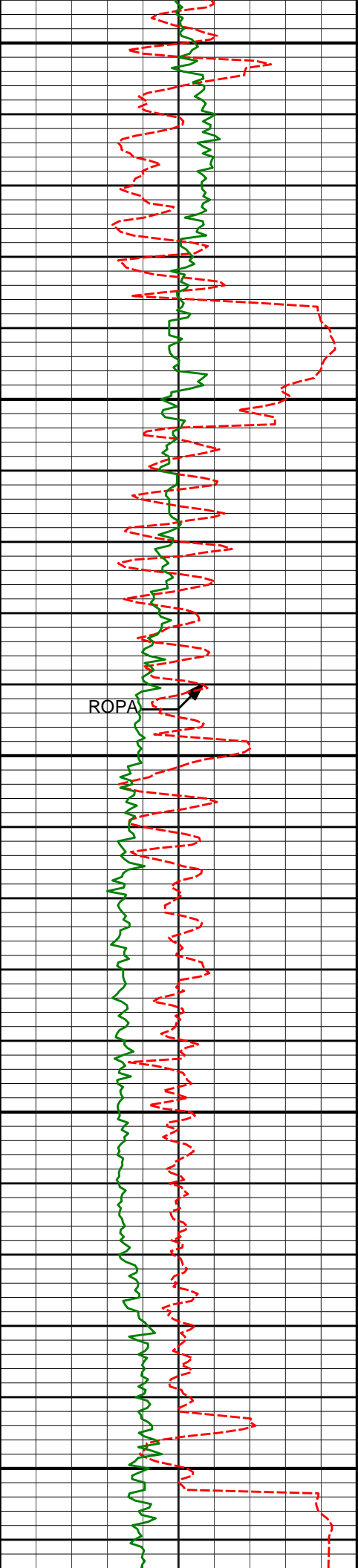
178.23°

7219.26'

6362.94'

PGRC

ROPA



13350

13400

13450

13500

13550

13400'

90.09°

179.15°

7218.03'

6457.92'

ROPA

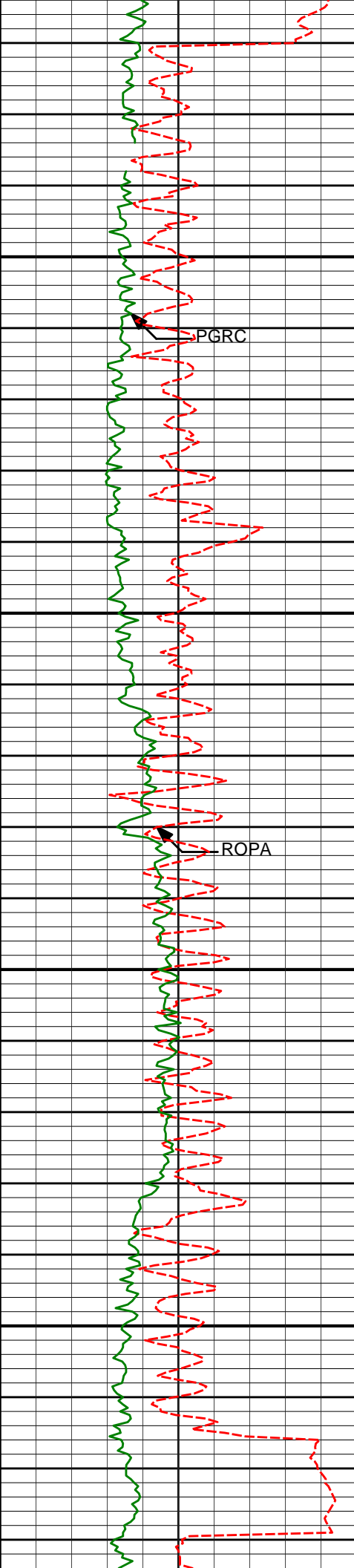
13494'

90.06°

178.63°

7217.91'

6551.92'



13589'	90.25°	179.89°	7217.66'	6646.92'
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13600

PGRC

13650

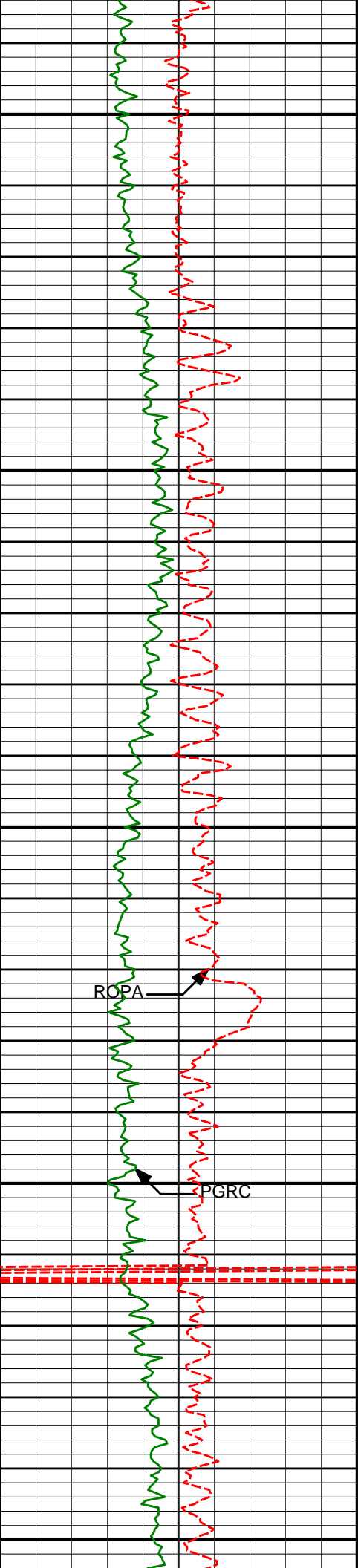
ROPA

13683'	89.45°	178.68°	7217.91'	6740.92'
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13700

13750

13778'	90.12°	180.13°	7218.27'	6835.91'
--------	--------	---------	----------	----------



13800

13850

13900

13950

14000

ROPA

PGRC

13873'

90.12°

180.12°

7218.06'

6930.89'

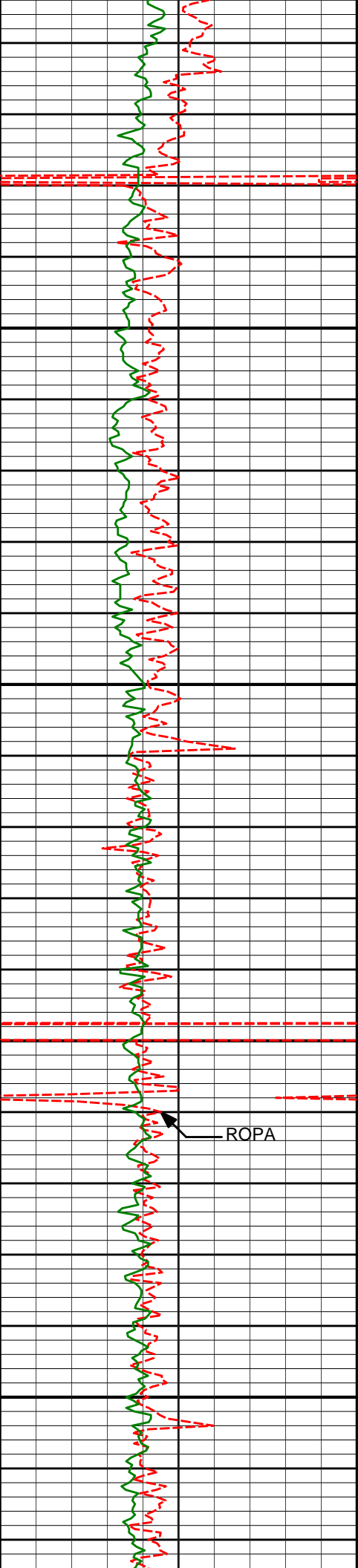
13967'

89.85°

179.17°

7218.09'

7024.88'



14050

14062'

90.52°

180.68°

7217.78'

7119.87'

14100

14150

14156'

90.12°

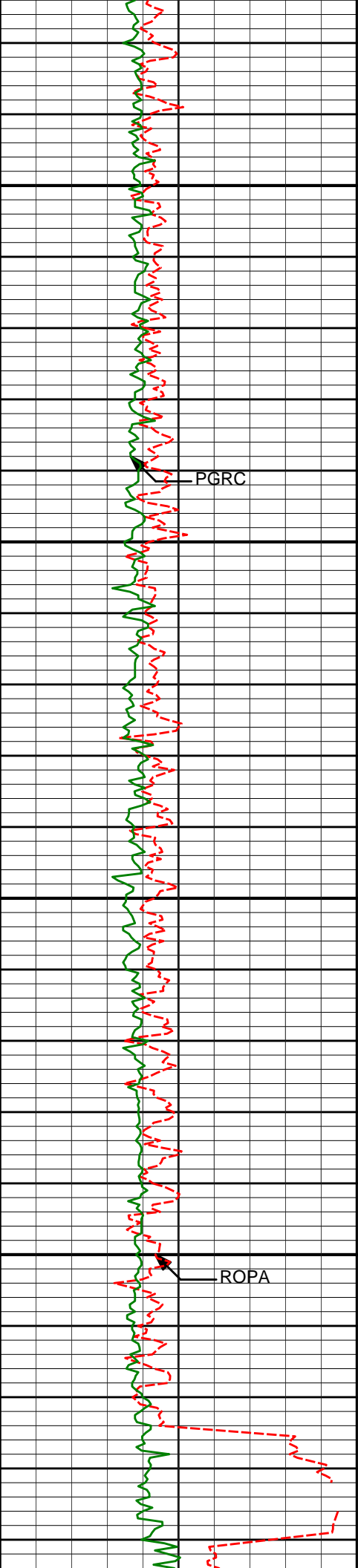
180.60°

7217.25'

7213.83'

ROPA

14200



14250

14251'

90.06°

181.94°

7217.10'

7308.76'

14300

PGRC

14350

14345'

90.09°

183.10°

7216.97'

7402.58'

14400

ROPA

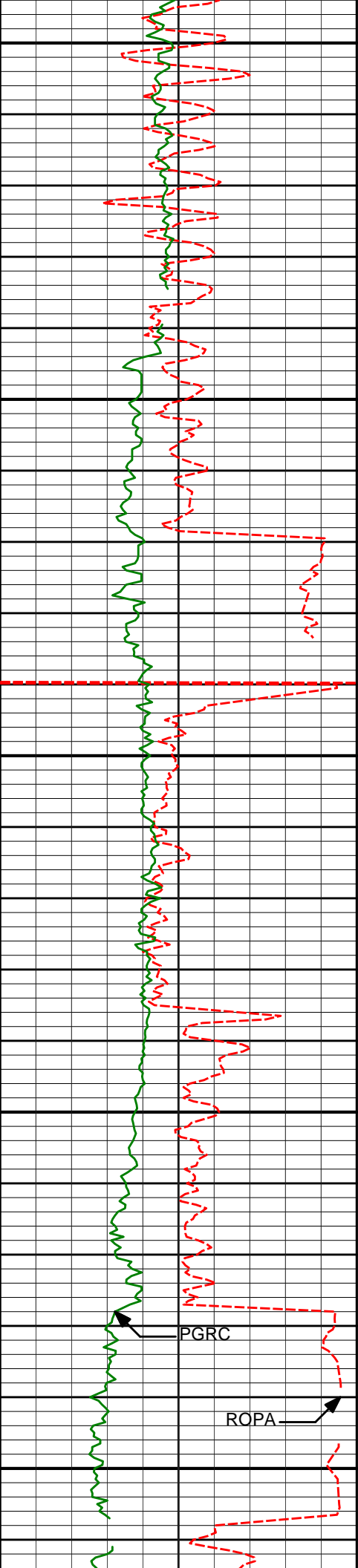
14440'

89.81°

183.58°

7217.05'

7497.31'



14450

14500

14535'

89.97°

183.64°

7217.23'

7592.01'

14550

14600

14629'

90.99°

184.00°

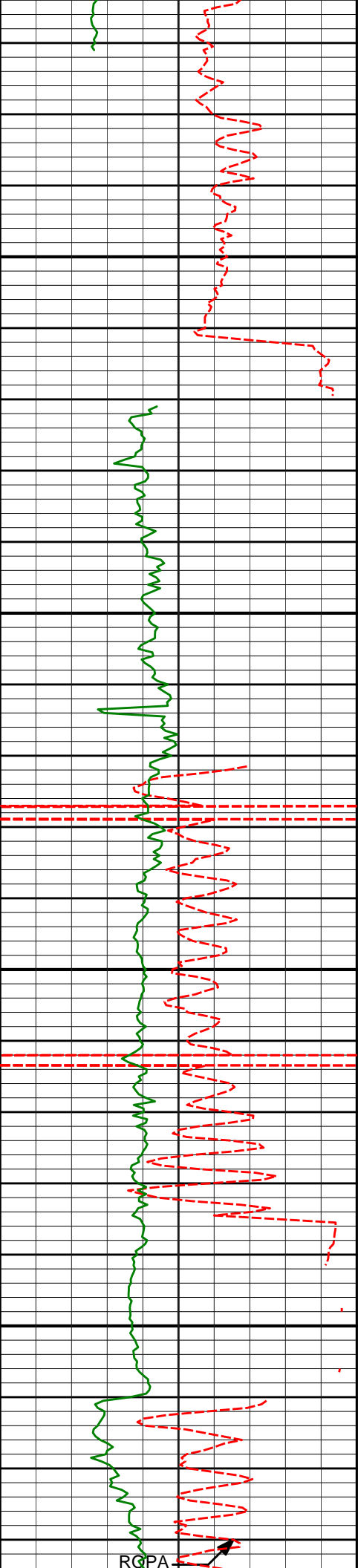
7216.44'

7685.67'

PGRC

ROPA

14650



14700

14724'

91.20°

182.16°

7214.63'

7780.41'

14750

14800

14818'

91.73°

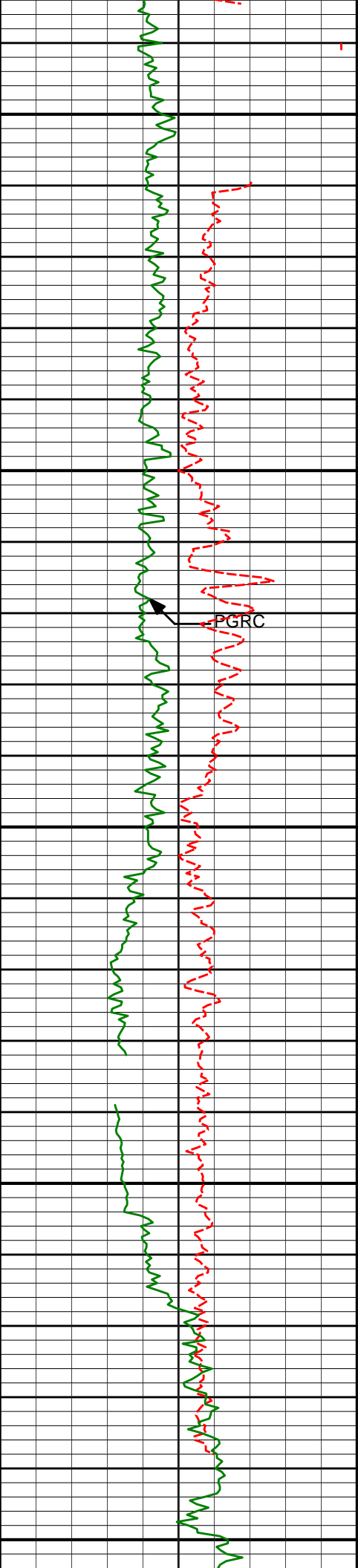
182.14°

7212.23'

7874.24'

14850

RGPA



14900

14950

15000

15050

15100

14913'

91.57°

178.46°

7209.49'

7969.16'

15008'

91.88°

178.52°

7206.63'

8064.12'

15102'

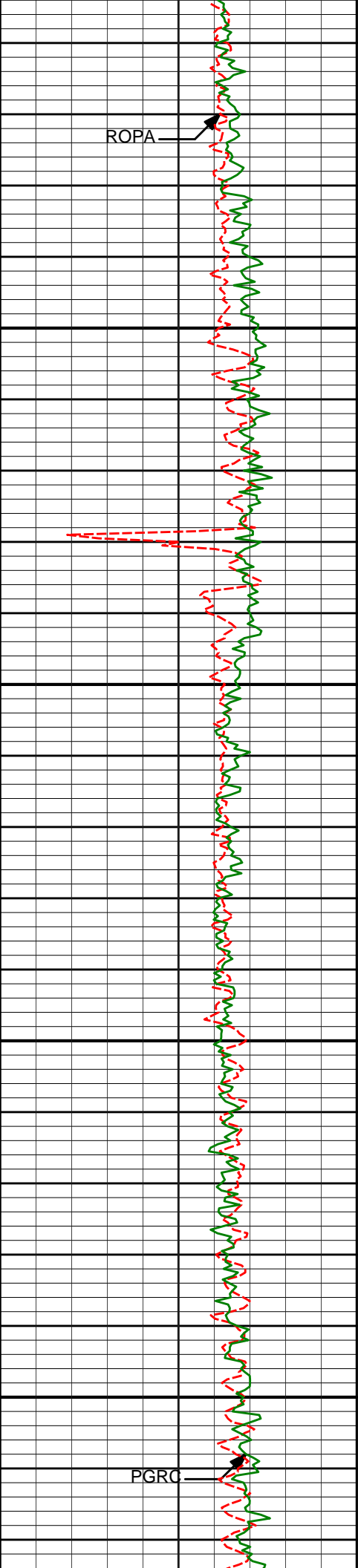
90.77°

177.15°

7204.46'

8158.07'

PGRC



ROPA

PGRC

15150

15200

15250

15300

15197'

90.03°

176.56°

7203.79'

8253.00'

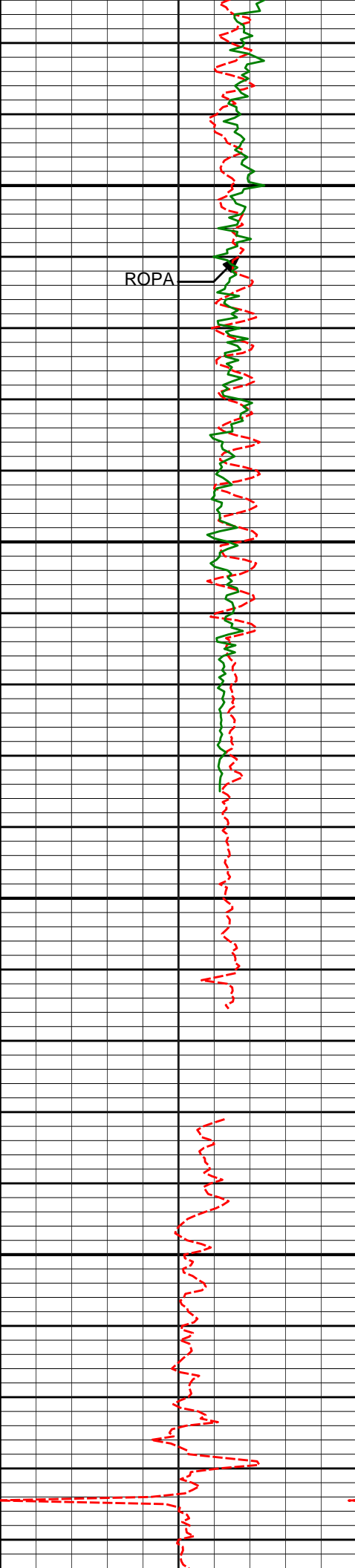
15291'

90.31°

176.01°

7203.51'

8346.89'



15350

15400

15450

15500

15386'

89.97°

174.99°

7203.28'

8441.71'

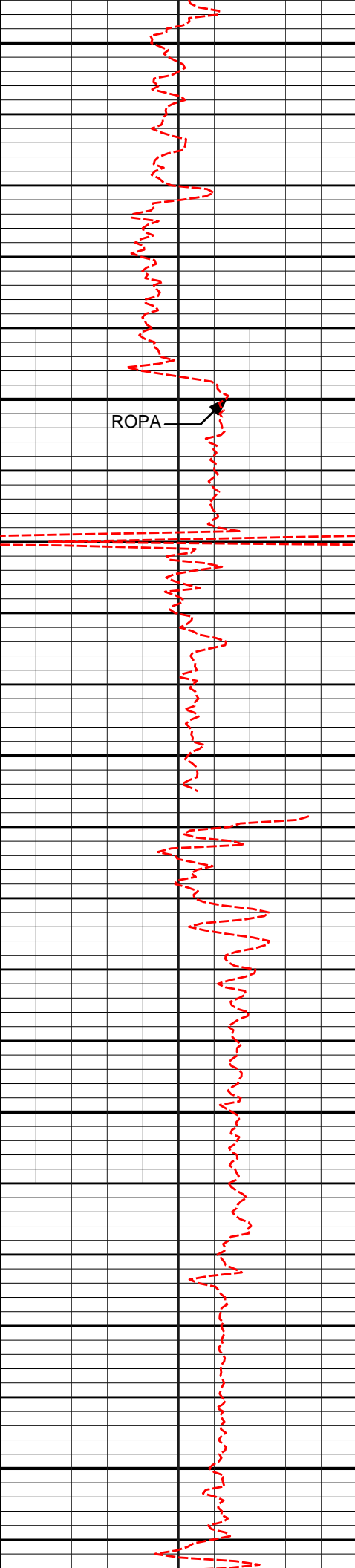
15480'

89.44°

175.80°

7203.76'

8535.51'



15550

15575'

90.71°

176.72°

7203.63'

8630.40'

15600

ROPA

15650

15670'

91.02°

176.22°

7202.20'

8725.29'

15700

15750

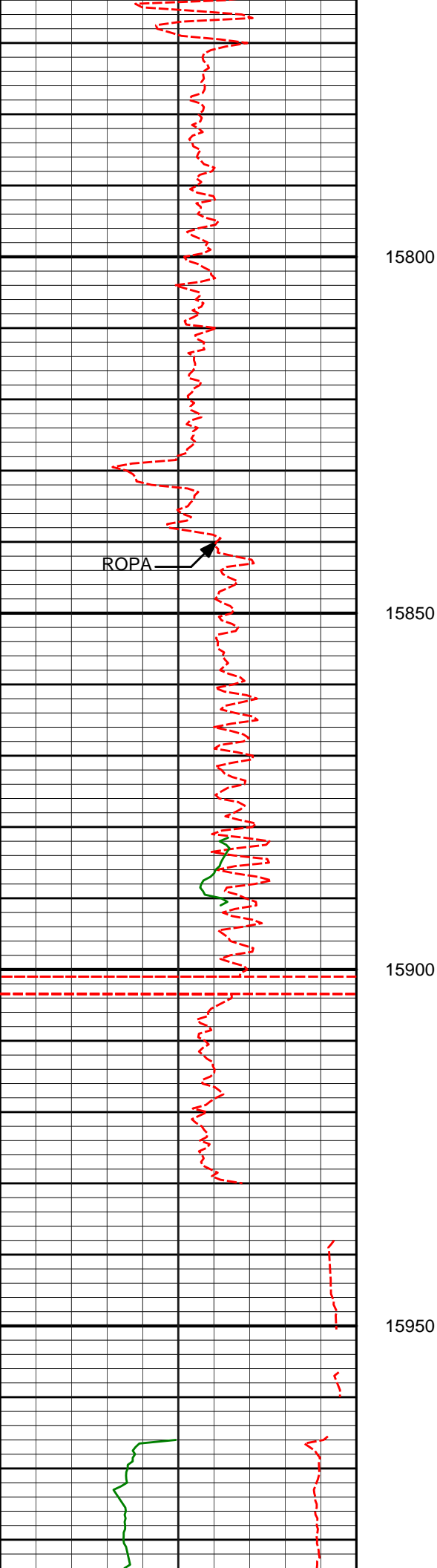
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91.60°

176.40°

7199.98'

8819.16'



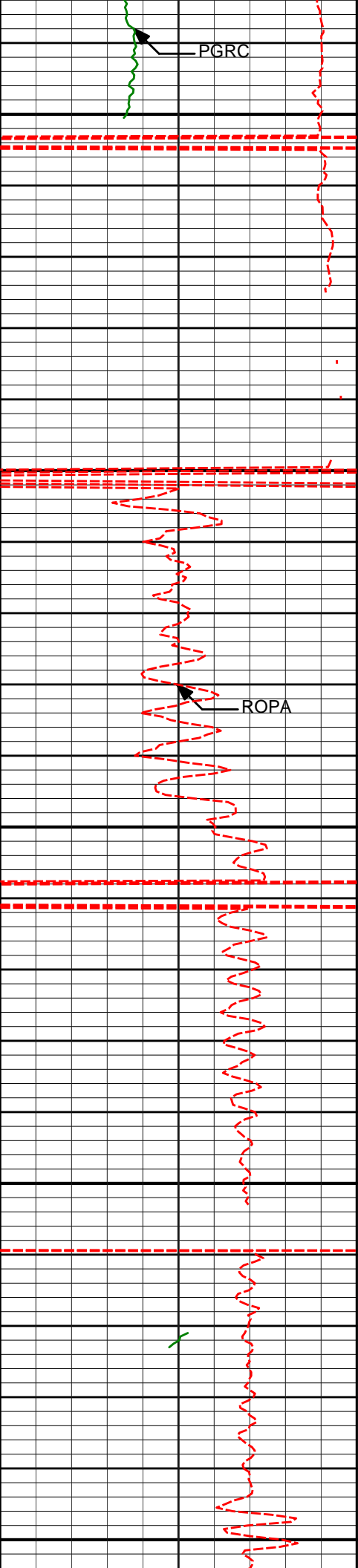
15800

15850

15900

15950

15764	91.69	176.40	7199.96	8819.16
15859'	92.06°	176.07°	7196.86'	8914.00'
15954'	91.63°	175.95°	7193.80'	9008.81'



16000

16050

16100

16150

16200

16048'

90.43°

176.65°

7192.10'

9102.69'

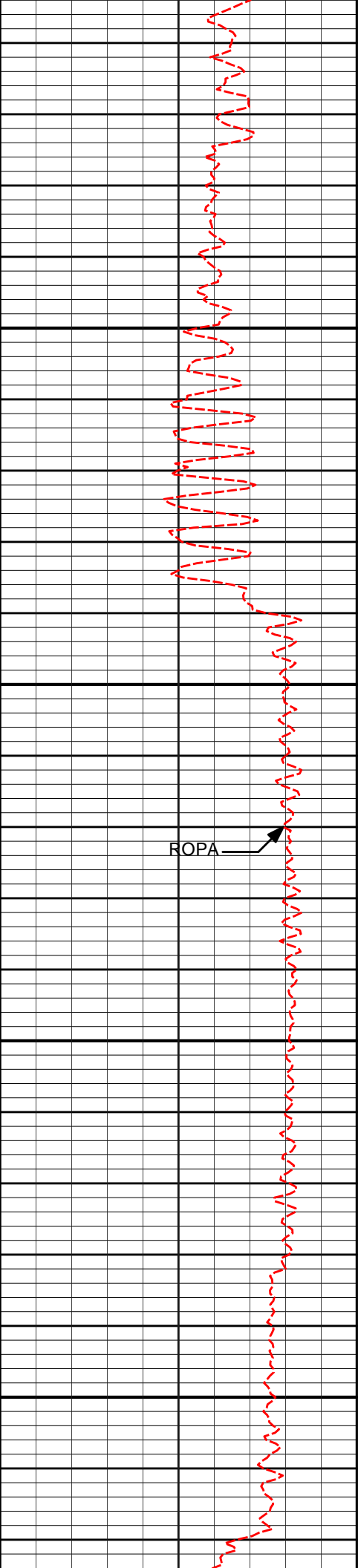
16143'

89.88°

175.86°

7191.85'

9197.58'



16237'

90.25°

175.54°

7191.75'

9291.42'

16250

16300

ROPA

16332'

90.09°

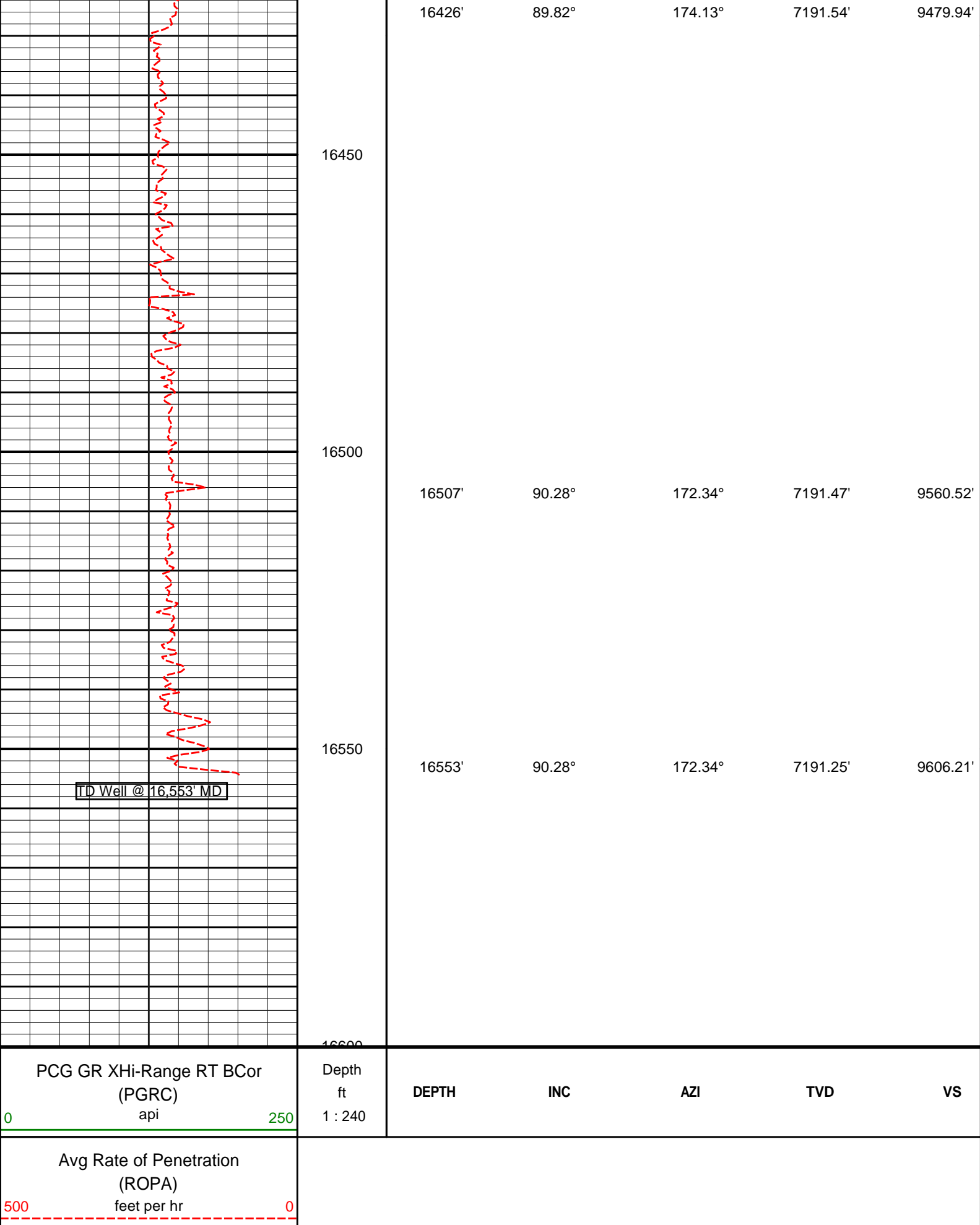
175.11°

7191.46'

9386.22'

16350

16400



MD 1:240 Detail Log



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp.
Crowder 38N-19HZ
Wattenburg
Weld Colorado
USA
CA-XX-0900118961

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
1004.00	0.48	10.72	1003.97	6.85 N	0.89 W	-6.86	TIE-IN
1172.00	0.10	301.06	1171.97	7.61 N	0.88 W	-7.63	0.27
1295.00	0.25	303.21	1294.97	7.81 N	1.19 W	-7.83	0.12
1356.00	0.86	129.19	1355.97	7.60 N	0.95 W	-7.61	1.80
1540.00	1.49	128.16	1539.93	5.25 N	1.99 E	-5.22	0.34
1724.00	1.34	125.48	1723.87	2.53 N	5.62 E	-2.44	0.09
1908.00	1.11	125.43	1907.83	0.25 N	8.82 E	-0.10	0.12
2002.00	0.98	108.20	2001.81	0.53 S	10.33 E	0.70	0.36
2097.00	1.18	91.16	2096.80	0.80 S	12.08 E	1.01	0.39
2191.00	1.50	121.82	2190.77	1.47 S	14.09 E	1.71	0.82
2286.00	3.38	123.96	2285.68	3.69 S	17.47 E	3.99	1.98
2380.00	4.71	101.34	2379.45	6.00 S	23.56 E	6.40	2.19
2475.00	4.56	102.41	2474.14	7.58 S	31.08 E	8.11	0.19
2570.00	5.67	93.14	2568.76	8.65 S	39.45 E	9.32	1.45
2664.00	7.05	91.38	2662.18	9.04 S	49.85 E	9.89	1.49
2759.00	8.88	83.28	2756.26	8.33 S	62.96 E	9.39	2.26
2854.00	7.88	81.17	2850.25	6.47 S	76.68 E	7.76	1.11
2949.00	9.44	81.34	2944.16	4.29 S	90.82 E	5.83	1.65
3043.00	8.79	78.86	3036.97	1.75 S	105.49 E	3.53	0.81
3138.00	8.18	74.47	3130.93	1.47 N	119.13 E	0.55	0.94
3233.00	7.48	71.46	3225.05	5.24 N	131.50 E	-3.01	0.85
3327.00	6.06	74.64	3318.39	8.50 N	142.09 E	-6.10	1.56
3422.00	7.09	86.40	3412.77	10.20 N	152.77 E	-7.61	1.78
3517.00	7.21	98.46	3507.04	9.69 N	164.52 E	-6.90	1.58
3611.00	6.63	92.66	3600.35	8.57 N	175.78 E	-5.59	0.97
3706.00	8.30	97.77	3694.54	7.38 N	188.06 E	-4.20	1.89
3801.00	7.69	92.60	3788.62	6.17 N	201.20 E	-2.76	0.99
3896.00	9.24	88.19	3882.58	6.12 N	215.18 E	-2.48	1.77
3990.00	8.41	81.05	3975.47	7.43 N	229.52 E	-3.54	1.46
4085.00	7.96	78.36	4069.50	9.84 N	242.82 E	-5.72	0.63
4179.00	9.62	92.49	4162.41	10.81 N	257.04 E	-6.45	2.89
4274.00	10.11	91.05	4256.01	10.31 N	273.30 E	-5.68	0.58
4369.00	9.66	86.96	4349.60	10.58 N	289.59 E	-5.68	0.88
4463.00	8.06	81.95	4442.47	11.92 N	303.98 E	-6.77	1.89
4558.00	8.54	77.36	4536.48	14.40 N	317.46 E	-9.02	0.86
4652.00	7.84	74.00	4629.52	17.69 N	330.43 E	-12.09	0.90
4747.00	8.87	78.29	4723.51	20.96 N	343.83 E	-15.14	1.27
4842.00	9.11	78.04	4817.35	24.01 N	358.36 E	-17.94	0.25
4936.00	9.31	88.57	4910.14	25.74 N	373.24 E	-19.42	1.80
5031.00	9.48	92.13	5003.87	25.64 N	388.74 E	-19.05	0.64
5125.00	8.27	89.94	5096.74	25.36 N	403.23 E	-18.53	1.33
5220.00	7.15	84.69	5190.88	25.91 N	415.95 E	-18.87	1.39

5314.00	6.85	102.65	5284.19	25.23 N	427.24 E	-17.99	2.34
5409.00	6.48	97.85	5378.55	23.25 N	438.08 E	-15.83	0.70
5503.00	6.75	94.09	5471.93	22.14 N	448.84 E	-14.53	0.54
5598.00	6.45	91.97	5566.30	21.56 N	459.74 E	-13.77	0.41
5693.00	5.97	88.42	5660.74	21.51 N	470.01 E	-13.55	0.65
5787.00	4.17	91.43	5754.37	21.56 N	478.31 E	-13.46	1.94
5882.00	3.41	100.90	5849.16	20.94 N	484.54 E	-12.73	1.03
5976.00	1.56	98.10	5943.07	20.23 N	488.56 E	-11.95	1.97
6071.00	0.87	75.02	6038.05	20.23 N	490.54 E	-11.92	0.88
6260.00	0.62	84.44	6227.03	20.70 N	492.94 E	-12.35	0.15
6449.00	0.54	80.64	6416.02	20.94 N	494.84 E	-12.56	0.05
6513.00	0.50	112.02	6480.02	20.89 N	495.39 E	-12.50	0.44
6544.00	0.47	129.15	6511.02	20.76 N	495.62 E	-12.36	0.48
6576.00	1.49	189.57	6543.01	20.26 N	495.65 E	-11.87	4.13
6607.00	3.73	192.33	6573.98	18.88 N	495.37 E	-10.49	7.25
6639.00	6.04	197.85	6605.86	16.26 N	494.63 E	-7.88	7.36
6670.00	8.98	192.05	6636.59	12.34 N	493.62 E	-3.98	9.77
6702.00	11.72	189.41	6668.07	6.69 N	492.57 E	1.65	8.69
6733.00	14.86	186.75	6698.24	0.37 S	491.59 E	8.69	10.32
6765.00	18.23	185.79	6728.91	9.43 S	490.60 E	17.73	10.58
6796.00	20.63	184.54	6758.14	19.70 S	489.68 E	27.98	7.83
6828.00	23.87	184.09	6787.75	31.78 S	488.77 E	40.05	10.14
6860.00	28.19	182.93	6816.50	45.79 S	487.92 E	54.04	13.60
6891.00	32.38	182.83	6843.26	61.40 S	487.14 E	69.64	13.53
6923.00	35.63	182.24	6869.79	79.27 S	486.35 E	87.50	10.20
6954.00	38.33	181.19	6894.55	97.91 S	485.80 E	106.12	8.95
6986.00	41.67	180.57	6919.06	118.47 S	485.48 E	126.67	10.51
7017.00	44.46	180.13	6941.71	139.64 S	485.36 E	147.83	9.07
7049.00	47.23	179.78	6964.00	162.59 S	485.38 E	170.79	8.67
7080.00	49.72	179.15	6984.55	185.80 S	485.60 E	193.99	8.18
7112.00	52.28	179.38	7004.69	210.66 S	485.91 E	218.86	8.03
7143.00	53.89	178.73	7023.30	235.44 S	486.32 E	243.64	5.46
7175.00	55.71	178.45	7041.75	261.58 S	486.96 E	269.79	5.73
7206.00	56.90	178.80	7058.95	287.37 S	487.58 E	295.58	3.93
7238.00	58.24	178.04	7076.11	314.37 S	488.33 E	322.59	4.66
7269.00	59.45	177.77	7092.14	340.88 S	489.30 E	349.11	3.97
7301.00	61.04	178.01	7108.02	368.64 S	490.32 E	376.89	5.02
7332.00	62.35	178.09	7122.72	395.92 S	491.25 E	404.18	4.23
7364.00	64.51	178.59	7137.03	424.53 S	492.08 E	432.80	6.89
7395.00	66.80	179.46	7149.81	452.76 S	492.56 E	461.04	7.80
7427.00	70.07	180.06	7161.57	482.52 S	492.68 E	490.79	10.37
7459.00	73.35	180.46	7171.61	512.90 S	492.54 E	521.16	10.31
7490.00	77.71	180.02	7179.36	542.90 S	492.41 E	551.16	14.15
7522.00	82.08	180.42	7184.97	574.40 S	492.29 E	582.65	13.71
7566.00	86.94	180.95	7189.18	618.18 S	491.77 E	626.42	11.11
7647.00	91.21	180.95	7190.48	699.14 S	490.43 E	707.34	5.27
7739.00	92.44	181.38	7187.56	791.07 S	488.57 E	799.23	1.41
7831.00	92.56	179.63	7183.55	882.98 S	487.76 E	891.11	1.90
7923.00	92.28	179.94	7179.66	974.90 S	488.11 E	983.02	0.45
8015.00	91.60	179.80	7176.54	1066.84 S	488.32 E	1074.96	0.75
8107.00	90.52	179.84	7174.83	1158.83 S	488.61 E	1166.93	1.17
8199.00	89.85	179.95	7174.54	1250.82 S	488.79 E	1258.92	0.75
8291.00	89.32	179.36	7175.21	1342.82 S	489.35 E	1350.91	0.85
8386.00	89.94	179.50	7175.82	1437.81 S	490.29 E	1445.91	0.67
8480.00	89.81	179.09	7176.02	1531.81 S	491.45 E	1539.91	0.45
8575.00	89.69	178.07	7176.43	1626.77 S	493.81 E	1634.90	1.08
8670.00	89.54	178.67	7177.07	1721.73 S	496.51 E	1729.89	0.65
8764.00	89.63	179.11	7177.75	1815.71 S	498.33 E	1823.89	0.48
8859.00	89.23	179.69	7178.70	1910.70 S	499.32 E	1918.88	0.74
8953.00	90.34	180.40	7179.06	2004.70 S	499.24 E	2012.86	1.40
9048.00	88.52	180.19	7180.00	2099.69 S	498.76 E	2107.83	1.93
9143.00	88.03	178.88	7182.86	2194.64 S	499.53 E	2202.78	1.47
9237.00	88.15	177.65	7186.00	2288.54 S	502.38 E	2296.72	1.31
9332.00	88.27	177.68	7188.96	2383.42 S	506.25 E	2391.65	0.13
9426.00	89.11	177.24	7191.11	2477.30 S	510.41 E	2485.59	1.00
9521.00	91.08	178.12	7190.96	2572.22 S	514.25 E	2580.55	2.27
9616.00	88.98	177.53	7190.91	2667.14 S	517.85 E	2675.53	2.29
9710.00	90.43	178.27	7191.39	2761.08 S	521.29 E	2769.50	1.73
9805.00	89.08	177.85	7191.79	2856.02 S	524.50 E	2864.49	1.50
9899.00	88.21	178.32	7194.02	2949.94 S	527.64 E	2958.45	1.05
9994.00	88.70	178.65	7196.58	3044.87 S	530.16 E	3053.41	0.62

10088.00	89.54	178.43	7198.02	3138.83 S	532.56 E	3147.39	0.92
10183.00	89.88	180.89	7198.51	3233.82 S	533.12 E	3242.38	2.61
10277.00	89.20	179.09	7199.27	3327.81 S	533.14 E	3336.36	2.05
10372.00	87.69	179.40	7201.85	3422.76 S	534.39 E	3431.32	1.62
10466.00	88.05	179.96	7205.34	3516.70 S	534.92 E	3525.25	0.71
10561.00	88.98	180.91	7207.80	3611.66 S	534.20 E	3620.19	1.40
10655.00	87.41	178.71	7210.76	3705.60 S	534.50 E	3714.12	2.87
10750.00	87.31	178.42	7215.14	3800.47 S	536.88 E	3809.02	0.33
10845.00	87.41	178.69	7219.51	3895.34 S	539.27 E	3903.91	0.30
10939.00	88.24	178.57	7223.08	3989.25 S	541.52 E	3997.84	0.89
11033.00	88.83	178.60	7225.49	4083.19 S	543.84 E	4091.81	0.63
11128.00	89.75	178.45	7226.66	4178.15 S	546.28 E	4186.80	0.98
11222.00	91.05	178.14	7226.00	4272.10 S	549.07 E	4280.78	1.42
11317.00	90.71	177.33	7224.55	4367.01 S	552.82 E	4375.75	0.92
11412.00	89.94	177.27	7224.01	4461.91 S	557.30 E	4470.70	0.81
11506.00	90.80	176.84	7223.40	4555.78 S	562.12 E	4564.64	1.02
11601.00	90.03	177.69	7222.71	4650.67 S	566.66 E	4659.59	1.21
11696.00	89.78	177.62	7222.86	4745.59 S	570.54 E	4754.57	0.27
11790.00	89.14	178.33	7223.75	4839.52 S	573.86 E	4848.55	1.02
11885.00	88.03	177.86	7226.10	4934.44 S	577.02 E	4943.50	1.27
11980.00	88.18	177.69	7229.24	5029.32 S	580.70 E	5038.43	0.24
12074.00	88.52	176.86	7231.95	5123.17 S	585.17 E	5132.34	0.96
12169.00	89.17	176.99	7233.87	5218.01 S	590.26 E	5227.26	0.70
12275.00	89.66	176.94	7234.95	5323.86 S	595.87 E	5333.18	0.46
12367.00	89.94	177.03	7235.27	5415.73 S	600.70 E	5425.13	0.32
12458.00	90.99	178.42	7234.54	5506.65 S	604.31 E	5516.10	1.91
12551.00	91.08	178.17	7232.86	5599.60 S	607.07 E	5609.07	0.28
12643.00	90.80	179.14	7231.36	5691.56 S	609.23 E	5701.06	1.10
12737.00	90.99	179.23	7229.89	5785.54 S	610.56 E	5795.05	0.22
12832.00	91.02	178.99	7228.22	5880.51 S	612.04 E	5890.03	0.26
12927.00	91.14	179.56	7226.43	5975.49 S	613.25 E	5985.01	0.62
13021.00	91.08	178.99	7224.61	6069.46 S	614.43 E	6078.99	0.61
13116.00	91.05	178.64	7222.85	6164.42 S	616.40 E	6173.98	0.37
13211.00	90.96	178.66	7221.18	6259.38 S	618.64 E	6268.96	0.10
13305.00	91.39	178.23	7219.26	6353.33 S	621.20 E	6362.94	0.65
13400.00	90.09	179.15	7218.03	6448.29 S	623.37 E	6457.92	1.68
13494.00	90.06	178.63	7217.91	6542.28 S	625.19 E	6551.92	0.55
13589.00	90.25	179.89	7217.66	6637.26 S	626.42 E	6646.92	1.34
13683.00	89.45	178.68	7217.91	6731.25 S	627.59 E	6740.92	1.54
13778.00	90.12	180.13	7218.27	6826.25 S	628.58 E	6835.91	1.69
13873.00	90.12	180.12	7218.06	6921.25 S	628.37 E	6930.89	0.02
13967.00	89.85	179.17	7218.09	7015.24 S	628.96 E	7024.88	1.06
14062.00	90.52	180.68	7217.78	7110.24 S	629.09 E	7119.87	1.75
14156.00	90.12	180.60	7217.25	7204.23 S	628.04 E	7213.83	0.44
14251.00	90.06	181.94	7217.10	7299.21 S	625.94 E	7308.76	1.42
14345.00	90.09	183.10	7216.97	7393.11 S	621.80 E	7402.58	1.24
14440.00	89.81	183.58	7217.05	7487.95 S	616.26 E	7497.31	0.58
14535.00	89.97	183.64	7217.23	7582.76 S	610.28 E	7592.01	0.17
14629.00	90.99	184.00	7216.44	7676.55 S	604.01 E	7685.67	1.15
14724.00	91.20	182.16	7214.63	7771.39 S	598.90 E	7780.41	1.95
14818.00	91.73	182.14	7212.23	7865.29 S	595.37 E	7874.24	0.56
14913.00	91.57	178.46	7209.49	7960.23 S	594.87 E	7969.16	3.88
15008.00	91.88	178.52	7206.63	8055.16 S	597.38 E	8064.12	0.33
15102.00	90.77	177.15	7204.46	8149.06 S	600.93 E	8158.07	1.87
15197.00	90.03	176.56	7203.79	8243.92 S	606.14 E	8253.00	0.99
15291.00	90.31	176.01	7203.51	8337.72 S	612.23 E	8346.89	0.66
15386.00	89.97	174.99	7203.28	8432.42 S	619.69 E	8441.71	1.13
15480.00	89.44	175.80	7203.76	8526.12 S	627.24 E	8535.51	1.03
15575.00	90.71	176.72	7203.63	8620.91 S	633.44 E	8630.40	1.65
15670.00	91.02	176.22	7202.20	8715.72 S	639.29 E	8725.29	0.61
15764.00	91.69	176.40	7199.98	8809.50 S	645.34 E	8819.16	0.74
15859.00	92.06	176.07	7196.86	8904.24 S	651.58 E	8914.00	0.52
15954.00	91.63	175.95	7193.80	8998.96 S	658.19 E	9008.81	0.47
16048.00	90.43	176.65	7192.10	9092.75 S	664.25 E	9102.69	1.48
16143.00	89.88	175.86	7191.85	9187.54 S	670.45 E	9197.58	1.02
16237.00	90.25	175.54	7191.75	9281.28 S	677.50 E	9291.42	0.52
16332.00	90.09	175.11	7191.46	9375.96 S	685.24 E	9386.22	0.48
16426.00	89.82	174.13	7191.54	9469.55 S	694.06 E	9479.94	1.09
16507.00	90.28	172.34	7191.47	9549.98 S	703.60 E	9560.52	2.28
16553.00	90.28	172.34	7191.25	9595.57 S	709.73 E	9606.21	0.00

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 179.03 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.63 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 16553.00 FEET
IS 9621.78 FEET ALONG 175.77 DEGREES (TRUE)**

Final survey is a projection to bit.

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