

PCG Pressure Case Gamma PCD Pressure Case Directional

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	22-Dec-14	23-Dec-14			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (TVD, ft)	1,226.99	5,416.96			
Log End Depth (TVD, ft)	5,416.96	5,592.13			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	22-Dec-14 01:00	23-Dec-14 05:00			
Drill/Wipe End Date and Time	22-Dec-14 19:00	23-Dec-14 12:00			
Min Inc (deg) @ Depth (TVD, ft)	0.40 @ 1,287.99	48.94 @ 5,477.07			
Max Inc (deg) @ Depth (TVD, ft)	38.74 @ 5,408.45	83.36 @ 5,588.46			
Bit TFA(in2) / Bit Type	1.21 / PDC	1.24 / PDC			
Flow Rate (gpm)	636.43	600.00			
Max AV (fpm) / CV (fpm) @ MWD	445.9 / 400.0	392.8 / 400.0			
Fluid Type	Native/Spud Mud	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	9.50 / 39.00	10.80 / 43.00			
Filtrate CL (ppm)	2,200.00	2,300.00			
pH / Fluid Loss (mptm)	9.80 / 6	9.00 / 5			
PV (cP) / YP (lbf2)	12 / 11.00	15 / 14.00			
% Solids / % Sand	5.7 / 0.20	10.70 / 0.15			
% Oil / Oil:Water Ratio	NA / NA	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) / C	159.46 / 65.8	159.47 / 65.8			

Max Tool Temp (degF) / Source	150.10 / PCM	158.47 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Brett Vandergon	Brett Vandergon			
Customer Representative	Seth Mulherin	Seth Mulherin			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11341350	11341350			
Insert Serial Number	11619985	11619985			
Date and Time Initialized	21-Dec-14 09:52	01-Jan-70 00:00			
Date and Time Read	23-Dec-14 16:37	23-Dec-14 16:31			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	58.00	54.00			
Software Version	6.21	6.21			
Sub Serial Number	11341350	11341350			
Sonde Serial Number	11478016	11478016			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	305.80	328.00			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	51.22	46.80			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11341350	11341350			
Insert/Sonde Serial Number	12037419	12037419			

REMARKS

1. All depths are true vertical 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 annual 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. The following smoothing parameters have been applied to the data:
1: 600
PGRC (Corrected Gamma Ray):
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
Gap Fill: 5.0 ft
ROPA (Average Rate of Penetration)
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
Gap Fill: 5.0 ft
1: 240
PGRC (Corrected Gamma Ray):
Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft
Gap Fill: 3.0 ft

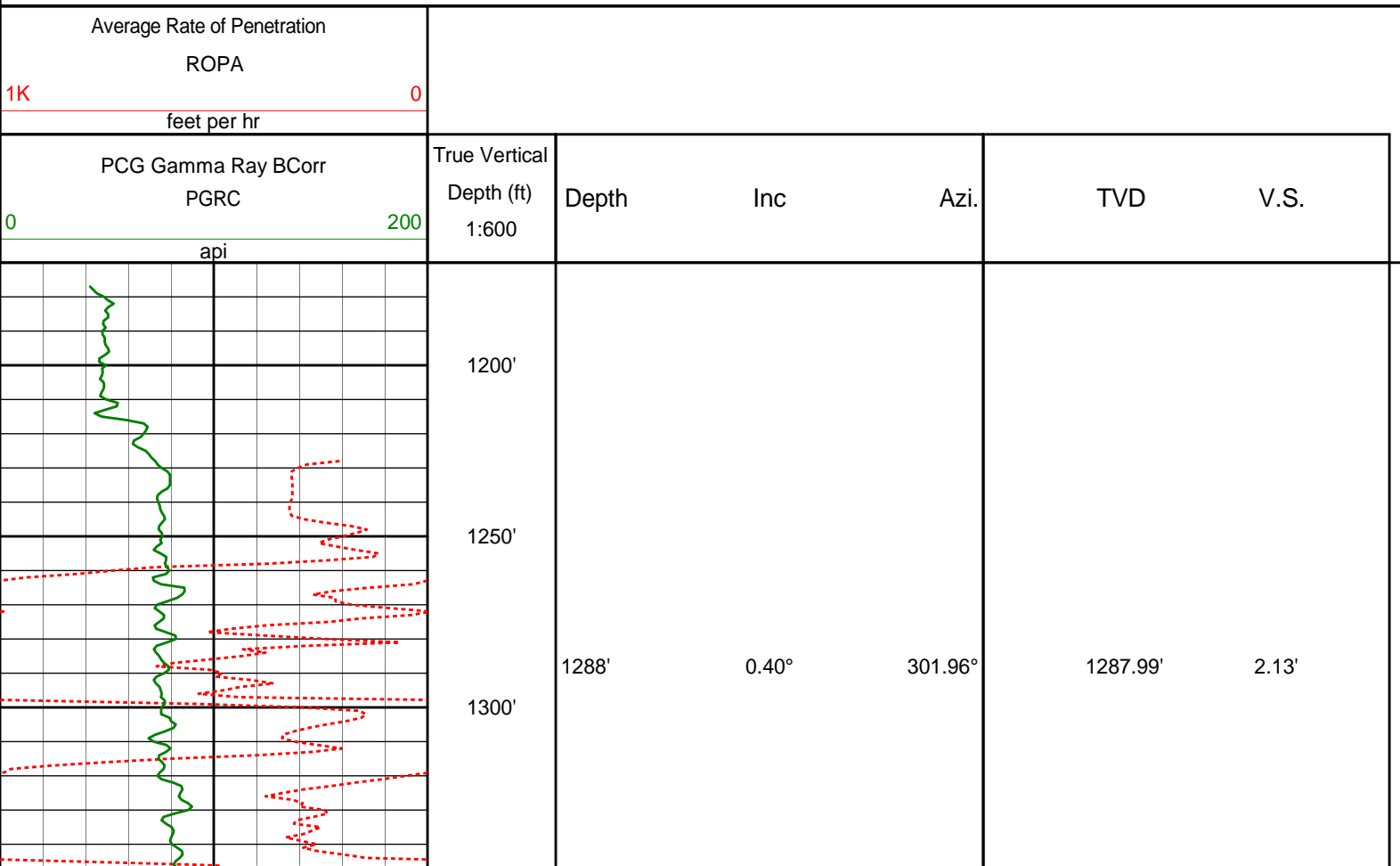
Gap Fill: 3.0 ft
ROPA (Average Rate of Penetration)
Interval Resolution: 0.5 ft
Interval Distance: 1.2 ft
Gap Fill: 3.0 ft
6. INSITE version 8.0.2

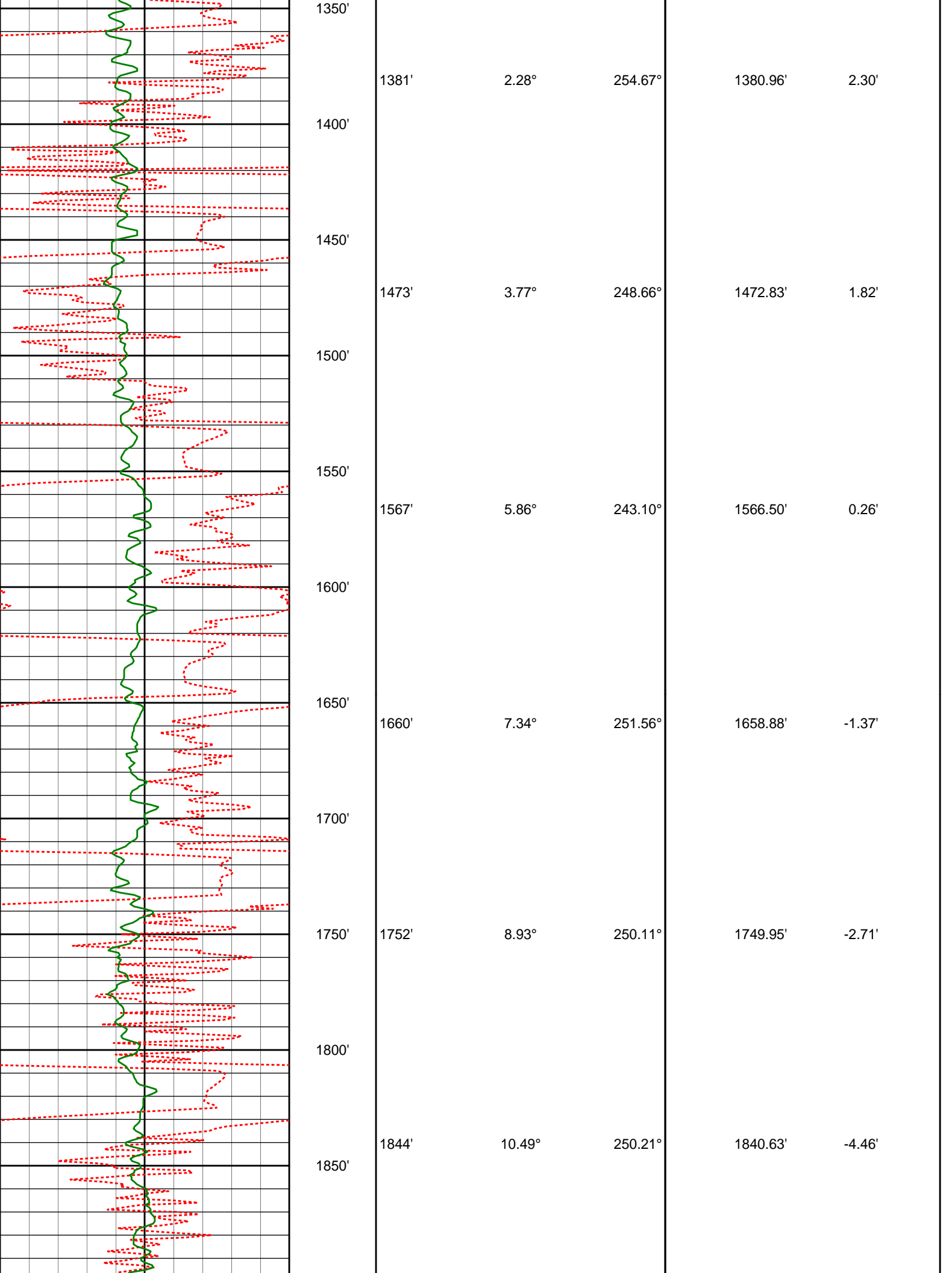
WARRANTY

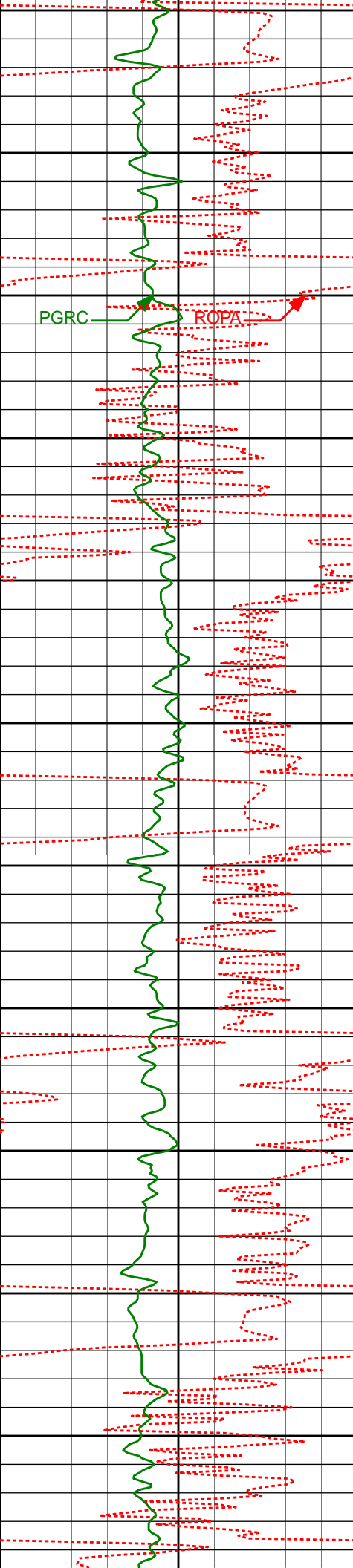
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TVD Main Log 1:600

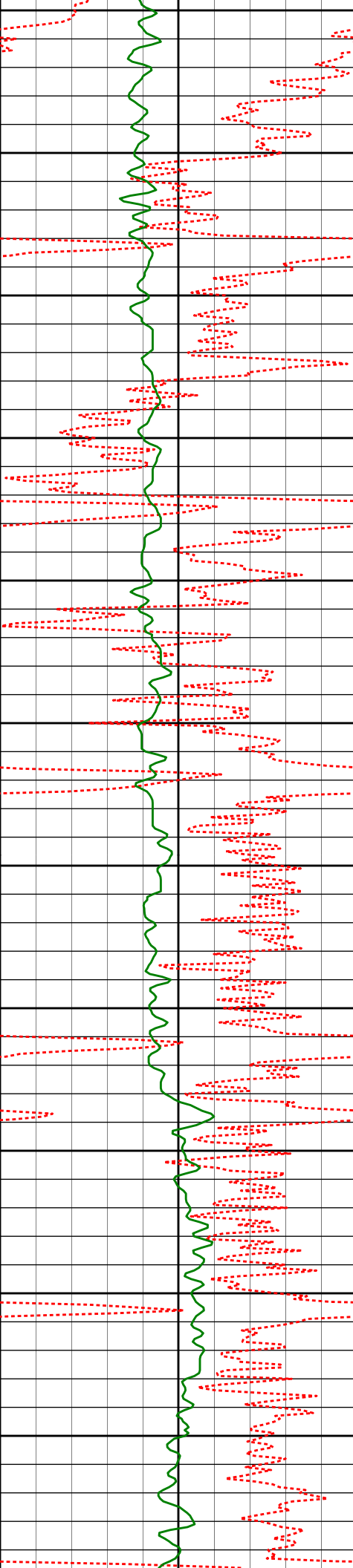




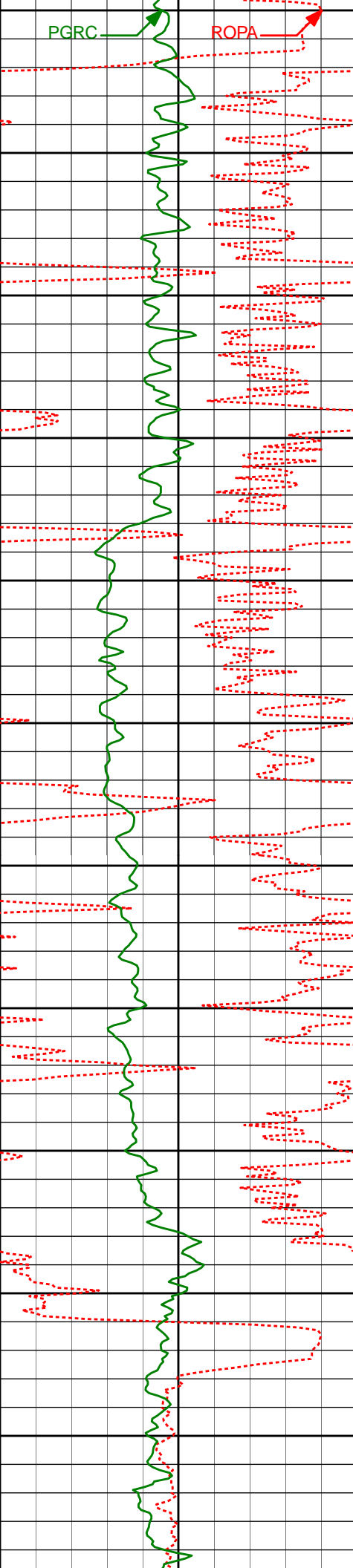


1900'
1950'
2000'
2050'
2100'
2150'
2200'
2250'
2300'
2350'
2400'

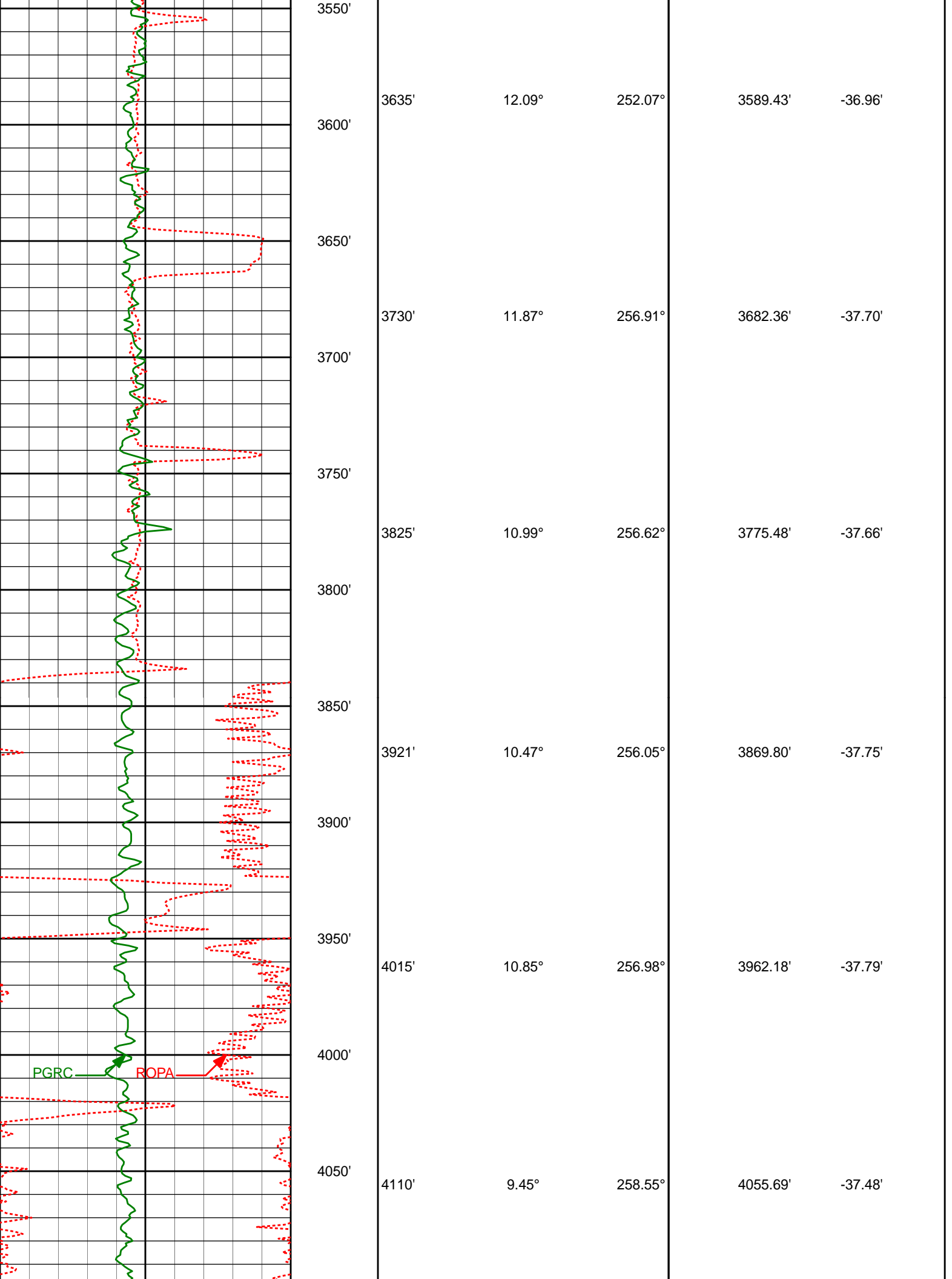
1937'	12.49°	251.25°	1931.77'	-6.35'
2029'	12.29°	249.13°	2021.62'	-8.56'
2122'	11.74°	247.43°	2112.59'	-11.37'
2214'	13.06°	250.82°	2202.44'	-13.93'
2306'	12.78°	249.72°	2292.11'	-16.20'
2400'	13.66°	255.50°	2383.62'	-17.68'

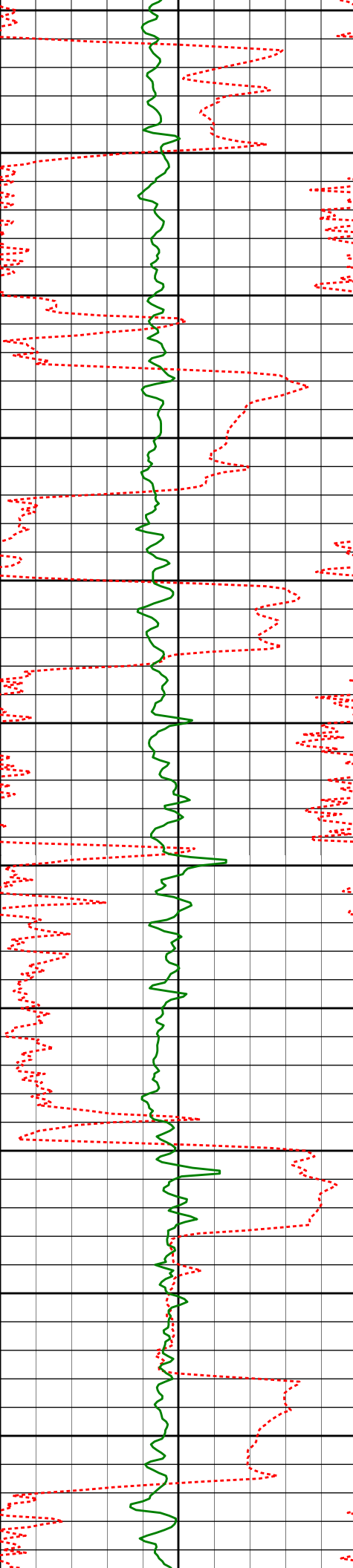


2494'	13.50°	255.00°	2474.99'	-18.21'
2589'	13.49°	254.47°	2567.37'	-18.95'
2684'	13.05°	254.15°	2659.83'	-19.84'
2780'	12.41°	253.23°	2753.47'	-20.92'
2875'	11.47°	253.31°	2846.42'	-22.08'
2970'	10.45°	251.55°	2939.69'	-23.39'



3065'	11.90°	252.35°	3032.88'	-24.89'
3160'	11.90°	251.07°	3125.84'	-26.57'
3255'	12.22°	249.99°	3218.75'	-28.69'
3350'	12.65°	250.04°	3311.52'	-31.04'
3445'	13.08°	250.48°	3404.13'	-33.39'
3540'	12.96°	252.28°	3496.69'	-35.36'





4100'

4150'

4200'

4250'

4300'

4350'

4400'

4450'

4500'

4550'

4600'

4206'

4301'

4396'

4491'

4586'

4681'

9.86°

11.01°

12.98°

10.77°

9.81°

12.38°

250.95°

251.38°

256.66°

257.61°

253.35°

256.46°

4150.33'

4243.76'

4336.68'

4429.65'

4523.12'

4616.33'

-38.03'

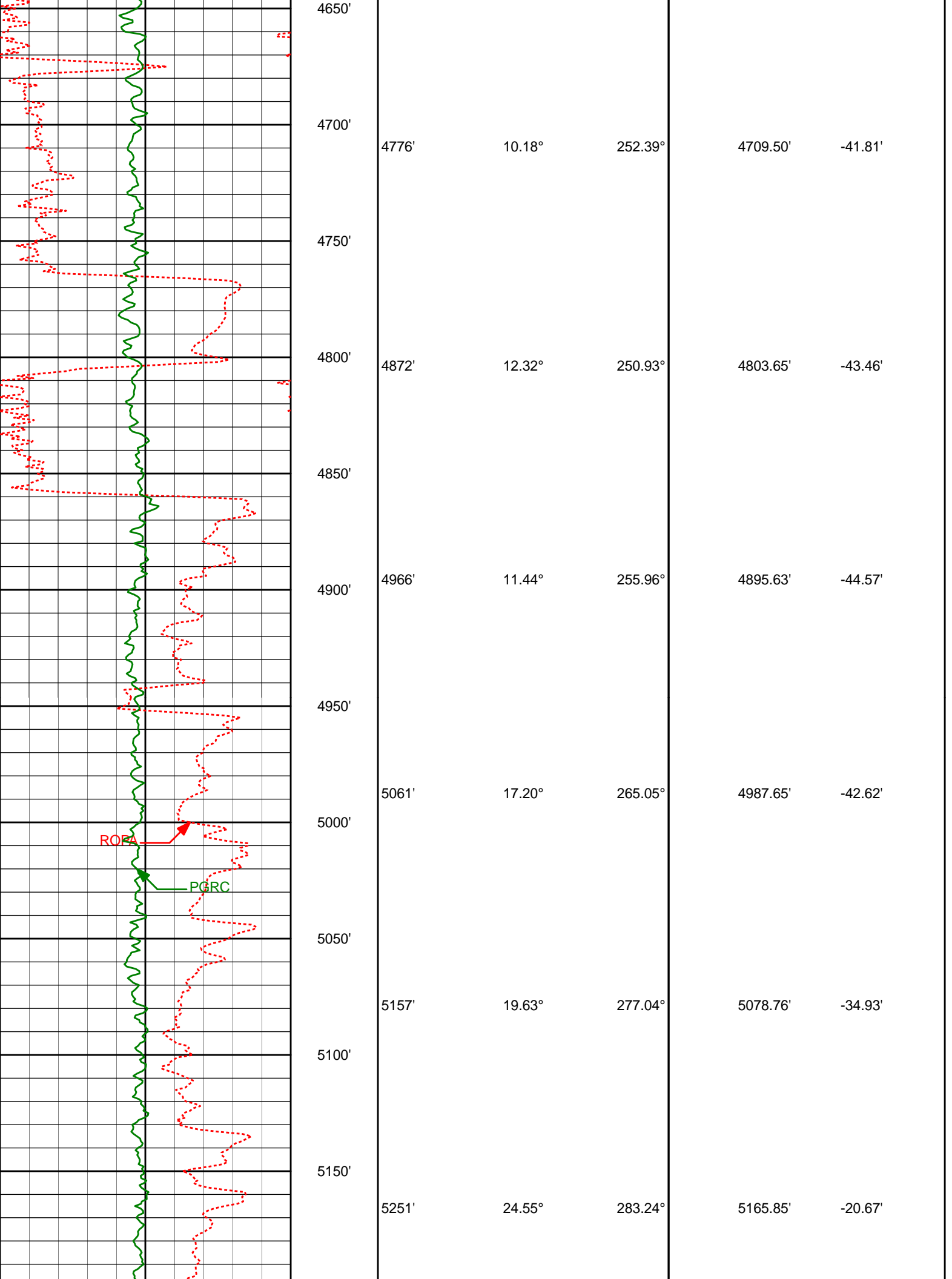
-39.67'

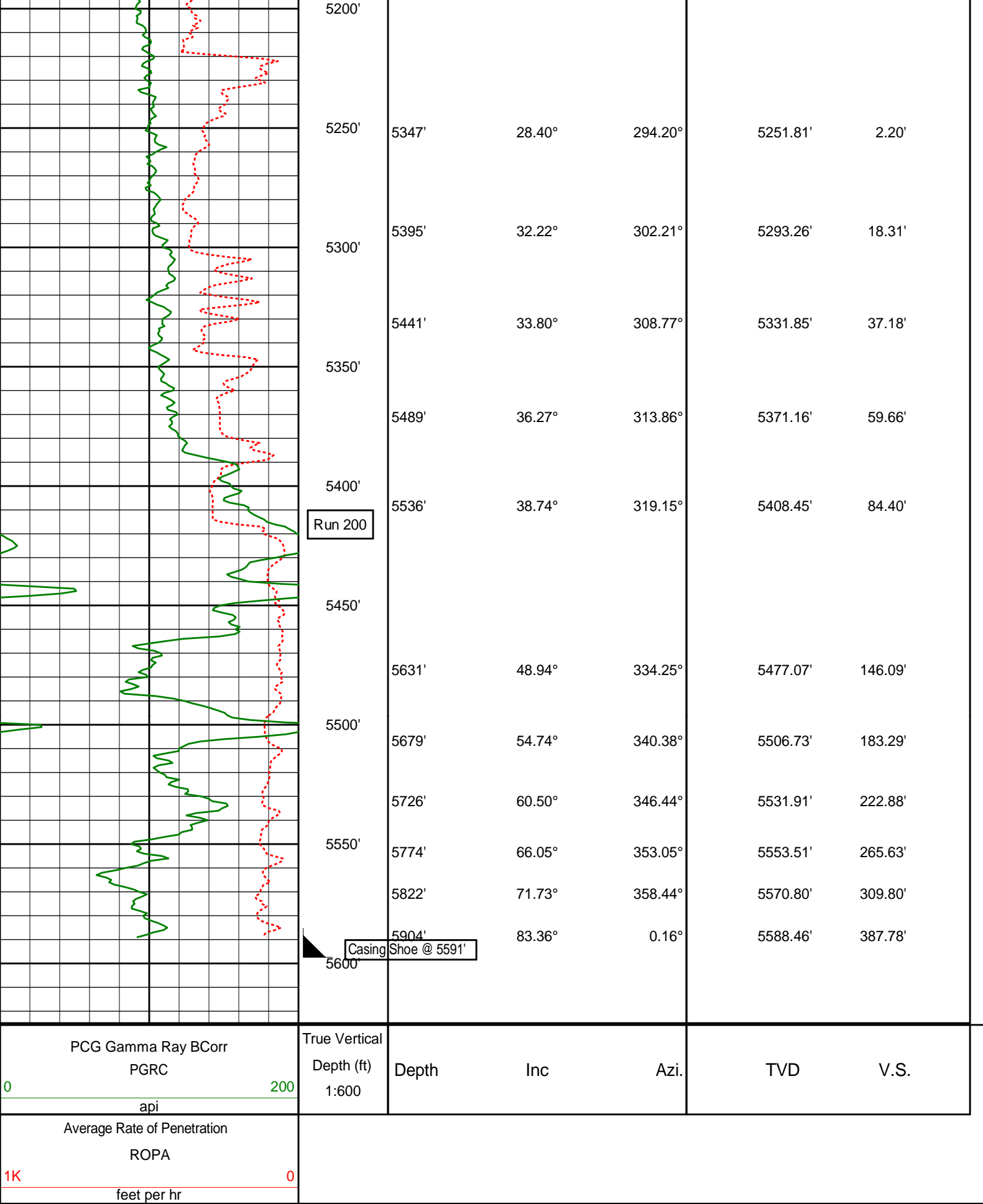
-40.50'

-40.34'

-40.66'

-41.16'

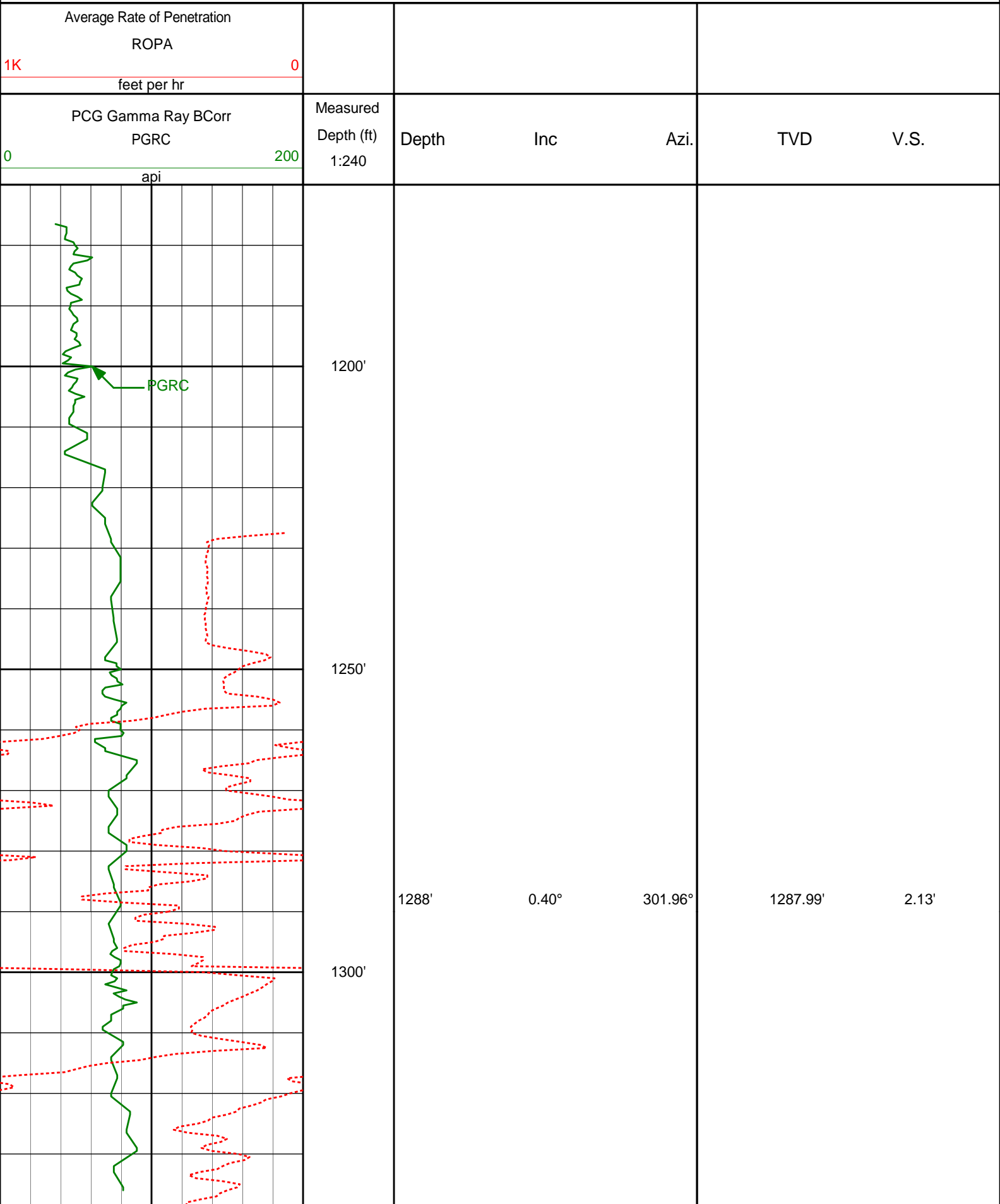


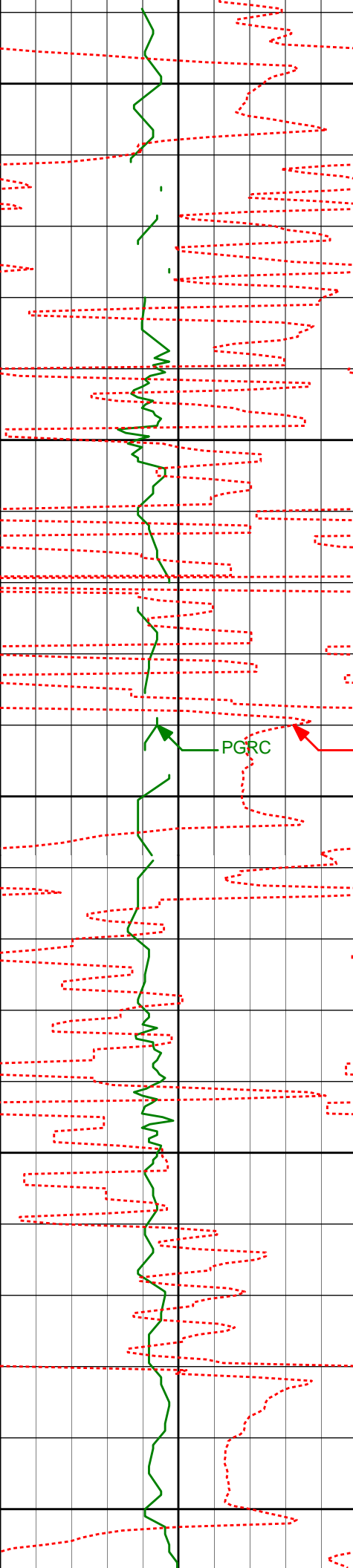


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TVD Main Log 1:240

TVD Main Log 1:240





1350'

1381'

2.28°

254.67°

1380.96'

2.30'

1400'

1450'

1473'

3.77°

248.66°

1472.83'

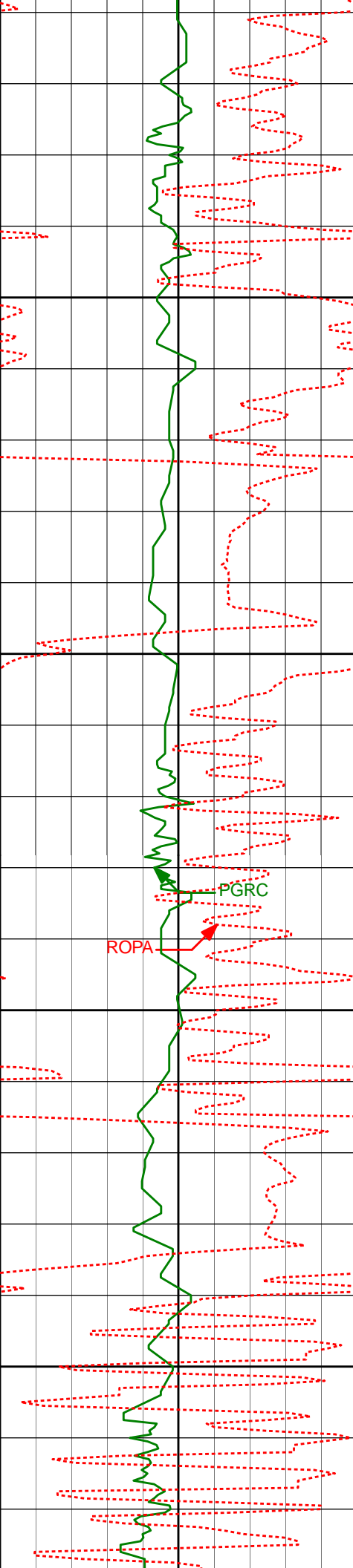
1.82'

1500'

1550'

PGRC

ROPA



1600'

1650'

1700'

1750'

1567'

5.86°

243.10°

1566.50'

0.26'

1660'

7.34°

251.56°

1658.88'

-1.37'

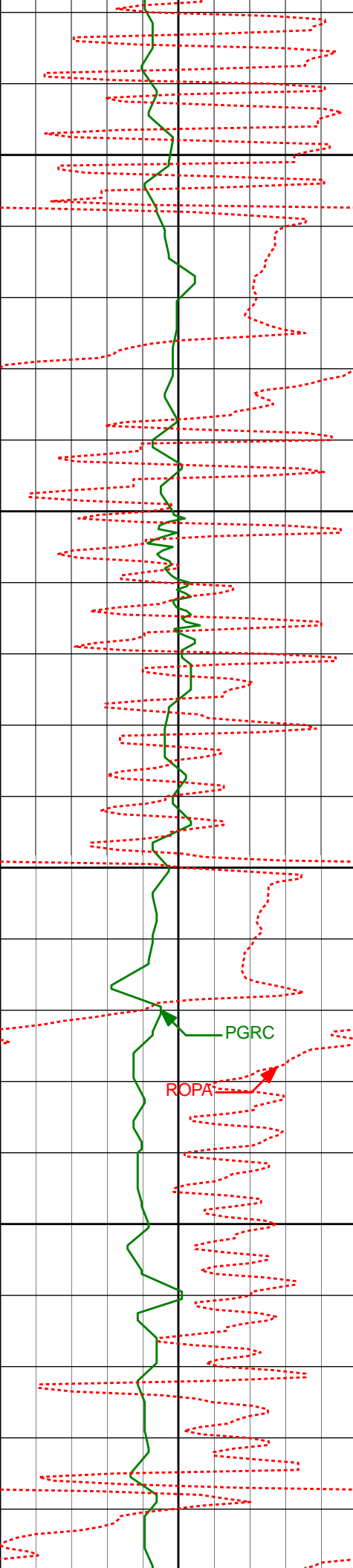
1752'

8.93°

250.11°

1749.95'

-2.71'



1800'

1850'

1900'

1950'

PGRC

ROPA

1844'

10.49°

250.21°

1840.63'

-4.46'

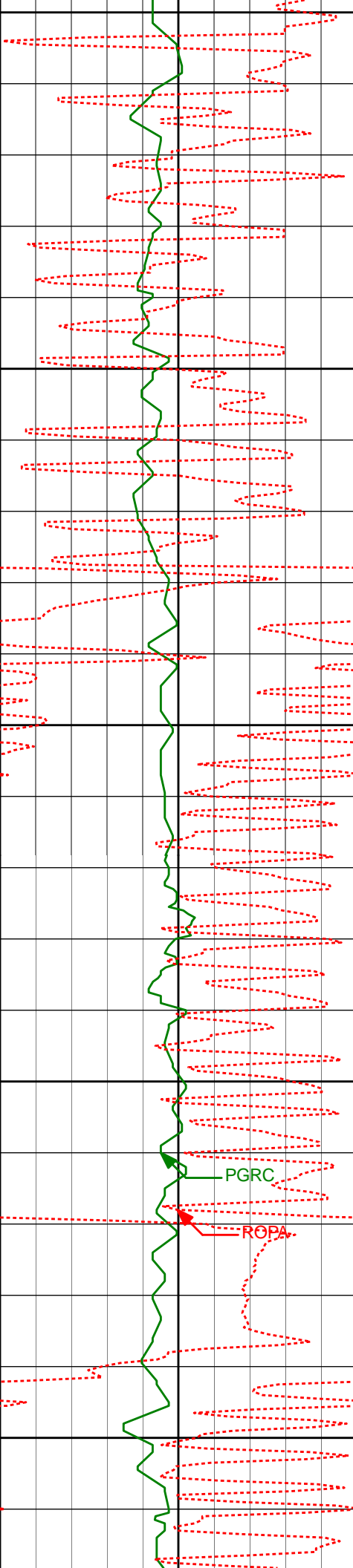
1937'

12.49°

251.25°

1931.77'

-6.35'



2000'

2029'

12.29°

249.13°

2021.62'

-8.56'

2050'

2100'

2122'

11.74°

247.43°

2112.59'

-11.37'

2150'

PGRC

ROPA

2200'

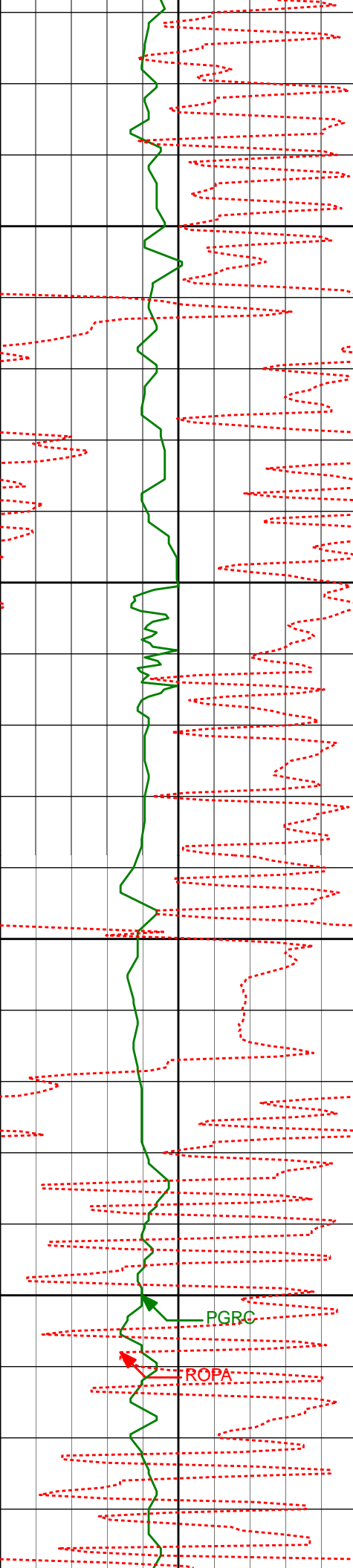
2214'

13.06°

250.82°

2202.44'

-13.93'



2250'

2300'

2350'

2400'

2400'

2306'

12.78°

249.72°

2292.11'

-16.20'

2400'

13.66°

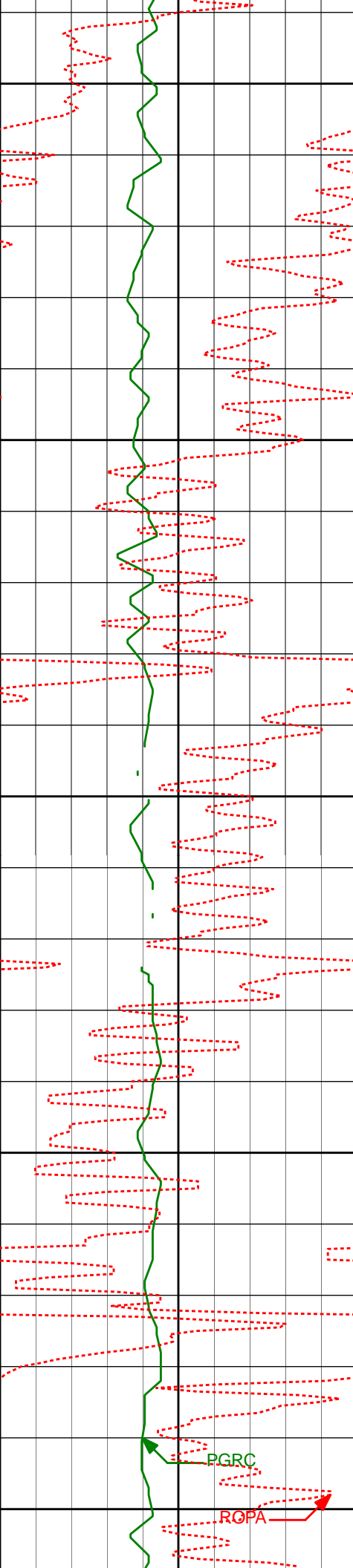
255.50°

2383.62'

-17.68'

PGRC

ROPA



2450'

2494'

13.50°

255.00°

2474.99'

-18.21'

2500'

2550'

2589'

13.49°

254.47°

2567.37'

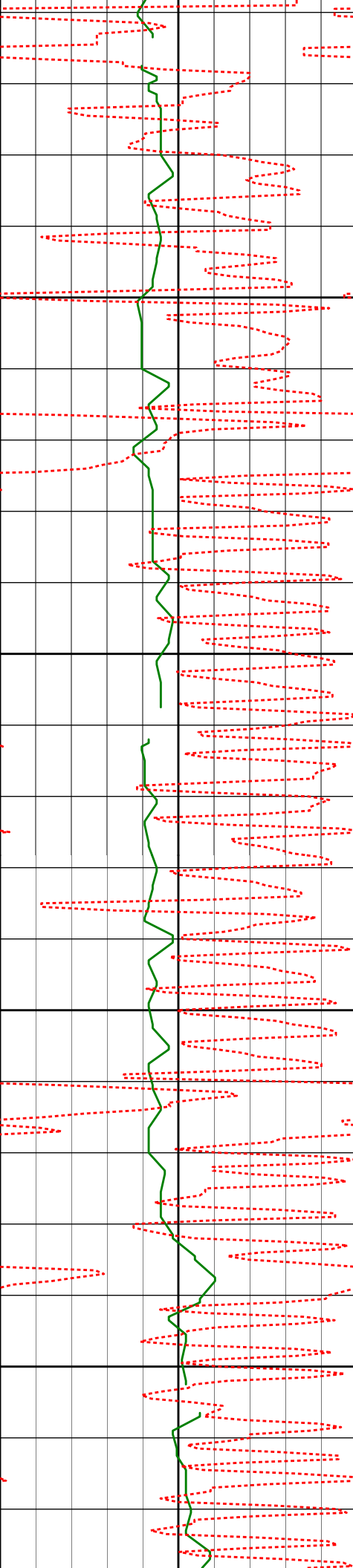
-18.95'

2600'

2650'

PGRC

ROPA



2700'

2750'

2800'

2850'

2684'

13.05°

254.15°

2659.83'

-19.84'

2780'

12.41°

253.23°

2753.47'

-20.92'

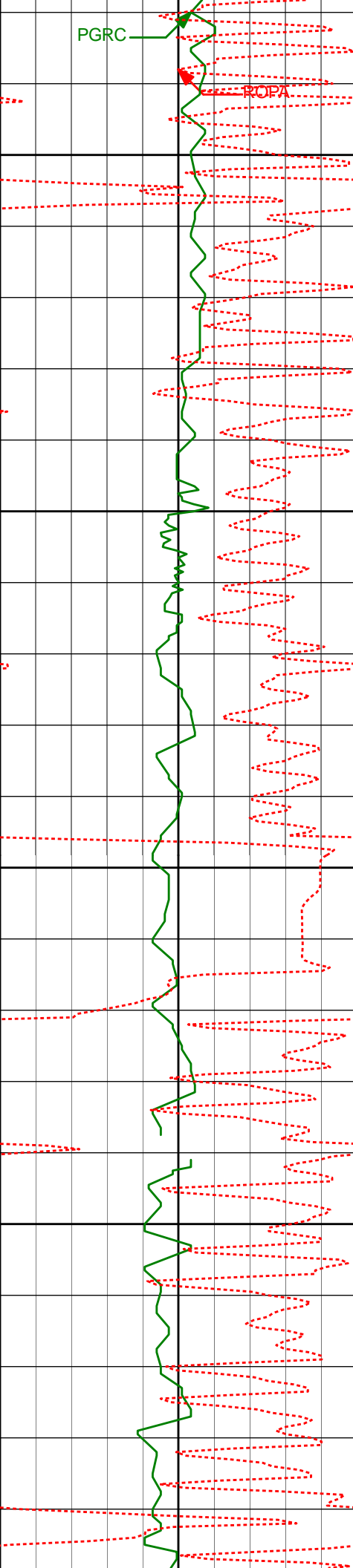
2875'

11.47°

253.31°

2846.42'

-22.08'



2900'

2950'

3000'

3050'

2970'

3065'

10.45°

11.90°

251.55°

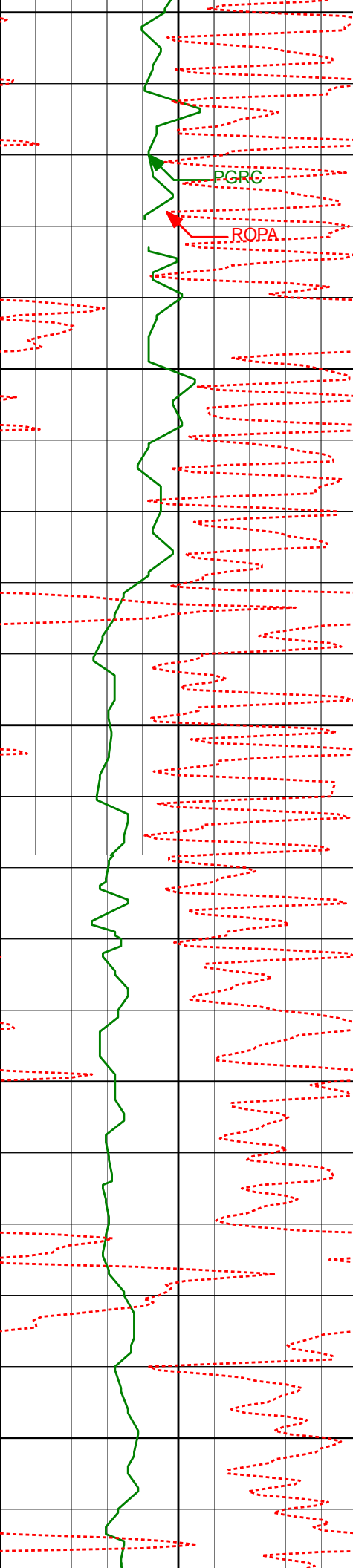
252.35°

2939.69'

3032.88'

-23.39'

-24.89'



3160'

11.90°

251.07°

3125.84'

-26.57'

3255'

12.22°

249.99°

3218.75'

-28.69'

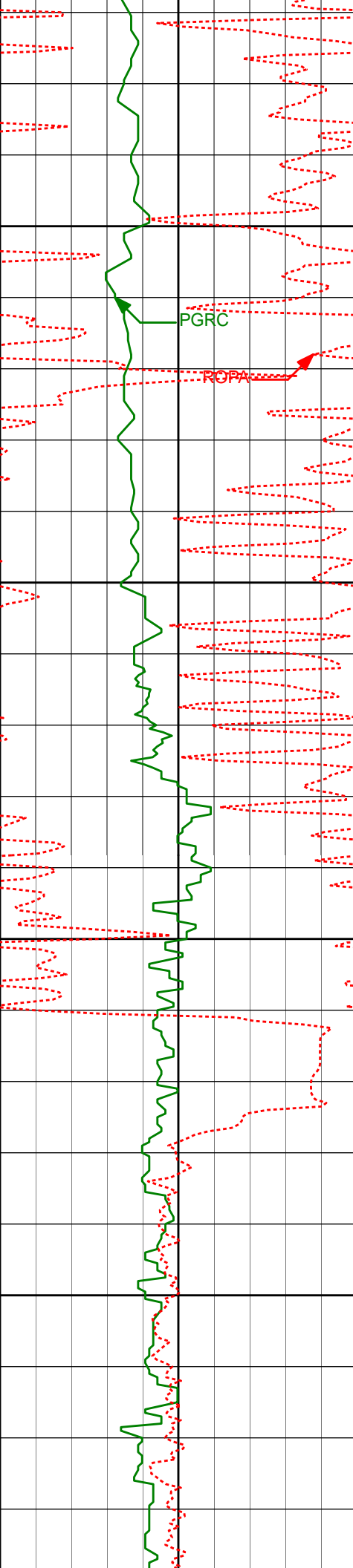
3350'

12.65°

250.04°

3311.52'

-31.04'



3350'

PGRC

ROPA

3400'

3445'

13.08°

250.48°

3404.13'

-33.39'

3450'

3500'

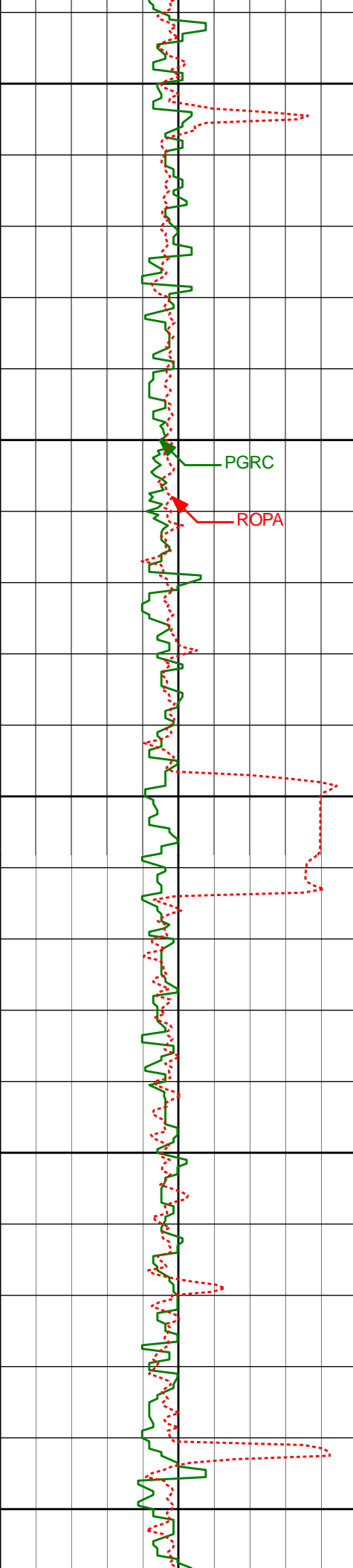
3540'

12.96°

252.28°

3496.69'

-35.36'



3550'

3635'

12.09°

252.07°

3589.43'

-36.96'

3600'

PGRC

ROPA

3650'

3730'

11.87°

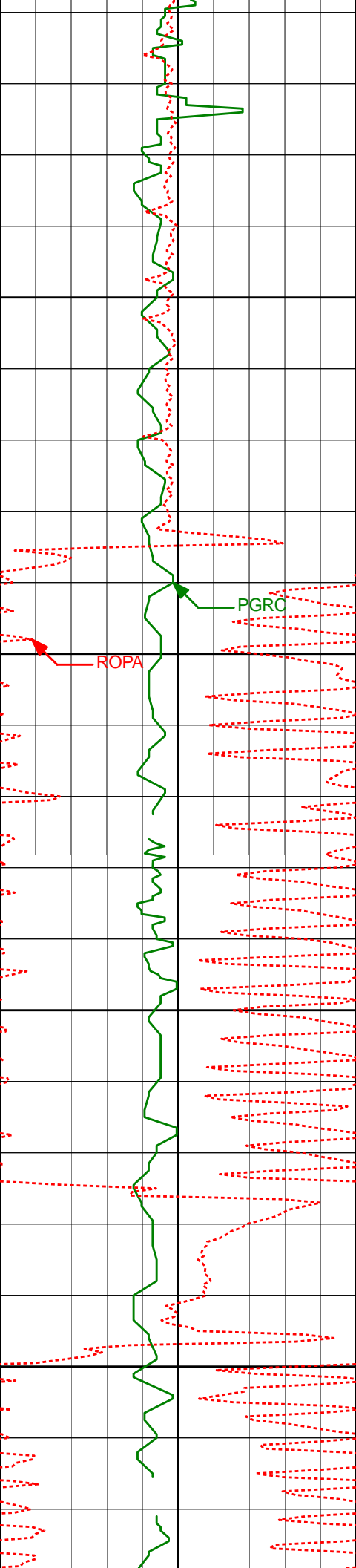
256.91°

3682.36'

-37.70'

3700'

3750'



3825'

10.99°

256.62°

3775.48'

-37.66'

3800'

3850'

3921'

10.47°

256.05°

3869.80'

-37.75'

3900'

3950'

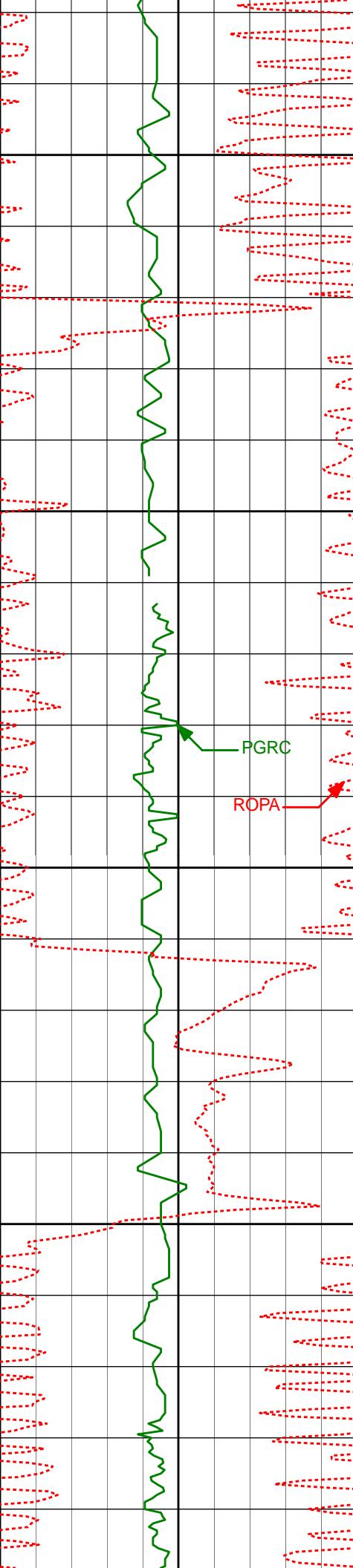
4015'

10.85°

256.98°

3962.18'

-37.79'



4000'

4050'

4100'

4150'

4110'

9.45°

258.55°

4055.69'

-37.48'

PGRC

ROPA

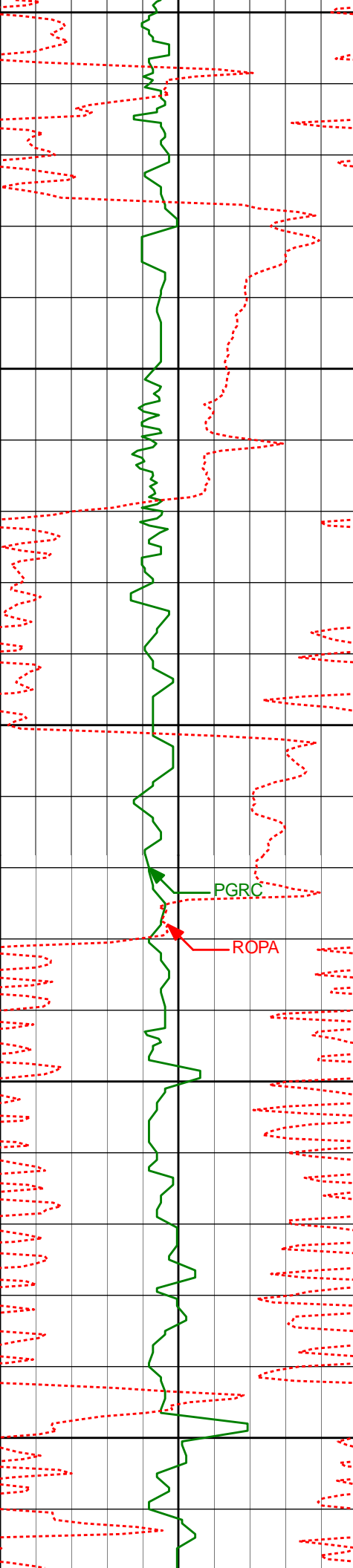
4206'

9.86°

250.95°

4150.33'

-38.03'



4200'

4301'

11.01°

251.38°

4243.76'

-39.67'

4250'

4300'

PGRC

ROPA

4396'

12.98°

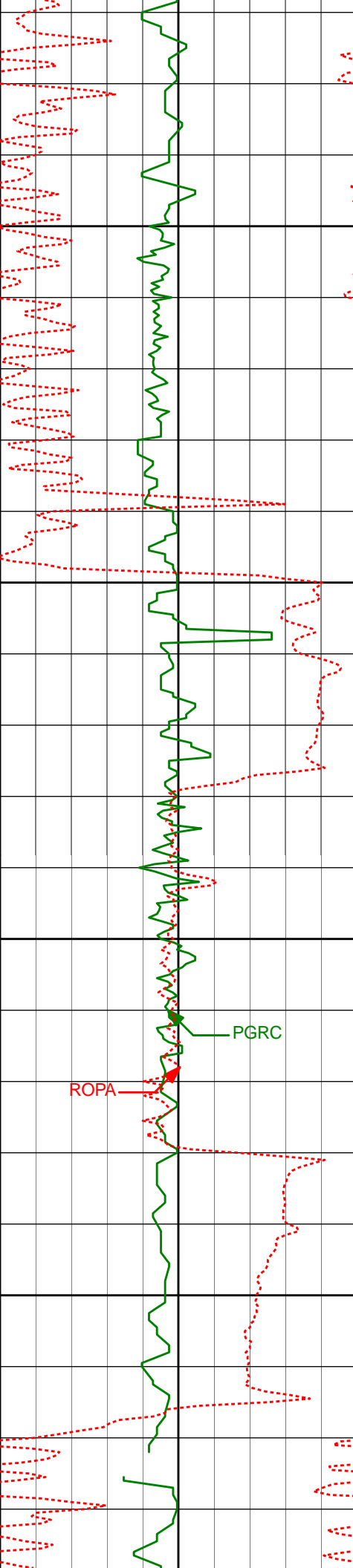
256.66°

4336.68'

-40.50'

4350'

4400'



4450'

4500'

4550'

4600'

4491'

10.77°

257.61°

4429.65'

-40.34'

4586'

9.81°

253.35°

4523.12'

-40.66'

4681'

12.38°

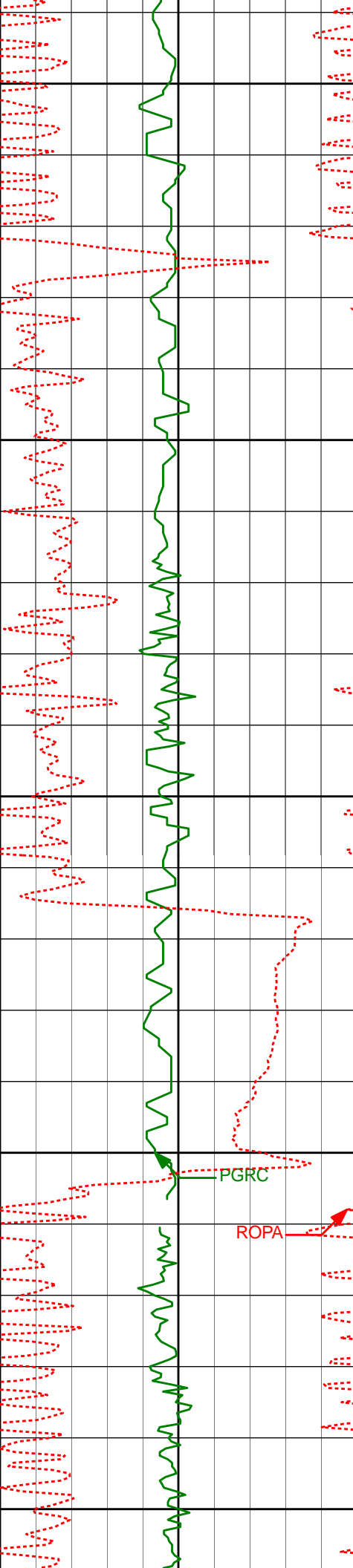
256.46°

4616.33'

-41.16'

PGRC

ROPA



4650'

4700'

4750'

4800'

4850'

4776'

10.18°

252.39°

4709.50'

-41.81'

4872'

12.32°

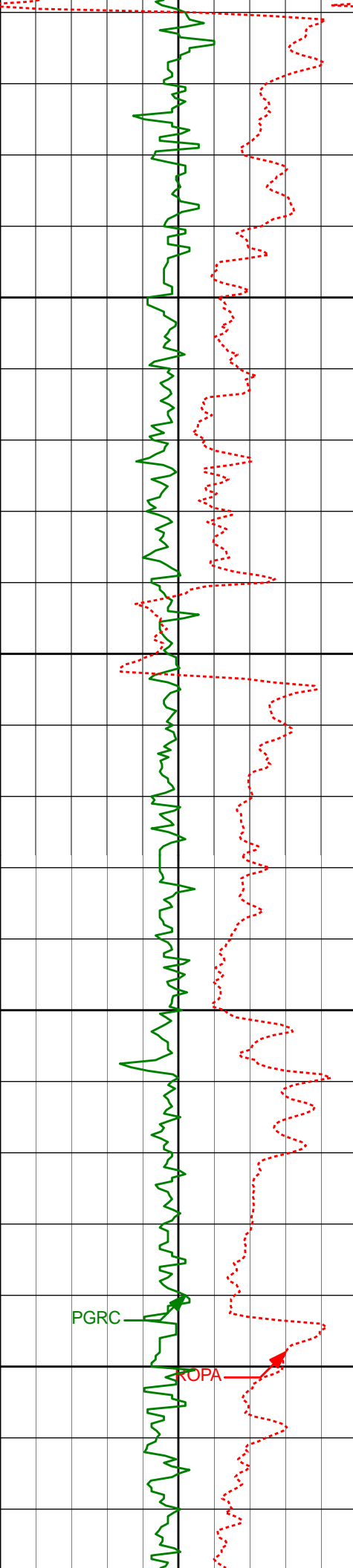
250.93°

4803.65'

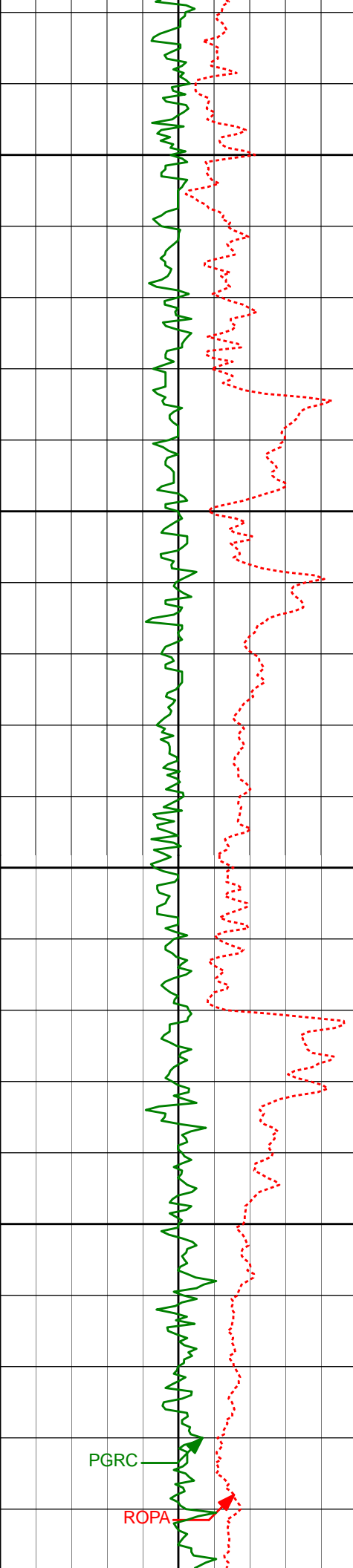
-43.46'

PGRC

ROPA



4900'	4966'	11.44°	255.96°	4895.63'	-44.57'
4950'					
5000'	5061'	17.20°	265.05°	4987.65'	-42.62'
5050'					



5100'

5150'

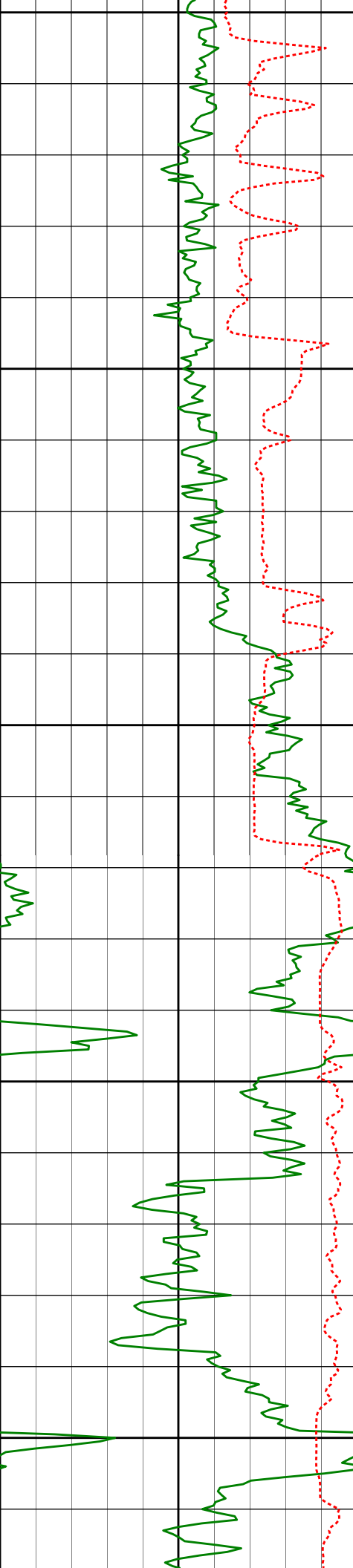
5200'

5250'

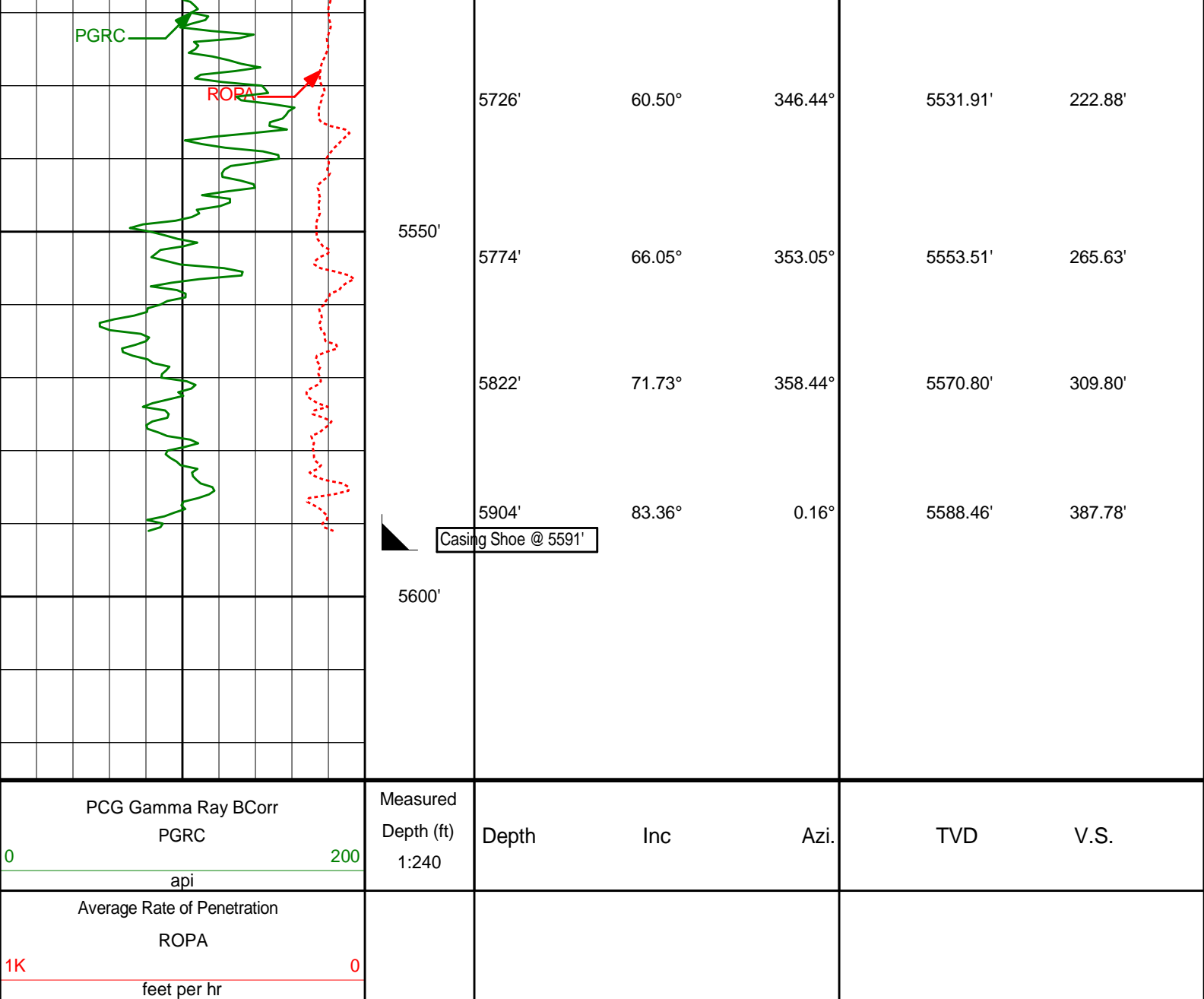
PGRC

ROPA

5157'	19.63°	277.04°	5078.76'	-34.93'
5251'	24.55°	283.24°	5165.85'	-20.67'
5347'	28.40°	294.20°	5251.81'	2.20'
5395'	32.22°	302.21°	5293.26'	18.31'



5300'				
5441'	33.80°	308.77°	5331.85'	37.18'
5350'				
5489'	36.27°	313.86°	5371.16'	59.66'
5400'				
5536'	38.74°	319.15°	5408.45'	84.40'
Run 200				
5450'				
5631'	48.94°	334.25°	5477.07'	146.09'
5500'				
5679'	54.74°	340.38°	5506.73'	183.29'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Davis State LD02-73HN
Wattenberg
Weld Colorado
USA
CA-XX-0901831239

The first three surveys at 364', 640', and 920' 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
364.00	0.10	257.91	364.00	0.07 S	0.31 W	0.01	0.03
640.00	0.40	38.41	640.00	0.64 N	0.05 E	0.61	0.17
920.00	0.00	209.11	920.00	1.40 N	0.66 E	1.21	0.14
1288.00	0.40	301.96	1287.99	2.09 N	0.43 W	2.13	0.11
1381.00	2.28	254.67	1380.96	1.77 N	2.50 W	2.30	2.18
1473.00	3.77	248.66	1472.83	0.19 N	7.08 W	1.82	1.65
1567.00	5.86	243.10	1566.50	3.11 S	14.23 W	0.26	2.28
1660.00	7.34	251.56	1658.88	7.14 S	24.10 W	-1.37	1.90

1752.00	8.93	250.11	1749.95	11.42 S	36.39 W	-2.71	1.74
1844.00	10.49	250.21	1840.63	16.69 S	50.98 W	-4.46	1.70
1937.00	12.49	251.25	1931.77	22.79 S	68.47 W	-6.35	2.16
2029.00	12.29	249.13	2021.62	29.47 S	87.04 W	-8.56	0.54
2122.00	11.74	247.43	2112.59	36.63 S	105.02 W	-11.37	0.70
2214.00	13.06	250.82	2202.44	43.64 S	123.49 W	-13.93	1.63
2306.00	12.78	249.72	2292.11	50.58 S	142.85 W	-16.20	0.40
2400.00	13.66	255.50	2383.62	56.96 S	163.34 W	-17.68	1.69
2494.00	13.50	255.00	2474.99	62.58 S	184.69 W	-18.21	0.21
2589.00	13.49	254.47	2567.37	68.42 S	206.08 W	-18.95	0.13
2684.00	13.05	254.15	2659.83	74.32 S	227.07 W	-19.84	0.47
2780.00	12.41	253.23	2753.47	80.25 S	247.37 W	-20.92	0.70
2875.00	11.47	253.31	2846.42	85.91 S	266.19 W	-22.08	0.99
2970.00	10.45	251.55	2939.69	91.35 S	283.41 W	-23.39	1.13
3065.00	11.90	252.35	3032.88	97.05 S	300.91 W	-24.89	1.53
3160.00	11.90	251.07	3125.84	103.19 S	319.51 W	-26.57	0.28
3255.00	12.22	249.99	3218.75	109.81 S	338.21 W	-28.69	0.41
3350.00	12.65	250.04	3311.52	116.80 S	357.44 W	-31.04	0.46
3445.00	13.08	250.48	3404.13	123.94 S	377.35 W	-33.39	0.46
3540.00	12.96	252.28	3496.69	130.78 S	397.63 W	-35.36	0.45
3635.00	12.09	252.07	3589.43	137.08 S	417.24 W	-36.96	0.91
3730.00	11.87	256.91	3682.36	142.35 S	436.22 W	-37.70	1.08
3825.00	10.99	256.62	3775.48	146.66 S	454.54 W	-37.66	0.93
3921.00	10.47	256.05	3869.80	150.88 S	471.91 W	-37.75	0.55
4015.00	10.85	256.98	3962.18	154.93 S	488.81 W	-37.79	0.45
4110.00	9.45	258.55	4055.69	158.50 S	505.17 W	-37.48	1.50
4206.00	9.86	250.95	4150.33	162.74 S	520.66 W	-38.03	1.39
4301.00	11.01	251.38	4243.76	168.30 S	536.95 W	-39.67	1.22
4396.00	12.98	256.66	4336.68	173.66 S	555.94 W	-40.50	2.37
4491.00	10.77	257.61	4429.65	178.02 S	574.99 W	-40.34	2.34
4586.00	9.81	253.35	4523.12	182.25 S	591.42 W	-40.66	1.28
4681.00	12.38	256.46	4616.33	186.95 S	609.08 W	-41.16	2.77
4776.00	10.18	252.39	4709.50	191.88 S	626.98 W	-41.81	2.46
4872.00	12.32	250.93	4803.65	197.79 S	644.74 W	-43.46	2.25
4966.00	11.44	255.96	4895.63	203.33 S	663.27 W	-44.57	1.44
5061.00	17.20	265.05	4987.65	206.83 S	686.43 W	-42.62	6.49
5157.00	19.63	277.04	5078.76	206.08 S	716.59 W	-34.93	4.67
5251.00	24.55	283.24	5165.85	199.67 S	751.30 W	-20.67	5.79
5347.00	28.40	294.20	5251.81	185.73 S	791.57 W	2.20	6.47
5395.00	32.22	302.21	5293.26	174.22 S	812.83 W	18.31	11.57
5441.00	33.80	308.77	5331.85	159.67 S	833.19 W	37.18	8.48
5489.00	36.27	313.86	5371.16	141.46 S	853.84 W	59.66	7.97
5536.00	38.74	319.15	5408.45	120.70 S	873.50 W	84.40	8.62
5631.00	48.94	334.25	5477.07	65.66 S	908.69 W	146.09	15.33
5679.00	54.74	340.38	5506.73	30.85 S	923.15 W	183.29	15.69
5726.00	60.50	346.44	5531.91	7.16 N	934.40 W	222.88	16.39
5774.00	66.05	353.05	5553.51	49.31 N	941.96 W	265.63	16.88
5822.00	71.73	358.44	5570.80	93.93 N	945.24 W	309.80	15.80
5904.00	83.36	0.16	5588.46	173.85 N	946.19 W	387.78	14.33
5988.00	91.88	3.07	5591.94	257.66 N	943.82 W	468.78	10.71
6081.00	92.10	3.97	5588.72	350.43 N	938.11 W	557.72	1.00
6173.00	93.05	0.55	5584.59	442.25 N	934.49 W	646.21	3.86
6267.00	91.45	358.89	5580.90	536.17 N	934.95 W	737.70	2.45
6362.00	91.17	358.93	5578.73	631.13 N	936.76 W	830.50	0.30
6457.00	91.33	358.50	5576.66	726.08 N	938.89 W	923.38	0.49
6552.00	91.69	358.39	5574.15	821.01 N	941.47 W	1016.34	0.41
6647.00	89.78	358.43	5572.93	915.96 N	944.11 W	1109.33	2.01
6742.00	90.22	358.22	5572.93	1010.92 N	946.89 W	1202.36	0.50
6837.00	90.46	358.01	5572.36	1105.87 N	950.02 W	1295.46	0.34
6932.00	90.83	357.41	5571.29	1200.79 N	953.81 W	1388.69	0.74
7027.00	90.96	359.39	5569.81	1295.73 N	956.46 W	1481.68	2.09
7122.00	88.74	359.15	5570.07	1390.72 N	957.67 W	1574.37	2.35
7217.00	89.14	358.65	5571.83	1485.69 N	959.49 W	1667.19	0.67
7312.00	89.97	358.65	5572.57	1580.66 N	961.73 W	1760.11	0.88
7407.00	88.86	357.95	5573.54	1675.61 N	964.55 W	1853.14	1.38
7502.00	88.65	357.47	5575.61	1770.51 N	968.35 W	1946.35	0.55
7597.00	89.57	359.70	5577.09	1865.46 N	970.69 W	2039.27	2.54
7692.00	90.55	0.47	5576.99	1960.46 N	970.55 W	2131.67	1.32
7787.00	90.52	359.81	5576.09	2055.45 N	970.31 W	2224.04	0.70
7882.00	90.83	359.52	5574.97	2150.45 N	970.87 W	2316.59	0.44
7977.00	91.33	359.31	5573.18	2245.42 N	971.84 W	2409.22	0.57
8072.00	90.34	358.46	5571.80	2340.39 N	973.69 W	2502.05	1.36
8168.00	90.77	358.30	5570.87	2436.35 N	976.39 W	2596.03	0.48
8263.00	91.32	358.17	5569.13	2531.29 N	979.32 W	2689.08	0.60
8358.00	90.43	357.67	5568.24	2626.22 N	982.33 W	2782.22	2.00

8358.00	88.43	357.67	5569.34	2626.22 N	982.77 W	2782.23	3.09
8453.00	88.46	356.92	5571.92	2721.07 N	987.25 W	2875.56	0.79
8548.00	89.17	356.91	5573.88	2815.92 N	992.36 W	2969.01	0.75
8643.00	89.97	357.05	5574.60	2910.78 N	997.37 W	3062.47	0.86
8738.00	90.80	356.92	5573.96	3005.65 N	1002.38 W	3155.92	0.89
8833.00	91.23	356.19	5572.28	3100.46 N	1008.09 W	3249.49	0.89
8928.00	88.98	358.10	5572.10	3195.33 N	1012.81 W	3342.89	3.11
9023.00	88.27	357.57	5574.37	3290.23 N	1016.40 W	3436.05	0.94
9118.00	88.64	357.56	5576.93	3385.11 N	1020.44 W	3529.29	0.39
9213.00	89.01	358.46	5578.87	3480.03 N	1023.73 W	3622.41	1.02
9308.00	88.80	357.53	5580.68	3574.96 N	1027.05 W	3715.53	1.00
9403.00	89.85	356.19	5581.81	3669.81 N	1032.25 W	3809.01	1.80
9498.00	89.32	357.85	5582.50	3764.67 N	1037.20 W	3902.45	1.83
9593.00	89.60	357.74	5583.39	3859.60 N	1040.86 W	3995.65	0.31
9688.00	92.34	358.83	5581.78	3954.53 N	1043.70 W	4088.68	3.11
9783.00	92.25	358.63	5577.98	4049.43 N	1045.81 W	4181.50	0.23
9878.00	92.53	358.06	5574.02	4144.31 N	1048.56 W	4274.44	0.66
9973.00	92.25	358.38	5570.06	4239.18 N	1051.51 W	4367.43	0.44
10068.00	92.34	358.96	5566.25	4334.08 N	1053.71 W	4460.26	0.62
10125.00	93.08	358.89	5563.55	4391.00 N	1054.78 W	4515.90	1.31
10182.00	93.08	358.89	5560.49	4447.91 N	1055.88 W	4571.52	0.01

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 346.64 DEGREES (GRID)
A TOTAL CORRECTION OF 6.91 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10182.00 FEET
IS 4571.52 FEET ALONG 346.65 DEGREES (GRID)**

Final survey is a straight line projection to TD.