

PCD Pressure Case Gamma Ray

1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	15-Jul-13	19-Jul-13	20-Jul-13		
Rig Bit Number	0100	0200	0300		
Bit Size (in)	13.500	8.750	8.750		
Tool Nominal OD (in)	6.750	6.75	4.750		
Log Start Depth (MD, ft)	0.00	947.00	7,569.00		
Log End Depth (MD, ft)	947.00	7,569.00	7,775.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	14-Jul-13 06:05	14-Jul-13 23:23	19-Jul-13 14:00		
Drill/Wipe End Date and Time	14-Jul-13 22:45	14-Jul-13 23:23	20-Jul-13 01:15		
Min Inc (deg) @ Depth (MD, ft)	.14 @ 601.00	.10 @ 5,790.00	70.32 @ 7,598.00		
Max Inc (deg) @ Depth (MD, ft)	.70 @ 891.00	63.94 @ 7,550.00	88.30 @ 7,732.00		
Bit TFA(in2) / Bit Type	1.49 / PDC	1.04 / PDC	.92 / Tricone		
Flow Rate (gpm)	541.32	585.72	505.33		
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A	N/A / N/A		
Fluid Type	Native/Spud Mud	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.50 / 28.00	9.38 / 39.00	10.20 / 36.00		
Filtrate CL (ppm)	400.00	N/A	850.00		
pH / Fluid Loss (mptm)	8.00 / 0	9.50 / 6	8.60 / 6		
PV (cP) / YP (lbf2)	1 / 4.00	13 / 11.00	13 / 11.00		
% Solids / % Sand	1.2 / 0	N/A / 1.00	9.8 / 1.00		
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	N/A / N/A		
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Max Tool Temp (degF) / Source	96.42 / PCM	185.02 / PCM	205.16 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ 96.42	N/A @ 185.02	N/A @ 205.16		
Lead MWD Engineer	Matt Busche	Matt Busche	Matt Busche		
Customer Representative	Sam Taylor	Sam Taylor	Terry Bradshaw		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11847568	11341324	11341324		
Insert Serial Number	11145581	11227549	11145581		
Date and Time Initialized	13-Jul-13 18:39	15-Jul-13 13:33	19-Jul-13 00:21		
Date and Time Read	15-Jul-13 04:23	19-Jul-13 08:29	20-Jul-13 15:33		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	56.00	45.28	42.18		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11847568	11341324	11341324		
Sonde Serial Number	11833228	11297584	11833228		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	111.28	276.84	199.17		

Gamma Ray Sensor Information

Tool Type	N/A	PCG	PCG		
Distance From Bit (ft)	N/A	50.23	47.13		
Recorded Sample Period (sec)	N/A	10	10		
Software Version	N/A	8.15	8.15		
Sub Serial Number	N/A	11341324	11341324		
Insert/Sonde Serial Number	N/A	11579782	11293285		

Pulser Controller Sensor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
PIC Software Version	1.30	1.40	1.30		
Sub/HOC Serial Number	11847568	11341324	11341324		
Insert/Probe/Module SN	11145581	11227549	11145581		
Battery Serial Number	N/A	N/A	N/A		
Valve Insert SN	N/A	N/A	N/A		
DC Insert Serial Number	N/A	N/A	N/A		
Choke Size (32nd)	N/A	N/A	N/A		
Driver Current (amps)	N/A	N/A	N/A		
Driver SMI Current (amps)	N/A	N/A	N/A		
Boot Strap Version	4,130.00	4,130.00	4,130.00		

REMARKS

1. All depths are calibrated to the driller's pipe tally and are measured bit depths, measured from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities have been calculated using the "Power Law" model for water based fluids and the "Bingha Plastic" model for syntheic and oil based fluids.
4. All data presented is recorded (memory) data unless otherwise stated.
ROPA is realtime data
5. Enviromental parameters used to process the data are as follows:
Hole Diameter: 8.75 inches
Mud Weight: 8.5-10.2 ppg
KCl Concentration: 0%

6. The following smoothing parameters have been applied to the data:
ROPA: 0.5 ft interval, 1.2 ft coercion distance, 3 ft gap fill
PGRC: 0.5 ft interval, 0.6 ft coercion distance, 3 ft gap fill

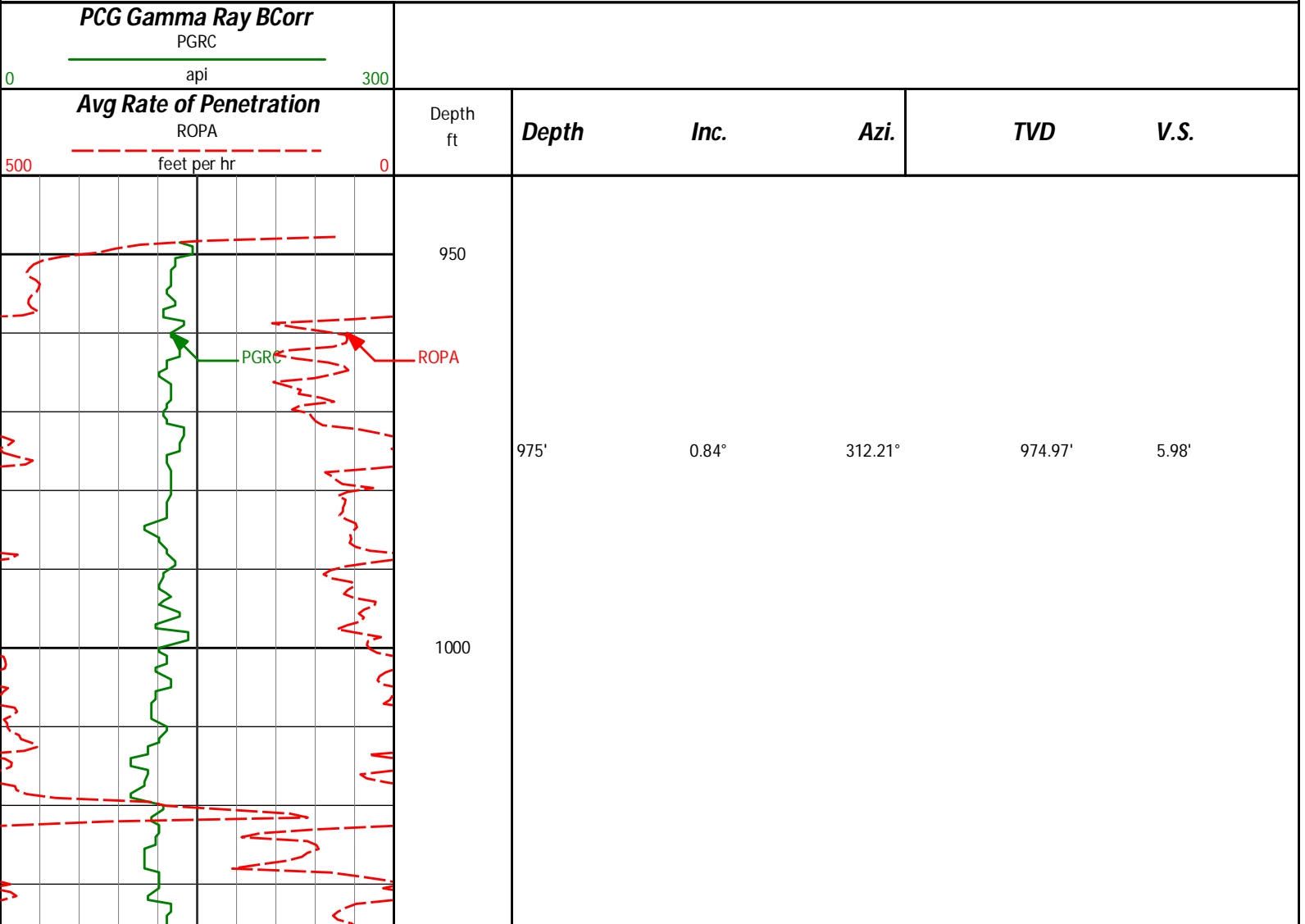
7. Insite Version 7.4.2

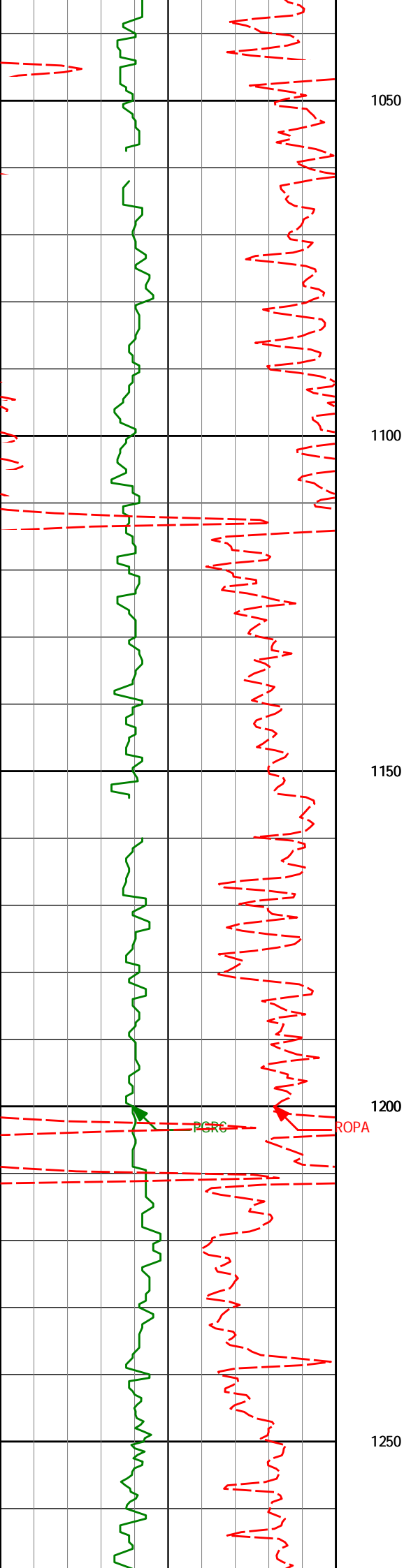
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Sperry Drilling Services
TVD Detail Log 1:240

Anadarko
USA Fed 29C-36HZ
Ensign 132
Weld County, CO





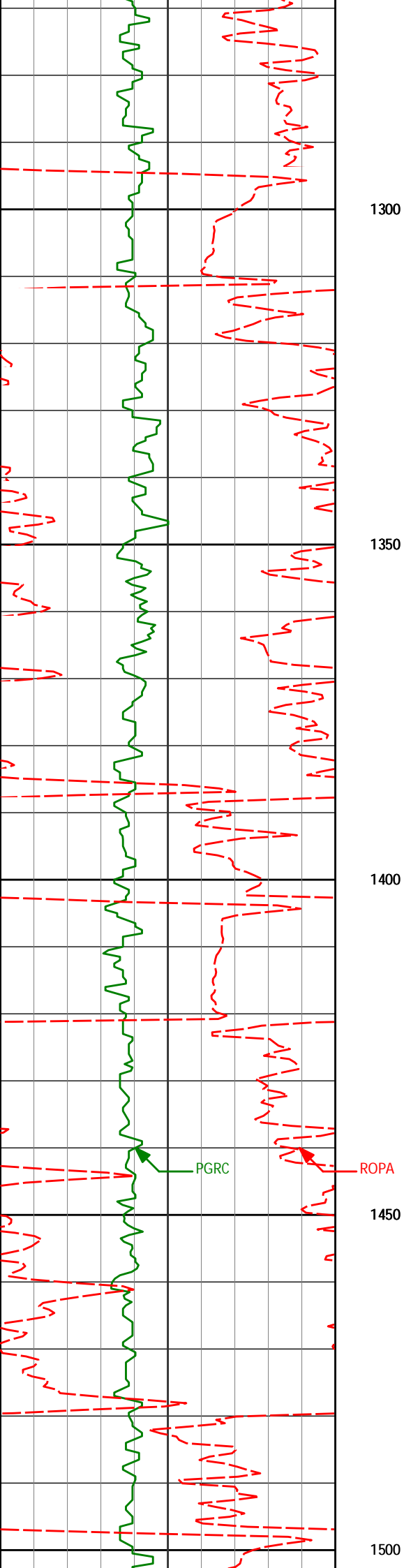
1249'

1.21°

312.68°

1248.92'

9.37'



1341'

3.11°

275.36°

1340.86'

10.32'

1300

1350

1400

1432'

4.65°

255.86°

1431.65'

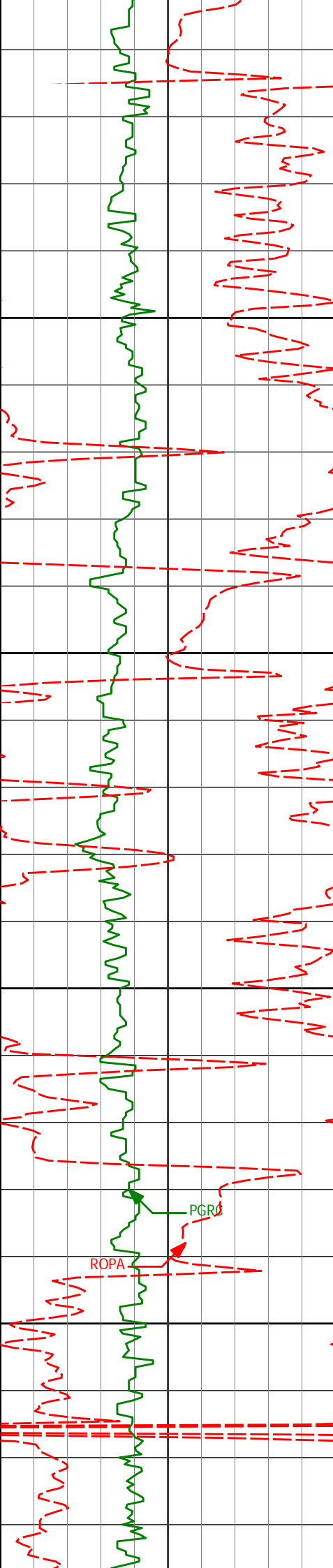
9.78'

1450

1500

PGRC

ROPA



1550

1600

1650

1700

1524'

6.65°

242.65°

1523.20'

6.59'

1616'

7.84°

230.04°

1614.47'

0.31'

1708'

8.86°

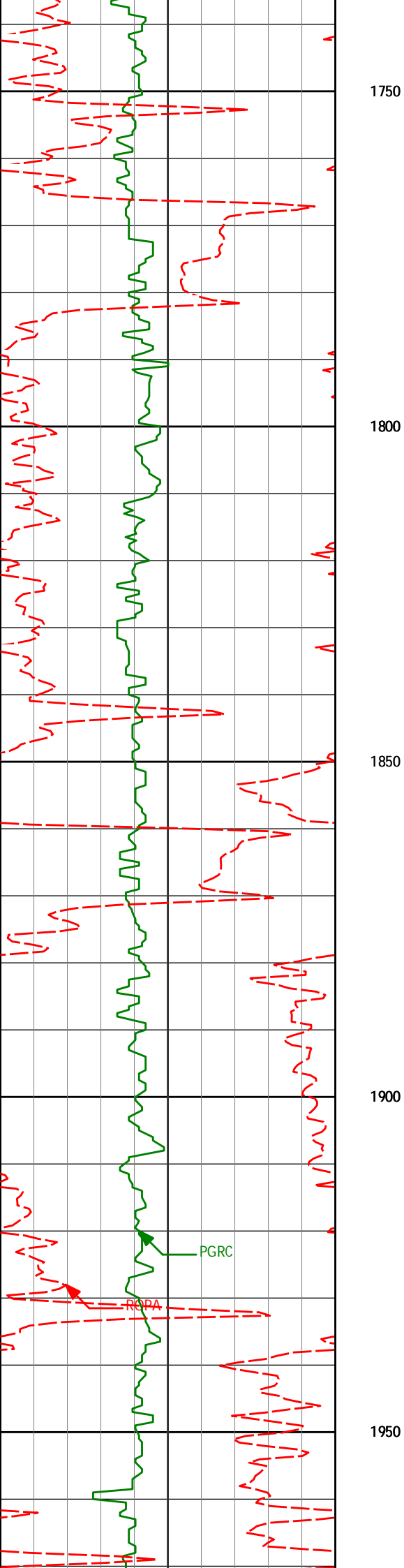
219.98°

1705.50'

-8.95'

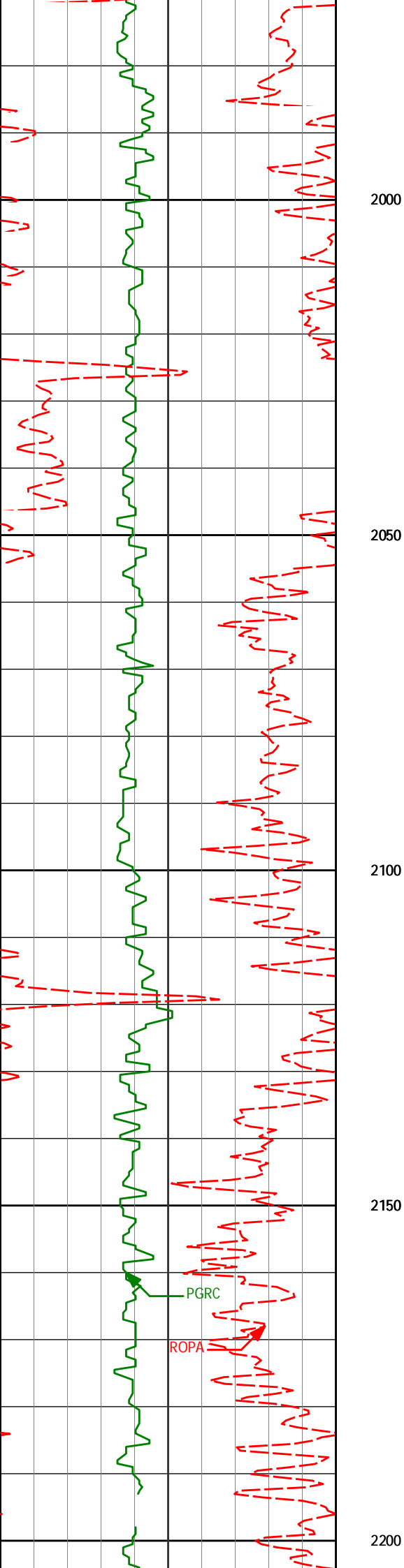
PGR

ROPA



1799' 9.77° 207.49° 1795.31' -21.00'

1891' 11.21° 209.58° 1885.77' -35.53'



1986' 11.35° 209.07° 1978.93' -51.54'

2000

2050

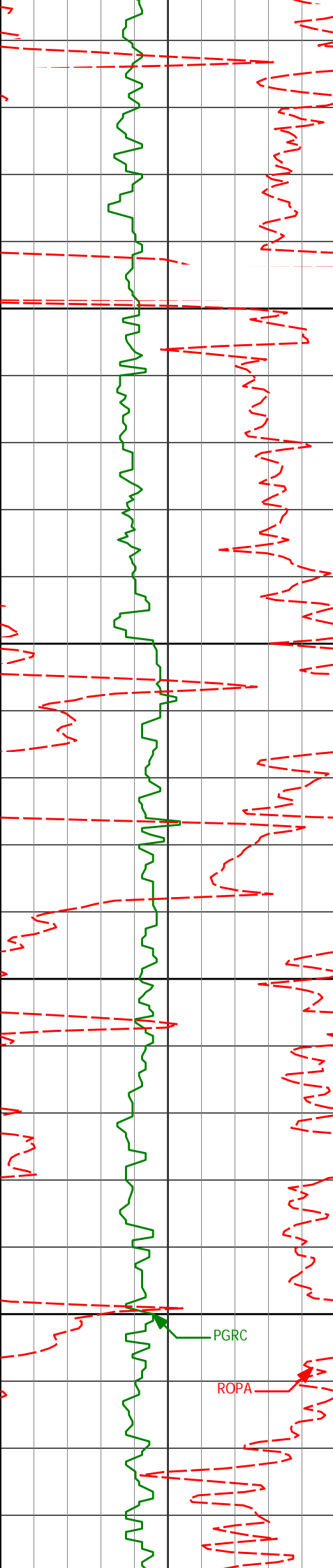
2081' 11.03° 208.76° 2072.13' -67.49'

2100

2150

2176' 10.59° 209.39° 2165.44' -82.88'

2200



2250

2300

2350

2400

2271'

10.05°

209.93°

2258.91'

-97.49'

2366'

11.23°

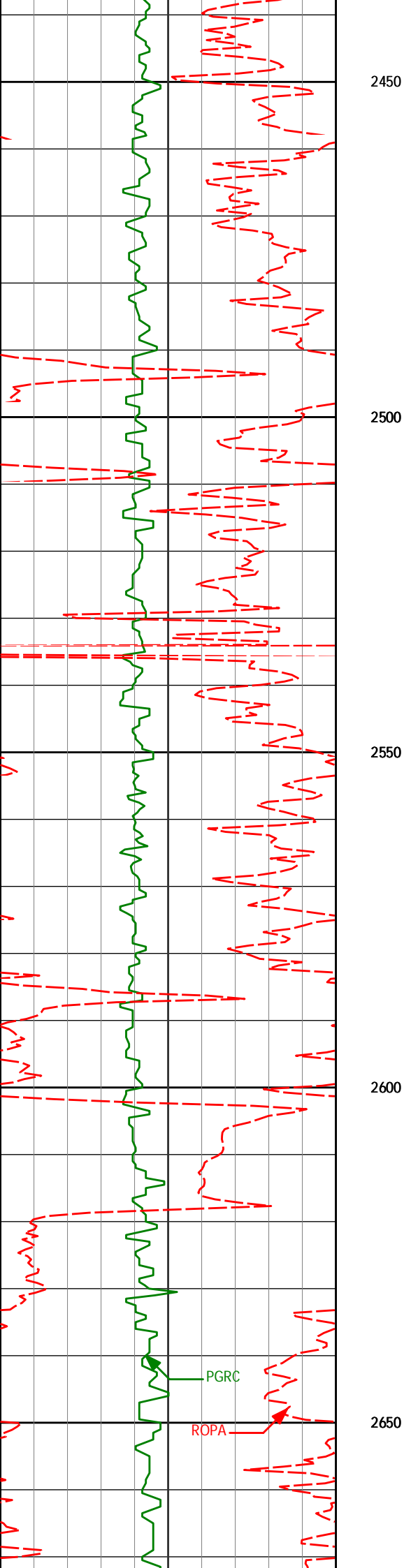
209.92°

2352.27'

-112.51'

PGRC

ROPA



2556'

9.06°

212.22°

2539.29'

-140.84'

2651'

10.54°

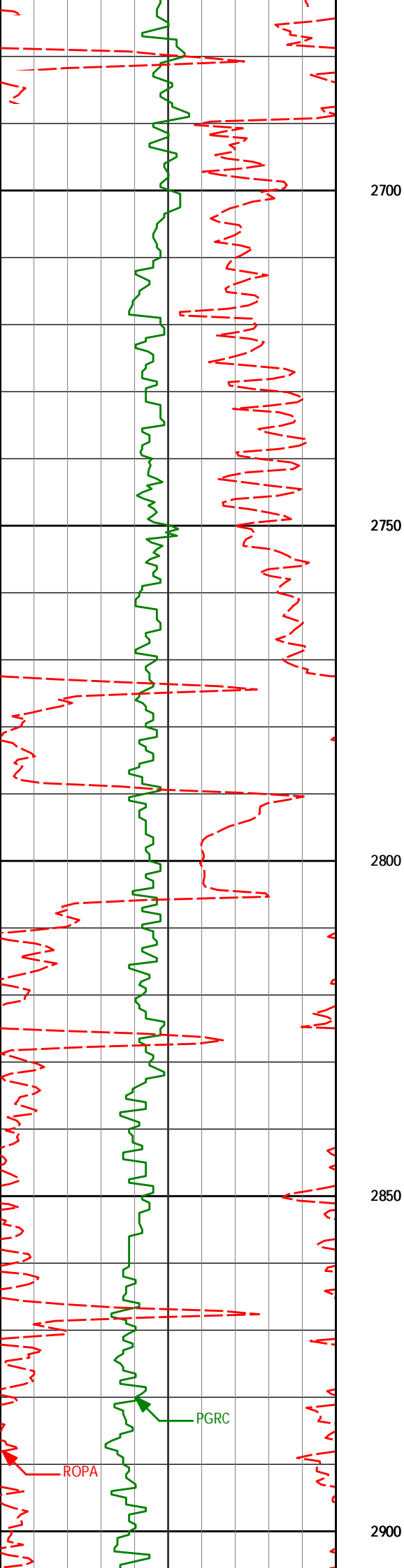
207.51°

2632.90'

-154.70'

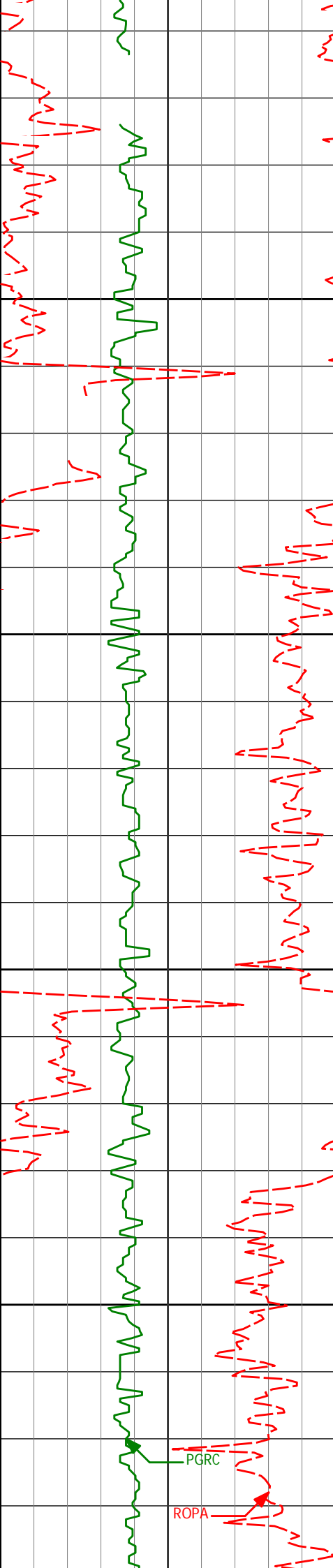
PGRC

ROPA



2746'	9.16°	209.29°	2726.50'	-168.84'
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2842'	10.74°	210.38°	2821.05'	-183.05'
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2950

3000

3050

3100

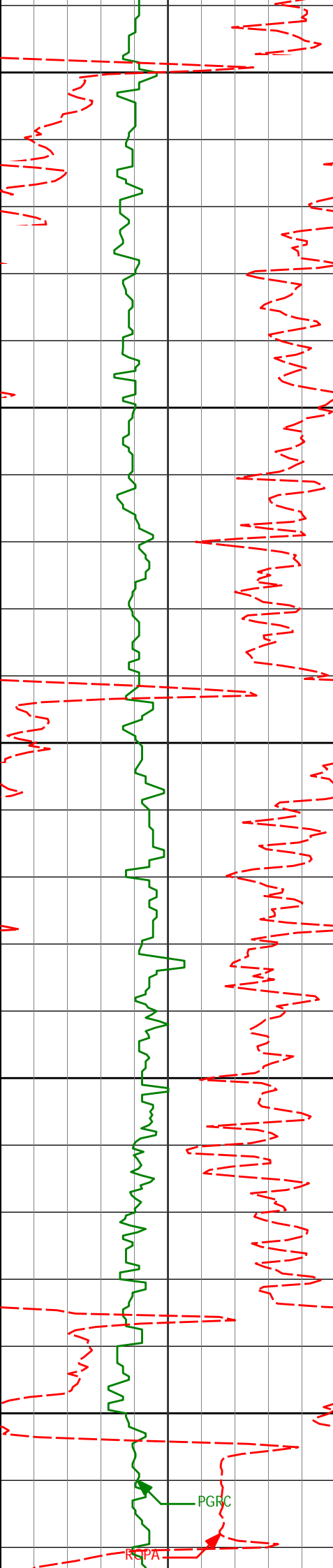
2937'	10.74°	212.42°	2914.39'	-197.96'
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3032'	10.80°	212.55°	3007.72'	-212.74'
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3127'	10.65°	212.76°	3101.06'	-227.42'
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PGRC

ROPA



3150

3222'

10.51°

214.31°

3194.44'

-241.76'

3200

3250

3317'

9.35°

213.18°

3288.02'

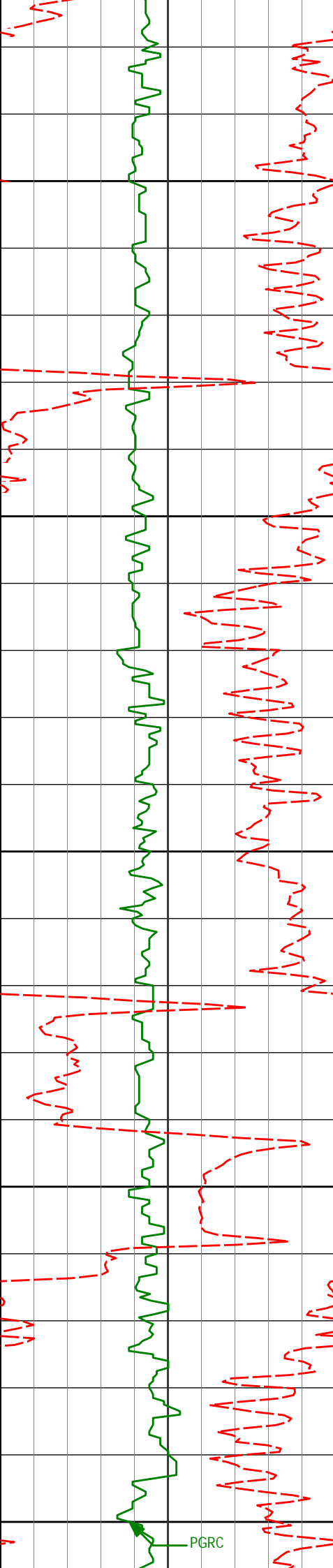
-255.18'

3300

3350

PGRC

RCPA



3412'

10.41°

208.97°

3381.61'

-268.97'

3400

3450

3508'

9.61°

210.67°

3476.15'

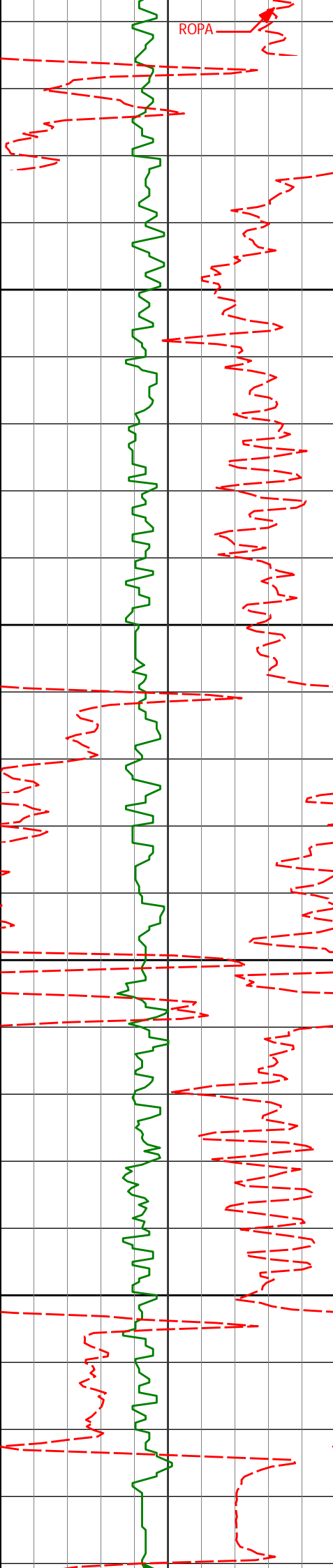
-283.28'

3500

3550

3600

PGRC



3650

3698'

9.78°

207.72°

3663.43'

-310.87'

3700

3750

3793'

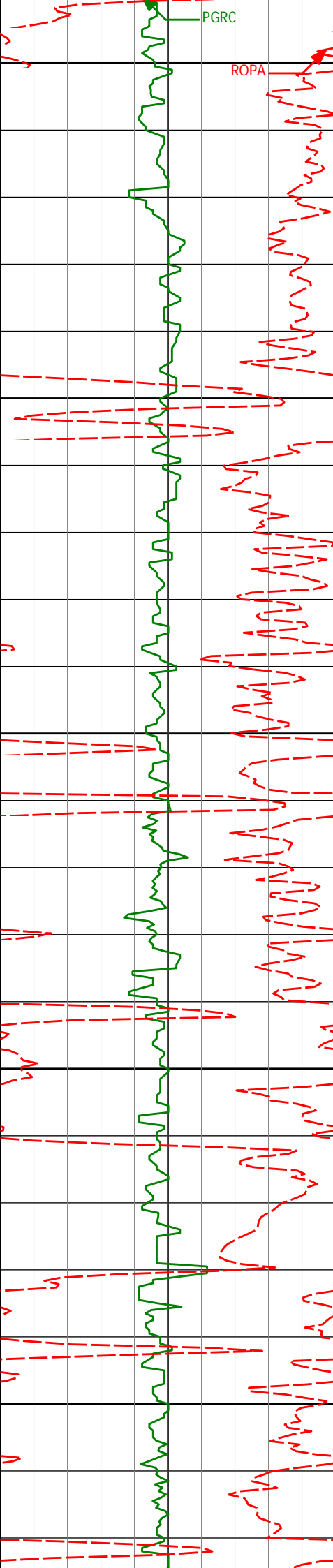
8.46°

208.58°

3757.23'

-324.00'

3800



3850

3900

3950

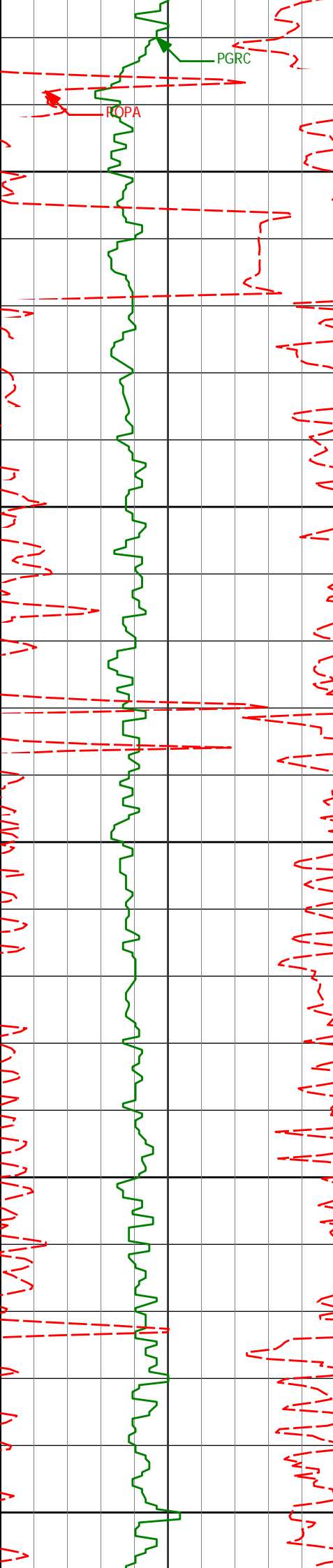
4000

4050

3888'	9.93°	210.03°	3851.01'	-337.07'
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3983'	8.78°	210.49°	3944.74'	-350.25'
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4078'	9.67°	206.31°	4038.51'	-363.50'
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4100

4150

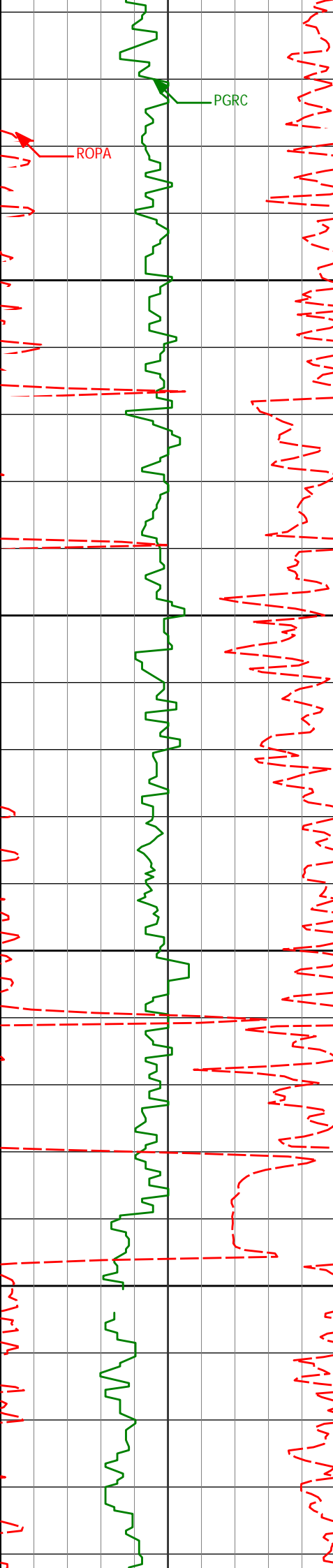
4200

4250

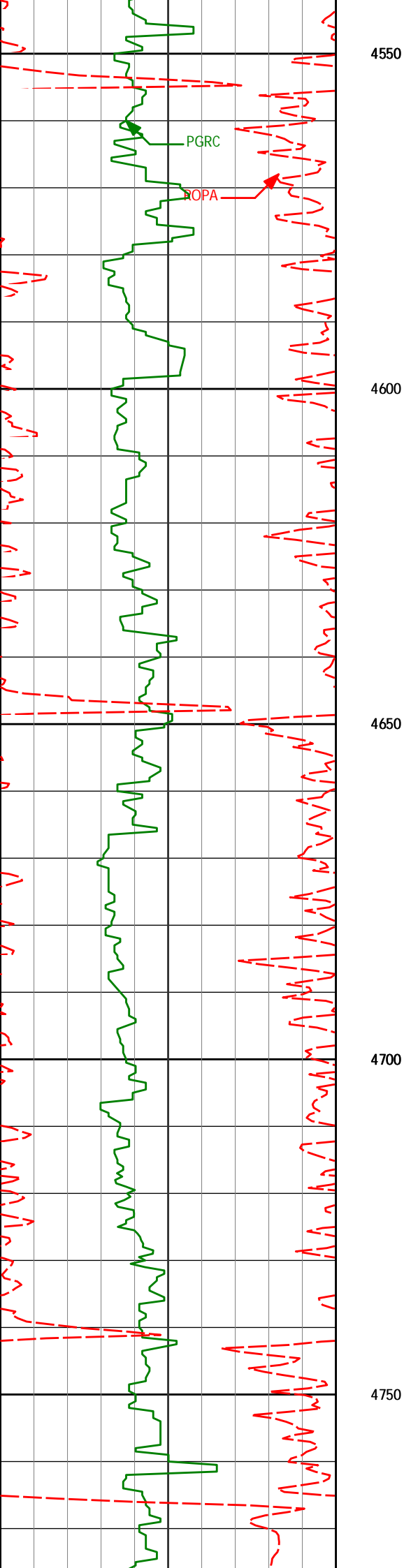
4300

4173'	10.58°	210.46°	4132.03'	-378.00'
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4269'	10.95°	210.40°	4226.34'	-393.27'
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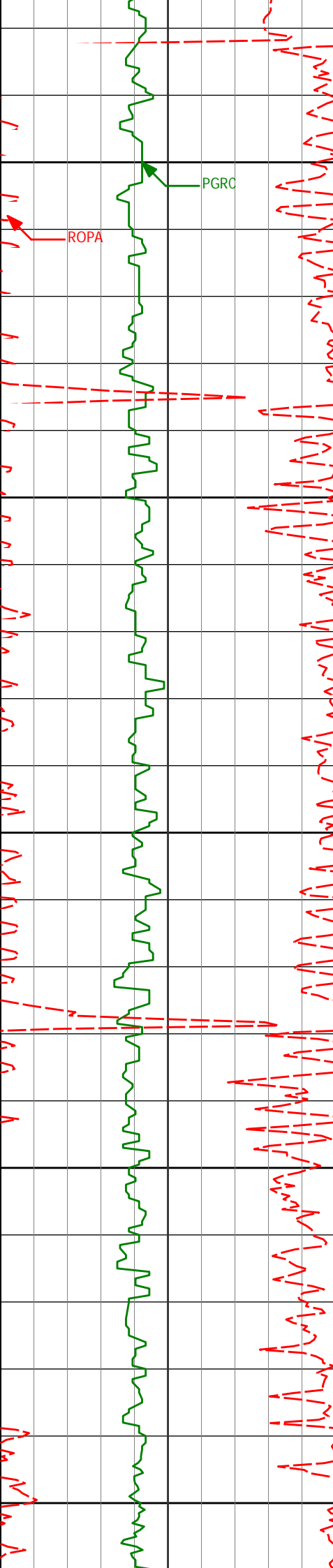


4364'	10.61°	212.39°	4319.67'	-408.24'
4350				
4400				
4459'	9.28°	212.11°	4413.24'	-421.93'
4450				
4500				
4554'	10.58°	208.96°	4506.81'	-435.87'



4649'	10.47°	209.48°	4600.22'	-450.84'
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4744'	9.46°	210.14°	4693.78'	-464.93'
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4800

4850

4900

4950

5000

4839'

10.30°

207.98°

4787.37'

-479.02'

4934'

9.92°

208.87°

4880.90'

-493.52'

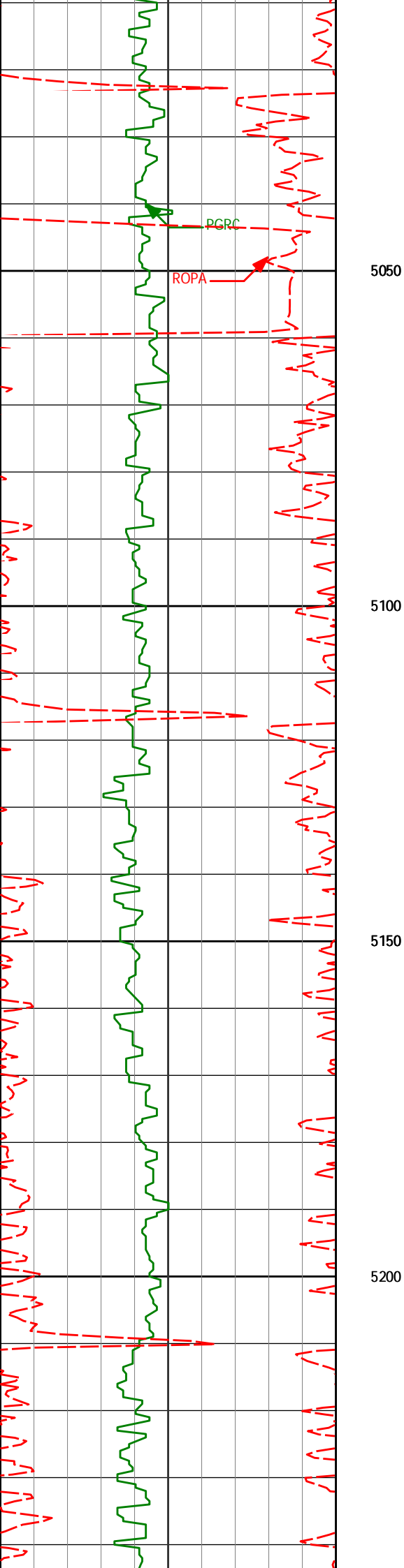
5030'

9.06°

208.79°

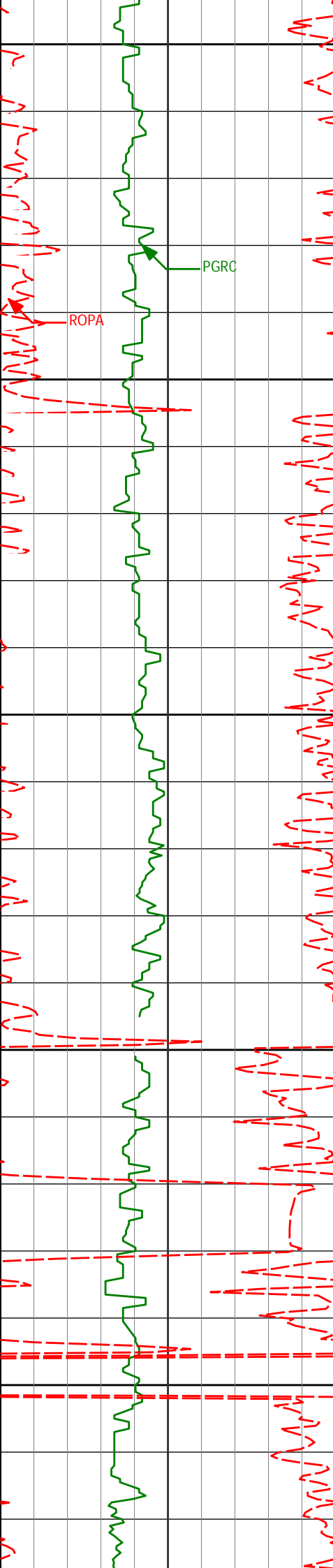
4975.58'

-507.22'



5125' 9.54° 200.45° 5069.34' -521.02'

5220' 8.40° 200.80° 5163.17' -534.77'



5250

5315'

7.54°

202.46°

5257.26'

-546.91'

PGRC

ROPA

5300

5350

5410'

6.40°

206.13°

5351.55'

-557.33'

5400

5450

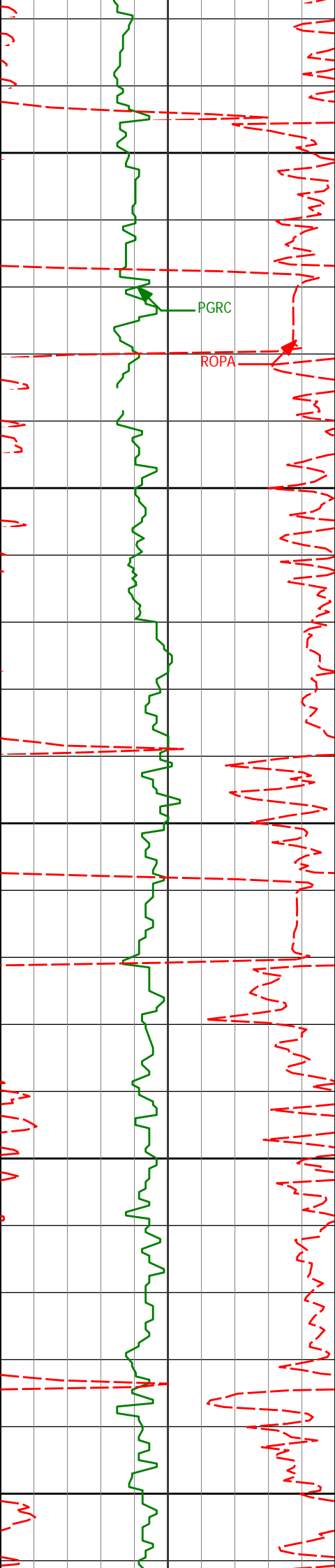
5505'

4.42°

204.66°

5446.12'

-565.33'



5500

5550

5600

5650

5700

5600'

2.57°

199.62°

5540.94'

-570.61'

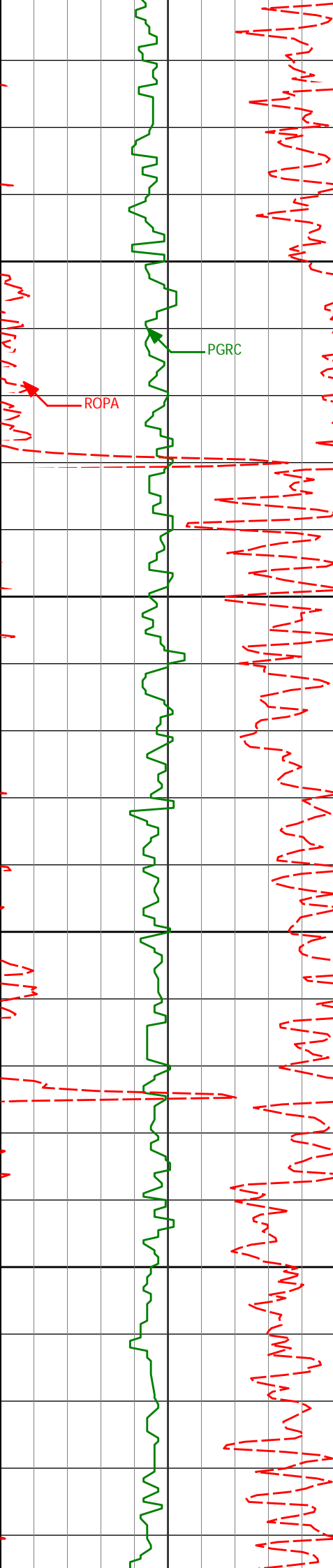
5695'

0.48°

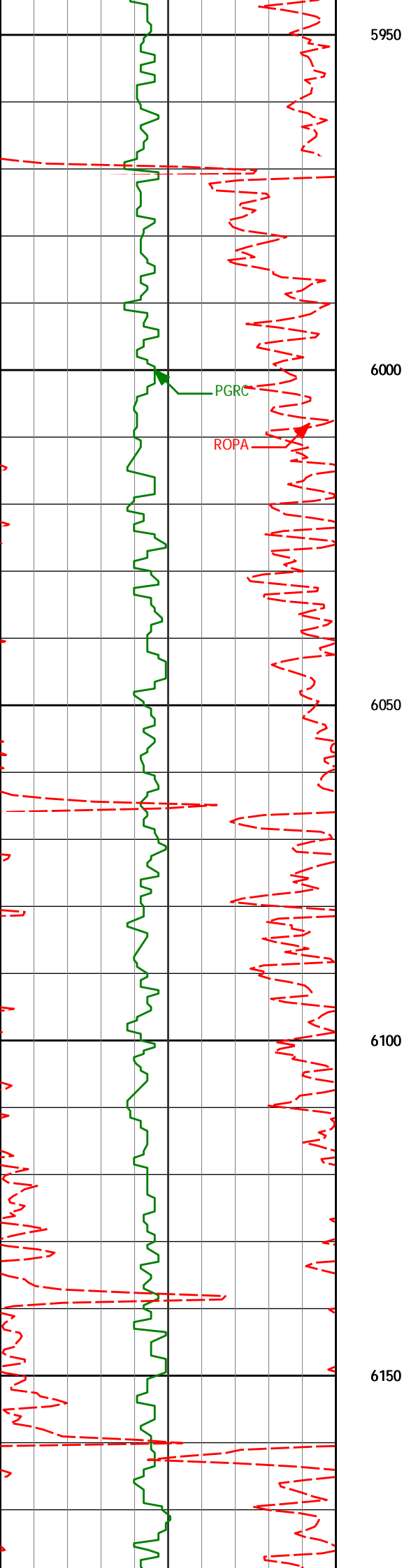
160.74°

5635.91'

-572.98'

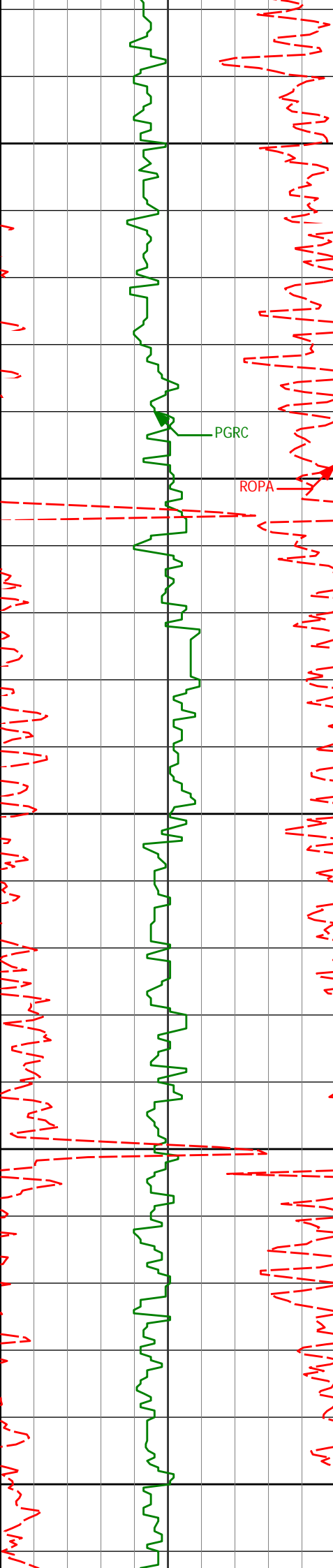


5790'	0.10°	151.52°	5730.90'	-573.44'
5750				
5800				
5885'	0.10°	134.93°	5825.90'	-573.57'
5850				
5900				
5980'	0.11°	135.87°	5920.90'	-573.70'



6076'	0.37°	153.44°	6016.90'	-574.04'
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6171'	0.58°	123.94°	6111.90'	-574.60'
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6200

6266'

0.59°

129.26°

6206.90'

-575.19'

PGRC

ROPA

6250

6300

6361'

0.68°

126.50°

6301.89'

-575.85'

6350

6400

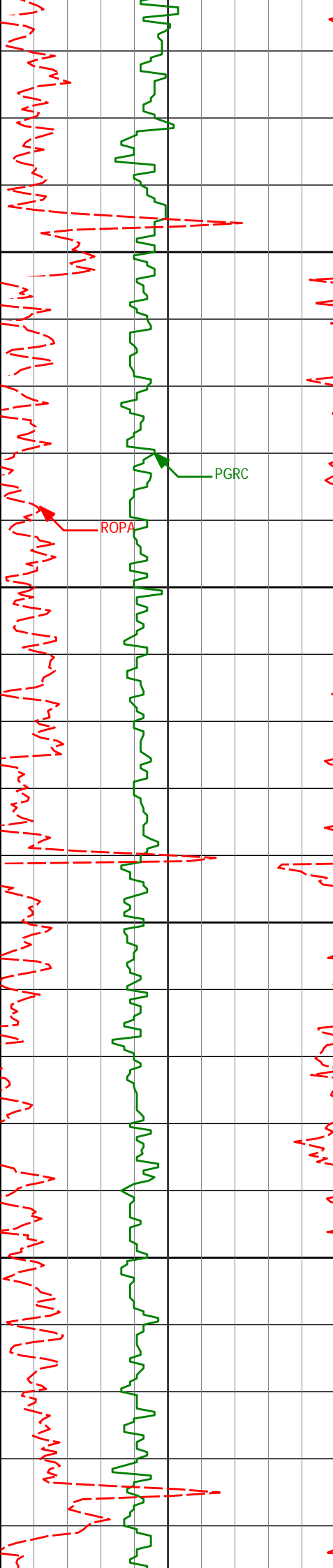
6456'

0.78°

159.14°

6396.88'

-576.81'



6450

6500

6550

6600

PGRC

ROPA

6551'

1.02°

151.75°

6491.87'

-578.17'

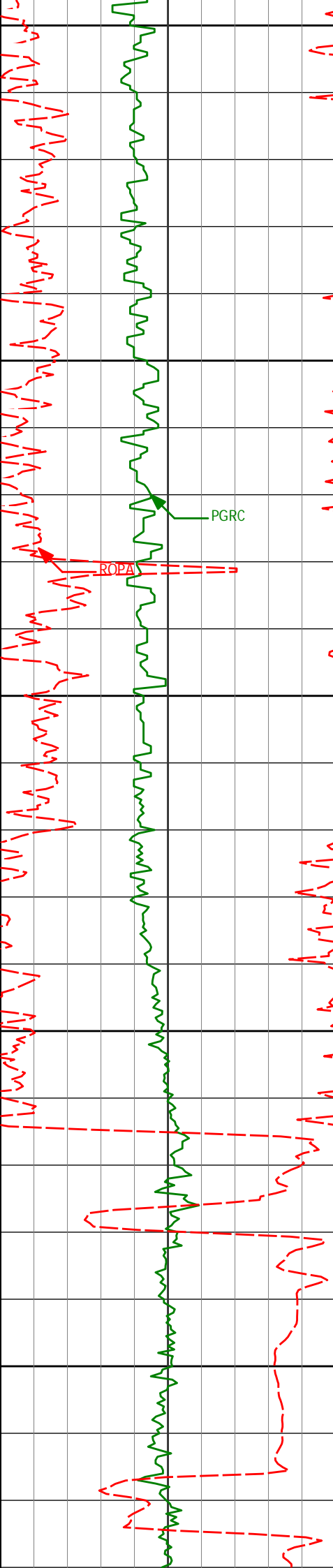
6646'

0.89°

148.18°

6586.86'

-579.56'



6650

6741'

0.71°

151.42°

6681.85'

-580.71'

6700

PGRC

ROPA

6750

6836'

0.68°

145.77°

6776.84'

-581.71'

6800

6888'

0.83°

20.32°

6828.84'

-581.62'

6850

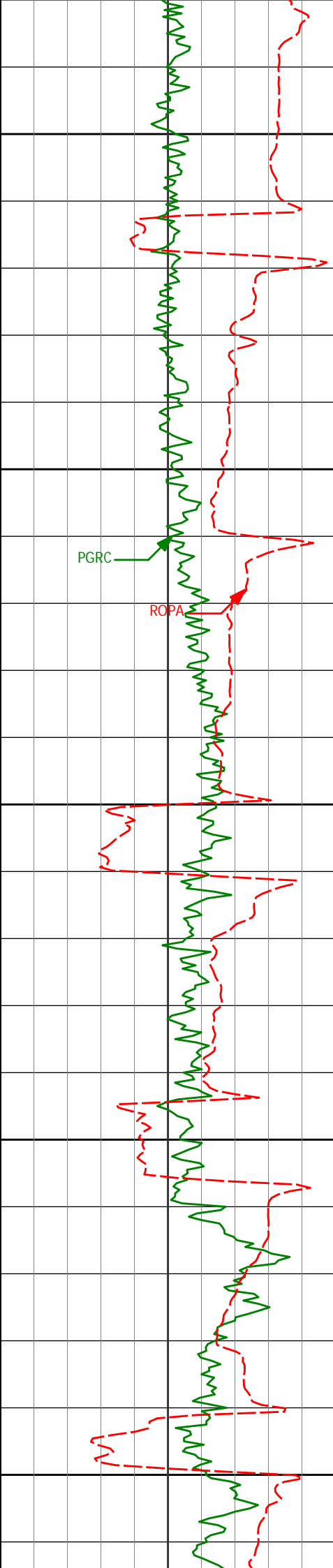
6931'

3.63°

8.78°

6871.80'

-579.99'



6900

6950

7000

7050

7100

6973'

7.10°

2.26°

6913.61'

-576.08'

7026'

13.29°

355.59°

6965.75'

-566.72'

7074'

17.13°

355.24°

7012.06'

-554.15'

7122'

20.46°

357.07°

7057.50'

-538.71'

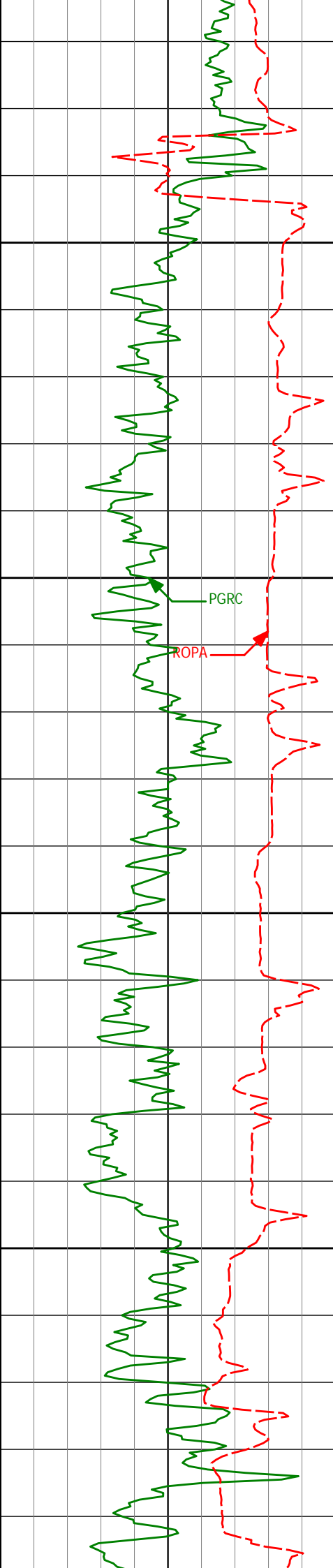
7170'

23.21°

0.76°

7102.05'

-520.87'



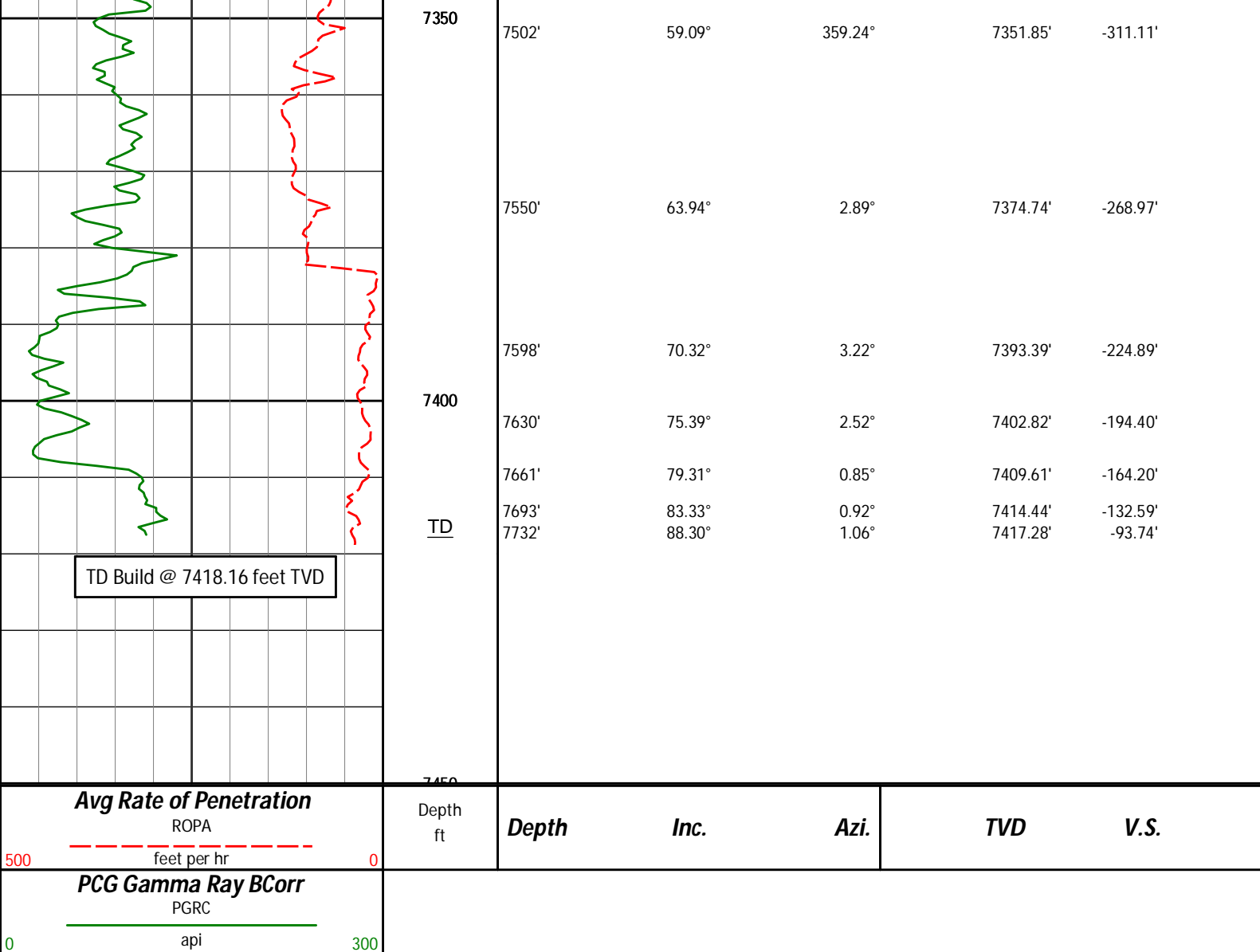
7150

7200

7250

7300

7217'	26.70°	0.40°	7144.66'	-501.05'
7265'	31.86°	358.83°	7186.51'	-477.59'
7312'	36.83°	358.47°	7225.30'	-451.08'
7360'	41.93°	358.54°	7262.39'	-420.63'
7407'	47.76°	357.25°	7295.70'	-387.51'
7455'	54.04°	356.37°	7325.96'	-350.30'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko
USA FED 29C-36HZ
Wattenberg
Weld Colorado
USA
CA-XX-0900382959
Surveys are IFR Corrected

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
323.00	0.57	322.08	322.99	1.27 N	0.99 W	1.29	0.18
415.00	0.34	342.83	414.99	1.89 N	1.35 W	1.92	0.30
507.00	0.28	11.05	506.99	2.37 N	1.39 W	2.40	0.18
601.00	0.14	11.21	600.99	2.71 N	1.32 W	2.74	0.15
725.00	0.62	347.68	724.99	3.51 N	1.43 W	3.54	0.40
818.00	0.66	322.34	817.98	4.43 N	1.87 W	4.47	0.30
891.00	0.70	320.53	890.98	5.11 N	2.41 W	5.15	0.06
975.00	0.84	312.21	974.97	5.92 N	3.19 W	5.98	0.21
1249.00	1.21	312.68	1248.92	9.23 N	6.81 W	9.37	0.14
1341.00	3.11	275.36	1340.86	10.12 N	10.00 W	10.32	2.47
1432.00	4.65	255.86	1431.65	9.45 N	16.04 W	9.78	2.21
1524.00	6.65	242.65	1523.20	6.09 N	24.39 W	6.59	2.58
1616.00	7.84	230.04	1614.47	0.39 S	33.93 W	0.31	2.15
1708.00	8.86	219.98	1705.50	9.85 S	43.29 W	-8.95	1.93
1799.00	9.77	207.49	1795.31	22.07 S	51.36 W	-21.00	2.43
1891.00	11.21	209.58	1885.77	36.77 S	59.38 W	-35.53	1.62

1986.00	11.35	209.07	1978.93	52.97 S	68.48 W	-51.54	0.18
2081.00	11.03	208.76	2072.13	69.11 S	77.39 W	-67.49	0.34
2176.00	10.59	209.39	2165.44	84.68 S	86.05 W	-82.88	0.48
2271.00	10.05	209.93	2258.91	99.47 S	94.47 W	-97.49	0.58
2366.00	11.23	209.92	2352.27	114.68 S	103.22 W	-112.51	1.24
2556.00	9.06	212.22	2539.29	143.37 S	120.43 W	-140.84	1.16
2651.00	10.54	207.51	2632.90	157.41 S	128.43 W	-154.70	1.77
2746.00	9.16	209.29	2726.50	171.71 S	136.14 W	-168.84	1.49
2842.00	10.74	210.38	2821.05	186.09 S	144.40 W	-183.05	1.66
2937.00	10.74	212.42	2914.39	201.20 S	153.63 W	-197.96	0.40
3032.00	10.80	212.55	3007.72	216.17 S	163.16 W	-212.74	0.07
3127.00	10.65	212.76	3101.06	231.06 S	172.70 W	-227.42	0.16
3222.00	10.51	214.31	3194.44	245.60 S	182.33 W	-241.76	0.33
3317.00	9.35	213.18	3288.02	259.21 S	191.44 W	-255.18	1.24
3412.00	10.41	208.97	3381.61	273.18 S	199.82 W	-268.97	1.35
3508.00	9.61	210.67	3476.15	287.66 S	208.11 W	-283.28	0.89
3698.00	9.78	207.72	3663.43	315.59 S	223.71 W	-310.87	0.28
3793.00	8.46	208.58	3757.23	328.87 S	230.80 W	-324.00	1.40
3888.00	9.93	210.03	3851.01	342.10 S	238.25 W	-337.07	1.57
3983.00	8.78	210.49	3944.74	355.44 S	246.02 W	-350.25	1.21
4078.00	9.67	206.31	4038.51	368.84 S	253.24 W	-363.50	1.17
4173.00	10.58	210.46	4132.03	383.51 S	261.20 W	-378.00	1.23
4269.00	10.95	210.40	4226.34	398.97 S	270.28 W	-393.27	0.39
4364.00	10.61	212.39	4319.67	414.14 S	279.53 W	-408.24	0.53
4459.00	9.28	212.11	4413.24	428.01 S	288.29 W	-421.93	1.40
4554.00	10.58	208.96	4506.81	442.13 S	296.58 W	-435.87	1.48
4649.00	10.47	209.48	4600.22	457.27 S	305.05 W	-450.84	0.15
4744.00	9.46	210.14	4693.78	471.54 S	313.22 W	-464.93	1.07
4839.00	10.30	207.98	4787.37	485.79 S	321.13 W	-479.02	0.97
4934.00	9.92	208.87	4880.90	500.46 S	329.06 W	-493.52	0.43
5030.00	9.06	208.79	4975.58	514.32 S	336.69 W	-507.22	0.90
5125.00	9.54	200.45	5069.34	528.26 S	343.05 W	-521.02	1.50
5220.00	8.40	200.80	5163.17	542.12 S	348.26 W	-534.77	1.20
5315.00	7.54	202.46	5257.26	554.37 S	353.11 W	-546.91	0.94
5410.00	6.40	206.13	5351.55	564.88 S	357.82 W	-557.33	1.29
5505.00	4.42	204.66	5446.12	572.96 S	361.68 W	-565.33	2.09
5600.00	2.57	199.62	5540.94	578.30 S	363.92 W	-570.61	1.97
5695.00	0.48	160.74	5635.91	580.68 S	364.51 W	-572.98	2.33
5790.00	0.10	151.52	5730.90	581.13 S	364.34 W	-573.44	0.40
5885.00	0.10	134.93	5825.90	581.26 S	364.24 W	-573.57	0.03
5980.00	0.11	135.87	5920.90	581.38 S	364.12 W	-573.70	0.01
6076.00	0.37	153.44	6016.90	581.73 S	363.91 W	-574.04	0.28
6171.00	0.58	123.94	6111.90	582.27 S	363.38 W	-574.60	0.33
6266.00	0.59	129.26	6206.90	582.85 S	362.60 W	-575.19	0.06
6361.00	0.68	126.50	6301.89	583.49 S	361.77 W	-575.85	0.10
6456.00	0.78	159.14	6396.88	584.43 S	361.08 W	-576.81	0.44
6551.00	1.02	151.75	6491.87	585.78 S	360.45 W	-578.17	0.28
6646.00	0.89	148.18	6586.86	587.15 S	359.66 W	-579.56	0.15
6741.00	0.71	151.42	6681.85	588.30 S	358.99 W	-580.71	0.20
6836.00	0.68	145.77	6776.84	589.28 S	358.40 W	-581.71	0.08
6888.00	0.83	20.32	6828.84	589.18 S	358.09 W	-581.62	2.58
6931.00	3.63	8.78	6871.80	587.54 S	357.78 W	-579.99	6.56
6973.00	7.10	2.26	6913.61	583.63 S	357.47 W	-576.08	8.38
7026.00	13.29	355.59	6965.75	574.28 S	357.81 W	-566.72	11.87
7074.00	17.13	355.24	7012.06	561.73 S	358.82 W	-554.15	8.00
7122.00	20.46	357.07	7057.50	546.30 S	359.84 W	-538.71	7.04
7170.00	23.21	0.76	7102.05	528.46 S	360.14 W	-520.87	6.40
7217.00	26.70	0.40	7144.66	508.64 S	359.94 W	-501.05	7.43
7265.00	31.86	358.83	7186.51	485.17 S	360.13 W	-477.59	10.87
7312.00	36.83	358.47	7225.30	458.67 S	360.76 W	-451.08	10.58
7360.00	41.93	358.54	7262.39	428.24 S	361.55 W	-420.63	10.63
7407.00	47.76	357.25	7295.70	395.13 S	362.79 W	-387.51	12.55
7455.00	54.04	356.37	7325.96	357.96 S	364.87 W	-350.30	13.16
7502.00	59.09	359.24	7351.85	318.78 S	366.34 W	-311.11	11.89
7550.00	63.94	2.89	7374.74	276.62 S	365.53 W	-268.97	12.11
7598.00	70.32	3.22	7393.39	232.48 S	363.17 W	-224.89	13.31
7630.00	75.39	2.52	7402.82	201.95 S	361.64 W	-194.40	15.98
7661.00	79.31	0.85	7409.61	171.73 S	360.76 W	-164.20	13.69
7693.00	83.33	0.92	7414.44	140.10 S	360.27 W	-132.59	12.56
7732.00	88.30	1.06	7417.28	101.23 S	359.60 W	-93.74	12.75

VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 358.81 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.57 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7732.00 FEET
IS 373.57 FEET ALONG 254.28 DEGREES (TRUE)

Tie-In at Surface

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