

Country	: USA
Field	: Redtail
Location	: Lat: 40° 47' 18.87" North Long: 103° 51' 45.01" West
Well	: Razor #33P-3316
Company	: Whiting Oil and Gas
Rig	: Frontier 26
LOCATION	
Latitude : 40° 47' 18.87" North Longitude : 103° 51' 45.01 " West	Company : Whiting Oil and Gas Rig : Frontier 26 Well : Razor #33P-3316 Field : Redtail Country : USA API Number : 05-123-40220-00
UTM Easting = 3,453,420.003 ft UTM Northing = 1,534,310.777 ft	Other Services Directional Drilling

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	08-Dec-14	10-Dec-14			
Rig Bit Number	0100	0200			
Bit Size (in)	13.500	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (MD, ft)	225.00	1,601.00			
Log End Depth (MD, ft)	1,601.00	5,972.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	08-Dec-14 03:00	09-Dec-14 04:55			
Drill/Wipe End Date and Time	08-Dec-14 09:10	10-Dec-14 01:35			
Min Inc (deg) @ Depth (MD, ft)	0.62 @ 264.00	0.75 @ 4,937.00			
Max Inc (deg) @ Depth (MD, ft)	9.14 @ 1,454.00	88.63 @ 5,924.00			
Bit TFA(in2) / Bit Type	1.53 / PDC	.74 / PDC			
Flow Rate (gpm)	720.00	542.73			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Polymer			
Density (ppg) / Viscosity (spqt)	8.50 / 28.00	9.50 / 40.00			
Filtrate CL (ppm)	N/A	3,000.00			
pH / Fluid Loss (mptm)	7.70 / 0	8.60 / 0			
PV (cP) / YP (lbf2)	1 / 1.00	11 / 9.00			
% Solids / % Sand	1.9 / 0.1	9.84 / 0.1			
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (in F) / C	112.42 / 45.2	170.07 / 65.9			

Max Tool Temp (degF) / Source	113.40 / PCM	170.37 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 113.40	N/A @ 170.37			
Lead MWD Engineer	Cody Wurdeman	Cody Wurdeman			
Customer Representative	Kennith Wilkerson	Kennith Wilkerson			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11342302	11342302			
Insert Serial Number	11680771	11400868			
Date and Time Initialized	07-Dec-14 09:47	08-Dec-14 17:49			
Date and Time Read	08-Dec-14 12:29	10-Dec-14 10:08			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	53.87	46.24			
Software Version	6.21	6.21			
Sub Serial Number	11342302	11342302			
Sonde Serial Number	11902178	11638590			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	159.61	9.11			

Gamma Ray Sensor Information

Tool Type		PCG			
Distance From Bit (ft)		55.04			
Recorded Sample Period (sec)		10			
Software Version		8.15			
Sub Serial Number		11342302			
Insert/Sonde Serial Number		11681067			

REMARKS

1. All depths are true vertical 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" for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.

4. All data is stored data unless otherwise specified.

5. The following smoothing parameters have been applied to the data:

PCG Gamma Ray BCorr (PGRC)
Interval Resolution: .5
Interval Distance: .6
Gap Fill: 3

Average Rate of Penetration (ROPA)
Interval Resolution: .5
Interval Distance: 1.2
Gap Fill: 3

WARRANTY

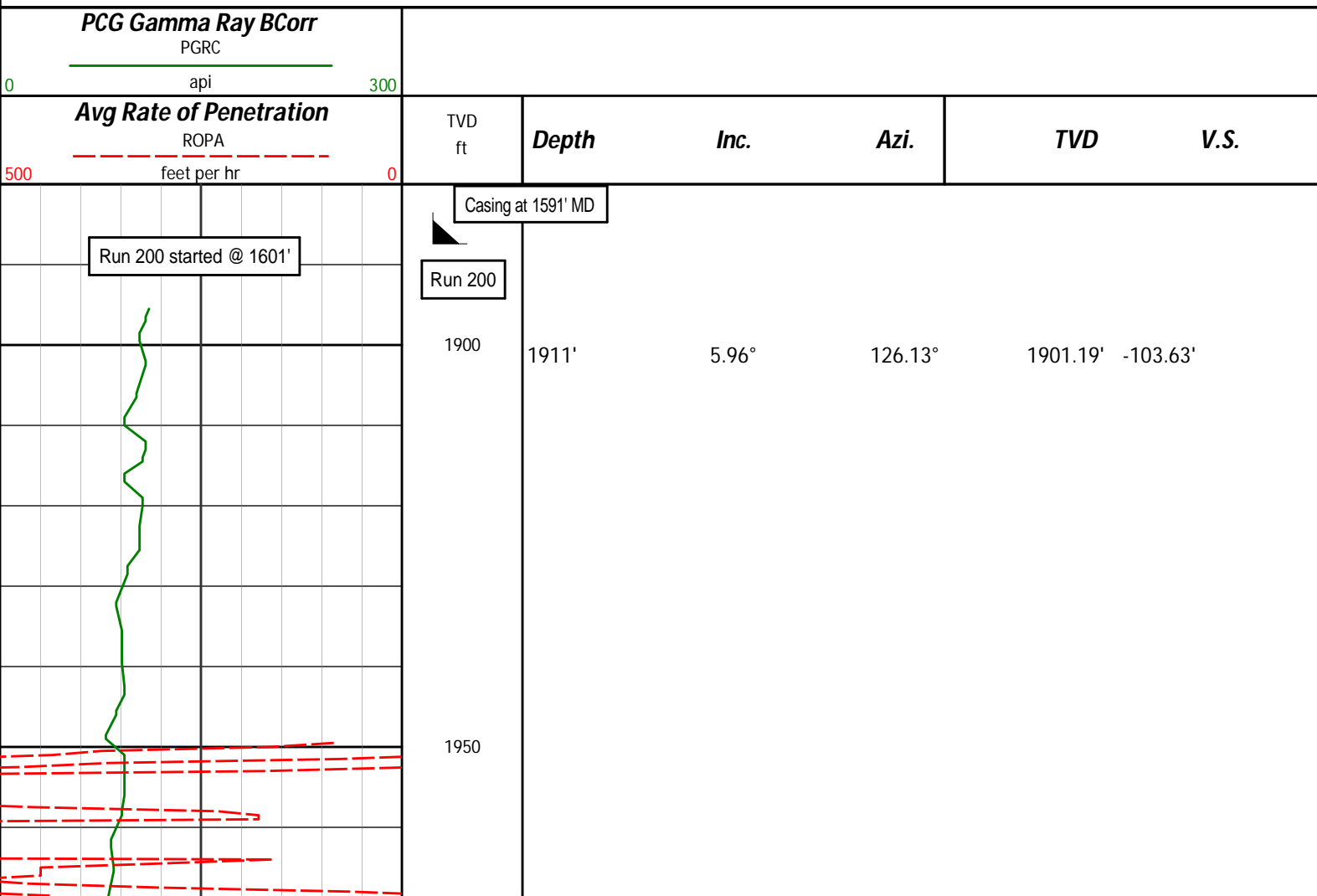
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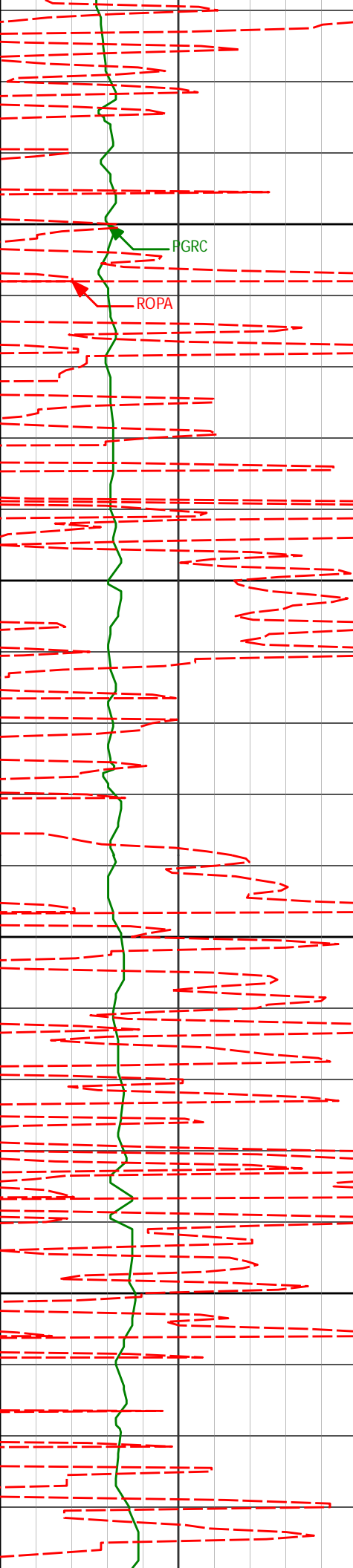
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Sperry Drilling Services

TVD Main Log 1:240

Whiting Oil and Gas
Razor #33P-3316
Frontier 26
Sec. 33-T10N-R58W





2002'

6.03°

125.15°

1991.69' -108.59'

2000

FGRC

ROPA

2050

2093'

5.42°

126.43°

2082.24' -113.34'

2100

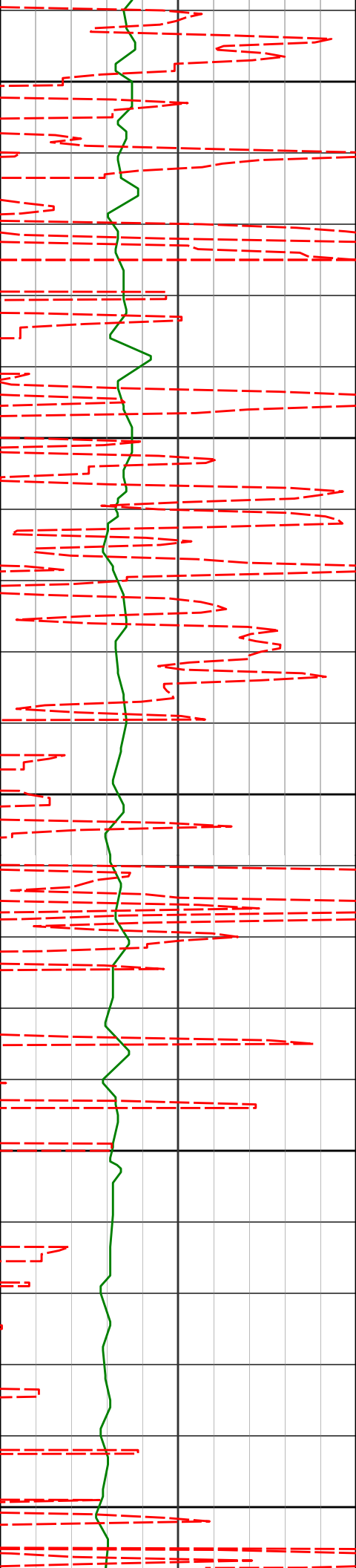
2150

2185'

5.04°

126.59°

2173.86' -117.82'



2200

2250

2300

2350

2400

2276'

4.47°

124.60°

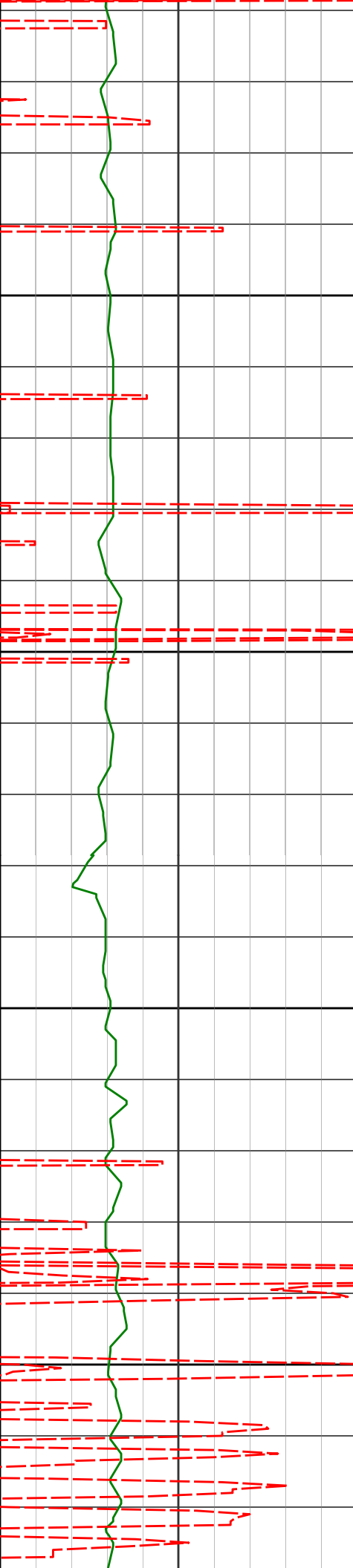
2264.54' -121.75'

2369'

4.57°

117.88°

2357.25' -125.07'



2450

2500

2550

2600

2460'

2552'

4.78°

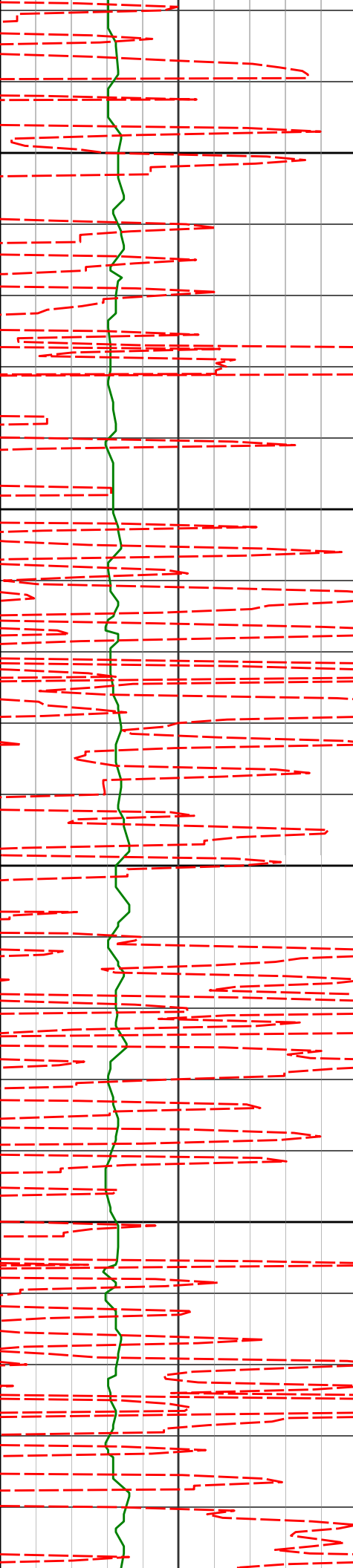
4.81°

118.52°

117.80°

2447.95' -128.08'

2539.63' -131.20'



2650

2700

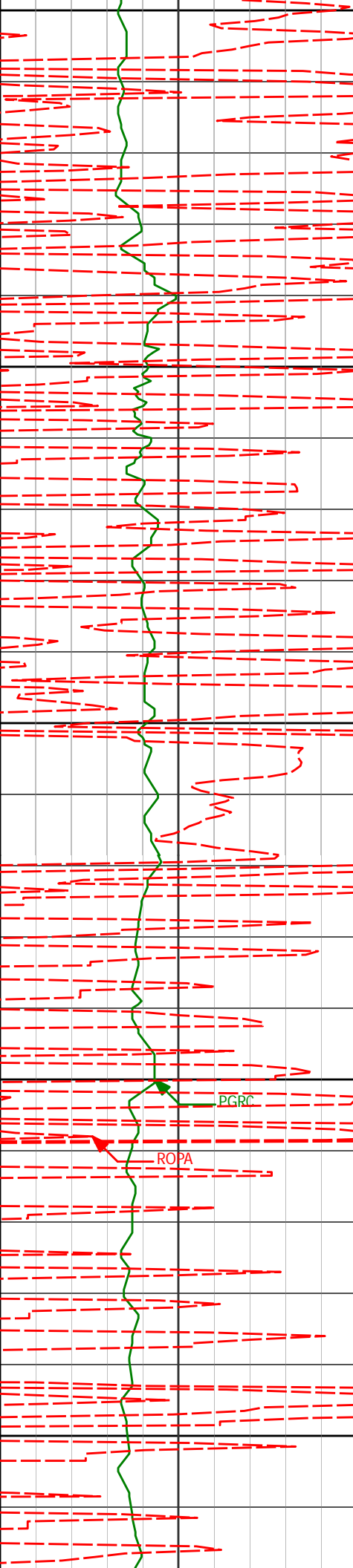
2750

2800

2643' 4.18° 117.80° 2630.35' -134.06'

2735' 4.38° 109.45° 2722.09' -136.32'

2826' 3.84° 112.65° 2812.86' -138.20'



2850

2900

2950

3000

3050

2918'

3.63°

113.78°

2904.66' -140.15'

3010'

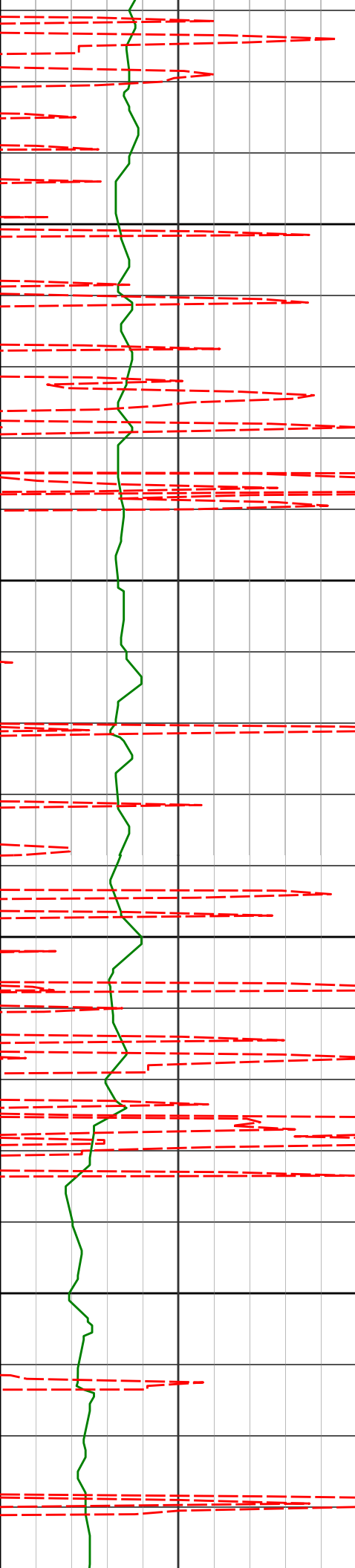
4.91°

115.57°

2996.41' -142.55'

PGRC

ROPA



3102'

4.23°

118.45°

3088.11' -145.38'

3100

3150

3194'

4.26°

111.39°

3179.86' -147.78'

3200

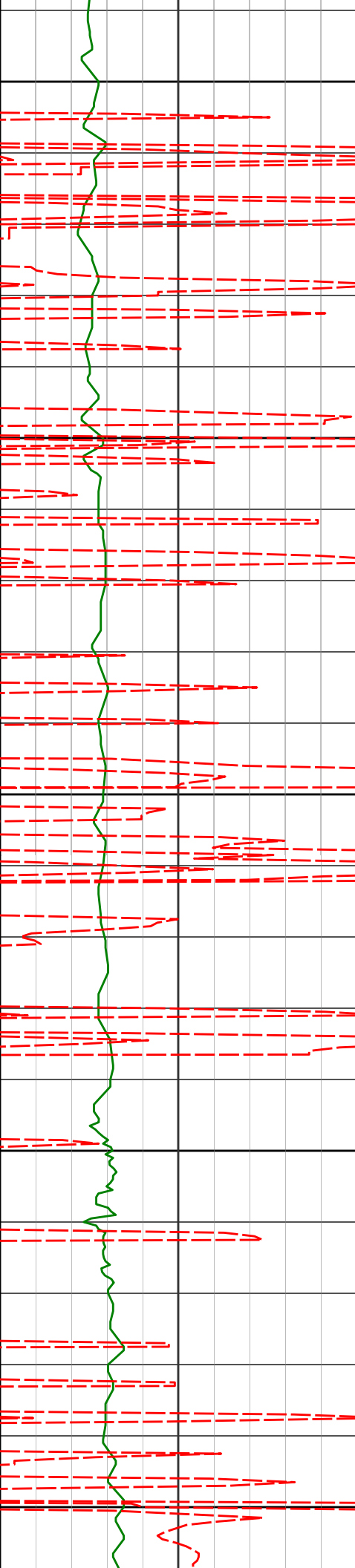
3250

3285'

4.02°

112.07°

3270.62' -149.76'



3300

3350

3400

3450

3500

3377'

3.87°

109.17°

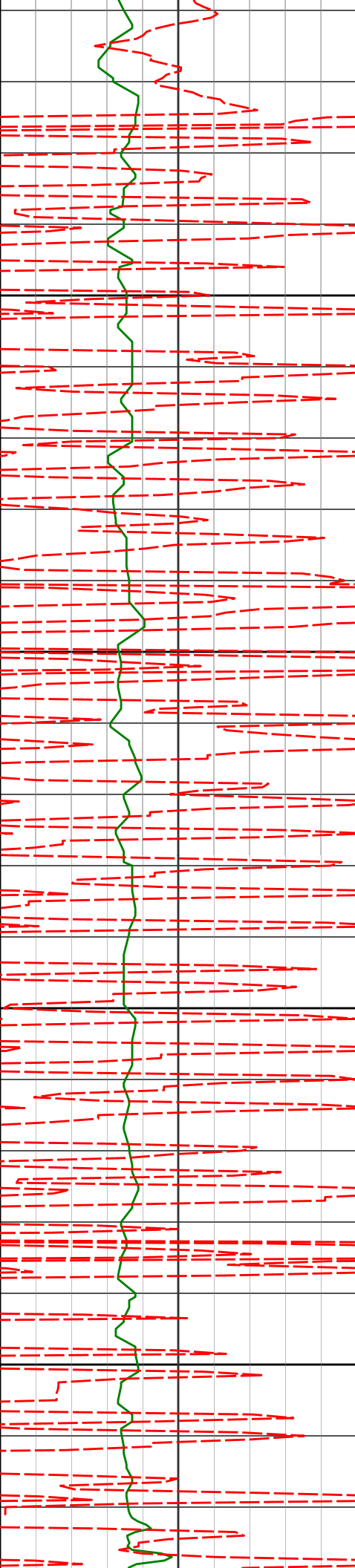
3362.41' -151.55'

3469'

3.91°

112.60°

3454.19' -153.34'



3560'

6.73°

118.73°

3544.79' -156.53'

3550

3600

3652'

6.07°

113.66°

3636.22' -160.38'

3650

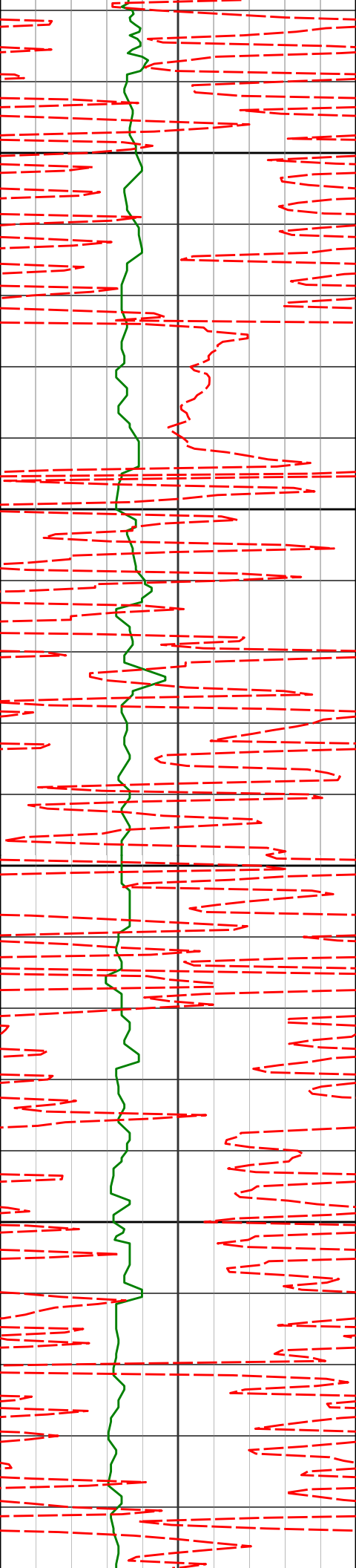
3700

3744'

5.09°

102.32°

3727.79' -162.58'



3750

3800

3850

3900

3836'

6.67°

111.94°

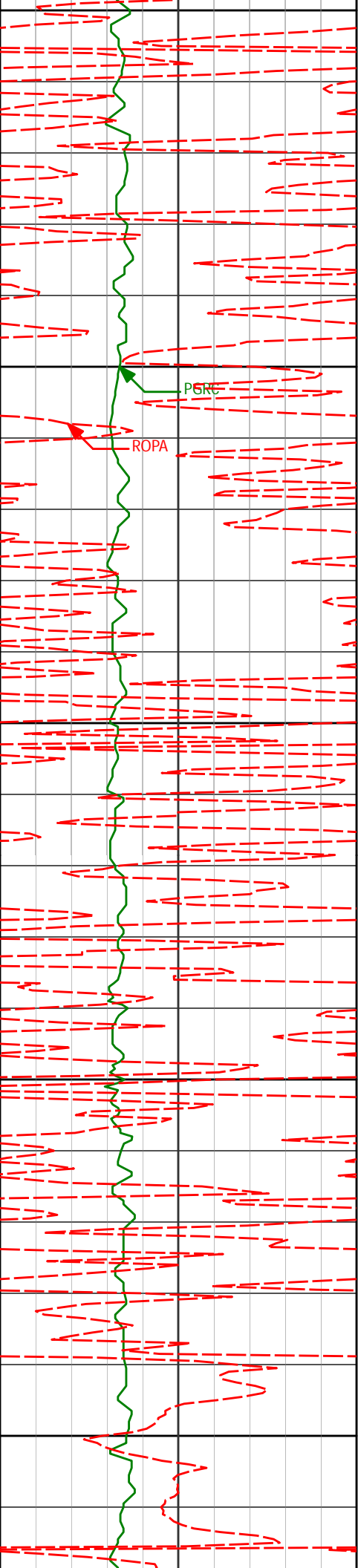
3819.30' -164.78'

3927'

6.07°

111.10°

3909.74' -167.78'



3950

4000

4050

4100

4150

4019'

5.75°

107.87°

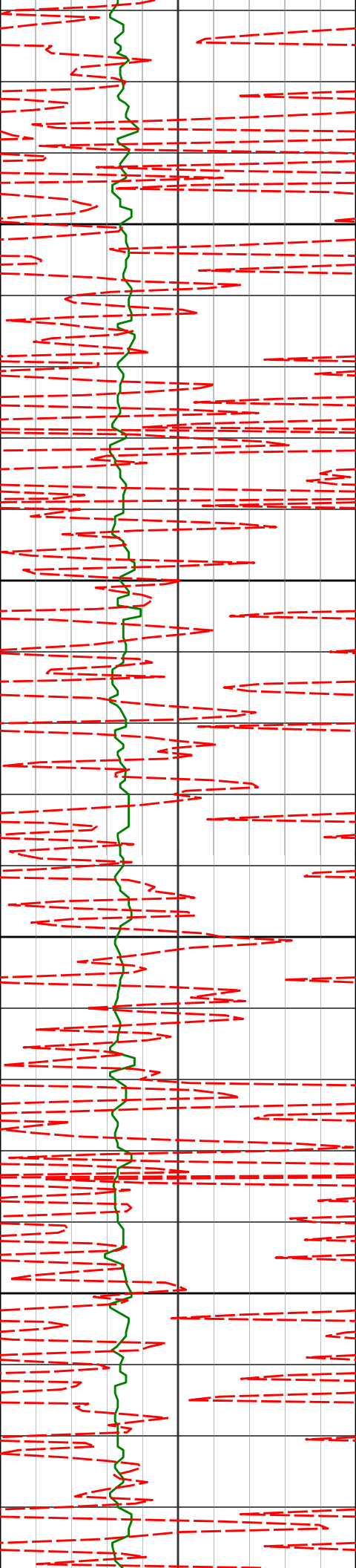
4001.25' -170.28'

4110'

5.03°

106.08°

4091.85' -172.18'



4202'

6.17°

114.98°

4183.41' -174.76'

4200

4250

4293'

5.15°

108.91°

4273.96' -177.53'

4300

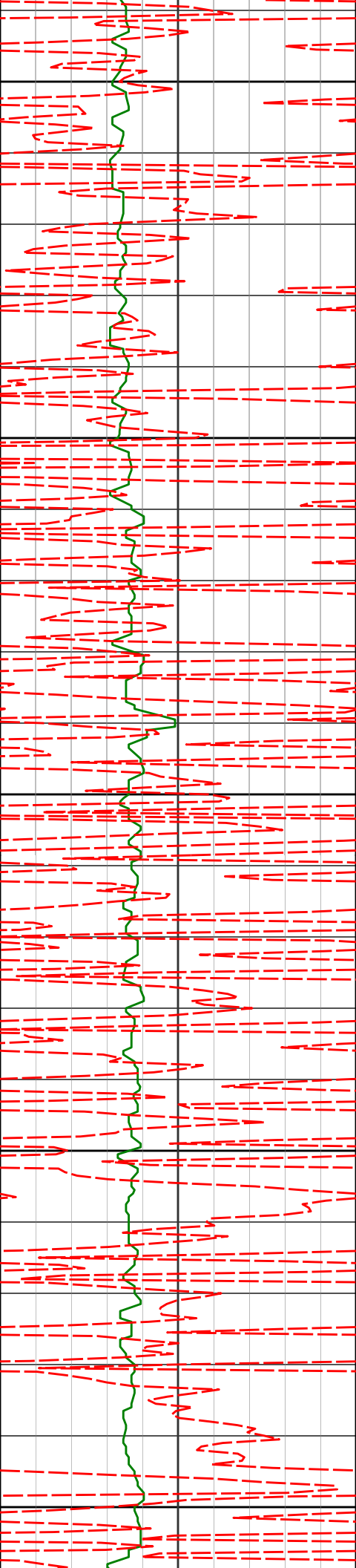
4350

4385'

4.16°

102.41°

4365.66' -179.05'



4400

4450

4500

4550

4600

4477'

3.60°

84.61°

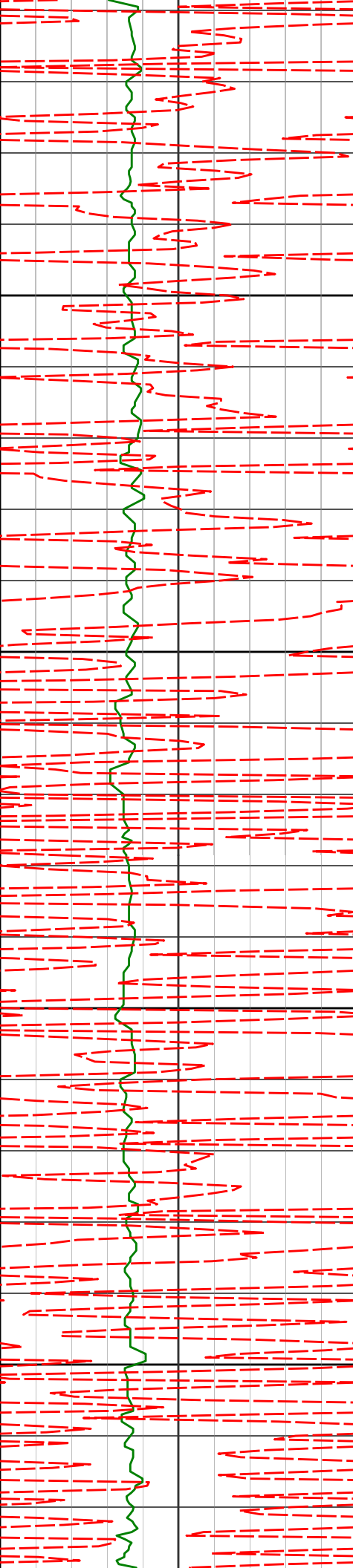
4457.45' -179.05'

4569'

3.06°

78.57°

4549.30' -177.90'



4661'

2.72°

75.61°

4641.18' -176.54'

4650

4700

4753'

2.01°

76.69°

4733.10' -175.36'

4750

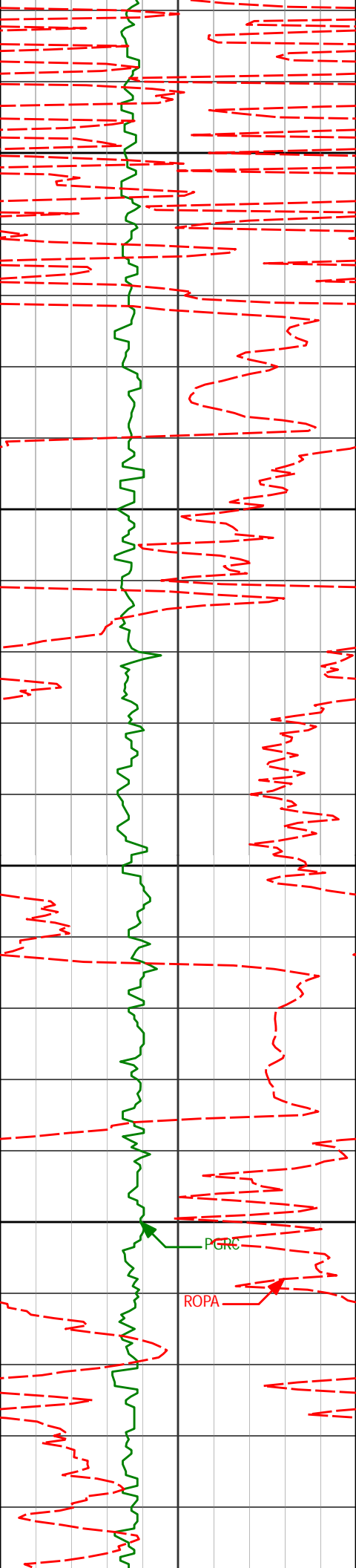
4800

4845'

1.85°

69.50°

4825.05' -174.25'



4850

4900

4950

5000

4937'

0.75°

109.50°

4917.03' -173.79'

5032'

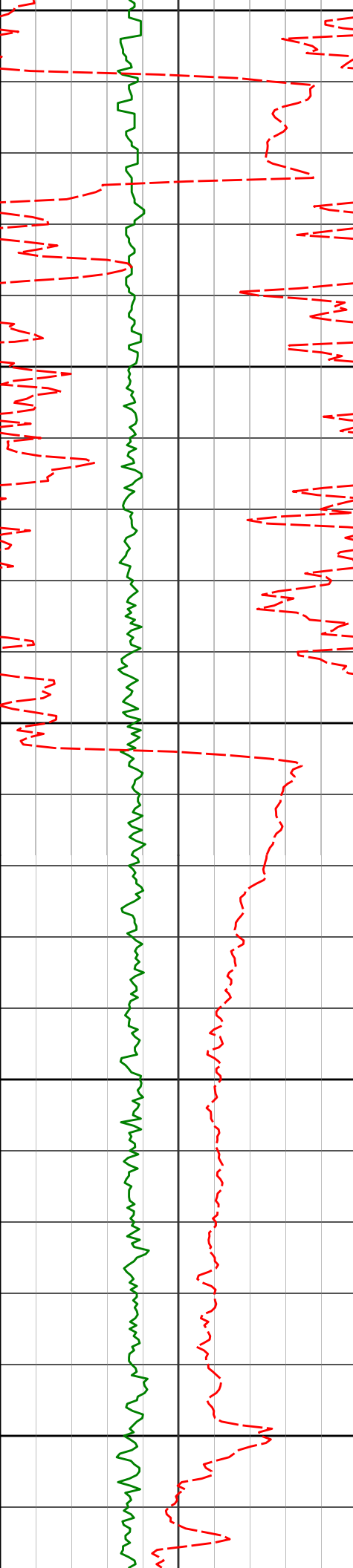
1.00°

4.95°

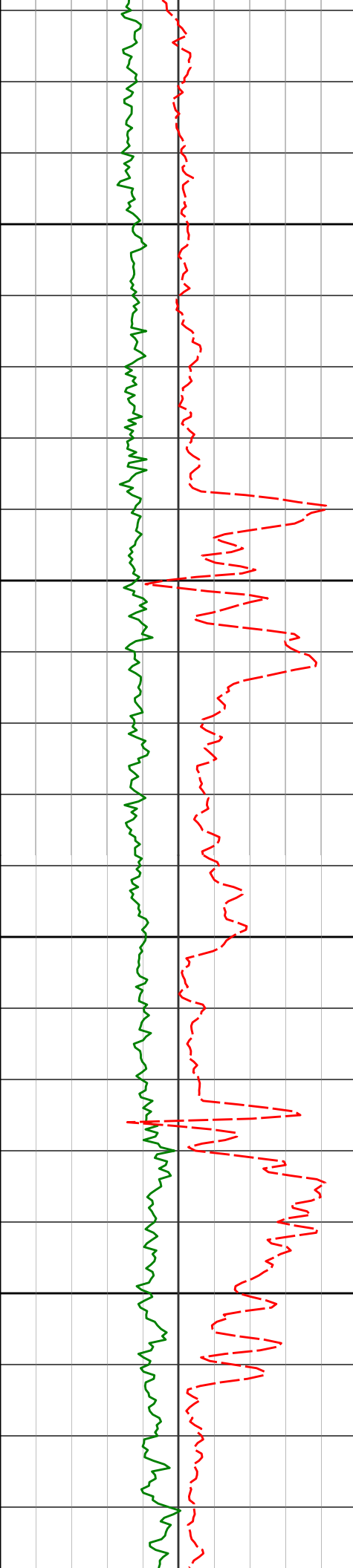
5012.02' -173.13'

PGRC

ROPA



5050				
5100	5126'	1.78°	11.25°	5105.99' -170.86'
5150				
	KOP 5176' MD			
5200	5221'	7.31°	356.29°	5200.66' -163.40'
5250	5268'	12.51°	359.46°	5246.94' -155.36'



5300

5316'

17.11°

5.06°

5293.34' -143.11'

5350

5363'

23.11°

4.81°

5337.45' -126.96'

5400

5412'

24.78°

2.70°

5382.23' -107.08'

5450

5459'

28.63°

0.29°

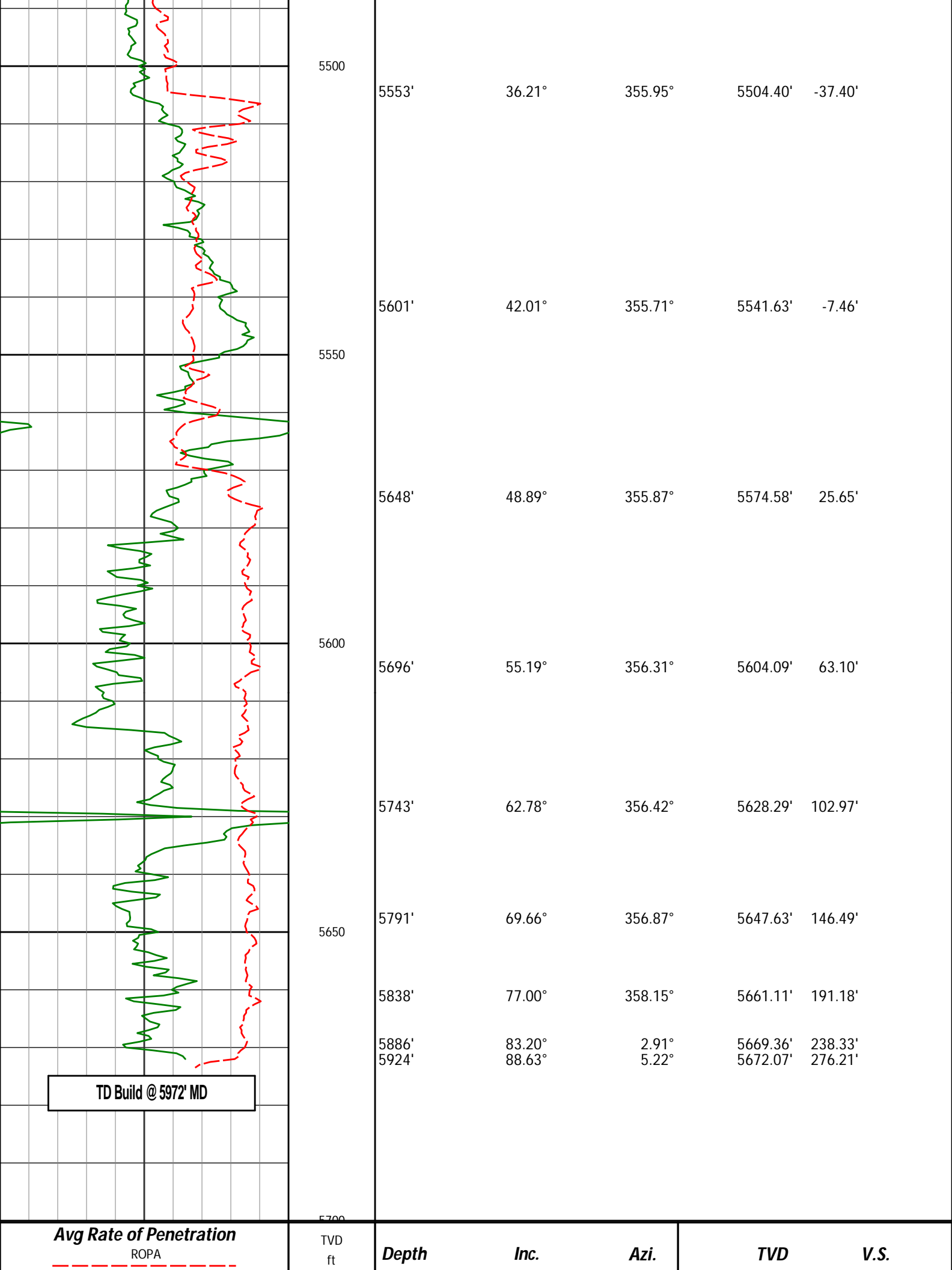
5424.21' -85.99'

5506'

30.35°

357.67°

5465.12' -62.96'



TD Build @ 5972' MD

Avg Rate of Penetration
ROPA

TVD
ft

Depth

Inc.

Azi.

TVD

V.S.

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DIRECTIONAL SURVEY REPORT

Whiting Oil and Gas
Razor #33P-3316
Redtail
Weld Colorado
USA
CA-XX-0901813681
Surveys are Sag, IFR and MS 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
173.00	0.30	163.85	173.00	0.44 S	0.13 E	-0.42	0.17
264.00	0.62	175.27	264.00	1.15 S	0.23 E	-1.13	0.36
356.00	0.69	177.62	355.99	2.20 S	0.30 E	-2.18	0.08
448.00	1.38	165.84	447.97	3.83 S	0.59 E	-3.78	0.78
540.00	1.74	166.43	539.94	6.26 S	1.19 E	-6.16	0.39
632.00	2.84	139.20	631.87	9.35 S	3.01 E	-9.10	1.65
724.00	4.63	121.63	723.67	13.02 S	7.66 E	-12.42	2.29
815.00	5.39	120.73	814.32	17.13 S	14.46 E	-16.02	0.84
997.00	5.82	125.64	995.45	26.88 S	29.31 E	-24.65	0.35
1088.00	6.38	128.31	1085.94	32.70 S	37.02 E	-29.88	0.69
1180.00	7.07	132.53	1177.31	39.69 S	45.21 E	-36.26	0.92
1271.00	7.82	133.06	1267.54	47.71 S	53.86 E	-43.61	0.83
1363.00	8.63	135.87	1358.59	56.93 S	63.24 E	-52.13	0.98
1454.00	9.14	137.13	1448.50	67.13 S	72.91 E	-61.59	0.60
1545.00	9.08	137.11	1538.35	77.69 S	82.71 E	-71.39	0.07
1636.00	8.58	145.44	1628.28	88.54 S	91.45 E	-81.57	1.51
1728.00	7.24	137.33	1719.40	98.46 S	99.27 E	-90.88	1.89
1819.00	6.58	131.19	1809.74	106.11 S	107.08 E	-97.94	1.09
1911.00	5.96	126.13	1901.19	112.39 S	114.91 E	-103.63	0.90
2002.00	6.03	125.15	1991.69	117.93 S	122.63 E	-108.59	0.14
2093.00	5.42	126.43	2082.24	123.24 S	130.00 E	-113.34	0.68
2185.00	5.04	126.59	2173.86	128.22 S	136.74 E	-117.82	0.41
2276.00	4.47	124.60	2264.54	132.62 S	142.87 E	-121.75	0.65
2369.00	4.57	117.88	2357.25	136.41 S	149.12 E	-125.07	0.58
2460.00	4.78	118.52	2447.95	139.92 S	155.66 E	-128.08	0.24
2552.00	4.81	117.80	2539.63	143.55 S	162.44 E	-131.20	0.07
2643.00	4.18	117.80	2630.35	146.87 S	168.75 E	-134.06	0.69
2735.00	4.38	109.45	2722.09	149.61 S	175.03 E	-136.32	0.71
2826.00	3.84	112.65	2812.86	151.94 S	181.12 E	-138.20	0.64
2918.00	3.63	113.78	2904.66	154.30 S	186.63 E	-140.15	0.24
3010.00	4.91	115.57	2996.41	157.17 S	192.84 E	-142.55	1.40
3102.00	4.23	118.45	3088.11	160.49 S	199.38 E	-145.38	0.78
3194.00	4.26	111.39	3179.86	163.35 S	205.54 E	-147.78	0.57
3285.00	4.02	112.07	3270.62	165.78 S	211.64 E	-149.76	0.27
3377.00	3.87	109.17	3362.41	168.01 S	217.57 E	-151.55	0.27
3469.00	3.91	112.60	3454.19	170.24 S	223.39 E	-153.34	0.26
3560.00	6.73	118.73	3544.79	173.99 S	230.94 E	-156.53	3.16
3652.00	6.07	113.66	3636.22	178.54 S	240.12 E	-160.38	0.94
3744.00	5.09	102.32	3727.79	181.36 S	248.56 E	-162.58	1.60
3836.00	6.67	111.94	3819.30	184.23 S	257.51 E	-164.78	2.02
3927.00	6.07	111.10	3909.74	187.93 S	266.90 E	-167.78	0.67
4019.00	5.75	107.87	4001.25	191.10 S	275.82 E	-170.28	0.50
4110.00	5.03	106.08	4091.85	193.60 S	283.99 E	-172.18	0.81
4202.00	6.17	114.98	4183.41	196.81 S	292.35 E	-174.76	1.55
4293.00	5.15	108.91	4273.96	200.20 S	300.65 E	-177.53	1.30
4385.00	4.16	102.41	4365.66	202.25 S	307.81 E	-179.05	1.22
4477.00	3.60	84.61	4457.45	202.70 S	313.95 E	-179.05	1.44
4569.00	3.06	78.57	4549.30	201.94 S	319.23 E	-177.90	0.70
4661.00	2.72	75.61	4641.18	200.91 S	323.75 E	-176.54	0.40

4753.00	2.01	76.69	4733.10	200.00 S	327.44 E	-175.36	0.77
4845.00	1.85	69.50	4825.05	199.11 S	330.40 E	-174.25	0.32
4937.00	0.75	109.50	4917.03	198.79 S	332.36 E	-173.79	1.48
5032.00	1.00	4.95	5012.02	198.17 S	333.01 E	-173.13	1.47
5126.00	1.78	11.25	5105.99	195.92 S	333.37 E	-170.86	0.84
5221.00	7.31	356.29	5200.66	188.43 S	333.27 E	-163.40	5.90
5268.00	12.51	359.46	5246.94	180.36 S	333.02 E	-155.36	11.12
5316.00	17.11	5.06	5293.34	168.12 S	333.60 E	-143.11	10.03
5363.00	23.11	4.81	5337.45	152.02 S	334.98 E	-126.96	12.77
5412.00	24.78	2.70	5382.23	132.18 S	336.27 E	-107.08	3.83
5459.00	28.63	0.29	5424.21	111.07 S	336.79 E	-85.99	8.51
5506.00	30.35	357.67	5465.12	87.95 S	336.37 E	-62.96	4.57
5553.00	36.21	355.95	5504.40	62.21 S	334.90 E	-37.40	12.63
5601.00	42.01	355.71	5541.63	32.03 S	332.70 E	-7.46	12.09
5648.00	48.89	355.87	5574.58	1.36 N	330.24 E	25.65	14.64
5696.00	55.19	356.31	5604.09	39.10 N	327.67 E	63.10	13.14
5743.00	62.78	356.42	5628.29	79.27 N	325.12 E	102.97	16.15
5791.00	69.66	356.87	5647.63	123.09 N	322.56 E	146.49	14.36
5838.00	77.00	358.15	5661.11	168.04 N	320.61 E	191.18	15.83
5886.00	83.20	2.91	5669.36	215.29 N	321.07 E	238.33	16.19
5924.00	88.63	5.22	5672.07	253.08 N	323.75 E	276.21	15.52

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 4.22 DEGREES (TRUE)
A TOTAL CORRECTION OF 7.57 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 5924.00 FEET
IS 410.93 FEET ALONG 51.99 DEGREES (TRUE)**

Tie onto surface at 0' MD