

PCG Pressure Case Gamma PCD Pressure Case Directional

1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	02-Dec-14				
Rig Bit Number	2				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (MD, ft)	1,227.00				
Log End Depth (MD, ft)	5,902.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	01-Dec-14 10:45				
Drill/Wipe End Date and Time	02-Dec-14 09:00				
Min Inc (deg) @ Depth (MD, ft)	0.37 @ 4,780.00				
Max Inc (deg) @ Depth (MD, ft)	84.48 @ 5,844.00				
Bit TFA(in2) / Bit Type	1.21 / PDC				
Flow Rate (gpm)	609.32				
Max AV (fpm) / CV (fpm) @ MWD	NA / NA				
Fluid Type	NA				
Density (ppg) / Viscosity (spqt)	10.80 / 39.00				
Filtrate CL (ppm)	NA				
pH / Fluid Loss (mptm)	9.60 / 7				
PV (cP) / YP (lbf2)	12 / 12.00				
% Solids / % Sand	11.40 / 0.25				
% Oil / Oil:Water Ratio	NA / NA				
Rm @ Measured Temp (degF)	NA @ NA				
Rmf @ Measured Temp (degF)	NA @ NA				
Rmc @ Measured Temp (degF)	NA @ NA				
Max Tool Temp (degF) @ Depth (MD, ft)	107.07 / 5,844.00				

Max Tool Temp (degF) / Source	167.97 / PCM				
Rm @ Max Tool Temp (degF)	NA @ 167.97				
Lead MWD Engineer	Kyle Wass				
Customer Representative	Seth Mulherin				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11404285				
Insert Serial Number	11619985				
Date and Time Initialized	30-Nov-14 09:06				
Date and Time Read	02-Dec-14 14:25				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	58.00				
Software Version	6.21				
Sub Serial Number	11404285				
Sonde Serial Number	11478122				
Sensor ID Number	N/A				
Toolface Offset (deg)	66.86				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	51.45				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404285				
Insert/Sonde Serial Number	12037419				

REMARKS

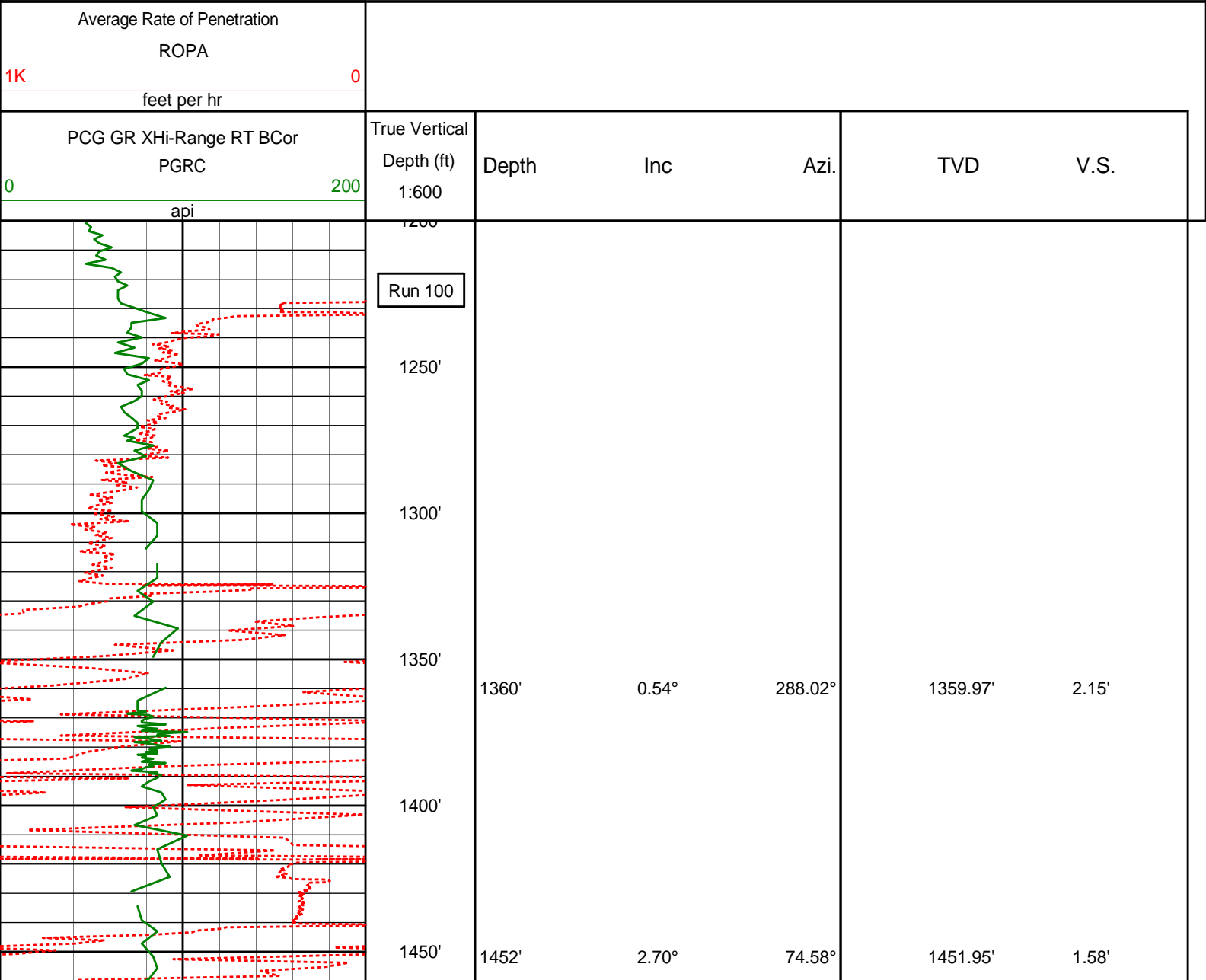
1. All depths are true vertical depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annual velocities are calculated using the "Power Law" model for water 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:
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
6. INSITE version 8.0.2

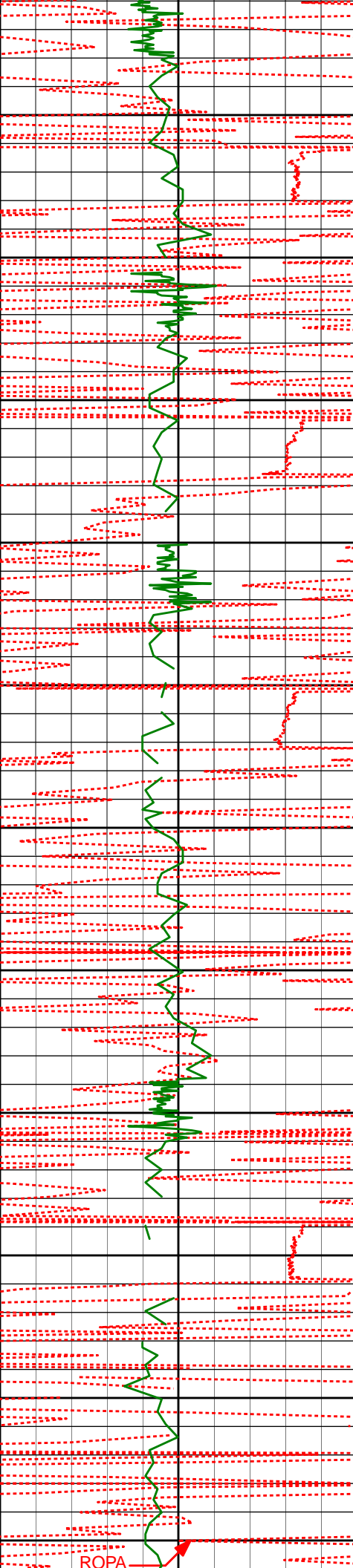
WARRANTY

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TVD Main Log 1:600





1500'

1550'

1600'

1650'

1700'

1750'

1800'

1850'

1900'

1950'

2000'

1547'

4.43°

86.06°

1546.76'

1.20'

1642'

7.47°

86.90°

1641.24'

1.41'

1738'

11.42°

85.92°

1735.92'

1.66'

1833'

10.15°

78.64°

1829.24'

0.77'

1928'

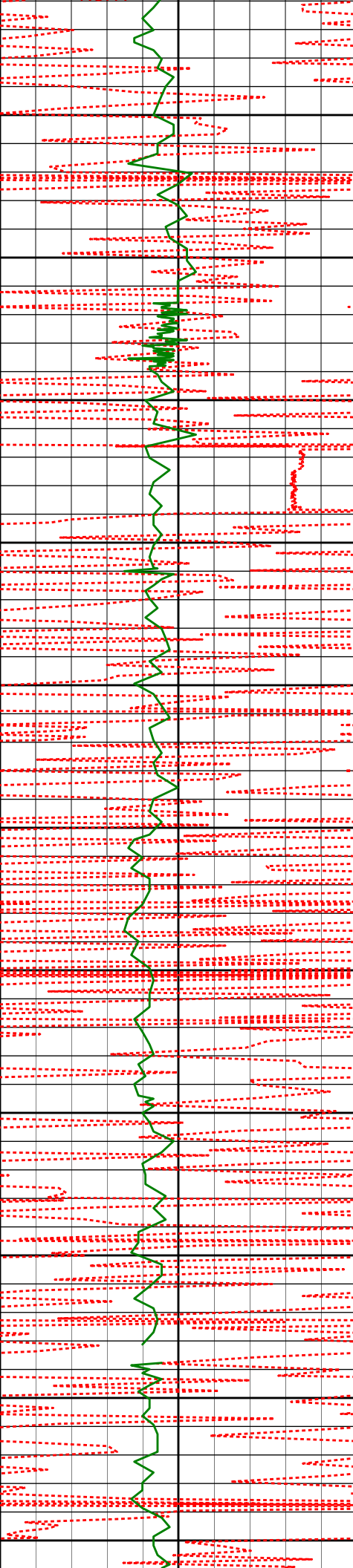
12.39°

89.59°

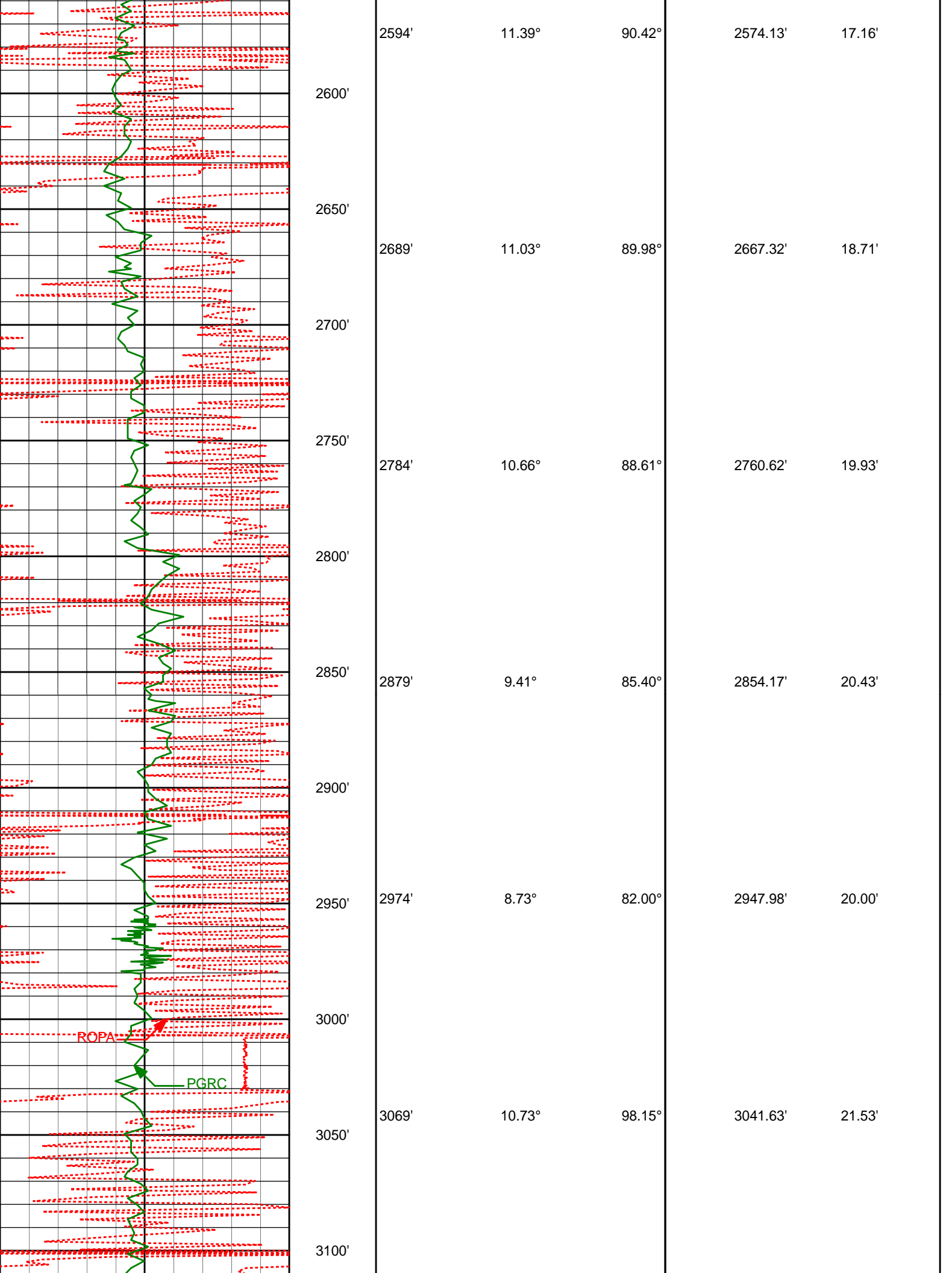
1922.41'

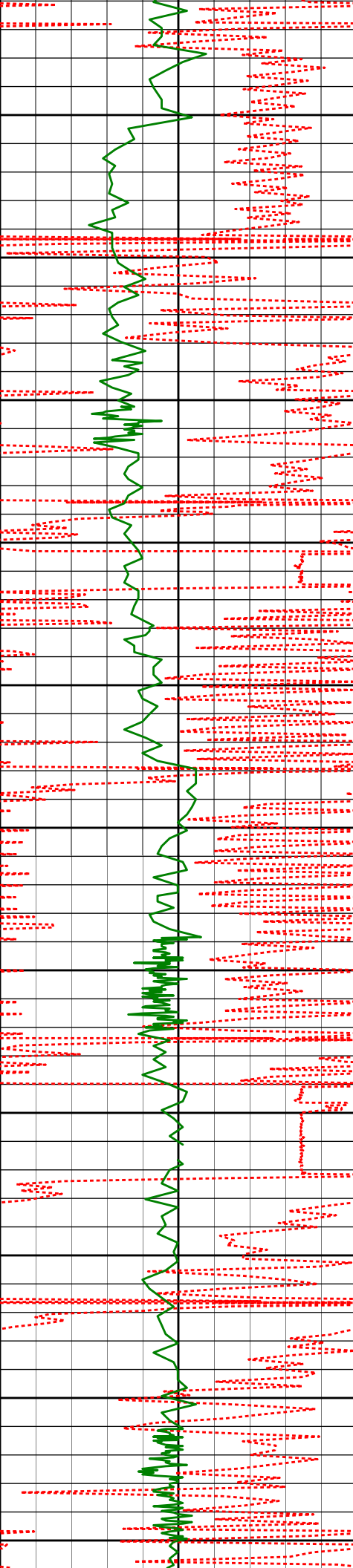
0.53'

ROPA



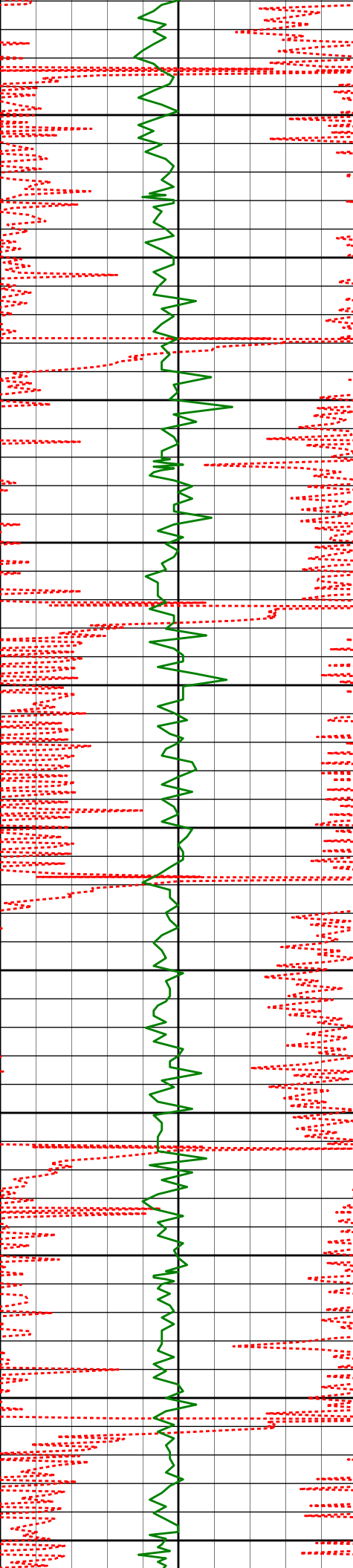
	2023'	12.25°	85.59°	2015.23'	1.31'
2050'					
2100'	2118'	11.42°	83.95°	2108.21'	1.11'
2150'					
2200'	2213'	12.32°	102.46°	2201.21'	3.85'
2250'					
2300'	2308'	12.15°	95.97°	2294.06'	8.66'
2350'					
2400'	2403'	11.73°	94.63°	2387.00'	12.04'
2450'					
2500'	2498'	11.55°	93.62°	2480.05'	14.95'
2550'					





3150'	3164'	10.97°	96.26°	3134.93'	25.19'
3200'					
3250'	3259'	11.25°	94.46°	3228.15'	28.35'
3300'					
3350'	3354'	10.43°	94.15°	3321.45'	31.12'
3400'					
3450'	3449'	10.12°	93.55°	3414.93'	33.62'
3500'					
3550'	3545'	7.67°	97.68°	3509.77'	36.18'
3600'					
3650'	3640'	6.15°	101.75°	3604.08'	38.96'





4250'

4300'

4350'

4400'

4450'

4500'

4550'

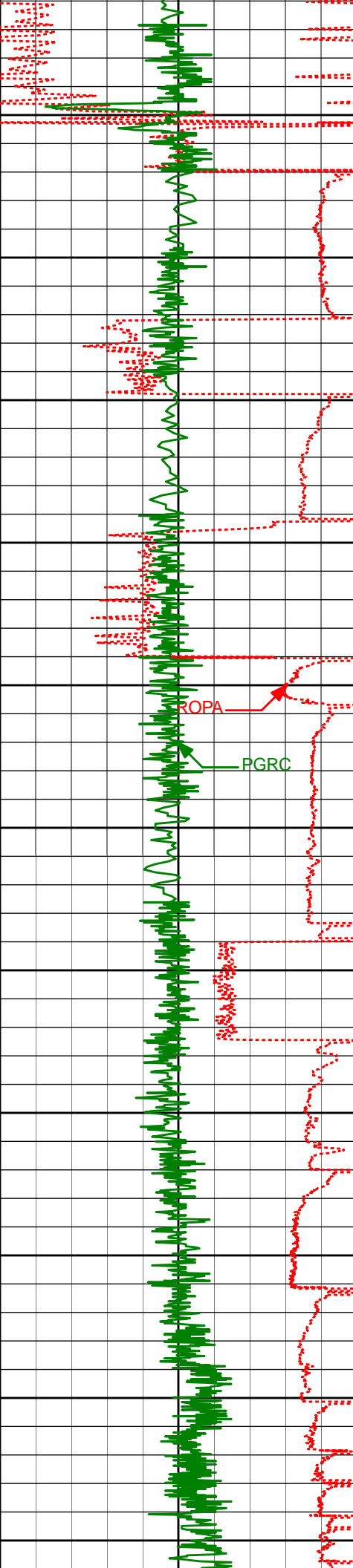
4600'

4650'

4700'

4750'

4305'	0.86°	68.94°	4268.65'	34.69'
4400'	0.49°	49.38°	4363.64'	34.24'
4495'	0.41°	12.49°	4458.64'	33.68'
4590'	0.57°	345.07°	4553.64'	32.90'
4685'	0.47°	328.72°	4648.63'	32.09'
4780'	0.37°	310.27°	4743.63'	31.53'



4800'

4875'

3.09°

174.23°

4838.59'

33.87'

4850'

4900'

4971'

9.30°

173.62°

4933.98'

44.23'

4950'

5000'

5066'

12.40°

179.27°

5027.27'

62.09'

5050'

5114'

17.30°

179.58°

5073.66'

74.35'

5100'

5161'

22.01°

180.86°

5117.90'

90.10'

5150'

5209'

25.88°

180.36°

5161.76'

109.50'

5200'

5256'

30.94°

178.46°

5203.09'

131.80'

5250'

5351'

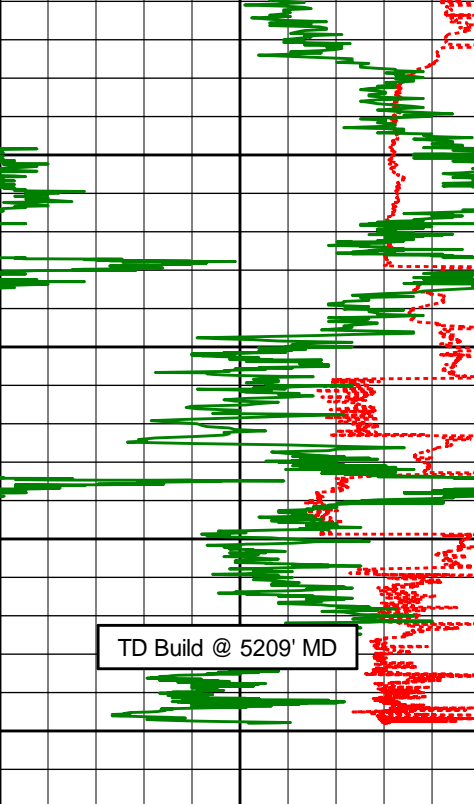
41.21°

178.21°

5279.77'

187.59'

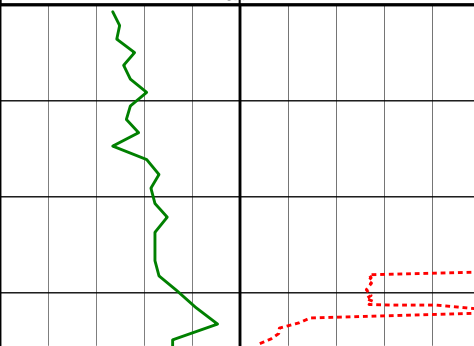
5300'

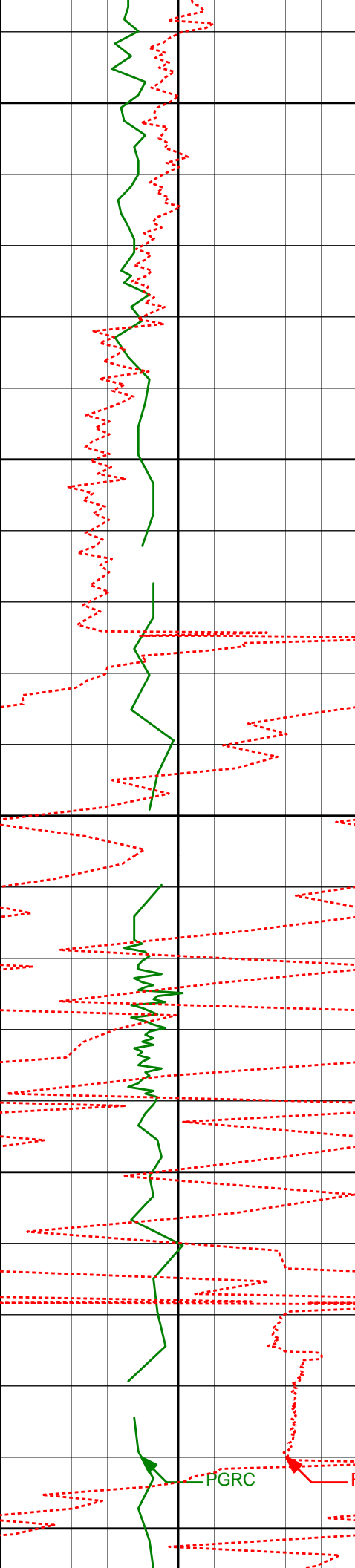
	5350'	5447'	51.48°	178.41°	5345.96'	256.86'
	5400'	5542'	62.79°	177.92°	5397.43'	336.43'
	5450'	5637'	66.51°	176.06°	5438.10'	422.23'
	5732'	72.90°	176.84°	5471.03'	511.27'	
	5844'	84.58°	188.88°	5493.77'	608.57'	
	5500'					

PCG GR XHi-Range RT BCor PGRC 0200 api	True Vertical Depth (ft) 1:600	Depth	Inc	Azi.	TVD	V.S.
Average Rate of Penetration ROPA 1K0 feet per hr						

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TVD Main Log 1:240

Average Rate of Penetration ROPA 1K0 feet per hr					
PCG Gamma Ray BCorr PGRC 0200 api	True Vertical Depth (ft) 1:240 1200	Depth	Inc	Azi.	TVD V.S.
	Run 100				



1250'

1300'

1350'

1400'

1450'

1360'

0.54°

288.02°

1359.97'

2.15'

1452'

2.70°

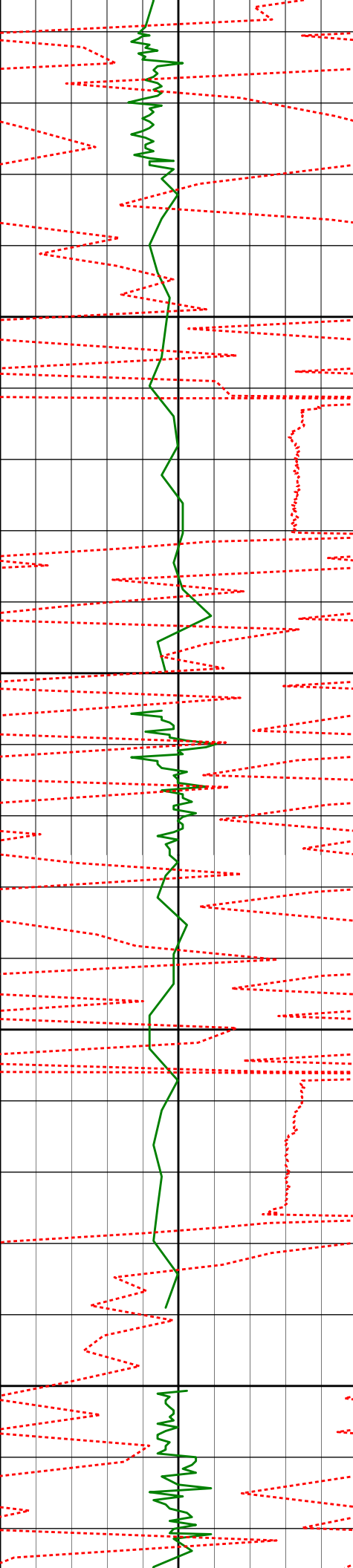
74.58°

1451.95'

1.58'

PGRC

ROPA



1500'

1550'

1600'

1650'

1547'

4.43°

86.06°

1546.76'

1.20'

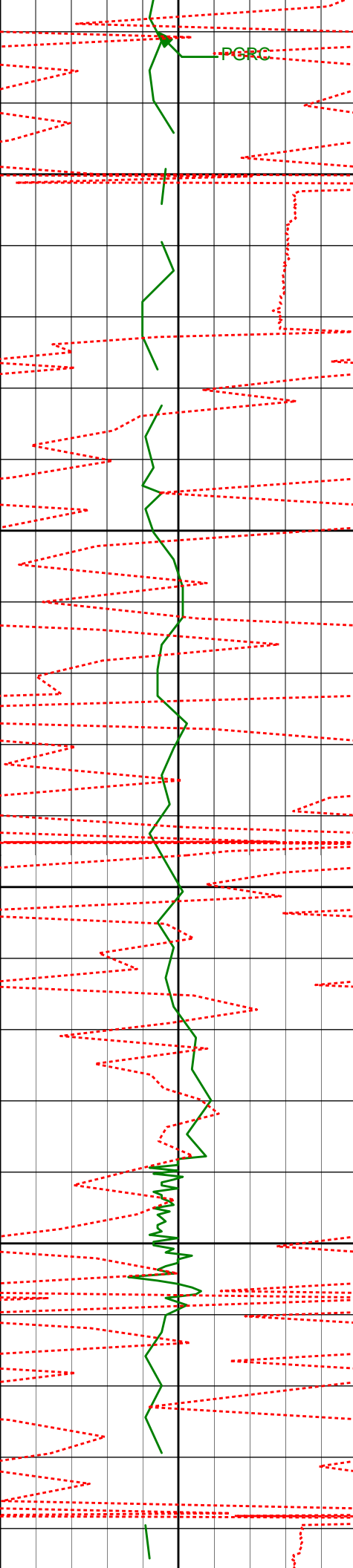
1642'

7.47°

86.90°

1641.24'

1.41'



PGRC

ROPA

1700'

1738'

11.42°

85.92°

1735.92'

1.66'

1750'

1800'

1833'

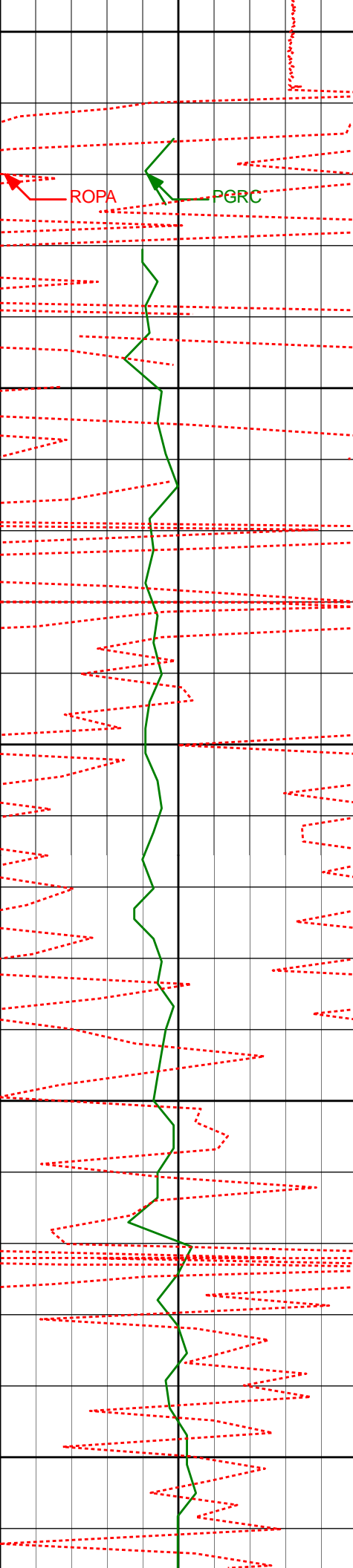
10.15°

78.64°

1829.24'

0.77'

1850'



1900'

1928'

12.39°

89.59°

1922.41'

0.53'

1950'

2000'

2023'

12.25°

85.59°

2015.23'

1.31'

2050'

2100'

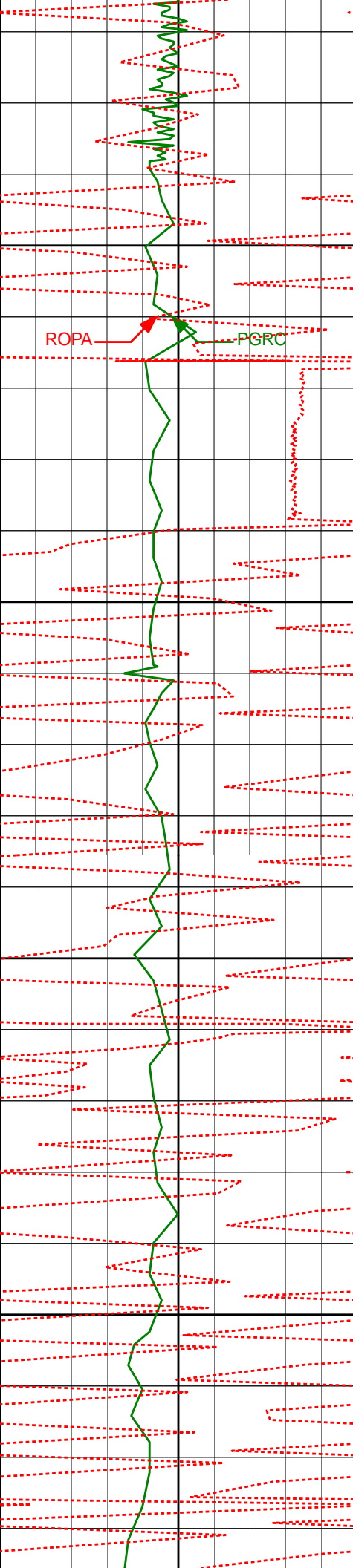
2118'

11.42°

83.95°

2108.21'

1.11'



2150'

2200'

2250'

2300'

ROPA

PGRO

2213'

12.32°

102.46°

2201.21'

3.85'

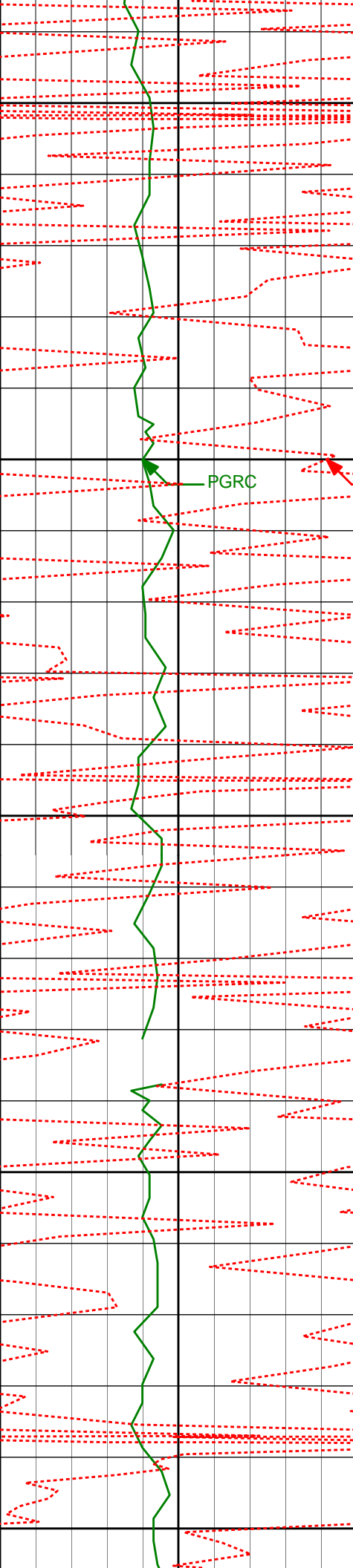
2308'

12.15°

95.97°

2294.06'

8.66'



2350'

2403'

11.73°

94.63°

2387.00'

12.04'

2400'

PGRC

2450'

2498'

11.55°

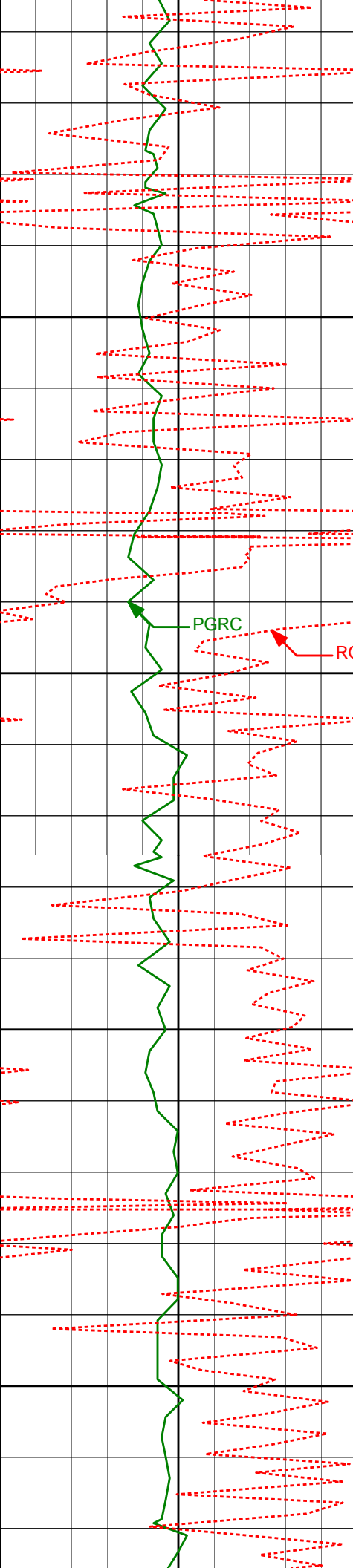
93.62°

2480.05'

14.95'

2500'

2550'



2600'

2650'

2700'

2750'

2594'

11.39°

90.42°

2574.13'

17.16'

2689'

11.03°

89.98°

2667.32'

18.71'

2784'

10.66°

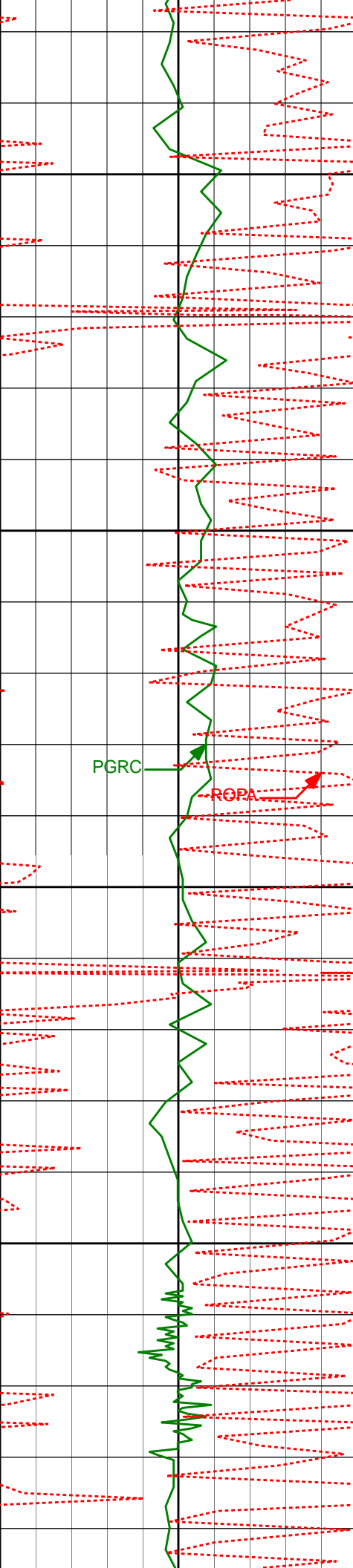
88.61°

2760.62'

19.93'

PGRC

ROPA



2800'

2850'

2900'

2950'

2879'

9.41°

85.40°

2854.17'

20.43'

PGRC

ROPA

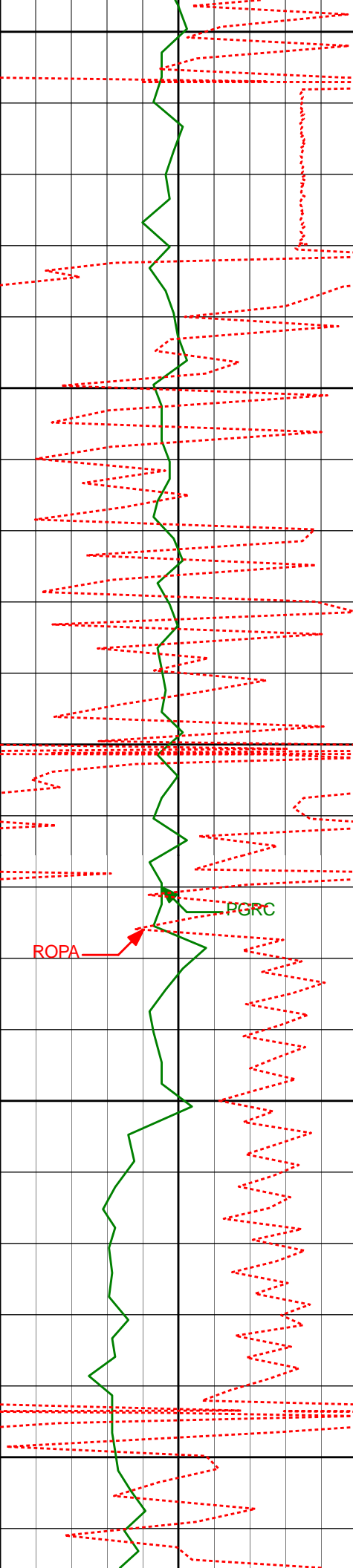
2974'

8.73°

82.00°

2947.98'

20.00'



3000'

3069'

10.73°

98.15°

3041.63'

21.53'

3050'

3100'

PGRC

ROPA

3164'

10.97°

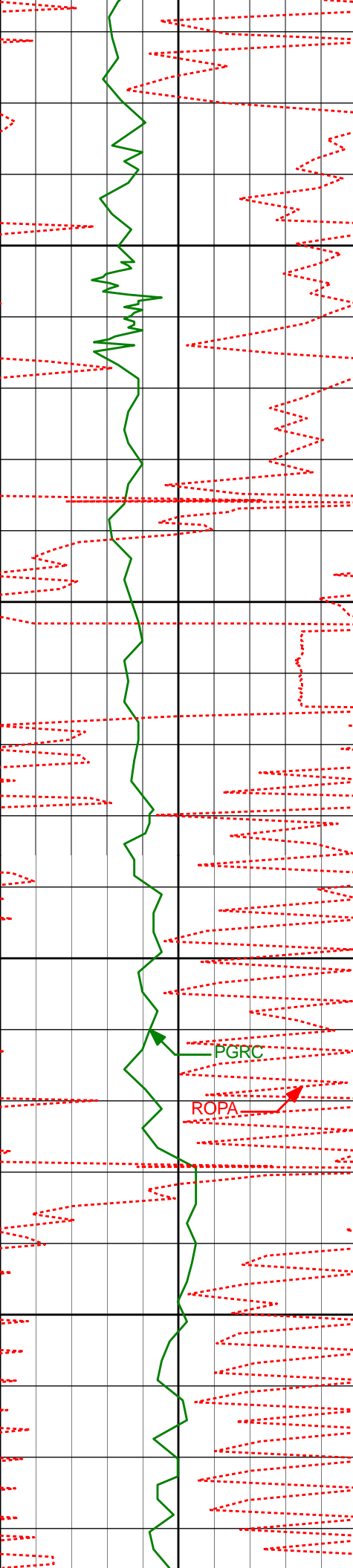
96.26°

3134.93'

25.19'

3150'

3200'



3250'

3300'

3350'

3400'

3259'

11.25°

94.46°

3228.15'

28.35'

3354'

10.43°

94.15°

3321.45'

31.12'

3449'

10.12°

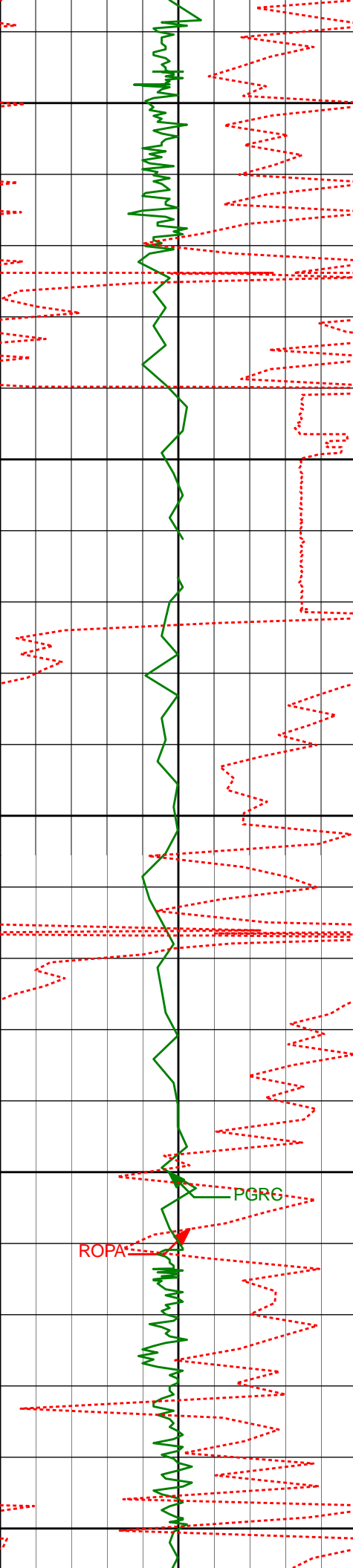
93.55°

3414.93'

33.62'

PGRC

ROPA



3450'

3500'

3550'

3600'

3650'

3545'

7.67°

97.68°

3509.77'

36.18'

3640'

6.15°

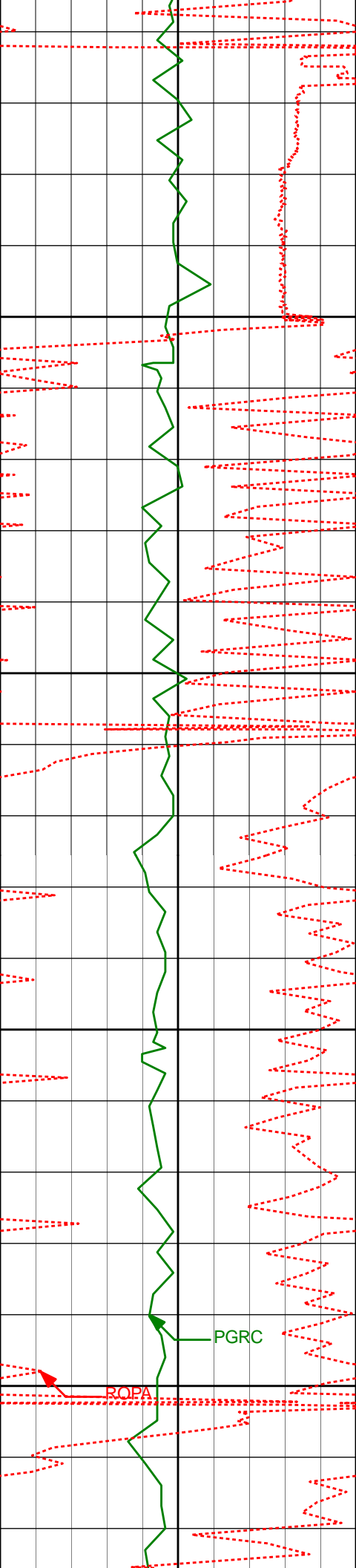
101.75°

3604.08'

38.96'

PGRG

ROPA



3700'

3735'

2.26°

65.07°

3698.82'

39.74'

3750'

3800'

3850'

3830'

1.65°

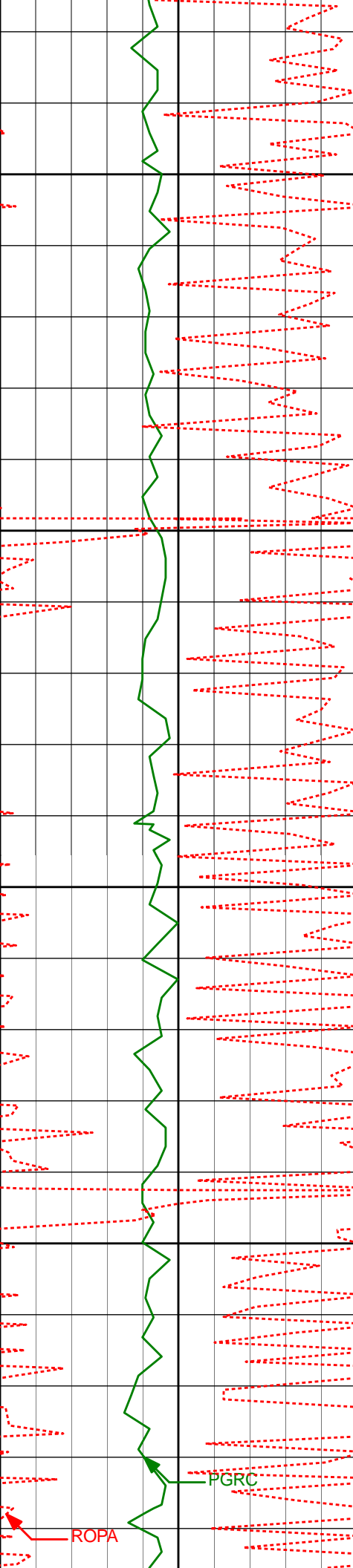
55.86°

3793.76'

38.42'

PGRC

ROPA



3900'

3950'

4000'

4050'

3925'

1.47°

52.37°

3888.72'

37.08'

4020'

1.36°

58.64°

3983.70'

35.91'

4115'

1.03°

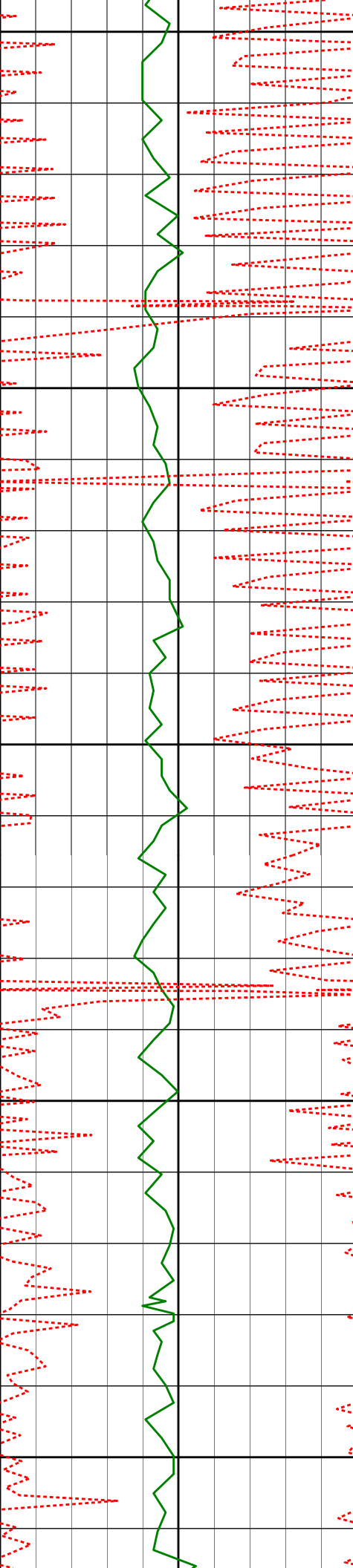
66.68°

4078.68'

35.13'

PGRC

ROPA



4100'

4150'

4210'

4200'

4250'

4305'

4300'

0.97°

86.61°

4173.66'

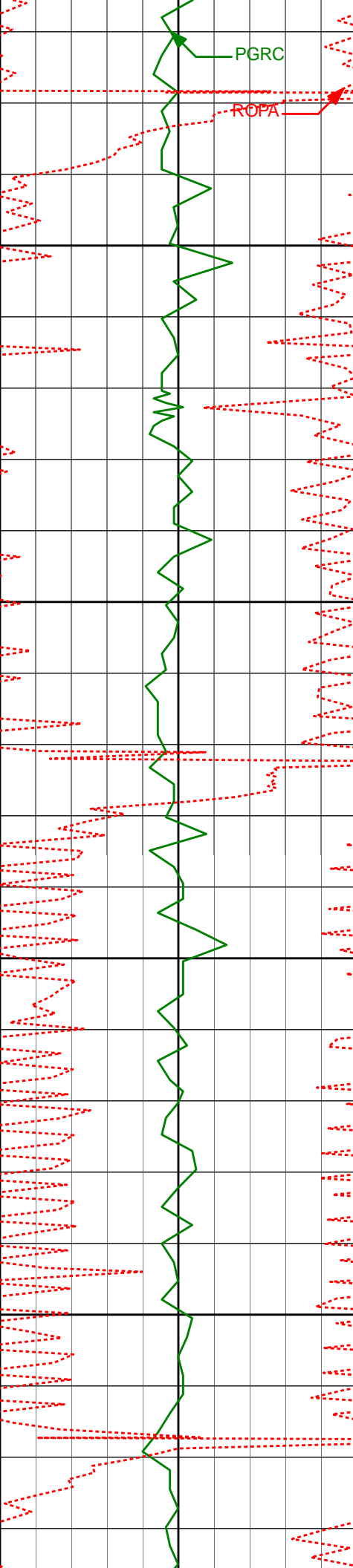
34.87'

0.86°

68.94°

4268.65'

34.69'



4350'

4400'

4400'

4450'

4495'

4500'

0.49°

49.38°

4363.64'

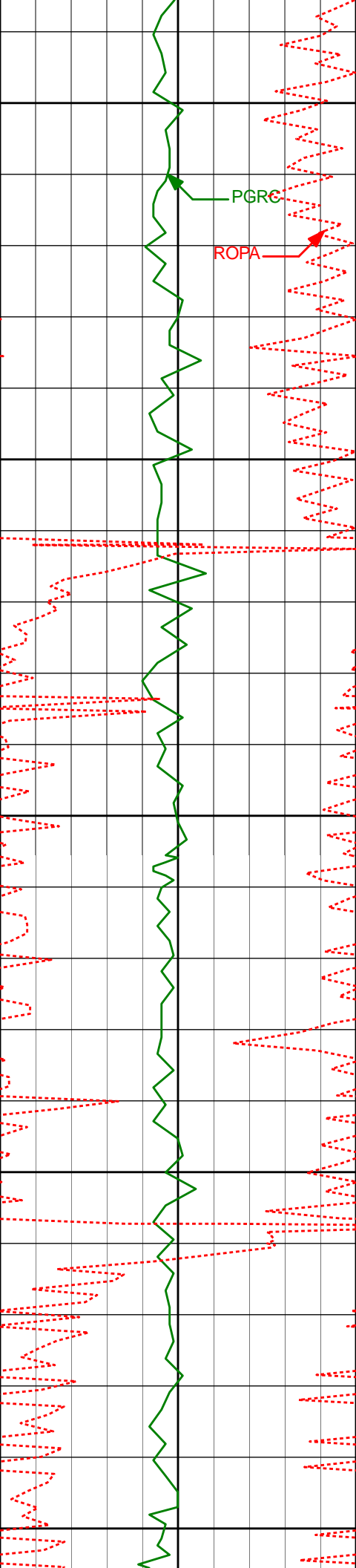
34.24'

0.41°

12.49°

4458.64'

33.68'



4550'

4590'

0.57°

345.07°

4553.64'

32.90'

PGRC

ROPA

4600'

4650'

4685'

0.47°

328.72°

4648.63'

32.09'

4700'

4780'

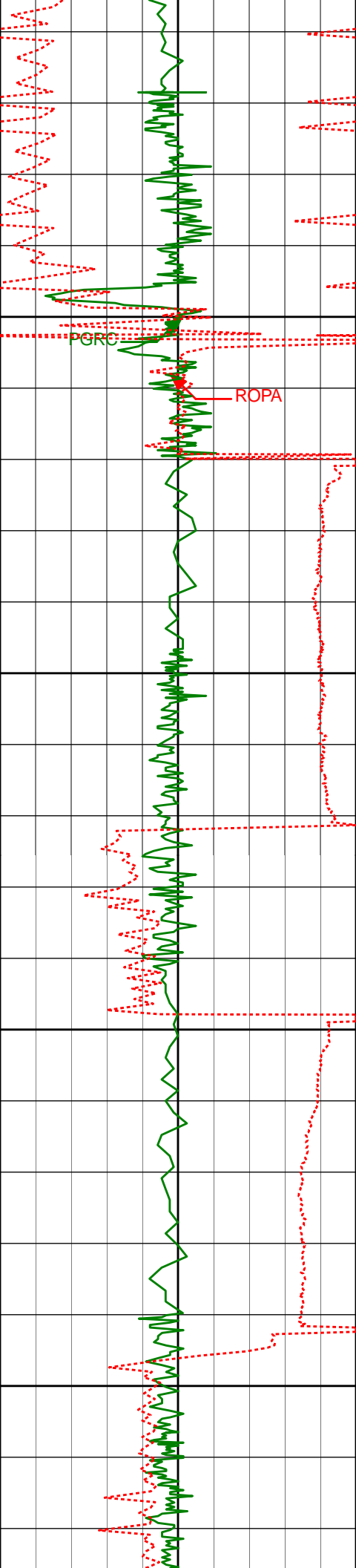
0.37°

310.27°

4743.63'

31.53'

4750'



4800'

4875'

4850'

4900'

4971'

4950'

3.09°

174.23°

4838.59'

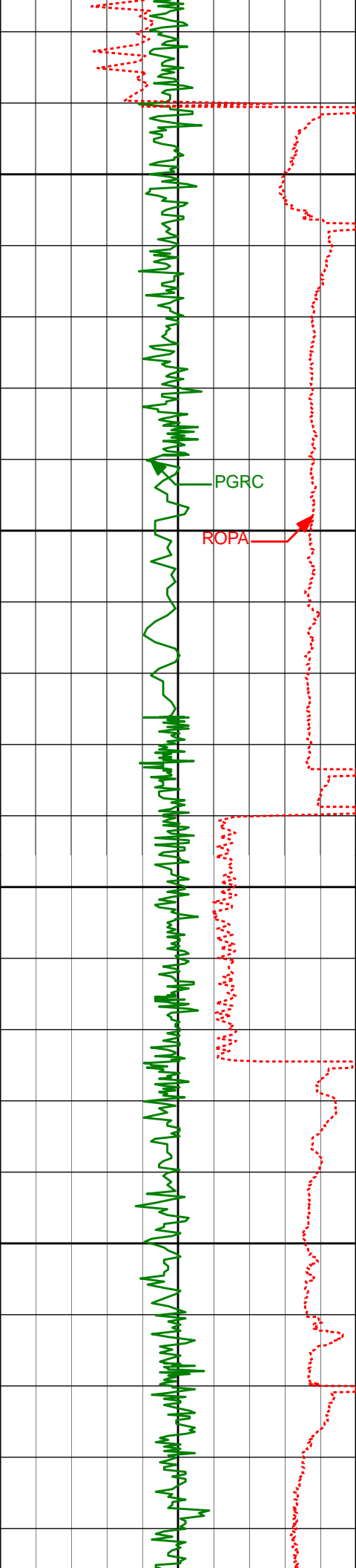
33.87'

9.30°

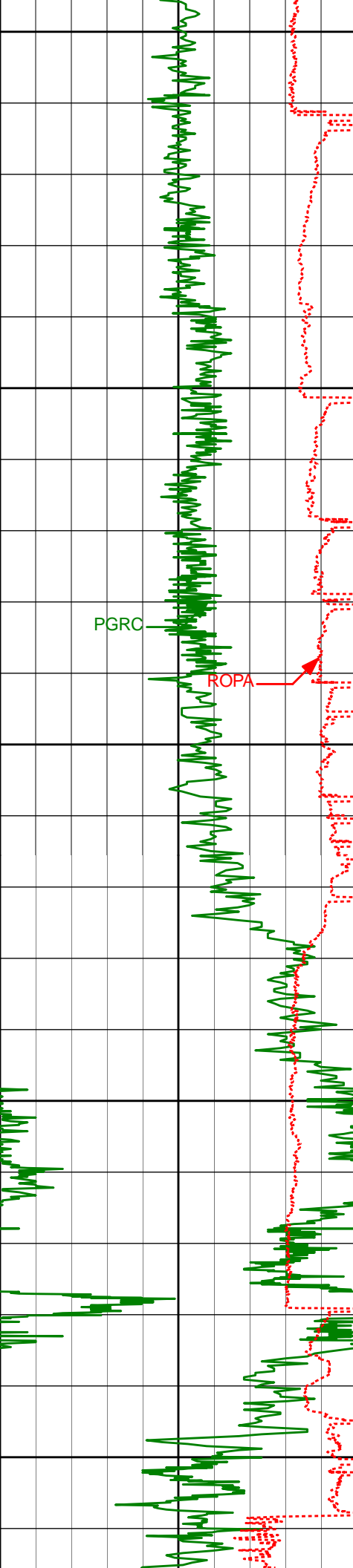
173.62°

4933.98'

44.23'



5066'	12.40°	179.27°	5027.27'	62.09'
5114'	17.30°	179.58°	5073.66'	74.35'
5161'	22.01°	180.86°	5117.90'	90.10'
5209'	25.88°	180.36°	5161.76'	109.50'



5200'

5256'

30.94°

178.46°

5203.09'

131.80'

5250'

5351'

41.21°

178.21°

5279.77'

187.59'

5300'

5447'

51.48°

178.41°

5345.96'

256.86'

5350'

5400'

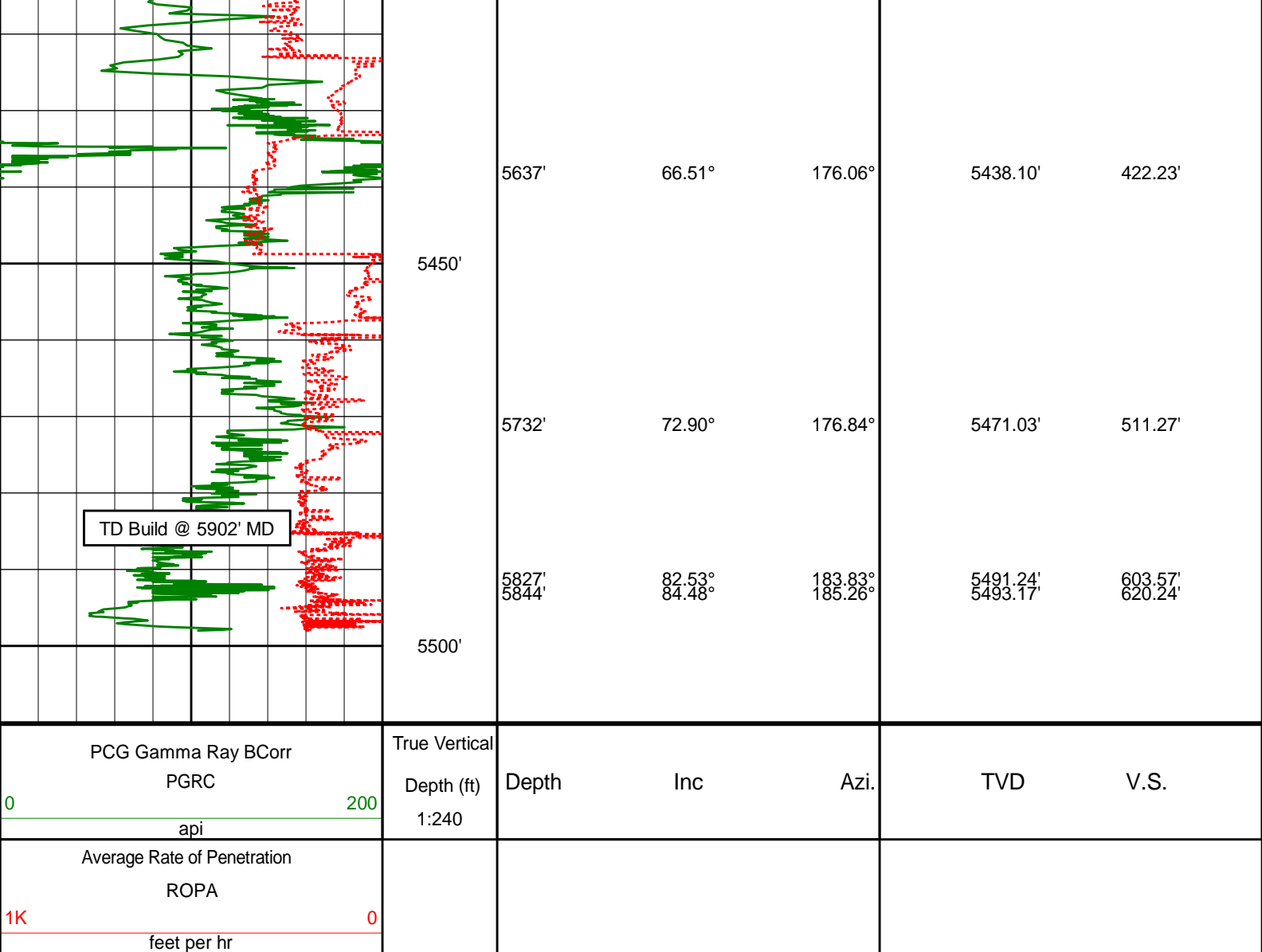
5542'

62.79°

177.92°

5397.43'

336.43'



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DIRECTIONAL SURVEY REPORT

Noble Energy
McCaffrey State LD12-74-1AHN
Wattenberg
Weld Colorado
USA
CA-XX-0901769918

The first three surveys at 471', 749' and 1027' 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
471.00	0.20	344.50	471.00	0.79 N	0.22 W	-0.81	0.04
749.00	0.50	212.90	749.00	0.24 N	1.01 W	-0.32	0.23
1027.00	0.50	212.90	1026.99	1.80 S	2.33 W	1.60	0.00
1360.00	0.54	288.02	1359.97	2.53 S	4.60 W	2.15	0.19
1452.00	2.70	74.58	1451.95	1.82 S	2.93 W	1.58	3.44
1547.00	4.43	86.06	1546.76	0.97 S	2.89 E	1.20	1.96
1642.00	7.47	86.90	1641.24	0.39 S	12.72 E	1.41	3.20
1738.00	11.42	85.92	1735.92	0.63 N	28.43 E	1.66	4.12
1833.00	10.15	78.64	1829.24	2.94 N	46.02 E	0.77	1.95
1928.00	12.39	89.59	1922.41	4.67 N	64.42 E	0.53	3.25
2023.00	12.25	85.59	2015.23	5.52 N	84.67 E	1.31	0.91
2118.00	11.42	83.95	2108.21	7.28 N	104.07 E	1.11	0.95

2213.00	12.32	102.46	2201.21	6.09 N	123.32 E	3.85	4.10
2308.00	12.15	95.97	2294.06	2.86 N	143.17 E	8.66	1.46
2403.00	11.73	94.63	2387.00	1.04 N	162.74 E	12.04	0.54
2498.00	11.55	93.62	2480.05	0.34 S	181.85 E	14.95	0.29
2594.00	11.39	90.42	2574.13	1.02 S	200.92 E	17.16	0.68
2689.00	11.03	89.98	2667.32	1.08 S	219.39 E	18.71	0.40
2784.00	10.66	88.61	2760.62	0.87 S	237.26 E	19.93	0.47
2879.00	9.41	85.40	2854.17	0.03 S	253.78 E	20.43	1.44
2974.00	8.73	82.00	2947.98	1.60 N	268.66 E	20.00	0.90
3069.00	10.73	98.15	3041.63	1.35 N	284.56 E	21.53	3.55
3164.00	10.97	96.26	3134.93	0.89 S	302.31 E	25.19	0.45
3259.00	11.25	94.46	3228.15	2.60 S	320.53 E	28.35	0.46
3354.00	10.43	94.15	3321.45	3.94 S	338.34 E	31.12	0.87
3449.00	10.12	93.55	3414.93	5.08 S	355.24 E	33.62	0.34
3545.00	7.67	97.68	3509.77	6.46 S	370.01 E	36.18	2.64
3640.00	6.15	101.75	3604.08	8.34 S	381.28 E	38.96	1.68
3735.00	2.26	65.07	3698.82	8.59 S	387.96 E	39.74	4.77
3830.00	1.65	55.86	3793.76	7.03 S	390.79 E	38.42	0.73
3925.00	1.47	52.37	3888.72	5.52 S	392.89 E	37.08	0.22
4020.00	1.36	58.64	3983.70	4.19 S	394.81 E	35.91	0.20
4115.00	1.03	66.68	4078.68	3.27 S	396.56 E	35.13	0.38
4210.00	0.97	86.61	4173.66	2.88 S	398.14 E	34.87	0.37
4305.00	0.86	68.94	4268.65	2.58 S	399.61 E	34.69	0.32
4400.00	0.49	49.38	4363.64	2.05 S	400.59 E	34.24	0.45
4495.00	0.41	12.49	4458.64	1.46 S	400.97 E	33.68	0.31
4590.00	0.57	345.07	4553.64	0.68 S	400.92 E	32.90	0.29
4685.00	0.47	328.72	4648.63	0.11 N	400.60 E	32.09	0.19
4780.00	0.37	310.27	4743.63	0.64 N	400.16 E	31.53	0.17
4875.00	3.09	174.23	4838.59	1.72 S	400.19 E	33.87	3.55
4971.00	9.30	173.62	4933.98	12.01 S	401.31 E	44.23	6.47
5066.00	12.40	179.27	5027.27	29.85 S	402.30 E	62.09	3.44
5114.00	17.30	179.58	5073.66	42.14 S	402.41 E	74.35	10.20
5161.00	22.01	180.86	5117.90	57.95 S	402.33 E	90.10	10.08
5209.00	25.88	180.36	5161.76	77.43 S	402.13 E	109.50	8.07
5256.00	30.94	178.46	5203.09	99.78 S	402.39 E	131.80	10.93
5351.00	41.21	178.21	5279.77	155.62 S	404.03 E	187.59	10.81
5447.00	51.48	178.41	5345.96	224.95 S	406.06 E	256.86	10.70
5542.00	62.79	177.92	5397.43	304.57 S	408.64 E	336.43	11.91
5637.00	66.51	176.06	5438.10	390.28 S	413.17 E	422.23	4.30
5732.00	72.90	176.84	5471.03	479.17 S	418.68 E	511.27	6.77
5827.00	82.53	183.83	5491.24	571.82 S	418.03 E	603.57	12.42
5844.00	84.48	185.26	5493.17	588.66 S	416.69 E	620.24	14.17
6002.00	88.12	182.93	5503.36	745.89 S	405.45 E	776.06	2.74
6095.00	89.48	178.63	5505.31	838.83 S	404.18 E	868.61	4.85
6187.00	88.24	177.78	5507.14	930.77 S	407.06 E	960.47	1.63
6280.00	89.20	178.86	5509.22	1023.70 S	409.78 E	1053.33	1.55
6372.00	90.59	181.56	5509.39	1115.69 S	409.44 E	1144.99	3.30
6465.00	89.35	182.27	5509.44	1208.64 S	406.33 E	1237.39	1.53
6557.00	89.85	180.75	5510.08	1300.60 S	403.91 E	1328.86	1.74
6650.00	91.48	180.50	5509.01	1393.59 S	402.90 E	1421.46	1.78
6743.00	91.20	179.97	5506.83	1486.56 S	402.51 E	1514.10	0.65
6835.00	91.11	179.11	5504.98	1578.54 S	403.25 E	1605.84	0.94
6930.00	90.18	177.28	5503.90	1673.48 S	406.24 E	1700.71	2.17
7025.00	91.51	178.98	5502.50	1768.41 S	409.35 E	1795.59	2.27
7120.00	91.05	177.92	5500.38	1863.35 S	411.92 E	1890.43	1.21
7215.00	90.68	179.41	5498.95	1958.31 S	414.13 E	1985.26	1.61
7311.00	89.66	179.39	5498.66	2054.30 S	415.13 E	2081.02	1.06
7406.00	88.64	178.06	5500.07	2149.27 S	417.24 E	2175.85	1.77
7501.00	89.11	180.25	5501.94	2244.23 S	418.65 E	2270.62	2.35
7596.00	87.78	180.21	5504.52	2339.19 S	418.27 E	2365.24	1.40
7691.00	89.57	180.68	5506.71	2434.16 S	417.53 E	2459.85	1.95
7786.00	92.59	181.26	5504.93	2529.12 S	415.91 E	2554.37	3.23
7881.00	92.34	180.12	5500.84	2624.02 S	414.77 E	2648.87	1.23
7976.00	92.71	179.78	5496.66	2718.93 S	414.85 E	2743.48	0.53
8071.00	91.32	180.06	5493.31	2813.87 S	414.99 E	2838.12	1.49
8166.00	92.15	178.91	5490.43	2908.82 S	415.85 E	2932.83	1.49

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 175.39 DEGREES (GRID)

A TOTAL CORRECTION OF 6.90 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 8166.00 FEET
IS 2938.39 FEET ALONG 171.86 DEGREES (GRID)

Final survey is a straight line projection to TD.

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