

## PCG Pressure Case Gamma PCD Pressure Case Directional

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100	200			
<b>Date run completed</b>	08-Dec-13	09-Dec-13			
<b>Rig Bit Number</b>	2	3			
<b>Bit Size (in)</b>	8.750	8.750			
<b>Tool Nominal OD (in)</b>	6.750	6.750			
<b>Log Start Depth (TVD, ft)</b>	761.91	5,879.17			
<b>Log End Depth (TVD, ft)</b>	5,879.17	6,647.98			
<b>Drill or Wipe</b>	Drill	Drill			
<b>Drill/Wipe Start Date and Time</b>	07-Dec-13 19:07	09-Dec-13 04:00			
<b>Drill/Wipe End Date and Time</b>	08-Dec-13 19:00	09-Dec-13 14:30			
<b>Min Inc (deg) @ Depth (TVD, ft)</b>	0.29 @ 5,391.20	3.38 @ 5,962.09			
<b>Max Inc (deg) @ Depth (TVD, ft)</b>	15.00 @ 3,695.69	82.15 @ 6,645.41			
<b>Bit TFA(in2) / Bit Type</b>	0.91 / PDC	1.24 / PDC			
<b>Flow Rate (gpm)</b>	598.01	589.50			
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	419.0 / 500.0	375.0 / 425.0			
<b>Fluid Type</b>	Fresh Water Gel	Fresh Water Gel			
<b>Density (ppg) / Viscosity (spqt)</b>	8.60 / 29.00	9.40 / 37.00			
<b>Filtrate CL (ppm)</b>	24,000.00	2,400.00			
<b>pH / Fluid Loss (mptm)</b>	9.30 / 24	9.80 / 7			
<b>PV (cP) / YP (lbf2)</b>	4 / 3.00	9 / 9.00			
<b>% Solids / % Sand</b>	1.40 / 0.25	4.9 / .25			
<b>% Oil / Oil:Water Ratio</b>	0 / 0:90	0 / 0:90			
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Max Tool Temp (in F) / S</b>	159.46 / PCM	159.70 / PCM			

Max Tool Temp (degF) / Source	150.10 / PCM	158.70 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Adam Sampson	Adam Sampson			
Customer Representative	Matt Settles	Matt Settles			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11341340	11341340			
Insert Serial Number	11227525	11227525			
Date and Time Initialized	06-Dec-13 19:22	06-Dec-13 19:22			
Date and Time Read	10-Dec-13 02:13	10-Dec-13 02:38			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	56.00	54.00			
Software Version	6.21	6.21			
Sub Serial Number	11341340	11341340			
Sonde Serial Number	11062040	11062040			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	235.94	135.80			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.52	47.49			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11341340	11341340			
Insert/Sonde Serial Number	12037422	12037422			

## REMARKS

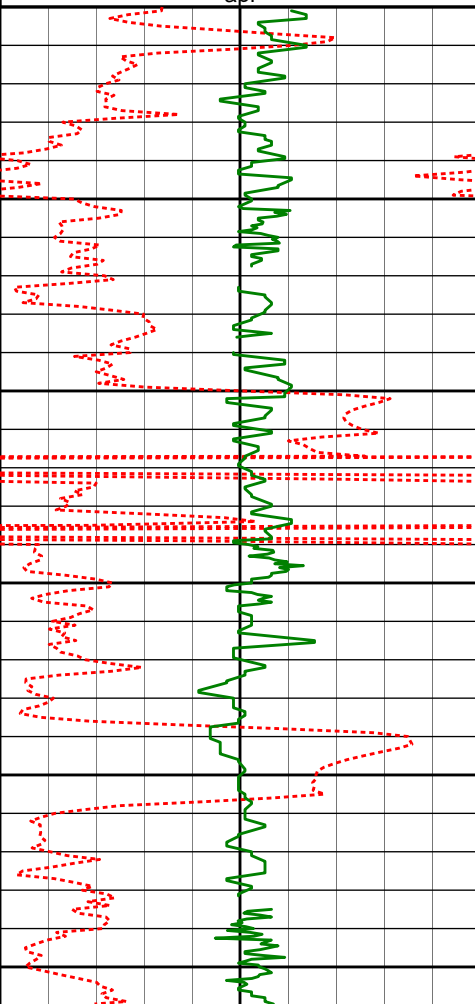
1. All depths are true vertical depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annual velocities are calculated using the "Power Law" model for water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

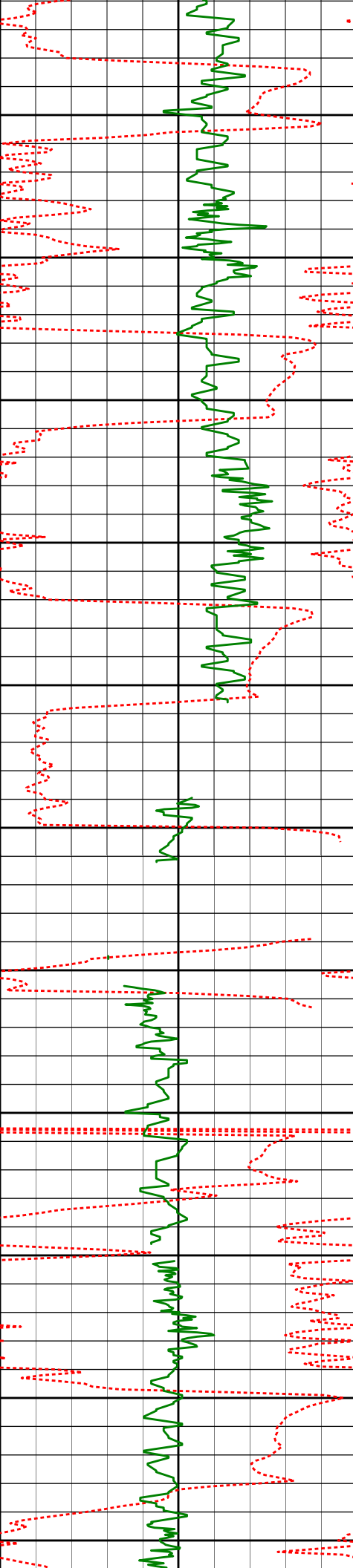
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TVD Main Log 1:600

Average Rate of Penetration ROPA						
1K0						
feet per hr						
PCG Gamma Ray PGRC		True Vertical	Depth	Inc	Azi.	TVD
0200		Depth (ft) 1:600				
api						
		3000'				
		3050'	3069'	12.50°	178.24°	3044.97'
		3100'				4.95'
		3150'	3164'	12.19°	179.84°	3137.77'
		3200'				5.92'
		3250'	3259'	11.67°	179.89°	3230.72'
						6.57'



3300'

3354'

10.00°

182.65°

3324.02'

6.76'

3350'

3400'

3449'

9.78°

178.08°

3417.61'

7.15'

3450'

3500'

3543'

10.07°

181.22°

3510.21'

7.73'

3550'

3600'

3638'

12.36°

176.76°

3603.39'

8.70'

3650'

3700'

3733'

15.00°

175.22°

3695.69'

10.99'

3750'

3800'

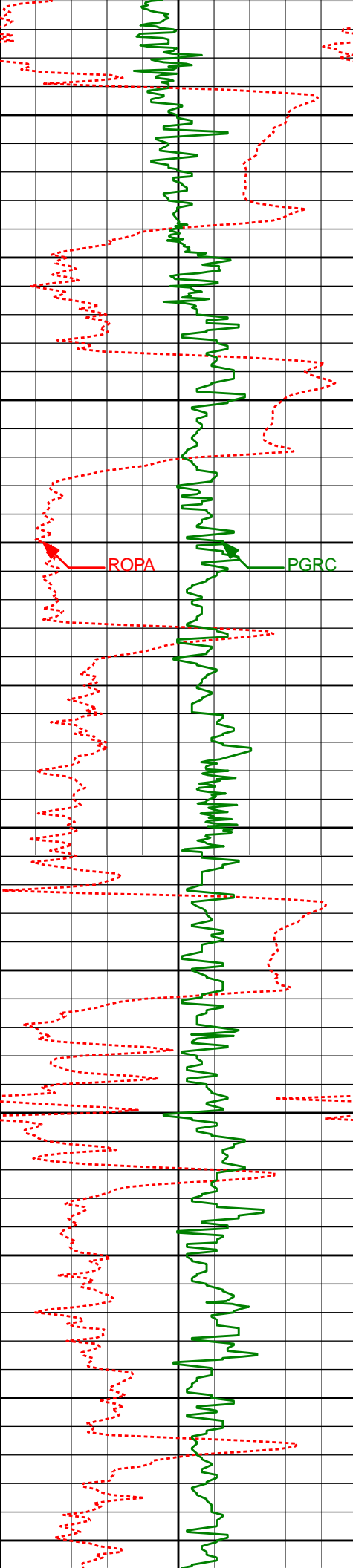
3828'

13.50°

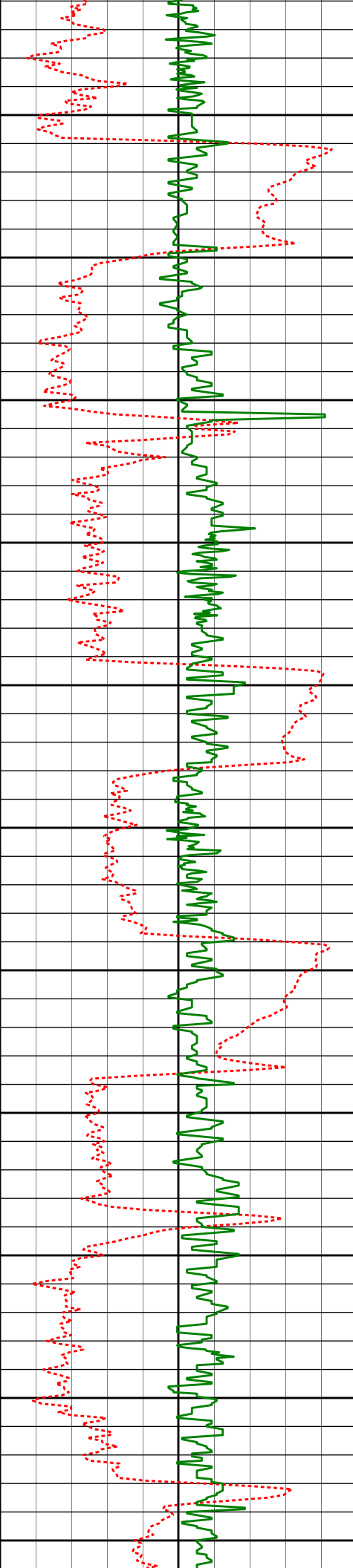
173.14°

3787.76'

14.05'



3850'				
3923'	11.15°	166.36°	3880.57'	18.15'
3900'				
3950'				
4018'	8.77°	176.11°	3974.14'	21.30'
4000'				
4050'				
4112'	8.43°	171.27°	4067.08'	23.26'
4100'				
4150'				
4207'	5.87°	183.93°	4161.34'	24.35'
4200'				
4250'				
4302'	4.51°	179.33°	4255.95'	24.32'
4300'				
4350'				
4397'	3.83°	176.73°	4350.70'	24.76'



4400'

4450'

4500'

4550'

4600'

4650'

4700'

4750'

4800'

4850'

4900'

4491'

2.47°

196.13°

4444.56'

24.53'

4586'

2.52°

205.87°

4539.47'

23.17'

4681'

3.10°

233.43°

4634.36'

20.30'

4776'

1.07°

268.25°

4729.29'

17.40'

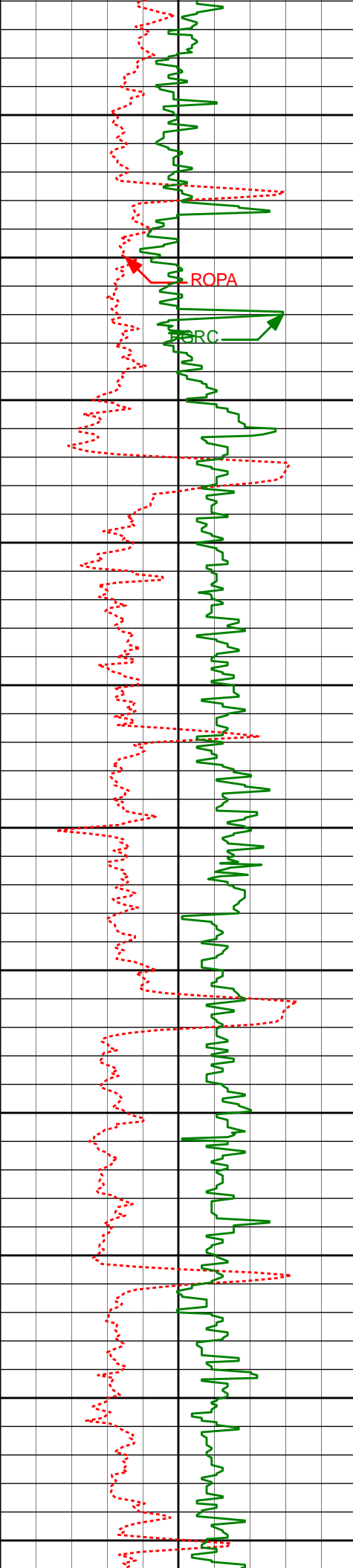
4871'

0.94°

261.96°

4824.28'

15.75'



4950'

5000'

5050'

5100'

5150'

5200'

5250'

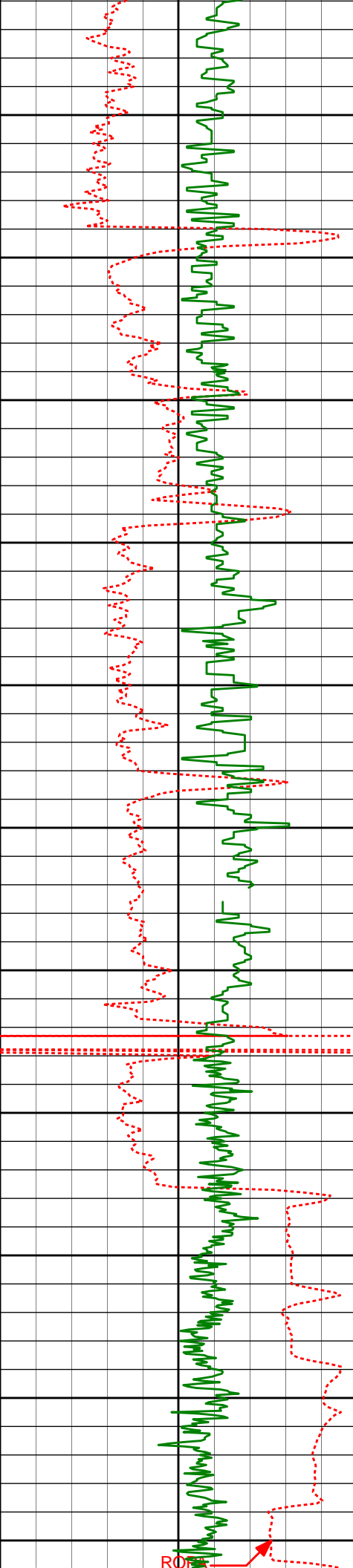
5300'

5350'

5400'

5450'

4966'	0.83°	240.00°	4919.27'	14.39'
5060'	0.99°	221.87°	5013.25'	13.29'
5155'	1.03°	234.31°	5108.24'	12.09'
5343'	1.08°	279.88°	5296.21'	8.99'
5438'	0.29°	202.63°	5391.20'	8.02'



5500'

5550'

5600'

5650'

5700'

5750'

5800'

5850'

5900'

5950'

6000'

Run 200

RO

5627'

0.74°

136.13°

5580.20'

8.72'

5722'

0.83°

132.13°

5675.19'

9.68'

5817'

0.71°

121.48°

5770.18'

10.72'

5870'

0.52°

152.60°

5823.18'

11.12'

6004'

3.38°

93.89°

5957.10'

15.24'

6049'

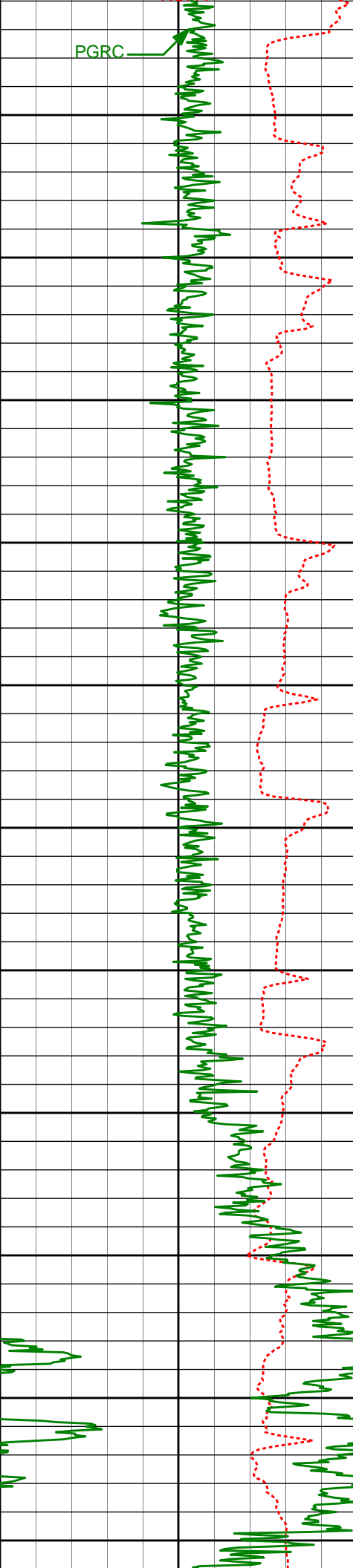
7.73°

91.53°

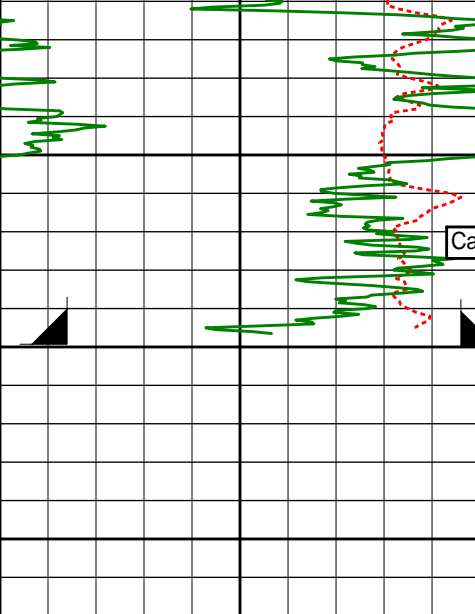
6002.04'

19.16'





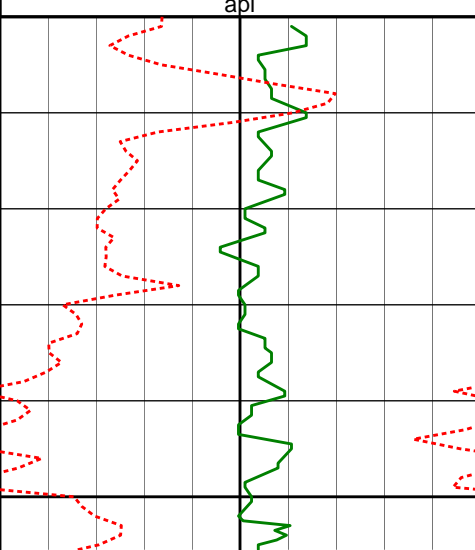
6050'	6093'	8.65°	89.50°	6045.78'	25.27'
6100'					
6150'	6182'	13.51°	87.49°	6132.66'	41.19'
6200'	6270'	18.30°	90.99°	6218.00'	63.90'
6250'					
6300'	6358'	23.60°	84.76°	6301.23'	93.41'
6350'					
6400'	6448'	32.13°	87.74°	6381.92'	131.28'
6450'	6537'	49.81°	91.34°	6455.04'	182.04'
6500'	6626'	59.97°	93.95°	6512.65'	250.01'
6550'	6715'	59.84°	91.29°	6558.49'	325.46'

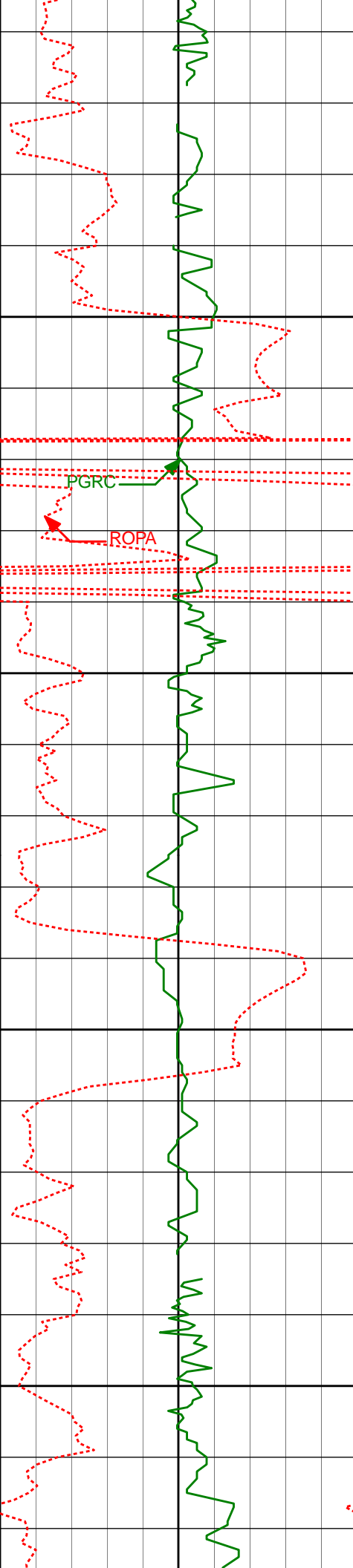
	6600'	6804'	67.76°	89.00°	6602.36'	403.20'
	Casing Shoe @ 6652'	6875'	82.15°	89.34°	6631.14'	468.48'
	6650'					
	6700'					

PCG Gamma Ray PGRC 0 200 api	True Vertical Depth (ft) 1:600	Depth	Inc	Azi.	TVD	V.S.
Average Rate of Penetration ROPA 1K 0 feet per hr						

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## TVD Main Log 1:240

Average Rate of Penetration ROPA 1K 0 feet per hr						
PCG Gamma Ray PGRC 0 200 api	Measured Depth (ft) 1:240	Depth	Inc	Azi.	TVD	V.S.
	3000'					
	3050'	3069'	12.50°	178.24°	3044.97'	4.95'



3100'

PGRC

ROPA

3150'

3200'

3250'

3164'

12.19°

179.84°

3137.77'

5.92'

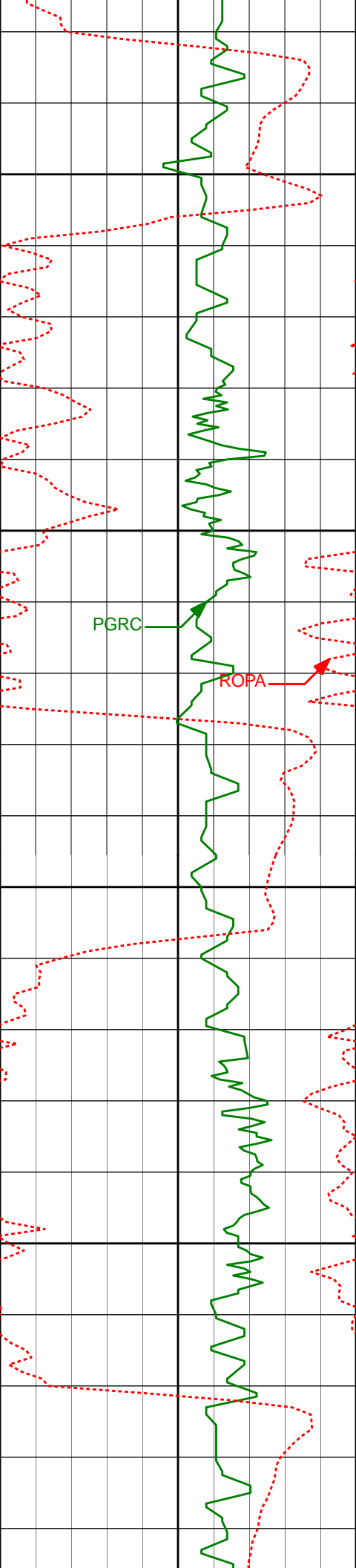
3259'

11.67°

179.89°

3230.72'

6.57'



3300'

3354'

10.00°

182.65°

3324.02'

6.76'

3350'

3400'

3449'

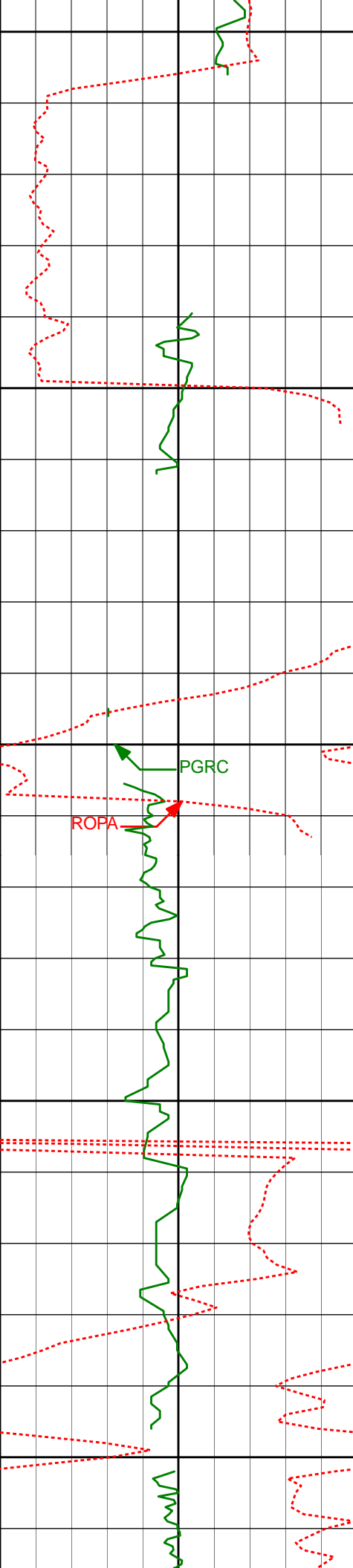
9.78°

178.08°

3417.61'

7.15'

3450'



3500'

3543'

10.07°

181.22°

3510.21'

7.73'

3550'

3600'

3638'

12.36°

176.76°

3603.39'

8.70'

3650'

3733'

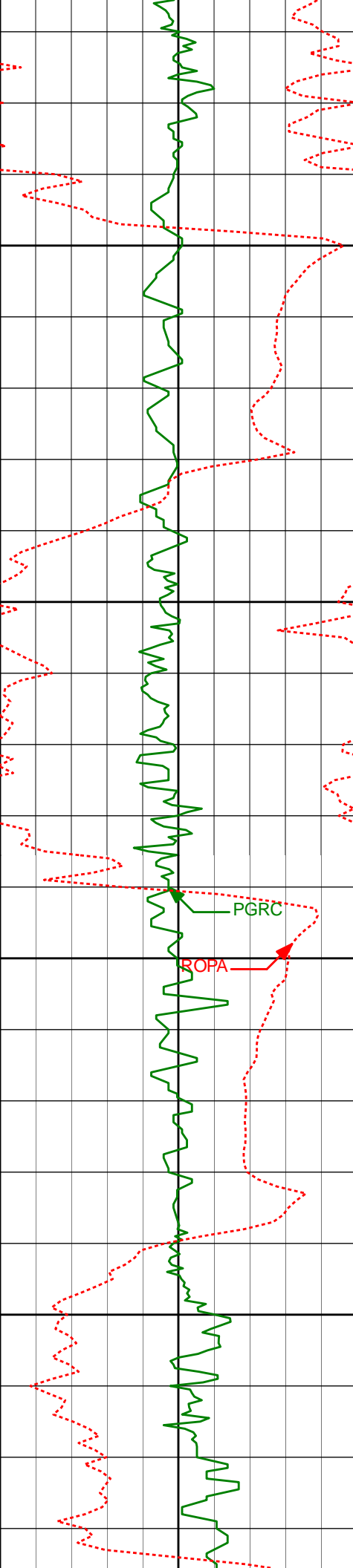
15.00°

175.22°

3695.69'

10.99'

3700'



3750'

3828'

13.50°

173.14°

3787.76'

14.05'

3800'

3850'

3923'

11.15°

166.36°

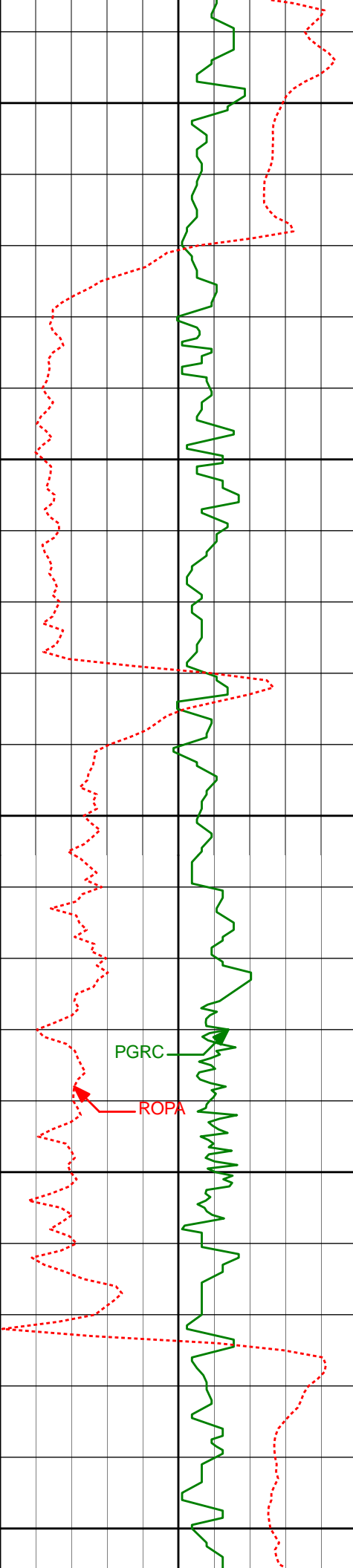
3880.57'

18.15'

3900'

PGRC

ROPA



3950'

4018'

8.77°

176.11°

3974.14'

21.30'

4000'

4050'

4112'

8.43°

171.27°

4067.08'

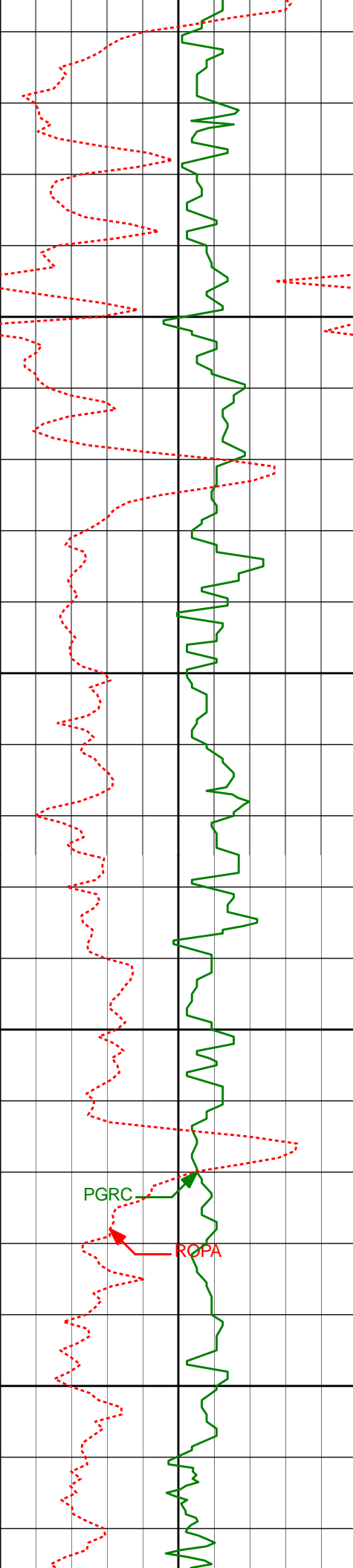
23.26'

4100'

4150'

PGRC

ROPA



4200'

4250'

4300'

4350'

PGRC

ROPA

4207'

5.87°

183.93°

4161.34'

24.35'

4302'

4.51°

179.33°

4255.95'

24.32'

4397'

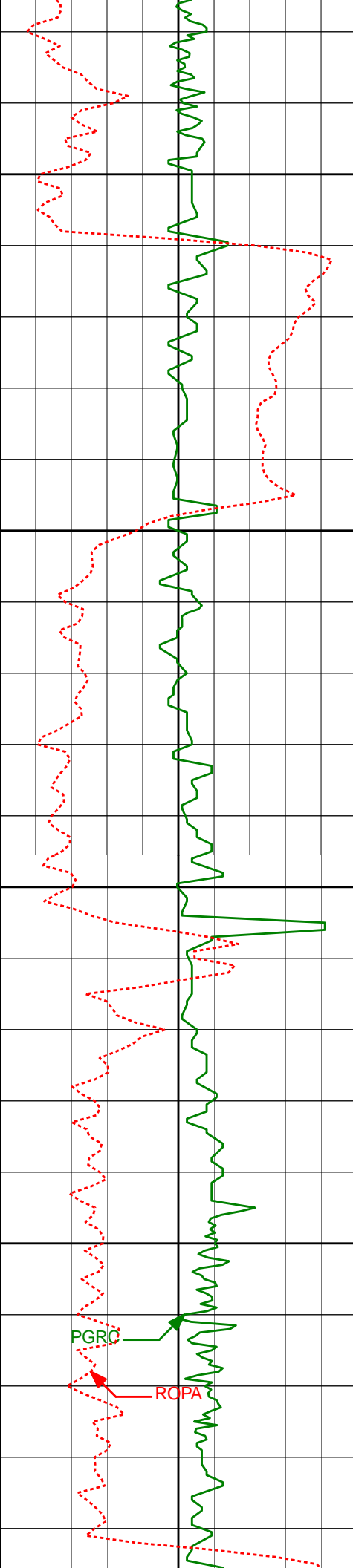
3.83°

176.73°

4350.70'

24.76'





4400'

4450'

4500'

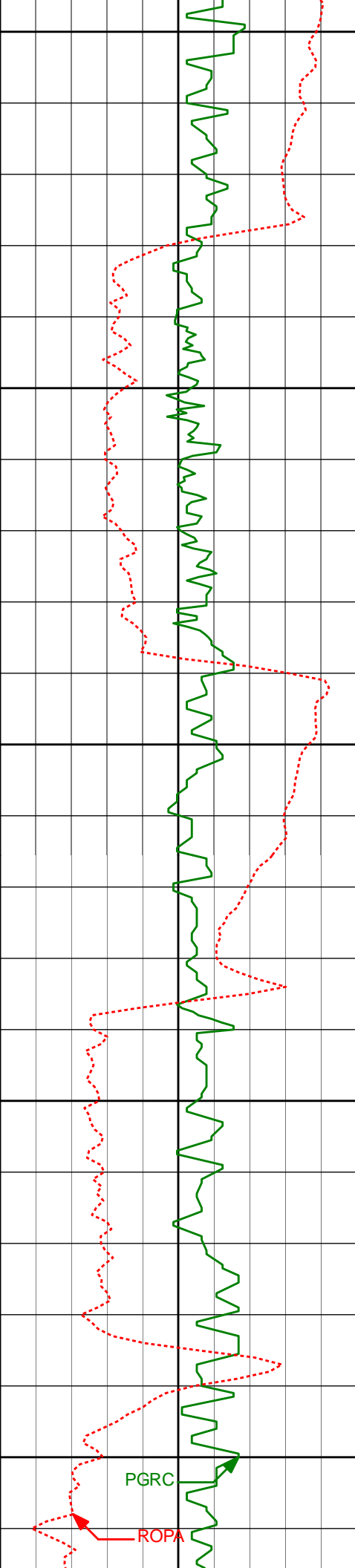
4550'

4491'	2.47°	196.13°	4444.56'	24.53'
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4586'	2.52°	205.87°	4539.47'	23.17'
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PGRC

RCPA



4600'

4681'

3.10°

233.43°

4634.36'

20.30'

4650'

4700'

4776'

1.07°

268.25°

4729.29'

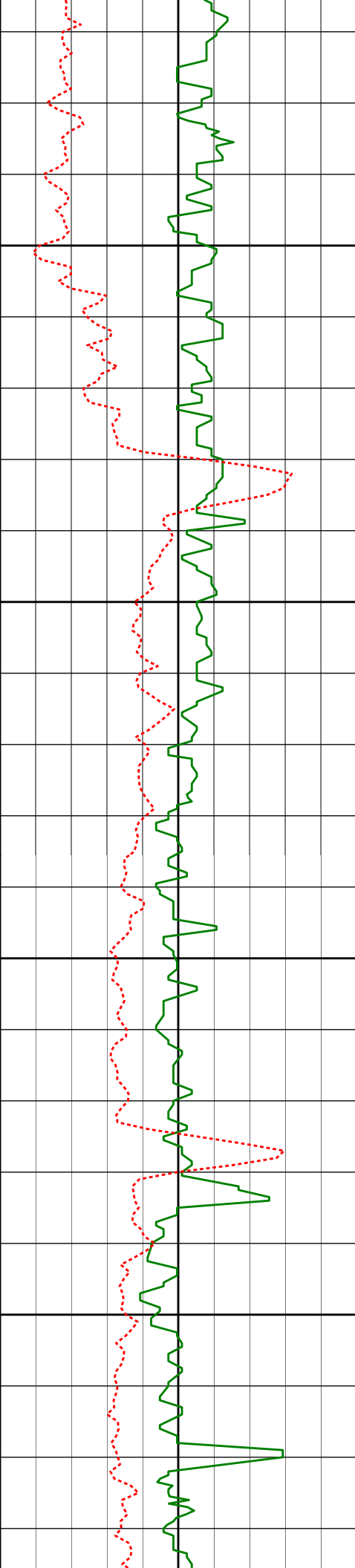
17.40'

4750'

4800'

PGRC

ROPA



4850'

4900'

4950'

5000'

4871'

0.94°

261.96°

4824.28'

15.75'

4966'

0.83°

240.00°

4919.27'

14.39'

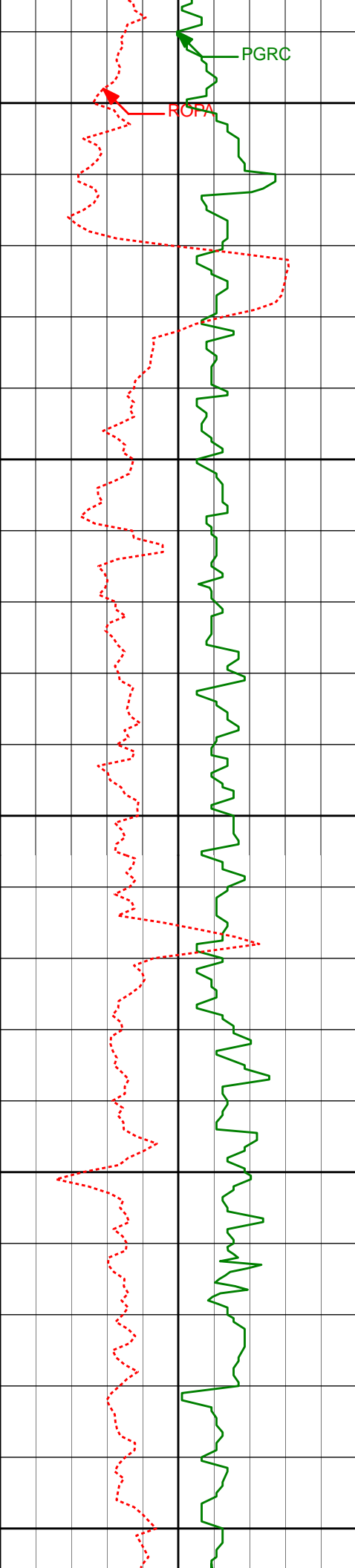
5060'

0.99°

221.87°

5013.25'

13.29'



5050'

5100'

5150'

5200'

5250'

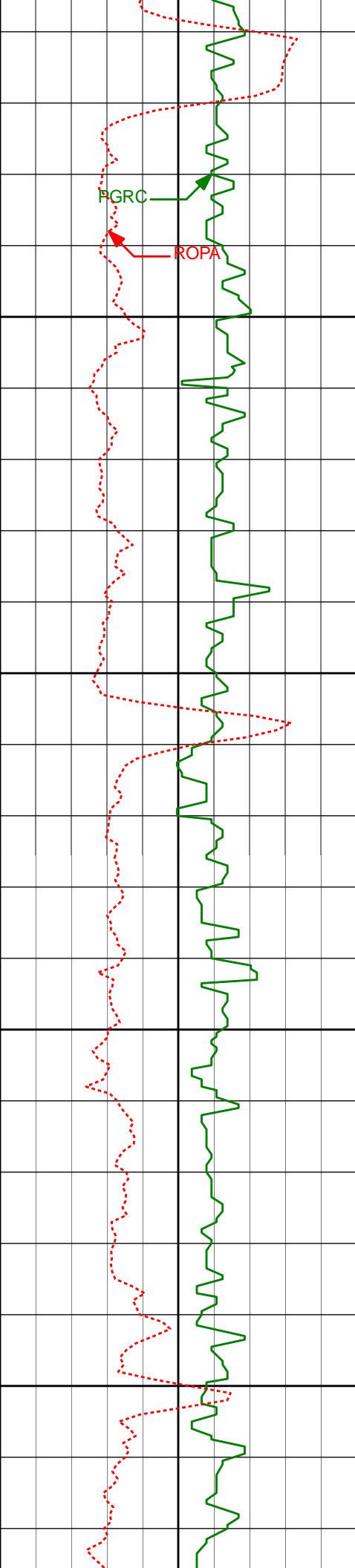
5155'

1.03°

234.31°

5108.24'

12.09'



5300'

5350'

5400'

5450'

5343'

1.08°

279.88°

5296.21'

8.99'

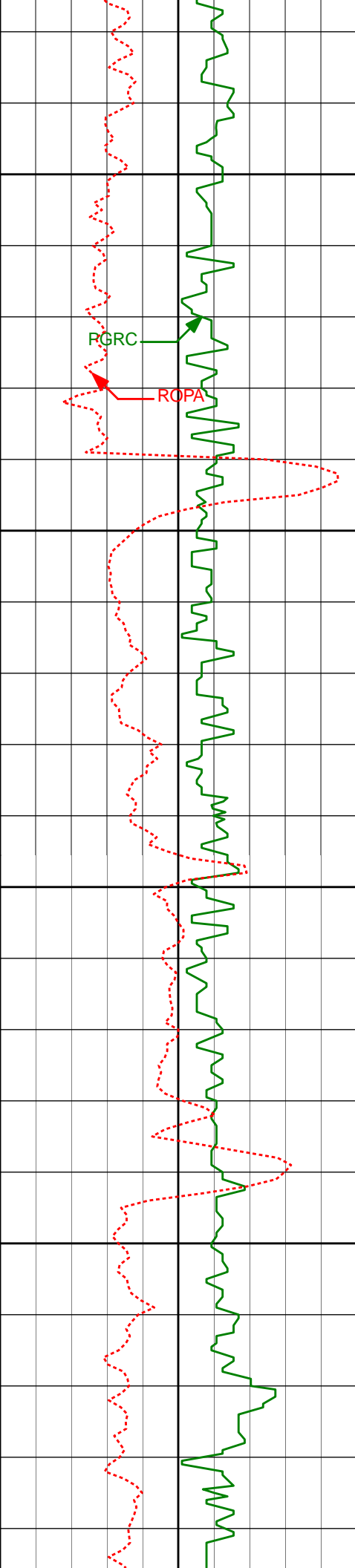
5438'

0.29°

202.63°

5391.20'

8.02'



5500'

RGRC

ROPA

5550'

5627'

0.74°

136.13°

5580.20'

8.72'

5600'

5650'

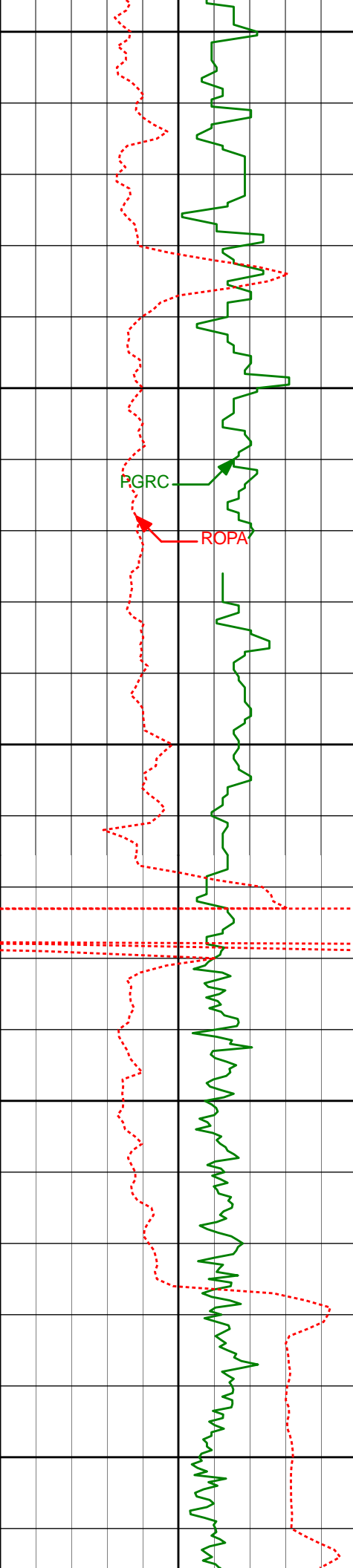
5722'

0.83°

132.13°

5675.19'

9.68'



5700'

5750'

5800'

5850'

5900'

PGRC

ROPA

Run 200

5817'

0.71°

121.48°

5770.18'

10.72'

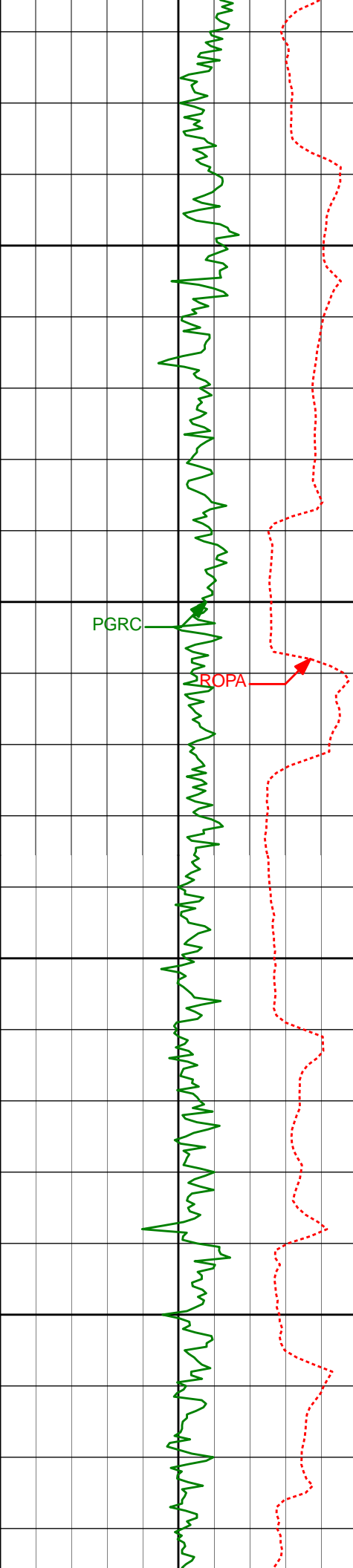
5870'

0.52°

152.60°

5823.18'

11.12'



5950'

6004'

3.38°

93.89°

5957.10'

15.24'

6000'

6049'

7.73°

91.53°

6002.04'

19.16'

6050'

6093'

8.65°

89.50°

6045.78'

25.27'

6100'

6182'

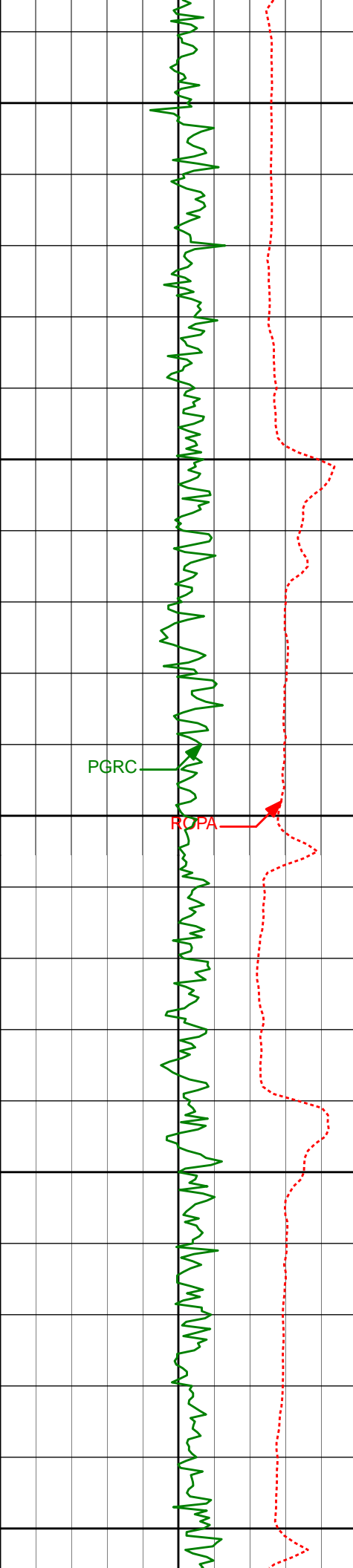
13.51°

87.49°

6132.66'

41.19'





6150'

6200'

6250'

6300'

6350'

6270'

18.30°

90.99°

6218.00'

63.90'

6358'

23.60°

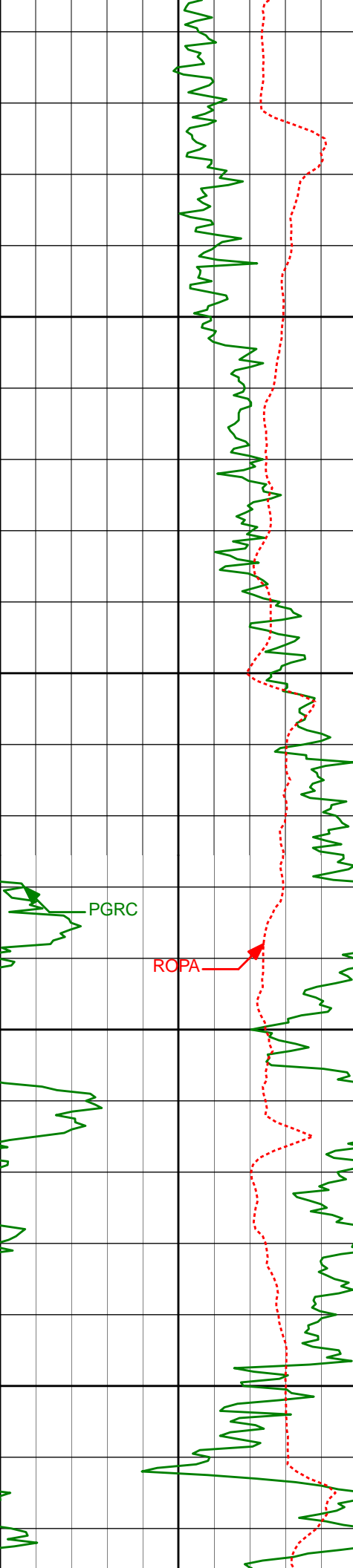
84.76°

6301.23'

93.41'

PGRC

ROPA



6400'

6450'

6500'

6550'

6448'

6537'

6626'

6715'

32.13°

49.81°

59.97°

59.84°

87.74°

91.34°

93.95°

91.29°

6381.92'

6455.04'

6512.65'

6558.49'

131.28'

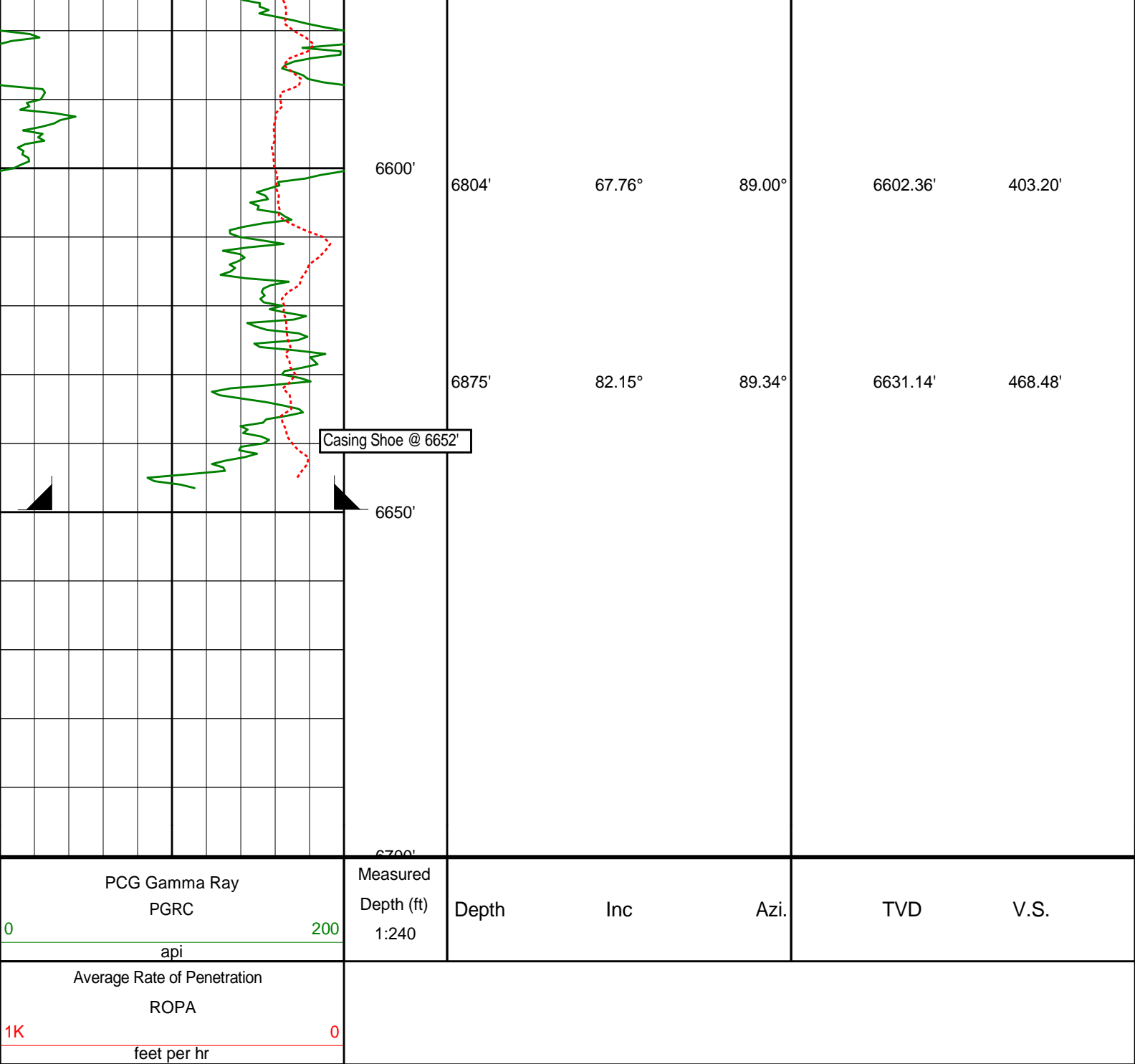
182.04'

250.01'

325.46'

PGRC

ROPA



**HALLIBURTON**

**DIRECTIONAL SURVEY REPORT**

Noble Energy  
NCLP PC AA04-64-1HN  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0900859741

Tie into existing surveys at 379' and 750' provided by HP

812.00	0.91	163.35	811.90	10.79 S	2.18 E	2.51	0.93
904.00	0.97	154.82	903.89	12.20 S	2.72 E	3.09	0.17
997.00	0.92	126.66	996.88	13.36 S	3.65 E	4.06	0.50
1090.00	1.09	113.10	1089.86	14.15 S	5.07 E	5.50	0.31
1183.00	1.08	110.30	1182.85	14.80 S	6.70 E	7.15	0.06
1277.00	0.42	29.35	1276.84	14.81 S	7.70 E	8.15	1.17
1464.00	0.42	22.85	1463.83	13.58 S	8.30 E	8.72	0.03
1556.00	0.87	213.83	1555.83	13.85 S	8.05 E	8.47	1.40
1649.00	1.55	227.43	1648.81	15.29 S	6.73 E	7.19	0.79
1744.00	3.43	201.34	1743.72	18.80 S	4.75 E	5.32	2.26
1839.00	5.03	192.74	1838.46	25.51 S	2.79 E	3.58	1.81
1933.00	6.48	193.80	1931.98	34.68 S	0.62 E	1.68	1.55
2027.00	8.63	188.79	2025.16	46.80 S	1.72 W	-0.29	2.39
2122.00	10.12	183.55	2118.89	62.18 S	3.33 W	-1.42	1.81
2216.00	11.39	185.90	2211.24	79.66 S	4.80 W	-2.35	1.43
2311.00	10.68	178.70	2304.49	97.79 S	5.56 W	-2.55	1.63
2406.00	10.42	182.45	2397.88	115.17 S	5.73 W	-2.19	0.77
2500.00	12.11	179.50	2490.07	133.53 S	6.00 W	-1.90	1.90
2595.00	12.37	176.15	2582.91	153.64 S	5.23 W	-0.51	0.80
2690.00	12.45	178.87	2675.69	174.04 S	4.35 W	1.00	0.62
2785.00	12.81	180.69	2768.39	194.80 S	4.27 W	1.71	0.56
2879.00	13.03	178.35	2860.01	215.82 S	4.09 W	2.54	0.60
2974.00	13.69	178.83	2952.44	237.76 S	3.56 W	3.75	0.70
3069.00	12.50	178.24	3044.97	259.28 S	3.01 W	4.95	1.26
3164.00	12.19	179.84	3137.77	279.58 S	2.67 W	5.92	0.49
3259.00	11.67	179.89	3230.72	299.22 S	2.62 W	6.57	0.55
3354.00	10.00	182.65	3324.02	317.07 S	2.98 W	6.76	1.84
3449.00	9.78	178.08	3417.61	333.37 S	3.10 W	7.15	0.86
3543.00	10.07	181.22	3510.21	349.57 S	3.00 W	7.73	0.65
3638.00	12.36	176.76	3603.39	368.03 S	2.60 W	8.70	2.58
3733.00	15.00	175.22	3695.69	390.43 S	1.01 W	10.99	2.81
3828.00	13.50	173.14	3787.76	413.70 S	1.34 E	14.05	1.67
3923.00	11.15	166.36	3880.57	433.64 S	4.83 E	18.15	2.90
4018.00	8.77	176.11	3974.14	449.79 S	7.49 E	21.30	3.06
4112.00	8.43	171.27	4067.08	463.75 S	9.02 E	23.26	0.85
4207.00	5.87	183.93	4161.34	475.48 S	9.75 E	24.35	3.15
4302.00	4.51	179.33	4255.95	484.07 S	9.46 E	24.32	1.50
4397.00	3.83	176.73	4350.70	490.97 S	9.68 E	24.76	0.74
4491.00	2.47	196.13	4444.56	496.05 S	9.30 E	24.53	1.82
4586.00	2.52	205.87	4539.47	499.89 S	7.82 E	23.17	0.45
4681.00	3.10	233.43	4634.36	503.30 S	4.85 E	20.30	1.53
4776.00	1.07	268.25	4729.29	504.86 S	1.90 E	17.40	2.43
4871.00	0.94	261.96	4824.28	505.00 S	0.24 E	15.75	0.18
4966.00	0.83	240.00	4919.27	505.45 S	1.13 W	14.39	0.37
5060.00	0.99	221.87	5013.25	506.40 S	2.26 W	13.29	0.35
5155.00	1.03	234.31	5108.24	507.50 S	3.50 W	12.09	0.23
5343.00	1.08	279.88	5296.21	508.19 S	6.62 W	8.99	0.44
5438.00	0.29	202.63	5391.20	508.25 S	7.59 W	8.02	1.11
5627.00	0.74	136.13	5580.20	509.58 S	6.93 W	8.72	0.36
5722.00	0.83	132.13	5675.19	510.48 S	6.00 W	9.68	0.11
5817.00	0.71	121.48	5770.18	511.25 S	4.99 W	10.72	0.20
5870.00	0.52	152.60	5823.18	511.63 S	4.59 W	11.12	0.71
6009.00	3.38	93.89	5962.09	512.47 S	0.22 W	15.52	2.26
6057.00	7.73	91.53	6009.85	512.65 S	4.43 E	20.17	9.07
6104.00	8.65	89.50	6056.37	512.71 S	11.12 E	26.86	2.05
6198.00	13.51	87.49	6148.59	512.17 S	29.17 E	44.89	5.19
6292.00	18.30	90.99	6238.97	511.94 S	54.91 E	70.61	5.19
6386.00	23.60	84.76	6326.74	510.47 S	88.43 E	104.07	6.11
6481.00	32.13	87.74	6410.65	507.74 S	132.69 E	148.23	9.10
6576.00	49.81	91.34	6482.10	507.59 S	194.71 E	210.21	18.77
6671.00	59.97	93.95	6536.68	511.28 S	272.23 E	287.80	10.93
6765.00	59.84	91.29	6583.82	515.00 S	353.46 E	369.11	2.45
6860.00	67.76	89.00	6625.73	515.15 S	438.62 E	454.24	8.61
6936.00	82.15	89.34	6645.41	514.10 S	511.82 E	527.37	18.94

<p>CALCULATION BASED ON MINIMUM CURVATURE METHOD</p> <p>SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT</p> <p>TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT</p> <p>VERTICAL SECTION RELATIVE TO WELL HEAD</p> <p>VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 91.76 DEGREES (GRID)</p> <p>A TOTAL CORRECTION OF 7.72 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED</p>
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HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6936.00 FEET  
IS 725.44 FEET ALONG 135.13 DEGREES (GRID)

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