

## PCG-K Pressure Case Gamma

1 : 240

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100				
<b>Date run completed</b>	26-Jun-13				
<b>Rig Bit Number</b>	0100				
<b>Bit Size (in)</b>	8.750				
<b>Tool Nominal OD (in)</b>	6.750				
<b>Log Start Depth (TVD, ft)</b>	1,105.99				
<b>Log End Depth (TVD, ft)</b>	7,457.98				
<b>Drill or Wipe</b>	Drill				
<b>Drill/Wipe Start Date and Time</b>	23-Jun-13 14:20				
<b>Drill/Wipe End Date and Time</b>	25-Jun-13 21:37				
<b>Min Inc (deg) @ Depth (TVD, ft)</b>	.21 @ 1,467.98				
<b>Max Inc (deg) @ Depth (TVD, ft)</b>	86.12 @ 7,455.15				
<b>Bit TFA(in2) / Bit Type</b>	.86 / PDC				
<b>Flow Rate (gpm)</b>	576.39				
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	443.0 / 399.0				
<b>Fluid Type</b>	Fresh Water Gel				
<b>Density (ppg) / Viscosity (spqt)</b>	9.20 / 56.00				
<b>Filtrate CL (ppm)</b>	1,200.00				
<b>pH / Fluid Loss (mptm)</b>	9.00 / 9.00				
<b>PV (cP) / YP (lhf2)</b>	18 / 15.00				
<b>% Solids / % Sand</b>	8 / .5				
<b>% Oil / Oil:Water Ratio</b>	N/A / N/A				
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A				
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A				
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A				
<b>Max Tool Temp (degF) / Source</b>	185.02 / PCM				
<b>Rm @ Max Tool Temp (degF)</b>	N/A @ 185.02				
<b>Lead MWD Engineer</b>	Ryan White				
<b>Customer Representative</b>	Travis Kruckenburg				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.84				
Sub Serial Number	11341324				
Insert Serial Number	11145605				
Date and Time Initialized	22-Jun-13 16:23				
Date and Time Read	26-Jun-13 05:21				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	49.20				
Software Version	6.21				
Sub Serial Number	11341324				
Sonde Serial Number	11638470				
Sensor ID Number	N/A				
Toolface Offset (deg)	31.56				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	54.15				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11341324				
Insert/Sonde Serial Number	11579782				

REMARKS

<div>1. All depths are true vertical depths referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.</div> <div>2. No depth corrections have been made for pipe stretch or compression.</div> <div>3. All data presented is recorded data unless otherwise specified</div> <div>4. 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</div> <div>5. INSITE version 7.4.1</div>
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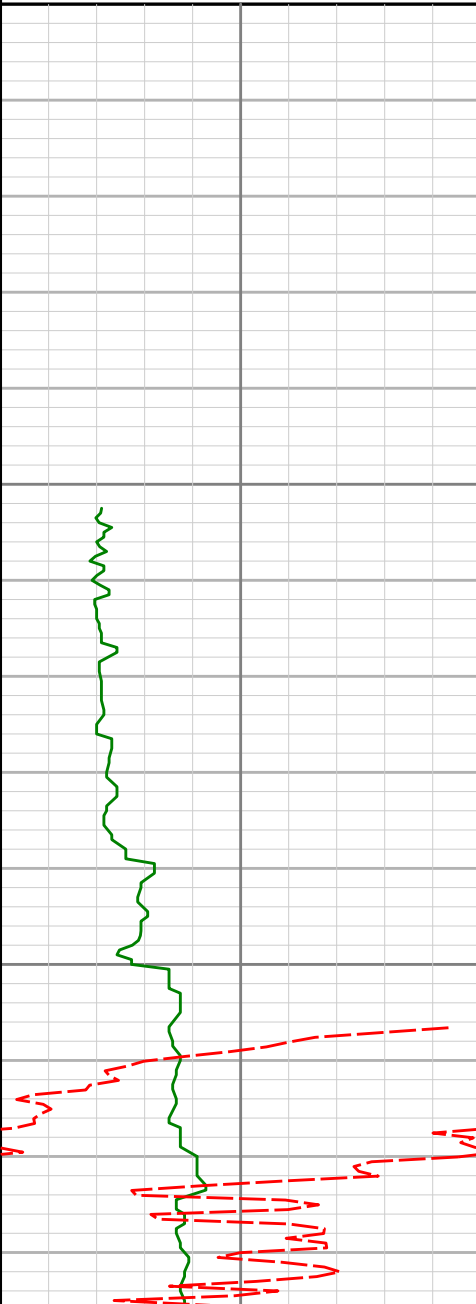
WARRANTY

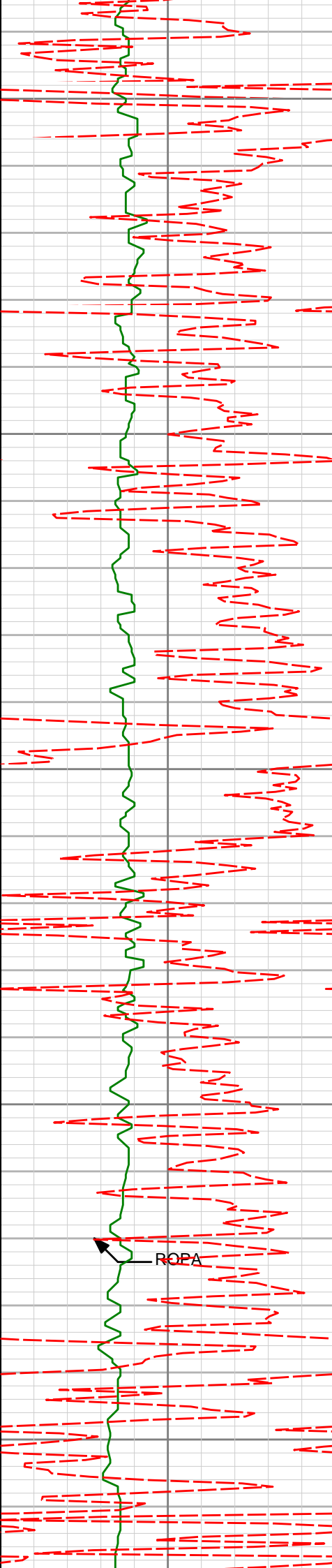
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1:240 TVD Detail Log

PCG Gamma Ray BCorr (PGRC) api						
0300						
Avg Rate of Penetration (ROPA) feet per hr		TVD ft				
5000			Depth	Inc	Azi	TVDV/S
		1050				
		1100	1100'	0.17°	272.98°	1099.99'2.33'



1150

1200

1250

1300

1350

1192'

0.35°

296.38°

1191.99'

2.45'

1284'

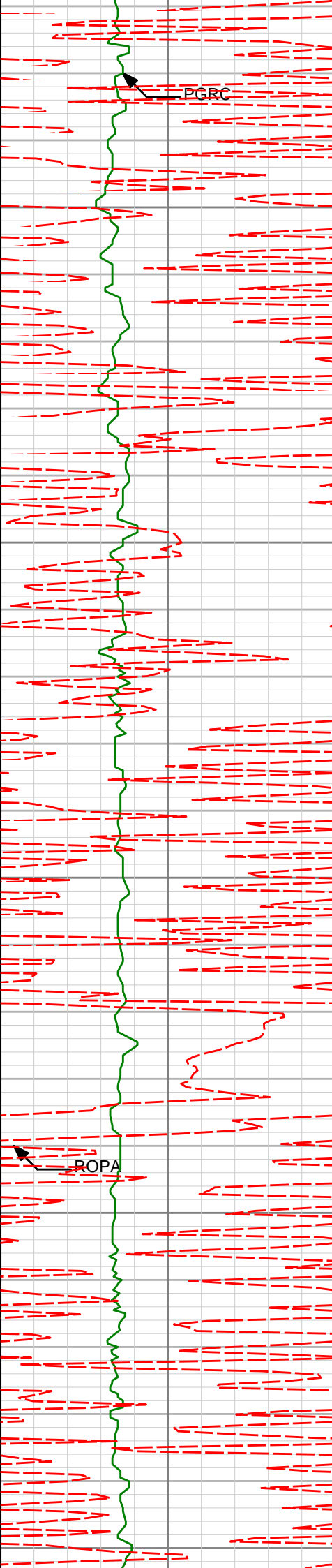
0.43°

302.99°

1283.99'

2.75'

ROPA



1400

1450

1500

1550

1600

1376'

0.22°

338.41°

1375.99'

3.09'

1468'

0.21°

289.07°

1467.98'

3.30'

1560'

2.07°

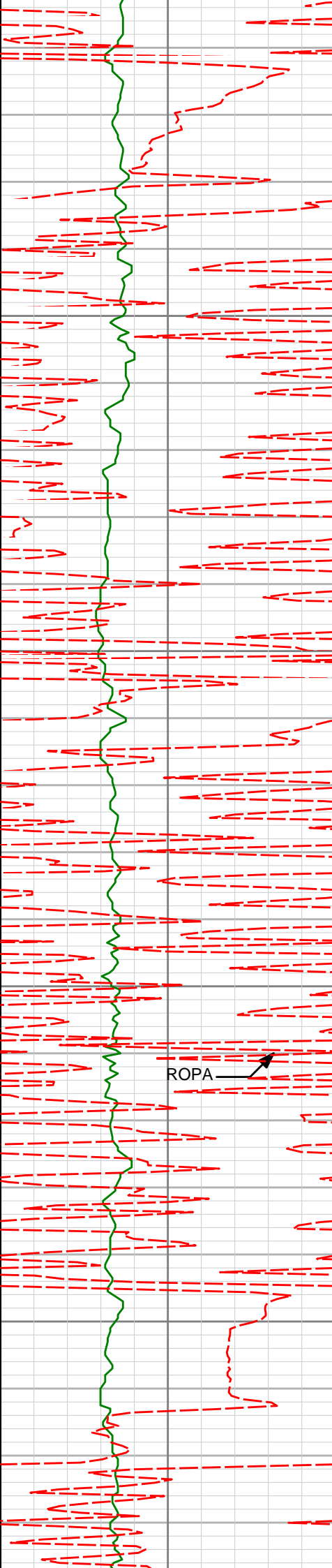
301.69°

1559.96'

4.19'

PGRC

ROPA



1650

1652'

4.71°

329.92°

1651.80'

8.24'

1700

1750

1744'

4.68°

326.36°

1743.49'

14.52'

1800

1836'

7.24°

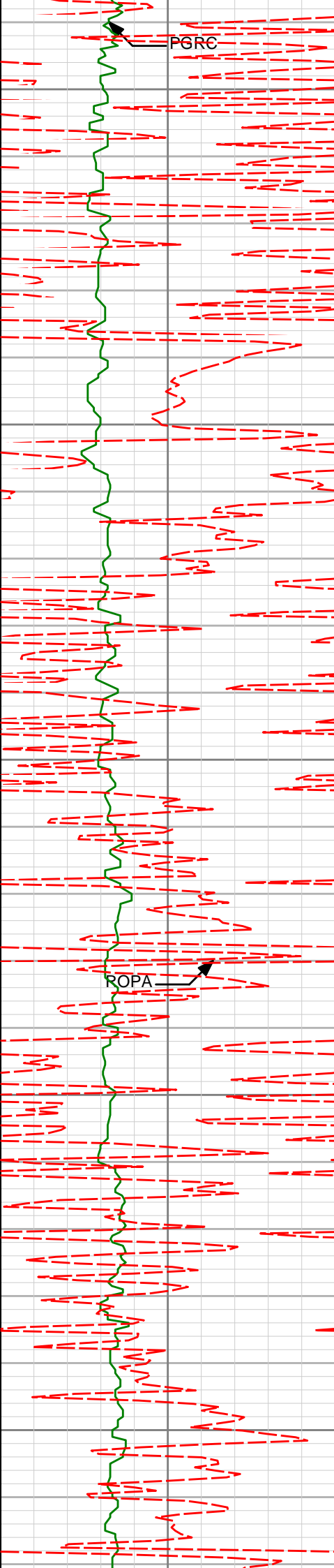
316.82°

1834.99'

21.71'

ROPA





1850

1900

1950

2000

2050

1928'

9.31°

318.60°

1926.02'

31.28'

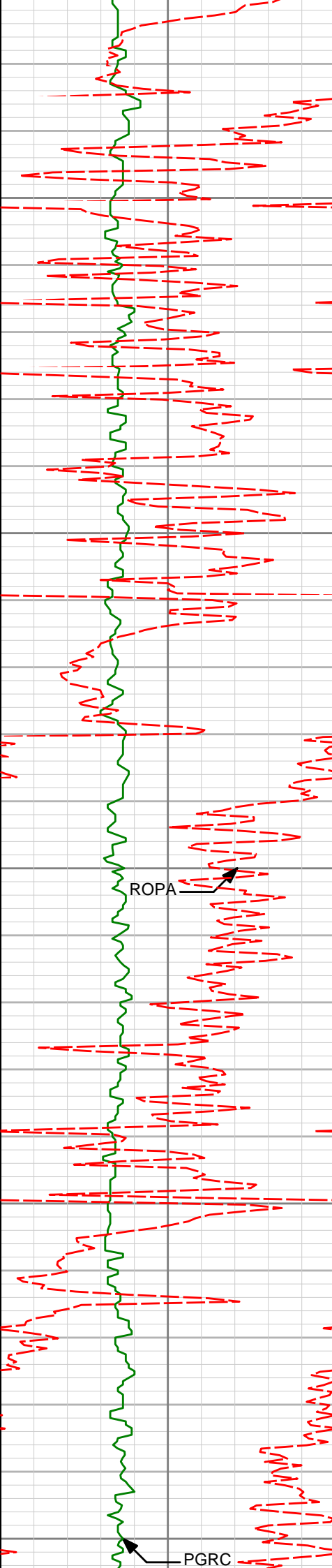
2020'

9.30°

318.42°

2016.81'

42.15'



2100

2112'

10.92°

315.83°

2107.38'

53.66'

2150

2200

2204'

13.65°

307.05°

2197.28'

66.05'

2250

2300

2296'

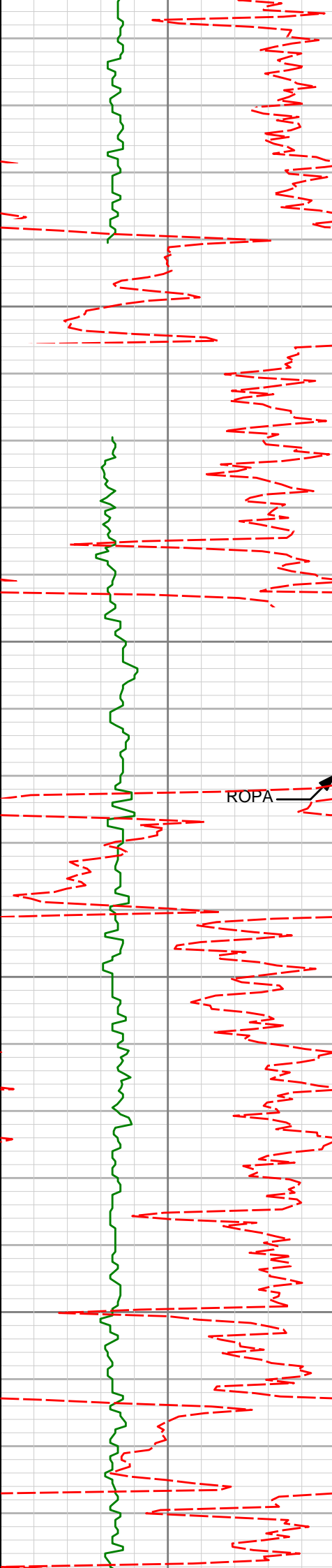
15.25°

305.71°

2286.36'

79.15'





2350

2388'

16.06°

298.79°

2374.96'

91.77'

2400

ROPA

2450

2480'

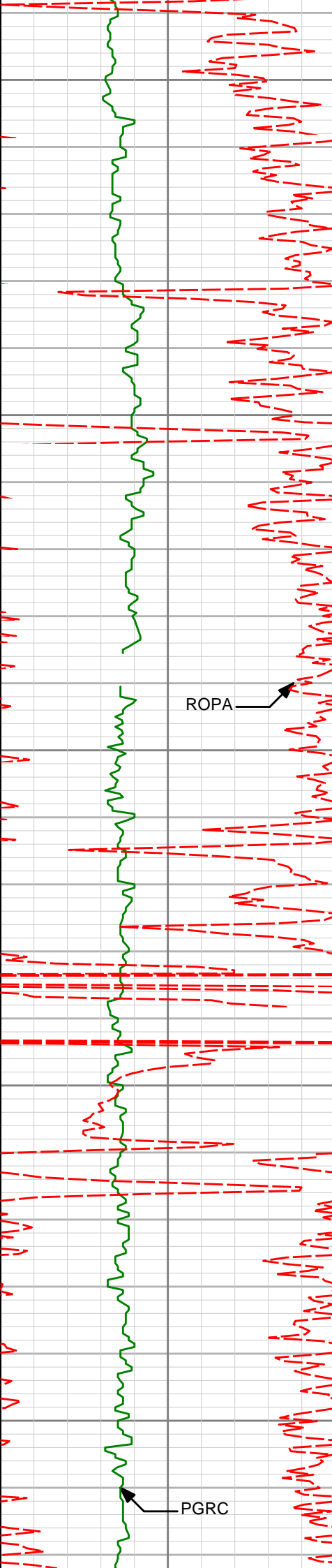
17.31°

294.84°

2463.08'

103.01'

2500



2550

2572'

17.60°

291.15°

2550.85'

113.08'

2600

ROPA

2650

2667'

16.16°

291.31°

2641.76'

122.37'

2700

2761'

17.56°

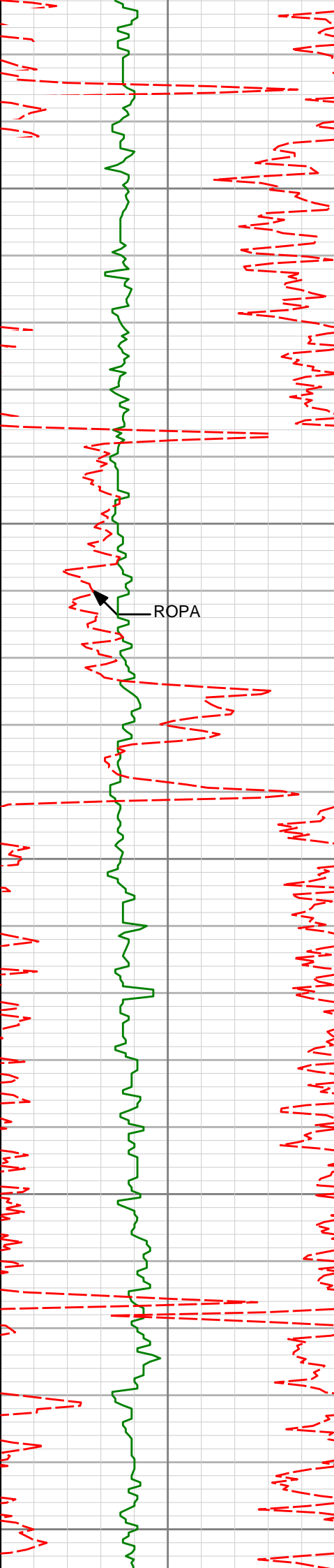
290.91°

2731.71'

131.49'

2750

PGRC



2800

2856'

17.04°

289.48°

2822.42'

140.53'

2850

ROPA

2900

2950'

17.44°

287.48°

2912.19'

148.64'

2950

3000

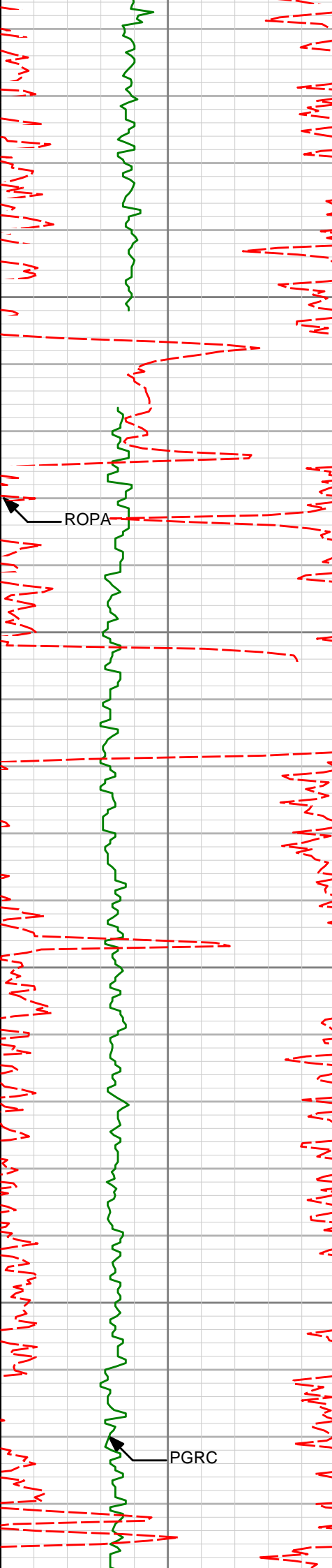
3045'

17.06°

286.48°

3002.92'

156.13'



3050

3100

3150

3200

ROPA

PGRC

3139'

19.10°

288.44°

3092.27'

164.16'

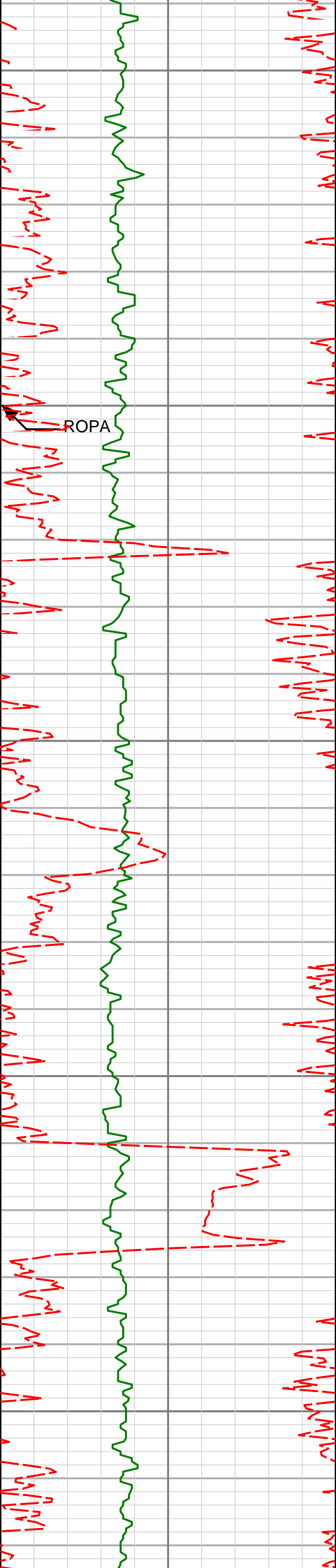
3234'

19.44°

288.81°

3181.95'

173.36'



3250

3328'

19.53°

288.67°

3270.57'

182.63'

3300

ROPA

3350

3423'

19.28°

288.24°

3360.17'

191.81'

3400

3450

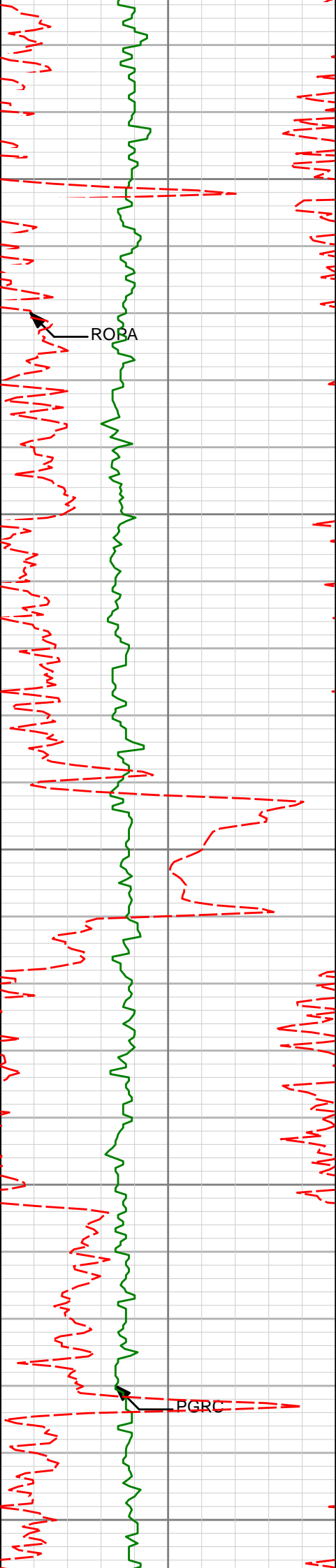
3518'

17.62°

292.30°

3450.29'

201.41'



3500

3550

3600

3650

3700

3612'

16.66°

289.82°

3540.11'

210.67'

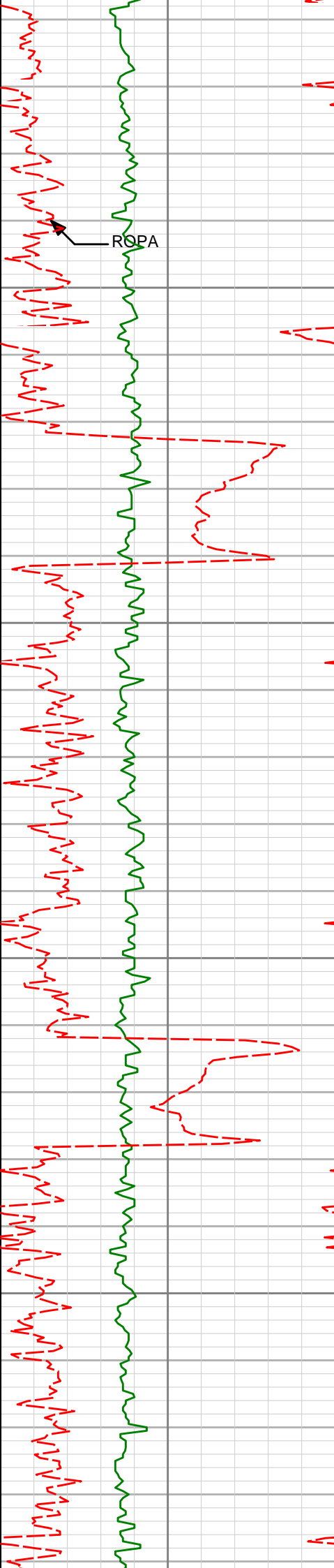
3707'

17.89°

295.10°

3630.83'

220.77'



3750

3800

3850

3900

3802'

16.99°

294.05°

3721.47'

231.91'

3896'

17.52°

299.81°

3811.24'

243.87'

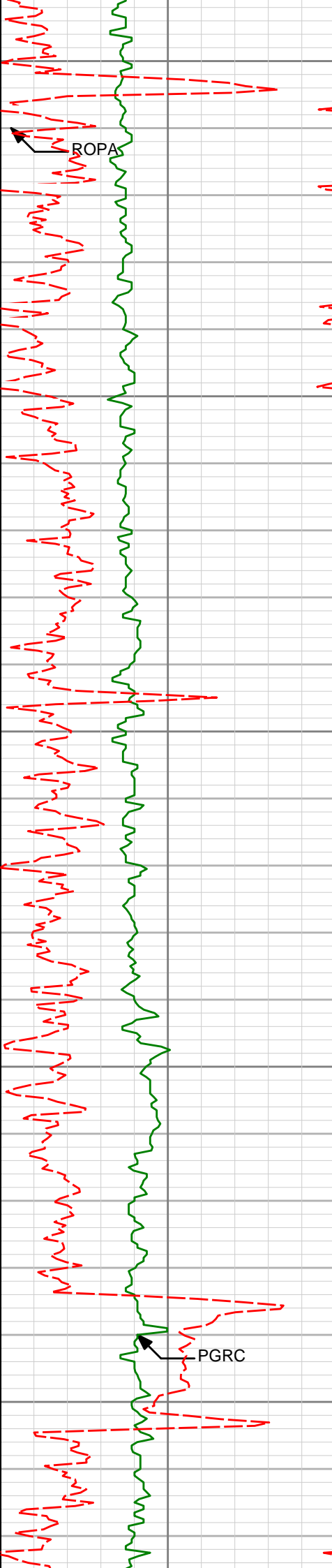
3991'

18.30°

300.14°

3901.64'

257.78'



3950

4000

4050

4100

4150

4085'

17.19°

299.27°

3991.16'

271.30'

4180'

15.54°

295.77°

4082.31'

283.05'

4274'

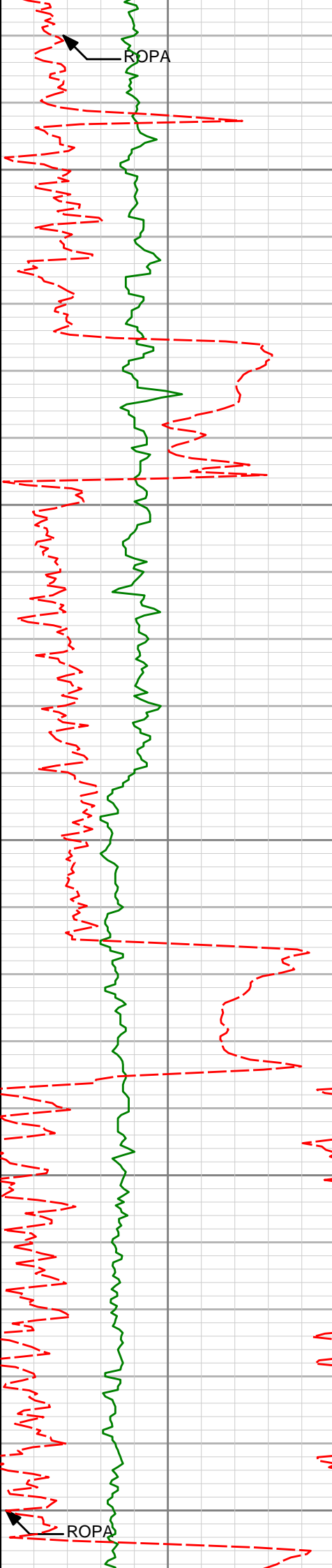
14.16°

304.37°

4173.18'

294.45'





4200

4250

4300

4350

4400

4369'

16.97°

303.43°

4264.69'

308.07'

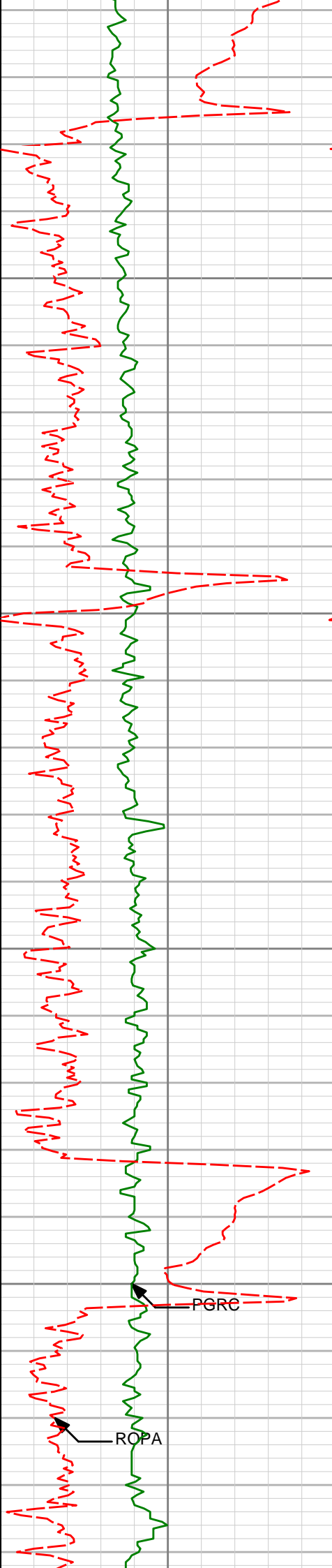
4464'

18.48°

301.30°

4355.18'

322.87'



4558'	21.33°	299.95°	4443.55'	338.40'
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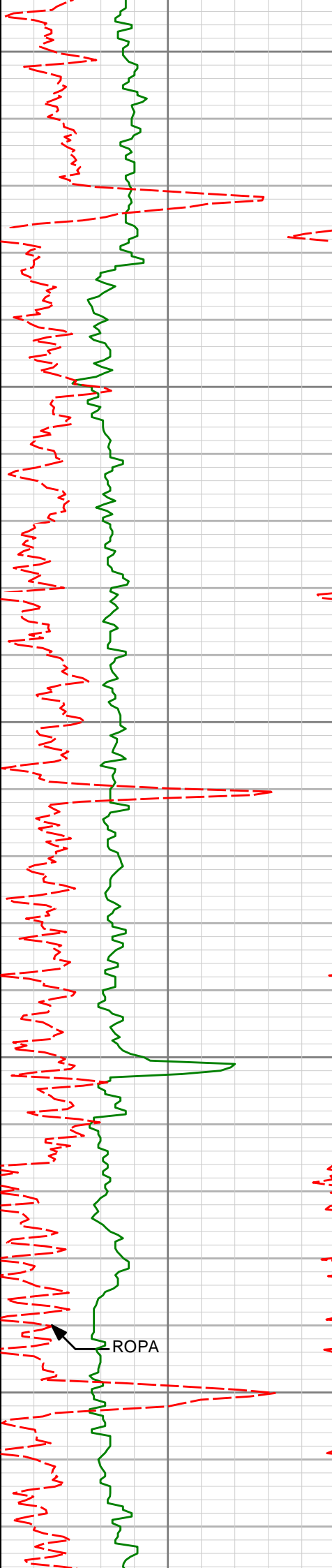
4500

4653'	19.98°	299.92°	4532.45'	354.33'
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4550

4600

4747'	21.55°	296.08°	4620.34'	369.13'
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4650

4700

4750

4800

4850

4842'

20.67°

294.74°

4708.97'

382.97'

4936'

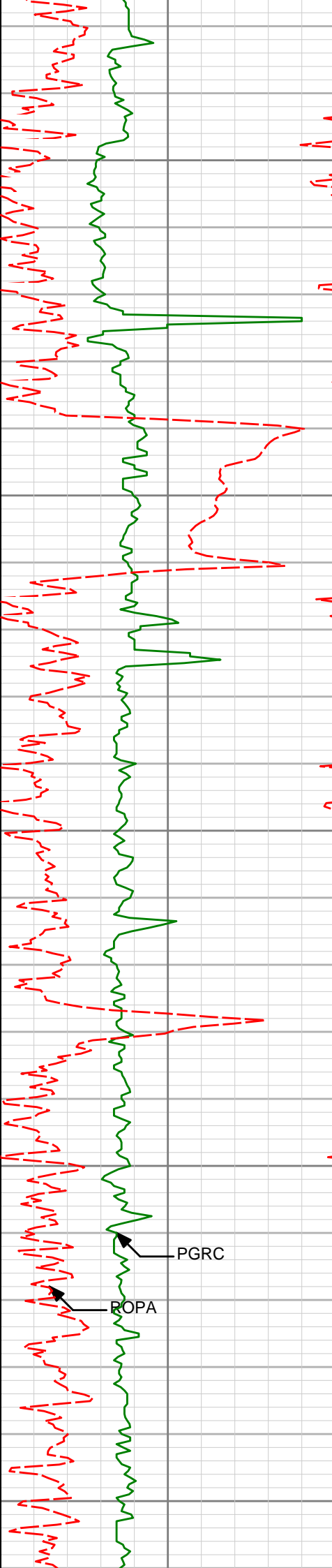
19.41°

294.99°

4797.27'

395.72'

ROPA



4900

4950

5000

5050

5100

5031'

18.15°

294.54°

4887.21'

407.78'

5126'

20.33°

291.34°

4976.90'

419.15'

PGRC

ROPA

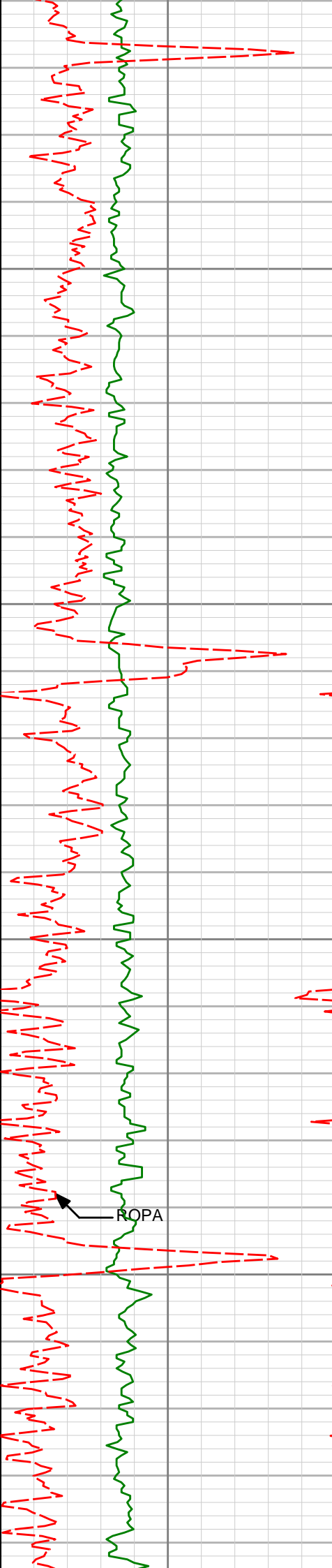
5220'

20.19°

291.94°

5065.09'

430.33'



5150

5315'

18.90°

291.97°

5154.61'

441.41'

5200

5250

5409'

17.74°

292.06°

5243.85'

451.74'

5300

5504'

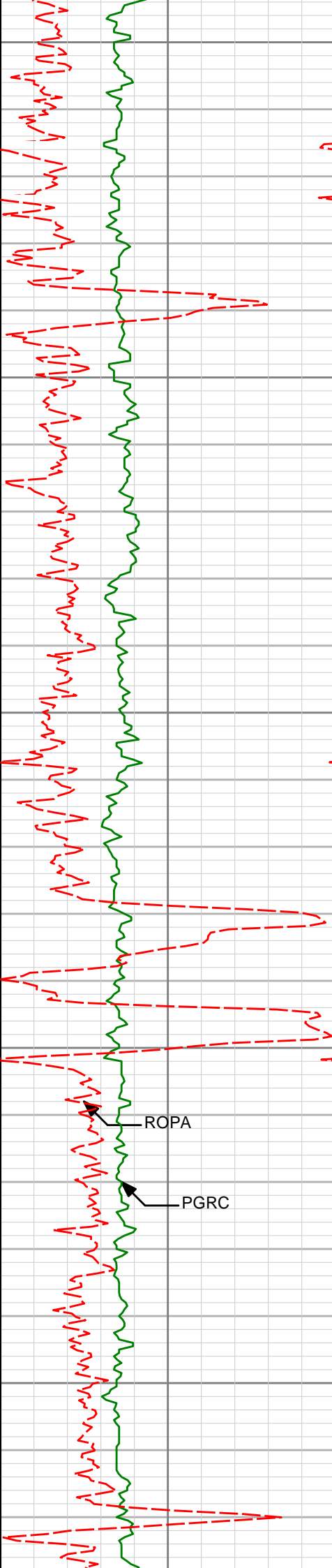
16.47°

291.25°

5334.64'

461.35'

ROPA



5350

5400

5450

5500

5550

5598'

15.66°

290.27°

5424.97'

469.91'

5693'

14.99°

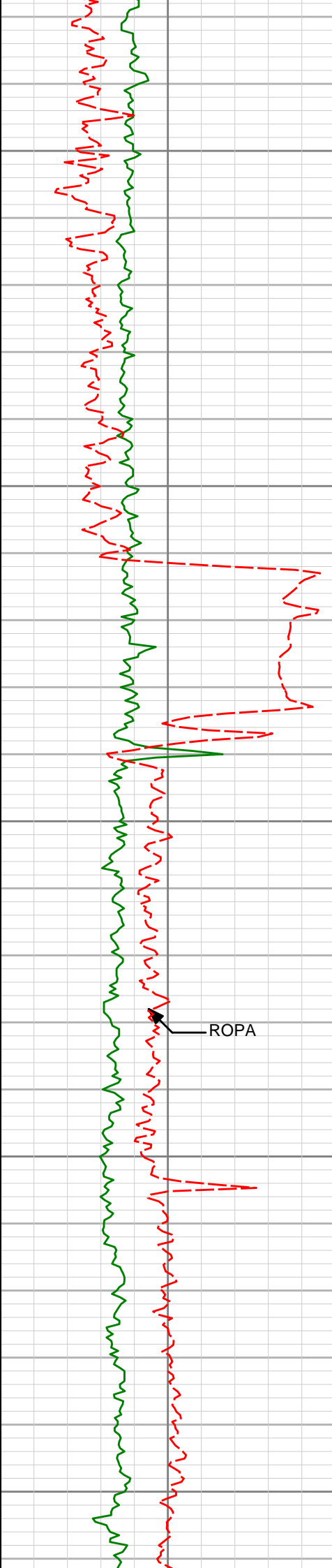
290.31°

5516.59'

477.98'

ROPA

PGRC



5600

5787'

13.12°

289.52°

5607.77'

485.18'

5650

5700

5882'

13.94°

293.55°

5700.14'

492.79'

ROPA

5750

5800

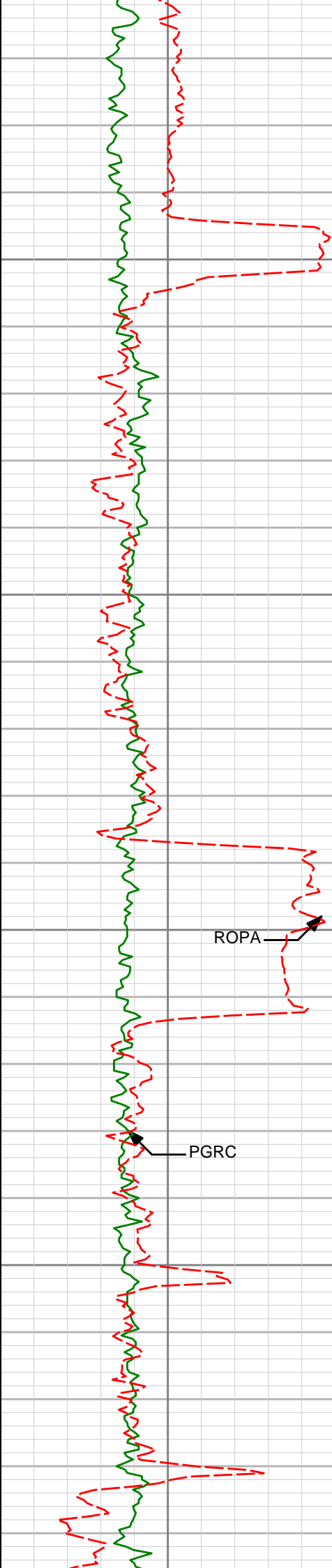
5976'

13.17°

291.48°

5791.52'

500.68'



5850

5900

5950

6000

6071'

11.61°

290.46°

5884.31'

507.47'

ROPA

6166'

13.20°

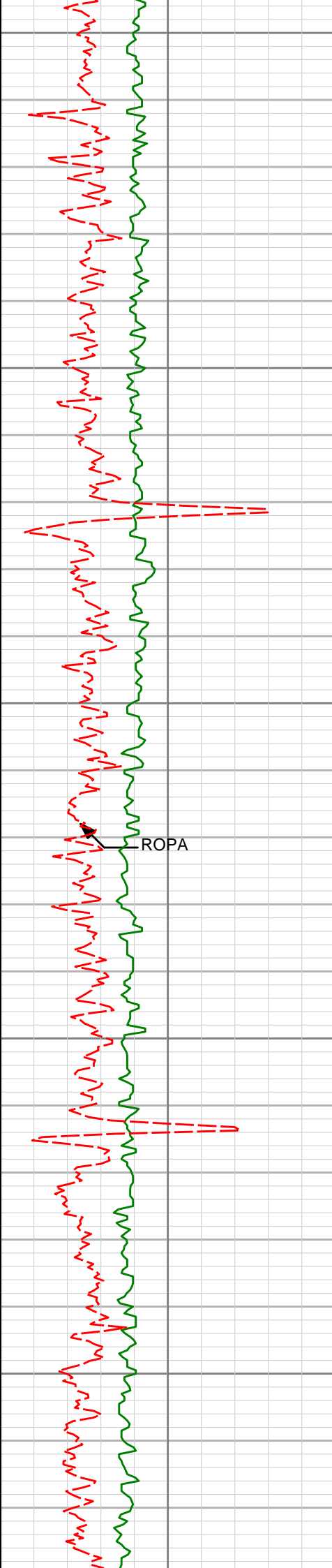
294.03°

5977.09'

514.72'

PGRC





6050

6260'

11.55°

291.48°

6068.90'

522.03'

6100

6150

6355'

9.36°

286.63°

6162.32'

527.28'

ROPA

6200

6250

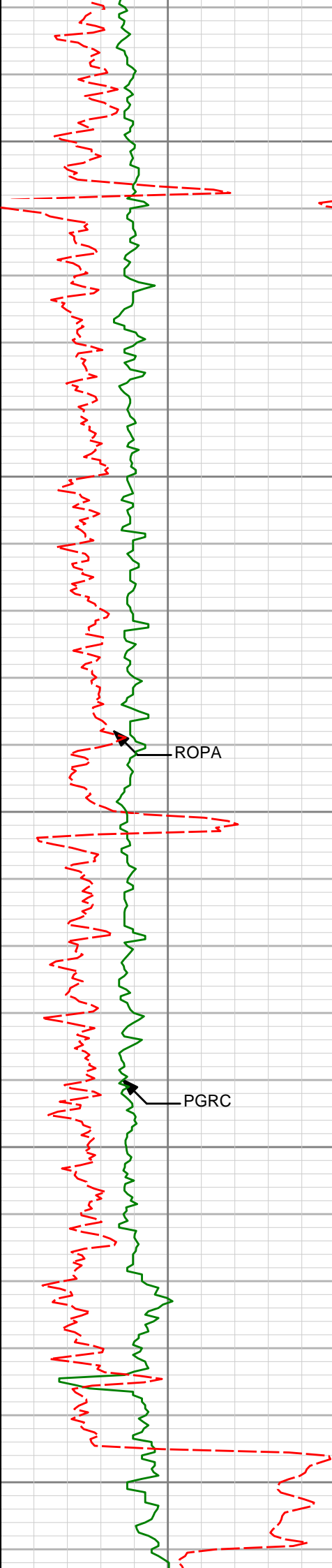
6449'

7.61°

286.08°

6255.29'

530.83'



6300

6350

6400

6450

6500

6544'

6.36°

286.46°

6349.58'

533.77'

ROPA

6638'

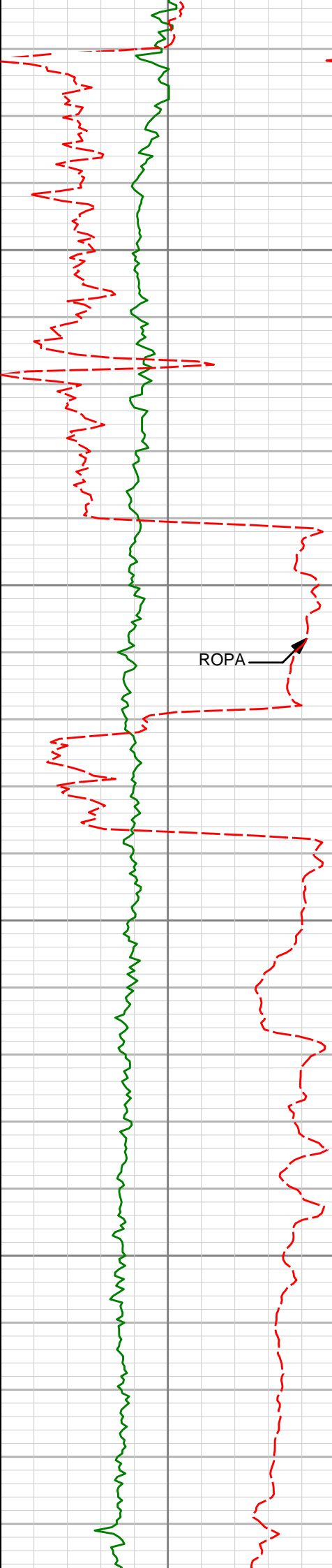
5.09°

279.28°

6443.11'

535.67'

PGRC



6550

6600

6650

6700

6733'

3.79°

292.25°

6537.83'

537.34'

6828'

3.23°

336.64°

6632.66'

540.88'

6875'

7.10°

4.70°

6679.47'

544.98'

6922'

12.53°

2.16°

6725.77'

552.99'



6750

6969'

16.99°

1.48°

6771.20'

564.96'

6800

7017'

21.00°

1.81°

6816.58'

580.58'

6850

7064'

21.64°

0.23°

6860.36'

597.66'

6900

7112'

24.76°

1.45°

6904.48'

616.57'

6950

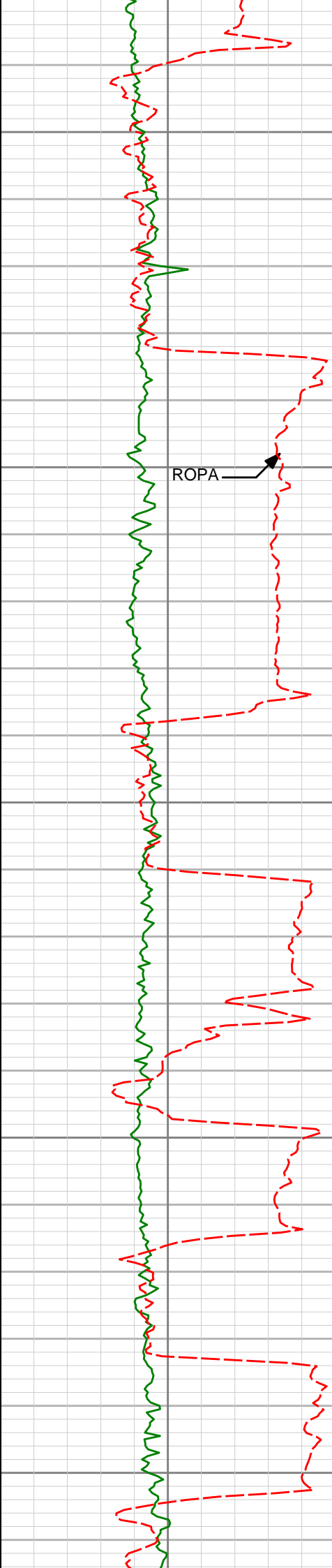
7159'

24.56°

0.52°

6947.19'

636.18'



7000

7050

7100

7150

7200

7206'

29.17°

1.75°

6989.11'

657.41'

7253'

28.83°

0.52°

7030.21'

680.19'

7301'

35.30°

359.90°

7070.87'

705.65'

7348'

37.63°

1.01°

7108.67'

733.58'

7395'

39.90°

1.95°

7145.31'

763.01'

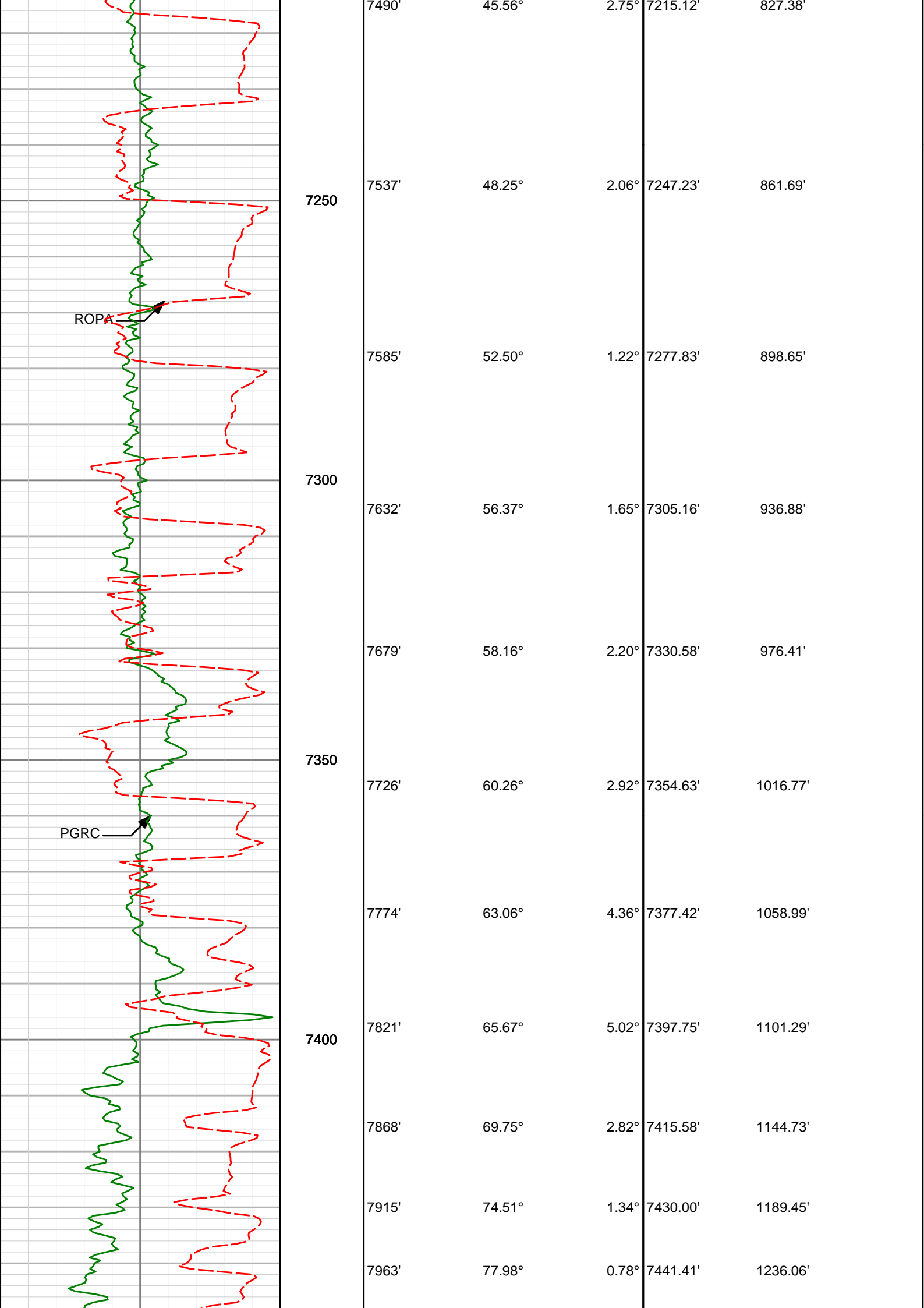
7442'

42.61°

2.76°

7180.64'

793.99'



<div><div>TD Well @ 8,109' MD 7,458' TVD</div></div>	<div><div>7450</div><div>Casing Set @ 7,457' TVD</div></div>	8010'	81.26°	1.43°	7449.87'	1282.29'	
		8058'	86.12°	0.99°	7455.15'	1329.98'	
<div>Avg Rate of Penetration (ROPA) feet per hr</div> <div>5000</div>	<div>TVD ft</div>	Depth		Inc	Azi	TVD	V/S
<div>PCG Gamma Ray BCorr (PGRC) api</div> <div>0300</div>							



# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp.  
 Turkey Springs 3N-14hZ  
 Wattenburg  
 Weld Colorado  
 USA  
 CA-XX-0900382956

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
1010.00	0.13	173.81	1009.99	2.52 N	3.46 W	2.43	TIE-IN
1100.00	0.17	272.98	1099.99	2.43 N	3.58 W	2.33	0.26
1192.00	0.35	296.38	1191.99	2.56 N	3.97 W	2.45	0.22
1284.00	0.43	302.99	1283.99	2.87 N	4.51 W	2.75	0.10
1376.00	0.22	338.41	1375.99	3.22 N	4.87 W	3.09	0.31
1468.00	0.21	289.07	1467.98	3.44 N	5.09 W	3.30	0.20
1560.00	2.07	301.69	1559.96	4.37 N	6.66 W	4.19	2.03
1652.00	4.71	329.92	1651.80	8.51 N	9.97 W	8.24	3.31
1744.00	4.68	326.36	1743.49	14.91 N	13.94 W	14.52	0.32
1836.00	7.24	316.82	1834.99	22.26 N	19.99 W	21.71	2.97
1928.00	9.31	318.60	1926.02	32.07 N	28.88 W	31.28	2.27
2020.00	9.30	318.42	2016.81	43.21 N	38.74 W	42.15	0.03
2112.00	10.92	315.83	2107.38	55.02 N	49.74 W	53.66	1.83
2204.00	13.65	307.05	2197.28	67.82 N	64.48 W	66.05	3.59
2296.00	15.25	305.71	2286.36	81.42 N	82.97 W	79.15	1.78
2388.00	16.06	298.79	2374.96	94.61 N	103.95 W	91.77	2.21
2480.00	17.31	294.84	2463.08	106.49 N	127.53 W	103.01	1.83
2572.00	17.60	291.15	2550.85	117.26 N	152.92 W	113.08	1.24
2667.00	16.16	291.31	2641.76	127.25 N	178.63 W	122.37	1.52
2761.00	17.56	290.91	2731.71	137.06 N	204.07 W	131.49	1.49
2856.00	17.04	289.48	2822.42	146.82 N	230.58 W	140.53	0.71
2950.00	17.44	287.48	2912.19	155.65 N	257.00 W	148.64	0.76
3045.00	17.06	286.48	3002.92	163.87 N	283.94 W	156.13	0.51
3139.00	19.10	288.44	3092.27	172.65 N	311.75 W	164.16	2.26
3234.00	19.44	288.81	3181.95	182.67 N	341.46 W	173.36	0.38
3328.00	19.53	288.67	3270.57	192.74 N	371.16 W	182.63	0.11
3423.00	19.28	288.24	3360.17	202.73 N	401.09 W	191.81	0.30
3518.00	17.62	292.30	3450.29	213.10 N	429.30 W	201.41	2.21
3612.00	16.66	289.82	3540.11	223.06 N	455.14 W	210.67	1.28
3707.00	17.89	295.10	3630.83	233.87 N	481.16 W	220.77	2.10
3802.00	16.99	294.05	3721.47	245.72 N	507.05 W	231.91	1.00
3898.00	17.52	293.04	3811.94	258.05 N	534.07 W	243.07	1.00

3896.00	17.52	299.81	3811.24	258.35 N	531.87 W	243.87	1.90
3991.00	18.30	300.14	3901.64	272.95 N	557.18 W	257.78	0.83
4085.00	17.19	299.27	3991.16	287.15 N	582.06 W	271.30	1.21
4180.00	15.54	295.77	4082.31	299.55 N	605.77 W	283.05	2.02
4274.00	14.16	304.37	4173.18	311.52 N	626.60 W	294.45	2.76
4369.00	16.97	303.43	4264.69	325.72 N	647.77 W	308.07	2.97
4464.00	18.48	301.30	4355.18	341.18 N	672.20 W	322.87	1.73
4558.00	21.33	299.95	4443.55	357.45 N	699.75 W	338.40	3.07
4653.00	19.98	299.92	4532.45	374.18 N	728.79 W	354.33	1.42
4747.00	21.55	296.08	4620.34	389.78 N	758.22 W	369.13	2.21
4842.00	20.67	294.74	4708.97	404.47 N	789.12 W	382.97	1.06
4936.00	19.41	294.99	4797.27	418.01 N	818.34 W	395.72	1.34
5031.00	18.15	294.54	4887.21	430.82 N	846.11 W	407.78	1.34
5126.00	20.33	291.34	4976.90	442.98 N	874.95 W	419.15	2.55
5220.00	20.19	291.94	5065.09	454.98 N	905.20 W	430.33	0.27
5315.00	18.90	291.97	5154.61	466.86 N	934.68 W	441.41	1.36
5409.00	17.74	292.06	5243.85	477.93 N	962.07 W	451.74	1.23
5504.00	16.47	291.25	5334.64	488.25 N	988.04 W	461.35	1.36
5598.00	15.66	290.27	5424.97	497.48 N	1012.36 W	469.91	0.91
5693.00	14.99	290.31	5516.59	506.18 N	1035.91 W	477.98	0.71
5787.00	13.12	289.52	5607.77	513.97 N	1057.37 W	485.18	2.00
5882.00	13.94	293.55	5700.14	522.14 N	1078.02 W	492.79	1.31
5976.00	13.17	291.48	5791.52	530.59 N	1098.37 W	500.68	0.97
6071.00	11.61	290.46	5884.31	537.89 N	1117.39 W	507.47	1.66
6166.00	13.20	294.03	5977.09	545.65 N	1136.26 W	514.72	1.86
6260.00	11.55	291.48	6068.90	553.47 N	1154.82 W	522.03	1.85
6355.00	9.36	286.63	6162.32	559.16 N	1171.07 W	527.28	2.48
6449.00	7.61	286.08	6255.29	563.08 N	1184.38 W	530.83	1.86
6544.00	6.36	286.46	6349.58	566.31 N	1195.47 W	533.77	1.32
6638.00	5.09	279.28	6443.11	568.46 N	1204.58 W	535.67	1.55
6733.00	3.79	292.25	6537.83	570.33 N	1211.64 W	537.34	1.72
6828.00	3.23	336.64	6632.66	573.97 N	1215.61 W	540.88	2.84
6875.00	7.10	4.70	6679.47	578.08 N	1215.90 W	544.98	9.60
6922.00	12.53	2.16	6725.77	586.08 N	1215.47 W	552.99	11.59
6969.00	16.99	1.48	6771.20	598.05 N	1215.10 W	564.96	9.50
7017.00	21.00	1.81	6816.58	613.66 N	1214.65 W	580.58	8.36
7064.00	21.64	0.23	6860.36	630.74 N	1214.35 W	597.66	1.83
7112.00	24.76	1.45	6904.48	649.65 N	1214.06 W	616.57	6.58
7159.00	24.56	0.52	6947.19	669.25 N	1213.72 W	636.18	0.93
7206.00	29.17	1.75	6989.11	690.48 N	1213.28 W	657.41	9.88
7253.00	28.83	0.52	7030.21	713.26 N	1212.83 W	680.19	1.46
7301.00	35.30	359.90	7070.87	738.73 N	1212.75 W	705.65	13.50
7348.00	37.63	1.01	7108.67	766.66 N	1212.52 W	733.58	5.15
7395.00	39.90	1.95	7145.31	796.07 N	1211.75 W	763.01	4.99
7442.00	42.61	2.76	7180.64	827.04 N	1210.47 W	793.99	5.88
7490.00	45.56	2.75	7215.12	860.39 N	1208.87 W	827.38	6.15
7537.00	48.25	2.06	7247.23	894.68 N	1207.43 W	861.69	5.82
7585.00	52.50	1.22	7277.83	931.62 N	1206.38 W	898.65	8.96
7632.00	56.37	1.65	7305.16	969.84 N	1205.42 W	936.88	8.27
7679.00	58.16	2.20	7330.58	1009.35 N	1204.09 W	976.41	3.93
7726.00	60.26	2.92	7354.63	1049.68 N	1202.28 W	1016.77	4.66
7774.00	63.06	4.36	7377.42	1091.84 N	1199.60 W	1058.99	6.40
7821.00	65.67	5.02	7397.75	1134.06 N	1196.13 W	1101.29	5.70
7868.00	69.75	2.82	7415.58	1177.44 N	1193.17 W	1144.73	9.70
7915.00	74.51	1.34	7430.00	1222.13 N	1191.55 W	1189.45	10.56
7963.00	77.98	0.78	7441.41	1268.73 N	1190.69 W	1236.06	7.32
8010.00	81.26	1.43	7449.87	1314.95 N	1189.80 W	1282.29	7.11
8058.00	86.12	0.99	7455.15	1362.63 N	1188.79 W	1329.98	10.17

# 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 1.55 DEGREES (TRUE)  
A TOTAL CORRECTION OF 8.59 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 8058.00 FEET  
IS 1808.31 FEET ALONG 318.90 DEGREES (TRUE)

Survey Data is tied on to Gyro Data.