

PCD Pressure Case Gamma Ray

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	17-Aug-13	02-Sep-13			
Rig Bit Number	0100	0200			
Bit Size (in)	13.500	8.750			
Tool Nominal OD (in)	8.110	6.750			
Log Start Depth (TVD, ft)	13.00	925.94			
Log End Depth (TVD, ft)	925.94	7,133.70			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	17-Aug-13 05:00	30-Aug-13 21:00			
Drill/Wipe End Date and Time	17-Aug-13 14:00	01-Sep-13 17:54			
Min Inc (deg) @ Depth (TVD, ft)	.39 @ 873.94	.21 @ 6,485.25			
Max Inc (deg) @ Depth (TVD, ft)	.97 @ 414.96	86.33 @ 7,131.27			
Bit TFA(in2) / Bit Type	1.49 / PDC	.97 / PDC			
Flow Rate (gpm)	579.04	557.14			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	8.50 / 29.00	9.35 / 38.00			
Filtrate CL (ppm)	700.00	850.00			
pH / Fluid Loss (mptm)	9.20 / 0	9.30 / 5			
PV (cP) / YP (lhf2)	2 / 2.00	14 / 10.00			
% Solids / % Sand	6.2 / .2	8.8 / 0.04			
% 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 (degF) / Source	102.72 / PCM	172.78 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 102.72	N/A @ 172.78			
Lead MWD Engineer	Patrick Megee	Matt Busche			
Customer Representative					

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11812718	11404300			
Insert Serial Number	11145513	11145513			
Date and Time Initialized	16-Aug-13 21:21	28-Aug-13 14:30			
Date and Time Read	17-Aug-13 17:52	02-Sep-13 01:30			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	49.70	46.05			
Software Version	6.21	6.21			
Sub Serial Number	11812718	11404300			
Sonde Serial Number	11638573	11478090			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	109.29	199.66			

Gamma Ray Sensor Information

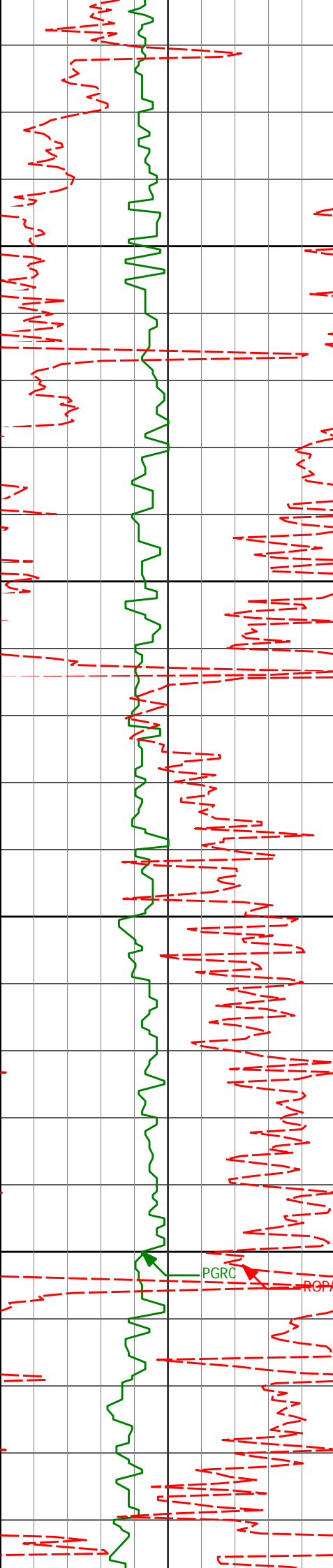
Tool Type	N/A	PCG			
Distance From Bit (ft)	N/A	51.00			
Recorded Sample Period (sec)	N/A	10			
Software Version	N/A	8.15			
Sub Serial Number	N/A	11404300			
Insert/Sonde Serial Number	N/A	11579846			

REMARKS

1. All depths are calibrated to the driller's pipe tally and are true vertical 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 "Bingham Plastic" model for syntheic and oil based fluids.
4. All data presented is recorded (memory) data unless otherwise stated.
ROPA is real time data
5. 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
6. Insite Version 7.4.2

WARRANTY

HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION



1050

1068'

0.44°

306.20°

1067.94'

3.16'

1100

1150

1160'

0.53°

315.57°

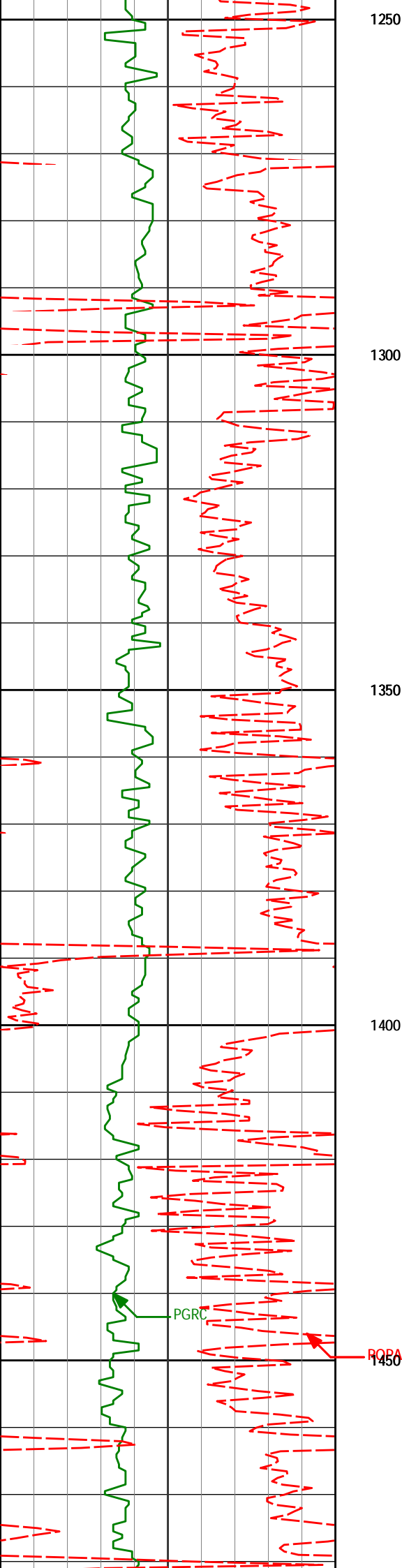
1159.93'

2.65'

1200

PGRG

ROP



1344'

0.62°

321.70°

1343.92'

1.25'

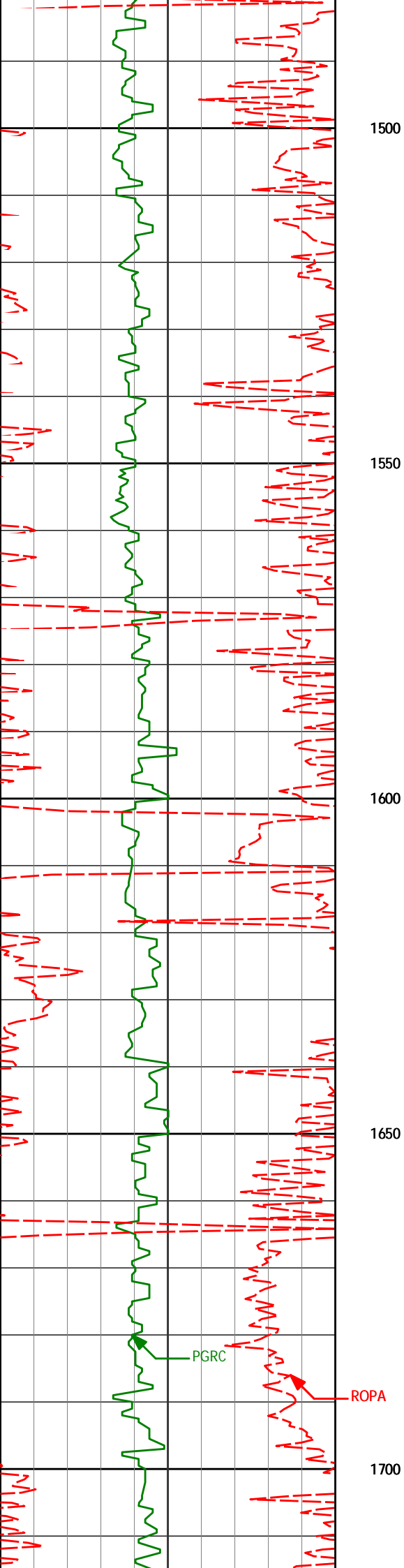
1435'

0.68°

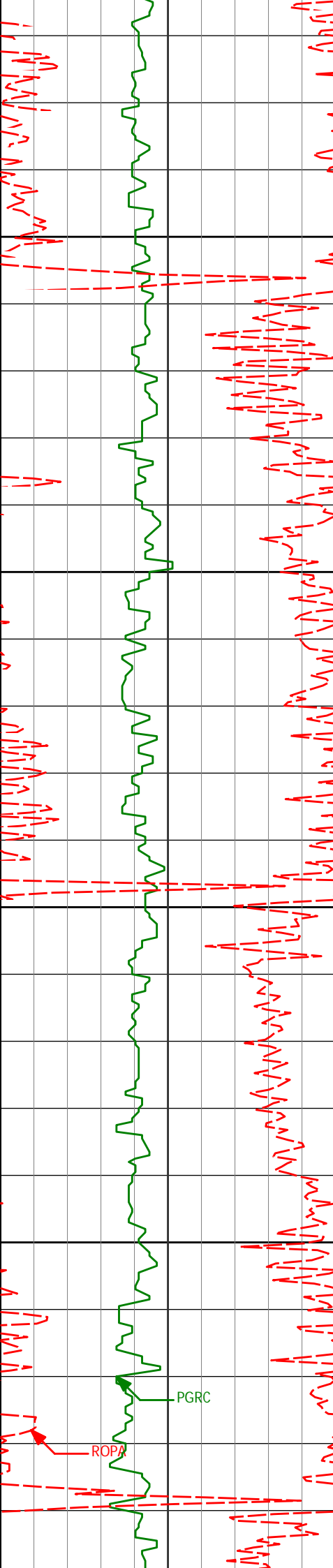
330.11°

1434.92'

0.40'



1526'	0.89°	332.68°	1525.91'	-0.70'
1618'	0.50°	42.49°	1617.90'	-1.63'
1710'	0.43°	74.61°	1709.90'	-2.02'



1750

1800

1850

1900

1801'

0.38°

24.71°

1800.90'

-2.38'

1893'

0.33°

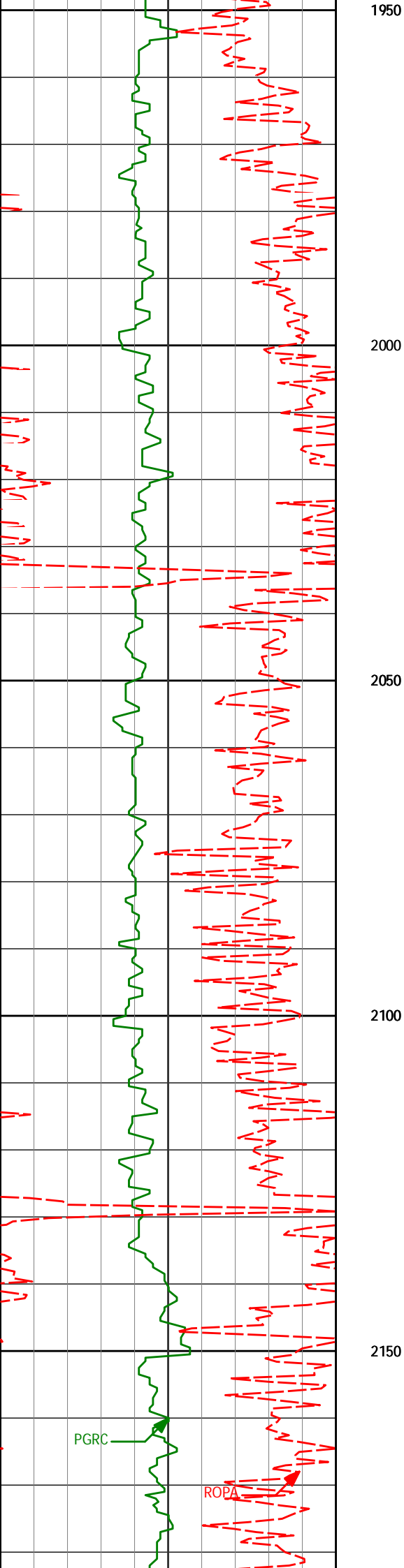
29.81°

1892.90'

-2.89'

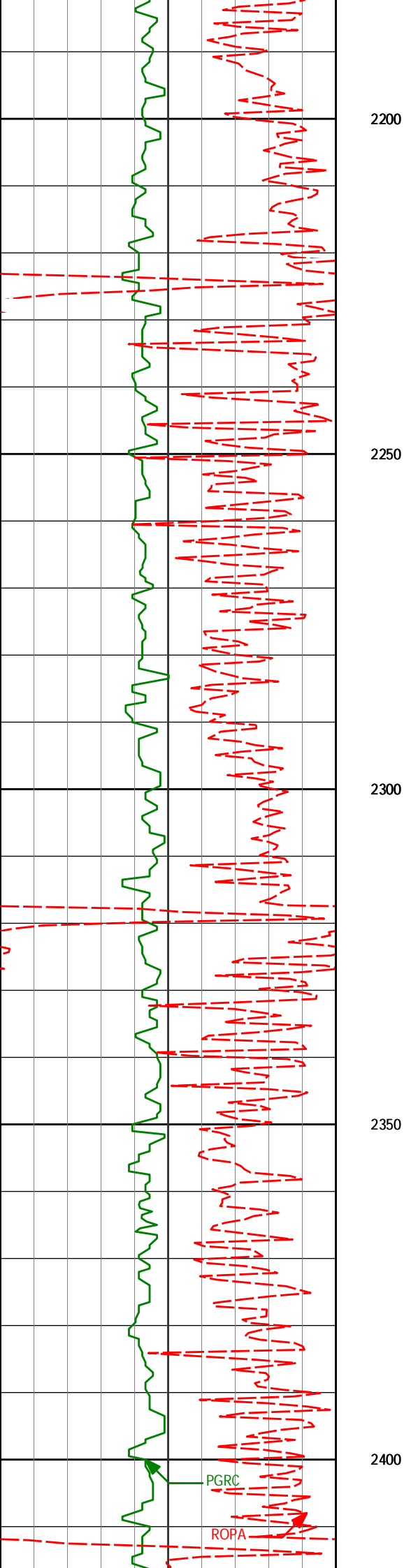
PGRC

ROPA



1988' 0.58° 20.52° 1987.89' -3.57'

2083' 0.71° 12.36° 2082.89' -4.60'



2368'

1.11°

350.53°

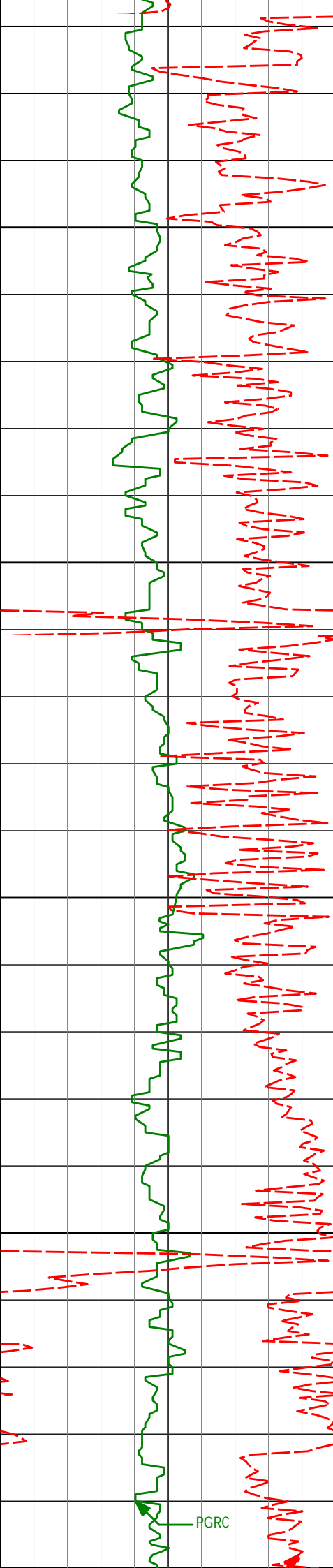
2367.85'

-9.05'

PGRC

ROPA

2400



2450

2463'

1.08°

349.07°

2462.84'

-10.83'

2500

2550

2558'

0.69°

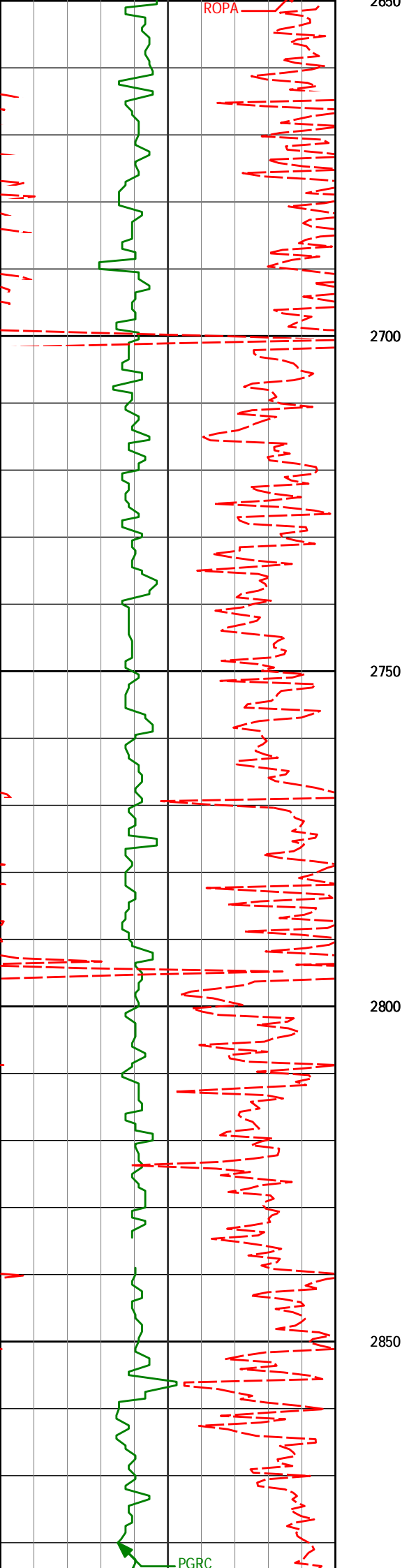
343.86°

2557.82'

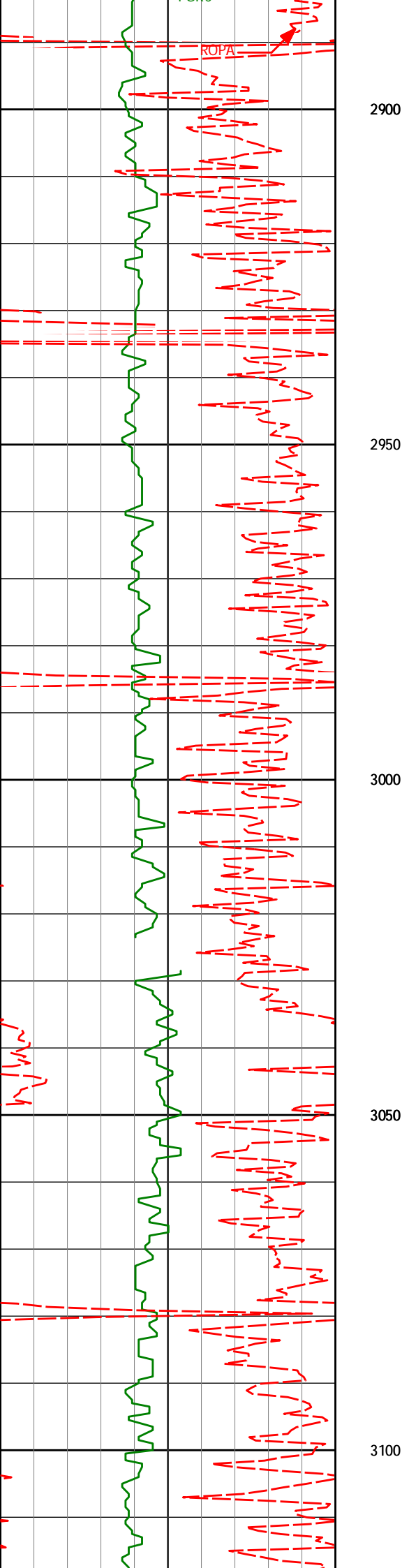
-12.26'

2600

2650



2653'	0.94°	333.27°	2652.81'	-13.51'
2749'	0.68°	351.01°	2748.80'	-14.77'
2844'	0.89°	358.94°	2843.80'	-16.07'



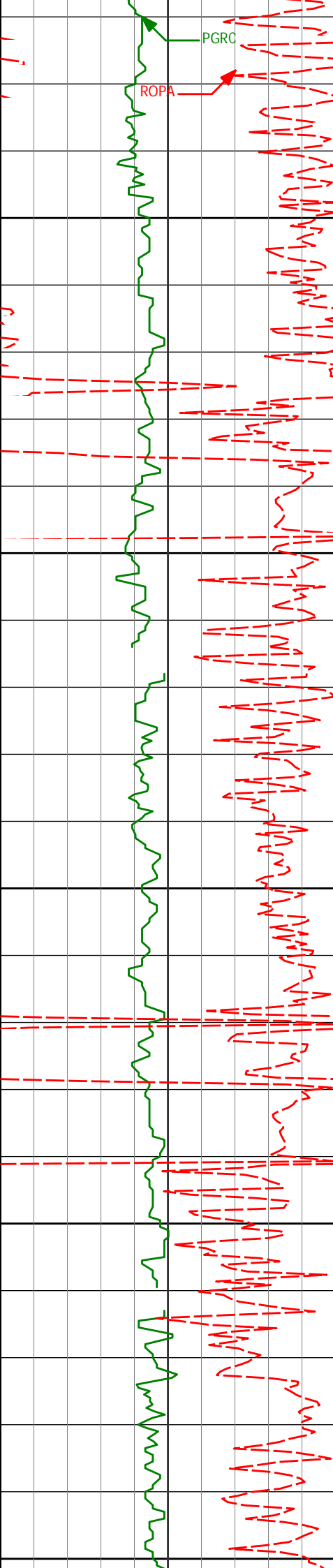
3034'

0.44°

14.89°

3033.78'

-18.25'



3129'	0.96°	45.44°	3128.78'	-19.16'
-------	-------	--------	----------	---------

3150

3200

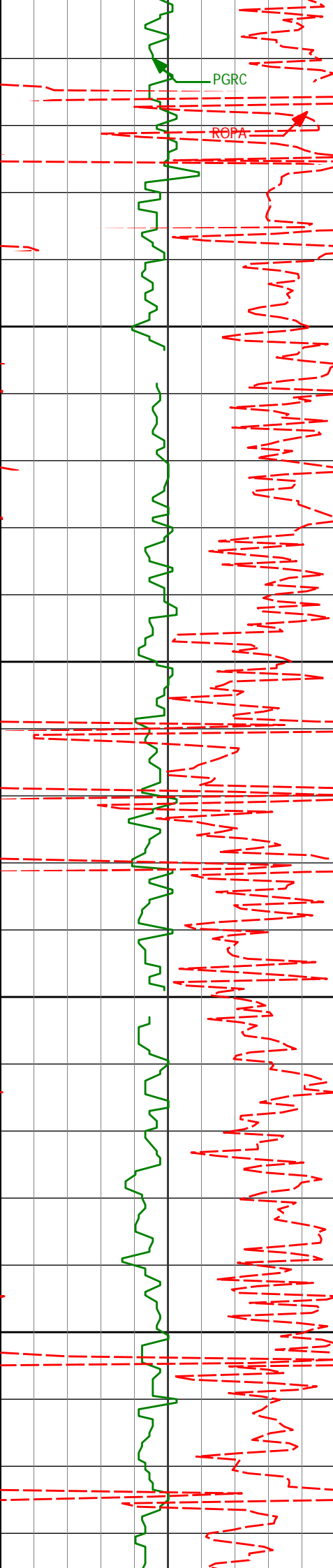
3224'	2.51°	33.48°	3223.73'	-21.45'
-------	-------	--------	----------	---------

3250

3300

3319'	4.04°	28.45°	3318.57'	-26.13'
-------	-------	--------	----------	---------

3350



3400

3414'

5.06°

27.31°

3413.27'

-32.79'

3450

3500

3509'

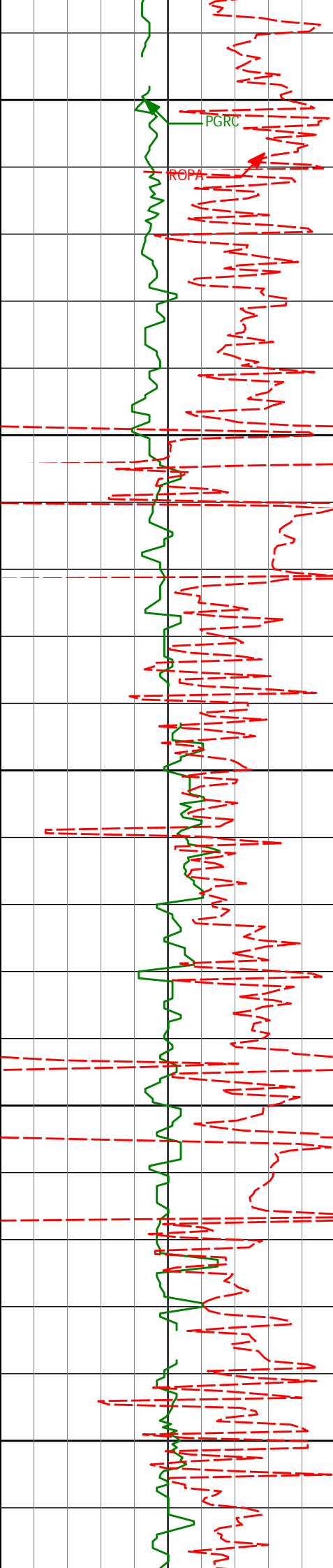
5.03°

22.19°

3507.90'

-40.36'

3550



3600

3605'

4.26°

20.40°

3603.59'

-47.60'

3650

3700

3700'

5.53°

20.73°

3698.24'

-55.18'

3750

3800

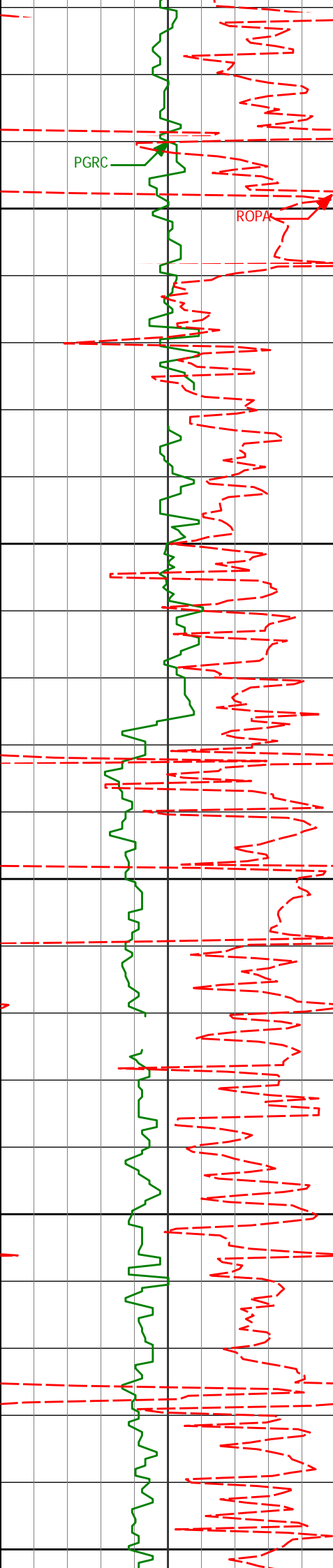
3795'

6.87°

25.31°

3792.68'

-64.59'



3850

3900

3950

4000

4050

3890'

8.17°

27.20°

3886.86'

-75.73'

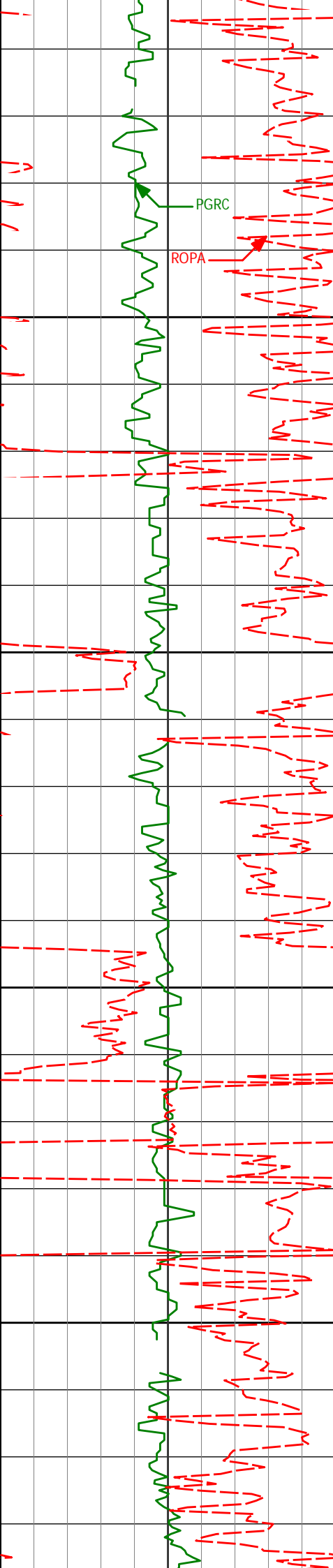
3985'

9.94°

25.74°

3980.68'

-89.11'



4100

4150

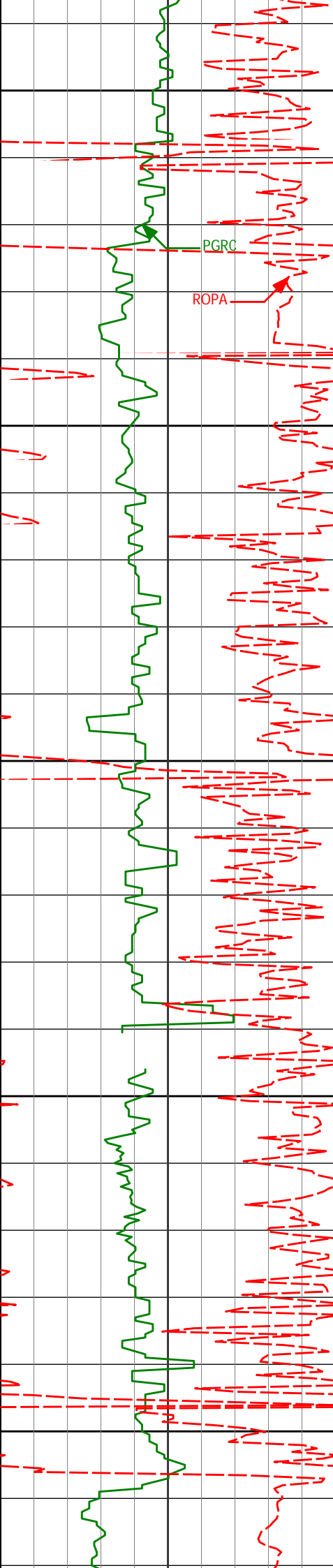
4200

4250

4080'	9.43°	25.29°	4074.32'	-103.52'
-------	-------	--------	----------	----------

4175'	8.69°	24.03°	4168.14'	-117.11'
-------	-------	--------	----------	----------

4270'	8.85°	25.36°	4262.02'	-130.26'
-------	-------	--------	----------	----------



4300

PGR

ROPA

4350

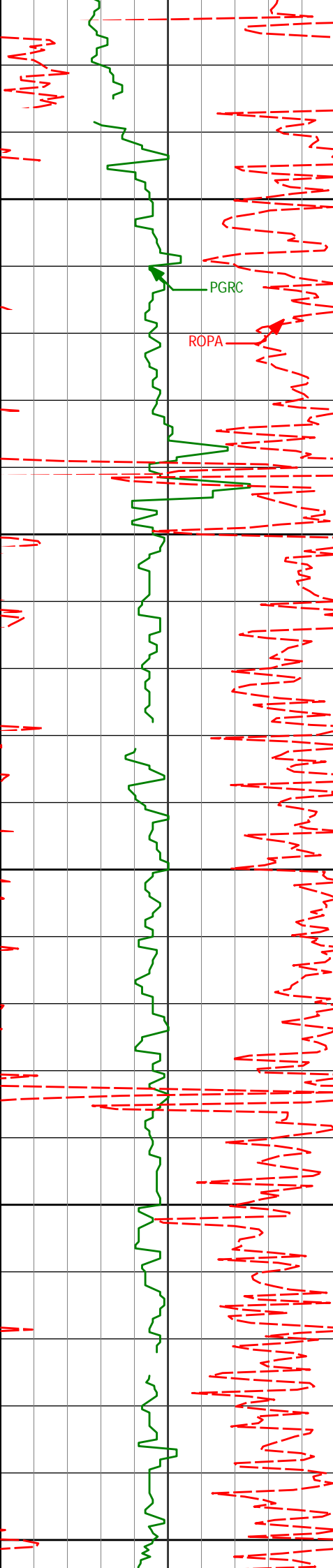
4366'	10.08°	24.71°	4356.72'	-144.56'
-------	--------	--------	----------	----------

4400

4450

4461'	9.15°	20.81°	4450.38'	-159.16'
-------	-------	--------	----------	----------

4500



4550

4600

4650

4700

4750

PGRC

ROPA

4556'

10.38°

26.04°

4544.00'

-173.91'

4651'

10.38°

24.32°

4637.45'

-189.39'

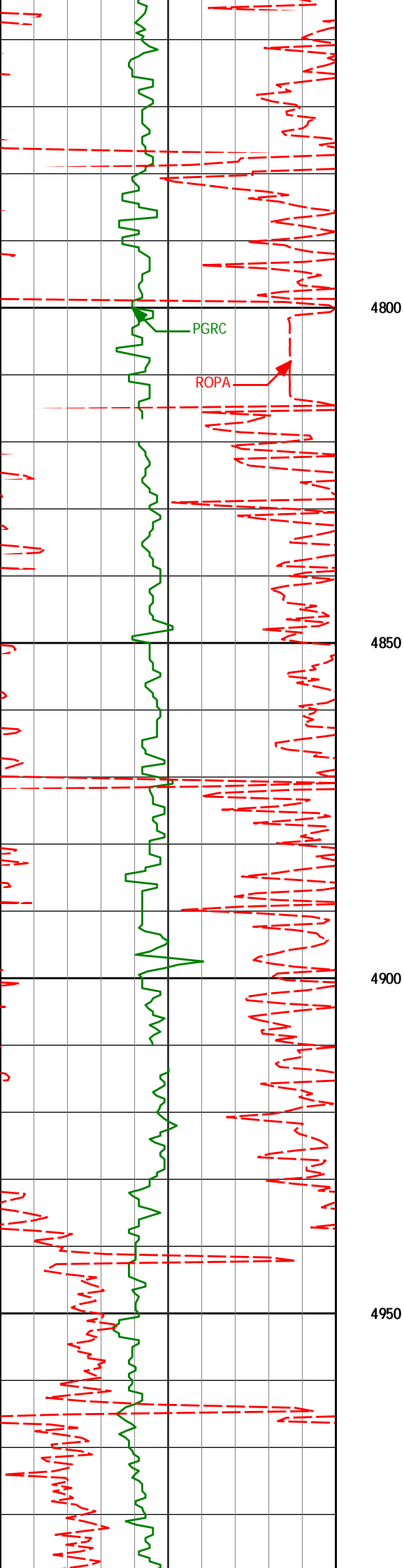
4746'

9.37°

23.62°

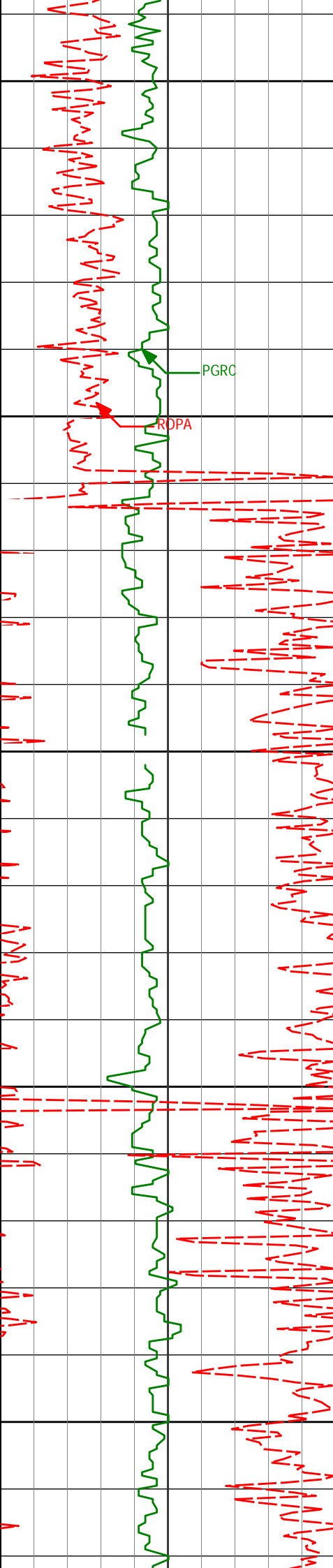
4731.04'

-204.26'



4841'	10.17°	28.88°	4824.67'	-218.68'
-------	--------	--------	----------	----------

4936'	8.96°	32.83°	4918.34'	-232.23'
-------	-------	--------	----------	----------



5000

5032'

8.29°

32.14°

5013.26'

-244.37'

PGRC

RPPA

5050

5100

5127'

7.54°

32.31°

5107.35'

-255.43'

5150

5200

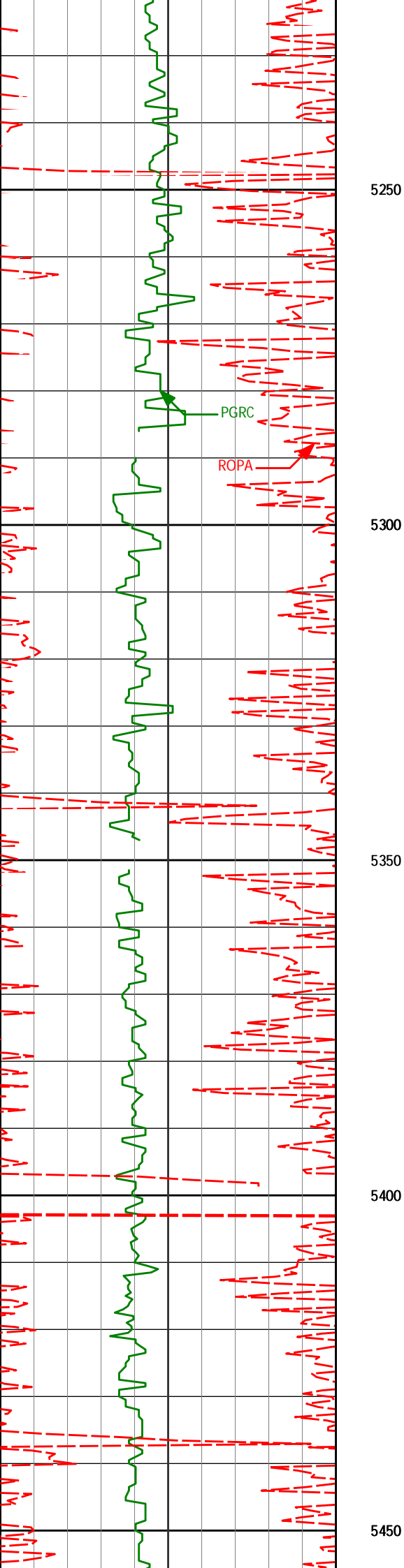
5222'

6.36°

31.10°

5201.65'

-265.19'



5317'

5.73°

28.59°

5296.12'

-273.86'

5250

5300

5350

5412'

5.50°

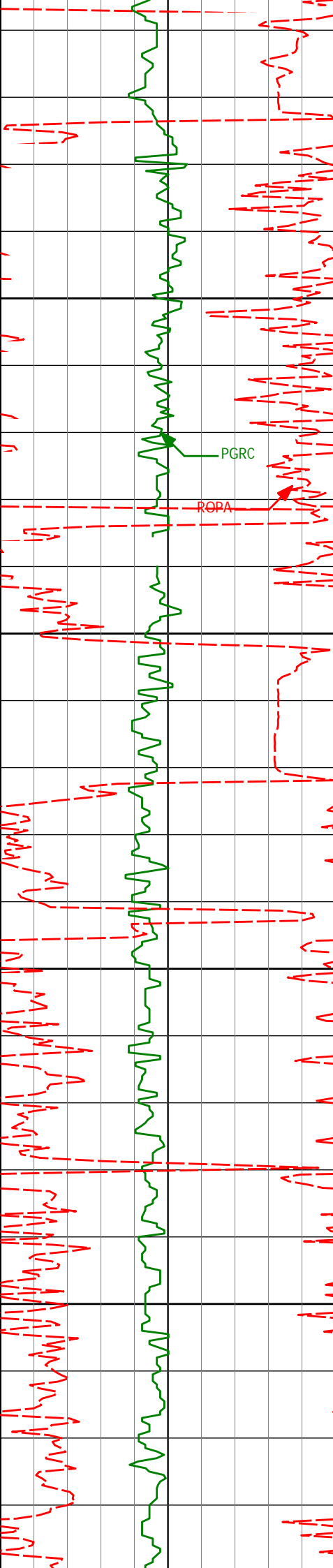
27.57°

5390.67'

-282.05'

5400

5450



5507'	3.08°	18.78°	5485.40'	-288.50'
-------	-------	--------	----------	----------

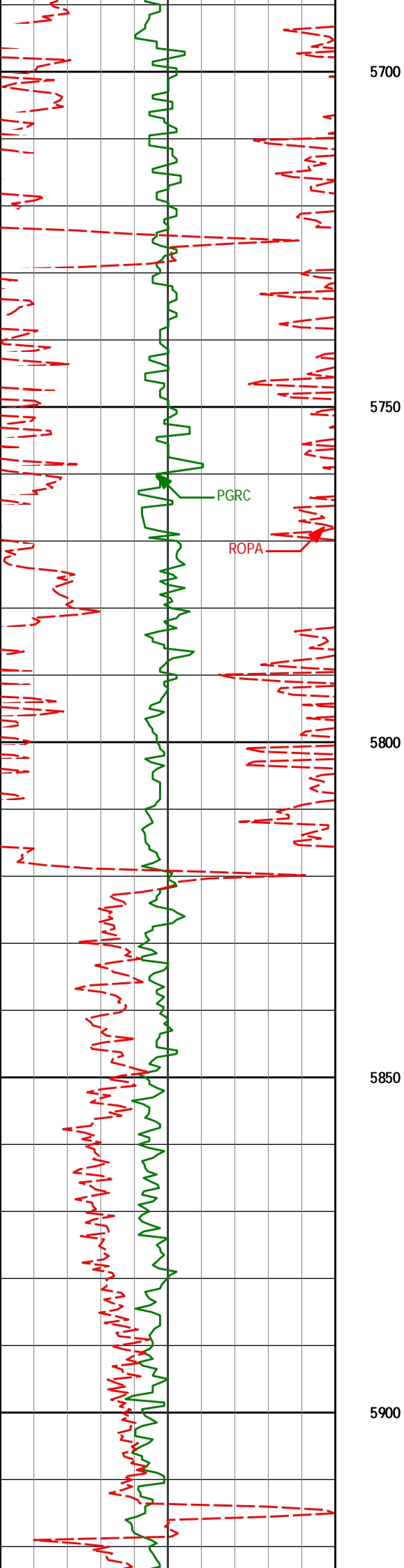
5500

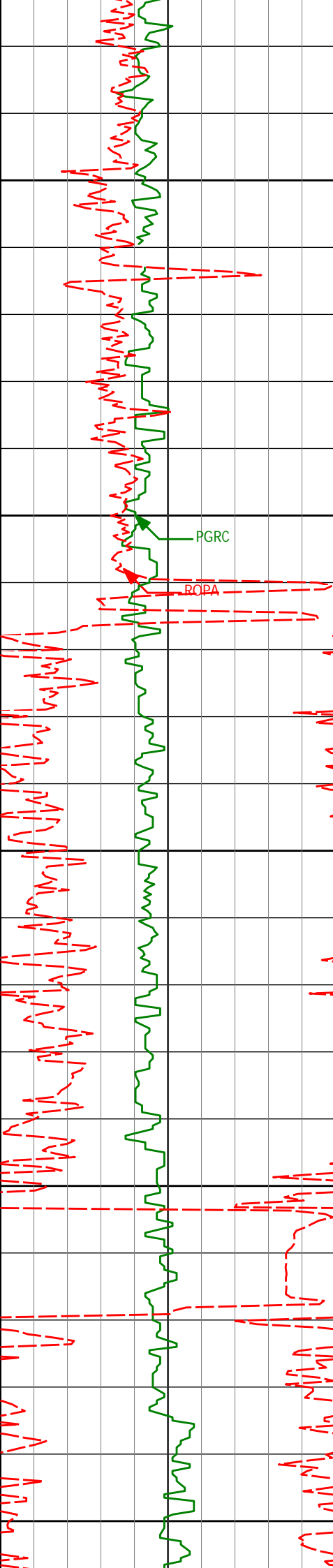
5550

5603'	0.52°	12.60°	5581.34'	-291.37'
-------	-------	--------	----------	----------

5600

5650





5950

5983'

1.22°

13.25°

5961.29'

-296.98'

6000

PGRC

ROPA

6050

6078'

1.42°

12.86°

6056.27'

-299.12'

6100

6150

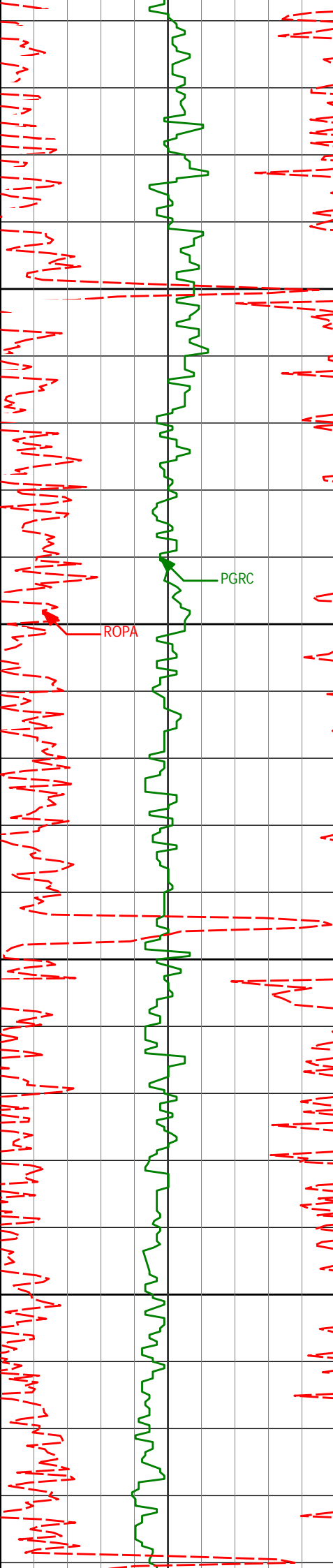
6173'

0.26°

152.97°

6151.26'

-300.07'



6200

6250

6300

6350

6268'

0.45°

179.03°

6246.26'

-299.51'

6364'

0.24°

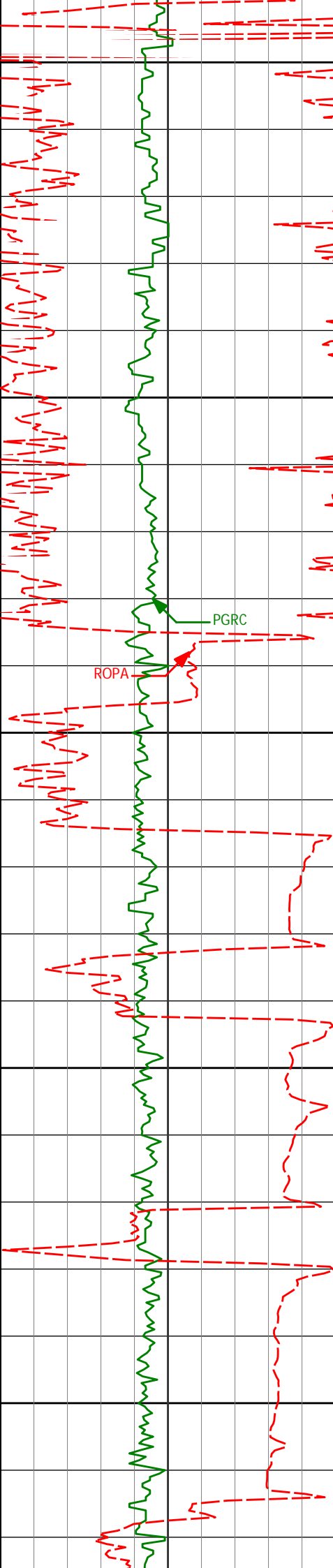
153.01°

6342.26'

-298.95'

ROPA

PGRC



6400

6459'	0.35°	156.79°	6437.26'	-298.51'
-------	-------	---------	----------	----------

6450

6507'	0.21°	114.23°	6485.25'	-298.33'
-------	-------	---------	----------	----------

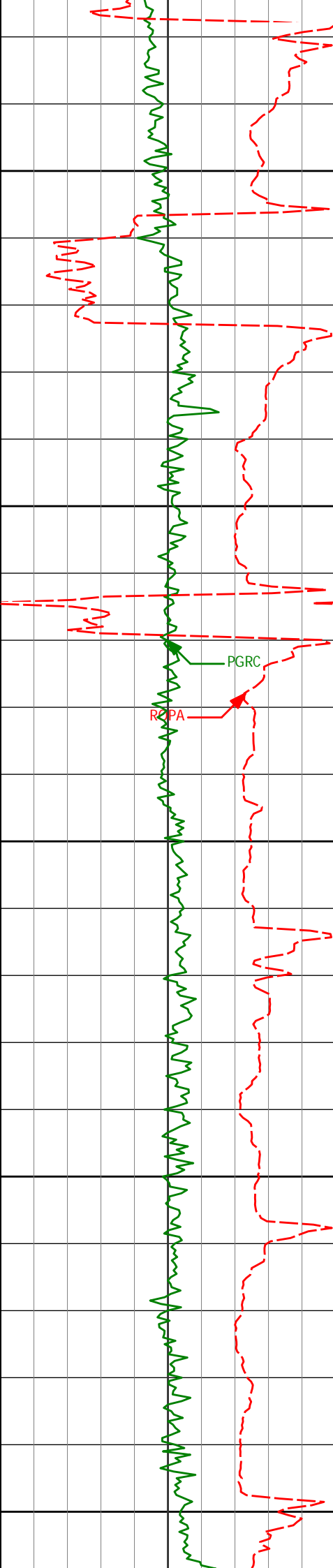
6500

6554'	2.27°	168.05°	6532.24'	-297.39'
-------	-------	---------	----------	----------

6550

6602'	6.66°	177.78°	6580.08'	-293.67'
-------	-------	---------	----------	----------

6600



6650

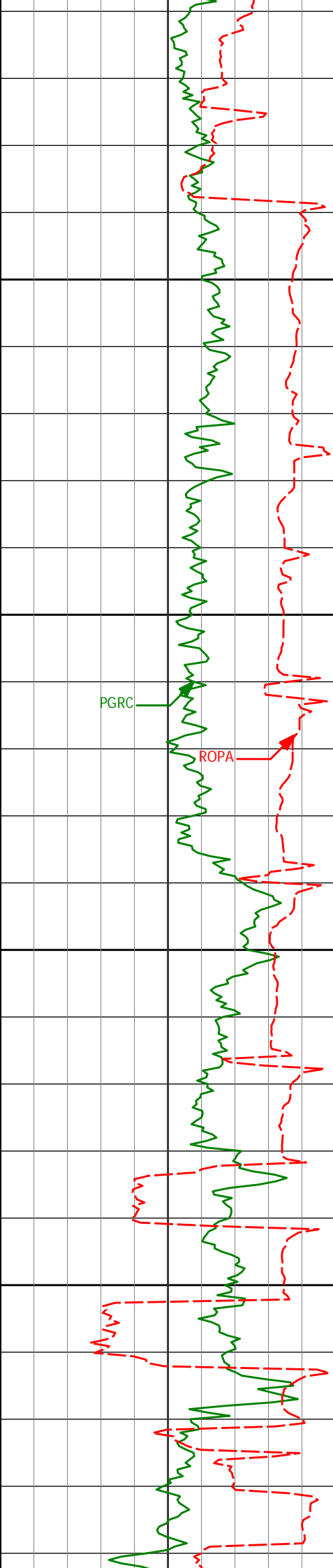
6700

6750

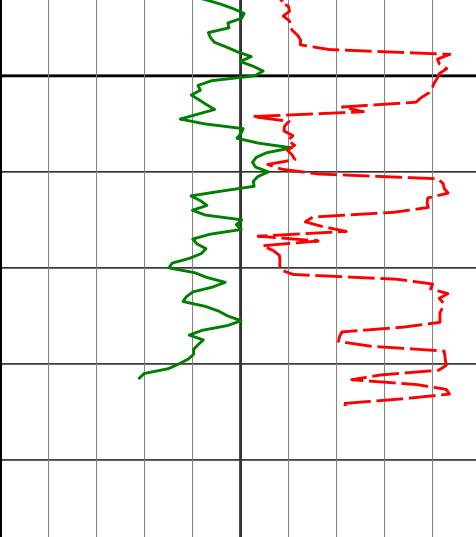
6800

6850

6649'	10.60°	181.96°	6626.54'	-286.63'
6697'	13.74°	181.83°	6673.46'	-276.52'
6744'	18.12°	180.93°	6718.64'	-263.62'
6792'	22.58°	182.22°	6763.64'	-246.94'
6839'	27.10°	182.29°	6806.28'	-227.22'
6887'	31.45°	181.57°	6848.14'	-203.77'



6900	6934'	36.51°	178.96°	6887.10'	-177.52'
	6982'	41.82°	180.98°	6924.30'	-147.22'
6950	7029'	46.43°	182.63°	6958.03'	-114.52'
	7077'	51.74°	183.05°	6989.46'	-78.31'
7000	7124'	57.57°	182.82°	7016.64'	-40.04'
	7172'	61.62°	182.21°	7040.93'	1.31'
7050	7219'	65.13°	181.35°	7061.99'	43.29'
	7267'	68.47°	179.72°	7080.89'	87.40'

		7100	7314'	72.47°	179.44°	7096.60'	131.69'
			7362'	75.59°	179.58°	7109.81'	177.83'
			7409'	78.65°	178.88°	7120.28'	223.64'
			7452'	82.95°	178.36°	7127.16'	266.06'
			7496'	86.33°	179.84°	7131.27'	309.86'
		<u>TD</u>					
		7150					
Avg Rate of Penetration ROPA feet per hr		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
500 0							
PCG Gamma Ray BCorr PGRC api							
0 300							



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum

Kunzman 14N-8HZ

Wattenburg

Weld Colorado

USA

CA-XX-0900582948

Surveys starting at 1068' MD 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
148.00	0.70	248.34	148.00	0.33 S	0.84 W	0.33	0.47
230.00	0.96	250.82	229.99	0.75 S	1.96 W	0.74	0.31
326.00	0.90	254.35	325.98	1.21 S	3.44 W	1.21	0.09
415.00	0.97	261.84	414.96	1.51 S	4.85 W	1.50	0.16
539.00	0.56	262.43	538.95	1.73 S	6.48 W	1.73	0.33
633.00	0.40	224.94	632.95	2.03 S	7.17 W	2.02	0.36
726.00	0.44	218.04	725.95	2.54 S	7.62 W	2.53	0.07
819.00	0.57	231.12	818.94	3.11 S	8.20 W	3.10	0.18
874.00	0.39	247.45	873.94	3.35 S	8.58 W	3.34	0.40
1068.00	0.44	306.20	1067.94	3.17 S	9.80 W	3.16	0.21
1160.00	0.53	315.57	1159.93	2.66 S	10.39 W	2.65	0.13
1344.00	0.62	321.70	1343.92	1.27 S	11.60 W	1.25	0.06
1435.00	0.68	330.11	1434.92	0.41 S	12.17 W	0.40	0.12
1526.00	0.89	332.68	1525.91	0.68 N	12.77 W	-0.70	0.23
1618.00	0.50	42.49	1617.90	1.61 N	12.82 W	-1.63	0.93
1710.00	0.43	74.61	1709.90	2.00 N	12.22 W	-2.02	0.29
1801.00	0.38	24.71	1800.90	2.36 N	11.76 W	-2.38	0.38
1893.00	0.33	29.81	1892.90	2.87 N	11.50 W	-2.89	0.06
1988.00	0.58	20.52	1987.89	3.56 N	11.20 W	-3.57	0.27
2083.00	0.71	12.36	2082.89	4.58 N	10.90 W	-4.60	0.17
2368.00	1.11	350.53	2367.85	9.03 N	10.98 W	-9.05	0.18
2463.00	1.08	349.07	2462.84	10.82 N	11.30 W	-10.83	0.04
2558.00	0.69	343.86	2557.82	12.25 N	11.63 W	-12.26	0.42
2653.00	0.94	333.27	2652.81	13.49 N	12.14 W	-13.51	0.31
2749.00	0.68	351.01	2748.80	14.76 N	12.58 W	-14.77	0.37
2844.00	0.89	358.94	2843.80	16.05 N	12.69 W	-16.07	0.25
3034.00	0.44	14.89	3033.78	18.23 N	12.53 W	-18.25	0.25
3129.00	0.96	45.44	3128.78	19.15 N	11.86 W	-19.16	0.66
3224.00	2.51	33.48	3223.73	21.44 N	10.15 W	-21.45	1.67
3319.00	4.04	28.45	3318.57	26.12 N	7.41 W	-26.13	1.64

3414.00	5.06	27.31	3413.27	32.78 N	3.89 W	-32.79	1.08
3509.00	5.03	22.19	3507.90	40.36 N	0.40 W	-40.36	0.47
3605.00	4.26	20.40	3603.59	47.60 N	2.44 E	-47.60	0.82
3700.00	5.53	20.73	3698.24	55.19 N	5.29 E	-55.18	1.34
3795.00	6.87	25.31	3792.68	64.61 N	9.34 E	-64.59	1.50
3890.00	8.17	27.20	3886.86	75.75 N	14.85 E	-75.73	1.39
3985.00	9.94	25.74	3980.68	89.14 N	21.50 E	-89.11	1.88
4080.00	9.43	25.29	4074.32	103.56 N	28.38 E	-103.52	0.54
4175.00	8.69	24.03	4168.14	117.15 N	34.63 E	-117.11	0.81
4270.00	8.85	25.36	4262.02	130.31 N	40.68 E	-130.26	0.27
4366.00	10.08	24.71	4356.72	144.61 N	47.36 E	-144.56	1.29
4461.00	9.15	20.81	4450.38	159.23 N	53.52 E	-159.16	1.19
4556.00	10.38	26.04	4544.00	173.98 N	59.96 E	-173.91	1.60
4651.00	10.38	24.32	4637.45	189.47 N	67.24 E	-189.39	0.33
4746.00	9.37	23.62	4731.04	204.35 N	73.86 E	-204.26	1.07
4841.00	10.17	28.88	4824.67	218.78 N	81.01 E	-218.68	1.26
4936.00	8.96	32.83	4918.34	232.34 N	89.07 E	-232.23	1.45
5032.00	8.29	32.14	5013.26	244.49 N	96.81 E	-244.37	0.71
5127.00	7.54	32.31	5107.35	255.55 N	103.78 E	-255.43	0.79
5222.00	6.36	31.10	5201.65	265.33 N	109.83 E	-265.19	1.25
5317.00	5.73	28.59	5296.12	274.00 N	114.82 E	-273.86	0.72
5412.00	5.50	27.57	5390.67	282.20 N	119.20 E	-282.05	0.26
5507.00	3.08	18.78	5485.40	288.65 N	122.13 E	-288.50	2.63
5603.00	0.52	12.60	5581.34	291.52 N	123.05 E	-291.37	2.67
5983.00	1.22	13.25	5961.29	297.14 N	124.36 E	-296.98	0.18
6078.00	1.42	12.86	6056.27	299.27 N	124.85 E	-299.12	0.21
6173.00	0.26	152.97	6151.26	300.22 N	125.21 E	-300.07	1.71
6268.00	0.45	179.03	6246.26	299.66 N	125.31 E	-299.51	0.26
6364.00	0.24	153.01	6342.26	299.10 N	125.41 E	-298.95	0.27
6459.00	0.35	156.79	6437.26	298.66 N	125.62 E	-298.51	0.12
6507.00	0.21	114.23	6485.25	298.49 N	125.75 E	-298.33	0.50
6554.00	2.27	168.05	6532.24	297.54 N	126.03 E	-297.39	4.58
6602.00	6.66	177.78	6580.08	293.83 N	126.33 E	-293.67	9.25
6649.00	10.60	181.96	6626.54	286.78 N	126.29 E	-286.63	8.48
6697.00	13.74	181.83	6673.46	276.67 N	125.96 E	-276.52	6.54
6744.00	18.12	180.93	6718.64	263.78 N	125.66 E	-263.62	9.33
6792.00	22.58	182.22	6763.64	247.10 N	125.18 E	-246.94	9.34
6839.00	27.10	182.29	6806.28	227.37 N	124.40 E	-227.22	9.62
6887.00	31.45	181.57	6848.14	203.92 N	123.62 E	-203.77	9.09
6934.00	36.51	178.96	6887.10	177.67 N	123.54 E	-177.52	11.20
6982.00	41.82	180.98	6924.30	147.37 N	123.52 E	-147.22	11.38
7029.00	46.43	182.63	6958.03	114.67 N	122.48 E	-114.52	10.11
7077.00	51.74	183.05	6989.46	78.46 N	120.67 E	-78.31	11.08
7124.00	57.57	182.82	7016.64	40.19 N	118.71 E	-40.04	12.41
7172.00	61.62	182.21	7040.93	1.16 S	116.90 E	1.31	8.51
7219.00	65.13	181.35	7061.99	43.15 S	115.60 E	43.29	7.65
7267.00	68.47	179.72	7080.89	87.26 S	115.20 E	87.40	7.63
7314.00	72.47	179.44	7096.60	131.55 S	115.52 E	131.69	8.53
7362.00	75.59	179.58	7109.81	177.69 S	115.92 E	177.83	6.51
7409.00	78.65	178.88	7120.28	223.49 S	116.54 E	223.64	6.67
7452.00	82.95	178.36	7127.16	265.92 S	117.56 E	266.06	10.07
7496.00	86.33	179.84	7131.27	309.71 S	118.25 E	309.86	8.38

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 179.93 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.60 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7496.00 FEET
IS 331.52 FEET ALONG 159.10 DEGREES (TRUE)**

Tie In to Surface