

PCGK - Pressure Case Gamma
PCDC - Pressure Case Directional

1 : 240

Country		: USA	
Field		: Wattenberg	
Location		: Lat: 40° 2' 41.61" North Long: 104° 42' 44.09" West	
Well		: Pettinger 3N-18HZ	
Company		: Anadarko Petroleum Corporation	
Rig		: Ensign 123	
LOCATION		Company : Anadarko Petroleum Corporation	
		Rig : Ensign 123	
		Well : Pettinger 3N-18HZ	
		Field : Wattenberg	
		Country : USA	
		API Number : 05-123-38023	
Latitude : 40° 2' 41.61" North Longitude : 104° 42' 44.09" West		Other Services Directional Drilling	
UTM Easting = 3,220,543,380 ft UTM Northing = 1,260,179,090 ft			
Permanent Datum : Ground Level		Elev. : 5008.00 ft	
Log Measured From : Drill Floor		13.00 ft Above Permanent Datum	
Drilling Measured From : Drill Floor		MD LOG	
Depth Logged : 1,203.00 ft To 12,363.00 ft		Unit No. : 11703726	
Date Logged : 24-Feb-14 To 03-Mar-14		Job No. : CA-XX-0900984322	
Total Depth MD : 12,363.00 ft TVD : 7,197.35 ft		Plot Type : Final	
Spud Date : 24-Feb-14		Plot Date : 03-Mar-14	
Borehole Record (MD)			
Run No.	Size	From	To
100	8.750 in	1,203.00 ft	7,753.00 ft
200	6.125 in	7,753.00 ft	12,363.00 ft
Casing Record (MD)			
	Size	Weight	From
	9.625 in	36.00 lbpf	SURFACE
	7.000 in	26.00 lbpf	SURFACE

WELL INFORMATION

MWD Run Number	100	200
Date run completed	27-Feb-14	03-Mar-14
Rig Bit Number	2	3
Bit Size (in)	8.750	6.125
Tool Nominal OD (in)	6.750	4.750
Log Start Depth (MD, ft)	1,203.00	7,753.00
Log End Depth (MD, ft)	7,753.00	12,363.00
Drill or Wipe	Drill	Drill
Drill/Wipe Start Date and Time	24-Feb-14 17:24	28-Feb-14 17:05
Drill/Wipe End Date and Time	26-Feb-14 20:12	02-Mar-14 08:10
Min Inc (deg) @ Depth (MD, ft)	0.25 @ 6,605.00	87.93 @ 12,134.00
Max Inc (deg) @ Depth (MD, ft)	89.50 @ 7,753.00	93.27 @ 11,684.00
Bit TFA(in2) / Bit Type	1.18 / PDC	0.98 / PDC
Flow Rate (gpm)	630.14	299.70
Max AV (fpm) / CV (fpm) @ MWD	491.6 / N/A	490.1 / N/A
Fluid Type	Fresh Water Gel	Fresh Water Gel
Density (ppg) / Viscosity (spqt)	9.50 / 43.00	9.40 / 45.00
Filtrate CL (ppm)	2,000.00	2,000.00
pH / Fluid Loss (mptm)	9.10 / 4.0	9.30 / N/A
PV (cP) / YP (Ihf2)	17 / 14.00	16 / 15.00
% Solids / % Sand	8.70 / 1.00	5.20 / 1.00
% 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	170.37 / PCM	226.08 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	D Evan Ponder	D Evan Ponder			
Customer Representative	Irvin McWhorter	Irvin McWhorter			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.76			
Sub Serial Number	11331931	12310750			
Insert Serial Number	11400958	11145557			
Date and Time Initialized	22-Feb-14 16:51	27-Feb-14 06:30			
Date and Time Read	27-Feb-14 09:02	03-Mar-14 12:32			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	48.00	42.21			
Software Version	6.21	6.21			
Sub Serial Number	11331931	12310750			
Sonde Serial Number	11297493	11062120			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	141.96	328.17			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	51.15	47.16			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11331931	12310750			
Insert/Sonde Serial Number	11293354	11680997			

REMARKS

1. All depths are measured 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. All data presented is recorded data unless otherwise specified.
4. The final survey is projected to the bit.
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

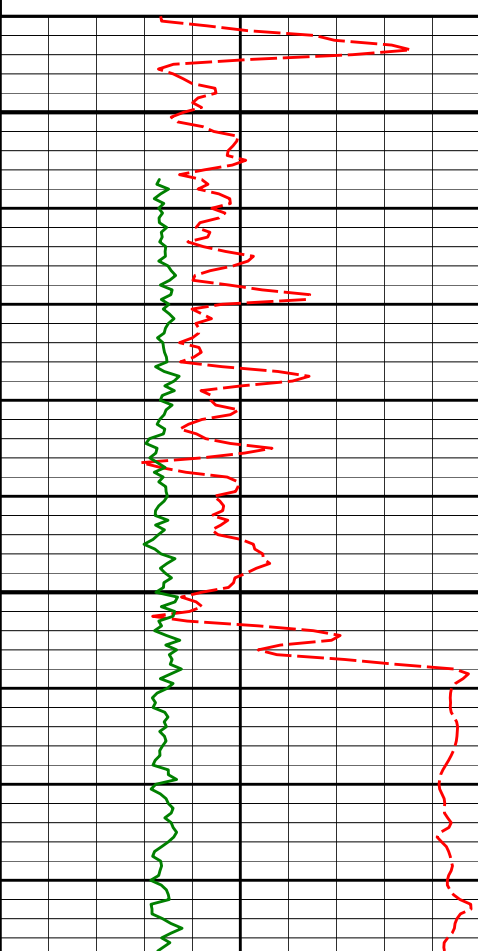
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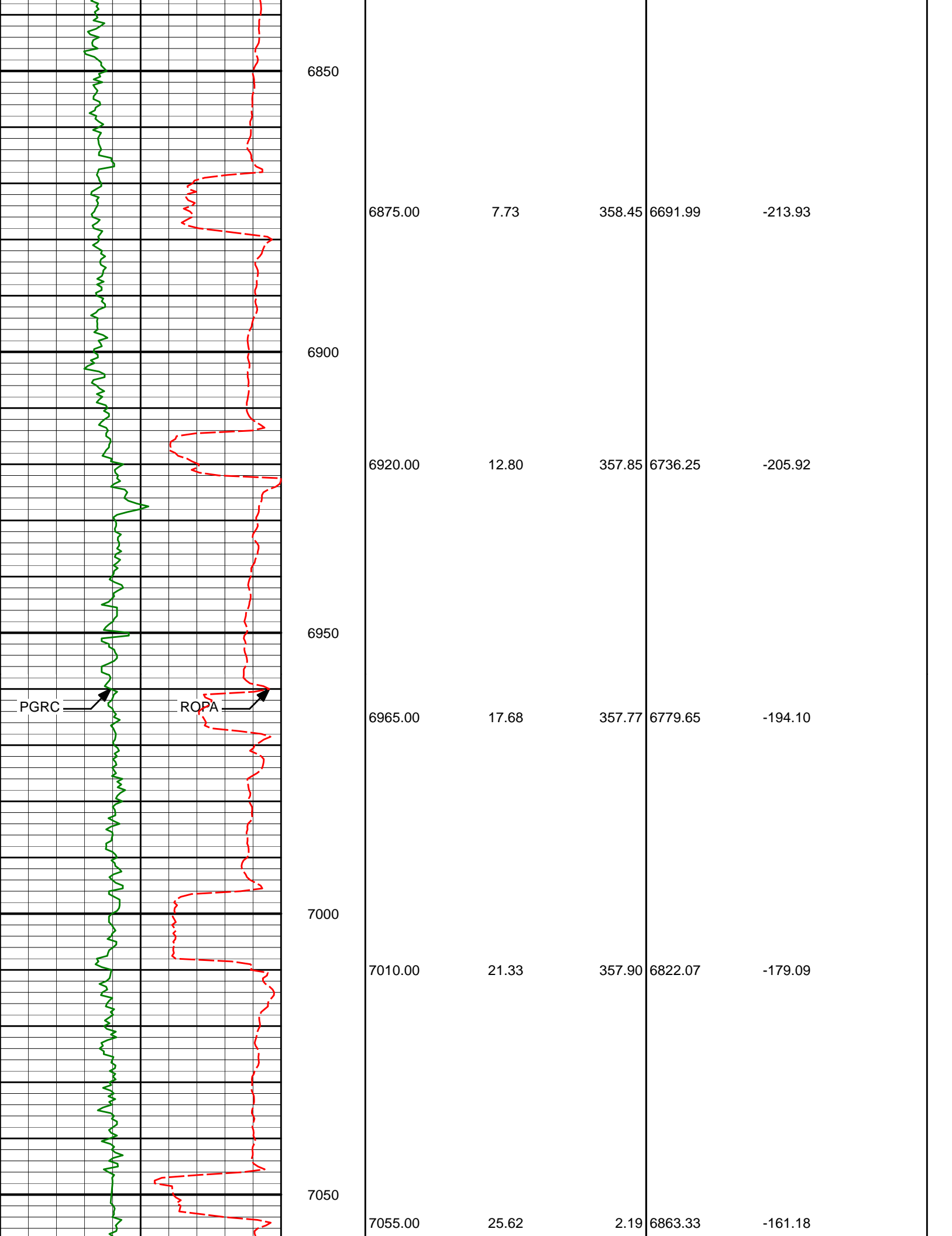
WARRANTY

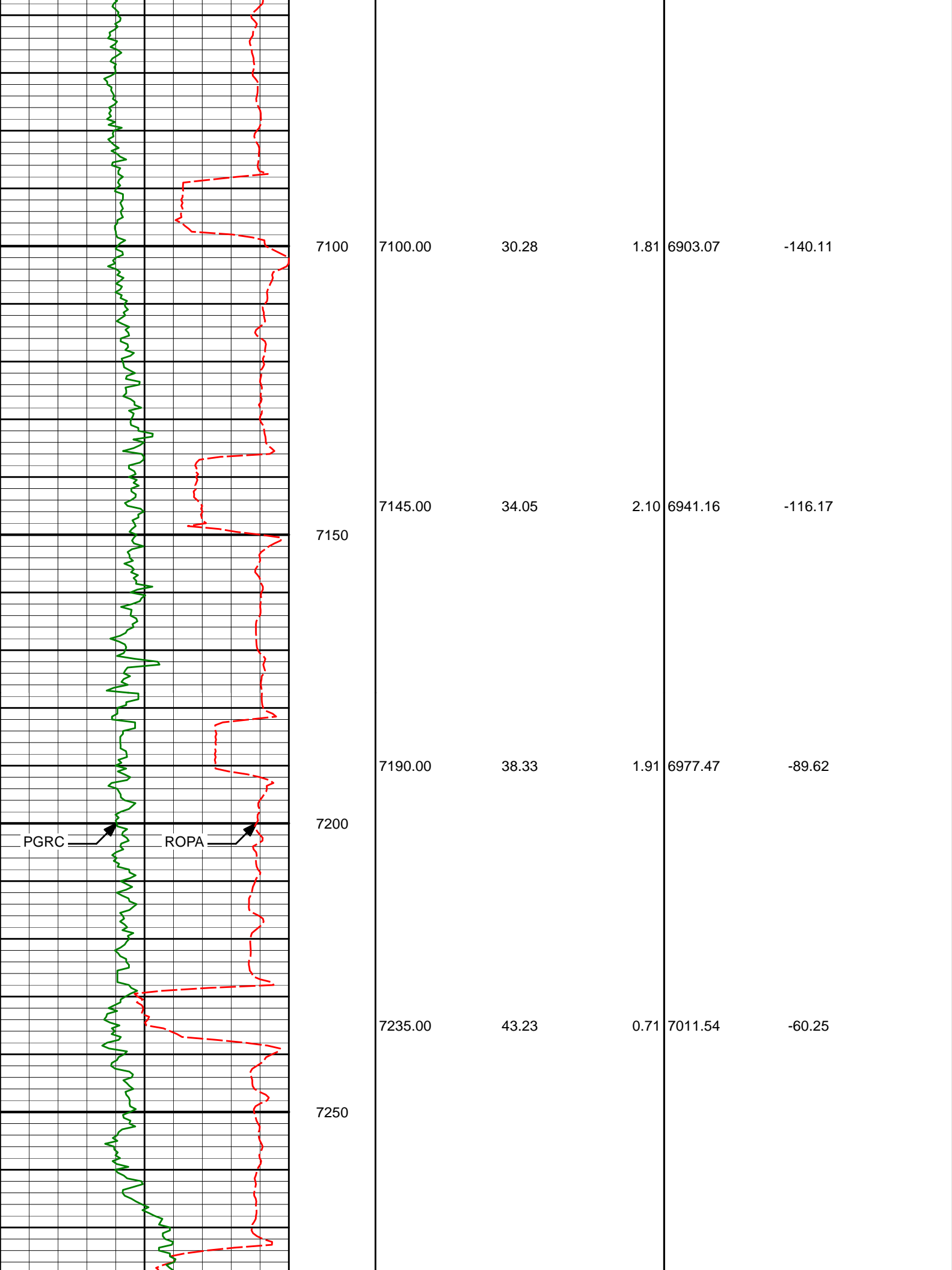
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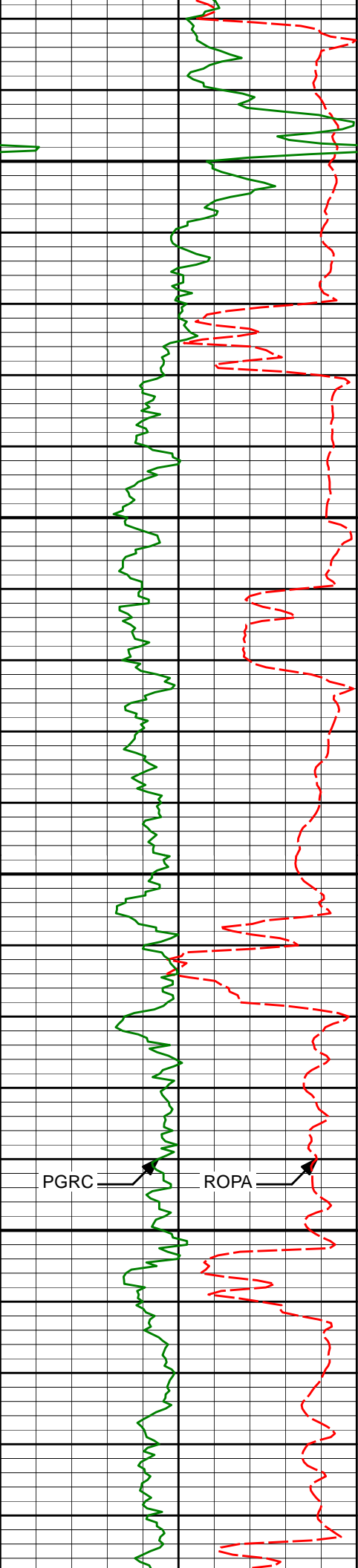
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MD Main Log 1:240

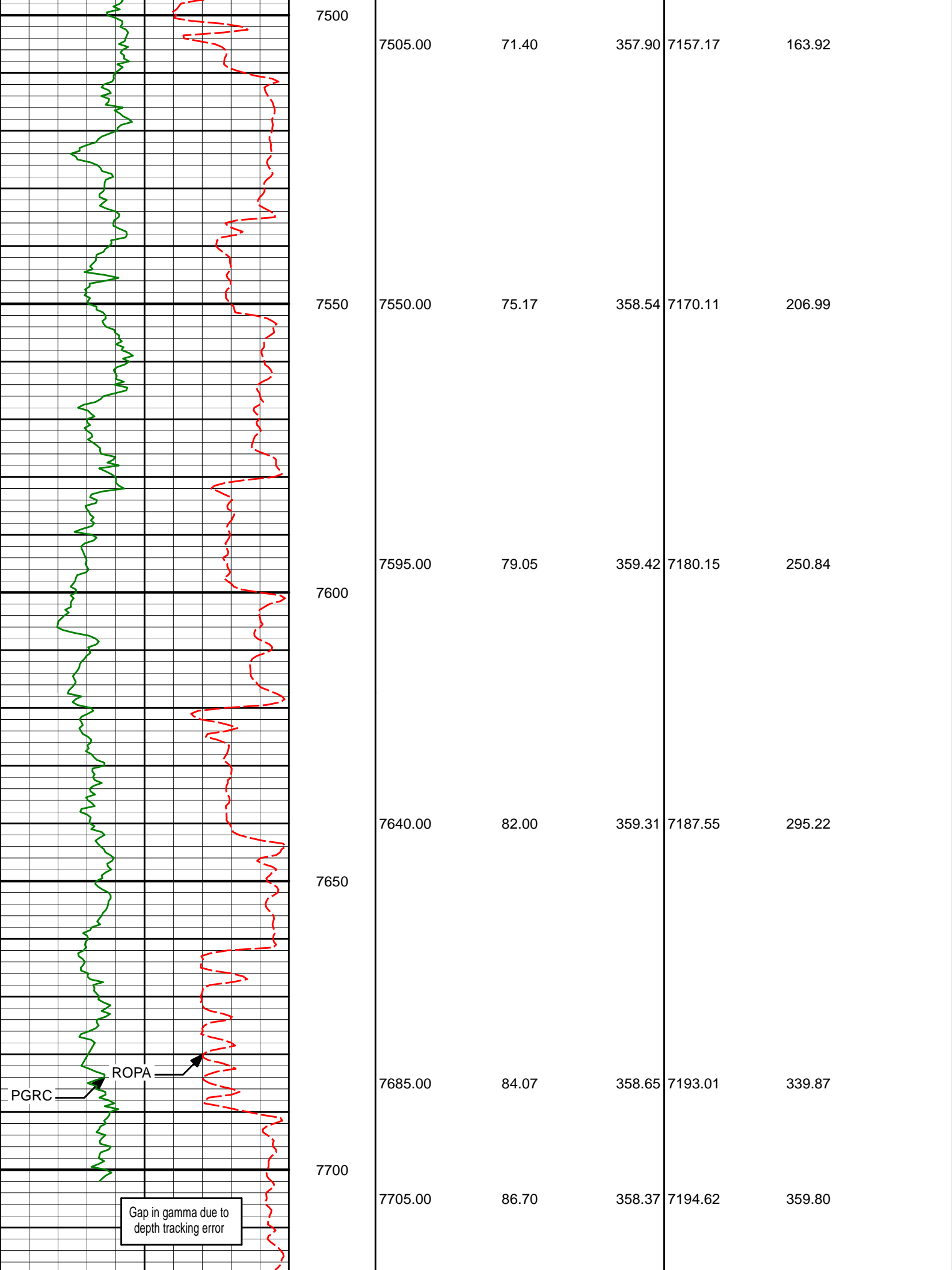
Avg Rate of Penetration feet per hr						
1K0						
PCG Gamma Ray BCorr api		Depth				
0300			Survey Depth	Inclination	Azimuth	TVD
						V/S
		6750				
			6757.00	0.61	264.44	6574.22
						-219.30
			6785.00	0.49	253.75	6602.22
						-219.35
		6800				
			6830.00	3.13	353.53	6647.20
						-218.18

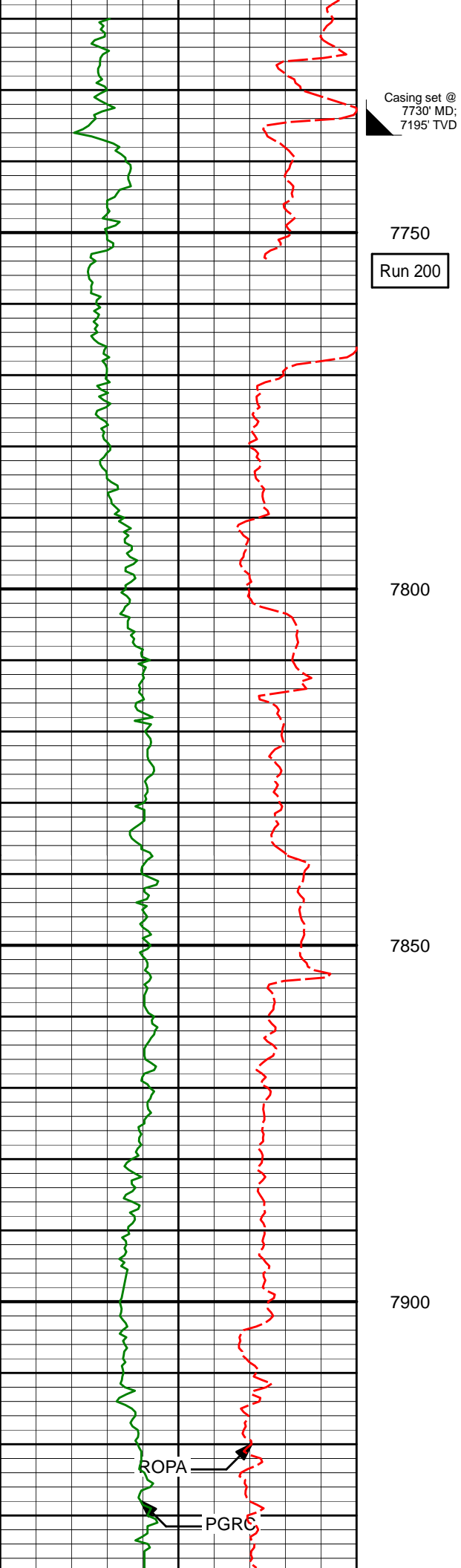




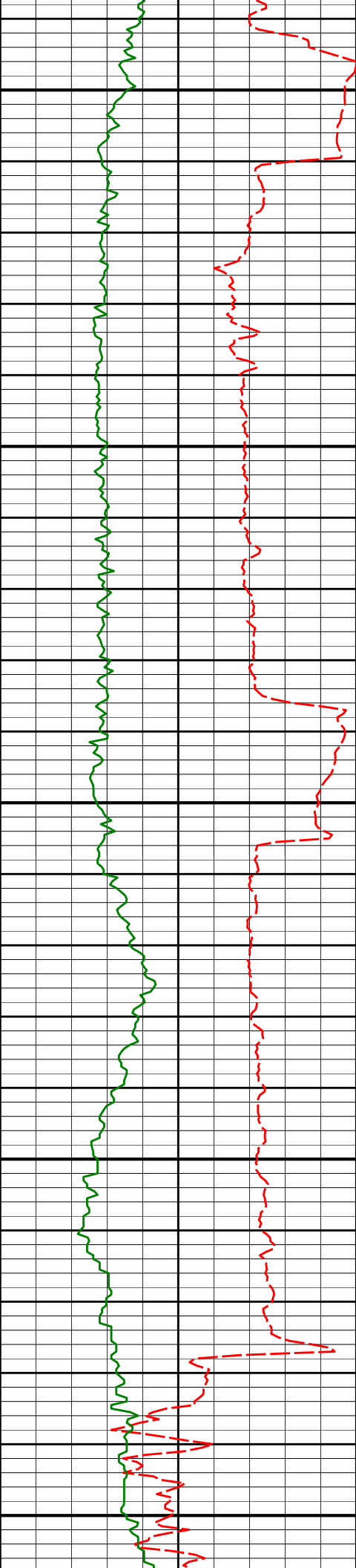


7280.00	48.32	1.00	7042.91	-28.01
7300				
7325.00	52.41	1.25	7071.61	6.63
7350				
7370.00	56.24	359.74	7097.85	43.17
7400				
7415.00	60.71	359.12	7121.37	81.52
7450				
7460.00	67.00	358.19	7141.19	121.88





7768.00	89.54	358.28	7196.69	422.74
7813.00	89.63	357.90	7197.01	467.71
7903.00	90.52	358.39	7196.89	557.66



7950

7993.00

90.83

0.22

7195.83

647.65

8000

8050

8083.00

88.70

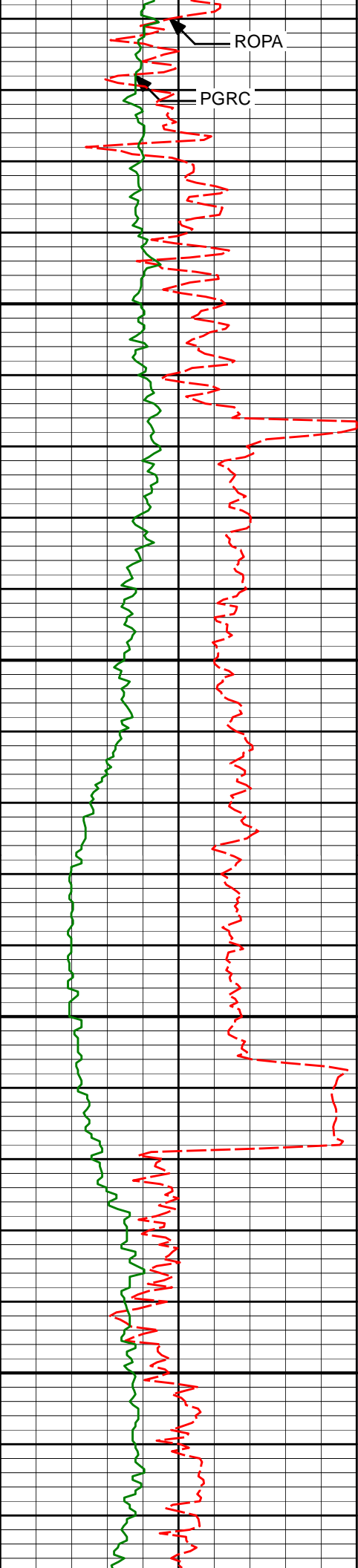
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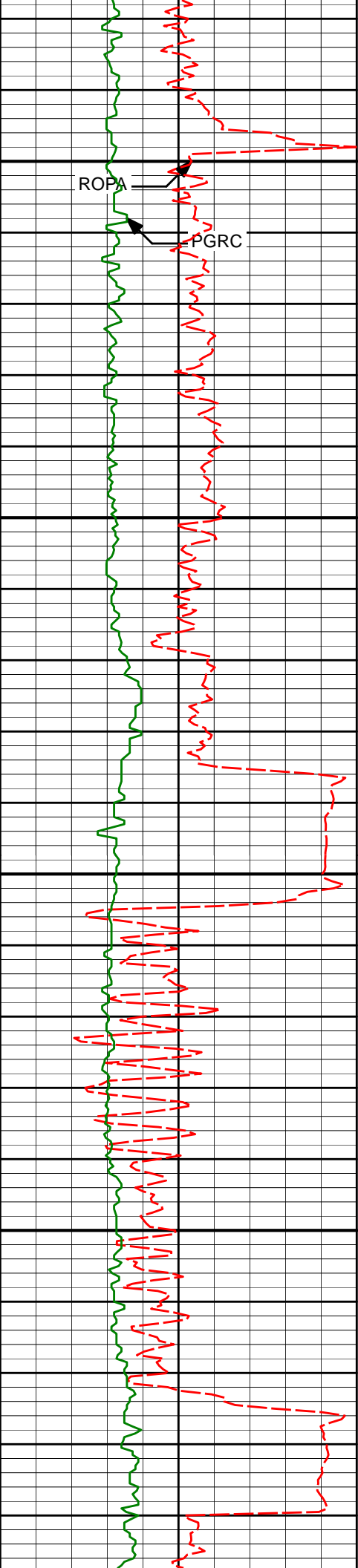
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8100

8150



	8173.00	89.04	359.88	7197.98	827.62
8200					
8250					
8263.00	8263.00	89.72	359.92	7198.95	917.62
8300					
8350					
8353.00	8353.00	89.88	0.98	7199.27	1007.61



8400

8450

8500

8550

8443.00

91.20

1.43

7198.42

1097.59

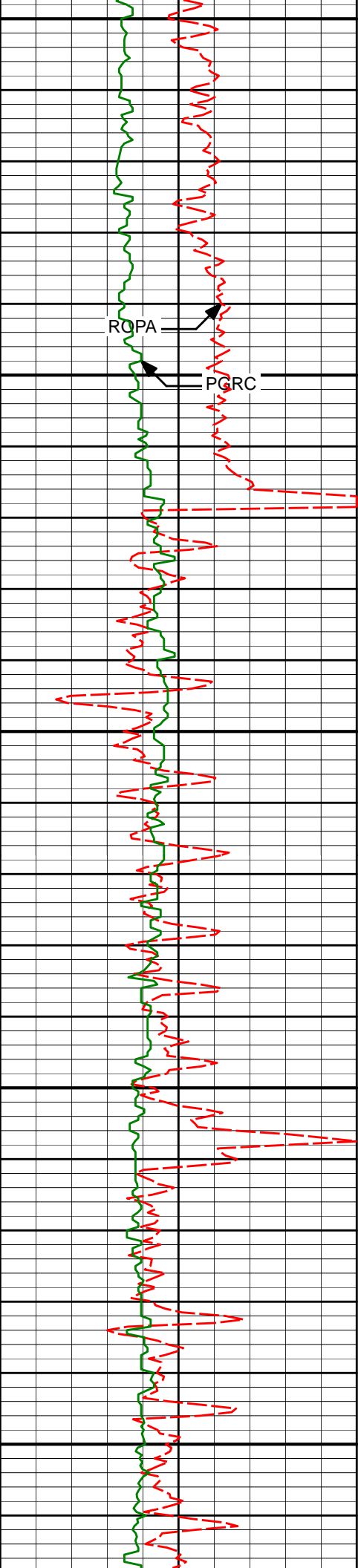
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91.05

1.18

7196.65

1187.54



8600

8623.00

89.11

359.94

7196.52

1277.53

ROPA

PGRC

8650

8700

8713.00

89.20

359.31

7197.85

1367.52

8750

8800

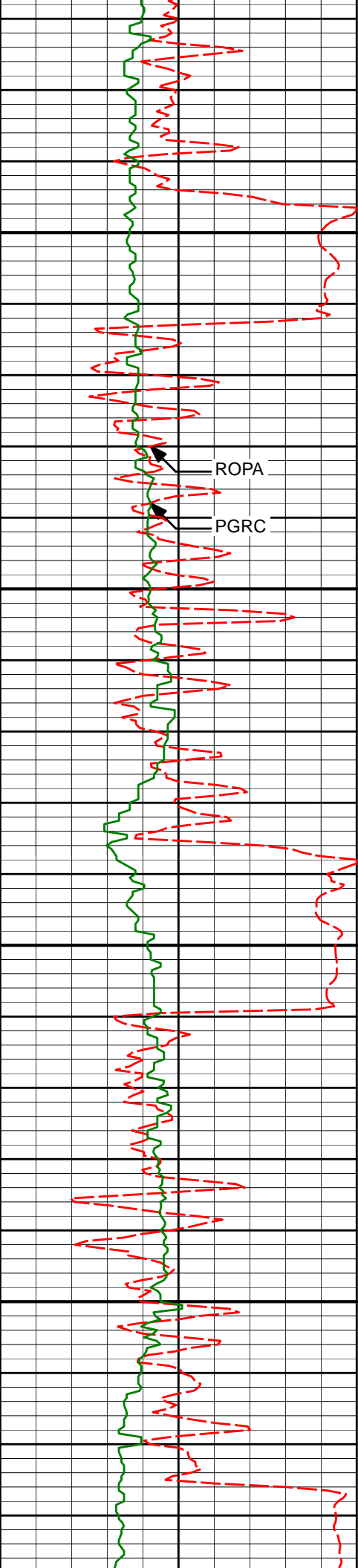
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1457.48



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8900

8950

9000

ROPA

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7199.42

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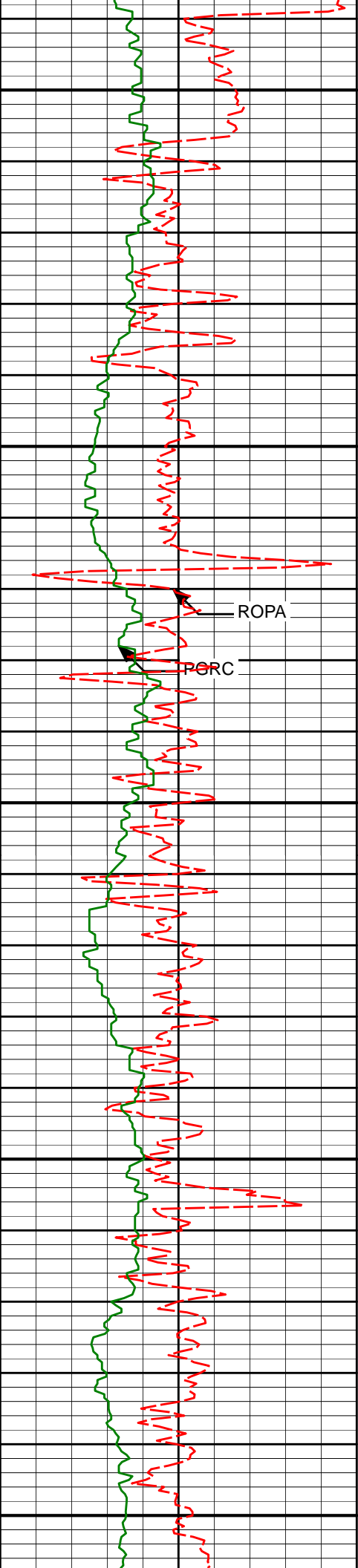
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0.39

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1637.43



9050

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9150

9200

9250

ROPA

PORC

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90.15

0.43

7196.48

1817.41

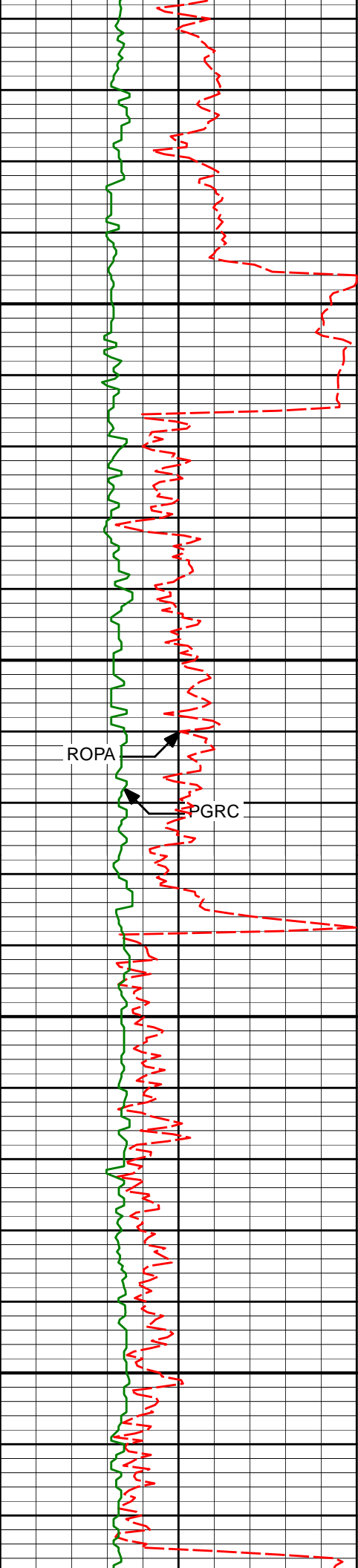
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90.89

359.87

7195.66

1907.41



9300

9350

9400

9450

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89.35

0.14

7195.47

1997.40

9433.00

89.20

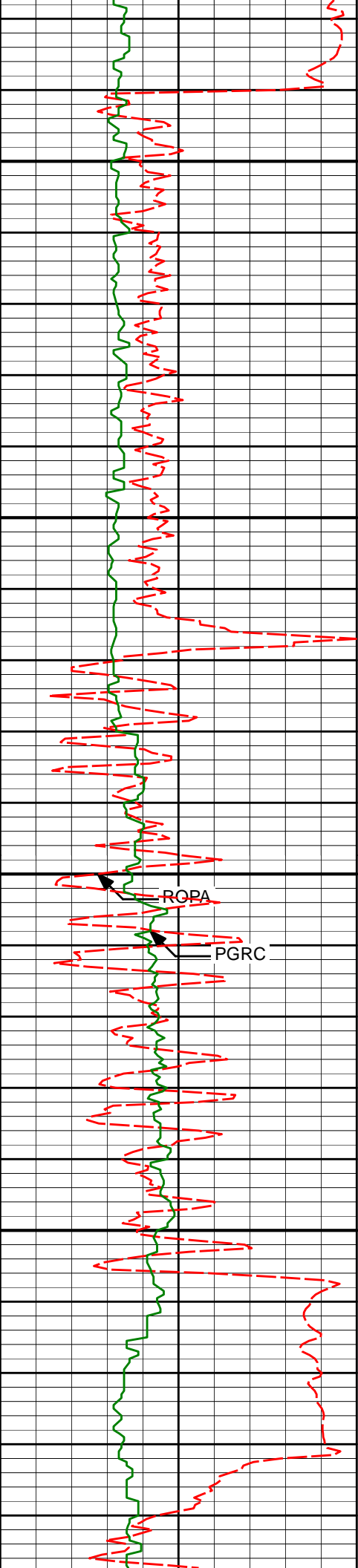
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2087.40

ROPA

PGRC



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9550

9600

9650

9523.00

89.14

0.08

7197.92

2177.39

9613.00

88.95

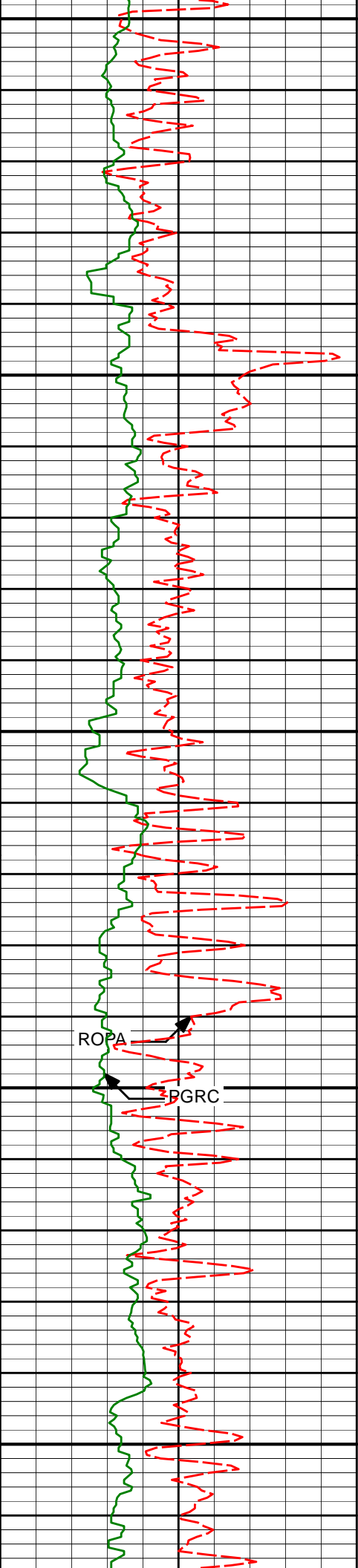
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2267.37

ROPA

PGRC



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9750

9800

9850

9900

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89.85

1.34

7200.36

2357.36

9883.00

92.10

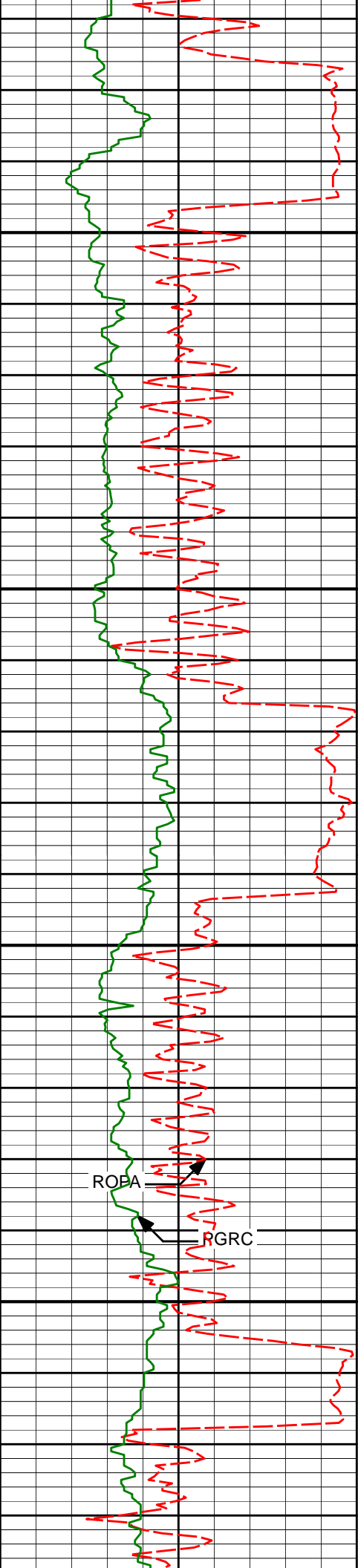
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7197.29

2537.30

ROPA

PGRC



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91.42

359.57

7194.53

2627.26

10000

10050

10063.00

89.57

359.56

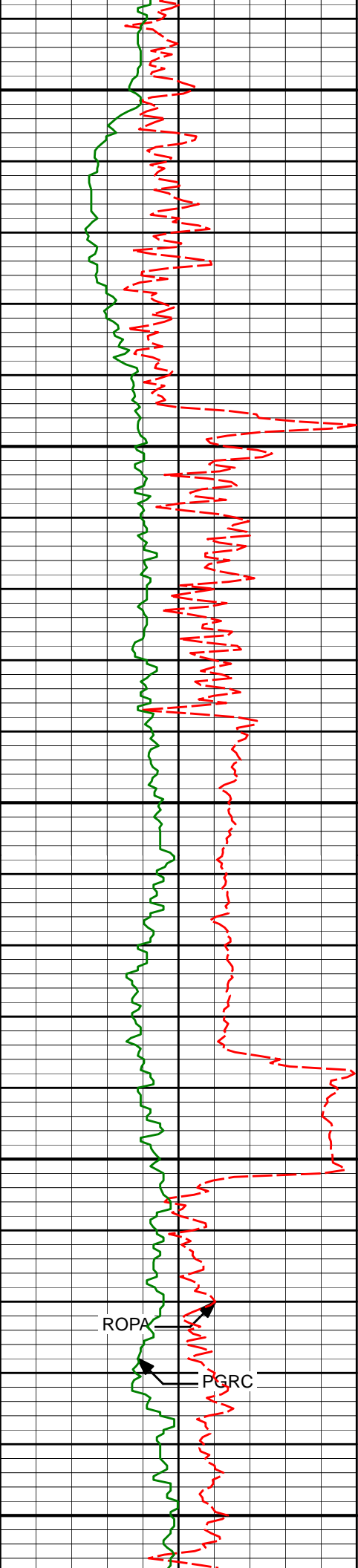
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RGRC

10100



10150

10153.00

90.06

0.20

7194.04

2807.25

10200

10250

10300

10350

ROPA

PGRC

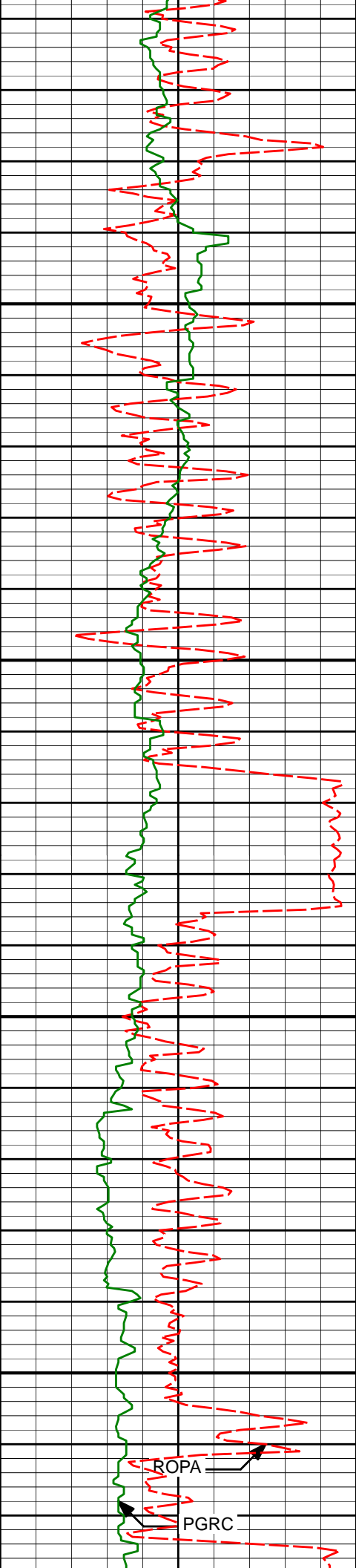
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359.90

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2987.25



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10450

10500

10550

10423.00

91.17

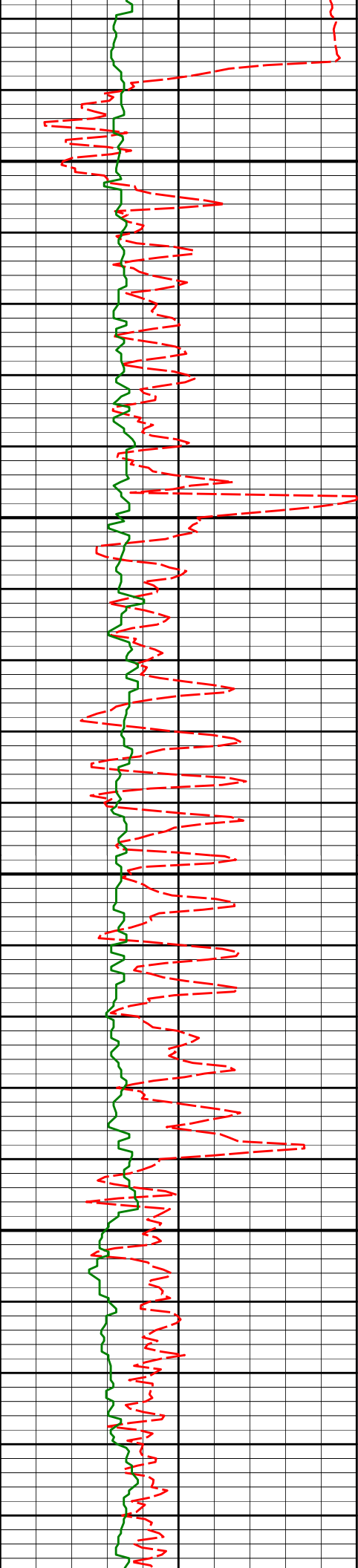
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7193.31

3077.24

ROPA

PGRC



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0.07

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3257.23

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10700

10750

10693.00

88.74

0.64

7195.60

3347.20

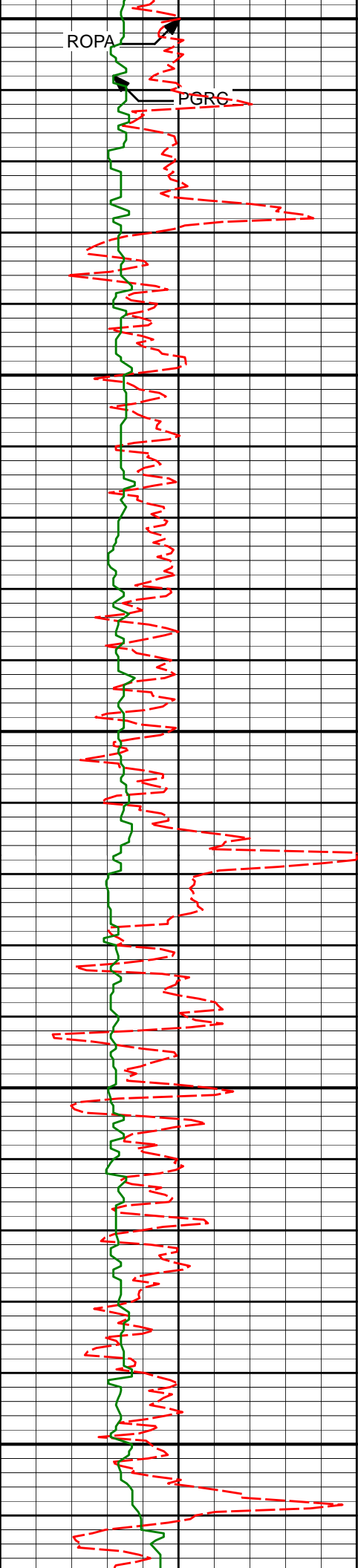
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0.36

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3437.18



ROPA

PGRC

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10900

10950

11000

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89.32

0.21

7198.49

3528.17

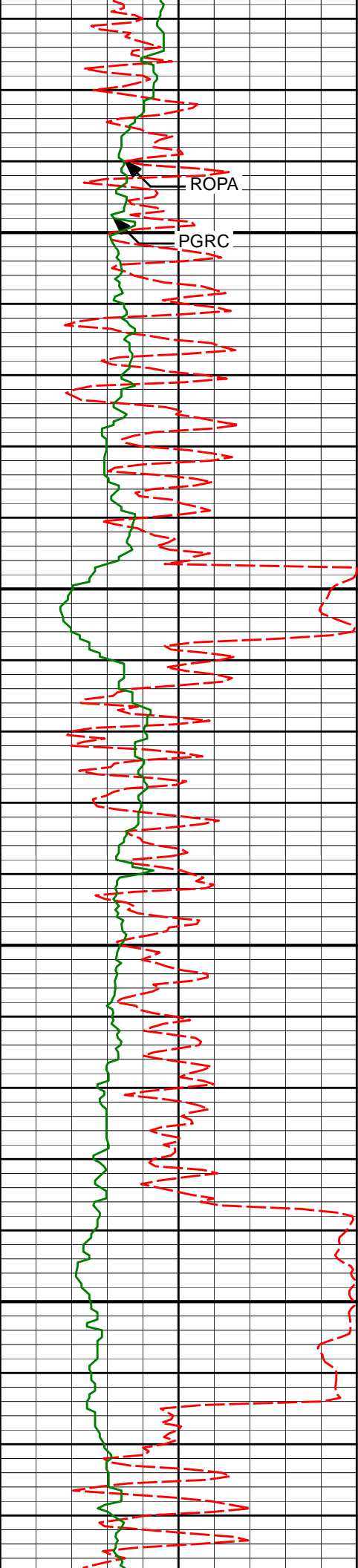
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357.76

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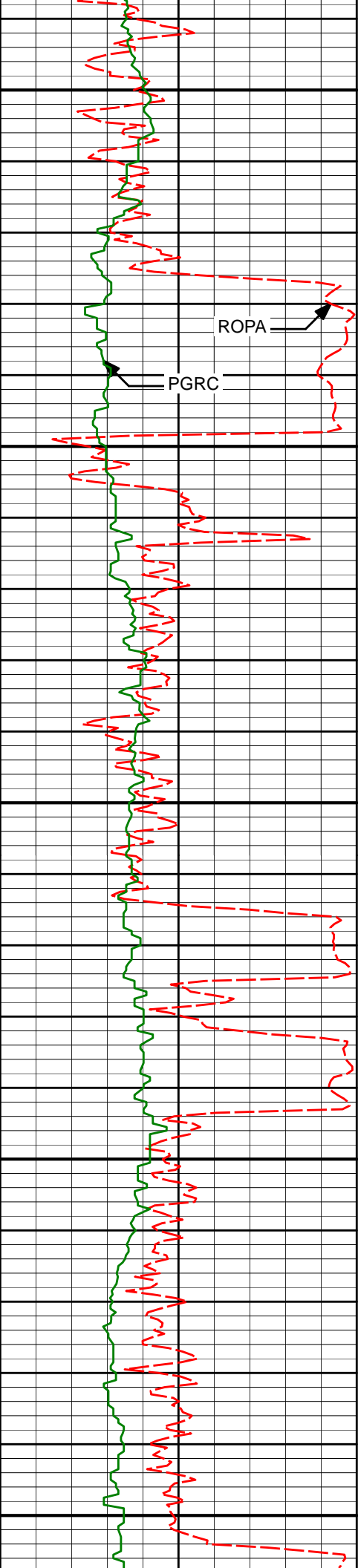
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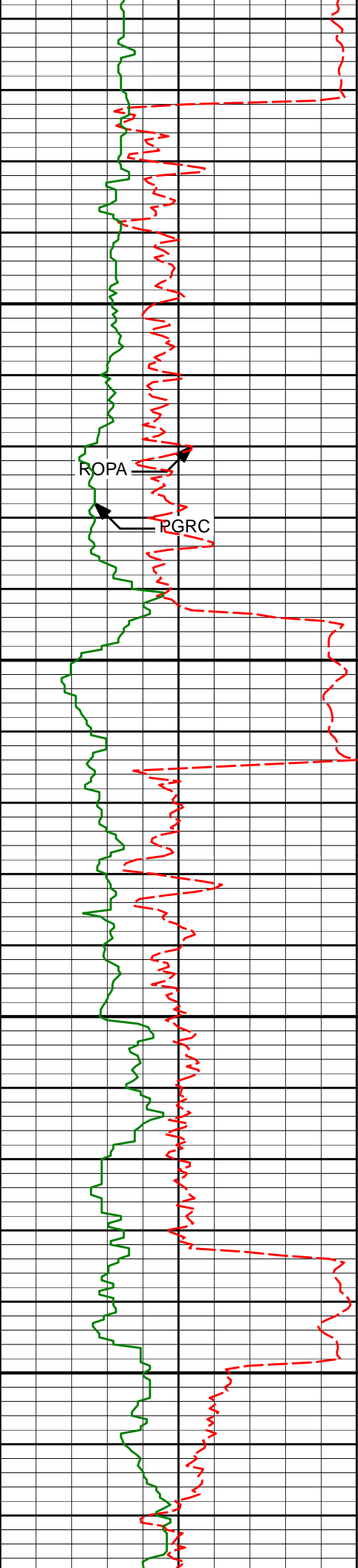
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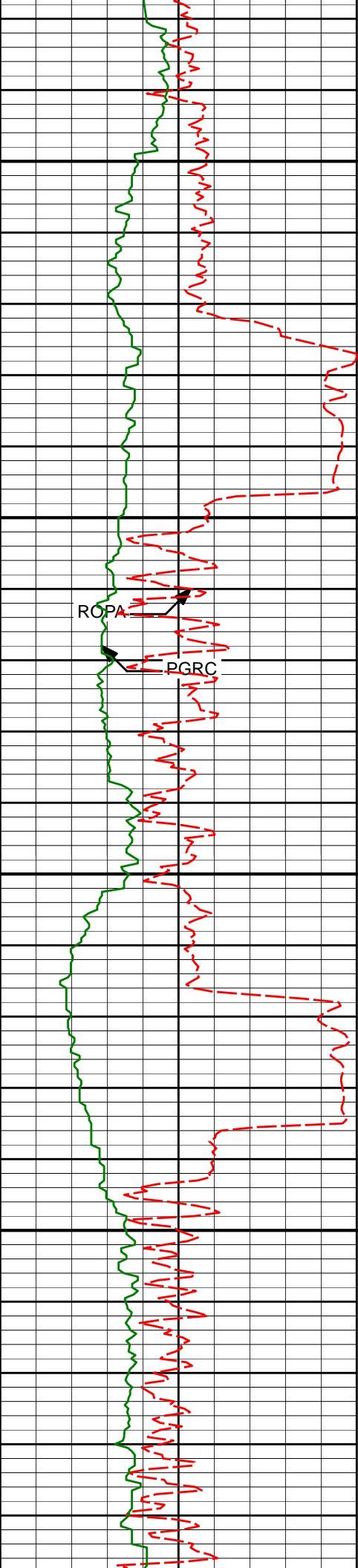
ROPA

RGRC

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11600

11650



11700

11750

11800

11850

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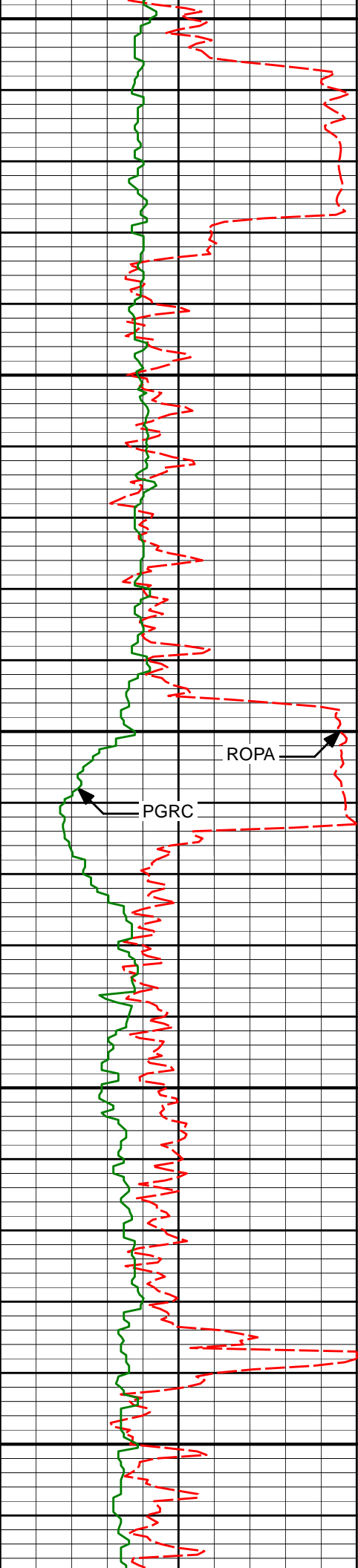
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PGRC



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7185.26

4607.64

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88.03

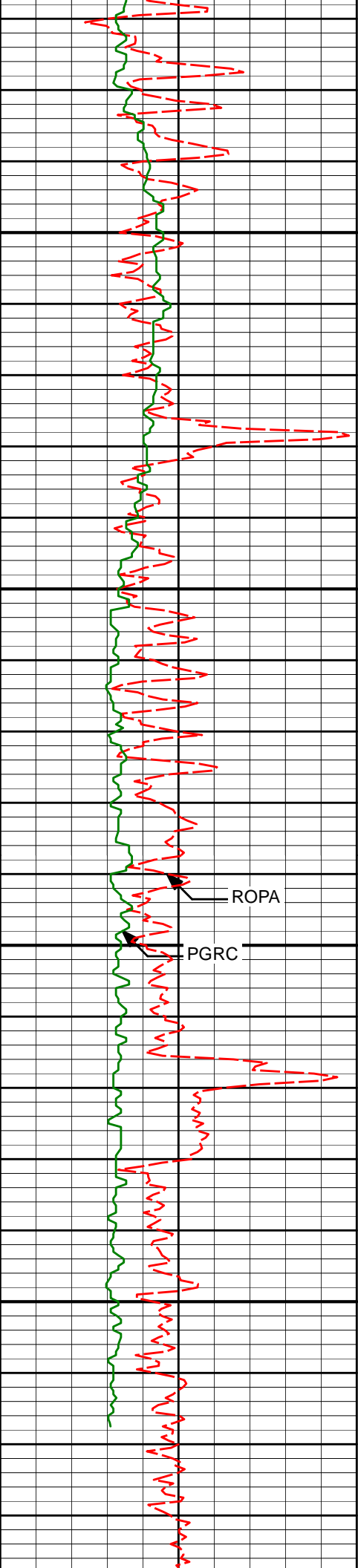
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ROPa

PGRC



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12200

12250

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12134.00

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2.32

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4787.41

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2.29

7192.79

4877.29

ROPA

PGRC

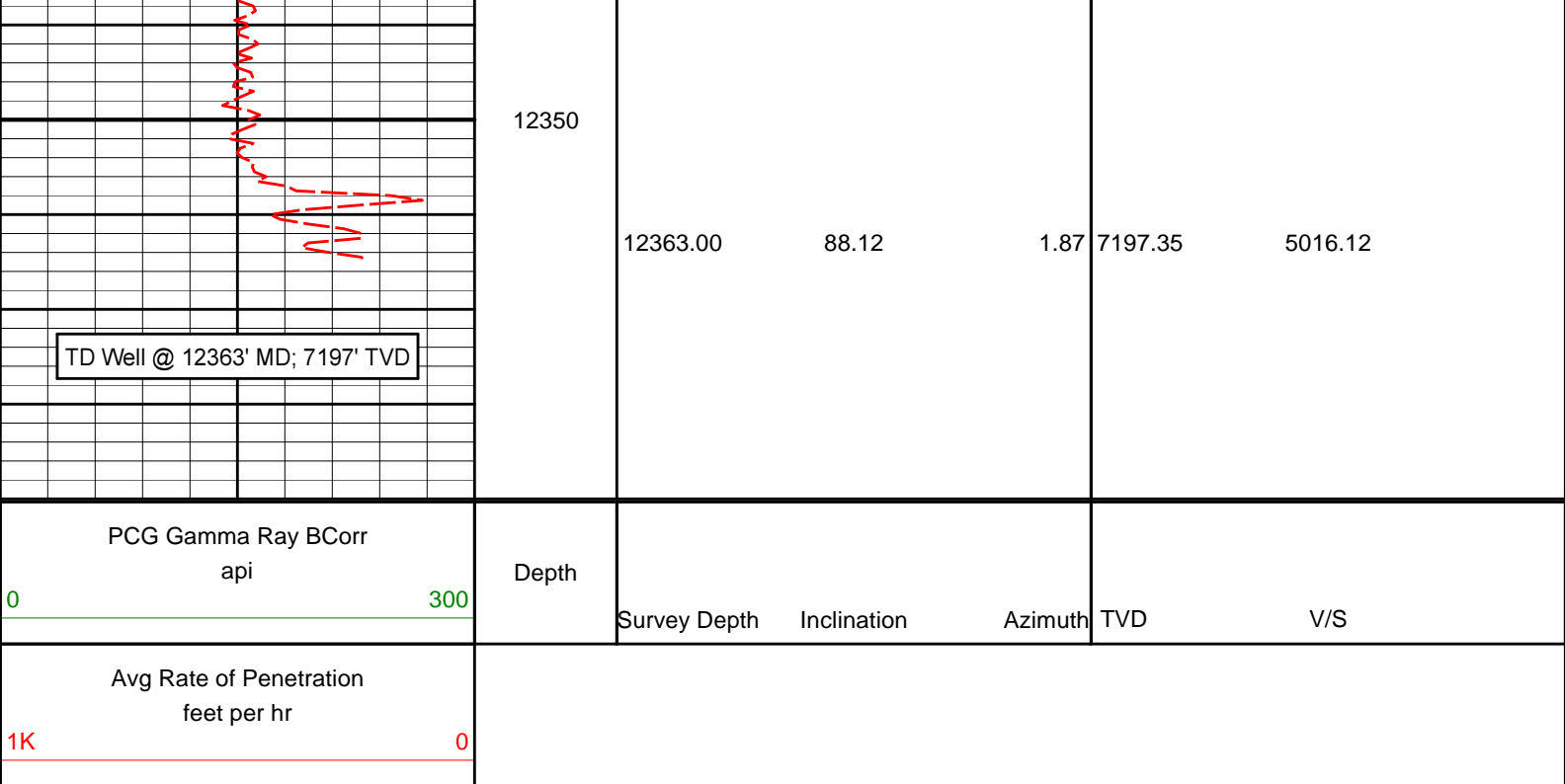
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88.12

1.87

7195.91

4972.17



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corporation
Pettinger 3N-18HZ
Wattenberg
Weld Colorado
USA
CA-XX-0900984322
Surveys are IFR corrected

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
1107.00	0.21	133.30	1106.96	3.24 S	5.28 W	-3.24	TIE-IN
1210.00	0.58	222.96	1209.96	3.75 S	5.50 W	-3.75	0.60
1305.00	0.72	222.48	1304.95	4.54 S	6.23 W	-4.54	0.15
1400.00	2.65	145.87	1399.91	6.80 S	5.40 W	-6.80	2.72
1495.00	3.99	125.48	1494.75	10.54 S	1.48 W	-10.54	1.86
1590.00	7.13	114.28	1589.30	14.88 S	6.59 E	-14.89	3.48
1684.00	10.28	108.59	1682.21	19.96 S	19.86 E	-19.97	3.47
1777.00	13.41	109.72	1773.21	26.24 S	37.89 E	-26.27	3.37
1871.00	16.04	106.96	1864.12	33.71 S	60.57 E	-33.75	2.89
1964.00	17.87	99.89	1953.08	39.91 S	86.92 E	-39.97	2.96
2058.00	18.99	94.03	2042.27	43.46 S	116.39 E	-43.54	2.30
2151.00	18.65	94.73	2130.30	45.75 S	146.30 E	-45.85	0.44
2338.00	18.11	94.22	2307.76	50.36 S	205.09 E	-50.50	0.30
2526.00	16.24	92.44	2487.37	53.63 S	260.50 E	-53.81	1.03
2619.00	15.77	98.12	2576.77	55.96 S	286.00 E	-56.16	1.76
2713.00	16.81	98.53	2666.99	59.78 S	312.09 E	-60.00	1.11
2806.00	15.46	96.75	2756.33	63.24 S	337.70 E	-63.47	1.55
2900.00	15.80	97.41	2846.85	66.36 S	362.83 E	-66.61	0.41
2993.00	14.49	96.24	2936.62	69.26 S	386.96 E	-69.53	1.45
3087.00	15.98	97.19	3027.31	72.15 S	411.48 E	-72.44	1.61

Pettinger 3N-18HZ

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
3180.00	18.40	99.96	3116.15	76.30 S	438.65 E	-76.60	2.75
3273.00	17.31	98.81	3204.67	80.95 S	466.78 E	-81.28	1.23
3363.00	16.22	98.08	3290.85	84.77 S	492.45 E	-85.12	1.23
3454.00	17.29	98.11	3377.98	88.47 S	518.42 E	-88.83	1.18
3544.00	17.94	99.98	3463.76	92.75 S	545.32 E	-93.14	0.96
3634.00	16.27	97.10	3549.78	96.72 S	571.48 E	-97.12	2.08
3724.00	17.00	95.91	3636.01	99.63 S	597.08 E	-100.05	0.90
3814.00	17.82	97.69	3721.89	102.83 S	623.81 E	-103.26	1.09
3904.00	15.91	97.25	3808.02	106.23 S	649.70 E	-106.68	2.13
3994.00	16.08	99.45	3894.53	109.83 S	674.23 E	-110.30	0.70
4084.00	14.99	103.78	3981.25	114.65 S	697.83 E	-115.14	1.77
4174.00	15.94	101.44	4067.99	119.87 S	721.25 E	-120.38	1.26
4264.00	18.80	103.45	4153.87	125.70 S	747.47 E	-126.22	3.25
4354.00	18.09	102.19	4239.25	132.02 S	775.24 E	-132.56	0.90
4444.00	19.78	102.60	4324.38	138.29 S	803.76 E	-138.86	1.88
4624.00	17.75	97.72	4494.81	148.63 S	860.68 E	-149.23	1.42
4714.00	16.68	94.71	4580.78	151.53 S	887.15 E	-152.15	1.55
4894.00	16.71	97.15	4753.19	156.87 S	938.57 E	-157.53	0.39
4984.00	16.50	100.82	4839.44	160.88 S	963.96 E	-161.56	1.19
5074.00	18.44	102.94	4925.29	166.47 S	990.39 E	-167.16	2.27
5164.00	17.07	102.17	5011.00	172.44 S	1017.18 E	-173.15	1.54
5254.00	16.13	99.96	5097.25	177.39 S	1042.41 E	-178.12	1.26
5344.00	15.87	99.04	5183.76	181.48 S	1066.87 E	-182.23	0.40
5434.00	16.93	98.73	5270.10	185.41 S	1091.98 E	-186.17	1.18
5524.00	16.81	97.94	5356.23	189.19 S	1117.82 E	-189.97	0.29
5614.00	16.53	101.62	5442.45	193.57 S	1143.25 E	-194.37	1.21
5704.00	16.20	102.49	5528.80	198.86 S	1168.05 E	-199.68	0.46
5794.00	12.97	96.77	5615.89	202.77 S	1190.34 E	-203.60	3.93
5884.00	11.06	103.52	5703.92	205.98 S	1208.77 E	-206.83	2.63
5974.00	8.30	107.81	5792.63	209.99 S	1223.35 E	-210.84	3.17
6065.00	6.12	103.25	5882.91	213.11 S	1234.32 E	-213.97	2.47
6155.00	3.97	96.61	5972.56	214.57 S	1242.09 E	-215.43	2.47
6335.00	2.48	102.59	6152.27	216.13 S	1252.08 E	-217.01	0.85
6425.00	0.64	145.49	6242.23	216.97 S	1254.27 E	-217.85	2.29
6515.00	0.41	127.77	6332.23	217.58 S	1254.81 E	-218.46	0.31
6605.00	0.25	146.70	6422.23	217.94 S	1255.17 E	-218.82	0.21
6695.00	0.41	238.82	6512.23	218.27 S	1255.00 E	-219.15	0.54
6757.00	0.61	264.44	6574.22	218.42 S	1254.48 E	-219.30	0.48
6785.00	0.49	253.75	6602.22	218.47 S	1254.22 E	-219.35	0.56
6830.00	3.13	353.53	6647.20	217.30 S	1253.90 E	-218.18	7.22
6875.00	7.73	358.45	6691.99	213.05 S	1253.68 E	-213.93	10.27
6920.00	12.80	357.85	6736.25	205.04 S	1253.41 E	-205.92	11.27
6965.00	17.68	357.77	6779.65	193.23 S	1252.95 E	-194.10	10.84
7010.00	21.33	357.90	6822.07	178.21 S	1252.39 E	-179.09	8.11
7055.00	25.62	2.19	6863.33	160.30 S	1252.46 E	-161.18	10.26
7100.00	30.28	1.81	6903.07	139.23 S	1253.19 E	-140.11	10.36
7145.00	34.05	2.10	6941.16	115.29 S	1254.01 E	-116.17	8.38
7190.00	38.33	1.91	6977.47	88.74 S	1254.94 E	-89.62	9.51
7235.00	43.23	0.71	7011.54	59.37 S	1255.59 E	-60.25	11.03
7280.00	48.32	1.00	7042.91	27.14 S	1256.08 E	-28.01	11.32
7325.00	52.41	1.25	7071.61	7.51 N	1256.76 E	6.63	9.10
7370.00	56.24	359.74	7097.85	44.05 N	1257.06 E	43.17	8.94
7415.00	60.71	359.12	7121.37	82.40 N	1256.68 E	81.52	10.00
7460.00	67.00	358.19	7141.19	122.76 N	1255.72 E	121.88	14.10
7505.00	71.40	357.90	7157.17	164.79 N	1254.29 E	163.92	9.80

Pettinger 3N-18HZ

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
7550.00	75.17	358.54	7170.11	207.86 N	1252.95 E	206.99	8.49
7595.00	79.05	359.42	7180.15	251.71 N	1252.17 E	250.84	8.83
7640.00	82.00	359.31	7187.55	296.09 N	1251.68 E	295.22	6.56
7685.00	84.07	358.65	7193.01	340.75 N	1250.88 E	339.87	4.82
7705.00	86.70	358.37	7194.62	360.68 N	1250.37 E	359.80	13.22
7768.00	89.54	358.28	7196.69	423.61 N	1248.52 E	422.74	4.51
7813.00	89.63	357.90	7197.01	468.58 N	1247.02 E	467.71	0.87
7903.00	90.52	358.39	7196.89	558.53 N	1244.11 E	557.66	1.13
7993.00	90.83	0.22	7195.83	648.52 N	1243.02 E	647.65	2.06
8083.00	88.70	0.04	7196.20	738.51 N	1243.22 E	737.64	2.38
8173.00	89.04	359.88	7197.98	828.49 N	1243.16 E	827.62	0.42
8263.00	89.72	359.92	7198.95	918.49 N	1243.00 E	917.62	0.76
8353.00	89.88	0.98	7199.27	1008.48 N	1243.71 E	1007.61	1.19
8443.00	91.20	1.43	7198.42	1098.46 N	1245.60 E	1097.59	1.55
8533.00	91.05	1.18	7196.65	1188.42 N	1247.65 E	1187.54	0.32
8623.00	89.11	359.94	7196.52	1278.41 N	1248.53 E	1277.53	2.56
8713.00	89.20	359.31	7197.85	1368.39 N	1247.94 E	1367.52	0.71
8803.00	89.08	357.93	7199.20	1458.35 N	1245.78 E	1457.48	1.54
8893.00	90.65	358.66	7199.42	1548.31 N	1243.10 E	1547.44	1.92
8983.00	90.93	0.39	7198.17	1638.30 N	1242.35 E	1637.43	1.95
9163.00	90.15	0.43	7196.48	1818.28 N	1243.64 E	1817.41	0.43
9253.00	90.89	359.87	7195.66	1908.28 N	1243.88 E	1907.41	1.03
9343.00	89.35	0.14	7195.47	1998.27 N	1243.88 E	1997.40	1.74
9433.00	89.20	359.39	7196.61	2088.27 N	1243.51 E	2087.40	0.85
9523.00	89.14	0.08	7197.92	2178.25 N	1243.10 E	2177.39	0.77
9613.00	88.95	359.49	7199.42	2268.24 N	1242.76 E	2267.37	0.69
9703.00	89.85	1.34	7200.36	2358.23 N	1243.41 E	2357.36	2.29
9883.00	92.10	359.95	7197.29	2538.18 N	1245.44 E	2537.30	1.47
9973.00	91.42	359.57	7194.53	2628.13 N	1245.06 E	2627.26	0.87
10063.00	89.57	359.56	7193.75	2718.12 N	1244.38 E	2717.25	2.06
10153.00	90.06	0.20	7194.04	2808.12 N	1244.19 E	2807.25	0.90
10333.00	89.88	359.90	7194.14	2988.12 N	1244.35 E	2987.25	0.19
10423.00	91.17	359.66	7193.31	3078.11 N	1244.00 E	3077.24	1.46
10603.00	88.67	0.07	7193.56	3258.10 N	1243.58 E	3257.23	1.41
10693.00	88.74	0.64	7195.60	3348.07 N	1244.13 E	3347.20	0.64
10783.00	89.14	0.36	7197.26	3438.05 N	1244.92 E	3437.18	0.54
10874.00	89.32	0.21	7198.49	3529.04 N	1245.37 E	3528.17	0.26
10964.00	89.41	359.42	7199.48	3619.04 N	1245.08 E	3618.17	0.88
11054.00	89.48	358.66	7200.36	3709.02 N	1243.57 E	3708.15	0.85
11144.00	89.57	357.76	7201.10	3798.97 N	1240.76 E	3798.10	1.00
11234.00	90.31	358.12	7201.20	3888.91 N	1237.53 E	3888.05	0.91
11324.00	90.89	359.73	7200.25	3978.89 N	1235.84 E	3978.02	1.90
11414.00	90.15	359.37	7199.44	4068.88 N	1235.13 E	4068.02	0.91
11504.00	89.88	359.69	7199.41	4158.88 N	1234.39 E	4158.01	0.47
11684.00	93.27	0.06	7194.47	4338.78 N	1234.00 E	4337.92	1.89
11774.00	92.16	0.54	7190.20	4428.68 N	1234.47 E	4427.82	1.34
11864.00	91.88	2.05	7187.03	4518.60 N	1236.50 E	4517.73	1.71
11954.00	90.37	2.42	7185.26	4608.51 N	1240.01 E	4607.64	1.73
12044.00	88.03	2.32	7186.52	4698.42 N	1243.73 E	4697.55	2.60
12134.00	87.93	2.32	7189.69	4788.29 N	1247.38 E	4787.41	0.11
12224.00	88.12	2.29	7192.79	4878.16 N	1250.99 E	4877.29	0.21
12319.00	88.12	1.87	7195.91	4973.05 N	1254.44 E	4972.17	0.44
12363.00	88.12	1.87	7197.35	5017.00 N	1255.87 E	5016.12	0.00

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 359.96 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.49 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 12363.00 FEET
IS 5171.80 FEET ALONG 14.05 DEGREES (TRUE)**

ALL DIRECTIONAL SURVEYS TIED ON TO THE LAST GYRO SURVEY @ 1107' MD

FINAL SURVEY IS A PROJECTION TO THE BIT