



PCG Pressure Case Gamma PCD Pressure Case Directional

Country	: USA
Field	: Wattenberg
Location	: Lat: 40° 25' 11.86" North Long: 104° 21' 19.30" West
Well	: Wells Ranch AF08-69-1HN
Company	: Noble Energy
Rig	: H&P 343
LOCATION	Company : Noble Energy
	Rig : H&P 343
Other Services Directional Drilling	Well : Wells Ranch AF08-69-1HN
	Field : Wattenberg
Latitude : 40° 25' 11.86" North Longitude : 104° 21' 19.30" West	Country : USA
	API Number : 05-123-34791
UTM Easting = 3,318,691.07 ft UTM Northing = 1,397,889.08 ft	
Permanent Datum : Ground Level	Elevation : 4664.00 ft
Log Measured From : Drill Floor	24.00 ft Above Permanent Datum
Drilling Measured From : Drill Floor	TVD LOG
Depth Logged : 584.00 ft To 6,392.30 ft	Unit No. : 11610115
Date Logged : 04-Apr-12 To 13-Apr-12	Job No. : CA-XX-0009394995
Total Depth MD : 15,725.00 ft	TVD : 6,392.30 ft
Spud Date : 04-Apr-12	Plot Type : Final
	Plot Date : 13-Apr-12
Run No. : 2	Size : 8.750 in
Borehole Record (TVD)	From : 584.00 ft To : 6,367.92 ft
Run No.	Size
Casing Record (TVD)	From
Size	Weight
From	From
To	To
9.625 in	36.00 lbpf
7.000 in	26.00 lbpf
	SURFACE
	SURFACE
	584.00 ft
	6,367.14 ft

WELL INFORMATION

MWD Run Number	100
Date run completed	07-Apr-12
Rig Bit Number	2
Bit Size (in)	8.750
Tool Nominal OD (in)	6.830
Log Start Depth (TVD, ft)	584.00
Log End Depth (TVD, ft)	6,367.92
Drill or Wipe	Drill
Drill/Wipe Start Date and Time	05-Apr-12 17:45
Drill/Wipe End Date and Time	07-Apr-12 12:30
Min Inc (deg) @ Depth (TVD, ft)	.29 @ 5,131.73
Max Inc (deg) @ Depth (TVD, ft)	82.79 @ 6,362.36
Bit TFA(in2) / Bit Type	.75 / PDC
Flow Rate (gpm)	586.00
Max AV (fpm) / CV (fpm) @ MWD	376.0 / NA
Fluid Type	Fresh Water Gel
Density (ppg) / Viscosity (spqt)	8.80 / 27.00
Filtrate CL (ppm)	2,800.00
pH / Fluid Loss (mptm)	9.70 / NA
PV (cP) / YP (Ihf2)	1 / 4.00
% Solids / % Sand	3.70 / 0.40
% Oil / Oil:Water Ratio	0 / 0:95.5
Rm @ Measured Temp (degF)	NA @ NA
Rmf @ Measured Temp (degF)	NA @ NA
Rmc @ Measured Temp (degF)	NA @ NA

Max Tool Temp (degF) / Source	163.20 / PCM				
Rm @ Max Tool Temp (degF)	NA @ NA				
Lead MWD Engineer	Gary Eifert				
Customer Representative	Matt Settles				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.76				
Sub Serial Number	11341347				
Insert Serial Number	11400855				
Date and Time Initialized	23-Mar-12 20:04				
Date and Time Read	07-Apr-12 20:26				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	56.00				
Software Version	6.21				
Sub Serial Number	11341347				
Sonde Serial Number	11833220				
Sensor ID Number	N/A				
Toolface Offset (deg)	315.00				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	49.12				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11341347				
Insert/Sonde Serial Number	11292594				

REMARKS

1. All depths are true vertical 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. Critical annular 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 7.3.40

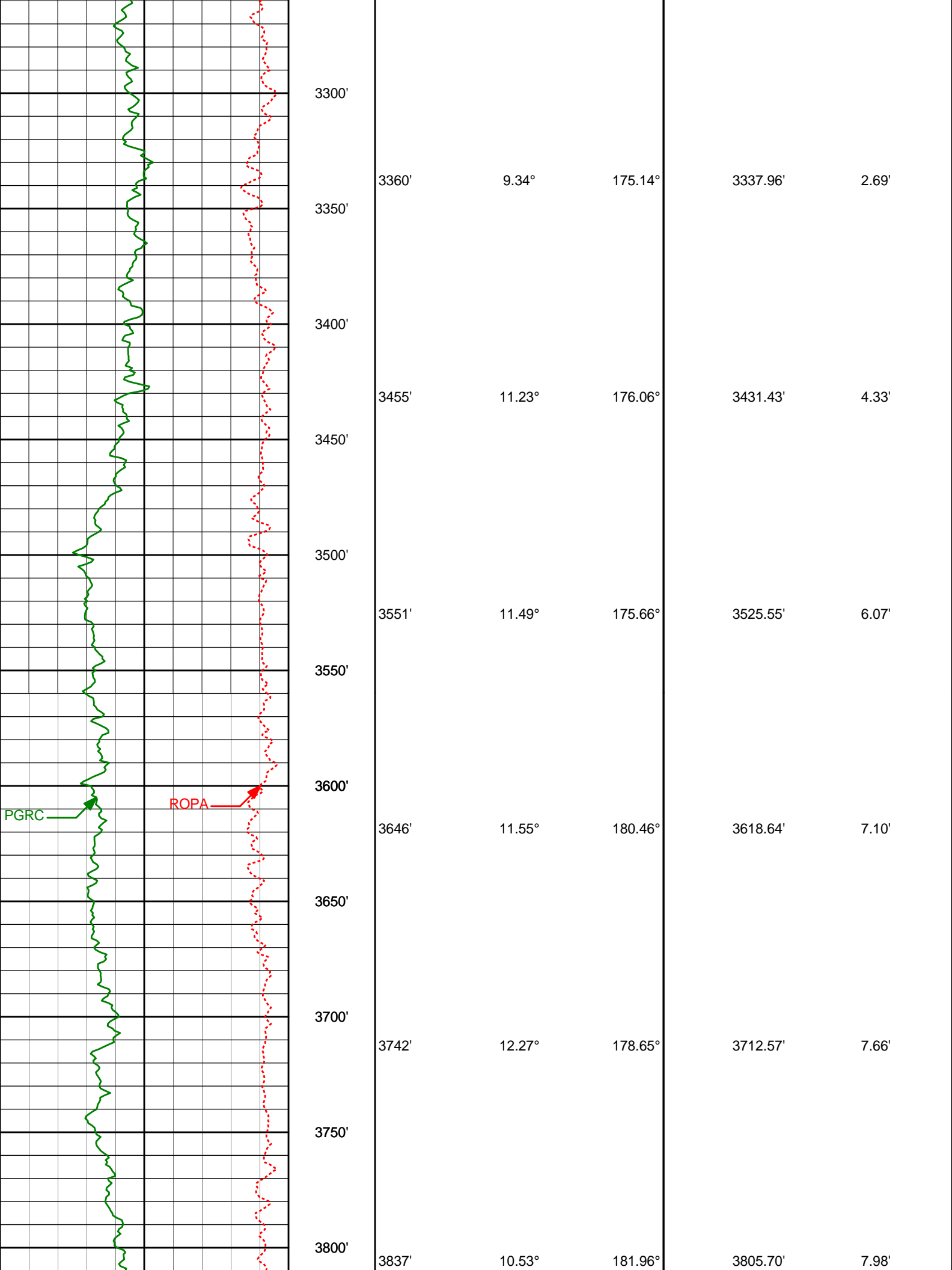
WARRANTY

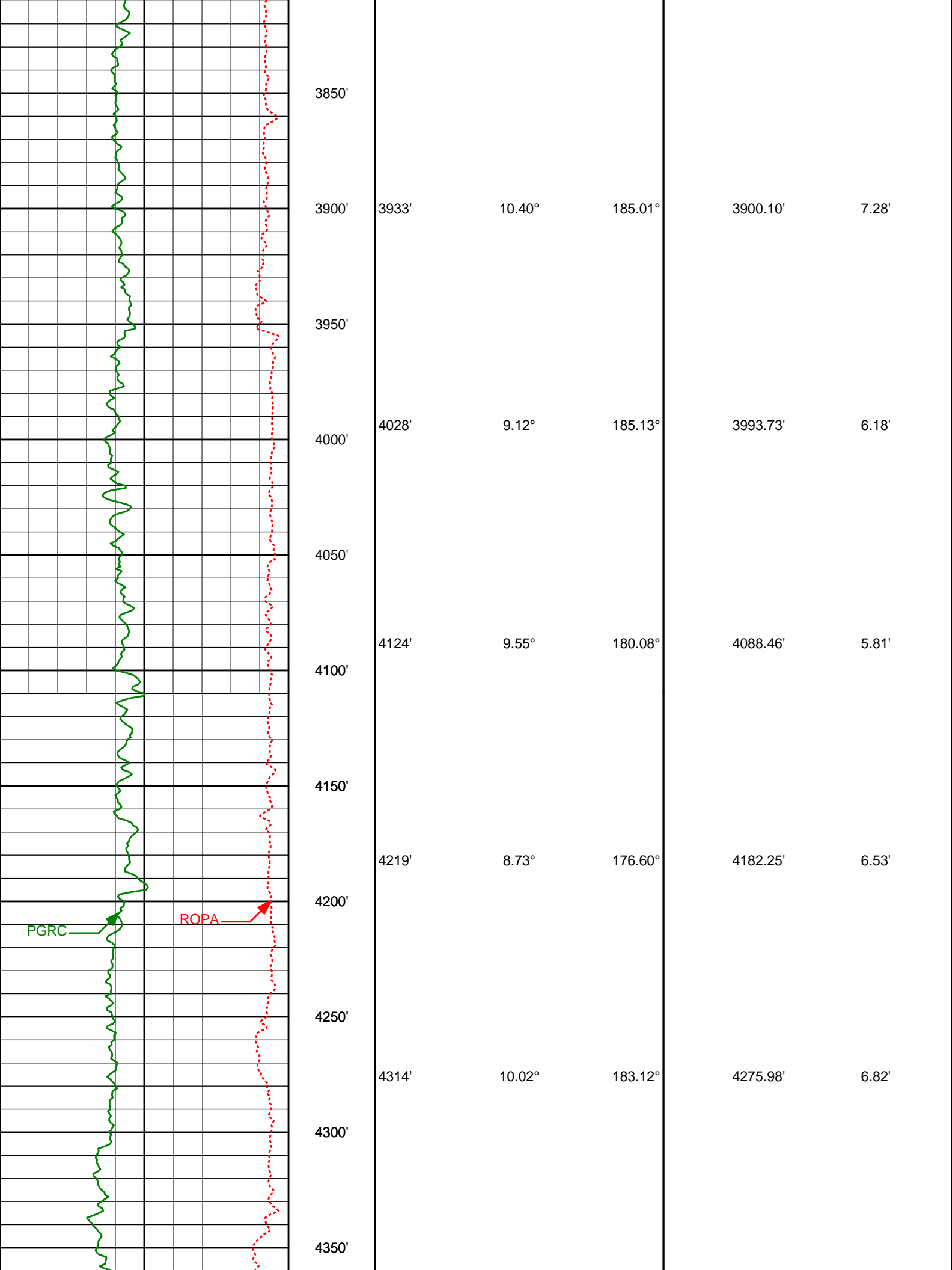
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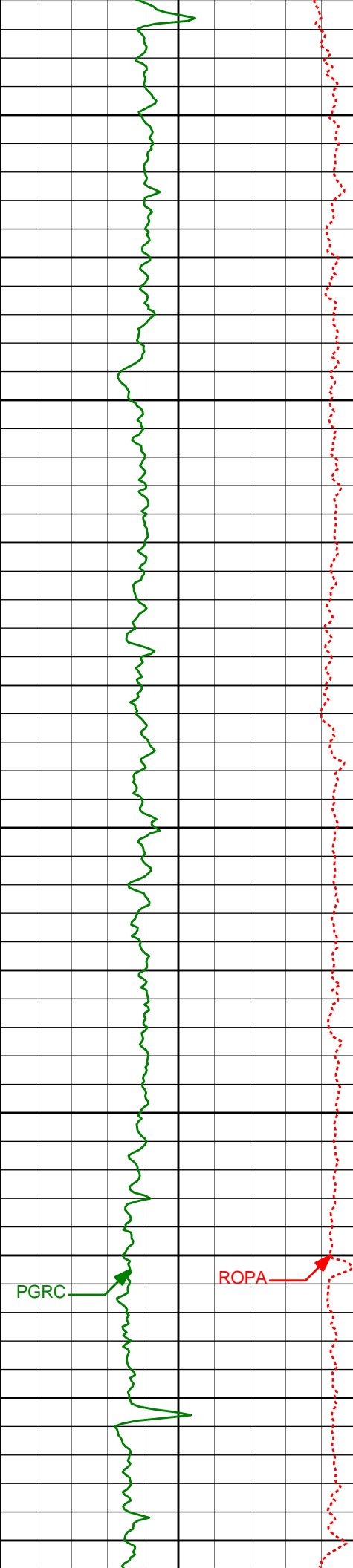
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TVD Main Log 1:600

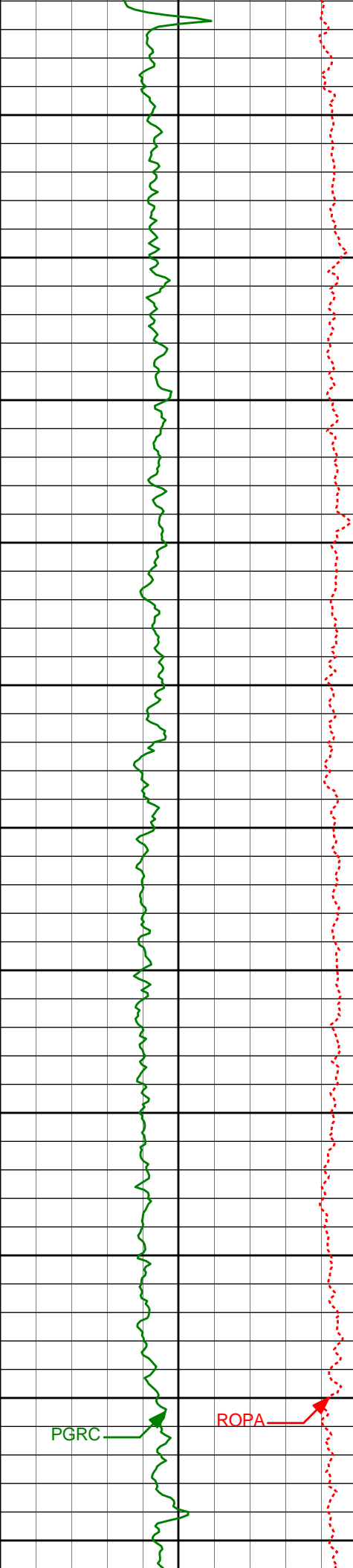
Average Rate of Penetration ROPA						
1K 0						
feet per hr						
Gamma Ray PGRC	True Vertical Depth (ft) 1:600	Depth	Inc	Azi.	TVD	V.S.
0 200						
api						
3000						
	3050'	3074'	9.54°	181.61°	3055.86'	2.52'
	3100'					
	3150'	3169'	9.71°	182.63°	3149.52'	2.26'
	3200'					
	3250'	3265'	9.25°	181.77°	3244.21'	1.97'







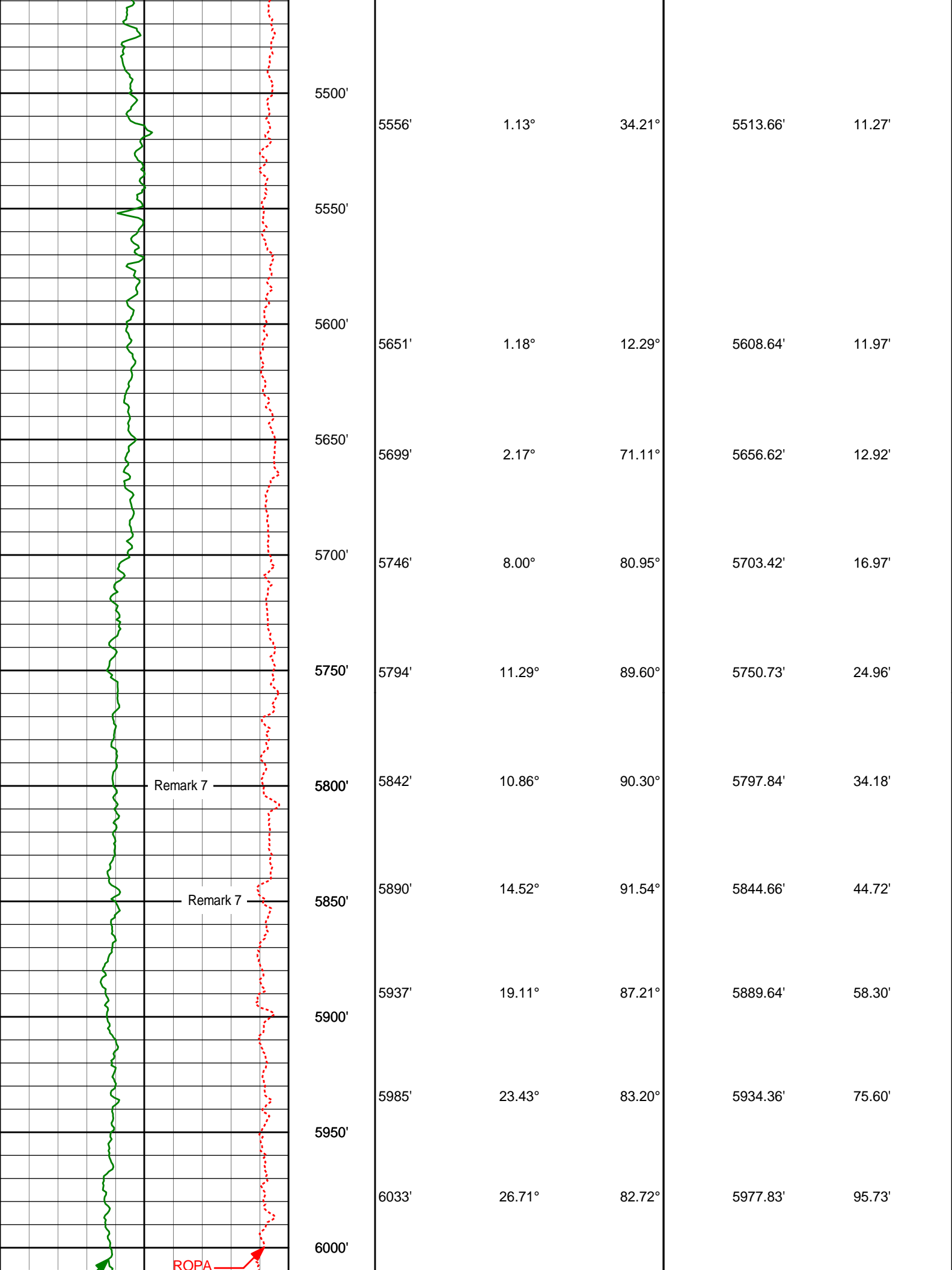
4410'	9.68°	183.70°	4370.56'	6.17'
4400'				
4450'				
4506'	8.91°	182.52°	4465.30'	5.64'
4500'				
4550'				
4601'	6.38°	184.47°	4559.45'	5.16'
4600'				
4650'				
4696'	4.58°	193.86°	4654.01'	4.02'
4700'				
4750'				
4792'	3.15°	162.99°	4749.80'	4.00'
4800'				
4850'				
4887'	0.86°	125.54°	4844.74'	5.40'
4900'				



4950'	4983'	0.64°	154.76°	4940.73'	6.23'
5000'					
5050'	5079'	0.57°	113.75°	5036.73'	6.91'
5100'					
5150'	5174'	0.29°	100.82°	5131.73'	7.59'
5200'					
5250'	5269'	1.05°	145.51°	5226.72'	8.33'
5300'					
5350'	5365'	1.75°	137.65°	5322.69'	9.86'
5400'					
5450'	5460'	1.20°	358.02°	5417.68'	10.80'

PGRC

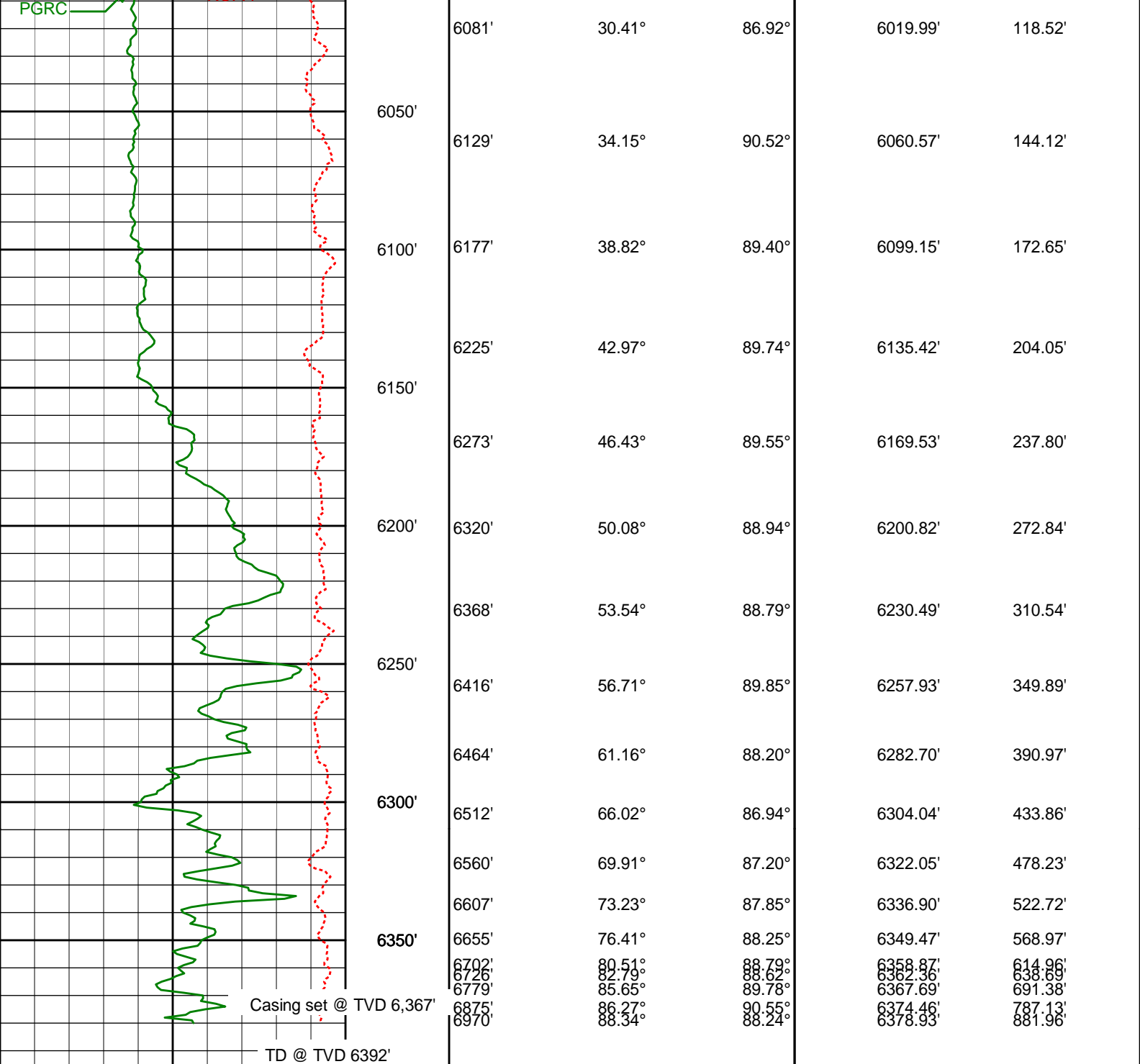
ROPA



Remark 7

Remark 7

ROPA



6081'	30.41°	86.92°	6019.99'	118.52'
6050'				
6129'	34.15°	90.52°	6060.57'	144.12'
6100'				
6177'	38.82°	89.40°	6099.15'	172.65'
6225'	42.97°	89.74°	6135.42'	204.05'
6150'				
6273'	46.43°	89.55°	6169.53'	237.80'
6200'				
6320'	50.08°	88.94°	6200.82'	272.84'
6368'	53.54°	88.79°	6230.49'	310.54'
6250'				
6416'	56.71°	89.85°	6257.93'	349.89'
6464'	61.16°	88.20°	6282.70'	390.97'
6300'				
6512'	66.02°	86.94°	6304.04'	433.86'
6560'	69.91°	87.20°	6322.05'	478.23'
6607'	73.23°	87.85°	6336.90'	522.72'
6350'				
6655'	76.41°	88.25°	6349.47'	568.97'
6702'	80.51°	88.79°	6358.87'	614.96'
6726'	82.79°	88.62°	6382.36'	638.69'
6779'	85.65°	89.78°	6367.69'	691.38'
6875'	86.27°	90.55°	6374.46'	787.13'
6970'	88.34°	88.24°	6378.93'	881.96'

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

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TVD Main Log 1:600

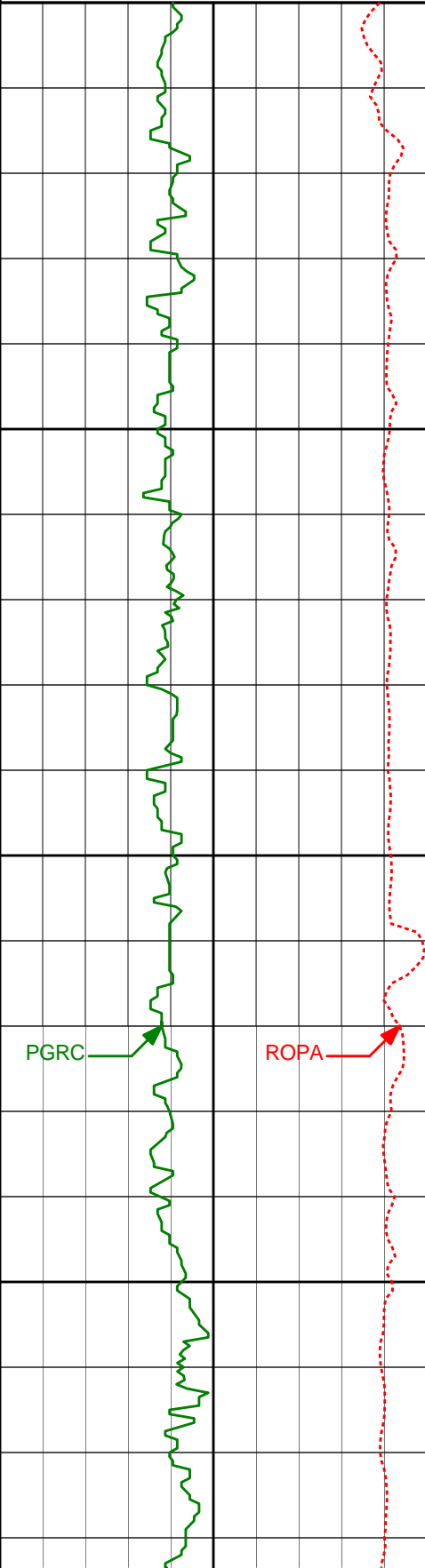
Average Rate of Penetration
ROPA
1K 0
feet per hr

Gamma Ray
PGRC
0 200
api

True Vertical
Depth (ft)
1:240

Depth Inc Azi.

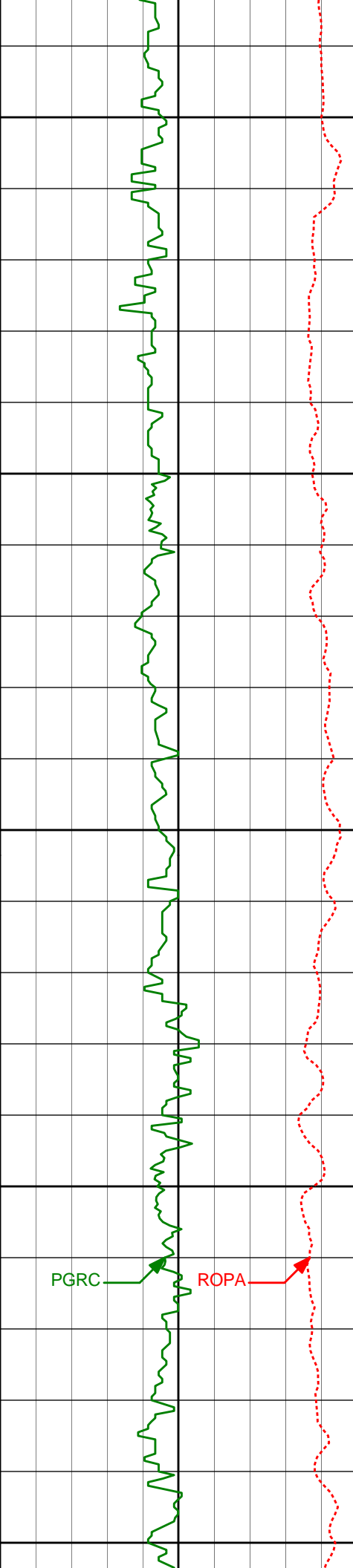
TVD V.S.



True Vertical Depth (ft)	Depth	Inc	Azi.	TVD	V.S.
3000					
3050	3074'	9.54°	181.61°	3055.86'	2.52'
3100					
3150	3169'	9.71°	182.63°	3149.52'	2.26'

PGRC

ROPA



3200'

3265'

9.25°

181.77°

3244.21'

1.97'

3250'

3300'

3360'

9.34°

175.14°

3337.96'

2.69'

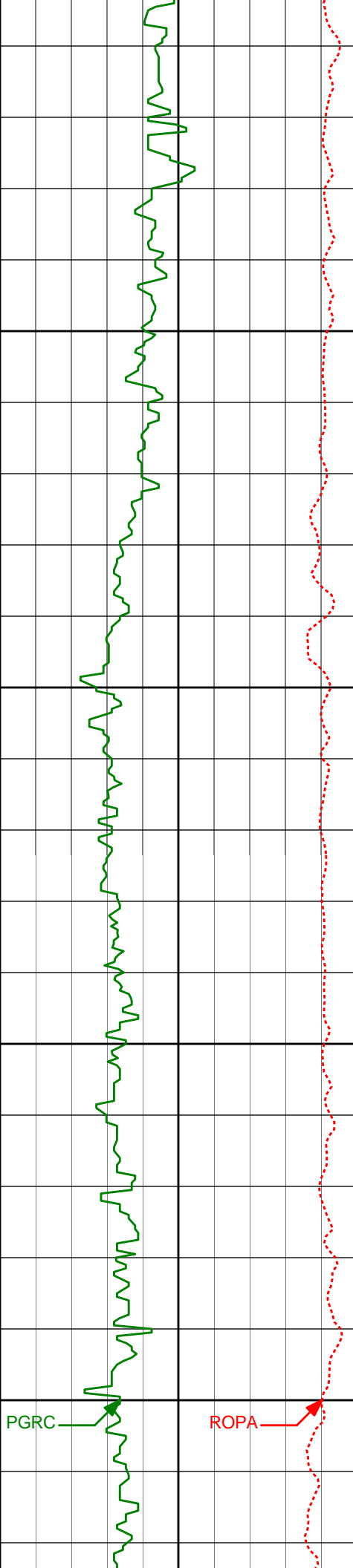
3350'

3400'

PGRC

ROPA





3455' 11.23° 176.06° 3431.43' 4.33'

3450'

3500'

3551' 11.49° 175.66° 3525.55' 6.07'

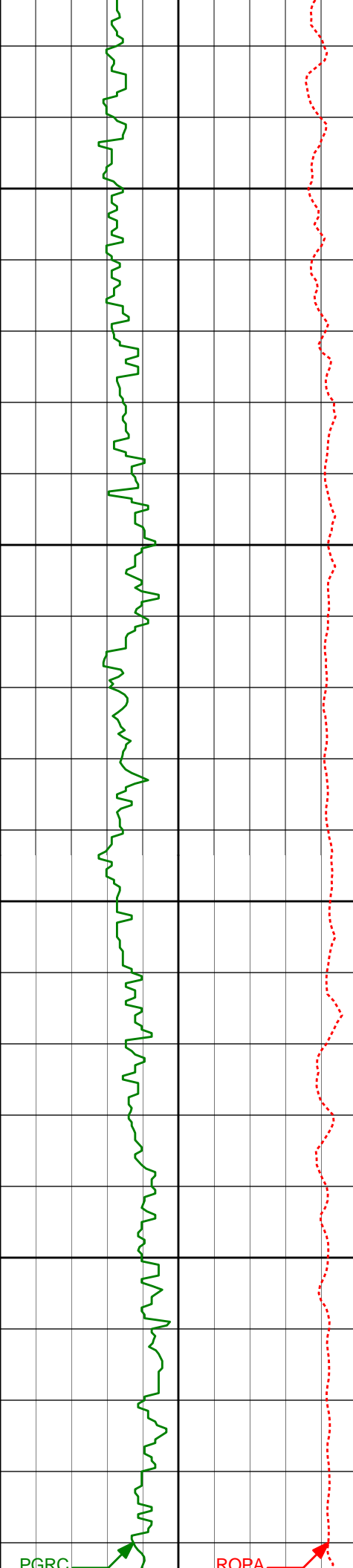
3550'

3600'

PGRC

ROPA

3646' 11.55° 180.46° 3618.64' 7.10'



3650'

3700'

3750'

3800'

3742'

12.27°

178.65°

3712.57'

7.66'

3837'

10.53°

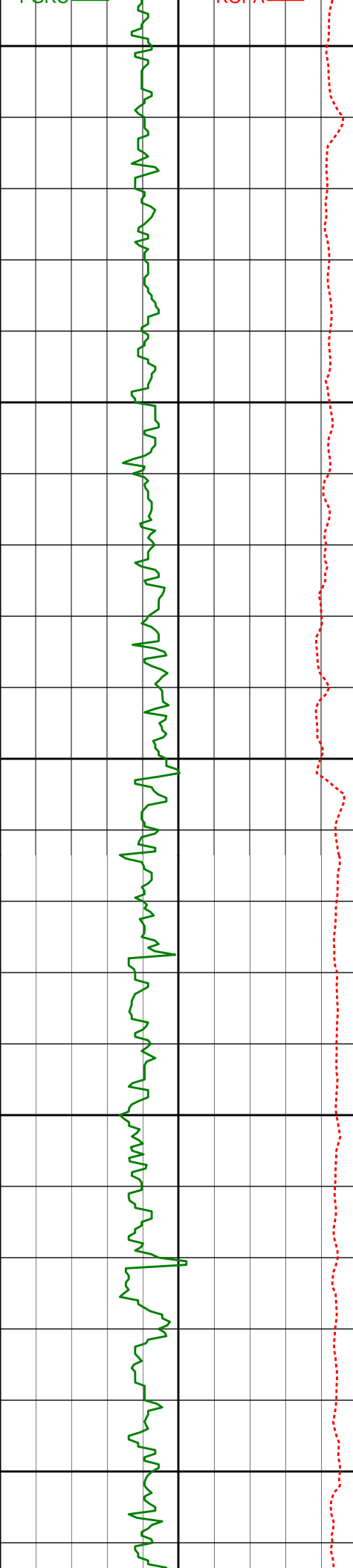
181.96°

3805.70'

7.98'

PGRC

ROPA



3850'

3900'

3950'

4000'

4050'

3933'

10.40°

185.01°

3900.10'

7.28'

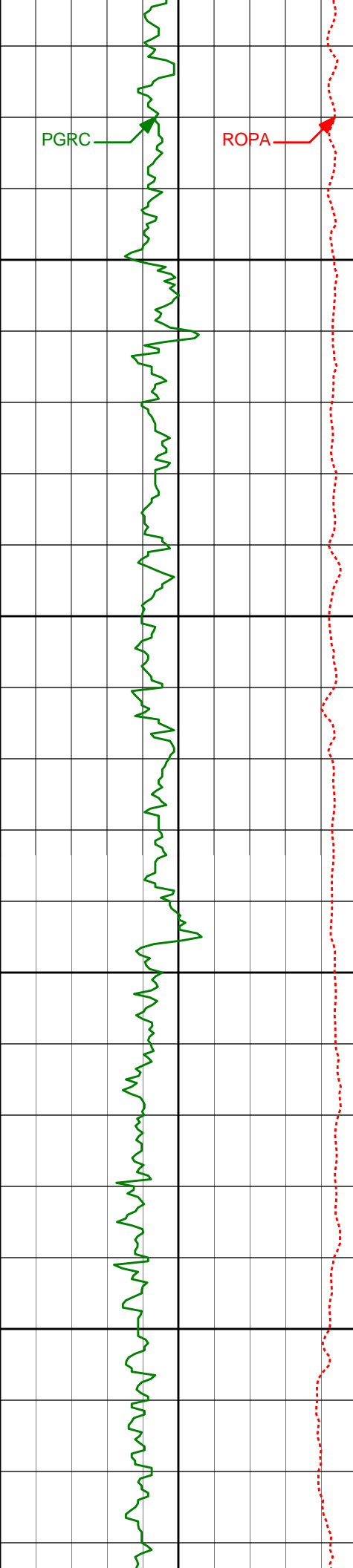
4028'

9.12°

185.13°

3993.73'

6.18'



PGRC

ROPA

4124' 9.55° 180.08° 4088.46' 5.81'

4100'

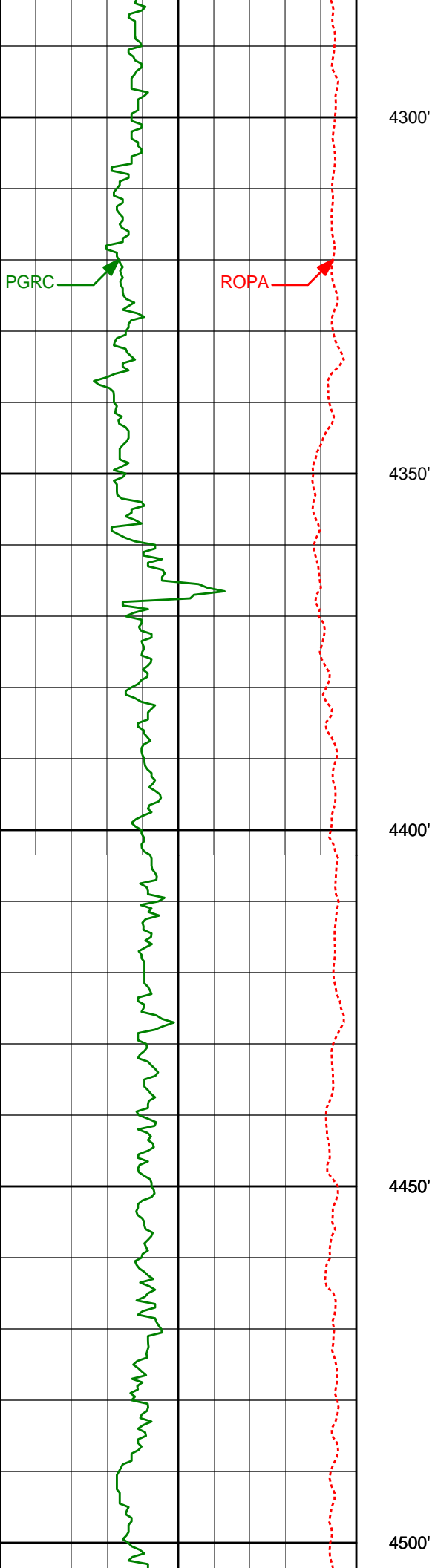
4150'

4219' 8.73° 176.60° 4182.25' 6.53'

4200'

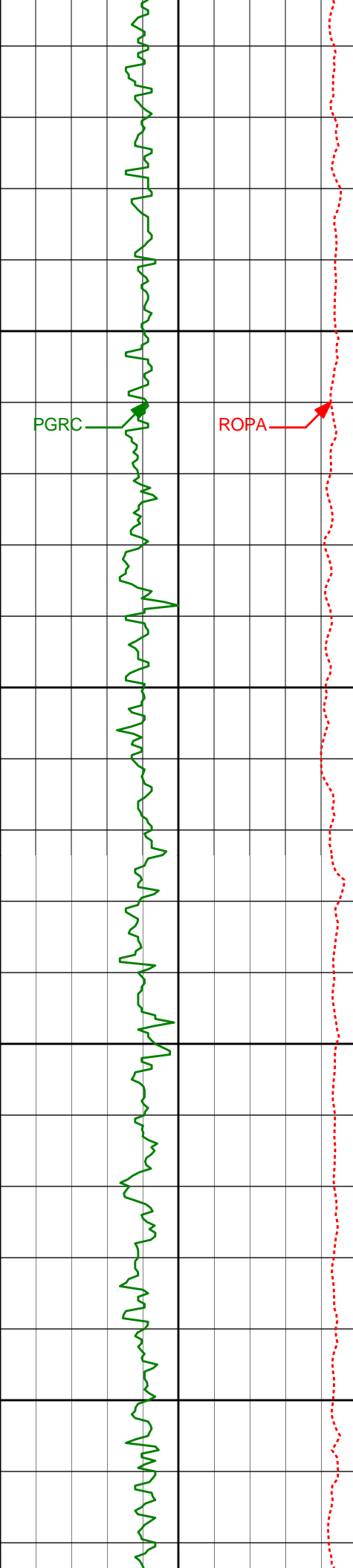
4250'

4314' 10.02° 183.12° 4275.98' 6.82'



4410' 9.68° 183.70° 4370.56' 6.17'

4506' 8.91° 182.52° 4465.30' 5.64'



4550'

PGRC

ROPA

4601'

6.38°

184.47°

4559.45'

5.16'

4600'

4650'

4696'

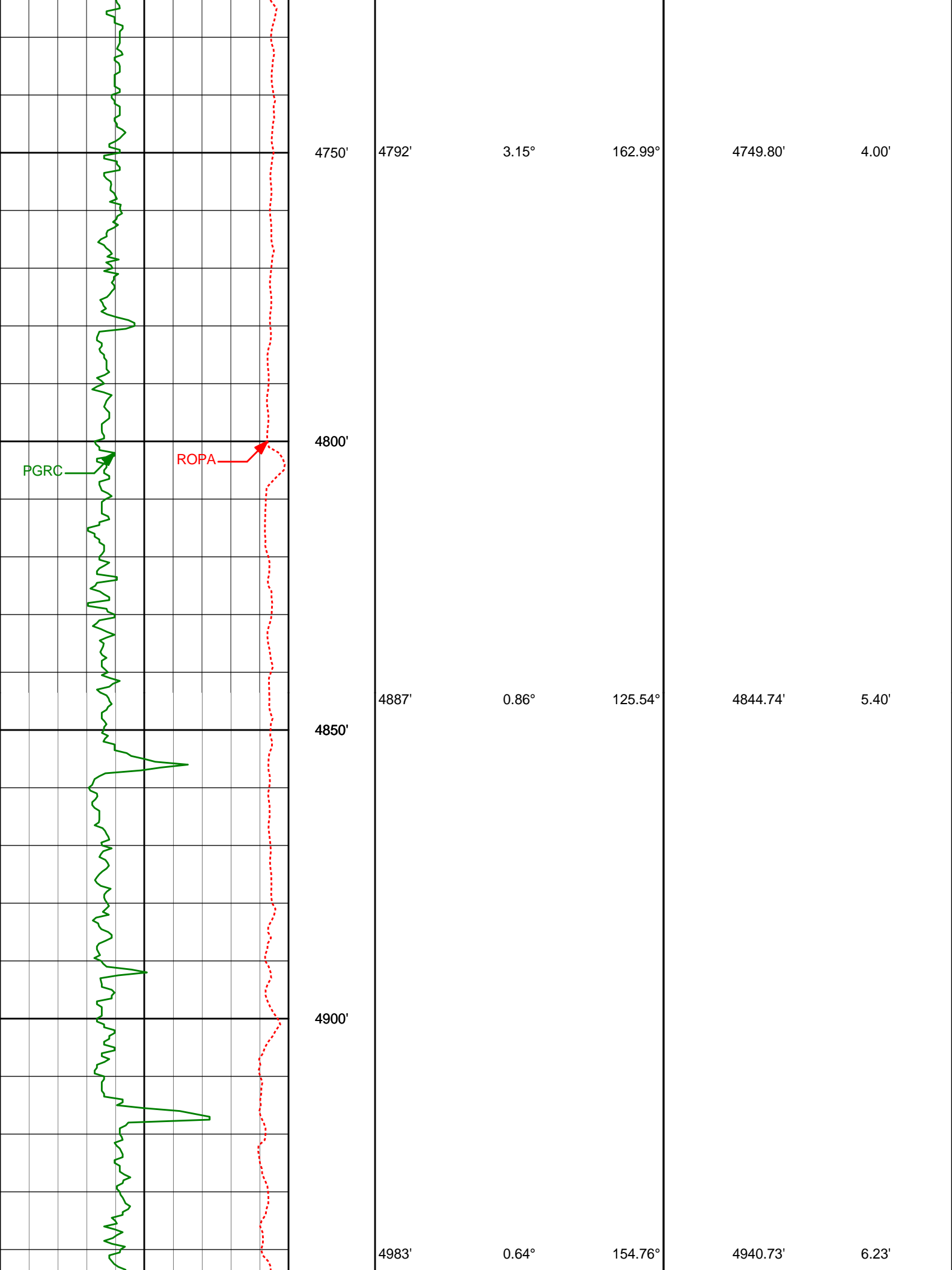
4.58°

193.86°

4654.01'

4.02'

4700'



4750'

4792'

3.15°

162.99°

4749.80'

4.00'

4800'

PGRC

ROPA

4850'

4887'

0.86°

125.54°

4844.74'

5.40'

4900'

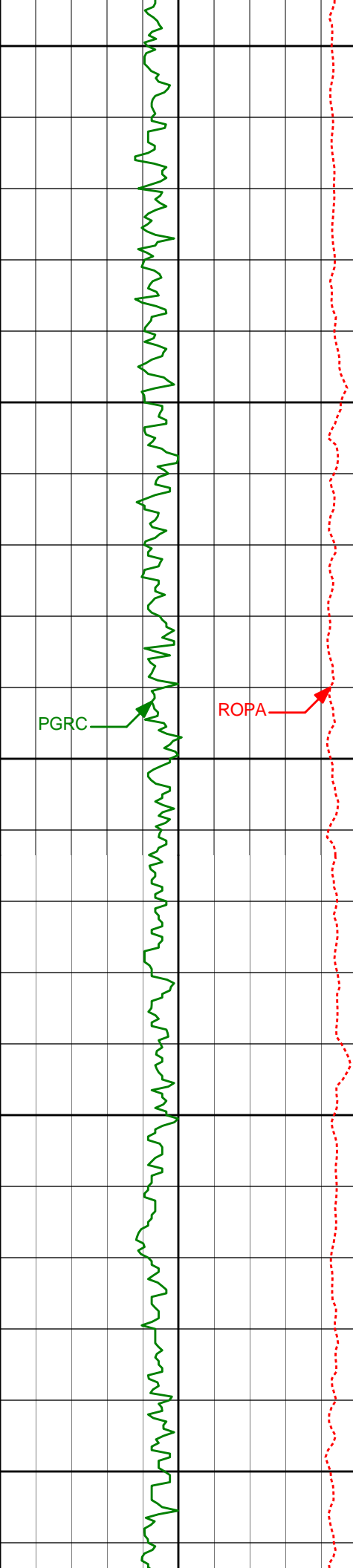
4983'

0.64°

154.76°

4940.73'

6.23'



4950'

5000'

5050'

5100'

5150'

5079'

0.57°

113.75°

5036.73'

6.91'

5174'

0.29°

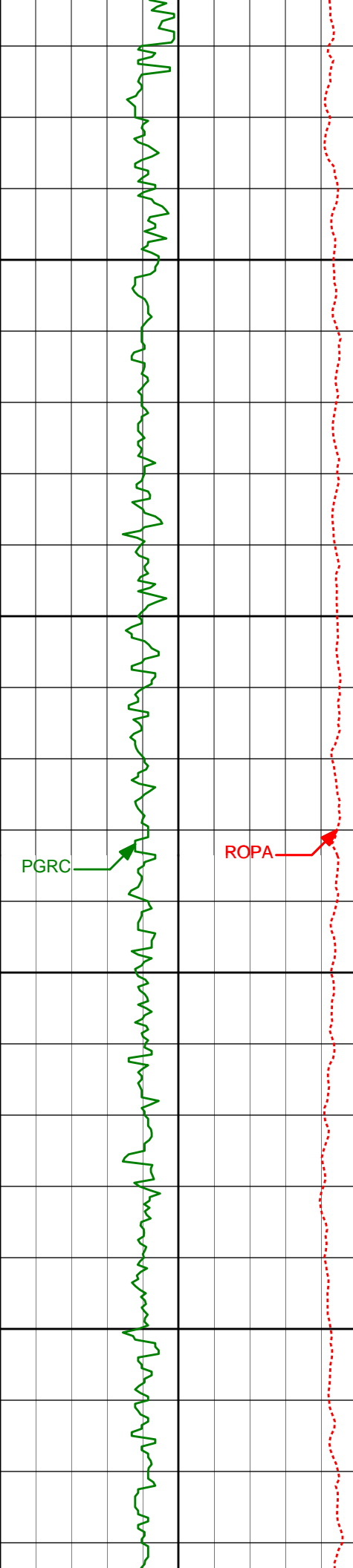
100.82°

5131.73'

7.59'

PGRC

ROPA



5200'

5269'

1.05°

145.51°

5226.72'

8.33'

5250'

PGRC

ROPA

5300'

5365'

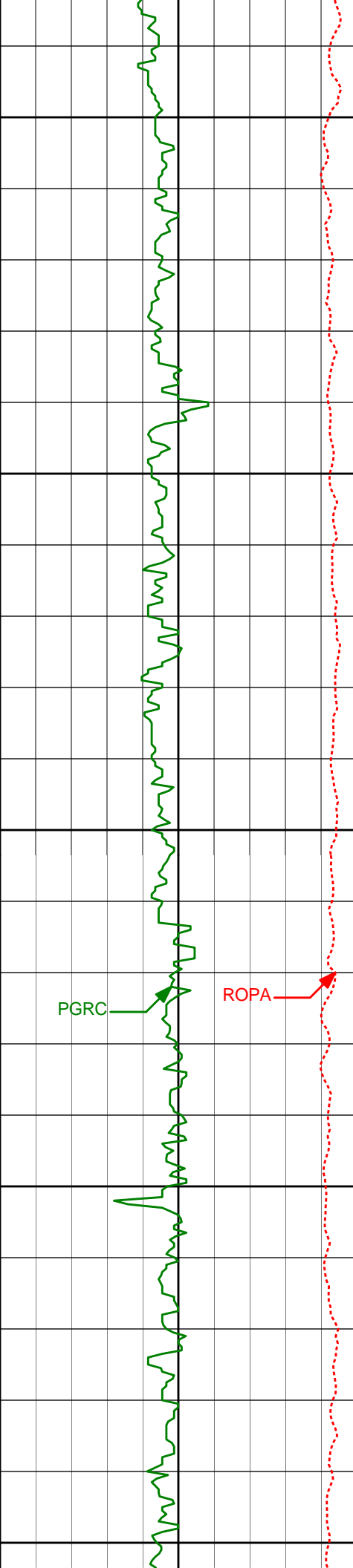
1.75°

137.65°

5322.69'

9.86'

5350'



5400'

5460'

1.20°

358.02°

5417.68'

10.80'

5450'

5500'

5556'

1.13°

34.21°

5513.66'

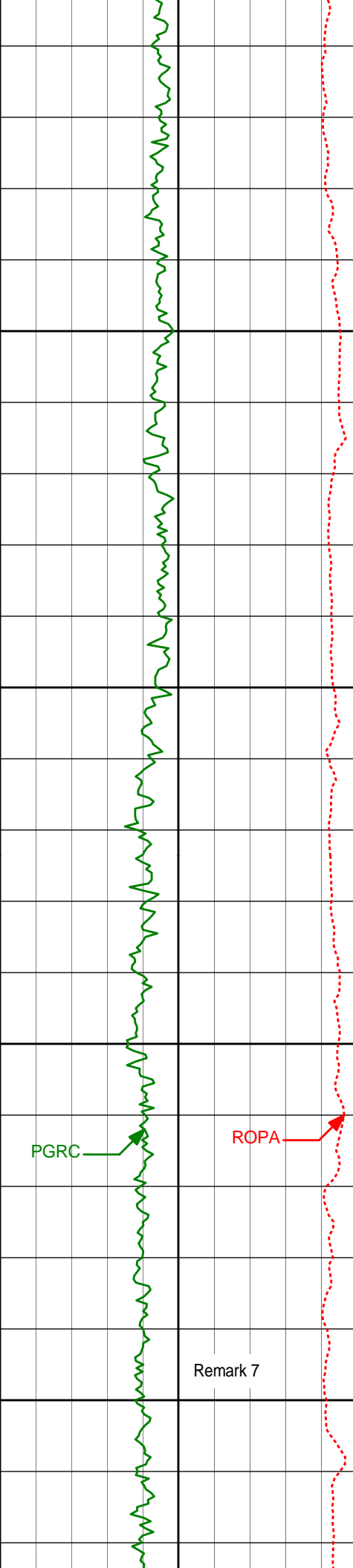
11.27'

PGRC

ROPA

5550'

5600'

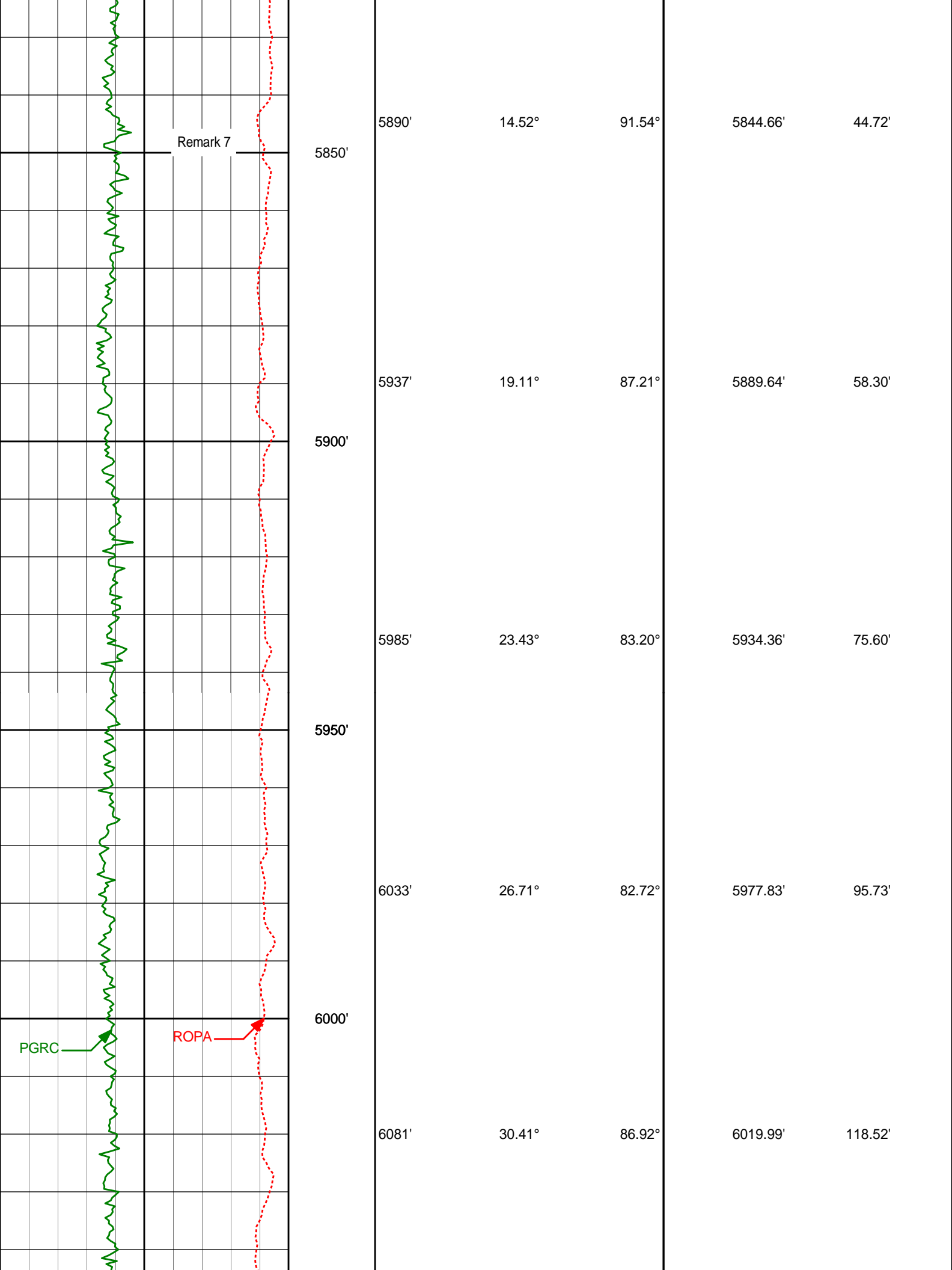


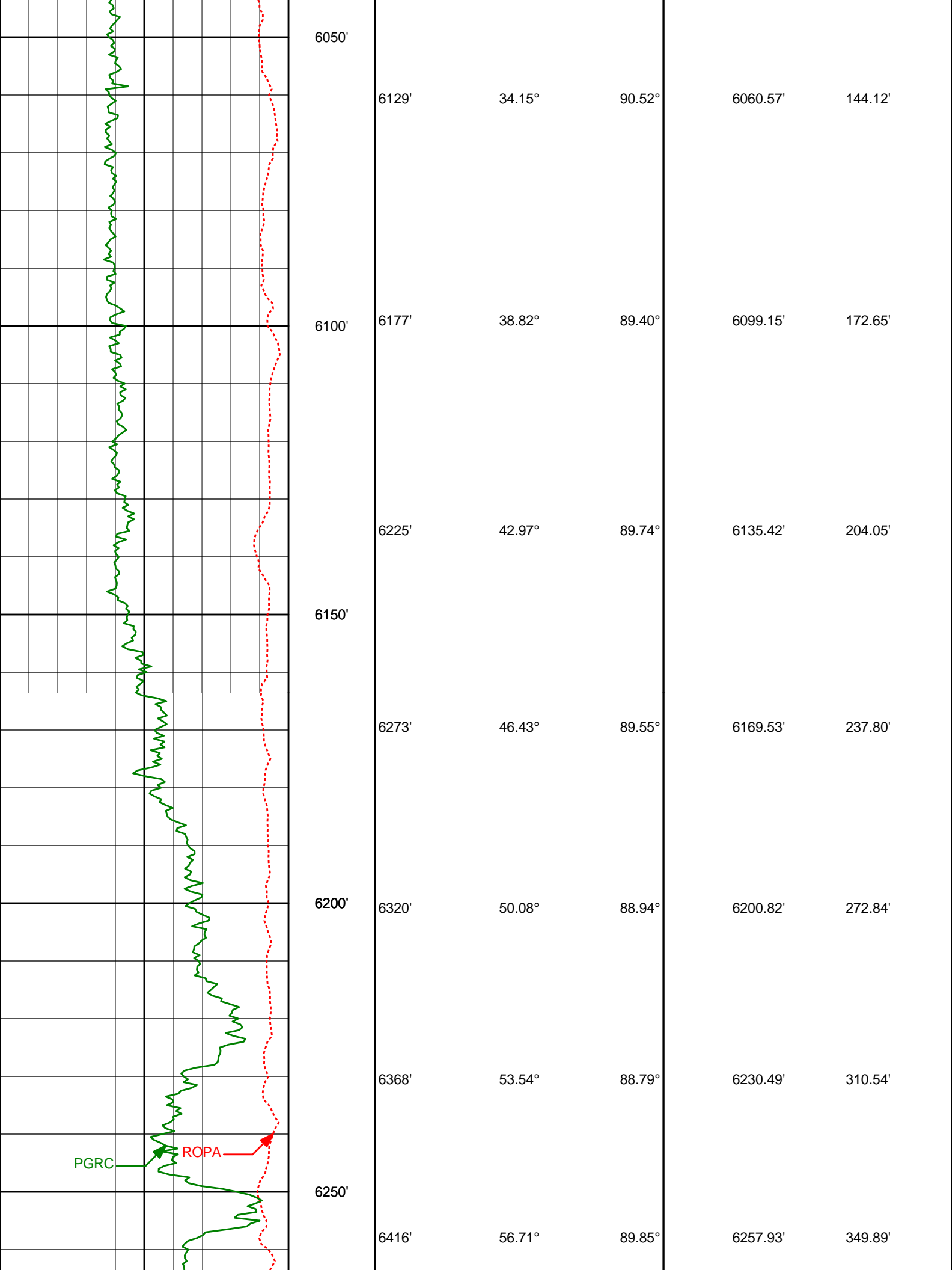
5651'	1.18°	12.29°	5608.64'	11.97'
5650'				
5699'	2.17°	71.11°	5656.62'	12.92'
5700'				
5746'	8.00°	80.95°	5703.42'	16.97'
5750'				
5794'	11.29°	89.60°	5750.73'	24.96'
5800'				
5842'	10.86°	90.30°	5797.84'	34.18'

PGRC

ROPA

Remark 7





6050'

6129'

34.15°

90.52°

6060.57'

144.12'

6100'

6177'

38.82°

89.40°

6099.15'

172.65'

6150'

6225'

42.97°

89.74°

6135.42'

204.05'

6200'

6273'

46.43°

89.55°

6169.53'

237.80'

6250'

6320'

50.08°

88.94°

6200.82'

272.84'

6368'

53.54°

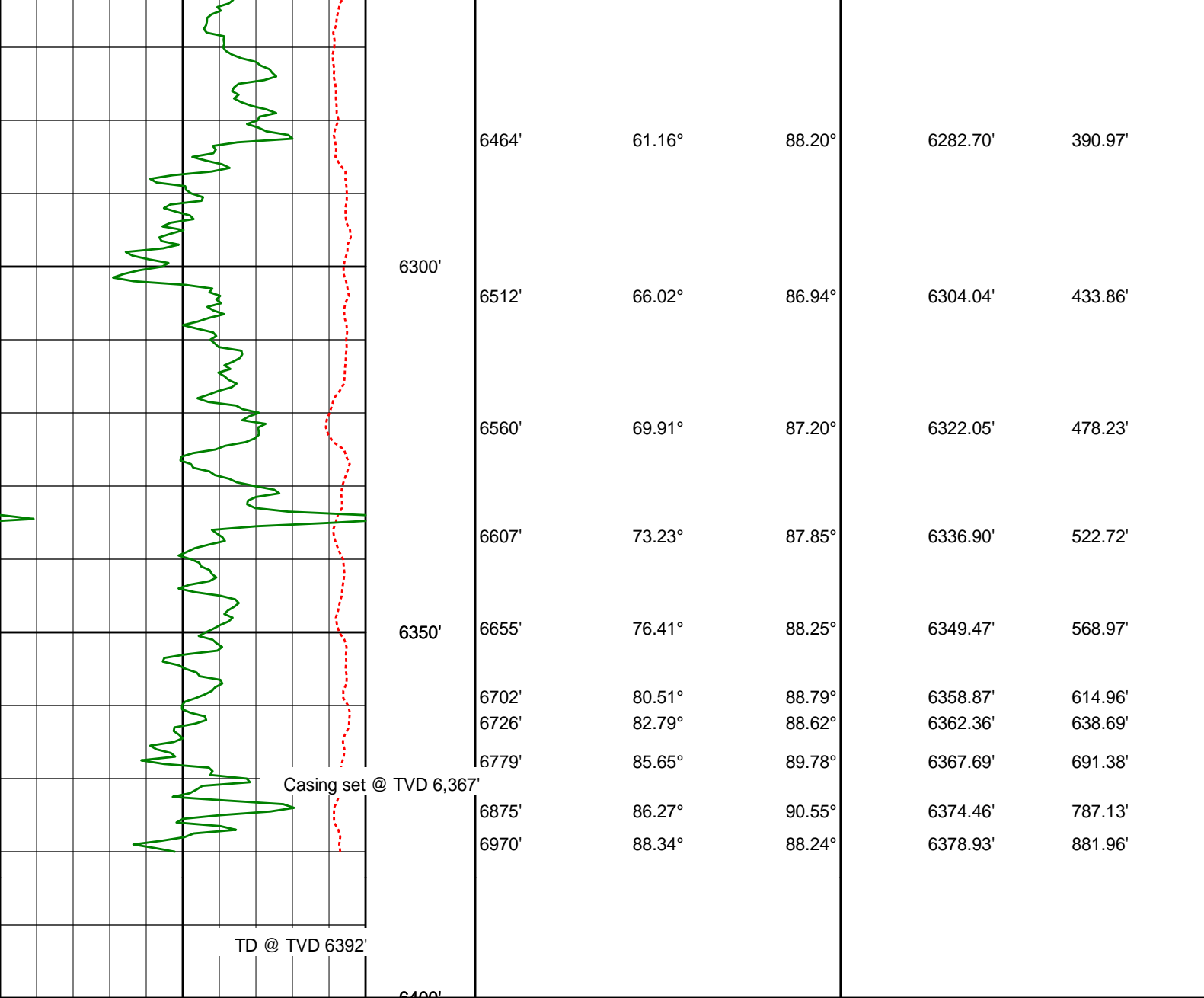
88.79°

6230.49'

310.54'

PGRC

ROPA



Gamma Ray PGRC 0 200 api	True Vertical Depth (ft) 1:240	Depth	Inc	Azi.	TVD	V.S.
Average Rate of Penetration ROPA 1K 0 feet per hr						



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch AF08-69-1HN
Wattenberg
Weld Colorado
USA
CA-XX-0009394995

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
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0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
584.00	0.00	0.00	584.00	0.00 N	0.00 E	0.00	0.00
629.00	0.31	173.74	629.00	0.12 S	0.01 E	0.02	0.69
819.00	0.61	174.54	818.99	1.63 S	0.16 E	0.20	0.16
914.00	0.76	185.08	913.99	2.76 S	0.16 E	0.21	0.21
1008.00	0.58	186.60	1007.98	3.85 S	0.05 E	0.12	0.20
1103.00	0.61	177.76	1102.98	4.83 S	0.01 E	0.11	0.10
1195.00	0.74	191.80	1194.97	5.91 S	0.09 W	0.03	0.23
1287.00	0.81	188.14	1286.96	7.13 S	0.30 W	-0.16	0.09
1380.00	0.75	189.30	1379.95	8.38 S	0.50 W	-0.33	0.07
1472.00	0.91	193.19	1471.94	9.68 S	0.76 W	-0.56	0.19
1656.00	0.68	189.92	1655.92	12.18 S	1.28 W	-1.03	0.13
1748.00	3.58	185.11	1747.85	15.57 S	1.63 W	-1.31	3.15
1840.00	5.54	181.75	1839.56	22.87 S	2.02 W	-1.56	2.15
1932.00	7.45	183.35	1930.96	33.27 S	2.51 W	-1.83	2.08
2025.00	9.69	174.64	2022.92	47.08 S	2.13 W	-1.17	2.78
2117.00	10.53	175.95	2113.49	63.18 S	0.81 W	0.47	0.95
2216.00	9.84	179.42	2210.93	80.66 S	0.08 W	1.55	0.93
2312.00	8.80	177.99	2305.66	96.20 S	0.26 E	2.20	1.11
2406.00	10.14	182.77	2398.38	111.65 S	0.11 E	2.37	1.65
2501.00	10.00	183.58	2491.92	128.24 S	0.81 W	1.79	0.21
2597.00	10.43	179.21	2586.40	145.25 S	1.21 W	1.73	0.92
2692.00	9.22	175.55	2680.00	161.43 S	0.50 W	2.77	1.43
2787.00	10.83	180.81	2773.55	177.95 S	0.04 W	3.56	1.95
2883.00	10.87	179.85	2867.84	196.02 S	0.14 W	3.83	0.19
2978.00	10.06	186.13	2961.26	213.22 S	1.00 W	3.31	1.47
3074.00	9.54	181.61	3055.86	229.51 S	2.12 W	2.52	0.96
3169.00	9.71	182.63	3149.52	245.39 S	2.71 W	2.26	0.25
3265.00	9.25	181.77	3244.21	261.19 S	3.32 W	1.97	0.50
3360.00	9.34	175.14	3337.96	276.51 S	2.90 W	2.69	1.13
3455.00	11.23	176.06	3431.43	293.42 S	1.61 W	4.33	1.99
3551.00	11.49	175.66	3525.55	312.28 S	0.25 W	6.07	0.28
3646.00	11.55	180.46	3618.64	331.22 S	0.39 E	7.10	1.01
3742.00	12.27	178.65	3712.57	351.03 S	0.55 E	7.66	0.85
3837.00	10.53	181.96	3805.70	369.80 S	0.49 E	7.98	1.96
3933.00	10.40	185.01	3900.10	387.20 S	0.56 W	7.28	0.59
4028.00	9.12	185.13	3993.73	403.23 S	1.98 W	6.18	1.35
4124.00	9.55	180.08	4088.46	418.77 S	2.67 W	5.81	0.97
4219.00	8.73	176.60	4182.25	433.86 S	2.26 W	6.53	1.04
4314.00	10.02	183.12	4275.98	449.31 S	2.28 W	6.82	1.76
4410.00	9.68	183.70	4370.56	465.71 S	3.26 W	6.17	0.37
4506.00	8.91	182.52	4465.30	481.18 S	4.10 W	5.64	0.83
4601.00	6.38	184.47	4559.45	493.80 S	4.84 W	5.16	2.67
4696.00	4.58	193.86	4654.01	502.75 S	6.16 W	4.02	2.11
4792.00	3.15	162.99	4749.80	509.00 S	6.31 W	4.00	2.58
4887.00	0.86	125.54	4844.74	511.91 S	4.97 W	5.40	2.66
4983.00	0.64	154.76	4940.73	512.81 S	4.15 W	6.23	0.45
5079.00	0.57	113.75	5036.73	513.48 S	3.49 W	6.91	0.45
5174.00	0.29	100.82	5131.73	513.72 S	2.81 W	7.59	0.31
5269.00	1.05	145.51	5226.72	514.48 S	2.08 W	8.33	0.91
5365.00	1.75	137.65	5322.69	516.29 S	0.59 W	9.86	0.76
5460.00	1.20	358.02	5417.68	516.37 S	0.35 E	10.80	2.93
5556.00	1.13	34.21	5513.66	514.58 S	0.85 E	11.27	0.76
5651.00	1.18	12.29	5608.64	512.84 S	1.59 E	11.97	0.47
5699.00	2.17	71.11	5656.62	512.07 S	2.55 E	12.92	3.87
5746.00	8.00	80.95	5703.42	511.26 S	6.63 E	16.97	12.50
5794.00	11.29	89.60	5750.73	510.70 S	14.63 E	24.96	7.47
5842.00	10.86	90.30	5797.84	510.70 S	23.85 E	34.18	0.95
5890.00	14.52	91.54	5844.66	510.88 S	34.39 E	44.72	7.65
5937.00	19.11	87.21	5889.64	510.66 S	47.97 E	58.30	10.11
5985.00	23.43	83.20	5934.36	509.15 S	65.30 E	75.60	9.50
6033.00	26.71	82.72	5977.83	506.65 S	85.49 E	95.73	6.85
6081.00	30.41	86.92	6019.99	504.63 S	108.33 E	118.52	8.76
6129.00	34.15	90.52	6060.57	504.10 S	133.94 E	144.12	8.75
6177.00	38.82	89.40	6099.15	504.07 S	162.48 E	172.65	9.83
6225.00	42.97	89.74	6135.42	503.84 S	193.89 E	204.05	8.66
6273.00	46.43	89.55	6169.53	503.63 S	227.65 E	237.80	7.21
6320.00	50.08	88.94	6200.82	503.16 S	262.71 E	272.84	7.84
6368.00	53.54	88.79	6230.49	502.41 S	300.43 E	310.54	7.21
6416.00	56.71	89.85	6257.93	501.95 S	339.80 E	349.89	6.85
6464.00	61.16	88.20	6282.70	501.24 S	380.90 E	390.97	9.73
6512.00	66.02	86.94	6304.04	499.41 S	423.83 E	433.86	10.39
6560.00	69.91	87.20	6322.05	497.14 S	468.26 E	478.23	8.13
6607.00	73.23	87.85	6336.90	495.22 S	512.80 E	522.72	7.19
6655.00	76.44	88.35	6349.47	493.64 S	559.99 E	568.97	6.68

6655.00	76.41	88.23	6349.47	493.04 S	339.09 E	368.97	6.68
6702.00	80.51	88.79	6358.87	492.45 S	605.12 E	614.96	8.78
6726.00	82.79	88.62	6362.36	491.92 S	628.86 E	638.69	9.54
6779.00	85.65	89.78	6367.69	491.19 S	681.58 E	691.38	5.82

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 91.16 DEGREES (GRID)
A TOTAL CORRECTION OF 7.78 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6779.00 FEET
IS 840.12 FEET ALONG 125.78 DEGREES (GRID)**