

PCG Pressure Case Gamma PCD Pressure Case Directional

1 : 600 / 1 : 240

| | | | | | |
|---|----------|---|--------------|----------------------------|--------------------|
| Country : USA | | | | | |
| Field : | | Wattenberg | | | |
| Location : | | Lat: 40° 46' 26.03" North Long: 103° 48' 36.45" West | | | |
| Well : | | McCaffrey State LD12-74-1AHN | | | |
| Company : | | Noble Energy | | | |
| Rig : | | H&P 343 | | | |
| LOCATION | | <div>Company : Noble Energy</div> <div>Rig : H&P 343</div> <div>Well : McCaffrey State LD12-74-1AHN</div> <div>Field : Wattenberg</div> <div>Country : USA</div> <div>API Number : 0512339672</div> | | | |
| | | Latitude : 40° 46' 26.03" North Longitude : 103° 48' 36.45" West | | Other Services | |
| | | UTM Easting = 3,468,023.590 ft UTM Northing = 1,529,236.500 ft | | Directional Drilling | |
| Permanent Datum : Ground Level | | Elevation : 4633.00 ft | | Elev. | KB NA |
| Log Measured From : Drill Floor | | 24.00 ft Above Permanent Datum | | DF 4657.00 ft | GL 4633.00 ft |
| Drilling Measured From : Drill Floor | | MD LOG | | WD NA | |
| Depth Logged : 1,227.00 ft To 10,351.00 ft | | Unit No. : 11610115 | | Job No. : CA-XX-0901769918 | |
| Date Logged : 29-Nov-14 To 05-Dec-14 | | Plot Type : Final | | | |
| Total Depth MD : 10,351.00 ft TVD : 5,493.91 ft | | Plot Date : 31-Dec-14 | | | |
| Spud Date : 30-Nov-14 | | | | | |
| Run No. | | Borehole Record (MD) | | Borehole Record (MD) | |
| | Size | From | To | Run No. | Size |
| 0100 | 8.750 in | 1,227.00 ft | 5,902.00 ft | | From |
| 0200 | 6.125 in | 5,902.00 ft | 9,646.00 ft | | To |
| 0300 | 6.125 in | 9,646.00 ft | 10,391.00 ft | | |
| | | | | | Casing Record (MD) |
| | | | | Size | Weight |
| | | | | 9.625 in | 36.60 lbpf |
| | | | | 7.000 in | 34.70 lbpf |
| | | | | | SURFACE |
| | | | | | SURFACE |
| | | | | | 1,219.00 ft |
| | | | | | 5,891.00 ft |

WELL INFORMATION

| | | | | | |
|---|------------------|------------------|-------------------|--|--|
| MWD Run Number | 100 | 200 | 300 | | |
| Date run completed | 02-Dec-14 | 04-Dec-14 | 05-Dec-14 | | |
| Rig Bit Number | 2 | 3 | 4 | | |
| Bit Size (in) | 8.750 | 6.125 | 6.125 | | |
| Tool Nominal OD (in) | 6.750 | 4.740 | 4.740 | | |
| Log Start Depth (MD, ft) | 1,227.00 | 5,902.00 | 9,646.00 | | |
| Log End Depth (MD, ft) | 5,902.00 | 9,646.00 | 10,391.00 | | |
| Drill or Wipe | Drill | Drill | Drill | | |
| Drill/Wipe Start Date and Time | 01-Dec-14 10:45 | 02-Dec-14 12:43 | 05-Dec-14 06:15 | | |
| Drill/Wipe End Date and Time | 02-Dec-14 09:00 | 02-Dec-14 12:43 | 05-Dec-14 12:03 | | |
| Min Inc (deg) @ Depth (MD, ft) | 0.37 @ 4,780.00 | 86.39 @ 8,737.00 | 88.55 @ 9,783.00 | | |
| Max Inc (deg) @ Depth (MD, ft) | 84.48 @ 5,844.00 | 92.71 @ 7,976.00 | 92.96 @ 10,391.00 | | |
| Bit TFA(in2) / Bit Type | 1.21 / PDC | 0.98 / PDC | 0.98 / PDC | | |
| Flow Rate (gpm) | 609.32 | 300.00 | 300.00 | | |
| Max AV (fpm) / CV (fpm) @ MWD | NA / NA | NA / NA | NA / NA | | |
| Fluid Type | Native/Spud Mud | Native/Spud Mud | Fresh Water Gel | | |
| Density (ppg) / Viscosity (spqt) | 10.80 / 39.00 | 10.20 / 40.00 | 10.30 / 40.00 | | |
| Filtrate CL (ppm) | 3,100.00 | 3,000.00 | 3,000.00 | | |
| pH / Fluid Loss (mptm) | 9.60 / 7 | 9.70 / 34 | 8.90 / 7 | | |
| PV (cP) / YP (lbf2) | 12 / 12.00 | 12 / 15.00 | 12 / 15.00 | | |
| % Solids / % Sand | 11.40 / 0.25 | 9.2 / 0.25 | 9.20 / 0.25 | | |
| % Oil / Oil:Water Ratio | NA / NA | NA / NA | NA / NA | | |
| Rm @ Measured Temp (degF) | NA @ NA | NA @ NA | NA @ NA | | |
| Rmf @ Measured Temp (degF) | NA @ NA | NA @ NA | NA @ NA | | |
| Rmc @ Measured Temp (degF) | NA @ NA | NA @ NA | NA @ NA | | |
| Min Tool Temp (deg F) / S | 127.67 / RPM | 127.51 / RPM | 200.00 / RPM | | |

| | | | | | |
|-------------------------------|---------------|---------------|---------------|--|--|
| Max Tool Temp (degF) / Source | 167.97 / PCM | 197.51 / PCM | 202.60 / PCM | | |
| Rm @ Max Tool Temp (degF) | NA @ NA | NA @ NA | NA @ NA | | |
| Lead MWD Engineer | Kyle Wass | Kyle Wass | Kyle Wass | | |
| Customer Representative | Seth Mulherin | Seth Mulherin | Seth Mulherin | | |

SENSOR INFORMATION

Downhole Processor Information

| | | | | | |
|---------------------------|-----------------|-----------------|-----------------|--|--|
| Tool Type | PCM | PCM | PCM | | |
| Software Version | 5.93 | 5.93 | 5.93 | | |
| Sub Serial Number | 11404285 | 11675316 | 11404285 | | |
| Insert Serial Number | 11619985 | 11619985 | 11226936 | | |
| Date and Time Initialized | 30-Nov-14 09:06 | 02-Dec-14 19:18 | 04-Dec-14 21:25 | | |
| Date and Time Read | 02-Dec-14 14:25 | 05-Dec-14 01:32 | 05-Dec-14 22:29 | | |
| ECMB SW Version | N/A | N/A | N/A | | |

Directional Sensor Information

| | | | | | |
|------------------------|----------|----------|----------|--|--|
| Tool Type | PCDC | PCDC | PCDC | | |
| Distance From Bit (ft) | 58.00 | 53.00 | 53.00 | | |
| Software Version | 6.21 | 6.21 | 6.33 | | |
| Sub Serial Number | 11404285 | 11675316 | 11404285 | | |
| Sonde Serial Number | 11478122 | 11478122 | 10993517 | | |
| Sensor ID Number | N/A | N/A | N/A | | |
| Toolface Offset (deg) | 66.86 | 317.60 | 311.49 | | |

Gamma Ray Sensor Information

| | | | | | |
|------------------------------|----------|----------|----------|--|--|
| Tool Type | PCG | PCG | PCG | | |
| Distance From Bit (ft) | 51.45 | 46.15 | 46.15 | | |
| Recorded Sample Period (sec) | 10 | 10 | 10 | | |
| Software Version | 8.15 | 8.15 | 8.15 | | |
| Sub Serial Number | 11404285 | 11675316 | 11404285 | | |
| Insert/Sonde Serial Number | 12037419 | 12037419 | 12071296 | | |

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. 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:
 - 1: 600
PGRC (Corrected Gamma Ray):
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
Gap Fill: 5.0 ft
 - ROPA (Average Rate of Penetration)
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
Gap Fill: 5.0 ft
 - 1: 240
PGRC (Corrected Gamma Ray):
Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft
Gap Fill: 3.0 ft

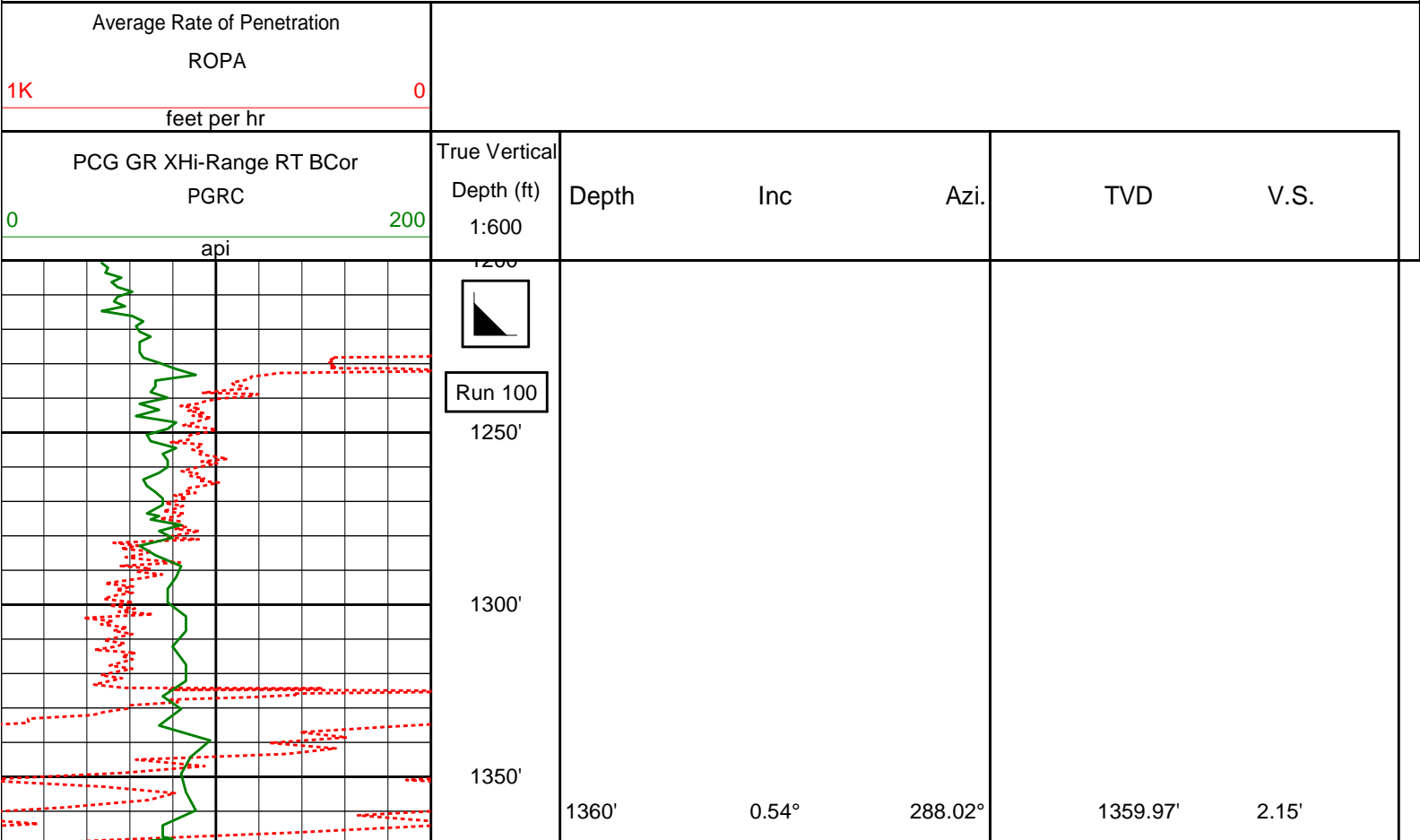
Gap Fill: 3.0 ft
ROPA (Average Rate of Penetration)
Interval Resolution: 0.5 ft
Interval Distance: 1.2 ft
Gap Fill: 3.0 ft
6. INSITE version 8.0.2

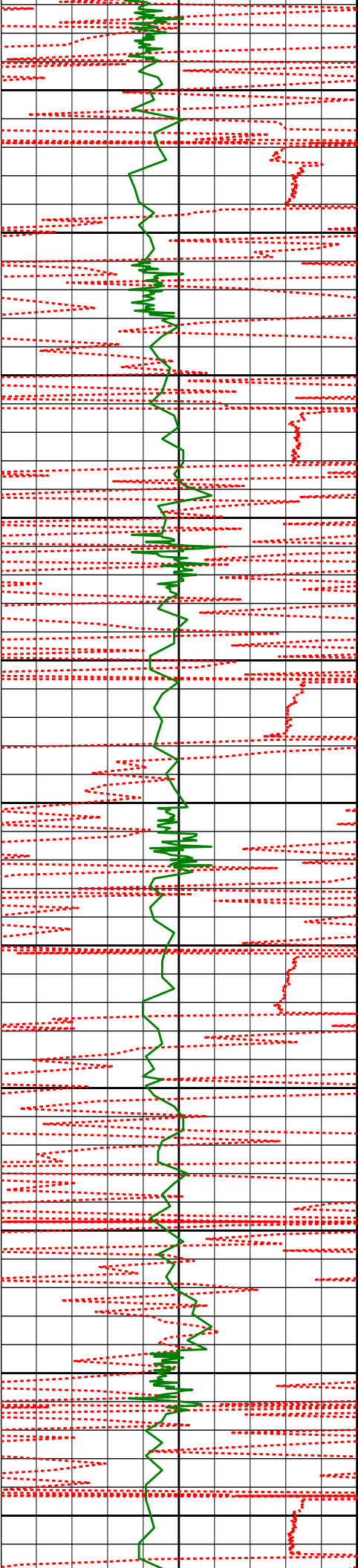
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MD Main Log 1:600





1400'

1450'

1500'

1550'

1600'

1650'

1700'

1750'

1800'

1850'

1900'

1452'

1547'

1642'

1738'

1833'

2.70°

4.43°

7.47°

11.42°

10.15°

74.58°

86.06°

86.90°

85.92°

78.64°

1451.95'

1546.76'

1641.24'

1735.92'

1829.24'

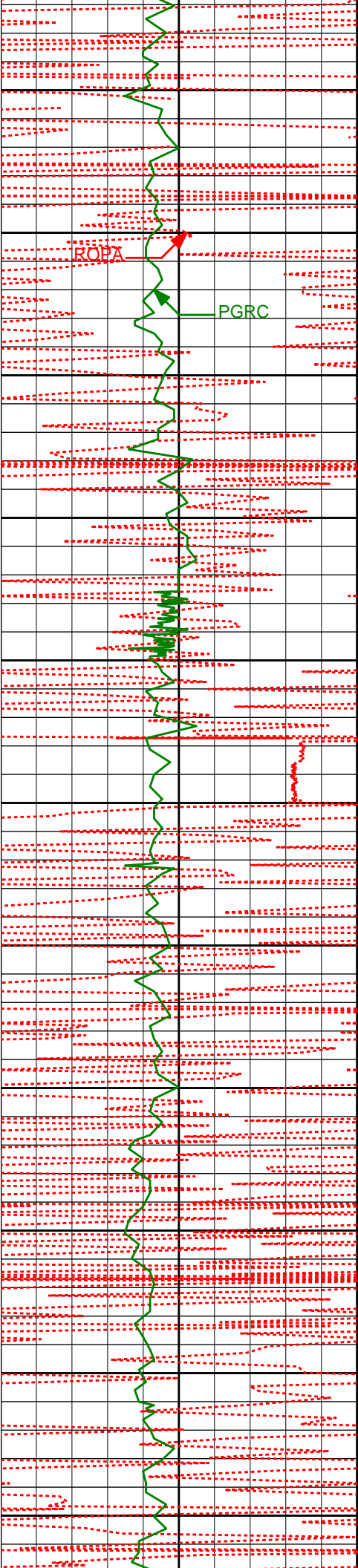
1.58'

1.20'

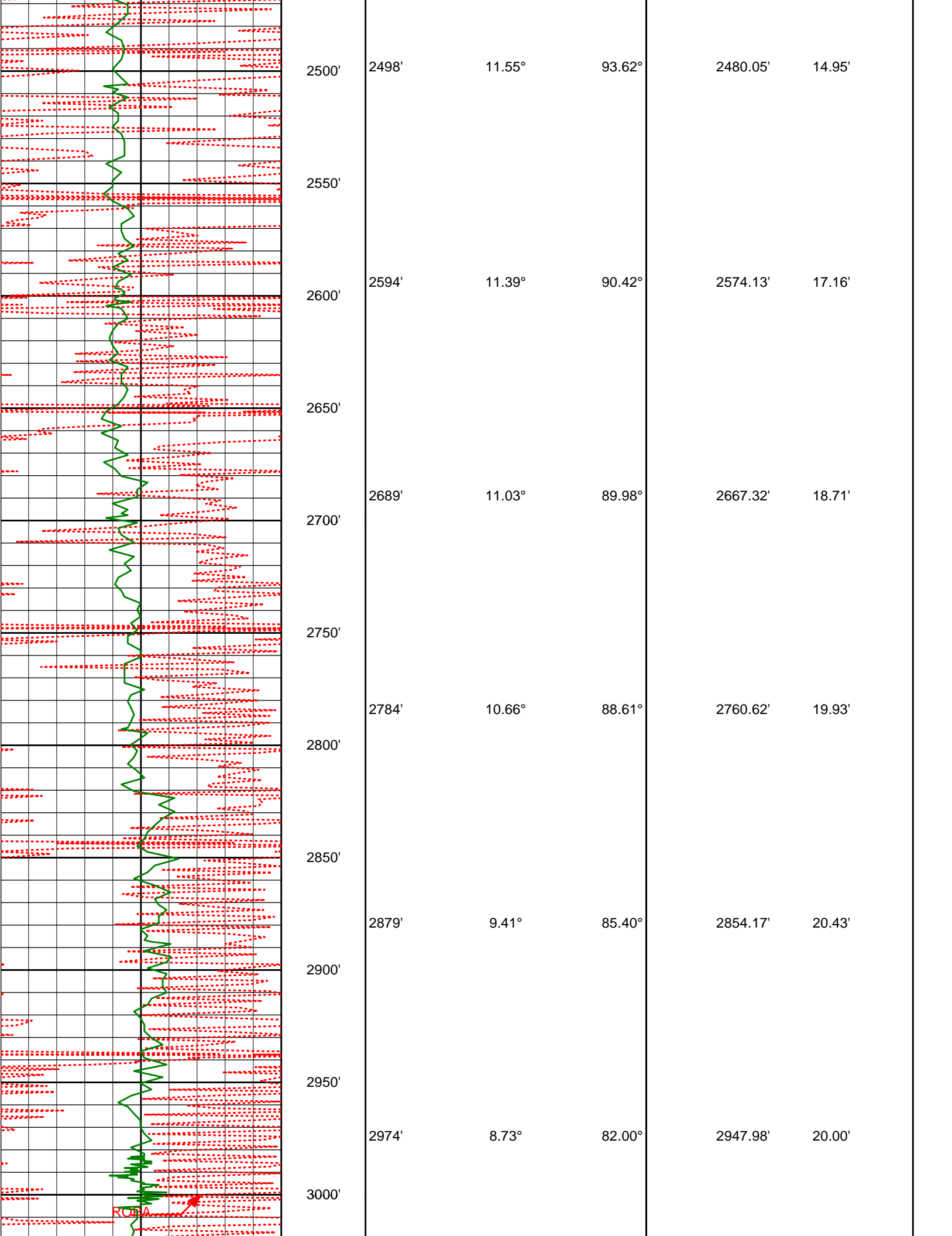
1.41'

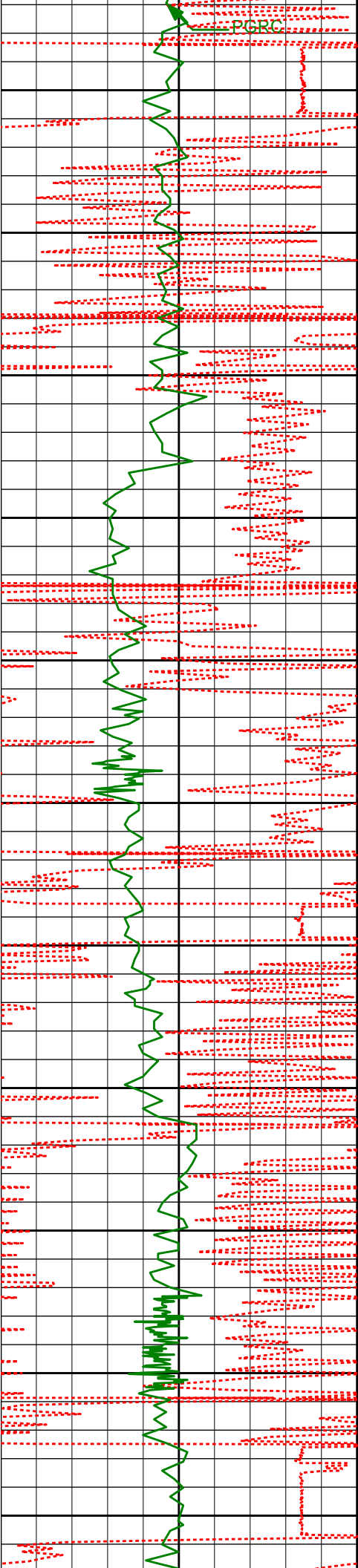
1.66'

0.77'



| | | | | |
|-------|--------|---------|----------|--------|
| 1928' | 12.39° | 89.59° | 1922.41' | 0.53' |
| 1950' | | | | |
| 2000' | | | | |
| 2023' | 12.25° | 85.59° | 2015.23' | 1.31' |
| 2050' | | | | |
| 2100' | | | | |
| 2118' | 11.42° | 83.95° | 2108.21' | 1.11' |
| 2150' | | | | |
| 2200' | | | | |
| 2213' | 12.32° | 102.46° | 2201.21' | 3.85' |
| 2250' | | | | |
| 2300' | | | | |
| 2308' | 12.15° | 95.97° | 2294.06' | 8.66' |
| 2350' | | | | |
| 2400' | 11.73° | 94.63° | 2387.00' | 12.04' |
| 2403' | | | | |
| 2450' | | | | |





3050'

3069'

10.73°

98.15°

3041.63'

21.53'

3100'

3150'

3164'

10.97°

96.26°

3134.93'

25.19'

3200'

3250'

3259'

11.25°

94.46°

3228.15'

28.35'

3300'

3350'

3354'

10.43°

94.15°

3321.45'

31.12'

3400'

3450'

3449'

10.12°

93.55°

3414.93'

33.62'

3500'

3550'

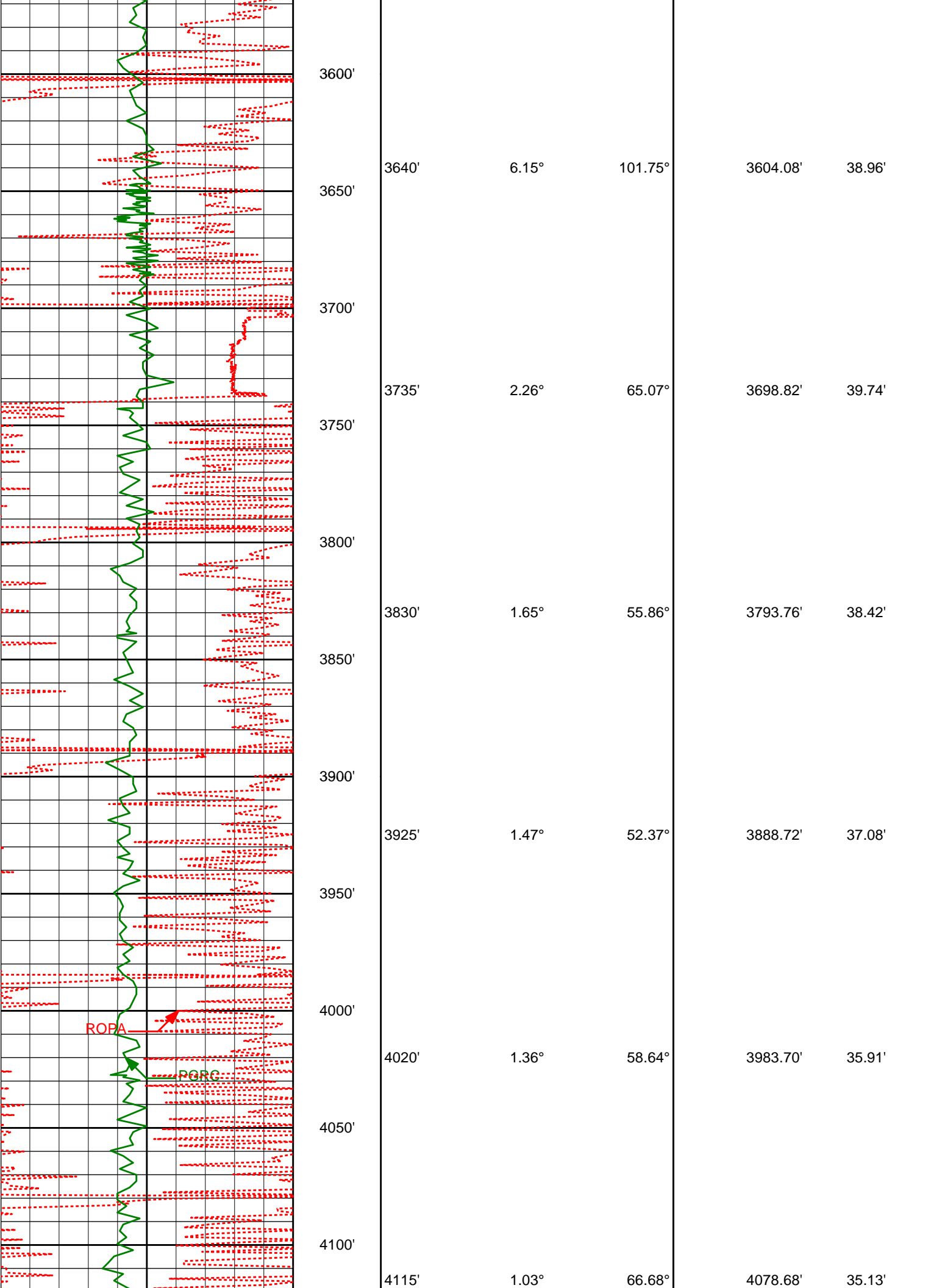
3545'

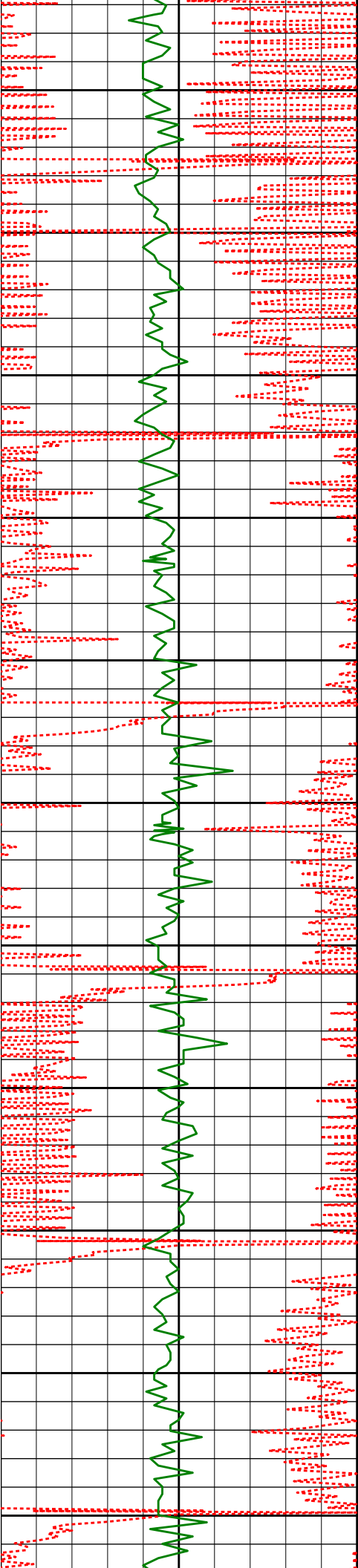
7.67°

97.68°

3509.77'

36.18'





4150'

4200'

4250'

4300'

4350'

4400'

4450'

4500'

4550'

4600'

4650'

4210'

0.97°

86.61°

4173.66'

34.87'

4305'

0.86°

68.94°

4268.65'

34.69'

4400'

0.49°

49.38°

4363.64'

34.24'

4495'

0.41°

12.49°

4458.64'

33.68'

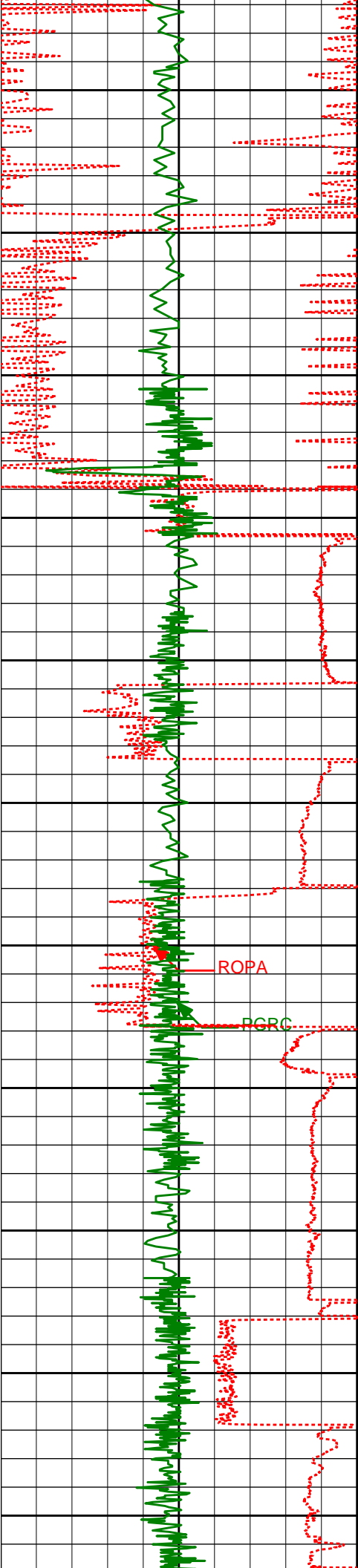
4590'

0.57°

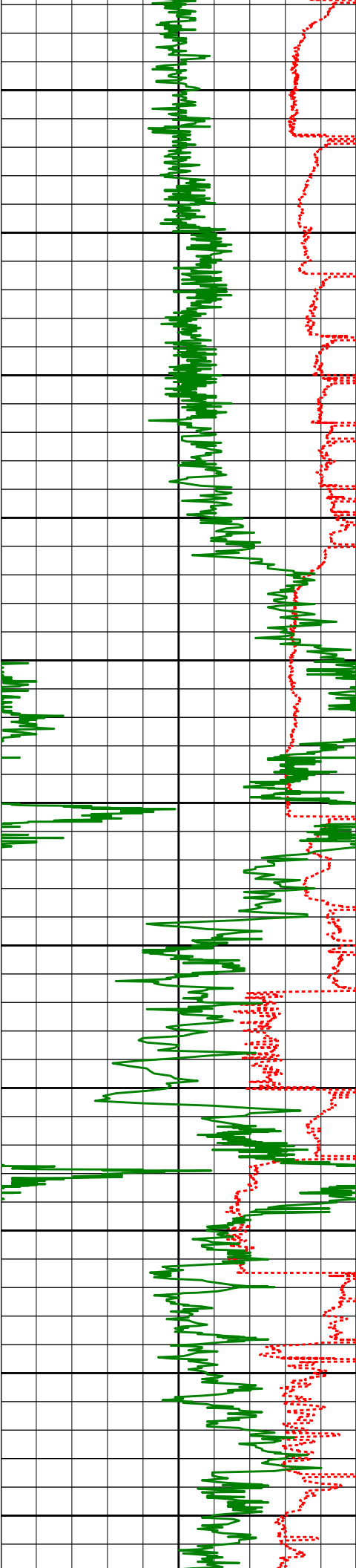
345.07°

4553.64'

32.90'



| | | | | |
|-------|--------|---------|----------|---------|
| 4685' | 0.47° | 328.72° | 4648.63' | 32.09' |
| 4700' | | | | |
| 4750' | | | | |
| 4780' | 0.37° | 310.27° | 4743.63' | 31.53' |
| 4800' | | | | |
| 4850' | | | | |
| 4875' | 3.09° | 174.23° | 4838.59' | 33.87' |
| 4900' | | | | |
| 4950' | | | | |
| 4971' | 9.30° | 173.62° | 4933.98' | 44.23' |
| 5000' | | | | |
| 5050' | | | | |
| 5066' | 12.40° | 179.27° | 5027.27' | 62.09' |
| 5100' | | | | |
| 5114' | 17.30° | 179.58° | 5073.66' | 74.35' |
| 5150' | | | | |
| 5161' | 22.01° | 180.86° | 5117.90' | 90.10' |
| 5200' | | | | |
| 5209' | 25.88° | 180.36° | 5161.76' | 109.50' |



5250'

5256'

30.94°

178.46°

5203.09'

131.80'

5300'

5350'

5351'

41.21°

178.21°

5279.77'

187.59'

5400'

5450'

5447'

51.48°

178.41°

5345.96'

256.86'

5500'

5550'

5542'

62.79°

177.92°

5397.43'

336.43'

5600'

5650'

5637'

66.51°

176.06°

5438.10'

422.23'

5700'

5750'

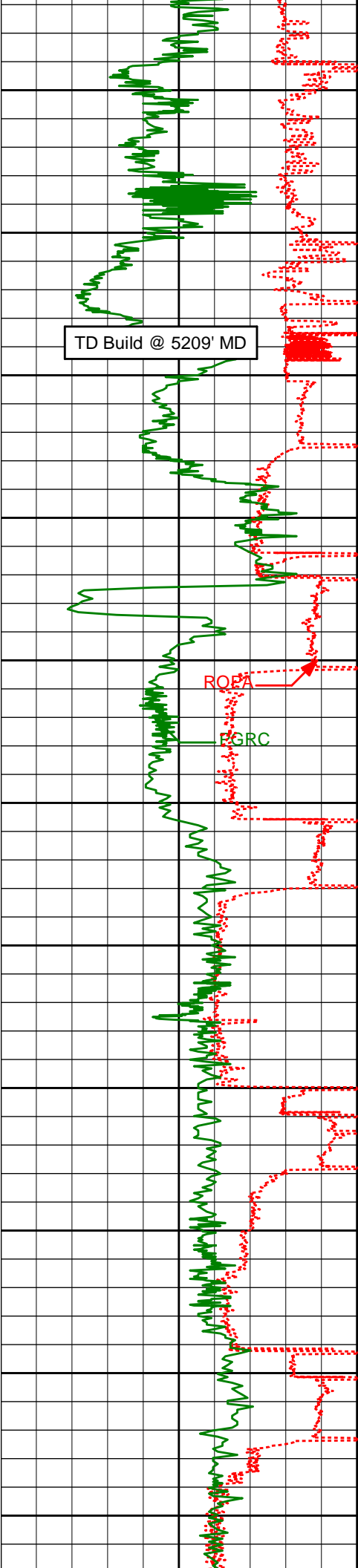
5732'

72.90°

176.84°

5471.03'

511.27'



TD Build @ 5209' MD



Run 200

5800'

5827'

82.53°

183.83°

5491.24'

603.57'

5850'

5844'

84.48°

185.26°

5493.17'

620.24'

5900'

5950'

6000'

6002'

88.12°

182.93°

5503.36'

776.06'

6050'

6100'

6095'

89.48°

178.63°

5505.31'

868.61'

6150'

6200'

6187'

88.24°

177.78°

5507.14'

960.47'

6250'

6300'

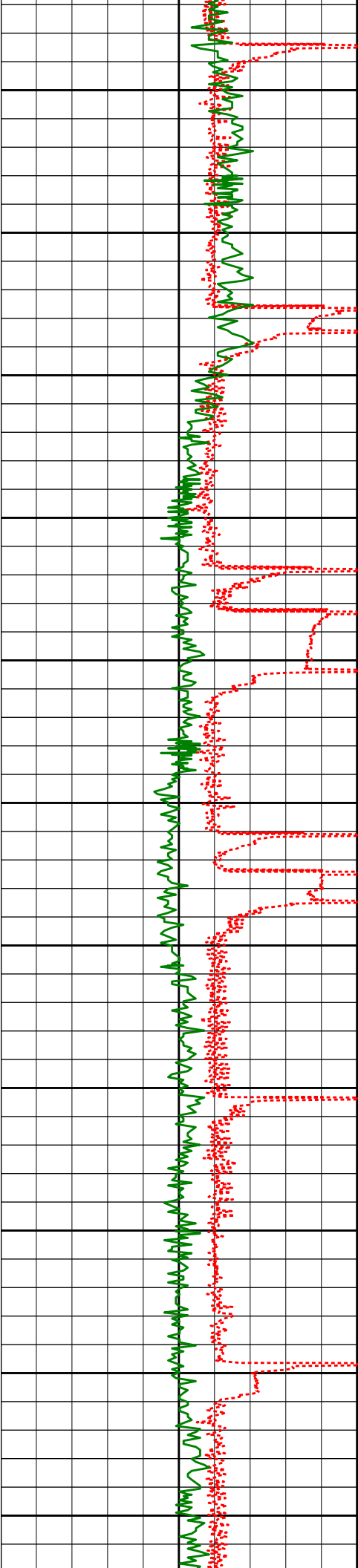
6280'

89.20°

178.86°

5509.22'

1053.33'



6350'

6372'

90.59°

181.56°

5509.39'

1144.99'

6400'

6450'

6465'

89.35°

182.27°

5509.44'

1237.39'

6500'

6550'

6557'

89.85°

180.75°

5510.08'

1328.86'

6600'

6650'

6650'

91.48°

180.50°

5509.01'

1421.46'

6700'

6750'

6743'

91.20°

179.97°

5506.83'

1514.10'

6800'

6850'

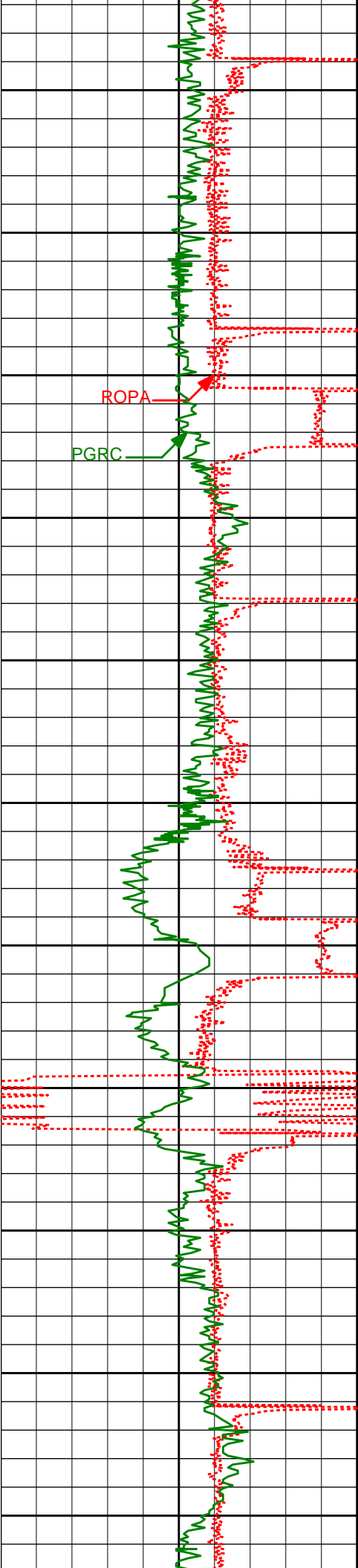
6835'

91.11°

179.11°

5504.98'

1605.84'



6900'

6930'

90.18°

177.28°

5503.90'

1700.71'

6950'

7000'

7025'

91.51°

178.98°

5502.50'

1795.59'

7050'

7100'

7120'

91.05°

177.92°

5500.38'

1890.43'

7150'

7200'

7215'

90.68°

179.41°

5498.95'

1985.26'

7250'

7300'

7311'

89.66°

179.39°

5498.66'

2081.02'

7350'

7400'

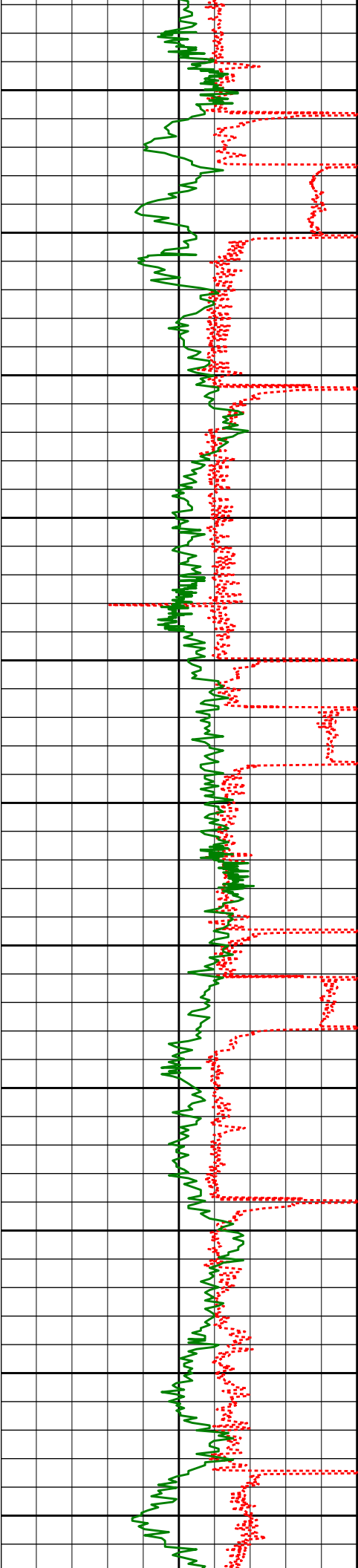
7406'

88.64°

178.06°

5500.07'

2175.85'



7450'

7500'

7550'

7600'

7650'

7700'

7750'

7800'

7850'

7900'

7950'

7501'

7596'

7691'

7786'

7881'

89.11°

87.78°

89.57°

92.59°

92.34°

180.25°

180.21°

180.68°

181.26°

180.12°

5501.94'

5504.52'

5506.71'

5504.93'

5500.84'

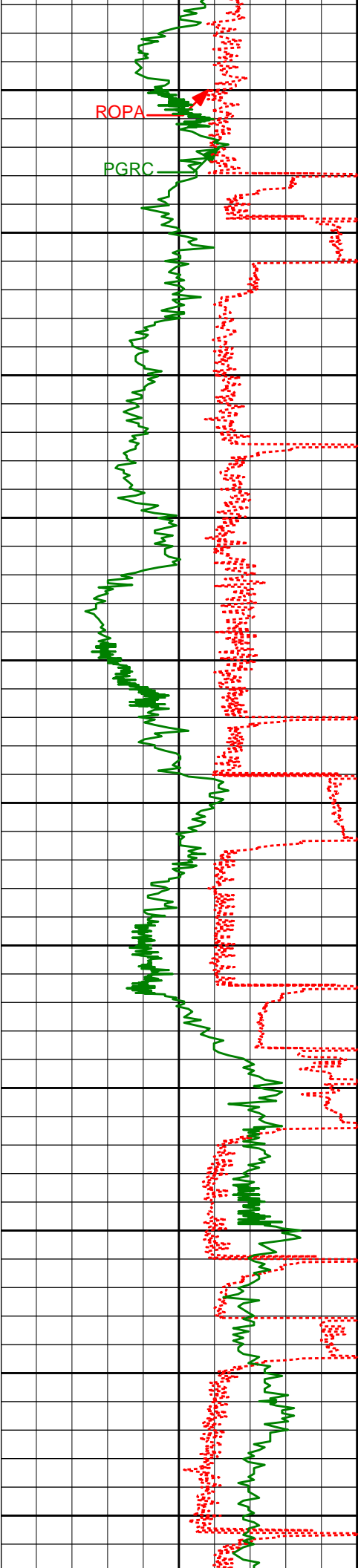
2270.62'

2365.24'

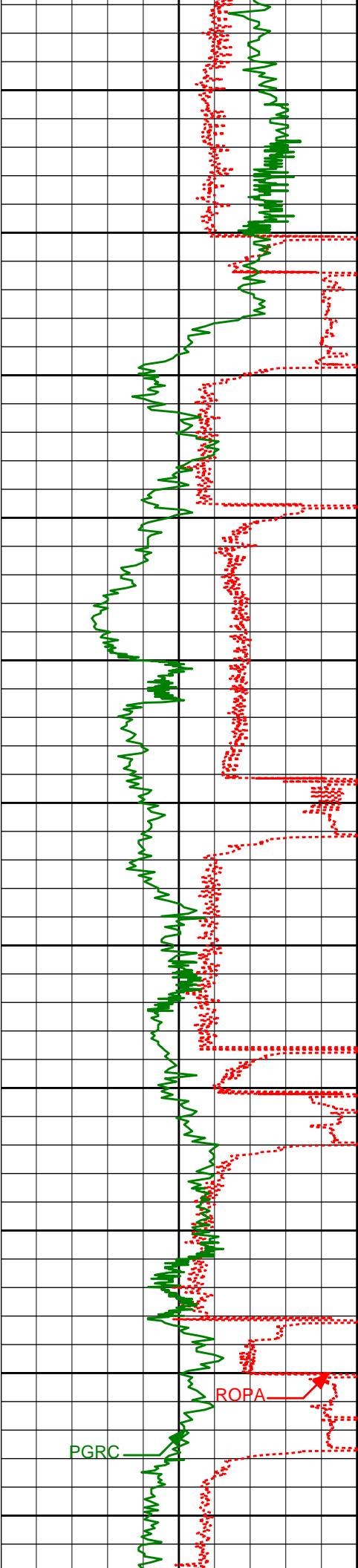
2459.85'

2554.37'

2648.87'



| | | | | |
|-------|--------|---------|----------|----------|
| 7976' | 92.71° | 179.78° | 5496.66' | 2743.48' |
| 8000' | | | | |
| 8050' | | | | |
| 8071' | 91.32° | 180.06° | 5493.31' | 2838.12' |
| 8100' | | | | |
| 8150' | | | | |
| 8166' | 92.15° | 178.91° | 5490.43' | 2932.83' |
| 8200' | | | | |
| 8250' | | | | |
| 8261' | 91.20° | 180.29° | 5487.65' | 3027.53' |
| 8300' | | | | |
| 8350' | | | | |
| 8356' | 90.06° | 180.80° | 5486.60' | 3122.14' |
| 8400' | | | | |
| 8450' | | | | |
| 8452' | 89.11° | 180.89° | 5487.30' | 3217.70' |
| 8500' | | | | |



8550'

8547'

90.25°

180.15°

5487.83'

3312.32'

8600'

8650'

8642'

86.86°

179.25°

5490.23'

3407.00'

8700'

8750'

8737'

86.39°

179.01°

5495.83'

3501.64'

8800'

8850'

8832'

88.00°

178.95°

5500.48'

3596.33'

8900'

8950'

8927'

88.46°

178.78°

5503.42'

3691.11'

9000'

9050'

9022'

88.86°

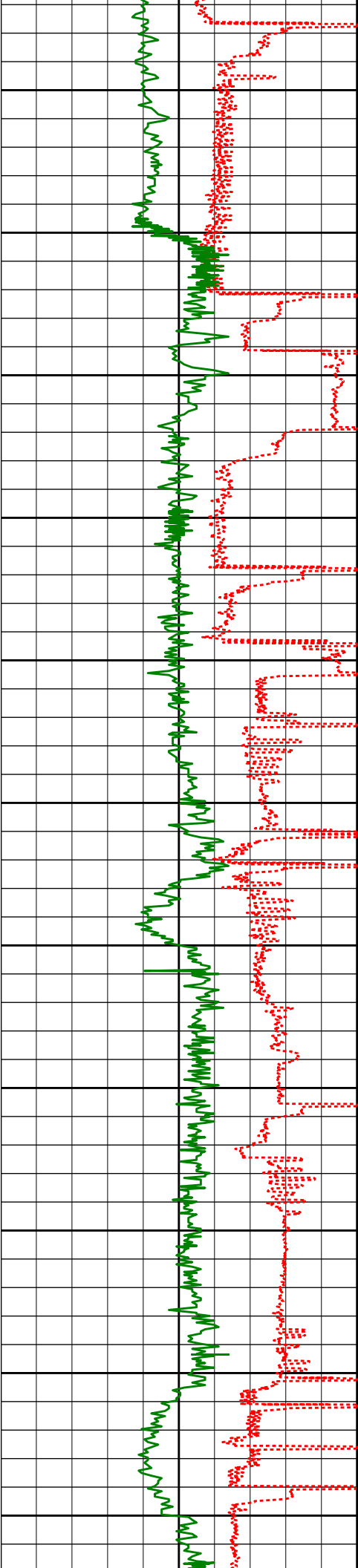
180.23°

5505.64'

3785.84'

ROPA

PGRC



9100'

9117'

88.89°

179.22°

5507.51'

3880.55'

9150'

9200'

9213'

89.85°

180.60°

5508.57'

3976.24'

9250'

9300'

9318'

90.59°

181.53°

5508.17'

4080.72'

9350'

9400'

9403'

90.96°

181.26°

5507.03'

4165.25'

9450'

9500'

9550'

9600'

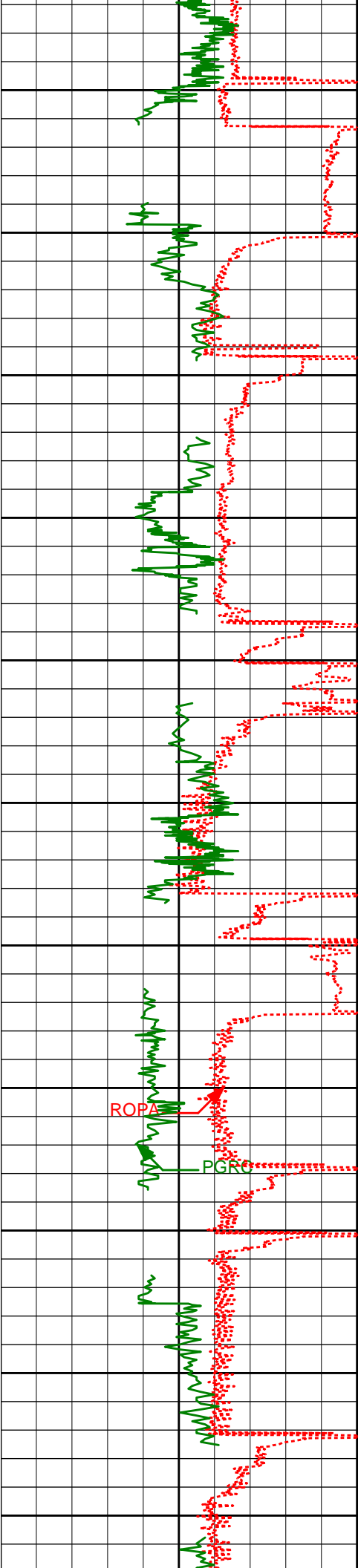
9593'

92.10°

182.07°

5501.97'

4354.04'



Run 300

9650'

9687'

89.38°

180.64°

5500.76'

4447.51'

9700'

9750'

9783'

88.55°

181.34°

5502.49'

4543.04'

9800'

9850'

9878'

89.08°

180.62°

5504.45'

4637.56'

9900'

9950'

9972'

90.12°

177.21°

5505.11'

4731.37'

10000'

10050'

10067'

90.65°

178.47°

5504.47'

4826.28'

10100'

10150'

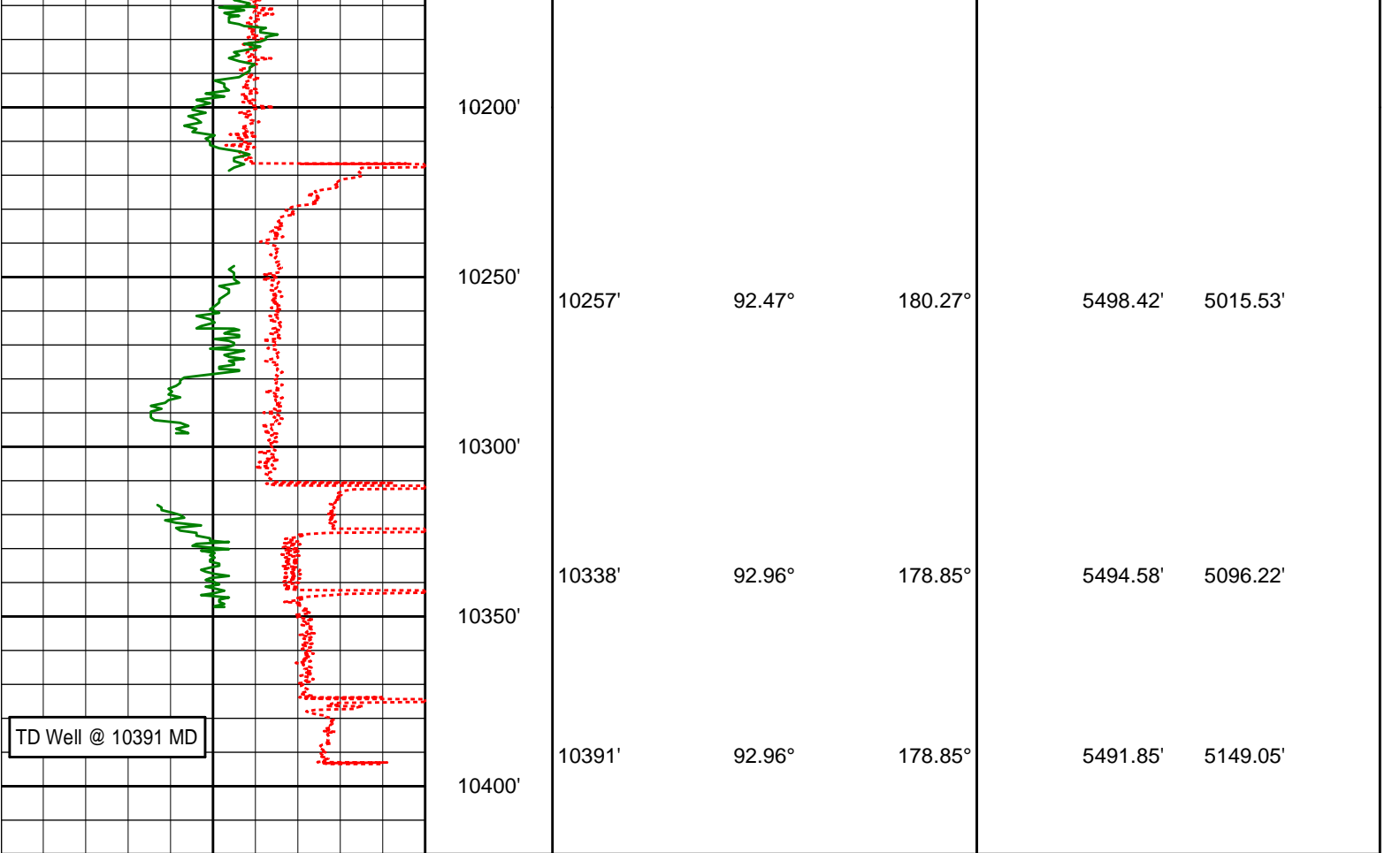
10162'

92.10°

180.74°

5502.20'

4920.98'



| | | | | | | |
|---|--------------------------------------|-------|-----|------|-----|------|
| PCG GR XHi-Range RT BCor PGRC 0200 api | True Vertical Depth (ft) 1:600 | Depth | Inc | Azi. | TVD | V.S. |
| | | | | | | |

| | |
|---|--|
| Average Rate of Penetration ROPA 1K0 feet per hr | |
| | |

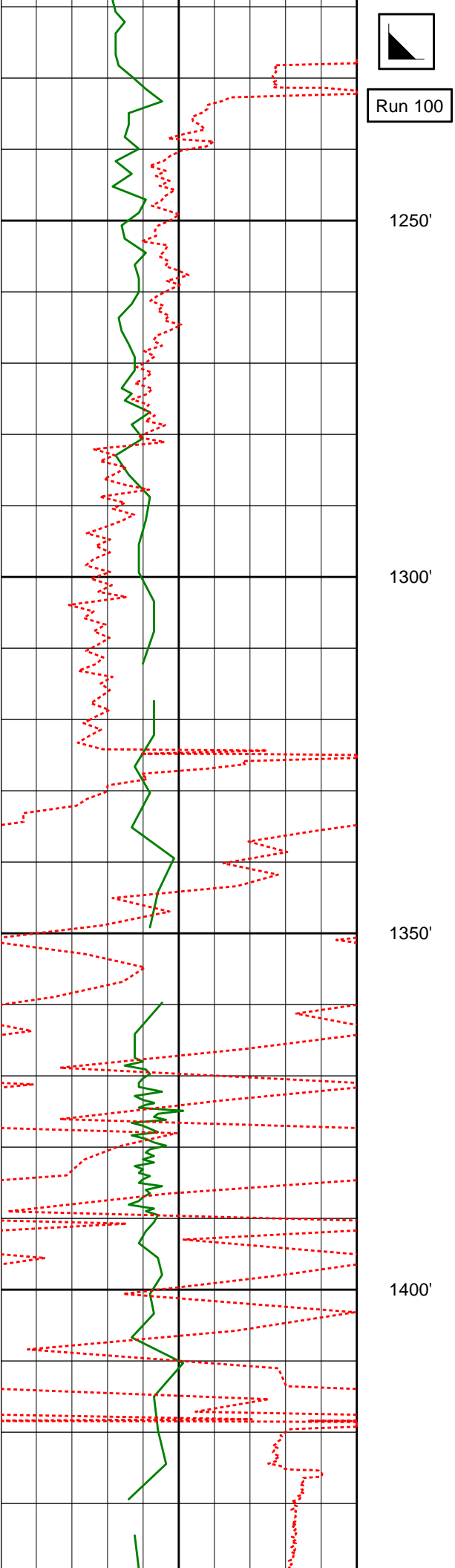
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MD Main Log 1:240

| | | | |
|---|--|--|--|
| Average Rate of Penetration ROPA 1K0 feet per hr | | | |
| | | | |

| | | | | | | |
|---|---------------------------------|-------|-----|------|-----|------|
| PCG Gamma Ray BCor PGRC 0200 api | Measured Depth (ft) 1:240 | Depth | Inc | Azi. | TVD | V.S. |
| | | | | | | |





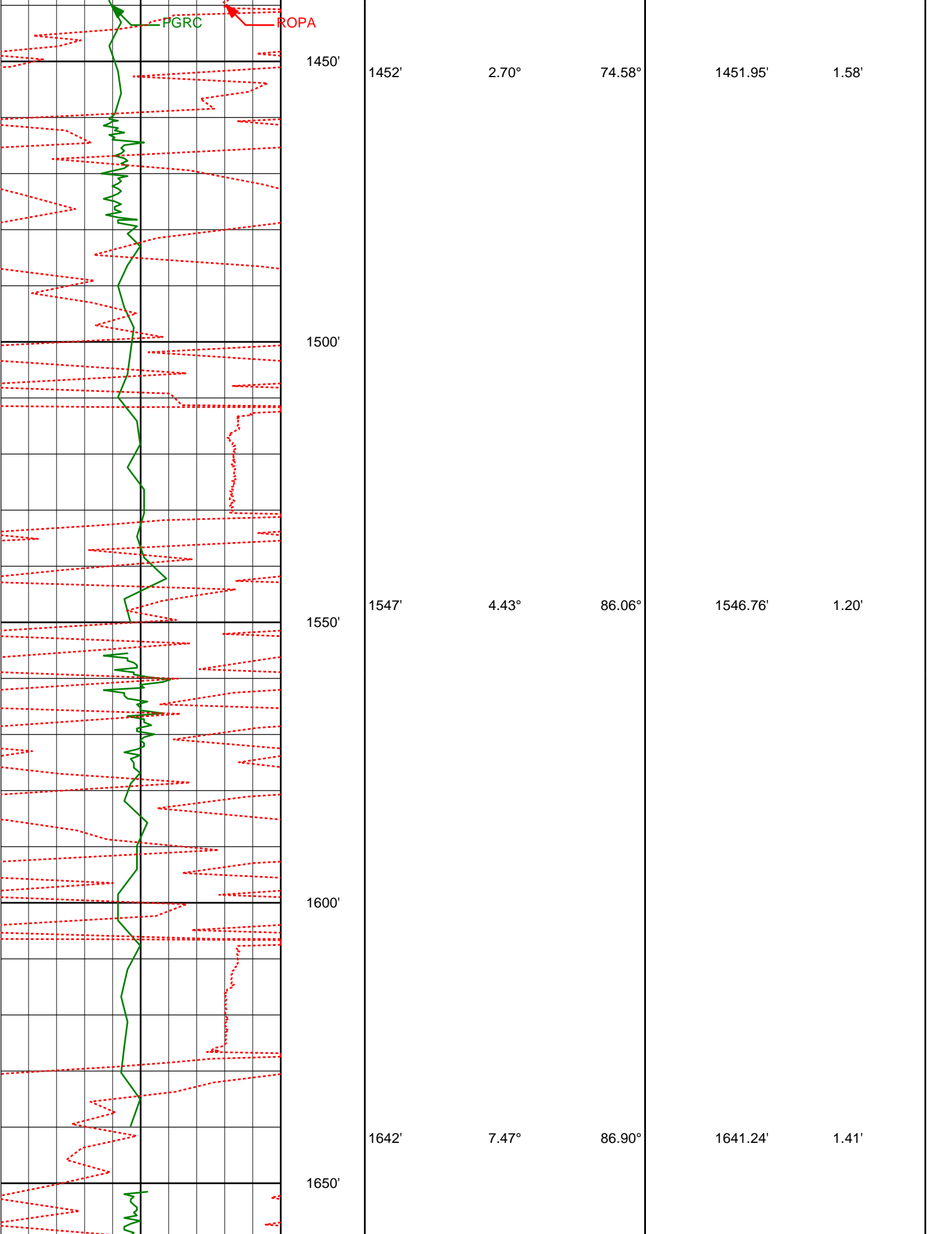
1360'

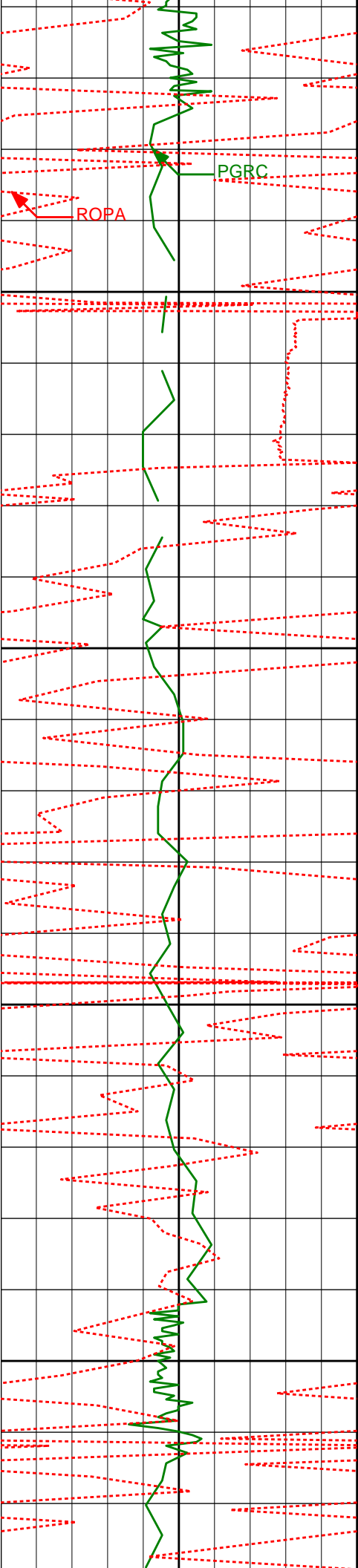
0.54°

288.02°

1359.97'

2.15'





1700'

1738'

11.42°

85.92°

1735.92'

1.66'

1750'

1800'

1833'

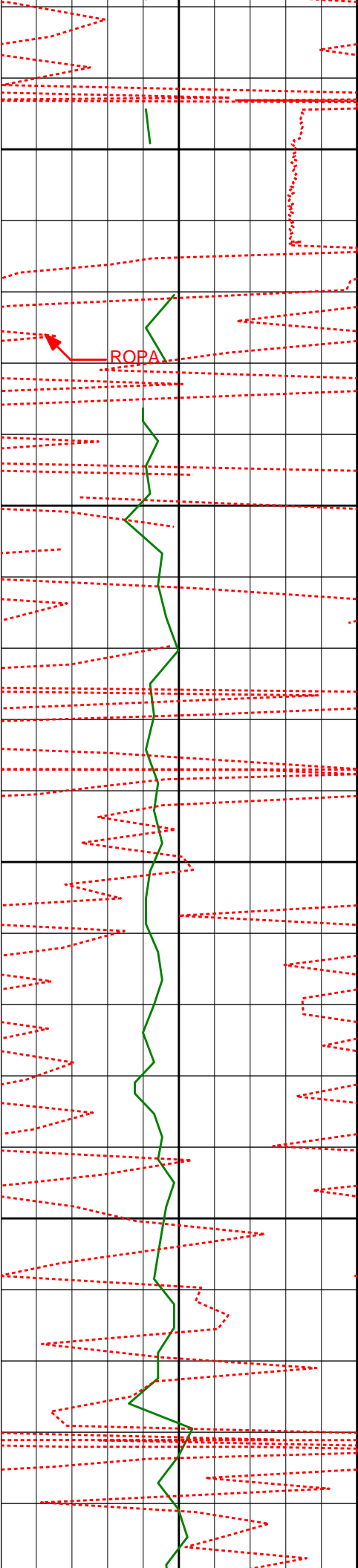
10.15°

78.64°

1829.24'

0.77'

1850'



1900'

1928'

12.39°

89.59°

1922.41'

0.53'

1950'

2000'

2023'

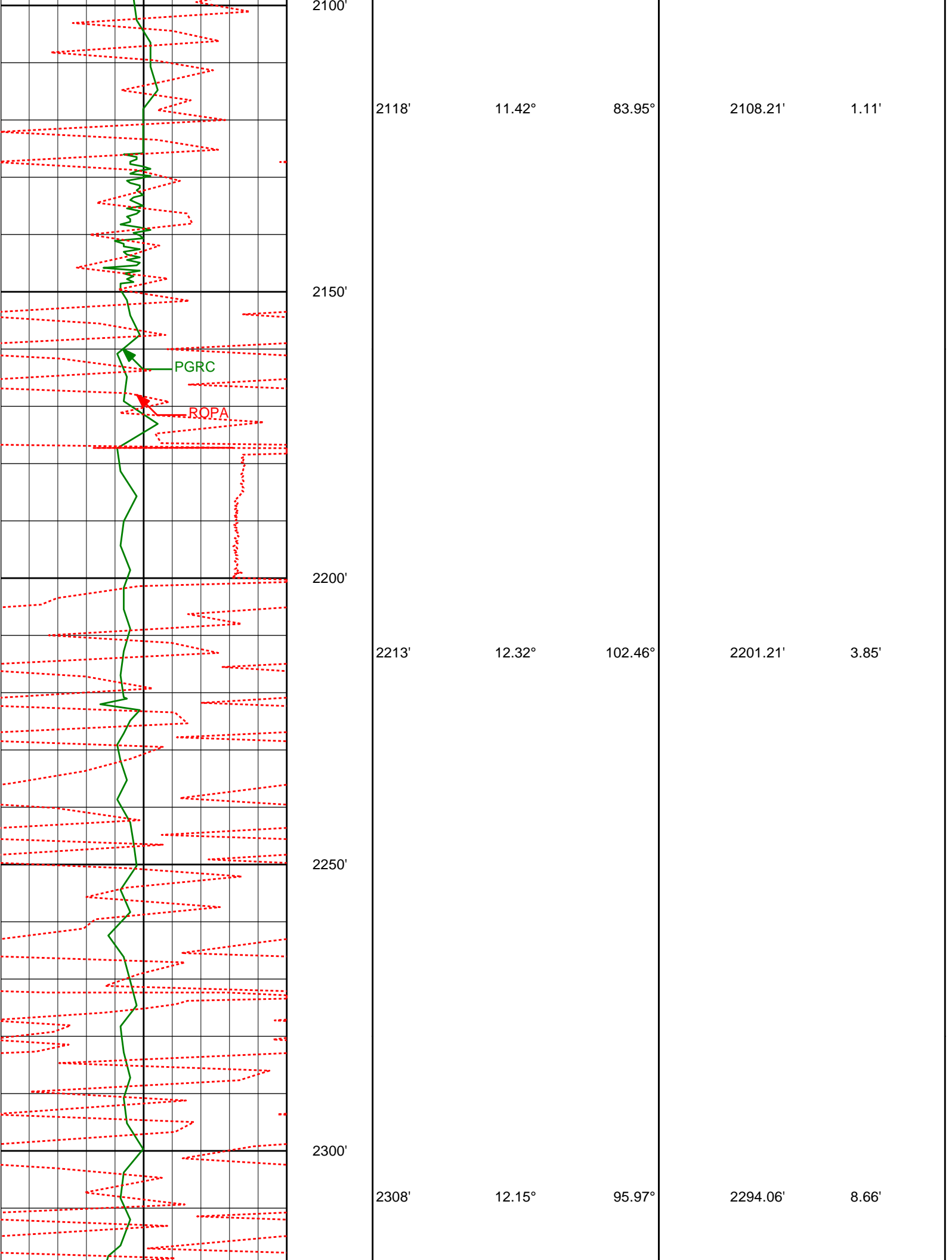
12.25°

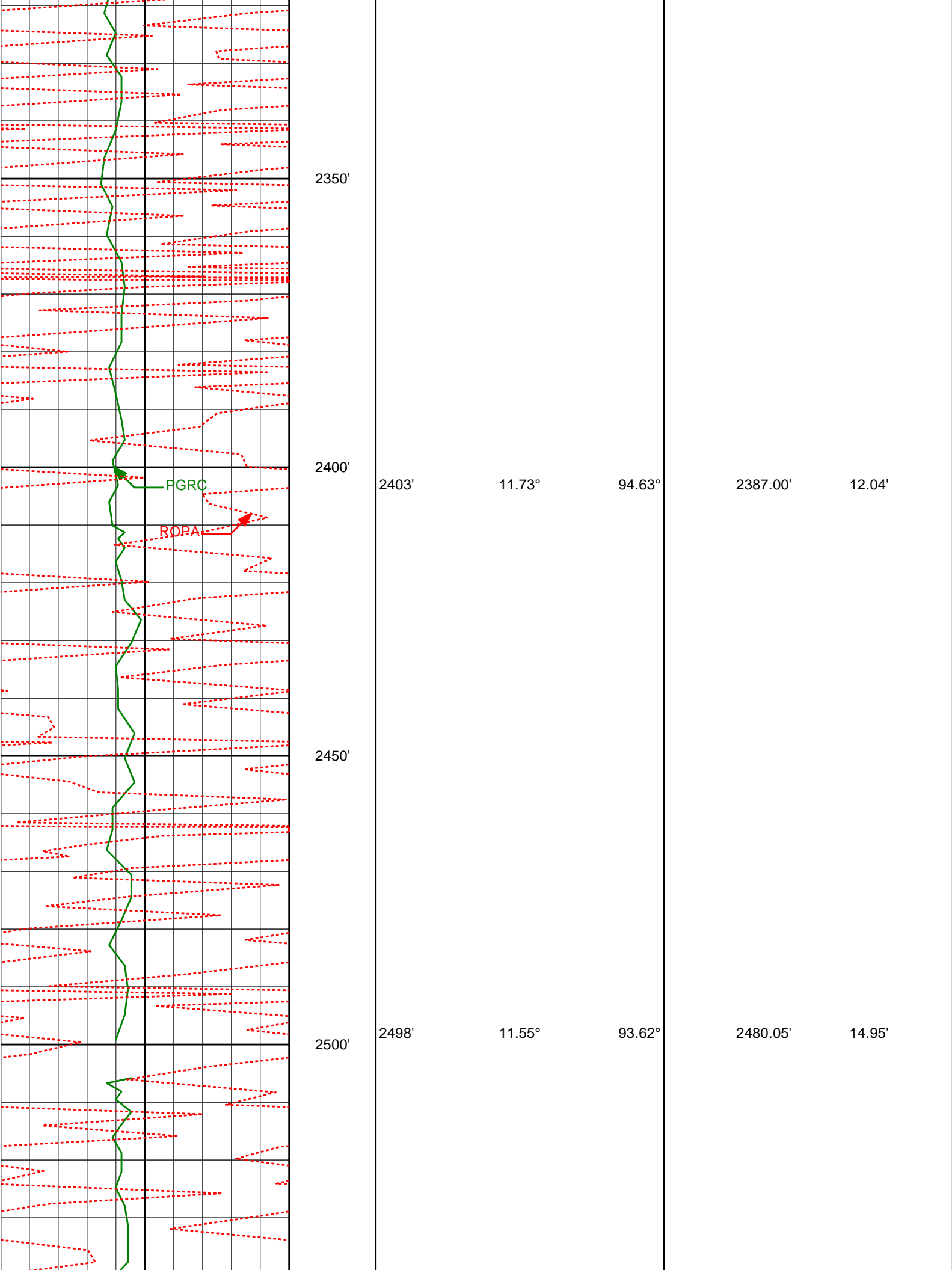
85.59°

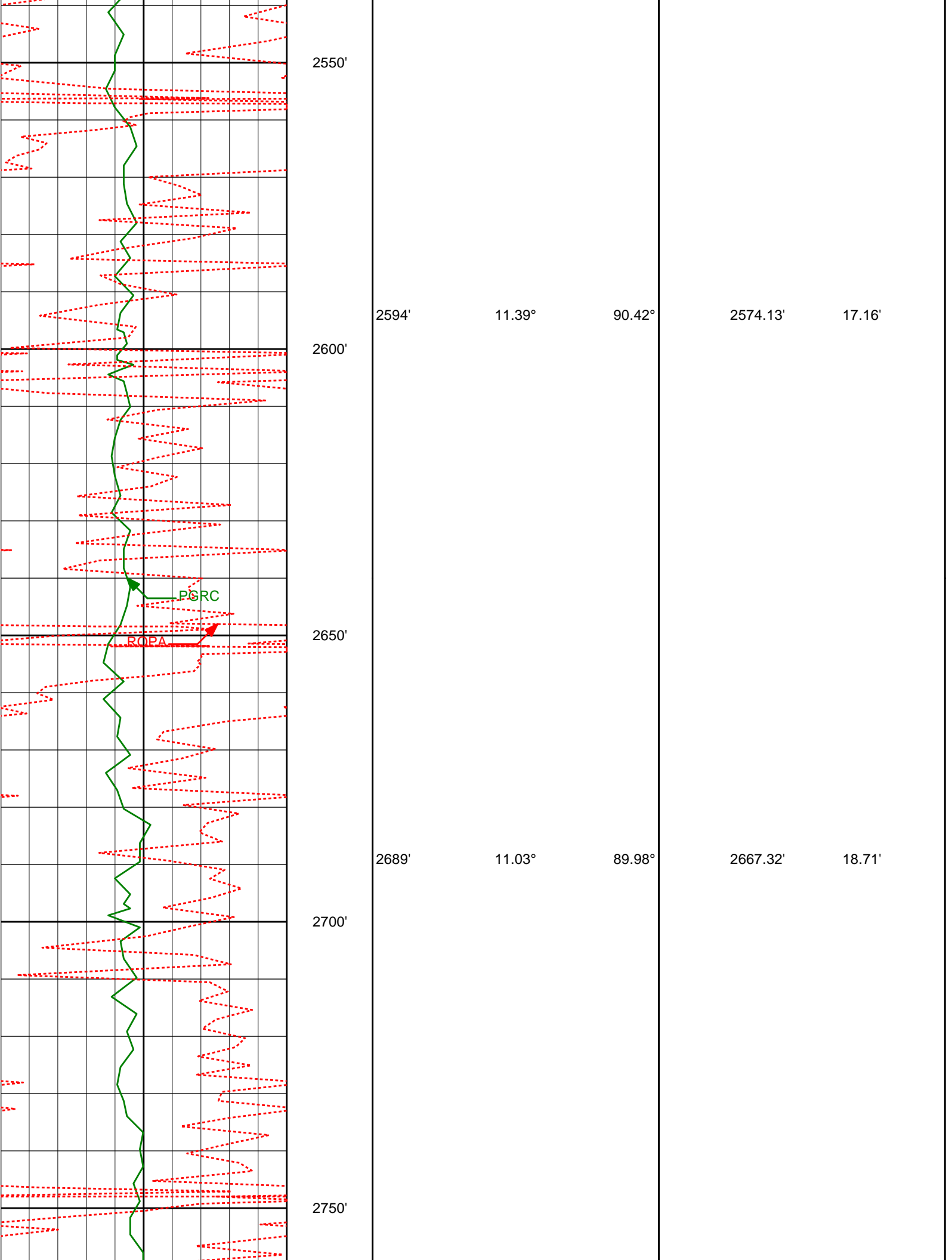
2015.23'

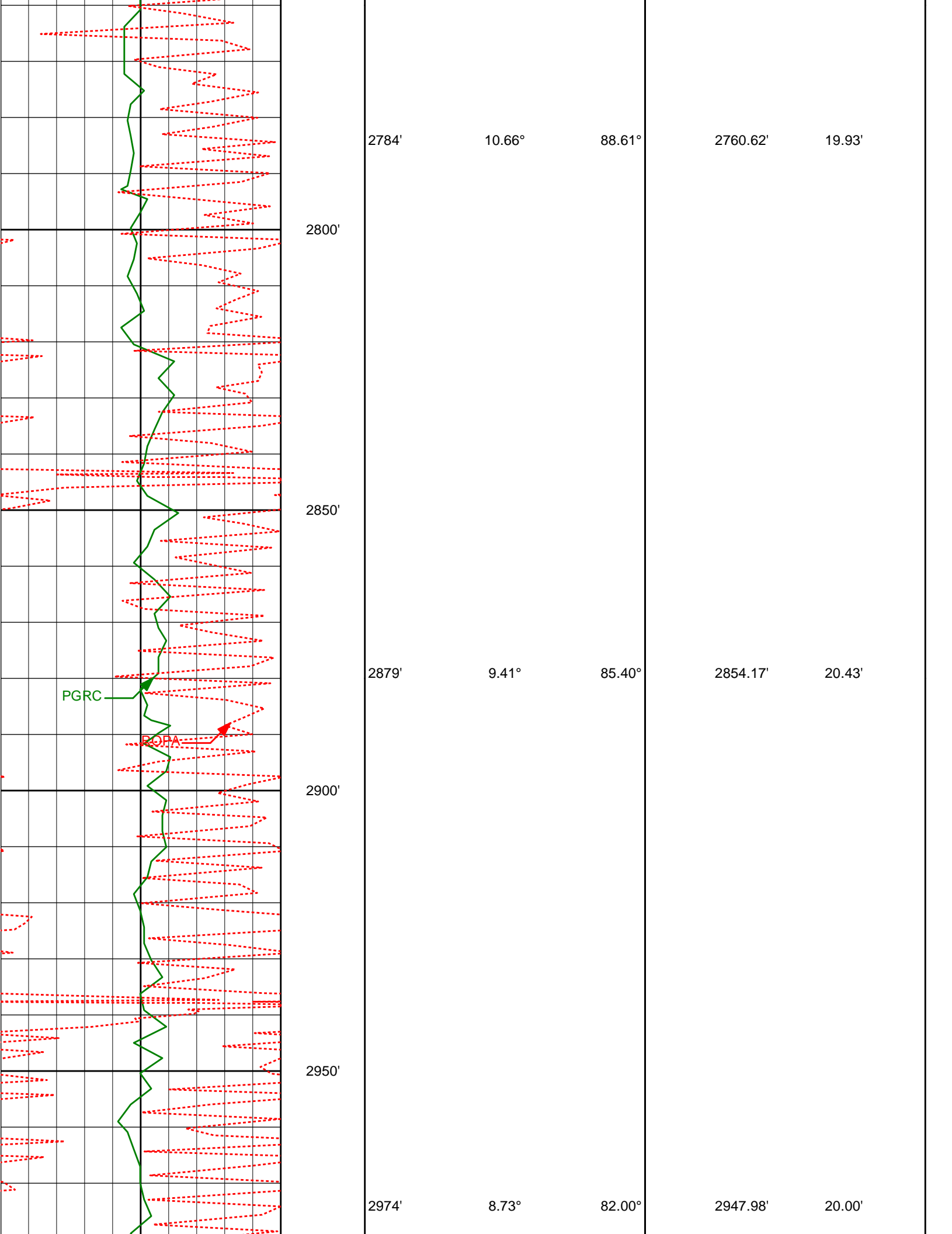
1.31'

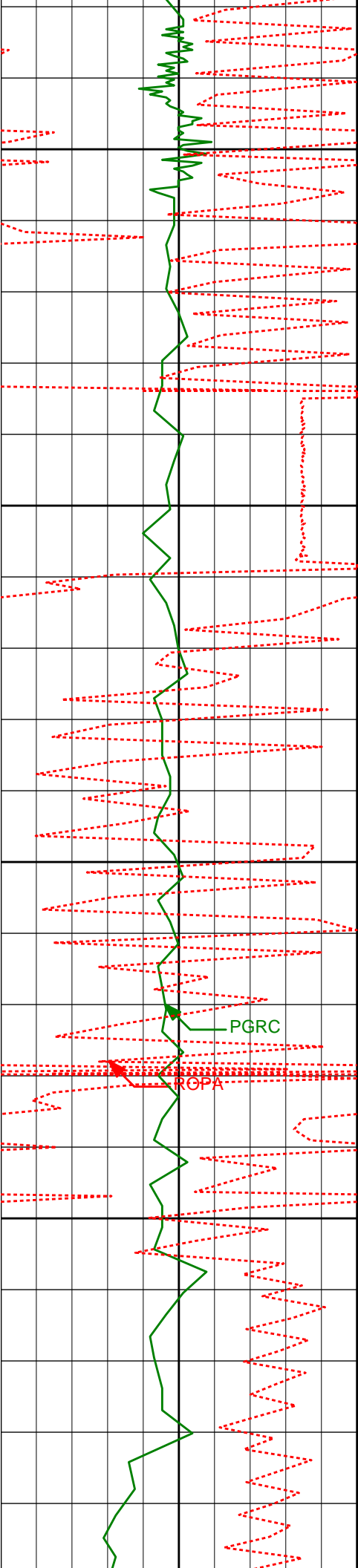
2050'











3000'

3050'

3069'

10.73°

98.15°

3041.63'

21.53'

3100'

PGRC

ROPA

3150'

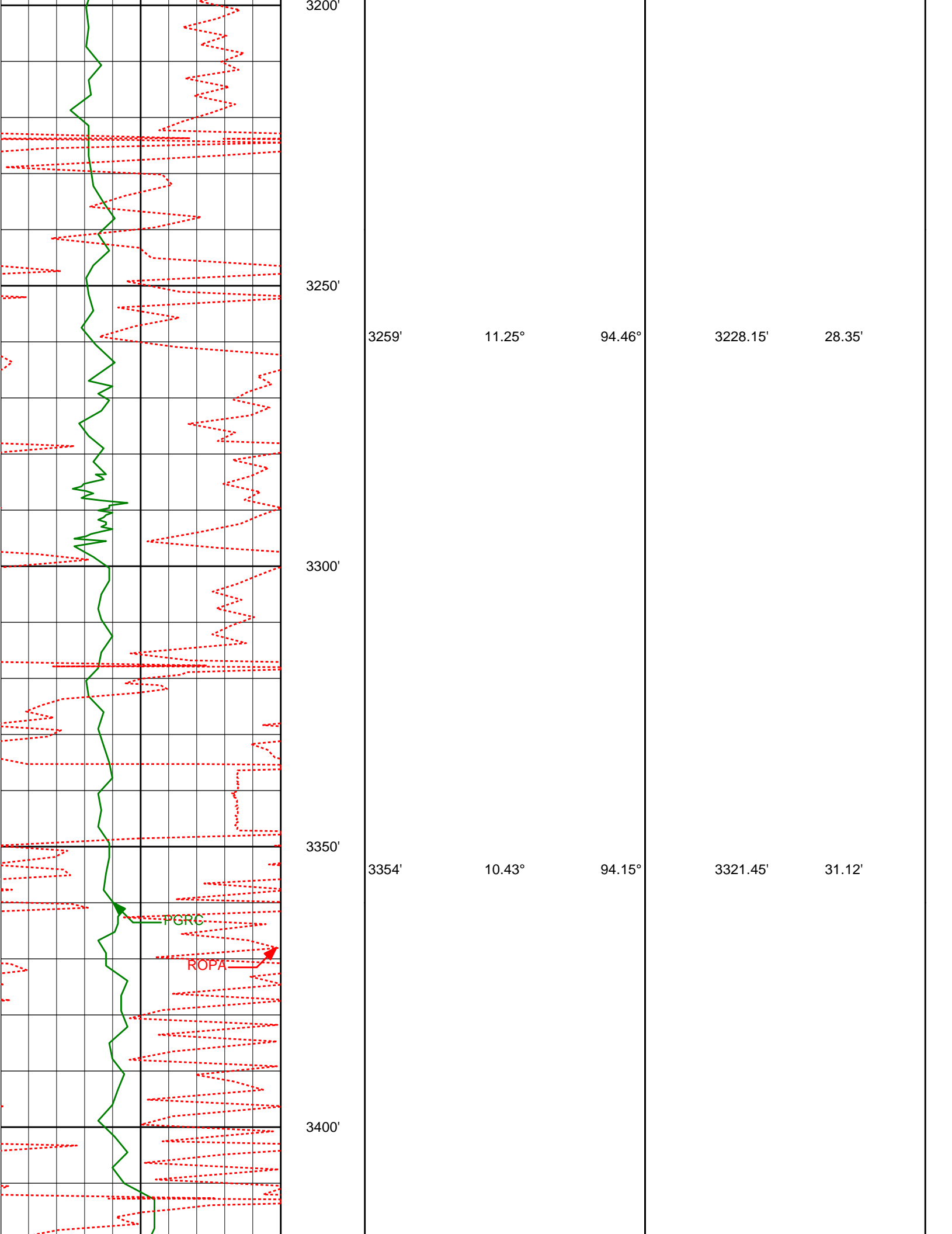
3164'

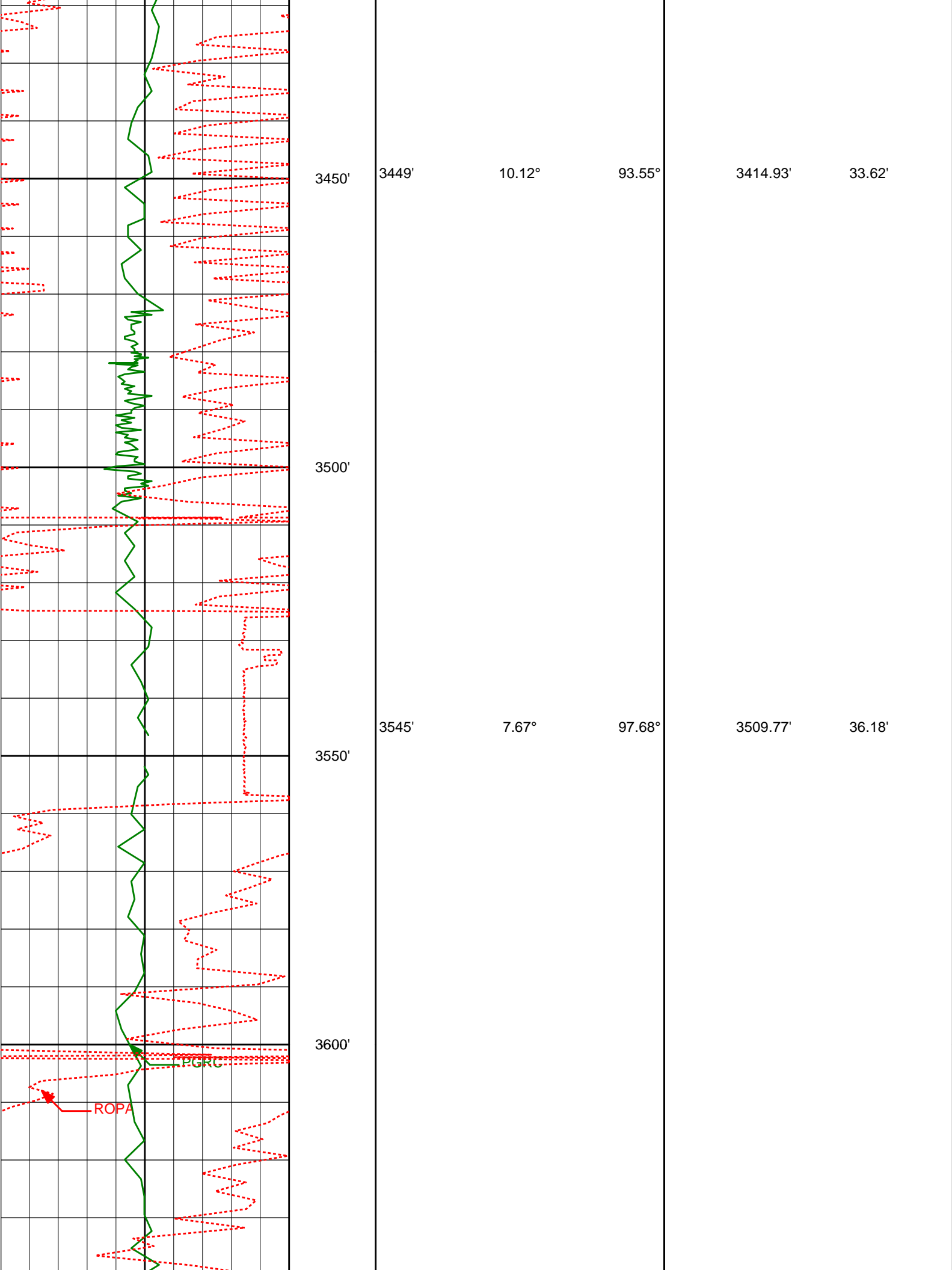
10.97°

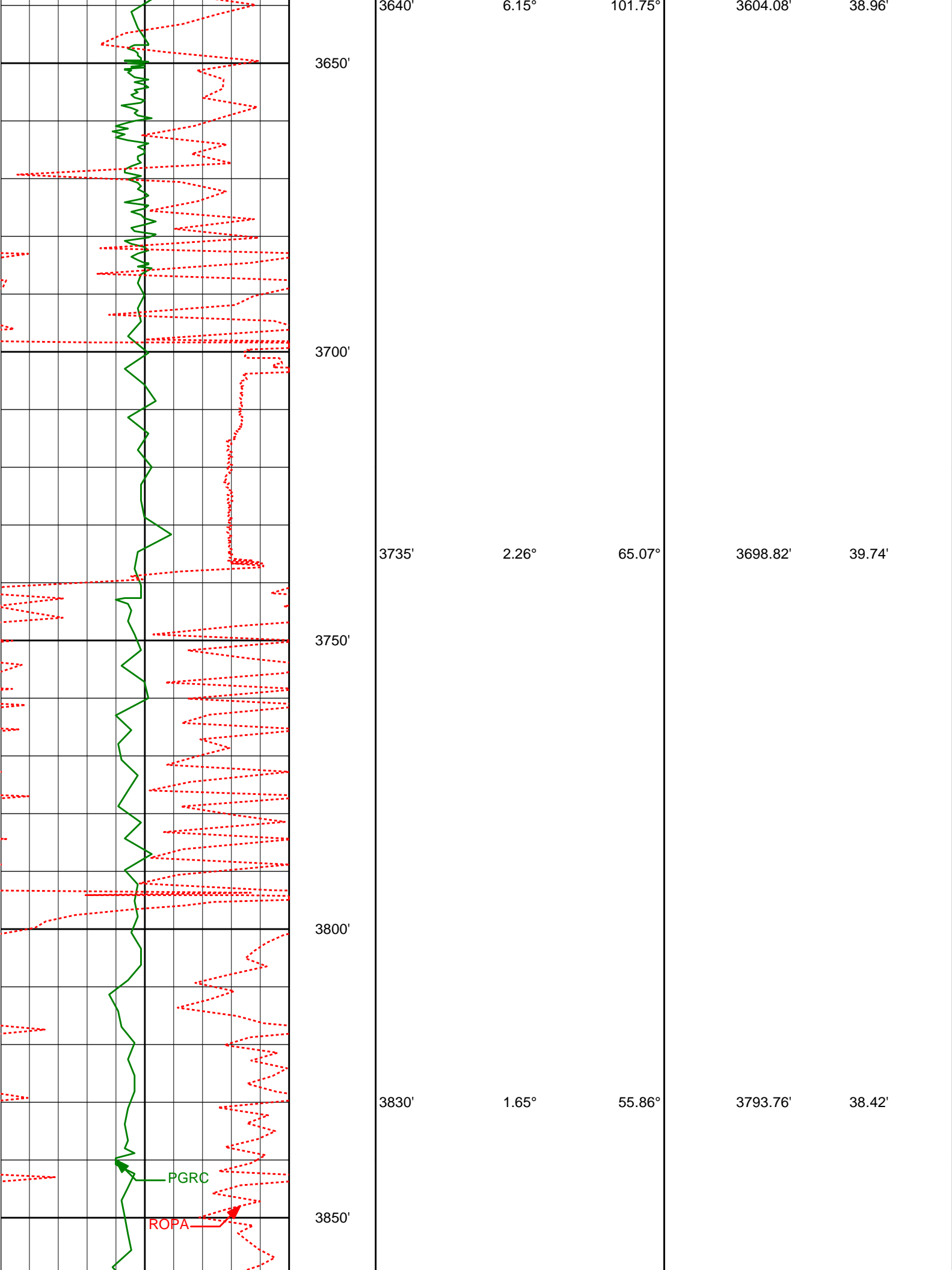
96.26°

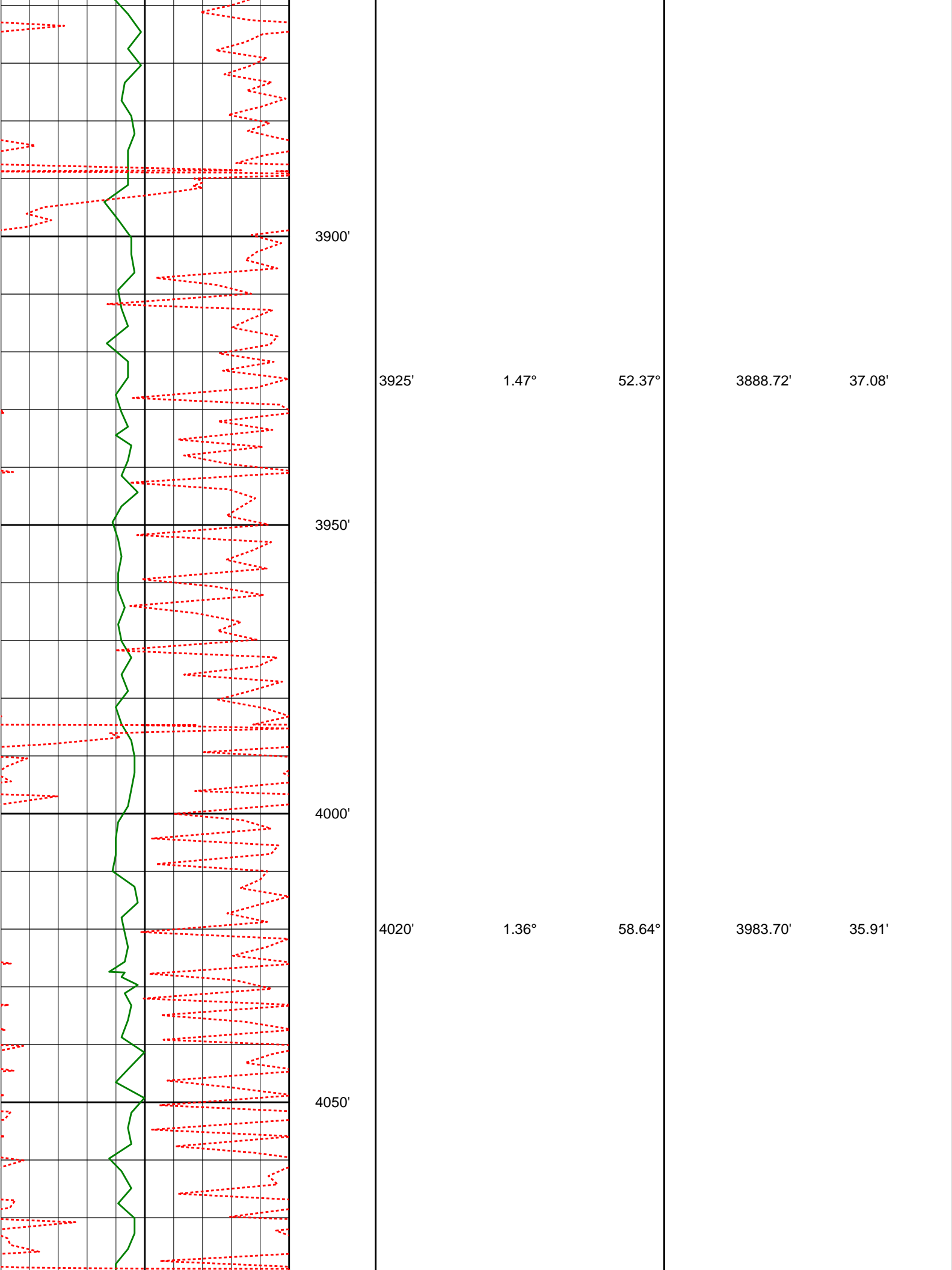
3134.93'

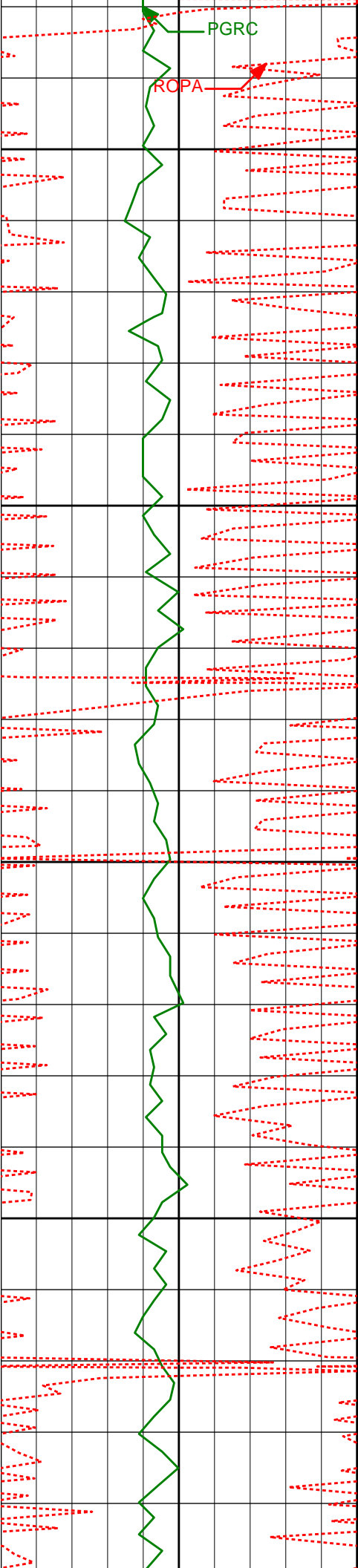
25.19'











4100'

4115'

1.03°

66.68°

4078.68'

35.13'

4150'

4200'

4210'

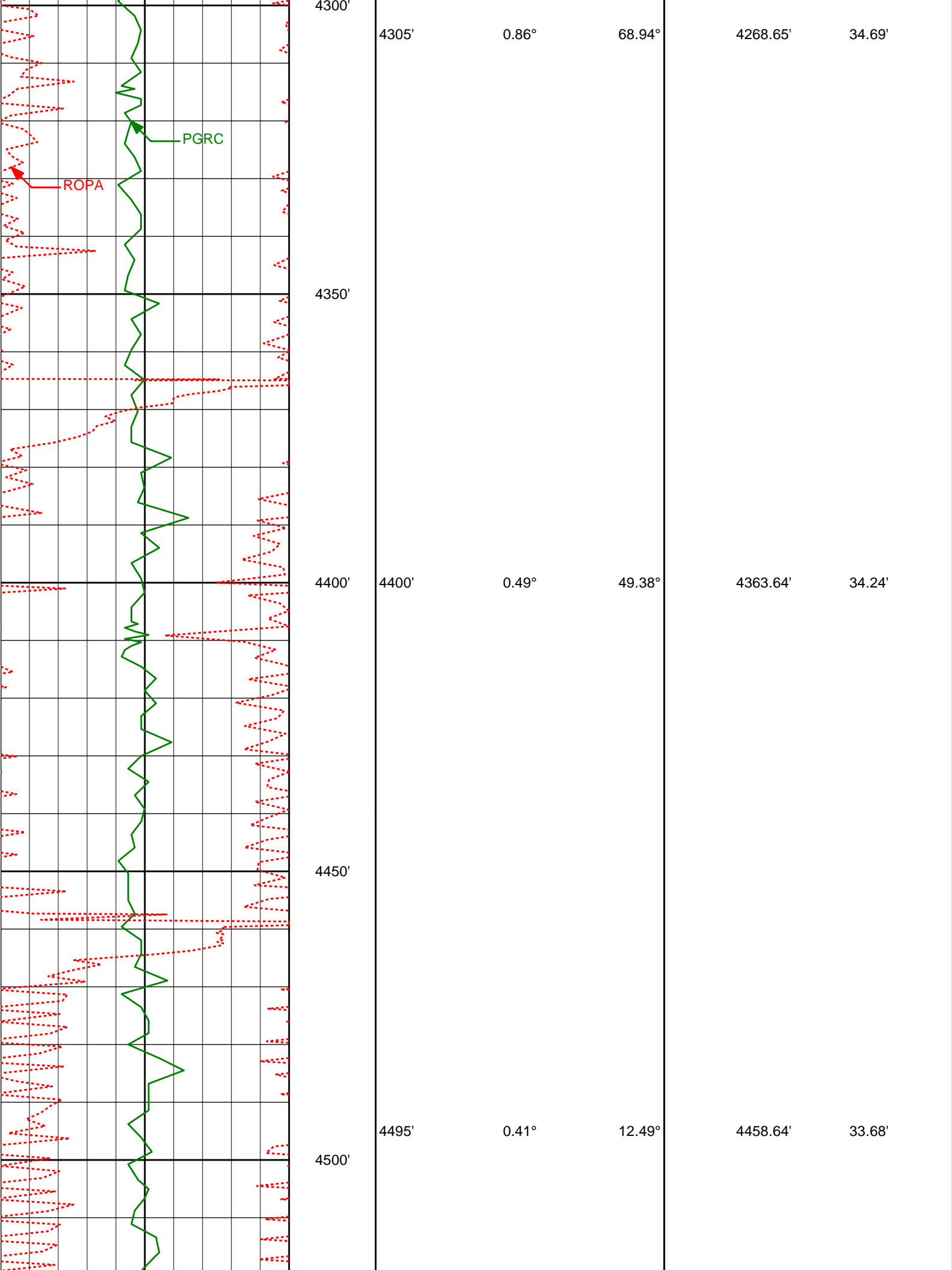
0.97°

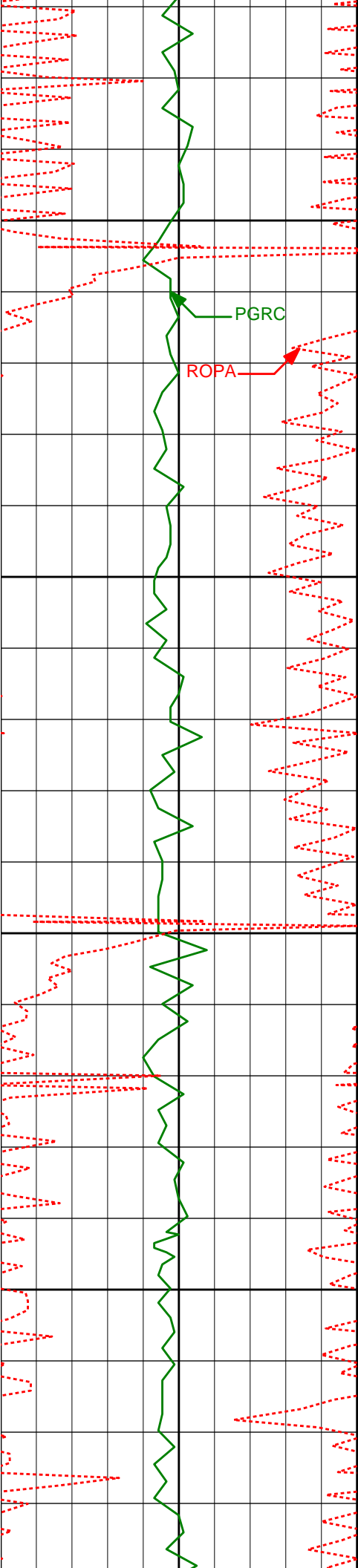
86.61°

4173.66'

34.87'

4250'





4550'

PGRC

ROPA

4590'

0.57°

345.07°

4553.64'

32.90'

4600'

4650'

4685'

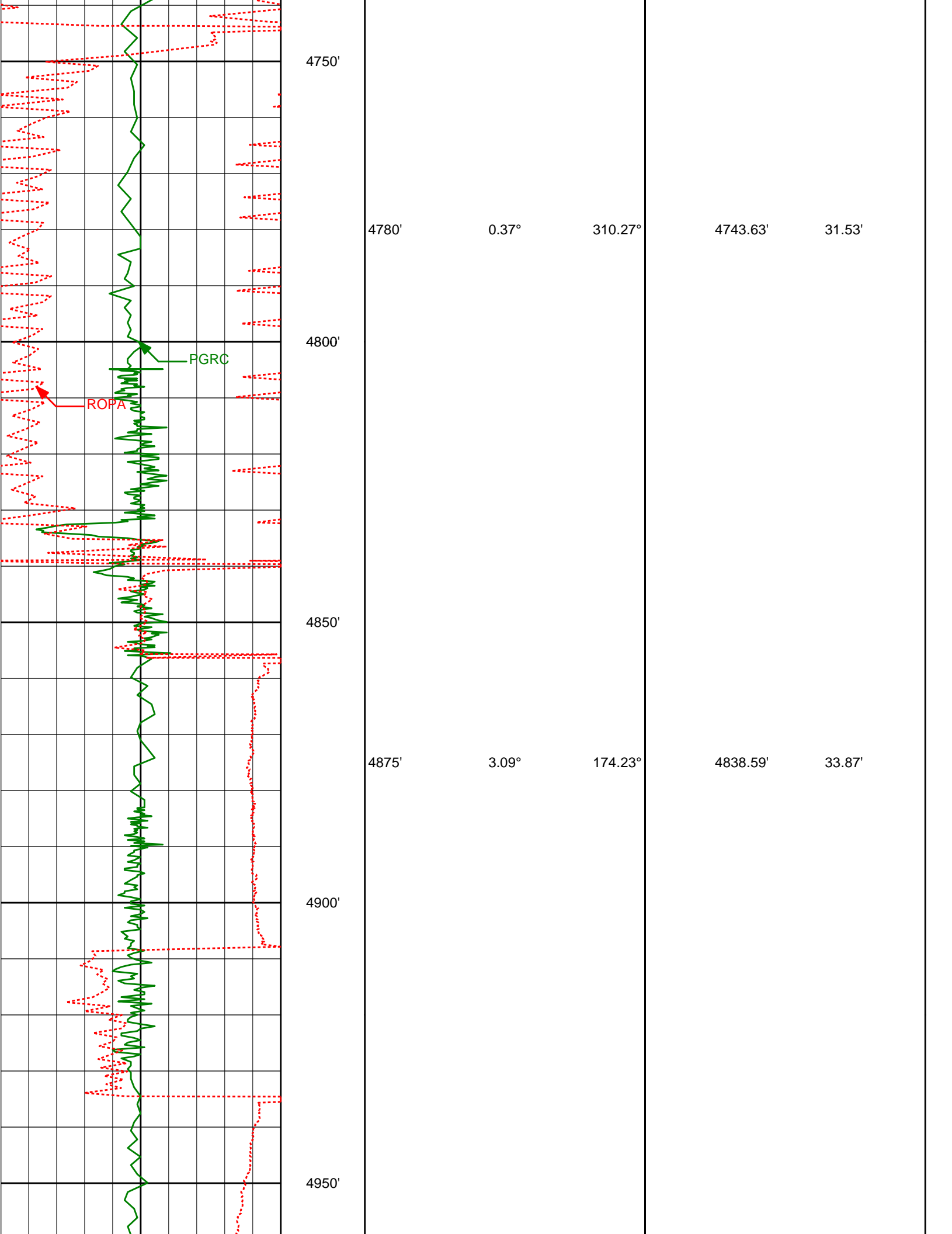
0.47°

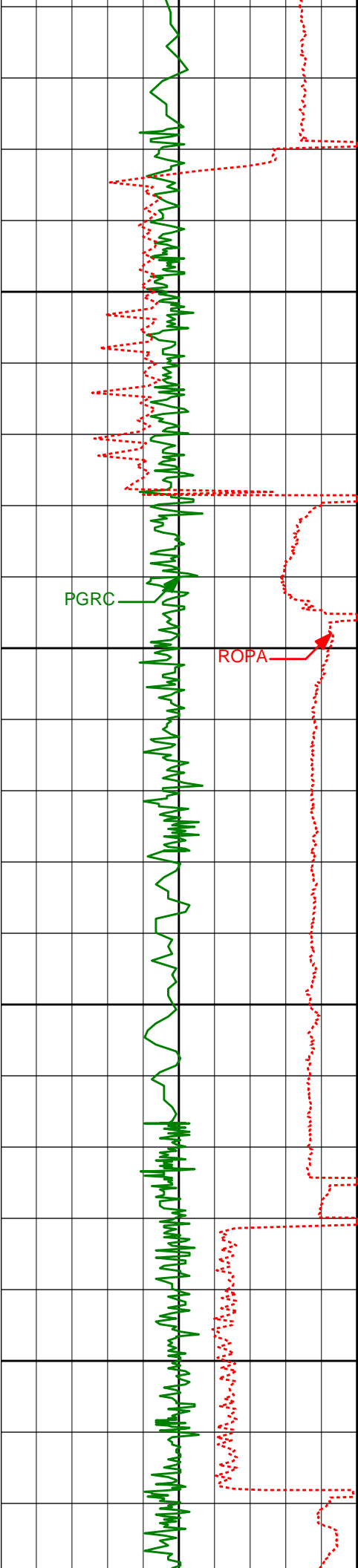
328.72°

4648.63'

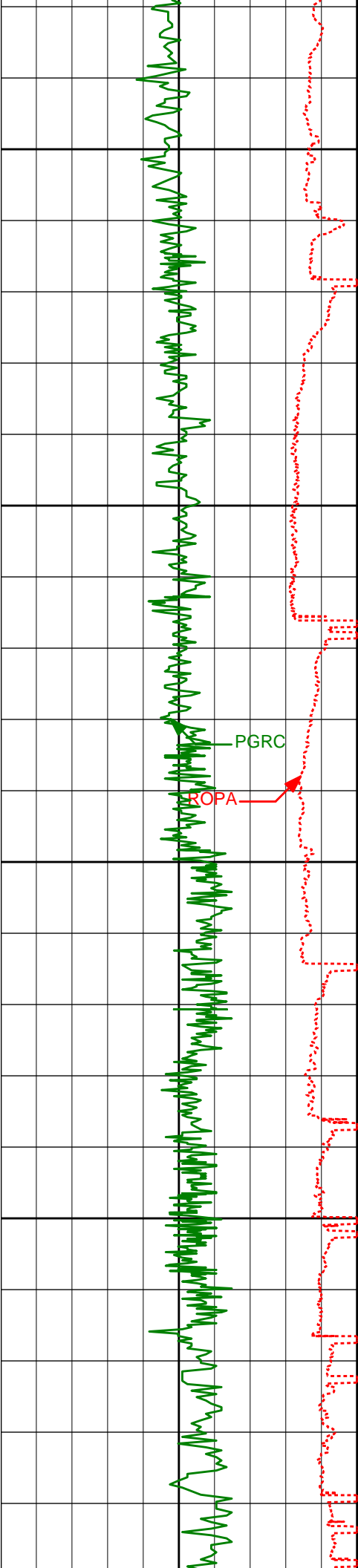
32.09'

4700'





| | | | | |
|-------|--------|---------|----------|--------|
| 4971' | 9.30° | 173.62° | 4933.98' | 44.23' |
| 5000' | | | | |
| 5050' | | | | |
| 5066' | 12.40° | 179.27° | 5027.27' | 62.09' |
| 5100' | | | | |
| 5114' | 17.30° | 179.58° | 5073.66' | 74.35' |
| 5150' | | | | |
| 5161' | 22.01° | 180.86° | 5117.90' | 90.10' |



5200'

5209'

25.88°

180.36°

5161.76'

109.50'

5250'

5256'

30.94°

178.46°

5203.09'

131.80'

5300'

5350'

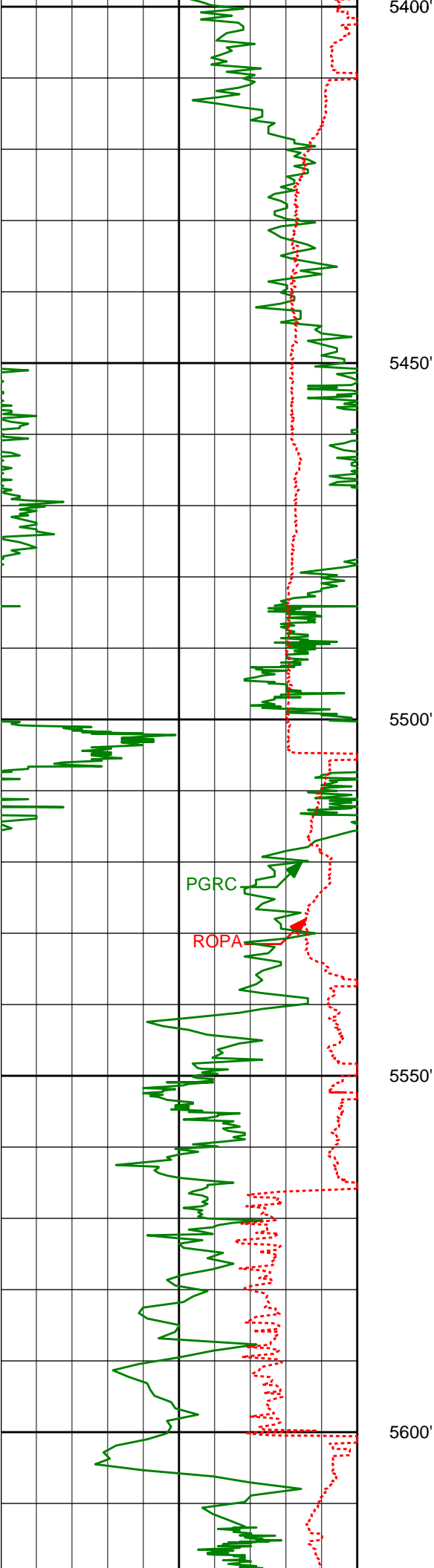
5351'

41.21°

178.21°

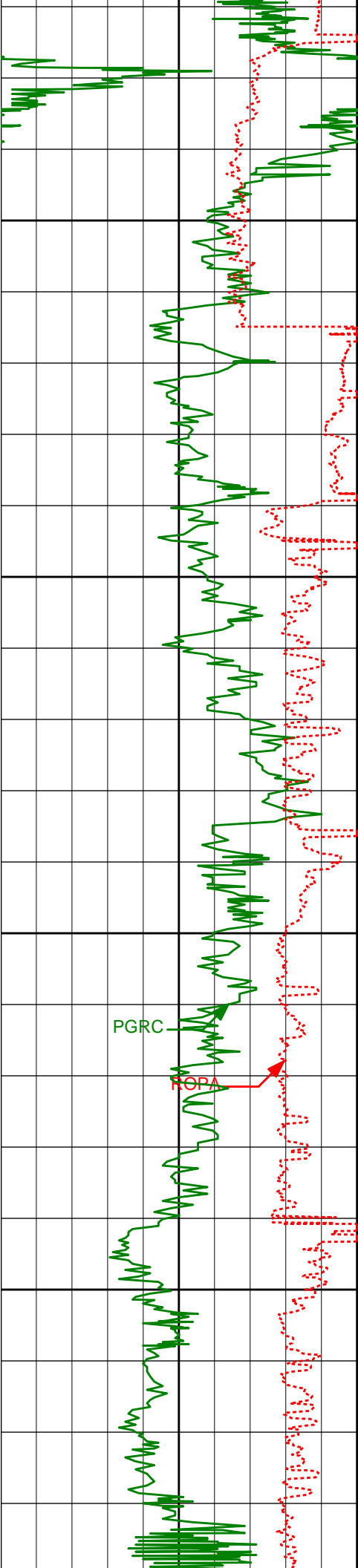
5279.77'

187.59'

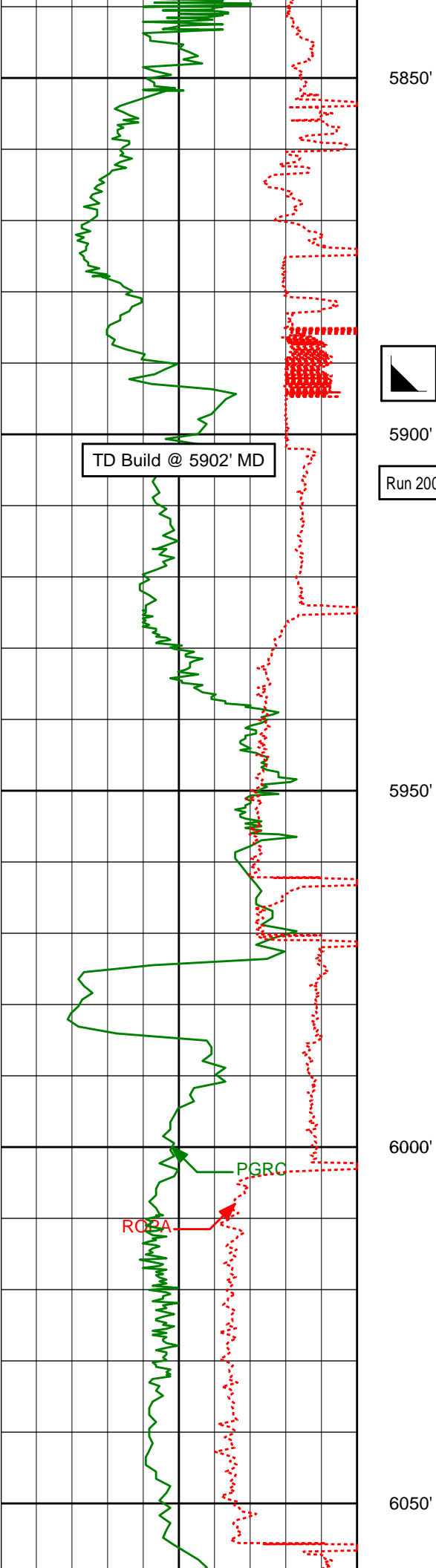


5447' 51.48° 178.41° 5345.96' 256.86'

5542' 62.79° 177.92° 5397.43' 336.43'



| | | | | |
|-------|--------|---------|----------|---------|
| 5637' | 66.51° | 176.06° | 5438.10' | 422.23' |
| 5650' | | | | |
| 5700' | | | | |
| 5732' | 72.90° | 176.84° | 5471.03' | 511.27' |
| 5750' | | | | |
| 5800' | | | | |
| 5827' | 82.53° | 183.83° | 5491.24' | 603.57' |



5844'

84.48°

185.26°

5493.17'

620.24'

5850'

5900'

5950'

6000'

6050'

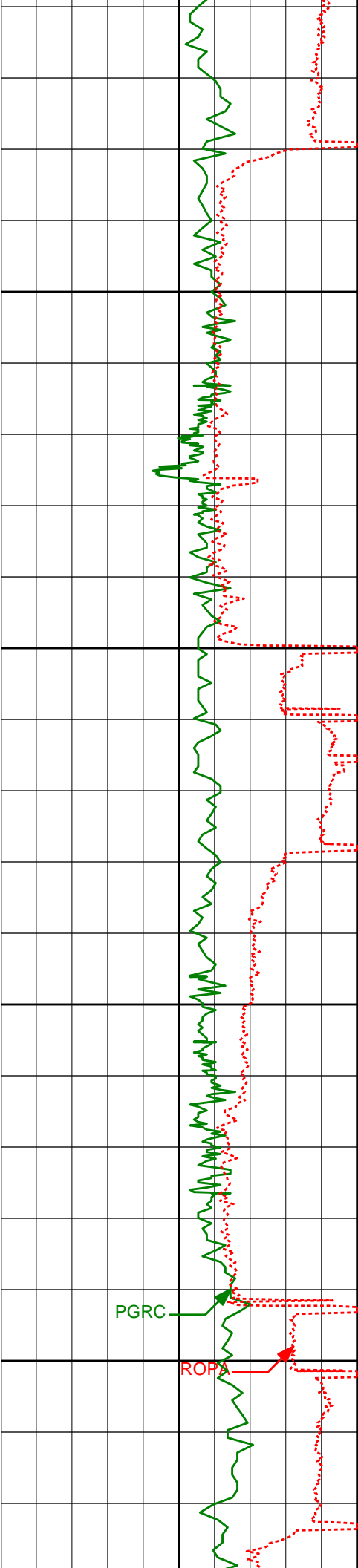
6002'

88.12°

182.93°

5503.36'

776.06'



6100'

6150'

6200'

6250'

6095'

89.48°

178.63°

5505.31'

868.61'

6187'

88.24°

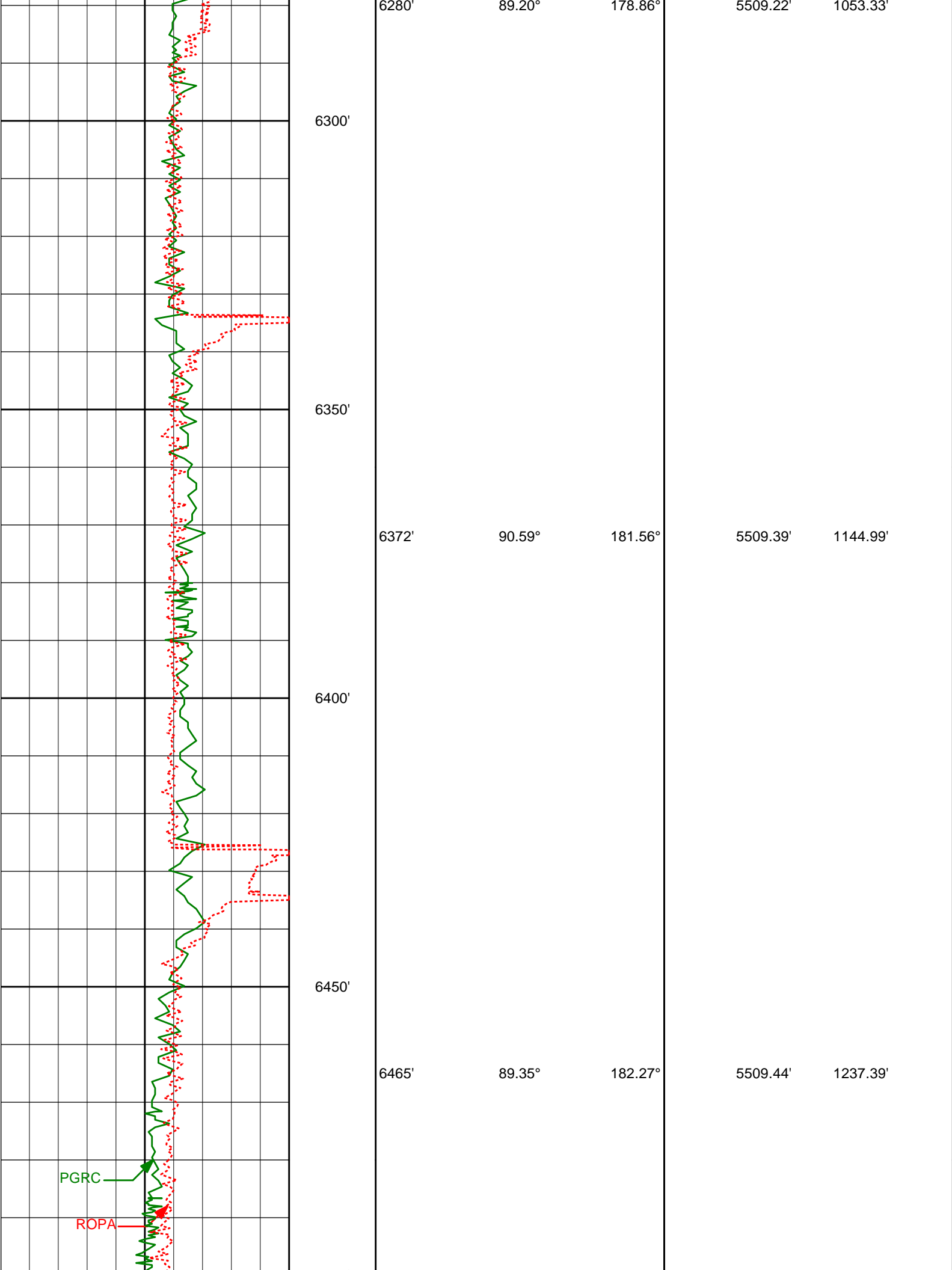
177.78°

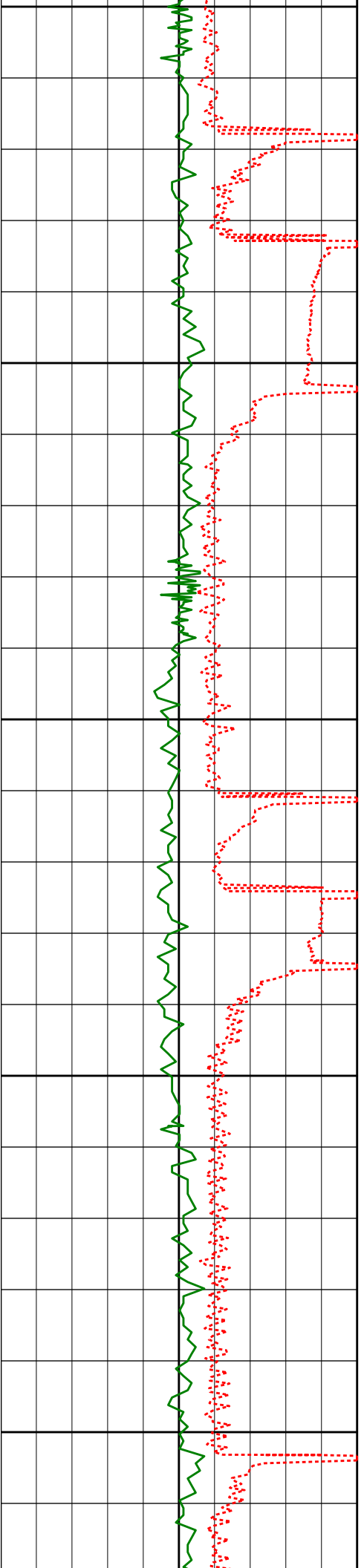
5507.14'

960.47'

PGRC

ROPA





6500'

6550'

6600'

6650'

6700'

6557'

89.85°

180.75°

5510.08'

1328.86'

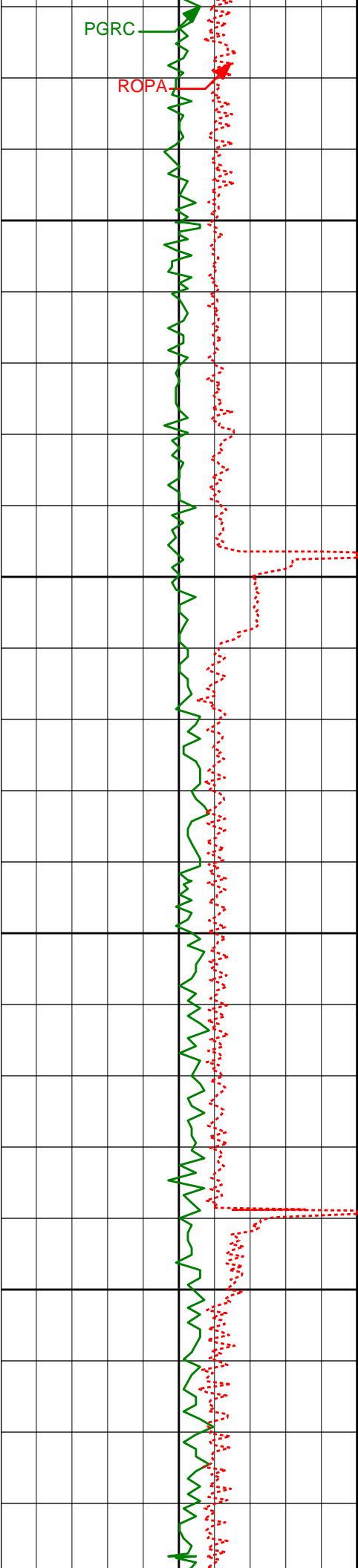
6650'

91.48°

180.50°

5509.01'

1421.46'



6743'

91.20°

179.97°

5506.83'

1514.10'

6835'

91.11°

179.11°

5504.98'

1605.84'

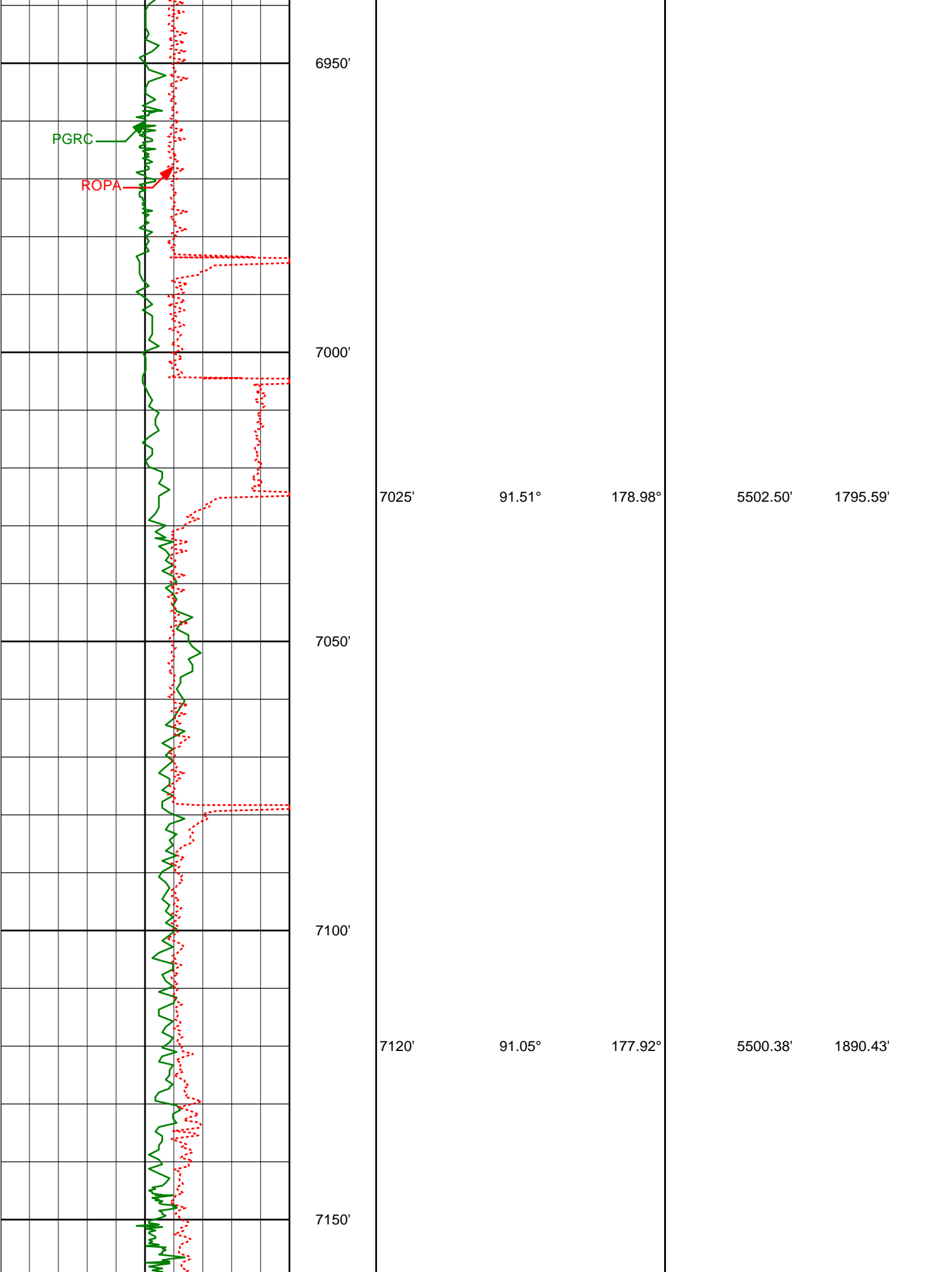
6930'

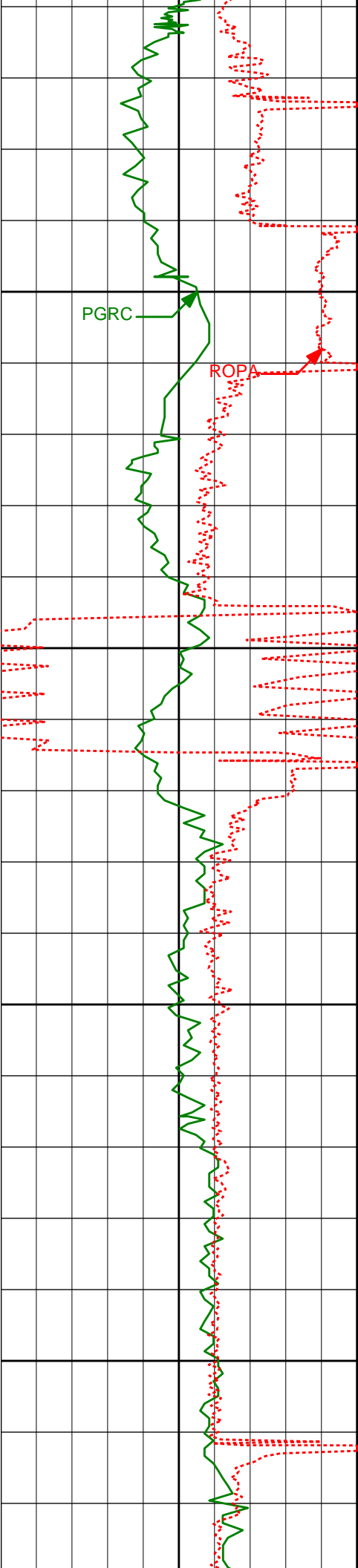
90.18°

177.28°

5503.90'

1700.71'





7200'

PGRC

ROPA

7250'

7300'

7350'

7215'

90.68°

179.41°

5498.95'

1985.26'

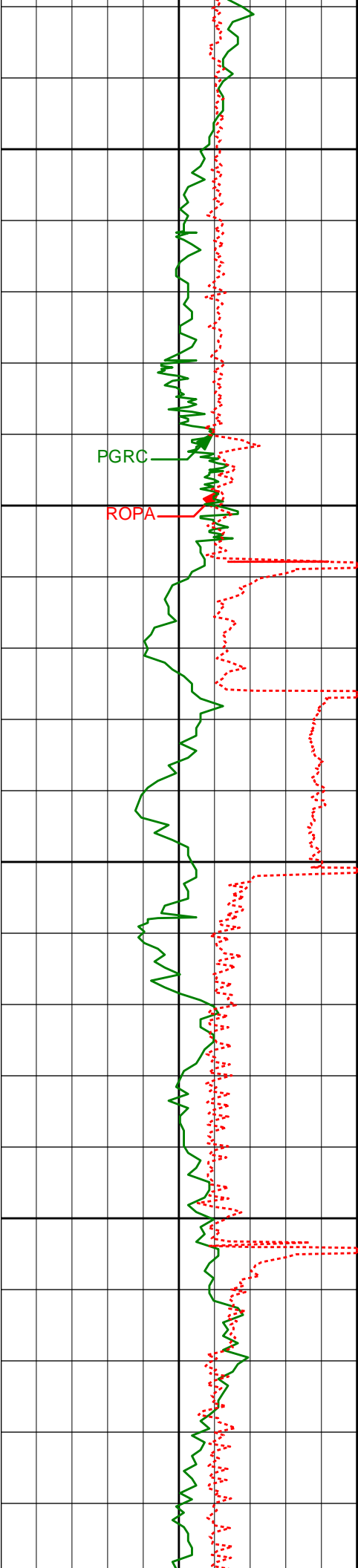
7311'

89.66°

179.39°

5498.66'

2081.02'



7400'

7406'

88.64°

178.06°

5500.07'

2175.85'

PGRC

ROPA

7450'

7500'

7501'

89.11°

180.25°

5501.94'

2270.62'

7550'

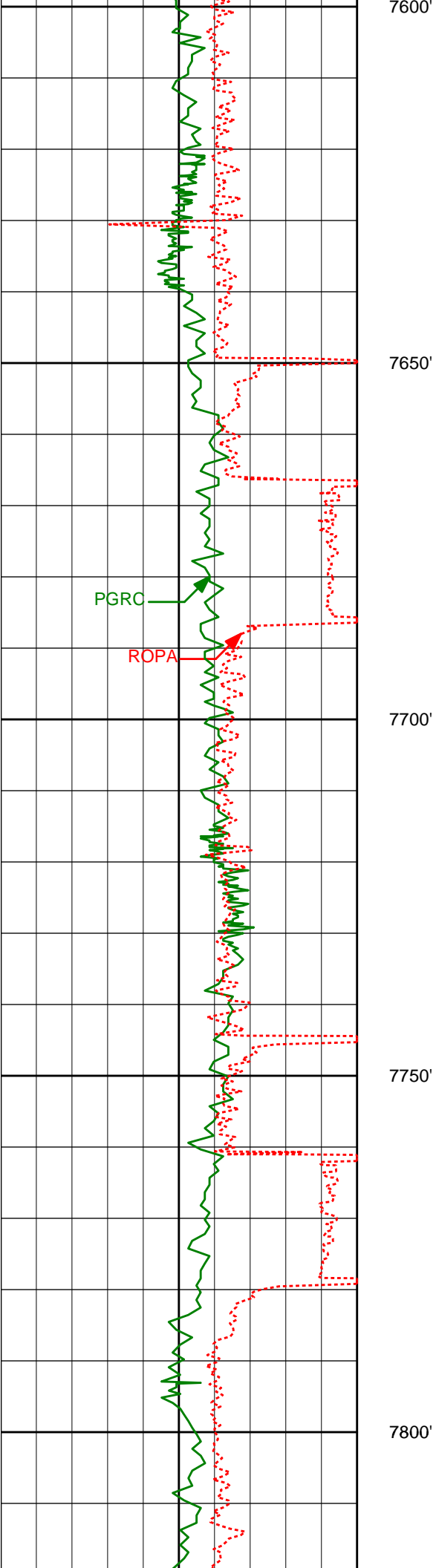
7596'

87.78°

180.21°

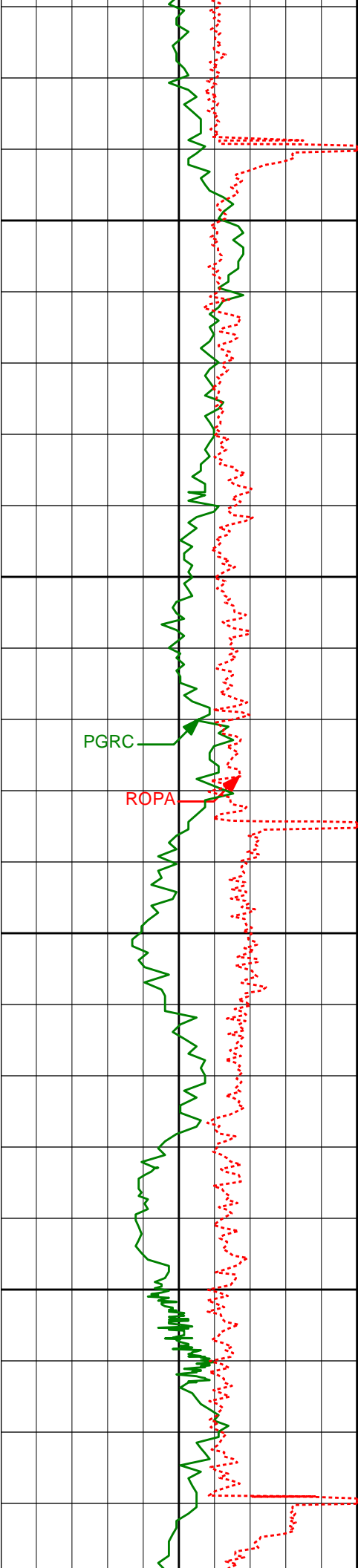
5504.52'

2365.24'



| | | | | |
|-------|--------|---------|----------|----------|
| 7691' | 89.57° | 180.68° | 5506.71' | 2459.85' |
|-------|--------|---------|----------|----------|

| | | | | |
|-------|--------|---------|----------|----------|
| 7786' | 92.59° | 181.26° | 5504.93' | 2554.37' |
|-------|--------|---------|----------|----------|



7850'

7881'

92.34°

180.12°

5500.84'

2648.87'

7900'

PGRC

ROPA

7950'

7976'

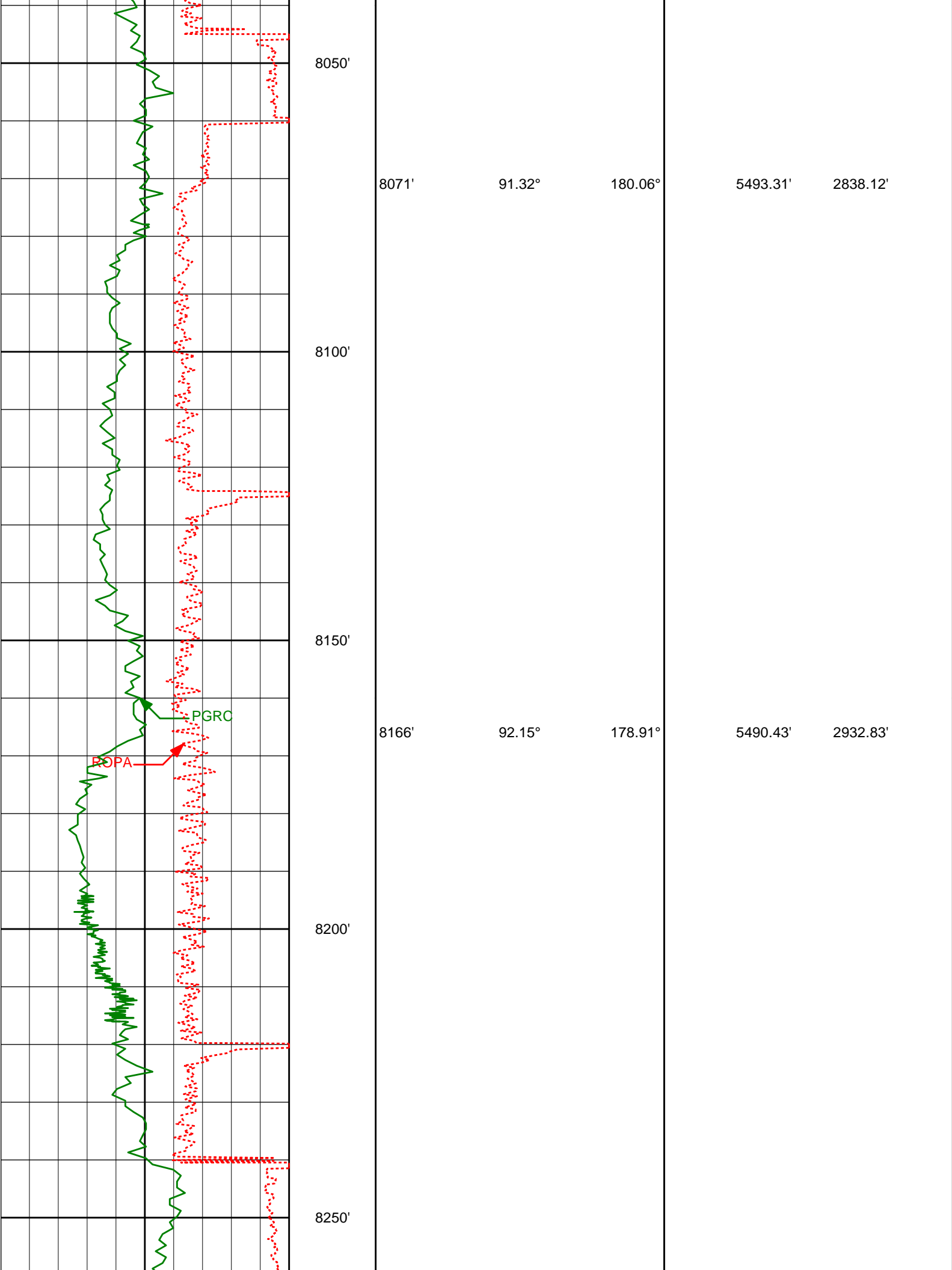
92.71°

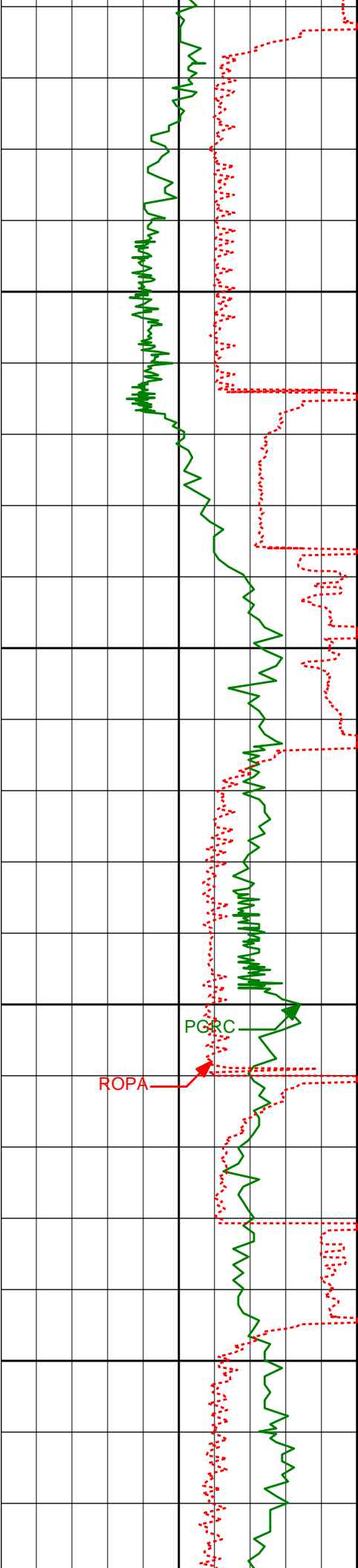
179.78°

5496.66'

2743.48'

8000'





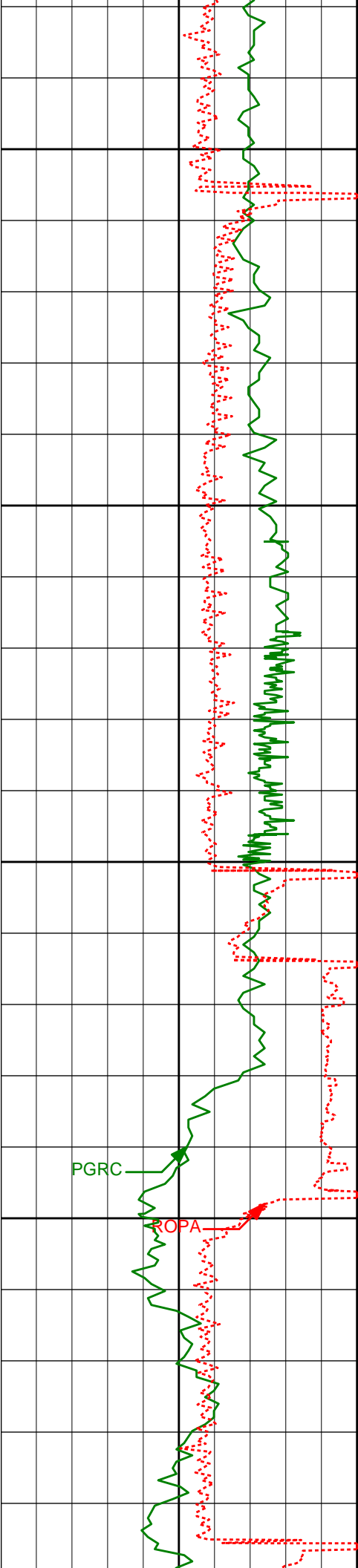
8300'

8350'

8400'

8450'

| | | | | |
|-------|--------|---------|----------|----------|
| 8261' | 91.20° | 180.29° | 5487.65' | 3027.53' |
| 8356' | 90.06° | 180.80° | 5486.60' | 3122.14' |
| 8452' | 89.11° | 180.89° | 5487.30' | 3217.70' |



8500'

8550'

8600'

8650'

PGRC

ROPA

8547'

90.25°

180.15°

5487.83'

3312.32'

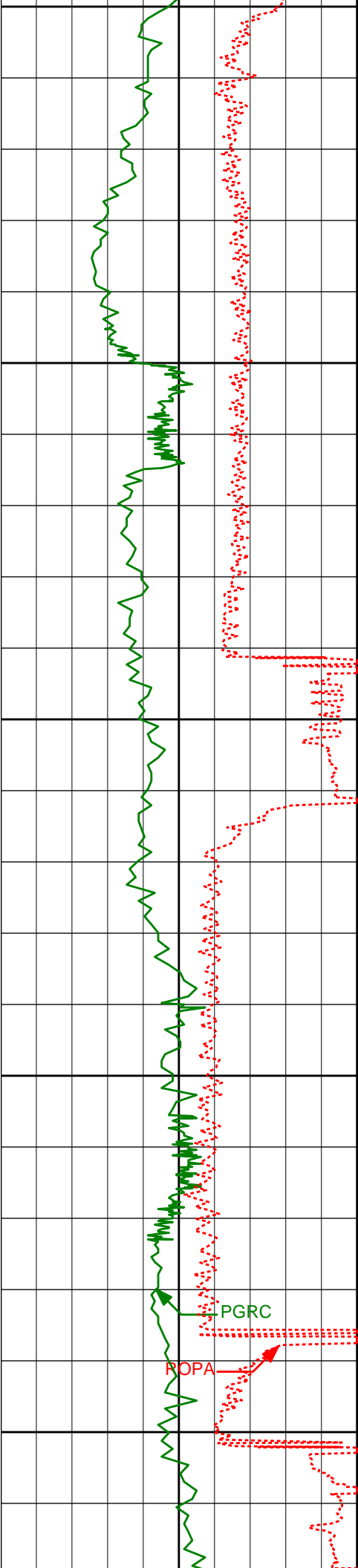
8642'

86.86°

179.25°

5490.23'

3407.00'



8700'

8737'

86.39°

179.01°

5495.83'

3501.64'

8750'

8800'

8832'

88.00°

178.95°

5500.48'

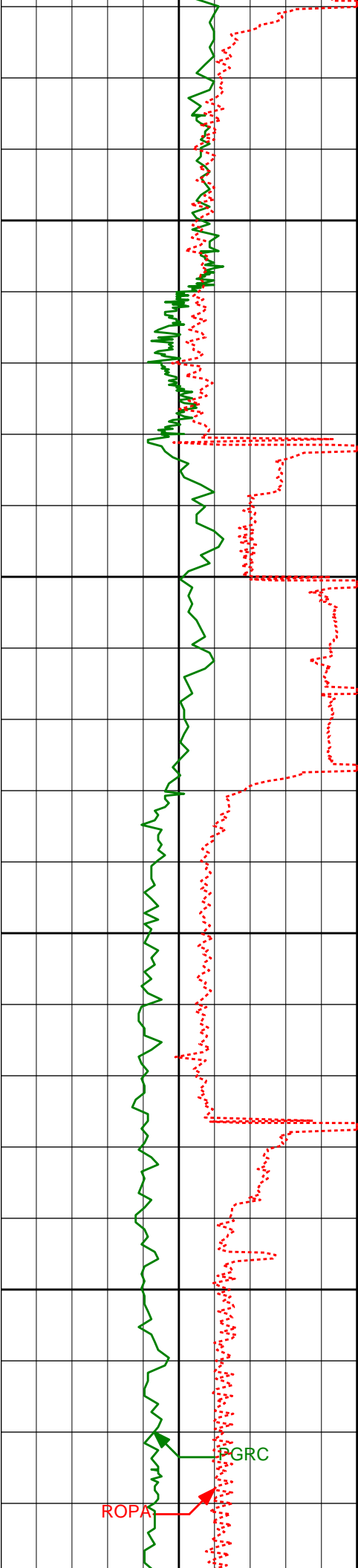
3596.33'

8850'

8900'

PGRC

POPA



8950'

9000'

9050'

9100'

8927'

88.46°

178.78°

5503.42'

3691.11'

9022'

88.86°

180.23°

5505.64'

3785.84'

9117'

88.89°

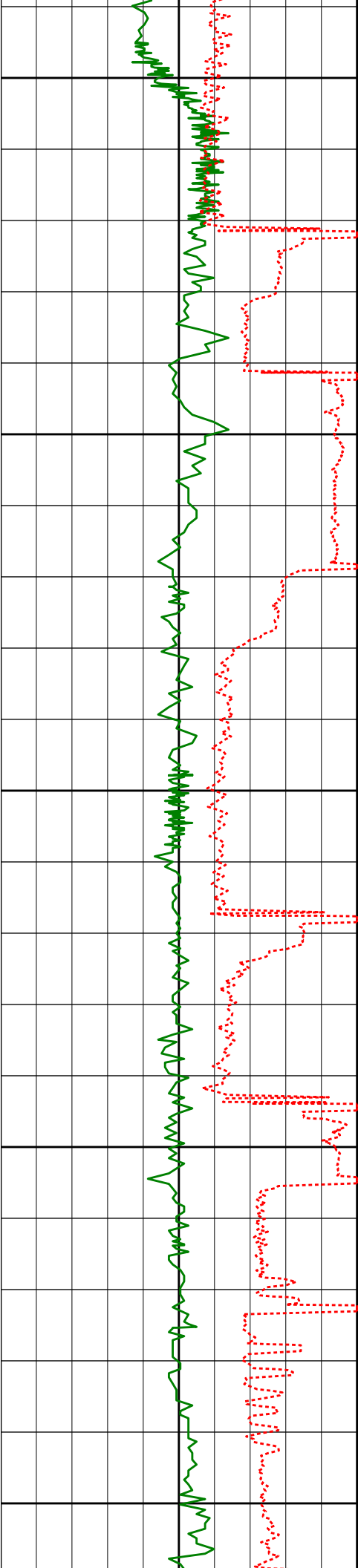
179.22°

5507.51'

3880.55'

PGRC

ROPA



9150'

9200'

9250'

9300'

9350'

9213'

89.85°

180.60°

5508.57'

3976.24'

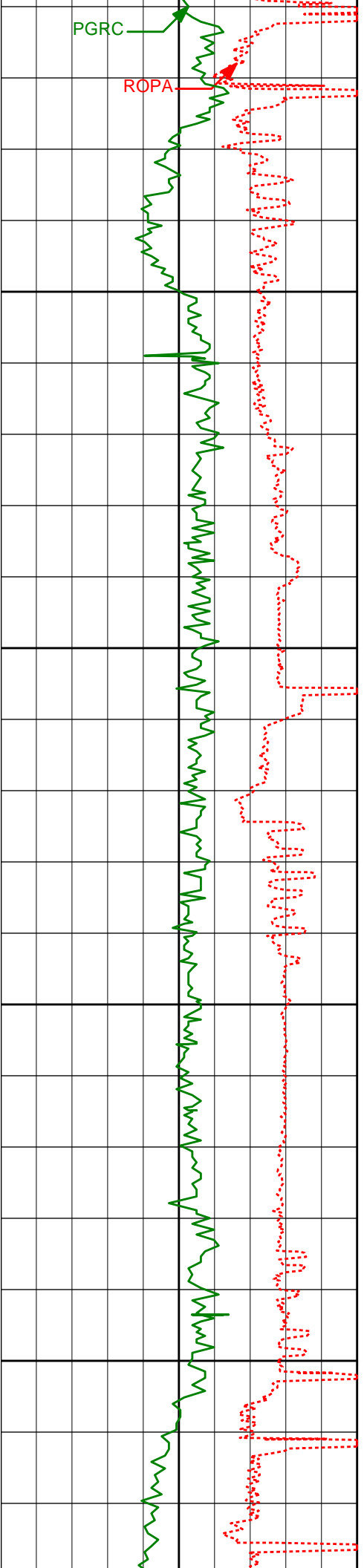
9318'

90.59°

181.53°

5508.17'

4080.72'



PGRC

ROPA

9400'

9450'

9500'

9550'

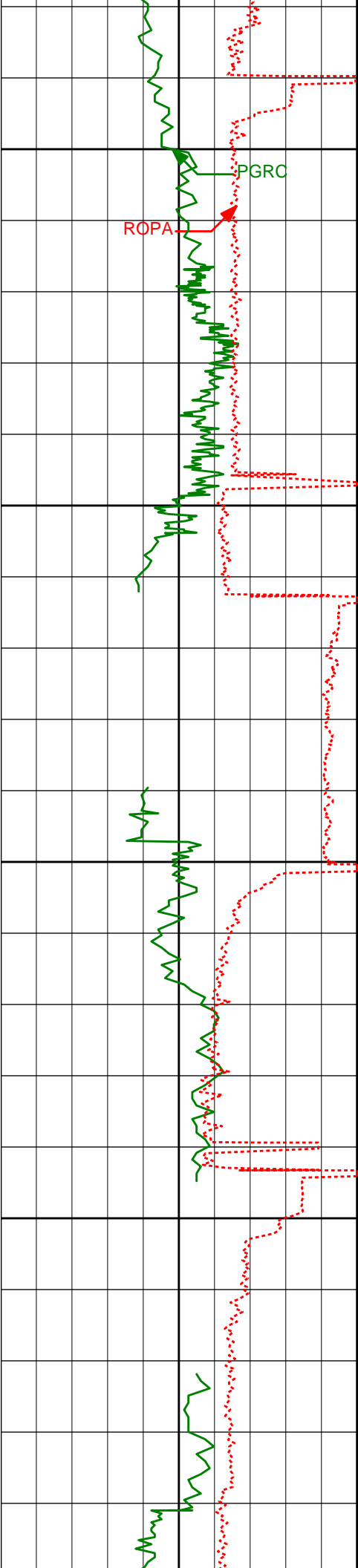
9403'

90.96°

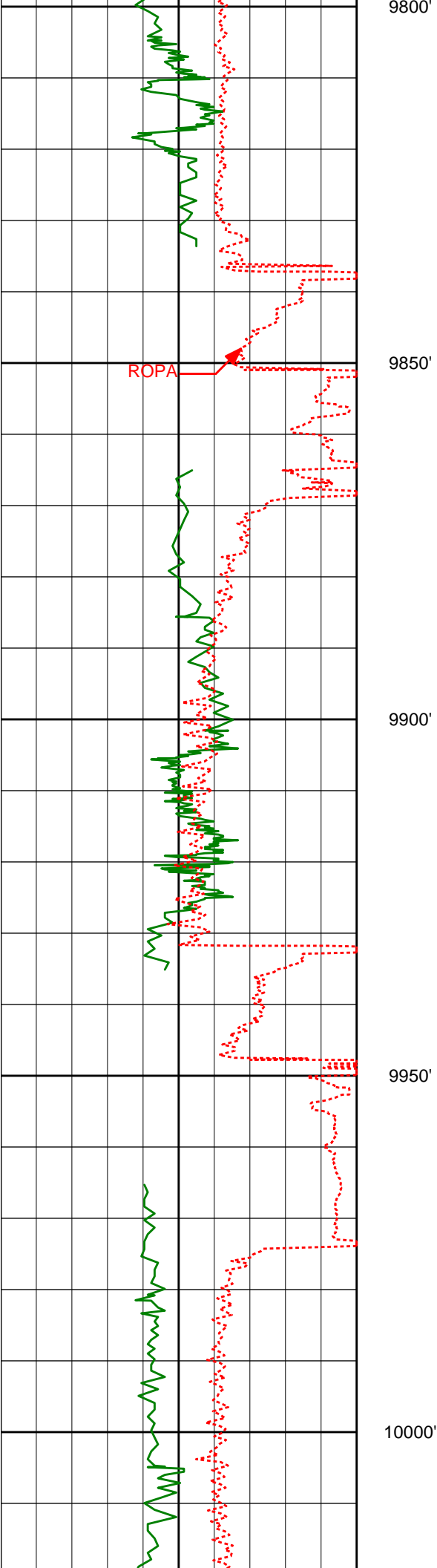
181.26°

5507.03'

4165.25'

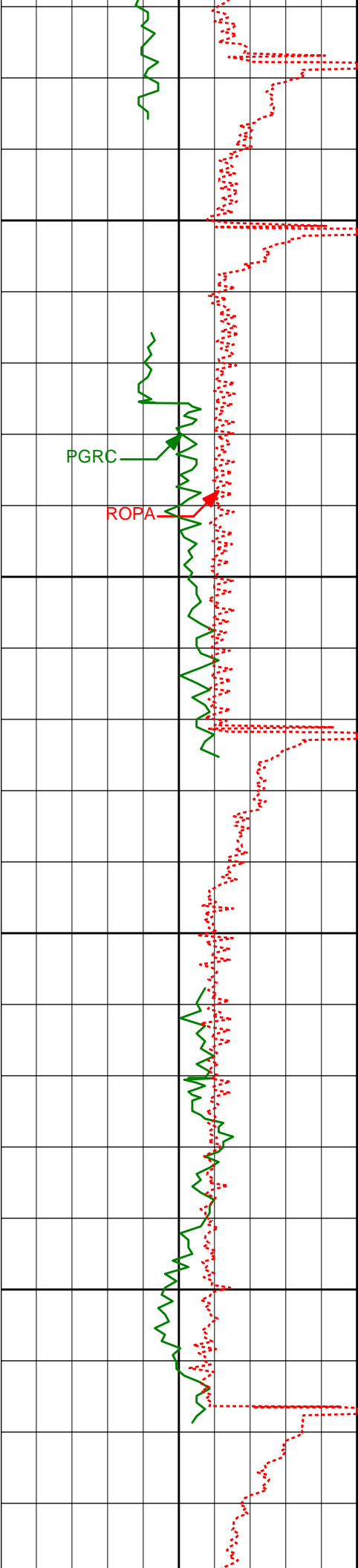


| | | | | |
|-------|--------|---------|----------|----------|
| 9593' | 92.10° | 182.07° | 5501.97' | 4354.04' |
| 9600' | | | | |
| 9650' | | | | |
| 9687' | 89.38° | 180.64° | 5500.76' | 4447.51' |
| 9700' | | | | |
| 9750' | | | | |
| 9783' | 88.55° | 181.34° | 5502.49' | 4543.04' |



| | | | | |
|-------|--------|---------|----------|----------|
| 9878' | 89.08° | 180.62° | 5504.45' | 4637.56' |
|-------|--------|---------|----------|----------|

| | | | | |
|-------|--------|---------|----------|----------|
| 9972' | 90.12° | 177.21° | 5505.11' | 4731.37' |
|-------|--------|---------|----------|----------|



10050'

10067'

90.65°

178.47°

5504.47'

4826.28'

10100'

10150'

10162'

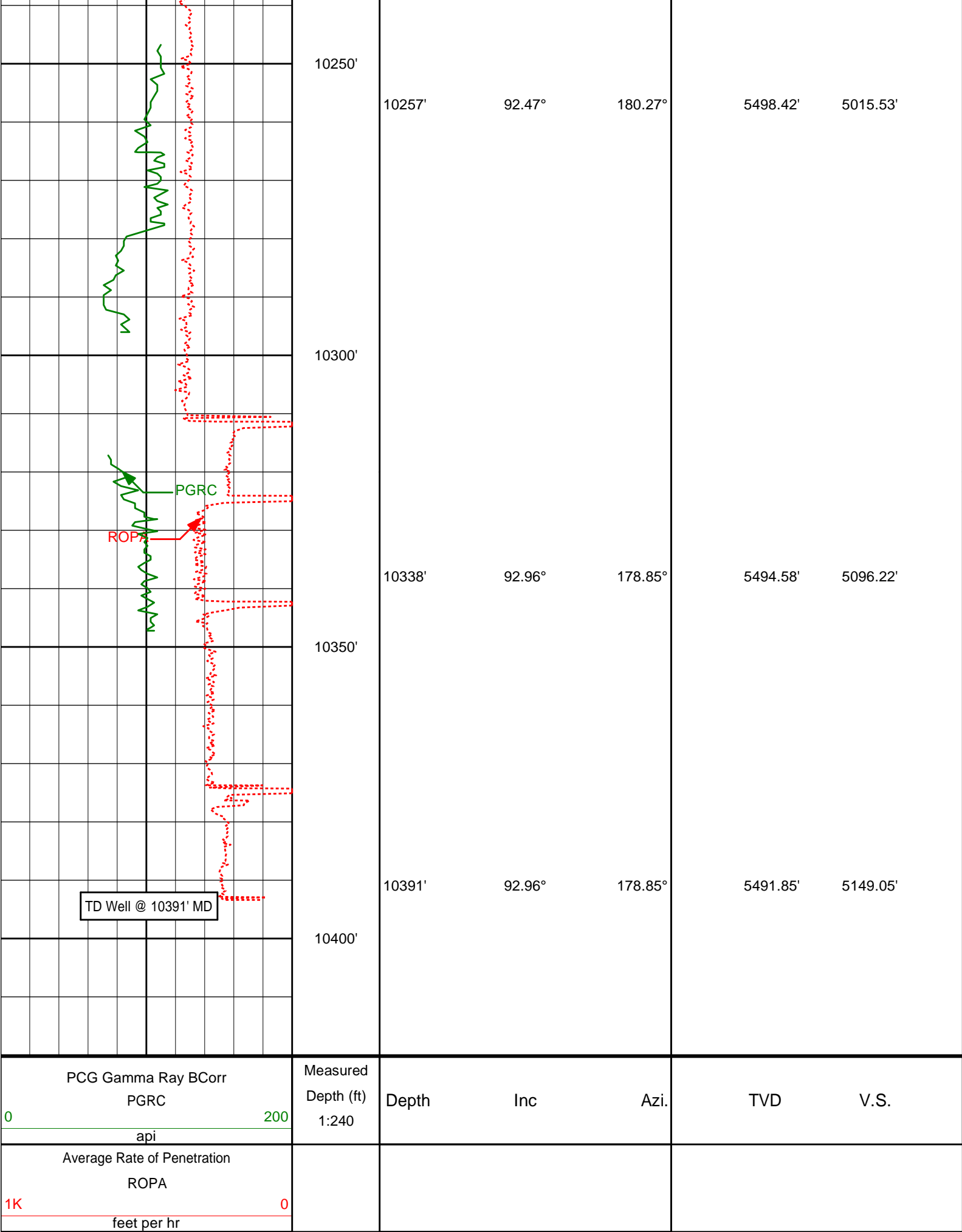
92.10°

180.74°

5502.20'

4920.98'

10200'



DIRECTIONAL SURVEY REPORT

Noble Energy
McCaffrey State LD12-74-1AHN
Wattenberg
Weld Colorado
USA
CA-XX-0901769918

The first three surveys at 471', 749' and 1027' are provided by HP.

| <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> |
|--------------------------------------|----------------------------------|--------------------------------|--------------------------------------|----------------------------|-----------------------------|--|-------------------------------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 N | 0.00 E | 0.00 | TIE-IN |
| 471.00 | 0.20 | 344.50 | 471.00 | 0.79 N | 0.22 W | -0.81 | 0.04 |
| 749.00 | 0.50 | 212.90 | 749.00 | 0.24 N | 1.01 W | -0.32 | 0.23 |
| 1027.00 | 0.50 | 212.90 | 1026.99 | 1.80 S | 2.33 W | 1.60 | 0.00 |
| 1360.00 | 0.54 | 288.02 | 1359.97 | 2.53 S | 4.60 W | 2.15 | 0.19 |
| 1452.00 | 2.70 | 74.58 | 1451.95 | 1.82 S | 2.93 W | 1.58 | 3.44 |
| 1547.00 | 4.43 | 86.06 | 1546.76 | 0.97 S | 2.89 E | 1.20 | 1.96 |
| 1642.00 | 7.47 | 86.90 | 1641.24 | 0.39 S | 12.72 E | 1.41 | 3.20 |
| 1738.00 | 11.42 | 85.92 | 1735.92 | 0.63 N | 28.43 E | 1.66 | 4.12 |
| 1833.00 | 10.15 | 78.64 | 1829.24 | 2.94 N | 46.02 E | 0.77 | 1.95 |
| 1928.00 | 12.39 | 89.59 | 1922.41 | 4.67 N | 64.42 E | 0.53 | 3.25 |
| 2023.00 | 12.25 | 85.59 | 2015.23 | 5.52 N | 84.67 E | 1.31 | 0.91 |
| 2118.00 | 11.42 | 83.95 | 2108.21 | 7.28 N | 104.07 E | 1.11 | 0.95 |
| 2213.00 | 12.32 | 102.46 | 2201.21 | 6.09 N | 123.32 E | 3.85 | 4.10 |
| 2308.00 | 12.15 | 95.97 | 2294.06 | 2.86 N | 143.17 E | 8.66 | 1.46 |
| 2403.00 | 11.73 | 94.63 | 2387.00 | 1.04 N | 162.74 E | 12.04 | 0.54 |
| 2498.00 | 11.55 | 93.62 | 2480.05 | 0.34 S | 181.85 E | 14.95 | 0.29 |
| 2594.00 | 11.39 | 90.42 | 2574.13 | 1.02 S | 200.92 E | 17.16 | 0.68 |
| 2689.00 | 11.03 | 89.98 | 2667.32 | 1.08 S | 219.39 E | 18.71 | 0.40 |
| 2784.00 | 10.66 | 88.61 | 2760.62 | 0.87 S | 237.26 E | 19.93 | 0.47 |
| 2879.00 | 9.41 | 85.40 | 2854.17 | 0.03 S | 253.78 E | 20.43 | 1.44 |
| 2974.00 | 8.73 | 82.00 | 2947.98 | 1.60 N | 268.66 E | 20.00 | 0.90 |
| 3069.00 | 10.73 | 98.15 | 3041.63 | 1.35 N | 284.56 E | 21.53 | 3.55 |
| 3164.00 | 10.97 | 96.26 | 3134.93 | 0.89 S | 302.31 E | 25.19 | 0.45 |
| 3259.00 | 11.25 | 94.46 | 3228.15 | 2.60 S | 320.53 E | 28.35 | 0.46 |
| 3354.00 | 10.43 | 94.15 | 3321.45 | 3.94 S | 338.34 E | 31.12 | 0.87 |
| 3449.00 | 10.12 | 93.55 | 3414.93 | 5.08 S | 355.24 E | 33.62 | 0.34 |
| 3545.00 | 7.67 | 97.68 | 3509.77 | 6.46 S | 370.01 E | 36.18 | 2.64 |
| 3640.00 | 6.15 | 101.75 | 3604.08 | 8.34 S | 381.28 E | 38.96 | 1.68 |
| 3735.00 | 2.26 | 65.07 | 3698.82 | 8.59 S | 387.96 E | 39.74 | 4.77 |
| 3830.00 | 1.65 | 55.86 | 3793.76 | 7.03 S | 390.79 E | 38.42 | 0.73 |
| 3925.00 | 1.47 | 52.37 | 3888.72 | 5.52 S | 392.89 E | 37.08 | 0.22 |
| 4020.00 | 1.36 | 58.64 | 3983.70 | 4.19 S | 394.81 E | 35.91 | 0.20 |
| 4115.00 | 1.03 | 66.68 | 4078.68 | 3.27 S | 396.56 E | 35.13 | 0.38 |
| 4210.00 | 0.97 | 86.61 | 4173.66 | 2.88 S | 398.14 E | 34.87 | 0.37 |
| 4305.00 | 0.86 | 68.94 | 4268.65 | 2.58 S | 399.61 E | 34.69 | 0.32 |
| 4400.00 | 0.49 | 49.38 | 4363.64 | 2.05 S | 400.59 E | 34.24 | 0.45 |
| 4495.00 | 0.41 | 12.49 | 4458.64 | 1.46 S | 400.97 E | 33.68 | 0.31 |
| 4590.00 | 0.57 | 345.07 | 4553.64 | 0.68 S | 400.92 E | 32.90 | 0.29 |
| 4685.00 | 0.47 | 328.72 | 4648.63 | 0.11 N | 400.60 E | 32.09 | 0.19 |
| 4780.00 | 0.37 | 310.27 | 4743.63 | 0.64 N | 400.16 E | 31.53 | 0.17 |
| 4875.00 | 3.09 | 174.23 | 4838.59 | 1.72 S | 400.19 E | 33.87 | 3.55 |
| 4971.00 | 9.30 | 173.62 | 4933.98 | 12.01 S | 401.31 E | 44.23 | 6.47 |
| 5066.00 | 12.40 | 179.27 | 5027.27 | 29.85 S | 402.30 E | 62.09 | 3.44 |
| 5114.00 | 17.30 | 179.58 | 5073.66 | 42.14 S | 402.41 E | 74.35 | 10.20 |
| 5161.00 | 22.01 | 180.86 | 5117.90 | 57.95 S | 402.33 E | 90.10 | 10.08 |
| 5209.00 | 25.88 | 180.36 | 5161.76 | 77.43 S | 402.13 E | 109.50 | 8.07 |
| 5256.00 | 30.94 | 178.46 | 5203.09 | 99.78 S | 402.39 E | 131.80 | 10.93 |
| 5351.00 | 41.21 | 178.21 | 5279.77 | 155.62 S | 404.03 E | 187.59 | 10.81 |
| 5447.00 | 51.48 | 178.41 | 5345.96 | 224.95 S | 406.06 E | 256.86 | 10.70 |
| 5542.00 | 62.79 | 177.92 | 5397.43 | 304.57 S | 408.64 E | 336.43 | 11.91 |
| 5637.00 | 66.51 | 176.06 | 5438.10 | 390.28 S | 413.17 E | 422.23 | 4.30 |
| 5732.00 | 72.90 | 176.84 | 5471.03 | 479.17 S | 418.68 E | 511.27 | 6.77 |
| 5827.00 | 82.53 | 183.83 | 5491.24 | 571.82 S | 418.03 E | 603.57 | 12.42 |
| 5844.00 | 84.48 | 185.26 | 5493.17 | 588.66 S | 416.69 E | 620.24 | 14.17 |

| | | | | | | | |
|----------|-------|--------|---------|-----------|----------|---------|------|
| 6002.00 | 88.12 | 182.93 | 5503.36 | 745.89 S | 405.45 E | 776.06 | 2.74 |
| 6095.00 | 89.48 | 178.63 | 5505.31 | 838.83 S | 404.18 E | 868.61 | 4.85 |
| 6187.00 | 88.24 | 177.78 | 5507.14 | 930.77 S | 407.06 E | 960.47 | 1.63 |
| 6280.00 | 89.20 | 178.86 | 5509.22 | 1023.70 S | 409.78 E | 1053.33 | 1.55 |
| 6372.00 | 90.59 | 181.56 | 5509.39 | 1115.69 S | 409.44 E | 1144.99 | 3.30 |
| 6465.00 | 89.35 | 182.27 | 5509.44 | 1208.64 S | 406.33 E | 1237.39 | 1.53 |
| 6557.00 | 89.85 | 180.75 | 5510.08 | 1300.60 S | 403.91 E | 1328.86 | 1.74 |
| 6650.00 | 91.48 | 180.50 | 5509.01 | 1393.59 S | 402.90 E | 1421.46 | 1.78 |
| 6743.00 | 91.20 | 179.97 | 5506.83 | 1486.56 S | 402.51 E | 1514.10 | 0.65 |
| 6835.00 | 91.11 | 179.11 | 5504.98 | 1578.54 S | 403.25 E | 1605.84 | 0.94 |
| 6930.00 | 90.18 | 177.28 | 5503.90 | 1673.48 S | 406.24 E | 1700.71 | 2.17 |
| 7025.00 | 91.51 | 178.98 | 5502.50 | 1768.41 S | 409.35 E | 1795.59 | 2.27 |
| 7120.00 | 91.05 | 177.92 | 5500.38 | 1863.35 S | 411.92 E | 1890.43 | 1.21 |
| 7215.00 | 90.68 | 179.41 | 5498.95 | 1958.31 S | 414.13 E | 1985.26 | 1.61 |
| 7311.00 | 89.66 | 179.39 | 5498.66 | 2054.30 S | 415.13 E | 2081.02 | 1.06 |
| 7406.00 | 88.64 | 178.06 | 5500.07 | 2149.27 S | 417.24 E | 2175.85 | 1.77 |
| 7501.00 | 89.11 | 180.25 | 5501.94 | 2244.23 S | 418.65 E | 2270.62 | 2.35 |
| 7596.00 | 87.78 | 180.21 | 5504.52 | 2339.19 S | 418.27 E | 2365.24 | 1.40 |
| 7691.00 | 89.57 | 180.68 | 5506.71 | 2434.16 S | 417.53 E | 2459.85 | 1.95 |
| 7786.00 | 92.59 | 181.26 | 5504.93 | 2529.12 S | 415.91 E | 2554.37 | 3.23 |
| 7881.00 | 92.34 | 180.12 | 5500.84 | 2624.02 S | 414.77 E | 2648.87 | 1.23 |
| 7976.00 | 92.71 | 179.78 | 5496.66 | 2718.93 S | 414.85 E | 2743.48 | 0.53 |
| 8071.00 | 91.32 | 180.06 | 5493.31 | 2813.87 S | 414.99 E | 2838.12 | 1.49 |
| 8166.00 | 92.15 | 178.91 | 5490.43 | 2908.82 S | 415.85 E | 2932.83 | 1.49 |
| 8261.00 | 91.20 | 180.29 | 5487.65 | 3003.77 S | 416.50 E | 3027.53 | 1.77 |
| 8356.00 | 90.06 | 180.80 | 5486.60 | 3098.76 S | 415.60 E | 3122.14 | 1.31 |
| 8452.00 | 89.11 | 180.89 | 5487.30 | 3194.75 S | 414.18 E | 3217.70 | 1.00 |
| 8547.00 | 90.25 | 180.15 | 5487.83 | 3289.74 S | 413.32 E | 3312.32 | 1.43 |
| 8642.00 | 86.86 | 179.25 | 5490.23 | 3384.69 S | 413.82 E | 3407.00 | 3.69 |
| 8737.00 | 86.39 | 179.01 | 5495.83 | 3479.52 S | 415.27 E | 3501.64 | 0.55 |
| 8832.00 | 88.00 | 178.95 | 5500.48 | 3574.38 S | 416.96 E | 3596.33 | 1.69 |
| 8927.00 | 88.46 | 178.78 | 5503.42 | 3669.32 S | 418.83 E | 3691.11 | 0.52 |
| 9022.00 | 88.86 | 180.23 | 5505.64 | 3764.29 S | 419.65 E | 3785.84 | 1.58 |
| 9117.00 | 88.89 | 179.22 | 5507.51 | 3859.27 S | 420.11 E | 3880.55 | 1.06 |
| 9213.00 | 89.85 | 180.60 | 5508.57 | 3955.26 S | 420.26 E | 3976.24 | 1.75 |
| 9318.00 | 90.59 | 181.53 | 5508.17 | 4060.24 S | 418.31 E | 4080.72 | 1.13 |
| 9403.00 | 90.96 | 181.26 | 5507.03 | 4145.20 S | 416.25 E | 4165.25 | 0.54 |
| 9593.00 | 92.10 | 182.07 | 5501.97 | 4335.05 S | 410.72 E | 4354.04 | 0.74 |
| 9687.00 | 89.38 | 180.64 | 5500.76 | 4429.01 S | 408.50 E | 4447.51 | 3.26 |
| 9783.00 | 88.55 | 181.34 | 5502.49 | 4524.98 S | 406.84 E | 4543.04 | 1.13 |
| 9878.00 | 89.08 | 180.62 | 5504.45 | 4619.94 S | 405.22 E | 4637.56 | 0.93 |
| 9972.00 | 90.12 | 177.21 | 5505.11 | 4713.91 S | 406.99 E | 4731.37 | 3.79 |
| 10067.00 | 90.65 | 178.47 | 5504.47 | 4808.83 S | 410.57 E | 4826.28 | 1.43 |
| 10162.00 | 92.10 | 180.74 | 5502.20 | 4903.80 S | 411.22 E | 4920.98 | 2.84 |
| 10257.00 | 92.47 | 180.27 | 5498.42 | 4998.72 S | 410.38 E | 5015.53 | 0.64 |
| 10338.00 | 92.96 | 178.85 | 5494.58 | 5079.62 S | 411.01 E | 5096.22 | 1.85 |
| 10391.00 | 92.96 | 178.85 | 5491.85 | 5132.54 S | 412.07 E | 5149.05 | 0.01 |

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 175.39 DEGREES (GRID)
A TOTAL CORRECTION OF 6.90 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10391.00 FEET
IS 5149.06 FEET ALONG 175.41 DEGREES (GRID)**

Final survey is a straight line projection to TD @ 11391' MD.