



**1 : 600 / 1 : 240**

| WELL INFORMATION                  |                   |  |  |  |  |
|-----------------------------------|-------------------|--|--|--|--|
| MWD Run Number                    | 100               |  |  |  |  |
| Date run completed                | 23-Nov-15         |  |  |  |  |
| Rig Bit Number                    | 0100              |  |  |  |  |
| Bit Size (in)                     | 8.750             |  |  |  |  |
| Tool Nominal OD (in)              | 6.750             |  |  |  |  |
| Log Start Depth (TVD, ft)         | 886.99            |  |  |  |  |
| Log End Depth (TVD, ft)           | 7,010.76          |  |  |  |  |
| Drill or Wipe                     | Drill             |  |  |  |  |
| Drill/Wipe Start Date and Time    | 22-Nov-15 08:00   |  |  |  |  |
| Drill/Wipe End Date and Time      | 23-Nov-15 14:15   |  |  |  |  |
| Min Inc (deg) @ Depth (TVD, ft)   | 0.04 @ 1,385.99   |  |  |  |  |
| Max Inc (deg) @ Depth (TVD, ft)   | 89.00 @ 7,010.76  |  |  |  |  |
| Bit TFA(in2) / Bit Type           | 1.20 / PDC        |  |  |  |  |
| Flow Rate (gpm)                   | 592.54            |  |  |  |  |
| Max AV (fpm) / CV (fpm) @ MWD     | N/A / N/A         |  |  |  |  |
| Fluid Type                        | Native/Spud Mud   |  |  |  |  |
| Density (ppg) / Viscosity (spqt)  | 10.60 / 35.00     |  |  |  |  |
| Filtrate CL (ppm)                 | 2,400.00          |  |  |  |  |
| pH / Fluid Loss (mptm)            | 9.00 / 8          |  |  |  |  |
| PV (cP) / YP (lhf2)               | 11 / 12.00        |  |  |  |  |
| % Solids / % Sand                 | 10.20 / 0.05      |  |  |  |  |
| % Oil / Oil:Water Ratio           | N/A / N/A         |  |  |  |  |
| Rm @ Measured Temp (degF)         | N/A @ N/A         |  |  |  |  |
| Rmf @ Measured Temp (degF)        | N/A @ N/A         |  |  |  |  |
| Rmc @ Measured Temp (degF)        | N/A @ N/A         |  |  |  |  |
| Max Tool Temp (degF) @ Depth (ft) | 100.00 @ 1,385.99 |  |  |  |  |

|                               |              |  |  |  |  |
|-------------------------------|--------------|--|--|--|--|
| Max Tool Temp (degF) / Source | 180.09 / PCM |  |  |  |  |
| Rm @ Max Tool Temp (degF)     | N/A @ N/A    |  |  |  |  |
| Lead MWD Engineer             | Brian Neu    |  |  |  |  |
| Customer Representative       | Bryant Dear  |  |  |  |  |

## SENSOR INFORMATION

### Downhole Processor Information

|                           |                 |  |  |  |  |
|---------------------------|-----------------|--|--|--|--|
| Tool Type                 | PCM             |  |  |  |  |
| Software Version          | 5.93            |  |  |  |  |
| Sub Serial Number         | 11341333        |  |  |  |  |
| Insert Serial Number      | 11620295        |  |  |  |  |
| Date and Time Initialized | 21-Nov-15 21:55 |  |  |  |  |
| Date and Time Read        | 23-Nov-15 19:18 |  |  |  |  |
| ECMB SW Version           | N/A             |  |  |  |  |

### Directional Sensor Information

|                        |          |  |  |  |  |
|------------------------|----------|--|--|--|--|
| Tool Type              | PCDC     |  |  |  |  |
| Distance From Bit (ft) | 57.00    |  |  |  |  |
| Software Version       | 6.33     |  |  |  |  |
| Sub Serial Number      | 11341333 |  |  |  |  |
| Sonde Serial Number    | 11062040 |  |  |  |  |
| Sensor ID Number       | N/A      |  |  |  |  |
| Toolface Offset (deg)  | 283.90   |  |  |  |  |

### Gamma Ray Sensor Information

|                              |          |  |  |  |  |
|------------------------------|----------|--|--|--|--|
| Tool Type                    | PCG      |  |  |  |  |
| Distance From Bit (ft)       | 50.18    |  |  |  |  |
| Recorded Sample Period (sec) | 10       |  |  |  |  |
| Software Version             | 8.15     |  |  |  |  |
| Sub Serial Number            | 11341333 |  |  |  |  |
| Insert/Sonde Serial Number   | 11680938 |  |  |  |  |

## REMARKS

1. All depths are calibrated to driller's pipe tally and are total vertical depth from the drill floor.

2. No depth corrections have been made for pipe stretch or compression.

3. All data presented is recorded (memory data) unless otherwise stated.

4. Environmental parameters used in gamma and resistance processing:

Hole Size: 8.75"

Mud Density: 8.75-10.75ppg

5. The following smoothing parameters have been applied to the data:

1:600 (2"):

Interval: 1.0 ft

Coercion Distance: 3.0 ft (ROPA)

Interval: 1.0 ft

Coercion Distance: 3.0 ft (Gamma Ray)

1:240 (5")

Interval: 0.5 ft

Coercion Distance: 1.2 ft (ROPA)

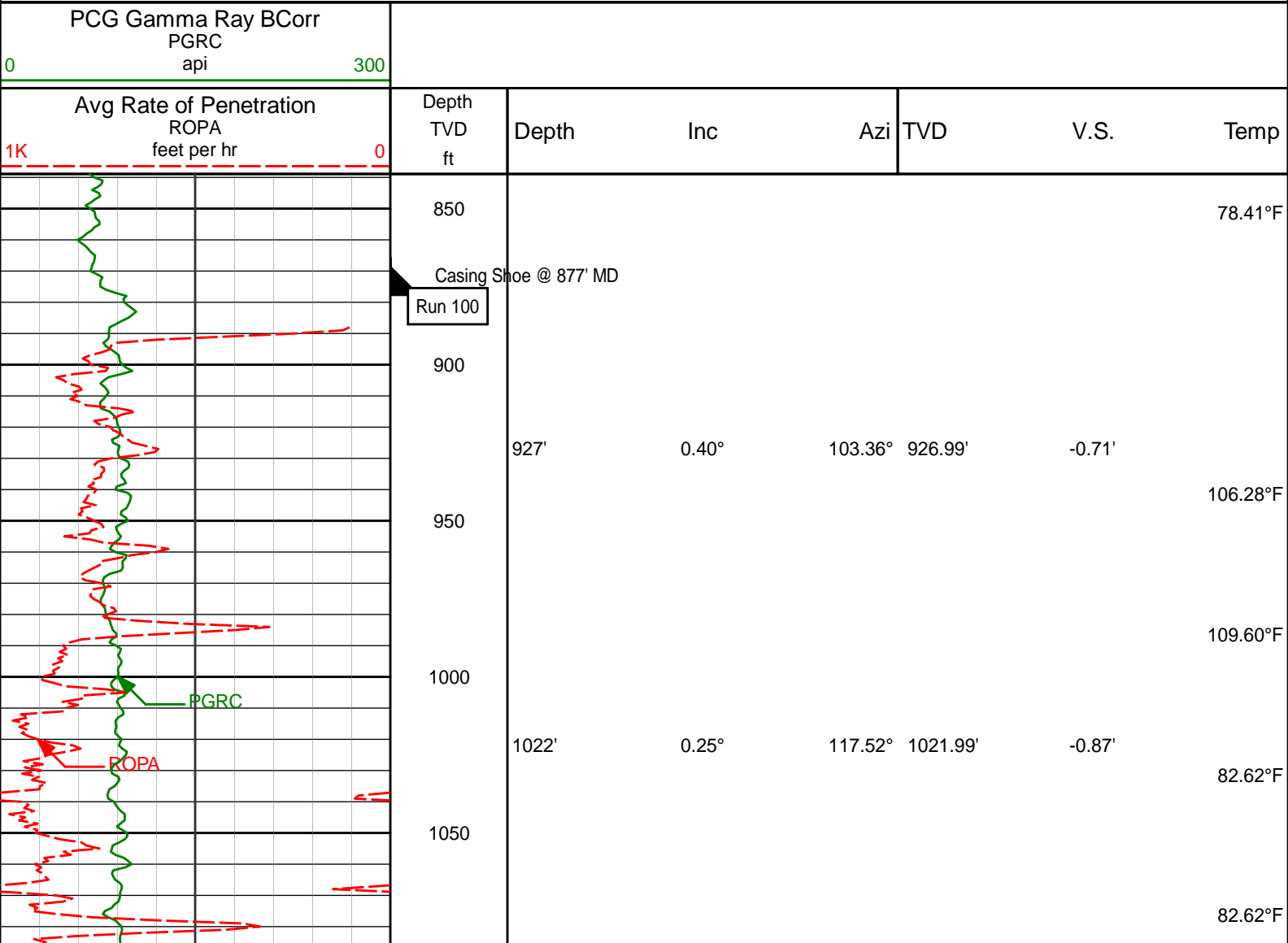
Interval: 0.5 ft

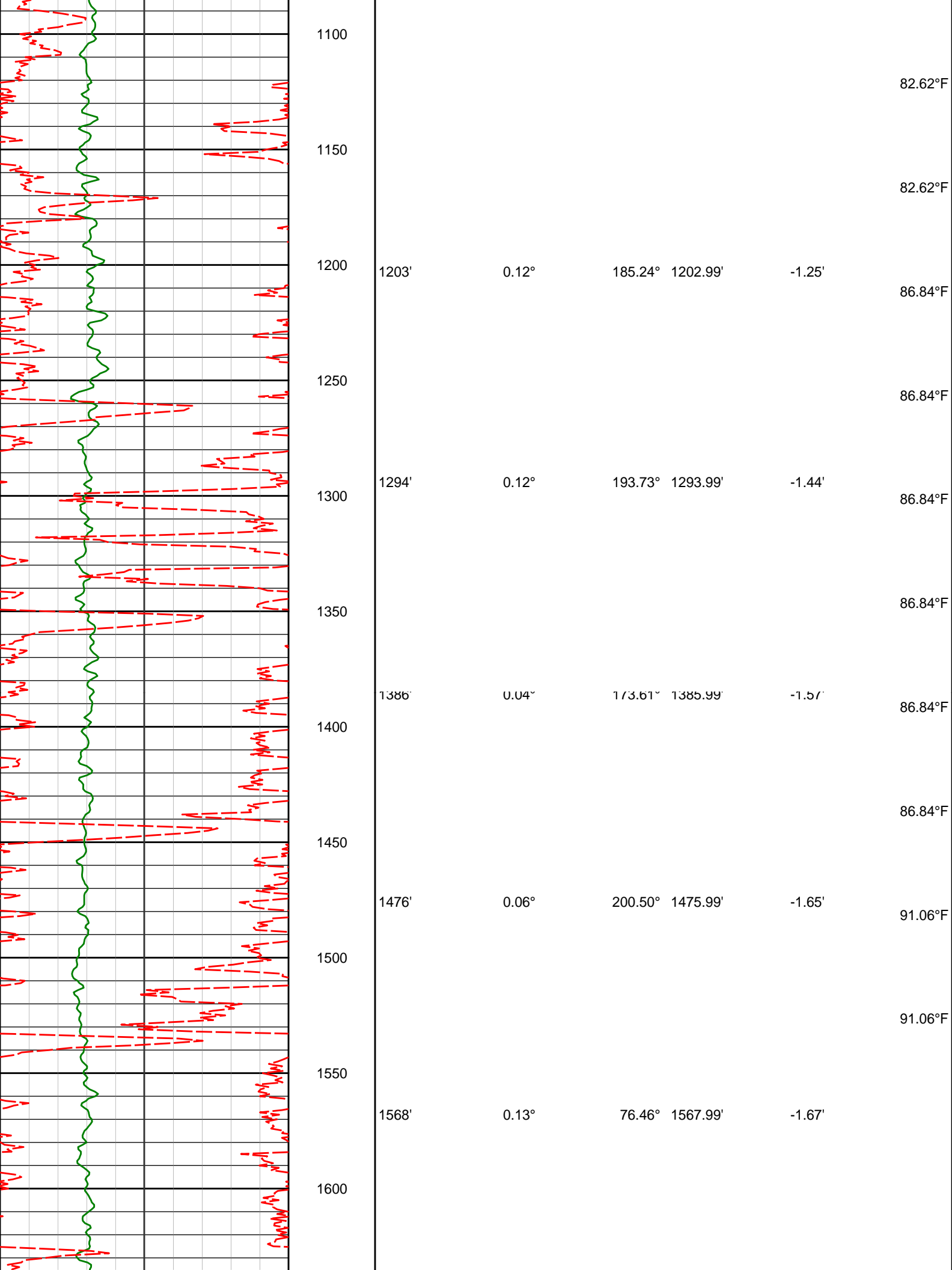
Coercion Distance: 0.6 ft (Gamma Ray)

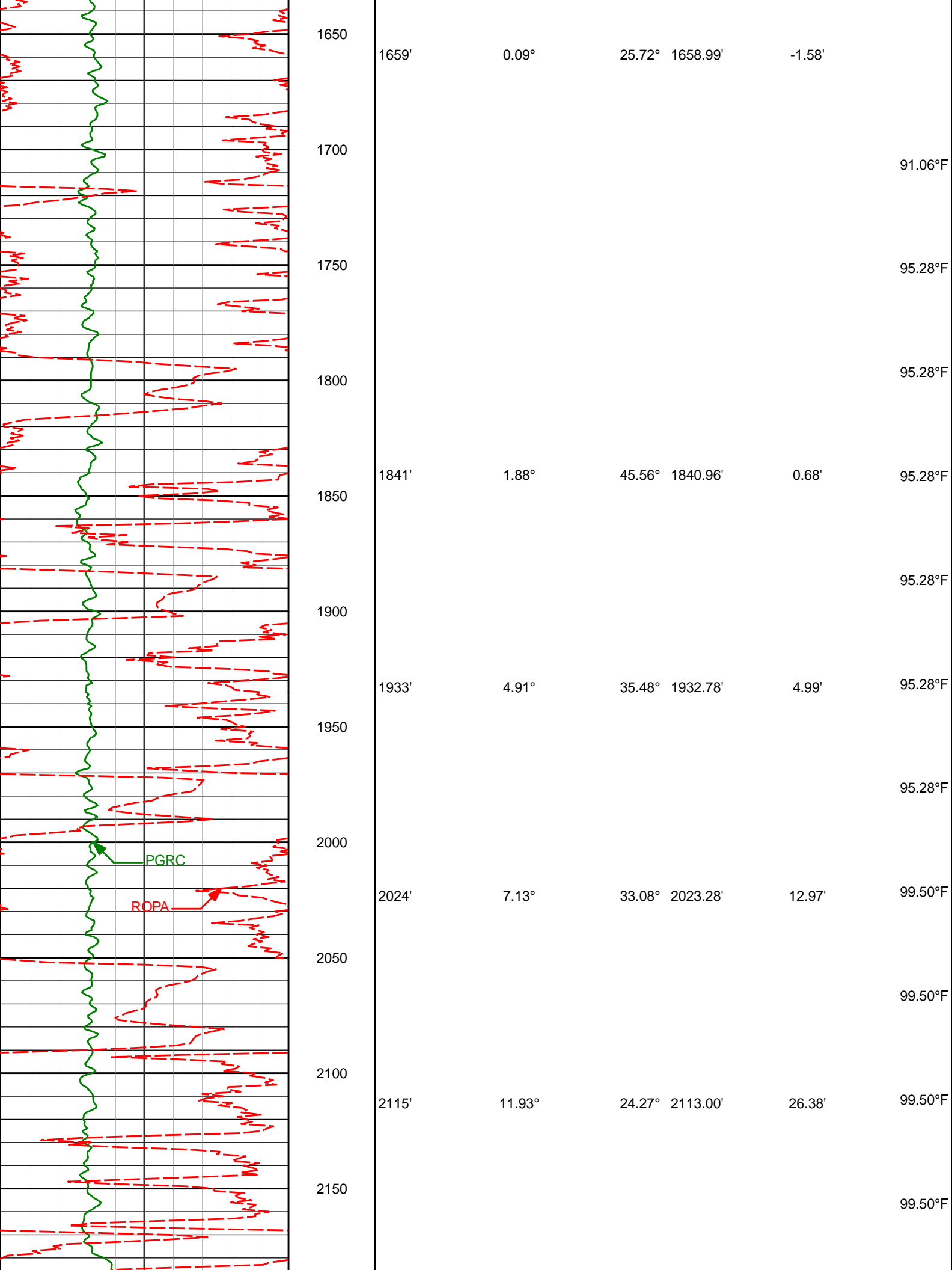
WARRANTY

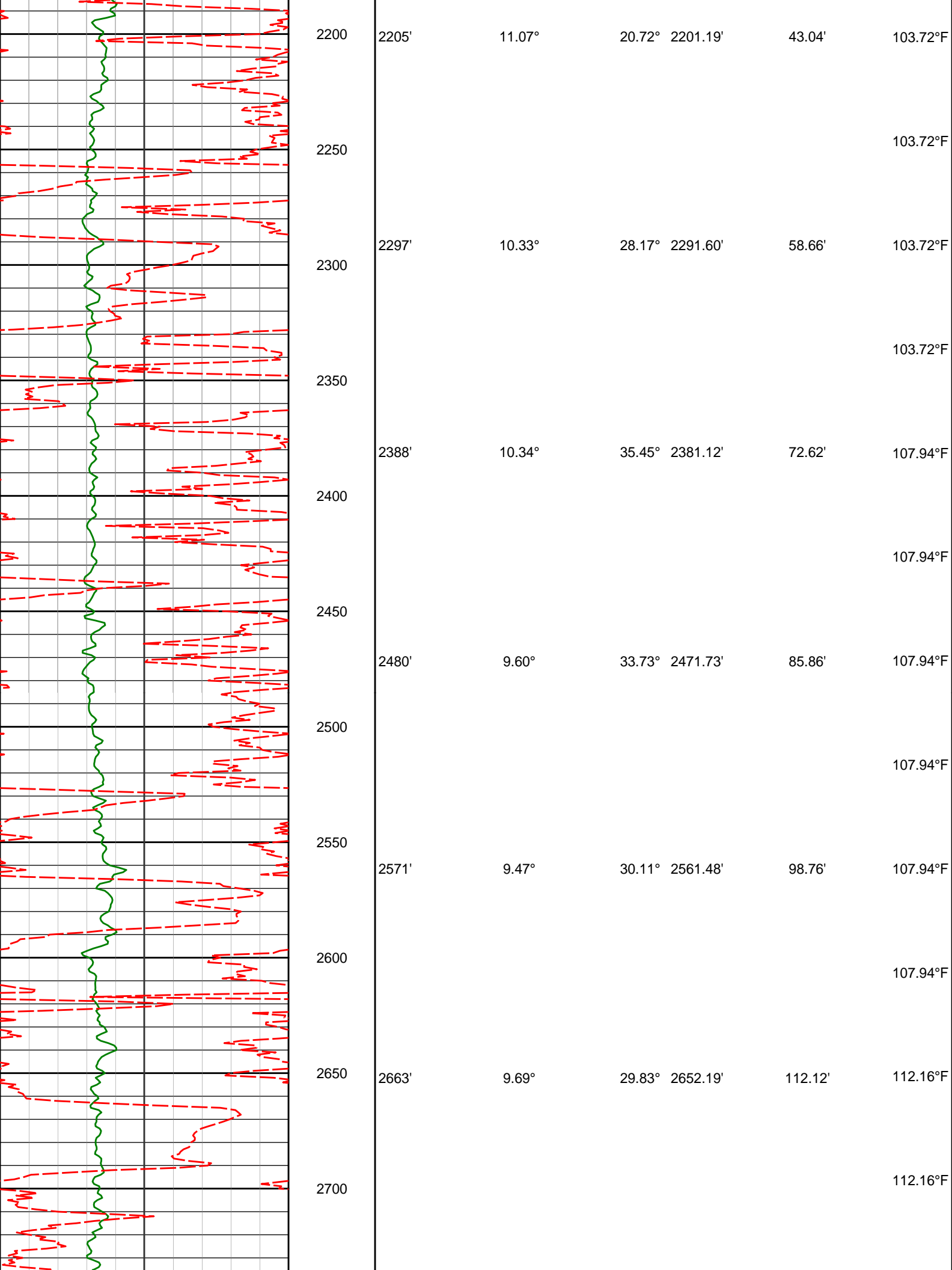
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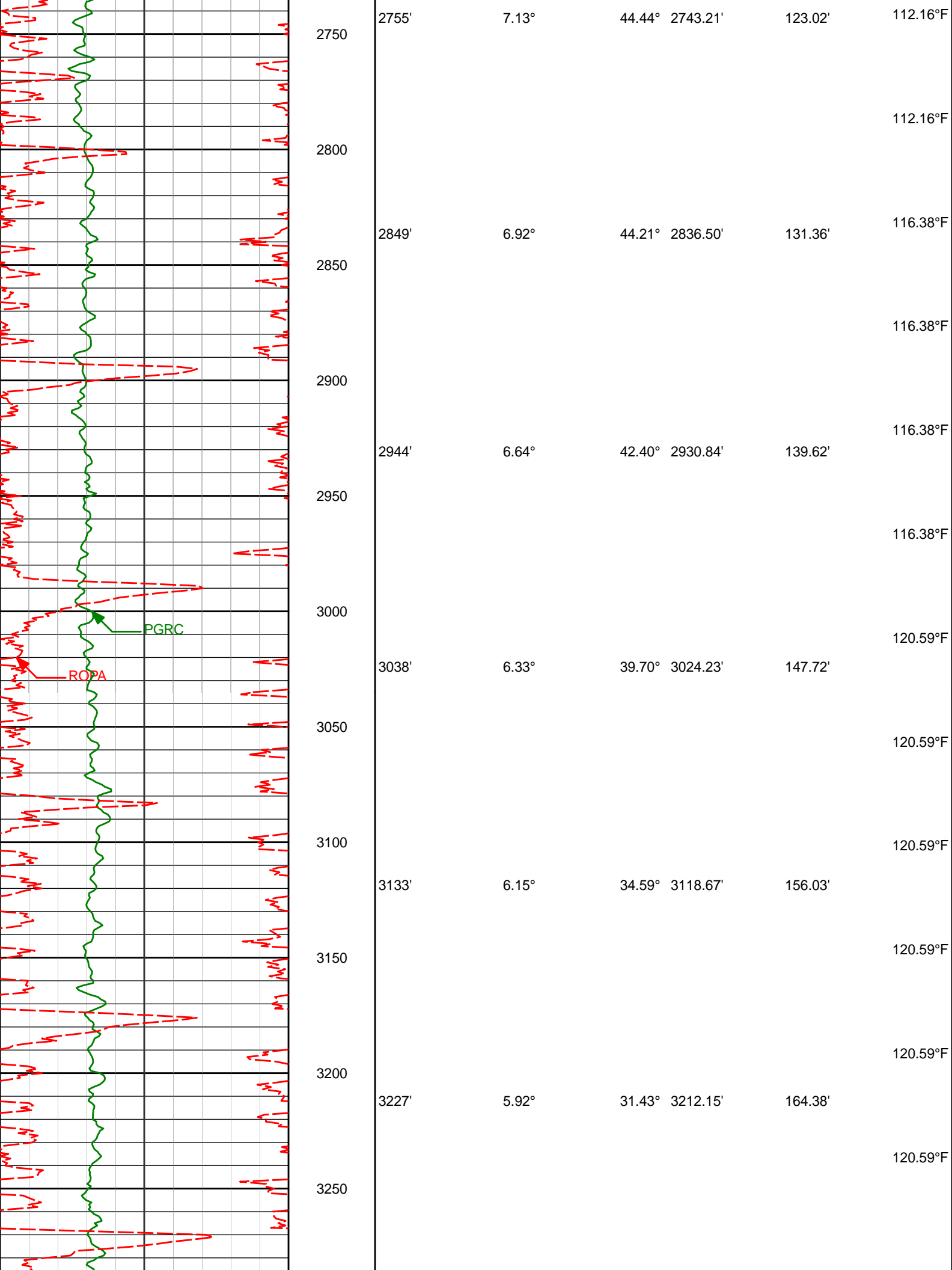
TVD Detail 1:600 Scale

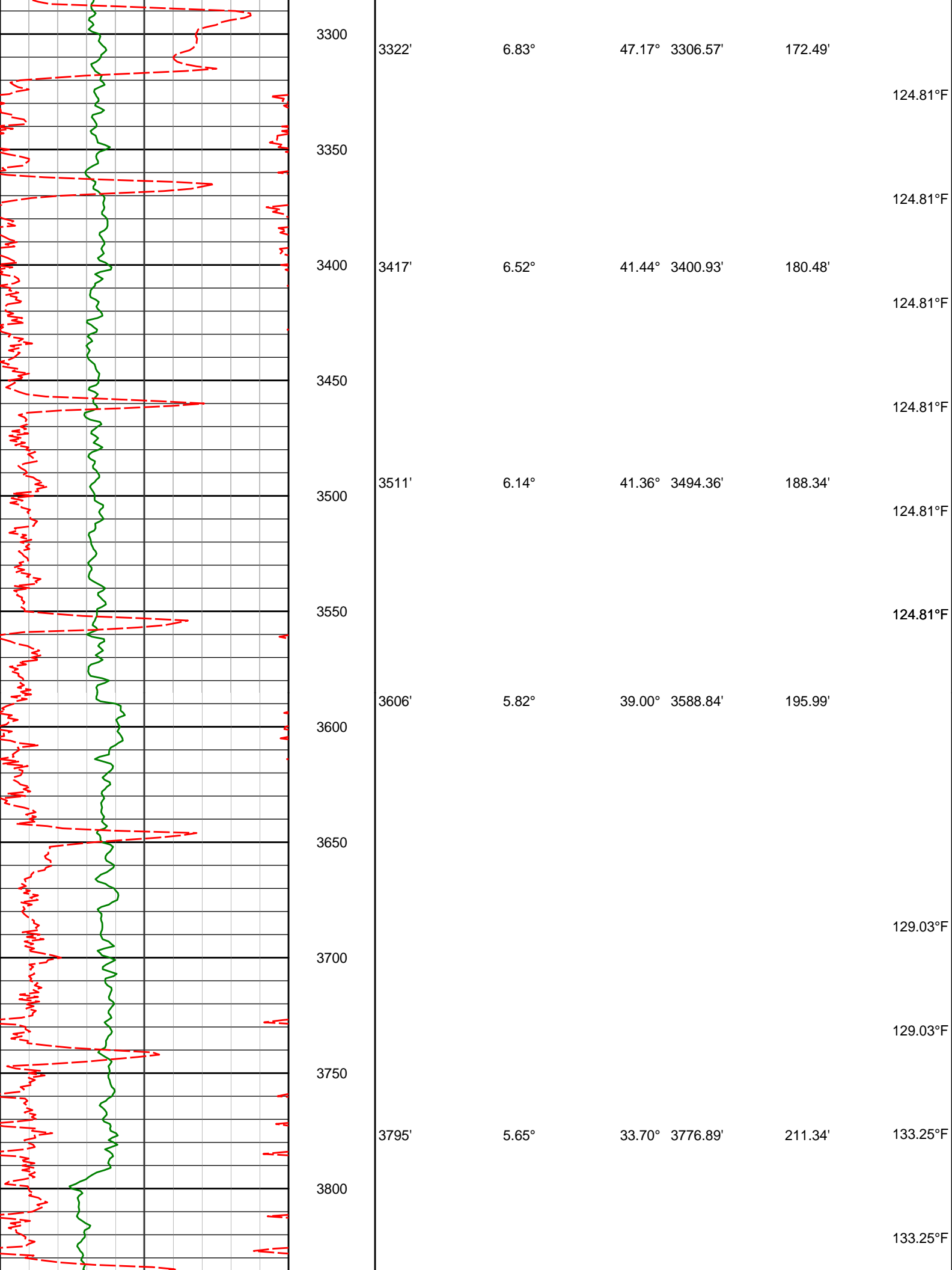




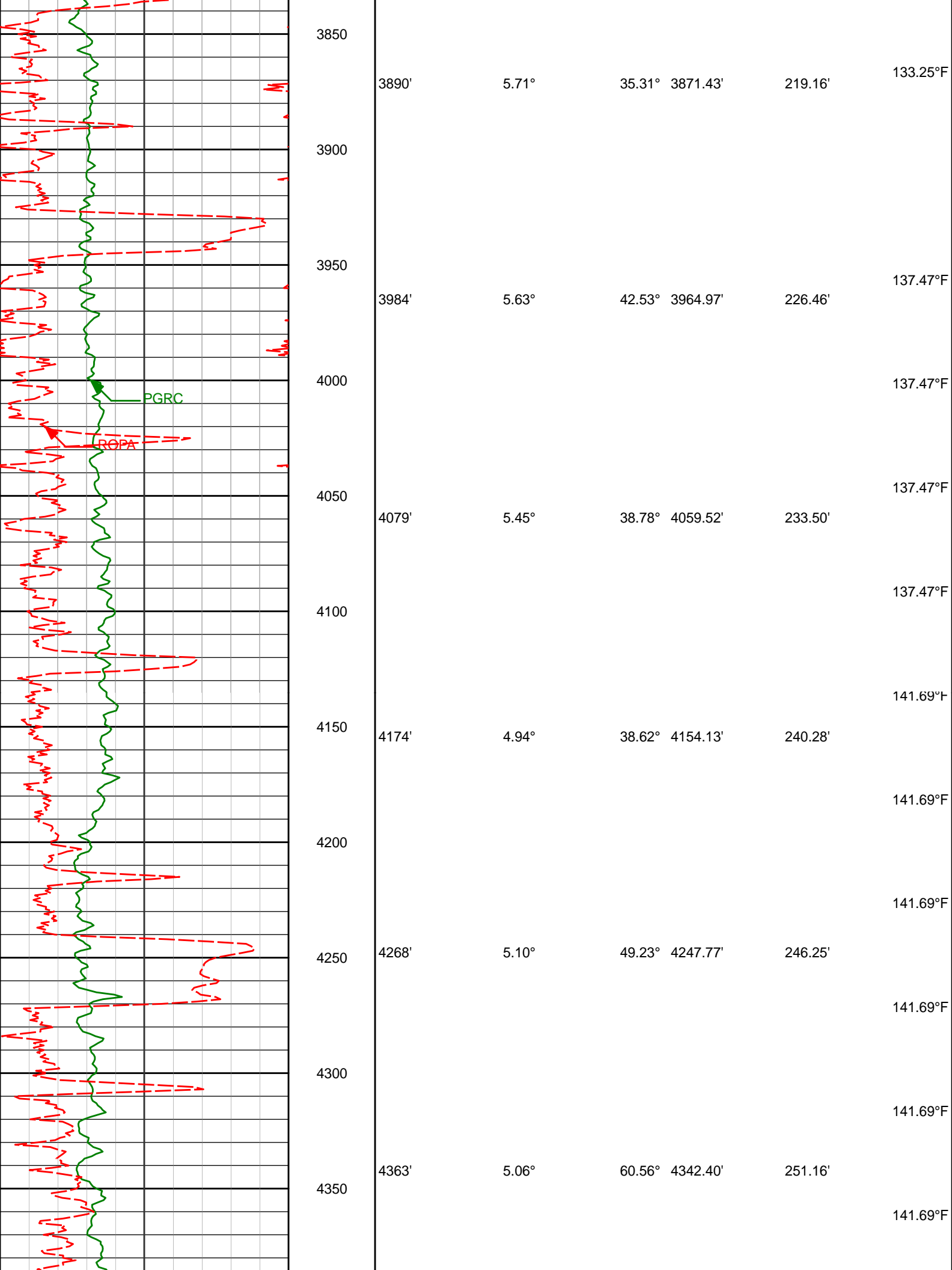


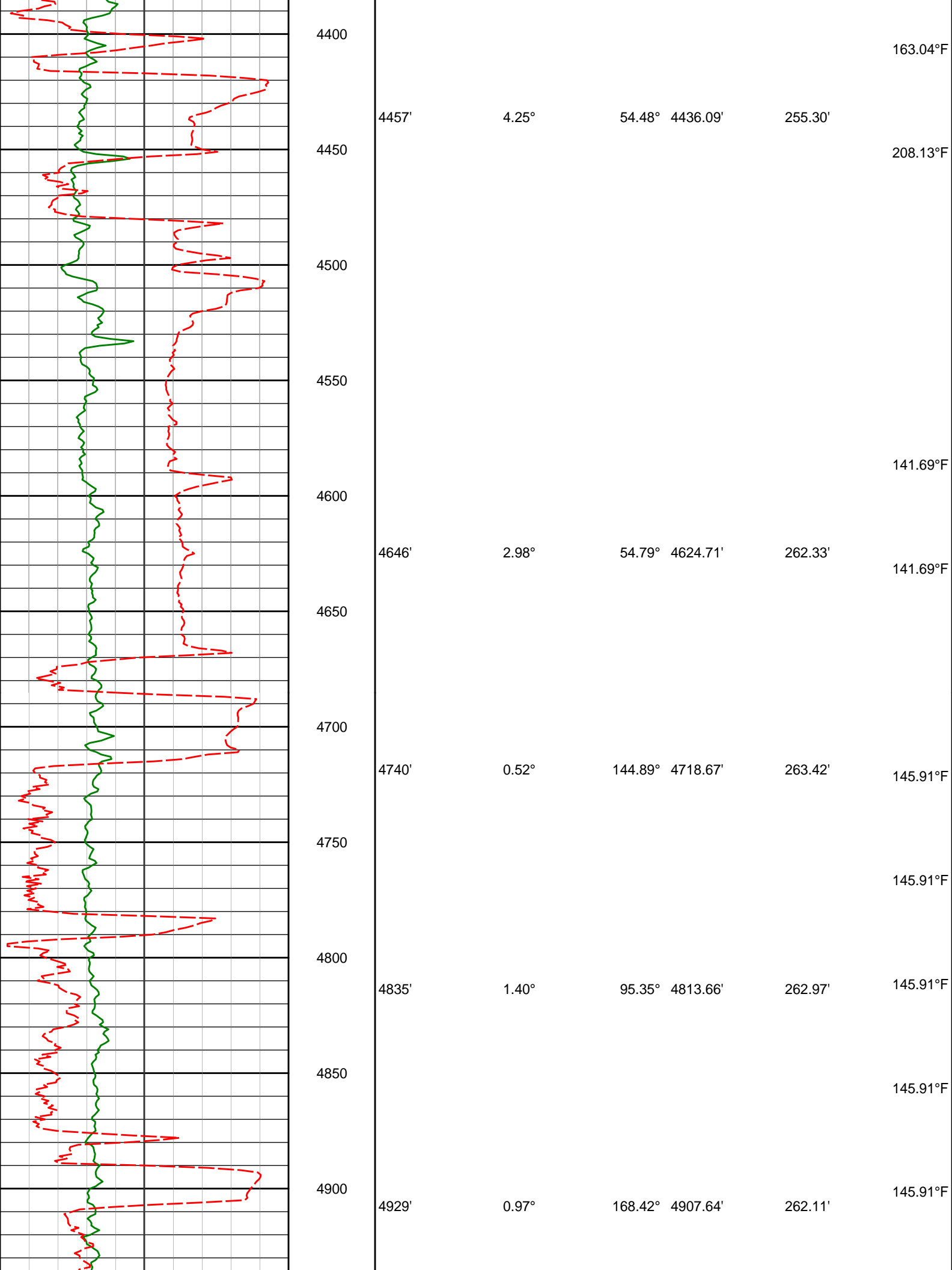


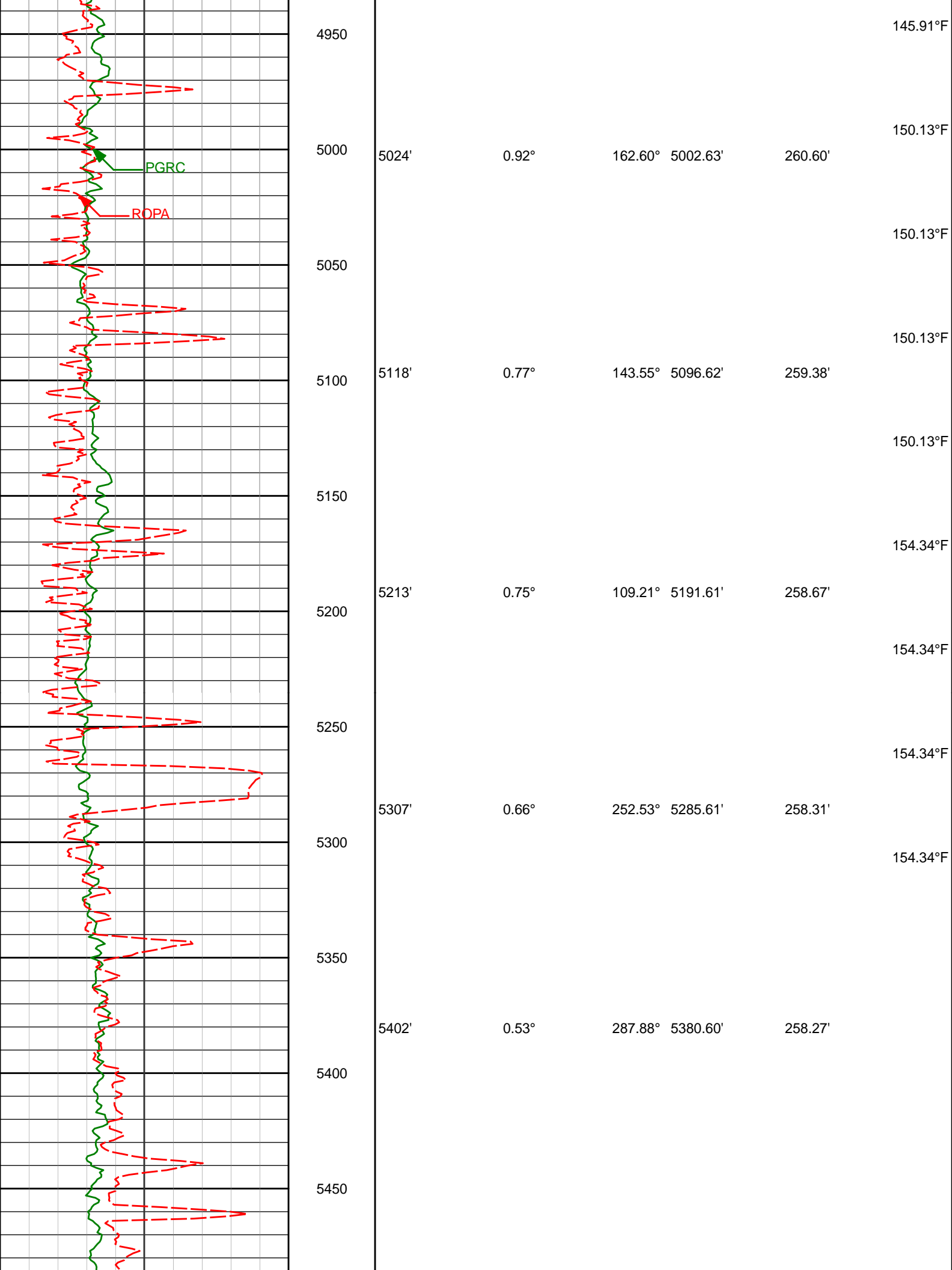


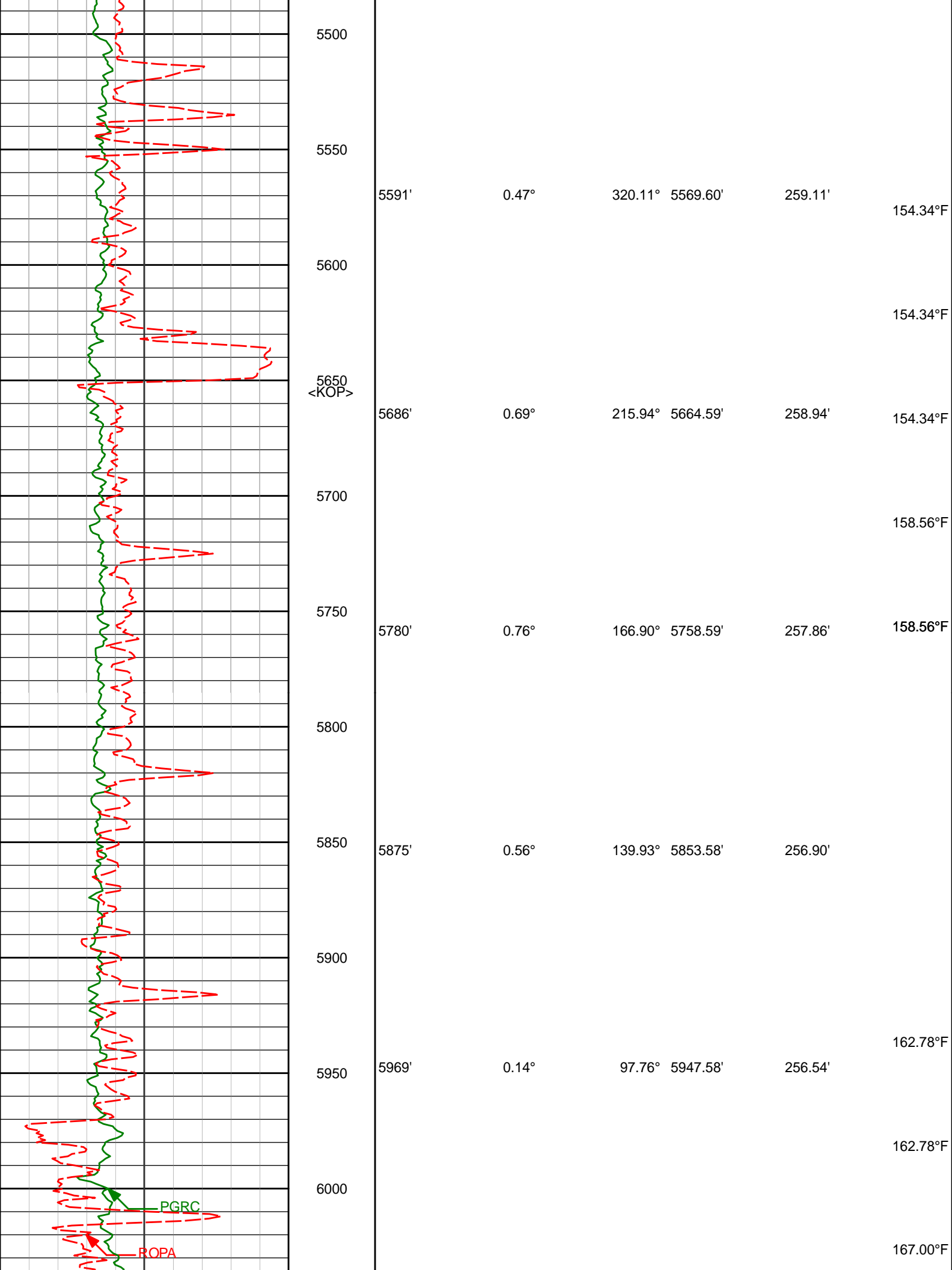


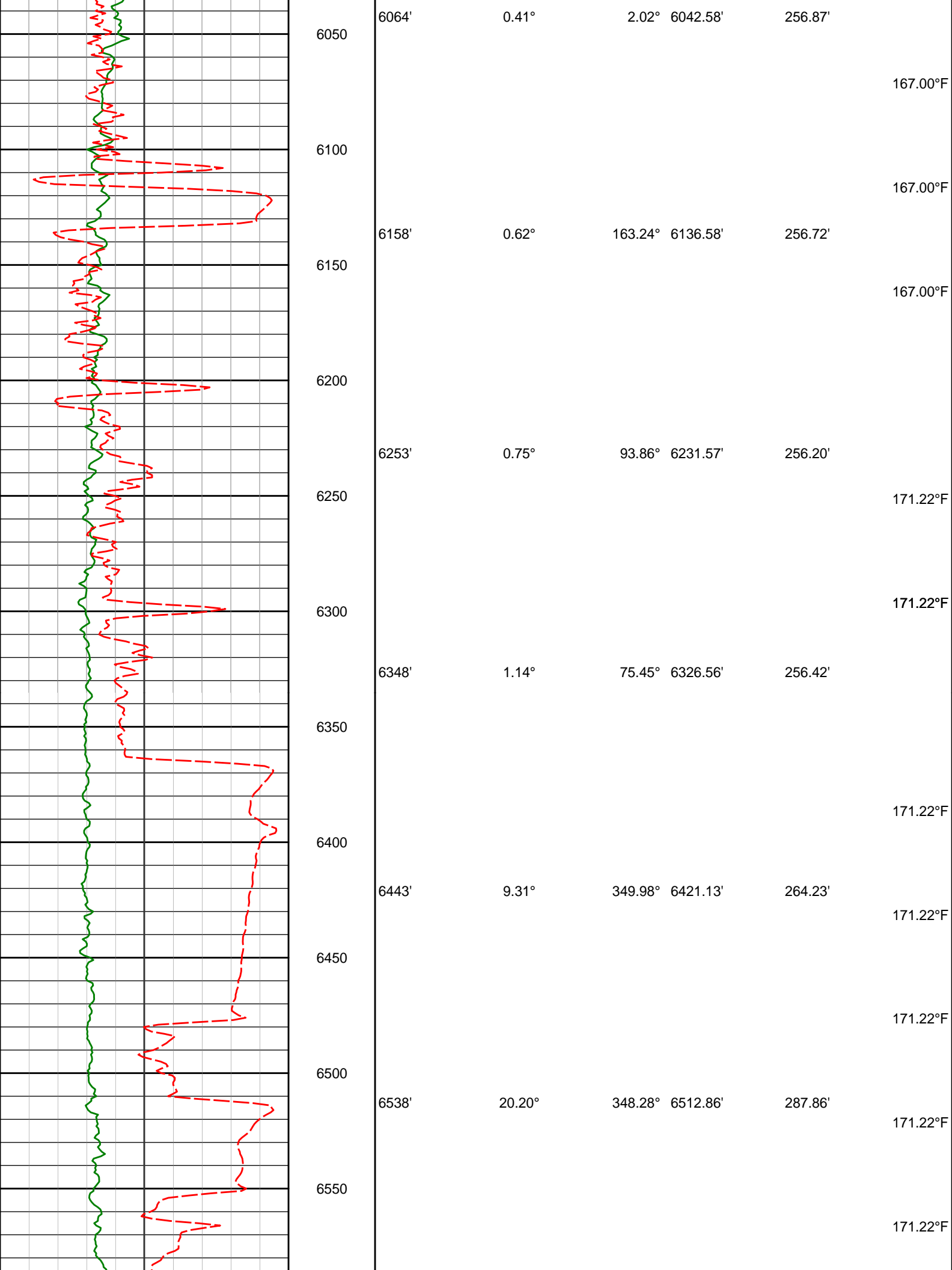


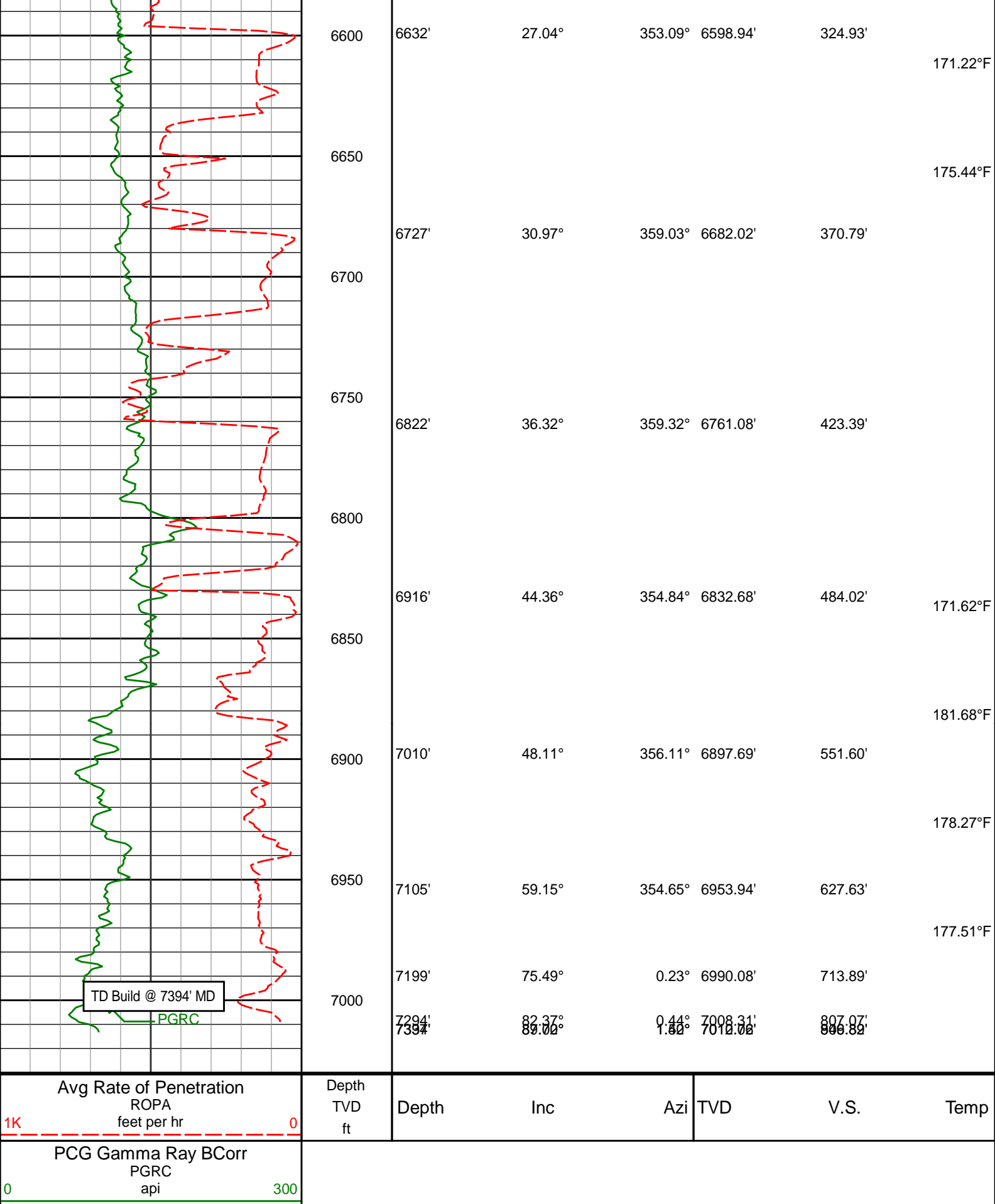








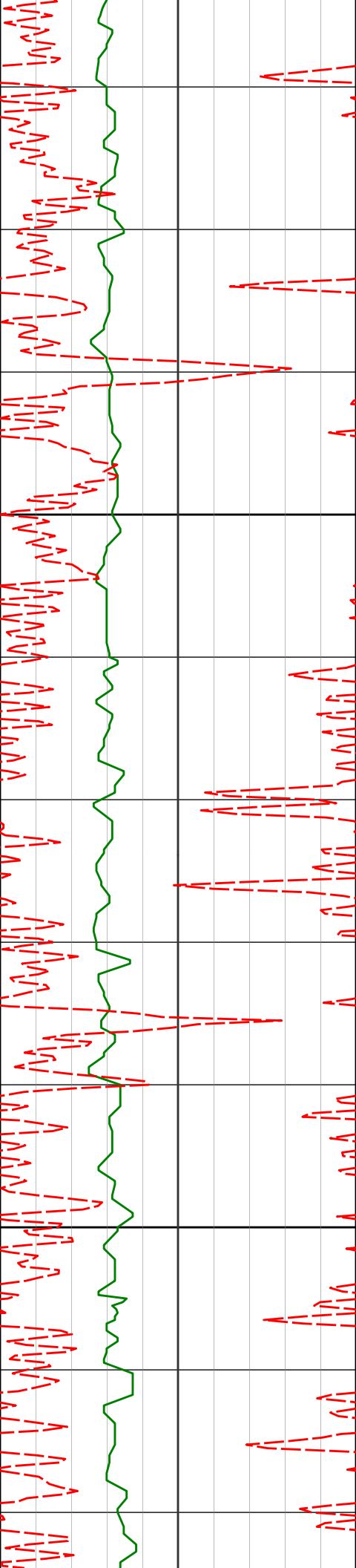




TVD Detail 1:240 Scale

| PCG Gamma Ray BCorr<br>PGRC<br>api             |  |  |  |  |  |                       |       |         |         |        |          |         |
|--|--|--|--|--|--|-----------------------|-------|---------|---------|--------|----------|---------|
| Avg Rate of Penetration<br>ROPA<br>feet per hr |  |  |  |  |  | Depth<br>TVD<br>ft    | Inc   | Azi     | TVD     | V.S.   | Temp     |         |
|  |  |  |  |  |  | Casing Shoe @ 877' MD |       |         |         |        |          | 78.41°F |
| Run 100  |  |  |  |  |  |                       |       |         |         |        |          |         |
|  |  |  |  |  |  | 900                   |       |         |         |        |          |         |
|  |  |  |  |  |  | 927'                  | 0.40° | 103.36° | 926.99' | -0.71' |          |         |
|  |  |  |  |  |  |                       |       |         |         |        | 106.28°F |         |
|  |  |  |  |  |  |                       |       |         |         |        |          |         |
|  |  |  |  |  |  |                       |       |         |         |        | 109.60°F |         |
| PGRC   |  |  |  |  |  | 1000                  |       |         |         |        |          |         |

| PCG Gamma Ray BCorr<br>PGRC<br>api             |     |                    |       |         |          |        |          |
|--|-----|--------------------|-------|---------|----------|--------|----------|
| Avg Rate of Penetration<br>ROPA<br>feet per hr |     | Depth<br>TVD<br>ft | Inc   | Azi     | TVD      | V.S.   | Temp     |
| 0  | 300 |                    |       |         |          |        | 78.41°F  |
| 1K   | 0   |                    |       |         |          |        |          |
|  |     |                    |       |         |          |        |          |
|  |     | 900                |       |         |          |        |          |
|  |     | 927'               | 0.40° | 103.36° | 926.99'  | -0.71' |          |
|  |     |                    |       |         |          |        | 106.28°F |
|  |     |                    |       |         |          |        |          |
|  |     |                    |       |         |          |        | 109.60°F |
|  |     | 1000               |       |         |          |        |          |
|  |     | 1022'              | 0.25° | 117.52° | 1021.99' | -0.87' |          |



1100

1200

1203'

0.12°

185.24° 1202.99'

-1.25'

82.62°F

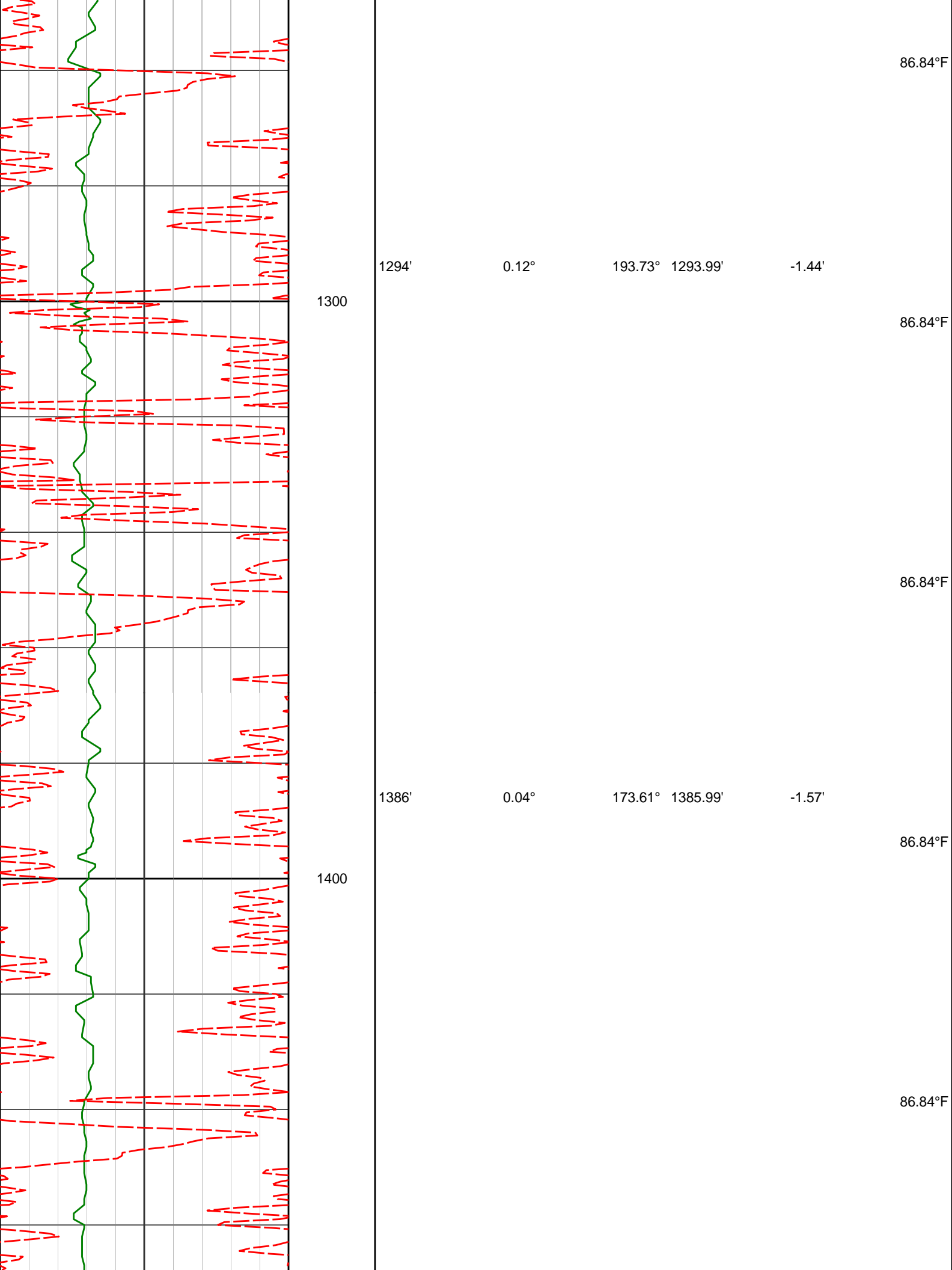
82.62°F

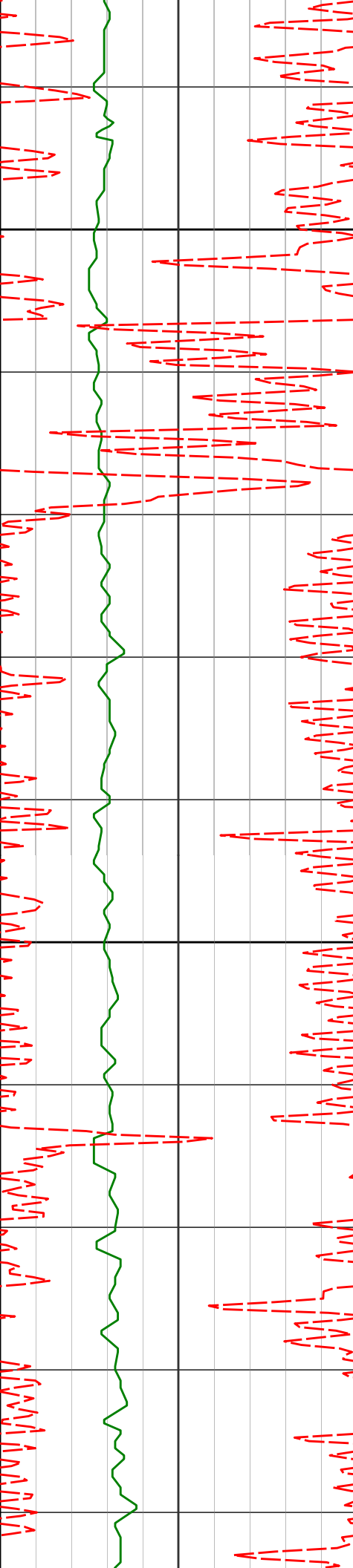
82.62°F

82.62°F

86.84°F







1476'

0.06°

200.50° 1475.99'

-1.65'

91.06°F

1500

91.06°F

1568'

0.13°

76.46° 1567.99'

-1.67'

1600

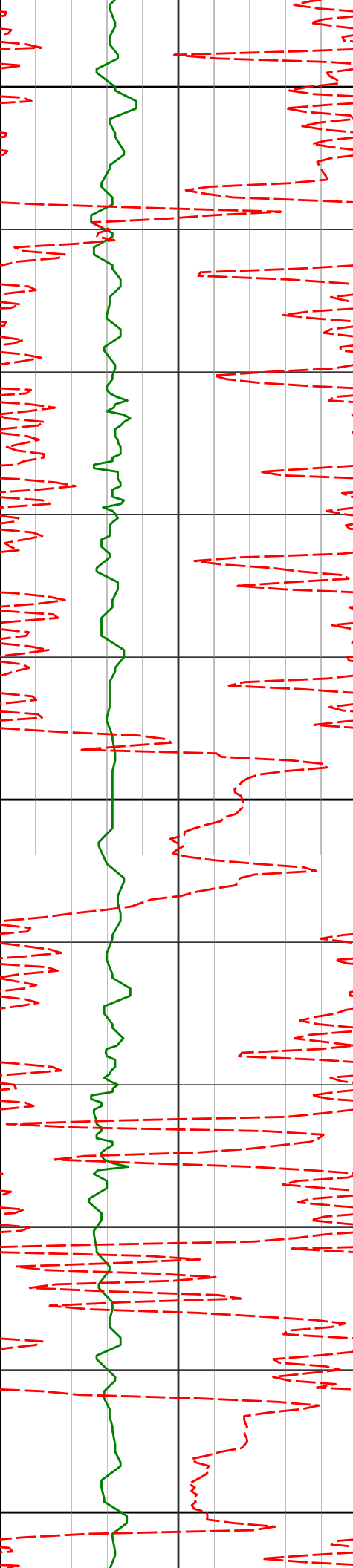
1659'

0.09°

25.72° 1658.99'

-1.58'

91.06°F



1700

91.06°F

95.28°F

1800

95.28°F

1841'

1.88°

45.56°

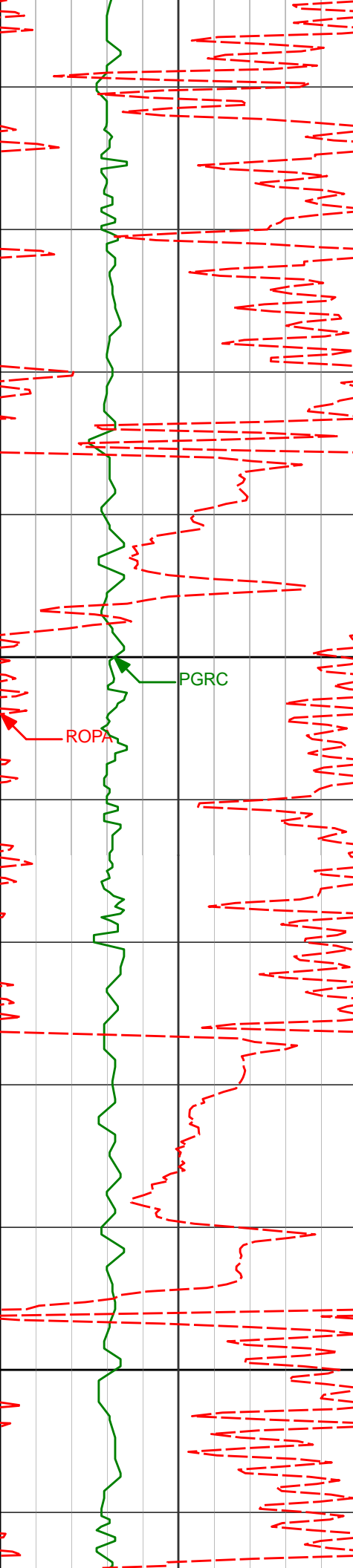
1840.96'

0.68'

95.28°F

1900

95.28°F



2000

2100

1933'

4.91°

35.48°

1932.78'

4.99'

95.28°F

95.28°F

2024'

7.13°

33.08°

2023.28'

12.97'

99.50°F

99.50°F

2115'

11.93°

24.27°

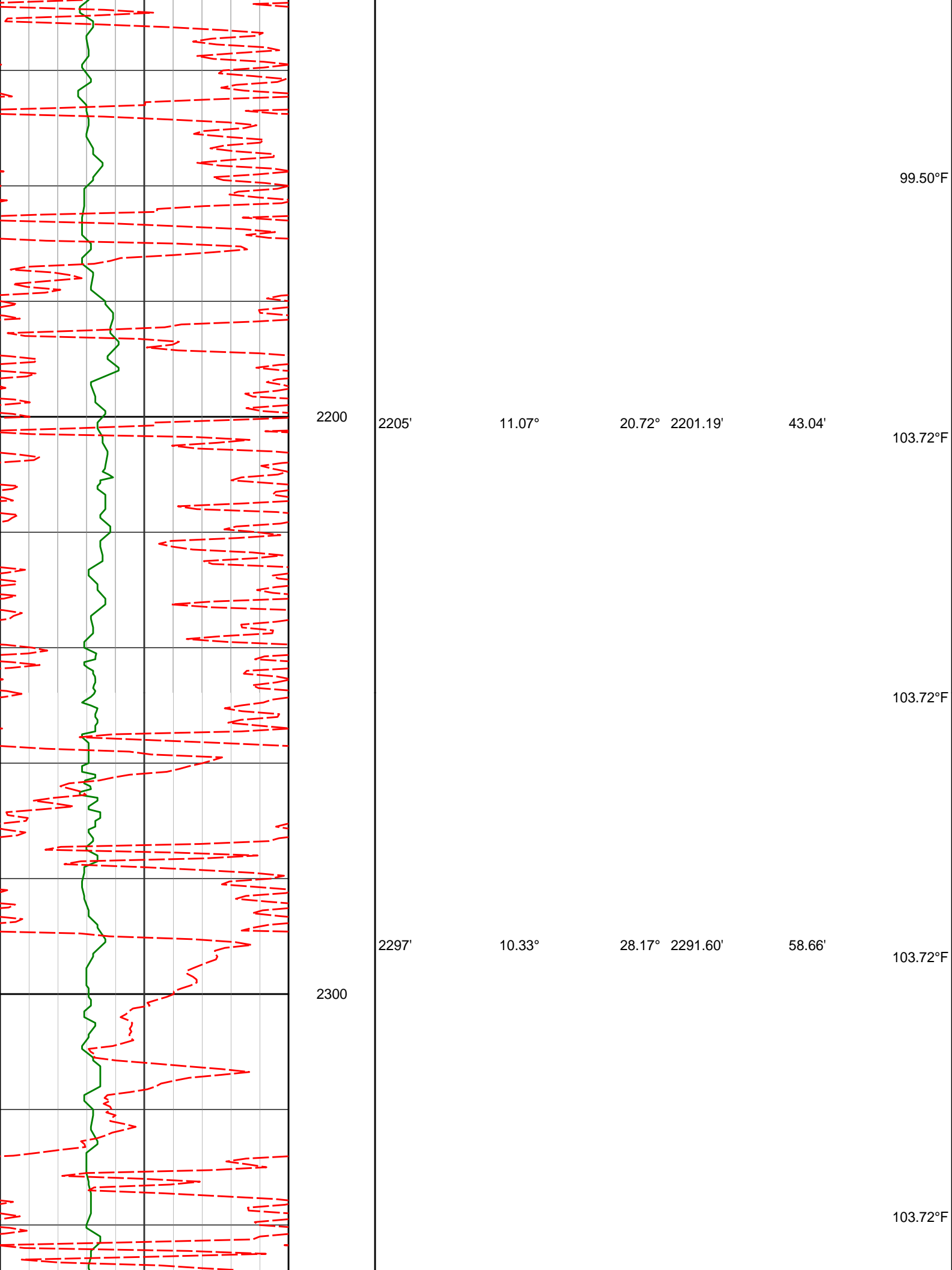
2113.00'

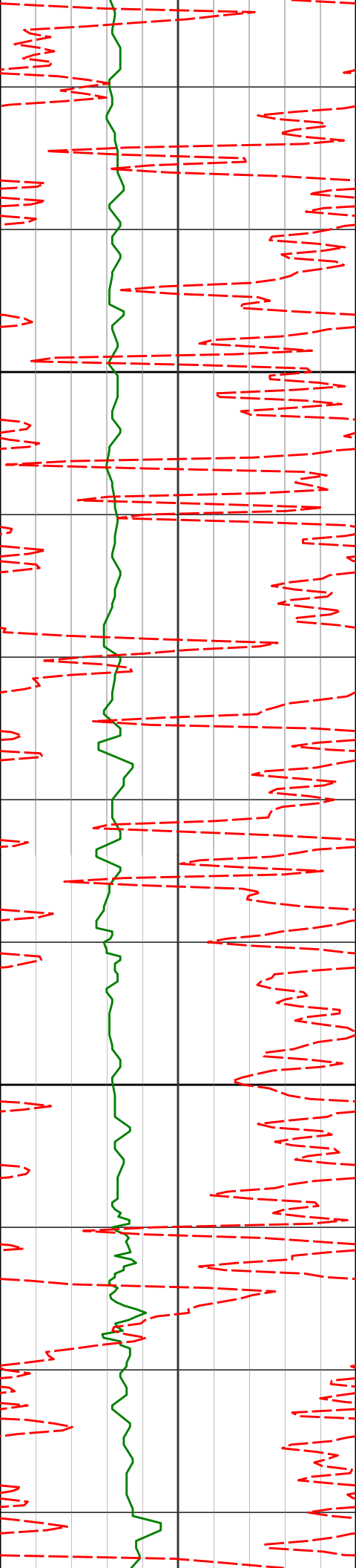
26.38'

99.50°F

PGRC

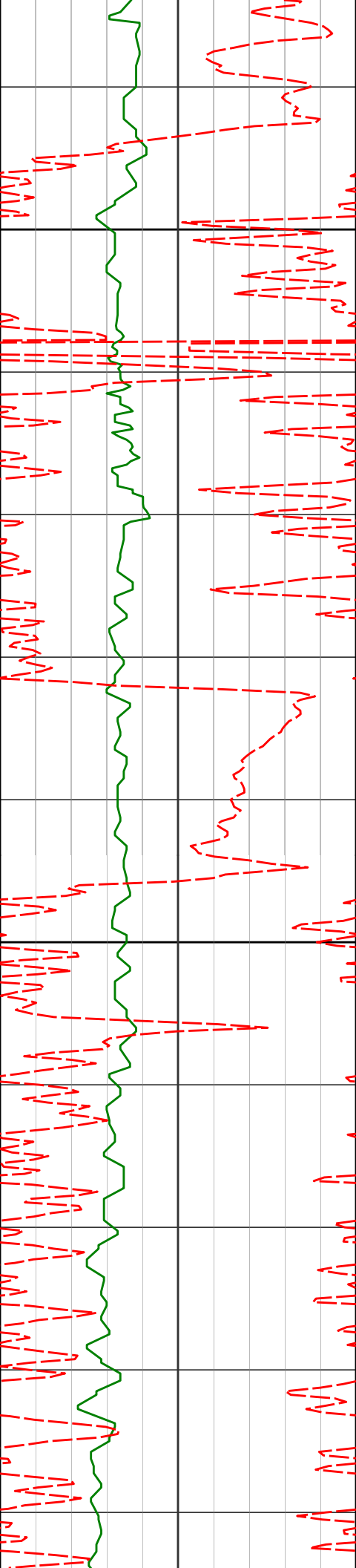
ROPA





2400

2500



2600

107.94°F

2663'

9.69°

29.83° 2652.19'

112.12'

112.16°F

2700

112.16°F

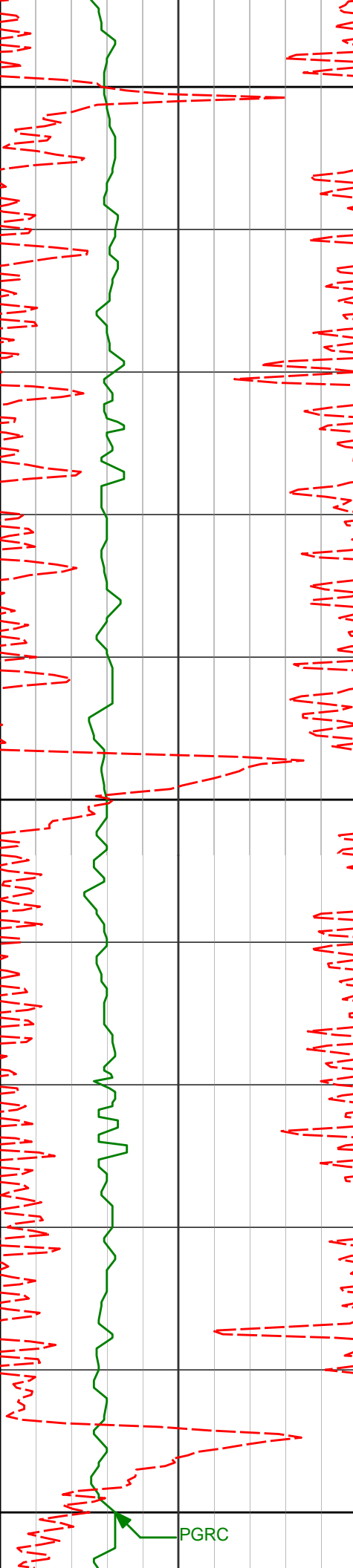
2755'

7.13°

44.44° 2743.21'

123.02'

112.16°F



2800

2849'

6.92°

44.21°

2836.50'

131.36'

116.38°F

2900

2944'

6.64°

42.40°

2930.84'

139.62'

116.38°F

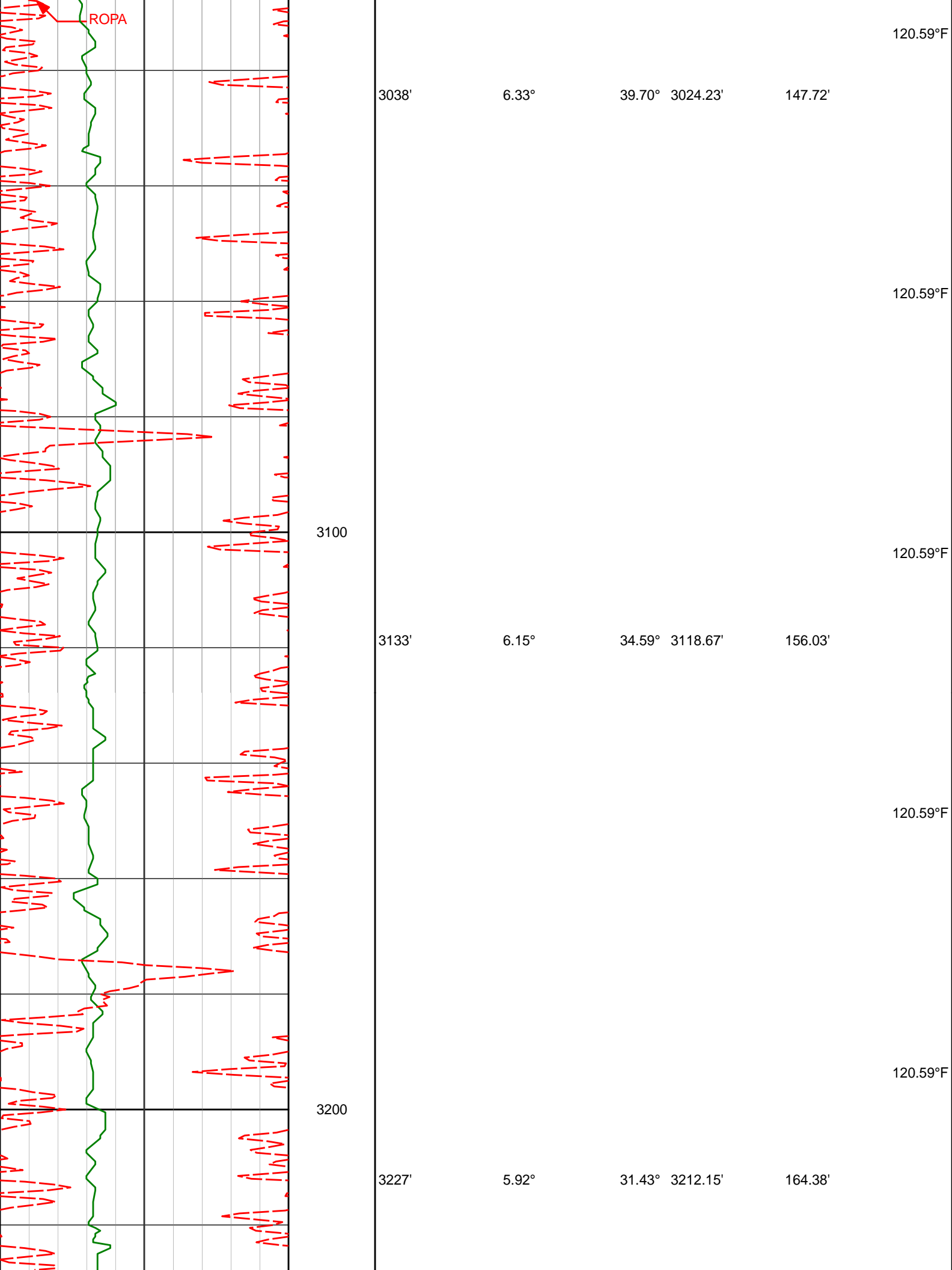
3000

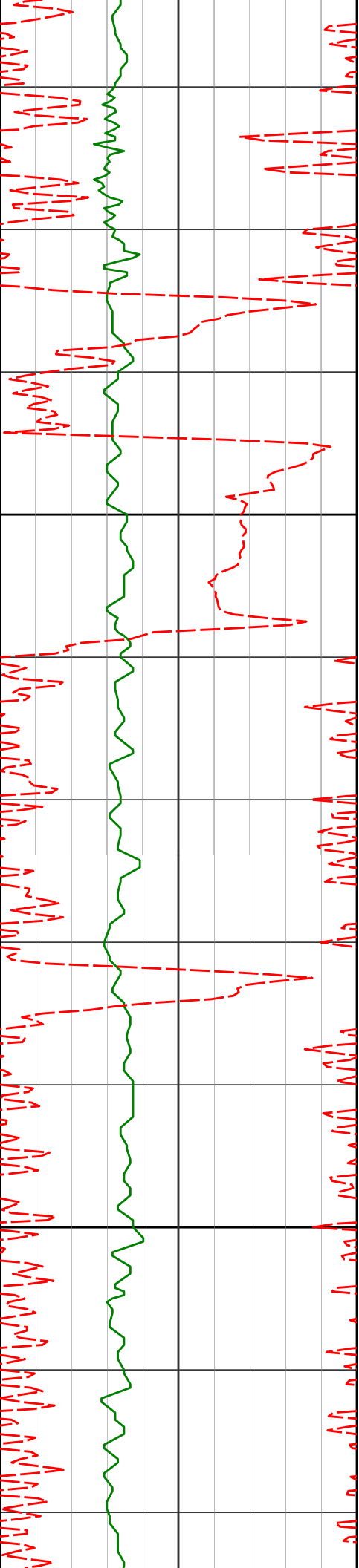
PGRC

116.38°F

112.16°F







3300

3322'

6.83°

47.17°

3306.57'

172.49'

3400

3417'

6.52°

41.44°

3400.93'

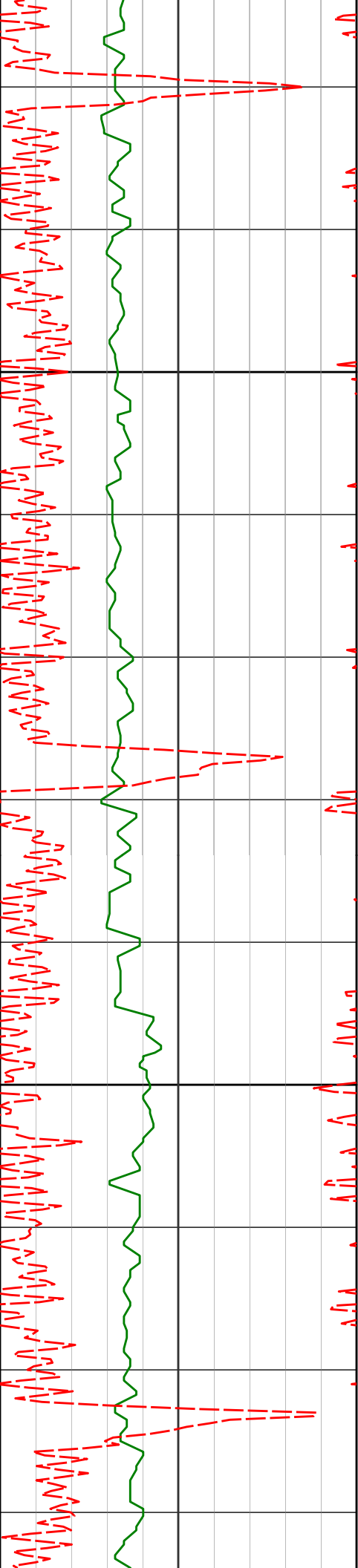
180.48'

120.59°F

124.81°F

124.81°F

124.81°F



3500

3600

3511'

6.14°

41.36° 3494.36'

188.34'

124.81°F

124.81°F

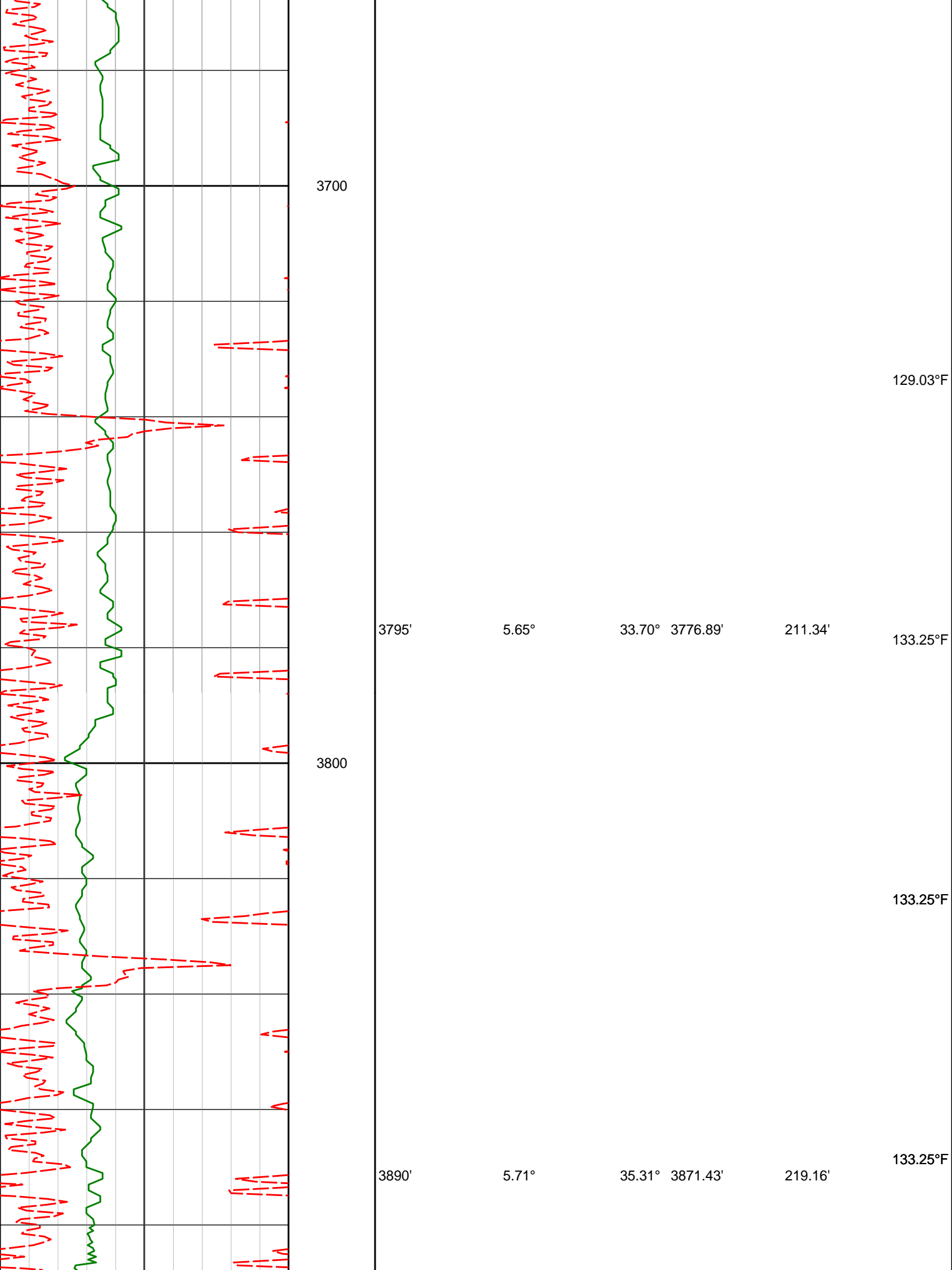
124.81°F

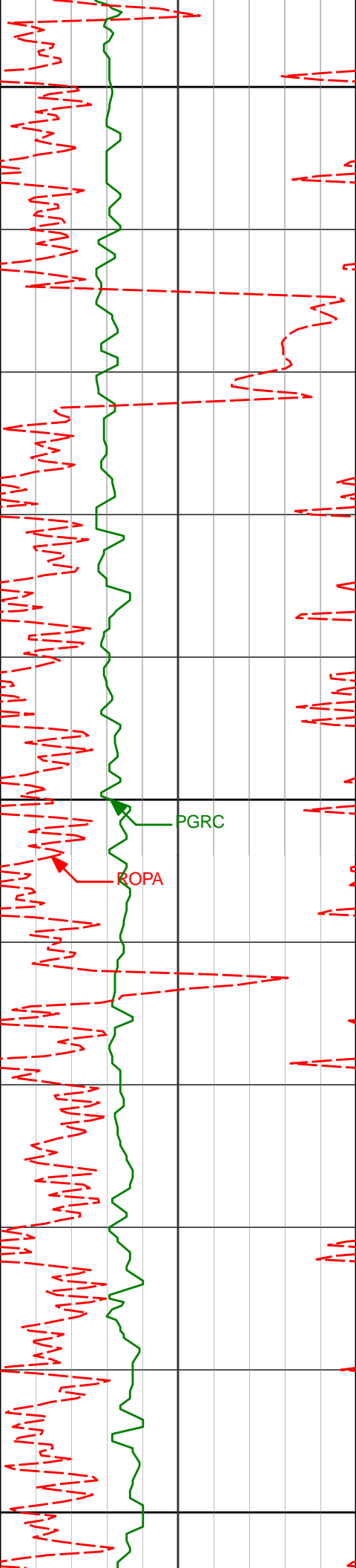
3606'

5.82°

39.00° 3588.84'

195.99'





3900

3984'

5.63°

42.53°

3964.97'

226.46'

137.47°F

4000

PGRC

137.47°F

ROPA

137.47°F

4079'

5.45°

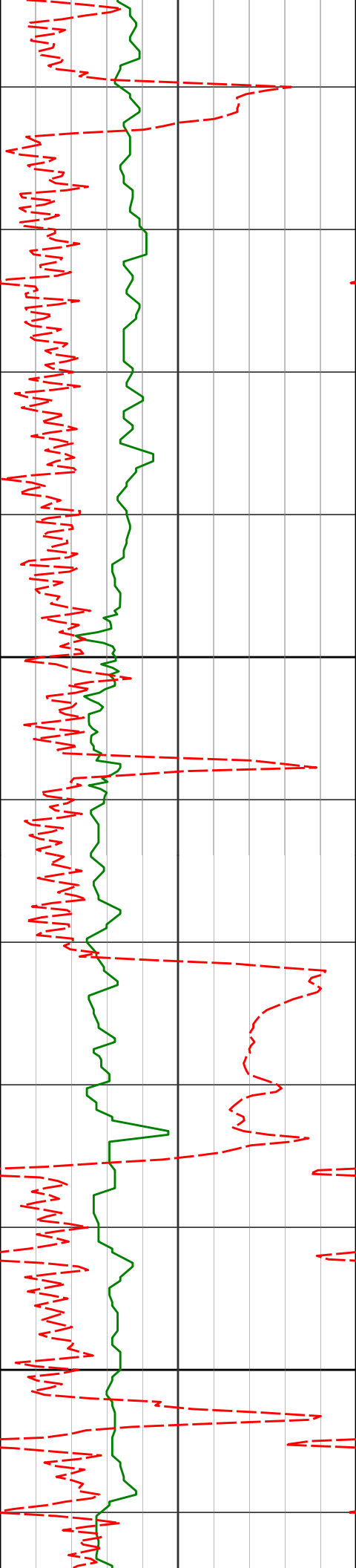
38.78°

4059.52'

233.50'

137.47°F

4100



4200

4300

4174'

4.94°

38.62°

4154.13'

240.28'

4268'

5.10°

49.23°

4247.77'

246.25'

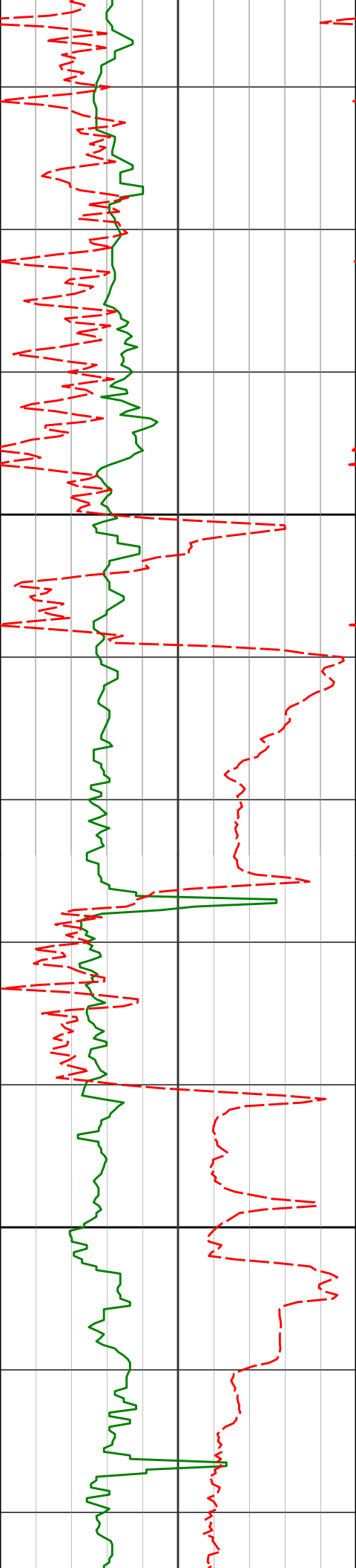
141.69°F

141.69°F

141.69°F

141.69°F

141.69°F



4363'

5.06°

60.56°

4342.40'

251.16'

141.69°F

4400

163.04°F

4457'

4.25°

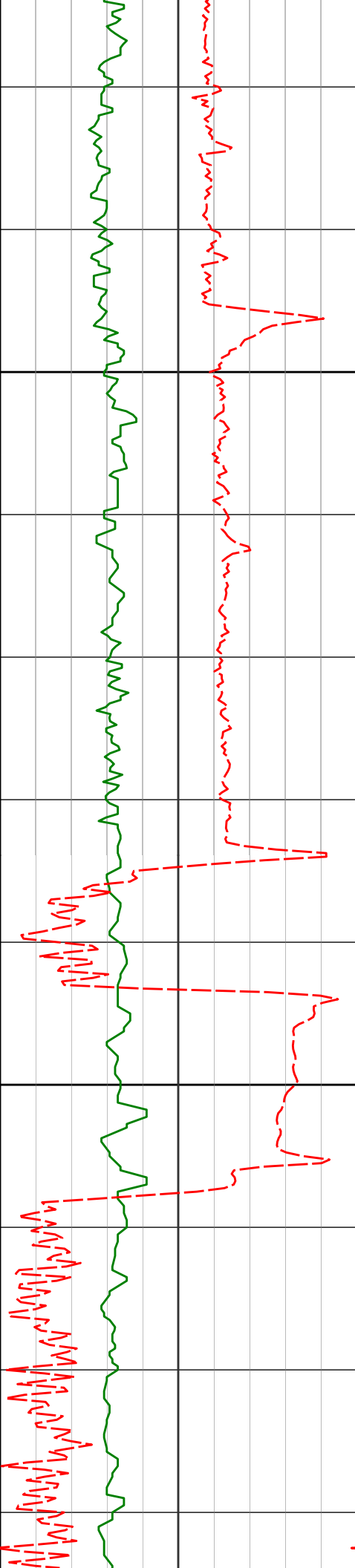
54.48°

4436.09'

255.30'

208.13°F

4500



4600

4646'

2.98°

54.79° 4624.71'

262.33'

141.69°F

4700

4740'

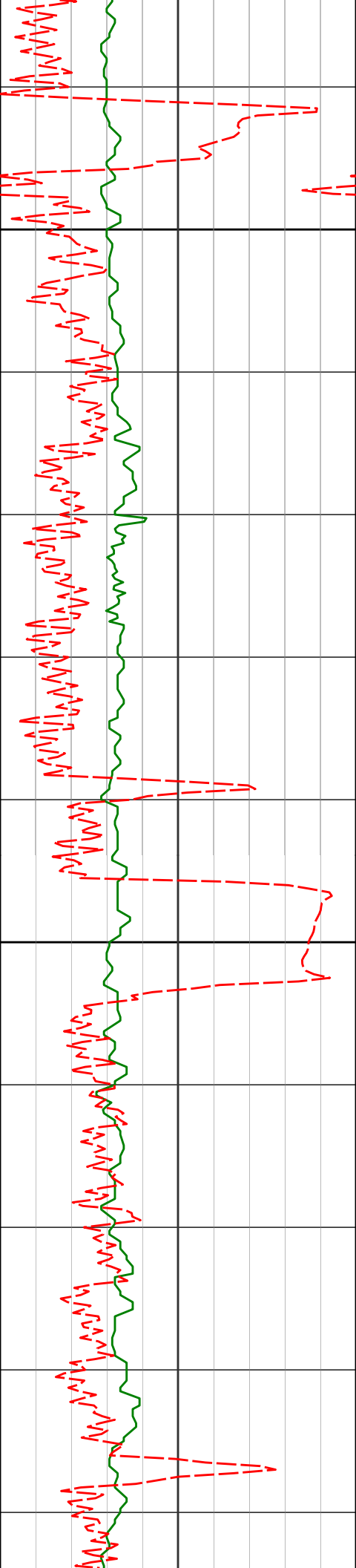
0.52°

144.89° 4718.67'

263.42'

145.91°F





4800

4835'

1.40°

95.35° 4813.66'

262.97'

145.91°F

145.91°F

4900

4929'

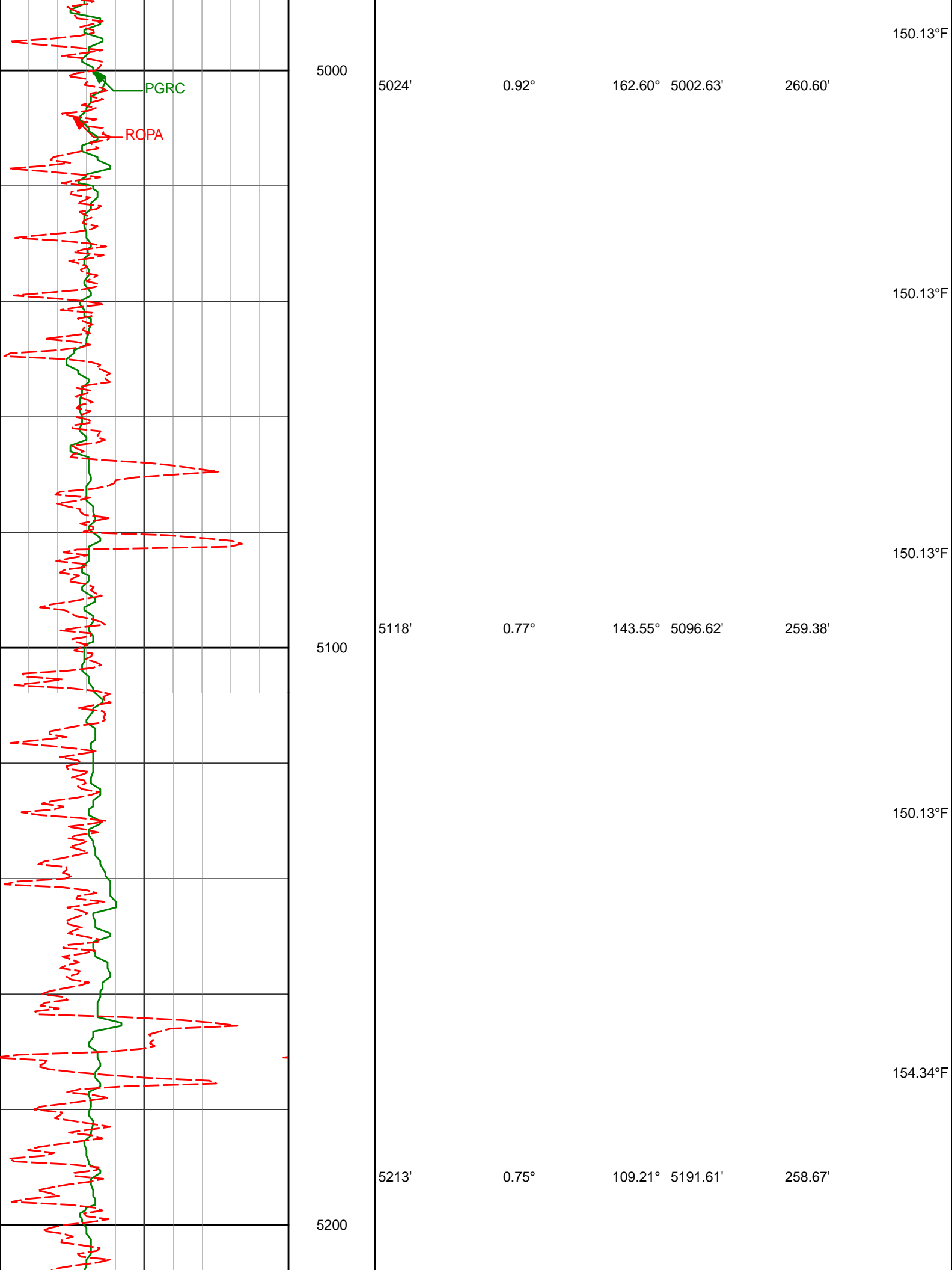
0.97°

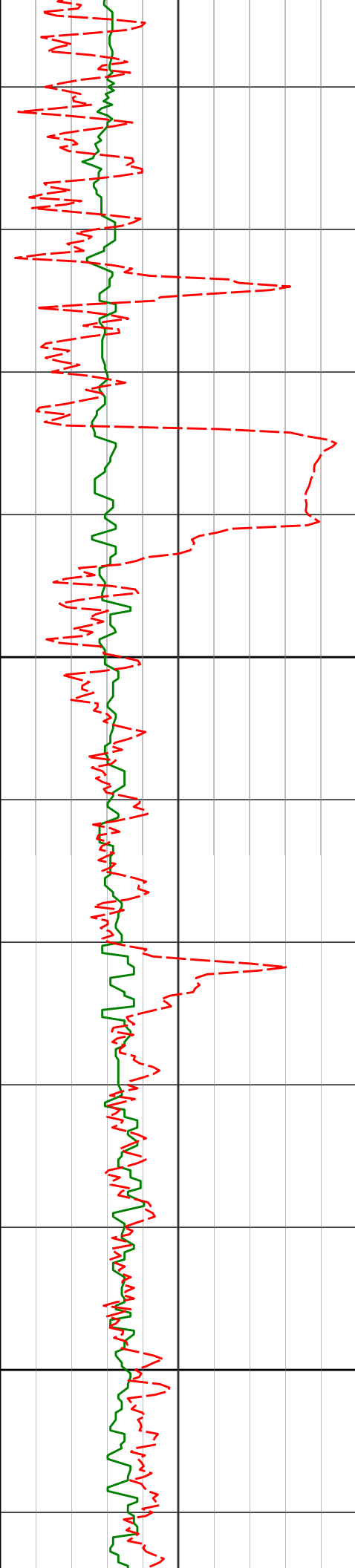
168.42° 4907.64'

262.11'

145.91°F

145.91°F





5300

5400

5307'

5402'

0.66°

0.53°

252.53° 5285.61'

287.88° 5380.60'

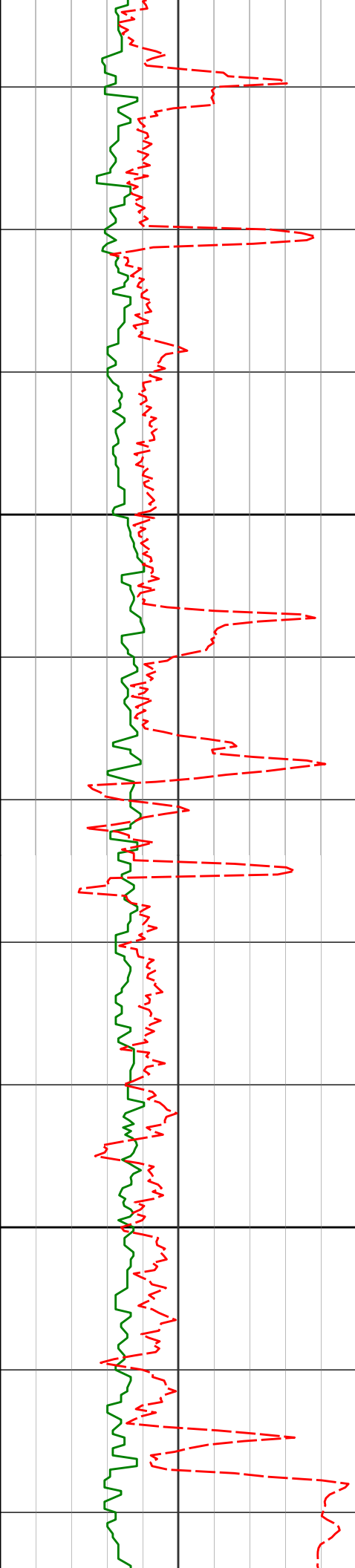
258.31'

258.27'

154.34°F

154.34°F

154.34°F



5500

5591'

0.47°

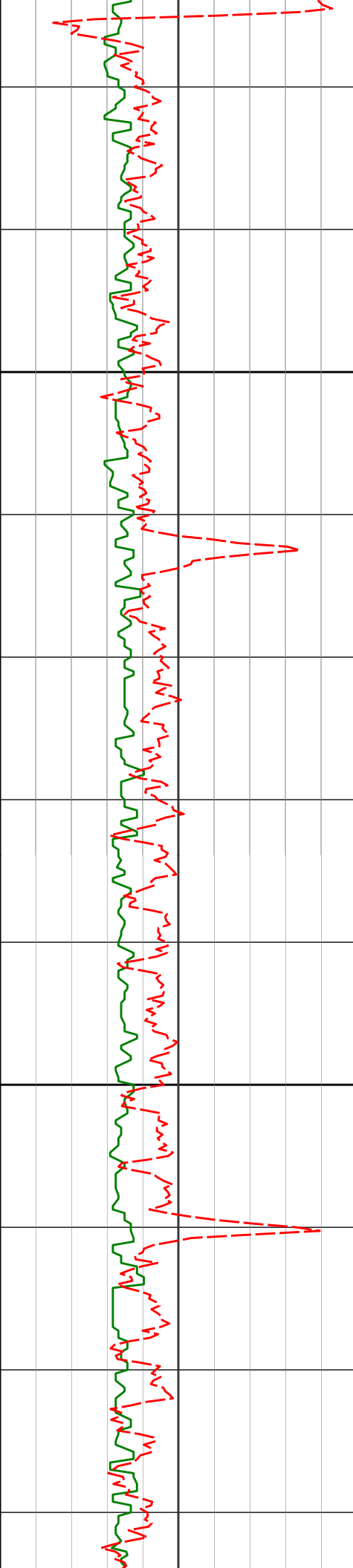
320.11° 5569.60'

259.11'

154.34°F

5600

154.34°F

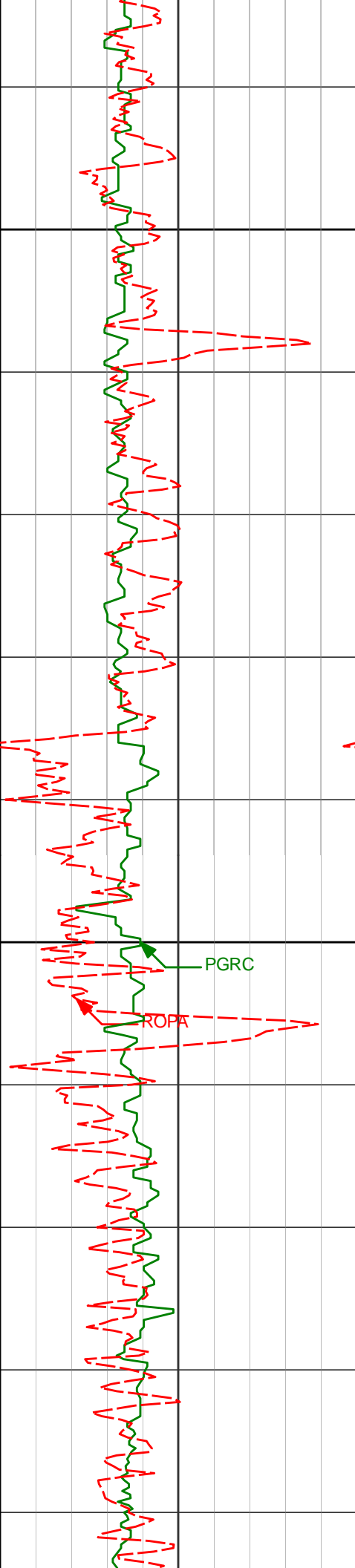


<KOP>

5700

5800

|       |       |         |          |         |          |
|-------|-------|---------|----------|---------|----------|
| 5686' | 0.69° | 215.94° | 5664.59' | 258.94' | 154.34°F |
| 5780' | 0.76° | 166.90° | 5758.59' | 257.86' | 158.56°F |
| 5875' | 0.56° | 139.93° | 5853.58' | 256.90' |          |



5900

5969'

0.14°

97.76°

5947.58'

256.54'

162.78°F

6000

PGRC

ROPA

167.00°F

6064'

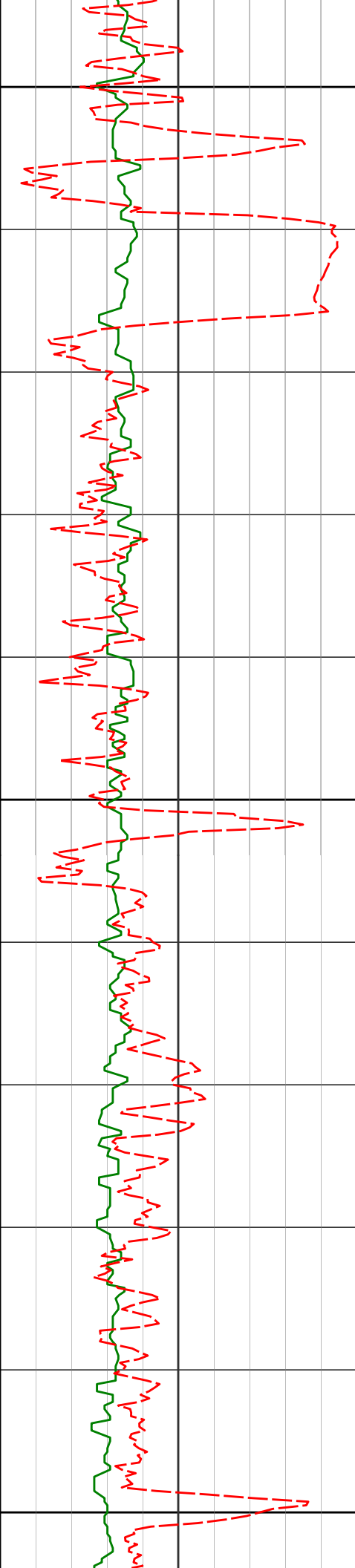
0.41°

2.02°

6042.58'

256.87'

167.00°F



6100

6200

6300

6158'

0.62°

163.24° 6136.58'

256.72'

6253'

0.75°

93.86° 6231.57'

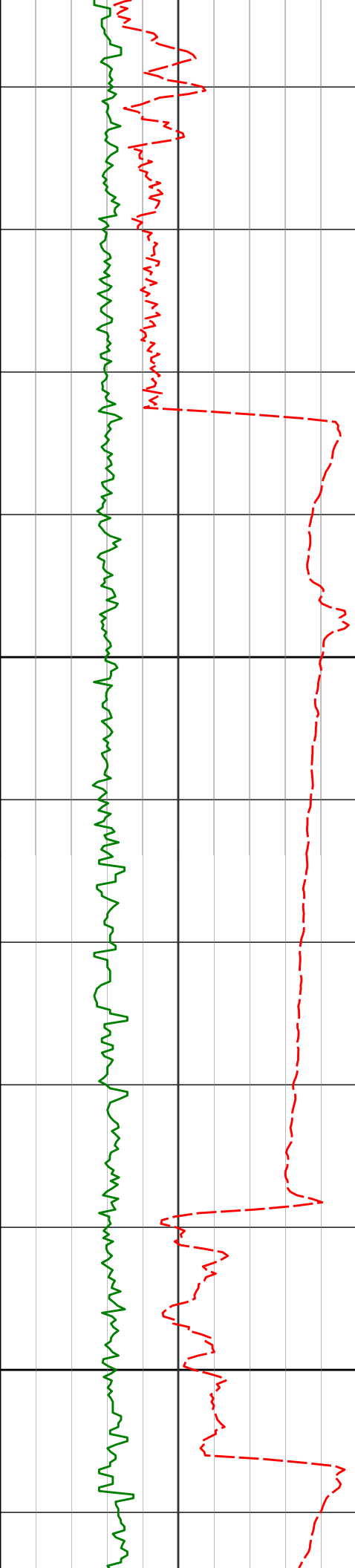
256.20'

167.00°F

167.00°F

171.22°F

171.22°F



6400

6500

6348'

1.14°

75.45° 6326.56'

256.42'

6443'

9.31°

349.98° 6421.13'

264.23'

6538'

20.20°

348.28° 6512.86'

287.86'

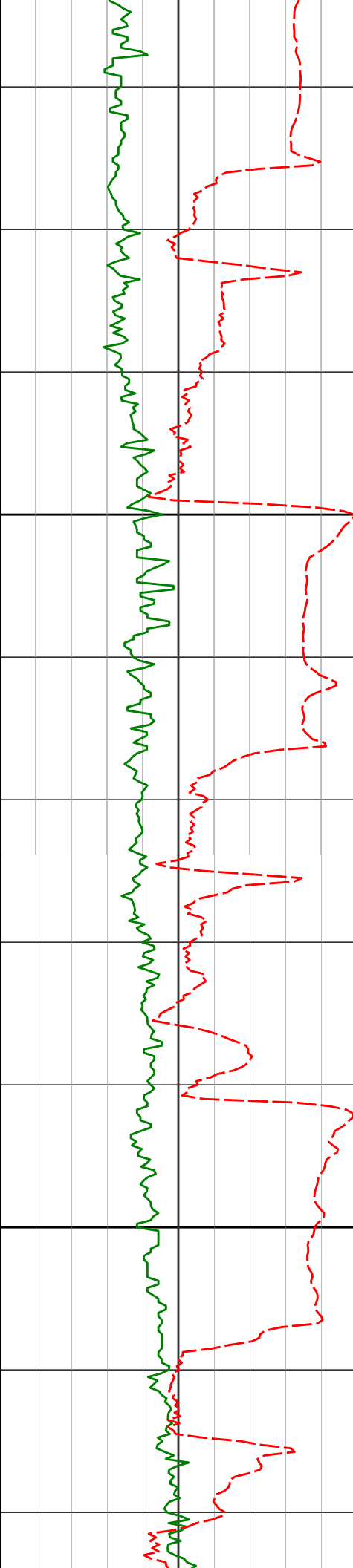
171.22°F

171.22°F

171.22°F

171.22°F





6600

6700

6632'

6727'

27.04°

 $30.97^\circ$ 

353.09°

359.03°

6598.94'

6682.02'

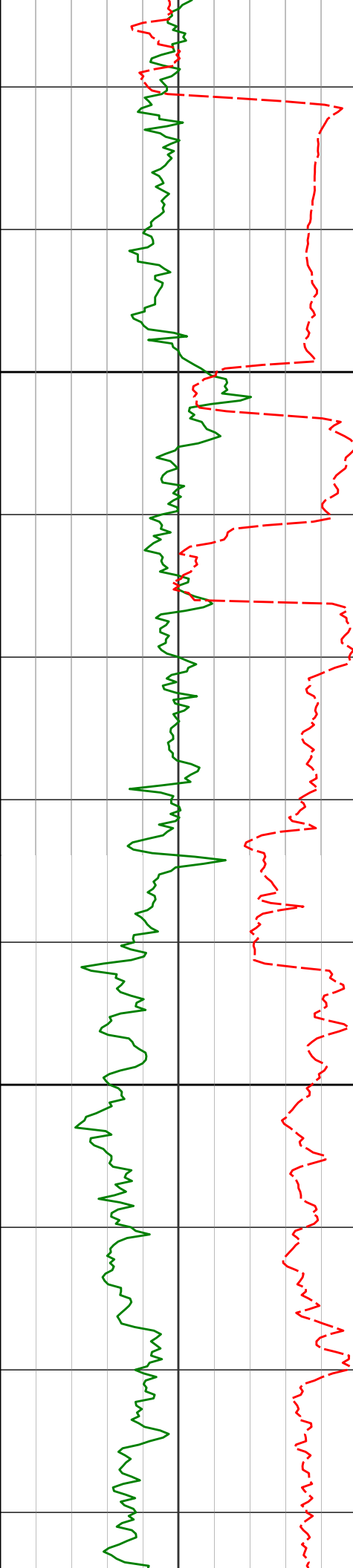
324.93'

370.79'

171.22°F

171.22°F

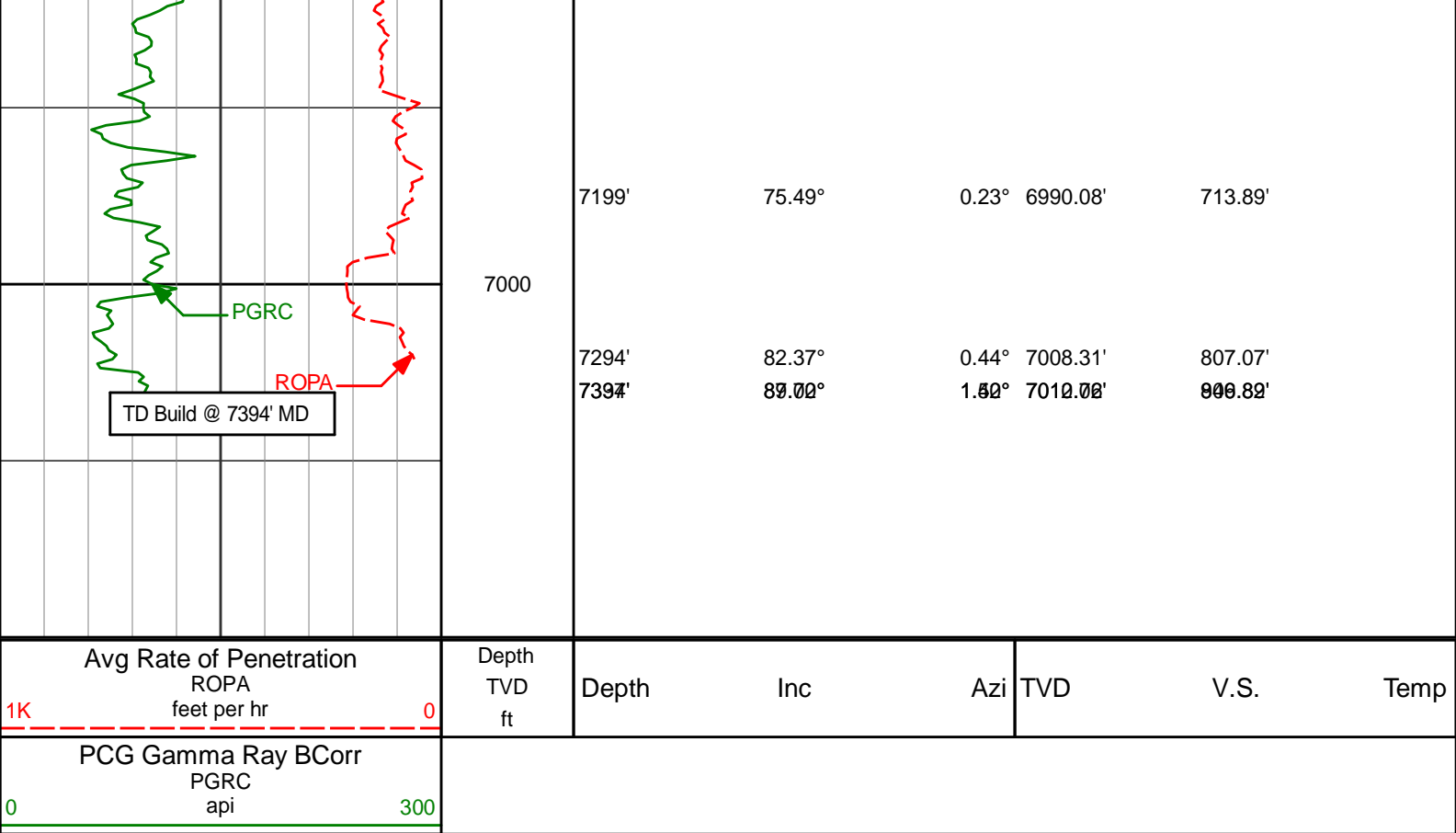
175.44°F



6800

6900

|       |        |         |          |         |
|-------|--------|---------|----------|---------|
| 6822' | 36.32° | 359.32° | 6761.08' | 423.39' |
|       |        |         |          |         |
| 6916' | 44.36° | 354.84° | 6832.68' | 484.02' |
|       |        |         |          |         |
| 7010' | 48.11° | 356.11° | 6897.69' | 551.60' |
|       |        |         |          |         |
| 7105' | 59.15° | 354.65° | 6953.94' | 627.63' |



## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Noble Energy  
Moser H22-715  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0902863038

| 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             |
| 927.00                | 0.40                  | 103.36              | 926.99                | 0.75 S          | 3.15 E           | -0.71                   | 0.04               |
| 1022.00               | 0.25                  | 117.52              | 1021.99               | 0.92 S          | 3.66 E           | -0.87                   | 0.18               |
| 1203.00               | 0.12                  | 185.24              | 1202.99               | 1.30 S          | 4.00 E           | -1.25                   | 0.13               |
| 1294.00               | 0.12                  | 193.73              | 1293.99               | 1.49 S          | 3.97 E           | -1.44                   | 0.02               |
| 1386.00               | 0.04                  | 173.61              | 1385.99               | 1.62 S          | 3.95 E           | -1.57                   | 0.09               |
| 1476.00               | 0.06                  | 200.50              | 1475.99               | 1.70 S          | 3.93 E           | -1.65                   | 0.03               |
| 1568.00               | 0.13                  | 76.46               | 1567.99               | 1.73 S          | 4.02 E           | -1.67                   | 0.19               |
| 1659.00               | 0.09                  | 25.72               | 1658.99               | 1.64 S          | 4.15 E           | -1.58                   | 0.11               |
| 1841.00               | 1.88                  | 45.56               | 1840.96               | 0.59 N          | 6.35 E           | 0.68                    | 0.99               |
| 1933.00               | 4.91                  | 35.48               | 1932.78               | 4.86 N          | 9.72 E           | 4.99                    | 3.34               |
| 2024.00               | 7.13                  | 33.08               | 2023.28               | 12.76 N         | 15.06 E          | 12.97                   | 2.46               |
| 2115.00               | 11.93                 | 24.27               | 2113.00               | 26.08 N         | 22.02 E          | 26.38                   | 5.50               |
| 2205.00               | 11.07                 | 20.72               | 2201.19               | 42.64 N         | 28.90 E          | 43.04                   | 1.24               |
| 2297.00               | 10.33                 | 28.17               | 2291.60               | 58.17 N         | 35.91 E          | 58.66                   | 1.70               |
| 2388.00               | 10.34                 | 35.45               | 2381.12               | 72.02 N         | 44.50 E          | 72.62                   | 1.43               |
| 2480.00               | 9.60                  | 33.73               | 2471.73               | 85.13 N         | 53.55 E          | 85.86                   | 0.87               |
| 2571.00               | 9.47                  | 30.11               | 2561.48               | 97.92 N         | 61.52 E          | 98.76                   | 0.67               |
| 2663.00               | 9.69                  | 29.83               | 2652.19               | 111.18 N        | 69.17 E          | 112.12                  | 0.24               |
| 2755.00               | 7.13                  | 44.44               | 2743.21               | 121.97 N        | 77.02 E          | 123.02                  | 3.60               |
| 2849.00               | 6.92                  | 44.21               | 2836.50               | 130.20 N        | 85.05 E          | 131.36                  | 0.22               |
| 2944.00               | 6.64                  | 42.40               | 2930.84               | 138.36 N        | 92.75 E          | 139.62                  | 0.37               |
| 3038.00               | 6.33                  | 39.70               | 3024.23               | 146.36 N        | 99.73 E          | 147.72                  | 0.47               |
| 3133.00               | 6.15                  | 34.59               | 3118.67               | 154.58 N        | 105.96 E         | 156.03                  | 0.61               |
| 3227.00               | 5.98                  | 31.42               | 3213.15               | 162.88 N        | 114.35 E         | 164.28                  | 0.42               |

|         |       |        |         |          |          |        |       |
|---------|-------|--------|---------|----------|----------|--------|-------|
| 3227.00 | 5.92  | 31.43  | 3212.15 | 162.86 N | 111.35 E | 164.38 | 0.43  |
| 3322.00 | 6.83  | 47.17  | 3306.57 | 170.88 N | 118.05 E | 172.49 | 2.06  |
| 3417.00 | 6.52  | 41.44  | 3400.93 | 178.76 N | 125.76 E | 180.48 | 0.77  |
| 3511.00 | 6.14  | 41.36  | 3494.36 | 186.53 N | 132.61 E | 188.34 | 0.40  |
| 3606.00 | 5.82  | 39.00  | 3588.84 | 194.09 N | 139.00 E | 195.99 | 0.43  |
| 3795.00 | 5.65  | 33.70  | 3776.89 | 209.28 N | 150.19 E | 211.34 | 0.29  |
| 3890.00 | 5.71  | 35.31  | 3871.43 | 217.04 N | 155.52 E | 219.16 | 0.18  |
| 3984.00 | 5.63  | 42.53  | 3964.97 | 224.26 N | 161.35 E | 226.46 | 0.76  |
| 4079.00 | 5.45  | 38.78  | 4059.52 | 231.21 N | 167.33 E | 233.50 | 0.43  |
| 4174.00 | 4.94  | 38.62  | 4154.13 | 237.92 N | 172.71 E | 240.28 | 0.54  |
| 4268.00 | 5.10  | 49.23  | 4247.77 | 243.82 N | 178.40 E | 246.25 | 1.00  |
| 4363.00 | 5.06  | 60.56  | 4342.40 | 248.63 N | 185.24 E | 251.16 | 1.05  |
| 4457.00 | 4.25  | 54.48  | 4436.09 | 252.69 N | 191.68 E | 255.30 | 1.01  |
| 4646.00 | 2.98  | 54.79  | 4624.71 | 259.58 N | 201.38 E | 262.33 | 0.67  |
| 4740.00 | 0.52  | 144.89 | 4718.67 | 260.64 N | 203.62 E | 263.42 | 3.22  |
| 4835.00 | 1.40  | 95.35  | 4813.66 | 260.17 N | 205.03 E | 262.97 | 1.19  |
| 4929.00 | 0.97  | 168.42 | 4907.64 | 259.29 N | 206.33 E | 262.11 | 1.54  |
| 5024.00 | 0.92  | 162.60 | 5002.63 | 257.77 N | 206.72 E | 260.60 | 0.11  |
| 5118.00 | 0.77  | 143.55 | 5096.62 | 256.54 N | 207.32 E | 259.38 | 0.34  |
| 5213.00 | 0.75  | 109.21 | 5191.61 | 255.82 N | 208.28 E | 258.67 | 0.47  |
| 5307.00 | 0.66  | 252.53 | 5285.61 | 255.46 N | 208.35 E | 258.31 | 1.42  |
| 5402.00 | 0.53  | 287.88 | 5380.60 | 255.43 N | 207.41 E | 258.27 | 0.40  |
| 5591.00 | 0.47  | 320.11 | 5569.60 | 256.30 N | 206.08 E | 259.11 | 0.15  |
| 5686.00 | 0.69  | 215.94 | 5664.59 | 256.13 N | 205.49 E | 258.94 | 0.98  |
| 5780.00 | 0.76  | 166.90 | 5758.59 | 255.06 N | 205.30 E | 257.86 | 0.65  |
| 5875.00 | 0.56  | 139.93 | 5853.58 | 254.09 N | 205.74 E | 256.90 | 0.38  |
| 5969.00 | 0.14  | 97.76  | 5947.58 | 253.72 N | 206.15 E | 256.54 | 0.50  |
| 6064.00 | 0.41  | 2.02   | 6042.58 | 254.05 N | 206.27 E | 256.87 | 0.47  |
| 6158.00 | 0.62  | 163.24 | 6136.58 | 253.90 N | 206.43 E | 256.72 | 1.08  |
| 6253.00 | 0.75  | 93.86  | 6231.57 | 253.37 N | 207.20 E | 256.20 | 0.83  |
| 6348.00 | 1.14  | 75.45  | 6326.56 | 253.56 N | 208.73 E | 256.42 | 0.52  |
| 6443.00 | 9.31  | 349.98 | 6421.13 | 261.38 N | 208.31 E | 264.23 | 9.78  |
| 6538.00 | 20.20 | 348.28 | 6512.86 | 285.08 N | 203.63 E | 287.86 | 11.47 |
| 6632.00 | 27.04 | 353.09 | 6598.94 | 322.23 N | 197.75 E | 324.93 | 7.56  |
| 6727.00 | 30.97 | 359.03 | 6682.02 | 368.14 N | 194.74 E | 370.79 | 5.12  |
| 6822.00 | 36.32 | 359.32 | 6761.08 | 420.76 N | 193.99 E | 423.39 | 5.64  |
| 6916.00 | 44.36 | 354.84 | 6832.68 | 481.44 N | 190.70 E | 484.02 | 9.08  |
| 7010.00 | 48.11 | 356.11 | 6897.69 | 549.10 N | 185.37 E | 551.60 | 4.11  |
| 7105.00 | 59.15 | 354.65 | 6953.94 | 625.22 N | 179.15 E | 627.63 | 11.69 |
| 7199.00 | 75.49 | 0.23   | 6990.08 | 711.54 N | 175.54 E | 713.89 | 18.21 |
| 7294.00 | 82.37 | 0.44   | 7008.31 | 804.71 N | 176.09 E | 807.07 | 7.24  |
| 7337.00 | 87.72 | 1.42   | 7012.02 | 847.53 N | 176.79 E | 849.89 | 12.66 |

# **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 0.79 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.79 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7337.00 FEET  
IS 865.77 FEET ALONG 11.78 DEGREES (GRID)**

**Final survey is a projection to the bit at TD.**