

D-C Pressure Case Directional
PCG-K Pressure Case Gamma



1 : 240

[illegible]

WELL INFORMATION

| | | | | | |
|----------------------------------|-----------------|--|--|--|--|
| MWD Run Number | 100 | | | | |
| Date run completed | 25-Aug-13 | | | | |
| Rig Bit Number | 0100 | | | | |
| Bit Size (in) | 8.750 | | | | |
| Tool Nominal OD (in) | 6.750 | | | | |
| Log Start Depth (TVD, ft) | 602.97 | | | | |
| Log End Depth (TVD, ft) | 7,131.22 | | | | |
| Drill or Wipe | Drill | | | | |
| Drill/Wipe Start Date and Time | 24-Aug-13 05:30 | | | | |
| Drill/Wipe End Date and Time | 25-Aug-13 16:30 | | | | |
| Min Inc (deg) @ Depth (TVD, ft) | .35 @ 5,299.21 | | | | |
| Max Inc (deg) @ Depth (TVD, ft) | 9.21 @ 2,658.72 | | | | |
| Bit TFA(in2) / Bit Type | .97 / PDC | | | | |
| Flow Rate (gpm) | 568.54 | | | | |
| Max AV (fpm) / CV (fpm) @ MWD | 492.0 / N/A | | | | |
| Fluid Type | Fresh Water Gel | | | | |
| Density (ppg) / Viscosity (spqt) | 9.40 / 42.00 | | | | |
| Filtrate CL (ppm) | 1,500.00 | | | | |
| pH / Fluid Loss (mptm) | 8.00 / 0 | | | | |
| PV (cP) / YP (lbf2) | 11 / 11.00 | | | | |
| % Solids / % Sand | 8.9 / .5 | | | | |
| % 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 (in) Temp (degF) | 122.00 / 204.00 | | | | |

| | | | | | |
|-------------------------------|--------------------|--|--|--|--|
| Max Tool Temp (degF) / Source | 180.09 / PCM | | | | |
| Rm @ Max Tool Temp (degF) | N/A @ 180.09 | | | | |
| Lead MWD Engineer | Patrick Lane | | | | |
| Customer Representative | Travis Kruckenberg | | | | |

SENSOR INFORMATION

Downhole Processor Information

| | | | | | |
|---------------------------|-----------------|--|--|--|--|
| Tool Type | PCM | | | | |
| Software Version | 5.84 | | | | |
| Sub Serial Number | 11341336 | | | | |
| Insert Serial Number | 11145558 | | | | |
| Date and Time Initialized | 21-Aug-13 00:43 | | | | |
| Date and Time Read | 26-Aug-13 00:47 | | | | |
| ECMB SW Version | N/A | | | | |

Directional Sensor Information

| | | | | | |
|------------------------|----------|--|--|--|--|
| Tool Type | PCDC | | | | |
| Distance From Bit (ft) | 51.06 | | | | |
| Software Version | 6.21 | | | | |
| Sub Serial Number | 11341336 | | | | |
| Sonde Serial Number | 11062040 | | | | |
| Sensor ID Number | N/A | | | | |
| Toolface Offset (deg) | 282.22 | | | | |

Gamma Ray Sensor Information

| | | | | | |
|------------------------------|----------|--|--|--|--|
| Tool Type | PCG | | | | |
| Distance From Bit (ft) | 56.01 | | | | |
| Recorded Sample Period (sec) | 10 | | | | |
| Software Version | 8.15 | | | | |
| Sub Serial Number | 11341336 | | | | |
| Insert/Sonde Serial Number | 11680969 | | | | |

REMARKS

1. All depths are true vertical 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 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

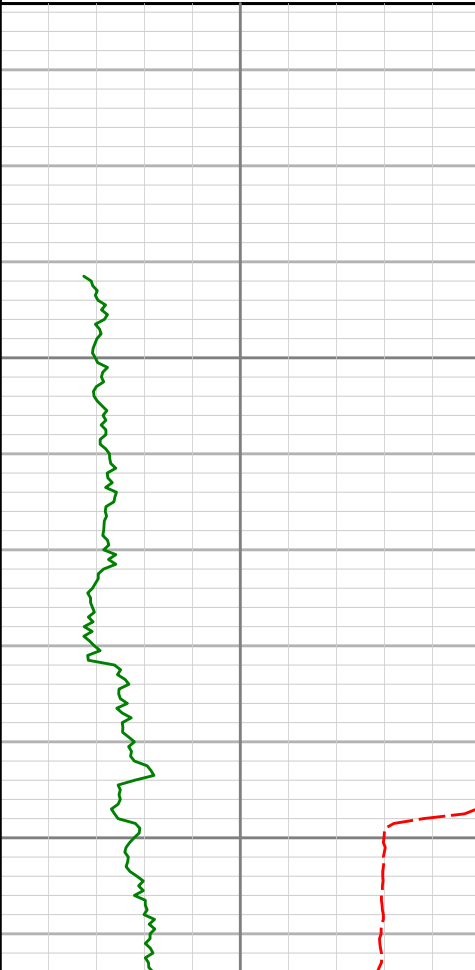
5. INSITE version 7.4.1

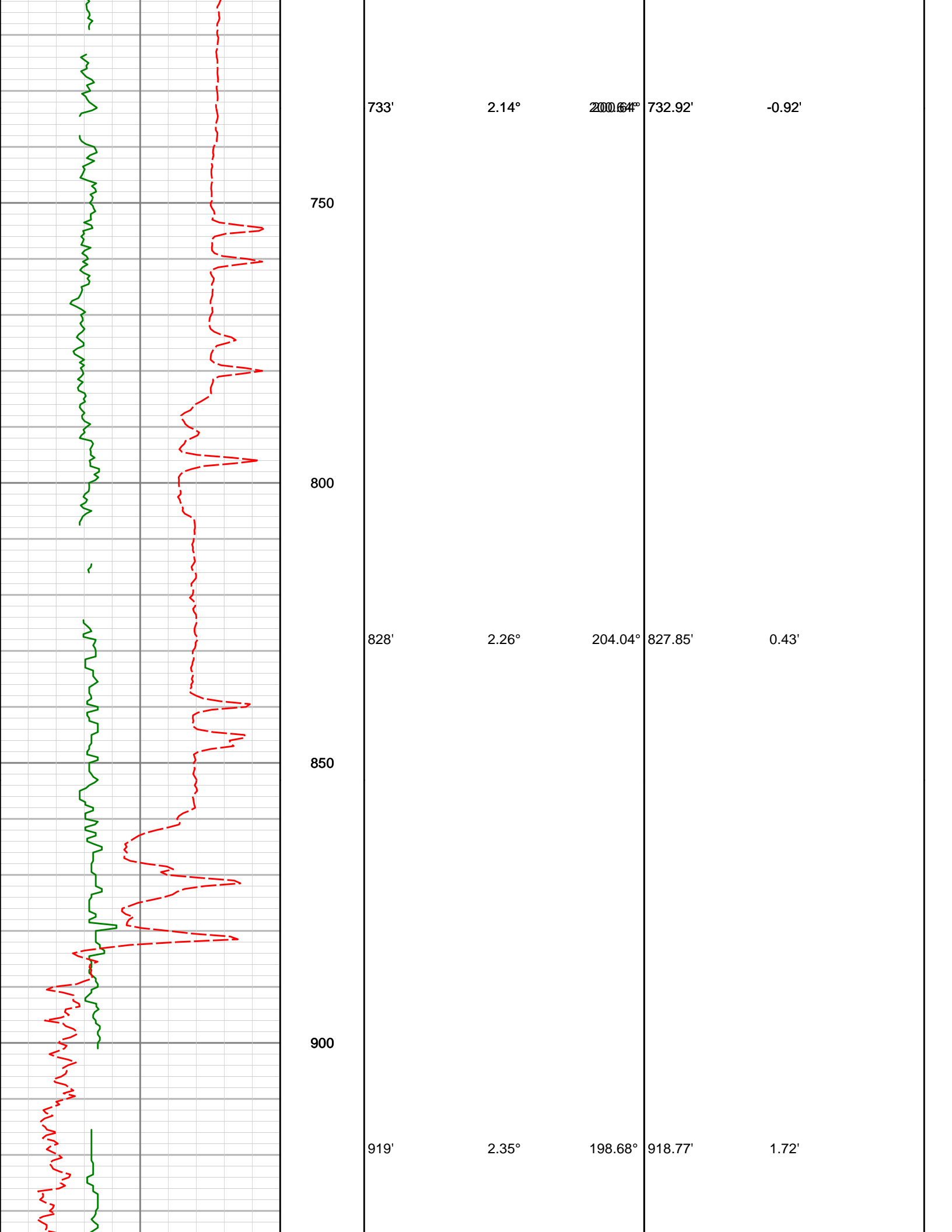
WARRANTY

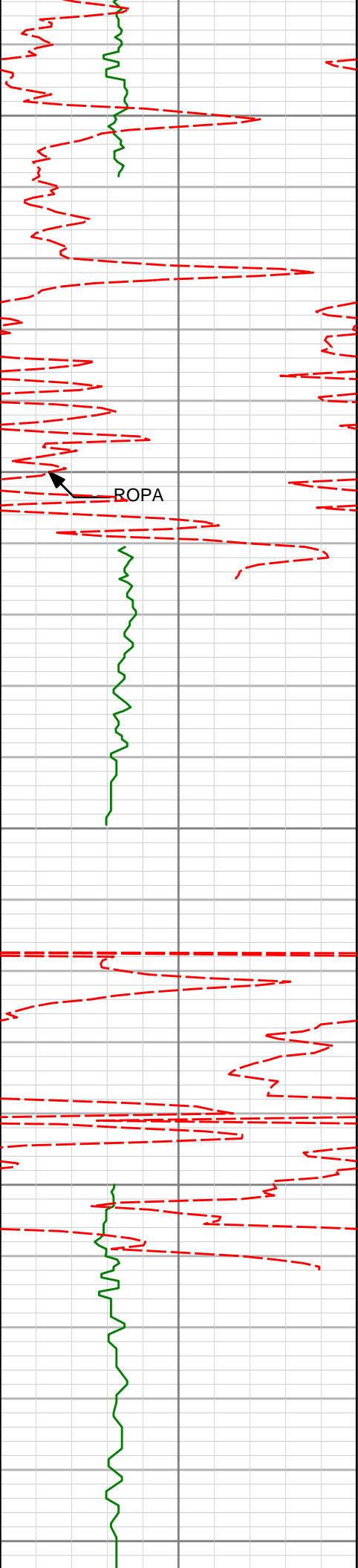
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HALLIBURTON

1:240 TVD Detail Log

| | | | | | |
|-----------------------------------------------------------------------------------|--|-----------|-----|-----|--------|
| Gamma Ray Cor (PGRC) api | | | | | |
| 0300 | | | | | |
| Avg Rate of Penetration (ROPA) feet per hr | | TVD ft | | | |
| 5000 | | Depth | Inc | Azi | TVDV/S |
|  | | 650 | | | |
| | | 700 | | | |





950

1000

1050

1100

1150

1011'

2.29°

203.69°

1010.70'

3.02'

1103'

2.44°

168.09°

1102.62'

3.31'



1200

1250

1300

1350

1195'

2.51°

125.06°

1194.54'

1.22'

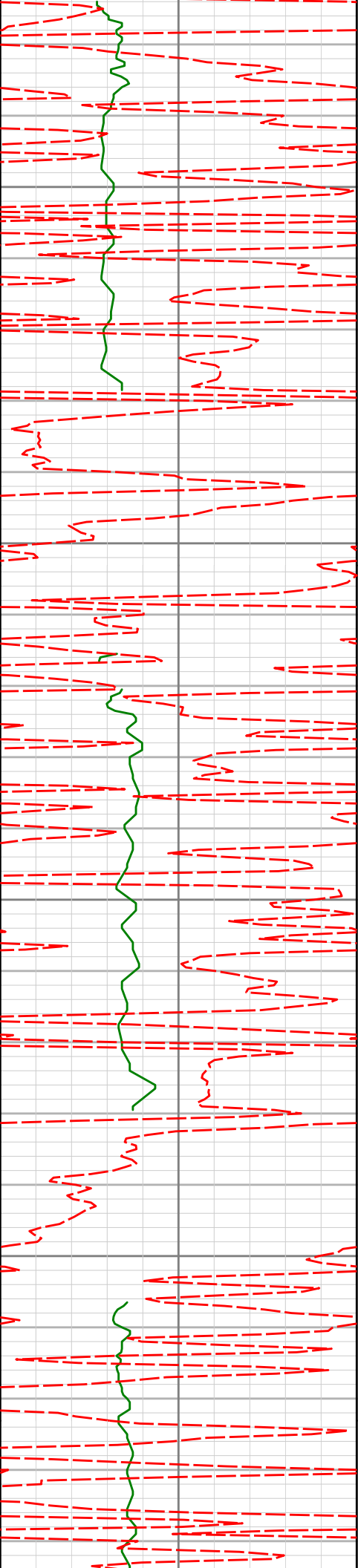
1286'

4.32°

111.92°

1285.38'

-3.62'



1400

1450

1500

1550

1377'

5.65°

125.43°

1376.04'

-10.50'

1469'

6.46°

116.52°

1467.53'

-18.88'

1561'

5.95°

114.16°

1558.99'

-27.91'



1600

1650

1700

1750

1800

1653'

6.47°

95.24°

1650.46'

-37.45'

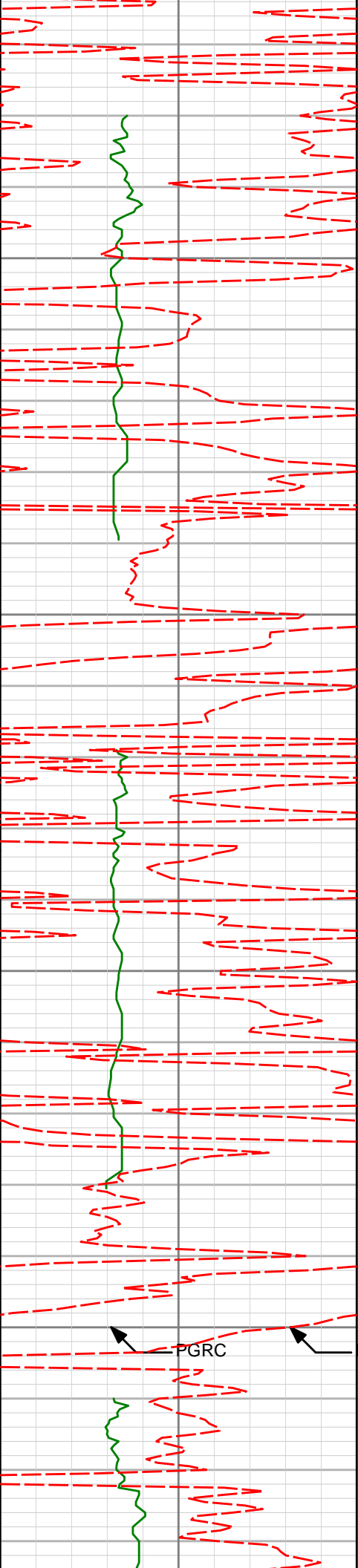
1745'

7.19°

84.04°

1741.81'

-48.34'



1837'

5.90°

80.23°

1833.21'

-58.71'

1850

1900

1928'

6.33°

62.64°

1923.70'

-67.73'

1950

2000

PGRC

ROPA

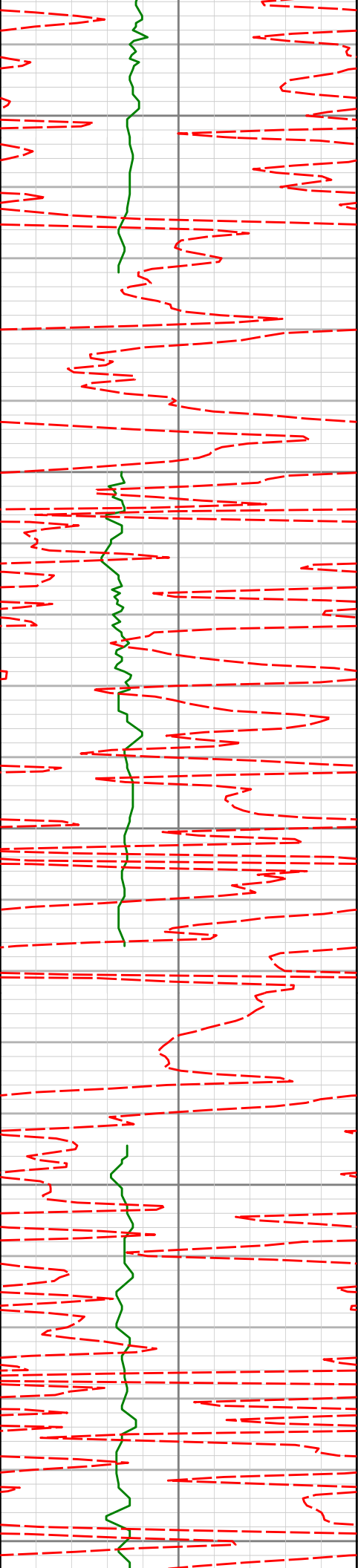
2020'

7.17°

49.60°

2015.06'

-76.54'



2050

2100

2150

2200

2250

2112'

7.32°

46.82°

2106.33'

-85.09'

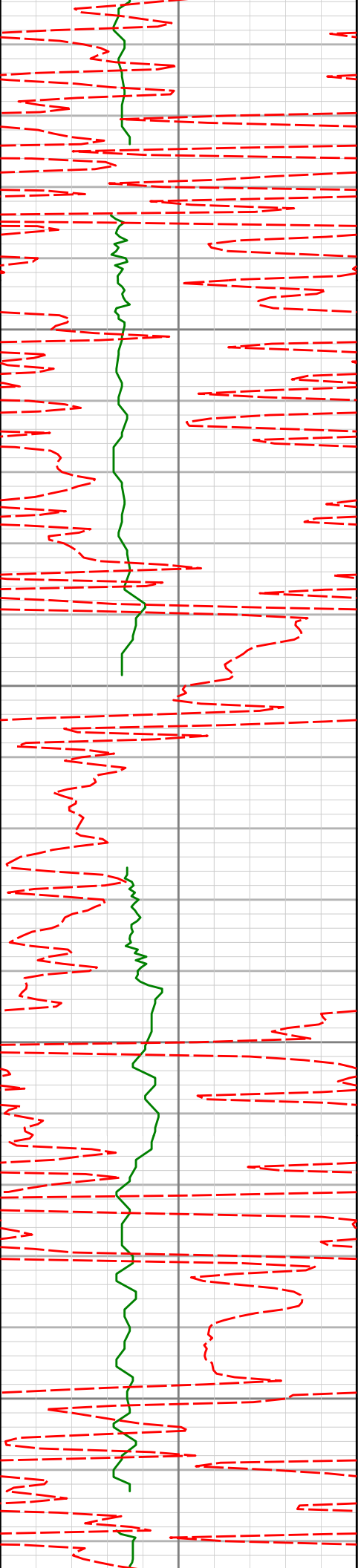
2203'

8.06°

50.10°

2196.51'

-94.11'



2295'

5.90°

48.26°

2287.82'

-102.50'

2300

2350

2386'

6.31°

50.71°

2378.31'

-109.79'

2400

2450

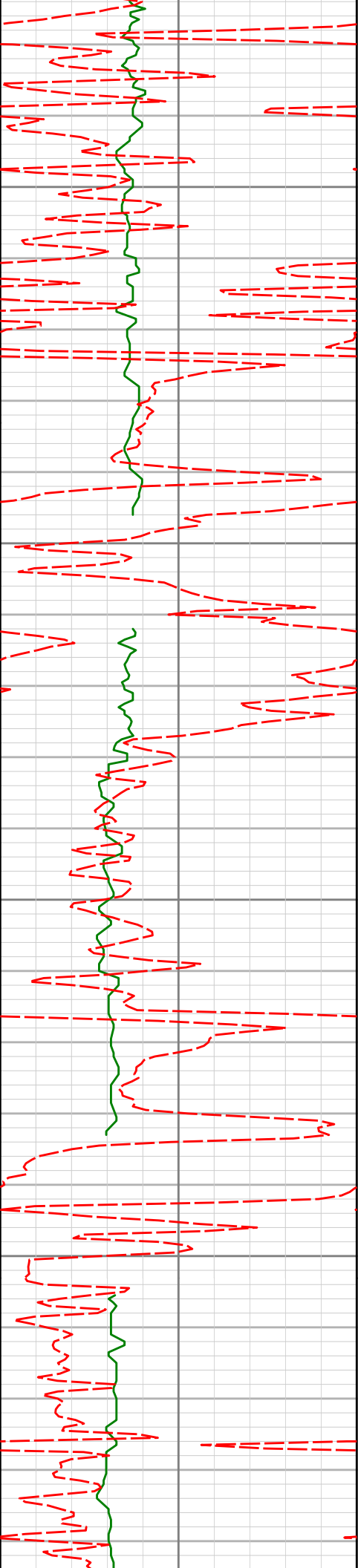
2481'

7.07°

52.95°

2472.66'

-118.41'



2500

2550

2600

2650

2575'

8.31°

59.77°

2565.81'

-128.81'

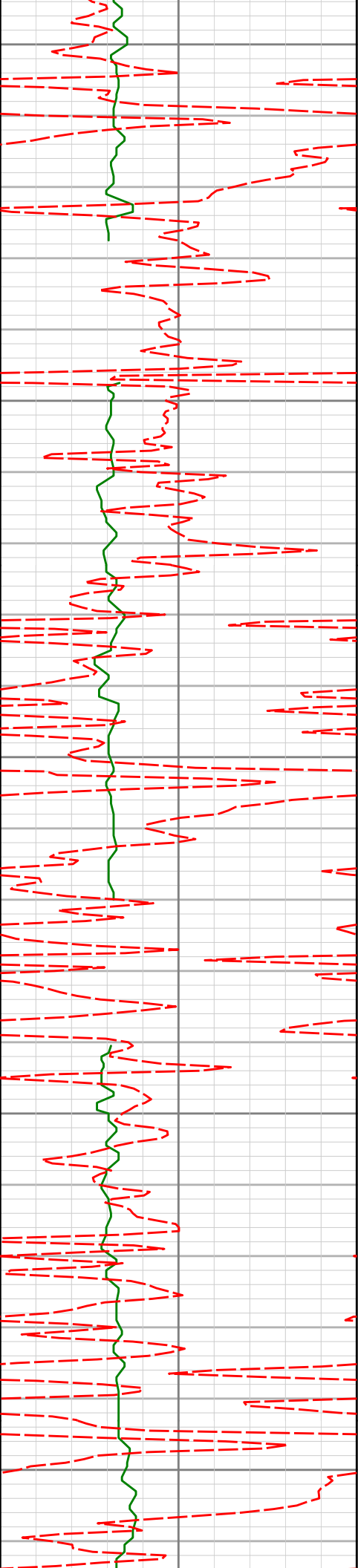
2669'

9.21°

65.48°

2658.72'

-141.45'



2700

2750

2800

2850

2900

2764'

9.18°

65.25°

2752.50'

-155.17'

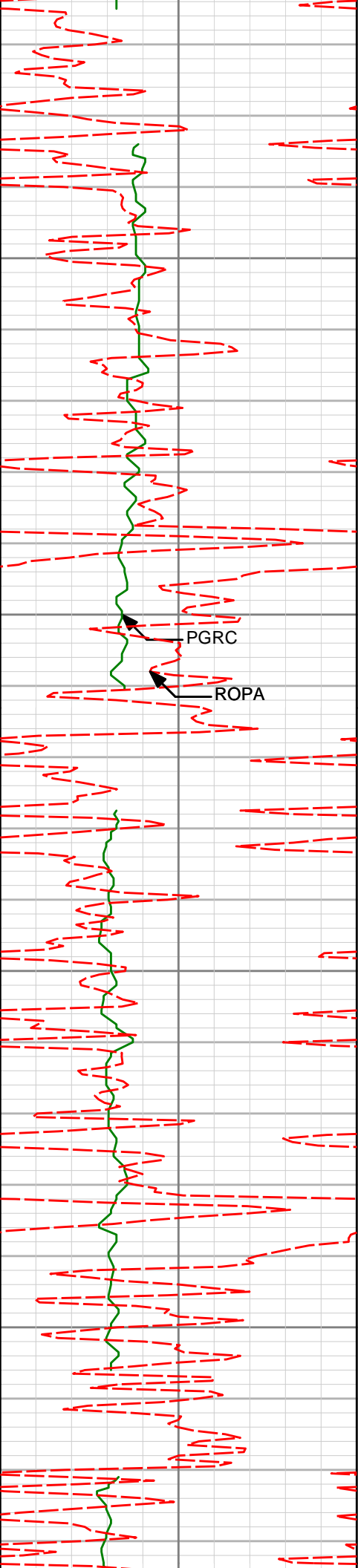
2858'

9.20°

64.28°

2845.29'

-168.67'



| | | | | |
|-------|-------|--------|----------|----------|
| 2952' | 8.79° | 63.27° | 2938.13' | -181.78' |
|-------|-------|--------|----------|----------|

2950

3000

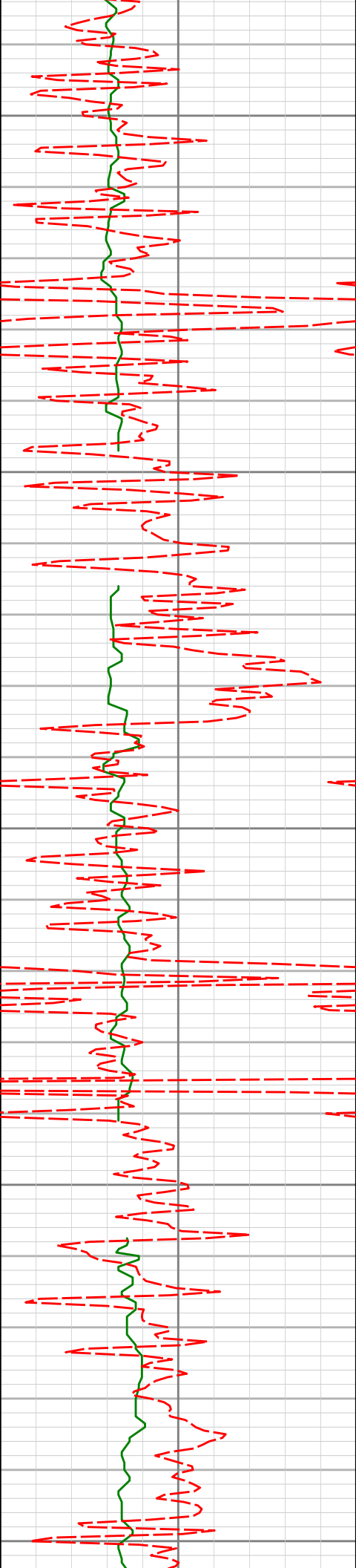
PGRC
ROPA

| | | | | |
|-------|-------|--------|----------|----------|
| 3047' | 7.50° | 62.79° | 3032.17' | -193.70' |
|-------|-------|--------|----------|----------|

3050

3100

| | | | | |
|-------|-------|--------|----------|----------|
| 3141' | 7.23° | 60.39° | 3125.40' | -204.23' |
|-------|-------|--------|----------|----------|



3150

3200

3250

3300

3350

3236'

6.27°

59.55°

3219.74'

-213.83'

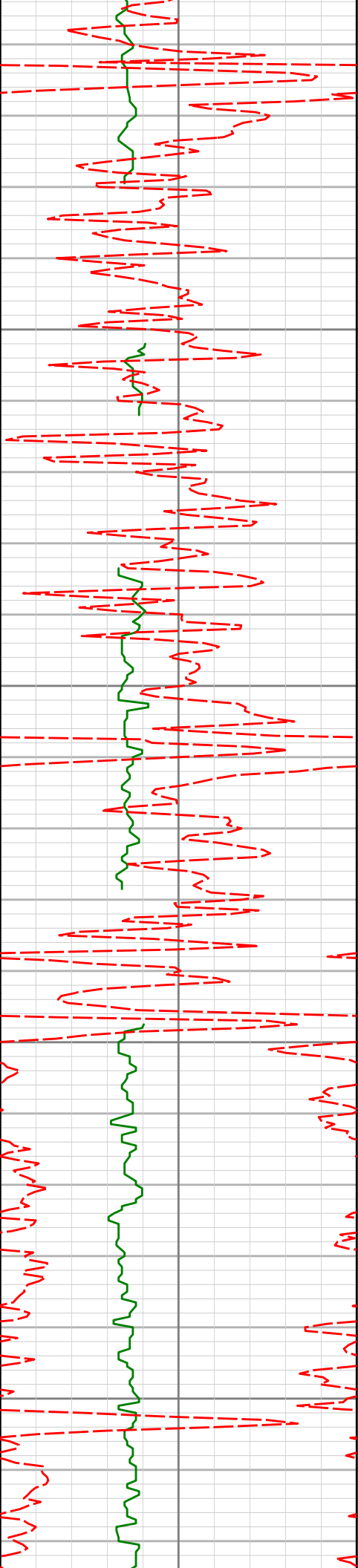
3331'

5.06°

57.96°

3314.27'

-221.79'



3400

3425'

3.86°

52.60°

3407.99'

-227.77'

3450

3500

3520'

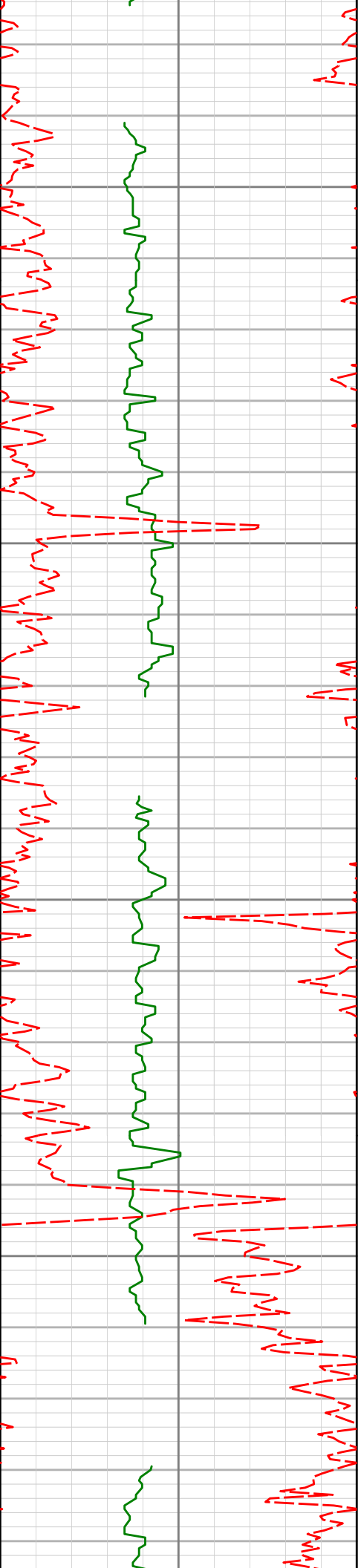
3.00°

54.97°

3502.82'

-232.31'

3550



3600

3650

3700

3750

3614'

2.01°

43.74°

3596.73'

-235.43'

3709'

1.60°

54.64°

3691.68'

-237.64'

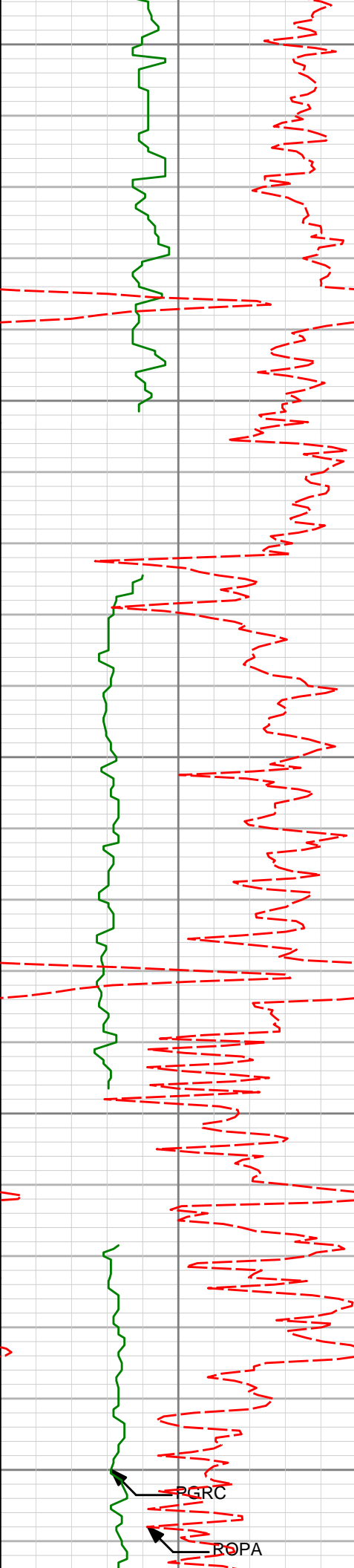
3804'

1.68°

51.58°

3786.64'

-239.79'



3800

3850

3900

3950

4000

3898'

2.11°

59.81°

3880.59'

-242.35'

3993'

2.20°

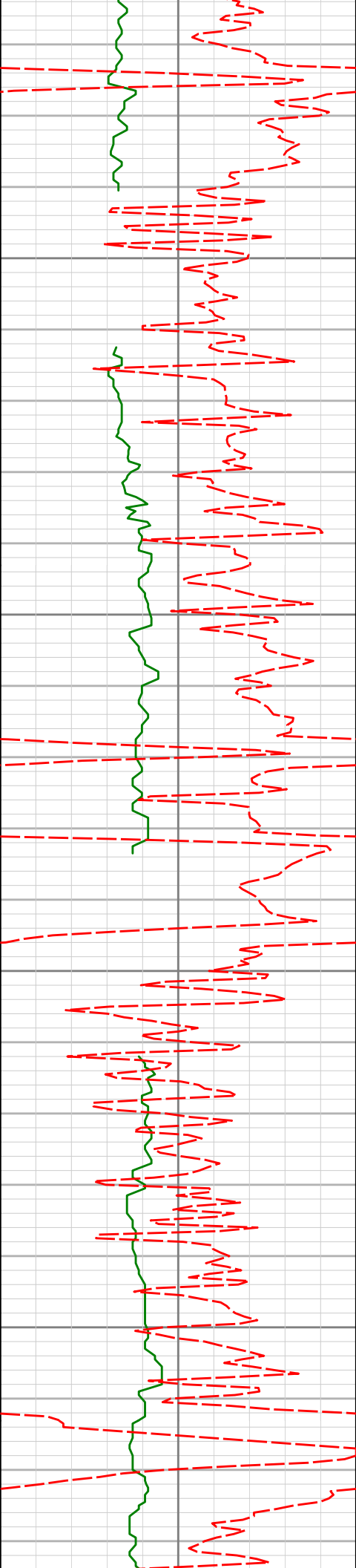
69.64°

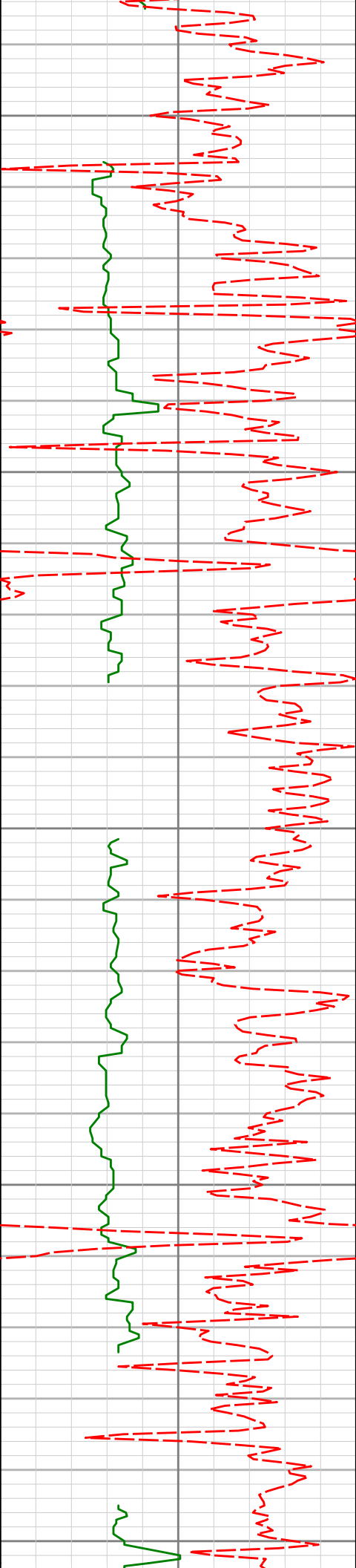
3975.52'

-245.55'

PGRC

ROPA





4250

4277'

1.20°

225.77°

4259.43'

-249.34'

4300

4350

4371'

1.36°

234.46°

4353.40'

-247.74'

4400

4450

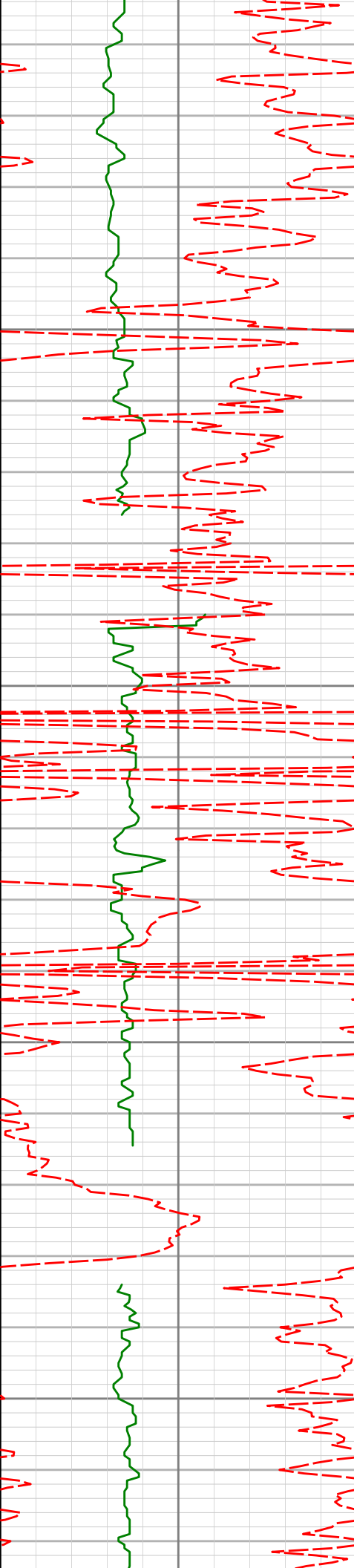
4466'

1.30°

233.47°

4448.38'

-245.97'



4500

4550

4600

4650

4560'

1.55°

218.94°

4542.35'

-244.34'

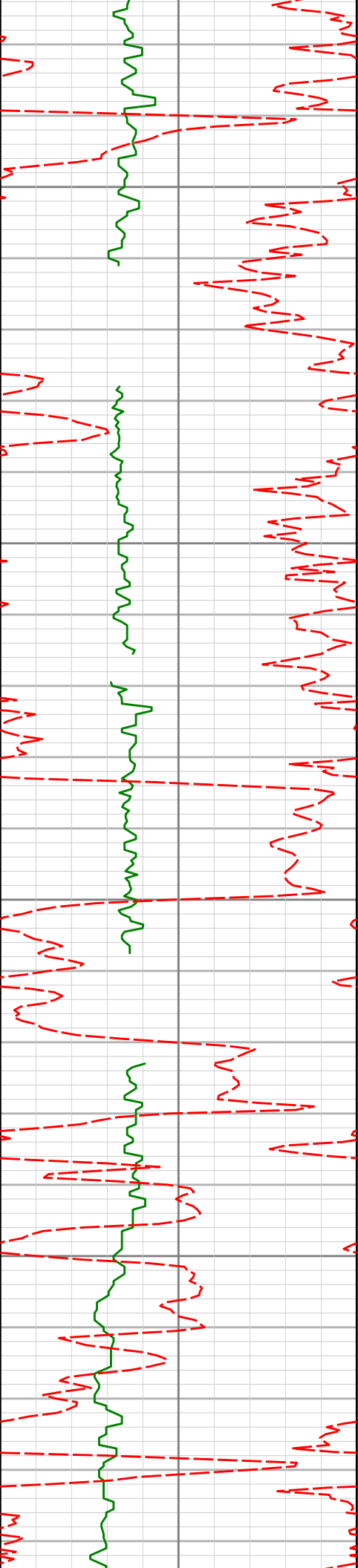
4655'

1.47°

226.34°

4637.32'

-242.67'



4700

4750

4800

4850

4750'

0.93°

289.45°

4732.30'

-241.07'

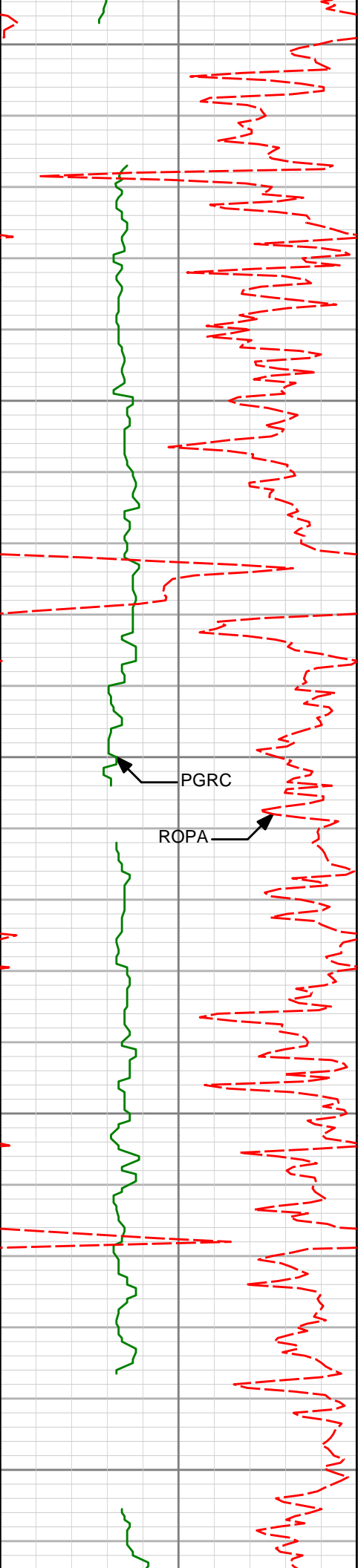
4844'

1.24°

342.53°

4826.28'

-240.03'



4900

4950

5000

5050

5100

4939'

1.44°

340.75°

4921.26'

-239.30'

PGRC

ROPA

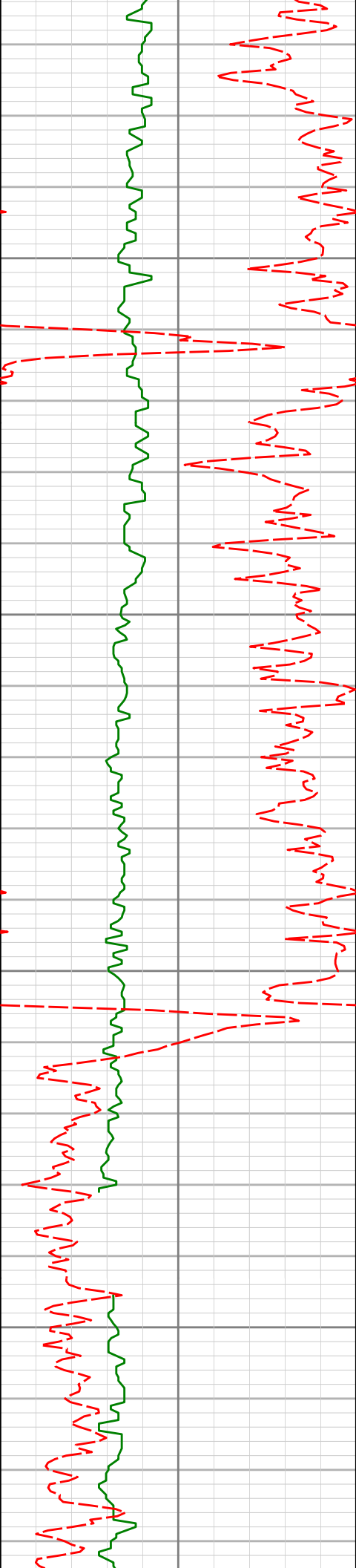
5128'

0.87°

340.12°

5110.22'

-237.99'



5150

5200

5250

5300

5222'

0.42°

336.16°

5204.21'

-237.59'

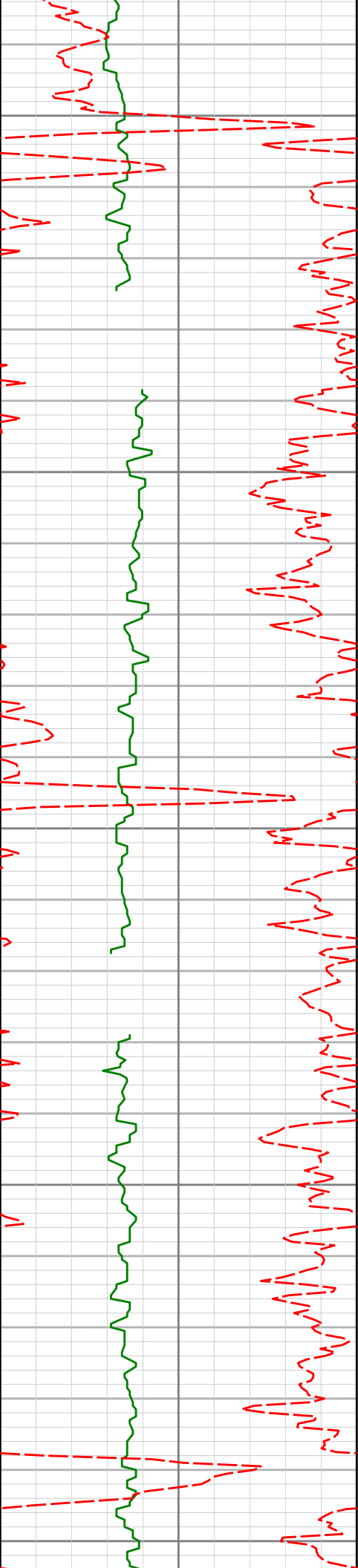
5317'

0.35°

325.33°

5299.21'

-237.28'



5350

5411'

0.13°

347.88°

5393.21'

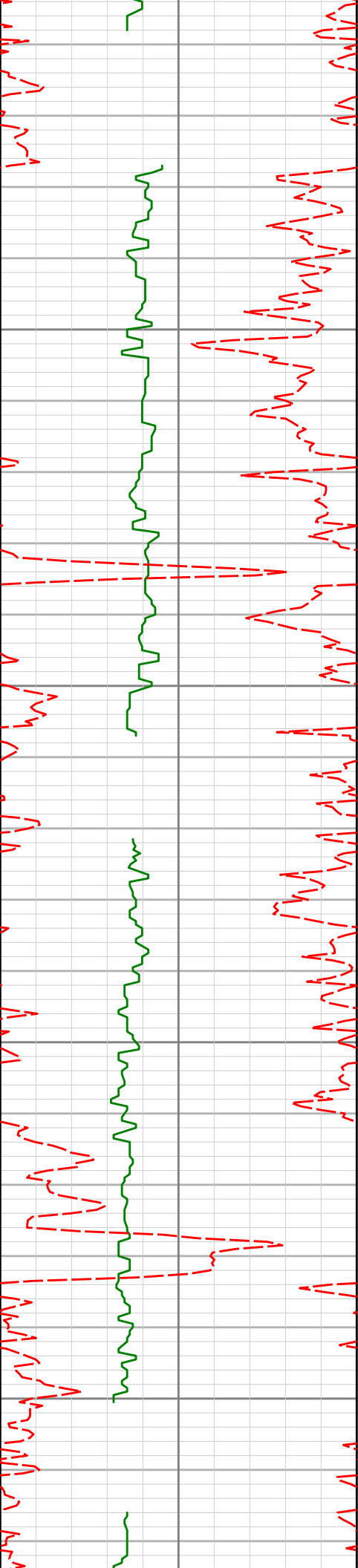
-237.09'

5400

5450

5500

5550



5600'

0.50°

156.55°

5582.21'

-237.38'

5600

5650

5695'

0.50°

137.77°

5677.20'

-237.83'

5700

5750

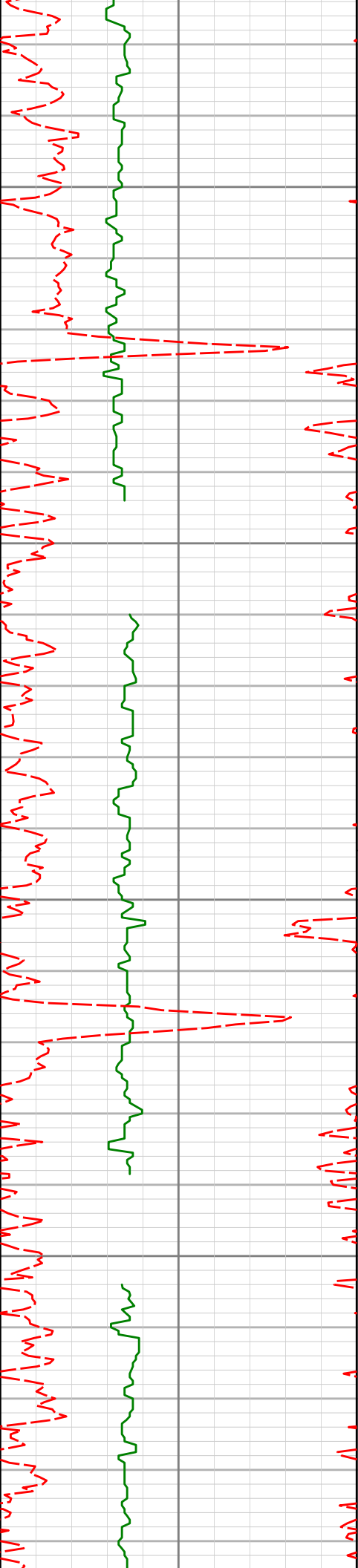
5790'

0.63°

155.26°

5772.20'

-238.34'



5800

5850

5900

5950

5885'

0.60°

126.24°

5867.19'

-238.97'

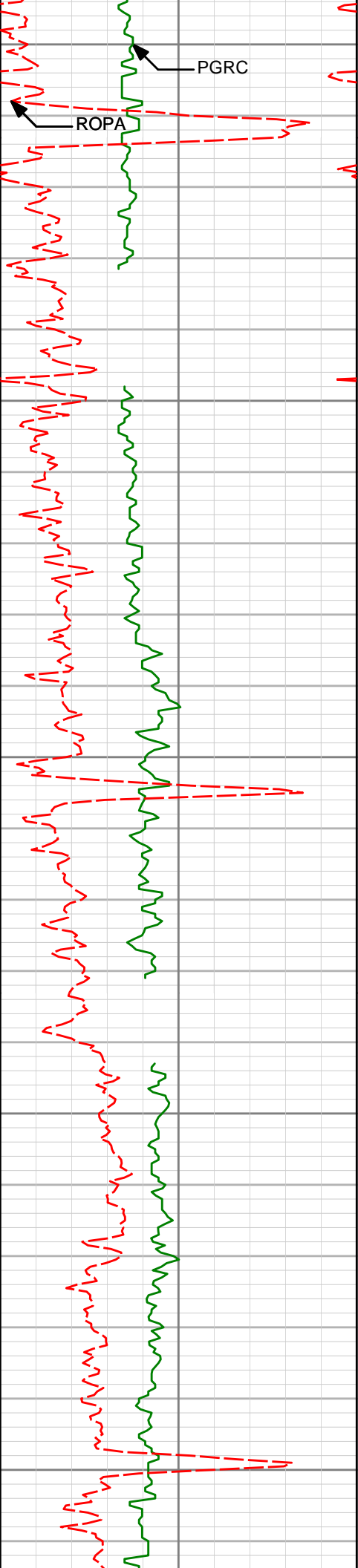
5980'

0.83°

127.42°

5962.19'

-239.92'



6000

PGRC

ROPA

6050

6075'

0.99°

107.35°

6057.18'

-241.26'

6100

6150

6169'

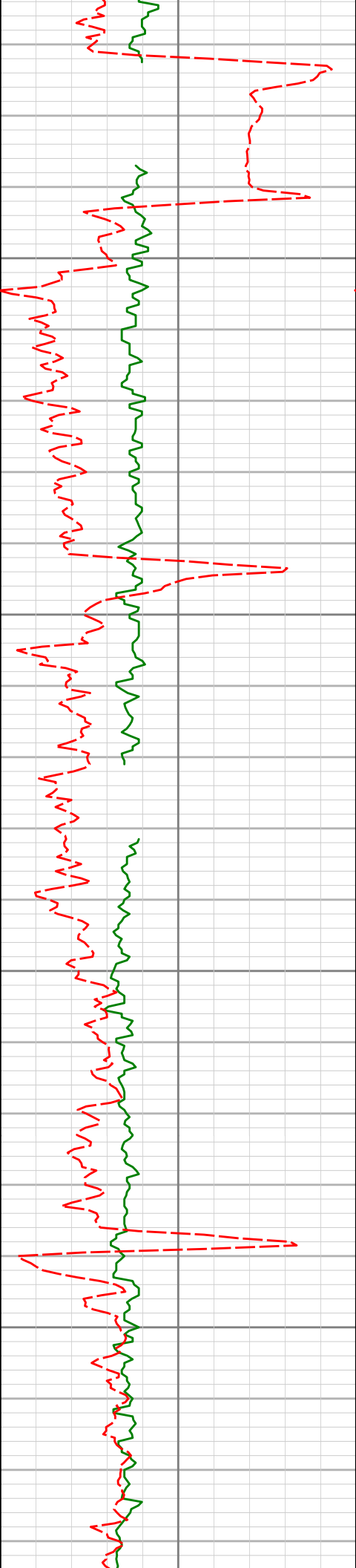
0.99°

115.04°

6151.16'

-242.78'

6200



6250

6300

6350

6400

6264'

1.49°

80.48°

6246.14'

-244.74'

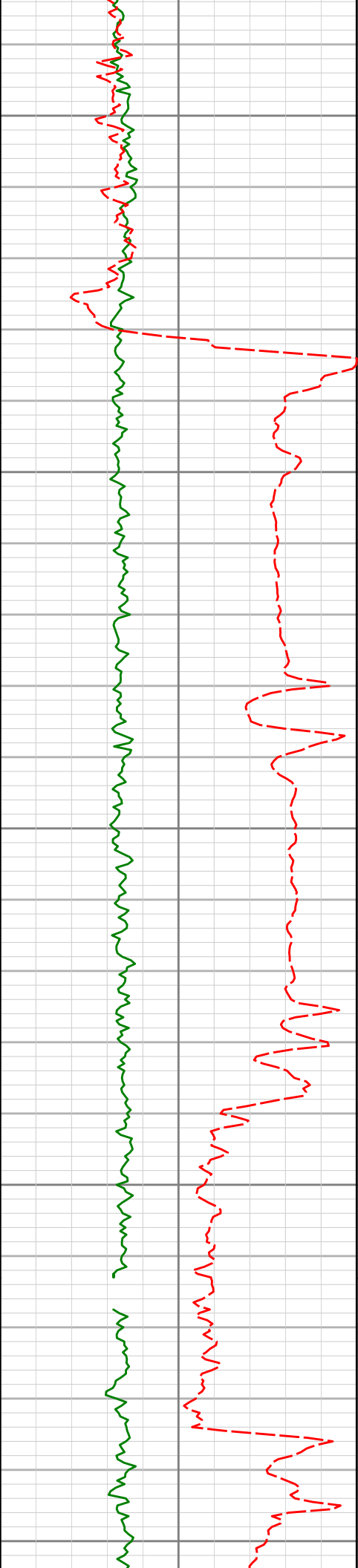
6359'

1.68°

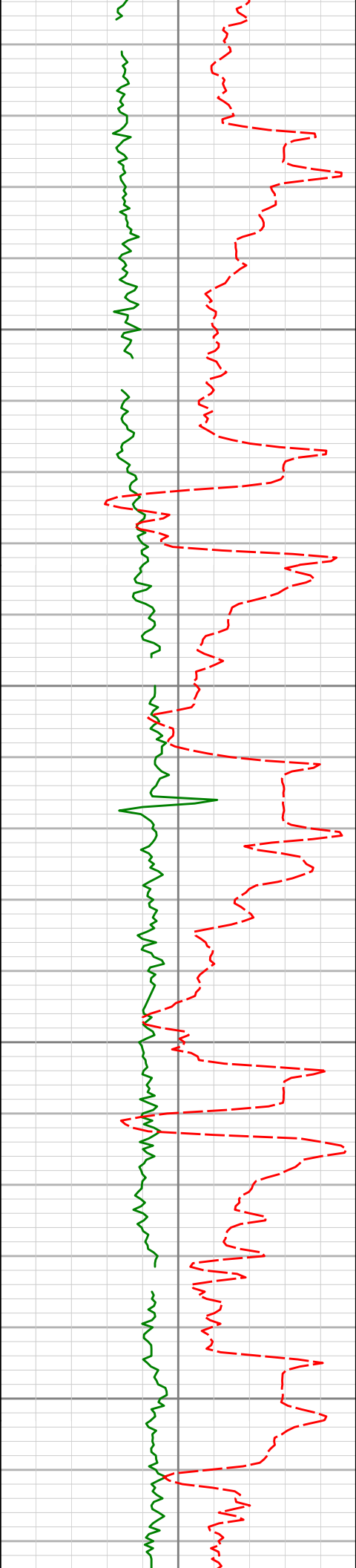
91.33°

6341.10'

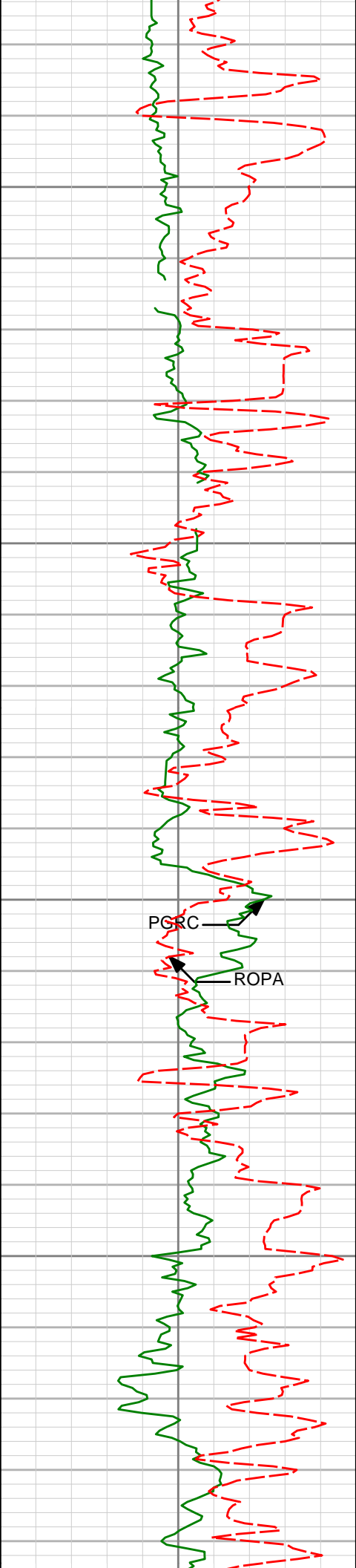
-247.35'



| | | | | |
|-------|--------|---------|----------|----------|
| 6454' | 2.48° | 100.95° | 6436.04' | -250.77' |
| 6501' | 2.84° | 107.63° | 6482.99' | -252.88' |
| 6549' | 1.51° | 265.69° | 6530.97' | -253.39' |
| 6596' | 5.23° | 277.47° | 6577.89' | -250.64' |
| 6643' | 11.41° | 274.56° | 6624.37' | -243.87' |



| | | | | | |
|------|-------|--------|---------|----------|----------|
| 6700 | 6690' | 15.48° | 275.08° | 6670.07' | -232.97' |
| | 6738' | 20.97° | 272.65° | 6715.65' | -217.99' |
| 6750 | 6785' | 23.88° | 268.30° | 6759.09' | -200.08' |
| | 6833' | 27.17° | 264.51° | 6802.40' | -179.47' |
| 6850 | 6880' | 31.33° | 263.41° | 6843.40' | -156.67' |



6900

6950

7000

7050

6928'

36.34°

264.27°

6883.26'

-130.14'

6975'

41.60°

264.97°

6919.79'

-100.76'

7023'

45.58°

263.59°

6954.55'

-67.88'

7070'

50.43°

264.98°

6985.99'

-33.17'

7118'

57.22°

267.31°

7014.30'

5.43'

7165'

61.34°

267.89°

7038.31'

45.76'

7213'

64.82°

268.95°

7060.04'

88.52'

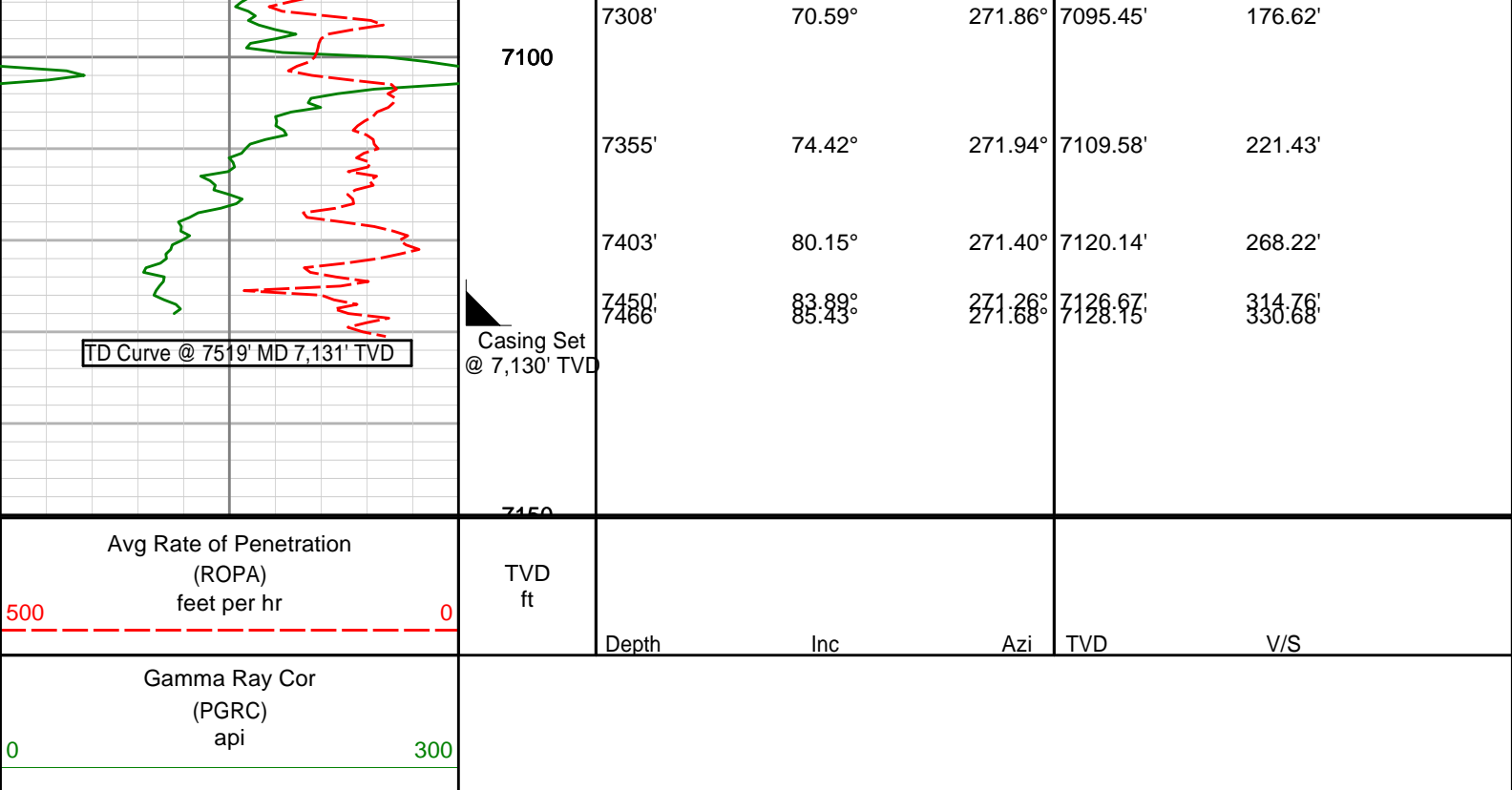
7260'

68.47°

271.23°

7078.67'

131.66'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp.
Eisenach Federal 5N-8HZ
Wattenberg
Weld County Colorado
USA
CA-XX-0900582952
IFR Corrections applied.

| Measured Depth (feet) | Inclination (degrees) | Direction (degrees) | Vertical Depth (feet) | Latitude (feet) | Departure (feet) | Vertical Section (feet) | Dogleg (deg/100ft) |
|-----------------------|-----------------------|---------------------|-----------------------|-----------------|------------------|-------------------------|--------------------|
| 603.00 | 1.15 | 186.84 | 602.97 | 2.85 S | 1.85 E | -1.88 | TIE-IN |
| 733.00 | 2.14 | 200.64 | 732.92 | 6.42 S | 0.84 E | -0.92 | 0.81 |
| 828.00 | 2.26 | 204.04 | 827.85 | 9.79 S | 0.55 W | 0.43 | 0.19 |
| 919.00 | 2.35 | 198.68 | 918.77 | 13.19 S | 1.88 W | 1.72 | 0.26 |
| 1011.00 | 2.29 | 203.69 | 1010.70 | 16.66 S | 3.22 W | 3.02 | 0.23 |
| 1103.00 | 2.44 | 168.09 | 1102.62 | 20.26 S | 3.55 W | 3.31 | 1.58 |
| 1195.00 | 2.51 | 125.06 | 1194.54 | 23.34 S | 1.50 W | 1.22 | 1.97 |
| 1286.00 | 4.32 | 111.92 | 1285.38 | 25.76 S | 3.31 E | -3.62 | 2.15 |
| 1377.00 | 5.65 | 125.43 | 1376.04 | 29.64 S | 10.14 E | -10.50 | 1.94 |
| 1469.00 | 6.46 | 116.52 | 1467.53 | 34.57 S | 18.46 E | -18.88 | 1.35 |
| 1561.00 | 5.95 | 114.16 | 1558.99 | 38.84 S | 27.44 E | -27.91 | 0.62 |
| 1653.00 | 6.47 | 95.24 | 1650.46 | 41.26 S | 36.96 E | -37.45 | 2.28 |
| 1745.00 | 7.19 | 84.04 | 1741.81 | 41.14 S | 47.85 E | -48.34 | 1.64 |
| 1837.00 | 5.90 | 80.23 | 1833.21 | 39.74 S | 58.23 E | -58.71 | 1.48 |
| 1928.00 | 6.33 | 62.64 | 1923.70 | 36.64 S | 67.30 E | -67.73 | 2.10 |
| 2020.00 | 7.17 | 49.60 | 2015.06 | 30.59 S | 76.17 E | -76.54 | 1.89 |
| 2112.00 | 7.32 | 46.82 | 2106.33 | 22.85 S | 84.82 E | -85.09 | 0.41 |
| 2203.00 | 8.06 | 50.10 | 2196.51 | 14.79 S | 93.94 E | -94.11 | 0.95 |
| 2295.00 | 5.90 | 48.26 | 2287.82 | 7.51 S | 102.42 E | -102.50 | 2.36 |
| 2386.00 | 6.31 | 50.71 | 2378.31 | 1.23 S | 109.78 E | -109.79 | 0.53 |
| 2481.00 | 7.07 | 52.95 | 2472.66 | 5.60 N | 118.49 E | -118.41 | 0.85 |
| 2575.00 | 8.31 | 59.77 | 2565.81 | 12.51 N | 128.97 E | -128.81 | 1.64 |
| 2669.00 | 9.21 | 65.48 | 2658.72 | 19.05 N | 141.69 E | -141.45 | 1.33 |
| 2764.00 | 9.18 | 65.25 | 2752.50 | 25.38 N | 155.49 E | -155.17 | 0.05 |
| 2858.00 | 9.20 | 64.28 | 2845.29 | 31.78 N | 169.07 E | -168.67 | 0.17 |

| | | | | | | | |
|---------|-------|--------|---------|---------|----------|---------|-------|
| 2952.00 | 8.79 | 63.27 | 2938.13 | 38.27 N | 182.25 E | -181.78 | 0.47 |
| 3047.00 | 7.50 | 62.79 | 3032.17 | 44.37 N | 194.25 E | -193.70 | 1.36 |
| 3141.00 | 7.23 | 60.39 | 3125.40 | 50.10 N | 204.85 E | -204.23 | 0.44 |
| 3236.00 | 6.27 | 59.55 | 3219.74 | 55.68 N | 214.52 E | -213.83 | 1.02 |
| 3331.00 | 5.06 | 57.96 | 3314.27 | 60.53 N | 222.54 E | -221.79 | 1.28 |
| 3425.00 | 3.86 | 52.60 | 3407.99 | 64.65 N | 228.57 E | -227.77 | 1.35 |
| 3520.00 | 3.00 | 54.97 | 3502.82 | 68.02 N | 233.14 E | -232.31 | 0.92 |
| 3614.00 | 2.01 | 43.74 | 3596.73 | 70.62 N | 236.30 E | -235.43 | 1.17 |
| 3709.00 | 1.60 | 54.64 | 3691.68 | 72.60 N | 238.53 E | -237.64 | 0.56 |
| 3804.00 | 1.68 | 51.58 | 3786.64 | 74.23 N | 240.70 E | -239.79 | 0.12 |
| 3898.00 | 2.11 | 59.81 | 3880.59 | 75.95 N | 243.28 E | -242.35 | 0.54 |
| 3993.00 | 2.20 | 69.64 | 3975.52 | 77.47 N | 246.50 E | -245.55 | 0.40 |
| 4087.00 | 2.09 | 66.55 | 4069.46 | 78.78 N | 249.76 E | -248.80 | 0.17 |
| 4182.00 | 0.41 | 210.36 | 4164.44 | 79.17 N | 251.18 E | -250.21 | 2.56 |
| 4277.00 | 1.20 | 225.77 | 4259.43 | 78.19 N | 250.30 E | -249.34 | 0.85 |
| 4371.00 | 1.36 | 234.46 | 4353.40 | 76.85 N | 248.68 E | -247.74 | 0.27 |
| 4466.00 | 1.30 | 233.47 | 4448.38 | 75.56 N | 246.90 E | -245.97 | 0.07 |
| 4560.00 | 1.55 | 218.94 | 4542.35 | 73.93 N | 245.24 E | -244.34 | 0.47 |
| 4655.00 | 1.47 | 226.34 | 4637.32 | 72.09 N | 243.56 E | -242.67 | 0.22 |
| 4750.00 | 0.93 | 289.45 | 4732.30 | 71.51 N | 241.95 E | -241.07 | 1.41 |
| 4844.00 | 1.24 | 342.53 | 4826.28 | 72.73 N | 240.92 E | -240.03 | 1.07 |
| 4939.00 | 1.44 | 340.75 | 4921.26 | 74.84 N | 240.22 E | -239.30 | 0.22 |
| 5128.00 | 0.87 | 340.12 | 5110.22 | 78.43 N | 238.95 E | -237.99 | 0.30 |
| 5222.00 | 0.42 | 336.16 | 5204.21 | 79.42 N | 238.57 E | -237.59 | 0.48 |
| 5317.00 | 0.35 | 325.33 | 5299.21 | 79.97 N | 238.26 E | -237.28 | 0.11 |
| 5411.00 | 0.13 | 347.88 | 5393.21 | 80.31 N | 238.08 E | -237.09 | 0.25 |
| 5600.00 | 0.50 | 156.55 | 5582.21 | 79.77 N | 238.36 E | -237.38 | 0.33 |
| 5695.00 | 0.50 | 137.77 | 5677.20 | 79.08 N | 238.80 E | -237.83 | 0.17 |
| 5790.00 | 0.63 | 155.26 | 5772.20 | 78.30 N | 239.30 E | -238.34 | 0.23 |
| 5885.00 | 0.60 | 126.24 | 5867.19 | 77.53 N | 239.92 E | -238.97 | 0.33 |
| 5980.00 | 0.83 | 127.42 | 5962.19 | 76.82 N | 240.87 E | -239.92 | 0.24 |
| 6075.00 | 0.99 | 107.35 | 6057.18 | 76.16 N | 242.20 E | -241.26 | 0.37 |
| 6169.00 | 0.99 | 115.04 | 6151.16 | 75.57 N | 243.71 E | -242.78 | 0.14 |
| 6264.00 | 1.49 | 80.48 | 6246.14 | 75.43 N | 245.67 E | -244.74 | 0.92 |
| 6359.00 | 1.68 | 91.33 | 6341.10 | 75.60 N | 248.28 E | -247.35 | 0.37 |
| 6454.00 | 2.48 | 100.95 | 6436.04 | 75.18 N | 251.69 E | -250.77 | 0.92 |
| 6501.00 | 2.84 | 107.63 | 6482.99 | 74.63 N | 253.80 E | -252.88 | 1.01 |
| 6549.00 | 1.51 | 265.69 | 6530.97 | 74.22 N | 254.30 E | -253.39 | 8.91 |
| 6596.00 | 5.23 | 277.47 | 6577.89 | 74.45 N | 251.56 E | -250.64 | 8.01 |
| 6643.00 | 11.41 | 274.56 | 6624.37 | 75.10 N | 244.79 E | -243.87 | 13.18 |
| 6690.00 | 15.48 | 275.08 | 6670.07 | 76.03 N | 233.91 E | -232.97 | 8.66 |
| 6738.00 | 20.97 | 272.65 | 6715.65 | 76.99 N | 218.93 E | -217.99 | 11.54 |
| 6785.00 | 23.88 | 268.30 | 6759.09 | 77.10 N | 201.02 E | -200.08 | 7.12 |
| 6833.00 | 27.17 | 264.51 | 6802.40 | 75.76 N | 180.39 E | -179.47 | 7.65 |
| 6880.00 | 31.33 | 263.41 | 6843.40 | 73.33 N | 157.56 E | -156.67 | 8.92 |
| 6928.00 | 36.34 | 264.27 | 6883.26 | 70.48 N | 131.00 E | -130.14 | 10.48 |
| 6975.00 | 41.60 | 264.97 | 6919.79 | 67.72 N | 101.58 E | -100.76 | 11.23 |
| 7023.00 | 45.58 | 263.59 | 6954.55 | 64.41 N | 68.66 E | -67.88 | 8.52 |
| 7070.00 | 50.43 | 264.98 | 6985.99 | 60.94 N | 33.91 E | -33.17 | 10.55 |
| 7118.00 | 57.22 | 267.31 | 7014.30 | 58.38 N | 4.72 W | 5.43 | 14.68 |
| 7165.00 | 61.34 | 267.89 | 7038.31 | 56.69 N | 45.08 W | 45.76 | 8.83 |
| 7213.00 | 64.82 | 268.95 | 7060.04 | 55.51 N | 87.86 W | 88.52 | 7.51 |
| 7260.00 | 68.47 | 271.23 | 7078.67 | 55.59 N | 131.00 W | 131.66 | 8.95 |
| 7308.00 | 70.59 | 271.86 | 7095.45 | 56.81 N | 175.95 W | 176.62 | 4.58 |
| 7355.00 | 74.42 | 271.94 | 7109.58 | 58.29 N | 220.74 W | 221.43 | 8.15 |
| 7403.00 | 80.15 | 271.40 | 7120.14 | 59.66 N | 267.52 W | 268.22 | 11.99 |
| 7450.00 | 83.89 | 271.26 | 7126.67 | 60.74 N | 314.05 W | 314.76 | 7.96 |
| 7466.00 | 85.43 | 271.68 | 7128.15 | 61.14 N | 329.97 W | 330.68 | 9.97 |

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 270.69 DEGREES (TRUE)

A TOTAL CORRECTION OF 8.60 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.

HORIZONTAL DISPLACEMENT(CLOSURE) AT 7466.00 FEET

IS 335.50 FEET ALONG 333.53 DEGREES (TRUE)

IS 335.59 FEET ALONG 280.50 DEGREES (TRUE)

Survey Data is tied on to Gyro Data.

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