# HALLIBURTON | Sperry Drilling

## PCGK - Pressure Case Gamma
## PCDC - Pressure Case Directional

Powered by INSITE™

**1 : 240**

Company : **Anadarko Petroleum Corp.**
Rig : **Ensign 132**
Well : **Highway 160 37N-2HZ**
Field : **Wattenberg**
Country : **USA**
API Number : **05-123-38025-00**

Country : **USA**
Field : **Wattenberg**
Location : **Lat: 40° 5' 7.91" North Long: 104° 44' 25.13" West**
Well : **Highway 160 37N-2HZ**
Company : **Anadarko Petroleum Corp.**
Rig : **Ensign 132**

LOCATION
Latitude : **40° 5' 7.91" North**
Longitude : **104° 44' 25.13" West**
UTM Easting = **3,212,559.520 ft**
UTM Northing = **1,274,914.190 ft**

Other Services
**Directional Drilling**

Permanent Datum : **Ground Level** Elevation : **5102.00 ft**
Log Measured From : **Kelly Bushing** **13.00 ft** Above Permanent Datum
Drilling Measured From : **Kelly Bushing**

TVD LOG

Elev. KB **5115.00 ft**
DF **5115.00 ft**
GL **5102.00 ft**
WD **N/A**

Depth Logged : **1,245.98 ft** To **7,396.64 ft**
Date Logged : **30-Nov-13** To **03-Dec-13**
Total Depth MD : **7,823.00 ft** TVD : **7,396.64 ft**
Spud Date : **30-Nov-13**

Unit No. : **11210429** Job No. : **CA-XX-0900754407**

Plot Type : **Final**
Plot Date : **11-Dec-13**

| Run No. | Borehole Record (TVD) Size | From | To |
|---|---|---|---|
| 0100 | 8.750 in | 1,245.98 ft | 7,396.51 ft |

| Run No. | Borehole Record (TVD) Size | From | To |
|---|---|---|---|
| | | | |

Casing Record (TVD)

| Size | Weight | From | To |
|---|---|---|---|
| 9.625 in | 36.00 lbpf | SURFACE | 1,235.98 ft |
| 7.000 in | 26.00 lbpf | 1,225.98 ft | 7,396.45 ft |

## WELL INFORMATION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MWD Run Number | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date run completed | 03-Dec-13 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rig Bit Number | 0100 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bit Size (in) | 8.750 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tool Nominal OD (in) | 6.750 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Log Start Depth (MD, ft) | 1,246.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Log End Depth (MD, ft) | 7,823.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drill or Wipe | Drill | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drill/Wipe Start Date and Time | 30-Nov-13 19:55 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drill/Wipe End Date and Time | 03-Dec-13 09:36 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Min Inc (deg) @ Depth (MD, ft) | 0.22 @ 6,785.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max Inc (deg) @ Depth (MD, ft) | 89.84 @ 7,823.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bit TFA(in2) / Bit Type | 1.49 / PDC | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flow Rate (gpm) | 571.94 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max AV (fpm) / CV (fpm) @ MWD | N/A / N/A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluid Type | Polymer | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Density (ppg) / Viscosity (spqt) | 8.50 / 29.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Filtrate CL (ppm) | 1,200.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pH / Fluid Loss (mptm) | 9.20 / 3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PV (cP) / YP (lhf2) | 1 / 4.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % Solids / % Sand | 8.5 / 0.50 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % 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) / Source** | 170.37 / PCM | | | | |
| **Rm @ Max Tool Temp (degF)** | N/A @ N/A | | | | |
| **Lead MWD Engineer** | Matt Busche | | | | |
| **Customer Representative** | Sam Taylor | | | | |

## SENSOR INFORMATION

### Downhole Processor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCM | | | | |
| **Software Version** | 5.84 | | | | |
| **Sub Serial Number** | 11404283 | | | | |
| **Insert Serial Number** | 11400908 | | | | |
| **Date and Time Initialized** | 30-Nov-13 10:49 | | | | |
| **Date and Time Read** | 03-Dec-13 22:45 | | | | |
| **ECMB SW Version** | N/A | | | | |

### Directional Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCDC | | | | |
| **Distance From Bit (ft)** | 44.90 | | | | |
| **Software Version** | 6.21 | | | | |
| **Sub Serial Number** | 11404283 | | | | |
| **Sonde Serial Number** | 11477984 | | | | |
| **Sensor ID Number** | N/A | | | | |
| **Toolface Offset (deg)** | 193.72 | | | | |

### Gamma Ray Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCG | | | | |
| **Distance From Bit (ft)** | 49.85 | | | | |
| **Recorded Sample Period (sec)** | 10 | | | | |
| **Software Version** | 8.15 | | | | |
| **Sub Serial Number** | 11404283 | | | | |
| **Insert/Sonde Serial Number** | 11579809 | | | | |

## REMARKS

**1. All depths are true vertical depths, referenced to the Driller's pipe tally and**

**are measured from the Kelly Bushing, unless otherwise specified.**
**2. No depth corrections have been made for pipe stretch or compression.**

**3. All data presented is recorded data unless otherwise specified.**

**4. The final survey is projection at bit**

**5. The following smoothing parameters have been applied to the data:**
**PGRC (Corrected Gamma Ray):**
**Interval Resolution: 0.5 ft**
**Interval Distance: 0.6 ft**
**Gap Fill: 3.0 ft**

**ROPA (Average Rate Of Penetration):**
**Interval Resolution: 0.5 ft**
**Interval Distance: 1.2 ft**
**Gap Fill: 3.0 ft**

**Insite version: 8.0**

## WARRANTY

HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

HALLIBURTON

# TVD Main Log 1:240

PCG Gamma Ray BCorr
(PGRC)
api
0 300

Average Rate of Penetration
(ROPA)
feet per hr
1K 0

Depth

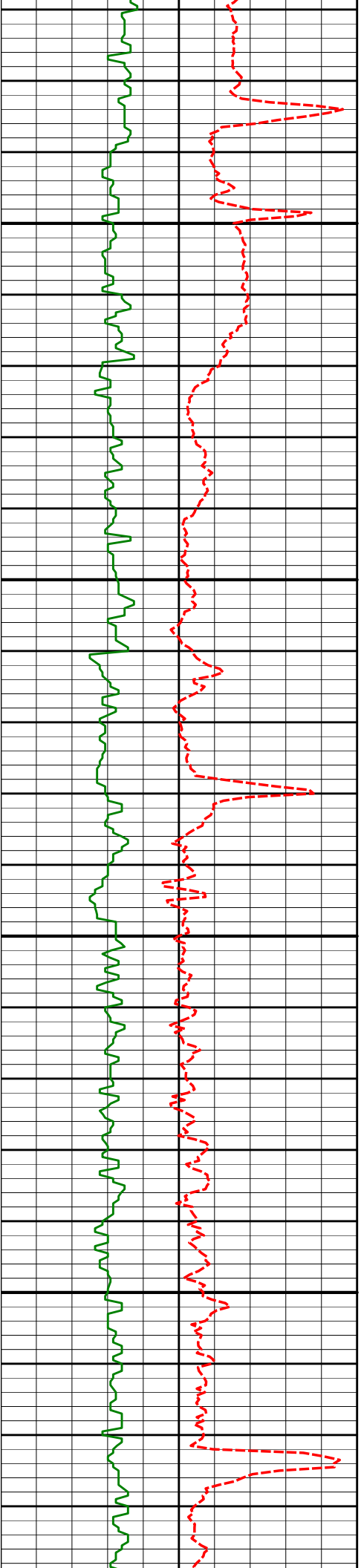
Depth Inc Azi

TVD V/S

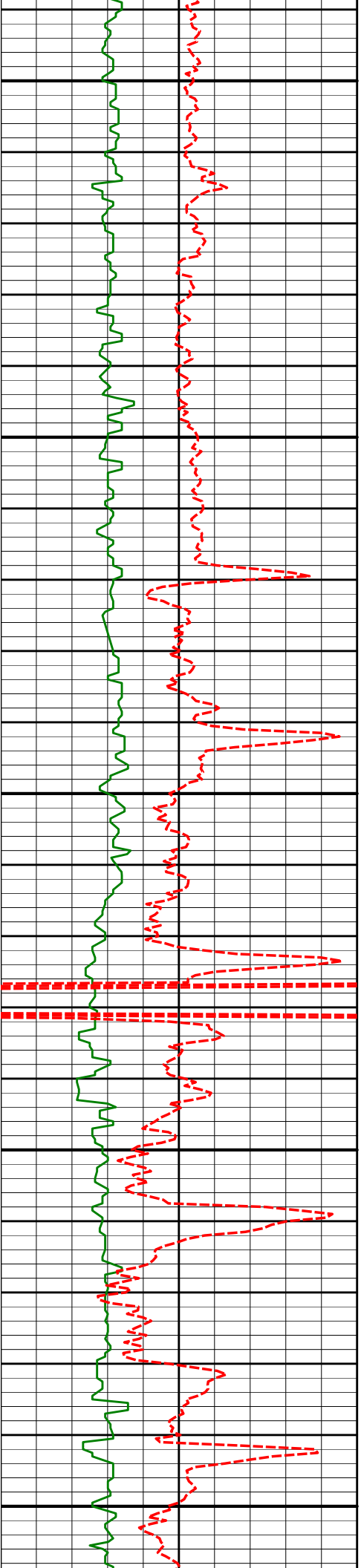
9.625" Casing Shoe @ 1236' MD / 1235.98' TVD

1250

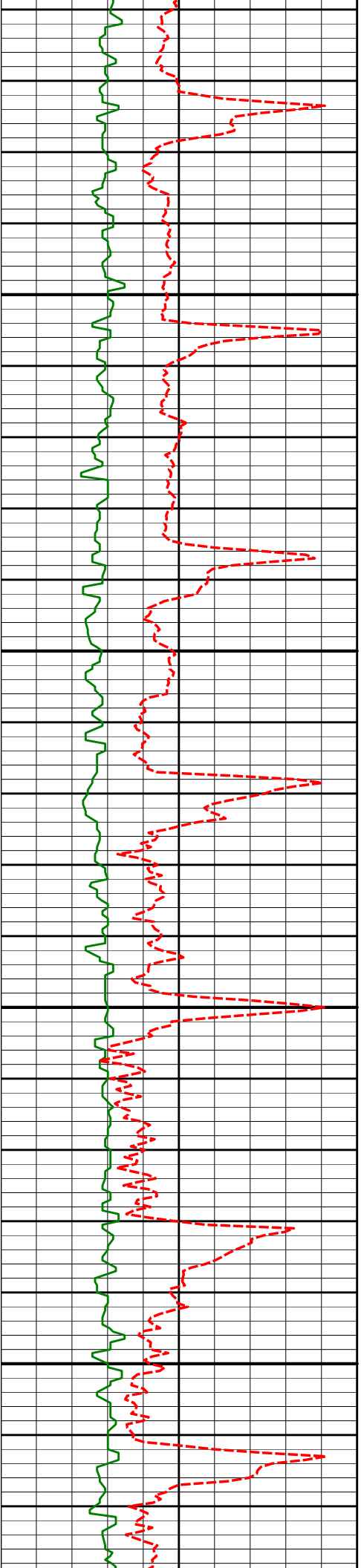
1300



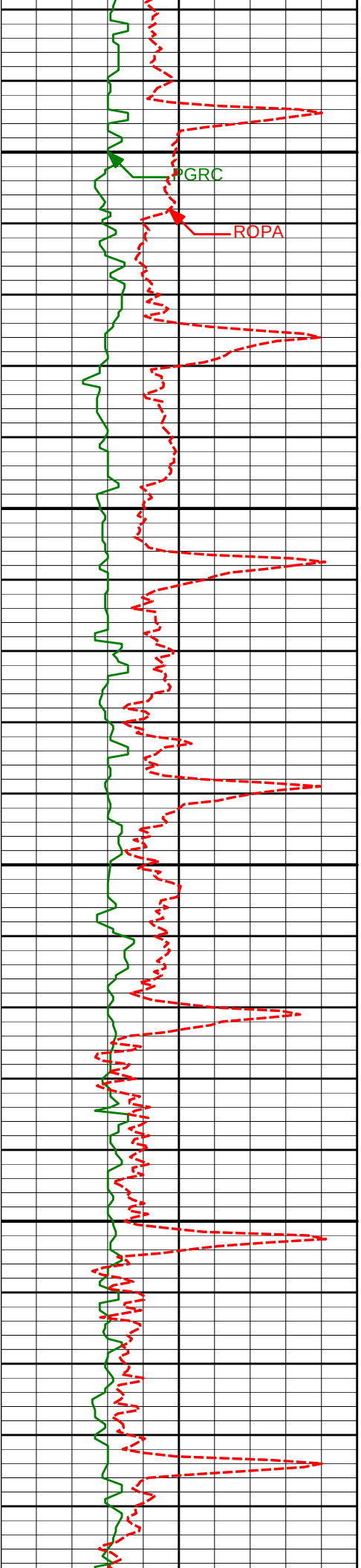

| | | | | |
|---|---|---|---|---|
| 1477' | 0.39° | 64.84° | 1476.98' | -5.47' |



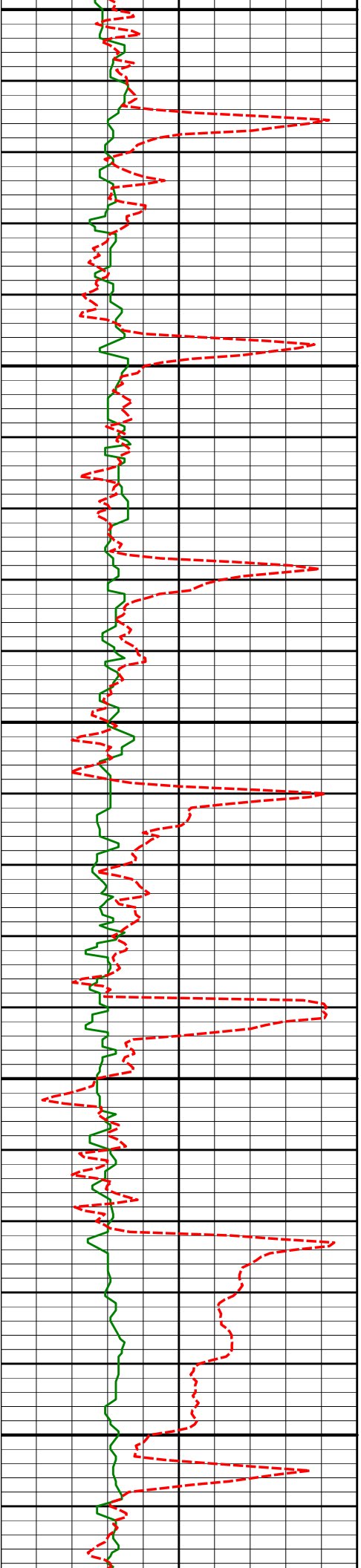

| | | | | |
|---|---|---|---|---|
| 1572' | 0.42° | 66.74° | 1571.97' | -5.74' |
| 1666' | 0.53° | 33.59° | 1665.97' | -6.24' |



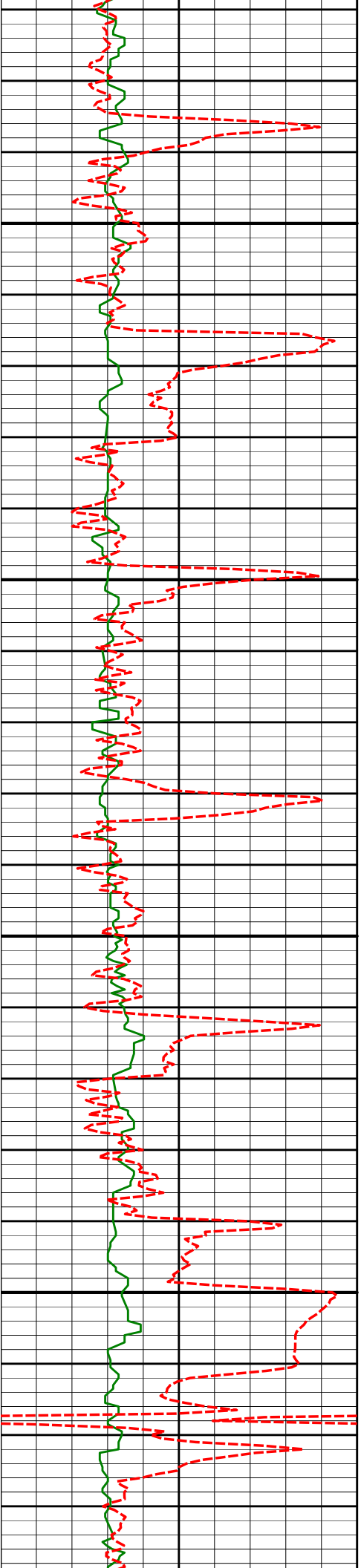

| | | | | |
|---|---|---|---|---|
| 1760' | 0.49° | 18.33° | 1759.97' | -6.98' |
| 1855' | 0.52° | 22.64° | 1854.96' | -7.76' |
| 1949' | 0.40° | 20.72° | 1948.96' | -8.46' |



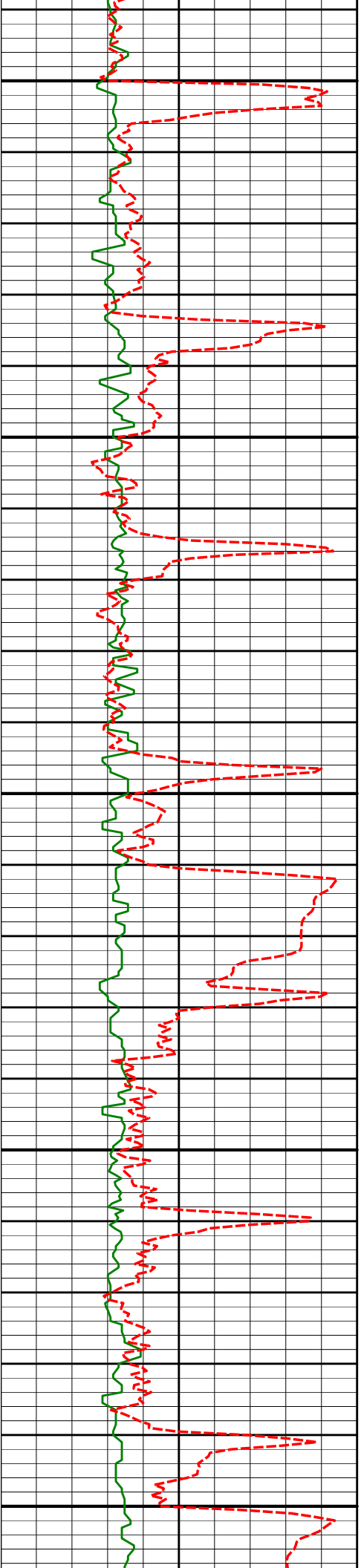

| | | | | | |
|---|---|---|---|---|---|
| 2043' | 0.52° | 4.08° | 2042.96' | -9.19' |
| 2138' | 0.43° | 34.14° | 2137.96' | -9.92' |



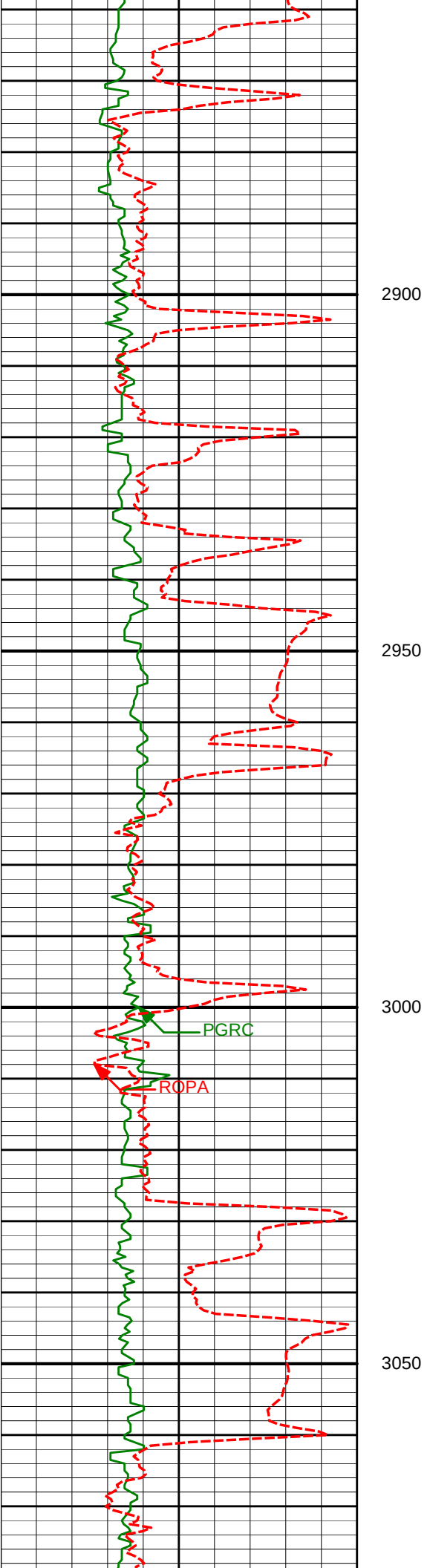

| | | | | |
|---|---|---|---|---|
| 2232' | 0.63° | 9.29° | 2231.95' | -10.72' |
| 2358' | 0.74° | 346.30° | 2357.94' | -12.19' |



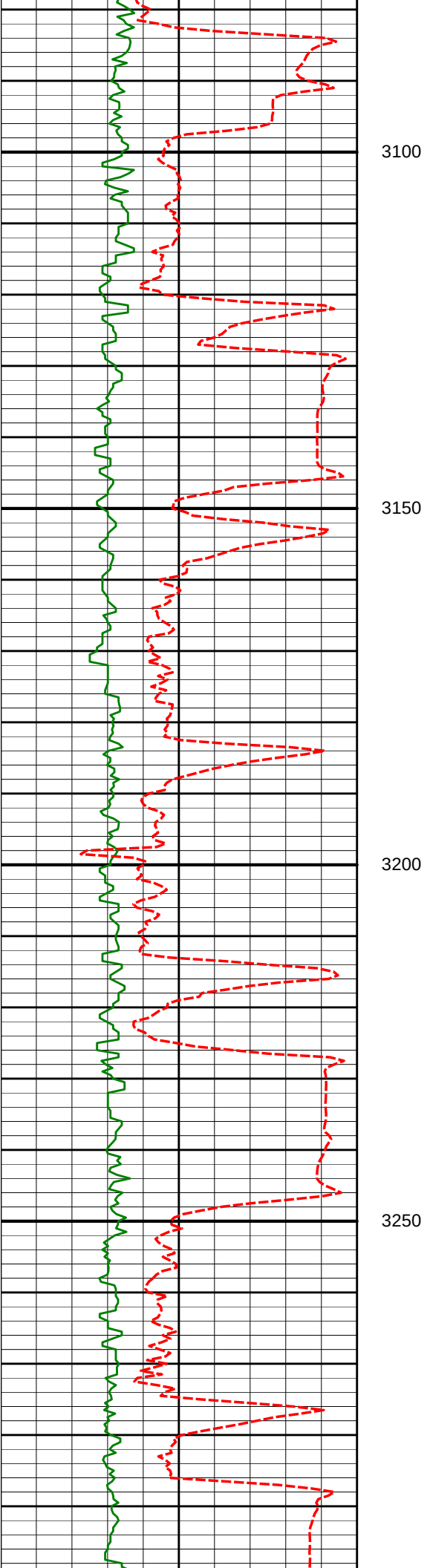

| | | | | |
|---|---|---|---|---|
| 2420' | 0.52° | 348.03° | 2419.94' | -12.86' |
| 2514' | 0.39° | 8.87° | 2513.94' | -13.59' |
| 2608' | 1.73° | 24.15° | 2607.92' | -15.20' |



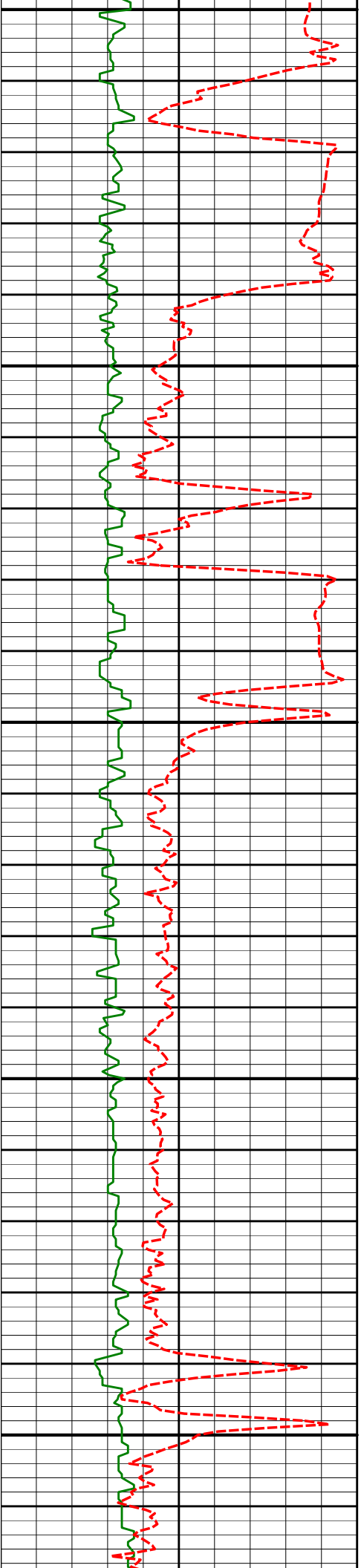

| | | | | | |
|---|---|---|---|---|---|
| 2702' | 2.31° | 30.28° | 2701.86' | -18.12' | |
| 2796' | 4.35° | 33.15° | 2795.70' | -22.73' | |



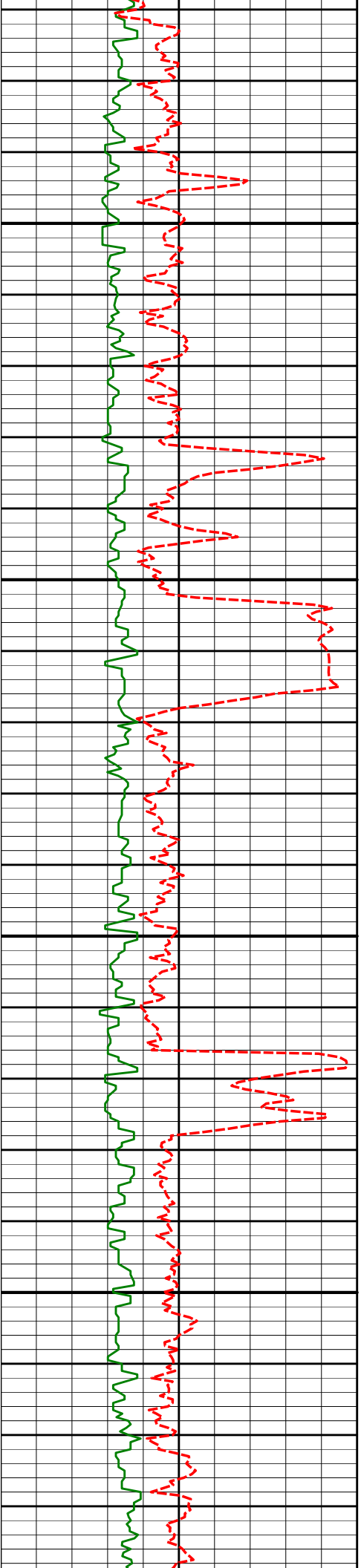

| | | | | |
|---|---|---|---|---|
| 2890' | 5.43° | 29.36° | 2889.35' | -29.58' |
| 2984' | 6.62° | 47.24° | 2982.84' | -37.11' |
| 3078' | 8.44° | 49.99° | 3076.02' | -45.19' |



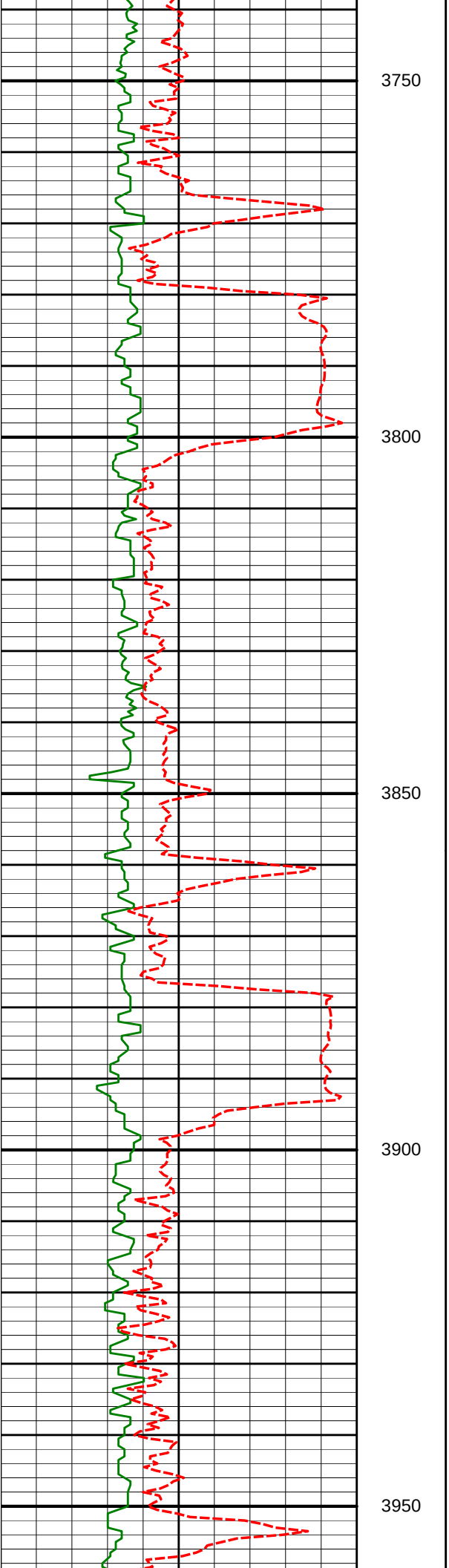

| | | | | |
|---|---|---|---|---|
| 3173' | 10.95° | 50.43° | 3169.66' | -55.37' |
| 3268' | 12.94° | 43.37° | 3262.60' | -68.80' |



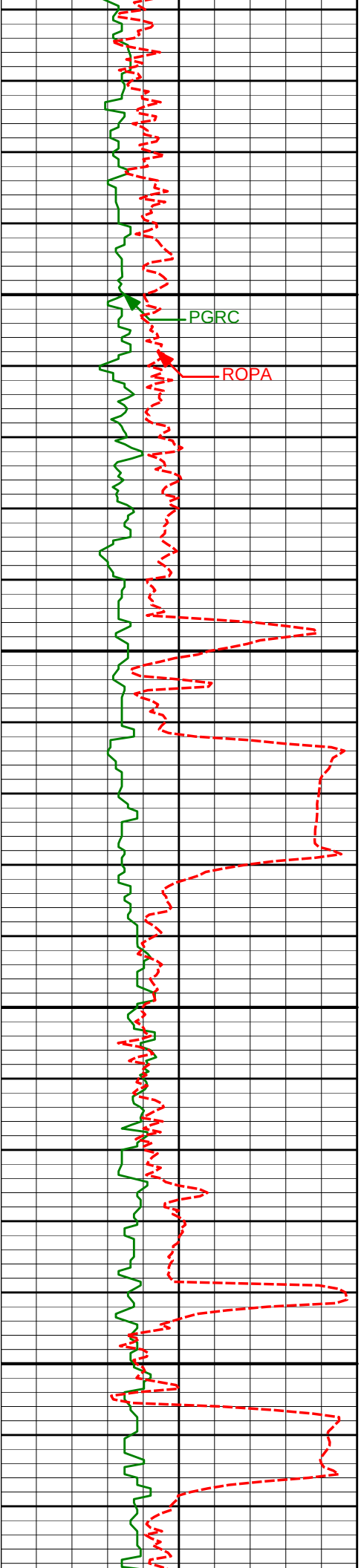

| | | | | | |
|---|---|---|---|---|---|
| 3363' | 16.22° | 28.77° | 3354.56' | -88.12' | |
| 3458' | 15.37° | 17.71° | 3446.00' | -111.71' | |



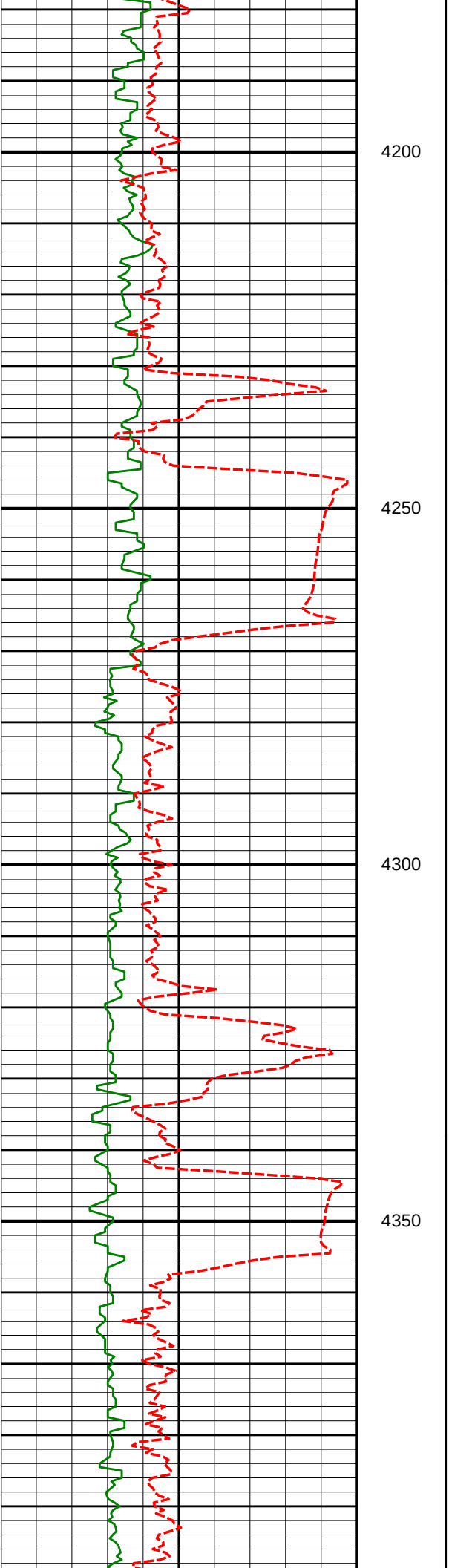

| | | | | |
|---|---|---|---|---|
| 3553' | 13.69° | 14.56° | 3537.96' | -134.56' |
| 3649' | 14.63° | 9.96° | 3631.04' | -157.48' |
| 3744' | 13.11° | 5.69° | 3723.27' | -180.01' |



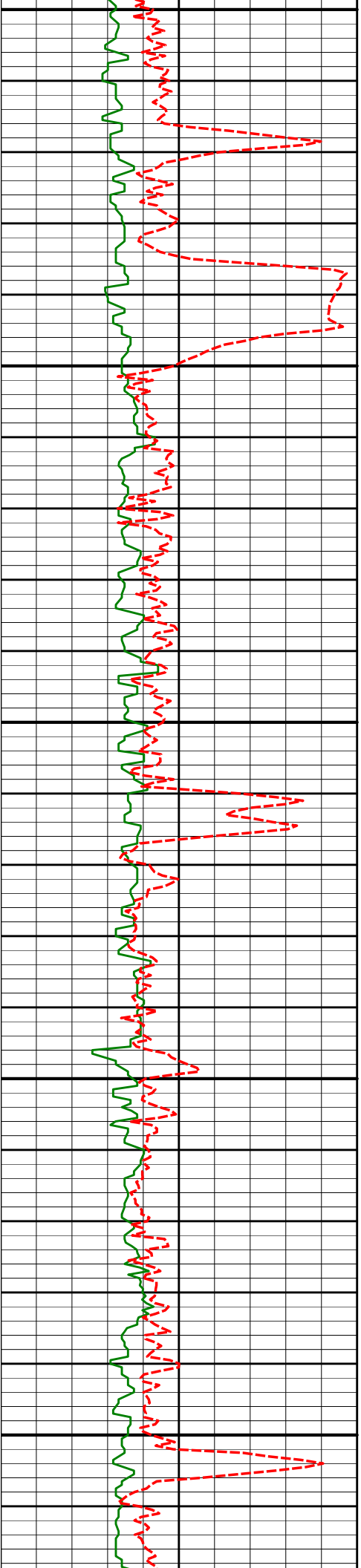

| | | | | | |
|---|---|---|---|---|---|
| 3839' | 12.89° | 13.61° | 3815.84' | -201.01' | |
| 3934' | 12.44° | 18.72° | 3908.53' | -220.98' | |



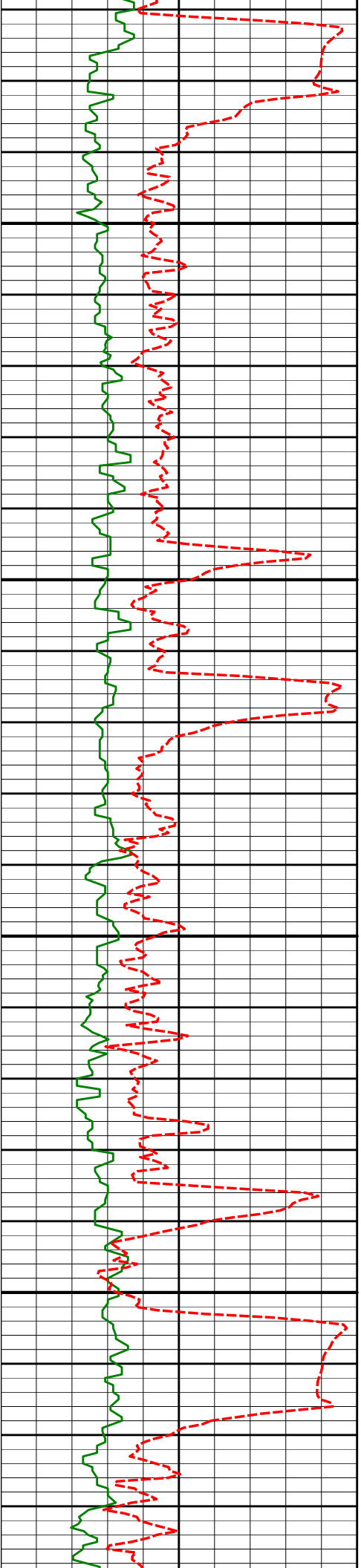

| | | | | | |
|---|---|---|---|---|---|
| 4027' | 10.83° | 13.93° | 3999.62' | -238.93' | |
| 4122' | 10.30° | 23.49° | 4093.02' | -255.36' | |



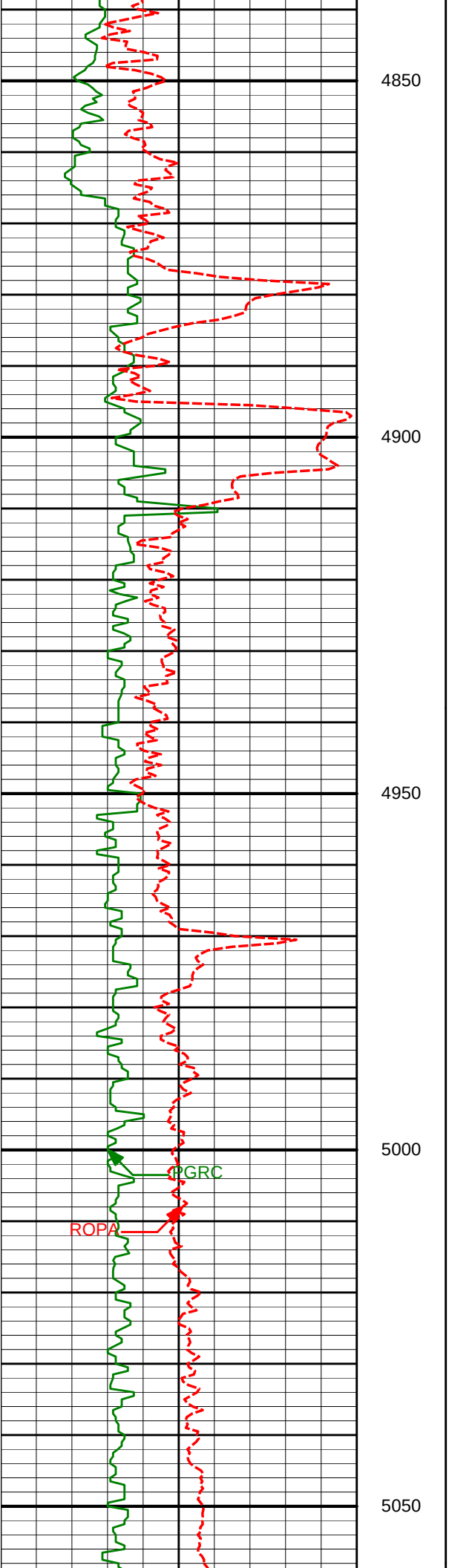

| | | | | |
|---|---|---|---|---|
| 4217' | 9.74° | 26.83° | 4186.57' | -270.30' |
| 4313' | 12.38° | 27.37° | 4280.78' | -286.65' |
| 4408' | 13.94° | 24.75° | 4373.28' | -306.05' |



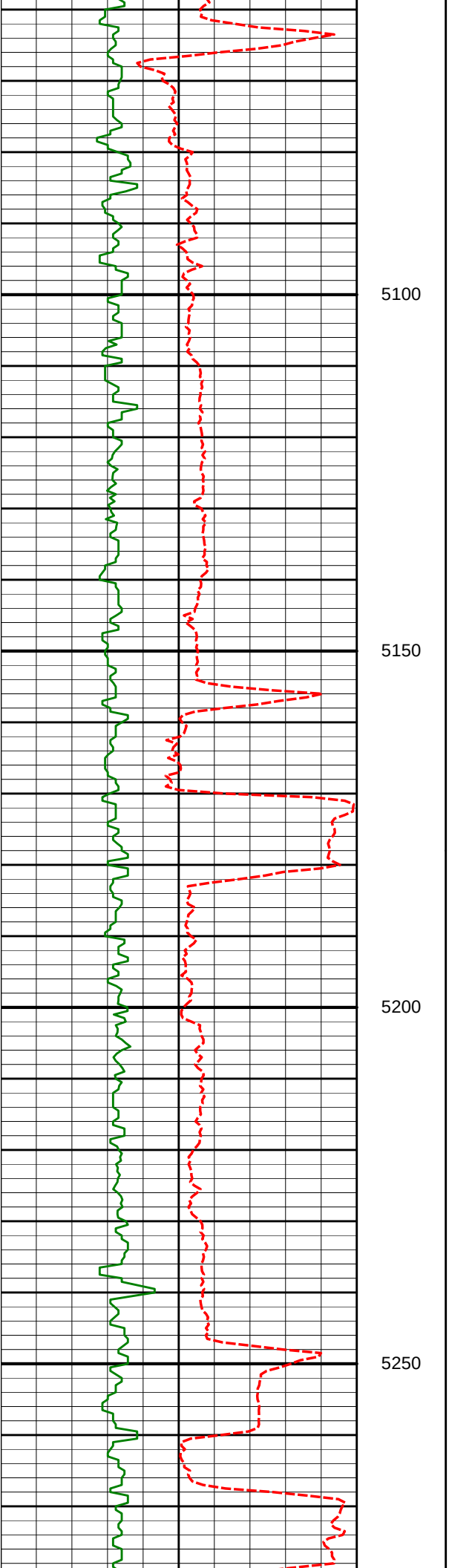

| | | | | |
|---|---|---|---|---|
| 4503' | 14.05° | 16.50° | 4465.47' | -327.47' |
| 4598' | 12.45° | 14.12° | 4557.94' | -348.44' |



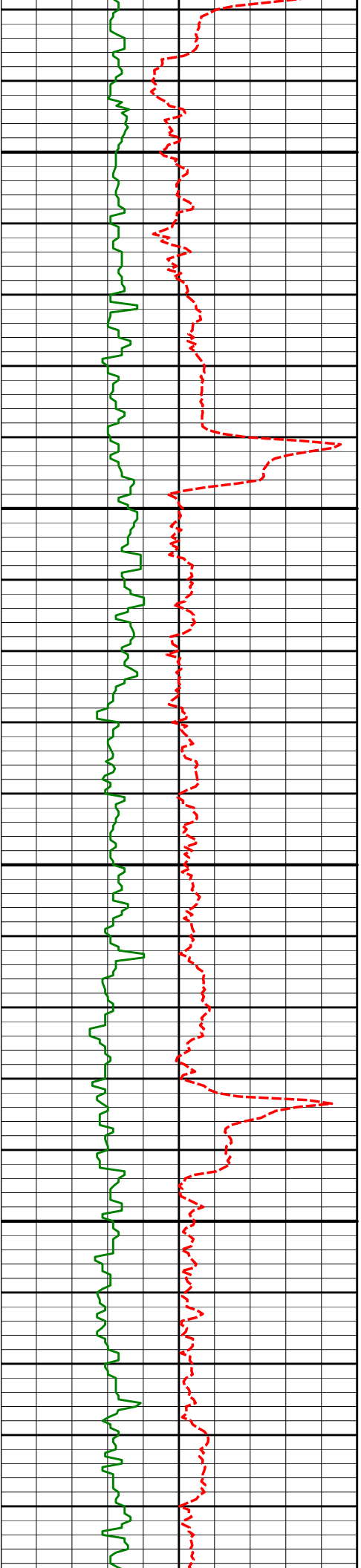

| | | | | | |
|---|---|---|---|---|---|
| 4693' | 13.20° | 16.88° | 4650.57' | -368.73' | |
| 4788' | 12.74° | 17.13° | 4743.15' | -389.09' | |
| 4883' | 13.82° | 22.61° | 4835.61' | -409.55' | |



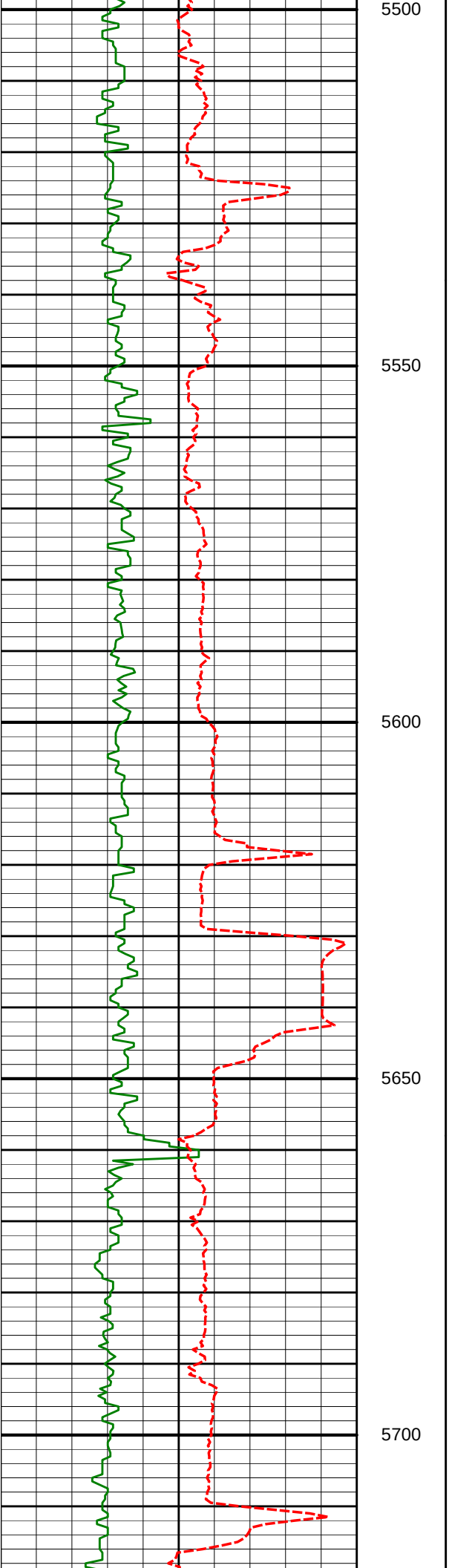

| | | | | |
|---|---|---|---|---|
| 4979' | 14.28° | 22.02° | 4928.74' | -431.08' |
| 5074' | 14.15° | 20.40° | 5020.83' | -452.79' |



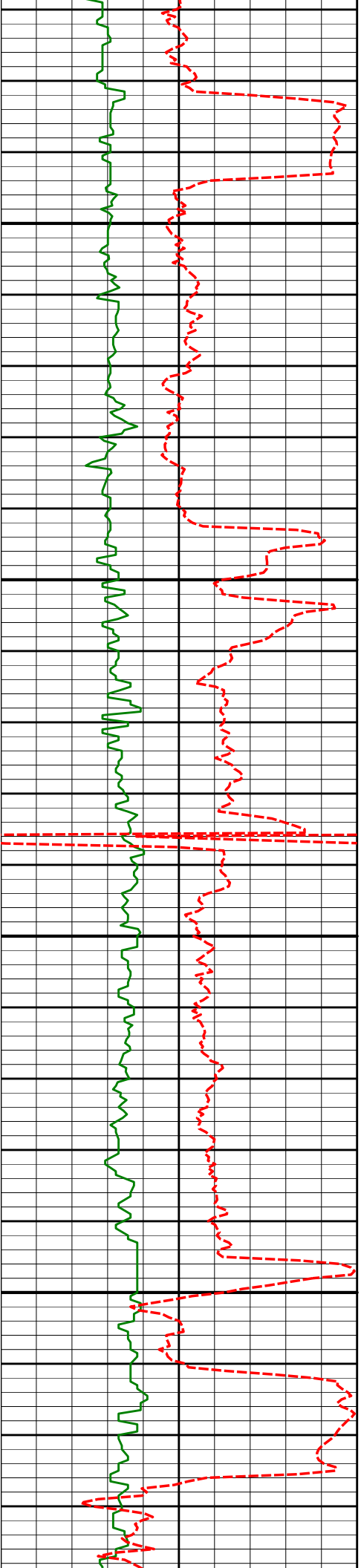

| | | | | | |
|---|---|---|---|---|---|
| 5169' | 12.86° | 18.37° | 5113.20' | -473.68' | |
| 5264' | 13.47° | 19.32° | 5205.70' | -494.13' | |



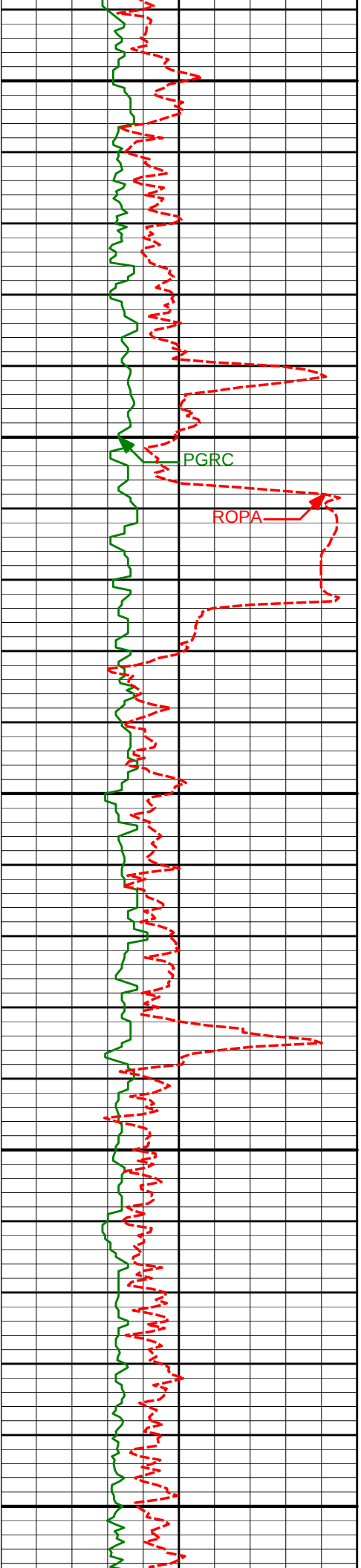

| | | | | |
|---|---|---|---|---|
| 5359' | 14.37° | 19.32° | 5297.91' | -515.66' |
| 5454' | 13.39° | 18.04° | 5390.14' | -537.22' |
| 5549' | 12.91° | 16.95° | 5482.65' | -557.81' |



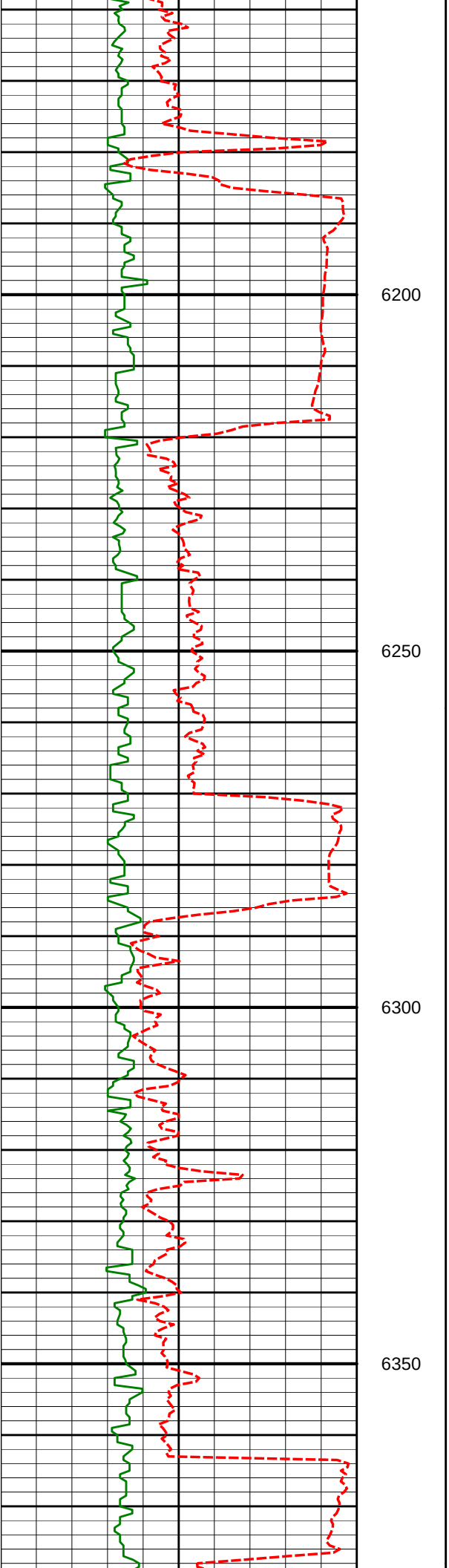

| | | | | |
|---|---|---|---|---|
| 5644' | 11.93° | 16.29° | 5575.42' | -577.36' |
| 5740' | 12.79° | 22.38° | 5669.20' | -596.69' |



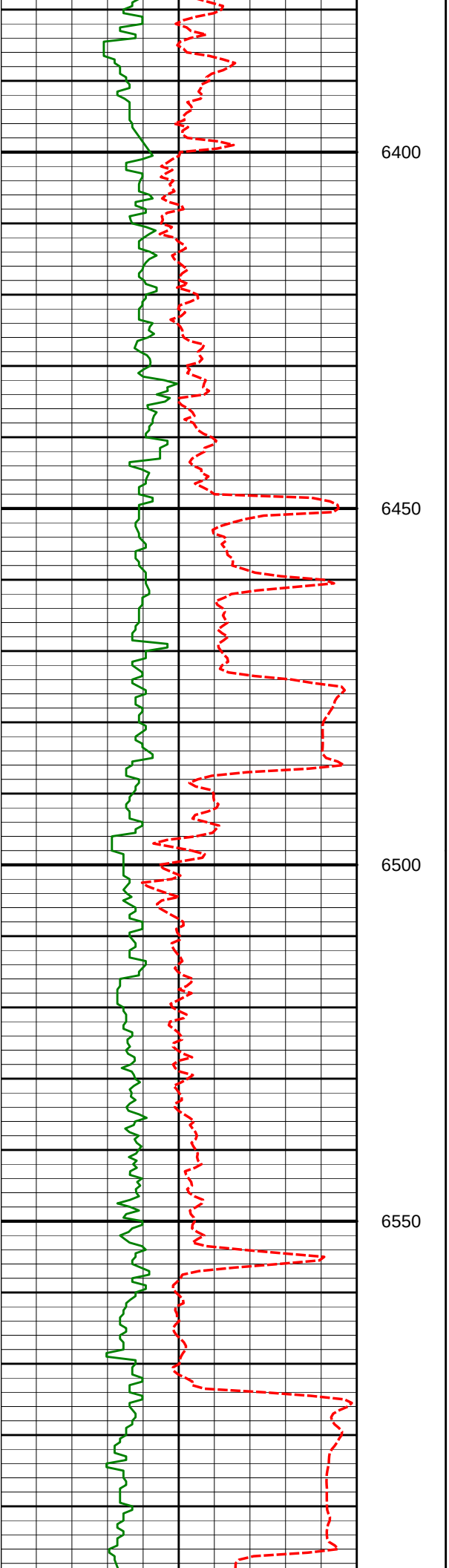

| | | | | | |
|---|---|---|---|---|---|
| 5835' | 13.58° | 22.22° | 5761.69' | -616.70' | |
| 5930' | 12.20° | 21.06° | 5854.30' | -636.37' | |



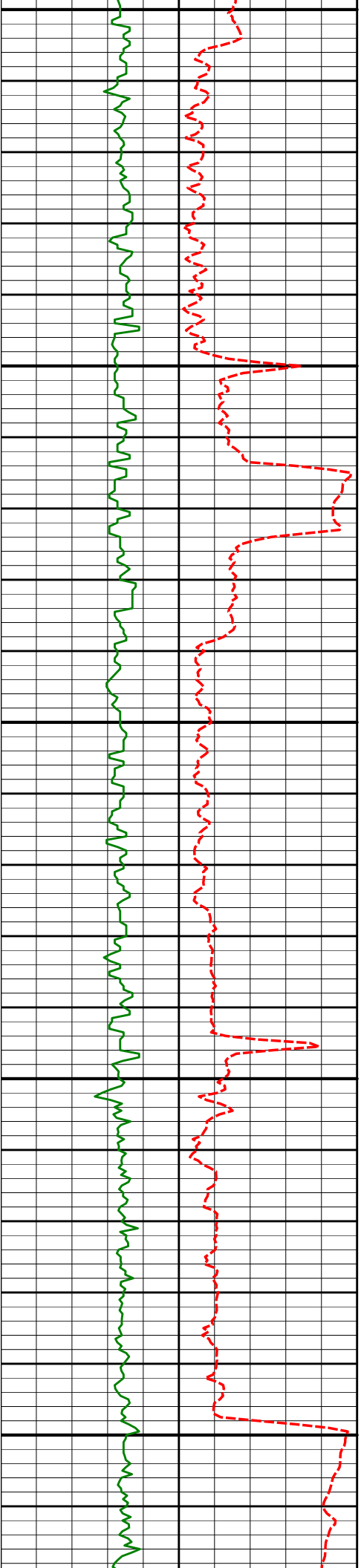

| | | | | |
|---|---|---|---|---|
| 6024' | 11.29° | 23.67° | 5946.33' | -654.03' |
| 6119' | 11.37° | 24.79° | 6039.48' | -671.02' |
| 6214' | 8.15° | 26.66° | 6133.09' | -685.52' |



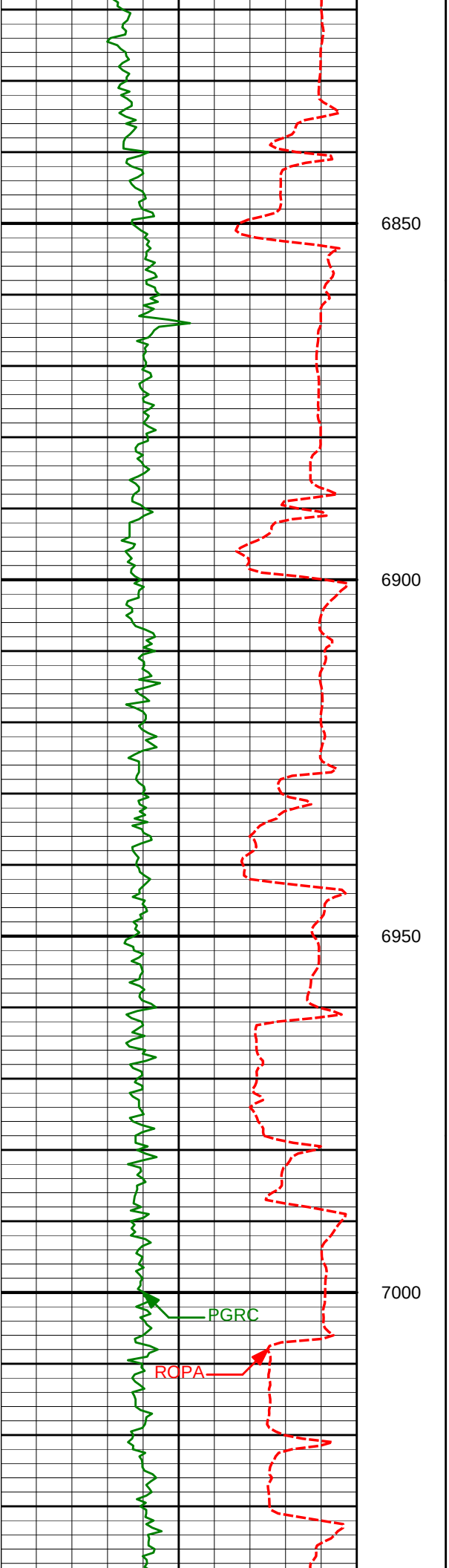

| | | | | |
|---|---|---|---|---|
| 6309' | 11.87° | 25.45° | 6226.63' | -700.34' |
| 6404' | 10.90° | 11.46° | 6319.78' | -717.94' |



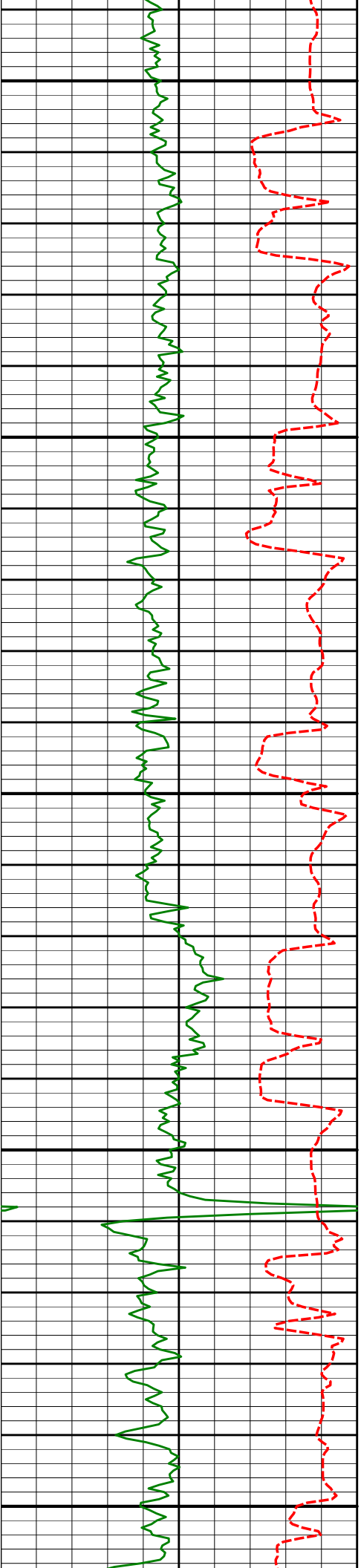

| | | | | | |
|---|---|---|---|---|---|
| 6499' | 7.62° | 5.96° | 6413.53' | -733.01' | |
| 6594' | 4.98° | 2.78° | 6507.95' | -743.39' | |



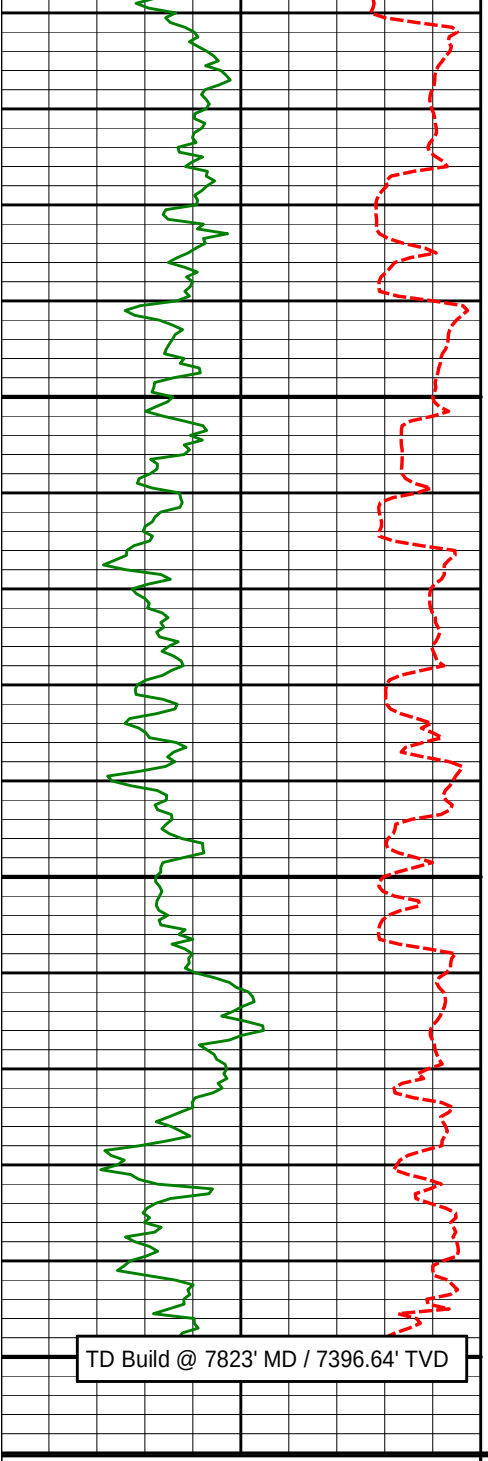

| | | | | |
|---|---|---|---|---|
| 6690' | 0.99° | 8.82° | 6603.80' | -748.37' |
| 6785' | 0.22° | 111.39° | 6698.79' | -749.11' |
| 6880' | 0.40° | 195.26° | 6793.79' | -748.73' |




| | | | | |
|---|---|---|---|---|
| 6928' | 5.80° | 189.21° | 6841.70' | -746.17' |
| 6975' | 12.14° | 188.16° | 6888.10' | -738.93' |
| 7023' | 17.18° | 187.18° | 6934.53' | -726.90' |
| 7070' | 19.98° | 186.27° | 6979.07' | -712.03' |
| 7118' | 22.89° | 183.94° | 7023.75' | -694.57' |




| | | | | |
|---|---|---|---|---|
| 7165' | 26.39° | 177.96° | 7066.47' | -675.01' |
| 7213' | 29.95° | 174.08° | 7108.78' | -652.41' |
| 7260' | 34.96° | 178.41° | 7148.43' | -627.26' |
| 7308' | 38.44° | 181.74° | 7186.92' | -598.59' |
| 7355' | 43.27° | 181.24° | 7222.45' | -567.86' |
| 7403' | 49.63° | 179.77° | 7255.51' | -533.10' |




| Depth | Depth | Inc | Azi | TVD | V/S |
|---|---|---|---|---|---|
| | 7450' | 54.16° | 179.67° | 7284.51' | -496.12' |
| 7300 | | | | | |
| | 7498' | 58.65° | 179.43° | 7311.06' | -456.15' |
| | 7546' | 63.92° | 179.81° | 7334.11' | -414.07' |
| 7350 | | | | | |
| | 7594' | 66.58° | 180.16° | 7354.21' | -370.48' |
| | 7641' | 73.05° | 181.44° | 7370.42' | -326.40' |
| | 7689' | 77.25° | 181.55° | 7382.71' | -280.03' |
| | 7736' | 82.80° | 183.03° | 7390.85' | -233.81' |
| | 7776' | 85.77° | 183.55° | 7394.84' | -194.09' |
| | 7823' | 90.15° | 184.59° | 7396.51' | -147.26' |
| 7400 | | | | | |

Average Rate of Penetration
(ROPA)
feet per hr
1K 0

PCG Gamma Ray BCorr
(PGRC)
api
0 300

HALLIBURTON

# DIRECTIONAL SURVEY REPORT

**Anadarko Petroleum Corp.**
**Highway 160 37N-2HZ**
**Wattenberg**
**Weld Colorado**
**USA**

| Measured Depth (feet) | Inclination (degrees) | Direction (degrees) | Vertical Depth (feet) | Latitude (feet) | Departure (feet) | Vertical Section (feet) | Dogleg (deg/100ft) |
|---|---|---|---|---|---|---|---|
| 1138.00 | 0.36 | 283.76 | 1137.98 | 4.72 N | 0.80 W | -4.72 | TIE-IN |
| 1477.00 | 0.39 | 64.84 | 1476.98 | 5.46 N | 0.79 W | -5.47 | 0.21 |
| 1572.00 | 0.42 | 66.74 | 1571.97 | 5.74 N | 0.18 W | -5.74 | 0.03 |
| 1666.00 | 0.53 | 33.59 | 1665.97 | 6.24 N | 0.38 E | -6.24 | 0.31 |
| 1760.00 | 0.49 | 18.33 | 1759.97 | 6.98 N | 0.75 E | -6.98 | 0.15 |
| 1855.00 | 0.52 | 22.64 | 1854.96 | 7.76 N | 1.04 E | -7.76 | 0.05 |
| 1949.00 | 0.40 | 20.72 | 1948.96 | 8.46 N | 1.32 E | -8.46 | 0.13 |
| 2043.00 | 0.52 | 4.08 | 2042.96 | 9.20 N | 1.47 E | -9.19 | 0.19 |
| 2138.00 | 0.43 | 34.14 | 2137.96 | 9.92 N | 1.70 E | -9.92 | 0.27 |
| 2232.00 | 0.63 | 9.29 | 2231.95 | 10.72 N | 1.98 E | -10.72 | 0.32 |
| 2358.00 | 0.74 | 346.30 | 2357.94 | 12.20 N | 1.90 E | -12.19 | 0.23 |
| 2420.00 | 0.52 | 348.03 | 2419.94 | 12.86 N | 1.74 E | -12.86 | 0.36 |
| 2514.00 | 0.39 | 8.87 | 2513.94 | 13.60 N | 1.71 E | -13.59 | 0.22 |
| 2608.00 | 1.73 | 24.15 | 2607.92 | 15.21 N | 2.34 E | -15.20 | 1.44 |
| 2702.00 | 2.31 | 30.28 | 2701.86 | 18.14 N | 3.87 E | -18.12 | 0.66 |
| 2796.00 | 4.35 | 33.15 | 2795.70 | 22.76 N | 6.78 E | -22.73 | 2.18 |
| 2890.00 | 5.43 | 29.36 | 2889.35 | 29.62 N | 10.91 E | -29.58 | 1.20 |
| 2984.00 | 6.62 | 47.24 | 2982.84 | 37.18 N | 17.07 E | -37.11 | 2.35 |
| 3078.00 | 8.44 | 49.99 | 3076.02 | 45.29 N | 26.33 E | -45.19 | 1.97 |
| 3173.00 | 10.95 | 50.43 | 3169.66 | 55.52 N | 38.63 E | -55.37 | 2.64 |
| 3268.00 | 12.94 | 43.37 | 3262.60 | 69.00 N | 52.89 E | -68.80 | 2.60 |
| 3363.00 | 16.22 | 28.77 | 3354.56 | 88.38 N | 66.59 E | -88.12 | 5.16 |
| 3458.00 | 15.37 | 17.71 | 3446.00 | 112.01 N | 76.80 E | -111.71 | 3.29 |
| 3553.00 | 13.69 | 14.56 | 3537.96 | 134.88 N | 83.46 E | -134.56 | 1.95 |
| 3649.00 | 14.63 | 9.96 | 3631.04 | 157.82 N | 88.41 E | -157.48 | 1.53 |
| 3744.00 | 13.11 | 5.69 | 3723.27 | 180.36 N | 91.56 E | -180.01 | 1.93 |
| 3839.00 | 12.89 | 13.61 | 3815.84 | 201.38 N | 95.12 E | -201.01 | 1.89 |
| 3934.00 | 12.44 | 18.72 | 3908.53 | 221.37 N | 100.90 E | -220.98 | 1.27 |
| 4027.00 | 10.83 | 13.93 | 3999.62 | 239.34 N | 106.22 E | -238.93 | 2.02 |
| 4122.00 | 10.30 | 23.49 | 4093.02 | 255.79 N | 111.75 E | -255.36 | 1.93 |
| 4217.00 | 9.74 | 26.83 | 4186.57 | 270.75 N | 118.76 E | -270.30 | 0.85 |
| 4313.00 | 12.38 | 27.37 | 4280.78 | 287.14 N | 127.16 E | -286.65 | 2.75 |
| 4408.00 | 13.94 | 24.75 | 4373.28 | 306.58 N | 136.63 E | -306.05 | 1.76 |
| 4503.00 | 14.05 | 16.50 | 4465.47 | 328.03 N | 144.70 E | -327.47 | 2.10 |
| 4598.00 | 12.45 | 14.12 | 4557.94 | 349.02 N | 150.47 E | -348.44 | 1.78 |
| 4693.00 | 13.20 | 16.88 | 4650.57 | 369.33 N | 156.12 E | -368.73 | 1.02 |
| 4788.00 | 12.74 | 17.13 | 4743.15 | 389.72 N | 162.36 E | -389.09 | 0.49 |
| 4883.00 | 13.82 | 22.61 | 4835.61 | 410.21 N | 169.80 E | -409.55 | 1.75 |
| 4979.00 | 14.28 | 22.02 | 4928.74 | 431.77 N | 178.65 E | -431.08 | 0.50 |
| 5074.00 | 14.15 | 20.40 | 5020.83 | 453.51 N | 187.09 E | -452.79 | 0.44 |
| 5169.00 | 12.86 | 18.37 | 5113.20 | 474.43 N | 194.47 E | -473.68 | 1.45 |
| 5264.00 | 13.47 | 19.32 | 5205.70 | 494.90 N | 201.47 E | -494.13 | 0.68 |
| 5359.00 | 14.37 | 19.32 | 5297.91 | 516.47 N | 209.03 E | -515.66 | 0.95 |
| 5454.00 | 13.39 | 18.04 | 5390.14 | 538.06 N | 216.33 E | -537.22 | 1.08 |
| 5549.00 | 12.91 | 16.95 | 5482.65 | 558.67 N | 222.83 E | -557.81 | 0.57 |
| 5644.00 | 11.93 | 16.29 | 5575.42 | 578.24 N | 228.68 E | -577.36 | 1.04 |
| 5740.00 | 12.79 | 22.38 | 5669.20 | 597.59 N | 235.51 E | -596.69 | 1.63 |
| 5835.00 | 13.58 | 22.22 | 5761.69 | 617.64 N | 243.73 E | -616.70 | 0.83 |
| 5930.00 | 12.20 | 21.06 | 5854.30 | 637.34 N | 251.56 E | -636.37 | 1.48 |
| 6024.00 | 11.29 | 23.67 | 5946.33 | 655.03 N | 258.82 E | -654.03 | 1.12 |
| 6119.00 | 11.37 | 24.79 | 6039.48 | 672.05 N | 266.48 E | -671.02 | 0.25 |
| 6214.00 | 8.15 | 26.66 | 6133.09 | 686.57 N | 273.43 E | -685.52 | 3.41 |
| 6309.00 | 11.87 | 25.45 | 6226.63 | 701.42 N | 280.65 E | -700.34 | 3.92 |
| 6404.00 | 10.90 | 11.46 | 6319.78 | 719.05 N | 286.64 E | -717.94 | 3.07 |
| 6499.00 | 7.62 | 5.96 | 6413.53 | 734.12 N | 289.08 E | -733.01 | 3.57 |
| 6594.00 | 4.98 | 2.78 | 6507.95 | 744.51 N | 289.93 E | -743.39 | 2.80 |
| 6690.00 | 0.99 | 8.82 | 6603.80 | 749.49 N | 290.26 E | -748.37 | 4.16 |
| 6785.00 | 0.22 | 111.39 | 6698.79 | 750.23 N | 290.56 E | -749.11 | 1.12 |
| 6880.00 | 0.40 | 195.26 | 6793.79 | 749.85 N | 290.64 E | -748.73 | 0.46 |
| 6928.00 | 5.80 | 189.21 | 6841.70 | 747.29 N | 290.21 E | -746.17 | 11.25 |
| 6975.00 | 12.14 | 188.16 | 6888.10 | 740.05 N | 289.12 E | -738.93 | 13.49 |
| 7023.00 | 17.18 | 187.18 | 6934.53 | 728.01 N | 287.52 E | -726.90 | 10.51 |
| 7070.00 | 19.98 | 186.27 | 6979.07 | 713.14 N | 285.78 E | -712.03 | 5.99 |
| 7118.00 | 22.89 | 183.94 | 7023.75 | 695.67 N | 284.24 E | -694.57 | 6.32 |
| 7165.00 | 26.39 | 177.96 | 7066.47 | 676.10 N | 283.98 E | -675.01 | 9.13 |
| 7213.00 | 29.95 | 174.08 | 7108.78 | 653.51 N | 285.60 E | -652.41 | 8.34 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7260.00 | 34.96 | 178.41 | 7148.43 | 628.36 N | 287.18 E | -627.26 | 11.74 |
| 7308.00 | 38.44 | 181.74 | 7186.92 | 599.69 N | 287.11 E | -598.59 | 8.35 |
| 7355.00 | 43.27 | 181.24 | 7222.45 | 568.97 N | 286.32 E | -567.86 | 10.30 |
| 7403.00 | 49.63 | 179.77 | 7255.51 | 534.20 N | 286.04 E | -533.10 | 13.43 |
| 7450.00 | 54.16 | 179.67 | 7284.51 | 497.23 N | 286.22 E | -496.12 | 9.64 |
| 7498.00 | 58.65 | 179.43 | 7311.06 | 457.25 N | 286.53 E | -456.15 | 9.36 |
| 7546.00 | 63.92 | 179.81 | 7334.11 | 415.17 N | 286.81 E | -414.07 | 11.00 |
| 7594.00 | 66.58 | 180.16 | 7354.21 | 371.59 N | 286.82 E | -370.48 | 5.58 |
| 7641.00 | 73.05 | 181.44 | 7370.42 | 327.50 N | 286.19 E | -326.40 | 14.00 |
| 7689.00 | 77.25 | 181.55 | 7382.71 | 281.13 N | 284.98 E | -280.03 | 8.75 |
| 7736.00 | 82.80 | 183.03 | 7390.85 | 234.90 N | 283.13 E | -233.81 | 12.21 |
| 7776.00 | 85.77 | 183.55 | 7394.84 | 195.17 N | 280.84 E | -194.09 | 7.54 |
| 7823.00 | 90.15 | 184.59 | 7396.51 | 148.33 N | 277.51 E | -147.26 | 9.58 |

**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 179.78 DEGREES (TRUE)**
**A TOTAL CORRECTION OF 8.53 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.**
**HORIZONTAL DISPLACEMENT(CLOSURE) AT 7823.00 FEET**
**IS 314.66 FEET ALONG 61.88 DEGREES (TRUE)**

**All directional surveys tied on to the last gyro survey at 1138.00' MD. Final survey is a projection to the bit.**

**Date Printed:11 December 2013**