HALLIBURTON | Sperry Drilling

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

**1 : 240**

| | |
|---|---|
| Country | : **USA** |
| Field | : **Wattenberg** |
| Location | : **Lat: 40° 43' 2.51" North**<br>**Long: 104° 4' 11.95" West** |
| Well | : **Keota PC LB26-62HN** |
| Company | : **Noble Energy** |
| Rig | : **H&P 322** |

LOCATION

Company : **Noble Energy**
Rig : **H&P 322**
Well : **Keota PC LB26-62HN**
Field : **Wattenberg**
Country : **USA**
API Number : **512336549**

Latitude : **40° 43' 2.51" North**
Longitude : **104° 4' 11.95" West**
UTM Easting = 3396391.962 ft
UTM Northing = 1507375.949 ft

Other Services
**Directional Drilling**

Permanent Datum : **Ground Level** Elevation : **4949.00 ft**
Log Measured From : **Drill Floor** **24.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

MD LOG

Elev. KB **N/A**
DF **4973.00 ft**
GL **4949.00 ft**
WD **N/A**

Depth Logged : **728.00 ft** To **10,740.00 ft**
Date Logged : **16-Feb-13** To **22-Feb-13**
Total Depth MD : **10,740.00 ft** TVD : **6,305.35 ft**
Spud Date : **15-Feb-13**

Unit No. : **11210425**
Plot Type : **Final**
Plot Date : **23-Feb-13**

Job No. :**CA-XX-0900145817**

Borehole Record (MD)

| Run No. | Size | From | To |
|---|---|---|---|
| 2 | 8.750 in | 728.00 ft | 5,616.00 ft |
| 3 | 8.750 in | 5,616.00 ft | 6,367.00 ft |
| 4 | 8.750 in | 6,367.00 ft | 6,744.00 ft |
| 5 | 6.125 in | 6,744.00 ft | 10,740.00 ft |

Borehole Record (MD)

| Run No. | Size | From | To |
|---|---|---|---|

Casing Record (MD)

| Size | Weight | From | To |
|---|---|---|---|
| 9.625 in | 36.00 lbpf | SURFACE | 718.00 ft |
| 7.000 in | 26.00 lbpf | SURFACE | 6,734.00 ft |

## WELL INFORMATION

| | | | | |
|---|---|---|---|---|
| **MWD Run Number** | 100 | 200 | 300 | 400 |
| **Date run completed** | 17-Feb-13 | 18-Feb-13 | 18-Feb-13 | 22-Feb-13 |
| **Rig Bit Number** | 2 | 3 | 4 | 5 |
| **Bit Size (in)** | 8.750 | 8.750 | 8.750 | 6.125 |
| **Tool Nominal OD (in)** | 6.750 | 6.750 | 6.750 | 4.750 |
| **Log Start Depth (MD, ft)** | 728.00 | 5,616.00 | 6,367.00 | 6,744.00 |
| **Log End Depth (MD, ft)** | 5,616.00 | 6,367.00 | 6,744.00 | 10,740.00 |
| **Drill or Wipe** | Drill | Drill | Drill | Drill |
| **Drill/Wipe Start Date and Time** | 16-Feb-13 16:20 | 17-Feb-13 13:30 | 18-Feb-13 06:00 | 19-Feb-13 20:45 |
| **Drill/Wipe End Date and Time** | 17-Feb-13 06:00 | 17-Feb-13 20:15 | 18-Feb-13 14:00 | 22-Feb-13 04:18 |
| **Min Inc (deg) @ Depth (MD, ft)** | .24 @ 5,369.00 | .91 @ 5,646.00 | 50.33 @ 6,358.00 | 83.70 @ 6,758.00 |
| **Max Inc (deg) @ Depth (MD, ft)** | 19.09 @ 3,849.00 | 45.69 @ 6,311.00 | 81.30 @ 6,690.00 | 93.98 @ 7,422.00 |
| **Bit TFA(in2) / Bit Type** | .75 / PDC | .86 / PDC | .86 / PDC | .46 / PDC |
| **Flow Rate (gpm)** | 600.00 | 600.00 | 553.00 | 270.00 |
| **Max AV (fpm) / CV (fpm) @ MWD** | 477.1 / 477.1 | 477.1 / 477.1 | 477.1 / 477.1 | 436.9 / 436.9 |
| **Fluid Type** | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel |
| **Density (ppg) / Viscosity (spqt)** | 8.65 / 27.00 | 9.55 / 90.00 | 10.40 / 38.00 | 9.95 / 36.00 |
| **Filtrate CL (ppm)** | 700.00 | 750.00 | 800.00 | 800.00 |
| **pH / Fluid Loss (mptm)** | 7.80 / N/A | 9.50 / N/A | 9.60 / N/A | 8.20 / N/A |
| **PV (cP) / YP (lhf2)** | 1 / 3.00 | 1 / 3.00 | 11 / 10.00 | 8 / 10.00 |
| **% Solids / % Sand** | 2.2 / 0.10 | 5.7 / 0.50 | 9.3 / .5 | 7.80 / 0.75 |
| **% Oil / Oil:Water Ratio** | N/A / N/A | N/A / N/A | N/A / N/A | N/A / N/A |
| **Rm @ Measured Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A |
| **Rmf @ Measured Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A |
| **Rmc @ Measured Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A |

| | | | | | |
|---|---|---|---|---|---|
| **Max Tool Temp (degF) / Source** | 137.50 / PCM | 145.90 / PCM | 156.13 / PCM | 209.60 / PCM | |
| **Rm @ Max Tool Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A | |
| **Lead MWD Engineer** | Robert Ley | Robert Ley | Robert Ley | Robert Ley | |
| **Customer Representative** | Charles Collver | Charles Collver | Charles Collver | Charles Collver | |

## SENSOR INFORMATION

### Downhole Processor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCM | PCM | PCM | PCM | |
| **Software Version** | 5.76 | 5.76 | 5.76 | 5.76 | |
| **Sub Serial Number** | 11404279 | 11404279 | 11404279 | 11854094 | |
| **Insert Serial Number** | 11680730 | 11680730 | 11680730 | 11227512 | |
| **Date and Time Initialized** | 15-Feb-13 23:55 | 15-Feb-13 23:55 | 15-Feb-13 23:55 | 18-Feb-13 20:21 | |
| **Date and Time Read** | 18-Feb-13 20:50 | 18-Feb-13 20:42 | 18-Feb-13 20:35 | 22-Feb-13 18:05 | |
| **ECMB SW Version** | N/A | N/A | N/A | N/A | |

### Directional Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCDC | PCDC | PCDC | PCDC | |
| **Distance From Bit (ft)** | 57.00 | 56.00 | 54.00 | 68.00 | |
| **Software Version** | 6.21 | 6.21 | 6.21 | 6.21 | |
| **Sub Serial Number** | 11404279 | 11404279 | 11404279 | 11854094 | |
| **Sonde Serial Number** | 10835184 | 10835184 | 10835184 | 11833053 | |
| **Sensor ID Number** | N/A | N/A | N/A | N/A | |
| **Toolface Offset (deg)** | 152.99 | 305.15 | 221.33 | 71.69 | |

### Gamma Ray Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCG | PCG | PCG | PCG | |
| **Distance From Bit (ft)** | 50.24 | 48.76 | 46.97 | 60.62 | |
| **Recorded Sample Period (sec)** | 10 | 10 | 10 | 10 | |
| **Software Version** | 8.15 | 8.15 | 8.15 | 8.15 | |
| **Sub Serial Number** | 11404279 | 11404279 | 11404279 | 11854094 | |
| **Insert/Sonde Serial Number** | 11293270 | 11293270 | 11293270 | 11293406 | |

## REMARKS

**1. All depths are measured depths and are calibrated to the driller' pipe tally and are measured 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. The Following smoothing parameters have been applied to the data"**

**PGRC (Gamma Ray Corrected):**
**Interval Resolution: 0.5 feet**
**Coercion Distance: 0.6 feet**
**Gap Fill: 3.0 feet**

**ROPA (Rate of Penetration):**
**Interval Resolution: 0.5 feet**
**Coercion Distance: 1.2 feet**
**Gap Fill: 3.0 feet**

**Insite Version 7.3.40 build 25**

**5. Due to detection issues there is no gamma data from 10072 feet to 10094 feet**

**6. Survey at TD is projected to the bit**

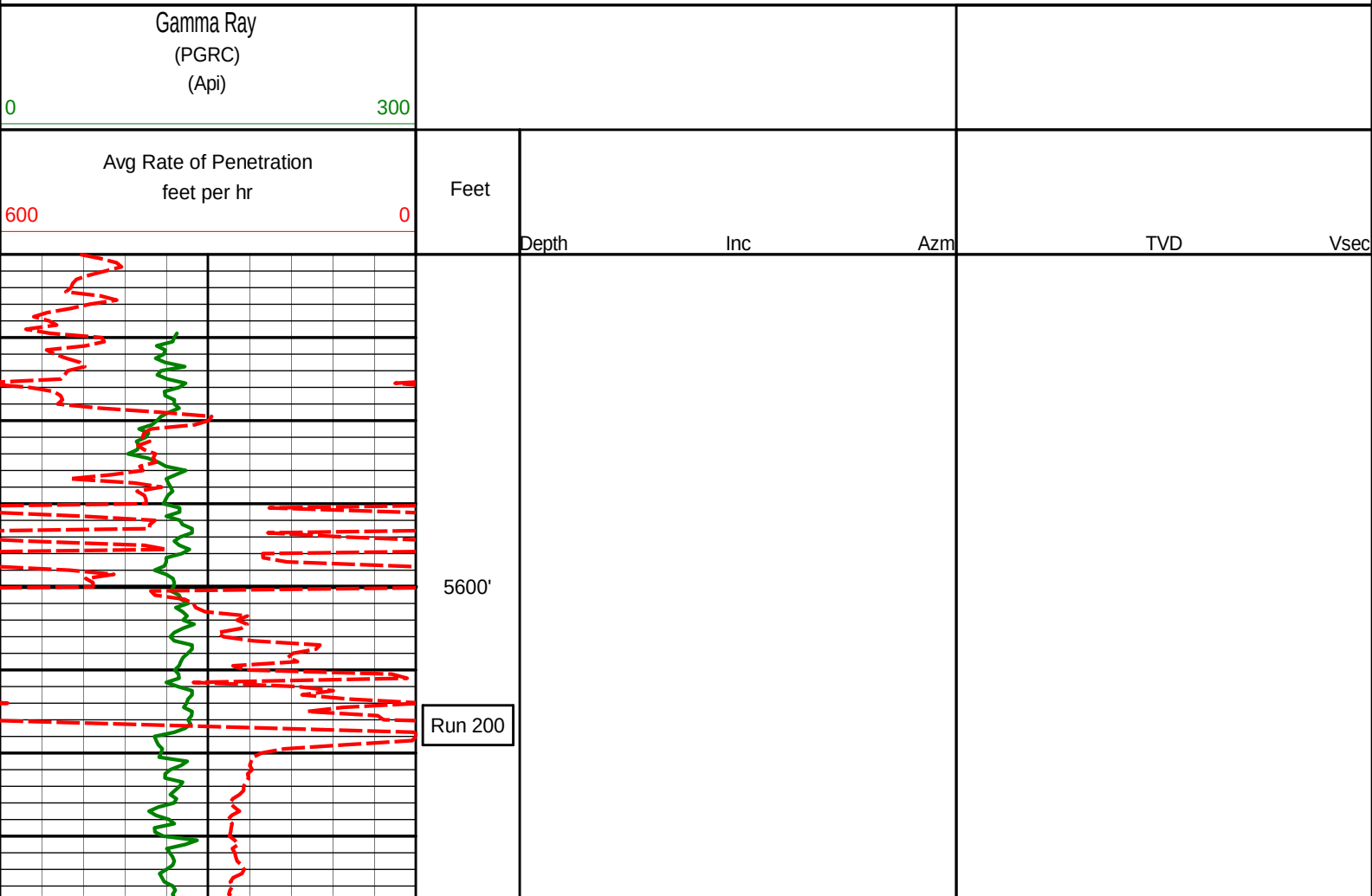
6. Survey at TD is projected to the bit

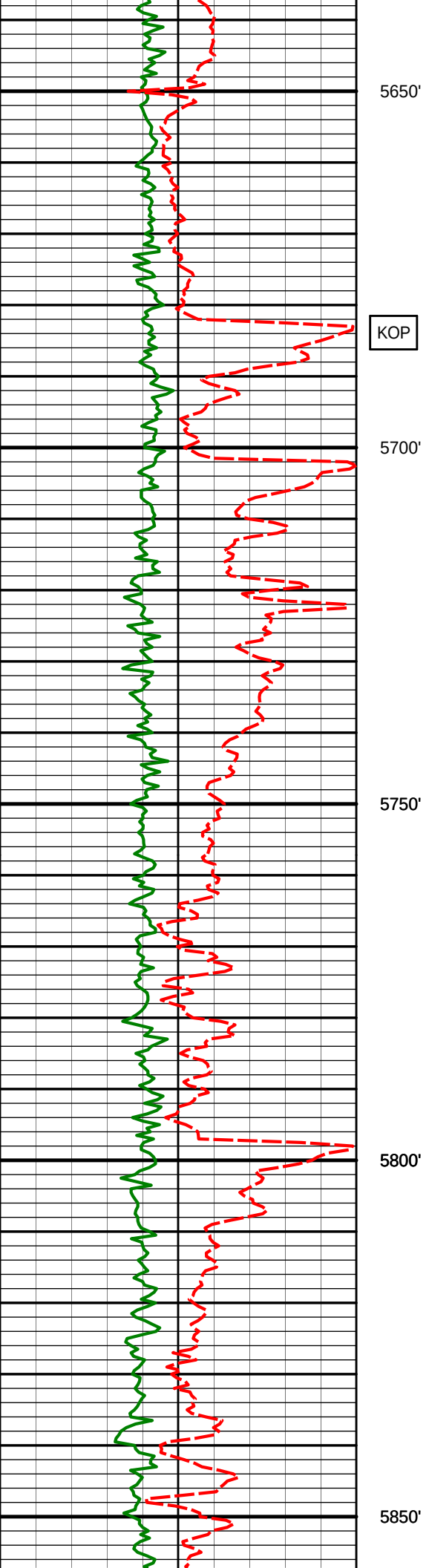
## WARRANTY

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.

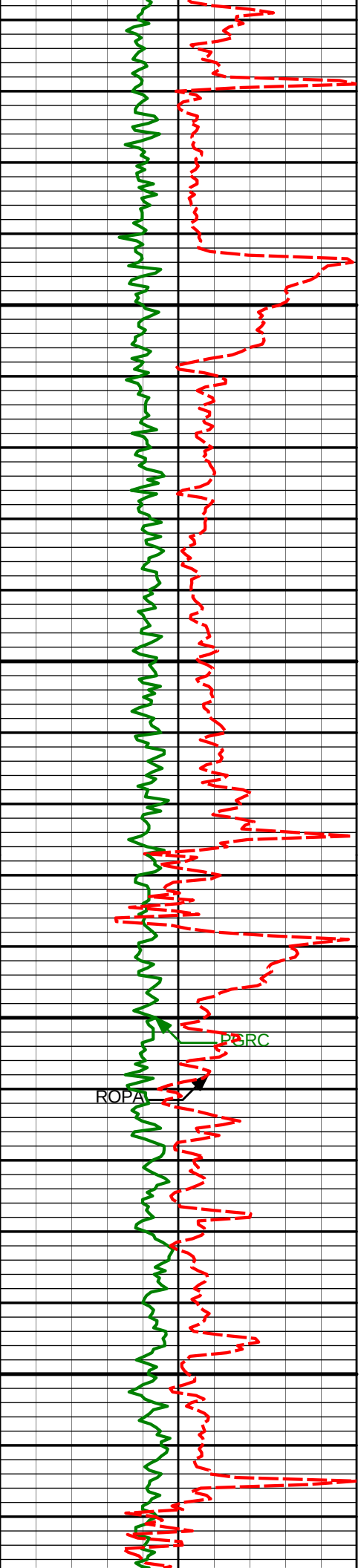
HALLIBURTON

# MD Detail Log 1:240

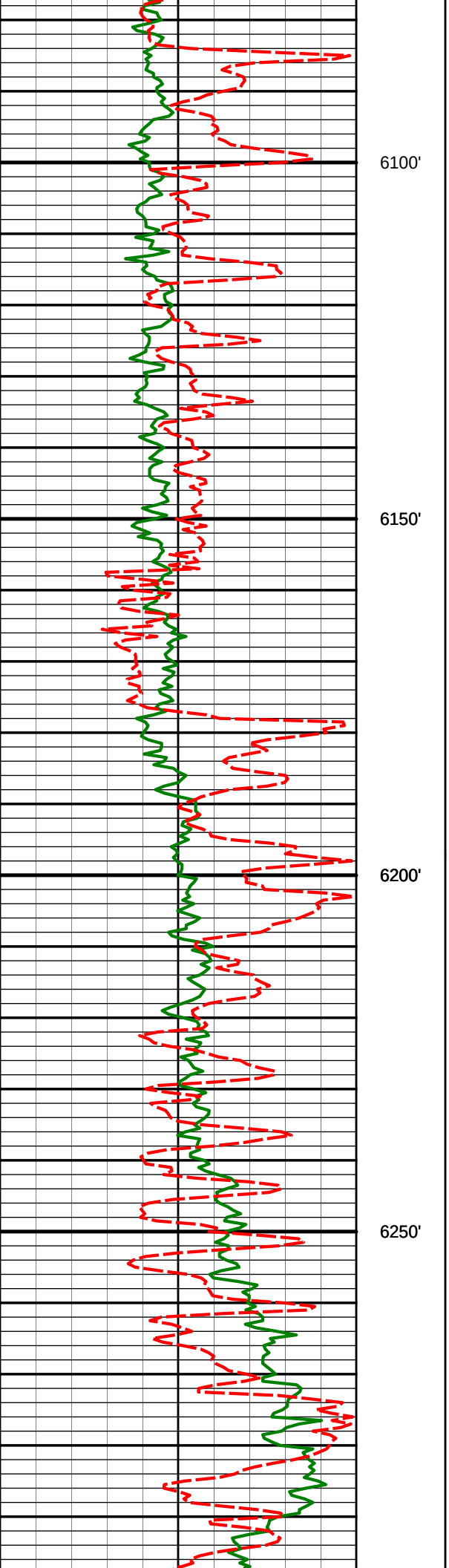




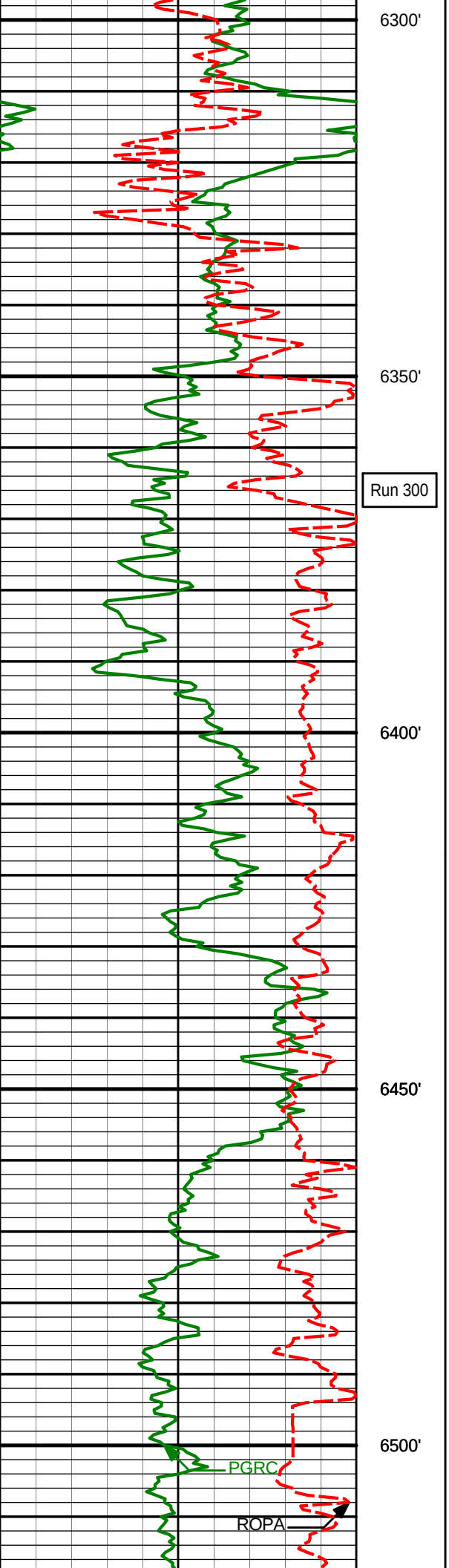

| | | | | |
|---|---|---|---|---|
| 5646' | 0.91° | 70.23° | 5548.29' | 440.27' |
| 5741' | 6.99° | 90.24° | 5643.02' | 446.71' |
| 5836' | 15.23° | 93.67° | 5736.16' | 464.97' |



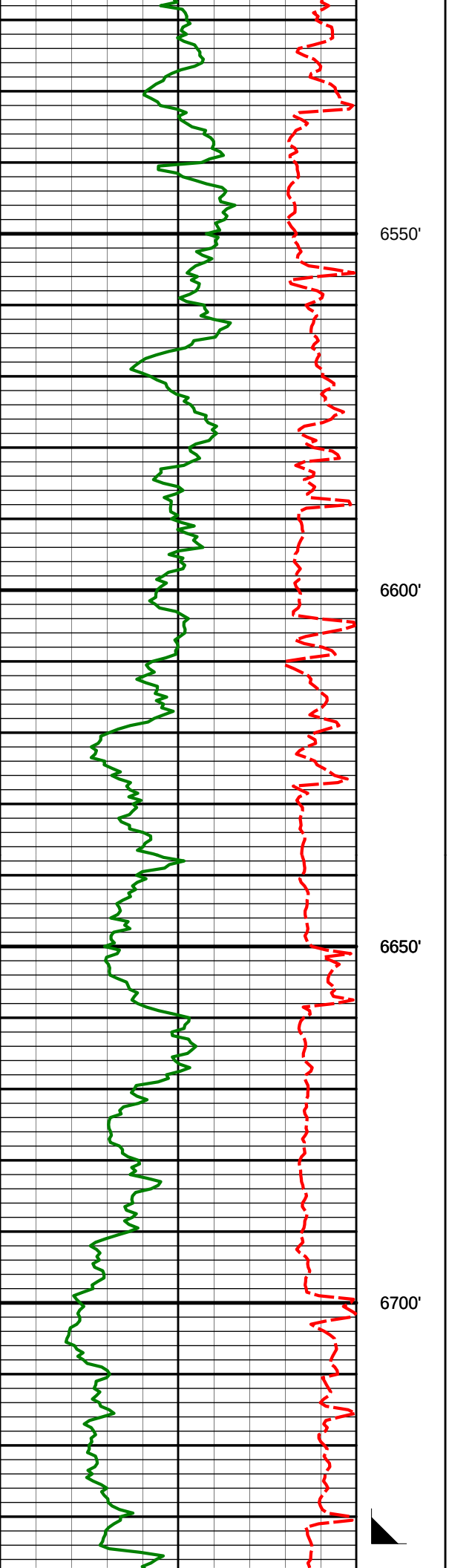

| | | | | |
|---|---|---|---|---|
| 5931' | 21.28° | 85.39° | 5826.35' | 494.43' |
| 6026' | 26.71° | 80.21° | 5913.12' | 531.98' |



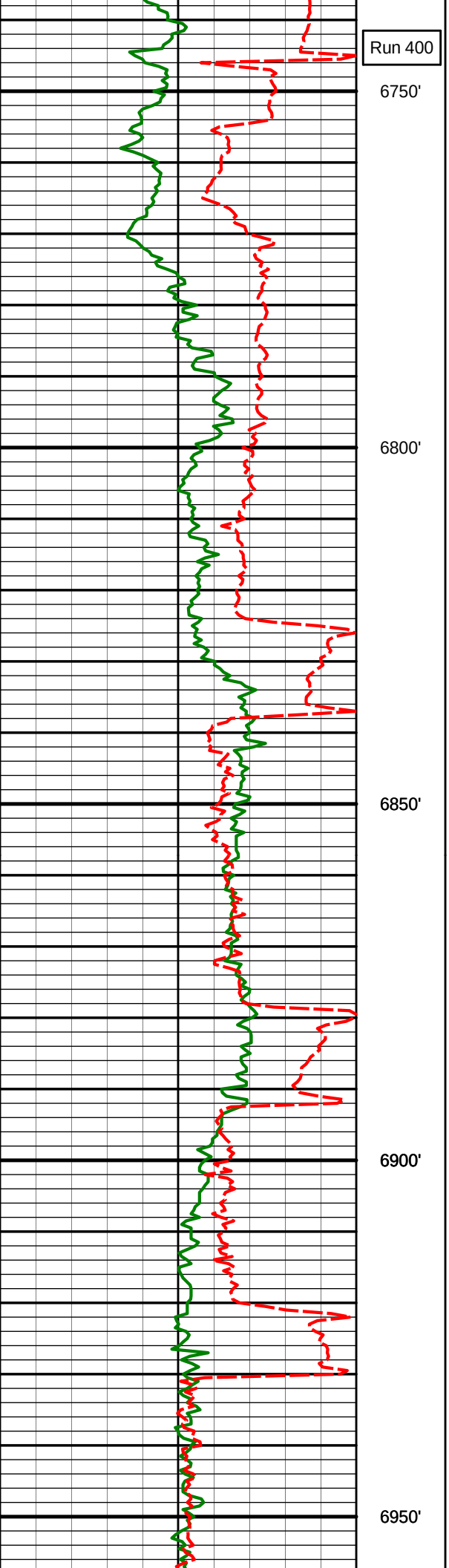

| | | | | |
|---|---|---|---|---|
| 6121' | 31.03° | 82.06° | 5996.29' | 576.35' |
| 6216' | 37.63° | 84.98° | 6074.71' | 628.68' |



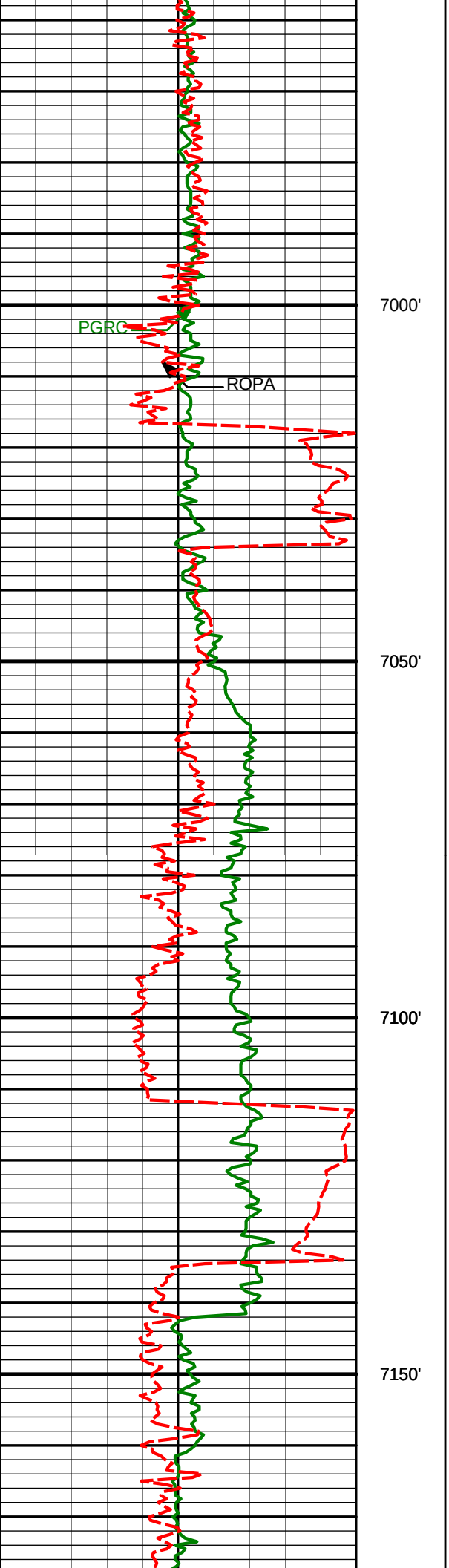

| | | | | |
|---|---|---|---|---|
| 6311' | 45.69° | 82.56° | 6145.63' | 690.36' |
| 6406' | 56.32° | 85.24° | 6205.72' | 762.11' |
| 6453' | 63.43° | 86.20° | 6229.29' | 802.11' |
| 6502' | 68.35° | 87.61° | 6249.31' | 846.28' |



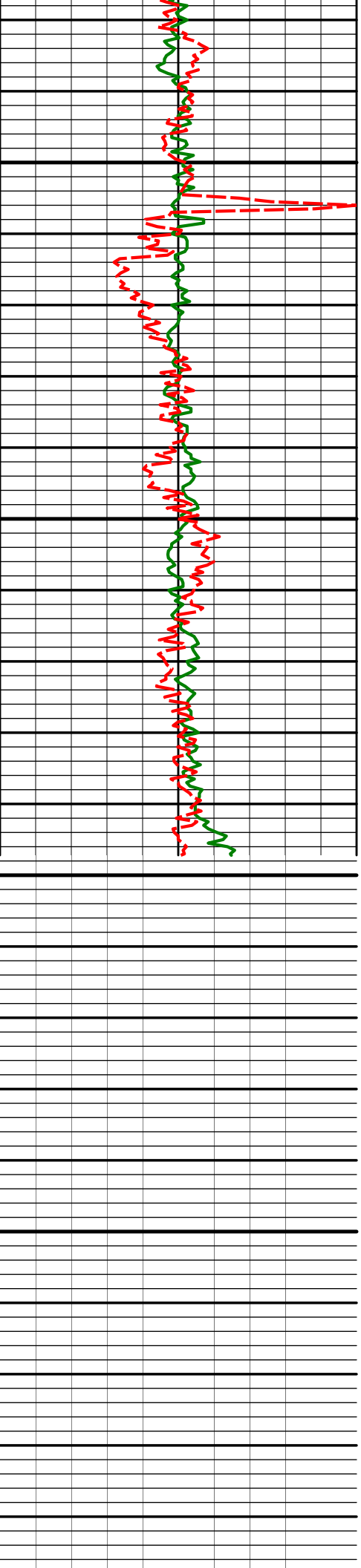

| | | | | | |
|---|---|---|---|---|---|
| 6550' | 72.09° | 89.19° | 6265.55' | 891.06' |
| 6597' | 76.90° | 89.10° | 6278.11' | 936.03' |
| 6645' | 80.01° | 89.80° | 6287.72' | 982.76' |
| 6690' | 81.30° | 90.23° | 6295.03' | 1026.94' |



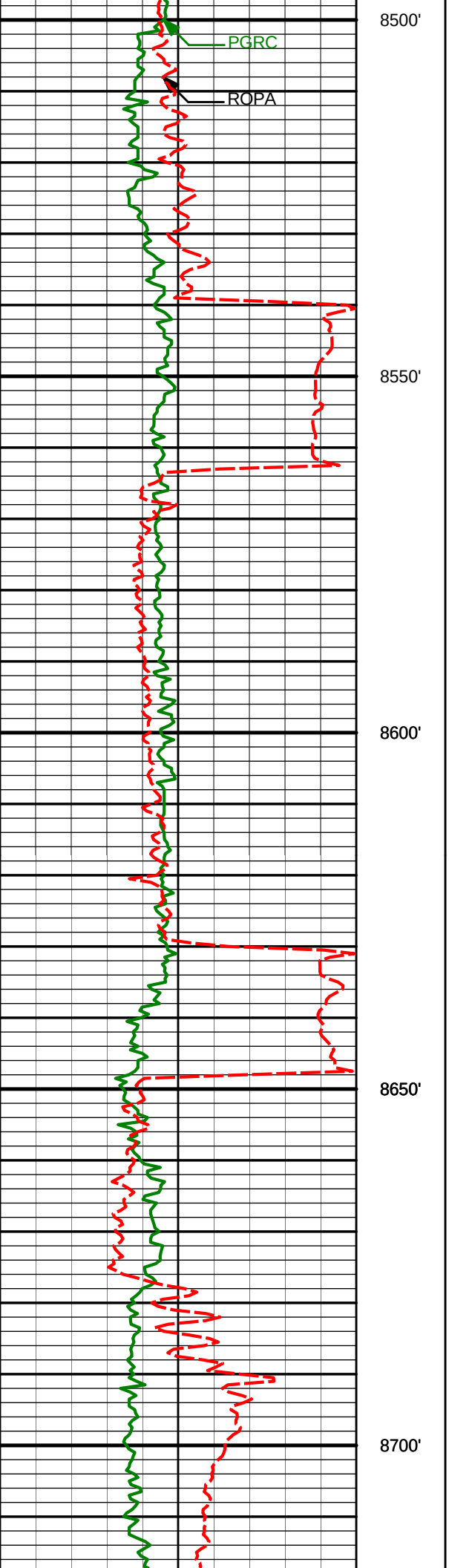

| | | | | |
|---|---|---|---|---|
| 6758' | 83.70° | 91.22° | 6303.90' | 1094.08' |
| 6853' | 85.96° | 91.54° | 6312.46' | 1188.41' |
| 6948' | 88.58° | 90.75° | 6316.99' | 1282.98' |



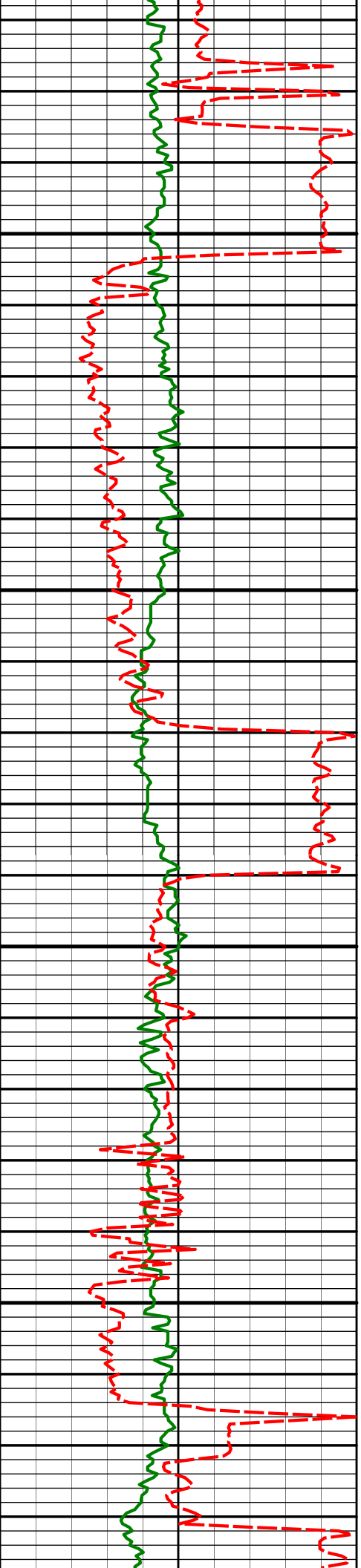

| | | | | |
|---|---|---|---|---|
| 7043' | 91.08° | 87.79° | 6317.27' | 1377.34' |
| 7137' | 91.20° | 89.72° | 6315.40' | 1470.61' |



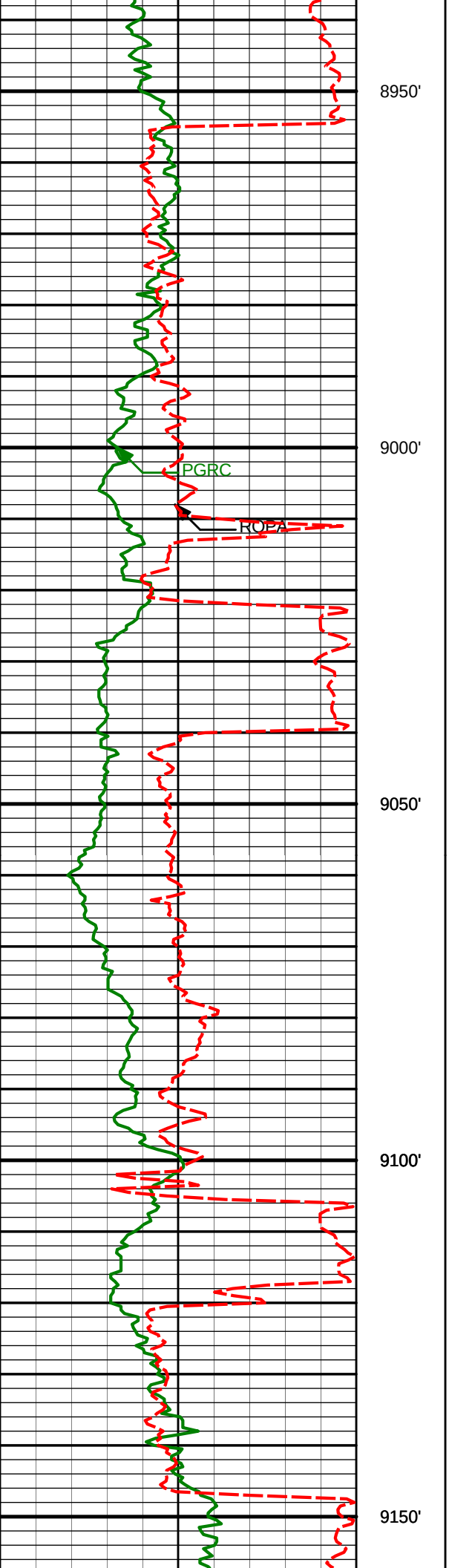

| | | | | |
|---|---|---|---|---|
| 7232' | 92.13° | 88.95° | 6312.64' | 1564.96' |



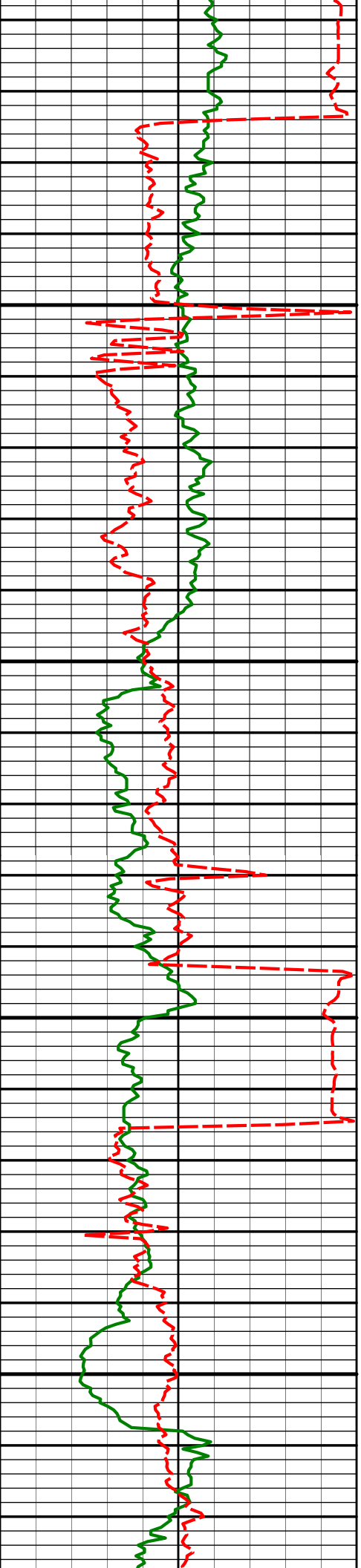

| | | | | |
|---|---|---|---|---|
| 8562' | 89.78° | 90.17° | 6299.66' | 2886.35' |
| 8657' | 89.51° | 90.13° | 6300.24' | 2980.88' |



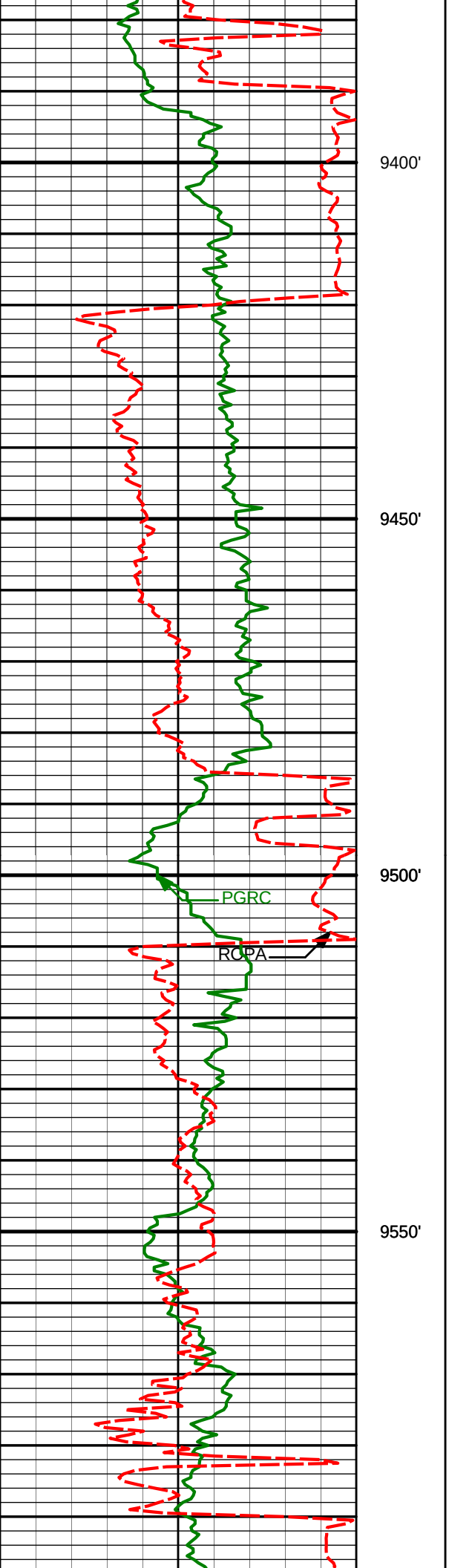

| | | | | |
|---|---|---|---|---|
| 8752' | 89.72° | 89.69° | 6300.88' | 3075.38' |
| 8847' | 87.38° | 86.21° | 6303.28' | 3169.44' |



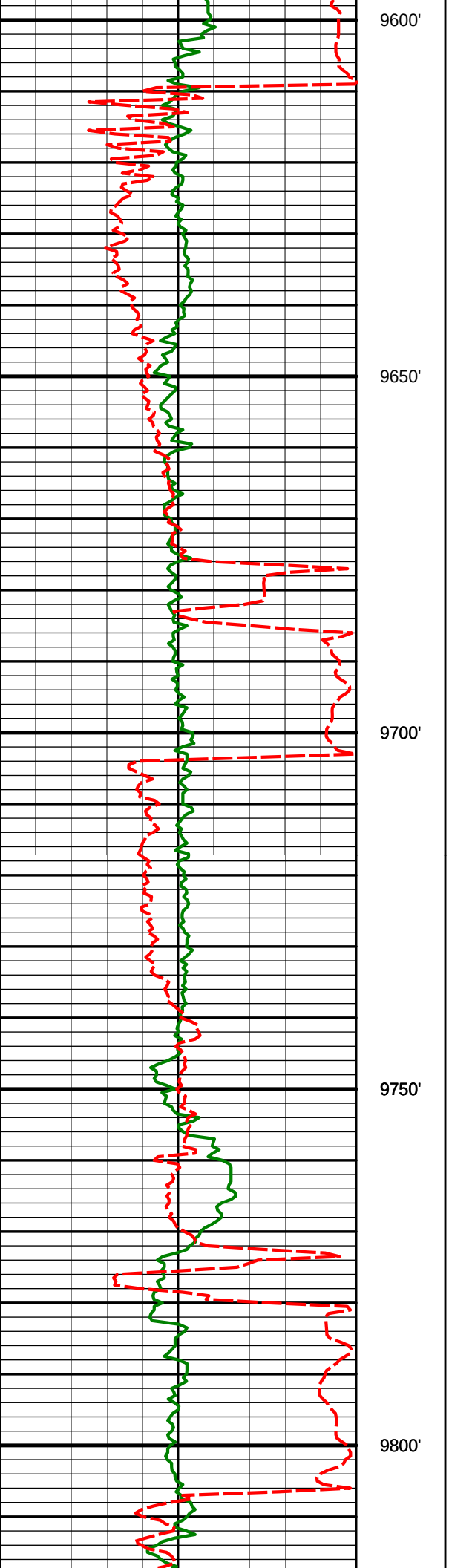

| | | | | |
|---|---|---|---|---|
| 8942' | 89.85° | 88.08° | 6305.58' | 3263.31' |
| 9037' | 90.34° | 88.82° | 6305.43' | 3357.53' |
| 9131' | 91.02° | 88.47° | 6304.31' | 3450.79' |



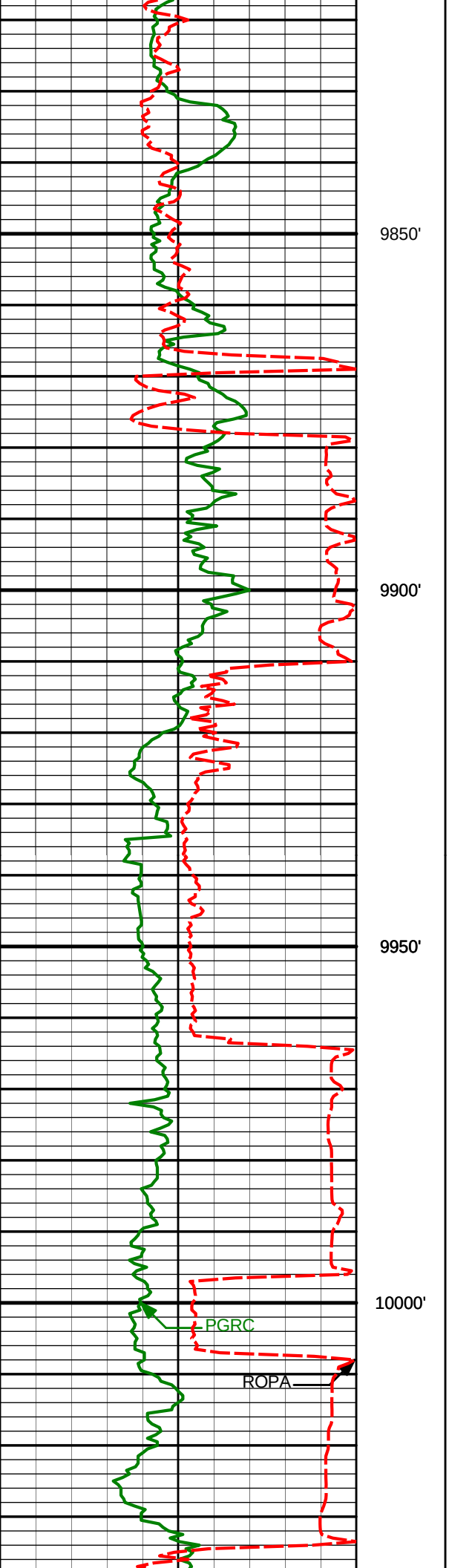

| | | | | |
|---|---|---|---|---|
| 9227' | 90.28° | 89.24° | 6303.23' | 3546.07' |
| 9322' | 90.31° | 88.28° | 6302.74' | 3640.35' |



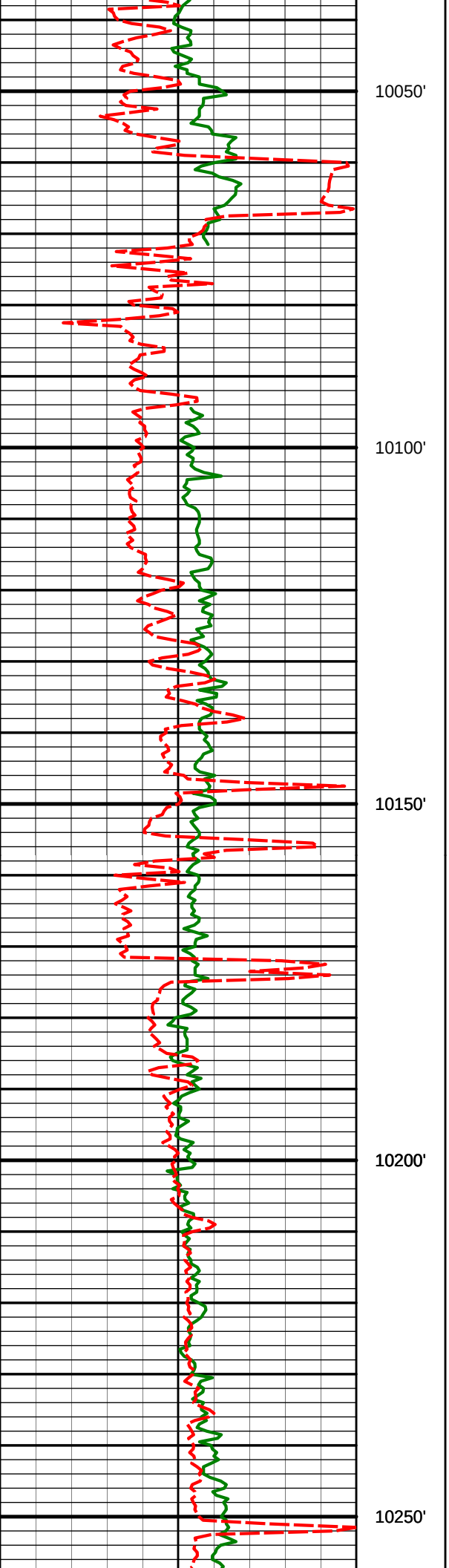

| | | | | |
|---|---|---|---|---|
| 9417' | 88.98° | 88.07° | 6303.33' | 3734.50' |
| 9512' | 88.95° | 85.91° | 6305.04' | 3828.36' |



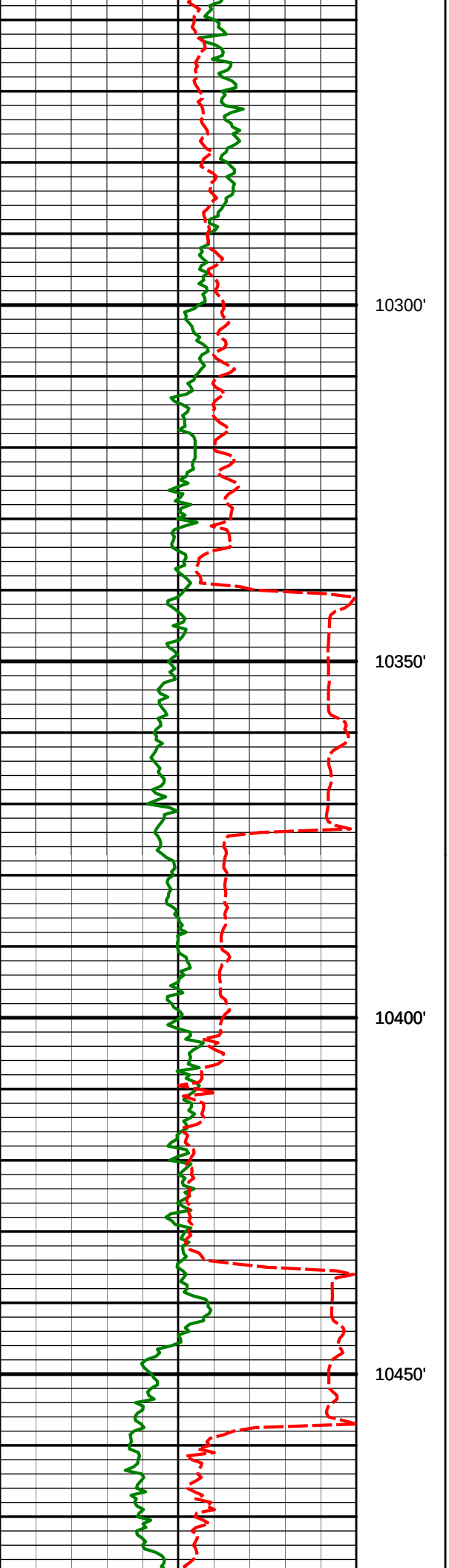

| | | | | |
|---|---|---|---|---|
| 9607' | 89.17° | 86.37° | 6306.60' | 3922.00' |
| 9702' | 90.15° | 87.77° | 6307.16' | 4015.89' |
| 9797' | 91.23° | 88.75° | 6306.01' | 4110.06' |



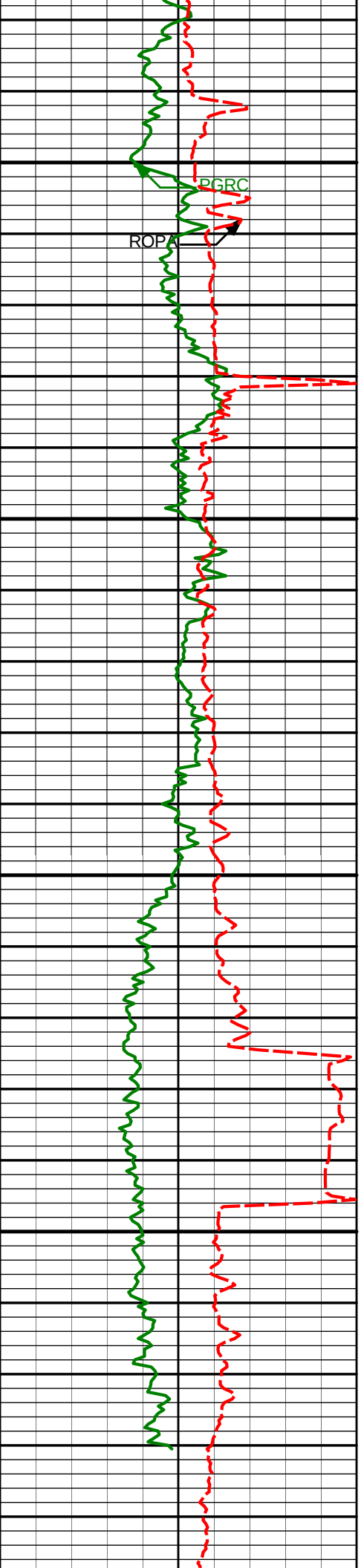

| | | | | |
|---|---|---|---|---|
| 9892' | 93.02° | 89.96° | 6302.48' | 4204.38' |
| 9987' | 91.29° | 90.82° | 6298.91' | 4298.89' |



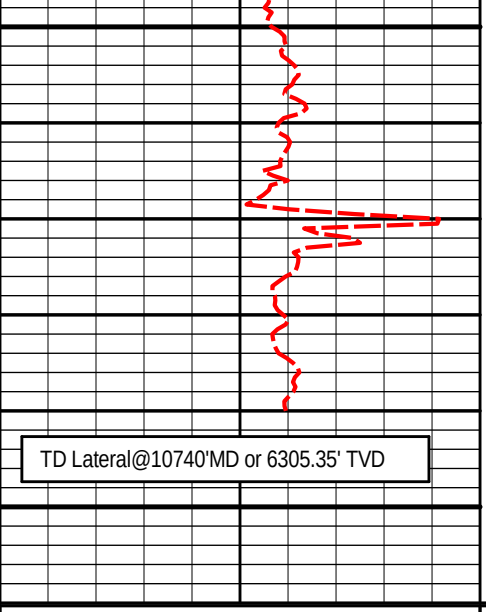

| | | | | |
|---|---|---|---|---|
| 10082' | 87.16° | 90.90° | 6300.19' | 4393.50' |
| 10177' | 89.32° | 92.22° | 6303.11' | 4488.19' |




| | | | | |
|---|---|---|---|---|
| 10272' | 91.11° | 91.61° | 6302.75' | 4582.97' |
| 10367' | 90.03° | 89.02° | 6301.80' | 4677.51' |
| 10461' | 89.17° | 89.31° | 6302.46' | 4770.88' |




| | | | | |
|---|---|---|---|---|
| 10556' | 90.43° | 88.09° | 6302.79' | 4865.15' |
| 10651' | 89.04° | 87.30° | 6303.23' | 4959.19' |
| 10672' | 88.58° | 86.80° | 6303.66' | 4979.94' |




| | | | | | |
|---|---|---|---|---|---|
| | | 10740' | 88.58° | 86.80° | 6305.35' 5047.08' |
| Avg Rate of Penetration feet per hr 600 0 | Feet | Depth | Inc | Azm | TVD Vsec |
| Gamma Ray (PGRC) (Api) 0 300 | | | | | |

INSITE

HALLIBURTON

# DIRECTIONAL SURVEY REPORT

**Noble Energy**
**Keota PC LB26-62HN**
**Wattenberg**
**Weld Colorado**
**USA**
**CA-XX-0900145817**

| *Measured Depth (feet)* | *Inclination (degrees)* | *Direction (degrees)* | *Vertical Depth (feet)* | *Latitude (feet)* | *Departure (feet)* | *Vertical Section (feet)* | *Dogleg (deg/100ft)* |
|---|---|---|---|---|---|---|---|
| 728.00 | 0.00 | 0.00 | 728.00 | 0.00 N | 0.00 E | 0.00 | TIE-IN |
| 826.00 | 0.28 | 130.35 | 826.00 | 0.15 S | 0.18 E | 0.20 | 0.28 |
| 1105.00 | 0.26 | 289.59 | 1105.00 | 0.38 S | 0.09 E | 0.13 | 0.19 |
| 1384.00 | 0.28 | 319.03 | 1384.00 | 0.34 N | 0.95 W | -0.98 | 0.05 |
| 1477.00 | 0.43 | 319.04 | 1476.99 | 0.78 N | 1.33 W | -1.40 | 0.16 |
| 1572.00 | 2.29 | 174.44 | 1571.97 | 0.85 S | 1.38 W | -1.29 | 2.79 |
| 1667.00 | 5.16 | 169.42 | 1666.76 | 6.94 S | 0.41 W | 0.29 | 3.03 |
| 1762.00 | 4.33 | 189.77 | 1761.44 | 14.67 S | 0.24 W | 1.25 | 1.96 |
| 1856.00 | 5.72 | 169.06 | 1855.09 | 22.76 S | 0.05 E | 2.35 | 2.41 |
| 1951.00 | 7.56 | 156.52 | 1949.45 | 33.14 S | 3.44 E | 6.77 | 2.45 |
| 2047.00 | 10.51 | 152.66 | 2044.25 | 46.71 S | 9.97 E | 14.65 | 3.14 |
| 2141.00 | 10.97 | 142.63 | 2136.61 | 61.44 S | 19.34 E | 25.46 | 2.05 |
| 2237.00 | 12.35 | 138.66 | 2230.63 | 76.41 S | 31.67 E | 39.24 | 1.66 |
| 2331.00 | 15.01 | 128.90 | 2321.97 | 91.60 S | 47.79 E | 56.81 | 3.74 |
| 2426.00 | 13.62 | 127.07 | 2414.01 | 106.07 S | 66.29 E | 76.69 | 1.54 |
| 2521.00 | 15.15 | 124.36 | 2506.03 | 119.82 S | 85.47 E | 97.16 | 1.76 |
| 2616.00 | 16.62 | 116.80 | 2597.41 | 132.96 S | 107.84 E | 120.75 | 2.66 |
| 2711.00 | 15.35 | 116.11 | 2688.74 | 144.62 S | 131.26 E | 145.22 | 1.35 |
| 2806.00 | 17.29 | 119.44 | 2779.91 | 157.09 S | 154.85 E | 169.95 | 2.27 |
| 2901.00 | 17.25 | 119.69 | 2870.62 | 171.01 S | 179.38 E | 195.77 | 0.09 |
| 2996.00 | 17.83 | 128.45 | 2961.22 | 187.03 S | 203.02 E | 220.91 | 2.84 |
| 3091.00 | 18.90 | 136.60 | 3051.40 | 207.26 S | 224.98 E | 244.81 | 2.93 |
| 3186.00 | 17.39 | 146.84 | 3141.69 | 230.33 S | 243.33 E | 265.39 | 3.71 |
| 3280.00 | 15.22 | 146.69 | 3231.91 | 252.41 S | 257.79 E | 282.02 | 2.31 |
| 3375.00 | 14.95 | 156.41 | 3323.65 | 274.06 S | 269.54 E | 295.90 | 2.68 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3470.00 | 12.02 | 153.57 | 3416.02 | 294.15 S | 278.85 E | 307.19 | 3.17 |
| 3565.00 | 14.44 | 160.79 | 3508.50 | 314.20 S | 287.15 E | 317.48 | 3.08 |
| 3754.00 | 18.95 | 160.48 | 3689.49 | 365.39 S | 305.16 E | 340.58 | 2.39 |
| 3849.00 | 19.09 | 158.54 | 3779.30 | 394.39 S | 316.00 E | 354.30 | 0.68 |
| 3944.00 | 19.05 | 157.26 | 3869.09 | 423.15 S | 327.67 E | 368.83 | 0.44 |
| 4039.00 | 18.36 | 166.31 | 3959.09 | 451.99 S | 337.21 E | 381.23 | 3.14 |
| 4134.00 | 16.18 | 167.06 | 4049.80 | 479.43 S | 343.72 E | 390.48 | 2.31 |
| 4229.00 | 14.75 | 164.92 | 4141.36 | 504.01 S | 349.83 E | 399.05 | 1.62 |
| 4324.00 | 13.01 | 163.24 | 4233.58 | 525.92 S | 356.06 E | 407.47 | 1.88 |
| 4419.00 | 11.10 | 160.59 | 4326.48 | 544.79 S | 362.18 E | 415.47 | 2.09 |
| 4514.00 | 9.66 | 164.02 | 4419.93 | 561.08 S | 367.42 E | 422.33 | 1.65 |
| 4609.00 | 9.37 | 165.54 | 4513.62 | 576.24 S | 371.54 E | 427.97 | 0.40 |
| 4704.00 | 7.99 | 163.70 | 4607.53 | 590.06 S | 375.33 E | 433.13 | 1.49 |
| 4799.00 | 6.25 | 176.66 | 4701.80 | 601.57 S | 377.48 E | 436.44 | 2.48 |
| 4894.00 | 3.96 | 166.28 | 4796.42 | 609.92 S | 378.56 E | 438.36 | 2.59 |
| 4989.00 | 0.89 | 193.00 | 4891.32 | 613.84 S | 379.18 E | 439.37 | 3.36 |
| 5084.00 | 0.39 | 242.69 | 4986.32 | 614.71 S | 378.72 E | 439.00 | 0.74 |
| 5179.00 | 0.53 | 269.49 | 5081.31 | 614.86 S | 377.99 E | 438.29 | 0.27 |
| 5369.00 | 0.24 | 1.44 | 5271.31 | 614.47 S | 377.12 E | 437.38 | 0.31 |
| 5559.00 | 0.95 | 94.58 | 5461.30 | 614.20 S | 378.70 E | 438.93 | 0.52 |
| 5646.00 | 0.91 | 70.23 | 5548.29 | 614.02 S | 380.06 E | 440.27 | 0.45 |
| 5741.00 | 6.99 | 90.24 | 5643.02 | 613.79 S | 386.56 E | 446.71 | 6.47 |
| 5836.00 | 15.23 | 93.67 | 5736.16 | 614.61 S | 404.83 E | 464.97 | 8.70 |
| 5931.00 | 21.28 | 85.39 | 5826.35 | 614.03 S | 434.50 E | 494.43 | 6.91 |
| 6026.00 | 26.71 | 80.21 | 5913.12 | 609.00 S | 472.76 E | 531.98 | 6.13 |
| 6121.00 | 31.03 | 82.06 | 5996.29 | 601.99 S | 518.07 E | 576.35 | 4.65 |
| 6216.00 | 37.63 | 84.98 | 6074.71 | 596.06 S | 571.28 E | 628.68 | 7.16 |
| 6311.00 | 45.69 | 82.56 | 6145.63 | 589.11 S | 633.98 E | 690.36 | 8.64 |
| 6358.00 | 50.33 | 83.30 | 6177.06 | 584.82 S | 668.63 E | 724.40 | 9.95 |
| 6406.00 | 56.32 | 85.24 | 6205.72 | 581.01 S | 706.92 E | 762.11 | 12.90 |
| 6453.00 | 63.43 | 86.20 | 6229.29 | 577.98 S | 747.44 E | 802.11 | 15.22 |
| 6502.00 | 68.35 | 87.61 | 6249.31 | 575.58 S | 792.08 E | 846.28 | 10.37 |
| 6550.00 | 72.09 | 89.19 | 6265.55 | 574.32 S | 837.22 E | 891.06 | 8.39 |
| 6597.00 | 76.90 | 89.10 | 6278.11 | 573.65 S | 882.49 E | 936.03 | 10.23 |
| 6645.00 | 80.01 | 89.80 | 6287.72 | 573.20 S | 929.51 E | 982.76 | 6.64 |
| 6690.00 | 81.30 | 90.23 | 6295.03 | 573.21 S | 973.91 E | 1026.94 | 3.03 |
| 6758.00 | 83.70 | 91.22 | 6303.90 | 574.07 S | 1041.32 E | 1094.08 | 3.81 |
| 6853.00 | 85.96 | 91.54 | 6312.46 | 576.35 S | 1135.90 E | 1188.41 | 2.41 |
| 6948.00 | 88.58 | 90.75 | 6316.99 | 578.24 S | 1230.76 E | 1282.98 | 2.88 |
| 7043.00 | 91.08 | 87.79 | 6317.27 | 577.03 S | 1325.74 E | 1377.34 | 4.08 |
| 7137.00 | 91.20 | 89.72 | 6315.40 | 574.99 S | 1419.69 E | 1470.61 | 2.06 |
| 7232.00 | 92.13 | 88.95 | 6312.64 | 573.88 S | 1514.64 E | 1564.96 | 1.27 |
| 7327.00 | 93.76 | 88.22 | 6307.76 | 571.54 S | 1609.49 E | 1659.08 | 1.88 |
| 7422.00 | 93.98 | 88.72 | 6301.35 | 569.01 S | 1704.24 E | 1753.08 | 0.57 |
| 7517.00 | 93.36 | 89.98 | 6295.27 | 567.93 S | 1799.03 E | 1847.28 | 1.48 |
| 7612.00 | 89.04 | 91.51 | 6293.27 | 569.17 S | 1893.98 E | 1941.86 | 4.82 |
| 7707.00 | 89.88 | 91.53 | 6294.17 | 571.68 S | 1988.94 E | 2036.59 | 0.88 |
| 7802.00 | 89.63 | 90.69 | 6294.58 | 573.53 S | 2083.92 E | 2131.27 | 0.92 |
| 7897.00 | 89.42 | 90.62 | 6295.37 | 574.61 S | 2178.91 E | 2225.88 | 0.24 |
| 7992.00 | 88.43 | 89.43 | 6297.15 | 574.65 S | 2273.89 E | 2320.38 | 1.62 |
| 8087.00 | 89.63 | 89.02 | 6298.76 | 573.37 S | 2368.87 E | 2414.74 | 1.33 |
| 8182.00 | 90.46 | 88.20 | 6298.69 | 571.07 S | 2463.84 E | 2508.99 | 1.23 |
| 8277.00 | 89.63 | 88.13 | 6298.61 | 568.03 S | 2558.79 E | 2603.14 | 0.88 |
| 8372.00 | 88.74 | 88.84 | 6299.96 | 565.52 S | 2653.74 E | 2697.36 | 1.20 |
| 8467.00 | 90.93 | 90.39 | 6300.25 | 564.89 S | 2748.73 E | 2791.79 | 2.82 |
| 8562.00 | 89.78 | 90.17 | 6299.66 | 565.35 S | 2843.73 E | 2886.35 | 1.23 |
| 8657.00 | 89.51 | 90.13 | 6300.24 | 565.59 S | 2938.72 E | 2980.88 | 0.29 |
| 8752.00 | 89.72 | 89.69 | 6300.88 | 565.44 S | 3033.72 E | 3075.38 | 0.51 |
| 8847.00 | 87.38 | 86.21 | 6303.28 | 562.05 S | 3128.61 E | 3169.44 | 4.42 |
| 8942.00 | 89.85 | 88.08 | 6305.58 | 557.32 S | 3223.45 E | 3263.31 | 3.25 |
| 9037.00 | 90.34 | 88.82 | 6305.43 | 554.75 S | 3318.42 E | 3357.53 | 0.94 |
| 9131.00 | 91.02 | 88.47 | 6304.31 | 552.52 S | 3412.38 E | 3450.79 | 0.82 |
| 9227.00 | 90.28 | 89.24 | 6303.23 | 550.60 S | 3508.36 E | 3546.07 | 1.12 |
| 9322.00 | 90.31 | 88.28 | 6302.74 | 548.54 S | 3603.33 E | 3640.35 | 1.01 |
| 9417.00 | 88.98 | 88.07 | 6303.33 | 545.52 S | 3698.28 E | 3734.50 | 1.41 |
| 9512.00 | 88.95 | 85.91 | 6305.04 | 540.53 S | 3793.13 E | 3828.36 | 2.27 |
| 9607.00 | 89.17 | 86.37 | 6306.60 | 534.14 S | 3887.90 E | 3922.00 | 0.54 |
| 9702.00 | 90.15 | 87.77 | 6307.16 | 529.29 S | 3982.77 E | 4015.89 | 1.80 |
| 9797.00 | 91.23 | 88.75 | 6306.01 | 526.40 S | 4077.72 E | 4110.06 | 1.53 |
| 9892.00 | 93.02 | 89.96 | 6302.48 | 525.33 S | 4172.64 E | 4204.38 | 2.28 |
| 9987.00 | 91.29 | 90.82 | 6298.91 | 525.97 S | 4267.57 E | 4298.89 | 2.03 |
| 10082.00 | 87.16 | 90.90 | 6300.19 | 527.39 S | 4362.53 E | 4393.50 | 4.35 |
| 10177.00 | 89.32 | 92.22 | 6303.11 | 529.98 S | 4457.44 E | 4488.19 | 2.67 |
| 10272.00 | 91.11 | 91.61 | 6302.75 | 533.16 S | 4552.38 E | 4582.97 | 1.99 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10367.00 | 90.03 | 89.02 | 6301.80 | 533.68 S | 4647.36 E | 4677.51 | 2.95 |
| 10461.00 | 89.17 | 89.31 | 6302.46 | 532.31 S | 4741.35 E | 4770.88 | 0.97 |
| 10556.00 | 90.43 | 88.09 | 6302.79 | 530.15 S | 4836.32 E | 4865.15 | 1.84 |
| 10651.00 | 89.04 | 87.30 | 6303.23 | 526.34 S | 4931.24 E | 4959.19 | 1.68 |
| 10672.00 | 88.58 | 86.80 | 6303.66 | 525.26 S | 4952.21 E | 4979.94 | 3.25 |
| 10740.00 | 88.58 | 86.80 | 6305.35 | 521.46 S | 5020.08 E | 5047.08 | 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 95.81 DEGREES (GRID)**
**A TOTAL CORRECTION OF 7.42 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.**
**HORIZONTAL DISPLACEMENT(CLOSURE) AT 10740.00 FEET**
**IS 5047.09 FEET ALONG 95.93 DEGREES (GRID)**

**Casing set @ 6734 ft.**

**Date Printed:22 February 2013**