

PCGK - Pressure Case Gamma

1 : 240

[illegible]

WELL INFORMATION

| | | | | | |
|---|------------------|------------------|--|--|--|
| MWD Run Number | 100 | 200 | | | |
| Date run completed | 10-Nov-13 | 11-Nov-13 | | | |
| Rig Bit Number | 100 | 0200 | | | |
| Bit Size (in) | 8.750 | 8.750 | | | |
| Tool Nominal OD (in) | 6.750 | 6.750 | | | |
| Log Start Depth (TVD, ft) | 970.96 | 5,610.27 | | | |
| Log End Depth (TVD, ft) | 5,610.27 | 6,672.73 | | | |
| Drill or Wipe | Drill | Drill | | | |
| Drill/Wipe Start Date and Time | 09-Nov-13 09:31 | 10-Nov-13 16:00 | | | |
| Drill/Wipe End Date and Time | 10-Nov-13 08:00 | 11-Nov-13 13:00 | | | |
| Min Inc (deg) @ Depth (TVD, ft) | 0.20 @ 502.97 | 8.46 @ 5,638.99 | | | |
| Max Inc (deg) @ Depth (TVD, ft) | 15.74 @ 3,873.62 | 83.25 @ 6,666.88 | | | |
| Bit TFA(in2) / Bit Type | 0.75 / PDC | 0.90 / PDC | | | |
| Flow Rate (gpm) | 575.00 | 539.82 | | | |
| Max AV (fpm) / CV (fpm) @ MWD | 481.9 / 481.9 | 481.9 / 481.9 | | | |
| Fluid Type | Fresh Water Gel | Fresh Water Gel | | | |
| Density (ppg) / Viscosity (spqt) | 8.85 / 28.00 | 8.90 / 8.90 | | | |
| Filtrate CL (ppm) | 2,200.00 | 2,400.00 | | | |
| pH / Fluid Loss (mptm) | 8.30 / N/A | 8.20 / N/A | | | |
| PV (cP) / YP (lbf2) | 2 / 3.00 | 2 / 3.00 | | | |
| % Solids / % Sand | 3.00 / 0.25 | 4.00 / 0.25 | | | |
| % Oil / Oil:Water Ratio | N/A / N/A | N/A / N/A | | | |
| Rm @ Measured Temp (degF) | N/A @ N/A | N/A @ N/A | | | |
| Rmf @ Measured Temp (degF) | N/A @ N/A | N/A @ N/A | | | |
| Rmc @ Measured Temp (degF) | N/A @ N/A | N/A @ N/A | | | |
| Max Tool Temp (in F) / S | 145.00 / PCM | 127.07 / PCM | | | |

| | | | | | |
|-------------------------------|----------------|----------------|--|--|--|
| Max Tool Temp (degF) / Source | 145.90 / PCM | 167.97 / PCM | | | |
| Rm @ Max Tool Temp (degF) | N/A @ N/A | N/A @ N/A | | | |
| Lead MWD Engineer | Osahon Igunbor | Osahon Igunbor | | | |
| Customer Representative | Jeremy Stolz | Jeremy Stolz | | | |

SENSOR INFORMATION

Downhole Processor Information

| | | | | | |
|---------------------------|-----------------|-----------------|--|--|--|
| Tool Type | PCM | PCM | | | |
| Software Version | 5.84 | 5.84 | | | |
| Sub Serial Number | 11331930 | 11331930 | | | |
| Insert Serial Number | 11680106 | 11680106 | | | |
| Date and Time Initialized | 08-Nov-13 12:04 | 01-Jan-70 00:00 | | | |
| Date and Time Read | 11-Nov-13 20:25 | 11-Nov-13 20:19 | | | |
| ECMB SW Version | N/A | N/A | | | |

Directional Sensor Information

| | | | | | |
|------------------------|----------|----------|--|--|--|
| Tool Type | PCDC | PCDC | | | |
| Distance From Bit (ft) | 58.00 | 56.00 | | | |
| Software Version | 6.21 | 6.21 | | | |
| Sub Serial Number | 11331930 | 11331930 | | | |
| Sonde Serial Number | 12174582 | 12174582 | | | |
| Sensor ID Number | N/A | N/A | | | |
| Toolface Offset (deg) | 27.33 | 55.71 | | | |

Gamma Ray Sensor Information

| | | | | | |
|------------------------------|----------|----------|--|--|--|
| Tool Type | PCG | PCG | | | |
| Distance From Bit (ft) | 51.71 | 49.41 | | | |
| Recorded Sample Period (sec) | 10 | 10 | | | |
| Software Version | 8.15 | 8.15 | | | |
| Sub Serial Number | 11331930 | 11331930 | | | |
| Insert/Sonde Serial Number | 12037396 | 12037396 | | | |

REMARKS

1. All depths are true vertical 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"

PGXR (Gamma Ray CG):
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

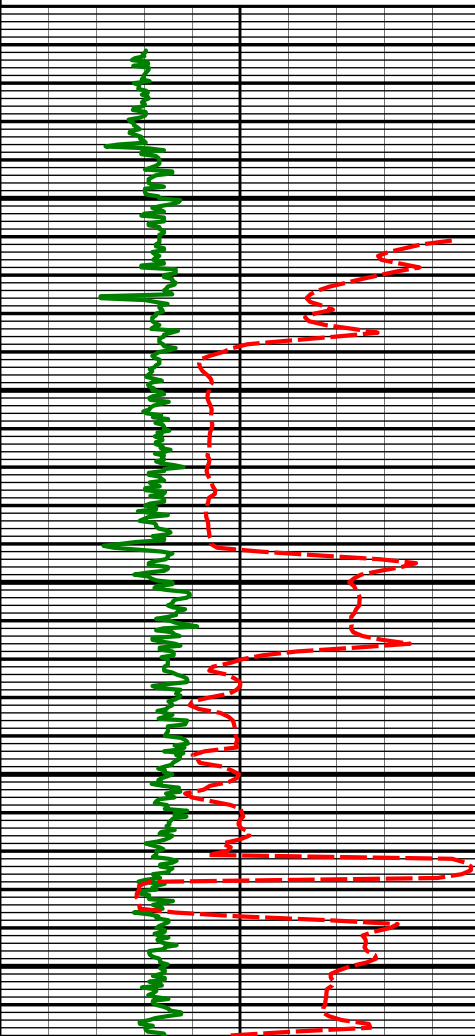
WARRANTY

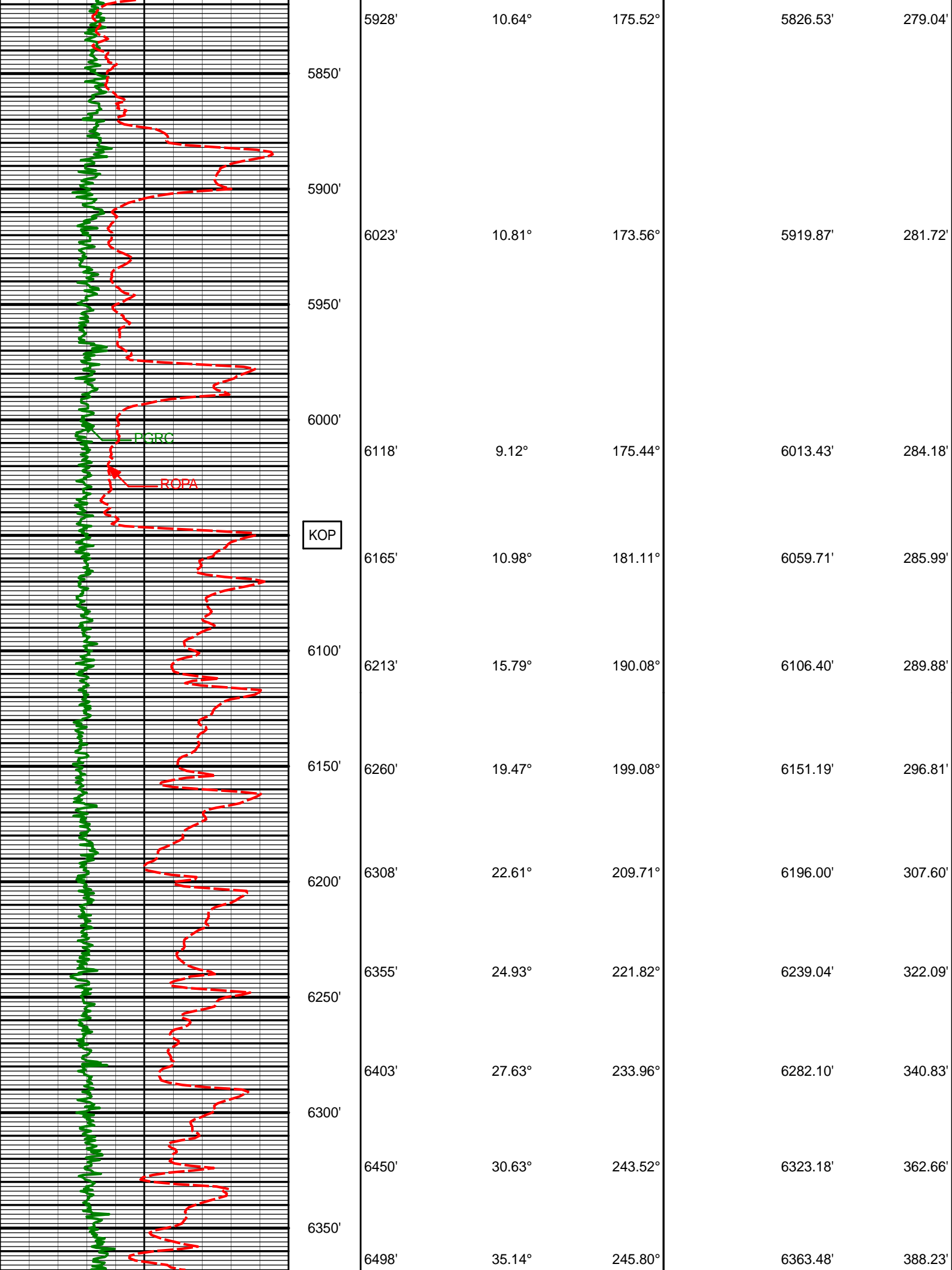
HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS

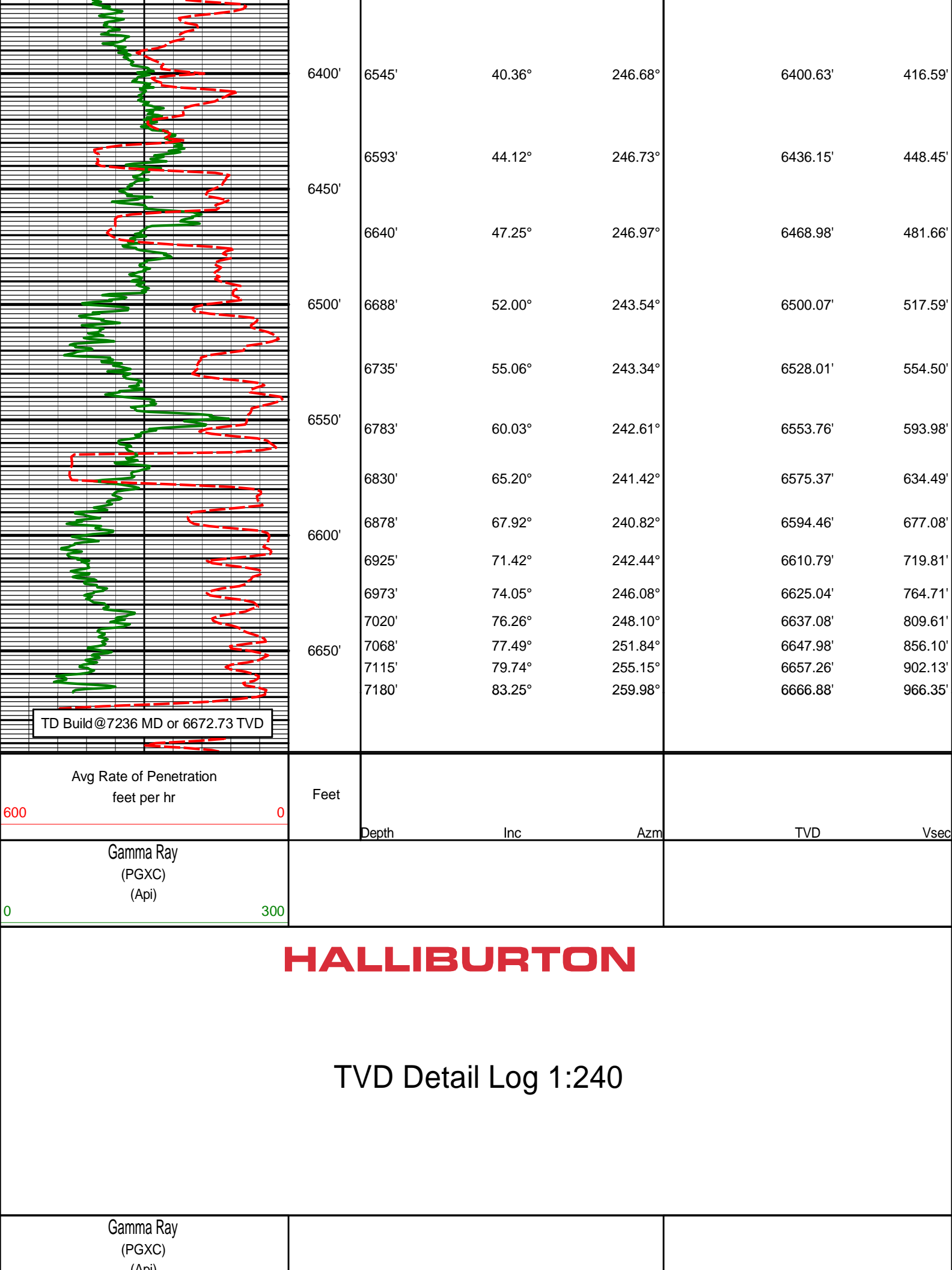
THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, 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.

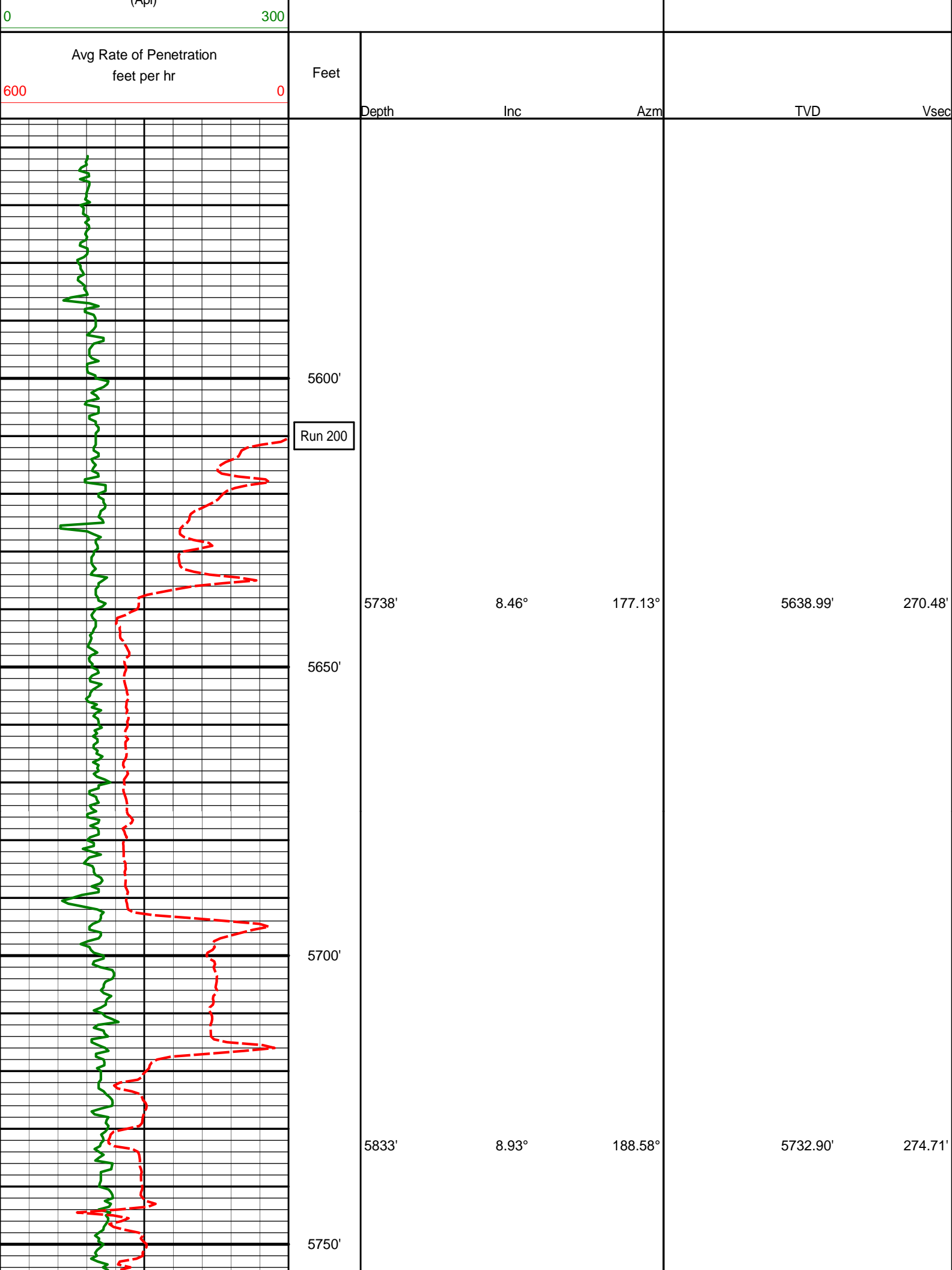
HALLIBURTON

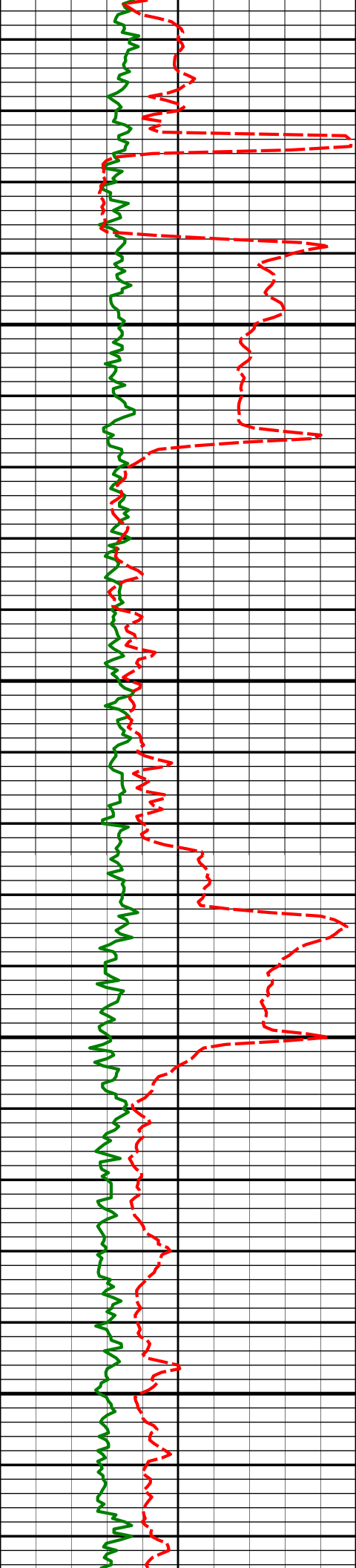
TVD Detail Log 1:600

| | | | | | | |
|---|-------|---------|-------|---------|----------|---------|
| Gamma Ray (PGXC) (Api) | | | | | | |
| 0300 | | | | | | |
| Avg Rate of Penetration feet per hr | Feet | | | | | |
| 6000 | | | | | | |
|  | 5550' | Depth | Inc | Azm | TVD | Vsec |
| | 5651' | | 5.49° | 174.76° | 5552.64' | 268.58' |
| | 5600' | Run 200 | | | | |
| | 5738' | | 8.46° | 177.13° | 5638.99' | 270.48' |
| | 5650' | | | | | |
| | 5700' | | | | | |
| | 5833' | | 8.93° | 188.58° | 5732.90' | 274.71' |
| | 5750' | | | | | |
| | 5800' | | | | | |









5800'

5928'

10.64°

175.52°

5826.53'

279.04'

5850'

5900'

6023'

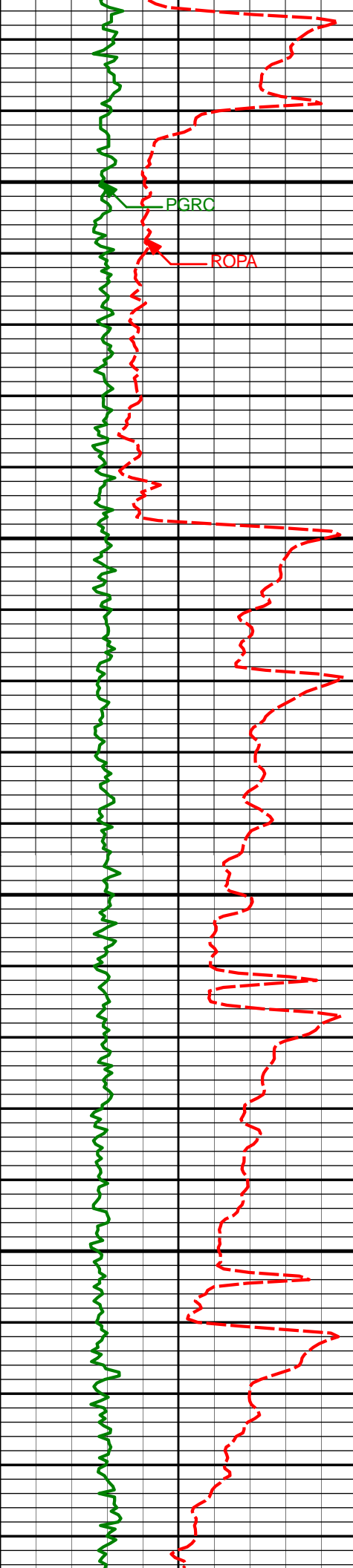
10.81°

173.56°

5919.87'

281.72'

5950'



6000'

PGRC

ROPA

KOP

6118'

9.12°

175.44°

6013.43'

284.18'

6165'

10.98°

181.11°

6059.71'

285.99'

6100'

6213'

15.79°

190.08°

6106.40'

289.88'

6150'

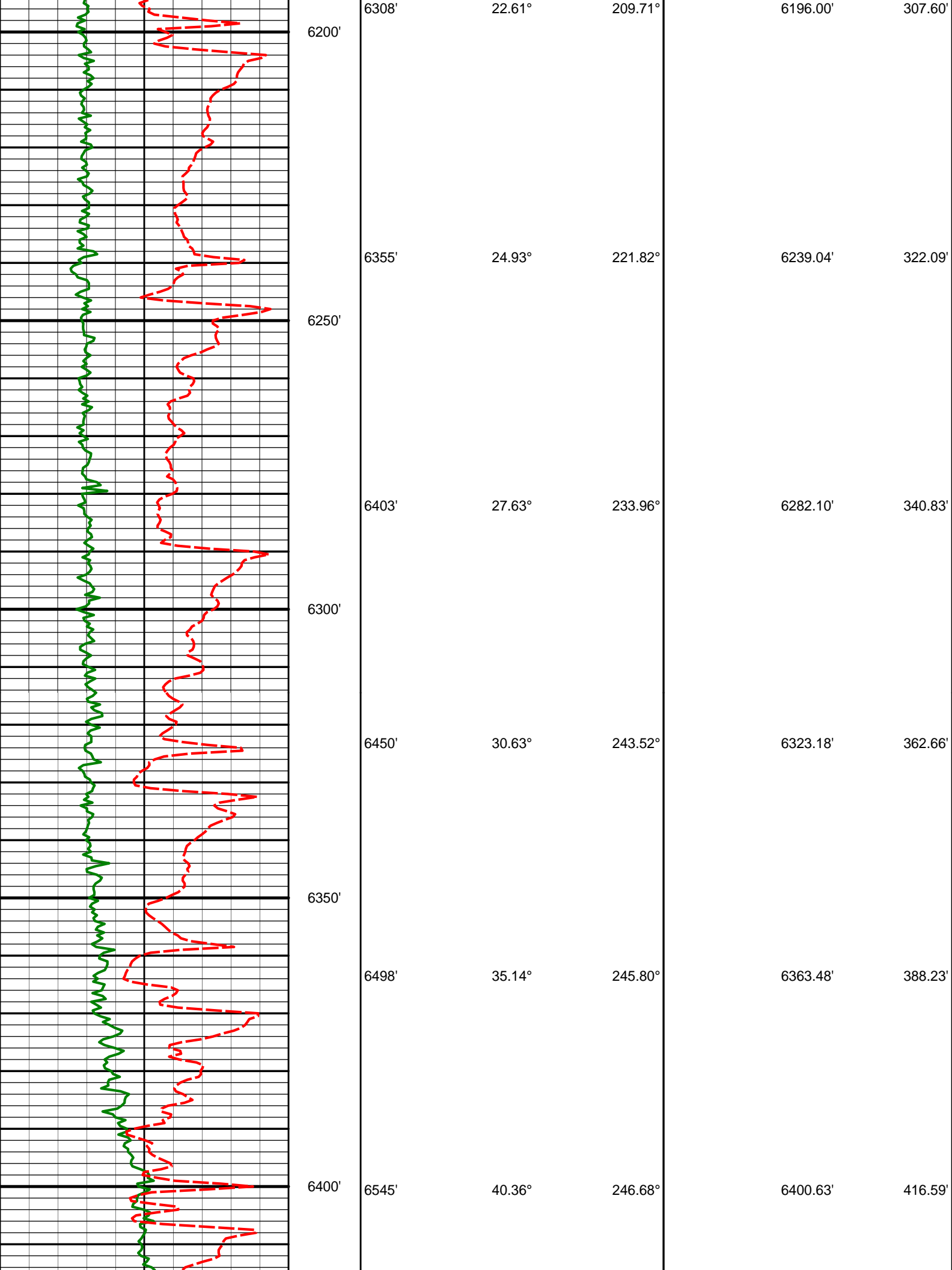
6260'

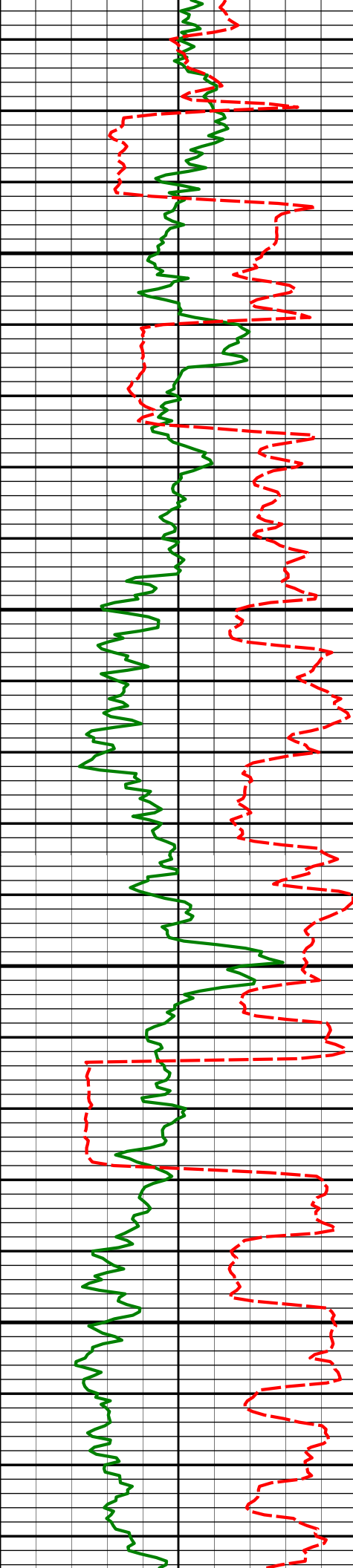
19.47°

199.08°

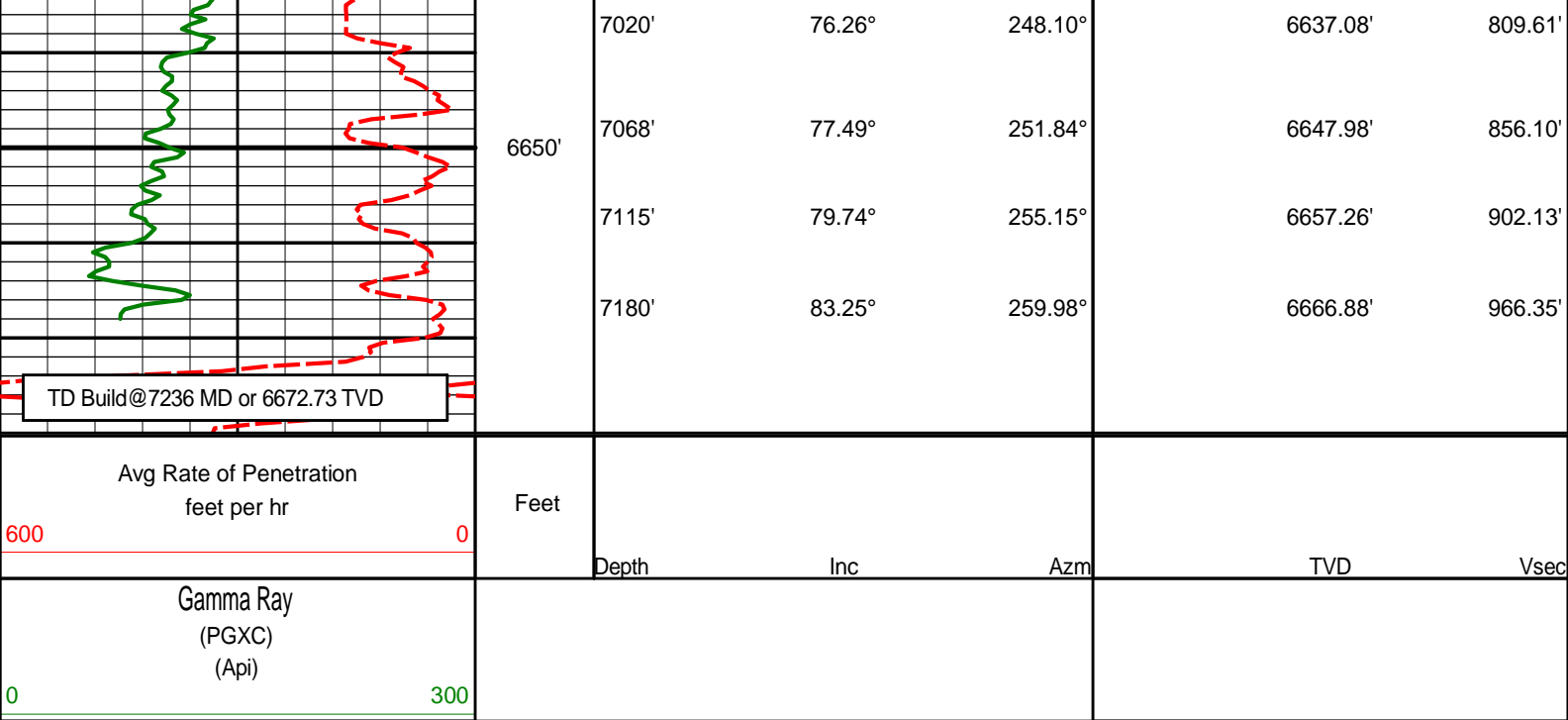
6151.19'

296.81'





| | | | | | |
|-------|-------|--------|---------|----------|---------|
| 6450' | 6593' | 44.12° | 246.73° | 6436.15' | 448.45' |
| | 6640' | 47.25° | 246.97° | 6468.98' | 481.66' |
| 6500' | 6688' | 52.00° | 243.54° | 6500.07' | 517.59' |
| | 6735' | 55.06° | 243.34° | 6528.01' | 554.50' |
| 6550' | 6783' | 60.03° | 242.61° | 6553.76' | 593.98' |
| | 6830' | 65.20° | 241.42° | 6575.37' | 634.49' |
| 6600' | 6878' | 67.92° | 240.82° | 6594.46' | 677.08' |
| | 6925' | 71.42° | 242.44° | 6610.79' | 719.81' |
| | 6973' | 74.05° | 246.08° | 6625.04' | 764.71' |



DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch AA26-62-1HN
Wattenberg
Weld Colorado
USA
CA-XX-0900829266

| 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 |
| 252.00 | 1.10 | 307.10 | 251.98 | 1.46 N | 1.93 W | 1.51 | 0.44 |
| 503.00 | 0.20 | 60.70 | 502.97 | 3.13 N | 3.47 W | 2.60 | 0.48 |
| 745.00 | 0.50 | 88.80 | 744.97 | 3.36 N | 2.04 W | 1.16 | 0.14 |
| 930.00 | 0.20 | 274.50 | 929.96 | 3.40 N | 1.56 W | 0.68 | 0.38 |
| 1011.00 | 0.65 | 358.64 | 1010.96 | 3.87 N | 1.71 W | 0.71 | 0.81 |
| 1105.00 | 2.40 | 205.84 | 1104.94 | 2.63 N | 2.58 W | 1.86 | 3.18 |
| 1197.00 | 4.95 | 194.25 | 1196.74 | 2.95 S | 4.40 W | 4.99 | 2.87 |
| 1291.00 | 8.00 | 191.71 | 1290.13 | 13.30 S | 6.73 W | 9.78 | 3.26 |
| 1384.00 | 10.55 | 186.82 | 1381.91 | 28.09 S | 9.05 W | 15.66 | 2.86 |
| 1477.00 | 13.80 | 187.56 | 1472.81 | 47.54 S | 11.52 W | 22.82 | 3.50 |
| 1572.00 | 15.11 | 182.50 | 1564.80 | 71.14 S | 13.55 W | 30.58 | 1.91 |
| 1667.00 | 14.79 | 182.35 | 1656.59 | 95.62 S | 14.59 W | 37.58 | 0.34 |
| 1761.00 | 13.71 | 180.99 | 1747.69 | 118.74 S | 15.27 W | 43.91 | 1.20 |
| 1856.00 | 14.34 | 182.12 | 1839.86 | 141.76 S | 15.90 W | 50.17 | 0.72 |
| 1951.00 | 14.75 | 184.61 | 1931.82 | 165.57 S | 17.31 W | 57.37 | 0.79 |
| 2046.00 | 13.41 | 184.41 | 2023.96 | 188.61 S | 19.13 W | 64.78 | 1.41 |
| 2141.00 | 12.28 | 177.97 | 2116.59 | 209.68 S | 19.62 W | 70.42 | 1.92 |
| 2236.00 | 13.96 | 183.41 | 2209.11 | 231.22 S | 19.94 W | 76.01 | 2.20 |
| 2330.00 | 11.93 | 182.88 | 2300.72 | 252.24 S | 21.10 W | 82.29 | 2.16 |
| 2425.00 | 12.60 | 176.24 | 2393.56 | 272.38 S | 20.92 W | 87.05 | 1.64 |
| 2520.00 | 12.72 | 177.79 | 2486.25 | 293.17 S | 19.84 W | 91.10 | 0.38 |
| 2615.00 | 13.32 | 175.16 | 2578.80 | 314.53 S | 18.51 W | 95.05 | 0.89 |
| 2710.00 | 13.85 | 180.95 | 2671.15 | 336.81 S | 17.77 W | 99.80 | 1.54 |
| 2805.00 | 12.61 | 181.32 | 2763.63 | 358.54 S | 18.20 W | 105.54 | 1.32 |
| 2900.00 | 13.92 | 182.49 | 2856.09 | 380.32 S | 18.94 W | 111.59 | 1.42 |
| 2995.00 | 13.77 | 177.98 | 2948.33 | 403.04 S | 19.03 W | 117.25 | 1.15 |
| 3090.00 | 13.67 | 186.05 | 3040.63 | 425.51 S | 19.82 W | 123.52 | 2.02 |
| 3184.00 | 11.42 | 185.19 | 3132.38 | 445.82 S | 21.83 W | 130.45 | 2.41 |
| 3279.00 | 12.53 | 180.59 | 3225.31 | 465.49 S | 22.79 W | 136.20 | 1.54 |
| 3374.00 | 12.22 | 186.38 | 3318.11 | 485.78 S | 24.01 W | 142.36 | 1.35 |
| 3469.00 | 11.89 | 186.89 | 3411.02 | 505.48 S | 26.30 W | 149.41 | 0.36 |
| 3564.00 | 10.77 | 188.25 | 3504.17 | 523.98 S | 28.75 W | 156.32 | 1.21 |
| 3658.00 | 11.23 | 182.22 | 3596.44 | 541.83 S | 30.37 W | 162.26 | 1.32 |

| | | | | | | | |
|---------|-------|--------|---------|-----------|----------|--------|-------|
| 3753.00 | 12.47 | 180.86 | 3689.41 | 561.33 S | 30.88 W | 167.54 | 1.34 |
| 3848.00 | 14.21 | 183.05 | 3781.85 | 583.24 S | 31.65 W | 173.66 | 1.90 |
| 3943.00 | 15.74 | 181.83 | 3873.62 | 607.76 S | 32.68 W | 180.67 | 1.64 |
| 4038.00 | 14.18 | 184.48 | 3965.40 | 632.23 S | 34.00 W | 187.95 | 1.79 |
| 4132.00 | 12.13 | 181.92 | 4056.93 | 653.58 S | 35.23 W | 194.38 | 2.27 |
| 4227.00 | 11.82 | 181.12 | 4149.86 | 673.28 S | 35.76 W | 199.71 | 0.37 |
| 4322.00 | 11.46 | 181.95 | 4242.91 | 692.45 S | 36.27 W | 204.91 | 0.42 |
| 4417.00 | 10.63 | 182.46 | 4336.15 | 710.63 S | 36.97 W | 210.04 | 0.88 |
| 4512.00 | 11.22 | 189.18 | 4429.43 | 728.51 S | 38.82 W | 216.22 | 1.48 |
| 4606.00 | 12.28 | 185.15 | 4521.46 | 747.49 S | 41.17 W | 223.15 | 1.42 |
| 4701.00 | 10.23 | 183.93 | 4614.63 | 765.97 S | 42.66 W | 229.12 | 2.16 |
| 4796.00 | 10.10 | 184.44 | 4708.14 | 782.69 S | 43.88 W | 234.41 | 0.17 |
| 4891.00 | 9.98 | 176.46 | 4801.69 | 799.21 S | 44.02 W | 238.59 | 1.47 |
| 4987.00 | 9.54 | 176.24 | 4896.30 | 815.45 S | 42.98 W | 241.57 | 0.46 |
| 5082.00 | 10.11 | 178.06 | 4989.90 | 831.64 S | 42.18 W | 244.76 | 0.69 |
| 5176.00 | 9.32 | 188.08 | 5082.56 | 847.42 S | 42.97 W | 249.40 | 1.98 |
| 5271.00 | 8.41 | 183.90 | 5176.43 | 861.97 S | 44.53 W | 254.47 | 1.17 |
| 5365.00 | 9.14 | 180.33 | 5269.33 | 876.29 S | 45.04 W | 258.48 | 0.97 |
| 5461.00 | 9.03 | 182.69 | 5364.12 | 891.45 S | 45.44 W | 262.58 | 0.41 |
| 5556.00 | 6.91 | 181.67 | 5458.20 | 904.61 S | 45.95 W | 266.31 | 2.23 |
| 5651.00 | 5.49 | 174.76 | 5552.64 | 914.85 S | 45.71 W | 268.58 | 1.69 |
| 5738.00 | 8.46 | 177.13 | 5638.99 | 925.39 S | 45.00 W | 270.48 | 3.43 |
| 5833.00 | 8.93 | 188.58 | 5732.90 | 939.66 S | 45.75 W | 274.71 | 1.88 |
| 5928.00 | 10.64 | 175.52 | 5826.53 | 955.70 S | 46.17 W | 279.04 | 2.94 |
| 6023.00 | 10.81 | 173.56 | 5919.87 | 973.30 S | 44.49 W | 281.72 | 0.42 |
| 6118.00 | 9.12 | 175.44 | 6013.43 | 989.65 S | 42.89 W | 284.18 | 1.81 |
| 6165.00 | 10.98 | 181.11 | 6059.71 | 997.84 S | 42.68 W | 285.99 | 4.47 |
| 6213.00 | 15.79 | 190.08 | 6106.40 | 1008.85 S | 43.91 W | 289.88 | 10.89 |
| 6260.00 | 19.47 | 199.08 | 6151.19 | 1022.55 S | 47.59 W | 296.81 | 9.73 |
| 6308.00 | 22.61 | 209.71 | 6196.00 | 1038.13 S | 54.79 W | 307.60 | 10.26 |
| 6355.00 | 24.93 | 221.82 | 6239.04 | 1053.38 S | 65.88 W | 322.09 | 11.48 |
| 6403.00 | 27.63 | 233.96 | 6282.10 | 1067.48 S | 81.64 W | 340.83 | 12.50 |
| 6450.00 | 30.63 | 243.52 | 6323.18 | 1079.24 S | 101.18 W | 362.66 | 11.77 |
| 6498.00 | 35.14 | 245.80 | 6363.48 | 1090.36 S | 124.74 W | 388.23 | 9.73 |
| 6545.00 | 40.36 | 246.68 | 6400.63 | 1101.94 S | 151.07 W | 416.59 | 11.16 |
| 6593.00 | 44.12 | 246.73 | 6436.15 | 1114.70 S | 180.71 W | 448.45 | 7.83 |
| 6640.00 | 47.25 | 246.97 | 6468.98 | 1127.91 S | 211.63 W | 481.66 | 6.68 |
| 6688.00 | 52.00 | 243.54 | 6500.07 | 1143.24 S | 244.80 W | 517.59 | 11.28 |
| 6735.00 | 55.06 | 243.34 | 6528.01 | 1160.14 S | 278.61 W | 554.50 | 6.53 |
| 6783.00 | 60.03 | 242.61 | 6553.76 | 1178.55 S | 314.67 W | 593.98 | 10.42 |
| 6830.00 | 65.20 | 241.42 | 6575.37 | 1198.13 S | 351.51 W | 634.49 | 11.23 |
| 6878.00 | 67.92 | 240.82 | 6594.46 | 1219.40 S | 390.06 W | 677.08 | 5.78 |
| 6925.00 | 71.42 | 242.44 | 6610.79 | 1240.33 S | 428.84 W | 719.81 | 8.12 |
| 6973.00 | 74.05 | 246.08 | 6625.04 | 1260.23 S | 470.12 W | 764.71 | 9.08 |
| 7020.00 | 76.26 | 248.10 | 6637.08 | 1277.91 S | 511.96 W | 809.61 | 6.27 |
| 7068.00 | 77.49 | 251.84 | 6647.98 | 1293.91 S | 555.87 W | 856.10 | 8.01 |
| 7115.00 | 79.74 | 255.15 | 6657.26 | 1306.99 S | 600.04 W | 902.13 | 8.40 |
| 7180.00 | 83.25 | 259.98 | 6666.88 | 1320.82 S | 662.79 W | 966.35 | 9.12 |

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 255.81 DEGREES (GRID)
A TOTAL CORRECTION OF 7.66 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7180.00 FEET
IS 1477.78 FEET ALONG 206.65 DEGREES (GRID)**

Tie-In @ Surface

Surveys at 252 ft, 503 ft, 745 ft and 930 ft were taken and provided by HP 322 while they were drilling the surface hole.