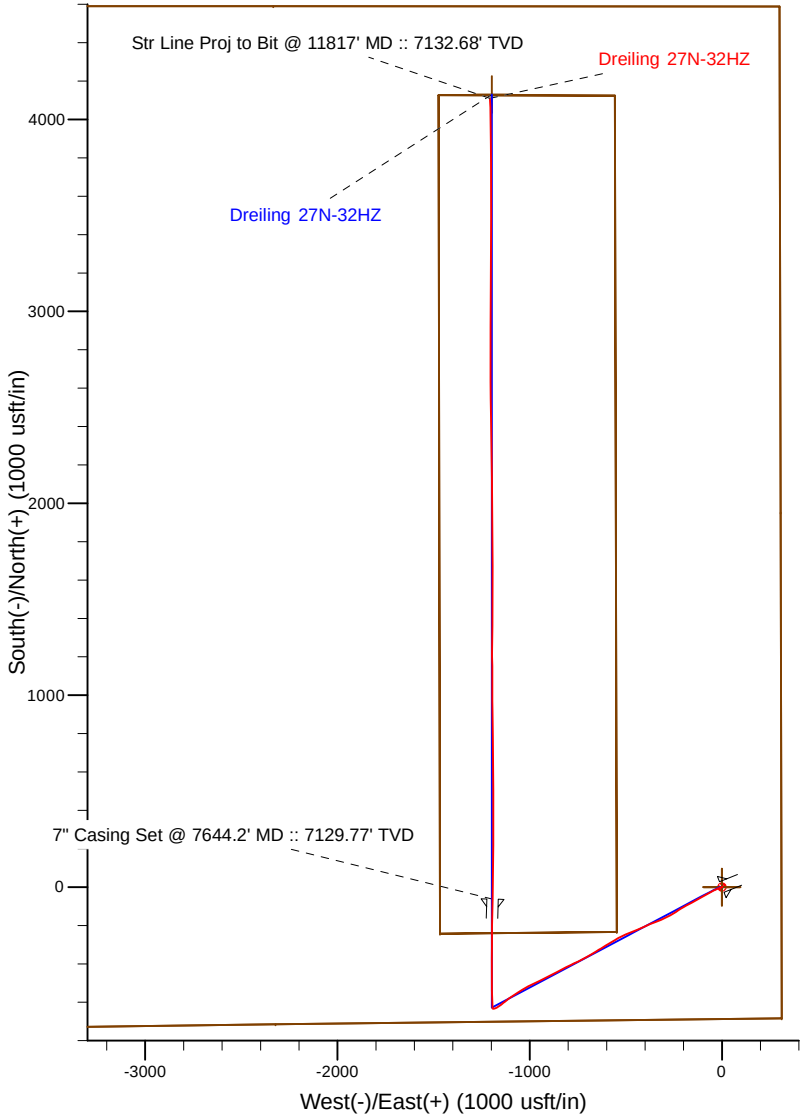
Project: Weld County, CO (NAD 83)
Site: Sec. 32-T2N-R65W
Well: Dreiling 27N-32HZ
Wellbore: Plan B
Design: Actual Field Surveys

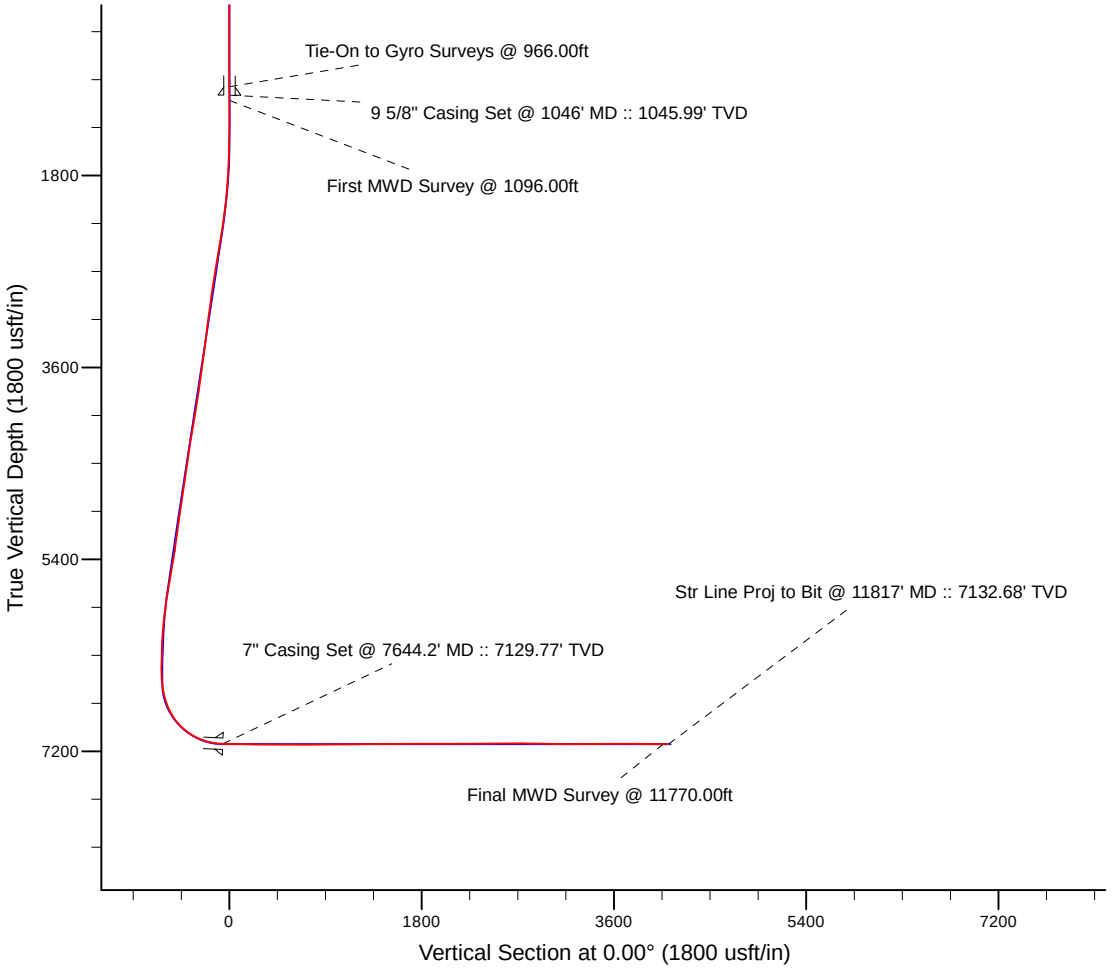
Anadarko Petroleum Corporation

HALLIBURTON
Sperry Drilling

LEGEND

Dreiling 27N-32HZ, Plan B, Rev B1 V0
Actual Field Surveys




7" Casing: ~638.82' FSL, ~1502.84' FEL
Lat/Long: 40.089463 N, -104.683652 E
State Planes - CO Northern: 1,276,487.40' N, 3,228,399.73' E
Location: Sec. 32-T2N-R65W

BHL: ~479.71' FNL, ~1506.64' FEL
Lat/Long: 40.100917 N, -104.683701 E
State Planes - CO Northern: 1,280,659.29' N, 3,228,347.63' E
Location: Sec. 32-T2N-R65W

WELL DETAILS: Dreiling 27N-32HZ

Ground Level: 4924.00
RKB = 13' @ 4937.00usft (Ensign 132)

Design: Actual Field Surveys (Dreiling 27N-32HZ/Plan B)

Created By: Clint Eshelman Date: 1/20/2013
Reviewed: _____ Date: _____

# Anadarko Petroleum Corp.

**Weld County, CO (NAD 83)**
**Sec. 32-T2N-R65W**
**Dreiling 27N-32HZ**

**Plan B**

**Design: Actual Field Surveys**

## Sperry Drilling Services

# Standard Report

**20 January, 2014**

Well Coordinates: 1,276,560.65 N, 3,229,591.68 E (40° 05' 22.68" N, 104° 40' 45.80" W)
Ground Level: 4,924.00 usft

| | |
|---|---|
| Local Coordinate Origin: | Centered on Well Dreiling 27N-32HZ |
| Viewing Datum: | RKB = 13' @ 4937.00usft (Ensign 132) |
| TVDs to System: | N |
| North Reference: | True |
| Unit System: | Dec-Deg - API - US Survey Feet - Custom |

Geodetic Scale Factor Applied
Version: 5000.1 Build: 70

HALLIBURTON

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13.00 | 0.00 | 0.00 | 13.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 113.00 | 0.28 | 202.20 | 113.00 | -0.23 | -0.09 | -0.23 | 0.28 |
| 213.00 | 0.20 | 138.04 | 213.00 | -0.58 | -0.07 | -0.58 | 0.26 |
| 313.00 | 0.08 | 18.32 | 313.00 | -0.65 | 0.07 | -0.65 | 0.25 |
| 413.00 | 0.20 | 92.83 | 413.00 | -0.59 | 0.27 | -0.59 | 0.19 |
| 513.00 | 0.17 | 66.57 | 513.00 | -0.54 | 0.58 | -0.54 | 0.09 |
| 613.00 | 0.33 | 49.65 | 613.00 | -0.29 | 0.93 | -0.29 | 0.17 |
| 713.00 | 0.25 | 35.14 | 713.00 | 0.07 | 1.28 | 0.07 | 0.11 |
| 813.00 | 0.30 | 4.79 | 812.99 | 0.51 | 1.43 | 0.51 | 0.15 |
| 913.00 | 0.50 | 277.91 | 912.99 | 0.83 | 1.02 | 0.83 | 0.57 |
| 966.00 | 0.74 | 278.67 | 965.99 | 0.92 | 0.45 | 0.92 | 0.45 |
| **Tie-On to Gyro Surveys @ 966.00ft** | | | | | | | |
| 1,046.00 | 0.51 | 247.98 | 1,045.99 | 0.86 | -0.39 | 0.86 | 0.50 |
| **9 5/8" Casing Set @ 1046' MD :: 1045.99' TVD** | | | | | | | |
| 1,096.00 | 0.49 | 219.19 | 1,095.98 | 0.61 | -0.73 | 0.61 | 0.50 |
| **First MWD Survey @ 1096.00ft** | | | | | | | |
| 1,191.00 | 0.40 | 279.62 | 1,190.98 | 0.35 | -1.32 | 0.35 | 0.48 |
| 1,286.00 | 0.41 | 284.06 | 1,285.98 | 0.49 | -1.97 | 0.49 | 0.03 |
| 1,380.00 | 0.53 | 282.19 | 1,379.98 | 0.66 | -2.72 | 0.66 | 0.13 |
| 1,475.00 | 3.20 | 246.86 | 1,474.92 | -0.29 | -5.59 | -0.29 | 2.93 |
| 1,571.00 | 4.47 | 243.17 | 1,570.70 | -3.03 | -11.40 | -3.03 | 1.35 |
| 1,666.00 | 5.98 | 248.05 | 1,665.30 | -6.55 | -19.29 | -6.55 | 1.66 |
| 1,760.00 | 6.88 | 244.42 | 1,758.71 | -10.81 | -28.91 | -10.81 | 1.05 |
| 1,854.00 | 9.66 | 243.37 | 1,851.73 | -16.78 | -41.04 | -16.78 | 2.96 |
| 1,948.00 | 10.94 | 243.39 | 1,944.21 | -24.31 | -56.07 | -24.31 | 1.36 |
| 2,042.00 | 12.22 | 238.99 | 2,036.30 | -33.43 | -72.57 | -33.43 | 1.65 |
| 2,137.00 | 12.99 | 241.67 | 2,129.01 | -43.67 | -90.58 | -43.67 | 1.02 |
| 2,230.00 | 15.23 | 240.14 | 2,219.19 | -54.72 | -110.38 | -54.72 | 2.44 |
| 2,324.00 | 17.49 | 239.87 | 2,309.38 | -67.96 | -133.31 | -67.96 | 2.41 |
| 2,418.00 | 18.02 | 242.14 | 2,398.91 | -81.84 | -158.38 | -81.84 | 0.93 |
| 2,512.00 | 20.10 | 242.94 | 2,487.75 | -95.99 | -185.62 | -95.99 | 2.23 |
| 2,607.00 | 19.23 | 238.21 | 2,577.21 | -111.66 | -213.46 | -111.66 | 1.91 |
| 2,701.00 | 18.66 | 235.18 | 2,666.12 | -128.40 | -238.96 | -128.40 | 1.21 |
| 2,795.00 | 17.36 | 241.91 | 2,755.52 | -143.59 | -263.68 | -143.59 | 2.61 |
| 2,890.00 | 17.92 | 243.88 | 2,846.06 | -156.70 | -289.31 | -156.70 | 0.86 |
| 2,984.00 | 19.47 | 247.03 | 2,935.10 | -169.18 | -316.72 | -169.18 | 1.97 |
| 3,078.00 | 19.28 | 247.90 | 3,023.77 | -181.13 | -345.52 | -181.13 | 0.37 |
| 3,173.00 | 18.82 | 247.40 | 3,113.57 | -192.92 | -374.20 | -192.92 | 0.51 |
| 3,267.00 | 17.59 | 246.99 | 3,202.86 | -204.30 | -401.27 | -204.30 | 1.32 |
| 3,361.00 | 19.19 | 246.34 | 3,292.06 | -216.05 | -428.50 | -216.05 | 1.72 |
| 3,456.00 | 18.63 | 247.59 | 3,381.93 | -228.10 | -456.83 | -228.10 | 0.73 |
| 3,552.00 | 16.90 | 248.59 | 3,473.35 | -239.04 | -484.00 | -239.04 | 1.83 |
| 3,647.00 | 16.73 | 245.05 | 3,564.29 | -249.85 | -509.25 | -249.85 | 1.09 |
| 3,742.00 | 16.96 | 240.18 | 3,655.22 | -262.51 | -533.67 | -262.51 | 1.50 |
| 3,837.00 | 16.87 | 240.74 | 3,746.11 | -276.14 | -557.72 | -276.14 | 0.20 |
| 3,932.00 | 17.05 | 238.67 | 3,836.98 | -290.12 | -581.64 | -290.12 | 0.66 |
| 4,027.00 | 17.80 | 238.52 | 3,927.62 | -304.94 | -605.92 | -304.94 | 0.79 |
| 4,122.00 | 16.46 | 238.35 | 4,018.40 | -319.59 | -629.76 | -319.59 | 1.41 |
| 4,218.00 | 18.37 | 239.48 | 4,110.00 | -334.41 | -654.37 | -334.41 | 2.02 |

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) |
|---|---|---|---|---|---|---|---|
| 4,313.00 | 17.86 | 239.54 | 4,200.29 | -349.40 | -679.83 | -349.40 | 0.54 |
| 4,408.00 | 16.18 | 238.76 | 4,291.13 | -363.65 | -703.70 | -363.65 | 1.78 |
| 4,503.00 | 17.50 | 241.87 | 4,382.05 | -377.25 | -727.62 | -377.25 | 1.68 |
| 4,598.00 | 20.34 | 245.73 | 4,471.92 | -390.77 | -755.27 | -390.77 | 3.27 |
| 4,693.00 | 19.04 | 243.96 | 4,561.36 | -404.36 | -784.25 | -404.36 | 1.51 |
| 4,788.00 | 18.08 | 242.99 | 4,651.42 | -417.86 | -811.30 | -417.86 | 1.06 |
| 4,883.00 | 18.13 | 242.64 | 4,741.71 | -431.35 | -837.56 | -431.35 | 0.13 |
| 4,979.00 | 17.07 | 242.03 | 4,833.22 | -444.82 | -863.27 | -444.82 | 1.12 |
| 5,074.00 | 16.91 | 243.32 | 4,924.07 | -457.56 | -887.93 | -457.56 | 0.43 |
| 5,169.00 | 18.14 | 242.65 | 5,014.66 | -470.56 | -913.42 | -470.56 | 1.31 |
| 5,264.00 | 16.61 | 242.94 | 5,105.32 | -483.53 | -938.64 | -483.53 | 1.61 |
| 5,359.00 | 18.14 | 244.99 | 5,195.99 | -495.96 | -964.14 | -495.96 | 1.73 |
| 5,455.00 | 17.00 | 245.34 | 5,287.51 | -508.14 | -990.44 | -508.14 | 1.19 |
| 5,550.00 | 18.55 | 239.80 | 5,377.98 | -521.53 | -1,016.12 | -521.53 | 2.41 |
| 5,708.00 | 17.53 | 237.82 | 5,528.21 | -546.85 | -1,057.99 | -546.85 | 0.75 |
| 5,835.00 | 17.11 | 235.33 | 5,649.45 | -567.66 | -1,089.54 | -567.66 | 0.67 |
| 5,930.00 | 14.61 | 234.12 | 5,740.83 | -582.64 | -1,110.74 | -582.64 | 2.65 |
| 6,026.00 | 12.70 | 231.46 | 5,834.11 | -596.31 | -1,128.81 | -596.31 | 2.09 |
| 6,121.00 | 10.98 | 230.07 | 5,927.09 | -608.62 | -1,143.92 | -608.62 | 1.84 |
| 6,216.00 | 9.21 | 235.11 | 6,020.61 | -618.78 | -1,157.09 | -618.78 | 2.08 |
| 6,311.00 | 6.99 | 240.95 | 6,114.66 | -625.94 | -1,168.38 | -625.94 | 2.49 |
| 6,406.00 | 5.08 | 248.36 | 6,209.13 | -630.30 | -1,177.35 | -630.30 | 2.17 |
| 6,501.00 | 3.58 | 250.40 | 6,303.86 | -632.84 | -1,184.05 | -632.84 | 1.59 |
| 6,596.00 | 2.06 | 264.93 | 6,398.74 | -633.99 | -1,188.55 | -633.99 | 1.76 |
| 6,691.00 | 1.84 | 315.23 | 6,493.69 | -633.06 | -1,191.32 | -633.06 | 1.76 |
| 6,739.00 | 1.79 | 330.68 | 6,541.67 | -631.86 | -1,192.23 | -631.86 | 1.02 |
| 6,786.00 | 7.41 | 351.59 | 6,588.50 | -628.21 | -1,193.03 | -628.21 | 12.28 |
| 6,834.00 | 11.76 | 355.97 | 6,635.82 | -620.27 | -1,193.83 | -620.27 | 9.18 |
| 6,881.00 | 15.27 | 357.41 | 6,681.51 | -609.30 | -1,194.45 | -609.30 | 7.50 |
| 6,929.00 | 18.03 | 358.68 | 6,727.50 | -595.56 | -1,194.90 | -595.56 | 5.80 |
| 6,977.00 | 20.67 | 0.21 | 6,772.78 | -579.66 | -1,195.04 | -579.66 | 5.60 |
| 7,025.00 | 25.81 | 359.20 | 6,816.87 | -560.73 | -1,195.16 | -560.73 | 10.74 |
| 7,072.00 | 30.71 | 358.55 | 6,858.26 | -538.49 | -1,195.61 | -538.49 | 10.45 |
| 7,120.00 | 35.61 | 0.37 | 6,898.43 | -512.24 | -1,195.83 | -512.24 | 10.42 |
| 7,167.00 | 40.28 | 358.94 | 6,935.48 | -483.35 | -1,196.02 | -483.35 | 10.11 |
| 7,215.00 | 45.88 | 359.03 | 6,970.53 | -450.59 | -1,196.60 | -450.59 | 11.67 |
| 7,262.00 | 51.84 | 0.46 | 7,001.44 | -415.21 | -1,196.74 | -415.21 | 12.89 |
| 7,310.00 | 55.21 | 0.35 | 7,029.97 | -376.62 | -1,196.46 | -376.62 | 7.02 |
| 7,357.00 | 61.62 | 0.55 | 7,054.57 | -336.60 | -1,196.15 | -336.60 | 13.64 |
| 7,405.00 | 66.15 | 0.30 | 7,075.69 | -293.51 | -1,195.83 | -293.51 | 9.45 |
| 7,452.00 | 69.01 | 0.63 | 7,093.62 | -250.07 | -1,195.48 | -250.07 | 6.12 |
| 7,500.00 | 74.40 | 0.47 | 7,108.68 | -204.52 | -1,195.04 | -204.52 | 11.23 |
| 7,548.00 | 79.52 | 0.52 | 7,119.51 | -157.77 | -1,194.63 | -157.77 | 10.67 |
| 7,608.00 | 85.22 | 1.63 | 7,127.47 | -98.34 | -1,193.52 | -98.34 | 9.68 |
| 7,644.20 | 87.49 | 1.20 | 7,129.77 | -62.23 | -1,192.62 | -62.23 | 6.37 |
| **7" Casing Set @ 7644.2' MD :: 7129.77' TVD** | | | | | | | |
| 7,678.00 | 89.60 | 0.80 | 7,130.63 | -28.44 | -1,192.03 | -28.44 | 6.37 |
| 7,774.00 | 89.07 | 0.64 | 7,131.75 | 67.54 | -1,190.83 | 67.54 | 0.58 |
| 7,869.00 | 89.04 | 0.36 | 7,133.31 | 162.52 | -1,190.00 | 162.52 | 0.30 |
| 7,964.00 | 88.89 | 359.95 | 7,135.03 | 257.51 | -1,189.74 | 257.51 | 0.46 |
| 8,059.00 | 89.78 | 0.11 | 7,136.13 | 352.50 | -1,189.69 | 352.50 | 0.95 |

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) |
|---|---|---|---|---|---|---|---|
| 8,154.00 | 90.15 | 0.25 | 7,136.19 | 447.50 | -1,189.39 | 447.50 | 0.42 |
| 8,249.00 | 90.25 | 359.99 | 7,135.86 | 542.50 | -1,189.20 | 542.50 | 0.29 |
| 8,345.00 | 89.94 | 359.41 | 7,135.70 | 638.50 | -1,189.70 | 638.50 | 0.69 |
| 8,440.00 | 90.03 | 358.85 | 7,135.72 | 733.49 | -1,191.14 | 733.49 | 0.60 |
| 8,535.00 | 89.97 | 359.52 | 7,135.72 | 828.48 | -1,192.49 | 828.48 | 0.71 |
| 8,630.00 | 90.15 | 359.03 | 7,135.63 | 923.47 | -1,193.69 | 923.47 | 0.55 |
| 8,725.00 | 90.86 | 0.13 | 7,134.79 | 1,018.46 | -1,194.39 | 1,018.46 | 1.38 |
| 8,859.00 | 90.68 | 359.40 | 7,132.99 | 1,152.45 | -1,194.94 | 1,152.45 | 0.56 |
| 8,915.00 | 90.15 | 0.22 | 7,132.58 | 1,208.44 | -1,195.13 | 1,208.44 | 1.74 |
| 9,010.00 | 90.56 | 0.71 | 7,131.99 | 1,303.44 | -1,194.35 | 1,303.44 | 0.67 |
| 9,106.00 | 90.43 | 0.29 | 7,131.16 | 1,399.43 | -1,193.52 | 1,399.43 | 0.46 |
| 9,201.00 | 90.31 | 0.15 | 7,130.55 | 1,494.43 | -1,193.15 | 1,494.43 | 0.19 |
| 9,296.00 | 90.09 | 0.10 | 7,130.22 | 1,589.43 | -1,192.94 | 1,589.43 | 0.24 |
| 9,391.00 | 89.91 | 359.77 | 7,130.22 | 1,684.43 | -1,193.05 | 1,684.43 | 0.40 |
| 9,486.00 | 90.37 | 359.79 | 7,129.99 | 1,779.42 | -1,193.42 | 1,779.42 | 0.48 |
| 9,581.00 | 90.28 | 359.76 | 7,129.45 | 1,874.42 | -1,193.79 | 1,874.42 | 0.10 |
| 9,676.00 | 90.40 | 359.73 | 7,128.88 | 1,969.42 | -1,194.21 | 1,969.42 | 0.13 |
| 9,772.00 | 90.31 | 359.32 | 7,128.29 | 2,065.41 | -1,195.01 | 2,065.41 | 0.44 |
| 9,867.00 | 90.09 | 359.01 | 7,127.96 | 2,160.40 | -1,196.39 | 2,160.40 | 0.40 |
| 9,962.00 | 90.09 | 358.73 | 7,127.81 | 2,255.38 | -1,198.27 | 2,255.38 | 0.29 |
| 10,057.00 | 90.25 | 359.60 | 7,127.53 | 2,350.37 | -1,199.65 | 2,350.37 | 0.93 |
| 10,153.00 | 90.43 | 359.18 | 7,126.96 | 2,446.37 | -1,200.67 | 2,446.37 | 0.48 |
| 10,248.00 | 90.12 | 358.70 | 7,126.50 | 2,541.35 | -1,202.43 | 2,541.35 | 0.60 |
| 10,343.00 | 90.34 | 359.66 | 7,126.12 | 2,636.34 | -1,203.79 | 2,636.34 | 1.04 |
| 10,438.00 | 89.51 | 0.44 | 7,126.24 | 2,731.33 | -1,203.71 | 2,731.33 | 1.20 |
| 10,533.00 | 89.35 | 359.91 | 7,127.19 | 2,826.33 | -1,203.42 | 2,826.33 | 0.58 |
| 10,628.00 | 89.75 | 359.88 | 7,127.93 | 2,921.33 | -1,203.59 | 2,921.33 | 0.42 |
| 10,723.00 | 89.20 | 1.05 | 7,128.81 | 3,016.32 | -1,202.82 | 3,016.32 | 1.36 |
| 10,818.00 | 88.98 | 0.45 | 7,130.31 | 3,111.30 | -1,201.58 | 3,111.30 | 0.67 |
| 10,913.00 | 88.89 | 0.05 | 7,132.08 | 3,206.28 | -1,201.16 | 3,206.28 | 0.43 |
| 11,008.00 | 91.08 | 0.36 | 7,132.10 | 3,301.27 | -1,200.82 | 3,301.27 | 2.33 |
| 11,103.00 | 90.68 | 359.47 | 7,130.65 | 3,396.26 | -1,200.96 | 3,396.26 | 1.03 |
| 11,199.00 | 90.77 | 359.80 | 7,129.43 | 3,492.25 | -1,201.57 | 3,492.25 | 0.36 |
| 11,294.00 | 90.31 | 0.94 | 7,128.54 | 3,587.24 | -1,200.96 | 3,587.24 | 1.29 |
| 11,389.00 | 89.69 | 0.30 | 7,128.54 | 3,682.24 | -1,199.93 | 3,682.24 | 0.94 |
| 11,484.00 | 88.86 | 359.50 | 7,129.74 | 3,777.23 | -1,200.10 | 3,777.23 | 1.21 |
| 11,579.00 | 88.83 | 359.16 | 7,131.65 | 3,872.20 | -1,201.21 | 3,872.20 | 0.36 |
| 11,770.00 | 90.37 | 358.59 | 7,132.99 | 4,063.15 | -1,204.96 | 4,063.15 | 0.86 |
| **Final MWD Survey @ 11770.00ft** | | | | | | | |
| 11,817.00 | 90.37 | 358.59 | 7,132.68 | 4,110.14 | -1,206.12 | 4,110.14 | 0.00 |
| **Str Line Proj to Bit @ 11817' MD :: 7132.68' TVD** | | | | | | | |

### *Design Annotations*

| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Comment |
|---|---|---|---|---|
| 966.00 | 965.99 | 0.92 | 0.45 | Tie-On to Gyro Surveys @ 966.00ft |
| 1,096.00 | 1,095.98 | 0.61 | -0.73 | First MWD Survey @ 1096.00ft |
| 11,770.00 | 7,132.99 | 4,063.15 | -1,204.96 | Final MWD Survey @ 11770.00ft |
| 11,817.00 | 7,132.68 | 4,110.14 | -1,206.12 | Str Line Proj to Bit @ 11817' MD :: 7132.68' TVD |

# Design Report for Dreiling 27N-32HZ - Actual Field Surveys

## Vertical Section Information

| Angle Type | Target | Azimuth (°) | Origin Type | Origin +N/_S (usft) | Origin +E/-W (usft) | Start TVD (usft) |
|---|---|---|---|---|---|---|
| User | No Target (Freehand) | 0.00 | Slot | 0.00 | 0.00 | 0.00 |

## Survey tool program

| From (usft) | To (usft) | Survey/Plan | Survey Tool |
|---|---|---|---|
| 13.00 | 966.00 | MS Energy Surveys | NS-GYRO-MS |
| 1,096.00 | 7,608.00 | MWD Vertical/Build Surveys | MWD+IFR1+SC |
| 7,678.00 | 11,770.00 | MWD Lateral Surveys | MWD+IFR1+SC |

## Casing Details

| Measured Depth (usft) | Vertical Depth (usft) | Name | Casing Diameter (") | Hole Diameter (") |
|---|---|---|---|---|
| 1,046.00 | 1,045.99 | 9 5/8" Casing Set @ 1046' MD :: 1045.99' TVD | 9-5/8 | 13-1/2 |
| 7,644.20 | 7,129.77 | 7" Casing Set @ 7644.2' MD :: 7129.77' TVD | 7 | 8-3/4 |

## Wellbore Targets

| Target Name - hit/miss target - Shape | Dip Angle (°) | Dip Dir. (°) | TVD (usft) | +N/-S (usft) | +E/-W (usft) | Northing (usft) | Easting (usft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|
| Dreiling 27N-32HZ_LD | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1,276,560.66 | 3,229,591.68 | 40.089634 | -104.679389 |
| - actual wellpath hits target center | | | | | | | | | |
| - Polygon | | | | | | | | | |
| Point 1 | | | | 0.00 | 4,127.31 | -1,473.61 | 1,280,673.99 | 3,228,080.00 | |
| Point 2 | | | | 0.00 | 4,124.83 | -556.56 | 1,280,680.00 | 3,228,997.00 | |
| Point 3 | | | | 0.00 | -233.62 | -546.89 | 1,276,322.00 | 3,229,047.00 | |
| Point 4 | | | | 0.00 | -242.11 | -1,466.04 | 1,276,305.00 | 3,228,128.00 | |
| Dreiling 27N-32HZ_SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1,276,560.66 | 3,229,591.68 | 40.089634 | -104.679389 |
| - actual wellpath hits target center | | | | | | | | | |
| - Polygon | | | | | | | | | |
| Point 1 | | | | 0.00 | 4,590.72 | -4,965.85 | 1,281,105.05 | 3,224,583.76 | |
| Point 2 | | | | 0.00 | 4,590.10 | -2,333.29 | 1,281,128.79 | 3,227,216.11 | |
| Point 3 | | | | 0.00 | 4,589.55 | 299.47 | 1,281,152.60 | 3,229,848.65 | |
| Point 4 | | | | 0.00 | 1,952.98 | 305.62 | 1,278,516.31 | 3,229,879.20 | |
| Point 5 | | | | 0.00 | -683.40 | 311.72 | 1,275,880.20 | 3,229,909.70 | |
| Point 6 | | | | 0.00 | -714.41 | -2,321.20 | 1,275,824.83 | 3,227,277.28 | |
| Point 7 | | | | 0.00 | -747.41 | -4,955.24 | 1,275,767.45 | 3,224,643.76 | |
| Point 8 | | | | 0.00 | 1,909.40 | -4,960.77 | 1,278,424.00 | 3,224,613.65 | |
| Dreiling 27N-32HZ_SH | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1,276,560.66 | 3,229,591.68 | 40.089634 | -104.679389 |
| - actual wellpath hits target center | | | | | | | | | |
| - Point | | | | | | | | | |
| Dreiling 27N-32HZ_BH | 0.00 | 0.00 | 7,132.00 | 4,130.01 | -1,196.56 | 1,280,679.25 | 3,228,357.00 | 40.100971 | -104.683666 |
| - actual wellpath misses target center by 22.06usft at 11817.00usft MD (7132.68 TVD, 4110.14 N, -1206.12 E) | | | | | | | | | |
| - Point | | | | | | | | | |

## Directional Difficulty Index

| | | | |
|---|---|---|---|
| Average Dogleg over Survey: | 1.70 °/100usft | Maximum Dogleg over Survey: | 13.64 °/100usft at 7,357.00 usft |
| Net Tortousity applicable to Plans: | 0.21 °/100usft | Directional Difficulty Index: | 6.309 |

***Audit Info***

# North Reference Sheet for Sec. 32-T2N-R65W - Dreiling 27N-32HZ - Plan B

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB = 13' @ 4937.00usft (Ensign 132). Northing and Easting are relative to Dreiling 27N-32HZ

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996078

Grid Coordinates of Well: 1,276,560.65 usft N, 3,229,591.68 usft E

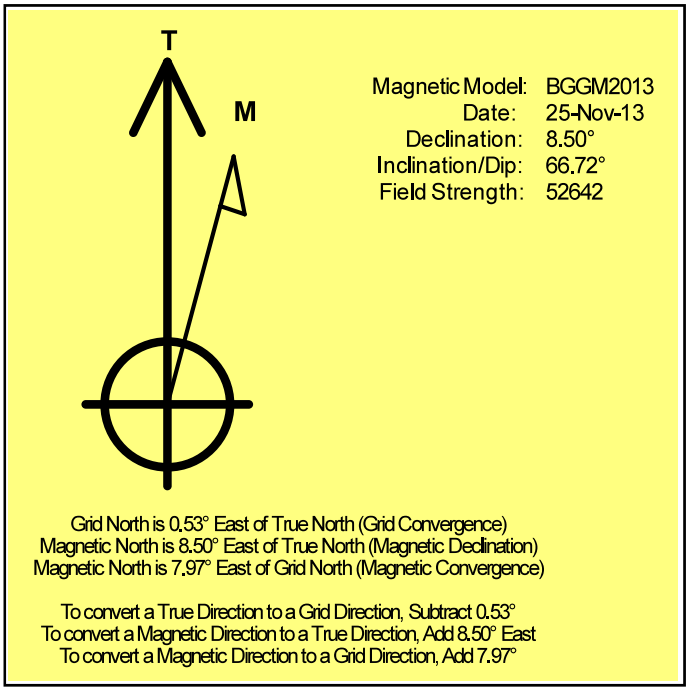
Geographical Coordinates of Well: 40° 05' 22.68" N, 104° 40' 45.80" W

Grid Convergence at Surface is: 0.53°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,817.00usft

the Bottom Hole Displacement is 4,283.45usft in the Direction of 343.65° (True).

Magnetic Convergence at surface is: -7.97° (25 November 2013, , BGGM2013)



# Anadarko Petroleum Corp.

**Weld County, CO (NAD 83)**
**Sec. 32-T2N-R65W**
**Dreiling 27N-32HZ**

**Plan B**

**Design: Actual Field Surveys**

## Sperry Drilling Services

# Geodetic Report

**20 January, 2014**

Well Coordinates: 1,276,560.65 N, 3,229,591.68 E (40° 05' 22.68" N, 104° 40' 45.80" W)
Ground Level: 4,924.00 usft

| | |
|---|---|
| Local Coordinate Origin: | Centered on Well Dreiling 27N-32HZ |
| Viewing Datum: | RKB = 13' @ 4937.00usft (Ensign 132) |
| TVDs to System: | N |
| North Reference: | True |
| Unit System: | Dec-Deg - API - US Survey Feet - Custom |

Geodetic Scale Factor Applied
Version: 5000.1 Build: 70

HALLIBURTON

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Geographic Coordinates Latitude (usft) | Geographic Coordinates Longitude (usft) | UTM Coordinates Northing (usft) | UTM Coordinates Easting (usft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 40.089634 | -104.679389 | 1,276,560.65 | 3,229,591.68 |
| 13.00 | 0.00 | 0.00 | 13.00 | 0.00 | 0.00 | 40.089634 | -104.679389 | 1,276,560.65 | 3,229,591.68 |
| 113.00 | 0.28 | 202.20 | 113.00 | -0.23 | -0.09 | 40.089633 | -104.679390 | 1,276,560.43 | 3,229,591.59 |
| 213.00 | 0.20 | 138.04 | 213.00 | -0.58 | -0.07 | 40.089632 | -104.679390 | 1,276,560.07 | 3,229,591.62 |
| 313.00 | 0.08 | 18.32 | 313.00 | -0.65 | 0.07 | 40.089632 | -104.679389 | 1,276,560.01 | 3,229,591.76 |
| 413.00 | 0.20 | 92.83 | 413.00 | -0.59 | 0.27 | 40.089632 | -104.679388 | 1,276,560.07 | 3,229,591.95 |
| 513.00 | 0.17 | 66.57 | 513.00 | -0.54 | 0.58 | 40.089633 | -104.679387 | 1,276,560.12 | 3,229,592.26 |
| 613.00 | 0.33 | 49.65 | 613.00 | -0.29 | 0.93 | 40.089633 | -104.679386 | 1,276,560.37 | 3,229,592.62 |
| 713.00 | 0.25 | 35.14 | 713.00 | 0.07 | 1.28 | 40.089634 | -104.679385 | 1,276,560.74 | 3,229,592.96 |
| 813.00 | 0.30 | 4.79 | 812.99 | 0.51 | 1.43 | 40.089635 | -104.679384 | 1,276,561.18 | 3,229,593.10 |
| 913.00 | 0.50 | 277.91 | 912.99 | 0.83 | 1.02 | 40.089636 | -104.679386 | 1,276,561.50 | 3,229,592.69 |
| 966.00 | 0.74 | 278.67 | 965.99 | 0.92 | 0.45 | 40.089637 | -104.679388 | 1,276,561.57 | 3,229,592.12 |
| 1,046.00 | 0.51 | 247.98 | 1,045.99 | 0.86 | -0.39 | 40.089636 | -104.679391 | 1,276,561.51 | 3,229,591.28 |
| 1,096.00 | 0.49 | 219.19 | 1,095.98 | 0.61 | -0.73 | 40.089636 | -104.679392 | 1,276,561.26 | 3,229,590.94 |
| 1,191.00 | 0.40 | 279.62 | 1,190.98 | 0.35 | -1.32 | 40.089635 | -104.679394 | 1,276,560.99 | 3,229,590.36 |
| 1,286.00 | 0.41 | 284.06 | 1,285.98 | 0.49 | -1.97 | 40.089635 | -104.679396 | 1,276,561.13 | 3,229,589.70 |
| 1,380.00 | 0.53 | 282.19 | 1,379.98 | 0.66 | -2.72 | 40.089636 | -104.679399 | 1,276,561.29 | 3,229,588.95 |
| 1,475.00 | 3.20 | 246.86 | 1,474.92 | -0.29 | -5.59 | 40.089633 | -104.679409 | 1,276,560.32 | 3,229,586.09 |
| 1,571.00 | 4.47 | 243.17 | 1,570.70 | -3.03 | -11.40 | 40.089626 | -104.679430 | 1,276,557.52 | 3,229,580.31 |
| 1,666.00 | 5.98 | 248.05 | 1,665.30 | -6.55 | -19.29 | 40.089616 | -104.679458 | 1,276,553.93 | 3,229,572.45 |
| 1,760.00 | 6.88 | 244.42 | 1,758.71 | -10.81 | -28.91 | 40.089604 | -104.679493 | 1,276,549.58 | 3,229,562.87 |
| 1,854.00 | 9.66 | 243.37 | 1,851.73 | -16.78 | -41.04 | 40.089588 | -104.679536 | 1,276,543.50 | 3,229,550.80 |
| 1,948.00 | 10.94 | 243.39 | 1,944.21 | -24.31 | -56.07 | 40.089567 | -104.679590 | 1,276,535.83 | 3,229,535.84 |
| 2,042.00 | 12.22 | 238.99 | 2,036.30 | -33.43 | -72.57 | 40.089542 | -104.679649 | 1,276,526.56 | 3,229,519.43 |
| 2,137.00 | 12.99 | 241.67 | 2,129.01 | -43.67 | -90.58 | 40.089514 | -104.679713 | 1,276,516.14 | 3,229,501.51 |
| 2,230.00 | 15.23 | 240.14 | 2,219.19 | -54.72 | -110.38 | 40.089484 | -104.679784 | 1,276,504.92 | 3,229,481.81 |
| 2,324.00 | 17.49 | 239.87 | 2,309.38 | -67.96 | -133.31 | 40.089448 | -104.679866 | 1,276,491.47 | 3,229,459.01 |
| 2,418.00 | 18.02 | 242.14 | 2,398.91 | -81.84 | -158.38 | 40.089409 | -104.679955 | 1,276,477.35 | 3,229,434.07 |
| 2,512.00 | 20.10 | 242.94 | 2,487.75 | -95.99 | -185.62 | 40.089371 | -104.680053 | 1,276,462.96 | 3,229,406.96 |
| 2,607.00 | 19.23 | 238.21 | 2,577.21 | -111.66 | -213.46 | 40.089328 | -104.680152 | 1,276,447.03 | 3,229,379.27 |
| 2,701.00 | 18.66 | 235.18 | 2,666.12 | -128.40 | -238.96 | 40.089282 | -104.680243 | 1,276,430.05 | 3,229,353.93 |
| 2,795.00 | 17.36 | 241.91 | 2,755.52 | -143.59 | -263.68 | 40.089240 | -104.680332 | 1,276,414.63 | 3,229,329.35 |
| 2,890.00 | 17.92 | 243.88 | 2,846.06 | -156.70 | -289.31 | 40.089204 | -104.680423 | 1,276,401.29 | 3,229,303.84 |
| 2,984.00 | 19.47 | 247.03 | 2,935.10 | -169.18 | -316.72 | 40.089170 | -104.680521 | 1,276,388.56 | 3,229,276.55 |
| 3,078.00 | 19.28 | 247.90 | 3,023.77 | -181.13 | -345.52 | 40.089137 | -104.680624 | 1,276,376.34 | 3,229,247.86 |
| 3,173.00 | 18.82 | 247.40 | 3,113.57 | -192.92 | -374.20 | 40.089104 | -104.680727 | 1,276,364.29 | 3,229,219.30 |
| 3,267.00 | 17.59 | 246.99 | 3,202.86 | -204.30 | -401.27 | 40.089073 | -104.680823 | 1,276,352.66 | 3,229,192.33 |
| 3,361.00 | 19.19 | 246.34 | 3,292.06 | -216.05 | -428.50 | 40.089041 | -104.680921 | 1,276,340.65 | 3,229,165.22 |
| 3,456.00 | 18.63 | 247.59 | 3,381.93 | -228.10 | -456.83 | 40.089008 | -104.681022 | 1,276,328.34 | 3,229,137.00 |
| 3,552.00 | 16.90 | 248.59 | 3,473.35 | -239.04 | -484.00 | 40.088978 | -104.681119 | 1,276,317.15 | 3,229,109.94 |
| 3,647.00 | 16.73 | 245.05 | 3,564.29 | -249.85 | -509.25 | 40.088948 | -104.681209 | 1,276,306.11 | 3,229,084.78 |
| 3,742.00 | 16.96 | 240.18 | 3,655.22 | -262.51 | -533.67 | 40.088913 | -104.681297 | 1,276,293.23 | 3,229,060.48 |

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Geographic Coordinates Latitude (usft) | Geographic Coordinates Longitude (usft) | UTM Coordinates Northing (usft) | UTM Coordinates Easting (usft) |
|---|---|---|---|---|---|---|---|---|---|
| 3,837.00 | 16.87 | 240.74 | 3,746.11 | -276.14 | -557.72 | 40.088876 | -104.681383 | 1,276,279.38 | 3,229,036.56 |
| 3,932.00 | 17.05 | 238.67 | 3,836.98 | -290.12 | -581.64 | 40.088838 | -104.681468 | 1,276,265.18 | 3,229,012.77 |
| 4,027.00 | 17.80 | 238.52 | 3,927.62 | -304.94 | -605.92 | 40.088797 | -104.681555 | 1,276,250.13 | 3,228,988.63 |
| 4,122.00 | 16.46 | 238.35 | 4,018.40 | -319.59 | -629.76 | 40.088757 | -104.681640 | 1,276,235.26 | 3,228,964.93 |
| 4,218.00 | 18.37 | 239.48 | 4,110.00 | -334.41 | -654.37 | 40.088716 | -104.681728 | 1,276,220.22 | 3,228,940.46 |
| 4,313.00 | 17.86 | 239.54 | 4,200.29 | -349.40 | -679.83 | 40.088675 | -104.681819 | 1,276,205.00 | 3,228,915.14 |
| 4,408.00 | 16.18 | 238.76 | 4,291.13 | -363.65 | -703.70 | 40.088636 | -104.681904 | 1,276,190.52 | 3,228,891.40 |
| 4,503.00 | 17.50 | 241.87 | 4,382.05 | -377.25 | -727.62 | 40.088598 | -104.681990 | 1,276,176.70 | 3,228,867.61 |
| 4,598.00 | 20.34 | 245.73 | 4,471.92 | -390.77 | -755.27 | 40.088561 | -104.682089 | 1,276,162.93 | 3,228,840.09 |
| 4,693.00 | 19.04 | 243.96 | 4,561.36 | -404.36 | -784.25 | 40.088524 | -104.682192 | 1,276,149.07 | 3,228,811.24 |
| 4,788.00 | 18.08 | 242.99 | 4,651.42 | -417.86 | -811.30 | 40.088487 | -104.682289 | 1,276,135.32 | 3,228,784.31 |
| 4,883.00 | 18.13 | 242.64 | 4,741.71 | -431.35 | -837.56 | 40.088450 | -104.682383 | 1,276,121.59 | 3,228,758.18 |
| 4,979.00 | 17.07 | 242.03 | 4,833.22 | -444.82 | -863.27 | 40.088413 | -104.682475 | 1,276,107.88 | 3,228,732.59 |
| 5,074.00 | 16.91 | 243.32 | 4,924.07 | -457.56 | -887.93 | 40.088378 | -104.682563 | 1,276,094.91 | 3,228,708.05 |
| 5,169.00 | 18.14 | 242.65 | 5,014.66 | -470.56 | -913.42 | 40.088342 | -104.682654 | 1,276,081.68 | 3,228,682.69 |
| 5,264.00 | 16.61 | 242.94 | 5,105.32 | -483.53 | -938.64 | 40.088307 | -104.682744 | 1,276,068.47 | 3,228,657.59 |
| 5,359.00 | 18.14 | 244.99 | 5,195.99 | -495.96 | -964.14 | 40.088273 | -104.682835 | 1,276,055.81 | 3,228,632.21 |
| 5,455.00 | 17.00 | 245.34 | 5,287.51 | -508.14 | -990.44 | 40.088239 | -104.682929 | 1,276,043.39 | 3,228,606.02 |
| 5,550.00 | 18.55 | 239.80 | 5,377.98 | -521.53 | -1,016.12 | 40.088202 | -104.683021 | 1,276,029.76 | 3,228,580.47 |
| 5,708.00 | 17.53 | 237.82 | 5,528.21 | -546.85 | -1,057.99 | 40.088133 | -104.683170 | 1,276,004.06 | 3,228,538.84 |
| 5,835.00 | 17.11 | 235.33 | 5,649.45 | -567.66 | -1,089.54 | 40.088076 | -104.683283 | 1,275,982.95 | 3,228,507.48 |
| 5,930.00 | 14.61 | 234.12 | 5,740.83 | -582.64 | -1,110.74 | 40.088035 | -104.683359 | 1,275,967.78 | 3,228,486.42 |
| 6,026.00 | 12.70 | 231.46 | 5,834.11 | -596.31 | -1,128.81 | 40.087997 | -104.683424 | 1,275,953.95 | 3,228,468.48 |
| 6,121.00 | 10.98 | 230.07 | 5,927.09 | -608.62 | -1,143.92 | 40.087963 | -104.683478 | 1,275,941.49 | 3,228,453.49 |
| 6,216.00 | 9.21 | 235.11 | 6,020.61 | -618.78 | -1,157.09 | 40.087935 | -104.683525 | 1,275,931.22 | 3,228,440.41 |
| 6,311.00 | 6.99 | 240.95 | 6,114.66 | -625.94 | -1,168.38 | 40.087916 | -104.683565 | 1,275,923.95 | 3,228,429.18 |
| 6,406.00 | 5.08 | 248.36 | 6,209.13 | -630.30 | -1,177.35 | 40.087904 | -104.683597 | 1,275,919.51 | 3,228,420.26 |
| 6,501.00 | 3.58 | 250.40 | 6,303.86 | -632.84 | -1,184.05 | 40.087897 | -104.683621 | 1,275,916.91 | 3,228,413.58 |
| 6,596.00 | 2.06 | 264.93 | 6,398.74 | -633.99 | -1,188.55 | 40.087894 | -104.683637 | 1,275,915.72 | 3,228,409.10 |
| 6,691.00 | 1.84 | 315.23 | 6,493.69 | -633.06 | -1,191.32 | 40.087896 | -104.683647 | 1,275,916.62 | 3,228,406.31 |
| 6,739.00 | 1.79 | 330.68 | 6,541.67 | -631.86 | -1,192.23 | 40.087900 | -104.683650 | 1,275,917.82 | 3,228,405.39 |
| 6,786.00 | 7.41 | 351.59 | 6,588.50 | -628.21 | -1,193.03 | 40.087910 | -104.683653 | 1,275,921.45 | 3,228,404.56 |
| 6,834.00 | 11.76 | 355.97 | 6,635.82 | -620.27 | -1,193.83 | 40.087931 | -104.683656 | 1,275,929.39 | 3,228,403.69 |
| 6,881.00 | 15.27 | 357.41 | 6,681.51 | -609.30 | -1,194.45 | 40.087961 | -104.683658 | 1,275,940.35 | 3,228,402.97 |
| 6,929.00 | 18.03 | 358.68 | 6,727.50 | -595.56 | -1,194.90 | 40.087999 | -104.683660 | 1,275,954.08 | 3,228,402.38 |
| 6,977.00 | 20.67 | 0.21 | 6,772.78 | -579.66 | -1,195.04 | 40.088043 | -104.683660 | 1,275,969.98 | 3,228,402.10 |
| 7,025.00 | 25.81 | 359.20 | 6,816.87 | -560.73 | -1,195.16 | 40.088095 | -104.683661 | 1,275,988.91 | 3,228,401.81 |
| 7,072.00 | 30.71 | 358.55 | 6,858.26 | -538.49 | -1,195.61 | 40.088156 | -104.683662 | 1,276,011.15 | 3,228,401.15 |
| 7,120.00 | 35.61 | 0.37 | 6,898.43 | -512.24 | -1,195.83 | 40.088228 | -104.683663 | 1,276,037.39 | 3,228,400.69 |
| 7,167.00 | 40.28 | 358.94 | 6,935.48 | -483.35 | -1,196.02 | 40.088307 | -104.683664 | 1,276,066.27 | 3,228,400.23 |
| 7,215.00 | 45.88 | 359.03 | 6,970.53 | -450.59 | -1,196.60 | 40.088397 | -104.683666 | 1,276,099.03 | 3,228,399.35 |
| 7,262.00 | 51.84 | 0.46 | 7,001.44 | -415.21 | -1,196.74 | 40.088494 | -104.683666 | 1,276,134.41 | 3,228,398.88 |

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Geographic Coordinates Latitude (usft) | Geographic Coordinates Longitude (usft) | UTM Coordinates Northing (usft) | UTM Coordinates Easting (usft) |
|---|---|---|---|---|---|---|---|---|---|
| 7,310.00 | 55.21 | 0.35 | 7,029.97 | -376.62 | -1,196.46 | 40.088600 | -104.683665 | 1,276,173.00 | 3,228,398.80 |
| 7,357.00 | 61.62 | 0.55 | 7,054.57 | -336.60 | -1,196.15 | 40.088710 | -104.683664 | 1,276,213.01 | 3,228,398.75 |
| 7,405.00 | 66.15 | 0.30 | 7,075.69 | -293.51 | -1,195.83 | 40.088828 | -104.683663 | 1,276,256.10 | 3,228,398.66 |
| 7,452.00 | 69.01 | 0.63 | 7,093.62 | -250.07 | -1,195.48 | 40.088948 | -104.683662 | 1,276,299.54 | 3,228,398.62 |
| 7,500.00 | 74.40 | 0.47 | 7,108.68 | -204.52 | -1,195.04 | 40.089073 | -104.683660 | 1,276,345.09 | 3,228,398.63 |
| 7,548.00 | 79.52 | 0.52 | 7,119.51 | -157.77 | -1,194.63 | 40.089201 | -104.683659 | 1,276,391.84 | 3,228,398.60 |
| 7,608.00 | 85.22 | 1.63 | 7,127.47 | -98.34 | -1,193.52 | 40.089364 | -104.683655 | 1,276,451.28 | 3,228,399.17 |
| 7,644.20 | 87.49 | 1.20 | 7,129.77 | -62.23 | -1,192.62 | 40.089463 | -104.683652 | 1,276,487.40 | 3,228,399.73 |
| 7,678.00 | 89.60 | 0.80 | 7,130.63 | -28.44 | -1,192.03 | 40.089556 | -104.683650 | 1,276,521.18 | 3,228,400.01 |
| 7,774.00 | 89.07 | 0.64 | 7,131.75 | 67.54 | -1,190.83 | 40.089819 | -104.683645 | 1,276,617.17 | 3,228,400.32 |
| 7,869.00 | 89.04 | 0.36 | 7,133.31 | 162.52 | -1,190.00 | 40.090080 | -104.683642 | 1,276,712.15 | 3,228,400.27 |
| 7,964.00 | 88.89 | 359.95 | 7,135.03 | 257.51 | -1,189.74 | 40.090341 | -104.683641 | 1,276,807.13 | 3,228,399.65 |
| 8,059.00 | 89.78 | 0.11 | 7,136.13 | 352.50 | -1,189.69 | 40.090602 | -104.683641 | 1,276,902.12 | 3,228,398.82 |
| 8,154.00 | 90.15 | 0.25 | 7,136.19 | 447.50 | -1,189.39 | 40.090862 | -104.683640 | 1,276,997.11 | 3,228,398.24 |
| 8,249.00 | 90.25 | 359.99 | 7,135.86 | 542.50 | -1,189.20 | 40.091123 | -104.683640 | 1,277,092.10 | 3,228,397.56 |
| 8,345.00 | 89.94 | 359.41 | 7,135.70 | 638.50 | -1,189.70 | 40.091387 | -104.683641 | 1,277,188.09 | 3,228,396.17 |
| 8,440.00 | 90.03 | 358.85 | 7,135.72 | 733.49 | -1,191.14 | 40.091647 | -104.683647 | 1,277,283.06 | 3,228,393.85 |
| 8,535.00 | 89.97 | 359.52 | 7,135.72 | 828.48 | -1,192.49 | 40.091908 | -104.683651 | 1,277,378.03 | 3,228,391.62 |
| 8,630.00 | 90.15 | 359.03 | 7,135.63 | 923.47 | -1,193.69 | 40.092169 | -104.683656 | 1,277,473.00 | 3,228,389.54 |
| 8,725.00 | 90.86 | 0.13 | 7,134.79 | 1,018.46 | -1,194.39 | 40.092430 | -104.683658 | 1,277,567.98 | 3,228,387.96 |
| 8,859.00 | 90.68 | 359.40 | 7,132.99 | 1,152.45 | -1,194.94 | 40.092798 | -104.683660 | 1,277,701.95 | 3,228,386.17 |
| 8,915.00 | 90.15 | 0.22 | 7,132.58 | 1,208.44 | -1,195.13 | 40.092951 | -104.683661 | 1,277,757.94 | 3,228,385.47 |
| 9,010.00 | 90.56 | 0.71 | 7,131.99 | 1,303.44 | -1,194.35 | 40.093212 | -104.683658 | 1,277,852.93 | 3,228,385.36 |
| 9,106.00 | 90.43 | 0.29 | 7,131.16 | 1,399.43 | -1,193.52 | 40.093476 | -104.683655 | 1,277,948.92 | 3,228,385.31 |
| 9,201.00 | 90.31 | 0.15 | 7,130.55 | 1,494.43 | -1,193.15 | 40.093736 | -104.683654 | 1,278,043.92 | 3,228,384.80 |
| 9,296.00 | 90.09 | 0.10 | 7,130.22 | 1,589.43 | -1,192.94 | 40.093997 | -104.683653 | 1,278,138.91 | 3,228,384.13 |
| 9,391.00 | 89.91 | 359.77 | 7,130.22 | 1,684.43 | -1,193.05 | 40.094258 | -104.683654 | 1,278,233.90 | 3,228,383.14 |
| 9,486.00 | 90.37 | 359.79 | 7,129.99 | 1,779.42 | -1,193.42 | 40.094519 | -104.683655 | 1,278,328.89 | 3,228,381.89 |
| 9,581.00 | 90.28 | 359.76 | 7,129.45 | 1,874.42 | -1,193.79 | 40.094779 | -104.683656 | 1,278,423.87 | 3,228,380.64 |
| 9,676.00 | 90.40 | 359.73 | 7,128.88 | 1,969.42 | -1,194.21 | 40.095040 | -104.683658 | 1,278,518.86 | 3,228,379.34 |
| 9,772.00 | 90.31 | 359.32 | 7,128.29 | 2,065.41 | -1,195.01 | 40.095304 | -104.683661 | 1,278,614.84 | 3,228,377.66 |
| 9,867.00 | 90.09 | 359.01 | 7,127.96 | 2,160.40 | -1,196.39 | 40.095564 | -104.683666 | 1,278,709.81 | 3,228,375.39 |
| 9,962.00 | 90.09 | 358.73 | 7,127.81 | 2,255.38 | -1,198.27 | 40.095825 | -104.683672 | 1,278,804.76 | 3,228,372.64 |
| 10,057.00 | 90.25 | 359.60 | 7,127.53 | 2,350.37 | -1,199.65 | 40.096086 | -104.683677 | 1,278,899.73 | 3,228,370.38 |
| 10,153.00 | 90.43 | 359.18 | 7,126.96 | 2,446.37 | -1,200.67 | 40.096349 | -104.683681 | 1,278,995.71 | 3,228,368.47 |
| 10,248.00 | 90.12 | 358.70 | 7,126.50 | 2,541.35 | -1,202.43 | 40.096610 | -104.683687 | 1,279,090.67 | 3,228,365.83 |
| 10,343.00 | 90.34 | 359.66 | 7,126.12 | 2,636.34 | -1,203.79 | 40.096871 | -104.683692 | 1,279,185.63 | 3,228,363.59 |
| 10,438.00 | 89.51 | 0.44 | 7,126.24 | 2,731.33 | -1,203.71 | 40.097132 | -104.683692 | 1,279,280.63 | 3,228,362.80 |
| 10,533.00 | 89.35 | 359.91 | 7,127.19 | 2,826.33 | -1,203.42 | 40.097392 | -104.683691 | 1,279,375.61 | 3,228,362.21 |
| 10,628.00 | 89.75 | 359.88 | 7,127.93 | 2,921.33 | -1,203.59 | 40.097653 | -104.683691 | 1,279,470.60 | 3,228,361.15 |
| 10,723.00 | 89.20 | 1.05 | 7,128.81 | 3,016.32 | -1,202.82 | 40.097914 | -104.683689 | 1,279,565.59 | 3,228,361.05 |
| 10,818.00 | 88.98 | 0.45 | 7,130.31 | 3,111.30 | -1,201.58 | 40.098175 | -104.683684 | 1,279,660.58 | 3,228,361.41 |

## Design Report for Dreiling 27N-32HZ - Actual Field Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Geographic Coordinates Latitude (usft) | Geographic Coordinates Longitude (usft) | UTM Coordinates Northing (usft) | UTM Coordinates Easting (usft) |
|---|---|---|---|---|---|---|---|---|---|
| 10,913.00 | 88.89 | 0.05 | 7,132.08 | 3,206.28 | -1,201.16 | 40.098435 | -104.683683 | 1,279,755.55 | 3,228,360.95 |
| 11,008.00 | 91.08 | 0.36 | 7,132.10 | 3,301.27 | -1,200.82 | 40.098696 | -104.683682 | 1,279,850.54 | 3,228,360.41 |
| 11,103.00 | 90.68 | 359.47 | 7,130.65 | 3,396.26 | -1,200.96 | 40.098957 | -104.683682 | 1,279,945.52 | 3,228,359.39 |
| 11,199.00 | 90.77 | 359.80 | 7,129.43 | 3,492.25 | -1,201.57 | 40.099220 | -104.683684 | 1,280,041.50 | 3,228,357.89 |
| 11,294.00 | 90.31 | 0.94 | 7,128.54 | 3,587.24 | -1,200.96 | 40.099481 | -104.683682 | 1,280,136.49 | 3,228,357.62 |
| 11,389.00 | 89.69 | 0.30 | 7,128.54 | 3,682.24 | -1,199.93 | 40.099742 | -104.683678 | 1,280,231.48 | 3,228,357.77 |
| 11,484.00 | 88.86 | 359.50 | 7,129.74 | 3,777.23 | -1,200.10 | 40.100003 | -104.683679 | 1,280,326.46 | 3,228,356.73 |
| 11,579.00 | 88.83 | 359.16 | 7,131.65 | 3,872.20 | -1,201.21 | 40.100263 | -104.683683 | 1,280,421.42 | 3,228,354.74 |
| 11,770.00 | 90.37 | 358.59 | 7,132.99 | 4,063.15 | -1,204.96 | 40.100788 | -104.683697 | 1,280,612.32 | 3,228,349.22 |
| 11,817.00 | 90.37 | 358.59 | 7,132.68 | 4,110.14 | -1,206.12 | 40.100917 | -104.683701 | 1,280,659.29 | 3,228,347.63 |

### *Design Annotations*

| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Comment |
|---|---|---|---|---|
| 966.00 | 965.99 | 0.92 | 0.45 | Tie-On to Gyro Surveys @ 966.00ft |
| 1,096.00 | 1,095.98 | 0.61 | -0.73 | First MWD Survey @ 1096.00ft |
| 11,770.00 | 7,132.99 | 4,063.15 | -1,204.96 | Final MWD Survey @ 11770.00ft |
| 11,817.00 | 7,132.68 | 4,110.14 | -1,206.12 | Str Line Proj to Bit @ 11817' MD :: 7132.68' TVD |

### *Vertical Section Information*

| Angle Type | Target | Azimuth (°) | Origin Type | Origin +N/_S (usft) | Origin +E/-W (usft) | Start TVD (usft) |
|---|---|---|---|---|---|---|
| User | No Target (Freehand) | 0.00 | Slot | 0.00 | 0.00 | 0.00 |

### *Survey tool program*

| From (usft) | To (usft) | Survey/Plan | Survey Tool |
|---|---|---|---|
| 13.00 | 966.00 | MS Energy Surveys | NS-GYRO-MS |
| 1,096.00 | 7,608.00 | MWD Vertical/Build Surveys | MWD+IFR1+SC |
| 7,678.00 | 11,770.00 | MWD Lateral Surveys | MWD+IFR1+SC |

# Design Report for Dreiling 27N-32HZ - Actual Field Surveys

## Casing Details

| Measured Depth (usft) | Vertical Depth (usft) | Name | Casing Diameter (") | Hole Diameter (") |
|---|---|---|---|---|
| 1,046.00 | 1,045.99 | 9 5/8" Casing Set @ 1046' MD :: 1045.99' TVD | 9-5/8 | 13-1/2 |
| 7,644.20 | 7,129.77 | 7" Casing Set @ 7644.2' MD :: 7129.77' TVD | 7 | 8-3/4 |

## Design Targets

| Shape | Target Name | TVD (usft) | Northing (usft) | Easting (usft) | +N/-S usft | +E/-W usft | Created | Updated |
|---|---|---|---|---|---|---|---|---|
| Polygon | Dreiling 27N-32HZ_LD | 0.00 | 1,276,560.66 | 3,229,591.68 | 0.00 | 0.00 | 11/26/2013 | 11/26/2013 |
| Point | Dreiling 27N-32HZ_SHL | 0.00 | 1,276,560.66 | 3,229,591.68 | 0.00 | 0.00 | 11/25/2013 | 11/25/2013 |
| Polygon | Dreiling 27N-32HZ_SEC | 0.00 | 1,276,560.66 | 3,229,591.68 | 0.00 | 0.00 | 11/25/2013 | 11/25/2013 |
| Point | Dreiling 27N-32HZ_BHL | 7,132.00 | 1,280,679.25 | 3,228,357.00 | 4,130.01 | -1,196.56 | 11/25/2013 | 11/25/2013 |

## Directional Difficulty Index

| | | | |
|---|---|---|---|
| Average Dogleg over Survey: | 1.70 °/100usft | Maximum Dogleg over Survey: | 13.64 °/100usft at 7,357.00 usft |
| Net Tortousity applicable to Plans: | 0.21 °/100usft | Directional Difficulty Index: | 6.309 |

## Audit Info

# North Reference Sheet for Sec. 32-T2N-R65W - Dreiling 27N-32HZ - Plan B

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB = 13' @ 4937.00usft (Ensign 132). Northing and Easting are relative to Dreiling 27N-32HZ

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996078

Grid Coordinates of Well: 1,276,560.65 usft N, 3,229,591.68 usft E

Geographical Coordinates of Well: 40° 05' 22.68" N, 104° 40' 45.80" W

Grid Convergence at Surface is: 0.53°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,817.00usft

the Bottom Hole Displacement is 4,283.45usft in the Direction of 343.65° (True).

Magnetic Convergence at surface is: -7.97° (25 November 2013, , BGGM2013)