

# Noble Energy

Weld County, CO (NAD 83)

Sec. 23-T6N-R65W

Feit E23-99HZ

Design: MWD Survey

## Sperry Drilling Services

# Final Survey Report

21 March, 2011

Well Coordinates: 1,417,105.06 N, 3,240,006.32 E (40° 28' 30.54" N, 104° 38' 14.21" W)

Ground Level: 4,732.00 ft

Local Coordinate Origin:

Centered on Well Feit E23-99HZ

Viewing Datum:

KB @ 4756.00ft (Rig KB)

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

**HALLIBURTON**

**Design Report for Feit E23-99HZ - MWD Survey**

| Measured Depth (ft)            | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) |
|--------------------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|
| 0.00                           | 0.00            | 0.00        | 0.00                | 0.00       | 0.00       | 0.00                  | 0.00                  |
| 708.00                         | 0.22            | 179.19      | 708.00              | -1.36      | 0.02       | 0.10                  | 0.03                  |
| <b>First Sperry MWD Survey</b> |                 |             |                     |            |            |                       |                       |
| 983.00                         | 0.36            | 185.78      | 982.99              | -2.75      | -0.06      | 0.11                  | 0.05                  |
| 1,260.00                       | 0.56            | 235.97      | 1,259.99            | -4.37      | -1.27      | -1.00                 | 0.16                  |
| 1,544.00                       | 0.38            | 256.15      | 1,543.98            | -5.37      | -3.33      | -3.00                 | 0.09                  |
| 1,922.00                       | 0.55            | 278.34      | 1,921.96            | -5.41      | -6.35      | -6.01                 | 0.06                  |
| 2,303.00                       | 1.30            | 298.46      | 2,302.91            | -3.08      | -11.96     | -11.75                | 0.21                  |
| 2,590.00                       | 0.80            | 248.28      | 2,589.87            | -2.27      | -16.68     | -16.51                | 0.35                  |
| 2,971.00                       | 0.93            | 226.52      | 2,970.83            | -5.39      | -21.39     | -21.03                | 0.09                  |
| 3,259.00                       | 0.47            | 96.14       | 3,258.82            | -7.12      | -21.92     | -21.44                | 0.45                  |
| 3,642.00                       | 0.20            | 158.37      | 3,641.81            | -7.91      | -20.11     | -19.59                | 0.11                  |
| 3,929.00                       | 0.73            | 193.87      | 3,928.80            | -10.15     | -20.36     | -19.71                | 0.20                  |
| 4,216.00                       | 1.32            | 108.28      | 4,215.77            | -12.96     | -17.66     | -16.84                | 0.51                  |
| 4,503.00                       | 1.79            | 77.52       | 4,502.66            | -13.03     | -10.14     | -9.34                 | 0.33                  |
| 4,788.00                       | 2.58            | 104.98      | 4,787.46            | -13.73     | 0.40       | 1.23                  | 0.45                  |
| 5,076.00                       | 1.88            | 115.25      | 5,075.24            | -17.42     | 10.93      | 11.97                 | 0.28                  |
| 5,363.00                       | 1.14            | 79.10       | 5,362.15            | -18.89     | 18.00      | 19.11                 | 0.41                  |
| 5,554.00                       | 0.77            | 342.07      | 5,553.13            | -17.31     | 19.47      | 20.48                 | 0.76                  |
| 5,841.00                       | 0.75            | 318.82      | 5,840.11            | -14.06     | 17.64      | 18.45                 | 0.11                  |
| 6,096.00                       | 0.96            | 11.75       | 6,095.08            | -10.71     | 16.97      | 17.59                 | 0.31                  |
| 6,157.00                       | 0.94            | 359.06      | 6,156.07            | -9.71      | 17.07      | 17.62                 | 0.35                  |
| 6,227.00                       | 2.85            | 80.83       | 6,226.04            | -8.86      | 18.78      | 19.28                 | 4.10                  |
| 6,259.00                       | 6.27            | 97.35       | 6,257.93            | -8.95      | 21.30      | 21.80                 | 11.34                 |
| 6,291.00                       | 9.69            | 102.27      | 6,289.62            | -9.75      | 25.66      | 26.21                 | 10.89                 |
| 6,323.00                       | 11.95           | 107.39      | 6,321.05            | -11.31     | 31.46      | 32.08                 | 7.67                  |
| 6,355.00                       | 14.97           | 109.68      | 6,352.17            | -13.70     | 38.51      | 39.27                 | 9.58                  |
| 6,387.00                       | 17.99           | 110.41      | 6,382.85            | -16.81     | 47.04      | 47.97                 | 9.46                  |
| 6,419.00                       | 20.63           | 109.75      | 6,413.05            | -20.44     | 56.97      | 58.11                 | 8.28                  |
| 6,451.00                       | 23.58           | 106.18      | 6,442.69            | -24.13     | 68.43      | 69.77                 | 10.13                 |
| 6,483.00                       | 26.76           | 103.16      | 6,471.65            | -27.55     | 81.60      | 83.11                 | 10.71                 |
| 6,515.00                       | 29.62           | 101.17      | 6,499.85            | -30.73     | 96.37      | 98.06                 | 9.41                  |
| 6,547.00                       | 31.62           | 98.80       | 6,527.39            | -33.54     | 112.42     | 114.25                | 7.30                  |
| 6,578.00                       | 33.12           | 95.43       | 6,553.58            | -35.59     | 128.89     | 130.81                | 7.57                  |
| 6,610.00                       | 35.13           | 92.40       | 6,580.07            | -36.80     | 146.79     | 148.75                | 8.22                  |
| 6,642.00                       | 36.63           | 90.55       | 6,605.99            | -37.28     | 165.54     | 167.49                | 5.78                  |
| 6,674.00                       | 37.34           | 90.13       | 6,631.56            | -37.39     | 184.79     | 186.71                | 2.36                  |
| 6,706.00                       | 39.54           | 89.87       | 6,656.62            | -37.39     | 204.68     | 206.57                | 6.89                  |
| 6,738.00                       | 41.46           | 91.71       | 6,680.95            | -37.68     | 225.46     | 227.33                | 7.07                  |
| 6,769.00                       | 43.65           | 92.80       | 6,703.79            | -38.51     | 246.41     | 248.29                | 7.45                  |
| 6,801.00                       | 45.75           | 94.81       | 6,726.53            | -40.01     | 268.86     | 270.79                | 7.91                  |
| 6,833.00                       | 48.74           | 95.42       | 6,748.25            | -42.11     | 292.26     | 294.27                | 9.45                  |
| 6,864.00                       | 51.25           | 96.03       | 6,768.18            | -44.48     | 315.89     | 318.00                | 8.24                  |
| 6,897.00                       | 54.15           | 95.59       | 6,788.17            | -47.14     | 342.00     | 344.23                | 8.85                  |
| 6,929.00                       | 56.73           | 94.77       | 6,806.33            | -49.51     | 368.24     | 370.56                | 8.33                  |
| 6,961.00                       | 59.83           | 93.70       | 6,823.15            | -51.52     | 395.38     | 397.78                | 10.10                 |
| 6,993.00                       | 62.08           | 94.70       | 6,838.68            | -53.57     | 423.28     | 425.75                | 7.54                  |
| 7,025.00                       | 64.12           | 93.31       | 6,853.16            | -55.56     | 451.75     | 454.28                | 7.46                  |
| 7,057.00                       | 66.90           | 93.20       | 6,866.43            | -57.21     | 480.82     | 483.40                | 8.69                  |
| 7,089.00                       | 70.81           | 93.46       | 6,877.97            | -58.95     | 510.61     | 513.24                | 12.24                 |

## Design Report for Feit E23-99HZ - MWD Survey

| Measured Depth (ft)  | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) |
|--|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|
| 7,120.00   | 74.63           | 93.27       | 6,887.17            | -60.68     | 540.15     | 542.84                | 12.34                 |
| 7,152.00   | 76.14           | 93.82       | 6,895.25            | -62.60     | 571.06     | 573.80                | 5.00                  |
| 7,184.00   | 76.94           | 94.22       | 6,902.70            | -64.78     | 602.10     | 604.92                | 2.78                  |
| 7,216.00   | 78.99           | 94.73       | 6,909.37            | -67.22     | 633.30     | 636.21                | 6.59                  |
| 7,261.00   | 82.16           | 94.91       | 6,916.74            | -70.95     | 677.53     | 680.58                | 7.06                  |
| 7,340.00   | 86.76           | 96.12       | 6,924.36            | -78.51     | 755.77     | 759.14                | 6.02                  |
| 7,372.00   | 87.26           | 95.64       | 6,926.03            | -81.78     | 787.56     | 791.07                | 2.16                  |
| 7,404.00   | 87.26           | 95.22       | 6,927.56            | -84.81     | 819.38     | 823.01                | 1.31                  |
| 7,468.00   | 88.03           | 94.87       | 6,930.19            | -90.43     | 883.08     | 886.94                | 1.32                  |
| 7,563.00   | 88.55           | 94.33       | 6,933.02            | -98.05     | 977.73     | 981.87                | 0.79                  |
| 7,627.00   | 88.49           | 93.18       | 6,934.68            | -102.24    | 1,041.57   | 1,045.85              | 1.80                  |
| 7,691.00   | 89.01           | 93.06       | 6,936.07            | -105.72    | 1,105.46   | 1,109.83              | 0.83                  |
| 7,787.00   | 89.23           | 90.67       | 6,937.55            | -108.84    | 1,201.39   | 1,205.78              | 2.50                  |
| 7,882.00   | 91.30           | 90.74       | 6,937.11            | -110.01    | 1,296.38   | 1,300.66              | 2.18                  |
| 7,945.00   | 91.35           | 89.66       | 6,935.65            | -110.23    | 1,359.36   | 1,363.54              | 1.72                  |
| 8,041.00   | 90.99           | 89.35       | 6,933.69            | -109.40    | 1,455.34   | 1,459.29              | 0.49                  |
| 8,137.00   | 88.58           | 88.87       | 6,934.05            | -107.91    | 1,551.32   | 1,555.00              | 2.56                  |
| 8,201.00   | 88.92           | 87.72       | 6,935.45            | -106.01    | 1,615.27   | 1,618.73              | 1.87                  |
| 8,265.00   | 89.11           | 87.00       | 6,936.55            | -103.06    | 1,679.19   | 1,682.35              | 1.16                  |
| 8,328.00   | 89.91           | 87.13       | 6,937.09            | -99.84     | 1,742.11   | 1,744.96              | 1.29                  |
| 8,392.00   | 90.77           | 87.22       | 6,936.71            | -96.68     | 1,806.03   | 1,808.57              | 1.35                  |
| 8,456.00   | 90.28           | 87.54       | 6,936.12            | -93.76     | 1,869.96   | 1,872.20              | 0.91                  |
| 8,519.00   | 89.91           | 87.52       | 6,936.02            | -91.04     | 1,932.90   | 1,934.87              | 0.59                  |
| 8,583.00   | 90.34           | 88.61       | 6,935.88            | -88.88     | 1,996.86   | 1,998.58              | 1.83                  |
| 8,647.00   | 90.56           | 88.87       | 6,935.37            | -87.47     | 2,060.84   | 2,062.36              | 0.53                  |
| 8,710.00   | 90.80           | 89.04       | 6,934.63            | -86.32     | 2,123.83   | 2,125.16              | 0.47                  |
| 8,806.00   | 90.49           | 91.90       | 6,933.55            | -87.11     | 2,219.81   | 2,221.01              | 3.00                  |
| 8,902.00   | 90.06           | 93.63       | 6,933.08            | -91.74     | 2,315.69   | 2,317.00              | 1.86                  |
| 9,029.00   | 90.65           | 95.60       | 6,932.30            | -101.96    | 2,442.27   | 2,443.96              | 1.62                  |
| 9,124.00   | 91.36           | 97.08       | 6,930.63            | -112.45    | 2,536.67   | 2,538.83              | 1.73                  |
| 9,220.00   | 89.48           | 97.32       | 6,929.93            | -124.48    | 2,631.91   | 2,634.62              | 1.97                  |
| 9,315.00   | 90.12           | 96.83       | 6,930.26            | -136.18    | 2,726.19   | 2,729.43              | 0.85                  |
| 9,411.00   | 89.66           | 95.01       | 6,930.44            | -146.08    | 2,821.67   | 2,825.34              | 1.96                  |
| 9,507.00   | 90.77           | 94.25       | 6,930.08            | -153.83    | 2,917.35   | 2,921.31              | 1.40                  |
| 9,603.00   | 91.66           | 92.48       | 6,928.05            | -159.46    | 3,013.16   | 3,017.29              | 2.06                  |
| 9,698.00   | 90.89           | 93.58       | 6,925.93            | -164.48    | 3,108.00   | 3,112.26              | 1.41                  |
| 9,793.00   | 89.04           | 93.22       | 6,925.99            | -170.12    | 3,202.83   | 3,207.25              | 1.98                  |
| 9,889.00   | 89.57           | 92.84       | 6,927.16            | -175.19    | 3,298.69   | 3,303.24              | 0.68                  |
| 9,984.00   | 91.23           | 92.67       | 6,926.49            | -179.76    | 3,393.57   | 3,398.23              | 1.76                  |
| 10,080.00  | 91.51           | 93.35       | 6,924.20            | -184.80    | 3,489.41   | 3,494.20              | 0.77                  |
| 10,175.00  | 90.34           | 93.84       | 6,922.66            | -190.75    | 3,584.21   | 3,589.19              | 1.34                  |
| 10,270.00  | 92.34           | 94.05       | 6,920.44            | -197.29    | 3,678.96   | 3,684.15              | 2.12                  |
| 10,366.00  | 90.65           | 94.57       | 6,917.94            | -204.50    | 3,774.65   | 3,780.10              | 1.84                  |
| 10,461.00  | 90.46           | 93.56       | 6,917.02            | -211.23    | 3,869.40   | 3,875.09              | 1.08                  |
| 10,532.00  | 91.82           | 92.84       | 6,915.61            | -215.20    | 3,940.28   | 3,946.08              | 2.17                  |
| Final Sperry MWD Survey                                      |                 |             |                     |            |            |                       |                       |
| 10,582.00  | 91.82           | 92.84       | 6,914.02            | -217.67    | 3,990.19   | 3,996.05              | 0.00                  |
| Survey Projection to TD - Estimated BHL: 1573' FNL, 576' FEL |                 |             |                     |            |            |                       |                       |



## Design Report for Feit E23-99HZ - MWD Survey

Design Annotations

| Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates |            | Comment                            |
|---------------------|---------------------|-------------------|------------|------------------------------------|
|                     |                     | +N/-S (ft)        | +E/-W (ft) |                                    |
| 708.00              | 708.00              | -1.36             | 0.02       | First Sperry MWD Survey            |
| 10,532.00           | 6,915.61            | -215.20           | 3,940.28   | Final Sperry MWD Survey            |
| 10,582.00           | 6,914.02            | -217.67           | 3,990.19   | Survey Projection to TD            |
| 10,582.00           | 6,914.02            | -217.67           | 3,990.19   | Estimated BHL: 1573' FNL, 576' FEL |

Vertical Section Information

| Angle Type | Target         | Azimuth (°) | Origin Type | +N/-S (ft) | +E/-W (ft) | Start TVD (ft) |
|------------|----------------|-------------|-------------|------------|------------|----------------|
| Target     | Feit E23-99HZ_ | 93.47       | Slot        | 0.00       | 0.00       | 0.00           |

Survey tool program

| From (ft) | To (ft)   | Survey/Plan        | Survey Tool |
|-----------|-----------|--------------------|-------------|
| 708.00    | 10,582.00 | Sperry MWD Surveys | MWD         |

Targets

| Target Name<br>- hit/miss target<br>- Shape  | Dip Angle (°) | Dip Dir. (°) | TVD (ft) | +N/-S (ft) | +E/-W (ft) | Northing (ft) | Easting (ft) | Latitude         | Longitude         |
|--|---------------|--------------|----------|------------|------------|---------------|--------------|------------------|-------------------|
| Feit   | 0.00          | 0.00         | 38.00    | -2,656.98  | 4,352.72   | 1,414,448.17  | 3,244,358.88 | 40° 28' 3.864 N  | 104° 37' 18.228 W |
| - actual wellpath misses target center by 5099.58ft at 43.22ft MD (43.22 TVD, -0.01 N, 0.00 E)         |               |              |          |            |            |               |              |                  |                   |
| - Polygon  |               |              |          |            |            |               |              |                  |                   |
| Point 1  |               |              |          | 4,623.72   | -3,939.98  | 1,413,165.22  | 3,244,629.87 |                  |                   |
| Point 2  |               |              |          | -681.28    | -4,061.98  | 1,413,043.22  | 3,239,325.06 |                  |                   |
| Point 3  |               |              |          | -789.28    | 1,329.02   | 1,418,434.03  | 3,239,217.06 |                  |                   |
| Point 4  |               |              |          | 4,540.72   | 1,360.02   | 1,418,465.03  | 3,244,546.87 |                  |                   |
| Point 5  |               |              |          | 4,623.72   | -3,939.98  | 1,413,165.22  | 3,244,629.87 |                  |                   |
| Feit E23-97HZ_460'   | 0.00          | 0.00         | 38.00    | -2,656.98  | 4,352.72   | 1,414,448.17  | 3,244,358.88 | 40° 28' 3.864 N  | 104° 37' 18.228 W |
| - actual wellpath misses target center by 5099.58ft at 43.22ft MD (43.22 TVD, -0.01 N, 0.00 E)         |               |              |          |            |            |               |              |                  |                   |
| - Polygon  |               |              |          |            |            |               |              |                  |                   |
| Point 1  |               |              |          | 4,163.72   | -3,479.98  | 1,413,625.20  | 3,244,169.89 |                  |                   |
| Point 2  |               |              |          | -221.28    | -3,601.98  | 1,413,503.21  | 3,239,785.04 |                  |                   |
| Point 3  |               |              |          | -329.28    | 869.02     | 1,417,974.05  | 3,239,677.04 |                  |                   |
| Point 4  |               |              |          | 4,080.72   | 900.02     | 1,418,005.05  | 3,244,086.89 |                  |                   |
| Point 5  |               |              |          | 4,163.72   | -3,479.98  | 1,413,625.20  | 3,244,169.89 |                  |                   |
| Feit   | 0.00          | 0.00         | 6,875.52 | -244.63    | 4,031.12   | 1,416,860.44  | 3,244,037.29 | 40° 28' 27.732 N | 104° 37' 22.080 W |
| - actual wellpath misses target center by 62.32ft at 10582.00ft MD (6914.02 TVD, -217.67 N, 3990.19 E) |               |              |          |            |            |               |              |                  |                   |
| - Point  |               |              |          |            |            |               |              |                  |                   |

**North Reference Sheet for Sec. 23-T6N-R65W - Feit E23-99HZ**

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

Vertical Depths are relative to KB @ 4756.00ft (Rig KB). Northing and Easting are relative to Feit E23-99HZ

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° 30' 0.000 W°, Longitude Origin: 0° 0' 0.000 E°, Latitude Origin: 40° 47' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996450

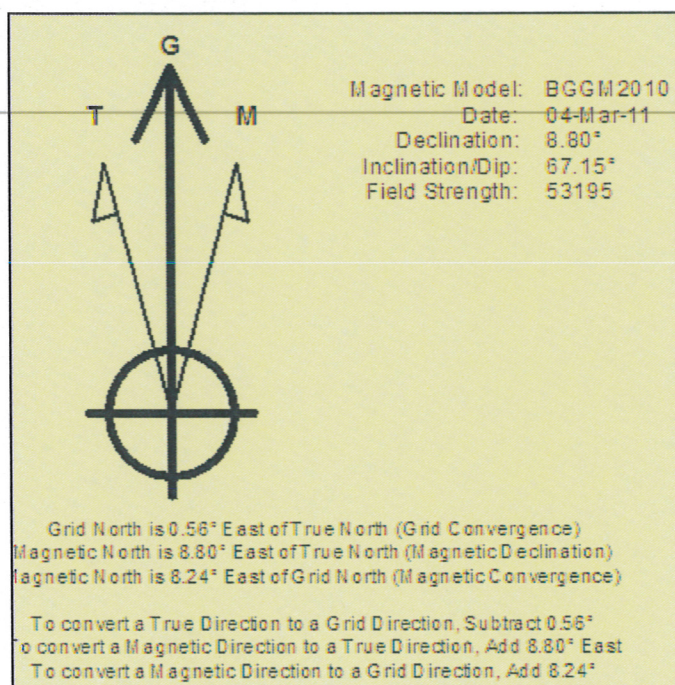
Grid Coordinates of Well: 1,417,105.06 ft N, 3,240,006.32 ft E

Geographical Coordinates of Well: 40° 28' 30.54" N, 104° 38' 14.21" W

Grid Convergence at Surface is: 0.56°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,582.00ft  
the Bottom Hole Displacement is 3,996.12ft in the Direction of 93.12° (Grid).

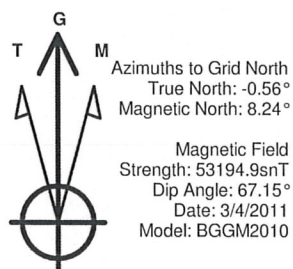
Magnetic Convergence at surface is: -8.24° ( 4 March 2011, , BGGM2010)



# Noble Energy

**HALLIBURTON**

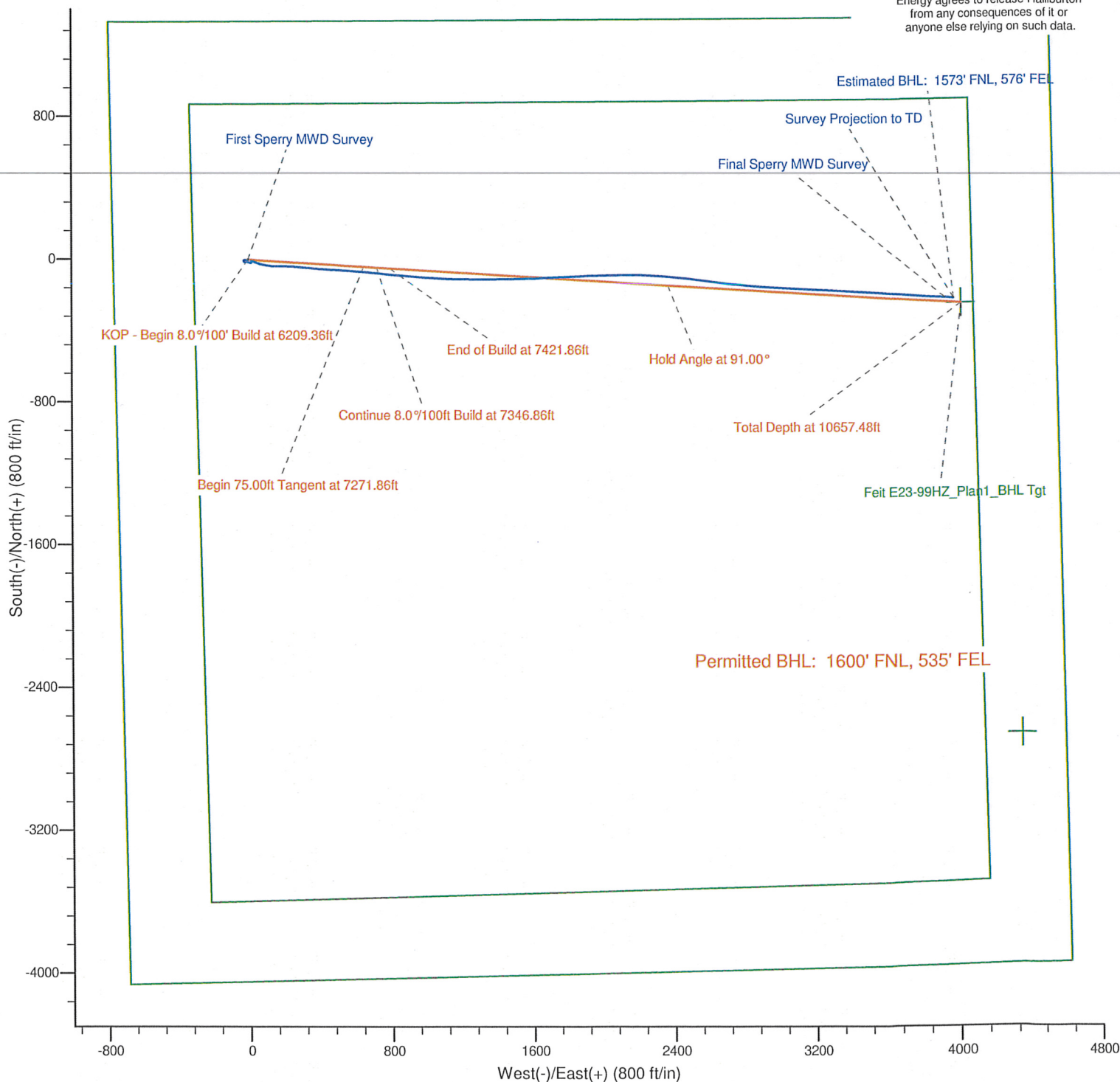
Sperry Drilling



## LEGEND

- Feit E23-99HZ,
- MWD Survey

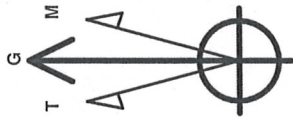
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Feit E23-99HZ well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.





Project: Weld County, CO (NAD 83)  
Site: Sec. 23-T6N-R65W  
Well: Felt E23-99HZ

# Noble Energy



Azimuths to Grid North  
True North: -0.56°  
Magnetic North: 8.24°  
Magnetic Field  
Strength: 53194.9snt  
Dip Angle: 67.15°  
Date: 3/4/2011  
Model: BGGM2010

## LEGEND

— Felt E23-99HZ,  
— MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Felt E23-99HZ well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.

