

NM OIL CONSERVATION  
ARTESIA DISTRICT

OCT 24 2018

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## Mack Energy

Chaves County

Sec 22 T15S R29E

Thunder Bay Federal Com #1H 17.5 KB

Lateral

30.005- 64308

**Provide Signature Page for  
Directional Survey**

Survey: Survey #1

## Standard Survey Report

05 July, 2018

# Survey Report

|                  |                                     |                                     |                       |
|------------------|-------------------------------------|-------------------------------------|-----------------------|
| <b>Company:</b>  | Mack Energy                         | <b>Local Co-ordinate Reference:</b> | Site Sec 22 T15S R29E |
| <b>Project:</b>  | Chaves County                       | <b>TVD Reference:</b>               | KB=17.5 @ 3882.40R    |
| <b>Site:</b>     | Sec 22 T15S R29E                    | <b>MD Reference:</b>                | KB=17.5 @ 3882.40R    |
| <b>Well:</b>     | Thunder Bay Federal Com #1H 17.5 KB | <b>North Reference:</b>             | Grid                  |
| <b>Wellbore:</b> | Lateral                             | <b>Survey Calculation Method:</b>   | Minimum Curvature     |
| <b>Design:</b>   | Lateral                             | <b>Database:</b>                    | EDM 5000.1            |

|                    |                           |                      |                |
|--------------------|---------------------------|----------------------|----------------|
| <b>Project</b>     | Chaves County             |                      |                |
| <b>Map System:</b> | US State Plane 1983       | <b>System Datum:</b> | Mean Sea Level |
| <b>Geo Datum:</b>  | North American Datum 1983 |                      |                |
| <b>Map Zone:</b>   | New Mexico Eastern Zone   |                      |                |

|                              |                  |                     |                 |                          |             |
|------------------------------|------------------|---------------------|-----------------|--------------------------|-------------|
| <b>Site</b>                  | Sec 22 T15S R29E |                     |                 |                          |             |
| <b>Site Position:</b>        |                  | <b>Northing:</b>    | 730,830.07 usft | <b>Latitude:</b>         | 33.008658   |
| <b>From:</b>                 | Map              | <b>Easting:</b>     | 837,519.31 usft | <b>Longitude:</b>        | -104.019575 |
| <b>Position Uncertainty:</b> | 0.00 ft          | <b>Slot Radius:</b> | 13-3/16 "       | <b>Grid Convergence:</b> | 0.17 "      |

|                             |                                     |         |                            |                 |                      |             |
|-----------------------------|-------------------------------------|---------|----------------------------|-----------------|----------------------|-------------|
| <b>Well</b>                 | Thunder Bay Federal Com #1H 17.5 KB |         |                            |                 |                      |             |
| <b>Well Position</b>        | +N/-S                               | 0.00 ft | <b>Northing:</b>           | 730,830.07 usft | <b>Latitude:</b>     | 33.008658   |
|                             | +E/-W                               | 0.00 ft | <b>Easting:</b>            | 837,519.31 usft | <b>Longitude:</b>    | -104.019575 |
| <b>Position Uncertainty</b> |                                     | 0.00 ft | <b>Wellhead Elevation:</b> | 0.00 ft         | <b>Ground Level:</b> | 3,844.90 ft |

|                  |                   |                    |                    |                  |                       |
|------------------|-------------------|--------------------|--------------------|------------------|-----------------------|
| <b>Wellbore</b>  | Lateral           |                    |                    |                  |                       |
| <b>Magnetics</b> | <b>Model Name</b> | <b>Sample Date</b> | <b>Declination</b> | <b>Dip Angle</b> | <b>Field Strength</b> |
|                  | HDGM              | 6/20/2018          | (°) 7.38           | (°) 60.72        | (nT) 48,269           |

|                          |                         |               |              |                      |          |
|--------------------------|-------------------------|---------------|--------------|----------------------|----------|
| <b>Design</b>            | Lateral                 |               |              |                      |          |
| <b>Audit Notes:</b>      |                         |               |              |                      |          |
| <b>Version:</b>          | 1.0                     | <b>Phase:</b> | ACTUAL       | <b>Tie On Depth:</b> | 2,439.00 |
| <b>Vertical Section:</b> | <b>Depth From (TVD)</b> | <b>+N/-S</b>  | <b>+E/-W</b> | <b>Direction</b>     |          |
|                          | (ft)                    | (ft)          | (ft)         | (°)                  |          |
|                          | 0.00                    | 0.00          | 0.00         | 178.14               |          |

|                       |                      |                          |
|-----------------------|----------------------|--------------------------|
| <b>Survey Program</b> | <b>Date</b> 7/5/2018 |                          |
| <b>From</b>           | <b>To</b>            | <b>Survey (Wellbore)</b> |
| (ft)                  | (ft)                 |                          |
| 94.00                 | 2,439.00             | Survey #1 (Pilot)        |
| 2,506.00              | 8,328.00             | Survey #1 (Lateral)      |
|                       |                      | <b>Tool Name</b>         |
|                       |                      | MWD                      |
|                       |                      | MWD                      |
|                       |                      | <b>Description</b>       |
|                       |                      | MWD - Standard           |
|                       |                      | MWD - Standard           |

|                               |                    |                |                 |              |              |                 |                    |                    |                    |
|-------------------------------|--------------------|----------------|-----------------|--------------|--------------|-----------------|--------------------|--------------------|--------------------|
| <b>Survey</b>                 |                    |                |                 |              |              |                 |                    |                    |                    |
| <b>Measured</b>               | <b>Inclination</b> | <b>Azimuth</b> | <b>Vertical</b> | <b>+N/-S</b> | <b>+E/-W</b> | <b>Vertical</b> | <b>Dogleg</b>      | <b>Build</b>       | <b>Turn</b>        |
| <b>Depth</b>                  | <b>(°)</b>         | <b>(°)</b>     | <b>Depth</b>    | <b>(ft)</b>  | <b>(ft)</b>  | <b>Section</b>  | <b>Rate</b>        | <b>Rate</b>        | <b>Rate</b>        |
| <b>(ft)</b>                   |                    |                | <b>(ft)</b>     |              |              | <b>(ft)</b>     | <b>(°/100usft)</b> | <b>(°/100usft)</b> | <b>(°/100usft)</b> |
| 2,439.00                      | 0.09               | 296.37         | 2,438.49        | -1.77        | -1.10        | 1.73            | 0.00               | 0.00               | 0.00               |
| 2,506.00                      | 0.26               | 208.81         | 2,505.49        | -1.88        | -1.21        | 1.84            | 0.41               | 0.25               | -133.67            |
| <b>1st Lateral MWD Survey</b> |                    |                |                 |              |              |                 |                    |                    |                    |
| 2,565.00                      | 0.92               | 147.66         | 2,564.49        | -2.40        | -1.02        | 2.37            | 1.39               | 1.12               | -100.25            |
| 2,586.00                      | 2.95               | 156.82         | 2,585.47        | -3.34        | -0.57        | 3.32            | 6.60               | 6.55               | 28.90              |
| 2,628.00                      | 6.42               | 158.03         | 2,627.36        | -5.76        | 0.43         | 5.77            | 10.85              | 10.84              | 4.41               |
| 2,722.00                      | 15.30              | 170.16         | 2,719.59        | -22.89       | 4.52         | 23.02           | 9.70               | 9.45               | 12.90              |
| 2,817.00                      | 20.84              | 172.97         | 2,809.88        | -52.03       | 8.73         | 52.29           | 5.90               | 5.83               | 2.98               |
| 2,912.00                      | 24.92              | 173.87         | 2,897.38        | -88.71       | 13.01        | 89.09           | 4.30               | 4.29               | 0.74               |
| 3,006.00                      | 31.96              | 174.02         | 2,979.99        | -133.19      | 17.79        | 133.70          | 7.49               | 7.49               | 0.37               |

# Survey Report

**Company:** Mack Energy  
**Project:** Chaves County  
**Site:** Sec 22 T15S R29E  
**Well:** Thunder Bay Federal Com #1H 17.5 KB  
**Wellbore:** Lateral  
**Design:** Lateral

**Local Co-ordinate Reference:** Site Sec 22 T15S R29E  
**TVD Reference:** KB=17.5 @ 3862.40ft  
**MD Reference:** KB=17.5 @ 3862.40ft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** EDM 5000.1

## Survey

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-------------------------|------------------------|-----------------------|
| 3,101.00            | 38.86           | 174.90      | 3,057.37            | -187.95    | 23.07      | 188.60                | 7.28                    | 7.28                   | 0.93                  |
| 3,196.00            | 47.34           | 173.85      | 3,126.67            | -252.48    | 29.47      | 253.31                | 8.98                    | 8.93                   | -1.11                 |
| 3,291.00            | 53.23           | 173.58      | 3,187.35            | -325.09    | 37.47      | 326.14                | 8.20                    | 8.20                   | -0.28                 |
| 3,300.00            | 53.98           | 173.85      | 3,192.69            | -332.29    | 38.27      | 333.36                | 8.88                    | 8.33                   | 3.00                  |
| 3,322.00            | 55.16           | 173.58      | 3,205.44            | -350.11    | 40.23      | 351.23                | 5.48                    | 5.38                   | -1.23                 |
| 3,337.00            | 55.69           | 173.93      | 3,213.95            | -362.39    | 41.57      | 363.54                | 4.02                    | 3.53                   | 2.33                  |
| 3,353.00            | 56.09           | 173.50      | 3,222.92            | -375.55    | 43.02      | 378.75                | 3.35                    | 2.50                   | -2.69                 |
| 3,368.00            | 56.57           | 173.23      | 3,231.24            | -387.95    | 44.47      | 389.19                | 3.53                    | 3.20                   | -1.80                 |
| 3,384.00            | 56.97           | 173.23      | 3,240.01            | -401.24    | 46.04      | 402.53                | 2.50                    | 2.50                   | 0.00                  |
| 3,400.00            | 58.33           | 173.87      | 3,248.57            | -414.87    | 47.59      | 418.00                | 8.81                    | 8.50                   | 2.75                  |
| 3,479.00            | 67.78           | 178.75      | 3,284.33            | -484.76    | 53.38      | 488.24                | 12.45                   | 11.98                  | 3.90                  |
| 3,574.00            | 76.35           | 177.80      | 3,313.56            | -574.98    | 57.65      | 578.53                | 9.08                    | 9.02                   | 1.11                  |
| 3,668.00            | 84.04           | 179.58      | 3,329.56            | -667.49    | 59.77      | 669.08                | 8.39                    | 8.18                   | 1.87                  |
| 3,762.00            | 90.51           | 180.44      | 3,334.02            | -761.33    | 59.77      | 762.87                | 6.95                    | 6.88                   | 0.94                  |
| 3,856.00            | 90.15           | 179.91      | 3,333.48            | -855.33    | 59.48      | 858.81                | 0.88                    | -0.38                  | -0.56                 |
| 3,951.00            | 89.54           | 178.33      | 3,333.74            | -950.32    | 60.94      | 951.79                | 1.78                    | -0.64                  | -1.66                 |
| 4,045.00            | 91.30           | 177.71      | 3,333.05            | -1,044.25  | 64.19      | 1,045.79              | 1.99                    | 1.87                   | -0.68                 |
| 4,140.00            | 89.71           | 177.71      | 3,332.21            | -1,139.17  | 67.98      | 1,140.78              | 1.67                    | -1.67                  | 0.00                  |
| 4,235.00            | 87.30           | 178.24      | 3,334.69            | -1,234.07  | 71.34      | 1,235.74              | 2.80                    | -2.54                  | 0.56                  |
| 4,329.00            | 88.70           | 178.51      | 3,337.97            | -1,327.97  | 74.00      | 1,329.68              | 1.52                    | 1.49                   | 0.29                  |
| 4,424.00            | 90.68           | 178.33      | 3,338.49            | -1,422.93  | 76.62      | 1,424.67              | 2.09                    | 2.08                   | -0.19                 |
| 4,518.00            | 89.78           | 180.35      | 3,338.13            | -1,518.92  | 77.70      | 1,518.64              | 2.36                    | -0.98                  | 2.15                  |
| 4,612.00            | 91.38           | 180.44      | 3,337.19            | -1,610.91  | 77.05      | 1,612.56              | 1.73                    | 1.72                   | 0.10                  |
| 4,707.00            | 91.16           | 180.61      | 3,335.09            | -1,705.88  | 76.18      | 1,707.46              | 0.29                    | -0.23                  | 0.18                  |
| 4,801.00            | 90.33           | 180.44      | 3,333.88            | -1,799.87  | 75.32      | 1,801.37              | 0.90                    | -0.88                  | -0.18                 |
| 4,895.00            | 89.01           | 179.21      | 3,334.40            | -1,893.86  | 75.61      | 1,895.32              | 1.92                    | -1.40                  | -1.31                 |
| 4,989.00            | 88.88           | 179.30      | 3,336.14            | -1,987.84  | 76.83      | 1,989.29              | 0.17                    | -0.14                  | 0.10                  |
| 5,084.00            | 89.93           | 179.30      | 3,337.12            | -2,082.83  | 77.99      | 2,084.26              | 1.11                    | 1.11                   | 0.00                  |
| 5,178.00            | 89.32           | 178.94      | 3,337.74            | -2,178.81  | 79.44      | 2,178.24              | 0.75                    | -0.65                  | -0.38                 |
| 5,273.00            | 91.12           | 180.09      | 3,337.37            | -2,271.80  | 80.24      | 2,273.21              | 2.25                    | 1.89                   | 1.21                  |
| 5,368.00            | 90.73           | 179.47      | 3,335.84            | -2,368.79  | 80.61      | 2,368.16              | 0.77                    | -0.41                  | -0.65                 |
| 5,462.00            | 89.10           | 178.68      | 3,335.98            | -2,460.77  | 82.12      | 2,462.14              | 1.93                    | -1.73                  | -0.84                 |
| 5,557.00            | 88.35           | 178.68      | 3,338.09            | -2,555.72  | 84.31      | 2,557.11              | 0.79                    | -0.79                  | 0.00                  |
| 5,651.00            | 89.23           | 179.12      | 3,340.08            | -2,649.68  | 86.11      | 2,651.08              | 1.05                    | 0.94                   | 0.47                  |
| 5,671.00            | 89.71           | 179.03      | 3,340.26            | -2,669.68  | 86.44      | 2,671.08              | 2.44                    | 2.40                   | -0.45                 |
| 5,766.00            | 90.20           | 178.86      | 3,340.34            | -2,764.66  | 88.19      | 2,766.07              | 0.55                    | 0.52                   | -0.18                 |
| 5,860.00            | 88.70           | 180.18      | 3,341.24            | -2,858.65  | 88.97      | 2,860.03              | 2.13                    | -1.60                  | 1.40                  |
| 5,955.00            | 90.88           | 180.35      | 3,341.75            | -2,953.64  | 88.53      | 2,954.96              | 2.09                    | 2.08                   | 0.18                  |
| 6,049.00            | 90.81           | 181.32      | 3,340.53            | -3,047.63  | 87.17      | 3,048.85              | 1.04                    | 0.14                   | 1.03                  |
| 6,143.00            | 89.93           | 180.00      | 3,339.92            | -3,141.61  | 86.08      | 3,142.75              | 1.69                    | -0.94                  | -1.40                 |
| 6,237.00            | 91.65           | 179.03      | 3,338.63            | -3,235.60  | 86.88      | 3,238.71              | 2.10                    | 1.83                   | -1.03                 |
| 6,331.00            | 90.37           | 179.21      | 3,336.97            | -3,329.57  | 88.32      | 3,330.68              | 1.38                    | -1.38                  | 0.19                  |
| 6,426.00            | 89.01           | 179.65      | 3,337.48            | -3,424.56  | 89.27      | 3,425.65              | 1.50                    | -1.43                  | 0.46                  |

# Survey Report

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**Wellbore:** Lateral  
**Design:** Lateral

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**MD Reference:** KB=17.5 @ 3862.40R  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** EDM 5000.1

## Survey

| Measured Depth (ft)                                                                   | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---------------------------------------------------------------------------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-------------------------|------------------------|-----------------------|
| 6,522.00                                                                              | 90.37           | 179.47      | 3,338.00            | -3,520.55  | 90.00      | 3,521.62              | 1.43                    | 1.42                   | -0.19                 |
| 6,616.00                                                                              | 90.42           | 178.77      | 3,337.36            | -3,614.54  | 91.45      | 3,615.60              | 0.75                    | 0.05                   | -0.74                 |
| 6,711.00                                                                              | 91.34           | 178.66      | 3,335.90            | -3,709.50  | 93.56      | 3,710.59              | 0.97                    | 0.97                   | -0.09                 |
| 6,805.00                                                                              | 89.80           | 178.33      | 3,334.96            | -3,803.47  | 96.01      | 3,804.58              | 1.66                    | -1.64                  | -0.37                 |
| 6,899.00                                                                              | 92.18           | 179.03      | 3,333.34            | -3,897.42  | 98.18      | 3,898.55              | 2.64                    | 2.53                   | 0.74                  |
| 6,994.00                                                                              | 91.16           | 179.74      | 3,330.57            | -3,992.37  | 99.20      | 3,993.49              | 1.31                    | -1.07                  | 0.75                  |
| 7,088.00                                                                              | 90.24           | 178.24      | 3,329.42            | -4,086.35  | 100.85     | 4,087.47              | 1.87                    | -0.98                  | -1.60                 |
| 7,183.00                                                                              | 89.58           | 178.94      | 3,329.57            | -4,181.32  | 103.19     | 4,182.46              | 1.01                    | -0.69                  | 0.74                  |
| 7,278.00                                                                              | 90.51           | 178.77      | 3,329.50            | -4,276.30  | 105.09     | 4,277.45              | 1.00                    | 0.98                   | -0.18                 |
| 7,373.00                                                                              | 89.85           | 180.70      | 3,329.20            | -4,371.29  | 105.53     | 4,372.41              | 2.15                    | -0.69                  | 2.03                  |
| 7,467.00                                                                              | 91.89           | 181.32      | 3,327.93            | -4,465.26  | 103.87     | 4,466.28              | 2.07                    | 1.96                   | 0.66                  |
| 7,562.00                                                                              | 90.64           | 180.97      | 3,326.00            | -4,560.22  | 101.97     | 4,561.13              | 1.17                    | -1.11                  | -0.37                 |
| 7,657.00                                                                              | 91.25           | 179.21      | 3,324.44            | -4,655.20  | 101.83     | 4,656.06              | 1.96                    | 0.64                   | -1.85                 |
| 7,752.00                                                                              | 89.93           | 179.12      | 3,323.46            | -4,750.19  | 103.21     | 4,751.03              | 1.39                    | -1.39                  | -0.09                 |
| 7,847.00                                                                              | 91.03           | 178.77      | 3,322.66            | -4,845.17  | 104.96     | 4,846.02              | 1.22                    | 1.16                   | -0.37                 |
| 7,942.00                                                                              | 90.95           | 177.45      | 3,321.02            | -4,940.10  | 108.09     | 4,941.00              | 1.39                    | -0.08                  | -1.39                 |
| 8,037.00                                                                              | 90.07           | 178.59      | 3,320.17            | -5,035.04  | 111.37     | 5,036.00              | 1.52                    | -0.83                  | 1.20                  |
| 8,132.00                                                                              | 89.63           | 179.12      | 3,320.42            | -5,130.02  | 113.27     | 5,130.99              | 0.73                    | -0.46                  | 0.56                  |
| 8,226.00                                                                              | 90.24           | 180.09      | 3,320.53            | -5,224.01  | 113.92     | 5,224.96              | 1.22                    | 0.65                   | 1.03                  |
| 8,284.00                                                                              | 91.21           | 180.35      | 3,319.80            | -5,282.01  | 113.70     | 5,282.91              | 1.73                    | 1.67                   | 0.45                  |
| Last Lateral MWD Survey 8284 MD/3319.8 TVD -5282.01 S 113.7 E N: 725548.0 E: 637633.0 |                 |             |                     |            |            |                       |                         |                        |                       |
| 8,328.00                                                                              | 91.21           | 180.35      | 3,318.87            | -5,326.00  | 113.43     | 5,326.87              | 0.00                    | 0.00                   | 0.00                  |
| Lateral PTB 8328 MD/3318.87 TVD -5326.99 S 113.43 E N: 725504.0 E: 637632.7           |                 |             |                     |            |            |                       |                         |                        |                       |

## Survey Annotations

| Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates |            | Comment                                                                  |
|---------------------|---------------------|-------------------|------------|--------------------------------------------------------------------------|
|                     |                     | +N/-S (ft)        | +E/-W (ft) |                                                                          |
| 2,508.00            | 2,505.49            | -1.88             | -1.21      | 1st Lateral MWD Survey                                                   |
| 8,284.00            | 3,319.80            | -5,282.01         | 113.70     | Last Lateral MWD Survey 8284 MD/3319.8 TVD -5282.01 S 113.7 E N: 725548  |
| 8,328.00            | 3,318.87            | -5,326.00         | 113.43     | Lateral PTB 8328 MD/3318.87 TVD -5326.99 S 113.43 E N: 725504.0 E: 63763 |

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_