# MALLARD EXPLORATION

**WELD COUNTY, COLORADO (NAD 83)**
**SE SW SEC. 31 T9N R59W 6th P.M.**
**ANDERSON FED 6-5-1HN**

**ORIGINAL WELLBORE**

**25 July, 2019**

**Plan: PROPOSAL #3**

MALLARD EXPLORATION

Project: WELD COUNTY, COLORADO (NAD 83)
Site: SE SW SEC. 31 T9N R59W 6th P.M.
Well: ANDERSON FED 6-5-1HN
Wellbore: ORIGINAL WELLBORE
Design: PROPOSAL #3

Azimuths to True North
Magnetic North: 7.61°

Magnetic Field
Strength: 52382.5snT
Dip Angle: 67.15°
Date: 22/07/2019
Model: IGRF2015

## ANNOTATIONS

| TVD | MD | Inc | Azi | +N/-S | +E/-W | VSect | Dep | Annotation |
|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | SHL: 702ft FSL & 1912ft FWL of Sec 31 |
| 1000.00 | 1000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | START NUDGE (3°/100ft BUR) |
| 1681.64 | 1697.01 | 20.91 | 238.05 | -66.57 | -106.72 | -98.63 | 125.78 | EOB TO 20.91° INC |
| 5494.45 | 5778.64 | 20.91 | 238.05 | -837.53 | -1342.76 | -1240.89 | 1582.55 | KOP (10°/100ft DGLG) |
| 6224.00 | 6853.34 | 90.00 | 90.79 | -995.81 | -798.36 | -682.22 | 2231.13 | LP *NEW*: 305ft FNL & 600ft FWL of Sec 6 |
| 6224.00 | 8886.68 | 90.00 | 90.79 | -1023.85 | 1234.79 | 1341.35 | 4264.47 | END OF TANGENT |
| 6224.00 | 8900.18 | 90.00 | 90.52 | -1024.00 | 1248.29 | 1354.78 | 4277.97 | EOT TO 90.52° INC |
| 6224.00 | 11527.18 | 90.00 | 90.52 | -1047.84 | 3875.18 | 3967.92 | 6904.97 | END OF TANGENT |
| 6224.00 | 11585.68 | 90.00 | 89.35 | -1047.77 | 3933.68 | 4026.05 | 6963.47 | EOT TO 89.35° AZ |
| 6224.00 | 14165.68 | 90.00 | 89.35 | -1018.51 | 6513.51 | 6586.49 | 9543.47 | END OF TANGENT |
| 6224.00 | 14167.68 | 90.00 | 89.39 | -1018.48 | 6515.51 | 6588.48 | 9545.47 | EOT TO 89.39° AZ |
| 6224.00 | 16499.99 | 90.00 | 89.39 | -993.75 | 8847.69 | 8903.32 | 11877.78 | BHL: 305ft FNL & 300ft FEL of Sec 5 |

## WELLBORE TARGET DETAILS (LAT/LONG)

| Name | TVD | +N/-S | +E/-W | Latitude | Longitude |
|---|---|---|---|---|---|
| LP *NEW* - ANDERSON FED 6-5-1HN (P3) | 6224.00 | -995.81 | -798.36 | 40.698453 | -104.026300 |
| BHL - ANDERSON FED 6-5-1HN (P3) | 6224.00 | -993.75 | 8847.69 | 40.698454 | -103.991513 |

## FORMATION TOP DETAILS

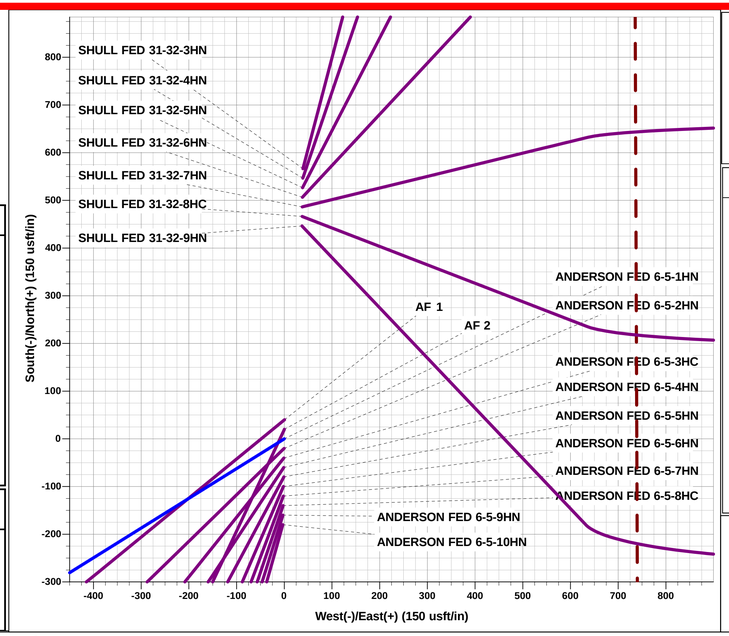
| TVDPath | MDPath | Formation |
|---|---|---|
| 470.00 | 470.00 | Fox Hills Base |
| 1487.00 | 1492.44 | Pierre Shale Top |
| 3290.00 | 3418.77 | Richard Sandstone |
| 3425.00 | 3563.28 | Parkman Sandstone |
| 4112.00 | 4298.72 | Sussex Sandstone |
| 4579.00 | 4798.64 | Shannon Sandstone |
| 5348.00 | 5621.86 | TeePee Buttes |
| 5959.00 | 6271.85 | Sharon Springs |
| 5998.00 | 6320.05 | Niobrara Top |
| 6028.00 | 6359.27 | Niobrara A Chalk |
| 6052.00 | 6392.38 | Niobrara A Chalk Base |
| 6090.00 | 6449.03 | Niobrara B1 Chalk Top |
| 6109.00 | 6479.93 | Niobrara B1 Chalk Base |
| 6137.00 | 6530.00 | Niobrara B2 Chalk Top |
| 6163.00 | 6583.69 | Niobrara B2 Chalk Base |
| 6191.00 | 6655.86 | Niobrara C Chalk Target Top |
| 6224.00 | 6853.34 | Niobrara C Chalk Target Center |

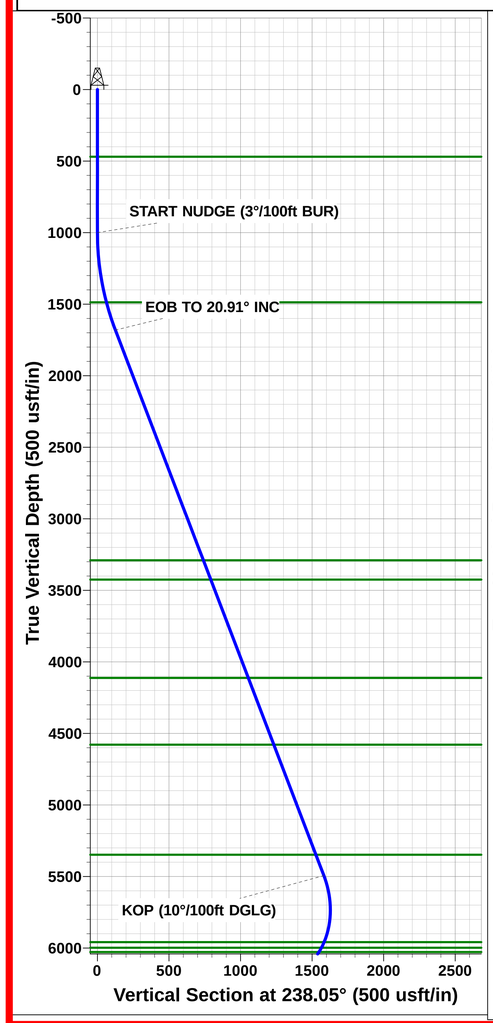
PROPOSED LOCAL COORDINATES:

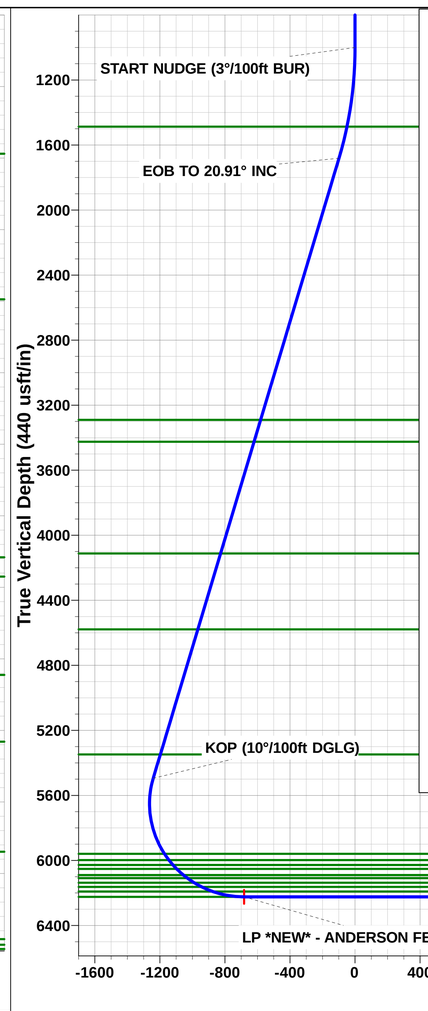
SHL: 702ft FSL & 1912ft FWL of Sec 31

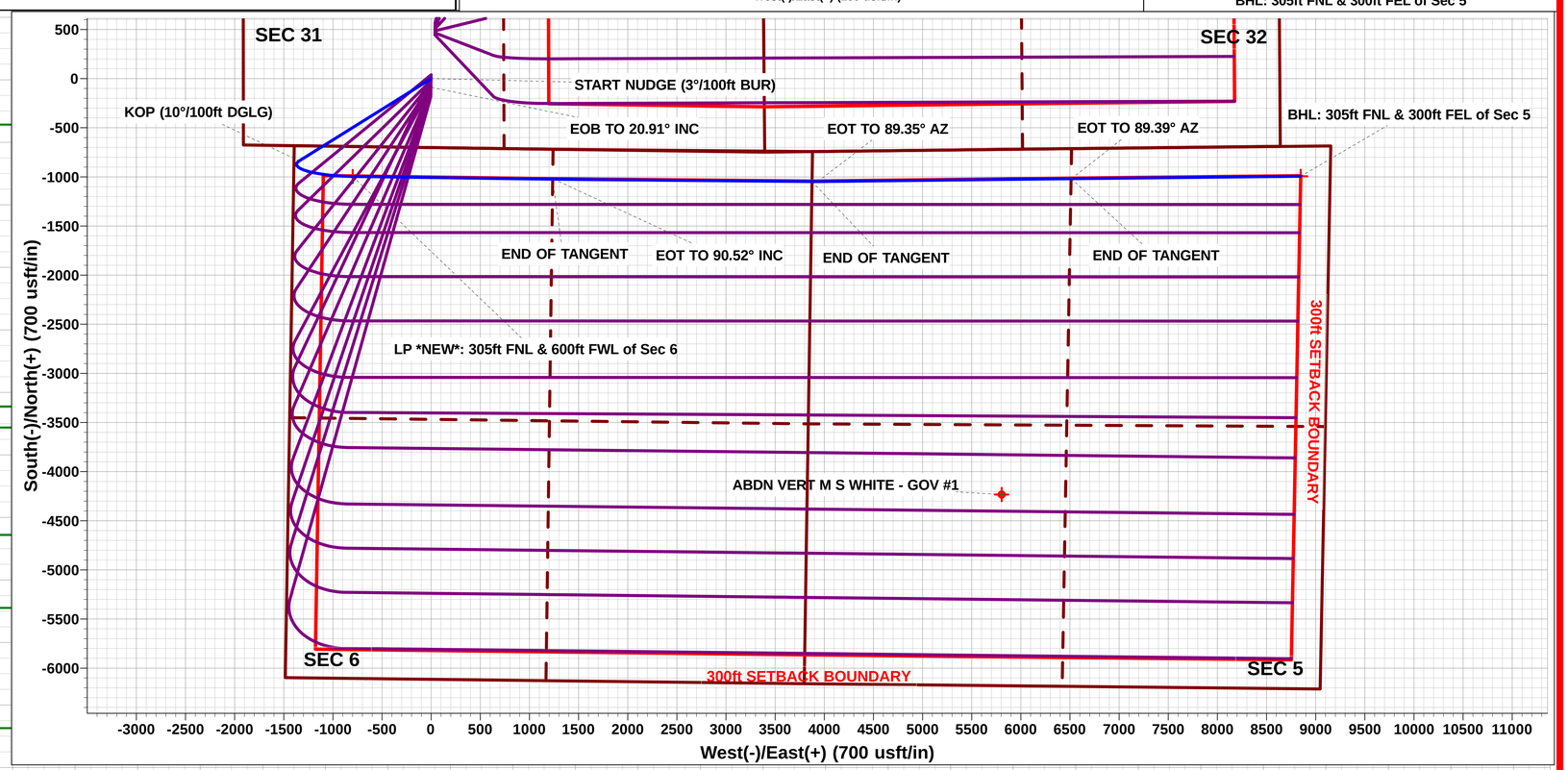
HZ LP *NEW*: 305ft FNL & 600ft FWL of Sec 6

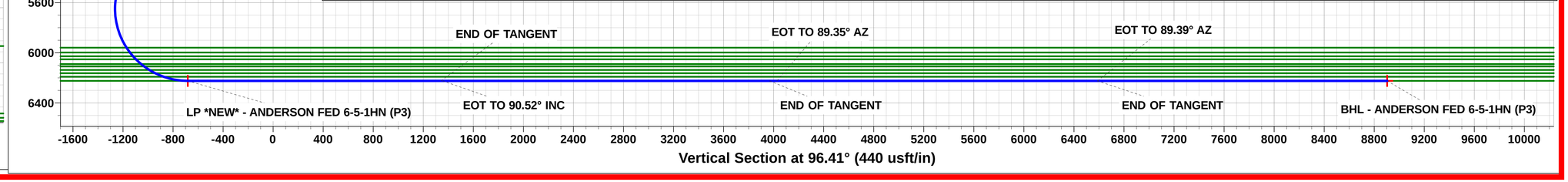
BHL: 305ft FNL & 300ft FEL of Sec 5



| | | | |
|---|---|---|---|
| **Database:** | Database 1 | **Local Co-ordinate Reference:** | Well ANDERSON FED 6-5-1HN |
| **Company:** | MALLARD EXPLORATION | **TVD Reference:** | KB 25' @ 4903.00usft |
| **Project:** | WELD COUNTY, COLORADO (NAD 83) | **MD Reference:** | KB 25' @ 4903.00usft |
| **Site:** | SE SW SEC. 31 T9N R59W 6th P.M. | **North Reference:** | True |
| **Well:** | ANDERSON FED 6-5-1HN | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | ORIGINAL WELLBORE | | |
| **Design:** | PROPOSAL #3 | | |

**Project** WELD COUNTY, COLORADO (NAD 83)

| | | | |
|---|---|---|---|
| **Map System:** | US State Plane 1983 | **System Datum:** | Mean Sea Level |
| **Geo Datum:** | North American Datum 1983 | | |
| **Map Zone:** | Colorado Northern Zone | | Using geodetic scale factor |

**Site** SE SW SEC. 31 T9N R59W 6th P.M.

| | | | | | |
|---|---|---|---|---|---|
| **Site Position:** | | **Northing:** | 1,501,513.53 usft | **Latitude:** | 40.700697 |
| **From:** | Lat/Long | **Easting:** | 3,409,242.57 usft | **Longitude:** | -104.023987 |
| **Position Uncertainty:** | 0.00 usft | **Slot Radius:** | 1.10 ft | **Grid Convergence:** | 0.95 ° |

**Well** ANDERSON FED 6-5-1HN

| | | | | | | |
|---|---|---|---|---|---|---|
| **Well Position** | **+N/-S** | 178.15 usft | **Northing:** | 1,501,694.26 usft | **Latitude:** | 40.701186 |
| | **+E/-W** | 156.94 usft | **Easting:** | 3,409,396.52 usft | **Longitude:** | -104.023421 |
| **Position Uncertainty** | | 0.00 usft | **Wellhead Elevation:** | usft | **Ground Level:** | 4,878.00 usft |

**Wellbore** ORIGINAL WELLBORE

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
|---|---|---|---|---|---|
| | IGRF2015 | 22/07/2019 | 7.61 | 67.15 | 52,383 |

**Design** PROPOSAL #3

**Audit Notes:**

| | | | | | |
|---|---|---|---|---|---|
| **Version:** | | **Phase:** | PROTOTYPE | **Tie On Depth:** | 0.00 |

| Vertical Section: | Depth From (TVD) (usft) | +N/-S (usft) | +E/-W (usft) | Direction (°) |
|---|---|---|---|---|
| | 6,224.00 | 0.00 | 0.00 | 96.41 |

**Plan Sections**

| MD (usft) | Inc (°) | Azi (°) | Vertical Depth | SS (usft) | +N/-S (usft) | +E/-W (usft) | Dogleg Rate (°/100usf | Build Rate (°/100usf | Turn Rate (°/100usf | TFO (°) | Target |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | -4,903.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 1,000.00 | 0.00 | 0.00 | 1,000.00 | -3,903.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 1,697.01 | 20.91 | 238.05 | 1,681.64 | -3,221.36 | -66.57 | -106.73 | 3.00 | 3.00 | 0.00 | 238.05 | |
| 5,778.64 | 20.91 | 238.05 | 5,494.46 | 591.46 | -837.53 | -1,342.76 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 6,853.34 | 90.00 | 90.79 | 6,224.00 | 1,321.00 | -995.81 | -798.36 | 10.00 | 6.43 | -13.70 | -145.46 | LP *NEW* - ANDEF |
| 8,886.68 | 90.00 | 90.79 | 6,224.00 | 1,321.00 | -1,023.85 | 1,234.79 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8,900.18 | 90.00 | 90.52 | 6,224.00 | 1,321.00 | -1,024.00 | 1,248.29 | 2.00 | 0.00 | -2.00 | -90.00 | |
| 11,527.18 | 90.00 | 90.52 | 6,224.00 | 1,321.00 | -1,047.84 | 3,875.18 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 11,585.68 | 90.00 | 89.35 | 6,224.00 | 1,321.00 | -1,047.77 | 3,933.68 | 2.00 | 0.00 | -2.00 | -90.00 | |
| 14,165.68 | 90.00 | 89.35 | 6,224.00 | 1,321.00 | -1,018.51 | 6,513.51 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 14,167.68 | 90.00 | 89.39 | 6,224.00 | 1,321.00 | -1,018.48 | 6,515.51 | 2.00 | 0.00 | 2.00 | 90.00 | |
| 16,499.99 | 90.00 | 89.39 | 6,224.00 | 1,321.00 | -993.75 | 8,847.69 | 0.00 | 0.00 | 0.00 | 90.00 | BHL - ANDERSON |

| | | | |
|---|---|---|---|
| **Database:** | Database 1 | **Local Co-ordinate Reference:** | Well ANDERSON FED 6-5-1HN |
| **Company:** | MALLARD EXPLORATION | **TVD Reference:** | KB 25' @ 4903.00usft |
| **Project:** | WELD COUNTY, COLORADO (NAD 83) | **MD Reference:** | KB 25' @ 4903.00usft |
| **Site:** | SE SW SEC. 31 T9N R59W 6th P.M. | **North Reference:** | True |
| **Well:** | ANDERSON FED 6-5-1HN | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | ORIGINAL WELLBORE | | |
| **Design:** | PROPOSAL #3 | | |

**Planned Survey**

| MD (usft) | Inc (°) | Azi (°) | TVD (usft) | SS (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|---|
| **SHL: 702ft FSL & 1912ft FWL of Sec 31** | | | | | | | | | | |
| ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***4,903.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 100.00 | 0.00 | 0.00 | 100.00 | 4,803.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200.00 | 0.00 | 0.00 | 200.00 | 4,703.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 300.00 | 0.00 | 0.00 | 300.00 | 4,603.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 400.00 | 0.00 | 0.00 | 400.00 | 4,503.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Fox Hills Base** | | | | | | | | | | |
| ***470.00*** | ***0.00*** | ***0.00*** | ***470.00*** | ***4,433.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 500.00 | 0.00 | 0.00 | 500.00 | 4,403.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 600.00 | 0.00 | 0.00 | 600.00 | 4,303.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 700.00 | 0.00 | 0.00 | 700.00 | 4,203.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 800.00 | 0.00 | 0.00 | 800.00 | 4,103.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 900.00 | 0.00 | 0.00 | 900.00 | 4,003.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **START NUDGE (3°/100ft BUR)** | | | | | | | | | | |
| ***1,000.00*** | ***0.00*** | ***0.00*** | ***1,000.00*** | ***3,903.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 1,100.00 | 3.00 | 238.05 | 1,099.95 | 3,803.05 | -1.39 | -2.22 | -2.05 | 3.00 | 3.00 | 0.00 |
| 1,200.00 | 6.00 | 238.05 | 1,199.63 | 3,703.37 | -5.54 | -8.88 | -8.20 | 3.00 | 3.00 | 0.00 |
| 1,300.00 | 9.00 | 238.05 | 1,298.77 | 3,604.23 | -12.44 | -19.95 | -18.44 | 3.00 | 3.00 | 0.00 |
| 1,400.00 | 12.00 | 238.05 | 1,397.08 | 3,505.92 | -22.09 | -35.41 | -32.72 | 3.00 | 3.00 | 0.00 |
| **Pierre Shale Top** | | | | | | | | | | |
| ***1,492.44*** | ***14.77*** | ***238.05*** | ***1,487.00*** | ***3,416.00*** | ***-33.41*** | ***-53.57*** | ***-49.50*** | ***3.00*** | ***3.00*** | ***0.00*** |
| 1,500.00 | 15.00 | 238.05 | 1,494.31 | 3,408.69 | -34.44 | -55.22 | -51.03 | 3.00 | 3.00 | 0.00 |
| 1,600.00 | 18.00 | 238.05 | 1,590.18 | 3,312.82 | -49.47 | -79.31 | -73.29 | 3.00 | 3.00 | 0.00 |
| **EOB TO 20.91° INC** | | | | | | | | | | |
| ***1,697.01*** | ***20.91*** | ***238.05*** | ***1,681.64*** | ***3,221.36*** | ***-66.57*** | ***-106.72*** | ***-98.63*** | ***3.00*** | ***3.00*** | ***0.00*** |
| 1,700.00 | 20.91 | 238.05 | 1,684.43 | 3,218.57 | -67.13 | -107.63 | -99.46 | 0.00 | 0.00 | 0.00 |
| 1,800.00 | 20.91 | 238.05 | 1,777.85 | 3,125.15 | -86.02 | -137.91 | -127.45 | 0.00 | 0.00 | 0.00 |
| 1,900.00 | 20.91 | 238.05 | 1,871.26 | 3,031.74 | -104.91 | -168.20 | -155.43 | 0.00 | 0.00 | 0.00 |
| 2,000.00 | 20.91 | 238.05 | 1,964.68 | 2,938.32 | -123.80 | -198.48 | -183.42 | 0.00 | 0.00 | 0.00 |
| 2,100.00 | 20.91 | 238.05 | 2,058.09 | 2,844.91 | -142.69 | -228.76 | -211.41 | 0.00 | 0.00 | 0.00 |
| 2,200.00 | 20.91 | 238.05 | 2,151.50 | 2,751.50 | -161.57 | -259.04 | -239.39 | 0.00 | 0.00 | 0.00 |
| 2,300.00 | 20.91 | 238.05 | 2,244.92 | 2,658.08 | -180.46 | -289.33 | -267.38 | 0.00 | 0.00 | 0.00 |
| 2,400.00 | 20.91 | 238.05 | 2,338.33 | 2,564.67 | -199.35 | -319.61 | -295.36 | 0.00 | 0.00 | 0.00 |
| 2,500.00 | 20.91 | 238.05 | 2,431.75 | 2,471.25 | -218.24 | -349.89 | -323.35 | 0.00 | 0.00 | 0.00 |
| 2,600.00 | 20.91 | 238.05 | 2,525.16 | 2,377.84 | -237.13 | -380.18 | -351.33 | 0.00 | 0.00 | 0.00 |
| 2,700.00 | 20.91 | 238.05 | 2,618.57 | 2,284.43 | -256.02 | -410.46 | -379.32 | 0.00 | 0.00 | 0.00 |
| 2,800.00 | 20.91 | 238.05 | 2,711.99 | 2,191.01 | -274.91 | -440.74 | -407.30 | 0.00 | 0.00 | 0.00 |
| 2,900.00 | 20.91 | 238.05 | 2,805.40 | 2,097.60 | -293.79 | -471.02 | -435.29 | 0.00 | 0.00 | 0.00 |
| 3,000.00 | 20.91 | 238.05 | 2,898.81 | 2,004.19 | -312.68 | -501.31 | -463.27 | 0.00 | 0.00 | 0.00 |
| 3,100.00 | 20.91 | 238.05 | 2,992.23 | 1,910.77 | -331.57 | -531.59 | -491.26 | 0.00 | 0.00 | 0.00 |
| 3,200.00 | 20.91 | 238.05 | 3,085.64 | 1,817.36 | -350.46 | -561.87 | -519.25 | 0.00 | 0.00 | 0.00 |
| 3,300.00 | 20.91 | 238.05 | 3,179.06 | 1,723.94 | -369.35 | -592.16 | -547.23 | 0.00 | 0.00 | 0.00 |
| 3,400.00 | 20.91 | 238.05 | 3,272.47 | 1,630.53 | -388.24 | -622.44 | -575.22 | 0.00 | 0.00 | 0.00 |
| **Richard Sandstone** | | | | | | | | | | |
| ***3,418.77*** | ***20.91*** | ***238.05*** | ***3,290.00*** | ***1,613.00*** | ***-391.78*** | ***-628.12*** | ***-580.47*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 3,500.00 | 20.91 | 238.05 | 3,365.88 | 1,537.12 | -407.13 | -652.72 | -603.20 | 0.00 | 0.00 | 0.00 |
| **Parkman Sandstone** | | | | | | | | | | |
| ***3,563.28*** | ***20.91*** | ***238.05*** | ***3,425.00*** | ***1,478.00*** | ***-419.08*** | ***-671.89*** | ***-620.91*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 3,600.00 | 20.91 | 238.05 | 3,459.30 | 1,443.70 | -426.01 | -683.00 | -631.19 | 0.00 | 0.00 | 0.00 |
| 3,700.00 | 20.91 | 238.05 | 3,552.71 | 1,350.29 | -444.90 | -713.29 | -659.17 | 0.00 | 0.00 | 0.00 |
| 3,800.00 | 20.91 | 238.05 | 3,646.13 | 1,256.87 | -463.79 | -743.57 | -687.16 | 0.00 | 0.00 | 0.00 |
| 3,900.00 | 20.91 | 238.05 | 3,739.54 | 1,163.46 | -482.68 | -773.85 | -715.14 | 0.00 | 0.00 | 0.00 |
| 4,000.00 | 20.91 | 238.05 | 3,832.95 | 1,070.05 | -501.57 | -804.14 | -743.13 | 0.00 | 0.00 | 0.00 |

| | | | |
|---|---|---|---|
| **Database:** | Database 1 | **Local Co-ordinate Reference:** | Well ANDERSON FED 6-5-1HN |
| **Company:** | MALLARD EXPLORATION | **TVD Reference:** | KB 25' @ 4903.00usft |
| **Project:** | WELD COUNTY, COLORADO (NAD 83) | **MD Reference:** | KB 25' @ 4903.00usft |
| **Site:** | SE SW SEC. 31 T9N R59W 6th P.M. | **North Reference:** | True |
| **Well:** | ANDERSON FED 6-5-1HN | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | ORIGINAL WELLBORE | | |
| **Design:** | PROPOSAL #3 | | |

**Planned Survey**

| MD (usft) | Inc (°) | Azi (°) | TVD (usft) | SS (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4,100.00 | 20.91 | 238.05 | 3,926.37 | 976.63 | -520.46 | -834.42 | -771.11 | 0.00 | 0.00 | 0.00 |
| 4,200.00 | 20.91 | 238.05 | 4,019.78 | 883.22 | -539.34 | -864.70 | -799.10 | 0.00 | 0.00 | 0.00 |
| **Sussex Sandstone** | | | | | | | | | | |
| ***4,298.72*** | ***20.91*** | ***238.05*** | ***4,112.00*** | ***791.00*** | ***-557.99*** | ***-894.60*** | ***-826.73*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 4,300.00 | 20.91 | 238.05 | 4,113.20 | 789.80 | -558.23 | -894.98 | -827.09 | 0.00 | 0.00 | 0.00 |
| 4,400.00 | 20.91 | 238.05 | 4,206.61 | 696.39 | -577.12 | -925.27 | -855.07 | 0.00 | 0.00 | 0.00 |
| 4,500.00 | 20.91 | 238.05 | 4,300.02 | 602.98 | -596.01 | -955.55 | -883.06 | 0.00 | 0.00 | 0.00 |
| 4,600.00 | 20.91 | 238.05 | 4,393.44 | 509.56 | -614.90 | -985.83 | -911.04 | 0.00 | 0.00 | 0.00 |
| 4,700.00 | 20.91 | 238.05 | 4,486.85 | 416.15 | -633.79 | -1,016.12 | -939.03 | 0.00 | 0.00 | 0.00 |
| **Shannon Sandstone** | | | | | | | | | | |
| ***4,798.64*** | ***20.91*** | ***238.05*** | ***4,579.00*** | ***324.00*** | ***-652.42*** | ***-1,045.99*** | ***-966.63*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 4,800.00 | 20.91 | 238.05 | 4,580.27 | 322.73 | -652.68 | -1,046.40 | -967.01 | 0.00 | 0.00 | 0.00 |
| 4,900.00 | 20.91 | 238.05 | 4,673.68 | 229.32 | -671.56 | -1,076.68 | -995.00 | 0.00 | 0.00 | 0.00 |
| 5,000.00 | 20.91 | 238.05 | 4,767.09 | 135.91 | -690.45 | -1,106.96 | -1,022.98 | 0.00 | 0.00 | 0.00 |
| 5,100.00 | 20.91 | 238.05 | 4,860.51 | 42.49 | -709.34 | -1,137.25 | -1,050.97 | 0.00 | 0.00 | 0.00 |
| 5,200.00 | 20.91 | 238.05 | 4,953.92 | -50.92 | -728.23 | -1,167.53 | -1,078.95 | 0.00 | 0.00 | 0.00 |
| 5,300.00 | 20.91 | 238.05 | 5,047.34 | -144.34 | -747.12 | -1,197.81 | -1,106.94 | 0.00 | 0.00 | 0.00 |
| 5,400.00 | 20.91 | 238.05 | 5,140.75 | -237.75 | -766.01 | -1,228.10 | -1,134.92 | 0.00 | 0.00 | 0.00 |
| 5,500.00 | 20.91 | 238.05 | 5,234.16 | -331.16 | -784.90 | -1,258.38 | -1,162.91 | 0.00 | 0.00 | 0.00 |
| 5,600.00 | 20.91 | 238.05 | 5,327.58 | -424.58 | -803.78 | -1,288.66 | -1,190.90 | 0.00 | 0.00 | 0.00 |
| **TeePee Buttes** | | | | | | | | | | |
| ***5,621.86*** | ***20.91*** | ***238.05*** | ***5,348.00*** | ***-445.00*** | ***-807.91*** | ***-1,295.28*** | ***-1,197.01*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 5,700.00 | 20.91 | 238.05 | 5,420.99 | -517.99 | -822.67 | -1,318.95 | -1,218.88 | 0.00 | 0.00 | 0.00 |
| **KOP (10°/100ft DGLG)** | | | | | | | | | | |
| ***5,778.64*** | ***20.91*** | ***238.05*** | ***5,494.45*** | ***-591.45*** | ***-837.53*** | ***-1,342.76*** | ***-1,240.89*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 5,800.00 | 19.19 | 234.36 | 5,514.52 | -611.52 | -841.59 | -1,348.85 | -1,246.48 | 10.00 | -8.06 | -17.26 |
| 5,900.00 | 12.82 | 205.56 | 5,610.74 | -707.74 | -861.22 | -1,367.04 | -1,262.37 | 10.00 | -6.37 | -28.81 |
| 6,000.00 | 12.56 | 158.83 | 5,708.54 | -805.54 | -881.43 | -1,367.90 | -1,260.97 | 10.00 | -0.26 | -46.73 |
| 6,100.00 | 18.67 | 128.50 | 5,804.96 | -901.96 | -901.58 | -1,351.40 | -1,242.33 | 10.00 | 6.10 | -30.32 |
| 6,200.00 | 27.13 | 114.57 | 5,897.06 | -994.06 | -921.08 | -1,318.06 | -1,207.02 | 10.00 | 8.47 | -13.93 |
| **Sharon Springs** | | | | | | | | | | |
| ***6,271.85*** | ***33.71*** | ***108.83*** | ***5,959.00*** | ***-1,056.00*** | ***-934.34*** | ***-1,284.24*** | ***-1,171.93*** | ***10.00*** | ***9.16*** | ***-7.99*** |
| 6,300.00 | 36.35 | 107.10 | 5,982.05 | -1,079.05 | -939.32 | -1,268.87 | -1,156.10 | 10.00 | 9.36 | -6.15 |
| **Niobrara Top** | | | | | | | | | | |
| ***6,320.05*** | ***38.23*** | ***106.00*** | ***5,998.00*** | ***-1,095.00*** | ***-942.77*** | ***-1,257.23*** | ***-1,144.14*** | ***10.00*** | ***9.43*** | ***-5.52*** |
| **Niobrara A Chalk** | | | | | | | | | | |
| ***6,359.27*** | ***41.96*** | ***104.08*** | ***6,028.00*** | ***-1,125.00*** | ***-949.31*** | ***-1,232.83*** | ***-1,119.17*** | ***10.00*** | ***9.49*** | ***-4.89*** |
| **Niobrara A Chalk Base** | | | | | | | | | | |
| ***6,392.38*** | ***45.12*** | ***102.66*** | ***6,052.00*** | ***-1,149.00*** | ***-954.58*** | ***-1,210.64*** | ***-1,096.53*** | ***10.00*** | ***9.56*** | ***-4.27*** |
| 6,400.00 | 45.85 | 102.36 | 6,057.34 | -1,154.34 | -955.75 | -1,205.34 | -1,091.13 | 10.00 | 9.59 | -3.98 |
| **Niobrara B1 Chalk Top** | | | | | | | | | | |
| ***6,449.03*** | ***50.57*** | ***100.57*** | ***6,090.00*** | ***-1,187.00*** | ***-963.00*** | ***-1,169.53*** | ***-1,054.73*** | ***10.00*** | ***9.62*** | ***-3.65*** |
| **Niobrara B1 Chalk Base** | | | | | | | | | | |
| ***6,479.93*** | ***53.56*** | ***99.57*** | ***6,109.00*** | ***-1,206.00*** | ***-967.26*** | ***-1,145.53*** | ***-1,030.41*** | ***10.00*** | ***9.66*** | ***-3.26*** |
| 6,500.00 | 55.50 | 98.95 | 6,120.64 | -1,217.64 | -969.88 | -1,129.40 | -1,014.09 | 10.00 | 9.69 | -3.05 |
| **Niobrara B2 Chalk Top** | | | | | | | | | | |
| ***6,530.00*** | ***58.41*** | ***98.09*** | ***6,137.00*** | ***-1,234.00*** | ***-973.61*** | ***-1,104.53*** | ***-988.96*** | ***10.00*** | ***9.70*** | ***-2.88*** |
| **Niobrara B2 Chalk Base** | | | | | | | | | | |
| ***6,583.69*** | ***63.64*** | ***96.67*** | ***6,163.00*** | ***-1,260.00*** | ***-979.62*** | ***-1,057.97*** | ***-942.01*** | ***10.00*** | ***9.73*** | ***-2.65*** |
| 6,600.00 | 65.23 | 96.26 | 6,170.04 | -1,267.04 | -981.28 | -1,043.35 | -927.30 | 10.00 | 9.75 | -2.49 |
| **Niobrara C Chalk Target Top** | | | | | | | | | | |
| ***6,655.86*** | ***70.68*** | ***94.95*** | ***6,191.00*** | ***-1,288.00*** | ***-986.32*** | ***-991.84*** | ***-875.56*** | ***10.00*** | ***9.76*** | ***-2.36*** |

| | | | |
|---|---|---|---|
| **Database:** | Database 1 | **Local Co-ordinate Reference:** | Well ANDERSON FED 6-5-1HN |
| **Company:** | MALLARD EXPLORATION | **TVD Reference:** | KB 25' @ 4903.00usft |
| **Project:** | WELD COUNTY, COLORADO (NAD 83) | **MD Reference:** | KB 25' @ 4903.00usft |
| **Site:** | SE SW SEC. 31 T9N R59W 6th P.M. | **North Reference:** | True |
| **Well:** | ANDERSON FED 6-5-1HN | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | ORIGINAL WELLBORE | | |
| **Design:** | PROPOSAL #3 | | |

**Planned Survey**

| MD (usft) | Inc (°) | Azi (°) | TVD (usft) | SS (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 6,700.00 | 74.99 | 93.97 | 6,204.03 | -1,301.03 | -989.59 | -949.80 | -833.41 | 10.00 | 9.77 | -2.22 |
| 6,800.00 | 84.78 | 91.87 | 6,221.57 | -1,318.57 | -994.57 | -851.61 | -735.28 | 10.00 | 9.79 | -2.09 |
| **LP *NEW*: 305ft FNL & 600ft FWL of Sec 6 - Niobrara C Chalk Target Center** | | | | | | | | | | |
| ***6,853.34*** | ***90.00*** | ***90.79*** | ***6,224.00*** | ***-1,321.00*** | ***-995.81*** | ***-798.36*** | ***-682.22*** | ***10.00*** | ***9.79*** | ***-2.03*** |
| 6,900.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -996.45 | -751.70 | -635.79 | 0.00 | 0.00 | 0.00 |
| 7,000.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -997.83 | -651.71 | -536.27 | 0.00 | 0.00 | 0.00 |
| 7,100.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -999.21 | -551.72 | -436.75 | 0.00 | 0.00 | 0.00 |
| 7,200.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,000.59 | -451.73 | -337.23 | 0.00 | 0.00 | 0.00 |
| 7,300.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,001.97 | -351.74 | -237.71 | 0.00 | 0.00 | 0.00 |
| 7,400.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,003.35 | -251.75 | -138.19 | 0.00 | 0.00 | 0.00 |
| 7,500.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,004.73 | -151.76 | -38.67 | 0.00 | 0.00 | 0.00 |
| 7,600.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,006.10 | -51.77 | 60.85 | 0.00 | 0.00 | 0.00 |
| 7,700.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,007.48 | 48.22 | 160.37 | 0.00 | 0.00 | 0.00 |
| 7,800.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,008.86 | 148.21 | 259.89 | 0.00 | 0.00 | 0.00 |
| 7,900.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,010.24 | 248.20 | 359.41 | 0.00 | 0.00 | 0.00 |
| 8,000.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,011.62 | 348.19 | 458.93 | 0.00 | 0.00 | 0.00 |
| 8,100.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,013.00 | 448.18 | 558.45 | 0.00 | 0.00 | 0.00 |
| 8,200.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,014.38 | 548.17 | 657.97 | 0.00 | 0.00 | 0.00 |
| 8,300.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,015.76 | 648.16 | 757.49 | 0.00 | 0.00 | 0.00 |
| 8,400.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,017.13 | 748.15 | 857.01 | 0.00 | 0.00 | 0.00 |
| 8,500.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,018.51 | 848.15 | 956.53 | 0.00 | 0.00 | 0.00 |
| 8,600.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,019.89 | 948.14 | 1,056.05 | 0.00 | 0.00 | 0.00 |
| 8,700.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,021.27 | 1,048.13 | 1,155.57 | 0.00 | 0.00 | 0.00 |
| 8,800.00 | 90.00 | 90.79 | 6,224.00 | -1,321.00 | -1,022.65 | 1,148.12 | 1,255.09 | 0.00 | 0.00 | 0.00 |
| **END OF TANGENT** | | | | | | | | | | |
| ***8,886.68*** | ***90.00*** | ***90.79*** | ***6,224.00*** | ***-1,321.00*** | ***-1,023.85*** | ***1,234.79*** | ***1,341.35*** | ***0.00*** | ***0.00*** | ***0.00*** |
| 8,900.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,024.00 | 1,248.11 | 1,354.60 | 2.00 | 0.00 | -2.00 |
| **EOT TO 90.52° INC** | | | | | | | | | | |
| ***8,900.18*** | ***90.00*** | ***90.52*** | ***6,224.00*** | ***-1,321.00*** | ***-1,024.00*** | ***1,248.29*** | ***1,354.78*** | ***1.98*** | ***0.00*** | ***-1.98*** |
| 9,000.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,024.91 | 1,348.10 | 1,454.07 | 0.00 | 0.00 | 0.00 |
| 9,100.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,025.81 | 1,448.10 | 1,553.55 | 0.00 | 0.00 | 0.00 |
| 9,200.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,026.72 | 1,548.10 | 1,653.02 | 0.00 | 0.00 | 0.00 |
| 9,300.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,027.63 | 1,648.09 | 1,752.49 | 0.00 | 0.00 | 0.00 |
| 9,400.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,028.54 | 1,748.09 | 1,851.96 | 0.00 | 0.00 | 0.00 |
| 9,500.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,029.44 | 1,848.08 | 1,951.44 | 0.00 | 0.00 | 0.00 |
| 9,600.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,030.35 | 1,948.08 | 2,050.91 | 0.00 | 0.00 | 0.00 |
| 9,700.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,031.26 | 2,048.07 | 2,150.38 | 0.00 | 0.00 | 0.00 |
| 9,800.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,032.17 | 2,148.07 | 2,249.85 | 0.00 | 0.00 | 0.00 |
| 9,900.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,033.07 | 2,248.07 | 2,349.33 | 0.00 | 0.00 | 0.00 |
| 10,000.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,033.98 | 2,348.06 | 2,448.80 | 0.00 | 0.00 | 0.00 |
| 10,100.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,034.89 | 2,448.06 | 2,548.27 | 0.00 | 0.00 | 0.00 |
| 10,200.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,035.80 | 2,548.05 | 2,647.74 | 0.00 | 0.00 | 0.00 |
| 10,300.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,036.70 | 2,648.05 | 2,747.22 | 0.00 | 0.00 | 0.00 |
| 10,400.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,037.61 | 2,748.05 | 2,846.69 | 0.00 | 0.00 | 0.00 |
| 10,500.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,038.52 | 2,848.04 | 2,946.16 | 0.00 | 0.00 | 0.00 |
| 10,600.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,039.43 | 2,948.04 | 3,045.63 | 0.00 | 0.00 | 0.00 |
| 10,700.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,040.33 | 3,048.03 | 3,145.10 | 0.00 | 0.00 | 0.00 |
| 10,800.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,041.24 | 3,148.03 | 3,244.58 | 0.00 | 0.00 | 0.00 |
| 10,900.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,042.15 | 3,248.03 | 3,344.05 | 0.00 | 0.00 | 0.00 |
| 11,000.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,043.06 | 3,348.02 | 3,443.52 | 0.00 | 0.00 | 0.00 |
| 11,100.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,043.96 | 3,448.02 | 3,542.99 | 0.00 | 0.00 | 0.00 |
| 11,200.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,044.87 | 3,548.01 | 3,642.47 | 0.00 | 0.00 | 0.00 |
| 11,300.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,045.78 | 3,648.01 | 3,741.94 | 0.00 | 0.00 | 0.00 |

| | | | |
|---|---|---|---|
| **Database:** | Database 1 | **Local Co-ordinate Reference:** | Well ANDERSON FED 6-5-1HN |
| **Company:** | MALLARD EXPLORATION | **TVD Reference:** | KB 25' @ 4903.00usft |
| **Project:** | WELD COUNTY, COLORADO (NAD 83) | **MD Reference:** | KB 25' @ 4903.00usft |
| **Site:** | SE SW SEC. 31 T9N R59W 6th P.M. | **North Reference:** | True |
| **Well:** | ANDERSON FED 6-5-1HN | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | ORIGINAL WELLBORE | | |
| **Design:** | PROPOSAL #3 | | |

**Planned Survey**

| MD (usft) | Inc (°) | Azi (°) | TVD (usft) | SS (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 11,400.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,046.69 | 3,748.00 | 3,841.41 | 0.00 | 0.00 | 0.00 |
| 11,500.00 | 90.00 | 90.52 | 6,224.00 | -1,321.00 | -1,047.59 | 3,848.00 | 3,940.88 | 0.00 | 0.00 | 0.00 |
| **END OF TANGENT** | | | | | | | | | | |
| ***11,527.18*** | ***90.00*** | ***90.52*** | ***6,224.00*** | ***-1,321.00*** | ***-1,047.84*** | ***3,875.18*** | ***3,967.92*** | ***0.00*** | ***0.00*** | ***0.00*** |
| **EOT TO 89.35° AZ** | | | | | | | | | | |
| ***11,585.68*** | ***90.00*** | ***89.35*** | ***6,224.00*** | ***-1,321.00*** | ***-1,047.77*** | ***3,933.68*** | ***4,026.05*** | ***2.00*** | ***0.00*** | ***-2.00*** |
| 11,600.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,047.61 | 3,948.00 | 4,040.26 | 0.00 | 0.00 | 0.00 |
| 11,700.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,046.48 | 4,047.99 | 4,139.50 | 0.00 | 0.00 | 0.00 |
| 11,800.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,045.34 | 4,147.98 | 4,238.74 | 0.00 | 0.00 | 0.00 |
| 11,900.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,044.21 | 4,247.98 | 4,337.98 | 0.00 | 0.00 | 0.00 |
| 12,000.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,043.07 | 4,347.97 | 4,437.23 | 0.00 | 0.00 | 0.00 |
| 12,100.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,041.94 | 4,447.97 | 4,536.47 | 0.00 | 0.00 | 0.00 |
| 12,200.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,040.81 | 4,547.96 | 4,635.71 | 0.00 | 0.00 | 0.00 |
| 12,300.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,039.67 | 4,647.95 | 4,734.95 | 0.00 | 0.00 | 0.00 |
| 12,400.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,038.54 | 4,747.95 | 4,834.19 | 0.00 | 0.00 | 0.00 |
| 12,500.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,037.40 | 4,847.94 | 4,933.44 | 0.00 | 0.00 | 0.00 |
| 12,600.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,036.27 | 4,947.93 | 5,032.68 | 0.00 | 0.00 | 0.00 |
| 12,700.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,035.13 | 5,047.93 | 5,131.92 | 0.00 | 0.00 | 0.00 |
| 12,800.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,034.00 | 5,147.92 | 5,231.16 | 0.00 | 0.00 | 0.00 |
| 12,900.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,032.86 | 5,247.91 | 5,330.41 | 0.00 | 0.00 | 0.00 |
| 13,000.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,031.73 | 5,347.91 | 5,429.65 | 0.00 | 0.00 | 0.00 |
| 13,100.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,030.60 | 5,447.90 | 5,528.89 | 0.00 | 0.00 | 0.00 |
| 13,200.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,029.46 | 5,547.89 | 5,628.13 | 0.00 | 0.00 | 0.00 |
| 13,300.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,028.33 | 5,647.89 | 5,727.37 | 0.00 | 0.00 | 0.00 |
| 13,400.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,027.19 | 5,747.88 | 5,826.62 | 0.00 | 0.00 | 0.00 |
| 13,500.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,026.06 | 5,847.88 | 5,925.86 | 0.00 | 0.00 | 0.00 |
| 13,600.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,024.92 | 5,947.87 | 6,025.10 | 0.00 | 0.00 | 0.00 |
| 13,700.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,023.79 | 6,047.86 | 6,124.34 | 0.00 | 0.00 | 0.00 |
| 13,800.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,022.65 | 6,147.86 | 6,223.58 | 0.00 | 0.00 | 0.00 |
| 13,900.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,021.52 | 6,247.85 | 6,322.83 | 0.00 | 0.00 | 0.00 |
| 14,000.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,020.39 | 6,347.84 | 6,422.07 | 0.00 | 0.00 | 0.00 |
| 14,100.00 | 90.00 | 89.35 | 6,224.00 | -1,321.00 | -1,019.25 | 6,447.84 | 6,521.31 | 0.00 | 0.00 | 0.00 |
| **END OF TANGENT** | | | | | | | | | | |
| ***14,165.68*** | ***90.00*** | ***89.35*** | ***6,224.00*** | ***-1,321.00*** | ***-1,018.51*** | ***6,513.51*** | ***6,586.49*** | ***0.00*** | ***0.00*** | ***0.00*** |
| **EOT TO 89.39° AZ** | | | | | | | | | | |
| ***14,167.68*** | ***90.00*** | ***89.39*** | ***6,224.00*** | ***-1,321.00*** | ***-1,018.48*** | ***6,515.51*** | ***6,588.48*** | ***2.00*** | ***0.00*** | ***2.00*** |
| 14,200.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,018.14 | 6,547.83 | 6,620.56 | 0.00 | 0.00 | 0.00 |
| 14,300.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,017.08 | 6,647.82 | 6,719.81 | 0.00 | 0.00 | 0.00 |
| 14,400.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,016.01 | 6,747.82 | 6,819.06 | 0.00 | 0.00 | 0.00 |
| 14,500.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,014.95 | 6,847.81 | 6,918.31 | 0.00 | 0.00 | 0.00 |
| 14,600.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,013.88 | 6,947.81 | 7,017.56 | 0.00 | 0.00 | 0.00 |
| 14,700.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,012.82 | 7,047.80 | 7,116.81 | 0.00 | 0.00 | 0.00 |
| 14,800.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,011.76 | 7,147.80 | 7,216.06 | 0.00 | 0.00 | 0.00 |
| 14,900.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,010.70 | 7,247.79 | 7,315.31 | 0.00 | 0.00 | 0.00 |
| 15,000.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,009.63 | 7,347.79 | 7,414.56 | 0.00 | 0.00 | 0.00 |
| 15,100.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,008.57 | 7,447.78 | 7,513.81 | 0.00 | 0.00 | 0.00 |
| 15,200.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,007.51 | 7,547.77 | 7,613.07 | 0.00 | 0.00 | 0.00 |
| 15,300.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,006.45 | 7,647.77 | 7,712.32 | 0.00 | 0.00 | 0.00 |
| 15,400.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,005.39 | 7,747.76 | 7,811.57 | 0.00 | 0.00 | 0.00 |
| 15,500.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,004.33 | 7,847.76 | 7,910.82 | 0.00 | 0.00 | 0.00 |
| 15,600.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,003.27 | 7,947.75 | 8,010.07 | 0.00 | 0.00 | 0.00 |
| 15,700.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,002.21 | 8,047.75 | 8,109.32 | 0.00 | 0.00 | 0.00 |
| 15,800.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,001.15 | 8,147.74 | 8,208.57 | 0.00 | 0.00 | 0.00 |
| 15,900.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -1,000.09 | 8,247.73 | 8,307.82 | 0.00 | 0.00 | 0.00 |

| | | | |
|---|---|---|---|
| **Database:** | Database 1 | **Local Co-ordinate Reference:** | Well ANDERSON FED 6-5-1HN |
| **Company:** | MALLARD EXPLORATION | **TVD Reference:** | KB 25' @ 4903.00usft |
| **Project:** | WELD COUNTY, COLORADO (NAD 83) | **MD Reference:** | KB 25' @ 4903.00usft |
| **Site:** | SE SW SEC. 31 T9N R59W 6th P.M. | **North Reference:** | True |
| **Well:** | ANDERSON FED 6-5-1HN | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | ORIGINAL WELLBORE | | |
| **Design:** | PROPOSAL #3 | | |

**Planned Survey**

| MD (usft) | Inc (°) | Azi (°) | TVD (usft) | SS (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 16,000.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -999.03 | 8,347.73 | 8,407.08 | 0.00 | 0.00 | 0.00 |
| 16,100.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -997.98 | 8,447.72 | 8,506.33 | 0.00 | 0.00 | 0.00 |
| 16,200.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -996.92 | 8,547.72 | 8,605.58 | 0.00 | 0.00 | 0.00 |
| 16,300.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -995.86 | 8,647.71 | 8,704.83 | 0.00 | 0.00 | 0.00 |
| 16,400.00 | 90.00 | 89.39 | 6,224.00 | -1,321.00 | -994.80 | 8,747.71 | 8,804.08 | 0.00 | 0.00 | 0.00 |
| **BHL: 305ft FNL & 300ft FEL of Sec 5** | | | | | | | | | | |
| ***16,499.99*** | ***90.00*** | ***89.39*** | ***6,224.00*** | ***-1,321.00*** | ***-993.75*** | ***8,847.69*** | ***8,903.32*** | ***0.00*** | ***0.00*** | ***0.00*** |

**Formations**

| MD (usft) | TVD (usft) | Name | Lithology | Dip (°) | Dip Direction (°) |
|---|---|---|---|---|---|
| 470.00 | 470.00 | Fox Hills Base | | | |
| 1,492.44 | 1,487.00 | Pierre Shale Top | | | |
| 3,418.77 | 3,290.00 | Richard Sandstone | | | |
| 3,563.28 | 3,425.00 | Parkman Sandstone | | | |
| 4,298.72 | 4,112.00 | Sussex Sandstone | | | |
| 4,798.64 | 4,579.00 | Shannon Sandstone | | | |
| 5,621.86 | 5,348.00 | TeePee Buttes | | | |
| 6,271.85 | 5,959.00 | Sharon Springs | | | |
| 6,320.05 | 5,998.00 | Niobrara Top | | | |
| 6,359.27 | 6,028.00 | Niobrara A Chalk | | | |
| 6,392.38 | 6,052.00 | Niobrara A Chalk Base | | | |
| 6,449.03 | 6,090.00 | Niobrara B1 Chalk Top | | | |
| 6,479.93 | 6,109.00 | Niobrara B1 Chalk Base | | | |
| 6,530.00 | 6,137.00 | Niobrara B2 Chalk Top | | | |
| 6,583.69 | 6,163.00 | Niobrara B2 Chalk Base | | | |
| 6,655.86 | 6,191.00 | Niobrara C Chalk Target Top | | | |
| 6,853.34 | 6,224.00 | Niobrara C Chalk Target Center | | | |

**Plan Annotations**

| MD (usft) | TVD (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Comment |
|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | SHL: 702ft FSL & 1912ft FWL of Sec 31 |
| 1,000.00 | 1,000.00 | 0.00 | 0.00 | START NUDGE (3°/100ft BUR) |
| 1,697.01 | 1,681.64 | -66.57 | -106.72 | EOB TO 20.91° INC |
| 5,778.64 | 5,494.45 | -837.53 | -1,342.76 | KOP (10°/100ft DGLG) |
| 6,853.34 | 6,224.00 | -995.81 | -798.36 | LP *NEW*: 305ft FNL & 600ft FWL of Sec 6 |
| 8,886.68 | 6,224.00 | -1,023.85 | 1,234.79 | END OF TANGENT |
| 8,900.18 | 6,224.00 | -1,024.00 | 1,248.29 | EOT TO 90.52° INC |
| 11,527.18 | 6,224.00 | -1,047.84 | 3,875.18 | END OF TANGENT |
| 11,585.68 | 6,224.00 | -1,047.77 | 3,933.68 | EOT TO 89.35° AZ |
| 14,165.68 | 6,224.00 | -1,018.51 | 6,513.51 | END OF TANGENT |
| 14,167.68 | 6,224.00 | -1,018.48 | 6,515.51 | EOT TO 89.39° AZ |
| 16,499.99 | 6,224.00 | -993.75 | 8,847.69 | BHL: 305ft FNL & 300ft FEL of Sec 5 |