

Well: Keith Stern S-12 HM (slot N)
 Site: Keith Stern
 Project: Marshall County, West Virginia.
 Design: rev2
 Rig: Nabors X08

SECTION DETAILS

| Sec | MD | Inc | Azi | TVD | +N-S | +E-W | Dleg | TFace | V Sect | Annotation |
|-----|----------|-------|---------|---------|----------|---------|--------|-------|---------|----------------------------|
| 1 | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | |
| 2 | 1000.00 | 0.00 | 0.000 | 1000.00 | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | KOP Begin 2 7/100' build |
| 3 | 1250.00 | 5.00 | 95.985 | 1249.68 | -1.14 | 10.84 | 2.000 | 95.98 | 7.71 | Begin 5.00° tangent |
| 4 | 3007.00 | 5.00 | 95.985 | 3000.00 | -17.10 | 163.14 | 0.000 | 0.00 | 116.01 | Begin 3 7/100' build/turn |
| 5 | 4185.92 | 28.58 | 95.855 | 4120.71 | -51.72 | 499.50 | 2.000 | -0.16 | 354.68 | Begin 28.58° tangent |
| 6 | 6199.00 | 28.58 | 95.855 | 5888.53 | -149.96 | 1457.45 | 0.000 | 0.00 | 1034.17 | Begin 8 7/100' build/turn |
| 7 | 6553.33 | 50.00 | 126.393 | 6163.63 | -240.99 | 1655.05 | 8.000 | 55.06 | 1229.32 | Begin 10 7/100' build/turn |
| 8 | 6999.88 | 89.00 | 150.318 | 6319.00 | -552.33 | 1916.65 | 10.000 | 35.23 | 1635.91 | Begin 89.00° lateral |
| 9 | 14031.84 | 89.00 | 150.318 | 6442.00 | -6660.66 | 5398.29 | 0.000 | 0.00 | 8573.56 | PBHL/TD |

ANNOTATIONS SURVEYS

| MD | Inc | Azi | TVD | +N-S | +E-W | V Sect | Annotation |
|----------|-------|---------|---------|----------|---------|---------|---|
| 191.00 | 0.22 | 273.850 | 191.00 | 0.02 | -0.37 | -0.25 | MWD surveys |
| 13959.00 | 88.48 | 149.600 | 6462.47 | -6610.04 | 5351.74 | 8504.93 | Survey @ 13959.00 MD 6462.47 TVD |
| 14013.00 | 88.48 | 149.600 | 6463.90 | -6656.60 | 5379.06 | 8558.30 | Survey Proj. to 14013.00 MD 6463.90 TVD |

Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: NAD83 West Virginia - HARN
 Ellipsoid: GRS 1980
 Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level
 Depth Reference: RKB=748+33 @ 781.00usft (Nabors X08)

| Northing | Easting | Latitude | Longitude |
|-------------|------------|-------------|--------------|
| 14444858.01 | 1726916.63 | 39.77474146 | -80.69213727 |

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.87°

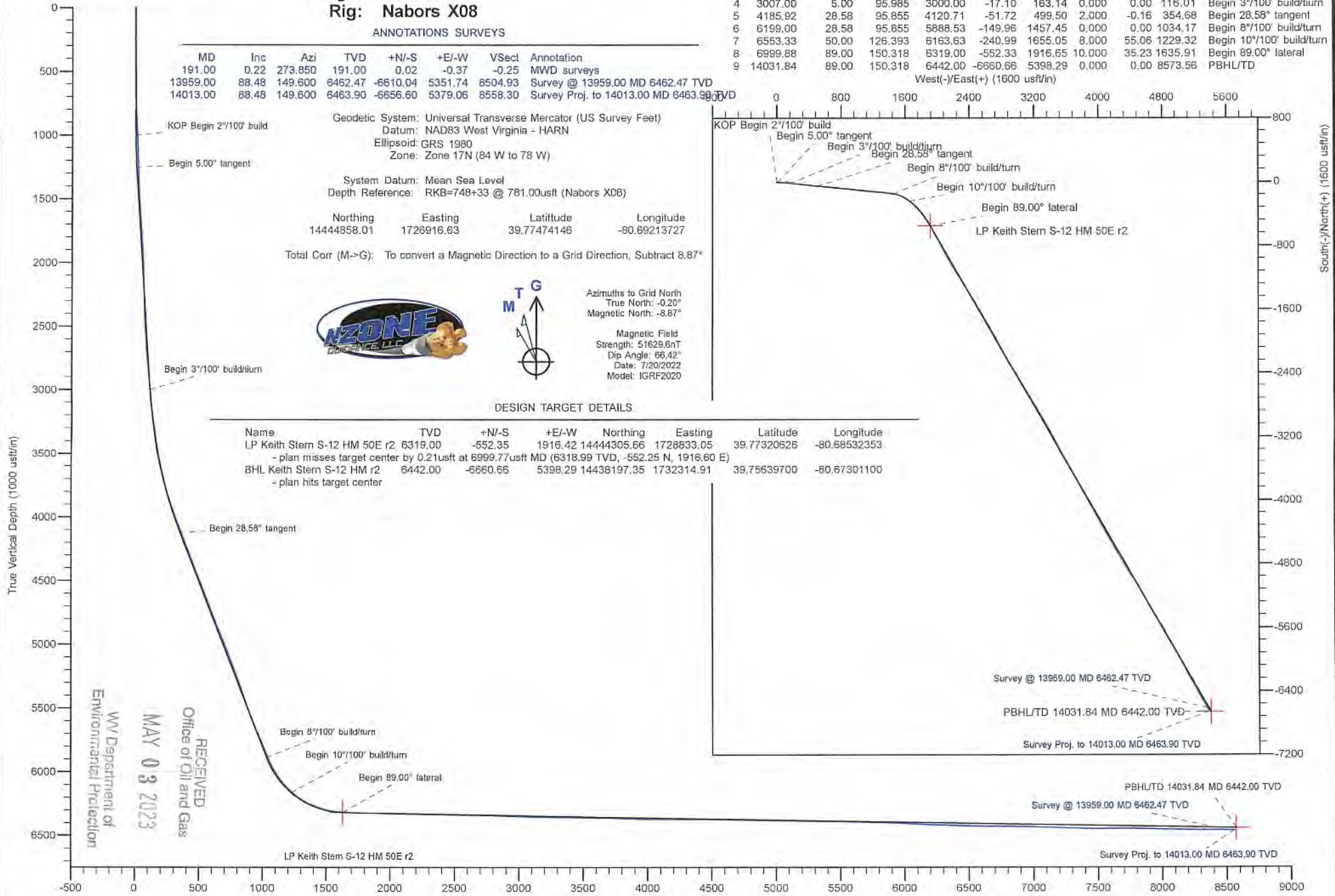


Azimuths to Grid North
 True North: -0.20°
 Magnetic North: -8.87°

Magnetic Field
 Strength: 51629.6nT
 Dip Angle: 66.42°
 Date: 7/20/2022
 Model: IGRF2020

DESIGN TARGET DETAILS

| Name | TVD | +N-S | +E-W | Northing | Easting | Latitude | Longitude |
|---|---------|----------|---------|-------------|------------|-------------|--------------|
| LP Keith Stern S-12 HM 50E r2 | 6319.00 | -552.35 | 1916.42 | 14444305.66 | 1728833.05 | 39.77320626 | -80.68532353 |
| - plan misses target center by 0.21usft at 6999.77usft MD (6318.99 TVD, -552.25 N, 1916.60 E) | | | | | | | |
| BHL Keith Stern S-12 HM r2 | 6442.00 | -6660.66 | 5398.29 | 14436197.35 | 1732314.91 | 39.75639700 | -80.67301100 |
| - plan hits target center | | | | | | | |



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 Office of Oil and Gas
 MAY 03 2023
 WV Department of Environmental Protection



Survey Report - Geographic



| | | | |
|------------------|---------------------------------|-------------------------------------|--------------------------------------|
| Company: | Tug Hill Operating LLC | Local Co-ordinate Reference: | Well Keith Stern S-12 HM (slot N) |
| Project: | Marshall County, West Virginia. | TVD Reference: | RKB=748+33 @ 781.00usft (Nabors X08) |
| Site: | Keith Stern | MD Reference: | RKB=748+33 @ 781.00usft (Nabors X08) |
| Well: | Keith Stern S-12 HM (slot N) | North Reference: | Grid |
| Wellbore: | Original Hole | Survey Calculation Method: | Minimum Curvature |
| Design: | Surveys Original Hole | Database: | DB_Feb2822 |

| | | | |
|--------------------|--|----------------------|----------------|
| Project | Marshall County, West Virginia. | | |
| Map System: | Universal Transverse Mercator (US Survey Feet) | System Datum: | Mean Sea Level |
| Geo Datum: | NAD83 West Virginia - HARN | | |
| Map Zone: | Zone 17N (84 W to 78 W) | | |

| | | | | | |
|------------------------------|------------------|---------------------|-------------------|--------------------------|--------------|
| Site | Keith Stern | | | | |
| Site Position: | Northing: | 14,444,890.33 usft | Latitude: | 39.77483004 | |
| From: | Lat/Long | Easting: | 1,726,932.47 usft | Longitude: | -80.69208048 |
| Position Uncertainty: | 0.00 usft | Slot Radius: | 13-3/16 " | Grid Convergence: | 0.20 ° |

| | | | | | | |
|-----------------------------|------------------------------|----------------------------|------------------|----------------------|-------------------|--------------|
| Well | Keith Stern S-12 HM (slot N) | | | | | |
| Well Position | +N/-S | 0.00 usft | Northing: | 14,444,858.02 usft | Latitude: | 39.77474146 |
| | +E/-W | 0.00 usft | Easting: | 1,726,916.62 usft | Longitude: | -80.69213727 |
| Position Uncertainty | 0.00 usft | Wellhead Elevation: | usft | Ground Level: | 748.00 usft | |

| | | | | | |
|------------------|-------------------|--------------------|------------------------|----------------------|----------------------------|
| Wellbore | Original Hole | | | | |
| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
| | IGRF2020 | 7/20/2022 | -8.67 | 66.42 | 51,629,64158002 |

| | | | | | |
|--------------------------|--------------------------------|---------------------|---------------------|----------------------|------|
| Design | Surveys Original Hole | | | | |
| Audit Notes: | | | | | |
| Version: | 1.0 | Phase: | ACTUAL | Tie On Depth: | 0.00 |
| Vertical Section: | Depth From (TVD) (usft) | +N/-S (usft) | +E/-W (usft) | Direction (°) | |
| | 0.00 | 0.00 | 0.00 | 140.976 | |

| | | | | | |
|-----------------------|------------------|----------------------------|------------------|--------------------|--|
| Survey Program | Date | 8/1/2022 | | | |
| From (usft) | To (usft) | Survey (Wellbore) | Tool Name | Description | |
| 191.00 | 515.00 | MWD surf (Original Hole) | MWD | MWD - Standard | |
| 554.00 | 2,023.00 | MWD int (Original Hole) | MWD | MWD - Standard | |
| 2,300.00 | 13,959.00 | MWD (Original Hole) | MWD | MWD - Standard | |
| 14,013.00 | 14,013.00 | Projection (Original Hole) | MWD | MWD - Standard | |

| | | | | | | | | | | |
|------------------------------|------------------------|--------------------|------------------------------|---------------------|---------------------|----------------------------|---------------------------|-----------------|------------------|--|
| Survey | | | | | | | | | | |
| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude | |
| 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 | 14,444,858.02 | 1,726,916.62 | 39.77474146 | -80.69213727 | |
| 191.00 | 0.22 | 273.850 | 191.00 | 0.02 | -0.37 | 14,444,858.04 | 1,726,916.26 | 39.77474153 | -80.69213857 | |
| MWD surveys | | | | | | | | | | |
| 221.00 | 0.23 | 266.120 | 221.00 | 0.02 | -0.48 | 14,444,858.04 | 1,726,916.14 | 39.77474153 | -80.69213899 | |
| 251.00 | 0.26 | 261.370 | 251.00 | 0.01 | -0.61 | 14,444,858.03 | 1,726,916.01 | 39.77474150 | -80.69213944 | |
| 282.00 | 0.18 | 288.320 | 282.00 | 0.01 | -0.73 | 14,444,858.03 | 1,726,915.90 | 39.77474151 | -80.69213986 | |
| 312.00 | 0.24 | 286.830 | 312.00 | 0.05 | -0.83 | 14,444,858.06 | 1,726,915.79 | 39.77474160 | -80.69214023 | |
| 342.00 | 0.18 | 299.900 | 342.00 | 0.09 | -0.93 | 14,444,858.11 | 1,726,915.69 | 39.77474172 | -80.69214059 | |
| 433.00 | 0.20 | 293.640 | 433.00 | 0.22 | -1.20 | 14,444,858.24 | 1,726,915.42 | 39.77474209 | -80.69214155 | |



Survey Report - Geographic



| | | | |
|------------------|---------------------------------|-------------------------------------|---------------------------------------|
| Company: | Tug Hill Operating LLC | Local Co-ordinate Reference: | Well Keith Stern S-12 HM (slot N) |
| Project: | Marshall County, West Virginia. | TVD Reference: | RKB=748+33 @ 781.00usft. (Nabors X08) |
| Site: | Keith Stern | MD Reference: | RKB=748+33 @ 781.00usft. (Nabors X08) |
| Well: | Keith Stern S-12 HM (slot N) | North Reference: | Grid |
| Wellbore: | Original Hole | Survey Calculation Method: | Minimum Curvature |
| Design: | Surveys Original Hole | Database: | DB_Feb2822 |

| Survey | | | | | | | | | | |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|---------------------|--------------------|-------------|--------------|--|
| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude | |
| 515.00 | 0.58 | 287.870 | 515.00 | 0.41 | -1.73 | 14,444,858.43 | 1,726,914.90 | 39.77474260 | -80.69214342 | |
| 554.00 | 0.73 | 286.730 | 553.99 | 0.54 | -2.15 | 14,444,858.56 | 1,726,914.47 | 39.77474297 | -80.69214493 | |
| 615.00 | 0.16 | 237.680 | 614.99 | 0.61 | -2.60 | 14,444,858.62 | 1,726,914.03 | 39.77474316 | -80.69214651 | |
| 675.00 | 1.05 | 129.940 | 674.99 | 0.21 | -2.25 | 14,444,858.23 | 1,726,914.38 | 39.77474206 | -80.69214527 | |
| 706.00 | 1.42 | 127.640 | 705.98 | -0.21 | -1.73 | 14,444,857.81 | 1,726,914.90 | 39.77474091 | -80.69214341 | |
| 800.00 | 3.05 | 125.010 | 799.91 | -2.35 | 1.25 | 14,444,855.66 | 1,726,917.87 | 39.77473499 | -80.69213287 | |
| 894.00 | 4.08 | 113.870 | 893.72 | -5.14 | 6.35 | 14,444,852.88 | 1,726,922.98 | 39.77472728 | -80.69211473 | |
| 988.00 | 3.54 | 101.350 | 987.52 | -7.07 | 12.26 | 14,444,850.95 | 1,726,928.88 | 39.77472194 | -80.69209374 | |
| 1,082.00 | 3.09 | 86.860 | 1,081.36 | -7.50 | 17.63 | 14,444,850.52 | 1,726,934.25 | 39.77472070 | -80.69207461 | |
| 1,176.00 | 3.48 | 76.500 | 1,175.21 | -6.69 | 22.93 | 14,444,851.32 | 1,726,939.56 | 39.77472286 | -80.69205573 | |
| 1,270.00 | 2.88 | 83.520 | 1,269.06 | -5.76 | 28.05 | 14,444,852.26 | 1,726,944.68 | 39.77472538 | -80.69203749 | |
| 1,364.00 | 2.56 | 100.150 | 1,362.96 | -5.86 | 32.47 | 14,444,852.15 | 1,726,949.09 | 39.77472505 | -80.69202179 | |
| 1,458.00 | 3.26 | 102.170 | 1,456.84 | -6.80 | 37.15 | 14,444,851.22 | 1,726,953.77 | 39.77472244 | -80.69200515 | |
| 1,552.00 | 4.96 | 98.900 | 1,550.59 | -7.99 | 43.77 | 14,444,850.03 | 1,726,960.40 | 39.77471911 | -80.69198157 | |
| 1,647.00 | 6.75 | 92.690 | 1,645.09 | -8.89 | 53.41 | 14,444,849.13 | 1,726,970.03 | 39.77471655 | -80.69194729 | |
| 1,741.00 | 6.88 | 85.470 | 1,738.43 | -9.00 | 64.56 | 14,444,849.02 | 1,726,981.18 | 39.77471615 | -80.69190762 | |
| 1,836.00 | 5.49 | 86.800 | 1,832.87 | -8.59 | 74.78 | 14,444,849.43 | 1,726,991.41 | 39.77471716 | -80.69187122 | |
| 1,929.00 | 3.87 | 89.280 | 1,925.56 | -8.30 | 82.36 | 14,444,849.71 | 1,726,998.99 | 39.77471788 | -80.69184424 | |
| 2,023.00 | 4.16 | 95.230 | 2,019.33 | -8.57 | 88.93 | 14,444,849.44 | 1,727,005.55 | 39.77471708 | -80.69182087 | |
| 2,300.00 | 5.15 | 56.360 | 2,295.48 | -2.60 | 109.29 | 14,444,855.42 | 1,727,025.92 | 39.77473329 | -80.69174833 | |
| 2,394.00 | 4.58 | 79.110 | 2,389.15 | 0.45 | 116.49 | 14,444,858.46 | 1,727,033.11 | 39.77474159 | -80.69172267 | |
| 2,488.00 | 4.81 | 100.050 | 2,482.84 | 0.47 | 124.06 | 14,444,858.48 | 1,727,040.68 | 39.77474157 | -80.69169574 | |
| 2,582.00 | 4.49 | 100.180 | 2,576.53 | -0.87 | 131.56 | 14,444,857.15 | 1,727,048.18 | 39.77473783 | -80.69166906 | |
| 2,677.00 | 5.96 | 96.430 | 2,671.13 | -2.08 | 140.12 | 14,444,855.94 | 1,727,056.74 | 39.77473442 | -80.69163860 | |
| 2,771.00 | 6.47 | 106.740 | 2,764.58 | -4.15 | 150.04 | 14,444,853.86 | 1,727,066.67 | 39.77472864 | -80.69160332 | |
| 2,868.00 | 5.96 | 98.830 | 2,861.02 | -6.50 | 160.25 | 14,444,851.52 | 1,727,076.88 | 39.77472210 | -80.69156701 | |
| 2,963.00 | 5.76 | 108.150 | 2,955.52 | -8.74 | 169.66 | 14,444,849.27 | 1,727,086.28 | 39.77471585 | -80.69153357 | |
| 3,057.00 | 5.36 | 103.440 | 3,049.08 | -11.23 | 178.41 | 14,444,846.79 | 1,727,095.03 | 39.77470893 | -80.69150244 | |
| 3,152.00 | 7.14 | 107.570 | 3,143.51 | -14.05 | 188.35 | 14,444,843.97 | 1,727,104.96 | 39.77470111 | -80.69146708 | |
| 3,246.00 | 9.38 | 103.150 | 3,236.53 | -17.55 | 201.38 | 14,444,840.46 | 1,727,118.01 | 39.77469136 | -80.69142075 | |
| 3,341.00 | 11.55 | 99.060 | 3,329.95 | -20.81 | 218.32 | 14,444,837.21 | 1,727,134.94 | 39.77468224 | -80.69136053 | |
| 3,435.00 | 12.99 | 101.070 | 3,421.80 | -24.32 | 237.98 | 14,444,833.69 | 1,727,154.60 | 39.77467242 | -80.69129059 | |
| 3,529.00 | 14.97 | 96.120 | 3,513.01 | -27.65 | 260.42 | 14,444,830.37 | 1,727,177.05 | 39.77466308 | -80.69121076 | |
| 3,624.00 | 16.79 | 95.060 | 3,604.38 | -30.16 | 286.29 | 14,444,827.85 | 1,727,202.92 | 39.77465592 | -80.69111872 | |
| 3,718.00 | 18.73 | 96.020 | 3,693.90 | -32.94 | 314.83 | 14,444,825.07 | 1,727,231.45 | 39.77464801 | -80.69101719 | |
| 3,811.00 | 21.21 | 95.320 | 3,781.30 | -36.07 | 346.43 | 14,444,821.95 | 1,727,263.06 | 39.77463912 | -80.69090475 | |
| 3,905.00 | 23.63 | 96.380 | 3,868.19 | -39.74 | 382.09 | 14,444,818.28 | 1,727,298.71 | 39.77462871 | -80.69077788 | |
| 3,999.00 | 25.84 | 98.120 | 3,953.56 | -44.73 | 421.10 | 14,444,813.29 | 1,727,337.72 | 39.77461464 | -80.69063911 | |
| 4,093.00 | 28.18 | 98.430 | 4,037.30 | -50.88 | 463.34 | 14,444,807.14 | 1,727,379.96 | 39.77459735 | -80.69048885 | |
| 4,188.00 | 28.82 | 96.270 | 4,120.79 | -56.67 | 508.29 | 14,444,801.35 | 1,727,424.91 | 39.77458103 | -80.69032893 | |
| 4,283.00 | 27.39 | 93.420 | 4,204.59 | -60.47 | 552.87 | 14,444,797.55 | 1,727,469.49 | 39.77457016 | -80.69017032 | |
| 4,376.00 | 29.42 | 94.570 | 4,286.39 | -63.57 | 597.00 | 14,444,794.45 | 1,727,513.62 | 39.77456123 | -80.69001331 | |
| 4,472.00 | 30.19 | 92.620 | 4,369.69 | -66.55 | 644.61 | 14,444,791.47 | 1,727,561.24 | 39.77455259 | -80.68984387 | |
| 4,567.00 | 28.39 | 94.360 | 4,452.55 | -69.36 | 691.00 | 14,444,788.66 | 1,727,607.62 | 39.77454443 | -80.68967882 | |
| 4,662.00 | 28.85 | 97.360 | 4,535.94 | -74.01 | 736.25 | 14,444,784.00 | 1,727,652.88 | 39.77453122 | -80.68951782 | |
| 4,756.00 | 29.89 | 95.590 | 4,617.86 | -79.20 | 782.06 | 14,444,778.82 | 1,727,698.68 | 39.77451654 | -80.68935486 | |
| 4,850.00 | 29.20 | 93.560 | 4,699.64 | -82.90 | 828.25 | 14,444,775.11 | 1,727,744.88 | 39.77450593 | -80.68919049 | |
| 4,944.00 | 28.50 | 96.110 | 4,781.98 | -86.72 | 873.44 | 14,444,771.30 | 1,727,790.06 | 39.77449503 | -80.68902972 | |
| 5,039.00 | 28.77 | 97.390 | 4,865.36 | -92.07 | 918.65 | 14,444,765.95 | 1,727,835.27 | 39.77447990 | -80.68886889 | |
| 5,133.00 | 28.76 | 98.610 | 4,947.76 | -98.36 | 963.44 | 14,444,759.65 | 1,727,880.06 | 39.77446218 | -80.68870955 | |
| 5,230.00 | 28.80 | 96.680 | 5,032.78 | -104.58 | 1,009.72 | 14,444,753.44 | 1,727,926.34 | 39.77444468 | -80.68854491 | |
| 5,325.00 | 28.95 | 93.710 | 5,115.97 | -108.73 | 1,055.39 | 14,444,749.29 | 1,727,972.02 | 39.77443285 | -80.68838240 | |
| 5,420.00 | 27.17 | 97.150 | 5,199.81 | -112.91 | 1,099.87 | 14,444,745.10 | 1,728,016.49 | 39.77442092 | -80.68822418 | |
| 5,515.00 | 27.84 | 95.610 | 5,284.07 | -117.78 | 1,143.47 | 14,444,740.24 | 1,728,060.09 | 39.77440911 | -80.68806907 | |
| 5,608.00 | 26.27 | 93.110 | 5,366.89 | -121.02 | 1,185.63 | 14,444,737.00 | 1,728,102.26 | 39.77439784 | -80.68791904 | |

12/08/2023

Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia.
Site: Keith Stern
Well: Keith Stern S-12 HM (slot N)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Keith Stern S-12 HM (slot N)
TVD Reference: RKB=748+33 @ 781.00usft (Nabors X08)
MD Reference: RKB=748+33 @ 781.00usft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Feb2822

| Survey | | | | | | | | | | |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|---------------------|--------------------|-------------|--------------|--|
| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude | |
| 5,701.00 | 27.07 | 95.090 | 5,450.00 | -124.02 | 1,227.26 | 14,444,734.00 | 1,728,143.89 | 39.77438922 | -80.68777091 | |
| 5,796.00 | 29.03 | 93.790 | 5,533.84 | -127.46 | 1,271.80 | 14,444,730.56 | 1,728,188.42 | 39.77437934 | -80.68761245 | |
| 5,890.00 | 28.85 | 96.930 | 5,616.11 | -131.70 | 1,317.07 | 14,444,726.32 | 1,728,233.69 | 39.77436725 | -80.68745138 | |
| 5,940.00 | 29.75 | 95.670 | 5,659.71 | -134.38 | 1,341.39 | 14,444,723.63 | 1,728,258.02 | 39.77435965 | -80.68736485 | |
| 6,008.00 | 30.68 | 97.480 | 5,718.47 | -138.31 | 1,375.38 | 14,444,719.71 | 1,728,292.01 | 39.77434854 | -80.68724393 | |
| 6,102.00 | 29.71 | 98.970 | 5,799.72 | -145.06 | 1,422.17 | 14,444,712.96 | 1,728,338.79 | 39.77432955 | -80.68707749 | |
| 6,193.00 | 29.58 | 98.360 | 5,878.81 | -151.84 | 1,466.67 | 14,444,706.17 | 1,728,383.29 | 39.77431050 | -80.68691921 | |
| 6,240.00 | 30.20 | 103.100 | 5,919.56 | -156.21 | 1,489.66 | 14,444,701.81 | 1,728,406.28 | 39.77429828 | -80.68683743 | |
| 6,287.00 | 31.52 | 107.230 | 5,959.91 | -162.53 | 1,512.91 | 14,444,695.49 | 1,728,429.54 | 39.77428071 | -80.68675475 | |
| 6,334.00 | 34.02 | 112.950 | 5,999.44 | -171.30 | 1,536.76 | 14,444,686.72 | 1,728,453.39 | 39.77425639 | -80.68666998 | |
| 6,362.00 | 36.79 | 116.110 | 6,038.56 | -182.86 | 1,562.04 | 14,444,675.15 | 1,728,478.67 | 39.77422439 | -80.68658015 | |
| 6,429.00 | 40.35 | 119.450 | 6,075.30 | -196.54 | 1,587.94 | 14,444,661.47 | 1,728,504.56 | 39.77418657 | -80.68648815 | |
| 6,476.00 | 44.00 | 122.350 | 6,110.13 | -212.77 | 1,614.99 | 14,444,645.25 | 1,728,531.61 | 39.77414176 | -80.68639208 | |
| 6,523.00 | 47.69 | 125.340 | 6,142.87 | -231.56 | 1,642.97 | 14,444,626.45 | 1,728,559.59 | 39.77408987 | -80.68629273 | |
| 6,571.00 | 50.51 | 129.730 | 6,174.30 | -253.68 | 1,671.71 | 14,444,604.34 | 1,728,588.33 | 39.77402886 | -80.68619073 | |
| 6,618.00 | 54.95 | 132.370 | 6,202.76 | -278.25 | 1,699.88 | 14,444,579.77 | 1,728,616.51 | 39.77396111 | -80.68609075 | |
| 6,665.00 | 59.30 | 134.830 | 6,228.27 | -305.48 | 1,728.45 | 14,444,552.54 | 1,728,645.07 | 39.77388606 | -80.68598944 | |
| 6,712.00 | 63.69 | 136.680 | 6,250.70 | -335.06 | 1,757.24 | 14,444,522.95 | 1,728,673.87 | 39.77380453 | -80.68588732 | |
| 6,759.00 | 68.48 | 139.230 | 6,269.75 | -366.97 | 1,785.99 | 14,444,491.05 | 1,728,702.62 | 39.77371663 | -80.68578540 | |
| 6,806.00 | 72.04 | 141.600 | 6,285.62 | -401.06 | 1,814.17 | 14,444,456.96 | 1,728,730.79 | 39.77362274 | -80.68568555 | |
| 6,854.00 | 76.22 | 144.590 | 6,298.75 | -437.98 | 1,841.87 | 14,444,420.04 | 1,728,758.50 | 39.77352109 | -80.68558741 | |
| 6,901.00 | 80.84 | 146.960 | 6,308.09 | -476.05 | 1,867.77 | 14,444,381.97 | 1,728,784.39 | 39.77341628 | -80.68549573 | |
| 6,949.00 | 85.41 | 148.810 | 6,313.84 | -516.40 | 1,893.09 | 14,444,341.81 | 1,728,809.71 | 39.77330521 | -80.68540611 | |
| 7,044.00 | 88.35 | 151.530 | 6,319.01 | -598.68 | 1,940.26 | 14,444,259.34 | 1,728,856.89 | 39.77307881 | -80.68523925 | |
| 7,138.00 | 88.79 | 151.790 | 6,321.35 | -681.39 | 1,984.87 | 14,444,176.63 | 1,728,901.49 | 39.77285124 | -80.68508153 | |
| 7,232.00 | 88.53 | 151.000 | 6,323.55 | -763.89 | 2,029.86 | 14,444,094.13 | 1,728,946.49 | 39.77262423 | -80.68492244 | |
| 7,327.00 | 88.66 | 151.880 | 6,325.88 | -847.30 | 2,075.26 | 14,444,010.71 | 1,728,991.89 | 39.77239472 | -80.68476190 | |
| 7,420.00 | 88.48 | 150.390 | 6,328.20 | -928.72 | 2,120.14 | 14,443,929.29 | 1,729,036.77 | 39.77217069 | -80.68460319 | |
| 7,514.00 | 88.00 | 149.330 | 6,331.09 | -1,009.97 | 2,167.32 | 14,443,848.04 | 1,729,083.95 | 39.77194709 | -80.68443632 | |
| 7,608.00 | 89.19 | 149.160 | 6,333.39 | -1,090.73 | 2,215.37 | 14,443,767.29 | 1,729,132.00 | 39.77172486 | -80.68426631 | |
| 7,703.00 | 89.14 | 148.540 | 6,334.78 | -1,172.02 | 2,264.51 | 14,443,685.99 | 1,729,181.13 | 39.77150113 | -80.68409246 | |
| 7,798.00 | 89.23 | 149.950 | 6,336.13 | -1,253.65 | 2,313.08 | 14,443,604.37 | 1,729,229.71 | 39.77127648 | -80.68392062 | |
| 7,892.00 | 89.23 | 149.770 | 6,337.39 | -1,334.94 | 2,360.28 | 14,443,523.06 | 1,729,276.90 | 39.77105280 | -80.68375368 | |
| 7,987.00 | 89.01 | 149.330 | 6,338.85 | -1,416.82 | 2,408.42 | 14,443,441.19 | 1,729,325.04 | 39.77082745 | -80.68358339 | |
| 8,081.00 | 88.70 | 148.540 | 6,340.73 | -1,497.32 | 2,456.91 | 14,443,360.69 | 1,729,373.54 | 39.77060590 | -80.68341182 | |
| 8,176.00 | 87.82 | 149.420 | 6,343.62 | -1,578.70 | 2,505.85 | 14,443,279.32 | 1,729,422.47 | 39.77038195 | -80.68323869 | |
| 8,270.00 | 88.18 | 149.160 | 6,346.90 | -1,659.47 | 2,553.82 | 14,443,198.55 | 1,729,470.45 | 39.77015967 | -80.68306897 | |
| 8,364.00 | 88.70 | 150.120 | 6,349.45 | -1,740.55 | 2,601.31 | 14,443,117.47 | 1,729,517.94 | 39.76993655 | -80.68290098 | |
| 8,458.00 | 88.18 | 149.680 | 6,352.01 | -1,821.84 | 2,648.44 | 14,443,036.18 | 1,729,565.06 | 39.76971283 | -80.68273430 | |
| 8,552.00 | 88.79 | 150.920 | 6,354.50 | -1,903.46 | 2,694.99 | 14,442,954.56 | 1,729,611.62 | 39.76948823 | -80.68256964 | |
| 8,645.00 | 88.84 | 151.620 | 6,356.42 | -1,984.99 | 2,739.69 | 14,442,873.02 | 1,729,656.31 | 39.76926388 | -80.68241162 | |
| 8,739.00 | 89.36 | 151.970 | 6,357.90 | -2,067.82 | 2,784.11 | 14,442,790.20 | 1,729,700.73 | 39.76903598 | -80.68225458 | |
| 8,833.00 | 89.41 | 151.270 | 6,358.91 | -2,150.52 | 2,828.79 | 14,442,707.50 | 1,729,745.41 | 39.76880844 | -80.68209663 | |
| 8,927.00 | 89.67 | 151.000 | 6,359.66 | -2,232.84 | 2,874.16 | 14,442,625.18 | 1,729,790.79 | 39.76858193 | -80.68193618 | |
| 9,022.00 | 88.75 | 149.250 | 6,360.97 | -2,315.20 | 2,921.48 | 14,442,542.82 | 1,729,838.10 | 39.76835527 | -80.68176885 | |
| 9,117.00 | 88.00 | 148.810 | 6,363.67 | -2,396.62 | 2,970.34 | 14,442,461.39 | 1,729,886.97 | 39.76813119 | -80.68159598 | |
| 9,211.00 | 88.66 | 149.420 | 6,366.41 | -2,477.26 | 3,018.57 | 14,442,380.76 | 1,729,935.20 | 39.76790927 | -80.68142536 | |
| 9,306.00 | 88.13 | 150.390 | 6,369.07 | -2,559.42 | 3,066.19 | 14,442,298.60 | 1,729,982.81 | 39.76768317 | -80.68125695 | |
| 9,400.00 | 89.67 | 150.390 | 6,370.87 | -2,641.13 | 3,112.62 | 14,442,216.89 | 1,730,029.25 | 39.76745833 | -80.68109273 | |
| 9,494.00 | 89.05 | 149.250 | 6,371.92 | -2,722.38 | 3,159.88 | 14,442,135.64 | 1,730,076.50 | 39.76723473 | -80.68092561 | |
| 9,587.00 | 90.02 | 149.420 | 6,372.88 | -2,802.37 | 3,207.30 | 14,442,055.65 | 1,730,123.93 | 39.76701459 | -80.68075784 | |
| 9,681.00 | 90.77 | 149.600 | 6,372.03 | -2,883.37 | 3,255.00 | 14,441,974.65 | 1,730,171.62 | 39.76679168 | -80.68058915 | |
| 9,775.00 | 89.67 | 150.560 | 6,371.67 | -2,964.84 | 3,301.88 | 14,441,893.18 | 1,730,218.51 | 39.76656748 | -80.68042333 | |
| 9,868.00 | 88.88 | 150.210 | 6,372.84 | -3,045.68 | 3,347.84 | 14,441,812.34 | 1,730,264.46 | 39.76634501 | -80.68026083 | |
| 9,962.00 | 88.13 | 150.560 | 6,375.30 | -3,127.37 | 3,394.27 | 14,441,730.64 | 1,730,310.90 | 39.76612021 | -80.68009662 | |



Survey Report - Geographic



| | | | |
|------------------|---------------------------------|-------------------------------------|--------------------------------------|
| Company: | Tug Hill Operating LLC | Local Co-ordinate Reference: | Well Keith Stern S-12 HM (slot N) |
| Project: | Marshall County, West Virginia. | TVD Reference: | RKB=748+33 @ 781.00usft (Nabors X08) |
| Site: | Keith Stern | MD Reference: | RKB=748+33 @ 781.00usft (Nabors X08) |
| Well: | Keith Stern S-12 HM (slot N) | North Reference: | Grid |
| Wellbore: | Original Hole | Survey Calculation Method: | Minimum Curvature |
| Design: | Surveys Original Hole | Database: | DB_Feb2822 |

| Survey | | | | | | | | | |
|--|-----------------|-------------|-----------------------|--------------|--------------|---------------------|--------------------|-------------|--------------|
| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude |
| 10,055.00 | 89.10 | 150.920 | 6,377.54 | -3,208.48 | 3,439.71 | 14,441,649.53 | 1,730,356.34 | 39.76589702 | -80.67993594 |
| 10,150.00 | 89.54 | 151.710 | 6,378.67 | -3,291.82 | 3,485.31 | 14,441,566.20 | 1,730,401.93 | 39.76566771 | -80.67977474 |
| 10,244.00 | 89.36 | 150.740 | 6,379.57 | -3,374.20 | 3,530.56 | 14,441,483.81 | 1,730,447.18 | 39.76544101 | -80.67961478 |
| 10,338.00 | 89.45 | 150.210 | 6,380.55 | -3,455.99 | 3,576.88 | 14,441,402.02 | 1,730,493.50 | 39.76521594 | -80.67945098 |
| 10,433.00 | 88.31 | 151.000 | 6,382.41 | -3,538.74 | 3,623.50 | 14,441,319.27 | 1,730,540.12 | 39.76498823 | -80.67928614 |
| 10,527.00 | 88.18 | 150.920 | 6,385.29 | -3,620.89 | 3,669.10 | 14,441,237.13 | 1,730,585.73 | 39.76476219 | -80.67912489 |
| 10,621.00 | 86.70 | 151.530 | 6,387.84 | -3,703.25 | 3,714.33 | 14,441,154.77 | 1,730,630.96 | 39.76453556 | -80.67896498 |
| 10,715.00 | 88.97 | 151.620 | 6,389.76 | -3,785.90 | 3,759.07 | 14,441,072.12 | 1,730,675.69 | 39.76430814 | -80.67880685 |
| 10,809.00 | 89.23 | 151.440 | 6,391.23 | -3,868.52 | 3,803.87 | 14,440,989.49 | 1,730,720.50 | 39.76408079 | -80.67864846 |
| 10,903.00 | 89.23 | 151.440 | 6,392.50 | -3,951.08 | 3,848.81 | 14,440,906.94 | 1,730,765.43 | 39.76385364 | -80.67848962 |
| 10,997.00 | 89.49 | 151.090 | 6,393.55 | -4,033.50 | 3,894.00 | 14,440,824.52 | 1,730,810.62 | 39.76362685 | -80.67832987 |
| 11,091.00 | 88.35 | 151.530 | 6,395.32 | -4,115.94 | 3,939.12 | 14,440,742.08 | 1,730,855.74 | 39.76339999 | -80.67817037 |
| 11,186.00 | 88.40 | 151.530 | 6,398.01 | -4,199.42 | 3,984.38 | 14,440,658.60 | 1,730,901.01 | 39.76317029 | -80.67801035 |
| 11,280.00 | 88.53 | 151.710 | 6,400.53 | -4,282.09 | 4,029.05 | 14,440,575.93 | 1,730,945.67 | 39.76294281 | -80.67785248 |
| 11,374.00 | 87.38 | 150.390 | 6,403.88 | -4,364.29 | 4,074.52 | 14,440,493.73 | 1,730,991.14 | 39.76271662 | -80.67769173 |
| 11,468.00 | 87.60 | 150.560 | 6,408.00 | -4,446.00 | 4,120.80 | 14,440,412.01 | 1,731,037.42 | 39.76249175 | -80.67752809 |
| 11,562.00 | 87.34 | 150.740 | 6,412.15 | -4,527.86 | 4,166.82 | 14,440,330.16 | 1,731,083.45 | 39.76226651 | -80.67736535 |
| 11,656.00 | 87.82 | 150.210 | 6,416.12 | -4,609.58 | 4,213.11 | 14,440,248.44 | 1,731,129.73 | 39.76204162 | -80.67720171 |
| 11,750.00 | 87.78 | 150.040 | 6,419.73 | -4,691.03 | 4,259.89 | 14,440,166.99 | 1,731,176.52 | 39.76181748 | -80.67703627 |
| 11,844.00 | 88.00 | 148.890 | 6,423.19 | -4,771.93 | 4,307.62 | 14,440,086.08 | 1,731,224.24 | 39.76159482 | -80.67686748 |
| 11,939.00 | 88.75 | 148.980 | 6,425.88 | -4,853.27 | 4,356.62 | 14,440,004.74 | 1,731,273.24 | 39.76137094 | -80.67669416 |
| 12,034.00 | 89.10 | 148.720 | 6,427.66 | -4,934.56 | 4,405.75 | 14,439,923.45 | 1,731,322.38 | 39.76114722 | -80.67652037 |
| 12,128.00 | 88.97 | 146.520 | 6,429.25 | -5,013.93 | 4,456.08 | 14,439,844.09 | 1,731,372.71 | 39.76092875 | -80.67634230 |
| 12,223.00 | 89.58 | 148.830 | 6,430.45 | -5,094.11 | 4,507.01 | 14,439,763.91 | 1,731,423.64 | 39.76070806 | -80.67616210 |
| 12,316.00 | 89.10 | 150.040 | 6,431.52 | -5,174.10 | 4,554.44 | 14,439,683.92 | 1,731,471.07 | 39.76048792 | -80.67599437 |
| 12,411.00 | 88.04 | 150.480 | 6,433.89 | -5,256.56 | 4,601.55 | 14,439,601.46 | 1,731,518.18 | 39.76026099 | -80.67582780 |
| 12,505.00 | 88.04 | 150.560 | 6,437.11 | -5,338.34 | 4,647.78 | 14,439,519.68 | 1,731,564.41 | 39.76003594 | -80.67566434 |
| 12,599.00 | 88.09 | 150.040 | 6,440.28 | -5,419.94 | 4,694.33 | 14,439,438.07 | 1,731,610.96 | 39.75981137 | -80.67549977 |
| 12,692.00 | 87.91 | 149.600 | 6,443.53 | -5,500.29 | 4,741.05 | 14,439,357.73 | 1,731,657.68 | 39.75959026 | -80.67533455 |
| 12,787.00 | 88.04 | 149.600 | 6,446.88 | -5,582.18 | 4,789.10 | 14,439,275.84 | 1,731,705.72 | 39.75936489 | -80.67516465 |
| 12,881.00 | 89.36 | 151.350 | 6,449.02 | -5,663.94 | 4,835.41 | 14,439,194.07 | 1,731,752.03 | 39.75913988 | -80.67500093 |
| 12,975.00 | 90.15 | 151.790 | 6,449.42 | -5,746.60 | 4,880.16 | 14,439,111.41 | 1,731,796.78 | 39.75891242 | -80.67484276 |
| 13,068.00 | 90.46 | 151.350 | 6,448.92 | -5,828.39 | 4,924.43 | 14,439,029.63 | 1,731,841.06 | 39.75868738 | -80.67468628 |
| 13,163.00 | 89.54 | 150.480 | 6,448.92 | -5,911.41 | 4,970.61 | 14,438,946.61 | 1,731,887.24 | 39.75845893 | -80.67452304 |
| 13,257.00 | 88.53 | 151.620 | 6,450.51 | -5,993.65 | 5,016.10 | 14,438,864.37 | 1,731,932.73 | 39.75823262 | -80.67436223 |
| 13,351.00 | 88.75 | 151.530 | 6,452.74 | -6,076.29 | 5,060.84 | 14,438,781.73 | 1,731,977.46 | 39.75800522 | -80.67420413 |
| 13,445.00 | 88.88 | 151.970 | 6,454.68 | -6,159.08 | 5,105.32 | 14,438,698.94 | 1,732,021.94 | 39.75777742 | -80.67404692 |
| 13,539.00 | 89.01 | 151.790 | 6,456.41 | -6,241.97 | 5,149.62 | 14,438,616.05 | 1,732,066.24 | 39.75754934 | -80.67389038 |
| 13,634.00 | 89.05 | 151.440 | 6,458.02 | -6,325.53 | 5,194.77 | 14,438,532.48 | 1,732,111.40 | 39.75731939 | -80.67373079 |
| 13,728.00 | 89.67 | 152.060 | 6,459.07 | -6,408.33 | 5,239.26 | 14,438,449.69 | 1,732,155.88 | 39.75709156 | -80.67357357 |
| 13,822.00 | 89.32 | 151.000 | 6,459.90 | -6,490.96 | 5,284.07 | 14,438,367.06 | 1,732,200.69 | 39.75686420 | -80.67341521 |
| 13,917.00 | 88.79 | 150.210 | 6,461.47 | -6,573.72 | 5,330.69 | 14,438,284.30 | 1,732,247.31 | 39.75663646 | -80.67325040 |
| 13,959.00 | 88.48 | 149.600 | 6,462.47 | -6,610.04 | 5,351.74 | 14,438,247.97 | 1,732,268.37 | 39.75653648 | -80.67317596 |
| Survey @ 13959.00 MD 6462.47 TVD | | | | | | | | | |
| 14,013.00 | 88.48 | 149.600 | 6,463.90 | -6,656.60 | 5,379.06 | 14,438,201.41 | 1,732,295.68 | 39.75640834 | -80.67307937 |
| Survey Proj. to 14013.00 MD 6463.90 TVD | | | | | | | | | |

| | | | |
|------------------|---------------------------------|-------------------------------------|--------------------------------------|
| Company: | Tug Hill Operating LLC | Local Co-ordinate Reference: | Well Keith Stern S-12 HM (slot N) |
| Project: | Marshall County, West Virginia. | TVD Reference: | RKB=748+33 @ 781.00usft (Nabors X08) |
| Site: | Keith Stern | MD Reference: | RKB=748+33 @ 781.00usft (Nabors X08) |
| Well: | Keith Stern S-12 HM (slot N) | North Reference: | Grid |
| Wellbore: | Original Hole | Survey Calculation Method: | Minimum Curvature |
| Design: | Surveys Original Hole | Database: | DB_Feb2822 |

| Design Annotations | | | | |
|-----------------------|-----------------------|-------------------|--------------|---|
| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates | | Comment |
| | | +N/-S (usft) | +E/-W (usft) | |
| 191.00 | 191.00 | 0.02 | -0.37 | MWD surveys |
| 13,959.00 | 6,462.47 | -6,610.04 | 5,351.74 | Survey @ 13959.00 MD 6462.47 TVD |
| 14,013.00 | 6,463.90 | -6,656.60 | 5,379.06 | Survey Proj. to 14013.00 MD 6463.90 TVD |

Checked By: _____ Approved By: _____ Date: _____

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Environmental Protection