



Survey Report - Geographic



Company: Tug Hill Operating LLC
 Project: Marshall County, West Virginia.
 Site: Heaven Hill 3
 Well: Heaven Hill 3-7 HU (F)
 Wellbore: Original Hole
 Designer: Surveys Original Hole

Local Co-ordinate Reference:
 TVD Reference: Well Heaven Hill 3-7 HU (F)
 MD Reference: RKB=1326+26 @ 1352.00usft
 North Reference: RKB=1326+26 @ 1352.00usft
 Survey Calculation Method: Grid
 Database: Minimum Curvature
 DB_Jul2216d_v14

Project: Marshall County, West Virginia.

Map System: Universal Transverse Mercator (US Survey Feet)
 Geo Datum: NAD83 West Virginia - HARN
 Map Zone: Zone 17N (84 W to 78 W)

Mean Sea Level

Site: Heaven Hill 3

Site Position: Northing: 14,457,178.77 usft Latitude: 39.80864817
 From: Easting: 1,726,571.98 usft Longitude: -80.69326096
 Position Uncertainty: Slot Radius: 0.00 usft Grid Convergence: 0.20 °

Well: Heaven Hill 3-7 HU (F)

Well Position: +N/-S 0.00 usft Northing: 14,457,203.32 usft Latitude: 39.80864817
 +E/-W 0.00 usft Easting: 1,726,558.60 usft Longitude: -80.69326096
 Position Uncertainty: Wellhead Elevation: 0.00 usft Ground Level: 1,326.00 usft

Wellbore: Original Hole

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (mT) |
|-----------|------------|-------------|-----------------|---------------|---------------------|
| | IGRF2015 | 10/27/2018 | -8.74 | 66.86 | 52,025.36408441 |

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 | 154.06 |

| Survey Program | From (usft) | To (usft) | Date | Survey (Wellbore) |
|----------------|-------------|-----------|------------|----------------------------|
| | 157.00 | 10,908.00 | 11/13/2018 | MWD (Original Hole) |
| | 10,985.00 | 22,670.00 | | MWD lat (Original Hole) |
| | 22,722.00 | 22,722.00 | | Projection (Original Hole) |

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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 | 0.00 | 0.00 | 0.00 | 0.00 | 14,457,203.32 | 1,726,558.60 | 39.80864817 | -80.69326096 |
| 157.00 | 0.30 | 305.10 | 157.00 | 0.24 | -0.34 | 14,457,203.56 | 1,726,558.26 | 39.80864882 | -80.69326215 |
| MWD surveys | | | | | | | | | |
| 187.00 | 0.18 | 319.16 | 187.00 | 0.32 | -0.43 | 14,457,203.64 | 1,726,558.17 | 39.80864905 | -80.69326249 |
| 218.00 | 0.22 | 329.92 | 218.00 | 0.41 | -0.49 | 14,457,203.73 | 1,726,558.11 | 39.80864829 | -80.69326271 |
| 248.00 | 0.27 | 322.21 | 248.00 | 0.51 | -0.57 | 14,457,203.84 | 1,726,558.03 | 39.80864956 | -80.69326297 |
| 278.00 | 0.30 | 307.00 | 278.00 | 0.61 | -0.67 | 14,457,203.94 | 1,726,557.93 | 39.80864987 | -80.69326334 |
| 308.00 | 0.25 | 328.09 | 308.00 | 0.72 | -0.77 | 14,457,204.04 | 1,726,557.83 | 39.80865015 | -80.69326369 |
| 339.00 | 0.22 | 32.75 | 339.00 | 0.82 | -0.77 | 14,457,204.15 | 1,726,557.83 | 39.80865044 | -80.69326370 |
| 377.00 | 0.30 | 58.73 | 377.00 | 0.94 | -0.65 | 14,457,204.26 | 1,726,557.95 | 39.80865075 | -80.69326326 |



TUG HILL
OPERATING

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Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference:
TVD Reference: Well Heaven Hill 3-7 HU (F)
MD Reference: RKB=1326+26 @ 152.00usft
North Reference: RKB=1326+26 @ 152.00usft
Survey Calculation Method: Grid
Database: Minimum Curvature
 DB_Jul2216dft_v14

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Survey

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|---------------------|--------------------|-------------|--------------|
| | | | | | | | | | |
| 408.00 | 0.16 | 27.26 | 408.00 | 1.02 | -0.56 | 14,457,204.34 | 1,726,558.04 | 39.80865097 | -80.69326294 |
| 438.00 | 0.33 | 56.49 | 438.00 | 1.10 | -0.47 | 14,457,204.43 | 1,726,558.13 | 39.80865121 | -80.69326261 |
| 469.00 | 0.07 | 42.70 | 469.00 | 1.17 | -0.38 | 14,457,204.49 | 1,726,558.22 | 39.80865138 | -80.69326230 |
| 498.00 | 0.31 | 116.17 | 498.00 | 1.14 | -0.30 | 14,457,204.47 | 1,726,558.30 | 39.80865132 | -80.69326201 |
| 529.00 | 0.21 | 138.94 | 529.00 | 1.06 | -0.18 | 14,457,204.39 | 1,726,558.41 | 39.80865110 | -80.69326181 |
| 559.00 | 0.28 | 69.92 | 559.00 | 1.05 | -0.08 | 14,457,204.37 | 1,726,558.52 | 39.80865105 | -80.69326123 |
| 589.00 | 0.30 | 118.15 | 589.00 | 1.04 | 0.06 | 14,457,204.36 | 1,726,558.66 | 39.80865102 | -80.69326074 |
| 619.00 | 0.42 | 58.57 | 618.99 | 1.06 | 0.22 | 14,457,204.38 | 1,726,558.82 | 39.80865107 | -80.69326016 |
| 650.00 | 0.20 | 15.55 | 649.99 | 1.17 | 0.33 | 14,457,204.49 | 1,726,558.93 | 39.80865138 | -80.69325976 |
| 680.00 | 0.12 | 76.36 | 679.99 | 1.23 | 0.38 | 14,457,204.55 | 1,726,558.98 | 39.80865154 | -80.69325960 |
| 711.00 | 0.03 | 310.18 | 710.99 | 1.24 | 0.40 | 14,457,204.56 | 1,726,559.00 | 39.80865157 | -80.69325951 |
| 741.00 | 0.08 | 112.70 | 740.99 | 1.24 | 0.42 | 14,457,204.56 | 1,726,559.01 | 39.80865156 | -80.69325946 |
| 771.00 | 0.08 | 19.37 | 770.99 | 1.25 | 0.44 | 14,457,204.57 | 1,726,559.04 | 39.80865159 | -80.69325937 |
| 802.00 | 0.32 | 11.91 | 801.99 | 1.35 | 0.47 | 14,457,204.68 | 1,726,559.07 | 39.80865188 | -80.69325928 |
| 833.00 | 0.12 | 85.15 | 832.99 | 1.44 | 0.52 | 14,457,204.77 | 1,726,559.12 | 39.80865212 | -80.69325910 |
| 863.00 | 0.27 | 62.06 | 862.99 | 1.48 | 0.61 | 14,457,204.80 | 1,726,559.21 | 39.80865222 | -80.69325877 |
| 894.00 | 0.20 | 88.84 | 893.99 | 1.51 | 0.73 | 14,457,204.84 | 1,726,559.33 | 39.80865232 | -80.69325834 |
| 925.00 | 0.31 | 20.19 | 924.99 | 1.59 | 0.81 | 14,457,204.92 | 1,726,559.41 | 39.80865253 | -80.69325805 |
| 957.00 | 0.32 | 55.60 | 956.99 | 1.72 | 0.92 | 14,457,205.05 | 1,726,559.52 | 39.80865290 | -80.69325768 |
| 981.00 | 0.12 | 54.11 | 980.99 | 1.78 | 0.99 | 14,457,205.10 | 1,726,559.59 | 39.80865304 | -80.69325741 |
| 1,020.00 | 0.11 | 341.36 | 1,019.99 | 1.84 | 1.01 | 14,457,205.16 | 1,726,559.68 | 39.80865320 | -80.69325710 |
| 1,052.00 | 0.28 | 72.52 | 1,051.99 | 1.89 | 1.08 | 14,457,205.21 | 1,726,559.83 | 39.80865336 | -80.69325666 |
| 1,084.00 | 0.28 | 86.74 | 1,083.99 | 1.92 | 1.23 | 14,457,205.24 | 1,726,559.83 | 39.80865342 | -80.69325656 |
| 1,108.00 | 0.17 | 135.47 | 1,105.99 | 1.90 | 1.31 | 14,457,205.22 | 1,726,559.91 | 39.80865336 | -80.69325628 |
| 1,188.00 | 0.11 | 185.94 | 1,187.99 | 1.73 | 1.38 | 14,457,205.06 | 1,726,559.98 | 39.80865291 | -80.69325601 |
| 1,282.00 | 0.33 | 196.15 | 1,281.99 | 1.38 | 1.30 | 14,457,204.71 | 1,726,559.90 | 39.80865195 | -80.69325632 |
| 1,377.00 | 0.20 | 325.97 | 1,376.99 | 1.26 | 1.13 | 14,457,204.58 | 1,726,559.73 | 39.80865161 | -80.69325692 |
| 1,472.00 | 0.38 | 57.49 | 1,471.99 | 1.56 | 1.30 | 14,457,204.89 | 1,726,559.90 | 39.80865245 | -80.69325630 |
| 1,566.00 | 0.78 | 32.92 | 1,565.98 | 2.27 | 1.91 | 14,457,205.59 | 1,726,560.51 | 39.80865438 | -80.69325412 |
| 1,660.00 | 1.90 | 43.69 | 1,659.96 | 3.93 | 3.34 | 14,457,207.26 | 1,726,561.94 | 39.80865893 | -80.69324902 |
| 1,754.00 | 3.56 | 47.44 | 1,753.85 | 7.03 | 6.56 | 14,457,210.36 | 1,726,565.16 | 39.80866742 | -80.69323750 |
| 1,849.00 | 4.43 | 48.33 | 1,848.62 | 11.47 | 11.48 | 14,457,214.79 | 1,726,570.08 | 39.80867955 | -80.69321995 |
| 1,944.00 | 3.58 | 40.56 | 1,943.38 | 16.16 | 16.15 | 14,457,219.48 | 1,726,574.75 | 39.80869237 | -80.69320327 |
| 2,038.00 | 3.10 | 38.00 | 2,037.22 | 20.39 | 19.62 | 14,457,223.72 | 1,726,578.22 | 39.80870399 | -80.69319085 |
| 2,132.00 | 3.85 | 36.75 | 2,131.05 | 24.92 | 23.07 | 14,457,228.25 | 1,726,581.67 | 39.80871640 | -80.69317850 |
| 2,226.00 | 3.98 | 43.03 | 2,224.83 | 29.84 | 27.19 | 14,457,233.16 | 1,726,585.79 | 39.80872985 | -80.69316379 |
| 2,321.00 | 4.33 | 42.77 | 2,319.58 | 34.88 | 31.87 | 14,457,238.20 | 1,726,590.47 | 39.80874366 | -80.69314794 |
| 2,415.00 | 4.83 | 44.33 | 2,413.28 | 40.31 | 37.05 | 14,457,243.64 | 1,726,595.65 | 39.80877590 | -80.69312855 |
| 2,510.00 | 5.42 | 39.08 | 2,507.90 | 46.66 | 42.67 | 14,457,249.98 | 1,726,601.27 | 39.80879475 | -80.69310845 |
| 2,607.00 | 5.13 | 39.93 | 2,604.49 | 53.54 | 48.34 | 14,457,256.86 | 1,726,606.94 | 39.80879475 | -80.69308817 |
| 2,701.00 | 3.16 | 44.94 | 2,698.24 | 58.80 | 52.87 | 14,457,261.92 | 1,726,611.47 | 39.80880860 | -80.69307198 |
| 2,795.00 | 0.65 | 137.83 | 2,792.19 | 60.04 | 55.06 | 14,457,263.36 | 1,726,613.66 | 39.80881253 | -80.69306647 |
| 2,867.00 | 1.67 | 208.59 | 2,864.18 | 58.81 | 54.83 | 14,457,262.14 | 1,726,613.43 | 39.80880917 | -80.69306500 |
| 2,966.00 | 3.02 | 207.11 | 2,963.09 | 55.22 | 52.95 | 14,457,256.55 | 1,726,611.55 | 39.80879933 | -80.69307173 |
| 3,064.00 | 1.94 | 212.24 | 3,061.00 | 51.52 | 50.89 | 14,457,254.85 | 1,726,609.49 | 39.80878919 | -80.69307912 |
| 3,158.00 | 0.85 | 186.91 | 3,154.97 | 49.48 | 49.96 | 14,457,252.81 | 1,726,608.56 | 39.80878360 | -80.69308246 |
| 3,253.00 | 0.32 | 183.53 | 3,249.97 | 48.52 | 49.86 | 14,457,251.85 | 1,726,608.46 | 39.80878095 | -80.69308284 |
| 3,348.00 | 0.74 | 6.70 | 3,344.96 | 48.86 | 49.91 | 14,457,252.19 | 1,726,608.51 | 39.80878190 | -80.69308263 |
| 3,443.00 | 0.95 | 25.03 | 3,439.96 | 50.19 | 50.32 | 14,457,253.51 | 1,726,609.52 | 39.80879018 | -80.69307900 |
| 3,538.00 | 1.23 | 15.48 | 3,534.94 | 51.88 | 50.92 | 14,457,255.21 | 1,726,609.52 | 39.80879665 | -80.69307693 |
| 3,633.00 | 1.70 | 12.34 | 3,629.91 | 54.24 | 51.50 | 14,457,257.57 | 1,726,610.09 | 39.80880468 | -80.69307465 |
| 3,727.00 | 1.95 | 11.98 | 3,723.86 | 57.17 | 52.13 | 14,457,260.49 | 1,726,610.72 | 39.80881419 | -80.69307298 |
| 3,823.00 | 2.23 | 3.68 | 3,819.79 | 60.63 | 52.58 | 14,457,263.96 | 1,726,611.18 | 39.80882202 | -80.69307180 |
| 3,918.00 | 1.24 | 11.28 | 3,914.75 | 63.46 | 52.90 | 14,457,266.81 | 1,726,611.50 | 39.80882244 | -80.69307095 |
| 4,012.00 | 1.22 | 11.63 | 4,008.73 | 65.46 | 53.31 | 14,457,268.79 | 1,726,611.90 | 39.80882744 | -80.69307035 |



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Design: Surveys Original Hole

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MD Reference:
North Reference:
Survey Calculation Method:
Database:

Well Heaven Hill 3-7 HU (F)
RKB=1326+26 @ 1352.00usft
RKB=1326+26 @ 1352.00usft
Grid
Minimum Curvature
DB_Jul21'16dt_v14

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Table with columns: Measured Depth (usft), Inclination (°), Azimuth (°), Vertical Depth (usft), +N-S (usft), +E-W (usft), Map Northing (usft), Map Easting (usft), Latitude, Longitude. Contains 40 rows of survey data.



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| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/S (usft) | +E/W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude |
|-----------------------|-----------------|-------------|-----------------------|-------------|-------------|---------------------|--------------------|-------------|---------------|
| 13,110.00 | 88.90 | 150.50 | 11,721.78 | -2,795.49 | 651.83 | 14,454,407.83 | 1,727,210.43 | 39.80096491 | -80.69097428 |
| 13,205.00 | 88.90 | 151.00 | 11,723.60 | -2,878.36 | 698.24 | 14,454,324.96 | 1,727,256.84 | 39.80073688 | -80.69081006 |
| 13,299.00 | 88.90 | 151.10 | 11,725.41 | -2,960.60 | 743.73 | 14,454,242.72 | 1,727,302.33 | 39.80051060 | -80.69064911 |
| 13,394.00 | 88.80 | 152.10 | 11,727.31 | -3,044.15 | 788.91 | 14,454,159.18 | 1,727,347.51 | 39.80028073 | -80.69048930 |
| 13,489.00 | 89.10 | 150.20 | 11,729.05 | -3,127.34 | 834.74 | 14,454,075.98 | 1,727,393.34 | 39.80005183 | -80.69032715 |
| 13,583.00 | 89.00 | 150.40 | 11,730.61 | -3,208.98 | 881.30 | 14,453,994.34 | 1,727,439.90 | 39.79982716 | -80.69016236 |
| 13,677.00 | 88.80 | 151.70 | 11,732.42 | -3,291.22 | 926.80 | 14,453,912.11 | 1,727,485.39 | 39.79960091 | -80.69000141 |
| 13,772.00 | 88.30 | 148.60 | 11,734.82 | -3,373.58 | 974.06 | 14,453,829.75 | 1,727,532.86 | 39.79937428 | -80.68983415 |
| 13,867.00 | 88.30 | 149.20 | 11,737.64 | -3,454.89 | 1,023.11 | 14,453,748.44 | 1,727,581.71 | 39.79915052 | -80.68966053 |
| 13,962.00 | 88.30 | 149.20 | 11,740.46 | -3,536.45 | 1,071.73 | 14,453,666.87 | 1,727,630.33 | 39.79892605 | -80.68948842 |
| 14,057.00 | 88.10 | 149.30 | 11,743.44 | -3,618.06 | 1,120.28 | 14,453,585.27 | 1,727,678.88 | 39.79870149 | -80.68931658 |
| 14,152.00 | 88.40 | 151.00 | 11,746.34 | -3,700.41 | 1,167.54 | 14,453,502.91 | 1,727,726.14 | 39.79847487 | -80.68914934 |
| 14,247.00 | 88.40 | 150.90 | 11,749.00 | -3,783.43 | 1,213.65 | 14,453,419.90 | 1,727,772.25 | 39.79824645 | -80.68898620 |
| 14,341.00 | 88.40 | 150.90 | 11,751.62 | -3,865.53 | 1,259.35 | 14,453,337.80 | 1,727,817.95 | 39.79802054 | -80.68882452 |
| 14,435.00 | 88.20 | 148.80 | 11,754.41 | -3,946.77 | 1,306.54 | 14,453,256.55 | 1,727,865.14 | 39.79779697 | -80.68865752 |
| 14,531.00 | 89.00 | 152.80 | 11,756.76 | -4,030.53 | 1,353.35 | 14,453,172.79 | 1,727,911.95 | 39.79756651 | -80.68849190 |
| 14,624.00 | 88.90 | 152.80 | 11,758.46 | -4,113.23 | 1,395.85 | 14,453,090.09 | 1,727,954.45 | 39.79733898 | -80.68834160 |
| 14,719.00 | 88.90 | 151.30 | 11,760.28 | -4,197.13 | 1,440.37 | 14,453,006.19 | 1,727,998.97 | 39.79710814 | -80.68818415 |
| 14,814.00 | 89.00 | 151.50 | 11,762.02 | -4,280.53 | 1,485.84 | 14,452,922.80 | 1,728,044.44 | 39.79687868 | -80.68802331 |
| 14,909.00 | 88.50 | 150.20 | 11,764.10 | -4,363.47 | 1,532.10 | 14,452,839.85 | 1,728,090.70 | 39.79665045 | -80.68785964 |
| 15,002.00 | 88.40 | 150.30 | 11,766.61 | -4,444.19 | 1,578.23 | 14,452,759.14 | 1,728,136.83 | 39.79642835 | -80.68769841 |
| 15,098.00 | 88.40 | 150.60 | 11,769.29 | -4,527.67 | 1,625.56 | 14,452,675.66 | 1,728,184.16 | 39.79619864 | -80.68752895 |
| 15,193.00 | 88.60 | 150.00 | 11,771.78 | -4,610.16 | 1,672.61 | 14,452,593.17 | 1,728,231.21 | 39.79597165 | -80.68736246 |
| 15,286.00 | 88.30 | 150.10 | 11,774.30 | -4,690.71 | 1,719.02 | 14,452,512.62 | 1,728,277.62 | 39.79574999 | -80.68719823 |
| 15,379.00 | 88.40 | 149.40 | 11,776.97 | -4,771.01 | 1,765.85 | 14,452,432.31 | 1,728,324.45 | 39.79552901 | -80.68703250 |
| 15,474.00 | 88.40 | 149.70 | 11,779.63 | -4,852.88 | 1,813.98 | 14,452,350.45 | 1,728,370.58 | 39.79530372 | -80.686866219 |
| 15,568.00 | 88.60 | 149.70 | 11,782.09 | -4,933.97 | 1,861.46 | 14,452,269.36 | 1,728,420.06 | 39.79508057 | -80.68669416 |
| 15,662.00 | 88.70 | 149.70 | 11,784.30 | -5,015.06 | 1,908.94 | 14,452,188.26 | 1,728,467.54 | 39.79485741 | -80.68652613 |
| 15,756.00 | 88.60 | 149.90 | 11,786.52 | -5,096.28 | 1,956.21 | 14,452,107.04 | 1,728,514.81 | 39.79463391 | -80.68635885 |
| 15,851.00 | 88.80 | 149.80 | 11,788.67 | -5,178.41 | 2,003.92 | 14,452,024.92 | 1,728,562.51 | 39.79440791 | -80.68619005 |
| 15,946.00 | 88.60 | 149.70 | 11,790.83 | -5,260.45 | 2,051.76 | 14,451,942.87 | 1,728,610.36 | 39.79418213 | -80.68602074 |
| 16,041.00 | 90.10 | 150.30 | 11,791.90 | -5,342.72 | 2,099.26 | 14,451,860.61 | 1,728,657.86 | 39.79395576 | -80.68585268 |
| 16,135.00 | 90.20 | 150.20 | 11,791.66 | -5,424.33 | 2,145.90 | 14,451,779.00 | 1,728,704.50 | 39.79373119 | -80.68568765 |
| 16,230.00 | 90.20 | 150.30 | 11,791.33 | -5,506.80 | 2,193.04 | 14,451,696.52 | 1,728,751.84 | 39.79350423 | -80.68552086 |
| 16,325.00 | 90.20 | 150.00 | 11,791.00 | -5,589.20 | 2,240.33 | 14,451,614.12 | 1,728,798.92 | 39.79327749 | -80.68535356 |
| 16,419.00 | 89.20 | 150.30 | 11,791.49 | -5,670.73 | 2,287.11 | 14,451,532.60 | 1,728,845.71 | 39.79305314 | -80.68518802 |
| 16,514.00 | 89.30 | 149.10 | 11,792.73 | -5,752.74 | 2,335.04 | 14,451,450.58 | 1,728,893.64 | 39.79282745 | -80.68501843 |
| 16,608.00 | 88.00 | 150.30 | 11,794.95 | -5,833.87 | 2,382.45 | 14,451,369.45 | 1,728,941.05 | 39.79260418 | -80.68485067 |
| 16,703.00 | 87.90 | 150.00 | 11,798.34 | -5,916.22 | 2,429.70 | 14,451,287.11 | 1,728,988.30 | 39.79237759 | -80.68468348 |
| 16,798.00 | 88.00 | 149.60 | 11,801.74 | -5,998.27 | 2,477.46 | 14,451,205.05 | 1,729,036.06 | 39.79215179 | -80.68451450 |
| 16,892.00 | 87.90 | 150.00 | 11,805.10 | -6,079.46 | 2,524.71 | 14,451,123.86 | 1,729,083.31 | 39.79192636 | -80.68434730 |
| 16,987.00 | 87.90 | 150.30 | 11,808.59 | -6,161.80 | 2,571.96 | 14,451,041.52 | 1,729,130.56 | 39.79170177 | -80.68418011 |
| 17,082.00 | 88.00 | 150.90 | 11,811.98 | -6,244.51 | 2,618.57 | 14,450,958.81 | 1,729,177.17 | 39.79147417 | -80.68401524 |
| 17,176.00 | 88.00 | 150.70 | 11,815.26 | -6,326.52 | 2,664.40 | 14,450,876.81 | 1,729,223.00 | 39.79124852 | -80.68385312 |
| 17,271.00 | 88.20 | 150.80 | 11,818.41 | -6,409.36 | 2,710.79 | 14,450,793.96 | 1,729,269.39 | 39.79102057 | -80.68368900 |
| 17,365.00 | 89.10 | 150.30 | 11,820.63 | -6,491.19 | 2,757.00 | 14,450,712.13 | 1,729,315.60 | 39.79079540 | -80.68352555 |
| 17,460.00 | 88.90 | 150.20 | 11,822.29 | -6,573.66 | 2,804.13 | 14,450,629.67 | 1,729,362.73 | 39.79056847 | -80.68335880 |
| 17,554.00 | 89.50 | 148.20 | 11,823.60 | -6,654.39 | 2,852.25 | 14,450,548.94 | 1,729,410.85 | 39.79034629 | -80.68318850 |
| 17,649.00 | 89.50 | 147.30 | 11,824.43 | -6,734.73 | 2,902.95 | 14,450,468.60 | 1,729,461.54 | 39.79012517 | -80.68302312 |
| 17,744.00 | 90.00 | 148.80 | 11,824.84 | -6,815.33 | 2,953.22 | 14,450,387.99 | 1,729,511.81 | 39.78990332 | -80.68283112 |
| 17,838.00 | 89.90 | 150.70 | 11,824.93 | -6,896.53 | 3,000.57 | 14,450,306.80 | 1,729,559.17 | 39.78967987 | -80.68266358 |
| 17,933.00 | 89.50 | 150.30 | 11,825.42 | -6,979.21 | 3,047.35 | 14,450,224.11 | 1,729,605.95 | 39.78945235 | -80.68249810 |
| 18,028.00 | 90.20 | 151.10 | 11,825.67 | -7,062.06 | 3,093.84 | 14,450,141.27 | 1,729,652.44 | 39.78922438 | -80.68233365 |
| 18,123.00 | 90.00 | 151.00 | 11,825.51 | -7,145.18 | 3,139.82 | 14,450,058.14 | 1,729,698.42 | 39.78899564 | -80.68217100 |
| 18,217.00 | 90.00 | 151.60 | 11,825.51 | -7,227.64 | 3,184.96 | 14,449,975.69 | 1,729,743.56 | 39.78876877 | -80.68201135 |



TUG HILL
OPERATING

Survey Report - Geographic



| | | | |
|------------------|---------------------------------|-------------------------------------|-----------------------------|
| Company: | Tug Hill Operating LLC | Local Co-ordinate Reference: | Well Heaven Hill 3-7 HU (F) |
| Project: | Marshall County, West Virginia. | TVD Reference: | RKB=1326+26 @ 1352.00usft |
| Site: | Heaven Hill 3 | MD Reference: | RKB=1326+26 @ 1352.00usft |
| Well: | Heaven Hill 3-7 HU (F) | North Reference: | Grid |
| Wellbore: | Original Hole | Survey Calculation Method: | Minimum Curvature |
| Design: | Surveys Original Hole | Database: | DB_Jul2216ct_v14 |

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| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Map Northing (usft) | Map Easting (usft) | Latitude | Longitude |
|---|-----------------|-------------|-----------------------|--------------|--------------|---------------------|--------------------|-------------|--------------|
| | | | | | | | | | |
| 18,312.00 | 89.90 | 151.60 | 11,825.59 | -7,311.20 | 3,230.15 | 14,449,892.12 | 1,729,788.75 | 39.78653883 | -80.68185157 |
| 18,406.00 | 89.20 | 151.60 | 11,826.33 | -7,393.89 | 3,274.85 | 14,449,809.44 | 1,729,633.45 | 39.78631132 | -80.68169347 |
| 18,501.00 | 89.10 | 150.70 | 11,827.74 | -7,477.09 | 3,320.69 | 14,449,726.24 | 1,729,679.29 | 39.78680239 | -80.68153136 |
| 18,596.00 | 89.60 | 150.00 | 11,828.81 | -7,559.64 | 3,367.68 | 14,449,643.68 | 1,729,926.28 | 39.78785522 | -80.68136512 |
| 18,690.00 | 90.00 | 150.00 | 11,829.14 | -7,641.05 | 3,414.68 | 14,449,562.28 | 1,729,973.28 | 39.78763120 | -80.68119885 |
| 18,785.00 | 88.60 | 149.80 | 11,830.30 | -7,723.23 | 3,462.32 | 14,449,480.10 | 1,730,020.90 | 39.78740504 | -80.68103031 |
| 18,879.00 | 88.60 | 149.60 | 11,832.60 | -7,804.36 | 3,509.73 | 14,449,398.96 | 1,730,068.33 | 39.78718176 | -80.68086257 |
| 18,973.00 | 88.50 | 149.60 | 11,834.98 | -7,885.41 | 3,557.28 | 14,449,317.91 | 1,730,115.88 | 39.78698871 | -80.68069433 |
| 19,068.00 | 88.50 | 150.30 | 11,837.46 | -7,967.61 | 3,604.84 | 14,449,235.71 | 1,730,163.44 | 39.78673249 | -80.68052609 |
| 19,163.00 | 88.20 | 150.30 | 11,840.20 | -8,050.10 | 3,651.89 | 14,449,153.22 | 1,730,210.49 | 39.78650551 | -80.68035966 |
| 19,258.00 | 89.60 | 150.30 | 11,842.02 | -8,132.60 | 3,698.95 | 14,449,070.72 | 1,730,257.54 | 39.78627847 | -80.68019320 |
| 19,352.00 | 89.20 | 150.80 | 11,843.01 | -8,214.45 | 3,745.16 | 14,448,988.87 | 1,730,303.76 | 39.78605324 | -80.68002973 |
| 19,447.00 | 90.60 | 150.40 | 11,843.17 | -8,297.22 | 3,791.79 | 14,448,906.11 | 1,730,350.39 | 39.78582549 | -80.67986478 |
| 19,542.00 | 90.60 | 150.70 | 11,842.18 | -8,379.94 | 3,838.50 | 14,448,823.39 | 1,730,397.10 | 39.78559787 | -80.67969858 |
| 19,636.00 | 90.10 | 150.20 | 11,841.60 | -8,461.71 | 3,884.86 | 14,448,741.62 | 1,730,443.46 | 39.78537285 | -80.67953561 |
| 19,731.00 | 89.50 | 150.80 | 11,841.94 | -8,544.39 | 3,931.64 | 14,448,658.94 | 1,730,490.24 | 39.78514532 | -80.67937015 |
| 19,826.00 | 89.40 | 150.40 | 11,842.85 | -8,627.15 | 3,978.27 | 14,448,576.17 | 1,730,536.87 | 39.78491758 | -80.67920521 |
| 19,921.00 | 88.00 | 150.40 | 11,845.00 | -8,709.73 | 4,025.18 | 14,448,493.60 | 1,730,583.78 | 39.78469033 | -80.67903927 |
| 20,015.00 | 89.60 | 150.30 | 11,846.97 | -8,791.40 | 4,071.67 | 14,448,411.92 | 1,730,630.27 | 39.78446559 | -80.67887483 |
| 20,110.00 | 90.50 | 150.40 | 11,846.89 | -8,873.96 | 4,118.67 | 14,448,329.36 | 1,730,677.27 | 39.78423839 | -80.67870860 |
| 20,205.00 | 90.30 | 150.20 | 11,846.23 | -8,956.48 | 4,165.74 | 14,448,246.85 | 1,730,724.33 | 39.78401131 | -80.67854212 |
| 20,300.00 | 90.50 | 150.30 | 11,845.56 | -9,038.95 | 4,212.88 | 14,448,164.37 | 1,730,771.47 | 39.78378435 | -80.67837538 |
| 20,394.00 | 88.20 | 149.60 | 11,846.63 | -9,120.31 | 4,259.94 | 14,448,083.02 | 1,730,818.54 | 39.78356046 | -80.67820889 |
| 20,488.00 | 89.20 | 150.40 | 11,848.76 | -9,201.69 | 4,306.93 | 14,448,001.63 | 1,730,865.53 | 39.78333650 | -80.67804268 |
| 20,583.00 | 89.10 | 150.60 | 11,850.17 | -9,284.37 | 4,353.70 | 14,447,918.96 | 1,730,912.30 | 39.78310899 | -80.67787725 |
| 20,677.00 | 87.70 | 151.00 | 11,852.80 | -9,366.39 | 4,399.54 | 14,447,836.14 | 1,730,958.14 | 39.78288329 | -80.67771513 |
| 20,771.00 | 88.40 | 150.10 | 11,855.99 | -9,448.19 | 4,445.73 | 14,447,755.93 | 1,731,004.33 | 39.78255177 | -80.67755177 |
| 20,865.00 | 90.20 | 149.80 | 11,857.14 | -9,529.55 | 4,492.80 | 14,447,673.78 | 1,731,051.39 | 39.78234249 | -80.67738529 |
| 20,960.00 | 89.70 | 149.30 | 11,857.23 | -9,611.44 | 4,540.94 | 14,447,591.88 | 1,731,099.54 | 39.78220690 | -80.67721497 |
| 21,055.00 | 89.10 | 148.70 | 11,858.22 | -9,692.87 | 4,589.87 | 14,447,510.45 | 1,731,148.46 | 39.78198480 | -80.67704187 |
| 21,150.00 | 90.90 | 149.90 | 11,858.22 | -9,774.55 | 4,638.36 | 14,447,428.77 | 1,731,196.96 | 39.78176000 | -80.67687029 |
| 21,245.00 | 91.20 | 150.20 | 11,856.48 | -9,856.85 | 4,685.78 | 14,447,346.47 | 1,731,244.38 | 39.78153352 | -80.67670256 |
| 21,339.00 | 90.10 | 150.10 | 11,855.41 | -9,938.37 | 4,732.57 | 14,447,264.95 | 1,731,291.17 | 39.78130917 | -80.67653709 |
| 21,434.00 | 89.60 | 150.00 | 11,855.66 | -10,020.69 | 4,780.00 | 14,447,182.64 | 1,731,338.59 | 39.78108265 | -80.67636933 |
| 21,529.00 | 90.80 | 150.20 | 11,855.33 | -10,103.04 | 4,827.35 | 14,447,100.26 | 1,731,385.95 | 39.78085602 | -80.67620184 |
| 21,623.00 | 90.40 | 150.10 | 11,854.35 | -10,184.57 | 4,874.13 | 14,447,018.76 | 1,731,432.73 | 39.78063166 | -80.67603637 |
| 21,717.00 | 89.80 | 149.70 | 11,854.18 | -10,265.89 | 4,921.28 | 14,446,937.44 | 1,731,479.87 | 39.78040786 | -80.67586962 |
| 21,812.00 | 90.10 | 150.10 | 11,854.26 | -10,348.08 | 4,968.92 | 14,446,855.25 | 1,731,527.52 | 39.78018167 | -80.67570110 |
| 21,906.00 | 89.80 | 149.60 | 11,854.35 | -10,429.36 | 5,016.13 | 14,446,773.96 | 1,731,574.73 | 39.77995798 | -80.67553410 |
| 22,001.00 | 89.40 | 149.10 | 11,855.01 | -10,511.09 | 5,064.56 | 14,446,692.24 | 1,731,623.16 | 39.77973306 | -80.67536278 |
| 22,095.00 | 89.50 | 149.50 | 11,855.91 | -10,591.91 | 5,112.55 | 14,446,611.42 | 1,731,671.15 | 39.77951062 | -80.67519302 |
| 22,190.00 | 88.80 | 149.90 | 11,857.32 | -10,673.92 | 5,160.47 | 14,446,529.40 | 1,731,719.07 | 39.77928492 | -80.67502350 |
| 22,285.00 | 88.80 | 151.40 | 11,859.31 | -10,756.71 | 5,207.03 | 14,446,446.62 | 1,731,765.63 | 39.77905710 | -80.67485888 |
| 22,379.00 | 89.70 | 151.60 | 11,860.54 | -10,839.39 | 5,251.73 | 14,446,363.94 | 1,731,810.33 | 39.77882960 | -80.67470083 |
| 22,474.00 | 89.30 | 152.40 | 11,861.37 | -10,923.34 | 5,296.18 | 14,446,279.98 | 1,731,854.78 | 39.77859860 | -80.67454370 |
| 22,569.00 | 89.00 | 153.00 | 11,862.78 | -11,007.75 | 5,339.75 | 14,446,195.58 | 1,731,898.35 | 39.77836835 | -80.67438973 |
| 22,661.00 | 89.20 | 152.90 | 11,864.23 | -11,089.67 | 5,381.58 | 14,446,113.65 | 1,731,940.18 | 39.77814095 | -80.67424190 |
| 22,670.00 | 89.10 | 152.90 | 11,864.36 | -11,087.69 | 5,385.68 | 14,446,105.64 | 1,731,944.28 | 39.77811891 | -80.67422741 |
| Survey @ 22670.00 MD 11864.36 TVD | | | | | | | | | |
| 22,722.00 | 89.10 | 152.90 | 11,865.18 | -11,143.97 | 5,409.37 | 14,446,059.35 | 1,731,967.97 | 39.77799156 | -80.67414371 |
| Survey projected to 22722.00 MD 11865.18 TVD | | | | | | | | | |



Company:

Tug Hill Operating LLC
Marshall County, West Virginia.

Local Co-ordinate Reference:

Well Heaven Hill 3-7 HU (F)
RKB=1326+26 @ 1352.00usft

Project:

Heaven Hill 3

TVD Reference:

RKB=1326+26 @ 1352.00usft

Site:

Heaven Hill 3-7 HU (F)

MD Reference:

Grid

Well:

Original Hole

North Reference:

Minimum Curvature

Wellbore:

Surveys Original Hole

Survey Calculation Method:

DB_Jul2216dt_v14

Design:

Surveys Original Hole

Database:

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Design Annotations

| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates | | Comment |
|-----------------------|-----------------------|-------------------|-------------|--|
| | | +N-S (usft) | +E-W (usft) | |
| 157.00 | 157.00 | 0.24 | -0.34 | MWD surveys |
| 22,670.00 | 11,864.36 | -11,097.69 | 5,385.68 | Survey @ 22670.00 MD 11864.36 TVD |
| 22,722.00 | 11,865.18 | -11,143.97 | 5,409.37 | Survey projected to 22722.00 MD 11865.18 TVD |

JUL 10 2020

WV Department of
Environmental Protection