



**Well:** Keith Stern S-18 HU (slot E)  
**Site:** Keith Stern  
**Project:** Marshall County, West Virginia.  
**Design:** rev3

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=744+33 @ 780.00usft (Nabors X08)

Northing 14444888.80 Easting 1726908.34 Latitude 39.77482608 Longitude -80.69216638

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.974°

**ANNOTATIONS SURVEYS**

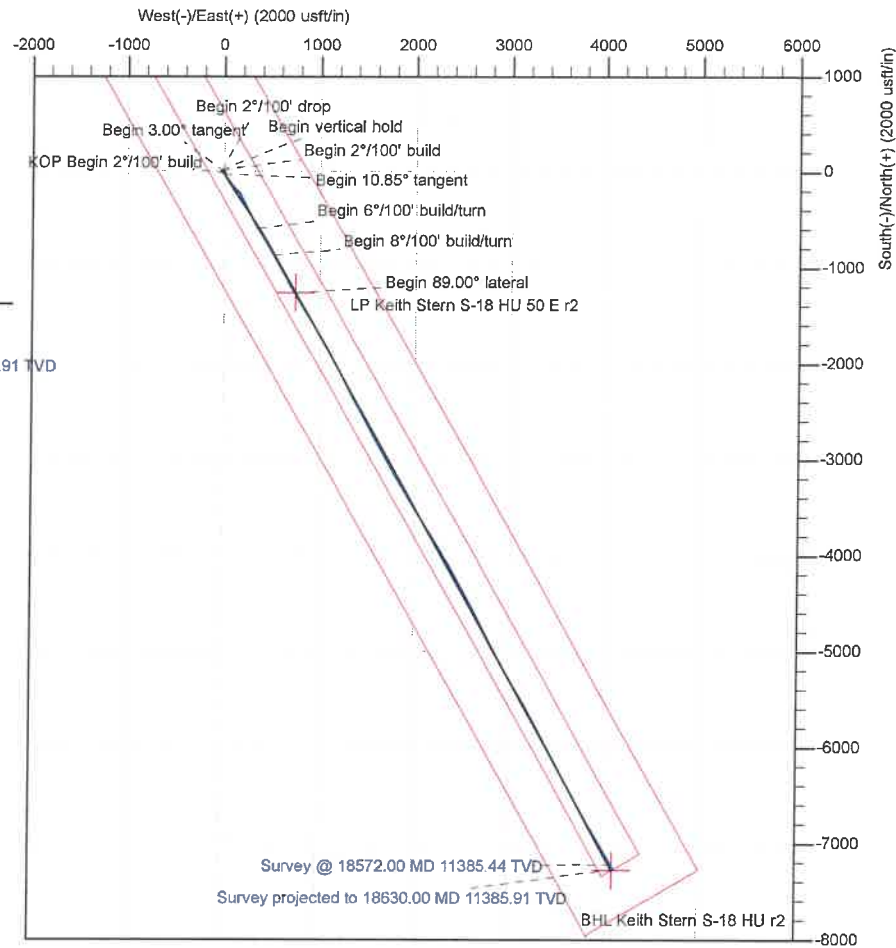
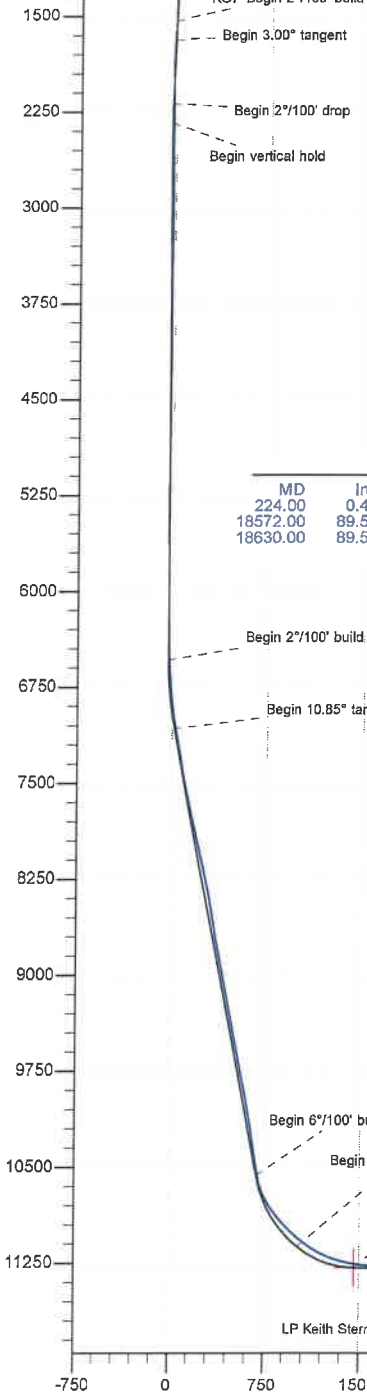
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Annotation
224.00	0.40	291.88	224.00	0.29	-0.73	-0.61	MWD surveys
18572.00	89.54	147.91	11385.44	-7217.91	4104.59	8303.34	Survey @ 18572.00 MD 11385.44 TVD
18630.00	89.54	147.91	11385.91	-7267.05	4135.41	8361.28	Survey projected to 18630.00 MD 11385.91 TVD

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**SECTION DETAILS**

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Diag	TFace	VSec	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1536.00	0.00	0.00	1536.00	0.00	0.00	0.00	0.000	0.00	KOP Begin 2°/100' build
3	1686.00	3.00	300.00	1685.93	1.96	-3.40	2.00	300.000	-3.38	Begin 3.00° tangent
4	2186.00	3.00	300.00	2185.25	15.05	-26.06	0.00	0.000	-25.92	Begin 2°/100' drop
5	2336.00	0.00	300.00	2335.18	17.01	-29.46	2.00	180.000	-29.31	Begin vertical hold
6	6536.82	0.00	300.00	6536.00	17.01	-29.46	0.00	300.000	-29.31	Begin 2°/100' build
7	7079.16	10.85	146.91	7075.10	-25.87	-1.52	2.00	146.910	21.77	Begin 10.85° tangent
8	10638.03	10.85	146.91	10570.39	-586.97	364.11	0.00	0.000	690.16	Begin 6°/100' build/turn
9	11290.93	50.00	150.17	11122.53	-866.35	528.50	6.00	3.954	1014.26	Begin 8°/100' build/turn
10	11778.43	89.00	150.80	11290.00	-1256.25	748.84	8.00	1.007	1462.11	Begin 89.00° lateral
11	18678.47	89.00	150.80	11411.00	-7278.74	4114.18	0.00	0.000	8361.01	PBHL/TD 18678.46 MD/11411.00 TVD

True Vertical Depth (1500 usft/in)



Azimuths to Grid North  
 True North: -0.20°  
 Magnetic North: -8.97°

Magnetic Field  
 Strength: 51868.1snT  
 Dip Angle: 66.73°  
 Date: 1/28/2020  
 Model: IGRF2015



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stern S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

<b>Site</b>	Keith Stern				
<b>Site Position:</b>		<b>Northing:</b>	14,444,890.33 usft	<b>Latitude:</b>	39.77483004
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,726,932.47 usft	<b>Longitude:</b>	-80.69208048
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.197 °

<b>Well</b>	Keith Stern S-18 HU (slot E)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,444,888.80 usft	<b>Latitude:</b>	39.77482608
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,726,908.34 usft	<b>Longitude:</b>	-80.69216638
<b>Position Uncertainty</b>	0.00 usft		<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	747.00 usft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	1/28/2020	-8.777	66.725	51,868.12536200

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	150.52	

<b>Survey Program</b>	<b>Date</b>	3/5/2020			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
224.00	506.00	MWD surf (Original Hole)	MWD	MWD - Standard	
598.00	2,188.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,309.00	18,572.00	MWD (Original Hole)	MWD	MWD - Standard	
18,630.00	18,630.00	Projection (Original Hole)	MWD	MWD - Standard	

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<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
224.00	0.40	291.88	224.00	0.29	-0.73	-0.61	0.18	0.18	0.00	
<b>MWD surveys</b>										
255.00	0.40	306.29	255.00	0.40	-0.91	-0.79	0.32	0.00	46.48	
285.00	0.35	298.21	285.00	0.50	-1.08	-0.97	0.24	-0.17	-26.93	
314.00	0.35	295.40	314.00	0.58	-1.24	-1.11	0.06	0.00	-9.69	
345.00	0.40	307.26	345.00	0.69	-1.41	-1.29	0.30	0.16	38.26	
377.00	0.44	302.95	376.99	0.82	-1.60	-1.50	0.16	0.13	-13.47	

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<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
411.00	0.44	314.47	410.99	0.98	-1.80	-1.74	0.26	0.00	33.88
443.00	0.75	304.80	442.99	1.19	-2.06	-2.05	1.01	0.97	-30.22
475.00	0.70	309.11	474.99	1.43	-2.39	-2.42	0.23	-0.16	13.47
506.00	0.66	303.13	505.99	1.65	-2.68	-2.76	0.26	-0.13	-19.29
598.00	0.22	284.05	597.98	1.98	-3.30	-3.35	0.50	-0.48	-20.74
692.00	0.18	351.03	691.98	2.17	-3.50	-3.61	0.24	-0.04	71.26
787.00	1.01	139.39	786.98	1.68	-2.97	-2.93	1.23	0.87	156.17
881.00	1.80	137.19	880.95	-0.03	-1.43	-0.68	0.84	0.84	-2.34
976.00	2.07	129.11	975.90	-2.21	0.91	2.37	0.40	0.28	-8.51
1,071.00	2.20	113.55	1,070.83	-4.02	3.92	5.42	0.62	0.14	-16.38
1,165.00	1.58	106.25	1,164.78	-5.10	6.81	7.79	0.71	-0.66	-7.77
1,260.00	1.10	70.75	1,259.76	-5.17	8.93	8.89	0.99	-0.51	-37.37
1,355.00	1.05	21.44	1,354.74	-4.05	10.11	8.51	0.95	-0.05	-51.91
1,450.00	2.59	328.09	1,449.69	-1.42	9.30	5.81	2.25	1.62	-56.16
1,544.00	4.26	318.42	1,543.52	2.99	5.86	0.28	1.87	1.78	-10.29
1,639.00	4.53	302.16	1,638.25	7.63	0.34	-6.48	1.34	0.28	-17.12
1,733.00	4.75	287.49	1,731.94	10.77	-6.52	-12.59	1.28	0.23	-15.61
1,828.00	4.13	270.08	1,826.66	11.96	-13.69	-17.15	1.55	-0.65	-18.33
1,921.00	2.90	252.41	1,919.49	11.26	-19.28	-19.29	1.75	-1.32	-19.00
2,016.00	2.54	230.97	2,014.38	9.20	-23.21	-19.43	1.13	-0.38	-22.57
2,111.00	1.97	239.93	2,109.31	7.06	-26.26	-19.07	0.70	-0.60	9.43
2,188.00	1.49	256.10	2,186.28	6.16	-28.37	-19.32	0.88	-0.62	21.00
2,309.00	1.53	261.03	2,307.23	5.53	-31.50	-20.31	0.11	0.03	4.07
2,404.00	0.66	263.84	2,402.22	5.27	-33.29	-20.97	0.92	-0.92	2.96
2,499.00	0.04	261.03	2,497.21	5.21	-33.87	-21.20	0.65	-0.65	-2.96
2,594.00	0.70	94.39	2,592.21	5.16	-33.32	-20.89	0.78	0.69	-175.41
2,688.00	0.97	95.97	2,686.20	5.03	-31.96	-20.11	0.29	0.29	1.68
2,782.00	0.92	100.98	2,780.19	4.80	-30.43	-19.16	0.10	-0.05	5.33
2,877.00	1.27	100.28	2,875.17	4.47	-28.64	-17.99	0.37	0.37	-0.74
2,971.00	0.88	90.52	2,969.15	4.28	-26.90	-16.96	0.46	-0.41	-10.38
3,066.00	0.57	37.00	3,064.15	4.65	-25.88	-16.78	0.75	-0.33	-56.34
3,161.00	0.92	5.88	3,159.14	5.78	-25.52	-17.59	0.55	0.37	-32.76
3,255.00	1.10	358.67	3,253.12	7.44	-25.46	-19.01	0.23	0.19	-7.67
3,349.00	1.45	351.29	3,347.10	9.51	-25.66	-20.91	0.41	0.37	-7.85
3,444.00	0.79	3.60	3,442.08	11.36	-25.81	-22.59	0.74	-0.69	12.96
3,539.00	0.44	44.29	3,537.08	12.27	-25.51	-23.24	0.57	-0.37	42.83
3,633.00	0.40	38.32	3,631.07	12.79	-25.05	-23.46	0.06	-0.04	-6.35
3,728.00	0.44	37.17	3,726.07	13.34	-24.63	-23.73	0.04	0.04	-1.21
3,825.00	0.53	27.15	3,823.07	14.03	-24.20	-24.13	0.13	0.09	-10.33
3,920.00	0.70	25.57	3,918.06	14.95	-23.75	-24.70	0.18	0.18	-1.66
4,015.00	0.70	42.70	4,013.06	15.90	-23.10	-25.21	0.22	0.00	18.03
4,109.00	0.61	66.79	4,107.05	16.52	-22.25	-25.33	0.31	-0.10	25.63
4,204.00	0.09	64.68	4,202.05	16.75	-21.72	-25.27	0.55	-0.55	-2.22

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<b>Site:</b>	Keith Stem	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
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<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,298.00	0.09	61.34	4,296.05	16.82	-21.59	-25.26	0.01	0.00	-3.55
4,393.00	0.04	81.03	4,391.05	16.86	-21.49	-25.25	0.06	-0.05	20.73
4,488.00	0.13	261.03	4,486.05	16.84	-21.57	-25.28	0.18	0.09	189.47
4,582.00	0.09	291.09	4,580.05	16.85	-21.74	-25.37	0.07	-0.04	31.98
4,677.00	0.22	302.51	4,675.05	16.98	-21.96	-25.59	0.14	0.14	12.02
4,773.00	0.40	281.42	4,771.05	17.15	-22.45	-25.97	0.22	0.19	-21.97
4,868.00	0.35	283.70	4,866.04	17.28	-23.05	-26.39	0.05	-0.05	2.40
4,963.00	0.66	279.93	4,961.04	17.44	-23.88	-26.93	0.33	0.33	-3.97
5,057.00	1.01	283.53	5,055.03	17.73	-25.21	-27.84	0.38	0.37	3.83
5,152.00	0.48	316.84	5,150.02	18.22	-26.30	-28.80	0.70	-0.56	35.06
5,247.00	0.44	344.26	5,245.02	18.86	-26.67	-29.54	0.23	-0.04	28.86
5,342.00	0.66	6.67	5,340.01	19.75	-26.71	-30.34	0.32	0.23	23.59
5,436.00	0.18	22.85	5,434.01	20.43	-26.59	-30.86	0.52	-0.51	17.21
5,531.00	0.48	132.89	5,529.01	20.29	-26.24	-30.58	0.60	0.32	115.83
5,626.00	0.62	135.08	5,624.01	19.66	-25.58	-29.70	0.15	0.15	2.31
5,720.00	0.26	149.06	5,718.00	19.11	-25.11	-29.00	0.40	-0.38	14.87
5,815.00	0.35	186.15	5,813.00	18.64	-25.03	-28.55	0.22	0.09	39.04
5,910.00	0.31	203.11	5,908.00	18.12	-25.17	-28.16	0.11	-0.04	17.85
6,005.00	0.44	211.81	6,003.00	17.57	-25.46	-27.82	0.15	0.14	9.16
6,099.00	0.61	212.51	6,096.99	16.84	-25.92	-27.42	0.18	0.18	0.74
6,163.00	0.66	190.10	6,160.99	16.19	-26.17	-26.97	0.39	0.08	-35.02
6,257.00	0.40	185.18	6,254.99	15.33	-26.29	-26.28	0.28	-0.28	-5.23
6,350.00	0.48	173.58	6,347.98	14.62	-26.28	-25.66	0.13	0.09	-12.47
6,445.00	1.01	172.61	6,442.98	13.40	-26.12	-24.52	0.56	0.56	-1.02
6,539.00	1.89	164.35	6,536.94	11.08	-25.60	-22.24	0.96	0.94	-8.79
6,666.00	3.78	153.19	6,663.78	5.33	-23.15	-16.03	1.54	1.49	-8.79
6,760.00	5.49	141.85	6,757.48	-0.97	-18.97	-8.49	2.06	1.82	-12.06
6,855.00	7.47	139.21	6,851.86	-9.22	-12.13	2.06	2.11	2.08	-2.78
6,949.00	8.61	139.13	6,944.94	-19.17	-3.53	14.95	1.21	1.21	-0.09
7,044.00	9.23	141.94	7,038.79	-30.55	5.82	29.46	0.80	0.65	2.96
7,138.00	9.45	139.03	7,131.54	-42.31	15.53	44.47	0.55	0.23	-3.10
7,233.00	10.11	141.32	7,225.16	-54.71	25.85	60.35	0.81	0.69	2.41
7,327.00	10.41	146.77	7,317.66	-68.25	35.66	76.97	1.08	0.32	5.80
7,421.00	10.85	146.42	7,410.05	-82.73	45.21	94.26	0.47	0.47	-0.37
7,516.00	11.07	145.28	7,503.32	-97.67	55.35	112.27	0.33	0.23	-1.20
7,610.00	11.60	144.31	7,595.48	-112.77	66.00	130.65	0.60	0.56	-1.03
7,705.00	12.13	142.47	7,688.45	-128.44	77.65	150.03	0.69	0.56	-1.94
7,798.00	12.83	141.06	7,779.25	-144.22	90.10	169.89	0.82	0.75	-1.52
7,893.00	13.05	138.51	7,871.84	-160.46	103.83	190.78	0.64	0.23	-2.68
7,987.00	13.58	136.23	7,963.32	-176.38	118.50	211.86	0.79	0.56	-2.43
8,081.00	13.84	135.96	8,054.64	-192.43	133.95	233.43	0.28	0.28	-0.29
8,176.00	13.71	134.73	8,146.91	-208.52	149.84	255.26	0.34	-0.14	-1.29
8,270.00	11.60	140.62	8,238.62	-223.67	163.75	275.30	2.63	-2.24	6.27
8,364.00	10.15	149.76	8,330.94	-238.13	173.92	292.89	2.39	-1.54	9.72



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8,458.00	9.67	153.45	8,423.54	-252.35	181.62	309.06	0.85	-0.51	3.93
8,550.00	9.98	154.33	8,514.19	-266.44	188.53	324.73	0.37	0.34	0.96
8,645.00	9.89	155.39	8,607.76	-281.28	195.49	341.07	0.21	-0.09	1.12
8,739.00	9.45	156.62	8,700.43	-295.70	201.92	356.79	0.52	-0.47	1.31
8,833.00	9.89	156.44	8,793.09	-310.19	208.21	372.49	0.47	0.47	-0.19
8,928.00	10.33	155.12	8,886.62	-325.39	215.05	389.09	0.52	0.46	-1.39
9,026.00	10.55	152.92	8,982.99	-341.35	222.83	406.82	0.46	0.22	-2.24
9,120.00	11.60	154.07	9,075.24	-357.51	230.88	424.85	1.14	1.12	1.22
9,214.00	11.56	154.42	9,167.33	-374.51	239.08	443.68	0.09	-0.04	0.37
9,308.00	10.33	153.10	9,259.62	-390.52	246.96	461.49	1.34	-1.31	-1.40
9,403.00	10.46	152.84	9,353.06	-405.79	254.75	478.62	0.15	0.14	-0.27
9,494.00	10.59	153.10	9,442.53	-420.60	262.31	495.23	0.15	0.14	0.29
9,589.00	10.20	149.76	9,535.97	-435.65	270.49	512.36	0.76	-0.41	-3.52
9,684.00	11.43	149.15	9,629.28	-451.00	279.56	530.18	1.30	1.29	-0.64
9,778.00	12.04	149.98	9,721.31	-467.48	289.24	549.29	0.67	0.65	0.88
9,872.00	11.51	151.07	9,813.34	-484.18	298.68	568.48	0.61	-0.56	1.16
9,967.00	11.21	152.66	9,906.47	-500.68	307.50	587.18	0.46	-0.32	1.67
10,062.00	10.02	151.61	9,999.85	-516.15	315.68	604.67	1.27	-1.25	-1.11
10,108.00	10.10	152.92	10,045.14	-523.26	319.41	612.70	0.53	0.17	2.85
10,183.00	10.86	153.19	10,118.89	-535.42	325.59	626.33	1.02	1.01	0.36
10,278.00	10.20	151.34	10,212.29	-550.79	333.67	643.68	0.78	-0.69	-1.95
10,372.00	9.54	149.94	10,304.90	-564.84	341.56	659.79	0.75	-0.70	-1.49
10,467.00	8.26	151.43	10,398.75	-577.64	348.77	674.49	1.37	-1.35	1.57
10,561.00	7.69	147.30	10,491.84	-588.87	355.39	687.52	0.86	-0.61	-4.39
10,656.00	10.64	145.63	10,585.62	-601.46	363.78	702.61	3.12	3.11	-1.76
10,703.00	17.27	146.60	10,631.21	-610.87	370.08	713.91	14.11	14.11	2.06
10,750.00	20.62	145.10	10,675.65	-623.49	378.66	729.11	7.20	7.13	-3.19
10,797.00	24.79	149.32	10,719.01	-638.76	388.42	747.21	9.52	8.87	8.98
10,845.00	28.75	150.55	10,761.85	-657.47	399.24	768.82	8.33	8.25	2.56
10,892.00	32.40	151.25	10,802.31	-678.36	410.86	792.72	7.80	7.77	1.49
10,939.00	35.96	150.11	10,841.19	-701.37	423.79	819.12	7.70	7.57	-2.43
10,986.00	38.81	150.20	10,878.53	-726.12	437.99	847.66	6.06	6.06	0.19
11,034.00	41.45	147.74	10,915.23	-752.62	453.95	878.57	6.41	5.50	-5.13
11,081.00	43.56	148.09	10,949.87	-779.52	470.82	910.30	4.52	4.49	0.74
11,129.00	44.53	148.71	10,984.38	-807.95	488.30	943.64	2.21	2.02	1.29
11,182.00	47.25	148.79	11,021.26	-840.48	508.04	981.68	5.13	5.13	0.15
11,223.00	47.69	149.32	11,048.98	-866.39	523.58	1,011.88	1.43	1.07	1.29
11,270.00	51.78	149.32	11,079.35	-897.23	541.87	1,047.73	8.70	8.70	0.00
11,318.00	54.73	150.29	11,108.06	-930.47	561.21	1,086.18	6.36	6.15	2.02
11,365.00	57.58	151.17	11,134.24	-964.52	580.29	1,125.21	6.26	6.06	1.87
11,413.00	60.09	150.99	11,159.08	-1,000.47	600.15	1,166.28	5.24	5.23	-0.38
11,460.00	63.60	149.85	11,181.25	-1,036.50	620.61	1,207.71	7.77	7.47	-2.43
11,507.00	66.73	150.73	11,200.99	-1,073.54	641.74	1,250.36	6.87	6.66	1.87

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stern S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
11,554.00	71.12	151.96	11,217.88	-1,112.02	662.76	1,294.20	9.65	9.34	2.62
11,602.00	74.29	150.73	11,232.15	-1,152.23	684.74	1,340.02	7.04	6.60	-2.56
11,649.00	76.62	150.64	11,243.96	-1,191.89	707.01	1,385.51	4.96	4.96	-0.19
11,696.00	78.73	150.46	11,253.99	-1,231.87	729.58	1,431.42	4.50	4.49	-0.38
11,743.00	81.27	150.02	11,262.15	-1,272.05	752.56	1,477.70	5.48	5.40	-0.94
11,791.00	83.30	149.94	11,268.59	-1,313.23	776.35	1,525.26	4.23	4.23	-0.17
11,838.00	84.97	149.58	11,273.40	-1,353.62	799.90	1,572.01	3.63	3.55	-0.77
11,885.00	86.59	149.06	11,276.85	-1,393.93	823.81	1,618.87	3.62	3.45	-1.11
11,932.00	88.84	149.15	11,278.73	-1,434.23	847.93	1,665.82	4.79	4.79	0.19
11,980.00	90.33	150.11	11,279.07	-1,475.64	872.19	1,713.81	3.69	3.10	2.00
12,074.00	89.45	150.64	11,279.26	-1,557.35	918.66	1,807.81	1.09	-0.94	0.56
12,169.00	88.40	150.90	11,281.04	-1,640.24	965.04	1,902.79	1.14	-1.11	0.27
12,263.00	88.35	150.64	11,283.70	-1,722.24	1,010.92	1,996.75	0.28	-0.05	-0.28
12,358.00	88.13	150.82	11,286.62	-1,805.07	1,057.35	2,091.70	0.30	-0.23	0.19
12,452.00	89.05	150.73	11,288.93	-1,887.08	1,103.23	2,185.67	0.98	0.98	-0.10
12,547.00	89.45	151.17	11,290.18	-1,970.12	1,149.35	2,280.66	0.63	0.42	0.46
12,642.00	89.32	150.99	11,291.20	-2,053.27	1,195.29	2,375.65	0.23	-0.14	-0.19
12,736.00	90.07	152.13	11,291.70	-2,135.92	1,240.06	2,469.63	1.45	0.80	1.21
12,831.00	89.85	152.13	11,291.76	-2,219.90	1,284.47	2,564.60	0.23	-0.23	0.00
12,925.00	89.67	151.96	11,292.16	-2,302.93	1,328.53	2,658.56	0.26	-0.19	-0.18
13,020.00	89.49	151.87	11,292.85	-2,386.74	1,373.25	2,753.53	0.21	-0.19	-0.09
13,115.00	89.27	151.61	11,293.88	-2,470.41	1,418.23	2,848.50	0.36	-0.23	-0.27
13,209.00	89.19	151.78	11,295.15	-2,553.17	1,462.80	2,942.47	0.20	-0.09	0.18
13,304.00	89.10	151.34	11,296.56	-2,636.69	1,508.04	3,037.45	0.47	-0.09	-0.46
13,398.00	88.75	151.25	11,298.33	-2,719.13	1,553.18	3,131.42	0.38	-0.37	-0.10
13,492.00	89.80	151.61	11,299.52	-2,801.67	1,598.13	3,225.40	1.18	1.12	0.38
13,587.00	89.80	151.25	11,299.85	-2,885.10	1,643.56	3,320.39	0.38	0.00	-0.38
13,682.00	89.80	152.05	11,300.18	-2,968.71	1,688.67	3,415.37	0.84	0.00	0.84
13,777.00	88.31	149.67	11,301.75	-3,051.67	1,734.92	3,510.35	2.96	-1.57	-2.51
13,871.00	88.04	149.67	11,304.74	-3,132.76	1,782.36	3,604.29	0.29	-0.29	0.00
13,966.00	88.00	150.02	11,308.02	-3,214.85	1,830.05	3,699.22	0.37	-0.04	0.37
14,060.00	88.66	149.58	11,310.76	-3,296.06	1,877.32	3,793.18	0.84	0.70	-0.47
14,154.00	88.48	148.97	11,313.11	-3,376.84	1,925.33	3,887.12	0.68	-0.19	-0.65
14,249.00	89.23	149.41	11,315.01	-3,458.41	1,973.98	3,982.08	0.92	0.79	0.46
14,343.00	89.14	149.41	11,316.34	-3,539.32	2,021.81	4,076.05	0.10	-0.10	0.00
14,437.00	88.75	148.71	11,318.07	-3,619.93	2,070.13	4,170.00	0.85	-0.41	-0.74
14,532.00	88.88	149.15	11,320.04	-3,701.29	2,119.15	4,264.95	0.48	0.14	0.46
14,627.00	90.07	149.23	11,320.91	-3,782.88	2,167.80	4,359.92	1.26	1.25	0.08
14,721.00	90.02	148.09	11,320.83	-3,863.16	2,216.69	4,453.86	1.21	-0.05	-1.21
14,815.00	89.45	147.74	11,321.27	-3,942.80	2,266.62	4,547.77	0.71	-0.61	-0.37
14,910.00	89.01	149.85	11,322.55	-4,024.04	2,315.83	4,642.71	2.27	-0.46	2.22
15,005.00	89.32	148.88	11,323.93	-4,105.78	2,364.24	4,737.68	1.07	0.33	-1.02
15,100.00	89.63	151.61	11,324.80	-4,188.24	2,411.38	4,832.66	2.89	0.33	2.87

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stern S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
15,194.00	89.49	151.17	11,325.52	-4,270.76	2,456.39	4,926.65	0.49	-0.15	-0.47
15,289.00	89.32	150.90	11,326.51	-4,353.87	2,502.39	5,021.64	0.34	-0.18	-0.28
15,384.00	88.66	152.40	11,328.18	-4,437.46	2,547.49	5,116.60	1.72	-0.69	1.58
15,478.00	88.84	152.92	11,330.24	-4,520.94	2,590.66	5,210.52	0.59	0.19	0.55
15,573.00	88.48	151.96	11,332.46	-4,605.14	2,634.60	5,305.44	1.08	-0.38	-1.01
15,668.00	88.84	152.13	11,334.68	-4,689.03	2,679.12	5,400.38	0.42	0.38	0.18
15,762.00	88.79	152.22	11,336.62	-4,772.14	2,722.99	5,494.32	0.11	-0.05	0.10
15,857.00	88.62	152.13	11,338.77	-4,856.14	2,767.32	5,589.25	0.20	-0.18	-0.09
15,951.00	88.62	151.78	11,341.03	-4,939.07	2,811.50	5,683.20	0.37	0.00	-0.37
16,046.00	89.27	151.17	11,342.78	-5,022.53	2,856.86	5,778.17	0.94	0.68	-0.64
16,141.00	89.10	150.64	11,344.13	-5,105.53	2,903.05	5,873.15	0.59	-0.18	-0.56
16,236.00	89.23	150.55	11,345.52	-5,188.28	2,949.69	5,968.14	0.17	0.14	-0.09
16,330.00	89.05	149.32	11,346.93	-5,269.63	2,996.77	6,062.13	1.32	-0.19	-1.31
16,425.00	88.75	150.11	11,348.75	-5,351.65	3,044.67	6,157.10	0.89	-0.32	0.83
16,519.00	88.70	150.38	11,350.84	-5,433.23	3,091.31	6,251.07	0.29	-0.05	0.29
16,614.00	88.75	149.41	11,352.96	-5,515.40	3,138.95	6,346.04	1.02	0.05	-1.02
16,708.00	89.14	151.69	11,354.69	-5,597.23	3,185.16	6,440.02	2.46	0.41	2.43
16,803.00	89.58	150.90	11,355.75	-5,680.55	3,230.78	6,535.01	0.95	0.46	-0.83
16,897.00	89.36	150.64	11,356.62	-5,762.58	3,276.68	6,629.00	0.36	-0.23	-0.28
16,991.00	89.14	150.99	11,357.85	-5,844.64	3,322.51	6,722.99	0.44	-0.23	0.37
17,086.00	89.05	151.87	11,359.35	-5,928.06	3,367.94	6,817.97	0.93	-0.09	0.93
17,181.00	88.40	152.40	11,361.46	-6,012.02	3,412.33	6,912.90	0.88	-0.68	0.56
17,276.00	88.40	152.22	11,364.12	-6,096.11	3,456.46	7,007.82	0.19	0.00	-0.19
17,370.00	88.53	152.05	11,366.64	-6,179.18	3,500.38	7,101.75	0.23	0.14	-0.18
17,465.00	88.70	150.99	11,368.93	-6,262.66	3,545.66	7,196.71	1.13	0.18	-1.12
17,559.00	88.79	150.99	11,370.99	-6,344.84	3,591.24	7,290.68	0.10	0.10	0.00
17,654.00	88.88	150.55	11,372.92	-6,427.73	3,637.62	7,385.66	0.47	0.09	-0.46
17,749.00	89.01	150.29	11,374.67	-6,510.33	3,684.51	7,480.64	0.31	0.14	-0.27
17,843.00	89.05	149.85	11,376.26	-6,591.78	3,731.40	7,574.63	0.47	0.04	-0.47
17,938.00	89.01	149.58	11,377.87	-6,673.81	3,779.30	7,669.60	0.29	-0.04	-0.28
18,033.00	89.19	148.18	11,379.36	-6,755.12	3,828.40	7,764.55	1.49	0.19	-1.47
18,128.00	89.36	149.76	11,380.57	-6,836.52	3,877.36	7,859.50	1.67	0.18	1.66
18,223.00	89.49	148.97	11,381.52	-6,918.26	3,925.77	7,954.48	0.84	0.14	-0.83
18,317.00	89.27	149.76	11,382.54	-6,999.13	3,973.66	8,048.45	0.87	-0.23	0.84
18,412.00	89.23	149.67	11,383.78	-7,081.16	4,021.57	8,143.44	0.10	-0.04	-0.09
18,506.00	89.45	148.53	11,384.86	-7,161.81	4,069.84	8,237.40	1.24	0.23	-1.21
18,572.00	89.54	147.91	11,385.44	-7,217.91	4,104.60	8,303.34	0.95	0.14	-0.94
<b>Survey @ 18572.00 MD 11385.44 TVD</b>									
18,630.00	89.54	147.91	11,385.91	-7,267.05	4,135.41	8,361.28	0.00	0.00	0.00
<b>Survey projected to 18630.00 MD 11385.91 TVD</b>									



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stern S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
224.00	224.00	0.29	-0.73	MWD surveys
18,572.00	11,385.44	-7,217.91	4,104.60	Survey @ 18572.00 MD 11385.44 TVD
18,630.00	11,385.91	-7,267.05	4,135.41	Survey projected to 18630.00 MD 11385.91 TVD

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stem S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stem	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stem S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

<b>Site</b>	Keith Stem				
<b>Site Position:</b>	<b>Northing:</b>	14,444,890.33 usft	<b>Latitude:</b>	39.77483004	
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,726,932.47 usft	<b>Longitude:</b>	-80.69208048
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.197 °

<b>Well</b>	Keith Stem S-18 HU (slot E)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,444,888.80 usft	<b>Latitude:</b>	39.77482608
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,726,908.34 usft	<b>Longitude:</b>	-80.69216638
<b>Position Uncertainty</b>	0.00 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	747.00 usft	

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	1/28/2020	-8.777	66.725	51,868.12536200

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	150.52	

<b>Survey Program</b>	Date 3/5/2020			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
224.00	506.00	MWD surf (Original Hole)	MWD	MWD - Standard
598.00	2,188.00	MWD int (Original Hole)	MWD	MWD - Standard
2,309.00	18,572.00	MWD (Original Hole)	MWD	MWD - Standard
18,630.00	18,630.00	Projection (Original Hole)	MWD	MWD - Standard

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<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>	
0.00	0.00	0.00	0.00	0.00	0.00	14,444,888.80	1,726,908.34	39.77482608	-80.69216638	
224.00	0.40	291.88	224.00	0.29	-0.73	14,444,889.09	1,726,907.61	39.77482689	-80.69216896	
<b>MWD surveys</b>										
255.00	0.40	306.29	255.00	0.40	-0.91	14,444,889.20	1,726,907.43	39.77482718	-80.69216963	
285.00	0.35	298.21	285.00	0.50	-1.08	14,444,889.30	1,726,907.26	39.77482747	-80.69217021	
314.00	0.35	295.40	314.00	0.58	-1.24	14,444,889.38	1,726,907.10	39.77482769	-80.69217077	
345.00	0.40	307.26	345.00	0.69	-1.41	14,444,889.49	1,726,906.93	39.77482798	-80.69217138	
377.00	0.44	302.95	376.99	0.82	-1.60	14,444,889.62	1,726,906.74	39.77482835	-80.69217207	
411.00	0.44	314.47	410.99	0.98	-1.80	14,444,889.79	1,726,906.54	39.77482880	-80.69217278	



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stem S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stem	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stem S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_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
443.00	0.75	304.80	442.99	1.19	-2.06	14,444,889.99	1,726,906.28	39.77482937	-80.69217371
475.00	0.70	309.11	474.99	1.43	-2.39	14,444,890.23	1,726,905.95	39.77483004	-80.69217486
506.00	0.66	303.13	505.99	1.65	-2.68	14,444,890.45	1,726,905.66	39.77483064	-80.69217591
598.00	0.22	284.05	597.98	1.98	-3.30	14,444,890.78	1,726,905.04	39.77483156	-80.69217809
692.00	0.18	351.03	691.98	2.17	-3.50	14,444,890.97	1,726,904.84	39.77483208	-80.69217880
787.00	1.01	139.39	786.98	1.68	-2.97	14,444,890.48	1,726,905.37	39.77483073	-80.69217694
881.00	1.80	137.19	880.95	-0.03	-1.43	14,444,888.77	1,726,906.91	39.77482602	-80.69217148
976.00	2.07	129.11	975.90	-2.21	0.91	14,444,886.60	1,726,909.25	39.77482002	-80.69216316
1,071.00	2.20	113.55	1,070.83	-4.02	3.92	14,444,884.78	1,726,912.26	39.77481501	-80.69215249
1,165.00	1.58	106.25	1,164.78	-5.10	6.81	14,444,883.70	1,726,915.15	39.77481201	-80.69214219
1,260.00	1.10	70.75	1,259.76	-5.17	8.93	14,444,883.64	1,726,917.27	39.77481181	-80.69213465
1,355.00	1.05	21.44	1,354.74	-4.05	10.11	14,444,884.75	1,726,918.45	39.77481485	-80.69213044
1,450.00	2.59	328.09	1,449.69	-1.42	9.30	14,444,887.38	1,726,917.64	39.77482209	-80.69213331
1,544.00	4.26	318.42	1,543.52	2.99	5.86	14,444,891.79	1,726,914.20	39.77483424	-80.69214550
1,639.00	4.53	302.16	1,638.25	7.63	0.34	14,444,896.43	1,726,908.68	39.77484703	-80.69216508
1,733.00	4.75	287.49	1,731.94	10.77	-6.52	14,444,899.58	1,726,901.82	39.77485573	-80.69218944
1,828.00	4.13	270.08	1,826.66	11.96	-13.69	14,444,900.76	1,726,894.65	39.77485906	-80.69221496
1,921.00	2.90	252.41	1,919.49	11.26	-19.28	14,444,900.06	1,726,889.06	39.77485717	-80.69223487
2,016.00	2.54	230.97	2,014.38	9.20	-23.21	14,444,898.00	1,726,885.13	39.77485158	-80.69224887
2,111.00	1.97	239.93	2,109.31	7.06	-26.26	14,444,895.86	1,726,882.08	39.77484572	-80.69225974
2,188.00	1.49	256.10	2,186.28	6.16	-28.37	14,444,894.96	1,726,879.97	39.77484326	-80.69226729
2,309.00	1.53	261.03	2,307.23	5.53	-31.50	14,444,894.33	1,726,876.84	39.77484156	-80.69227841
2,404.00	0.66	263.84	2,402.22	5.27	-33.29	14,444,894.07	1,726,875.05	39.77484087	-80.69228481
2,499.00	0.04	261.03	2,497.21	5.21	-33.87	14,444,894.01	1,726,874.47	39.77484070	-80.69228686
2,594.00	0.70	94.39	2,592.21	5.16	-33.32	14,444,893.96	1,726,875.02	39.77484056	-80.69228492
2,688.00	0.97	95.97	2,686.20	5.03	-31.96	14,444,893.83	1,726,876.38	39.77484020	-80.69228007
2,782.00	0.92	100.98	2,780.19	4.80	-30.43	14,444,893.60	1,726,877.91	39.77483956	-80.69227462
2,877.00	1.27	100.28	2,875.17	4.47	-28.64	14,444,893.27	1,726,879.70	39.77483863	-80.69226827
2,971.00	0.88	90.52	2,969.15	4.28	-26.90	14,444,893.08	1,726,881.44	39.77483808	-80.69226205
3,066.00	0.57	37.00	3,064.15	4.65	-25.88	14,444,893.45	1,726,882.46	39.77483909	-80.69225844
3,161.00	0.92	5.88	3,159.14	5.78	-25.52	14,444,894.59	1,726,882.82	39.77484221	-80.69225714
3,255.00	1.10	358.67	3,253.12	7.44	-25.46	14,444,896.24	1,726,882.88	39.77484675	-80.69225692
3,349.00	1.45	351.29	3,347.10	9.51	-25.66	14,444,898.32	1,726,882.67	39.77485245	-80.69225761
3,444.00	0.79	3.60	3,442.08	11.36	-25.81	14,444,900.16	1,726,882.53	39.77485751	-80.69225809
3,539.00	0.44	44.29	3,537.08	12.27	-25.51	14,444,901.07	1,726,882.83	39.77486002	-80.69225702
3,633.00	0.40	38.32	3,631.07	12.79	-25.05	14,444,901.59	1,726,883.29	39.77486143	-80.69225539
3,728.00	0.44	37.17	3,726.07	13.34	-24.63	14,444,902.14	1,726,883.71	39.77486294	-80.69225387
3,825.00	0.53	27.15	3,823.07	14.03	-24.20	14,444,902.84	1,726,884.14	39.77486485	-80.69225233
3,920.00	0.70	25.57	3,918.06	14.95	-23.75	14,444,903.75	1,726,884.59	39.77486736	-80.69225072
4,015.00	0.70	42.70	4,013.06	15.90	-23.10	14,444,904.70	1,726,885.24	39.77486996	-80.69224841
4,109.00	0.61	66.79	4,107.05	16.52	-22.25	14,444,905.32	1,726,886.09	39.77487165	-80.69224538
4,204.00	0.09	64.68	4,202.05	16.75	-21.72	14,444,905.55	1,726,886.62	39.77487228	-80.69224349
4,298.00	0.09	61.34	4,296.05	16.82	-21.59	14,444,905.62	1,726,886.75	39.77487247	-80.69224302
4,393.00	0.04	81.03	4,391.05	16.86	-21.49	14,444,905.66	1,726,886.85	39.77487258	-80.69224267
4,488.00	0.13	261.03	4,486.05	16.84	-21.57	14,444,905.65	1,726,886.77	39.77487255	-80.69224293
4,582.00	0.09	291.09	4,580.05	16.85	-21.74	14,444,905.66	1,726,886.60	39.77487257	-80.69224355
4,677.00	0.22	302.51	4,675.05	16.98	-21.96	14,444,905.78	1,726,886.38	39.77487292	-80.69224434
4,773.00	0.40	281.42	4,771.05	17.15	-22.45	14,444,905.95	1,726,885.89	39.77487338	-80.69224606
4,868.00	0.35	283.70	4,866.04	17.28	-23.05	14,444,906.08	1,726,885.29	39.77487375	-80.69224822
4,963.00	0.66	279.93	4,961.04	17.44	-23.88	14,444,906.24	1,726,884.46	39.77487421	-80.69225114
5,057.00	1.01	283.53	5,055.03	17.73	-25.21	14,444,906.53	1,726,883.13	39.77487501	-80.69225590
5,152.00	0.48	316.84	5,150.02	18.22	-26.30	14,444,907.02	1,726,882.04	39.77487636	-80.69225976
5,247.00	0.44	344.26	5,245.02	18.86	-26.67	14,444,907.66	1,726,881.67	39.77487812	-80.69226108
5,342.00	0.66	6.67	5,340.01	19.75	-26.71	14,444,908.55	1,726,881.63	39.77488058	-80.69226119
5,436.00	0.18	22.85	5,434.01	20.43	-26.59	14,444,909.23	1,726,881.75	39.77488243	-80.69226075

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stern S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_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
5,531.00	0.48	132.89	5,529.01	20.29	-26.24	14,444,909.09	1,726,882.10	39.77488206	-80.69225951
5,626.00	0.62	135.08	5,624.01	19.66	-25.58	14,444,908.46	1,726,882.76	39.77488031	-80.69225719
5,720.00	0.26	149.06	5,718.00	19.11	-25.11	14,444,907.92	1,726,883.23	39.77487881	-80.69225553
5,815.00	0.35	186.15	5,813.00	18.64	-25.03	14,444,907.44	1,726,883.31	39.77487751	-80.69225525
5,910.00	0.31	203.11	5,908.00	18.12	-25.17	14,444,906.92	1,726,883.17	39.77487607	-80.69225573
6,005.00	0.44	211.81	6,003.00	17.57	-25.46	14,444,906.37	1,726,882.88	39.77487457	-80.69225678
6,099.00	0.61	212.51	6,096.99	16.84	-25.92	14,444,905.64	1,726,882.42	39.77487258	-80.69225842
6,163.00	0.66	190.10	6,160.99	16.19	-26.17	14,444,904.99	1,726,882.17	39.77487079	-80.69225931
6,257.00	0.40	185.18	6,254.99	15.33	-26.29	14,444,904.13	1,726,882.05	39.77486843	-80.69225976
6,350.00	0.48	173.58	6,347.98	14.62	-26.28	14,444,903.42	1,726,882.06	39.77486648	-80.69225972
6,445.00	1.01	172.61	6,442.98	13.40	-26.12	14,444,902.20	1,726,882.22	39.77486311	-80.69225919
6,539.00	1.89	164.35	6,536.94	11.08	-25.60	14,444,899.88	1,726,882.74	39.77485675	-80.69225736
6,666.00	3.78	153.19	6,663.78	5.33	-23.15	14,444,894.13	1,726,885.19	39.77484093	-80.69224869
6,760.00	5.49	141.85	6,757.48	-0.97	-18.97	14,444,887.83	1,726,889.37	39.77482358	-80.69223391
6,855.00	7.47	139.21	6,851.86	-9.22	-12.13	14,444,879.58	1,726,896.21	39.77480086	-80.69220966
6,949.00	8.61	139.13	6,944.94	-19.17	-3.53	14,444,869.63	1,726,904.81	39.77477346	-80.69217919
7,044.00	9.23	141.94	7,038.79	-30.55	5.82	14,444,858.25	1,726,914.16	39.77474213	-80.69214605
7,138.00	9.45	139.03	7,131.54	-42.31	15.53	14,444,846.49	1,726,923.86	39.77470974	-80.69211164
7,233.00	10.11	141.32	7,225.16	-54.71	25.85	14,444,834.09	1,726,934.19	39.77467559	-80.69207505
7,327.00	10.41	146.77	7,317.66	-68.25	35.66	14,444,820.55	1,726,944.00	39.77463830	-80.69204030
7,421.00	10.85	146.42	7,410.05	-82.73	45.21	14,444,806.07	1,726,953.55	39.77459846	-80.69200650
7,516.00	11.07	145.28	7,503.32	-97.67	55.35	14,444,791.13	1,726,963.69	39.77455732	-80.69197059
7,610.00	11.60	144.31	7,595.48	-112.77	66.00	14,444,776.03	1,726,974.34	39.77451577	-80.69193286
7,705.00	12.13	142.47	7,688.45	-128.44	77.65	14,444,760.36	1,726,985.99	39.77447262	-80.69189158
7,798.00	12.83	141.06	7,779.25	-144.22	90.10	14,444,744.58	1,726,998.44	39.77442916	-80.69184749
7,893.00	13.05	138.51	7,871.84	-160.46	103.83	14,444,728.34	1,727,012.17	39.77438444	-80.69179880
7,987.00	13.58	136.23	7,963.32	-176.38	118.50	14,444,712.42	1,727,026.84	39.77434058	-80.69174681
8,081.00	13.84	135.96	8,054.64	-192.43	133.95	14,444,696.37	1,727,042.29	39.77429636	-80.69169202
8,176.00	13.71	134.73	8,146.91	-208.52	149.84	14,444,680.28	1,727,058.18	39.77425202	-80.69163564
8,270.00	11.60	140.62	8,238.62	-223.67	163.75	14,444,665.13	1,727,072.09	39.77421029	-80.69158631
8,364.00	10.15	149.76	8,330.94	-238.13	173.92	14,444,650.67	1,727,082.26	39.77417047	-80.69155029
8,458.00	9.67	153.45	8,423.54	-252.35	181.62	14,444,636.45	1,727,089.96	39.77413135	-80.69152306
8,550.00	9.98	154.33	8,514.19	-266.44	188.53	14,444,622.36	1,727,096.87	39.77409257	-80.69149865
8,645.00	9.89	155.39	8,607.76	-281.28	195.49	14,444,607.52	1,727,103.83	39.77405176	-80.69147405
8,739.00	9.45	156.62	8,700.43	-295.70	201.92	14,444,593.10	1,727,110.26	39.77401209	-80.69145137
8,833.00	9.89	156.44	8,793.09	-310.19	208.21	14,444,578.61	1,727,116.55	39.77397226	-80.69142916
8,928.00	10.33	155.12	8,886.62	-325.39	215.05	14,444,563.41	1,727,123.39	39.77393044	-80.69140499
9,026.00	10.55	152.92	8,982.99	-341.35	222.83	14,444,547.45	1,727,131.17	39.77388654	-80.69137749
9,120.00	11.60	154.07	9,075.24	-357.51	230.88	14,444,531.29	1,727,139.22	39.77384207	-80.69134904
9,214.00	11.56	154.42	9,167.33	-374.51	239.08	14,444,514.29	1,727,147.42	39.77379533	-80.69132007
9,308.00	10.33	153.10	9,259.62	-390.52	246.96	14,444,498.28	1,727,155.30	39.77375128	-80.69129222
9,403.00	10.46	152.84	9,353.06	-405.79	254.75	14,444,483.01	1,727,163.09	39.77370927	-80.69126468
9,494.00	10.59	153.10	9,442.53	-420.60	262.31	14,444,468.21	1,727,170.65	39.77366854	-80.69123798
9,589.00	10.20	149.76	9,535.97	-435.65	270.49	14,444,453.15	1,727,178.83	39.77362712	-80.69120903
9,684.00	11.43	149.15	9,629.28	-451.00	279.56	14,444,437.81	1,727,187.90	39.77358489	-80.69117696
9,778.00	12.04	149.98	9,721.31	-467.48	289.24	14,444,421.32	1,727,197.58	39.77353952	-80.69114271
9,872.00	11.51	151.07	9,813.34	-484.18	298.68	14,444,404.62	1,727,207.02	39.77349358	-80.69110931
9,967.00	11.21	152.66	9,906.47	-500.68	307.50	14,444,388.12	1,727,215.84	39.77344819	-80.69107810
10,062.00	10.02	151.61	9,999.85	-516.15	315.68	14,444,372.65	1,727,224.02	39.77340561	-80.69104921
10,108.00	10.10	152.92	10,045.14	-523.26	319.41	14,444,365.54	1,727,227.75	39.77338605	-80.69103599
10,183.00	10.86	153.19	10,118.89	-535.42	325.59	14,444,353.38	1,727,233.93	39.77335259	-80.69101414
10,278.00	10.20	151.34	10,212.29	-550.79	333.67	14,444,338.01	1,727,242.01	39.77331031	-80.69098561
10,372.00	9.54	149.94	10,304.90	-564.84	341.56	14,444,323.96	1,727,249.90	39.77327166	-80.69095769
10,467.00	8.26	151.43	10,398.75	-577.64	348.77	14,444,311.16	1,727,257.11	39.77323642	-80.69093219
10,561.00	7.69	147.30	10,491.84	-588.87	355.39	14,444,299.93	1,727,263.73	39.77320554	-80.69090874

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stem S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stem	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stem S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_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
10,656.00	10.64	145.63	10,585.62	-601.46	363.78	14,444,287.34	1,727,272.12	39.77317088	-80.69087905
10,703.00	17.27	146.60	10,631.21	-610.87	370.08	14,444,277.93	1,727,278.42	39.77314496	-80.69085676
10,750.00	20.62	145.10	10,675.65	-623.49	378.66	14,444,265.31	1,727,287.00	39.77311023	-80.69082638
10,797.00	24.79	149.32	10,719.01	-638.76	388.42	14,444,250.04	1,727,296.76	39.77306821	-80.69079181
10,845.00	28.75	150.55	10,761.85	-657.47	399.24	14,444,231.33	1,727,307.58	39.77301671	-80.69075355
10,892.00	32.40	151.25	10,802.31	-678.36	410.86	14,444,210.44	1,727,319.20	39.77295923	-80.69071246
10,939.00	35.96	150.11	10,841.19	-701.37	423.79	14,444,187.43	1,727,332.13	39.77289591	-80.69066669
10,986.00	38.81	150.20	10,878.53	-726.12	437.99	14,444,162.68	1,727,346.33	39.77282781	-80.69061646
11,034.00	41.45	147.74	10,915.23	-752.62	453.95	14,444,136.18	1,727,362.29	39.77275490	-80.69055999
11,081.00	43.56	148.09	10,949.87	-779.52	470.82	14,444,109.28	1,727,379.16	39.77268085	-80.69050030
11,129.00	44.53	148.71	10,984.38	-807.95	488.30	14,444,080.85	1,727,396.64	39.77260263	-80.69043842
11,182.00	47.25	148.79	11,021.26	-840.48	508.04	14,444,048.32	1,727,416.38	39.77251310	-80.69036857
11,223.00	47.69	149.32	11,048.98	-866.39	523.58	14,444,022.41	1,727,431.92	39.77244179	-80.69031360
11,270.00	51.78	149.32	11,079.35	-897.23	541.87	14,443,991.57	1,727,450.21	39.77235693	-80.69024887
11,318.00	54.73	150.29	11,108.06	-930.47	561.21	14,443,958.33	1,727,469.55	39.77226545	-80.69018046
11,365.00	57.58	151.17	11,134.24	-964.52	580.29	14,443,924.28	1,727,488.63	39.77217176	-80.69011298
11,413.00	60.09	150.99	11,159.08	-1,000.47	600.15	14,443,888.33	1,727,508.49	39.77207285	-80.69004274
11,460.00	63.60	149.85	11,181.25	-1,036.50	620.61	14,443,852.31	1,727,528.95	39.77197371	-80.68997037
11,507.00	66.73	150.73	11,200.99	-1,073.54	641.74	14,443,815.26	1,727,550.08	39.77187178	-80.68989562
11,554.00	71.12	151.96	11,217.88	-1,112.02	662.76	14,443,776.78	1,727,571.10	39.77176591	-80.68982129
11,602.00	74.29	150.73	11,232.15	-1,152.23	684.74	14,443,736.58	1,727,593.08	39.77165528	-80.68974357
11,649.00	76.62	150.64	11,243.96	-1,191.89	707.01	14,443,696.91	1,727,615.35	39.77154614	-80.68966479
11,696.00	78.73	150.46	11,253.99	-1,231.87	729.58	14,443,656.93	1,727,637.92	39.77143612	-80.68958494
11,743.00	81.27	150.02	11,262.15	-1,272.05	752.56	14,443,616.75	1,727,660.90	39.77132557	-80.68950368
11,791.00	83.30	149.94	11,268.59	-1,313.23	776.35	14,443,575.57	1,727,684.69	39.77121224	-80.68941950
11,838.00	84.97	149.58	11,273.40	-1,353.62	799.90	14,443,535.18	1,727,708.24	39.77110110	-80.68933620
11,885.00	86.59	149.06	11,276.85	-1,393.93	823.81	14,443,494.87	1,727,732.15	39.77099016	-80.68925159
11,932.00	88.84	149.15	11,278.73	-1,434.23	847.93	14,443,454.57	1,727,756.27	39.77087927	-80.68916627
11,980.00	90.33	150.11	11,279.07	-1,475.64	872.19	14,443,413.16	1,727,780.53	39.77076531	-80.68908042
12,074.00	89.45	150.64	11,279.26	-1,557.35	918.66	14,443,331.45	1,727,827.00	39.77054047	-80.68891607
12,169.00	88.40	150.90	11,281.04	-1,640.24	965.04	14,443,248.56	1,727,873.38	39.77031240	-80.68875203
12,263.00	88.35	150.64	11,283.70	-1,722.24	1,010.92	14,443,166.57	1,727,919.26	39.77008677	-80.68858976
12,358.00	88.13	150.82	11,286.62	-1,805.07	1,057.35	14,443,083.73	1,727,965.69	39.76985885	-80.68842556
12,452.00	89.05	150.73	11,288.93	-1,887.08	1,103.23	14,443,001.72	1,728,011.57	39.76963320	-80.68826330
12,547.00	89.45	151.17	11,290.18	-1,970.12	1,149.35	14,442,918.68	1,728,057.69	39.76940470	-80.68810017
12,642.00	89.32	150.99	11,291.20	-2,053.27	1,195.29	14,442,835.54	1,728,103.63	39.76917592	-80.68793772
12,736.00	90.07	152.13	11,291.70	-2,135.92	1,240.06	14,442,752.88	1,728,148.40	39.76894850	-80.68777944
12,831.00	89.85	152.13	11,291.76	-2,219.90	1,284.47	14,442,668.90	1,728,192.81	39.76871744	-80.68762244
12,925.00	89.67	151.96	11,292.16	-2,302.93	1,328.53	14,442,585.87	1,728,236.87	39.76848900	-80.68746666
13,020.00	89.49	151.87	11,292.85	-2,386.74	1,373.25	14,442,502.06	1,728,281.59	39.76825840	-80.68730854
13,115.00	89.27	151.61	11,293.88	-2,470.41	1,418.23	14,442,418.39	1,728,326.57	39.76802818	-80.68714952
13,209.00	89.19	151.78	11,295.15	-2,553.17	1,462.80	14,442,335.63	1,728,371.14	39.76780049	-80.68699194
13,304.00	89.10	151.34	11,296.56	-2,636.69	1,508.04	14,442,252.11	1,728,416.38	39.76757068	-80.68683200
13,398.00	88.75	151.25	11,298.33	-2,719.13	1,553.18	14,442,169.68	1,728,461.52	39.76734386	-80.68667238
13,492.00	89.80	151.61	11,299.52	-2,801.67	1,598.13	14,442,087.13	1,728,506.47	39.76711673	-80.68651345
13,587.00	89.80	151.25	11,299.85	-2,885.10	1,643.56	14,442,003.70	1,728,551.90	39.76688717	-80.68635281
13,682.00	89.80	152.05	11,300.18	-2,968.71	1,688.67	14,441,920.09	1,728,597.01	39.76665714	-80.68619332
13,777.00	88.31	149.67	11,301.75	-3,051.67	1,734.92	14,441,837.14	1,728,643.26	39.76642887	-80.68602978
13,871.00	88.04	149.67	11,304.74	-3,132.76	1,782.36	14,441,756.04	1,728,690.70	39.76620571	-80.68586195
13,966.00	88.00	150.02	11,308.02	-3,214.85	1,830.05	14,441,673.95	1,728,738.39	39.76597980	-80.68569325
14,060.00	88.66	149.58	11,310.76	-3,296.06	1,877.32	14,441,592.74	1,728,785.66	39.76575633	-80.68552608
14,154.00	88.48	148.97	11,313.11	-3,376.84	1,925.33	14,441,511.96	1,728,833.67	39.76553402	-80.68535623
14,249.00	89.23	149.41	11,315.01	-3,458.41	1,973.98	14,441,430.39	1,728,882.32	39.76530953	-80.68518414
14,343.00	89.14	149.41	11,316.34	-3,539.32	2,021.81	14,441,349.48	1,728,930.15	39.76508686	-80.68501494
14,437.00	88.75	148.71	11,318.07	-3,619.93	2,070.13	14,441,268.87	1,728,978.47	39.76486502	-80.68484400



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stem S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stem	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stem S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_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
14,532.00	88.88	149.15	11,320.04	-3,701.29	2,119.15	14,441,187.51	1,729,027.49	39.76464113	-80.68467058
14,627.00	90.07	149.23	11,320.91	-3,782.88	2,167.80	14,441,105.93	1,729,076.14	39.76441660	-80.68449847
14,721.00	90.02	148.09	11,320.83	-3,863.16	2,216.69	14,441,025.64	1,729,125.03	39.76419564	-80.68432550
14,815.00	89.45	147.74	11,321.27	-3,942.80	2,266.62	14,440,946.00	1,729,174.96	39.76397644	-80.68414882
14,910.00	89.01	149.85	11,322.55	-4,024.04	2,315.83	14,440,864.76	1,729,224.17	39.76375285	-80.68397472
15,005.00	89.32	148.88	11,323.93	-4,105.78	2,364.24	14,440,783.03	1,729,272.58	39.76352793	-80.68380350
15,100.00	89.63	151.61	11,324.80	-4,188.24	2,411.38	14,440,700.56	1,729,319.72	39.76330100	-80.68363679
15,194.00	89.49	151.17	11,325.52	-4,270.76	2,456.39	14,440,618.04	1,729,364.73	39.76307395	-80.68347766
15,289.00	89.32	150.90	11,326.51	-4,353.87	2,502.39	14,440,534.93	1,729,410.73	39.76284525	-80.68331500
15,384.00	88.66	152.40	11,328.18	-4,437.46	2,547.49	14,440,451.34	1,729,455.83	39.76261525	-80.68315556
15,478.00	88.84	152.92	11,330.24	-4,520.94	2,590.66	14,440,367.86	1,729,499.00	39.76238558	-80.68300302
15,573.00	88.48	151.96	11,332.46	-4,605.14	2,634.60	14,440,283.66	1,729,542.94	39.76215393	-80.68284772
15,668.00	88.84	152.13	11,334.68	-4,689.03	2,679.12	14,440,199.77	1,729,587.46	39.76192310	-80.68269035
15,762.00	88.79	152.22	11,336.62	-4,772.14	2,722.99	14,440,116.66	1,729,631.33	39.76169442	-80.68253530
15,857.00	88.62	152.13	11,338.77	-4,856.14	2,767.32	14,440,032.66	1,729,675.66	39.76146332	-80.68237861
15,951.00	88.62	151.78	11,341.03	-4,939.07	2,811.50	14,439,949.73	1,729,719.84	39.76123512	-80.68222244
16,046.00	89.27	151.17	11,342.78	-5,022.53	2,856.86	14,439,866.27	1,729,765.20	39.76100550	-80.68206209
16,141.00	89.10	150.64	11,344.13	-5,105.53	2,903.05	14,439,783.27	1,729,811.39	39.76077710	-80.68189878
16,236.00	89.23	150.55	11,345.52	-5,188.28	2,949.69	14,439,700.52	1,729,858.03	39.76054938	-80.68173387
16,330.00	89.05	149.32	11,346.93	-5,269.63	2,996.77	14,439,619.18	1,729,905.11	39.76032553	-80.68156736
16,425.00	88.75	150.11	11,348.75	-5,351.65	3,044.67	14,439,537.16	1,729,953.01	39.76009982	-80.68139795
16,519.00	88.70	150.38	11,350.84	-5,433.23	3,091.31	14,439,455.57	1,729,999.65	39.75987531	-80.68123303
16,614.00	88.75	149.41	11,352.96	-5,515.40	3,138.95	14,439,373.41	1,730,047.29	39.75964920	-80.68106456
16,708.00	89.14	151.69	11,354.69	-5,597.23	3,185.16	14,439,291.57	1,730,093.50	39.75942401	-80.68090118
16,803.00	89.58	150.90	11,355.75	-5,680.55	3,230.78	14,439,208.25	1,730,139.12	39.75919474	-80.68073989
16,897.00	89.36	150.64	11,356.62	-5,762.58	3,276.68	14,439,126.23	1,730,185.02	39.75896903	-80.68057761
16,991.00	89.14	150.99	11,357.85	-5,844.64	3,322.51	14,439,044.17	1,730,230.85	39.75874322	-80.68041557
17,086.00	89.05	151.87	11,359.35	-5,928.06	3,367.94	14,438,960.75	1,730,276.28	39.75851368	-80.68025499
17,181.00	88.40	152.40	11,361.46	-6,012.02	3,412.33	14,438,876.78	1,730,320.67	39.75828266	-80.68009810
17,276.00	88.40	152.22	11,364.12	-6,096.11	3,456.46	14,438,792.69	1,730,364.80	39.75805130	-80.67994216
17,370.00	88.53	152.05	11,366.64	-6,179.18	3,500.38	14,438,709.62	1,730,408.72	39.75782273	-80.67978694
17,465.00	88.70	150.99	11,368.93	-6,262.66	3,545.66	14,438,626.15	1,730,454.00	39.75759304	-80.67962686
17,559.00	88.79	150.99	11,370.99	-6,344.84	3,591.24	14,438,543.96	1,730,499.58	39.75736688	-80.67946574
17,654.00	88.88	150.55	11,372.92	-6,427.73	3,637.62	14,438,461.07	1,730,545.96	39.75713880	-80.67930177
17,749.00	89.01	150.29	11,374.67	-6,510.33	3,684.51	14,438,378.47	1,730,592.85	39.75691149	-80.67913599
17,843.00	89.05	149.85	11,376.26	-6,591.78	3,731.40	14,438,297.02	1,730,639.74	39.75668734	-80.67897017
17,938.00	89.01	149.58	11,377.87	-6,673.81	3,779.30	14,438,214.99	1,730,687.64	39.75646161	-80.67880078
18,033.00	89.19	148.18	11,379.36	-6,755.12	3,828.40	14,438,133.68	1,730,736.74	39.75623781	-80.67862714
18,128.00	89.36	149.76	11,380.57	-6,836.52	3,877.36	14,438,052.28	1,730,785.70	39.75601379	-80.67845396
18,223.00	89.49	148.97	11,381.52	-6,918.26	3,925.77	14,437,970.55	1,730,834.11	39.75578884	-80.67828277
18,317.00	89.27	149.76	11,382.54	-6,999.13	3,973.66	14,437,889.67	1,730,882.00	39.75556627	-80.67811339
18,412.00	89.23	149.67	11,383.78	-7,081.16	4,021.57	14,437,807.64	1,730,929.91	39.75534052	-80.67794399
18,506.00	89.45	148.53	11,384.86	-7,161.81	4,069.84	14,437,726.99	1,730,978.18	39.75511856	-80.67777328
18,572.00	89.54	147.91	11,385.44	-7,217.91	4,104.60	14,437,670.89	1,731,012.93	39.75496414	-80.67765032
<b>Survey @ 18572.00 MD 11385.44 TVD</b>									
18,630.00	89.54	147.91	11,385.91	-7,267.05	4,135.41	14,437,621.75	1,731,043.75	39.75482889	-80.67754132
<b>Survey projected to 18630.00 MD 11385.91 TVD</b>									

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-18 HU (slot E)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=744+33 @ 780.00usft (Nabors X08)
<b>Well:</b>	Keith Stern S-18 HU (slot E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
224.00	224.00	0.29	-0.73	MWD surveys
18,572.00	11,385.44	-7,217.91	4,104.60	Survey @ 18572.00 MD 11385.44 TVD
18,630.00	11,385.91	-7,267.05	4,135.41	Survey projected to 18630.00 MD 11385.91 TVD

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