



Well: Knob Creek N-11HU (slot K)
 Site: Knob Creek
 Project: Marshall County, West Virginia
 Design: rev5
 Rig: Nabors X08

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	3033.00	0.00	0.00	3033.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 1°/100' build
3	3333.00	3.00	247.49	3332.66	-3.01	-7.25	1.00	247.49	1.50	Begin 3.00° tangent
4	4033.00	3.00	247.49	4031.90	-17.03	-41.10	0.00	0.00	8.47	Begin 1°/100' drop
5	4333.00	0.00	247.49	4331.77	-20.04	-48.35	1.00	180.00	9.97	Begin vertical hold
6	7534.23	0.00	247.49	7533.00	-20.04	-48.35	0.00	247.49	9.97	Begin 2°/100' build
7	8298.83	15.29	227.40	8288.55	-88.69	-123.01	2.00	227.40	-6.08	Begin 15.29° tangent
8	10311.41	15.29	227.40	10229.87	-447.97	-513.73	0.00	0.00	-90.10	Begin 6°/100' build/turn
9	11171.31	50.00	317.06	10971.79	-271.52	-844.21	6.00	102.17	239.42	Begin 8°/100' build/turn
10	11705.37	91.00	330.23	11146.99	128.71	-1129.47	8.00	19.62	730.60	Begin 91.00° lateral section
11	25121.57	91.00	330.23	10914.00	11772.61	-7789.78	0.00	0.0014116.48		PBHLTD 25121.57 MD 10914.00 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=737+33 @ 770.00usft (Nabors X08)

Surface location
 Northing: 14443117.19 Easting: 1723175.53 Latitude: 39.769995 Longitude: -80.705472

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.85°

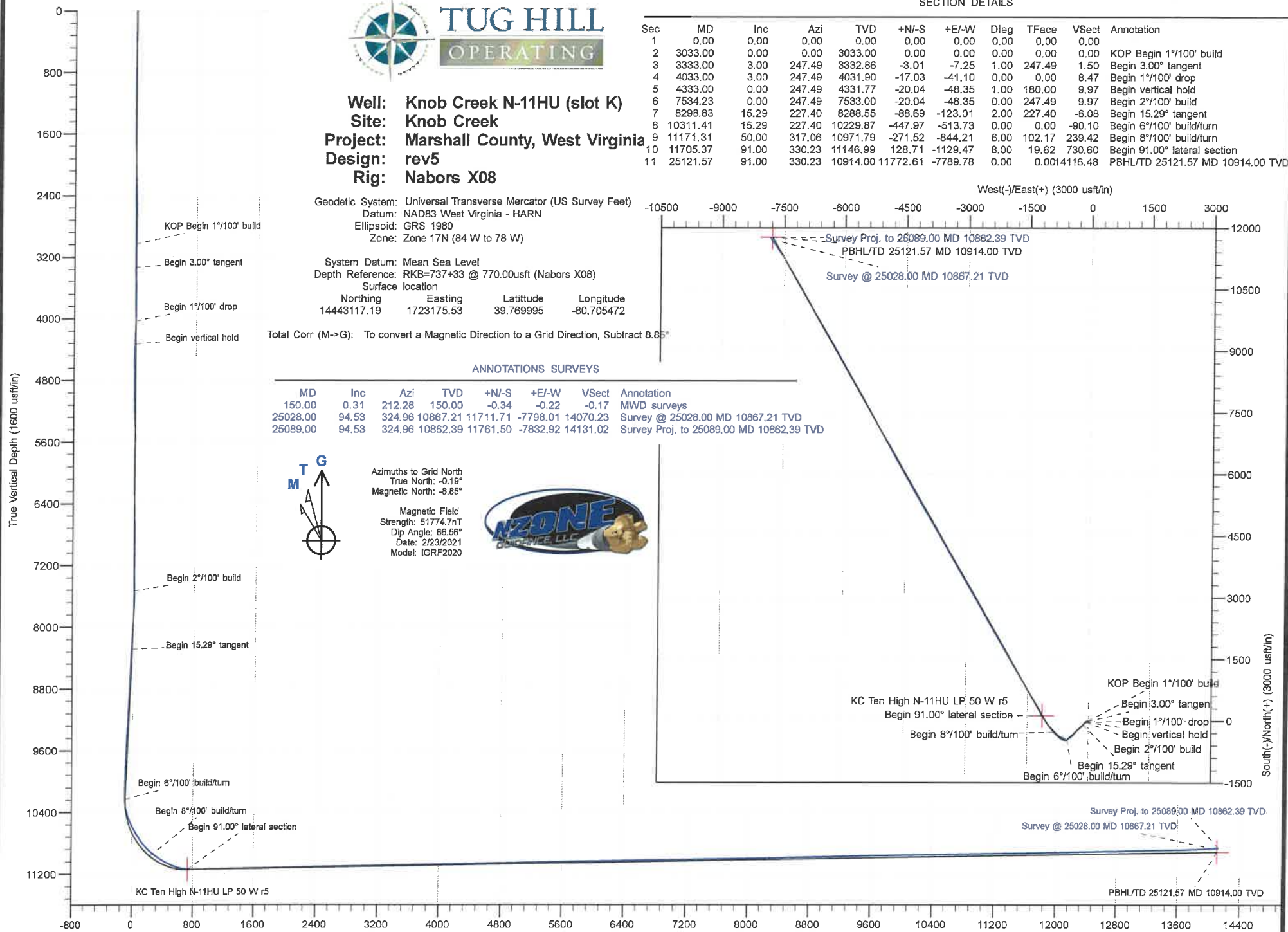
ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
150.00	0.31	212.28	150.00	-0.34	-0.22	-0.17	MWD surveys
25028.00	94.53	324.96	10867.21	11711.71	-7798.01	14070.23	Survey @ 25028.00 MD 10867.21 TVD
25089.00	94.53	324.96	10862.39	11761.50	-7832.92	14131.02	Survey Proj. to 25089.00 MD 10862.39 TVD



Azimuths to Grid North
 True North: -0.19°
 Magnetic North: -8.85°

Magnetic Field
 Strength: 51774.7nT
 Dip Angle: 66.56°
 Date: 2/23/2021
 Model: IGRF2020



Vertical Section at 326.51° (1600 usft/in)

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
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Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

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	Knob Creek				
Site Position:		Northing:	14,443,053.74 usft	Latitude:	39.769822
From:	Lat/Long	Easting:	1,723,120.29 usft	Longitude:	-80.705670
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "		

Well	Knob Creek N-11HU (slot K)					
Well Position	+N/-S	0.00 usft	Northing:	14,443,117.19 usft	Latitude:	39.769995
	+E/-W	0.00 usft	Easting:	1,723,175.53 usft	Longitude:	-80.705473
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	737.00 usft
Grid Convergence:	0.19 °					

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	2/23/2021	-8.66	66.56	51,774.66788771

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	326.51	

Survey Program	Date 4/1/2021				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
150.00	510.00	MWD surf (Original Hole)	MWD	MWD - Standard	
607.00	2,204.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,301.00	10,057.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
10,147.00	25,028.00	MWD (Original Hole)	MWD	MWD - Standard	
25,089.00	25,089.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
150.00	0.31	212.28	150.00	-0.34	-0.22	-0.17	0.21	0.21	0.00	
MWD surveys										
180.00	0.44	120.96	180.00	-0.47	-0.16	-0.30	1.81	0.43	-304.40	
211.00	0.40	81.15	211.00	-0.52	0.05	-0.46	0.93	-0.13	-128.42	
242.00	0.66	76.76	242.00	-0.46	0.33	-0.56	0.85	0.84	-14.16	

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Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

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)
272.00	0.35	81.15	272.00	-0.40	0.59	-0.66	1.04	-1.03	14.63
303.00	0.18	169.83	303.00	-0.44	0.69	-0.75	1.26	-0.55	286.06
334.00	0.35	95.56	334.00	-0.49	0.79	-0.85	1.12	0.55	-239.58
364.00	0.44	124.04	363.99	-0.57	0.98	-1.01	0.71	0.30	94.93
395.00	0.31	81.15	394.99	-0.62	1.16	-1.16	0.97	-0.42	-138.35
426.00	0.57	111.91	425.99	-0.67	1.39	-1.32	1.10	0.84	99.23
456.00	0.40	69.20	455.99	-0.69	1.62	-1.47	1.29	-0.57	-142.37
487.00	0.35	66.38	486.99	-0.61	1.81	-1.51	0.17	-0.16	-9.10
510.00	0.70	115.78	509.99	-0.64	2.00	-1.64	2.36	1.52	214.78
607.00	0.66	97.41	606.98	-0.97	3.09	-2.51	0.23	-0.04	-18.94
699.00	0.66	112.79	698.98	-1.24	4.10	-3.30	0.19	0.00	16.72
792.00	0.35	122.02	791.97	-1.60	4.84	-4.01	0.34	-0.33	9.92
887.00	0.31	60.50	886.97	-1.63	5.31	-4.29	0.36	-0.04	-64.76
982.00	0.62	98.90	981.97	-1.58	6.04	-4.65	0.45	0.33	40.42
1,075.00	0.44	111.65	1,074.97	-1.79	6.87	-5.28	0.23	-0.19	13.71
1,169.00	0.92	130.19	1,168.96	-2.41	7.78	-6.31	0.56	0.51	19.72
1,262.00	0.75	97.59	1,261.95	-2.98	8.95	-7.42	0.53	-0.18	-35.05
1,357.00	0.57	96.36	1,356.94	-3.11	10.04	-8.13	0.19	-0.19	-1.29
1,451.00	0.26	337.97	1,450.94	-2.96	10.42	-8.22	0.78	-0.33	-125.95
1,545.00	0.62	287.61	1,544.94	-2.61	9.86	-7.62	0.53	0.38	-53.57
1,639.00	0.97	297.98	1,638.93	-2.09	8.67	-6.52	0.40	0.37	11.03
1,734.00	1.05	332.43	1,733.92	-0.94	7.56	-4.95	0.63	0.08	36.26
1,829.00	1.27	335.15	1,828.90	0.79	6.71	-3.05	0.24	0.23	2.86
1,923.00	0.97	295.87	1,922.88	2.08	5.56	-1.33	0.86	-0.32	-41.79
2,017.00	1.85	280.22	2,016.85	2.70	3.35	0.40	1.01	0.94	-16.65
2,111.00	2.07	270.91	2,110.80	3.00	0.16	2.41	0.41	0.23	-9.90
2,204.00	2.46	275.56	2,203.72	3.22	-3.51	4.62	0.46	0.42	5.00
2,301.00	2.55	276.18	2,300.63	3.65	-7.72	7.31	0.10	0.09	0.64
2,395.00	2.50	286.20	2,394.54	4.45	-11.77	10.20	0.47	-0.05	10.66
2,489.00	1.63	305.27	2,488.48	5.79	-14.83	13.01	1.17	-0.93	20.29
2,583.00	0.66	306.15	2,582.46	6.88	-16.36	14.77	1.03	-1.03	0.94
2,678.00	0.09	55.05	2,677.46	7.25	-16.74	15.28	0.73	-0.60	114.63
2,772.00	0.70	110.68	2,771.45	7.09	-16.14	14.82	0.70	0.65	59.18
2,866.00	1.01	92.31	2,865.44	6.85	-14.78	13.87	0.44	0.33	-19.54
2,960.00	0.66	150.06	2,959.43	6.35	-13.68	12.84	0.92	-0.37	61.44
3,054.00	1.01	192.16	3,053.43	5.07	-13.58	11.72	0.73	0.37	44.79
3,148.00	1.36	185.13	3,147.41	3.15	-13.86	10.27	0.40	0.37	-7.48
3,242.00	1.32	203.23	3,241.38	1.04	-14.39	8.81	0.45	-0.04	19.26
3,336.00	1.63	244.01	3,335.35	-0.54	-16.01	8.39	1.14	0.33	43.38
3,430.00	1.85	251.75	3,429.31	-1.60	-18.66	8.96	0.34	0.23	8.23
3,525.00	1.93	248.23	3,524.26	-2.67	-21.60	9.69	0.15	0.08	-3.71
3,618.00	2.20	248.32	3,617.20	-3.91	-24.71	10.37	0.29	0.29	0.10
3,713.00	2.20	248.49	3,712.13	-5.26	-28.10	11.12	0.01	0.00	0.18
3,806.00	2.29	242.61	3,805.05	-6.76	-31.41	11.69	0.27	0.10	-6.32

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3,899.00	2.90	235.49	3,897.96	-8.95	-35.00	11.85	0.74	0.66	-7.66
3,993.00	3.52	231.80	3,991.81	-12.08	-39.23	11.57	0.69	0.66	-3.93
4,087.00	3.52	211.67	4,085.64	-16.32	-43.01	10.12	1.31	0.00	-21.41
4,180.00	3.21	192.51	4,178.48	-21.30	-45.07	7.11	1.25	-0.33	-20.60
4,275.00	2.81	176.78	4,273.35	-26.22	-45.52	3.25	0.96	-0.42	-16.56
4,369.00	1.54	142.85	4,367.28	-29.53	-44.63	0.00	1.87	-1.35	-36.10
4,463.00	1.58	81.15	4,461.26	-30.33	-42.58	-1.80	1.70	0.04	-65.64
4,557.00	1.14	68.93	4,555.23	-29.80	-40.43	-2.54	0.56	-0.47	-13.00
4,653.00	0.57	47.84	4,651.22	-29.13	-39.19	-2.67	0.67	-0.59	-21.97
4,748.00	0.57	24.11	4,746.21	-28.39	-38.64	-2.35	0.25	0.00	-24.98
4,842.00	1.05	29.21	4,840.20	-27.21	-38.03	-1.70	0.52	0.51	5.43
4,937.00	0.57	33.60	4,935.19	-26.05	-37.34	-1.12	0.51	-0.51	4.62
5,032.00	0.62	355.28	5,030.19	-25.15	-37.13	-0.49	0.41	0.05	-40.34
5,126.00	0.97	2.14	5,124.18	-23.85	-37.14	0.61	0.39	0.37	7.30
5,220.00	1.36	315.99	5,218.16	-22.25	-37.88	2.35	1.04	0.41	-49.10
5,315.00	2.24	296.75	5,313.12	-20.60	-40.32	5.07	1.11	0.93	-20.25
5,409.00	2.20	299.21	5,407.05	-18.89	-43.54	8.27	0.11	-0.04	2.62
5,503.00	0.53	270.73	5,501.02	-18.01	-45.55	10.12	1.86	-1.78	-30.30
5,597.00	0.53	193.91	5,595.01	-18.42	-46.09	10.07	0.70	0.00	-81.72
5,691.00	0.97	178.27	5,689.00	-19.64	-46.17	9.09	0.51	0.47	-16.64
5,785.00	1.63	179.59	5,782.98	-21.77	-46.14	7.30	0.70	0.70	1.40
5,878.00	0.57	166.14	5,875.96	-23.55	-46.02	5.75	1.17	-1.14	-14.46
5,972.00	1.27	33.16	5,969.95	-23.13	-45.33	5.73	1.82	0.74	-141.47
6,067.00	1.98	33.51	6,064.92	-20.88	-43.85	6.78	0.75	0.75	0.37
6,166.00	0.79	31.14	6,163.89	-18.87	-42.55	7.75	1.20	-1.20	-2.39
6,261.00	0.57	3.63	6,258.88	-17.84	-42.19	8.40	0.41	-0.23	-28.96
6,354.00	0.66	358.80	6,351.87	-16.84	-42.17	9.22	0.11	0.10	-5.19
6,448.00	0.88	355.02	6,445.86	-15.58	-42.24	10.32	0.24	0.23	-4.02
6,541.00	1.05	359.85	6,538.85	-14.01	-42.31	11.66	0.20	0.18	5.19
6,634.00	1.41	355.37	6,631.83	-12.02	-42.40	13.37	0.40	0.39	-4.82
6,729.00	0.92	359.85	6,726.81	-10.09	-42.50	15.03	0.52	-0.52	4.72
6,823.00	0.26	29.21	6,820.80	-9.15	-42.39	15.76	0.75	-0.70	31.23
6,916.00	0.40	176.16	6,913.80	-9.29	-42.27	15.57	0.68	0.15	158.01
7,010.00	0.70	196.38	7,007.80	-10.17	-42.41	14.92	0.38	0.32	21.51
7,103.00	0.83	228.19	7,100.79	-11.17	-43.07	14.45	0.47	0.14	34.20
7,292.00	1.58	258.87	7,289.75	-12.58	-46.65	15.25	0.51	0.40	16.23
7,386.00	2.37	258.07	7,383.69	-13.23	-49.82	16.46	0.84	0.84	-0.85
7,479.00	3.69	243.57	7,476.56	-14.96	-54.38	17.53	1.63	1.42	-15.59
7,572.00	4.79	233.20	7,569.31	-18.62	-60.17	17.67	1.44	1.18	-11.15
7,666.00	5.84	223.71	7,662.90	-24.43	-66.62	16.39	1.45	1.12	-10.10
7,807.00	7.34	217.03	7,802.97	-36.81	-77.00	11.79	1.19	1.06	-4.74
7,855.00	8.09	215.71	7,850.54	-42.00	-80.82	9.57	1.61	1.56	-2.75
7,948.00	9.18	214.13	7,942.48	-53.45	-88.80	4.42	1.20	1.17	-1.70

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8,043.00	8.88	216.85	8,036.30	-65.59	-97.45	-0.93	0.55	-0.32	2.86
8,137.00	9.10	217.21	8,129.15	-77.32	-106.30	-5.83	0.24	0.23	0.38
8,231.00	11.03	218.44	8,221.70	-90.28	-116.38	-11.07	2.07	2.05	1.31
8,326.00	12.83	220.90	8,314.64	-105.37	-128.94	-16.73	1.97	1.89	2.59
8,420.00	14.28	225.55	8,406.03	-121.38	-144.05	-21.74	1.93	1.54	4.95
8,514.00	16.39	229.60	8,496.68	-138.10	-162.43	-25.54	2.52	2.24	4.31
8,608.00	18.85	230.56	8,586.26	-156.34	-184.26	-28.71	2.64	2.62	1.02
8,702.00	19.56	229.60	8,675.03	-176.19	-207.97	-32.18	0.83	0.76	-1.02
8,797.00	19.60	230.56	8,764.53	-196.62	-232.39	-35.75	0.34	0.04	1.01
8,891.00	16.61	229.07	8,853.87	-215.44	-254.72	-39.12	3.22	-3.18	-1.59
8,985.00	15.07	225.29	8,944.30	-232.84	-273.56	-43.24	1.97	-1.64	-4.02
9,080.00	16.30	221.51	9,035.76	-251.51	-291.17	-49.09	1.68	1.29	-3.98
9,174.00	15.47	222.04	9,126.17	-270.70	-308.31	-55.64	0.90	-0.88	0.56
9,269.00	13.54	223.80	9,218.14	-288.14	-324.49	-61.25	2.08	-2.03	1.85
9,362.00	13.45	222.21	9,308.57	-304.01	-339.29	-66.32	0.41	-0.10	-1.71
9,455.00	13.27	224.85	9,399.06	-319.59	-354.09	-71.15	0.68	-0.19	2.84
9,548.00	13.54	227.93	9,489.53	-334.45	-369.70	-74.93	0.82	0.29	3.31
9,642.00	13.97	227.93	9,580.83	-349.43	-386.29	-78.26	0.46	0.46	0.00
9,736.00	14.60	226.79	9,671.92	-365.14	-403.35	-81.96	0.73	0.67	-1.21
9,829.00	13.84	229.25	9,762.07	-380.43	-420.32	-85.34	1.04	-0.82	2.65
9,923.00	13.49	230.39	9,853.41	-394.76	-437.28	-87.93	0.47	-0.37	1.21
10,016.00	14.41	231.53	9,943.67	-408.87	-454.70	-90.09	1.03	0.99	1.23
10,057.00	14.72	231.62	9,983.35	-415.28	-462.77	-90.98	0.76	0.76	0.22
10,147.00	16.40	232.50	10,070.05	-430.11	-481.82	-92.84	1.88	1.87	0.98
10,241.00	14.53	229.60	10,160.64	-445.84	-501.33	-95.19	2.15	-1.99	-3.09
10,334.00	13.07	247.46	10,251.00	-457.43	-519.94	-94.60	4.82	-1.57	19.20
10,381.00	13.27	269.31	10,296.79	-459.54	-530.24	-90.66	10.54	0.43	46.49
10,428.00	13.42	292.24	10,342.55	-457.54	-540.69	-83.23	11.19	0.32	48.79
10,475.00	15.07	309.35	10,388.13	-451.59	-550.47	-72.88	9.58	3.51	36.40
10,522.00	18.63	312.02	10,433.10	-442.69	-560.78	-59.77	7.75	7.57	5.68
10,569.00	22.05	307.01	10,477.17	-432.35	-573.40	-44.18	8.16	7.28	-10.66
10,616.00	25.40	299.08	10,520.20	-422.14	-589.27	-26.90	9.83	7.13	-16.87
10,663.00	28.62	294.88	10,562.07	-412.50	-608.29	-8.37	7.96	6.85	-8.94
10,711.00	32.37	293.52	10,603.43	-402.53	-630.51	12.21	7.94	7.81	-2.83
10,758.00	35.03	295.23	10,642.53	-391.76	-654.26	34.29	6.01	5.66	3.64
10,805.00	37.23	296.95	10,680.49	-379.56	-679.14	58.19	5.15	4.68	3.66
10,852.00	36.03	297.90	10,718.20	-366.65	-704.03	82.70	2.82	-2.55	2.02
10,900.00	35.84	305.78	10,757.09	-351.82	-727.92	108.25	9.64	-0.40	16.42
10,947.00	37.34	312.33	10,794.84	-334.17	-749.63	134.95	8.89	3.19	13.94
10,994.00	41.03	314.57	10,831.27	-313.74	-771.16	163.87	8.41	7.85	4.77
11,041.00	44.58	315.59	10,865.74	-291.12	-793.70	195.17	7.70	7.55	2.17
11,088.00	47.97	315.35	10,898.22	-266.91	-817.52	228.50	7.22	7.21	-0.51
11,135.00	51.01	314.98	10,928.75	-241.58	-842.71	263.53	6.50	6.47	-0.79

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
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)	
11,181.00	53.34	315.64	10,956.96	-215.74	-868.26	299.17	5.19	5.07	1.43	
11,228.00	55.66	315.79	10,984.25	-188.35	-894.98	336.76	4.94	4.94	0.32	
11,275.00	57.72	316.94	11,010.06	-159.93	-922.08	375.42	4.84	4.38	2.45	
11,322.00	59.87	318.24	11,034.41	-130.24	-949.18	415.13	5.15	4.57	2.77	
11,369.00	62.44	320.36	11,057.09	-99.03	-976.02	455.97	6.75	5.47	4.51	
11,416.00	66.10	324.05	11,077.49	-65.57	-1,001.94	498.17	10.52	7.79	7.85	
11,462.00	69.99	327.33	11,094.69	-30.34	-1,025.96	540.82	10.73	8.46	7.13	
11,509.00	73.14	329.18	11,109.55	7.58	-1,049.41	585.38	7.67	6.70	3.94	
11,556.00	76.25	330.53	11,121.96	46.78	-1,072.17	630.62	7.17	6.62	2.87	
11,603.00	80.16	331.13	11,131.56	86.94	-1,094.59	676.49	8.41	8.32	1.28	
11,650.00	84.38	331.94	11,137.88	127.87	-1,116.78	722.88	9.14	8.98	1.72	
11,745.00	89.58	332.21	11,142.89	211.67	-1,161.19	817.26	5.48	5.47	0.28	
11,839.00	91.29	329.69	11,142.17	293.83	-1,206.83	910.97	3.24	1.82	-2.68	
11,934.00	91.58	327.75	11,139.79	374.99	-1,256.14	1,005.86	2.06	0.31	-2.04	
12,028.00	91.42	328.08	11,137.33	454.61	-1,306.05	1,099.80	0.39	-0.17	0.35	
12,122.00	91.34	328.65	11,135.07	534.62	-1,355.34	1,193.73	0.61	-0.09	0.61	
12,217.00	91.62	329.00	11,132.62	615.87	-1,404.50	1,288.62	0.47	0.29	0.37	
12,311.00	91.15	328.76	11,130.34	696.32	-1,453.07	1,382.51	0.56	-0.50	-0.26	
12,405.00	91.48	329.78	11,128.19	777.10	-1,501.09	1,476.37	1.14	0.35	1.09	
12,500.00	91.11	329.55	11,126.04	859.07	-1,549.06	1,571.20	0.46	-0.39	-0.24	
12,594.00	91.08	329.57	11,124.24	940.10	-1,596.67	1,665.05	0.04	-0.03	0.02	
12,687.00	90.88	329.97	11,122.65	1,020.44	-1,643.49	1,757.89	0.48	-0.22	0.43	
12,781.00	90.89	329.54	11,121.20	1,101.63	-1,690.83	1,851.73	0.46	0.01	-0.46	
12,875.00	90.83	329.63	11,119.79	1,182.69	-1,738.41	1,945.58	0.12	-0.06	0.10	
12,969.00	91.15	329.77	11,118.17	1,263.83	-1,785.83	2,039.42	0.37	0.34	0.15	
13,063.00	91.54	329.63	11,115.96	1,344.97	-1,833.24	2,133.25	0.44	0.41	-0.15	
13,157.00	91.55	329.52	11,113.43	1,426.00	-1,880.83	2,227.08	0.12	0.01	-0.12	
13,251.00	91.29	329.54	11,111.10	1,506.99	-1,928.48	2,320.92	0.28	-0.28	0.02	
13,345.00	91.33	329.37	11,108.95	1,587.92	-1,976.24	2,414.77	0.19	0.04	-0.18	
13,439.00	91.41	329.25	11,106.70	1,668.74	-2,024.20	2,508.63	0.15	0.09	-0.13	
13,534.00	91.58	329.75	11,104.22	1,750.56	-2,072.40	2,603.47	0.56	0.18	0.53	
13,628.00	91.36	329.38	11,101.81	1,831.58	-2,120.00	2,697.31	0.46	-0.23	-0.39	
13,721.00	91.35	329.65	11,099.61	1,911.70	-2,167.17	2,790.15	0.29	-0.01	0.29	
13,815.00	91.20	330.50	11,097.52	1,993.15	-2,214.05	2,883.95	0.92	-0.16	0.90	
13,910.00	90.90	330.53	11,095.78	2,075.83	-2,260.80	2,978.70	0.32	-0.32	0.03	
14,003.00	91.10	330.86	11,094.15	2,156.92	-2,306.32	3,071.44	0.41	0.22	0.35	
14,097.00	91.13	330.73	11,092.33	2,238.95	-2,352.17	3,165.16	0.14	0.03	-0.14	
14,191.00	90.82	330.31	11,090.73	2,320.77	-2,398.42	3,258.91	0.56	-0.33	-0.45	
14,285.00	90.87	330.56	11,089.34	2,402.52	-2,444.80	3,352.68	0.27	0.05	0.27	
14,379.00	91.02	330.35	11,087.79	2,484.29	-2,491.15	3,446.45	0.27	0.16	-0.22	
14,474.00	90.89	330.41	11,086.21	2,566.86	-2,538.09	3,541.22	0.15	-0.14	0.06	
14,568.00	91.05	330.46	11,084.61	2,648.61	-2,584.47	3,634.98	0.18	0.17	0.05	
14,662.00	91.31	330.82	11,082.68	2,730.52	-2,630.54	3,728.72	0.47	0.28	0.38	
14,756.00	91.02	330.20	11,080.77	2,812.33	-2,676.81	3,822.47	0.73	-0.31	-0.66	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
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)	
14,850.00	91.12	329.97	11,079.01	2,893.79	-2,723.68	3,916.27	0.27	0.11	-0.24	
14,944.00	90.93	329.80	11,077.33	2,975.09	-2,770.83	4,010.09	0.27	-0.20	-0.18	
15,037.00	91.23	330.32	11,075.58	3,055.66	-2,817.24	4,102.90	0.65	0.32	0.56	
15,131.00	91.06	329.84	11,073.70	3,137.12	-2,864.12	4,196.69	0.54	-0.18	-0.51	
15,225.00	91.08	330.22	11,071.94	3,218.53	-2,911.07	4,290.50	0.40	0.02	0.40	
15,319.00	91.22	330.58	11,070.06	3,300.25	-2,957.49	4,384.27	0.41	0.15	0.38	
15,414.00	90.99	330.16	11,068.23	3,382.81	-3,004.45	4,479.03	0.50	-0.24	-0.44	
15,509.00	91.39	330.39	11,066.25	3,465.29	-3,051.54	4,573.81	0.49	0.42	0.24	
15,603.00	91.23	330.39	11,064.10	3,546.99	-3,097.97	4,667.57	0.17	-0.17	0.00	
15,697.00	91.13	330.17	11,062.17	3,628.61	-3,144.57	4,761.34	0.26	-0.11	-0.23	
15,792.00	91.49	330.59	11,060.00	3,711.18	-3,191.51	4,856.10	0.58	0.38	0.44	
15,886.00	91.72	331.37	11,057.36	3,793.34	-3,237.09	4,949.78	0.86	0.24	0.83	
15,981.00	91.02	330.52	11,055.09	3,876.36	-3,283.21	5,044.46	1.16	-0.74	-0.89	
16,076.00	90.94	330.35	11,053.47	3,958.98	-3,330.08	5,139.23	0.20	-0.08	-0.18	
16,170.00	91.27	329.95	11,051.65	4,040.49	-3,376.86	5,233.02	0.55	0.35	-0.43	
16,264.00	91.18	328.98	11,049.64	4,121.44	-3,424.60	5,326.87	1.04	-0.10	-1.03	
16,358.00	91.09	329.43	11,047.78	4,202.17	-3,472.72	5,420.75	0.49	-0.10	0.48	
16,452.00	90.81	329.25	11,046.22	4,283.02	-3,520.65	5,514.62	0.35	-0.30	-0.19	
16,546.00	90.89	329.47	11,044.83	4,363.88	-3,568.55	5,608.50	0.25	0.09	0.23	
16,641.00	90.87	330.28	11,043.37	4,446.04	-3,616.22	5,703.32	0.85	-0.02	0.85	
16,735.00	90.79	330.16	11,042.01	4,527.62	-3,662.90	5,797.11	0.15	-0.09	-0.13	
16,828.00	90.84	330.33	11,040.69	4,608.35	-3,709.05	5,889.91	0.19	0.05	0.18	
16,922.00	90.85	330.20	11,039.30	4,689.96	-3,755.67	5,983.69	0.14	0.01	-0.14	
17,016.00	91.04	330.29	11,037.75	4,771.56	-3,802.32	6,077.48	0.22	0.20	0.10	
17,110.00	91.02	330.67	11,036.06	4,853.34	-3,848.63	6,171.24	0.40	-0.02	0.40	
17,204.00	90.76	329.88	11,034.60	4,934.96	-3,895.23	6,265.03	0.88	-0.28	-0.84	
17,298.00	90.70	329.94	11,033.40	5,016.29	-3,942.35	6,358.85	0.09	-0.06	0.06	
17,393.00	91.12	330.12	11,031.89	5,098.58	-3,989.80	6,453.66	0.48	0.44	0.19	
17,486.00	90.90	329.98	11,030.25	5,179.14	-4,036.23	6,546.47	0.28	-0.24	-0.15	
17,580.00	91.05	330.29	11,028.65	5,260.65	-4,083.03	6,640.27	0.37	0.16	0.33	
17,674.00	91.01	330.11	11,026.96	5,342.21	-4,129.74	6,734.06	0.20	-0.04	-0.19	
17,768.00	91.18	330.17	11,025.17	5,423.71	-4,176.53	6,827.85	0.19	0.18	0.06	
17,862.00	91.30	330.53	11,023.13	5,505.39	-4,223.02	6,921.62	0.40	0.13	0.38	
17,954.00	91.14	330.32	11,021.18	5,585.38	-4,268.42	7,013.38	0.29	-0.17	-0.23	
18,047.00	91.04	330.36	11,019.41	5,666.18	-4,314.43	7,106.16	0.12	-0.11	0.04	
18,141.00	91.22	329.71	11,017.55	5,747.60	-4,361.37	7,199.96	0.72	0.19	-0.69	
18,234.00	91.22	330.16	11,015.57	5,828.07	-4,407.95	7,292.77	0.48	0.00	0.48	
18,328.00	91.28	330.34	11,013.52	5,909.66	-4,454.58	7,386.55	0.20	0.06	0.19	
18,422.00	91.25	330.18	11,011.45	5,991.26	-4,501.20	7,480.33	0.17	-0.03	-0.17	
18,516.00	91.17	329.47	11,009.46	6,072.50	-4,548.44	7,574.15	0.76	-0.09	-0.76	
18,610.00	91.03	329.81	11,007.66	6,153.60	-4,595.94	7,667.99	0.39	-0.15	0.36	
18,705.00	91.29	331.12	11,005.73	6,236.23	-4,642.76	7,762.74	1.41	0.27	1.38	
18,799.00	91.02	331.02	11,003.84	6,318.49	-4,688.22	7,856.43	0.31	-0.29	-0.11	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
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)
18,892.00	91.14	331.49	11,002.09	6,400.01	-4,732.94	7,949.09	0.52	0.13	0.51
18,987.00	91.12	331.32	11,000.21	6,483.41	-4,778.40	8,043.73	0.18	-0.02	-0.18
19,081.00	91.22	331.99	10,998.29	6,566.12	-4,823.02	8,137.33	0.72	0.11	0.71
19,175.00	91.37	331.94	10,996.17	6,649.07	-4,867.19	8,230.88	0.17	0.16	-0.05
19,269.00	91.01	331.24	10,994.22	6,731.73	-4,911.90	8,324.49	0.84	-0.38	-0.74
19,363.00	91.15	331.03	10,992.44	6,814.04	-4,957.27	8,418.17	0.27	0.15	-0.22
19,457.00	90.92	330.81	10,990.75	6,896.17	-5,002.95	8,511.87	0.34	-0.24	-0.23
19,550.00	91.36	331.09	10,988.90	6,977.46	-5,048.10	8,604.57	0.56	0.47	0.30
19,644.00	91.42	331.14	10,986.62	7,059.74	-5,093.50	8,698.24	0.08	0.06	0.05
19,738.00	91.15	331.00	10,984.51	7,141.99	-5,138.96	8,791.92	0.32	-0.29	-0.15
19,832.00	91.38	331.30	10,982.43	7,224.30	-5,184.30	8,885.59	0.40	0.24	0.32
19,926.00	91.27	331.40	10,980.26	7,306.77	-5,229.36	8,979.23	0.16	-0.12	0.11
20,019.00	91.45	331.63	10,978.05	7,388.49	-5,273.70	9,071.85	0.31	0.19	0.25
20,114.00	91.46	331.57	10,975.64	7,472.03	-5,318.87	9,166.44	0.06	0.01	-0.06
20,207.00	91.42	331.49	10,973.30	7,553.75	-5,363.19	9,259.06	0.10	-0.04	-0.09
20,301.00	91.47	330.51	10,970.93	7,635.94	-5,408.75	9,352.74	1.04	0.05	-1.04
20,395.00	91.09	330.31	10,968.83	7,717.66	-5,455.15	9,446.50	0.46	-0.40	-0.21
20,489.00	90.92	330.44	10,967.18	7,799.36	-5,501.61	9,540.27	0.23	-0.18	0.14
20,582.00	90.93	330.15	10,965.68	7,880.13	-5,547.69	9,633.05	0.31	0.01	-0.31
20,675.00	91.24	330.36	10,963.92	7,960.86	-5,593.82	9,725.84	0.40	0.33	0.23
20,770.00	91.30	330.83	10,961.82	8,043.60	-5,640.45	9,820.57	0.50	0.06	0.49
20,864.00	90.94	330.36	10,959.98	8,125.48	-5,686.60	9,914.32	0.63	-0.38	-0.50
20,958.00	91.47	330.33	10,958.00	8,207.15	-5,733.09	10,008.09	0.56	0.56	-0.03
21,052.00	91.28	330.64	10,955.75	8,288.92	-5,779.39	10,101.83	0.39	-0.20	0.33
21,145.00	91.42	330.62	10,953.55	8,369.95	-5,824.99	10,194.57	0.15	0.15	-0.02
21,239.00	91.22	330.19	10,951.39	8,451.66	-5,871.40	10,288.32	0.50	-0.21	-0.46
21,333.00	91.16	330.04	10,949.44	8,533.15	-5,918.23	10,382.12	0.17	-0.06	-0.16
21,427.00	91.06	330.17	10,947.62	8,614.62	-5,965.07	10,475.91	0.17	-0.11	0.14
21,521.00	90.98	330.00	10,945.94	8,696.09	-6,011.94	10,569.72	0.20	-0.09	-0.18
21,614.00	91.17	330.38	10,944.20	8,776.76	-6,058.16	10,662.51	0.46	0.20	0.41
21,708.00	91.01	330.44	10,942.41	8,858.49	-6,104.57	10,756.27	0.18	-0.17	0.06
21,802.00	90.55	329.74	10,941.13	8,939.96	-6,151.44	10,850.08	0.89	-0.49	-0.74
21,895.00	91.02	330.28	10,939.86	9,020.50	-6,197.92	10,942.90	0.77	0.51	0.58
21,989.00	90.62	330.16	10,938.51	9,102.08	-6,244.60	11,036.69	0.44	-0.43	-0.13
22,083.00	90.92	330.10	10,937.25	9,183.59	-6,291.41	11,130.50	0.33	0.32	-0.06
22,176.00	91.12	330.04	10,935.59	9,264.17	-6,337.81	11,223.30	0.22	0.22	-0.06
22,270.00	90.83	329.64	10,933.99	9,345.43	-6,385.03	11,317.13	0.53	-0.31	-0.43
22,364.00	91.18	330.12	10,932.34	9,426.73	-6,432.19	11,410.95	0.63	0.37	0.51
22,457.00	91.20	329.81	10,930.41	9,507.22	-6,478.73	11,503.76	0.33	0.02	-0.33
22,551.00	91.12	330.06	10,928.51	9,588.56	-6,525.81	11,597.57	0.28	-0.09	0.27
22,644.00	91.11	329.33	10,926.70	9,668.83	-6,572.73	11,690.41	0.78	-0.01	-0.78
22,738.00	91.15	330.05	10,924.85	9,749.97	-6,620.16	11,784.25	0.77	0.04	0.77
22,831.00	91.01	329.76	10,923.09	9,830.42	-6,666.79	11,877.07	0.35	-0.15	-0.31

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

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)
22,925.00	91.12	329.65	10,921.35	9,911.57	-6,714.20	11,970.91	0.17	0.12	-0.12
23,019.00	91.02	329.64	10,919.59	9,992.67	-6,761.69	12,064.75	0.11	-0.11	-0.01
23,113.00	91.03	330.20	10,917.91	10,073.99	-6,808.80	12,158.57	0.60	0.01	0.60
23,207.00	91.22	330.32	10,916.06	10,155.60	-6,855.42	12,252.35	0.24	0.20	0.13
23,300.00	90.94	330.12	10,914.31	10,236.30	-6,901.60	12,345.14	0.37	-0.30	-0.22
23,394.00	91.27	330.34	10,912.50	10,317.88	-6,948.27	12,438.92	0.42	0.35	0.23
23,488.00	91.09	330.07	10,910.56	10,399.44	-6,994.96	12,532.71	0.35	-0.19	-0.29
23,584.00	91.71	330.23	10,908.22	10,482.68	-7,042.73	12,628.48	0.67	0.65	0.17
23,679.00	91.19	330.76	10,905.81	10,565.33	-7,089.50	12,723.22	0.78	-0.55	0.56
23,774.00	91.80	331.11	10,903.33	10,648.34	-7,135.64	12,817.91	0.74	0.64	0.37
23,869.00	91.19	330.41	10,900.86	10,731.20	-7,182.03	12,912.61	0.98	-0.64	-0.74
23,964.00	91.54	330.23	10,898.59	10,813.71	-7,229.05	13,007.38	0.41	0.37	-0.19
24,059.00	91.10	329.00	10,896.40	10,895.64	-7,277.09	13,102.21	1.37	-0.46	-1.29
24,154.00	90.22	328.65	10,895.31	10,976.92	-7,326.27	13,197.12	1.00	-0.93	-0.37
24,249.00	91.54	328.65	10,893.85	11,058.04	-7,375.68	13,292.04	1.39	1.39	0.00
24,344.00	91.36	328.47	10,891.45	11,139.06	-7,425.22	13,386.95	0.27	-0.19	-0.19
24,439.00	89.96	328.12	10,890.35	11,219.88	-7,475.14	13,481.90	1.52	-1.47	-0.37
24,534.00	91.36	327.77	10,889.26	11,300.39	-7,525.56	13,576.86	1.52	1.47	-0.37
24,629.00	92.68	327.60	10,885.91	11,380.62	-7,576.31	13,671.78	1.40	1.39	-0.18
24,724.00	93.30	327.60	10,880.95	11,460.72	-7,627.14	13,766.63	0.65	0.65	0.00
24,819.00	91.28	326.01	10,877.16	11,540.15	-7,679.11	13,861.55	2.71	-2.13	-1.67
24,914.00	92.51	325.13	10,874.02	11,618.46	-7,732.79	13,956.48	1.59	1.29	-0.93
25,009.00	94.00	324.96	10,868.62	11,696.20	-7,787.13	14,051.29	1.58	1.57	-0.18
25,028.00	94.53	324.96	10,867.21	11,711.71	-7,798.01	14,070.23	2.79	2.79	0.00
Survey @ 25028.00 MD 10867.21 TVD									
25,089.00	94.53	324.96	10,862.39	11,761.50	-7,832.92	14,131.02	0.00	0.00	0.00
Survey Proj. to 25089.00 MD 10862.39 TVD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
150.00	150.00	-0.34	-0.22	MWD surveys
25,028.00	10,867.21	11,711.71	-7,798.01	Survey @ 25028.00 MD 10867.21 TVD
25,089.00	10,862.39	11,761.50	-7,832.92	Survey Proj. to 25089.00 MD 10862.39 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

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	Knob Creek				
Site Position:		Northing:	14,443,053.74 usft	Latitude:	39.769822
From:	Lat/Long	Easting:	1,723,120.29 usft	Longitude:	-80.705670
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.19 °

Well	Knob Creek N-11HU (slot K)					
Well Position	+N/-S	0.00 usft	Northing:	14,443,117.19 usft	Latitude:	39.769995
	+E/-W	0.00 usft	Easting:	1,723,175.53 usft	Longitude:	-80.705473
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level:	737.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	2/23/2021	-8.66	66.56	51,774.66788771

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	326.51	

Survey Program	Date	4/1/2021			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
150.00	510.00	MWD surf (Original Hole)	MWD	MWD - Standard	
607.00	2,204.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,301.00	10,057.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
10,147.00	25,028.00	MWD (Original Hole)	MWD	MWD - Standard	
25,089.00	25,089.00	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	0.00	0.00	0.00	0.00	14,443,117.19	1,723,175.53	39.769995	-80.705473	
150.00	0.31	212.28	150.00	-0.34	-0.22	14,443,116.85	1,723,175.32	39.769994	-80.705473	
MWD surveys										
180.00	0.44	120.96	180.00	-0.47	-0.16	14,443,116.72	1,723,175.37	39.769994	-80.705473	
211.00	0.40	81.15	211.00	-0.52	0.05	14,443,116.68	1,723,175.58	39.769994	-80.705472	
242.00	0.66	76.76	242.00	-0.46	0.33	14,443,116.73	1,723,175.86	39.769994	-80.705471	
272.00	0.35	81.15	272.00	-0.40	0.59	14,443,116.79	1,723,176.12	39.769994	-80.705471	
303.00	0.18	169.83	303.00	-0.44	0.69	14,443,116.76	1,723,176.22	39.769994	-80.705470	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
334.00	0.35	95.56	334.00	-0.49	0.79	14,443,116.70	1,723,176.32	39.769994	-80.705470	
364.00	0.44	124.04	363.99	-0.57	0.98	14,443,116.62	1,723,176.51	39.769994	-80.705469	
395.00	0.31	81.15	394.99	-0.62	1.16	14,443,116.57	1,723,176.69	39.769994	-80.705469	
426.00	0.57	111.91	425.99	-0.67	1.39	14,443,116.53	1,723,176.92	39.769994	-80.705468	
456.00	0.40	69.20	455.99	-0.69	1.62	14,443,116.51	1,723,177.15	39.769993	-80.705467	
487.00	0.35	66.38	486.99	-0.61	1.81	14,443,116.58	1,723,177.34	39.769994	-80.705466	
510.00	0.70	115.78	509.99	-0.64	2.00	14,443,116.55	1,723,177.53	39.769994	-80.705466	
607.00	0.66	97.41	606.98	-0.97	3.09	14,443,116.22	1,723,178.62	39.769993	-80.705462	
699.00	0.66	112.79	698.98	-1.24	4.10	14,443,115.95	1,723,179.63	39.769992	-80.705458	
792.00	0.35	122.02	791.97	-1.60	4.84	14,443,115.59	1,723,180.37	39.769991	-80.705455	
887.00	0.31	60.50	886.97	-1.63	5.31	14,443,115.56	1,723,180.84	39.769991	-80.705454	
982.00	0.62	98.90	981.97	-1.58	6.04	14,443,115.61	1,723,181.57	39.769991	-80.705451	
1,075.00	0.44	111.65	1,074.97	-1.79	6.87	14,443,115.40	1,723,182.40	39.769990	-80.705448	
1,169.00	0.92	130.19	1,168.96	-2.41	7.78	14,443,114.78	1,723,183.31	39.769989	-80.705445	
1,262.00	0.75	97.59	1,261.95	-2.98	8.95	14,443,114.22	1,723,184.49	39.769987	-80.705441	
1,357.00	0.57	96.36	1,356.94	-3.11	10.04	14,443,114.08	1,723,185.57	39.769987	-80.705437	
1,451.00	0.26	337.97	1,450.94	-2.96	10.42	14,443,114.23	1,723,185.96	39.769987	-80.705436	
1,545.00	0.62	287.61	1,544.94	-2.61	9.86	14,443,114.58	1,723,185.39	39.769988	-80.705438	
1,639.00	0.97	297.98	1,638.93	-2.09	8.67	14,443,115.11	1,723,184.20	39.769990	-80.705442	
1,734.00	1.05	332.43	1,733.92	-0.94	7.56	14,443,116.26	1,723,183.09	39.769993	-80.705446	
1,829.00	1.27	335.15	1,828.90	0.79	6.71	14,443,117.98	1,723,182.25	39.769997	-80.705449	
1,923.00	0.97	295.87	1,922.88	2.08	5.56	14,443,119.28	1,723,181.09	39.770001	-80.705453	
2,017.00	1.85	280.22	2,016.85	2.70	3.35	14,443,119.89	1,723,178.88	39.770003	-80.705461	
2,111.00	2.07	270.91	2,110.80	3.00	0.16	14,443,120.19	1,723,175.69	39.770004	-80.705472	
2,204.00	2.46	275.56	2,203.72	3.22	-3.51	14,443,120.41	1,723,172.03	39.770004	-80.705485	
2,301.00	2.55	276.18	2,300.63	3.65	-7.72	14,443,120.84	1,723,167.81	39.770005	-80.705500	
2,395.00	2.50	286.20	2,394.54	4.45	-11.77	14,443,121.64	1,723,163.76	39.770008	-80.705514	
2,489.00	1.63	305.27	2,488.48	5.79	-14.83	14,443,122.98	1,723,160.70	39.770011	-80.705525	
2,583.00	0.66	306.15	2,582.46	6.88	-16.36	14,443,124.07	1,723,159.17	39.770014	-80.705531	
2,678.00	0.09	55.05	2,677.46	7.25	-16.74	14,443,124.44	1,723,158.79	39.770015	-80.705532	
2,772.00	0.70	110.68	2,771.45	7.09	-16.14	14,443,124.28	1,723,159.39	39.770015	-80.705530	
2,866.00	1.01	92.31	2,865.44	6.85	-14.78	14,443,124.04	1,723,160.75	39.770014	-80.705525	
2,960.00	0.66	150.06	2,959.43	6.35	-13.68	14,443,123.54	1,723,161.85	39.770013	-80.705521	
3,054.00	1.01	192.16	3,053.43	5.07	-13.58	14,443,122.26	1,723,161.95	39.770009	-80.705521	
3,148.00	1.36	185.13	3,147.41	3.15	-13.86	14,443,120.34	1,723,161.67	39.770004	-80.705522	
3,242.00	1.32	203.23	3,241.38	1.04	-14.39	14,443,118.24	1,723,161.15	39.769998	-80.705524	
3,336.00	1.63	244.01	3,335.35	-0.54	-16.01	14,443,116.65	1,723,159.52	39.769994	-80.705530	
3,430.00	1.85	251.75	3,429.31	-1.60	-18.66	14,443,115.59	1,723,156.88	39.769991	-80.705539	
3,525.00	1.93	248.23	3,524.26	-2.67	-21.60	14,443,114.52	1,723,153.93	39.769988	-80.705550	
3,618.00	2.20	248.32	3,617.20	-3.91	-24.71	14,443,113.28	1,723,150.82	39.769985	-80.705561	
3,713.00	2.20	248.49	3,712.13	-5.26	-28.10	14,443,111.94	1,723,147.43	39.769981	-80.705573	
3,806.00	2.29	242.61	3,805.05	-6.76	-31.41	14,443,110.43	1,723,144.12	39.769977	-80.705585	
3,899.00	2.90	235.49	3,897.96	-8.95	-35.00	14,443,108.24	1,723,140.53	39.769971	-80.705597	
3,993.00	3.52	231.80	3,991.81	-12.08	-39.23	14,443,105.11	1,723,136.30	39.769963	-80.705612	
4,087.00	3.52	211.67	4,085.64	-16.32	-43.01	14,443,100.87	1,723,132.52	39.769951	-80.705626	
4,180.00	3.21	192.51	4,178.48	-21.30	-45.07	14,443,095.90	1,723,130.46	39.769937	-80.705633	
4,275.00	2.81	176.78	4,273.35	-26.22	-45.52	14,443,090.97	1,723,130.01	39.769924	-80.705635	
4,369.00	1.54	142.85	4,367.28	-29.53	-44.63	14,443,087.67	1,723,130.90	39.769915	-80.705632	
4,463.00	1.58	81.15	4,461.26	-30.33	-42.58	14,443,086.86	1,723,132.95	39.769912	-80.705625	
4,557.00	1.14	68.93	4,555.23	-29.80	-40.43	14,443,087.40	1,723,135.10	39.769914	-80.705617	
4,653.00	0.57	47.84	4,651.22	-29.13	-39.19	14,443,088.06	1,723,136.35	39.769916	-80.705612	
4,748.00	0.57	24.11	4,746.21	-28.39	-38.64	14,443,088.81	1,723,136.89	39.769918	-80.705610	
4,842.00	1.05	29.21	4,840.20	-27.21	-38.03	14,443,089.99	1,723,137.50	39.769921	-80.705608	
4,937.00	0.57	33.60	4,935.19	-26.05	-37.34	14,443,091.14	1,723,138.19	39.769924	-80.705606	
5,032.00	0.62	355.28	5,030.19	-25.15	-37.13	14,443,092.05	1,723,138.41	39.769927	-80.705605	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,126.00	0.97	2.14	5,124.18	-23.85	-37.14	14,443,093.35	1,723,138.39	39.769930	-80.705605
5,220.00	1.36	315.99	5,218.16	-22.25	-37.88	14,443,094.94	1,723,137.65	39.769935	-80.705608
5,315.00	2.24	296.75	5,313.12	-20.60	-40.32	14,443,096.59	1,723,135.21	39.769939	-80.705616
5,409.00	2.20	299.21	5,407.05	-18.89	-43.54	14,443,098.30	1,723,131.99	39.769944	-80.705628
5,503.00	0.53	270.73	5,501.02	-18.01	-45.55	14,443,099.18	1,723,129.98	39.769946	-80.705635
5,597.00	0.53	193.91	5,595.01	-18.42	-46.09	14,443,098.77	1,723,129.44	39.769945	-80.705637
5,691.00	0.97	178.27	5,689.00	-19.64	-46.17	14,443,097.55	1,723,129.36	39.769942	-80.705637
5,785.00	1.63	179.59	5,782.98	-21.77	-46.14	14,443,095.42	1,723,129.40	39.769936	-80.705637
5,878.00	0.57	166.14	5,875.96	-23.55	-46.02	14,443,093.65	1,723,129.52	39.769931	-80.705637
5,972.00	1.27	33.16	5,969.95	-23.13	-45.33	14,443,094.06	1,723,130.20	39.769932	-80.705634
6,067.00	1.98	33.51	6,064.92	-20.88	-43.85	14,443,096.31	1,723,131.68	39.769938	-80.705629
6,166.00	0.79	31.14	6,163.89	-18.87	-42.55	14,443,098.32	1,723,132.98	39.769944	-80.705624
6,261.00	0.57	3.63	6,258.88	-17.84	-42.19	14,443,099.36	1,723,133.35	39.769947	-80.705623
6,354.00	0.66	358.80	6,351.87	-16.84	-42.17	14,443,100.35	1,723,133.36	39.769949	-80.705623
6,448.00	0.88	355.02	6,445.86	-15.58	-42.24	14,443,101.61	1,723,133.29	39.769953	-80.705623
6,541.00	1.05	359.85	6,538.85	-14.01	-42.31	14,443,103.18	1,723,133.23	39.769957	-80.705623
6,634.00	1.41	355.37	6,631.83	-12.02	-42.40	14,443,105.17	1,723,133.13	39.769963	-80.705624
6,729.00	0.92	359.85	6,726.81	-10.09	-42.50	14,443,107.10	1,723,133.04	39.769968	-80.705624
6,823.00	0.26	29.21	6,820.80	-9.15	-42.39	14,443,108.04	1,723,133.14	39.769971	-80.705624
6,916.00	0.40	176.16	6,913.80	-9.29	-42.27	14,443,107.90	1,723,133.26	39.769970	-80.705623
7,010.00	0.70	196.38	7,007.80	-10.17	-42.41	14,443,107.02	1,723,133.12	39.769968	-80.705624
7,103.00	0.83	228.19	7,100.79	-11.17	-43.07	14,443,106.03	1,723,132.46	39.769965	-80.705626
7,292.00	1.58	258.87	7,289.75	-12.58	-46.65	14,443,104.61	1,723,128.88	39.769961	-80.705639
7,386.00	2.37	258.07	7,383.69	-13.23	-49.82	14,443,103.96	1,723,125.71	39.769959	-80.705650
7,479.00	3.69	243.57	7,476.56	-14.96	-54.38	14,443,102.23	1,723,121.15	39.769955	-80.705666
7,572.00	4.79	233.20	7,569.31	-18.62	-60.17	14,443,098.57	1,723,115.36	39.769945	-80.705687
7,666.00	5.84	223.71	7,662.90	-24.43	-66.62	14,443,092.76	1,723,108.91	39.769929	-80.705710
7,807.00	7.34	217.03	7,802.97	-36.81	-77.00	14,443,080.39	1,723,098.53	39.769895	-80.705747
7,855.00	8.09	215.71	7,850.54	-42.00	-80.82	14,443,075.20	1,723,094.71	39.769881	-80.705761
7,948.00	9.18	214.13	7,942.48	-53.45	-88.80	14,443,063.74	1,723,086.73	39.769849	-80.705789
8,043.00	8.88	216.85	8,036.30	-65.59	-97.45	14,443,051.60	1,723,078.08	39.769816	-80.705820
8,137.00	9.10	217.21	8,129.15	-77.32	-106.30	14,443,039.88	1,723,069.23	39.769784	-80.705852
8,231.00	11.03	218.44	8,221.70	-90.28	-116.38	14,443,026.91	1,723,059.15	39.769748	-80.705888
8,326.00	12.83	220.90	8,314.64	-105.37	-128.94	14,443,011.82	1,723,046.59	39.769707	-80.705933
8,420.00	14.28	225.55	8,406.03	-121.38	-144.05	14,442,995.81	1,723,031.48	39.769663	-80.705987
8,514.00	16.39	229.60	8,496.68	-138.10	-162.43	14,442,979.09	1,723,013.10	39.769618	-80.706052
8,608.00	18.85	230.56	8,586.26	-156.34	-184.26	14,442,960.85	1,722,991.27	39.769568	-80.706130
8,702.00	19.56	229.60	8,675.03	-176.19	-207.97	14,442,941.00	1,722,967.56	39.769513	-80.706215
8,797.00	19.60	230.56	8,764.53	-196.62	-232.39	14,442,920.57	1,722,943.14	39.769457	-80.706302
8,891.00	16.61	229.07	8,853.87	-215.44	-254.72	14,442,901.75	1,722,920.81	39.769406	-80.706382
8,985.00	15.07	225.29	8,944.30	-232.84	-273.56	14,442,884.35	1,722,901.98	39.769358	-80.706449
9,080.00	16.30	221.51	9,035.76	-251.51	-291.17	14,442,865.68	1,722,884.36	39.769307	-80.706512
9,174.00	15.47	222.04	9,126.17	-270.70	-308.31	14,442,846.49	1,722,867.22	39.769255	-80.706573
9,269.00	13.54	223.80	9,218.14	-288.14	-324.49	14,442,829.05	1,722,851.04	39.769207	-80.706631
9,362.00	13.45	222.21	9,308.57	-304.01	-339.29	14,442,813.18	1,722,836.24	39.769164	-80.706684
9,455.00	13.27	224.85	9,399.06	-319.59	-354.09	14,442,797.61	1,722,821.44	39.769121	-80.706736
9,548.00	13.54	227.93	9,489.53	-334.45	-369.70	14,442,782.74	1,722,805.84	39.769080	-80.706792
9,642.00	13.97	227.93	9,580.83	-349.43	-386.29	14,442,767.77	1,722,789.24	39.769039	-80.706851
9,736.00	14.60	226.79	9,671.92	-365.14	-403.35	14,442,752.05	1,722,772.19	39.768996	-80.706912
9,829.00	13.84	229.25	9,762.07	-380.43	-420.32	14,442,736.77	1,722,755.22	39.768954	-80.706973
9,923.00	13.49	230.39	9,853.41	-394.76	-437.28	14,442,722.44	1,722,738.25	39.768915	-80.707033
10,016.00	14.41	231.53	9,943.67	-408.87	-454.70	14,442,708.32	1,722,720.83	39.768877	-80.707096
10,057.00	14.72	231.62	9,983.35	-415.28	-462.77	14,442,701.91	1,722,712.76	39.768859	-80.707124
10,147.00	16.40	232.50	10,070.05	-430.11	-481.82	14,442,687.08	1,722,693.71	39.768818	-80.707192
10,241.00	14.53	229.60	10,160.64	-445.84	-501.33	14,442,671.36	1,722,674.20	39.768775	-80.707262

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,334.00	13.07	247.46	10,251.00	-457.43	-519.94	14,442,659.76	1,722,655.60	39.768744	-80.707328
10,381.00	13.27	269.31	10,296.79	-459.54	-530.24	14,442,657.66	1,722,645.29	39.768738	-80.707365
10,428.00	13.42	292.24	10,342.55	-457.54	-540.69	14,442,659.66	1,722,634.84	39.768744	-80.707402
10,475.00	15.07	309.35	10,388.13	-451.59	-550.47	14,442,665.60	1,722,625.06	39.768760	-80.707437
10,522.00	18.63	312.02	10,433.10	-442.69	-560.78	14,442,674.50	1,722,614.76	39.768785	-80.707473
10,569.00	22.05	307.01	10,477.17	-432.35	-573.40	14,442,684.84	1,722,602.13	39.768813	-80.707518
10,616.00	25.40	299.08	10,520.20	-422.14	-589.27	14,442,695.06	1,722,586.27	39.768841	-80.707575
10,663.00	28.62	294.88	10,562.07	-412.50	-608.29	14,442,704.69	1,722,567.24	39.768868	-80.707642
10,711.00	32.37	293.52	10,603.43	-402.53	-630.51	14,442,714.66	1,722,545.02	39.768896	-80.707721
10,758.00	35.03	295.23	10,642.53	-391.76	-654.26	14,442,725.43	1,722,521.28	39.768925	-80.707806
10,805.00	37.23	296.95	10,680.49	-379.56	-679.14	14,442,737.63	1,722,496.40	39.768959	-80.707894
10,852.00	36.03	297.90	10,718.20	-366.65	-704.03	14,442,750.54	1,722,471.50	39.768995	-80.707982
10,900.00	35.84	305.78	10,757.09	-351.82	-727.92	14,442,765.37	1,722,447.61	39.769036	-80.708067
10,947.00	37.34	312.33	10,794.84	-334.17	-749.63	14,442,783.02	1,722,425.90	39.769084	-80.708144
10,994.00	41.03	314.57	10,831.27	-313.74	-771.16	14,442,803.46	1,722,404.37	39.769141	-80.708221
11,041.00	44.58	315.59	10,865.74	-291.12	-793.70	14,442,826.07	1,722,381.83	39.769203	-80.708301
11,088.00	47.97	315.35	10,898.22	-266.91	-817.52	14,442,850.28	1,722,358.01	39.769270	-80.708385
11,135.00	51.01	314.98	10,928.75	-241.58	-842.71	14,442,875.62	1,722,332.82	39.769339	-80.708474
11,181.00	53.34	315.64	10,956.96	-215.74	-868.26	14,442,901.45	1,722,307.27	39.769411	-80.708565
11,228.00	55.66	315.79	10,984.25	-188.35	-894.98	14,442,928.84	1,722,280.55	39.769486	-80.708660
11,275.00	57.72	316.94	11,010.06	-159.93	-922.08	14,442,957.27	1,722,253.46	39.769564	-80.708756
11,322.00	59.87	318.24	11,034.41	-130.24	-949.18	14,442,986.95	1,722,226.35	39.769646	-80.708852
11,369.00	62.44	320.36	11,057.09	-99.03	-976.02	14,443,018.16	1,722,199.52	39.769732	-80.708947
11,416.00	66.10	324.05	11,077.49	-65.57	-1,001.94	14,443,051.62	1,722,173.60	39.769824	-80.709039
11,462.00	69.99	327.33	11,094.69	-30.34	-1,025.96	14,443,086.86	1,722,149.57	39.769921	-80.709124
11,509.00	73.14	329.18	11,109.55	7.58	-1,049.41	14,443,124.77	1,722,126.12	39.770026	-80.709207
11,556.00	76.25	330.53	11,121.96	46.78	-1,072.17	14,443,163.97	1,722,103.36	39.770133	-80.709288
11,603.00	80.16	331.13	11,131.56	86.94	-1,094.59	14,443,204.13	1,722,080.94	39.770244	-80.709367
11,650.00	84.38	331.94	11,137.88	127.87	-1,116.78	14,443,245.07	1,722,058.75	39.770357	-80.709446
11,745.00	89.58	332.21	11,142.89	211.67	-1,161.19	14,443,328.86	1,722,014.34	39.770587	-80.709603
11,839.00	91.29	329.69	11,142.17	293.83	-1,206.83	14,443,411.02	1,721,968.70	39.770813	-80.709764
11,934.00	91.58	327.75	11,139.79	374.99	-1,256.14	14,443,492.18	1,721,919.39	39.771036	-80.709939
12,028.00	91.42	328.08	11,137.33	454.61	-1,306.05	14,443,571.80	1,721,869.48	39.771256	-80.710115
12,122.00	91.34	328.65	11,135.07	534.62	-1,355.34	14,443,651.81	1,721,820.19	39.771476	-80.710290
12,217.00	91.62	329.00	11,132.62	615.87	-1,404.50	14,443,733.06	1,721,771.03	39.771699	-80.710464
12,311.00	91.15	328.76	11,130.34	696.32	-1,453.07	14,443,813.51	1,721,722.46	39.771921	-80.710636
12,405.00	91.48	329.78	11,128.19	777.10	-1,501.09	14,443,894.29	1,721,674.44	39.772143	-80.710806
12,500.00	91.11	329.55	11,126.04	859.07	-1,549.06	14,443,976.26	1,721,626.48	39.772368	-80.710976
12,594.00	91.08	329.57	11,124.24	940.10	-1,596.67	14,444,057.29	1,721,578.86	39.772591	-80.711144
12,687.00	90.88	329.97	11,122.65	1,020.44	-1,643.49	14,444,137.63	1,721,532.04	39.772812	-80.711310
12,781.00	90.89	329.54	11,121.20	1,101.63	-1,690.83	14,444,218.83	1,721,484.70	39.773036	-80.711477
12,875.00	90.83	329.63	11,119.79	1,182.69	-1,738.41	14,444,299.88	1,721,437.12	39.773259	-80.711646
12,969.00	91.15	329.77	11,118.17	1,263.83	-1,785.83	14,444,381.03	1,721,389.70	39.773482	-80.711814
13,063.00	91.54	329.63	11,115.96	1,344.97	-1,833.24	14,444,462.16	1,721,342.29	39.773705	-80.711981
13,157.00	91.55	329.52	11,113.43	1,426.00	-1,880.83	14,444,543.19	1,721,294.70	39.773928	-80.712150
13,251.00	91.29	329.54	11,111.10	1,506.99	-1,928.48	14,444,624.18	1,721,247.05	39.774151	-80.712319
13,345.00	91.33	329.37	11,108.95	1,587.92	-1,976.24	14,444,705.12	1,721,199.29	39.774374	-80.712488
13,439.00	91.41	329.25	11,106.70	1,668.74	-2,024.20	14,444,785.93	1,721,151.33	39.774596	-80.712657
13,534.00	91.58	329.75	11,104.22	1,750.56	-2,072.40	14,444,867.76	1,721,103.13	39.774821	-80.712828
13,628.00	91.36	329.38	11,101.81	1,831.58	-2,120.00	14,444,948.78	1,721,055.53	39.775044	-80.712996
13,721.00	91.35	329.65	11,099.61	1,911.70	-2,167.17	14,445,028.90	1,721,008.36	39.775265	-80.713163
13,815.00	91.20	330.50	11,097.52	1,993.15	-2,214.05	14,445,110.34	1,720,961.48	39.775489	-80.713329
13,910.00	90.90	330.53	11,095.78	2,075.83	-2,260.80	14,445,193.03	1,720,914.73	39.775716	-80.713495
14,003.00	91.10	330.86	11,094.15	2,156.92	-2,306.32	14,445,274.11	1,720,869.22	39.775939	-80.713656
14,097.00	91.13	330.73	11,092.33	2,238.95	-2,352.17	14,445,356.15	1,720,823.36	39.776165	-80.713818

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
14,191.00	90.82	330.31	11,090.73	2,320.77	-2,398.42	14,445,437.96	1,720,777.11	39.776390	-80.713982	
14,285.00	90.87	330.56	11,089.34	2,402.52	-2,444.80	14,445,519.72	1,720,730.73	39.776615	-80.714146	
14,379.00	91.02	330.35	11,087.79	2,484.29	-2,491.15	14,445,601.48	1,720,684.39	39.776840	-80.714310	
14,474.00	90.89	330.41	11,086.21	2,566.86	-2,538.09	14,445,684.06	1,720,637.44	39.777067	-80.714476	
14,568.00	91.05	330.46	11,084.61	2,648.61	-2,584.47	14,445,765.81	1,720,591.07	39.777292	-80.714640	
14,662.00	91.31	330.82	11,082.68	2,730.52	-2,630.54	14,445,847.71	1,720,544.99	39.777517	-80.714803	
14,756.00	91.02	330.20	11,080.77	2,812.33	-2,676.81	14,445,929.52	1,720,498.72	39.777743	-80.714967	
14,850.00	91.12	329.97	11,079.01	2,893.79	-2,723.68	14,446,010.98	1,720,451.85	39.777967	-80.715133	
14,944.00	90.93	329.80	11,077.33	2,975.09	-2,770.83	14,446,092.28	1,720,404.70	39.778190	-80.715300	
15,037.00	91.23	330.32	11,075.58	3,055.66	-2,817.24	14,446,172.85	1,720,358.29	39.778412	-80.715464	
15,131.00	91.06	329.84	11,073.70	3,137.12	-2,864.12	14,446,254.31	1,720,311.41	39.778636	-80.715630	
15,225.00	91.08	330.22	11,071.94	3,218.53	-2,911.07	14,446,335.73	1,720,264.46	39.778860	-80.715796	
15,319.00	91.22	330.58	11,070.06	3,300.25	-2,957.49	14,446,417.44	1,720,218.04	39.779085	-80.715961	
15,414.00	90.99	330.16	11,068.23	3,382.81	-3,004.45	14,446,500.00	1,720,171.08	39.779312	-80.716127	
15,509.00	91.39	330.39	11,066.25	3,465.29	-3,051.54	14,446,582.48	1,720,123.99	39.779539	-80.716293	
15,603.00	91.23	330.39	11,064.10	3,546.99	-3,097.97	14,446,664.19	1,720,077.56	39.779764	-80.716458	
15,697.00	91.13	330.17	11,062.17	3,628.61	-3,144.57	14,446,745.81	1,720,030.97	39.779988	-80.716623	
15,792.00	91.49	330.59	11,060.00	3,711.18	-3,191.51	14,446,828.37	1,719,984.02	39.780215	-80.716789	
15,886.00	91.72	331.37	11,057.36	3,793.34	-3,237.09	14,446,910.53	1,719,938.44	39.780442	-80.716950	
15,981.00	91.02	330.52	11,055.09	3,876.36	-3,283.21	14,446,993.55	1,719,892.32	39.780670	-80.717113	
16,076.00	90.94	330.35	11,053.47	3,958.98	-3,330.08	14,447,076.17	1,719,845.45	39.780897	-80.717279	
16,170.00	91.27	329.95	11,051.65	4,040.49	-3,376.86	14,447,157.69	1,719,798.67	39.781121	-80.717445	
16,264.00	91.18	328.98	11,049.64	4,121.44	-3,424.60	14,447,238.63	1,719,750.93	39.781344	-80.717614	
16,358.00	91.09	329.43	11,047.78	4,202.17	-3,472.72	14,447,319.36	1,719,702.81	39.781566	-80.717784	
16,452.00	90.81	329.25	11,046.22	4,283.02	-3,520.65	14,447,400.21	1,719,654.88	39.781789	-80.717954	
16,546.00	90.89	329.47	11,044.83	4,363.88	-3,568.55	14,447,481.08	1,719,606.98	39.782011	-80.718124	
16,641.00	90.87	330.28	11,043.37	4,446.04	-3,616.22	14,447,563.23	1,719,559.31	39.782237	-80.718292	
16,735.00	90.79	330.16	11,042.01	4,527.62	-3,662.90	14,447,644.81	1,719,512.63	39.782462	-80.718458	
16,828.00	90.84	330.33	11,040.69	4,608.35	-3,709.05	14,447,725.54	1,719,466.48	39.782684	-80.718621	
16,922.00	90.85	330.20	11,039.30	4,689.96	-3,755.67	14,447,807.16	1,719,419.86	39.782908	-80.718786	
17,016.00	91.04	330.29	11,037.75	4,771.56	-3,802.32	14,447,888.75	1,719,373.21	39.783133	-80.718951	
17,110.00	91.02	330.67	11,036.06	4,853.34	-3,848.63	14,447,970.54	1,719,326.91	39.783358	-80.719115	
17,204.00	90.76	329.88	11,034.60	4,934.96	-3,895.23	14,448,052.16	1,719,280.30	39.783582	-80.719280	
17,298.00	90.70	329.94	11,033.40	5,016.29	-3,942.35	14,448,133.48	1,719,233.18	39.783806	-80.719447	
17,393.00	91.12	330.12	11,031.89	5,098.58	-3,989.80	14,448,215.77	1,719,185.73	39.784033	-80.719615	
17,486.00	90.90	329.98	11,030.25	5,179.14	-4,036.23	14,448,296.34	1,719,139.31	39.784254	-80.719779	
17,580.00	91.05	330.29	11,028.65	5,260.65	-4,083.03	14,448,377.84	1,719,092.50	39.784478	-80.719945	
17,674.00	91.01	330.11	11,026.96	5,342.21	-4,129.74	14,448,459.40	1,719,045.80	39.784703	-80.720110	
17,768.00	91.18	330.17	11,025.17	5,423.71	-4,176.53	14,448,540.91	1,718,999.00	39.784927	-80.720276	
17,862.00	91.30	330.53	11,023.13	5,505.39	-4,223.02	14,448,622.58	1,718,952.51	39.785152	-80.720440	
17,954.00	91.14	330.32	11,021.18	5,585.38	-4,268.42	14,448,702.57	1,718,907.12	39.785372	-80.720601	
18,047.00	91.04	330.36	11,019.41	5,666.18	-4,314.43	14,448,783.37	1,718,861.10	39.785594	-80.720764	
18,141.00	91.22	329.71	11,017.55	5,747.60	-4,361.37	14,448,864.79	1,718,814.16	39.785818	-80.720930	
18,234.00	91.22	330.16	11,015.57	5,828.07	-4,407.95	14,448,945.26	1,718,767.58	39.786040	-80.721095	
18,328.00	91.28	330.34	11,013.52	5,909.66	-4,454.58	14,449,026.85	1,718,720.95	39.786264	-80.721260	
18,422.00	91.25	330.18	11,011.45	5,991.26	-4,501.20	14,449,108.45	1,718,674.33	39.786488	-80.721425	
18,516.00	91.17	329.47	11,009.46	6,072.50	-4,548.44	14,449,189.70	1,718,627.09	39.786712	-80.721593	
18,610.00	91.03	329.81	11,007.66	6,153.60	-4,595.94	14,449,270.79	1,718,579.59	39.786935	-80.721761	
18,705.00	91.29	331.12	11,005.73	6,236.23	-4,642.76	14,449,353.43	1,718,532.77	39.787162	-80.721926	
18,799.00	91.02	331.02	11,003.84	6,318.49	-4,688.22	14,449,435.68	1,718,487.31	39.787389	-80.722087	
18,892.00	91.14	331.49	11,002.09	6,400.01	-4,732.94	14,449,517.20	1,718,442.59	39.787613	-80.722246	
18,987.00	91.12	331.32	11,000.21	6,483.41	-4,778.40	14,449,600.60	1,718,397.13	39.787842	-80.722407	
19,081.00	91.22	331.99	10,998.29	6,566.12	-4,823.02	14,449,683.31	1,718,352.51	39.788070	-80.722565	
19,175.00	91.37	331.94	10,996.17	6,649.07	-4,867.19	14,449,766.26	1,718,308.34	39.788298	-80.722721	
19,269.00	91.01	331.24	10,994.22	6,731.73	-4,911.90	14,449,848.92	1,718,263.63	39.788526	-80.722879	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
19,363.00	91.15	331.03	10,992.44	6,814.04	-4,957.27	14,449,931.23	1,718,218.26	39.788752	-80.723040
19,457.00	90.92	330.81	10,990.75	6,896.17	-5,002.95	14,450,013.37	1,718,172.58	39.788978	-80.723201
19,550.00	91.36	331.09	10,988.90	6,977.46	-5,048.10	14,450,094.65	1,718,127.43	39.789202	-80.723361
19,644.00	91.42	331.14	10,986.62	7,059.74	-5,093.50	14,450,176.93	1,718,082.04	39.789428	-80.723522
19,738.00	91.15	331.00	10,984.51	7,141.99	-5,138.96	14,450,259.18	1,718,036.58	39.789654	-80.723683
19,832.00	91.38	331.30	10,982.43	7,224.30	-5,184.30	14,450,341.49	1,717,991.23	39.789881	-80.723843
19,926.00	91.27	331.40	10,980.26	7,306.77	-5,229.36	14,450,423.96	1,717,946.17	39.790107	-80.724003
20,019.00	91.45	331.63	10,978.05	7,388.49	-5,273.70	14,450,506.68	1,717,901.83	39.790332	-80.724160
20,114.00	91.46	331.57	10,975.64	7,472.03	-5,318.87	14,450,589.22	1,717,856.66	39.790562	-80.724320
20,207.00	91.42	331.49	10,973.30	7,553.75	-5,363.19	14,450,670.95	1,717,812.34	39.790787	-80.724477
20,301.00	91.47	330.51	10,970.93	7,635.94	-5,408.75	14,450,753.13	1,717,766.79	39.791013	-80.724638
20,395.00	91.09	330.31	10,968.83	7,717.66	-5,455.15	14,450,834.85	1,717,720.38	39.791238	-80.724802
20,489.00	90.92	330.44	10,967.18	7,799.36	-5,501.61	14,450,916.55	1,717,673.92	39.791463	-80.724967
20,582.00	90.93	330.15	10,965.68	7,880.13	-5,547.69	14,450,997.32	1,717,627.84	39.791685	-80.725130
20,675.00	91.24	330.36	10,963.92	7,960.86	-5,593.82	14,451,078.05	1,717,581.71	39.791907	-80.725293
20,770.00	91.30	330.83	10,961.82	8,043.60	-5,640.45	14,451,160.79	1,717,535.08	39.792134	-80.725458
20,864.00	90.94	330.36	10,959.98	8,125.48	-5,686.60	14,451,242.67	1,717,488.94	39.792360	-80.725622
20,958.00	91.47	330.33	10,958.00	8,207.15	-5,733.09	14,451,324.34	1,717,442.44	39.792584	-80.725786
21,052.00	91.28	330.64	10,955.75	8,288.92	-5,779.39	14,451,406.12	1,717,396.14	39.792809	-80.725950
21,145.00	91.42	330.62	10,953.55	8,369.95	-5,824.99	14,451,487.14	1,717,350.54	39.793032	-80.726112
21,239.00	91.22	330.19	10,951.39	8,451.66	-5,871.40	14,451,568.85	1,717,304.13	39.793257	-80.726276
21,333.00	91.16	330.04	10,949.44	8,533.15	-5,918.23	14,451,650.34	1,717,257.31	39.793481	-80.726442
21,427.00	91.06	330.17	10,947.62	8,614.62	-5,965.07	14,451,731.81	1,717,210.46	39.793705	-80.726608
21,521.00	90.98	330.00	10,945.94	8,696.09	-6,011.94	14,451,813.28	1,717,163.59	39.793929	-80.726774
21,614.00	91.17	330.38	10,944.20	8,776.76	-6,058.16	14,451,893.96	1,717,117.37	39.794151	-80.726937
21,708.00	91.01	330.44	10,942.41	8,858.49	-6,104.57	14,451,975.68	1,717,070.96	39.794376	-80.727102
21,802.00	90.55	329.74	10,941.13	8,939.96	-6,151.44	14,452,057.16	1,717,024.09	39.794600	-80.727268
21,895.00	91.02	330.28	10,939.86	9,020.50	-6,197.92	14,452,137.70	1,716,977.61	39.794822	-80.727432
21,989.00	90.62	330.16	10,938.51	9,102.08	-6,244.60	14,452,219.27	1,716,930.93	39.795046	-80.727598
22,083.00	90.92	330.10	10,937.25	9,183.59	-6,291.41	14,452,300.78	1,716,884.12	39.795271	-80.727763
22,176.00	91.12	330.04	10,935.59	9,264.17	-6,337.81	14,452,381.36	1,716,837.72	39.795492	-80.727928
22,270.00	90.83	329.64	10,933.99	9,345.43	-6,385.03	14,452,462.63	1,716,790.50	39.795716	-80.728095
22,364.00	91.18	330.12	10,932.34	9,426.73	-6,432.19	14,452,543.92	1,716,743.34	39.795939	-80.728262
22,457.00	91.20	329.81	10,930.41	9,507.22	-6,478.73	14,452,624.42	1,716,696.80	39.796161	-80.728427
22,551.00	91.12	330.06	10,928.51	9,588.56	-6,525.81	14,452,705.75	1,716,649.72	39.796385	-80.728593
22,644.00	91.11	329.33	10,926.70	9,668.83	-6,572.73	14,452,786.03	1,716,602.80	39.796606	-80.728760
22,738.00	91.15	330.05	10,924.85	9,749.97	-6,620.16	14,452,867.16	1,716,555.37	39.796829	-80.728928
22,831.00	91.01	329.76	10,923.09	9,830.42	-6,666.79	14,452,947.61	1,716,508.74	39.797050	-80.729093
22,925.00	91.12	329.65	10,921.35	9,911.57	-6,714.20	14,453,028.76	1,716,461.33	39.797273	-80.729261
23,019.00	91.02	329.64	10,919.59	9,992.67	-6,761.69	14,453,109.86	1,716,413.84	39.797496	-80.729429
23,113.00	91.03	330.20	10,917.91	10,073.99	-6,808.80	14,453,191.19	1,716,366.73	39.797720	-80.729596
23,207.00	91.22	330.32	10,916.06	10,155.60	-6,855.42	14,453,272.79	1,716,320.11	39.797945	-80.729761
23,300.00	90.94	330.12	10,914.31	10,236.30	-6,901.60	14,453,353.49	1,716,273.93	39.798167	-80.729924
23,394.00	91.27	330.34	10,912.50	10,317.88	-6,948.27	14,453,435.07	1,716,227.27	39.798391	-80.730090
23,488.00	91.09	330.07	10,910.56	10,399.44	-6,994.96	14,453,516.63	1,716,180.57	39.798615	-80.730255
23,584.00	91.71	330.23	10,908.22	10,482.68	-7,042.73	14,453,599.87	1,716,132.80	39.798844	-80.730424
23,679.00	91.19	330.76	10,905.81	10,565.33	-7,089.50	14,453,682.52	1,716,086.03	39.799072	-80.730590
23,774.00	91.80	331.11	10,903.33	10,648.34	-7,135.64	14,453,765.53	1,716,039.89	39.799300	-80.730753
23,869.00	91.19	330.41	10,900.86	10,731.20	-7,182.03	14,453,848.39	1,715,993.50	39.799528	-80.730917
23,964.00	91.54	330.23	10,898.59	10,813.71	-7,229.05	14,453,930.91	1,715,946.48	39.799755	-80.731084
24,059.00	91.10	329.00	10,896.40	10,895.64	-7,277.09	14,454,012.84	1,715,898.44	39.799981	-80.731254
24,154.00	90.22	328.65	10,895.31	10,976.92	-7,326.27	14,454,094.11	1,715,849.27	39.800204	-80.731428
24,249.00	91.54	328.65	10,893.85	11,058.04	-7,375.68	14,454,175.23	1,715,799.85	39.800427	-80.731603
24,344.00	91.36	328.47	10,891.45	11,139.06	-7,425.22	14,454,256.26	1,715,750.31	39.800650	-80.731779
24,439.00	89.96	328.12	10,890.35	11,219.88	-7,475.14	14,454,337.07	1,715,700.39	39.800873	-80.731956

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek N-11HU (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek N-11HU (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
24,534.00	91.36	327.77	10,889.26	11,300.39	-7,525.56	14,454,417.58	1,715,649.97	39.801094	-80.732134
24,629.00	92.68	327.60	10,885.91	11,380.62	-7,576.31	14,454,497.81	1,715,599.22	39.801315	-80.732314
24,724.00	93.30	327.60	10,880.95	11,460.72	-7,627.14	14,454,577.92	1,715,548.39	39.801535	-80.732494
24,819.00	91.28	326.01	10,877.16	11,540.15	-7,679.11	14,454,657.34	1,715,496.42	39.801754	-80.732679
24,914.00	92.51	325.13	10,874.02	11,618.46	-7,732.79	14,454,735.66	1,715,442.74	39.801969	-80.732869
25,009.00	94.00	324.96	10,868.62	11,696.20	-7,787.13	14,454,813.39	1,715,388.40	39.802183	-80.733062
25,028.00	94.53	324.96	10,867.21	11,711.71	-7,798.01	14,454,828.90	1,715,377.52	39.802226	-80.733100
Survey @ 25028.00 MD 10867.21 TVD									
25,089.00	94.53	324.96	10,862.39	11,761.50	-7,832.92	14,454,878.69	1,715,342.61	39.802363	-80.733224
Survey Proj. to 25089.00 MD 10862.39 TVD									

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
150.00	150.00	-0.34	-0.22	MWD surveys
25,028.00	10,867.21	11,711.71	-7,798.01	Survey @ 25028.00 MD 10867.21 TVD
25,089.00	10,862.39	11,761.50	-7,832.92	Survey Proj. to 25089.00 MD 10862.39 TVD