



Well: Van Winkle N-18 HU (slot G)
Site: Van Winkle
Project: Marshall County, West Virginia NAD83 UTM 17N
Design: rev6
Rig: Nabors B28

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	V Sect	Annotation
1	4406.00	0.93	346.540	4404.82	-59.22	1.73	0.00	0.00	-51.15	Survey @ 4406.00 MD 4404.82 TVD
2	4606.00	0.93	346.540	4604.79	-56.06	0.98	0.00	0.00	-48.07	Begin 1"/100' drop
3	4699.00	0.00	346.540	4697.79	-55.33	0.80	1.00	180.00	-47.36	Begin vertical hold
4	8026.21	0.00	346.540	8025.00	-55.33	0.80	0.00	346.54	-47.36	Begin 2"/100' build
5	8957.51	18.63	178.707	8939.99	-205.34	4.19	2.00	178.71	-176.40	Begin 18.63° tangent
6	9925.31	18.63	178.707	9857.09	-514.36	11.16	0.00	0.00	-442.23	Begin 6"/100' build/turn
7	11020.56	50.00	322.671	10838.01	-335.61	-270.90	6.00	150.37	-141.23	Begin 8"/100' build/turn
8	11540.14	91.00	330.169	11008.00	65.73	-532.36	8.00	11.34	337.67	Begin 91.00° lateral
9	22681.05	91.00	330.169	10814.00	9728.92	-6073.56	0.00	0.0011469.09		PBHL/TD 22681.05 MD 10814.00 TVD

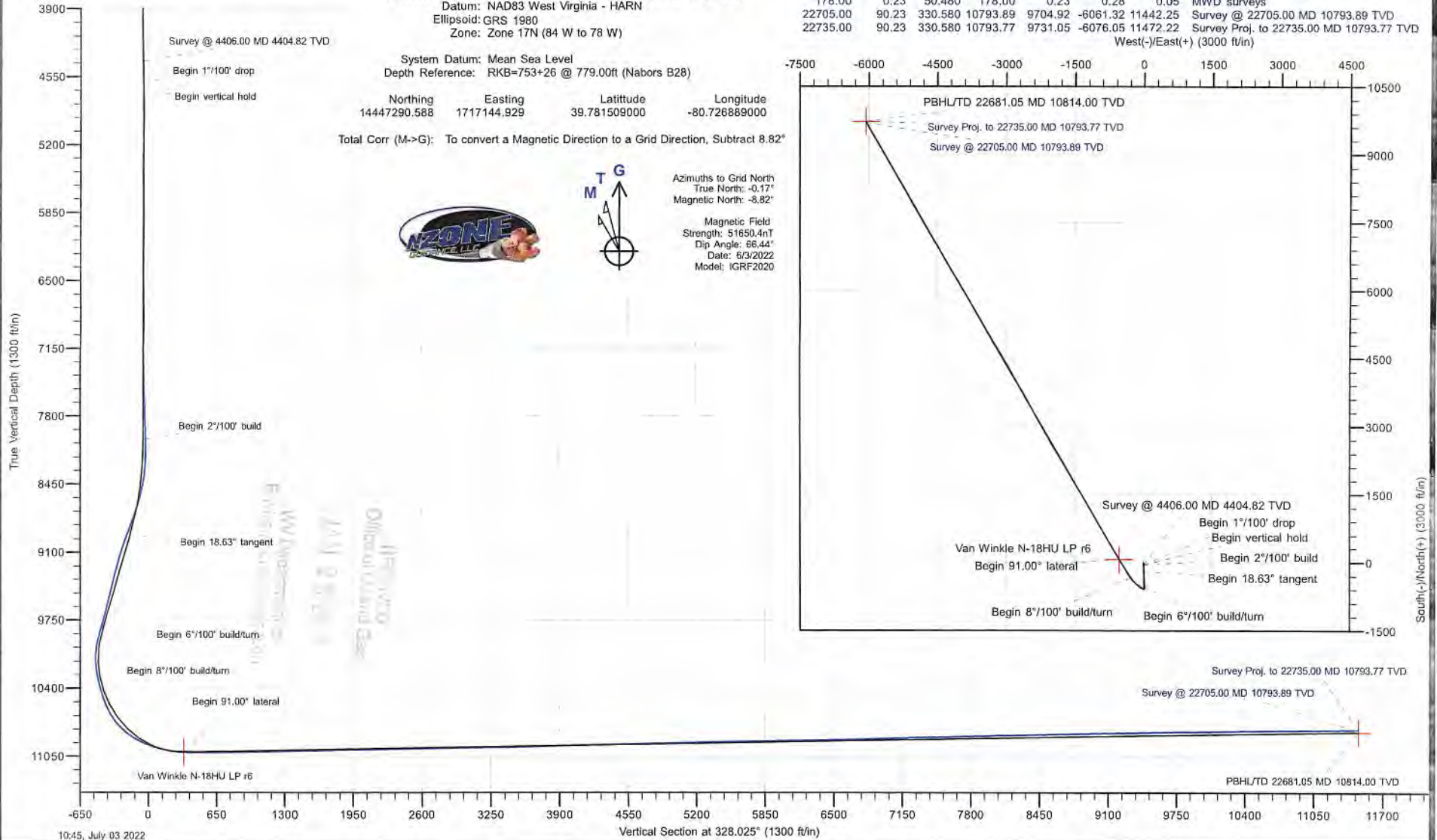
DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Van Winkle N-18HU PBHL r6	10814.00	9728.92	-6073.58	4457019.491	1711071.383	39.808276000	-80.748410000
- plan hits target center							
Van Winkle N-18HU LP r6	11008.00	65.75	-532.3114447356	334 1716612.620	39.781694000	-80.728783000	
- plan misses target center by 0.05ft at 11540.13ft MD (11008.00 TVD, 65.72 N, -532.36 E)							

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	V Sect	Annotation
178.00	0.23	50.480	178.00	0.23	0.28	0.05	MWD surveys
22705.00	90.23	330.580	10793.89	9704.92	-6061.32	11442.25	Survey @ 22705.00 MD 10793.89 TVD
22735.00	90.23	330.580	10793.77	9731.05	-6076.05	11472.22	Survey Proj. to 22735.00 MD 10793.77 TVD

West(-)/East(+) (3000 ft/in)



Azimuths to Grid North
 True North: -0.17°
 Magnetic North: -8.82°
 Magnetic Field
 Strength: 51650.4nT
 Dip Angle: 86.44°
 Date: 6/3/2022
 Model: IGRF2020

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.82°

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=753+26 @ 779.00ft (Nabors B28)

Northing: 14447290.588
 Easting: 1717144.929
 Latitude: 39.781509000
 Longitude: -80.726889000



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Project	Marshall County, West Virginia NAD83 UTM 17N		
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	Van Winkle				
Site Position:		Northing:	14,447,369.493 usft	Latitude:	39.781725330
From:	Lat/Long	Easting:	1,717,188.440 usft	Longitude:	-80.726733270
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "		

Well	Van Winkle N-18 HU (slot G)					
Well Position	+N/-S	0.00 ft	Northing:	14,447,290.588 usft	Latitude:	39.781509000
	+E/-W	0.00 ft	Easting:	1,717,144.929 usft	Longitude:	-80.726889000
Position Uncertainty	0.00 ft		Wellhead Elevation:	ft	Ground Level:	753.00 ft
Grid Convergence:	0.17 °					

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	6/3/2022	-8.65	66.44	51,650.39809539

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	328.020	

Survey Program	Date 7/3/2022				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
178.00	524.00	MWD surf (Original Hole)	MWD	MWD - Standard	
550.00	2,192.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,256.00	4,406.00	MWD 2256-4406 MD (Original Hole)	MWD	MWD - Standard	
4,438.00	22,705.00	MWD (Original Hole)	MWD	MWD - Standard	
22,735.00	22,735.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey	WV Department of Environmental Protection									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
178.00	0.23	50.480	178.00	0.23	0.28	0.05	0.13	0.13	0.00	
MWD surveys										
208.00	0.21	330.950	208.00	0.31	0.30	0.11	0.94	-0.07	-265.10	
238.00	0.13	53.630	238.00	0.38	0.30	0.17	0.77	-0.27	275.60	
267.00	0.28	11.560	267.00	0.47	0.34	0.22	0.70	0.52	-145.07	



Survey Report



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Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
298.00	0.33	4.420	298.00	0.63	0.36	0.35	0.20	0.16	-23.03
328.00	0.34	18.570	328.00	0.80	0.39	0.47	0.28	0.03	47.17
359.00	0.24	22.340	359.00	0.95	0.45	0.57	0.33	-0.32	12.16
391.00	0.28	97.520	391.00	1.00	0.55	0.56	1.00	0.13	234.94
422.00	0.22	161.370	422.00	0.94	0.64	0.45	0.87	-0.19	205.97
454.00	0.81	156.250	454.00	0.67	0.76	0.17	1.85	1.84	-16.00
486.00	1.14	142.130	485.99	0.21	1.04	-0.37	1.27	1.03	-44.13
524.00	1.06	169.020	523.98	-0.43	1.34	-1.07	1.36	-0.21	70.76
550.00	1.21	176.620	549.98	-0.94	1.40	-1.54	0.82	0.58	29.23
581.00	1.25	169.250	580.97	-1.60	1.49	-2.14	0.53	0.13	-23.77
613.00	1.27	174.390	612.96	-2.29	1.59	-2.79	0.36	0.06	16.06
644.00	1.13	195.980	643.96	-2.93	1.53	-3.30	1.52	-0.45	69.65
676.00	1.37	200.200	675.95	-3.59	1.32	-3.74	0.80	0.75	13.19
708.00	1.43	197.430	707.94	-4.33	1.06	-4.24	0.28	0.19	-8.66
739.00	1.31	195.310	738.93	-5.04	0.85	-4.73	0.42	-0.39	-6.84
771.00	1.65	206.230	770.92	-5.81	0.55	-5.22	1.38	1.06	34.13
803.00	1.49	201.960	802.91	-6.61	0.20	-5.71	0.62	-0.50	-13.34
834.00	1.48	212.620	833.90	-7.32	-0.17	-6.12	0.89	-0.03	34.39
866.00	1.37	212.980	865.89	-7.99	-0.60	-6.46	0.34	-0.34	1.13
898.00	1.33	203.060	897.88	-8.65	-0.96	-6.83	0.74	-0.13	-31.00
930.00	1.11	196.330	929.87	-9.29	-1.19	-7.25	0.82	-0.69	-21.03
961.00	0.97	183.080	960.87	-9.84	-1.29	-7.67	0.89	-0.45	-42.74
993.00	0.97	170.000	992.86	-10.38	-1.25	-8.14	0.69	0.00	-40.88
1,025.00	0.93	170.940	1,024.86	-10.90	-1.17	-8.63	0.13	-0.13	2.94
1,056.00	1.18	173.410	1,055.85	-11.47	-1.09	-9.15	0.82	0.81	7.97
1,088.00	0.86	156.080	1,087.85	-12.01	-0.96	-9.68	1.38	-1.00	-54.16
1,120.00	0.95	142.760	1,119.84	-12.44	-0.70	-10.19	0.71	0.28	-41.63
1,151.00	1.17	136.240	1,150.84	-12.88	-0.32	-10.75	0.81	0.71	-21.03
1,183.00	0.85	142.930	1,182.83	-13.30	0.05	-11.31	1.06	-1.00	20.91
1,215.00	1.04	148.700	1,214.83	-13.74	0.34	-11.83	0.66	0.59	18.03
1,247.00	0.76	139.400	1,246.83	-14.15	0.63	-12.34	0.98	-0.88	-29.06
1,278.00	0.82	162.580	1,277.82	-14.52	0.83	-12.75	1.04	0.19	74.77
1,310.00	0.70	176.860	1,309.82	-14.93	0.91	-13.15	0.70	-0.38	44.63
1,342.00	0.77	180.580	1,341.82	-15.34	0.92	-13.50	0.26	0.22	11.63
1,374.00	0.55	180.510	1,373.82	-15.71	0.91	-13.81	0.69	-0.69	-0.22
1,405.00	0.89	181.290	1,404.81	-16.10	0.91	-14.14	1.10	1.10	2.52
1,437.00	0.64	179.210	1,436.81	-16.53	0.90	-14.50	0.79	-0.78	-6.50
1,468.00	0.85	186.110	1,467.81	-16.93	0.88	-14.83	0.74	0.68	22.26
1,500.00	0.84	179.800	1,499.80	-17.40	0.86	-15.21	0.29	-0.03	-19.72
1,531.00	1.29	181.540	1,530.80	-17.97	0.85	-15.70	1.46	1.45	5.61
1,563.00	1.40	179.290	1,562.79	-18.73	0.84	-16.33	0.38	0.34	-7.03
1,593.00	1.08	177.010	1,592.78	-19.37	0.86	-16.89	1.08	-1.07	-7.60
1,625.00	1.06	177.170	1,624.78	-19.97	0.89	-17.41	0.06	-0.06	0.50
1,658.00	1.11	175.730	1,657.77	-20.59	0.93	-17.96	0.17	0.15	-4.36



Survey Report



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Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,689.00	1.11	157.180	1,688.77	-21.17	1.07	-18.53	1.15	0.00	-59.84
1,720.00	1.17	159.040	1,719.76	-21.74	1.30	-19.13	0.23	0.19	6.00
1,752.00	0.86	162.180	1,751.75	-22.28	1.49	-19.69	0.98	-0.97	9.81
1,784.00	1.13	162.120	1,783.75	-22.81	1.66	-20.22	0.84	0.84	-0.19
1,816.00	1.20	144.880	1,815.74	-23.38	1.95	-20.87	1.11	0.22	-53.88
1,847.00	1.50	159.310	1,846.73	-24.03	2.28	-21.59	1.46	0.97	46.55
1,878.00	1.72	165.550	1,877.72	-24.86	2.54	-22.43	0.91	0.71	20.13
1,909.00	1.95	166.030	1,908.71	-25.82	2.78	-23.37	0.74	0.74	1.55
1,940.00	2.07	176.670	1,939.69	-26.89	2.94	-24.37	1.26	0.39	34.32
1,971.00	2.63	173.070	1,970.66	-28.15	3.06	-25.50	1.87	1.81	-11.61
2,003.00	2.71	179.110	2,002.63	-29.64	3.16	-26.82	0.91	0.25	18.88
2,035.00	3.14	176.330	2,034.58	-31.27	3.23	-28.23	1.41	1.34	-8.69
2,066.00	3.44	179.270	2,065.53	-33.05	3.30	-29.78	1.11	0.97	9.48
2,098.00	3.20	179.390	2,097.48	-34.90	3.32	-31.36	0.75	-0.75	0.38
2,129.00	3.13	183.660	2,128.43	-36.61	3.27	-32.79	0.79	-0.23	13.77
2,161.00	2.83	181.550	2,160.39	-38.27	3.20	-34.16	1.00	-0.94	-6.59
2,192.00	2.93	180.710	2,191.35	-39.83	3.17	-35.46	0.35	0.32	-2.71
2,256.00	3.20	180.390	2,255.26	-43.25	3.13	-38.35	0.42	0.42	-0.50
2,288.00	3.44	181.180	2,287.20	-45.10	3.11	-39.90	0.76	0.75	2.47
2,320.00	3.07	181.690	2,319.15	-46.92	3.06	-41.42	1.16	-1.16	1.59
2,352.00	2.07	179.070	2,351.12	-48.35	3.05	-42.63	3.15	-3.13	-8.19
2,383.00	1.45	178.280	2,382.11	-49.31	3.07	-43.45	2.00	-2.00	-2.55
2,414.00	1.26	175.340	2,413.10	-50.04	3.11	-44.09	0.65	-0.61	-9.48
2,445.00	1.08	170.440	2,444.09	-50.67	3.18	-44.66	0.66	-0.58	-15.81
2,477.00	1.02	167.270	2,476.09	-51.24	3.30	-45.21	0.26	-0.19	-9.91
2,508.00	1.08	166.070	2,507.08	-51.79	3.43	-45.75	0.21	0.19	-3.87
2,540.00	1.09	165.290	2,539.07	-52.38	3.58	-46.33	0.06	0.03	-2.44
2,572.00	1.05	164.130	2,571.07	-52.96	3.73	-46.90	0.14	-0.13	-3.63
2,603.00	0.85	161.270	2,602.06	-53.45	3.89	-47.39	0.66	-0.65	-9.23
2,635.00	0.83	158.060	2,634.06	-53.89	4.05	-47.85	0.16	-0.06	-10.03
2,667.00	0.77	165.310	2,666.06	-54.31	4.19	-48.29	0.37	-0.19	22.66
2,699.00	0.90	177.010	2,698.05	-54.77	4.26	-48.71	0.67	0.41	36.56
2,730.00	0.98	190.350	2,729.05	-55.27	4.22	-49.12	0.75	0.26	43.03
2,762.00	1.13	199.790	2,761.04	-55.84	4.07	-49.52	0.72	0.47	29.50
2,793.00	1.20	205.320	2,792.04	-56.42	3.82	-49.88	0.43	0.23	17.84
2,824.00	1.19	206.790	2,823.03	-57.00	3.54	-50.23	0.10	-0.03	4.74
2,856.00	1.11	210.980	2,855.03	-57.56	3.23	-50.54	0.36	-0.25	13.09
2,888.00	0.98	212.830	2,887.02	-58.06	2.92	-50.80	0.42	-0.41	5.78
2,920.00	1.02	210.040	2,919.02	-58.54	2.63	-51.05	0.20	0.13	-8.72
2,950.00	0.94	216.200	2,949.01	-58.97	2.35	-51.26	0.44	-0.27	20.53
2,982.00	0.92	217.490	2,981.01	-59.38	2.04	-51.45	0.09	-0.06	4.03
3,013.00	0.97	216.590	3,012.00	-59.79	1.73	-51.63	0.17	0.16	-2.90
3,045.00	0.84	218.090	3,044.00	-60.19	1.43	-51.81	0.41	-0.41	4.69



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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,076.00	0.89	215.600	3,074.99	-60.57	1.15	-51.98	0.20	0.16	-8.03
3,108.00	0.78	216.940	3,106.99	-60.94	0.87	-52.16	0.35	-0.34	4.19
3,139.00	0.70	214.680	3,137.99	-61.27	0.64	-52.31	0.27	-0.26	-7.29
3,171.00	0.78	214.160	3,169.99	-61.61	0.40	-52.47	0.25	0.25	-1.63
3,202.00	0.66	214.280	3,200.98	-61.93	0.18	-52.63	0.39	-0.39	0.39
3,234.00	0.59	218.890	3,232.98	-62.21	-0.02	-52.76	0.27	-0.22	14.41
3,266.00	0.42	238.290	3,264.98	-62.40	-0.23	-52.81	0.75	-0.53	60.63
3,297.00	0.21	344.840	3,295.98	-62.41	-0.34	-52.76	1.68	-0.68	343.71
3,329.00	0.53	356.400	3,327.98	-62.20	-0.36	-52.57	1.02	1.00	36.13
3,359.00	0.66	16.370	3,357.98	-61.90	-0.32	-52.33	0.81	0.43	66.57
3,392.00	0.75	12.880	3,390.98	-61.50	-0.22	-52.05	0.30	0.27	-10.58
3,423.00	0.83	20.340	3,421.97	-61.10	-0.10	-51.77	0.42	0.26	24.06
3,455.00	0.83	28.290	3,453.97	-60.67	0.09	-51.52	0.36	0.00	24.84
3,487.00	0.76	35.150	3,485.97	-60.30	0.33	-51.32	0.37	-0.22	21.44
3,519.00	0.91	40.410	3,517.96	-59.93	0.61	-51.16	0.53	0.47	16.44
3,550.00	0.95	52.640	3,548.96	-59.59	0.98	-51.06	0.65	0.13	39.45
3,582.00	0.90	59.350	3,580.95	-59.30	1.40	-51.04	0.37	-0.16	20.97
3,615.00	1.01	63.800	3,613.95	-59.04	1.89	-51.08	0.40	0.33	13.48
3,646.00	1.14	66.290	3,644.94	-58.79	2.41	-51.15	0.45	0.42	8.03
3,678.00	1.30	68.990	3,676.94	-58.53	3.05	-51.26	0.53	0.50	8.44
3,710.00	1.26	77.570	3,708.93	-58.33	3.73	-51.45	0.61	-0.13	26.81
3,742.00	1.03	87.360	3,740.92	-58.24	4.36	-51.71	0.94	-0.72	30.59
3,773.00	0.97	96.850	3,771.92	-58.26	4.90	-52.01	0.57	-0.19	30.61
3,805.00	0.89	113.620	3,803.91	-58.39	5.39	-52.38	0.88	-0.25	52.41
3,837.00	0.76	127.990	3,835.91	-58.62	5.79	-52.79	0.76	-0.41	44.91
3,868.00	0.72	146.490	3,866.91	-58.91	6.06	-53.18	0.78	-0.13	59.68
3,900.00	0.79	148.010	3,898.91	-59.26	6.29	-53.60	0.23	0.22	4.75
3,932.00	0.70	155.180	3,930.90	-59.63	6.49	-54.01	0.40	-0.28	22.41
3,964.00	0.79	174.660	3,962.90	-60.02	6.59	-54.40	0.84	0.28	60.88
3,995.00	0.89	192.100	3,993.90	-60.47	6.56	-54.77	0.88	0.32	56.26
4,027.00	1.11	189.860	4,025.89	-61.02	6.45	-55.18	0.70	0.69	-7.00
4,059.00	1.10	188.350	4,057.89	-61.63	6.35	-55.64	0.10	-0.03	-4.72
4,091.00	0.97	210.010	4,089.88	-62.17	6.17	-56.00	1.28	-0.41	67.69
4,122.00	0.91	254.070	4,120.88	-62.46	5.81	-56.06	2.28	-0.19	142.13
4,154.00	0.91	268.620	4,152.87	-62.54	5.31	-55.86	0.72	0.00	45.47
4,185.00	1.14	286.420	4,183.87	-62.46	4.77	-55.50	1.26	0.74	57.42
4,217.00	1.17	302.160	4,215.86	-62.19	4.18	-54.97	0.99	0.09	49.19
4,248.00	1.25	305.930	4,246.85	-61.83	3.64	-54.37	0.36	0.26	12.16
4,280.00	1.36	314.820	4,278.85	-61.36	3.09	-53.68	0.72	0.34	27.78
4,311.00	1.38	325.390	4,309.84	-60.79	2.62	-52.95	0.82	0.06	34.10
4,343.00	1.20	324.090	4,341.83	-60.20	2.20	-52.23	0.57	-0.56	-4.06
4,375.00	0.93	335.270	4,373.82	-59.69	1.90	-51.64	1.06	-0.84	34.94
4,406.00	0.93	346.540	4,404.82	-59.22	1.73	-51.15	0.59	0.00	36.35



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,438.00	0.86	345.110	4,436.82	-58.74	1.61	-50.67	0.23	-0.22	-4.47
4,531.00	1.07	357.880	4,529.80	-57.19	1.40	-49.25	0.32	0.23	13.73
4,625.00	1.45	359.050	4,623.78	-55.13	1.35	-47.47	0.41	0.40	1.24
4,718.00	1.02	357.730	4,716.76	-53.12	1.29	-45.75	0.46	-0.46	-1.42
4,812.00	0.56	228.890	4,810.75	-52.59	0.92	-45.09	1.53	-0.49	-137.06
4,905.00	0.92	216.820	4,903.75	-53.49	0.13	-45.43	0.42	0.39	-12.98
4,999.00	0.79	207.670	4,997.74	-54.66	-0.63	-46.04	0.20	-0.14	-9.73
5,095.00	0.85	201.290	5,093.73	-55.91	-1.19	-46.80	0.11	0.06	-6.65
5,187.00	0.91	204.440	5,185.71	-57.21	-1.74	-47.61	0.08	0.07	3.42
5,280.00	1.20	212.270	5,278.70	-58.71	-2.57	-48.44	0.35	0.31	8.42
5,374.00	1.57	216.190	5,372.67	-60.58	-3.85	-49.35	0.41	0.39	4.17
5,468.00	1.03	252.460	5,466.65	-61.88	-5.42	-49.61	1.02	-0.57	38.59
5,562.00	0.94	317.210	5,560.64	-61.56	-6.75	-48.65	1.13	-0.10	68.88
5,655.00	1.25	330.070	5,653.62	-60.13	-7.77	-46.88	0.42	0.33	13.83
5,749.00	0.37	356.380	5,747.61	-58.93	-8.31	-45.59	0.99	-0.94	27.99
5,844.00	0.34	77.750	5,842.61	-58.57	-8.05	-45.42	0.49	-0.03	85.65
5,938.00	0.47	85.370	5,936.61	-58.48	-7.39	-45.69	0.15	0.14	8.11
6,030.00	0.61	90.590	6,028.60	-58.45	-6.53	-46.12	0.16	0.15	5.67
6,093.00	0.61	92.160	6,091.60	-58.47	-5.86	-46.49	0.03	0.00	2.49
6,186.00	0.62	93.910	6,184.59	-58.52	-4.86	-47.07	0.02	0.01	1.88
6,279.00	0.79	100.400	6,277.59	-58.67	-3.73	-47.79	0.20	0.18	6.98
6,372.00	1.02	99.440	6,370.57	-58.92	-2.28	-48.77	0.25	0.25	-1.03
6,465.00	1.11	110.810	6,463.56	-59.38	-0.62	-50.04	0.25	0.10	12.23
6,496.00	1.01	106.490	6,494.55	-59.56	-0.08	-50.48	0.41	-0.32	-13.94
6,590.00	0.17	88.100	6,588.55	-59.79	0.86	-51.17	0.90	-0.89	-19.56
6,684.00	0.11	73.970	6,682.55	-59.76	1.08	-51.27	0.07	-0.06	-15.03
6,872.00	0.10	57.420	6,870.55	-59.63	1.39	-51.31	0.02	-0.01	-8.80
6,964.00	0.19	305.700	6,962.55	-59.49	1.34	-51.17	0.27	0.10	-121.43
7,060.00	0.43	356.950	7,058.55	-59.04	1.19	-50.71	0.36	0.25	53.39
7,248.00	1.27	341.710	7,246.52	-56.36	0.50	-48.07	0.46	0.45	-8.11
7,342.00	1.16	334.690	7,340.50	-54.51	-0.24	-46.11	0.20	-0.12	-7.47
7,437.00	1.40	341.060	7,435.48	-52.54	-1.02	-44.03	0.29	0.25	6.71
7,529.00	1.64	349.120	7,527.45	-50.19	-1.64	-41.70	0.35	0.26	8.76
7,717.00	2.08	353.260	7,715.35	-44.16	-2.55	-36.11	0.24	0.23	2.20
7,810.00	1.79	344.540	7,808.29	-41.08	-3.13	-33.19	0.44	-0.31	-9.38
7,903.00	1.98	339.860	7,901.24	-38.17	-4.07	-30.22	0.26	0.20	-5.03
7,997.00	1.42	344.190	7,995.20	-35.53	-4.95	-27.51	0.61	-0.60	4.61
8,090.00	0.70	26.460	8,088.19	-33.91	-5.01	-26.11	1.09	-0.77	45.45
8,184.00	1.57	128.580	8,182.17	-34.20	-3.75	-27.02	1.97	0.93	108.64
8,278.00	3.77	154.630	8,276.07	-37.79	-1.41	-31.31	2.61	2.34	27.71
8,371.00	7.76	168.820	8,368.58	-46.72	1.11	-40.22	4.52	4.29	15.26
8,464.00	12.41	171.670	8,460.12	-62.78	3.78	-55.25	5.03	5.00	3.06
8,557.00	16.06	174.900	8,550.25	-85.48	6.37	-75.89	4.02	3.92	3.47
8,651.00	19.31	178.660	8,639.80	-113.98	7.89	-100.86	3.66	3.46	4.00



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,745.00	21.32	179.100	8,727.95	-146.61	8.52	-128.87	2.14	2.14	0.47
8,838.00	22.61	178.550	8,814.20	-181.39	9.24	-158.75	1.40	1.39	-0.59
8,931.00	23.94	178.050	8,899.63	-218.12	10.34	-190.49	1.45	1.43	-0.54
9,025.00	23.58	179.050	8,985.66	-255.98	11.30	-223.11	0.57	-0.38	1.06
9,118.00	20.79	177.190	9,071.77	-291.07	12.41	-253.47	3.09	-3.00	-2.00
9,211.00	17.81	175.650	9,159.53	-321.74	14.30	-280.49	3.25	-3.20	-1.66
9,303.00	16.44	175.300	9,247.45	-348.75	16.44	-304.52	1.49	-1.49	-0.38
9,396.00	15.44	177.270	9,336.87	-374.23	18.11	-327.02	1.22	-1.08	2.12
9,489.00	15.15	179.980	9,426.58	-398.75	18.70	-348.13	0.83	-0.31	2.91
9,581.00	16.13	179.870	9,515.17	-423.55	18.73	-369.19	1.07	1.07	-0.12
9,674.00	16.46	177.000	9,604.44	-449.63	19.45	-391.69	0.94	0.35	-3.09
9,767.00	16.52	173.930	9,693.62	-475.93	21.54	-415.11	0.94	0.06	-3.30
9,861.00	16.38	170.720	9,783.77	-502.30	25.09	-439.36	0.98	-0.15	-3.41
9,944.00	16.33	170.030	9,863.41	-525.35	29.00	-460.97	0.24	-0.06	-0.83
9,984.00	17.15	171.100	9,901.72	-536.71	30.88	-471.61	2.19	2.05	2.68
10,035.00	15.47	178.460	9,950.67	-550.94	32.23	-484.40	5.22	-3.29	14.43
10,086.00	12.95	191.680	10,000.12	-563.34	31.26	-494.40	8.03	-4.94	25.92
10,133.00	10.96	210.060	10,046.11	-572.37	27.95	-500.31	9.09	-4.23	39.11
10,178.00	10.52	230.060	10,090.34	-578.71	22.66	-502.88	8.30	-0.98	44.44
10,225.00	9.77	253.770	10,136.62	-582.58	15.53	-502.39	8.96	-1.60	50.45
10,273.00	9.54	276.550	10,183.96	-583.27	7.67	-498.81	7.92	-0.48	47.46
10,320.00	9.68	295.280	10,230.31	-581.14	0.22	-493.06	6.63	0.30	39.85
10,367.00	11.22	304.850	10,276.54	-576.83	-7.10	-485.53	4.93	3.28	20.36
10,414.00	12.99	309.560	10,322.49	-570.86	-14.93	-476.31	4.31	3.77	10.02
10,461.00	14.23	309.030	10,368.17	-563.85	-23.49	-465.84	2.65	2.64	-1.13
10,508.00	15.91	308.150	10,413.55	-556.24	-33.04	-454.32	3.61	3.57	-1.87
10,556.00	18.16	307.230	10,459.44	-547.65	-44.17	-441.14	4.72	4.69	-1.92
10,603.00	20.68	306.560	10,503.76	-538.27	-56.67	-426.56	5.38	5.36	-1.43
10,650.00	24.08	305.810	10,547.22	-527.71	-71.12	-409.96	7.26	7.23	-1.60
10,697.00	27.66	305.420	10,589.50	-515.78	-87.79	-391.00	7.63	7.62	-0.83
10,744.00	30.67	305.020	10,630.54	-502.57	-106.50	-369.89	6.42	6.40	-0.85
10,790.00	34.60	305.810	10,669.27	-488.19	-126.71	-346.99	8.59	8.54	1.72
10,839.00	38.58	308.410	10,708.61	-470.55	-149.97	-319.71	8.71	8.12	5.31
10,886.00	42.29	311.410	10,744.38	-450.98	-173.33	-290.74	8.91	7.89	6.38
10,934.00	46.18	314.720	10,778.77	-428.10	-197.76	-258.39	9.42	8.10	6.90
10,981.00	49.76	317.180	10,810.23	-403.00	-222.01	-224.26	8.55	7.62	5.23
11,028.00	54.04	319.920	10,839.23	-375.27	-246.46	-187.79	10.20	9.11	5.83
11,075.00	57.80	322.160	10,865.56	-345.00	-270.92	-149.16	8.92	8.00	4.77
11,122.00	60.80	323.530	10,889.56	-312.79	-295.32	-108.91	6.86	6.38	2.91
11,169.00	64.07	325.070	10,911.30	-278.96	-319.62	-67.34	7.54	6.96	3.28
11,217.00	66.81	326.220	10,931.25	-242.92	-344.25	-23.73	6.11	5.71	2.40
11,264.00	70.08	327.720	10,948.52	-206.27	-368.07	19.97	7.56	6.96	3.19
11,312.00	73.09	329.080	10,963.68	-167.49	-391.92	65.50	6.82	6.27	2.83



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,359.00	75.78	330.050	10,976.29	-128.45	-414.85	110.76	6.06	5.72	2.06
11,406.00	77.69	330.230	10,987.08	-88.78	-437.63	156.47	4.08	4.06	0.38
11,453.00	80.25	330.760	10,996.07	-48.63	-460.34	202.56	5.56	5.45	1.13
11,501.00	82.55	331.110	11,003.24	-7.15	-483.40	249.95	4.85	4.79	0.73
11,548.00	85.29	331.550	11,008.22	33.85	-505.82	296.60	5.90	5.83	0.94
11,595.00	87.23	331.730	11,011.29	75.12	-528.10	343.41	4.15	4.13	0.38
11,642.00	89.53	330.670	11,012.62	116.28	-550.73	390.31	5.39	4.89	-2.26
11,689.00	89.13	329.260	11,013.17	156.97	-574.25	437.28	3.12	-0.85	-3.00
11,783.00	89.22	329.520	11,014.52	237.86	-622.11	531.25	0.29	0.10	0.28
11,878.00	90.72	329.700	11,014.57	319.81	-670.17	626.21	1.59	1.58	0.19
11,973.00	91.25	329.700	11,012.94	401.82	-718.09	721.15	0.56	0.56	0.00
12,067.00	91.21	330.450	11,010.92	483.26	-764.97	815.07	0.80	-0.04	0.80
12,162.00	91.12	329.790	11,008.99	565.62	-812.29	909.98	0.70	-0.09	-0.69
12,256.00	90.99	330.320	11,007.26	647.06	-859.20	1,003.91	0.58	-0.14	0.56
12,351.00	90.99	328.910	11,005.61	728.99	-907.25	1,098.85	1.48	0.00	-1.48
12,445.00	91.12	330.270	11,003.88	810.05	-954.82	1,192.80	1.45	0.14	1.45
12,540.00	91.25	330.580	11,001.92	892.65	-1,001.70	1,287.70	0.35	0.14	0.33
12,634.00	91.25	330.270	10,999.87	974.38	-1,048.08	1,381.59	0.33	0.00	-0.33
12,728.00	91.38	329.960	10,997.71	1,055.86	-1,094.90	1,475.50	0.36	0.14	-0.33
12,821.00	91.38	330.100	10,995.47	1,136.40	-1,141.35	1,568.42	0.15	0.00	0.15
12,916.00	91.21	330.320	10,993.32	1,218.83	-1,188.53	1,663.33	0.29	-0.18	0.23
13,011.00	91.03	330.540	10,991.47	1,301.44	-1,235.41	1,758.22	0.30	-0.19	0.23
13,105.00	91.07	328.250	10,989.74	1,382.33	-1,283.25	1,852.18	2.44	0.04	-2.44
13,205.00	91.30	329.570	10,987.68	1,467.94	-1,334.88	1,952.14	1.34	0.23	1.32
13,299.00	91.07	329.480	10,985.73	1,548.94	-1,382.54	2,046.09	0.26	-0.24	-0.10
13,394.00	91.34	329.700	10,983.73	1,630.85	-1,430.62	2,141.03	0.37	0.28	0.23
13,488.00	91.07	329.080	10,981.76	1,711.73	-1,478.47	2,234.98	0.72	-0.29	-0.66
13,583.00	91.12	327.980	10,979.94	1,792.74	-1,528.06	2,329.96	1.16	0.05	-1.16
13,678.00	91.34	329.480	10,977.90	1,873.92	-1,577.36	2,424.93	1.60	0.23	1.58
13,772.00	91.91	330.100	10,975.24	1,955.12	-1,624.63	2,518.84	0.90	0.61	0.66
13,867.00	90.54	327.980	10,973.21	2,036.56	-1,673.49	2,613.80	2.66	-1.44	-2.23
13,962.00	90.77	329.350	10,972.12	2,117.70	-1,722.89	2,708.78	1.46	0.24	1.44
14,057.00	90.81	329.040	10,970.81	2,199.29	-1,771.54	2,803.76	0.33	0.04	-0.33
14,150.00	90.90	329.880	10,969.42	2,279.38	-1,818.79	2,896.72	0.91	0.10	0.90
14,240.00	90.59	327.580	10,968.25	2,358.29	-1,865.50	2,986.69	2.58	-0.34	-2.56
14,332.00	90.59	330.490	10,967.30	2,435.17	-1,912.83	3,078.67	3.16	0.00	3.16
14,426.00	90.54	329.610	10,966.38	2,516.61	-1,959.75	3,172.60	0.94	-0.05	-0.94
14,521.00	90.85	330.850	10,965.23	2,599.06	-2,006.92	3,267.52	1.35	0.33	1.31
14,614.00	91.43	331.510	10,963.38	2,680.53	-2,051.74	3,360.36	0.94	0.62	0.71
14,709.00	91.87	331.770	10,960.64	2,764.09	-2,096.85	3,455.13	0.54	0.46	0.27
14,803.00	91.78	330.850	10,957.65	2,846.51	-2,141.95	3,548.93	0.98	-0.10	-0.98
14,897.00	91.78	331.990	10,954.73	2,929.01	-2,186.90	3,642.72	1.21	0.00	1.21
14,990.00	91.56	330.400	10,952.02	3,010.47	-2,231.69	3,735.53	1.73	-0.24	-1.71



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
15,084.00	91.87	331.810	10,949.20	3,092.73	-2,277.09	3,829.35	1.54	0.33	1.50
15,179.00	91.74	331.460	10,946.21	3,176.28	-2,322.20	3,924.11	0.39	-0.14	-0.37
15,273.00	91.56	331.860	10,943.50	3,258.98	-2,366.80	4,017.88	0.47	-0.19	0.43
15,367.00	91.83	332.170	10,940.72	3,341.95	-2,410.89	4,111.61	0.44	0.29	0.33
15,460.00	91.07	331.420	10,938.37	3,423.88	-2,454.83	4,204.38	1.15	-0.82	-0.81
15,552.00	91.07	330.140	10,936.65	3,504.16	-2,499.73	4,296.26	1.39	0.00	-1.39
15,646.00	91.21	332.650	10,934.78	3,586.66	-2,544.72	4,390.07	2.67	0.15	2.67
15,740.00	91.25	329.740	10,932.76	3,669.00	-2,590.00	4,483.89	3.10	0.04	-3.10
15,833.00	91.30	331.290	10,930.69	3,749.93	-2,635.76	4,576.78	1.67	0.05	1.67
15,927.00	91.30	332.520	10,928.56	3,832.84	-2,680.02	4,670.54	1.31	0.00	1.31
16,021.00	91.30	332.430	10,926.43	3,916.17	-2,723.45	4,764.23	0.10	0.00	-0.10
16,115.00	91.47	329.350	10,924.16	3,998.27	-2,769.16	4,858.07	3.28	0.18	-3.28
16,209.00	91.25	330.140	10,921.92	4,079.44	-2,816.51	4,952.00	0.87	-0.23	0.84
16,303.00	91.30	330.270	10,919.83	4,160.99	-2,863.20	5,045.91	0.15	0.05	0.14
16,396.00	91.38	328.990	10,917.66	4,241.21	-2,910.21	5,138.85	1.38	0.09	-1.38
16,489.00	91.12	330.010	10,915.63	4,321.32	-2,957.40	5,231.79	1.13	-0.28	1.10
16,583.00	91.16	330.230	10,913.76	4,402.81	-3,004.22	5,325.71	0.24	0.04	0.23
16,676.00	91.30	329.920	10,911.76	4,483.39	-3,050.60	5,418.63	0.37	0.15	-0.33
16,770.00	91.12	329.660	10,909.78	4,564.61	-3,097.89	5,512.56	0.34	-0.19	-0.28
16,863.00	91.16	329.610	10,907.93	4,644.83	-3,144.89	5,605.51	0.07	0.04	-0.05
16,957.00	91.07	330.320	10,906.10	4,726.19	-3,191.93	5,699.43	0.76	-0.10	0.76
17,050.00	91.34	328.950	10,904.14	4,806.42	-3,238.93	5,792.37	1.50	0.29	-1.47
17,144.00	91.30	330.360	10,901.98	4,887.52	-3,286.41	5,886.31	1.50	-0.04	1.50
17,237.00	91.43	328.600	10,899.76	4,967.60	-3,333.62	5,979.25	1.90	0.14	-1.89
17,330.00	91.30	329.430	10,897.55	5,047.31	-3,381.48	6,072.21	0.90	-0.14	0.89
17,423.00	90.72	328.820	10,895.91	5,127.12	-3,429.20	6,165.18	0.91	-0.62	-0.66
17,517.00	90.59	329.130	10,894.83	5,207.66	-3,477.65	6,259.16	0.36	-0.14	0.33
17,611.00	90.63	329.480	10,893.83	5,288.49	-3,525.63	6,353.13	0.37	0.04	0.37
17,704.00	90.77	330.180	10,892.69	5,368.89	-3,572.36	6,446.07	0.77	0.15	0.75
17,798.00	91.38	330.180	10,890.93	5,450.42	-3,619.10	6,539.99	0.65	0.65	0.00
17,892.00	91.16	330.140	10,888.85	5,531.94	-3,665.86	6,633.90	0.24	-0.23	-0.04
17,987.00	91.96	329.390	10,886.26	5,613.99	-3,713.68	6,728.82	1.15	0.84	-0.79
18,080.00	91.65	330.930	10,883.33	5,694.61	-3,759.93	6,821.71	1.69	-0.33	1.66
18,173.00	91.56	329.960	10,880.73	5,775.48	-3,805.78	6,914.58	1.05	-0.10	-1.04
18,267.00	91.65	329.390	10,878.09	5,856.59	-3,853.22	7,008.51	0.61	0.10	-0.61
18,360.00	92.40	330.890	10,874.81	5,937.19	-3,899.50	7,101.38	1.80	0.81	1.61
18,453.00	92.67	329.960	10,870.69	6,017.99	-3,945.35	7,194.21	1.04	0.29	-1.00
18,546.00	91.30	330.140	10,867.47	6,098.52	-3,991.75	7,287.09	1.49	-1.47	0.19
18,639.00	91.25	329.350	10,865.40	6,178.83	-4,038.60	7,380.03	0.85	-0.05	-0.85
18,733.00	91.38	330.800	10,863.25	6,260.28	-4,085.48	7,473.94	1.55	0.14	1.54
18,827.00	91.43	331.110	10,860.94	6,342.43	-4,131.10	7,567.79	0.33	0.05	0.33
18,921.00	91.21	330.050	10,858.78	6,424.29	-4,177.26	7,661.67	1.15	-0.23	-1.13
19,015.00	91.25	330.050	10,856.76	6,505.72	-4,224.18	7,755.59	0.04	0.04	0.00
19,108.00	91.16	329.080	10,854.80	6,585.88	-4,271.28	7,848.53	1.05	-0.10	-1.04



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
19,201.00	91.16	330.490	10,852.92	6,666.23	-4,318.07	7,941.47	1.52	0.00	1.52	
19,296.00	91.43	330.050	10,850.77	6,748.70	-4,365.17	8,036.37	0.54	0.28	-0.46	
19,390.00	91.12	330.580	10,848.68	6,830.35	-4,411.71	8,130.27	0.65	-0.33	0.56	
19,484.00	91.16	328.420	10,846.81	6,911.32	-4,459.41	8,224.21	2.30	0.04	-2.30	
19,578.00	91.21	330.580	10,844.87	6,992.29	-4,507.10	8,318.16	2.30	0.05	2.30	
19,671.00	91.30	329.430	10,842.83	7,072.81	-4,553.58	8,411.08	1.24	0.10	-1.24	
19,765.00	91.12	329.610	10,840.84	7,153.80	-4,601.25	8,505.02	0.27	-0.19	0.19	
19,859.00	91.12	330.760	10,839.01	7,235.34	-4,647.98	8,598.94	1.22	0.00	1.22	
19,951.00	91.34	331.020	10,837.03	7,315.71	-4,692.73	8,690.80	0.37	0.24	0.28	
20,045.00	91.34	330.320	10,834.83	7,397.63	-4,738.76	8,784.67	0.74	0.00	-0.74	
20,138.00	91.07	328.380	10,832.88	7,477.62	-4,786.16	8,877.62	2.11	-0.29	-2.09	
20,232.00	91.07	330.010	10,831.12	7,558.34	-4,834.29	8,971.58	1.73	0.00	1.73	
20,325.00	90.99	329.790	10,829.45	7,638.79	-4,880.92	9,064.52	0.25	-0.09	-0.24	
20,419.00	91.56	330.490	10,827.36	7,720.29	-4,927.71	9,158.43	0.96	0.61	0.74	
20,512.00	91.65	329.350	10,824.75	7,800.73	-4,974.30	9,251.34	1.23	0.10	-1.23	
20,606.00	91.69	329.570	10,822.02	7,881.65	-5,022.05	9,345.27	0.24	0.04	0.23	
20,699.00	90.99	329.570	10,819.84	7,961.82	-5,069.14	9,438.21	0.75	-0.75	0.00	
20,793.00	90.72	330.270	10,818.44	8,043.15	-5,116.24	9,532.15	0.80	-0.29	0.74	
20,886.00	90.81	331.200	10,817.20	8,124.27	-5,161.70	9,625.03	1.00	0.10	1.00	
20,979.00	90.77	330.400	10,815.91	8,205.45	-5,207.07	9,717.92	0.86	-0.04	-0.86	
21,072.00	90.94	330.620	10,814.53	8,286.39	-5,252.85	9,810.82	0.30	0.18	0.24	
21,166.00	90.68	331.420	10,813.20	8,368.61	-5,298.38	9,904.68	0.89	-0.28	0.85	
21,259.00	90.77	331.640	10,812.02	8,450.36	-5,342.71	9,997.50	0.26	0.10	0.24	
21,352.00	90.90	330.100	10,810.66	8,531.58	-5,387.98	10,090.37	1.66	0.14	-1.66	
21,445.00	90.81	331.070	10,809.28	8,612.58	-5,433.65	10,183.26	1.05	-0.10	1.04	
21,537.00	90.99	331.590	10,807.83	8,693.29	-5,477.78	10,275.10	0.60	0.20	0.57	
21,630.00	90.77	329.830	10,806.40	8,774.39	-5,523.27	10,367.98	1.91	-0.24	-1.89	
21,722.00	90.72	329.520	10,805.21	8,853.80	-5,569.72	10,459.94	0.34	-0.05	-0.34	
21,815.00	90.54	329.830	10,804.18	8,934.07	-5,616.67	10,552.89	0.39	-0.19	0.33	
21,909.00	91.16	330.850	10,802.79	9,015.74	-5,663.18	10,646.80	1.27	0.66	1.09	
22,003.00	91.12	329.260	10,800.92	9,097.17	-5,710.09	10,740.72	1.69	-0.04	-1.69	
22,095.00	91.25	330.760	10,799.02	9,178.84	-5,756.07	10,832.64	1.64	0.14	1.63	
22,189.00	90.99	329.480	10,797.18	9,258.32	-5,802.89	10,926.56	1.39	-0.28	-1.36	
22,283.00	90.15	330.010	10,796.24	9,339.52	-5,850.25	11,020.51	1.06	-0.89	0.56	
22,376.00	90.32	329.700	10,795.86	9,419.94	-5,896.95	11,113.46	0.38	0.18	-0.33	
22,470.00	90.41	330.180	10,795.26	9,501.29	-5,944.03	11,207.41	0.52	0.10	0.51	
22,564.00	90.23	329.480	10,794.74	9,582.56	-5,991.28	11,301.36	0.77	-0.19	-0.74	
22,658.00	90.46	330.580	10,794.17	9,663.98	-6,038.23	11,395.30	1.20	0.24	1.17	
22,705.00	90.23	330.580	10,793.89	9,704.92	-6,061.32	11,442.25	0.49	-0.49	0.00	
Survey @ 22705.00 MD 10793.89 TVD										
22,735.00	90.23	330.580	10,793.77	9,731.05	-6,076.05	11,472.22	0.00	0.00	0.00	
Survey Proj. to 22735.00 MD 10793.77 TVD										



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
178.00	178.00	0.23	0.28	MWD surveys
22,705.00	10,793.89	9,704.92	-6,061.32	Survey @ 22705.00 MD 10793.89 TVD



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Project	Marshall County, West Virginia NAD83 UTM 17N		
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	Van Winkle				
Site Position:		Northing:	14,447,369.493 usft	Latitude:	39.781725330
From:	Lat/Long	Easting:	1,717,188.440 usft	Longitude:	-80.726733270
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.17 °

Well	Van Winkle N-18 HU (slot G)					
Well Position	+N/-S	0.00 ft	Northing:	14,447,290.588 usft	Latitude:	39.781509000
	+E/-W	0.00 ft	Easting:	1,717,144.929 usft	Longitude:	-80.726889000
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	753.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	6/3/2022	-8.65	66.44	51,650.39809539

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:		Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
		0.00	0.00	0.00	328.020

Survey Program	Date 7/3/2022				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
178.00	524.00	MWD surf (Original Hole)	MWD	MWD - Standard	
550.00	2,192.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,256.00	4,406.00	MWD 2256-4406 MD (Original Hole)	MWD	MWD - Standard	
4,438.00	22,705.00	MWD (Original Hole)	MWD	MWD - Standard	
22,735.00	22,735.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.000	0.00	0.00	0.00	14,447,290.588	1,717,144.929	39.781509000	-80.726889000	
178.00	0.23	50.480	178.00	0.23	0.28	14,447,290.815	1,717,145.205	39.781509622	-80.726888017	
MWD surveys										
208.00	0.21	330.950	208.00	0.31	0.30	14,447,290.902	1,717,145.224	39.781509859	-80.726887945	
238.00	0.13	53.630	238.00	0.38	0.30	14,447,290.970	1,717,145.225	39.781510047	-80.726887942	
267.00	0.28	11.560	267.00	0.47	0.34	14,447,291.059	1,717,145.266	39.781510290	-80.726887796	
298.00	0.33	4.420	298.00	0.63	0.36	14,447,291.222	1,717,145.288	39.781510739	-80.726887716	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft. (Nabors B26)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft. (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
328.00	0.34	18.570	328.00	0.80	0.39	14,447,291.392	1,717,145.323	39.781511207	-80.726887590
359.00	0.24	22.340	359.00	-0.95	0.45	14,447,291.540	1,717,145.377	39.7815111610	-80.726887396
391.00	0.28	97.520	391.00	1.00	0.55	14,447,291.591	1,717,145.480	39.781511752	-80.726887029
422.00	0.22	161.370	422.00	0.94	0.64	14,447,291.525	1,717,145.574	39.781511569	-80.726886695
454.00	0.81	156.250	454.00	0.67	0.76	14,447,291.260	1,717,145.685	39.781510839	-80.726886303
486.00	1.14	142.130	485.99	-0.21	1.04	14,447,290.802	1,717,145.971	39.781509578	-80.726885288
524.00	1.06	169.020	523.98	-0.43	1.34	14,447,290.158	1,717,146.270	39.781507809	-80.726884231
550.00	1.21	176.620	549.98	-0.94	1.40	14,447,289.648	1,717,146.332	39.781506407	-80.726884016
581.00	1.25	169.250	580.97	-1.60	1.49	14,447,288.989	1,717,146.414	39.781504597	-80.726883730
613.00	1.27	174.390	612.96	-2.29	1.59	14,447,288.293	1,717,146.514	39.781502685	-80.726883382
644.00	1.13	195.980	643.96	-2.93	1.53	14,447,287.657	1,717,146.464	39.781500940	-80.726883569
676.00	1.37	200.200	675.95	-3.59	1.32	14,447,286.995	1,717,146.245	39.781499122	-80.726884356
708.00	1.43	197.430	707.94	-4.33	1.06	14,447,286.255	1,717,145.993	39.781497092	-80.726885260
739.00	1.31	195.310	738.93	-5.04	0.85	14,447,285.544	1,717,145.784	39.781495142	-80.726886013
771.00	1.65	206.230	770.92	-5.81	0.55	14,447,284.778	1,717,145.483	39.781493041	-80.726887090
803.00	1.49	201.960	802.91	-6.61	0.20	14,447,283.979	1,717,145.124	39.781490849	-80.726888377
834.00	1.48	212.620	833.90	-7.32	-0.17	14,447,283.268	1,717,144.758	39.781488900	-80.726889689
866.00	1.37	212.980	865.89	-7.99	-0.60	14,447,282.599	1,717,144.327	39.781487066	-80.726891231
898.00	1.33	203.060	897.88	-8.65	-0.96	14,447,281.937	1,717,143.973	39.781485249	-80.726892497
930.00	1.11	196.330	929.87	-9.29	-1.19	14,447,281.297	1,717,143.740	39.781483496	-80.726893332
961.00	0.97	183.080	960.87	-9.84	-1.29	14,447,280.747	1,717,143.642	39.781481986	-80.726893689
993.00	0.97	170.000	992.86	-10.38	-1.25	14,447,280.210	1,717,143.674	39.781480510	-80.726893579
1,025.00	0.93	170.940	1,024.86	-10.90	-1.17	14,447,279.687	1,717,143.762	39.781479073	-80.726893271
1,056.00	1.18	173.410	1,055.85	-11.47	-1.09	14,447,279.121	1,717,143.838	39.781477519	-80.726893006
1,088.00	0.86	156.080	1,087.85	-12.01	-0.96	14,447,278.574	1,717,143.974	39.781476016	-80.726892531
1,120.00	0.95	142.760	1,119.84	-12.44	-0.70	14,447,278.144	1,717,144.232	39.781474831	-80.726891618
1,151.00	1.17	136.240	1,150.84	-12.88	-0.32	14,447,277.711	1,717,144.606	39.781473638	-80.726890290
1,183.00	0.85	142.930	1,182.83	-13.30	0.05	14,447,277.285	1,717,144.975	39.781472467	-80.726889981
1,215.00	1.04	148.700	1,214.83	-13.74	0.34	14,447,276.848	1,717,145.269	39.781471263	-80.726889793
1,247.00	0.76	139.400	1,246.83	-14.15	0.63	14,447,276.438	1,717,145.558	39.781470137	-80.726889615
1,278.00	0.82	162.580	1,277.82	-14.52	0.83	14,447,276.071	1,717,145.758	39.781469125	-80.726889206
1,310.00	0.70	176.860	1,309.82	-14.93	0.91	14,447,275.657	1,717,145.837	39.781467989	-80.726889529
1,342.00	0.77	180.580	1,341.82	-15.34	0.92	14,447,275.247	1,717,145.846	39.781466862	-80.726889503
1,374.00	0.55	180.510	1,373.82	-15.71	0.91	14,447,274.878	1,717,145.842	39.781465850	-80.726889519
1,405.00	0.89	181.290	1,404.81	-16.10	0.91	14,447,274.489	1,717,145.836	39.781464780	-80.726889548
1,437.00	0.64	179.210	1,436.81	-16.53	0.90	14,447,274.062	1,717,145.833	39.781463607	-80.726889563
1,468.00	0.85	186.110	1,467.81	-16.93	0.88	14,447,273.660	1,717,145.810	39.781462504	-80.726889646
1,500.00	0.84	179.800	1,499.80	-17.40	0.86	14,447,273.189	1,717,145.786	39.781461212	-80.726889139
1,531.00	1.29	181.540	1,530.80	-17.97	0.85	14,447,272.613	1,717,145.777	39.781459630	-80.726889175
1,563.00	1.40	179.290	1,562.79	-18.73	0.84	14,447,271.862	1,717,145.773	39.781457568	-80.726889201
1,593.00	1.08	177.010	1,592.78	-19.37	0.86	14,447,271.214	1,717,145.792	39.781455786	-80.726889139
1,625.00	1.06	177.170	1,624.78	-19.97	0.89	14,447,270.617	1,717,145.822	39.781454147	-80.726889038
1,658.00	1.11	175.730	1,657.77	-20.59	0.93	14,447,269.993	1,717,145.861	39.781452434	-80.726889506
1,689.00	1.11	157.180	1,688.77	-21.17	1.07	14,447,269.417	1,717,146.000	39.781450850	-80.726889548
1,720.00	1.17	159.040	1,719.76	-21.74	1.30	14,447,268.845	1,717,146.230	39.781449276	-80.7268894607
1,752.00	0.86	162.180	1,751.75	-22.28	1.49	14,447,268.311	1,717,146.420	39.781447809	-80.7268893935
1,784.00	1.13	162.120	1,783.75	-22.81	1.66	14,447,267.782	1,717,146.590	39.781446355	-80.726889334
1,816.00	1.20	144.880	1,815.74	-23.38	1.95	14,447,267.208	1,717,146.880	39.781444775	-80.7268892310
1,847.00	1.50	159.310	1,846.73	-24.03	2.28	14,447,266.562	1,717,147.210	39.781443001	-80.7268891142
1,878.00	1.72	165.550	1,877.72	-24.86	2.54	14,447,265.732	1,717,147.469	39.781440719	-80.7268890227
1,909.00	1.95	166.030	1,908.71	-25.82	2.78	14,447,264.770	1,717,147.713	39.781438074	-80.726889371
1,940.00	2.07	176.670	1,939.69	-26.89	2.94	14,447,263.699	1,717,147.873	39.781435132	-80.726889814
1,971.00	2.63	173.070	1,970.66	-28.15	3.06	14,447,262.434	1,717,147.991	39.781431657	-80.726889407
2,003.00	2.71	179.110	2,002.63	-29.64	3.16	14,447,260.949	1,717,148.091	39.781427578	-80.7268898066



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
2,035.00	3.14	176.330	2,034.58	-31.27	3.23	14,447,259.318	1,717,148.159	39.781423098	-80.726877842	
2,066.00	3.44	179.270	2,065.53	-33.05	3.30	14,447,257.541	1,717,148.225	39.781418217	-80.726877625	
2,098.00	3.20	179.390	2,097.48	-34.90	3.32	14,447,255.688	1,717,148.247	39.781413127	-80.726877568	
2,129.00	3.13	183.660	2,128.43	-36.61	3.27	14,447,253.978	1,717,148.202	39.781408432	-80.726877466	
2,161.00	2.83	181.550	2,160.39	-38.27	3.20	14,447,252.316	1,717,148.125	39.781403870	-80.726878039	
2,192.00	2.93	180.710	2,191.35	-39.83	3.17	14,447,250.759	1,717,148.095	39.781399594	-80.726878164	
2,256.00	3.20	180.390	2,255.26	-43.25	3.13	14,447,247.337	1,717,148.062	39.781390197	-80.726878317	
2,288.00	3.44	181.180	2,287.20	-45.10	3.11	14,447,245.484	1,717,148.036	39.781385108	-80.726878429	
2,320.00	3.07	181.690	2,319.15	-46.92	3.06	14,447,243.668	1,717,147.991	39.781380120	-80.726878609	
2,352.00	2.07	179.070	2,351.12	-48.35	3.05	14,447,242.234	1,717,147.975	39.781376181	-80.726878681	
2,383.00	1.45	178.280	2,382.11	-49.31	3.07	14,447,241.282	1,717,147.996	39.781373567	-80.726878617	
2,414.00	1.26	175.340	2,413.10	-50.04	3.11	14,447,240.550	1,717,148.036	39.781371557	-80.726878485	
2,445.00	1.08	170.440	2,444.09	-50.67	3.18	14,447,239.922	1,717,148.112	39.781369832	-80.726878220	
2,477.00	1.02	167.270	2,476.09	-51.24	3.30	14,447,239.347	1,717,148.225	39.781368252	-80.726877825	
2,508.00	1.08	166.070	2,507.08	-51.79	3.43	14,447,238.794	1,717,148.356	39.781366733	-80.726877364	
2,540.00	1.09	165.290	2,539.07	-52.38	3.58	14,447,238.207	1,717,148.506	39.781365119	-80.726876837	
2,572.00	1.05	164.130	2,571.07	-52.96	3.73	14,447,237.631	1,717,148.663	39.781363535	-80.726876283	
2,603.00	0.85	161.270	2,602.06	-53.45	3.89	14,447,237.140	1,717,148.815	39.781362185	-80.726875749	
2,635.00	0.83	158.060	2,634.06	-53.89	4.05	14,447,236.700	1,717,148.978	39.781360976	-80.726875174	
2,667.00	0.77	165.310	2,666.06	-54.31	4.19	14,447,236.277	1,717,149.119	39.781359813	-80.726874676	
2,699.00	0.90	177.010	2,698.05	-54.77	4.26	14,447,235.818	1,717,149.186	39.781358552	-80.726874441	
2,730.00	0.98	190.350	2,729.05	-55.27	4.22	14,447,235.314	1,717,149.152	39.781357169	-80.726874570	
2,762.00	1.13	199.790	2,761.04	-55.84	4.07	14,447,234.748	1,717,148.996	39.781355615	-80.726875132	
2,793.00	1.20	205.320	2,792.04	-56.42	3.82	14,447,234.167	1,717,148.753	39.781354022	-80.726876001	
2,824.00	1.19	206.790	2,823.03	-57.00	3.54	14,447,233.586	1,717,148.469	39.781352429	-80.726877018	
2,856.00	1.11	210.980	2,855.03	-57.56	3.23	14,447,233.024	1,717,148.160	39.781350887	-80.726878125	
2,888.00	0.98	212.830	2,887.02	-58.06	2.92	14,447,232.528	1,717,147.852	39.781349529	-80.726879226	
2,920.00	1.02	210.040	2,919.02	-58.54	2.63	14,447,232.052	1,717,147.561	39.781348222	-80.726880267	
2,950.00	0.94	216.200	2,949.01	-58.97	2.35	14,447,231.622	1,717,147.282	39.781347045	-80.726881264	
2,982.00	0.92	217.490	2,981.01	-59.38	2.04	14,447,231.206	1,717,146.971	39.781345906	-80.726882377	
3,013.00	0.97	216.590	3,012.00	-59.79	1.73	14,447,230.798	1,717,146.663	39.781344787	-80.726883478	
3,045.00	0.84	218.090	3,044.00	-60.19	1.43	14,447,230.396	1,717,146.357	39.781343686	-80.726884572	
3,076.00	0.89	215.600	3,074.99	-60.57	1.15	14,447,230.022	1,717,146.076	39.781342659	-80.726885574	
3,108.00	0.78	216.940	3,106.99	-60.94	0.87	14,447,229.645	1,717,145.801	39.781341629	-80.726886559	
3,139.00	0.70	214.680	3,137.99	-61.27	0.64	14,447,229.321	1,717,145.566	39.781340740	-80.726887397	
3,171.00	0.78	214.160	3,169.99	-61.61	0.40	14,447,228.980	1,717,145.333	39.781339805	-80.726888232	
3,202.00	0.66	214.280	3,200.98	-61.93	0.18	14,447,228.658	1,717,145.114	39.781338922	-80.726889015	
3,234.00	0.59	218.890	3,232.98	-62.21	-0.02	14,447,228.377	1,717,144.906	39.781338154	-80.726889756	
3,266.00	0.42	238.290	3,264.98	-62.40	-0.23	14,447,228.187	1,717,144.703	39.781337634	-80.726890481	
3,297.00	0.21	344.840	3,295.98	-62.41	-0.34	14,447,228.183	1,717,144.592	39.781337622	-80.726890878	
3,329.00	0.53	356.400	3,327.98	-62.20	-0.36	14,447,228.387	1,717,144.567	39.781338183	-80.726890964	
3,359.00	0.66	16.370	3,357.98	-61.90	-0.32	14,447,228.691	1,717,144.607	39.781339018	-80.726890818	
3,392.00	0.75	12.880	3,390.98	-61.50	-0.22	14,447,229.084	1,717,144.709	39.781340096	-80.726890452	
3,423.00	0.83	20.340	3,421.97	-61.10	-0.10	14,447,229.492	1,717,144.832	39.781341216	-80.726890008	
3,455.00	0.83	28.290	3,453.97	-60.67	0.09	14,447,229.914	1,717,145.022	39.781342372	-80.726889326	
3,487.00	0.76	35.150	3,485.97	-60.30	0.33	14,447,230.291	1,717,145.254	39.781343407	-80.726888496	
3,519.00	0.91	40.410	3,517.96	-59.93	0.61	14,447,230.658	1,717,145.541	39.781344413	-80.726887471	
3,550.00	0.95	52.640	3,548.96	-59.59	0.98	14,447,231.002	1,717,145.905	39.781345353	-80.726886172	
3,582.00	0.90	59.350	3,580.95	-59.30	1.40	14,447,231.291	1,717,146.332	39.781346143	-80.726884649	
3,615.00	1.01	63.800	3,613.95	-59.04	1.89	14,447,231.551	1,717,146.816	39.781346855	-80.726882924	
3,646.00	1.14	66.290	3,644.94	-58.79	2.41	14,447,231.796	1,717,147.344	39.781347522	-80.726881043	
3,678.00	1.30	68.990	3,676.94	-58.53	3.05	14,447,232.054	1,717,147.974	39.781348226	-80.726878797	
3,710.00	1.26	77.570	3,708.93	-58.33	3.73	14,447,232.260	1,717,148.656	39.781348785	-80.726876366	
3,742.00	1.03	87.360	3,740.92	-58.24	4.36	14,447,232.349	1,717,149.287	39.781349024	-80.726874119	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
3,773.00	0.97	96.850	3,771.92	-58.26	4.90	14,447,232.331	1,717,149.826	39.781348969	-80.726872201
3,805.00	0.89	113.620	3,803.91	-58.39	5.39	14,447,232.199	1,717,150.323	39.781348603	-80.726870435
3,837.00	0.76	127.990	3,835.91	-58.62	5.79	14,447,231.969	1,717,150.718	39.781347967	-80.726869032
3,868.00	0.72	146.490	3,866.91	-58.91	6.06	14,447,231.680	1,717,150.987	39.781347172	-80.726868075
3,900.00	0.79	148.010	3,898.91	-59.26	6.29	14,447,231.325	1,717,151.215	39.781346195	-80.726867268
3,932.00	0.70	155.180	3,930.90	-59.63	6.49	14,447,230.960	1,717,151.414	39.781345193	-80.726866564
3,964.00	0.79	174.660	3,962.90	-60.02	6.59	14,447,230.563	1,717,151.517	39.781344101	-80.726866203
3,995.00	0.89	192.100	3,993.90	-60.47	6.56	14,447,230.115	1,717,151.486	39.781342871	-80.726866317
4,027.00	1.11	189.860	4,025.89	-61.02	6.45	14,447,229.567	1,717,151.381	39.781341366	-80.726866697
4,059.00	1.10	188.350	4,057.89	-61.63	6.35	14,447,228.957	1,717,151.283	39.781339693	-80.726867051
4,091.00	0.97	210.010	4,089.88	-62.17	6.17	14,447,228.419	1,717,151.103	39.781338216	-80.726867698
4,122.00	0.91	254.070	4,120.88	-62.46	5.81	14,447,228.124	1,717,150.735	39.781337410	-80.726869011
4,154.00	0.91	268.620	4,152.87	-62.54	5.31	14,447,228.048	1,717,150.237	39.781337205	-80.726870786
4,185.00	1.14	286.420	4,183.87	-62.46	4.77	14,447,228.130	1,717,149.695	39.781337433	-80.726872714
4,217.00	1.17	302.160	4,215.86	-62.19	4.18	14,447,228.393	1,717,149.113	39.781336163	-80.726874782
4,248.00	1.25	305.930	4,246.85	-61.83	3.64	14,447,228.760	1,717,148.571	39.781339175	-80.726876707
4,280.00	1.36	314.820	4,278.85	-61.36	3.09	14,447,229.233	1,717,148.019	39.781340477	-80.726878666
4,311.00	1.38	325.390	4,309.84	-60.79	2.62	14,447,229.799	1,717,147.546	39.781342037	-80.726880344
4,343.00	1.20	324.090	4,341.83	-60.20	2.20	14,447,230.388	1,717,147.131	39.781343656	-80.726881816
4,375.00	0.93	335.270	4,373.82	-59.69	1.90	14,447,230.895	1,717,146.826	39.781345052	-80.726882897
4,406.00	0.93	346.540	4,404.82	-59.22	1.73	14,447,231.368	1,717,146.662	39.781346353	-80.726883474
4,438.00	0.86	345.110	4,436.82	-58.74	1.61	14,447,231.853	1,717,146.540	39.781347685	-80.726883904
4,531.00	1.07	357.880	4,529.80	-57.19	1.40	14,447,233.395	1,717,146.328	39.781351922	-80.726884640
4,625.00	1.45	359.050	4,623.78	-55.13	1.35	14,447,235.461	1,717,146.276	39.781357597	-80.726884803
4,718.00	1.02	357.730	4,716.76	-53.12	1.29	14,447,237.465	1,717,146.224	39.781363100	-80.726884968
4,812.00	0.56	228.890	4,810.75	-52.59	0.92	14,447,237.999	1,717,145.845	39.781364570	-80.726886312
4,905.00	0.92	216.820	4,903.75	-53.49	0.13	14,447,237.103	1,717,145.055	39.781362114	-80.726889133
4,999.00	0.79	207.670	4,997.74	-54.66	-0.63	14,447,235.925	1,717,144.302	39.781358885	-80.726891827
5,095.00	0.85	201.290	5,093.73	-55.91	-1.19	14,447,234.675	1,717,143.736	39.781355458	-80.726893854
5,187.00	0.91	204.440	5,185.71	-57.21	-1.74	14,447,233.374	1,717,143.186	39.781351890	-80.726895826
5,280.00	1.20	212.270	5,278.70	-58.71	-2.57	14,447,231.878	1,717,142.360	39.781347789	-80.726898781
5,374.00	1.57	216.190	5,372.67	-60.58	-3.85	14,447,230.007	1,717,141.074	39.781342660	-80.726903378
5,468.00	1.03	252.460	5,466.65	-61.88	-5.42	14,447,228.713	1,717,139.508	39.781339120	-80.726908966
5,562.00	0.94	317.210	5,560.64	-61.56	-6.75	14,447,229.024	1,717,138.179	39.781339886	-80.726913695
5,655.00	1.25	330.070	5,653.62	-60.13	-7.77	14,447,230.463	1,717,137.155	39.781343946	-80.726917325
5,749.00	0.37	356.380	5,747.61	-58.93	-8.31	14,447,231.654	1,717,136.624	39.781347223	-80.726919201
5,844.00	0.34	77.750	5,842.61	-58.57	-8.05	14,447,232.020	1,717,136.880	39.781348226	-80.726918286
5,938.00	0.47	85.370	5,936.61	-58.48	-7.39	14,447,232.111	1,717,137.537	39.781348468	-80.726915947
6,030.00	0.61	90.590	6,028.60	-58.45	-6.53	14,447,232.136	1,717,138.403	39.781348531	-80.726912865
6,093.00	0.61	92.160	6,091.60	-58.47	-5.86	14,447,232.120	1,717,139.073	39.781348481	-80.726910479
6,186.00	0.62	93.910	6,184.59	-58.52	-4.86	14,447,232.067	1,717,140.070	39.781348327	-80.726906931
6,279.00	0.79	100.400	6,277.59	-58.67	-3.73	14,447,231.917	1,717,141.202	39.781347906	-80.726902902
6,372.00	1.02	99.440	6,370.57	-58.92	-2.28	14,447,231.665	1,717,142.649	39.781347203	-80.726897753
6,465.00	1.11	110.810	6,463.56	-59.38	-0.62	14,447,231.210	1,717,144.308	39.781345937	-80.726891855
6,496.00	1.01	106.490	6,494.55	-59.56	-0.08	14,447,231.025	1,717,144.851	39.781345427	-80.726899925
6,590.00	0.17	88.100	6,588.55	-59.79	0.86	14,447,230.795	1,717,145.784	39.781344786	-80.726886604
6,684.00	0.11	73.970	6,682.55	-59.76	1.08	14,447,230.824	1,717,146.011	39.781344865	-80.726885799
6,872.00	0.10	57.420	6,870.55	-59.63	1.39	14,447,230.963	1,717,146.322	39.781345242	-80.726884688
6,964.00	0.19	305.700	6,962.55	-59.49	1.34	14,447,231.095	1,717,146.266	39.781345605	-80.726884887
7,060.00	0.43	356.950	7,058.55	-59.04	1.19	14,447,231.548	1,717,146.118	39.781346850	-80.726885410
7,248.00	1.27	341.710	7,246.52	-56.35	0.50	14,447,234.230	1,717,145.426	39.781354223	-80.726887842
7,342.00	1.16	334.690	7,340.50	-54.51	-0.24	14,447,236.079	1,717,144.693	39.781359307	-80.726890433
7,437.00	1.40	341.060	7,435.48	-52.54	-1.02	14,447,238.046	1,717,143.905	39.781364716	-80.726893216
7,529.00	1.64	349.120	7,527.45	-50.19	-1.64	14,447,240.402	1,717,143.292	39.781371191	-80.726895373



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
7,717.00	2.08	353.260	7,715.35	-44.16	-2.55	14,447,246.432	1,717,142.383	39.781387758	-80.726898541	
7,810.00	1.79	344.540	7,808.29	-41.08	-3.13	14,447,249.508	1,717,141.798	39.781396211	-80.726900590	
7,903.00	1.98	339.860	7,901.24	-38.17	-4.07	14,447,252.417	1,717,140.858	39.781404206	-80.726903906	
7,997.00	1.42	344.190	7,995.20	-35.53	-4.95	14,447,255.062	1,717,139.981	39.781411478	-80.726906997	
8,090.00	0.70	26.460	8,088.19	-33.91	-5.01	14,447,256.679	1,717,139.920	39.781415920	-80.726907196	
8,184.00	1.57	128.580	8,182.17	-34.20	-3.75	14,447,256.390	1,717,141.183	39.781415116	-80.726902705	
8,278.00	3.77	154.630	8,276.07	-37.79	-1.41	14,447,252.794	1,717,143.514	39.781405221	-80.726894447	
8,371.00	7.76	168.820	8,368.58	-46.72	1.11	14,447,243.868	1,717,146.043	39.781380686	-80.726885543	
8,464.00	12.41	171.670	8,460.12	-62.78	3.78	14,447,227.812	1,717,148.709	39.781336570	-80.726876226	
8,557.00	16.06	174.900	8,550.25	-85.48	6.37	14,447,205.104	1,717,151.301	39.781274184	-80.726867246	
8,651.00	19.31	178.660	8,639.80	-113.98	7.89	14,447,176.607	1,717,152.821	39.781195911	-80.726862146	
8,745.00	21.32	179.100	8,727.95	-146.61	8.52	14,447,143.980	1,717,153.453	39.781106303	-80.726860251	
8,838.00	22.61	178.550	8,814.20	-181.39	9.24	14,447,109.202	1,717,154.171	39.781010790	-80.726858073	
8,931.00	23.94	178.050	8,899.63	-218.12	10.34	14,447,072.472	1,717,155.265	39.780909908	-80.726854576	
9,025.00	23.58	179.050	8,985.66	-255.98	11.30	14,447,034.612	1,717,156.226	39.780805927	-80.726851568	
9,118.00	20.79	177.190	9,071.77	-291.07	12.41	14,446,999.521	1,717,157.344	39.780709548	-80.726847970	
9,211.00	17.81	175.650	9,159.53	-321.74	14.30	14,446,968.847	1,717,159.232	39.780625295	-80.726841582	
9,303.00	16.44	175.300	9,247.45	-348.75	16.44	14,446,941.842	1,717,161.366	39.780551114	-80.726834280	
9,396.00	15.44	177.270	9,336.87	-374.23	18.11	14,446,916.360	1,717,163.034	39.780481119	-80.726828619	
9,489.00	15.15	179.980	9,426.58	-398.75	18.70	14,446,891.841	1,717,163.628	39.780413779	-80.726826772	
9,581.00	16.13	179.870	9,515.17	-423.55	18.73	14,446,867.039	1,717,163.661	39.780345666	-80.726826923	
9,674.00	16.46	177.000	9,604.44	-449.63	19.45	14,446,840.963	1,717,164.380	39.780274047	-80.726824647	
9,767.00	16.52	173.930	9,693.62	-475.93	21.54	14,446,814.657	1,717,166.468	39.780201786	-80.726817502	
9,861.00	16.38	170.720	9,783.77	-502.30	25.09	14,446,788.286	1,717,170.019	39.780129335	-80.726805150	
9,944.00	16.33	170.030	9,863.41	-525.35	29.00	14,446,765.243	1,717,173.926	39.780066021	-80.726791492	
9,984.00	17.15	171.100	9,901.72	-536.71	30.88	14,446,753.878	1,717,175.812	39.780034794	-80.726784903	
10,035.00	15.47	178.460	9,950.67	-550.94	32.23	14,446,739.648	1,717,177.158	39.779995702	-80.726780265	
10,086.00	12.95	191.680	10,000.12	-563.34	31.26	14,446,727.247	1,717,176.184	39.779961654	-80.726783869	
10,133.00	10.96	210.060	10,046.11	-572.37	27.95	14,446,718.219	1,717,172.878	39.779936887	-80.726795733	
10,178.00	10.52	230.060	10,090.34	-578.71	22.66	14,446,711.877	1,717,167.584	39.779919515	-80.726814646	
10,225.00	9.77	253.770	10,136.62	-582.58	15.53	14,446,708.006	1,717,160.462	39.779908944	-80.726840037	
10,273.00	9.54	276.550	10,183.96	-583.27	7.67	14,446,707.321	1,717,152.597	39.779907130	-80.726868038	
10,320.00	9.68	295.280	10,230.31	-581.14	0.22	14,446,709.453	1,717,145.153	39.779913048	-80.726894511	
10,367.00	11.22	304.850	10,276.54	-576.83	-7.10	14,446,713.754	1,717,137.827	39.779924920	-80.726920542	
10,414.00	12.99	309.560	10,322.49	-570.86	-14.93	14,446,719.732	1,717,130.001	39.779941402	-80.726948331	
10,461.00	14.23	309.030	10,368.17	-563.85	-23.49	14,446,726.734	1,717,121.441	39.779960704	-80.726978724	
10,508.00	15.91	308.150	10,413.55	-556.24	-33.04	14,446,734.352	1,717,111.887	39.779981704	-80.727012647	
10,556.00	18.16	307.230	10,459.44	-547.65	-44.17	14,446,742.942	1,717,100.756	39.780005390	-80.727052173	
10,603.00	20.68	306.560	10,503.76	-538.27	-56.67	14,446,752.319	1,717,088.256	39.780031244	-80.727096562	
10,650.00	24.08	305.810	10,547.22	-527.71	-71.12	14,446,762.875	1,717,073.810	39.780060356	-80.727147866	
10,697.00	27.66	305.420	10,589.50	-515.78	-87.79	14,446,774.812	1,717,057.139	39.780093277	-80.727207075	
10,744.00	30.67	305.020	10,630.54	-502.57	-106.50	14,446,788.016	1,717,038.427	39.780129697	-80.727273533	
10,790.00	34.60	305.810	10,669.27	-488.19	-126.71	14,446,802.396	1,717,018.220	39.780169357	-80.727345303	
10,839.00	38.58	308.410	10,708.61	-470.55	-149.97	14,446,820.037	1,716,994.955	39.780217996	-80.727427919	
10,886.00	42.29	311.410	10,744.38	-450.98	-173.33	14,446,839.609	1,716,971.602	39.780271943	-80.727510829	
10,934.00	46.18	314.720	10,778.77	-428.10	-197.76	14,446,862.488	1,716,947.173	39.780334977	-80.727597532	
10,981.00	49.76	317.180	10,810.23	-403.00	-222.01	14,446,887.586	1,716,922.922	39.780404108	-80.727683577	
11,028.00	54.04	319.920	10,839.23	-375.27	-246.46	14,446,915.315	1,716,898.468	39.780480461	-80.727770318	
11,075.00	57.80	322.160	10,865.56	-345.00	-270.92	14,446,945.587	1,716,874.011	39.780563800	-80.727857042	
11,122.00	60.80	323.530	10,889.56	-312.79	-295.32	14,446,977.796	1,716,849.613	39.780652458	-80.727943538	
11,169.00	64.07	325.070	10,911.30	-278.96	-319.62	14,447,011.630	1,716,825.311	39.780745578	-80.728029672	
11,217.00	66.81	326.220	10,931.25	-242.92	-344.25	14,447,047.670	1,716,800.681	39.780844759	-80.728116949	
11,264.00	70.08	327.720	10,948.52	-206.27	-368.07	14,447,084.315	1,716,776.863	39.780945596	-80.728201329	
11,312.00	73.09	329.080	10,963.68	-167.49	-391.92	14,447,123.101	1,716,753.007	39.781052312	-80.728285822	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
11,359.00	75.78	330.050	10,976.29	-128.45	-414.85	14,447,162.136	1,716,730.077	39.781159702	-80.728367020	
11,406.00	77.69	330.230	10,987.08	-88.78	-437.63	14,447,201.807	1,716,707.302	39.781268840	-80.728447656	
11,453.00	80.25	330.760	10,996.07	-48.63	-460.34	14,447,241.953	1,716,684.585	39.781379280	-80.728528082	
11,501.00	82.55	331.110	11,003.24	-7.15	-483.40	14,447,283.434	1,716,661.531	39.781493390	-80.728609695	
11,548.00	85.29	331.550	11,008.22	33.85	-505.82	14,447,324.436	1,716,639.111	39.781606178	-80.728689053	
11,595.00	87.23	331.730	11,011.29	75.12	-528.10	14,447,365.705	1,716,616.835	39.781719699	-80.728767900	
11,642.00	89.53	330.670	11,012.62	116.28	-550.73	14,447,406.871	1,716,594.203	39.781832941	-80.728848012	
11,689.00	89.13	329.260	11,013.17	156.97	-574.25	14,447,447.556	1,716,570.680	39.781944868	-80.728931301	
11,783.00	89.22	329.520	11,014.52	237.86	-622.11	14,447,528.449	1,716,522.821	39.782167419	-80.729100781	
11,878.00	90.72	329.700	11,014.57	319.81	-670.17	14,447,610.393	1,716,474.764	39.782392860	-80.729270957	
11,973.00	91.25	329.700	11,012.94	401.82	-718.09	14,447,692.403	1,716,426.841	39.782618479	-80.729440655	
12,067.00	91.21	330.450	11,010.92	483.26	-764.97	14,447,773.852	1,716,379.959	39.782842547	-80.729606655	
12,162.00	91.12	329.790	11,008.99	565.62	-812.29	14,447,856.206	1,716,332.642	39.783069105	-80.729774196	
12,256.00	90.99	330.320	11,007.26	647.06	-859.20	14,447,937.643	1,716,285.728	39.783293142	-80.729940311	
12,351.00	90.99	328.910	11,005.61	728.99	-907.25	14,448,019.580	1,716,237.685	39.783518561	-80.730110443	
12,445.00	91.12	330.270	11,003.88	810.05	-954.82	14,448,100.632	1,716,190.113	39.783741545	-80.730278907	
12,540.00	91.25	330.580	11,001.92	892.65	-1,001.70	14,448,183.237	1,716,143.235	39.783968787	-80.730444887	
12,634.00	91.25	330.270	10,999.87	974.38	-1,048.08	14,448,264.970	1,716,096.851	39.784193631	-80.730609117	
12,728.00	91.38	329.960	10,997.71	1,055.86	-1,094.90	14,448,346.448	1,716,050.027	39.784417780	-80.730774917	
12,821.00	91.38	330.100	10,995.47	1,136.40	-1,141.35	14,448,426.990	1,716,003.583	39.784639351	-80.730939377	
12,916.00	91.21	330.320	10,993.32	1,218.83	-1,188.53	14,448,509.414	1,715,956.397	39.784866100	-80.731106459	
13,011.00	91.03	330.540	10,991.47	1,301.44	-1,235.41	14,448,592.025	1,715,909.525	39.785093357	-80.731272422	
13,105.00	91.07	328.250	10,989.74	1,382.33	-1,283.25	14,448,672.911	1,715,861.678	39.785315887	-80.731441870	
13,205.00	91.30	329.570	10,987.68	1,467.94	-1,334.88	14,448,758.526	1,715,810.052	39.785551434	-80.731624725	
13,299.00	91.07	329.480	10,985.73	1,548.94	-1,382.54	14,448,839.523	1,715,762.389	39.785774264	-80.731793524	
13,394.00	91.34	329.700	10,983.73	1,630.85	-1,430.62	14,448,921.435	1,715,714.312	39.785999611	-80.731963787	
13,488.00	91.07	329.080	10,981.76	1,711.73	-1,478.47	14,449,002.318	1,715,666.459	39.786222131	-80.732133266	
13,583.00	91.12	327.980	10,979.94	1,792.74	-1,528.06	14,449,083.328	1,715,616.874	39.786445014	-80.732308910	
13,678.00	91.34	329.480	10,977.90	1,873.92	-1,577.36	14,449,164.506	1,715,567.575	39.786668356	-80.732483535	
13,772.00	91.91	330.100	10,975.24	1,955.12	-1,624.63	14,449,245.706	1,715,520.297	39.786891740	-80.732650969	
13,867.00	90.54	327.980	10,973.21	2,036.56	-1,673.49	14,449,327.146	1,715,471.440	39.787115795	-80.732824019	
13,962.00	90.77	329.350	10,972.12	2,117.70	-1,722.89	14,449,408.282	1,715,422.040	39.787339020	-80.732999006	
14,057.00	90.81	329.040	10,970.81	2,199.29	-1,771.54	14,449,489.871	1,715,373.394	39.787563483	-80.733171308	
14,150.00	90.90	329.880	10,969.42	2,279.38	-1,818.79	14,449,569.959	1,715,326.143	39.787783815	-80.733338660	
14,240.00	90.59	327.580	10,968.25	2,356.29	-1,865.50	14,449,646.873	1,715,279.433	39.787995423	-80.733504118	
14,332.00	90.59	330.490	10,967.30	2,435.17	-1,912.83	14,449,725.749	1,715,232.106	39.788212422	-80.733671758	
14,426.00	90.54	329.610	10,966.38	2,516.61	-1,959.75	14,449,807.191	1,715,185.180	39.788436468	-80.733837942	
14,521.00	90.85	330.850	10,965.23	2,599.06	-2,006.92	14,449,889.646	1,715,138.015	39.788663295	-80.734004966	
14,614.00	91.43	331.510	10,963.38	2,680.53	-2,051.74	14,449,971.109	1,715,093.193	39.788887381	-80.734163663	
14,709.00	91.87	331.770	10,960.64	2,764.09	-2,096.85	14,450,054.672	1,715,048.086	39.789117235	-80.734323352	
14,803.00	91.78	330.850	10,957.65	2,846.51	-2,141.95	14,450,137.089	1,715,002.982	39.789343941	-80.734483041	
14,897.00	91.78	331.990	10,954.73	2,929.01	-2,186.90	14,450,219.594	1,714,958.037	39.789570886	-80.734642169	
14,990.00	91.56	330.400	10,952.02	3,010.47	-2,231.69	14,450,301.049	1,714,913.247	39.789794948	-80.734800754	
15,084.00	91.87	331.810	10,949.20	3,092.73	-2,277.09	14,450,383.307	1,714,867.847	39.790021221	-80.734961504	
15,179.00	91.74	331.460	10,946.21	3,176.28	-2,322.20	14,450,466.860	1,714,822.737	39.790251044	-80.735121212	
15,273.00	91.56	331.860	10,943.50	3,258.98	-2,366.80	14,450,549.559	1,714,778.133	39.790478520	-80.735279123	
15,367.00	91.83	332.170	10,940.72	3,341.95	-2,410.89	14,450,632.531	1,714,734.044	39.790706741	-80.735435203	
15,460.00	91.07	331.420	10,938.37	3,423.88	-2,454.83	14,450,714.461	1,714,690.104	39.790932098	-80.735590762	
15,552.00	91.07	330.140	10,936.65	3,504.16	-2,499.73	14,450,794.738	1,714,645.202	39.791152925	-80.735749766	
15,646.00	91.21	332.650	10,934.78	3,586.66	-2,544.72	14,450,877.241	1,714,600.211	39.791379865	-80.735909067	
15,740.00	91.25	329.740	10,932.76	3,669.00	-2,590.00	14,450,959.582	1,714,554.934	39.791606362	-80.736069384	
15,833.00	91.30	331.290	10,930.69	3,749.93	-2,635.76	14,451,040.514	1,714,509.173	39.791828994	-80.736231443	
15,927.00	91.30	332.520	10,928.56	3,832.84	-2,680.02	14,451,123.415	1,714,464.917	39.792057019	-80.736388122	
16,021.00	91.30	332.430	10,926.43	3,916.17	-2,723.45	14,451,206.754	1,714,421.488	39.792286239	-80.736541856	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
16,115.00	91.47	329.350	10,924.16	3,998.27	-2,769.16	14,451,288.846	1,714,375.777	39.792512056	-80.736703726	
16,209.00	91.25	330.140	10,921.92	4,079.44	-2,816.51	14,451,370.019	1,714,328.429	39.792735360	-80.736871435	
16,303.00	91.30	330.270	10,919.83	4,160.99	-2,863.20	14,451,451.572	1,714,281.732	39.792959705	-80.737036823	
16,396.00	91.38	328.990	10,917.66	4,241.21	-2,910.21	14,451,531.787	1,714,234.727	39.793180374	-80.737203324	
16,489.00	91.12	330.010	10,915.63	4,321.32	-2,957.40	14,451,611.898	1,714,187.538	39.793400761	-80.737370481	
16,583.00	91.16	330.230	10,913.76	4,402.81	-3,004.22	14,451,693.387	1,714,140.718	39.793624926	-80.737536311	
16,676.00	91.30	329.920	10,911.76	4,483.39	-3,050.60	14,451,773.969	1,714,094.334	39.793846600	-80.737700599	
16,770.00	91.12	329.660	10,909.78	4,564.61	-3,097.89	14,451,855.184	1,714,047.047	39.794070018	-80.737868098	
16,863.00	91.16	329.610	10,907.93	4,644.83	-3,144.89	14,451,935.410	1,714,000.044	39.794290719	-80.738034595	
16,957.00	91.07	330.320	10,906.10	4,726.19	-3,191.93	14,452,016.772	1,713,953.004	39.794514537	-80.738201216	
17,050.00	91.34	328.950	10,904.14	4,806.42	-3,238.93	14,452,096.995	1,713,906.003	39.794735227	-80.738367707	
17,144.00	91.30	330.360	10,901.98	4,887.52	-3,286.41	14,452,178.093	1,713,858.528	39.794958325	-80.738535881	
17,237.00	91.43	328.600	10,899.76	4,967.60	-3,333.62	14,452,258.182	1,713,811.314	39.795178649	-80.738703135	
17,330.00	91.30	329.430	10,897.55	5,047.31	-3,381.48	14,452,337.887	1,713,763.451	39.795397925	-80.738872708	
17,423.00	90.72	328.820	10,895.91	5,127.12	-3,429.20	14,452,417.695	1,713,715.734	39.795617479	-80.739041757	
17,517.00	90.59	329.130	10,894.83	5,207.66	-3,477.65	14,452,498.242	1,713,667.289	39.795839069	-80.739213395	
17,611.00	90.83	329.480	10,893.83	5,288.49	-3,525.63	14,452,579.067	1,713,619.307	39.796061421	-80.739383377	
17,704.00	90.77	330.180	10,892.69	5,368.89	-3,572.36	14,452,659.463	1,713,572.573	39.796282581	-80.739548929	
17,798.00	91.38	330.180	10,890.93	5,450.42	-3,619.10	14,452,741.002	1,713,525.837	39.796506881	-80.739714472	
17,892.00	91.16	330.140	10,888.85	5,531.94	-3,665.86	14,452,822.519	1,713,479.076	39.796731122	-80.739880106	
17,987.00	91.96	329.390	10,886.26	5,613.99	-3,713.68	14,452,904.564	1,713,431.258	39.796956821	-80.740049501	
18,080.00	91.65	330.930	10,883.33	5,694.61	-3,759.93	14,452,985.191	1,713,385.008	39.797178613	-80.740213330	
18,173.00	91.56	329.960	10,880.73	5,775.48	-3,805.78	14,453,066.057	1,713,339.153	39.797401058	-80.740375747	
18,267.00	91.65	329.390	10,878.09	5,856.59	-3,853.22	14,453,147.163	1,713,291.711	39.797624174	-80.740543815	
18,360.00	92.40	330.890	10,874.81	5,937.19	-3,899.50	14,453,227.763	1,713,245.438	39.797845892	-80.740707725	
18,453.00	92.67	329.960	10,870.69	6,017.99	-3,945.35	14,453,308.566	1,713,199.583	39.798068162	-80.740870151	
18,546.00	91.30	330.140	10,867.47	6,098.52	-3,991.75	14,453,389.097	1,713,153.182	39.798289689	-80.741034520	
18,639.00	91.25	329.350	10,865.40	6,178.83	-4,038.60	14,453,469.410	1,713,106.336	39.798510618	-80.741200479	
18,733.00	91.38	330.800	10,863.25	6,260.28	-4,085.48	14,453,550.854	1,713,059.457	39.798734657	-80.741366547	
18,827.00	91.43	331.110	10,860.94	6,342.43	-4,131.10	14,453,633.007	1,713,013.834	39.798960634	-80.741528134	
18,921.00	91.21	330.050	10,858.78	6,424.29	-4,177.26	14,453,714.862	1,712,967.673	39.799185794	-80.741691639	
19,015.00	91.25	330.050	10,856.76	6,505.72	-4,224.18	14,453,796.290	1,712,920.755	39.799409790	-80.741857847	
19,108.00	91.16	329.080	10,854.80	6,585.88	-4,271.28	14,453,876.457	1,712,873.656	39.799630320	-80.742024713	
19,201.00	91.16	330.490	10,852.92	6,666.23	-4,318.07	14,453,956.803	1,712,826.865	39.799851343	-80.742190482	
19,296.00	91.43	330.050	10,850.77	6,748.70	-4,365.17	14,454,036.977	1,712,779.766	39.800078210	-80.742357328	
19,390.00	91.12	330.580	10,848.68	6,830.35	-4,411.71	14,454,120.920	1,712,733.226	39.800302790	-80.742522192	
19,484.00	91.16	328.420	10,846.81	6,911.32	-4,459.41	14,454,201.892	1,712,685.529	39.800525538	-80.742691181	
19,578.00	91.21	330.580	10,844.87	6,992.29	-4,507.10	14,454,282.863	1,712,637.834	39.800748281	-80.742860168	
19,671.00	91.30	329.430	10,842.83	7,072.81	-4,553.58	14,454,363.886	1,712,591.353	39.800969786	-80.743024836	
19,765.00	91.12	329.610	10,840.84	7,153.80	-4,601.25	14,454,444.378	1,712,543.684	39.801192586	-80.743193733	
19,859.00	91.12	330.760	10,839.01	7,235.34	-4,647.98	14,454,525.919	1,712,496.956	39.801416886	-80.743359269	
19,951.00	91.34	331.020	10,837.03	7,315.71	-4,692.73	14,454,606.279	1,712,450.210	39.801637928	-80.743517767	
20,045.00	91.34	330.320	10,834.83	7,397.63	-4,738.76	14,454,688.206	1,712,403.478	39.801863284	-80.743680826	
20,138.00	91.07	328.380	10,832.88	7,477.62	-4,786.16	14,454,768.192	1,712,356.780	39.802083319	-80.743848770	
20,232.00	91.07	330.010	10,831.12	7,558.34	-4,834.29	14,454,848.913	1,712,310.651	39.802303578	-80.744019310	
20,325.00	90.99	329.790	10,829.45	7,638.79	-4,880.92	14,454,929.359	1,712,264.018	39.802526670	-80.744184528	
20,419.00	91.56	330.490	10,827.36	7,720.29	-4,927.71	14,455,010.859	1,712,217.230	39.802750856	-80.744350291	
20,512.00	91.65	329.350	10,824.75	7,800.73	-4,974.30	14,455,091.301	1,712,170.636	39.802972137	-80.744515370	
20,606.00	91.69	329.570	10,822.02	7,881.65	-5,022.05	14,455,172.226	1,712,122.892	39.803194753	-80.744684544	
20,699.00	90.99	329.570	10,819.84	7,961.82	-5,069.14	14,455,252.393	1,712,075.802	39.803415280	-80.744851396	
20,793.00	90.72	330.270	10,818.44	8,043.15	-5,116.24	14,455,333.724	1,712,028.694	39.803639004	-80.745018301	
20,886.00	90.81	331.200	10,817.20	8,124.27	-5,161.70	14,455,414.846	1,711,983.236	39.803862142	-80.745179337	
20,979.00	90.77	330.400	10,815.91	8,205.45	-5,207.07	14,455,496.019	1,711,937.869	39.804085419	-80.745340044	
21,072.00	90.94	330.620	10,814.53	8,286.39	-5,252.85	14,455,576.961	1,711,892.093	39.804308064	-80.745502214	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle N-18 HU (slot G)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle N-18 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
21,166.00	90.68	331.420	10,813.20	8,368.61	-5,298.38	14,455,659.182	1,711,846.555	39.804534220	-80.745663526
21,259.00	90.77	331.640	10,812.02	8,450.36	-5,342.71	14,455,740.928	1,711,802.226	39.804759062	-80.745820539
21,352.00	90.90	330.100	10,810.66	8,531.58	-5,387.98	14,455,822.154	1,711,756.960	39.804982483	-80.745980891
21,445.00	90.81	331.070	10,809.28	8,612.58	-5,433.65	14,455,903.155	1,711,711.291	39.805205288	-80.746142686
21,537.00	90.99	331.590	10,807.83	8,693.29	-5,477.78	14,455,983.865	1,711,667.158	39.805427282	-80.746299012
21,630.00	90.77	329.830	10,806.40	8,774.39	-5,523.27	14,456,064.962	1,711,621.667	39.805650351	-80.746460172
21,722.00	90.72	329.520	10,805.21	8,853.80	-5,569.72	14,456,144.367	1,711,575.220	39.805868779	-80.746624755
21,815.00	90.54	329.830	10,804.18	8,934.07	-5,616.67	14,456,224.638	1,711,528.267	39.806089587	-80.746791131
21,909.00	91.16	330.850	10,802.79	9,015.74	-5,663.18	14,456,306.311	1,711,481.757	39.806314243	-80.746955917
22,003.00	91.12	329.260	10,800.92	9,097.17	-5,710.09	14,456,387.743	1,711,434.846	39.806538242	-80.747122134
22,095.00	91.25	330.760	10,799.02	9,176.84	-5,756.07	14,456,467.406	1,711,388.871	39.806757374	-80.747285036
22,189.00	90.99	329.480	10,797.18	9,258.32	-5,802.89	14,456,548.893	1,711,342.051	39.806981522	-80.747450928
22,283.00	90.15	330.010	10,796.24	9,339.52	-5,850.25	14,456,630.085	1,711,294.693	39.807204861	-80.747618745
22,376.00	90.32	329.700	10,795.86	9,419.94	-5,896.95	14,456,710.506	1,711,247.990	39.807426080	-80.747784236
22,470.00	90.41	330.180	10,795.26	9,501.29	-5,944.03	14,456,791.861	1,711,200.906	39.807649867	-80.747951076
22,564.00	90.23	329.480	10,794.74	9,582.56	-5,991.28	14,456,873.126	1,711,153.665	39.807873405	-80.748118473
22,658.00	90.46	330.580	10,794.17	9,663.98	-6,038.23	14,456,954.554	1,711,106.710	39.808097391	-80.748284856
22,705.00	90.23	330.580	10,793.89	9,704.92	-6,061.32	14,456,995.492	1,711,083.623	39.808209996	-80.748366652
Survey @ 22705.00 MD 10793.89 TVD									
22,735.00	90.23	330.580	10,793.77	9,731.05	-6,076.05	14,457,021.623	1,711,068.887	39.808281872	-80.748418863
Survey Proj. to 22735.00 MD 10793.77 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
178.00	178.00	0.23	0.28	MWD surveys
22,705.00	10,793.89	9,704.92	-6,061.32	Survey @ 22705.00 MD 10793.89 TVD
22,735.00	10,793.77	9,731.05	-6,076.05	Survey Proj. to 22735.00 MD 10793.77 TVD

Checked By: _____ Approved By: _____ Date: _____