



Well: Hillrock 1S-14 HU (F)
 Site: Hillrock/Simms
 Project: Marshall County, West Virginia
 Design: rev4

SECTION DETAILS

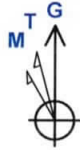
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	10309.00	13.14	88.650	10197.54	206.01	1099.39	0.00	0.000	489.22	Survey @ 10309.00 MD 10197.54 TVD
2	10524.00	13.14	88.650	10406.92	207.16	1148.25	0.00	0.000	517.39	KOP Begin 6"/100' build/turn
3	10634.02	14.03	60.534	10513.97	214.02	1172.39	6.00	-96.170	526.26	Begin 6"/100' build/turn
4	11445.40	50.00	139.058	11210.72	15.57	1480.40	6.00	90.606	869.11	Begin 8"/100' build/turn
5	11949.76	89.10	150.000	11384.00	-364.57	1744.05	8.00	17.047	1331.49	Begin 89.10° lateral
6	22333.27	89.10	150.000	11547.00	-9355.88	6935.10	0.00	0.000	1645.95	PBHL/TD 22333.27 MD/11547.00 TVD

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
209.00	0.30	326.390	209.00	0.46	-0.30	-0.55	MWD surveys
22291.00	88.81	150.910	11534.48	-9321.44	6915.75	11606.76	Survey @ 22291.00 MD 11534.48 TVD
22330.00	88.81	150.910	11535.29	-9355.51	6934.70	11645.42	Survey projected to 22330.00 MD 11535.29 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=1219+26 @ 1245.00ft (Nabors B28)

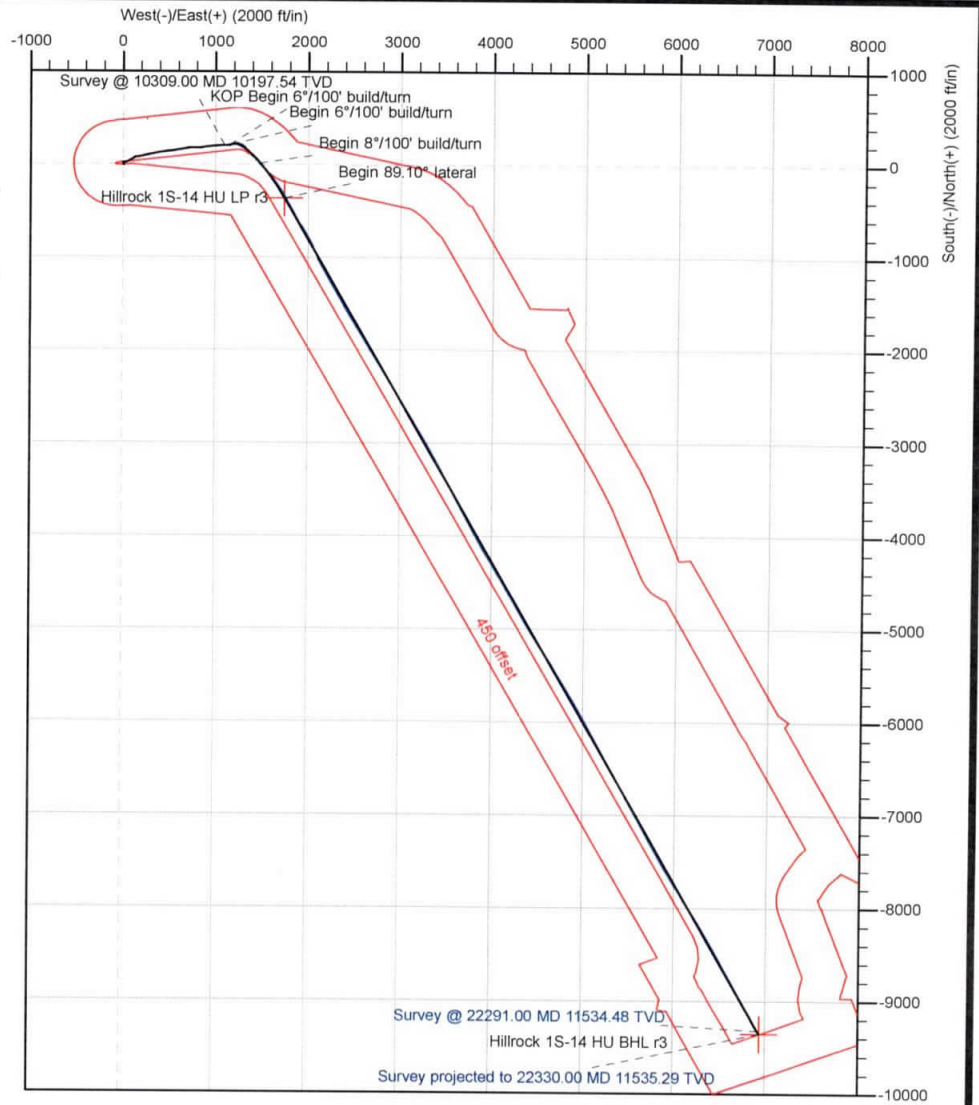
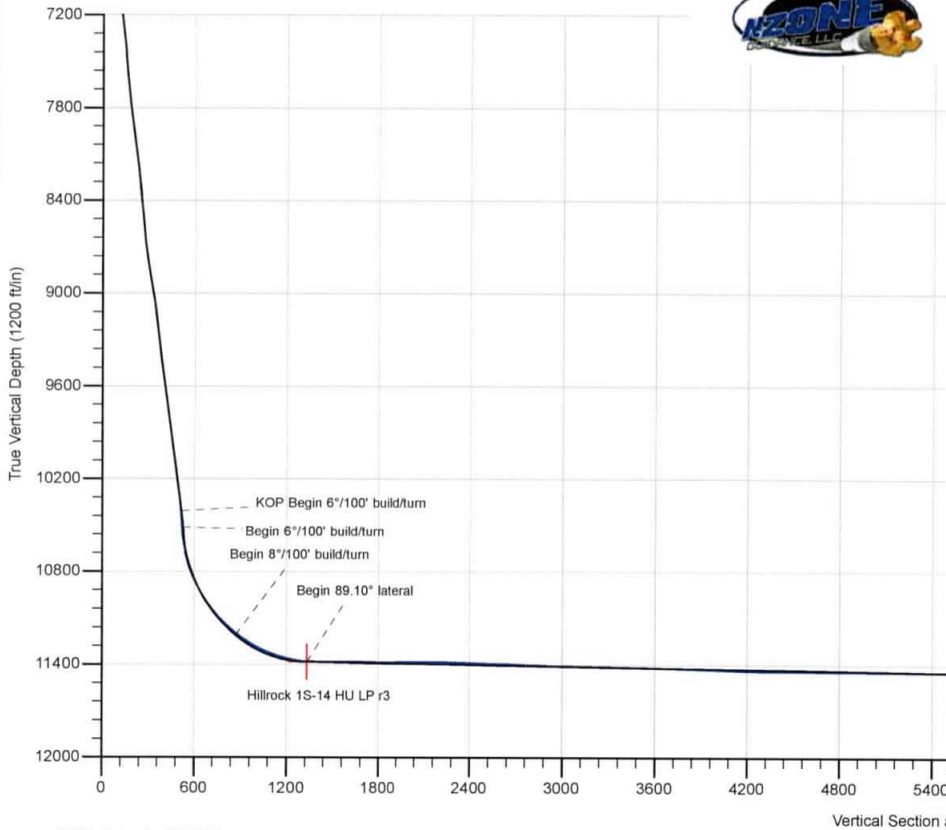
Northing	Easting	Latitude	Longitude
14434251.87	1704992.93	39.74579470	-80.77026220



Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.88°

Magnetic Field
 Strength: 51792.4snT
 Dip Angle: 66.67°
 Date: 8/24/2020
 Model: IGRF2015

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.885°





Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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	Hillrock/Simms		
Site Position:		Northing:	14,434,279.29 usft
From:	Lat/Long	Easting:	1,704,992.60 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	39.74587001
		Longitude:	-80.77026312
		Grid Convergence:	0.147 °

Well	Hillrock 1S-14 HU (F)		
Well Position	+N/-S	0.00 ft	Northing: 14,434,251.87 usft
	+E/-W	0.00 ft	Easting: 1,704,992.93 usft
Position Uncertainty		0.00 ft	Wellhead Elevation: ft
			Latitude: 39.74579470
			Longitude: -80.77026220
			Ground Level: 1,219.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	8/24/2020	-8.738	66.665	51,792.40890170

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	143.450	

Survey Program	Date 9/7/2020			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
209.00	932.00	MWD surf (Original Hole)	MWD	MWD - Standard
976.00	2,678.00	MWD int (Original Hole)	MWD	MWD - Standard
2,777.00	10,309.00	MWD (Original Hole)	MWD	MWD - Standard
10,361.00	22,291.00	MWD Lat (Original Hole)	MWD	MWD - Standard
22,330.00	22,330.00	Projection (Original Hole)	MWD	MWD - Standard

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)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
209.00	0.30	326.390	209.00	0.46	-0.30	-0.55	0.14	0.14	0.00	
MWD surveys										
241.00	0.30	332.370	241.00	0.60	-0.39	-0.71	0.10	0.00	18.69	
288.00	0.08	305.470	288.00	0.73	-0.47	-0.87	0.49	-0.47	-57.23	
332.00	0.13	321.470	332.00	0.78	-0.53	-0.94	0.13	0.11	36.36	
379.00	0.13	323.310	379.00	0.87	-0.59	-1.05	0.01	0.00	3.91	



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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)
422.00	0.08	317.780	422.00	0.93	-0.64	-1.13	0.12	-0.12	-12.86
469.00	0.09	329.820	469.00	0.99	-0.68	-1.20	0.04	0.02	25.62
513.00	0.13	275.420	513.00	1.02	-0.75	-1.27	0.24	0.09	-123.64
560.00	0.09	290.710	560.00	1.04	-0.84	-1.33	0.10	-0.09	32.53
604.00	0.08	161.600	604.00	1.02	-0.86	-1.33	0.35	-0.02	-293.43
651.00	0.18	173.730	651.00	0.92	-0.84	-1.24	0.22	0.21	25.81
695.00	0.17	177.680	695.00	0.78	-0.83	-1.13	0.04	-0.02	8.98
742.00	0.13	190.600	742.00	0.66	-0.84	-1.03	0.11	-0.09	27.49
787.00	0.17	187.790	787.00	0.55	-0.86	-0.95	0.09	0.09	-6.24
834.00	0.22	170.480	834.00	0.39	-0.85	-0.82	0.16	0.11	-36.83
882.00	0.35	158.080	882.00	0.16	-0.78	-0.59	0.30	0.27	-25.83
932.00	0.62	183.750	931.99	-0.25	-0.74	-0.24	0.68	0.54	51.34
976.00	0.92	167.750	975.99	-0.83	-0.68	0.26	0.83	0.68	-36.36
1,070.00	0.79	152.810	1,069.98	-2.15	-0.23	1.59	0.27	-0.14	-15.89
1,164.00	1.19	129.520	1,163.97	-3.35	0.82	3.18	0.60	0.43	-24.78
1,259.00	0.83	114.050	1,258.95	-4.25	2.21	4.73	0.47	-0.38	-16.28
1,353.00	0.31	354.340	1,352.95	-4.28	2.81	5.11	1.08	-0.55	-127.35
1,448.00	0.57	28.890	1,447.95	-3.61	3.01	4.69	0.38	0.27	36.37
1,542.00	0.48	13.240	1,541.94	-2.82	3.33	4.24	0.18	-0.10	-16.65
1,637.00	0.70	12.630	1,636.94	-1.86	3.55	3.61	0.23	0.23	-0.64
1,733.00	0.83	338.440	1,732.93	-0.64	3.42	2.55	0.49	0.14	-35.61
1,827.00	0.66	213.980	1,826.92	-0.46	2.87	2.07	1.41	-0.18	-132.40
1,922.00	1.89	174.700	1,921.90	-2.47	2.70	3.60	1.52	1.29	-41.35
2,016.00	2.07	146.570	2,015.85	-5.43	3.78	6.62	1.04	0.19	-29.93
2,110.00	2.59	115.550	2,109.77	-7.77	6.63	10.19	1.43	0.55	-33.00
2,205.00	2.19	97.430	2,204.69	-8.93	10.37	13.35	0.89	-0.42	-19.07
2,300.00	1.31	357.150	2,299.66	-8.08	12.12	13.70	2.89	-0.93	-105.56
2,395.00	3.12	331.400	2,394.59	-4.72	10.83	10.24	2.13	1.91	-27.11
2,489.00	3.60	330.440	2,488.43	0.09	8.14	4.78	0.51	0.51	-1.02
2,584.00	2.46	332.020	2,583.29	4.49	5.72	-0.20	1.20	-1.20	1.66
2,678.00	1.98	338.960	2,677.22	7.78	4.19	-3.76	0.58	-0.51	7.38
2,777.00	1.93	351.790	2,776.17	11.03	3.34	-6.87	0.44	-0.05	12.96
2,871.00	1.80	344.410	2,870.12	14.02	2.71	-9.65	0.29	-0.14	-7.85
2,966.00	1.23	341.420	2,965.08	16.42	1.99	-12.01	0.61	-0.60	-3.15
3,060.00	1.32	339.050	3,059.06	18.39	1.28	-14.01	0.11	0.10	-2.52
3,155.00	0.88	1.380	3,154.04	20.14	0.90	-15.64	0.64	-0.46	23.51
3,250.00	0.75	53.930	3,249.03	21.24	1.42	-16.21	0.77	-0.14	55.32
3,344.00	1.27	71.690	3,343.02	21.93	2.91	-15.88	0.64	0.55	18.89
3,438.00	2.15	88.910	3,436.98	22.29	5.66	-14.53	1.07	0.94	18.32
3,532.00	3.12	89.710	3,530.88	22.33	9.98	-12.00	1.03	1.03	0.85
3,627.00	3.96	93.310	3,625.69	22.16	15.84	-8.36	0.91	0.88	3.79
3,722.00	4.44	93.750	3,720.44	21.73	22.79	-3.88	0.51	0.51	0.46
3,816.00	4.44	87.950	3,814.16	21.62	30.06	0.53	0.48	0.00	-6.17
3,910.00	4.61	76.430	3,907.87	22.64	37.36	4.07	0.98	0.18	-12.26

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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
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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)
4,004.00	5.05	71.160	4,001.53	24.86	44.95	6.80	0.66	0.47	-5.61
4,098.00	5.36	65.890	4,095.14	27.99	52.87	9.00	0.61	0.33	-5.61
4,192.00	5.49	61.140	4,188.72	31.95	60.82	10.55	0.50	0.14	-5.05
4,290.00	5.14	61.400	4,286.30	36.32	68.78	11.79	0.36	-0.36	0.27
4,384.00	4.97	61.140	4,379.94	40.30	76.04	12.91	0.18	-0.18	-0.28
4,479.00	5.67	58.860	4,474.53	44.71	83.66	13.91	0.77	0.74	-2.40
4,573.00	6.37	55.080	4,568.01	50.10	91.91	14.49	0.86	0.74	-4.02
4,666.00	6.28	57.540	4,660.44	55.78	100.44	15.00	0.31	-0.10	2.65
4,761.00	6.76	59.640	4,754.83	61.39	109.64	15.98	0.56	0.51	2.21
4,855.00	6.11	57.190	4,848.24	66.90	118.62	16.90	0.75	-0.69	-2.61
4,902.00	5.45	56.210	4,895.00	69.50	122.58	17.17	1.42	-1.40	-2.09
4,949.00	5.01	57.540	4,941.80	71.84	126.17	17.42	0.97	-0.94	2.83
4,996.00	4.79	60.790	4,988.63	73.90	129.61	17.82	0.75	-0.47	6.91
5,044.00	4.66	62.460	5,036.47	75.78	133.09	18.38	0.39	-0.27	3.48
5,091.00	4.31	71.420	5,083.32	77.22	136.46	19.23	1.66	-0.74	19.06
5,138.00	4.70	78.020	5,130.18	78.19	140.01	20.57	1.38	0.83	14.04
5,232.00	6.46	89.090	5,223.73	79.07	149.07	25.25	2.19	1.87	11.78
5,327.00	6.24	85.660	5,318.15	79.55	159.56	31.12	0.46	-0.23	-3.61
5,420.00	6.02	81.800	5,410.62	80.62	169.43	36.13	0.50	-0.24	-4.15
5,515.00	5.19	78.810	5,505.16	82.17	178.57	40.34	0.93	-0.87	-3.15
5,608.00	4.39	78.810	5,597.84	83.68	186.19	43.66	0.86	-0.86	0.00
5,703.00	5.10	76.520	5,692.51	85.37	193.87	46.87	0.77	0.75	-2.41
5,798.00	5.41	76.080	5,787.11	87.43	202.32	50.25	0.33	0.33	-0.46
5,892.00	4.92	71.250	5,880.73	89.79	210.44	53.19	0.70	-0.52	-5.14
5,986.00	5.36	69.670	5,974.35	92.61	218.37	55.65	0.49	0.47	-1.68
6,081.00	5.45	69.580	6,068.93	95.73	226.76	58.14	0.10	0.09	-0.09
6,176.00	4.83	76.520	6,163.55	98.23	234.88	60.96	0.92	-0.65	7.31
6,271.00	5.31	82.320	6,258.18	99.75	243.12	64.65	0.74	0.51	6.11
6,366.00	6.20	79.950	6,352.70	101.23	252.53	69.06	0.97	0.94	-2.49
6,560.00	5.45	75.730	6,545.69	105.33	271.77	77.23	0.44	-0.39	-2.18
6,655.00	5.54	81.180	6,640.26	107.15	280.68	81.07	0.56	0.09	5.74
6,750.00	7.16	78.100	6,734.67	109.07	291.00	85.68	1.74	1.71	-3.24
6,845.00	9.05	77.050	6,828.72	111.97	304.08	91.14	2.00	1.99	-1.11
6,939.00	10.72	76.700	6,921.32	115.64	319.79	97.55	1.78	1.78	-0.37
7,034.00	11.60	78.890	7,014.52	119.51	337.76	105.14	1.03	0.93	2.31
7,128.00	12.39	82.320	7,106.47	122.68	357.03	114.07	1.13	0.84	3.65
7,222.00	13.32	84.430	7,198.12	125.08	377.80	124.51	1.11	0.99	2.24
7,317.00	13.01	83.470	7,290.62	127.36	399.32	135.50	0.40	-0.33	-1.01
7,412.00	12.08	78.980	7,383.35	130.47	419.70	145.13	1.42	-0.98	-4.73
7,506.00	10.94	75.820	7,475.46	134.54	438.01	152.76	1.39	-1.21	-3.36
7,694.00	12.00	80.830	7,659.71	142.02	474.60	168.54	0.77	0.56	2.66
7,789.00	13.01	81.710	7,752.45	145.14	494.93	178.15	1.08	1.06	0.93
7,884.00	14.37	85.840	7,844.75	147.54	517.27	189.53	1.76	1.43	4.35

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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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)
7,978.00	14.19	85.140	7,935.85	149.36	540.38	201.83	0.27	-0.19	-0.74
8,073.00	14.63	84.170	8,027.86	151.56	563.92	214.07	0.53	0.46	-1.02
8,167.00	14.41	82.150	8,118.86	154.37	587.32	225.75	0.59	-0.23	-2.15
8,262.00	14.63	79.420	8,210.83	158.18	610.82	236.68	0.76	0.23	-2.87
8,356.00	13.80	78.190	8,301.95	162.66	633.47	246.58	0.94	-0.88	-1.31
8,451.00	12.52	76.170	8,394.45	167.44	654.56	255.29	1.43	-1.35	-2.13
8,546.00	12.30	74.940	8,487.23	172.53	674.33	262.98	0.36	-0.23	-1.29
8,640.00	12.92	79.770	8,578.97	177.00	694.34	271.31	1.30	0.66	5.14
8,735.00	13.10	84.340	8,671.53	179.94	715.50	281.54	1.10	0.19	4.81
8,829.00	14.41	88.210	8,762.83	181.36	737.79	293.68	1.70	1.39	4.12
8,924.00	15.34	91.380	8,854.65	181.43	762.17	308.14	1.30	0.98	3.34
9,019.00	15.78	90.580	8,946.17	180.99	787.65	323.67	0.52	0.46	-0.84
9,114.00	14.68	89.180	9,037.83	181.04	812.61	338.49	1.22	-1.16	-1.47
9,209.00	13.71	85.400	9,129.93	182.11	835.87	351.48	1.41	-1.02	-3.98
9,303.00	13.84	81.180	9,221.23	184.73	858.08	362.61	1.08	0.14	-4.49
9,396.00	13.84	80.830	9,311.53	188.21	880.05	372.90	0.09	0.00	-0.38
9,491.00	14.50	82.500	9,403.64	191.57	903.06	383.90	0.82	0.69	1.76
9,586.00	15.21	83.030	9,495.46	194.63	927.22	395.83	0.76	0.75	0.56
9,681.00	14.19	85.570	9,587.35	197.05	951.20	408.17	1.27	-1.07	2.67
9,775.00	13.49	86.100	9,678.63	198.68	973.63	420.21	0.76	-0.74	0.56
9,869.00	13.54	86.810	9,770.02	200.04	995.55	432.18	0.18	0.05	0.76
9,963.00	13.80	87.330	9,861.36	201.17	1,017.74	444.48	0.31	0.28	0.55
10,056.00	14.02	87.070	9,951.63	202.27	1,040.07	456.90	0.25	0.24	-0.28
10,151.00	13.80	84.700	10,043.85	203.90	1,062.84	469.15	0.64	-0.23	-2.49
10,245.00	13.27	87.160	10,135.24	205.47	1,084.78	480.95	0.83	-0.56	2.62
10,309.00	13.14	88.650	10,197.54	206.01	1,099.39	489.22	0.57	-0.20	2.33
10,361.00	13.37	90.960	10,248.16	206.05	1,111.31	496.29	1.11	0.44	4.44
10,456.00	13.54	81.120	10,340.56	207.58	1,133.29	508.14	2.41	0.18	-10.36
10,503.00	13.28	80.240	10,386.28	209.34	1,144.04	513.13	0.70	-0.55	-1.87
10,551.00	13.72	70.220	10,432.96	212.20	1,154.83	517.26	4.95	0.92	-20.88
10,598.00	14.33	64.250	10,478.56	216.62	1,165.32	519.96	3.34	1.30	-12.70
10,646.00	15.21	66.000	10,524.98	221.76	1,176.42	522.44	2.06	1.83	3.65
10,693.00	15.83	77.960	10,570.28	225.61	1,188.32	526.44	6.92	1.32	25.45
10,741.00	16.44	84.460	10,616.39	227.63	1,201.49	532.65	3.97	1.27	13.54
10,788.00	17.32	87.980	10,661.36	228.52	1,215.10	540.05	2.87	1.87	7.49
10,835.00	20.49	94.130	10,705.83	228.17	1,230.30	549.38	7.96	6.74	13.09
10,882.00	22.77	104.670	10,749.53	225.27	1,247.32	561.84	9.57	4.85	22.43
10,930.00	22.95	111.880	10,793.77	219.43	1,264.99	577.05	5.84	0.38	15.02
10,977.00	24.36	122.430	10,836.84	210.81	1,281.68	593.92	9.48	3.00	22.45
11,025.00	26.91	129.640	10,880.12	198.57	1,298.41	613.71	8.39	5.31	15.02
11,072.00	29.19	131.920	10,921.60	184.13	1,315.13	635.28	5.36	4.85	4.85
11,119.00	31.74	133.500	10,962.11	167.96	1,332.63	658.69	5.69	5.43	3.36
11,167.00	34.65	135.260	11,002.27	149.57	1,351.40	684.63	6.39	6.06	3.67

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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)
11,213.00	37.81	136.840	11,039.37	129.99	1,370.25	711.59	7.16	6.87	3.43
11,260.00	41.50	137.370	11,075.55	108.02	1,390.66	741.40	7.88	7.85	1.13
11,307.00	44.32	137.190	11,109.97	84.51	1,412.37	773.21	6.01	6.00	-0.38
11,354.00	47.13	136.490	11,142.78	59.97	1,435.39	806.63	6.07	5.98	-1.49
11,400.00	49.68	136.840	11,173.32	34.95	1,458.99	840.79	5.57	5.54	0.76
11,447.00	52.76	137.900	11,202.75	7.99	1,483.80	877.22	6.78	6.55	2.26
11,495.00	54.96	139.130	11,231.06	-21.05	1,509.47	915.84	5.03	4.58	2.56
11,542.00	58.04	139.830	11,257.00	-50.84	1,534.93	954.93	6.67	6.55	1.49
11,589.00	61.55	140.180	11,280.64	-81.96	1,561.03	995.47	7.50	7.47	0.74
11,636.00	64.54	141.240	11,301.94	-114.38	1,587.55	1,037.31	6.67	6.36	2.26
11,684.00	67.80	142.290	11,321.33	-148.87	1,614.71	1,081.19	7.08	6.79	2.19
11,731.00	71.05	143.870	11,337.85	-184.04	1,641.14	1,125.19	7.60	6.91	3.36
11,779.00	74.30	145.980	11,352.14	-221.54	1,667.46	1,170.98	7.97	6.77	4.40
11,826.00	76.85	147.390	11,363.85	-259.58	1,692.45	1,216.42	6.15	5.43	3.00
11,873.00	79.49	148.800	11,373.49	-298.63	1,716.76	1,262.27	6.34	5.62	3.00
11,920.00	84.06	149.500	11,380.21	-338.55	1,740.60	1,308.54	9.83	9.72	1.49
11,967.00	89.25	150.910	11,382.95	-379.25	1,763.91	1,355.12	11.44	11.04	3.00
12,062.00	90.66	151.430	11,383.02	-462.48	1,809.72	1,449.26	1.58	1.48	0.55
12,156.00	90.48	151.430	11,382.09	-545.03	1,854.67	1,542.34	0.19	-0.19	0.00
12,250.00	89.16	148.970	11,382.38	-626.59	1,901.38	1,635.68	2.97	-1.40	-2.62
12,345.00	88.46	148.800	11,384.36	-707.90	1,950.46	1,730.23	0.76	-0.74	-0.18
12,443.00	89.60	149.670	11,386.02	-792.10	2,000.58	1,827.72	1.46	1.16	0.89
12,537.00	90.66	153.890	11,385.80	-874.90	2,045.02	1,920.70	4.63	1.13	4.49
12,632.00	89.87	154.950	11,385.36	-960.59	2,086.04	2,013.96	1.39	-0.83	1.12
12,725.00	90.31	152.840	11,385.22	-1,044.10	2,126.96	2,105.42	2.32	0.47	-2.27
12,756.00	90.13	153.310	11,385.10	-1,071.74	2,140.99	2,135.98	1.62	-0.58	1.52
12,788.00	89.78	151.610	11,385.12	-1,100.11	2,155.79	2,167.58	5.42	-1.09	-5.31
12,819.00	89.60	151.610	11,385.29	-1,127.38	2,170.53	2,198.27	0.58	-0.58	0.00
12,851.00	89.43	150.910	11,385.56	-1,155.44	2,185.91	2,229.97	2.25	-0.53	-2.19
12,883.00	88.81	150.730	11,386.05	-1,183.37	2,201.51	2,261.70	2.02	-1.94	-0.56
12,914.00	88.46	150.380	11,386.79	-1,210.36	2,216.75	2,292.46	1.60	-1.13	-1.13
12,946.00	88.64	150.380	11,387.60	-1,238.17	2,232.56	2,324.21	0.56	0.56	0.00
13,006.00	87.58	151.780	11,389.58	-1,290.66	2,261.56	2,383.65	2.93	-1.77	2.33
13,100.00	88.37	149.500	11,392.90	-1,372.53	2,307.61	2,476.84	2.57	0.84	-2.43
13,195.00	88.11	149.500	11,395.82	-1,454.34	2,355.81	2,571.27	0.27	-0.27	0.00
13,290.00	87.76	149.500	11,399.24	-1,536.14	2,403.99	2,665.68	0.37	-0.37	0.00
13,384.00	88.46	149.150	11,402.34	-1,616.95	2,451.92	2,759.13	0.83	0.74	-0.37
13,478.00	88.46	149.670	11,404.87	-1,697.84	2,499.74	2,852.59	0.55	0.00	0.55
13,573.00	88.64	149.150	11,407.27	-1,779.59	2,548.07	2,947.05	0.58	0.19	-0.55
13,667.00	89.16	149.150	11,409.08	-1,860.27	2,596.26	3,040.56	0.55	0.55	0.00
13,762.00	88.72	149.320	11,410.84	-1,941.89	2,644.85	3,135.06	0.50	-0.46	0.18
13,857.00	88.72	148.970	11,412.96	-2,023.42	2,693.56	3,229.57	0.37	0.00	-0.37
13,952.00	88.90	149.150	11,414.93	-2,104.89	2,742.39	3,324.09	0.27	0.19	0.19
14,046.00	88.99	148.970	11,416.66	-2,185.50	2,790.71	3,417.63	0.21	0.10	-0.19

Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Hillrock/Simms
Well: Hillrock 1S-14 HU (F)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Hillrock 1S-14 HU (F)
TVD Reference: RKB=1219+26 @ 1245.00ft (Nabors B28)
MD Reference: RKB=1219+26 @ 1245.00ft (Nabors B28)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Aug1919_v14

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)
14,141.00	88.55	148.970	11,418.70	-2,266.88	2,839.67	3,512.17	0.46	-0.46	0.00
14,236.00	88.81	148.970	11,420.89	-2,348.27	2,888.63	3,606.70	0.27	0.27	0.00
14,331.00	88.20	148.800	11,423.37	-2,429.57	2,937.70	3,701.24	0.67	-0.64	-0.18
14,425.00	88.37	149.320	11,426.18	-2,510.16	2,986.01	3,794.75	0.58	0.18	0.55
14,520.00	87.93	148.800	11,429.25	-2,591.60	3,034.83	3,889.24	0.72	-0.46	-0.55
14,615.00	88.11	149.320	11,432.53	-2,673.03	3,083.64	3,983.73	0.58	0.19	0.55
14,709.00	87.49	149.500	11,436.14	-2,753.89	3,131.44	4,077.15	0.69	-0.66	0.19
14,804.00	88.64	149.320	11,439.35	-2,835.62	3,179.76	4,171.58	1.23	1.21	-0.19
14,899.00	89.25	148.800	11,441.10	-2,917.09	3,228.59	4,266.11	0.84	0.64	-0.55
14,993.00	88.90	148.620	11,442.61	-2,997.41	3,277.41	4,359.70	0.42	-0.37	-0.19
15,088.00	89.87	152.140	11,443.63	-3,079.97	3,324.35	4,453.99	3.84	1.02	3.71
15,183.00	89.69	150.910	11,444.00	-3,163.48	3,369.64	4,548.04	1.31	-0.19	-1.29
15,277.00	90.13	150.910	11,444.15	-3,245.62	3,415.34	4,641.25	0.47	0.47	0.00
15,372.00	90.13	151.260	11,443.93	-3,328.78	3,461.28	4,735.41	0.37	0.00	0.37
15,467.00	90.13	151.080	11,443.71	-3,412.00	3,507.09	4,829.54	0.19	0.00	-0.19
15,562.00	89.34	150.730	11,444.15	-3,495.01	3,553.28	4,923.74	0.91	-0.83	-0.37
15,657.00	89.69	151.260	11,444.96	-3,578.10	3,599.34	5,017.91	0.67	0.37	0.56
15,752.00	89.34	151.430	11,445.76	-3,661.46	3,644.90	5,112.01	0.41	-0.37	0.18
15,846.00	89.08	151.080	11,447.06	-3,743.86	3,690.10	5,205.13	0.46	-0.28	-0.37
15,941.00	89.43	150.730	11,448.29	-3,826.87	3,736.29	5,299.32	0.52	0.37	-0.37
16,036.00	89.43	151.430	11,449.24	-3,910.02	3,782.23	5,393.47	0.74	0.00	0.74
16,131.00	89.43	151.430	11,450.18	-3,993.45	3,827.66	5,487.55	0.00	0.00	0.00
16,225.00	89.16	151.430	11,451.34	-4,075.99	3,872.61	5,580.63	0.29	-0.29	0.00
16,320.00	90.13	149.500	11,451.93	-4,158.64	3,919.44	5,674.91	2.27	1.02	-2.03
16,415.00	88.55	148.800	11,453.02	-4,240.19	3,968.15	5,769.43	1.82	-1.66	-0.74
16,509.00	89.25	149.150	11,454.83	-4,320.73	4,016.58	5,862.98	0.83	0.74	0.37
16,604.00	88.81	149.320	11,456.44	-4,402.35	4,065.17	5,957.48	0.50	-0.46	0.18
16,698.00	88.72	149.320	11,458.46	-4,483.17	4,113.12	6,050.97	0.10	-0.10	0.00
16,793.00	88.20	150.910	11,461.01	-4,565.51	4,160.44	6,145.29	1.76	-0.55	1.67
16,887.00	88.99	150.550	11,463.32	-4,647.48	4,206.38	6,238.50	0.92	0.84	-0.38
16,982.00	88.90	150.730	11,465.07	-4,730.26	4,252.95	6,332.74	0.21	-0.09	0.19
17,076.00	89.52	150.380	11,466.36	-4,812.11	4,299.16	6,426.00	0.76	0.66	-0.37
17,171.00	90.31	150.200	11,466.51	-4,894.63	4,346.24	6,520.33	0.85	0.83	-0.19
17,266.00	89.34	147.740	11,466.80	-4,976.02	4,395.21	6,614.88	2.78	-1.02	-2.59
17,361.00	89.69	148.270	11,467.60	-5,056.59	4,445.54	6,709.57	0.67	0.37	0.56
17,455.00	89.34	147.920	11,468.40	-5,136.38	4,495.22	6,803.26	0.53	-0.37	-0.37
17,550.00	89.52	148.970	11,469.34	-5,217.33	4,544.93	6,897.90	1.12	0.19	1.11
17,645.00	88.81	148.620	11,470.73	-5,298.58	4,594.15	6,992.47	0.83	-0.75	-0.37
17,740.00	88.90	147.920	11,472.62	-5,379.36	4,644.10	7,087.12	0.74	0.09	-0.74
17,834.00	89.43	148.090	11,473.99	-5,459.08	4,693.90	7,180.81	0.59	0.56	0.18
17,929.00	89.43	148.800	11,474.94	-5,540.02	4,743.61	7,275.44	0.75	0.00	0.75
18,023.00	88.64	147.920	11,476.52	-5,620.04	4,792.91	7,369.08	1.26	-0.84	-0.94
18,118.00	88.64	149.850	11,478.78	-5,701.34	4,841.99	7,463.62	2.03	0.00	2.03

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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)
18,213.00	89.16	150.910	11,480.60	-5,783.91	4,888.93	7,557.91	1.24	0.55	1.12
18,308.00	89.08	150.910	11,482.06	-5,866.92	4,935.11	7,652.10	0.08	-0.08	0.00
18,403.00	88.99	150.730	11,483.66	-5,949.85	4,981.43	7,746.30	0.21	-0.09	-0.19
18,497.00	88.99	150.730	11,485.32	-6,031.84	5,027.38	7,839.53	0.00	0.00	0.00
18,592.00	89.16	150.550	11,486.85	-6,114.63	5,073.95	7,933.77	0.26	0.18	-0.19
18,686.00	88.99	150.730	11,488.37	-6,196.54	5,120.03	8,027.01	0.26	-0.18	0.19
18,781.00	89.25	150.910	11,489.83	-6,279.47	5,166.34	8,121.22	0.33	0.27	0.19
18,875.00	89.43	150.380	11,490.91	-6,361.40	5,212.42	8,214.47	0.60	0.19	-0.56
18,969.00	89.60	150.730	11,491.71	-6,443.25	5,258.63	8,307.75	0.41	0.18	0.37
19,064.00	89.52	150.380	11,492.43	-6,525.98	5,305.33	8,402.01	0.38	-0.08	-0.37
19,158.00	89.43	151.080	11,493.30	-6,607.97	5,351.28	8,495.25	0.75	-0.10	0.74
19,252.00	89.52	149.670	11,494.16	-6,689.68	5,397.75	8,588.56	1.50	0.10	-1.50
19,347.00	89.52	151.430	11,494.95	-6,772.40	5,444.45	8,682.82	1.85	0.00	1.85
19,442.00	89.52	150.380	11,495.75	-6,855.41	5,490.64	8,777.02	1.11	0.00	-1.11
19,536.00	88.81	151.260	11,497.12	-6,937.47	5,536.47	8,870.23	1.20	-0.76	0.94
19,631.00	88.90	150.730	11,499.02	-7,020.54	5,582.52	8,964.39	0.57	0.09	-0.56
19,726.00	88.99	150.730	11,500.77	-7,103.39	5,628.96	9,058.61	0.09	0.09	0.00
19,821.00	89.16	150.910	11,502.30	-7,186.33	5,675.28	9,152.81	0.26	0.18	0.19
19,916.00	88.99	150.550	11,503.83	-7,269.19	5,721.72	9,247.03	0.42	-0.18	-0.38
20,011.00	88.81	150.910	11,505.66	-7,352.04	5,768.16	9,341.25	0.42	-0.19	0.38
20,106.00	89.60	150.550	11,506.98	-7,434.90	5,814.60	9,435.47	0.91	0.83	-0.38
20,201.00	89.34	150.910	11,507.85	-7,517.77	5,861.05	9,529.70	0.47	-0.27	0.38
20,295.00	90.40	149.500	11,508.07	-7,599.34	5,907.75	9,623.04	1.88	1.13	-1.50
20,389.00	88.90	147.740	11,508.64	-7,679.59	5,956.69	9,716.65	2.46	-1.60	-1.87
20,484.00	89.16	148.620	11,510.25	-7,760.30	6,006.78	9,811.32	0.97	0.27	0.93
20,579.00	88.99	148.270	11,511.78	-7,841.24	6,056.48	9,905.94	0.41	-0.18	-0.37
20,673.00	88.90	148.440	11,513.51	-7,921.25	6,105.79	9,999.58	0.20	-0.10	0.18
20,768.00	89.08	148.620	11,515.19	-8,002.26	6,155.38	10,094.19	0.27	0.19	0.19
20,862.00	88.72	148.440	11,516.99	-8,082.42	6,204.44	10,187.81	0.43	-0.38	-0.19
20,956.00	89.60	148.800	11,518.37	-8,162.66	6,253.39	10,281.41	1.01	0.94	0.38
21,050.00	89.34	148.270	11,519.24	-8,242.84	6,302.45	10,375.04	0.63	-0.28	-0.56
21,145.00	89.52	148.270	11,520.19	-8,323.63	6,352.41	10,469.70	0.19	0.19	0.00
21,239.00	88.72	149.500	11,521.63	-8,404.10	6,400.98	10,563.26	1.56	-0.85	1.31
21,334.00	89.78	151.260	11,522.87	-8,486.67	6,447.92	10,657.56	2.16	1.12	1.85
21,428.00	89.34	150.730	11,523.60	-8,568.88	6,493.50	10,750.74	0.73	-0.47	-0.56
21,523.00	89.52	150.730	11,524.54	-8,651.75	6,539.95	10,844.97	0.19	0.19	0.00
21,617.00	89.43	150.380	11,525.40	-8,733.60	6,586.15	10,938.24	0.38	-0.10	-0.37
21,712.00	89.60	150.910	11,526.21	-8,816.40	6,632.72	11,032.49	0.59	0.18	0.56
21,807.00	89.08	150.730	11,527.30	-8,899.34	6,679.04	11,126.70	0.58	-0.55	-0.19
21,901.00	89.34	150.730	11,528.60	-8,981.33	6,724.99	11,219.93	0.28	0.28	0.00
21,995.00	89.25	150.380	11,529.75	-9,063.18	6,771.20	11,313.20	0.38	-0.10	-0.37
22,090.00	89.16	150.910	11,531.07	-9,145.97	6,817.76	11,407.45	0.57	-0.09	0.56
22,184.00	89.08	150.730	11,532.52	-9,228.03	6,863.59	11,500.66	0.21	-0.09	-0.19

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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)
22,291.00	88.81	150.910	11,534.49	-9,321.44	6,915.75	11,606.76	0.30	-0.25	0.17
Survey @ 22291.00 MD 11534.48 TVD									
22,330.00	88.81	150.910	11,535.30	-9,355.51	6,934.70	11,645.42	0.00	0.00	0.00
Survey projected to 22330.00 MD 11535.29 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
209.00	209.00	0.46	-0.30	MWD surveys
22,291.00	11,534.49	-9,321.44	6,915.75	Survey @ 22291.00 MD 11534.48 TVD



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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	Hillrock/Simms				
Site Position:		Northing:	14,434,279.29 usft	Latitude:	39.74587001
From:	Lat/Long	Easting:	1,704,992.60 usft	Longitude:	-80.77026312
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.147 °

Well	Hillrock 1S-14 HU (F)					
Well Position	+N/-S	0.00 ft	Northing:	14,434,251.87 usft	Latitude:	39.74579470
	+E/-W	0.00 ft	Easting:	1,704,992.93 usft	Longitude:	-80.77026220
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	8/24/2020	-8.738	66.665	51,792.40890170

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	143.450	

Survey Program	Date	9/7/2020			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
209.00	932.00	MWD surf (Original Hole)	MWD	MWD - Standard	
976.00	2,678.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,777.00	10,309.00	MWD (Original Hole)	MWD	MWD - Standard	
10,361.00	22,291.00	MWD Lat (Original Hole)	MWD	MWD - Standard	
22,330.00	22,330.00	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	14,434,251.87	1,704,992.93	39.74579470	-80.77026220	
209.00	0.30	326.390	209.00	0.46	-0.30	14,434,252.32	1,704,992.62	39.74579596	-80.77026327	
MWD surveys										
241.00	0.30	332.370	241.00	0.60	-0.39	14,434,252.47	1,704,992.54	39.74579635	-80.77026358	
288.00	0.08	305.470	288.00	0.73	-0.47	14,434,252.60	1,704,992.45	39.74579670	-80.77026387	
332.00	0.13	321.470	332.00	0.78	-0.53	14,434,252.65	1,704,992.40	39.74579686	-80.77026407	
379.00	0.13	323.310	379.00	0.87	-0.59	14,434,252.74	1,704,992.33	39.74579709	-80.77026430	
422.00	0.08	317.780	422.00	0.93	-0.64	14,434,252.80	1,704,992.28	39.74579726	-80.77026448	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
469.00	0.09	329.820	469.00	0.99	-0.68	14,434,252.86	1,704,992.24	39.74579742	-80.77026462
513.00	0.13	275.420	513.00	1.02	-0.75	14,434,252.89	1,704,992.18	39.74579751	-80.77026486
560.00	0.09	290.710	560.00	1.04	-0.84	14,434,252.91	1,704,992.09	39.74579756	-80.77026517
604.00	0.08	161.600	604.00	1.02	-0.86	14,434,252.89	1,704,992.07	39.74579752	-80.77026525
651.00	0.18	173.730	651.00	0.92	-0.84	14,434,252.79	1,704,992.08	39.74579723	-80.77026519
695.00	0.17	177.680	695.00	0.78	-0.83	14,434,252.65	1,704,992.09	39.74579686	-80.77026515
742.00	0.13	190.600	742.00	0.66	-0.84	14,434,252.53	1,704,992.09	39.74579653	-80.77026518
787.00	0.17	187.790	787.00	0.55	-0.86	14,434,252.41	1,704,992.07	39.74579621	-80.77026525
834.00	0.22	170.480	834.00	0.39	-0.85	14,434,252.26	1,704,992.08	39.74579577	-80.77026523
882.00	0.35	158.080	882.00	0.16	-0.78	14,434,252.03	1,704,992.14	39.74579515	-80.77026498
932.00	0.62	183.750	931.99	-0.25	-0.74	14,434,251.62	1,704,992.18	39.74579402	-80.77026484
976.00	0.92	167.750	975.99	-0.83	-0.68	14,434,251.03	1,704,992.24	39.74579242	-80.77026464
1,070.00	0.79	152.810	1,069.98	-2.15	-0.23	14,434,249.72	1,704,992.70	39.74578881	-80.77026303
1,164.00	1.19	129.520	1,163.97	-3.35	0.82	14,434,248.52	1,704,993.75	39.74578551	-80.77025931
1,259.00	0.83	114.050	1,258.95	-4.25	2.21	14,434,247.62	1,704,995.14	39.74578300	-80.77025437
1,353.00	0.31	354.340	1,352.95	-4.28	2.81	14,434,247.59	1,704,995.73	39.74578293	-80.77025225
1,448.00	0.57	28.890	1,447.95	-3.61	3.01	14,434,248.26	1,704,995.94	39.74578477	-80.77025152
1,542.00	0.48	13.240	1,541.94	-2.82	3.33	14,434,249.05	1,704,996.25	39.74578695	-80.77025039
1,637.00	0.70	12.630	1,636.94	-1.86	3.55	14,434,250.01	1,704,996.47	39.74578956	-80.77024960
1,733.00	0.83	338.440	1,732.93	-0.64	3.42	14,434,251.23	1,704,996.34	39.74579291	-80.77025005
1,827.00	0.66	213.980	1,826.92	-0.46	2.87	14,434,251.41	1,704,995.79	39.74579342	-80.77025201
1,922.00	1.89	174.700	1,921.90	-2.47	2.70	14,434,249.40	1,704,995.63	39.74578789	-80.77025260
2,016.00	2.07	146.570	2,015.85	-5.43	3.78	14,434,246.44	1,704,996.71	39.74577975	-80.77024879
2,110.00	2.59	115.550	2,109.77	-7.77	6.63	14,434,244.10	1,704,999.56	39.74577333	-80.77023867
2,205.00	2.19	97.430	2,204.69	-8.93	10.37	14,434,242.94	1,705,003.30	39.74577011	-80.77022539
2,300.00	1.31	357.150	2,299.66	-8.08	12.12	14,434,243.79	1,705,005.04	39.74577244	-80.77021917
2,395.00	3.12	331.400	2,394.59	-4.72	10.83	14,434,247.15	1,705,003.75	39.74578166	-80.77022373
2,489.00	3.60	330.440	2,488.43	0.09	8.14	14,434,251.96	1,705,001.07	39.74579490	-80.77023322
2,584.00	2.46	332.020	2,583.29	4.49	5.72	14,434,256.36	1,704,998.64	39.74580698	-80.77024182
2,678.00	1.98	338.960	2,677.22	7.78	4.19	14,434,259.65	1,704,997.11	39.74581605	-80.77024723
2,777.00	1.93	351.790	2,776.17	11.03	3.34	14,434,262.90	1,704,996.26	39.74582497	-80.77025023
2,871.00	1.80	344.410	2,870.12	14.02	2.71	14,434,265.89	1,704,995.64	39.74583318	-80.77025242
2,966.00	1.23	341.420	2,965.08	16.42	1.99	14,434,268.29	1,704,994.91	39.74583979	-80.77025749
3,060.00	1.32	339.050	3,059.06	18.39	1.28	14,434,270.26	1,704,994.20	39.74584520	-80.77025498
3,155.00	0.88	1.380	3,154.04	20.14	0.90	14,434,272.01	1,704,993.83	39.74585001	-80.77025880
3,250.00	0.75	53.930	3,249.03	21.24	1.42	14,434,273.10	1,704,994.35	39.74585301	-80.77025694
3,344.00	1.27	71.690	3,343.02	21.93	2.91	14,434,273.79	1,704,995.84	39.74585490	-80.77025165
3,438.00	2.15	88.910	3,436.98	22.29	5.66	14,434,274.16	1,704,998.59	39.74585587	-80.77024185
3,532.00	3.12	89.710	3,530.88	22.33	9.98	14,434,274.20	1,705,002.91	39.74585596	-80.77022648
3,627.00	3.96	93.310	3,625.69	22.16	15.84	14,434,274.03	1,705,008.77	39.74585544	-80.77020563
3,722.00	4.44	93.750	3,720.44	21.73	22.79	14,434,273.60	1,705,015.71	39.74585421	-80.77018093
3,816.00	4.44	87.950	3,814.16	21.62	30.06	14,434,273.49	1,705,022.98	39.74585386	-80.77015508
3,910.00	4.61	76.430	3,907.87	22.64	37.36	14,434,274.50	1,705,030.29	39.74585660	-80.77012907
4,004.00	5.05	71.160	4,001.53	24.86	44.95	14,434,276.73	1,705,037.88	39.74586265	-80.77010206
4,098.00	5.36	65.890	4,095.14	27.99	52.87	14,434,279.86	1,705,045.80	39.74587119	-80.77007384
4,192.00	5.49	61.140	4,188.72	31.95	60.82	14,434,283.82	1,705,053.75	39.74588202	-80.77004554
4,290.00	5.14	61.400	4,286.30	36.32	68.78	14,434,288.18	1,705,061.71	39.74589395	-80.77001718
4,384.00	4.97	61.140	4,379.94	40.30	76.04	14,434,292.16	1,705,068.97	39.74590483	-80.76999130
4,479.00	5.67	58.860	4,474.53	44.71	83.66	14,434,296.58	1,705,076.59	39.74591690	-80.76996415
4,573.00	6.37	55.080	4,568.01	50.10	91.91	14,434,301.96	1,705,084.84	39.74593163	-80.76993475
4,666.00	6.28	57.540	4,660.44	55.78	100.44	14,434,307.65	1,705,093.36	39.74594718	-80.76990438
4,761.00	6.76	59.640	4,754.83	61.39	109.64	14,434,313.26	1,705,102.57	39.74596253	-80.76987157
4,855.00	6.11	57.190	4,848.24	66.90	118.62	14,434,318.77	1,705,111.55	39.74597759	-80.76983958
4,902.00	5.45	56.210	4,895.00	69.50	122.58	14,434,321.37	1,705,115.51	39.74598470	-80.76982548
4,949.00	5.01	57.540	4,941.80	71.84	126.17	14,434,323.71	1,705,119.09	39.74599111	-80.76981269



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
4,996.00	4.79	60.790	4,988.63	73.90	129.61	14,434,325.77	1,705,122.54	39.74599674	-80.76980042
5,044.00	4.66	62.460	5,036.47	75.78	133.09	14,434,327.65	1,705,126.02	39.74600187	-80.76978803
5,091.00	4.31	71.420	5,083.32	77.22	136.46	14,434,329.09	1,705,129.38	39.74600582	-80.76977604
5,138.00	4.70	78.020	5,130.18	78.19	140.01	14,434,330.06	1,705,132.94	39.74600844	-80.76976337
5,232.00	6.46	89.090	5,223.73	79.07	149.07	14,434,330.94	1,705,142.00	39.74601080	-80.76973115
5,327.00	6.24	85.660	5,318.15	79.55	159.56	14,434,331.41	1,705,152.49	39.74601203	-80.76969382
5,420.00	6.02	81.800	5,410.62	80.62	169.43	14,434,332.49	1,705,162.35	39.74601492	-80.76965871
5,515.00	5.19	78.810	5,505.16	82.17	178.57	14,434,334.04	1,705,171.50	39.74601910	-80.76962616
5,608.00	4.39	78.810	5,597.84	83.68	186.19	14,434,335.54	1,705,179.12	39.74602319	-80.76959904
5,703.00	5.10	76.520	5,692.51	85.37	193.87	14,434,337.23	1,705,186.79	39.74602777	-80.76957173
5,798.00	5.41	76.080	5,787.11	87.43	202.32	14,434,339.30	1,705,195.24	39.74603337	-80.76954164
5,892.00	4.92	71.250	5,880.73	89.79	210.44	14,434,341.66	1,705,203.36	39.74603980	-80.76951273
5,986.00	5.36	69.670	5,974.35	92.61	218.37	14,434,344.48	1,705,211.30	39.74604749	-80.76948448
6,081.00	5.45	69.580	6,068.93	95.73	226.76	14,434,347.59	1,705,219.69	39.74605599	-80.76945461
6,176.00	4.83	76.520	6,163.55	98.23	234.88	14,434,350.10	1,705,227.80	39.74606282	-80.76942571
6,271.00	5.31	82.320	6,258.18	99.75	243.12	14,434,351.62	1,705,236.05	39.74606693	-80.76939636
6,366.00	6.20	79.950	6,352.70	101.23	252.53	14,434,353.10	1,705,245.46	39.74607094	-80.76936288
6,560.00	5.45	75.730	6,545.69	105.33	271.77	14,434,357.20	1,705,264.70	39.74608206	-80.76929438
6,655.00	5.54	81.180	6,640.26	107.15	280.68	14,434,359.02	1,705,273.60	39.74608698	-80.76926268
6,750.00	7.16	78.100	6,734.67	109.07	291.00	14,434,360.94	1,705,283.93	39.74609219	-80.76922593
6,845.00	9.05	77.050	6,828.72	111.97	304.08	14,434,363.84	1,705,297.01	39.74610005	-80.76917939
6,939.00	10.72	76.700	6,921.32	115.64	319.79	14,434,367.50	1,705,312.72	39.74611001	-80.76912345
7,034.00	11.60	78.890	7,014.52	119.51	337.76	14,434,371.38	1,705,330.69	39.74612052	-80.76905948
7,128.00	12.39	82.320	7,106.47	122.68	357.03	14,434,374.55	1,705,349.96	39.74612909	-80.76899090
7,222.00	13.32	84.430	7,198.12	125.08	377.80	14,434,376.95	1,705,370.73	39.74613553	-80.76891698
7,317.00	13.01	83.470	7,290.62	127.36	399.32	14,434,379.22	1,705,392.25	39.74614164	-80.76884042
7,412.00	12.08	78.980	7,383.35	130.47	419.70	14,434,382.34	1,705,412.63	39.74615005	-80.76876788
7,506.00	10.94	75.820	7,475.46	134.54	438.01	14,434,386.41	1,705,430.93	39.74616108	-80.76870272
7,694.00	12.00	80.830	7,659.71	142.02	474.60	14,434,393.89	1,705,467.52	39.74618138	-80.76857247
7,789.00	13.01	81.710	7,752.45	145.14	494.93	14,434,397.01	1,705,487.85	39.74618979	-80.76850011
7,884.00	14.37	85.840	7,844.75	147.54	517.27	14,434,399.40	1,705,510.20	39.74619622	-80.76842061
7,978.00	14.19	85.140	7,935.85	149.36	540.38	14,434,401.23	1,705,533.31	39.74620106	-80.76833837
8,073.00	14.63	84.170	8,027.86	151.56	563.92	14,434,403.43	1,705,556.85	39.74620695	-80.76825461
8,167.00	14.41	82.150	8,118.86	154.37	587.32	14,434,406.23	1,705,580.24	39.74621448	-80.76817135
8,262.00	14.63	79.420	8,210.83	158.18	610.82	14,434,410.05	1,705,603.75	39.74622480	-80.76808769
8,356.00	13.80	78.190	8,301.95	162.66	633.47	14,434,414.53	1,705,626.39	39.74623692	-80.76800710
8,451.00	12.52	76.170	8,394.45	167.44	654.56	14,434,419.31	1,705,647.48	39.74624990	-80.76793202
8,546.00	12.30	74.940	8,487.23	172.53	674.33	14,434,424.40	1,705,667.25	39.74626374	-80.76786164
8,640.00	12.92	79.770	8,578.97	177.00	694.34	14,434,428.86	1,705,687.26	39.74627587	-80.76779041
8,735.00	13.10	84.340	8,671.53	179.94	715.50	14,434,431.81	1,705,708.43	39.74628382	-80.76771508
8,829.00	14.41	88.210	8,762.83	181.36	737.79	14,434,433.23	1,705,730.72	39.74628755	-80.76763576
8,924.00	15.34	91.380	8,854.65	181.43	762.17	14,434,433.30	1,705,755.10	39.74628756	-80.76754903
9,019.00	15.78	90.580	8,946.17	180.99	787.65	14,434,432.86	1,705,780.58	39.74628618	-80.76745839
9,114.00	14.68	89.180	9,037.83	181.04	812.61	14,434,432.90	1,705,805.53	39.74628612	-80.76736961
9,209.00	13.71	85.400	9,129.93	182.11	835.87	14,434,433.98	1,705,828.79	39.74628891	-80.76728686
9,303.00	13.84	81.180	9,221.23	184.73	858.08	14,434,440.60	1,705,851.00	39.74629594	-80.76720780
9,396.00	13.84	80.830	9,311.53	188.21	880.05	14,434,440.07	1,705,872.98	39.74630533	-80.76712960
9,491.00	14.50	82.500	9,403.64	191.57	903.06	14,434,443.44	1,705,895.99	39.74631440	-80.76704771
9,586.00	15.21	83.030	9,495.46	194.63	927.22	14,434,446.50	1,705,920.15	39.74632265	-80.76696173
9,681.00	14.19	85.570	9,587.35	197.05	951.20	14,434,448.91	1,705,944.13	39.74632910	-80.76687639
9,775.00	13.49	86.100	9,678.63	198.68	973.63	14,434,450.55	1,705,966.55	39.74633343	-80.76679659
9,869.00	13.54	86.810	9,770.02	200.04	995.55	14,434,451.91	1,705,988.48	39.74633700	-80.76671858
9,963.00	13.80	87.330	9,861.36	201.17	1,017.74	14,434,453.04	1,706,010.66	39.74633996	-80.76663964
10,056.00	14.02	87.070	9,951.63	202.27	1,040.07	14,434,454.13	1,706,032.99	39.74634280	-80.76656019
10,151.00	13.80	84.700	10,043.85	203.90	1,062.84	14,434,455.77	1,706,055.77	39.74634713	-80.76647915

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,245.00	13.27	87.160	10,135.24	205.47	1,084.78	14,434,457.34	1,706,077.71	39.74635128	-80.76640109
10,309.00	13.14	88.650	10,197.54	206.01	1,099.39	14,434,457.88	1,706,092.32	39.74635265	-80.76634911
10,361.00	13.37	90.960	10,248.16	206.05	1,111.31	14,434,457.91	1,706,104.24	39.74635267	-80.76630670
10,456.00	13.54	81.120	10,340.56	207.58	1,133.29	14,434,459.45	1,706,126.21	39.74635672	-80.76622852
10,503.00	13.28	80.240	10,386.28	209.34	1,144.04	14,434,461.21	1,706,136.97	39.74636149	-80.76619023
10,551.00	13.72	70.220	10,432.96	212.20	1,154.83	14,434,464.07	1,706,147.76	39.74636927	-80.76615182
10,598.00	14.33	64.250	10,478.56	216.62	1,165.32	14,434,468.49	1,706,158.24	39.74638132	-80.76611448
10,646.00	15.21	66.000	10,524.98	221.76	1,176.42	14,434,473.63	1,706,169.34	39.74639536	-80.76607493
10,693.00	15.83	77.960	10,570.28	225.61	1,188.32	14,434,477.47	1,706,181.25	39.74640583	-80.76603254
10,741.00	16.44	84.460	10,616.39	227.63	1,201.49	14,434,479.49	1,706,194.41	39.74641129	-80.76598569
10,788.00	17.32	87.980	10,661.36	228.52	1,215.10	14,434,480.38	1,706,208.03	39.74641363	-80.76593725
10,835.00	20.49	94.130	10,705.83	228.17	1,230.30	14,434,480.04	1,706,223.23	39.74641258	-80.76588317
10,882.00	22.77	104.670	10,749.53	225.27	1,247.32	14,434,477.14	1,706,240.24	39.74640450	-80.76582268
10,930.00	22.95	111.880	10,793.77	219.43	1,264.99	14,434,471.30	1,706,257.91	39.74638833	-80.76575986
10,977.00	24.36	122.430	10,836.84	210.81	1,281.68	14,434,462.68	1,706,274.61	39.74636454	-80.76570055
11,025.00	26.91	129.640	10,880.12	198.57	1,298.41	14,434,450.44	1,706,291.33	39.74633080	-80.76564115
11,072.00	29.19	131.920	10,921.60	184.13	1,315.13	14,434,435.99	1,706,308.05	39.74629101	-80.76558180
11,119.00	31.74	133.500	10,962.11	167.96	1,332.63	14,434,419.82	1,706,325.55	39.74624648	-80.76551970
11,167.00	34.65	135.260	11,002.27	149.57	1,351.40	14,434,401.44	1,706,344.32	39.74619584	-80.76545310
11,213.00	37.81	136.840	11,039.37	129.99	1,370.25	14,434,381.86	1,706,363.17	39.74614194	-80.76538621
11,260.00	41.50	137.370	11,075.55	108.02	1,390.66	14,434,359.88	1,706,383.58	39.74608145	-80.76531381
11,307.00	44.32	137.190	11,109.97	84.51	1,412.37	14,434,336.38	1,706,405.29	39.74601674	-80.76523680
11,354.00	47.13	136.490	11,142.78	59.97	1,435.39	14,434,311.84	1,706,428.31	39.74594917	-80.76515513
11,400.00	49.68	136.840	11,173.32	34.95	1,458.99	14,434,286.82	1,706,451.92	39.74588029	-80.76507139
11,447.00	52.76	137.900	11,202.75	7.99	1,483.80	14,434,259.86	1,706,476.72	39.74580608	-80.76498339
11,495.00	54.96	139.130	11,231.06	-21.05	1,509.47	14,434,230.82	1,706,502.39	39.74572614	-80.76489234
11,542.00	58.04	139.830	11,257.00	-50.84	1,534.93	14,434,201.03	1,706,527.85	39.74564414	-80.76480205
11,589.00	61.55	140.180	11,280.64	-81.96	1,561.03	14,434,169.91	1,706,553.95	39.74555850	-80.76470948
11,636.00	64.54	141.240	11,301.94	-114.38	1,587.55	14,434,137.49	1,706,580.47	39.74546926	-80.76461543
11,684.00	67.80	142.290	11,321.33	-148.87	1,614.71	14,434,103.00	1,706,607.64	39.74537436	-80.76451911
11,731.00	71.05	143.870	11,337.85	-184.04	1,641.14	14,434,067.83	1,706,634.06	39.74527756	-80.76442544
11,779.00	74.30	145.980	11,352.14	-221.54	1,667.46	14,434,030.33	1,706,660.38	39.74517439	-80.76433216
11,826.00	76.85	147.390	11,363.85	-259.58	1,692.45	14,433,992.29	1,706,685.37	39.74506976	-80.76424359
11,873.00	79.49	148.800	11,373.49	-298.63	1,716.76	14,433,953.24	1,706,709.68	39.74496234	-80.76415748
11,920.00	84.06	149.500	11,380.21	-338.55	1,740.60	14,433,913.32	1,706,733.53	39.74485252	-80.76407302
11,967.00	89.25	150.910	11,382.95	-379.25	1,763.91	14,433,872.62	1,706,756.83	39.74474057	-80.76399050
12,062.00	90.66	151.430	11,383.02	-462.48	1,809.72	14,433,789.39	1,706,802.64	39.74451169	-80.76382831
12,156.00	90.48	151.430	11,382.09	-545.03	1,854.67	14,433,706.84	1,706,847.59	39.74428466	-80.76366917
12,250.00	89.16	148.970	11,382.38	-626.59	1,901.38	14,433,625.28	1,706,894.30	39.74406033	-80.76350376
12,345.00	88.46	148.800	11,384.36	-707.90	1,950.46	14,433,543.97	1,706,943.38	39.74383666	-80.76332992
12,443.00	89.60	149.670	11,386.02	-792.10	2,000.58	14,433,459.77	1,706,993.50	39.74360507	-80.76315241
12,537.00	90.66	153.890	11,385.80	-874.90	2,045.02	14,433,376.97	1,707,037.94	39.74337734	-80.76299510
12,632.00	89.87	154.950	11,385.36	-960.59	2,086.04	14,433,291.28	1,707,078.96	39.74314172	-80.76284999
12,725.00	90.31	152.840	11,385.22	-1,044.10	2,126.96	14,433,207.77	1,707,119.88	39.74291209	-80.76270521
12,756.00	90.13	153.310	11,385.10	-1,071.74	2,140.99	14,433,180.13	1,707,133.91	39.74283608	-80.76265554
12,788.00	89.78	151.610	11,385.12	-1,100.11	2,155.79	14,433,151.76	1,707,148.71	39.74275805	-80.76260317
12,819.00	89.60	151.610	11,385.29	-1,127.38	2,170.53	14,433,124.49	1,707,163.45	39.74268305	-80.76255099
12,851.00	89.43	150.910	11,385.56	-1,155.44	2,185.91	14,433,096.43	1,707,178.84	39.74260589	-80.76249652
12,883.00	88.81	150.730	11,386.05	-1,183.37	2,201.51	14,433,068.50	1,707,194.44	39.74252906	-80.76244129
12,914.00	88.46	150.380	11,386.79	-1,210.36	2,216.75	14,433,041.51	1,707,209.67	39.74245483	-80.76238735
12,946.00	88.64	150.380	11,387.60	-1,238.17	2,232.56	14,433,013.70	1,707,225.48	39.74237834	-80.76233137
13,006.00	87.58	151.780	11,389.58	-1,290.66	2,261.56	14,432,961.21	1,707,254.48	39.74223398	-80.76222870
13,100.00	88.37	149.500	11,392.90	-1,372.53	2,307.61	14,432,879.34	1,707,300.54	39.74200881	-80.76206564
13,195.00	88.11	149.500	11,395.82	-1,454.34	2,355.81	14,432,797.53	1,707,348.73	39.74178377	-80.76189497
13,290.00	87.76	149.500	11,399.24	-1,536.14	2,403.99	14,432,715.73	1,707,396.91	39.74155877	-80.76172433

Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Hillrock/Simms
Well: Hillrock 1S-14 HU (F)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Hillrock 1S-14 HU (F)
TVD Reference: RKB=1219+26 @ 1245.00ft (Nabors B28)
MD Reference: RKB=1219+26 @ 1245.00ft (Nabors B28)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Aug1919_v14

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
13,384.00	88.46	149.150	11,402.34	-1,616.95	2,451.92	14,432,634.93	1,707,444.84	39.74133651	-80.76155459
13,478.00	88.46	149.670	11,404.87	-1,697.84	2,499.74	14,432,554.04	1,707,492.66	39.74111402	-80.76138525
13,573.00	88.64	149.150	11,407.27	-1,779.59	2,548.07	14,432,472.28	1,707,540.99	39.74088915	-80.76121410
13,667.00	89.16	149.150	11,409.08	-1,860.27	2,596.26	14,432,391.60	1,707,589.18	39.74066721	-80.76104343
13,762.00	88.72	149.320	11,410.84	-1,941.89	2,644.85	14,432,309.98	1,707,637.77	39.74044271	-80.76087137
13,857.00	88.72	148.970	11,412.96	-2,023.42	2,693.56	14,432,228.45	1,707,686.48	39.74021844	-80.76069887
13,952.00	88.90	149.150	11,414.93	-2,104.89	2,742.39	14,432,146.98	1,707,735.31	39.73999436	-80.76052593
14,046.00	88.99	148.970	11,416.66	-2,185.50	2,790.71	14,432,066.37	1,707,783.63	39.73977262	-80.76035480
14,141.00	88.55	148.970	11,418.70	-2,266.88	2,839.67	14,431,984.99	1,707,832.59	39.73954875	-80.76018141
14,236.00	88.81	148.970	11,420.89	-2,348.27	2,888.63	14,431,903.60	1,707,881.55	39.73932489	-80.76000803
14,331.00	88.20	148.800	11,423.37	-2,429.57	2,937.70	14,431,822.30	1,707,930.62	39.73910125	-80.75983424
14,425.00	88.37	149.320	11,426.18	-2,510.16	2,986.01	14,431,741.71	1,707,978.93	39.73887957	-80.75966316
14,520.00	87.93	148.800	11,429.25	-2,591.60	3,034.83	14,431,660.27	1,708,027.75	39.73865556	-80.75949029
14,615.00	88.11	149.320	11,432.53	-2,673.03	3,083.64	14,431,578.84	1,708,076.56	39.73843156	-80.75931742
14,709.00	87.49	149.500	11,436.14	-2,753.89	3,131.44	14,431,497.98	1,708,124.36	39.73820915	-80.75914816
14,804.00	88.64	149.320	11,439.35	-2,835.62	3,179.76	14,431,416.25	1,708,172.68	39.73798433	-80.75897707
14,899.00	89.25	148.800	11,441.10	-2,917.09	3,228.59	14,431,334.78	1,708,221.51	39.73776024	-80.75880414
14,993.00	88.90	148.620	11,442.61	-2,997.41	3,277.41	14,431,254.47	1,708,270.33	39.73753930	-80.75863127
15,088.00	89.87	152.140	11,443.63	-3,079.97	3,324.35	14,431,171.90	1,708,317.27	39.73731220	-80.75846508
15,183.00	89.69	150.910	11,444.00	-3,163.48	3,369.64	14,431,088.40	1,708,362.56	39.73708254	-80.75830476
15,277.00	90.13	150.910	11,444.15	-3,245.62	3,415.34	14,431,006.25	1,708,408.26	39.73685661	-80.75814299
15,372.00	90.13	151.260	11,443.93	-3,328.78	3,461.28	14,430,923.10	1,708,454.20	39.73662790	-80.75798040
15,467.00	90.13	151.080	11,443.71	-3,412.00	3,507.09	14,430,839.87	1,708,500.01	39.73639900	-80.75781824
15,562.00	89.34	150.730	11,444.15	-3,495.01	3,553.28	14,430,756.86	1,708,546.20	39.73617069	-80.75765473
15,657.00	89.69	151.260	11,444.96	-3,578.10	3,599.34	14,430,673.78	1,708,592.26	39.73594218	-80.75749168
15,752.00	89.34	151.430	11,445.76	-3,661.46	3,644.90	14,430,590.42	1,708,637.82	39.73571291	-80.75733044
15,846.00	89.08	151.080	11,447.06	-3,743.86	3,690.10	14,430,508.01	1,708,683.02	39.73548625	-80.75717045
15,941.00	89.43	150.730	11,448.29	-3,826.87	3,736.29	14,430,425.01	1,708,729.21	39.73525795	-80.75700695
16,036.00	89.43	151.430	11,449.24	-3,910.02	3,782.23	14,430,341.86	1,708,775.15	39.73502926	-80.75684435
16,131.00	89.43	151.430	11,450.18	-3,993.45	3,827.66	14,430,258.43	1,708,820.58	39.73479981	-80.75668356
16,225.00	89.16	151.430	11,451.34	-4,075.99	3,872.61	14,430,175.88	1,708,865.53	39.73457277	-80.75652447
16,320.00	90.13	149.500	11,451.93	-4,158.64	3,919.44	14,430,093.23	1,708,912.35	39.73434544	-80.75635870
16,415.00	88.55	148.800	11,453.02	-4,240.19	3,968.15	14,430,011.68	1,708,961.06	39.73412112	-80.75618623
16,509.00	89.25	149.150	11,454.83	-4,320.73	4,016.58	14,429,931.15	1,709,009.50	39.73389958	-80.75601471
16,604.00	88.81	149.320	11,456.44	-4,402.35	4,065.17	14,429,849.53	1,709,058.09	39.73367507	-80.75584268
16,698.00	88.72	149.320	11,458.46	-4,483.17	4,113.12	14,429,768.70	1,709,106.04	39.73345274	-80.75567290
16,793.00	88.20	150.910	11,461.01	-4,565.51	4,160.44	14,429,686.37	1,709,153.36	39.73322627	-80.75550540
16,887.00	88.99	150.550	11,463.32	-4,647.48	4,206.38	14,429,604.40	1,709,199.30	39.73300081	-80.75534277
16,982.00	88.90	150.730	11,465.07	-4,730.26	4,252.95	14,429,521.61	1,709,245.87	39.73277311	-80.75517793
17,076.00	89.52	150.380	11,466.36	-4,812.11	4,299.16	14,429,439.76	1,709,292.08	39.73254798	-80.75501438
17,171.00	90.31	150.200	11,466.51	-4,894.63	4,346.24	14,429,357.25	1,709,339.16	39.73232103	-80.75484772
17,266.00	89.34	147.740	11,466.80	-4,976.02	4,393.21	14,429,275.86	1,709,388.13	39.73209712	-80.75467434
17,361.00	89.69	148.270	11,467.60	-5,056.59	4,445.54	14,429,195.29	1,709,438.46	39.73187548	-80.75449609
17,455.00	89.34	147.920	11,468.40	-5,136.38	4,495.22	14,429,115.49	1,709,488.14	39.73165597	-80.75432017
17,550.00	89.52	148.970	11,469.34	-5,217.33	4,544.93	14,429,034.55	1,709,537.85	39.73143328	-80.75414415
17,645.00	88.81	148.620	11,470.73	-5,298.58	4,594.15	14,428,953.30	1,709,587.06	39.73120979	-80.75396989
17,740.00	88.90	147.920	11,472.62	-5,379.36	4,644.10	14,428,872.52	1,709,637.02	39.73098755	-80.75379301
17,834.00	89.43	148.090	11,473.99	-5,459.08	4,693.90	14,428,792.80	1,709,686.81	39.73076827	-80.75361666
17,929.00	89.43	148.800	11,474.94	-5,540.02	4,743.61	14,428,711.86	1,709,736.53	39.73054558	-80.75344064
18,023.00	88.64	147.920	11,476.52	-5,620.04	4,792.91	14,428,631.84	1,709,785.83	39.73032547	-80.75326606
18,118.00	88.64	149.850	11,478.78	-5,701.34	4,841.99	14,428,550.54	1,709,834.91	39.73010180	-80.75309230
18,213.00	89.16	150.910	11,480.60	-5,783.91	4,888.93	14,428,467.97	1,709,881.85	39.72987469	-80.75292614
18,308.00	89.08	150.910	11,482.06	-5,866.92	4,935.11	14,428,384.96	1,709,928.03	39.72964638	-80.75276270
18,403.00	88.99	150.730	11,483.66	-5,949.85	4,981.43	14,428,302.03	1,709,974.34	39.72941828	-80.75259880
18,497.00	88.99	150.730	11,485.32	-6,031.84	5,027.38	14,428,220.04	1,710,020.29	39.72919277	-80.75243616

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
18,592.00	89.16	150.550	11,486.85	-6,114.63	5,073.95	14,428,137.26	1,710,066.87	39.72896506	-80.75227133
18,686.00	88.99	150.730	11,488.37	-6,196.54	5,120.03	14,428,055.34	1,710,112.95	39.72873975	-80.75210824
18,781.00	89.25	150.910	11,489.83	-6,279.47	5,166.34	14,427,972.41	1,710,159.26	39.72851163	-80.75194434
18,875.00	89.43	150.380	11,490.91	-6,361.40	5,212.42	14,427,890.48	1,710,205.34	39.72828629	-80.75178126
18,969.00	89.60	150.730	11,491.71	-6,443.25	5,258.63	14,427,808.63	1,710,251.54	39.72806115	-80.75161722
19,064.00	89.52	150.380	11,492.43	-6,525.98	5,305.33	14,427,725.90	1,710,298.24	39.72783360	-80.75145244
19,158.00	89.43	151.080	11,493.30	-6,607.97	5,351.28	14,427,643.91	1,710,344.20	39.72760807	-80.75128980
19,252.00	89.52	149.670	11,494.16	-6,689.68	5,397.75	14,427,562.20	1,710,390.66	39.72738332	-80.75112535
19,347.00	89.52	151.430	11,494.95	-6,772.40	5,444.45	14,427,479.48	1,710,437.37	39.72715580	-80.75096006
19,442.00	89.52	150.380	11,495.75	-6,855.41	5,490.64	14,427,396.47	1,710,483.56	39.72692748	-80.75079659
19,536.00	88.81	151.260	11,497.12	-6,937.47	5,536.47	14,427,314.41	1,710,529.38	39.72670177	-80.75063442
19,631.00	88.90	150.730	11,499.02	-7,020.54	5,582.52	14,427,231.35	1,710,575.44	39.72647329	-80.75047145
19,726.00	88.99	150.730	11,500.77	-7,103.39	5,628.96	14,427,148.49	1,710,621.88	39.72624538	-80.75030710
19,821.00	89.16	150.910	11,502.30	-7,186.33	5,675.28	14,427,065.56	1,710,668.19	39.72601727	-80.75014321
19,916.00	88.99	150.550	11,503.83	-7,269.19	5,721.72	14,426,982.70	1,710,714.63	39.72578936	-80.74997886
20,011.00	88.81	150.910	11,505.66	-7,352.04	5,768.16	14,426,899.84	1,710,761.07	39.72556146	-80.74981452
20,106.00	89.60	150.550	11,506.98	-7,434.90	5,814.60	14,426,816.98	1,710,807.51	39.72533354	-80.74965017
20,201.00	89.34	150.910	11,507.85	-7,517.77	5,861.05	14,426,734.11	1,710,853.96	39.72510560	-80.74948580
20,295.00	90.40	149.500	11,508.07	-7,599.34	5,907.75	14,426,652.54	1,710,900.67	39.72488123	-80.74932050
20,389.00	88.90	147.740	11,508.64	-7,679.59	5,956.69	14,426,572.30	1,710,949.61	39.72466048	-80.74914724
20,484.00	89.16	148.620	11,510.25	-7,760.30	6,006.78	14,426,491.59	1,710,999.69	39.72443844	-80.74896993
20,579.00	88.99	148.270	11,511.78	-7,841.24	6,056.48	14,426,410.65	1,711,049.40	39.72421577	-80.74879394
20,673.00	88.90	148.440	11,513.51	-7,921.25	6,105.79	14,426,330.64	1,711,098.71	39.72399566	-80.74861938
20,768.00	89.08	148.620	11,515.19	-8,002.26	6,155.38	14,426,249.62	1,711,148.29	39.72377279	-80.74844383
20,862.00	88.72	148.440	11,516.99	-8,082.42	6,204.44	14,426,169.46	1,711,197.36	39.72355227	-80.74827014
20,956.00	89.60	148.800	11,518.37	-8,162.66	6,253.39	14,426,089.22	1,711,246.30	39.72333152	-80.74809688
21,050.00	89.34	148.270	11,519.24	-8,242.84	6,302.45	14,426,009.05	1,711,295.36	39.72311096	-80.74792319
21,145.00	89.52	148.270	11,520.19	-8,323.63	6,352.41	14,425,928.25	1,711,345.32	39.72288869	-80.74774633
21,239.00	88.72	149.500	11,521.63	-8,404.10	6,400.98	14,425,847.79	1,711,393.89	39.72266733	-80.74757440
21,334.00	89.78	151.260	11,522.87	-8,486.67	6,447.92	14,425,765.21	1,711,440.84	39.72244020	-80.74740827
21,428.00	89.34	150.730	11,523.60	-8,568.88	6,493.50	14,425,683.01	1,711,486.41	39.72221408	-80.74724700
21,523.00	89.52	150.730	11,524.54	-8,651.75	6,539.95	14,425,600.14	1,711,532.86	39.72198614	-80.74708266
21,617.00	89.43	150.380	11,525.40	-8,733.60	6,586.15	14,425,518.29	1,711,579.07	39.72176099	-80.74691915
21,712.00	89.60	150.910	11,526.21	-8,816.40	6,632.72	14,425,435.49	1,711,625.64	39.72153324	-80.74675437
21,807.00	89.08	150.730	11,527.30	-8,899.34	6,679.04	14,425,352.55	1,711,671.95	39.72130510	-80.74659049
21,901.00	89.34	150.730	11,528.60	-8,981.33	6,724.99	14,425,270.56	1,711,717.91	39.72107958	-80.74642788
21,995.00	89.25	150.380	11,529.75	-9,063.18	6,771.20	14,425,188.71	1,711,764.11	39.72085443	-80.74626439
22,090.00	89.16	150.910	11,531.07	-9,145.97	6,817.76	14,425,105.91	1,711,810.68	39.72062669	-80.74609962
22,184.00	89.08	150.730	11,532.52	-9,228.03	6,863.59	14,425,023.85	1,711,856.50	39.72040097	-80.74593748
22,291.00	88.81	150.910	11,534.49	-9,321.44	6,915.75	14,424,930.45	1,711,908.66	39.72014405	-80.74575293
Survey @ 22291.00 MD 11534.48 TVD									
22,330.00	88.81	150.910	11,535.30	-9,355.51	6,934.70	14,424,896.37	1,711,927.62	39.72005033	-80.74568585
Survey projected to 22330.00 MD 11535.29 TVD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
209.00	209.00	0.46	-0.30	MWD surveys
22,291.00	11,534.49	-9,321.44	6,915.75	Survey @ 22291.00 MD 11534.48 TVD
22,330.00	11,535.30	-9,355.51	6,934.70	Survey projected to 22330.00 MD 11535.29 TVD



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-14 HU (F)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-14 HU (F)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14