



Well: Hillrock 04 HM (H)
 Site: Hillrock/Simms
 Project: Marshall County, West Virginia
 Design: rev2
 Rig:

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
187.00	0.14	100.720	187.00	-0.04	0.22	0.09	MWD surveys
18471.00	86.11	149.810	6524.02	-7154.09	1584.80	7327.52	Survey @ 18471.00 MD 6524.02 TVD
18526.00	86.11	149.810	6527.75	-7201.43	1612.56	7379.71	Survey projected to 18526.00 MD 6527.75 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+18 @ 1237.00ft

Northing	Easting	Latitude	Longitude
14434279.29	1704992.60	39.74587001	-80.77026312



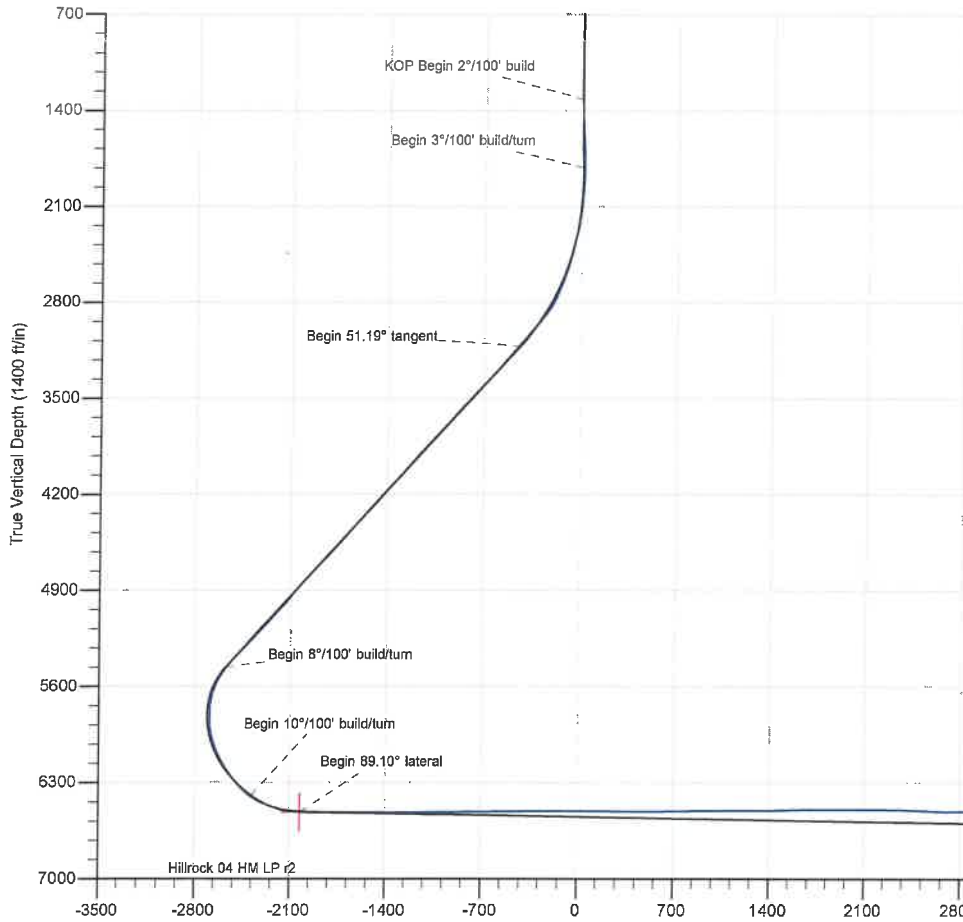
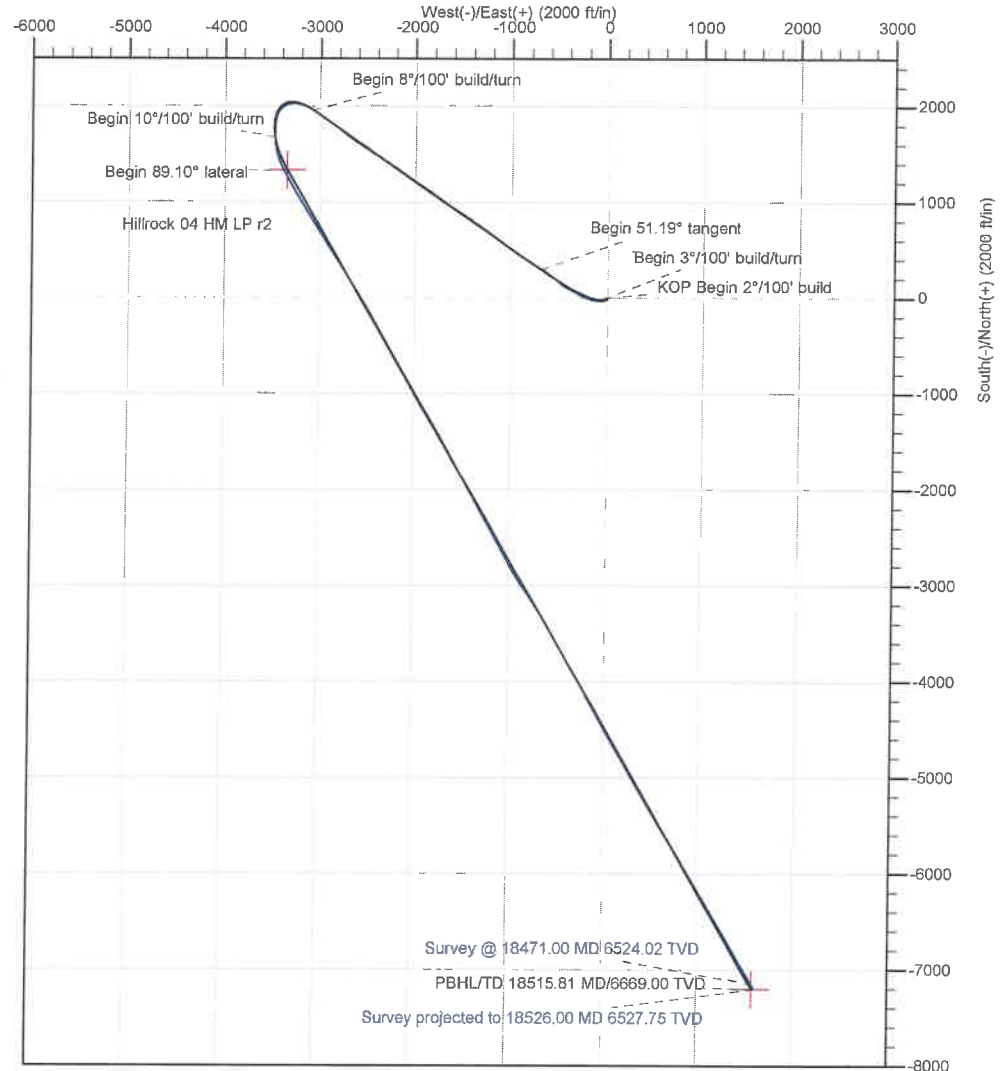
Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.86°

Magnetic Field
 Strength: 51899.4snT
 Dip Angle: 66.74°
 Date: 9/20/2019
 Model: IGRF2015

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.855°

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
2	1318.00	0.00	0.000	1318.00	0.00	0.00	0.00	0.000	0.00	KOP Begin 2°/100' build
3	1818.00	10.00	250.000	1815.47	-14.89	-40.90	2.00	250.000	5.75	Begin 3°/100' build/turn
4	3350.15	51.19	304.844	3120.77	297.63	-691.09	3.00	62.401	-439.17	Begin 51.19° tangent
5	7080.92	51.19	304.844	5458.89	1958.65	-3077.06	0.00	0.000	-2574.04	Begin 8°/100' build/turn
6	8266.71	55.00	170.740	6394.79	1675.41	-3472.95	8.00	-143.819	-2362.47	Begin 10°/100' build/turn
7	8658.73	89.10	149.997	6515.01	1333.78	-3344.04	10.00	-34.075	-2021.13	Begin 89.10° lateral
8	18515.81	89.10	149.997	6669.00	-7201.42	1584.28	0.00	0.000	7373.63	PBHL/TD 18515.81 MD/6669.00 TVD



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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 04 HM (H)					
Well Position	+N/-S	0.00 ft	Northing:	14,434,279.29 usft	Latitude:	39.74587001
	+E/-W	0.00 ft	Easting:	1,704,992.60 usft	Longitude:	-80.77026312
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	9/20/2019	-8.708	66.744	51,899.35230924

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	167.590	

Survey Program	Date	10/15/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
187.00	916.00	MWD surf (Original Hole)	MWD	MWD - Standard	
980.00	2,687.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,782.00	18,471.00	MWD (Original Hole)	MWD	MWD - Standard	
18,526.00	18,526.00	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	
187.00	0.14	100.720	187.00	-0.04	0.22	0.09	0.07	0.07	0.00	
MWD surveys										
246.00	0.27	91.970	246.00	-0.06	0.43	0.15	0.23	0.22	-14.83	
277.00	0.30	132.370	277.00	-0.12	0.57	0.24	0.64	0.10	130.32	
306.00	0.07	138.970	306.00	-0.18	0.63	0.31	0.80	-0.79	22.76	
337.00	0.32	141.100	337.00	-0.26	0.70	0.41	0.81	0.81	6.87	
368.00	0.12	244.090	368.00	-0.35	0.73	0.49	1.18	-0.65	332.23	

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Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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)
398.00	0.26	270.720	398.00	-0.36	0.63	0.49	0.54	0.47	88.77
428.00	0.38	300.180	428.00	-0.31	0.48	0.40	0.67	0.40	98.20
459.00	0.16	311.390	459.00	-0.23	0.36	0.30	0.73	-0.71	36.16
490.00	0.15	7.350	490.00	-0.16	0.33	0.23	0.47	-0.03	180.52
519.00	0.13	80.540	519.00	-0.12	0.37	0.19	0.58	-0.07	252.38
549.00	0.13	116.940	549.00	-0.13	0.43	0.21	0.27	0.00	121.33
579.00	0.14	235.550	579.00	-0.16	0.43	0.25	0.77	0.03	395.37
609.00	0.12	109.160	609.00	-0.19	0.43	0.28	0.77	-0.07	-421.30
639.00	0.13	248.520	639.00	-0.22	0.43	0.30	0.78	0.03	464.53
668.00	0.02	221.490	668.00	-0.23	0.39	0.31	0.39	-0.38	-93.21
699.00	0.26	63.730	699.00	-0.20	0.45	0.30	0.90	0.77	-508.90
729.00	0.45	241.860	729.00	-0.23	0.41	0.31	2.37	0.63	593.77
760.00	0.25	222.080	760.00	-0.34	0.26	0.38	0.74	-0.65	-63.81
790.00	0.36	359.410	790.00	-0.29	0.21	0.33	1.90	0.37	457.77
821.00	0.22	333.580	821.00	-0.14	0.18	0.18	0.61	-0.45	-83.32
853.00	0.07	220.950	853.00	-0.10	0.14	0.13	0.80	-0.47	-351.97
885.00	0.11	27.680	885.00	-0.09	0.15	0.12	0.56	0.13	521.03
916.00	0.29	345.440	916.00	0.01	0.14	0.02	0.71	0.58	-136.26
980.00	0.21	45.450	979.99	0.25	0.18	-0.21	0.41	-0.13	93.77
1,012.00	0.05	315.100	1,011.99	0.30	0.21	-0.25	0.68	-0.50	-282.34
1,042.00	0.20	324.800	1,041.99	0.36	0.18	-0.31	0.50	0.50	32.33
1,074.00	0.22	327.260	1,073.99	0.45	0.11	-0.42	0.07	0.06	7.69
1,105.00	0.47	16.290	1,104.99	0.63	0.11	-0.59	1.18	0.81	158.16
1,137.00	0.45	32.010	1,136.99	0.86	0.22	-0.79	0.40	-0.06	49.13
1,168.00	0.24	33.030	1,167.99	1.02	0.32	-0.92	0.68	-0.68	3.29
1,200.00	0.48	49.150	1,199.99	1.16	0.45	-1.04	0.81	0.75	50.38
1,232.00	0.30	35.400	1,231.99	1.32	0.60	-1.16	0.63	-0.56	-42.97
1,264.00	0.45	57.320	1,263.99	1.45	0.76	-1.26	0.64	0.47	68.50
1,296.00	0.45	136.470	1,295.99	1.43	0.95	-1.19	1.79	0.00	247.34
1,328.00	0.85	178.760	1,327.99	1.10	1.04	-0.85	1.87	1.25	132.16
1,359.00	1.36	184.510	1,358.98	0.50	1.02	-0.27	1.68	1.65	18.55
1,391.00	1.77	185.140	1,390.97	-0.37	0.94	0.56	1.28	1.28	1.97
1,423.00	2.57	187.080	1,422.95	-1.57	0.81	1.71	2.51	2.50	6.06
1,455.00	3.35	193.930	1,454.90	-3.19	0.50	3.22	2.67	2.44	21.41
1,486.00	3.97	198.790	1,485.84	-5.09	-0.07	4.95	2.23	2.00	15.68
1,518.00	4.49	203.560	1,517.75	-7.28	-0.92	6.91	1.96	1.63	14.91
1,550.00	5.04	209.310	1,549.64	-9.66	-2.11	8.98	2.27	1.72	17.97
1,581.00	5.47	215.880	1,580.51	-12.04	-3.64	10.98	2.38	1.39	21.19
1,613.00	5.84	229.460	1,612.36	-14.34	-5.78	12.76	4.33	1.16	42.44
1,645.00	6.30	242.630	1,644.18	-16.20	-8.57	13.98	4.57	1.44	41.16
1,676.00	7.08	248.610	1,674.97	-17.68	-11.86	14.72	3.37	2.52	19.29
1,708.00	7.81	250.760	1,706.70	-19.12	-15.75	15.28	2.44	2.28	6.72
1,740.00	8.84	250.460	1,738.36	-20.65	-20.12	15.85	3.22	3.22	-0.94

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1,771.00	10.01	250.660	1,768.94	-22.34	-24.91	16.47	3.78	3.77	0.65
1,801.00	11.37	252.340	1,798.42	-24.10	-30.19	17.05	4.65	4.53	5.60
1,833.00	12.46	255.310	1,829.73	-25.94	-36.53	17.48	3.91	3.41	9.28
1,864.00	13.29	260.730	1,859.95	-27.36	-43.28	17.42	4.72	2.68	17.48
1,896.00	13.91	266.170	1,891.06	-28.21	-50.75	16.64	4.44	1.94	17.00
1,928.00	15.19	270.260	1,922.03	-28.45	-58.78	15.15	5.13	4.00	12.78
1,960.00	16.61	273.380	1,952.81	-28.16	-67.54	12.98	5.18	4.44	9.75
1,991.00	17.32	273.030	1,982.46	-27.65	-76.57	10.55	2.31	2.29	-1.13
2,023.00	18.04	272.110	2,012.95	-27.22	-86.28	8.04	2.41	2.25	-2.88
2,054.00	18.64	271.530	2,042.37	-26.91	-96.03	5.64	2.02	1.94	-1.87
2,086.00	19.79	272.360	2,072.59	-26.55	-106.55	3.03	3.69	3.59	2.59
2,118.00	21.17	273.230	2,102.56	-26.00	-117.74	0.09	4.42	4.31	2.72
2,150.00	22.58	274.580	2,132.26	-25.18	-129.63	-3.26	4.68	4.41	4.22
2,182.00	23.81	277.260	2,161.67	-23.88	-142.16	-7.23	5.06	3.84	8.38
2,213.00	23.74	280.560	2,190.04	-21.94	-154.50	-11.77	4.30	-0.23	10.65
2,245.00	21.97	284.970	2,219.53	-19.22	-166.62	-17.04	7.69	-5.53	13.78
2,277.00	20.75	289.200	2,249.34	-15.80	-177.76	-22.77	6.14	-3.81	13.22
2,309.00	19.69	293.480	2,279.37	-11.79	-188.06	-28.90	5.69	-3.31	13.38
2,340.00	20.04	296.400	2,308.52	-7.35	-197.61	-35.29	3.39	1.13	9.42
2,372.00	20.16	296.590	2,338.57	-2.44	-207.45	-42.20	0.43	0.38	0.59
2,404.00	20.79	296.480	2,368.55	2.56	-217.46	-49.23	1.97	1.97	-0.34
2,434.00	21.83	295.950	2,398.50	7.37	-227.24	-56.04	3.53	3.47	-1.77
2,466.00	22.84	295.170	2,426.10	12.62	-238.21	-63.52	3.29	3.16	-2.44
2,498.00	24.05	295.060	2,455.46	18.02	-249.74	-71.27	3.78	3.78	-0.34
2,529.00	25.05	295.140	2,483.65	23.48	-261.41	-79.11	3.23	3.23	0.26
2,561.00	25.62	295.540	2,512.58	29.34	-273.78	-87.50	1.86	1.78	1.25
2,592.00	26.58	296.610	2,540.41	35.34	-286.03	-95.98	3.45	3.10	3.45
2,624.00	27.32	297.700	2,568.94	41.96	-298.93	-105.22	2.78	2.31	3.41
2,655.00	28.31	299.450	2,596.36	48.88	-311.63	-114.71	4.14	3.19	5.65
2,687.00	29.55	299.880	2,624.36	56.54	-325.08	-125.09	3.93	3.88	1.34
2,782.00	33.64	296.860	2,705.27	80.12	-368.89	-157.52	4.61	4.31	-3.18
2,829.00	33.57	294.290	2,744.42	91.34	-392.35	-173.53	3.03	-0.15	-5.47
2,876.00	35.18	299.260	2,783.22	103.31	-416.01	-190.30	6.88	3.43	10.57
2,923.00	37.93	303.390	2,820.97	117.88	-439.89	-209.66	7.85	5.85	8.79
2,970.00	40.91	308.110	2,857.28	135.34	-464.07	-231.91	8.99	6.34	10.04
3,017.00	43.76	309.750	2,892.02	155.23	-488.69	-256.63	6.50	6.06	3.49
3,064.00	45.64	308.120	2,925.43	176.00	-514.40	-282.44	4.68	4.00	-3.47
3,111.00	47.27	306.420	2,957.81	196.62	-541.51	-308.40	4.35	3.47	-3.62
3,158.00	48.64	305.870	2,989.29	217.21	-569.70	-334.57	3.04	2.91	-1.17
3,205.00	48.35	304.470	3,020.43	237.48	-598.47	-360.55	2.31	-0.62	-2.98
3,254.00	49.92	303.290	3,052.49	258.14	-629.24	-387.33	3.69	3.20	-2.41
3,301.00	52.16	303.040	3,082.04	278.13	-659.83	-413.43	4.78	4.77	-0.53
3,349.00	51.85	302.260	3,111.59	298.53	-691.68	-440.20	1.43	-0.65	-1.63
3,443.00	51.32	302.410	3,170.00	337.93	-753.91	-492.05	0.58	-0.56	0.16

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3,537.00	48.58	305.150	3,230.49	377.90	-813.72	-543.94	3.67	-2.91	2.91
3,632.00	49.68	305.790	3,292.65	419.58	-872.22	-597.23	1.26	1.16	0.67
3,726.00	52.90	305.850	3,351.43	462.51	-931.69	-651.93	3.43	3.43	0.06
3,821.00	50.12	306.100	3,410.55	506.18	-991.86	-707.51	2.93	-2.93	0.26
3,916.00	50.43	305.270	3,471.26	548.80	-1,051.21	-761.89	0.75	0.33	-0.87
4,011.00	52.47	306.270	3,530.46	592.23	-1,111.48	-817.26	2.30	2.15	1.05
4,106.00	50.81	304.170	3,589.42	635.20	-1,172.32	-872.30	2.46	-1.75	-2.21
4,200.00	50.81	304.520	3,648.82	676.30	-1,232.47	-925.37	0.29	0.00	0.37
4,294.00	50.16	306.680	3,708.63	718.51	-1,291.43	-979.26	1.90	-0.69	2.30
4,390.00	50.69	305.740	3,769.80	762.22	-1,351.14	-1,034.77	0.94	0.55	-0.98
4,485.00	52.63	306.070	3,828.72	805.91	-1,411.49	-1,090.42	2.06	2.04	0.35
4,580.00	50.54	304.220	3,887.75	848.77	-1,472.34	-1,145.35	2.68	-2.20	-1.95
4,675.00	50.78	303.880	3,947.98	889.91	-1,533.21	-1,198.61	0.37	0.25	-0.36
4,770.00	50.47	303.930	4,008.24	930.87	-1,594.16	-1,251.72	0.33	-0.33	0.05
4,864.00	50.86	304.240	4,067.82	971.62	-1,654.37	-1,304.45	0.49	0.41	0.33
4,959.00	50.86	306.300	4,127.79	1,014.16	-1,714.53	-1,358.93	1.68	0.00	2.17
5,053.00	51.21	306.660	4,186.91	1,057.62	-1,773.29	-1,413.99	0.48	0.37	0.38
5,147.00	50.89	305.740	4,246.00	1,100.79	-1,832.28	-1,468.84	0.83	-0.34	-0.98
5,242.00	51.09	303.700	4,305.80	1,142.83	-1,892.95	-1,522.93	1.68	0.21	-2.15
5,337.00	51.34	302.980	4,365.31	1,183.53	-1,954.82	-1,575.98	0.65	0.26	-0.76
5,399.00	50.19	303.410	4,404.52	1,209.82	-1,995.00	-1,610.29	1.93	-1.85	0.69
5,462.00	50.34	304.850	4,444.80	1,237.00	-2,035.10	-1,645.45	1.77	0.24	2.29
5,525.00	50.19	305.060	4,485.07	1,264.76	-2,074.81	-1,681.10	0.35	-0.24	0.33
5,620.00	50.63	306.210	4,545.61	1,307.41	-2,134.31	-1,735.54	1.04	0.46	1.21
5,715.00	51.78	305.530	4,605.13	1,350.79	-2,194.31	-1,790.80	1.33	1.21	-0.72
5,778.00	51.30	303.990	4,644.32	1,378.92	-2,234.83	-1,826.98	2.06	-0.76	-2.44
5,841.00	53.03	303.720	4,682.96	1,406.63	-2,276.15	-1,862.93	2.77	2.75	-0.43
5,905.00	52.11	303.160	4,721.86	1,434.64	-2,318.56	-1,899.39	1.60	-1.44	-0.88
5,968.00	52.20	303.220	4,760.51	1,461.88	-2,360.19	-1,934.94	0.16	0.14	0.10
6,032.00	51.53	302.430	4,800.03	1,489.16	-2,402.49	-1,970.68	1.43	-1.05	-1.23
6,093.00	52.98	302.570	4,837.37	1,515.08	-2,443.17	-2,004.73	2.38	2.38	0.23
6,156.00	51.61	302.390	4,875.90	1,541.85	-2,485.22	-2,039.91	2.19	-2.17	-0.29
6,220.00	49.76	302.940	4,916.45	1,568.57	-2,526.90	-2,074.96	2.97	-2.89	0.86
6,284.00	48.97	302.680	4,958.13	1,594.88	-2,567.72	-2,109.44	1.27	-1.23	-0.41
6,379.00	50.41	305.770	5,019.59	1,635.64	-2,627.59	-2,162.11	2.91	1.52	3.25
6,473.00	51.10	307.960	5,079.07	1,679.31	-2,685.83	-2,217.27	1.95	0.73	2.33
6,568.00	51.33	305.940	5,138.58	1,723.82	-2,745.00	-2,273.46	1.68	0.24	-2.13
6,663.00	51.93	305.640	5,197.55	1,767.38	-2,805.42	-2,328.98	0.68	0.63	-0.32
6,758.00	51.87	306.570	5,256.17	1,811.43	-2,865.82	-2,384.99	0.77	-0.06	0.98
6,852.00	51.89	304.850	5,314.20	1,854.59	-2,925.86	-2,440.04	1.44	0.02	-1.83
6,949.00	51.96	305.960	5,374.02	1,898.83	-2,988.10	-2,496.62	0.90	0.07	1.14
6,994.00	50.46	304.560	5,402.21	1,919.08	-3,016.73	-2,522.55	4.12	-3.33	-3.11
7,089.00	48.31	302.360	5,464.05	1,958.85	-3,076.87	-2,574.32	2.87	-2.26	-2.32

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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)
7,136.00	46.20	300.080	5,495.95	1,976.75	-3,106.38	-2,598.14	5.73	-4.49	-4.85
7,184.00	43.12	295.860	5,530.10	1,992.59	-3,136.14	-2,620.01	8.91	-6.42	-8.79
7,231.00	41.19	291.110	5,564.95	2,005.18	-3,165.05	-2,638.51	7.93	-4.11	-10.11
7,279.00	38.73	286.980	5,601.74	2,015.26	-3,194.16	-2,654.62	7.53	-5.13	-8.60
7,326.00	35.21	281.790	5,639.30	2,022.32	-3,221.50	-2,667.39	10.00	-7.49	-11.04
7,374.00	31.34	277.220	5,679.43	2,026.72	-3,247.45	-2,677.26	9.60	-8.06	-9.52
7,421.00	28.79	271.420	5,720.11	2,028.54	-3,270.90	-2,684.08	8.22	-5.43	-12.34
7,469.00	28.13	265.710	5,762.31	2,027.98	-3,293.74	-2,688.44	5.83	-1.38	-11.90
7,516.00	27.43	260.440	5,803.90	2,025.35	-3,315.47	-2,690.54	5.43	-1.49	-11.21
7,563.00	26.86	253.410	5,845.74	2,020.52	-3,336.32	-2,690.31	6.93	-1.21	-14.96
7,610.00	26.59	246.110	5,887.73	2,013.23	-3,356.12	-2,687.44	7.00	-0.57	-15.53
7,657.00	28.48	239.340	5,929.41	2,003.25	-3,375.38	-2,681.83	7.77	4.02	-14.40
7,704.00	29.98	233.100	5,970.44	1,990.48	-3,394.42	-2,673.46	7.22	3.19	-13.28
7,753.00	30.15	224.930	6,012.86	1,974.41	-3,412.91	-2,661.73	8.35	0.35	-16.67
7,800.00	30.64	215.170	6,053.43	1,956.26	-3,428.15	-2,647.28	10.55	1.04	-20.77
7,845.00	31.69	206.120	6,091.95	1,936.26	-3,439.97	-2,630.29	10.66	2.33	-20.11
7,892.00	32.13	200.580	6,131.86	1,913.47	-3,449.80	-2,610.14	6.30	0.94	-11.79
7,940.00	33.36	195.220	6,172.24	1,888.78	-3,457.75	-2,587.74	6.56	2.56	-11.17
8,034.00	38.11	188.720	6,248.55	1,835.12	-3,468.95	-2,537.73	6.46	5.05	-6.91
8,081.00	41.76	184.590	6,284.59	1,805.16	-3,472.40	-2,509.22	9.59	7.77	-8.79
8,129.00	44.48	181.160	6,319.62	1,772.41	-3,474.02	-2,477.58	7.48	5.67	-7.15
8,176.00	48.35	178.260	6,352.02	1,738.38	-3,473.82	-2,444.30	9.37	8.23	-6.17
8,223.00	52.92	177.290	6,381.83	1,702.08	-3,472.40	-2,408.55	9.85	9.72	-2.06
8,270.00	57.19	176.150	6,408.74	1,663.63	-3,470.19	-2,370.52	9.30	9.09	-2.43
8,317.00	61.49	174.570	6,432.71	1,623.34	-3,466.90	-2,330.47	9.59	9.15	-3.36
8,411.00	70.68	169.120	6,470.79	1,538.43	-3,454.59	-2,244.90	11.12	9.78	-5.80
8,506.00	78.37	161.120	6,496.16	1,450.13	-3,431.00	-2,153.59	11.46	8.09	-8.42
8,601.00	87.30	153.740	6,508.02	1,363.26	-3,394.83	-2,060.98	12.15	9.40	-7.77
8,696.00	88.62	152.070	6,511.40	1,278.75	-3,351.59	-1,969.14	2.24	1.39	-1.76
8,790.00	89.45	149.870	6,512.98	1,196.57	-3,305.99	-1,879.09	2.50	0.88	-2.34
8,885.00	88.62	149.870	6,514.58	1,114.42	-3,258.31	-1,788.61	0.87	-0.87	0.00
8,980.00	89.36	148.020	6,516.25	1,033.05	-3,209.31	-1,698.62	2.10	0.78	-1.95
9,075.00	90.42	148.110	6,516.44	952.43	-3,159.06	-1,609.08	1.12	1.12	0.09
9,169.00	89.89	147.590	6,516.18	872.85	-3,109.04	-1,520.61	0.79	-0.56	-0.55
9,265.00	89.19	148.380	6,516.95	791.45	-3,058.15	-1,430.17	1.10	-0.73	0.82
9,359.00	91.16	148.990	6,516.67	711.15	-3,009.30	-1,341.25	2.19	2.10	0.65
9,455.00	90.37	148.990	6,515.38	628.88	-2,959.84	-1,250.27	0.82	-0.82	0.00
9,550.00	90.77	146.790	6,514.44	548.42	-2,909.35	-1,160.84	2.35	0.42	-2.32
9,645.00	90.24	146.350	6,513.60	469.14	-2,857.02	-1,072.17	0.73	-0.56	-0.46
9,740.00	90.99	148.020	6,512.58	389.31	-2,805.54	-983.14	1.93	0.79	1.76
9,835.00	90.29	147.500	6,511.52	308.96	-2,754.86	-893.78	0.92	-0.74	-0.55
9,930.00	89.45	147.150	6,511.74	229.00	-2,703.58	-804.66	0.96	-0.88	-0.37
10,025.00	91.16	149.260	6,511.23	148.26	-2,653.53	-715.06	2.86	1.80	2.22



Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Hillrock/Simms
Well: Hillrock 04 HM (H)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Hillrock 04 HM (H)
TVD Reference: RKB=1219+18 @ 1237.00ft
MD Reference: RKB=1219+18 @ 1237.00ft
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)
10,120.00	90.51	148.900	6,509.85	66.77	-2,604.72	-624.98	0.78	-0.68	-0.38
10,215.00	89.98	148.640	6,509.44	-14.46	-2,555.46	-535.06	0.62	-0.56	-0.27
10,310.00	91.47	149.430	6,508.24	-95.91	-2,506.59	-445.01	1.78	1.57	0.83
10,406.00	90.68	149.610	6,506.44	-178.63	-2,457.90	-353.76	0.84	-0.82	0.19
10,501.00	89.93	150.050	6,505.93	-260.76	-2,410.16	-263.29	0.92	-0.79	0.46
10,596.00	88.84	150.220	6,506.95	-343.14	-2,362.86	-172.67	1.16	-1.15	0.18
10,691.00	91.16	150.400	6,506.95	-425.66	-2,315.81	-81.97	2.45	2.44	0.19
10,786.00	90.42	150.570	6,505.64	-508.32	-2,269.01	8.82	0.80	-0.78	0.18
10,881.00	89.67	150.660	6,505.57	-591.10	-2,222.40	99.68	0.80	-0.79	0.09
10,975.00	88.70	151.100	6,506.90	-673.21	-2,176.66	189.70	1.13	-1.03	0.47
11,070.00	90.11	149.260	6,507.89	-755.62	-2,129.42	280.34	2.44	1.48	-1.94
11,165.00	89.14	148.820	6,508.51	-837.08	-2,080.55	370.40	1.12	-1.02	-0.46
11,260.00	90.46	150.220	6,508.84	-918.95	-2,032.37	460.71	2.03	1.39	1.47
11,355.00	90.02	149.520	6,508.45	-1,001.11	-1,984.68	551.20	0.87	-0.46	-0.74
11,450.00	91.52	149.690	6,507.17	-1,083.05	-1,936.62	641.55	1.59	1.58	0.18
11,545.00	90.73	149.690	6,505.30	-1,165.04	-1,888.69	731.93	0.83	-0.83	0.00
11,639.00	89.98	149.690	6,504.72	-1,246.19	-1,841.25	821.38	0.80	-0.80	0.00
11,734.00	91.21	150.130	6,503.74	-1,328.38	-1,793.62	911.89	1.38	1.29	0.46
11,827.00	90.46	150.220	6,502.38	-1,409.06	-1,747.37	1,000.61	0.81	-0.81	0.10
11,922.00	89.45	150.570	6,502.45	-1,491.65	-1,700.44	1,091.36	1.13	-1.06	0.37
12,018.00	91.38	151.190	6,501.76	-1,575.51	-1,653.73	1,183.30	2.11	2.01	0.65
12,112.00	90.73	152.160	6,500.03	-1,658.24	-1,609.14	1,273.68	1.24	-0.69	1.03
12,206.00	89.85	153.030	6,499.55	-1,741.69	-1,565.87	1,364.48	1.32	-0.94	0.93
12,301.00	90.81	150.750	6,499.01	-1,825.48	-1,521.12	1,455.93	2.60	1.01	-2.40
12,395.00	90.07	151.190	6,498.28	-1,907.66	-1,475.50	1,546.00	0.92	-0.79	0.47
12,491.00	91.25	150.400	6,497.18	-1,991.45	-1,428.67	1,637.89	1.48	1.23	-0.82
12,585.00	90.59	150.750	6,495.67	-2,073.32	-1,382.49	1,727.77	0.79	-0.70	0.37
12,679.00	89.76	150.840	6,495.38	-2,155.36	-1,336.63	1,817.76	0.89	-0.88	0.10
12,775.00	90.90	151.190	6,494.83	-2,239.34	-1,290.11	1,909.76	1.24	1.19	0.36
12,870.00	90.86	150.840	6,493.37	-2,322.43	-1,244.08	2,000.81	0.37	-0.04	-0.37
12,965.00	90.55	150.400	6,492.20	-2,405.20	-1,197.47	2,091.66	0.57	-0.33	-0.46
13,060.00	89.36	150.570	6,492.28	-2,487.87	-1,150.67	2,182.46	1.27	-1.25	0.18
13,154.00	88.79	151.540	6,493.79	-2,570.12	-1,105.19	2,272.56	1.20	-0.61	1.03
13,249.00	88.13	151.190	6,496.35	-2,653.47	-1,059.68	2,363.74	0.79	-0.69	-0.37
13,343.00	87.69	151.540	6,499.77	-2,735.92	-1,014.66	2,453.94	0.60	-0.47	0.37
13,438.00	88.09	148.990	6,503.27	-2,818.35	-967.58	2,544.56	2.72	0.42	-2.68
13,532.00	87.30	148.550	6,507.05	-2,898.66	-918.88	2,633.46	0.96	-0.84	-0.47
13,627.00	90.02	147.500	6,509.27	-2,979.21	-868.59	2,722.94	3.07	2.86	-1.11
13,722.00	91.08	146.880	6,508.36	-3,059.05	-817.12	2,811.97	1.29	1.12	-0.65
13,817.00	90.42	147.590	6,507.12	-3,138.93	-765.71	2,901.03	1.02	-0.69	0.75
13,911.00	90.68	149.340	6,506.22	-3,219.04	-716.55	2,989.84	1.88	0.28	1.86
14,005.00	89.63	148.730	6,505.96	-3,299.64	-668.19	3,078.95	1.29	-1.12	-0.65
14,100.00	91.52	149.430	6,505.01	-3,381.13	-619.38	3,169.03	2.12	1.99	0.74
14,195.00	90.73	149.780	6,503.14	-3,463.06	-571.32	3,259.37	0.91	-0.83	0.37

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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)
14,289.00	89.71	150.310	6,502.78	-3,544.50	-524.39	3,348.99	1.22	-1.09	0.56
14,383.00	91.56	150.840	6,501.74	-3,626.37	-478.21	3,438.87	2.05	1.97	0.56
14,478.00	90.55	150.490	6,499.99	-3,709.17	-431.68	3,529.73	1.13	-1.06	-0.37
14,574.00	89.54	151.280	6,499.92	-3,793.04	-384.97	3,621.68	1.34	-1.05	0.82
14,669.00	91.30	149.780	6,499.22	-3,875.74	-338.24	3,712.49	2.43	1.85	-1.58
14,764.00	90.86	149.610	6,497.43	-3,957.74	-290.31	3,802.88	0.50	-0.46	-0.18
14,859.00	90.24	150.050	6,496.52	-4,039.87	-242.57	3,893.35	0.80	-0.65	0.46
14,955.00	89.32	150.930	6,496.89	-4,123.41	-195.28	3,985.10	1.33	-0.96	0.92
15,050.00	88.84	151.540	6,498.41	-4,206.68	-149.57	4,076.25	0.82	-0.51	0.64
15,144.00	90.20	151.100	6,499.20	-4,289.14	-104.46	4,166.48	1.52	1.45	-0.47
15,239.00	89.27	150.750	6,499.64	-4,372.17	-58.30	4,257.48	1.05	-0.98	-0.37
15,334.00	88.53	151.360	6,501.46	-4,455.28	-12.33	4,348.54	1.01	-0.78	0.64
15,429.00	89.10	149.430	6,503.43	-4,537.86	34.59	4,439.27	2.12	0.60	-2.03
15,523.00	88.18	149.430	6,505.66	-4,618.77	82.39	4,528.56	0.98	-0.98	0.00
15,618.00	91.52	149.690	6,505.91	-4,700.66	130.51	4,618.88	3.53	3.52	0.27
15,713.00	90.59	149.780	6,504.16	-4,782.70	178.38	4,709.29	0.98	-0.98	0.09
15,807.00	89.98	149.690	6,503.69	-4,863.89	225.76	4,798.76	0.66	-0.65	-0.10
15,902.00	89.32	151.010	6,504.27	-4,946.45	272.75	4,889.49	1.55	-0.69	1.39
15,996.00	90.95	149.430	6,504.05	-5,028.03	319.43	4,979.19	2.41	1.73	-1.68
16,090.00	90.20	150.130	6,503.11	-5,109.25	366.74	5,068.68	1.09	-0.80	0.74
16,185.00	89.41	150.570	6,503.43	-5,191.81	413.74	5,159.41	0.95	-0.83	0.46
16,280.00	91.16	149.260	6,502.96	-5,274.00	461.36	5,249.92	2.30	1.84	-1.38
16,376.00	90.33	149.260	6,501.71	-5,356.51	510.42	5,341.04	0.86	-0.86	0.00
16,470.00	89.71	149.170	6,501.68	-5,437.26	558.53	5,430.25	0.67	-0.66	-0.10
16,565.00	88.97	148.730	6,502.77	-5,518.64	607.53	5,520.26	0.91	-0.78	-0.46
16,659.00	87.87	149.170	6,505.36	-5,599.14	655.99	5,609.29	1.26	-1.17	0.47
16,754.00	90.90	148.110	6,506.38	-5,680.25	705.42	5,699.13	3.38	3.19	-1.12
16,849.00	90.24	148.110	6,505.44	-5,760.90	755.61	5,788.68	0.69	-0.69	0.00
16,944.00	89.45	148.900	6,505.69	-5,841.91	805.24	5,878.46	1.18	-0.83	0.83
17,039.00	88.75	148.640	6,507.19	-5,923.13	854.49	5,968.37	0.79	-0.74	-0.27
17,134.00	87.56	148.990	6,510.24	-6,004.36	903.65	6,058.27	1.31	-1.25	0.37
17,228.00	90.64	149.780	6,511.72	-6,085.24	951.51	6,147.54	3.38	3.28	0.84
17,323.00	89.89	149.340	6,511.28	-6,167.14	999.64	6,237.87	0.92	-0.79	-0.46
17,418.00	88.97	149.170	6,512.23	-6,248.78	1,048.20	6,328.04	0.98	-0.97	-0.18
17,513.00	92.44	149.780	6,511.06	-6,330.60	1,096.44	6,418.31	3.71	3.65	0.64
17,608.00	92.18	149.170	6,507.23	-6,412.36	1,144.66	6,508.53	0.70	-0.27	-0.64
17,702.00	91.65	149.170	6,504.09	-6,493.04	1,192.80	6,597.67	0.56	-0.56	0.00
17,796.00	88.75	147.590	6,503.76	-6,573.07	1,242.08	6,686.42	3.51	-3.09	-1.68
17,891.00	89.36	149.430	6,505.33	-6,654.06	1,291.69	6,776.18	2.04	0.64	1.94
17,985.00	89.14	149.170	6,506.56	-6,734.88	1,339.68	6,865.43	0.36	-0.23	-0.28
18,080.00	89.10	149.960	6,508.01	-6,816.78	1,387.80	6,955.75	0.83	-0.04	0.83
18,175.00	88.44	149.690	6,510.05	-6,898.89	1,435.54	7,046.20	0.75	-0.69	-0.28
18,269.00	87.82	149.780	6,513.12	-6,980.03	1,482.89	7,135.63	0.67	-0.66	0.10

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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)
18,364.00	86.90	149.610	6,517.50	-7,061.97	1,530.77	7,225.93	0.98	-0.97	-0.18
18,471.00	86.11	149.610	6,524.02	-7,154.09	1,584.80	7,327.52	0.74	-0.74	0.00
Survey @ 18471.00 MD 6524.02 TVD									
18,526.00	86.11	149.610	6,527.75	-7,201.43	1,612.56	7,379.71	0.00	0.00	0.00
Survey projected to 18526.00 MD 6527.75 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
187.00	187.00	-0.04	0.22	MWD surveys
18,471.00	6,524.02	-7,154.09	1,584.80	Survey @ 18471.00 MD 6524.02 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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 04 HM (H)					
Well Position	+N/-S	0.00 ft	Northing:	14,434,279.29 usft	Latitude:	39.74587001
	+E/-W	0.00 ft	Easting:	1,704,992.60 usft	Longitude:	-80.77026312
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	9/20/2019	-8.708	66.744	51,899.35230924

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	167.590	

Survey Program	Date	10/15/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
187.00	916.00	MWD surf (Original Hole)	MWD	MWD - Standard	
980.00	2,687.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,782.00	18,471.00	MWD (Original Hole)	MWD	MWD - Standard	
18,526.00	18,526.00	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	14,434,279.29	1,704,992.60	39.74587001	-80.77026312	
187.00	0.14	100.720	187.00	-0.04	0.22	14,434,279.25	1,704,992.82	39.74586989	-80.77026232	
MWD surveys										
246.00	0.27	91.970	246.00	-0.06	0.43	14,434,279.23	1,704,993.03	39.74586984	-80.77026158	
277.00	0.30	132.370	277.00	-0.12	0.57	14,434,279.17	1,704,993.16	39.74586968	-80.77026110	
306.00	0.07	138.970	306.00	-0.18	0.63	14,434,279.11	1,704,993.23	39.74586951	-80.77026086	
337.00	0.32	141.100	337.00	-0.26	0.70	14,434,279.03	1,704,993.30	39.74586928	-80.77026063	
368.00	0.12	244.090	368.00	-0.35	0.73	14,434,278.94	1,704,993.32	39.74586906	-80.77026054	
398.00	0.26	270.720	398.00	-0.36	0.63	14,434,278.93	1,704,993.23	39.74586902	-80.77026088	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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
428.00	0.38	300.180	428.00	-0.31	0.48	14,434,278.98	1,704,993.07	39.74586916	-80.77026143
459.00	0.16	311.390	459.00	-0.23	0.36	14,434,279.06	1,704,992.95	39.74586938	-80.77026186
490.00	0.15	7.350	490.00	-0.16	0.33	14,434,279.13	1,704,992.93	39.74586957	-80.77026196
519.00	0.13	80.540	519.00	-0.12	0.37	14,434,279.17	1,704,992.96	39.74586969	-80.77026182
549.00	0.13	116.940	549.00	-0.13	0.43	14,434,279.16	1,704,993.03	39.74586966	-80.77026160
579.00	0.14	235.550	579.00	-0.16	0.43	14,434,279.13	1,704,993.03	39.74586957	-80.77026160
609.00	0.12	109.160	609.00	-0.19	0.43	14,434,279.10	1,704,993.03	39.74586948	-80.77026160
639.00	0.13	248.520	639.00	-0.22	0.43	14,434,279.07	1,704,993.02	39.74586942	-80.77026160
668.00	0.02	221.490	668.00	-0.23	0.39	14,434,279.06	1,704,992.99	39.74586937	-80.77026173
699.00	0.26	63.730	699.00	-0.20	0.45	14,434,279.09	1,704,993.05	39.74586945	-80.77026151
729.00	0.45	241.860	729.00	-0.23	0.41	14,434,279.06	1,704,993.01	39.74586938	-80.77026167
760.00	0.25	222.080	760.00	-0.34	0.26	14,434,278.95	1,704,992.85	39.74586908	-80.77026221
790.00	0.36	359.410	790.00	-0.29	0.21	14,434,279.00	1,704,992.81	39.74586921	-80.77026237
821.00	0.22	333.580	821.00	-0.14	0.18	14,434,279.15	1,704,992.78	39.74586962	-80.77026247
853.00	0.07	220.950	853.00	-0.10	0.14	14,434,279.19	1,704,992.74	39.74586973	-80.77026261
885.00	0.11	27.680	885.00	-0.09	0.15	14,434,279.20	1,704,992.74	39.74586977	-80.77026260
916.00	0.29	345.440	916.00	0.01	0.14	14,434,279.30	1,704,992.74	39.74587005	-80.77026262
980.00	0.21	45.450	979.99	0.25	0.18	14,434,279.54	1,704,992.78	39.74587071	-80.77026247
1,012.00	0.05	315.100	1,011.99	0.30	0.21	14,434,279.59	1,704,992.81	39.74587085	-80.77026235
1,042.00	0.20	324.800	1,041.99	0.36	0.18	14,434,279.65	1,704,992.77	39.74587099	-80.77026249
1,074.00	0.22	327.260	1,073.99	0.45	0.11	14,434,279.74	1,704,992.71	39.74587126	-80.77026273
1,105.00	0.47	16.290	1,104.99	0.63	0.11	14,434,279.92	1,704,992.71	39.74587173	-80.77026271
1,137.00	0.45	32.010	1,136.99	0.86	0.22	14,434,280.15	1,704,992.81	39.74587237	-80.77026234
1,168.00	0.24	33.030	1,167.99	1.02	0.32	14,434,280.31	1,704,992.91	39.74587280	-80.77026199
1,200.00	0.48	49.150	1,199.99	1.16	0.45	14,434,280.45	1,704,993.05	39.74587319	-80.77026149
1,232.00	0.30	35.400	1,231.99	1.32	0.60	14,434,280.61	1,704,993.20	39.74587362	-80.77026096
1,264.00	0.45	57.320	1,263.99	1.45	0.76	14,434,280.74	1,704,993.36	39.74587399	-80.77026041
1,296.00	0.45	136.470	1,295.99	1.43	0.95	14,434,280.72	1,704,993.55	39.74587393	-80.77025972
1,328.00	0.85	178.760	1,327.99	1.10	1.04	14,434,280.39	1,704,993.64	39.74587303	-80.77025940
1,359.00	1.36	184.510	1,358.98	0.50	1.02	14,434,279.79	1,704,993.62	39.74587139	-80.77025949
1,391.00	1.77	185.140	1,390.97	-0.37	0.94	14,434,278.92	1,704,993.54	39.74586900	-80.77025976
1,423.00	2.57	187.080	1,422.95	-1.57	0.81	14,434,277.72	1,704,993.41	39.74586569	-80.77026025
1,455.00	3.35	193.930	1,454.90	-3.19	0.50	14,434,276.10	1,704,993.10	39.74586125	-80.77026138
1,486.00	3.97	198.790	1,485.84	-5.09	-0.07	14,434,274.20	1,704,992.53	39.74585604	-80.77026340
1,518.00	4.49	203.560	1,517.75	-7.28	-0.92	14,434,272.01	1,704,991.67	39.74585002	-80.77026647
1,550.00	5.04	209.310	1,549.64	-9.66	-2.11	14,434,269.63	1,704,990.49	39.74584351	-80.77027072
1,581.00	5.47	215.880	1,580.51	-12.04	-3.64	14,434,267.25	1,704,988.95	39.74583697	-80.77027620
1,613.00	5.84	229.460	1,612.36	-14.34	-5.78	14,434,264.96	1,704,986.82	39.74583068	-80.77028380
1,645.00	6.30	242.630	1,644.18	-16.20	-8.57	14,434,263.09	1,704,984.03	39.74582558	-80.77029376
1,676.00	7.08	248.610	1,674.97	-17.68	-11.86	14,434,261.61	1,704,980.74	39.74582154	-80.77030548
1,708.00	7.81	250.760	1,706.70	-19.12	-15.75	14,434,260.18	1,704,976.85	39.74581763	-80.77031933
1,740.00	8.84	250.460	1,738.36	-20.65	-20.12	14,434,258.64	1,704,972.48	39.74581343	-80.77033489
1,771.00	10.01	250.660	1,768.94	-22.34	-24.91	14,434,256.95	1,704,967.69	39.74580883	-80.77035194
1,801.00	11.37	252.340	1,798.42	-24.10	-30.19	14,434,255.19	1,704,962.41	39.74580403	-80.77037073
1,833.00	12.46	255.310	1,829.73	-25.94	-36.53	14,434,253.35	1,704,956.07	39.74579904	-80.77039332
1,864.00	13.29	260.730	1,859.95	-27.36	-43.28	14,434,251.93	1,704,949.31	39.74579518	-80.77041735
1,896.00	13.91	266.170	1,891.06	-28.21	-50.75	14,434,251.08	1,704,941.85	39.74579290	-80.77044393
1,928.00	15.19	270.260	1,922.03	-28.45	-58.78	14,434,250.84	1,704,933.82	39.74579231	-80.77047250
1,960.00	16.61	273.380	1,952.81	-28.16	-67.54	14,434,251.13	1,704,925.06	39.74579316	-80.77050366
1,991.00	17.32	273.030	1,982.46	-27.65	-76.57	14,434,251.64	1,704,916.03	39.74579461	-80.77053578
2,023.00	18.04	272.110	2,012.95	-27.22	-86.28	14,434,252.07	1,704,906.32	39.74579587	-80.77057032
2,054.00	18.64	271.530	2,042.37	-26.91	-96.03	14,434,252.38	1,704,896.57	39.74579679	-80.77060500
2,086.00	19.79	272.360	2,072.59	-26.55	-106.55	14,434,252.74	1,704,886.04	39.74579785	-80.77064244
2,118.00	21.17	273.230	2,102.56	-26.00	-117.74	14,434,253.29	1,704,874.86	39.74579944	-80.77068222
2,150.00	22.58	274.580	2,132.26	-25.18	-129.63	14,434,254.11	1,704,862.97	39.74580176	-80.77072452

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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	
2,182.00	23.81	277.260	2,161.67	-23.88	-142.16	14,434,255.41	1,704,850.44	39.74580544	-80.77076909	
2,213.00	23.74	280.560	2,190.04	-21.94	-154.50	14,434,257.35	1,704,838.09	39.74581084	-80.77081298	
2,245.00	21.97	284.970	2,219.53	-19.22	-166.62	14,434,260.07	1,704,825.98	39.74581841	-80.77085607	
2,277.00	20.75	289.200	2,249.34	-15.80	-177.76	14,434,263.49	1,704,814.84	39.74582786	-80.77089566	
2,309.00	19.69	293.480	2,279.37	-11.79	-188.06	14,434,267.50	1,704,804.54	39.74583895	-80.77093226	
2,340.00	20.04	296.400	2,308.52	-7.35	-197.61	14,434,271.94	1,704,794.99	39.74585122	-80.77096619	
2,372.00	20.16	296.590	2,338.57	-2.44	-207.45	14,434,276.85	1,704,785.15	39.74586476	-80.77100116	
2,404.00	20.79	296.480	2,368.55	2.56	-217.46	14,434,281.85	1,704,775.14	39.74587856	-80.77103674	
2,434.00	21.83	295.950	2,396.50	7.37	-227.24	14,434,286.66	1,704,765.35	39.74589185	-80.77107149	
2,466.00	22.84	295.170	2,426.10	12.62	-238.21	14,434,291.91	1,704,754.38	39.74590633	-80.77111047	
2,498.00	24.05	295.060	2,455.46	18.02	-249.74	14,434,297.31	1,704,742.86	39.74592126	-80.77115144	
2,529.00	25.05	295.140	2,483.65	23.48	-261.41	14,434,302.77	1,704,731.19	39.74593634	-80.77119288	
2,561.00	25.62	295.540	2,512.58	29.34	-273.78	14,434,308.64	1,704,718.82	39.74595252	-80.77123686	
2,592.00	26.58	296.610	2,540.41	35.34	-286.03	14,434,314.63	1,704,706.57	39.74596908	-80.77128038	
2,624.00	27.32	297.700	2,568.94	41.96	-298.93	14,434,321.25	1,704,693.67	39.74598735	-80.77132622	
2,655.00	28.31	299.450	2,596.36	48.88	-311.63	14,434,328.17	1,704,680.97	39.74600645	-80.77137134	
2,687.00	29.55	299.880	2,624.36	56.54	-325.08	14,434,335.83	1,704,667.52	39.74602758	-80.77141912	
2,782.00	33.64	296.860	2,705.27	80.12	-368.89	14,434,359.41	1,704,623.71	39.74609262	-80.77154776	
2,829.00	33.57	294.290	2,744.42	91.34	-392.35	14,434,370.63	1,704,600.25	39.74612362	-80.77165811	
2,876.00	35.18	299.260	2,783.22	103.31	-416.01	14,434,382.60	1,704,576.59	39.74615665	-80.77174219	
2,923.00	37.93	303.390	2,820.97	117.88	-439.89	14,434,397.17	1,704,552.71	39.74619684	-80.77182701	
2,970.00	40.91	308.110	2,857.28	135.34	-464.07	14,434,414.63	1,704,528.52	39.74624494	-80.77191288	
3,017.00	43.76	309.750	2,892.02	155.23	-488.69	14,434,434.52	1,704,503.91	39.74629976	-80.77200026	
3,064.00	45.64	308.120	2,925.43	176.00	-514.40	14,434,455.29	1,704,478.20	39.74635697	-80.77209156	
3,111.00	47.27	306.420	2,957.81	196.62	-541.51	14,434,475.91	1,704,451.08	39.74641379	-80.77218783	
3,158.00	48.64	305.870	2,989.29	217.21	-569.70	14,434,496.50	1,704,422.90	39.74647052	-80.77228792	
3,205.00	48.35	304.470	3,020.43	237.48	-598.47	14,434,516.77	1,704,394.13	39.74652640	-80.77239009	
3,254.00	49.92	303.290	3,052.49	258.14	-629.24	14,434,537.42	1,704,363.36	39.74658333	-80.77249935	
3,301.00	52.16	303.040	3,082.04	278.13	-659.83	14,434,557.42	1,704,332.77	39.74663845	-80.77260801	
3,349.00	51.85	302.260	3,111.59	298.53	-691.68	14,434,577.82	1,704,300.92	39.74669471	-80.77272113	
3,443.00	51.32	302.410	3,170.00	337.93	-753.91	14,434,617.22	1,704,238.69	39.74680333	-80.77294217	
3,537.00	48.58	305.150	3,230.49	377.90	-813.72	14,434,657.18	1,704,178.88	39.74691351	-80.77315460	
3,632.00	49.68	305.790	3,292.65	419.58	-872.22	14,434,698.87	1,704,120.38	39.74702841	-80.77336235	
3,726.00	52.90	305.850	3,351.43	462.51	-931.69	14,434,741.80	1,704,060.91	39.74714670	-80.77357354	
3,821.00	50.12	306.100	3,410.55	506.18	-991.86	14,434,785.47	1,704,000.74	39.74726706	-80.77378721	
3,916.00	50.43	305.270	3,471.26	548.80	-1,051.21	14,434,828.09	1,703,941.39	39.74738451	-80.77399797	
4,011.00	52.47	306.270	3,530.46	592.23	-1,111.48	14,434,871.52	1,703,881.12	39.74750421	-80.77421201	
4,106.00	50.81	304.170	3,589.42	635.20	-1,172.32	14,434,914.49	1,703,820.28	39.74762263	-80.77442807	
4,200.00	50.81	304.520	3,648.82	676.30	-1,232.47	14,434,955.59	1,703,760.13	39.74773593	-80.77464170	
4,294.00	50.16	306.680	3,708.63	718.51	-1,291.43	14,434,997.80	1,703,701.17	39.74785224	-80.77485109	
4,390.00	50.69	305.740	3,769.80	762.22	-1,351.14	14,435,041.51	1,703,641.46	39.74797269	-80.77506311	
4,485.00	52.63	306.070	3,828.72	805.91	-1,411.49	14,435,085.20	1,703,581.11	39.74809311	-80.77527743	
4,580.00	50.54	304.220	3,887.75	848.77	-1,472.34	14,435,128.06	1,703,520.27	39.74821123	-80.77549352	
4,675.00	50.78	303.880	3,947.98	889.91	-1,533.21	14,435,169.20	1,703,459.39	39.74832463	-80.77570973	
4,770.00	50.47	303.930	4,008.24	930.87	-1,594.16	14,435,210.16	1,703,398.44	39.74843754	-80.77592621	
4,864.00	50.86	304.240	4,067.82	971.62	-1,654.37	14,435,250.91	1,703,338.23	39.74854985	-80.77614007	
4,959.00	50.86	306.300	4,127.79	1,014.16	-1,714.53	14,435,293.45	1,703,278.08	39.74866710	-80.77635370	
5,053.00	51.21	306.660	4,186.91	1,057.62	-1,773.29	14,435,336.90	1,703,219.31	39.74878684	-80.77656239	
5,147.00	50.89	305.740	4,246.00	1,100.79	-1,832.28	14,435,380.08	1,703,160.32	39.74890582	-80.77677187	
5,242.00	51.09	303.700	4,305.80	1,142.83	-1,892.95	14,435,422.12	1,703,099.65	39.74902168	-80.77698735	
5,337.00	51.34	302.980	4,365.31	1,183.53	-1,954.82	14,435,462.82	1,703,037.78	39.74913388	-80.77720709	
5,399.00	50.19	303.410	4,404.52	1,209.82	-1,995.00	14,435,489.11	1,702,977.60	39.74920635	-80.77734983	
5,462.00	50.34	304.850	4,444.80	1,237.00	-2,035.10	14,435,516.29	1,702,917.50	39.74928127	-80.77749226	
5,525.00	50.19	305.060	4,485.07	1,264.76	-2,074.81	14,435,544.05	1,702,858.29	39.74935777	-80.77763329	
5,620.00	50.63	306.210	4,545.61	1,307.41	-2,134.31	14,435,586.70	1,702,800.00	39.74947532	-80.77784459	

Company: Tug Hill Operating LLC
 Project: Marshall County, West Virginia
 Site: Hillrock/Simms
 Well: Hillrock 04 HM (H)
 Wellbore: Original Hole
 Design: Surveys Original Hole

Local Co-ordinate Reference: Well Hillrock 04 HM (H)
 TVD Reference: RKB=1219+18 @ 1237.00ft
 MD Reference: RKB=1219+18 @ 1237.00ft
 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
5,715.00	51.78	305.530	4,605.13	1,350.79	-2,194.31	14,435,630.08	1,702,798.29	39.74959486	-80.77805767
5,778.00	51.30	303.990	4,644.32	1,378.92	-2,234.83	14,435,658.21	1,702,757.77	39.74967238	-80.77820160
5,841.00	53.03	303.720	4,682.96	1,406.63	-2,276.15	14,435,685.92	1,702,716.45	39.74974878	-80.77834836
5,905.00	52.11	303.160	4,721.86	1,434.64	-2,318.56	14,435,713.93	1,702,674.04	39.74982598	-80.77849900
5,968.00	52.20	303.220	4,760.51	1,461.88	-2,360.19	14,435,741.16	1,702,632.41	39.74990106	-80.77864688
6,032.00	51.53	302.430	4,800.03	1,489.16	-2,402.49	14,435,768.45	1,702,590.11	39.74997629	-80.77879714
6,093.00	52.98	302.570	4,837.37	1,515.08	-2,443.17	14,435,794.37	1,702,549.43	39.75004774	-80.77894164
6,156.00	51.61	302.390	4,875.90	1,541.85	-2,485.22	14,435,821.13	1,702,507.38	39.75012153	-80.77909099
6,220.00	49.76	302.940	4,916.45	1,568.57	-2,526.90	14,435,847.85	1,702,465.70	39.75019519	-80.77923906
6,284.00	48.97	302.680	4,958.13	1,594.88	-2,567.72	14,435,874.17	1,702,424.88	39.75026774	-80.77938406
6,379.00	50.41	305.770	5,019.59	1,635.64	-2,627.59	14,435,914.92	1,702,365.01	39.75038006	-80.77959671
6,473.00	51.10	307.960	5,079.07	1,679.31	-2,685.83	14,435,958.60	1,702,306.78	39.75050040	-80.77980351
6,568.00	51.33	305.940	5,138.58	1,723.82	-2,745.00	14,436,003.11	1,702,247.60	39.75062303	-80.78001366
6,663.00	51.93	305.640	5,197.55	1,767.38	-2,805.42	14,436,046.66	1,702,187.19	39.75074306	-80.78022823
6,758.00	51.87	306.570	5,256.17	1,811.43	-2,865.82	14,436,090.72	1,702,126.79	39.75086445	-80.78044274
6,852.00	51.89	304.850	5,314.20	1,854.59	-2,925.86	14,436,133.88	1,702,066.74	39.75098338	-80.78065599
6,949.00	51.96	305.960	5,374.02	1,898.83	-2,988.10	14,436,178.11	1,702,004.51	39.75110529	-80.78087703
6,994.00	50.46	304.560	5,402.21	1,919.08	-3,016.73	14,436,198.36	1,701,975.87	39.75116110	-80.78097874
7,089.00	48.31	302.360	5,464.05	1,958.85	-3,076.87	14,436,238.14	1,701,915.73	39.75127073	-80.78119236
7,136.00	46.20	300.080	5,495.95	1,976.75	-3,106.38	14,436,256.03	1,701,886.22	39.75132008	-80.78129719
7,184.00	43.12	295.860	5,530.10	1,992.59	-3,136.14	14,436,271.88	1,701,856.46	39.75136379	-80.78140295
7,231.00	41.19	291.110	5,564.95	2,005.18	-3,165.05	14,436,284.46	1,701,827.56	39.75139854	-80.78150567
7,279.00	38.73	286.980	5,601.74	2,015.26	-3,194.16	14,436,294.54	1,701,798.44	39.75142642	-80.78160917
7,326.00	35.21	281.790	5,639.30	2,022.32	-3,221.50	14,436,301.61	1,701,771.10	39.75144601	-80.78170639
7,374.00	31.34	277.220	5,679.43	2,026.72	-3,247.45	14,436,306.01	1,701,745.16	39.75145827	-80.78179865
7,421.00	28.79	271.420	5,720.11	2,028.54	-3,270.90	14,436,307.83	1,701,721.71	39.75146341	-80.78188207
7,469.00	28.13	265.710	5,762.31	2,027.98	-3,293.74	14,436,307.27	1,701,698.87	39.75146203	-80.78196334
7,516.00	27.43	260.440	5,803.90	2,025.35	-3,315.47	14,436,304.64	1,701,677.14	39.75145496	-80.78204067
7,563.00	26.86	253.410	5,845.74	2,020.52	-3,336.32	14,436,299.81	1,701,656.28	39.75144183	-80.78211492
7,610.00	26.59	246.110	5,887.73	2,013.23	-3,356.12	14,436,292.52	1,701,636.48	39.75142193	-80.78218542
7,657.00	28.48	239.340	5,929.41	2,003.25	-3,375.38	14,436,282.54	1,701,617.22	39.75139466	-80.78225404
7,704.00	29.98	233.100	5,970.44	1,990.48	-3,394.42	14,436,269.77	1,701,598.18	39.75135972	-80.78232188
7,753.00	30.15	224.930	6,012.86	1,974.41	-3,412.91	14,436,253.70	1,701,579.70	39.75131571	-80.78238780
7,800.00	30.64	215.170	6,053.43	1,956.26	-3,428.15	14,436,235.54	1,701,564.45	39.75126595	-80.78244219
7,845.00	31.69	206.120	6,091.95	1,936.26	-3,439.97	14,436,215.54	1,701,552.64	39.75121111	-80.78248441
7,892.00	32.13	200.580	6,131.86	1,913.47	-3,449.80	14,436,192.75	1,701,542.81	39.75114858	-80.78251958
7,940.00	33.36	195.220	6,172.24	1,888.78	-3,457.75	14,436,168.06	1,701,534.85	39.75108083	-80.78254809
8,034.00	38.11	188.720	6,248.55	1,835.12	-3,468.95	14,436,114.40	1,701,523.66	39.75093354	-80.78258838
8,081.00	41.76	184.590	6,284.59	1,805.16	-3,472.40	14,436,084.45	1,701,520.21	39.75085130	-80.78260092
8,129.00	44.48	181.160	6,319.62	1,772.41	-3,474.02	14,436,051.69	1,701,518.59	39.75076135	-80.78260697
8,176.00	48.35	178.260	6,352.02	1,738.38	-3,473.82	14,436,017.66	1,701,518.79	39.75066789	-80.78260655
8,223.00	52.92	177.290	6,381.83	1,702.08	-3,472.40	14,435,981.37	1,701,520.21	39.75056820	-80.78260181
8,270.00	57.19	176.150	6,408.74	1,663.63	-3,470.19	14,435,942.91	1,701,522.42	39.75046258	-80.78259426
8,317.00	61.49	174.570	6,432.71	1,623.34	-3,466.90	14,435,902.63	1,701,525.70	39.75035193	-80.78258294
8,411.00	70.68	169.120	6,470.79	1,538.43	-3,454.59	14,435,817.72	1,701,538.02	39.75011867	-80.78253986
8,506.00	78.37	161.120	6,496.16	1,450.13	-3,431.00	14,435,729.42	1,701,561.60	39.74987599	-80.78245670
8,601.00	87.30	153.740	6,508.02	1,363.26	-3,394.83	14,435,642.55	1,701,597.77	39.74963719	-80.78232877
8,696.00	88.62	152.070	6,511.40	1,278.75	-3,351.59	14,435,558.03	1,701,641.01	39.74940480	-80.78217566
8,790.00	89.45	149.870	6,512.98	1,196.57	-3,305.99	14,435,475.86	1,701,686.62	39.74917883	-80.78201412
8,885.00	88.62	149.870	6,514.58	1,114.42	-3,258.31	14,435,393.71	1,701,734.30	39.74895290	-80.78184520
8,980.00	89.36	148.020	6,516.25	1,033.05	-3,209.31	14,435,312.34	1,701,783.29	39.74872911	-80.78167158
9,075.00	90.42	148.110	6,516.44	952.43	-3,159.06	14,435,231.72	1,701,833.54	39.74850737	-80.78149351
9,169.00	89.89	147.590	6,516.18	872.85	-3,109.04	14,435,152.14	1,701,883.56	39.74828847	-80.78131624
9,265.00	89.19	148.380	6,516.95	791.45	-3,058.15	14,435,070.74	1,701,934.45	39.74806459	-80.78113589
9,359.00	91.16	148.990	6,516.67	711.15	-3,009.30	14,434,990.44	1,701,983.31	39.74784373	-80.78096278

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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
9,455.00	90.37	148.990	6,515.38	628.88	-2,959.84	14,434,908.17	1,702,032.76	39.74761746	-80.78078756
9,550.00	90.77	146.790	6,514.44	548.42	-2,909.35	14,434,827.71	1,702,083.25	39.74739616	-80.78060863
9,645.00	90.24	146.350	6,513.60	469.14	-2,857.02	14,434,748.43	1,702,135.59	39.74717808	-80.78042313
9,740.00	90.99	148.020	6,512.58	389.31	-2,805.54	14,434,668.60	1,702,187.06	39.74695849	-80.78024068
9,835.00	90.29	147.500	6,511.52	308.96	-2,754.86	14,434,588.25	1,702,237.74	39.74673749	-80.78006110
9,930.00	89.45	147.150	6,511.74	229.00	-2,703.58	14,434,508.29	1,702,289.03	39.74651754	-80.77987934
10,025.00	91.16	149.260	6,511.23	148.26	-2,653.53	14,434,427.55	1,702,339.08	39.74629548	-80.77970199
10,120.00	90.51	148.900	6,509.85	66.77	-2,604.72	14,434,346.06	1,702,387.89	39.74607136	-80.77952906
10,215.00	89.98	148.640	6,509.44	-14.46	-2,555.46	14,434,264.83	1,702,437.14	39.74584794	-80.77935454
10,310.00	91.47	149.430	6,508.24	-95.91	-2,506.59	14,434,183.38	1,702,486.01	39.74562392	-80.77918138
10,406.00	90.68	149.610	6,506.44	-178.63	-2,457.90	14,434,100.66	1,702,534.70	39.74539642	-80.77900891
10,501.00	89.93	150.050	6,505.93	-260.76	-2,410.16	14,434,018.53	1,702,582.44	39.74517055	-80.77883978
10,596.00	88.84	150.220	6,506.95	-343.14	-2,362.86	14,433,936.15	1,702,629.74	39.74494399	-80.77867222
10,691.00	91.16	150.400	6,506.95	-425.66	-2,315.81	14,433,853.63	1,702,676.79	39.74471704	-80.77850556
10,786.00	90.42	150.570	6,505.64	-508.32	-2,269.01	14,433,770.97	1,702,723.59	39.74448971	-80.77833981
10,881.00	89.67	150.660	6,505.57	-591.10	-2,222.40	14,433,688.19	1,702,770.21	39.74426206	-80.77817471
10,975.00	88.70	151.100	6,506.90	-673.21	-2,176.66	14,433,606.08	1,702,815.94	39.74403625	-80.77801271
11,070.00	90.11	149.260	6,507.89	-755.62	-2,129.42	14,433,523.67	1,702,863.18	39.74380961	-80.77784540
11,165.00	89.14	148.820	6,508.51	-837.08	-2,080.55	14,433,442.21	1,702,912.05	39.74358556	-80.77767226
11,260.00	90.46	150.220	6,508.84	-918.95	-2,032.37	14,433,360.34	1,702,960.23	39.74336040	-80.77750157
11,355.00	90.02	149.520	6,508.45	-1,001.11	-1,984.68	14,433,278.18	1,703,007.92	39.74313443	-80.77733266
11,450.00	91.52	149.690	6,507.17	-1,083.05	-1,936.62	14,433,196.25	1,703,055.98	39.74290909	-80.77716241
11,545.00	90.73	149.690	6,505.30	-1,165.04	-1,888.69	14,433,114.25	1,703,103.92	39.74268357	-80.77699261
11,639.00	89.98	149.690	6,504.72	-1,246.19	-1,841.25	14,433,033.10	1,703,151.35	39.74246039	-80.77682457
11,734.00	91.21	150.130	6,503.74	-1,328.38	-1,793.62	14,432,950.91	1,703,198.98	39.74223434	-80.77665587
11,827.00	90.46	150.220	6,502.38	-1,409.06	-1,747.37	14,432,870.24	1,703,245.23	39.74201247	-80.77649206
11,922.00	89.45	150.570	6,502.45	-1,491.65	-1,700.44	14,432,787.64	1,703,292.16	39.74178532	-80.77632585
12,018.00	91.38	151.190	6,501.76	-1,575.51	-1,653.73	14,432,703.78	1,703,338.87	39.74155470	-80.77616041
12,112.00	90.73	152.160	6,500.03	-1,658.24	-1,609.14	14,432,621.05	1,703,383.46	39.74132719	-80.77600252
12,206.00	89.85	153.030	6,499.55	-1,741.69	-1,565.87	14,432,537.60	1,703,426.73	39.74109772	-80.77584935
12,301.00	90.81	150.750	6,499.01	-1,825.48	-1,521.12	14,432,453.82	1,703,471.48	39.74109772	-80.77569088
12,395.00	90.07	151.190	6,498.28	-1,907.66	-1,475.50	14,432,371.63	1,703,517.10	39.74086731	-80.77552935
12,491.00	91.25	150.400	6,497.18	-1,991.45	-1,428.67	14,432,287.84	1,703,563.94	39.74064129	-80.77536349
12,585.00	90.59	150.750	6,495.67	-2,073.32	-1,382.49	14,432,205.98	1,703,610.11	39.74041086	-80.77519996
12,679.00	89.76	150.840	6,495.38	-2,155.36	-1,336.63	14,432,123.93	1,703,655.98	39.74018572	-80.77503754
12,775.00	90.90	151.190	6,494.83	-2,239.34	-1,290.11	14,432,039.96	1,703,702.49	39.74018572	-80.77487281
12,870.00	90.86	150.840	6,493.37	-2,322.43	-1,244.08	14,431,956.87	1,703,748.52	39.73997291	-80.77470981
12,965.00	90.55	150.400	6,492.20	-2,405.20	-1,197.47	14,431,874.09	1,703,795.13	39.73979298	-80.77454477
13,060.00	89.36	150.570	6,492.28	-2,487.87	-1,150.67	14,431,791.42	1,703,841.93	39.73904562	-80.77437903
13,154.00	88.79	151.540	6,493.79	-2,570.12	-1,105.19	14,431,709.18	1,703,887.41	39.73881944	-80.77421796
13,249.00	88.13	151.190	6,496.35	-2,653.47	-1,059.68	14,431,625.83	1,703,932.92	39.73859022	-80.77405682
13,343.00	87.69	151.540	6,499.77	-2,735.92	-1,014.66	14,431,543.38	1,703,977.94	39.73836348	-80.77389742
13,438.00	88.09	148.990	6,503.27	-2,818.35	-967.58	14,431,460.95	1,704,025.02	39.73813678	-80.77373068
13,532.00	87.30	148.550	6,507.05	-2,898.66	-918.88	14,431,380.64	1,704,073.72	39.73791588	-80.77356817
13,627.00	90.02	147.500	6,509.27	-2,979.21	-868.59	14,431,300.08	1,704,124.01	39.73769430	-80.77338001
13,722.00	91.08	146.880	6,508.36	-3,059.05	-817.12	14,431,220.24	1,704,175.48	39.73747468	-80.77319764
13,817.00	90.42	147.590	6,507.12	-3,138.93	-765.71	14,431,140.37	1,704,226.89	39.73725496	-80.77301549
13,911.00	90.68	149.340	6,506.22	-3,219.04	-716.55	14,431,060.25	1,704,276.05	39.73703461	-80.77284134
14,005.00	89.63	148.730	6,505.96	-3,299.64	-668.19	14,430,979.65	1,704,324.41	39.73681292	-80.77267003
14,100.00	91.52	149.430	6,505.01	-3,381.13	-619.38	14,430,898.16	1,704,373.22	39.73658878	-80.77249715
14,195.00	90.73	149.780	6,503.14	-3,463.06	-571.32	14,430,816.24	1,704,421.28	39.73636345	-80.77232694
14,289.00	89.71	150.310	6,502.78	-3,544.50	-524.39	14,430,734.80	1,704,468.21	39.73613946	-80.77216073
14,383.00	91.56	150.840	6,501.74	-3,626.37	-478.21	14,430,652.93	1,704,514.39	39.73591431	-80.77199722
14,478.00	90.55	150.490	6,499.99	-3,709.17	-431.68	14,430,570.13	1,704,560.92	39.73568659	-80.77183245
14,574.00	89.54	151.280	6,499.92	-3,793.04	-384.97	14,430,486.26	1,704,607.63	39.73545593	-80.77166706

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	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
14,669.00	91.30	149.780	6,499.22	-3,875.74	-338.24	14,430,403.56	1,704,654.36	39.73522849	-80.77150158
14,764.00	90.86	149.610	6,497.43	-3,957.74	-290.31	14,430,321.56	1,704,702.29	39.73500295	-80.77133184
14,859.00	90.24	150.050	6,496.52	-4,039.87	-242.57	14,430,239.43	1,704,750.03	39.73477707	-80.77116277
14,955.00	89.32	150.930	6,496.89	-4,123.41	-195.28	14,430,155.89	1,704,797.32	39.73454730	-80.77099533
15,050.00	88.84	151.540	6,498.41	-4,206.68	-149.57	14,430,072.62	1,704,843.03	39.73431831	-80.77083350
15,144.00	90.20	151.100	6,499.20	-4,289.14	-104.46	14,429,990.16	1,704,888.14	39.73409152	-80.77067379
15,239.00	89.27	150.750	6,499.64	-4,372.17	-58.30	14,429,907.13	1,704,934.30	39.73386319	-80.77051034
15,334.00	88.53	151.360	6,501.46	-4,455.28	-12.33	14,429,824.01	1,704,980.27	39.73363460	-80.77034759
15,429.00	89.10	149.430	6,503.43	-4,537.86	34.59	14,429,741.44	1,705,027.19	39.73340749	-80.77018145
15,523.00	88.18	149.430	6,505.66	-4,618.77	82.39	14,429,660.53	1,705,074.98	39.73318495	-80.77001219
15,618.00	91.52	149.690	6,505.91	-4,700.66	130.51	14,429,578.64	1,705,123.11	39.73295971	-80.76984177
15,713.00	90.59	149.780	6,504.16	-4,782.70	178.38	14,429,496.60	1,705,170.98	39.73273407	-80.76967225
15,807.00	89.98	149.690	6,503.69	-4,863.89	225.76	14,429,415.41	1,705,218.35	39.73251077	-80.76950448
15,902.00	89.32	151.010	6,504.27	-4,946.45	272.75	14,429,332.85	1,705,265.35	39.73228372	-80.76933808
15,996.00	90.95	149.430	6,504.05	-5,028.03	319.43	14,429,251.27	1,705,312.03	39.73205934	-80.76917278
16,090.00	90.20	150.130	6,503.11	-5,109.25	366.74	14,429,170.05	1,705,359.34	39.73183595	-80.76900525
16,185.00	89.41	150.570	6,503.43	-5,191.81	413.74	14,429,087.49	1,705,406.34	39.73160889	-80.76883885
16,280.00	91.16	149.260	6,502.96	-5,274.00	461.36	14,429,005.30	1,705,453.95	39.73138282	-80.76867023
16,376.00	90.33	149.260	6,501.71	-5,356.51	510.42	14,428,922.80	1,705,503.02	39.73115589	-80.76849647
16,470.00	89.71	149.170	6,501.68	-5,437.26	558.53	14,428,842.04	1,705,551.13	39.73093377	-80.76832609
16,565.00	88.97	148.730	6,502.77	-5,518.64	607.53	14,428,760.66	1,705,600.13	39.73070992	-80.76815257
16,659.00	87.87	149.170	6,505.36	-5,599.14	655.99	14,428,680.16	1,705,648.59	39.73048850	-80.76798093
16,754.00	90.90	148.110	6,506.38	-5,680.25	705.42	14,428,599.05	1,705,698.02	39.73026541	-80.76780587
16,849.00	90.24	148.110	6,505.44	-5,760.90	755.61	14,428,518.40	1,705,748.20	39.73004355	-80.76762811
16,944.00	89.45	148.900	6,505.69	-5,841.91	805.24	14,428,437.39	1,705,797.83	39.72982073	-80.76745234
17,039.00	88.75	148.640	6,507.19	-5,923.13	854.49	14,428,356.17	1,705,847.08	39.72959732	-80.76727792
17,134.00	87.56	148.990	6,510.24	-6,004.36	903.65	14,428,274.94	1,705,896.25	39.72937389	-80.76710381
17,228.00	90.64	149.780	6,511.72	-6,085.24	951.51	14,428,194.07	1,705,944.11	39.72915144	-80.76693433
17,323.00	89.89	149.340	6,511.28	-6,167.14	999.64	14,428,112.16	1,705,992.24	39.72892616	-80.76676391
17,418.00	88.97	149.170	6,512.23	-6,248.78	1,048.20	14,428,030.52	1,706,040.80	39.72870160	-80.76659194
17,513.00	92.44	149.780	6,511.06	-6,330.60	1,096.44	14,427,948.70	1,706,089.04	39.72847657	-80.76642112
17,608.00	92.18	149.170	6,507.23	-6,412.36	1,144.66	14,427,866.94	1,706,137.25	39.72825167	-80.76625040
17,702.00	91.65	149.170	6,504.09	-6,493.04	1,192.80	14,427,786.27	1,706,185.40	39.72802978	-80.76607991
17,796.00	88.75	147.590	6,503.76	-6,573.07	1,242.08	14,427,706.23	1,706,234.67	39.72780963	-80.76590539
17,891.00	89.36	149.430	6,505.33	-6,654.06	1,291.69	14,427,625.24	1,706,284.29	39.72758684	-80.76572969
17,985.00	89.14	149.170	6,506.56	-6,734.88	1,339.68	14,427,544.42	1,706,332.27	39.72736454	-80.76555977
18,080.00	89.10	149.960	6,508.01	-6,816.78	1,387.80	14,427,462.52	1,706,380.39	39.72713927	-80.76538939
18,175.00	88.44	149.690	6,510.05	-6,898.89	1,435.54	14,427,380.41	1,706,428.13	39.72691344	-80.76522036
18,269.00	87.82	149.780	6,513.12	-6,980.03	1,482.89	14,427,299.27	1,706,475.48	39.72669025	-80.76505271
18,364.00	86.90	149.610	6,517.50	-7,061.97	1,530.77	14,427,217.34	1,706,523.37	39.72646490	-80.76488317
18,471.00	86.11	149.610	6,524.02	-7,154.09	1,584.80	14,427,125.21	1,706,577.40	39.72621151	-80.76469187
Survey @ 18471.00 MD 6524.02 TVD									
18,526.00	86.11	149.610	6,527.75	-7,201.43	1,612.56	14,427,077.88	1,706,605.15	39.72608131	-80.76459358
Survey projected to 18526.00 MD 6527.75 TVD									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
187.00	187.00	-0.04	0.22	MWD surveys
18,471.00	6,524.02	-7,154.09	1,584.80	Survey @ 18471.00 MD 6524.02 TVD
18,526.00	6,527.75	-7,201.43	1,612.56	Survey projected to 18526.00 MD 6527.75 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 04 HM (H)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft
Well:	Hillrock 04 HM (H)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14