



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	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	Bryan Pad				
Site Position:		Northing:	14,445,110.80 usft	Latitude:	39.77562900
From:	Lat/Long	Easting:	1,703,181.57 usft	Longitude:	-80.77660992
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.143 °

Well	Bryan N-05HM (slot C)					
Well Position	+N/-S	0.00 usft	Northing:	14,445,130.17 usft	Latitude:	39.77568207
	+E/-W	0.00 usft	Easting:	1,703,199.96 usft	Longitude:	-80.77654430
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level:	1,191.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF2015	6/13/2019	(°) -8.701	(°) 66.791	(nT) 51,946.62563515

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0.00	0.00	0.00	337.67	

Survey Program	Date	10/12/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	<p>RECEIVED Office of Oil and Gas</p> <p>DEC 29 2020</p> <p>WV Department of Environmental Protection</p>
173.00	879.00	MWD surf (Original Hole)	MWD	MWD - Standard	
974.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,707.00	16,719.00	MWD (Original Hole)	MWD	MWD - Standard	
16,797.00	16,797.00	Projection OH (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,445,130.17	1,703,199.96	39.77568207	-80.77654430	
173.00	0.30	311.34	173.00	0.30	-0.34	14,445,130.47	1,703,199.62	39.77568290	-80.77654551	
MWD surveys										
235.00	0.30	330.50	235.00	0.55	-0.54	14,445,130.72	1,703,199.42	39.77568358	-80.77654622	
280.00	0.21	24.82	280.00	0.73	-0.57	14,445,130.89	1,703,199.40	39.77568407	-80.77654631	
327.00	0.08	124.31	327.00	0.78	-0.50	14,445,130.95	1,703,199.46	39.77568423	-80.77654608	
372.00	0.17	204.99	372.00	0.71	-0.50	14,445,130.87	1,703,199.46	39.77568402	-80.77654609	
419.00	0.17	228.02	419.00	0.60	-0.59	14,445,130.76	1,703,199.38	39.77568371	-80.77654638	
481.00	0.17	227.84	481.00	0.47	-0.72	14,445,130.64	1,703,199.24	39.77568338	-80.77654687	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
511.00	0.17	146.19	511.00	0.41	-0.73	14,445,130.57	1,703,199.23	39.77568319	-80.77654690
573.00	0.17	278.73	573.00	0.34	-0.77	14,445,130.51	1,703,199.19	39.77568302	-80.77654704
603.00	0.13	123.43	603.00	0.33	-0.79	14,445,130.50	1,703,199.18	39.77568299	-80.77654709
693.00	0.21	150.41	693.00	0.13	-0.62	14,445,130.30	1,703,199.34	39.77568244	-80.77654650
788.00	0.17	97.59	788.00	-0.04	-0.39	14,445,130.13	1,703,199.57	39.77568197	-80.77654570
879.00	0.13	312.31	879.00	0.01	-0.34	14,445,130.18	1,703,199.63	39.77568211	-80.77654550
974.00	0.30	3.55	974.00	0.33	-0.40	14,445,130.50	1,703,199.56	39.77568299	-80.77654572
1,069.00	0.39	349.75	1,068.99	0.90	-0.44	14,445,131.07	1,703,199.52	39.77568455	-80.77654587
1,164.00	0.30	354.76	1,163.99	1.47	-0.52	14,445,131.63	1,703,199.44	39.77568610	-80.77654615
1,258.00	0.43	291.83	1,257.99	1.84	-0.87	14,445,132.01	1,703,199.09	39.77568714	-80.77654739
1,353.00	0.92	40.99	1,352.99	2.55	-0.70	14,445,132.72	1,703,199.26	39.77568908	-80.77654678
1,448.00	3.69	47.49	1,447.90	5.19	2.05	14,445,135.36	1,703,202.01	39.77569632	-80.77653695
1,543.00	4.65	63.14	1,542.65	9.00	7.74	14,445,139.17	1,703,207.70	39.77570673	-80.77651667
1,637.00	5.40	76.76	1,636.29	11.73	15.45	14,445,141.90	1,703,215.41	39.77571419	-80.77648922
1,732.00	4.96	88.71	1,730.91	12.85	23.90	14,445,143.02	1,703,223.87	39.77571720	-80.77645911
1,827.00	3.03	128.18	1,825.69	11.39	29.98	14,445,141.56	1,703,229.95	39.77571315	-80.77643748
1,922.00	2.90	131.87	1,920.56	8.23	33.75	14,445,138.40	1,703,233.71	39.77570445	-80.77642412
2,016.00	3.29	104.18	2,014.43	5.99	38.13	14,445,136.15	1,703,238.10	39.77569825	-80.77640853
2,111.00	3.51	77.02	2,109.27	5.97	43.61	14,445,136.14	1,703,243.57	39.77569817	-80.77638903
2,206.00	4.61	88.01	2,204.03	6.76	50.26	14,445,136.93	1,703,250.22	39.77570028	-80.77636536
2,301.00	3.64	94.16	2,298.78	6.67	57.08	14,445,136.84	1,703,257.05	39.77570000	-80.77634107
2,395.00	1.84	130.02	2,392.68	5.48	61.22	14,445,135.65	1,703,261.18	39.77569671	-80.77632638
2,490.00	1.31	129.32	2,487.64	3.82	63.22	14,445,133.98	1,703,263.19	39.77569212	-80.77631925
2,585.00	1.93	64.02	2,582.61	3.83	65.50	14,445,134.00	1,703,265.47	39.77569214	-80.77631114
2,707.00	2.28	61.12	2,704.53	5.90	69.47	14,445,136.07	1,703,269.44	39.77569780	-80.77629698
2,802.00	2.37	58.13	2,799.45	7.85	72.80	14,445,138.02	1,703,272.76	39.77570313	-80.77628514
2,896.00	2.15	44.24	2,893.38	10.14	75.68	14,445,140.31	1,703,275.64	39.77570940	-80.77627487
2,991.00	4.43	67.44	2,988.22	12.82	80.31	14,445,142.99	1,703,280.27	39.77571674	-80.77625835
3,086.00	4.13	50.04	3,082.96	16.43	86.32	14,445,146.60	1,703,286.28	39.77572660	-80.77623693
3,181.00	4.83	60.59	3,177.67	20.59	92.43	14,445,150.76	1,703,292.39	39.77573798	-80.77621516
3,275.00	6.06	59.18	3,271.24	25.08	100.14	14,445,155.24	1,703,300.10	39.77575025	-80.77618768
3,370.00	3.16	56.02	3,365.92	29.11	106.61	14,445,159.28	1,703,306.58	39.77576128	-80.77616459
3,465.00	2.90	49.95	3,460.79	32.12	110.63	14,445,162.29	1,703,310.59	39.77576952	-80.77615029
3,560.00	2.28	99.08	3,555.70	33.37	114.33	14,445,163.53	1,703,314.29	39.77577292	-80.77613708
3,654.00	4.48	102.86	3,649.54	32.25	119.76	14,445,162.42	1,703,319.72	39.77576983	-80.77611778
3,749.00	7.82	82.21	3,743.99	32.31	129.78	14,445,162.47	1,703,329.75	39.77576990	-80.77609210
3,844.00	8.78	76.58	3,837.99	34.86	143.24	14,445,165.03	1,703,343.20	39.77577683	-80.77603419
3,939.00	8.56	76.15	3,931.91	38.24	157.16	14,445,168.41	1,703,357.12	39.77578601	-80.77598462
4,033.00	9.53	77.82	4,024.74	41.56	171.55	14,445,171.72	1,703,371.52	39.77579502	-80.77593335
4,128.00	10.59	77.11	4,118.27	45.16	187.75	14,445,175.33	1,703,387.72	39.77580481	-80.77587567
4,222.00	11.99	88.10	4,210.46	47.41	205.93	14,445,177.58	1,703,405.90	39.77581087	-80.77581094
4,317.00	14.58	91.88	4,302.92	47.35	227.75	14,445,177.52	1,703,427.71	39.77581054	-80.77573329
4,415.00	16.08	87.92	4,397.43	47.44	253.64	14,445,177.60	1,703,453.61	39.77581060	-80.77564113
4,510.00	19.33	84.58	4,487.92	49.40	282.45	14,445,179.57	1,703,482.42	39.77581580	-80.77553857
4,605.00	23.46	81.07	4,576.36	53.82	316.80	14,445,183.99	1,703,516.77	39.77582771	-80.77541628
4,699.00	24.43	79.40	4,662.27	60.30	354.39	14,445,190.47	1,703,554.36	39.77584524	-80.77528242
4,794.00	26.67	75.10	4,747.98	69.40	394.32	14,445,199.57	1,703,594.28	39.77586995	-80.77514026
4,889.00	28.65	76.23	4,832.12	80.30	437.04	14,445,210.47	1,703,637.01	39.77589960	-80.77498808
4,984.00	30.45	77.90	4,914.76	90.77	482.71	14,445,220.94	1,703,682.67	39.77592804	-80.77482547
5,078.00	30.41	80.10	4,995.81	99.86	529.43	14,445,230.02	1,703,729.40	39.77595266	-80.77465908
5,173.00	32.56	80.45	5,076.82	108.23	578.33	14,445,238.40	1,703,778.30	39.77597533	-80.77448496
5,268.00	34.40	81.86	5,156.06	116.27	630.12	14,445,246.44	1,703,830.08	39.77599705	-80.77430059
5,363.00	35.50	79.49	5,233.93	125.11	683.81	14,445,255.27	1,703,883.77	39.77602093	-80.77410942
5,458.00	33.17	74.65	5,312.38	137.02	736.00	14,445,267.19	1,703,935.97	39.77605329	-80.77392353
5,552.00	31.64	75.97	5,391.74	149.81	784.73	14,445,279.97	1,703,984.69	39.77608807	-80.77375001

WV Department of Environmental Protection



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,821.00	90.77	329.89	6,400.61	7,530.50	-2,720.60	14,452,660.67	1,700,479.37	39.79638115	-80.78616325
14,916.00	90.90	328.66	6,399.23	7,612.16	-2,769.13	14,452,742.32	1,700,430.84	39.79660571	-80.78633534
15,010.00	92.13	329.36	6,396.74	7,692.71	-2,817.51	14,452,822.88	1,700,382.46	39.79682724	-80.78650691
15,105.00	91.65	333.14	6,393.61	7,775.94	-2,863.17	14,452,906.10	1,700,336.80	39.79705611	-80.78666876
15,200.00	91.38	333.76	6,391.10	7,860.89	-2,905.62	14,452,991.06	1,700,294.35	39.79728969	-80.78681916
15,296.00	90.68	332.88	6,389.37	7,946.65	-2,948.71	14,453,076.82	1,700,251.25	39.79752550	-80.78697187
15,390.00	90.02	332.53	6,388.80	8,030.18	-2,991.82	14,453,160.35	1,700,208.15	39.79775518	-80.78712463
15,486.00	89.80	334.02	6,388.95	8,115.93	-3,034.99	14,453,246.09	1,700,164.97	39.79799094	-80.78727760
15,581.00	90.37	334.02	6,388.81	8,201.33	-3,076.60	14,453,331.49	1,700,123.36	39.79822574	-80.78742504
15,676.00	90.42	333.93	6,388.15	8,286.69	-3,118.29	14,453,416.86	1,700,081.68	39.79846044	-80.78757272
15,771.00	89.49	333.49	6,388.23	8,371.86	-3,160.36	14,453,502.03	1,700,039.60	39.79869462	-80.78772181
15,866.00	90.20	330.15	6,388.48	8,455.59	-3,205.22	14,453,585.76	1,699,994.75	39.79892485	-80.78788080
15,961.00	91.16	329.45	6,387.36	8,537.69	-3,253.00	14,453,667.86	1,699,946.96	39.79915063	-80.78805023
16,056.00	90.73	329.28	6,385.79	8,619.42	-3,301.40	14,453,749.59	1,699,898.56	39.79937540	-80.78822187
16,151.00	90.11	329.28	6,385.09	8,701.08	-3,349.93	14,453,831.25	1,699,850.03	39.79959999	-80.78839397
16,245.00	91.21	328.48	6,384.01	8,781.55	-3,398.51	14,453,911.72	1,699,801.45	39.79982128	-80.78856624
16,340.00	93.19	329.54	6,380.36	8,862.92	-3,447.38	14,453,993.09	1,699,752.58	39.80004507	-80.78873958
16,435.00	92.79	329.10	6,375.41	8,944.51	-3,495.79	14,454,074.68	1,699,704.17	39.80026946	-80.78891124
16,529.00	90.20	329.54	6,372.96	9,025.32	-3,543.73	14,454,155.49	1,699,656.23	39.80049169	-80.78908125
16,624.00	90.42	330.42	6,372.44	9,107.58	-3,591.26	14,454,237.74	1,699,608.70	39.80071789	-80.78924978
16,719.00	90.11	330.42	6,372.00	9,190.19	-3,638.16	14,454,320.36	1,699,561.81	39.80094508	-80.78941606
Survey @ 16719.00 MD 6372.00 TVD									
16,797.00	90.11	330.42	6,371.85	9,258.03	-3,676.66	14,454,388.20	1,699,523.30	39.80113162	-80.78955258
Survey projected to 16797.00 MD 6371.85 TVD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
173.00	173.00	0.30	-0.34	MWD surveys
16,719.00	6,372.00	9,190.19	-3,638.16	Survey @ 16719.00 MD 6372.00 TVD
16,797.00	6,371.85	9,258.03	-3,676.66	Survey projected to 16797.00 MD 6371.85 TVD

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Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	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	Bryan Pad				
Site Position:		Northing:	14,445,110.80 usft	Latitude:	39.77562900
From:	Lat/Long	Easting:	1,703,181.57 usft	Longitude:	-80.77660992
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.143 °

Well	Bryan N-05HM (slot C)					
Well Position	+N/-S	0.00 usft	Northing:	14,445,130.17 usft	Latitude:	39.77568207
	+E/-W	0.00 usft	Easting:	1,703,199.96 usft	Longitude:	-80.77654430
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level:	1,191.00 usft

Wellbore	Sidetrack 01				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	10/7/2019	-8.711	66.764	51,909.98138499

Design	Surveys Sidetrack 01				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	16,151.00
Vertical Section:		Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
		0.00	0.00	0.00	337.83

Survey Program	Date 10/12/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
173.00	879.00	MWD surf (Original Hole)	MWD	MWD - Standard
974.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard
2,707.00	16,151.00	MWD (Original Hole)	MWD	MWD - Standard
16,232.00	17,546.00	MWD ST1 (Sidetrack 01)	MWD	MWD - Standard
17,594.00	17,594.00	Projection (Sidetrack 01)	MWD	MWD - Standard

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Survey	[Empty]									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
173.00	0.30	311.34	173.00	0.30	-0.34	0.41	0.17	0.17	0.00	0.00
235.00	0.30	330.50	235.00	0.55	-0.54	0.71	0.16	0.00	30.90	30.90
280.00	0.21	24.82	280.00	0.73	-0.57	0.88	0.55	-0.20	120.71	120.71
327.00	0.08	124.31	327.00	0.78	-0.50	0.92	0.50	-0.28	211.68	211.68
372.00	0.17	204.99	372.00	0.71	-0.50	0.84	0.39	0.20	179.29	179.29
419.00	0.17	228.02	419.00	0.60	-0.59	0.77	0.14	0.00	49.00	49.00

WV Department of
Environmental Protection



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
481.00	0.17	227.84	481.00	0.47	-0.72	0.71	0.00	0.00	-0.29
511.00	0.17	146.19	511.00	0.41	-0.73	0.65	0.74	0.00	-272.17
573.00	0.17	278.73	573.00	0.34	-0.77	0.61	0.50	0.00	213.77
603.00	0.13	123.43	603.00	0.33	-0.79	0.60	0.98	-0.13	-517.67
693.00	0.21	150.41	693.00	0.13	-0.62	0.36	0.12	0.09	29.98
788.00	0.17	97.59	788.00	-0.04	-0.39	0.11	0.18	-0.04	-55.60
879.00	0.13	312.31	879.00	0.01	-0.34	0.14	0.31	-0.04	-159.65
974.00	0.30	3.55	974.00	0.33	-0.40	0.46	0.25	0.18	53.94
1,069.00	0.39	349.75	1,068.99	0.90	-0.44	1.00	0.13	0.09	-14.53
1,164.00	0.30	354.76	1,163.99	1.47	-0.52	1.56	0.10	-0.09	5.27
1,258.00	0.43	291.83	1,257.99	1.84	-0.87	2.04	0.42	0.14	-66.95
1,353.00	0.92	40.99	1,352.99	2.55	-0.70	2.63	1.20	0.52	114.91
1,448.00	3.69	47.49	1,447.90	5.19	2.05	4.04	2.92	2.92	6.84
1,543.00	4.65	63.14	1,542.65	9.00	7.74	5.41	1.56	1.01	16.47
1,637.00	5.40	76.76	1,636.29	11.73	15.45	5.04	1.49	0.80	14.49
1,732.00	4.96	88.71	1,730.91	12.85	23.90	2.88	1.22	-0.46	12.58
1,827.00	3.03	128.18	1,825.69	11.39	29.98	-0.77	3.42	-2.03	41.55
1,922.00	2.90	131.87	1,920.56	8.23	33.75	-5.11	0.24	-0.14	3.88
2,016.00	3.29	104.18	2,014.43	5.99	38.13	-8.84	1.63	0.41	-29.46
2,111.00	3.51	77.02	2,109.27	5.97	43.61	-10.92	1.69	0.23	-28.59
2,206.00	4.61	88.01	2,204.03	6.76	50.26	-12.71	1.41	1.16	11.57
2,301.00	3.64	94.16	2,298.78	6.67	57.08	-15.36	1.12	-1.02	6.47
2,395.00	1.84	130.02	2,392.68	5.48	61.22	-18.02	2.56	-1.91	38.15
2,490.00	1.31	129.32	2,487.64	3.82	63.22	-20.32	0.56	-0.56	-0.74
2,585.00	1.93	64.02	2,582.61	3.83	65.50	-21.17	1.92	0.65	-68.74
2,707.00	2.28	61.12	2,704.53	5.90	69.47	-20.75	0.30	0.29	-2.38
2,802.00	2.37	58.13	2,799.45	7.85	72.80	-20.20	0.16	0.09	-3.15
2,896.00	2.15	44.24	2,893.38	10.14	75.68	-19.16	0.63	-0.23	-14.78
2,991.00	4.43	67.44	2,988.22	12.82	80.31	-18.43	2.73	2.40	24.42
3,086.00	4.13	50.04	3,082.96	16.43	86.32	-17.36	1.40	-0.32	-18.32
3,181.00	4.83	60.59	3,177.67	20.59	92.43	-15.81	1.14	0.74	11.11
3,275.00	6.06	59.18	3,271.24	25.08	100.14	-14.56	1.32	1.31	-1.50
3,370.00	3.16	56.02	3,365.92	29.11	106.61	-13.27	3.06	-3.05	-3.33
3,465.00	2.90	49.95	3,460.79	32.12	110.63	-12.00	0.43	-0.27	-6.39
3,560.00	2.28	99.08	3,555.70	33.37	114.33	-12.24	2.34	-0.65	51.72
3,654.00	4.48	102.86	3,649.54	32.25	119.76	-15.32	2.35	2.34	4.02
3,749.00	7.82	82.21	3,743.99	32.31	129.78	-19.05	4.16	3.52	-21.74
3,844.00	8.78	76.58	3,837.99	34.86	143.24	-21.76	1.32	1.01	-5.93
3,939.00	8.56	76.15	3,931.91	38.24	157.16	-23.88	0.24	-0.23	-0.45
4,033.00	9.53	77.82	4,024.74	41.56	171.55	-26.25	1.07	1.03	1.78
4,128.00	10.59	77.11	4,118.27	45.16	187.75	-29.02	1.12	1.12	-0.75
4,222.00	11.99	88.10	4,210.46	47.41	205.93	-33.79	2.72	1.49	11.69
4,317.00	14.58	91.88	4,302.92	47.35	227.75	-42.08	2.87	2.73	3.98

WV Department of Environmental Protection



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,415.00	16.08	87.92	4,397.43	47.44	253.64	-51.77	1.87	1.53	-4.04
4,510.00	19.33	84.58	4,487.92	49.40	282.45	-60.82	3.58	3.42	-3.52
4,605.00	23.46	81.07	4,576.36	53.82	316.80	-69.69	4.55	4.35	-3.69
4,699.00	24.43	79.40	4,662.27	60.30	354.39	-77.87	1.26	1.03	-1.78
4,794.00	26.67	75.10	4,747.98	69.40	394.32	-84.51	3.06	2.36	-4.53
4,889.00	28.65	76.23	4,832.12	80.30	437.04	-90.53	2.16	2.08	1.19
4,984.00	30.45	77.90	4,914.76	90.77	482.71	-98.07	2.08	1.89	1.76
5,078.00	30.41	80.10	4,995.81	99.86	529.43	-107.29	1.19	-0.04	2.34
5,173.00	32.56	80.45	5,076.82	108.23	578.33	-117.98	2.27	2.26	0.37
5,268.00	34.40	81.86	5,156.06	116.27	630.12	-130.07	2.10	1.94	1.48
5,363.00	35.50	79.49	5,233.93	125.11	683.81	-142.15	1.84	1.16	-2.49
5,458.00	33.17	74.65	5,312.38	137.02	736.00	-150.81	3.78	-2.45	-5.09
5,552.00	31.64	75.97	5,391.74	149.81	784.73	-157.35	1.79	-1.63	1.40
5,647.00	29.75	81.07	5,473.44	159.51	832.20	-166.28	3.38	-1.99	5.37
5,742.00	27.77	91.53	5,556.77	162.58	877.64	-180.58	5.68	-2.08	11.01
5,837.00	29.66	94.07	5,640.09	160.32	923.21	-199.87	2.37	1.99	2.67
5,885.00	29.53	91.88	5,681.83	159.09	946.88	-209.94	2.27	-0.27	-4.56
5,950.00	31.21	89.60	5,737.91	158.68	979.74	-222.72	3.13	2.58	-3.51
5,997.00	30.20	80.63	5,778.34	160.69	1,003.59	-229.85	9.97	-2.15	-19.09
6,044.00	30.07	72.55	5,819.01	166.15	1,026.50	-233.44	8.63	-0.28	-17.19
6,091.00	29.76	62.53	5,859.77	175.06	1,048.09	-233.33	10.64	-0.66	-21.32
6,139.00	30.51	55.23	5,901.30	187.51	1,068.68	-229.57	7.79	1.56	-15.21
6,186.00	31.78	50.13	5,941.53	202.25	1,087.98	-223.20	6.23	2.70	-10.85
6,234.00	33.19	44.16	5,982.03	219.79	1,106.84	-214.08	7.29	2.94	-12.44
6,281.00	34.02	35.98	6,021.19	239.67	1,123.54	-201.97	9.79	1.77	-17.40
6,329.00	35.08	33.00	6,060.73	262.10	1,138.94	-187.01	4.16	2.21	-6.21
6,376.00	34.95	30.71	6,099.22	285.01	1,153.17	-171.17	2.81	-0.28	-4.87
6,423.00	36.97	23.59	6,137.28	309.54	1,165.71	-153.17	9.87	4.30	-15.15
6,470.00	40.00	16.91	6,174.08	336.97	1,175.77	-131.57	10.94	6.45	-14.21
6,518.00	41.85	12.78	6,210.36	367.35	1,183.80	-106.46	6.83	3.85	-8.60
6,565.00	43.69	7.42	6,244.87	398.75	1,189.36	-79.48	8.67	3.91	-11.40
6,613.00	45.45	5.93	6,279.06	432.21	1,193.27	-49.98	4.26	3.67	-3.10
6,660.00	45.54	5.75	6,312.01	465.55	1,196.68	-20.38	0.33	0.19	-0.38
6,708.00	50.02	3.99	6,344.26	500.96	1,199.68	11.28	9.72	9.33	-3.67
6,755.00	54.55	1.44	6,373.00	538.09	1,201.42	45.00	10.55	9.64	-5.43
6,803.00	59.03	357.40	6,399.30	578.22	1,200.97	82.34	11.69	9.33	-8.42
6,850.00	61.49	350.90	6,422.63	618.78	1,196.79	121.48	13.10	5.23	-13.83
6,897.00	61.49	345.80	6,445.07	659.21	1,188.45	162.07	9.53	0.00	-10.85
6,944.00	64.70	342.90	6,466.34	699.55	1,177.14	203.70	8.77	6.83	-6.17
6,992.00	70.29	341.58	6,484.71	741.76	1,163.61	247.89	11.92	11.65	-2.75
7,039.00	77.14	340.00	6,497.88	784.33	1,148.76	292.92	14.93	14.57	-3.36
7,087.00	82.46	337.36	6,506.38	828.32	1,131.58	340.13	12.33	11.08	-5.50
7,182.00	88.79	332.79	6,513.63	914.15	1,091.68	434.67	8.21	6.66	-4.81
7,277.00	92.92	331.21	6,512.21	998.00	1,047.10	529.15	4.65	4.35	-1.66

WV Department of Environmental Protection



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Rate (°/100usft)
7,371.00	92.31	331.82	6,507.92	1,080.53	1,002.31	622.48	0.92	-0.65	0.65
7,466.00	91.74	331.82	6,504.56	1,164.22	957.48	716.90	0.60	-0.60	0.00
7,561.00	90.99	331.65	6,502.30	1,247.87	912.50	811.33	0.81	-0.79	-0.18
7,656.00	89.85	331.56	6,501.60	1,331.43	867.33	905.77	1.20	-1.20	-0.09
7,750.00	90.81	329.01	6,501.06	1,413.06	820.74	998.94	2.90	1.02	-2.71
7,845.00	90.11	328.66	6,500.30	1,494.35	771.58	1,092.77	0.82	-0.74	-0.37
7,940.00	89.27	328.92	6,500.81	1,575.60	722.35	1,186.59	0.93	-0.88	0.27
8,034.00	92.09	328.92	6,499.70	1,656.09	673.84	1,279.44	3.00	3.00	0.00
8,129.00	91.60	328.92	6,496.64	1,737.41	624.82	1,373.24	0.52	-0.52	0.00
8,224.00	91.03	328.40	6,494.46	1,818.53	575.42	1,467.00	0.81	-0.60	-0.55
8,319.00	91.30	328.13	6,492.53	1,899.31	525.46	1,560.66	0.40	0.28	-0.28
8,413.00	92.00	327.52	6,489.82	1,978.84	475.43	1,653.19	0.99	0.74	-0.65
8,508.00	89.76	327.34	6,488.36	2,058.88	424.30	1,746.61	2.37	-2.36	-0.19
8,603.00	91.16	329.80	6,487.60	2,139.93	374.76	1,840.36	2.98	1.47	2.59
8,698.00	89.80	330.42	6,486.80	2,222.29	327.43	1,934.49	1.57	-1.43	0.65
8,792.00	89.01	329.80	6,487.78	2,303.78	280.59	2,027.63	1.07	-0.84	-0.66
8,887.00	90.90	331.82	6,487.85	2,386.71	234.26	2,121.91	2.91	1.99	2.13
8,982.00	90.55	331.12	6,486.65	2,470.17	188.89	2,216.32	0.82	-0.37	-0.74
9,077.00	89.89	331.12	6,486.29	2,553.35	143.01	2,310.66	0.69	-0.69	0.00
9,171.00	91.87	330.07	6,484.84	2,635.23	96.86	2,403.90	2.38	2.11	-1.12
9,266.00	91.21	330.33	6,482.29	2,717.63	49.67	2,498.02	0.75	-0.69	0.27
9,361.00	90.51	329.36	6,480.86	2,799.77	1.95	2,592.09	1.26	-0.74	-1.02
9,456.00	89.71	329.98	6,480.68	2,881.76	-46.02	2,686.12	1.07	-0.84	0.65
9,550.00	92.26	331.03	6,479.07	2,963.56	-92.29	2,779.33	2.93	2.71	1.12
9,645.00	91.60	331.21	6,475.87	3,046.70	-138.15	2,873.63	0.72	-0.69	0.19
9,740.00	90.86	330.86	6,473.83	3,129.79	-184.14	2,967.94	0.86	-0.78	-0.37
9,834.00	90.55	330.68	6,472.67	3,211.82	-230.04	3,061.22	0.38	-0.33	-0.19
9,929.00	89.41	330.33	6,472.70	3,294.50	-276.81	3,155.44	1.26	-1.20	-0.37
10,024.00	91.74	331.38	6,471.75	3,377.47	-323.07	3,249.72	2.69	2.45	1.11
10,119.00	90.90	331.30	6,469.56	3,460.80	-368.62	3,344.09	0.89	-0.88	-0.08
10,213.00	90.29	331.03	6,468.59	3,543.14	-413.96	3,437.45	0.71	-0.65	-0.29
10,308.00	89.63	330.68	6,468.65	3,626.12	-460.22	3,531.74	0.79	-0.69	-0.37
10,403.00	91.91	330.42	6,467.38	3,708.83	-506.92	3,625.96	2.42	2.40	-0.27
10,498.00	91.21	330.51	6,464.79	3,791.45	-553.74	3,720.14	0.74	-0.74	0.09
10,593.00	90.90	329.80	6,463.04	3,873.84	-601.01	3,814.27	0.82	-0.33	-0.75
10,687.00	90.20	329.28	6,462.14	3,954.86	-648.66	3,907.29	0.93	-0.74	-0.55
10,782.00	89.67	328.92	6,462.25	4,036.37	-697.44	4,001.18	0.67	-0.56	-0.38
10,877.00	91.69	331.30	6,461.12	4,118.72	-744.78	4,095.30	3.29	2.13	2.51
10,972.00	90.95	330.59	6,458.93	4,201.74	-790.90	4,189.59	1.08	-0.78	-0.75
11,066.00	90.24	330.51	6,457.95	4,283.59	-837.11	4,282.83	0.76	-0.76	-0.09
11,161.00	89.63	330.59	6,458.06	4,366.32	-883.82	4,377.06	0.65	-0.64	0.08
11,256.00	92.04	330.15	6,456.68	4,448.88	-930.78	4,471.24	2.58	2.54	-0.46
11,351.00	91.47	330.33	6,453.77	4,531.31	-977.91	4,565.36	0.63	-0.60	0.19



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Rate (°/100usft)
11,445.00	90.77	331.03	6,451.93	4,613.25	-1,023.93	4,658.61	1.05	-0.74	0.74
11,540.00	89.85	330.68	6,451.42	4,696.22	-1,070.20	4,752.90	1.04	-0.97	-0.37
11,635.00	92.75	330.33	6,449.26	4,778.88	-1,116.96	4,847.09	3.07	3.05	-0.37
11,730.00	92.31	330.07	6,445.07	4,861.24	-1,164.12	4,941.16	0.54	-0.46	-0.27
11,824.00	91.60	329.98	6,441.86	4,942.62	-1,211.06	5,034.23	0.76	-0.76	-0.10
11,919.00	91.03	330.15	6,439.68	5,024.92	-1,258.45	5,128.34	0.63	-0.60	0.18
12,014.00	90.07	330.59	6,438.77	5,107.49	-1,305.42	5,222.53	1.11	-1.01	0.46
12,109.00	89.41	330.77	6,439.20	5,190.32	-1,351.94	5,316.79	0.72	-0.69	0.19
12,203.00	90.59	329.89	6,439.20	5,271.99	-1,398.47	5,409.98	1.57	1.26	-0.94
12,298.00	89.89	329.98	6,438.80	5,354.21	-1,446.06	5,504.08	0.74	-0.74	0.09
12,393.00	92.13	330.24	6,437.13	5,436.56	-1,493.39	5,598.19	2.37	2.36	0.27
12,488.00	92.13	330.77	6,433.60	5,519.19	-1,540.13	5,692.35	0.56	0.00	0.56
12,582.00	91.60	330.68	6,430.54	5,601.14	-1,586.07	5,785.58	0.57	-0.56	-0.10
12,677.00	91.12	330.42	6,428.28	5,683.84	-1,632.77	5,879.79	0.57	-0.51	-0.27
12,772.00	90.68	330.24	6,426.79	5,766.37	-1,679.79	5,973.96	0.50	-0.46	-0.19
12,867.00	89.98	330.15	6,426.24	5,848.81	-1,727.00	6,068.12	0.74	-0.74	-0.09
12,961.00	89.27	330.42	6,426.86	5,930.44	-1,773.60	6,161.30	0.81	-0.76	0.29
13,056.00	88.70	330.07	6,428.54	6,012.90	-1,820.74	6,255.45	0.70	-0.60	-0.37
13,151.00	91.08	329.98	6,428.72	6,095.19	-1,868.20	6,349.57	2.51	2.51	-0.09
13,246.00	92.66	327.96	6,425.62	6,176.55	-1,917.14	6,443.37	2.70	1.66	-2.13
13,341.00	92.13	328.04	6,421.65	6,257.04	-1,967.44	6,536.90	0.56	-0.56	0.08
13,435.00	91.47	327.78	6,418.70	6,336.64	-2,017.35	6,629.44	0.75	-0.70	-0.28
13,530.00	90.99	328.31	6,416.66	6,417.22	-2,067.62	6,723.04	0.75	-0.51	0.56
13,625.00	90.46	328.40	6,415.46	6,498.09	-2,117.46	6,816.73	0.57	-0.56	0.09
13,720.00	89.98	328.48	6,415.10	6,579.04	-2,167.18	6,910.46	0.51	-0.51	0.08
13,814.00	89.49	327.78	6,415.53	6,658.87	-2,216.81	7,003.11	0.91	-0.52	-0.74
13,873.00	89.80	328.40	6,415.90	6,708.95	-2,247.99	7,061.26	1.17	0.53	1.05
13,967.00	90.86	329.19	6,415.35	6,789.35	-2,296.69	7,154.09	1.41	1.13	0.84
14,062.00	91.25	329.71	6,413.60	6,871.15	-2,344.97	7,248.06	0.68	0.41	0.55
14,157.00	90.77	329.89	6,411.93	6,953.24	-2,392.75	7,342.11	0.54	-0.51	0.19
14,251.00	90.68	331.38	6,410.74	7,035.15	-2,438.84	7,435.36	1.59	-0.10	1.59
14,347.00	90.90	330.51	6,409.42	7,119.06	-2,485.46	7,530.66	0.93	0.23	-0.91
14,442.00	90.95	329.80	6,407.88	7,201.45	-2,532.73	7,624.79	0.75	0.05	-0.75
14,537.00	90.59	329.45	6,406.61	7,283.40	-2,580.76	7,718.81	0.53	-0.38	-0.37
14,631.00	92.09	330.86	6,404.41	7,364.91	-2,627.53	7,811.94	2.19	1.60	1.50
14,726.00	90.86	330.95	6,401.96	7,447.89	-2,673.71	7,906.21	1.30	-1.29	0.09
14,821.00	90.77	329.89	6,400.61	7,530.50	-2,720.60	8,000.41	1.12	-0.09	-1.12
14,916.00	90.90	328.66	6,399.23	7,612.16	-2,769.13	8,094.34	1.30	0.14	-1.29
15,010.00	92.13	329.36	6,396.74	7,692.71	-2,817.51	8,187.19	1.51	1.31	0.74
15,105.00	91.65	333.14	6,393.61	7,775.94	-2,863.17	8,281.50	4.01	-0.51	3.98
15,200.00	91.38	333.76	6,391.10	7,860.89	-2,905.62	8,376.18	0.71	-0.28	0.65
15,296.00	90.68	332.88	6,389.37	7,946.65	-2,948.71	8,471.87	1.17	-0.73	-0.92
15,390.00	90.02	332.53	6,388.80	8,030.18	-2,991.82	8,565.49	0.79	-0.70	-0.37

WV Department of Environmental Protection



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Enviro Rate (°/100usft)
15,486.00	89.80	334.02	6,388.95	8,115.93	-3,034.99	8,661.18	1.57	-0.23	1.55
15,581.00	90.37	334.02	6,388.81	8,201.33	-3,076.60	8,755.97	0.60	0.60	0.00
15,676.00	90.42	333.93	6,388.15	8,286.69	-3,118.29	8,850.76	0.11	0.05	-0.09
15,771.00	89.49	333.49	6,388.23	8,371.86	-3,160.36	8,945.51	1.08	-0.98	-0.46
15,866.00	90.20	330.15	6,388.48	8,455.59	-3,205.22	9,039.97	3.59	0.75	-3.52
15,961.00	91.16	329.45	6,387.36	8,537.69	-3,253.00	9,134.03	1.25	1.01	-0.74
16,056.00	90.73	329.28	6,385.79	8,619.42	-3,301.40	9,227.98	0.49	-0.45	-0.18
16,151.00	90.11	329.28	6,385.09	8,701.08	-3,349.93	9,321.92	0.65	-0.65	0.00
Tie into original hole @ 16151 MD									
16,232.00	87.87	328.31	6,386.52	8,770.35	-3,391.89	9,401.90	3.01	-2.77	-1.20
16,292.00	89.14	323.21	6,388.09	8,819.92	-3,425.62	9,460.53	8.76	2.12	-8.50
16,339.00	91.78	322.68	6,387.71	8,857.42	-3,453.94	9,505.95	5.73	5.62	-1.13
16,386.00	93.67	321.98	6,385.47	8,894.58	-3,482.63	9,551.18	4.29	4.02	-1.49
16,434.00	93.36	324.18	6,382.53	8,932.88	-3,511.41	9,597.51	4.62	-0.65	4.58
16,529.00	92.00	326.37	6,378.09	9,010.87	-3,565.46	9,690.13	2.71	-1.43	2.31
16,624.00	90.15	327.87	6,376.31	9,090.63	-3,617.02	9,783.45	2.51	-1.95	1.58
16,719.00	89.76	328.75	6,376.38	9,171.46	-3,666.92	9,877.14	1.01	-0.41	0.93
16,814.00	90.86	328.75	6,375.87	9,252.68	-3,716.21	9,970.95	1.16	1.16	0.00
16,909.00	90.11	329.63	6,375.06	9,334.27	-3,764.86	10,064.86	1.22	-0.79	0.93
17,004.00	90.24	330.51	6,374.77	9,416.60	-3,812.26	10,158.99	0.94	0.14	0.93
17,099.00	88.79	331.21	6,375.58	9,499.57	-3,858.52	10,253.28	1.69	-1.53	0.74
17,193.00	89.67	331.03	6,376.84	9,581.87	-3,903.91	10,346.63	0.96	0.94	-0.19
17,288.00	90.81	330.77	6,376.44	9,664.87	-3,950.11	10,440.93	1.23	1.20	-0.27
17,383.00	91.65	332.18	6,374.40	9,748.32	-3,995.47	10,535.32	1.73	0.88	1.48
17,478.00	92.53	332.09	6,370.94	9,832.25	-4,039.84	10,629.79	0.93	0.93	-0.09
17,546.00	93.19	332.35	6,367.55	9,892.34	-4,071.49	10,697.38	1.04	0.97	0.38
Survey @ 17546.00 MD 6367.55 TVD									
17,594.00	93.19	332.35	6,364.87	9,934.79	-4,093.74	10,745.09	0.00	0.00	0.00
Survey projected to 17594.00 MD 6364.87 TVD									

WV Department of Environmental Protection

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
16,151.00	6,385.09	8,701.08	-3,349.93	Tie into original hole @ 16151 MD
17,546.00	6,367.55	9,892.34	-4,071.49	Survey @ 17546.00 MD 6367.55 TVD



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	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	Bryan Pad				
Site Position:		Northing:	14,445,110.80 usft	Latitude:	39.77562900
From:	Lat/Long	Easting:	1,703,181.57 usft	Longitude:	-80.77660992
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.143 °

Well	Bryan N-05HM (slot C)					
Well Position	+N/-S	0.00 usft	Northing:	14,445,130.17 usft	Latitude:	39.77568207
	+E/-W	0.00 usft	Easting:	1,703,199.96 usft	Longitude:	-80.77654430
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level:	1,191.00 usft

Wellbore	Sidetrack 01				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	10/7/2019	-8.711	66.764	51,909.98138499

Design	Surveys Sidetrack 01				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	16,151.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	337.83	

Survey Program	Date 10/12/2019				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
173.00	879.00	MWD surf (Original Hole)	MWD	MWD - Standard	
974.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,707.00	16,151.00	MWD (Original Hole)	MWD	MWD - Standard	
16,232.00	17,548.00	MWD ST1 (Sidetrack 01)	MWD	MWD - Standard	
17,594.00	17,594.00	Projection (Sidetrack 01)	MWD	MWD - Standard	

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Survey	WV Department of Environmental Protection									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,445,130.17	1,703,199.96	39.77568207	-80.77654430	
173.00	0.30	311.34	173.00	0.30	-0.34	14,445,130.47	1,703,199.62	39.77568290	-80.77654551	
235.00	0.30	330.50	235.00	0.55	-0.54	14,445,130.72	1,703,199.42	39.77568358	-80.77654622	
280.00	0.21	24.82	280.00	0.73	-0.57	14,445,130.89	1,703,199.40	39.77568407	-80.77654631	
327.00	0.08	124.31	327.00	0.78	-0.50	14,445,130.95	1,703,199.46	39.77568423	-80.77654608	
372.00	0.17	204.99	372.00	0.71	-0.50	14,445,130.87	1,703,199.46	39.77568402	-80.77654609	
419.00	0.17	228.02	419.00	0.60	-0.59	14,445,130.76	1,703,199.38	39.77568371	-80.77654638	
481.00	0.17	227.84	481.00	0.47	-0.72	14,445,130.64	1,703,199.24	39.77568338	-80.77654687	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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West Virginia Department of Environmental Protection

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude
511.00	0.17	146.19	511.00	0.41	-0.73	14,445,130.57	1,703,199.23	39.77568319
573.00	0.17	278.73	573.00	0.34	-0.77	14,445,130.51	1,703,199.19	39.77568302
603.00	0.13	123.43	603.00	0.33	-0.79	14,445,130.50	1,703,199.18	39.77568299
693.00	0.21	150.41	693.00	0.13	-0.62	14,445,130.30	1,703,199.34	39.77568244
788.00	0.17	97.59	788.00	-0.04	-0.39	14,445,130.13	1,703,199.57	39.77568197
879.00	0.13	312.31	879.00	0.01	-0.34	14,445,130.18	1,703,199.63	39.77568211
974.00	0.30	3.55	974.00	0.33	-0.40	14,445,130.50	1,703,199.56	39.77568299
1,069.00	0.39	349.75	1,068.99	0.90	-0.44	14,445,131.07	1,703,199.52	39.77568455
1,164.00	0.30	354.76	1,163.99	1.47	-0.52	14,445,131.63	1,703,199.44	39.77568610
1,258.00	0.43	291.83	1,257.99	1.84	-0.87	14,445,132.01	1,703,199.09	39.77568714
1,353.00	0.92	40.99	1,352.99	2.55	-0.70	14,445,132.72	1,703,199.26	39.77568908
1,448.00	3.69	47.49	1,447.90	5.19	2.05	14,445,135.36	1,703,202.01	39.77569632
1,543.00	4.65	63.14	1,542.65	9.00	7.74	14,445,139.17	1,703,207.70	39.77570673
1,637.00	5.40	76.76	1,636.29	11.73	15.45	14,445,141.90	1,703,215.41	39.77571419
1,732.00	4.96	88.71	1,730.91	12.85	23.90	14,445,143.02	1,703,223.87	39.77571720
1,827.00	3.03	128.18	1,825.69	11.39	29.98	14,445,141.56	1,703,229.95	39.77571315
1,922.00	2.90	131.87	1,920.56	8.23	33.75	14,445,138.40	1,703,233.71	39.77570445
2,016.00	3.29	104.18	2,014.43	5.99	38.13	14,445,136.15	1,703,238.10	39.77569825
2,111.00	3.51	77.02	2,109.27	5.97	43.61	14,445,136.14	1,703,243.57	39.77569817
2,206.00	4.61	88.01	2,204.03	6.76	50.26	14,445,136.93	1,703,250.22	39.77570228
2,301.00	3.64	94.16	2,298.78	6.67	57.08	14,445,136.84	1,703,257.05	39.77570000
2,395.00	1.84	130.02	2,392.68	5.48	61.22	14,445,135.65	1,703,261.18	39.77569671
2,490.00	1.31	129.32	2,487.64	3.82	63.22	14,445,133.98	1,703,263.19	39.77569212
2,585.00	1.93	64.02	2,582.61	3.83	65.50	14,445,134.00	1,703,265.47	39.77569214
2,707.00	2.28	61.12	2,704.53	5.90	69.47	14,445,136.07	1,703,269.44	39.77569780
2,802.00	2.37	58.13	2,799.45	7.85	72.80	14,445,138.02	1,703,272.76	39.77570313
2,896.00	2.15	44.24	2,893.38	10.14	75.68	14,445,140.31	1,703,275.64	39.77570940
2,991.00	4.43	67.44	2,988.22	12.82	80.31	14,445,142.99	1,703,280.27	39.77571674
3,086.00	4.13	50.04	3,082.96	16.43	86.32	14,445,146.60	1,703,286.28	39.77572660
3,181.00	4.83	60.59	3,177.67	20.59	92.43	14,445,150.76	1,703,292.39	39.77573798
3,275.00	6.06	59.18	3,271.24	25.08	100.14	14,445,155.24	1,703,300.10	39.77575025
3,370.00	3.16	56.02	3,365.92	29.11	106.61	14,445,159.28	1,703,306.58	39.77576128
3,465.00	2.90	49.95	3,460.79	32.12	110.63	14,445,162.29	1,703,310.59	39.77576952
3,560.00	2.28	99.08	3,555.70	33.37	114.33	14,445,163.53	1,703,314.29	39.77577292
3,654.00	4.48	102.86	3,649.54	32.25	119.76	14,445,162.42	1,703,319.72	39.77576983
3,749.00	7.82	82.21	3,743.99	32.31	129.78	14,445,162.47	1,703,329.75	39.77576990
3,844.00	8.78	76.58	3,837.99	34.86	143.24	14,445,165.03	1,703,343.20	39.77577683
3,939.00	8.56	76.15	3,931.91	38.24	157.16	14,445,168.41	1,703,357.12	39.77578601
4,033.00	9.53	77.82	4,024.74	41.56	171.55	14,445,171.72	1,703,371.52	39.77579502
4,128.00	10.59	77.11	4,118.27	45.16	187.75	14,445,175.33	1,703,387.72	39.77580481
4,222.00	11.99	88.10	4,210.46	47.41	205.93	14,445,177.58	1,703,405.90	39.77581087
4,317.00	14.58	91.88	4,302.92	47.35	227.75	14,445,177.52	1,703,427.71	39.77581054
4,415.00	16.08	87.92	4,397.43	47.44	253.64	14,445,177.60	1,703,453.61	39.77581060
4,510.00	19.33	84.58	4,487.92	49.40	282.45	14,445,179.57	1,703,482.42	39.77581580
4,605.00	23.46	81.07	4,576.36	53.82	316.80	14,445,183.99	1,703,516.77	39.77582771
4,699.00	24.43	79.40	4,662.27	60.30	354.39	14,445,190.47	1,703,554.36	39.77584524
4,794.00	26.67	75.10	4,747.98	69.40	394.32	14,445,199.57	1,703,594.28	39.77586995
4,889.00	28.65	76.23	4,832.12	80.30	437.04	14,445,210.47	1,703,637.01	39.77589960
4,984.00	30.45	77.90	4,914.76	90.77	482.71	14,445,220.94	1,703,682.67	39.77592804
5,078.00	30.41	80.10	4,995.81	99.86	529.43	14,445,230.02	1,703,729.40	39.77595266
5,173.00	32.56	80.45	5,076.82	108.23	578.33	14,445,238.40	1,703,778.30	39.77597533
5,268.00	34.40	81.86	5,156.06	116.27	630.12	14,445,246.44	1,703,830.08	39.77599705
5,363.00	35.50	79.49	5,233.93	125.11	683.81	14,445,255.27	1,703,883.77	39.77602093
5,458.00	33.17	74.65	5,312.38	137.02	736.00	14,445,267.19	1,703,935.97	39.77605329
5,552.00	31.64	75.97	5,391.74	149.81	784.73	14,445,279.97	1,703,984.69	39.77608807

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-05HM (slot C)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Site:	Bryan Pad	MD Reference:	RKB=1191+25 @ 1216.00usft (H&P 611)
Well:	Bryan N-05HM (slot C)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,821.00	90.77	329.89	6,400.61	7,530.50	-2,720.60	14,452,660.67	1,700,479.37	39.79638115	-80.78616325
14,916.00	90.90	328.66	6,399.23	7,612.16	-2,769.13	14,452,742.32	1,700,430.84	39.79660571	-80.78633534
15,010.00	92.13	329.36	6,396.74	7,692.71	-2,817.51	14,452,822.88	1,700,382.46	39.79682724	-80.78650691
15,105.00	91.65	333.14	6,393.61	7,775.94	-2,863.17	14,452,906.10	1,700,336.80	39.79705811	-80.78666876
15,200.00	91.38	333.76	6,391.10	7,860.89	-2,905.62	14,452,991.06	1,700,294.35	39.79728989	-80.78681916
15,296.00	90.68	332.88	6,389.37	7,946.65	-2,948.71	14,453,076.82	1,700,251.25	39.79752550	-80.78697187
15,390.00	90.02	332.53	6,388.80	8,030.18	-2,991.82	14,453,160.35	1,700,208.15	39.79775518	-80.78712463
15,486.00	89.80	334.02	6,388.95	8,115.93	-3,034.99	14,453,246.09	1,700,164.97	39.79799094	-80.78727760
15,581.00	90.37	334.02	6,388.81	8,201.33	-3,076.60	14,453,331.49	1,700,123.36	39.79822574	-80.78742504
15,676.00	90.42	333.93	6,388.15	8,286.69	-3,118.29	14,453,416.86	1,700,081.68	39.79846044	-80.78757272
15,771.00	89.49	333.49	6,388.23	8,371.86	-3,160.36	14,453,502.03	1,700,039.60	39.79869462	-80.78772181
15,866.00	90.20	330.15	6,388.48	8,455.59	-3,205.22	14,453,585.76	1,699,994.75	39.79892485	-80.78788080
15,961.00	91.16	329.45	6,387.36	8,537.69	-3,253.00	14,453,667.86	1,699,946.96	39.79915063	-80.78805023
16,056.00	90.73	329.28	6,385.79	8,619.42	-3,301.40	14,453,749.59	1,699,898.56	39.79937540	-80.78822187
16,151.00	90.11	329.28	6,385.09	8,701.08	-3,349.93	14,453,831.25	1,699,850.03	39.79959999	-80.78839397
Tie into original hole @ 16151 MD									
16,232.00	87.87	328.31	6,386.52	8,770.35	-3,391.89	14,453,900.52	1,699,808.08	39.79979048	-80.78854276
16,292.00	89.14	323.21	6,388.09	8,819.92	-3,425.62	14,453,950.08	1,699,774.34	39.79992682	-80.78866246
16,339.00	91.78	322.68	6,387.71	8,857.42	-3,453.94	14,453,987.59	1,699,746.02	39.80003000	-80.78876297
16,386.00	93.67	321.98	6,385.47	8,894.58	-3,482.63	14,454,024.75	1,699,717.33	39.80013224	-80.78886480
16,434.00	93.36	324.18	6,382.53	8,932.88	-3,511.41	14,454,063.05	1,699,688.56	39.80023761	-80.78896694
16,529.00	92.00	326.37	6,378.09	9,010.87	-3,565.46	14,454,141.04	1,699,634.50	39.80045213	-80.78915873
16,624.00	90.15	327.87	6,376.31	9,090.63	-3,617.02	14,454,220.80	1,699,582.94	39.80067152	-80.78934163
16,719.00	89.76	328.75	6,376.38	9,171.46	-3,666.92	14,454,301.63	1,699,533.04	39.80089383	-80.78951864
16,814.00	90.86	328.75	6,375.87	9,252.68	-3,716.21	14,454,382.85	1,699,483.76	39.80111719	-80.78969343
16,909.00	90.11	329.63	6,375.06	9,334.27	-3,764.86	14,454,464.43	1,699,435.10	39.80134156	-80.78986598
17,004.00	90.24	330.51	6,374.77	9,416.60	-3,812.26	14,454,546.76	1,699,387.70	39.80156797	-80.79003405
17,099.00	88.79	331.21	6,375.58	9,499.57	-3,858.52	14,454,629.73	1,699,341.45	39.80179813	-80.79019806
17,193.00	89.67	331.03	6,376.84	9,581.87	-3,903.91	14,454,712.04	1,699,296.05	39.80202244	-80.79035900
17,288.00	90.81	330.77	6,376.44	9,664.87	-3,950.11	14,454,795.04	1,699,249.85	39.80225069	-80.79052281
17,383.00	91.65	332.18	6,374.40	9,748.32	-3,995.47	14,454,878.49	1,699,204.49	39.80248015	-80.79068360
17,478.00	92.53	332.09	6,370.94	9,832.25	-4,039.84	14,454,962.42	1,699,160.12	39.80271092	-80.79084089
17,546.00	93.19	332.35	6,367.55	9,892.34	-4,071.49	14,455,022.50	1,699,128.47	39.80287614	-80.79095309
Survey @ 17546.00 MD 6367.55 TVD									
17,594.00	93.19	332.35	6,364.87	9,934.79	-4,093.74	14,455,064.96	1,699,106.23	39.80299287	-80.79103193
Survey projected to 17594.00 MD 6364.87 TVD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
16,151.00	6,385.09	8,701.08	-3,349.93	Tie into original hole @ 16151 MD
17,546.00	6,367.55	9,892.34	-4,071.49	Survey @ 17546.00 MD 6367.55 TVD
17,594.00	6,364.87	9,934.79	-4,093.74	Survey projected to 17594.00 MD 6364.87 TVD

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