



TUG HILL
OPERATING

Well: McMasters N-15 HU (slot E)
Site: McMasters Shields
Project: Marshall County, West Virginia
Design: rev8
Rig: Nabors B28

SECTION DETAILS

S/c	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	10446.00	19.51	68.70	10034.89	765.31	2134.00	0.00	0.000	208.39	Survey @ 10446.00 MD 10034.89 TVD
2	10515.00	19.51	68.70	10099.93	773.68	2155.47	0.00	0.000	211.13	Projection
3	10615.00	19.51	68.70	10194.19	785.81	2186.58	0.00	0.000	215.11	KOP Begin 6.36°/100' build/turn
4	10915.99	38.56	64.79	10456.16	844.57	2319.53	6.36	-7.442	238.82	Begin 6.36°/100' build/turn
5	11720.59	50.00	349.92	11070.70	1284.40	2504.97	6.36	-108.287	618.44	Begin 8°/100' build/turn
6	12279.72	91.00	330.33	11255.00	1762.67	2319.62	8.00	-28.444	1127.84	Begin 91.00° lateral
7	22518.08	91.00	330.33	11077.00	10657.52	-2747.35	0.00	0.000	11005.94	PBHL/TD 22518.08 MD 11077.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
174.00	0.22	116.73	174.00	-0.15	0.30	-0.22	MWD surveys
22461.00	92.40	330.57	11050.62	10607.07	-2724.54	10951.39	Survey @ 22461.00 MD 11050.62 TVD
22517.00	92.40	330.57	11048.28	10655.80	-2752.03	11005.44	Survey Proj. to 22517.00 MD 11048.28 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=1206+26 @ 1232.00ft (Nabors B28)

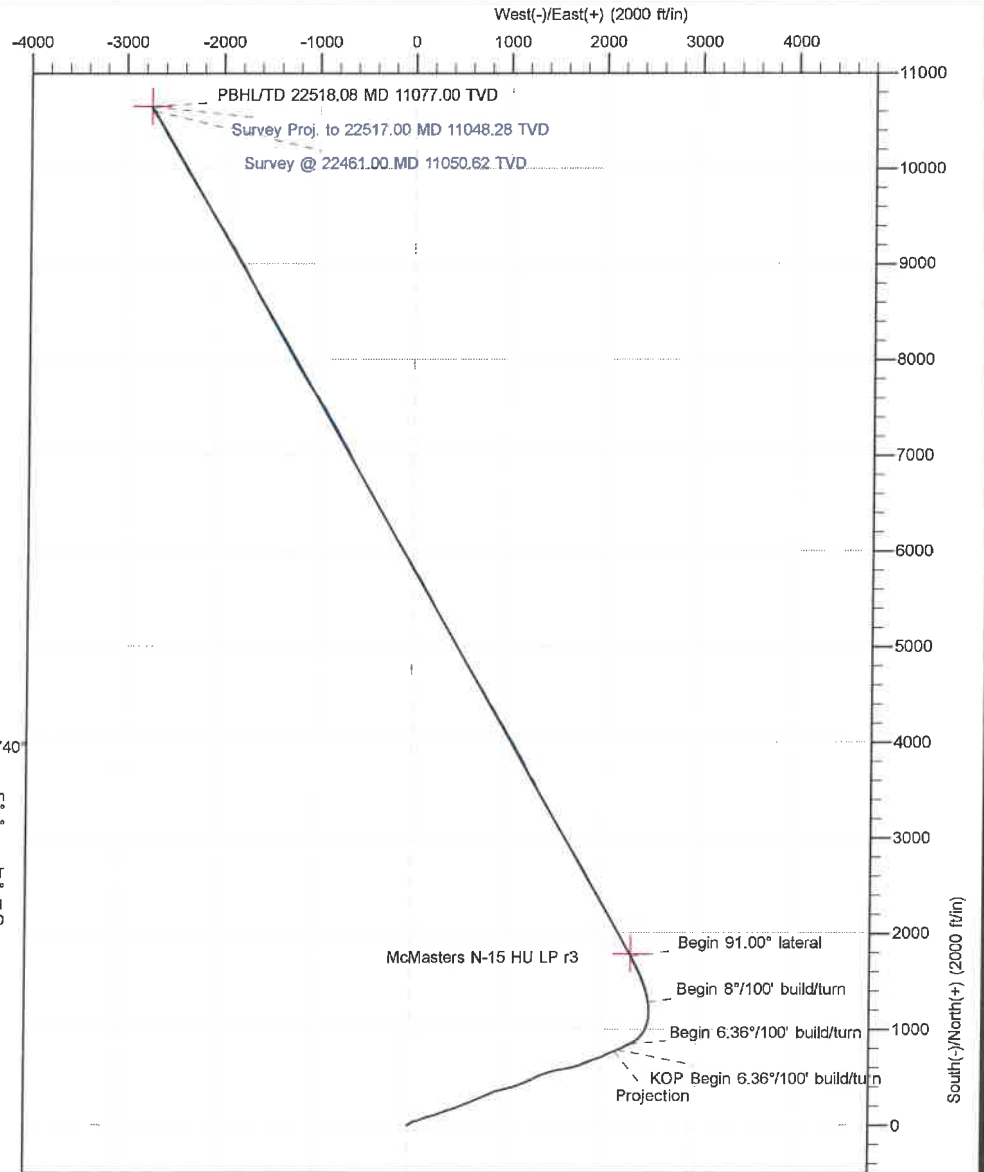
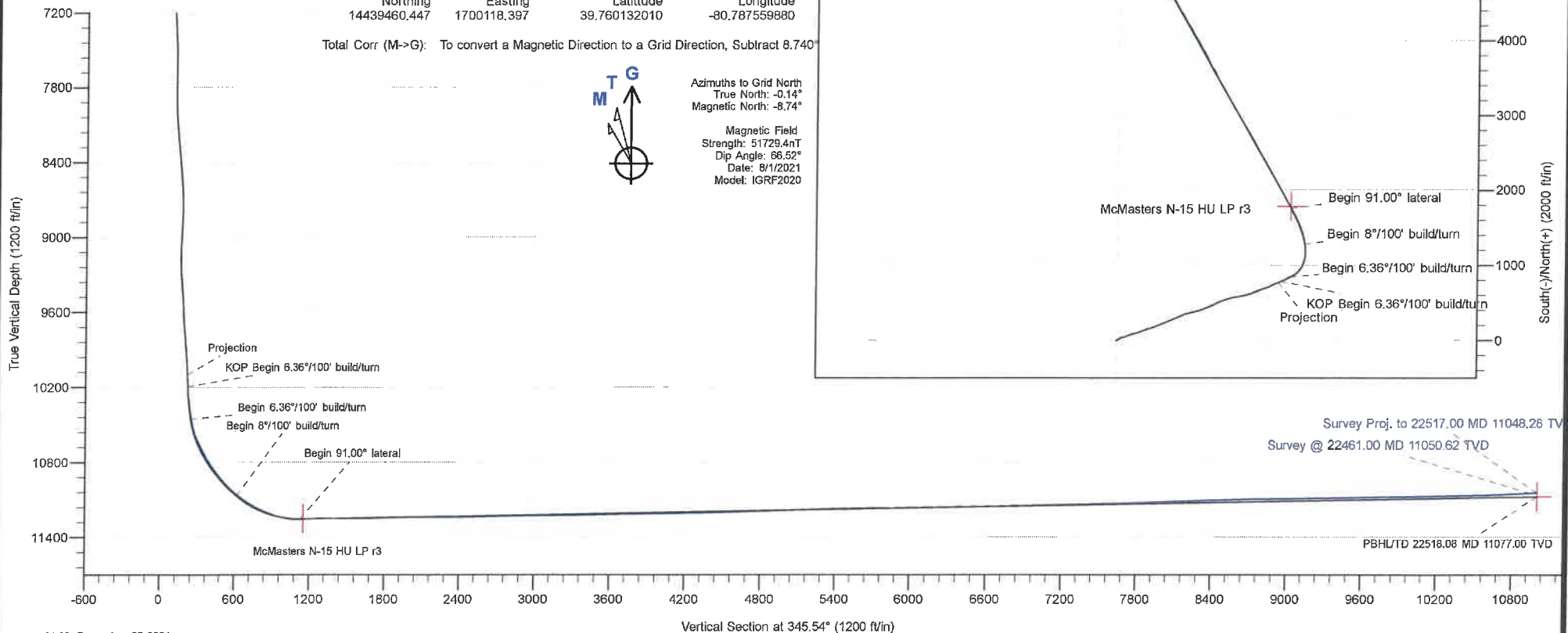
Northing 14439460.447 Easting 1700118.397 Latitude 39.760132010 Longitude -80.787559880

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.740°



Azimuths to Grid North
True North: -0.14°
Magnetic North: -8.74°

Magnetic Field
Strength: 51729.4nT
Dip Angle: 66.52°
Date: 8/1/2021
Model: IGRF2020



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Project	Marshall County, West Virginia NAD83 UTM 17N		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	McMasters Shields				
Site Position:		Northing:	14,439,441.755 usft	Latitude:	39.760080500
From:	Lat/Long	Easting:	1,700,145.187 usft	Longitude:	-80.787464710
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.136 °

Well	McMasters N-15 HU (slot E)					
Well Position	+N/-S	0.00 ft	Northing:	14,439,460.448 usft	Latitude:	39.760132010
	+E/-W	0.00 ft	Easting:	1,700,118.397 usft	Longitude:	-80.787559880
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,206.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	8/1/2021	-8.604	66.516	51,729.37530614

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	345.54	

Survey Program	Date	12/5/2021			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
174.00	913.00	MWD surf (Original Hole)	MWD	MWD - Standard	
947.00	2,815.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,677.00	6,398.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
6,533.00	22,461.00	MWD (Original Hole)	MWD	MWD - Standard	
22,517.00	22,517.00	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	0.00	0.00	0.00	0.00	14,439,460.448	1,700,118.397	39.760132010	-80.787559880	
174.00	0.22	116.73	174.00	-0.15	0.30	14,439,460.297	1,700,118.695	39.760131596	-80.787558819	
MWD surveys										
235.00	0.18	132.34	235.00	-0.27	0.47	14,439,460.180	1,700,118.871	39.760131273	-80.787558196	
266.00	0.09	35.48	266.00	-0.28	0.52	14,439,460.167	1,700,118.921	39.760131237	-80.787558018	
297.00	0.18	108.78	297.00	-0.28	0.58	14,439,460.171	1,700,118.981	39.760131248	-80.787557804	
328.00	0.22	87.34	328.00	-0.29	0.69	14,439,460.158	1,700,119.086	39.760131212	-80.787557428	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
358.00	0.18	11.31	358.00	-0.24	0.76	14,439,460.207	1,700,119.153	39.760131346	-80.787557190
420.00	0.13	89.80	420.00	-0.14	0.85	14,439,460.303	1,700,119.243	39.760131608	-80.787556871
481.00	0.26	76.61	481.00	-0.11	1.05	14,439,460.335	1,700,119.447	39.760131695	-80.787556145
512.00	0.31	85.75	512.00	-0.09	1.20	14,439,460.358	1,700,119.599	39.760131756	-80.787555604
542.00	0.26	134.36	542.00	-0.13	1.33	14,439,460.316	1,700,119.728	39.760131641	-80.787555143
573.00	0.09	151.41	573.00	-0.20	1.39	14,439,460.246	1,700,119.790	39.760131447	-80.787554924
604.00	0.22	46.29	604.00	-0.18	1.45	14,439,460.265	1,700,119.845	39.760131501	-80.787554729
634.00	0.18	118.01	634.00	-0.16	1.53	14,439,460.283	1,700,119.928	39.760131549	-80.787554433
665.00	0.13	75.56	665.00	-0.18	1.61	14,439,460.269	1,700,120.005	39.760131510	-80.787554158
696.00	0.26	76.88	696.00	-0.15	1.71	14,439,460.294	1,700,120.108	39.760131577	-80.787553793
727.00	0.18	82.85	727.00	-0.13	1.83	14,439,460.316	1,700,120.224	39.760131637	-80.787553377
758.00	0.26	92.70	758.00	-0.13	1.95	14,439,460.319	1,700,120.343	39.760131643	-80.787552956
789.00	0.31	125.92	789.00	-0.18	2.08	14,439,460.266	1,700,120.481	39.760131498	-80.787552464
821.00	0.44	102.19	821.00	-0.26	2.27	14,439,460.189	1,700,120.671	39.760131286	-80.787551788
852.00	0.26	135.94	851.99	-0.33	2.44	14,439,460.114	1,700,120.837	39.760131077	-80.787551201
884.00	0.48	123.55	883.99	-0.46	2.60	14,439,459.987	1,700,120.999	39.760130730	-80.787550625
913.00	0.26	121.44	912.99	-0.56	2.76	14,439,459.886	1,700,121.156	39.760130450	-80.787550065
947.00	0.44	91.29	946.99	-0.60	2.96	14,439,459.843	1,700,121.353	39.760130330	-80.787549367
981.00	0.48	112.21	980.99	-0.66	3.22	14,439,459.786	1,700,121.615	39.760130172	-80.787548434
1,010.00	0.35	89.89	1,009.99	-0.71	3.42	14,439,459.740	1,700,121.816	39.760130045	-80.787547719
1,042.00	0.48	89.62	1,041.99	-0.71	3.65	14,439,459.741	1,700,122.048	39.760130047	-80.787546894
1,073.00	0.48	109.05	1,072.99	-0.75	3.90	14,439,459.700	1,700,122.300	39.760129931	-80.787545996
1,104.00	0.35	84.00	1,103.99	-0.78	4.12	14,439,459.667	1,700,122.517	39.760129841	-80.787545224
1,136.00	0.48	101.75	1,135.99	-0.80	4.35	14,439,459.650	1,700,122.746	39.760129792	-80.787544412
1,167.00	0.31	85.49	1,166.99	-0.82	4.56	14,439,459.630	1,700,122.956	39.760129736	-80.787543662
1,199.00	0.53	100.78	1,198.99	-0.84	4.79	14,439,459.609	1,700,123.188	39.760129678	-80.787542838
1,230.00	0.66	62.29	1,229.98	-0.78	5.09	14,439,459.666	1,700,123.487	39.760129830	-80.787541774
1,261.00	0.57	102.81	1,260.98	-0.73	5.40	14,439,459.715	1,700,123.795	39.760129962	-80.787540676
1,293.00	0.83	56.14	1,292.98	-0.64	5.75	14,439,459.808	1,700,124.143	39.760130217	-80.787539438
1,324.00	0.62	115.37	1,323.98	-0.59	6.08	14,439,459.862	1,700,124.481	39.760130361	-80.787538235
1,355.00	0.79	74.24	1,354.98	-0.60	6.44	14,439,459.848	1,700,124.838	39.760130321	-80.787536964
1,386.00	1.05	80.13	1,385.97	-0.49	6.93	14,439,459.955	1,700,125.324	39.760130611	-80.787535235
1,416.00	1.36	78.72	1,415.97	-0.38	7.55	14,439,460.071	1,700,125.944	39.760130928	-80.787533028
1,449.00	1.32	69.93	1,448.96	-0.17	8.29	14,439,460.278	1,700,126.685	39.760131492	-80.787530390
1,496.00	1.45	72.83	1,495.94	0.19	9.36	14,439,460.640	1,700,127.761	39.760132477	-80.787526555
1,543.00	1.71	64.84	1,542.92	0.67	10.57	14,439,461.113	1,700,128.964	39.760133770	-80.787522271
1,636.00	2.15	53.24	1,635.87	2.30	13.22	14,439,462.747	1,700,131.618	39.760138240	-80.787512815
1,731.00	2.46	45.59	1,730.80	4.79	16.11	14,439,465.240	1,700,134.502	39.760145068	-80.787502532
1,825.00	2.86	51.13	1,824.69	7.68	19.37	14,439,468.124	1,700,137.769	39.760152965	-80.787490883
1,919.00	2.94	42.60	1,918.57	10.92	22.83	14,439,471.370	1,700,141.226	39.760161858	-80.787478552
2,014.00	3.47	53.76	2,013.43	14.42	26.80	14,439,474.863	1,700,145.194	39.760171425	-80.787464403
2,107.00	2.94	61.58	2,106.28	17.21	31.17	14,439,477.662	1,700,149.562	39.760179083	-80.787448838
2,200.00	3.08	66.77	2,199.15	19.33	35.56	14,439,479.782	1,700,153.955	39.760184878	-80.787433187
2,295.00	2.64	62.90	2,294.03	21.34	39.85	14,439,481.786	1,700,158.248	39.760190352	-80.787417894
2,389.00	3.21	63.17	2,387.91	23.51	44.13	14,439,483.960	1,700,162.524	39.760196294	-80.787402662
2,483.00	3.34	59.30	2,481.76	26.10	48.83	14,439,486.546	1,700,167.227	39.760203365	-80.787385905
2,577.00	3.25	66.95	2,575.60	28.54	53.64	14,439,488.987	1,700,172.033	39.760210038	-80.787368782
2,615.00	3.30	64.75	2,613.54	29.43	55.62	14,439,489.875	1,700,174.014	39.760212465	-80.787361727
2,677.00	3.65	66.24	2,675.43	30.98	59.04	14,439,491.432	1,700,177.434	39.760216717	-80.787349544
2,770.00	3.25	48.93	2,768.26	33.91	63.73	14,439,494.356	1,700,182.131	39.760224718	-80.787332806
2,864.00	4.13	59.30	2,862.07	37.39	68.65	14,439,497.835	1,700,187.050	39.760234240	-80.787315271
2,958.00	4.61	75.82	2,955.80	40.04	75.23	14,439,500.489	1,700,193.624	39.760241485	-80.787291859
3,052.00	5.98	82.33	3,049.39	41.62	83.74	14,439,502.068	1,700,202.139	39.760245766	-80.787261544
3,146.00	6.72	80.74	3,142.82	43.16	94.02	14,439,503.606	1,700,212.420	39.760249924	-80.787224948

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
3,241.00	7.29	75.11	3,237.11	45.60	105.33	14,439,506.050	1,700,223.731	39.760256560	-80.787184679
3,335.00	8.96	69.67	3,330.16	49.68	117.96	14,439,510.126	1,700,236.360	39.760267672	-80.787139707
3,429.00	9.88	64.57	3,422.90	55.68	132.11	14,439,516.132	1,700,250.508	39.760284074	-80.787089314
3,523.00	9.84	66.24	3,515.51	62.38	146.75	14,439,522.831	1,700,265.142	39.760302377	-80.787037182
3,617.00	9.58	69.93	3,608.16	68.30	161.44	14,439,528.752	1,700,279.841	39.760318540	-80.786984830
3,711.00	9.62	67.56	3,700.85	73.99	176.05	14,439,534.434	1,700,294.447	39.760334050	-80.786932807
3,805.00	9.44	73.44	3,793.55	79.18	190.70	14,439,539.629	1,700,309.096	39.760348223	-80.786880637
3,900.00	8.70	77.49	3,887.36	82.96	205.18	14,439,543.406	1,700,323.578	39.760358500	-80.786829072
3,994.00	9.40	77.40	3,980.19	86.17	219.61	14,439,546.621	1,700,338.010	39.760367233	-80.786777691
4,088.00	10.28	76.97	4,072.81	89.74	235.28	14,439,550.186	1,700,353.674	39.760376923	-80.786721925
4,182.00	10.20	74.68	4,165.31	93.83	251.48	14,439,554.277	1,700,369.873	39.760388050	-80.786664249
4,276.00	10.11	73.19	4,257.84	98.41	267.40	14,439,558.862	1,700,385.798	39.760400537	-80.786607544
4,370.00	9.89	73.54	4,350.41	103.09	283.04	14,439,563.535	1,700,401.437	39.760413269	-80.786551853
4,464.00	9.71	72.92	4,443.04	107.70	298.36	14,439,568.150	1,700,416.756	39.760425845	-80.786497303
4,558.00	10.68	69.32	4,535.56	113.11	314.09	14,439,573.555	1,700,432.483	39.760440584	-80.786441295
4,654.00	11.56	66.86	4,629.75	120.03	331.26	14,439,580.476	1,700,449.651	39.760459480	-80.786380147
4,748.00	11.90	65.18	4,721.79	127.80	348.71	14,439,588.246	1,700,467.108	39.760480703	-80.786317962
4,842.00	11.25	69.05	4,813.88	135.15	366.07	14,439,595.593	1,700,484.468	39.760500766	-80.786256127
4,937.00	10.59	72.39	4,907.16	141.10	383.05	14,439,601.547	1,700,501.443	39.760517008	-80.786195674
5,032.00	10.59	72.74	5,000.54	146.33	399.70	14,439,606.779	1,700,518.100	39.760531265	-80.786136358
5,126.00	11.07	73.71	5,092.87	151.43	416.62	14,439,611.873	1,700,535.011	39.760545144	-80.786076140
5,220.00	10.63	72.57	5,185.19	156.55	433.55	14,439,617.001	1,700,551.945	39.760559117	-80.786015840
5,315.00	10.94	70.63	5,278.51	162.17	450.41	14,439,622.616	1,700,568.809	39.760574425	-80.785955783
5,409.00	10.06	71.16	5,370.93	167.78	466.60	14,439,628.225	1,700,584.994	39.760589725	-80.785898143
5,504.00	8.17	71.86	5,464.73	172.56	480.87	14,439,633.007	1,700,599.263	39.760602762	-80.785847329
5,597.00	7.51	72.40	5,556.86	176.45	492.94	14,439,636.902	1,700,611.336	39.760613380	-80.785804336
5,690.00	9.36	70.90	5,648.85	180.77	505.88	14,439,641.214	1,700,624.276	39.760625139	-80.785758253
5,784.00	10.90	69.85	5,741.38	186.33	521.45	14,439,646.778	1,700,639.844	39.760636921	-80.785702810
5,878.00	11.25	70.73	5,833.63	192.42	538.45	14,439,652.865	1,700,656.843	39.760649319	-80.785642269
5,971.00	10.46	67.91	5,924.97	198.59	554.83	14,439,659.034	1,700,673.229	39.760663754	-80.785583909
6,065.00	10.19	67.38	6,017.44	204.99	570.42	14,439,665.441	1,700,688.811	39.760679127	-80.785528409
6,160.00	10.67	68.44	6,110.87	211.46	586.35	14,439,671.905	1,700,704.747	39.760694894	-80.785471646
6,254.00	11.38	68.96	6,203.14	217.98	603.10	14,439,678.432	1,700,721.496	39.760710884	-80.785411992
6,349.00	10.54	66.50	6,296.41	224.81	619.82	14,439,685.262	1,700,738.212	39.760726710	-80.785352452
6,398.00	9.62	67.73	6,344.65	228.15	627.72	14,439,688.601	1,700,746.111	39.760734474	-80.785324316
6,533.00	9.01	63.61	6,477.87	237.13	647.62	14,439,697.574	1,700,766.020	39.760778987	-80.785253398
6,628.00	10.37	67.21	6,571.51	243.75	662.17	14,439,704.193	1,700,780.567	39.760797068	-80.785201577
6,723.00	12.66	68.09	6,664.60	250.94	679.71	14,439,711.390	1,700,798.110	39.760816719	-80.785139090
6,817.00	13.97	68.35	6,756.07	258.97	699.82	14,439,719.421	1,700,818.214	39.760838639	-80.785067485
6,912.00	15.24	67.47	6,847.99	267.99	722.01	14,439,728.436	1,700,840.406	39.760863251	-80.784988441
7,006.00	16.30	65.01	6,938.46	278.30	745.38	14,439,738.743	1,700,863.775	39.760891404	-80.784905197
7,102.00	17.31	64.57	7,030.36	290.12	770.49	14,439,750.567	1,700,888.885	39.760923711	-80.784815747
7,196.00	17.45	66.77	7,120.06	301.68	796.07	14,439,762.131	1,700,914.466	39.760955301	-80.784724620
7,290.00	16.74	66.33	7,209.91	312.68	821.42	14,439,773.125	1,700,939.816	39.760985326	-80.784634321
7,383.00	18.36	69.67	7,298.58	323.15	847.42	14,439,783.592	1,700,965.819	39.761013899	-80.784541701
7,477.00	17.84	66.15	7,387.93	334.11	874.48	14,439,794.558	1,700,992.872	39.761043836	-80.784445344
7,571.00	18.63	66.95	7,477.21	345.81	901.46	14,439,806.259	1,701,019.857	39.761075792	-80.784349219
7,665.00	22.58	75.64	7,565.20	356.17	932.78	14,439,816.620	1,701,051.176	39.761104039	-80.784237688
7,759.00	27.46	76.87	7,650.36	365.58	971.39	14,439,826.025	1,701,089.789	39.761129612	-80.784100208
7,854.00	28.52	75.99	7,734.24	376.04	1,014.73	14,439,836.491	1,701,133.126	39.761158069	-80.783945907
7,947.00	27.81	76.43	7,816.23	386.51	1,057.36	14,439,846.957	1,701,175.757	39.761186527	-80.783794121
8,042.00	28.04	74.50	7,900.17	397.68	1,100.42	14,439,858.124	1,701,218.817	39.761216910	-80.783640800
8,132.00	29.35	70.11	7,979.12	410.84	1,141.55	14,439,871.283	1,701,259.948	39.761252775	-80.783494325
8,226.00	28.82	68.08	8,061.27	427.13	1,184.24	14,439,887.579	1,701,302.631	39.761297245	-80.783342303



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,320.00	28.16	67.29	8,143.89	444.15	1,225.72	14,439,904.600	1,701,344.112	39.761343716	-80.783194552
8,415.00	27.46	66.59	8,227.92	461.51	1,266.50	14,439,921.957	1,701,384.892	39.761391113	-80.783049290
8,509.00	25.53	64.92	8,312.04	478.71	1,304.74	14,439,939.156	1,701,423.131	39.761438092	-80.782913070
8,603.00	23.82	61.41	8,397.46	496.38	1,339.76	14,439,956.828	1,701,458.149	39.761486391	-80.782788310
8,696.00	23.91	65.36	8,482.51	513.23	1,373.38	14,439,973.674	1,701,491.772	39.761532429	-80.782668522
8,790.00	27.07	67.39	8,567.35	529.40	1,410.45	14,439,989.843	1,701,528.841	39.761576587	-80.782536474
8,884.00	29.97	71.43	8,649.95	545.10	1,452.46	14,440,005.548	1,701,570.855	39.761619437	-80.782386836
8,978.00	29.70	75.47	8,731.50	558.42	1,497.26	14,440,018.869	1,701,615.658	39.761655721	-80.782227295
9,072.00	28.65	77.31	8,813.57	569.22	1,541.79	14,440,029.662	1,701,660.186	39.761685064	-80.782068752
9,166.00	29.22	80.65	8,895.84	577.89	1,586.42	14,440,038.340	1,701,704.812	39.761708600	-80.781909879
9,260.00	29.22	80.04	8,977.88	585.59	1,631.66	14,440,046.036	1,701,750.049	39.761729432	-80.781748841
9,354.00	29.18	80.48	9,059.94	593.35	1,676.85	14,440,053.794	1,701,795.246	39.761750436	-80.781587942
9,445.00	27.94	79.42	9,139.86	600.93	1,719.69	14,440,061.378	1,701,838.083	39.761770976	-80.781435446
9,539.00	26.46	70.90	9,223.50	611.83	1,761.14	14,440,072.279	1,701,879.537	39.761800635	-80.781287839
9,632.00	27.15	66.77	9,306.51	626.98	1,800.23	14,440,087.429	1,701,918.618	39.761841980	-80.781148640
9,726.00	27.90	66.85	9,389.87	644.09	1,840.16	14,440,104.535	1,701,958.549	39.761888689	-80.781006401
9,819.00	28.87	68.35	9,471.69	660.93	1,881.03	14,440,121.373	1,701,999.424	39.761934656	-80.780860802
9,913.00	28.04	70.46	9,554.33	676.69	1,922.95	14,440,137.135	1,702,041.340	39.761977663	-80.780711512
9,960.00	28.25	72.13	9,595.78	683.80	1,943.94	14,440,144.243	1,702,062.337	39.761997043	-80.780636732
10,007.00	29.00	69.76	9,637.03	691.15	1,965.22	14,440,151.598	1,702,083.614	39.762017099	-80.780560956
10,101.00	27.50	67.03	9,719.84	707.51	2,006.59	14,440,167.952	1,702,124.979	39.762061732	-80.780413620
10,196.00	25.84	64.13	9,804.73	725.10	2,045.41	14,440,185.547	1,702,163.805	39.762109791	-80.780275304
10,290.00	23.73	65.36	9,890.07	741.93	2,081.04	14,440,202.373	1,702,199.434	39.762155760	-80.780148375
10,384.00	21.53	65.80	9,976.83	756.88	2,113.97	14,440,217.331	1,702,232.363	39.762196617	-80.780031071
10,446.00	19.51	68.70	10,034.89	765.31	2,134.00	14,440,225.756	1,702,252.388	39.762219620	-80.779959738
10,491.00	18.55	67.60	10,077.43	770.77	2,147.61	14,440,231.214	1,702,266.007	39.762234516	-80.779911227
10,514.00	18.39	67.69	10,099.25	773.54	2,154.35	14,440,233.985	1,702,272.746	39.762242082	-80.779887223
10,561.00	18.24	68.22	10,143.87	779.08	2,168.04	14,440,239.529	1,702,286.435	39.762257214	-80.779838462
10,609.00	21.01	69.18	10,189.07	784.93	2,183.06	14,440,245.376	1,702,301.457	39.762273169	-80.779784957
10,656.00	25.54	68.13	10,232.24	791.70	2,200.35	14,440,252.148	1,702,318.744	39.762291652	-80.779723383
10,703.00	27.56	66.90	10,274.28	799.74	2,219.76	14,440,260.189	1,702,338.150	39.762313603	-80.779654258
10,750.00	31.03	64.53	10,315.26	809.22	2,240.70	14,440,269.667	1,702,359.095	39.762339492	-80.779579644
10,798.00	33.41	63.47	10,355.87	820.45	2,263.70	14,440,280.892	1,702,382.091	39.762370163	-80.779497715
10,845.00	35.47	62.77	10,394.63	832.47	2,287.40	14,440,292.913	1,702,405.796	39.762403015	-80.779413256
10,892.00	38.51	64.09	10,432.17	845.10	2,312.70	14,440,305.549	1,702,431.089	39.762437547	-80.779323142
10,939.00	38.24	62.94	10,469.01	858.11	2,338.81	14,440,318.560	1,702,457.204	39.762473102	-80.779230099
10,986.00	37.36	59.69	10,506.15	871.93	2,364.08	14,440,332.376	1,702,482.471	39.762510872	-80.779140065
11,033.00	36.22	53.28	10,543.81	887.44	2,387.53	14,440,347.881	1,702,505.922	39.762553296	-80.779056480
11,080.00	35.96	46.24	10,581.80	905.29	2,408.64	14,440,365.736	1,702,527.028	39.762602187	-80.778981217
11,127.00	37.05	38.95	10,619.60	925.86	2,427.51	14,440,386.302	1,702,545.906	39.762658540	-80.778913863
11,174.00	37.41	34.55	10,657.03	948.63	2,444.51	14,440,409.076	1,702,562.906	39.762720969	-80.778853166
11,221.00	37.41	31.30	10,694.36	972.59	2,460.03	14,440,433.036	1,702,578.421	39.762786664	-80.778797746
11,268.00	36.18	26.73	10,732.01	997.18	2,473.69	14,440,457.630	1,702,592.081	39.762854115	-80.778748922
11,315.00	36.66	23.22	10,769.83	1,022.47	2,485.46	14,440,482.918	1,702,603.854	39.762923482	-80.778706806
11,363.00	38.55	19.00	10,807.86	1,049.79	2,495.98	14,440,510.236	1,702,614.376	39.762998433	-80.778669124
11,410.00	39.43	14.60	10,844.40	1,078.09	2,504.52	14,440,538.532	1,702,622.908	39.763076086	-80.778638514
11,457.00	40.70	10.12	10,880.38	1,107.62	2,510.97	14,440,568.069	1,702,629.364	39.763157159	-80.778615279
11,504.00	41.32	6.34	10,915.85	1,138.14	2,515.38	14,440,598.582	1,702,633.771	39.763240925	-80.778599329
11,552.00	42.29	2.12	10,951.64	1,170.03	2,517.73	14,440,630.476	1,702,636.119	39.763328501	-80.778590694
11,599.00	43.91	357.38	10,985.96	1,202.12	2,517.57	14,440,662.570	1,702,635.959	39.763416639	-80.778590981
11,646.00	47.78	353.77	11,018.70	1,235.72	2,514.93	14,440,696.170	1,702,633.324	39.763508932	-80.778600062
11,693.00	51.08	350.52	11,049.27	1,271.07	2,510.03	14,440,731.519	1,702,628.422	39.763606046	-80.778617196
11,741.00	53.14	348.41	11,078.75	1,308.31	2,503.10	14,440,768.754	1,702,621.487	39.763708351	-80.778641545
11,788.00	55.21	346.57	11,106.26	1,345.51	2,494.83	14,440,805.951	1,702,613.226	39.763810560	-80.778670616



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,835.00	57.14	345.78	11,132.42	1,383.42	2,485.50	14,440,843.862	1,702,603.894	39.763914737	-80.778703492
11,882.00	60.79	343.58	11,156.65	1,422.24	2,474.85	14,440,882.689	1,702,593.242	39.764021438	-80.778741055
11,929.00	64.97	341.20	11,178.07	1,462.10	2,462.18	14,440,922.543	1,702,580.575	39.764130975	-80.778785782
11,976.00	67.03	340.15	11,197.19	1,502.61	2,447.97	14,440,963.056	1,702,566.364	39.764242333	-80.778835996
12,023.00	69.63	338.30	11,214.54	1,543.44	2,432.48	14,441,003.886	1,702,550.867	39.764354570	-80.778890781
12,070.00	72.35	337.07	11,229.85	1,584.54	2,415.60	14,441,044.989	1,702,533.993	39.764467563	-80.778950468
12,118.00	77.54	333.12	11,242.32	1,626.55	2,396.08	14,441,086.999	1,702,514.467	39.764583067	-80.779019585
12,170.00	81.27	331.36	11,251.88	1,671.77	2,372.27	14,441,132.217	1,702,490.661	39.764707411	-80.779103903
12,217.00	86.42	330.57	11,256.92	1,712.61	2,349.60	14,441,173.059	1,702,467.988	39.764819726	-80.779184229
12,264.00	91.87	330.39	11,257.62	1,753.49	2,326.45	14,441,213.937	1,702,444.841	39.764932147	-80.779266240
12,311.00	92.84	330.13	11,255.69	1,794.27	2,303.15	14,441,254.712	1,702,421.546	39.765044283	-80.779348780
12,358.00	91.56	329.43	11,253.88	1,834.85	2,279.52	14,441,295.293	1,702,397.908	39.765155891	-80.779432542
12,405.00	90.33	329.69	11,253.11	1,875.36	2,255.71	14,441,335.808	1,702,374.100	39.765267318	-80.779516911
12,500.00	91.03	329.69	11,251.98	1,957.37	2,207.77	14,441,417.816	1,702,326.159	39.765492859	-80.779686795
12,594.00	90.02	330.31	11,251.12	2,038.77	2,160.77	14,441,499.217	1,702,279.162	39.765716727	-80.779853327
12,688.00	90.07	330.31	11,251.05	2,120.43	2,114.21	14,441,580.877	1,702,232.603	39.765941301	-80.780018298
12,781.00	89.71	330.31	11,251.23	2,201.22	2,068.15	14,441,661.667	1,702,186.540	39.766163485	-80.780181515
12,875.00	92.13	330.83	11,249.72	2,283.08	2,021.97	14,441,743.520	1,702,140.362	39.766388578	-80.780345133
12,970.00	92.04	331.10	11,246.26	2,366.08	1,975.89	14,441,826.525	1,702,094.285	39.766616854	-80.780508381
13,063.00	91.08	331.01	11,243.73	2,447.43	1,930.90	14,441,907.877	1,702,049.293	39.766840571	-80.780667783
13,158.00	90.99	330.92	11,242.01	2,530.48	1,884.80	14,441,990.924	1,702,003.193	39.767068952	-80.780831115
13,252.00	89.93	330.31	11,241.26	2,612.38	1,838.68	14,442,072.826	1,701,957.072	39.767294187	-80.780994534
13,346.00	89.58	330.48	11,241.66	2,694.11	1,792.24	14,442,154.553	1,701,910.635	39.767518945	-80.781159079
13,440.00	90.29	329.43	11,241.77	2,775.48	1,745.18	14,442,235.921	1,701,863.572	39.767742719	-80.781325855
13,534.00	90.02	329.78	11,241.51	2,856.56	1,697.62	14,442,317.000	1,701,816.012	39.767965706	-80.781494403
13,627.00	91.60	329.87	11,240.20	2,936.95	1,650.88	14,442,397.388	1,701,769.272	39.768186785	-80.781660039
13,722.00	91.65	329.95	11,237.50	3,019.11	1,603.27	14,442,479.552	1,701,721.663	39.768412751	-80.781828759
13,816.00	91.47	329.52	11,234.94	3,100.27	1,555.91	14,442,560.710	1,701,674.304	39.768635949	-80.781996592
13,910.00	91.08	329.69	11,232.85	3,181.33	1,508.36	14,442,641.770	1,701,626.756	39.768858881	-80.782165104
14,004.00	90.90	330.48	11,231.23	3,262.79	1,461.49	14,442,723.233	1,701,579.885	39.769082914	-80.782331205
14,098.00	90.86	330.57	11,229.78	3,344.62	1,415.24	14,442,805.056	1,701,533.638	39.769307934	-80.782495080
14,192.00	90.77	331.19	11,228.45	3,426.73	1,369.50	14,442,887.166	1,701,487.899	39.769533736	-80.782657148
14,286.00	90.81	331.89	11,227.15	3,509.36	1,324.71	14,442,969.798	1,701,443.108	39.769760964	-80.782815837
14,380.00	90.59	331.62	11,226.00	3,592.16	1,280.23	14,443,052.599	1,701,398.627	39.769988655	-80.782973424
14,473.00	90.24	331.54	11,225.33	3,673.95	1,235.97	14,443,134.388	1,701,354.367	39.770213567	-80.783130235
14,568.00	89.80	331.27	11,225.30	3,757.36	1,190.50	14,443,217.800	1,701,308.898	39.770442942	-80.783291331
14,663.00	90.99	330.39	11,224.64	3,840.31	1,144.20	14,443,300.748	1,701,262.598	39.770671046	-80.783455395
14,756.00	92.22	330.13	11,222.04	3,921.03	1,098.09	14,443,381.465	1,701,216.483	39.770893024	-80.783618818
14,850.00	92.44	330.22	11,218.22	4,002.51	1,051.38	14,443,462.947	1,701,169.770	39.771117107	-80.783784362
14,945.00	90.86	329.69	11,215.48	4,084.71	1,003.83	14,443,545.144	1,701,122.227	39.771343160	-80.783952859
15,039.00	90.55	329.43	11,214.32	4,165.74	956.21	14,443,626.181	1,701,074.607	39.771568025	-80.784121639
15,133.00	90.77	329.78	11,213.24	4,246.82	908.66	14,443,707.256	1,701,027.050	39.771788994	-80.784290194
15,227.00	90.55	330.22	11,212.16	4,328.22	861.66	14,443,788.656	1,700,980.054	39.772012853	-80.784456755
15,322.00	91.43	330.22	11,210.52	4,410.66	814.48	14,443,871.097	1,700,932.878	39.772239571	-80.784623947
15,415.00	91.47	330.31	11,208.16	4,491.39	768.37	14,443,951.826	1,700,886.765	39.772461579	-80.784787368
15,510.00	91.08	329.87	11,206.05	4,573.71	721.01	14,444,034.152	1,700,839.407	39.772687982	-80.784955212
15,604.00	90.77	329.25	11,204.53	4,654.75	673.39	14,444,115.184	1,700,791.790	39.772910832	-80.785123989
15,698.00	90.77	329.24	11,203.27	4,735.52	625.33	14,444,195.956	1,700,743.725	39.773132972	-80.785294360
15,791.00	91.82	329.87	11,201.17	4,815.67	578.22	14,444,276.111	1,700,696.614	39.773353410	-80.785461345
15,886.00	91.82	330.31	11,198.15	4,897.98	530.87	14,444,358.416	1,700,649.268	39.773579754	-80.785629152
15,979.00	91.87	330.22	11,195.16	4,978.69	484.77	14,444,439.128	1,700,603.165	39.773801716	-80.785792546
16,074.00	92.00	330.92	11,191.95	5,061.38	438.12	14,444,521.821	1,700,556.512	39.774029121	-80.785957880
16,167.00	91.65	330.92	11,188.99	5,142.62	392.94	14,444,603.056	1,700,511.335	39.774252511	-80.786117979
16,262.00	91.21	330.66	11,186.61	5,225.51	346.59	14,444,685.950	1,700,464.988	39.774480463	-80.786282225

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Weil McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
16,357.00	91.47	330.75	11,184.39	5,308.34	300.12	14,444,768.777	1,700,418.517	39.774708236	-80.786446917	
16,452.00	91.25	331.36	11,182.14	5,391.45	254.16	14,444,851.886	1,700,372.553	39.774936778	-80.786609801	
16,546.00	91.82	330.57	11,179.62	5,473.61	208.55	14,444,934.042	1,700,326.948	39.775162699	-80.786771418	
16,639.00	91.87	330.57	11,176.63	5,554.56	162.88	14,445,014.999	1,700,281.275	39.775385328	-80.786933287	
16,734.00	91.47	330.75	11,173.86	5,637.34	116.35	14,445,097.777	1,700,234.746	39.775612965	-80.787098189	
16,828.00	91.03	329.08	11,171.81	5,718.66	69.24	14,445,179.091	1,700,187.638	39.775836583	-80.787265164	
16,922.00	90.86	329.69	11,170.26	5,799.54	21.38	14,445,259.977	1,700,139.774	39.776059030	-80.787434837	
17,016.00	90.90	329.95	11,168.81	5,880.79	-25.87	14,445,341.226	1,700,092.524	39.776282469	-80.787602320	
17,109.00	90.73	330.13	11,167.49	5,961.35	-72.31	14,445,421.790	1,700,046.085	39.776504024	-80.787766925	
17,202.00	90.73	330.48	11,166.31	6,042.13	-118.38	14,445,502.570	1,700,000.019	39.776726168	-80.787930203	
17,297.00	90.81	330.39	11,165.03	6,124.76	-165.25	14,445,585.193	1,699,953.149	39.776953379	-80.788096326	
17,390.00	90.81	330.04	11,163.71	6,205.46	-211.44	14,445,665.899	1,699,906.956	39.777175320	-80.788260055	
17,484.00	90.42	329.69	11,162.70	6,286.75	-258.63	14,445,747.189	1,699,859.768	39.777398872	-80.788427326	
17,579.00	90.42	330.22	11,162.01	6,368.99	-306.19	14,445,829.422	1,699,812.205	39.777625014	-80.788595923	
17,673.00	90.73	330.31	11,161.07	6,450.61	-352.81	14,445,911.040	1,699,765.584	39.777849463	-80.788761171	
17,768.00	90.81	330.04	11,159.79	6,533.02	-400.06	14,445,993.449	1,699,718.340	39.778076089	-80.788928633	
17,862.00	90.77	330.31	11,158.49	6,614.56	-446.80	14,446,074.991	1,699,671.594	39.778300327	-80.789094333	
17,956.00	90.90	330.48	11,157.12	6,696.28	-493.24	14,446,156.711	1,699,625.161	39.778525052	-80.789258914	
18,050.00	90.99	331.45	11,155.57	6,778.45	-538.85	14,446,238.885	1,699,579.545	39.778751020	-80.789420585	
18,145.00	91.30	331.27	11,153.67	6,861.81	-584.38	14,446,322.244	1,699,534.021	39.778980243	-80.789581924	
18,239.00	91.47	331.71	11,151.40	6,944.39	-629.23	14,446,404.821	1,699,489.167	39.779207310	-80.789740883	
18,334.00	91.56	332.33	11,148.89	7,028.25	-673.79	14,446,488.688	1,699,444.612	39.779437916	-80.789898766	
18,428.00	91.43	331.36	11,146.44	7,111.10	-718.13	14,446,571.534	1,699,400.273	39.779665725	-80.790055892	
18,522.00	91.38	331.54	11,144.13	7,193.65	-763.04	14,446,654.079	1,699,355.362	39.779892705	-80.790215059	
18,616.00	91.38	330.39	11,141.87	7,275.81	-808.64	14,446,736.240	1,699,309.754	39.780118635	-80.790376710	
18,709.00	91.25	330.92	11,139.73	7,356.85	-854.21	14,446,817.285	1,699,264.190	39.780341500	-80.790538214	
18,804.00	91.56	330.31	11,137.41	7,439.60	-900.81	14,446,900.037	1,699,217.590	39.780569059	-80.790703392	
18,897.00	91.21	327.93	11,135.16	7,519.39	-948.52	14,446,979.824	1,699,169.876	39.780788484	-80.790872561	
18,991.00	91.25	327.41	11,133.14	7,598.80	-998.78	14,447,059.234	1,699,119.617	39.781006887	-80.791050793	
19,085.00	91.12	327.41	11,131.20	7,677.98	-1,049.40	14,447,138.416	1,699,068.997	39.781224668	-80.791230312	
19,180.00	91.25	327.32	11,129.23	7,757.97	-1,100.62	14,447,218.400	1,699,017.776	39.781444655	-80.791411966	
19,273.00	92.22	328.72	11,126.41	7,836.82	-1,149.85	14,447,297.247	1,698,968.545	39.781661504	-80.791586547	
19,367.00	92.84	329.08	11,122.27	7,917.23	-1,198.36	14,447,377.657	1,698,920.039	39.781882642	-80.791758537	
19,461.00	92.13	329.60	11,118.19	7,998.01	-1,246.25	14,447,458.439	1,698,872.150	39.782104799	-80.791928327	
19,556.00	92.22	331.10	11,114.58	8,080.51	-1,293.21	14,447,540.938	1,698,825.189	39.782331664	-80.792094802	
19,650.00	91.08	330.75	11,111.88	8,162.63	-1,338.87	14,447,623.057	1,698,779.529	39.782557476	-80.792256650	
19,745.00	91.69	330.31	11,109.58	8,245.31	-1,385.59	14,447,705.740	1,698,732.806	39.782784845	-80.792422277	
19,839.00	91.21	331.45	11,107.20	8,327.40	-1,431.32	14,447,787.831	1,698,687.078	39.783010580	-80.792584371	
19,934.00	91.87	331.54	11,104.65	8,410.85	-1,476.64	14,447,871.284	1,698,641.757	39.783240053	-80.792745002	
20,027.00	92.22	331.62	11,101.33	8,492.59	-1,520.88	14,447,953.023	1,698,597.524	39.783464813	-80.792901779	
20,121.00	90.95	331.01	11,098.73	8,575.02	-1,565.98	14,448,035.453	1,698,552.423	39.783691475	-80.793061640	
20,215.00	91.69	331.62	11,096.57	8,657.46	-1,611.08	14,448,117.894	1,698,507.316	39.783918165	-80.793221522	
20,309.00	90.02	331.27	11,095.16	8,740.02	-1,656.01	14,448,200.447	1,698,462.390	39.784145164	-80.793380759	
20,403.00	90.68	331.36	11,094.59	8,822.48	-1,701.13	14,448,282.908	1,698,417.272	39.784371912	-80.793540684	
20,497.00	91.21	331.54	11,093.04	8,905.04	-1,746.05	14,448,365.466	1,698,372.353	39.784598923	-80.793699899	
20,591.00	90.46	330.83	11,091.67	8,987.39	-1,791.35	14,448,447.817	1,698,327.053	39.784825368	-80.793860477	
20,685.00	91.16	330.92	11,090.34	9,069.49	-1,837.09	14,448,529.923	1,698,281.306	39.785051143	-80.794022644	
20,778.00	91.34	330.92	11,088.31	9,150.75	-1,882.28	14,448,611.180	1,698,236.116	39.785274583	-80.794182838	
20,872.00	90.99	330.39	11,086.40	9,232.67	-1,928.34	14,448,693.101	1,698,190.060	39.785499851	-80.794346112	
20,966.00	90.68	329.78	11,085.03	9,314.14	-1,975.22	14,448,774.567	1,698,143.186	39.785723876	-80.794512301	
21,060.00	91.25	329.69	11,083.45	9,395.32	-2,022.58	14,448,855.743	1,698,095.817	39.785947107	-80.794680256	
21,153.00	90.73	329.43	11,081.84	9,475.48	-2,069.69	14,448,935.912	1,698,048.707	39.786167568	-80.794847297	
21,247.00	90.90	329.08	11,080.50	9,556.26	-2,117.74	14,449,016.692	1,698,000.658	39.786389714	-80.795017679	
21,340.00	90.95	328.72	11,079.00	9,635.89	-2,165.77	14,449,096.314	1,697,952.626	39.786608681	-80.795188007	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well McMasters N-15 HU (slot E)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Site:	McMasters Shields	MD Reference:	RKB=1206+26 @ 1232.00ft (Nabors B28)
Well:	McMasters N-15 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
21,434.00	90.95	328.81	11,077.44	9,716.25	-2,214.51	14,449,176.677	1,697,903.890	39.786829687	-80.795360842
21,527.00	91.03	328.64	11,075.84	9,795.72	-2,262.79	14,449,256.151	1,697,855.616	39.787048246	-80.795532034
21,622.00	90.51	329.43	11,074.56	9,877.18	-2,311.66	14,449,337.603	1,697,806.743	39.787272243	-80.795705350
21,717.00	90.07	329.95	11,074.08	9,959.19	-2,359.60	14,449,419.616	1,697,758.799	39.787497773	-80.795875350
21,811.00	90.99	330.66	11,073.21	10,040.84	-2,406.17	14,449,501.266	1,697,712.236	39.787722299	-80.796040441
21,905.00	91.96	330.66	11,070.79	10,122.75	-2,452.21	14,449,583.180	1,697,666.193	39.787947545	-80.796203680
21,999.00	91.96	330.66	11,067.57	10,204.65	-2,498.24	14,449,665.074	1,697,620.161	39.788172737	-80.796366881
22,093.00	92.04	330.48	11,064.29	10,286.47	-2,544.40	14,449,746.894	1,697,574.001	39.788397726	-80.796530537
22,187.00	92.00	330.83	11,060.98	10,368.36	-2,590.44	14,449,828.781	1,697,527.963	39.788622898	-80.796693759
22,281.00	92.13	330.66	11,057.59	10,450.31	-2,636.35	14,449,910.739	1,697,482.056	39.788848261	-80.796856519
22,375.00	92.18	330.66	11,054.06	10,532.20	-2,682.37	14,449,992.623	1,697,436.029	39.789073424	-80.797019704
22,461.00	92.40	330.57	11,050.62	10,607.07	-2,724.54	14,450,067.498	1,697,393.865	39.789279315	-80.797169198
Survey @ 22461.00 MD 11050.62 TVD									
22,517.00	92.40	330.57	11,048.28	10,655.80	-2,752.03	14,450,116.229	1,697,366.373	39.789413314	-80.797266672
Survey Proj. to 22517.00 MD 11048.28 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
174.00	174.00	-0.15	0.30	MWD surveys
22,461.00	11,050.62	10,607.07	-2,724.54	Survey @ 22461.00 MD 11050.62 TVD
22,517.00	11,048.28	10,655.80	-2,752.03	Survey Proj. to 22517.00 MD 11048.28 TVD