



Survey Report - Geographic



Company: Tug Hill Operating LLC	Local Co-ordinate Reference: Well Weller 1 HM (E)
Project: Marshall County, West Virginia.	TVD Reference: RKB=1273+26 @ 1299.00usft (Nabors B 28)
Site: Lily/Weller	MD Reference: RKB=1273+26 @ 1299.00usft (Nabors B 28)
Well: Weller 1 HM (E)	North Reference: Grid
Wellbore: Original Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Original Hole	Database: DB_Jul2216dt_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	Lily/Weller				
Site Position:		Northing:	14,431,189.55 usft	Latitude:	39.73745061
From:	Lat/Long	Easting:	1,694,826.67 usft	Longitude:	-80.80645320
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.124 °

Well	Weller 1 HM (E)					
Well Position	+N/-S	0.00 usft	Northing:	14,431,155.90 usft	Latitude:	39.73735799
	+E/-W	0.00 usft	Easting:	1,694,860.87 usft	Longitude:	-80.80633179
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	1,273.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	3/27/2019	-8.667	66.783	51,954.43115606

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

Survey Program	Date	4/5/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
154.00	947.00	MWD surf (Original Hole)	MWD	MWD - Standard	
947.00	2,740.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,866.00	14,424.00	MWD (Original Hole)	MWD	MWD - Standard	
14,479.00	14,479.00	Projection (Original Hole)	MWD	MWD - Standard	

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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	
0.00	0.00	0.00	0.00	0.00	0.00	14,431,155.90	1,694,860.87	39.73735799	-80.80633179	
154.00	0.93	228.15	153.99	-0.83	-0.93	14,431,155.07	1,694,859.94	39.73735571	-80.80633511	
MWD surveys										
184.00	0.60	328.01	183.99	-0.86	-1.20	14,431,155.04	1,694,859.68	39.73735563	-80.80633605	
215.00	0.79	315.98	214.99	-0.57	-1.43	14,431,155.33	1,694,859.44	39.73735643	-80.80633688	
245.00	0.88	348.84	244.99	-0.20	-1.62	14,431,155.71	1,694,859.25	39.73735746	-80.80633755	
275.00	0.55	7.69	274.98	0.17	-1.64	14,431,156.07	1,694,859.23	39.73735847	-80.80633764	
305.00	0.66	58.93	304.98	0.40	-1.48	14,431,156.31	1,694,859.40	39.73735911	-80.80633704	
335.00	0.52	43.78	334.98	0.59	-1.23	14,431,156.49	1,694,859.64	39.73735962	-80.80633618	



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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
365.00	0.17	8.42	364.98	0.73	-1.13	14,431,156.64	1,694,859.74	39.73736001	-80.80633582
396.00	0.19	348.96	395.98	0.83	-1.14	14,431,156.73	1,694,859.74	39.73736028	-80.80633583
426.00	0.53	62.47	425.98	0.94	-1.02	14,431,156.85	1,694,859.85	39.73736059	-80.80633542
456.00	0.12	46.25	455.98	1.03	-0.88	14,431,156.93	1,694,859.99	39.73736082	-80.80633490
486.00	0.40	4.44	485.98	1.15	-0.85	14,431,157.06	1,694,860.03	39.73736117	-80.80633479
516.00	0.21	354.23	515.98	1.31	-0.84	14,431,157.22	1,694,860.03	39.73736160	-80.80633478
547.00	0.32	60.03	546.98	1.41	-0.77	14,431,157.32	1,694,860.10	39.73736188	-80.80633454
576.00	0.31	211.36	575.98	1.39	-0.75	14,431,157.29	1,694,860.13	39.73736180	-80.80633443
607.00	0.21	74.86	606.98	1.33	-0.73	14,431,157.23	1,694,860.14	39.73736165	-80.80633439
637.00	0.30	273.88	636.98	1.35	-0.76	14,431,157.25	1,694,860.11	39.73736170	-80.80633448
667.00	0.26	318.89	666.98	1.41	-0.88	14,431,157.31	1,694,859.99	39.73736186	-80.80633492
697.00	0.12	198.53	696.98	1.43	-0.94	14,431,157.33	1,694,859.93	39.73736192	-80.80633511
728.00	0.18	181.07	727.98	1.35	-0.95	14,431,157.25	1,694,859.92	39.73736170	-80.80633515
759.00	0.28	335.51	758.98	1.37	-0.98	14,431,157.27	1,694,859.89	39.73736176	-80.80633527
790.00	0.39	265.84	789.97	1.43	-1.12	14,431,157.33	1,694,859.75	39.73736192	-80.80633576
821.00	0.00	10.55	820.97	1.42	-1.22	14,431,157.33	1,694,859.65	39.73736190	-80.80633613
852.00	0.14	149.80	851.97	1.39	-1.20	14,431,157.29	1,694,859.67	39.73736181	-80.80633606
884.00	0.21	190.26	883.97	1.30	-1.19	14,431,157.20	1,694,859.68	39.73736156	-80.80633603
915.00	0.30	53.46	914.97	1.29	-1.14	14,431,157.19	1,694,859.73	39.73736154	-80.80633583
947.00	0.27	102.63	946.97	1.32	-1.00	14,431,157.23	1,694,859.87	39.73736163	-80.80633533
1,078.00	0.52	139.45	1,077.97	0.80	-0.31	14,431,156.71	1,694,860.56	39.73736020	-80.80633289
1,173.00	0.54	155.30	1,172.97	0.07	0.16	14,431,155.97	1,694,861.03	39.73735818	-80.80633123
1,267.00	0.67	145.06	1,266.96	-0.78	0.66	14,431,155.12	1,694,861.53	39.73735584	-80.80632946
1,362.00	0.47	185.63	1,361.96	-1.63	0.94	14,431,154.28	1,694,861.81	39.73735352	-80.80632847
1,456.00	1.98	245.69	1,455.94	-2.68	-0.58	14,431,153.22	1,694,860.29	39.73735064	-80.80633388
1,550.00	2.81	231.86	1,549.85	-4.77	-3.87	14,431,151.13	1,694,857.00	39.73734492	-80.80634561
1,645.00	3.05	193.66	1,644.74	-8.66	-6.30	14,431,147.24	1,694,854.57	39.73733423	-80.80635428
1,739.00	3.67	171.70	1,738.58	-14.07	-6.46	14,431,141.83	1,694,854.41	39.73731939	-80.80635487
1,834.00	2.96	181.72	1,833.42	-19.53	-6.09	14,431,136.37	1,694,854.78	39.73730439	-80.80635362
1,928.00	1.34	161.12	1,927.35	-23.00	-5.81	14,431,132.91	1,694,855.06	39.73729487	-80.80635264
2,022.00	1.77	109.59	2,021.32	-24.52	-4.09	14,431,131.38	1,694,856.78	39.73729066	-80.80634652
2,116.00	2.74	109.56	2,115.25	-25.76	-0.60	14,431,130.14	1,694,860.27	39.73728724	-80.80633413
2,211.00	3.86	114.60	2,210.09	-27.86	4.45	14,431,128.05	1,694,865.32	39.73728147	-80.80631619
2,306.00	5.16	114.16	2,304.79	-30.93	11.25	14,431,124.97	1,694,872.12	39.73727297	-80.80629201
2,401.00	6.63	112.95	2,399.29	-34.82	20.20	14,431,121.08	1,694,881.07	39.73726224	-80.80626021
2,495.00	8.63	109.04	2,492.45	-39.24	31.86	14,431,116.66	1,694,892.74	39.73725004	-80.80621875
2,588.00	9.80	98.37	2,584.26	-42.67	46.29	14,431,113.24	1,694,907.16	39.73724054	-80.80616745
2,640.00	9.87	94.49	2,635.49	-43.66	55.11	14,431,112.24	1,694,915.98	39.73723776	-80.80613608
2,700.00	11.52	93.37	2,694.45	-44.42	66.22	14,431,111.49	1,694,927.09	39.73723562	-80.80609657
2,740.00	13.28	86.44	2,733.52	-44.37	74.80	14,431,111.54	1,694,935.67	39.73723571	-80.80606607
2,866.00	20.37	80.60	2,854.06	-39.88	110.92	14,431,116.02	1,694,971.79	39.73724781	-80.80593753
2,960.00	20.77	90.29	2,942.09	-37.29	143.74	14,431,118.61	1,695,004.61	39.73725473	-80.80582077
3,054.00	22.67	99.59	3,029.44	-40.39	178.28	14,431,115.51	1,695,039.15	39.73724600	-80.80569793
3,149.00	23.61	100.25	3,116.79	-46.83	215.05	14,431,109.07	1,695,075.93	39.73722810	-80.80556717
3,246.00	23.30	101.08	3,205.78	-53.97	253.00	14,431,101.93	1,695,113.87	39.73720826	-80.80543226
3,341.00	24.16	97.94	3,292.75	-60.27	290.69	14,431,095.63	1,695,151.56	39.73719074	-80.80529822
3,435.00	24.69	100.34	3,378.34	-66.45	329.06	14,431,089.45	1,695,189.93	39.73717354	-80.80516179
3,529.00	21.97	99.58	3,464.64	-72.90	365.72	14,431,083.00	1,695,226.59	39.73715560	-80.80503144
3,623.00	22.63	97.19	3,551.62	-78.09	401.00	14,431,077.81	1,695,261.87	39.73714114	-80.80490598
3,718.00	23.51	97.92	3,639.02	-82.99	437.90	14,431,072.91	1,695,298.77	39.73712747	-80.80477475
3,812.00	23.08	98.58	3,725.36	-88.32	474.69	14,431,067.58	1,695,335.56	39.73711260	-80.80464393
3,907.00	23.41	97.78	3,812.64	-93.66	511.80	14,431,062.25	1,695,372.67	39.73709773	-80.80451196
4,002.00	24.25	97.28	3,899.54	-98.68	549.85	14,431,057.22	1,695,410.72	39.73708370	-80.80437665
4,097.00	24.94	98.60	3,985.92	-104.15	589.01	14,431,051.75	1,695,449.88	39.73706845	-80.80423740
4,191.00	24.65	97.91	4,071.26	-109.81	628.02	14,431,046.09	1,695,488.89	39.73705267	-80.80409868



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4,286.00	24.32	96.78	4,157.72	-114.85	667.07	14,431,041.06	1,695,527.94	39.73703860	-80.80395982
4,381.00	23.42	97.49	4,244.59	-119.62	705.21	14,431,036.29	1,695,566.08	39.73702527	-80.80382417
4,475.00	23.74	97.24	4,330.74	-124.44	742.50	14,431,031.47	1,695,603.38	39.73701181	-80.80369155
4,570.00	24.11	97.30	4,417.58	-129.31	780.72	14,431,026.59	1,695,641.59	39.73699819	-80.80355565
4,665.00	23.96	97.44	4,504.34	-134.28	819.09	14,431,021.63	1,695,679.97	39.73698433	-80.80341918
4,759.00	24.14	96.59	4,590.18	-138.95	857.11	14,431,016.95	1,695,717.99	39.73697126	-80.80328398
4,854.00	24.54	96.91	4,676.74	-143.56	896.00	14,431,012.35	1,695,756.87	39.73695838	-80.80314570
4,948.00	24.37	98.43	4,762.31	-148.75	934.56	14,431,007.16	1,695,795.43	39.73694389	-80.80300857
5,042.00	24.74	97.26	4,847.80	-154.08	973.26	14,431,001.83	1,695,834.13	39.73692902	-80.80287096
5,137.00	22.21	92.36	4,934.94	-157.33	1,010.93	14,430,998.57	1,695,871.80	39.73691986	-80.80273699
5,232.00	21.74	96.25	5,023.05	-159.98	1,046.36	14,430,995.92	1,695,907.23	39.73691236	-80.80261098
5,327.00	23.73	99.67	5,110.66	-165.11	1,082.69	14,430,990.79	1,695,943.57	39.73689806	-80.80248176
5,421.00	24.04	98.73	5,196.61	-171.19	1,120.27	14,430,984.71	1,695,981.14	39.73688112	-80.80234816
5,515.00	21.82	92.09	5,283.20	-174.74	1,156.66	14,430,981.16	1,696,017.53	39.73687117	-80.80221874
5,609.00	22.36	95.72	5,370.30	-177.16	1,191.91	14,430,978.75	1,696,052.78	39.73686431	-80.80209336
5,704.00	23.26	95.29	5,457.87	-180.69	1,228.57	14,430,975.21	1,696,089.44	39.73685439	-80.80196299
5,798.00	23.86	94.28	5,544.03	-183.82	1,266.01	14,430,972.08	1,696,126.88	39.73684557	-80.80182983
5,892.00	23.69	96.74	5,630.06	-187.45	1,303.72	14,430,968.45	1,696,164.59	39.73683536	-80.80169571
5,987.00	25.41	99.77	5,716.47	-193.15	1,342.77	14,430,962.75	1,696,203.64	39.73681947	-80.80155687
6,082.00	24.15	93.14	5,802.74	-197.68	1,382.27	14,430,958.23	1,696,243.14	39.73680680	-80.80141640
6,177.00	25.57	96.12	5,888.94	-200.93	1,422.06	14,430,954.98	1,696,282.93	39.73679763	-80.80127488
6,210.00	25.93	95.40	5,918.66	-202.37	1,436.32	14,430,953.54	1,696,297.19	39.73679360	-80.80122415
6,275.00	23.38	97.42	5,977.73	-205.37	1,463.26	14,430,950.53	1,696,324.14	39.73678519	-80.80112833
6,330.00	23.69	99.79	6,028.16	-208.66	1,484.98	14,430,947.25	1,696,345.85	39.73677602	-80.80105113
6,360.00	25.93	106.74	6,055.39	-211.57	1,497.20	14,430,944.33	1,696,358.07	39.73676794	-80.80100767
6,400.00	29.67	112.10	6,090.77	-217.82	1,514.76	14,430,938.08	1,696,375.63	39.73675068	-80.80094527
6,447.00	32.84	112.89	6,130.95	-227.15	1,537.28	14,430,928.75	1,696,398.15	39.73672490	-80.80086522
6,494.00	35.96	113.24	6,169.72	-237.56	1,561.71	14,430,918.34	1,696,422.58	39.73669618	-80.80077842
6,541.00	38.11	115.79	6,207.24	-249.32	1,587.45	14,430,906.59	1,696,448.32	39.73666373	-80.80068694
6,589.00	39.69	119.31	6,244.60	-263.27	1,614.16	14,430,892.64	1,696,475.03	39.73662526	-80.80059205
6,636.00	42.15	123.35	6,280.12	-279.29	1,640.43	14,430,876.61	1,696,501.30	39.73658110	-80.80049874
6,684.00	44.31	127.83	6,315.10	-298.43	1,667.13	14,430,857.47	1,696,528.00	39.73652836	-80.80040389
6,731.00	46.86	129.77	6,347.99	-319.47	1,693.28	14,430,836.43	1,696,554.15	39.73647041	-80.80031104
6,777.00	50.86	132.93	6,378.25	-342.37	1,719.26	14,430,813.53	1,696,580.13	39.73640737	-80.80021882
6,824.00	55.21	136.62	6,406.51	-368.83	1,745.88	14,430,787.07	1,696,606.75	39.73633454	-80.80012434
6,871.00	58.29	137.76	6,432.28	-397.67	1,772.58	14,430,758.23	1,696,633.45	39.73625518	-80.80002959
6,918.00	61.14	138.47	6,455.98	-427.88	1,799.67	14,430,728.02	1,696,660.54	39.73617204	-80.79993347
6,966.00	66.02	139.70	6,477.33	-460.36	1,827.81	14,430,695.54	1,696,688.68	39.73608267	-80.79983364
7,013.00	71.74	142.25	6,494.26	-494.42	1,855.38	14,430,661.49	1,696,716.25	39.73598897	-80.79973581
7,060.00	74.77	144.09	6,507.80	-530.44	1,882.35	14,430,625.46	1,696,743.22	39.73588988	-80.79964017
7,107.00	77.54	146.29	6,519.05	-567.90	1,908.40	14,430,588.00	1,696,769.27	39.73578683	-80.79954783
7,155.00	82.86	148.40	6,527.22	-607.71	1,933.90	14,430,548.19	1,696,794.77	39.73567734	-80.79945742
7,212.00	88.22	149.89	6,531.65	-656.48	1,963.03	14,430,499.42	1,696,823.90	39.73554324	-80.79935419
7,282.00	89.58	150.77	6,532.99	-717.29	1,997.67	14,430,438.61	1,696,858.55	39.73537602	-80.79923145
7,344.00	89.85	150.60	6,533.30	-771.35	2,028.03	14,430,384.55	1,696,888.90	39.73522737	-80.79912390
7,439.00	90.68	149.80	6,532.86	-853.79	2,075.24	14,430,302.12	1,696,936.11	39.73500069	-80.79895663
7,534.00	90.15	150.68	6,532.18	-936.25	2,122.39	14,430,219.65	1,696,983.27	39.73477392	-80.79878956
7,629.00	90.86	150.77	6,531.34	-1,019.12	2,168.85	14,430,136.79	1,697,029.72	39.73454606	-80.79862499
7,722.00	89.63	151.21	6,530.94	-1,100.45	2,213.95	14,430,055.46	1,697,074.82	39.73432243	-80.79846521
7,817.00	90.33	150.68	6,530.97	-1,183.49	2,260.08	14,429,972.41	1,697,120.96	39.73409408	-80.79830177
7,911.00	89.49	151.65	6,531.12	-1,265.83	2,305.42	14,429,890.07	1,697,166.29	39.73386766	-80.79814118
8,006.00	87.34	151.21	6,533.75	-1,349.23	2,350.83	14,429,806.68	1,697,211.70	39.73363835	-80.79798032
8,100.00	87.56	151.21	6,537.93	-1,431.53	2,396.05	14,429,724.38	1,697,256.93	39.73341205	-80.79782011
8,195.00	89.63	150.51	6,540.26	-1,514.47	2,442.30	14,429,641.43	1,697,303.17	39.73318397	-80.79765629
8,289.00	90.02	150.68	6,540.55	-1,596.36	2,488.45	14,429,559.54	1,697,349.32	39.73295879	-80.79749279



Survey Report - Geographic



Company: Tug Hill Operating LLC	Local Co-ordinate Reference: Well Weller 1 HM (E)
Project: Marshall County, West Virginia.	TVD Reference: RKB=1273+26 @ 1299.00usft (Nabors B 28)
Site: Lily/Weller	MD Reference: RKB=1273+26 @ 1299.00usft (Nabors B 28)
Well: Weller 1 HM (E)	North Reference: Grid
Wellbore: Original Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Original Hole	Database: DB_Jul2216dt_v14

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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
8,383.00	90.33	150.42	6,540.26	-1,678.22	2,534.67	14,429,477.69	1,697,395.54	39.73273371	-80.79732906
8,477.00	88.13	150.95	6,541.52	-1,760.17	2,580.68	14,429,395.74	1,697,441.55	39.73250837	-80.79716604
8,571.00	88.53	149.72	6,544.26	-1,841.81	2,627.18	14,429,314.09	1,697,488.06	39.73228386	-80.79700130
8,666.00	88.75	150.51	6,546.52	-1,924.15	2,674.51	14,429,231.75	1,697,535.38	39.73205743	-80.79683364
8,760.00	90.46	151.39	6,547.17	-2,006.32	2,720.15	14,429,149.58	1,697,581.02	39.73183148	-80.79667197
8,855.00	89.98	151.39	6,546.80	-2,089.72	2,765.64	14,429,066.18	1,697,626.51	39.73160216	-80.79651084
8,950.00	90.86	149.89	6,546.10	-2,172.51	2,812.21	14,428,983.39	1,697,673.08	39.73137449	-80.79634585
9,044.00	91.65	150.33	6,544.05	-2,253.99	2,859.04	14,428,901.91	1,697,719.92	39.73115044	-80.79617993
9,139.00	90.77	148.57	6,542.04	-2,335.78	2,907.32	14,428,820.12	1,697,768.19	39.73092552	-80.79600889
9,233.00	91.52	148.75	6,540.16	-2,416.05	2,956.20	14,428,739.86	1,697,817.07	39.73070478	-80.79583568
9,328.00	90.33	147.61	6,538.63	-2,496.76	3,006.28	14,428,659.15	1,697,867.15	39.73048281	-80.79565820
9,423.00	90.68	147.96	6,537.79	-2,577.13	3,056.92	14,428,578.77	1,697,917.79	39.73026177	-80.79547873
9,518.00	89.80	147.43	6,537.39	-2,657.42	3,107.69	14,428,498.48	1,697,968.56	39.73004094	-80.79529881
9,613.00	90.11	144.20	6,537.47	-2,736.00	3,161.06	14,428,419.90	1,698,021.93	39.72982481	-80.79510962
9,708.00	90.73	148.93	6,536.77	-2,815.25	3,213.39	14,428,340.65	1,698,074.26	39.72960683	-80.79492415
9,803.00	89.71	150.95	6,536.40	-2,897.47	3,260.97	14,428,258.43	1,698,121.84	39.72938074	-80.79475558
9,898.00	88.66	151.65	6,537.76	-2,980.79	3,306.59	14,428,175.12	1,698,167.46	39.72915163	-80.79459401
9,993.00	89.23	150.60	6,539.51	-3,063.96	3,352.45	14,428,091.94	1,698,213.33	39.72892292	-80.79443155
10,088.00	89.49	151.56	6,540.57	-3,147.11	3,398.39	14,428,008.80	1,698,259.26	39.72869429	-80.79426884
10,183.00	89.63	152.27	6,541.30	-3,230.92	3,443.11	14,427,924.98	1,698,303.99	39.72846383	-80.79411046
10,278.00	90.20	152.53	6,541.44	-3,315.11	3,487.13	14,427,840.80	1,698,348.00	39.72823235	-80.79395461
10,373.00	88.13	151.83	6,542.82	-3,399.11	3,531.46	14,427,756.79	1,698,392.33	39.72800136	-80.79379763
10,468.00	88.62	151.30	6,545.52	-3,482.62	3,576.67	14,427,673.29	1,698,437.54	39.72777175	-80.79363750
10,563.00	88.84	151.47	6,547.62	-3,565.99	3,622.16	14,427,589.91	1,698,483.03	39.72754248	-80.79347640
10,657.00	89.58	149.63	6,548.92	-3,647.84	3,668.37	14,427,508.07	1,698,529.24	39.72731743	-80.79331272
10,752.00	90.02	149.54	6,549.25	-3,729.76	3,716.46	14,427,426.14	1,698,577.33	39.72709213	-80.79314233
10,847.00	90.68	149.19	6,548.67	-3,811.50	3,764.87	14,427,344.40	1,698,625.74	39.72686735	-80.79297084
10,941.00	89.41	149.01	6,548.59	-3,892.16	3,813.14	14,427,263.75	1,698,674.01	39.72664553	-80.79279982
11,036.00	89.58	148.57	6,549.43	-3,973.40	3,862.37	14,427,182.50	1,698,723.24	39.72642209	-80.79262541
11,131.00	90.07	148.22	6,549.72	-4,054.31	3,912.15	14,427,101.59	1,698,773.02	39.72619957	-80.79244901
11,225.00	90.95	149.01	6,548.89	-4,134.55	3,961.10	14,427,021.35	1,698,821.98	39.72597889	-80.79227557
11,320.00	89.80	149.80	6,548.26	-4,216.33	4,009.45	14,426,939.58	1,698,870.32	39.72575402	-80.79210429
11,414.00	90.51	148.84	6,548.01	-4,297.17	4,057.41	14,426,858.74	1,698,918.29	39.72553170	-80.79193438
11,509.00	90.29	151.56	6,547.35	-4,379.59	4,104.62	14,426,776.31	1,698,965.49	39.72530502	-80.79176716
11,604.00	90.33	151.47	6,546.83	-4,463.09	4,149.93	14,426,692.81	1,699,010.80	39.72507542	-80.79160672
11,698.00	89.19	151.04	6,547.23	-4,545.51	4,195.13	14,426,610.40	1,699,056.01	39.72484880	-80.79144663
11,793.00	89.63	152.53	6,548.20	-4,629.21	4,240.04	14,426,526.69	1,699,100.92	39.72461863	-80.79128759
11,888.00	90.37	151.30	6,548.20	-4,713.02	4,284.77	14,426,442.88	1,699,145.64	39.72438817	-80.79112923
11,982.00	89.49	150.07	6,548.32	-4,794.98	4,330.79	14,426,360.92	1,699,191.66	39.72416279	-80.79096623
12,077.00	89.93	150.77	6,548.80	-4,877.60	4,377.68	14,426,278.30	1,699,238.56	39.72393560	-80.79080014
12,172.00	89.58	150.24	6,549.21	-4,960.29	4,424.46	14,426,195.62	1,699,285.33	39.72370822	-80.79063448
12,265.00	88.97	150.24	6,550.38	-5,041.01	4,470.61	14,426,114.89	1,699,331.49	39.72348622	-80.79047099
12,360.00	89.32	150.51	6,551.80	-5,123.59	4,517.57	14,426,032.32	1,699,378.44	39.72325915	-80.79030468
12,456.00	89.67	150.77	6,552.65	-5,207.25	4,564.64	14,425,948.65	1,699,425.51	39.72302907	-80.79013799
12,551.00	90.42	150.60	6,552.57	-5,290.09	4,611.15	14,425,865.82	1,699,472.02	39.72280129	-80.78997326
12,646.00	89.85	149.54	6,552.35	-5,372.42	4,658.55	14,425,783.49	1,699,519.42	39.72257488	-80.78980538
12,741.00	90.15	149.28	6,552.35	-5,454.19	4,706.89	14,425,701.71	1,699,567.76	39.72234998	-80.78963413
12,836.00	89.14	150.42	6,552.94	-5,536.34	4,754.60	14,425,619.57	1,699,615.48	39.72212408	-80.78946513
12,930.00	89.36	150.07	6,554.17	-5,617.94	4,801.25	14,425,537.97	1,699,662.12	39.72189968	-80.78929992
13,024.00	90.07	149.89	6,554.63	-5,699.33	4,848.28	14,425,456.58	1,699,709.15	39.72167586	-80.78913335
13,119.00	88.44	150.68	6,555.87	-5,781.82	4,895.36	14,425,374.08	1,699,756.24	39.72144900	-80.78896659
13,214.00	88.53	151.12	6,558.38	-5,864.80	4,941.55	14,425,291.10	1,699,802.42	39.72122081	-80.78880304
13,309.00	88.18	148.66	6,561.11	-5,946.94	4,989.18	14,425,208.96	1,699,850.06	39.72099492	-80.78863432
13,403.00	89.71	148.13	6,562.84	-6,026.98	5,038.44	14,425,128.92	1,699,899.31	39.72077478	-80.78846598
13,498.00	90.77	147.87	6,562.44	-6,107.55	5,088.78	14,425,048.36	1,699,949.65	39.72055321	-80.78828149



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Weller 1 HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1273+26 @ 1299.00usft (Nabors B 28)
Site:	Lily/Weller	MD Reference:	RKB=1273+26 @ 1299.00usft (Nabors B 28)
Well:	Weller 1 HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
13,592.00	89.89	149.45	6,561.90	-6,187.83	5,137.66	14,424,968.08	1,699,998.54	39.72033241	-80.78810830
13,687.00	90.02	150.24	6,561.97	-6,269.97	5,185.39	14,424,885.93	1,700,046.26	39.72010651	-80.78793928
13,782.00	90.20	150.42	6,561.79	-6,352.51	5,232.41	14,424,803.39	1,700,093.28	39.71987952	-80.78777274
13,876.00	90.33	149.98	6,561.36	-6,434.08	5,279.13	14,424,721.82	1,700,140.00	39.71965520	-80.78760729
13,971.00	89.01	151.12	6,561.90	-6,516.80	5,325.83	14,424,639.10	1,700,186.70	39.71942772	-80.78744189
14,066.00	89.05	152.09	6,563.51	-6,600.36	5,371.00	14,424,555.54	1,700,231.87	39.71919795	-80.78728196
14,161.00	89.41	152.97	6,564.79	-6,684.64	5,414.82	14,424,471.26	1,700,275.69	39.71896621	-80.78712685
14,255.00	88.75	149.54	6,566.30	-6,767.03	5,460.01	14,424,388.87	1,700,320.88	39.71873963	-80.78696683
14,349.00	88.84	149.28	6,568.28	-6,847.93	5,507.84	14,424,307.97	1,700,368.71	39.71851715	-80.78679744
14,424.00	89.14	148.84	6,569.60	-6,912.25	5,546.39	14,424,243.65	1,700,407.26	39.71834026	-80.78666088
Survey @ 14424.00 MD 6569.60 TVD									
14,479.00	89.14	148.84	6,570.42	-6,959.31	5,574.85	14,424,196.59	1,700,435.72	39.71821083	-80.78656008
Survey projected to 14479.00 MD 6570.42 TVD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
154.00	153.99	-0.83	-0.93	MWD surveys
14,424.00	6,569.60	-6,912.25	5,546.39	Survey @ 14424.00 MD 6569.60 TVD
14,479.00	6,570.42	-6,959.31	5,574.85	Survey projected to 14479.00 MD 6570.42 TVD

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