

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2W-12 HU (slot J)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Site:	Heaven Hill 2	MD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Well:	Heaven Hill 2W-12 HU (slot J)	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	Heaven Hill 2				
Site Position:		Northing:	14,457,660.30 usft	Latitude:	39.80995400
From:	Lat/Long	Easting:	1,720,974.97 usft	Longitude:	-80.71313800
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.18 "

Well	Heaven Hill 2W-12 HU (slot J)					
Well Position	+N/-S	0.00 usft	Northing:	14,457,734.21 usft	Latitude:	39.81015638
	+E/-W	0.00 usft	Easting:	1,721,041.30 usft	Longitude:	-80.71290095
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	1,331.00 usft

Wellbore	Original Hole				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	4/30/2018	-8.71	66.90	52,085.10332240

Design	Surveys Original Hole				
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Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	RECEIVED Office of Oil and Gas JUL 10 2020	167.55
	0.00	0.00	0.00		

Survey Program	Date	From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
	5/13/2018	60.00	895.00	Gyro (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s
		930.00	10,736.00	MWD TIP=895 MD (Original Hole)	MWD	MWD - Standard
		10,764.00	19,657.00	MWD Lat (Original Hole)	MWD	MWD - Standard
		19,712.00	19,712.00	Projection (Original Hole)	MWD	MWD - Standard

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	14,457,734.21	1,721,041.30	39.81015638	-80.71290095
60.00	0.66	315.97	60.00	0.25	-0.24	14,457,734.46	1,721,041.06	39.81015707	-80.71290180
Gyro									
90.00	0.47	327.66	90.00	0.48	-0.43	14,457,734.69	1,721,040.88	39.81015769	-80.71290246
120.00	0.52	315.19	120.00	0.68	-0.59	14,457,734.89	1,721,040.72	39.81015825	-80.71290304
150.00	0.46	323.41	150.00	0.87	-0.76	14,457,735.08	1,721,040.55	39.81015878	-80.71290363
180.00	0.13	314.06	179.99	0.99	-0.85	14,457,735.20	1,721,040.45	39.81015911	-80.71290397
210.00	0.17	12.02	209.99	1.06	-0.87	14,457,735.27	1,721,040.44	39.81015930	-80.71290403
240.00	0.16	357.30	239.99	1.14	-0.86	14,457,735.35	1,721,040.44	39.81015953	-80.71290400



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Well:	Heaven Hill 2W-12 HU (slot J)	North Reference:	Grid
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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	
270.00	0.22	337.27	269.99	1.24	-0.88	14,457,735.45	1,721,040.42	39.81015979	-80.71290408	
300.00	0.15	344.09	299.99	1.33	-0.92	14,457,735.54	1,721,040.39	39.81016004	-80.71290420	
330.00	0.10	308.04	329.99	1.38	-0.95	14,457,735.59	1,721,040.36	39.81016019	-80.71290431	
360.00	0.08	36.94	359.99	1.42	-0.96	14,457,735.62	1,721,040.35	39.81016028	-80.71290434	
390.00	0.06	323.38	389.99	1.45	-0.95	14,457,735.65	1,721,040.35	39.81016036	-80.71290433	
420.00	0.09	308.50	419.99	1.47	-0.98	14,457,735.68	1,721,040.32	39.81016043	-80.71290443	
450.00	0.17	278.98	449.99	1.49	-1.04	14,457,735.70	1,721,040.26	39.81016049	-80.71290465	
480.00	0.17	297.88	479.99	1.52	-1.13	14,457,735.73	1,721,040.18	39.81016057	-80.71290495	
510.00	0.19	280.60	509.99	1.55	-1.21	14,457,735.76	1,721,040.09	39.81016065	-80.71290526	
540.00	0.16	300.34	539.99	1.58	-1.30	14,457,735.79	1,721,040.00	39.81016074	-80.71290556	
570.00	0.22	305.57	569.99	1.64	-1.38	14,457,735.85	1,721,039.92	39.81016089	-80.71290586	
600.00	0.07	313.04	599.99	1.68	-1.44	14,457,735.89	1,721,039.86	39.81016102	-80.71290607	
630.00	0.13	329.07	629.99	1.72	-1.47	14,457,735.93	1,721,039.83	39.81016113	-80.71290618	
660.00	0.12	342.85	659.99	1.78	-1.50	14,457,735.99	1,721,039.80	39.81016129	-80.71290627	
690.00	0.08	16.01	689.99	1.83	-1.50	14,457,736.04	1,721,039.80	39.81016143	-80.71290629	
720.00	0.13	12.36	719.99	1.89	-1.49	14,457,736.10	1,721,039.81	39.81016158	-80.71290624	
750.00	0.05	28.68	749.99	1.93	-1.48	14,457,736.14	1,721,039.83	39.81016170	-80.71290619	
780.00	0.15	24.15	779.99	1.98	-1.46	14,457,736.19	1,721,039.85	39.81016183	-80.71290611	
810.00	0.13	9.22	809.99	2.05	-1.43	14,457,736.26	1,721,039.87	39.81016202	-80.71290603	
840.00	0.09	324.01	839.99	2.10	-1.44	14,457,736.31	1,721,039.86	39.81016217	-80.71290606	
870.00	0.10	339.29	869.99	2.15	-1.47	14,457,736.35	1,721,039.84	39.81016229	-80.71290614	
895.00	0.14	335.30	894.99	2.19	-1.49	14,457,736.40	1,721,039.82	39.81016242	-80.71290622	
930.00	0.22	42.81	929.99	2.28	-1.46	14,457,736.49	1,721,039.85	39.81016266	-80.71290612	
MWD surveys										
962.00	0.22	312.90	961.99	2.37	-1.46	14,457,736.58	1,721,039.84	39.81016290	-80.71290613	
993.00	0.09	299.82	992.99	2.42	-1.53	14,457,736.63	1,721,039.78	39.81016304	-80.71290636	
1,025.00	0.09	41.01	1,024.99	2.45	-1.53	14,457,736.66	1,721,039.77	39.81016313	-80.71290638	
1,056.00	0.22	42.99	1,055.99	2.51	-1.47	14,457,736.72	1,721,039.83	39.81016330	-80.71290617	
1,088.00	0.49	54.89	1,087.99	2.64	-1.32	14,457,736.85	1,721,039.98	39.81016364	-80.71290562	
1,119.00	0.31	264.69	1,118.99	2.71	-1.30	14,457,736.91	1,721,040.01	39.81016383	-80.71290553	
1,153.00	0.62	160.39	1,152.99	2.52	-1.33	14,457,736.73	1,721,039.98	39.81016333	-80.71290564	
1,182.00	0.31	40.70	1,181.99	2.44	-1.22	14,457,736.64	1,721,040.08	39.81016308	-80.71290527	
1,277.00	0.40	40.30	1,276.99	2.88	-0.84	14,457,737.09	1,721,040.46	39.81016431	-80.71290391	
1,371.00	0.31	63.09	1,370.99	3.25	-0.40	14,457,737.46	1,721,040.90	39.81016531	-80.71290234	
1,466.00	0.62	45.02	1,465.98	3.73	0.19	14,457,737.94	1,721,041.50	39.81016662	-80.71290022	
1,560.00	0.40	51.80	1,559.98	4.29	0.81	14,457,738.50	1,721,042.11	39.81016816	-80.71289802	
1,655.00	0.09	307.09	1,654.98	4.54	1.01	14,457,738.75	1,721,042.31	39.81016884	-80.71289730	
1,749.00	0.71	235.21	1,748.98	4.25	0.47	14,457,738.46	1,721,041.78	39.81016806	-80.71289922	
1,843.00	2.12	239.49	1,842.94	3.04	-1.50	14,457,737.25	1,721,039.80	39.81016474	-80.71290627	
1,938.00	4.20	238.52	1,937.80	0.33	-5.98	14,457,734.54	1,721,035.32	39.81015734	-80.71292226	
2,033.00	6.10	232.70	2,032.41	-4.55	-12.97	14,457,729.66	1,721,028.34	39.81014401	-80.71294718	
2,127.00	7.38	233.19	2,125.76	-11.19	-21.77	14,457,723.02	1,721,019.53	39.81012584	-80.71297861	
2,222.00	7.60	228.78	2,219.95	-18.99	-31.38	14,457,715.22	1,721,009.92	39.81010452	-80.71301292	
2,317.00	6.81	228.78	2,314.20	-26.84	-40.35	14,457,707.37	1,721,000.96	39.81008304	-80.71304493	
2,411.00	5.61	229.00	2,407.64	-33.52	-48.01	14,457,700.68	1,720,993.30	39.81006474	-80.71307228	
2,506.00	5.48	232.39	2,502.20	-39.34	-55.10	14,457,694.87	1,720,986.20	39.81004883	-80.71309762	
2,601.00	5.79	236.49	2,596.74	-44.75	-62.69	14,457,689.46	1,720,978.61	39.81003403	-80.71312470	
2,695.00	5.92	242.09	2,690.25	-49.64	-70.93	14,457,684.57	1,720,970.37	39.81002068	-80.71315409	
2,790.00	5.92	244.82	2,784.74	-54.02	-79.69	14,457,680.19	1,720,961.61	39.81000874	-80.71318535	
2,888.00	6.58	243.98	2,882.16	-58.63	-89.31	14,457,675.58	1,720,951.99	39.80999615	-80.71321965	
2,982.00	4.11	243.59	2,975.74	-62.49	-97.17	14,457,671.72	1,720,944.13	39.80998562	-80.71324768	
3,077.00	2.39	253.41	3,070.59	-64.57	-102.12	14,457,669.64	1,720,939.19	39.80997995	-80.71326532	
3,171.00	3.09	256.89	3,164.48	-65.71	-106.46	14,457,668.50	1,720,934.84	39.80997687	-80.71328081	
3,266.00	4.82	257.51	3,259.25	-67.15	-112.86	14,457,667.06	1,720,928.45	39.80997296	-80.71330358	
3,361.00	5.48	251.78	3,353.87	-69.43	-121.06	14,457,664.78	1,720,920.24	39.80996677	-80.71333283	



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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2020

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	WV Department of Environmental Protection	
								Latitude	Longitude
3,455.00	5.79	248.92	3,447.41	-72.54	-129.75	14,457,661.67	1,720,911.55	39.80995831	-80.71336380
3,550.00	6.19	245.61	3,541.89	-76.38	-138.88	14,457,657.83	1,720,902.42	39.80994785	-80.71339637
3,645.00	7.29	246.49	3,636.24	-80.90	-149.08	14,457,653.31	1,720,892.23	39.80993553	-80.71343272
3,739.00	9.10	249.01	3,729.27	-85.94	-161.49	14,457,648.27	1,720,879.82	39.80992179	-80.71347697
3,834.00	11.31	247.51	3,822.76	-92.20	-177.11	14,457,642.01	1,720,864.19	39.80990475	-80.71353267
3,928.00	13.21	244.60	3,914.62	-100.33	-195.33	14,457,633.88	1,720,845.97	39.80988257	-80.71359764
4,023.00	14.72	242.88	4,006.81	-110.49	-215.88	14,457,623.72	1,720,825.42	39.80985485	-80.71367093
4,118.00	15.91	243.91	4,098.43	-121.72	-238.32	14,457,612.49	1,720,802.99	39.80982421	-80.71375096
4,212.00	17.50	245.92	4,188.46	-133.15	-262.79	14,457,601.06	1,720,778.51	39.80979303	-80.71383825
4,307.00	17.50	248.61	4,279.07	-144.19	-289.13	14,457,590.02	1,720,752.17	39.80976295	-80.71393217
4,402.00	16.88	245.00	4,369.83	-155.23	-314.93	14,457,578.98	1,720,726.37	39.80973286	-80.71402417
4,496.00	17.90	245.39	4,459.53	-167.01	-340.44	14,457,567.20	1,720,700.87	39.80970072	-80.71411511
4,591.00	18.38	247.90	4,549.81	-178.73	-367.59	14,457,555.48	1,720,673.71	39.80966879	-80.71421193
4,648.00	18.76	247.34	4,603.84	-185.64	-384.37	14,457,548.57	1,720,656.93	39.80964995	-80.71427177
450 Hard line intercept @ 4648 MD									
4,685.00	19.00	246.98	4,638.85	-190.29	-395.40	14,457,543.92	1,720,645.90	39.80963729	-80.71431110
4,780.00	18.78	246.19	4,728.73	-202.51	-423.63	14,457,531.70	1,720,617.68	39.80960397	-80.71441174
4,875.00	17.81	245.00	4,818.93	-214.82	-450.79	14,457,519.39	1,720,590.52	39.80957039	-80.71450859
4,969.00	17.72	249.31	4,908.45	-225.95	-477.20	14,457,508.26	1,720,564.11	39.80954006	-80.71460277
5,064.00	16.70	252.09	4,999.20	-235.26	-503.71	14,457,498.95	1,720,537.59	39.80951474	-80.71469729
5,159.00	17.10	253.10	5,090.10	-243.51	-530.06	14,457,490.70	1,720,511.24	39.80949229	-80.71479122
5,254.00	17.41	249.58	5,180.82	-252.53	-556.75	14,457,481.68	1,720,484.56	39.80946775	-80.71488633
5,348.00	18.69	242.31	5,270.21	-264.44	-583.27	14,457,469.77	1,720,458.04	39.80943528	-80.71498090
5,443.00	19.49	242.09	5,359.98	-278.93	-610.75	14,457,455.28	1,720,430.55	39.80939573	-80.71507893
5,538.00	18.78	247.29	5,449.74	-292.25	-638.86	14,457,441.95	1,720,402.44	39.80935938	-80.71517919
5,636.00	18.21	251.12	5,542.68	-303.30	-667.91	14,457,430.91	1,720,373.40	39.80932930	-80.71528273
5,730.00	16.88	253.72	5,632.31	-311.88	-694.91	14,457,422.33	1,720,346.40	39.80930598	-80.71537896
5,825.00	16.08	248.61	5,723.41	-320.54	-720.40	14,457,413.66	1,720,320.91	39.80928241	-80.71546983
5,920.00	17.90	240.99	5,814.27	-332.43	-745.42	14,457,401.78	1,720,295.88	39.80925000	-80.71555907
6,014.00	19.18	238.78	5,903.39	-347.44	-771.26	14,457,388.77	1,720,270.04	39.80920900	-80.71565125
6,109.00	18.38	240.81	5,993.33	-362.83	-797.68	14,457,371.38	1,720,243.62	39.80916695	-80.71574551
6,203.00	18.29	247.90	6,082.57	-375.61	-824.29	14,457,358.60	1,720,217.01	39.80913209	-80.71584040
6,298.00	17.72	250.28	6,172.92	-386.09	-851.71	14,457,348.11	1,720,189.59	39.80910353	-80.71593816
6,392.00	18.78	249.18	6,262.19	-396.30	-879.32	14,457,337.91	1,720,161.98	39.80907575	-80.71603659
6,487.00	19.09	250.02	6,352.05	-407.04	-908.21	14,457,327.16	1,720,133.09	39.80904649	-80.71613960
6,582.00	17.90	248.52	6,442.14	-417.70	-936.40	14,457,316.51	1,720,104.90	39.80901748	-80.71624009
6,676.00	17.19	237.20	6,531.80	-430.52	-961.53	14,457,303.69	1,720,079.78	39.80898250	-80.71632970
6,770.00	17.90	233.19	6,621.43	-446.70	-984.77	14,457,287.51	1,720,056.53	39.80893826	-80.71641265
6,864.00	18.78	233.58	6,710.65	-464.34	-1,008.51	14,457,269.87	1,720,032.79	39.80889003	-80.71649739
6,959.00	18.12	232.08	6,800.77	-482.49	-1,032.47	14,457,251.71	1,720,008.83	39.80884037	-80.71658291
7,054.00	17.90	233.89	6,891.12	-500.18	-1,055.92	14,457,234.03	1,719,985.38	39.80879201	-80.71666661
7,149.00	18.29	233.98	6,981.42	-517.55	-1,079.77	14,457,216.66	1,719,961.53	39.80874452	-80.71675173
7,244.00	18.21	233.89	7,071.64	-535.06	-1,103.82	14,457,199.15	1,719,937.48	39.80869663	-80.71683756
7,338.00	17.28	230.01	7,161.17	-552.69	-1,126.38	14,457,181.52	1,719,914.92	39.80864841	-80.71691811
7,433.00	17.41	227.19	7,251.85	-571.42	-1,147.62	14,457,162.79	1,719,893.68	39.80859717	-80.71699394
7,528.00	17.99	227.99	7,342.35	-590.89	-1,168.95	14,457,143.32	1,719,872.36	39.80854386	-80.71707010
7,622.00	17.28	228.38	7,431.93	-609.88	-1,190.17	14,457,124.33	1,719,851.13	39.80849190	-80.71714588
7,717.00	16.22	226.31	7,522.90	-628.42	-1,210.31	14,457,105.79	1,719,830.99	39.80844117	-80.71721781
7,811.00	14.80	223.71	7,613.48	-646.17	-1,228.10	14,457,088.04	1,719,813.20	39.80839258	-80.71728136
7,906.00	14.49	224.69	7,705.39	-663.39	-1,244.85	14,457,070.82	1,719,796.46	39.80834544	-80.71734117
8,001.00	16.08	226.88	7,797.03	-680.83	-1,262.81	14,457,053.38	1,719,778.50	39.80829769	-80.71740533
8,096.00	17.99	230.19	7,887.86	-699.22	-1,283.68	14,457,034.99	1,719,757.62	39.80824737	-80.71747987
8,190.00	18.69	230.89	7,977.08	-718.01	-1,306.52	14,457,016.20	1,719,734.78	39.80819596	-80.71756140
8,285.00	18.38	230.72	8,067.16	-737.10	-1,329.92	14,456,997.11	1,719,711.38	39.80814375	-80.71764495
8,380.00	17.81	230.01	8,157.46	-755.92	-1,352.65	14,456,978.29	1,719,688.65	39.80809226	-80.71772608



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2W-12 HU (slot J)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Site:	Heaven Hill 2	MD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Well:	Heaven Hill 2W-12 HU (slot J)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

JUL 10 2020

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	WV Department of Environmental Protection	
								Latitude	Longitude
8,474.00	17.90	230.59	8,246.93	-774.33	-1,374.82	14,456,959.88	1,719,666.48	39.80804190	-80.71780525
8,569.00	17.41	228.60	8,337.46	-792.99	-1,396.77	14,456,941.21	1,719,644.54	39.80799082	-80.71788359
8,658.00	17.90	226.49	8,422.27	-811.22	-1,416.67	14,456,922.99	1,719,624.63	39.80794095	-80.71795468
8,752.00	16.62	227.02	8,512.03	-830.33	-1,436.99	14,456,903.88	1,719,604.32	39.80788864	-80.71802722
8,847.00	16.62	226.31	8,603.06	-848.97	-1,456.75	14,456,885.23	1,719,584.55	39.80783760	-80.71809780
8,942.00	18.12	225.69	8,693.73	-868.68	-1,477.15	14,456,865.53	1,719,564.16	39.80778367	-80.71817065
9,036.00	18.78	226.62	8,782.90	-889.28	-1,498.60	14,456,844.93	1,719,542.70	39.80772727	-80.71824729
9,131.00	18.29	227.99	8,872.97	-909.76	-1,520.79	14,456,824.45	1,719,520.51	39.80767122	-80.71832653
9,225.00	18.60	229.79	8,962.14	-929.31	-1,543.20	14,456,804.90	1,719,498.10	39.80761772	-80.71840654
9,320.00	18.21	232.00	9,052.28	-948.23	-1,566.47	14,456,785.98	1,719,474.83	39.80756596	-80.71848960
9,415.00	17.99	235.21	9,142.58	-965.74	-1,590.22	14,456,768.47	1,719,451.09	39.80751808	-80.71857435
9,510.00	18.29	234.51	9,232.86	-982.77	-1,614.40	14,456,751.44	1,719,426.90	39.80747154	-80.71866066
9,604.00	18.12	230.89	9,322.16	-1,000.55	-1,637.75	14,456,733.66	1,719,403.55	39.80742290	-80.71874401
9,699.00	18.29	227.90	9,412.40	-1,019.87	-1,660.28	14,456,714.34	1,719,381.03	39.80737005	-80.71882443
9,793.00	19.31	224.99	9,501.39	-1,040.75	-1,682.21	14,456,693.46	1,719,359.09	39.80731290	-80.71890276
9,888.00	18.52	224.28	9,591.26	-1,062.66	-1,703.85	14,456,671.55	1,719,337.45	39.80725291	-80.71898006
9,982.00	16.88	221.90	9,680.81	-1,083.51	-1,723.39	14,456,650.70	1,719,317.92	39.80719583	-80.71904986
10,077.00	15.20	221.90	9,772.11	-1,103.04	-1,740.92	14,456,631.17	1,719,300.39	39.80714232	-80.71911250
10,171.00	14.01	222.21	9,863.07	-1,120.64	-1,756.79	14,456,613.57	1,719,284.51	39.80709413	-80.71916922
10,266.00	14.10	224.11	9,955.22	-1,137.47	-1,772.57	14,456,596.74	1,719,268.73	39.80704805	-80.71922560
10,361.00	13.79	227.50	10,047.43	-1,153.43	-1,788.97	14,456,580.78	1,719,252.33	39.80700437	-80.71928418
10,456.00	11.31	224.59	10,140.15	-1,167.71	-1,803.86	14,456,566.50	1,719,237.44	39.80696527	-80.71933736
10,550.00	13.21	222.92	10,232.00	-1,182.14	-1,817.65	14,456,552.07	1,719,223.65	39.80692575	-80.71938661
10,645.00	18.12	224.90	10,323.45	-1,200.57	-1,835.48	14,456,533.64	1,719,205.82	39.80687531	-80.71945031
10,736.00	22.09	230.81	10,408.89	-1,221.41	-1,858.74	14,456,512.79	1,719,182.56	39.80681826	-80.71953337
10,764.00	22.55	232.73	10,434.79	-1,227.99	-1,867.10	14,456,506.22	1,719,174.21	39.80680027	-80.71956319
10,858.00	23.16	232.11	10,521.41	-1,250.26	-1,896.03	14,456,483.95	1,719,145.27	39.80673936	-80.71966645
10,953.00	20.92	218.58	10,609.52	-1,275.01	-1,921.37	14,456,459.20	1,719,119.94	39.80667161	-80.71975696
11,048.00	21.80	210.31	10,698.02	-1,303.51	-1,940.85	14,456,430.70	1,719,100.45	39.80659352	-80.71982665
11,142.00	18.55	201.17	10,786.26	-1,332.53	-1,955.07	14,456,401.68	1,719,086.23	39.80651393	-80.71987759
11,237.00	17.36	201.17	10,876.63	-1,359.84	-1,965.64	14,456,374.37	1,719,075.66	39.80643902	-80.71991556
11,332.00	17.19	181.22	10,967.43	-1,387.12	-1,971.07	14,456,347.09	1,719,070.24	39.80636416	-80.71993517
11,426.00	22.33	173.58	11,055.88	-1,418.78	-1,969.36	14,456,315.43	1,719,071.94	39.80627721	-80.71992946
11,520.00	27.69	175.51	11,141.03	-1,458.32	-1,965.65	14,456,275.88	1,719,075.65	39.80616857	-80.71991669
11,615.00	33.85	175.95	11,222.62	-1,506.77	-1,962.05	14,456,227.44	1,719,079.25	39.80603549	-80.71990441
11,710.00	40.48	175.16	11,298.28	-1,563.95	-1,957.58	14,456,170.26	1,719,083.72	39.80587842	-80.71988911
11,804.00	46.07	168.48	11,366.73	-1,627.60	-1,948.23	14,456,106.60	1,719,093.07	39.80570353	-80.71985654
11,899.00	54.02	166.37	11,427.70	-1,698.60	-1,932.32	14,456,035.61	1,719,108.99	39.80550842	-80.71980066
11,994.00	61.89	163.82	11,478.07	-1,776.32	-1,911.55	14,455,957.89	1,719,129.76	39.80529479	-80.71972758
12,089.00	68.26	159.86	11,518.10	-1,858.10	-1,884.65	14,455,876.11	1,719,156.66	39.80506999	-80.71963270
12,184.00	72.97	157.75	11,549.62	-1,941.61	-1,852.23	14,455,792.60	1,719,189.07	39.80484036	-80.71951823
12,279.00	76.35	156.08	11,574.75	-2,025.87	-1,816.31	14,455,708.34	1,719,224.99	39.80460866	-80.71939125
12,374.00	84.84	155.03	11,590.26	-2,111.11	-1,777.55	14,455,623.10	1,719,263.75	39.80437424	-80.71925420
12,468.00	88.53	151.78	11,595.70	-2,194.99	-1,735.55	14,455,539.22	1,719,305.76	39.80414351	-80.71910559
12,563.00	88.53	152.39	11,598.14	-2,278.91	-1,691.09	14,455,455.30	1,719,350.22	39.80391266	-80.71894822
12,658.00	88.48	152.92	11,600.61	-2,363.27	-1,647.46	14,455,370.94	1,719,393.84	39.80368062	-80.71879384
12,752.00	88.22	152.13	11,603.32	-2,446.63	-1,604.12	14,455,287.58	1,719,437.19	39.80345131	-80.71864042
12,847.00	88.00	151.69	11,606.45	-2,530.39	-1,559.41	14,455,203.82	1,719,481.90	39.80322089	-80.71848218
12,942.00	87.30	151.16	11,610.35	-2,613.75	-1,514.01	14,455,120.46	1,719,527.30	39.80299158	-80.71832146
13,037.00	89.36	150.20	11,613.12	-2,696.54	-1,467.51	14,455,037.67	1,719,573.79	39.80276382	-80.71815684
13,131.00	88.84	149.58	11,614.59	-2,777.85	-1,420.36	14,454,956.36	1,719,620.94	39.80254012	-80.71798987
13,227.00	88.18	148.88	11,617.09	-2,860.30	-1,371.26	14,454,873.91	1,719,670.04	39.80231325	-80.71781599
13,321.00	90.37	149.67	11,618.28	-2,941.10	-1,323.25	14,454,793.11	1,719,718.06	39.80209096	-80.71764593
13,416.00	90.20	149.32	11,617.81	-3,022.94	-1,275.02	14,454,711.26	1,719,766.28	39.80186576	-80.71747515
13,510.00	89.49	148.97	11,618.06	-3,103.64	-1,226.81	14,454,630.57	1,719,814.49	39.80164373	-80.71730441

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2W-12 HU (slot J)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Site:	Heaven Hill 2	MD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Well:	Heaven Hill 2W-12 HU (slot J)	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
13.605.00	89.14	148.79	11,619.20	-3,184.96	-1,177.72	14,454,549.25	1,719,863.59		39.80141997	-80.71713052
13.700.00	88.97	148.70	11,620.76	-3,266.16	-1,128.43	14,454,468.05	1,719,912.87		39.80119655	-80.71695597
13.795.00	89.10	149.49	11,622.36	-3,347.66	-1,079.65	14,454,386.55	1,719,961.66		39.80097230	-80.71678318
13.890.00	88.79	149.58	11,624.11	-3,429.53	-1,031.49	14,454,304.68	1,720,009.81		39.80074705	-80.71661265
13.984.00	88.53	149.14	11,626.31	-3,510.39	-983.60	14,454,223.82	1,720,057.71		39.80052459	-80.71644304
14.079.00	88.09	148.09	11,629.11	-3,591.45	-934.14	14,454,142.76	1,720,107.16		39.80030153	-80.71626788
14.174.00	88.75	148.44	11,631.73	-3,672.22	-884.20	14,454,061.99	1,720,157.11		39.80007930	-80.71609096
14.268.00	89.36	149.23	11,633.28	-3,752.64	-835.56	14,453,981.57	1,720,205.75		39.79985801	-80.71591869
14.363.00	88.88	149.14	11,634.74	-3,834.22	-786.90	14,453,899.99	1,720,254.41		39.79963355	-80.71574637
14.457.00	89.45	150.81	11,636.11	-3,915.59	-739.87	14,453,818.62	1,720,301.43		39.79940967	-80.71557985
14.552.00	89.10	150.37	11,637.31	-3,998.34	-693.22	14,453,735.87	1,720,348.08		39.79918201	-80.71541471
14.647.00	88.35	149.67	11,639.43	-4,080.61	-645.76	14,453,653.60	1,720,395.54		39.79895567	-80.71524668
14.742.00	89.71	151.34	11,641.04	-4,163.28	-599.00	14,453,570.93	1,720,442.30		39.79872822	-80.71508112
14.836.00	90.02	152.04	11,641.26	-4,246.04	-554.42	14,453,488.17	1,720,486.88		39.79850056	-80.71492335
14.931.00	89.36	151.95	11,641.77	-4,329.91	-509.82	14,453,404.30	1,720,531.49		39.79826983	-80.71476549
15.026.00	88.97	151.16	11,643.16	-4,413.43	-464.57	14,453,320.78	1,720,576.73		39.79804007	-80.71460535
15.120.00	88.62	150.64	11,645.13	-4,495.55	-418.87	14,453,238.66	1,720,622.44		39.79781415	-80.71444356
15.215.00	88.04	150.64	11,647.90	-4,578.31	-372.31	14,453,155.90	1,720,669.00		39.79758646	-80.71427874
15,310.00	90.73	151.34	11,648.92	-4,661.38	-326.24	14,453,072.83	1,720,715.06		39.79735793	-80.71411569
15,404.00	90.15	151.34	11,648.20	-4,743.86	-281.16	14,452,990.35	1,720,760.14		39.79713102	-80.71395613
15,499.00	89.93	151.16	11,648.13	-4,827.15	-235.47	14,452,907.06	1,720,805.84		39.79690189	-80.71379439
15,594.00	89.01	151.60	11,649.01	-4,910.54	-189.97	14,452,823.67	1,720,851.34		39.79667248	-80.71363334
15,689.00	88.66	150.72	11,650.94	-4,993.73	-144.15	14,452,740.47	1,720,897.15		39.79644360	-80.71347118
15,783.00	88.13	150.46	11,653.58	-5,075.59	-98.01	14,452,658.62	1,720,943.29		39.79621840	-80.71330785
15,878.00	89.10	150.37	11,655.87	-5,158.18	-51.12	14,452,576.03	1,720,990.18		39.79599118	-80.71314186
15,973.00	89.58	150.81	11,656.97	-5,240.93	-4.47	14,452,493.28	1,721,036.83		39.79576351	-80.71297673
16,068.00	89.32	151.25	11,657.88	-5,324.04	41.54	14,452,410.17	1,721,082.84		39.79553486	-80.71281387
16,162.00	89.10	150.64	11,659.17	-5,406.20	87.18	14,452,328.01	1,721,128.49		39.79530882	-80.71265231
16,257.00	89.01	150.81	11,660.74	-5,489.06	133.63	14,452,245.15	1,721,174.94		39.79508087	-80.71248789
16,352.00	88.92	150.90	11,662.46	-5,572.01	179.89	14,452,162.19	1,721,221.19		39.79485264	-80.71232415
16,447.00	88.48	150.99	11,664.61	-5,655.04	226.02	14,452,079.17	1,721,267.32		39.79462423	-80.71216089
16,542.00	87.82	150.64	11,667.68	-5,737.93	272.32	14,451,996.28	1,721,313.62		39.79439617	-80.71199701
16,636.00	89.63	148.97	11,669.77	-5,819.15	319.58	14,451,915.06	1,721,360.88		39.79417270	-80.71182968
16,731.00	89.63	149.58	11,670.38	-5,900.81	368.11	14,451,833.39	1,721,409.42		39.79394800	-80.71165783
16,826.00	89.23	148.88	11,671.33	-5,982.44	416.71	14,451,751.77	1,721,458.02		39.79372342	-80.71148575
16,920.00	88.79	148.35	11,672.95	-6,062.67	465.66	14,451,671.54	1,721,506.96		39.79350264	-80.71131242
17,015.00	88.13	147.82	11,675.51	-6,143.28	515.86	14,451,590.93	1,721,557.17		39.79328082	-80.71113462
17,110.00	89.89	148.44	11,677.15	-6,223.94	566.01	14,451,510.27	1,721,607.32		39.79305886	-80.71095701
17,204.00	89.41	147.82	11,677.72	-6,303.77	615.64	14,451,430.44	1,721,656.95		39.79283919	-80.71078125
17,299.00	88.92	146.86	11,679.11	-6,383.74	666.90	14,451,350.47	1,721,708.21		39.79261912	-80.71059968
17,394.00	88.31	146.24	11,681.40	-6,462.98	719.25	14,451,271.23	1,721,760.56		39.79240104	-80.71041423
17,488.00	88.84	147.30	11,683.74	-6,541.58	770.75	14,451,192.62	1,721,812.05		39.79218472	-80.71023181
17,583.00	88.75	147.82	11,685.74	-6,621.74	821.70	14,451,112.47	1,721,863.00		39.79196413	-80.71005136
17,678.00	89.63	149.49	11,687.08	-6,702.87	871.11	14,451,031.34	1,721,912.41		39.79174090	-80.70987640
17,772.00	89.76	149.84	11,687.58	-6,783.99	918.58	14,450,950.21	1,721,959.88		39.79151768	-80.70970833
17,867.00	90.77	151.69	11,687.14	-6,866.89	964.98	14,450,867.32	1,722,006.28		39.79128962	-80.70954413
17,962.00	89.36	151.78	11,687.04	-6,950.56	1,009.96	14,450,783.65	1,722,051.26		39.79105944	-80.70938495
18,057.00	89.32	150.46	11,688.13	-7,033.74	1,055.84	14,450,700.47	1,722,097.14		39.79083060	-80.70922258
18,151.00	88.79	149.32	11,689.68	-7,115.04	1,102.99	14,450,619.17	1,722,144.29		39.79060690	-80.70905568
18,246.00	88.62	151.87	11,691.83	-7,197.77	1,149.62	14,450,536.44	1,722,190.92		39.79037928	-80.70889065
18,340.00	88.57	152.04	11,694.13	-7,280.71	1,193.80	14,450,453.50	1,722,235.10		39.79015112	-80.70873433
18,435.00	88.62	151.78	11,696.46	-7,364.49	1,238.52	14,450,369.71	1,722,279.82		39.78992062	-80.70857611
18,530.00	88.92	152.31	11,698.50	-7,448.39	1,283.04	14,450,285.82	1,722,324.34		39.78968983	-80.70841859
18,625.00	88.62	151.95	11,700.54	-7,532.35	1,327.44	14,450,201.86	1,722,368.74		39.78945885	-80.70826151
18,719.00	88.92	151.87	11,702.56	-7,615.26	1,371.69	14,450,118.95	1,722,412.99		39.78923077	-80.70810494



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2W-12 HU (slot J)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Site:	Heaven Hill 2	MD Reference:	RKB=1331+33 @ 1364.00usft (Nabors X08)
Well:	Heaven Hill 2W-12 HU (slot J)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
18,814.00	89.01	152.04	11,704.27	-7,699.09	1,416.35	14,450,035.12	1,722,457.65	39.78900014	-80.70794694
18,908.00	89.23	152.13	11,705.72	-7,782.14	1,460.35	14,449,952.06	1,722,501.65	39.78877166	-80.70779127
19,003.00	89.23	152.57	11,706.99	-7,866.29	1,504.43	14,449,867.92	1,722,545.74	39.78854019	-80.70763532
19,098.00	90.20	150.72	11,707.47	-7,949.88	1,549.55	14,449,784.33	1,722,590.85	39.78831021	-80.70747569
19,193.00	89.67	150.64	11,707.57	-8,032.71	1,596.07	14,449,701.50	1,722,637.37	39.78808232	-80.70731106
19,287.00	89.23	150.28	11,708.48	-8,114.49	1,642.41	14,449,619.72	1,722,683.71	39.78785732	-80.70714704
19,381.00	89.05	149.14	11,709.89	-8,195.65	1,689.82	14,449,538.56	1,722,731.12	39.78763402	-80.70697924
19,476.00	89.32	149.05	11,711.24	-8,277.15	1,738.60	14,449,457.06	1,722,779.91	39.78740975	-80.70680651
19,571.00	88.88	149.41	11,712.73	-8,358.77	1,787.20	14,449,375.44	1,722,828.50	39.78718517	-80.70663448
19,657.00	88.84	149.05	11,714.44	-8,432.65	1,831.19	14,449,301.56	1,722,872.49	39.78698189	-80.70647876
Survey @ 19657.00 MD 11714.44 TVD									
19,712.00	88.84	149.05	11,715.56	-8,479.81	1,859.47	14,449,254.40	1,722,900.77	39.78685212	-80.70637864
Survey projected to 19712.00 MD 11715.56 TVD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
60.00	60.00	0.25	-0.24	Gyro
930.00	929.99	2.28	-1.46	MWD surveys
4,648.00	4,603.84	-185.64	-384.37	450 Hard line intercept @ 4648 MD
19,657.00	11,714.44	-8,432.65	1,831.19	Survey @ 19657.00 MD 11714.44 TVD
19,712.00	11,715.56	-8,479.81	1,859.47	Survey projected to 19712.00 MD 11715.56 TVD

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 Environmental Protection