



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2-07 HU (slot E)
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 2-07 HU (slot 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	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 2-07 HU (slot E)					
Well Position	+N/-S	0.00 usft	Northing:	14,457,691.63 usft	Latitude:	39.81003950
	+E/-W	0.00 usft	Easting:	1,721,035.50 usft	Longitude:	-80.71292210
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	1,331.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	4/21/2018	-8.71	66.91	52,087.89162470

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	150.00	

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From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
50.00	850.00	Gyro (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s
875.00	2,795.00	MWD (Original Hole)	MWD	MWD - Standard
2,889.00	10,365.00	MWD int (Original Hole)	MWD	MWD - Standard
10,446.00	20,366.00	MWD lat (Original Hole)	MWD	MWD - Standard
20,420.00	20,420.00	Projection (Original Hole)	MWD	MWD - Standard

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Latitude (°)	Longitude (°)	V. Sec (usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.81003950	-80.71292210	0.00
50.00	0.15	287.21	50.00	0.02	-0.06	0.30	39.81003955	-80.71292232	-0.05
100.00	0.21	338.04	100.00	0.12	-0.16	0.33	39.81003984	-80.71292267	-0.19
150.00	0.24	322.53	150.00	0.29	-0.26	0.14	39.81004030	-80.71292301	-0.38
200.00	0.39	331.16	200.00	0.52	-0.40	0.31	39.81004094	-80.71292353	-0.66
218.00	0.40	344.90	218.00	0.64	-0.45	0.53	39.81004126	-80.71292369	-0.78
MWD surveys									
250.00	0.47	5.41	250.00	0.88	-0.47	0.53	39.81004191	-80.71292375	-0.99
300.00	0.30	24.40	300.00	1.20	-0.39	0.42	39.81004280	-80.71292348	-1.24
350.00	0.35	17.91	350.00	1.47	-0.29	0.12	39.81004353	-80.71292312	-1.41
400.00	0.32	23.53	399.99	1.74	-0.19	0.09	39.81004428	-80.71292275	-1.60
450.00	0.29	39.01	449.99	1.96	-0.05	0.17	39.81004490	-80.71292227	-1.73
500.00	0.29	28.12	499.99	2.13	0.06	0.24	39.81004536	-80.71292185	-1.81
550.00	0.29	11.04	549.99	2.22	0.17	0.25	39.81004561	-80.71292148	-1.84
600.00	0.29	2.16	599.99	2.24	0.28	0.17	39.81004564	-80.71292106	-1.79
650.00	0.29	7.55	649.99	2.21	0.35	0.18	39.81004557	-80.71292084	-1.74
700.00	0.29	56.31	699.99	2.12	0.39	0.33	39.81004532	-80.71292067	-1.64
750.00	0.29	176.16	749.99	1.93	0.44	0.18	39.81004480	-80.71292053	-1.45
800.00	0.29	148.21	799.99	1.71	0.51	0.27	39.81004420	-80.71292027	-1.23

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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Latitude (°)	Longitude (°)	V. Sec (usft)	
850.00	0.28	171.18	849.99	1.49	0.60	0.23	39.81004358	-80.71291996	-0.99	
875.00	0.43	147.50	874.99	1.35	0.65	0.83	39.81004319	-80.71291975	-0.84	
MWD surveys										
910.00	0.49	161.50	909.99	1.09	0.77	0.36	39.81004250	-80.71291933	-0.56	
942.00	0.49	110.51	941.99	0.92	0.94	1.32	39.81004201	-80.71291873	-0.32	
973.00	0.62	154.09	972.99	0.72	1.14	1.39	39.81004146	-80.71291803	-0.05	
1.005.00	0.71	151.32	1,004.99	0.39	1.31	0.30	39.81004056	-80.71291742	0.32	
1.037.00	0.88	144.93	1,036.98	0.01	1.55	0.60	39.81003952	-80.71291658	0.76	
1.068.00	0.80	146.12	1,067.98	-0.36	1.81	0.26	39.81003849	-80.71291567	1.22	
1.099.00	0.88	141.23	1,098.98	-0.73	2.08	0.35	39.81003749	-80.71291471	1.67	
1.131.00	0.88	147.62	1,130.97	-1.12	2.36	0.31	39.81003639	-80.71291370	2.16	
1.282.00	0.62	177.23	1,281.96	-2.92	3.02	0.30	39.81003145	-80.71291137	4.04	
1.376.00	1.02	161.32	1,375.95	-4.22	3.31	0.49	39.81002788	-80.71291034	5.31	
1.470.00	0.71	129.81	1,469.94	-5.39	4.03	0.59	39.81002467	-80.71290781	6.68	
1.565.00	0.49	133.30	1,564.93	-6.04	4.78	0.23	39.81002287	-80.71290516	7.62	
1.659.00	0.62	133.30	1,658.93	-6.67	5.44	0.14	39.81002114	-80.71290280	8.49	
1.754.00	0.62	139.42	1,753.92	-7.41	6.15	0.07	39.81001910	-80.71290029	9.49	
1.849.00	0.49	113.99	1,848.92	-7.96	6.85	0.29	39.81001757	-80.71289778	10.32	
1.943.00	0.80	111.79	1,942.91	-8.37	7.83	0.33	39.81001644	-80.71289431	11.17	
2.038.00	0.80	145.33	2,037.91	-9.04	8.74	0.47	39.81001460	-80.71289108	12.20	
2.133.00	0.80	133.60	2,132.90	-9.75	9.46	0.25	39.81001265	-80.71288853	13.17	
2.227.00	0.80	136.91	2,226.90	-10.46	10.16	0.27	39.81001070	-80.71288604	14.14	
2.322.00	0.80	136.90	2,321.89	-10.91	10.77	0.52	39.81000945	-80.71288387	14.83	
2.417.00	0.80	136.60	2,416.89	-10.97	11.62	0.23	39.81000927	-80.71288086	15.31	
2.511.00	0.80	136.20	2,510.88	-10.97	12.52	0.17	39.81000926	-80.71287763	15.76	
2.606.00	0.80	138.99	2,605.88	-10.71	13.18	0.30	39.81000996	-80.71287530	15.87	
2.701.00	0.80	140.00	2,700.88	-10.17	13.51	0.25	39.81001144	-80.71287412	15.56	

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2,795.00	0.22	28.50	2,794.88	-9.70	13.67	0.21	39.81001275	-80.71287352	15.23
2,889.00	0.22	12.81	2,888.88	-9.36	13.80	0.06	39.81001367	-80.71287307	15.01
2,984.00	0.80	310.09	2,983.87	-8.76	13.33	0.76	39.81001533	-80.71287473	14.25
3,078.00	2.52	307.01	3,077.83	-7.09	11.18	1.83	39.81001993	-80.71288237	11.73
3,173.00	4.20	307.32	3,172.66	-3.72	6.75	1.77	39.81002921	-80.71289812	6.60
3,268.00	5.08	309.92	3,267.35	1.08	0.75	0.95	39.81004247	-80.71291941	-0.56
3,362.00	5.92	310.01	3,360.92	6.87	-6.15	0.89	39.81005842	-80.71294393	-9.03
3,457.00	6.72	307.23	3,455.34	13.38	-14.33	0.90	39.81007638	-80.71297298	-18.76
3,551.00	6.81	304.19	3,548.69	19.84	-23.32	0.39	39.81009420	-80.71300491	-28.84
3,646.00	6.81	299.69	3,643.02	25.80	-32.87	0.56	39.81011064	-80.71303886	-38.78
3,740.00	6.89	297.23	3,736.35	31.14	-42.73	0.32	39.81012539	-80.71307389	-48.33
3,835.00	6.98	295.99	3,830.65	36.27	-52.98	0.18	39.81013959	-80.71311035	-57.91
3,930.00	6.19	301.19	3,925.02	41.46	-62.55	1.04	39.81015390	-80.71314437	-67.18
4,024.00	5.79	313.09	4,018.51	47.32	-70.35	1.38	39.81017007	-80.71317207	-76.16
4,119.00	6.01	315.51	4,113.01	54.14	-77.33	0.35	39.81018887	-80.71319686	-85.56
4,214.00	6.10	315.60	4,207.48	61.30	-84.35	0.10	39.81020858	-80.71322177	-95.26
4,308.00	6.19	318.42	4,300.94	68.66	-91.21	0.34	39.81022885	-80.71324610	-105.06
4,403.00	6.81	319.13	4,395.33	76.75	-98.29	0.66	39.81025113	-80.71327124	-115.61
4,498.00	7.38	315.91	4,489.60	85.39	-106.23	0.73	39.81027493	-80.71329938	-127.06
4,592.00	7.82	314.02	4,582.78	94.17	-115.02	0.54	39.81029912	-80.71333061	-139.06
4,687.00	7.51	310.01	4,676.93	102.65	-124.43	0.65	39.81032250	-80.71336400	-151.00
4,781.00	7.38	308.33	4,770.14	110.34	-133.87	0.27	39.81034371	-80.71339753	-162.00
4,876.00	7.11	305.03	4,864.38	117.50	-143.47	0.52	39.81036346	-80.71343163	-173.00
4,971.00	6.19	306.22	4,958.74	123.90	-152.41	0.98	39.81038111	-80.71346342	-183.50
5,065.00	5.70	303.00	5,052.23	129.44	-160.42	0.63	39.81039639	-80.71349186	-192.30
5,160.00	4.99	294.80	5,146.82	133.74	-168.13	1.10	39.81040827	-80.71351925	-199.80
5,255.00	4.91	281.63	5,241.47	136.30	-175.86	1.20	39.81041535	-80.71354676	-205.90

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5,350.00	5.21	288.32	5,336.10	138.47	-183.94	0.70	39.81042140	-80.71357550	-211.89
5,445.00	5.70	304.63	5,430.67	142.51	-191.91	1.70	39.81043255	-80.71360386	-219.37
5,539.00	6.72	311.20	5,524.12	148.78	-199.89	1.32	39.81044986	-80.71363220	-228.80
5,634.00	6.50	309.12	5,618.49	155.84	-208.25	0.34	39.81046930	-80.71366186	-239.08
5,729.00	4.91	305.51	5,713.02	161.59	-215.73	1.71	39.81048517	-80.71368844	-247.81
5,823.00	3.80	298.42	5,806.75	165.41	-221.74	1.31	39.81049571	-80.71370981	-254.12
5,918.00	3.09	287.53	5,901.57	167.68	-226.95	1.01	39.81050199	-80.71372834	-258.69
6,013.00	1.99	263.51	5,996.48	168.27	-231.03	1.59	39.81050363	-80.71374287	-261.24
6,107.00	1.28	232.93	6,090.45	167.45	-233.49	1.17	39.81050141	-80.71375163	-261.76
6,201.00	1.50	207.50	6,184.42	165.72	-234.90	0.69	39.81049669	-80.71375666	-260.97
6,296.00	1.10	210.50	6,279.39	163.84	-235.94	0.43	39.81049151	-80.71376037	-259.85
6,390.00	0.62	242.49	6,373.38	162.82	-236.84	0.70	39.81048874	-80.71376362	-259.43
6,485.00	0.88	260.69	6,468.38	162.47	-238.02	0.37	39.81048777	-80.71376781	-259.71
6,580.00	0.80	231.83	6,563.37	161.94	-239.26	0.45	39.81048633	-80.71377224	-259.88
6,674.00	0.88	168.11	6,657.36	160.83	-239.63	0.95	39.81048328	-80.71377356	-259.10
6,769.00	0.88	114.39	6,752.35	159.81	-238.81	0.84	39.81048049	-80.71377067	-257.81
6,863.00	1.41	80.81	6,846.33	159.70	-237.01	0.89	39.81048016	-80.71376426	-256.81
6,958.00	0.62	48.02	6,941.31	160.23	-235.48	1.00	39.81048160	-80.71375879	-256.50
7,053.00	0.31	310.93	7,036.31	160.74	-235.29	0.76	39.81048301	-80.71375811	-256.85
7,148.00	1.41	311.02	7,131.30	161.68	-236.37	1.16	39.81048559	-80.71376193	-258.20
7,243.00	1.41	329.79	7,226.27	163.46	-237.84	0.48	39.81049048	-80.71376715	-260.15
7,337.00	1.10	59.39	7,320.26	164.91	-237.64	1.90	39.81049449	-80.71376644	-261.50
7,432.00	2.70	83.01	7,415.20	165.65	-234.64	1.84	39.81049648	-80.71375573	-260.77
7,527.00	1.68	78.52	7,510.13	166.20	-231.05	1.09	39.81049796	-80.71374295	-259.44
7,622.00	1.59	72.13	7,605.09	166.88	-228.43	0.21	39.81049981	-80.71373362	-258.77
7,716.00	1.28	53.80	7,699.06	167.90	-226.34	0.59	39.81050259	-80.71372617	-258.50
7,811.00	1.59	68.43	7,794.03	169.01	-224.26	0.50	39.81050563	-80.71371874	-258.50

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7,906.00	2.30	62.13		7,888.98	170.39	-221.35	0.78	39.81050938	-80.71370836	-258.24	
8,000.00	2.70	79.49		7,982.89	171.68	-217.51	0.91	39.81051288	-80.71369466	-257.43	
8,095.00	1.50	94.91		8,077.83	171.98	-214.07	1.39	39.81051367	-80.71368241	-255.97	
8,190.00	0.62	121.71		8,172.81	171.60	-212.39	1.04	39.81051263	-80.71367644	-254.81	
8,284.00	0.80	278.01		8,266.81	171.42	-212.61	1.48	39.81051214	-80.71367722	-254.76	
8,379.00	1.68	282.11		8,361.78	171.81	-214.63	0.93	39.81051322	-80.71368440	-256.10	
8,473.00	2.30	265.63		8,455.73	171.95	-217.85	0.89	39.81051365	-80.71369589	-257.84	
8,567.00	1.99	283.52		8,549.66	172.19	-221.32	0.78	39.81051433	-80.71370824	-259.78	
8,662.00	1.10	264.40		8,644.63	172.49	-223.83	1.07	39.81051517	-80.71371718	-261.30	
8,756.00	0.62	273.61		8,738.62	172.43	-225.24	0.53	39.81051502	-80.71372218	-261.95	
8,851.00	1.02	317.50		8,833.61	173.09	-226.32	0.75	39.81051684	-80.71372604	-263.06	
8,946.00	1.10	346.80		8,928.59	174.60	-227.10	0.57	39.81052099	-80.71372880	-264.76	
9,040.00	1.59	341.29		9,022.57	176.71	-227.73	0.54	39.81052680	-80.71373100	-266.90	
9,135.00	1.28	351.62		9,117.54	179.01	-228.30	0.42	39.81053312	-80.71373303	-269.18	
9,230.00	0.88	12.11		9,212.52	180.77	-228.31	0.58	39.81053796	-80.71373301	-270.71	
9,324.00	0.49	282.82		9,306.51	181.57	-228.55	1.07	39.81054015	-80.71373386	-271.52	
9,419.00	0.31	230.20		9,401.51	181.50	-229.14	0.41	39.81053995	-80.71373597	-271.75	
9,514.00	0.88	185.03		9,496.51	180.60	-229.40	0.73	39.81053750	-80.71373691	-271.11	
9,608.00	0.62	170.62		9,590.50	179.38	-229.38	0.34	39.81053415	-80.71373686	-270.04	
9,703.00	1.81	156.69		9,685.48	177.50	-228.70	1.28	39.81052897	-80.71373447	-268.07	
9,797.00	2.39	131.62		9,779.41	174.83	-226.65	1.14	39.81052163	-80.71372719	-264.74	
9,891.00	2.21	135.63		9,873.34	172.24	-223.92	0.26	39.81051447	-80.71371749	-261.12	
9,986.00	1.99	143.92		9,968.28	169.59	-221.67	0.39	39.81050719	-80.71370950	-257.71	
10,080.00	2.52	155.42		10,062.20	166.39	-219.85	0.74	39.81049840	-80.71370305	-254.02	
10,175.00	1.99	145.33		10,157.13	163.14	-218.04	0.70	39.81048944	-80.71369665	-250.30	
10,270.00	1.10	135.81		10,252.09	161.13	-216.46	0.97	39.81048390	-80.71369107	-247.77	
10,365.00	0.40	61.42		10,347.09	160.63	-215.54	1.12	39.81048253	-80.71368778	-246.88	

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Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Heaven Hill 2
Well: Heaven Hill 2-07 HU (slot E)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Heaven Hill 2-07 HU (slot E)
TVD Reference: RKB=1331+33 @ 1364.00usft (Nabors X08)
MD Reference: RKB=1331+33 @ 1364.00usft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	EW (usft)	DLeg (°/100usft)	Latitude (°)	Longitude (°)	V. Sec (usft)
10,452.00	0.44	90.08	10,434.08	160.78	-214.94	0.24	39.81048293	-80.71368564	-246.71
10,547.00	0.26	100.89	10,529.08	160.74	-214.36	0.20	39.81048281	-80.71368358	-246.38
10,640.00	0.04	238.44	10,622.08	160.68	-214.18	0.31	39.81048265	-80.71368294	-246.24
10,734.00	0.09	84.72	10,716.08	160.67	-214.14	0.14	39.81048262	-80.71368278	-246.21
10,828.00	0.13	311.92	10,810.08	160.75	-214.14	0.22	39.81048284	-80.71368280	-246.28
10,923.00	0.31	325.80	10,905.08	161.03	-214.37	0.20	39.81048362	-80.71368360	-246.64
11,017.00	0.44	326.07	10,999.08	161.54	-214.71	0.14	39.81048502	-80.71368482	-247.25
11,111.00	2.15	109.85	11,093.06	161.24	-213.25	2.68	39.81048419	-80.71367963	-246.27
11,206.00	6.15	118.03	11,187.79	158.24	-207.08	4.25	39.81047590	-80.71365770	-240.59
11,300.00	10.55	122.25	11,280.77	151.28	-195.35	4.72	39.81045668	-80.71361601	-228.69
11,396.00	25.49	137.80	11,371.85	131.17	-173.91	16.22	39.81040125	-80.71353989	-200.55
11,490.00	35.21	138.68	11,452.87	95.75	-142.36	10.35	39.81030369	-80.71342793	-154.10
11,584.00	43.43	137.28	11,525.53	51.58	-102.48	8.79	39.81018205	-80.71328642	-95.91
11,678.00	58.37	140.26	11,584.66	-3.25	-54.70	16.08	39.81003106	-80.71311690	-24.53
11,773.00	72.31	150.72	11,624.29	-74.34	-6.36	17.74	39.80983541	-80.71294559	61.20
11,868.00	84.62	151.51	11,643.25	-155.69	38.51	12.98	39.80961161	-80.71278676	154.08
11,962.00	92.79	152.39	11,645.37	-238.55	82.66	8.74	39.80938365	-80.71263049	247.92
12,057.00	92.31	152.39	11,641.14	-322.65	126.64	0.51	39.80915230	-80.71247483	342.75
12,151.00	91.52	152.22	11,638.00	-405.83	170.31	0.86	39.80892348	-80.71232031	436.62
12,246.00	91.16	152.22	11,635.78	-489.86	214.57	0.38	39.80869232	-80.71216365	531.52
12,340.00	90.42	152.31	11,634.48	-573.05	258.31	0.79	39.80846347	-80.71200884	625.44
12,435.00	89.98	151.95	11,634.15	-657.03	302.72	0.60	39.80823245	-80.71185168	720.37
12,530.00	89.23	151.87	11,634.81	-740.84	347.45	0.79	39.80800190	-80.71169336	815.31
12,625.00	90.24	151.51	11,635.25	-824.48	392.50	1.13	39.80777182	-80.71153390	910.27
12,720.00	90.24	151.43	11,634.85	-907.94	437.88	0.08	39.80754220	-80.71137330	1,005.24
12,814.00	89.49	151.16	11,635.07	-990.39	483.02	0.85	39.80731538	-80.71121348	1,099.21
12,909.00	89.49	151.60	11,635.92	-1,073.78	528.53	0.46	39.80708597	-80.71105242	1,194.18

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2-07 HU (slot E)
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 2-07 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey										
MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	N/S (usft)	E/W (usft)	DLeg ("/100usft)	Latitude (")	Longitude (")	V. Sec (usft)	
13,004.00	88.88	151.69	11,637.27	-1,157.37	573.64	0.65	39.80685601	-80.71089274	1,289.13	
13,099.00	89.01	152.92	11,639.02	-1,241.47	617.79	1.30	39.80662465	-80.71073652	1,384.04	
13,193.00	88.44	152.57	11,641.11	-1,325.01	660.82	0.71	39.80639484	-80.71058425	1,477.91	
13,288.00	89.01	151.43	11,643.22	-1,408.87	705.41	1.34	39.80616415	-80.71042645	1,572.82	
13,383.00	89.14	151.43	11,644.75	-1,492.29	750.84	0.14	39.80593465	-80.71026566	1,667.78	
13,478.00	90.07	150.90	11,645.41	-1,575.51	796.65	1.13	39.80570571	-80.71010349	1,762.76	
13,573.00	89.36	150.81	11,645.88	-1,658.48	842.92	0.75	39.80547744	-80.70993971	1,857.74	
13,667.00	88.88	149.93	11,647.33	-1,740.18	889.39	1.07	39.80525266	-80.70977520	1,951.73	
13,762.00	88.53	149.67	11,649.47	-1,822.26	937.16	0.46	39.80502681	-80.70960604	2,046.70	
13,857.00	88.22	150.11	11,652.17	-1,904.41	984.80	0.57	39.80480079	-80.70943736	2,141.67	
13,952.00	88.04	149.84	11,655.27	-1,986.62	1,032.31	0.34	39.80457460	-80.70926915	2,236.62	
14,046.00	88.75	148.09	11,657.90	-2,067.13	1,080.75	2.01	39.80435307	-80.70909760	2,330.56	
14,141.00	88.66	148.35	11,660.05	-2,147.86	1,130.77	0.29	39.80413090	-80.70892043	2,425.49	
14,236.00	90.99	149.49	11,660.34	-2,229.22	1,179.81	2.73	39.80390704	-80.70874677	2,520.46	
14,331.00	90.24	149.41	11,659.32	-2,311.02	1,228.09	0.79	39.80368195	-80.70857580	2,615.45	
14,425.00	89.76	149.58	11,659.32	-2,392.01	1,275.81	0.54	39.80345911	-80.70840684	2,709.45	
14,520.00	89.36	149.67	11,660.05	-2,473.97	1,323.84	0.43	39.80323360	-80.70823676	2,804.44	
14,615.00	88.66	148.97	11,661.69	-2,555.66	1,372.31	1.04	39.80300883	-80.70806515	2,899.42	
14,710.00	89.80	150.72	11,662.97	-2,637.79	1,420.02	2.20	39.80278284	-80.70789621	2,994.41	
14,805.00	90.11	150.99	11,663.04	-2,720.76	1,466.29	0.43	39.80255457	-80.70773244	3,089.40	
14,899.00	89.85	150.99	11,663.07	-2,802.97	1,511.88	0.28	39.80232840	-80.70757109	3,183.38	
14,993.00	88.70	150.28	11,664.26	-2,884.88	1,557.97	1.44	39.80210303	-80.70740794	3,277.37	
15,088.00	88.84	151.60	11,666.30	-2,967.90	1,604.10	1.40	39.80187462	-80.70724465	3,372.36	
15,183.00	89.85	150.20	11,667.39	-3,050.90	1,650.30	1.82	39.80164627	-80.70708114	3,467.35	
15,278.00	89.71	150.55	11,667.75	-3,133.48	1,697.26	0.40	39.80141906	-80.70691490	3,562.34	
15,372.00	88.35	149.14	11,669.34	-3,214.75	1,744.47	2.08	39.80119547	-80.70674776	3,656.23	
15,467.00	89.85	151.25	11,670.84	-3,297.16	1,791.68	2.72	39.80096870	-80.70658063	3,751.27	

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Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Heaven Hill 2
Well: Heaven Hill 2-07 HU (slot E)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Heaven Hill 2-07 HU (slot E)
TVD Reference: RKB=1331+33 @ 1364.00usft (Nabors X08)
MD Reference: RKB=1331+33 @ 1364.00usft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Jul2216dt_v14

Survey										
MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	N/S (usft)	E/W (usft)	DLeg ("/100usft)	Latitude (")	Longitude (")	V. Sec (usft)	
15,562.00	89.54	151.34	11,671.34	-3,380.49	1,837.31	0.34	39.80073947	-80.70641915	3,846.24	
15,656.00	89.01	151.43	11,672.53	-3,463.00	1,882.32	0.57	39.80051246	-80.70625984	3,940.21	
15,751.00	90.15	152.04	11,673.23	-3,546.67	1,927.31	1.36	39.80028228	-80.70610066	4,035.16	
15,846.00	90.68	149.41	11,672.54	-3,629.53	1,973.76	2.82	39.80005431	-80.70593625	4,130.14	
15,940.00	90.20	149.41	11,671.82	-3,710.44	2,021.59	0.51	39.79983167	-80.70576689	4,224.13	
16,035.00	89.76	149.49	11,671.85	-3,792.25	2,069.88	0.47	39.79960656	-80.70559593	4,319.13	
16,130.00	88.09	149.41	11,673.63	-3,874.05	2,118.15	1.76	39.79938149	-80.70542500	4,414.10	
16,224.00	87.65	149.49	11,677.13	-3,954.94	2,165.90	0.48	39.79915890	-80.70525596	4,508.03	
16,319.00	88.31	148.88	11,680.47	-4,036.48	2,214.54	0.95	39.79893454	-80.70508376	4,602.96	
16,414.00	87.65	148.44	11,683.82	-4,117.57	2,263.92	0.83	39.79871140	-80.70490890	4,697.88	
16,508.00	89.45	149.41	11,686.20	-4,198.05	2,312.42	2.18	39.79848994	-80.70473717	4,791.83	
16,603.00	90.55	150.02	11,686.20	-4,280.08	2,360.32	1.32	39.79826422	-80.70456757	4,886.82	
16,698.00	89.93	149.49	11,685.80	-4,362.15	2,408.17	0.86	39.79803841	-80.70439817	4,981.82	
16,793.00	89.36	149.76	11,686.39	-4,444.11	2,456.21	0.66	39.79781290	-80.70422812	5,076.82	
16,888.00	89.93	149.76	11,686.98	-4,526.18	2,504.05	0.60	39.79758708	-80.70405875	5,171.81	
16,983.00	89.23	149.14	11,687.68	-4,607.99	2,552.34	0.98	39.79736197	-80.70388780	5,266.80	
17,078.00	90.59	149.23	11,687.83	-4,689.57	2,601.00	1.43	39.79713747	-80.70371551	5,361.79	
17,172.00	90.15	149.05	11,687.22	-4,770.26	2,649.22	0.51	39.79691544	-80.70354480	5,455.78	
17,267.00	89.85	149.14	11,687.22	-4,851.78	2,698.01	0.33	39.79669114	-80.70337205	5,550.77	
17,362.00	89.14	148.61	11,688.06	-4,933.10	2,747.12	0.93	39.79646737	-80.70319819	5,645.74	
17,457.00	88.88	148.79	11,689.70	-5,014.26	2,796.46	0.33	39.79624403	-80.70302346	5,740.71	
17,551.00	88.22	148.88	11,692.08	-5,094.67	2,845.09	0.71	39.79602277	-80.70285129	5,834.66	
17,646.00	90.02	150.11	11,693.54	-5,176.50	2,893.31	2.29	39.79579759	-80.70268060	5,929.64	
17,740.00	89.32	150.20	11,694.08	-5,258.03	2,940.09	0.75	39.79557325	-80.70251503	6,023.63	
17,835.00	89.36	150.37	11,695.17	-5,340.54	2,987.17	0.18	39.79534625	-80.70234837	6,118.63	
17,930.00	90.51	151.16	11,695.28	-5,423.43	3,033.57	1.47	39.79511817	-80.70218417	6,213.61	
18,025.00	89.89	150.81	11,694.95	-5,506.51	3,079.65	0.75	39.79488960	-80.70202112	6,308.60	

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 2-07 HU (slot E)
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 2-07 HU (slot E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Latitude (°)	Longitude (°)	V. Sec (usft)
18,119.00	89.85	150.64	11,695.16	-5,588.50	3,125.61	0.19	39.79466400	-80.70185844	6,402.59
18,214.00	90.81	150.90	11,694.61	-5,671.40	3,172.00	1.05	39.79443591	-80.70169428	6,497.58
18,309.00	88.97	150.11	11,694.80	-5,754.09	3,218.77	2.11	39.79420842	-80.70152875	6,592.57
18,403.00	88.44	150.28	11,696.92	-5,835.63	3,265.48	0.59	39.79398405	-80.70136343	6,686.55
18,498.00	88.57	150.28	11,699.40	-5,918.11	3,312.56	0.14	39.79375712	-80.70119680	6,781.51
18,593.00	87.96	149.84	11,702.28	-6,000.39	3,359.96	0.79	39.79353071	-80.70102906	6,876.47
18,620.00	87.91	149.93	11,703.25	-6,023.73	3,373.49	0.38	39.79346649	-80.70098114	6,903.45
18,714.00	88.70	149.32	11,706.03	-6,104.79	3,421.00	1.06	39.79324344	-80.70081297	6,997.41
18,809.00	90.29	149.14	11,706.87	-6,186.41	3,469.60	1.68	39.79301884	-80.70064093	7,092.39
18,904.00	89.67	148.53	11,706.90	-6,267.70	3,518.76	0.92	39.79279515	-80.70046688	7,187.37
18,998.00	88.75	147.65	11,708.20	-6,347.49	3,568.45	1.35	39.79257558	-80.70029096	7,281.31
19,093.00	89.01	150.37	11,710.05	-6,428.90	3,617.35	2.88	39.79235154	-80.70011785	7,376.27
19,188.00	89.23	151.43	11,711.51	-6,511.90	3,663.54	1.14	39.79212318	-80.69995439	7,471.24
19,282.00	89.23	151.87	11,712.78	-6,594.62	3,708.17	0.47	39.79189561	-80.69979648	7,565.19
19,377.00	89.23	151.87	11,714.05	-6,678.39	3,752.96	0.00	39.79166514	-80.69963805	7,660.14
19,471.00	89.19	151.69	11,715.35	-6,761.21	3,797.40	0.20	39.79143729	-80.69948082	7,754.08
19,566.00	89.27	151.51	11,716.62	-6,844.77	3,842.58	0.21	39.79120740	-80.69932098	7,849.04
19,661.00	88.88	151.34	11,718.16	-6,928.19	3,888.02	0.45	39.79097789	-80.69916024	7,943.99
19,756.00	88.31	151.51	11,720.49	-7,011.59	3,933.44	0.63	39.79074843	-80.69899953	8,038.93
19,850.00	89.54	149.76	11,722.25	-7,093.49	3,979.53	2.28	39.79052307	-80.69883645	8,132.91
19,945.00	89.98	149.67	11,722.65	-7,175.52	4,027.44	0.47	39.79029735	-80.69866689	8,227.90
20,039.00	90.07	150.02	11,722.61	-7,256.80	4,074.66	0.38	39.79007370	-80.69849977	8,321.90
20,133.00	90.20	150.20	11,722.39	-7,338.30	4,121.50	0.24	39.78984945	-80.69833399	8,415.90
20,228.00	90.33	150.37	11,721.95	-7,420.81	4,168.59	0.23	39.78962243	-80.69816735	8,510.90
20,322.00	88.79	149.76	11,722.67	-7,502.26	4,215.49	1.76	39.78939830	-80.69800135	8,604.90
20,366.00	89.10	149.84	11,723.48	-7,540.28	4,237.62	0.73	39.78929368	-80.69792304	8,648.89

Survey @ 20366.00 MD 11723.48 TVD

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Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Heaven Hill 2
Well: Heaven Hill 2-07 HU (slot E)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Database:

Well Heaven Hill 2-07 HU (slot E)
 RKB=1331+33 @ 1364 00usft (Nabors X08)
 RKB=1331+33 @ 1364 00usft (Nabors X08)
Grid
 Minimum Curvature
 DB_Jul22 16dt_v14

Survey	MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Latitude (°)	Longitude (°)	V_Sec (usft)
	20,420.00	89.10	149.84	11,724.33	-7,586.97	4,264.75	0.00	39.789165522	-80.69782703	8,702.88
Survey projected to 20420.00 MD 11724.33 TVD										

Design Annotations	Measured Depth (usft)	Vertical Depth (usft)	+N/S (usft)	Local Coordinates		Comment
				+E/W (usft)		
	218.00	218.00	0.64	-0.45	MWD surveys	
	875.00	874.99	1.35	0.65	MWD surveys	
	20,366.00	11,723.48	-7,540.28	4,237.62	Survey @ 20366.00 MD 11723.48 TVD	
	20,420.00	11,724.33	-7,586.97	4,264.75	Survey projected to 20420.00 MD 11724.33 TVD	

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