



Well: Old Crow S-11 HM (slot T)  
 Site: Old Crow Pad  
 Project: Marshall County, West Virginia.  
 Design: rev4  
 Rig: Nabors B 28

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSEct	Annotation
6462.00	49.26	358.96	5462.85	2469.21	-417.69	0.00	0.000-2046.12		Survey @ 6462.00 MD 5462.85 TVD
6528.00	49.26	358.96	5505.92	2519.21	-418.59	0.00	0.000-2082.23		KOP Begin 8.18°/100' build/turn
6567.61	50.44	355.01	5531.47	2549.43	-420.20	8.18	-69.987-2104.81		Begin 8.18°/100' build/turn
7694.66	50.00	134.42	6463.09	2718.21	-70.73	8.18	150.081-1978.25		Begin 10°/100' build/turn
8108.55	89.00	149.66	6606.00	2415.40	157.01	10.00	23.421-1602.93		Begin 89.00° lateral
15368.44	89.00	149.66	6733.00	-3849.15	3823.80	0.00	0.000 5425.62		PBHL/TD 15368.44 MD/6733.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSEct	Annotation
173.00	0.44	295.15	173.00	0.28	-0.60	-0.62	MWD surveys
15278.00	88.79	149.85	6631.69	-3781.53	3792.02	5355.26	Survey @ 15278.00 MD 6631.69 TVD
15350.00	88.79	149.85	6633.21	-3843.78	3828.17	5424.90	Survey projected to 15350.00 MD 6633.21 TVD



Azimuths to Grid North  
 True North: -0.15°  
 Magnetic North: -8.88°

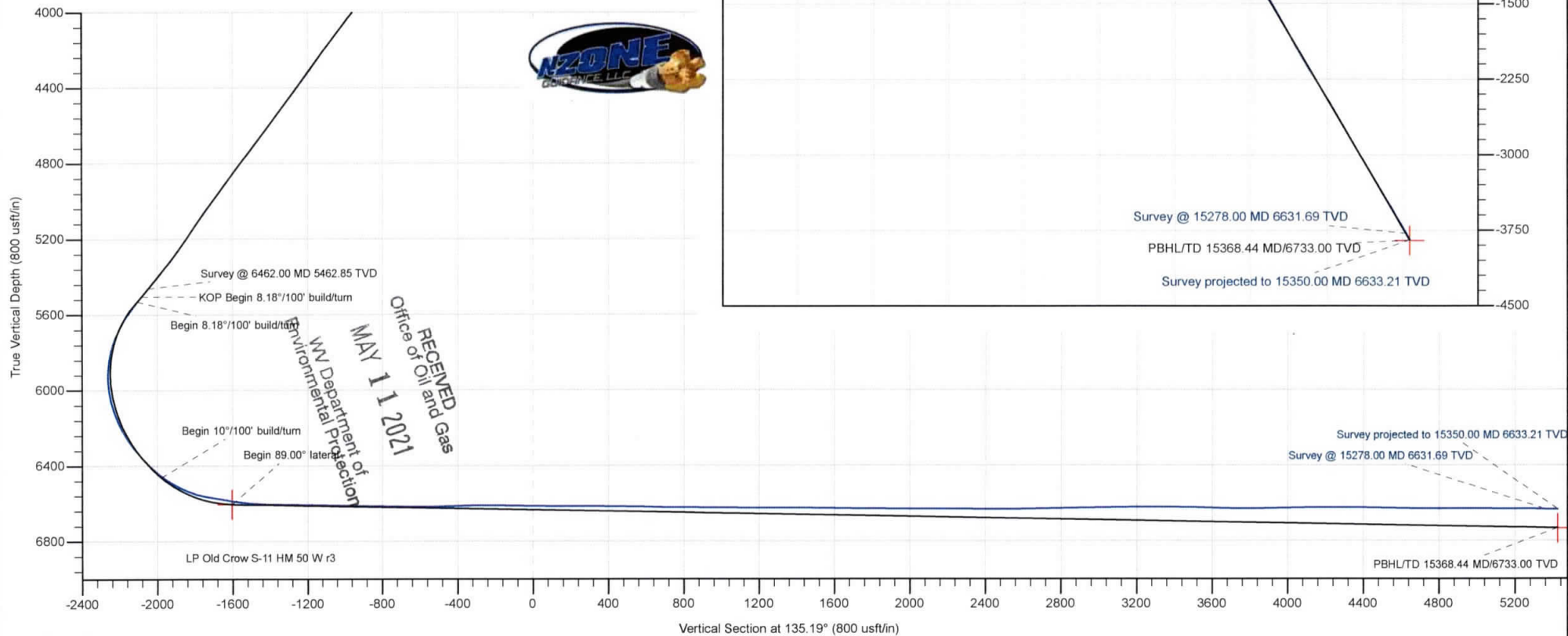
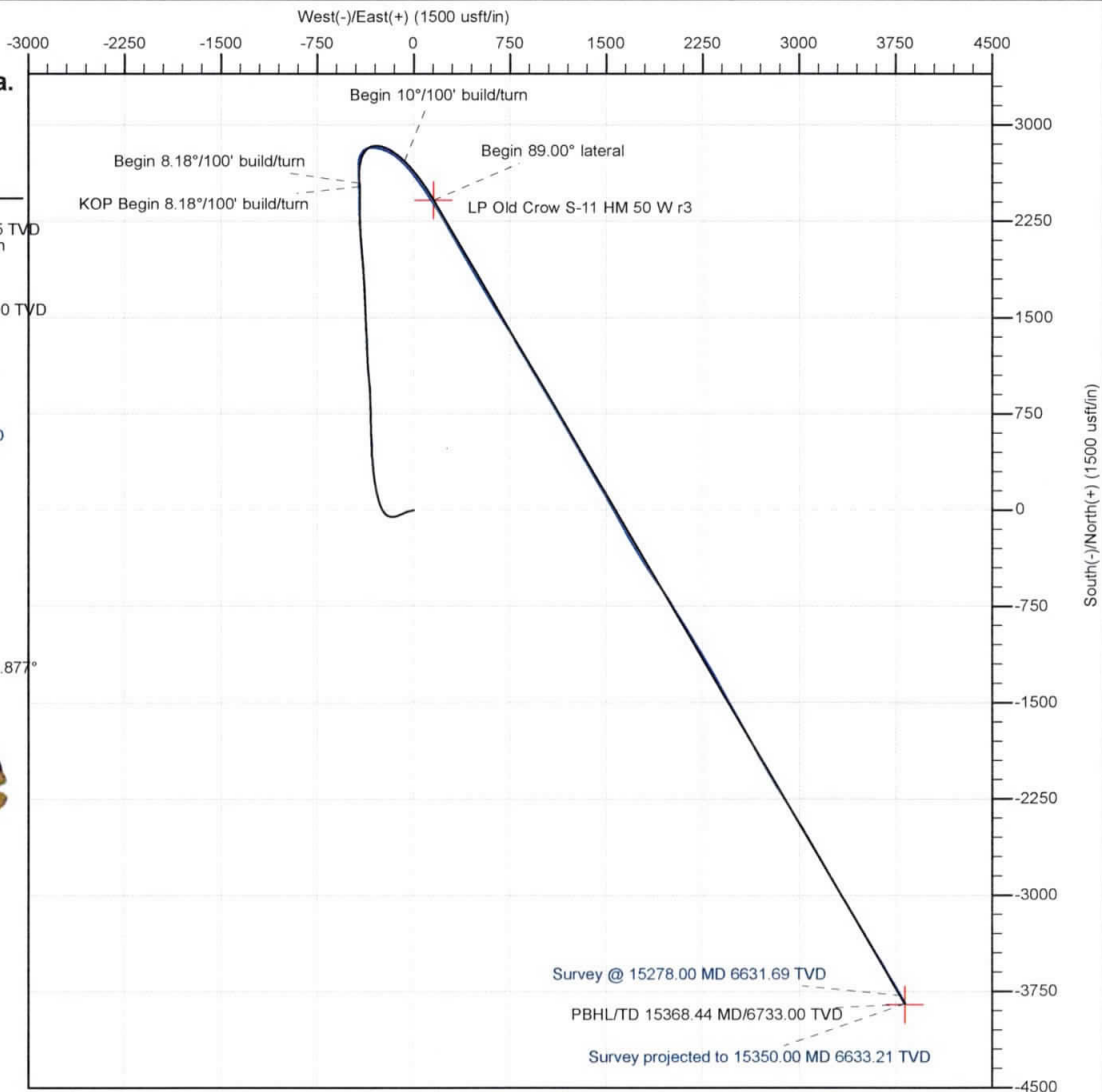
Magnetic Field  
 Strength: 51892.8snT  
 Dip Angle: 66.75°  
 Date: 11/28/2019  
 Model: IGRF2015

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=1265+26 @ 1291.00usft (Nabors B 28)

Northing: 14446101.29    Easting: 1707029.28    Latitude: 39.77832202    Longitude: -80.76290613

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.877°



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

<b>Site</b>	Old Crow Pad				
<b>Site Position:</b>		<b>Northing:</b>	14,446,179.89 usft	<b>Latitude:</b>	39.77853828
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,706,970.33 usft	<b>Longitude:</b>	-80.76311519
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.152 °

<b>Well</b>	Old Crow S-11 HM (slot T)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,446,101.30 usft	<b>Latitude:</b>	39.77832202
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,707,029.28 usft	<b>Longitude:</b>	-80.76290613
<b>Position Uncertainty</b>		0.00 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	1,265.00 usft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	11/28/2019	-8.725	66.752	51,892.79177457

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	135.19	

<b>Survey Program</b>	<b>Date</b>	12/3/2019			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
173.00	993.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,064.00	2,825.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,898.00	6,462.00	MWD (Original Hole)	MWD	MWD - Standard	
6,484.00	15,278.00	MWD lat (Original Hole)	MWD	MWD - Standard	
15,350.00	15,350.00	Projection (Original Hole)	MWD	MWD - Standard	

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<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
173.00	0.44	295.15	173.00	0.28	-0.60	-0.62	0.25	0.25	0.00	
<b>MWD surveys</b>										
234.00	0.35	305.88	234.00	0.49	-0.96	-1.03	0.19	-0.15	17.59	
281.00	0.18	288.30	281.00	0.60	-1.15	-1.24	0.40	-0.36	-37.40	
324.00	0.13	312.03	324.00	0.65	-1.25	-1.34	0.19	-0.12	55.19	
371.00	0.09	301.57	371.00	0.71	-1.32	-1.43	0.09	-0.09	-22.26	

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<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
414.00	0.04	134.40	414.00	0.71	-1.34	-1.45	0.30	-0.12	-388.77
461.00	0.22	195.66	461.00	0.62	-1.35	-1.39	0.43	0.38	130.34
504.00	0.22	224.84	503.99	0.48	-1.43	-1.35	0.26	0.00	67.86
551.00	0.22	167.18	550.99	0.33	-1.48	-1.27	0.45	0.00	-122.68
594.00	0.09	109.53	593.99	0.23	-1.43	-1.17	0.44	-0.30	-134.07
688.00	0.18	187.75	687.99	0.06	-1.38	-1.02	0.20	0.10	83.21
781.00	0.04	313.17	780.99	-0.06	-1.42	-0.96	0.22	-0.15	134.86
875.00	0.04	131.06	874.99	-0.06	-1.42	-0.96	0.09	0.00	189.25
970.00	0.18	247.34	969.99	-0.14	-1.53	-0.98	0.21	0.15	122.40
993.00	0.09	214.56	992.99	-0.17	-1.58	-0.99	0.50	-0.39	-142.52
1,064.00	0.22	170.61	1,063.99	-0.35	-1.59	-0.87	0.24	0.18	-61.90
1,159.00	1.49	242.77	1,158.98	-1.09	-2.65	-1.10	1.51	1.34	75.96
1,254.00	3.74	251.91	1,253.88	-2.62	-6.70	-2.86	2.40	2.37	9.62
1,349.00	5.23	258.42	1,348.59	-4.45	-13.89	-6.63	1.65	1.57	6.85
1,443.00	6.77	259.56	1,442.07	-6.31	-23.53	-12.10	1.64	1.64	1.21
1,538.00	8.53	254.02	1,536.22	-9.27	-35.81	-18.66	2.01	1.85	-5.83
1,632.00	9.67	247.25	1,629.04	-14.24	-49.80	-24.99	1.66	1.21	-7.20
1,728.00	11.51	248.40	1,723.40	-20.89	-66.14	-31.79	1.93	1.92	1.20
1,826.00	12.48	247.17	1,819.26	-28.59	-84.99	-39.61	1.02	0.99	-1.26
1,922.00	12.17	244.09	1,913.05	-37.04	-103.65	-46.77	0.76	-0.32	-3.21
2,016.00	12.88	247.78	2,004.81	-45.33	-122.26	-54.01	1.14	0.76	3.93
2,111.00	12.74	259.82	2,097.46	-51.19	-142.38	-64.03	2.81	-0.15	12.67
2,206.00	12.44	271.16	2,190.19	-52.83	-162.92	-77.34	2.62	-0.32	11.94
2,301.00	12.26	285.40	2,283.02	-49.95	-182.88	-93.45	3.20	-0.19	14.99
2,396.00	11.25	299.20	2,376.04	-42.75	-200.70	-111.12	3.14	-1.06	14.53
2,491.00	12.48	314.23	2,469.03	-31.06	-216.15	-130.30	3.49	1.29	15.82
2,586.00	14.55	322.66	2,561.40	-14.41	-230.74	-152.40	3.00	2.18	8.87
2,680.00	15.51	330.13	2,652.20	5.88	-244.17	-176.25	2.30	1.02	7.95
2,775.00	17.80	339.19	2,743.22	30.47	-255.65	-201.80	3.64	2.41	9.54
2,825.00	19.64	342.61	2,790.57	45.64	-260.88	-216.24	4.28	3.68	6.84
2,898.00	21.88	344.28	2,858.83	70.44	-268.23	-239.02	3.17	3.07	2.29
3,056.00	28.34	347.36	3,001.83	135.45	-284.44	-296.55	4.17	4.09	1.95
3,154.00	30.94	348.77	3,087.00	182.86	-294.43	-337.24	2.75	2.65	1.44
3,249.00	32.04	352.46	3,168.02	231.80	-302.50	-377.64	2.34	1.16	3.88
3,343.00	34.15	352.55	3,246.76	282.69	-309.19	-418.46	2.25	2.24	0.10
3,438.00	36.43	355.45	3,324.31	337.26	-314.89	-461.19	2.98	2.40	3.05
3,532.00	40.03	355.80	3,398.13	395.25	-319.32	-505.45	3.84	3.83	0.37
3,627.00	42.80	357.91	3,469.37	457.98	-322.73	-552.36	3.26	3.92	2.22
3,721.00	46.58	358.17	3,536.19	524.04	-324.99	-600.82	4.03	4.02	0.28
3,815.00	48.47	357.29	3,599.66	593.31	-327.74	-651.90	2.13	2.01	-0.94
3,909.00	46.14	358.52	3,663.40	662.35	-330.28	-702.67	2.68	2.48	1.31
4,003.00	47.68	358.00	3,727.61	730.96	-332.37	-752.81	1.69	1.64	-0.55
4,098.00	45.04	359.31	3,793.17	799.68	-334.00	-802.72	2.95	2.78	1.38
4,192.00	45.70	358.26	3,859.21	866.56	-335.42	-851.17	1.06	0.70	-1.12

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<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,287.00	46.05	356.41	3,925.35	934.67	-338.59	-901.72	1.45	0.37	-1.95
4,381.00	44.38	354.22	3,991.57	1,001.16	-344.03	-952.72	2.43	-1.78	-2.33
4,475.00	45.97	354.30	4,057.84	1,067.49	-350.69	-1,004.48	1.69	1.69	0.09
4,570.00	45.67	356.50	4,124.05	1,135.39	-356.16	-1,056.50	1.69	-0.32	2.32
4,665.00	44.78	358.08	4,190.96	1,202.75	-359.35	-1,106.54	1.51	-0.94	1.66
4,759.00	44.91	357.73	4,257.61	1,269.00	-361.78	-1,155.24	0.30	0.14	-0.37
4,854.00	43.77	357.91	4,325.55	1,335.34	-364.30	-1,204.09	1.21	-1.20	0.19
4,948.00	45.31	357.47	4,392.55	1,401.22	-366.97	-1,252.70	1.67	1.64	-0.47
5,043.00	44.69	357.82	4,459.72	1,468.34	-369.73	-1,302.27	0.70	-0.65	0.37
5,137.00	45.57	357.29	4,526.04	1,534.89	-372.57	-1,351.49	1.02	0.94	-0.56
5,232.00	45.75	357.47	4,592.44	1,602.77	-375.68	-1,401.83	0.23	0.19	0.19
5,327.00	44.87	358.08	4,659.25	1,670.25	-378.30	-1,451.56	1.03	-0.93	0.64
5,421.00	45.44	356.15	4,725.54	1,736.81	-381.66	-1,501.14	1.58	0.61	-2.05
5,516.00	45.26	356.76	4,792.30	1,804.26	-385.84	-1,551.94	0.49	-0.19	0.64
5,611.00	44.91	356.94	4,859.38	1,871.44	-389.54	-1,602.20	0.39	-0.37	0.19
5,705.00	43.81	356.15	4,926.58	1,937.04	-393.49	-1,651.53	1.31	-1.17	-0.84
5,799.00	44.30	353.86	4,994.14	2,002.14	-399.19	-1,701.73	1.77	0.52	-2.44
5,894.00	41.97	354.74	5,063.46	2,066.77	-405.65	-1,752.13	2.53	-2.45	0.93
5,988.00	41.66	355.45	5,133.52	2,129.21	-411.01	-1,800.21	0.60	-0.33	0.76
6,083.00	42.06	356.59	5,204.28	2,192.45	-415.41	-1,848.17	0.90	0.42	1.20
6,178.00	45.97	0.10	5,272.59	2,258.40	-417.24	-1,896.26	4.85	4.12	3.69
6,273.00	47.94	359.75	5,337.44	2,327.82	-417.34	-1,945.57	2.09	2.07	-0.37
6,367.00	48.25	0.37	5,400.22	2,397.78	-417.26	-1,995.15	0.59	0.33	0.66
6,462.00	49.26	358.96	5,462.85	2,469.21	-417.69	-2,046.12	1.54	1.06	-1.48
6,484.00	49.05	357.54	5,477.24	2,485.84	-418.19	-2,058.28	4.98	-0.95	-6.45
6,532.00	48.70	357.10	5,508.81	2,521.96	-419.89	-2,085.10	1.00	-0.73	-0.92
6,580.00	46.99	356.66	5,541.02	2,557.49	-421.82	-2,111.67	3.63	-3.56	-0.92
6,627.00	45.14	357.10	5,573.63	2,591.28	-423.66	-2,136.94	3.99	-3.94	0.94
6,675.00	41.71	357.98	5,608.49	2,624.24	-425.09	-2,161.33	7.26	-7.15	1.83
6,722.00	37.71	359.38	5,644.64	2,654.25	-425.79	-2,183.12	8.72	-8.51	2.98
6,769.00	33.93	1.40	5,682.74	2,681.75	-425.63	-2,202.51	8.43	-8.04	4.30
6,816.00	32.09	6.24	5,722.16	2,707.28	-423.95	-2,219.44	6.84	-3.91	10.30
6,863.00	30.55	11.95	5,762.32	2,731.39	-420.12	-2,233.84	7.11	-3.28	12.15
6,910.00	28.79	16.08	5,803.16	2,753.95	-414.51	-2,245.89	5.74	-3.74	8.79
6,957.00	24.97	24.69	5,845.09	2,773.85	-407.23	-2,254.88	11.59	-8.13	18.32
7,004.00	22.20	36.65	5,888.19	2,790.00	-397.78	-2,259.68	11.74	-5.89	25.45
7,052.00	21.32	48.25	5,932.79	2,803.10	-385.85	-2,260.56	9.13	-1.88	24.17
7,099.00	21.10	59.67	5,976.62	2,813.06	-372.17	-2,257.99	8.79	6.42	24.30
7,147.00	20.79	70.75	6,021.47	2,820.24	-356.66	-2,252.15	8.27	0.65	23.08
7,194.00	22.07	82.44	6,065.24	2,824.15	-340.02	-2,243.20	9.47	2.72	24.87
7,242.00	25.41	91.23	6,109.18	2,825.12	-320.78	-2,230.32	10.12	6.96	18.31
7,289.00	28.75	96.06	6,151.03	2,823.71	-299.45	-2,214.29	8.50	7.11	10.28
7,336.00	31.25	99.66	6,191.73	2,820.47	-276.18	-2,195.59	6.55	5.32	7.66

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<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
7,383.00	34.42	105.82	6,231.23	2,814.80	-251.37	-2,174.08	9.79	6.74	13.11
7,431.00	37.54	110.74	6,270.08	2,805.91	-224.63	-2,148.94	8.86	6.50	10.25
7,478.00	39.82	114.78	6,306.77	2,794.53	-197.57	-2,121.79	7.24	4.85	8.60
7,524.00	41.58	119.53	6,341.65	2,780.83	-170.90	-2,093.28	7.74	3.83	10.33
7,571.00	41.80	127.00	6,376.77	2,763.71	-144.81	-2,062.74	10.58	0.47	15.89
7,618.00	46.24	130.25	6,410.56	2,743.30	-119.33	-2,030.30	10.60	9.45	6.91
7,665.00	50.73	132.80	6,441.71	2,719.96	-93.01	-1,995.20	10.38	9.55	5.43
7,712.00	54.95	136.75	6,470.10	2,693.57	-66.46	-1,957.76	11.20	8.98	8.40
7,759.00	59.69	138.42	6,495.47	2,664.36	-39.80	-1,918.25	10.52	10.09	3.55
7,807.00	63.78	141.06	6,518.20	2,632.10	-12.50	-1,876.12	9.80	8.52	5.50
7,854.00	68.75	142.91	6,537.12	2,598.20	13.98	-1,833.42	11.17	10.57	3.94
7,901.00	74.24	144.58	6,552.03	2,562.27	40.31	-1,789.36	12.16	11.68	3.55
7,948.00	78.15	145.28	6,563.24	2,524.92	66.53	-1,744.39	8.44	8.32	1.49
7,996.00	80.35	146.42	6,572.19	2,485.90	93.00	-1,698.05	5.14	4.58	2.38
8,043.00	81.14	146.07	6,579.75	2,447.33	118.78	-1,652.52	1.83	1.68	-0.74
8,090.00	81.10	145.90	6,587.01	2,408.84	144.75	-1,606.91	0.37	-0.09	-0.36
8,137.00	81.10	145.90	6,594.28	2,370.39	170.79	-1,561.28	0.00	0.00	0.00
8,185.00	85.01	148.53	6,600.08	2,330.34	196.58	-1,514.69	9.79	8.15	5.48
8,232.00	87.65	149.76	6,603.09	2,290.08	220.63	-1,469.18	6.19	5.62	2.62
8,277.00	87.87	149.85	6,604.85	2,251.22	243.24	-1,425.67	0.53	0.49	0.20
8,371.00	89.45	150.29	6,607.05	2,169.78	290.13	-1,334.85	1.74	1.68	0.47
8,466.00	89.58	150.91	6,607.85	2,087.01	336.76	-1,243.27	0.67	0.14	0.65
8,560.00	89.19	150.11	6,608.86	2,005.20	383.03	-1,152.62	0.95	-0.41	-0.85
8,654.00	88.88	149.85	6,610.45	1,923.82	430.06	-1,061.74	0.43	-0.33	-0.28
8,747.00	88.84	149.76	6,612.30	1,843.45	476.82	-971.77	0.11	-0.04	-0.10
8,841.00	88.66	149.85	6,614.35	1,762.23	524.09	-880.84	0.21	-0.19	0.10
8,936.00	88.84	148.80	6,616.42	1,680.54	572.54	-788.74	1.12	0.19	-1.11
9,030.00	90.77	149.41	6,616.74	1,599.88	620.80	-697.50	2.15	2.05	0.65
9,125.00	89.80	148.00	6,616.27	1,518.71	670.15	-605.13	1.80	-1.02	-1.48
9,220.00	90.42	147.13	6,616.08	1,438.53	721.10	-512.34	1.12	0.65	-0.92
9,315.00	91.52	149.76	6,614.47	1,357.60	770.80	-419.90	3.00	1.16	2.77
9,409.00	91.56	149.85	6,611.95	1,276.38	818.06	-328.97	0.10	0.04	0.10
9,504.00	89.80	149.06	6,610.82	1,194.57	866.34	-236.91	2.03	-1.85	-0.83
9,598.00	89.23	149.06	6,611.62	1,113.95	914.66	-145.66	0.61	-0.61	0.00
9,694.00	88.75	148.71	6,613.31	1,031.78	964.26	-52.40	0.62	-0.50	0.36
9,789.00	89.80	150.29	6,614.51	949.93	1,012.47	39.64	2.00	0.74	1.66
9,885.00	89.67	150.47	6,614.96	866.48	1,059.92	132.28	0.23	0.19	0.19
9,980.00	89.54	150.11	6,615.61	783.97	1,107.00	224.00	0.40	0.75	1.02
10,075.00	90.51	150.20	6,615.57	701.57	1,154.28	315.78	1.03	-0.75	-0.74
10,170.00	89.80	149.50	6,615.31	619.42	1,201.99	407.68	1.05	-0.75	-0.65
10,265.00	89.05	148.88	6,616.27	537.84	1,250.65	499.85	1.02	-0.75	-0.65
10,359.00	88.26	148.71	6,618.47	457.46	1,299.34	591.19	0.86	-0.84	-0.18
10,454.00	89.27	150.20	6,620.52	375.66	1,347.60	683.24	1.89	1.06	1.57

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,549.00	89.58	150.38	6,621.47	293.16	1,394.68	774.95	0.38	0.33	0.19
10,643.00	89.54	150.03	6,622.19	211.59	1,441.39	865.74	0.37	-0.04	-0.37
10,738.00	89.63	149.85	6,622.88	129.36	1,488.98	957.60	0.21	0.09	-0.19
10,833.00	89.76	151.43	6,623.39	46.57	1,535.55	1,049.17	1.67	0.14	1.66
10,928.00	89.85	151.26	6,623.71	-36.79	1,581.11	1,140.42	0.20	0.09	-0.18
11,023.00	89.71	150.99	6,624.08	-119.98	1,626.98	1,231.76	0.32	-0.15	-0.28
11,118.00	89.80	150.47	6,624.48	-202.85	1,673.43	1,323.29	0.56	0.09	-0.55
11,213.00	90.68	149.76	6,624.08	-285.22	1,720.76	1,415.08	1.19	0.93	-0.75
11,307.00	88.97	146.77	6,624.37	-365.15	1,770.20	1,506.63	3.66	-1.82	-3.18
11,402.00	88.84	147.13	6,626.19	-444.76	1,822.00	1,599.62	0.40	-0.14	0.38
11,496.00	88.70	147.13	6,628.21	-523.70	1,873.01	1,691.56	0.15	-0.15	0.00
11,590.00	89.27	146.60	6,629.87	-602.40	1,924.38	1,783.60	0.83	0.61	-0.56
11,685.00	90.46	148.88	6,630.09	-682.73	1,975.08	1,876.33	2.71	1.25	2.40
11,779.00	89.71	147.74	6,629.95	-762.71	2,024.46	1,967.87	1.45	-0.80	-1.21
11,873.00	89.98	148.18	6,630.21	-842.39	2,074.33	2,059.54	0.55	0.29	0.47
11,968.00	89.85	147.65	6,630.35	-922.88	2,124.79	2,152.21	0.57	-0.14	-0.56
12,061.00	89.41	148.88	6,630.95	-1,001.97	2,173.71	2,242.79	1.40	-0.47	1.32
12,156.00	90.68	150.82	6,630.88	-1,084.11	2,221.42	2,334.69	2.44	1.34	2.04
12,250.00	89.41	148.71	6,630.80	-1,165.32	2,268.75	2,425.66	2.62	-1.35	-2.24
12,345.00	89.49	148.97	6,631.71	-1,246.61	2,317.90	2,517.97	0.29	0.08	0.27
12,439.00	91.43	151.70	6,630.96	-1,328.28	2,364.42	2,608.69	3.56	2.06	2.90
12,533.00	91.08	151.43	6,628.90	-1,410.92	2,409.16	2,698.86	0.47	-0.37	-0.29
12,628.00	91.03	151.26	6,627.15	-1,494.27	2,454.71	2,790.09	0.19	-0.05	-0.18
12,723.00	91.21	150.99	6,625.29	-1,577.44	2,500.58	2,881.42	0.34	0.19	-0.28
12,818.00	91.12	150.73	6,623.36	-1,660.40	2,546.83	2,972.87	0.29	-0.09	-0.27
12,912.00	90.81	150.64	6,621.78	-1,742.35	2,592.85	3,063.44	0.34	-0.33	-0.10
13,007.00	90.46	150.73	6,620.73	-1,825.18	2,639.36	3,154.98	0.38	-0.37	0.09
13,101.00	90.59	150.91	6,619.87	-1,907.25	2,685.18	3,245.50	0.24	0.14	0.19
13,196.00	89.98	149.76	6,619.39	-1,989.79	2,732.20	3,337.20	1.37	-0.64	-1.21
13,290.00	88.88	148.88	6,620.33	-2,070.63	2,780.16	3,428.35	1.50	-1.17	-0.94
13,385.00	88.40	149.06	6,622.58	-2,152.01	2,829.12	3,520.59	0.54	-0.51	0.19
13,479.00	88.79	148.88	6,624.89	-2,232.54	2,877.56	3,611.86	0.46	0.41	-0.19
13,574.00	88.35	149.06	6,627.26	-2,313.91	2,926.51	3,704.09	0.50	-0.46	0.19
13,669.00	89.54	149.24	6,629.01	-2,395.46	2,975.22	3,796.27	1.27	1.25	0.19
13,763.00	91.03	149.85	6,628.54	-2,476.49	3,022.86	3,887.33	1.71	-0.18	0.65
13,857.00	91.38	149.76	6,626.56	-2,557.71	3,070.13	3,978.27	0.38	-0.18	-0.10
13,952.00	91.21	149.67	6,624.42	-2,639.73	3,118.03	4,070.21	0.20	-0.18	-0.09
14,047.00	90.90	149.76	6,622.67	-2,721.75	3,165.93	4,162.15	0.34	-0.18	0.09
14,141.00	89.76	149.32	6,622.13	-2,802.77	3,213.58	4,253.22	1.30	-1.21	0.09
14,236.00	89.19	149.41	6,623.00	-2,884.51	3,261.98	4,345.32	0.61	-0.00	0.09
14,331.00	89.19	149.24	6,624.34	-2,966.21	3,310.44	4,437.43	0.18	0.00	-0.18
14,425.00	88.97	149.76	6,625.85	-3,047.19	3,358.15	4,528.51	0.60	-0.23	0.55
14,520.00	88.66	149.32	6,627.81	-3,129.06	3,406.30	4,620.52	0.57	-0.33	-0.46
14,615.00	90.20	149.94	6,628.76	-3,211.02	3,454.32	4,712.51	1.75	1.62	0.65

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,710.00	89.89	149.41	6,628.68	-3,293.02	3,502.29	4,804.49	0.65	-0.33	-0.56
14,805.00	89.93	149.32	6,628.83	-3,374.76	3,550.70	4,896.60	0.10	0.04	-0.09
14,900.00	90.11	148.80	6,628.80	-3,456.24	3,599.54	4,988.83	0.58	0.19	-0.55
14,996.00	89.67	148.80	6,628.98	-3,538.36	3,649.27	5,082.13	0.46	-0.46	0.00
15,091.00	89.63	149.50	6,629.56	-3,619.91	3,697.98	5,174.32	0.74	-0.04	0.74
15,184.00	89.49	149.94	6,630.28	-3,700.22	3,744.88	5,264.35	0.50	-0.15	0.47
15,278.00	88.79	149.85	6,631.69	-3,781.53	3,792.02	5,355.26	0.75	-0.74	-0.10
<b>Survey @ 15278.00 MD 6631.69 TVD</b>									
15,350.00	88.79	149.85	6,633.21	-3,843.78	3,828.17	5,424.90	0.00	0.00	0.00
<b>Survey projected to 15350.00 MD 6633.21 TVD</b>									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
173.00	173.00	0.28	-0.60	MWD surveys
15,278.00	6,631.69	-3,781.53	3,792.02	Survey @ 15278.00 MD 6631.69 TVD

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

<b>Site</b>	Old Crow Pad				
<b>Site Position:</b>		<b>Northing:</b>	14,446,179.89 usft	<b>Latitude:</b>	39.77853828
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,706,970.33 usft	<b>Longitude:</b>	-80.76311519
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.152 °

<b>Well</b>	Old Crow S-11 HM (slot T)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,446,101.30 usft	<b>Latitude:</b>	39.77832202
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,707,029.28 usft	<b>Longitude:</b>	-80.76290613
<b>Position Uncertainty</b>	0.00 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	1,265.00 usft	

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination</b>	<b>Dip Angle</b>	<b>Field Strength</b>
	IGRF2015	11/28/2019	(°)	(°)	(nT)
			-8.725	66.752	51,892.79177457

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD)</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Direction</b>	
	(usft)	(usft)	(usft)	(°)	
	0.00	0.00	0.00	135.19	

<b>Survey Program</b>	<b>Date</b>	12/3/2019			
<b>From</b>	<b>To</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
(usft)	(usft)				
173.00	993.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,064.00	2,825.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,898.00	6,462.00	MWD (Original Hole)	MWD	MWD - Standard	
6,484.00	15,278.00	MWD lat (Original Hole)	MWD	MWD - Standard	
15,350.00	15,350.00	Projection (Original Hole)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured</b>	<b>Inclination</b>	<b>Azimuth</b>	<b>Vertical</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Map</b>	<b>Map</b>	<b>Latitude</b>	<b>Longitude</b>	
<b>Depth</b>	(°)	(°)	<b>Depth</b>	<b>(usft)</b>	<b>(usft)</b>	<b>Northing</b>	<b>Easting</b>			
<b>(usft)</b>			<b>(usft)</b>			<b>(usft)</b>	<b>(usft)</b>			
0.00	0.00	0.00	0.00	0.00	0.00	14,446,101.30	1,707,029.28	39.77832202	-80.76290613	
173.00	0.44	295.15	173.00	0.28	-0.60	14,446,101.58	1,707,028.67	39.77832280	-80.76290827	
<b>MWD surveys</b>										
234.00	0.35	305.88	234.00	0.49	-0.96	14,446,101.79	1,707,028.31	39.77832338	-80.76290956	
281.00	0.18	288.30	281.00	0.60	-1.15	14,446,101.90	1,707,028.12	39.77832367	-80.76291022	
324.00	0.13	312.03	324.00	0.65	-1.25	14,446,101.95	1,707,028.02	39.77832382	-80.76291058	
371.00	0.09	301.57	371.00	0.71	-1.32	14,446,102.00	1,707,027.95	39.77832397	-80.76291083	
414.00	0.04	134.40	414.00	0.71	-1.34	14,446,102.01	1,707,027.93	39.77832399	-80.76291089	

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
461.00	0.22	195.66	461.00	0.62	-1.35	14,446,101.91	1,707,027.92	39.77832372	-80.76291094
504.00	0.22	224.84	503.99	0.48	-1.43	14,446,101.78	1,707,027.84	39.77832335	-80.76291123
551.00	0.22	167.18	550.99	0.33	-1.48	14,446,101.62	1,707,027.80	39.77832293	-80.76291138
594.00	0.09	109.53	593.99	0.23	-1.43	14,446,101.53	1,707,027.85	39.77832268	-80.76291121
688.00	0.18	187.75	687.99	0.06	-1.38	14,446,101.36	1,707,027.90	39.77832221	-80.76291103
781.00	0.04	313.17	780.99	-0.06	-1.42	14,446,101.24	1,707,027.85	39.77832187	-80.76291119
875.00	0.04	131.06	874.99	-0.06	-1.42	14,446,101.24	1,707,027.86	39.77832187	-80.76291118
970.00	0.18	247.34	969.99	-0.14	-1.53	14,446,101.16	1,707,027.74	39.77832165	-80.76291159
993.00	0.09	214.56	992.99	-0.17	-1.58	14,446,101.13	1,707,027.70	39.77832158	-80.76291174
1,064.00	0.22	170.61	1,063.99	-0.35	-1.59	14,446,100.95	1,707,027.69	39.77832108	-80.76291178
1,159.00	1.49	242.77	1,158.98	-1.09	-2.65	14,446,100.21	1,707,026.62	39.77831904	-80.76291559
1,254.00	3.74	251.91	1,253.88	-2.62	-6.70	14,446,098.68	1,707,022.58	39.77831488	-80.76292999
1,349.00	5.23	258.42	1,348.59	-4.45	-13.89	14,446,096.85	1,707,015.39	39.77830990	-80.76295559
1,443.00	6.77	259.56	1,442.07	-6.31	-23.53	14,446,094.98	1,707,005.74	39.77830485	-80.76298995
1,538.00	8.53	254.02	1,536.22	-9.27	-35.81	14,446,092.03	1,706,993.46	39.77829683	-80.76303369
1,632.00	9.67	247.25	1,629.04	-14.24	-49.80	14,446,087.06	1,706,979.48	39.77828327	-80.76308350
1,728.00	11.51	248.40	1,723.40	-20.89	-66.14	14,446,080.41	1,706,963.14	39.77826514	-80.76314173
1,826.00	12.48	247.17	1,819.26	-28.59	-84.99	14,446,072.70	1,706,944.29	39.77824411	-80.76320890
1,922.00	12.17	244.09	1,913.05	-37.04	-103.65	14,446,064.26	1,706,925.62	39.77822105	-80.76327540
2,016.00	12.88	247.78	2,004.81	-45.33	-122.26	14,446,055.97	1,706,907.01	39.77819842	-80.76334172
2,111.00	12.74	259.82	2,097.46	-51.19	-142.38	14,446,050.11	1,706,886.90	39.77818248	-80.76341338
2,206.00	12.44	271.16	2,190.19	-52.83	-162.92	14,446,048.46	1,706,866.35	39.77817811	-80.76348651
2,301.00	12.26	285.40	2,283.02	-49.95	-182.88	14,446,051.35	1,706,846.39	39.77818618	-80.76355752
2,396.00	11.25	299.20	2,376.04	-42.75	-200.70	14,446,058.55	1,706,828.58	39.77820609	-80.76362087
2,491.00	12.48	314.23	2,469.03	-31.06	-216.15	14,446,070.24	1,706,813.13	39.77823829	-80.76367575
2,586.00	14.55	322.66	2,561.40	-14.41	-230.74	14,446,086.89	1,706,798.53	39.77828412	-80.76372754
2,680.00	15.51	330.13	2,652.20	5.88	-244.17	14,446,107.18	1,706,785.11	39.77833994	-80.76377513
2,775.00	17.80	339.19	2,743.22	30.47	-255.65	14,446,131.77	1,706,773.62	39.77840756	-80.76381579
2,825.00	19.64	342.61	2,790.57	45.64	-260.88	14,446,146.93	1,706,768.39	39.77844925	-80.76383425
2,898.00	21.88	344.28	2,858.83	70.44	-268.23	14,446,171.74	1,706,761.04	39.77851742	-80.76386019
3,056.00	28.34	347.36	3,001.83	135.45	-284.44	14,446,236.74	1,706,744.84	39.77869605	-80.76391724
3,154.00	30.94	348.77	3,087.00	182.86	-294.43	14,446,284.16	1,706,734.84	39.77882634	-80.76395238
3,249.00	32.04	352.46	3,168.02	231.80	-302.50	14,446,333.10	1,706,726.78	39.77896081	-80.76398062
3,343.00	34.15	352.55	3,246.76	282.69	-309.19	14,446,383.99	1,706,720.08	39.77910060	-80.76400397
3,438.00	36.43	355.45	3,324.31	337.26	-314.89	14,446,438.55	1,706,714.39	39.77925051	-80.76402373
3,532.00	40.03	355.80	3,398.13	395.25	-319.32	14,446,496.55	1,706,709.96	39.77940980	-80.76403896
3,627.00	42.80	357.91	3,469.37	457.98	-322.73	14,446,559.28	1,706,706.54	39.77958211	-80.76405052
3,721.00	46.58	358.17	3,536.19	524.04	-324.99	14,446,625.34	1,706,704.29	39.77976354	-80.76405793
3,815.00	48.47	357.29	3,599.66	593.31	-327.74	14,446,694.61	1,706,701.53	39.77995380	-80.76406708
3,909.00	46.14	358.52	3,663.40	662.35	-330.28	14,446,763.64	1,706,698.99	39.78014340	-80.76407548
4,003.00	47.68	358.00	3,727.61	730.96	-332.37	14,446,832.26	1,706,696.91	39.78033185	-80.76408226
4,098.00	45.04	359.31	3,793.17	799.68	-334.00	14,446,900.98	1,706,695.28	39.78052059	-80.76408742
4,192.00	45.70	358.26	3,859.21	866.56	-335.42	14,446,967.86	1,706,693.85	39.78070427	-80.76409186
4,287.00	46.05	356.41	3,925.35	934.67	-338.59	14,447,035.97	1,706,690.68	39.78089135	-80.76410252
4,381.00	44.38	354.22	3,991.57	1,001.16	-344.03	14,447,102.46	1,706,685.25	39.78107397	-80.76412122
4,475.00	45.97	354.30	4,057.84	1,067.49	-350.69	14,447,168.79	1,706,678.58	39.78125619	-80.76414433
4,570.00	45.67	356.50	4,124.05	1,135.39	-356.16	14,447,236.69	1,706,673.12	39.78143842	-80.76416315
4,665.00	44.78	358.08	4,190.96	1,202.75	-359.35	14,447,304.05	1,706,669.92	39.78162172	-80.76417389
4,759.00	44.91	357.73	4,257.61	1,269.00	-361.78	14,447,370.29	1,706,667.50	39.78180966	-80.76418190
4,854.00	43.77	357.91	4,325.55	1,335.34	-364.30	14,447,436.64	1,706,664.97	39.78199788	-80.76419027
4,948.00	45.31	357.47	4,392.55	1,401.22	-366.97	14,447,502.52	1,706,662.31	39.78217282	-80.76419912
5,043.00	44.69	357.82	4,459.72	1,468.34	-369.73	14,447,569.64	1,706,659.55	39.78235716	-80.76420832
5,137.00	45.57	357.29	4,526.04	1,534.89	-372.57	14,447,636.19	1,706,656.70	39.78253996	-80.76421782
5,232.00	45.75	357.47	4,592.44	1,602.77	-375.68	14,447,704.07	1,706,653.60	39.78272639	-80.76422824
5,327.00	44.87	358.08	4,659.25	1,670.25	-378.30	14,447,771.55	1,706,650.97	39.78291174	-80.76423695

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,421.00	45.44	356.15	4,725.54	1,736.81	-381.66	14,447,838.11	1,706,647.61	39.78309454	-80.76424829
5,516.00	45.26	356.76	4,792.30	1,804.26	-385.84	14,447,905.56	1,706,643.43	39.78327982	-80.76426253
5,611.00	44.91	356.94	4,859.38	1,871.44	-389.54	14,447,972.73	1,706,639.74	39.78346432	-80.76427506
5,705.00	43.81	356.15	4,926.58	1,937.04	-393.49	14,448,038.33	1,706,635.78	39.78364451	-80.76428853
5,799.00	44.30	353.86	4,994.14	2,002.14	-399.19	14,448,103.44	1,706,630.09	39.78382335	-80.76430820
5,894.00	41.97	354.74	5,063.46	2,066.77	-405.65	14,448,168.06	1,706,623.62	39.78400087	-80.76433059
5,988.00	41.66	355.45	5,133.52	2,129.21	-411.01	14,448,230.51	1,706,618.26	39.78417239	-80.76434908
6,083.00	42.06	356.59	5,204.28	2,192.45	-415.41	14,448,293.75	1,706,613.87	39.78434610	-80.76436414
6,178.00	45.97	0.10	5,272.59	2,258.40	-417.24	14,448,359.70	1,706,612.03	39.78452723	-80.76437006
6,273.00	47.94	359.75	5,337.44	2,327.82	-417.34	14,448,429.12	1,706,611.94	39.78471789	-80.76436974
6,367.00	48.25	0.37	5,400.22	2,397.78	-417.26	14,448,499.08	1,706,612.01	39.78491001	-80.76436882
6,462.00	49.26	358.96	5,462.85	2,469.21	-417.69	14,448,570.51	1,706,611.59	39.78510617	-80.76436966
6,484.00	49.05	357.54	5,477.24	2,485.84	-418.19	14,448,587.14	1,706,611.08	39.78515185	-80.76437131
6,532.00	48.70	357.10	5,508.81	2,521.96	-419.89	14,448,623.26	1,706,609.39	39.78525106	-80.76437699
6,580.00	46.99	356.66	5,541.02	2,557.49	-421.82	14,448,658.79	1,706,607.46	39.78534864	-80.76438355
6,627.00	45.14	357.10	5,573.63	2,591.28	-423.66	14,448,692.58	1,706,605.61	39.78544146	-80.76438980
6,675.00	41.71	357.98	5,608.49	2,624.24	-425.09	14,448,725.54	1,706,604.19	39.78553199	-80.76439456
6,722.00	37.71	359.38	5,644.64	2,654.25	-425.79	14,448,755.55	1,706,603.48	39.78561442	-80.76439679
6,769.00	33.93	1.40	5,682.74	2,681.75	-425.63	14,448,783.05	1,706,603.65	39.78568993	-80.76439595
6,816.00	32.09	6.24	5,722.16	2,707.28	-423.95	14,448,808.58	1,706,605.32	39.78576003	-80.76438973
6,863.00	30.55	11.95	5,762.32	2,731.39	-420.12	14,448,832.68	1,706,609.15	39.78582620	-80.76437587
6,910.00	28.79	16.08	5,803.16	2,753.95	-414.51	14,448,855.25	1,706,614.76	39.78588813	-80.76435569
6,957.00	24.97	24.69	5,845.09	2,773.85	-407.23	14,448,875.15	1,706,622.05	39.78594274	-80.76432958
7,004.00	22.20	36.65	5,888.19	2,790.00	-397.78	14,448,891.30	1,706,631.50	39.78598702	-80.76429578
7,052.00	21.32	48.25	5,932.79	2,803.10	-385.85	14,448,904.39	1,706,643.43	39.78602289	-80.76425320
7,099.00	21.10	59.67	5,976.62	2,813.06	-372.17	14,448,914.36	1,706,657.11	39.78605016	-80.76420440
7,147.00	20.79	70.75	6,021.47	2,820.24	-356.66	14,448,921.53	1,706,672.62	39.78606975	-80.76414914
7,194.00	22.07	82.44	6,065.24	2,824.15	-340.02	14,448,925.45	1,706,689.25	39.78608037	-80.76408988
7,242.00	25.41	91.23	6,109.18	2,825.12	-320.78	14,448,926.41	1,706,708.50	39.78608289	-80.76402136
7,289.00	28.75	96.06	6,151.03	2,823.71	-299.45	14,448,925.00	1,706,729.83	39.78607886	-80.76394544
7,336.00	31.25	99.66	6,191.73	2,820.47	-276.18	14,448,921.76	1,706,753.09	39.78606979	-80.76386266
7,383.00	34.42	105.82	6,231.23	2,814.80	-251.37	14,448,916.09	1,706,777.90	39.78605404	-80.76377439
7,431.00	37.54	110.74	6,270.08	2,805.91	-224.63	14,448,907.21	1,706,804.65	39.78602946	-80.76367929
7,478.00	39.82	114.78	6,306.77	2,794.53	-197.57	14,448,895.83	1,706,831.71	39.78599801	-80.76358306
7,524.00	41.58	119.53	6,341.65	2,780.83	-170.90	14,448,882.13	1,706,858.37	39.78596019	-80.76348828
7,571.00	41.80	127.00	6,376.77	2,763.71	-144.81	14,448,865.00	1,706,884.47	39.78591297	-80.76339555
7,618.00	46.24	130.25	6,410.56	2,743.30	-119.33	14,448,844.60	1,706,909.95	39.78585674	-80.76330505
7,665.00	50.73	132.80	6,441.71	2,719.96	-93.01	14,448,821.26	1,706,936.26	39.78579245	-80.76321158
7,712.00	54.95	136.75	6,470.10	2,693.57	-66.46	14,448,794.86	1,706,962.81	39.78571978	-80.76311732
7,759.00	59.69	138.42	6,495.47	2,664.36	-39.80	14,448,765.66	1,706,989.48	39.78563937	-80.76302269
7,807.00	63.78	141.06	6,518.20	2,632.10	-12.50	14,448,733.40	1,707,016.77	39.78555057	-80.76292582
7,854.00	68.75	142.91	6,537.12	2,598.20	13.98	14,448,699.50	1,707,043.25	39.78545730	-80.76283189
7,901.00	74.24	144.58	6,552.03	2,562.27	40.31	14,448,663.57	1,707,069.59	39.78535843	-80.76273848
7,948.00	78.15	145.28	6,563.24	2,524.92	66.53	14,448,626.22	1,707,095.81	39.78525567	-80.76264550
7,996.00	80.35	146.42	6,572.19	2,485.90	93.00	14,448,587.20	1,707,122.28	39.78514830	-80.76255165
8,043.00	81.14	146.07	6,579.75	2,447.33	118.78	14,448,548.63	1,707,148.05	39.78504220	-80.76246027
8,090.00	81.10	145.90	6,587.01	2,408.84	144.75	14,448,510.14	1,707,174.03	39.78493600	-80.76236816
8,137.00	81.10	145.90	6,594.28	2,370.39	170.79	14,448,471.69	1,707,200.06	39.78483052	-80.76227586
8,185.00	85.01	148.53	6,600.08	2,330.34	196.58	14,448,431.64	1,707,225.85	39.78472393	-80.76218444
8,232.00	87.65	149.76	6,603.09	2,290.08	220.63	14,448,391.38	1,707,249.90	39.78460960	-80.76209200
8,277.00	87.87	149.85	6,604.85	2,251.22	243.24	14,448,352.51	1,707,272.52	39.78450270	-80.76201907
8,371.00	89.45	150.29	6,607.05	2,169.78	290.13	14,448,271.07	1,707,319.40	39.78427871	-80.76185294
8,466.00	89.58	150.91	6,607.85	2,087.01	336.76	14,448,188.31	1,707,366.04	39.78405108	-80.76168773
8,560.00	89.19	150.11	6,608.86	2,005.20	383.03	14,448,106.50	1,707,412.31	39.78382605	-80.76152380
8,654.00	88.88	149.85	6,610.45	1,923.82	430.06	14,448,025.12	1,707,459.33	39.78360222	-80.76135720

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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,747.00	88.84	149.76	6,612.30	1,843.45	476.82	14,447,944.75	1,707,506.09	39.78338117	-80.76119150
8,841.00	88.66	149.85	6,614.35	1,762.23	524.09	14,447,863.53	1,707,553.36	39.78315776	-80.76102403
8,936.00	88.84	148.80	6,616.42	1,680.54	572.54	14,447,781.84	1,707,601.81	39.78293307	-80.76085234
9,030.00	90.77	149.41	6,616.74	1,599.88	620.80	14,447,701.18	1,707,650.08	39.78271121	-80.76068131
9,125.00	89.80	148.00	6,616.27	1,518.71	670.15	14,447,620.01	1,707,699.42	39.78248792	-80.76050644
9,220.00	90.42	147.13	6,616.08	1,438.53	721.10	14,447,539.83	1,707,750.37	39.78226735	-80.76032585
9,315.00	91.52	149.76	6,614.47	1,357.60	770.80	14,447,458.90	1,707,800.08	39.78204472	-80.76014970
9,409.00	91.56	149.85	6,611.95	1,276.38	818.06	14,447,377.68	1,707,847.34	39.78182133	-80.75998226
9,504.00	89.80	149.06	6,610.82	1,194.57	866.34	14,447,295.87	1,707,895.61	39.78159631	-80.75981121
9,598.00	89.23	149.06	6,611.62	1,113.95	914.66	14,447,215.25	1,707,943.94	39.78137455	-80.75963996
9,694.00	88.75	148.71	6,613.31	1,031.78	964.26	14,447,133.08	1,707,993.54	39.78114850	-80.75946419
9,789.00	89.80	150.29	6,614.51	949.93	1,012.47	14,447,051.23	1,708,041.75	39.78092338	-80.75929338
9,885.00	89.67	150.47	6,614.96	866.48	1,059.92	14,446,967.78	1,708,089.20	39.78069384	-80.75912529
9,980.00	89.54	150.11	6,615.61	783.97	1,107.00	14,446,885.27	1,708,136.28	39.78046690	-80.75895850
10,075.00	90.51	150.20	6,615.57	701.57	1,154.28	14,446,802.87	1,708,183.55	39.78024026	-80.75879102
10,170.00	89.80	149.50	6,615.31	619.42	1,201.99	14,446,720.72	1,708,231.27	39.78001431	-80.75862197
10,265.00	89.05	148.88	6,616.27	537.84	1,250.65	14,446,639.13	1,708,279.92	39.77978989	-80.75844957
10,359.00	88.26	148.71	6,618.47	457.46	1,299.34	14,446,558.76	1,708,328.61	39.77956879	-80.75827705
10,454.00	89.27	150.20	6,620.52	375.66	1,347.60	14,446,476.96	1,708,376.88	39.77934380	-80.75810604
10,549.00	89.58	150.38	6,621.47	293.16	1,394.68	14,446,394.45	1,708,423.96	39.77911686	-80.75793926
10,643.00	89.54	150.03	6,622.19	211.59	1,441.39	14,446,312.88	1,708,470.67	39.77889250	-80.75777380
10,738.00	89.63	149.85	6,622.88	129.36	1,488.98	14,446,230.66	1,708,518.25	39.77866635	-80.75760522
10,833.00	89.76	151.43	6,623.39	46.57	1,535.55	14,446,147.87	1,708,564.83	39.77843862	-80.75744024
10,928.00	89.85	151.26	6,623.71	-36.79	1,581.11	14,446,064.50	1,708,610.38	39.77820934	-80.75727890
11,023.00	89.71	150.99	6,624.08	-119.98	1,626.98	14,445,981.32	1,708,656.26	39.77798054	-80.75711643
11,118.00	89.80	150.47	6,624.48	-202.85	1,673.43	14,445,898.45	1,708,702.71	39.77775262	-80.75695191
11,213.00	90.68	149.76	6,624.08	-285.22	1,720.76	14,445,816.08	1,708,750.04	39.77752606	-80.75678423
11,307.00	88.97	146.77	6,624.37	-365.15	1,770.20	14,445,736.15	1,708,799.47	39.77730618	-80.75660906
11,402.00	88.84	147.13	6,626.19	-444.76	1,822.00	14,445,656.53	1,708,851.28	39.77708715	-80.75642546
11,496.00	88.70	147.13	6,628.21	-523.70	1,873.01	14,445,577.60	1,708,902.28	39.77686999	-80.75624468
11,590.00	89.27	146.60	6,629.87	-602.40	1,924.38	14,445,498.90	1,708,953.65	39.77665348	-80.75606260
11,685.00	90.46	148.88	6,630.09	-682.73	1,975.08	14,445,418.57	1,709,004.36	39.77643249	-80.75588292
11,779.00	89.71	147.74	6,629.95	-762.71	2,024.46	14,445,338.59	1,709,053.74	39.77621247	-80.75570795
11,873.00	89.98	148.18	6,630.21	-842.39	2,074.33	14,445,258.91	1,709,103.60	39.77599327	-80.75553123
11,968.00	89.85	147.65	6,630.35	-922.88	2,124.79	14,445,178.42	1,709,154.07	39.77577184	-80.75535242
12,061.00	89.41	148.88	6,630.95	-1,001.97	2,173.71	14,445,099.32	1,709,202.98	39.77555427	-80.75517909
12,156.00	90.68	150.82	6,630.88	-1,084.11	2,221.42	14,445,017.18	1,709,250.69	39.77532832	-80.75501008
12,250.00	89.41	148.71	6,630.80	-1,165.32	2,268.75	14,444,935.98	1,709,298.02	39.77510495	-80.75484242
12,345.00	89.49	148.97	6,631.71	-1,246.61	2,317.90	14,444,854.69	1,709,347.18	39.77488134	-80.75466827
12,439.00	91.43	151.70	6,630.96	-1,328.28	2,364.42	14,444,773.02	1,709,393.69	39.77465671	-80.75450351
12,533.00	91.08	151.43	6,628.90	-1,410.92	2,409.16	14,444,690.38	1,709,438.44	39.77442942	-80.75434506
12,628.00	91.03	151.26	6,627.15	-1,494.27	2,454.71	14,444,607.03	1,709,483.99	39.77420018	-80.75418376
12,723.00	91.21	150.99	6,625.29	-1,577.44	2,500.58	14,444,523.86	1,709,529.85	39.77397141	-80.75402133
12,818.00	91.12	150.73	6,623.36	-1,660.40	2,546.83	14,444,440.90	1,709,576.10	39.77374324	-80.75385754
12,912.00	90.81	150.64	6,621.78	-1,742.35	2,592.85	14,444,358.95	1,709,622.12	39.77351783	-80.75369456
13,007.00	90.46	150.73	6,620.73	-1,825.18	2,639.36	14,444,276.12	1,709,668.63	39.77329001	-80.75352985
13,101.00	90.59	150.91	6,619.87	-1,907.25	2,685.18	14,444,194.05	1,709,714.46	39.77306428	-80.75336755
13,196.00	89.98	149.76	6,619.39	-1,989.79	2,732.20	14,444,111.51	1,709,761.48	39.77283728	-80.75320102
13,290.00	88.88	148.88	6,620.33	-2,070.63	2,780.16	14,444,030.67	1,709,809.44	39.77261027	-80.75303113
13,385.00	88.40	149.06	6,622.58	-2,152.01	2,829.12	14,443,949.29	1,709,858.39	39.77239100	-80.75285769
13,479.00	88.79	148.88	6,624.89	-2,232.54	2,877.56	14,443,868.76	1,709,906.83	39.77216949	-80.75268609
13,574.00	88.35	149.06	6,627.26	-2,313.91	2,926.51	14,443,787.38	1,709,955.79	39.77194563	-80.75251265
13,669.00	89.54	149.24	6,629.01	-2,395.46	2,975.22	14,443,705.84	1,710,004.50	39.77172132	-80.75234012
13,763.00	91.03	149.85	6,628.54	-2,476.49	3,022.86	14,443,624.81	1,710,052.14	39.77149844	-80.75217136
13,857.00	91.38	149.76	6,626.56	-2,557.71	3,070.13	14,443,543.58	1,710,099.40	39.77127500	-80.75200394

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow S-11 HM (slot T)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow S-11 HM (slot T)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
13,952.00	91.21	149.67	6,624.42	-2,639.73	3,118.03	14,443,461.57	1,710,147.30	39.77104940	-80.75183429	
14,047.00	90.90	149.76	6,622.67	-2,721.75	3,165.93	14,443,379.55	1,710,195.20	39.77082379	-80.75166463	
14,141.00	89.76	149.32	6,622.13	-2,802.77	3,213.58	14,443,298.53	1,710,242.85	39.77060091	-80.75149585	
14,236.00	89.19	149.41	6,623.00	-2,884.51	3,261.98	14,443,216.79	1,710,291.26	39.77037607	-80.75132438	
14,331.00	89.19	149.24	6,624.34	-2,966.21	3,310.44	14,443,135.09	1,710,339.72	39.77015133	-80.75115272	
14,425.00	88.97	149.76	6,625.85	-3,047.19	3,358.15	14,443,054.11	1,710,387.42	39.76992857	-80.75098376	
14,520.00	88.66	149.32	6,627.81	-3,129.06	3,406.30	14,442,972.24	1,710,435.57	39.76970336	-80.75081322	
14,615.00	90.20	149.94	6,628.76	-3,211.02	3,454.32	14,442,890.28	1,710,483.60	39.76947792	-80.75064311	
14,710.00	89.89	149.41	6,628.68	-3,293.02	3,502.29	14,442,808.28	1,710,531.56	39.76925235	-80.75047323	
14,805.00	89.93	149.32	6,628.83	-3,374.76	3,550.70	14,442,726.54	1,710,579.97	39.76902750	-80.75030176	
14,900.00	90.11	148.80	6,628.80	-3,456.24	3,599.54	14,442,645.06	1,710,628.81	39.76880335	-80.75012875	
14,996.00	89.67	148.80	6,628.98	-3,538.36	3,649.27	14,442,562.94	1,710,678.54	39.76857746	-80.74995258	
15,091.00	89.63	149.50	6,629.56	-3,619.91	3,697.98	14,442,481.38	1,710,727.26	39.76835311	-80.74978003	
15,184.00	89.49	149.94	6,630.28	-3,700.22	3,744.88	14,442,401.08	1,710,774.15	39.76813220	-80.74961396	
15,278.00	88.79	149.85	6,631.69	-3,781.53	3,792.02	14,442,319.76	1,710,821.29	39.76790854	-80.74944699	
<b>Survey @ 15278.00 MD 6631.69 TVD</b>										
15,350.00	88.79	149.85	6,633.21	-3,843.78	3,828.17	14,442,257.52	1,710,857.45	39.76773731	-80.74931895	
<b>Survey projected to 15350.00 MD 6633.21 TVD</b>										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
173.00	173.00	0.28	-0.60	MWD surveys	
15,278.00	6,631.69	-3,781.53	3,792.02	Survey @ 15278.00 MD 6631.69 TVD	
15,350.00	6,633.21	-3,843.78	3,828.17	Survey projected to 15350.00 MD 6633.21 TVD	

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