



Tug Hill Operating, LLC

Comanche County, Kansas (NAD83)

Bearden Trust

1-7H

Wellbore #1

Survey: MS MWD

Standard Survey Report

28 June, 2012



Company:	Tug Hill Operating, LLC	Local Co-ordinate Reference:	Well 1-7H
Project:	Comanche County, Kansas (NAD83)	TVD Reference:	WELL @ 1907.00usft (Patterson - UTI #421)
Site:	Bearden Trust	MD Reference:	WELL @ 1907.00usft (Patterson - UTI #421)
Well:	1-7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Southern Region

Project	Comanche County, Kansas (NAD83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Kansas Southern Zone		

Well	1-7H				
Well Position	+N/-S	0.00 usft	Northing:	1,500,182.03 usft	Latitude: 37° 10' 49.5719 N
	+E/-W	0.00 usft	Easting:	1,107,627.08 usft	Longitude: 99° 12' 9.463 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level: 1,884.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	WMM_2010	2012/06/06	5.34	65.18	51,818

Design	Surveys				
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		359.22

Survey Program	Date	2012/06/28			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	720.00	VES Gyro (Wellbore #1)	NS-GYRO-MS	North sensing gyrocompassing m/s	
830.00	9,668.00	MS MWD (Wellbore #1)	MWD	MWD - Standard	

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)	
720.00	1.06	356.85	719.98	3.02	2.93	2.98	0.00	0.00	0.00	
Tie-In to VES Gyro-720.00' MD										
830.00	0.60	347.70	829.97	4.60	2.75	4.56	0.43	-0.42	-8.32	
894.00	0.70	337.30	893.96	5.29	2.53	5.25	0.24	0.16	-16.25	
989.00	0.60	351.40	988.96	6.31	2.23	6.28	0.20	-0.11	14.84	
1,084.00	0.70	334.90	1,083.95	7.33	1.91	7.30	0.22	0.11	-17.37	
1,178.00	0.60	326.90	1,177.95	8.26	1.40	8.24	0.14	-0.11	-8.51	
1,274.00	0.70	318.50	1,273.94	9.12	0.73	9.11	0.14	0.10	-8.75	
1,369.00	0.70	331.90	1,368.93	10.07	0.08	10.07	0.17	0.00	14.11	
1,464.00	0.80	339.70	1,463.93	11.20	-0.43	11.21	0.15	0.11	8.21	
1,559.00	1.00	335.20	1,558.91	12.58	-1.00	12.59	0.22	0.21	-4.74	
1,654.00	0.30	216.00	1,653.91	13.13	-1.50	13.15	1.24	-0.74	-125.47	
1,749.00	0.40	192.40	1,748.91	12.61	-1.72	12.63	0.18	0.11	-24.84	
1,843.00	0.40	177.50	1,842.90	11.96	-1.77	11.98	0.11	0.00	-15.85	
1,938.00	0.30	187.40	1,937.90	11.38	-1.79	11.40	0.12	-0.11	10.42	



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Well:	1-7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Southern Region

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)	
2,032.00	0.30	167.40	2,031.90	10.89	-1.77	10.92	0.11	0.00	-21.28	
2,127.00	0.40	183.90	2,126.90	10.32	-1.74	10.34	0.15	0.11	17.37	
2,222.00	0.30	155.40	2,221.90	9.76	-1.65	9.79	0.21	-0.11	-30.00	
2,316.00	0.40	189.20	2,315.90	9.22	-1.60	9.24	0.24	0.11	35.96	
2,411.00	0.20	168.90	2,410.90	8.73	-1.63	8.75	0.24	-0.21	-21.37	
2,506.00	0.30	159.60	2,505.89	8.33	-1.51	8.35	0.11	0.11	-9.79	
2,601.00	0.40	157.20	2,600.89	7.79	-1.29	7.81	0.11	0.11	-2.53	
2,695.00	0.40	177.50	2,694.89	7.16	-1.15	7.18	0.15	0.00	21.60	
2,790.00	0.40	143.10	2,789.89	6.57	-0.94	6.58	0.25	0.00	-36.21	
2,885.00	0.30	97.10	2,884.89	6.27	-0.49	6.28	0.30	-0.11	-48.42	
2,980.00	0.20	33.30	2,979.89	6.38	-0.15	6.38	0.29	-0.11	-67.16	
3,074.00	0.40	40.70	3,073.88	6.76	0.15	6.76	0.22	0.21	7.87	
3,168.00	0.20	53.90	3,167.88	7.11	0.50	7.10	0.22	-0.21	14.04	
3,262.00	0.30	8.90	3,261.88	7.45	0.67	7.44	0.23	0.11	-47.87	
3,356.00	0.10	356.80	3,355.88	7.77	0.70	7.76	0.22	-0.21	-12.87	
3,451.00	0.10	48.80	3,450.88	7.91	0.76	7.90	0.09	0.00	54.74	
3,545.00	0.20	15.80	3,544.88	8.12	0.87	8.11	0.14	0.11	-35.11	
3,640.00	0.30	42.70	3,639.88	8.46	1.08	8.45	0.16	0.11	28.32	
3,735.00	0.30	49.30	3,734.88	8.81	1.44	8.79	0.04	0.00	6.95	
3,890.00	0.20	98.00	3,889.88	9.04	2.01	9.01	0.15	-0.06	31.42	
3,925.00	0.30	48.90	3,924.88	9.09	2.14	9.06	0.65	0.29	-140.29	
4,020.00	0.20	32.10	4,019.88	9.39	2.42	9.36	0.13	-0.11	-17.68	
4,114.00	0.40	28.20	4,113.88	9.82	2.66	9.78	0.21	0.21	-4.15	
4,209.00	0.40	21.70	4,208.87	10.42	2.94	10.38	0.05	0.00	-6.84	
4,304.00	0.40	10.80	4,303.87	11.05	3.12	11.01	0.08	0.00	-11.47	
4,399.00	0.40	28.00	4,398.87	11.67	3.34	11.63	0.13	0.00	18.11	
4,493.00	0.40	32.80	4,492.87	12.24	3.67	12.19	0.04	0.00	5.11	
4,601.00	0.50	44.50	4,600.86	12.89	4.21	12.83	0.13	0.09	10.83	
4,633.00	0.70	35.60	4,632.86	13.15	4.42	13.09	0.69	0.63	-27.81	
4,664.00	3.30	13.20	4,663.84	14.17	4.73	14.11	8.60	8.39	-72.26	
4,696.00	6.60	5.60	4,695.72	16.90	5.12	16.83	10.49	10.31	-23.75	
4,728.00	11.00	3.70	4,727.33	21.78	5.50	21.70	13.78	13.75	-5.94	
4,760.00	16.00	4.20	4,758.44	29.23	6.02	29.14	15.63	15.63	1.56	
4,791.00	20.50	3.00	4,787.87	38.92	6.62	38.82	14.57	14.52	-3.87	
4,817.00	25.00	2.10	4,811.84	48.96	7.06	48.86	17.36	17.31	-3.46	
4,848.00	28.70	1.40	4,839.50	62.95	7.48	62.84	11.98	11.94	-2.26	
4,880.00	32.40	0.80	4,867.05	79.21	7.79	79.10	11.60	11.56	-1.88	
4,911.00	35.70	0.00	4,892.73	96.56	7.90	96.45	10.74	10.65	-2.58	
4,942.00	39.30	358.40	4,917.32	115.43	7.63	115.31	12.03	11.61	-5.16	
4,974.00	42.70	356.30	4,941.47	136.39	6.65	136.29	11.46	10.63	-6.56	
5,006.00	46.70	355.60	4,964.21	158.84	5.05	158.76	12.59	12.50	-2.19	
5,038.00	50.00	356.10	4,985.47	182.69	3.32	182.62	10.38	10.31	1.56	
5,070.00	53.90	355.50	5,005.19	207.81	1.47	207.77	12.28	12.19	-1.88	



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Survey										
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5,101.00	58.40	356.00	5,022.46	233.48	-0.43	233.47	14.58	14.52	1.61	
5,133.00	60.80	356.70	5,038.65	261.02	-2.18	261.03	7.73	7.50	2.19	
5,165.00	61.60	355.90	5,054.06	289.01	-3.99	289.03	3.32	2.50	-2.50	
5,195.00	61.80	355.80	5,068.29	315.35	-5.91	315.40	0.73	0.67	-0.33	
5,228.00	62.50	356.10	5,083.70	344.46	-7.97	344.53	2.27	2.12	0.91	
5,260.00	65.10	356.30	5,097.83	373.10	-9.87	373.20	8.14	8.13	0.63	
5,292.00	68.50	357.60	5,110.44	402.47	-11.43	402.59	11.26	10.63	4.06	
5,324.00	71.80	358.10	5,121.30	432.54	-12.56	432.67	10.42	10.31	1.56	
5,356.00	75.80	358.20	5,130.23	463.25	-13.55	463.39	12.50	12.50	0.31	
5,388.00	78.70	358.60	5,137.29	494.44	-14.42	494.59	9.14	9.06	1.25	
5,419.00	81.80	358.90	5,142.54	524.99	-15.09	525.14	10.05	10.00	0.97	
5,451.00	85.30	358.80	5,146.13	556.77	-15.72	556.93	10.94	10.94	-0.31	
5,514.00	88.40	358.80	5,149.59	619.65	-17.04	619.83	4.92	4.92	0.00	
5,613.00	90.50	359.20	5,150.54	718.63	-18.77	718.82	2.16	2.12	0.40	
5,708.00	91.90	358.80	5,148.55	813.59	-20.43	813.79	1.53	1.47	-0.42	
5,804.00	90.90	358.70	5,146.21	909.54	-22.52	909.76	1.05	-1.04	-0.10	
5,899.00	90.30	359.10	5,145.21	1,004.52	-24.34	1,004.75	0.76	-0.63	0.42	
5,994.00	91.30	1.30	5,143.89	1,099.50	-24.01	1,099.72	2.54	1.05	2.32	
6,089.00	91.00	0.70	5,141.98	1,194.46	-22.35	1,194.66	0.71	-0.32	-0.63	
6,184.00	90.80	1.20	5,140.49	1,289.44	-20.78	1,289.60	0.57	-0.21	0.53	
6,279.00	91.40	0.60	5,138.66	1,384.41	-19.29	1,384.54	0.89	0.63	-0.63	
6,373.00	90.70	0.80	5,136.94	1,478.39	-18.14	1,478.50	0.77	-0.74	0.21	
6,468.00	90.40	0.30	5,136.03	1,573.38	-17.23	1,573.47	0.61	-0.32	-0.53	
6,564.00	91.80	0.20	5,134.19	1,669.36	-16.81	1,669.43	1.46	1.46	-0.10	
6,659.00	90.40	0.80	5,132.36	1,764.33	-15.98	1,764.39	1.60	-1.47	0.63	
6,754.00	90.60	359.70	5,131.53	1,859.33	-15.56	1,859.37	1.18	0.21	-1.16	
6,850.00	90.90	358.50	5,130.28	1,955.30	-17.07	1,955.36	1.29	0.31	-1.25	
6,944.00	89.80	358.00	5,129.70	2,049.26	-19.94	2,049.34	1.29	-1.17	-0.53	
7,039.00	89.70	358.10	5,130.12	2,144.20	-23.18	2,144.32	0.15	-0.11	0.11	
7,132.00	90.90	358.10	5,129.63	2,237.15	-26.26	2,237.30	1.29	1.29	0.00	
7,226.00	91.00	357.40	5,128.07	2,331.06	-29.95	2,331.25	0.75	0.11	-0.74	
7,321.00	92.10	357.50	5,125.50	2,425.93	-34.17	2,426.17	1.16	1.16	0.11	
7,416.00	92.00	358.10	5,122.10	2,520.80	-37.82	2,521.08	0.64	-0.11	0.63	
7,510.00	90.90	359.50	5,119.72	2,614.74	-39.79	2,615.04	1.89	-1.17	1.49	
7,606.00	91.20	359.50	5,117.97	2,710.72	-40.62	2,711.03	0.31	0.31	0.00	
7,701.00	89.10	359.40	5,117.72	2,805.71	-41.54	2,806.02	2.21	-2.21	-0.11	
7,796.00	88.40	358.70	5,119.79	2,900.68	-43.11	2,901.00	1.04	-0.74	-0.74	
7,890.00	91.20	359.30	5,120.12	2,994.65	-44.75	2,994.98	3.05	2.98	0.64	
7,986.00	92.40	359.30	5,117.10	3,090.60	-45.92	3,090.94	1.25	1.25	0.00	
8,080.00	93.10	358.10	5,112.59	3,184.46	-48.05	3,184.82	1.48	0.74	-1.28	
8,174.00	92.10	359.50	5,108.33	3,278.34	-50.02	3,278.72	1.83	-1.06	1.49	
8,268.00	91.30	359.80	5,105.54	3,372.30	-50.59	3,372.67	0.91	-0.85	0.32	
8,363.00	91.70	359.20	5,103.05	3,467.26	-51.42	3,467.64	0.76	0.42	-0.63	



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Site:	Bearden Trust	MD Reference:	WELL @ 1907.00usft (Patterson - UTI #421)
Well:	1-7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Southern Region

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)
8,457.00	90.70	359.30	5,101.08	3,561.23	-52.65	3,561.62	1.07	-1.06	0.11
8,552.00	90.50	0.10	5,100.09	3,656.22	-53.15	3,656.61	0.87	-0.21	0.84
8,648.00	89.90	1.60	5,099.75	3,752.21	-51.72	3,752.57	1.68	-0.63	1.56
8,743.00	89.30	1.20	5,100.42	3,847.18	-49.40	3,847.49	0.76	-0.63	-0.42
8,838.00	88.40	358.80	5,102.32	3,942.15	-49.40	3,942.46	2.70	-0.95	-2.53
8,933.00	88.50	358.40	5,104.89	4,037.09	-51.72	4,037.42	0.43	0.11	-0.42
9,027.00	89.30	357.40	5,106.70	4,131.00	-55.17	4,131.37	1.36	0.85	-1.06
9,123.00	90.60	357.70	5,106.78	4,226.91	-59.27	4,227.33	1.39	1.35	0.31
9,218.00	88.30	357.00	5,107.69	4,321.80	-63.66	4,322.27	2.53	-2.42	-0.74
Final Survey-9218.00' MD									
9,668.00	88.30	357.00	5,121.04	4,770.99	-87.20	4,771.73	0.00	0.00	0.00
Projection to TD-9668.00' MD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
720.00	719.98	3.02	2.93	Tie-In to VES Gyro-720.00' MD
9,218.00	5,107.69	4,321.80	-63.66	Final Survey-9218.00' MD
9,668.00	5,121.04	4,770.99	-87.20	Projection to TD-9668.00' MD