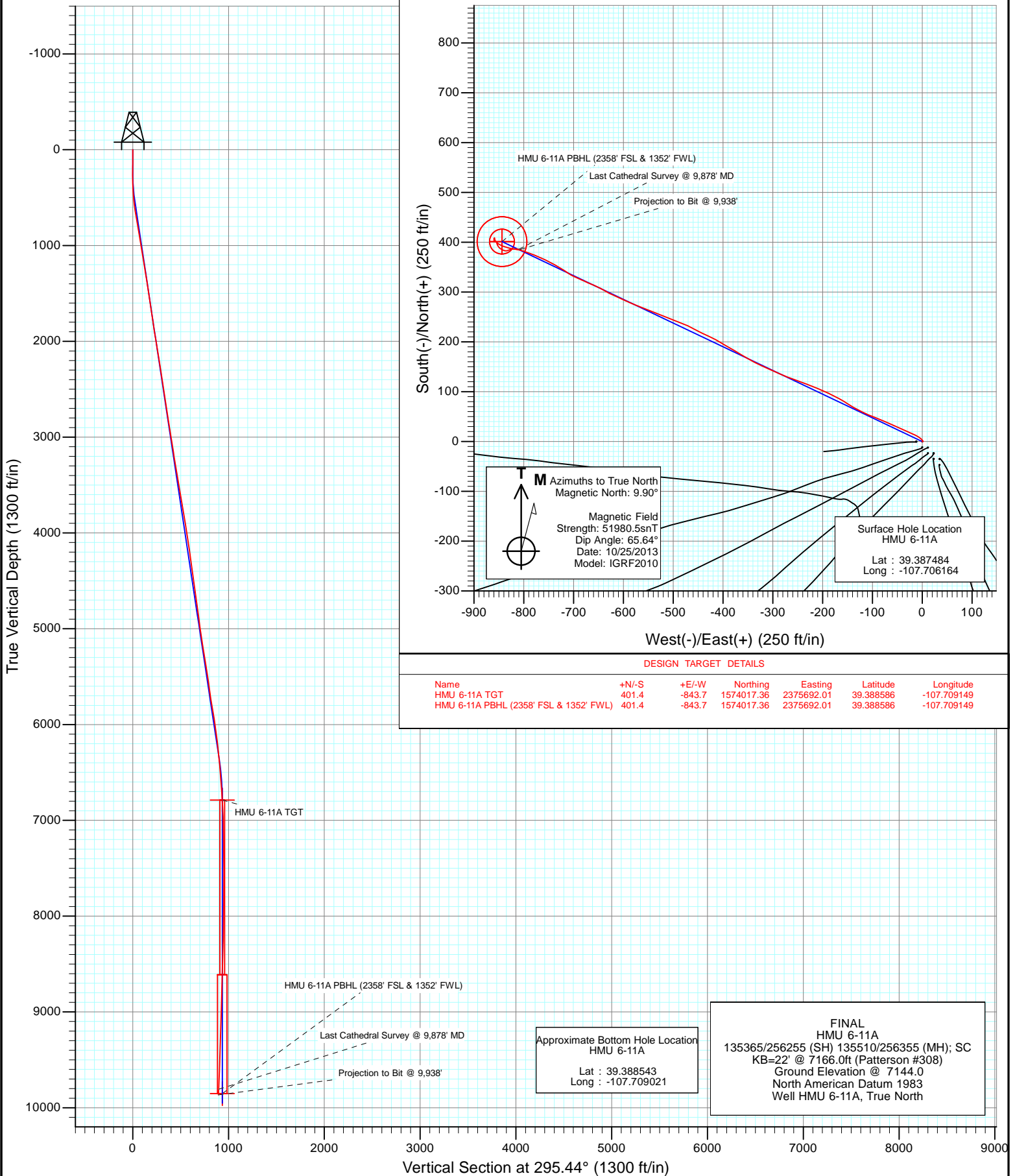


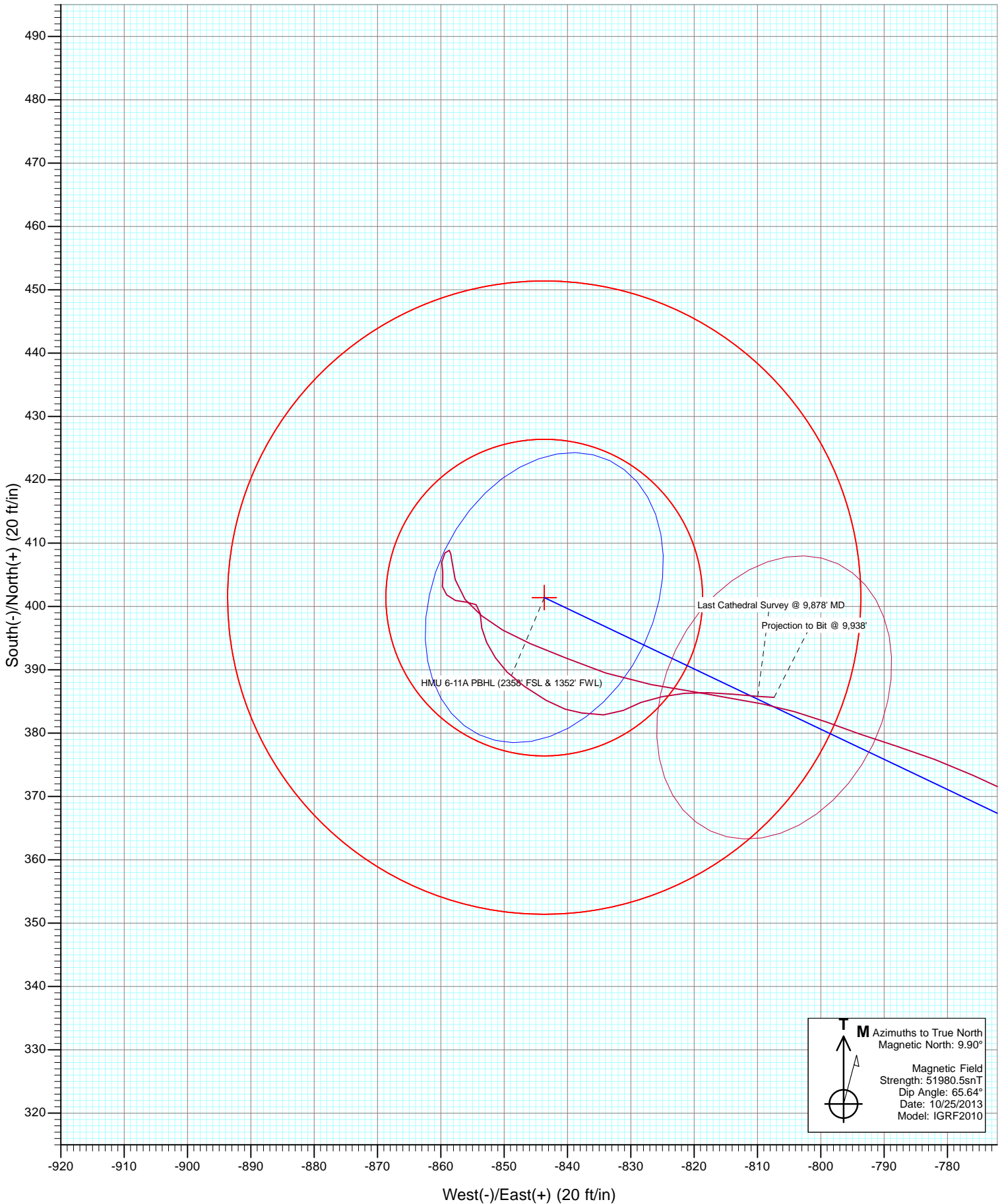


Project: Mamm Creek  
 Site: J6SEB Pad  
 Well: HMU 6-11A  
 Wellbore: OH  
 Design: FINAL



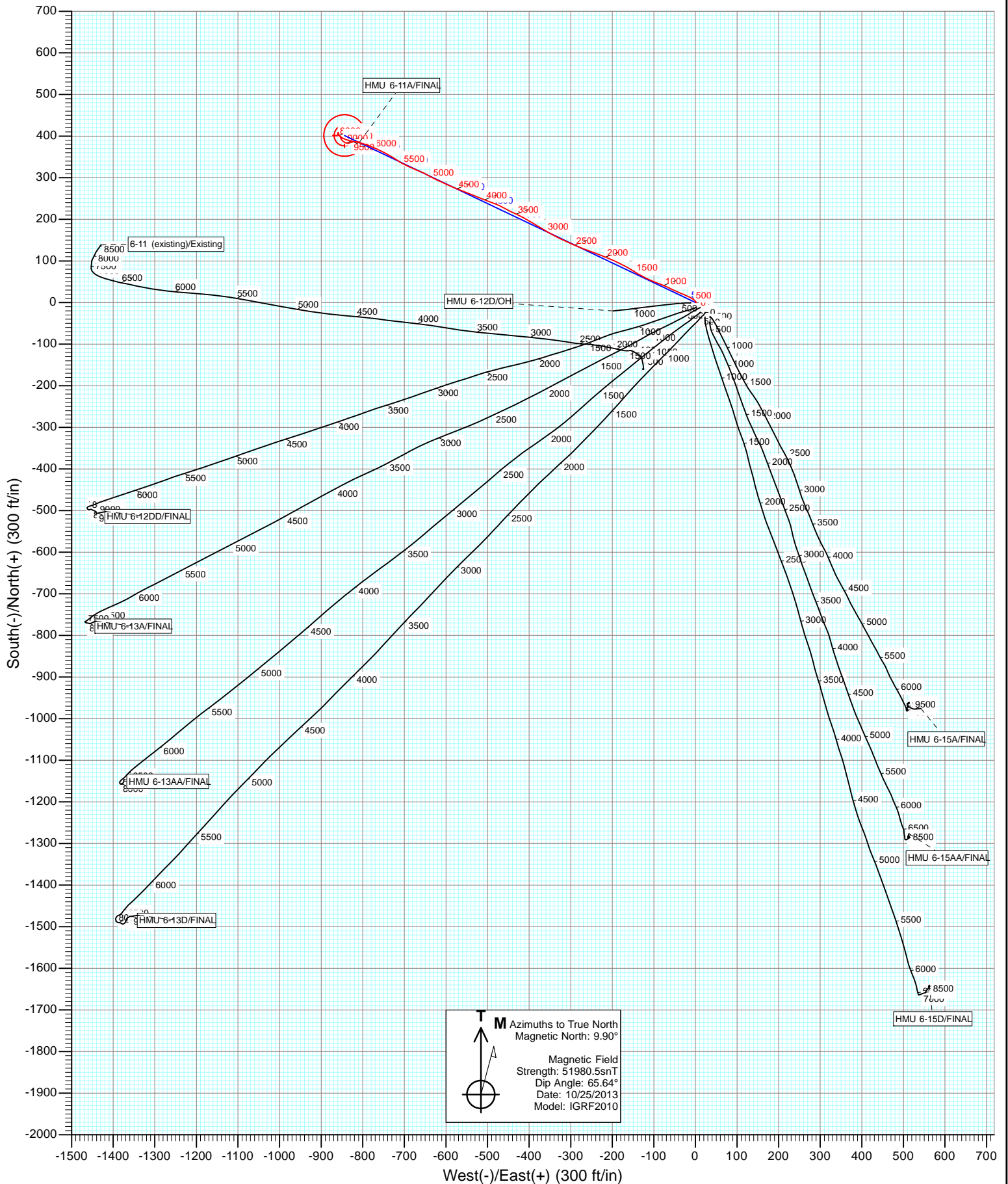


Project: Mamm Creek  
Site: J6SEB Pad  
Well: HMU 6-11A  
Wellbore: OH  
Design: FINAL





Project: Mamm Creek  
Site: J6SEB Pad  
Well: HMU 6-11A  
Wellbore: OH  
Design: FINAL



# Cathedral Energy Services

## Survey Report

<b>Company:</b> EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b> Well HMU 6-11A
<b>Project:</b> Mamm Creek	<b>TVD Reference:</b> KB=22' @ 7166.0ft (Patterson #308)
<b>Site:</b> J6SEB Pad	<b>MD Reference:</b> KB=22' @ 7166.0ft (Patterson #308)
<b>Well:</b> HMU 6-11A	<b>North Reference:</b> True
<b>Wellbore:</b> OH	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> FINAL	<b>Database:</b> USA EDM 5000 Multi Users DB

<b>Project</b> Mamm Creek		
<b>Map System:</b> US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b> North American Datum 1983		
<b>Map Zone:</b> Colorado Central Zone		

<b>Site</b> J6SEB Pad				
<b>Site Position:</b>	<b>Northing:</b>	1,573,595.87 ft	<b>Latitude:</b>	39.387484
<b>From:</b> Lat/Long	<b>Easting:</b>	2,376,514.08 ft	<b>Longitude:</b>	-107.706205
<b>Position Uncertainty:</b> 0.0 ft	<b>Slot Radius:</b>	13.200 in	<b>Grid Convergence:</b>	-1.39 °

<b>Well</b> HMU 6-11A				
<b>Well Position</b>	<b>+N/-S</b>	0.0 ft	<b>Northing:</b>	1,573,595.58 ft
	<b>+E/-W</b>	0.0 ft	<b>Easting:</b>	2,376,525.67 ft
			<b>Longitude:</b>	-107.706164
<b>Position Uncertainty</b>		0.0 ft	<b>Wellhead Elevation:</b>	ft
			<b>Ground Level:</b>	7,144.0 ft

<b>Wellbore</b> OH					
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	10/25/2013	9.90	65.64	51,981

<b>Design</b> FINAL				
<b>Audit Notes:</b>				
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b> 0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>
	0.0	0.0	0.0	295.44

<b>Survey Program</b>		<b>Date</b> 11/8/2013
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>
121.0	9,938.0	Survey #1 (OH)
		<b>Tool Name</b> Geolink MWD
		<b>Description</b> Geolink MWD

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
121.0	0.40	93.30	121.0	0.0	0.4	-0.4	0.33	0.33	
151.0	0.50	94.00	151.0	0.0	0.7	-0.6	0.33	0.33	
181.0	0.50	88.90	181.0	0.0	0.9	-0.8	0.15	0.00	
212.0	0.70	70.10	212.0	0.0	1.2	-1.1	0.90	0.65	
242.0	0.60	68.30	242.0	0.1	1.5	-1.3	0.34	-0.33	
273.0	0.50	43.00	273.0	0.3	1.8	-1.5	0.84	-0.32	
303.0	0.70	3.20	303.0	0.6	1.9	-1.5	1.50	0.67	
334.0	1.80	306.60	334.0	1.1	1.5	-0.9	4.94	3.55	
364.0	2.40	323.30	364.0	1.8	0.8	0.1	2.84	2.00	
395.0	3.10	322.40	394.9	3.0	-0.1	1.4	2.26	2.26	
487.0	5.10	306.60	486.7	7.4	-4.9	7.7	2.48	2.17	
578.0	6.80	296.90	577.2	12.3	-13.0	17.0	2.16	1.87	

# Cathedral Energy Services

## Survey Report

<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well HMU 6-11A
<b>Project:</b>	Mamm Creek	<b>TD Reference:</b>	KB=22' @ 7166.0ft (Patterson #308)
<b>Site:</b>	J6SEB Pad	<b>MVD Reference:</b>	KB=22' @ 7166.0ft (Patterson #308)
<b>Well:</b>	HMU 6-11A	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
670.0	8.80	293.90	668.3	17.6	-24.3	29.5	2.22	2.17	
762.0	9.40	293.40	759.2	23.4	-37.6	44.0	0.66	0.65	
854.0	10.20	294.20	849.8	29.8	-51.9	59.7	0.88	0.87	
946.0	10.70	295.60	940.3	36.8	-67.1	76.4	0.61	0.54	
1,038.0	9.10	291.10	1,030.9	43.1	-81.6	92.2	1.93	-1.74	
1,130.0	8.80	289.20	1,121.8	48.0	-95.0	106.4	0.46	-0.33	
1,222.0	8.80	295.60	1,212.7	53.4	-108.0	120.5	1.06	0.00	
1,313.0	9.50	295.80	1,302.6	59.7	-121.0	134.9	0.77	0.77	
1,436.0	9.00	300.00	1,424.0	68.9	-138.5	154.7	0.68	-0.41	
1,531.0	8.30	304.20	1,517.9	76.5	-150.6	168.8	0.99	-0.74	
1,626.0	9.20	298.40	1,611.8	83.9	-163.0	183.2	1.33	0.95	
1,721.0	8.70	297.40	1,705.6	90.8	-176.0	198.0	0.55	-0.53	
1,815.0	8.00	295.60	1,798.6	96.9	-188.2	211.6	0.79	-0.74	
1,909.0	8.90	292.20	1,891.6	102.5	-200.9	225.4	1.09	0.96	
2,004.0	8.70	293.50	1,985.5	108.2	-214.3	239.9	0.30	-0.21	
2,099.0	9.70	291.60	2,079.3	114.0	-228.3	255.1	1.10	1.05	
2,192.0	9.60	289.70	2,171.0	119.5	-242.9	270.6	0.36	-0.11	
2,287.0	9.30	289.20	2,264.7	124.7	-257.6	286.2	0.33	-0.32	
2,382.0	8.80	291.90	2,358.5	129.9	-271.6	301.0	0.69	-0.53	
2,478.0	8.40	292.50	2,453.4	135.3	-284.9	315.4	0.43	-0.42	
2,573.0	8.10	295.90	2,547.4	140.9	-297.3	329.0	0.60	-0.32	
2,667.0	8.40	292.60	2,640.5	146.4	-309.6	342.5	0.60	0.32	
2,762.0	9.10	294.90	2,734.4	152.3	-322.8	356.9	0.82	0.74	
2,857.0	9.60	297.90	2,828.1	159.1	-336.6	372.3	0.73	0.53	
2,952.0	9.00	299.90	2,921.8	166.5	-350.1	387.7	0.72	-0.63	
3,043.0	9.00	299.70	3,011.7	173.6	-362.4	401.9	0.03	0.00	
3,138.0	8.30	302.90	3,105.6	181.0	-374.6	416.1	0.89	-0.74	
3,233.0	9.50	298.10	3,199.5	188.4	-387.3	430.7	1.48	1.26	
3,329.0	9.30	303.40	3,294.2	196.4	-400.8	446.3	0.93	-0.21	
3,424.0	9.40	297.70	3,388.0	204.3	-414.0	461.6	0.98	0.11	
3,518.0	9.70	293.70	3,480.7	211.0	-428.1	477.2	0.77	0.32	
3,613.0	9.80	296.50	3,574.3	217.9	-442.7	493.3	0.51	0.11	
3,708.0	9.40	299.20	3,668.0	225.2	-456.7	509.1	0.63	-0.42	
3,803.0	9.80	295.40	3,761.6	232.5	-470.7	525.0	0.79	0.42	
3,898.0	9.10	289.70	3,855.3	238.5	-485.1	540.5	1.23	-0.74	
3,993.0	9.30	290.70	3,949.1	243.7	-499.4	555.7	0.27	0.21	
4,088.0	9.00	292.30	4,042.9	249.3	-513.4	570.7	0.41	-0.32	
4,183.0	8.20	291.90	4,136.8	254.6	-526.6	584.9	0.84	-0.84	
4,278.0	7.50	291.80	4,230.9	259.5	-538.6	597.9	0.74	-0.74	
4,375.0	7.70	293.10	4,327.1	264.4	-550.5	610.7	0.27	0.21	
4,468.0	8.60	289.60	4,419.2	269.1	-562.8	623.8	1.10	0.97	
4,563.0	8.00	292.30	4,513.2	274.0	-575.6	637.5	0.75	-0.63	
4,658.0	7.70	293.50	4,607.3	279.1	-587.5	650.4	0.36	-0.32	
4,753.0	7.20	295.10	4,701.5	284.1	-598.8	662.8	0.57	-0.53	
4,848.0	8.00	294.40	4,795.6	289.4	-610.2	675.3	0.85	0.84	
4,942.0	8.30	293.80	4,888.7	294.8	-622.3	688.6	0.33	0.32	
5,037.0	7.70	301.30	4,982.8	300.9	-634.0	701.8	1.27	-0.63	
5,132.0	8.20	297.00	5,076.8	307.3	-645.5	714.9	0.82	0.53	
5,228.0	9.10	292.70	5,171.8	313.3	-658.6	729.4	1.15	0.94	
5,324.0	8.50	294.80	5,266.6	319.2	-672.1	744.0	0.71	-0.62	
5,419.0	9.70	292.90	5,360.4	325.3	-685.8	759.0	1.30	1.26	
5,514.0	9.40	296.60	5,454.1	331.9	-700.1	774.8	0.72	-0.32	
5,610.0	7.70	304.30	5,549.0	339.0	-712.4	789.0	2.13	-1.77	

# Cathedral Energy Services

## Survey Report

<b>Company:</b> EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b> Well HMU 6-11A
<b>Project:</b> Mamm Creek	<b>TVD Reference:</b> KB=22' @ 7166.0ft (Patterson #308)
<b>Site:</b> J6SEB Pad	<b>MD Reference:</b> KB=22' @ 7166.0ft (Patterson #308)
<b>Well:</b> HMU 6-11A	<b>North Reference:</b> True
<b>Wellbore:</b> OH	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> FINAL	<b>Database:</b> USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
5,705.0	8.00	301.60	5,643.2	346.1	-723.3	801.9	0.50	0.32	
5,800.0	8.80	301.60	5,737.1	353.3	-735.2	815.7	0.84	0.84	
5,895.0	9.70	294.00	5,830.9	360.4	-748.7	830.9	1.60	0.95	
5,990.0	9.30	296.70	5,924.6	367.1	-762.8	846.6	0.63	-0.42	
6,085.0	8.20	294.00	6,018.5	373.3	-775.9	861.0	1.24	-1.16	
6,180.0	7.60	287.60	6,112.6	378.0	-788.1	874.0	1.12	-0.63	
6,275.0	6.50	290.50	6,206.9	381.7	-799.1	885.6	1.22	-1.16	
6,370.0	6.20	281.00	6,301.3	384.6	-809.2	895.9	1.15	-0.32	
6,465.0	5.40	279.20	6,395.8	386.3	-818.6	905.2	0.86	-0.84	
6,560.0	4.60	279.90	6,490.4	387.7	-826.8	913.1	0.84	-0.84	
6,655.0	4.40	289.10	6,585.1	389.5	-834.0	920.4	0.79	-0.21	
6,748.0	4.00	292.20	6,677.9	391.9	-840.3	927.2	0.49	-0.43	
6,843.0	3.20	291.40	6,772.7	394.1	-845.9	933.2	0.84	-0.84	
6,938.0	2.70	302.10	6,867.6	396.3	-850.2	938.0	0.78	-0.53	
7,033.0	2.20	306.70	6,962.5	398.6	-853.6	942.0	0.57	-0.53	
7,128.0	2.20	322.80	7,057.4	401.1	-856.2	945.4	0.65	0.00	
7,223.0	2.10	345.30	7,152.4	404.2	-857.7	948.2	0.89	-0.11	
7,318.0	1.60	355.30	7,247.3	407.2	-858.3	950.0	0.62	-0.53	
7,413.0	0.50	317.40	7,342.3	408.9	-858.6	951.0	1.31	-1.16	
7,508.0	1.00	209.80	7,437.3	408.5	-859.3	951.5	1.31	0.53	
7,602.0	0.90	186.80	7,531.3	407.0	-859.8	951.3	0.42	-0.11	
7,698.0	1.00	164.50	7,627.3	405.5	-859.7	950.5	0.40	0.10	
7,792.0	0.60	204.80	7,721.3	404.2	-859.7	950.0	0.71	-0.43	
7,887.0	0.80	166.50	7,816.3	403.1	-859.7	949.5	0.52	0.21	
7,982.0	1.00	141.90	7,911.2	401.8	-859.1	948.4	0.45	0.21	
8,076.0	1.10	105.00	8,005.2	400.9	-857.7	946.8	0.71	0.11	
8,171.0	1.10	93.00	8,100.2	400.7	-855.9	945.0	0.24	0.00	
8,266.0	0.80	119.40	8,195.2	400.3	-854.4	943.5	0.55	-0.32	
8,361.0	1.30	176.50	8,290.2	398.9	-853.8	942.3	1.15	0.53	
8,456.0	1.50	170.80	8,385.2	396.6	-853.5	941.1	0.26	0.21	
8,550.0	1.50	151.60	8,479.1	394.3	-852.7	939.4	0.53	0.00	
8,645.0	1.80	149.10	8,574.1	391.9	-851.4	937.2	0.32	0.32	
8,739.0	1.80	132.70	8,668.0	389.6	-849.5	934.5	0.55	0.00	
8,835.0	2.40	127.10	8,764.0	387.4	-846.8	931.1	0.66	0.62	
8,929.0	2.60	119.20	8,857.9	385.2	-843.4	927.1	0.42	0.21	
9,025.0	1.40	106.20	8,953.8	383.8	-840.4	923.7	1.33	-1.25	
9,119.0	1.90	100.50	9,047.8	383.2	-837.7	921.1	0.56	0.53	
9,213.0	2.30	90.50	9,141.7	382.9	-834.3	917.9	0.58	0.43	
9,308.0	1.70	59.30	9,236.7	383.6	-831.2	915.4	1.29	-0.63	
9,403.0	2.00	71.20	9,331.6	384.8	-828.4	913.4	0.51	0.32	
9,498.0	2.20	78.20	9,426.6	385.8	-825.0	910.8	0.34	0.21	
9,593.0	2.10	84.90	9,521.5	386.3	-821.5	907.8	0.28	-0.11	
9,687.0	2.40	91.10	9,615.4	386.4	-817.8	904.5	0.41	0.32	
9,783.0	2.30	96.10	9,711.3	386.2	-813.9	900.9	0.24	-0.10	
9,878.0	2.50	93.80	9,806.2	385.8	-810.0	897.2	0.23	0.21	Last Cathedral Survey @ 9,878' MD
9,938.0	2.50	93.80	9,866.2	385.6	-807.3	894.7	0.00	0.00	Projection to Bit @ 9,938'

# Cathedral Energy Services

## Survey Report

<b>Company:</b> EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b> Well HMU 6-11A
<b>Project:</b> Mamm Creek	<b>TVD Reference:</b> KB=22' @ 7166.0ft (Patterson #308)
<b>Site:</b> J6SEB Pad	<b>MD Reference:</b> KB=22' @ 7166.0ft (Patterson #308)
<b>Well:</b> HMU 6-11A	<b>North Reference:</b> True
<b>Wellbore:</b> OH	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> FINAL	<b>Database:</b> USA EDM 5000 Multi Users DB

Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
- Shape									
HMU 6-11A PBHL (2358)	0.00	0.00	9,852.0	401.4	-843.7	1,574,017.36	2,375,692.01	39.388586	-107.709149
- actual wellpath misses target center by 39.0ft at 9922.2ft MD (9850.4 TVD, 385.7 N, -808.0 E)									
- Circle (radius 50.0)									
HMU 6-11A TGT	0.00	0.00	6,788.0	401.4	-843.7	1,574,017.36	2,375,692.01	39.388586	-107.709149
- actual wellpath misses target center by 7.6ft at 6858.3ft MD (6788.0 TVD, 394.4 N, -846.7 E)									
- Circle (radius 25.0)									

Design Annotations					
Measured Depth	Vertical Depth	Local Coordinates		Comment	
		+N/-S	+E/-W		
(ft)	(ft)	(ft)	(ft)		
9,878.0	9,806.2	385.8	-810.0	Last Cathedral Survey @ 9,878' MD	
9,938.0	9,866.2	385.6	-807.3	Projection to Bit @ 9,938'	

Checked By: _____	Approved By: _____	Date: _____
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