



# Cathedral Energy Services

## Survey Report

<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well ALP FEE 24-6AA
<b>Project:</b>	Mamm Creek	<b>TVD Reference:</b>	KB=22' @ 5702.0ft (Nabors M15)
<b>Site:</b>	J24NW Pad	<b>MD Reference:</b>	KB=22' @ 5702.0ft (Nabors M15)
<b>Well:</b>	ALP FEE 24-6AA	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	SURVEYS	<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		

Site		J24NW Pad			
Site Position:		Northing:	1,618,899.86 ft	Latitude:	39.511614
From:	Lat/Long	Easting:	2,373,314.58 ft	Longitude:	-107.721441
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.40 °

Well	ALP FEE 24-6AA					
Well Position	+N/-S	0.0 ft	Northing:	1,618,883.90 ft	Latitude:	39.511567
	+E/-W	0.0 ft	Easting:	2,373,266.77 ft	Longitude:	-107.721609
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	5,680.0 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	6/11/2013	9.97	65.75	52,095

<b>Design</b>	SURVEYS				
<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)</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Direction</b>	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	315.37	

<b>Survey Program</b>	<b>Date</b>	6/24/2013			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
121.0	1,010.0	Survey #1 (OH)	MWD	Geolink MWD	
1,155.0	5,969.0	Survey #2 (OH)	Geolink MWD	Geolink MWD	

<b>Survey</b>										
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Formations / Comments</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
121.0	0.70	202.70	121.0	-0.7	-0.3	-0.3	0.58	0.58		
151.0	0.70	198.80	151.0	-1.0	-0.4	-0.4	0.16	0.00		
182.0	0.70	194.00	182.0	-1.4	-0.5	-0.6	0.19	0.00		
213.0	0.60	224.20	213.0	-1.7	-0.7	-0.7	1.14	-0.32		
244.0	0.70	280.00	244.0	-1.8	-1.0	-0.6	1.98	0.32		
274.0	1.60	302.50	274.0	-1.5	-1.5	0.0	3.30	3.00		
305.0	2.30	308.80	305.0	-0.9	-2.4	1.0	2.36	2.26		
335.0	3.40	313.70	334.9	0.1	-3.5	2.5	3.75	3.67		
365.0	4.40	322.90	364.9	1.6	-4.8	4.5	3.92	3.33		
396.0	5.90	324.20	395.7	3.9	-6.5	7.3	4.85	4.84		
488.0	9.70	321.10	486.9	13.7	-14.1	19.7	4.15	4.13		

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<b>Site:</b>	J24NW Pad	<b>MD Reference:</b>	KB=22' @ 5702.0ft (Nabors M15)
<b>Well:</b>	ALP FEE 24-6AA	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	SURVEYS	<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
579.0	13.00	315.40	576.1	27.0	-26.1	37.6	3.83	3.63	
671.0	16.20	313.60	665.1	43.2	-42.7	60.7	3.51	3.48	
764.0	17.80	312.90	754.0	61.8	-62.5	87.9	1.73	1.72	
855.0	18.50	310.40	840.5	80.7	-83.7	116.2	1.15	0.77	
948.0	19.60	308.70	928.4	100.0	-107.1	146.4	1.32	1.18	
1,010.0	20.10	307.90	986.7	113.0	-123.6	167.3	0.92	0.81	Last Cathedral Survey @ 1010' MD
1,155.0	21.40	309.10	1,122.3	145.0	-163.8	218.3	0.94	0.90	
1,250.0	20.20	308.70	1,211.1	166.2	-190.0	251.8	1.27	-1.26	
1,346.0	17.80	309.90	1,301.9	186.0	-214.2	282.9	2.53	-2.50	
1,441.0	17.40	310.10	1,392.4	204.5	-236.2	311.5	0.43	-0.42	
1,536.0	18.70	311.00	1,482.8	223.6	-258.6	340.8	1.40	1.37	
1,632.0	18.90	310.60	1,573.6	243.8	-282.0	371.6	0.25	0.21	
1,727.0	19.10	310.00	1,663.5	263.8	-305.6	402.4	0.29	0.21	
1,823.0	18.10	309.40	1,754.4	283.4	-329.2	432.9	1.06	-1.04	
1,919.0	18.40	309.50	1,845.6	302.5	-352.4	462.8	0.31	0.31	
2,014.0	17.30	308.60	1,936.0	320.8	-375.0	491.8	1.19	-1.16	
2,110.0	17.40	308.70	2,027.7	338.7	-397.3	520.2	0.11	0.10	
2,205.0	17.60	308.20	2,118.3	356.5	-419.7	548.5	0.26	0.21	
2,301.0	17.90	307.90	2,209.7	374.5	-442.8	577.6	0.33	0.31	
2,397.0	17.00	310.90	2,301.3	392.8	-465.0	606.2	1.33	-0.94	
2,492.0	16.70	309.90	2,392.2	410.6	-486.0	633.6	0.44	-0.32	
2,587.0	16.40	310.20	2,483.3	428.0	-506.7	660.6	0.33	-0.32	
2,683.0	17.30	309.30	2,575.2	445.8	-528.1	688.3	0.98	0.94	
2,778.0	18.50	311.70	2,665.6	464.8	-550.3	717.4	1.48	1.26	
2,874.0	18.60	311.00	2,756.6	485.0	-573.2	747.8	0.25	0.10	
2,969.0	17.90	311.00	2,846.8	504.5	-595.7	777.5	0.74	-0.74	
3,063.0	17.80	310.00	2,936.3	523.2	-617.6	806.2	0.34	-0.11	
3,159.0	17.00	310.20	3,027.9	541.7	-639.5	834.8	0.84	-0.83	
3,253.0	18.30	310.50	3,117.4	560.1	-661.2	863.2	1.39	1.38	
3,348.0	18.20	309.90	3,207.7	579.3	-684.0	892.8	0.22	-0.11	
3,441.0	17.70	310.20	3,296.1	597.8	-705.9	921.3	0.55	-0.54	
3,535.0	16.30	309.50	3,386.0	615.4	-727.0	948.7	1.51	-1.49	
3,630.0	18.10	310.80	3,476.8	633.5	-748.5	976.7	1.94	1.89	
3,725.0	18.50	311.30	3,567.0	653.1	-771.0	1,006.4	0.45	0.42	
3,821.0	17.60	312.10	3,658.2	672.9	-793.2	1,036.1	0.97	-0.94	
3,917.0	16.70	310.90	3,750.0	691.7	-814.4	1,064.3	1.01	-0.94	
4,013.0	17.30	308.50	3,841.8	709.6	-836.0	1,092.3	0.96	0.62	
4,108.0	18.80	311.10	3,932.1	728.4	-858.6	1,121.5	1.79	1.58	
4,203.0	19.40	308.80	4,021.9	748.4	-882.4	1,152.5	1.01	0.63	
4,298.0	19.00	308.80	4,111.6	768.0	-906.7	1,183.5	0.42	-0.42	
4,393.0	17.70	309.30	4,201.8	786.8	-930.0	1,213.2	1.38	-1.37	
4,488.0	18.60	309.40	4,292.0	805.6	-952.8	1,242.7	0.95	0.95	
4,583.0	18.60	309.50	4,382.1	824.8	-976.2	1,272.8	0.03	0.00	
4,679.0	18.50	310.10	4,473.1	844.4	-999.7	1,303.2	0.22	-0.10	
4,774.0	17.40	309.60	4,563.5	863.1	-1,022.2	1,332.4	1.17	-1.16	
4,870.0	14.50	309.70	4,655.8	880.0	-1,042.5	1,358.6	3.02	-3.02	
4,965.0	14.40	310.70	4,747.7	895.3	-1,060.6	1,382.2	0.28	-0.11	
5,061.0	14.40	309.00	4,840.7	910.6	-1,078.9	1,406.0	0.44	0.00	
5,156.0	12.70	307.70	4,933.1	924.4	-1,096.4	1,428.1	1.82	-1.79	
5,251.0	11.90	311.80	5,025.9	937.3	-1,111.9	1,448.2	1.25	-0.84	
5,297.0	11.04	311.36	5,071.0	943.4	-1,118.8	1,457.3	1.89	-1.88	Approximate Top of Plug @ 5,297'
5,347.0	10.10	310.80	5,120.1	949.4	-1,125.7	1,466.5	1.89	-1.87	
5,442.0	9.70	314.20	5,213.7	960.4	-1,137.7	1,482.8	0.75	-0.42	

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<b>Site:</b>	J24NW Pad	<b>MD Reference:</b>	KB=22' @ 5702.0ft (Nabors M15)
<b>Well:</b>	ALP FEE 24-6AA	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	SURVEYS	<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
5,537.0	9.50	309.80	5,307.4	971.0	-1,149.5	1,498.6	0.80	-0.21	
5,633.0	8.20	309.30	5,402.3	980.4	-1,160.9	1,513.3	1.36	-1.35	
5,728.0	6.70	308.00	5,496.4	988.1	-1,170.5	1,525.5	1.59	-1.58	
5,797.0	5.91	310.25	5,565.0	992.9	-1,176.4	1,533.0	1.20	-1.15	Top of Fish @ 5,797'
5,824.0	5.60	311.30	5,591.9	994.7	-1,178.4	1,535.7	1.20	-1.14	
5,865.0	5.34	312.15	5,632.7	997.3	-1,181.3	1,539.6	0.66	-0.63	Bottom of Fish @ 5,865'
5,919.0	5.00	313.40	5,686.5	1,000.6	-1,184.9	1,544.5	0.66	-0.63	
5,969.0	5.00	313.40	5,736.3	1,003.6	-1,188.1	1,548.8	0.00	0.00	Open Hole Depth @ 5,969'

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
ALP FEE 24-6AA TGT	0.00	0.00	5,791.0	994.8	-1,181.6	1,619,907.27	2,372,109.90	39.514298	-107.725797
- actual wellpath misses target center by 55.8ft at 5969.0ft MD (5736.3 TVD, 1003.6 N, -1188.1 E)									
- Point									
ALP FEE 24-6AA PBHL	0.00	0.00	7,787.0	994.8	-1,181.6	1,619,907.27	2,372,109.90	39.514298	-107.725797
- actual wellpath misses target center by 2050.7ft at 5969.0ft MD (5736.3 TVD, 1003.6 N, -1188.1 E)									
- Circle (radius 25.0)									

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
1,010.0	986.7	113.0	-123.6	Last Cathedral Survey @ 1010' MD	
5,297.0	5,071.0	943.4	-1,118.8	Approximate Top of Plug @ 5,297'	
5,797.0	5,565.0	992.9	-1,176.4	Top of Fish @ 5,797'	
5,865.0	5,632.7	997.3	-1,181.3	Bottom of Fish @ 5,865'	
5,969.0	5,736.3	1,003.6	-1,188.1	Open Hole Depth @ 5,969'	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_