

Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Benzel Fee 25-3A (F25NWB Pad)
Project:	Mamm Creek	TVD Reference:	kbe @ 5851.0ft
Site:	F25NWB Pad	MD Reference:	kbe @ 5851.0ft
Well:	Benzel Fee 25-3A (F25NWB Pad)	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	DD	Database:	USA EDM 5000 Multi Users DB

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

Site		F25NWB Pad			
Site Position:		Northing:	1,614,821.30 ft	Latitude:	39.500328
From:	Lat/Long	Easting:	2,371,946.03 ft	Longitude:	-107.725936
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.40 °

Well	Benzel Fee 25-3A (F25NWB Pad)					
Well Position	+N/-S	0.0 ft	Northing:	1,614,913.92 ft	Latitude:	39.500575
	+E/-W	0.0 ft	Easting:	2,371,838.78 ft	Longitude:	-107.726324
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	5,829.0 ft

Wellbore		DD			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	11/9/2012	10.05	65.75	52,147

Design	DD			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	32.15

Survey Program		Date	11/18/2012		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
175.0	8,065.0	Survey #1 (DD)	MWD	Geolink MWD	

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
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
175.0	0.50	163.60	175.0	-0.7	0.2	-0.5	0.29	0.29	
205.0	0.50	162.70	205.0	-1.0	0.3	-0.7	0.03	0.00	
236.0	0.40	147.50	236.0	-1.2	0.4	-0.8	0.50	-0.32	
266.0	0.20	135.40	266.0	-1.3	0.5	-0.9	0.70	-0.67	
297.0	0.20	60.90	297.0	-1.3	0.6	-0.8	0.78	0.00	
328.0	0.30	69.70	328.0	-1.3	0.7	-0.7	0.34	0.32	
358.0	0.20	80.70	358.0	-1.3	0.8	-0.6	0.37	-0.33	
389.0	0.40	76.00	389.0	-1.2	1.0	-0.5	0.65	0.65	
419.0	0.70	54.50	419.0	-1.1	1.2	-0.3	1.20	1.00	
450.0	1.10	33.70	450.0	-0.7	1.5	0.2	1.65	1.29	
481.0	1.90	30.50	481.0	0.0	2.0	1.0	2.59	2.58	
511.0	3.40	27.80	510.9	1.2	2.6	2.4	5.02	5.00	

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Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	DD	Database:	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
541.0	4.60	27.10	540.9	3.0	3.6	4.5	4.00	4.00	
572.0	6.10	23.20	571.7	5.7	4.8	7.4	4.98	4.84	
602.0	7.20	23.20	601.5	8.9	6.2	10.8	3.67	3.67	
633.0	8.00	21.50	632.3	12.6	7.7	14.8	2.68	2.58	
664.0	8.80	21.60	662.9	16.9	9.4	19.3	2.58	2.58	
757.0	10.90	20.70	754.6	31.7	15.1	34.9	2.26	2.26	
849.0	13.40	20.50	844.5	49.8	21.9	53.9	2.72	2.72	
941.0	15.60	22.40	933.5	71.2	30.4	76.5	2.45	2.39	
1,033.0	17.00	21.80	1,021.8	95.2	40.1	101.9	1.53	1.52	
1,124.0	18.10	20.90	1,108.6	120.7	50.1	128.9	1.25	1.21	
1,215.0	19.50	19.80	1,194.8	148.2	60.3	157.6	1.59	1.54	
1,306.0	19.30	21.70	1,280.6	176.5	71.0	187.2	0.73	-0.22	
1,398.0	20.30	22.60	1,367.1	205.4	82.7	217.9	1.14	1.09	
1,475.0	21.10	22.00	1,439.2	230.5	93.1	244.7	1.07	1.04	
1,532.0	21.90	21.80	1,492.2	249.9	100.8	265.3	1.41	1.40	
1,623.0	22.10	21.00	1,576.6	281.7	113.3	298.8	0.40	0.22	
1,715.0	21.10	23.80	1,662.1	313.0	126.2	332.1	1.56	-1.09	
1,806.0	19.00	22.50	1,747.6	341.6	138.4	362.9	2.36	-2.31	
1,899.0	18.90	22.00	1,835.6	369.6	149.9	392.7	0.21	-0.11	
1,990.0	17.50	24.10	1,922.0	395.7	161.0	420.7	1.70	-1.54	
2,081.0	17.50	25.00	2,008.8	420.6	172.4	447.9	0.30	0.00	
2,173.0	17.20	24.70	2,096.6	445.5	183.9	475.1	0.34	-0.33	
2,264.0	17.10	25.70	2,183.6	469.8	195.3	501.7	0.34	-0.11	
2,356.0	16.80	26.20	2,271.6	493.9	207.1	528.4	0.36	-0.33	
2,447.0	16.30	26.50	2,358.8	517.2	218.6	554.2	0.56	-0.55	
2,539.0	16.10	25.20	2,447.1	540.3	229.7	579.7	0.45	-0.22	
2,630.0	16.40	20.40	2,534.5	563.7	239.6	604.8	1.51	0.33	
2,722.0	16.00	21.10	2,622.9	587.7	248.7	629.9	0.48	-0.43	
2,813.0	15.60	21.30	2,710.4	610.8	257.7	654.3	0.44	-0.44	
2,905.0	15.40	22.60	2,799.1	633.6	266.8	678.5	0.44	-0.22	
2,997.0	16.20	21.00	2,887.6	656.9	276.1	703.1	0.99	0.87	
3,088.0	18.10	19.20	2,974.6	682.1	285.3	729.3	2.17	2.09	
3,180.0	18.20	19.50	3,062.0	709.1	294.8	757.3	0.15	0.11	
3,272.0	18.00	21.00	3,149.4	735.9	304.7	785.2	0.55	-0.22	
3,364.0	17.20	22.10	3,237.1	761.8	314.9	812.6	0.94	-0.87	
3,456.0	16.90	22.20	3,325.1	786.8	325.1	839.2	0.33	-0.33	
3,547.0	16.60	22.10	3,412.2	811.1	335.0	865.0	0.33	-0.33	
3,639.0	18.50	22.20	3,499.9	836.8	345.4	892.3	2.07	2.07	
3,730.0	18.20	21.90	3,586.3	863.3	356.2	920.5	0.35	-0.33	
3,822.0	17.50	24.60	3,673.9	889.2	367.3	948.4	1.18	-0.76	
3,913.0	17.00	25.60	3,760.8	913.7	378.8	975.1	0.64	-0.55	
4,005.0	16.40	26.10	3,848.9	937.5	390.3	1,001.4	0.67	-0.65	
4,096.0	15.30	26.80	3,936.4	959.7	401.4	1,026.1	1.23	-1.21	
4,187.0	16.60	25.60	4,023.9	982.2	412.4	1,051.0	1.47	1.43	
4,279.0	16.30	27.00	4,112.2	1,005.5	423.9	1,076.9	0.54	-0.33	
4,370.0	16.50	24.40	4,199.5	1,028.7	435.1	1,102.5	0.84	0.22	
4,462.0	16.60	18.30	4,287.7	1,053.0	444.6	1,128.2	1.89	0.11	
4,554.0	15.10	18.60	4,376.2	1,076.9	452.5	1,152.6	1.63	-1.63	
4,645.0	16.20	19.70	4,463.8	1,100.1	460.6	1,176.5	1.25	1.21	
4,737.0	15.70	22.10	4,552.2	1,123.7	469.6	1,201.3	0.90	-0.54	
4,828.0	16.00	24.90	4,639.8	1,146.5	479.5	1,225.8	0.90	0.33	
4,920.0	17.20	24.60	4,727.9	1,170.3	490.5	1,251.9	1.31	1.30	
5,011.0	16.70	24.30	4,815.0	1,194.5	501.5	1,278.2	0.56	-0.55	

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Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	DD	Database:	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
5,103.0	15.40	24.00	4,903.4	1,217.7	511.9	1,303.4	1.42	-1.41	
5,195.0	13.50	26.10	4,992.5	1,238.5	521.6	1,326.2	2.14	-2.07	
5,286.0	11.70	28.50	5,081.3	1,256.1	530.7	1,345.9	2.06	-1.98	
5,378.0	11.40	25.00	5,171.4	1,272.6	539.0	1,364.3	0.83	-0.33	
5,469.0	10.90	19.30	5,260.7	1,288.9	545.6	1,381.6	1.33	-0.55	
5,561.0	10.20	22.60	5,351.2	1,304.6	551.6	1,398.1	1.00	-0.76	
5,652.0	8.80	20.90	5,440.9	1,318.5	557.2	1,412.9	1.57	-1.54	
5,744.0	6.70	18.60	5,532.1	1,330.2	561.4	1,425.0	2.31	-2.28	
5,836.0	5.10	34.80	5,623.6	1,338.6	565.5	1,434.3	2.49	-1.74	
5,927.0	3.00	57.90	5,714.4	1,343.2	569.8	1,440.5	2.88	-2.31	
6,019.0	3.60	77.60	5,806.2	1,345.1	574.7	1,444.7	1.38	0.65	
6,111.0	3.70	80.50	5,898.0	1,346.2	580.4	1,448.7	0.23	0.11	
6,203.0	2.00	77.50	5,989.9	1,347.1	584.9	1,451.8	1.85	-1.85	
6,293.0	0.80	314.20	6,079.9	1,347.8	586.0	1,453.0	2.81	-1.33	
6,385.0	2.40	255.80	6,171.9	1,347.8	583.7	1,451.7	2.28	1.74	
6,477.0	1.80	239.00	6,263.8	1,346.6	580.6	1,449.1	0.93	-0.65	
6,568.0	1.80	225.80	6,354.8	1,344.9	578.3	1,446.4	0.45	0.00	
6,660.0	1.70	204.80	6,446.7	1,342.6	576.7	1,443.6	0.70	-0.11	
6,751.0	1.80	180.90	6,537.7	1,340.0	576.1	1,441.1	0.80	0.11	
6,843.0	2.10	227.90	6,629.6	1,337.4	574.8	1,438.2	1.72	0.33	
6,934.0	2.10	202.90	6,720.6	1,334.7	572.9	1,435.0	1.00	0.00	
7,025.0	1.40	53.00	6,811.5	1,333.9	573.2	1,434.4	3.72	-0.77	
7,117.0	1.50	87.00	6,903.5	1,334.6	575.3	1,436.1	0.93	0.11	
7,208.0	0.30	333.80	6,994.5	1,334.9	576.4	1,436.9	1.80	-1.32	
7,300.0	0.50	94.10	7,086.5	1,335.1	576.7	1,437.2	0.76	0.22	
7,391.0	1.20	107.00	7,177.5	1,334.8	578.0	1,437.7	0.79	0.77	
7,483.0	1.40	118.90	7,269.5	1,333.9	579.9	1,438.0	0.36	0.22	
7,575.0	1.90	123.30	7,361.4	1,332.6	582.1	1,438.0	0.56	0.54	
7,666.0	0.50	6.30	7,452.4	1,332.1	583.4	1,438.3	2.39	-1.54	
7,758.0	0.90	335.20	7,544.4	1,333.2	583.2	1,439.1	0.58	0.43	
7,849.0	0.40	23.90	7,635.4	1,334.1	583.0	1,439.8	0.77	-0.55	
7,941.0	0.40	31.20	7,727.4	1,334.7	583.3	1,440.4	0.06	0.00	
8,015.0	0.50	70.30	7,801.4	1,335.0	583.7	1,441.0	0.43	0.14	Last Cathedral Survey @ 8,015' MD
8,065.0	0.50	70.30	7,851.4	1,335.2	584.2	1,441.3	0.00	0.00	Projection to Bit @ 8,065'

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Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Benzel Fee 25-3A (F25NWB Pad)
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Site:	F25NWB Pad	MD Reference:	kbe @ 5851.0ft
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Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	DD	Database:	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									
Benzel Federal 25-2A (F	0.00	0.00	5,375.0	1,183.1	748.3	1,616,078.30	2,372,615.86	39.503823	-107.723672
- actual wellpath misses target center by 231.8ft at 5577.9ft MD (5367.9 TVD, 1307.3 N, 552.8 E)									
- Circle (radius 25.0)									
Benzel Fee 25-3A TGT (0.00	0.00	5,742.0	1,342.6	563.5	1,616,242.31	2,372,435.00	39.504261	-107.724327
- actual wellpath misses target center by 7.7ft at 5954.2ft MD (5741.6 TVD, 1343.9 N, 571.1 E)									
- Point									
Benzel Federal 25-2A (F	0.00	0.00	9,103.0	1,183.1	748.3	1,616,078.30	2,372,615.86	39.503823	-107.723672
- actual wellpath misses target center by 1271.5ft at 8065.0ft MD (7851.4 TVD, 1335.2 N, 584.2 E)									
- Circle (radius 40.0)									
Benzel Fee 25-3A PBHL	0.00	0.00	7,782.0	1,342.6	563.5	1,616,242.31	2,372,435.00	39.504261	-107.724327
- actual wellpath misses target center by 21.5ft at 7995.5ft MD (7781.9 TVD, 1335.0 N, 583.6 E)									
- Circle (radius 25.0)									
Benzel Fee 25-3A PBHL	0.00	0.00	8,837.0	1,342.6	563.5	1,616,242.31	2,372,435.00	39.504261	-107.724327
- actual wellpath misses target center by 985.8ft at 8065.0ft MD (7851.4 TVD, 1335.2 N, 584.2 E)									
- Circle (radius 25.0)									

Design Annotations					
Measured Depth	Vertical Depth	Local Coordinates			
(ft)	(ft)	+N/-S (ft)	+E/-W (ft)	Comment	
8,015.0	7,801.4	1,335.0	583.7	Last Cathedral Survey @ 8,015' MD	
8,065.0	7,851.4	1,335.2	584.2	Projection to Bit @ 8,065'	

Checked By: _____ Approved By: _____ Date: _____