





Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Shideler Fee 31-13C
Project:	Mamm Creek	TVD Reference:	KB = 22' @ 7129.0ft
Site:	O31E Pad	MD Reference:	KB = 22' @ 7129.0ft
Well:	Shideler Fee 31-13C	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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		O31E Pad			
Site Position:		Northing:	1,577,012.73 ft	Latitude:	39.396873
From:	Lat/Long	Easting:	2,376,675.10 ft	Longitude:	-107.705929
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.39 °

Well	Shideler Fee 31-13C					
Well Position	+N/-S	0.0 ft	Northing:	1,576,822.93 ft	Latitude:	39.396348
	+E/-W	0.0 ft	Easting:	2,376,613.10 ft	Longitude:	-107.706132
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	7,107.0 ft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/2/2012	10.02	65.67	52,076

Design	FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	3.0
Vertical Section:	Depth From (TVD)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	3.0	0.0	0.0	278.29	

Survey Program	Date	12/11/2012			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
111.0	9,118.0	Survey #1 (OH)	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		
111.0	0.20	185.80	111.0	-0.2	0.0	0.0	0.18	0.18		
141.0	0.20	189.40	141.0	-0.3	0.0	0.0	0.04	0.00		
171.0	0.10	176.50	171.0	-0.4	0.0	0.0	0.35	-0.33		
203.0	0.20	307.60	203.0	-0.4	-0.1	0.0	0.86	0.31		
233.0	0.30	356.40	233.0	-0.3	-0.1	0.1	0.75	0.33		
264.0	0.30	6.10	264.0	-0.1	-0.1	0.1	0.16	0.00		
295.0	0.60	352.60	295.0	0.1	-0.1	0.2	1.02	0.97		
325.0	1.40	350.60	325.0	0.7	-0.2	0.3	2.67	2.67		
356.0	2.30	347.10	356.0	1.6	-0.4	0.7	2.92	2.90		
387.0	2.90	346.40	386.9	3.0	-0.7	1.2	1.94	1.94		
417.0	3.70	344.60	416.9	4.7	-1.2	1.8	2.69	2.67		
448.0	4.70	339.70	447.8	6.8	-1.9	2.9	3.42	3.23		

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Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
478.0	5.50	336.30	477.7	9.3	-2.9	4.2	2.85	2.67	
508.0	6.30	333.80	507.5	12.1	-4.2	5.9	2.80	2.67	
539.0	6.70	331.40	538.3	15.2	-5.8	7.9	1.56	1.29	
570.0	6.90	330.30	569.1	18.4	-7.6	10.2	0.77	0.65	
661.0	8.70	321.10	659.3	28.5	-14.6	18.6	2.40	1.98	
753.0	11.00	303.90	749.9	38.8	-26.3	31.6	4.03	2.50	
845.0	13.00	288.50	839.9	47.0	-43.4	49.7	4.08	2.17	
937.0	14.50	279.60	929.3	52.2	-64.6	71.4	2.81	1.63	
1,029.0	16.60	275.70	1,017.9	55.5	-89.0	96.1	2.55	2.28	
1,121.0	18.70	276.80	1,105.6	58.5	-116.7	123.9	2.31	2.28	
1,213.0	21.80	278.00	1,191.9	62.6	-148.3	155.8	3.40	3.37	
1,310.0	23.30	278.20	1,281.5	67.9	-185.1	193.0	1.55	1.55	
1,426.0	23.50	277.30	1,387.9	74.1	-230.8	239.0	0.35	0.17	
1,518.0	23.60	277.10	1,472.3	78.7	-267.2	275.8	0.14	0.11	
1,609.0	24.10	276.80	1,555.5	83.1	-303.8	312.6	0.57	0.55	
1,700.0	24.10	275.60	1,638.6	87.2	-340.7	349.7	0.54	0.00	
1,792.0	24.70	275.50	1,722.4	90.8	-378.5	387.7	0.65	0.65	
1,883.0	25.10	274.80	1,804.9	94.3	-416.7	425.9	0.55	0.44	
1,974.0	24.00	275.60	1,887.7	97.7	-454.3	463.7	1.26	-1.21	
2,066.0	23.90	278.80	1,971.8	102.4	-491.4	501.0	1.42	-0.11	
2,157.0	24.20	278.50	2,054.9	107.9	-528.0	538.1	0.36	0.33	
2,249.0	24.50	278.20	2,138.7	113.5	-565.6	576.0	0.35	0.33	
2,341.0	22.20	279.80	2,223.1	119.1	-601.6	612.5	2.59	-2.50	
2,432.0	22.30	280.00	2,307.4	125.1	-635.5	646.9	0.14	0.11	
2,524.0	21.80	280.40	2,392.6	131.2	-669.5	681.4	0.57	-0.54	
2,616.0	22.80	278.60	2,477.8	136.9	-704.0	716.3	1.32	1.09	
2,708.0	22.30	279.00	2,562.7	142.3	-738.8	751.6	0.57	-0.54	
2,799.0	23.30	276.70	2,646.6	147.1	-773.7	786.9	1.47	1.10	
2,891.0	23.40	276.40	2,731.1	151.3	-810.0	823.3	0.17	0.11	
2,982.0	23.70	276.20	2,814.5	155.3	-846.1	859.7	0.34	0.33	
3,073.0	22.80	276.20	2,898.1	159.1	-881.8	895.6	0.99	-0.99	
3,165.0	22.80	276.10	2,982.9	163.0	-917.3	931.2	0.04	0.00	
3,256.0	22.70	275.90	3,066.8	166.6	-952.3	966.3	0.14	-0.11	
3,348.0	22.50	275.50	3,151.8	170.2	-987.4	1,001.7	0.27	-0.22	
3,440.0	22.30	275.00	3,236.8	173.4	-1,022.4	1,036.7	0.30	-0.22	
3,531.0	22.60	276.90	3,320.9	177.0	-1,056.9	1,071.4	0.86	0.33	
3,622.0	22.30	276.80	3,405.0	181.1	-1,091.4	1,106.1	0.33	-0.33	
3,714.0	21.80	277.30	3,490.3	185.4	-1,125.7	1,140.7	0.58	-0.54	
3,806.0	23.50	277.00	3,575.2	189.8	-1,160.8	1,176.1	1.85	1.85	
3,898.0	23.40	276.90	3,659.6	194.2	-1,197.2	1,212.7	0.12	-0.11	
3,989.0	23.80	276.50	3,743.0	198.4	-1,233.4	1,249.1	0.47	0.44	
4,081.0	24.20	275.60	3,827.0	202.4	-1,270.6	1,286.5	0.59	0.43	
4,172.0	23.60	278.00	3,910.2	206.7	-1,307.2	1,323.3	1.26	-0.66	
4,264.0	24.70	277.80	3,994.2	211.9	-1,344.5	1,361.0	1.20	1.20	
4,356.0	22.80	277.80	4,078.4	216.9	-1,381.2	1,398.0	2.07	-2.07	
4,447.0	22.40	278.20	4,162.4	221.8	-1,415.8	1,433.0	0.47	-0.44	
4,539.0	22.50	278.60	4,247.4	226.9	-1,450.6	1,468.1	0.20	0.11	
4,630.0	22.80	276.80	4,331.4	231.6	-1,485.3	1,503.2	0.83	0.33	
4,722.0	21.40	279.30	4,416.7	236.4	-1,519.6	1,537.8	1.83	-1.52	
4,813.0	21.50	280.50	4,501.4	242.2	-1,552.3	1,571.0	0.49	0.11	
4,905.0	21.90	277.90	4,586.8	247.6	-1,585.9	1,605.0	1.13	0.43	
4,997.0	22.00	277.80	4,672.2	252.3	-1,620.0	1,639.4	0.12	0.11	
5,088.0	21.80	276.90	4,756.6	256.6	-1,653.6	1,673.4	0.43	-0.22	

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Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
5,180.0	21.70	277.30	4,842.1	260.9	-1,687.5	1,707.4	0.19	-0.11	
5,271.0	21.60	276.20	4,926.6	264.8	-1,720.8	1,741.0	0.46	-0.11	
5,363.0	21.60	276.40	5,012.2	268.5	-1,754.5	1,774.8	0.08	0.00	
5,454.0	22.00	275.80	5,096.7	272.1	-1,788.1	1,808.6	0.50	0.44	
5,546.0	22.30	275.60	5,181.9	275.6	-1,822.6	1,843.3	0.34	0.33	
5,638.0	20.30	277.00	5,267.6	279.2	-1,855.8	1,876.7	2.24	-2.17	
5,730.0	20.60	276.30	5,353.8	282.9	-1,887.7	1,908.8	0.42	0.33	
5,821.0	18.80	277.70	5,439.5	286.6	-1,918.2	1,939.5	2.04	-1.98	
5,913.0	18.00	277.50	5,526.8	290.5	-1,947.0	1,968.5	0.87	-0.87	
6,004.0	16.00	278.40	5,613.8	294.2	-1,973.3	1,995.1	2.22	-2.20	
6,096.0	15.00	279.10	5,702.4	297.9	-1,997.6	2,019.7	1.11	-1.09	
6,188.0	14.40	279.10	5,791.4	301.6	-2,020.7	2,043.0	0.65	-0.65	
6,279.0	13.40	277.40	5,879.8	304.7	-2,042.3	2,064.9	1.19	-1.10	
6,371.0	11.70	277.20	5,969.5	307.3	-2,062.1	2,084.9	1.85	-1.85	
6,463.0	11.30	275.70	6,059.7	309.3	-2,080.3	2,103.2	0.54	-0.43	
6,555.0	10.50	276.80	6,150.0	311.2	-2,097.6	2,120.6	0.90	-0.87	
6,646.0	8.80	278.40	6,239.8	313.2	-2,112.8	2,135.8	1.89	-1.87	
6,738.0	7.60	278.30	6,330.8	315.1	-2,125.7	2,149.0	1.30	-1.30	
6,829.0	6.30	278.20	6,421.1	316.7	-2,136.6	2,160.0	1.43	-1.43	
6,920.0	5.80	280.40	6,511.6	318.2	-2,146.1	2,169.6	0.61	-0.55	
7,012.0	4.50	274.70	6,603.3	319.4	-2,154.3	2,177.8	1.52	-1.41	
7,103.0	3.70	274.00	6,694.0	319.9	-2,160.8	2,184.3	0.88	-0.88	
7,195.0	2.60	272.10	6,785.9	320.2	-2,165.8	2,189.3	1.20	-1.20	
7,286.0	2.10	266.60	6,876.8	320.1	-2,169.5	2,193.0	0.60	-0.55	
7,378.0	1.40	267.30	6,968.8	320.0	-2,172.3	2,195.8	0.76	-0.76	
7,469.0	0.90	258.70	7,059.7	319.8	-2,174.1	2,197.5	0.58	-0.55	
7,561.0	0.60	254.60	7,151.7	319.5	-2,175.3	2,198.7	0.33	-0.33	
7,653.0	0.30	176.40	7,243.7	319.2	-2,175.8	2,199.0	0.67	-0.33	
7,744.0	0.70	87.60	7,334.7	318.9	-2,175.2	2,198.5	0.83	0.44	
7,836.0	1.30	80.60	7,426.7	319.1	-2,173.6	2,196.9	0.66	0.65	
7,928.0	0.30	151.20	7,518.7	319.1	-2,172.5	2,195.8	1.34	-1.09	
8,020.0	0.60	113.30	7,610.7	318.7	-2,171.9	2,195.2	0.44	0.33	
8,111.0	1.40	93.00	7,701.7	318.4	-2,170.4	2,193.6	0.95	0.88	
8,203.0	0.60	215.10	7,793.7	318.0	-2,169.5	2,192.7	1.95	-0.87	
8,294.0	0.70	153.80	7,884.7	317.1	-2,169.5	2,192.6	0.73	0.11	
8,386.0	1.10	118.40	7,976.7	316.2	-2,168.5	2,191.4	0.72	0.43	
8,478.0	0.60	256.30	8,068.7	315.6	-2,168.2	2,191.1	1.74	-0.54	
8,569.0	0.20	291.70	8,159.7	315.6	-2,168.8	2,191.7	0.50	-0.44	
8,661.0	0.20	42.10	8,251.7	315.8	-2,168.9	2,191.7	0.36	0.00	
8,753.0	0.90	48.20	8,343.7	316.4	-2,168.2	2,191.2	0.76	0.76	
8,844.0	1.80	42.70	8,434.6	317.9	-2,166.7	2,189.9	1.00	0.99	
8,936.0	2.70	42.50	8,526.6	320.6	-2,164.3	2,187.9	0.98	0.98	
9,027.0	2.20	50.20	8,617.5	323.3	-2,161.5	2,185.5	0.66	-0.55	
9,063.0	2.10	59.10	8,653.4	324.0	-2,160.4	2,184.5	0.97	-0.28	Last Cathedral Survey @ 9,063' MD
9,118.0	2.10	59.10	8,708.4	325.1	-2,158.6	2,183.0	0.00	0.00	Projection to Bit @ 9,118'

Cathedral Energy Services

Survey Report

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Project:	Mamm Creek	TVD Reference:	KB = 22' @ 7129.0ft
Site:	O31E Pad	MD Reference:	KB = 22' @ 7129.0ft
Well:	Shideler Fee 31-13C	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
Shideler Fee 31-13C PB	0.00	0.00	8,621.0	316.3	-2,170.6	1,577,191.81	2,374,450.79	39.397216	-107.713813
- actual wellpath misses target center by 11.6ft at 9030.1ft MD (8620.6 TVD, 323.3 N, -2161.4 E)									
- Circle (radius 25.0)									
Shideler Fee 31-13C PB	0.00	0.00	8,624.0	316.3	-2,170.6	1,577,191.81	2,374,450.79	39.397216	-107.713813
- actual wellpath misses target center by 11.8ft at 9033.1ft MD (8623.6 TVD, 323.4 N, -2161.3 E)									
- Circle (radius 25.0)									
Shideler Fee 31-13C TG	0.00	0.00	6,694.0	316.3	-2,170.6	1,577,191.81	2,374,450.79	39.397216	-107.713813
- actual wellpath misses target center by 10.5ft at 7103.5ft MD (6694.5 TVD, 319.9 N, -2160.8 E)									
- Point									
Shideler Fee 31-13C TG	0.00	0.00	6,691.0	316.3	-2,170.6	1,577,191.81	2,374,450.79	39.397216	-107.713813
- actual wellpath misses target center by 10.7ft at 7100.7ft MD (6691.7 TVD, 319.9 N, -2160.6 E)									
- Point									

Design Annotations					
Measured Depth	Vertical Depth	Local Coordinates			
(ft)	(ft)	+N/-S (ft)	+E/-W (ft)	Comment	
9,063.0	8,653.4	324.0	-2,160.4	Last Cathedral Survey @ 9,063' MD	
9,118.0	8,708.4	325.1	-2,158.6	Projection to Bit @ 9,118'	

Checked By: _____ Approved By: _____ Date: _____