



Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well lone 1A-8H
Project:	DJ Wattenberg	TVD Reference:	WELL @ 4917.0ft (Ensign 135)
Site:	S8-T2N-R66W (lone)	MD Reference:	WELL @ 4917.0ft (Ensign 135)
Well:	lone 1A-8H	North Reference:	True
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	Hz	Database:	USA EDM 5000 Multi Users DB

Project	DJ Wattenberg		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		S8-T2N-R66W (lone)			
Site Position:		Northing:	1,297,444.41 ft	Latitude:	40.147740
From:	Lat/Long	Easting:	3,196,240.52 ft	Longitude:	-104.798020
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.45 °

Well	lone 1A-8H					
Well Position	+N/-S	0.0 ft	Northing:	1,301,630.59 ft	Latitude:	40.159220
	+E/-W	0.0 ft	Easting:	3,196,758.01 ft	Longitude:	-104.796050
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,904.0 ft

Wellbore	Hz				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	11/17/2012	8.67	66.80	52,851

Design	Hz				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	180.00	

Survey Program	Date	11/28/2012			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
108.0	11,742.0	Survey #1 (Hz)	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		
108.0	0.50	216.00	108.0	-0.4	-0.3	0.4	0.46	0.46		
169.0	0.20	134.40	169.0	-0.7	-0.4	0.7	0.84	-0.49		
261.0	1.40	93.60	261.0	-0.9	0.9	0.9	1.36	1.30		
353.0	2.30	85.40	352.9	-0.8	3.8	0.8	1.02	0.98		
445.0	3.30	77.20	444.8	0.0	8.3	0.0	1.17	1.09		
537.0	3.90	96.00	536.6	0.2	14.0	-0.2	1.43	0.65		
629.0	5.10	97.10	628.4	-0.6	21.1	0.6	1.31	1.30		
721.0	5.80	87.50	719.9	-0.9	29.8	0.9	1.25	0.76		
811.0	6.50	75.60	809.4	0.5	39.3	-0.5	1.61	0.78		
826.0	6.60	75.70	824.3	1.0	41.0	-1.0	0.67	0.67		
920.0	6.90	74.10	917.7	3.9	51.6	-3.9	0.38	0.32		
1,011.0	8.00	85.00	1,007.9	5.9	63.2	-5.9	1.96	1.21		

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Design:	Hz	Database:	USA EDM 5000 Multi Users DB

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1,103.0	9.40	81.70	1,098.9	7.5	77.0	-7.5	1.61	1.52	
1,195.0	9.70	80.90	1,189.6	9.9	92.1	-9.9	0.36	0.33	
1,287.0	11.20	82.80	1,280.1	12.2	108.6	-12.2	1.67	1.63	
1,379.0	12.20	81.00	1,370.1	14.8	127.1	-14.8	1.16	1.09	
1,471.0	13.40	78.50	1,459.9	18.5	147.1	-18.5	1.44	1.30	
1,563.0	14.20	79.50	1,549.2	22.7	168.7	-22.7	0.91	0.87	
1,655.0	13.20	73.90	1,638.6	27.6	189.9	-27.6	1.80	-1.09	
1,747.0	12.70	69.80	1,728.2	34.0	209.4	-34.0	1.14	-0.54	
1,839.0	12.40	68.90	1,818.0	41.1	228.1	-41.1	0.39	-0.33	
1,931.0	13.60	77.40	1,907.7	47.0	247.9	-47.0	2.45	1.30	
2,026.0	13.70	76.70	2,000.0	52.0	269.8	-52.0	0.20	0.11	
2,121.0	15.00	75.20	2,092.0	57.8	292.6	-57.8	1.42	1.37	
2,216.0	13.40	73.20	2,184.1	64.1	315.0	-64.1	1.76	-1.68	
2,311.0	13.50	69.10	2,276.5	71.2	335.9	-71.2	1.01	0.11	
2,405.0	14.50	71.70	2,367.7	78.8	357.4	-78.8	1.26	1.06	
2,500.0	13.40	75.90	2,459.9	85.2	379.3	-85.2	1.57	-1.16	
2,595.0	13.50	78.80	2,552.3	90.1	400.9	-90.1	0.72	0.11	
2,689.0	12.90	78.90	2,643.9	94.2	421.9	-94.2	0.64	-0.64	
2,784.0	13.10	84.50	2,736.4	97.3	443.1	-97.3	1.34	0.21	
2,879.0	14.20	83.70	2,828.7	99.6	465.4	-99.6	1.17	1.16	
2,974.0	15.00	84.70	2,920.7	102.0	489.2	-102.0	0.88	0.84	
3,068.0	13.60	84.00	3,011.8	104.3	512.3	-104.3	1.50	-1.49	
3,163.0	13.20	81.30	3,104.2	107.1	534.1	-107.1	0.78	-0.42	
3,258.0	13.30	77.00	3,196.6	111.2	555.5	-111.2	1.04	0.11	
3,353.0	13.50	75.90	3,289.1	116.4	576.9	-116.4	0.34	0.21	
3,448.0	13.40	75.30	3,381.5	121.9	598.3	-121.9	0.18	-0.11	
3,543.0	13.80	78.00	3,473.8	127.0	620.0	-127.0	0.79	0.42	
3,638.0	13.80	77.70	3,566.1	131.8	642.2	-131.8	0.08	0.00	
3,732.0	13.80	80.20	3,657.3	136.1	664.2	-136.1	0.63	0.00	
3,827.0	13.50	75.60	3,749.7	140.8	686.1	-140.8	1.19	-0.32	
3,922.0	13.70	78.20	3,842.0	145.8	707.8	-145.8	0.68	0.21	
4,017.0	14.60	79.60	3,934.1	150.3	730.6	-150.3	1.01	0.95	
4,112.0	13.90	78.90	4,026.2	154.7	753.6	-154.7	0.76	-0.74	
4,206.0	15.30	81.40	4,117.2	158.7	776.9	-158.7	1.63	1.49	
4,301.0	14.70	76.70	4,208.9	163.3	801.1	-163.3	1.43	-0.63	
4,396.0	13.00	73.20	4,301.2	169.2	823.0	-169.2	1.99	-1.79	
4,490.0	12.30	70.50	4,392.9	175.6	842.6	-175.6	0.97	-0.74	
4,585.0	12.70	72.60	4,485.6	182.1	862.1	-182.1	0.64	0.42	
4,680.0	12.20	77.70	4,578.4	187.4	881.9	-187.4	1.27	-0.53	
4,774.0	11.80	80.10	4,670.3	191.1	901.0	-191.1	0.68	-0.43	
4,869.0	10.70	80.70	4,763.5	194.2	919.3	-194.2	1.16	-1.16	
4,964.0	8.40	81.40	4,857.2	196.7	934.9	-196.7	2.42	-2.42	
5,059.0	7.90	85.30	4,951.2	198.3	948.2	-198.3	0.78	-0.53	
5,154.0	7.30	81.80	5,045.4	199.6	960.7	-199.6	0.80	-0.63	
5,248.0	6.20	81.20	5,138.7	201.3	971.7	-201.3	1.17	-1.17	
5,343.0	5.40	80.30	5,233.3	202.8	981.1	-202.8	0.85	-0.84	
5,438.0	4.30	75.30	5,327.9	204.5	989.0	-204.5	1.24	-1.16	
5,533.0	3.40	71.20	5,422.7	206.3	995.1	-206.3	0.99	-0.95	
5,628.0	2.70	67.40	5,517.6	208.0	999.8	-208.0	0.77	-0.74	
5,722.0	2.70	65.30	5,611.5	209.8	1,003.9	-209.8	0.11	0.00	
5,817.0	0.90	52.70	5,706.4	211.2	1,006.5	-211.2	1.93	-1.89	
5,912.0	0.80	3.70	5,801.4	212.3	1,007.1	-212.3	0.75	-0.11	
6,006.0	0.70	33.00	5,895.4	213.5	1,007.5	-213.5	0.42	-0.11	

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Design:	Hz	Database:	USA EDM 5000 Multi Users DB

Survey									
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6,101.0	0.10	302.80	5,990.4	214.0	1,007.7	-214.0	0.74	-0.63	
6,196.0	0.20	47.40	6,085.4	214.2	1,007.8	-214.2	0.26	0.11	
6,290.0	0.70	122.80	6,179.4	214.0	1,008.4	-214.0	0.72	0.53	
6,385.0	0.50	92.10	6,274.4	213.6	1,009.3	-213.6	0.39	-0.21	
6,480.0	0.80	98.50	6,369.4	213.5	1,010.4	-213.5	0.32	0.32	
6,543.0	1.30	135.80	6,432.4	212.9	1,011.3	-212.9	1.30	0.79	
6,574.0	2.70	174.20	6,463.3	212.0	1,011.6	-212.0	6.02	4.52	
6,606.0	5.20	180.60	6,495.3	209.8	1,011.7	-209.8	7.92	7.81	
6,637.0	7.60	182.50	6,526.1	206.3	1,011.6	-206.3	7.77	7.74	
6,669.0	10.20	184.10	6,557.7	201.4	1,011.3	-201.4	8.16	8.12	
6,701.0	12.70	185.70	6,589.0	195.0	1,010.7	-195.0	7.87	7.81	
6,732.0	15.40	185.90	6,619.1	187.5	1,010.0	-187.5	8.71	8.71	
6,763.0	17.70	185.20	6,648.8	178.8	1,009.1	-178.8	7.45	7.42	
6,794.0	19.90	183.50	6,678.2	168.8	1,008.4	-168.8	7.31	7.10	
6,826.0	21.10	181.10	6,708.1	157.6	1,007.9	-157.6	4.58	3.75	
6,858.0	22.90	180.80	6,737.8	145.6	1,007.7	-145.6	5.64	5.62	
6,889.0	25.80	180.90	6,766.1	132.8	1,007.5	-132.8	9.36	9.35	
6,921.0	28.30	180.70	6,794.6	118.3	1,007.3	-118.3	7.82	7.81	
6,952.0	30.90	180.70	6,821.5	103.0	1,007.2	-103.0	8.39	8.39	
6,984.0	33.60	179.40	6,848.6	85.9	1,007.1	-85.9	8.71	8.44	
7,015.0	37.10	178.60	6,873.8	68.0	1,007.5	-68.0	11.39	11.29	
7,047.0	40.30	178.70	6,898.8	48.0	1,007.9	-48.0	10.00	10.00	
7,079.0	43.10	177.50	6,922.7	26.7	1,008.6	-26.7	9.10	8.75	
7,110.0	45.00	176.40	6,945.0	5.2	1,009.8	-5.2	6.61	6.13	
7,142.0	46.40	175.70	6,967.3	-17.7	1,011.4	17.7	4.65	4.37	
7,173.0	48.50	175.70	6,988.3	-40.4	1,013.1	40.4	6.77	6.77	
7,205.0	49.90	176.20	7,009.2	-64.6	1,014.8	64.6	4.53	4.37	
7,237.0	52.50	176.50	7,029.3	-89.5	1,016.4	89.5	8.16	8.12	
7,268.0	55.30	176.60	7,047.5	-114.5	1,017.9	114.5	9.04	9.03	
7,300.0	58.60	176.70	7,065.0	-141.3	1,019.5	141.3	10.32	10.31	
7,331.0	60.50	177.00	7,080.7	-167.9	1,020.9	167.9	6.19	6.13	
7,363.0	63.10	177.50	7,095.8	-196.1	1,022.3	196.1	8.24	8.12	
7,394.0	65.20	177.50	7,109.3	-224.0	1,023.5	224.0	6.77	6.77	
7,407.0	66.40	177.70	7,114.6	-235.8	1,024.0	235.8	9.34	9.23	
7,450.0	68.70	179.40	7,131.1	-275.5	1,025.0	275.5	6.48	5.35	
7,482.0	71.20	180.50	7,142.0	-305.6	1,025.0	305.6	8.45	7.81	
7,514.0	73.50	181.40	7,151.7	-336.1	1,024.5	336.1	7.67	7.19	
7,545.0	75.50	181.60	7,160.0	-366.0	1,023.7	366.0	6.48	6.45	
7,577.0	78.50	181.30	7,167.2	-397.1	1,022.9	397.1	9.42	9.37	
7,608.0	82.50	180.90	7,172.3	-427.7	1,022.4	427.7	12.97	12.90	
7,640.0	84.20	180.20	7,176.0	-459.5	1,022.0	459.5	5.74	5.31	
7,672.0	84.90	180.50	7,179.1	-491.3	1,021.9	491.3	2.38	2.19	
7,703.0	86.80	181.00	7,181.3	-522.2	1,021.4	522.2	6.34	6.13	
7,735.0	87.80	181.60	7,182.8	-554.2	1,020.7	554.2	3.64	3.12	
7,782.0	88.80	181.20	7,184.2	-601.2	1,019.6	601.2	2.29	2.13	
7,830.0	89.30	180.80	7,185.0	-649.1	1,018.7	649.1	1.33	1.04	
7,877.0	89.40	180.80	7,185.6	-696.1	1,018.1	696.1	0.21	0.21	
7,924.0	90.20	180.70	7,185.7	-743.1	1,017.5	743.1	1.72	1.70	
8,019.0	89.40	180.00	7,186.0	-838.1	1,016.9	838.1	1.12	-0.84	
8,114.0	90.20	179.50	7,186.4	-933.1	1,017.3	933.1	0.99	0.84	
8,208.0	90.90	180.00	7,185.5	-1,027.1	1,017.7	1,027.1	0.92	0.74	
8,303.0	91.30	180.10	7,183.7	-1,122.1	1,017.6	1,122.1	0.43	0.42	
8,398.0	91.80	180.80	7,181.1	-1,217.1	1,016.9	1,217.1	0.91	0.53	

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8,493.0	91.80	180.80	7,178.1	-1,312.0	1,015.6	1,312.0	0.00	0.00	
8,588.0	91.20	181.00	7,175.6	-1,407.0	1,014.1	1,407.0	0.67	-0.63	
8,683.0	90.20	180.60	7,174.5	-1,501.9	1,012.7	1,501.9	1.13	-1.05	
8,777.0	91.10	180.20	7,173.4	-1,595.9	1,012.1	1,595.9	1.05	0.96	
8,871.0	90.00	179.90	7,172.5	-1,689.9	1,012.0	1,689.9	1.21	-1.17	
8,967.0	89.50	179.80	7,172.9	-1,785.9	1,012.2	1,785.9	0.53	-0.52	
9,062.0	88.30	180.20	7,174.7	-1,880.9	1,012.2	1,880.9	1.33	-1.26	
9,157.0	87.60	180.20	7,178.1	-1,975.8	1,011.9	1,975.8	0.74	-0.74	
9,251.0	87.60	180.00	7,182.1	-2,069.8	1,011.8	2,069.8	0.21	0.00	
9,346.0	87.40	179.20	7,186.2	-2,164.7	1,012.4	2,164.7	0.87	-0.21	
9,441.0	87.40	180.60	7,190.5	-2,259.6	1,012.6	2,259.6	1.47	0.00	
9,536.0	87.30	180.80	7,194.9	-2,354.5	1,011.4	2,354.5	0.24	-0.11	
9,631.0	86.10	180.70	7,200.4	-2,449.3	1,010.2	2,449.3	1.27	-1.26	
9,725.0	86.30	180.00	7,206.6	-2,543.1	1,009.6	2,543.1	0.77	0.21	
9,820.0	86.50	179.80	7,212.6	-2,637.9	1,009.8	2,637.9	0.30	0.21	
9,914.0	86.50	179.50	7,218.3	-2,731.7	1,010.3	2,731.7	0.32	0.00	
10,009.0	87.60	178.80	7,223.2	-2,826.6	1,011.8	2,826.6	1.37	1.16	
10,103.0	88.90	178.30	7,226.1	-2,920.5	1,014.1	2,920.5	1.48	1.38	
10,198.0	89.70	179.50	7,227.2	-3,015.5	1,016.0	3,015.5	1.52	0.84	
10,293.0	89.20	178.40	7,228.1	-3,110.5	1,017.7	3,110.5	1.27	-0.53	
10,388.0	89.80	178.60	7,229.0	-3,205.4	1,020.2	3,205.4	0.67	0.63	
10,483.0	90.10	179.40	7,229.1	-3,300.4	1,021.8	3,300.4	0.90	0.32	
10,577.0	90.30	179.60	7,228.7	-3,394.4	1,022.7	3,394.4	0.30	0.21	
10,672.0	90.00	180.20	7,228.5	-3,489.4	1,022.8	3,489.4	0.71	-0.32	
10,767.0	90.40	180.20	7,228.1	-3,584.4	1,022.5	3,584.4	0.42	0.42	
10,862.0	90.80	180.20	7,227.1	-3,679.4	1,022.2	3,679.4	0.42	0.42	
10,956.0	91.40	180.40	7,225.3	-3,773.4	1,021.7	3,773.4	0.67	0.64	
11,051.0	91.30	181.30	7,223.1	-3,868.3	1,020.3	3,868.3	0.95	-0.11	
11,146.0	90.70	180.70	7,221.4	-3,963.3	1,018.6	3,963.3	0.89	-0.63	
11,241.0	90.40	181.20	7,220.5	-4,058.3	1,017.0	4,058.3	0.61	-0.32	
11,336.0	90.30	181.10	7,220.0	-4,153.3	1,015.1	4,153.3	0.15	-0.11	
11,431.0	90.70	181.30	7,219.1	-4,248.2	1,013.1	4,248.2	0.47	0.42	
11,526.0	91.50	180.90	7,217.3	-4,343.2	1,011.3	4,343.2	0.94	0.84	
11,620.0	91.30	179.60	7,215.0	-4,437.2	1,010.9	4,437.2	1.40	-0.21	
11,693.0	91.60	179.20	7,213.2	-4,510.1	1,011.7	4,510.1	0.68	0.41	Last Cathedral Survey @ 11693' MD Projection to Bit @ 11742' MD
11,742.0	91.60	179.20	7,211.8	-4,559.1	1,012.3	4,559.1	0.00	0.00	

Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well lone 1A-8H
Project:	DJ Wattenberg	TVD Reference:	WELL @ 4917.0ft (Ensign 135)
Site:	S8-T2N-R66W (lone)	MD Reference:	WELL @ 4917.0ft (Ensign 135)
Well:	lone 1A-8H	North Reference:	True
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	Hz	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
lone 1A-8H TGT #3 - survey misses target center by 16.2ft at 9991.2ft MD (7222.4 TVD, -2808.8 N, 1011.4 E) - Point	0.00	0.00	7,238.6	-2,807.9	1,012.0	1,298,830.80	3,197,792.24	40.151512	-104.792430
lone 1A-8H TGT #2 - survey misses target center by 24.7ft at 8990.1ft MD (7173.2 TVD, -1809.0 N, 1012.3 E) - Point	0.00	0.00	7,197.9	-1,808.5	1,012.0	1,299,830.15	3,197,784.31	40.154255	-104.792430
lone 1A-8H PBHL (11.21 - survey misses target center by 33.4ft at 11742.0ft MD (7211.8 TVD, -4559.1 N, 1012.3 E) - Point	0.00	0.00	7,224.7	-4,589.9	1,012.0	1,297,048.86	3,197,806.39	40.146620	-104.792430
lone 1A-8H TGT #1 - survey misses target center by 10.2ft at 8565.5ft MD (7176.1 TVD, -1384.5 N, 1014.4 E) - Point	0.00	0.00	7,186.0	-1,384.7	1,012.0	1,300,253.96	3,197,780.95	40.155419	-104.792430
lone 1A-8H TGT #4 - survey misses target center by 14.1ft at 10990.3ft MD (7224.5 TVD, -3807.7 N, 1021.3 E) - Point	0.00	0.00	7,235.1	-3,807.8	1,012.0	1,297,830.98	3,197,800.18	40.148767	-104.792430

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
11,693.0	7,213.2	-4,510.1	1,011.7	Last Cathedral Survey @ 11693' MD	
11,742.0	7,211.8	-4,559.1	1,012.3	Projection to Bit @ 11742' MD	

Checked By: _____ Approved By: _____ Date: _____