



# Cathedral Energy Services

## Survey Report

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

<b>Project</b>	DJ Wattenberg		
<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 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 1B-8H					
Well Position	+N/-S	0.0 ft	Northing:	1,301,630.49 ft	Latitude:	40.159220
	+E/-W	0.0 ft	Easting:	3,196,746.83 ft	Longitude:	-104.796090
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,904.0 ft

<b>Wellbore</b>	Hz				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	11/3/2012	8.67	66.80	52,855

Design	Hz			
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	180.00

<b>Survey Program</b>	<b>Date</b>	11/15/2012			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
169.0	11,634.0	Survey #1 (Hz)	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		
169.0	0.30	168.70	169.0	-0.4	0.1	0.4	0.18	0.18		
261.0	0.80	79.60	261.0	-0.6	0.8	0.6	0.92	0.54		
354.0	2.10	70.20	354.0	0.1	3.0	-0.1	1.42	1.40		
446.0	3.00	60.30	445.9	1.9	6.7	-1.9	1.09	0.98		
538.0	4.30	65.40	537.7	4.5	11.9	-4.5	1.46	1.41		
630.0	5.50	66.20	629.3	7.7	19.1	-7.7	1.31	1.30		
721.0	6.30	56.70	719.9	12.2	27.2	-12.2	1.38	0.88		
822.0	6.10	50.30	820.3	18.7	36.0	-18.7	0.71	-0.20		
888.0	5.90	48.30	885.9	23.2	41.2	-23.2	0.44	-0.30		
919.0	6.00	47.00	916.7	25.4	43.6	-25.4	0.54	0.32		
1,011.0	6.40	47.40	1,008.2	32.1	50.9	-32.1	0.44	0.43		
1,103.0	7.00	47.80	1,099.6	39.4	58.8	-39.4	0.65	0.65		

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<b>Well:</b>	lone 1B-8H	<b>North Reference:</b>	True
<b>Wellbore:</b>	Hz	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Hz	<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
1,195.0	8.30	52.30	1,190.8	47.2	68.2	-47.2	1.55	1.41	
1,287.0	9.00	53.60	1,281.7	55.5	79.3	-55.5	0.79	0.76	
1,379.0	9.40	51.60	1,372.5	64.5	91.0	-64.5	0.56	0.43	
1,471.0	8.90	61.50	1,463.4	72.5	103.1	-72.5	1.79	-0.54	
1,563.0	9.30	59.40	1,554.2	79.7	115.8	-79.7	0.57	0.43	
1,655.0	7.60	54.10	1,645.2	87.1	127.1	-87.1	2.03	-1.85	
1,747.0	7.00	46.10	1,736.5	94.5	136.1	-94.5	1.28	-0.65	
1,839.0	6.30	49.60	1,827.8	101.7	143.9	-101.7	0.88	-0.76	
1,931.0	6.70	55.80	1,919.3	108.0	152.2	-108.0	0.88	0.43	
2,026.0	6.90	54.40	2,013.6	114.4	161.4	-114.4	0.27	0.21	
2,120.0	5.90	58.70	2,107.0	120.2	170.2	-120.2	1.18	-1.06	
2,215.0	5.40	63.30	2,201.5	124.7	178.3	-124.7	0.71	-0.53	
2,310.0	6.00	63.70	2,296.1	128.9	186.8	-128.9	0.63	0.63	
2,405.0	6.20	71.30	2,390.5	132.8	196.1	-132.8	0.88	0.21	
2,499.0	6.90	60.80	2,483.9	137.2	205.8	-137.2	1.47	0.74	
2,594.0	7.00	60.60	2,578.2	142.8	215.8	-142.8	0.11	0.11	
2,689.0	7.00	63.60	2,672.5	148.2	226.1	-148.2	0.38	0.00	
2,783.0	7.10	57.90	2,765.8	153.8	236.1	-153.8	0.75	0.11	
2,878.0	8.00	59.20	2,860.0	160.4	246.8	-160.4	0.96	0.95	
2,973.0	8.40	55.60	2,954.0	167.7	258.2	-167.7	0.68	0.42	
3,068.0	8.30	54.70	3,048.0	175.5	269.5	-175.5	0.17	-0.11	
3,163.0	6.90	53.30	3,142.2	182.9	279.7	-182.9	1.49	-1.47	
3,258.0	6.00	48.90	3,236.6	189.6	288.0	-189.6	1.08	-0.95	
3,352.0	5.40	48.00	3,330.1	195.8	295.0	-195.8	0.65	-0.64	
3,447.0	3.60	42.10	3,424.8	201.0	300.3	-201.0	1.95	-1.89	
3,542.0	3.40	45.10	3,519.6	205.2	304.3	-205.2	0.29	-0.21	
3,637.0	0.70	39.00	3,614.6	207.6	306.7	-207.6	2.85	-2.84	
3,732.0	0.30	137.00	3,709.6	207.9	307.2	-207.9	0.84	-0.42	
3,827.0	0.50	284.80	3,804.6	207.8	307.0	-207.8	0.81	0.21	
3,921.0	0.30	75.00	3,898.6	208.0	306.8	-208.0	0.82	-0.21	
4,016.0	0.80	319.70	3,993.6	208.6	306.6	-208.6	1.02	0.53	
4,111.0	0.20	147.30	4,088.6	208.9	306.3	-208.9	1.05	-0.63	
4,206.0	1.20	116.40	4,183.5	208.3	307.3	-208.3	1.09	1.05	
4,301.0	0.70	34.60	4,278.5	208.4	308.5	-208.4	1.37	-0.53	
4,395.0	0.30	71.40	4,372.5	208.9	309.0	-208.9	0.53	-0.43	
4,490.0	0.50	42.60	4,467.5	209.3	309.6	-209.3	0.29	0.21	
4,585.0	1.40	322.70	4,562.5	210.5	309.1	-210.5	1.48	0.95	
4,679.0	1.00	0.30	4,656.5	212.3	308.4	-212.3	0.92	-0.43	
4,774.0	0.60	86.30	4,751.5	213.1	308.9	-213.1	1.19	-0.42	
4,869.0	1.90	143.40	4,846.5	211.9	310.4	-211.9	1.74	1.37	
4,964.0	1.60	157.90	4,941.4	209.4	311.8	-209.4	0.56	-0.32	
5,059.0	1.40	169.40	5,036.4	207.0	312.5	-207.0	0.38	-0.21	
5,153.0	1.00	179.50	5,130.4	205.1	312.7	-205.1	0.48	-0.43	
5,248.0	0.70	221.40	5,225.4	203.8	312.4	-203.8	0.70	-0.32	
5,343.0	1.10	176.50	5,320.4	202.5	312.0	-202.5	0.82	0.42	
5,438.0	1.80	112.00	5,415.3	201.0	313.5	-201.0	1.74	0.74	
5,533.0	1.00	113.00	5,510.3	200.1	315.6	-200.1	0.84	-0.84	
5,627.0	0.50	96.50	5,604.3	199.8	316.8	-199.8	0.57	-0.53	
5,722.0	0.40	97.70	5,699.3	199.7	317.5	-199.7	0.11	-0.11	
5,817.0	0.10	291.40	5,794.3	199.7	317.8	-199.7	0.52	-0.32	
5,911.0	0.50	290.00	5,888.3	199.8	317.3	-199.8	0.43	0.43	
6,006.0	0.50	7.20	5,983.3	200.4	317.0	-200.4	0.66	0.00	
6,101.0	0.60	319.20	6,078.3	201.2	316.7	-201.2	0.48	0.11	

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<b>Design:</b>	Hz	<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
6,195.0	0.60	345.00	6,172.3	202.0	316.3	-202.0	0.28	0.00	
6,290.0	0.70	107.40	6,267.3	202.3	316.7	-202.3	1.20	0.11	
6,385.0	0.60	134.10	6,362.3	201.8	317.6	-201.8	0.33	-0.11	
6,416.0	0.70	131.40	6,393.3	201.6	317.9	-201.6	0.34	0.32	
6,480.0	2.60	175.70	6,457.2	199.9	318.3	-199.9	3.37	2.97	
6,511.0	5.50	181.10	6,488.2	197.7	318.3	-197.7	9.43	9.35	
6,543.0	8.30	184.10	6,519.9	193.8	318.1	-193.8	8.82	8.75	
6,574.0	10.90	185.40	6,550.5	188.7	317.7	-188.7	8.42	8.39	
6,606.0	13.30	186.10	6,581.8	182.0	317.0	-182.0	7.51	7.50	
6,638.0	15.70	186.80	6,612.8	174.1	316.1	-174.1	7.52	7.50	
6,669.0	18.10	185.30	6,642.4	165.1	315.1	-165.1	7.87	7.74	
6,701.0	20.80	182.70	6,672.6	154.5	314.4	-154.5	8.86	8.44	
6,732.0	23.60	179.60	6,701.3	142.8	314.2	-142.8	9.79	9.03	
6,764.0	26.60	178.10	6,730.3	129.2	314.5	-129.2	9.58	9.37	
6,796.0	28.50	178.30	6,758.6	114.4	314.9	-114.4	5.94	5.94	
6,827.0	29.50	177.50	6,785.7	99.4	315.5	-99.4	3.46	3.23	
6,859.0	30.80	177.60	6,813.4	83.3	316.2	-83.3	4.07	4.06	
6,891.0	33.30	177.80	6,840.5	66.4	316.9	-66.4	7.82	7.81	
6,922.0	36.40	178.60	6,866.0	48.6	317.4	-48.6	10.11	10.00	
6,954.0	39.70	180.50	6,891.2	28.9	317.5	-28.9	10.94	10.31	
6,985.0	42.40	181.00	6,914.5	8.6	317.3	-8.6	8.77	8.71	
7,017.0	44.40	181.20	6,937.8	-13.4	316.9	13.4	6.26	6.25	
7,048.0	46.30	180.50	6,959.6	-35.5	316.5	35.5	6.34	6.13	
7,080.0	48.10	180.10	6,981.3	-58.9	316.4	58.9	5.70	5.62	
7,112.0	50.40	179.40	7,002.2	-83.2	316.5	83.2	7.38	7.19	
7,143.0	53.10	178.50	7,021.4	-107.5	317.0	107.5	9.00	8.71	
7,175.0	54.80	179.30	7,040.2	-133.4	317.5	133.4	5.68	5.31	
7,206.0	56.80	179.80	7,057.7	-159.0	317.7	159.0	6.59	6.45	
7,238.0	58.90	180.20	7,074.7	-186.1	317.7	186.1	6.65	6.56	
7,269.0	61.40	180.20	7,090.1	-213.0	317.6	213.0	8.06	8.06	
7,301.0	63.60	180.80	7,104.9	-241.4	317.3	241.4	7.07	6.87	
7,333.0	65.10	180.90	7,118.7	-270.2	316.9	270.2	4.70	4.69	
7,364.0	66.90	180.50	7,131.3	-298.5	316.5	298.5	5.92	5.81	
7,384.0	68.30	181.10	7,139.0	-317.0	316.3	317.0	7.53	7.00	
7,453.0	72.50	182.60	7,162.1	-382.0	314.2	382.0	6.42	6.09	
7,485.0	76.70	182.40	7,170.6	-412.8	312.8	412.8	13.14	13.12	
7,516.0	80.80	182.20	7,176.6	-443.1	311.6	443.1	13.25	13.23	
7,548.0	83.90	181.70	7,180.9	-474.8	310.5	474.8	9.81	9.69	
7,580.0	86.50	180.50	7,183.6	-506.7	309.9	506.7	8.94	8.12	
7,611.0	88.10	180.10	7,185.0	-537.7	309.8	537.7	5.32	5.16	
7,643.0	90.20	179.80	7,185.5	-569.7	309.8	569.7	6.63	6.56	
7,690.0	90.10	179.30	7,185.4	-616.7	310.2	616.7	1.08	-0.21	
7,738.0	90.10	178.80	7,185.3	-664.7	311.0	664.7	1.04	0.00	
7,785.0	89.70	178.70	7,185.4	-711.7	312.0	711.7	0.88	-0.85	
7,832.0	89.10	178.10	7,185.9	-758.6	313.3	758.6	1.81	-1.28	
7,927.0	89.10	178.30	7,187.4	-853.6	316.3	853.6	0.21	0.00	
8,022.0	90.10	178.10	7,188.0	-948.5	319.3	948.5	1.07	1.05	
8,117.0	88.90	177.90	7,188.9	-1,043.5	322.6	1,043.5	1.28	-1.26	
8,212.0	89.20	179.50	7,190.4	-1,138.4	324.7	1,138.4	1.71	0.32	
8,306.0	89.30	179.30	7,191.7	-1,232.4	325.7	1,232.4	0.24	0.11	
8,401.0	89.90	179.20	7,192.3	-1,327.4	327.0	1,327.4	0.64	0.63	
8,496.0	90.50	179.20	7,192.0	-1,422.4	328.3	1,422.4	0.63	0.63	
8,591.0	90.90	178.70	7,190.8	-1,517.4	330.0	1,517.4	0.67	0.42	

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<b>Wellbore:</b>	Hz	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Hz	<b>Database:</b>	USA EDM 5000 Multi Users DB

Survey									
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8,686.0	90.30	179.20	7,189.9	-1,612.3	331.8	1,612.3	0.82	-0.63	
8,780.0	89.80	179.70	7,189.8	-1,706.3	332.7	1,706.3	0.75	-0.53	
8,875.0	88.40	180.30	7,191.3	-1,801.3	332.7	1,801.3	1.60	-1.47	
8,970.0	88.60	179.80	7,193.7	-1,896.3	332.6	1,896.3	0.57	0.21	
9,065.0	89.20	180.00	7,195.6	-1,991.3	332.7	1,991.3	0.67	0.63	
9,160.0	90.20	179.50	7,196.1	-2,086.3	333.2	2,086.3	1.18	1.05	
9,254.0	90.70	178.90	7,195.3	-2,180.3	334.5	2,180.3	0.83	0.53	
9,349.0	91.30	179.40	7,193.7	-2,275.2	335.9	2,275.2	0.82	0.63	
9,444.0	91.50	180.30	7,191.4	-2,370.2	336.1	2,370.2	0.97	0.21	
9,539.0	90.40	180.30	7,189.8	-2,465.2	335.6	2,465.2	1.16	-1.16	
9,633.0	90.00	180.70	7,189.4	-2,559.2	334.8	2,559.2	0.60	-0.43	
9,728.0	89.10	180.30	7,190.2	-2,654.2	334.0	2,654.2	1.04	-0.95	
9,823.0	88.10	180.40	7,192.5	-2,749.1	333.4	2,749.1	1.06	-1.05	
9,918.0	88.20	180.30	7,195.6	-2,844.1	332.8	2,844.1	0.15	0.11	
10,012.0	89.10	181.20	7,197.8	-2,938.1	331.6	2,938.1	1.35	0.96	
10,107.0	89.10	180.80	7,199.3	-3,033.0	329.9	3,033.0	0.42	0.00	
10,202.0	89.20	180.60	7,200.7	-3,128.0	328.8	3,128.0	0.24	0.11	
10,296.0	90.60	180.50	7,200.9	-3,222.0	327.9	3,222.0	1.49	1.49	
10,391.0	89.70	180.40	7,200.6	-3,317.0	327.1	3,317.0	0.95	-0.95	
10,486.0	90.30	180.60	7,200.6	-3,412.0	326.3	3,412.0	0.67	0.63	
10,580.0	91.30	180.40	7,199.3	-3,506.0	325.5	3,506.0	1.08	1.06	
10,675.0	91.10	179.80	7,197.3	-3,601.0	325.3	3,601.0	0.67	-0.21	
10,770.0	90.90	179.40	7,195.7	-3,695.9	326.0	3,695.9	0.47	-0.21	
10,865.0	91.10	180.40	7,194.0	-3,790.9	326.1	3,790.9	1.07	0.21	
10,959.0	90.30	180.30	7,192.8	-3,884.9	325.6	3,884.9	0.86	-0.85	
11,054.0	89.80	179.90	7,192.8	-3,979.9	325.4	3,979.9	0.67	-0.53	
11,149.0	89.80	179.70	7,193.1	-4,074.9	325.7	4,074.9	0.21	0.00	
11,244.0	89.80	180.00	7,193.4	-4,169.9	326.0	4,169.9	0.32	0.00	
11,339.0	89.80	179.50	7,193.8	-4,264.9	326.4	4,264.9	0.53	0.00	
11,433.0	89.40	179.40	7,194.4	-4,358.9	327.3	4,358.9	0.44	-0.43	
11,528.0	89.50	179.20	7,195.3	-4,453.9	328.5	4,453.9	0.24	0.11	
11,585.0	89.90	178.80	7,195.6	-4,510.9	329.5	4,510.9	0.99	0.70	Last Cathedral Survey @ 11,585' MD
11,634.0	89.90	178.80	7,195.7	-4,559.9	330.5	4,559.9	0.00	0.00	Projection to Bit @ 11,634' MD

# Cathedral Energy Services

## Survey Report

<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well lone 1B-8H
<b>Project:</b>	DJ Wattenberg	<b>TVD Reference:</b>	WELL @ 4917.0ft (Ensign 135)
<b>Site:</b>	S8-T2N-R66W (lone)	<b>MD Reference:</b>	WELL @ 4917.0ft (Ensign 135)
<b>Well:</b>	lone 1B-8H	<b>North Reference:</b>	True
<b>Wellbore:</b>	Hz	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Hz	<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									
lone 1B-8H PBHL NEW	0.00	0.00	7,200.0	-4,589.9	324.3	1,297,043.30	3,197,107.54	40.146620	-104.794930
- survey misses target center by 31.0ft at 11634.0ft MD (7195.7 TVD, -4559.9 N, 330.5 E)									
- Point									

Survey Annotations					
Measured Depth	Vertical Depth	Local Coordinates			
(ft)	(ft)	+N/-S	+E/-W		
(ft)	(ft)	(ft)	(ft)	Comment	
11,585.0	7,195.6	-4,510.9	329.5	Last Cathedral Survey @ 11,585' MD	
11,634.0	7,195.7	-4,559.9	330.5	Projection to Bit @ 11,634' MD	

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