





Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well lone 2B-2H
Project:	DJ Wattenberg	TVD Reference:	KB=13' @ 5059.0ft (Ensign 124)
Site:	S2-T2N-R66W (lone.)	MD Reference:	KB=13' @ 5059.0ft (Ensign 124)
Well:	lone 2B-2H	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		S2-T2N-R66W (lone.)			
Site Position:		Northing:	1,306,798.50 ft	Latitude:	40.173110
From:	Lat/Long	Easting:	3,209,901.52 ft	Longitude:	-104.748870
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.49 °

Well	lone 2B-2H					
Well Position	+N/-S	0.0 ft	Northing:	1,306,798.55 ft	Latitude:	40.173110
	+E/-W	0.0 ft	Easting:	3,209,909.90 ft	Longitude:	-104.748840
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	5,046.0 ft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	4/11/2013	8.59	66.81	52,820

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	4/23/2013			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
171.0	11,850.0	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		
171.0	0.20	290.10	171.0	0.1	-0.3	-0.1	0.12	0.12		
265.0	0.80	316.20	265.0	0.6	-0.9	-0.6	0.67	0.64		
358.0	0.90	325.20	358.0	1.7	-1.8	-1.7	0.18	0.11		
451.0	1.70	320.10	451.0	3.4	-3.1	-3.4	0.87	0.86		
544.0	2.60	302.10	543.9	5.5	-5.7	-5.5	1.20	0.97		
637.0	2.70	302.00	636.8	7.8	-9.4	-7.8	0.11	0.11		
730.0	3.70	303.60	729.6	10.6	-13.7	-10.6	1.08	1.08		
823.0	3.60	300.40	822.5	13.8	-18.7	-13.8	0.24	-0.11		
916.0	3.70	296.80	915.3	16.6	-23.9	-16.6	0.27	0.11		
962.0	3.80	298.60	961.2	18.0	-26.6	-18.0	0.34	0.22		
1,019.0	4.00	306.10	1,018.0	20.1	-29.9	-20.1	0.96	0.35		
1,112.0	6.40	309.90	1,110.7	25.3	-36.5	-25.3	2.61	2.58		

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Design:	HZ	Database:	USA EDM 5000 Multi Users DB

Survey

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1,205.0	7.90	306.50	1,202.9	32.4	-45.6	-32.4	1.68	1.61	
1,298.0	7.50	304.20	1,295.1	39.7	-55.7	-39.7	0.54	-0.43	
1,391.0	7.40	304.50	1,387.3	46.5	-65.7	-46.5	0.12	-0.11	
1,484.0	9.20	292.10	1,479.3	52.7	-77.5	-52.7	2.72	1.94	
1,577.0	8.60	292.40	1,571.2	58.1	-90.8	-58.1	0.65	-0.65	
1,670.0	7.50	296.50	1,663.3	63.5	-102.7	-63.5	1.33	-1.18	
1,763.0	7.60	294.00	1,755.5	68.7	-113.8	-68.7	0.37	0.11	
1,856.0	7.60	291.90	1,847.7	73.5	-125.1	-73.5	0.30	0.00	
1,949.0	7.30	300.50	1,939.9	78.8	-135.9	-78.8	1.24	-0.32	
2,044.0	7.20	297.40	2,034.1	84.6	-146.4	-84.6	0.42	-0.11	
2,139.0	6.90	311.10	2,128.4	91.1	-155.9	-91.1	1.79	-0.32	
2,234.0	6.70	309.40	2,222.8	98.3	-164.5	-98.3	0.30	-0.21	
2,329.0	6.30	307.10	2,317.1	105.0	-173.0	-105.0	0.50	-0.42	
2,424.0	5.80	305.20	2,411.6	110.9	-181.0	-110.9	0.57	-0.53	
2,519.0	5.50	301.60	2,506.2	116.0	-188.8	-116.0	0.49	-0.32	
2,614.0	4.90	299.90	2,600.8	120.5	-196.2	-120.5	0.65	-0.63	
2,709.0	5.80	299.90	2,695.3	124.9	-203.9	-124.9	0.95	0.95	
2,804.0	5.10	296.50	2,789.9	129.1	-211.9	-129.1	0.81	-0.74	
2,899.0	6.80	295.60	2,884.4	133.5	-220.7	-133.5	1.79	1.79	
2,994.0	8.00	302.90	2,978.6	139.5	-231.3	-139.5	1.60	1.26	
3,089.0	7.60	301.40	3,072.7	146.3	-242.3	-146.3	0.47	-0.42	
3,184.0	7.20	297.90	3,166.9	152.4	-252.9	-152.4	0.63	-0.42	
3,279.0	6.80	295.00	3,261.2	157.6	-263.2	-157.6	0.56	-0.42	
3,374.0	6.30	291.80	3,355.6	161.9	-273.2	-161.9	0.65	-0.53	
3,469.0	7.40	292.60	3,449.9	166.2	-283.7	-166.2	1.16	1.16	
3,564.0	7.00	303.90	3,544.2	171.7	-294.1	-171.7	1.55	-0.42	
3,659.0	5.90	301.00	3,638.6	177.5	-303.1	-177.5	1.21	-1.16	
3,754.0	7.20	305.40	3,733.0	183.5	-312.1	-183.5	1.47	1.37	
3,850.0	8.10	302.90	3,828.1	190.6	-322.7	-190.6	1.00	0.94	
3,945.0	7.20	300.20	3,922.3	197.2	-333.5	-197.2	1.02	-0.95	
4,040.0	7.60	303.90	4,016.5	203.7	-343.8	-203.7	0.65	0.42	
4,135.0	6.70	300.50	4,110.7	210.1	-353.8	-210.1	1.05	-0.95	
4,230.0	7.50	311.10	4,205.0	216.9	-363.3	-216.9	1.61	0.84	
4,325.0	7.50	310.70	4,299.2	225.1	-372.7	-225.1	0.05	0.00	
4,420.0	6.60	312.00	4,393.5	232.8	-381.4	-232.8	0.96	-0.95	
4,515.0	5.80	316.60	4,487.9	239.9	-388.8	-239.9	0.99	-0.84	
4,610.0	6.80	308.50	4,582.3	246.9	-396.5	-246.9	1.41	1.05	
4,705.0	7.30	306.00	4,676.6	253.9	-405.8	-253.9	0.62	0.53	
4,800.0	8.80	298.70	4,770.7	261.0	-417.0	-261.0	1.91	1.58	
4,895.0	8.40	297.60	4,864.6	267.7	-429.5	-267.7	0.46	-0.42	
4,990.0	8.40	297.80	4,958.6	274.1	-441.8	-274.1	0.03	0.00	
5,085.0	8.20	296.70	5,052.6	280.4	-454.0	-280.4	0.27	-0.21	
5,180.0	7.40	297.60	5,146.7	286.3	-465.5	-286.3	0.85	-0.84	
5,275.0	7.00	300.90	5,241.0	292.1	-475.9	-292.1	0.61	-0.42	
5,370.0	6.00	305.00	5,335.4	297.9	-484.9	-297.9	1.16	-1.05	
5,465.0	5.90	301.20	5,429.9	303.3	-493.2	-303.3	0.43	-0.11	
5,560.0	4.80	305.50	5,524.4	308.1	-500.6	-308.1	1.23	-1.16	
5,655.0	5.80	285.60	5,619.0	311.7	-508.4	-311.7	2.19	1.05	
5,750.0	4.60	286.20	5,713.7	314.1	-516.7	-314.1	1.26	-1.26	
5,845.0	5.40	293.60	5,808.3	316.9	-524.5	-316.9	1.08	0.84	
5,940.0	4.50	292.50	5,902.9	320.2	-532.0	-320.2	0.95	-0.95	
6,035.0	3.60	291.00	5,997.7	322.7	-538.2	-322.7	0.95	-0.95	
6,130.0	3.20	286.80	6,092.5	324.5	-543.6	-324.5	0.50	-0.42	

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6,225.0	4.40	303.00	6,187.3	327.2	-549.1	-327.2	1.68	1.26	
6,320.0	4.10	300.10	6,282.1	330.9	-555.1	-330.9	0.39	-0.32	
6,415.0	3.50	296.70	6,376.8	333.9	-560.7	-333.9	0.67	-0.63	
6,510.0	1.20	326.30	6,471.8	336.1	-563.8	-336.1	2.66	-2.42	
6,605.0	1.20	326.80	6,566.7	337.7	-564.9	-337.7	0.01	0.00	
6,701.0	1.10	324.80	6,662.7	339.3	-566.0	-339.3	0.11	-0.10	
6,764.0	0.90	235.70	6,725.7	339.5	-566.8	-339.5	2.24	-0.32	
6,827.0	3.60	181.10	6,788.7	337.3	-567.2	-337.3	5.02	4.29	
6,859.0	7.00	177.50	6,820.5	334.3	-567.1	-334.3	10.67	10.62	
6,891.0	8.80	181.80	6,852.2	329.9	-567.1	-329.9	5.92	5.62	
6,922.0	11.80	182.30	6,882.7	324.4	-567.3	-324.4	9.68	9.68	
6,954.0	14.90	181.50	6,913.9	317.0	-567.6	-317.0	9.70	9.69	
6,986.0	17.90	179.50	6,944.5	308.0	-567.6	-308.0	9.54	9.37	
7,017.0	19.40	178.20	6,973.9	298.1	-567.4	-298.1	5.02	4.84	
7,049.0	20.70	177.40	7,004.0	287.1	-567.0	-287.1	4.15	4.06	
7,081.0	22.50	177.00	7,033.7	275.3	-566.4	-275.3	5.64	5.62	
7,113.0	23.80	177.10	7,063.2	262.8	-565.8	-262.8	4.06	4.06	
7,144.0	26.60	178.70	7,091.2	249.6	-565.3	-249.6	9.29	9.03	
7,176.0	30.30	180.00	7,119.3	234.3	-565.1	-234.3	11.72	11.56	
7,208.0	33.20	181.60	7,146.5	217.5	-565.4	-217.5	9.44	9.06	
7,239.0	35.80	181.30	7,172.1	200.0	-565.8	-200.0	8.40	8.39	
7,271.0	39.40	180.80	7,197.4	180.4	-566.2	-180.4	11.29	11.25	
7,303.0	41.90	180.50	7,221.7	159.6	-566.4	-159.6	7.84	7.81	
7,334.0	42.30	179.70	7,244.7	138.8	-566.5	-138.8	2.16	1.29	
7,366.0	44.80	179.60	7,267.9	116.8	-566.3	-116.8	7.82	7.81	
7,398.0	47.30	179.00	7,290.1	93.7	-566.0	-93.7	7.93	7.81	
7,429.0	50.30	178.20	7,310.5	70.4	-565.5	-70.4	9.87	9.68	
7,461.0	52.70	178.00	7,330.4	45.4	-564.6	-45.4	7.52	7.50	
7,493.0	54.10	177.80	7,349.5	19.7	-563.7	-19.7	4.40	4.37	
7,524.0	55.60	178.00	7,367.4	-5.6	-562.8	5.6	4.87	4.84	
7,556.0	58.30	178.50	7,384.8	-32.4	-561.9	32.4	8.54	8.44	
7,588.0	61.10	179.20	7,401.0	-60.0	-561.4	60.0	8.95	8.75	
7,619.0	63.40	179.90	7,415.4	-87.5	-561.2	87.5	7.68	7.42	
7,651.0	65.80	179.50	7,429.1	-116.4	-561.0	116.4	7.58	7.50	
7,682.0	68.60	179.90	7,441.1	-144.9	-560.9	144.9	9.11	9.03	
7,714.0	70.60	179.90	7,452.3	-174.9	-560.8	174.9	6.25	6.25	
7,746.0	72.30	179.70	7,462.5	-205.3	-560.7	205.3	5.35	5.31	
7,777.0	74.60	179.60	7,471.3	-235.0	-560.5	235.0	7.43	7.42	
7,809.0	77.40	178.20	7,479.0	-266.0	-559.9	266.0	9.73	8.75	
7,835.0	80.30	176.70	7,484.1	-291.5	-558.8	291.5	12.51	11.15	
7,891.0	84.90	175.60	7,491.3	-346.9	-555.1	346.9	8.44	8.21	
7,923.0	87.40	176.90	7,493.4	-378.8	-553.0	378.8	8.80	7.81	
7,955.0	89.10	177.90	7,494.4	-410.7	-551.5	410.7	6.16	5.31	
8,050.0	90.50	178.00	7,494.7	-505.6	-548.1	505.6	1.48	1.47	
8,145.0	90.70	179.60	7,493.7	-600.6	-546.1	600.6	1.70	0.21	
8,240.0	90.00	179.20	7,493.2	-695.6	-545.2	695.6	0.85	-0.74	
8,336.0	89.80	180.30	7,493.3	-791.6	-544.7	791.6	1.16	-0.21	
8,431.0	89.20	181.60	7,494.2	-886.6	-546.3	886.6	1.51	-0.63	
8,525.0	88.90	181.60	7,495.7	-980.5	-548.9	980.5	0.32	-0.32	
8,620.0	90.40	181.70	7,496.3	-1,075.5	-551.7	1,075.5	1.58	1.58	
8,715.0	90.70	182.00	7,495.4	-1,170.4	-554.7	1,170.4	0.45	0.32	
8,810.0	90.20	182.20	7,494.6	-1,265.4	-558.2	1,265.4	0.57	-0.53	
8,906.0	90.20	179.70	7,494.3	-1,361.3	-559.8	1,361.3	2.60	0.00	

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9,000.0	89.80	179.90	7,494.3	-1,455.3	-559.5	1,455.3	0.48	-0.43	
9,096.0	88.70	178.80	7,495.6	-1,551.3	-558.4	1,551.3	1.62	-1.15	
9,191.0	88.10	178.40	7,498.2	-1,646.3	-556.1	1,646.3	0.76	-0.63	
9,285.0	88.40	177.90	7,501.1	-1,740.2	-553.0	1,740.2	0.62	0.32	
9,381.0	89.10	176.90	7,503.2	-1,836.0	-548.7	1,836.0	1.27	0.73	
9,476.0	90.40	177.30	7,503.6	-1,930.9	-543.9	1,930.9	1.43	1.37	
9,571.0	90.30	177.70	7,503.0	-2,025.8	-539.7	2,025.8	0.43	-0.11	
9,666.0	87.90	176.20	7,504.5	-2,120.7	-534.7	2,120.7	2.98	-2.53	
9,761.0	87.90	175.80	7,508.0	-2,215.4	-528.1	2,215.4	0.42	0.00	
9,856.0	88.10	175.40	7,511.3	-2,310.0	-520.8	2,310.0	0.47	0.21	
9,951.0	89.50	175.40	7,513.3	-2,404.7	-513.2	2,404.7	1.47	1.47	
10,046.0	87.30	177.10	7,515.9	-2,499.5	-506.9	2,499.5	2.93	-2.32	
10,141.0	88.40	178.50	7,519.5	-2,594.3	-503.3	2,594.3	1.87	1.16	
10,236.0	88.60	179.90	7,522.0	-2,689.3	-502.0	2,689.3	1.49	0.21	
10,331.0	90.20	181.50	7,523.0	-2,784.3	-503.1	2,784.3	2.38	1.68	
10,426.0	90.20	181.60	7,522.7	-2,879.2	-505.7	2,879.2	0.11	0.00	
10,521.0	90.10	181.60	7,522.4	-2,974.2	-508.4	2,974.2	0.11	-0.11	
10,616.0	90.40	183.00	7,522.0	-3,069.1	-512.2	3,069.1	1.51	0.32	
10,711.0	92.00	183.80	7,520.0	-3,163.9	-517.8	3,163.9	1.88	1.68	
10,806.0	92.00	183.70	7,516.7	-3,258.7	-524.0	3,258.7	0.11	0.00	
10,901.0	93.70	185.60	7,512.0	-3,353.2	-531.7	3,353.2	2.68	1.79	
10,996.0	93.80	188.90	7,505.7	-3,447.2	-543.7	3,447.2	3.47	0.11	
11,091.0	93.90	188.40	7,499.4	-3,540.9	-557.9	3,540.9	0.54	0.11	
11,186.0	89.00	190.90	7,497.0	-3,634.5	-573.8	3,634.5	5.79	-5.16	
11,281.0	88.20	190.50	7,499.3	-3,727.9	-591.5	3,727.9	0.94	-0.84	
11,376.0	89.00	189.30	7,501.6	-3,821.4	-607.8	3,821.4	1.52	0.84	
11,472.0	89.80	189.70	7,502.6	-3,916.1	-623.6	3,916.1	0.93	0.83	
11,567.0	91.10	189.60	7,501.9	-4,009.7	-639.6	4,009.7	1.37	1.37	
11,662.0	91.30	189.80	7,499.9	-4,103.4	-655.6	4,103.4	0.30	0.21	
11,757.0	91.60	190.20	7,497.5	-4,196.9	-672.1	4,196.9	0.53	0.32	
11,800.0	91.00	189.10	7,496.5	-4,239.3	-679.3	4,239.3	2.91	-1.40	Last Cathedral Survey @ 11,800' MD
11,850.0	91.00	189.10	7,495.6	-4,288.6	-687.2	4,288.6	0.00	0.00	Projection to Bit @ 11,850'

Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well lone 2B-2H
Project:	DJ Wattenberg	TVD Reference:	KB=13' @ 5059.0ft (Ensign 124)
Site:	S2-T2N-R66W (lone.)	MD Reference:	KB=13' @ 5059.0ft (Ensign 124)
Well:	lone 2B-2H	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	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
lone 2B-2H PBHL P2 (4ft)	0.00	0.00	7,541.0	-4,316.7	-746.0	1,302,475.67	3,209,200.50	40.161260	-104.751509
- actual wellpath misses target center by 79.4ft at 11850.0ft MD (7495.6 TVD, -4288.6 N, -687.2 E)									
- Point									
lone 2B-2H TGT 2 (9100')	0.00	0.00	7,495.0	-1,280.3	-544.6	1,305,513.70	3,209,376.17	40.169595	-104.750789
- actual wellpath misses target center by 14.1ft at 8824.7ft MD (7494.6 TVD, -1280.1 N, -558.7 E)									
- Point									
lone 2B-2H TGT 4 (10400')	0.00	0.00	7,531.0	-2,580.3	-509.6	1,304,214.04	3,209,422.18	40.166027	-104.750663
- actual wellpath misses target center by 13.3ft at 10127.2ft MD (7519.1 TVD, -2580.5 N, -503.7 E)									
- Point									
lone 2B-2H PBHL (460' I)	0.00	0.00	7,541.0	-4,316.7	-659.6	1,302,476.40	3,209,286.89	40.161260	-104.751200
- actual wellpath misses target center by 60.1ft at 11850.0ft MD (7495.6 TVD, -4288.6 N, -687.2 E)									
- Point									
lone 2B-2H 9200' P3	0.00	0.00	7,495.0	-1,461.5	-555.9	1,305,332.35	3,209,366.35	40.169098	-104.750829
- actual wellpath misses target center by 3.6ft at 9006.2ft MD (7494.3 TVD, -1461.6 N, -559.5 E)									
- Point									
lone 2B-2H TGT 5 (11400')	0.00	0.00	7,506.0	-3,580.3	-609.6	1,303,213.23	3,209,330.65	40.163282	-104.751021
- actual wellpath misses target center by 45.7ft at 11138.3ft MD (7497.2 TVD, -3587.6 N, -565.3 E)									
- Point									
lone 2B-2H PBHL (460' I)	0.00	0.00	7,504.0	-4,316.7	-659.6	1,302,476.40	3,209,286.89	40.161260	-104.751200
- actual wellpath misses target center by 40.2ft at 11850.0ft MD (7495.6 TVD, -4288.6 N, -687.2 E)									
- Point									
lone 2B-2H 11500' P3	0.00	0.00	7,504.0	-3,738.9	-623.0	1,303,054.53	3,209,318.60	40.162846	-104.751069
- actual wellpath misses target center by 29.3ft at 11297.4ft MD (7499.8 TVD, -3744.0 N, -594.4 E)									
- Point									
lone 2B-2H TGT 3 (10300')	0.00	0.00	7,528.0	-2,480.3	-530.6	1,304,313.86	3,209,400.33	40.166301	-104.750739
- actual wellpath misses target center by 26.0ft at 10025.7ft MD (7515.1 TVD, -2479.2 N, -508.0 E)									
- Point									
lone 2B-2H TGT 1 (8000')	0.00	0.00	7,495.0	-180.3	-659.6	1,306,612.69	3,209,251.85	40.172615	-104.751200
- actual wellpath misses target center by 106.1ft at 7732.3ft MD (7458.2 TVD, -192.3 N, -560.8 E)									
- Point									
lone 2B-2H 10400' P3	0.00	0.00	7,526.0	-2,660.8	-514.1	1,304,133.48	3,209,418.39	40.165806	-104.750679
- actual wellpath misses target center by 12.8ft at 10207.5ft MD (7521.3 TVD, -2660.8 N, -502.1 E)									
- Point									

Design Annotations				
Measured Depth	Vertical Depth	Local Coordinates		Comment
(ft)	(ft)	+N/-S (ft)	+E/-W (ft)	
11,800.0	7,496.5	-4,239.3	-679.3	Last Cathedral Survey @ 11,800' MD
11,850.0	7,495.6	-4,288.6	-687.2	Projection to Bit @ 11,850'

Checked By: _____ Approved By: _____ Date: _____