







Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Cook Carpenter 20-3C (PB-20)
Project:	S. Piceance (Parachute)	TVD Reference:	KBE @ 5665.0ft (Original Well Elev)
Site:	PB-20 Pad	MD Reference:	KBE @ 5665.0ft (Original Well Elev)
Well:	Cook Carpenter 20-3C (PB-20)	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	DD	Database:	USA EDM 5000 Multi Users DB

Project	S. Piceance (Parachute), Garfield County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		PB-20 Pad			
Site Position:		Northing:	1,590,537.58 ft	Latitude:	39.427690
From:	Lat/Long	Easting:	2,288,393.21 ft	Longitude:	-108.019530
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.59 °

Well		Cook Carpenter 20-3C (PB-20)				
Well Position	+N/-S	0.0 ft	Northing:	1,590,499.14 ft	Latitude:	39.427580
	+E/-W	0.0 ft	Easting:	2,288,333.93 ft	Longitude:	-108.019736
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	5,643.0 ft

Wellbore	DD				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	4/23/2012	10.24	65.66	52,126

Design	DD				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	252.02	

Survey Program	Date	4/30/2012			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
113.0	6,670.0	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		
113.0	0.20	12.20	113.0	0.2	0.0	-0.1	0.18	0.18		
143.0	0.20	345.50	143.0	0.3	0.0	-0.1	0.31	0.00		
173.0	0.40	318.40	173.0	0.4	0.0	-0.1	0.80	0.67		
204.0	0.20	296.60	204.0	0.5	-0.2	0.0	0.73	-0.65		
235.0	0.40	252.00	235.0	0.5	-0.3	0.1	0.95	0.65		
266.0	0.70	208.00	266.0	0.3	-0.5	0.4	1.60	0.97		
297.0	1.30	212.60	297.0	-0.1	-0.8	0.8	1.95	1.94		
328.0	2.00	203.40	328.0	-0.9	-1.2	1.4	2.41	2.26		
359.0	3.00	199.80	358.9	-2.2	-1.7	2.3	3.26	3.23		
389.0	4.10	199.20	388.9	-3.9	-2.3	3.4	3.67	3.67		
420.0	5.10	198.50	419.8	-6.3	-3.1	4.9	3.23	3.23		
451.0	6.60	201.90	450.6	-9.3	-4.2	6.9	4.96	4.84		

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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
482.0	8.00	206.80	481.4	-12.8	-5.8	9.5	4.94	4.52	
513.0	9.10	206.30	512.0	-17.0	-7.9	12.7	3.56	3.55	
542.0	9.80	211.00	540.6	-21.1	-10.2	16.2	3.59	2.41	
573.0	9.60	213.20	571.2	-25.6	-13.0	20.2	1.36	-0.65	
604.0	9.40	218.50	601.8	-29.7	-15.9	24.3	2.89	-0.65	
696.0	10.00	244.40	692.5	-39.0	-27.8	38.5	4.75	0.65	
789.0	11.40	253.80	783.9	-45.1	-43.9	55.7	2.40	1.51	
880.0	12.60	252.10	872.9	-50.7	-62.0	74.6	1.37	1.32	
972.0	13.50	249.60	962.5	-57.5	-81.6	95.4	1.15	0.98	
1,070.0	14.20	250.10	1,057.7	-65.6	-103.7	118.8	0.72	0.71	
1,166.0	14.20	249.10	1,150.7	-73.8	-125.7	142.4	0.26	0.00	
1,262.0	13.60	248.10	1,243.9	-82.2	-147.2	165.4	0.67	-0.62	
1,357.0	13.10	247.90	1,336.4	-90.4	-167.5	187.3	0.53	-0.53	
1,452.0	12.80	250.70	1,428.9	-97.9	-187.5	208.5	0.73	-0.32	
1,548.0	12.20	259.40	1,522.7	-103.3	-207.5	229.2	2.06	-0.62	
1,643.0	10.20	261.40	1,615.9	-106.4	-225.7	247.5	2.14	-2.11	
1,738.0	8.40	261.40	1,709.6	-108.7	-240.8	262.6	1.89	-1.89	
1,834.0	7.60	258.20	1,804.7	-111.1	-254.0	275.9	0.95	-0.83	
1,929.0	7.80	254.40	1,898.8	-114.1	-266.3	288.5	0.58	0.21	
2,025.0	7.50	247.90	1,994.0	-118.2	-278.4	301.3	0.95	-0.31	
2,121.0	7.60	256.20	2,089.1	-122.1	-290.4	313.9	1.14	0.10	
2,216.0	7.60	252.60	2,183.3	-125.4	-302.5	326.4	0.50	0.00	
2,311.0	7.60	260.70	2,277.5	-128.3	-314.7	338.9	1.13	0.00	
2,406.0	7.90	262.50	2,371.6	-130.2	-327.3	351.6	0.41	0.32	
2,502.0	8.90	269.20	2,466.6	-131.2	-341.3	365.1	1.46	1.04	
2,597.0	8.20	266.70	2,560.5	-131.6	-355.4	378.7	0.83	-0.74	
2,693.0	9.20	272.90	2,655.4	-131.7	-369.9	392.5	1.43	1.04	
2,788.0	9.90	262.50	2,749.1	-132.3	-385.6	407.6	1.96	0.74	
2,883.0	9.50	265.80	2,842.7	-134.0	-401.5	423.3	0.72	-0.42	
2,978.0	10.60	261.70	2,936.3	-135.8	-418.0	439.5	1.38	1.16	
3,074.0	9.40	257.60	3,030.8	-138.8	-434.4	456.0	1.45	-1.25	
3,169.0	9.90	257.40	3,124.5	-142.2	-449.9	471.9	0.53	0.53	
3,264.0	9.50	262.00	3,218.1	-145.1	-465.7	487.7	0.92	-0.42	
3,360.0	8.90	257.80	3,312.9	-147.8	-480.8	502.9	0.94	-0.62	
3,455.0	9.70	248.60	3,406.6	-152.2	-495.4	518.2	1.77	0.84	
3,550.0	9.20	251.30	3,500.4	-157.6	-510.1	533.8	0.70	-0.53	
3,645.0	10.10	247.80	3,594.0	-163.2	-525.0	549.7	1.13	0.95	
3,740.0	9.30	245.80	3,687.7	-169.5	-539.7	565.6	0.91	-0.84	
3,836.0	10.40	245.80	3,782.2	-176.2	-554.7	582.0	1.15	1.15	
3,931.0	10.40	252.90	3,875.7	-182.2	-570.7	599.1	1.35	0.00	
4,027.0	9.40	250.80	3,970.3	-187.4	-586.4	615.6	1.11	-1.04	
4,122.0	9.50	254.90	4,064.0	-192.0	-601.3	631.1	0.72	0.11	
4,218.0	6.90	260.10	4,159.0	-195.0	-614.6	644.8	2.81	-2.71	
4,313.0	5.60	262.30	4,253.4	-196.6	-624.8	655.0	1.39	-1.37	
4,408.0	5.10	257.90	4,348.0	-198.1	-633.5	663.7	0.68	-0.53	
4,504.0	3.10	250.60	4,443.7	-199.9	-640.1	670.6	2.15	-2.08	
4,599.0	1.50	252.70	4,538.7	-201.1	-643.8	674.4	1.69	-1.68	
4,694.0	0.80	195.40	4,633.7	-202.1	-645.1	676.0	1.33	-0.74	
4,790.0	1.10	197.00	4,729.6	-203.6	-645.6	676.9	0.31	0.31	
4,885.0	1.40	219.50	4,824.6	-205.4	-646.6	678.4	0.60	0.32	
4,981.0	0.30	126.20	4,920.6	-206.5	-647.1	679.2	1.51	-1.15	
5,076.0	1.60	13.10	5,015.6	-205.3	-646.6	678.4	1.83	1.37	
5,171.0	0.90	16.30	5,110.6	-203.3	-646.1	677.3	0.74	-0.74	

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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
5,266.0	0.10	110.40	5,205.6	-202.6	-645.8	676.8	0.96	-0.84	
5,361.0	1.40	19.90	5,300.6	-201.6	-645.3	676.0	1.48	1.37	
5,456.0	1.10	5.00	5,395.5	-199.6	-644.9	675.0	0.46	-0.32	
5,550.0	0.40	331.30	5,489.5	-198.4	-644.9	674.7	0.85	-0.74	
5,645.0	0.40	274.20	5,584.5	-198.1	-645.4	675.0	0.40	0.00	
5,741.0	1.10	254.60	5,680.5	-198.3	-646.7	676.3	0.77	0.73	
5,836.0	1.60	237.50	5,775.5	-199.2	-648.7	678.5	0.67	0.53	
5,931.0	1.80	239.40	5,870.4	-200.7	-651.1	681.2	0.22	0.21	
6,027.0	2.00	247.80	5,966.4	-202.1	-653.9	684.4	0.36	0.21	
6,122.0	0.80	205.50	6,061.4	-203.3	-655.7	686.5	1.59	-1.26	
6,217.0	1.70	190.90	6,156.3	-205.3	-656.3	687.6	1.00	0.95	
6,311.0	1.80	205.50	6,250.3	-208.0	-657.2	689.3	0.48	0.11	
6,407.0	1.40	190.50	6,346.3	-210.5	-658.0	690.9	0.60	-0.42	
6,502.0	1.40	205.50	6,441.2	-212.7	-658.8	692.2	0.38	0.00	
6,598.0	1.50	207.10	6,537.2	-214.9	-659.8	693.9	0.11	0.10	
6,620.0	1.70	215.10	6,559.2	-215.4	-660.1	694.4	1.36	0.91	Last Cathedral Survey @ 6,620' MD Projection to Bit @ 6,670'
6,670.0	1.70	215.10	6,609.2	-216.6	-661.0	695.6	0.00	0.00	

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
Cook Carpenter 20-3C (I	0.00	0.00	4,695.0	-211.2	-650.8	1,590,306.04	2,287,677.49	39.427000	-108.022040
- actual wellpath misses target center by 9.8ft at 4755.5ft MD (4695.2 TVD, -203.0 N, -645.4 E)									
- Circle (radius 25.0)									
Cook Carpenter 20-3C (I	0.00	0.00	6,556.0	-211.2	-650.8	1,590,306.04	2,287,677.49	39.427000	-108.022040
- actual wellpath misses target center by 10.1ft at 6616.6ft MD (6555.8 TVD, -215.3 N, -660.1 E)									
- Circle (radius 25.0)									

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
6,620.0	6,559.2	-215.4	-660.1	Last Cathedral Survey @ 6,620' MD	
6,670.0	6,609.2	-216.6	-661.0	Projection to Bit @ 6,670'	

Checked By: _____ Approved By: _____ Date: _____