

Azimuths to True North
 Magnetic North: 10.26°

Magnetic Field
 Strength: 52224.9snT
 Dip Angle: 65.73°
 Date: 8/22/2011
 Model: IGRF2010

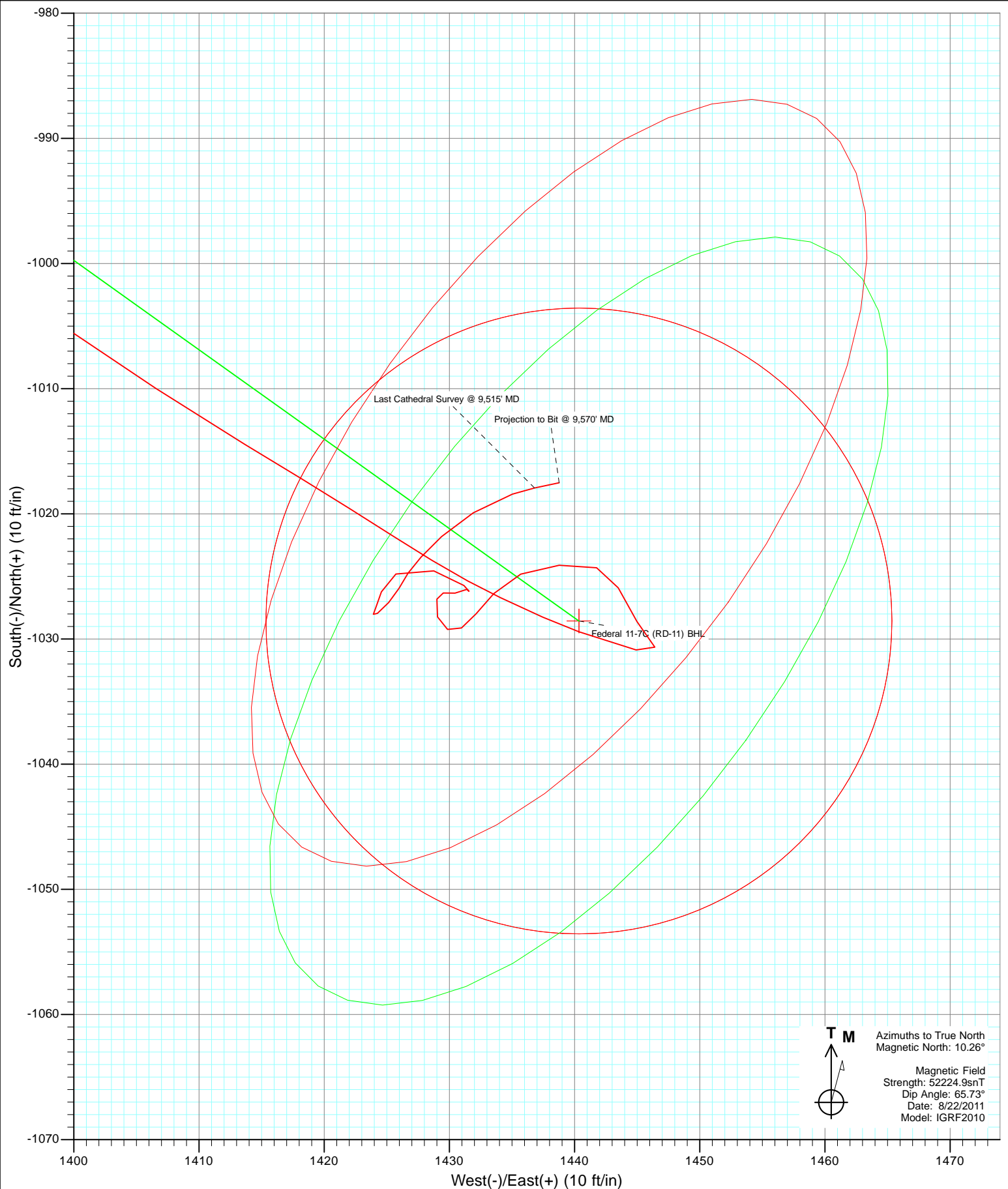
DESIGN DETAILS: DD

115314/7558 (SH); BH 115400/7653 (MH); SC
 KB @ 6406.0ft (Nabors M11)

Target	Azimuth	Origin	N/S	E/W	From TVD
Federal 11-7C (RD-11) BHL	125.53	Slot	0.0	0.0	0.0

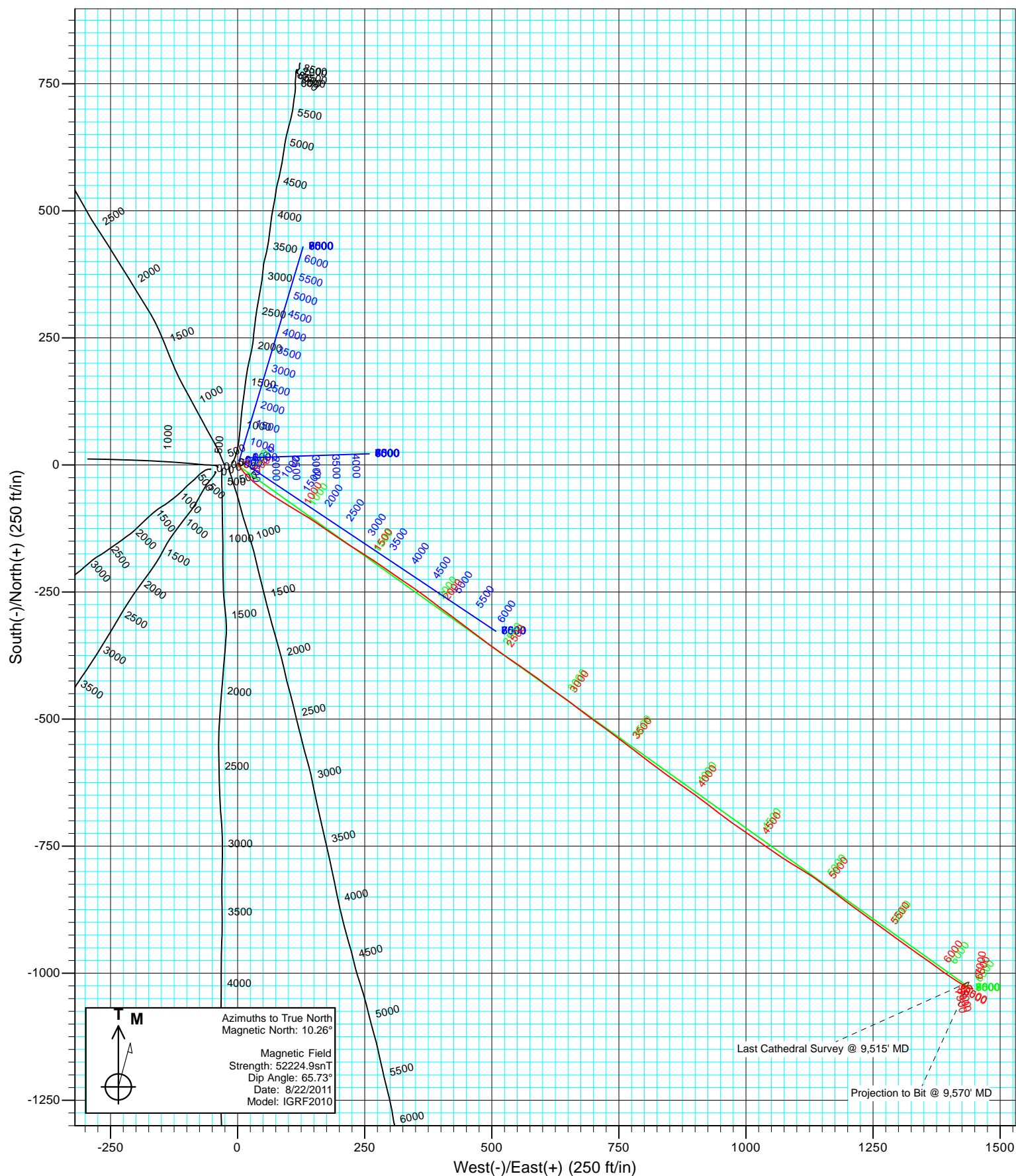


Project: S. Piceance (Parachute)
Site: NWNW S11-T7S-R94W (RD-11)
Well: Federal 11-7C (RD-11)
Wellbore: DD
Design: FINAL





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Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Federal 11-7C (RD-11)
Project:	S. Piceance (Parachute)	TVD Reference:	KB @ 6406.0ft (Nabors M11)
Site:	NWNW S11-T7S-R94W (RD-11)	MD Reference:	KB @ 6406.0ft (Nabors M11)
Well:	Federal 11-7C (RD-11)	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		NWNW S11-T7S-R94W (RD-11)			
Site Position:		Northing:	1,600,170.34 ft	Latitude:	39.457481
From:	Lat/Long	Easting:	2,333,893.08 ft	Longitude:	-107.859394
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.49 °

Well	Federal 11-7C (RD-11)					
Well Position	+N/-S	0.0 ft	Northing:	1,600,176.98 ft	Latitude:	39.457503
	+E/-W	0.0 ft	Easting:	2,333,945.79 ft	Longitude:	-107.859208
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	6,384.0 ft

Wellbore	DD				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	8/22/2011	10.26	65.73	52,225

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	125.53	

Survey Program	Date	9/27/2011			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
112.0	1,387.0	Survey #1 (DD)	MWD	Geolink MWD	
1,455.0	9,570.0	Survey #2 (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		
112.0	0.80	76.40	112.0	0.2	0.8	0.5	0.71	0.71		
143.0	0.60	93.10	143.0	0.2	1.1	0.8	0.92	-0.65		
174.0	1.10	130.40	174.0	0.0	1.5	1.2	2.33	1.61		
204.0	1.50	120.10	204.0	-0.4	2.1	1.9	1.54	1.33		
235.0	1.80	148.70	235.0	-1.0	2.7	2.8	2.79	0.97		
266.0	2.60	145.10	265.9	-2.0	3.3	3.9	2.62	2.58		
296.0	3.20	149.40	295.9	-3.3	4.2	5.3	2.13	2.00		
326.0	4.00	146.90	325.9	-4.8	5.2	7.0	2.72	2.67		
357.0	4.60	145.40	356.8	-6.8	6.4	9.2	1.97	1.94		
388.0	5.60	137.30	387.6	-8.9	8.2	11.8	3.97	3.23		
418.0	6.30	142.00	417.5	-11.3	10.2	14.8	2.84	2.33		

Cathedral Energy Services

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Site:	NWNW S11-T7S-R94W (RD-11)	MD Reference:	KB @ 6406.0ft (Nabors M11)
Well:	Federal 11-7C (RD-11)	North Reference:	True
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
449.0	7.30	140.80	448.3	-14.2	12.5	18.4	3.26	3.23	
480.0	7.90	142.20	479.0	-17.4	15.0	22.3	2.03	1.94	
511.0	8.80	135.70	509.7	-20.7	18.0	26.7	4.20	2.90	
542.0	9.40	131.30	540.3	-24.1	21.5	31.5	2.96	1.94	
572.0	10.20	133.00	569.8	-27.5	25.3	36.6	2.84	2.67	
602.0	11.10	131.40	599.3	-31.3	29.4	42.1	3.16	3.00	
633.0	11.80	131.40	629.7	-35.3	34.1	48.2	2.26	2.26	
664.0	12.40	127.10	660.0	-39.4	39.1	54.7	3.49	1.94	
694.0	13.20	126.50	689.3	-43.4	44.4	61.4	2.70	2.67	
725.0	14.50	126.00	719.4	-47.8	50.4	68.8	4.21	4.19	
755.0	15.10	124.00	748.4	-52.2	56.7	76.5	2.63	2.00	
786.0	16.00	122.60	778.2	-56.8	63.6	84.8	3.15	2.90	
816.0	16.30	123.70	807.0	-61.3	70.6	93.1	1.43	1.00	
847.0	17.50	122.00	836.7	-66.2	78.2	102.1	4.19	3.87	
938.0	18.10	121.50	923.4	-80.8	101.8	129.9	0.68	0.66	
1,032.0	17.90	120.40	1,012.8	-95.8	126.7	158.8	0.42	-0.21	
1,127.0	19.00	123.50	1,102.9	-111.7	152.2	188.8	1.55	1.16	
1,223.0	19.30	125.60	1,193.6	-129.6	178.2	220.3	0.78	0.31	
1,318.0	19.70	123.10	1,283.1	-147.4	204.3	252.0	0.97	0.42	
1,387.0	19.80	122.50	1,348.1	-160.1	223.9	275.3	0.33	0.14	Last Cathedral Survey @ 1387' MD
1,455.0	19.60	122.10	1,412.1	-172.3	243.3	298.2	0.35	-0.29	
1,550.0	19.20	123.40	1,501.7	-189.4	269.9	329.7	0.62	-0.42	
1,645.0	19.30	126.00	1,591.4	-207.2	295.6	361.0	0.91	0.11	
1,741.0	19.30	123.00	1,682.0	-225.2	321.7	392.7	1.03	0.00	
1,836.0	19.30	125.10	1,771.6	-242.8	347.8	424.1	0.73	0.00	
1,931.0	19.60	127.30	1,861.2	-261.4	373.3	455.7	0.83	0.32	
2,027.0	18.90	127.30	1,951.8	-280.6	398.5	487.3	0.73	-0.73	
2,122.0	18.10	126.40	2,041.9	-298.7	422.6	517.5	0.89	-0.84	
2,217.0	18.40	127.00	2,132.2	-316.5	446.4	547.2	0.37	0.32	
2,313.0	18.00	127.70	2,223.4	-334.7	470.3	577.2	0.47	-0.42	
2,408.0	17.80	125.50	2,313.8	-352.1	493.7	606.4	0.74	-0.21	
2,504.0	17.20	125.20	2,405.3	-368.8	517.2	635.2	0.63	-0.62	
2,599.0	18.30	125.20	2,495.8	-385.5	540.9	664.2	1.16	1.16	
2,695.0	17.60	124.00	2,587.1	-402.3	565.3	693.8	0.82	-0.73	
2,790.0	18.40	126.20	2,677.5	-419.2	589.3	723.1	1.10	0.84	
2,886.0	18.00	127.00	2,768.7	-437.0	613.3	753.1	0.49	-0.42	
2,981.0	17.10	125.00	2,859.2	-453.9	636.5	781.8	1.14	-0.95	
3,076.0	17.90	127.90	2,949.8	-470.9	659.5	810.3	1.25	0.84	
3,171.0	17.10	126.40	3,040.5	-488.1	682.2	838.9	0.97	-0.84	
3,266.0	18.20	126.80	3,131.0	-505.3	705.3	867.7	1.16	1.16	
3,362.0	17.90	125.70	3,222.3	-522.9	729.3	897.4	0.47	-0.31	
3,457.0	18.50	127.50	3,312.5	-540.6	753.1	927.1	0.87	0.63	
3,552.0	18.00	126.80	3,402.7	-558.6	776.9	956.8	0.57	-0.53	
3,647.0	19.70	128.10	3,492.6	-577.2	801.2	987.5	1.84	1.79	
3,742.0	19.50	126.90	3,582.1	-596.6	826.5	1,019.3	0.47	-0.21	
3,837.0	18.50	125.00	3,671.9	-614.8	851.5	1,050.3	1.24	-1.05	
3,932.0	17.50	124.80	3,762.3	-631.6	875.6	1,079.6	1.05	-1.05	
4,027.0	18.20	126.20	3,852.7	-648.5	899.3	1,108.7	0.86	0.74	
4,122.0	18.00	127.70	3,943.0	-666.2	922.9	1,138.2	0.53	-0.21	
4,218.0	18.50	127.80	4,034.2	-684.7	946.6	1,168.3	0.52	0.52	
4,313.0	18.80	125.00	4,124.2	-702.7	971.1	1,198.6	0.99	0.32	
4,408.0	17.60	125.00	4,214.5	-719.7	995.4	1,228.3	1.26	-1.26	
4,504.0	19.50	125.01	4,305.5	-737.2	1,020.4	1,258.8	1.98	1.98	

Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Federal 11-7C (RD-11)
Project:	S. Piceance (Parachute)	TVD Reference:	KB @ 6406.0ft (Nabors M11)
Site:	NWNW S11-T7S-R94W (RD-11)	MD Reference:	KB @ 6406.0ft (Nabors M11)
Well:	Federal 11-7C (RD-11)	North Reference:	True
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
4,600.0	19.20	124.70	4,396.0	-755.4	1,046.5	1,290.6	0.33	-0.31	
4,695.0	18.90	123.70	4,485.8	-772.8	1,072.2	1,321.6	0.47	-0.32	
4,790.0	18.20	120.90	4,575.9	-789.0	1,097.7	1,351.8	1.19	-0.74	
4,886.0	17.40	122.10	4,667.3	-804.3	1,122.7	1,381.1	0.92	-0.83	
4,981.0	17.40	126.70	4,758.0	-820.3	1,146.1	1,409.5	1.45	0.00	
5,076.0	19.50	126.70	4,848.1	-838.3	1,170.2	1,439.5	2.21	2.21	
5,172.0	18.10	127.80	4,938.9	-857.0	1,194.9	1,470.4	1.50	-1.46	
5,267.0	17.90	125.50	5,029.3	-874.5	1,218.4	1,499.8	0.78	-0.21	
5,363.0	16.30	126.70	5,121.1	-891.2	1,241.2	1,528.0	1.71	-1.67	
5,458.0	15.90	125.30	5,212.3	-906.7	1,262.5	1,554.4	0.59	-0.42	
5,554.0	15.80	127.10	5,304.7	-922.1	1,283.7	1,580.6	0.52	-0.10	
5,649.0	16.30	126.40	5,396.0	-937.8	1,304.7	1,606.8	0.56	0.53	
5,745.0	15.50	124.60	5,488.3	-953.1	1,326.2	1,633.1	0.98	-0.83	
5,840.0	12.70	124.30	5,580.4	-966.2	1,345.2	1,656.3	2.95	-2.95	
5,936.0	14.30	126.20	5,673.8	-979.2	1,363.5	1,678.7	1.73	1.67	
6,032.0	13.80	126.40	5,766.9	-993.0	1,382.3	1,702.0	0.52	-0.52	
6,127.0	11.30	124.60	5,859.6	-1,005.0	1,399.1	1,722.6	2.66	-2.63	
6,222.0	9.80	121.10	5,953.0	-1,014.4	1,413.7	1,740.0	1.72	-1.58	
6,318.0	6.90	122.80	6,048.0	-1,021.8	1,425.5	1,753.9	3.03	-3.02	
6,414.0	4.90	115.70	6,143.5	-1,026.7	1,434.1	1,763.7	2.21	-2.08	
6,510.0	3.30	110.10	6,239.2	-1,029.4	1,440.3	1,770.4	1.72	-1.67	
6,605.0	2.50	104.40	6,334.1	-1,030.9	1,444.9	1,775.0	0.89	-0.84	
6,701.0	1.10	324.20	6,430.1	-1,030.6	1,446.4	1,776.0	3.56	-1.46	
6,796.0	1.90	325.70	6,525.1	-1,028.6	1,445.0	1,773.7	0.84	0.84	
6,892.0	1.80	336.70	6,621.0	-1,025.9	1,443.5	1,770.9	0.38	-0.10	
6,987.0	1.40	281.20	6,716.0	-1,024.3	1,441.8	1,768.6	1.61	-0.42	
7,083.0	2.20	269.40	6,811.9	-1,024.1	1,438.8	1,766.0	0.91	0.83	
7,176.0	1.80	241.70	6,904.9	-1,024.8	1,435.7	1,763.9	1.11	-0.43	
7,272.0	1.40	224.30	7,000.8	-1,026.4	1,433.6	1,763.1	0.65	-0.42	
7,367.0	1.20	217.20	7,095.8	-1,028.0	1,432.1	1,762.9	0.27	-0.21	
7,462.0	0.80	239.50	7,190.8	-1,029.1	1,431.0	1,762.6	0.58	-0.42	
7,558.0	0.70	292.00	7,286.8	-1,029.2	1,429.9	1,761.8	0.70	-0.10	
7,653.0	1.00	341.70	7,381.8	-1,028.2	1,429.1	1,760.5	0.80	0.32	
7,748.0	0.80	18.20	7,476.8	-1,026.8	1,429.0	1,759.7	0.63	-0.21	
7,844.0	0.40	116.00	7,572.8	-1,026.3	1,429.5	1,759.8	0.98	-0.42	
7,939.0	0.80	78.20	7,667.8	-1,026.3	1,430.5	1,760.6	0.57	0.42	
8,035.0	0.40	61.30	7,763.8	-1,026.0	1,431.4	1,761.2	0.45	-0.42	
8,130.0	0.40	201.30	7,858.8	-1,026.2	1,431.6	1,761.4	0.79	0.00	
8,225.0	1.00	339.50	7,953.8	-1,025.7	1,431.2	1,760.8	1.40	0.63	
8,320.0	2.60	280.30	8,048.7	-1,024.6	1,428.8	1,758.1	2.38	1.68	
8,416.0	1.30	234.20	8,144.7	-1,024.8	1,425.7	1,755.8	2.02	-1.35	
8,512.0	1.00	199.00	8,240.6	-1,026.2	1,424.6	1,755.7	0.78	-0.31	
8,607.0	0.50	202.10	8,335.6	-1,027.4	1,424.2	1,756.0	0.53	-0.53	
8,702.0	0.30	193.80	8,430.6	-1,028.0	1,423.9	1,756.2	0.22	-0.21	
8,798.0	0.60	49.50	8,526.6	-1,027.9	1,424.3	1,756.4	0.90	0.31	
8,893.0	0.90	43.60	8,621.6	-1,027.1	1,425.2	1,756.7	0.33	0.32	
8,989.0	0.80	28.20	8,717.6	-1,025.9	1,426.0	1,756.7	0.26	-0.10	
9,084.0	0.90	32.80	8,812.6	-1,024.7	1,426.7	1,756.6	0.13	0.11	
9,179.0	1.10	44.10	8,907.6	-1,023.5	1,427.7	1,756.7	0.29	0.21	
9,274.0	1.70	45.80	9,002.6	-1,021.8	1,429.4	1,757.1	0.63	0.63	
9,370.0	2.10	58.90	9,098.5	-1,019.9	1,431.9	1,758.0	0.61	0.42	
9,465.0	2.10	70.30	9,193.4	-1,018.4	1,435.0	1,759.7	0.44	0.00	
9,515.0	2.10	78.10	9,243.4	-1,017.9	1,436.8	1,760.8	0.57	0.00	Last Cathedral Survey @ 9,515' MD

Cathedral Energy Services

Survey Report

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Project:	S. Piceance (Parachute)	TVD Reference:	KB @ 6406.0ft (Nabors M11)
Site:	NWNW S11-T7S-R94W (RD-11)	MD Reference:	KB @ 6406.0ft (Nabors M11)
Well:	Federal 11-7C (RD-11)	North Reference:	True
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
9,570.0	2.10	78.10	9,298.4	-1,017.5	1,438.8	1,762.2	0.00	0.00	Projection to Bit @ 9,570' MD

Targets

Target Name

- hit/miss target	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- Shape									
Federal 11-7C (RD-11) E	0.00	0.00	9,117.0	-1,028.6	1,440.4	1,599,111.37	2,335,358.95	39.454679	-107.854107
- actual wellpath misses target center by 11.9ft at 9388.6ft MD (9117.1 TVD, -1019.6 N, 1432.5 E)									
- Circle (radius 25.0)									
Federal 11-7C (RD-11) T	0.00	0.00	6,330.0	-1,028.6	1,440.4	1,599,111.37	2,335,358.95	39.454679	-107.854107
- actual wellpath misses target center by 4.9ft at 6600.6ft MD (6329.8 TVD, -1030.8 N, 1444.7 E)									
- Point									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
1,387.0	1,348.1	-160.1	223.9	Last Cathedral Survey @ 1387' MD
9,515.0	9,243.4	-1,017.9	1,436.8	Last Cathedral Survey @ 9,515' MD
9,570.0	9,298.4	-1,017.5	1,438.8	Projection to Bit @ 9,570' MD

Checked By: _____ Approved By: _____ Date: _____