

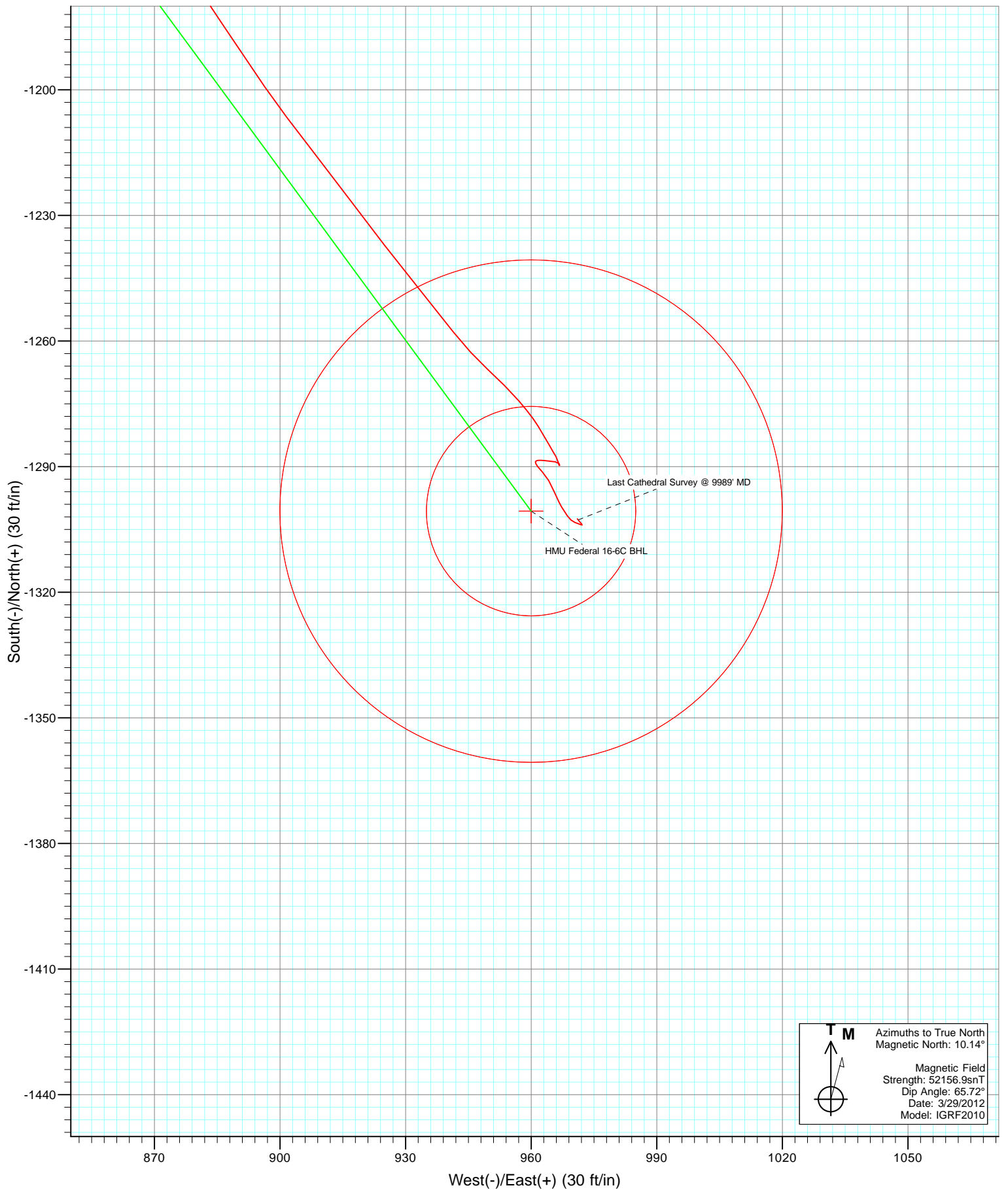
Azimuths to True North
 Magnetic North: 10.14°

Magnetic Field
 Strength: 52156.9snT
 Dip Angle: 65.72°
 Date: 3/29/2012
 Model: IGRF2010

DESIGN DETAILS: FINAL

125144; 132655; DN
 KBE @ 7667.0ft (Nabors M11)

Target	Azimuth	Origin	N/S	E/W	From TVD
HMU Federal 16-6C BHL	143.57	Slot	0.0	0.0	0.0



Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well HMU Federal 16-16C
Project:	Mamm Creek	TVD Reference:	KBE @ 7667.0ft (Nabors M11)
Site:	J16W Pad	MD Reference:	KBE @ 7667.0ft (Nabors M11)
Well:	HMU Federal 16-16C	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Mamm Creek		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site	J16W Pad			
Site Position:		Northing:	1,594,381.52 ft	Latitude: 39.443239
From:	Lat/Long	Easting:	2,357,395.39 ft	Longitude: -107.775670
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence: -1.44 °

Well	HMU Federal 16-16C			
Well Position	+N/-S	0.0 ft	Northing:	1,594,309.09 ft
	+E/-W	0.0 ft	Easting:	2,357,390.75 ft
Position Uncertainty	0.0 ft		Wellhead Elevation:	ft
			Ground Level:	7,645.0 ft

Wellbore	DD				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/29/2012	10.14	65.72	52,157

Design	FINAL			
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	143.57

Survey Program	Date	6/28/2012		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
81.0	1,540.0	Survey #1 (DD)	MWD	Geolink MWD
1,647.0	10,040.0	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	
81.0	1.00	17.65	81.0	0.7	0.2	-0.4	1.23	1.23	
112.0	1.10	40.80	112.0	1.2	0.5	-0.6	1.40	0.32	
143.0	1.10	48.90	143.0	1.6	0.9	-0.7	0.50	0.00	
173.0	0.80	75.70	173.0	1.8	1.3	-0.7	1.76	-1.00	
203.0	0.60	104.20	203.0	1.8	1.7	-0.5	1.32	-0.67	
235.0	0.90	156.50	235.0	1.6	1.9	-0.1	2.23	0.94	
265.0	0.90	191.90	265.0	1.1	2.0	0.3	1.82	0.00	
295.0	1.20	174.40	295.0	0.6	2.0	0.7	1.45	1.00	
326.0	1.90	159.10	326.0	-0.2	2.2	1.5	2.60	2.26	
357.0	2.90	166.50	356.9	-1.5	2.6	2.7	3.37	3.23	
388.0	3.30	168.90	387.9	-3.1	2.9	4.2	1.36	1.29	

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Site:	J16W Pad	MD Reference:	KBE @ 7667.0ft (Nabors M11)
Well:	HMU Federal 16-16C	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
419.0	4.40	149.00	418.8	-5.0	3.7	6.2	5.53	3.55	
450.0	4.80	153.10	449.7	-7.2	4.9	8.7	1.67	1.29	
480.0	5.40	150.80	479.6	-9.5	6.2	11.3	2.11	2.00	
511.0	5.70	149.80	510.5	-12.1	7.6	14.3	1.02	0.97	
542.0	6.70	147.50	541.3	-15.0	9.4	17.6	3.32	3.23	
572.0	7.00	146.80	571.1	-18.0	11.3	21.2	1.04	1.00	
603.0	8.00	143.00	601.8	-21.3	13.7	25.3	3.60	3.23	
634.0	9.10	141.00	632.4	-24.9	16.5	29.9	3.68	3.55	
664.0	9.60	141.70	662.0	-28.7	19.5	34.7	1.71	1.67	
695.0	10.50	143.80	692.6	-33.0	22.8	40.1	3.13	2.90	
725.0	11.10	143.90	722.0	-37.6	26.1	45.8	2.00	2.00	
755.0	12.30	143.70	751.4	-42.5	29.7	51.8	4.00	4.00	
848.0	13.50	145.40	842.1	-59.4	41.8	72.6	1.35	1.29	
939.0	14.40	142.70	930.4	-77.2	54.6	94.5	1.22	0.99	
1,031.0	15.40	139.50	1,019.3	-95.5	69.5	118.2	1.41	1.09	
1,123.0	14.90	137.30	1,108.1	-113.5	85.5	142.1	0.83	-0.54	
1,214.0	13.40	141.60	1,196.3	-130.4	99.9	164.3	2.01	-1.65	
1,306.0	13.60	141.70	1,285.8	-147.2	113.3	185.7	0.22	0.22	
1,398.0	13.10	142.90	1,375.3	-164.0	126.3	207.0	0.62	-0.54	
1,490.0	13.60	146.80	1,464.8	-181.4	138.5	228.2	1.12	0.54	
1,540.0	13.70	145.40	1,513.4	-191.2	145.1	240.0	0.69	0.20	
1,647.0	13.60	145.50	1,617.4	-212.0	159.4	265.2	0.10	-0.09	
1,742.0	13.80	145.50	1,709.7	-230.5	172.1	287.7	0.21	0.21	
1,837.0	13.60	145.20	1,802.0	-249.1	184.9	310.2	0.22	-0.21	
1,933.0	13.50	142.60	1,895.3	-267.2	198.2	332.7	0.64	-0.10	
2,028.0	12.70	142.90	1,987.8	-284.4	211.2	354.2	0.85	-0.84	
2,123.0	12.40	142.60	2,080.6	-300.8	223.7	374.8	0.32	-0.32	
2,218.0	12.10	144.40	2,173.4	-317.0	235.7	395.0	0.51	-0.32	
2,314.0	14.10	142.30	2,266.9	-334.4	248.7	416.8	2.14	2.08	
2,409.0	13.80	141.50	2,359.1	-352.4	262.8	439.6	0.38	-0.32	
2,504.0	13.40	142.30	2,451.4	-370.0	276.6	462.0	0.47	-0.42	
2,599.0	13.10	141.20	2,543.9	-387.1	290.1	483.7	0.41	-0.32	
2,694.0	12.60	140.30	2,636.5	-403.5	303.4	504.8	0.57	-0.53	
2,790.0	12.80	145.60	2,730.2	-420.3	316.1	525.9	1.23	0.21	
2,884.0	14.30	141.50	2,821.6	-438.0	329.3	547.9	1.89	1.60	
2,980.0	13.80	142.40	2,914.7	-456.3	343.6	571.2	0.57	-0.52	
3,075.0	13.10	140.60	3,007.1	-473.6	357.4	593.3	0.86	-0.74	
3,170.0	15.10	144.00	3,099.2	-492.0	371.5	616.4	2.28	2.11	
3,266.0	14.80	145.10	3,192.0	-512.1	385.8	641.2	0.43	-0.31	
3,361.0	14.60	145.00	3,283.9	-531.9	399.7	665.3	0.21	-0.21	
3,456.0	13.90	143.80	3,375.9	-550.9	413.3	688.7	0.80	-0.74	
3,551.0	13.50	143.60	3,468.2	-569.1	426.6	711.2	0.42	-0.42	
3,647.0	12.50	144.20	3,561.8	-586.5	439.3	732.8	1.05	-1.04	
3,742.0	14.70	143.30	3,654.1	-604.5	452.5	755.1	2.33	2.32	
3,836.0	14.60	143.10	3,745.0	-623.5	466.8	778.9	0.12	-0.11	
3,931.0	13.90	141.10	3,837.1	-642.0	481.1	802.3	0.90	-0.74	
4,027.0	13.50	142.50	3,930.4	-659.9	495.2	825.0	0.54	-0.42	
4,122.0	12.50	142.20	4,023.0	-676.8	508.2	846.3	1.06	-1.05	
4,218.0	15.20	142.50	4,116.2	-695.0	522.3	869.3	2.81	2.81	
4,313.0	14.40	142.20	4,208.0	-714.2	537.1	893.6	0.85	-0.84	
4,408.0	13.40	141.00	4,300.2	-732.1	551.3	916.4	1.10	-1.05	
4,503.0	15.10	143.70	4,392.3	-750.6	565.5	939.8	1.92	1.79	
4,598.0	14.80	143.90	4,484.1	-770.4	580.0	964.3	0.32	-0.32	

Survey Report

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Site:	J16W Pad	MD Reference:	KBE @ 7667.0ft (Nabors M11)
Well:	HMU Federal 16-16C	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
4,694.0	14.70	141.30	4,576.9	-789.8	594.8	988.7	0.70	-0.10	
4,790.0	14.30	141.00	4,669.9	-808.5	609.9	1,012.7	0.42	-0.42	
4,885.0	13.90	142.20	4,762.0	-826.7	624.3	1,035.8	0.52	-0.42	
4,980.0	13.40	140.40	4,854.3	-844.2	638.3	1,058.2	0.69	-0.53	
5,076.0	14.70	144.80	4,947.4	-862.7	652.4	1,081.5	1.75	1.35	
5,171.0	14.10	145.40	5,039.5	-882.1	665.9	1,105.1	0.65	-0.63	
5,266.0	13.70	144.70	5,131.7	-900.8	679.0	1,128.0	0.46	-0.42	
5,362.0	13.90	144.30	5,224.9	-919.4	692.3	1,150.9	0.23	0.21	
5,458.0	13.50	143.70	5,318.2	-937.8	705.7	1,173.6	0.44	-0.42	
5,553.0	13.10	143.40	5,410.6	-955.4	718.6	1,195.4	0.43	-0.42	
5,647.0	12.40	141.20	5,502.3	-971.8	731.3	1,216.2	0.91	-0.74	
5,743.0	13.80	142.40	5,595.8	-988.9	744.8	1,237.9	1.49	1.46	
5,838.0	13.80	142.30	5,688.1	-1,006.8	758.6	1,260.6	0.03	0.00	
5,934.0	13.10	142.60	5,781.4	-1,024.5	772.2	1,282.9	0.73	-0.73	
6,029.0	12.70	140.00	5,874.0	-1,041.1	785.5	1,304.1	0.74	-0.42	
6,125.0	12.30	142.90	5,967.8	-1,057.3	798.4	1,324.8	0.78	-0.42	
6,221.0	12.20	144.40	6,061.6	-1,073.7	810.5	1,345.2	0.35	-0.10	
6,316.0	12.00	144.40	6,154.5	-1,089.9	822.1	1,365.1	0.21	-0.21	
6,412.0	11.90	144.60	6,248.4	-1,106.1	833.6	1,385.0	0.11	-0.10	
6,507.0	11.30	144.10	6,341.4	-1,121.6	844.8	1,404.1	0.64	-0.63	
6,603.0	11.90	147.10	6,435.5	-1,137.6	855.6	1,423.4	0.89	0.62	
6,698.0	11.30	147.20	6,528.5	-1,153.6	866.0	1,442.5	0.63	-0.63	
6,793.0	11.40	146.10	6,621.7	-1,169.2	876.3	1,461.1	0.25	0.11	
6,889.0	10.60	147.00	6,715.9	-1,184.5	886.4	1,479.4	0.85	-0.83	
6,984.0	10.90	145.00	6,809.3	-1,199.2	896.3	1,497.1	0.50	0.32	
7,080.0	10.00	141.70	6,903.7	-1,213.2	906.7	1,514.5	1.13	-0.94	
7,175.0	9.10	143.60	6,997.3	-1,225.7	916.2	1,530.3	1.00	-0.95	
7,270.0	8.20	141.60	7,091.3	-1,237.1	924.9	1,544.6	1.00	-0.95	
7,364.0	7.90	141.50	7,184.3	-1,247.4	933.1	1,557.7	0.32	-0.32	
7,460.0	8.10	141.50	7,279.4	-1,257.8	941.4	1,571.1	0.21	0.21	
7,554.0	6.90	132.60	7,372.6	-1,266.8	949.7	1,583.2	1.77	-1.28	
7,649.0	5.70	138.90	7,467.0	-1,274.2	957.0	1,593.5	1.46	-1.26	
7,744.0	3.60	148.70	7,561.7	-1,280.3	961.6	1,601.2	2.36	-2.21	
7,799.1	3.13	149.54	7,616.7	-1,283.1	963.3	1,604.4	0.86	-0.85	HMU Federal 16-6C TOG
7,838.0	2.80	150.30	7,655.6	-1,284.9	964.3	1,606.4	0.86	-0.85	
7,933.0	1.00	147.30	7,750.5	-1,287.6	965.9	1,609.6	1.90	-1.89	
8,029.0	1.00	169.40	7,846.5	-1,289.1	966.5	1,611.1	0.40	0.00	
8,124.0	0.30	33.90	7,941.5	-1,289.7	966.8	1,611.8	1.30	-0.74	
8,220.0	0.40	308.40	8,037.5	-1,289.3	966.7	1,611.4	0.50	0.10	
8,315.0	0.90	288.20	8,132.5	-1,288.9	965.7	1,610.5	0.57	0.53	
8,408.0	1.50	270.90	8,225.5	-1,288.6	963.8	1,609.1	0.75	0.65	
8,504.0	0.30	296.30	8,321.4	-1,288.5	962.3	1,608.2	1.29	-1.25	
8,599.0	0.50	248.70	8,416.4	-1,288.5	961.7	1,607.8	0.39	0.21	
8,694.0	0.10	332.60	8,511.4	-1,288.6	961.3	1,607.6	0.53	-0.42	
8,790.0	0.40	217.30	8,607.4	-1,288.8	961.1	1,607.6	0.47	0.31	
8,885.0	1.10	141.30	8,702.4	-1,289.8	961.4	1,608.7	1.13	0.74	
8,980.0	1.20	138.80	8,797.4	-1,291.2	962.6	1,610.6	0.12	0.11	
9,076.0	1.90	147.70	8,893.4	-1,293.3	964.2	1,613.1	0.77	0.73	
9,171.0	1.70	159.40	8,988.3	-1,296.0	965.5	1,616.1	0.44	-0.21	
9,267.0	1.40	151.60	9,084.3	-1,298.3	966.6	1,618.6	0.38	-0.31	
9,322.0	1.40	151.60	9,139.3	-1,299.5	967.2	1,619.9	0.00	0.00	
9,417.0	1.80	143.80	9,234.2	-1,301.7	968.6	1,622.6	0.48	0.42	
9,512.0	1.20	111.10	9,329.2	-1,303.3	970.4	1,624.9	1.08	-0.63	

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Well:	HMU Federal 16-16C	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
9,608.0	0.50	110.10	9,425.2	-1,303.8	971.8	1,626.1	0.73	-0.73	
9,703.0	0.00	280.10	9,520.2	-1,304.0	972.2	1,626.4	0.53	-0.53	
9,798.0	0.40	337.70	9,615.2	-1,303.7	972.0	1,626.1	0.42	0.42	
9,894.0	0.40	297.20	9,711.2	-1,303.2	971.6	1,625.5	0.29	0.00	
9,914.9	0.38	306.66	9,732.1	-1,303.1	971.5	1,625.4	0.32	-0.10	HMU Federal 16-6C BHL
9,989.0	0.40	342.40	9,806.2	-1,302.7	971.2	1,624.9	0.32	0.03	Last Cathedral Survey @ 9989' MD
10,040.0	0.40	296.80	9,857.2	-1,302.5	971.0	1,624.6	0.61	0.00	Projection to Bit @ 10040' MD

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
HMU Federal 16-6C BHL	0.00	0.00	9,732.0	-1,300.6	960.0	1,592,984.83	2,358,317.84	39.439469	-107.772281
- hit/miss target									
- Shape									
- actual wellpath misses target center by 11.8ft at 9914.9ft MD (9732.1 TVD, -1303.1 N, 971.5 E)									
- Circle (radius 60.0)									
HMU Federal 16-6C TOC	0.00	0.00	7,616.0	-1,300.6	960.0	1,592,984.83	2,358,317.84	39.439469	-107.772281
- hit/miss target									
- Shape									
- actual wellpath misses target center by 17.8ft at 7799.1ft MD (7616.7 TVD, -1283.1 N, 963.3 E)									
- Circle (radius 25.0)									

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
9,989.0	9,806.2	-1,302.7	971.2	Last Cathedral Survey @ 9989' MD	
10,040.0	9,857.2	-1,302.5	971.0	Projection to Bit @ 10040' MD	

Checked By: _____ Approved By: _____ Date: _____