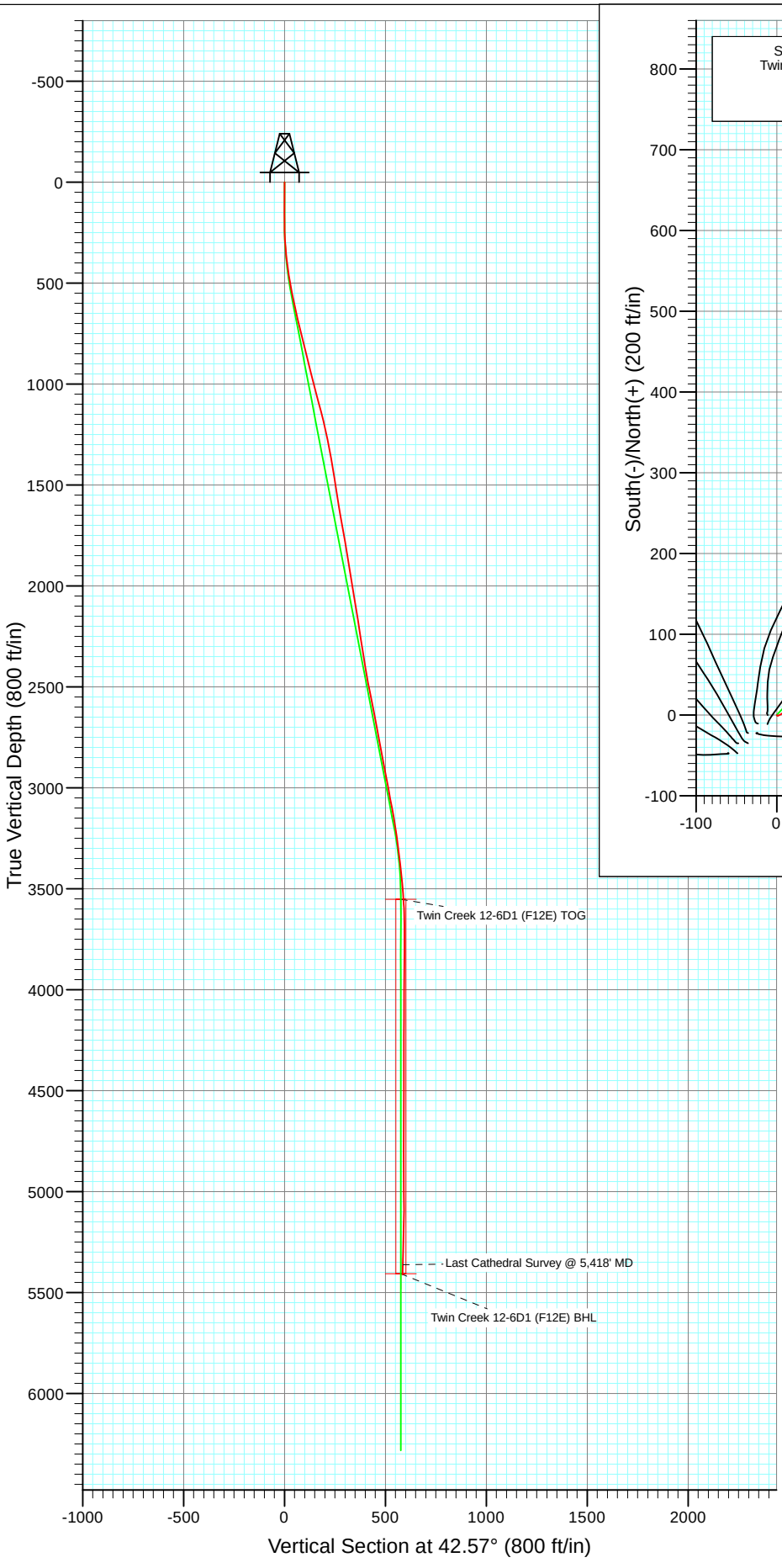
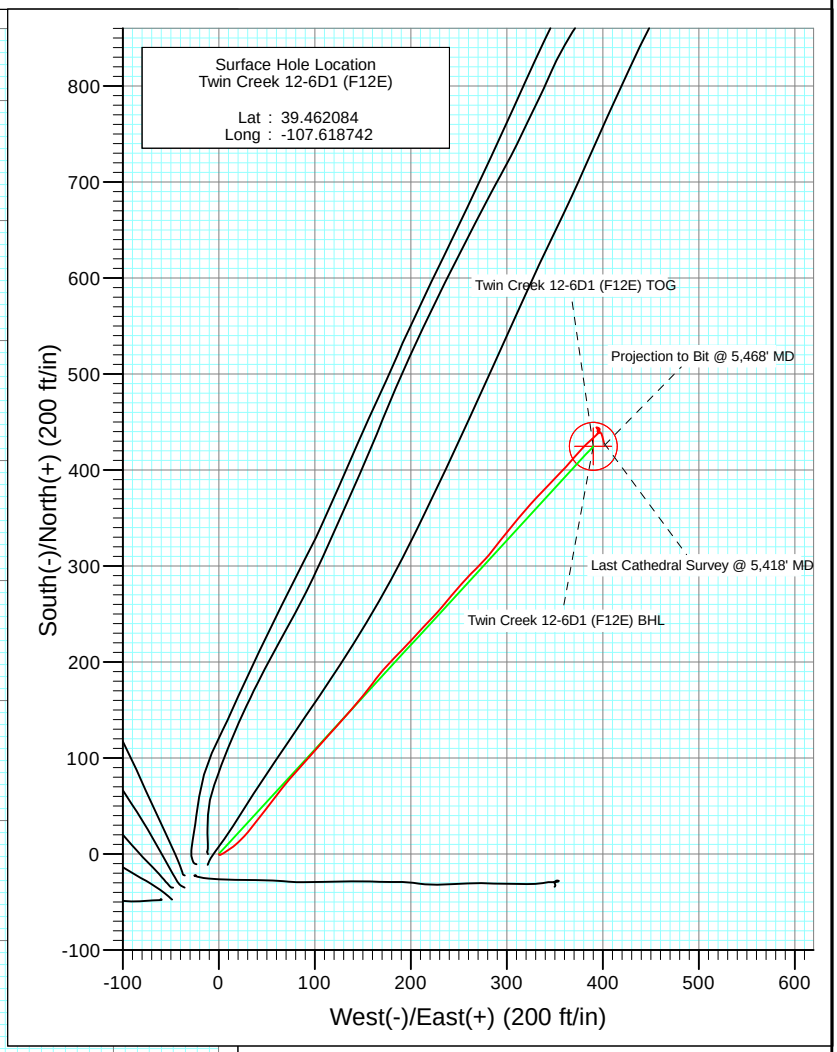
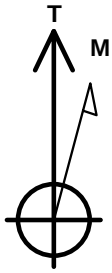
encana natural gas

Project: Mamm Creek
Site: F12E Pad
Well: Twin Creek 12-6D1 (F12E)
Wellbore: DD
Design: Final Survey

CATHEDRAL







Azimuths to True North
Magnetic North: 10.07°

Magnetic Field
Strength: 52196.5snT
Dip Angle: 65.76°
Date: 4/9/2012
Model: IGRF2010

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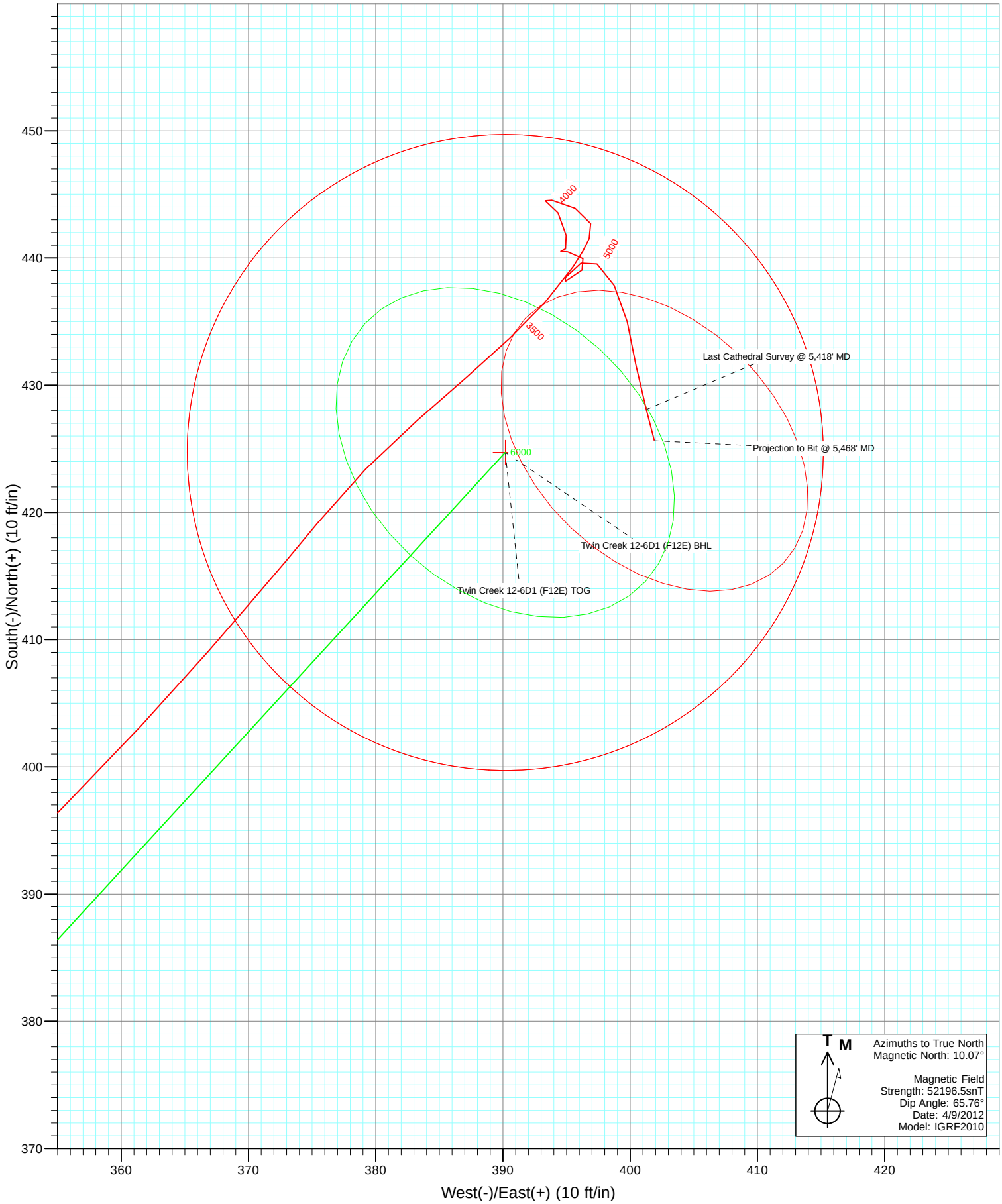

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	**Local Co-ordinate Reference:**	Well Twin Creek 12-6D1 (F12E)
Project:	Mamm Creek	**TVD Reference:**	KBE @ 6167.0ft (Original Well Elev)
Site:	F12E Pad	**MD Reference:**	KBE @ 6167.0ft (Original Well Elev)
Well:	Twin Creek 12-6D1 (F12E)	**North Reference:**	True
Wellbore:	DD	**Survey Calculation Method:**	Minimum Curvature
Design:	DD	**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 F12E Pad

Site Position:		**Northing:**	1,600,159.70 ft	**Latitude:**	39.462050
From:	Lat/Long	**Easting:**	2,401,852.74 ft	**Longitude:**	-107.618770
Position Uncertainty:	0.0 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-1.34 °

Well Twin Creek 12-6D1 (F12E)

Well Position	**+N/-S**	0.0 ft	**Northing:**	1,600,171.89 ft	**Latitude:**	39.462084
	+E/-W	0.0 ft	**Easting:**	2,401,860.93 ft	**Longitude:**	-107.618742
Position Uncertainty		0.0 ft	**Wellhead Elevation:**	ft	**Ground Level:**	6,145.0 ft

Wellbore DD

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	4/9/2012	10.07	65.76	52,196

Design DD

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	42.57

Survey Program **Date** 4/26/2012

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
154.0	1,108.0	Survey #1 (DD)	MWD	Geolink MWD
1,254.0	5,468.0	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	
154.0	0.60	141.10	154.0	-0.6	0.5	-0.1	0.39	0.39	
215.0	1.20	88.50	215.0	-0.9	1.3	0.3	1.58	0.98	
308.0	4.40	56.60	307.9	1.1	5.3	4.4	3.70	3.44	
400.0	6.80	56.70	399.4	6.1	12.8	13.1	2.61	2.61	
492.0	9.80	44.50	490.5	14.6	22.8	26.2	3.76	3.26	
584.0	12.20	38.50	580.8	27.8	34.4	43.8	2.89	2.61	
676.0	12.90	38.00	670.6	43.5	46.8	63.7	0.77	0.76	
768.0	14.20	36.70	760.0	60.7	59.8	85.2	1.45	1.41	
860.0	13.70	41.20	849.3	77.9	73.7	107.3	1.30	-0.54	
951.0	14.00	41.30	937.6	94.3	88.1	129.1	0.33	0.33	
1,054.0	14.70	41.70	1,037.4	113.4	105.0	154.6	0.69	0.68	

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Site:	F12E Pad	**MD Reference:**	KBE @ 6167.0ft (Original Well Elev)
Well:	Twin Creek 12-6D1 (F12E)	**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
1,108.0	15.10	42.50	1,089.6	123.7	114.3	168.5	0.83	0.74	
1,254.0	13.10	40.70	1,231.2	150.3	138.0	204.0	1.40	-1.37	
1,349.0	10.20	39.20	1,324.2	165.0	150.3	223.2	3.07	-3.05	
1,444.0	9.40	37.60	1,417.9	177.6	160.4	239.3	0.89	-0.84	
1,539.0	9.20	37.90	1,511.6	189.8	169.8	254.6	0.22	-0.21	
1,634.0	9.00	44.90	1,605.4	201.0	179.7	269.6	1.18	-0.21	
1,730.0	10.30	43.60	1,700.1	212.6	190.9	285.7	1.37	1.35	
1,823.0	9.90	42.90	1,791.6	224.4	202.1	302.0	0.45	-0.43	
1,918.0	9.40	43.40	1,885.3	236.1	213.0	317.9	0.53	-0.53	
2,013.0	8.50	43.40	1,979.1	246.8	223.1	332.7	0.95	-0.95	
2,109.0	9.90	39.90	2,073.9	258.3	233.3	348.0	1.57	1.46	
2,204.0	8.70	39.40	2,167.6	270.1	243.1	363.4	1.27	-1.26	
2,299.0	9.40	43.00	2,261.4	281.3	252.9	378.3	0.95	0.74	
2,394.0	8.40	43.50	2,355.3	292.0	263.0	393.0	1.06	-1.05	
2,489.0	10.30	44.80	2,449.0	303.1	273.8	408.4	2.01	2.00	
2,583.0	11.80	37.60	2,541.3	316.7	285.5	426.4	2.17	1.60	
2,678.0	11.00	38.80	2,634.4	331.4	297.2	445.1	0.88	-0.84	
2,772.0	10.40	39.60	2,726.8	345.0	308.2	462.5	0.66	-0.64	
2,867.0	10.70	40.70	2,820.2	358.3	319.4	479.9	0.38	0.32	
2,963.0	11.10	43.40	2,914.4	371.7	331.6	498.1	0.68	0.42	
3,058.0	10.00	43.20	3,007.8	384.4	343.5	515.4	1.16	-1.16	
3,153.0	11.10	44.40	3,101.2	396.9	355.5	532.8	1.18	1.16	
3,247.0	9.20	41.20	3,193.8	409.1	366.8	549.4	2.11	-2.02	
3,342.0	6.90	39.40	3,287.8	419.2	375.4	562.7	2.44	-2.42	
3,437.0	6.70	49.10	3,382.2	427.2	383.3	573.9	1.23	-0.21	
3,532.0	5.10	47.30	3,476.6	433.7	390.5	583.6	1.70	-1.68	
3,606.6	4.22	37.58	3,551.0	438.1	394.7	589.6	1.59	-1.19	**Twin Creek 12-6D1 (F12E) TOG**
3,627.0	4.00	34.20	3,571.3	439.3	395.5	591.1	1.59	-1.05	
3,721.0	1.00	325.90	3,665.3	442.7	396.9	594.5	3.99	-3.19	
3,816.0	1.10	303.60	3,760.2	443.9	395.7	594.6	0.44	0.11	
3,911.0	1.30	277.00	3,855.2	444.5	393.8	593.8	0.62	0.21	
4,006.0	0.70	107.30	3,950.2	444.5	393.3	593.4	2.10	-0.63	
4,100.0	1.10	149.70	4,044.2	443.5	394.3	593.4	0.80	0.43	
4,195.0	1.20	169.70	4,139.2	441.8	395.0	592.5	0.43	0.11	
4,289.0	0.30	248.30	4,233.2	440.7	394.9	591.7	1.25	-0.96	
4,370.0	0.30	233.00	4,314.2	440.5	394.5	591.3	0.10	0.00	
4,485.0	0.80	79.60	4,429.2	440.5	395.1	591.7	0.94	0.43	
4,580.0	1.00	140.00	4,524.2	440.0	396.3	592.1	0.97	0.21	
4,675.0	0.80	245.70	4,619.2	439.1	396.2	591.4	1.52	-0.21	
4,769.0	1.10	228.40	4,713.1	438.2	394.9	589.9	0.44	0.32	
4,864.0	1.30	36.40	4,808.1	438.4	394.9	590.0	2.51	0.21	
4,959.0	0.80	65.00	4,903.1	439.6	396.1	591.7	0.75	-0.53	
5,054.0	0.90	118.00	4,998.1	439.5	397.4	592.5	0.80	0.11	
5,149.0	1.80	152.50	5,093.1	437.8	398.7	592.2	1.24	0.95	
5,244.0	1.90	168.00	5,188.0	435.0	399.8	590.8	0.54	0.11	
5,339.0	2.30	169.00	5,283.0	431.6	400.5	588.7	0.42	0.42	
5,418.0	2.90	165.30	5,361.9	428.1	401.3	586.7	0.79	0.76	**Last Cathedral Survey @ 5,418' MD**
5,463.1	2.90	165.30	5,406.9	425.9	401.8	585.5	0.00	0.00	**Twin Creek 12-6D1 (F12E) BHL**
5,468.0	2.90	165.30	5,411.8	425.6	401.9	585.3	0.00	0.00	**Projection to Bit @ 5,468' MD**

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Well:	Twin Creek 12-6D1 (F12E)	**North Reference:**	True
Wellbore:	DD	**Survey Calculation Method:**	Minimum Curvature
Design:	DD	**Database:**	USA EDM 5000 Multi Users DB

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Twin Creek 12-6D1 (F12	0.00	0.00	3,552.0	424.7	390.2	1,600,587.39	2,402,260.91	39.463250	-107.617360
- actual wellpath misses target center by 14.2ft at 3606.6ft MD (3551.0 TVD, 438.1 N, 394.7 E)									
- Point									
Twin Creek 12-6D1 (F12	0.00	0.00	5,407.0	424.7	390.2	1,600,587.39	2,402,260.91	39.463250	-107.617360
- actual wellpath misses target center by 11.7ft at 5463.1ft MD (5406.9 TVD, 425.9 N, 401.8 E)									
- Circle (radius 25.0)									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
5,418.0	5,361.9	428.1	401.3	Last Cathedral Survey @ 5,418' MD
5,468.0	5,411.8	425.6	401.9	Projection to Bit @ 5,468' MD

Checked By: _____ Approved By: _____ Date: _____