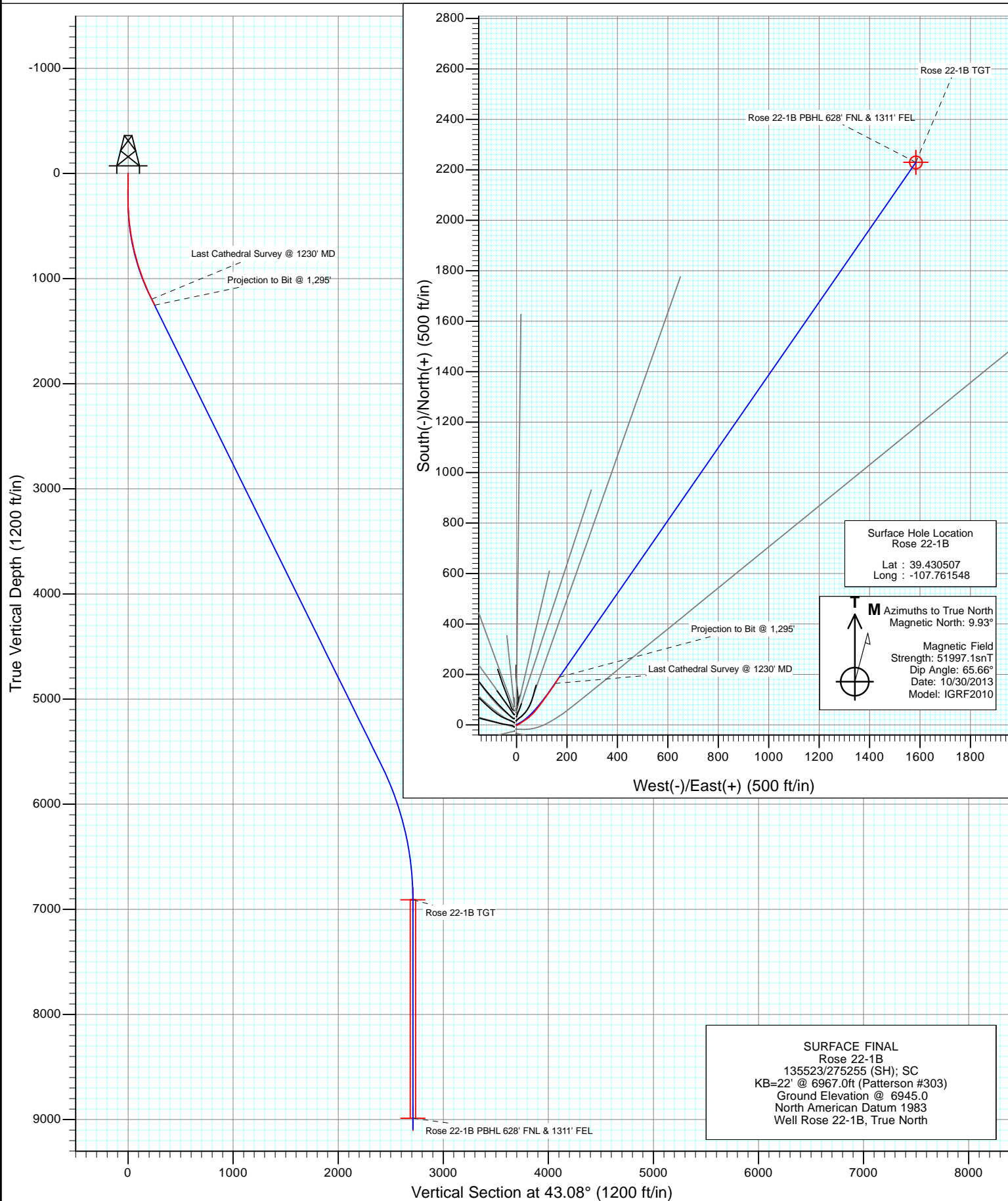




Project: Mamm Creek  
Site: K22W Pad  
Well: Rose 22-1B  
Wellbore: OH  
Design: SURFACE FINAL



# Cathedral Energy Services

## Survey Report

<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well Rose 22-1B
<b>Project:</b>	Mamm Creek	<b>TVD Reference:</b>	KB=22' @ 6967.0ft (Patterson #303)
<b>Site:</b>	K22W Pad	<b>MD Reference:</b>	KB=22' @ 6967.0ft (Patterson #303)
<b>Well:</b>	Rose 22-1B	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	SURFACE FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

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

Site		K22W Pad			
Site Position:		Northing:	1,589,615.65 ft	Latitude:	39.430424
From:	Lat/Long	Easting:	2,361,269.29 ft	Longitude:	-107.761537
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.43 °

Well	Rose 22-1B					
Well Position	+N/-S	0.0 ft	Northing:	1,589,645.92 ft	Latitude:	39.430507
	+E/-W	0.0 ft	Easting:	2,361,266.94 ft	Longitude:	-107.761548
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	6,945.0 ft

<b>Wellbore</b>	OH				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	10/30/2013	9.93	65.66	51,997

Design	SURFACE 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	43.08

<b>Survey Program</b>	<b>Date</b>	12/16/2013			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
114.0	1,295.0	Survey #1 (OH)	Geolink MWD	Geolink MWD	

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Formations / Comments</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
114.0	0.50	186.20	114.0	-0.5	-0.1	-0.4	0.44	0.44	
175.0	0.60	183.10	175.0	-1.1	-0.1	-0.9	0.17	0.16	
205.0	0.60	173.60	205.0	-1.4	-0.1	-1.1	0.33	0.00	
235.0	0.80	108.60	235.0	-1.6	0.1	-1.1	2.57	0.67	
296.0	2.00	87.40	296.0	-1.7	1.6	-0.2	2.11	1.97	
357.0	3.20	65.30	356.9	-0.9	4.2	2.2	2.53	1.97	
418.0	5.00	55.10	417.8	1.3	7.9	6.4	3.17	2.95	
479.0	6.40	56.00	478.4	4.7	12.9	12.3	2.30	2.30	
570.0	9.10	56.20	568.6	11.6	23.1	24.2	2.97	2.97	
661.0	12.30	56.70	658.0	20.9	37.2	40.7	3.52	3.52	
752.0	14.80	47.60	746.5	34.0	53.9	61.7	3.60	2.75	
844.0	16.00	43.50	835.2	51.2	71.3	86.1	1.76	1.30	

# Cathedral Energy Services

## Survey Report

<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well Rose 22-1B
<b>Project:</b>	Mamm Creek	<b>TVD Reference:</b>	KB=22' @ 6967.0ft (Patterson #303)
<b>Site:</b>	K22W Pad	<b>MD Reference:</b>	KB=22' @ 6967.0ft (Patterson #303)
<b>Well:</b>	Rose 22-1B	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	SURFACE FINAL	<b>Database:</b>	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
934.0	17.90	34.80	921.3	71.5	87.7	112.2	3.52	2.11	
1,024.0	20.60	36.60	1,006.2	95.6	105.1	141.6	3.07	3.00	
1,116.0	24.00	36.40	1,091.4	123.7	125.8	176.3	3.70	3.70	
1,207.0	26.80	33.30	1,173.6	155.7	148.1	214.9	3.41	3.08	
1,230.0	27.10	33.00	1,194.1	164.4	153.8	225.1	1.43	1.30	Last Cathedral Survey @ 1230' MD Projection to Bit @ 1,295'
1,295.0	27.10	33.00	1,251.9	189.3	169.9	254.3	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
Rose 22-1B TGT	0.00	0.00	6,909.0	2,229.5	1,583.9	1,591,835.35	2,362,905.86	39.436628	-107.755940
- hit/miss target									
- Shape									
- actual wellpath misses target center by 6177.8ft at 1295.0ft MD (1251.9 TVD, 189.3 N, 169.9 E)									
- Point									
Rose 22-1B PBHL 628' I	0.00	0.00	8,987.0	2,229.5	1,583.9	1,591,835.35	2,362,905.86	39.436628	-107.755940
- actual wellpath misses target center by 8123.6ft at 1295.0ft MD (1251.9 TVD, 189.3 N, 169.9 E)									
- Circle (radius 25.0)									

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
1,230.0	1,194.1	164.4	153.8	Last Cathedral Survey @ 1230' MD Projection to Bit @ 1,295'	
1,295.0	1,251.9	189.3	169.9		

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_