



Azimuths to True North  
Magnetic North: 10.16°

Magnetic Field  
Strength: 52073.6snT  
Dip Angle: 65.78°  
Date: 9/9/2013  
Model: IGRF2010

DD 8509A-33 E34 496 135414 264855; LR WELL @ 8324.0ft (Patterson 326) GL @ 8501.0 North American Datum 1983 Well 8509A-33 E34 496, True North							
Type	Target	Azimuth	Origin	N/S	E/W	From TVD	
	E34 496 8509A-33 PBHL	256.83	Slot	0.0	0.0	0.0	
TVD	+N/-S	+E/-W	Latitude	Longitude			
E34 496 8509A-33 TGT	7172.0	-526.1	-2274.1	39° 39' 30.35 N	108° 10' 7.30 W		
E34 496 8509A-33 PBHL	10704.0	-536.1	-2291.1	39° 39' 30.25 N	108° 10' 7.51 W		



Cathedral Energy Services  
Survey Report



<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well 8509A-33 E34 496
<b>Project:</b>	Story Gulch	<b>TVD Reference:</b>	WELL @ 8324.0ft (Patterson 326)
<b>Site:</b>	E34 496 S33-T4S-R96W	<b>MD Reference:</b>	WELL @ 8324.0ft (Patterson 326)
<b>Well:</b>	8509A-33 E34 496	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	DD	<b>Database:</b>	USA EDM 5000 Multi Users DB

<b>Project</b>	Story Gulch		
<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		

<b>Site</b>	E34 496 S33-T4S-R96W			
<b>Site Position:</b>		<b>Northing:</b>	1,676,257.20 ft	<b>Latitude:</b> 39° 39' 36.02 N
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,251,040.13 ft	<b>Longitude:</b> 108° 9' 38.14 W
<b>Position Uncertainty:</b>	0.0 ft	<b>Slot Radius:</b>	13.200 in	<b>Grid Convergence:</b> -1.68 °

<b>Well</b>	8509A-33 E34 496			
<b>Well Position</b>	<b>+N/-S</b>	0.0 ft	<b>Northing:</b>	1,676,209.47 ft
	<b>+E/-W</b>	0.0 ft	<b>Easting:</b>	2,251,032.48 ft
<b>Position Uncertainty</b>	0.0 ft		<b>Wellhead Elevation:</b>	ft
			<b>Ground Level:</b>	8,301.0 ft

<b>Wellbore</b>	DD				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	9/9/2013	10.16	65.78	52,074

<b>Design</b>	DD			
<b>Audit Notes:</b>				
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b> 0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>
	0.0	0.0	0.0	256.83

<b>Survey Program</b>	<b>Date</b>	9/10/2013		
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
268.0	2,801.0	Survey #1 (DD)	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	
268.0	4.40	257.20	267.7	-2.3	-10.0	10.3	1.64	1.64	
390.0	5.80	270.00	389.3	-3.3	-20.8	21.0	1.47	1.15	
420.0	6.60	272.00	419.1	-3.3	-24.0	24.1	2.76	2.67	
512.0	9.00	260.20	510.2	-4.3	-36.4	36.4	3.12	2.61	
606.0	10.60	255.80	602.9	-7.7	-52.0	52.4	1.88	1.70	
698.0	11.30	258.40	693.2	-11.6	-69.0	69.9	0.93	0.76	
789.0	13.50	255.70	782.1	-16.0	-88.1	89.4	2.50	2.42	
881.0	15.50	254.90	871.1	-21.8	-110.3	112.4	2.18	2.17	
972.0	18.50	253.80	958.1	-29.0	-136.0	139.0	3.32	3.30	
1,063.0	19.40	254.00	1,044.2	-37.2	-164.3	168.5	0.99	0.99	
1,246.0	19.80	255.10	1,216.6	-53.6	-223.5	229.8	0.30	0.22	
1,338.0	18.50	256.80	1,303.5	-60.9	-252.8	260.0	1.54	-1.41	



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Survey Report



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<b>Project:</b>	Story Gulch	<b>TVD Reference:</b>	WELL @ 8324.0ft (Patterson 326)
<b>Site:</b>	E34 496 S33-T4S-R96W	<b>MD Reference:</b>	WELL @ 8324.0ft (Patterson 326)
<b>Well:</b>	8509A-33 E34 496	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	DD	<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
1,430.0	18.60	256.10	1,390.7	-67.8	-281.2	289.3	0.27	0.11	
1,521.0	19.10	256.10	1,476.8	-74.8	-309.8	318.7	0.55	0.55	
1,612.0	20.50	256.60	1,562.5	-82.1	-339.7	349.5	1.55	1.54	
1,704.0	21.00	257.60	1,648.5	-89.4	-371.5	382.1	0.67	0.54	
1,795.0	21.80	257.70	1,733.2	-96.5	-403.9	415.3	0.88	0.88	
1,886.0	22.10	257.40	1,817.6	-103.8	-437.2	449.3	0.35	0.33	
1,978.0	20.70	256.90	1,903.3	-111.3	-469.9	482.9	1.53	-1.52	
2,069.0	20.70	259.00	1,988.4	-118.0	-501.3	515.0	0.82	0.00	
2,160.0	20.80	258.70	2,073.5	-124.2	-533.0	547.2	0.16	0.11	
2,252.0	21.20	256.80	2,159.4	-131.2	-565.2	580.2	0.86	0.43	
2,344.0	21.70	255.90	2,245.0	-139.2	-597.9	613.9	0.65	0.54	
2,435.0	21.20	256.90	2,329.7	-147.0	-630.2	647.1	0.68	-0.55	
2,527.0	20.80	257.00	2,415.6	-154.4	-662.3	680.1	0.44	-0.43	
2,618.0	20.80	257.00	2,500.7	-161.7	-693.8	712.4	0.00	0.00	
2,710.0	21.40	256.90	2,586.5	-169.2	-726.1	745.5	0.65	0.65	
2,801.0	22.40	258.00	2,670.9	-176.5	-759.2	779.5	1.19	1.10	Last Cathedral Survey @ 2801' MD

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									
E34 496 8509A-33 TGT	0.00	0.00	7,172.0	-526.1	-2,274.1	1,675,750.19	2,248,743.94	39° 39' 30.35 N	108° 10' 7.30 W
- survey misses target center by 4762.0ft at 2801.0ft MD (2670.9 TVD, -176.5 N, -759.2 E)									
- Point									
E34 496 8509A-33 PBH	0.00	0.00	10,704.0	-536.1	-2,291.1	1,675,740.72	2,248,726.69	39° 39' 30.25 N	108° 10' 7.51 W
- survey misses target center by 8185.7ft at 2801.0ft MD (2670.9 TVD, -176.5 N, -759.2 E)									
- Rectangle (sides W30.0 H50.0 D0.0)									

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
2,801.0	2,670.9	-176.5	-759.2	Last Cathedral Survey @ 2801' MD

Checked By: _____	Approved By: _____	Date: _____
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