

Apollo Operating, LLC

Loewen Multi Well Plan

Sec. 32, T4N, R68W

Loewen 21-32D - Slot 21-32D

Wellbore #1

Plan: Plan 2

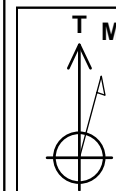
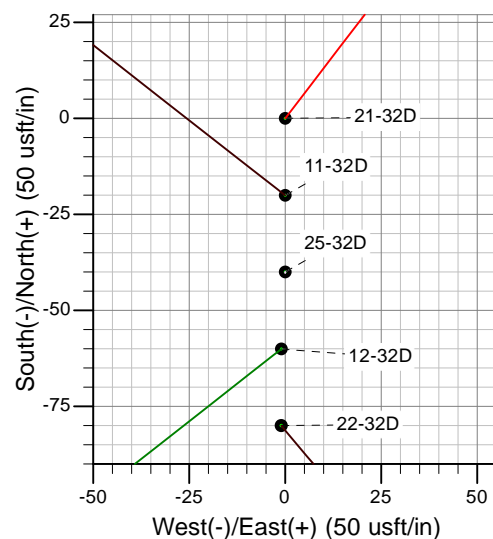
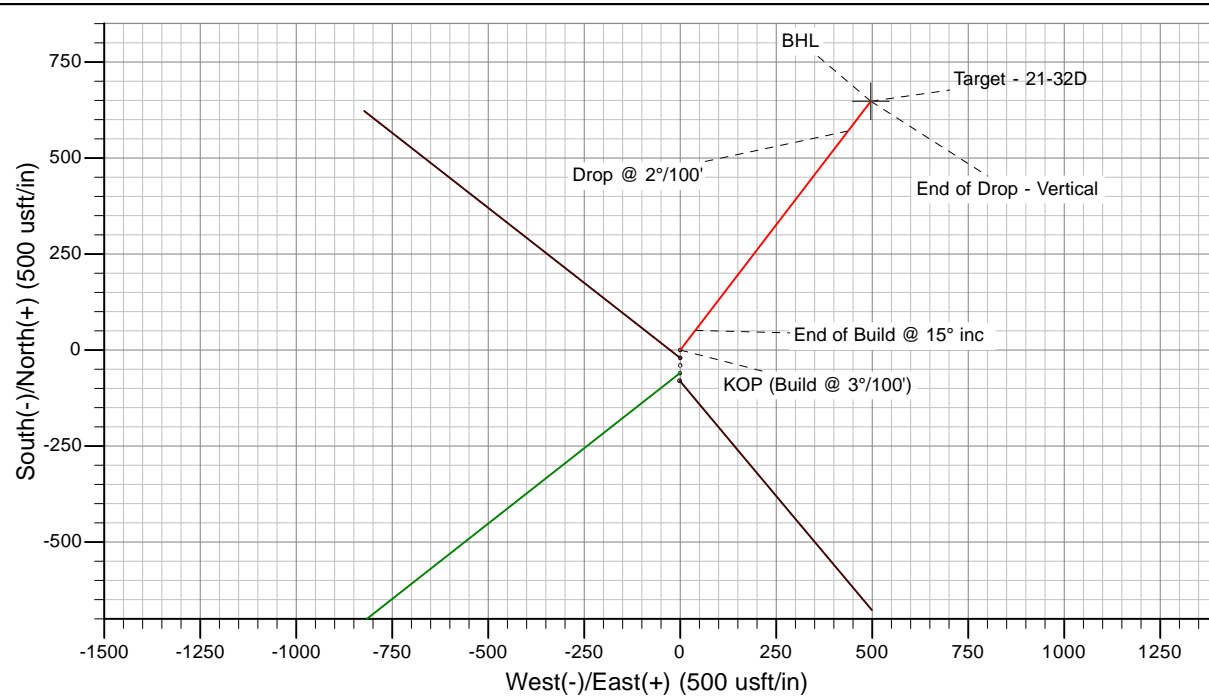
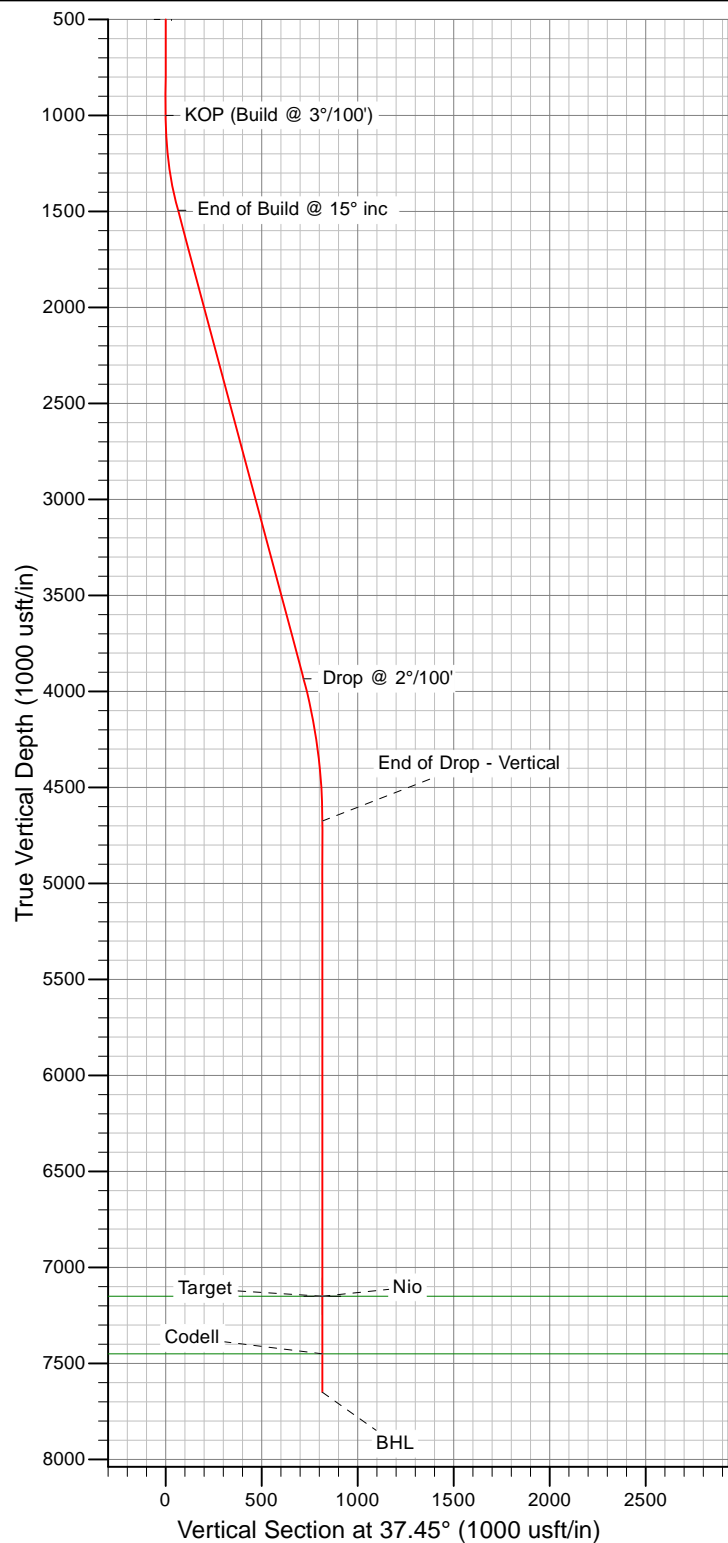
06 May, 2011

Directional Planning Report



Apollo Operating, LLC

Project: Loewen Multi Well Plan
 Site: Sec. 32, T4N, R68W
 Well: Loewen 21-32D
 Wellbore: Wellbore #1
 Design: Plan 2



Azimuths to True North
 Magnetic North: 9.01°

Magnetic Field
 Strength: 53046.3snT
 Dip Angle: 66.91°
 Date: 5/4/2011
 Model: IGRF2010



Plan: Plan 2 (Loewen 21-32D/Wellbore #1)

Created By: Roopa Dattan Date: 11:09, May 06 2011

Total Directional Services

Directional Planning Report



Database:	Total	Local Co-ordinate Reference:	Well Loewen 21-32D - Slot 21-32D
Company:	Apollo Operating, LLC	TVD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Project:	Loewen Multi Well Plan	MD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Project	Loewen Multi Well Plan		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD83 Colorado - HARN		
Map Zone:	Zone 13N (108 W to 102 W)		

Site	Sec. 32, T4N, R68W		
Site Position:		Northing:	4,458,068.71 m
From:	Lat/Long	Easting:	497,389.93 m
Position Uncertainty:	0.00usft	Slot Radius:	13-3/16 "
		Latitude:	40° 16' 23.124 N
		Longitude:	105° 1' 50.520 W
		Grid Convergence:	-0.02 °

Well	Loewen 21-32D - Slot 21-32D					
Well Position	+N/-S	0.00 usft	Northing:	4,458,068.71 m	Latitude:	40° 16' 23.124 N
	+E/-W	0.00 usft	Easting:	497,389.93 m	Longitude:	105° 1' 50.520 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	4,999.00 usft

Wellbore	Wellbore #1					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)	
	IGRF2010	5/4/2011	9.01	66.91	53,046	

Design	Plan 2			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	37.45

Total Directional Services

Directional Planning Report



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Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,500.00	15.00	37.45	1,494.31	51.66	39.57	3.00	3.00	0.00	37.45	
4,026.11	15.00	37.45	3,934.34	570.71	437.13	0.00	0.00	0.00	0.00	
4,776.11	0.00	0.00	4,675.81	648.21	496.49	2.00	-2.00	0.00	180.00	
7,250.31	0.00	0.00	7,150.00	648.21	496.49	0.00	0.00	0.00	0.00	Target - 21-32D
7,750.31	0.00	0.00	7,650.00	648.21	496.49	0.00	0.00	0.00	0.00	

Total Directional Services

Directional Planning Report



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Company:	Apollo Operating, LLC	TVD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Project:	Loewen Multi Well Plan	MD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Planned Survey											
Measured Depth (usft)	Inclination (°)	Azimuth (°)	TVD (usft)	Sub Sea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Dogleg Rate (°/100usft)	Comment/Formation
0.00	0.00	0.00	0.00	5,020.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.00	0.00	100.00	4,920.00	0.00	0.00	0.00	0.00	0.00	0.00	
200.00	0.00	0.00	200.00	4,820.00	0.00	0.00	0.00	0.00	0.00	0.00	
300.00	0.00	0.00	300.00	4,720.00	0.00	0.00	0.00	0.00	0.00	0.00	
400.00	0.00	0.00	400.00	4,620.00	0.00	0.00	0.00	0.00	0.00	0.00	
500.00	0.00	0.00	500.00	4,520.00	0.00	0.00	0.00	0.00	0.00	0.00	Surface Casing
600.00	0.00	0.00	600.00	4,420.00	0.00	0.00	0.00	0.00	0.00	0.00	
700.00	0.00	0.00	700.00	4,320.00	0.00	0.00	0.00	0.00	0.00	0.00	
800.00	0.00	0.00	800.00	4,220.00	0.00	0.00	0.00	0.00	0.00	0.00	
900.00	0.00	0.00	900.00	4,120.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,000.00	0.00	0.00	1,000.00	4,020.00	0.00	0.00	0.00	0.00	0.00	0.00	KOP (Build @ 3°/100')
1,100.00	3.00	37.45	1,099.95	3,920.05	2.08	1.59	2.62	3.00	0.00	3.00	
1,200.00	6.00	37.45	1,199.63	3,820.37	8.31	6.36	10.46	3.00	0.00	3.00	
1,300.00	9.00	37.45	1,298.77	3,721.23	18.67	14.30	23.51	3.00	0.00	3.00	
1,400.00	12.00	37.45	1,397.08	3,622.92	33.13	25.38	41.74	3.00	0.00	3.00	
1,500.00	15.00	37.45	1,494.31	3,525.69	51.66	39.57	65.08	3.00	0.00	3.00	End of Build @ 15° inc
1,600.00	15.00	37.45	1,590.90	3,429.10	72.21	55.31	90.96	0.00	0.00	0.00	
1,700.00	15.00	37.45	1,687.49	3,332.51	92.76	71.05	116.84	0.00	0.00	0.00	
1,800.00	15.00	37.45	1,784.09	3,235.91	113.31	86.79	142.72	0.00	0.00	0.00	
1,900.00	15.00	37.45	1,880.68	3,139.32	133.85	102.52	168.60	0.00	0.00	0.00	
2,000.00	15.00	37.45	1,977.27	3,042.73	154.40	118.26	194.49	0.00	0.00	0.00	
2,100.00	15.00	37.45	2,073.86	2,946.14	174.95	134.00	220.37	0.00	0.00	0.00	
2,200.00	15.00	37.45	2,170.46	2,849.54	195.49	149.74	246.25	0.00	0.00	0.00	

Total Directional Services

Directional Planning Report



Database:	Total	Local Co-ordinate Reference:	Well Loewen 21-32D - Slot 21-32D
Company:	Apollo Operating, LLC	TVD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Project:	Loewen Multi Well Plan	MD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Planned Survey											
Measured Depth (usft)	Inclination (°)	Azimuth (°)	TVD (usft)	Sub Sea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Dogleg Rate (°/100usft)	Comment/Formation
2,300.00	15.00	37.45	2,267.05	2,752.95	216.04	165.47	272.13	0.00	0.00	0.00	
2,400.00	15.00	37.45	2,363.64	2,656.36	236.59	181.21	298.01	0.00	0.00	0.00	
2,500.00	15.00	37.45	2,460.23	2,559.77	257.14	196.95	323.90	0.00	0.00	0.00	
2,600.00	15.00	37.45	2,556.83	2,463.17	277.68	212.69	349.78	0.00	0.00	0.00	
2,700.00	15.00	37.45	2,653.42	2,366.58	298.23	228.43	375.66	0.00	0.00	0.00	
2,800.00	15.00	37.45	2,750.01	2,269.99	318.78	244.16	401.54	0.00	0.00	0.00	
2,900.00	15.00	37.45	2,846.60	2,173.40	339.33	259.90	427.42	0.00	0.00	0.00	
3,000.00	15.00	37.45	2,943.20	2,076.80	359.87	275.64	453.31	0.00	0.00	0.00	
3,100.00	15.00	37.45	3,039.79	1,980.21	380.42	291.38	479.19	0.00	0.00	0.00	
3,200.00	15.00	37.45	3,136.38	1,883.62	400.97	307.12	505.07	0.00	0.00	0.00	
3,300.00	15.00	37.45	3,232.97	1,787.03	421.51	322.85	530.95	0.00	0.00	0.00	
3,400.00	15.00	37.45	3,329.57	1,690.43	442.06	338.59	556.83	0.00	0.00	0.00	
3,500.00	15.00	37.45	3,426.16	1,593.84	462.61	354.33	582.71	0.00	0.00	0.00	
3,600.00	15.00	37.45	3,522.75	1,497.25	483.16	370.07	608.60	0.00	0.00	0.00	
3,700.00	15.00	37.45	3,619.34	1,400.66	503.70	385.81	634.48	0.00	0.00	0.00	
3,800.00	15.00	37.45	3,715.94	1,304.06	524.25	401.54	660.36	0.00	0.00	0.00	
3,900.00	15.00	37.45	3,812.53	1,207.47	544.80	417.28	686.24	0.00	0.00	0.00	
4,000.00	15.00	37.45	3,909.12	1,110.88	565.35	433.02	712.12	0.00	0.00	0.00	
4,026.11	15.00	37.45	3,934.34	1,085.66	570.71	437.13	718.88	0.00	0.00	0.00	Drop @ 2°/100'
4,100.00	13.52	37.45	4,005.95	1,014.05	585.16	448.20	737.08	-2.00	0.00	2.00	
4,200.00	11.52	37.45	4,103.57	916.43	602.37	461.38	758.76	-2.00	0.00	2.00	
4,300.00	9.52	37.45	4,201.88	818.12	616.87	472.48	777.03	-2.00	0.00	2.00	
4,400.00	7.52	37.45	4,300.77	719.23	628.63	481.49	791.84	-2.00	0.00	2.00	
4,500.00	5.52	37.45	4,400.12	619.88	637.65	488.40	803.20	-2.00	0.00	2.00	

Total Directional Services

Directional Planning Report



Database:	Total	Local Co-ordinate Reference:	Well Loewen 21-32D - Slot 21-32D
Company:	Apollo Operating, LLC	TVD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Project:	Loewen Multi Well Plan	MD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Planned Survey											
Measured Depth (usft)	Inclination (°)	Azimuth (°)	TVD (usft)	Sub Sea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Dogleg Rate (°/100usft)	Comment/Formation
4,600.00	3.52	37.45	4,499.81	520.19	643.91	493.20	811.09	-2.00	0.00	2.00	
4,700.00	1.52	37.45	4,599.70	420.30	647.40	495.87	815.49	-2.00	0.00	2.00	
4,776.11	0.00	0.00	4,675.80	344.20	648.21	496.49	816.50	-2.00	-49.20	2.00	End of Drop - Vertical
4,800.00	0.00	0.00	4,699.69	320.31	648.21	496.49	816.50	0.00	0.00	0.00	
4,900.00	0.00	0.00	4,799.69	220.31	648.21	496.49	816.50	0.00	0.00	0.00	
5,000.00	0.00	0.00	4,899.69	120.31	648.21	496.49	816.50	0.00	0.00	0.00	
5,100.00	0.00	0.00	4,999.69	20.31	648.21	496.49	816.50	0.00	0.00	0.00	
5,200.00	0.00	0.00	5,099.69	-79.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,300.00	0.00	0.00	5,199.69	-179.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,400.00	0.00	0.00	5,299.69	-279.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,500.00	0.00	0.00	5,399.69	-379.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,600.00	0.00	0.00	5,499.69	-479.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,700.00	0.00	0.00	5,599.69	-579.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,800.00	0.00	0.00	5,699.69	-679.69	648.21	496.49	816.50	0.00	0.00	0.00	
5,900.00	0.00	0.00	5,799.69	-779.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,000.00	0.00	0.00	5,899.69	-879.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,100.00	0.00	0.00	5,999.69	-979.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,200.00	0.00	0.00	6,099.69	-1,079.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,300.00	0.00	0.00	6,199.69	-1,179.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,400.00	0.00	0.00	6,299.69	-1,279.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,500.00	0.00	0.00	6,399.69	-1,379.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,600.00	0.00	0.00	6,499.69	-1,479.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,700.00	0.00	0.00	6,599.69	-1,579.69	648.21	496.49	816.50	0.00	0.00	0.00	
6,800.00	0.00	0.00	6,699.69	-1,679.69	648.21	496.49	816.50	0.00	0.00	0.00	

Total Directional Services

Directional Planning Report



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Company:	Apollo Operating, LLC	TVD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Project:	Loewen Multi Well Plan	MD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Planned Survey											
Measured Depth (usft)	Inclination (°)	Azimuth (°)	TVD (usft)	Sub Sea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Dogleg Rate (°/100usft)	Comment/Formation
6,900.00	0.00	0.00	6,799.69	-1,779.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,000.00	0.00	0.00	6,899.69	-1,879.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,100.00	0.00	0.00	6,999.69	-1,979.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,200.00	0.00	0.00	7,099.69	-2,079.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,250.31	0.00	0.00	7,150.00	-2,130.00	648.21	496.49	816.50	0.00	0.00	0.00	Target - Nio
7,300.00	0.00	0.00	7,199.69	-2,179.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,400.00	0.00	0.00	7,299.69	-2,279.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,500.00	0.00	0.00	7,399.69	-2,379.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,550.31	0.00	0.00	7,450.00	-2,430.00	648.21	496.49	816.50	0.00	0.00	0.00	Codell
7,600.00	0.00	0.00	7,499.69	-2,479.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,700.00	0.00	0.00	7,599.69	-2,579.69	648.21	496.49	816.50	0.00	0.00	0.00	
7,750.31	0.00	0.00	7,650.00	-2,630.00	648.21	496.49	816.50	0.00	0.00	0.00	BHL

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
500.00	500.00	Surface Casing	0	0	

Formations					
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
7,250.31	7,150.00	Nio		0.00	
7,550.31	7,450.00	Codell		0.00	

Total Directional Services

Directional Planning Report



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Company:	Apollo Operating, LLC	TVD Reference:	Est. KB @ 5020.00usft (Original Well Elev)
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Site:	Sec. 32, T4N, R68W	North Reference:	True
Well:	Loewen 21-32D	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan 2		

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
1,000.00	1,000.00	0.00	0.00	KOP (Build @ 3°/100')	
1,500.00	1,494.31	51.66	39.57	End of Build @ 15° inc	
4,026.11	3,934.34	570.71	437.13	Drop @ 2°/100'	
4,776.11	4,675.80	648.21	496.49	End of Drop - Vertical	
7,250.31	7,150.00	648.21	496.49	Target	
7,750.31	7,650.00	648.21	496.49	BHL	