

# Noble Energy

Weld County, CO (NAD 83)

Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD)

Rohn State LD10-69HN - A4

05-123-37476

Original Wellbore

Design: Actual Surveys

## Sperry Drilling Services

### Final Report

20 October, 2014

Surface UWI : 05-123-37476

Well Coordinates: 1,529,361.30 N, 3,453,861.22 E (40° 46' 29.89" N, 103° 51' 40.46" W)

Ground Level: 4,707.00 usft

Local Coordinate Origin:

Centered on Well Rohn State LD10-69HN - Slot A4

Viewing Datum:

KB=24' @ 4731.00usft (H&P 273)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

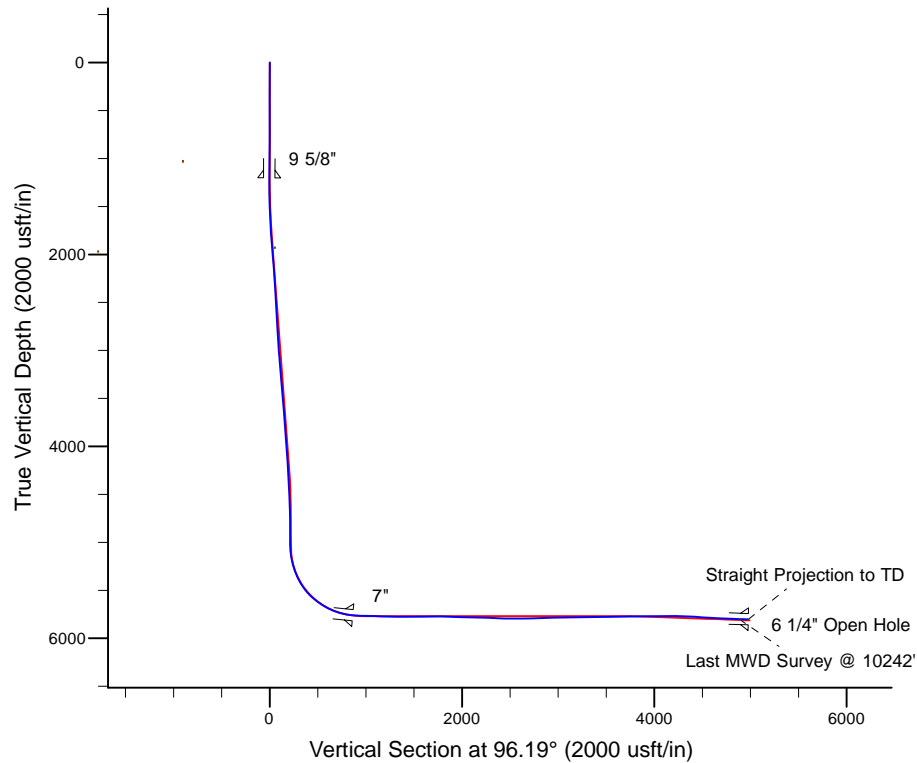
Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
Site: Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD)  
Well: Rohn State LD10-69HN  
Wellbore: Original Wellbore  
Design: Actual Surveys

# Noble Energy



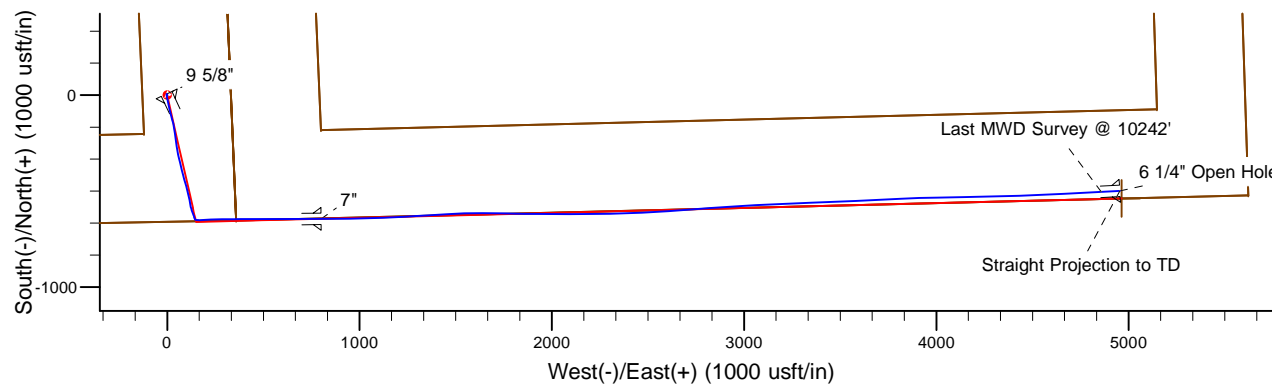
Platted SHL: 661 FSL, 330 FEL  
Platted Lat/Long: 40.77497 N, 103.86124 W  
Location: Sec. 4-T9N-R58W

~7" Casing: 44' FSL, 667' FWL  
Lat/Long: 40.773160 N, 103.858395 W  
State Planes - CO Northern: 1528716.47 N, 3454661.28 E  
Location: Sec. 4-T9N-R58W

Platted BHL: 0 FSL, 660 FEL  
Lat/Long: 40.77324 N, 103.84336 W  
State Planes - CO Northern: 1528823.13 N, 3458824.36 E  
Location: Sec. 3-T9N-R58W

## LEGEND

- △ Rohn State LD10-69HN, Original Wellbore, Rev B0 Proposal V0
- Actual Surveys



WELL DETAILS: Rohn State LD10-69HN

Ground Level: 4707.00  
KB=24' @ 4731.00usft (H&P 273)

Created By: Gordy Roth  
Created On: 10/20/2014

**Design Report for Rohn State LD10-69HN - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
340.00	0.30	333.58	340.00	0.80	-0.40	-0.48	0.09
<b>First Gyro Survey @ 340'</b>							
830.00	0.40	335.98	829.99	3.51	-1.66	-2.03	0.02
1,200.00	0.40	335.98	1,199.98	5.87	-2.71	-3.33	0.00
<b>Last Gyro Survey @ 1200'</b>							
1,270.00	0.43	204.34	1,269.98	5.85	-2.92	-3.54	1.08
<b>First MWD Survey @ 1270'</b>							
1,363.00	3.23	178.73	1,362.92	2.91	-3.01	-3.30	3.06
1,455.00	6.31	170.19	1,454.59	-4.66	-2.09	-1.57	3.43
1,547.00	8.45	171.83	1,545.83	-16.34	-0.27	1.50	2.34
1,640.00	9.85	166.17	1,637.64	-30.82	2.61	5.91	1.79
1,733.00	10.80	166.90	1,729.14	-47.04	6.48	11.52	1.03
1,828.00	12.82	168.71	1,822.12	-66.04	10.56	17.62	2.16
1,922.00	12.85	167.65	1,913.77	-86.48	14.84	24.08	0.25
2,017.00	13.12	165.02	2,006.34	-107.22	19.89	31.33	0.68
2,112.00	12.96	164.24	2,098.89	-127.88	25.57	39.21	0.25
2,206.00	12.57	163.80	2,190.57	-147.85	31.28	47.04	0.43
2,301.00	12.72	172.21	2,283.27	-168.14	35.59	53.51	1.94
2,491.00	12.62	172.30	2,468.65	-209.44	41.20	63.54	0.05
2,586.00	12.74	172.39	2,561.33	-230.10	43.98	68.53	0.13
2,680.00	12.95	171.41	2,652.98	-250.79	46.93	73.69	0.32
2,775.00	12.65	171.24	2,745.62	-271.60	50.10	79.09	0.32
2,870.00	12.42	171.69	2,838.35	-291.99	53.16	84.33	0.26
2,965.00	12.22	165.94	2,931.17	-311.85	57.08	90.37	1.31
3,059.00	11.63	166.28	3,023.14	-330.70	61.74	97.04	0.63
3,154.00	13.18	166.94	3,115.92	-350.56	66.46	103.87	1.64
3,344.00	13.74	165.79	3,300.70	-393.53	76.90	118.87	0.33
3,438.00	13.98	165.14	3,391.96	-415.33	82.55	126.84	0.30
3,534.00	14.45	165.95	3,485.02	-438.16	88.43	135.15	0.53
3,628.00	12.87	164.10	3,576.36	-459.60	94.15	143.14	1.74
3,723.00	11.95	164.15	3,669.14	-479.24	99.73	150.81	0.97
3,818.00	11.30	165.34	3,762.19	-497.71	104.77	157.82	0.73
3,913.00	12.04	167.96	3,855.23	-516.40	109.20	164.23	0.96
4,008.00	12.15	168.12	3,948.12	-535.88	113.32	170.43	0.12
4,103.00	11.87	169.01	4,041.04	-555.25	117.24	176.42	0.35
4,197.00	11.53	169.41	4,133.09	-573.97	120.81	181.98	0.37
4,292.00	10.66	163.91	4,226.31	-591.75	124.99	188.06	1.44
4,387.00	8.83	160.03	4,319.94	-607.05	129.92	194.60	2.05
4,482.00	7.57	159.68	4,413.97	-619.77	134.58	200.61	1.33
4,577.00	5.97	163.27	4,508.30	-630.37	138.18	205.33	1.74
4,672.00	3.93	158.53	4,602.94	-638.13	140.79	208.76	2.19
4,766.00	2.00	155.58	4,696.81	-642.62	142.65	211.09	2.06
4,861.00	1.18	166.48	4,791.78	-645.08	143.56	212.27	0.92
4,956.00	0.92	176.41	4,886.76	-646.80	143.84	212.73	0.33
5,049.00	0.83	162.44	4,979.75	-648.18	144.09	213.12	0.25
5,097.00	0.34	177.82	5,027.75	-648.66	144.20	213.28	1.06
5,144.00	3.56	103.40	5,074.71	-649.13	145.62	214.75	7.41
5,192.00	9.07	100.69	5,122.41	-650.18	150.79	220.01	11.49
5,238.00	10.22	96.31	5,167.75	-651.30	158.41	227.70	2.96

## Design Report for Rohn State LD10-69HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,286.00	12.60	89.38	5,214.81	-651.71	167.88	237.16	5.71
5,333.00	17.11	84.88	5,260.22	-651.04	179.90	249.04	9.90
5,381.00	21.35	87.08	5,305.54	-649.97	195.67	264.60	8.96
5,428.00	25.10	87.57	5,348.72	-649.11	214.18	282.91	7.99
5,476.00	27.15	86.74	5,391.81	-648.05	235.29	303.78	4.34
5,523.00	30.81	87.72	5,432.92	-646.96	258.03	326.27	7.85
5,571.00	36.44	90.69	5,472.88	-646.65	284.59	352.64	12.22
5,618.00	39.44	90.92	5,509.94	-647.05	313.48	381.41	6.39
5,666.00	43.90	89.25	5,545.79	-647.08	345.38	413.13	9.57
5,712.00	48.93	88.88	5,577.49	-646.53	378.69	446.18	10.95
5,760.00	52.85	89.66	5,607.76	-646.07	415.92	483.14	8.26
5,807.00	56.08	89.91	5,635.08	-645.92	454.16	521.15	6.89
5,855.00	58.98	89.97	5,660.84	-645.88	494.65	561.40	6.04
5,902.00	62.81	90.40	5,683.70	-646.02	535.71	602.23	8.19
5,950.00	65.57	90.44	5,704.60	-646.33	578.92	645.22	5.75
5,997.00	70.36	90.21	5,722.23	-646.58	622.47	688.55	10.20
6,045.00	74.65	88.94	5,736.65	-646.23	668.24	734.01	9.29
6,092.00	79.27	88.53	5,747.25	-645.22	714.00	779.40	9.87
6,135.00	81.59	90.51	5,754.40	-644.87	756.40	821.51	7.05
6,205.00	85.92	88.75	5,762.02	-644.42	825.96	890.62	6.67
6,298.00	88.40	90.40	5,766.62	-643.73	918.83	982.87	3.20
6,391.00	88.77	89.12	5,768.92	-643.34	1,011.80	1,075.26	1.43
6,483.00	87.96	87.45	5,771.55	-640.59	1,103.72	1,166.34	2.02
6,577.00	88.67	86.99	5,774.31	-636.03	1,197.57	1,259.15	0.90
6,672.00	89.48	86.48	5,775.84	-630.62	1,292.40	1,352.85	1.01
6,736.00	88.39	86.87	5,777.03	-626.91	1,356.28	1,415.96	1.81
6,830.00	91.60	85.55	5,777.04	-620.70	1,450.06	1,508.52	3.69
6,925.00	91.88	88.59	5,774.16	-615.84	1,544.88	1,602.27	3.21
7,020.00	90.65	90.38	5,772.06	-614.99	1,639.85	1,696.59	2.29
7,115.00	88.89	91.24	5,772.44	-616.33	1,734.83	1,791.17	2.06
7,210.00	87.66	91.08	5,775.30	-618.25	1,829.77	1,885.76	1.31
7,305.00	87.53	90.50	5,779.29	-619.56	1,924.68	1,980.25	0.63
7,399.00	88.55	90.40	5,782.50	-620.30	2,018.62	2,073.72	1.09
7,494.00	89.26	89.69	5,784.32	-620.38	2,113.60	2,168.16	1.06
7,589.00	88.27	89.36	5,786.36	-619.59	2,208.57	2,262.49	1.10
7,684.00	87.22	88.84	5,790.10	-618.10	2,303.48	2,356.69	1.23
7,778.00	88.89	88.06	5,793.29	-615.56	2,397.39	2,449.78	1.96
7,873.00	89.01	87.22	5,795.03	-611.64	2,492.29	2,543.71	0.89
7,968.00	91.79	86.11	5,794.37	-606.12	2,587.12	2,637.39	3.15
8,063.00	91.08	85.19	5,791.99	-598.92	2,681.82	2,730.75	1.22
8,157.00	92.37	86.47	5,789.16	-592.08	2,775.52	2,823.17	1.93
8,252.00	91.79	86.18	5,785.71	-586.00	2,870.26	2,916.71	0.68
8,347.00	91.11	86.10	5,783.31	-579.61	2,965.02	3,010.22	0.72
8,441.00	89.60	86.58	5,782.73	-573.61	3,058.82	3,102.83	1.69
8,536.00	91.33	87.69	5,781.96	-568.86	3,153.69	3,196.64	2.16
8,631.00	91.57	87.81	5,779.55	-565.13	3,248.59	3,290.58	0.28
8,726.00	91.05	87.79	5,777.38	-561.48	3,343.49	3,384.54	0.55
8,821.00	90.15	86.95	5,776.39	-557.12	3,438.39	3,478.41	1.30
8,916.00	90.89	88.02	5,775.52	-552.96	3,533.29	3,572.31	1.37
9,010.00	90.71	87.44	5,774.21	-549.23	3,627.21	3,665.28	0.65
9,105.00	90.68	87.25	5,773.06	-544.83	3,722.10	3,759.14	0.20

## Design Report for Rohn State LD10-69HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,200.00	90.89	87.29	5,771.76	-540.31	3,816.98	3,852.98	0.23
9,294.00	90.34	88.08	5,770.75	-536.51	3,910.90	3,945.94	1.02
9,389.00	90.65	88.98	5,769.93	-534.07	4,005.86	4,040.09	1.00
9,484.00	91.33	89.02	5,768.29	-532.42	4,100.83	4,134.33	0.72
9,578.00	88.95	88.70	5,768.06	-530.55	4,194.81	4,227.55	2.55
9,673.00	86.79	88.73	5,771.59	-528.42	4,289.71	4,321.68	2.27
9,768.00	86.67	88.16	5,777.01	-525.84	4,384.52	4,415.66	0.61
9,862.00	86.73	87.74	5,782.42	-522.49	4,478.30	4,508.53	0.45
9,957.00	86.85	87.20	5,787.74	-518.30	4,573.06	4,602.29	0.58
10,052.00	87.35	87.20	5,792.54	-513.67	4,667.83	4,696.00	0.53
10,147.00	87.87	87.26	5,796.50	-509.08	4,762.63	4,789.76	0.55
10,242.00	88.15	87.05	5,799.80	-504.37	4,857.46	4,883.52	0.37
Last MWD Survey @ 10242'							
10,339.00	88.15	87.05	5,802.93	-499.38	4,954.28	4,979.24	0.00
Straight Projection to TD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
340.00	340.00	0.80	-0.40	First Gyro Survey @ 340'
1,200.00	1,199.98	5.87	-2.71	Last Gyro Survey @ 1200'
1,270.00	1,269.98	5.85	-2.92	First MWD Survey @ 1270'
10,242.00	5,799.80	-504.37	4,857.46	Last MWD Survey @ 10242'
10,339.00	5,802.93	-499.38	4,954.28	Straight Projection to TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Rohn State LD10-69HN_Rev B0_BHL Tgt	96.19	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
340.00	1,200.00	Surface Surveys	Flexi-Shot
1,270.00	6,135.00	Intermediate Surveys	MWD
6,205.00	10,339.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,202.00	1,201.98	9 5/8"	9-5/8	13-3/4
6,179.00	5,759.80	7"	7	8-3/4
10,339.00	5,802.93	6 1/4" Open Hole	6-1/4	6-1/4

## Design Report for Rohn State LD10-69HN - Actual Surveys

**Wellbore Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Rohn State LD03-65HI	0.00	0.00	0.00	2,763.66	-114.78	1,532,124.95	3,453,746.44	40.782560	-103.861470
- actual wellpath misses target center by 2766.05usft at 6.61usft MD (6.61 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	1,306.69	-4,481.08	1,533,431.64	3,449,265.36	
Point 2				0.00	-3,048.17	-4,330.55	1,529,076.79	3,449,415.89	
Point 3				0.00	-2,965.64	-6.00	1,529,159.32	3,453,740.44	
Point 4				0.00	1,400.65	-187.40	1,533,525.60	3,453,559.04	
Point 5				0.00	1,306.69	-4,481.08	1,533,431.64	3,449,265.36	
Rohn State LD03-65HI	0.00	0.00	0.00	2,763.66	-114.78	1,532,124.95	3,453,746.44	40.782560	-103.861470
- actual wellpath misses target center by 2766.05usft at 6.61usft MD (6.61 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-2,945.49	913.96	1,529,179.47	3,454,660.40	
Point 2				0.00	-2,837.50	5,262.44	1,529,287.46	3,459,008.87	
Point 3				0.00	1,514.25	5,123.82	1,533,639.20	3,458,870.25	
Point 4				0.00	1,420.53	732.57	1,533,545.48	3,454,479.01	
Point 5				0.00	-2,945.49	913.96	1,529,179.47	3,454,660.40	
Rohn State LD03-65HI	0.00	0.00	0.00	2,763.66	-114.78	1,532,124.95	3,453,746.44	40.782560	-103.861470
- actual wellpath misses target center by 2766.05usft at 6.61usft MD (6.61 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	1,756.39	-4,956.90	1,533,881.34	3,448,789.54	
Point 2				0.00	-3,516.73	-4,774.63	1,528,608.23	3,448,971.81	
Point 3				0.00	-3,416.58	473.13	1,528,708.38	3,454,219.57	
Point 4				0.00	1,870.41	253.48	1,533,995.36	3,453,999.92	
Point 5				0.00	-3,416.58	473.13	1,528,708.38	3,454,219.57	
Point 6				0.00	-3,285.86	5,736.95	1,528,839.10	3,459,483.38	
Point 7				0.00	1,983.86	5,569.10	1,534,108.81	3,459,315.53	
Point 8				0.00	1,870.41	253.48	1,533,995.36	3,453,999.92	
Rohn State LD10-69HI	0.00	0.00	5,771.00	-538.18	4,963.15	1,528,823.13	3,458,824.36	40.773240	-103.843360
- actual wellpath misses target center by 51.03usft at 10339.00usft MD (5802.93 TVD, -499.38 N, 4954.28 E)									
- Point									
Rohn State LD10-69HI	0.00	0.00	5,813.00	-538.18	4,963.15	1,528,823.13	3,458,824.36	40.773240	-103.843360
- actual wellpath misses target center by 41.05usft at 10339.00usft MD (5802.93 TVD, -499.38 N, 4954.28 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	1.77 °/100usft	Maximum Dogleg over Survey:	12.22 °/100usft at 5,571.00 usft
Net Tortousity applicable to Plans:	0.62 °/100usft	Directional Difficulty Index:	6.252

**Audit Info**

North Reference Sheet for Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD) -  
Rohn State LD10-69HN - Original Wellbore

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB=24' @ 4731.00usft (H&P 273). Northing and Easting are relative to Rohn State LD10-69HN - Slot A4

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999865

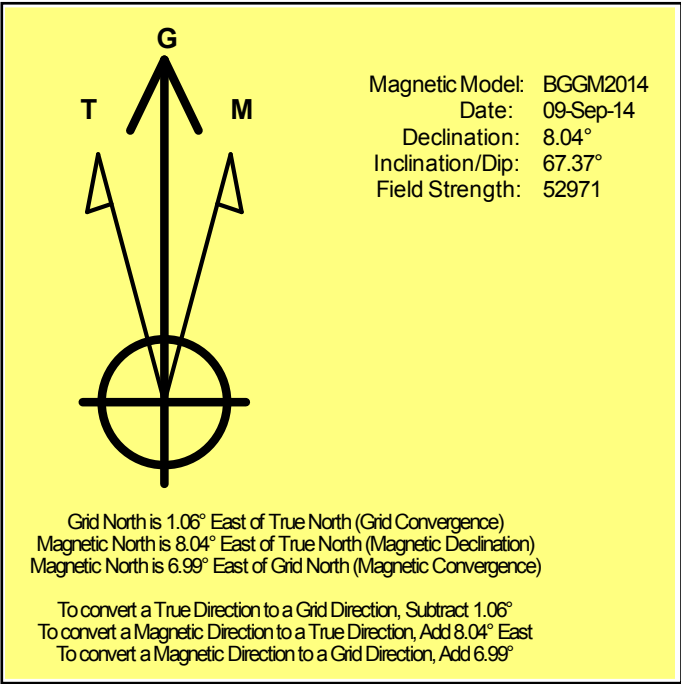
Grid Coordinates of Well: 1,529,361.30 usft N, 3,453,861.22 usft E

Geographical Coordinates of Well: 40° 46' 29.89" N, 103° 51' 40.46" W

Grid Convergence at Surface is: 1.06°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,339.00usft  
the Bottom Hole Displacement is 4,979.38usft in the Direction of 95.76° (Grid).

Magnetic Convergence at surface is: -6.99° ( 9 September 2014, , BGGM2014)



# Noble Energy

Weld County, CO (NAD 83)

Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD)

Rohn State LD10-69HN - A4

05-123-37476

Original Wellbore

Design: Actual Surveys

## Sperry Drilling Services

### Geodetic Report

20 October, 2014

Well Coordinates: 1,529,361.30 N, 3,453,861.22 E (40° 46' 29.89" N, 103° 51' 40.46" W)

Ground Level: 4,707.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Rohn State LD10-69HN - Slot A4

KB=24' @ 4731.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**



## Design Report for Rohn State LD10-69HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.774970	-103.861240	1,529,361.30	3,453,861.22
340.00	0.30	333.58	340.00	0.80	-0.40	40.774972	-103.861242	1,529,362.10	3,453,860.82
830.00	0.40	335.98	829.99	3.51	-1.66	40.774980	-103.861246	1,529,364.81	3,453,859.56
1,200.00	0.40	335.98	1,199.98	5.87	-2.71	40.774986	-103.861250	1,529,367.17	3,453,858.51
1,270.00	0.43	204.34	1,269.98	5.85	-2.92	40.774986	-103.861250	1,529,367.15	3,453,858.30
1,363.00	3.23	178.73	1,362.92	2.91	-3.01	40.774978	-103.861251	1,529,364.21	3,453,858.21
1,455.00	6.31	170.19	1,454.59	-4.66	-2.09	40.774957	-103.861248	1,529,356.64	3,453,859.13
1,547.00	8.45	171.83	1,545.83	-16.34	-0.27	40.774925	-103.861242	1,529,344.96	3,453,860.95
1,640.00	9.85	166.17	1,637.64	-30.82	2.61	40.774885	-103.861233	1,529,330.48	3,453,863.83
1,733.00	10.80	166.90	1,729.14	-47.04	6.48	40.774841	-103.861220	1,529,314.26	3,453,867.70
1,828.00	12.82	168.71	1,822.12	-66.04	10.56	40.774788	-103.861207	1,529,295.26	3,453,871.78
1,922.00	12.85	167.65	1,913.77	-86.48	14.84	40.774732	-103.861192	1,529,274.82	3,453,876.06
2,017.00	13.12	165.02	2,006.34	-107.22	19.89	40.774675	-103.861176	1,529,254.08	3,453,881.11
2,112.00	12.96	164.24	2,098.89	-127.88	25.57	40.774618	-103.861157	1,529,233.42	3,453,886.79
2,206.00	12.57	163.80	2,190.57	-147.85	31.28	40.774563	-103.861137	1,529,213.45	3,453,892.50
2,301.00	12.72	172.21	2,283.27	-168.14	35.59	40.774507	-103.861123	1,529,193.16	3,453,896.81
2,491.00	12.62	172.30	2,468.65	-209.44	41.20	40.774393	-103.861106	1,529,151.87	3,453,902.42
2,586.00	12.74	172.39	2,561.33	-230.10	43.98	40.774336	-103.861097	1,529,131.20	3,453,905.20
2,680.00	12.95	171.41	2,652.98	-250.79	46.93	40.774279	-103.861088	1,529,110.51	3,453,908.15
2,775.00	12.65	171.24	2,745.62	-271.60	50.10	40.774222	-103.861078	1,529,089.70	3,453,911.32
2,870.00	12.42	171.69	2,838.35	-291.99	53.16	40.774166	-103.861068	1,529,069.31	3,453,914.38
2,965.00	12.22	165.94	2,931.17	-311.85	57.08	40.774111	-103.861055	1,529,049.45	3,453,918.30
3,059.00	11.63	166.28	3,023.14	-330.70	61.74	40.774059	-103.861039	1,529,030.60	3,453,922.96
3,154.00	13.18	166.94	3,115.92	-350.56	66.46	40.774005	-103.861024	1,529,010.74	3,453,927.68
3,344.00	13.74	165.79	3,300.70	-393.53	76.90	40.773886	-103.860989	1,528,967.77	3,453,938.12
3,438.00	13.98	165.14	3,391.96	-415.33	82.55	40.773826	-103.860970	1,528,945.97	3,453,943.77
3,534.00	14.45	165.95	3,485.02	-438.16	88.43	40.773763	-103.860950	1,528,923.14	3,453,949.65
3,628.00	12.87	164.10	3,576.36	-459.60	94.15	40.773704	-103.860931	1,528,901.70	3,453,955.37
3,723.00	11.95	164.15	3,669.14	-479.24	99.73	40.773650	-103.860912	1,528,882.06	3,453,960.95
3,818.00	11.30	165.34	3,762.19	-497.71	104.77	40.773599	-103.860895	1,528,863.59	3,453,965.99
3,913.00	12.04	167.96	3,855.23	-516.40	109.20	40.773547	-103.860881	1,528,844.90	3,453,970.42
4,008.00	12.15	168.12	3,948.12	-535.88	113.32	40.773494	-103.860867	1,528,825.43	3,453,974.54
4,103.00	11.87	169.01	4,041.04	-555.25	117.24	40.773440	-103.860854	1,528,806.05	3,453,978.46
4,197.00	11.53	169.41	4,133.09	-573.97	120.81	40.773389	-103.860842	1,528,787.33	3,453,982.03
4,292.00	10.66	163.91	4,226.31	-591.75	124.99	40.773340	-103.860829	1,528,769.55	3,453,986.21
4,387.00	8.83	160.03	4,319.94	-607.05	129.92	40.773298	-103.860812	1,528,754.25	3,453,991.14
4,482.00	7.57	159.68	4,413.97	-619.77	134.58	40.773262	-103.860796	1,528,741.53	3,453,995.80
4,577.00	5.97	163.27	4,508.30	-630.37	138.18	40.773233	-103.860784	1,528,730.93	3,453,999.40
4,672.00	3.93	158.53	4,602.94	-638.13	140.79	40.773212	-103.860775	1,528,723.17	3,454,002.01
4,766.00	2.00	155.58	4,696.81	-642.62	142.65	40.773199	-103.860768	1,528,718.68	3,454,003.87
4,861.00	1.18	166.48	4,791.78	-645.08	143.56	40.773193	-103.860765	1,528,716.22	3,454,004.78
4,956.00	0.92	176.41	4,886.76	-646.80	143.84	40.773188	-103.860764	1,528,714.51	3,454,005.06

## Design Report for Rohn State LD10-69HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
5,049.00	0.83	162.44	4,979.75	-648.18	144.09	40.773184	-103.860763	1,528,713.12	3,454,005.31
5,097.00	0.34	177.82	5,027.75	-648.66	144.20	40.773183	-103.860763	1,528,712.64	3,454,005.42
5,144.00	3.56	103.40	5,074.71	-649.13	145.62	40.773181	-103.860758	1,528,712.17	3,454,006.84
5,192.00	9.07	100.69	5,122.41	-650.18	150.79	40.773178	-103.860739	1,528,711.12	3,454,012.01
5,238.00	10.22	96.31	5,167.75	-651.30	158.41	40.773175	-103.860712	1,528,710.00	3,454,019.63
5,286.00	12.60	89.38	5,214.81	-651.71	167.88	40.773173	-103.860678	1,528,709.59	3,454,029.10
5,333.00	17.11	84.88	5,260.22	-651.04	179.90	40.773174	-103.860634	1,528,710.26	3,454,041.12
5,381.00	21.35	87.08	5,305.54	-649.97	195.67	40.773176	-103.860577	1,528,711.33	3,454,056.89
5,428.00	25.10	87.57	5,348.72	-649.11	214.18	40.773178	-103.860510	1,528,712.19	3,454,075.40
5,476.00	27.15	86.74	5,391.81	-648.05	235.29	40.773180	-103.860434	1,528,713.25	3,454,096.51
5,523.00	30.81	87.72	5,432.92	-646.96	258.03	40.773182	-103.860352	1,528,714.34	3,454,119.25
5,571.00	36.44	90.69	5,472.88	-646.65	284.59	40.773181	-103.860256	1,528,714.65	3,454,145.81
5,618.00	39.44	90.92	5,509.94	-647.05	313.48	40.773179	-103.860152	1,528,714.25	3,454,174.70
5,666.00	43.90	89.25	5,545.79	-647.08	345.38	40.773177	-103.860037	1,528,714.22	3,454,206.60
5,712.00	48.93	88.88	5,577.49	-646.53	378.69	40.773177	-103.859916	1,528,714.77	3,454,239.91
5,760.00	52.85	89.66	5,607.76	-646.07	415.92	40.773176	-103.859782	1,528,715.24	3,454,277.14
5,807.00	56.08	89.91	5,635.08	-645.92	454.16	40.773174	-103.859644	1,528,715.38	3,454,315.38
5,855.00	58.98	89.97	5,660.84	-645.88	494.65	40.773173	-103.859498	1,528,715.42	3,454,355.87
5,902.00	62.81	90.40	5,683.70	-646.02	535.71	40.773170	-103.859350	1,528,715.28	3,454,396.93
5,950.00	65.57	90.44	5,704.60	-646.33	578.92	40.773167	-103.859194	1,528,714.97	3,454,440.14
5,997.00	70.36	90.21	5,722.23	-646.58	622.47	40.773164	-103.859036	1,528,714.72	3,454,483.69
6,045.00	74.65	88.94	5,736.65	-646.23	668.24	40.773163	-103.858871	1,528,715.07	3,454,529.46
6,092.00	79.27	88.53	5,747.25	-645.22	714.00	40.773163	-103.858706	1,528,716.08	3,454,575.22
6,135.00	81.59	90.51	5,754.40	-644.87	756.40	40.773162	-103.858553	1,528,716.43	3,454,617.62
6,205.00	85.92	88.75	5,762.02	-644.42	825.96	40.773160	-103.858302	1,528,716.89	3,454,687.18
6,298.00	88.40	90.40	5,766.62	-643.73	918.83	40.773157	-103.857966	1,528,717.57	3,454,780.05
6,391.00	88.77	89.12	5,768.92	-643.34	1,011.80	40.773153	-103.857631	1,528,717.96	3,454,873.02
6,483.00	87.96	87.45	5,771.55	-640.59	1,103.72	40.773156	-103.857299	1,528,720.71	3,454,964.94
6,577.00	88.67	86.99	5,774.31	-636.03	1,197.57	40.773164	-103.856960	1,528,725.27	3,455,058.79
6,672.00	89.48	86.48	5,775.84	-630.62	1,292.40	40.773174	-103.856617	1,528,730.68	3,455,153.62
6,736.00	88.39	86.87	5,777.03	-626.91	1,356.28	40.773181	-103.856386	1,528,734.39	3,455,217.50
6,830.00	91.60	85.55	5,777.04	-620.70	1,450.06	40.773193	-103.856047	1,528,740.60	3,455,311.28
6,925.00	91.88	88.59	5,774.16	-615.84	1,544.88	40.773202	-103.855705	1,528,745.46	3,455,406.10
7,020.00	90.65	90.38	5,772.06	-614.99	1,639.85	40.773199	-103.855362	1,528,746.31	3,455,501.07
7,115.00	88.89	91.24	5,772.44	-616.33	1,734.83	40.773191	-103.855019	1,528,744.97	3,455,596.05
7,210.00	87.66	91.08	5,775.30	-618.25	1,829.77	40.773180	-103.854676	1,528,743.05	3,455,690.99
7,305.00	87.53	90.50	5,779.29	-619.56	1,924.68	40.773172	-103.854334	1,528,741.74	3,455,785.89
7,399.00	88.55	90.40	5,782.50	-620.30	2,018.62	40.773165	-103.853995	1,528,741.00	3,455,879.83
7,494.00	89.26	89.69	5,784.32	-620.38	2,113.60	40.773160	-103.853652	1,528,740.93	3,455,974.82
7,589.00	88.27	89.36	5,786.36	-619.59	2,208.57	40.773157	-103.853309	1,528,741.71	3,456,069.79
7,684.00	87.22	88.84	5,790.10	-618.10	2,303.48	40.773157	-103.852966	1,528,743.20	3,456,164.70
7,778.00	88.89	88.06	5,793.29	-615.56	2,397.39	40.773159	-103.852627	1,528,745.74	3,456,258.61

## Design Report for Rohn State LD10-69HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
7,873.00	89.01	87.22	5,795.03	-611.64	2,492.29	40.773165	-103.852284	1,528,749.66	3,456,353.51
7,968.00	91.79	86.11	5,794.37	-606.12	2,587.12	40.773175	-103.851942	1,528,755.18	3,456,448.34
8,063.00	91.08	85.19	5,791.99	-598.92	2,681.82	40.773190	-103.851599	1,528,762.38	3,456,543.03
8,157.00	92.37	86.47	5,789.16	-592.08	2,775.52	40.773204	-103.851261	1,528,769.22	3,456,636.74
8,252.00	91.79	86.18	5,785.71	-586.00	2,870.26	40.773216	-103.850918	1,528,775.30	3,456,731.48
8,347.00	91.11	86.10	5,783.31	-579.61	2,965.02	40.773229	-103.850576	1,528,781.70	3,456,826.23
8,441.00	89.60	86.58	5,782.73	-573.61	3,058.82	40.773240	-103.850237	1,528,787.70	3,456,920.04
8,536.00	91.33	87.69	5,781.96	-568.86	3,153.69	40.773248	-103.849894	1,528,792.44	3,457,014.91
8,631.00	91.57	87.81	5,779.55	-565.13	3,248.59	40.773254	-103.849551	1,528,796.17	3,457,109.80
8,726.00	91.05	87.79	5,777.38	-561.48	3,343.49	40.773259	-103.849208	1,528,799.82	3,457,204.71
8,821.00	90.15	86.95	5,776.39	-557.12	3,438.39	40.773266	-103.848866	1,528,804.18	3,457,299.60
8,916.00	90.89	88.02	5,775.52	-552.96	3,533.29	40.773273	-103.848523	1,528,808.35	3,457,394.50
9,010.00	90.71	87.44	5,774.21	-549.23	3,627.21	40.773278	-103.848183	1,528,812.07	3,457,488.42
9,105.00	90.68	87.25	5,773.06	-544.83	3,722.10	40.773285	-103.847841	1,528,816.47	3,457,583.31
9,200.00	90.89	87.29	5,771.76	-540.31	3,816.98	40.773293	-103.847498	1,528,820.99	3,457,678.19
9,294.00	90.34	88.08	5,770.75	-536.51	3,910.90	40.773299	-103.847159	1,528,824.79	3,457,772.11
9,389.00	90.65	88.98	5,769.93	-534.07	4,005.86	40.773300	-103.846816	1,528,827.23	3,457,867.08
9,484.00	91.33	89.02	5,768.29	-532.42	4,100.83	40.773300	-103.846473	1,528,828.88	3,457,962.05
9,578.00	88.95	88.70	5,768.06	-530.55	4,194.81	40.773300	-103.846133	1,528,830.75	3,458,056.02
9,673.00	86.79	88.73	5,771.59	-528.42	4,289.71	40.773301	-103.845791	1,528,832.88	3,458,150.92
9,768.00	86.67	88.16	5,777.01	-525.84	4,384.52	40.773304	-103.845448	1,528,835.46	3,458,245.73
9,862.00	86.73	87.74	5,782.42	-522.49	4,478.30	40.773308	-103.845109	1,528,838.81	3,458,339.52
9,957.00	86.85	87.20	5,787.74	-518.30	4,573.06	40.773315	-103.844767	1,528,843.00	3,458,434.28
10,052.00	87.35	87.20	5,792.54	-513.67	4,667.83	40.773322	-103.844425	1,528,847.64	3,458,529.04
10,147.00	87.87	87.26	5,796.50	-509.08	4,762.63	40.773330	-103.844082	1,528,852.22	3,458,623.85
10,242.00	88.15	87.05	5,799.80	-504.37	4,857.46	40.773338	-103.843740	1,528,856.94	3,458,718.67
10,339.00	88.15	87.05	5,802.93	-499.38	4,954.28	40.773347	-103.843390	1,528,861.92	3,458,815.49

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
10,242.00	5,799.80	-504.37	4,857.46	Last MWD Survey @ 10242'
10,339.00	5,802.93	-499.38	4,954.28	Straight Projection to TD

## Design Report for Rohn State LD10-69HN - Actual Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Rohn State LD10-69HN_Rev B0_BHL Tgt	96.19	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
340.00	1,200.00	Surface Surveys	Flexi-Shot
1,270.00	6,135.00	Intermediate Surveys	MWD
6,205.00	10,339.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,202.00	1,201.98	9 5/8"	9-5/8	13-3/4
6,179.00	5,759.80	7"	7	8-3/4
10,339.00	5,802.93	6 1/4" Open Hole	6-1/4	6-1/4

Design Targets

Shape	Target Name	TVD (usft)	Northing (usft)	Easting (usft)	+N/-S usft	+E/-W usft	Created	Updated
Polygon	Rohn State LD03-65HN_4	0.00	1,532,124.95	3,453,746.44	2,763.66	-114.78	8/5/2014	8/12/2014
Polygon	Rohn State LD03-65HN_S	0.00	1,532,124.95	3,453,746.44	2,763.66	-114.78	8/5/2014	8/12/2014
Polygon	Rohn State LD03-65HN_4	0.00	1,532,124.95	3,453,746.44	2,763.66	-114.78	8/5/2014	8/12/2014
Point	Rohn State LD10-69HN_R	5,813.00	1,528,823.13	3,458,824.36	-538.18	4,963.15	9/18/2014	9/18/2014

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Design Report for Rohn State LD10-69HN - Actual Surveys

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Directional Difficulty Index

Average Dogleg over Survey: 1.77 °/100usft

Maximum Dogleg over Survey: 12.22 °/100usft at 5,571.00  
usft

Net Tortosity applicable to Plans: 0.62 °/100usft

Directional Difficulty Index: 6.252

Audit Info

## North Reference Sheet for Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD) - Rohn State LD10-69HN - Original Wellbore

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB=24' @ 4731.00usft (H&P 273). Northing and Easting are relative to Rohn State LD10-69HN - Slot A4

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999865

Grid Coordinates of Well: 1,529,361.30 usft N, 3,453,861.22 usft E

Geographical Coordinates of Well: 40° 46' 29.89" N, 103° 51' 40.46" W

Grid Convergence at Surface is: 1.06°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,339.00usft

the Bottom Hole Displacement is 4,979.38usft in the Direction of 95.76° (Grid).

Magnetic Convergence at surface is: -6.99° ( 9 September 2014, , BGM2014)

