

# Noble Energy

Weld County, CO (NAD 83)

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

Rohn State LD03-62-1HN - A3

Original Wellbore

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

30 September, 2014

Well Coordinates: 1,529,397.73 N, 3,453,860.55 E (40° 46' 30.25" N, 103° 51' 40.46" W)

Ground Level: 4,706.00 usft

Local Coordinate Origin:

Centered on Well Rohn State LD03-62-1HN - Slot A3

Viewing Datum:

KB=24' @ 4730.00usft (H&P 273)

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

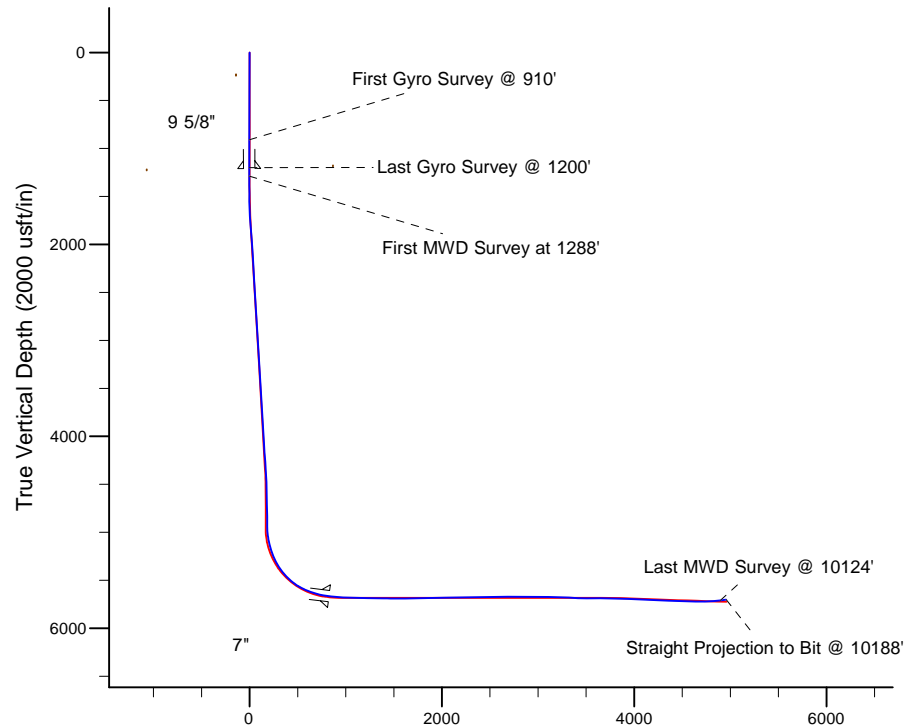
Version: 5000.1 Build: 70

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
Site: Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD)  
Well: Rohn State LD03-62-1HN  
Wellbore: Original Wellbore  
Design: Actual Surveys

# Noble Energy

**HALLIBURTON**  
Sperry Drilling



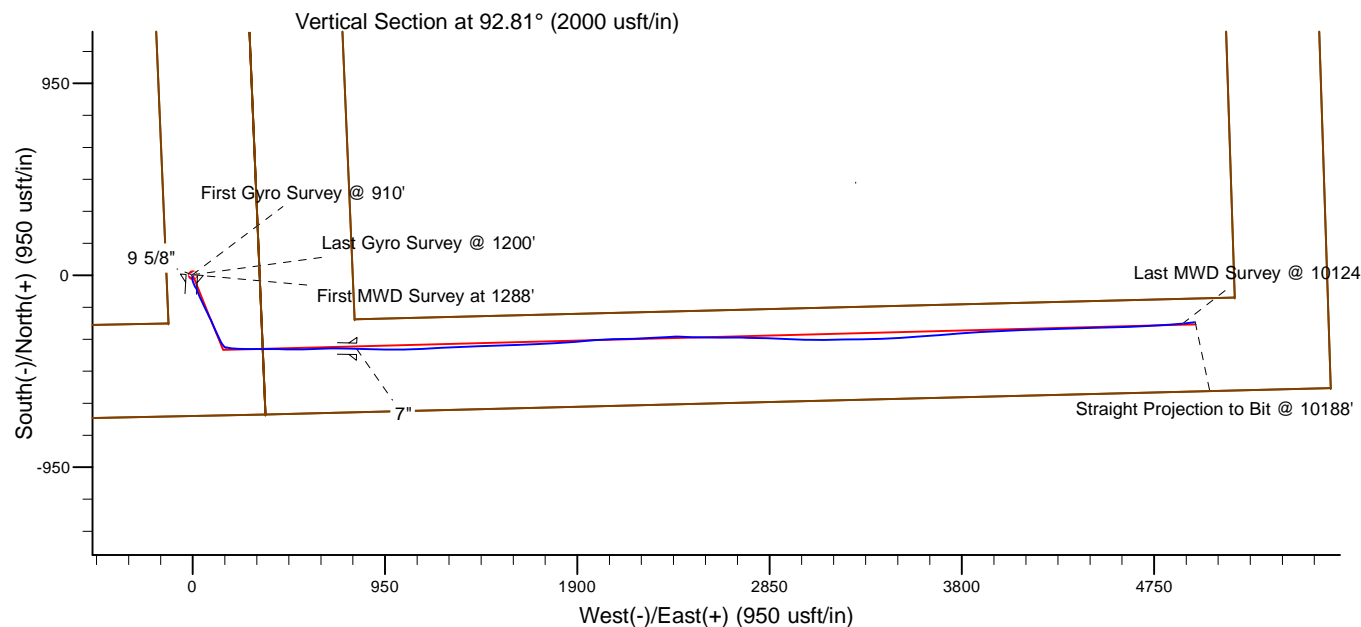
Platted SHL: 699 FSL, 330 FEL  
Platted Lat/Long: 40.77507 N, 103.86124 W  
Location: Sec. 4-T9N-R58W

~7" Casing: 316' FSL, 461' FWL  
Lat/Long: 40° 46' 26.506 N 103° 51' 30.025 W  
State Planes - CO Northern: 1529033.59 N 3454670.60 E  
Location: Sec. 3-T9N-R58W

Platted BHL: 330 FSL, 660 FEL  
Lat/Long: 40.77415 N, 103.84337 W  
State Planes - CO Northern: 1529154.56 N, 3458815.40 E  
Location: Sec. 3-T9N-R58W

## LEGEND

- Rohn State LD03-62-1HN, Original Wellbore, Rev B0 Proposal V0
- Actual Surveys



WELL DETAILS: Rohn State LD03-62-1HN

Ground Level: 4706.00  
KB=24' @ 4730.00usft (H&P 273)

Created By: Amanda Marchand  
Created On: 9/30/2014

**Design Report for Rohn State LD03-62-1HN - 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
910.00	0.40	299.58	909.99	1.57	-2.76	-2.84	0.04
<b>First Gyro Survey @ 910'</b>							
1,200.00	0.20	336.78	1,199.99	2.53	-3.84	-3.96	0.09
<b>Last Gyro Survey @ 1200'</b>							
1,288.00	0.64	79.50	1,287.99	2.76	-3.42	-3.55	0.81
<b>First MWD Survey at 1288'</b>							
1,381.00	0.87	69.90	1,380.98	3.10	-2.25	-2.40	0.28
1,473.00	6.58	180.73	1,472.78	-1.94	-1.66	-1.56	7.54
1,566.00	6.61	182.91	1,565.17	-12.61	-2.00	-1.38	0.27
1,659.00	8.43	168.37	1,657.37	-24.63	-0.89	0.32	2.82
1,752.00	9.28	158.21	1,749.27	-38.28	3.26	5.14	1.91
1,845.00	9.58	150.21	1,841.02	-51.95	9.89	12.43	1.44
1,938.00	9.14	150.00	1,932.78	-65.07	17.43	20.60	0.47
2,030.00	7.88	159.86	2,023.77	-77.32	23.26	27.02	2.09
2,122.00	7.83	159.29	2,114.90	-89.10	27.64	31.98	0.10
2,402.00	7.75	154.90	2,392.32	-124.04	42.40	48.43	0.21
2,679.00	7.44	154.43	2,666.89	-157.13	58.06	65.69	0.11
2,774.00	7.52	155.00	2,761.08	-168.31	63.34	71.52	0.11
2,963.00	6.96	153.43	2,948.58	-189.76	73.69	82.91	0.31
3,058.00	7.01	154.15	3,042.87	-200.13	78.79	88.51	0.11
3,247.00	6.82	153.39	3,230.50	-220.54	88.85	99.55	0.11
3,436.00	7.79	155.92	3,417.96	-242.27	99.10	110.86	0.54
3,531.00	8.10	157.95	3,512.05	-254.35	104.24	116.59	0.44
3,626.00	7.87	156.07	3,606.13	-266.50	109.39	122.33	0.37
3,721.00	7.57	155.58	3,700.27	-278.14	114.62	128.12	0.32
3,816.00	6.95	156.80	3,794.50	-289.12	119.47	133.50	0.67
4,100.00	7.16	152.45	4,076.36	-320.60	134.42	149.98	0.20
4,195.00	7.02	154.33	4,170.63	-331.09	139.68	155.74	0.29
4,289.00	6.35	142.07	4,263.99	-340.36	145.36	161.87	1.67
4,384.00	6.26	142.44	4,358.42	-348.61	151.75	168.66	0.10
4,479.00	2.87	129.41	4,453.11	-354.23	156.74	173.92	3.71
4,574.00	2.37	131.42	4,548.01	-357.04	160.05	177.37	0.54
4,764.00	0.87	44.38	4,737.95	-358.61	164.01	181.39	1.31
4,859.00	0.78	36.60	4,832.94	-357.57	164.90	182.23	0.15
4,953.00	0.57	37.66	4,926.93	-356.69	165.57	182.85	0.22
5,001.00	3.25	99.41	4,974.90	-356.72	167.06	184.34	6.30
5,048.00	7.27	104.37	5,021.69	-357.68	171.25	188.58	8.60
5,096.00	9.85	104.96	5,069.15	-359.49	178.16	195.57	5.38
5,143.00	12.77	96.10	5,115.24	-361.08	187.21	204.69	7.21
5,191.00	16.20	93.01	5,161.71	-362.00	199.18	216.69	7.32
5,238.00	19.01	94.72	5,206.50	-362.97	213.36	230.90	6.08
5,286.00	22.32	93.30	5,251.41	-364.14	230.25	247.83	6.97
5,333.00	25.99	91.61	5,294.29	-364.95	249.46	267.06	7.95
5,381.00	30.49	91.26	5,336.56	-365.51	272.16	289.75	9.38
5,428.00	34.45	90.19	5,376.21	-365.82	297.39	314.96	8.51
5,476.00	38.41	89.39	5,414.82	-365.70	325.89	343.42	8.31
5,522.00	42.45	89.18	5,449.83	-365.33	355.71	373.19	8.79
5,570.00	46.38	90.49	5,484.11	-365.24	389.29	406.73	8.41
5,617.00	50.02	91.31	5,515.43	-365.80	424.32	441.74	7.85

## Design Report for Rohn State LD03-62-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,665.00	54.95	90.77	5,544.65	-366.49	462.38	479.79	10.31
5,712.00	60.92	89.92	5,569.59	-366.72	502.19	519.56	12.79
5,760.00	65.05	89.04	5,591.39	-366.32	544.94	562.24	8.76
5,807.00	68.23	87.73	5,610.02	-365.10	588.06	605.25	7.23
5,855.00	71.11	87.46	5,626.70	-363.21	633.03	650.07	6.02
5,902.00	73.65	89.01	5,640.93	-361.84	677.79	694.72	6.25
5,949.00	77.13	91.00	5,652.78	-361.85	723.27	740.13	8.46
5,994.00	81.46	91.70	5,661.14	-362.89	767.46	784.33	9.74
6,084.00	85.06	91.64	5,671.70	-365.49	856.78	873.67	4.00
6,177.00	85.99	90.75	5,678.95	-367.43	949.48	966.35	1.38
6,270.00	87.78	88.84	5,684.01	-367.09	1,042.33	1,059.08	2.81
6,362.00	90.12	87.63	5,685.69	-364.26	1,134.27	1,150.76	2.86
6,454.00	88.98	85.92	5,686.42	-359.09	1,226.11	1,242.24	2.23
6,549.00	89.48	88.81	5,687.69	-354.72	1,320.99	1,336.79	3.09
6,644.00	88.27	87.53	5,689.56	-351.69	1,415.92	1,431.46	1.85
6,739.00	90.43	87.88	5,690.64	-347.88	1,510.83	1,526.07	2.30
6,833.00	90.55	88.45	5,689.83	-344.87	1,604.78	1,619.76	0.62
6,928.00	90.46	86.55	5,689.00	-340.73	1,699.68	1,714.34	2.00
7,023.00	91.29	87.44	5,687.54	-335.75	1,794.54	1,808.84	1.28
7,118.00	91.17	84.95	5,685.50	-329.45	1,889.30	1,903.18	2.62
7,213.00	91.26	85.06	5,683.49	-321.18	1,983.92	1,997.28	0.15
7,308.00	91.42	89.24	5,681.27	-316.46	2,078.75	2,091.77	4.40
7,402.00	91.26	88.25	5,679.07	-314.40	2,172.71	2,185.51	1.07
7,497.00	90.71	85.68	5,677.44	-309.37	2,267.55	2,279.99	2.77
7,592.00	90.83	88.52	5,676.16	-304.56	2,362.41	2,374.50	2.99
7,686.00	91.48	92.96	5,674.26	-305.78	2,456.36	2,468.40	4.77
7,781.00	89.44	90.66	5,673.50	-308.78	2,551.30	2,563.37	3.24
7,876.00	89.17	89.43	5,674.65	-308.85	2,646.29	2,658.25	1.33
7,971.00	90.80	90.91	5,674.68	-309.13	2,741.28	2,753.14	2.32
8,066.00	90.12	91.80	5,673.92	-311.38	2,836.25	2,848.11	1.18
8,160.00	89.60	92.51	5,674.14	-314.91	2,930.18	2,942.10	0.94
8,255.00	90.80	91.95	5,673.81	-318.61	3,025.11	3,037.09	1.39
8,349.00	88.64	89.16	5,674.27	-319.52	3,119.09	3,131.00	3.75
8,444.00	87.75	89.60	5,677.27	-318.49	3,214.03	3,225.78	1.04
8,539.00	87.04	88.97	5,681.58	-317.31	3,308.93	3,320.50	1.00
8,634.00	87.87	87.59	5,685.80	-314.46	3,403.79	3,415.11	1.69
8,729.00	88.61	86.47	5,688.72	-309.54	3,498.61	3,509.58	1.41
8,824.00	89.48	85.97	5,690.30	-303.28	3,593.39	3,603.94	1.06
8,918.00	91.23	85.51	5,689.72	-296.30	3,687.13	3,697.22	1.92
8,967.00	90.09	86.11	5,689.16	-292.72	3,735.99	3,745.85	2.63
9,013.00	88.98	84.45	5,689.53	-288.93	3,781.83	3,791.45	4.34
9,108.00	86.45	86.39	5,693.32	-281.35	3,876.44	3,885.57	3.35
9,202.00	88.15	87.95	5,697.74	-276.72	3,970.22	3,979.01	2.45
9,297.00	87.99	87.48	5,700.94	-272.93	4,065.09	4,073.58	0.52
9,392.00	88.12	86.96	5,704.17	-268.33	4,159.92	4,168.07	0.56
9,486.00	86.95	88.94	5,708.21	-264.97	4,253.77	4,261.64	2.44
9,581.00	87.56	88.62	5,712.76	-262.95	4,348.63	4,356.30	0.72
9,676.00	87.44	88.53	5,716.91	-260.59	4,443.51	4,450.95	0.16
9,771.00	87.81	88.40	5,720.84	-258.04	4,538.40	4,545.59	0.41
9,865.00	89.11	87.79	5,723.37	-254.92	4,632.31	4,639.24	1.53
9,960.00	91.60	86.97	5,722.78	-250.58	4,727.20	4,733.80	2.76

## Design Report for Rohn State LD03-62-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,055.00	94.88	85.79	5,717.41	-244.59	4,821.85	4,828.04	3.67
10,124.00	96.83	84.64	5,710.37	-238.87	4,890.24	4,896.07	3.28
Last MWD Survey @ 10124'							
10,188.00	96.83	84.64	5,702.76	-232.93	4,953.51	4,958.97	0.00
Straight Projection to Bit @ 10188'							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
910.00	909.99	1.57	-2.76	First Gyro Survey @ 910'
1,200.00	1,199.99	2.53	-3.84	Last Gyro Survey @ 1200'

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	92.81	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
0.00	1,200.00	Surface Surveys	Flexi-Shot
1,288.00	5,994.00	Intermediate Surveys	MWD
6,084.00	10,188.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,211.00	1,210.99	9 5/8"	9-5/8	13-1/16
6,037.00	5,666.88	7"	7	8-3/4

## Design Report for Rohn State LD03-62-1HN - 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	-1.00	2,727.23	-114.11	1,532,124.95	3,453,746.44	40° 46' 57.216 N	103° 51' 41.292 W
- actual wellpath misses target center by 2729.62usft at 4.05usft MD (4.05 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1.00	1,306.69	-4,481.08	1,533,431.64	3,449,265.36		
Point 2			-1.00	-3,048.17	-4,330.55	1,529,076.79	3,449,415.89		
Point 3			-1.00	-2,965.64	-6.00	1,529,159.32	3,453,740.44		
Point 4			-1.00	1,400.65	-187.40	1,533,525.60	3,453,559.04		
Point 5			-1.00	1,306.69	-4,481.08	1,533,431.64	3,449,265.36		
Rohn State LD03-65HI	0.00	0.00	-1.00	2,727.23	-114.11	1,532,124.95	3,453,746.44	40° 46' 57.216 N	103° 51' 41.292 W
- actual wellpath misses target center by 2729.62usft at 4.05usft MD (4.05 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1.00	-2,945.49	913.96	1,529,179.47	3,454,660.40		
Point 2			-1.00	-2,837.50	5,262.44	1,529,287.46	3,459,008.87		
Point 3			-1.00	1,514.25	5,123.82	1,533,639.20	3,458,870.25		
Point 4			-1.00	1,420.53	732.57	1,533,545.48	3,454,479.01		
Point 5			-1.00	-2,945.49	913.96	1,529,179.47	3,454,660.40		
Rohn State LD03-65HI	0.00	0.00	-1.00	2,727.23	-114.11	1,532,124.95	3,453,746.44	40° 46' 57.216 N	103° 51' 41.292 W
- actual wellpath misses target center by 2729.62usft at 4.05usft MD (4.05 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1.00	1,756.39	-4,956.90	1,533,881.34	3,448,789.54		
Point 2			-1.00	-3,516.73	-4,774.63	1,528,608.23	3,448,971.81		
Point 3			-1.00	-3,416.58	473.13	1,528,708.38	3,454,219.57		
Point 4			-1.00	1,870.41	253.48	1,533,995.36	3,453,999.92		
Point 5			-1.00	-3,416.58	473.13	1,528,708.38	3,454,219.57		
Point 6			-1.00	-3,285.86	5,736.95	1,528,839.10	3,459,483.38		
Point 7			-1.00	1,983.86	5,569.10	1,534,108.81	3,459,315.53		
Point 8			-1.00	1,870.41	253.48	1,533,995.36	3,453,999.92		
Rohn State LD03-62-1	0.00	0.00	5,685.00	-243.17	4,954.86	1,529,154.56	3,458,815.40	40° 46' 26.940 N	103° 50' 36.132 W
- actual wellpath misses target center by 20.55usft at 10188.00usft MD (5702.76 TVD, -232.93 N, 4953.51 E)									
- Point									
Rohn State LD03-62-1	0.00	0.00	5,725.60	-243.17	4,954.86	1,529,154.56	3,458,815.40	40° 46' 26.940 N	103° 50' 36.132 W
- actual wellpath misses target center by 24.96usft at 10185.67usft MD (5703.04 TVD, -233.15 N, 4951.20 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	1.96 °/100usft	Maximum Dogleg over Survey:	12.79 °/100usft at 5,712.00 usft
Net Tortosity applicable to Plans:	0.89 °/100usft	Directional Difficulty Index:	6.267

**Audit Info**

North Reference Sheet for Sec. 4-T9N-R58W (Rohn State 4 LD03 South PAD) -  
Rohn State LD03-62-1HN - 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' @ 4730.00usft (H&P 273). Northing and Easting are relative to Rohn State LD03-62-1HN - Slot A3

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° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999867

Grid Coordinates of Well: 1,529,397.73 usft N, 3,453,860.55 usft E

Geographical Coordinates of Well: 40° 46' 30.25" N, 103° 51' 40.46" W

Grid Convergence at Surface is: 1.06°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,188.00usft  
the Bottom Hole Displacement is 4,958.98usft in the Direction of 92.69° (Grid).

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

