



Noble Energy Inc.

Weld County, CO

Sec 9, T9N, R58W

Rohn State LD09-64-1HN

Wellbore #1

Design: Wellbore #1 **FINAL**

DDC Survey Report

07 November, 2013



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Rohn State LD09-64-1HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4746.0usft (H&P 326)
Site:	Sec 9, T9N, R58W	MD Reference:	WELL @ 4746.0usft (H&P 326)
Well:	Rohn State LD09-64-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site	Sec 9, T9N, R58W				
Site Position:		Northing:	1,523,890.74 usft	Latitude:	40° 45' 35.850 N
From:	Map	Easting:	3,453,841.03 usft	Longitude:	103° 51' 42.040 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.06 °

Well	Rohn State LD09-64-1HN					
Well Position	+N/-S	0.0 usft	Northing:	1,525,439.63 usft	Latitude:	40° 45' 51.156 N
	+E/-W	0.0 usft	Easting:	3,453,820.11 usft	Longitude:	103° 51' 41.940 W
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,716.0 usft	

Wellbore	Wellbore #1				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/17/2013	8.09	67.41	53,175

Design	Wellbore #1				
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Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	263.59

Survey Program		Date	11/7/2013	
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
473.0	1,255.0	MSS (Wellbore #1)	Good_gyro	Good Gyro
1,305.0	9,687.0	DDC (Wellbore #1)	MWD default	MWD - Standard

Survey	Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
	0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
	473.0	0.60	157.50	473.0	-2.3	0.9	-0.7	0.13	0.13	0.00
	843.0	0.60	57.80	843.0	-3.0	3.3	-3.0	0.25	0.00	-26.95
	1,255.0	0.20	266.40	1,255.0	-1.9	4.4	-4.2	0.19	-0.10	-36.75
TIE IN @ 1255' MD / 1255' TVD										
	1,255.1	0.20	266.40	1,255.1	-1.9	4.4	-4.2	0.00	0.00	0.00
	1,305.0	1.00	42.90	1,305.0	-1.6	4.6	-4.4	2.31	1.60	273.55
	1,397.0	0.90	47.30	1,397.0	-0.5	5.7	-5.6	0.13	-0.11	4.78
	1,489.0	2.30	152.90	1,488.9	-1.7	7.1	-6.9	2.92	1.52	114.78
	1,581.0	4.80	164.20	1,580.7	-7.1	9.0	-8.1	2.81	2.72	12.28

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Well:	Rohn State LD09-64-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,675.0	7.60	165.60	1,674.2	-16.9	11.6	-9.6	2.98	2.98	1.49
1,768.0	10.10	167.30	1,766.1	-30.8	14.9	-11.4	2.70	2.69	1.83
1,860.0	12.50	167.20	1,856.3	-48.4	18.9	-13.4	2.61	2.61	-0.11
1,953.0	14.00	163.60	1,946.8	-69.0	24.3	-16.5	1.84	1.61	-3.87
2,046.0	14.50	164.30	2,036.9	-91.0	30.6	-20.3	0.57	0.54	0.75
2,140.0	15.60	157.70	2,127.7	-114.0	38.6	-25.6	2.16	1.17	-7.02
2,233.0	14.10	152.20	2,217.6	-135.6	48.6	-33.2	2.21	-1.61	-5.91
2,326.0	14.20	153.10	2,307.8	-155.8	59.1	-41.3	0.26	0.11	0.97
2,418.0	14.40	154.70	2,397.0	-176.2	69.1	-49.0	0.48	0.22	1.74
2,510.0	14.90	155.90	2,486.0	-197.3	78.8	-56.3	0.64	0.54	1.30
2,602.0	14.50	154.90	2,574.9	-218.5	88.5	-63.6	0.51	-0.43	-1.09
2,697.0	13.30	149.60	2,667.2	-238.7	99.1	-71.8	1.84	-1.26	-5.58
2,791.0	11.30	144.70	2,759.0	-255.6	109.9	-80.7	2.40	-2.13	-5.21
2,886.0	11.00	144.70	2,852.2	-270.6	120.5	-89.5	0.32	-0.32	0.00
2,980.0	9.90	145.40	2,944.7	-284.5	130.3	-97.7	1.18	-1.17	0.74
3,074.0	8.90	145.70	3,037.4	-297.2	139.0	-104.9	1.07	-1.06	0.32
3,169.0	8.80	144.10	3,131.3	-309.2	147.4	-111.9	0.28	-0.11	-1.68
3,264.0	9.10	144.50	3,225.1	-321.2	156.0	-119.1	0.32	0.32	0.42
3,359.0	8.90	151.70	3,318.9	-333.8	163.8	-125.5	1.20	-0.21	7.58
3,453.0	9.10	153.80	3,411.8	-346.8	170.6	-130.8	0.41	0.21	2.23
3,548.0	8.00	154.10	3,505.7	-359.5	176.8	-135.5	1.16	-1.16	0.32
3,643.0	7.50	148.00	3,599.9	-370.7	182.9	-140.4	1.01	-0.53	-6.42
3,737.0	5.40	154.70	3,693.3	-379.9	188.1	-144.5	2.37	-2.23	7.13
3,832.0	4.90	157.70	3,787.9	-387.7	191.5	-147.0	0.60	-0.53	3.16
3,927.0	3.50	175.90	3,882.6	-394.4	193.3	-148.0	2.02	-1.47	19.16
4,021.0	1.60	147.50	3,976.5	-398.3	194.2	-148.5	2.37	-2.02	-30.21
4,116.0	1.50	85.60	4,071.5	-399.4	196.1	-150.3	1.68	-0.11	-65.16
4,210.0	1.80	21.10	4,165.5	-397.9	197.9	-152.2	1.89	0.32	-68.62
4,305.0	1.30	263.00	4,260.4	-396.6	197.4	-151.8	2.81	-0.53	-124.32
4,399.0	1.50	264.90	4,354.4	-396.9	195.1	-149.5	0.22	0.21	2.02
4,494.0	1.70	255.20	4,449.4	-397.3	192.5	-146.9	0.35	0.21	-10.21
4,588.0	1.80	266.50	4,543.3	-397.8	189.7	-144.0	0.38	0.11	12.02
4,683.0	1.50	270.70	4,638.3	-397.9	186.9	-141.3	0.34	-0.32	4.42
4,777.0	1.50	276.00	4,732.3	-397.7	184.5	-138.9	0.15	0.00	5.64
4,872.0	1.50	290.90	4,827.2	-397.1	182.1	-136.6	0.41	0.00	15.68
4,966.0	1.00	285.10	4,921.2	-396.5	180.1	-134.7	0.55	-0.53	-6.17
5,060.0	4.80	260.00	5,015.1	-397.0	175.5	-130.0	4.17	4.04	-26.70
5,155.0	17.10	258.70	5,108.2	-400.4	157.8	-112.1	12.95	12.95	-1.37
5,249.0	24.20	276.80	5,196.2	-400.8	125.0	-79.5	10.08	7.55	19.26
5,344.0	31.40	281.10	5,280.2	-393.7	81.4	-36.9	7.86	7.58	4.53
5,439.0	36.50	272.10	5,359.0	-387.9	28.8	14.7	7.53	5.37	-9.47
5,533.0	41.20	264.20	5,432.2	-390.0	-30.0	73.4	7.26	5.00	-8.40
5,628.0	47.10	260.00	5,500.4	-399.3	-95.5	139.5	6.93	6.21	-4.42

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
CROSSED HARDLINE @ 5645.8' MD / 5512.2' TVD										
5,645.8	49.33	260.50	5,512.2	-401.5	-108.6	152.8	12.70	12.53	2.78	
5,722.0	58.90	262.30	5,556.8	-410.7	-169.6	214.4	12.70	12.56	2.37	
5,817.0	70.20	266.00	5,597.6	-419.3	-254.8	300.0	12.40	11.89	3.89	
5,911.0	68.80	265.80	5,630.5	-425.6	-342.6	388.0	1.50	-1.49	-0.21	
6,006.0	69.40	262.10	5,664.4	-434.9	-430.8	476.7	3.69	0.63	-3.89	
6,087.0	79.40	260.10	5,686.2	-447.0	-507.8	554.5	12.57	12.35	-2.47	
6,140.0	85.10	267.20	5,693.3	-452.8	-559.9	607.0	17.08	10.75	13.40	
6,233.0	87.80	262.60	5,699.1	-461.0	-652.3	699.8	5.73	2.90	-4.95	
6,326.0	88.40	264.50	5,702.2	-471.5	-744.7	792.7	2.14	0.65	2.04	
6,421.0	88.90	267.50	5,704.4	-478.1	-839.4	887.6	3.20	0.53	3.16	
6,515.0	88.40	269.80	5,706.6	-480.3	-933.4	981.2	2.50	-0.53	2.45	
6,610.0	88.60	271.20	5,709.1	-479.5	-1,028.3	1,075.4	1.49	0.21	1.47	
6,704.0	89.10	271.40	5,711.0	-477.4	-1,122.3	1,168.6	0.57	0.53	0.21	
6,799.0	89.80	271.60	5,711.9	-474.9	-1,217.2	1,262.7	0.77	0.74	0.21	
6,893.0	90.20	271.90	5,711.9	-472.0	-1,311.2	1,355.7	0.53	0.43	0.32	
6,989.0	90.80	271.90	5,711.1	-468.8	-1,407.1	1,450.7	0.63	0.63	0.00	
7,083.0	91.50	272.10	5,709.2	-465.5	-1,501.1	1,543.7	0.77	0.74	0.21	
7,179.0	90.00	271.40	5,707.9	-462.6	-1,597.0	1,638.7	1.72	-1.56	-0.73	
7,274.0	88.30	270.30	5,709.3	-461.2	-1,692.0	1,732.9	2.13	-1.79	-1.16	
7,368.0	88.40	270.50	5,712.1	-460.5	-1,785.9	1,826.2	0.24	0.11	0.21	
7,463.0	88.50	270.30	5,714.6	-459.9	-1,880.9	1,920.5	0.24	0.11	-0.21	
7,558.0	89.20	270.70	5,716.5	-459.0	-1,975.9	2,014.8	0.85	0.74	0.42	
7,653.0	89.20	270.20	5,717.9	-458.3	-2,070.9	2,109.1	0.53	0.00	-0.53	
7,748.0	91.20	273.00	5,717.5	-455.6	-2,165.8	2,203.2	3.62	2.11	2.95	
7,842.0	89.20	271.00	5,717.2	-452.4	-2,259.8	2,296.1	3.01	-2.13	-2.13	
7,937.0	89.20	271.20	5,718.5	-450.5	-2,354.7	2,390.3	0.21	0.00	0.21	
8,031.0	88.90	270.50	5,720.1	-449.2	-2,448.7	2,483.5	0.81	-0.32	-0.74	
8,126.0	90.00	272.80	5,721.0	-446.4	-2,543.6	2,577.6	2.68	1.16	2.42	
8,221.0	90.30	273.30	5,720.7	-441.4	-2,638.5	2,671.3	0.61	0.32	0.53	
8,315.0	88.70	272.30	5,721.6	-436.8	-2,732.4	2,764.1	2.01	-1.70	-1.06	
8,410.0	88.30	271.00	5,724.1	-434.0	-2,827.3	2,858.1	1.43	-0.42	-1.37	
8,505.0	88.80	271.20	5,726.5	-432.2	-2,922.3	2,952.3	0.57	0.53	0.21	
8,600.0	90.90	273.90	5,726.7	-428.0	-3,017.2	3,046.1	3.60	2.21	2.84	
8,695.0	89.00	270.20	5,726.8	-424.6	-3,112.1	3,140.0	4.38	-2.00	-3.89	
8,789.0	90.10	269.50	5,727.5	-424.8	-3,206.1	3,233.5	1.39	1.17	-0.74	
8,883.0	90.80	269.10	5,726.8	-426.0	-3,300.1	3,327.0	0.86	0.74	-0.43	
8,978.0	88.60	267.70	5,727.3	-428.6	-3,395.0	3,421.7	2.74	-2.32	-1.47	
9,073.0	88.90	266.10	5,729.4	-433.8	-3,489.9	3,516.5	1.71	0.32	-1.68	
9,167.0	89.40	266.10	5,730.8	-440.2	-3,583.6	3,610.4	0.53	0.53	0.00	
9,262.0	87.20	267.00	5,733.6	-445.9	-3,678.4	3,705.2	2.50	-2.32	0.95	
9,356.0	87.80	267.90	5,737.7	-450.1	-3,772.2	3,798.9	1.15	0.64	0.96	
9,451.0	88.20	267.70	5,741.0	-453.7	-3,867.1	3,893.6	0.47	0.42	-0.21	
9,545.0	88.30	268.20	5,743.9	-457.1	-3,961.0	3,987.3	0.54	0.11	0.53	

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Well:	Rohn State LD09-64-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,623.0	88.40	268.40	5,746.1	-459.4	-4,038.9	4,065.0	0.29	0.13	0.26
TD @ 9687' MD / 5747.9' TVD									
9,687.0	88.40	268.40	5,747.9	-461.2	-4,102.9	4,128.7	0.00	0.00	0.00

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,255.1	1,255.1	-1.9	4.4	TIE IN @ 1255' MD / 1255' TVD
5,645.8	5,512.2	-401.5	-108.6	CROSSED HARDLINE @ 5645.8' MD / 5512.2' TVD
9,687.0	5,747.9	-461.2	-4,102.9	TD @ 9687' MD / 5747.9' TVD

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy INC.
Company

RM-13846
Job Number

11/7/13
Date

Sec9, T9N, R58W
Lease

Rohn State LD 09-64-1HN
Well Name

Weld, OK
County & State

API: 05-123-37622

Surveyed from a depth of: 1255.1 feet to 9687 feet MD

Type of Survey: MWD

Directional Supervisor/Surveyor: Bob Kubistek

The data and calculations for this survey have been checked by me and conform to the standards and procedures set forth by **The Directional Drilling Company (DDC)**. This report represents a true and correct Directional survey of this well based on the original data obtained at the well site. Wellbore Coordinates are calculated using minimum curvature.

Digitally signed by Larry Wright
DN: cn=Larry Wright, o=The
Directional Drilling Company,
ou=GM of Guidance Services,
email=larryw@directionaldrillers.c
om, c=US
Date: 2013.11.11 15:53:16 -06'00'

Larry Wright
MWD General Manager



Rohn State LD09-64-1HN
Weld County, CO
Q130803 & RM-13846
Design #1

WELL DETAILS:			Rohn State LD09-64-1HN	
+NI-S	+E/W	Ground Level:	4716.0	
0.0	0.0	Northing	3453970.11	
0.0	0.0	Easting	40° 45' 51.156 N	

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PPBHL Rohn State LD09-64-1HNS739.2		-472.7	-4102.9	1524966.93	3445717.21	40° 45' 47.231 N	103° 52' 35.364 W

- plan hits target center

Rohn State LD09-64-1HN

Ground Level:		4716.0		Latitude		Longitude	
+N/-S	+E/-W	Northing	Easting				
0.0	0.0	1525429.63	3453920.11	40° 45' 51.156 N		103° 51' 41.940 W	

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	V-Sect	Departure	Annotation
2255.1	0.20	266.40	1255.1	-1.9	-4.2	9.2		TIE IN @ 1255' MD / 1255' TVD
5645.8	49.33	260.50	5612.2	-401.5	-198.6	152.8	774.2	CROSSED HARDLINE @ 5645.8' MD / 5512.2' TVD
5687.0	88.40	268.40	5747.9	-461.2	-4102.9	4128.7	4773.8	TD @ 5687' MD / 5747.9' TVD

Correction: 7.03°
Magnetic Field
Strength: 53175.4nT
Dip Angle: 67.41°
Date: 9/17/2013
Model: IGRF2010

