

Noble Energy Inc.

Weld County, CO

Sec 23, T6N, R65W 6th PM

Reliance E23-69-1HN

Wellbore #1

Design: Wellbore #1 FINAL

DDC Survey Report

10 March, 2015

05-123-38141



HP

Survey Report



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Reliance E23-69-1HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4763.0usft (H&P #326)
Site:	Sec 23, T6N, R65W 6th PM	MD Reference:	WELL @ 4763.0usft (H&P #326)
Well:	Reliance E23-69-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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 23, T6N, R65W 6th PM				
Site Position:		Northing:	1,417,199.77 usft	Latitude:	40° 28' 31.476 N
From:	Lat/Long	Easting:	3,240,005.40 usft	Longitude:	104° 38' 14.208 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.56 °

Well	Reliance E23-69-1HN					
Well Position	+N/-S	0.0 usft	Northing:	1,417,174.26 usft	Latitude:	40° 28' 31.224 N
	+E/-W	0.0 usft	Easting:	3,240,005.64 usft	Longitude:	104° 38' 14.208 W
Position Uncertainty	0.0 usft		Wellhead Elevation:	0.0 usft	Ground Level:	4,733.0 usft

Wellbore	Wellbore #1				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2/2/2015	8.31	67.01	52,801

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	77.15

Survey Program		Date	3/10/2015		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
307.0	650.0	Surface (Wellbore #1)	MWD default	MWD - Standard	
835.0	7,307.0	MWD Survey - Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
7,383.0	11,567.0	MWD Survey - Lateral (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
307.0	0.40	340.15	307.0	1.0	-0.4	-0.1	0.13	0.13	0.00
TIE IN @ 650' MD / 650' TVD / END OF SUR HOLE / BEGIN IN HOLE									
650.0	0.70	354.15	650.0	4.2	-1.0	0.0	0.10	0.09	4.08
835.0	0.62	290.93	835.0	5.7	-2.0	-0.7	0.38	-0.04	-34.17
927.0	0.97	287.24	927.0	6.1	-3.2	-1.8	0.38	0.38	-4.01
1,022.0	0.88	279.16	1,022.0	6.5	-4.7	-3.2	0.17	-0.09	-8.51
1,115.0	0.88	284.96	1,114.9	6.8	-6.1	-4.5	0.10	0.00	6.24
1,207.0	0.97	280.56	1,206.9	7.1	-7.6	-5.8	0.12	0.10	-4.78

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Well:	Reliance E23-69-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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)
1,309.0	1.06	282.67	1,308.9	7.5	-9.3	-7.5	0.10	0.09	2.07
1,402.0	0.88	256.30	1,401.9	7.5	-10.9	-8.9	0.51	-0.19	-28.35
1,494.0	0.88	253.84	1,493.9	7.1	-12.2	-10.4	0.04	0.00	-2.67
1,589.0	2.99	308.16	1,588.8	8.4	-14.9	-12.6	2.71	2.22	57.18
1,682.0	6.77	325.39	1,681.5	14.4	-19.9	-16.2	4.31	4.06	18.53
1,774.0	6.42	319.41	1,772.9	22.8	-26.3	-20.6	0.84	-0.38	-6.50
1,868.0	6.16	314.84	1,866.3	30.4	-33.3	-25.7	0.60	-0.28	-4.86
1,960.0	5.36	313.26	1,957.8	36.8	-40.0	-30.8	0.89	-0.87	-1.72
2,053.0	7.47	326.28	2,050.3	44.8	-46.5	-35.4	2.74	2.27	14.00
2,146.0	10.02	320.99	2,142.2	56.1	-54.9	-41.1	2.87	2.74	-5.69
2,239.0	9.85	315.02	2,233.8	68.0	-65.7	-48.9	1.12	-0.18	-6.42
2,332.0	9.50	315.89	2,325.5	79.2	-76.6	-57.1	0.41	-0.38	0.94
2,424.0	11.26	323.98	2,416.0	91.9	-87.2	-64.6	2.48	1.91	8.79
2,515.0	11.08	320.64	2,505.2	105.8	-98.0	-72.0	0.74	-0.20	-3.67
2,607.0	10.46	320.82	2,595.6	119.1	-108.8	-79.6	0.67	-0.67	0.20
2,699.0	10.20	319.41	2,686.1	131.8	-119.4	-87.1	0.39	-0.28	-1.53
2,791.0	10.20	318.00	2,776.7	144.0	-130.2	-94.9	0.27	0.00	-1.53
2,883.0	10.20	317.30	2,867.2	156.1	-141.1	-102.9	0.13	0.00	-0.76
2,978.0	9.50	316.42	2,960.8	167.9	-152.2	-111.1	0.75	-0.74	-0.93
3,073.0	9.06	317.30	3,054.6	179.1	-162.7	-118.8	0.49	-0.46	0.93
3,167.0	12.31	320.29	3,146.9	192.3	-174.1	-127.0	3.51	3.46	3.18
3,261.0	11.34	318.71	3,238.9	206.9	-186.6	-136.0	1.09	-1.03	-1.68
3,355.0	9.50	316.95	3,331.4	219.5	-198.0	-144.3	1.99	-1.96	-1.87
3,450.0	8.18	314.31	3,425.2	230.0	-208.2	-151.9	1.45	-1.39	-2.78
3,544.0	10.46	310.27	3,518.0	240.2	-219.5	-160.6	2.52	2.43	-4.30
3,639.0	9.15	305.70	3,611.6	250.2	-232.2	-170.8	1.60	-1.38	-4.81
3,733.0	12.13	310.80	3,704.0	261.0	-245.8	-181.6	3.32	3.17	5.43
3,828.0	12.75	310.09	3,796.8	274.2	-261.4	-193.8	0.67	0.65	-0.75
3,922.0	12.13	313.79	3,888.6	287.8	-276.4	-205.5	1.07	-0.66	3.94
4,016.0	12.31	313.61	3,980.4	301.5	-290.8	-216.5	0.20	0.19	-0.19
4,110.0	10.02	326.09	4,072.6	315.2	-302.6	-225.0	3.53	-2.44	13.28
CROSSED 460' HARD LINE @ 4130' MD / 4093' TVD									
4,130.3	9.81	325.99	4,092.6	318.1	-304.6	-226.2	1.01	-1.01	-0.52
4,205.0	9.06	325.56	4,166.3	328.2	-311.5	-230.7	1.01	-1.01	-0.57
4,299.0	8.18	324.68	4,259.3	339.8	-319.5	-236.0	0.95	-0.94	-0.94
4,394.0	10.73	322.57	4,353.0	352.3	-328.8	-242.2	2.71	2.68	-2.22
4,489.0	10.29	320.64	4,446.4	365.9	-339.6	-249.7	0.59	-0.46	-2.03
4,583.0	9.85	318.71	4,538.9	378.5	-350.2	-257.3	0.59	-0.47	-2.05
4,678.0	8.62	322.05	4,632.7	390.2	-359.9	-264.2	1.41	-1.29	3.52
4,772.0	8.88	319.06	4,725.6	401.2	-369.0	-270.6	0.56	0.28	-3.18
4,867.0	12.40	315.02	4,819.0	414.0	-381.0	-279.4	3.79	3.71	-4.25
4,961.0	10.02	314.31	4,911.2	426.8	-394.0	-289.2	2.54	-2.53	-0.76
5,055.0	9.23	316.42	5,003.8	438.0	-405.1	-297.5	0.92	-0.84	2.24

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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)
5,149.0	10.55	313.26	5,096.4	449.3	-416.5	-306.2	1.52	1.40	-3.36
5,244.0	8.44	314.66	5,190.1	460.2	-427.8	-314.8	2.23	-2.22	1.47
5,338.0	9.94	320.64	5,282.9	471.3	-437.9	-322.1	1.89	1.60	6.36
5,433.0	8.62	318.36	5,376.7	483.0	-447.8	-329.2	1.44	-1.39	-2.40
5,528.0	11.52	323.63	5,470.2	496.0	-458.2	-336.4	3.20	3.05	5.55
5,622.0	9.41	325.21	5,562.6	509.8	-468.1	-343.0	2.27	-2.24	1.68
5,717.0	6.95	323.45	5,656.7	520.8	-476.0	-348.2	2.60	-2.59	-1.85
5,811.0	9.41	315.72	5,749.7	530.9	-484.7	-354.5	2.86	2.62	-8.22
5,906.0	9.94	316.25	5,843.4	542.4	-495.8	-362.8	0.57	0.56	0.56
6,000.0	8.00	315.89	5,936.2	552.9	-506.0	-370.4	2.06	-2.06	-0.38
6,095.0	11.26	316.07	6,029.8	564.4	-517.0	-378.6	3.43	3.43	0.19
6,189.0	8.97	322.22	6,122.4	576.8	-527.9	-386.4	2.69	-2.44	6.54
6,284.0	11.61	347.36	6,215.9	592.0	-534.5	-389.5	5.42	2.78	26.46
6,378.0	26.82	14.08	6,304.5	622.0	-531.4	-379.8	18.30	16.18	28.43
6,473.0	37.02	38.16	6,385.4	665.5	-508.4	-347.6	17.00	10.74	25.35
6,567.0	35.53	46.77	6,461.2	706.5	-471.0	-302.0	5.64	-1.59	9.16
6,662.0	33.59	69.27	6,539.8	734.9	-426.1	-252.0	13.53	-2.04	23.68
6,757.0	36.23	85.09	6,617.8	746.6	-373.4	-198.0	9.90	2.78	16.65
CROSSED 460' HARD LINE @ 6850' MD / 6690' TVD									
6,849.5	41.59	83.88	6,689.8	752.2	-315.6	-140.4	5.86	5.80	-1.31
6,851.0	41.68	83.86	6,690.9	752.3	-314.6	-139.4	5.86	5.80	-1.17
6,945.0	48.19	81.58	6,757.4	760.8	-248.8	-73.4	7.13	6.93	-2.43
7,040.0	58.04	79.64	6,814.4	773.3	-174.0	2.4	10.50	10.37	-2.04
7,135.0	73.95	77.89	6,852.9	790.2	-89.1	88.8	16.83	16.75	-1.84
7,229.0	79.23	75.43	6,874.7	811.3	-0.2	180.2	6.17	5.62	-2.62
7,307.0	82.13	76.48	6,887.3	830.0	74.4	257.2	3.95	3.72	1.35
CROSSED 460' HARDLINE @ 7311' MD / 6888' TVD									
7,311.4	82.18	76.60	6,887.9	831.0	78.7	261.5	2.99	1.15	2.78
7" CASING POINT @ 7365' MD / 6895' TVD / END OF INT HOLE / BEGIN LATERAL									
7,365.0	82.80	78.09	6,894.9	842.6	130.5	314.7	2.99	1.16	2.78
7,383.0	83.01	78.59	6,897.2	846.2	148.0	332.5	2.99	1.16	2.77
7,477.0	83.62	83.16	6,908.1	861.0	240.2	425.7	4.87	0.65	4.86
7,572.0	86.53	84.74	6,916.3	871.0	334.3	519.6	3.48	3.06	1.66
7,666.0	89.87	85.09	6,919.2	879.3	427.9	612.7	3.57	3.55	0.37
7,761.0	90.22	86.15	6,919.1	886.6	522.6	706.7	1.18	0.37	1.12
7,855.0	90.40	88.26	6,918.6	891.2	616.5	799.2	2.25	0.19	2.24
7,950.0	91.10	87.73	6,917.4	894.5	711.4	892.5	0.92	0.74	-0.56
8,044.0	91.28	86.50	6,915.4	899.2	805.3	985.1	1.32	0.19	-1.31
8,138.0	92.24	88.79	6,912.5	903.1	899.1	1,077.4	2.64	1.02	2.44
8,233.0	92.68	88.96	6,908.5	905.0	994.0	1,170.4	0.50	0.46	0.18
8,327.0	92.77	91.60	6,904.0	904.5	1,087.9	1,261.8	2.81	0.10	2.81
8,422.0	89.87	92.48	6,901.8	901.1	1,182.8	1,353.6	3.19	-3.05	0.93
8,517.0	90.22	92.48	6,901.7	897.0	1,277.7	1,445.2	0.37	0.37	0.00
8,611.0	90.75	92.30	6,900.9	893.1	1,371.6	1,535.9	0.60	0.56	-0.19

HP Survey Report



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Reliance E23-69-1HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4763.0usft (H&P #326)
Site:	Sec 23, T6N, R65W 6th PM	MD Reference:	WELL @ 4763.0usft (H&P #326)
Well:	Reliance E23-69-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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)	
8,706.0	88.37	92.12	6,901.7	889.4	1,466.5	1,627.6	2.51	-2.51	-0.19	
8,800.0	89.25	91.60	6,903.6	886.4	1,560.5	1,718.5	1.09	0.94	-0.55	
8,895.0	89.87	90.54	6,904.4	884.6	1,655.5	1,810.7	1.29	0.65	-1.12	
8,989.0	90.31	89.49	6,904.2	884.6	1,749.5	1,902.4	1.21	0.47	-1.12	
9,084.0	90.66	88.79	6,903.4	886.0	1,844.4	1,995.3	0.82	0.37	-0.74	
9,178.0	90.75	87.91	6,902.2	888.7	1,938.4	2,087.5	0.94	0.10	-0.94	
9,273.0	91.45	87.73	6,900.4	892.3	2,033.3	2,180.8	0.76	0.74	-0.19	
9,368.0	89.69	88.79	6,899.5	895.2	2,128.3	2,274.0	2.16	-1.85	1.12	
9,462.0	90.13	89.31	6,899.6	896.8	2,222.2	2,366.0	0.72	0.47	0.55	
9,557.0	90.57	89.66	6,899.0	897.6	2,317.2	2,458.8	0.59	0.46	0.37	
9,651.0	88.29	90.19	6,900.0	897.7	2,411.2	2,550.5	2.49	-2.43	0.56	
9,746.0	88.29	89.66	6,902.8	897.9	2,506.2	2,643.1	0.56	0.00	-0.56	
9,840.0	87.93	89.49	6,905.9	898.6	2,600.1	2,734.8	0.42	-0.38	-0.18	
9,935.0	90.48	87.91	6,907.2	900.7	2,695.1	2,827.9	3.16	2.68	-1.66	
10,030.0	88.81	86.32	6,907.8	905.5	2,789.9	2,921.5	2.43	-1.76	-1.67	
10,124.0	91.36	86.32	6,907.7	911.5	2,883.7	3,014.3	2.71	2.71	0.00	
10,219.0	91.80	85.62	6,905.1	918.2	2,978.5	3,108.1	0.87	0.46	-0.74	
10,313.0	92.33	85.27	6,901.7	925.7	3,072.1	3,201.0	0.68	0.56	-0.37	
10,408.0	90.04	86.15	6,899.7	932.8	3,166.8	3,295.0	2.58	-2.41	0.93	
10,503.0	90.75	85.62	6,899.1	939.6	3,261.6	3,388.9	0.93	0.75	-0.56	
10,597.0	90.84	84.74	6,897.7	947.5	3,355.2	3,481.9	0.94	0.10	-0.94	
10,692.0	91.80	83.69	6,895.6	957.1	3,449.7	3,576.2	1.50	1.01	-1.11	
10,786.0	91.89	82.81	6,892.5	968.1	3,543.0	3,669.6	0.94	0.10	-0.94	
10,881.0	90.92	85.97	6,890.2	977.4	3,637.5	3,763.8	3.48	-1.02	3.33	
10,975.0	90.40	85.80	6,889.1	984.1	3,731.3	3,856.7	0.58	-0.55	-0.18	
11,070.0	90.92	84.74	6,888.0	992.0	3,825.9	3,950.7	1.24	0.55	-1.12	
11,164.0	89.78	85.97	6,887.5	999.6	3,919.6	4,043.8	1.78	-1.21	1.31	
11,259.0	90.84	88.61	6,886.9	1,004.1	4,014.5	4,137.3	2.99	1.12	2.78	
11,353.0	91.89	88.08	6,884.7	1,006.8	4,108.4	4,229.5	1.25	1.12	-0.56	
11,448.0	89.69	89.14	6,883.4	1,009.1	4,203.4	4,322.5	2.57	-2.32	1.12	
11,505.0	89.87	88.79	6,883.6	1,010.1	4,260.4	4,378.3	0.69	0.32	-0.61	
TD @ 11567' MD / 6884' TVD										
11,567.0	89.87	88.79	6,883.7	1,011.4	4,322.4	4,439.1	0.00	0.00	0.00	

HP
Survey Report



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Reliance E23-69-1HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4763.0usft (H&P #326)
Site:	Sec 23, T6N, R65W 6th PM	MD Reference:	WELL @ 4763.0usft (H&P #326)
Well:	Reliance E23-69-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
650.0	650.0	4.2	-1.0	TIE IN @ 650' MD / 650' TVD / END OF SUR HOLE / BEGIN IN HOLE
4,130.3	4,092.6	318.1	-304.6	CROSSED 460' HARD LINE @ 4130' MD / 4093' TVD
6,849.5	6,689.8	752.2	-315.6	CROSSED 460' HARD LINE @ 6850' MD / 6690' TVD
7,311.4	6,887.9	831.0	78.7	CROOSED 460' HARDLINE @ 7311' MD / 6888' TVD
7,365.0	6,894.9	842.6	130.5	7" CASING POINT @ 7365' MD / 6895' TVD / END OF INT HOLE / BEI
11,567.0	6,883.7	1,011.4	4,322.4	TD @ 11567' MD / 6884' TVD

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy Inc
Company

RM-150117
Job Number

2/17/15
Date

Sec23,T6N,R65W,6TH PM
Lease

Reliance E23-69-1HN
Well Name

Weld, CO
County & State

API: 05-123-38141

Surveyed from a depth of: 650' to 7307' MD (DDC Certified Survey Data
7307' to 11567' MD (DDC Certified Survey Data

Type of Survey: MWD

Directional Supervisor/Surveyor: Chris Abbott

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.

Bryon Reed
MWD General Manager

Bryon Reed

Digitally signed by Bryon Reed
DN: cn=Bryon Reed, o=DDC, ou,
email=Bryon.reed@directionaldrillers.com, c=US
Date: 2015.02.17 14:28:22 -06'00'

