

## **Noble Energy Inc.**

Weld County, CO

Sec 28, T9N, R59W, 6th PM

Brook LC28-77-1HNA

Wellbore #1

Design: Wellbore #1 **FINAL**

## **DDC Survey Report**

23 September, 2014



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Brook LC28-77-1HNA
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Well:</b>	Brook LC28-77-1HNA	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM Compass

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

<b>Site</b>	Sec 28, T9N, R59W, 6th PM		
<b>Site Position:</b>		<b>Northing:</b>	1,506,743.69 usft
<b>From:</b>	Map	<b>Easting:</b>	3,420,557.77 usft
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "
		<b>Latitude:</b>	40° 42' 52.295 N
		<b>Longitude:</b>	103° 58' 58.302 W
		<b>Grid Convergence:</b>	0.98 °

<b>Well</b>	Brook LC28-77-1HNA		
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b> 1,506,893.11 usft
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b> 3,419,418.92 usft
<b>Position Uncertainty</b>	0.0 usft	<b>Wellhead Elevation:</b>	0.0 usft
		<b>Latitude:</b>	40° 42' 53.964 N
		<b>Longitude:</b>	103° 59' 13.056 W
		<b>Ground Level:</b>	4,853.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	9/2/2014	8.03	67.31	53,034

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	0.64	

<b>Survey Program</b>	<b>Date</b>	9/23/2014			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
267.0	604.0	Surface Surveys (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
677.0	6,410.0	MWD Survey - Vert / Build (Wellbore #1)	MWD default	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
267.0	0.20	194.25	267.0	-0.5	-0.1	-0.5	0.07	0.07	0.00	
<b>TIE IN @ 604' MD / 604' TVD / END OF SURFACE HOLE / BEGIN INT HOLE</b>										
604.0	0.60	122.55	604.0	-2.0	1.2	-2.0	0.17	0.12	-21.28	
677.0	0.44	21.11	677.0	-1.9	1.7	-1.9	1.11	-0.22	-138.96	
739.0	0.53	22.69	739.0	-1.4	1.8	-1.4	0.15	0.15	2.55	
833.0	0.70	357.73	833.0	-0.5	2.0	-0.4	0.33	0.18	-26.55	
926.0	0.70	14.78	926.0	0.7	2.1	0.7	0.22	0.00	18.33	
1,018.0	0.53	14.43	1,018.0	1.6	2.4	1.6	0.18	-0.18	-0.38	
1,110.0	0.53	337.17	1,110.0	2.4	2.3	2.4	0.37	0.00	-40.50	



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Brook LC28-77-1HNA
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Well:</b>	Brook LC28-77-1HNA	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 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)
1,202.0	0.44	333.65	1,202.0	3.1	2.0	3.2	0.10	-0.10	-3.83
1,248.0	0.26	307.64	1,248.0	3.4	1.8	3.4	0.51	-0.39	-56.54
1,310.0	0.35	289.71	1,310.0	3.5	1.5	3.5	0.21	0.15	-28.92
1,402.0	0.44	279.34	1,402.0	3.7	0.9	3.7	0.12	0.10	-11.27
1,495.0	0.62	282.67	1,495.0	3.8	0.1	3.8	0.20	0.19	3.58
1,589.0	0.79	293.75	1,588.9	4.2	-1.0	4.2	0.23	0.18	11.79
1,682.0	0.97	281.97	1,681.9	4.6	-2.4	4.6	0.27	0.19	-12.67
1,774.0	0.70	269.67	1,773.9	4.8	-3.7	4.7	0.35	-0.29	-13.37
1,866.0	2.73	178.09	1,865.9	2.6	-4.2	2.5	3.08	2.21	-99.54
1,958.0	4.66	162.44	1,957.7	-3.2	-3.0	-3.2	2.35	2.10	-17.01
2,051.0	6.86	156.11	2,050.2	-11.9	0.4	-11.8	2.46	2.37	-6.81
2,143.0	9.76	147.85	2,141.3	-23.5	6.8	-23.4	3.40	3.15	-8.98
2,236.0	9.23	147.50	2,233.0	-36.4	15.0	-36.3	0.57	-0.57	-0.38
2,329.0	9.15	146.62	2,324.8	-48.9	23.1	-48.6	0.17	-0.09	-0.95
2,421.0	11.26	143.63	2,415.3	-62.3	32.4	-61.9	2.36	2.29	-3.25
2,512.0	12.13	150.14	2,504.4	-77.7	42.4	-77.2	1.74	0.96	7.15
2,606.0	12.05	148.91	2,596.4	-94.7	52.4	-94.1	0.29	-0.09	-1.31
2,699.0	11.78	158.05	2,687.4	-111.8	61.0	-111.1	2.05	-0.29	9.83
2,791.0	11.87	156.64	2,777.4	-129.2	68.3	-128.4	0.33	0.10	-1.53
2,883.0	12.13	155.59	2,867.4	-146.7	76.0	-145.8	0.37	0.28	-1.14
2,978.0	11.87	155.23	2,960.3	-164.6	84.2	-163.7	0.28	-0.27	-0.38
3,072.0	9.41	145.04	3,052.7	-179.7	92.7	-178.7	3.29	-2.62	-10.84
3,166.0	6.77	141.00	3,145.8	-190.3	100.6	-189.2	2.87	-2.81	-4.30
3,261.0	6.60	140.47	3,240.1	-198.9	107.6	-197.7	0.19	-0.18	-0.56
3,355.0	5.63	153.83	3,333.6	-207.2	113.0	-205.9	1.83	-1.03	14.21
3,450.0	5.72	154.53	3,428.1	-215.6	117.1	-214.3	0.12	0.09	0.74
3,544.0	6.16	154.35	3,521.6	-224.4	121.3	-223.0	0.47	0.47	-0.19
3,639.0	6.60	153.83	3,616.0	-233.9	125.9	-232.5	0.47	0.46	-0.55
3,733.0	3.96	154.35	3,709.6	-241.7	129.7	-240.2	2.81	-2.81	0.55
3,828.0	2.55	176.15	3,804.5	-246.8	131.3	-245.3	1.95	-1.48	22.95
3,922.0	0.09	109.88	3,898.4	-248.9	131.5	-247.4	2.68	-2.62	-70.50
4,016.0	0.79	110.06	3,992.4	-249.1	132.2	-247.6	0.74	0.74	0.19
4,111.0	1.23	107.95	4,087.4	-249.7	133.8	-248.1	0.46	0.46	-2.22
4,206.0	1.58	109.53	4,182.4	-250.4	136.0	-248.9	0.37	0.37	1.66
4,300.0	1.76	110.76	4,276.3	-251.3	138.5	-249.8	0.20	0.19	1.31
4,394.0	1.76	108.12	4,370.3	-252.3	141.3	-250.7	0.09	0.00	-2.81
4,489.0	2.11	104.08	4,465.2	-253.2	144.3	-251.6	0.40	0.37	-4.25
4,583.0	1.76	114.80	4,559.2	-254.2	147.3	-252.6	0.53	-0.37	11.40
4,677.0	1.06	102.50	4,653.2	-255.0	149.5	-253.3	0.81	-0.74	-13.09
4,772.0	0.62	63.65	4,748.2	-255.0	150.8	-253.3	0.73	-0.46	-40.89
4,866.0	0.79	53.28	4,842.1	-254.4	151.8	-252.6	0.23	0.18	-11.03
4,960.0	0.70	86.33	4,936.1	-253.9	152.9	-252.2	0.46	-0.10	35.16
5,055.0	0.44	128.16	5,031.1	-254.1	153.7	-252.4	0.50	-0.27	44.03

Company: Noble Energy Inc.

Project: Weld County, CO

Site: Sec 28, T9N, R59W, 6th PM

Well: Brook LC28-77-1HNA

Wellbore: Wellbore #1

Design: Wellbore #1

Local Co-ordinate Reference:

TVD Reference:

MD Reference:

North Reference:

Survey Calculation Method:

Database:

Well Brook LC28-77-1HNA

WELL @ 4883.0usft (H&amp;P #326)

WELL @ 4883.0usft (H&amp;P #326)

Grid

Minimum Curvature

EDM 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	0.53	148.73	5,125.1	-254.7	154.3	-253.0	0.21	0.10	21.88
5,244.0	0.44	133.09	5,220.1	-255.3	154.7	-253.6	0.17	-0.09	-16.46
5,339.0	0.26	326.44	5,315.1	-255.4	154.9	-253.7	0.73	-0.19	-175.42
5,433.0	8.97	350.00	5,408.7	-248.0	153.5	-246.3	9.29	9.27	25.06
5,528.0	19.52	356.15	5,500.7	-224.8	151.1	-223.1	11.20	11.11	6.47
5,622.0	25.76	357.73	5,587.4	-188.7	149.3	-187.0	6.67	6.64	1.68
5,717.0	37.81	357.21	5,668.0	-138.8	147.0	-137.1	12.69	12.68	-0.55
5,812.0	46.08	357.21	5,738.6	-75.4	143.9	-73.8	8.71	8.71	0.00
5,906.0	50.65	357.21	5,801.0	-5.3	140.5	-3.7	4.86	4.86	0.00
6,001.0	53.02	357.21	5,859.7	69.3	136.9	70.9	2.49	2.49	0.00
6,095.0	59.00	0.55	5,912.3	147.2	135.4	148.7	7.01	6.36	3.55
6,190.0	65.77	3.53	5,956.3	231.3	138.5	232.8	7.65	7.13	3.14
OH CROSSED 600' HARDLINE @ 6226.1' MD / 5970.6' TVD									
6,226.1	67.64	3.12	5,970.6	264.4	140.4	265.9	5.29	5.19	-1.13
6,285.0	70.70	2.48	5,991.5	319.3	143.1	320.9	5.29	5.19	-1.09
6,367.0	82.90	357.91	6,010.2	399.0	143.3	400.6	15.83	14.88	-5.57
TD OH @ 6410' MD / 6014.4' TVD									
6,410.0	86.00	356.00	6,014.4	441.7	141.0	443.3	8.46	7.21	-4.44

## Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
604.0	604.0	-2.0	1.2	TIE IN @ 604' MD / 604' TVD / END OF SURFACE HOLE / BEGIN INT HOLE
6,226.1	5,970.6	264.4	140.4	OH CROSSED 600' HARDLINE @ 6226.1' MD / 5970.6' TVD
6,410.0	6,014.4	441.7	141.0	TD OH @ 6410' MD / 6014.4' TVD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_



## **Noble Energy Inc.**

Weld County, CO

Sec 28, T9N, R59W, 6th PM

Brook LC28-77-1HNA

Sidetrack #1

Design: Sidetrack #1

## **DDC Survey Report**

23 September, 2014





<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Brook LC28-77-1HNA
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Well:</b>	Brook LC28-77-1HNA	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sidetrack #1	<b>Database:</b>	EDM 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 28, T9N, R59W, 6th PM			
Site Position:		Northing:	1,506,743.69 usft	Latitude:	40° 42' 52.295 N
From:	Map	Easting:	3,420,557.77 usft	Longitude:	103° 58' 58.302 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.98 °

Well	Brook LC28-77-1HNA					
Well Position	+N/-S	0.0 usft	Northing:	1,506,893.11 usft	Latitude:	40° 42' 53.964 N
	+E/-W	0.0 usft	Easting:	3,419,418.92 usft	Longitude:	103° 59' 13.056 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,853.0 usft

Wellbore	Sidetrack #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/5/2014	8.03	67.31	53,034

Design		Sidetrack #1			
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	4,960.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	0.64	

Survey Program		Date	9/23/2014	
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
267.0	604.0	Surface Surveys (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool
677.0	4,960.0	MWD Survey - Vert / Build (Wellbore #1)	MWD default	MWD - Standard
5,056.0	10,411.0	MWD SURVEY - VERT/BUILD LAT	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
267.0	0.20	194.25	267.0	-0.5	-0.1	-0.5	0.07	0.07	0.00
604.0	0.60	122.55	604.0	-2.0	1.2	-2.0	0.17	0.12	-21.28
677.0	0.44	21.11	677.0	-1.9	1.7	-1.9	1.11	-0.22	-138.96
739.0	0.53	22.69	739.0	-1.4	1.8	-1.4	0.15	0.15	2.55
833.0	0.70	357.73	833.0	-0.5	2.0	-0.4	0.33	0.18	-26.55
926.0	0.70	14.78	926.0	0.7	2.1	0.7	0.22	0.00	18.33
1,018.0	0.53	14.43	1,018.0	1.6	2.4	1.6	0.18	-0.18	-0.38
1,110.0	0.53	337.17	1,110.0	2.4	2.3	2.4	0.37	0.00	-40.50

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<b>Wellbore:</b>	Sidetrack #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sidetrack #1	<b>Database:</b>	EDM Compass

Survey										
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1,310.0	0.35	289.71	1,310.0	3.5	1.5	3.5	0.21	0.15	-28.92	
1,402.0	0.44	279.34	1,402.0	3.7	0.9	3.7	0.12	0.10	-11.27	
1,495.0	0.62	282.67	1,495.0	3.8	0.1	3.8	0.20	0.19	3.58	
1,589.0	0.79	293.75	1,588.9	4.2	-1.0	4.2	0.23	0.18	11.79	
1,682.0	0.97	281.97	1,681.9	4.6	-2.4	4.6	0.27	0.19	-12.67	
1,774.0	0.70	269.67	1,773.9	4.8	-3.7	4.7	0.35	-0.29	-13.37	
1,866.0	2.73	178.09	1,865.9	2.6	-4.2	2.5	3.08	2.21	-99.54	
1,958.0	4.66	162.44	1,957.7	-3.2	-3.0	-3.2	2.35	2.10	-17.01	
2,051.0	6.86	156.11	2,050.2	-11.9	0.4	-11.8	2.46	2.37	-6.81	
2,143.0	9.76	147.85	2,141.3	-23.5	6.8	-23.4	3.40	3.15	-8.98	
2,236.0	9.23	147.50	2,233.0	-36.4	15.0	-36.3	0.57	-0.57	-0.38	
2,329.0	9.15	146.62	2,324.8	-48.9	23.1	-48.6	0.17	-0.09	-0.95	
2,421.0	11.26	143.63	2,415.3	-62.3	32.4	-61.9	2.36	2.29	-3.25	
2,512.0	12.13	150.14	2,504.4	-77.7	42.4	-77.2	1.74	0.96	7.15	
2,606.0	12.05	148.91	2,596.4	-94.7	52.4	-94.1	0.29	-0.09	-1.31	
2,699.0	11.78	158.05	2,687.4	-111.8	61.0	-111.1	2.05	-0.29	9.83	
2,791.0	11.87	156.64	2,777.4	-129.2	68.3	-128.4	0.33	0.10	-1.53	
2,883.0	12.13	155.59	2,867.4	-146.7	76.0	-145.8	0.37	0.28	-1.14	
2,978.0	11.87	155.23	2,960.3	-164.6	84.2	-163.7	0.28	-0.27	-0.38	
3,072.0	9.41	145.04	3,052.7	-179.7	92.7	-178.7	3.29	-2.62	-10.84	
3,166.0	6.77	141.00	3,145.8	-190.3	100.6	-189.2	2.87	-2.81	-4.30	
3,261.0	6.60	140.47	3,240.1	-198.9	107.6	-197.7	0.19	-0.18	-0.56	
3,355.0	5.63	153.83	3,333.6	-207.2	113.0	-205.9	1.83	-1.03	14.21	
3,450.0	5.72	154.53	3,428.1	-215.6	117.1	-214.3	0.12	0.09	0.74	
3,544.0	6.16	154.35	3,521.6	-224.4	121.3	-223.0	0.47	0.47	-0.19	
3,639.0	6.60	153.83	3,616.0	-233.9	125.9	-232.5	0.47	0.46	-0.55	
3,733.0	3.96	154.35	3,709.6	-241.7	129.7	-240.2	2.81	-2.81	0.55	
3,828.0	2.55	176.15	3,804.5	-246.8	131.3	-245.3	1.95	-1.48	22.95	
3,922.0	0.09	109.88	3,898.4	-248.9	131.5	-247.4	2.68	-2.62	-70.50	
4,016.0	0.79	110.06	3,992.4	-249.1	132.2	-247.6	0.74	0.74	0.19	
4,111.0	1.23	107.95	4,087.4	-249.7	133.8	-248.1	0.46	0.46	-2.22	
4,206.0	1.58	109.53	4,182.4	-250.4	136.0	-248.9	0.37	0.37	1.66	
4,300.0	1.76	110.76	4,276.3	-251.3	138.5	-249.8	0.20	0.19	1.31	
4,394.0	1.76	108.12	4,370.3	-252.3	141.3	-250.7	0.09	0.00	-2.81	
4,489.0	2.11	104.08	4,465.2	-253.2	144.3	-251.6	0.40	0.37	-4.25	
4,583.0	1.76	114.80	4,559.2	-254.2	147.3	-252.6	0.53	-0.37	11.40	
4,677.0	1.06	102.50	4,653.2	-255.0	149.5	-253.3	0.81	-0.74	-13.09	
4,772.0	0.62	63.65	4,748.2	-255.0	150.8	-253.3	0.73	-0.46	-40.89	
4,866.0	0.79	53.28	4,842.1	-254.4	151.8	-252.6	0.23	0.18	-11.03	
TIE INTO OH @ 4960' MD / 4936.1' TVD										
4,960.0	0.70	86.33	4,936.1	-253.9	152.9	-252.2	0.46	-0.10	35.16	



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Brook LC28-77-1HNA
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Well:</b>	Brook LC28-77-1HNA	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sidetrack #1	<b>Database:</b>	EDM 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)
5,056.0	0.53	119.20	5,032.1	-254.1	153.8	-252.4	0.40	-0.18	34.24
5,150.0	0.53	137.48	5,126.1	-254.6	154.5	-252.9	0.18	0.00	19.45
5,245.0	0.53	141.70	5,221.1	-255.3	155.1	-253.6	0.04	0.00	4.44
5,340.0	1.49	159.45	5,316.1	-256.8	155.8	-255.1	1.05	1.01	18.68
5,434.0	7.30	276.35	5,409.9	-257.3	150.3	-255.6	8.60	6.18	124.36
5,529.0	13.19	290.23	5,503.3	-252.9	134.1	-251.4	6.68	6.20	14.61
5,623.0	19.87	298.67	5,593.4	-241.5	110.0	-240.2	7.53	7.11	8.98
5,718.0	22.60	325.92	5,682.2	-218.6	85.5	-217.6	10.68	2.87	28.68
5,813.0	30.07	347.54	5,767.4	-180.1	70.1	-179.3	12.68	7.86	22.76
5,907.0	39.66	0.02	5,844.6	-126.9	65.0	-126.1	12.67	10.20	13.28
6,002.0	53.73	0.72	5,909.6	-57.9	65.5	-57.2	14.82	14.81	0.74
6,096.0	63.93	359.14	5,958.2	22.4	65.4	23.1	10.95	10.85	-1.68
6,191.0	73.78	1.95	5,992.4	110.9	66.3	111.6	10.73	10.37	2.96
6,286.0	85.38	1.07	6,009.5	204.1	68.7	204.9	12.24	12.21	-0.93
<b>ST1 CROSSED 600' HARDLINE @ 6344.9' MD / 6014.6' TVD</b>									
6,344.9	84.78	0.13	6,014.6	262.8	69.3	263.5	1.89	-1.03	-1.60
6,363.0	84.59	359.84	6,016.3	280.8	69.3	281.6	1.89	-1.02	-1.60
<b>7" CASING POINT @ 6410' MD / 6020.4' TVD / END OF INT HOLE / BEGIN LATERAL</b>									
6,410.0	85.43	359.95	6,020.4	327.6	69.2	328.4	1.80	1.78	0.24
6,437.0	85.91	0.02	6,022.4	354.6	69.2	355.3	1.80	1.78	0.24
6,529.0	88.55	0.19	6,026.8	446.4	69.4	447.2	2.88	2.87	0.18
6,622.0	87.49	359.84	6,030.1	539.4	69.4	540.1	1.20	-1.14	-0.38
6,716.0	90.22	0.19	6,031.9	633.4	69.5	634.1	2.93	2.90	0.37
6,811.0	91.01	0.19	6,030.9	728.4	69.8	729.1	0.83	0.83	0.00
6,906.0	90.92	359.14	6,029.3	823.3	69.2	824.1	1.11	-0.09	-1.11
7,000.0	89.69	357.03	6,028.8	917.3	66.1	918.0	2.60	-1.31	-2.24
7,095.0	90.13	0.55	6,029.0	1,012.2	64.1	1,012.9	3.73	0.46	3.71
7,189.0	89.60	0.19	6,029.2	1,106.2	64.7	1,106.9	0.68	-0.56	-0.38
7,284.0	91.36	3.53	6,028.4	1,201.2	67.8	1,201.8	3.97	1.85	3.52
7,378.0	91.10	2.66	6,026.4	1,295.0	72.8	1,295.7	0.97	-0.28	-0.93
7,473.0	91.80	1.95	6,024.0	1,389.9	76.6	1,390.7	1.05	0.74	-0.75
7,567.0	88.99	0.72	6,023.3	1,483.9	78.8	1,484.6	3.26	-2.99	-1.31
7,662.0	89.34	359.67	6,024.7	1,578.8	79.2	1,579.6	1.16	0.37	-1.11
7,757.0	91.45	0.02	6,024.1	1,673.8	78.9	1,674.6	2.25	2.22	0.37
7,851.0	90.75	358.79	6,022.2	1,767.8	77.9	1,768.6	1.51	-0.74	-1.31
7,945.0	91.01	358.44	6,020.8	1,861.8	75.7	1,862.5	0.46	0.28	-0.37
8,039.0	90.04	359.49	6,019.9	1,955.8	74.0	1,956.5	1.52	-1.03	1.12
8,134.0	89.52	0.37	6,020.3	2,050.7	73.8	2,051.4	1.08	-0.55	0.93
8,229.0	89.25	359.67	6,021.3	2,145.7	73.9	2,146.4	0.79	-0.28	-0.74
8,324.0	89.60	359.84	6,022.3	2,240.7	73.5	2,241.4	0.41	0.37	0.18
8,418.0	89.25	359.14	6,023.2	2,334.7	72.6	2,335.4	0.83	-0.37	-0.74
8,513.0	88.81	358.61	6,024.8	2,429.7	70.8	2,430.3	0.73	-0.46	-0.56
8,608.0	88.72	357.91	6,026.9	2,524.6	67.9	2,525.2	0.74	-0.09	-0.74
8,702.0	88.02	357.21	6,029.6	2,618.5	63.9	2,619.1	1.05	-0.74	-0.74



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Brook LC28-77-1HNA
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4883.0usft (H&P #326)
<b>Well:</b>	Brook LC28-77-1HNA	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sidetrack #1	<b>Database:</b>	EDM Compass

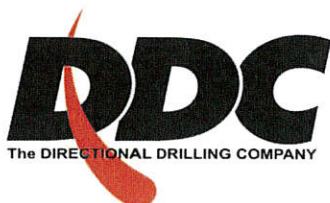
Survey

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)
8,796.0	86.70	357.03	6,033.9	2,712.3	59.2	2,712.8	1.42	-1.40	-0.19
8,891.0	89.78	357.38	6,036.8	2,807.1	54.5	2,807.5	3.26	3.24	0.37
8,986.0	91.54	359.67	6,035.7	2,902.1	52.1	2,902.5	3.04	1.85	2.41
9,081.0	92.15	358.96	6,032.6	2,997.0	51.0	2,997.4	0.99	0.64	-0.75
9,175.0	91.45	1.95	6,029.7	3,090.9	51.7	3,091.3	3.27	-0.74	3.18
9,270.0	90.92	3.53	6,027.7	3,185.8	56.2	3,186.2	1.75	-0.56	1.66
9,365.0	91.45	2.83	6,025.8	3,280.6	61.5	3,281.1	0.92	0.56	-0.74
9,459.0	89.52	4.41	6,025.0	3,374.5	67.4	3,375.0	2.65	-2.05	1.68
9,554.0	89.69	3.89	6,025.6	3,469.2	74.3	3,469.8	0.58	0.18	-0.55
9,648.0	89.69	2.83	6,026.1	3,563.0	79.8	3,563.7	1.13	0.00	-1.13
9,743.0	90.13	3.01	6,026.3	3,657.9	84.7	3,658.6	0.50	0.46	0.19
9,837.0	87.67	1.25	6,028.1	3,751.8	88.2	3,752.6	3.22	-2.62	-1.87
9,932.0	87.23	358.79	6,032.3	3,846.7	88.2	3,847.5	2.63	-0.46	-2.59
10,026.0	89.16	357.73	6,035.3	3,940.6	85.3	3,941.3	2.34	2.05	-1.13
10,121.0	89.16	356.85	6,036.7	4,035.5	80.9	4,036.2	0.93	0.00	-0.93
10,215.0	89.69	355.10	6,037.6	4,129.3	74.3	4,129.8	1.95	0.56	-1.86
10,310.0	91.71	352.81	6,036.4	4,223.7	64.3	4,224.2	3.21	2.13	-2.41
10,359.0	91.54	352.28	6,035.1	4,272.3	57.9	4,272.7	1.14	-0.35	-1.08
<b>TD ST1 @ 10411' MD / 6033.7' TVD</b>									
10,411.0	91.54	352.28	6,033.7	4,323.8	50.9	4,324.1	0.00	0.00	0.00

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,960.0	4,936.1	-253.9	152.9	TIE INTO OH @ 4960' MD / 4936.1' TVD
6,344.9	6,014.6	262.8	69.3	ST1 CROSSED 600' HARDLINE @ 6344.9' MD / 6014.6' TVD
6,410.0	6,020.4	327.6	69.2	7" CASING POINT @ 6410' MD / 6020.4' TVD / END OF INT HOLE / BEGIN L
10,411.0	6,033.7	4,323.8	50.9	TD ST1 @ 10411' MD / 6033.7' TVD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_



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## Survey Certification Sheet

Noble Energy Inc  
Company

RM-14898  
Job Number

11/3/14  
Date

Sec28,T9N,R59W,6<sup>TH</sup> PM  
Lease

Brook LC28-77-1HNA  
Well Name

Weld, CO  
County & State

API: 05-123-38856

Surveyed from a depth of: 604' to 6410' MD O.H  
4960' to 10411' MD ST#1

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.

Mike Baldwin  
Gulf Coast District Manager  
Mike Baldwin

Digitally signed by Mike Baldwin  
DN: cn=Mike Baldwin, o=Directional Drilling  
Company, ou,  
email=mike.baldwin@directionaldrillers.com, c=US  
Date: 2014.11.03 15:25:28 -0600



Company Name: Noble Energy Inc.  
 Brook LC28-77-1HNA  
 Weld County, CO  
 Rig: H&P #228  
 Created By: Jerry Arsenault  
 Date: 09/23/2014

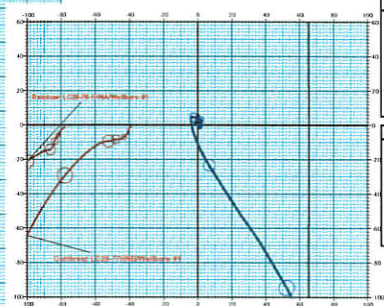
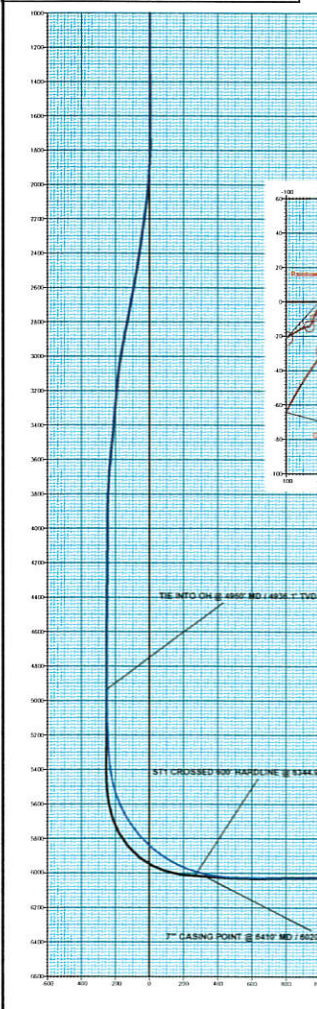
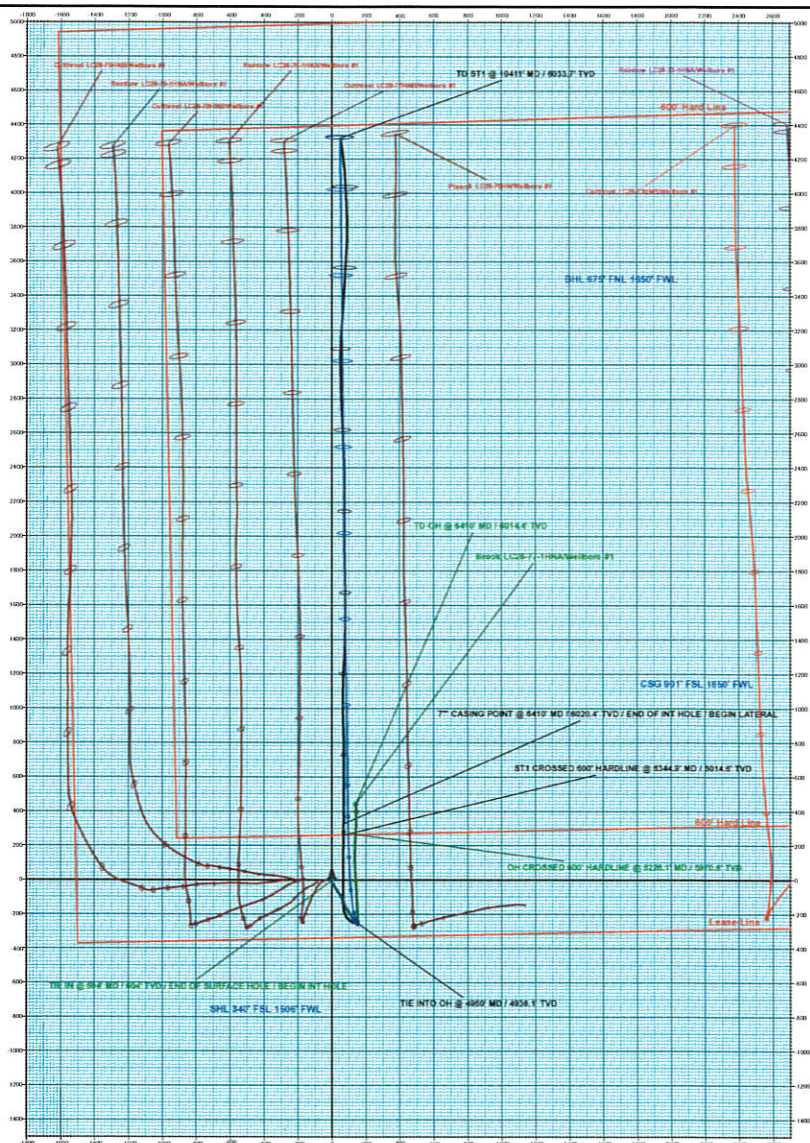
Brook LC28-77-1HNA  
 Weld County, CO  
 Q140639 & RM-140898  
 Design #2

PROJECT DETAILS: Weld County, CO  
 Geodetic System: US State Plane 1983  
 Datum: North American Datum 1983  
 Ellipsoid: GRS 1980  
 Zone: Colorado Northern Zone  
 System Datum: Mean Sea Level

**noble energy**

**T M** Azimuths to Grid North  
 Correction: 7.05°  
 Magnetic Field  
 Strength: 53033.6nT  
 Dip Angle: 67.31°  
 Date: 9/5/2014  
 Model: IGRF2010

**DDC**  
 The DIRECTIONAL DRILLING COMPANY



ANNOTATIONS									
TVD	MD	Inc	Azi	WOB	EW	Y	W	W	W
4328.1	4901.0	0.70	86.33	25.8	152.8	251.2	328.9	716.0	END OF INT. HOLE / BEGIN LATERAL
9014.6	8344.9	84.79	0.13	262.8	89.3	263.5	903.7	ST1 CROSSED 600' HARDLINE @ 8344.9' MD / 8014.6' TVD	
8025.6	5419.0	85.43	339.95	37.5	89.2	328.4	598.1	7"	
9023.7	10491.0	91.54	352.28	422.9	50.9	424.1	498.0	TD 811' @ 10491' MD / 9023.7' TVD	

ANNOTATIONS									
TVD	MD	Inc	Azi	WOB	EW	Y	W	W	W
5870.8	804.0	0.00	123.25	-2.0	1.2	-2.0	2.8	WE IN @ 804 MD / 587 MD / END OF SURFACE HOLE / BEGINNIT HOLE	
5970.8	8226.1	87.04	3.12	264.4	140.4	265.9	852.1	OH CROSSED 600' HARDLINE @ 8226.1' MD / 5970.8' TVD	
9014.6	8410.0	86.00	358.00	44.7	141.0	443.3	1025.2	TO OH @ 8410' MD / 8014.6' TVD	

DESIGN TARGET DETAILS							
Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude
PDHL Brook LC28-77-1HNA - plan line target center	6039.0	4326.1	48.2	1511219.21	3419467.13	40° 42' 35.07" N	102° 59' 11.41" W

WELL DETAILS: Brook LC28-77-1HNA							
		Ground Level:		4853.0			
+N-S	+E-W	Northing	Easting	Latitude	Longitude	Spot	
0.0	0.0	1506693.11	3419418.93	40° 42' 53.964 N	103° 59' 13.056 W		

Vertical Section at 0.04\"/>