

## **Noble Energy Inc.**

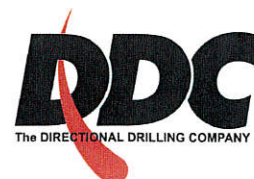
Weld County, CO  
Sec 28, T9N, R59W, 6th PM  
Cutthroat LC28-79HNB

Wellbore #1

Design: Wellbore #1 **FINAL**

## **DDC Survey Report**

22 September, 2014



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Cutthroat LC28-79HNB
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4884.0usft
<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4884.0usft
<b>Well:</b>	Cutthroat LC28-79HNB	<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		

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	Cutthroat LC28-79HNB					
Well Position	+N/-S	0.0 usft	Northing:	1,506,888.62 usft	Latitude:	40° 42' 53.964 N
	+E/-W	0.0 usft	Easting:	3,419,155.61 usft	Longitude:	103° 59' 16.476 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,854.0 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	8/4/2014	8.04	67.32	53,043

<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	342.59	

<b>Survey Program</b>	<b>Date</b>	9/22/2014			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
360.0	605.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
740.0	6,630.0	MWD Survey - Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
6,723.0	10,325.0	MWD Survey - Lateral (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	
360.0	0.00	148.66	360.0	0.0	0.0	0.0	0.00	0.00	0.00	
TIE IN @ 605' MD / 605' TVD END OF SUR HOLE / BEGIN INT HOLE										
605.0	0.00	0.00	605.0	0.0	0.0	0.0	0.00	0.00	0.00	
740.0	0.18	0.03	740.0	0.2	0.0	0.2	0.13	0.13	0.00	
834.0	0.18	276.36	834.0	0.4	-0.1	0.4	0.26	0.00	-89.01	
927.0	0.18	261.10	927.0	0.4	-0.4	0.5	0.05	0.00	-16.41	
1,019.0	2.73	273.54	1,019.0	0.5	-2.8	1.3	2.78	2.77	13.52	
1,111.0	4.84	274.07	1,110.8	0.9	-8.8	3.5	2.29	2.29	0.58	



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<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4884.0usft
<b>Well:</b>	Cutthroat LC28-79HNB	<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)
1,203.0	7.47	273.54	1,202.2	1.5	-18.7	7.1	2.86	2.86	-0.58
1,295.0	9.76	261.94	1,293.2	0.8	-32.4	10.5	3.11	2.49	-12.61
1,387.0	11.70	262.12	1,383.6	-1.6	-49.3	13.3	2.11	2.11	0.20
1,481.0	12.13	263.00	1,475.5	-4.1	-68.6	16.6	0.50	0.46	0.94
1,574.0	11.61	263.70	1,566.6	-6.3	-87.6	20.2	0.58	-0.56	0.75
1,666.0	11.52	263.35	1,656.7	-8.4	-105.9	23.7	0.12	-0.10	-0.38
1,757.0	11.34	262.29	1,745.9	-10.6	-123.8	26.9	0.30	-0.20	-1.16
1,851.0	10.64	262.29	1,838.2	-13.0	-141.5	29.9	0.74	-0.74	0.00
1,943.0	10.82	261.94	1,928.5	-15.4	-158.5	32.8	0.21	0.20	-0.38
2,035.0	11.43	267.92	2,018.8	-16.9	-176.2	36.6	1.42	0.66	6.50
2,128.0	11.17	267.92	2,110.0	-17.6	-194.4	41.4	0.28	-0.28	0.00
2,222.0	13.01	272.67	2,201.9	-17.4	-214.1	47.4	2.22	1.96	5.05
2,317.0	13.19	272.67	2,294.5	-16.4	-235.6	54.8	0.19	0.19	0.00
2,412.0	12.75	271.79	2,387.0	-15.6	-256.9	62.0	0.51	-0.46	-0.93
2,506.0	12.13	271.79	2,478.8	-14.9	-277.1	68.7	0.66	-0.66	0.00
2,600.0	12.13	272.14	2,570.7	-14.3	-296.8	75.2	0.08	0.00	0.37
2,695.0	12.40	273.02	2,663.6	-13.4	-317.0	82.1	0.35	0.28	0.93
2,789.0	12.22	267.74	2,755.4	-13.2	-337.0	88.2	1.21	-0.19	-5.62
2,884.0	12.40	267.39	2,848.2	-14.1	-357.3	93.5	0.21	0.19	-0.37
2,979.0	12.31	267.74	2,941.0	-14.9	-377.6	98.7	0.12	-0.09	0.37
3,073.0	12.05	267.92	3,032.9	-15.7	-397.4	103.9	0.28	-0.28	0.19
3,168.0	10.73	267.04	3,126.0	-16.5	-416.1	108.8	1.40	-1.39	-0.93
3,262.0	9.32	265.11	3,218.6	-17.6	-432.5	112.6	1.54	-1.50	-2.05
3,357.0	10.99	268.80	3,312.1	-18.5	-449.2	116.8	1.89	1.76	3.88
3,452.0	11.96	269.33	3,405.2	-18.8	-468.1	122.1	1.03	1.02	0.56
3,546.0	12.66	268.97	3,497.0	-19.1	-488.1	127.9	0.75	0.74	-0.38
3,641.0	13.54	266.34	3,589.6	-20.0	-509.6	133.4	1.12	0.93	-2.77
3,735.0	12.93	262.82	3,681.1	-22.0	-531.0	137.9	1.07	-0.65	-3.74
3,830.0	10.46	258.60	3,774.1	-25.0	-550.0	140.7	2.75	-2.60	-4.44
3,924.0	10.29	259.48	3,866.6	-28.2	-566.7	142.6	0.25	-0.18	0.94
4,019.0	9.94	259.66	3,960.1	-31.2	-583.1	144.6	0.37	-0.37	0.19
4,114.0	8.88	262.82	4,053.8	-33.6	-598.4	146.9	1.24	-1.12	3.33
4,208.0	9.76	265.63	4,146.6	-35.2	-613.5	150.0	1.05	0.94	2.99
4,302.0	9.15	264.76	4,239.3	-36.4	-628.9	153.4	0.67	-0.65	-0.93
4,397.0	11.52	262.12	4,332.7	-38.4	-645.9	156.6	2.54	2.49	-2.78
4,492.0	10.90	263.35	4,425.9	-40.8	-664.2	159.8	0.70	-0.65	1.29
4,586.0	12.49	265.99	4,518.0	-42.5	-683.1	163.8	1.78	1.69	2.81
4,681.0	12.05	263.70	4,610.8	-44.3	-703.2	168.1	0.69	-0.46	-2.41
4,775.0	10.99	267.39	4,702.9	-45.8	-721.9	172.3	1.37	-1.13	3.93
4,870.0	12.66	265.28	4,795.9	-47.1	-741.4	176.9	1.82	1.76	-2.22
4,965.0	10.20	264.05	4,889.0	-48.8	-760.1	180.9	2.60	-2.59	-1.29
5,059.0	9.58	257.02	4,981.6	-51.4	-776.0	183.1	1.44	-0.66	-7.48
5,154.0	9.50	255.26	5,075.3	-55.2	-791.3	184.1	0.32	-0.08	-1.85

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<b>Site:</b>	Sec 28, T9N, R59W, 6th PM	<b>MD Reference:</b>	WELL @ 4884.0usft
<b>Well:</b>	Cutthroat LC28-79HNB	<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)
5,248.0	8.71	261.42	5,168.1	-58.2	-805.8	185.6	1.33	-0.84	6.55
5,343.0	9.94	283.92	5,261.9	-57.3	-820.9	190.9	4.02	1.29	23.68
5,411.0	10.20	292.18	5,328.8	-53.6	-832.2	197.8	2.16	0.38	12.15
5,437.0	9.85	293.23	5,354.4	-51.9	-836.4	200.7	1.52	-1.35	4.04
5,531.0	16.36	292.00	5,445.9	-43.8	-856.0	214.4	6.93	6.93	-1.31
5,626.0	30.16	287.26	5,533.0	-31.6	-891.4	236.6	14.65	14.53	-4.99
5,721.0	33.15	289.19	5,613.9	-16.0	-938.8	265.6	3.32	3.15	2.03
5,815.0	36.49	291.83	5,691.0	2.9	-989.0	298.6	3.90	3.55	2.81
5,910.0	43.79	303.25	5,763.7	31.5	-1,042.8	342.1	10.89	7.68	12.02
6,004.0	49.77	322.41	5,828.4	78.0	-1,092.2	401.2	16.11	6.36	20.38
6,099.0	49.51	329.62	5,889.9	138.0	-1,132.6	470.5	5.79	-0.27	7.59
6,194.0	54.52	328.92	5,948.4	202.3	-1,170.9	543.4	5.31	5.27	-0.74
6,288.0	60.32	332.78	5,999.0	271.5	-1,209.4	620.9	7.07	6.17	4.11
6,383.0	67.45	334.72	6,040.8	347.9	-1,247.0	705.1	7.73	7.51	2.04
<b>CROSSED LEASE LINE @ 6400.2' MD / 6047.2' TVD</b>									
6,400.2	68.73	336.97	6,047.2	362.5	-1,253.6	721.0	14.20	7.42	13.05
6,478.0	74.83	346.67	6,071.6	432.6	-1,276.5	794.7	14.20	7.85	12.47
6,559.0	85.74	354.93	6,085.3	511.2	-1,289.1	873.5	16.80	13.47	10.20
<b>7" CASING POINT @ 6606' MD / 6087.1' TVD END OLF INT HOLE / BEGIN LATERAL HOLE</b>									
6,606.0	89.87	357.72	6,087.1	558.1	-1,292.1	919.1	10.61	8.79	5.95
6,630.0	91.98	359.15	6,086.7	582.1	-1,292.8	942.2	10.61	8.79	5.94
6,723.0	89.60	359.85	6,085.4	675.0	-1,293.6	1,031.2	2.67	-2.56	0.75
6,817.0	90.40	359.33	6,085.4	769.0	-1,294.3	1,121.1	1.02	0.85	-0.55
6,912.0	89.34	359.15	6,085.6	864.0	-1,295.5	1,212.1	1.13	-1.12	-0.19
7,006.0	87.76	0.38	6,088.0	958.0	-1,295.9	1,301.9	2.13	-1.68	1.31
7,101.0	87.76	0.20	6,091.7	1,052.9	-1,295.4	1,392.3	0.19	0.00	-0.19
7,195.0	87.49	359.50	6,095.6	1,146.8	-1,295.7	1,482.0	0.80	-0.29	-0.74
7,290.0	87.23	359.15	6,100.0	1,241.7	-1,296.8	1,572.9	0.46	-0.27	-0.37
7,384.0	89.43	0.91	6,102.7	1,335.7	-1,296.7	1,662.5	3.00	2.34	1.87
7,479.0	88.72	1.08	6,104.2	1,430.7	-1,295.1	1,752.6	0.77	-0.75	0.18
7,573.0	90.22	1.79	6,105.1	1,524.6	-1,292.7	1,841.6	1.77	1.60	0.76
7,667.0	90.75	3.54	6,104.3	1,618.5	-1,288.4	1,929.9	1.95	0.56	1.86
<b>CROSSED LEASE LINE @ 7759.9' MD / 6103.8' TVD</b>									
7,759.9	89.89	4.23	6,103.8	1,711.2	-1,282.1	2,016.4	1.19	-0.93	0.75
7,762.0	89.87	4.25	6,103.8	1,713.3	-1,281.9	2,018.4	1.19	-0.93	0.75
7,856.0	89.78	1.43	6,104.1	1,807.2	-1,277.3	2,106.5	3.00	-0.10	-3.00
7,951.0	89.34	0.56	6,104.8	1,902.1	-1,275.6	2,196.7	1.03	-0.46	-0.92
8,045.0	90.31	1.26	6,105.1	1,996.1	-1,274.1	2,285.9	1.27	1.03	0.74
8,140.0	89.52	0.20	6,105.2	2,091.1	-1,272.9	2,376.2	1.39	-0.83	-1.12
8,234.0	90.31	359.33	6,105.4	2,185.1	-1,273.3	2,466.0	1.25	0.84	-0.93
8,329.0	91.71	358.97	6,103.7	2,280.1	-1,274.7	2,557.0	1.52	1.47	-0.38
8,423.0	92.95	358.27	6,099.9	2,374.0	-1,277.0	2,647.3	1.51	1.32	-0.74
8,517.0	91.10	357.74	6,096.6	2,467.9	-1,280.2	2,737.9	2.05	-1.97	-0.56
8,611.0	89.60	358.10	6,096.0	2,561.8	-1,283.7	2,828.5	1.64	-1.60	0.38



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**Project:** Weld County, CO  
**Site:** Sec 28, T9N, R59W, 6th PM  
**Well:** Cutthroat LC28-79HNB  
**Wellbore:** Wellbore #1  
**Design:** Wellbore #1

**Local Co-ordinate Reference:** Well Cutthroat LC28-79HNB  
**TVD Reference:** WELL @ 4884.0usft  
**MD Reference:** WELL @ 4884.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** 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)
8,706.0	90.84	358.45	6,095.6	2,656.8	-1,286.5	2,920.0	1.36	1.31	0.37
8,801.0	88.64	358.97	6,096.1	2,751.7	-1,288.6	3,011.2	2.38	-2.32	0.55
8,895.0	88.11	358.62	6,098.7	2,845.7	-1,290.6	3,101.5	0.68	-0.56	-0.37
8,990.0	87.67	357.92	6,102.2	2,940.6	-1,293.5	3,192.9	0.87	-0.46	-0.74
9,084.0	91.01	358.10	6,103.3	3,034.5	-1,296.8	3,283.5	3.56	3.55	0.19
9,179.0	91.63	357.39	6,101.1	3,129.4	-1,300.5	3,375.1	0.99	0.65	-0.75
9,273.0	89.87	359.68	6,099.9	3,223.3	-1,302.9	3,465.5	3.07	-1.87	2.44
9,368.0	89.60	358.97	6,100.3	3,318.3	-1,304.0	3,556.5	0.80	-0.28	-0.75
9,463.0	89.52	358.45	6,101.0	3,413.3	-1,306.2	3,647.7	0.55	-0.08	-0.55
9,557.0	89.08	357.22	6,102.2	3,507.2	-1,309.7	3,738.4	1.39	-0.47	-1.31
9,652.0	90.66	358.10	6,102.4	3,602.1	-1,313.6	3,830.1	1.90	1.66	0.93
9,747.0	90.31	357.74	6,101.6	3,697.1	-1,317.0	3,921.8	0.53	-0.37	-0.38
9,841.0	90.22	357.22	6,101.2	3,791.0	-1,321.2	4,012.6	0.56	-0.10	-0.55
9,936.0	90.66	355.99	6,100.4	3,885.8	-1,326.8	4,104.8	1.38	0.46	-1.29
<b>CROSSED LEASE LINE @ 10004' MD / 6099.5' TVD</b>									
10,004.0	90.91	355.61	6,099.5	3,953.6	-1,331.8	4,171.0	0.68	0.37	-0.56
10,030.0	91.01	355.46	6,099.1	3,979.5	-1,333.8	4,196.3	0.68	0.37	-0.56
10,125.0	91.54	354.93	6,097.0	4,074.2	-1,341.7	4,289.0	0.79	0.56	-0.56
10,219.0	88.90	355.28	6,096.6	4,167.8	-1,349.8	4,380.7	2.83	-2.81	0.37
10,274.0	89.25	354.93	6,097.5	4,222.6	-1,354.5	4,434.4	0.90	0.64	-0.64
<b>TD @ 10325' MD / 6098.2' TVD</b>									
10,325.0	89.25	354.93	6,098.2	4,273.4	-1,359.0	4,484.3	0.00	0.00	0.00

# Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
605.0	605.0	0.0	0.0	TIE IN @ 605' MD / 605' TVD END OF SUR HOLE / BEGIN INT HOLE
6,400.2	6,047.2	362.5	-1,253.6	CROSSED LEASE LINE @ 6400.2' MD / 6047.2' TVD
6,606.0	6,087.1	558.1	-1,292.1	7" CASING POINT @ 6606' MD / 6087.1' TVD END OF INT HOLE / BEGIN L
7,759.9	6,103.8	1,711.2	-1,282.1	CROSSED LEASE LINE @ 7759.9' MD / 6103.8' TVD
10,004.0	6,099.5	3,953.6	-1,331.8	CROSSED LEASE LINE @ 10004' MD / 6099.5' TVD
10,325.0	6,098.2	4,273.4	-1,359.0	TD @ 10325' MD / 6098.2' TVD

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



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## Survey Certification Sheet

Noble Energy Inc  
Company

RM-140773  
Job Number

8/13/14  
Date

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

Cutthroat LC28 79HNB  
Well Name

Weld, CO  
County & State

API: 05-123-38855

Surveyed from a depth of: 605 feet to 10325 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.  
com, c=US  
Date: 2014.08.15 09:42:59 -05'00'

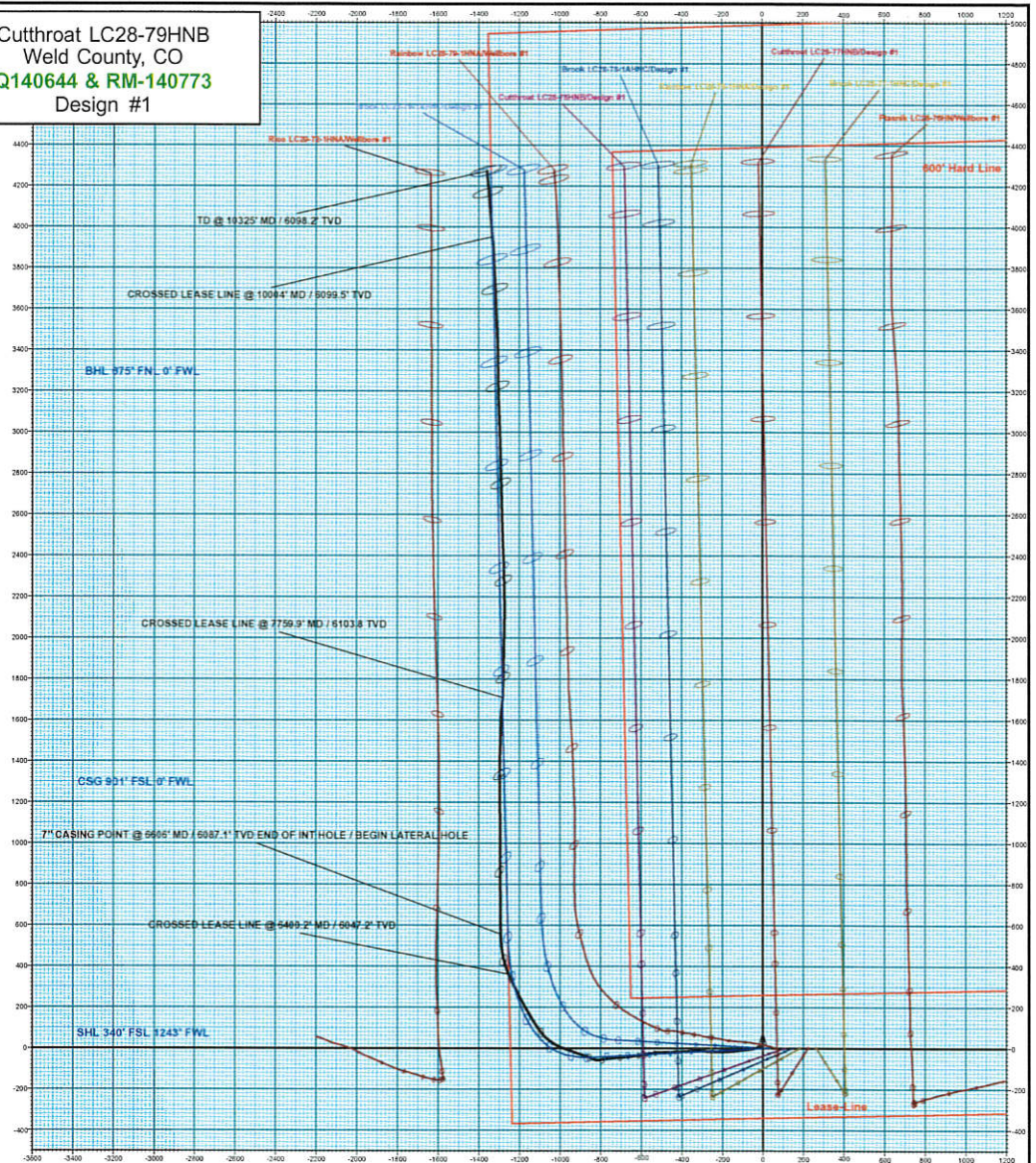
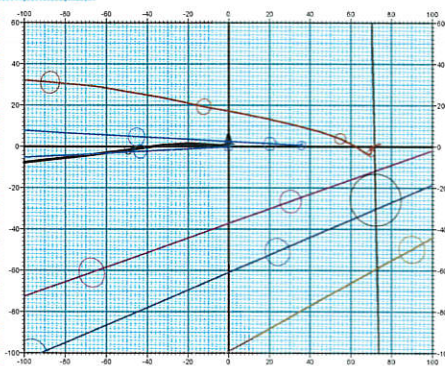
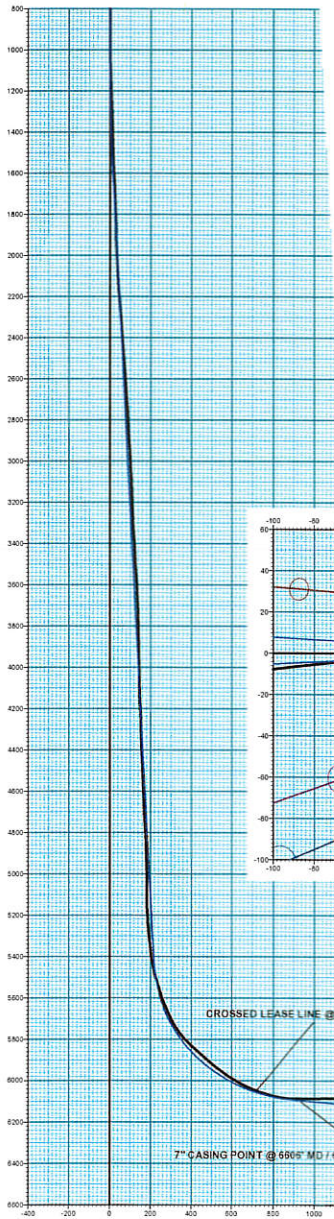
Larry Wright  
MWD General Manager



Company Name: Noble Energy Inc.  
Cutthroat LC28-79HNB  
Weld County, CO  
Rig: H&P #326  
Created By: Kris Ray  
Date: 8/11/2014

Cutthroat LC28-79HNB  
Weld County, CO  
Q140644 & RM-140773  
Design #1

**noble**  
energy

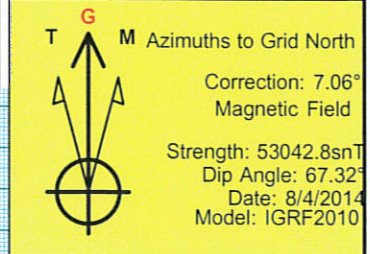


TVD	MD	Inc	Act	+N-S	+E-W	Y-Sect	Departure	Annotation
065.0	005.0	0.00	0.00	0.0	0.0	0.0	0.0	TIE IN @ 605' MD / 605' TVD END OF SUR HOLE / BEGIN INT HOLE
0647.2	6406.2	08.73	330.97	362.5	-1253.8	721.0	1462.4	CROSSED LEASE LINE @ 6400.2' MD / 6047.2' TVD
6087.1	6006.0	89.87	357.72	658.1	-1292.1	918.1	1902.8	7\"/>

Name	+N-S	+E-W	North	East	Latitude	Longitude
PBHL Cutthroat LC28-79HNB	6120.0	4273.3	-1330.7	151161.92	3417815.91	40° 43' 36.408 N 103° 59' 32.028 W
- plus hits target center						

WELL DETAILS: Cutthroat LC28-79HNB					
Ground Level:	4852.0				
+N-S	+E-W	North	East	Latitude	Longitude
0.0	0.0	150688.82	3419155.81	40° 42' 53.964 N	103° 55' 15.476 W
				Slot	

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



Vertical Section at 342.59° (200 usf/in)