

# Noble Energy Inc.- Weld County, CO (Grid North)

Well Name: **Furrow Federal PC AB14-64HN**

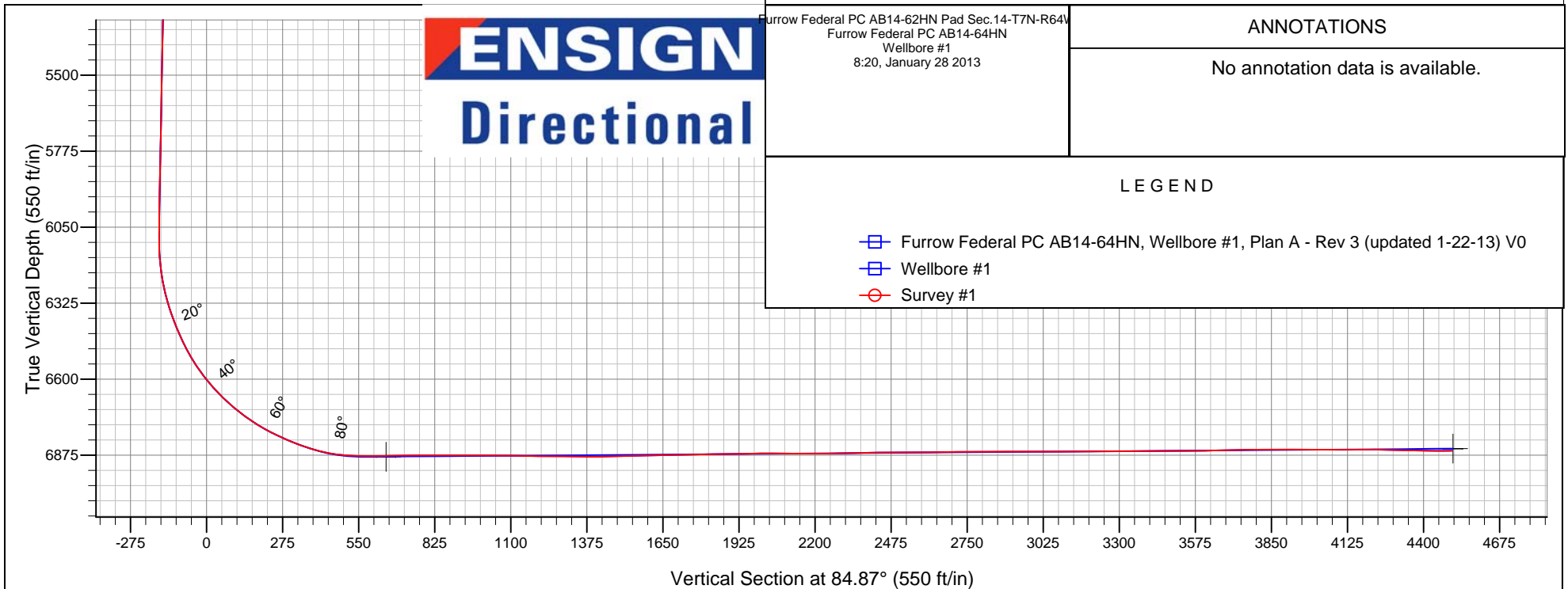
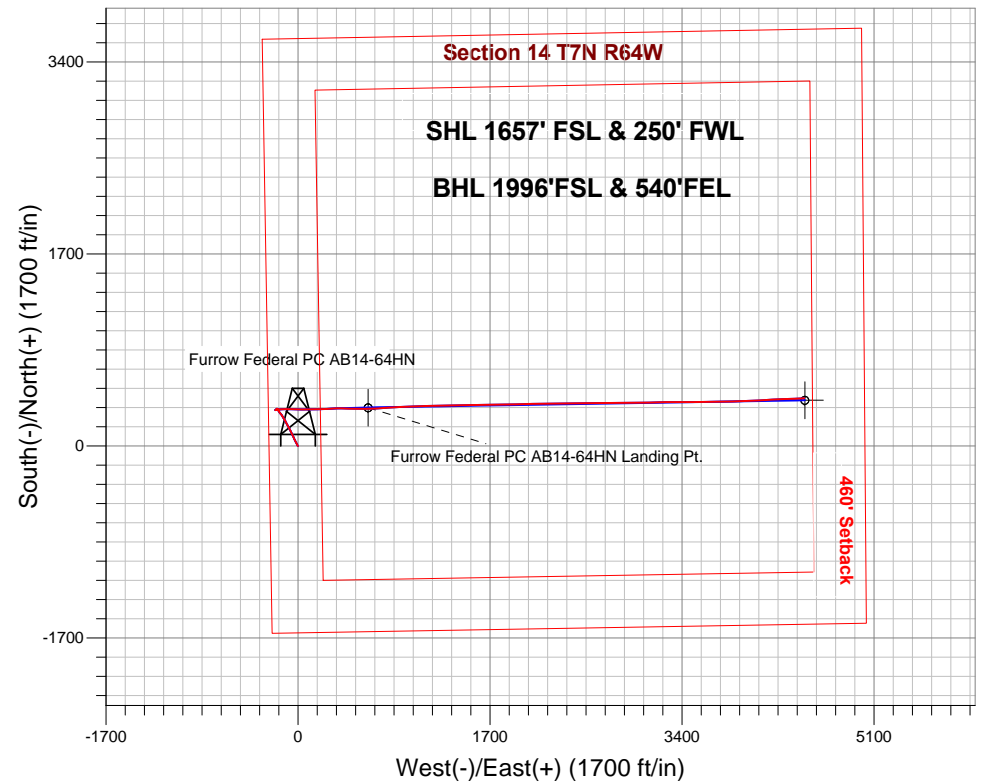
Surface Location: Furrow Federal PC AB14-62HN Pad Sec.14-T7N-R64W  
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4807.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1452181.13	3270820.09	40.570550	-104.525140	
Original Well Elev WELL @ 4820.0ft (Original Well Elev)						

## FINAL SURVEY

Projected Bottom Hole Location  
11273' MD 6859' TVD 419' N & 4483' E of SHL  
90.9 degree Incl @ 88.9 degree AZM





# **Noble Energy Inc.- Weld County, CO (Grid North)**

**Sec.14-T7N-R64W**

**Furrow Federal PC AB14-62HN Pad Sec.14-T7N-R64W**

**Furrow Federal PC AB14-64HN**

**Wellbore #1**

**Survey: Survey #1**

## **Standard Survey Report**

**28 January, 2013**

<b>Company:</b>	Noble Energy Inc.- Weld County, CO (Grid North)	<b>Local Co-ordinate Reference:</b>	Well Furrow Federal PC AB14-64HN
<b>Project:</b>	Sec.14-T7N-R64W	<b>TVD Reference:</b>	WELL @ 4820.0ft (Original Well Elev)
<b>Site:</b>	Furrow Federal PC AB14-62HN Pad Sec.14-T7N-R64W	<b>MD Reference:</b>	WELL @ 4820.0ft (Original Well Elev)
<b>Well:</b>	Furrow Federal PC AB14-64HN	<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>	Landmark

<b>Project</b>	Sec.14-T7N-R64W, 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		Using Well Reference Point
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

Site		Furrow Federal PC AB14-62HN Pad Sec.14-T7N-R64W			
Site Position:		Northing:	1,452,104.64 ft	Latitude:	40.570340
From:	Lat/Long	Easting:	3,270,820.93 ft	Longitude:	-104.525140
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.63 °

Well	Furrow Federal PC AB14-64HN					
Well Position	+N/-S	0.0 ft	Northing:	1,452,181.13 ft	Latitude:	40.570550
	+E/-W	0.0 ft	Easting:	3,270,820.09 ft	Longitude:	-104.525140
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,807.0 ft

<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	1/15/2013	8.54	67.17	53,079

<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) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	84.87	

<b>Survey Program</b>	<b>Date</b>	1/27/2013			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
1,115.0	11,273.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Turn Rate (°/100ft)</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
1,115.0	0.00	0.00	1,115.0	0.0	0.0	0.0	0.00	0.00	0.00
1,172.0	0.60	168.40	1,172.0	-0.3	0.1	0.0	1.05	1.05	0.00
1,219.0	0.40	183.30	1,219.0	-0.7	0.1	0.0	0.50	-0.43	31.70
1,315.0	0.30	208.10	1,315.0	-1.3	0.0	-0.1	0.19	-0.10	25.83
1,410.0	0.20	234.50	1,410.0	-1.6	-0.3	-0.4	0.16	-0.11	27.79
1,504.0	2.00	327.00	1,504.0	-0.3	-1.3	-1.3	2.15	1.91	98.40
1,600.0	4.50	329.90	1,599.8	4.4	-4.1	-3.7	2.61	2.60	3.02
1,694.0	6.30	334.00	1,693.4	12.2	-8.2	-7.1	1.96	1.91	4.36
1,789.0	7.70	334.00	1,787.7	22.6	-13.3	-11.2	1.47	1.47	0.00
1,884.0	9.10	336.30	1,881.7	35.2	-19.1	-15.9	1.52	1.47	2.42

<b>Company:</b>	Noble Energy Inc.- Weld County, CO (Grid North)	<b>Local Co-ordinate Reference:</b>	Well Furrow Federal PC AB14-64HN
<b>Project:</b>	Sec.14-T7N-R64W	<b>TVD Reference:</b>	WELL @ 4820.0ft (Original Well Elev)
<b>Site:</b>	Furrow Federal PC AB14-62HN Pad Sec.14-T7N-R64W	<b>MD Reference:</b>	WELL @ 4820.0ft (Original Well Elev)
<b>Well:</b>	Furrow Federal PC AB14-64HN	<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>	Landmark

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,979.0	9.80	331.30	1,975.4	49.2	-26.0	-21.5	1.13	0.74	-5.26
2,074.0	10.70	332.10	2,068.9	64.1	-34.0	-28.2	0.96	0.95	0.84
2,149.0	12.00	335.60	2,142.4	77.3	-40.5	-33.4	1.96	1.73	4.67
2,244.0	12.30	338.60	2,235.3	95.7	-48.3	-39.5	0.74	0.32	3.16
2,339.0	12.30	334.90	2,328.1	114.3	-56.3	-45.8	0.83	0.00	-3.89
2,433.0	12.90	332.20	2,419.8	132.7	-65.4	-53.3	0.89	0.64	-2.87
2,528.0	11.60	331.90	2,512.7	150.5	-74.8	-61.1	1.37	-1.37	-0.32
2,623.0	12.00	328.20	2,605.6	167.3	-84.6	-69.2	0.90	0.42	-3.89
2,718.0	12.10	332.80	2,698.6	184.5	-94.3	-77.4	1.02	0.11	4.84
2,813.0	12.70	335.70	2,791.3	202.9	-103.2	-84.6	0.91	0.63	3.05
2,908.0	12.80	329.90	2,884.0	221.5	-112.7	-92.5	1.35	0.11	-6.11
3,003.0	12.20	329.90	2,976.7	239.3	-123.0	-101.1	0.63	-0.63	0.00
3,098.0	11.60	329.10	3,069.7	256.2	-133.0	-109.5	0.66	-0.63	-0.84
3,192.0	9.70	322.40	3,162.1	270.6	-142.7	-117.9	2.41	-2.02	-7.13
3,287.0	9.20	320.60	3,255.8	282.8	-152.4	-126.5	0.61	-0.53	-1.89
3,382.0	7.80	321.00	3,349.8	293.7	-161.2	-134.3	1.47	-1.47	0.42
3,477.0	6.10	330.10	3,444.1	303.1	-167.8	-140.0	2.13	-1.79	9.58
3,572.0	4.00	337.30	3,538.7	310.5	-171.6	-143.2	2.30	-2.21	7.58
3,667.0	2.80	323.60	3,633.5	315.4	-174.3	-145.4	1.52	-1.26	-14.42
3,762.0	2.60	0.00	3,728.4	319.4	-175.7	-146.4	1.79	-0.21	38.32
3,857.0	1.90	336.30	3,823.3	323.0	-176.3	-146.7	1.21	-0.74	-24.95
3,952.0	2.70	300.10	3,918.3	325.6	-178.9	-149.0	1.70	0.84	-38.11
4,047.0	1.60	270.00	4,013.2	326.7	-182.1	-152.2	1.62	-1.16	-31.68
4,141.0	1.10	280.70	4,107.2	326.9	-184.3	-154.3	0.59	-0.53	11.38
4,236.0	1.20	271.80	4,202.2	327.1	-186.2	-156.2	0.22	0.11	-9.37
4,331.0	0.10	109.50	4,297.2	327.1	-187.1	-157.1	1.36	-1.16	-170.84
4,426.0	0.30	24.40	4,392.2	327.3	-186.9	-156.9	0.32	0.21	-89.58
4,521.0	0.40	62.40	4,487.2	327.7	-186.5	-156.5	0.26	0.11	40.00
4,616.0	0.30	113.60	4,582.1	327.7	-186.0	-156.0	0.33	-0.11	53.89
4,711.0	0.40	170.00	4,677.1	327.3	-185.7	-155.7	0.36	0.11	59.37
4,805.0	0.80	151.00	4,771.1	326.4	-185.4	-155.4	0.47	0.43	-20.21
4,900.0	0.90	181.80	4,866.1	325.1	-185.1	-155.2	0.49	0.11	32.42
4,995.0	0.90	189.00	4,961.1	323.6	-185.2	-155.5	0.12	0.00	7.58
5,090.0	0.50	200.60	5,056.1	322.5	-185.5	-155.9	0.44	-0.42	12.21
5,185.0	0.60	194.60	5,151.1	321.6	-185.7	-156.2	0.12	0.11	-6.32
5,280.0	1.00	243.50	5,246.1	320.8	-186.6	-157.2	0.80	0.42	51.47
5,374.0	1.10	241.70	5,340.1	320.0	-188.1	-158.8	0.11	0.11	-1.91
5,469.0	1.00	286.20	5,435.1	319.8	-189.7	-160.4	0.84	-0.11	46.84
5,564.0	1.30	281.10	5,530.1	320.2	-191.6	-162.2	0.33	0.32	-5.37
5,659.0	1.00	274.60	5,625.0	320.5	-193.5	-164.0	0.34	-0.32	-6.84
5,754.0	1.10	240.50	5,720.0	320.1	-195.1	-165.7	0.66	0.11	-35.89
5,849.0	1.10	248.90	5,815.0	319.3	-196.7	-167.4	0.17	0.00	8.84
5,944.0	1.20	257.00	5,910.0	318.8	-198.6	-169.2	0.20	0.11	8.53
6,038.0	1.20	237.70	6,004.0	318.0	-200.3	-171.1	0.43	0.00	-20.53
6,132.0	0.40	70.80	6,098.0	317.6	-200.9	-171.6	1.69	-0.85	-177.55
6,227.0	6.20	79.50	6,192.8	318.6	-195.5	-166.2	6.11	6.11	9.16
6,322.0	13.50	83.10	6,286.3	320.9	-179.4	-150.0	7.71	7.68	3.79
6,416.0	20.00	84.60	6,376.3	323.7	-152.5	-122.9	6.93	6.91	1.60
6,511.0	25.60	87.90	6,463.8	326.0	-115.8	-86.2	6.04	5.89	3.47
6,606.0	33.00	92.60	6,546.6	325.6	-69.4	-40.0	8.15	7.79	4.95
6,701.0	41.20	90.70	6,622.3	324.1	-12.1	16.9	8.71	8.63	-2.00
6,796.0	48.60	90.70	6,689.6	323.2	54.9	83.6	7.79	7.79	0.00
6,891.0	55.60	89.30	6,747.9	323.3	129.8	158.2	7.46	7.37	-1.47

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<b>Well:</b>	Furrow Federal PC AB14-64HN	<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>	Landmark

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,986.0	63.60	87.70	6,795.9	325.5	211.6	239.9	8.55	8.42	-1.68
7,059.0	67.80	86.80	6,826.0	328.7	278.1	306.3	5.86	5.75	-1.23
7,106.0	70.50	87.00	6,842.7	331.0	321.9	350.2	5.76	5.74	0.43
7,154.0	74.40	90.70	6,857.2	331.9	367.7	395.9	10.95	8.13	7.71
7,202.0	79.80	91.80	6,867.9	330.9	414.4	442.4	11.47	11.25	2.29
7,249.0	84.20	91.80	6,874.4	329.5	460.9	488.5	9.36	9.36	0.00
7,297.0	87.80	91.20	6,877.8	328.2	508.8	536.1	7.60	7.50	-1.25
7,392.0	91.50	88.90	6,878.3	328.1	603.8	630.7	4.59	3.89	-2.42
7,486.0	90.70	87.20	6,876.5	331.3	697.7	724.5	2.00	-0.85	-1.81
7,581.0	89.70	86.30	6,876.2	336.7	792.5	819.5	1.42	-1.05	-0.95
7,676.0	90.40	86.10	6,876.1	343.0	887.3	914.4	0.77	0.74	-0.21
7,771.0	89.40	87.50	6,876.3	348.3	982.2	1,009.4	1.81	-1.05	1.47
7,866.0	89.40	88.40	6,877.3	351.7	1,077.1	1,104.2	0.95	0.00	0.95
7,961.0	89.00	89.10	6,878.6	353.8	1,172.1	1,199.0	0.85	-0.42	0.74
8,056.0	89.80	87.70	6,879.6	356.4	1,267.0	1,293.8	1.70	0.84	-1.47
8,151.0	89.40	88.90	6,880.3	359.2	1,362.0	1,388.6	1.33	-0.42	1.26
8,246.0	91.50	89.60	6,879.5	360.5	1,457.0	1,483.4	2.33	2.21	0.74
8,340.0	91.50	89.10	6,877.1	361.6	1,550.9	1,577.0	0.53	0.00	-0.53
8,435.0	91.40	88.80	6,874.6	363.3	1,645.9	1,671.8	0.33	-0.11	-0.32
8,530.0	90.70	89.30	6,872.9	364.9	1,740.8	1,766.5	0.91	-0.74	0.53
8,625.0	90.70	89.10	6,871.7	366.2	1,835.8	1,861.2	0.21	0.00	-0.21
8,720.0	91.50	89.10	6,869.9	367.7	1,930.8	1,955.9	0.84	0.84	0.00
8,815.0	89.90	88.40	6,868.8	369.8	2,025.8	2,050.7	1.84	-1.68	-0.74
8,909.0	89.10	89.50	6,869.6	371.5	2,119.7	2,144.5	1.45	-0.85	1.17
9,004.0	90.90	88.60	6,869.6	373.1	2,214.7	2,239.2	2.12	1.89	-0.95
9,099.0	91.60	88.80	6,867.5	375.2	2,309.7	2,334.0	0.77	0.74	0.21
9,194.0	90.70	89.10	6,865.6	377.0	2,404.6	2,428.7	1.00	-0.95	0.32
9,289.0	90.30	90.00	6,864.8	377.7	2,499.6	2,523.4	1.04	-0.42	0.95
9,384.0	90.30	89.50	6,864.3	378.1	2,594.6	2,618.0	0.53	0.00	-0.53
9,479.0	90.70	90.40	6,863.4	378.2	2,689.6	2,712.7	1.04	0.42	0.95
9,574.0	90.30	89.10	6,862.6	378.6	2,784.6	2,807.3	1.43	-0.42	-1.37
9,668.0	89.90	88.90	6,862.5	380.3	2,878.6	2,901.1	0.48	-0.43	-0.21
9,763.0	90.00	89.10	6,862.5	381.9	2,973.6	2,995.8	0.24	0.11	0.21
9,858.0	90.10	89.60	6,862.5	383.0	3,068.6	3,090.5	0.54	0.11	0.53
9,952.0	90.70	88.40	6,861.8	384.6	3,162.6	3,184.3	1.43	0.64	-1.28
10,047.0	90.30	88.90	6,861.0	386.9	3,257.5	3,279.1	0.67	-0.42	0.53
10,142.0	90.20	89.10	6,860.6	388.5	3,352.5	3,373.8	0.24	-0.11	0.21
10,236.0	90.70	90.00	6,859.8	389.3	3,446.5	3,467.5	1.10	0.53	0.96
10,331.0	90.00	90.00	6,859.2	389.3	3,541.5	3,562.1	0.74	-0.74	0.00
10,426.0	91.60	90.40	6,857.9	388.9	3,636.5	3,656.7	1.74	1.68	0.42
10,521.0	91.10	88.60	6,855.7	389.8	3,731.5	3,751.4	1.97	-0.53	-1.89
10,616.0	89.90	88.60	6,854.8	392.1	3,826.4	3,846.2	1.26	-1.26	0.00
10,711.0	89.50	87.20	6,855.3	395.6	3,921.4	3,941.0	1.53	-0.42	-1.47
10,806.0	90.20	87.20	6,855.6	400.2	4,016.2	4,035.9	0.74	0.74	0.00
10,901.0	90.40	86.50	6,855.1	405.4	4,111.1	4,130.9	0.77	0.21	-0.74
10,995.0	89.30	87.50	6,855.3	410.3	4,205.0	4,224.8	1.58	-1.17	1.06
11,090.0	88.50	87.40	6,857.2	414.6	4,299.9	4,319.7	0.85	-0.84	-0.11
11,185.0	89.20	88.10	6,859.1	418.3	4,394.8	4,414.6	1.04	0.74	0.74
11,216.0	89.80	88.40	6,859.3	419.2	4,425.7	4,445.5	2.16	1.94	0.97
11,273.0	90.90	88.90	6,859.0	420.6	4,482.7	4,502.4	2.12	1.93	0.88

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<b>Well:</b>	Furrow Federal PC AB14-64HN	<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>	Landmark

Design Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
Furrow Federal PC AE	0.00	0.00	6,851.4	403.2	4,488.1	1,452,584.30	3,275,308.05	40.571520	-104.508970
- survey misses target center by 19.7ft at 11273.0ft MD (6859.0 TVD, 420.6 N, 4482.7 E)									
- Circle (radius 35.0)									
Furrow Federal PC AE	0.00	0.00	6,881.1	336.8	621.3	1,452,517.92	3,271,441.37	40.571456	-104.522890
- survey misses target center by 8.9ft at 7409.8ft MD (6877.9 TVD, 328.5 N, 621.5 E)									
- Circle (radius 35.0)									

Checked By: _____	Approved By: _____	Date: _____
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