

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

Well Name: **Furrow Federal PC AB14-65HN**

Surface Location: Furrow Federal PC AB14-62HN Pad Sec.14-T7N-R64W

North American Datum 1983 , US State Plane 1983 Colorado Northern Zone

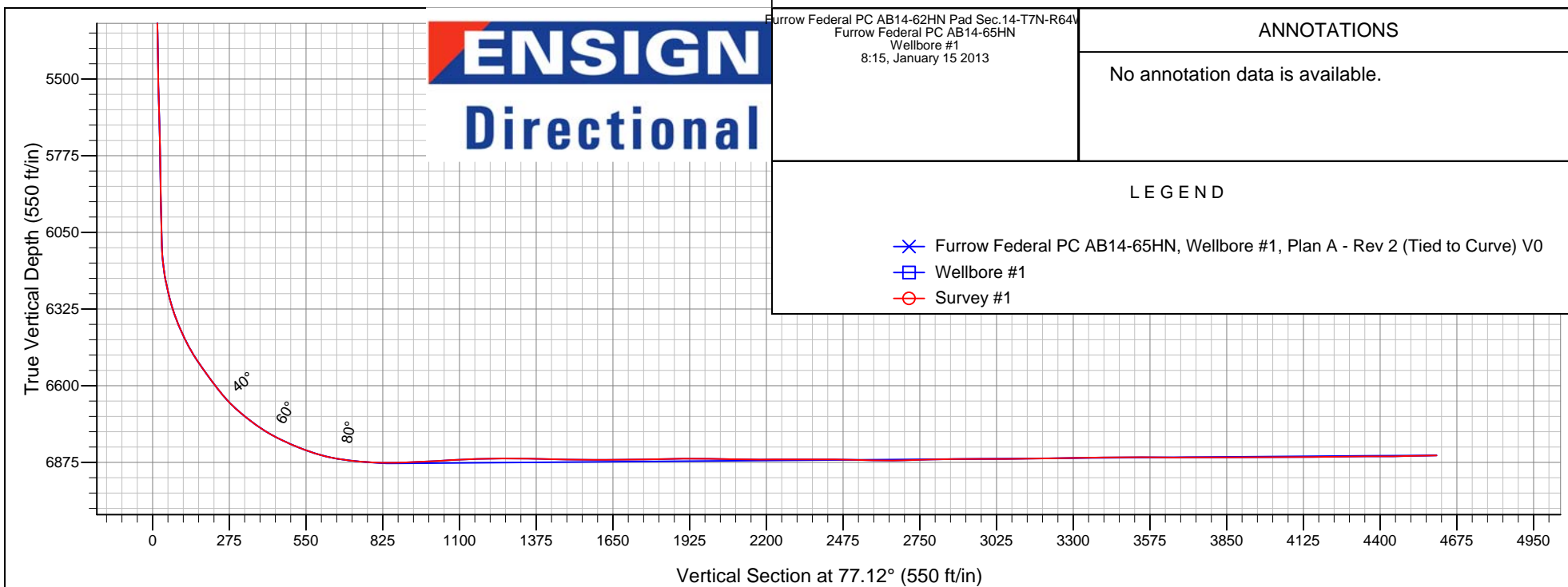
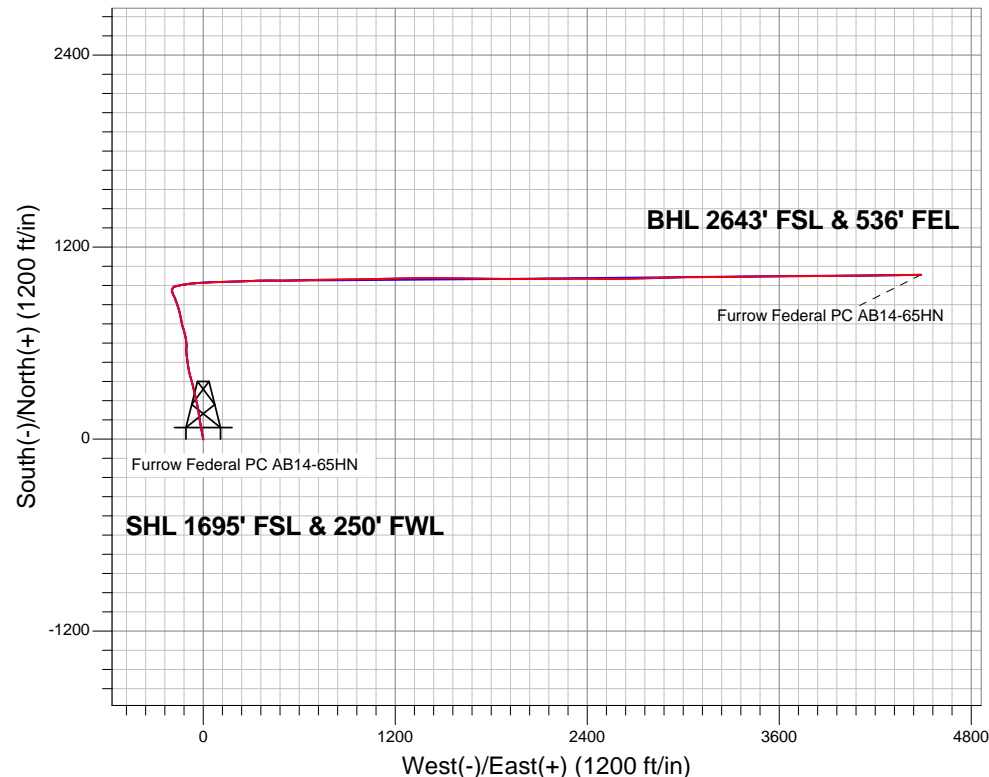
Ground Elevation: 4807.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1452217.56	3270819.69	40.570650	-104.525140	

Original Well Elev WELL @ 4820.0ft (Original Well Elev)

## FINAL SURVEY

Projected Bottom Hole Location  
11341' MD 6850.6' TVD 1029' N & 4486' E of  
SHL  
91.5 degree Incl @ 88.6 degree AZM





## **Directional**

# **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 AB14-65HN**

**Wellbore #1**

**Survey: Survey #1**

## **Standard Survey Report**

**15 January, 2013**

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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
1,150.0	0.00	0.00	1,150.0	0.0	0.0	0.0	0.00	0.00	0.00
1,213.0	0.50	176.20	1,213.0	-0.3	0.0	0.0	0.79	0.79	0.00
1,308.0	1.10	348.80	1,308.0	0.2	-0.1	-0.1	1.68	0.63	181.68
1,403.0	2.20	359.00	1,403.0	2.9	-0.3	0.3	1.19	1.16	10.74
1,498.0	3.80	349.10	1,497.8	7.8	-1.0	0.8	1.76	1.68	-10.42
1,593.0	5.00	353.50	1,592.5	15.0	-2.0	1.4	1.31	1.26	4.63
1,688.0	5.50	347.70	1,687.1	23.6	-3.5	1.9	0.77	0.53	-6.11
1,783.0	6.50	348.80	1,781.6	33.3	-5.5	2.1	1.06	1.05	1.16
1,878.0	7.40	347.70	1,875.9	44.6	-7.8	2.3	0.96	0.95	-1.16
1,973.0	9.30	347.00	1,969.9	58.0	-10.9	2.4	2.00	2.00	-0.74

<b>Company:</b>	Noble Energy Inc.- Weld County, CO (Grid North)	<b>Local Co-ordinate Reference:</b>	Well Furrow Federal PC AB14-65HN
<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 AB14-65HN	<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)	
2,068.0	11.40	349.60	2,063.4	74.8	-14.3	2.7	2.26	2.21	2.74	
2,163.0	13.00	351.20	2,156.2	94.6	-17.6	3.9	1.72	1.68	1.68	
2,258.0	14.50	349.50	2,248.5	116.8	-21.4	5.2	1.64	1.58	-1.79	
2,352.0	16.60	351.80	2,339.0	141.7	-25.5	6.8	2.33	2.23	2.45	
2,447.0	17.90	353.90	2,429.8	169.6	-29.0	9.6	1.52	1.37	2.21	
2,542.0	18.30	348.40	2,520.1	198.7	-33.5	11.6	1.85	0.42	-5.79	
2,637.0	17.80	346.50	2,610.4	227.5	-39.9	11.8	0.81	-0.53	-2.00	
2,732.0	18.60	347.70	2,700.6	256.4	-46.5	11.8	0.93	0.84	1.26	
2,827.0	18.20	347.00	2,790.8	285.7	-53.1	11.9	0.48	-0.42	-0.74	
2,922.0	16.90	346.00	2,881.4	313.5	-59.8	11.6	1.40	-1.37	-1.05	
3,016.0	17.50	346.30	2,971.2	340.5	-66.4	11.2	0.65	0.64	0.32	
3,111.0	17.30	343.80	3,061.8	367.9	-73.7	10.2	0.81	-0.21	-2.63	
3,206.0	17.00	345.80	3,152.6	395.0	-81.1	9.0	0.70	-0.32	2.11	
3,301.0	16.40	345.80	3,243.6	421.4	-87.8	8.4	0.63	-0.63	0.00	
3,396.0	16.30	351.10	3,334.7	447.6	-93.1	9.0	1.57	-0.11	5.58	
3,491.0	15.60	353.00	3,426.1	473.5	-96.8	11.2	0.92	-0.74	2.00	
3,586.0	15.10	352.80	3,517.7	498.4	-99.9	13.8	0.53	-0.53	-0.21	
3,681.0	14.70	351.60	3,609.5	522.6	-103.2	15.9	0.53	-0.42	-1.26	
3,776.0	16.20	359.10	3,701.1	547.8	-105.1	19.6	2.63	1.58	7.89	
3,871.0	18.50	3.40	3,791.8	576.1	-104.5	26.6	2.77	2.42	4.53	
3,966.0	20.60	353.00	3,881.3	607.7	-105.6	32.6	4.27	2.21	-10.95	
4,060.0	21.00	348.80	3,969.2	640.7	-110.9	34.7	1.64	0.43	-4.47	
4,155.0	19.70	343.30	4,058.3	672.7	-118.8	34.2	2.43	-1.37	-5.79	
4,250.0	18.60	341.70	4,148.0	702.4	-128.2	31.7	1.28	-1.16	-1.68	
4,345.0	18.20	352.50	4,238.2	731.5	-134.9	31.6	3.61	-0.42	11.37	
4,440.0	16.90	346.30	4,328.8	759.7	-140.1	32.8	2.40	-1.37	-6.53	
4,535.0	15.60	348.20	4,420.0	785.6	-145.9	32.9	1.48	-1.37	2.00	
4,629.0	14.90	344.20	4,510.6	809.6	-151.8	32.5	1.34	-0.74	-4.26	
4,724.0	14.20	341.70	4,602.6	832.4	-158.8	30.8	0.99	-0.74	-2.63	
4,819.0	12.90	340.20	4,695.0	853.5	-166.1	28.4	1.42	-1.37	-1.58	
4,914.0	11.00	336.10	4,787.9	871.7	-173.3	25.4	2.19	-2.00	-4.32	
4,992.0	9.70	336.50	4,864.6	884.5	-179.0	22.8	1.67	-1.67	0.51	
5,087.0	7.90	333.50	4,958.5	897.7	-185.1	19.8	1.95	-1.89	-3.16	
5,182.0	6.50	337.30	5,052.8	908.5	-190.0	17.3	1.56	-1.47	4.00	
5,277.0	5.50	347.50	5,147.2	917.9	-193.1	16.4	1.53	-1.05	10.74	
5,372.0	4.20	351.90	5,241.9	925.8	-194.6	16.7	1.42	-1.37	4.63	
5,466.0	2.70	9.20	5,335.7	931.4	-194.7	17.9	1.93	-1.60	18.40	
5,561.0	2.30	0.50	5,430.6	935.5	-194.3	19.1	0.58	-0.42	-9.16	
5,656.0	1.80	36.20	5,525.6	938.6	-193.4	20.7	1.41	-0.53	37.58	
5,751.0	2.90	34.50	5,620.5	941.8	-191.2	23.6	1.16	1.16	-1.79	
5,846.0	1.30	24.10	5,715.4	944.8	-189.4	26.0	1.72	-1.68	-10.95	
5,941.0	1.10	49.40	5,810.4	946.4	-188.3	27.5	0.59	-0.21	26.63	
6,036.0	1.50	38.90	5,905.4	947.9	-186.8	29.3	0.49	0.42	-11.05	
6,130.0	1.50	39.70	5,999.3	949.8	-185.2	31.2	0.02	0.00	0.85	
6,224.0	1.40	32.50	6,093.3	951.8	-183.8	33.0	0.22	-0.11	-7.66	
6,319.0	8.70	77.00	6,187.9	954.4	-176.2	41.0	8.17	7.68	46.84	
6,414.0	13.90	78.40	6,281.0	958.3	-158.0	59.6	5.48	5.47	1.47	
6,509.0	21.70	79.10	6,371.4	963.9	-129.5	88.6	8.21	8.21	0.74	
6,604.0	28.30	82.10	6,457.5	970.3	-89.9	128.7	7.07	6.95	3.16	
6,699.0	36.70	86.90	6,537.5	975.0	-39.2	179.2	9.24	8.84	5.05	
6,794.0	37.20	87.00	6,613.4	978.0	17.8	235.4	0.53	0.53	0.11	
6,888.0	48.50	87.40	6,682.3	981.1	81.6	298.3	12.02	12.02	0.43	
6,983.0	54.90	88.60	6,741.1	983.7	156.1	371.4	6.81	6.74	1.26	

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<b>Well:</b>	Furrow Federal PC AB14-65HN	<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)
7,078.0	63.90	87.40	6,789.4	986.5	237.7	451.7	9.54	9.47	-1.26
7,173.0	69.50	88.30	6,827.0	989.8	324.8	537.4	5.96	5.89	0.95
7,220.0	72.50	89.30	6,842.3	990.7	369.3	580.9	6.69	6.38	2.13
7,267.0	76.90	89.80	6,854.7	991.1	414.6	625.1	9.42	9.36	1.06
7,321.0	81.90	90.40	6,864.6	991.0	467.6	676.8	9.32	9.26	1.11
7,371.0	85.00	90.40	6,870.3	990.6	517.3	725.2	6.20	6.20	0.00
7,390.0	84.80	87.90	6,872.0	990.9	536.2	743.7	13.15	-1.05	-13.16
7,474.3	89.24	88.70	6,876.4	993.4	620.3	826.2	5.35	5.26	0.95
<b>Furrow Federal PC AB14-65HN Landing Pt.</b>									
7,485.0	89.80	88.80	6,876.5	993.7	631.1	836.7	5.35	5.26	0.94
7,580.0	92.60	89.30	6,874.5	995.2	726.0	929.6	2.99	2.95	0.53
7,675.0	92.60	89.50	6,870.2	996.2	820.9	1,022.4	0.21	0.00	0.21
7,770.0	93.40	88.80	6,865.2	997.6	915.8	1,115.2	1.12	0.84	-0.74
7,865.0	90.80	88.80	6,861.7	999.6	1,010.7	1,208.1	2.74	-2.74	0.00
7,960.0	89.90	88.80	6,861.1	1,001.6	1,105.7	1,301.1	0.95	-0.95	0.00
8,054.0	88.30	88.80	6,862.6	1,003.6	1,199.6	1,393.2	1.70	-1.70	0.00
8,149.0	88.80	89.10	6,865.0	1,005.3	1,294.6	1,486.1	0.61	0.53	0.32
8,244.0	89.70	89.80	6,866.3	1,006.2	1,389.6	1,578.9	1.20	0.95	0.74
8,339.0	90.80	90.90	6,865.8	1,005.6	1,484.6	1,671.4	1.64	1.16	1.16
8,434.0	91.00	90.70	6,864.4	1,004.3	1,579.5	1,763.7	0.30	0.21	-0.21
8,529.0	91.00	90.70	6,862.7	1,003.2	1,674.5	1,856.0	0.00	0.00	0.00
8,624.0	90.10	90.40	6,861.8	1,002.2	1,769.5	1,948.4	1.00	-0.95	-0.32
8,718.0	88.30	90.20	6,863.1	1,001.8	1,863.5	2,039.9	1.93	-1.91	-0.21
8,813.0	90.00	90.50	6,864.5	1,001.2	1,958.5	2,132.4	1.82	1.79	0.32
8,908.0	90.00	89.50	6,864.5	1,001.2	2,053.5	2,225.0	1.05	0.00	-1.05
9,003.0	90.20	89.50	6,864.3	1,002.0	2,148.5	2,317.8	0.21	0.21	0.00
9,098.0	89.80	89.50	6,864.3	1,002.8	2,243.5	2,410.6	0.42	-0.42	0.00
9,193.0	88.40	89.30	6,865.8	1,003.8	2,338.4	2,503.4	1.49	-1.47	-0.21
9,288.0	88.80	90.40	6,868.2	1,004.1	2,433.4	2,596.0	1.23	0.42	1.16
9,383.0	91.80	90.40	6,867.7	1,003.4	2,528.4	2,688.5	3.16	3.16	0.00
9,478.0	91.40	90.50	6,865.0	1,002.7	2,623.4	2,780.9	0.43	-0.42	0.11
9,572.0	90.60	88.10	6,863.4	1,003.8	2,717.3	2,872.7	2.69	-0.85	-2.55
9,667.0	89.90	87.90	6,862.9	1,007.1	2,812.3	2,966.0	0.77	-0.74	-0.21
9,762.0	90.20	88.60	6,862.9	1,010.0	2,907.2	3,059.2	0.80	0.32	0.74
9,856.0	91.30	89.50	6,861.6	1,011.6	3,001.2	3,151.2	1.51	1.17	0.96
9,951.0	90.80	89.30	6,859.9	1,012.6	3,096.2	3,244.0	0.57	-0.53	-0.21
10,045.0	90.90	89.70	6,858.5	1,013.4	3,190.2	3,335.8	0.44	0.11	0.43
10,140.0	90.60	90.00	6,857.3	1,013.7	3,285.2	3,428.5	0.45	-0.32	0.32
10,235.0	90.00	89.00	6,856.8	1,014.5	3,380.1	3,521.3	1.23	-0.63	-1.05
10,330.0	89.30	89.00	6,857.3	1,016.1	3,475.1	3,614.2	0.74	-0.74	0.00
10,425.0	90.40	88.80	6,857.6	1,018.0	3,570.1	3,707.2	1.18	1.16	-0.21
10,520.0	89.80	89.70	6,857.4	1,019.2	3,665.1	3,800.1	1.14	-0.63	0.95
10,615.0	90.60	90.20	6,857.1	1,019.3	3,760.1	3,892.7	0.99	0.84	0.53
10,710.0	90.30	90.00	6,856.3	1,019.1	3,855.1	3,985.3	0.38	-0.32	-0.21
10,804.0	90.00	89.70	6,856.1	1,019.4	3,949.1	4,077.0	0.45	-0.32	-0.32
10,899.0	90.40	89.30	6,855.8	1,020.2	4,044.1	4,169.8	0.60	0.42	-0.42
10,994.0	91.10	89.00	6,854.5	1,021.6	4,139.1	4,262.7	0.80	0.74	-0.32
11,089.0	90.00	89.30	6,853.6	1,023.0	4,234.1	4,355.6	1.20	-1.16	0.32
11,183.0	90.50	89.00	6,853.2	1,024.4	4,328.0	4,447.5	0.62	0.53	-0.32
11,285.0	91.50	88.60	6,851.4	1,026.5	4,430.0	4,547.4	1.06	0.98	-0.39
11,341.0	91.50	88.60	6,850.0	1,027.9	4,486.0	4,602.2	0.00	0.00	0.00
<b>Furrow Federal PC AB14-65HN BHL 2640'FSL, 535'FEL</b>									

<b>Company:</b>	Noble Energy Inc.- Weld County, CO (Grid North)	<b>Local Co-ordinate Reference:</b>	Well Furrow Federal PC AB14-65HN
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<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 AB14-65HN	<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

Wellbore 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	6,849.6	1,026.2	4,486.7	1,453,243.72	3,275,306.24	40.573330	-104.508950
- survey misses target center by 1.9ft at 11341.0ft MD (6850.0 TVD, 1027.9 N, 4486.0 E)									
- Circle (radius 35.0)									
Furrow Federal PC AE	0.00	0.00	6,879.0	958.9	621.2	1,453,176.43	3,271,440.87	40.573263	-104.522866
- survey misses target center by 34.6ft at 7474.4ft MD (6876.4 TVD, 993.4 N, 620.5 E)									
- Circle (radius 35.0)									

Checked By: _____	Approved By: _____	Date: _____
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