

# Noble Energy

Weld County, CO (NAD 83)

Sec. 8-T6N-R62W (Wells Ranch 8 South PAD)

Wells Ranch AE08-64-1HN

MWD Survey

## Sperry Drilling Services

### Final Survey Report

05 January, 2013

Well Coordinates: 1,425,985.69 N, 3,318,387.09 E (40° 29' 49.52" N, 104° 21' 18.54" W)

Ground Level: 4,929.00 ft

Local Coordinate Origin: Centered on Well Wells Ranch AE08-64-1HN - Slot A

Viewing Datum: KB=30' @ 4959.00ft (H&P 321)

TVDs to System: N

North Reference: Grid

Unit System: API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 431

**HALLIBURTON**

## Design Report for Wells Ranch AE08-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
743.00	0.00	0.00	743.00	0.00	0.00	0.00	0.00
<b>Tie On To Surface Casing Assumed Vertical</b>							
819.00	1.07	326.56	819.00	0.59	-0.39	-0.30	1.41
<b>First MWD Survey</b>							
1,094.00	1.17	324.96	1,093.94	5.03	-3.42	-2.66	0.04
1,370.00	0.33	338.03	1,369.92	8.08	-5.33	-4.12	0.31
1,647.00	0.70	59.61	1,646.91	9.67	-4.17	-2.75	0.26
1,742.00	1.14	97.25	1,741.90	9.85	-2.73	-1.30	0.76
1,836.00	3.02	15.84	1,835.84	12.11	-1.13	0.61	3.26
1,931.00	3.50	354.41	1,930.69	17.41	-0.73	1.77	1.37
2,025.00	5.03	352.92	2,024.43	24.35	-1.52	1.98	1.63
2,119.00	7.03	344.08	2,117.91	33.97	-3.60	1.29	2.34
2,214.00	8.78	339.42	2,212.00	46.35	-7.75	-1.04	1.96
2,308.00	11.26	341.35	2,304.56	61.77	-13.20	-4.24	2.66
2,403.00	13.58	335.17	2,397.34	80.68	-20.86	-9.10	2.81
2,497.00	14.47	334.28	2,488.53	101.28	-30.59	-15.79	0.97
2,592.00	15.27	335.69	2,580.35	123.37	-40.89	-22.82	0.92
2,686.00	16.46	334.36	2,670.77	146.66	-51.74	-30.24	1.32
2,780.00	14.76	334.00	2,761.30	169.43	-62.76	-37.88	1.81
2,875.00	15.96	336.52	2,852.90	192.29	-73.27	-45.02	1.44
2,970.00	15.97	340.59	2,944.24	216.59	-82.81	-50.99	1.18
3,065.00	15.04	340.36	3,035.79	240.53	-91.30	-55.97	0.98
3,160.00	15.91	343.85	3,127.34	264.65	-99.06	-60.20	1.34
3,255.00	14.47	342.96	3,219.02	288.50	-106.16	-63.82	1.54
3,350.00	14.47	345.82	3,311.01	311.36	-112.55	-66.87	0.75
3,444.00	14.04	346.63	3,402.11	333.84	-118.06	-69.11	0.50
3,539.00	13.68	348.50	3,494.35	356.06	-122.97	-70.79	0.61
3,634.00	13.16	345.64	3,586.76	377.54	-127.89	-72.59	0.89
3,729.00	14.79	345.01	3,678.94	399.73	-133.71	-75.17	1.72
3,824.00	15.57	344.42	3,770.63	423.73	-140.27	-78.24	0.84
3,919.00	13.36	343.19	3,862.61	446.52	-146.87	-81.51	2.35
4,014.00	10.60	344.07	3,955.53	465.43	-152.45	-84.32	2.91
4,109.00	7.50	339.41	4,049.34	479.64	-157.03	-86.82	3.35
4,204.00	6.80	338.68	4,143.60	490.68	-161.25	-89.43	0.74
4,299.00	5.06	329.92	4,238.09	499.55	-165.40	-92.26	2.06
4,394.00	2.42	327.10	4,332.88	504.86	-168.59	-94.66	2.78
4,488.00	0.75	13.62	4,426.84	507.12	-169.52	-95.26	2.11
4,773.00	0.57	326.90	4,711.82	510.12	-169.85	-95.16	0.19
5,058.00	0.88	17.74	4,996.80	513.40	-169.96	-94.80	0.24
5,342.00	0.35	52.74	5,280.79	516.00	-168.61	-93.09	0.22
5,627.00	0.73	353.72	5,565.78	518.33	-168.11	-92.26	0.22
5,911.00	0.80	337.66	5,849.75	521.96	-169.06	-92.69	0.08
5,945.00	0.80	332.44	5,883.75	522.39	-169.26	-92.82	0.21
6,007.00	0.50	331.17	5,945.74	523.01	-169.59	-93.06	0.48
6,102.00	3.64	86.37	6,040.68	523.57	-166.78	-90.20	4.08
6,150.00	7.21	90.65	6,088.46	523.63	-162.25	-85.70	7.48
6,197.00	9.78	90.89	6,134.94	523.53	-155.31	-78.85	5.47
6,245.00	11.87	90.17	6,182.08	523.46	-146.29	-69.94	4.36
6,292.00	14.96	84.76	6,227.80	524.00	-135.42	-59.09	7.09

## Design Report for Wells Ranch AE08-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,340.00	19.45	84.21	6,273.64	525.37	-121.29	-44.91	9.36
6,387.00	24.31	85.63	6,317.24	526.90	-103.85	-27.43	10.40
6,435.00	29.74	87.40	6,359.98	528.19	-82.09	-5.71	11.43
6,481.00	34.06	90.65	6,399.03	528.56	-57.79	18.38	10.10
6,529.00	37.63	92.16	6,437.93	527.86	-29.70	46.09	7.66
6,576.00	42.00	91.82	6,474.02	526.82	0.37	75.70	9.31
6,624.00	47.70	90.14	6,508.04	526.26	34.20	109.10	12.13
6,671.00	52.69	88.47	6,538.12	526.72	70.29	144.89	10.96
6,719.00	56.56	88.95	6,565.90	527.60	109.41	183.73	8.10
6,766.00	58.11	89.78	6,591.27	528.03	148.97	222.95	3.62
6,814.00	60.22	90.52	6,615.87	527.92	190.19	263.72	4.59
6,861.00	62.86	90.91	6,638.27	527.40	231.50	304.54	5.67
6,909.00	67.14	90.80	6,658.55	526.75	274.99	347.49	8.92
6,956.00	71.34	88.51	6,675.21	527.03	318.92	391.01	10.03
7,004.00	75.45	87.99	6,688.92	528.44	364.89	436.70	8.62
7,051.00	78.83	89.99	6,699.38	529.24	410.69	482.15	8.30
7,085.00	81.20	90.86	6,705.28	528.99	444.17	515.25	7.41
7,167.00	85.81	95.83	6,714.56	524.22	525.46	595.02	8.24
7,214.00	86.39	95.95	6,717.75	519.41	572.10	640.50	1.26
7,262.00	86.79	92.64	6,720.61	515.83	619.88	687.27	6.93
7,309.00	87.72	88.91	6,722.86	515.19	666.81	733.63	8.16
7,404.00	89.48	87.11	6,725.18	518.49	761.72	828.03	2.65
7,499.00	91.88	87.12	6,724.05	523.28	856.58	922.61	2.53
7,594.00	90.52	86.72	6,722.06	528.39	951.42	1,017.20	1.49
7,689.00	89.32	86.64	6,722.20	533.89	1,046.26	1,111.85	1.27
7,783.00	93.98	86.77	6,719.49	539.28	1,140.04	1,205.44	4.96
7,878.00	91.91	86.48	6,714.61	544.88	1,234.74	1,299.97	2.20
7,973.00	89.48	86.78	6,713.46	550.47	1,329.57	1,394.62	2.58
8,068.00	89.11	87.01	6,714.63	555.61	1,424.42	1,489.23	0.46
8,163.00	88.43	86.71	6,716.67	560.81	1,519.25	1,583.84	0.78
8,258.00	88.99	86.63	6,718.81	566.32	1,614.07	1,678.46	0.60
8,353.00	90.40	86.69	6,719.31	571.86	1,708.90	1,773.12	1.49
8,448.00	91.20	87.05	6,717.98	577.05	1,803.75	1,867.73	0.92
8,542.00	93.05	88.10	6,714.50	581.03	1,897.60	1,961.18	2.26
8,637.00	93.76	89.34	6,708.86	583.14	1,992.40	2,055.32	1.50
8,732.00	95.89	92.81	6,700.86	581.38	2,087.03	2,148.72	4.28
8,827.00	91.73	96.13	6,694.55	573.98	2,181.50	2,241.16	5.60
8,921.00	89.78	92.82	6,693.31	566.65	2,275.18	2,332.83	4.09
9,016.00	88.65	90.98	6,694.61	563.49	2,370.12	2,426.34	2.27
9,111.00	87.56	89.51	6,697.76	563.08	2,465.06	2,520.25	1.92
9,205.00	87.47	86.26	6,701.83	566.54	2,558.90	2,613.61	3.46
9,300.00	86.14	86.40	6,707.13	572.61	2,653.55	2,708.16	1.41
9,395.00	87.66	84.96	6,712.26	579.75	2,748.14	2,802.80	2.21
9,490.00	90.80	85.74	6,713.54	587.45	2,842.80	2,897.59	3.41
9,584.00	91.08	84.83	6,712.00	595.18	2,936.47	2,991.40	1.01
9,679.00	91.76	86.46	6,709.64	602.39	3,031.17	3,086.15	1.86
9,774.00	90.71	87.11	6,707.60	607.71	3,125.99	3,180.77	1.30
9,869.00	90.43	89.78	6,706.65	610.29	3,220.94	3,275.11	2.82
9,964.00	90.37	89.71	6,705.99	610.72	3,315.94	3,369.19	0.10
10,059.00	88.46	86.64	6,706.96	613.75	3,410.87	3,463.58	3.81
10,154.00	84.41	86.44	6,712.86	619.47	3,505.49	3,558.05	4.27

## Design Report for Wells Ranch AE08-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
10,249.00	86.04	86.03	6,720.77	625.69	3,599.96	3,652.43	1.77
10,344.00	87.75	85.03	6,725.92	633.08	3,694.53	3,747.09	2.08
10,438.00	89.69	86.20	6,728.02	640.25	3,788.22	3,840.84	2.41
10,533.00	91.85	89.16	6,726.74	644.09	3,883.12	3,935.32	3.85
10,628.00	94.22	88.84	6,721.71	645.75	3,977.96	4,029.42	2.52
10,723.00	93.79	88.35	6,715.08	648.08	4,072.70	4,123.52	0.69
10,818.00	92.34	88.02	6,710.00	651.08	4,167.52	4,217.79	1.56
10,913.00	91.51	88.96	6,706.81	653.58	4,262.43	4,312.08	1.32
11,008.00	92.87	89.39	6,703.18	654.95	4,357.35	4,406.22	1.50
11,103.00	91.39	89.30	6,699.64	656.03	4,452.27	4,500.33	1.56
<b>Final MWD Survey</b>							
11,166.00	91.39	89.30	6,698.12	656.80	4,515.25	4,562.77	0.01
<b>Bit Projection - Estimated BHL 1654'FSL 536'FEL</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
743.00	743.00	0.00	0.00	Tie On To Surface Casing Assumed Vertical
819.00	819.00	0.59	-0.39	First MWD Survey
11,103.00	6,699.64	656.03	4,452.27	Final MWD Survey
11,166.00	6,698.12	656.80	4,515.25	Bit Projection
11,166.00	6,698.12	656.80	4,515.25	Estimated BHL 1654'FSL 536'FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Wells Ranch AE08-64-1HN_PlanA - Rev0_B HL Tgt	81.78	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
743.00	11,166.00	Sperry MWD Surveys	MWD

## Design Report for Wells Ranch AE08-64-1HN - MWD Survey

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Wells Ranch	0.00	0.00	-59.00	2,685.52	20.95	1,428,671.12	3,318,408.04	40° 30' 16.056 N	104° 21' 17.820 W
- actual wellpath misses target center by 2686.25ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				186.95	3,664.52	1,429,650.08	3,318,574.03		
Point 2				4,542.95	3,835.52	1,429,821.08	3,322,929.88		
Point 3				4,614.95	-519.48	1,425,466.22	3,323,001.88		
Point 4				260.95	-679.48	1,425,306.23	3,318,648.03		
Point 5				186.95	3,664.52	1,429,650.08	3,318,574.03		
Wells Ranch	0.00	0.00	6,710.66	652.62	4,516.87	1,426,638.29	3,322,903.80	40° 29' 55.392 N	104° 20' 19.968 W
- actual wellpath misses target center by 13.32ft at 11166.00ft MD (6698.12 TVD, 656.80 N, 4515.25 E)									
- Point									
Wells Ranch	0.00	0.00	-59.00	2,685.52	20.95	1,428,671.12	3,318,408.04	40° 30' 16.056 N	104° 21' 17.820 W
- actual wellpath misses target center by 2686.25ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-273.05	4,124.52	1,430,110.07	3,318,114.05		
Point 2				5,002.95	4,295.52	1,430,281.06	3,323,389.87		
Point 3				5,074.95	-979.48	1,425,006.24	3,323,461.86		
Point 4				-199.05	-1,139.48	1,424,846.25	3,318,188.04		
Point 5				-273.05	4,124.52	1,430,110.07	3,318,114.05		

## North Reference Sheet for Sec. 8-T6N-R62W (Wells Ranch 8 South PAD) - Wells Ranch AE08-64-1HN

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB=30' @ 4959.00ft (H&P 321). Northing and Easting are relative to Wells Ranch AE08-64-1HN - Slot A2

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996607

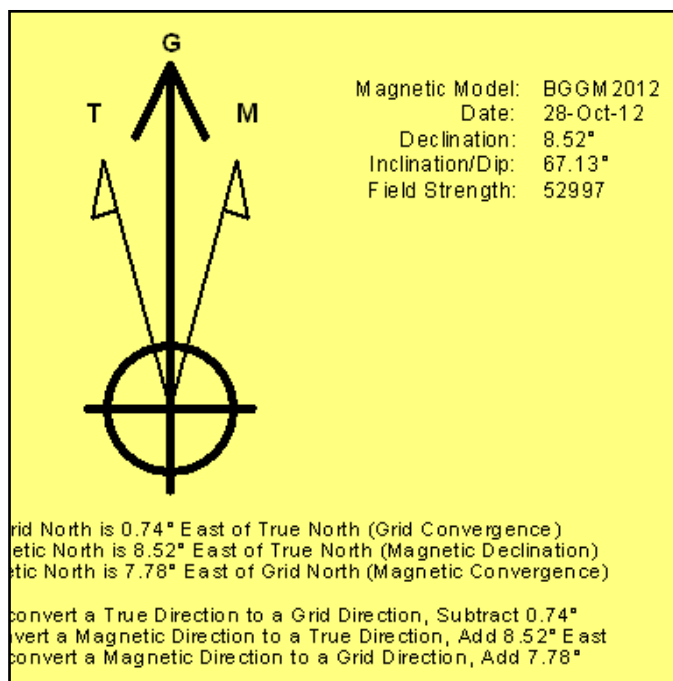
Grid Coordinates of Well: 1,425,985.69 ft N, 3,318,387.09 ft E

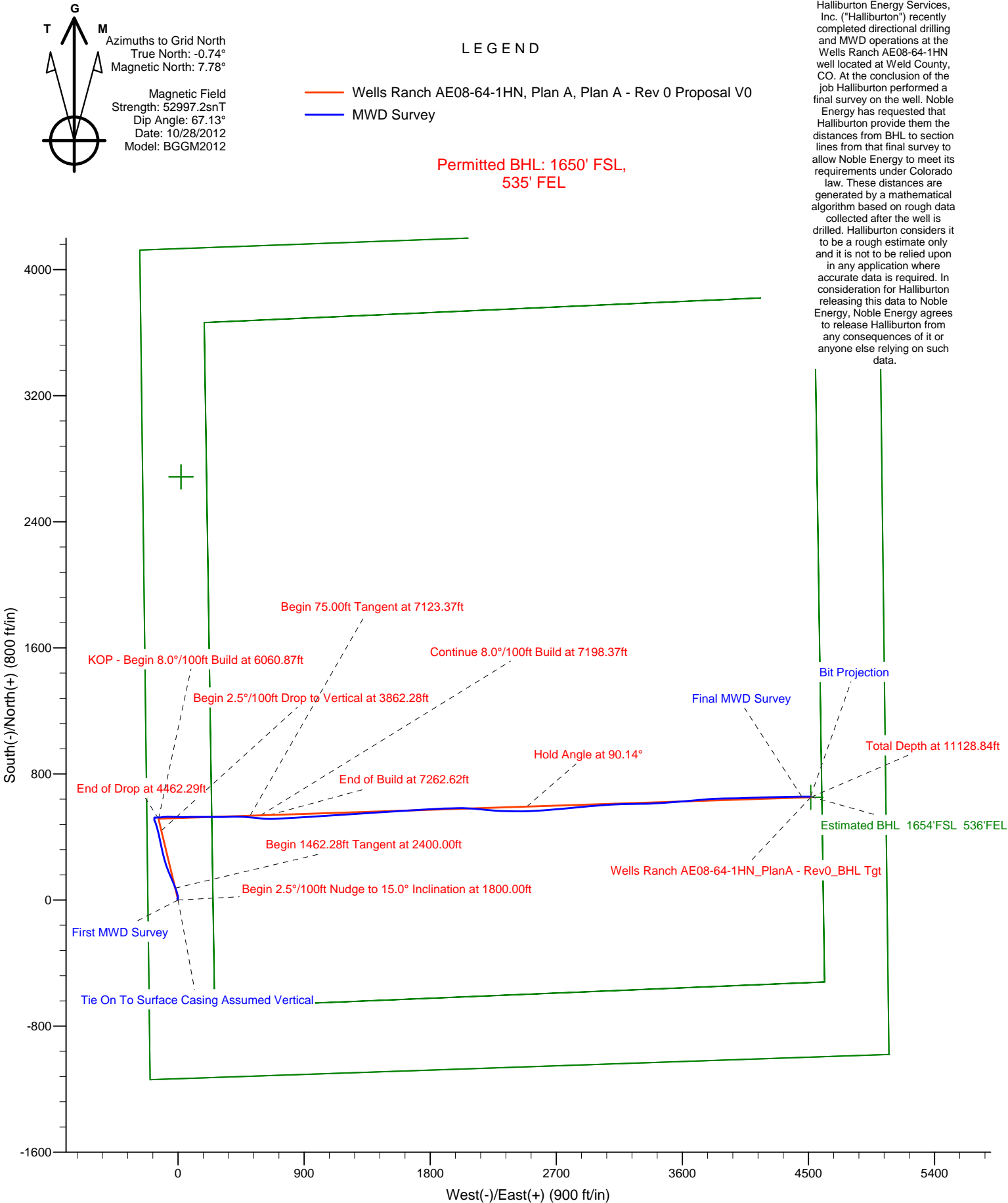
Geographical Coordinates of Well: 40° 29' 49.52" N, 104° 21' 18.54" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,166.00ft the Bottom Hole Displacement is 4,562.77ft in the Direction of 81.72° (Grid).

Magnetic Convergence at surface is: -7.78° (28 October 2012, , BGGM2012)





Project: Weld County, CO (NAD 83)  
Site: Sec. 8-T6N-R62W (Wells Ranch 8 South PAD)  
Well: Wells Ranch AE08-64-1HN

# Noble Energy



Azimuths to Grid North  
True North: -0.74°  
Magnetic North: 7.78°  
  
Magnetic Field  
Strength: 52997.2snT  
Dip Angle: 67.13°  
Date: 10/28/2012  
Model: BGGM2012

## LEGEND

- Wells Ranch AE08-64-1HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE08-64-1HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.

