

# Noble Energy

Weld County, CO (NAD 83)

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

Wells Ranch AE08-67-1HN

Design: MWD Survey

## Sperry Drilling Services

### Final Survey Report

23 May, 2013

Well Coordinates: 1,428,558.19 N, 3,318,409.49 E (40° 30' 14.94" N, 104° 21' 17.82" W)

Ground Level: 4,987.00 ft

Local Coordinate Origin: Centered on Well Wells Ranch AE08-67-1HN - Slot A

Viewing Datum: KB=30' @ 5017.00ft (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 AE08-67-1HN - 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
815.00	0.00	0.00	815.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 815.00 ft							
898.00	0.79	344.77	898.00	0.55	-0.15	-0.14	0.95
First MWD Survey							
1,174.00	1.17	8.62	1,173.96	5.16	-0.23	-0.16	0.20
1,450.00	1.11	5.42	1,449.90	10.61	0.45	0.58	0.03
1,735.00	0.96	356.30	1,734.86	15.75	0.56	0.75	0.08
2,019.00	0.68	341.83	2,018.83	19.73	-0.13	0.11	0.12
2,304.00	0.38	153.87	2,303.82	20.50	-0.24	0.01	0.37
2,399.00	0.22	106.24	2,398.82	20.17	0.07	0.31	0.29
2,494.00	2.83	231.09	2,493.78	18.65	-1.59	-1.36	3.12
2,589.00	4.72	235.91	2,588.57	14.98	-6.65	-6.47	2.02
2,684.00	6.06	250.42	2,683.16	11.11	-14.61	-14.48	2.00
2,779.00	9.24	251.35	2,777.30	6.99	-26.57	-26.48	3.36
2,874.00	10.77	252.21	2,870.85	1.84	-42.25	-42.23	1.62
2,969.00	12.30	250.22	2,963.93	-4.30	-60.23	-60.28	1.66
3,063.00	11.57	249.41	3,055.89	-11.00	-78.48	-78.61	0.80
3,158.00	13.06	248.71	3,148.70	-18.25	-97.41	-97.62	1.58
3,253.00	12.26	248.56	3,241.39	-25.84	-116.80	-117.10	0.85
3,348.00	10.79	247.71	3,334.48	-32.90	-134.41	-134.80	1.55
3,443.00	9.34	247.66	3,428.01	-39.20	-149.77	-150.24	1.53
3,538.00	7.53	248.83	3,521.98	-44.38	-162.71	-163.23	1.91
3,633.00	6.51	249.74	3,616.27	-48.49	-173.57	-174.15	1.08
3,728.00	6.14	250.45	3,710.69	-52.06	-183.41	-184.03	0.40
3,822.00	6.89	241.09	3,804.08	-56.47	-193.09	-193.76	1.38
3,917.00	4.85	229.14	3,898.58	-61.85	-201.11	-201.85	2.49
4,012.00	1.72	219.47	3,993.42	-65.58	-205.06	-205.84	3.33
4,107.00	1.76	219.67	4,088.37	-67.81	-206.90	-207.71	0.04
4,202.00	1.46	232.56	4,183.33	-69.67	-208.79	-209.62	0.50
4,297.00	0.87	259.41	4,278.32	-70.53	-210.46	-211.30	0.83
4,582.00	0.58	273.45	4,563.29	-70.84	-214.02	-214.86	0.12
4,676.00	0.13	268.76	4,657.29	-70.82	-214.60	-215.44	0.48
4,771.00	1.13	183.06	4,752.28	-71.75	-214.76	-215.61	1.19
4,866.00	1.54	171.23	4,847.26	-73.95	-214.61	-215.50	0.52
4,958.00	1.51	166.36	4,939.23	-76.36	-214.13	-215.05	0.15
5,148.00	1.87	162.48	5,129.14	-81.76	-212.61	-213.59	0.20
5,243.00	0.36	302.44	5,224.13	-83.07	-212.39	-213.39	2.27
5,528.00	0.89	325.20	5,509.11	-80.78	-214.41	-215.38	0.20
5,812.00	0.98	315.61	5,793.07	-77.24	-217.36	-218.29	0.06
6,002.00	1.33	324.78	5,983.03	-74.28	-219.77	-220.66	0.21
6,097.00	5.23	88.19	6,077.91	-73.24	-216.08	-216.96	6.38
6,145.00	10.97	96.32	6,125.41	-73.67	-209.35	-210.23	12.17
6,192.00	14.85	104.01	6,171.22	-75.62	-199.05	-199.96	9.01
6,240.00	18.20	104.53	6,217.23	-79.00	-185.82	-186.77	6.98
6,287.00	20.59	101.23	6,261.56	-82.45	-170.61	-171.60	5.59
6,335.00	23.48	94.47	6,306.06	-84.83	-152.79	-153.81	8.01
6,382.00	26.94	89.73	6,348.58	-85.51	-132.80	-133.83	8.51
6,430.00	30.20	90.13	6,390.73	-85.49	-109.85	-110.88	6.81
6,477.00	33.33	90.45	6,430.68	-85.61	-85.11	-86.15	6.68

## Design Report for Wells Ranch AE08-67-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,525.00	36.42	89.84	6,470.06	-85.68	-57.67	-58.71	6.46
6,571.00	39.69	89.23	6,506.27	-85.44	-29.32	-30.36	7.17
6,619.00	43.46	89.40	6,542.17	-85.06	2.53	1.49	7.86
6,666.00	48.46	87.75	6,574.84	-84.20	36.29	35.26	10.92
6,714.00	53.03	87.29	6,605.20	-82.59	73.41	72.40	9.55
6,761.00	56.80	88.12	6,632.22	-81.05	111.84	110.84	8.15
6,809.00	58.85	89.25	6,657.78	-80.13	152.45	151.46	4.72
6,856.00	60.61	89.06	6,681.47	-79.53	193.04	192.05	3.76
6,904.00	64.39	88.84	6,703.63	-78.75	235.60	234.62	7.89
6,951.00	69.57	88.55	6,722.00	-77.77	278.83	277.86	11.02
6,999.00	74.93	88.94	6,736.63	-76.77	324.51	323.55	11.21
7,046.00	78.55	88.91	6,747.41	-75.91	370.25	369.29	7.69
7,095.00	82.27	88.27	6,755.58	-74.72	418.54	417.60	7.71
7,149.00	84.84	87.36	6,761.64	-72.67	472.15	471.23	5.04
<b>Estimated 7" Casing Point: 1649' FNL, 743' FWL (Not a Survey Station)</b>							
7,166.00	85.64	87.07	6,763.05	-71.85	489.07	488.16	5.04
7,222.00	86.42	87.23	6,766.92	-69.07	544.87	543.99	1.42
7,317.00	88.55	88.33	6,771.09	-65.39	639.70	638.85	2.52
7,412.00	89.01	89.00	6,773.10	-63.18	734.65	733.83	0.86
7,507.00	90.03	87.72	6,773.90	-60.46	829.61	828.81	1.73
7,602.00	89.41	87.24	6,774.36	-56.28	924.51	923.76	0.82
7,697.00	89.69	88.12	6,775.10	-52.44	1,019.43	1,018.72	0.97
7,792.00	87.44	84.89	6,777.47	-46.65	1,114.21	1,113.55	4.14
7,887.00	90.86	86.70	6,778.88	-39.69	1,208.92	1,208.35	4.08
7,981.00	91.70	89.96	6,776.78	-36.95	1,302.84	1,302.30	3.57
8,076.00	92.13	89.50	6,773.60	-36.50	1,397.79	1,397.24	0.66
8,171.00	91.26	88.74	6,770.79	-35.05	1,492.74	1,492.20	1.21
8,266.00	89.04	88.40	6,770.54	-32.68	1,587.70	1,587.18	2.36
8,361.00	89.48	87.11	6,771.77	-28.96	1,682.62	1,682.14	1.42
8,456.00	90.09	88.66	6,772.12	-25.45	1,777.55	1,777.11	1.75
8,551.00	90.93	88.64	6,771.28	-23.21	1,872.52	1,872.09	0.88
8,646.00	90.65	89.03	6,769.97	-21.28	1,967.49	1,967.08	0.50
8,740.00	89.04	89.49	6,770.23	-20.06	2,061.48	2,061.08	1.78
8,835.00	90.06	88.66	6,770.97	-18.52	2,156.46	2,156.07	1.38
8,930.00	89.88	90.09	6,771.02	-17.48	2,251.45	2,251.07	1.52
9,025.00	90.37	88.70	6,770.82	-16.48	2,346.44	2,346.07	1.55
9,120.00	90.40	89.39	6,770.18	-14.90	2,441.43	2,441.06	0.72
9,215.00	91.02	88.30	6,769.00	-12.99	2,536.40	2,536.05	1.31
9,310.00	87.19	87.87	6,770.49	-9.82	2,631.32	2,631.00	4.05
9,405.00	90.09	88.30	6,772.74	-6.65	2,726.23	2,725.94	3.09
9,499.00	89.78	85.86	6,772.85	-1.86	2,820.10	2,819.86	2.62
9,594.00	90.22	88.58	6,772.85	2.74	2,914.98	2,914.79	2.90
9,689.00	89.08	86.67	6,773.43	6.68	3,009.89	3,009.74	2.35
9,784.00	90.86	87.05	6,773.49	11.88	3,104.74	3,104.65	1.92
9,879.00	91.14	87.74	6,771.83	16.20	3,199.63	3,199.59	0.78
9,974.00	90.12	88.14	6,770.78	19.61	3,294.56	3,294.55	1.15
10,069.00	90.83	88.86	6,769.98	22.10	3,389.52	3,389.54	1.06
10,163.00	90.40	90.00	6,768.97	23.04	3,483.51	3,483.53	1.29
10,258.00	89.97	90.24	6,768.67	22.84	3,578.51	3,578.52	0.52
10,353.00	91.39	89.64	6,767.54	22.94	3,673.50	3,673.50	1.63
10,448.00	91.05	88.00	6,765.52	24.90	3,768.45	3,768.48	1.76

## Design Report for Wells Ranch AE08-67-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
10,543.00	90.31	88.36	6,764.40	27.91	3,863.40	3,863.45	0.87
10,638.00	89.75	89.38	6,764.34	29.79	3,958.38	3,958.45	1.22
10,733.00	88.79	87.61	6,765.55	32.28	4,053.33	4,053.42	2.11
10,828.00	89.91	87.94	6,766.62	35.97	4,148.25	4,148.38	1.22
10,923.00	88.46	87.86	6,767.98	39.45	4,243.18	4,243.34	1.53
11,017.00	89.91	87.79	6,769.32	43.02	4,337.10	4,337.30	1.54
11,086.00	90.93	89.07	6,768.82	44.92	4,406.07	4,406.29	2.37
<b>Final MWD Survey</b>							
11,148.00	90.93	89.07	6,767.81	45.93	4,468.05	4,468.28	0.01
<b>Estimated BHL: 1658.54 FNL, 535.54 FEL - Survey Projection to TD</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
815.00	815.00	0.00	0.00	Surface Casing Assumed Vertical at 815.00 ft
898.00	898.00	0.55	-0.15	First MWD Survey
7,149.00	6,761.64	-72.67	472.15	Estimated 7" Casing Point: 1649' FNL, 743' FWL (Not a Survey Station)
11,086.00	6,768.82	44.92	4,406.07	Final MWD Survey
11,148.00	6,767.81	45.93	4,468.05	Estimated BHL: 1658.54 FNL, 535.54 FEL
11,148.00	6,767.81	45.93	4,468.05	Survey Projection to TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Wells Ranch AE08-67-1HN_PlanB - Rev0_B HL Tgt	89.30	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
815.00	11,148.00	MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,149.00	6,761.64	7" Csg	7	8-3/4

## Design Report for Wells Ranch AE08-67-1HN - 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	6,764.40	54.47	4,468.61	1,428,612.66	3,322,877.95	40.504140	-104.338880
- actual wellpath misses target center by 9.21ft at 11148.00ft MD (6767.81 TVD, 45.93 N, 4468.05 E)									
- Point									
Wells Ranch	0.00	0.00	-1.00	112.93	-1.45	1,428,671.12	3,318,408.04	40.504460	-104.354950
- actual wellpath misses target center by 112.94ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				164.55	1,091.93	1,429,650.08	3,318,574.03		
Point 2				4,520.55	1,262.93	1,429,821.08	3,322,929.88		
Point 3				4,592.55	-3,092.07	1,425,466.22	3,323,001.88		
Point 4				238.55	-3,252.07	1,425,306.23	3,318,648.03		
Point 5				164.55	1,091.93	1,429,650.08	3,318,574.03		
Wells Ranch	0.00	0.00	-1.00	112.93	-1.45	1,428,671.12	3,318,408.04	40.504460	-104.354950
- actual wellpath misses target center by 112.94ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-295.45	1,551.93	1,430,110.07	3,318,114.05		
Point 2				4,980.55	1,722.93	1,430,281.06	3,323,389.87		
Point 3				5,052.55	-3,552.07	1,425,006.24	3,323,461.87		
Point 4				-221.45	-3,712.07	1,424,846.24	3,318,188.04		
Point 5				-295.45	1,551.93	1,430,110.07	3,318,114.05		

# North Reference Sheet for Sec. 8-T6N-R62W (Wells Ranch 8 North PAD) - Wells Ranch AE08-67-1HN

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' @ 5017.00ft (H&P 321). Northing and Easting are relative to Wells Ranch AE08-67-1HN - Slot A4

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 -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996660

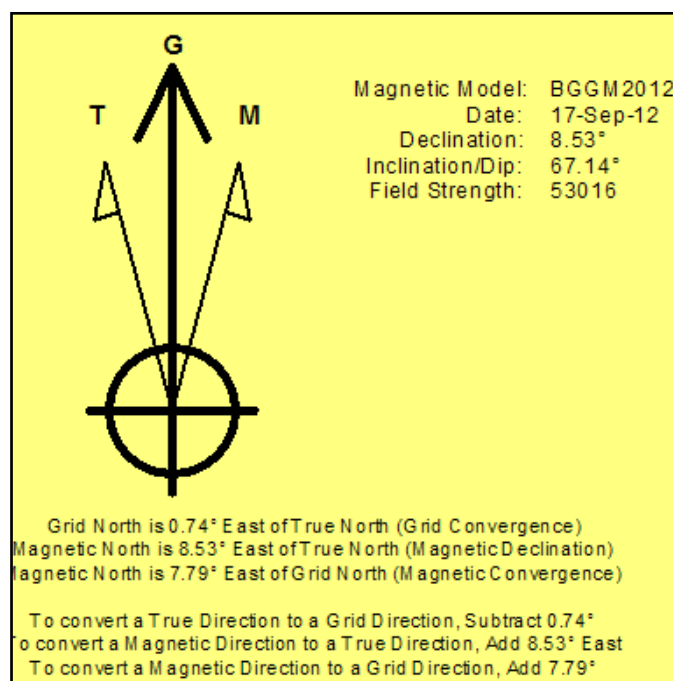
Grid Coordinates of Well: 1,428,558.19 ft N, 3,318,409.49 ft E

Geographical Coordinates of Well: 40° 30' 14.94" N, 104° 21' 17.82" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,148.00ft the Bottom Hole Displacement is 4,468.29ft in the Direction of 89.41° (Grid).

Magnetic Convergence at surface is: -7.79° (17 September 2012, , BGGM2012)

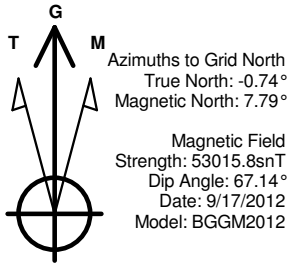


Project: Weld County, CO (NAD 83)  
Site: Sec. 8-T6N-R62W (Wells Ranch 8 North PAD)  
Well: Wells Ranch AE08-67-1HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling

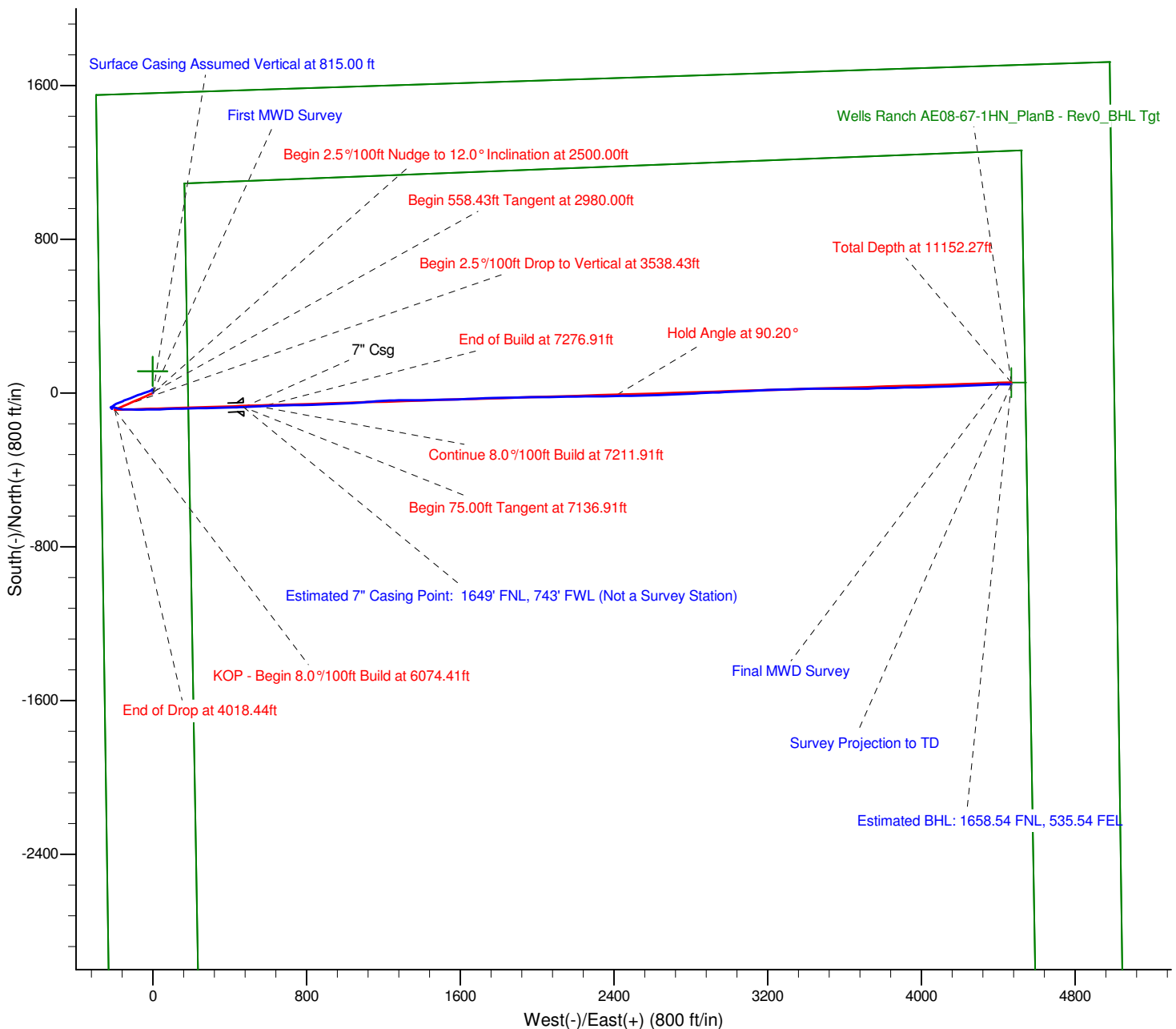


## LEGEND

- Wells Ranch AE08-67-1HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE08-67-1HN 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.

Permitted BHL: 1650' FNL, 535' FEL

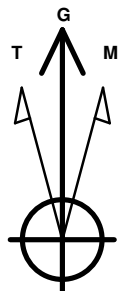


Project: Weld County, CO (NAD 83)  
Site: Sec. 8-T6N-R62W (Wells Ranch 8 North PAD)  
Well: Wells Ranch AE08-67-1HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling



Azimuths to Grid North  
True North:  $-0.74^\circ$   
Magnetic North:  $7.79^\circ$

Magnetic Field  
Strength: 53015.8snT  
Dip Angle:  $67.14^\circ$   
Date: 9/17/2012  
Model: BGGM2012

## LEGEND

- Wells Ranch AE08-67-1HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Survey

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