

# Noble Energy

Weld County, CO (NAD 83)

Sec. 10-T5N-R62W

Bronco State AF10-64-1HN

Design: MWD Survey

## Sperry Drilling Services

### Final Survey Report

10 June, 2013

Well Coordinates: 1,395,127.59 N, 3,333,893.32 E (40° 24' 42.59" N, 104° 18' 03.24" W)

Ground Level: 4,646.00 ft

Local Coordinate Origin:

Centered on Well Bronco State AF10-64-1HN

Viewing Datum:

KB=24' @ 4670.00ft (H&P 343)

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 Bronco State AF10-64-1HN - 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
587.00	0.00	0.00	587.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 587.00ft							
654.00	0.32	227.41	654.00	-0.13	-0.14	0.14	0.48
First MWD Survey							
717.00	0.18	272.43	717.00	-0.24	-0.37	0.37	0.37
810.00	0.65	202.62	810.00	-0.72	-0.71	0.73	0.66
904.00	0.86	198.42	903.99	-1.88	-1.14	1.18	0.23
997.00	0.70	199.28	996.98	-3.08	-1.55	1.61	0.17
1,089.00	0.70	201.33	1,088.97	-4.14	-1.94	2.03	0.03
1,183.00	0.50	227.62	1,182.97	-4.95	-2.45	2.56	0.36
1,276.00	0.60	218.77	1,275.96	-5.60	-3.06	3.17	0.14
1,460.00	0.61	220.60	1,459.95	-7.10	-4.30	4.44	0.01
1,555.00	0.50	183.16	1,554.95	-7.89	-4.65	4.81	0.39
1,650.00	0.37	176.32	1,649.95	-8.61	-4.65	4.83	0.15
1,745.00	1.05	197.47	1,744.94	-9.75	-4.89	5.10	0.76
1,852.00	0.62	213.73	1,851.93	-11.17	-5.51	5.74	0.45
1,946.00	0.64	187.67	1,945.92	-12.11	-5.86	6.11	0.30
2,039.00	0.85	143.74	2,038.91	-13.18	-5.52	5.80	0.63
2,225.00	0.82	136.57	2,224.89	-15.26	-3.79	4.11	0.06
2,318.00	1.37	128.60	2,317.88	-16.44	-2.47	2.81	0.61
2,410.00	1.74	121.22	2,409.84	-17.85	-0.41	0.78	0.46
2,502.00	2.03	64.00	2,501.80	-17.86	2.25	-1.87	1.98
2,597.00	1.54	49.47	2,596.76	-16.29	4.73	-4.39	0.70
2,692.00	1.11	48.55	2,691.73	-14.85	6.39	-6.08	0.45
2,787.00	1.39	25.52	2,786.71	-13.20	7.57	-7.30	0.60
2,882.00	1.64	7.88	2,881.67	-10.81	8.26	-8.03	0.55
2,977.00	1.71	58.58	2,976.64	-8.73	9.65	-9.47	1.51
3,072.00	3.41	91.91	3,071.55	-8.08	13.69	-13.52	2.31
3,167.00	5.95	98.45	3,166.22	-8.90	21.38	-21.19	2.73
3,262.00	8.33	87.64	3,260.48	-9.34	33.13	-32.93	2.87
3,357.00	10.81	88.76	3,354.15	-8.87	48.92	-48.72	2.62
3,452.00	12.19	88.75	3,447.24	-8.45	67.85	-67.66	1.45
3,547.00	13.58	90.94	3,539.85	-8.42	89.03	-88.84	1.55
3,642.00	14.51	90.95	3,632.01	-8.80	112.08	-111.88	0.98
3,737.00	11.84	79.02	3,724.52	-7.14	133.56	-133.38	4.00
3,832.00	8.30	74.61	3,818.04	-3.46	149.74	-149.64	3.81
3,927.00	6.01	76.05	3,912.29	-0.44	161.18	-161.14	2.42
4,022.00	2.66	84.05	4,007.01	0.98	168.20	-168.19	3.57
4,117.00	2.03	83.50	4,101.93	1.40	172.07	-172.06	0.66
4,212.00	0.48	32.33	4,196.91	1.93	173.95	-173.95	1.86
4,307.00	1.06	333.50	4,291.90	3.05	173.77	-173.80	0.96
4,402.00	1.26	332.27	4,386.88	4.76	172.89	-172.96	0.21
4,497.00	0.95	344.39	4,481.86	6.45	172.20	-172.29	0.41
4,592.00	0.98	358.95	4,576.85	8.02	171.97	-172.10	0.26
4,687.00	0.81	342.30	4,671.84	9.47	171.75	-171.91	0.33
4,782.00	1.00	353.15	4,766.82	10.93	171.45	-171.64	0.27
4,877.00	0.77	355.56	4,861.81	12.39	171.30	-171.52	0.25
4,972.00	0.47	16.61	4,956.81	13.40	171.36	-171.60	0.39
5,067.00	0.42	288.41	5,051.81	13.89	171.14	-171.39	0.65

## Design Report for Bronco State AF10-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,162.00	0.51	272.48	5,146.80	14.01	170.39	-170.64	0.16
5,256.00	0.34	194.89	5,240.80	13.76	169.90	-170.15	0.58
5,351.00	0.73	188.23	5,335.80	12.89	169.74	-169.97	0.42
5,446.00	1.16	195.13	5,430.78	11.36	169.40	-169.60	0.47
5,541.00	1.43	203.68	5,525.76	9.35	168.68	-168.83	0.35
5,589.00	3.41	248.33	5,573.72	8.27	167.11	-167.24	5.41
5,636.00	7.28	258.30	5,620.50	7.15	162.89	-163.01	8.44
5,684.00	9.49	263.45	5,667.99	6.09	155.98	-156.07	4.86
5,731.00	11.45	266.09	5,714.20	5.32	147.48	-147.56	4.29
5,779.00	14.36	263.91	5,760.99	4.37	136.80	-136.86	6.15
5,826.00	16.56	266.95	5,806.28	3.39	124.32	-124.36	4.99
5,921.00	20.24	272.41	5,896.42	3.36	94.37	-94.42	4.27
5,969.00	21.80	271.49	5,941.22	3.95	77.16	-77.23	3.32
6,016.00	24.13	271.18	5,984.50	4.37	58.83	-58.91	4.96
6,064.00	26.70	269.95	6,027.85	4.56	38.23	-38.32	5.47
6,111.00	29.86	269.31	6,069.23	4.41	15.97	-16.06	6.75
6,159.00	34.09	269.05	6,109.94	4.05	-9.44	9.36	8.82
6,206.00	38.82	269.00	6,147.73	3.57	-37.36	37.27	10.06
6,254.00	40.87	271.19	6,184.59	3.63	-68.11	68.01	5.17
6,301.00	45.45	271.01	6,218.86	4.25	-100.24	100.13	9.75
6,349.00	51.86	271.25	6,250.55	4.96	-136.25	136.12	13.36
6,396.00	57.71	270.27	6,277.64	5.46	-174.63	174.48	12.56
6,444.00	64.12	267.75	6,300.97	4.71	-216.54	216.40	14.12
6,491.00	68.80	268.01	6,319.73	3.11	-259.59	259.47	9.97
6,539.00	73.22	268.90	6,335.35	1.90	-304.95	304.84	9.37
6,586.00	76.41	269.90	6,347.66	1.42	-350.30	350.19	7.09
6,634.00	79.81	270.65	6,357.55	1.65	-397.26	397.14	7.25
6,679.00	85.57	269.94	6,363.27	1.88	-441.88	441.74	12.90
6,727.00	87.16	269.55	6,366.31	1.67	-489.78	489.64	3.42
<b>Estimated 7" Casing Point: 1665' FSL, 740' FEL (Not a Survey Station)</b>							
6,803.00	89.69	268.94	6,368.40	0.67	-565.74	565.60	3.42
6,897.00	89.17	267.86	6,369.33	-1.96	-659.69	659.59	1.28
6,990.00	90.96	268.56	6,369.23	-4.86	-752.64	752.58	2.07
7,083.00	91.91	268.92	6,366.90	-6.91	-845.59	845.55	1.09
7,176.00	90.52	268.25	6,364.93	-9.20	-938.54	938.53	1.66
7,269.00	89.26	268.09	6,365.10	-12.17	-1,031.49	1,031.52	1.37
7,362.00	88.64	267.85	6,366.81	-15.47	-1,124.41	1,124.49	0.71
7,456.00	90.46	268.30	6,367.55	-18.62	-1,218.35	1,218.48	1.99
7,549.00	90.40	268.40	6,366.85	-21.30	-1,311.31	1,311.47	0.13
7,642.00	88.80	268.15	6,367.50	-24.10	-1,404.26	1,404.46	1.74
7,734.00	89.75	268.02	6,368.66	-27.17	-1,496.20	1,496.45	1.04
7,828.00	89.81	267.83	6,369.02	-30.58	-1,590.14	1,590.43	0.21
7,921.00	89.78	270.62	6,369.36	-31.84	-1,683.12	1,683.42	3.00
8,014.00	88.58	268.74	6,370.69	-32.36	-1,776.11	1,776.40	2.40
8,106.00	88.61	267.91	6,372.94	-35.04	-1,868.04	1,868.36	0.90
8,199.00	89.51	267.73	6,374.47	-38.58	-1,960.96	1,961.34	0.99
8,293.00	90.93	267.51	6,374.11	-42.48	-2,054.87	2,055.31	1.53
8,388.00	90.28	268.02	6,373.11	-46.19	-2,149.80	2,150.29	0.87
8,483.00	88.55	268.37	6,374.07	-49.18	-2,244.74	2,245.28	1.86
8,578.00	87.97	268.77	6,376.96	-51.55	-2,339.67	2,340.23	0.74
8,673.00	88.09	269.32	6,380.23	-53.13	-2,434.60	2,435.17	0.59

## Design Report for Bronco State AF10-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,768.00	88.49	269.27	6,383.06	-54.30	-2,529.55	2,530.13	0.42
8,863.00	91.08	269.69	6,383.42	-55.16	-2,624.53	2,625.11	2.76
8,958.00	90.74	270.11	6,381.91	-55.33	-2,719.52	2,720.08	0.57
9,053.00	89.48	269.06	6,381.73	-56.02	-2,814.52	2,815.07	1.73
9,148.00	89.75	268.36	6,382.36	-58.16	-2,909.49	2,910.07	0.79
9,243.00	90.71	267.88	6,381.98	-61.27	-3,004.44	3,005.06	1.13
9,338.00	90.12	267.18	6,381.29	-65.37	-3,099.34	3,100.03	0.96
9,433.00	89.01	268.52	6,382.02	-68.93	-3,194.27	3,195.01	1.83
9,528.00	89.51	268.12	6,383.24	-71.72	-3,289.22	3,290.00	0.67
9,623.00	90.06	267.50	6,383.60	-75.35	-3,384.15	3,384.99	0.87
9,718.00	90.15	268.12	6,383.42	-78.98	-3,479.08	3,479.97	0.66
9,812.00	89.38	269.06	6,383.81	-81.29	-3,573.05	3,573.97	1.29
9,908.00	89.97	268.53	6,384.36	-83.31	-3,669.03	3,669.96	0.83
10,003.00	90.74	268.76	6,383.77	-85.55	-3,764.00	3,764.96	0.85
10,097.00	90.80	269.37	6,382.50	-87.09	-3,857.98	3,858.95	0.65
10,192.00	89.11	269.66	6,382.58	-87.89	-3,952.97	3,953.94	1.80
10,287.00	88.52	268.27	6,384.54	-89.61	-4,047.93	4,048.92	1.59
10,382.00	89.51	268.12	6,386.18	-92.60	-4,142.87	4,143.90	1.05
10,477.00	89.38	266.87	6,387.10	-96.75	-4,237.77	4,238.87	1.32
10,572.00	88.74	265.73	6,388.65	-102.88	-4,332.56	4,333.76	1.38
10,640.00	89.29	265.43	6,389.82	-108.12	-4,400.34	4,401.64	0.92
<b>Final MWD Survey</b>							
10,705.00	89.29	265.43	6,390.63	-113.30	-4,465.13	4,466.52	0.00
<b>Survey Projection to TD - Estimated BHL: 1629' FSL, 536' FWL</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
587.00	587.00	0.00	0.00	Surface Casing Assumed Vertical at 587.00ft
654.00	654.00	-0.13	-0.14	First MWD Survey
6,727.00	6,366.31	1.67	-489.78	Estimated 7" Casing Point: 1665' FSL, 740' FEL (Not a Survey Station)
10,640.00	6,389.82	-108.12	-4,400.34	Final MWD Survey
10,705.00	6,390.63	-113.30	-4,465.13	Survey Projection to TD
10,705.00	6,390.63	-113.30	-4,465.13	Estimated BHL: 1629' FSL, 536' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Bronco State AF10-64-1HN_PlanA - Rev0_B HL Tgt	268.81	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
587.00	6,727.00	Sperry MWD Surveys	MWD
6,727.00	10,705.00	Sperry MWD Surveys	MWD

## Design Report for Bronco State AF10-64-1HN - MWD Survey

### Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
6,727.00	6,366.31	7" Csg	7	8-3/4

### 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
Bronco State	0.00	0.00	6,372.27	-92.78	-4,465.86	1,395,034.81	3,329,427.63	40.411740	-104.316940
- actual wellpath misses target center by 27.52ft at 10703.86ft MD (6390.61 TVD, -113.21 N, -4464.00 E)									
- Point									
Bronco State	0.00	0.00	0.00	0.00	0.00	1,395,127.59	3,333,893.32	40.411830	-104.300900
- actual wellpath hits target center									
- Polygon									
Point 1				-184.00	-1,187.00	1,393,940.64	3,333,709.32		
Point 2				-4,513.00	-1,297.00	1,393,830.64	3,329,380.49		
Point 3				-4,606.00	3,112.00	1,398,239.47	3,329,287.50		
Point 4				-265.00	3,233.00	1,398,360.46	3,333,628.33		
Point 5				-184.00	-1,187.00	1,393,940.64	3,333,709.32		
Bronco State	0.00	0.00	0.00	0.00	0.00	1,395,127.59	3,333,893.32	40.411830	-104.300900
- actual wellpath hits target center									
- Polygon									
Point 1				276.00	-1,647.00	1,393,480.65	3,334,169.30		
Point 2				-4,973.00	-1,757.00	1,393,370.66	3,328,920.51		
Point 3				-5,066.00	3,572.00	1,398,699.45	3,328,827.51		
Point 4				195.00	3,693.00	1,398,820.44	3,334,088.31		
Point 5				276.00	-1,647.00	1,393,480.65	3,334,169.30		

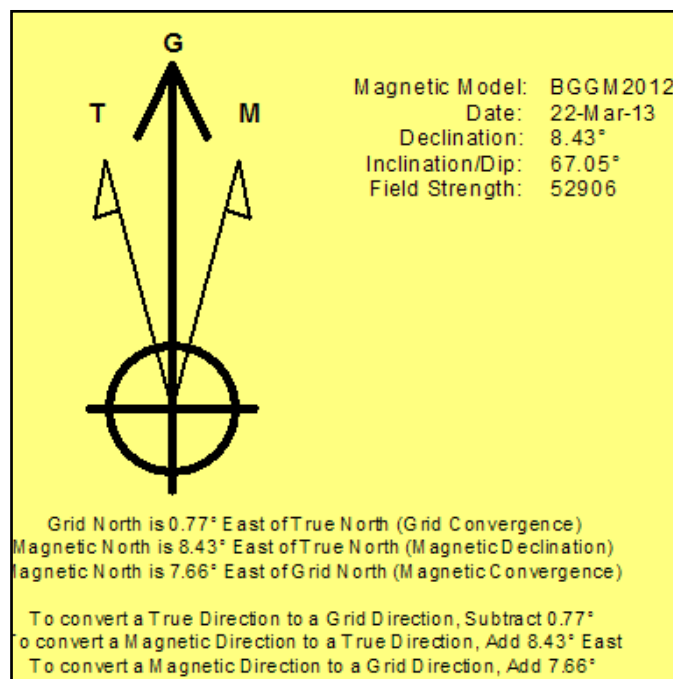
# North Reference Sheet for Sec. 10-T5N-R62W - Bronco State AF10-64-1HN

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.  
Vertical Depths are relative to KB=24' @ 4670.00ft (H&P 343). Northing and Easting are relative to Bronco State AF10-64-1HN  
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: 0.99996079

Grid Coordinates of Well: 1,395,127.59 ft N, 3,333,893.32 ft E  
Geographical Coordinates of Well: 40° 24' 42.59" N, 104° 18' 03.24" W  
Grid Convergence at Surface is: 0.77°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,705.00ft  
the Bottom Hole Displacement is 4,466.57ft in the Direction of 268.55° (Grid).

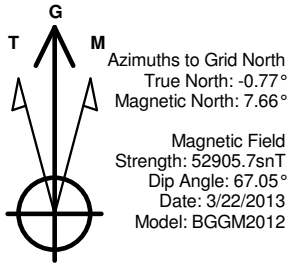
Magnetic Convergence at surface is: -7.66° (22 March 2013, , BGGM2012)



# Noble Energy

**HALLIBURTON**

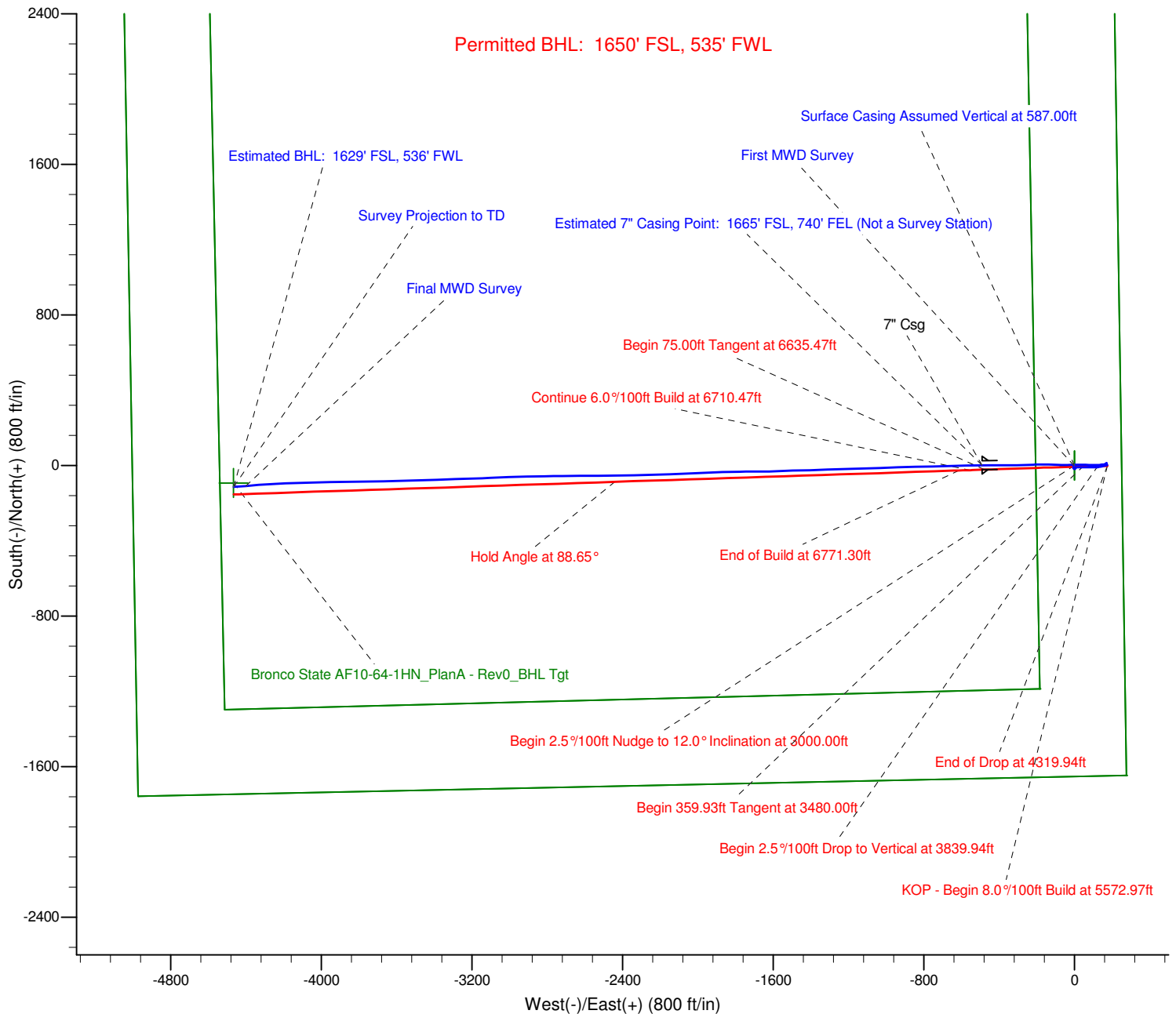
Sperry Drilling



## LEGEND

- Bronco State AF10-64-1HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Bronco State AF10-64-1HN 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.

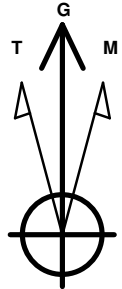


Project: Weld County, CO (NAD 83)  
Site: Sec. 10-T5N-R62W  
Well: Bronco State AF10-64-1HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling



Azimuths to Grid North  
True North:  $-0.77^\circ$   
Magnetic North:  $7.66^\circ$

Magnetic Field  
Strength: 52905.7snT  
Dip Angle:  $67.05^\circ$   
Date: 3/22/2013  
Model: BGGM2012

## LEGEND

- Bronco State AF10-64-1HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Bronco State AF10-64-1HN 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.

