

# Noble Energy

Weld County, CO (NAD 83)

Sec. 24-T6N-R63W (Wells Ranch 24 South PAD)

Wells Ranch AA24-64-1HN

MWD Survey

## Sperry Drilling Services

### Final Survey Report

05 January, 2013

Well Coordinates: 1,414,921.34 N, 3,307,803.10 E (40° 28' 01.52" N, 104° 23' 37.32" W)

Ground Level: 4,831.00 ft

Local Coordinate Origin: Centered on Well Wells Ranch AA24-64-1HN - Slot A

Viewing Datum: KB=24' @ 4855.00ft (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 Wells Ranch AA24-64-1HN - 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
628.00	0.00	0.00	628.00	0.00	0.00	0.00	0.00
Tie On To Surface Casing Assumed Vertical							
713.00	0.22	142.52	713.00	-0.13	0.10	0.07	0.26
First MWD Survey							
805.00	0.10	63.50	805.00	-0.23	0.28	0.23	0.24
897.00	0.10	217.96	897.00	-0.26	0.30	0.25	0.21
989.00	0.19	211.37	989.00	-0.45	0.17	0.09	0.10
1,084.00	0.36	221.86	1,084.00	-0.81	-0.11	-0.26	0.19
1,179.00	0.14	247.53	1,179.00	-1.08	-0.42	-0.61	0.25
1,273.00	0.14	265.37	1,273.00	-1.13	-0.64	-0.83	0.05
1,368.00	0.36	288.66	1,368.00	-1.05	-1.03	-1.21	0.25
1,463.00	0.12	234.23	1,463.00	-1.01	-1.40	-1.56	0.32
1,557.00	0.60	328.51	1,556.99	-0.65	-1.73	-1.82	0.66
1,652.00	0.48	333.46	1,651.99	0.13	-2.17	-2.11	0.14
1,747.00	0.35	348.64	1,746.99	0.77	-2.41	-2.22	0.18
1,842.00	0.19	340.71	1,841.99	1.21	-2.52	-2.25	0.17
1,936.00	0.10	220.18	1,935.99	1.29	-2.62	-2.34	0.27
2,035.00	0.22	91.93	2,034.99	1.22	-2.49	-2.22	0.30
2,129.00	0.31	166.05	2,128.98	0.97	-2.25	-2.03	0.35
2,224.00	0.85	168.31	2,223.98	0.03	-2.04	-2.00	0.57
2,319.00	0.99	138.14	2,318.97	-1.27	-1.35	-1.56	0.52
2,414.00	1.51	154.18	2,413.94	-3.01	-0.26	-0.80	0.65
2,509.00	1.25	156.10	2,508.92	-5.09	0.71	-0.24	0.28
2,604.00	1.29	152.22	2,603.89	-6.98	1.63	0.32	0.10
2,699.00	1.33	139.02	2,698.87	-8.76	2.85	1.20	0.32
2,794.00	1.22	136.39	2,793.85	-10.32	4.27	2.31	0.13
2,888.00	0.91	137.22	2,887.83	-11.59	5.47	3.25	0.33
2,983.00	1.80	264.62	2,982.81	-12.29	4.49	2.17	2.59
3,078.00	4.91	281.22	3,077.64	-11.64	-0.98	-3.10	3.40
3,172.00	5.34	320.72	3,171.29	-7.47	-7.70	-8.94	3.71
3,267.00	8.86	337.33	3,265.56	2.71	-13.32	-12.60	4.25
3,362.00	10.03	347.83	3,359.28	17.55	-17.88	-14.37	2.19
3,457.00	11.66	346.90	3,452.58	34.99	-21.80	-15.03	1.73
3,552.00	11.56	354.76	3,545.64	53.82	-24.85	-14.57	1.67
3,647.00	14.53	353.90	3,638.18	75.15	-26.99	-12.76	3.13
3,741.00	17.33	354.76	3,728.56	100.82	-29.52	-10.55	2.99
3,836.00	18.27	352.70	3,819.01	129.68	-32.70	-8.40	1.19
3,930.00	16.25	350.60	3,908.78	157.28	-36.72	-7.29	2.25
4,024.00	13.19	349.70	3,999.68	180.81	-40.79	-6.98	3.26
4,120.00	11.09	349.85	4,093.53	200.68	-44.38	-6.87	2.19
4,214.00	11.72	348.71	4,185.67	218.94	-47.84	-6.93	0.71
4,308.00	9.95	348.42	4,277.99	236.26	-51.34	-7.19	1.88
4,403.00	9.91	346.64	4,371.57	252.25	-54.87	-7.74	0.33
4,497.00	11.20	351.68	4,463.98	269.16	-58.06	-7.78	1.69
4,592.00	10.99	350.59	4,557.20	287.22	-60.88	-7.24	0.31
4,686.00	10.43	351.79	4,649.56	304.48	-63.56	-6.71	0.64
4,781.00	10.66	348.23	4,742.96	321.59	-66.58	-6.55	0.73
4,875.00	12.99	349.30	4,834.96	340.49	-70.32	-6.76	2.49
4,970.00	10.74	354.54	4,927.93	359.79	-73.14	-6.00	2.62

## Design Report for Wells Ranch AA24-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,064.00	11.70	351.43	5,020.13	377.94	-75.39	-4.89	1.21
5,159.00	14.45	347.90	5,112.66	399.06	-79.32	-4.88	3.01
5,253.00	9.50	345.93	5,204.59	418.06	-83.66	-5.67	5.28
5,347.00	10.34	343.74	5,297.18	433.68	-87.91	-6.99	0.98
5,442.00	11.44	342.72	5,390.47	450.86	-93.10	-8.94	1.18
5,536.00	12.06	349.06	5,482.50	469.41	-97.73	-10.10	1.52
5,631.00	12.15	351.39	5,575.39	489.04	-101.11	-9.82	0.52
5,726.00	12.67	347.00	5,668.17	509.07	-104.95	-9.93	1.13
5,820.00	13.17	347.62	5,759.79	529.58	-109.56	-10.71	0.55
5,915.00	9.82	346.88	5,852.87	548.04	-113.73	-11.42	3.53
6,010.00	10.92	350.48	5,946.32	564.81	-117.05	-11.62	1.34
6,057.00	12.16	350.33	5,992.37	574.08	-118.62	-11.46	2.64
6,104.00	16.40	348.94	6,037.91	585.48	-120.73	-11.44	9.05
6,151.00	20.89	352.32	6,082.43	600.30	-123.12	-11.08	9.82
6,199.00	24.43	358.01	6,126.72	618.71	-124.61	-9.17	8.67
6,246.00	28.04	6.70	6,168.89	639.41	-123.66	-4.45	11.20
6,294.00	30.11	15.72	6,210.86	662.22	-119.08	4.24	10.09
6,341.00	30.91	30.27	6,251.41	684.02	-109.78	17.36	15.78
6,388.00	30.62	44.82	6,291.85	702.96	-95.24	35.13	15.82
6,435.00	30.74	60.28	6,332.34	717.43	-76.34	56.36	16.75
6,483.00	33.31	73.00	6,373.07	727.38	-53.05	81.08	15.01
6,530.00	35.37	76.46	6,411.88	734.34	-27.48	107.49	6.04
6,578.00	37.55	76.49	6,450.49	741.01	0.25	135.97	4.54
6,625.00	41.06	77.16	6,486.85	747.79	29.23	165.71	7.52
6,673.00	45.66	79.18	6,521.74	754.52	61.48	198.65	10.01
6,720.00	49.54	80.80	6,553.43	760.53	95.66	233.34	8.64
6,767.00	55.65	83.10	6,581.97	765.73	132.61	270.62	13.57
6,814.00	62.77	84.95	6,606.01	769.91	172.74	310.84	15.52
6,861.00	67.64	84.35	6,625.72	773.89	215.20	353.31	10.43
6,908.00	71.20	84.28	6,642.23	778.24	258.98	397.15	7.58
6,955.00	72.62	85.61	6,656.83	782.18	303.48	441.62	4.05
7,002.00	75.50	86.89	6,669.74	785.13	348.57	486.49	6.66
7,050.00	77.74	87.23	6,680.84	787.53	395.21	532.77	4.72
7,106.00	80.86	87.03	6,691.24	790.28	450.16	587.29	5.58
7,205.00	91.94	87.84	6,697.45	794.69	548.71	684.99	11.22
7,299.00	90.62	90.72	6,695.35	795.87	642.66	777.57	3.37
7,393.00	90.46	90.29	6,694.46	795.04	736.66	869.82	0.49
7,488.00	87.87	88.84	6,695.84	795.76	831.63	963.32	3.12
7,536.00	88.19	88.69	6,697.49	796.80	879.59	1,010.66	0.74
7,583.00	91.33	88.25	6,697.69	798.05	926.57	1,057.07	6.75
7,677.00	88.95	87.41	6,697.46	801.61	1,020.49	1,150.06	2.68
7,771.00	88.09	87.77	6,699.89	805.56	1,114.38	1,243.08	0.99
7,866.00	88.77	87.37	6,702.49	809.59	1,209.26	1,337.09	0.83
7,914.00	91.48	87.66	6,702.39	811.67	1,257.21	1,384.61	5.68
7,961.00	92.65	87.44	6,700.69	813.68	1,304.13	1,431.11	2.53
8,056.00	93.18	89.57	6,695.86	816.15	1,398.97	1,524.80	2.31
8,150.00	91.32	90.33	6,692.17	816.24	1,492.89	1,617.15	2.14
8,244.00	89.75	89.40	6,691.29	816.46	1,586.89	1,709.59	1.94
8,339.00	88.77	87.85	6,692.52	818.74	1,681.85	1,803.36	1.93
8,434.00	89.01	87.67	6,694.36	822.45	1,776.76	1,897.34	0.32
8,529.00	93.05	88.83	6,692.65	825.35	1,871.68	1,991.19	4.42



## Design Report for Wells Ranch AA24-64-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,623.00	93.02	90.98	6,687.68	825.50	1,965.54	2,083.49	2.28
8,718.00	92.06	93.16	6,683.47	822.08	2,060.38	2,176.10	2.51
8,812.00	88.77	93.02	6,682.78	817.01	2,154.22	2,267.43	3.50
8,907.00	88.30	91.07	6,685.21	813.62	2,249.13	2,360.11	2.11
9,002.00	89.20	89.08	6,687.29	813.50	2,344.10	2,453.45	2.30
9,096.00	89.66	88.23	6,688.22	815.70	2,438.07	2,546.23	1.03
9,191.00	90.49	88.36	6,688.10	818.53	2,533.02	2,640.10	0.88
9,284.00	91.64	88.77	6,686.37	820.86	2,625.98	2,731.90	1.31
9,379.00	90.83	89.27	6,684.32	822.48	2,720.94	2,825.56	1.00
9,473.00	91.05	89.81	6,682.78	823.24	2,814.92	2,918.09	0.62
9,568.00	92.93	90.64	6,679.48	822.86	2,909.86	3,011.35	2.16
9,663.00	92.13	88.19	6,675.29	823.83	3,004.76	3,104.82	2.71
9,757.00	88.83	87.71	6,674.50	827.20	3,098.68	3,197.77	3.55
9,805.00	87.32	87.75	6,676.11	829.10	3,146.61	3,245.24	3.15
9,851.00	87.26	87.80	6,678.29	830.88	3,192.53	3,290.70	0.17
9,946.00	89.14	88.65	6,681.27	833.82	3,287.43	3,384.54	2.17
10,041.00	88.31	88.23	6,683.38	836.41	3,382.37	3,478.35	0.98
10,136.00	87.26	88.87	6,687.06	838.81	3,477.27	3,572.08	1.29
10,230.00	90.77	89.93	6,688.67	839.79	3,571.23	3,664.63	3.90
10,324.00	90.31	90.05	6,687.79	839.81	3,665.23	3,757.04	0.51
10,419.00	89.75	88.71	6,687.74	840.84	3,760.22	3,850.62	1.53
10,514.00	92.53	92.23	6,685.85	840.06	3,855.17	3,943.82	4.72
10,609.00	91.26	92.58	6,682.70	836.07	3,950.03	4,036.35	1.39
10,703.00	91.11	91.01	6,680.76	833.13	4,043.97	4,128.15	1.68
10,797.00	91.79	90.12	6,678.38	832.20	4,137.93	4,220.36	1.19
10,892.00	90.80	87.54	6,676.23	834.14	4,232.88	4,314.05	2.91
10,987.00	91.88	87.22	6,674.01	838.49	4,327.75	4,408.11	1.19
11,081.00	92.00	88.60	6,670.83	841.91	4,421.63	4,501.04	1.47
11,104.00	92.25	88.80	6,669.98	842.43	4,444.61	4,523.72	1.39
<b>Final MWD Survey</b>							
11,167.00	92.25	88.80	6,667.50	843.75	4,507.55	4,585.83	0.00
<b>Bit Projection - Estimated BHL 1653'FSL 535'FEL</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
628.00	628.00	0.00	0.00	Tie On To Surface Casing Assumed Vertical	
713.00	713.00	-0.13	0.10	First MWD Survey	
11,104.00	6,669.98	842.43	4,444.61	Final MWD Survey	
11,167.00	6,667.50	843.75	4,507.55	Bit Projection	
11,167.00	6,667.50	843.75	4,507.55	Estimated BHL 1653'FSL 535'FEL	

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/_S (ft)	+E/-W (ft)	Start TVD (ft)
Target	Wells Ranch AA24-64-1HN_PlanC - Rev0_ BHL Tgt	79.45	Slot	0.00	0.00	0.00

## Design Report for Wells Ranch AA24-64-1HN - MWD Survey

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
628.00	11,167.00	Sperry MWD Surveys from DD	MWD

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
Bob	0.00	0.00	36.00	3,335.42	133.67	1,418,256.64	3,307,936.76	40° 28' 34.464 N	104° 23' 35.052 W
- actual wellpath misses target center by 3338.10ft at 36.00ft MD (36.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-233.33	4,442.42	1,419,363.60	3,307,569.78		
Point 2				5,023.67	4,497.42	1,419,418.60	3,312,826.59		
Point 3				5,052.67	-803.58	1,414,117.79	3,312,855.59		
Point 4				-239.33	-859.58	1,414,061.79	3,307,563.78		
Point 5				-233.33	4,442.42	1,419,363.60	3,307,569.78		
Wells Ranch	89.44		6,703.00	801.71	622.90	1,415,723.02	3,308,425.98	40° 28' 9.369 N	104° 23' 29.132 W
- actual wellpath misses target center by 9.33ft at 7279.14ft MD (6695.61 TVD, 796.02 N, 622.81 E)									
- Rectangle (sides W70.00 H16.00 D3,885.86)									
Wells Ranch	0.00	0.00	6,000.00	595.16	-122.93	1,415,516.48	3,307,680.17	40° 28' 7.420 N	104° 23' 38.814 W
- actual wellpath misses target center by 19.31ft at 6069.70ft MD (6004.76 TVD, 576.84 N, -119.10 E)									
- Circle (radius 35.00)									
Bob	0.00	0.00	36.00	3,335.42	133.67	1,418,256.64	3,307,936.76	40° 28' 34.464 N	104° 23' 35.052 W
- actual wellpath misses target center by 3338.10ft at 36.00ft MD (36.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				226.67	3,982.42	1,418,903.62	3,308,029.76		
Point 2				4,563.67	4,037.42	1,418,958.62	3,312,366.61		
Point 3				4,592.67	-343.58	1,414,577.77	3,312,395.60		
Point 4				220.67	-399.58	1,414,521.78	3,308,023.76		
Point 5				226.67	3,982.42	1,418,903.62	3,308,029.76		
Wells Ranch	0.00	0.00	6,697.80	800.40	489.70	1,415,721.71	3,308,292.78	40° 28' 9.372 N	104° 23' 30.855 W
- actual wellpath misses target center by 8.35ft at 7146.35ft MD (6696.07 TVD, 792.24 N, 490.16 E)									
- Point									
Wells Ranch	0.00	0.00	6,669.09	840.01	4,508.42	1,415,761.32	3,312,311.36	40° 28' 9.264 N	104° 22' 38.856 W
- actual wellpath misses target center by 4.16ft at 11167.00ft MD (6667.50 TVD, 843.75 N, 4507.55 E)									
- Point									

## North Reference Sheet for Sec. 24-T6N-R63W (Wells Ranch 24 South PAD) - Wells Ranch AA24-64-1HN

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' @ 4855.00ft (H&P 343). Northing and Easting are relative to Wells Ranch AA24-64-1HN - Slot A5

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: 0.99996396

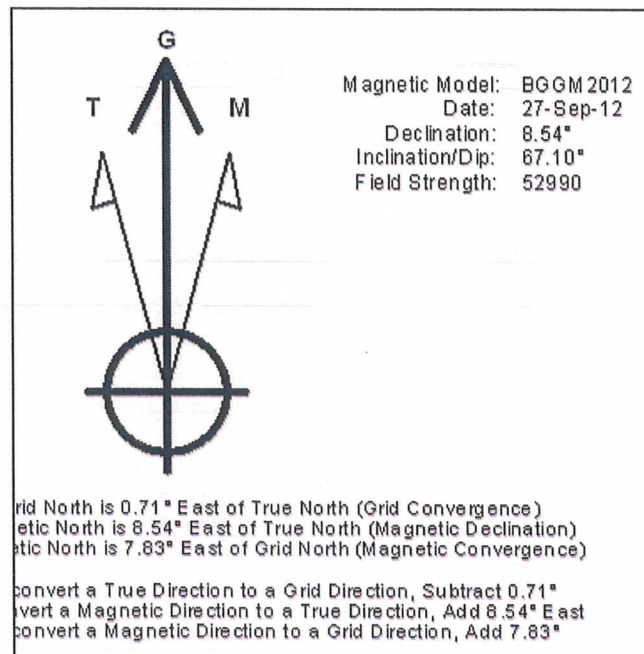
Grid Coordinates of Well: 1,414,921.34 ft N, 3,307,803.10 ft E

Geographical Coordinates of Well: 40° 28' 01.52" N, 104° 23' 37.32" W

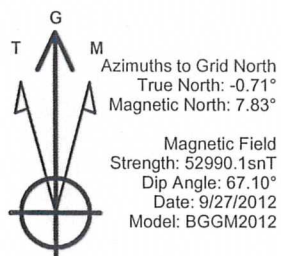
Grid Convergence at Surface is: 0.71°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,167.00ft  
the Bottom Hole Displacement is 4,585.84ft in the Direction of 79.40° (Grid).

Magnetic Convergence at surface is: -7.83° (27 September 2012, , BGGM2012)





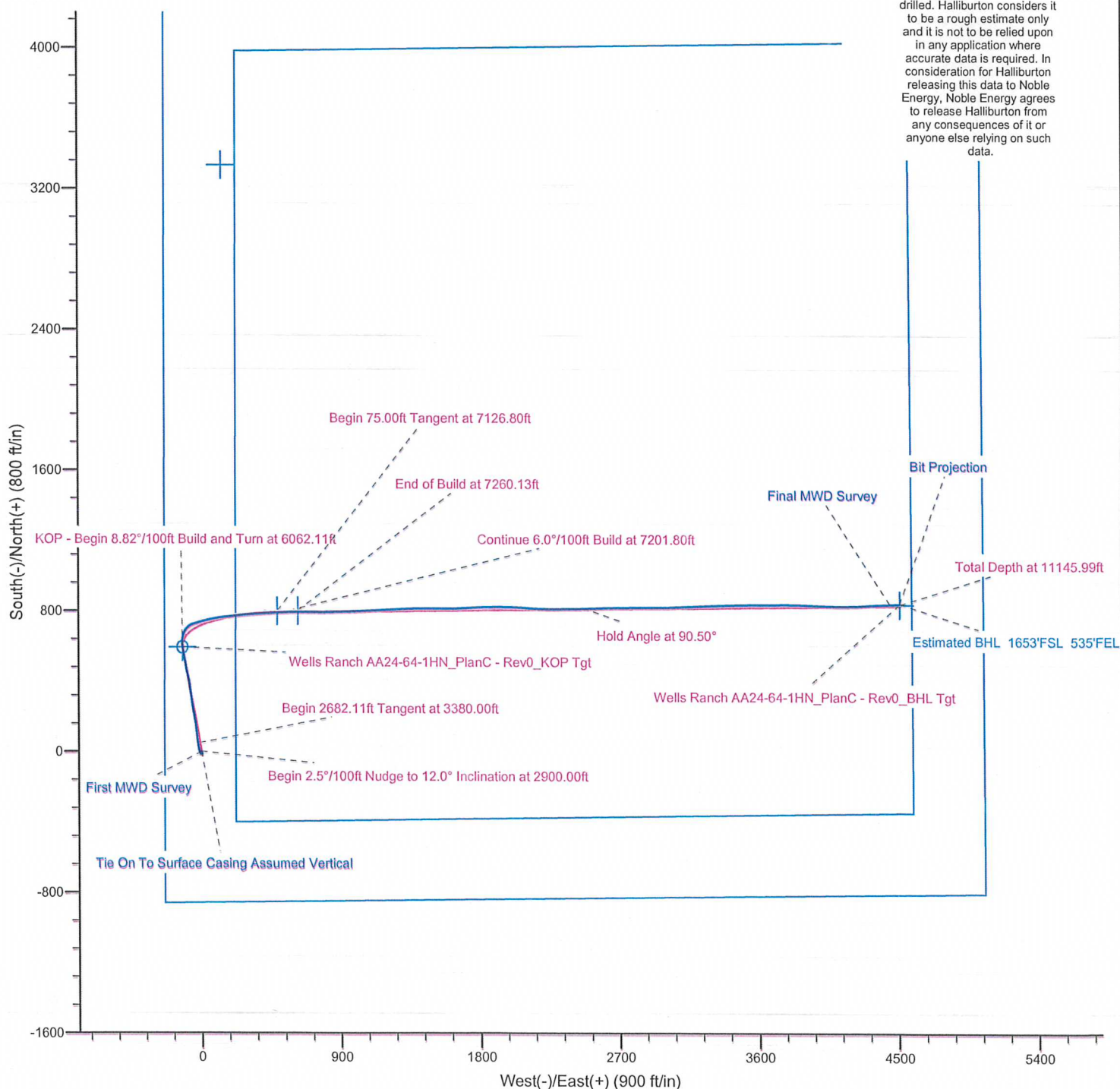


### LEGEND

- Wells Ranch AA24-64-1HN, Plan C, Plan C - Rev 0 Proposal V0
- MWD Survey

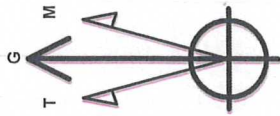
Permitted BHL: 1650' FSL,  
 535' FEL

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AA24-64-1HN 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. 24-T6N-R63W (Wells Ranch 24 South PAD)  
Well: Wells Ranch AA24-64-1HN

# Noble Energy



Azimuths to Grid North  
True North: -0.71°  
Magnetic North: 7.83°  
  
Magnetic Field  
Strength: 52990.1snT  
Dip Angle: 67.10°  
Date: 9/27/2012  
Model: BGGM2012

## LEGEND

- Wells Ranch AA24-64-1HN, Plan C, Plan C - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AA24-64-1HN 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.

