

# Noble Energy

Weld County, CO (NAD 83)

Sec. 6-T6N-R62W (Wells Ranch 5 Middle PAD)

Wells Ranch AE05-65-1HN

Design: Vaughn ESS and Sperry MWD Survey

## Sperry Drilling Services

### Final Survey Report

13 June, 2013

Well Coordinates: 1,433,525.93 N, 3,317,986.66 E (40° 31' 04.08" N, 104° 21' 22.46" W)

Ground Level: 4,948.00 ft

Local Coordinate Origin:

Centered on Well Wells Ranch AE05-65-1HN

Viewing Datum:

KB=30' @ 4978.00ft (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 AE05-65-1HN - Vaughn ESS and Sperry 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
270.00	0.30	31.67	270.00	0.60	0.37	0.24	0.11
Surveys from 270.00ft to 609.00ft are Vaughn ESS Surveys							
475.00	0.50	275.07	475.00	1.14	-0.24	-0.46	0.34
609.00	0.30	72.27	608.99	1.30	-0.49	-0.74	0.59
Tie-On to Vaughn ESS Survey							
671.00	0.46	203.16	670.99	1.12	-0.43	-0.65	1.12
First Sperry MWD Survey							
726.00	0.57	259.82	725.99	0.86	-0.78	-0.94	0.90
817.00	0.66	202.82	816.99	0.30	-1.43	-1.46	0.65
909.00	0.56	189.77	908.98	-0.63	-1.71	-1.55	0.19
1,002.00	1.46	221.70	1,001.97	-1.96	-2.58	-2.13	1.11
1,094.00	0.51	118.31	1,093.96	-3.03	-3.00	-2.33	1.80
1,186.00	0.68	124.51	1,185.95	-3.53	-2.19	-1.44	0.19
1,278.00	0.35	115.11	1,277.95	-3.96	-1.49	-0.66	0.36
1,370.00	0.71	104.81	1,369.94	-4.22	-0.68	0.18	0.40
1,462.00	1.36	107.26	1,461.93	-4.69	0.91	1.84	0.70
1,556.00	0.74	198.49	1,555.92	-5.60	1.79	2.87	1.66
1,651.00	1.83	223.67	1,650.89	-7.28	0.55	2.00	1.26
1,746.00	1.35	258.41	1,745.86	-8.60	-1.59	0.16	1.11
1,841.00	1.14	257.89	1,840.84	-9.02	-3.61	-1.73	0.22
1,936.00	0.94	254.46	1,935.82	-9.43	-5.29	-3.29	0.21
2,030.00	0.26	248.04	2,029.81	-9.72	-6.24	-4.16	0.73
2,125.00	2.71	169.16	2,124.78	-12.00	-6.02	-3.49	2.81
2,220.00	2.78	166.11	2,219.67	-16.45	-5.05	-1.64	0.17
2,315.00	4.86	172.09	2,314.45	-22.67	-3.94	0.69	2.22
2,410.00	7.38	158.79	2,408.91	-32.35	-1.18	5.34	3.03
2,505.00	9.17	161.35	2,502.91	-45.22	3.45	12.46	1.92
2,600.00	11.33	159.71	2,596.39	-61.15	9.11	21.20	2.30
2,694.00	14.00	167.61	2,688.10	-80.93	14.76	30.69	3.38
2,789.00	13.40	163.80	2,780.40	-102.72	20.29	40.49	1.14
2,884.00	12.20	162.73	2,873.04	-122.88	26.34	50.46	1.29
2,979.00	13.07	163.00	2,965.74	-142.73	32.46	60.44	0.92
3,074.00	12.96	170.15	3,058.30	-163.50	37.43	69.47	1.70
3,169.00	13.63	170.65	3,150.76	-185.05	41.07	77.36	0.72
3,263.00	12.61	175.37	3,242.30	-206.21	43.70	84.18	1.57
3,358.00	11.70	172.93	3,335.17	-226.10	45.72	90.16	1.11
3,453.00	12.23	178.88	3,428.11	-245.72	47.10	95.45	1.41
3,548.00	12.25	181.10	3,520.96	-265.85	47.11	99.49	0.50
3,643.00	13.41	171.50	3,613.59	-286.82	48.54	105.10	2.55
3,738.00	14.31	169.96	3,705.83	-309.27	52.22	113.21	1.02
3,832.00	15.98	162.36	3,796.57	-333.05	58.17	123.81	2.76
3,927.00	17.22	166.17	3,887.61	-359.17	65.50	136.23	1.74
4,022.00	16.32	168.89	3,978.57	-385.93	71.43	147.41	1.26
4,116.00	14.30	172.56	4,069.23	-410.39	75.48	156.29	2.38
4,211.00	11.02	175.26	4,161.91	-431.08	77.75	162.66	3.50
4,306.00	10.90	173.37	4,255.18	-449.06	79.54	168.02	0.40
4,400.00	9.44	171.97	4,347.70	-465.52	81.64	173.38	1.58
4,495.00	10.82	171.12	4,441.21	-482.04	84.11	179.11	1.46
4,590.00	10.15	173.76	4,534.63	-499.18	86.39	184.79	0.86

## Design Report for Wells Ranch AE05-65-1HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,685.00	11.51	165.65	4,627.94	-516.68	89.65	191.49	2.14
4,779.00	13.37	168.32	4,719.73	-536.41	94.18	199.89	2.07
4,874.00	12.93	169.64	4,812.24	-557.62	98.31	208.19	0.56
4,969.00	13.96	168.36	4,904.63	-579.30	102.53	216.68	1.12
5,064.00	12.67	166.94	4,997.08	-600.67	107.20	225.54	1.40
5,159.00	13.79	168.70	5,089.56	-621.93	111.77	234.29	1.26
5,254.00	13.47	168.81	5,181.88	-643.89	116.14	242.97	0.34
5,349.00	12.83	171.03	5,274.39	-665.17	119.93	250.95	0.86
5,443.00	13.43	170.51	5,365.93	-686.25	123.36	258.54	0.64
5,538.00	11.01	168.78	5,458.77	-706.03	126.94	266.02	2.57
5,633.00	11.74	173.24	5,551.90	-724.53	129.85	272.58	1.20
5,728.00	13.65	172.44	5,644.58	-745.24	132.46	279.29	2.02
5,822.00	12.91	170.08	5,736.06	-766.58	135.73	286.78	0.97
5,917.00	13.50	167.38	5,828.55	-787.86	139.98	295.21	0.90
6,012.00	14.11	168.51	5,920.81	-810.03	144.71	304.30	0.70
6,107.00	12.30	169.75	6,013.29	-831.34	148.82	312.60	1.93
6,131.00	11.35	171.78	6,036.78	-836.20	149.61	314.35	4.33
6,194.00	10.65	165.84	6,098.62	-847.98	151.93	318.97	2.11
6,201.00	10.83	166.43	6,105.50	-849.24	152.24	319.53	3.06
6,249.00	12.26	158.88	6,152.53	-858.38	155.13	324.20	4.32
6,296.00	17.96	139.86	6,197.91	-868.59	161.61	332.60	15.93
6,344.00	21.22	134.17	6,243.13	-880.30	172.62	345.73	7.86
6,391.00	23.72	137.41	6,286.57	-893.19	185.11	360.56	5.93
6,439.00	28.23	138.48	6,329.71	-908.81	199.18	377.47	9.44
6,485.00	33.33	136.30	6,369.22	-926.10	215.13	396.57	11.35
6,533.00	38.13	134.84	6,408.17	-946.09	234.76	419.81	10.16
6,580.00	42.05	137.19	6,444.12	-967.88	255.75	444.75	8.96
6,628.00	46.82	139.31	6,478.39	-992.96	278.10	471.67	10.39
6,675.00	52.46	135.85	6,508.82	-1,019.35	302.28	500.65	13.25
6,723.00	55.10	129.86	6,537.20	-1,045.64	330.66	533.74	11.47
6,769.00	54.08	121.80	6,563.88	-1,067.57	361.01	567.86	14.45
6,817.00	51.84	114.01	6,592.82	-1,085.51	394.80	604.57	13.76
6,864.00	52.93	107.65	6,621.52	-1,098.73	429.57	641.28	10.97
6,912.00	54.99	101.22	6,649.78	-1,108.36	467.13	680.01	11.65
6,959.00	58.40	94.45	6,675.61	-1,113.67	506.01	719.16	14.05
7,007.00	66.15	90.90	6,697.93	-1,115.60	548.41	761.09	17.42
7,054.00	74.29	88.84	6,713.82	-1,115.48	592.60	804.36	17.80
7,096.00	80.44	86.77	6,723.01	-1,113.90	633.53	844.14	15.41
7,150.00	83.29	86.60	6,730.65	-1,110.81	686.89	895.79	5.28
<b>Estimated 7" Casing Point: 2286' FSL, 600' FWL (Not a Survey Station)</b>							
7,180.00	84.87	86.50	6,733.74	-1,109.01	716.67	924.61	5.28
7,217.00	84.72	87.03	6,737.10	-1,106.93	753.46	960.23	1.47
7,265.00	86.12	88.47	6,740.94	-1,105.05	801.27	1,006.69	4.19
7,312.00	86.67	88.79	6,743.89	-1,103.93	848.16	1,052.41	1.35
7,406.00	90.09	90.82	6,746.55	-1,103.62	942.10	1,144.38	4.23
7,501.00	89.54	89.27	6,746.86	-1,103.69	1,037.10	1,237.46	1.73
7,595.00	90.09	89.36	6,747.16	-1,102.57	1,131.09	1,329.31	0.60
7,690.00	89.20	89.96	6,747.75	-1,102.00	1,226.09	1,422.26	1.13
7,785.00	89.91	90.32	6,748.49	-1,102.24	1,321.08	1,515.37	0.84
7,880.00	88.37	86.45	6,749.92	-1,099.56	1,416.01	1,607.84	4.39
7,975.00	90.71	85.54	6,750.69	-1,092.92	1,510.77	1,699.33	2.64

## Design Report for Wells Ranch AE05-65-1HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,070.00	90.89	84.89	6,749.36	-1,084.99	1,605.43	1,790.48	0.71
8,164.00	94.35	88.73	6,745.06	-1,079.76	1,699.15	1,881.25	5.49
8,259.00	92.16	87.19	6,739.66	-1,076.38	1,793.93	1,973.42	2.82
8,354.00	91.05	90.80	6,737.01	-1,074.72	1,888.86	2,066.08	3.97
8,449.00	89.72	90.41	6,736.37	-1,075.73	1,983.85	2,159.35	1.45
8,544.00	88.86	90.68	6,737.54	-1,076.63	2,078.84	2,252.58	0.95
8,639.00	86.73	89.58	6,741.20	-1,076.85	2,173.76	2,345.62	2.52
8,733.00	87.10	86.94	6,746.25	-1,074.00	2,267.57	2,436.95	2.84
8,828.00	91.14	86.42	6,747.71	-1,068.50	2,362.38	2,528.73	4.28
8,923.00	92.04	85.78	6,745.07	-1,062.03	2,457.13	2,620.25	1.16
9,017.00	91.51	87.84	6,742.16	-1,056.80	2,550.93	2,711.09	2.26
9,112.00	90.46	90.82	6,740.52	-1,055.70	2,645.90	2,803.91	3.33
9,207.00	88.95	91.17	6,741.01	-1,057.35	2,740.88	2,897.29	1.63
9,302.00	89.45	89.12	6,742.33	-1,057.59	2,835.86	2,990.39	2.22
9,397.00	90.00	89.50	6,742.79	-1,056.45	2,930.86	3,083.22	0.71
9,491.00	87.68	88.13	6,744.69	-1,054.51	3,024.81	3,174.87	2.87
9,586.00	86.76	89.53	6,749.30	-1,052.57	3,119.67	3,267.42	1.77
9,681.00	89.17	90.01	6,752.67	-1,052.19	3,214.60	3,360.35	2.58
9,776.00	86.88	88.26	6,755.94	-1,050.76	3,309.53	3,453.05	3.03
9,871.00	89.32	89.79	6,759.09	-1,049.15	3,404.45	3,545.72	3.03
9,965.00	90.77	85.29	6,759.01	-1,045.11	3,498.34	3,636.89	5.03
10,060.00	91.70	83.58	6,756.97	-1,035.90	3,592.86	3,727.65	2.04
10,155.00	93.12	85.51	6,752.98	-1,026.88	3,687.34	3,818.39	2.52
10,249.00	92.38	87.55	6,748.48	-1,021.19	3,781.06	3,909.06	2.30
10,344.00	91.76	89.62	6,745.05	-1,018.85	3,875.96	4,001.57	2.28
10,439.00	92.25	89.30	6,741.73	-1,017.96	3,970.90	4,094.39	0.62
10,533.00	87.90	88.50	6,741.61	-1,016.15	4,064.86	4,186.08	4.70
10,628.00	86.39	86.38	6,746.34	-1,011.92	4,159.64	4,278.08	2.74
10,723.00	88.24	84.10	6,750.79	-1,004.05	4,254.20	4,369.14	3.09
10,818.00	89.29	81.72	6,752.83	-992.33	4,348.44	4,459.12	2.74
10,912.00	92.78	84.25	6,751.14	-980.86	4,441.70	4,548.18	4.58
11,007.00	92.28	88.68	6,746.94	-975.01	4,536.40	4,639.78	4.68
11,102.00	91.33	91.18	6,743.95	-974.89	4,631.35	4,732.77	2.83
11,197.00	87.50	89.95	6,744.92	-975.83	4,726.32	4,826.00	4.23
11,240.00	87.13	90.38	6,746.94	-975.95	4,769.27	4,868.10	1.32
<b>Final Sperry MWD Survey</b>							
11,305.00	87.13	90.38	6,750.19	-976.38	4,834.19	4,931.78	0.00
<b>Survey Projection to TD - Estimated BHL: 2289' FSL, 535' FEL</b>							

## Design Report for Wells Ranch AE05-65-1HN - Vaughn ESS and Sperry MWD Survey

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
270.00	270.00	0.60	0.37	Surveys from 270.00ft to 609.00ft are Vaughn ESS Surveys
609.00	608.99	1.30	-0.49	Tie-On to Vaughn ESS Survey
671.00	670.99	1.12	-0.43	First Sperry MWD Survey
7,150.00	6,730.65	-1,110.81	686.89	Estimated 7" Casing Point: 2286' FSL, 600' FWL (Not a Survey Station)
11,240.00	6,746.94	-975.95	4,769.27	Final Sperry MWD Survey
11,305.00	6,750.19	-976.38	4,834.19	Survey Projection to TD
11,305.00	6,750.19	-976.38	4,834.19	Estimated BHL: 2289' FSL, 535' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Wells Ranch AE05-65-1HN_PlanA - Rev0_B HL Tgt	101.57	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
270.00	609.00	Vaughn ESS Surveys	Flexi-Shot
671.00	7,150.00	Sperry MWD Surveys	MWD
7,150.00	11,305.00	Sperry MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,150.00	6,730.65	7" Csg	7	8-3/4

## Design Report for Wells Ranch AE05-65-1HN - Vaughn ESS and Sperry 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	9.00	-2,058.58	-1.26	1,431,467.41	3,317,985.40	40.512150	-104.356340
- actual wellpath misses target center by 2058.59ft at 4.41ft MD (4.41 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				587.67	-2,955.63	1,430,570.39	3,318,574.31		
Point 2				491.05	1,431.37	1,434,957.25	3,318,477.69		
Point 3				4,861.06	1,564.99	1,435,090.87	3,322,847.56		
Point 4				4,943.68	-2,786.01	1,430,740.00	3,322,930.18		
Point 5				587.67	-2,955.63	1,430,570.39	3,318,574.31		
Wells Ranch	0.00	0.00	6,735.01	-1,122.00	740.00	1,432,403.96	3,318,726.64	40.514694	-104.353631
- actual wellpath misses target center by 14.34ft at 7202.58ft MD (6735.78 TVD, -1107.70 N, 739.12 E)									
- Point									
Wells Ranch	0.00	0.00	9.00	-2,058.58	-1.26	1,431,467.41	3,317,985.40	40.512150	-104.356340
- actual wellpath misses target center by 2058.59ft at 4.41ft MD (4.41 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				127.63	-3,415.59	1,430,110.44	3,318,114.28		
Point 2				31.09	1,891.41	1,435,417.28	3,318,017.75		
Point 3				5,321.10	2,024.95	1,435,550.81	3,323,307.59		
Point 4				5,403.64	-3,246.06	1,430,279.98	3,323,390.13		
Point 5				127.63	-3,415.59	1,430,110.44	3,318,114.28		
Wells Ranch	0.00	0.00	6,747.00	-990.13	4,834.51	1,432,535.83	3,322,821.01	40.514910	-104.338900
- actual wellpath misses target center by 14.12ft at 11305.00ft MD (6750.19 TVD, -976.38 N, 4834.19 E)									
- Point									

# North Reference Sheet for Sec. 6-T6N-R62W (Wells Ranch 5 Middle PAD) - Wells Ranch AE05-65-1HN

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' @ 4978.00ft (H&P 321). Northing and Easting are relative to Wells Ranch AE05-65-1HN

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: 0.99996768

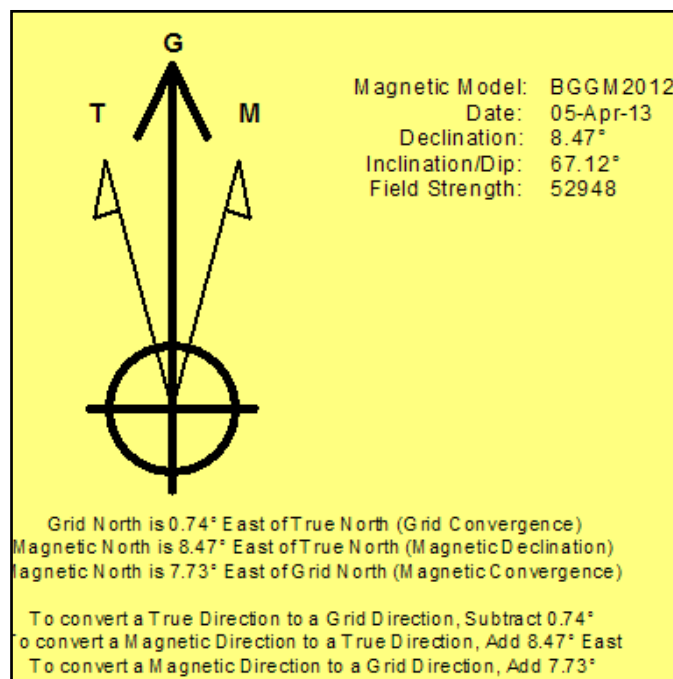
Grid Coordinates of Well: 1,433,525.93 ft N, 3,317,986.66 ft E

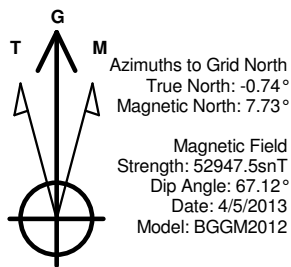
Geographical Coordinates of Well: 40° 31' 04.08" N, 104° 21' 22.46" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,305.00ft the Bottom Hole Displacement is 4,931.80ft in the Direction of 101.42° (Grid).

Magnetic Convergence at surface is: -7.73° ( 5 April 2013, , BGGM2012)



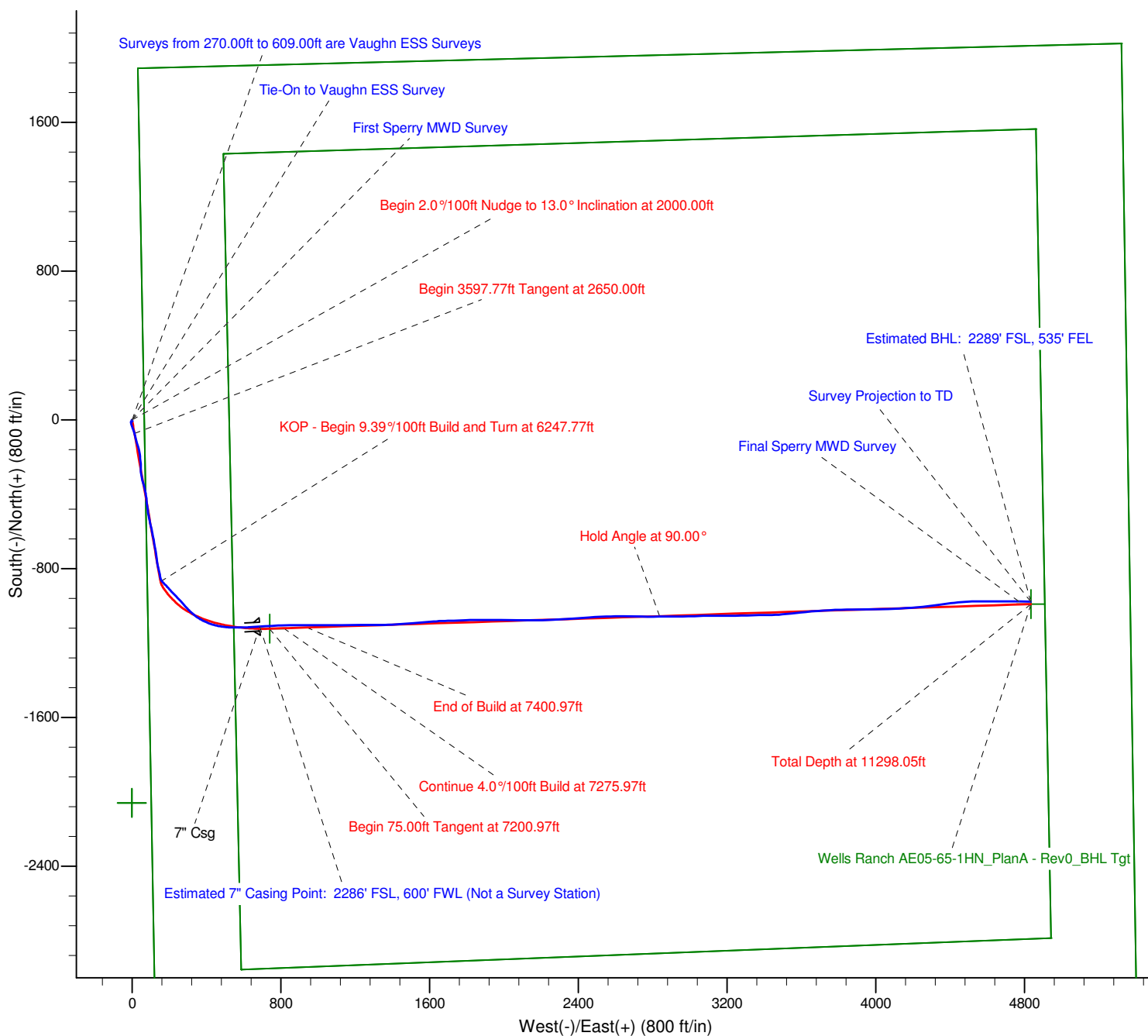


### LEGEND

- Wells Ranch AE05-65-1HN, Plan A, Plan A - Rev 0 Proposal V0
- Vaughn ESS and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE05-65-1HN 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: 2275' FSL, 535' FEL





Project: Weld County, CO (NAD 83)  
Site: Sec. 6-T6N-R62W (Wells Ranch 5 Middle PAD)  
Well: Wells Ranch AE05-65-1HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling



Azimuths to Grid North  
True North:  $-0.74^\circ$   
Magnetic North:  $7.73^\circ$

Magnetic Field  
Strength: 52947.5snT  
Dip Angle:  $67.12^\circ$   
Date: 4/5/2013  
Model: BGGM2012

## LEGEND

- Wells Ranch AE05-65-1HN, Plan A, Plan A - Rev 0 Proposal V0
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