

Noble Energy

Weld County, CO (NAD 83)

Sec. 24-T6N-R63W (Wells Ranch USX AA23 PAD)

Wells Ranch USX AA23-63-1HN

Design: Vaughn ESS and Sperry MWD Survey

Sperry Drilling Services

Final Survey Report

16 September, 2013

Well Coordinates: 1,414,883.04 N, 3,307,653.32 E (40° 28' 01.16" N, 104° 23' 39.26" W)

Ground Level: 4,836.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Wells Ranch USX AA23-63-1HN - Slot A3

RKB 24 ft. @ 4860.00usft (H&P 343)

N

Grid

API - US Survey Feet - Custom

HALLIBURTON

Design Report for Wells Ranch USX AA23-63-1HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
370.00	0.60	208.51	369.99	-1.70	-0.92	0.87	0.16
640.00	0.60	208.11	639.98	-4.19	-2.27	2.14	0.00
Tie-On to VES Gyro Surveys @ 640.00 ft. MD							
716.00	0.39	339.22	715.98	-4.30	-2.54	2.42	1.19
First Sperry MWD Survey @ 716.00 ft. MD							
900.00	0.19	276.21	899.97	-3.68	-3.07	2.96	0.19
993.00	0.50	321.39	992.97	-3.35	-3.48	3.38	0.42
1,085.00	0.76	323.46	1,084.97	-2.54	-4.09	4.01	0.28
1,179.00	0.63	287.88	1,178.96	-1.89	-4.95	4.90	0.47
1,272.00	0.68	302.88	1,271.96	-1.43	-5.90	5.86	0.19
1,366.00	0.76	311.70	1,365.95	-0.71	-6.84	6.81	0.15
1,555.00	0.86	314.01	1,554.93	1.11	-8.79	8.82	0.06
1,650.00	0.76	291.43	1,649.92	1.83	-9.89	9.94	0.35
1,745.00	0.75	304.06	1,744.91	2.41	-10.99	11.06	0.18
1,840.00	0.68	321.50	1,839.90	3.20	-11.86	11.95	0.24
1,935.00	1.16	332.31	1,934.89	4.49	-12.66	12.79	0.54
2,030.00	0.89	316.47	2,029.88	5.88	-13.61	13.78	0.41
2,124.00	0.73	288.56	2,123.87	6.60	-14.68	14.87	0.45
2,219.00	1.29	208.74	2,218.86	5.86	-15.77	15.94	1.44
2,314.00	0.92	303.19	2,313.84	5.34	-16.92	17.07	1.73
2,409.00	3.44	347.66	2,408.77	8.54	-18.17	18.42	3.01
2,504.00	6.53	340.02	2,503.40	16.40	-20.63	21.10	3.32
2,599.00	8.45	331.91	2,597.59	27.64	-25.76	26.57	2.30
2,694.00	10.18	331.49	2,691.33	41.17	-33.05	34.26	1.82
2,789.00	10.97	329.14	2,784.72	56.31	-41.70	43.35	0.95
2,884.00	12.93	323.92	2,877.66	72.66	-52.60	54.73	2.35
2,979.00	13.15	323.04	2,970.21	89.89	-65.35	67.99	0.31
3,074.00	13.06	323.35	3,062.74	107.13	-78.26	81.40	0.12
3,169.00	11.86	325.05	3,155.50	123.75	-90.26	93.89	1.32
3,263.00	10.79	324.75	3,247.67	138.85	-100.87	104.94	1.14
3,358.00	8.67	322.77	3,341.29	151.81	-110.33	114.79	2.26
3,453.00	6.63	317.06	3,435.44	161.53	-118.40	123.14	2.29
3,548.00	4.69	302.70	3,529.98	167.65	-125.41	130.33	2.51
3,643.00	3.97	293.70	3,624.71	171.07	-131.69	136.71	1.04
3,738.00	3.64	288.77	3,719.50	173.36	-137.56	142.64	0.49
3,833.00	2.20	281.26	3,814.38	174.68	-142.20	147.32	1.57
3,928.00	2.12	278.32	3,909.31	175.29	-145.73	150.86	0.14
4,023.00	0.75	10.98	4,004.28	176.16	-147.35	152.51	2.40
4,118.00	1.31	21.06	4,099.27	177.78	-146.84	152.05	0.62
4,213.00	0.67	346.92	4,194.25	179.34	-146.57	151.83	0.89
4,307.00	0.67	341.70	4,288.25	180.39	-146.87	152.16	0.06
4,402.00	0.48	343.37	4,383.24	181.30	-147.16	152.47	0.20
4,497.00	0.24	340.04	4,478.24	181.87	-147.34	152.67	0.25
4,592.00	0.23	359.11	4,573.24	182.25	-147.41	152.75	0.08
4,687.00	0.54	215.21	4,668.24	182.07	-147.67	153.01	0.78
4,781.00	0.10	100.37	4,762.24	181.70	-147.85	153.17	0.63
4,876.00	0.76	68.89	4,857.24	181.91	-147.18	152.51	0.71
4,971.00	1.39	63.41	4,952.22	182.65	-145.56	150.91	0.67
5,066.00	1.42	51.76	5,047.19	183.90	-143.60	149.00	0.30

Design Report for Wells Ranch USX AA23-63-1HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,161.00	1.51	53.79	5,142.16	185.36	-141.67	147.11	0.11
5,256.00	1.41	60.45	5,237.13	186.68	-139.64	145.12	0.21
5,351.00	1.54	56.85	5,332.10	187.95	-137.56	143.07	0.17
5,446.00	1.77	61.54	5,427.06	189.35	-135.20	140.76	0.28
5,540.00	1.57	73.11	5,521.02	190.42	-132.69	138.28	0.42
5,635.00	1.94	76.48	5,615.97	191.17	-129.88	135.50	0.40
5,730.00	1.71	110.34	5,710.93	191.05	-126.99	132.60	1.14
5,825.00	1.27	99.42	5,805.89	190.39	-124.62	130.22	0.55
5,849.00	1.19	96.73	5,829.89	190.32	-124.11	129.70	0.41
5,918.00	1.37	93.38	5,898.87	190.18	-122.58	128.16	0.28
6,013.00	1.07	299.80	5,993.86	190.56	-122.21	127.81	2.50
6,108.00	8.84	272.57	6,088.44	191.33	-130.29	135.91	8.32
6,203.00	17.25	275.98	6,180.91	193.13	-151.63	157.29	8.89
6,298.00	24.39	272.53	6,269.65	195.46	-185.28	190.99	7.62
6,393.00	30.91	268.25	6,353.76	195.58	-229.31	235.02	7.17
6,487.00	38.89	262.60	6,430.82	191.04	-282.81	288.35	9.15
6,582.00	50.10	261.54	6,498.47	181.81	-348.64	353.88	11.83
6,677.00	56.43	265.33	6,555.28	173.21	-424.22	429.17	7.39
6,771.00	66.03	266.98	6,600.47	167.75	-506.34	511.09	10.33
6,819.00	73.58	266.36	6,617.03	165.13	-551.28	555.93	15.78
6,866.00	78.79	266.61	6,628.25	162.33	-596.81	601.37	11.10
6,914.00	80.41	266.32	6,636.91	159.42	-643.93	648.38	3.43
6,961.00	81.69	266.33	6,644.22	156.44	-690.27	694.60	2.72
7,011.00	83.08	266.51	6,650.85	153.35	-739.73	743.95	2.80
7,054.00	84.31	267.85	6,655.57	151.25	-782.41	786.56	4.22
Estimated 7" Casing Point: 990' FSL, 689' FEL (Not a Survey Station)							
7,152.00	87.13	270.88	6,662.88	150.17	-880.11	884.18	4.22
7,247.00	87.78	270.61	6,667.10	151.40	-975.01	979.07	0.74
7,342.00	89.66	270.71	6,669.23	152.50	-1,069.98	1,074.03	1.98
7,437.00	90.12	270.51	6,669.41	153.51	-1,164.97	1,169.01	0.53
7,532.00	91.67	271.00	6,667.92	154.76	-1,259.95	1,263.98	1.71
7,627.00	90.06	271.35	6,666.49	156.71	-1,354.91	1,358.97	1.73
7,722.00	88.86	270.61	6,667.38	158.33	-1,449.89	1,453.95	1.48
7,817.00	89.14	270.53	6,669.04	159.28	-1,544.87	1,548.92	0.31
7,912.00	89.35	270.85	6,670.29	160.42	-1,639.86	1,643.90	0.40
8,007.00	88.67	270.69	6,671.94	161.70	-1,734.83	1,738.87	0.74
8,102.00	87.94	270.49	6,674.75	162.67	-1,829.79	1,833.81	0.80
8,197.00	89.72	270.62	6,676.69	163.59	-1,924.76	1,928.77	1.88
8,292.00	90.22	270.50	6,676.74	164.52	-2,019.75	2,023.75	0.54
8,387.00	90.46	270.26	6,676.17	165.15	-2,114.75	2,118.72	0.36
8,482.00	91.39	270.29	6,674.64	165.61	-2,209.74	2,213.68	0.98
8,577.00	91.33	270.36	6,672.38	166.15	-2,304.71	2,308.62	0.10
8,672.00	91.26	269.25	6,670.24	165.82	-2,399.68	2,403.54	1.17
8,767.00	90.15	270.17	6,669.07	165.34	-2,494.67	2,498.48	1.52
8,862.00	90.93	270.84	6,668.17	166.18	-2,589.66	2,593.45	1.08
8,957.00	90.55	270.72	6,666.94	167.47	-2,684.64	2,688.43	0.42
9,052.00	88.00	270.89	6,668.15	168.81	-2,779.62	2,783.40	2.69
9,147.00	88.06	269.35	6,671.41	169.01	-2,874.56	2,878.31	1.62
9,242.00	88.55	269.28	6,674.22	167.87	-2,969.51	2,973.19	0.52
9,337.00	89.38	269.57	6,675.94	166.92	-3,064.49	3,068.09	0.93
9,432.00	88.68	268.83	6,677.55	165.59	-3,159.47	3,162.99	1.07

Design Report for Wells Ranch USX AA23-63-1HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,527.00	87.84	268.27	6,680.43	163.19	-3,254.39	3,257.80	1.06
9,622.00	89.60	267.65	6,682.55	159.81	-3,349.30	3,352.57	1.96
9,717.00	89.85	268.92	6,683.01	156.97	-3,444.26	3,447.40	1.36
9,812.00	89.91	270.58	6,683.21	156.55	-3,539.25	3,542.34	1.75
9,907.00	91.02	273.80	6,682.44	160.18	-3,634.17	3,637.32	3.59
10,002.00	89.94	272.26	6,681.64	165.20	-3,729.03	3,732.29	1.98
10,097.00	89.01	270.45	6,682.51	167.45	-3,823.99	3,827.27	2.14
10,192.00	88.43	268.20	6,684.63	166.33	-3,918.95	3,922.16	2.45
10,288.00	89.32	267.89	6,686.52	163.05	-4,014.88	4,017.95	0.98
10,382.00	91.11	268.37	6,686.17	159.99	-4,108.82	4,111.76	1.97
10,477.00	89.66	268.71	6,685.53	157.57	-4,203.79	4,206.61	1.57
10,571.00	87.22	267.47	6,688.09	154.44	-4,297.69	4,300.38	2.91
10,666.00	88.27	267.75	6,691.83	150.48	-4,392.53	4,395.06	1.14
10,761.00	89.54	267.48	6,693.64	146.53	-4,487.43	4,489.80	1.37
10,856.00	91.23	267.37	6,693.00	142.26	-4,582.33	4,584.53	1.78
10,951.00	91.39	269.94	6,690.83	140.03	-4,677.27	4,679.37	2.71
11,057.00	90.22	270.05	6,689.34	140.02	-4,783.26	4,785.31	1.11
Final Sperry MWD Survey @ 11057.00 ft. MD							
11,125.00	90.22	270.05	6,689.08	140.08	-4,851.26	4,853.28	0.00
Estimated BHL: 994' FSL, 534' FWL :: Straight Line Projection to TD @ 11125.00 ft. MD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
640.00	639.98	-4.19	-2.27	Tie-On to VES Gyro Surveys @ 640.00 ft. MD
716.00	715.98	-4.30	-2.54	First Sperry MWD Survey @ 716.00 ft. MD
7,054.00	6,655.57	151.25	-782.41	Estimated 7" Casing Point: 990' FSL, 689' FEL (Not a Survey Station)
11,057.00	6,689.34	140.02	-4,783.26	Final Sperry MWD Survey @ 11057.00 ft. MD
11,125.00	6,689.08	140.08	-4,851.26	Estimated BHL: 994' FSL, 534' FWL :: Straight Line Projection to TD @ 11125.00 ft. MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wells Ranch USX AA23-63-1HN (PAR0) BHL	271.70	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
370.00	640.00	Vaughn ESS Surveys	Flexi-Shot
716.00	7,054.00	MWD Surveys	MWD
7,054.00	11,125.00	MWD Surveys	MWD

Design Report for Wells Ranch USX AA23-63-1HN - Vaughn ESS and Sperry MWD Survey

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
7,054.00	6,655.57	7" Casing PT	7	8-3/4

Wellbore Targets

Target Name - hit/miss target	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- Shane									
Wells Ranch USX	0.00	0.00	0.00	0.00	0.00	1,414,883.04	3,307,653.32	40° 28' 1.164 N	104° 23' 39.264 W
- actual wellpath hits target center									
- Point									
Wells Ranch USX	0.00	0.00	0.00	72.89	1.87	1,414,955.93	3,307,655.19	40° 28' 1.884 N	104° 23' 39.228 W
- actual wellpath misses target center by 72.92usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-468.01	-4,924.39	1,414,487.94	3,302,730.98	
Point 2				0.00	-434.79	-553.82	1,414,521.16	3,307,101.39	
Point 3				0.00	3,942.50	-545.57	1,418,898.29	3,307,109.64	
Point 4				0.00	3,897.50	-4,952.85	1,418,853.29	3,302,702.52	
Point 5				0.00	-468.01	-4,924.39	1,414,487.94	3,302,730.98	
Wells Ranch USX	0.00	0.00	0.00	72.89	1.87	1,414,955.93	3,307,655.19	40° 28' 1.884 N	104° 23' 39.228 W
- actual wellpath misses target center by 72.92usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-930.01	-5,381.39	1,414,025.95	3,302,274.00	
Point 2				0.00	-893.79	-91.82	1,414,062.17	3,307,563.38	
Point 3				0.00	-838.18	5,200.30	1,414,117.78	3,312,855.31	
Point 4				0.00	-893.79	-91.82	1,414,062.17	3,307,563.38	
Point 5				0.00	4,407.50	-85.57	1,419,363.27	3,307,569.63	
Point 6				0.00	4,462.69	5,172.03	1,419,418.46	3,312,827.04	
Point 7				0.00	4,407.50	-85.57	1,419,363.27	3,307,569.63	
Point 8				0.00	4,352.55	-5,415.50	1,419,308.32	3,302,239.89	
Point 9				0.00	-930.01	-5,381.39	1,414,025.95	3,302,274.00	
Wells Ranch USX	0.00	0.00	6,660.20	175.67	-843.69	1,415,058.70	3,306,809.66	40° 28' 3.003 N	104° 23' 50.151 W
- actual wellpath misses target center by 25.71usft at 7115.19usft MD (6660.70 TVD, 149.97 N, -843.37 E)									
- Point									
Wells Ranch USX	0.00	0.00	6,693.06	144.00	-4,851.95	1,415,027.04	3,302,801.55	40° 28' 3.180 N	104° 24' 42.012 W
- actual wellpath misses target center by 5.63usft at 11125.00usft MD (6689.08 TVD, 140.08 N, -4851.26 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.72 °/100usft	Maximum Dogleg over Survey:	15.78 °/100usft at 6,819.00 usft
Net Tortosity applicable to Plans:	0.69 °/100usft	Directional Difficulty Index:	6.203

Audit Info

North Reference Sheet for Sec. 24-T6N-R63W (Wells Ranch USX AA23 PAD) - Wells Ranch USX AA23-63-1HN

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

Vertical Depths are relative to RKB 24 ft. @ 4860.00usft (H&P 343). Northing and Easting are relative to Wells Ranch USX AA23-63-1HN - Slot A3

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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996395

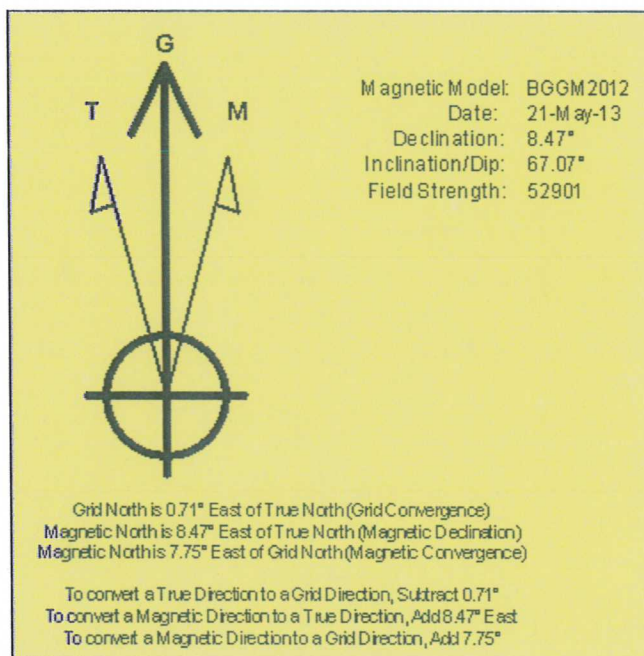
Grid Coordinates of Well: 1,414,883.04 usft N, 3,307,653.32 usft E

Geographical Coordinates of Well: 40° 28' 01.16" N, 104° 23' 39.26" W

Grid Convergence at Surface is: 0.71°

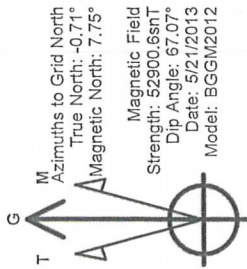
Based upon Minimum Curvature type calculations, at a Measured Depth of 11,125.00usft the Bottom Hole Displacement is 4,853.28usft in the Direction of 271.65° (Grid).

Magnetic Convergence at surface is: -7.75° (21 May 2013, , BGGM2012)



Project: Weld County, CO (NAD 83)
Site: Sec. 24-T6N-R63W (Wells Ranch USX AA23 PAD)
Well: Wells Ranch USX AA23-63-1HN

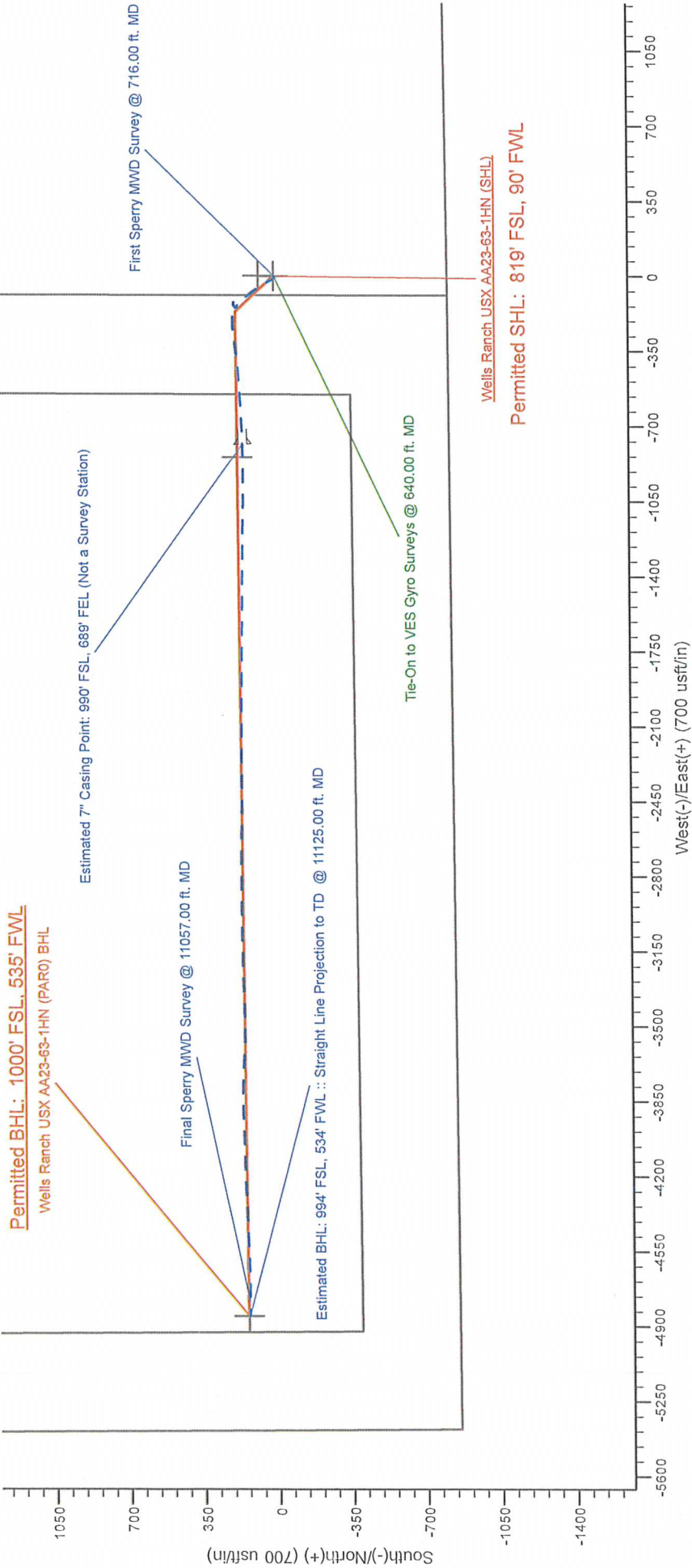
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LEGEND

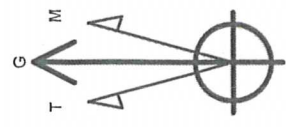
- Wells Ranch USX AA23-63-1HN, Plan A Rev 0, PAR0 Proposal V0
- Vaughn ESS and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the "Wells Ranch USX AA23-63-1HN" 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.



Noble Energy

Project: Weld County, CO (NAD 83)
Site: Sec. 24-T6N-R63W (Wells Ranch USX AA23 PAD)
Well: Wells Ranch USX AA23-63-1HN



Azimuths to Grid North
True North: -0.71°
Magnetic North: 7.75°

Magnetic Field
Strength: 52900.6snT
Dip Angle: 67.07°
Date: 5/21/2013
Model: BGGM2012

LEGEND

- Wells Ranch USX AA23-63-1HN, Plan A Rev 0, PAR0 Proposal
- - - Vaughn ESS and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the "Wells Ranch USX AA23-63-1HN" 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.

