

Project: Weld County, CO (NAD 83)
 Site: Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD)
 Well: Wells Ranch AE20-66HN
 Wellbore: Plan A
 Design: Final Surveys

Noble Energy

HALLIBURTON
 Sperry Drilling

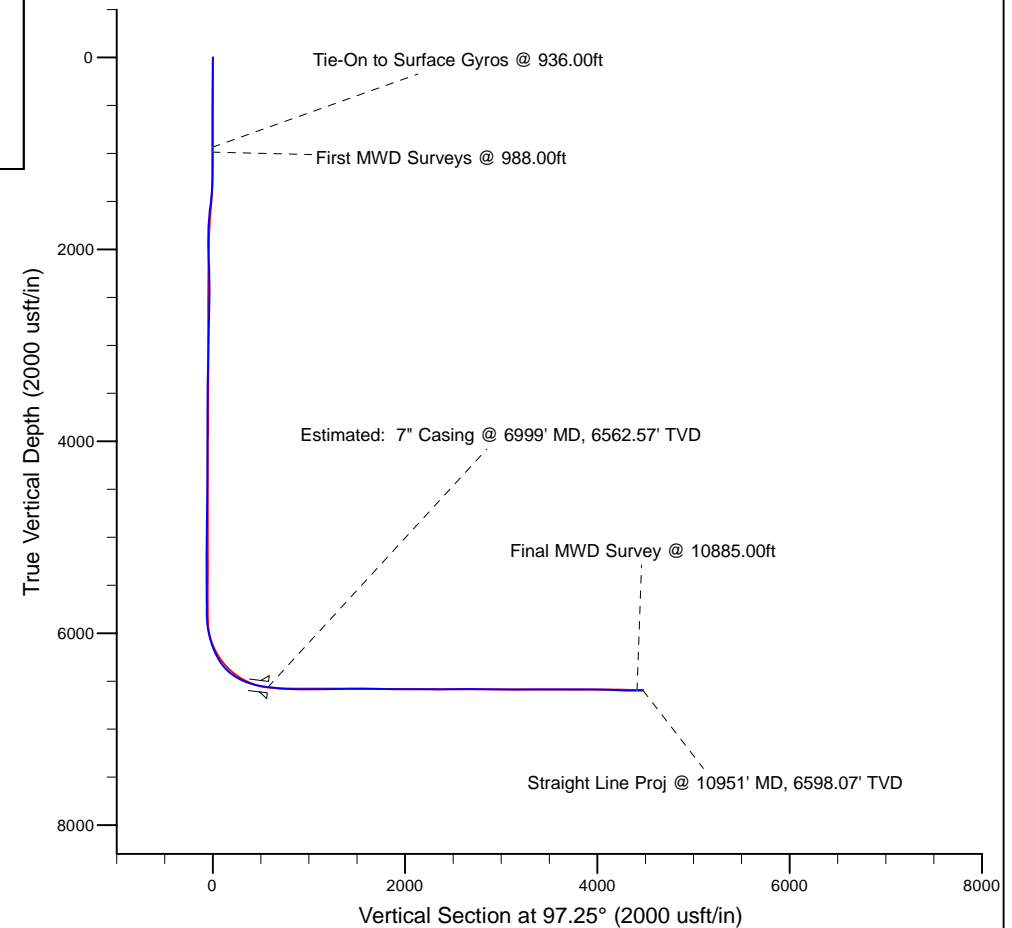
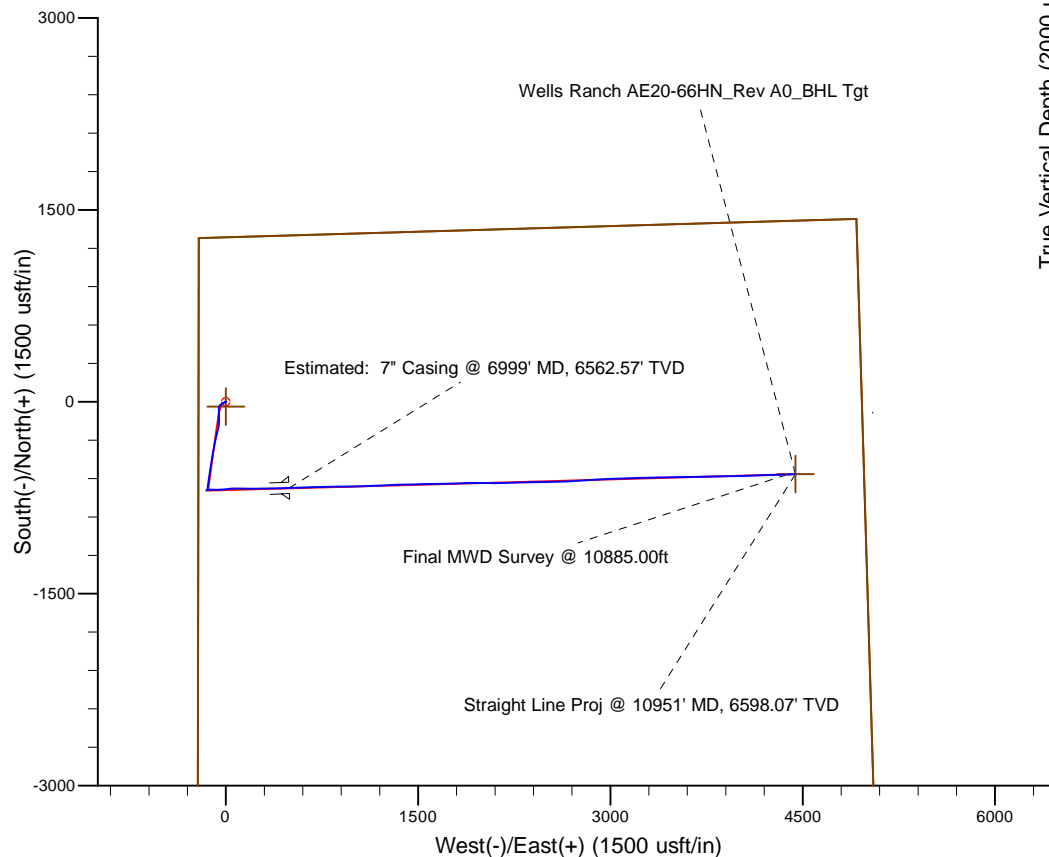
Platted SHL: 1286' FNL, 215' FWL
 Platted Lat/Long: 40.47599° N, 104.35520° W
 Location: Sec. 20-T6N-R62W

7" Casing: ~1972.13' FNL, ~708.55' FWL
 Lat/Long: 40° 28' 26.854 N, 104° 21' 12.445 W
 State Planes - CO Northern: 1,417,626.60' N, 3,318,966.08' E
 Location: Sec. 20-T6N-R62W

BHL: ~1980.51' FNL, ~534.37' FEL
 Lat/Long: 40° 28' 27.408 N, 104° 20' 21.339 W
 State Planes - CO Northern: 1,417,734.10' N, 3,322,914.43' E
 Location: Sec. 20-T6N-R62W

LEGEND

- ◆ Wells Ranch AE20-66HN, Plan A, Rev A0 Proposal V0
- Final Surveys



WELL DETAILS: Wells Ranch AE20-66HN

Ground Level: 4840.00
 KB=30' @ 4870.00usft (H&P 321)

Created By: Fred Hartmann
 Created On: 10/30/2013

Noble Energy

Weld County, CO (NAD 83)

Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD)

Wells Ranch AE20-66HN - A2

Design: Final Surveys

Sperry Drilling Services

Final Survey Report

30 October, 2013

Well Coordinates: 1,418,299.33 N, 3,318,472.42 E (40° 28' 33.56" N, 104° 21' 18.72" W)

Ground Level: 4,840.00 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 AE20-66HN - Slot A2

KB=30' @ 4870.00usft (H&P 321)

N

Grid

API - US Survey Feet - Custom

HALLIBURTON

Design Report for Wells Ranch AE20-66HN - Final Surveys

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
323.00	0.70	265.83	322.99	-0.14	-1.97	-1.93	0.22
569.00	0.30	54.43	568.99	0.12	-2.94	-2.93	0.39
813.00	0.60	24.33	812.98	1.66	-1.90	-2.09	0.15
936.00	0.60	210.43	935.98	1.69	-1.96	-2.16	0.97
Tie-On to Surface Gyros @ 936.00ft							
988.00	0.53	181.32	987.97	1.21	-2.10	-2.24	0.56
First MWD Surveys @ 988.00ft							
998.00	0.54	175.35	997.97	1.12	-2.10	-2.22	0.56
1,091.00	0.59	198.72	1,090.97	0.23	-2.22	-2.23	0.25
1,184.00	0.41	221.43	1,183.97	-0.48	-2.59	-2.51	0.28
1,275.00	1.78	232.14	1,274.95	-1.59	-3.92	-3.69	1.52
1,368.00	3.63	253.75	1,367.84	-3.30	-7.89	-7.41	2.24
1,460.00	6.51	247.66	1,459.47	-6.10	-15.51	-14.62	3.18
1,555.00	8.01	239.73	1,553.71	-11.48	-26.21	-24.55	1.90
1,650.00	8.88	233.92	1,647.68	-19.13	-37.85	-35.13	1.28
1,745.00	7.86	216.79	1,741.68	-28.66	-47.67	-43.67	2.82
1,840.00	7.54	196.44	1,835.84	-39.84	-53.33	-47.87	2.87
1,934.00	9.93	179.66	1,928.76	-53.86	-55.02	-47.78	3.69
2,029.00	13.18	181.07	2,021.82	-72.89	-55.18	-45.54	3.43
2,124.00	14.32	175.43	2,114.10	-95.43	-54.44	-41.96	1.85
2,219.00	14.47	176.47	2,206.12	-118.99	-52.78	-37.33	0.31
2,314.00	15.12	185.22	2,297.98	-143.17	-53.17	-34.67	2.45
2,408.00	13.46	181.94	2,389.07	-166.32	-54.66	-33.23	1.96
2,503.00	14.31	186.43	2,481.30	-189.04	-56.35	-32.04	1.44
2,598.00	16.78	194.56	2,572.83	-213.98	-61.11	-33.61	3.46
2,693.00	16.03	195.29	2,663.96	-239.91	-68.02	-37.19	0.82
2,788.00	15.23	191.83	2,755.45	-264.77	-74.03	-40.02	1.29
2,882.00	14.65	192.02	2,846.27	-288.49	-79.04	-41.99	0.62
2,977.00	16.19	191.59	2,937.85	-313.21	-84.20	-43.99	1.63
3,072.00	16.44	191.01	3,029.02	-339.38	-89.43	-45.88	0.31
3,167.00	15.43	190.84	3,120.37	-364.99	-94.38	-47.55	1.06
3,262.00	13.52	195.05	3,212.35	-388.13	-99.64	-49.85	2.29
3,357.00	13.02	188.10	3,304.82	-409.45	-104.03	-51.51	1.76
3,451.00	14.43	190.71	3,396.14	-431.44	-107.70	-52.38	1.64
3,546.00	14.72	188.44	3,488.08	-455.01	-111.67	-53.34	0.67
3,641.00	16.58	188.31	3,579.56	-480.36	-115.40	-53.84	1.96
3,735.00	17.43	189.40	3,669.44	-507.53	-119.64	-54.62	0.97
3,830.00	16.61	187.40	3,760.28	-535.03	-123.71	-55.19	1.06
3,925.00	15.75	187.87	3,851.52	-561.27	-127.23	-55.36	0.92
4,020.00	13.68	186.50	3,943.40	-585.20	-130.26	-55.35	2.21
4,115.00	13.27	186.74	4,035.78	-607.19	-132.81	-55.11	0.44
4,210.00	11.48	191.04	4,128.58	-627.30	-135.90	-55.63	2.12
4,305.00	9.81	192.47	4,221.94	-644.48	-139.46	-57.00	1.78
4,400.00	8.43	184.05	4,315.74	-659.33	-141.70	-57.34	2.02
4,494.00	6.95	191.55	4,408.89	-671.78	-143.33	-57.38	1.90
4,589.00	5.22	188.22	4,503.35	-681.69	-145.10	-57.89	1.86
4,684.00	3.00	188.99	4,598.10	-688.42	-146.10	-58.04	2.34
4,779.00	0.84	204.74	4,693.05	-691.51	-146.78	-58.32	2.32
4,874.00	1.47	246.63	4,788.03	-692.62	-148.19	-59.58	1.07

Design Report for Wells Ranch AE20-66HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,969.00	1.09	269.55	4,883.00	-693.11	-150.21	-61.52	0.66
5,063.00	1.16	307.99	4,976.99	-692.54	-151.86	-63.23	0.79
5,158.00	0.39	343.33	5,071.98	-691.63	-152.71	-64.18	0.92
5,253.00	0.54	26.66	5,166.98	-690.92	-152.60	-64.17	0.39
5,348.00	1.20	17.03	5,261.96	-689.57	-152.11	-63.85	0.71
5,443.00	0.42	214.55	5,356.96	-688.91	-152.02	-63.84	1.69
5,537.00	0.24	11.21	5,450.96	-689.00	-152.17	-63.98	0.69
5,632.00	0.74	98.77	5,545.95	-688.90	-151.53	-63.36	0.81
5,727.00	0.54	51.05	5,640.95	-688.71	-150.57	-62.43	0.58
5,820.00	0.65	103.08	5,733.94	-688.55	-149.72	-61.61	0.57
5,916.00	0.44	81.10	5,829.94	-688.62	-148.82	-60.71	0.30
5,964.00	3.42	83.02	5,877.91	-688.42	-147.22	-59.15	6.21
6,011.00	8.15	82.97	5,924.66	-687.84	-142.52	-54.56	10.06
6,059.00	10.35	85.90	5,972.03	-687.11	-134.84	-47.03	4.69
6,106.00	12.63	86.25	6,018.08	-686.48	-125.50	-37.85	4.85
6,154.00	16.16	88.10	6,064.57	-685.91	-113.58	-26.10	7.42
6,201.00	19.13	91.59	6,109.35	-685.91	-99.35	-11.97	6.71
6,249.00	21.18	94.18	6,154.41	-686.76	-82.83	4.52	4.66
6,296.00	24.07	90.16	6,197.79	-687.40	-64.78	22.51	6.97
6,344.00	28.06	85.16	6,240.91	-686.48	-43.73	43.27	9.48
6,390.00	32.31	83.76	6,280.66	-684.23	-20.72	65.82	9.36
6,438.00	36.90	84.15	6,320.16	-681.36	6.39	92.34	9.57
6,485.00	41.50	85.42	6,356.57	-678.68	35.96	121.34	9.93
6,533.00	46.69	88.58	6,391.04	-676.98	69.30	154.20	11.74
6,580.00	52.00	90.38	6,421.65	-676.68	104.94	189.51	11.66
6,628.00	56.95	91.03	6,449.53	-677.16	143.99	228.31	10.37
6,675.00	61.76	90.85	6,473.48	-677.82	184.41	268.49	10.24
6,723.00	66.11	90.01	6,494.57	-678.14	227.51	311.29	9.20
6,770.00	69.12	90.06	6,512.47	-678.17	270.97	354.40	6.41
6,818.00	73.02	89.05	6,528.03	-677.81	316.36	399.39	8.37
6,864.00	76.49	88.61	6,540.13	-676.90	360.72	443.28	7.60
6,912.00	79.28	88.43	6,550.20	-675.69	407.63	489.66	5.82
6,955.00	82.21	88.04	6,557.12	-674.38	450.05	531.58	6.87
6,999.00	83.55	87.69	6,562.57	-672.76	493.68	574.65	3.16
Estimated: 7" Casing @ 6999' MD, 6562.57' TVD							
7,030.00	84.50	87.44	6,565.79	-671.45	524.48	605.04	3.16
7,088.00	83.58	87.90	6,571.82	-669.10	582.12	661.92	1.77
7,183.00	86.61	88.66	6,579.94	-666.26	676.72	755.41	3.29
7,277.00	88.43	88.69	6,584.01	-664.09	770.60	848.26	1.94
7,372.00	89.97	89.31	6,585.33	-662.43	865.57	942.27	1.75
7,467.00	89.75	89.68	6,585.57	-661.60	960.57	1,036.40	0.45
7,562.00	91.23	87.71	6,584.75	-659.43	1,055.53	1,130.33	2.59
7,657.00	91.08	87.74	6,582.84	-655.66	1,150.44	1,224.00	0.16
7,751.00	90.62	87.01	6,581.44	-651.36	1,244.33	1,316.60	0.92
7,846.00	91.27	88.30	6,579.88	-647.47	1,339.24	1,410.25	1.52
7,941.00	90.96	88.78	6,578.03	-645.05	1,434.19	1,504.14	0.60
8,035.00	88.58	89.30	6,578.40	-643.48	1,528.17	1,597.17	2.59
8,130.00	89.26	88.69	6,580.20	-641.81	1,623.13	1,691.16	0.96
8,225.00	88.98	88.34	6,581.65	-639.35	1,718.09	1,785.05	0.47
8,320.00	88.95	88.04	6,583.37	-636.35	1,813.03	1,878.85	0.32
8,415.00	88.98	89.14	6,585.09	-634.01	1,907.98	1,972.75	1.16

Design Report for Wells Ranch AE20-66HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,510.00	90.12	90.31	6,585.83	-633.55	2,002.97	2,066.92	1.72
8,604.00	89.97	90.89	6,585.76	-634.54	2,096.97	2,160.29	0.64
8,699.00	89.78	88.12	6,585.97	-633.72	2,191.95	2,254.41	2.92
8,794.00	89.38	88.08	6,586.66	-630.57	2,286.90	2,348.20	0.42
8,889.00	91.82	89.34	6,585.67	-628.43	2,381.86	2,442.14	2.89
8,984.00	90.59	88.43	6,583.67	-626.58	2,476.82	2,536.10	1.61
9,079.00	91.45	89.53	6,581.98	-624.89	2,571.79	2,630.09	1.47
9,173.00	88.40	86.33	6,582.10	-621.50	2,665.70	2,722.83	4.70
9,268.00	88.27	86.38	6,584.86	-615.46	2,760.47	2,816.08	0.15
9,363.00	88.73	86.80	6,587.35	-609.81	2,855.27	2,909.41	0.66
9,458.00	90.46	87.27	6,588.02	-604.90	2,950.14	3,002.89	1.89
9,553.00	90.00	86.48	6,587.64	-599.72	3,044.99	3,096.34	0.96
9,647.00	90.80	88.74	6,586.98	-595.80	3,138.90	3,189.00	2.55
9,742.00	89.78	87.94	6,586.50	-593.05	3,233.86	3,282.85	1.36
9,837.00	89.38	89.93	6,587.20	-591.28	3,328.83	3,376.84	2.14
9,932.00	90.12	89.42	6,587.61	-590.74	3,423.83	3,471.01	0.95
10,026.00	90.03	88.01	6,587.49	-588.63	3,517.81	3,563.97	1.50
10,121.00	90.00	89.26	6,587.47	-586.37	3,612.78	3,657.90	1.32
10,216.00	90.59	89.38	6,586.98	-585.24	3,707.77	3,751.98	0.63
10,311.00	90.34	88.87	6,586.20	-583.79	3,802.75	3,846.03	0.60
10,406.00	89.04	88.54	6,586.72	-581.65	3,897.73	3,939.97	1.41
10,500.00	89.45	88.70	6,587.96	-579.38	3,991.69	4,032.90	0.47
10,595.00	87.85	88.30	6,590.20	-576.90	4,086.63	4,126.76	1.74
10,690.00	86.17	88.51	6,595.15	-574.26	4,181.46	4,220.50	1.78
10,784.00	88.61	87.87	6,599.43	-571.29	4,275.31	4,313.22	2.68
10,885.00	91.27	87.95	6,599.54	-567.61	4,376.23	4,412.87	2.63
Final MWD Survey @ 10885.00ft							
10,951.00	91.27	87.95	6,598.07	-565.25	4,442.17	4,477.99	0.00
Straight Line Proj @ 10951' MD, 6598.07' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
936.00	935.98	1.69	-1.96	Tie-On to Surface Gyros @ 936.00ft
988.00	987.97	1.21	-2.10	First MWD Surveys @ 988.00ft
10,885.00	6,599.54	-567.61	4,376.23	Final MWD Survey @ 10885.00ft
10,951.00	6,598.07	-565.25	4,442.17	Straight Line Proj @ 10951' MD, 6598.07' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AE20-66HN_Rev A0_BHL Tgt	97.25	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
323.00	936.00	Surface Gyros	Flexi-Shot
998.00	6,955.00	MWD Surveys - Vert/Build	MWD+IFR1+MS_WY

Design Report for Wells Ranch AE20-66HN - Final Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
7,030.00	10,885.00	MWD Surveys - Lateral	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,999.00	6,562.57	Estimated: 7" Casing @ 6999' MD, 6562.57' TVD	7	8-3/4

Wellbore Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Wells Ranch AE20-66-	0.00	0.00	0.00	-36.43	0.47	1,418,262.91	3,318,472.89	40° 28' 33.204 N	104° 21' 18.720 W
- actual wellpath misses target center by 36.43usft at 0.01usft MD (0.01 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	856.00	248.00	1,419,118.85	3,318,720.95		
Point 2			0.00	1,007.00	4,457.00	1,419,269.48	3,322,929.82		
Point 3			0.00	-3,383.00	4,615.00	1,414,879.62	3,323,087.43		
Point 4			0.00	-3,525.00	239.00	1,414,738.01	3,318,711.57		
Point 5			0.00	856.00	248.00	1,419,118.85	3,318,720.95		
Wells Ranch AE20-66-	0.00	0.00	0.00	-36.43	0.47	1,418,262.91	3,318,472.89	40° 28' 33.204 N	104° 21' 18.720 W
- actual wellpath misses target center by 36.43usft at 0.01usft MD (0.01 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	1,316.00	-212.00	1,419,578.88	3,318,261.01		
Point 2			0.00	1,467.00	4,917.00	1,419,729.42	3,323,389.84		
Point 3			0.00	-3,843.00	5,075.00	1,414,419.60	3,323,547.37		
Point 4			0.00	-3,985.00	-221.00	1,414,278.07	3,318,251.55		
Point 5			0.00	1,316.00	-212.00	1,419,578.88	3,318,261.01		
Wells Ranch AE20-66-	0.00	0.00	4,740.00	-694.00	-140.00	1,417,605.35	3,318,332.42	40° 28' 26.725 N	104° 21' 20.647 W
- actual wellpath misses target center by 7.52usft at 4825.88usft MD (4739.91 TVD, -692.10 N, -147.27 E)									
- Point									
Wells Ranch AE20-66-	0.00	0.00	6,590.79	-565.28	4,442.41	1,417,734.07	3,322,914.68	40° 28' 27.408 N	104° 20' 21.336 W
- actual wellpath misses target center by 7.29usft at 10951.00usft MD (6598.07 TVD, -565.25 N, 4442.17 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	2.03 °/100usft	Maximum Dogleg over Survey:	11.74 °/100usft at 6,533.00 usft
Net Tortousity applicable to Plans:	0.90 °/100usft	Directional Difficulty Index:	6.295

Audit Info

North Reference Sheet for Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD) - Wells Ranch AE20-66HN

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' @ 4870.00usft (H&P 321). Northing and Easting are relative to Wells Ranch AE20-66HN - Slot A2

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: 0.99996455

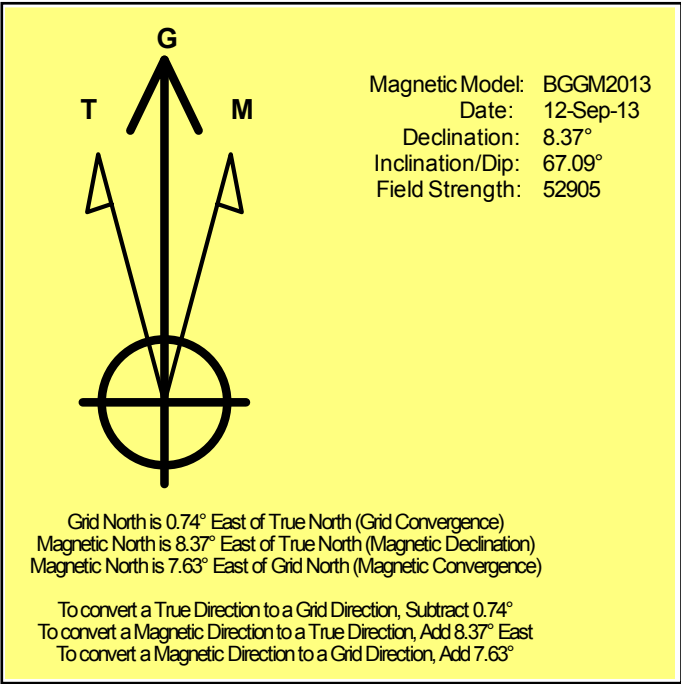
Grid Coordinates of Well: 1,418,299.33 usft N, 3,318,472.42 usft E

Geographical Coordinates of Well: 40° 28' 33.56" N, 104° 21' 18.72" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,951.00usft the Bottom Hole Displacement is 4,477.99usft in the Direction of 97.25° (Grid).

Magnetic Convergence at surface is: -7.63° (12 September 2013, , BGGM2013)



Noble Energy

Weld County, CO (NAD 83)

Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD)

Wells Ranch AE20-66HN - A2

Design: Final Surveys

Sperry Drilling Services

Geodetic Report

30 October, 2013

Well Coordinates: 1,418,299.33 N, 3,318,472.42 E (40° 28' 33.56" N, 104° 21' 18.72" W)

Ground Level: 4,840.00 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 AE20-66HN - Slot A2

KB=30' @ 4870.00usft (H&P 321)

N

Grid

API - US Survey Feet - Custom

HALLIBURTON

Design Report for Wells Ranch AE20-66HN - Final Surveys

Measured			Vertical	Local Coordinates		Geographic Coordinates		UTM Coordinates	
Depth (usft)	Inclination (°)	Azimuth (°)	Depth (usft)	+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40° 28' 33.564 N	104° 21' 18.720 W	1,418,299.33	3,318,472.42
323.00	0.70	265.83	322.99	-0.14	-1.97	40° 28' 33.563 N	104° 21' 18.745 W	1,418,299.19	3,318,470.45
569.00	0.30	54.43	568.99	0.12	-2.94	40° 28' 33.566 N	104° 21' 18.758 W	1,418,299.45	3,318,469.48
813.00	0.60	24.33	812.98	1.66	-1.90	40° 28' 33.581 N	104° 21' 18.744 W	1,418,300.99	3,318,470.52
936.00	0.60	210.43	935.98	1.69	-1.96	40° 28' 33.581 N	104° 21' 18.745 W	1,418,301.02	3,318,470.46
988.00	0.53	181.32	987.97	1.21	-2.10	40° 28' 33.576 N	104° 21' 18.747 W	1,418,300.54	3,318,470.32
998.00	0.54	175.35	997.97	1.12	-2.10	40° 28' 33.575 N	104° 21' 18.747 W	1,418,300.45	3,318,470.32
1,091.00	0.59	198.72	1,090.97	0.23	-2.22	40° 28' 33.566 N	104° 21' 18.749 W	1,418,299.56	3,318,470.20
1,184.00	0.41	221.43	1,183.97	-0.48	-2.59	40° 28' 33.560 N	104° 21' 18.754 W	1,418,298.85	3,318,469.83
1,275.00	1.78	232.14	1,274.95	-1.59	-3.92	40° 28' 33.549 N	104° 21' 18.771 W	1,418,297.74	3,318,468.50
1,368.00	3.63	253.75	1,367.84	-3.30	-7.89	40° 28' 33.532 N	104° 21' 18.823 W	1,418,296.03	3,318,464.53
1,460.00	6.51	247.66	1,459.47	-6.10	-15.51	40° 28' 33.506 N	104° 21' 18.922 W	1,418,293.23	3,318,456.91
1,555.00	8.01	239.73	1,553.71	-11.48	-26.21	40° 28' 33.454 N	104° 21' 19.061 W	1,418,287.85	3,318,446.21
1,650.00	8.88	233.92	1,647.68	-19.13	-37.85	40° 28' 33.380 N	104° 21' 19.213 W	1,418,280.20	3,318,434.57
1,745.00	7.86	216.79	1,741.68	-28.66	-47.67	40° 28' 33.287 N	104° 21' 19.342 W	1,418,270.68	3,318,424.75
1,840.00	7.54	196.44	1,835.84	-39.84	-53.33	40° 28' 33.177 N	104° 21' 19.417 W	1,418,259.49	3,318,419.10
1,934.00	9.93	179.66	1,928.76	-53.86	-55.02	40° 28' 33.039 N	104° 21' 19.441 W	1,418,245.47	3,318,417.40
2,029.00	13.18	181.07	2,021.82	-72.89	-55.18	40° 28' 32.851 N	104° 21' 19.446 W	1,418,226.45	3,318,417.25
2,124.00	14.32	175.43	2,114.10	-95.43	-54.44	40° 28' 32.628 N	104° 21' 19.440 W	1,418,203.90	3,318,417.98
2,219.00	14.47	176.47	2,206.12	-118.99	-52.78	40° 28' 32.395 N	104° 21' 19.423 W	1,418,180.35	3,318,419.65
2,314.00	15.12	185.22	2,297.98	-143.17	-53.17	40° 28' 32.156 N	104° 21' 19.432 W	1,418,156.16	3,318,419.25
2,408.00	13.46	181.94	2,389.07	-166.32	-54.66	40° 28' 31.928 N	104° 21' 19.455 W	1,418,133.02	3,318,417.76
2,503.00	14.31	186.43	2,481.30	-189.04	-56.35	40° 28' 31.703 N	104° 21' 19.481 W	1,418,110.30	3,318,416.07
2,598.00	16.78	194.56	2,572.83	-213.98	-61.11	40° 28' 31.457 N	104° 21' 19.546 W	1,418,085.35	3,318,411.31
2,693.00	16.03	195.29	2,663.96	-239.91	-68.02	40° 28' 31.202 N	104° 21' 19.640 W	1,418,059.43	3,318,404.40
2,788.00	15.23	191.83	2,755.45	-264.77	-74.03	40° 28' 30.957 N	104° 21' 19.722 W	1,418,034.56	3,318,398.39
2,882.00	14.65	192.02	2,846.27	-288.49	-79.04	40° 28' 30.724 N	104° 21' 19.791 W	1,418,010.85	3,318,393.38
2,977.00	16.19	191.59	2,937.85	-313.21	-84.20	40° 28' 30.480 N	104° 21' 19.862 W	1,417,986.13	3,318,388.22
3,072.00	16.44	191.01	3,029.02	-339.38	-89.43	40° 28' 30.222 N	104° 21' 19.934 W	1,417,959.96	3,318,382.99
3,167.00	15.43	190.84	3,120.37	-364.99	-94.38	40° 28' 29.970 N	104° 21' 20.002 W	1,417,934.35	3,318,378.05
3,262.00	13.52	195.05	3,212.35	-388.13	-99.64	40° 28' 29.742 N	104° 21' 20.074 W	1,417,911.21	3,318,372.79
3,357.00	13.02	188.10	3,304.82	-409.45	-104.03	40° 28' 29.532 N	104° 21' 20.134 W	1,417,889.90	3,318,368.39
3,451.00	14.43	190.71	3,396.14	-431.44	-107.70	40° 28' 29.315 N	104° 21' 20.186 W	1,417,867.90	3,318,364.73
3,546.00	14.72	188.44	3,488.08	-455.01	-111.67	40° 28' 29.082 N	104° 21' 20.241 W	1,417,844.33	3,318,360.75
3,641.00	16.58	188.31	3,579.56	-480.36	-115.40	40° 28' 28.832 N	104° 21' 20.293 W	1,417,818.98	3,318,357.02
3,735.00	17.43	189.40	3,669.44	-507.53	-119.64	40° 28' 28.564 N	104° 21' 20.353 W	1,417,791.82	3,318,352.79
3,830.00	16.61	187.40	3,760.28	-535.03	-123.71	40° 28' 28.293 N	104° 21' 20.410 W	1,417,764.32	3,318,348.71
3,925.00	15.75	187.87	3,851.52	-561.27	-127.23	40° 28' 28.034 N	104° 21' 20.460 W	1,417,738.08	3,318,345.20
4,020.00	13.68	186.50	3,943.40	-585.20	-130.26	40° 28' 27.798 N	104° 21' 20.503 W	1,417,714.15	3,318,342.16
4,115.00	13.27	186.74	4,035.78	-607.19	-132.81	40° 28' 27.581 N	104° 21' 20.540 W	1,417,692.16	3,318,339.61
4,210.00	11.48	191.04	4,128.58	-627.30	-135.90	40° 28' 27.383 N	104° 21' 20.583 W	1,417,672.05	3,318,336.52
4,305.00	9.81	192.47	4,221.94	-644.48	-139.46	40° 28' 27.214 N	104° 21' 20.632 W	1,417,654.87	3,318,332.96

Design Report for Wells Ranch AE20-66HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
4,400.00	8.43	184.05	4,315.74	-659.33	-141.70	40° 28' 27.067 N	104° 21' 20.664 W	1,417,640.02	3,318,330.72
4,494.00	6.95	191.55	4,408.89	-671.78	-143.33	40° 28' 26.945 N	104° 21' 20.687 W	1,417,627.58	3,318,329.10
4,589.00	5.22	188.22	4,503.35	-681.69	-145.10	40° 28' 26.847 N	104° 21' 20.711 W	1,417,617.67	3,318,327.33
4,684.00	3.00	188.99	4,598.10	-688.42	-146.10	40° 28' 26.780 N	104° 21' 20.725 W	1,417,610.93	3,318,326.32
4,779.00	0.84	204.74	4,693.05	-691.51	-146.78	40° 28' 26.750 N	104° 21' 20.735 W	1,417,607.85	3,318,325.64
4,874.00	1.47	246.63	4,788.03	-692.62	-148.19	40° 28' 26.739 N	104° 21' 20.753 W	1,417,606.73	3,318,324.23
4,969.00	1.09	269.55	4,883.00	-693.11	-150.21	40° 28' 26.735 N	104° 21' 20.779 W	1,417,606.24	3,318,322.21
5,063.00	1.16	307.99	4,976.99	-692.54	-151.86	40° 28' 26.741 N	104° 21' 20.800 W	1,417,606.82	3,318,320.57
5,158.00	0.39	343.33	5,071.98	-691.63	-152.71	40° 28' 26.750 N	104° 21' 20.811 W	1,417,607.72	3,318,319.72
5,253.00	0.54	26.66	5,166.98	-690.92	-152.60	40° 28' 26.757 N	104° 21' 20.810 W	1,417,608.43	3,318,319.82
5,348.00	1.20	17.03	5,261.96	-689.57	-152.11	40° 28' 26.770 N	104° 21' 20.803 W	1,417,609.78	3,318,320.32
5,443.00	0.42	214.55	5,356.96	-688.91	-152.02	40° 28' 26.776 N	104° 21' 20.802 W	1,417,610.45	3,318,320.41
5,537.00	0.24	11.21	5,450.96	-689.00	-152.17	40° 28' 26.776 N	104° 21' 20.804 W	1,417,610.35	3,318,320.25
5,632.00	0.74	98.77	5,545.95	-688.90	-151.53	40° 28' 26.776 N	104° 21' 20.796 W	1,417,610.46	3,318,320.90
5,727.00	0.54	51.05	5,640.95	-688.71	-150.57	40° 28' 26.778 N	104° 21' 20.783 W	1,417,610.64	3,318,321.85
5,820.00	0.65	103.08	5,733.94	-688.55	-149.72	40° 28' 26.780 N	104° 21' 20.772 W	1,417,610.80	3,318,322.71
5,916.00	0.44	81.10	5,829.94	-688.62	-148.82	40° 28' 26.779 N	104° 21' 20.761 W	1,417,610.73	3,318,323.60
5,964.00	3.42	83.02	5,877.91	-688.42	-147.22	40° 28' 26.781 N	104° 21' 20.740 W	1,417,610.94	3,318,325.21
6,011.00	8.15	82.97	5,924.66	-687.84	-142.52	40° 28' 26.786 N	104° 21' 20.679 W	1,417,611.52	3,318,329.91
6,059.00	10.35	85.90	5,972.03	-687.11	-134.84	40° 28' 26.792 N	104° 21' 20.579 W	1,417,612.24	3,318,337.58
6,106.00	12.63	86.25	6,018.08	-686.48	-125.50	40° 28' 26.797 N	104° 21' 20.458 W	1,417,612.88	3,318,346.92
6,154.00	16.16	88.10	6,064.57	-685.91	-113.58	40° 28' 26.801 N	104° 21' 20.304 W	1,417,613.44	3,318,358.84
6,201.00	19.13	91.59	6,109.35	-685.91	-99.35	40° 28' 26.799 N	104° 21' 20.120 W	1,417,613.45	3,318,373.08
6,249.00	21.18	94.18	6,154.41	-686.76	-82.83	40° 28' 26.789 N	104° 21' 19.906 W	1,417,612.60	3,318,389.59
6,296.00	24.07	90.16	6,197.79	-687.40	-64.78	40° 28' 26.780 N	104° 21' 19.673 W	1,417,611.95	3,318,407.65
6,344.00	28.06	85.16	6,240.91	-686.48	-43.73	40° 28' 26.787 N	104° 21' 19.400 W	1,417,612.88	3,318,428.69
6,390.00	32.31	83.76	6,280.66	-684.23	-20.72	40° 28' 26.806 N	104° 21' 19.102 W	1,417,615.13	3,318,451.71
6,438.00	36.90	84.15	6,320.16	-681.36	6.39	40° 28' 26.831 N	104° 21' 18.751 W	1,417,617.99	3,318,478.81
6,485.00	41.50	85.42	6,356.57	-678.68	35.96	40° 28' 26.853 N	104° 21' 18.368 W	1,417,620.67	3,318,508.38
6,533.00	46.69	88.58	6,391.04	-676.98	69.30	40° 28' 26.866 N	104° 21' 17.936 W	1,417,622.38	3,318,541.72
6,580.00	52.00	90.38	6,421.65	-676.68	104.94	40° 28' 26.865 N	104° 21' 17.475 W	1,417,622.68	3,318,577.35
6,628.00	56.95	91.03	6,449.53	-677.16	143.99	40° 28' 26.855 N	104° 21' 16.970 W	1,417,622.19	3,318,616.40
6,675.00	61.76	90.85	6,473.48	-677.82	184.41	40° 28' 26.843 N	104° 21' 16.447 W	1,417,621.53	3,318,656.82
6,723.00	66.11	90.01	6,494.57	-678.14	227.51	40° 28' 26.834 N	104° 21' 15.890 W	1,417,621.21	3,318,699.92
6,770.00	69.12	90.06	6,512.47	-678.17	270.97	40° 28' 26.829 N	104° 21' 15.327 W	1,417,621.18	3,318,743.38
6,818.00	73.02	89.05	6,528.03	-677.81	316.36	40° 28' 26.826 N	104° 21' 14.740 W	1,417,621.54	3,318,788.77
6,864.00	76.49	88.61	6,540.13	-676.90	360.72	40° 28' 26.830 N	104° 21' 14.166 W	1,417,622.45	3,318,833.13
6,912.00	79.28	88.43	6,550.20	-675.69	407.63	40° 28' 26.836 N	104° 21' 13.559 W	1,417,623.66	3,318,880.04
6,955.00	82.21	88.04	6,557.12	-674.38	450.05	40° 28' 26.843 N	104° 21' 13.010 W	1,417,624.97	3,318,922.45
6,999.00	83.55	87.69	6,562.57	-672.76	493.68	40° 28' 26.854 N	104° 21' 12.445 W	1,417,626.60	3,318,966.08
7,030.00	84.50	87.44	6,565.79	-671.45	524.48	40° 28' 26.863 N	104° 21' 12.046 W	1,417,627.91	3,318,996.88
7,088.00	83.58	87.90	6,571.82	-669.10	582.12	40° 28' 26.878 N	104° 21' 11.300 W	1,417,630.25	3,319,054.52

Design Report for Wells Ranch AE20-66HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
7,183.00	86.61	88.66	6,579.94	-666.26	676.72	40° 28' 26.894 N	104° 21' 10.076 W	1,417,633.09	3,319,149.11
7,277.00	88.43	88.69	6,584.01	-664.09	770.60	40° 28' 26.904 N	104° 21' 8.860 W	1,417,635.26	3,319,242.99
7,372.00	89.97	89.31	6,585.33	-662.43	865.57	40° 28' 26.908 N	104° 21' 7.631 W	1,417,636.92	3,319,337.96
7,467.00	89.75	89.68	6,585.57	-661.60	960.57	40° 28' 26.904 N	104° 21' 6.402 W	1,417,637.76	3,319,432.96
7,562.00	91.23	87.71	6,584.75	-659.43	1,055.53	40° 28' 26.913 N	104° 21' 5.173 W	1,417,639.92	3,319,527.92
7,657.00	91.08	87.74	6,582.84	-655.66	1,150.44	40° 28' 26.939 N	104° 21' 3.944 W	1,417,643.69	3,319,622.82
7,751.00	90.62	87.01	6,581.44	-651.36	1,244.33	40° 28' 26.969 N	104° 21' 2.729 W	1,417,648.00	3,319,716.71
7,846.00	91.27	88.30	6,579.88	-647.47	1,339.24	40° 28' 26.995 N	104° 21' 1.500 W	1,417,651.88	3,319,811.61
7,941.00	90.96	88.78	6,578.03	-645.05	1,434.19	40° 28' 27.007 N	104° 21' 0.271 W	1,417,654.30	3,319,906.56
8,035.00	88.58	89.30	6,578.40	-643.48	1,528.17	40° 28' 27.011 N	104° 20' 59.055 W	1,417,655.88	3,320,000.53
8,130.00	89.26	88.69	6,580.20	-641.81	1,623.13	40° 28' 27.015 N	104° 20' 57.826 W	1,417,657.54	3,320,095.50
8,225.00	88.98	88.34	6,581.65	-639.35	1,718.09	40° 28' 27.027 N	104° 20' 56.597 W	1,417,660.00	3,320,190.45
8,320.00	88.95	88.04	6,583.37	-636.35	1,813.03	40° 28' 27.044 N	104° 20' 55.368 W	1,417,663.00	3,320,285.38
8,415.00	88.98	89.14	6,585.09	-634.01	1,907.98	40° 28' 27.055 N	104° 20' 54.139 W	1,417,665.34	3,320,380.33
8,510.00	90.12	90.31	6,585.83	-633.55	2,002.97	40° 28' 27.048 N	104° 20' 52.910 W	1,417,665.80	3,320,475.32
8,604.00	89.97	90.89	6,585.76	-634.54	2,096.97	40° 28' 27.026 N	104° 20' 51.694 W	1,417,664.81	3,320,569.31
8,699.00	89.78	88.12	6,585.97	-633.72	2,191.95	40° 28' 27.022 N	104° 20' 50.465 W	1,417,665.63	3,320,664.30
8,794.00	89.38	88.08	6,586.66	-630.57	2,286.90	40° 28' 27.041 N	104° 20' 49.236 W	1,417,668.78	3,320,759.24
8,889.00	91.82	89.34	6,585.67	-628.43	2,381.86	40° 28' 27.050 N	104° 20' 48.007 W	1,417,670.92	3,320,854.20
8,984.00	90.59	88.43	6,583.67	-626.58	2,476.82	40° 28' 27.056 N	104° 20' 46.778 W	1,417,672.77	3,320,949.15
9,079.00	91.45	89.53	6,581.98	-624.89	2,571.79	40° 28' 27.060 N	104° 20' 45.549 W	1,417,674.46	3,321,044.12
9,173.00	88.40	86.33	6,582.10	-621.50	2,665.70	40° 28' 27.082 N	104° 20' 44.333 W	1,417,677.86	3,321,138.03
9,268.00	88.27	86.38	6,584.86	-615.46	2,760.47	40° 28' 27.129 N	104° 20' 43.106 W	1,417,683.89	3,321,232.79
9,363.00	88.73	86.80	6,587.35	-609.81	2,855.27	40° 28' 27.173 N	104° 20' 41.879 W	1,417,689.54	3,321,327.59
9,458.00	90.46	87.27	6,588.02	-604.90	2,950.14	40° 28' 27.209 N	104° 20' 40.651 W	1,417,694.45	3,321,422.45
9,553.00	90.00	86.48	6,587.64	-599.72	3,044.99	40° 28' 27.248 N	104° 20' 39.422 W	1,417,699.63	3,321,517.30
9,647.00	90.80	88.74	6,586.98	-595.80	3,138.90	40° 28' 27.275 N	104° 20' 38.207 W	1,417,703.55	3,321,611.21
9,742.00	89.78	87.94	6,586.50	-593.05	3,233.86	40° 28' 27.290 N	104° 20' 36.978 W	1,417,706.30	3,321,706.16
9,837.00	89.38	89.93	6,587.20	-591.28	3,328.83	40° 28' 27.295 N	104° 20' 35.748 W	1,417,708.07	3,321,801.14
9,932.00	90.12	89.42	6,587.61	-590.74	3,423.83	40° 28' 27.288 N	104° 20' 34.519 W	1,417,708.61	3,321,896.13
10,026.00	90.03	88.01	6,587.49	-588.63	3,517.81	40° 28' 27.297 N	104° 20' 33.303 W	1,417,710.72	3,321,990.10
10,121.00	90.00	89.26	6,587.47	-586.37	3,612.78	40° 28' 27.307 N	104° 20' 32.074 W	1,417,712.98	3,322,085.07
10,216.00	90.59	89.38	6,586.98	-585.24	3,707.77	40° 28' 27.306 N	104° 20' 30.845 W	1,417,714.11	3,322,180.06
10,311.00	90.34	88.87	6,586.20	-583.79	3,802.75	40° 28' 27.308 N	104° 20' 29.615 W	1,417,715.56	3,322,275.04
10,406.00	89.04	88.54	6,586.72	-581.65	3,897.73	40° 28' 27.317 N	104° 20' 28.386 W	1,417,717.70	3,322,370.01
10,500.00	89.45	88.70	6,587.96	-579.38	3,991.69	40° 28' 27.327 N	104° 20' 27.170 W	1,417,719.97	3,322,463.97
10,595.00	87.85	88.30	6,590.20	-576.90	4,086.63	40° 28' 27.339 N	104° 20' 25.941 W	1,417,722.45	3,322,558.90
10,690.00	86.17	88.51	6,595.15	-574.26	4,181.46	40° 28' 27.353 N	104° 20' 24.714 W	1,417,725.09	3,322,653.73
10,784.00	88.61	87.87	6,599.43	-571.29	4,275.31	40° 28' 27.370 N	104° 20' 23.499 W	1,417,728.06	3,322,747.57
10,885.00	91.27	87.95	6,599.54	-567.61	4,376.23	40° 28' 27.393 N	104° 20' 22.193 W	1,417,731.74	3,322,848.49
10,951.00	91.27	87.95	6,598.07	-565.25	4,442.17	40° 28' 27.408 N	104° 20' 21.339 W	1,417,734.10	3,322,914.43

Design Report for Wells Ranch AE20-66HN - Final Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
936.00	935.98	1.69	-1.96	Tie-On to Surface Gyros @ 936.00ft
988.00	987.97	1.21	-2.10	First MWD Surveys @ 988.00ft
10,885.00	6,599.54	-567.61	4,376.23	Final MWD Survey @ 10885.00ft
10,951.00	6,598.07	-565.25	4,442.17	Straight Line Proj @ 10951' MD, 6598.07' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch AE20-66HN_Rev A0_BHL Tgt	97.25	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
323.00	936.00	Surface Gyros	Flexi-Shot
998.00	6,955.00	MWD Surveys - Vert/Build	MWD+IFR1+MS_WY
7,030.00	10,885.00	MWD Surveys - Lateral	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,999.00	6,562.57	Estimated: 7" Casing @ 6999' MD, 6562.57' TVD	7	8-3/4

Design Report for Wells Ranch AE20-66HN - Final Surveys

Design Targets

Shape	Target Name	TVD ()	Northing ()	Easting ()	+N/-S	+E/-W	Created	Updated
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Directional Difficulty Index

Average Dogleg over Survey:	2.03 °/100usft	Maximum Dogleg over Survey:	11.74 °/100usft at 6,533.00 usft
Net Tortosity applicable to Plans:	0.90 °/100usft	Directional Difficulty Index:	6.295

Audit Info

North Reference Sheet for Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD) - Wells Ranch AE20-66HN -

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' @ 4870.00usft (H&P 321). Northing and Easting are relative to Wells Ranch AE20-66HN - Slot A2

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: 0.99996455

Grid Coordinates of Well: 1,418,299.33 usft N, 3,318,472.42 usft E

Geographical Coordinates of Well: 40° 28' 33.56" N, 104° 21' 18.72" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,951.00usft

the Bottom Hole Displacement is 4,477.99usft in the Direction of 97.25° (Grid).

Magnetic Convergence at surface is: -7.63° (12 September 2013, , BGGM2013)

