

# Noble Energy

Weld County, CO (NAD 83)

Sec. 11-T6N-R63W (Wells Ranch PAD)

Wells Ranch AA11-667

## Plan A

Design: Actual Surveys

# Sperry Drilling Services

## Final Survey Report

30 June, 2015

05-123-41254

Well Coordinates: 1,428,040.99 N, 3,307,222.25 E (40° 30' 11.23" N, 104° 23' 42.72" W)

Ground Level: 4,869.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

Centered on Well Wells Ranch AA11-667

KB = 24 @ 4893.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

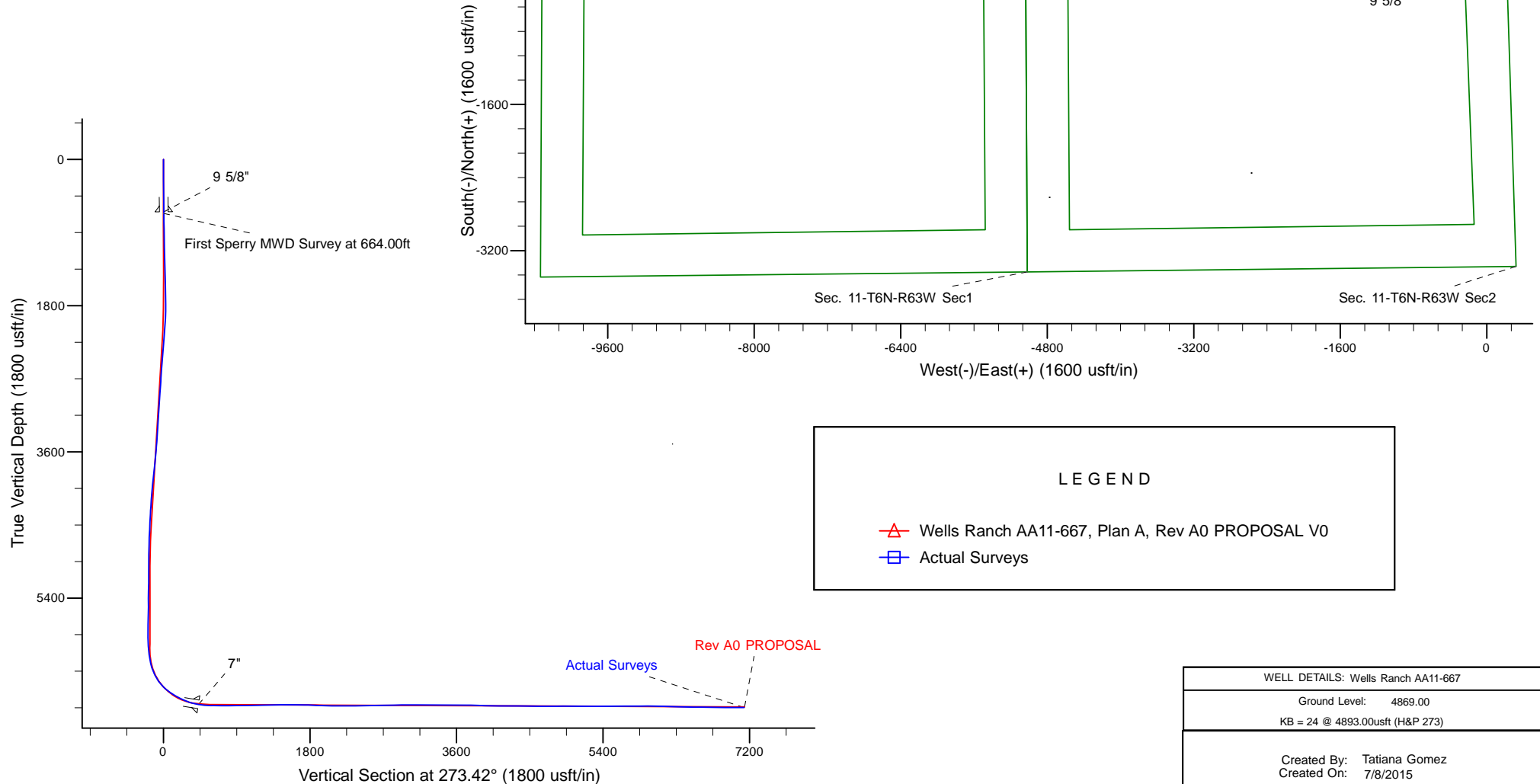
Project: Weld County, CO (NAD 83)  
 Site: Sec. 11-T6N-R63W (Wells Ranch PAD)  
 Well: Wells Ranch AA11-667  
 Wellbore: Plan A  
 Design: Actual Surveys



Platted SHL: 1925' FNL, 215' FEL  
 Platted Lat/Long: 40.503120, -104.3952  
 Location: Sec. 11-T6N-R63W

~7" Casing: 1522' FNL, 600' FEL  
 Lat/Long: 40.504242 N, -104.396644 W  
 State Planes - CO Northern: 1,428,444.57 N, 3,306,815.66 E  
 Sec. 11-T6N-R63W

Platted BHL: 1527' FNL, 2085' FEL  
 Platted Lat/Long: 40.504493 N, -104.420557 W  
 State Planes - CO Northern: 1,428,454.19 N, 3,300,165.28 E  
 Location: Sec. 10-T6N-R63W



WELL DETAILS: Wells Ranch AA11-667	
Ground Level:	4869.00
KB = 24 @ 4893.00usft (H&P 273)	
Created By:	Tatiana Gomez
Created On:	7/8/2015

**Design Report for Wells Ranch AA11-667 - Actual 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
250.00	0.41	312.00	250.00	0.60	-0.66	0.70	0.16
<b>First Gyro Survey at 250.00ft.</b>							
500.00	0.82	312.00	499.98	2.39	-2.66	2.80	0.16
<b>Tie on to Gyro Survey at 500.00ft. - Final Gyro Survey at 500.00ft.</b>							
644.00	1.03	312.00	643.96	3.95	-4.39	4.62	0.15
<b>9 5/8"</b>							
664.00	1.06	312.00	663.96	4.19	-4.66	4.90	0.15
<b>First Sperry MWD Survey at 664.00ft</b>							
759.00	0.97	315.95	758.95	5.36	-5.87	6.18	0.12
854.00	1.30	312.20	853.93	6.66	-7.23	7.61	0.36
1,043.00	1.43	313.23	1,042.87	9.72	-10.53	11.10	0.07
1,138.00	1.59	310.38	1,137.84	11.38	-12.40	13.06	0.19
1,229.00	1.42	307.99	1,228.81	12.90	-14.25	15.00	0.20
1,321.00	1.57	304.37	1,320.78	14.31	-16.19	17.02	0.19
1,412.00	1.67	311.23	1,411.74	15.89	-18.22	19.13	0.24
1,595.00	1.87	314.03	1,594.65	19.72	-22.37	23.51	0.12
1,687.00	1.77	304.99	1,686.61	21.58	-24.61	25.86	0.33
1,778.00	2.08	341.40	1,777.56	23.95	-26.29	27.67	1.36
1,870.00	2.22	47.72	1,869.51	26.73	-25.50	27.05	2.56
1,961.00	3.84	43.56	1,960.38	30.12	-22.10	23.86	1.80
2,053.00	5.97	45.07	2,052.04	35.74	-16.59	18.69	2.32
2,144.00	7.23	43.56	2,142.43	43.23	-9.29	11.86	1.40
2,236.00	8.78	40.53	2,233.53	52.76	-0.74	3.89	1.75
2,327.00	8.64	36.16	2,323.48	63.56	7.81	-4.00	0.74
2,419.00	8.04	33.53	2,414.51	74.50	15.44	-10.96	0.77
2,510.00	9.12	35.26	2,504.49	85.69	23.12	-17.96	1.22
2,602.00	8.39	28.87	2,595.42	97.53	30.57	-24.69	1.32
2,694.00	8.35	26.13	2,686.44	109.40	36.75	-30.15	0.44
2,786.00	9.37	34.45	2,777.35	121.58	43.93	-36.59	1.78
2,881.00	9.19	26.74	2,871.11	134.73	51.72	-43.58	1.32
2,976.00	9.16	23.65	2,964.89	148.43	58.16	-49.20	0.52
3,070.00	10.27	28.17	3,057.54	162.67	65.12	-55.30	1.43
3,165.00	10.21	26.51	3,151.03	177.67	72.88	-62.14	0.32
3,260.00	9.59	23.53	3,244.62	192.46	79.79	-68.17	0.85
3,355.00	9.16	20.67	3,338.35	206.79	85.62	-73.13	0.67
3,449.00	8.56	36.27	3,431.24	219.43	92.40	-79.14	2.63
3,544.00	7.22	37.40	3,525.34	229.88	100.21	-86.31	1.42
3,639.00	8.95	39.09	3,619.39	240.36	108.50	-93.96	1.84
3,733.00	9.95	38.15	3,712.11	252.42	118.13	-102.85	1.08
3,828.00	10.46	38.73	3,805.61	265.60	128.59	-112.51	0.55
3,923.00	10.98	37.81	3,898.95	279.47	139.53	-122.60	0.58
4,018.00	11.81	32.51	3,992.08	294.82	150.30	-132.44	1.41
4,112.00	10.04	32.52	4,084.37	309.84	159.88	-141.10	1.88
4,302.00	8.31	29.57	4,271.94	335.75	175.56	-155.21	0.94
4,397.00	7.10	28.66	4,366.08	346.88	181.76	-160.74	1.28
4,492.00	6.27	29.09	4,460.43	356.56	187.10	-165.49	0.88
4,587.00	6.24	27.74	4,554.86	365.66	192.03	-169.86	0.16
4,681.00	5.77	27.32	4,648.35	374.38	196.57	-173.88	0.50
4,776.00	4.91	25.89	4,742.94	382.28	200.54	-177.37	0.92

## Design Report for Wells Ranch AA11-667 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,871.00	3.72	21.87	4,837.66	388.80	203.46	-179.90	1.29
4,966.00	1.13	18.82	4,932.57	392.55	204.91	-181.12	2.73
5,061.00	0.60	358.18	5,027.56	393.93	205.20	-181.32	0.64
5,156.00	0.79	37.26	5,122.55	394.95	205.58	-181.64	0.52
5,250.00	0.81	71.37	5,216.55	395.68	206.60	-182.62	0.50
5,345.00	0.96	53.00	5,311.53	396.37	207.88	-183.85	0.34
5,440.00	0.83	66.01	5,406.52	397.13	209.14	-185.07	0.25
5,535.00	1.25	61.90	5,501.51	397.90	210.68	-186.56	0.45
5,629.00	1.07	57.87	5,595.49	398.85	212.33	-188.15	0.21
5,819.00	0.14	11.87	5,785.48	400.02	213.88	-189.63	0.51
5,914.00	0.95	289.42	5,880.47	400.39	213.16	-188.89	0.99
6,009.00	1.95	265.28	5,975.44	400.52	210.81	-186.53	1.21
6,104.00	5.19	274.76	6,070.24	400.75	204.91	-180.63	3.46
6,198.00	10.48	274.01	6,163.33	401.70	192.14	-167.82	5.63
6,293.00	18.59	276.69	6,255.22	404.07	168.44	-144.03	8.56
6,388.00	26.14	273.46	6,343.01	407.10	132.46	-107.93	8.05
6,483.00	35.09	270.46	6,424.69	408.59	84.16	-59.63	9.55
6,578.00	46.93	271.19	6,496.25	409.53	21.95	2.53	12.47
6,672.00	53.92	271.77	6,556.10	411.42	-50.44	74.90	7.45
6,767.00	60.43	269.94	6,607.57	412.56	-130.21	154.60	7.04
6,862.00	65.79	267.34	6,650.53	410.51	-214.88	238.99	6.15
6,957.00	72.26	268.05	6,684.52	406.95	-303.46	327.21	6.85
7,014.00	77.89	268.34	6,699.19	405.22	-358.49	382.03	9.89
7,063.00	80.62	267.80	6,708.32	403.60	-406.60	429.96	5.68
7"							
7,157.00	85.87	266.78	6,719.37	399.18	-499.81	522.74	5.68
7,252.00	89.48	266.68	6,723.23	393.77	-594.56	617.00	3.80
7,347.00	89.41	269.34	6,724.15	390.47	-689.49	711.56	2.80
7,442.00	91.11	271.11	6,723.72	390.84	-784.48	806.41	2.58
7,536.00	90.19	270.65	6,722.65	392.28	-878.46	900.31	1.09
7,631.00	90.77	270.50	6,721.85	393.24	-973.45	995.19	0.63
7,726.00	91.54	270.38	6,719.94	393.97	-1,068.43	1,090.04	0.82
7,818.00	90.92	271.59	6,717.96	395.55	-1,160.39	1,181.93	1.48
7,909.00	91.51	271.37	6,716.04	397.90	-1,251.34	1,272.86	0.69
8,000.00	90.15	272.03	6,714.72	400.60	-1,342.29	1,363.81	1.66
8,092.00	91.33	272.48	6,713.53	404.22	-1,434.21	1,455.78	1.37
8,183.00	89.26	272.19	6,713.06	407.92	-1,525.13	1,546.75	2.30
8,275.00	89.42	271.88	6,714.12	411.19	-1,617.06	1,638.72	0.38
8,366.00	89.88	271.70	6,714.68	414.03	-1,708.02	1,729.68	0.54
8,458.00	87.94	271.72	6,716.43	416.78	-1,799.95	1,821.62	2.11
8,549.00	87.01	271.68	6,720.43	419.48	-1,890.82	1,912.49	1.02
8,641.00	88.00	270.62	6,724.44	421.32	-1,982.72	2,004.33	1.58
8,732.00	88.98	269.76	6,726.84	421.62	-2,073.68	2,095.15	1.43
8,824.00	90.62	270.33	6,727.16	421.69	-2,165.68	2,186.99	1.89
8,915.00	90.62	270.00	6,726.17	421.96	-2,256.67	2,277.83	0.36
9,007.00	90.89	269.84	6,724.96	421.83	-2,348.66	2,369.65	0.34
9,099.00	90.40	269.33	6,723.93	421.16	-2,440.66	2,461.44	0.77
9,190.00	90.86	270.85	6,722.93	421.30	-2,531.65	2,552.28	1.75
9,282.00	90.93	270.84	6,721.49	422.66	-2,623.63	2,644.17	0.08
9,374.00	91.42	270.21	6,719.60	423.50	-2,715.60	2,736.04	0.87
9,469.00	90.74	270.09	6,717.81	423.75	-2,810.58	2,830.86	0.73

## Design Report for Wells Ranch AA11-667 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,563.00	91.23	269.51	6,716.20	423.42	-2,904.57	2,924.66	0.81
9,658.00	89.66	270.23	6,715.46	423.21	-2,999.56	3,019.47	1.82
9,752.00	89.81	269.86	6,715.89	423.28	-3,093.56	3,113.31	0.42
9,847.00	90.22	269.20	6,715.87	422.50	-3,188.56	3,208.09	0.82
9,942.00	89.57	270.09	6,716.04	421.91	-3,283.55	3,302.88	1.16
10,037.00	89.78	270.37	6,716.58	422.30	-3,378.55	3,397.73	0.37
10,132.00	89.91	270.01	6,716.84	422.61	-3,473.55	3,492.58	0.40
10,226.00	90.86	269.94	6,716.21	422.57	-3,567.55	3,586.41	1.01
10,416.00	88.46	272.25	6,717.33	426.20	-3,757.48	3,776.22	1.75
10,510.00	87.93	271.85	6,720.29	429.56	-3,851.38	3,870.15	0.71
10,605.00	88.27	271.24	6,723.44	432.12	-3,946.29	3,965.04	0.73
10,700.00	89.11	271.15	6,725.62	434.10	-4,041.24	4,059.95	0.89
10,795.00	89.35	270.67	6,726.89	435.61	-4,136.22	4,154.85	0.56
10,889.00	89.78	270.20	6,727.61	436.32	-4,230.21	4,248.71	0.68
10,984.00	90.74	269.85	6,727.18	436.36	-4,325.21	4,343.55	1.08
11,079.00	88.71	269.56	6,727.63	435.88	-4,420.20	4,438.34	2.16
11,174.00	88.77	269.61	6,729.72	435.19	-4,515.18	4,533.10	0.08
11,268.00	89.41	269.36	6,731.21	434.34	-4,609.16	4,626.87	0.73
11,363.00	89.91	268.91	6,731.78	432.91	-4,704.15	4,721.60	0.71
11,458.00	91.14	268.63	6,730.91	430.87	-4,799.12	4,816.28	1.33
11,553.00	89.85	269.52	6,730.09	429.34	-4,894.10	4,911.00	1.65
11,648.00	89.57	269.30	6,730.57	428.36	-4,989.10	5,005.77	0.37
11,742.00	89.45	268.95	6,731.37	426.92	-5,083.08	5,099.50	0.39
11,837.00	90.03	268.55	6,731.80	424.85	-5,178.06	5,194.18	0.74
11,932.00	90.00	268.66	6,731.78	422.54	-5,273.03	5,288.85	0.12
12,027.00	90.00	270.63	6,731.78	421.95	-5,368.02	5,383.64	2.07
12,122.00	90.34	271.10	6,731.49	423.38	-5,463.01	5,478.54	0.61
12,217.00	90.46	270.73	6,730.83	424.90	-5,558.00	5,573.45	0.41
12,311.00	90.40	270.48	6,730.13	425.89	-5,651.99	5,667.33	0.27
12,406.00	90.25	269.39	6,729.59	425.78	-5,746.99	5,762.15	1.16
12,501.00	89.85	270.44	6,729.50	425.64	-5,841.98	5,856.97	1.18
12,596.00	90.22	270.09	6,729.45	426.08	-5,936.98	5,951.83	0.54
12,690.00	89.75	271.08	6,729.47	427.04	-6,030.98	6,045.71	1.17
12,785.00	87.93	270.66	6,731.39	428.49	-6,125.94	6,140.60	1.97
12,880.00	88.15	270.26	6,734.64	429.25	-6,220.88	6,235.41	0.48
12,975.00	88.24	269.76	6,737.64	429.26	-6,315.84	6,330.20	0.53
13,070.00	89.08	270.95	6,739.86	429.85	-6,410.81	6,425.03	1.53
13,164.00	88.77	270.39	6,741.62	430.95	-6,504.78	6,518.91	0.68
13,259.00	89.66	270.64	6,742.92	431.81	-6,599.77	6,613.77	0.97
13,449.00	89.14	267.89	6,744.91	429.37	-6,789.72	6,803.25	1.47
13,543.00	89.32	266.82	6,746.18	425.03	-6,883.61	6,896.71	1.15
13,638.00	90.03	265.95	6,746.71	419.04	-6,978.42	6,990.99	1.18
13,717.00	90.89	265.59	6,746.08	413.21	-7,057.20	7,069.28	1.18
<b>Final Sperry MWD Survey at 13717.00ft</b>							
13,782.00	90.89	265.59	6,745.07	408.22	-7,122.00	7,133.67	0.00
<b>Straight Line Projection to TD at 13782.00ft</b>							

## Design Report for Wells Ranch AA11-667 - Actual Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	0.60	-0.66	First Gyro Survey at 250.00ft.
500.00	499.98	2.39	-2.66	Tie on to Gyro Survey at 500.00ft.
500.00	499.98	2.39	-2.66	Final Gyro Survey at 500.00ft.
664.00	663.96	4.19	-4.66	First Sperry MWD Survey at 664.00ft
13,717.00	6,746.08	413.21	-7,057.20	Final Sperry MWD Survey at 13717.00ft
13,782.00	6,745.07	408.22	-7,122.00	Straight Line Projection to TD at 13782.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch AA11-667_Rev A0_BHL	273.42	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
250.00	500.00	Gyro Surveys	Flexi-Shot
664.00	7,014.00	Intermediate Surveys	MWD
7,157.00	13,782.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
644.00	643.96	9 5/8"	9-5/8	13-3/4
7,063.00	6,708.32	7"	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 AA11-667	0.00	0.00	0.00	0.01	0.00	1,428,041.00	3,307,222.25	40.503120	-104.395200
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Wells Ranch AA11-667	0.00	0.00	6,739.00	425.99	-7,124.97	1,428,466.96	3,300,097.52	40.504530	-104.420800
- actual wellpath misses target center by 19.01usft at 13782.00usft MD (6745.07 TVD, 408.22 N, -7122.00 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.50 °/100usft	Maximum Dogleg over Survey:	12.47 °/100usft at 6,578.00 usft
Net Tortousity applicable to Plans:	0.71 °/100usft	Directional Difficulty Index:	6.518

Audit Info

North Reference Sheet for Sec. 11-T6N-R63W (Wells Ranch PAD) - Wells Ranch  
AA11-667 - Plan A

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 @ 4893.00usft (H&P 273). Northing and Easting are relative to Wells Ranch AA11 -667

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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996652

Grid Coordinates of Well: 1,428,040.99 usft N, 3,307,222.25 usft E

Geographical Coordinates of Well: 40° 30' 11.23" N, 104° 23' 42.72" W

Grid Convergence at Surface is: 0.71°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,782.00usft  
the Bottom Hole Displacement is 7,133.69usft in the Direction of 273.28° (Grid).

Magnetic Convergence at surface is: -7.65° (26 May 2015, , BGGM2015)

