

Noble Energy

Weld County, CO (NAD 83)

Sec. 5-T5N-R62W (Wells Ranch BB01)

Wells Ranch BB01-611

05-123-41990

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

22 February, 2016

Surface UWI : 05-123-41990

Well Coordinates: 1,399,083.83 N, 3,318,703.80 E (40° 25' 23.66" N, 104° 21' 18.94" W)

Ground Level: 4,662.00 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 BB01-611

KB = 24' @ 4686.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

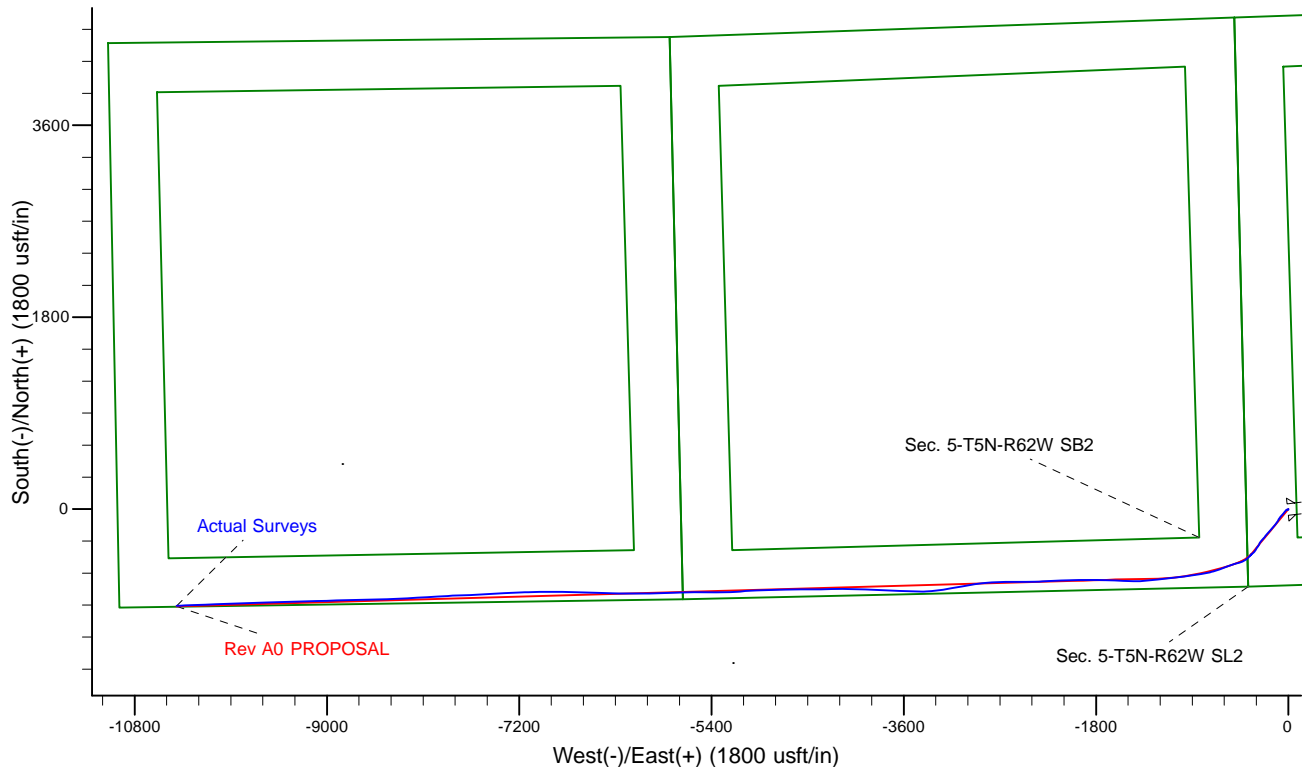
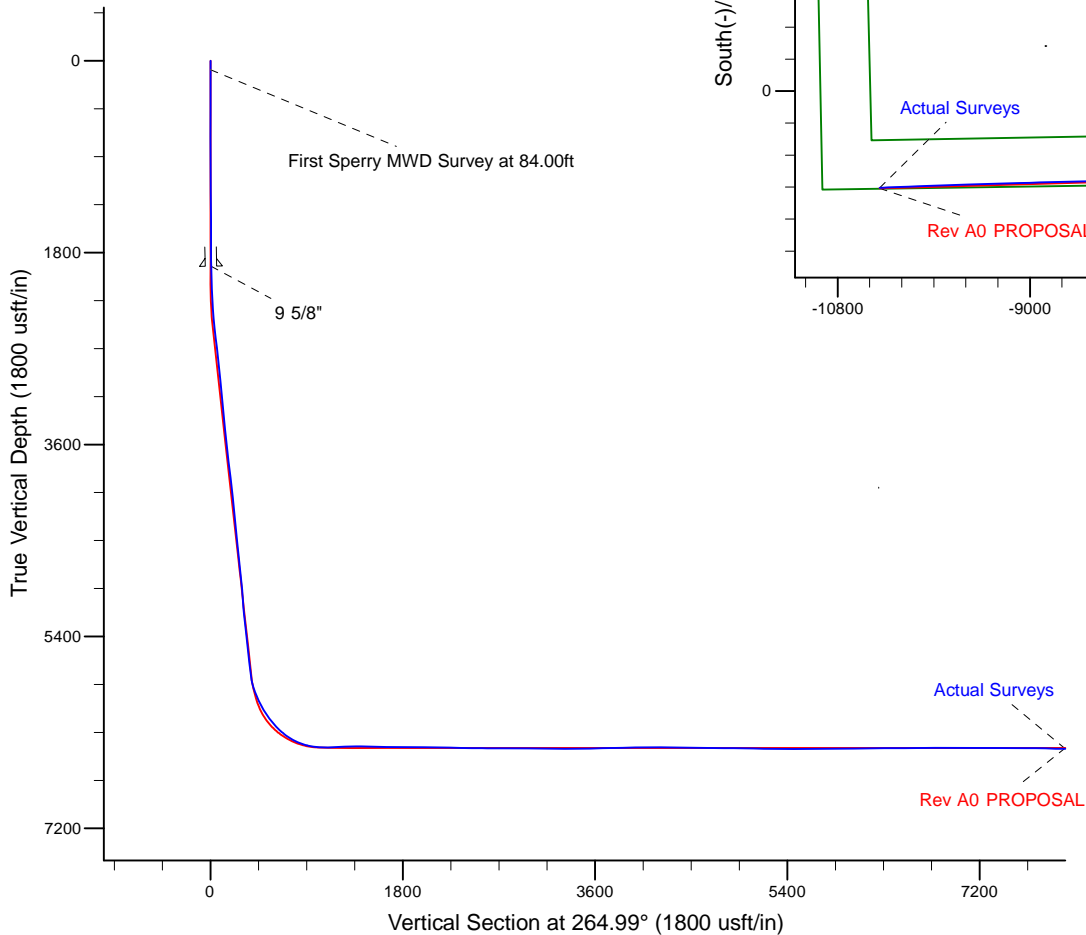
HALLIBURTON

Project: Weld County, CO (NAD 83)
Site: Sec. 5-T5N-R62W (Wells Ranch BB01)
Well: Wells Ranch BB01-611
Wellbore: Plan A
Design: Actual Surveys



Platted SHL: 713' FSL, 393' FWL
Platted Lat/Long: 40.42324, -104.35526
Location: Sec. 5-T5N-R62W

Platted BHL: 1' FSL, 535' FWL
Platted Lat/Long: 40.421119 N, -104.392537 W
State Planes - CO Northern: 1,398,179.38 N, 3,308,335.82 E
Sec. 1-T5N-R63W



LEGEND

- Wells Ranch BB01-611, Plan A, Rev A0 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch BB01-611

Ground Level: 4662.00

KB = 24' @ 4686.00usft (H&P 343)

Created By: Tatiana Gomez
Created On: 12/22/15

Design Report for Wells Ranch BB01-611 - 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
84.00	0.12	290.20	84.00	0.03	-0.08	0.08	0.14
First Sperry MWD Survey at 84.00ft							
175.00	0.55	36.31	175.00	0.42	0.09	-0.12	0.65
270.00	0.10	218.33	270.00	0.72	0.31	-0.37	0.68
362.00	0.25	177.86	362.00	0.45	0.26	-0.30	0.20
453.00	0.21	108.54	453.00	0.20	0.43	-0.44	0.29
548.00	0.19	127.80	548.00	0.05	0.72	-0.72	0.07
642.00	0.42	169.73	641.99	-0.38	0.90	-0.87	0.33
737.00	0.89	165.67	736.99	-1.44	1.15	-1.02	0.50
832.00	0.70	210.05	831.98	-2.66	1.04	-0.80	0.66
926.00	0.60	218.15	925.97	-3.54	0.45	-0.14	0.14
1,021.00	0.73	235.49	1,020.97	-4.28	-0.36	0.73	0.25
1,115.00	0.57	232.09	1,114.96	-4.90	-1.22	1.64	0.18
1,210.00	0.44	233.60	1,209.96	-5.41	-1.89	2.35	0.14
1,305.00	0.61	228.73	1,304.95	-5.96	-2.56	3.07	0.18
1,399.00	0.64	244.61	1,398.95	-6.52	-3.41	3.97	0.19
1,494.00	0.49	237.41	1,493.94	-6.96	-4.23	4.82	0.17
1,588.00	0.23	226.82	1,587.94	-7.31	-4.71	5.33	0.28
1,682.00	0.56	49.58	1,681.94	-7.14	-4.50	5.10	0.84
1,777.00	0.73	13.64	1,776.93	-6.25	-4.00	4.53	0.45
1,872.00	0.81	283.56	1,871.93	-5.50	-4.51	4.97	1.15
1,921.00	1.48	262.87	1,920.92	-5.50	-5.48	5.93	1.59
1,928.00	1.51	264.13	1,927.92	-5.52	-5.66	6.12	0.67
9 5/8"							
2,051.00	2.19	279.32	2,050.85	-5.31	-9.59	10.02	0.67
2,143.00	2.23	278.37	2,142.78	-4.76	-13.10	13.46	0.06
2,234.00	2.06	241.36	2,233.72	-5.29	-16.28	16.68	1.51
2,326.00	5.50	219.00	2,325.51	-9.51	-20.51	21.26	4.00
2,510.00	9.25	218.64	2,507.96	-27.92	-35.30	37.60	2.04
2,605.00	9.16	219.22	2,601.74	-39.74	-44.85	48.15	0.14
2,699.00	9.21	221.26	2,694.53	-51.19	-54.54	58.80	0.35
2,888.00	9.14	221.96	2,881.11	-73.72	-74.55	80.70	0.07
2,982.00	8.63	215.44	2,973.99	-85.02	-83.63	90.74	1.20
3,077.00	8.34	209.12	3,067.95	-96.85	-91.12	99.22	1.03
3,172.00	7.78	208.69	3,162.01	-108.51	-97.56	106.66	0.59
3,266.00	8.46	214.61	3,255.07	-119.78	-104.54	114.60	1.15
3,361.00	8.77	215.82	3,349.00	-131.40	-112.75	123.79	0.38
3,455.00	8.92	218.48	3,441.88	-142.92	-121.48	133.49	0.46
3,550.00	9.27	218.55	3,535.69	-154.67	-130.83	143.83	0.37
3,645.00	9.78	219.58	3,629.38	-166.87	-140.74	154.77	0.57
3,739.00	9.48	221.83	3,722.05	-178.79	-150.99	166.02	0.51
3,834.00	8.94	220.38	3,815.83	-190.25	-160.99	176.98	0.62
3,928.00	9.01	219.84	3,908.68	-201.46	-170.44	187.37	0.12
4,023.00	8.93	222.42	4,002.51	-212.62	-180.18	198.04	0.43
4,118.00	8.08	222.87	4,096.47	-222.95	-189.69	208.43	0.90
4,212.00	7.42	219.82	4,189.61	-232.46	-198.07	217.60	0.83
4,307.00	8.34	217.15	4,283.71	-242.66	-206.16	226.55	1.04
4,402.00	8.42	219.29	4,377.70	-253.53	-214.73	236.04	0.34
4,496.00	7.15	221.92	4,470.83	-263.21	-222.99	245.12	1.40

Design Report for Wells Ranch BB01-611 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,591.00	8.56	221.90	4,564.94	-272.88	-231.67	254.60	1.48
4,685.00	8.87	221.95	4,657.85	-283.47	-241.18	265.00	0.33
4,780.00	7.94	218.87	4,751.83	-294.03	-250.20	274.90	1.09
4,875.00	9.50	214.85	4,845.73	-305.57	-258.79	284.48	1.76
4,969.00	8.91	210.84	4,938.52	-318.19	-266.96	293.71	0.93
5,064.00	7.04	202.97	5,032.60	-329.87	-273.00	300.75	2.28
5,158.00	7.54	212.65	5,125.84	-340.36	-278.58	307.22	1.41
5,253.00	9.83	214.85	5,219.75	-352.27	-286.58	316.23	2.44
5,348.00	9.69	215.34	5,313.37	-365.45	-295.84	326.60	0.17
5,442.00	9.38	208.86	5,406.08	-378.61	-304.11	335.99	1.19
5,537.00	9.84	214.26	5,499.75	-392.10	-312.42	345.44	1.06
5,632.00	9.79	226.89	5,593.37	-404.33	-322.88	356.94	2.26
5,726.00	8.71	231.14	5,686.14	-414.26	-334.26	369.14	1.36
5,821.00	8.35	225.94	5,780.09	-423.57	-344.82	380.47	0.90
5,915.00	21.64	223.79	5,870.69	-440.90	-361.79	398.89	14.15
5,963.00	27.06	225.64	5,914.40	-454.94	-375.73	414.01	11.40
6,010.00	27.09	232.14	5,956.26	-468.98	-391.83	431.27	6.29
6,057.00	27.41	238.18	5,998.05	-481.26	-409.48	449.92	5.92
6,104.00	27.71	246.50	6,039.74	-491.32	-428.70	469.94	8.21
6,152.00	31.01	251.49	6,081.57	-499.70	-450.67	492.56	8.55
6,199.00	33.98	253.60	6,121.21	-507.25	-474.75	517.21	6.76
6,247.00	36.88	253.76	6,160.32	-515.07	-501.45	544.49	6.04
6,293.00	38.91	253.08	6,196.62	-523.14	-528.53	572.17	4.51
6,341.00	42.68	251.31	6,232.95	-532.74	-558.38	602.74	8.21
6,388.00	46.49	247.72	6,266.42	-544.31	-589.25	634.51	9.72
6,436.00	50.53	249.87	6,298.22	-557.29	-622.77	669.03	9.06
6,482.00	53.97	251.83	6,326.38	-569.21	-657.13	704.30	8.20
6,530.00	58.70	252.61	6,352.98	-581.40	-695.16	743.25	9.95
6,577.00	62.91	255.46	6,375.90	-592.66	-734.60	783.52	10.40
6,625.00	67.76	258.89	6,395.93	-602.31	-777.11	826.72	12.01
6,671.00	71.88	261.69	6,411.80	-609.58	-819.66	869.73	10.62
6,719.00	77.14	262.31	6,424.62	-616.01	-865.45	915.91	11.03
6,766.00	82.49	262.95	6,432.92	-621.94	-911.31	962.11	11.46
6,955.00	93.45	263.40	6,439.61	-644.35	-1,098.57	1,150.61	5.80
7,026.00	94.70	262.63	6,434.56	-652.96	-1,168.86	1,221.39	2.07
7,120.00	90.49	263.07	6,430.31	-664.65	-1,262.01	1,315.21	4.50
7,215.00	88.52	265.44	6,431.13	-674.15	-1,356.52	1,410.18	3.24
7,310.00	88.27	271.05	6,433.79	-677.06	-1,451.40	1,504.95	5.91
7,404.00	89.20	273.28	6,435.87	-673.51	-1,545.30	1,598.19	2.57
7,499.00	90.00	273.41	6,436.53	-667.97	-1,640.14	1,692.18	0.85
7,593.00	89.88	270.22	6,436.63	-664.99	-1,734.08	1,785.50	3.40
7,688.00	89.57	269.77	6,437.08	-665.00	-1,829.08	1,880.14	0.58
7,782.00	89.88	270.33	6,437.54	-664.92	-1,923.08	1,973.77	0.68
7,877.00	88.58	268.90	6,438.81	-665.56	-2,018.06	2,068.45	2.03
7,972.00	88.21	267.73	6,441.47	-668.35	-2,112.98	2,163.25	1.29
8,066.00	89.26	267.38	6,443.55	-672.36	-2,206.87	2,257.13	1.18
8,161.00	88.83	266.58	6,445.13	-677.36	-2,301.73	2,352.06	0.96
8,256.00	89.81	269.18	6,446.26	-680.87	-2,396.64	2,446.92	2.92
8,350.00	88.77	270.17	6,447.42	-681.41	-2,490.63	2,540.60	1.53
8,445.00	90.00	269.34	6,448.44	-681.81	-2,585.62	2,635.26	1.56
8,540.00	90.37	268.59	6,448.14	-683.53	-2,680.61	2,730.03	0.88

Design Report for Wells Ranch BB01-611 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,634.00	89.07	266.30	6,448.60	-687.72	-2,774.50	2,823.94	2.80
8,729.00	89.26	263.88	6,449.98	-695.85	-2,869.14	2,918.92	2.55
8,823.00	89.88	260.75	6,450.69	-708.42	-2,962.28	3,012.80	3.39
8,918.00	89.63	259.86	6,451.09	-724.42	-3,055.92	3,107.48	0.97
9,012.00	89.44	259.48	6,451.86	-741.27	-3,148.39	3,201.08	0.45
9,107.00	89.51	261.54	6,452.73	-756.93	-3,242.09	3,295.78	2.17
9,202.00	89.94	264.61	6,453.18	-768.39	-3,336.38	3,390.71	3.26
9,296.00	91.11	269.02	6,452.32	-773.61	-3,430.21	3,484.63	4.85
9,390.00	91.73	272.21	6,449.99	-772.60	-3,524.16	3,578.14	3.46
9,485.00	91.48	272.89	6,447.33	-768.37	-3,619.03	3,672.28	0.76
9,580.00	91.42	272.46	6,444.93	-763.94	-3,713.89	3,766.40	0.46
9,674.00	91.17	272.42	6,442.80	-759.94	-3,807.78	3,859.58	0.27
9,768.00	90.93	272.20	6,441.08	-756.15	-3,901.69	3,952.80	0.35
9,863.00	90.49	272.24	6,439.90	-752.47	-3,996.61	4,047.04	0.47
9,958.00	89.94	270.55	6,439.55	-750.16	-4,091.58	4,141.44	1.87
10,052.00	90.00	269.71	6,439.59	-749.95	-4,185.58	4,235.06	0.90
10,147.00	89.26	269.46	6,440.21	-750.64	-4,280.57	4,329.75	0.82
10,241.00	89.32	269.34	6,441.37	-751.62	-4,374.56	4,423.47	0.14
10,336.00	88.70	269.78	6,443.01	-752.35	-4,469.54	4,518.15	0.80
10,430.00	88.83	269.69	6,445.04	-752.78	-4,563.52	4,611.81	0.17
10,525.00	90.31	269.08	6,445.75	-753.80	-4,658.51	4,706.52	1.69
10,619.00	89.01	267.94	6,446.31	-756.25	-4,752.47	4,800.34	1.84
10,714.00	89.51	269.25	6,447.54	-758.58	-4,847.43	4,895.14	1.48
10,808.00	88.77	268.12	6,448.95	-760.73	-4,941.40	4,988.93	1.44
10,903.00	89.07	266.21	6,450.74	-765.43	-5,036.26	5,083.84	2.03
10,997.00	89.01	264.67	6,452.32	-772.90	-5,129.94	5,177.83	1.64
11,092.00	89.81	268.46	6,453.29	-778.59	-5,224.75	5,272.77	4.08
11,186.00	89.38	269.95	6,453.96	-779.90	-5,318.74	5,366.51	1.65
11,281.00	90.99	270.74	6,453.65	-779.33	-5,413.73	5,461.09	1.89
11,375.00	89.32	269.54	6,453.40	-779.10	-5,507.73	5,554.71	2.19
11,470.00	90.00	269.19	6,453.96	-780.15	-5,602.72	5,649.43	0.81
11,565.00	90.12	268.29	6,453.86	-782.24	-5,697.69	5,744.22	0.96
11,659.00	90.31	267.84	6,453.51	-785.41	-5,791.64	5,838.09	0.52
11,754.00	90.93	268.22	6,452.48	-788.68	-5,886.58	5,932.95	0.77
11,848.00	91.17	269.19	6,450.76	-790.80	-5,980.54	6,026.73	1.06
11,943.00	91.42	269.85	6,448.61	-791.60	-6,075.51	6,121.41	0.74
12,037.00	90.49	270.26	6,447.04	-791.51	-6,169.49	6,215.03	1.08
12,132.00	89.57	270.67	6,446.99	-790.74	-6,264.49	6,309.60	1.06
12,227.00	90.12	271.83	6,447.25	-788.66	-6,359.46	6,404.03	1.35
12,321.00	90.49	271.98	6,446.75	-785.54	-6,453.41	6,497.34	0.42
12,416.00	90.56	271.23	6,445.88	-782.88	-6,548.37	6,591.71	0.79
12,510.00	90.62	272.28	6,444.91	-780.00	-6,642.32	6,685.05	1.12
12,605.00	90.49	271.35	6,443.99	-776.99	-6,737.26	6,779.37	0.99
12,700.00	89.81	269.82	6,443.74	-776.02	-6,832.26	6,873.91	1.76
12,794.00	89.88	269.60	6,444.00	-776.50	-6,926.25	6,967.59	0.25
12,889.00	89.57	268.93	6,444.45	-777.71	-7,021.24	7,062.33	0.78
12,983.00	89.75	269.65	6,445.01	-778.88	-7,115.23	7,156.06	0.79
13,078.00	89.75	267.41	6,445.43	-781.32	-7,210.20	7,250.87	2.36
13,172.00	89.75	266.02	6,445.84	-786.70	-7,304.04	7,344.83	1.48
13,267.00	90.00	266.82	6,446.04	-792.63	-7,398.85	7,439.80	0.88
13,362.00	89.94	267.13	6,446.09	-797.65	-7,493.72	7,534.74	0.33

Design Report for Wells Ranch BB01-611 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
13,456.00	89.51	267.52	6,446.54	-802.03	-7,587.62	7,628.66	0.62
13,551.00	89.32	268.26	6,447.51	-805.53	-7,682.55	7,723.53	0.80
13,646.00	88.58	267.56	6,449.26	-809.00	-7,777.47	7,818.39	1.07
13,740.00	88.40	266.23	6,451.73	-814.09	-7,871.29	7,912.31	1.43
13,835.00	89.81	266.65	6,453.22	-819.98	-7,966.10	8,007.26	1.55
13,929.00	89.26	266.49	6,453.98	-825.61	-8,059.92	8,101.22	0.61
14,024.00	89.57	266.80	6,454.95	-831.17	-8,154.76	8,196.18	0.46
14,118.00	90.37	266.72	6,455.00	-836.48	-8,248.60	8,290.13	0.86
14,212.00	90.86	267.54	6,453.99	-841.19	-8,342.48	8,384.06	1.02
14,307.00	90.31	268.57	6,453.02	-844.41	-8,437.42	8,478.92	1.23
14,402.00	89.81	268.17	6,452.92	-847.11	-8,532.38	8,573.75	0.67
14,496.00	90.86	268.64	6,452.37	-849.73	-8,626.34	8,667.58	1.22
14,591.00	91.05	268.56	6,450.79	-852.05	-8,721.30	8,762.38	0.22
14,686.00	90.93	268.61	6,449.15	-854.39	-8,816.26	8,857.18	0.14
14,780.00	90.68	268.66	6,447.83	-856.63	-8,910.22	8,950.98	0.27
14,874.00	90.31	268.39	6,447.01	-859.05	-9,004.18	9,044.80	0.49
14,969.00	89.14	268.28	6,447.47	-861.81	-9,099.14	9,139.64	1.24
15,064.00	90.00	268.18	6,448.18	-864.75	-9,194.09	9,234.48	0.91
15,158.00	90.00	268.01	6,448.18	-867.87	-9,288.04	9,328.34	0.18
15,253.00	90.25	268.16	6,447.97	-871.05	-9,382.99	9,423.21	0.31
15,347.00	90.19	268.25	6,447.61	-873.99	-9,476.94	9,517.06	0.12
15,442.00	89.75	268.21	6,447.66	-876.93	-9,571.90	9,611.90	0.47
15,536.00	89.75	268.58	6,448.07	-879.56	-9,665.86	9,705.74	0.39
15,631.00	89.88	268.23	6,448.38	-882.20	-9,760.82	9,800.57	0.39
15,725.00	89.14	268.18	6,449.18	-885.15	-9,854.77	9,894.42	0.79
15,820.00	89.14	268.01	6,450.61	-888.31	-9,949.71	9,989.27	0.18
15,914.00	89.26	267.49	6,451.92	-892.00	-10,043.62	10,083.15	0.57
16,009.00	89.94	267.95	6,452.59	-895.77	-10,138.55	10,178.04	0.86
16,104.00	89.44	268.06	6,453.10	-899.08	-10,233.49	10,272.91	0.54
16,198.00	89.94	267.50	6,453.61	-902.72	-10,327.41	10,366.79	0.80
16,239.00	89.63	267.57	6,453.76	-904.49	-10,368.38	10,407.75	0.78
Final Sperry MWD Survey at 16239.00ft							
16,278.00	89.63	267.57	6,454.01	-906.14	-10,407.34	10,446.71	0.00
Straight Line Projection to TD at 16278.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
84.00	84.00	0.03	-0.08	First Sperry MWD Survey at 84.00ft
16,239.00	6,453.76	-904.49	-10,368.38	Final Sperry MWD Survey at 16239.00ft
16,278.00	6,454.01	-906.14	-10,407.34	Straight Line Projection to TD at 16278.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch BB01-611_Rev A0_BHL	264.99	Slot	0.00	0.00	0.00

Design Report for Wells Ranch BB01-611 - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	6,766.00	Intermediate Sperry MWD Survey	MWD
6,814.00	16,278.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,928.00	1,927.92	9 5/8"	9-5/8	13-3/4

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 BB01-611 - actual wellpath misses target center by 3.28usft at 6813.22usft MD (6437.97 TVD, -627.65 N, -957.91 E) - Point	0.00	0.00	6,441.24	-627.35	-957.88	1,398,456.51	3,317,745.96	40.421552	-104.358729
Wells Ranch BB01-611 - actual wellpath misses target center by 10.70usft at 16278.00usft MD (6454.01 TVD, -906.14 N, -10407.34 E) - Point	0.00	0.00	6,445.00	-911.86	-10,408.11	1,398,172.01	3,308,296.09	40.421100	-104.392680

Directional Difficulty Index

Average Dogleg over Survey:	1.64 °/100usft	Maximum Dogleg over Survey:	14.15 °/100usft at 5,915.00 usft
Net Tortousity applicable to Plans:	1.03 °/100usft	Directional Difficulty Index:	6.857

Audit Info

**North Reference Sheet for Sec. 5-T5N-R62W (Wells Ranch BB01) - Wells Ranch
BB01-611 - 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' @ 4686.00usft (H&P 343). Northing and Easting are relative to Wells Ranch BB01-611

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: 0.99996137

Grid Coordinates of Well: 1,399,083.83 usft N, 3,318,703.80 usft E

Geographical Coordinates of Well: 40° 25' 23.66" N, 104° 21' 18.94" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,278.00usft
the Bottom Hole Displacement is 10,446.71usft in the Direction of 265.02° (Grid).

Magnetic Convergence at surface is: -7.52° (27 January 2016, , BGGM2015)

