

Noble Energy

Weld County, CO (NAD 83)

Sec. 17-T6N-R63W

Colt A13-648

05-123-40907

Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

15 April, 2015

Surface UWI : 05-123-40907

Well Coordinates: 1,421,598.05 N, 3,286,825.83 E (40° 29' 10.00" N, 104° 28' 07.72" W)

Ground Level: 4,664.00 usft

Local Coordinate Origin:

Centered on Well Colt A13-648

Viewing Datum:

WELL @ 4694.00usft (Original Well Elev)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

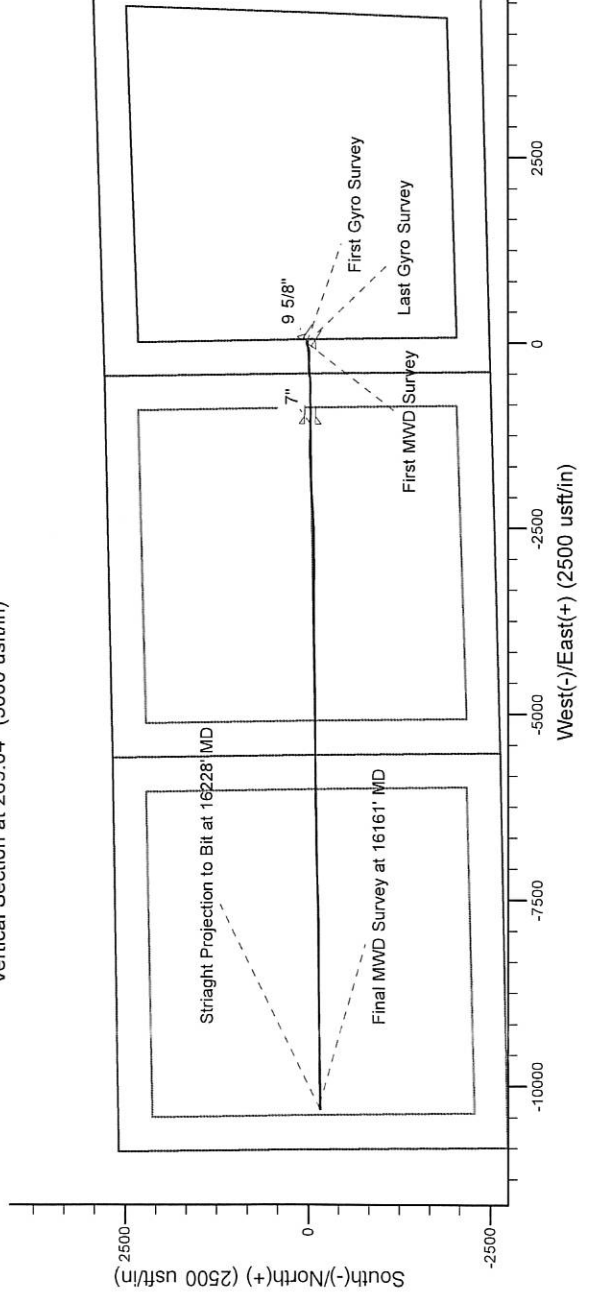
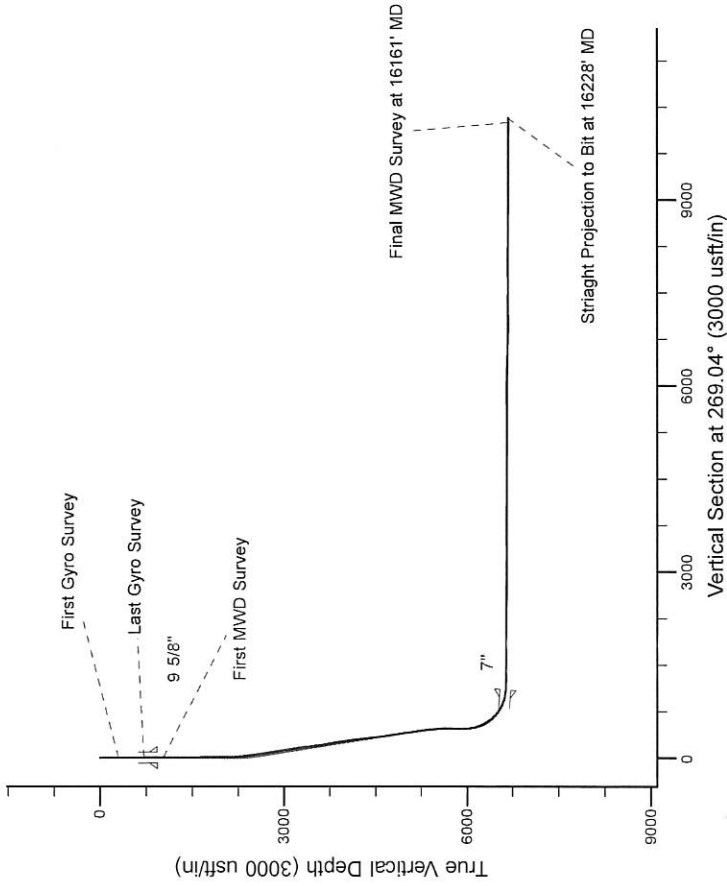
Version: 5000.1 Build: 73

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 17-T6N-R63W
 Well: Colt A13-648
 Wellbore: Original Wellbore
 Design: Actual Surveys

Noble Energy

HALLIBURTON
 Sperry Drilling



Platted SHL: 2496' FSL, 424' FWL
 Platted Lat/Long: 40.486110 N, 104.468810 W
 Location: Sec. 17-T6N-R63W

~7" Casing: 2538' FSL, 626' FEL
 Lat/Long: 40.486037 N, 104.472776 W
 State Planes - CO Northern: 1421558.80 N, 3285723.18 E
 Location: Sec. 17-T6N-R63W

Platted BHL: 2560' FSL, 535 FWL
 Lat/Long: 40.485980 N, 104.505910 W
 State Planes - CO Northern: 1421425.57 N, 3276507.51 E
 Location: Sec. 13-T6N-R64W

LEGEND

—+— Colt A13-648, Original Wellbore, Rev A0 V0

—□— Actual Surveys

WELL DETAILS: Colt A13-648	
Ground Level:	4664.00
WELL @ 4694.00usft (Original Well Elev)	
Created By:	Amanda Marchand
Created On:	4/15/2015

Design Report for Colt A13-648 - 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
306.00	1.20	294.32	305.98	1.32	-2.92	2.90	0.39
First Gyro Survey							
708.00	0.80	311.82	707.92	4.93	-8.85	8.76	0.12
Last Gyro Survey							
957.00	0.17	297.59	956.91	6.26	-10.47	10.36	0.26
1,015.00	0.25	269.44	1,014.91	6.29	-10.67	10.57	0.22
First MWD Survey							
1,198.00	0.22	314.90	1,197.90	6.54	-11.32	11.21	0.10
1,290.00	0.45	303.26	1,289.90	6.86	-11.75	11.63	0.26
1,381.00	0.53	330.75	1,380.90	7.42	-12.25	12.13	0.27
1,473.00	0.59	311.08	1,472.90	8.11	-12.82	12.68	0.22
1,564.00	0.54	307.76	1,563.89	8.68	-13.51	13.36	0.07
1,655.00	0.33	289.31	1,654.89	9.03	-14.10	13.94	0.27
1,748.00	0.44	304.46	1,747.89	9.32	-14.64	14.49	0.16
1,840.00	0.44	324.54	1,839.88	9.80	-15.14	14.97	0.17
1,931.00	0.35	305.14	1,930.88	10.25	-15.57	15.40	0.18
2,023.00	0.32	273.02	2,022.88	10.42	-16.06	15.88	0.20
2,115.00	1.74	225.65	2,114.86	9.46	-17.31	17.15	1.68
2,207.00	3.48	245.64	2,206.77	7.33	-20.85	20.73	2.11
2,299.00	5.55	246.60	2,298.48	4.41	-27.48	27.40	2.25
2,391.00	6.85	247.83	2,389.94	0.58	-36.65	36.63	1.42
2,486.00	8.62	245.82	2,484.07	-4.48	-48.39	48.46	1.88
2,579.00	8.52	245.29	2,576.03	-10.21	-61.00	61.17	0.14
2,674.00	9.24	253.66	2,669.89	-15.30	-74.72	74.96	1.55
2,769.00	9.15	261.25	2,763.68	-18.59	-89.50	89.80	1.28
2,863.00	9.82	262.03	2,856.39	-20.84	-104.83	105.16	0.73
2,958.00	8.98	265.37	2,950.12	-22.56	-120.24	120.60	1.05
3,053.00	9.28	263.97	3,043.91	-23.97	-135.25	135.63	0.39
3,148.00	9.29	262.83	3,137.67	-25.73	-150.47	150.88	0.19
3,242.00	7.56	265.72	3,230.65	-27.14	-164.17	164.60	1.89
3,337.00	6.81	264.99	3,324.90	-28.10	-176.01	176.46	0.80
3,432.00	6.40	281.00	3,419.28	-27.58	-186.82	187.26	1.98
3,527.00	7.09	274.83	3,513.62	-26.07	-197.86	198.27	1.05
3,621.00	7.75	274.13	3,606.84	-25.13	-209.96	210.35	0.71
3,716.00	9.56	272.22	3,700.75	-24.36	-224.24	224.61	1.93
3,810.00	10.35	271.19	3,793.33	-23.88	-240.48	240.84	0.86
3,905.00	9.69	271.44	3,886.89	-23.51	-257.00	257.36	0.70
4,000.00	8.11	270.27	3,980.74	-23.27	-271.70	272.05	1.67
4,094.00	7.40	272.85	4,073.88	-22.94	-284.37	284.72	0.84
4,189.00	7.20	270.80	4,168.11	-22.55	-296.44	296.77	0.35
4,284.00	6.18	282.05	4,262.46	-21.40	-307.39	307.71	1.74
4,379.00	6.65	273.36	4,356.87	-20.01	-317.88	318.17	1.13
4,473.00	6.49	278.76	4,450.26	-18.89	-328.57	328.84	0.68
4,568.00	7.00	271.38	4,544.60	-17.93	-339.66	339.91	1.06
4,663.00	7.15	269.19	4,638.88	-17.87	-351.36	351.61	0.32
4,758.00	8.06	263.03	4,733.04	-18.76	-363.88	364.15	1.28
4,853.00	9.38	262.72	4,826.94	-20.55	-378.17	378.46	1.39
4,947.00	7.52	272.28	4,919.92	-21.28	-391.92	392.22	2.47
5,042.00	9.10	268.06	5,013.92	-21.29	-405.64	405.94	1.78

Design Report for Colt A13-648 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,137.00	8.86	257.32	5,107.76	-23.15	-420.29	420.62	1.78
5,231.00	8.77	257.17	5,200.65	-26.33	-434.34	434.72	0.10
5,326.00	7.40	257.06	5,294.71	-29.31	-447.36	447.79	1.44
5,420.00	6.80	258.43	5,387.99	-31.78	-458.71	459.18	0.66
5,515.00	4.01	263.04	5,482.55	-33.31	-467.52	468.01	2.97
5,609.00	1.94	258.67	5,576.42	-34.02	-472.35	472.85	2.21
5,704.00	0.90	178.44	5,671.40	-35.08	-473.90	474.42	2.10
5,798.00	0.66	159.85	5,765.39	-36.33	-473.70	474.24	0.37
5,893.00	0.36	162.47	5,860.39	-37.13	-473.42	473.97	0.32
5,988.00	0.40	258.96	5,955.39	-37.47	-473.65	474.21	0.60
6,034.00	4.81	278.58	6,001.33	-37.22	-475.72	476.27	9.64
6,082.00	7.94	278.49	6,049.02	-36.43	-480.99	481.53	6.52
6,130.00	10.20	274.49	6,096.42	-35.60	-488.51	489.03	4.89
6,177.00	15.64	263.75	6,142.22	-35.97	-498.96	499.49	12.60
6,225.00	21.06	264.50	6,187.76	-37.50	-513.99	514.54	11.30
6,272.00	24.09	266.75	6,231.16	-38.85	-531.98	532.55	6.70
6,320.00	26.85	268.31	6,274.49	-39.73	-552.60	553.18	5.92
6,367.00	30.09	268.21	6,315.80	-40.41	-574.99	575.58	6.89
6,415.00	34.09	268.53	6,356.46	-41.13	-600.47	601.08	8.34
6,462.00	39.27	269.74	6,394.14	-41.54	-628.53	629.14	11.13
6,510.00	44.82	270.93	6,429.77	-41.33	-660.66	661.26	11.68
6,556.00	48.21	273.26	6,461.42	-40.09	-694.01	694.58	8.23
6,604.00	50.72	273.79	6,492.62	-37.85	-730.42	730.95	5.30
6,651.00	54.29	270.12	6,521.23	-36.60	-767.67	768.17	9.80
6,699.00	59.51	267.41	6,547.43	-37.50	-807.85	808.36	11.86
6,746.00	63.87	266.80	6,569.72	-39.59	-849.16	849.71	9.35
6,794.00	69.37	267.62	6,588.76	-41.73	-893.15	893.73	11.57
6,841.00	73.21	269.92	6,603.83	-42.67	-937.65	938.23	9.39
6,889.00	77.64	271.35	6,615.91	-42.15	-984.09	984.65	9.67
6,936.00	80.56	272.06	6,624.80	-40.78	-1,030.21	1,030.75	6.39
6,965.00	83.05	270.96	6,628.93	-40.02	-1,058.91	1,059.43	9.37
7,039.00	87.91	271.15	6,634.76	-38.67	-1,132.64	1,133.13	6.57
7,122.00	87.87	271.46	6,637.82	-36.78	-1,215.56	1,216.01	0.38
7,217.00	88.06	271.06	6,641.19	-34.69	-1,310.48	1,310.88	0.47
7,312.00	89.72	270.51	6,643.03	-33.39	-1,405.45	1,405.81	1.84
7,407.00	90.56	270.50	6,642.80	-32.55	-1,500.44	1,500.78	0.88
7,502.00	89.82	268.55	6,642.48	-33.34	-1,595.43	1,595.77	2.20
7,596.00	89.85	267.16	6,642.75	-36.86	-1,689.37	1,689.75	1.48
7,691.00	89.85	266.94	6,643.00	-41.75	-1,784.24	1,784.69	0.23
7,786.00	90.77	268.61	6,642.49	-45.43	-1,879.16	1,879.66	2.01
7,880.00	89.69	265.53	6,642.11	-50.24	-1,973.03	1,973.59	3.47
7,975.00	89.57	266.22	6,642.73	-57.07	-2,067.78	2,068.44	0.74
8,070.00	89.69	264.94	6,643.34	-64.39	-2,162.49	2,163.27	1.35
8,165.00	89.75	264.37	6,643.80	-73.24	-2,257.08	2,257.99	0.60
8,259.00	89.29	267.62	6,644.59	-79.81	-2,350.83	2,351.84	3.49
8,354.00	89.88	269.61	6,645.28	-82.10	-2,445.80	2,446.83	2.18
8,449.00	89.48	268.90	6,645.81	-83.34	-2,540.79	2,541.82	0.86
8,544.00	89.41	267.87	6,646.73	-86.01	-2,635.74	2,636.81	1.09
8,639.00	89.66	269.00	6,647.50	-88.61	-2,730.70	2,731.80	1.22
8,734.00	89.78	270.87	6,647.97	-88.72	-2,825.70	2,826.78	1.97
8,828.00	89.69	270.13	6,648.40	-87.90	-2,919.69	2,920.75	0.79

Design Report for Colt A13-648 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,923.00	89.57	270.81	6,649.01	-87.12	-3,014.69	3,015.72	0.73
9,018.00	89.23	268.71	6,650.01	-87.52	-3,109.67	3,110.70	2.24
9,113.00	89.60	269.73	6,650.98	-88.81	-3,204.66	3,205.70	1.14
9,207.00	90.28	270.18	6,651.08	-88.88	-3,298.66	3,299.68	0.87
9,302.00	90.55	270.58	6,650.39	-88.25	-3,393.65	3,394.65	0.51
9,397.00	90.89	270.76	6,649.19	-87.14	-3,488.64	3,489.61	0.40
9,492.00	91.69	270.62	6,647.06	-86.00	-3,583.61	3,584.54	0.85
9,587.00	90.74	271.37	6,645.04	-84.35	-3,678.57	3,679.47	1.27
9,682.00	90.03	270.05	6,644.40	-83.17	-3,773.56	3,774.42	1.58
9,777.00	89.69	269.41	6,644.64	-83.62	-3,868.56	3,869.41	0.76
9,871.00	89.51	268.97	6,645.29	-84.95	-3,962.54	3,963.41	0.51
9,966.00	89.85	269.22	6,645.82	-86.45	-4,057.53	4,058.41	0.44
10,058.00	89.63	268.35	6,646.24	-88.40	-4,149.51	4,150.41	0.98
10,150.00	90.03	268.69	6,646.51	-90.78	-4,241.48	4,242.40	0.57
10,244.00	89.72	268.04	6,646.72	-93.46	-4,335.44	4,336.39	0.77
10,335.00	90.22	267.99	6,646.77	-96.61	-4,426.38	4,427.38	0.55
10,427.00	87.87	268.88	6,648.30	-99.12	-4,518.33	4,519.35	2.73
10,519.00	88.03	268.28	6,651.59	-101.40	-4,610.24	4,611.29	0.67
10,610.00	88.77	269.45	6,654.13	-103.20	-4,701.18	4,702.25	1.52
10,702.00	90.28	270.16	6,654.89	-103.51	-4,793.18	4,794.24	1.81
10,793.00	90.59	270.19	6,654.20	-103.24	-4,884.17	4,885.22	0.34
10,885.00	91.14	269.65	6,652.81	-103.37	-4,976.16	4,977.20	0.84
10,977.00	90.03	270.05	6,651.87	-103.61	-5,068.16	5,069.18	1.28
11,069.00	90.25	269.86	6,651.65	-103.68	-5,160.16	5,161.17	0.32
11,160.00	89.66	269.81	6,651.72	-103.94	-5,251.15	5,252.16	0.65
11,252.00	89.97	269.72	6,652.02	-104.32	-5,343.15	5,344.15	0.35
11,344.00	90.22	269.40	6,651.87	-105.02	-5,435.15	5,436.15	0.44
11,437.00	90.83	268.47	6,651.01	-106.75	-5,528.13	5,529.14	1.20
11,529.00	90.43	269.86	6,650.00	-108.09	-5,620.11	5,621.13	1.57
11,621.00	91.17	269.98	6,648.72	-108.22	-5,712.10	5,713.11	0.81
11,715.00	89.54	270.13	6,648.13	-108.13	-5,806.10	5,807.09	1.74
11,809.00	89.75	270.39	6,648.72	-107.70	-5,900.09	5,901.07	0.36
11,904.00	89.97	269.54	6,648.95	-107.76	-5,995.09	5,996.06	0.92
11,998.00	87.84	270.28	6,650.75	-107.91	-6,089.07	6,090.02	2.40
12,093.00	88.06	270.03	6,654.14	-107.65	-6,184.01	6,184.94	0.35
12,188.00	88.18	269.40	6,657.26	-108.13	-6,278.95	6,279.89	0.67
12,283.00	88.18	269.51	6,660.28	-109.03	-6,373.90	6,374.83	0.12
12,378.00	88.40	269.71	6,663.11	-109.68	-6,468.86	6,469.79	0.31
12,473.00	88.80	269.35	6,665.43	-110.45	-6,563.83	6,564.76	0.57
12,568.00	89.07	269.20	6,667.20	-111.66	-6,658.80	6,659.74	0.33
12,663.00	89.35	269.03	6,668.51	-113.12	-6,753.78	6,754.73	0.34
12,758.00	88.89	268.42	6,669.97	-115.24	-6,848.75	6,849.72	0.80
12,852.00	89.57	268.57	6,671.23	-117.71	-6,942.70	6,943.70	0.74
12,947.00	90.74	267.71	6,670.97	-120.79	-7,037.65	7,038.69	1.53
13,042.00	90.58	267.61	6,669.88	-124.67	-7,132.57	7,133.65	0.20
13,137.00	91.29	267.53	6,668.33	-128.69	-7,227.47	7,228.61	0.75
13,232.00	91.85	267.20	6,665.73	-133.06	-7,322.33	7,323.53	0.68
13,326.00	90.31	268.14	6,663.96	-136.88	-7,416.23	7,417.48	1.92
13,421.00	89.11	267.16	6,664.44	-140.78	-7,511.15	7,512.45	1.63
13,516.00	90.00	268.81	6,665.17	-144.12	-7,606.08	7,607.43	1.97
13,611.00	90.18	271.13	6,665.03	-144.17	-7,701.08	7,702.41	2.45

Design Report for Colt A13-648 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
13,706.00	90.25	270.31	6,664.67	-142.97	-7,796.07	7,797.37	0.87
13,801.00	90.55	270.40	6,664.01	-142.38	-7,891.06	7,892.34	0.33
13,896.00	91.14	270.05	6,662.60	-142.01	-7,986.05	7,987.31	0.72
13,991.00	88.68	269.78	6,662.75	-142.15	-8,081.04	8,082.29	2.61
14,085.00	89.38	270.11	6,664.34	-142.24	-8,175.03	8,176.26	0.82
14,180.00	90.49	269.64	6,664.45	-142.45	-8,270.03	8,271.25	1.27
14,275.00	88.64	269.85	6,665.17	-142.87	-8,365.02	8,366.24	1.96
14,370.00	88.95	269.45	6,667.17	-143.45	-8,460.00	8,461.21	0.53
14,465.00	89.11	269.00	6,668.78	-144.74	-8,554.97	8,556.20	0.50
14,559.00	89.72	269.06	6,669.74	-146.33	-8,648.95	8,650.19	0.65
14,654.00	90.55	269.14	6,669.52	-147.82	-8,743.94	8,745.19	0.88
14,749.00	90.12	269.37	6,668.96	-149.06	-8,838.93	8,840.19	0.51
14,843.00	90.74	268.53	6,668.25	-150.78	-8,932.91	8,934.18	1.11
14,938.00	89.91	269.43	6,667.72	-152.47	-9,027.89	9,029.18	1.29
15,033.00	88.74	269.67	6,668.84	-153.22	-9,122.88	9,124.17	1.26
15,128.00	89.23	269.68	6,670.52	-153.75	-9,217.87	9,219.15	0.52
15,223.00	89.54	269.53	6,671.54	-154.41	-9,312.86	9,314.14	0.36
15,318.00	90.34	269.03	6,671.64	-155.60	-9,407.85	9,409.14	0.99
15,413.00	90.18	269.71	6,671.21	-156.65	-9,502.84	9,504.13	0.74
15,508.00	90.43	269.51	6,670.70	-157.29	-9,597.84	9,599.13	0.34
15,603.00	90.89	269.96	6,669.61	-157.73	-9,692.83	9,694.11	0.68
15,698.00	89.91	270.13	6,668.94	-157.66	-9,787.83	9,789.10	1.05
15,793.00	90.52	270.97	6,668.59	-156.75	-9,882.82	9,884.06	1.09
15,887.00	89.60	268.96	6,668.49	-156.80	-9,976.82	9,978.04	2.35
15,982.00	89.94	269.42	6,668.87	-158.15	-10,071.80	10,073.04	0.60
16,077.00	91.20	268.73	6,667.92	-159.68	-10,166.78	10,168.03	1.51
16,161.00	91.32	269.30	6,666.08	-161.12	-10,250.75	10,252.01	0.69
Final MWD Survey at 16161' MD							
16,228.00	91.32	269.30	6,664.53	-161.94	-10,317.73	10,318.99	0.00
Striaight Projection to Bit at 16228' MD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
306.00	305.98	1.32	-2.92	First Gyro Survey
708.00	707.92	4.93	-8.85	Last Gyro Survey
1,015.00	1,014.91	6.29	-10.67	First MWD Survey
16,161.00	6,666.08	-161.12	-10,250.75	Final MWD Survey at 16161' MD
16,228.00	6,664.53	-161.94	-10,317.73	Striaight Projection to Bit at 16228' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Colt A13-648_BHL	269.04	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
306.00	708.00	Surface Surveys	Flexi-Shot

Design Report for Colt A13-648 - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
957.00	6,965.00	Intermediate Surveys	MWD+IFR1+MS_WY
7,039.00	16,228.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
924.00	923.91	9 5/8"	9-5/8	13-3/4
7,009.00	6,633.15	7"	4-1/2	8-3/4

Wellbore Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Colt A13-648_BHL	0.00	0.00	6,677.03	-172.48	-10,318.68	1,421,425.57	3,276,507.51	40.485960	-104.505910
- hit/miss target									
- Shape									
- actual wellpath misses target center by 16.38usft at 16228.00usft MD (6664.53 TVD, -161.94 N, -10317.73 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.49 °/100usft	Maximum Dogleg over Survey:	12.60 °/100usft at 6,177.00 usft
Net Tortousity applicable to Plans:	0.82 °/100usft	Directional Difficulty Index:	6.784

Audit Info

HALLIBURTON

North Reference Sheet for Sec. 17-T6N-R63W - Colt A13-648 - Original Wellbore

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

Vertical Depths are relative to WELL @ 4694.00usft (Original Well Elev). Northing and Easting are relative to Colt A13-648

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: 0.99996526

Grid Coordinates of Well: 1,421,598.05 usft N, 3,286,825.83 usft E

Geographical Coordinates of Well: 40° 29' 10.00" N, 104° 28' 07.72" W

Grid Convergence at Surface is: 0.67°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,228.00usft the Bottom Hole Displacement is 10,319.00usft in the Direction of 269.10° (Grid).

Magnetic Convergence at surface is: -7.65° (2 March 2015, , BGGM2014)

