

# Noble Energy

Weld County, CO (NAD 83)

Sec. 17-T6N-R63W (Aggie State AA17)

Colt A13-633

05-123-40911

Plan B

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

13 April, 2015

Surface UWI : 05-123-40911

Well Coordinates: 1,420,191.97 N, 3,286,844.97 E (40° 28' 56.10" N, 104° 28' 07.68" W)

Ground Level: 4,667.00 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 Colt A13-633

KB = 24' @ 4691.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

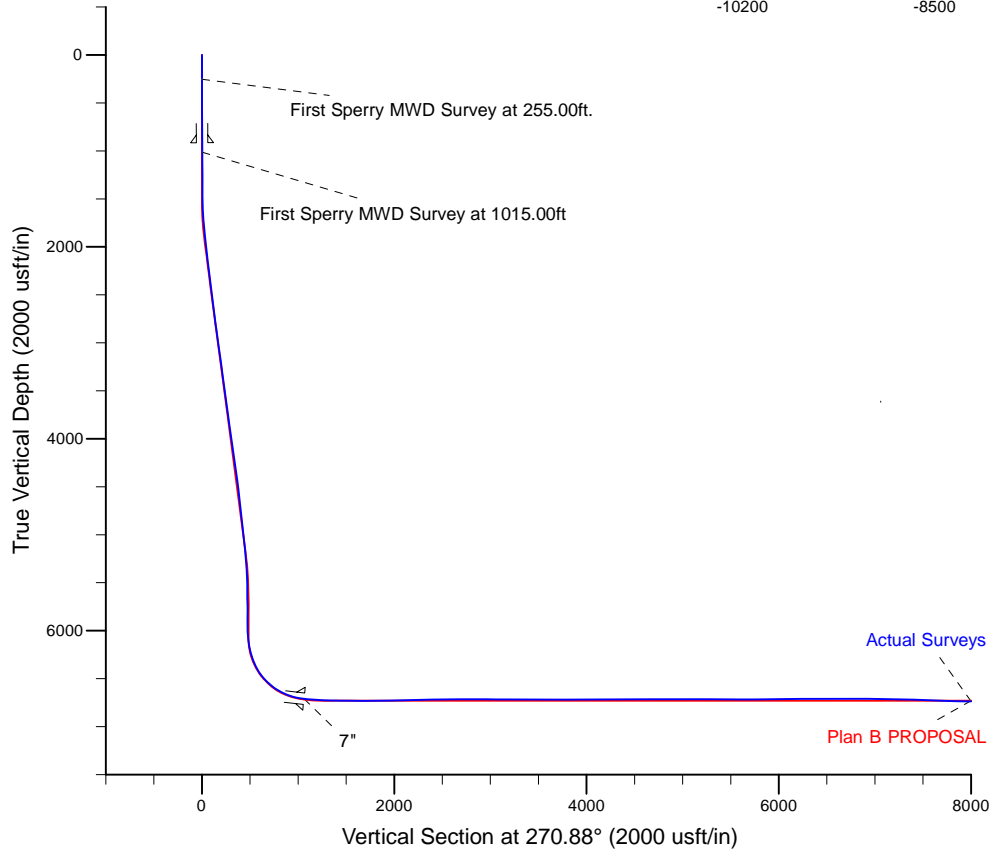
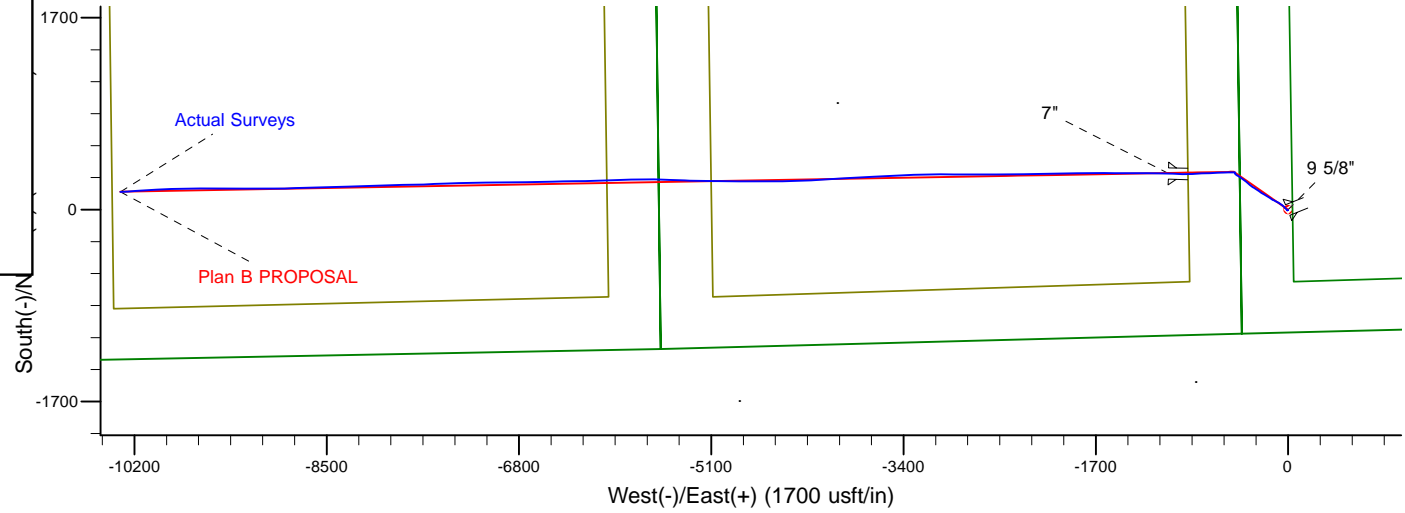
Project: Weld County, CO (NAD 83)  
 Site: Sec. 17-T6N-R63W (Aggie State AA17)  
 Well: Colt A13-633  
 Wellbore: Plan B  
 Design: Actual Surveys



Platted SHL: 1127' FSL, 424' FWL  
 Platted Lat/Long: 40.482360 N, 104.4688 W  
 Location: Sec. 17-T6N-R63W

~7" Casing: 1434' FSL, 628' FEL  
 Lat/Long: 40.483160 N, 104.472588 W  
 State Planes - CO Northern: 1,420,511.03 N, 3,285,787.59 E  
 Location: Sec. 18-T6N-R63W

Platted BHL: 1485' FSL, 535' FWL  
 Platted Lat/Long: 40.483012 N, 104.505669 W  
 State Planes - CO Northern: 1,420,352.53 N, 3,276,586.64 E  
 Location: Sec. 13-T6N-R63W



#### LEGEND

- Colt A13-633, Plan B, Plan B PROPOSAL V0
- Actual Surveys

WELL DETAILS: Colt A13-633

Ground Level: 4667.00  
 KB = 24' @ 4691.00usft (H&P 273)

Created By: Tatiana Gomez  
 Created On: 4/13/2015

## Design Report for Colt A13-633 - 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
<b>Colt A13-633_Rev B0_SHL - Colt A13-633_SHL</b>							
255.00	0.30	217.63	255.00	-0.53	-0.41	0.40	0.12
<b>First Sperry MWD Survey at 255.00ft.</b>							
504.00	0.60	220.03	503.99	-2.04	-1.64	1.61	0.12
747.00	0.20	229.33	746.98	-3.29	-2.78	2.73	0.17
<b>Final Sperry MWD Survey at 747.00ft - Tie on to Gyro Survey at 747.00ft.</b>							
918.00	0.41	248.33	917.98	-3.72	-3.58	3.52	0.14
<b>9 5/8"</b>							
1,015.00	0.54	252.25	1,014.98	-3.98	-4.34	4.28	0.14
<b>First Sperry MWD Survey at 1015.00ft</b>							
1,110.00	0.37	238.71	1,109.98	-4.28	-5.03	4.96	0.21
1,294.00	0.55	226.95	1,293.97	-5.19	-6.18	6.10	0.11
1,387.00	0.33	214.28	1,386.97	-5.72	-6.66	6.57	0.26
1,480.00	0.46	189.06	1,479.96	-6.31	-6.87	6.77	0.23
1,572.00	2.85	327.04	1,571.93	-4.75	-8.17	8.10	3.49
1,664.00	4.98	318.18	1,663.71	0.14	-12.08	12.08	2.40
1,756.00	7.23	317.54	1,755.18	7.39	-18.65	18.76	2.45
1,941.00	8.97	312.66	1,938.33	25.75	-37.12	37.51	1.01
2,033.00	8.38	313.15	2,029.28	35.20	-47.28	47.82	0.65
2,126.00	8.20	306.47	2,121.31	43.78	-57.56	58.23	1.05
2,311.00	8.15	297.88	2,304.44	57.75	-79.76	80.64	0.66
2,402.00	7.41	295.48	2,394.60	63.29	-90.76	91.73	0.89
2,587.00	8.14	300.16	2,577.90	75.00	-112.86	114.00	0.52
2,679.00	7.92	297.20	2,669.00	81.17	-124.13	125.36	0.51
2,772.00	8.07	294.32	2,761.09	86.79	-135.77	137.09	0.46
2,863.00	9.44	306.70	2,851.04	93.88	-147.58	149.01	2.55
3,051.00	9.46	303.46	3,036.49	111.62	-172.83	174.53	0.28
3,240.00	9.04	298.53	3,223.03	127.27	-198.83	200.77	0.47
3,334.00	8.62	295.32	3,315.92	133.81	-211.69	213.72	0.69
3,429.00	8.16	302.37	3,409.91	140.47	-223.82	225.95	1.19
3,524.00	8.96	305.71	3,503.85	148.39	-235.52	237.78	0.99
3,619.00	9.14	304.46	3,597.67	156.98	-247.75	250.14	0.28
3,714.00	9.34	305.26	3,691.43	165.70	-260.26	262.78	0.25
3,904.00	10.09	302.78	3,878.71	183.61	-286.85	289.64	0.45
3,999.00	9.58	300.00	3,972.31	192.07	-300.69	303.61	0.73
4,094.00	9.52	300.58	4,066.00	200.02	-314.30	317.34	0.12
4,188.00	9.96	310.78	4,158.65	209.28	-327.15	330.33	1.89
4,283.00	9.95	310.70	4,252.22	220.00	-339.59	342.94	0.02
4,378.00	9.83	309.75	4,345.80	230.54	-352.05	355.56	0.21
4,473.00	9.62	308.60	4,439.44	240.68	-364.49	368.15	0.30
4,568.00	8.90	309.09	4,533.20	250.26	-376.40	380.20	0.76
4,663.00	8.46	307.86	4,627.11	259.19	-387.62	391.56	0.50
4,758.00	8.22	306.99	4,721.11	267.56	-398.56	402.63	0.29
4,947.00	7.10	305.78	4,908.42	282.52	-418.83	423.13	0.60
5,042.00	7.28	305.74	5,002.67	289.47	-428.47	432.88	0.19
5,137.00	6.69	302.04	5,096.97	295.92	-438.05	442.55	0.78
5,232.00	6.27	300.46	5,191.36	301.49	-447.21	451.80	0.48
5,326.00	5.58	298.67	5,284.86	306.28	-455.65	460.31	0.76
5,420.00	4.41	313.07	5,378.50	310.94	-462.30	467.03	1.82

## Design Report for Colt A13-633 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,515.00	2.78	320.01	5,473.31	315.20	-466.45	471.24	1.77
5,610.00	1.37	344.03	5,568.25	318.06	-468.24	473.08	1.71
5,704.00	1.61	344.46	5,662.22	320.41	-468.90	473.78	0.26
5,799.00	1.16	338.72	5,757.19	322.59	-469.61	474.52	0.50
5,893.00	2.69	340.00	5,851.13	325.55	-470.71	475.67	1.63
5,988.00	1.39	332.20	5,946.07	328.67	-472.01	477.01	1.40
6,082.00	1.09	327.38	6,040.05	330.43	-473.02	478.05	0.34
6,177.00	10.41	265.78	6,134.50	330.56	-482.09	487.12	10.46
6,272.00	15.73	268.47	6,227.00	329.58	-503.54	508.56	5.64
6,366.00	20.25	269.75	6,316.38	329.17	-532.56	537.57	4.83
6,461.00	28.40	268.24	6,402.88	328.40	-571.65	576.64	8.60
6,556.00	39.57	266.66	6,481.53	325.94	-624.61	629.55	11.79
6,651.00	48.26	268.54	6,549.90	323.27	-690.37	695.27	9.25
6,745.00	56.13	267.38	6,607.48	320.59	-764.53	769.38	8.43
6,840.00	65.16	266.15	6,654.00	315.88	-847.11	851.88	9.57
6,935.00	73.27	272.38	6,687.71	314.87	-935.80	940.53	10.51
7,019.00	82.22	271.83	6,705.52	317.88	-1,017.74	1,022.52	10.67
7,059.00	83.40	271.63	6,710.53	319.08	-1,057.41	1,062.20	3.00
7"							
7,157.00	86.30	271.15	6,719.32	321.44	-1,154.98	1,159.79	3.00
7,252.00	87.81	270.33	6,724.20	322.67	-1,249.84	1,254.66	1.81
7,347.00	87.53	270.06	6,728.07	322.99	-1,344.76	1,349.57	0.41
7,442.00	89.17	270.20	6,730.80	323.21	-1,439.72	1,444.52	1.73
7,537.00	89.97	270.29	6,731.51	323.61	-1,534.71	1,539.51	0.85
7,632.00	89.66	270.18	6,731.82	324.00	-1,629.71	1,634.51	0.35
7,727.00	90.62	269.44	6,731.59	323.69	-1,724.71	1,729.49	1.28
7,822.00	90.28	269.26	6,730.84	322.61	-1,819.70	1,824.45	0.40
7,917.00	90.06	269.08	6,730.56	321.23	-1,914.69	1,919.41	0.30
8,011.00	91.45	269.17	6,729.32	319.80	-2,008.67	2,013.35	1.48
8,106.00	90.40	268.49	6,727.79	317.86	-2,103.63	2,108.28	1.32
8,201.00	92.59	269.28	6,725.31	316.01	-2,198.58	2,203.18	2.45
8,296.00	91.85	269.24	6,721.63	314.78	-2,293.50	2,298.07	0.78
8,391.00	92.07	269.12	6,718.38	313.43	-2,388.43	2,392.97	0.26
8,486.00	91.11	269.44	6,715.75	312.23	-2,483.39	2,487.90	1.07
8,581.00	90.06	270.00	6,714.78	311.77	-2,578.38	2,582.87	1.25
8,675.00	89.97	270.02	6,714.75	311.79	-2,672.38	2,676.86	0.10
8,770.00	89.78	269.86	6,714.96	311.69	-2,767.38	2,771.85	0.26
8,865.00	89.66	270.00	6,715.42	311.57	-2,862.38	2,866.83	0.19
8,959.00	89.69	270.18	6,715.96	311.72	-2,956.38	2,960.82	0.19
9,053.00	89.72	270.41	6,716.44	312.20	-3,050.37	3,054.82	0.25
9,148.00	89.35	270.06	6,717.21	312.59	-3,145.37	3,149.81	0.54
9,243.00	89.01	267.56	6,718.57	310.62	-3,240.33	3,244.73	2.66
9,338.00	89.57	267.89	6,719.75	306.85	-3,335.25	3,339.58	0.68
9,432.00	89.94	267.98	6,720.15	303.46	-3,429.19	3,433.45	0.41
9,527.00	89.66	267.02	6,720.48	299.32	-3,524.09	3,528.28	1.05
9,621.00	89.11	266.67	6,721.49	294.14	-3,617.95	3,622.04	0.69
9,716.00	91.02	267.28	6,721.38	289.13	-3,712.81	3,716.82	2.11
9,810.00	91.08	267.19	6,719.66	284.60	-3,806.68	3,810.61	0.12
9,905.00	91.20	266.82	6,717.77	279.63	-3,901.53	3,905.38	0.41
10,000.00	90.74	266.04	6,716.16	273.72	-3,996.33	4,000.08	0.95
10,095.00	90.12	266.42	6,715.45	267.47	-4,091.13	4,094.76	0.77

## Design Report for Colt A13-633 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,186.00	90.46	266.66	6,714.99	261.98	-4,181.96	4,185.50	0.46
10,279.00	89.82	267.13	6,714.76	256.94	-4,274.82	4,278.27	0.85
10,371.00	89.97	268.50	6,714.93	253.44	-4,366.75	4,370.14	1.50
10,464.00	90.15	269.37	6,714.83	251.71	-4,459.73	4,463.08	0.96
10,556.00	90.00	269.19	6,714.71	250.55	-4,551.73	4,555.05	0.25
10,649.00	90.00	270.02	6,714.71	249.91	-4,644.72	4,648.02	0.89
10,741.00	89.88	269.83	6,714.81	249.79	-4,736.72	4,740.01	0.24
10,833.00	89.85	270.26	6,715.02	249.86	-4,828.72	4,832.00	0.47
10,925.00	89.94	270.86	6,715.19	250.76	-4,920.72	4,924.00	0.66
11,018.00	89.57	270.72	6,715.59	252.04	-5,013.71	5,016.99	0.43
11,110.00	90.25	271.17	6,715.74	253.56	-5,105.70	5,108.99	0.89
11,203.00	89.97	271.38	6,715.56	255.63	-5,198.67	5,201.99	0.38
11,295.00	89.20	270.70	6,716.22	257.30	-5,290.65	5,293.99	1.12
11,387.00	89.85	272.42	6,716.99	259.80	-5,382.61	5,385.97	2.00
11,479.00	89.88	272.86	6,717.20	264.04	-5,474.51	5,477.93	0.48
11,572.00	90.31	270.85	6,717.05	267.05	-5,567.46	5,570.91	2.21
11,664.00	90.34	269.95	6,716.53	267.69	-5,659.46	5,662.91	0.98
11,756.00	89.45	269.07	6,716.70	266.91	-5,751.45	5,754.88	1.36
11,847.00	90.49	268.60	6,716.74	265.06	-5,842.43	5,845.82	1.25
11,940.00	90.89	268.22	6,715.62	262.48	-5,935.39	5,938.72	0.59
12,035.00	91.51	267.72	6,713.63	259.11	-6,030.31	6,033.58	0.84
12,130.00	90.40	268.27	6,712.05	255.79	-6,125.23	6,128.44	1.30
12,224.00	90.15	268.79	6,711.60	253.38	-6,219.20	6,222.36	0.61
12,319.00	90.43	269.50	6,711.12	251.96	-6,314.19	6,317.32	0.80
12,414.00	88.95	268.84	6,711.63	250.59	-6,409.17	6,412.27	1.71
12,508.00	90.80	268.71	6,711.84	248.58	-6,503.15	6,506.20	1.97
12,603.00	89.94	267.83	6,711.22	245.71	-6,598.10	6,601.10	1.30
12,698.00	89.45	268.78	6,711.73	242.90	-6,693.06	6,696.00	1.13
12,793.00	89.75	269.54	6,712.39	241.51	-6,788.04	6,790.96	0.86
12,888.00	89.78	269.86	6,712.78	241.01	-6,883.04	6,885.93	0.34
12,983.00	89.82	270.11	6,713.11	240.98	-6,978.04	6,980.92	0.27
13,078.00	89.88	269.10	6,713.36	240.33	-7,073.04	7,075.90	1.07
13,173.00	88.79	268.77	6,714.47	238.56	-7,168.01	7,170.83	1.20
13,267.00	89.97	269.35	6,715.48	237.02	-7,261.99	7,264.78	1.40
13,363.00	88.43	267.97	6,716.82	234.78	-7,357.95	7,360.69	2.15
13,457.00	87.19	267.61	6,720.41	231.15	-7,451.81	7,454.49	1.37
13,552.00	86.76	267.59	6,725.43	227.18	-7,546.59	7,549.20	0.45
13,648.00	88.27	267.99	6,729.59	223.48	-7,642.43	7,644.96	1.63
13,743.00	88.37	268.47	6,732.38	220.55	-7,737.34	7,739.82	0.52
13,838.00	88.70	269.06	6,734.80	218.50	-7,832.29	7,834.73	0.71
13,932.00	89.41	268.23	6,736.35	216.28	-7,926.25	7,928.64	1.16
14,027.00	90.19	268.07	6,736.69	213.21	-8,021.20	8,023.53	0.84
14,122.00	89.54	267.79	6,736.91	209.78	-8,116.14	8,118.40	0.74
14,217.00	90.93	268.51	6,736.52	206.72	-8,211.08	8,213.29	1.65
14,311.00	90.31	268.40	6,735.50	204.18	-8,305.04	8,307.20	0.67
14,405.00	91.67	268.75	6,733.88	201.84	-8,399.00	8,401.11	1.49
14,500.00	92.25	268.08	6,730.63	199.22	-8,493.90	8,495.96	0.93
14,595.00	91.73	268.11	6,727.33	196.06	-8,588.79	8,590.79	0.55
14,689.00	91.91	267.75	6,724.35	192.67	-8,682.68	8,684.62	0.43
14,784.00	91.14	268.59	6,721.82	189.64	-8,777.60	8,779.48	1.20
14,878.00	88.92	269.22	6,721.77	187.84	-8,871.58	8,873.42	2.45

## Design Report for Colt A13-633 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
14,973.00	88.80	269.21	6,723.66	186.54	-8,966.55	8,968.36	0.13
15,067.00	89.57	269.98	6,725.00	185.87	-9,060.54	9,062.32	1.16
15,162.00	90.59	270.67	6,724.86	186.41	-9,155.53	9,157.32	1.30
15,257.00	89.91	270.07	6,724.45	187.03	-9,250.53	9,252.31	0.95
15,351.00	88.70	270.33	6,725.59	187.35	-9,344.52	9,346.30	1.32
15,446.00	89.23	270.21	6,727.30	187.80	-9,439.50	9,441.28	0.57
15,541.00	88.30	270.36	6,729.35	188.27	-9,534.48	9,536.25	0.99
15,636.00	88.77	269.45	6,731.78	188.12	-9,629.45	9,631.20	1.08
15,730.00	89.01	268.55	6,733.60	186.48	-9,723.41	9,725.13	0.99
15,825.00	89.54	268.42	6,734.80	183.97	-9,818.37	9,820.04	0.57
15,919.00	89.97	267.92	6,735.21	180.96	-9,912.32	9,913.93	0.70
16,014.00	89.14	267.19	6,735.94	176.91	-10,007.23	10,008.77	1.16
16,106.00	89.63	266.01	6,736.93	171.46	-10,099.06	10,100.51	1.39
16,198.00	89.63	265.99	6,737.53	165.04	-10,190.84	10,192.17	0.02
16,266.00	88.98	266.47	6,738.35	160.57	-10,258.68	10,259.94	1.19
Final Sperry MWD Survey at 16266.00ft							
16,331.00	88.98	266.47	6,739.51	156.57	-10,323.55	10,324.74	0.00
Straight Line Projection to TD at 16331.00ft - Colt A13-633_Rev B0_BHL - Colt A13-633_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
255.00	255.00	-0.53	-0.41	First Sperry MWD Survey at 255.00ft.
747.00	746.98	-3.29	-2.78	Final Sperry MWD Survey at 747.00ft
747.00	746.98	-3.29	-2.78	Tie on to Gyro Survey at 747.00ft.
1,015.00	1,014.98	-3.98	-4.34	First Sperry MWD Survey at 1015.00ft
16,266.00	6,738.35	160.57	-10,258.68	Final Sperry MWD Survey at 16266.00ft
16,331.00	6,739.51	156.57	-10,323.55	Straight Line Projection to TD at 16331.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Colt A13-633_BHL	270.88	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
255.00	747.00	Surface Surveys	Flexi-Shot
1,015.00	7,019.00	Intermediate Survey	MWD+IFR1+MS_WY
7,157.00	16,331.00	Production Survey	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
918.00	917.98	9 5/8"	9-5/8	13-3/4
7,059.00	6,710.53	7"	7	8-3/4

## Design Report for Colt A13-633 - Actual Surveys

**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
Colt A13-633_Rev B0_ - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,420,191.97	3,286,844.97	40.482250	-104.468800
Colt A13-633_SHL - actual wellpath misses target center by 40.08usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	40.08	-0.47	1,420,232.04	3,286,844.50	40.482360	-104.468800
Colt A13-633_Rev B0_ - actual wellpath misses target center by 10.06usft at 16331.00usft MD (6739.51 TVD, 156.57 N, -10323.55 E) - Point	0.00	0.00	6,730.00	158.98	-10,325.77	1,420,350.94	3,276,519.56	40.483010	-104.505910
Colt A13-633_BHL - actual wellpath misses target center by 10.06usft at 16331.00usft MD (6739.51 TVD, 156.57 N, -10323.55 E) - Point	0.00	0.00	6,730.00	158.98	-10,325.77	1,420,350.94	3,276,519.56	40.483010	-104.505910

**Directional Difficulty Index**

Average Dogleg over Survey:	1.33 °/100usft	Maximum Dogleg over Survey:	11.79 °/100usft at 6,556.00 usft
Net Tortousity applicable to Plans:	0.66 °/100usft	Directional Difficulty Index:	6.739

**Audit Info**

## North Reference Sheet for Sec. 17-T6N-R63W (Aggie State AA17) - Colt A13-633 - Plan B

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' @ 4691.00usft (H&P 273). Northing and Easting are relative to Colt A13-633

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: 0.99996499

Grid Coordinates of Well: 1,420,191.97 usft N, 3,286,844.97 usft E

Geographical Coordinates of Well: 40° 28' 56.10" N, 104° 28' 07.68" W

Grid Convergence at Surface is: 0.67°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,331.00usft the Bottom Hole Displacement is 10,324.74usft in the Direction of 270.87° (Grid).

Magnetic Convergence at surface is: -7.66° (26 January 2015, , BGGM2014)

