Noble Energy

Weld County, CO (NAD 83)
Sec. 17-T6N-R63W (Aggie State AA17)
Colt A13-638
05-123-40919
Plan C

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

14 April, 2015

Surface UWI : 05-123-40919

Well Coordinates: 1,420,268.46 N, 3,286,844.08 E (40° 28' 56.86" N, 104° 28' 07.68" W)
Ground Level: 4,669.00 usft

Local Coordinate Origin:	Centered on Well Colt A13-638
Viewing Datum:	KB = 24' @ 4693.00usft (H&P 273)
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

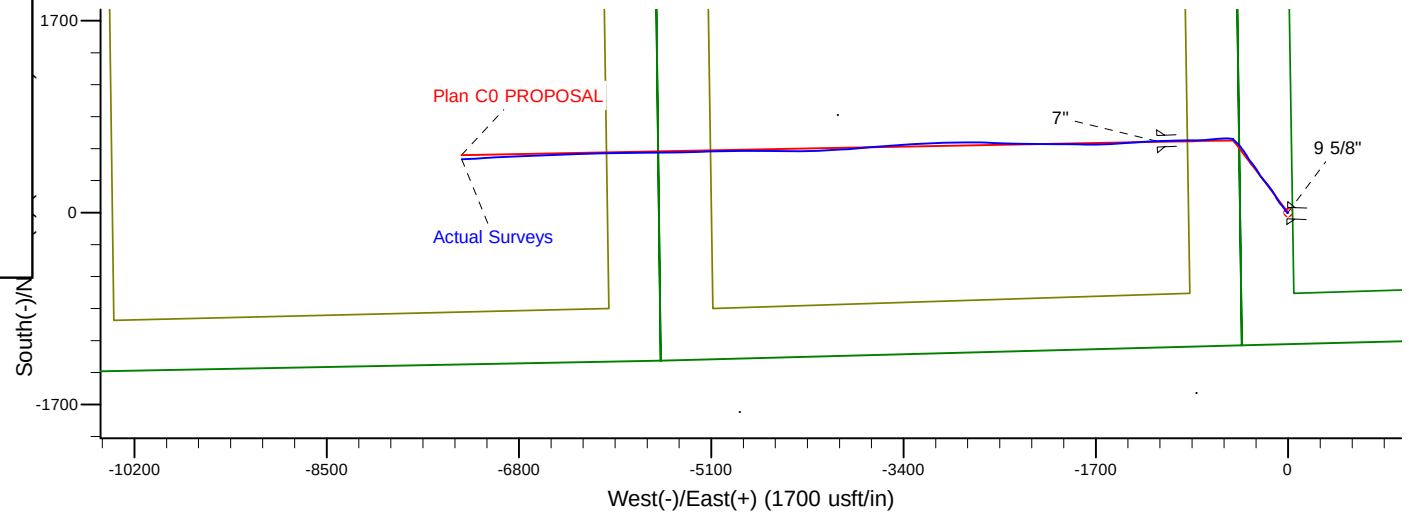
HALLIBURTON

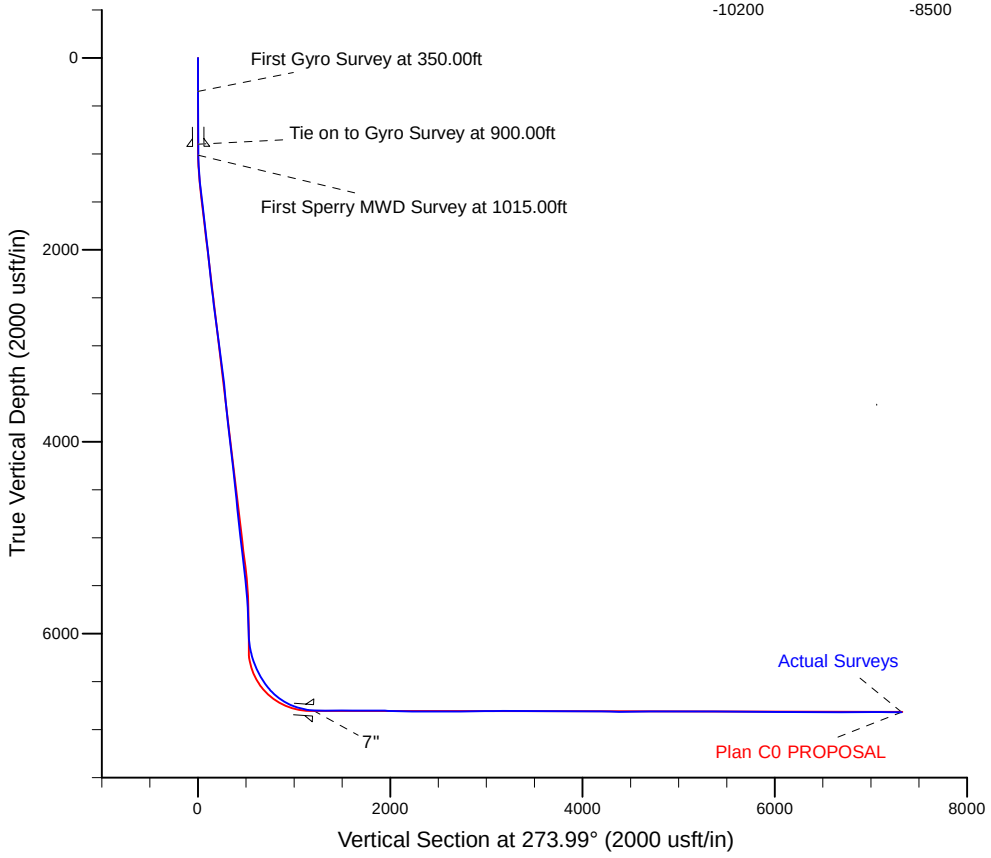
Project: Weld County, CO (NAD 83)
Site: Sec. 17-T6N-R63W (Aggie State AA17)
Well: Colt A13-638
Wellbore: Plan C
Design: Actual Surveys

noble energy

HALLIBURTON
Sperry Drilling

Platted SHL:	1165' FSL, 424' FWL
Platted Lat/Long:	40.482460 N, 104.4688 W
Location:	Sec. 17-T6N-R63W
~7" Casing:	1824' FSL, 719' FEL
Lat/Long:	40.484231 N,104.472932 W
State Planes - CO Northern:	1,420,900.33 N, 3,285,687.28 E
	Sec. 18-T6N-R63W
Platted BHL:	1855' FSL, 1740' FEL
Platted Lat/Long:	40.483995 N,104.494799 W
State Planes - CO Northern:	1,420,744.72 N, 3,279,606.21 E
Location:	Sec. 13-T6N-R63W





LEGEND

Colt A13-638, Plan C, Plan C0 PROPOSAL V0
Actual Surveys

WELL DETAILS: Colt A13-638
Ground Level: 4669.00
KB = 24' @ 4693.00usft (H&P 273)

Created By: Tatiana Gomez
Created On: 4/14/2015

Design Report for Colt A13-638 - 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
Colt A13-638_Rev B0_SHL - Colt A13-638_SHL							
350.00	0.60	223.62	349.99	-1.33	-1.26	1.17	0.17
First Gyro Survey at 350.00ft							
650.00	0.70	218.82	649.97	-3.89	-3.50	3.22	0.04
900.00	0.70	247.12	899.96	-5.68	-5.86	5.45	0.14
Final Gyro Survey at 900.00ft - Tie on to Gyro Survey at 900.00ft							
923.00	0.44	272.28	922.96	-5.73	-6.08	5.67	1.53
9 5/8"							
1,015.00	1.23	16.89	1,014.95	-4.77	-6.15	5.80	1.53
First Sperry MWD Survey at 1015.00ft							
1,110.00	4.34	325.17	1,109.83	-0.84	-7.91	7.83	3.90
1,202.00	6.24	324.10	1,201.44	6.07	-12.83	13.22	2.07
1,294.00	8.56	324.16	1,292.67	15.67	-19.77	20.81	2.52
1,387.00	10.65	323.66	1,384.36	28.20	-28.92	30.81	2.25
1,572.00	9.89	319.43	1,566.39	54.04	-49.38	53.02	0.58
1,664.00	10.41	324.08	1,656.96	66.78	-59.39	63.90	1.05
1,848.00	9.14	319.97	1,838.28	91.43	-78.55	84.72	0.79
1,941.00	10.47	327.58	1,929.93	104.22	-87.83	94.87	1.99
2,034.00	9.76	326.27	2,021.48	117.91	-96.74	104.71	0.80
2,126.00	12.28	334.45	2,111.78	133.23	-105.29	114.31	3.22
2,219.00	11.61	333.02	2,202.77	150.49	-113.80	124.00	0.79
2,311.00	10.81	328.75	2,293.01	166.11	-122.47	133.74	1.25
2,402.00	10.27	324.28	2,382.48	180.00	-131.64	143.85	1.08
2,495.00	9.60	320.64	2,474.08	192.72	-141.40	154.47	0.99
2,587.00	11.83	326.58	2,564.48	206.53	-151.46	165.47	2.70
2,680.00	11.45	326.27	2,655.57	222.16	-161.83	176.90	0.41
2,772.00	10.88	323.47	2,745.82	236.73	-172.07	188.13	0.85
2,863.00	10.76	320.13	2,835.21	250.15	-182.63	199.60	0.70
2,956.00	10.30	317.94	2,926.64	262.99	-193.76	211.60	0.66
3,051.00	10.25	316.13	3,020.12	275.39	-205.31	223.98	0.34
3,146.00	11.83	325.11	3,113.36	289.47	-216.74	236.37	2.45
3,240.00	11.15	319.92	3,205.48	304.33	-228.11	248.74	1.32
3,335.00	10.54	317.63	3,298.79	317.78	-239.87	261.41	0.79
3,430.00	10.25	332.66	3,392.24	331.71	-249.61	272.10	2.86
3,525.00	9.29	328.99	3,485.87	345.79	-257.45	280.89	1.20
3,620.00	9.36	328.74	3,579.61	358.96	-265.41	289.75	0.09
3,715.00	9.58	328.32	3,673.32	372.30	-273.57	298.82	0.24
3,810.00	9.90	325.53	3,766.95	385.76	-282.34	308.51	0.60
3,904.00	10.15	326.15	3,859.51	399.30	-291.53	318.61	0.29
3,999.00	10.26	323.14	3,953.01	413.02	-301.27	329.28	0.57
4,094.00	10.03	322.91	4,046.52	426.39	-311.33	340.25	0.25
4,189.00	9.80	320.88	4,140.10	439.26	-321.42	351.22	0.44
4,284.00	9.50	319.84	4,233.76	451.52	-331.58	362.20	0.37
4,379.00	9.11	320.31	4,327.51	463.30	-341.44	372.86	0.42
4,474.00	10.94	331.06	4,421.06	476.98	-350.60	382.95	2.75
4,663.00	9.84	328.46	4,606.96	506.44	-367.73	402.09	0.63
4,758.00	9.40	328.84	4,700.63	520.00	-375.99	411.27	0.47
4,852.00	10.83	325.50	4,793.16	533.84	-384.96	421.19	1.64
4,946.00	10.03	326.35	4,885.61	547.94	-394.50	431.69	0.87

Design Report for Colt A13-638 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,041.00	9.60	323.29	4,979.22	561.17	-403.82	441.90	0.71
5,135.00	9.13	322.18	5,071.97	573.35	-413.08	451.99	0.54
5,230.00	10.07	319.51	5,165.64	585.62	-423.09	462.83	1.09
5,325.00	9.22	317.01	5,259.29	597.50	-433.68	474.22	1.00
5,419.00	8.51	315.19	5,352.17	607.95	-443.71	484.96	0.81
5,514.00	7.52	314.53	5,446.24	617.29	-453.10	494.97	1.05
5,609.00	6.79	315.03	5,540.50	625.62	-461.50	503.93	0.77
5,703.00	6.45	312.97	5,633.87	633.15	-469.29	512.23	0.44
5,798.00	3.45	318.94	5,728.51	638.95	-475.07	518.40	3.20
5,893.00	2.79	317.76	5,823.37	642.82	-478.51	522.09	0.70
6,083.00	2.87	314.70	6,013.14	649.58	-485.00	529.04	0.09
6,272.00	12.75	277.47	6,200.22	655.64	-509.11	553.51	5.61
6,367.00	19.73	274.29	6,291.38	658.21	-535.52	580.04	7.40
6,461.00	25.18	267.31	6,378.23	658.46	-571.36	615.80	6.45
6,556.00	31.13	263.17	6,461.96	654.58	-615.97	660.04	6.59
6,651.00	37.45	264.22	6,540.41	648.75	-669.14	712.68	6.68
6,746.00	44.32	266.34	6,612.19	643.71	-731.07	774.11	7.38
6,840.00	54.25	269.95	6,673.44	641.58	-802.18	844.89	10.95
6,936.00	61.48	270.18	6,724.47	641.68	-883.42	925.94	7.53
7,031.00	71.70	267.54	6,762.17	639.87	-970.45	1,012.64	11.05
7,126.00	77.51	267.62	6,787.38	636.00	-1,061.93	1,103.62	6.12
7,181.00	83.11	267.21	6,796.64	633.56	-1,116.06	1,157.46	10.21
7,222.00	85.84	268.09	6,800.59	631.88	-1,156.83	1,198.01	6.99
7"							
7,254.00	87.97	268.77	6,802.31	631.01	-1,188.77	1,229.81	6.99
7,348.00	90.34	267.61	6,803.70	628.04	-1,282.71	1,323.31	2.81
7,443.00	90.49	265.28	6,803.01	622.15	-1,377.52	1,417.48	2.46
7,538.00	90.03	264.82	6,802.58	613.95	-1,472.16	1,511.33	0.68
7,633.00	89.97	266.38	6,802.58	606.67	-1,566.88	1,605.31	1.64
7,727.00	89.48	269.35	6,803.03	603.16	-1,660.80	1,698.76	3.20
7,819.00	89.45	270.61	6,803.89	603.13	-1,752.79	1,790.53	1.37
7,911.00	90.77	271.38	6,803.71	604.73	-1,844.78	1,882.40	1.66
8,004.00	88.03	270.57	6,804.69	606.31	-1,937.75	1,975.25	3.07
8,097.00	88.03	270.02	6,807.88	606.79	-2,030.69	2,068.00	0.59
8,189.00	88.74	270.66	6,810.48	607.34	-2,122.65	2,159.78	1.04
8,281.00	89.26	269.92	6,812.08	607.80	-2,214.64	2,251.57	0.98
8,374.00	89.72	270.30	6,812.91	607.98	-2,307.63	2,344.36	0.64
8,465.00	89.82	271.30	6,813.28	609.25	-2,398.62	2,435.21	1.10
8,558.00	89.69	272.28	6,813.67	612.16	-2,491.58	2,528.14	1.06
8,651.00	90.00	273.39	6,813.93	616.75	-2,584.46	2,621.12	1.24
8,743.00	90.71	271.78	6,813.36	620.90	-2,676.36	2,713.09	1.91
8,836.00	91.36	270.25	6,811.68	622.55	-2,769.33	2,805.94	1.79
8,928.00	90.92	269.02	6,809.84	621.97	-2,861.31	2,897.66	1.42
9,019.00	91.75	269.69	6,807.72	620.94	-2,952.27	2,988.34	1.17
9,112.00	90.12	267.91	6,806.21	618.99	-3,045.23	3,080.93	2.59
9,205.00	90.46	267.45	6,805.74	615.23	-3,138.16	3,173.37	0.62
9,297.00	88.95	266.57	6,806.21	610.43	-3,230.03	3,264.68	1.90
9,389.00	89.41	266.69	6,807.53	605.02	-3,321.86	3,355.91	0.52
9,480.00	90.40	267.80	6,807.68	600.65	-3,412.75	3,446.28	1.63
9,573.00	89.72	265.94	6,807.58	595.57	-3,505.61	3,538.56	2.13
9,667.00	89.82	265.58	6,807.96	588.62	-3,599.35	3,631.59	0.40

Design Report for Colt A13-638 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,761.00	89.75	263.73	6,808.31	579.87	-3,692.93	3,724.34	1.97
9,856.00	89.54	264.47	6,808.90	570.10	-3,787.43	3,817.93	0.81
9,951.00	89.82	266.83	6,809.43	562.90	-3,882.15	3,911.91	2.50
10,046.00	89.38	267.17	6,810.09	557.92	-3,977.01	4,006.20	0.59
10,141.00	90.00	266.57	6,810.61	552.74	-4,071.87	4,100.47	0.91
10,235.00	88.92	267.47	6,811.49	547.85	-4,165.74	4,193.77	1.50
10,329.00	88.95	268.97	6,813.24	544.93	-4,259.67	4,287.27	1.60
10,424.00	89.85	269.79	6,814.23	543.90	-4,354.66	4,381.96	1.28
10,518.00	90.74	270.84	6,813.75	544.42	-4,448.65	4,475.76	1.46
10,613.00	91.69	271.16	6,811.74	546.08	-4,543.62	4,570.61	1.06
10,708.00	90.31	270.01	6,810.08	547.05	-4,638.59	4,665.42	1.89
10,803.00	89.45	270.21	6,810.28	547.23	-4,733.59	4,760.20	0.93
10,898.00	90.65	269.73	6,810.19	547.18	-4,828.59	4,854.97	1.36
10,992.00	89.72	268.49	6,809.89	545.72	-4,922.58	4,948.62	1.65
11,086.00	90.03	269.27	6,810.10	543.88	-5,016.56	5,042.25	0.89
11,181.00	89.85	268.55	6,810.20	542.08	-5,111.54	5,136.87	0.78
11,276.00	89.48	266.71	6,810.75	538.15	-5,206.45	5,231.28	1.98
11,370.00	89.38	268.48	6,811.69	534.20	-5,300.36	5,324.69	1.89
11,465.00	89.42	270.36	6,812.68	533.24	-5,395.35	5,419.38	1.98
11,559.00	89.23	269.12	6,813.79	532.81	-5,489.34	5,513.11	1.33
11,654.00	89.54	269.38	6,814.81	531.57	-5,584.32	5,607.78	0.43
11,749.00	89.72	269.51	6,815.42	530.65	-5,679.32	5,702.48	0.23
11,844.00	89.51	269.22	6,816.06	529.60	-5,774.31	5,797.17	0.38
11,938.00	89.57	269.23	6,816.81	528.33	-5,868.30	5,890.84	0.06
12,033.00	89.78	269.21	6,817.35	527.03	-5,963.29	5,985.51	0.22
12,128.00	90.00	268.87	6,817.54	525.44	-6,058.27	6,080.15	0.43
12,223.00	89.88	268.13	6,817.64	522.96	-6,153.24	6,174.72	0.79
12,317.00	89.97	268.05	6,817.76	519.82	-6,247.19	6,268.22	0.13
12,412.00	90.09	267.67	6,817.71	516.27	-6,342.12	6,362.67	0.42
12,507.00	90.68	268.79	6,817.07	513.34	-6,437.07	6,457.19	1.33
12,601.00	89.88	266.47	6,816.61	509.45	-6,530.98	6,550.60	2.61
12,695.00	90.43	269.04	6,816.36	505.77	-6,624.90	6,644.04	2.80
12,884.00	89.63	267.10	6,816.26	499.41	-6,813.78	6,832.02	1.11
12,979.00	89.97	268.07	6,816.59	495.40	-6,908.70	6,926.42	1.08
13,073.00	89.45	265.84	6,817.07	490.41	-7,002.56	7,019.71	2.44
13,168.00	89.82	266.52	6,817.67	484.08	-7,097.34	7,113.83	0.81
13,262.00	89.72	266.79	6,818.05	478.60	-7,191.18	7,207.05	0.31
13,309.00	90.00	267.53	6,818.16	476.27	-7,238.13	7,253.72	1.68
Final Sperry MWD Survey at 13309.00ft							
13,377.00	90.00	267.53	6,818.16	473.34	-7,306.06	7,321.29	0.00
Striaght Line Projection to TD at 13377.00ft - Colt A13-638_Rev B0_BHL - Colt A13-638_BHL - Colt A13-638_Rev C0_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
350.00	349.99	-1.33	-1.26	First Gyro Survey at 350.00ft
900.00	899.96	-5.68	-5.86	Final Gyro Survey at 900.00ft
900.00	899.96	-5.68	-5.86	Tie on to Gyro Survey at 900.00ft
1,015.00	1,014.95	-4.77	-6.15	First Sperry MWD Survey at 1015.00ft
13,309.00	6,818.16	476.27	-7,238.13	Final Sperry MWD Survey at 13309.00ft
13,377.00	6,818.16	473.34	-7,306.06	Striaght Line Projection to TD at 13377.00ft

Design Report for Colt A13-638 - Actual Surveys

Vertical Section Information

	Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
	Target	Colt A13-638_Rev C0_BHL	273.99	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
350.00	900.00	Surface Surveys	Flexi-Shot
1,015.00	7,181.00	Intermediate Surveys	MWD+IFR1+MS_WY
7,254.00	13,377.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
923.00		9 5/8"	9-5/8	13-3/4
7,222.00	6,800.59	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
Colt A13-638_Rev B0_	0.00	0.00	0.00	0.00	0.00	1,420,268.47	3,286,844.08	40.482460	-104.468800
- actual wellpath hits target center									
- Point									
Colt A13-638_SHL	0.00	0.00	-3.00	36.43	-0.42	1,420,304.90	3,286,843.65	40.482560	-104.468800
- actual wellpath misses target center by 36.56usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Colt A13-638_BHL	0.00	0.00	6,812.00	509.97	-7,308.51	1,420,778.41	3,279,535.82	40.484090	-104.495050
- actual wellpath misses target center by 37.22usft at 13377.00usft MD (6818.16 TVD, 473.34 N, -7306.06 E)									
- Point									
Colt A13-638_Rev B0_	0.00	0.00	6,815.00	509.97	-7,308.51	1,420,778.41	3,279,535.82	40.484090	-104.495050
- actual wellpath misses target center by 36.85usft at 13377.00usft MD (6818.16 TVD, 473.34 N, -7306.06 E)									
- Point									
Colt A13-638_Rev C0_	0.00	0.00	6,815.00	509.97	-7,308.51	1,420,778.41	3,279,535.82	40.484090	-104.495050
- actual wellpath misses target center by 36.85usft at 13377.00usft MD (6818.16 TVD, 473.34 N, -7306.06 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.70 °/100usft	Maximum Dogleg over Survey:	11.05 °/100usft at 7,031.00 usft
Net Tortousity applicable to Plans:	0.87 °/100usft	Directional Difficulty Index:	6.532

Audit Info

North Reference Sheet for Sec. 17-T6N-R63W (Aggie State AA17) - Colt A13-638 - Plan C

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' @ 4693.00usft (H&P 273). Northing and Easting are relative to Colt A 13-638

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: 0.99996500

Grid Coordinates of Well: 1,420,268.46 usft N, 3,286,844.08 usft E

Geographical Coordinates of Well: 40° 28' 56.86" N, 104° 28' 07.68" W

Grid Convergence at Surface is: 0.67°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,377.00usft

the Bottom Hole Displacement is 7,321.38usft in the Direction of 273.71° (Grid).

Magnetic Convergence at surface is: -7.64° (5 April 2015, , BGGM2014)