

Noble Energy

Weld County, CO (NAD 83)

Sec. 1-T6N-R63W (Crow Creek 1/AA01 PAD)

Crow Creek AA01-743

05-123-40161

Crow Creek AA01-743

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

02 February, 2015

Surface UWI : 05-123-40161

Well Coordinates: 1,434,987.43 N, 3,310,597.18 E (40° 31' 19.45" N, 104° 22' 57.90" W)

Ground Level: 4,834.00 usft

Local Coordinate Origin:

Centered on Well Crow Creek AA01-743

Viewing Datum:

KB @ 4858.00usft (HP 343)

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. 1-T6N-R63W (Crow Creek 1/AA01 PAD)
 Well: Crow Creek AA01-743
 Wellbore: Crow Creek AA01-743
 Design: Actual Surveys

Noble Energy



Platted SHL: 290' FNL, 2200' FEL
 Platted Lat/Long: 40.52207 N, 104.38275 W
 Location: Sec. 1-T6N-R63W

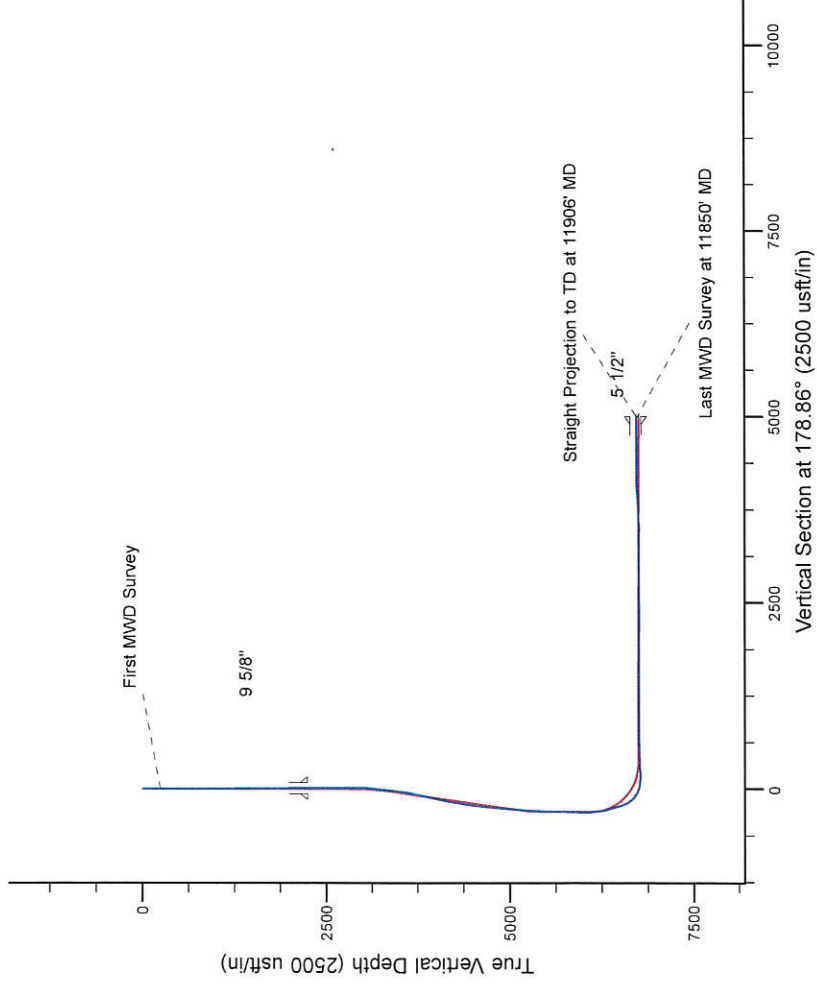
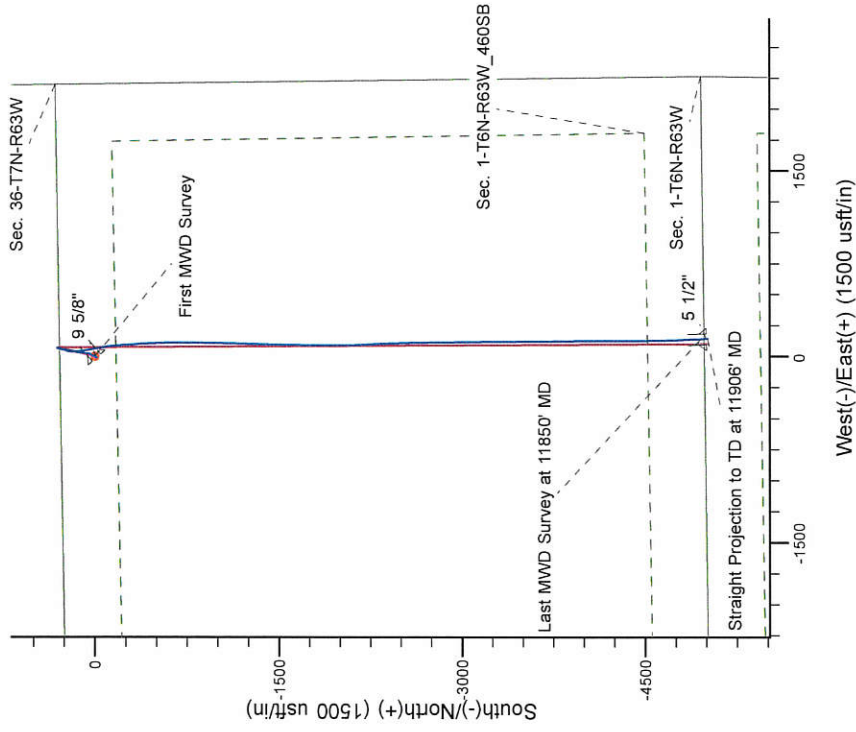
Platted BHL: 30' FNL, 2165' FEL
 Lat/Long: 40.50832 N, 104.38262 W
 Location: Sec. 12-T6N-R63W

State Planes - CO Northern: 1429979.07 N, 3310696.43 E
 Location: Sec. 12-T6N-R63W

LEGEND

— Crow Creek AA01-743, Crow Creek AA01-743, Rev A0 V0

— Actual Surveys



WELL DETAILS: Crow Creek AA01-743
Ground Level: 4834.00
KB @ 4859.00usft (HP 343)
Created By: Amanda Marchand
Created On: 2/22/2015

Design Report for Crow Creek AA01-743 - 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
244.00	0.41	255.20	244.00	-0.22	-0.84	0.21	0.17
First MWD Survey							
426.00	0.19	235.60	426.00	-0.56	-1.72	0.53	0.13
518.00	0.16	281.82	517.99	-0.62	-1.97	0.58	0.15
610.00	0.22	214.48	609.99	-0.74	-2.20	0.70	0.24
701.00	0.26	187.03	700.99	-1.09	-2.32	1.04	0.13
794.00	0.42	186.04	793.99	-1.64	-2.39	1.59	0.17
885.00	0.54	194.76	884.99	-2.38	-2.53	2.33	0.15
977.00	0.68	200.05	976.98	-3.31	-2.83	3.26	0.16
1,070.00	0.62	197.03	1,069.98	-4.31	-3.16	4.25	0.07
1,162.00	0.77	213.08	1,161.97	-5.31	-3.65	5.23	0.27
1,254.00	0.65	204.02	1,253.96	-6.30	-4.20	6.22	0.18
1,347.00	0.86	219.51	1,346.96	-7.32	-4.86	7.23	0.31
1,439.00	1.00	217.74	1,438.94	-8.49	-5.79	8.37	0.16
1,531.00	0.78	228.20	1,530.93	-9.54	-6.74	9.41	0.30
1,623.00	0.79	246.19	1,622.92	-10.22	-7.79	10.06	0.27
1,715.00	0.56	239.82	1,714.92	-10.70	-8.76	10.52	0.26
1,806.00	0.42	255.97	1,805.91	-11.00	-9.47	10.81	0.21
1,901.00	0.53	239.56	1,900.91	-11.31	-10.19	11.11	0.18
1,996.00	0.28	257.31	1,995.91	-11.58	-10.79	11.37	0.29
2,090.00	0.30	261.34	2,089.91	-11.67	-11.26	11.45	0.03
2,200.00	0.63	249.21	2,199.90	-11.93	-12.11	11.69	0.31
2,318.00	0.59	196.02	2,317.90	-12.74	-12.88	12.49	0.46
2,410.00	0.36	133.57	2,409.90	-13.40	-12.80	13.14	0.58
2,502.00	0.22	112.93	2,501.89	-13.67	-12.43	13.42	0.19
2,594.00	0.22	61.40	2,593.89	-13.65	-12.11	13.41	0.21
2,686.00	0.31	80.57	2,685.89	-13.52	-11.71	13.29	0.14
2,871.00	0.47	132.57	2,870.89	-13.96	-10.66	13.74	0.20
2,963.00	0.92	22.25	2,962.88	-13.53	-10.10	13.32	1.27
3,055.00	3.85	17.97	3,054.79	-9.91	-8.87	9.73	3.19
3,148.00	5.47	22.85	3,147.48	-2.85	-6.19	2.73	1.79
3,240.00	6.75	22.60	3,238.96	6.18	-2.40	-6.23	1.39
3,331.00	8.55	23.98	3,329.15	17.30	2.40	-17.25	1.99
3,423.00	7.12	27.54	3,420.29	28.61	7.82	-28.45	1.64
3,518.00	6.25	29.16	3,514.64	38.34	13.06	-38.08	0.94
3,612.00	9.76	10.87	3,607.72	50.64	17.06	-50.29	4.57
3,707.00	11.56	8.42	3,701.08	67.97	19.97	-67.56	1.95
3,802.00	12.25	7.93	3,794.04	87.37	22.75	-86.90	0.73
3,896.00	13.16	7.87	3,885.73	107.84	25.59	-107.31	0.97
3,991.00	13.06	10.39	3,978.26	129.11	29.01	-128.51	0.61
4,086.00	12.48	11.45	4,070.91	149.73	32.98	-149.05	0.66
4,181.00	12.45	11.82	4,163.67	169.81	37.12	-169.05	0.09
4,276.00	9.89	10.95	4,256.86	187.85	40.77	-187.01	2.70
4,370.00	8.26	11.77	4,349.68	202.39	43.68	-201.48	1.74
4,465.00	7.71	10.15	4,443.76	215.34	46.19	-214.38	0.63
4,560.00	7.02	9.88	4,537.98	227.33	48.31	-226.33	0.73
4,655.00	5.97	12.07	4,632.37	237.88	50.34	-236.84	1.14
4,750.00	4.68	12.10	4,726.95	246.51	52.19	-245.42	1.36
4,844.00	5.65	15.65	4,820.57	254.71	54.24	-253.59	1.09

Design Report for Crow Creek AA01-743 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,939.00	5.85	14.37	4,915.09	263.90	56.70	-262.73	0.25
5,034.00	5.66	13.65	5,009.61	273.15	59.01	-271.92	0.21
5,129.00	4.68	11.65	5,104.23	281.49	60.90	-280.23	1.05
5,223.00	3.80	9.14	5,197.97	288.33	62.17	-287.04	0.96
5,318.00	2.98	8.11	5,292.80	293.88	63.01	-292.57	0.87
5,412.00	2.36	2.56	5,386.70	298.23	63.45	-296.92	0.71
5,507.00	1.50	0.90	5,481.64	301.43	63.55	-300.11	0.91
5,602.00	1.65	3.76	5,576.61	304.04	63.66	-302.72	0.18
5,791.00	1.26	9.51	5,765.55	308.80	64.18	-307.47	0.22
5,886.00	0.83	20.96	5,860.53	310.47	64.60	-309.13	0.50
5,981.00	0.52	46.03	5,955.52	311.42	65.16	-310.06	0.44
6,075.00	0.76	70.89	6,049.52	311.92	66.05	-310.55	0.38
6,170.00	5.02	187.74	6,144.40	308.00	66.09	-306.63	5.69
6,265.00	10.08	204.78	6,238.56	296.32	62.04	-295.04	5.77
6,359.00	14.35	193.50	6,330.42	277.52	55.87	-276.36	5.18
6,454.00	18.06	198.13	6,421.64	252.07	48.54	-251.05	4.13
6,549.00	19.20	197.08	6,511.66	223.14	39.37	-222.31	1.25
6,644.00	30.02	180.70	6,598.00	184.28	34.47	-183.57	13.37
6,739.00	44.34	172.32	6,673.54	127.29	38.64	-126.50	15.96
6,834.00	63.04	169.94	6,729.55	52.02	50.58	-51.01	19.79
6,928.00	84.01	170.18	6,756.06	-36.27	66.04	37.57	22.31
7,022.00	87.91	173.16	6,762.68	-129.02	79.62	130.57	5.22
7,117.00	92.06	176.34	6,762.71	-223.59	88.31	225.29	5.50
7,212.00	92.40	175.79	6,759.01	-318.29	94.82	320.11	0.68
7,307.00	91.85	176.80	6,755.49	-413.03	100.96	414.95	1.21
7,401.00	91.69	177.59	6,752.58	-506.87	105.55	508.86	0.86
7,496.00	91.05	178.86	6,750.31	-601.79	108.49	603.82	1.50
7,591.00	89.82	180.68	6,749.59	-696.78	108.88	698.80	2.31
7,685.00	90.31	179.72	6,749.48	-790.78	108.55	792.78	1.15
7,780.00	90.31	180.75	6,748.97	-885.78	108.16	887.75	1.08
7,875.00	90.80	180.62	6,748.05	-980.77	107.02	982.69	0.53
7,969.00	89.72	181.88	6,747.62	-1,074.74	104.97	1,076.61	1.77
8,064.00	89.91	182.33	6,747.93	-1,169.68	101.48	1,171.46	0.51
8,159.00	89.26	182.10	6,748.62	-1,264.60	97.81	1,266.29	0.73
8,254.00	89.26	182.49	6,749.84	-1,359.52	94.01	1,361.11	0.41
8,348.00	89.17	181.05	6,751.13	-1,453.46	91.10	1,454.98	1.53
8,443.00	89.75	180.71	6,752.03	-1,548.45	89.65	1,549.92	0.71
8,538.00	90.46	180.34	6,751.85	-1,643.44	88.77	1,644.88	0.84
8,632.00	89.01	180.68	6,752.29	-1,737.43	87.94	1,738.83	1.58
8,727.00	89.63	180.93	6,753.42	-1,832.42	86.60	1,833.77	0.70
8,822.00	89.91	180.48	6,753.80	-1,927.41	85.43	1,928.72	0.56
8,917.00	89.82	178.68	6,754.02	-2,022.40	86.13	2,023.71	1.90
9,011.00	89.63	177.60	6,754.47	-2,116.35	89.18	2,117.70	1.17
9,106.00	90.22	177.10	6,754.60	-2,211.25	93.57	2,212.67	0.81
9,201.00	90.37	176.73	6,754.11	-2,306.11	98.69	2,307.61	0.42
9,296.00	89.66	178.33	6,754.08	-2,401.02	102.78	2,402.58	1.84
9,390.00	90.18	178.89	6,754.21	-2,494.99	105.06	2,496.58	0.81
9,485.00	91.39	179.21	6,752.91	-2,589.96	106.64	2,591.57	1.32
9,580.00	90.86	178.48	6,751.05	-2,684.92	108.55	2,686.55	0.95
9,674.00	92.16	179.29	6,748.57	-2,778.87	110.38	2,780.51	1.63
9,769.00	88.46	178.22	6,748.06	-2,873.83	112.44	2,875.49	4.05

Design Report for Crow Creek AA01-743 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,863.00	88.15	178.81	6,750.84	-2,967.76	114.88	2,969.45	0.71
9,958.00	89.45	180.11	6,752.83	-3,062.73	115.77	3,064.42	1.94
10,053.00	89.75	180.08	6,753.49	-3,157.72	115.62	3,159.40	0.32
10,148.00	90.34	180.12	6,753.42	-3,252.72	115.45	3,254.37	0.62
10,242.00	90.12	179.29	6,753.04	-3,346.72	115.93	3,348.36	0.91
10,337.00	90.89	179.36	6,752.20	-3,441.71	117.05	3,443.35	0.81
10,431.00	91.60	179.83	6,750.16	-3,535.68	117.72	3,537.32	0.91
10,526.00	92.49	180.20	6,746.77	-3,630.62	117.69	3,632.24	1.01
10,621.00	91.79	178.21	6,743.22	-3,725.54	119.01	3,727.17	2.22
10,715.00	92.31	178.84	6,739.86	-3,819.45	121.43	3,821.11	0.87
10,810.00	92.99	179.24	6,735.47	-3,914.33	123.02	3,916.00	0.83
10,905.00	94.41	179.03	6,729.34	-4,009.12	124.45	4,010.80	1.51
10,999.00	94.26	179.87	6,722.23	-4,102.85	125.35	4,104.53	0.91
11,094.00	91.51	180.55	6,717.45	-4,197.72	125.00	4,199.37	2.98
11,189.00	89.72	180.14	6,716.43	-4,292.71	124.43	4,294.33	1.93
11,283.00	90.15	180.36	6,716.54	-4,386.71	124.02	4,388.30	0.51
11,378.00	90.34	179.54	6,716.13	-4,481.70	124.10	4,483.28	0.89
11,473.00	89.69	178.17	6,716.10	-4,576.68	126.00	4,578.28	1.60
11,567.00	89.48	178.10	6,716.79	-4,670.63	129.06	4,672.27	0.24
11,662.00	90.15	178.01	6,717.09	-4,765.57	132.28	4,767.26	0.71
11,756.00	89.88	177.81	6,717.07	-4,859.51	135.71	4,861.25	0.36
11,850.00	90.22	177.65	6,716.99	-4,953.44	139.43	4,955.23	0.40
Last MWD Survey at 11850' MD							
11,906.00	90.22	177.65	6,716.77	-5,009.39	141.73	5,011.22	0.00
Straight Projection to TD at 11906' MD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
244.00	244.00	-0.22	-0.84	First MWD Survey

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Crow Creek AA01-743_BHL	178.86	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
244.00	2,200.00	Surface Surveys	MWD
2,318.00	6,928.00	Intermediate Surveys	MWD
7,022.00	11,906.00	Production Surveys	MWD

Design Report for Crow Creek AA01-743 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
2,248.00	2,247.90	9 5/8"	9-5/8	13-3/4
11,896.00	6,716.81	5 1/2"	5-1/2	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
Crow Creek AA01-743	0.00	0.00	6,752.50	-5,008.52	99.25	1,429,979.07	3,310,696.43	40.508320	-104.382620
- hit/miss target									
- Shape									
- actual wellpath misses target center by 55.44usft at 11903.25usft MD (6716.78 TVD, -5006.64 N, 141.62 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.63 °/100usft	Maximum Dogleg over Survey:	22.31 °/100usft at 6,928.00 usft
Net Tortousity applicable to Plans:	0.73 °/100usft	Directional Difficulty Index:	6.290

Audit Info

North Reference Sheet for Sec. 1-T6N-R63W (Crow Creek 1/AA01 PAD) - Crow Creek AA01-743 - Crow Creek AA01-743

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

Vertical Depths are relative to KB @ 4858.00usft (HP 343). Northing and Easting are relative to Crow Creek AA01-743

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: 0.99996803

Grid Coordinates of Well: 1,434,987.43 usft N, 3,310,597.18 usft E

Geographical Coordinates of Well: 40° 31' 19.45" N, 104° 22' 57.90" W

Grid Convergence at Surface is: 0.72°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,906.00usft the Bottom Hole Displacement is 5,011.40usft in the Direction of 178.38° (Grid).

Magnetic Convergence at surface is: -7.57° (15 December 2014, , BGGM2014)

