

Noble Energy

Weld County, CO (NAD 83)

Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA)

Ann LC34-755

05-123-40634

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

06 January, 2016

Surface UWI : 05-123-40634

Well Coordinates: 1,505,889.91 N, 3,424,867.75 E (40° 42' 43.13" N, 103° 58' 02.53" W)

Ground Level: 4,828.00 usft

Local Coordinate Origin:

Centered on Site Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA)

Viewing Datum:

KB = 24' @ 4852.00usft (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. 34-T9N-R59W (FAITH, ANN LC34, REMORA)
 Well: Ann LC34-755
 Wellbore: Plan A
 Design: Actual Surveys



HALLIBURTON

Sperry Drilling

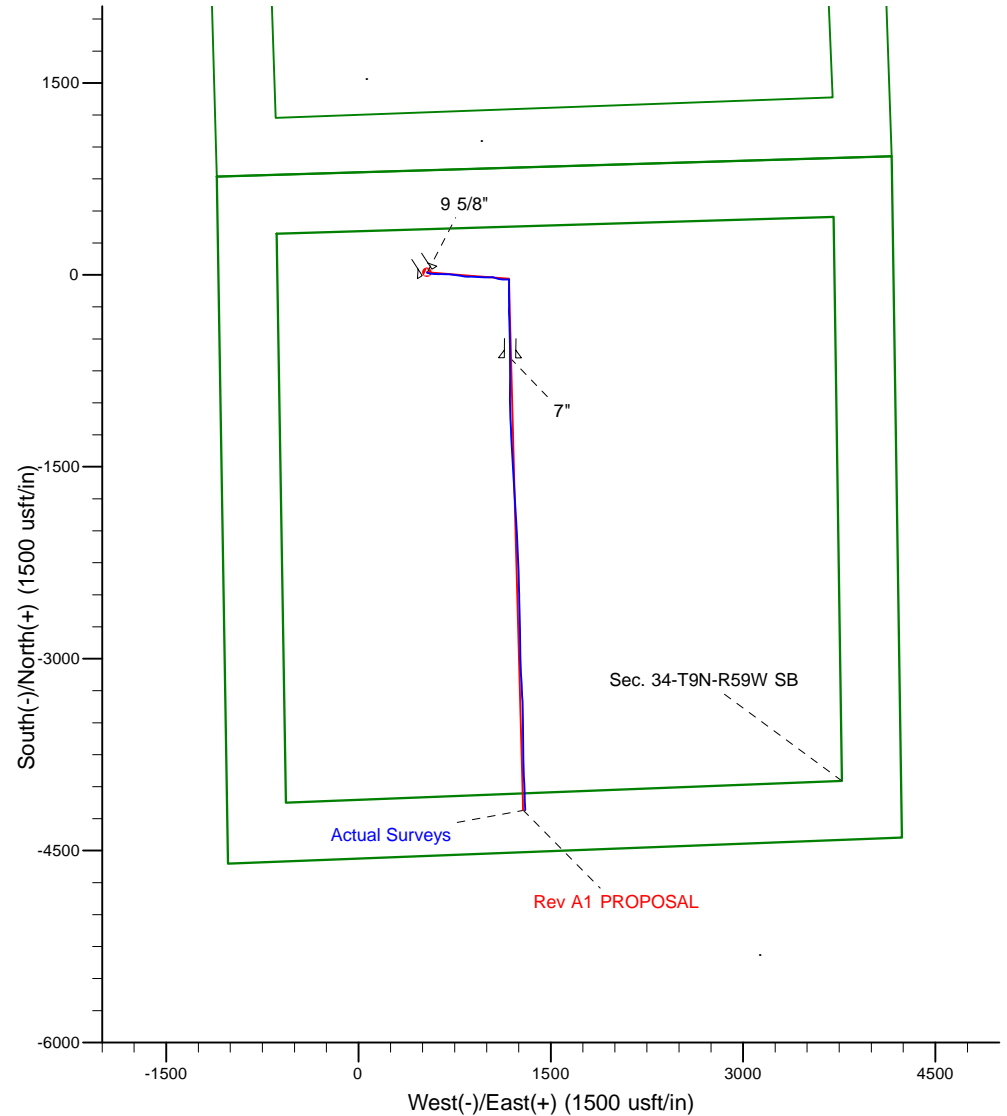
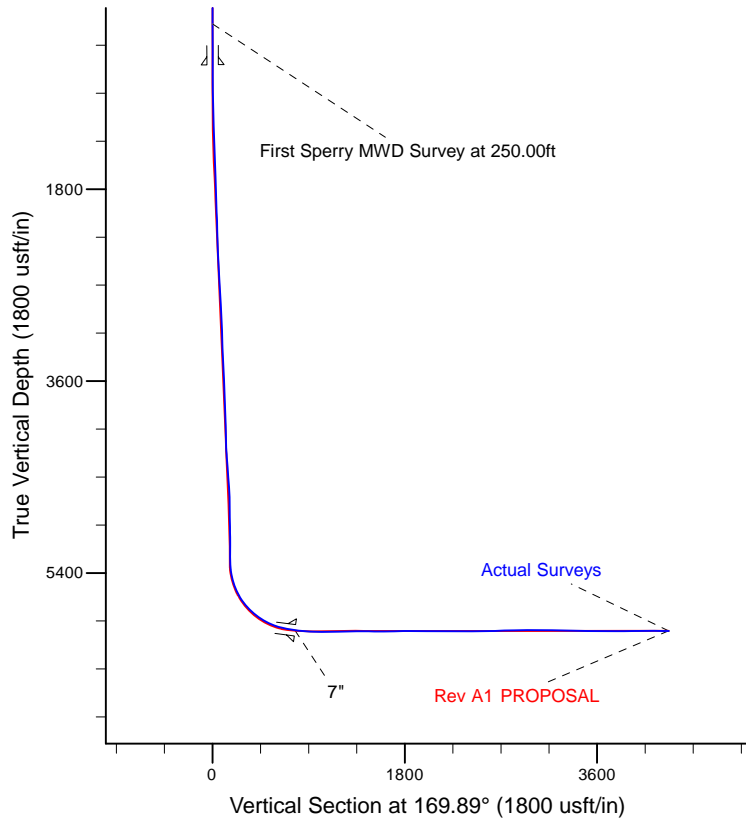
Platted SHL: 810' FNL, 1628' FWL
 Platted Lat/Long: 40.71198, --103.96737
 Location: Sec. 34-T9N-R59W

~7" Casing: 1486' FNL, 2274' FWL
 Lat/Long: 40.710112 N, -103.965075 W
 State Planes - CO Northern: 1,505,220.46 N, 3,425,515.64 E
 Location: Sec. 34-T9N-R59W

Platted BHL: 330' FSL, 2310 FWL
 Platted Lat/Long: 40.700593 N, -103.964874 W
 State Planes - CO Northern: 1,501,753.98 N, 3,425,631.38 E
 Location: Sec. 34-T9N-R59W

LEGEND

- ▣ Ann LC34-755, Plan A, Rev A1 PROPOSAL V0
- ▣ Actual Surveys



WELL DETAILS: Ann LC34-755	
Ground Level:	4828.00
KB = 24' @ 4852.00usft (H&P 273)	
Created By:	Tatiana Gomez
Created On:	1-6-2016



Design Report for Ann LC34-755 - 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	20.16	534.79	0.00	0.00
250.00	0.15	147.32	250.00	19.89	534.97	0.30	0.06
First Sperry MWD Survey at 250.00ft							
500.00	0.30	147.32	500.00	19.06	535.50	1.21	0.06
633.00	0.37	147.32	633.00	18.40	535.92	1.93	0.06
9 5/8"							
643.00	0.38	147.32	643.00	18.35	535.95	1.99	0.06
725.00	0.43	147.32	724.99	17.86	536.27	2.53	0.06
914.00	0.68	140.23	913.98	16.40	537.37	4.16	0.14
1,009.00	2.39	117.39	1,008.95	15.05	539.49	5.85	1.88
1,103.00	2.08	112.05	1,102.88	13.51	542.81	7.95	0.40
1,195.00	4.29	98.12	1,194.73	12.40	547.76	9.92	2.53
1,287.00	6.29	101.52	1,286.33	10.91	556.11	12.85	2.20
1,378.00	7.86	98.07	1,376.64	9.04	567.15	16.63	1.79
1,469.00	8.75	94.83	1,466.68	7.58	580.21	20.36	1.10
1,561.00	8.40	90.86	1,557.65	6.89	593.90	23.44	0.75
1,652.00	9.57	94.45	1,647.54	6.20	608.09	26.61	1.43
1,744.00	8.94	87.66	1,738.34	5.90	622.86	29.50	1.37
1,836.00	8.50	85.68	1,829.28	6.71	636.78	31.15	0.58
1,927.00	8.64	95.15	1,919.27	6.60	650.30	33.62	1.56
2,019.00	9.78	94.80	2,010.08	5.33	664.97	37.45	1.24
2,110.00	9.49	90.78	2,099.80	4.58	680.17	40.86	0.80
2,201.00	9.54	88.44	2,189.55	4.68	695.21	43.40	0.43
2,293.00	9.41	95.64	2,280.29	4.15	710.32	46.57	1.30
2,384.00	9.30	92.48	2,370.08	3.10	725.06	50.19	0.58
2,476.00	8.91	92.08	2,460.92	2.52	739.61	53.32	0.43
2,568.00	9.55	101.49	2,551.74	0.74	754.21	57.63	1.78
2,660.00	9.49	100.24	2,642.47	-2.13	769.15	63.08	0.23
2,845.00	10.27	100.58	2,824.73	-7.87	800.37	74.21	0.42
2,940.00	9.95	99.06	2,918.25	-10.72	816.80	79.90	0.44
3,035.00	9.02	96.03	3,011.95	-12.79	832.31	84.66	1.11
3,224.00	9.14	87.05	3,198.59	-13.57	862.04	90.65	0.75
3,319.00	10.37	91.62	3,292.22	-13.43	878.12	93.33	1.53
3,414.00	10.56	91.38	3,385.64	-13.88	895.37	96.80	0.21
3,508.00	11.11	95.11	3,477.96	-14.89	913.00	100.89	0.95
3,603.00	11.54	94.54	3,571.11	-16.46	931.59	105.70	0.47
3,698.00	10.92	94.72	3,664.29	-17.95	950.03	110.40	0.65
3,792.00	10.76	92.74	3,756.62	-19.10	967.67	114.63	0.43
3,887.00	10.48	91.44	3,849.99	-19.75	985.17	118.34	0.39
3,981.00	9.89	87.14	3,942.51	-19.56	1,001.78	121.07	1.02
4,076.00	9.20	81.14	4,036.20	-17.98	1,017.43	122.26	1.27
4,171.00	9.38	89.63	4,129.95	-16.76	1,032.68	123.74	1.45
4,265.00	8.39	98.44	4,222.83	-17.72	1,047.12	127.21	1.79
4,360.00	10.07	108.20	4,316.60	-21.33	1,061.87	133.36	2.41
4,455.00	9.55	107.99	4,410.21	-26.36	1,077.25	141.01	0.55
4,550.00	10.06	105.93	4,503.83	-31.07	1,092.73	148.36	0.65
4,644.00	10.63	97.52	4,596.30	-34.46	1,109.22	154.59	1.72
4,739.00	8.93	88.48	4,689.92	-35.41	1,125.28	158.35	2.41
4,833.00	6.95	83.51	4,783.02	-34.57	1,138.22	159.80	2.23
4,928.00	5.78	94.80	4,877.44	-34.32	1,148.70	161.39	1.80

Design Report for Ann LC34-755 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,022.00	5.34	92.78	4,970.99	-34.93	1,157.79	163.58	0.51
5,117.00	4.33	87.70	5,065.65	-35.00	1,165.79	165.06	1.15
5,211.00	3.02	78.50	5,159.46	-34.37	1,171.76	165.48	1.52
5,306.00	0.78	62.47	5,254.40	-33.57	1,174.79	165.22	2.40
5,401.00	4.33	180.22	5,349.32	-36.86	1,175.35	168.56	4.99
5,449.00	9.21	181.86	5,396.97	-42.51	1,175.21	174.10	10.17
5,496.00	13.10	182.37	5,443.07	-51.60	1,174.87	182.99	8.28
5,544.00	17.35	182.64	5,489.37	-64.19	1,174.32	195.29	8.86
5,590.00	21.96	183.39	5,532.68	-79.63	1,173.49	210.35	10.04
5,638.00	26.31	181.68	5,576.48	-99.23	1,172.65	229.50	9.18
5,685.00	30.20	178.89	5,617.87	-121.47	1,172.57	251.38	8.74
5,733.00	34.44	177.59	5,658.43	-147.12	1,173.38	276.76	8.95
5,779.00	39.54	178.88	5,695.16	-174.77	1,174.21	304.13	11.21
5,827.00	44.27	180.27	5,730.87	-206.82	1,174.43	335.72	10.04
5,874.00	47.72	180.80	5,763.52	-240.62	1,174.11	368.94	7.39
5,922.00	52.18	180.21	5,794.40	-277.35	1,173.79	405.05	9.34
5,968.00	56.04	178.06	5,821.36	-314.60	1,174.37	441.82	9.21
6,016.00	60.06	178.87	5,846.76	-355.31	1,175.46	482.09	8.50
6,063.00	64.08	177.88	5,868.77	-396.81	1,176.64	523.15	8.75
6,111.00	68.66	176.92	5,888.00	-440.72	1,178.64	566.74	9.72
6,158.00	73.56	178.05	5,903.21	-485.14	1,180.59	610.80	10.67
6,206.00	76.01	178.50	5,915.81	-531.43	1,181.98	656.62	5.18
6,253.00	78.63	179.28	5,926.13	-577.27	1,182.87	701.90	5.80
6,281.00	80.26	180.18	5,931.25	-604.79	1,182.99	729.02	6.62
6,326.00	82.63	180.60	5,937.95	-649.29	1,182.69	772.77	5.34
7"							
6,386.00	85.78	181.16	5,944.01	-708.97	1,181.77	831.36	5.34
6,512.00	89.35	180.02	5,949.36	-834.82	1,180.48	955.04	2.97
6,605.00	89.54	179.76	5,950.26	-927.82	1,180.65	1,046.62	0.35
6,699.00	90.15	178.12	5,950.52	-1,021.80	1,182.39	1,139.45	1.86
6,794.00	90.92	177.80	5,949.63	-1,116.73	1,185.78	1,233.51	0.88
6,889.00	90.18	177.62	5,948.72	-1,211.65	1,189.57	1,327.62	0.80
6,983.00	89.72	176.04	5,948.80	-1,305.51	1,194.77	1,420.93	1.75
7,077.00	89.45	176.66	5,949.48	-1,399.31	1,200.75	1,514.33	0.72
7,170.00	90.92	177.86	5,949.18	-1,492.20	1,205.20	1,606.55	2.04
7,265.00	92.37	177.12	5,946.45	-1,587.07	1,209.36	1,700.68	1.71
7,359.00	90.49	175.84	5,944.11	-1,680.86	1,215.13	1,794.02	2.42
7,454.00	89.60	176.79	5,944.03	-1,775.66	1,221.23	1,888.42	1.37
7,548.00	89.41	176.62	5,944.85	-1,869.50	1,226.63	1,981.75	0.27
7,642.00	89.26	176.16	5,945.94	-1,963.30	1,232.55	2,075.14	0.51
7,737.00	90.00	177.54	5,946.55	-2,058.16	1,237.77	2,169.44	1.65
7,832.00	89.60	176.96	5,946.88	-2,153.05	1,242.33	2,263.66	0.74
7,927.00	90.43	178.78	5,946.86	-2,247.97	1,245.86	2,357.73	2.11
8,021.00	90.89	178.29	5,945.77	-2,341.94	1,248.26	2,450.66	0.71
8,116.00	90.43	177.60	5,944.68	-2,436.87	1,251.67	2,544.71	0.87
8,211.00	91.76	179.46	5,942.86	-2,531.81	1,254.11	2,638.61	2.41
8,305.00	91.29	178.84	5,940.36	-2,625.77	1,255.50	2,731.35	0.83
8,400.00	91.17	178.08	5,938.32	-2,720.71	1,258.05	2,825.27	0.81
8,589.00	90.40	179.26	5,935.73	-2,909.64	1,262.44	3,012.04	0.75
8,684.00	89.66	179.10	5,935.68	-3,004.63	1,263.80	3,105.79	0.80
8,778.00	89.08	177.76	5,936.72	-3,098.59	1,266.37	3,198.74	1.55

Design Report for Ann LC34-755 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,873.00	88.40	176.04	5,938.81	-3,193.42	1,271.51	3,293.00	1.95
8,968.00	88.77	177.01	5,941.15	-3,288.21	1,277.27	3,387.34	1.09
9,062.00	89.20	178.36	5,942.82	-3,382.12	1,281.06	3,480.45	1.51
9,157.00	88.89	179.55	5,944.40	-3,477.09	1,282.80	3,574.25	1.29
9,251.00	89.72	179.27	5,945.54	-3,571.08	1,283.76	3,666.95	0.93
9,346.00	90.03	179.32	5,945.75	-3,666.07	1,284.93	3,760.67	0.33
9,441.00	91.08	178.99	5,944.83	-3,761.05	1,286.33	3,854.43	1.16
9,536.00	90.99	178.54	5,943.11	-3,856.02	1,288.38	3,948.27	0.48
9,726.00	89.29	177.16	5,942.65	-4,045.87	1,295.51	4,136.43	1.15
9,796.00	89.72	178.05	5,943.25	-4,115.81	1,298.43	4,205.79	1.41
Final Sperry MWD Survey at 9796.00ft							
9,863.00	89.72	178.05	5,943.58	-4,182.77	1,300.71	4,272.12	0.00
Straight Line Projection to TD at 9863.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	19.89	534.97	First Sperry MWD Survey at 250.00ft
9,796.00	5,943.25	-4,115.81	1,298.43	Final Sperry MWD Survey at 9796.00ft
9,863.00	5,943.58	-4,182.77	1,300.71	Straight Line Projection to TD at 9863.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Ann LC34-755_Rev A1_BHL	169.89	Slot	20.16	534.79	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
250.00	6,281.00	Intermediate Sperry MWD Surveys	MWD
6,386.00	9,863.00	Production Sperry MWD Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
633.00	633.00	9 5/8"	9-5/8	13-3/4
6,326.00	5,937.95	7"	7	8-3/4

Design Report for Ann LC34-755 - 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
Ann LC34-755_Rev A - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 20.16 N, 534.79 E) - Point	0.00	0.00	0.00	20.17	534.79	1,505,889.91	3,424,867.75	40.711980	-103.967370
Ann LC34-755_Rev A1 - actual wellpath misses target center by 16.68usft at 9862.46usft MD (5943.58 TVD, -4182.23 N, 1300.69 E) - Point	0.00	0.00	5,942.00	-4,182.80	1,284.10	1,501,686.99	3,425,617.05	40.700410	-103.964930
Ann LC34-755_Rev A - actual wellpath misses target center by 45.56usft at 9862.68usft MD (5943.58 TVD, -4182.44 N, 1300.70 E) - Point	0.00	0.00	5,986.00	-4,182.80	1,284.10	1,501,686.99	3,425,617.05	40.700410	-103.964930

Directional Difficulty Index

Average Dogleg over Survey:	1.84 °/100usft	Maximum Dogleg over Survey:	11.21 °/100usft at 5,779.00 usft
Net Tortosity applicable to Plans:	0.72 °/100usft	Directional Difficulty Index:	6.159

Audit Info

North Reference Sheet for Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA) - Ann LC34-755 - 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' @ 4852.00usft (H&P 273). Northing and Easting are relative to Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA)

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: 0.99998920

Grid Coordinates of Well: 1,505,889.91 usft N, 3,424,867.75 usft E

Geographical Coordinates of Well: 40° 42' 43.13" N, 103° 58' 02.53" W

Grid Convergence at Surface is: 0.99°

Based upon Minimum Curvature type calculations, at a Measured Depth of 9,863.00usft the Bottom Hole Displacement is 4,272.15usft in the Direction of 169.67° (Grid).

Magnetic Convergence at surface is: -7.06° (30 November 2015, , BGGM2015)

