

Noble Energy

Weld County, CO (NAD 83)

Sec. 26-T9N-59W (JD & Douglas LC PAD)

Douglas LC35-770

05-123-40660

Plan B

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

12 January, 2016

Surface UWI : 05-123-40660

Well Coordinates: 1,507,267.11 N, 3,429,263.39 E (40° 42' 55.98" N, 103° 57' 05.15" W)

Ground Level: 4,812.00 usft

Local Coordinate Origin:

Centered on Well Douglas LC35-770

Viewing Datum:

KB = 24' @ 4836.00usft (H&P 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. 26-T9N-59W (JD & Douglas LC PAD)
 Well: Douglas LC35-770
 Wellbore: Plan B
 Design: Actual Surveys



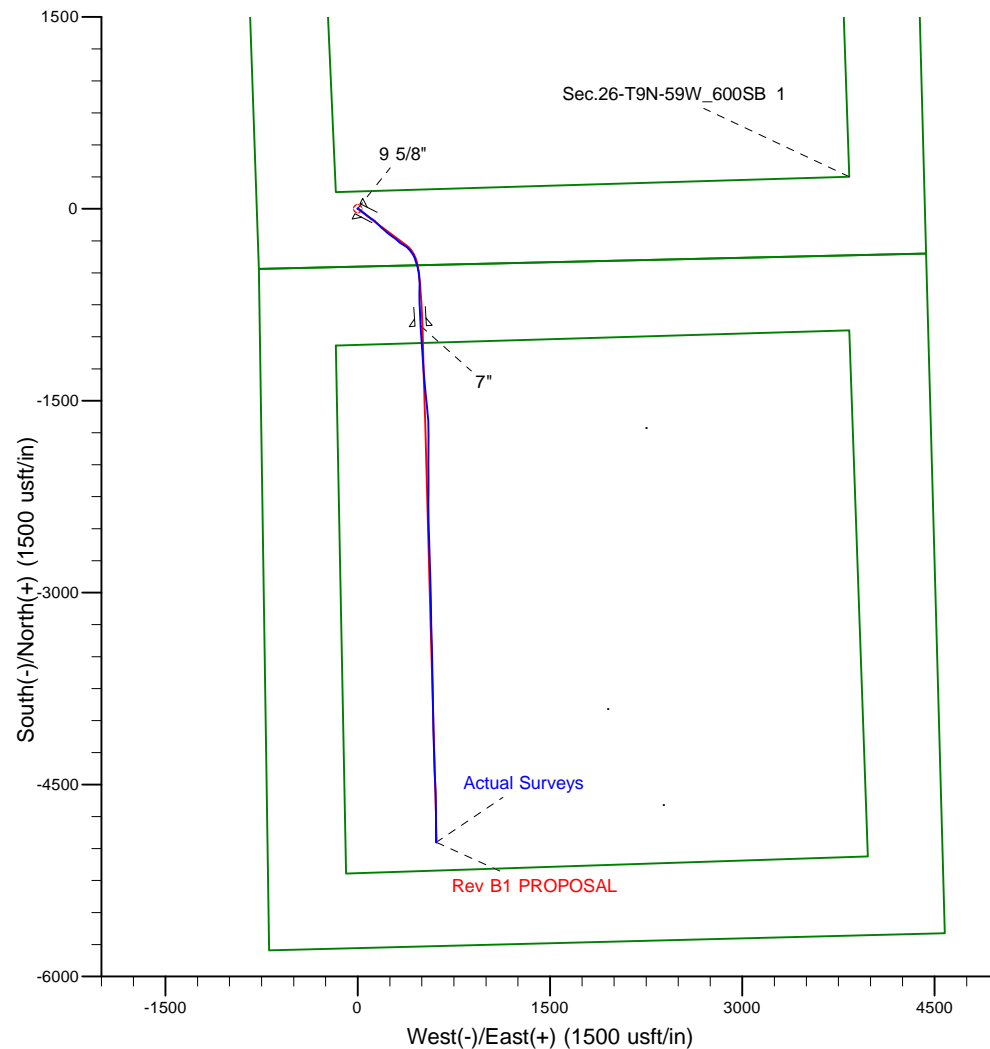
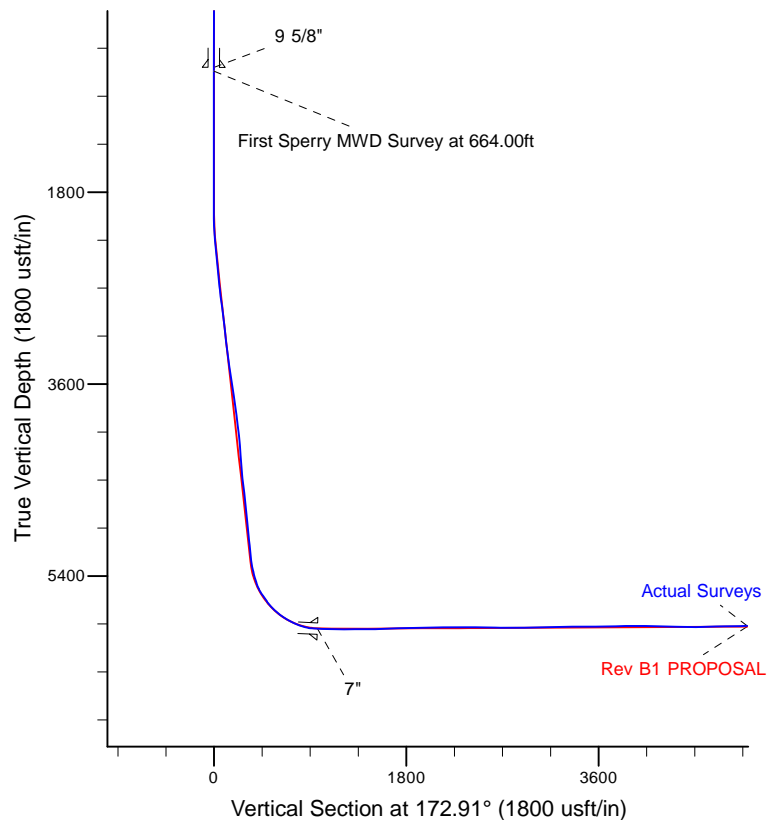
Platted SHL: 450' FSL, 787' FWL
 Platted Lat/Long: 40.71555 N, -103.95143 W
 Location: Sec. 26-T9N-R59W

~7" Casing: 481' FNL, 1249 FWL
 Lat/Long: 40.713015 N, -103.949715 W
 State Planes - CO Northern: 1,506,351.98 N, 3,429,755.07 E
 Sec. 26-T9N-R59W

Platted BHL: 810' FSL, 1320 FWL
 Platted Lat/Long: 40.702115 N, -103.949538 W
 State Planes - CO Northern: 1,502,382.29 N, 3,429,873.55 E
 Location: Sec. 26-T9N-R59W

LEGEND

- ▬ Douglas LC35-770, Plan B, Rev B1 PROPOSAL V0
- ▬ Actual Surveys



WELL DETAILS: Douglas LC35-770

Ground Level: 4812.00

KB = 24' @ 4836.00usft (H&P 343)

Created By: Tatiana Gomez
 Created On: 1-12-2016

Design Report for Douglas LC35-770 - 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
631.00	0.33	297.14	631.00	0.84	-1.63	-1.03	0.05
9 5/8"							
664.00	0.35	297.14	664.00	0.93	-1.80	-1.14	0.05
First Sperry MWD Survey at 664.00ft							
759.00	0.41	304.31	758.99	1.25	-2.34	-1.53	0.08
853.00	0.10	42.39	852.99	1.50	-2.57	-1.80	0.46
948.00	0.13	47.28	947.99	1.63	-2.43	-1.92	0.03
1,134.00	0.28	71.57	1,133.99	1.92	-1.84	-2.13	0.09
1,225.00	0.20	88.60	1,224.99	1.99	-1.48	-2.16	0.12
1,317.00	0.20	133.56	1,316.99	1.89	-1.20	-2.02	0.17
1,409.00	0.26	111.58	1,408.99	1.70	-0.89	-1.80	0.11
1,500.00	0.12	116.74	1,499.99	1.58	-0.61	-1.64	0.15
1,592.00	0.22	140.35	1,591.99	1.40	-0.41	-1.44	0.13
1,682.00	0.06	136.21	1,681.99	1.24	-0.27	-1.26	0.18
1,774.00	0.32	48.57	1,773.99	1.37	-0.04	-1.37	0.35
1,865.00	0.40	23.69	1,864.99	1.83	0.27	-1.78	0.19
1,955.00	1.11	53.69	1,954.98	2.63	1.10	-2.48	0.88
2,047.00	2.37	102.85	2,046.94	2.74	3.68	-2.26	2.01
2,138.00	4.20	125.04	2,137.79	0.41	8.24	0.61	2.41
2,228.00	5.66	135.28	2,227.45	-4.64	14.06	6.34	1.89
2,320.00	7.90	130.65	2,318.81	-11.98	22.05	14.61	2.50
2,411.00	8.27	128.41	2,408.90	-20.12	31.92	23.91	0.53
2,503.00	7.83	128.42	2,499.99	-28.13	42.02	33.10	0.48
2,594.00	7.60	127.86	2,590.17	-35.67	51.63	41.78	0.27
2,689.00	7.64	127.18	2,684.33	-43.35	61.62	50.62	0.10
2,783.00	10.24	127.09	2,777.18	-52.16	73.26	60.81	2.77
2,878.00	11.72	128.08	2,870.44	-63.21	87.60	73.54	1.57
2,972.00	10.88	126.93	2,962.62	-74.42	102.20	86.47	0.93
3,067.00	9.18	119.68	3,056.17	-83.57	115.95	97.24	2.23
3,162.00	8.19	125.37	3,150.08	-91.23	128.06	106.35	1.38
3,256.00	9.41	136.47	3,242.98	-100.68	138.81	117.05	2.22
3,351.00	9.83	133.87	3,336.64	-111.93	150.00	129.60	0.64
3,445.00	10.48	135.24	3,429.17	-123.56	161.81	142.60	0.74
3,540.00	10.76	134.66	3,522.54	-135.93	174.20	156.40	0.32
3,635.00	11.20	134.01	3,615.80	-148.58	187.14	170.55	0.48
3,729.00	10.75	131.38	3,708.08	-160.71	200.29	184.21	0.72
3,824.00	10.24	129.73	3,801.49	-171.97	213.43	197.01	0.62
3,918.00	10.31	131.11	3,893.98	-182.84	226.19	209.37	0.27
4,013.00	9.16	128.51	3,987.62	-193.14	238.52	221.11	1.30
4,107.00	8.60	129.63	4,080.49	-202.28	249.78	231.57	0.62
4,202.00	7.81	123.71	4,174.52	-210.39	260.62	240.96	1.22
4,297.00	6.89	121.59	4,268.74	-216.96	270.85	248.74	1.01
4,391.00	7.00	118.27	4,362.05	-222.63	280.70	255.58	0.44
4,486.00	7.29	131.42	4,456.31	-229.36	290.31	263.45	1.74
4,580.00	9.56	133.60	4,549.29	-238.69	300.44	273.96	2.44
4,675.00	7.93	133.58	4,643.19	-248.64	310.90	285.13	1.72
4,864.00	7.86	126.31	4,830.40	-265.29	330.76	304.09	0.53
4,959.00	8.63	121.48	4,924.42	-272.85	342.07	313.00	1.09
5,054.00	10.02	122.64	5,018.16	-281.03	355.11	322.73	1.48

Design Report for Douglas LC35-770 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,149.00	8.79	119.83	5,111.88	-289.10	368.37	332.37	1.38
5,243.00	8.47	122.04	5,204.82	-296.35	380.47	341.06	0.49
5,338.00	12.07	140.41	5,298.31	-307.72	392.74	353.86	5.08
5,432.00	17.53	140.73	5,389.15	-326.27	407.97	374.14	5.81
5,527.00	20.96	143.55	5,478.83	-351.02	427.13	401.07	3.74
5,620.00	34.02	160.55	5,561.28	-389.15	445.78	441.22	16.26
5,714.00	35.75	163.67	5,638.39	-440.31	462.26	494.01	2.64
5,809.00	45.71	169.30	5,710.31	-500.52	476.42	555.52	11.17
5,903.00	53.80	180.32	5,771.10	-571.75	482.47	626.95	12.39
5,997.00	62.22	180.26	5,820.85	-651.40	482.07	705.94	8.96
6,092.00	68.52	179.38	5,860.43	-737.72	482.36	791.63	6.68
6,185.00	78.84	176.36	5,886.53	-826.77	485.73	880.42	11.52
6,228.00	86.83	176.00	5,891.89	-869.31	488.58	922.98	18.60
6,274.00	87.31	176.25	5,894.24	-915.14	491.68	968.85	1.16
7"							
6,436.00	88.98	177.11	5,899.49	-1,076.78	501.06	1,130.40	1.16
6,531.00	90.52	176.53	5,899.91	-1,171.63	506.33	1,225.18	1.73
6,626.00	90.06	174.93	5,899.43	-1,266.36	513.41	1,320.06	1.75
6,720.00	90.46	174.57	5,899.00	-1,359.96	522.01	1,414.01	0.57
6,815.00	90.74	174.45	5,898.00	-1,454.52	531.10	1,508.97	0.32
6,909.00	91.66	174.05	5,896.04	-1,548.03	540.51	1,602.92	1.07
7,003.00	92.96	176.10	5,892.25	-1,641.60	548.58	1,696.77	2.58
7,098.00	92.68	179.13	5,887.57	-1,736.39	552.52	1,791.32	3.20
7,192.00	91.14	181.34	5,884.44	-1,830.33	552.14	1,884.49	2.86
7,285.00	88.58	179.80	5,884.67	-1,923.31	551.21	1,976.65	3.21
7,379.00	91.02	179.73	5,884.99	-2,017.30	551.60	2,069.97	2.60
7,474.00	92.37	179.89	5,882.18	-2,112.26	551.91	2,164.24	1.43
7,569.00	90.18	180.45	5,880.07	-2,207.23	551.63	2,258.45	2.38
7,663.00	89.63	179.89	5,880.23	-2,301.23	551.35	2,351.69	0.84
7,758.00	89.26	178.83	5,881.15	-2,396.22	552.41	2,446.09	1.18
7,853.00	89.20	178.84	5,882.42	-2,491.19	554.34	2,540.57	0.06
7,947.00	88.30	178.01	5,884.47	-2,585.13	556.93	2,634.11	1.30
8,042.00	89.85	178.21	5,886.01	-2,680.06	560.06	2,728.70	1.65
8,137.00	90.31	178.26	5,885.87	-2,775.02	562.99	2,823.29	0.49
8,231.00	90.65	178.35	5,885.09	-2,868.97	565.77	2,916.87	0.37
8,420.00	91.48	178.61	5,881.57	-3,057.87	570.78	3,104.95	0.46
8,515.00	90.95	179.51	5,879.56	-3,152.83	572.34	3,199.38	1.10
8,609.00	91.85	179.72	5,877.26	-3,246.80	572.97	3,292.70	0.98
8,703.00	90.25	178.39	5,875.54	-3,340.77	574.52	3,386.14	2.21
8,797.00	89.91	178.02	5,875.41	-3,434.72	577.46	3,479.74	0.53
8,891.00	91.11	178.78	5,874.57	-3,528.68	580.09	3,573.30	1.51
8,985.00	90.83	178.52	5,872.98	-3,622.64	582.30	3,666.82	0.41
9,079.00	91.60	178.11	5,870.99	-3,716.58	585.06	3,760.38	0.93
9,173.00	91.54	179.25	5,868.41	-3,810.52	587.23	3,853.86	1.21
9,268.00	88.92	179.87	5,868.03	-3,905.50	587.96	3,948.22	2.83
9,362.00	88.95	179.73	5,869.78	-3,999.49	588.29	4,041.52	0.15
9,456.00	88.68	178.90	5,871.72	-4,093.46	589.41	4,134.91	0.93
9,550.00	88.46	177.84	5,874.07	-4,187.39	592.08	4,228.45	1.15
9,644.00	89.26	177.74	5,875.94	-4,281.30	595.71	4,322.09	0.86
9,738.00	88.54	177.11	5,877.74	-4,375.19	599.93	4,415.78	1.02
9,833.00	90.28	178.07	5,878.72	-4,470.09	603.92	4,510.46	2.09

Design Report for Douglas LC35-770 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,927.00	91.20	178.14	5,877.51	-4,564.03	607.03	4,604.06	0.98
10,021.00	92.71	179.05	5,874.30	-4,657.95	609.34	4,697.54	1.88
10,116.00	90.83	180.03	5,871.37	-4,752.89	610.10	4,791.85	2.23
10,248.00	90.83	179.91	5,869.45	-4,884.88	610.17	4,922.84	0.09
Final Sperry MWD Survey at 10248.00ft							
10,315.00	90.83	179.91	5,868.48	-4,951.87	610.27	4,989.33	0.00
Straight Line Projection to TD at 10315.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
664.00	664.00	0.93	-1.80	First Sperry MWD Survey at 664.00ft
10,248.00	5,869.45	-4,884.88	610.17	Final Sperry MWD Survey at 10248.00ft
10,315.00	5,868.48	-4,951.87	610.27	Straight Line Projection to TD at 10315.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Douglas LC35-770 _Rev B1_BHL	172.91	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
664.00	6,228.00	Intermediate Sperry MWD Surveys	MWD
6,436.00	10,315.00	Production Sperry MWD Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
631.00	631.00	9 5/8"	9-5/8	13-3/4
6,274.00	5,894.24	7"	7	8-3/4

Design Report for Douglas LC35-770 - 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
Douglas LC35-770 _Ri - actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.02	0.00	1,507,267.13	3,429,263.39	40.715550	-103.951430
Douglas LC35-770 _Re - actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.02	0.00	1,507,267.13	3,429,263.39	40.715550	-103.951430
Douglas LC35-770 _Ri - actual wellpath misses target center by 8.79usft at 10315.00usft MD (5868.48 TVD, -4951.87 N, 610.27 E) - Point	0.00	0.00	5,875.00	-4,952.15	616.16	1,502,315.01	3,429,879.55	40.701930	-103.949520
Douglas LC35-770 _Ri - actual wellpath misses target center by 66.77usft at 10314.33usft MD (5868.49 TVD, -4951.20 N, 610.27 E) - Point	0.00	0.00	5,935.00	-4,952.15	616.16	1,502,315.01	3,429,879.55	40.701930	-103.949520
Douglas LC35-770 _Ri - actual wellpath misses target center by 66.77usft at 10314.33usft MD (5868.49 TVD, -4951.20 N, 610.27 E) - Point	0.00	0.00	5,935.00	-4,952.15	616.16	1,502,315.01	3,429,879.55	40.701930	-103.949520
Douglas LC35-770 _Re - actual wellpath misses target center by 66.77usft at 10314.33usft MD (5868.49 TVD, -4951.20 N, 610.27 E) - Point	0.00	0.00	5,935.00	-4,952.15	616.16	1,502,315.01	3,429,879.55	40.701930	-103.949520

Directional Difficulty Index

Average Dogleg over Survey:	1.76 °/100usft	Maximum Dogleg over Survey:	18.60 °/100usft at 6,228.00 usft
Net Tortousity applicable to Plans:	0.83 °/100usft	Directional Difficulty Index:	6.217

Audit Info

North Reference Sheet for Sec. 26-T9N-59W (JD & Douglas LC PAD) - Douglas
LC35-770 - 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' @ 4836.00usft (H&P 343). Northing and Easting are relative to Douglas LC35-770

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: 0.99998970

Grid Coordinates of Well: 1,507,267.11 usft N, 3,429,263.39 usft E

Geographical Coordinates of Well: 40° 42' 55.98" N, 103° 57' 05.15" W

Grid Convergence at Surface is: 1.00°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,315.00usft
the Bottom Hole Displacement is 4,989.34usft in the Direction of 172.97° (Grid).

Magnetic Convergence at surface is: -7.04° (20 December 2015, , BGGM2015)

