

Noble Energy

Weld County, CO (NAD 83)

Sec. 28-T9N-R58W (Greyson & Brecken PAD)

Greyson LD28-780

05-123-41584

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

23 September, 2015

Surface UWI : 05-123-41584

Well Coordinates: 1,507,995.94 N, 3,451,037.15 E (40° 42' 59.33" N, 103° 52' 22.26" W)

Ground Level: 4,855.00 usft

Local Coordinate Origin:

Centered on Well Greyson LD28-780

Viewing Datum:

KB = 24 @ 4879.00usft (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

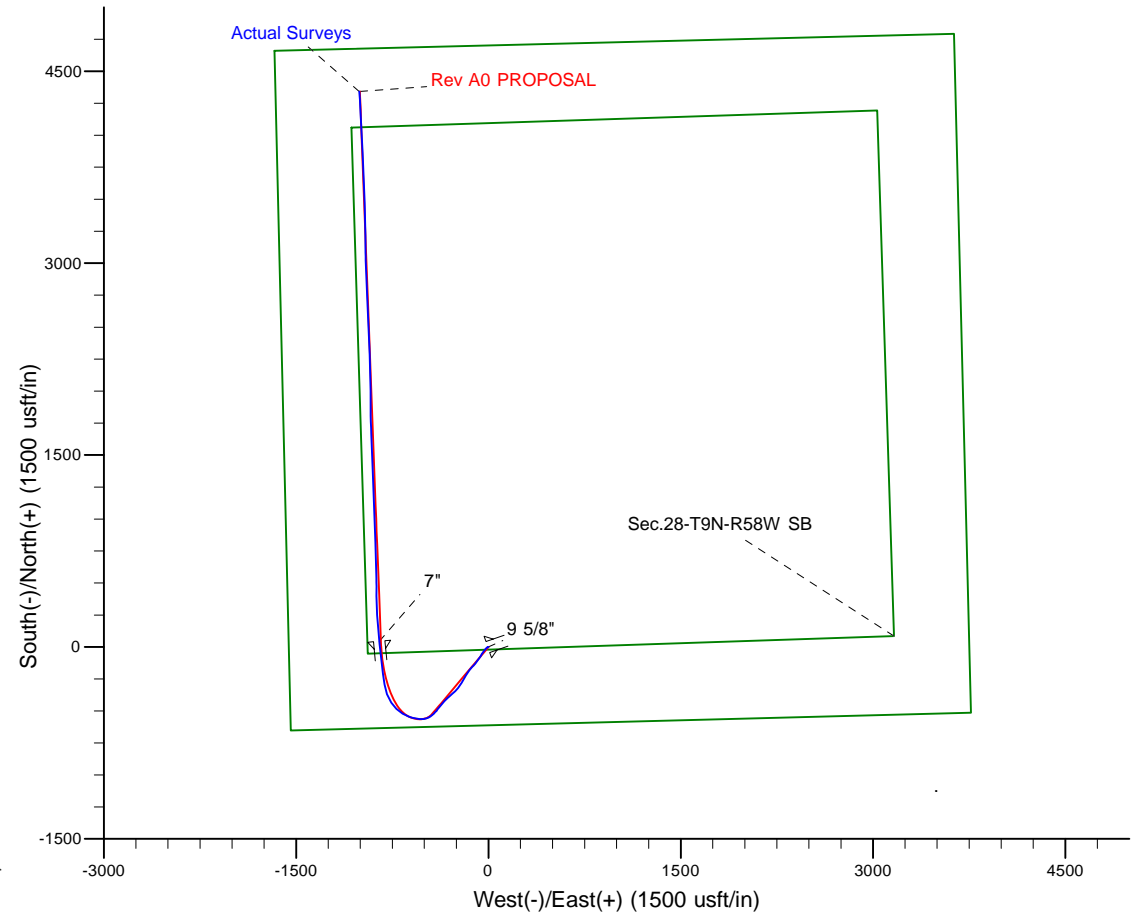
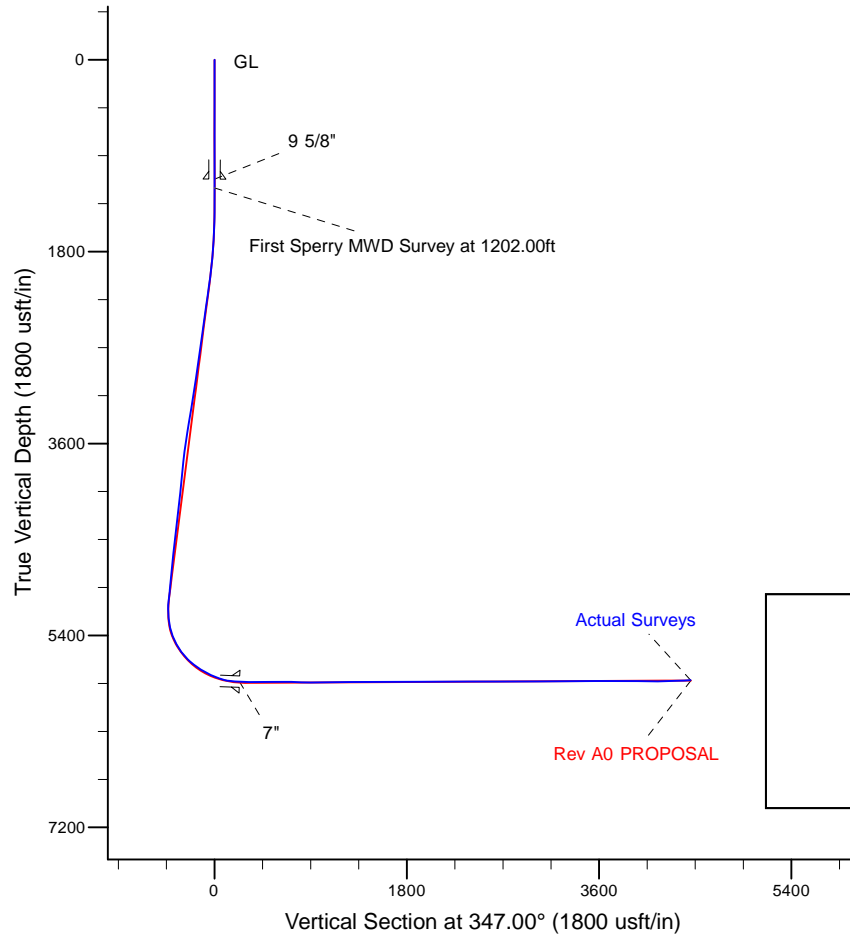
Project: Weld County, CO (NAD 83)
 Site: Sec. 28-T9N-R58W (Greyson & Brecken PAD)
 Well: Greyson LD28-780
 Wellbore: Plan A
 Design: Actual Surveys



Platted SHL: 610' FSL, 1560' FWL
 Platted Lat/Long: 40.716480, -103.872850
 Location: Sec. 28-T9N-R58W

~7" Casing: 674' FSL, 696' FWL
 Lat/Long: 40.716644 S, -103.875919 W
 State Planes - CO Northern: 1,508,040.13 N, 3,450,185.56 E
 Location: Sec. 28-T9N-R58W

Platted BHL: 330' FNL, 660' FWL
 Platted Lat/Long: 40.728277 N, -103.876185 W
 State Planes - CO Northern: 1,512,276.30 N, 3,450,034.16 E
 Location: Sec. 28-T9N-R58W



LEGEND

- +— Greyson LD28-780, Plan A, Rev A0 PROPOSAL V0
- +— Actual Surveys

WELL DETAILS: Greyson LD28-780

Ground Level: 4855.00
 KB = 24 @ 4879.00usft (H&P 343)

Created By: Tatiana Gomez
 Created On: 9/22/2015

Design Report for Greyson LD28-780 - 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
Greyson LD28-780_Rev A0_SHL							
1,119.00	0.33	250.82	1,118.99	-1.05	-3.01	-0.34	0.03
9 5/8"							
1,202.00	0.35	250.82	1,201.99	-1.21	-3.47	-0.40	0.03
First Sperry MWD Survey at 1202.00ft							
1,386.00	0.50	275.63	1,385.99	-1.31	-4.80	-0.20	0.13
1,479.00	3.64	242.46	1,478.92	-2.64	-7.82	-0.81	3.48
1,572.00	4.60	226.87	1,571.68	-6.55	-13.16	-3.42	1.58
1,666.00	4.37	226.63	1,665.39	-11.59	-18.51	-7.13	0.25
1,758.00	6.63	220.18	1,756.96	-18.05	-24.49	-12.08	2.54
1,850.00	7.62	216.31	1,848.25	-27.03	-31.53	-19.24	1.20
1,943.00	9.67	216.84	1,940.19	-38.25	-39.86	-28.30	2.21
2,034.00	11.15	215.39	2,029.69	-51.54	-49.54	-39.07	1.65
2,126.00	11.56	212.35	2,119.89	-66.58	-59.63	-51.46	0.79
2,219.00	11.22	208.33	2,211.06	-82.41	-68.91	-64.80	0.93
2,311.00	12.16	218.58	2,301.16	-97.87	-79.20	-77.54	2.47
2,404.00	11.89	215.89	2,392.12	-113.29	-90.92	-89.93	0.67
2,497.00	11.67	214.76	2,483.16	-128.78	-101.90	-102.55	0.34
2,590.00	13.52	221.80	2,573.92	-144.61	-114.51	-115.14	2.58
2,682.00	13.48	220.52	2,663.38	-160.78	-128.65	-127.72	0.33
2,869.00	13.01	220.29	2,845.41	-193.40	-156.42	-153.26	0.25
2,964.00	12.35	215.96	2,938.09	-209.78	-169.30	-166.32	1.22
3,058.00	11.51	208.36	3,030.07	-226.18	-179.66	-179.96	1.89
3,153.00	11.06	204.05	3,123.23	-242.84	-187.87	-194.35	1.01
3,248.00	12.99	210.06	3,216.15	-260.40	-196.94	-209.42	2.42
3,342.00	13.43	209.75	3,307.66	-279.02	-207.65	-225.16	0.47
3,437.00	13.47	217.15	3,400.06	-297.42	-219.80	-240.35	1.81
3,532.00	14.07	217.86	3,492.33	-315.36	-233.57	-254.73	0.66
3,626.00	13.90	223.18	3,583.55	-332.61	-248.31	-268.23	1.38
3,721.00	13.39	222.75	3,675.86	-349.01	-263.59	-280.77	0.55
3,815.00	13.01	230.40	3,767.39	-363.75	-279.13	-291.63	1.90
3,910.00	12.47	229.76	3,860.05	-377.19	-295.20	-301.11	0.59
4,005.00	11.65	227.68	3,952.95	-390.28	-310.12	-310.51	0.98
4,099.00	10.68	225.68	4,045.17	-402.75	-323.37	-319.68	1.11
4,194.00	10.99	223.94	4,138.48	-415.42	-335.95	-329.20	0.47
4,288.00	11.11	222.24	4,230.74	-428.58	-348.26	-339.25	0.37
4,383.00	11.88	221.02	4,323.83	-442.73	-360.83	-350.21	0.85
4,477.00	11.10	220.09	4,415.95	-456.96	-373.00	-361.33	0.85
4,572.00	9.58	220.11	4,509.40	-470.00	-383.99	-371.57	1.60
4,667.00	9.98	218.21	4,603.02	-482.51	-394.17	-381.47	0.54
4,761.00	9.09	214.15	4,695.72	-495.06	-403.38	-391.62	1.19
4,856.00	8.73	223.84	4,789.58	-506.47	-412.59	-400.67	1.62
4,951.00	10.35	224.45	4,883.26	-517.76	-423.56	-409.20	1.71
5,045.00	12.21	227.57	4,975.44	-530.50	-436.81	-418.63	2.08
5,140.00	20.38	238.18	5,066.57	-546.03	-458.32	-428.92	9.12
5,234.00	21.47	255.33	5,154.45	-559.03	-488.90	-434.71	6.60
5,329.00	24.69	271.02	5,241.92	-563.08	-525.60	-430.41	7.28
5,424.00	30.68	280.80	5,326.05	-558.18	-569.31	-415.80	7.90
5,518.00	35.00	289.24	5,405.05	-544.79	-618.37	-391.71	6.69

Design Report for Greyson LD28-780 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,613.00	38.01	300.23	5,481.49	-521.05	-669.43	-357.10	7.57
5,708.00	41.07	314.28	5,554.89	-484.46	-717.15	-310.70	9.93
5,802.00	46.88	326.42	5,622.63	-434.18	-758.34	-252.45	10.87
5,897.00	54.26	340.06	5,683.09	-368.78	-790.80	-181.42	13.51
5,991.00	59.84	350.47	5,734.30	-292.63	-810.60	-102.78	11.02
6,086.00	65.74	353.33	5,777.73	-209.03	-822.44	-18.65	6.76
6,180.00	73.13	352.87	5,810.72	-121.72	-833.01	68.80	7.88
6,291.00	86.61	353.78	5,830.20	-13.44	-845.67	177.15	12.17
6,349.00	87.88	354.46	5,832.99	44.18	-851.60	234.63	2.48
7"							
6,381.00	88.58	354.83	5,833.98	76.03	-854.59	266.33	2.48
6,473.00	88.49	355.47	5,836.33	167.67	-862.36	357.37	0.70
6,565.00	89.82	356.28	5,837.69	259.42	-868.98	448.26	1.69
6,657.00	91.45	359.70	5,836.67	351.34	-872.21	538.55	4.12
6,750.00	90.49	359.78	5,835.09	444.32	-872.63	629.25	1.04
6,843.00	88.61	358.55	5,835.82	537.31	-873.98	720.15	2.42
6,936.00	88.83	358.09	5,837.90	630.24	-876.71	811.32	0.55
7,029.00	88.83	357.97	5,839.80	723.17	-879.91	902.58	0.13
7,123.00	90.46	358.40	5,840.38	817.12	-882.88	994.79	1.79
7,215.00	91.48	358.55	5,838.82	909.07	-885.33	1,084.93	1.12
7,310.00	91.32	358.65	5,836.50	1,004.01	-887.65	1,177.97	0.20
7,404.00	89.57	357.72	5,835.77	1,097.96	-890.63	1,270.17	2.11
7,499.00	89.75	357.40	5,836.34	1,192.87	-894.67	1,363.56	0.39
7,688.00	91.02	357.20	5,835.07	1,381.65	-903.58	1,549.51	0.68
7,783.00	89.94	358.57	5,834.27	1,476.58	-907.08	1,642.79	1.84
7,878.00	89.63	357.94	5,834.63	1,571.53	-909.97	1,735.96	0.74
7,972.00	89.38	357.31	5,835.44	1,665.45	-913.87	1,828.35	0.72
8,067.00	90.77	358.48	5,835.31	1,760.38	-917.36	1,921.63	1.91
8,161.00	91.97	359.74	5,833.07	1,854.34	-918.82	2,013.51	1.85
8,256.00	89.97	359.48	5,831.46	1,949.32	-919.46	2,106.20	2.12
8,351.00	89.88	358.68	5,831.58	2,044.30	-920.99	2,199.09	0.85
8,446.00	89.97	358.98	5,831.71	2,139.28	-922.93	2,292.08	0.33
8,540.00	90.34	358.47	5,831.45	2,233.26	-925.02	2,384.11	0.67
8,635.00	89.97	358.12	5,831.20	2,328.22	-927.85	2,477.27	0.54
8,824.00	90.12	357.49	5,831.05	2,517.08	-935.09	2,662.92	0.34
8,919.00	89.51	357.33	5,831.35	2,611.98	-939.38	2,756.35	0.66
9,014.00	89.94	357.25	5,831.81	2,706.87	-943.87	2,849.83	0.46
9,108.00	90.65	357.05	5,831.33	2,800.75	-948.54	2,942.35	0.78
9,203.00	90.55	357.58	5,830.33	2,895.64	-952.99	3,035.81	0.57
9,297.00	91.05	358.13	5,829.02	2,989.57	-956.51	3,128.12	0.79
9,392.00	89.29	359.16	5,828.74	3,084.54	-958.76	3,221.16	2.15
9,486.00	90.31	359.36	5,829.07	3,178.53	-959.97	3,313.01	1.11
9,581.00	90.65	359.09	5,828.27	3,273.52	-961.26	3,405.85	0.46
9,770.00	90.22	358.17	5,826.83	3,462.45	-965.78	3,590.97	0.54
9,865.00	90.06	358.10	5,826.60	3,557.40	-968.87	3,684.18	0.18
9,960.00	89.69	357.94	5,826.81	3,652.35	-972.15	3,777.42	0.42
10,055.00	89.26	357.66	5,827.68	3,747.27	-975.80	3,870.74	0.54
10,149.00	88.95	357.28	5,829.15	3,841.17	-979.95	3,963.16	0.52
10,243.00	89.38	355.91	5,830.52	3,934.99	-985.53	4,055.83	1.53
10,338.00	91.36	357.76	5,829.91	4,029.83	-990.77	4,149.43	2.85
10,433.00	91.60	357.40	5,827.45	4,124.72	-994.78	4,242.78	0.46

Design Report for Greyson LD28-780 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,527.00	92.16	356.86	5,824.37	4,218.55	-999.49	4,335.26	0.83
10,589.00	92.38	356.63	5,821.91	4,280.40	-1,003.00	4,396.32	0.51
Final Sperry MWD Survey at 10589.00ft							
10,651.00	92.38	356.63	5,819.34	4,342.24	-1,006.65	4,457.39	0.00
Straight Line Projection to TD at 10651.00ft - Greyson LD28-780_Rev A1_BHL - Greyson LD28-780_Rev A0_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
1,202.00	1,201.99	-1.21	-3.47	First Sperry MWD Survey at 1202.00ft
10,589.00	5,821.91	4,280.40	-1,003.00	Final Sperry MWD Survey at 10589.00ft
10,651.00	5,819.34	4,342.24	-1,006.65	Straight Line Projection to TD at 10651.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Greyson LD28-780_Rev A1_BHL	347.00	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
1,202.00	6,291.00	Intermediate Survey	MWD
6,381.00	10,651.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,119.00	1,118.99	9 5/8"	9-5/8	13-3/4
6,349.00	5,832.99	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
Greyson LD28-780_Rc - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,507,995.95	3,451,037.15	40.716480	-103.872850
Greyson LD28-780_Rc - actual wellpath misses target center by 4.81usft at 10651.00usft MD (5819.34 TVD, 4342.24 N, -1006.65 E) - Point	0.00	0.00	5,822.00	4,343.41	-1,002.82	1,512,339.31	3,450,034.34	40.728450	-103.876180
Greyson LD28-780_Rc - actual wellpath misses target center by 4.81usft at 10651.00usft MD (5819.34 TVD, 4342.24 N, -1006.65 E) - Point	0.00	0.00	5,822.00	4,343.41	-1,002.82	1,512,339.31	3,450,034.34	40.728450	-103.876180

Design Report for Greyson LD28-780 - Actual Surveys

Directional Difficulty Index

Average Dogleg over Survey:	1.92 °/100usft	Maximum Dogleg over Survey:	13.51 °/100usft at 5,897.00 usft
Net Tortosity applicable to Plans:	0.76 °/100usft	Directional Difficulty Index:	6.339

Audit Info

North Reference Sheet for Sec. 28-T9N-R58W (Greyson & Brecken PAD) -
Greyson LD28-780 - 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 @ 4879.00usft (H&P 343). Northing and Easting are relative to Greyson LD28-780

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: 0.99998984

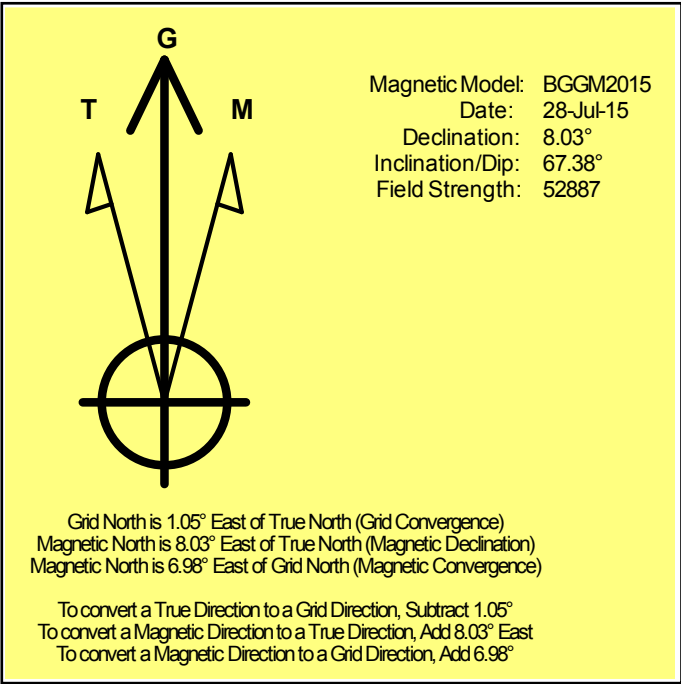
Grid Coordinates of Well: 1,507,995.94 usft N, 3,451,037.15 usft E

Geographical Coordinates of Well: 40° 42' 59.33" N, 103° 52' 22.26" W

Grid Convergence at Surface is: 1.05°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,651.00usft
the Bottom Hole Displacement is 4,457.40usft in the Direction of 346.95° (Grid).

Magnetic Convergence at surface is: -6.98° (28 July 2015, , BGGM2015)



Noble Energy

Weld County, CO (NAD 83)

Sec. 28-T9N-R58W (Greyson & Brecken PAD)

Greyson LD28-780

05-123-41584

Plan A

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

23 September, 2015

Well Coordinates: 1,507,995.94 N, 3,451,037.15 E (40° 42' 59.33" N, 103° 52' 22.26" W)

Ground Level: 4,855.00 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 Greyson LD28-780

KB = 24 @ 4879.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Design Report for Greyson LD28-780 - Actual Surveys

Measured			Vertical			Local Coordinates		Geographic Coordinates		UTM Coordinates	
Depth (usft)	Inclination (°)	Azimuth (°)	Depth (usft)	+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.716480	-103.872850	40.716480	-103.872850	1,507,995.94	3,451,037.15
1,119.00	0.33	250.82	1,118.99	-1.05	-3.01	40.716477	-103.872861	40.716477	-103.872861	1,507,994.90	3,451,034.15
1,202.00	0.35	250.82	1,201.99	-1.21	-3.47	40.716477	-103.872863	40.716477	-103.872863	1,507,994.74	3,451,033.69
1,386.00	0.50	275.63	1,385.99	-1.31	-4.80	40.716477	-103.872868	40.716477	-103.872868	1,507,994.63	3,451,032.36
1,479.00	3.64	242.46	1,478.92	-2.64	-7.82	40.716473	-103.872879	40.716473	-103.872879	1,507,993.31	3,451,029.33
1,572.00	4.60	226.87	1,571.68	-6.55	-13.16	40.716463	-103.872898	40.716463	-103.872898	1,507,989.39	3,451,023.99
1,666.00	4.37	226.63	1,665.39	-11.59	-18.51	40.716449	-103.872918	40.716449	-103.872918	1,507,984.36	3,451,018.64
1,758.00	6.63	220.18	1,756.96	-18.05	-24.49	40.716432	-103.872940	40.716432	-103.872940	1,507,977.89	3,451,012.66
1,850.00	7.62	216.31	1,848.25	-27.03	-31.53	40.716407	-103.872966	40.716407	-103.872966	1,507,968.92	3,451,005.63
1,943.00	9.67	216.84	1,940.19	-38.25	-39.86	40.716377	-103.872997	40.716377	-103.872997	1,507,957.70	3,450,997.29
2,034.00	11.15	215.39	2,029.69	-51.54	-49.54	40.716341	-103.873032	40.716341	-103.873032	1,507,944.41	3,450,987.61
2,126.00	11.56	212.35	2,119.89	-66.58	-59.63	40.716300	-103.873070	40.716300	-103.873070	1,507,929.37	3,450,977.53
2,219.00	11.22	208.33	2,211.06	-82.41	-68.91	40.716257	-103.873104	40.716257	-103.873104	1,507,913.53	3,450,968.25
2,311.00	12.16	218.58	2,301.16	-97.87	-79.20	40.716215	-103.873142	40.716215	-103.873142	1,507,898.08	3,450,957.96
2,404.00	11.89	215.89	2,392.12	-113.29	-90.92	40.716174	-103.873186	40.716174	-103.873186	1,507,882.66	3,450,946.23
2,497.00	11.67	214.76	2,483.16	-128.78	-101.90	40.716132	-103.873226	40.716132	-103.873226	1,507,867.17	3,450,935.25
2,590.00	13.52	221.80	2,573.92	-144.61	-114.51	40.716089	-103.873273	40.716089	-103.873273	1,507,851.33	3,450,922.64
2,682.00	13.48	220.52	2,663.38	-160.78	-128.65	40.716045	-103.873325	40.716045	-103.873325	1,507,835.17	3,450,908.51
2,869.00	13.01	220.29	2,845.41	-193.40	-156.42	40.715957	-103.873427	40.715957	-103.873427	1,507,802.54	3,450,880.74
2,964.00	12.35	215.96	2,938.09	-209.78	-169.30	40.715913	-103.873475	40.715913	-103.873475	1,507,786.16	3,450,867.85
3,058.00	11.51	208.36	3,030.07	-226.18	-179.66	40.715868	-103.873513	40.715868	-103.873513	1,507,769.77	3,450,857.50
3,153.00	11.06	204.05	3,123.23	-242.84	-187.87	40.715823	-103.873544	40.715823	-103.873544	1,507,753.11	3,450,849.28
3,248.00	12.99	210.06	3,216.15	-260.40	-196.94	40.715775	-103.873578	40.715775	-103.873578	1,507,735.54	3,450,840.22
3,342.00	13.43	209.75	3,307.66	-279.02	-207.65	40.715725	-103.873618	40.715725	-103.873618	1,507,716.92	3,450,829.51
3,437.00	13.47	217.15	3,400.06	-297.42	-219.80	40.715675	-103.873663	40.715675	-103.873663	1,507,698.53	3,450,817.35
3,532.00	14.07	217.86	3,492.33	-315.36	-233.57	40.715626	-103.873714	40.715626	-103.873714	1,507,680.59	3,450,803.58
3,626.00	13.90	223.18	3,583.55	-332.61	-248.31	40.715580	-103.873768	40.715580	-103.873768	1,507,663.33	3,450,788.84
3,721.00	13.39	222.75	3,675.86	-349.01	-263.59	40.715536	-103.873824	40.715536	-103.873824	1,507,646.94	3,450,773.57
3,815.00	13.01	230.40	3,767.39	-363.75	-279.13	40.715496	-103.873881	40.715496	-103.873881	1,507,632.20	3,450,758.03
3,910.00	12.47	229.76	3,860.05	-377.19	-295.20	40.715460	-103.873940	40.715460	-103.873940	1,507,618.76	3,450,741.96
4,005.00	11.65	227.68	3,952.95	-390.28	-310.12	40.715425	-103.873995	40.715425	-103.873995	1,507,605.67	3,450,727.04
4,099.00	10.68	225.68	4,045.17	-402.75	-323.37	40.715391	-103.874043	40.715391	-103.874043	1,507,593.20	3,450,713.79
4,194.00	10.99	223.94	4,138.48	-415.42	-335.95	40.715357	-103.874089	40.715357	-103.874089	1,507,580.53	3,450,701.21
4,288.00	11.11	222.24	4,230.74	-428.58	-348.26	40.715321	-103.874135	40.715321	-103.874135	1,507,567.37	3,450,688.90
4,383.00	11.88	221.02	4,323.83	-442.73	-360.83	40.715283	-103.874181	40.715283	-103.874181	1,507,553.22	3,450,676.33
4,477.00	11.10	220.09	4,415.95	-456.96	-373.00	40.715245	-103.874226	40.715245	-103.874226	1,507,538.99	3,450,664.15
4,572.00	9.58	220.11	4,509.40	-470.00	-383.99	40.715210	-103.874266	40.715210	-103.874266	1,507,525.95	3,450,653.17
4,667.00	9.98	218.21	4,603.02	-482.51	-394.17	40.715176	-103.874304	40.715176	-103.874304	1,507,513.44	3,450,642.98
4,761.00	9.09	214.15	4,695.72	-495.06	-403.38	40.715142	-103.874338	40.715142	-103.874338	1,507,500.89	3,450,633.78
4,856.00	8.73	223.84	4,789.58	-506.47	-412.59	40.715111	-103.874372	40.715111	-103.874372	1,507,489.48	3,450,624.57
4,951.00	10.35	224.45	4,883.26	-517.76	-423.56	40.715081	-103.874412	40.715081	-103.874412	1,507,478.19	3,450,613.60
5,045.00	12.21	227.57	4,975.44	-530.50	-436.81	40.715046	-103.874461	40.715046	-103.874461	1,507,465.45	3,450,600.35

Design Report for Greyson LD28-780 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
5,140.00	20.38	238.18	5,066.57	-546.03	-458.32	40.715005	-103.874539	1,507,449.92	3,450,578.84
5,234.00	21.47	255.33	5,154.45	-559.03	-488.90	40.714971	-103.874651	1,507,436.92	3,450,548.26
5,329.00	24.69	271.02	5,241.92	-563.08	-525.60	40.714961	-103.874783	1,507,432.87	3,450,511.56
5,424.00	30.68	280.80	5,326.05	-558.18	-569.31	40.714977	-103.874940	1,507,437.77	3,450,467.85
5,518.00	35.00	289.24	5,405.05	-544.79	-618.37	40.715016	-103.875117	1,507,451.16	3,450,418.79
5,613.00	38.01	300.23	5,481.49	-521.05	-669.43	40.715084	-103.875299	1,507,474.90	3,450,367.73
5,708.00	41.07	314.28	5,554.89	-484.46	-717.15	40.715187	-103.875469	1,507,511.49	3,450,320.01
5,802.00	46.88	326.42	5,622.63	-434.18	-758.34	40.715327	-103.875614	1,507,561.77	3,450,278.82
5,897.00	54.26	340.06	5,683.09	-368.78	-790.80	40.715508	-103.875727	1,507,627.17	3,450,246.36
5,991.00	59.84	350.47	5,734.30	-292.63	-810.60	40.715718	-103.875793	1,507,703.31	3,450,226.57
6,086.00	65.74	353.33	5,777.73	-209.03	-822.44	40.715948	-103.875830	1,507,786.91	3,450,214.72
6,180.00	73.13	352.87	5,810.72	-121.72	-833.01	40.716188	-103.875863	1,507,874.22	3,450,204.15
6,291.00	86.61	353.78	5,830.20	-13.44	-845.67	40.716486	-103.875901	1,507,982.50	3,450,191.50
6,349.00	87.88	354.46	5,832.99	44.18	-851.60	40.716644	-103.875919	1,508,040.13	3,450,185.56
6,381.00	88.58	354.83	5,833.98	76.03	-854.59	40.716732	-103.875928	1,508,071.97	3,450,182.57
6,473.00	88.49	355.47	5,836.33	167.67	-862.36	40.716984	-103.875949	1,508,163.61	3,450,174.80
6,565.00	89.82	356.28	5,837.69	259.42	-868.98	40.717236	-103.875967	1,508,255.36	3,450,168.18
6,657.00	91.45	359.70	5,836.67	351.34	-872.21	40.717488	-103.875973	1,508,347.28	3,450,164.95
6,750.00	90.49	359.78	5,835.09	444.32	-872.63	40.717743	-103.875968	1,508,440.26	3,450,164.53
6,843.00	88.61	358.55	5,835.82	537.31	-873.98	40.717999	-103.875967	1,508,533.24	3,450,163.18
6,936.00	88.83	358.09	5,837.90	630.24	-876.71	40.718254	-103.875971	1,508,626.18	3,450,160.45
7,029.00	88.83	357.97	5,839.80	723.17	-879.91	40.718509	-103.875976	1,508,719.10	3,450,157.26
7,123.00	90.46	358.40	5,840.38	817.12	-882.88	40.718767	-103.875981	1,508,813.05	3,450,154.28
7,215.00	91.48	358.55	5,838.82	909.07	-885.33	40.719019	-103.875983	1,508,905.00	3,450,151.83
7,310.00	91.32	358.65	5,836.50	1,004.01	-887.65	40.719280	-103.875985	1,508,999.95	3,450,149.51
7,404.00	89.57	357.72	5,835.77	1,097.96	-890.63	40.719538	-103.875990	1,509,093.89	3,450,146.53
7,499.00	89.75	357.40	5,836.34	1,192.87	-894.67	40.719799	-103.875998	1,509,188.80	3,450,142.49
7,688.00	91.02	357.20	5,835.07	1,381.65	-903.58	40.720317	-103.876018	1,509,377.58	3,450,133.59
7,783.00	89.94	358.57	5,834.27	1,476.58	-907.08	40.720578	-103.876024	1,509,472.51	3,450,130.08
7,878.00	89.63	357.94	5,834.63	1,571.53	-909.97	40.720839	-103.876028	1,509,567.46	3,450,127.19
7,972.00	89.38	357.31	5,835.44	1,665.45	-913.87	40.721097	-103.876036	1,509,661.38	3,450,123.29
8,067.00	90.77	358.48	5,835.31	1,760.38	-917.36	40.721357	-103.876043	1,509,756.31	3,450,119.80
8,161.00	91.97	359.74	5,833.07	1,854.34	-918.82	40.721615	-103.876042	1,509,850.26	3,450,118.34
8,256.00	89.97	359.48	5,831.46	1,949.32	-919.46	40.721876	-103.876038	1,509,945.24	3,450,117.70
8,351.00	89.88	358.68	5,831.58	2,044.30	-920.99	40.722137	-103.876037	1,510,040.23	3,450,116.17
8,446.00	89.97	358.98	5,831.71	2,139.28	-922.93	40.722397	-103.876038	1,510,135.21	3,450,114.23
8,540.00	90.34	358.47	5,831.45	2,233.26	-925.02	40.722655	-103.876039	1,510,229.18	3,450,112.14
8,635.00	89.97	358.12	5,831.20	2,328.22	-927.85	40.722916	-103.876043	1,510,324.14	3,450,109.31
8,824.00	90.12	357.49	5,831.05	2,517.08	-935.09	40.723435	-103.876057	1,510,513.00	3,450,102.08
8,919.00	89.51	357.33	5,831.35	2,611.98	-939.38	40.723695	-103.876066	1,510,607.90	3,450,097.78
9,014.00	89.94	357.25	5,831.81	2,706.87	-943.87	40.723956	-103.876076	1,510,702.79	3,450,093.29
9,108.00	90.65	357.05	5,831.33	2,800.75	-948.54	40.724214	-103.876086	1,510,796.67	3,450,088.62

Design Report for Greyson LD28-780 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Geographic Coordinates Latitude (usft)	Longitude (usft)	UTM Coordinates Northing (usft)	Easting (usft)
9,203.00	90.55	357.58	5,830.33	2,895.64	-952.99	40.724475	-103.876096	1,510,891.56	3,450,084.17
9,297.00	91.05	358.13	5,829.02	2,989.57	-956.51	40.724732	-103.876103	1,510,985.48	3,450,080.65
9,392.00	89.29	359.16	5,828.74	3,084.54	-958.76	40.724993	-103.876104	1,511,080.45	3,450,078.40
9,486.00	90.31	359.36	5,829.07	3,178.53	-959.97	40.725251	-103.876103	1,511,174.44	3,450,077.19
9,581.00	90.65	359.09	5,828.27	3,273.52	-961.26	40.725512	-103.876101	1,511,269.43	3,450,075.90
9,770.00	90.22	358.17	5,826.83	3,462.45	-965.78	40.726031	-103.876105	1,511,458.36	3,450,071.39
9,865.00	90.06	358.10	5,826.60	3,557.40	-968.87	40.726291	-103.876110	1,511,553.31	3,450,068.29
9,960.00	89.69	357.94	5,826.81	3,652.35	-972.15	40.726552	-103.876115	1,511,648.25	3,450,065.01
10,055.00	89.26	357.66	5,827.68	3,747.27	-975.80	40.726813	-103.876122	1,511,743.18	3,450,061.37
10,149.00	88.95	357.28	5,829.15	3,841.17	-979.95	40.727071	-103.876131	1,511,837.07	3,450,057.22
10,243.00	89.38	355.91	5,830.52	3,934.99	-985.53	40.727328	-103.876145	1,511,930.89	3,450,051.63
10,338.00	91.36	357.76	5,829.91	4,029.83	-990.77	40.727589	-103.876158	1,512,025.74	3,450,046.39
10,433.00	91.60	357.40	5,827.45	4,124.72	-994.78	40.727850	-103.876166	1,512,120.62	3,450,042.38
10,527.00	92.16	356.86	5,824.37	4,218.55	-999.49	40.728107	-103.876176	1,512,214.45	3,450,037.68
10,589.00	92.38	356.63	5,821.91	4,280.40	-1,003.00	40.728277	-103.876185	1,512,276.30	3,450,034.16
10,651.00	92.38	356.63	5,819.34	4,342.24	-1,006.65	40.728447	-103.876194	1,512,338.14	3,450,030.52

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
1,202.00	1,201.99	-1.21	-3.47	First Sperry MWD Survey at 1202.00ft
10,589.00	5,821.91	4,280.40	-1,003.00	Final Sperry MWD Survey at 10589.00ft
10,651.00	5,819.34	4,342.24	-1,006.65	Straight Line Projection to TD at 10651.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Greyson LD28-780_Rev A1_BHL	347.00	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
1,202.00	6,291.00	Intermediate Survey	MWD
6,381.00	10,651.00	Production Surveys	MWD+IFR1+MS_WY

Design Report for Greyson LD28-780 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,119.00	1,118.99	9 5/8"	9-5/8	13-3/4
6,349.00	5,832.99	7"	7	8-3/4

Design Targets

Shape	Target Name	TVD (')	Northing (')	Easting (')	+N/-S	+E/-W	Created	Updated
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Directional Difficulty Index

Average Dogleg over Survey:	1.92 °/100usft	Maximum Dogleg over Survey:	13.51 °/100usft at 5,897.00 usft
Net Tortosity applicable to Plans:	0.76 °/100usft	Directional Difficulty Index:	6.339

Audit Info

North Reference Sheet for Sec. 28-T9N-R58W (Greyson & Brecken PAD) - Greyson LD28-780 - 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 @ 4879.00usft (H&P 343). Northing and Easting are relative to Greyson LD28-780

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: 0.99998984

Grid Coordinates of Well: 1,507,995.94 usft N, 3,451,037.15 usft E

Geographical Coordinates of Well: 40° 42' 59.33" N, 103° 52' 22.26" W

Grid Convergence at Surface is: 1.05°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,651.00usft

the Bottom Hole Displacement is 4,457.40usft in the Direction of 346.95° (Grid).

Magnetic Convergence at surface is: -6.98° (28 July 2015, , BGGM2015)

