

Noble Energy

Weld County, CO (NAD 83)
Sec. 1-T9N-R58W (Nalen State 1 PAD)
Nalen State LD12-77HN
05-123-39760
Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Report

10 December, 2014

Surface UWI : 05-123-39760

Well Coordinates: 1,529,235.51 N, 3,466,210.38 E (40° 46' 26.36" N, 103° 49' 00.01" W)
Ground Level: 4,647.00 usft

Local Coordinate Origin:

Centered on Well Nalen State LD12-77HN

Viewing Datum:

KB=24 @ 4671.00usft (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: 70

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 1-T9N-R58W (Nalen State 1 PAD)
 Well: Nalen State LD12-77HN
 Wellbore: Original Wellbore
 Design: Actual Surveys



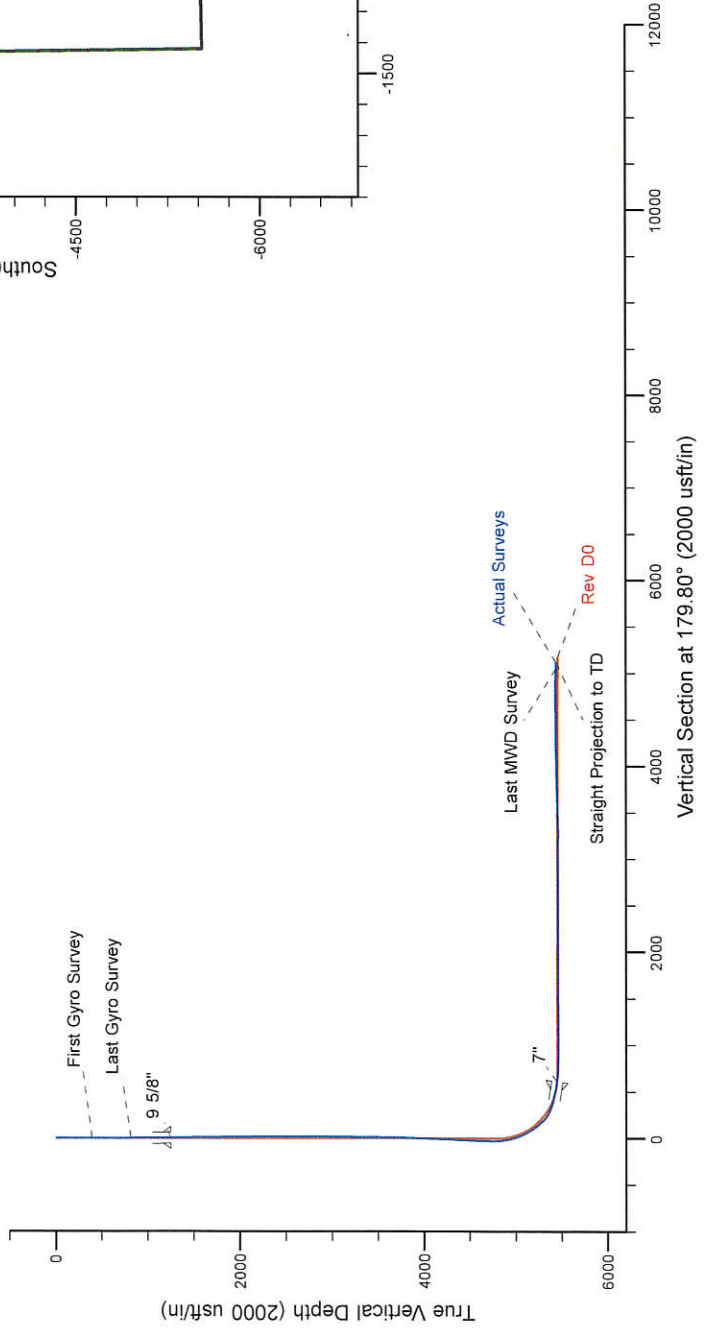
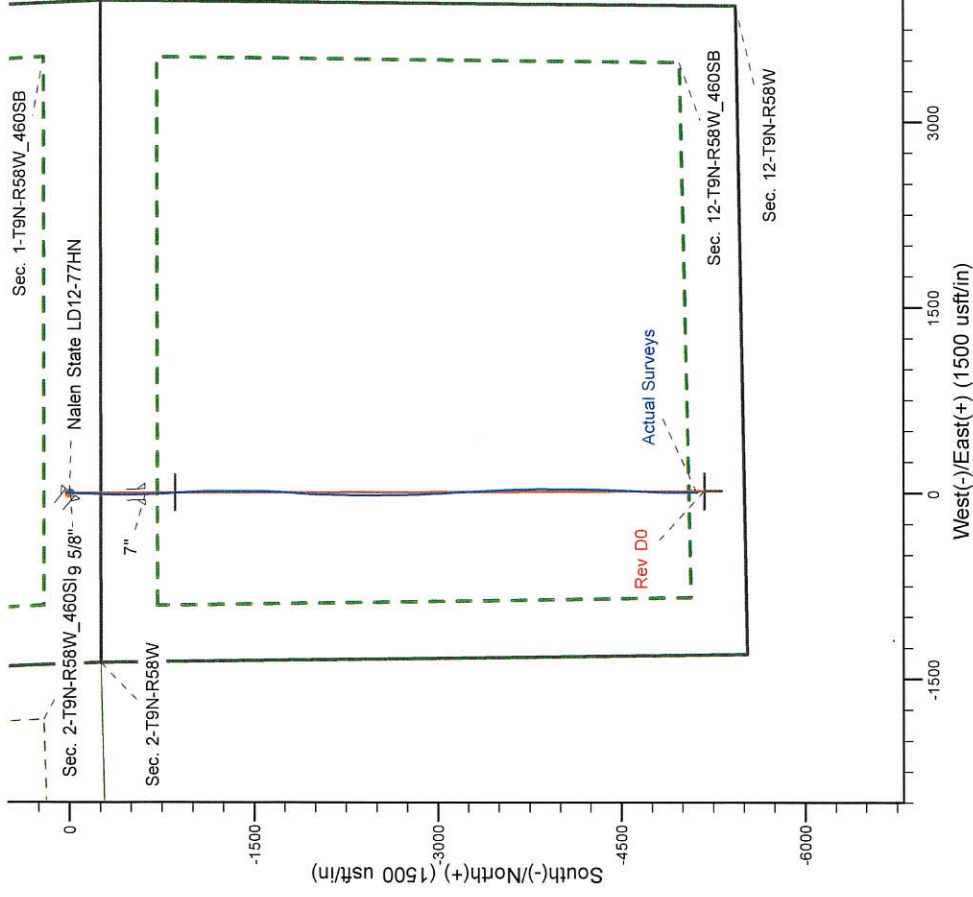
Platted SHL: 250' FSL, 1375' FWL
 Platted Lat/Long: 40.77399 N, 103.81667 W
 Location: Sec. 1-T9N-R58W

~7" Casing: 363' FNL, 1359' FWL
 Lat/Long: 40.772313 N, 103.816752 W
 State Planes - CO Northern: 1528624.07 N, 3466199.31 E
 Location: Sec. 1-T9N-R58W

Platted BHL: 330' FSL, 1320' FWL
 Lat/Long: 40.759790N, 103.816960 W
 State Planes - CO Northern: 1524061.41 N, 3466228.26 E
 Location: Sec. 12-T9N-R58W

LEGEND

- Nalen State LD12-77HN, Original Wellbore, Rev D0 V0
- Actual Surveys



WELL DETAILS: Nalen State LD12-77HN
 Ground Level: 4647.00
 KB=24 @ 4671.00usft (H&P 273)

Created By: Gordy Roth
 Created On: 12/10/2014

Design Report for Nalen State LD12-77HN - 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
400.00	0.50	107.51	399.99	-0.53	1.66	0.53	0.12
First Gyro Survey							
820.00	0.50	157.21	819.98	-2.77	4.12	2.78	0.10
Last Gyro Survey							
1,288.00	0.95	127.67	1,287.94	-7.02	7.98	7.05	0.12
1,473.00	1.38	137.28	1,472.91	-9.59	10.71	9.63	0.25
1,750.00	0.64	168.08	1,749.86	-13.56	13.29	13.60	0.32
2,028.00	0.59	179.46	2,027.85	-16.51	13.63	16.56	0.05
2,213.00	0.53	203.25	2,212.84	-18.25	13.30	18.29	0.13
2,490.00	0.25	111.03	2,489.83	-19.64	13.36	19.69	0.21
2,768.00	0.25	326.87	2,767.83	-19.35	13.59	19.40	0.17
2,957.00	0.59	17.88	2,956.83	-18.08	13.66	18.13	0.25
3,052.00	0.79	16.10	3,051.82	-16.98	14.00	17.03	0.21
3,337.00	1.37	35.57	3,336.77	-12.33	16.52	12.38	0.24
3,431.00	0.90	28.06	3,430.75	-10.76	17.52	10.82	0.52
3,526.00	0.92	11.20	3,525.74	-9.35	18.02	9.42	0.28
3,621.00	0.66	54.11	3,620.73	-8.28	18.61	8.35	0.66
3,810.00	1.23	342.28	3,809.71	-5.71	18.88	5.78	0.64
3,905.00	1.49	338.19	3,904.68	-3.60	18.11	3.66	0.29
4,000.00	1.88	332.76	3,999.64	-1.06	16.94	1.12	0.44
4,285.00	3.24	338.78	4,284.35	10.60	11.88	-10.56	0.49
4,379.00	3.89	324.37	4,378.17	15.67	9.06	-15.64	1.17
4,664.00	1.96	306.83	4,662.79	26.45	-0.47	-26.45	0.74
4,712.00	1.64	306.68	4,710.77	27.35	-1.68	-27.36	0.67
4,758.00	0.17	104.84	4,756.76	27.73	-2.14	-27.73	3.91
4,806.00	3.34	189.68	4,804.73	26.33	-2.31	-26.34	6.94
4,853.00	6.97	179.67	4,851.54	22.13	-2.52	-22.14	7.93
4,948.00	13.43	182.80	4,944.99	5.33	-3.03	-5.34	6.82
5,043.00	20.60	179.83	5,035.77	-22.44	-3.52	22.43	7.60
5,137.00	27.87	181.57	5,121.43	-60.99	-4.07	60.98	7.77
5,232.00	35.05	181.82	5,202.41	-110.52	-5.55	110.50	7.56
5,326.00	41.31	184.23	5,276.27	-168.50	-8.70	168.47	6.84
5,421.00	55.11	182.13	5,339.43	-239.05	-12.48	239.01	14.62
5,516.00	70.17	181.40	5,382.96	-323.14	-15.03	323.09	15.87
5,611.00	76.76	178.63	5,409.99	-414.15	-15.02	414.10	7.48
5,706.00	78.96	179.08	5,429.97	-507.00	-13.16	506.96	2.36
5,764.00	80.13	178.82	5,440.49	-564.03	-12.12	563.99	2.06
5,901.00	86.05	178.31	5,456.97	-699.93	-8.71	699.90	4.34
5,993.00	89.51	177.22	5,460.53	-791.78	-5.12	791.75	3.94
6,085.00	88.95	175.16	5,461.77	-883.56	0.99	883.56	2.32
6,178.00	90.15	177.47	5,462.50	-976.36	6.96	976.38	2.80
6,271.00	89.41	177.01	5,462.86	-1,069.25	11.44	1,069.28	0.94
6,363.00	89.97	180.41	5,463.35	-1,161.21	13.51	1,161.25	3.75
6,456.00	90.31	180.01	5,463.13	-1,254.21	13.17	1,254.25	0.56
6,640.00	91.20	179.56	5,460.70	-1,438.19	13.86	1,438.23	0.54
6,733.00	91.26	179.49	5,458.71	-1,531.16	14.63	1,531.21	0.10
6,825.00	91.29	182.68	5,456.66	-1,623.11	12.89	1,623.15	3.47
6,918.00	89.41	182.54	5,456.09	-1,716.01	8.66	1,716.03	2.03
7,011.00	90.43	185.04	5,456.22	-1,808.80	2.51	1,808.80	2.90

Design Report for Nalen State LD12-77HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7,105.00	90.22	184.83	5,455.69	-1,902.45	-5.58	1,902.42	0.32
7,200.00	89.54	181.50	5,455.89	-1,997.29	-10.82	1,997.24	3.58
7,294.00	90.62	180.95	5,455.75	-2,091.27	-12.83	2,091.21	1.29
7,389.00	90.62	181.89	5,454.73	-2,186.23	-15.18	2,186.16	0.99
7,484.00	89.82	180.69	5,454.36	-2,281.20	-17.32	2,281.13	1.52
7,579.00	89.38	181.40	5,455.03	-2,376.18	-19.05	2,376.10	0.88
7,673.00	89.08	178.88	5,456.29	-2,470.17	-19.28	2,470.09	2.70
7,768.00	90.59	178.35	5,456.56	-2,565.14	-16.99	2,565.06	1.68
7,863.00	90.62	179.06	5,455.56	-2,660.11	-14.84	2,660.04	0.75
7,957.00	90.22	178.95	5,454.87	-2,754.09	-13.21	2,754.03	0.44
8,052.00	88.98	177.68	5,455.53	-2,849.04	-10.42	2,848.99	1.87
8,147.00	88.86	177.46	5,457.32	-2,943.94	-6.39	2,943.90	0.26
8,242.00	89.26	176.56	5,458.88	-3,038.80	-1.43	3,038.77	1.04
8,336.00	89.54	177.25	5,459.87	-3,132.65	3.64	3,132.65	0.79
8,431.00	88.55	176.79	5,461.45	-3,227.51	8.58	3,227.52	1.15
8,526.00	91.45	177.16	5,461.45	-3,322.37	13.59	3,322.39	3.08
8,621.00	91.35	176.71	5,459.13	-3,417.20	18.67	3,417.25	0.49
8,716.00	91.11	176.48	5,457.09	-3,512.01	24.31	3,512.08	0.35
8,810.00	91.30	178.77	5,455.11	-3,605.91	28.21	3,605.98	2.44
8,905.00	90.92	177.82	5,453.27	-3,700.84	31.03	3,700.93	1.08
8,999.00	91.60	180.50	5,451.20	-3,794.80	32.41	3,794.89	2.94
9,093.00	91.88	179.76	5,448.35	-3,888.76	32.20	3,888.85	0.84
9,188.00	91.66	179.63	5,445.42	-3,983.71	32.70	3,983.80	0.27
9,283.00	92.34	179.79	5,442.10	-4,078.65	33.18	4,078.74	0.74
9,377.00	91.67	181.04	5,438.81	-4,172.59	32.50	4,172.68	1.51
9,472.00	91.26	181.04	5,436.38	-4,267.54	30.78	4,267.62	0.43
9,567.00	89.35	182.23	5,435.88	-4,362.50	28.07	4,362.57	2.37
9,662.00	89.82	182.74	5,436.57	-4,457.40	23.95	4,457.46	0.73
9,756.00	90.37	182.58	5,436.41	-4,551.30	19.59	4,551.34	0.61
9,850.00	91.20	183.01	5,435.12	-4,645.18	15.00	4,645.20	0.99
9,944.00	91.42	182.81	5,432.97	-4,739.03	10.23	4,739.04	0.32
10,039.00	88.46	181.18	5,433.07	-4,833.96	6.93	4,833.96	3.56
10,134.00	88.31	180.98	5,435.75	-4,928.91	5.14	4,928.90	0.26
10,229.00	87.96	180.19	5,438.84	-5,023.85	4.17	5,023.84	0.91
10,256.00	87.69	180.17	5,439.87	-5,050.83	4.08	5,050.82	1.00
Last MWD Survey							
10,320.00	87.69	180.17	5,442.45	-5,114.78	3.89	5,114.76	0.00
Straight Projection to TD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
400.00	399.99	-0.53	1.66	First Gyro Survey
820.00	819.98	-2.77	4.12	Last Gyro Survey
10,256.00	5,439.87	-5,050.83	4.08	Last MWD Survey
10,320.00	5,442.45	-5,114.78	3.89	Straight Projection to TD

Design Report for Nalen State LD12-77HN - Actual Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Nalen State LD12-77HN_BHL	179.80	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
400.00	820.00	Surface Surveys	Flexi-Shot
1,288.00	5,764.00	Intermediate Surveys	MWD
5,901.00	10,320.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,252.00	1,251.95	9 5/8"	9-5/8	13-3/4
5,812.00	5,447.86	7"	7	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
Nalen State LD12-77H	0.00	0.00	5,451.48	-850.83	2.94	1,528,384.68	3,466,213.32	40.771655	-103.816718
- hit/miss target									
- Shape									
- actual wellpath misses target center by 10.74usft at 6052.33usft MD (5461.23 TVD, -851.00 N, -1.56 E)									
- Point									
Nalen State LD12-77H	0.00	0.00	5,459.02	-5,174.11	17.88	1,524,061.41	3,466,228.26	40.759790	-103.816960
- actual wellpath misses target center by 63.17usft at 10320.00usft MD (5442.45 TVD, -5114.78 N, 3.89 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.61 °/100usft	Maximum Dogleg over Survey:	15.87 °/100usft at 5,516.00 usft
Net Tortosity applicable to Plans:	0.74 °/100usft	Directional Difficulty Index:	6.215

Audit Info

**North Reference Sheet for Sec. 1-T9N-R58W (Nalen State 1 PAD) - Nalen State
LD12-77HN - Original Wellbore**

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 @ 4671.00usft (H&P 273). Northing and Easting are relative to Nalen State LD12-77HN

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: 0.99999850

Grid Coordinates of Well: 1,529,235.51 usft N, 3,466,210.38 usft E

Geographical Coordinates of Well: 40° 46' 26.36" N, 103° 49' 00.01" W

Grid Convergence at Surface is: 1.09°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,320.00usft
the Bottom Hole Displacement is 5,114.78usft in the Direction of 179.96° (Grid).

Magnetic Convergence at surface is: -6.92° (25 October 2014, , BGGM2014)

