

Noble Energy

Weld County, CO (NAD 83)
Sec. 1-T9N-R58W (Atwater State 1 PAD)
Atwater State LD01-77HN
05-123-39766
Original Wellbore

Design: Noble Flexishot and Sperry MWD Survey

Sperry Drilling Services Final Report

03 December, 2014

Surface UWI : 05-123-39766

Well Coordinates: 1,529,384.78 N, 3,466,202.01 E (40° 46' 27.84" N, 103° 49' 00.08" W)
Ground Level: 4,648.00 usft

Local Coordinate Origin:	Centered on Well Atwater State LD01-77HN
Viewing Datum:	KB=24' @ 4672.00usft (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 (Atwater State 1 PAD)
 Well: Atwater State LD01-77HN
 Wellbore: Original Wellbore
 Design: Noble Flexishot and Sperry MWD Survey

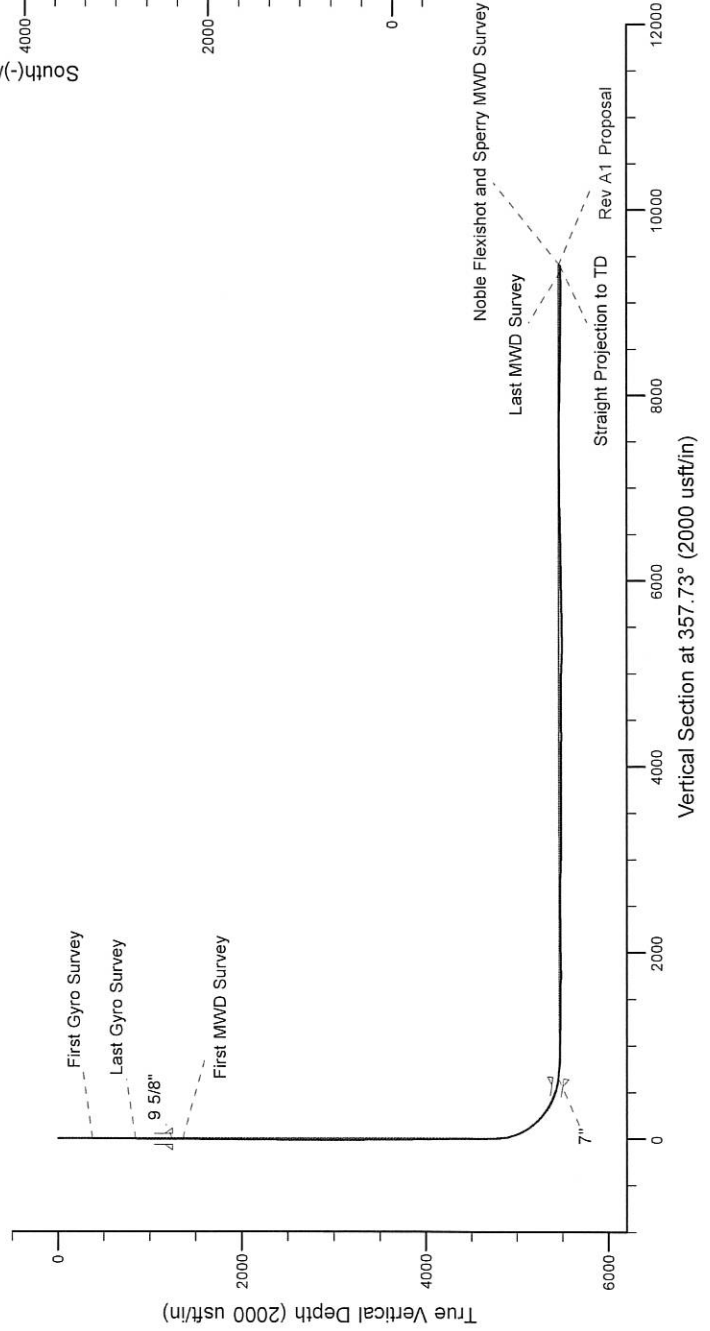
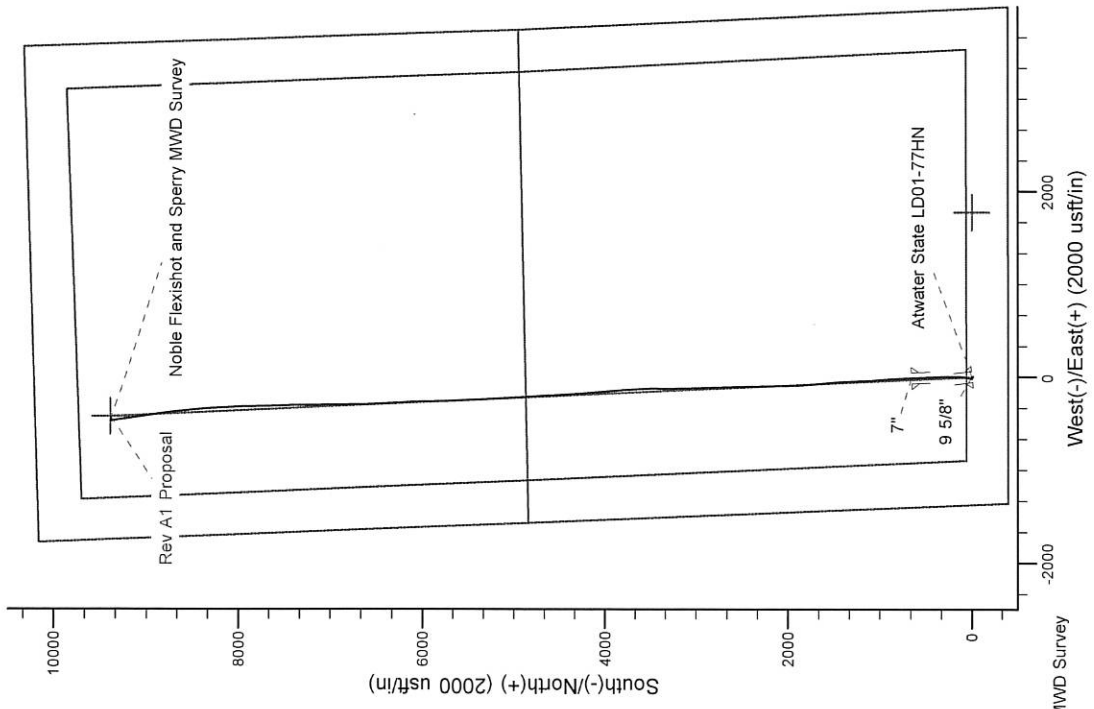
Platted SHL: 400' FSL, 1375' FWL
 Platted Lat/Long: 40.7744 N, 103.81669 W
 Location: Sec. 1-T9N-R58W

~7" Casing: 1050' FSL, 1380' FWL
 Lat/Long: 40.776200 N, 103.816684 W
 State Planes - CO Northern: 1530040.46 N, 3466191.18 E
 Location: Sec. 1-T9N-R58W

Platted BHL: 810' FNL, 1320' FWL
 Lat/Long: 40.800190N, 103.817590 W
 State Planes - CO Northern: 1538774.59 N, 3465774.51 E
 Location: Sec. 36-T10N-R58W

LEGEND

— Atwater State LD01-77HN, Original Wellbore, Rev A1 Proposal V0
 — Noble Flexishot and Sperry MWD Survey



WELL DETAILS: Atwater State LD01-77HN
Ground Level: 4648.00
KB=24 @ 4972.00usft (H&P Z13)
Created By: Gordy Roth
Created On: 12/3/2014

Design Report for Atwater State LD01-77HN - Noble Flexishot and Sperry MWD Survey

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
380.00	0.40	227.71	380.00	-0.89	-0.98	-0.85	0.11
First Gyro Survey							
845.00	0.60	113.71	844.99	-2.96	0.05	-2.96	0.18
Last Gyro Survey							
1,359.00	0.53	189.32	1,358.97	-6.39	2.13	-6.47	0.14
First MWD Survey							
1,452.00	0.37	221.01	1,451.97	-7.04	1.86	-7.11	0.31
1,545.00	0.35	224.70	1,544.96	-7.47	1.46	-7.52	0.03
1,730.00	0.11	215.95	1,729.96	-8.02	0.96	-8.05	0.13
2,009.00	0.64	171.25	2,008.96	-9.77	1.04	-9.81	0.20
2,103.00	0.68	187.33	2,102.95	-10.85	1.05	-10.88	0.20
2,198.00	0.55	149.81	2,197.94	-11.80	1.21	-11.84	0.44
2,482.00	0.61	129.74	2,481.93	-13.94	3.05	-14.05	0.07
2,671.00	0.58	154.31	2,670.92	-15.45	4.24	-15.60	0.13
2,766.00	0.56	167.35	2,765.92	-16.34	4.55	-16.50	0.14
2,861.00	0.55	19.66	2,860.91	-16.36	4.81	-16.54	1.12
2,956.00	0.72	24.17	2,955.91	-15.38	5.21	-15.58	0.19
3,051.00	0.61	41.59	3,050.90	-14.46	5.79	-14.68	0.24
3,335.00	0.12	325.08	3,334.90	-13.09	6.62	-13.34	0.21
3,430.00	0.53	261.78	3,429.89	-13.07	6.13	-13.30	0.51
3,715.00	0.96	303.23	3,714.87	-11.95	2.83	-12.05	0.23
3,809.00	1.23	300.87	3,808.85	-11.00	1.30	-11.04	0.29
3,999.00	2.00	316.67	3,998.78	-7.54	-2.72	-7.43	0.46
4,093.00	2.11	319.11	4,092.72	-5.04	-4.98	-4.84	0.15
4,187.00	1.10	318.69	4,186.68	-3.05	-6.71	-2.79	1.07
4,282.00	1.42	292.68	4,281.66	-1.92	-8.40	-1.58	0.68
4,376.00	2.02	286.30	4,375.61	-1.00	-11.06	-0.56	0.67
4,471.00	2.26	268.85	4,470.55	-0.57	-14.54	0.01	0.73
4,623.00	0.55	282.77	4,622.50	-0.47	-18.25	0.25	1.14
4,684.00	0.81	275.09	4,683.49	-0.37	-18.97	0.39	0.45
4,756.00	2.40	7.90	4,755.47	1.17	-19.27	1.93	3.57
4,804.00	4.73	18.50	4,803.37	4.05	-18.50	4.77	5.02
4,850.00	7.72	16.59	4,849.10	8.81	-17.02	9.47	6.51
4,898.00	12.11	9.77	4,896.37	16.86	-15.24	17.45	9.45
4,945.00	16.77	12.14	4,941.87	28.36	-12.98	28.85	9.99
4,993.00	20.81	13.43	4,987.31	43.43	-9.54	43.77	8.46
5,040.00	25.39	12.22	5,030.53	61.40	-5.46	61.57	9.80
5,088.00	28.36	11.26	5,073.34	82.65	-1.06	82.62	6.25
5,135.00	32.43	5.70	5,113.88	106.15	2.37	105.97	10.52
5,183.00	35.07	4.04	5,153.79	132.72	4.62	132.43	5.83
5,230.00	40.17	0.84	5,191.01	161.37	5.80	161.01	11.62
5,278.00	44.39	0.11	5,226.51	193.65	6.06	193.26	8.85
5,324.00	49.40	359.04	5,257.93	227.22	5.80	226.81	11.02
5,372.00	51.12	358.54	5,288.62	264.12	5.02	263.72	3.67
5,419.00	56.58	358.23	5,316.34	302.04	3.94	301.65	11.63
5,467.00	58.12	358.60	5,342.23	342.44	2.83	342.06	3.27
5,514.00	62.51	357.56	5,365.50	383.24	1.45	382.88	9.54
5,562.00	63.48	357.66	5,387.30	425.97	-0.33	425.65	2.03
5,608.00	68.85	356.66	5,405.88	467.98	-2.42	467.71	11.84

Design Report for Atwater State LD01-77HN - Noble Flexishot and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,656.00	73.04	356.26	5,421.55	513.25	-5.23	513.05	8.76
5,703.00	76.85	357.70	5,433.75	558.56	-7.61	558.43	8.63
5,756.00	78.90	358.35	5,444.88	610.35	-9.40	610.24	4.05
5,821.00	83.30	357.90	5,454.94	674.51	-11.50	674.44	6.80
5,916.00	85.96	356.79	5,463.83	768.99	-15.88	769.01	3.03
6,010.00	87.59	356.52	5,469.12	862.67	-21.36	862.84	1.76
6,105.00	88.61	354.81	5,472.27	957.35	-28.54	957.72	2.10
6,200.00	88.98	355.55	5,474.26	1,051.99	-36.52	1,052.61	0.87
6,295.00	89.85	358.08	5,475.23	1,146.83	-41.79	1,147.58	2.82
6,389.00	88.92	357.21	5,476.24	1,240.74	-45.66	1,241.58	1.35
6,484.00	89.38	358.36	5,477.65	1,335.66	-49.33	1,336.56	1.30
6,579.00	89.29	355.89	5,478.76	1,430.52	-54.09	1,431.54	2.60
6,673.00	89.45	354.30	5,479.79	1,524.17	-62.13	1,525.44	1.70
6,768.00	90.55	355.52	5,479.79	1,618.79	-70.56	1,620.32	1.73
6,863.00	88.58	354.41	5,480.51	1,713.42	-78.89	1,715.20	2.38
6,958.00	90.86	356.60	5,480.97	1,808.11	-86.34	1,810.11	3.33
7,053.00	91.20	357.11	5,479.27	1,902.95	-91.55	1,905.09	0.65
7,148.00	90.89	359.41	5,477.53	1,997.89	-94.43	2,000.06	2.44
7,242.00	90.71	359.10	5,476.22	2,091.87	-95.65	2,094.02	0.38
7,337.00	90.55	358.92	5,475.18	2,186.85	-97.30	2,188.99	0.25
7,432.00	90.15	357.95	5,474.60	2,281.81	-99.89	2,283.98	1.10
7,527.00	90.18	358.41	5,474.32	2,376.76	-102.91	2,378.97	0.49
7,621.00	90.62	358.41	5,473.67	2,470.72	-105.51	2,472.96	0.47
7,716.00	90.28	358.25	5,472.92	2,565.68	-108.28	2,567.96	0.40
7,811.00	90.68	359.88	5,472.13	2,660.66	-109.83	2,662.92	1.77
7,906.00	87.69	358.47	5,473.48	2,755.63	-111.20	2,757.87	3.48
8,001.00	88.37	358.62	5,476.74	2,850.54	-113.61	2,852.80	0.73
8,096.00	87.69	358.15	5,480.01	2,945.45	-116.29	2,947.74	0.87
8,190.00	88.61	358.16	5,483.04	3,039.35	-119.31	3,041.69	0.98
8,285.00	89.29	356.57	5,484.78	3,134.23	-123.68	3,136.67	1.82
8,380.00	90.71	359.35	5,484.78	3,229.16	-127.06	3,231.65	3.29
8,474.00	90.12	359.00	5,484.10	3,323.14	-128.41	3,325.62	0.73
8,569.00	90.46	1.63	5,483.62	3,418.13	-127.89	3,420.52	2.79
8,664.00	90.62	358.70	5,482.73	3,513.12	-127.62	3,515.42	3.09
8,759.00	90.09	358.67	5,482.14	3,608.09	-129.80	3,610.40	0.56
8,854.00	89.17	354.40	5,482.75	3,702.89	-135.54	3,705.35	4.60
8,948.00	90.18	355.48	5,483.28	3,796.52	-143.83	3,799.24	1.57
9,043.00	90.09	355.58	5,483.06	3,891.23	-151.23	3,894.17	0.14
9,138.00	90.31	356.49	5,482.73	3,986.00	-157.80	3,989.12	0.99
9,233.00	89.41	355.54	5,482.96	4,080.77	-164.40	4,084.08	1.38
9,328.00	89.41	355.00	5,483.94	4,175.44	-172.24	4,178.99	0.57
9,423.00	88.80	354.34	5,485.42	4,270.02	-181.06	4,273.84	0.95
9,518.00	89.63	356.86	5,486.72	4,364.72	-188.35	4,368.76	2.79
9,612.00	89.60	356.37	5,487.36	4,458.55	-193.90	4,462.73	0.52
9,707.00	90.80	357.26	5,487.02	4,553.40	-199.17	4,557.72	1.57
9,802.00	90.92	357.18	5,485.60	4,648.28	-203.78	4,652.70	0.15
9,897.00	91.67	357.70	5,483.45	4,743.16	-208.02	4,747.68	0.96
9,992.00	88.67	357.02	5,483.17	4,838.05	-212.40	4,842.66	3.24
10,084.00	88.61	356.75	5,485.35	4,929.89	-217.40	4,934.63	0.30
10,177.00	88.21	356.08	5,487.93	5,022.67	-223.21	5,027.57	0.84
10,269.00	87.81	355.80	5,491.13	5,114.38	-229.72	5,119.47	0.53

Design Report for Atwater State LD01-77HN - Noble Flexishot and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,362.00	89.41	356.03	5,493.38	5,207.12	-236.34	5,212.39	1.74
10,454.00	90.31	357.10	5,493.61	5,298.95	-241.85	5,304.37	1.52
10,546.00	91.20	357.67	5,492.40	5,390.84	-246.05	5,396.36	1.15
10,639.00	91.11	356.82	5,490.52	5,483.72	-250.52	5,489.33	0.92
10,731.00	90.95	356.48	5,488.87	5,575.54	-255.90	5,581.30	0.41
10,824.00	91.11	358.88	5,487.20	5,668.45	-259.66	5,674.28	2.59
10,917.00	91.05	358.86	5,485.44	5,761.41	-261.49	5,767.25	0.07
11,010.00	90.03	358.77	5,484.57	5,854.39	-263.42	5,860.22	1.10
11,103.00	89.26	358.64	5,485.14	5,947.36	-265.52	5,953.21	0.84
11,196.00	90.89	357.31	5,485.02	6,040.30	-268.80	6,046.20	2.26
11,288.00	91.08	357.16	5,483.44	6,132.18	-273.24	6,138.18	0.26
11,381.00	91.05	356.78	5,481.71	6,225.03	-278.16	6,231.16	0.41
11,474.00	91.26	356.20	5,479.84	6,317.84	-283.85	6,324.12	0.66
11,567.00	91.51	356.00	5,477.59	6,410.59	-290.17	6,417.05	0.34
11,659.00	91.11	359.38	5,475.49	6,502.48	-293.88	6,509.02	3.70
11,751.00	91.23	359.10	5,473.61	6,594.45	-295.10	6,600.96	0.33
11,842.00	91.70	359.16	5,471.28	6,685.41	-296.48	6,691.91	0.52
11,937.00	89.97	359.13	5,469.90	6,780.39	-297.90	6,786.86	1.82
12,031.00	90.25	358.68	5,469.72	6,874.37	-299.69	6,880.84	0.56
12,126.00	90.59	359.91	5,469.02	6,969.36	-300.86	6,975.81	1.34
12,221.00	90.77	0.14	5,467.89	7,064.35	-300.82	7,070.72	0.31
12,315.00	90.25	359.13	5,467.06	7,158.34	-301.42	7,164.67	1.21
12,411.00	90.65	359.30	5,466.30	7,254.33	-302.74	7,260.63	0.45
12,506.00	91.14	359.61	5,464.82	7,349.32	-303.64	7,355.58	0.61
12,601.00	90.09	358.34	5,463.80	7,444.29	-305.34	7,450.54	1.73
12,696.00	90.65	357.88	5,463.18	7,539.24	-308.47	7,545.54	0.76
12,791.00	89.91	357.71	5,462.72	7,634.17	-312.13	7,640.54	0.80
12,885.00	88.92	358.36	5,463.68	7,728.10	-315.35	7,734.53	1.26
12,981.00	89.75	358.99	5,464.79	7,824.07	-317.57	7,830.51	1.09
13,075.00	88.74	358.80	5,466.03	7,918.04	-319.38	7,924.48	1.09
13,170.00	88.77	357.94	5,468.10	8,012.98	-322.08	8,019.45	0.91
13,265.00	89.20	358.12	5,469.78	8,107.91	-325.35	8,114.43	0.49
13,359.00	88.21	356.63	5,471.90	8,201.78	-329.65	8,208.40	1.90
13,454.00	88.74	356.35	5,474.43	8,296.57	-335.47	8,303.35	0.63
13,549.00	89.04	355.04	5,476.27	8,391.28	-342.60	8,398.27	1.41
13,644.00	89.26	355.19	5,477.68	8,485.93	-350.68	8,493.16	0.28
13,738.00	89.38	353.69	5,478.80	8,579.48	-359.79	8,586.99	1.60
13,833.00	89.54	353.29	5,479.69	8,673.86	-370.56	8,681.73	0.45
13,927.00	89.57	352.68	5,480.42	8,767.15	-382.04	8,775.40	0.65
14,022.00	89.97	352.33	5,480.80	8,861.34	-394.43	8,870.01	0.56
14,117.00	89.63	351.29	5,481.14	8,955.37	-407.97	8,964.50	1.15
14,212.00	89.69	351.20	5,481.70	9,049.26	-422.43	9,058.89	0.11
14,307.00	90.06	351.36	5,481.91	9,143.16	-436.83	9,153.28	0.42
14,401.00	90.83	351.35	5,481.18	9,236.09	-450.96	9,246.70	0.82
14,491.00	91.36	350.80	5,479.46	9,324.98	-464.92	9,336.08	0.85
Last MWD Survey							
14,556.00	91.36	350.80	5,477.91	9,389.13	-475.31	9,400.58	0.00
Straight Projection to TD							

Design Report for Atwater State LD01-77HN - Noble Flexishot and Sperry MWD Survey

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
380.00	380.00	-0.89	-0.98	First Gyro Survey
845.00	844.99	-2.96	0.05	Last Gyro Survey
1,359.00	1,358.97	-6.39	2.13	First MWD Survey
14,491.00	5,479.46	9,324.98	-464.92	Last MWD Survey
14,556.00	5,477.91	9,389.13	-475.31	Straight Projection to TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	357.73	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
380.00	845.00	Noble Flexishot Surveys	Flexi-Shot
1,359.00	5,756.00	Intermediate Surveys	MWD
5,821.00	14,556.00	Production Survey	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,249.00	1,248.97	9 5/8"	9-5/8	13-3/4
5,802.00	5,452.51	7"	7	8-3/4

Design Report for Atwater State LD01-77HN - Noble Flexishot and Sperry MWD Survey

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
Elway State LD01-74-	0.00	0.00	15.00	0.98	1,775.69	1,529,385.76	3,467,977.70	40.774310	-103.810280
- actual wellpath misses target center by 1775.70usft at 10.41usft MD (10.41 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			15.00	69.00	1,761.00	1,529,454.76	3,469,738.70		
Point 2			15.00	58.00	-2,674.00	1,529,443.76	3,465,303.70		
Point 3			15.00	4,841.00	-2,887.00	1,534,226.76	3,465,090.71		
Point 4			15.00	9,698.00	-3,092.00	1,539,083.75	3,464,885.71		
Point 5			15.00	9,865.00	1,326.00	1,539,250.75	3,469,303.70		
Point 6			15.00	4,957.00	1,509.00	1,534,342.76	3,469,486.70		
Point 7			15.00	69.00	1,761.00	1,529,454.76	3,469,738.70		
Elway State LD01-74-	0.00	0.00	15.00	0.98	1,775.69	1,529,385.76	3,467,977.70	40.774310	-103.810280
- actual wellpath misses target center by 1775.70usft at 10.41usft MD (10.41 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			15.00	-391.00	2,221.00	1,528,994.77	3,470,198.70		
Point 2			15.00	-402.00	-3,134.00	1,528,983.77	3,464,843.71		
Point 3			15.00	4,841.00	-3,347.00	1,534,226.76	3,464,630.71		
Point 4			15.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70		
Point 5			15.00	-391.00	2,221.00	1,528,994.77	3,470,198.70		
Elway State LD01-74-	0.00	0.00	15.00	0.98	1,775.69	1,529,385.76	3,467,977.70	40.774310	-103.810280
- actual wellpath misses target center by 1775.70usft at 10.41usft MD (10.41 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			15.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70		
Point 2			15.00	4,841.00	-3,347.00	1,534,226.76	3,464,630.71		
Point 3			15.00	10,158.00	-3,552.00	1,539,543.75	3,464,425.71		
Point 4			15.00	10,325.00	1,786.00	1,539,710.75	3,469,763.70		
Point 5			15.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70		
Atwater State LD01-77	0.00	0.00	5,456.80	9,389.83	-427.50	1,538,774.59	3,465,774.51	40.800190	-103.817590
- actual wellpath misses target center by 51.87usft at 14549.55usft MD (5478.07 TVD, 9382.76 N, -474.27 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.44 °/100usft	Maximum Dogleg over Survey:	11.84 °/100usft at 5,608.00 usft
Net Tortosity applicable to Plans:	0.82 °/100usft	Directional Difficulty Index:	6.721

Audit Info

HALLIBURTON

North Reference Sheet for Sec. 1-T9N-R58W (Atwater State 1 PAD) - Atwater State LD01-77HN - 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' @ 4672.00usft (H&P 273). Northing and Easting are relative to Atwater State LD01-77HN

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: 0.99999856

Grid Coordinates of Well: 1,529,384.78 usft N, 3,466,202.01 usft E

Geographical Coordinates of Well: 40° 46' 27.84" N, 103° 49' 00.08" W

Grid Convergence at Surface is: 1.09°

Based upon Minimum Curvature type calculations, at a Measured Depth of 14,556.00usft the Bottom Hole Displacement is 9,401.15usft in the Direction of 357.10° (Grid).

Magnetic Convergence at surface is: -6.92° (5 November 2014, , BGGM2014)

