

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 11-T1N-R66W

Griswold 3N-11HZ

05-123-40996

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Final Report

25 March, 2015

Surface UWI : 05-123-40996

Well Coordinates: 1,265,630.56 N, 3,210,848.98 E (40° 03' 36.31" N, 104° 44' 48.15" W)

Ground Level: 5,143.00 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 Griswold 3N-11HZ

RKB = 13' @ 5156.00usft (Ensign 145)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
 Site: Sec. 11-T1N-R66W  
 Well: Griswold 3N-11HZ  
 Wellbore: Plan A  
 Design: Actual Surveys



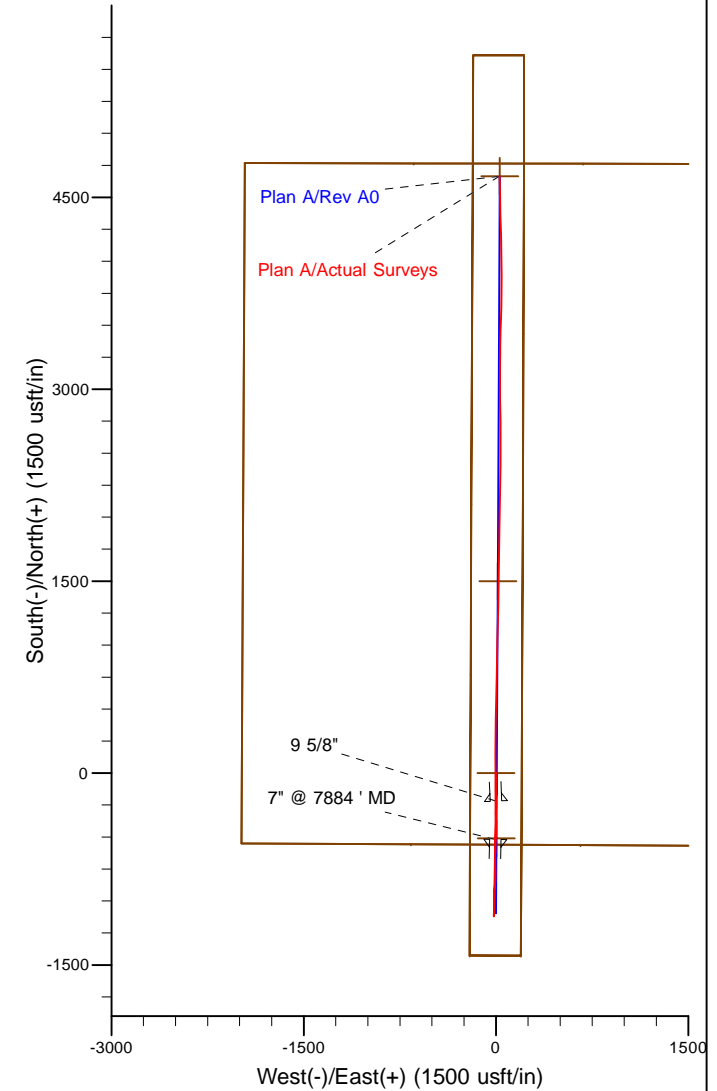
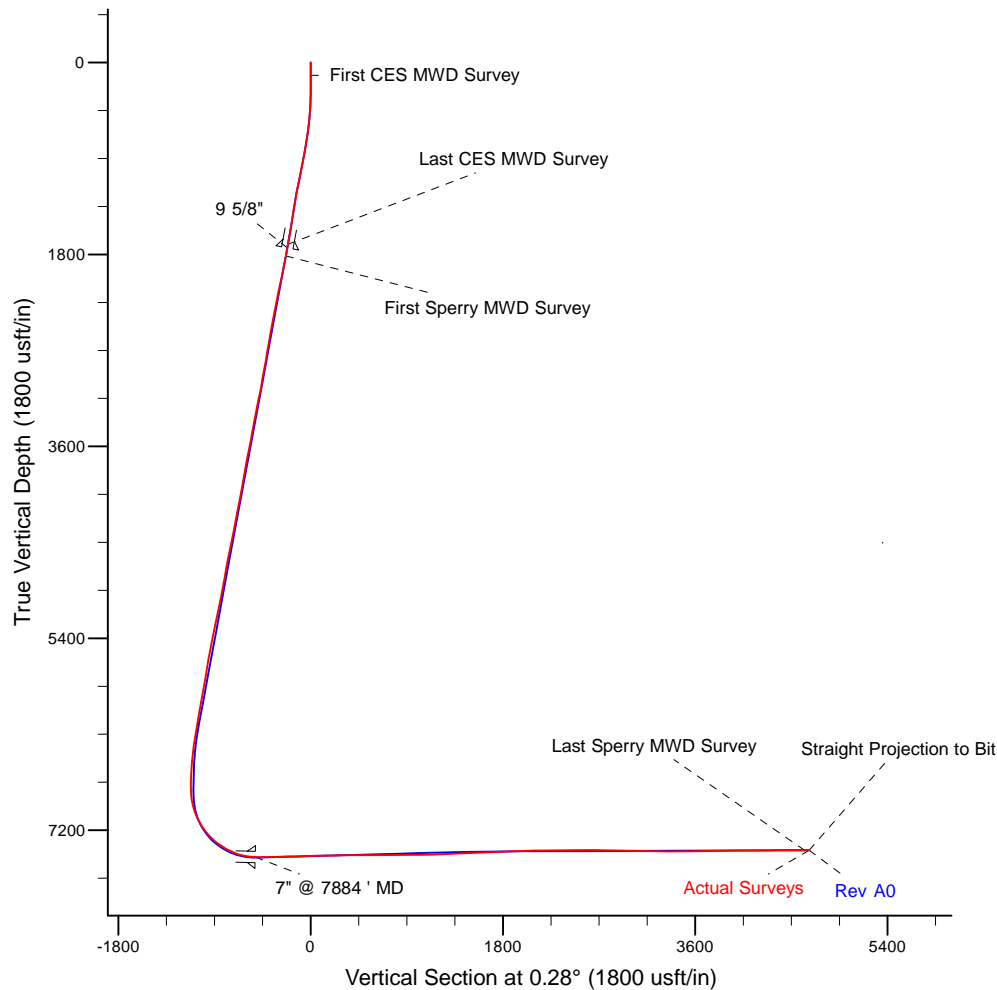
Platted SHL: 560' FSL, 1983' FWL  
 Platted Lat/Long: 40.060087N, 104.746708W  
 Location: Sec. 11-T1N-R66W

~ 7" Casing: 36' FSL 1975' FWL  
 Lat/Long: 40.058662N, 104.746729W  
 State Planes - CO Northern: 1265111.38N, 3210847.48E  
 Location: Sec. 11-T1N-R66W

~ BHL: 95' FNL, 1985' FWL  
 Lat/Long: 40.072895N, 104.746610W  
 State Planes - CO Northern: 1270296.17N, 3210836.79E  
 Location: Sec. 11-T1N-R66W

### LEGEND

- Griswold 3N-11HZ, Plan A, Rev A0 V0
- Actual Surveys



WELL DETAILS: Griswold 3N-11HZ	
Ground Level:	5143.00
RKB = 13' @ 5156.00usft (Ensign 145)	
Created By:	Gordy Roth
Created On:	3/25/15

**Design Report for Griswold 3N-11HZ - 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
119.00	0.30	354.20	119.00	0.31	-0.03	0.31	0.25
<b>First CES MWD Survey</b>							
209.00	0.10	238.40	209.00	0.50	-0.12	0.50	0.39
295.00	0.90	201.30	295.00	-0.17	-0.43	-0.17	0.96
382.00	2.20	168.40	381.96	-2.44	-0.34	-2.44	1.75
472.00	4.40	164.40	471.81	-7.46	0.93	-7.45	2.46
566.00	6.70	169.80	565.36	-16.33	2.87	-16.31	2.51
661.00	8.40	179.90	659.54	-28.72	3.87	-28.70	2.26
757.00	8.40	185.50	754.51	-42.71	3.21	-42.70	0.85
852.00	9.90	179.70	848.30	-57.79	2.58	-57.77	1.85
948.00	10.90	178.50	942.72	-75.11	2.87	-75.10	1.07
1,043.00	12.00	179.00	1,035.83	-93.97	3.27	-93.95	1.16
1,139.00	11.90	179.60	1,129.75	-113.84	3.52	-113.83	0.17
1,233.00	11.00	183.30	1,221.88	-132.49	3.07	-132.47	1.24
1,327.00	9.10	181.10	1,314.43	-148.88	2.41	-148.86	2.06
1,423.00	8.70	183.00	1,409.28	-163.72	1.88	-163.71	0.52
1,519.00	8.50	185.70	1,504.20	-178.03	0.80	-178.02	0.47
1,613.00	10.00	178.30	1,596.98	-193.10	0.35	-193.10	2.03
1,722.00	10.40	177.90	1,704.25	-212.39	0.99	-212.38	0.37
<b>Last CES MWD Survey</b>							
1,834.00	11.03	177.05	1,814.30	-233.19	1.91	-233.18	0.58
<b>First Sperry MWD Survey</b>							
2,017.00	11.62	183.80	1,993.75	-269.07	1.59	-269.06	0.79
2,107.00	11.60	182.94	2,081.90	-287.15	0.53	-287.14	0.19
2,198.00	11.68	181.46	2,171.03	-305.49	-0.18	-305.49	0.34
2,288.00	11.40	180.43	2,259.21	-323.49	-0.47	-323.49	0.39
2,378.00	10.96	180.03	2,347.51	-340.94	-0.55	-340.94	0.50
2,468.00	10.72	178.91	2,435.90	-357.87	-0.39	-357.87	0.35
2,558.00	10.17	179.65	2,524.41	-374.18	-0.18	-374.18	0.63
2,648.00	9.44	178.00	2,613.09	-389.51	0.12	-389.50	0.87
2,738.00	9.69	176.77	2,701.84	-404.44	0.81	-404.44	0.36
2,828.00	10.54	180.64	2,790.44	-420.24	1.14	-420.23	1.21
2,917.00	9.86	179.27	2,878.04	-436.00	1.15	-435.99	0.81
3,007.00	9.88	184.24	2,966.71	-451.40	0.68	-451.39	0.95
3,097.00	10.30	184.87	3,055.31	-467.12	-0.58	-467.12	0.48
3,188.00	12.07	184.83	3,144.58	-484.71	-2.07	-484.71	1.95
3,277.00	11.61	184.45	3,231.69	-502.91	-3.55	-502.92	0.52
3,367.00	11.05	182.66	3,319.93	-520.55	-4.65	-520.57	0.73
3,457.00	10.30	181.72	3,408.38	-537.21	-5.29	-537.23	0.86
3,547.00	9.34	180.62	3,497.06	-552.56	-5.61	-552.58	1.09
3,637.00	11.06	179.48	3,585.63	-568.49	-5.61	-568.51	1.92
3,817.00	11.23	180.85	3,762.24	-603.28	-5.72	-603.31	0.17
3,907.00	9.81	180.51	3,850.72	-619.71	-5.92	-619.74	1.58
3,997.00	10.69	180.63	3,939.28	-635.73	-6.08	-635.75	0.98
4,088.00	9.77	180.13	4,028.84	-651.89	-6.19	-651.91	1.02
4,178.00	10.38	183.76	4,117.45	-667.62	-6.74	-667.64	0.98
4,269.00	11.79	179.16	4,206.75	-685.09	-7.14	-685.12	1.83
4,359.00	10.93	177.48	4,294.99	-702.81	-6.63	-702.84	1.02
4,449.00	10.04	176.74	4,383.48	-719.17	-5.81	-719.19	1.00

**Design Report for Griswold 3N-11HZ - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,539.00	11.99	178.41	4,471.82	-736.35	-5.10	-736.36	2.20
4,629.00	11.94	180.11	4,559.87	-755.00	-4.86	-755.02	0.40
4,719.00	11.16	180.67	4,648.04	-773.02	-4.98	-773.04	0.88
4,809.00	10.19	180.54	4,736.48	-789.69	-5.16	-789.71	1.08
4,899.00	9.65	179.99	4,825.14	-805.20	-5.23	-805.21	0.61
4,989.00	10.95	182.16	4,913.69	-821.28	-5.55	-821.30	1.51
5,080.00	10.40	183.03	5,003.11	-838.12	-6.31	-838.14	0.63
5,170.00	12.38	182.70	5,091.33	-855.87	-7.19	-855.90	2.20
5,260.00	12.27	184.41	5,179.26	-875.04	-8.38	-875.07	0.42
5,349.00	11.65	185.62	5,266.33	-893.42	-9.99	-893.45	0.75
5,440.00	11.44	187.83	5,355.49	-911.50	-12.12	-911.55	0.54
5,530.00	11.11	185.61	5,443.75	-928.97	-14.18	-929.03	0.61
5,620.00	10.65	178.83	5,532.14	-945.92	-14.86	-945.98	1.51
5,710.00	9.46	177.55	5,620.75	-961.62	-14.38	-961.68	1.35
5,890.00	9.06	176.94	5,798.41	-990.55	-12.99	-990.60	0.23
5,980.00	10.97	185.36	5,887.04	-1,006.16	-13.41	-1,006.21	2.67
6,070.00	10.11	185.61	5,975.52	-1,022.54	-14.98	-1,022.61	0.96
6,160.00	9.15	184.78	6,064.25	-1,037.54	-16.35	-1,037.61	1.08
6,250.00	10.67	178.68	6,152.90	-1,053.00	-16.75	-1,053.07	2.05
6,340.00	10.11	177.92	6,241.43	-1,069.22	-16.28	-1,069.29	0.64
6,430.00	8.73	179.71	6,330.21	-1,083.95	-15.95	-1,084.01	1.57
6,520.00	6.49	183.72	6,419.41	-1,095.86	-16.25	-1,095.92	2.56
6,610.00	5.79	183.22	6,508.90	-1,105.46	-16.83	-1,105.53	0.78
6,790.00	2.82	169.21	6,688.37	-1,118.88	-16.52	-1,118.95	1.74
6,880.00	0.52	70.69	6,778.34	-1,120.92	-15.72	-1,120.99	3.27
6,971.00	3.36	8.57	6,869.28	-1,118.15	-14.93	-1,118.21	3.46
7,061.00	13.07	356.10	6,958.26	-1,105.36	-15.23	-1,105.42	10.91
7,151.00	21.03	1.06	7,044.23	-1,079.01	-15.62	-1,079.08	8.98
7,241.00	29.77	0.37	7,125.46	-1,040.45	-15.18	-1,040.51	9.72
7,331.00	36.59	1.95	7,200.74	-991.24	-14.12	-991.30	7.64
7,421.00	43.99	0.28	7,269.34	-933.09	-13.05	-933.15	8.31
7,511.00	54.32	1.33	7,328.13	-865.11	-12.05	-865.16	11.51
7,601.00	62.21	1.38	7,375.43	-788.65	-10.24	-788.69	8.77
7,691.00	67.59	1.37	7,413.59	-707.20	-8.28	-707.23	5.98
7,781.00	78.15	0.26	7,440.06	-621.33	-7.09	-621.35	11.79
7,850.00	85.13	0.80	7,450.09	-553.11	-6.45	-553.13	10.15
7,902.00	90.25	1.14	7,452.19	-501.17	-5.57	-501.19	9.87
7,992.00	90.89	0.55	7,451.29	-411.19	-4.25	-411.20	0.97
8,082.00	91.20	0.31	7,449.65	-321.21	-3.57	-321.22	0.44
8,172.00	91.51	359.99	7,447.52	-231.23	-3.33	-231.24	0.49
8,262.00	91.39	0.11	7,445.24	-141.26	-3.26	-141.27	0.19
8,352.00	91.79	359.99	7,442.75	-51.29	-3.18	-51.31	0.46
8,442.00	92.16	359.36	7,439.64	38.65	-3.69	38.63	0.81
8,532.00	90.34	359.39	7,437.68	128.62	-4.67	128.59	2.02
8,622.00	90.65	1.02	7,436.90	218.61	-4.35	218.59	1.84
8,712.00	91.11	0.78	7,435.52	308.59	-2.93	308.57	0.58
8,802.00	90.77	359.94	7,434.04	398.58	-2.37	398.56	1.01
8,892.00	90.34	0.98	7,433.17	488.57	-1.65	488.55	1.25
8,982.00	90.12	1.81	7,432.81	578.54	0.55	578.53	0.95
9,072.00	90.40	2.18	7,432.40	668.48	3.68	668.49	0.52
9,162.00	90.46	1.15	7,431.73	758.44	6.29	758.46	1.15

**Design Report for Griswold 3N-11HZ - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,252.00	90.22	0.69	7,431.19	848.43	7.74	848.46	0.58
9,342.00	90.31	0.42	7,430.78	938.42	8.61	938.45	0.32
9,432.00	91.02	1.43	7,429.73	1,028.40	10.06	1,028.44	1.37
9,522.00	92.06	2.03	7,427.31	1,118.33	12.78	1,118.38	1.33
9,612.00	92.22	1.46	7,423.95	1,208.22	15.52	1,208.28	0.66
9,702.00	92.34	0.86	7,420.37	1,298.13	17.34	1,298.20	0.68
9,973.00	91.91	0.77	7,410.32	1,568.92	21.19	1,569.00	0.16
10,153.00	92.31	0.48	7,403.70	1,748.78	23.15	1,748.88	0.27
10,243.00	92.96	0.80	7,399.56	1,838.68	24.16	1,838.78	0.80
10,333.00	91.79	1.91	7,395.83	1,928.58	26.28	1,928.68	1.79
10,423.00	92.10	1.43	7,392.77	2,018.49	28.90	2,018.60	0.63
10,513.00	90.43	1.56	7,390.79	2,108.43	31.25	2,108.56	1.86
10,603.00	90.52	1.32	7,390.04	2,198.40	33.51	2,198.54	0.28
10,874.00	91.20	359.67	7,385.97	2,469.35	35.85	2,469.49	0.66
10,964.00	89.66	359.84	7,385.30	2,559.34	35.47	2,559.49	1.72
11,054.00	89.48	359.41	7,385.97	2,649.34	34.88	2,649.48	0.52
11,144.00	89.29	358.88	7,386.94	2,739.32	33.54	2,739.45	0.63
11,324.00	88.40	359.18	7,390.57	2,919.26	30.49	2,919.37	0.52
11,414.00	89.29	0.25	7,392.38	3,009.24	30.04	3,009.35	1.55
11,594.00	88.86	0.51	7,395.29	3,189.21	31.24	3,189.32	0.28
11,684.00	88.52	0.37	7,397.35	3,279.18	31.93	3,279.30	0.41
11,865.00	90.62	2.00	7,398.70	3,460.12	35.67	3,460.25	1.47
11,955.00	91.94	1.70	7,396.69	3,550.05	38.58	3,550.20	1.50
12,045.00	90.68	1.65	7,394.64	3,639.99	41.21	3,640.14	1.40
12,315.00	90.62	359.59	7,391.57	3,909.94	44.13	3,910.11	0.76
12,405.00	90.59	359.52	7,390.62	3,999.93	43.43	4,000.10	0.08
12,495.00	90.25	358.59	7,389.96	4,089.92	41.94	4,090.07	1.10
12,585.00	89.97	357.86	7,389.79	4,179.87	39.16	4,180.01	0.87
12,765.00	90.37	359.08	7,389.26	4,359.80	34.35	4,359.92	0.71
12,855.00	90.25	358.87	7,388.77	4,449.79	32.74	4,449.89	0.27
12,945.00	90.46	358.54	7,388.21	4,539.76	30.71	4,539.86	0.43
13,030.00	90.18	358.50	7,387.74	4,624.73	28.51	4,624.82	0.33
<b>Last Sperry MWD Survey</b>							
13,071.00	90.18	358.50	7,387.61	4,665.72	27.44	4,665.80	0.00
<b>Straight Projection to Bit</b>							

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
119.00	119.00	0.31	-0.03	First CES MWD Survey
1,722.00	1,704.25	-212.39	0.99	Last CES MWD Survey
1,834.00	1,814.30	-233.19	1.91	First Sperry MWD Survey
13,030.00	7,387.74	4,624.73	28.51	Last Sperry MWD Survey
13,071.00	7,387.61	4,665.72	27.44	Straight Projection to Bit

## Design Report for Griswold 3N-11HZ - Actual Surveys

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	0.28	Slot	0.00	0.00	0.00

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
119.00	1,722.00	Cathedral MWD Surface Surveys	MWD
1,834.00	7,902.00	MWD Vertical/Build Surveys	MWD+IFR1+SC
7,992.00	13,071.00	MWD Lateral Surveys	MWD+IFR1+SC

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,757.00	9 5/8"		9-5/8	13-3/4
7,884.00	7" @ 7884 ' MD		7	8-3/4

## Design Report for Griswold 3N-11HZ - 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
GRISWOLD 3N-11HZ_	0.00	0.00	0.00	0.02	0.00	1,265,630.58	3,210,848.98	40.060087	-104.746708
- actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-550.06	-1,985.81	1,265,063.69	3,208,867.99	
Point 2				0.00	2,109.07	-1,973.29	1,267,722.73	3,208,857.92	
Point 3				0.00	4,768.34	-1,960.00	1,270,381.92	3,208,848.62	
Point 4				0.00	4,765.81	-640.62	1,270,390.60	3,210,167.93	
Point 5				0.00	4,763.40	678.82	1,270,399.39	3,211,487.29	
Point 6				0.00	4,760.77	1,998.20	1,270,407.97	3,212,806.60	
Point 7				0.00	4,758.43	3,317.80	1,270,416.84	3,214,126.12	
Point 8				0.00	2,091.25	3,310.90	1,267,749.80	3,214,141.87	
Point 9				0.00	-576.12	3,303.96	1,265,082.57	3,214,157.59	
Point 10				0.00	-563.46	658.75	1,265,072.76	3,211,512.47	
Point 11				0.00	-556.64	-663.48	1,265,068.34	3,210,190.28	
GRISWOLD 3N-11HZ_	0.00	0.00	7,386.00	4,665.15	29.67	1,270,295.62	3,210,839.02	40.072893	-104.746602
- actual wellpath misses target center by 2.74usft at 13070.38usft MD (7387.61 TVD, 4665.09 N, 27.45 E)									
- Point									
GRISWOLD 3N-11HZ_	0.00	0.00	7,401.00	1,499.95	13.95	1,267,130.52	3,210,850.19	40.064204	-104.746658
- actual wellpath misses target center by 13.28usft at 9904.33usft MD (7412.68 TVD, 1500.30 N, 20.25 E)									
- Point									
GRISWOLD 3N-11HZ_	0.00	0.00	7,456.00	-509.99	2.52	1,265,120.63	3,210,855.83	40.058687	-104.746699
- actual wellpath misses target center by 9.11usft at 7893.48usft MD (7452.16 TVD, -509.69 N, -5.74 E)									
- Polygon									
Point 1				7,456.00	5,274.98	-183.12	1,270,393.67	3,210,627.92	
Point 2				7,456.00	6,119.49	-180.62	1,271,238.14	3,210,623.25	
Point 3				7,456.00	6,119.18	216.34	1,271,241.20	3,211,020.18	
Point 4				7,456.00	5,274.25	216.28	1,270,396.33	3,211,027.30	
Point 5				7,456.00	3,942.96	211.24	1,269,065.10	3,211,033.57	
Point 6				7,456.00	2,611.69	206.21	1,267,733.88	3,211,039.84	
Point 7				7,456.00	1,280.26	201.22	1,266,402.51	3,211,046.16	
Point 8				7,456.00	-51.08	196.23	1,265,071.22	3,211,052.48	
Point 9				7,456.00	-916.22	192.48	1,264,206.12	3,211,056.08	
Point 10				7,456.00	-914.64	-209.25	1,264,204.28	3,210,654.37	
Point 11				7,456.00	-49.01	-205.99	1,265,069.88	3,210,650.28	
Point 12				7,456.00	1,281.95	-200.33	1,266,400.79	3,210,644.63	
Point 13				7,456.00	2,613.07	-194.64	1,267,731.86	3,210,639.01	
Point 14				7,456.00	3,944.02	-188.88	1,269,062.76	3,210,633.47	

**Directional Difficulty Index**

Average Dogleg over Survey:	1.57 °/100usft	Maximum Dogleg over Survey:	11.79 °/100usft at 7,781.00 usft
Net Tortousity applicable to Plans:	0.62 °/100usft	Directional Difficulty Index:	6.397

**Audit Info**

North Reference Sheet for Sec. 11-T1N-R66W - Griswold 3N-11HZ - Plan A

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB = 13' @ 5156.00usft (Ensign 145). Northing and Easting are relative to Griswold 3N- 11HZ

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: 0.99996235

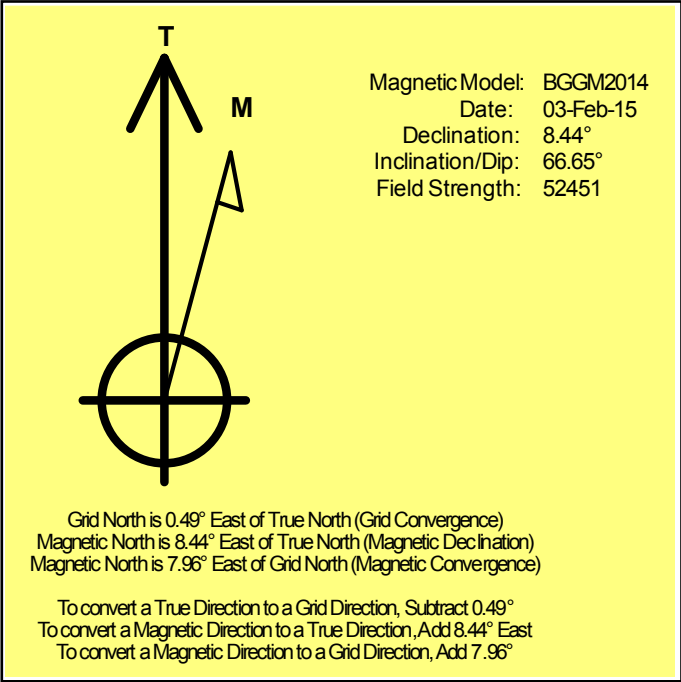
Grid Coordinates of Well: 1,265,630.56 usft N, 3,210,848.98 usft E

Geographical Coordinates of Well: 40° 03' 36.31" N, 104° 44' 48.15" W

Grid Convergence at Surface is: 0.49°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,071.00usft  
the Bottom Hole Displacement is 4,665.80usft in the Direction of 0.34° (True).

Magnetic Convergence at surface is: -7.96° ( 3 February 2015, , BGGM2014)





# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 11-T1N-R66W

Griswold 3N-11HZ

05-123-40996

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Geodetic Report

25 March, 2015

Well Coordinates: 1,265,630.56 N, 3,210,848.98 E (40° 03' 36.31" N, 104° 44' 48.15" W)

Ground Level: 5,143.00 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 Griswold 3N-11HZ

RKB = 13' @ 5156.00usft (Ensign 145)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for Griswold 3N-11HZ - 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)
0.00	0.00	0.00	0.00	0.00	0.00	40.060087	-104.746708	1,265,630.56	3,210,848.98
119.00	0.30	354.20	119.00	0.31	-0.03	40.060088	-104.746708	1,265,630.87	3,210,848.95
209.00	0.10	238.40	209.00	0.50	-0.12	40.060088	-104.746709	1,265,631.06	3,210,848.86
295.00	0.90	201.30	295.00	-0.17	-0.43	40.060087	-104.746710	1,265,630.39	3,210,848.55
382.00	2.20	168.40	381.96	-2.44	-0.34	40.060080	-104.746709	1,265,628.12	3,210,848.66
472.00	4.40	164.40	471.81	-7.46	0.93	40.060066	-104.746705	1,265,623.11	3,210,849.98
566.00	6.70	169.80	565.36	-16.33	2.87	40.060042	-104.746698	1,265,614.26	3,210,852.00
661.00	8.40	179.90	659.54	-28.72	3.87	40.060008	-104.746694	1,265,601.88	3,210,853.09
757.00	8.40	185.50	754.51	-42.71	3.21	40.059970	-104.746697	1,265,587.88	3,210,852.55
852.00	9.90	179.70	848.30	-57.79	2.58	40.059928	-104.746699	1,265,572.80	3,210,852.06
948.00	10.90	178.50	942.72	-75.11	2.87	40.059881	-104.746698	1,265,555.48	3,210,852.49
1,043.00	12.00	179.00	1,035.83	-93.97	3.27	40.059829	-104.746697	1,265,536.63	3,210,853.05
1,139.00	11.90	179.60	1,129.75	-113.84	3.52	40.059774	-104.746696	1,265,516.76	3,210,853.47
1,233.00	11.00	183.30	1,221.88	-132.49	3.07	40.059723	-104.746697	1,265,498.11	3,210,853.18
1,327.00	9.10	181.10	1,314.43	-148.88	2.41	40.059678	-104.746700	1,265,481.72	3,210,852.66
1,423.00	8.70	183.00	1,409.28	-163.72	1.88	40.059638	-104.746702	1,265,466.87	3,210,852.26
1,519.00	8.50	185.70	1,504.20	-178.03	0.80	40.059598	-104.746705	1,265,452.55	3,210,851.29
1,613.00	10.00	178.30	1,596.98	-193.10	0.35	40.059557	-104.746707	1,265,437.48	3,210,850.97
1,722.00	10.40	177.90	1,704.25	-212.39	0.99	40.059504	-104.746705	1,265,418.20	3,210,851.78
1,834.00	11.03	177.05	1,814.30	-233.19	1.91	40.059447	-104.746701	1,265,397.40	3,210,852.88
2,017.00	11.62	183.80	1,993.75	-269.07	1.59	40.059348	-104.746703	1,265,361.53	3,210,852.86
2,107.00	11.60	182.94	2,081.90	-287.15	0.53	40.059299	-104.746706	1,265,343.44	3,210,851.95
2,198.00	11.68	181.46	2,171.03	-305.49	-0.18	40.059248	-104.746709	1,265,325.09	3,210,851.40
2,288.00	11.40	180.43	2,259.21	-323.49	-0.47	40.059199	-104.746710	1,265,307.09	3,210,851.26
2,378.00	10.96	180.03	2,347.51	-340.94	-0.55	40.059151	-104.746710	1,265,289.64	3,210,851.33
2,468.00	10.72	178.91	2,435.90	-357.87	-0.39	40.059105	-104.746710	1,265,272.72	3,210,851.63
2,558.00	10.17	179.65	2,524.41	-374.18	-0.18	40.059060	-104.746709	1,265,256.40	3,210,851.98
2,648.00	9.44	178.00	2,613.09	-389.51	0.12	40.059018	-104.746708	1,265,241.09	3,210,852.41
2,738.00	9.69	176.77	2,701.84	-404.44	0.81	40.058977	-104.746705	1,265,226.15	3,210,853.23
2,828.00	10.54	180.64	2,790.44	-420.24	1.14	40.058933	-104.746704	1,265,210.37	3,210,853.69
2,917.00	9.86	179.27	2,878.04	-436.00	1.15	40.058890	-104.746704	1,265,194.61	3,210,853.83
3,007.00	9.88	184.24	2,966.71	-451.40	0.68	40.058848	-104.746706	1,265,179.20	3,210,853.49
3,097.00	10.30	184.87	3,055.31	-467.12	-0.58	40.058805	-104.746710	1,265,163.47	3,210,852.37
3,188.00	12.07	184.83	3,144.58	-484.71	-2.07	40.058756	-104.746716	1,265,145.87	3,210,851.03
3,277.00	11.61	184.45	3,231.69	-502.91	-3.55	40.058706	-104.746721	1,265,127.66	3,210,849.71
3,367.00	11.05	182.66	3,319.93	-520.55	-4.65	40.058658	-104.746725	1,265,110.01	3,210,848.75
3,457.00	10.30	181.72	3,408.38	-537.21	-5.29	40.058612	-104.746727	1,265,093.34	3,210,848.25
3,547.00	9.34	180.62	3,497.06	-552.56	-5.61	40.058570	-104.746728	1,265,078.00	3,210,848.06
3,637.00	11.06	179.48	3,585.63	-568.49	-5.61	40.058526	-104.746728	1,265,062.06	3,210,848.20
3,817.00	11.23	180.85	3,762.24	-603.28	-5.72	40.058431	-104.746729	1,265,027.27	3,210,848.39
3,907.00	9.81	180.51	3,850.72	-619.71	-5.92	40.058386	-104.746729	1,265,010.84	3,210,848.33
3,997.00	10.69	180.63	3,939.28	-635.73	-6.08	40.058342	-104.746730	1,264,994.83	3,210,848.31

## Design Report for Griswold 3N-11HZ - 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)
4,088.00	9.77	180.13	4,028.84	-651.89	-6.19	40.058297	-104.746730	1,264,978.67	3,210,848.33
4,178.00	10.38	183.76	4,117.45	-667.62	-6.74	40.058254	-104.746732	1,264,962.94	3,210,847.92
4,269.00	11.79	179.16	4,206.75	-685.09	-7.14	40.058206	-104.746734	1,264,945.46	3,210,847.67
4,359.00	10.93	177.48	4,294.99	-702.81	-6.63	40.058158	-104.746732	1,264,927.75	3,210,848.33
4,449.00	10.04	176.74	4,383.48	-719.17	-5.81	40.058113	-104.746729	1,264,911.40	3,210,849.29
4,539.00	11.99	178.41	4,471.82	-736.35	-5.10	40.058066	-104.746726	1,264,894.23	3,210,850.14
4,629.00	11.94	180.11	4,559.87	-755.00	-4.86	40.058014	-104.746726	1,264,875.57	3,210,850.54
4,719.00	11.16	180.67	4,648.04	-773.02	-4.98	40.057965	-104.746726	1,264,857.56	3,210,850.57
4,809.00	10.19	180.54	4,736.48	-789.69	-5.16	40.057919	-104.746727	1,264,840.88	3,210,850.54
4,899.00	9.65	179.99	4,825.14	-805.20	-5.23	40.057877	-104.746727	1,264,825.38	3,210,850.59
4,989.00	10.95	182.16	4,913.69	-821.28	-5.55	40.057832	-104.746728	1,264,809.29	3,210,850.41
5,080.00	10.40	183.03	5,003.11	-838.12	-6.31	40.057786	-104.746731	1,264,792.45	3,210,849.79
5,170.00	12.38	182.70	5,091.33	-855.87	-7.19	40.057738	-104.746734	1,264,774.69	3,210,849.06
5,260.00	12.27	184.41	5,179.26	-875.04	-8.38	40.057685	-104.746738	1,264,755.51	3,210,848.03
5,349.00	11.65	185.62	5,266.33	-893.42	-9.99	40.057634	-104.746744	1,264,737.13	3,210,846.58
5,440.00	11.44	187.83	5,355.49	-911.50	-12.12	40.057585	-104.746752	1,264,719.03	3,210,844.61
5,530.00	11.11	185.61	5,443.75	-928.97	-14.18	40.057537	-104.746759	1,264,701.54	3,210,842.69
5,620.00	10.65	178.83	5,532.14	-945.92	-14.86	40.057490	-104.746761	1,264,684.59	3,210,842.16
5,710.00	9.46	177.55	5,620.75	-961.62	-14.38	40.057447	-104.746760	1,264,668.89	3,210,842.78
5,890.00	9.06	176.94	5,798.41	-990.55	-12.99	40.057368	-104.746755	1,264,639.97	3,210,844.41
5,980.00	10.97	185.36	5,887.04	-1,006.16	-13.41	40.057325	-104.746756	1,264,624.37	3,210,844.12
6,070.00	10.11	185.61	5,975.52	-1,022.54	-14.98	40.057280	-104.746762	1,264,607.97	3,210,842.69
6,160.00	9.15	184.78	6,064.25	-1,037.54	-16.35	40.057239	-104.746767	1,264,592.96	3,210,841.45
6,250.00	10.67	178.68	6,152.90	-1,053.00	-16.75	40.057196	-104.746768	1,264,577.50	3,210,841.18
6,340.00	10.11	177.92	6,241.43	-1,069.22	-16.28	40.057152	-104.746766	1,264,561.28	3,210,841.79
6,430.00	8.73	179.71	6,330.21	-1,083.95	-15.95	40.057111	-104.746765	1,264,546.56	3,210,842.24
6,520.00	6.49	183.72	6,419.41	-1,095.86	-16.25	40.057079	-104.746766	1,264,534.65	3,210,842.04
6,610.00	5.79	183.22	6,508.90	-1,105.46	-16.83	40.057052	-104.746768	1,264,525.04	3,210,841.54
6,790.00	2.82	169.21	6,688.37	-1,118.88	-16.52	40.057016	-104.746767	1,264,511.62	3,210,841.97
6,880.00	0.52	70.69	6,778.34	-1,120.92	-15.72	40.057010	-104.746764	1,264,509.59	3,210,842.79
6,971.00	3.36	8.57	6,869.28	-1,118.15	-14.93	40.057018	-104.746762	1,264,512.37	3,210,843.55
7,061.00	13.07	356.10	6,958.26	-1,105.36	-15.23	40.057053	-104.746763	1,264,525.16	3,210,843.15
7,151.00	21.03	1.06	7,044.23	-1,079.01	-15.62	40.057125	-104.746764	1,264,551.50	3,210,842.53
7,241.00	29.77	0.37	7,125.46	-1,040.45	-15.18	40.057231	-104.746762	1,264,590.06	3,210,842.64
7,331.00	36.59	1.95	7,200.74	-991.24	-14.12	40.057366	-104.746759	1,264,639.28	3,210,843.29
7,421.00	43.99	0.28	7,269.34	-933.09	-13.05	40.057526	-104.746755	1,264,697.43	3,210,843.86
7,511.00	54.32	1.33	7,328.13	-865.11	-12.05	40.057712	-104.746751	1,264,765.41	3,210,844.28
7,601.00	62.21	1.38	7,375.43	-788.65	-10.24	40.057922	-104.746745	1,264,841.88	3,210,845.44
7,691.00	67.59	1.37	7,413.59	-707.20	-8.28	40.058146	-104.746738	1,264,923.34	3,210,846.71
7,781.00	78.15	0.26	7,440.06	-621.33	-7.09	40.058381	-104.746734	1,265,009.22	3,210,847.18
7,850.00	85.13	0.80	7,450.09	-553.11	-6.45	40.058569	-104.746731	1,265,077.44	3,210,847.23
7,902.00	90.25	1.14	7,452.19	-501.17	-5.57	40.058711	-104.746728	1,265,129.38	3,210,847.67

## Design Report for Griswold 3N-11HZ - 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)
7,992.00	90.89	0.55	7,451.29	-411.19	-4.25	40.058958	-104.746723	1,265,219.37	3,210,848.23
8,082.00	91.20	0.31	7,449.65	-321.21	-3.57	40.059205	-104.746721	1,265,309.35	3,210,848.14
8,172.00	91.51	359.99	7,447.52	-231.23	-3.33	40.059452	-104.746720	1,265,399.32	3,210,847.61
8,262.00	91.39	0.11	7,445.24	-141.26	-3.26	40.059699	-104.746720	1,265,489.29	3,210,846.93
8,352.00	91.79	359.99	7,442.75	-51.29	-3.18	40.059946	-104.746720	1,265,579.24	3,210,846.24
8,442.00	92.16	359.36	7,439.64	38.65	-3.69	40.060193	-104.746721	1,265,669.18	3,210,844.97
8,532.00	90.34	359.39	7,437.68	128.62	-4.67	40.060440	-104.746725	1,265,759.13	3,210,843.22
8,622.00	90.65	1.02	7,436.90	218.61	-4.35	40.060687	-104.746724	1,265,849.12	3,210,842.78
8,712.00	91.11	0.78	7,435.52	308.59	-2.93	40.060934	-104.746719	1,265,939.10	3,210,843.43
8,802.00	90.77	359.94	7,434.04	398.58	-2.37	40.061181	-104.746717	1,266,029.09	3,210,843.23
8,892.00	90.34	0.98	7,433.17	488.57	-1.65	40.061428	-104.746714	1,266,119.08	3,210,843.19
8,982.00	90.12	1.81	7,432.81	578.54	0.55	40.061675	-104.746706	1,266,209.06	3,210,844.61
9,072.00	90.40	2.18	7,432.40	668.48	3.68	40.061922	-104.746695	1,266,299.03	3,210,846.98
9,162.00	90.46	1.15	7,431.73	758.44	6.29	40.062169	-104.746686	1,266,389.00	3,210,848.83
9,252.00	90.22	0.69	7,431.19	848.43	7.74	40.062416	-104.746681	1,266,478.99	3,210,849.51
9,342.00	90.31	0.42	7,430.78	938.42	8.61	40.062663	-104.746678	1,266,568.99	3,210,849.62
9,432.00	91.02	1.43	7,429.73	1,028.40	10.06	40.062910	-104.746672	1,266,658.97	3,210,850.31
9,522.00	92.06	2.03	7,427.31	1,118.33	12.78	40.063157	-104.746663	1,266,748.92	3,210,852.26
9,612.00	92.22	1.46	7,423.95	1,208.22	15.52	40.063404	-104.746653	1,266,838.83	3,210,854.24
9,702.00	92.34	0.86	7,420.37	1,298.13	17.34	40.063650	-104.746646	1,266,928.75	3,210,855.29
9,973.00	91.91	0.77	7,410.32	1,568.92	21.19	40.064394	-104.746633	1,267,199.54	3,210,856.84
10,153.00	92.31	0.48	7,403.70	1,748.78	23.15	40.064887	-104.746626	1,267,379.41	3,210,857.28
10,243.00	92.96	0.80	7,399.56	1,838.68	24.16	40.065134	-104.746622	1,267,469.32	3,210,857.52
10,333.00	91.79	1.91	7,395.83	1,928.58	26.28	40.065381	-104.746614	1,267,559.22	3,210,858.88
10,423.00	92.10	1.43	7,392.77	2,018.49	28.90	40.065628	-104.746605	1,267,649.15	3,210,860.74
10,513.00	90.43	1.56	7,390.79	2,108.43	31.25	40.065875	-104.746597	1,267,739.10	3,210,862.32
10,603.00	90.52	1.32	7,390.04	2,198.40	33.51	40.066122	-104.746589	1,267,829.09	3,210,863.82
10,874.00	91.20	359.67	7,385.97	2,469.35	35.85	40.066865	-104.746580	1,268,100.03	3,210,863.86
10,964.00	89.66	359.84	7,385.30	2,559.34	35.47	40.067113	-104.746582	1,268,190.02	3,210,862.71
11,054.00	89.48	359.41	7,385.97	2,649.34	34.88	40.067360	-104.746584	1,268,280.00	3,210,861.36
11,144.00	89.29	358.88	7,386.94	2,739.32	33.54	40.067607	-104.746588	1,268,369.97	3,210,859.25
11,324.00	88.40	359.18	7,390.57	2,919.26	30.49	40.068101	-104.746599	1,268,549.86	3,210,854.68
11,414.00	89.29	0.25	7,392.38	3,009.24	30.04	40.068348	-104.746601	1,268,639.83	3,210,853.46
11,594.00	88.86	0.51	7,395.29	3,189.21	31.24	40.068842	-104.746597	1,268,819.80	3,210,853.13
11,684.00	88.52	0.37	7,397.35	3,279.18	31.93	40.069089	-104.746594	1,268,909.77	3,210,853.05
11,865.00	90.62	2.00	7,398.70	3,460.12	35.67	40.069585	-104.746581	1,269,090.73	3,210,855.26
11,955.00	91.94	1.70	7,396.69	3,550.05	38.58	40.069832	-104.746570	1,269,180.68	3,210,857.40
12,045.00	90.68	1.65	7,394.64	3,639.99	41.21	40.070079	-104.746561	1,269,270.63	3,210,859.27
12,315.00	90.62	359.59	7,391.57	3,909.94	44.13	40.070820	-104.746551	1,269,540.59	3,210,859.89
12,405.00	90.59	359.52	7,390.62	3,999.93	43.43	40.071067	-104.746553	1,269,630.57	3,210,858.43
12,495.00	90.25	358.59	7,389.96	4,089.92	41.94	40.071314	-104.746558	1,269,720.53	3,210,856.18
12,585.00	89.97	357.86	7,389.79	4,179.87	39.16	40.071561	-104.746568	1,269,810.46	3,210,852.63

## Design Report for Griswold 3N-11HZ - 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)
12,765.00	90.37	359.08	7,389.26	4,359.80	34.35	40.072055	-104.746586	1,269,990.34	3,210,846.30
12,855.00	90.25	358.87	7,388.77	4,449.79	32.74	40.072302	-104.746591	1,270,080.30	3,210,843.92
12,945.00	90.46	358.54	7,388.21	4,539.76	30.71	40.072549	-104.746599	1,270,170.25	3,210,841.12
13,030.00	90.18	358.50	7,387.74	4,624.73	28.51	40.072782	-104.746606	1,270,255.20	3,210,838.21
13,071.00	90.18	358.50	7,387.61	4,665.72	27.44	40.072895	-104.746610	1,270,296.17	3,210,836.79

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
119.00	119.00	0.31	-0.03	First CES MWD Survey
1,722.00	1,704.25	-212.39	0.99	Last CES MWD Survey
1,834.00	1,814.30	-233.19	1.91	First Sperry MWD Survey
13,030.00	7,387.74	4,624.73	28.51	Last Sperry MWD Survey
13,071.00	7,387.61	4,665.72	27.44	Straight Projection to Bit

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	+E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	0.28	Slot	0.00	0.00	0.00

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
119.00	1,722.00	Cathedral MWD Surface Surveys	MWD
1,834.00	7,902.00	MWD Vertical/Build Surveys	MWD+IFR1+SC
7,992.00	13,071.00	MWD Lateral Surveys	MWD+IFR1+SC

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Design Report for Griswold 3N-11HZ - Actual Surveys

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Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,757.00		9 5/8"	9-5/8	13-3/4
7,884.00		7" @ 7884 ' MD	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:	1.57 °/100usft	Maximum Dogleg over Survey:	11.79 °/100usft at 7,781.00 usft
Net Tortosity applicable to Plans:	0.62 °/100usft	Directional Difficulty Index:	6.397

Audit Info

**North Reference Sheet for Sec. 11-T1N-R66W - Griswold 3N-11HZ - Plan A**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB = 13' @ 5156.00usft (Ensign 145). Northing and Easting are relative to Griswold 3N- 11HZ

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: 0.99996235

Grid Coordinates of Well: 1,265,630.56 usft N, 3,210,848.98 usft E

Geographical Coordinates of Well: 40° 03' 36.31" N, 104° 44' 48.15" W

Grid Convergence at Surface is: 0.49°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,071.00usft

the Bottom Hole Displacement is 4,665.80usft in the Direction of 0.34° ( True).

Magnetic Convergence at surface is: -7.96° ( 3 February 2015, , BGGM2014)

