

SPERRY-SUN DRILLING SERVICES

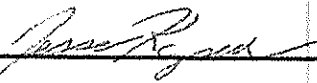
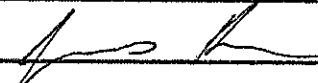
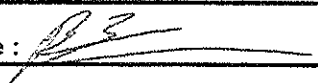
CERTIFIED SURVEY WORK SHEET

OPERATOR:	Anadarko Petroleum Corp.
WELL:	Thomsen 4N-31HZ
FIELD:	DJ Basin
RIG:	H&P 308
LEGALS:	Sec. 7-T2N-R65W
COUNTY:	Weld
STATE:	Colorado
CAL. METHOD:	True N
MAG. DECL. APPLIED:	8.41
VERTICAL SEC. DIR. :	0.230

SSDS Job Number :	901927789
Start Date of Job :	1/5/2015
End Date of Job :	1/27/2015
Lead Directional Driller:	Jesse Kysar
Other SSDS DD's :	Brandon Watson
	Ryan Elliott
SSDS MWD Engineers :	James Ramsy
	Wilson Holland

	Main Hole =====>	1st Side Track =====>	2nd Side Track =====>	3rd Side Track =====>	4th Side Track =====>
ESS Survey	Tie On	Tie On	Tie On	Tie On	Tie On
First Survey Depth	101 -82- Gyro				
Last Survey Depth	1319-1345-				
KOP Depth/Sidetrack MD	6712 KOP	KOP-ST1	KOP-ST2	KOP-ST3	KOP-ST4
First Survey Depth	1366 MWD	MWD	MWD	MWD	MWD
Last Survey Depth	17258 MWD	MWD	MWD	MWD	MWD
Fit Extrapolation to TD	17306 T.D.	T.D.	T.D.	T.D.	T.D.

The following Sperry Sun Drilling Services personnel listed below, do certify the above survey information to be accurate :

Print Name :	Jesse Kysar	Print Name :	James Ramsy	Print Name :	Ryan Elliott
Sign Name :		Sign Name :		Sign Name :	
Print Name :	Brandon Watson	Print Name :	Wilson Holland	Print Name :	
Sign Name :		Sign Name :		Sign Name :	

Examples of Survey Types:	TieOn	Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)
	MWD	Sperry Sun Drilling Services (SSDS) Measurement While Drilling (MWD) Survey's
	ESS	Sperry Sun Drilling Services (SSDS) Electronic Survey System (ESS) Survey's
	Gyro	Gyro Survey's ; Provided by third party vendor, or by Sperry Sun Drilling Services (SSDS)
	SS	Single Shot (SS) Survey's ; Provided by Sperry Sun Drilling Services (SSDS) or third party vendor.

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 7-T2N-R65W

Thomsen 4N- 31HZ

API: 05-123-40555 :: Job #: 901927789

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Report

12 March, 2015

Surface UWI : API: 05-123-40555 :: Job #: 901927789

Well Coordinates: 1,299,839.26 N, 3,220,668.49 E (40° 09' 13.53" N, 104° 42' 37.94" W)

Ground Level: 4,949.00 usft

Local Coordinate Origin:

Centered on Well Thomsen 4N- 31HZ

Viewing Datum:

RKB = 25' @ 4974.00usft (H&P 308)

TVDs to System:

N

North Reference:

True

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. 7-T2N-R65W
 Well: Thomsen 4N- 31HZ
 Wellbore: Plan A
 Design: Actual Surveys



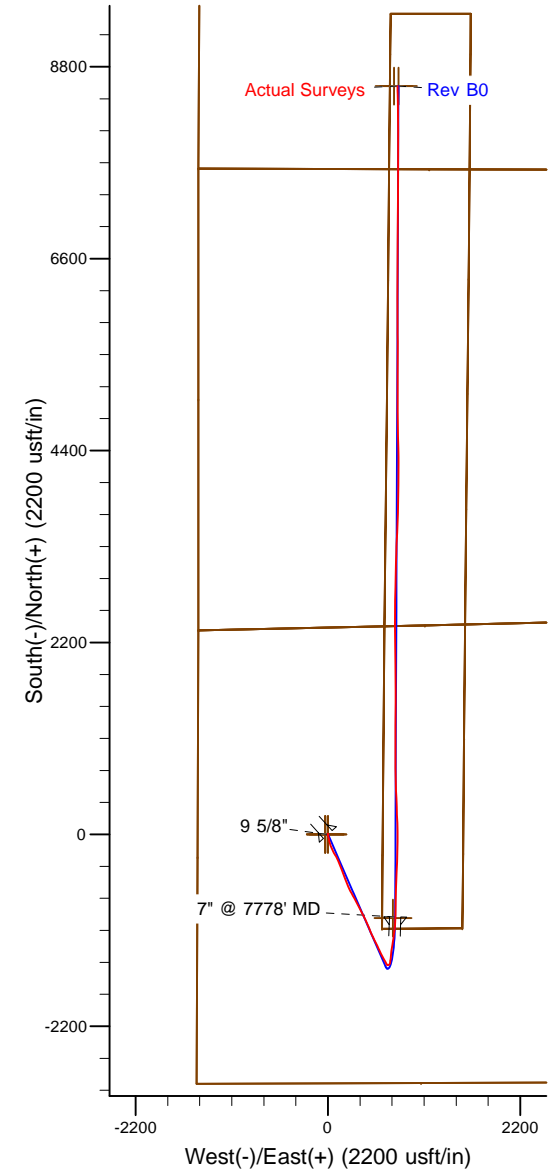
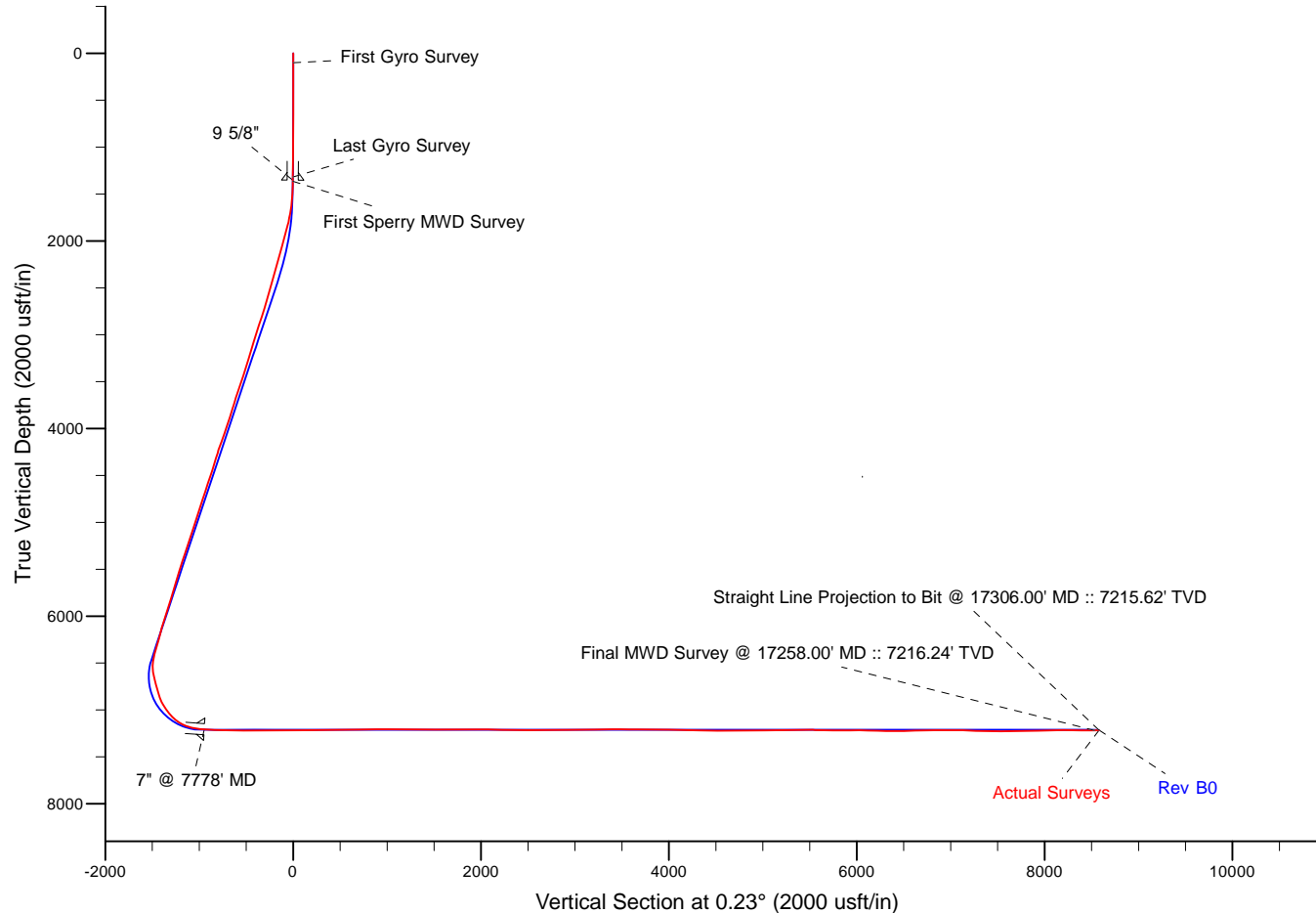
Platted SHL: 2371' FNL, 1491' FWL
 Platted Lat/Long: 40.153757N, 104.710540W
 Location: Sec. 7-T2N-R65W

~ 7" Casing: 3339' FNL 2270' FWL
 Lat/Long: 40.151157N, 104.707781W
 State Planes - CO Northern: 1298899.05N, 3221448.26E
 Location: Sec. 7-T2N-R65W

~ BHL: 950' FSL, 2270' FWL
 Lat/Long: 40.177301N, 104.707689W
 State Planes - CO Northern: 1308422.79N, 3221388.86E
 Location: Sec. 31-T3N-R65W

LEGEND

- Thomsen 4N- 31HZ, Plan A, Rev B0 V0
- Actual Surveys



WELL DETAILS: Thomsen 4N- 31HZ	
Ground Level:	4949.00
RKB = 25' @ 4974.00usft (H&P 308)	
Created By:	Gordy Roth
Created On:	3/13/15

Design Report for Thomsen 4N- 31HZ - 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
101.00	0.50	314.10	101.00	0.31	-0.32	0.31	0.50
First Gyro Survey							
180.00	0.50	291.40	180.00	0.67	-0.88	0.67	0.25
269.00	0.40	309.40	268.99	1.01	-1.49	1.01	0.19
349.00	0.30	297.00	348.99	1.28	-1.89	1.28	0.16
429.00	0.20	257.00	428.99	1.35	-2.21	1.34	0.24
509.00	0.10	148.80	508.99	1.26	-2.31	1.25	0.31
589.00	0.10	184.50	588.99	1.13	-2.28	1.12	0.08
669.00	0.10	123.20	668.99	1.02	-2.23	1.01	0.13
749.00	0.20	322.10	748.99	1.09	-2.26	1.08	0.37
829.00	0.20	306.90	828.99	1.28	-2.45	1.28	0.07
909.00	0.30	132.00	908.99	1.23	-2.41	1.22	0.62
989.00	0.80	130.60	988.99	0.73	-1.83	0.72	0.63
1,069.00	0.80	139.70	1,068.98	-0.06	-1.04	-0.07	0.16
1,149.00	0.70	143.30	1,148.97	-0.88	-0.39	-0.88	0.14
1,229.00	0.70	124.20	1,228.97	-1.55	0.31	-1.55	0.29
1,309.00	0.70	145.60	1,308.96	-2.23	0.99	-2.22	0.32
1,319.00	0.70	137.70	1,318.96	-2.32	1.06	-2.32	0.96
Last Gyro Survey							
1,364.00	0.70	137.70	1,363.96	-2.73	1.43	-2.72	0.00
1,366.00	0.73	139.89	1,365.96	-2.75	1.45	-2.74	1.93
First Sperry MWD Survey							
1,458.00	2.36	171.28	1,457.92	-5.07	2.11	-5.06	1.93
1,550.00	4.53	171.31	1,549.75	-10.53	2.95	-10.52	2.36
1,643.00	7.92	171.58	1,642.19	-20.50	4.44	-20.48	3.65
1,734.00	11.28	172.62	1,731.90	-35.53	6.50	-35.51	3.70
1,826.00	14.03	165.20	1,821.66	-55.25	10.51	-55.20	3.47
1,917.00	15.53	166.89	1,909.65	-77.78	16.09	-77.71	1.71
2,011.00	15.89	165.34	2,000.14	-102.48	22.20	-102.39	0.59
2,105.00	17.16	159.60	2,090.26	-127.93	30.29	-127.81	2.20
2,200.00	17.31	157.64	2,180.99	-154.14	40.55	-153.97	0.63
2,294.00	17.48	153.46	2,270.70	-179.70	52.18	-179.49	1.34
2,388.00	16.19	152.00	2,360.67	-203.90	64.64	-203.64	1.44
2,482.00	17.49	150.08	2,450.64	-227.72	77.84	-227.40	1.50
2,577.00	18.21	152.98	2,541.06	-253.31	91.71	-252.94	1.20
2,671.00	17.96	154.48	2,630.42	-279.48	104.62	-279.06	0.56
2,765.00	18.53	153.64	2,719.69	-305.94	117.50	-305.47	0.67
2,860.00	18.67	157.39	2,809.74	-333.50	130.05	-332.98	1.27
2,954.00	19.60	159.24	2,898.54	-362.14	141.42	-361.57	1.18
3,048.00	19.14	160.05	2,987.22	-391.36	152.27	-390.75	0.57
3,142.00	18.19	159.24	3,076.28	-419.57	162.73	-418.91	1.05
3,237.00	19.02	160.75	3,166.31	-448.05	173.09	-447.35	1.01
3,331.00	17.03	159.95	3,255.69	-475.45	182.86	-474.71	2.13
3,426.00	17.01	157.00	3,346.54	-501.31	193.05	-500.53	0.91
3,520.00	20.20	159.26	3,435.61	-529.15	204.18	-528.32	3.48
3,614.00	20.64	158.00	3,523.71	-559.68	216.13	-558.81	0.66
3,709.00	20.56	156.40	3,612.63	-590.50	229.08	-589.57	0.60
3,803.00	18.36	154.10	3,701.26	-618.94	242.16	-617.97	2.48
3,897.00	19.66	153.82	3,790.13	-646.45	255.60	-645.42	1.39

Design Report for Thomsen 4N- 31HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
3,992.00	20.09	150.94	3,879.47	-675.06	270.58	-673.96	1.13
4,086.00	20.39	152.37	3,967.67	-703.68	286.01	-702.52	0.62
4,181.00	21.61	152.75	4,056.36	-733.89	301.70	-732.67	1.29
4,275.00	21.77	153.28	4,143.70	-764.85	317.46	-763.57	0.27
4,369.00	20.99	152.53	4,231.23	-795.36	333.07	-794.01	0.88
4,463.00	18.87	150.75	4,319.60	-823.56	348.26	-822.16	2.35
4,558.00	19.54	148.88	4,409.31	-850.57	363.98	-849.10	0.96
4,652.00	21.03	151.58	4,497.48	-878.86	380.13	-877.33	1.87
4,746.00	20.13	150.85	4,585.48	-907.82	396.04	-906.22	1.00
4,841.00	20.27	152.77	4,674.64	-936.73	411.53	-935.07	0.71
4,935.00	20.52	158.35	4,762.76	-966.52	425.06	-964.81	2.08
5,030.00	19.33	158.42	4,852.07	-996.62	436.99	-994.86	1.25
5,124.00	18.63	159.11	4,940.96	-1,025.12	448.06	-1,023.31	0.78
5,218.00	19.96	156.15	5,029.68	-1,053.82	459.91	-1,051.97	1.76
5,313.00	18.31	155.25	5,119.43	-1,082.20	472.71	-1,080.30	1.76
5,407.00	21.04	157.78	5,207.93	-1,111.24	485.28	-1,109.28	3.04
5,501.00	19.34	155.65	5,296.15	-1,141.04	498.08	-1,139.04	1.97
5,596.00	20.36	153.45	5,385.51	-1,170.16	511.95	-1,168.10	1.33
5,690.00	19.34	154.06	5,473.92	-1,198.79	526.07	-1,196.66	1.11
5,784.00	17.74	153.29	5,563.04	-1,225.58	539.31	-1,223.40	1.72
5,879.00	19.08	152.78	5,653.18	-1,252.31	552.92	-1,250.08	1.42
5,973.00	19.71	156.74	5,741.85	-1,280.54	566.21	-1,278.26	1.55
6,067.00	18.12	153.53	5,830.77	-1,308.19	578.99	-1,305.86	2.02
6,162.00	19.94	157.03	5,920.58	-1,336.33	591.89	-1,333.95	2.26
6,256.00	18.17	155.28	6,009.42	-1,364.41	604.28	-1,361.97	1.98
6,351.00	19.38	151.87	6,099.37	-1,391.76	617.91	-1,389.27	1.72
6,445.00	16.74	149.94	6,188.73	-1,417.24	632.04	-1,414.69	2.88
6,539.00	18.15	150.48	6,278.41	-1,441.70	646.04	-1,439.09	1.51
6,633.00	17.57	152.37	6,367.88	-1,467.01	659.83	-1,464.35	0.87
6,728.00	14.52	149.63	6,459.17	-1,489.99	672.51	-1,487.28	3.31
6,775.00	13.68	116.05	6,504.82	-1,497.53	680.49	-1,494.79	17.26
6,822.00	12.35	75.67	6,550.71	-1,498.73	690.37	-1,495.94	19.16
6,869.00	14.80	50.64	6,596.43	-1,493.67	699.90	-1,490.85	13.41
6,916.00	13.78	26.48	6,642.02	-1,484.85	707.04	-1,482.00	12.78
6,963.00	14.98	11.15	6,687.56	-1,473.87	710.71	-1,471.01	8.47
7,010.00	15.00	7.02	6,732.96	-1,461.88	712.63	-1,459.00	2.27
7,057.00	15.66	3.53	6,778.29	-1,449.51	713.76	-1,446.63	2.41
7,105.00	15.41	8.28	6,824.54	-1,436.73	715.08	-1,433.85	2.70
7,152.00	20.00	10.30	6,869.30	-1,422.63	717.42	-1,419.74	9.85
7,199.00	28.32	5.50	6,912.15	-1,403.59	719.93	-1,400.69	18.18
7,246.00	32.95	4.85	6,952.58	-1,379.75	722.08	-1,376.84	9.88
7,293.00	33.95	5.39	6,991.79	-1,353.95	724.39	-1,351.03	2.22
7,340.00	37.50	9.03	7,029.95	-1,326.74	727.87	-1,323.81	8.80
7,387.00	39.95	9.90	7,066.61	-1,297.74	732.71	-1,294.79	5.34
7,434.00	48.39	9.88	7,100.30	-1,265.51	738.33	-1,262.53	17.96
7,482.00	57.38	8.07	7,129.23	-1,227.74	744.26	-1,224.74	18.97
7,529.00	66.27	7.31	7,151.40	-1,186.72	749.79	-1,183.70	18.97
7,576.00	69.24	7.35	7,169.19	-1,143.58	755.34	-1,140.53	6.32
7,623.00	73.11	6.81	7,184.35	-1,099.44	760.82	-1,096.37	8.31
7,671.00	78.07	5.63	7,196.30	-1,053.24	765.85	-1,050.15	10.60
7,731.00	85.74	2.09	7,204.74	-994.02	769.83	-990.92	14.05

Design Report for Thomsen 4N- 31HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7,913.00	88.55	0.81	7,213.81	-812.33	774.42	-809.21	1.70
8,007.00	87.81	0.97	7,216.79	-718.39	775.88	-715.27	0.81
8,101.00	88.98	1.77	7,219.42	-624.45	778.13	-621.32	1.51
8,196.00	88.55	2.42	7,221.47	-529.54	781.60	-526.40	0.82
8,290.00	89.97	2.76	7,222.69	-435.65	785.85	-432.49	1.55
8,385.00	91.05	3.35	7,221.84	-340.79	790.91	-337.61	1.30
8,479.00	90.65	0.86	7,220.45	-246.87	794.36	-243.68	2.68
8,574.00	90.59	0.34	7,219.42	-151.88	795.36	-148.68	0.55
8,668.00	91.76	0.34	7,217.49	-57.90	795.91	-54.71	1.24
8,762.00	90.80	359.28	7,215.39	36.07	795.60	39.27	1.52
8,856.00	89.38	358.09	7,215.24	130.04	793.45	133.23	1.97
8,951.00	90.22	358.32	7,215.57	224.99	790.47	228.17	0.92
9,045.00	90.40	357.98	7,215.07	318.94	787.44	322.10	0.41
9,139.00	90.40	357.01	7,214.41	412.85	783.33	415.99	1.03
9,234.00	91.08	358.00	7,213.18	507.75	779.19	510.88	1.26
9,328.00	90.22	358.75	7,212.12	601.71	776.53	604.82	1.21
9,423.00	91.39	359.03	7,210.78	696.68	774.69	699.78	1.27
9,517.00	90.49	359.23	7,209.24	790.65	773.26	793.75	0.98
9,612.00	91.45	358.86	7,207.63	885.62	771.68	888.71	1.08
9,706.00	90.28	359.36	7,206.21	979.60	770.22	982.68	1.35
9,800.00	89.01	1.04	7,206.79	1,073.59	770.54	1,076.68	2.24
9,895.00	88.58	0.94	7,208.79	1,168.56	772.19	1,171.65	0.46
9,989.00	89.63	0.51	7,210.26	1,262.54	773.37	1,265.63	1.21
10,083.00	90.18	0.15	7,210.42	1,356.53	773.92	1,359.63	0.70
10,178.00	90.96	359.74	7,209.47	1,451.53	773.82	1,454.62	0.93
10,271.00	89.57	0.44	7,209.04	1,544.52	773.97	1,547.62	1.67
10,366.00	89.32	359.67	7,209.96	1,639.52	774.06	1,642.61	0.85
10,460.00	89.82	358.94	7,210.67	1,733.51	772.92	1,736.60	0.94
10,555.00	90.49	359.90	7,210.41	1,828.50	771.96	1,831.59	1.23
10,646.00	90.15	359.97	7,209.90	1,919.50	771.86	1,922.58	0.38
10,738.00	90.28	359.05	7,209.56	2,011.50	771.07	2,014.57	1.01
10,829.00	88.21	0.07	7,210.76	2,102.48	770.37	2,105.55	2.54
10,921.00	89.14	359.51	7,212.88	2,194.45	770.03	2,197.53	1.18
11,012.00	88.83	358.32	7,214.50	2,285.42	768.31	2,288.49	1.35
11,104.00	89.75	359.72	7,215.64	2,377.40	766.74	2,380.45	1.82
11,195.00	90.12	359.95	7,215.74	2,468.40	766.48	2,471.45	0.48
11,287.00	89.85	1.74	7,215.76	2,560.38	767.83	2,563.44	1.97
11,378.00	90.00	1.27	7,215.88	2,651.35	770.22	2,654.42	0.54
11,470.00	90.31	0.78	7,215.63	2,743.33	771.87	2,746.41	0.63
11,563.00	91.45	1.05	7,214.20	2,836.31	773.35	2,839.39	1.26
11,656.00	89.41	1.67	7,213.51	2,929.28	775.56	2,932.37	2.29
11,748.00	90.06	0.99	7,213.93	3,021.25	777.70	3,024.35	1.02
11,841.00	90.99	0.79	7,213.08	3,114.23	779.14	3,117.34	1.02
11,933.00	90.59	1.68	7,211.81	3,206.20	781.12	3,209.31	1.06
12,025.00	92.04	1.38	7,209.70	3,298.14	783.58	3,301.26	1.61
12,118.00	91.02	2.80	7,207.22	3,391.04	786.97	3,394.18	1.88
12,209.00	89.41	3.73	7,206.88	3,481.89	792.15	3,485.04	2.04
12,301.00	88.80	2.69	7,208.31	3,573.73	797.30	3,576.91	1.31
12,392.00	89.94	1.92	7,209.31	3,664.65	800.96	3,667.84	1.51
12,487.00	88.40	1.11	7,210.69	3,759.61	803.47	3,762.80	1.83
12,581.00	90.52	1.00	7,211.58	3,853.58	805.20	3,856.78	2.26

Design Report for Thomsen 4N- 31HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
12,675.00	88.95	0.20	7,212.01	3,947.57	806.19	3,950.77	1.87
12,770.00	90.28	359.87	7,212.65	4,042.57	806.25	4,045.77	1.44
12,864.00	87.97	0.38	7,214.08	4,136.55	806.45	4,139.75	2.52
12,959.00	88.52	0.06	7,216.99	4,231.50	806.82	4,234.71	0.67
13,053.00	88.67	359.76	7,219.30	4,325.47	806.67	4,328.68	0.36
13,149.00	89.14	359.45	7,221.13	4,421.45	806.01	4,424.65	0.59
13,243.00	89.69	359.22	7,222.09	4,515.44	804.92	4,518.64	0.63
13,337.00	91.29	357.69	7,221.29	4,609.40	802.38	4,612.58	2.36
13,432.00	89.75	359.23	7,220.43	4,704.35	799.83	4,707.53	2.29
13,526.00	90.46	358.50	7,220.25	4,798.33	797.97	4,801.50	1.08
13,621.00	90.18	358.05	7,219.72	4,893.29	795.11	4,896.44	0.56
13,715.00	90.19	2.03	7,219.42	4,987.27	795.17	4,990.42	4.23
13,810.00	89.75	0.80	7,219.47	5,082.24	797.52	5,085.40	1.38
13,904.00	91.42	359.91	7,218.51	5,176.23	798.10	5,179.39	2.01
13,998.00	92.28	359.88	7,215.48	5,270.18	797.93	5,273.34	0.92
14,092.00	90.03	0.07	7,213.58	5,364.15	797.89	5,367.31	2.40
14,186.00	90.93	0.00	7,212.79	5,458.15	797.95	5,461.31	0.96
14,281.00	87.56	0.21	7,214.04	5,553.13	798.12	5,556.29	3.55
14,375.00	88.34	359.85	7,217.41	5,647.07	798.17	5,650.22	0.91
14,469.00	89.26	359.64	7,219.38	5,741.04	797.75	5,744.20	1.00
14,564.00	90.09	358.98	7,219.91	5,836.03	796.61	5,839.18	1.12
14,659.00	91.88	358.85	7,218.28	5,931.00	794.81	5,934.14	1.89
14,753.00	88.67	0.86	7,217.83	6,024.98	794.57	6,028.12	4.03
14,848.00	88.03	0.92	7,220.57	6,119.93	796.05	6,123.07	0.68
14,943.00	88.58	0.47	7,223.38	6,214.88	797.20	6,218.03	0.75
15,038.00	89.38	0.41	7,225.07	6,309.86	797.93	6,313.01	0.84
15,132.00	90.28	0.11	7,225.35	6,403.86	798.35	6,407.01	1.01
15,227.00	90.65	359.48	7,224.57	6,498.85	798.01	6,502.01	0.77
15,321.00	91.39	359.50	7,222.90	6,592.83	797.18	6,595.98	0.79
15,416.00	92.56	359.74	7,219.63	6,687.77	796.55	6,690.92	1.26
15,510.00	91.45	359.43	7,216.34	6,781.71	795.87	6,784.85	1.23
15,604.00	88.89	1.23	7,216.06	6,875.70	796.41	6,878.84	3.33
15,699.00	89.66	0.72	7,217.26	6,970.68	798.02	6,973.82	0.97
15,793.00	90.59	0.62	7,217.06	7,064.67	799.12	7,067.82	1.00
15,888.00	88.12	0.70	7,218.13	7,159.65	800.22	7,162.80	2.60
15,982.00	87.81	0.41	7,221.46	7,253.59	801.13	7,256.74	0.45
16,077.00	87.90	0.19	7,225.02	7,348.52	801.62	7,351.68	0.25
16,172.00	89.11	0.65	7,227.50	7,443.48	802.32	7,446.64	1.36
16,266.00	89.41	0.39	7,228.71	7,537.47	803.17	7,540.63	0.42
16,361.00	90.12	359.90	7,229.10	7,632.47	803.41	7,635.63	0.91
16,455.00	91.36	0.55	7,227.89	7,726.46	803.78	7,729.62	1.49
16,549.00	92.16	0.46	7,225.00	7,820.41	804.61	7,823.57	0.86
16,643.00	91.54	359.72	7,221.97	7,914.36	804.76	7,917.52	1.03
16,738.00	91.20	358.77	7,219.70	8,009.32	803.51	8,012.48	1.06
16,832.00	92.50	358.46	7,216.66	8,103.24	801.24	8,106.39	1.42
16,927.00	89.23	0.38	7,215.23	8,198.21	800.28	8,201.36	3.99
17,021.00	88.80	0.28	7,216.84	8,292.19	800.82	8,295.34	0.47
17,115.00	89.26	359.05	7,218.43	8,386.18	800.27	8,389.32	1.40
17,210.00	90.34	358.77	7,218.77	8,481.16	798.46	8,484.29	1.17
17,258.00	90.74	359.08	7,218.31	8,529.15	797.56	8,532.28	1.05

Final MWD Survey @ 17258.00' MD :: 7216.24' TVD

Design Report for Thomsen 4N- 31HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
17,306.00	90.74	359.08	7,217.69	8,577.14	796.79	8,580.27	0.00
Straight Line Projection to Bit @ 17306.00' MD :: 7215.62' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
101.00	101.00	0.31	-0.32	First Gyro Survey
1,319.00	1,318.96	-2.32	1.06	Last Gyro Survey
1,366.00	1,365.96	-2.75	1.45	First Sperry MWD Survey
17,258.00	7,218.31	8,529.15	797.56	Final MWD Survey @ 17258.00' MD :: 7216.24' TVD
17,306.00	7,217.69	8,577.14	796.79	Straight Line Projection to Bit @ 17306.00' MD :: 7215.62' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	0.23	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
101.00	1,364.00	Surface Surveys	MWD
1,385.00	7,750.00	Vertical/Build Surveys	MWD+IFR1+SC
7,838.00	17,306.00	Lateral Surveys	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,354.00	1,353.96	9 5/8"	9-5/8	13-3/4
7,778.00	7,207.94	7" @ 7778' MD	7	8-3/4

Design Report for Thomsen 4N- 31HZ - 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
THOMSEN 4N-31HZ_┘	0.00	0.00	0.00	0.00	0.00	1,299,839.26	3,220,668.49	40.153757	-104.710540
- actual wellpath hits target center									
- Polygon									
Point 1				0.00	7,627.01	700.59	1,307,471.89	3,221,301.12	
Point 2				0.00	8,947.63	713.84	1,308,792.52	3,221,302.62	
Point 3				0.00	9,407.64	718.46	1,309,252.53	3,221,303.14	
Point 4				0.00	9,406.05	1,632.93	1,309,259.08	3,222,217.55	
Point 5				0.00	8,946.59	1,629.76	1,308,799.63	3,222,218.47	
Point 6				0.00	7,624.89	1,620.64	1,307,477.96	3,222,221.12	
Point 7				0.00	6,366.34	1,608.02	1,306,219.40	3,222,219.70	
Point 8				0.00	5,054.81	1,595.31	1,304,907.86	3,222,218.67	
Point 9				0.00	3,730.67	1,581.76	1,303,583.71	3,222,216.91	
Point 10				0.00	2,406.56	1,568.36	1,302,259.59	3,222,215.30	
Point 11				0.00	1,092.67	1,557.31	1,300,945.71	3,222,215.94	
Point 12				0.00	-221.23	1,546.27	1,299,631.82	3,222,216.60	
Point 13				0.00	-1,075.01	1,539.11	1,298,778.04	3,222,217.04	
Point 14				0.00	-1,083.04	618.96	1,298,761.82	3,221,297.04	
Point 15				0.00	-233.56	626.09	1,299,611.30	3,221,296.61	
Point 16				0.00	2,385.84	648.09	1,302,230.68	3,221,295.29	
Point 17				0.00	5,033.82	675.02	1,304,878.68	3,221,298.64	
Point 18				0.00	6,356.87	687.84	1,306,201.74	3,221,299.68	
THOMSEN 4N-31HZ_┘	0.00	0.00	0.00	0.00	0.00	1,299,839.26	3,220,668.49	40.153757	-104.710540
- actual wellpath hits target center									
- Point									
THOMSEN 6-7HZ_SE	0.00	0.00	1.00	0.00	-29.91	1,299,839.00	3,220,638.58	40.153757	-104.710647
- actual wellpath misses target center by 29.91usft at 1.09usft MD (1.09 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				1.00	7,632.35	-1,453.02	1,307,457.79	3,219,117.73	
Point 2				1.00	10,270.52	-1,436.96	1,310,095.89	3,219,110.31	
Point 3				1.00	12,908.29	-1,421.76	1,312,733.58	3,219,102.02	
Point 4				1.00	12,909.69	1,226.98	1,312,758.56	3,221,750.53	
Point 5				1.00	12,907.78	3,891.66	1,312,780.37	3,224,415.01	
Point 6				1.00	10,263.87	3,871.46	1,310,136.50	3,224,418.35	
Point 7				1.00	7,620.17	3,852.05	1,307,492.84	3,224,422.48	
Point 8				1.00	7,625.89	1,190.53	1,307,474.86	3,221,761.13	
THOMSEN 6-7HZ_SE	0.00	0.00	1.00	0.00	-29.91	1,299,839.00	3,220,638.58	40.153757	-104.710647
- actual wellpath misses target center by 29.91usft at 1.09usft MD (1.09 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				1.00	2,337.85	-1,452.93	1,302,163.72	3,219,164.96	
Point 2				1.00	4,984.95	-1,452.83	1,304,810.61	3,219,141.49	
Point 3				1.00	7,632.39	-1,453.13	1,307,457.83	3,219,117.62	
Point 4				1.00	7,625.93	1,190.41	1,307,474.90	3,221,761.01	
Point 5				1.00	7,620.09	3,852.17	1,307,492.76	3,224,422.60	
Point 6				1.00	5,105.30	3,824.17	1,304,977.93	3,224,416.99	
Point 7				1.00	2,455.93	3,788.69	1,302,328.46	3,224,405.10	
Point 8				1.00	2,396.13	1,138.03	1,302,245.06	3,221,755.19	
THOMSEN 6-7HZ_SE	0.00	0.00	1.00	0.00	-29.91	1,299,839.00	3,220,638.58	40.153757	-104.710647
- actual wellpath misses target center by 29.91usft at 1.09usft MD (1.09 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				1.00	-2,861.17	-1,471.43	1,296,964.96	3,219,192.74	
Point 2				1.00	-261.92	-1,462.21	1,299,564.08	3,219,178.82	
Point 3				1.00	2,337.91	-1,452.89	1,302,163.78	3,219,165.00	
Point 4				1.00	2,396.19	1,138.12	1,302,245.12	3,221,755.28	
Point 5				1.00	2,455.95	3,788.77	1,302,328.48	3,224,405.18	
Point 6				1.00	-191.92	3,764.35	1,299,680.60	3,224,404.33	
Point 7				1.00	-2,840.33	3,739.98	1,297,032.19	3,224,403.54	
Point 8				1.00	-2,850.81	1,094.07	1,296,998.16	3,221,757.94	
THOMSEN 4N-31HZ_┘	0.00	0.00	7,214.00	-960.00	743.00	1,298,885.96	3,221,419.97	40.151122	-104.707882
- actual wellpath misses target center by 28.82usft at 7764.76usft MD (7207.10 TVD, -960.37 N, 770.98 E)									
- Point									
THOMSEN 4N-31HZ_┘	0.00	0.00	7,214.00	8,577.02	756.99	1,308,422.32	3,221,349.07	40.177301	-104.707831

Design Report for Thomsen 4N- 31HZ - Actual Surveys

- actual wellpath misses target center by 39.97usft at 17306.00usft MD (7217.69 TVD, 8577.14 N, 796.79 E)

- Point

THOMSEN 4N-31HZ_	0.00	0.00	7,214.00	8,577.02	806.99	1,308,422.77	3,221,399.06	40.177301	-104.707652
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- actual wellpath misses target center by 10.85usft at 17305.77usft MD (7217.70 TVD, 8576.90 N, 796.79 E)

- Point

Directional Difficulty Index

Average Dogleg over Survey:	1.90 °/100usft	Maximum Dogleg over Survey:	19.16 °/100usft at 6,822.00 usft
Net Tortosity applicable to Plans:	1.13 °/100usft	Directional Difficulty Index:	6.967

Audit Info

North Reference Sheet for Sec. 7-T2N-R65W - Thomsen 4N- 31HZ - 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 = 25' @ 4974.00usft (H&P 308). Northing and Easting are relative to Thomsen 4N- 31HZ

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: 0.99995827

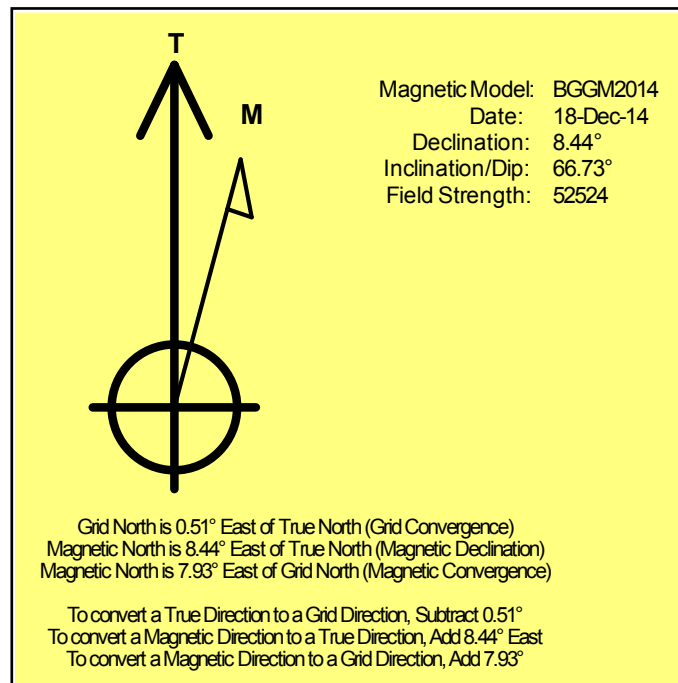
Grid Coordinates of Well: 1,299,839.26 usft N, 3,220,668.49 usft E

Geographical Coordinates of Well: 40° 09' 13.53" N, 104° 42' 37.94" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 17,306.00usft
the Bottom Hole Displacement is 8,614.07usft in the Direction of 5.31° (True).

Magnetic Convergence at surface is: -7.93° (18 December 2014, , BGGM2014)



Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 7-T2N-R65W

Thomsen 4N- 31HZ

API: 05-123-40555 :: Job #: 901927789

Plan A

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

12 March, 2015

Well Coordinates: 1,299,839.26 N, 3,220,668.49 E (40° 09' 13.53" N, 104° 42' 37.94" W)

Ground Level: 4,949.00 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 Thomsen 4N- 31HZ

RKB = 25' @ 4974.00usft (H&P 308)

N

True

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Design Report for Thomsen 4N- 31HZ - 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	40.153757	-104.710540	1,299,839.26	3,220,668.49
101.00	0.50	314.10	101.00	0.31	-0.32	40.153758	-104.710541	1,299,839.57	3,220,668.17
180.00	0.50	291.40	180.00	0.67	-0.88	40.153759	-104.710543	1,299,839.93	3,220,667.60
269.00	0.40	309.40	268.99	1.01	-1.49	40.153760	-104.710546	1,299,840.26	3,220,666.99
349.00	0.30	297.00	348.99	1.28	-1.89	40.153761	-104.710547	1,299,840.53	3,220,666.59
429.00	0.20	257.00	428.99	1.35	-2.21	40.153761	-104.710548	1,299,840.59	3,220,666.27
509.00	0.10	148.80	508.99	1.26	-2.31	40.153761	-104.710549	1,299,840.50	3,220,666.17
589.00	0.10	184.50	588.99	1.13	-2.28	40.153760	-104.710548	1,299,840.37	3,220,666.20
669.00	0.10	123.20	668.99	1.02	-2.23	40.153760	-104.710548	1,299,840.26	3,220,666.25
749.00	0.20	322.10	748.99	1.09	-2.26	40.153760	-104.710548	1,299,840.33	3,220,666.22
829.00	0.20	306.90	828.99	1.28	-2.45	40.153761	-104.710549	1,299,840.53	3,220,666.02
909.00	0.30	132.00	908.99	1.23	-2.41	40.153760	-104.710549	1,299,840.47	3,220,666.07
989.00	0.80	130.60	988.99	0.73	-1.83	40.153759	-104.710547	1,299,839.97	3,220,666.65
1,069.00	0.80	139.70	1,068.98	-0.06	-1.04	40.153757	-104.710544	1,299,839.19	3,220,667.45
1,149.00	0.70	143.30	1,148.97	-0.88	-0.39	40.153755	-104.710542	1,299,838.38	3,220,668.11
1,229.00	0.70	124.20	1,228.97	-1.55	0.31	40.153753	-104.710539	1,299,837.72	3,220,668.81
1,309.00	0.70	145.60	1,308.96	-2.23	0.99	40.153751	-104.710537	1,299,837.05	3,220,669.49
1,319.00	0.70	137.70	1,318.96	-2.32	1.06	40.153751	-104.710536	1,299,836.95	3,220,669.57
1,364.00	0.70	137.70	1,363.96	-2.73	1.43	40.153750	-104.710535	1,299,836.55	3,220,669.94
1,366.00	0.73	139.89	1,365.96	-2.75	1.45	40.153750	-104.710535	1,299,836.53	3,220,669.96
1,458.00	2.36	171.28	1,457.92	-5.07	2.11	40.153743	-104.710533	1,299,834.22	3,220,670.65
1,550.00	4.53	171.31	1,549.75	-10.53	2.95	40.153728	-104.710530	1,299,828.76	3,220,671.53
1,643.00	7.92	171.58	1,642.19	-20.50	4.44	40.153701	-104.710524	1,299,818.80	3,220,673.11
1,734.00	11.28	172.62	1,731.90	-35.53	6.50	40.153660	-104.710517	1,299,803.79	3,220,675.31
1,826.00	14.03	165.20	1,821.66	-55.25	10.51	40.153605	-104.710503	1,299,784.12	3,220,679.49
1,917.00	15.53	166.89	1,909.65	-77.78	16.09	40.153544	-104.710483	1,299,761.64	3,220,685.27
2,011.00	15.89	165.34	2,000.14	-102.48	22.20	40.153476	-104.710461	1,299,736.99	3,220,691.60
2,105.00	17.16	159.60	2,090.26	-127.93	30.29	40.153406	-104.710432	1,299,711.61	3,220,699.92
2,200.00	17.31	157.64	2,180.99	-154.14	40.55	40.153334	-104.710395	1,299,685.50	3,220,710.41
2,294.00	17.48	153.46	2,270.70	-179.70	52.18	40.153264	-104.710354	1,299,660.04	3,220,722.27
2,388.00	16.19	152.00	2,360.67	-203.90	64.64	40.153197	-104.710309	1,299,635.95	3,220,734.94
2,482.00	17.49	150.08	2,450.64	-227.72	77.84	40.153132	-104.710262	1,299,612.26	3,220,748.35
2,577.00	18.21	152.98	2,541.06	-253.31	91.71	40.153062	-104.710212	1,299,586.79	3,220,762.44
2,671.00	17.96	154.48	2,630.42	-279.48	104.62	40.152990	-104.710166	1,299,560.74	3,220,775.59
2,765.00	18.53	153.64	2,719.69	-305.94	117.50	40.152917	-104.710120	1,299,534.39	3,220,788.70
2,860.00	18.67	157.39	2,809.74	-333.50	130.05	40.152842	-104.710075	1,299,506.94	3,220,801.49
2,954.00	19.60	159.24	2,898.54	-362.14	141.42	40.152763	-104.710034	1,299,478.41	3,220,813.12
3,048.00	19.14	160.05	2,987.22	-391.36	152.27	40.152683	-104.709996	1,299,449.29	3,220,824.23
3,142.00	18.19	159.24	3,076.28	-419.57	162.73	40.152605	-104.709958	1,299,421.18	3,220,834.94
3,237.00	19.02	160.75	3,166.31	-448.05	173.09	40.152527	-104.709921	1,299,392.79	3,220,845.55
3,331.00	17.03	159.95	3,255.69	-475.45	182.86	40.152452	-104.709886	1,299,365.48	3,220,855.56
3,426.00	17.01	157.00	3,346.54	-501.31	193.05	40.152381	-104.709850	1,299,339.72	3,220,865.99

Design Report for Thomsen 4N- 31HZ - 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)
3,520.00	20.20	159.26	3,435.61	-529.15	204.18	40.152305	-104.709810	1,299,311.98	3,220,877.36
3,614.00	20.64	158.00	3,523.71	-559.68	216.13	40.152221	-104.709767	1,299,281.55	3,220,889.58
3,709.00	20.56	156.40	3,612.63	-590.50	229.08	40.152136	-104.709721	1,299,250.85	3,220,902.81
3,803.00	18.36	154.10	3,701.26	-618.94	242.16	40.152058	-104.709674	1,299,222.53	3,220,916.14
3,897.00	19.66	153.82	3,790.13	-646.45	255.60	40.151983	-104.709626	1,299,195.14	3,220,929.82
3,992.00	20.09	150.94	3,879.47	-675.06	270.58	40.151904	-104.709572	1,299,166.67	3,220,945.05
4,086.00	20.39	152.37	3,967.67	-703.68	286.01	40.151825	-104.709517	1,299,138.19	3,220,960.74
4,181.00	21.61	152.75	4,056.36	-733.89	301.70	40.151743	-104.709461	1,299,108.12	3,220,976.70
4,275.00	21.77	153.28	4,143.70	-764.85	317.46	40.151658	-104.709405	1,299,077.30	3,220,992.73
4,369.00	20.99	152.53	4,231.23	-795.36	333.07	40.151574	-104.709349	1,299,046.94	3,221,008.61
4,463.00	18.87	150.75	4,319.60	-823.56	348.26	40.151496	-104.709294	1,299,018.87	3,221,024.05
4,558.00	19.54	148.88	4,409.31	-850.57	363.98	40.151422	-104.709238	1,298,992.01	3,221,040.01
4,652.00	21.03	151.58	4,497.48	-878.86	380.13	40.151345	-104.709180	1,298,963.86	3,221,056.41
4,746.00	20.13	150.85	4,585.48	-907.82	396.04	40.151265	-104.709124	1,298,935.04	3,221,072.58
4,841.00	20.27	152.77	4,674.64	-936.73	411.53	40.151186	-104.709068	1,298,906.27	3,221,088.33
4,935.00	20.52	158.35	4,762.76	-966.52	425.06	40.151104	-104.709020	1,298,876.60	3,221,102.12
5,030.00	19.33	158.42	4,852.07	-996.62	436.99	40.151021	-104.708977	1,298,846.61	3,221,114.31
5,124.00	18.63	159.11	4,940.96	-1,025.12	448.06	40.150943	-104.708937	1,298,818.22	3,221,125.64
5,218.00	19.96	156.15	5,029.68	-1,053.82	459.91	40.150864	-104.708895	1,298,789.62	3,221,137.74
5,313.00	18.31	155.25	5,119.43	-1,082.20	472.71	40.150786	-104.708849	1,298,761.36	3,221,150.79
5,407.00	21.04	157.78	5,207.93	-1,111.24	485.28	40.150707	-104.708804	1,298,732.43	3,221,163.62
5,501.00	19.34	155.65	5,296.15	-1,141.04	498.08	40.150625	-104.708759	1,298,702.75	3,221,176.68
5,596.00	20.36	153.45	5,385.51	-1,170.16	511.95	40.150545	-104.708709	1,298,673.76	3,221,190.81
5,690.00	19.34	154.06	5,473.92	-1,198.79	526.07	40.150466	-104.708658	1,298,645.26	3,221,205.18
5,784.00	17.74	153.29	5,563.04	-1,225.58	539.31	40.150393	-104.708611	1,298,618.59	3,221,218.67
5,879.00	19.08	152.78	5,653.18	-1,252.31	552.92	40.150319	-104.708562	1,298,591.97	3,221,232.51
5,973.00	19.71	156.74	5,741.85	-1,280.54	566.21	40.150242	-104.708515	1,298,563.87	3,221,246.05
6,067.00	18.12	153.53	5,830.77	-1,308.19	578.99	40.150166	-104.708469	1,298,536.33	3,221,259.07
6,162.00	19.94	157.03	5,920.58	-1,336.33	591.89	40.150089	-104.708423	1,298,508.31	3,221,272.23
6,256.00	18.17	155.28	6,009.42	-1,364.41	604.28	40.150012	-104.708379	1,298,480.35	3,221,284.86
6,351.00	19.38	151.87	6,099.37	-1,391.76	617.91	40.149937	-104.708330	1,298,453.11	3,221,298.73
6,445.00	16.74	149.94	6,188.73	-1,417.24	632.04	40.149867	-104.708279	1,298,427.77	3,221,313.10
6,539.00	18.15	150.48	6,278.41	-1,441.70	646.04	40.149800	-104.708229	1,298,403.43	3,221,327.31
6,633.00	17.57	152.37	6,367.88	-1,467.01	659.83	40.149730	-104.708180	1,298,378.25	3,221,341.33
6,728.00	14.52	149.63	6,459.17	-1,489.99	672.51	40.149667	-104.708135	1,298,355.38	3,221,354.20
6,775.00	13.68	116.05	6,504.82	-1,497.53	680.49	40.149646	-104.708106	1,298,347.91	3,221,362.26
6,822.00	12.35	75.67	6,550.71	-1,498.73	690.37	40.149643	-104.708071	1,298,346.80	3,221,372.15
6,869.00	14.80	50.64	6,596.43	-1,493.67	699.90	40.149657	-104.708037	1,298,351.94	3,221,381.62
6,916.00	13.78	26.48	6,642.02	-1,484.85	707.04	40.149681	-104.708011	1,298,360.83	3,221,388.69
6,963.00	14.98	11.15	6,687.56	-1,473.87	710.71	40.149711	-104.707998	1,298,371.84	3,221,392.26
7,010.00	15.00	7.02	6,732.96	-1,461.88	712.63	40.149744	-104.707991	1,298,383.85	3,221,394.07
7,057.00	15.66	3.53	6,778.29	-1,449.51	713.76	40.149778	-104.707987	1,298,396.23	3,221,395.10

Design Report for Thomsen 4N- 31HZ - 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)
7,105.00	15.41	8.28	6,824.54	-1,436.73	715.08	40.149813	-104.707982	1,298,409.02	3,221,396.30
7,152.00	20.00	10.30	6,869.30	-1,422.63	717.42	40.149852	-104.707974	1,298,423.13	3,221,398.51
7,199.00	28.32	5.50	6,912.15	-1,403.59	719.93	40.149904	-104.707965	1,298,442.19	3,221,400.85
7,246.00	32.95	4.85	6,952.58	-1,379.75	722.08	40.149970	-104.707957	1,298,466.06	3,221,402.79
7,293.00	33.95	5.39	6,991.79	-1,353.95	724.39	40.150040	-104.707949	1,298,491.88	3,221,404.88
7,340.00	37.50	9.03	7,029.95	-1,326.74	727.87	40.150115	-104.707937	1,298,519.11	3,221,408.11
7,387.00	39.95	9.90	7,066.61	-1,297.74	732.71	40.150195	-104.707919	1,298,548.15	3,221,412.69
7,434.00	48.39	9.88	7,100.30	-1,265.51	738.33	40.150283	-104.707899	1,298,580.43	3,221,418.03
7,482.00	57.38	8.07	7,129.23	-1,227.74	744.26	40.150387	-104.707878	1,298,618.25	3,221,423.62
7,529.00	66.27	7.31	7,151.40	-1,186.72	749.79	40.150499	-104.707858	1,298,659.32	3,221,428.78
7,576.00	69.24	7.35	7,169.19	-1,143.58	755.34	40.150618	-104.707838	1,298,702.50	3,221,433.95
7,623.00	73.11	6.81	7,184.35	-1,099.44	760.82	40.150739	-104.707819	1,298,746.69	3,221,439.03
7,671.00	78.07	5.63	7,196.30	-1,053.24	765.85	40.150866	-104.707801	1,298,792.93	3,221,443.65
7,731.00	85.74	2.09	7,204.74	-994.02	769.83	40.151028	-104.707786	1,298,852.18	3,221,447.10
7,913.00	88.55	0.81	7,213.81	-812.33	774.42	40.151527	-104.707770	1,299,033.90	3,221,450.08
8,007.00	87.81	0.97	7,216.79	-718.39	775.88	40.151785	-104.707765	1,299,127.84	3,221,450.70
8,101.00	88.98	1.77	7,219.42	-624.45	778.13	40.152043	-104.707757	1,299,221.79	3,221,452.11
8,196.00	88.55	2.42	7,221.47	-529.54	781.60	40.152303	-104.707744	1,299,316.72	3,221,454.74
8,290.00	89.97	2.76	7,222.69	-435.65	785.85	40.152561	-104.707729	1,299,410.65	3,221,458.15
8,385.00	91.05	3.35	7,221.84	-340.79	790.91	40.152822	-104.707711	1,299,505.55	3,221,462.37
8,479.00	90.65	0.86	7,220.45	-246.87	794.36	40.153079	-104.707699	1,299,599.49	3,221,464.98
8,574.00	90.59	0.34	7,219.42	-151.88	795.36	40.153340	-104.707695	1,299,694.48	3,221,465.13
8,668.00	91.76	0.34	7,217.49	-57.90	795.91	40.153598	-104.707693	1,299,788.45	3,221,464.85
8,762.00	90.80	359.28	7,215.39	36.07	795.60	40.153856	-104.707694	1,299,882.41	3,221,463.71
8,856.00	89.38	358.09	7,215.24	130.04	793.45	40.154114	-104.707702	1,299,976.36	3,221,460.71
8,951.00	90.22	358.32	7,215.57	224.99	790.47	40.154375	-104.707712	1,300,071.28	3,221,456.89
9,045.00	90.40	357.98	7,215.07	318.94	787.44	40.154633	-104.707723	1,300,165.19	3,221,453.02
9,139.00	90.40	357.01	7,214.41	412.85	783.33	40.154890	-104.707738	1,300,259.05	3,221,448.08
9,234.00	91.08	358.00	7,213.18	507.75	779.19	40.155151	-104.707753	1,300,353.91	3,221,443.10
9,328.00	90.22	358.75	7,212.12	601.71	776.53	40.155409	-104.707762	1,300,447.83	3,221,439.59
9,423.00	91.39	359.03	7,210.78	696.68	774.69	40.155669	-104.707769	1,300,542.78	3,221,436.91
9,517.00	90.49	359.23	7,209.24	790.65	773.26	40.155927	-104.707774	1,300,636.73	3,221,434.65
9,612.00	91.45	358.86	7,207.63	885.62	771.68	40.156188	-104.707780	1,300,731.69	3,221,432.22
9,706.00	90.28	359.36	7,206.21	979.60	770.22	40.156446	-104.707785	1,300,825.64	3,221,429.92
9,800.00	89.01	1.04	7,206.79	1,073.59	770.54	40.156704	-104.707784	1,300,919.63	3,221,429.41
9,895.00	88.58	0.94	7,208.79	1,168.56	772.19	40.156965	-104.707778	1,301,014.60	3,221,430.21
9,989.00	89.63	0.51	7,210.26	1,262.54	773.37	40.157223	-104.707773	1,301,108.58	3,221,430.56
10,083.00	90.18	0.15	7,210.42	1,356.53	773.92	40.157481	-104.707772	1,301,202.58	3,221,430.26
10,178.00	90.96	359.74	7,209.47	1,451.53	773.82	40.157742	-104.707772	1,301,297.56	3,221,429.33
10,271.00	89.57	0.44	7,209.04	1,544.52	773.97	40.157997	-104.707771	1,301,390.55	3,221,428.65
10,366.00	89.32	359.67	7,209.96	1,639.52	774.06	40.158258	-104.707771	1,301,485.54	3,221,427.89
10,460.00	89.82	358.94	7,210.67	1,733.51	772.92	40.158516	-104.707775	1,301,579.51	3,221,425.92

Design Report for Thomsen 4N- 31HZ - 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)
10,555.00	90.49	359.90	7,210.41	1,828.50	771.96	40.158776	-104.707778	1,301,674.49	3,221,424.11
10,646.00	90.15	359.97	7,209.90	1,919.50	771.86	40.159026	-104.707779	1,301,765.48	3,221,423.19
10,738.00	90.28	359.05	7,209.56	2,011.50	771.07	40.159279	-104.707782	1,301,857.46	3,221,421.59
10,829.00	88.21	0.07	7,210.76	2,102.48	770.37	40.159528	-104.707784	1,301,948.43	3,221,420.08
10,921.00	89.14	359.51	7,212.88	2,194.45	770.03	40.159781	-104.707785	1,302,040.39	3,221,418.92
11,012.00	88.83	358.32	7,214.50	2,285.42	768.31	40.160031	-104.707791	1,302,131.34	3,221,416.39
11,104.00	89.75	359.72	7,215.64	2,377.40	766.74	40.160283	-104.707797	1,302,223.29	3,221,414.00
11,195.00	90.12	359.95	7,215.74	2,468.40	766.48	40.160533	-104.707798	1,302,314.28	3,221,412.93
11,287.00	89.85	1.74	7,215.76	2,560.38	767.83	40.160785	-104.707793	1,302,406.27	3,221,413.47
11,378.00	90.00	1.27	7,215.88	2,651.35	770.22	40.161035	-104.707785	1,302,497.25	3,221,415.05
11,470.00	90.31	0.78	7,215.63	2,743.33	771.87	40.161288	-104.707779	1,302,589.25	3,221,415.87
11,563.00	91.45	1.05	7,214.20	2,836.31	773.35	40.161543	-104.707773	1,302,682.23	3,221,416.53
11,656.00	89.41	1.67	7,213.51	2,929.28	775.56	40.161798	-104.707765	1,302,775.20	3,221,417.91
11,748.00	90.06	0.99	7,213.93	3,021.25	777.70	40.162050	-104.707758	1,302,867.19	3,221,419.22
11,841.00	90.99	0.79	7,213.08	3,114.23	779.14	40.162306	-104.707753	1,302,960.18	3,221,419.84
11,933.00	90.59	1.68	7,211.81	3,206.20	781.12	40.162558	-104.707746	1,303,052.16	3,221,421.01
12,025.00	92.04	1.38	7,209.70	3,298.14	783.58	40.162810	-104.707737	1,303,144.11	3,221,422.64
12,118.00	91.02	2.80	7,207.22	3,391.04	786.97	40.163066	-104.707725	1,303,237.04	3,221,425.21
12,209.00	89.41	3.73	7,206.88	3,481.89	792.15	40.163315	-104.707706	1,303,327.92	3,221,429.58
12,301.00	88.80	2.69	7,208.31	3,573.73	797.30	40.163567	-104.707688	1,303,419.80	3,221,433.91
12,392.00	89.94	1.92	7,209.31	3,664.65	800.96	40.163817	-104.707674	1,303,510.75	3,221,436.76
12,487.00	88.40	1.11	7,210.69	3,759.61	803.47	40.164077	-104.707665	1,303,605.72	3,221,438.43
12,581.00	90.52	1.00	7,211.58	3,853.58	805.20	40.164335	-104.707659	1,303,699.70	3,221,439.32
12,675.00	88.95	0.20	7,212.01	3,947.57	806.19	40.164593	-104.707656	1,303,793.69	3,221,439.47
12,770.00	90.28	359.87	7,212.65	4,042.57	806.25	40.164854	-104.707656	1,303,888.68	3,221,438.68
12,864.00	87.97	0.38	7,214.08	4,136.55	806.45	40.165112	-104.707655	1,303,982.65	3,221,438.05
12,959.00	88.52	0.06	7,216.99	4,231.50	806.82	40.165373	-104.707653	1,304,077.60	3,221,437.57
13,053.00	88.67	359.76	7,219.30	4,325.47	806.67	40.165631	-104.707654	1,304,171.57	3,221,436.58
13,149.00	89.14	359.45	7,221.13	4,421.45	806.01	40.165894	-104.707656	1,304,267.53	3,221,435.07
13,243.00	89.69	359.22	7,222.09	4,515.44	804.92	40.166152	-104.707660	1,304,361.50	3,221,433.14
13,337.00	91.29	357.69	7,221.29	4,609.40	802.38	40.166410	-104.707669	1,304,455.43	3,221,429.77
13,432.00	89.75	359.23	7,220.43	4,704.35	799.83	40.166671	-104.707678	1,304,550.36	3,221,426.37
13,526.00	90.46	358.50	7,220.25	4,798.33	797.97	40.166929	-104.707685	1,304,644.31	3,221,423.67
13,621.00	90.18	358.05	7,219.72	4,893.29	795.11	40.167189	-104.707695	1,304,739.23	3,221,419.97
13,715.00	90.19	2.03	7,219.42	4,987.27	795.17	40.167447	-104.707695	1,304,833.21	3,221,419.20
13,810.00	89.75	0.80	7,219.47	5,082.24	797.52	40.167708	-104.707687	1,304,928.19	3,221,420.70
13,904.00	91.42	359.91	7,218.51	5,176.23	798.10	40.167966	-104.707685	1,305,022.18	3,221,420.44
13,998.00	92.28	359.88	7,215.48	5,270.18	797.93	40.168224	-104.707685	1,305,116.12	3,221,419.44
14,092.00	90.03	0.07	7,213.58	5,364.15	797.89	40.168482	-104.707685	1,305,210.08	3,221,418.56
14,186.00	90.93	0.00	7,212.79	5,458.15	797.95	40.168740	-104.707685	1,305,304.07	3,221,417.78
14,281.00	87.56	0.21	7,214.04	5,553.13	798.12	40.169000	-104.707684	1,305,399.04	3,221,417.11
14,375.00	88.34	359.85	7,217.41	5,647.07	798.17	40.169258	-104.707684	1,305,492.97	3,221,416.32

Design Report for Thomsen 4N- 31HZ - 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)
14,469.00	89.26	359.64	7,219.38	5,741.04	797.75	40.169516	-104.707686	1,305,586.94	3,221,415.07
14,564.00	90.09	358.98	7,219.91	5,836.03	796.61	40.169777	-104.707690	1,305,681.91	3,221,413.08
14,659.00	91.88	358.85	7,218.28	5,931.00	794.81	40.170038	-104.707696	1,305,776.85	3,221,410.43
14,753.00	88.67	0.86	7,217.83	6,024.98	794.57	40.170296	-104.707697	1,305,870.83	3,221,409.36
14,848.00	88.03	0.92	7,220.57	6,119.93	796.05	40.170556	-104.707692	1,305,965.78	3,221,409.99
14,943.00	88.58	0.47	7,223.38	6,214.88	797.20	40.170817	-104.707688	1,306,060.73	3,221,410.29
15,038.00	89.38	0.41	7,225.07	6,309.86	797.93	40.171078	-104.707685	1,306,155.71	3,221,410.18
15,132.00	90.28	0.11	7,225.35	6,403.86	798.35	40.171336	-104.707684	1,306,249.71	3,221,409.77
15,227.00	90.65	359.48	7,224.57	6,498.85	798.01	40.171597	-104.707685	1,306,344.69	3,221,408.58
15,321.00	91.39	359.50	7,222.90	6,592.83	797.18	40.171854	-104.707688	1,306,438.66	3,221,406.91
15,416.00	92.56	359.74	7,219.63	6,687.77	796.55	40.172115	-104.707690	1,306,533.58	3,221,405.43
15,510.00	91.45	359.43	7,216.34	6,781.71	795.87	40.172373	-104.707692	1,306,627.51	3,221,403.92
15,604.00	88.89	1.23	7,216.06	6,875.70	796.41	40.172631	-104.707690	1,306,721.49	3,221,403.62
15,699.00	89.66	0.72	7,217.26	6,970.68	798.02	40.172892	-104.707685	1,306,816.48	3,221,404.39
15,793.00	90.59	0.62	7,217.06	7,064.67	799.12	40.173150	-104.707681	1,306,910.47	3,221,404.65
15,888.00	88.12	0.70	7,218.13	7,159.65	800.22	40.173410	-104.707677	1,307,005.45	3,221,404.90
15,982.00	87.81	0.41	7,221.46	7,253.59	801.13	40.173668	-104.707673	1,307,099.39	3,221,404.98
16,077.00	87.90	0.19	7,225.02	7,348.52	801.62	40.173929	-104.707672	1,307,194.32	3,221,404.63
16,172.00	89.11	0.65	7,227.50	7,443.48	802.32	40.174190	-104.707669	1,307,289.28	3,221,404.48
16,266.00	89.41	0.39	7,228.71	7,537.47	803.17	40.174448	-104.707666	1,307,383.27	3,221,404.50
16,361.00	90.12	359.90	7,229.10	7,632.47	803.41	40.174708	-104.707665	1,307,478.26	3,221,403.89
16,455.00	91.36	0.55	7,227.89	7,726.46	803.78	40.174966	-104.707664	1,307,572.25	3,221,403.42
16,549.00	92.16	0.46	7,225.00	7,820.41	804.61	40.175224	-104.707661	1,307,666.20	3,221,403.41
16,643.00	91.54	359.72	7,221.97	7,914.36	804.76	40.175482	-104.707660	1,307,760.14	3,221,402.73
16,738.00	91.20	358.77	7,219.70	8,009.32	803.51	40.175743	-104.707665	1,307,855.08	3,221,400.63
16,832.00	92.50	358.46	7,216.66	8,103.24	801.24	40.176001	-104.707673	1,307,948.98	3,221,397.52
16,927.00	89.23	0.38	7,215.23	8,198.21	800.28	40.176261	-104.707676	1,308,043.93	3,221,395.72
17,021.00	88.80	0.28	7,216.84	8,292.19	800.82	40.176519	-104.707674	1,308,137.91	3,221,395.42
17,115.00	89.26	359.05	7,218.43	8,386.18	800.27	40.176777	-104.707676	1,308,231.88	3,221,394.03
17,210.00	90.34	358.77	7,218.77	8,481.16	798.46	40.177038	-104.707683	1,308,326.84	3,221,391.38
17,258.00	90.74	359.08	7,218.31	8,529.15	797.56	40.177170	-104.707686	1,308,374.82	3,221,390.05
17,306.00	90.74	359.08	7,217.69	8,577.14	796.79	40.177301	-104.707689	1,308,422.79	3,221,388.86

Design Report for Thomsen 4N- 31HZ - Actual Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
101.00	101.00	0.31	-0.32	First Gyro Survey
1,319.00	1,318.96	-2.32	1.06	Last Gyro Survey
1,366.00	1,365.96	-2.75	1.45	First Sperry MWD Survey
17,258.00	7,218.31	8,529.15	797.56	Final MWD Survey @ 17258.00' MD :: 7216.24' TVD
17,306.00	7,217.69	8,577.14	796.79	Straight Line Projection to Bit @ 17306.00' MD :: 7215.62' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	0.23	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
101.00	1,364.00	Surface Surveys	MWD
1,385.00	7,750.00	Vertical/Build Surveys	MWD+IFR1+SC
7,838.00	17,306.00	Lateral Surveys	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,354.00	1,353.96	9 5/8"	9-5/8	13-3/4
7,778.00	7,207.94	7" @ 7778' MD	7	8-3/4

Design Report for Thomsen 4N- 31HZ - Actual Surveys

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:	1.90 °/100usft	Maximum Dogleg over Survey:	19.16 °/100usft at 6,822.00 usft
Net Tortosity applicable to Plans:	1.13 °/100usft	Directional Difficulty Index:	6.967

Audit Info

North Reference Sheet for Sec. 7-T2N-R65W - Thomsen 4N- 31HZ - 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 = 25' @ 4974.00usft (H&P 308). Northing and Easting are relative to Thomsen 4N- 31HZ

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: 0.99995827

Grid Coordinates of Well: 1,299,839.26 usft N, 3,220,668.49 usft E

Geographical Coordinates of Well: 40° 09' 13.53" N, 104° 42' 37.94" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 17,306.00usft

the Bottom Hole Displacement is 8,614.07usft in the Direction of 5.31° (True).

Magnetic Convergence at surface is: -7.93° (18 December 2014, , BGGM2014)

