

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 31-T3N-R66W

FRANK 13N-31HZ

Plan A

Plan: Rev A0 Permit

## Sperry Drilling Services

### Proposal Report

31 March, 2014

Well Coordinates: 1,339,471.33 N, 3,160,513.41 E (40° 15' 49.75" N, 104° 55' 29.36" W)

Ground Level: 4,931.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well FRANK 13N-31HZ

RKB=17' @ 4948.00usft (DRILLING RIG)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
 Site: Sec. 31-T4N-R67W  
 Well: FRANK 13N-31HZ  
 Wellbore: Plan A  
 Design: Rev A0 Permit

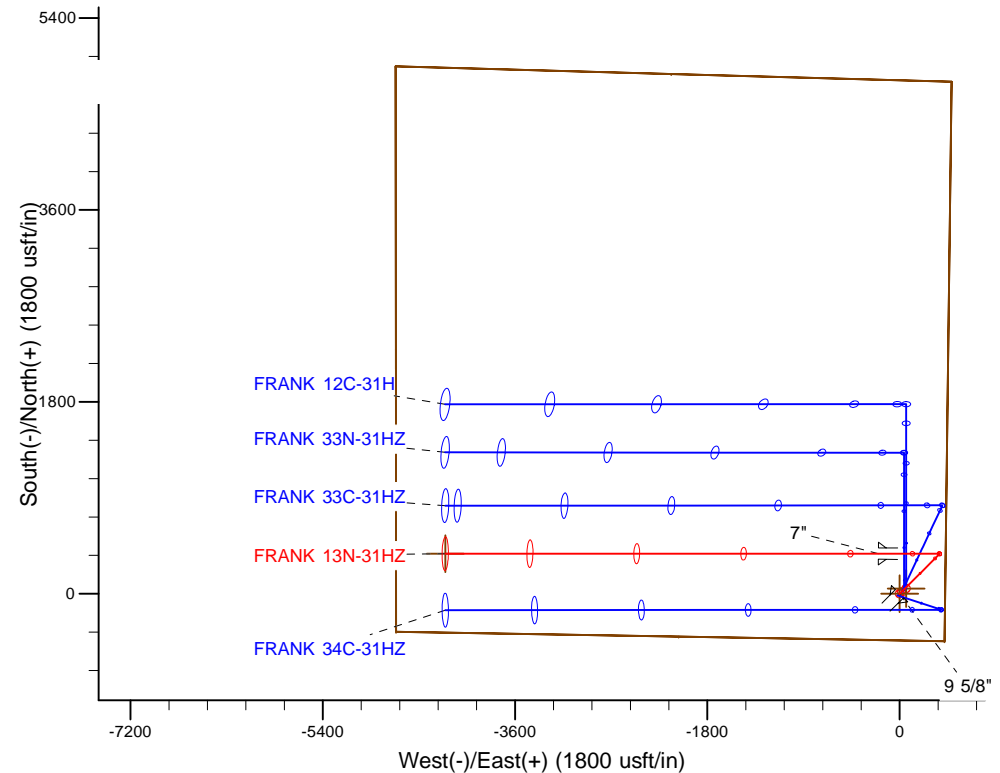
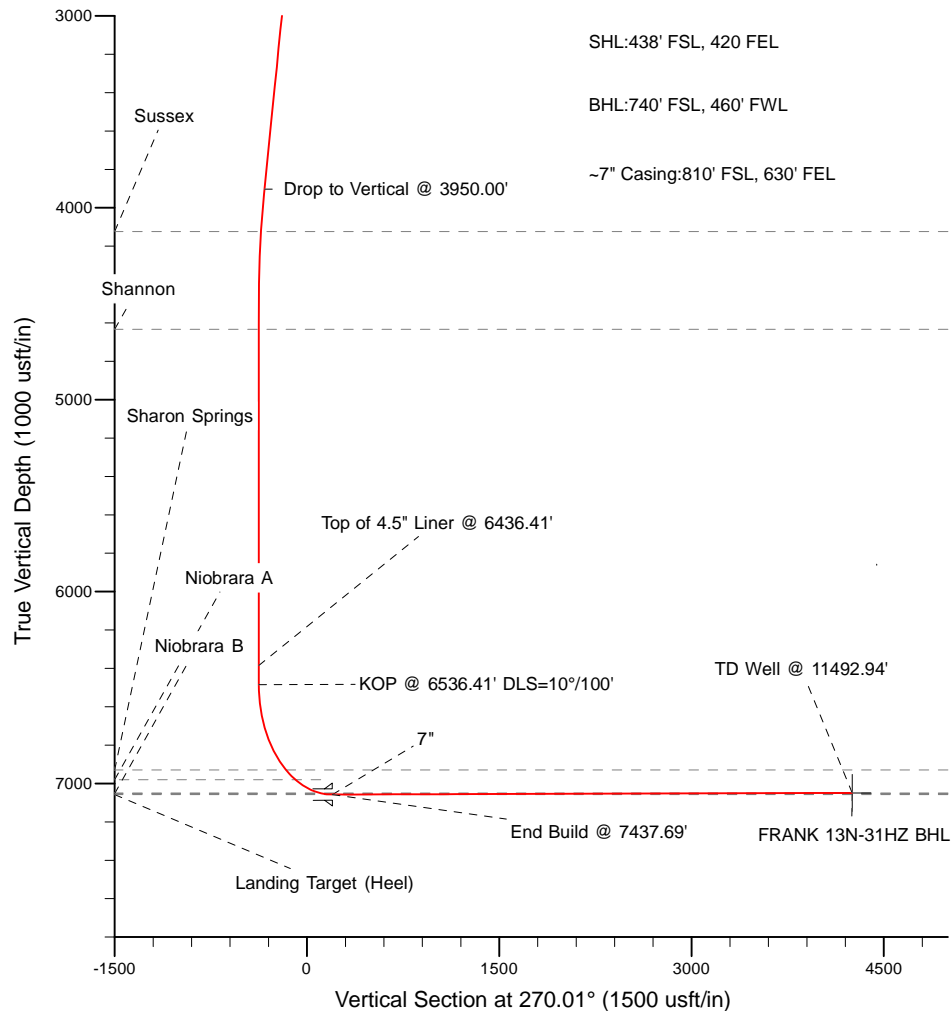
# Anadarko Petroleum Corp.

**HALLIBURTON**  
 Sperry Drilling

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
FRANK 12C-31HZ Sec. Line	-1.00	48.46	61.12	1339520.19	3160574.21	40.263952	-104.924604
FRANK 13N-31HZ SHL	0.00	0.00	0.00	1339471.34	3160513.41	40.263819	-104.924823
FRANK 13N-31HZ BHL	7049.00	375.97	-4254.26	1339819.69	3156256.99	40.264850	-104.940067

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	VSect
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1400.00	0.00	0.00	1400.00	0.00	0.00	0.00	0.00
2000.00	12.00	45.00	1995.62	44.27	44.27	2.00	-44.26
3950.00	12.00	45.00	3903.01	330.95	330.95	0.00	-330.89
4550.00	0.00	0.00	4498.63	375.21	375.21	2.00	-375.15
6536.41	0.00	0.00	6485.05	375.21	375.21	0.00	-375.15
7437.69	90.13	270.01	7058.00	375.31	-199.02	10.00	199.08
11492.94	90.13	270.01	7049.00	375.97	-4254.26	0.00	4254.32



WELL DETAILS: FRANK 13N-31HZ	
Ground Level:	4931.00
RKB=17' @ 4948.00usft (DRILLING RIG)	
Plan: Rev A0 Permit (FRANK 13N-31HZ/Plan A)	
Created By: Pari Amanlou	Date: 3-31-2014

**Plan Report for FRANK 13N-31HZ - Rev A0 Permit**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,217.00	0.00	0.00	1,217.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Fox Hills Marker</b>										
1,267.00	0.00	0.00	1,267.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>9 5/8"</b>										
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Begin Nudge @ 1400.00'</b>										
1,500.00	2.00	45.00	1,499.98	1.23	1.23	-1.23	2.00	2.00	0.00	45.00
1,600.00	4.00	45.00	1,599.84	4.93	4.93	-4.93	2.00	2.00	0.00	0.00
1,700.00	6.00	45.00	1,699.45	11.10	11.10	-11.10	2.00	2.00	0.00	0.00
1,800.00	8.00	45.00	1,798.70	19.71	19.71	-19.71	2.00	2.00	0.00	0.00
1,900.00	10.00	45.00	1,897.47	30.78	30.78	-30.77	2.00	2.00	0.00	0.00
2,000.00	12.00	45.00	1,995.62	44.27	44.27	-44.26	2.00	2.00	0.00	0.00
2,100.00	12.00	45.00	2,093.44	58.97	58.97	-58.96	0.00	0.00	0.00	0.00
2,200.00	12.00	45.00	2,191.25	73.67	73.67	-73.66	0.00	0.00	0.00	0.00
2,300.00	12.00	45.00	2,289.07	88.37	88.37	-88.36	0.00	0.00	0.00	0.00
2,400.00	12.00	45.00	2,386.88	103.07	103.07	-103.05	0.00	0.00	0.00	0.00
2,500.00	12.00	45.00	2,484.70	117.77	117.77	-117.75	0.00	0.00	0.00	0.00
2,600.00	12.00	45.00	2,582.51	132.48	132.48	-132.45	0.00	0.00	0.00	0.00
2,700.00	12.00	45.00	2,680.33	147.18	147.18	-147.15	0.00	0.00	0.00	0.00
2,800.00	12.00	45.00	2,778.14	161.88	161.88	-161.85	0.00	0.00	0.00	0.00
2,900.00	12.00	45.00	2,875.96	176.58	176.58	-176.55	0.00	0.00	0.00	0.00
3,000.00	12.00	45.00	2,973.77	191.28	191.28	-191.25	0.00	0.00	0.00	0.00
3,100.00	12.00	45.00	3,071.59	205.98	205.98	-205.95	0.00	0.00	0.00	0.00
3,200.00	12.00	45.00	3,169.40	220.69	220.69	-220.65	0.00	0.00	0.00	0.00
3,300.00	12.00	45.00	3,267.22	235.39	235.39	-235.35	0.00	0.00	0.00	0.00
3,400.00	12.00	45.00	3,365.03	250.09	250.09	-250.05	0.00	0.00	0.00	0.00
3,500.00	12.00	45.00	3,462.84	264.79	264.79	-264.74	0.00	0.00	0.00	0.00
3,600.00	12.00	45.00	3,560.66	279.49	279.49	-279.44	0.00	0.00	0.00	0.00
3,700.00	12.00	45.00	3,658.47	294.19	294.19	-294.14	0.00	0.00	0.00	0.00
3,800.00	12.00	45.00	3,756.29	308.90	308.90	-308.84	0.00	0.00	0.00	0.00
3,900.00	12.00	45.00	3,854.10	323.60	323.60	-323.54	0.00	0.00	0.00	0.00
3,950.00	12.00	45.00	3,903.01	330.95	330.95	-330.89	0.00	0.00	0.00	0.00
<b>Drop to Vertical @ 3950.00'</b>										
4,000.00	11.00	45.00	3,952.01	338.00	338.00	-337.94	2.00	-2.00	0.00	180.00
4,100.00	9.00	45.00	4,050.48	350.27	350.27	-350.21	2.00	-2.00	0.00	180.00
4,174.29	7.51	45.00	4,124.00	357.82	357.82	-357.76	2.00	-2.00	0.00	-180.00
<b>Sussex</b>										
4,200.00	7.00	45.00	4,149.50	360.11	360.11	-360.05	2.00	-2.00	0.00	180.00
4,300.00	5.00	45.00	4,248.95	367.51	367.51	-367.44	2.00	-2.00	0.00	180.00
4,400.00	3.00	45.00	4,348.70	372.44	372.44	-372.37	2.00	-2.00	0.00	180.00
4,500.00	1.00	45.00	4,448.64	374.91	374.91	-374.84	2.00	-2.00	0.00	180.00
4,550.00	0.00	0.00	4,498.63	375.21	375.21	-375.15	2.00	-2.00	0.00	-180.00
4,600.00	0.00	0.00	4,548.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
4,684.37	0.00	0.00	4,633.00	375.21	375.21	-375.15	0.00	0.00	0.00	0.00

**Plan Report for FRANK 13N-31HZ - Rev A0 Permit**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
<b>Shannon</b>										
4,700.00	0.00	0.00	4,648.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,748.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,848.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	4,948.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,100.00	0.00	0.00	5,048.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,200.00	0.00	0.00	5,148.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,300.00	0.00	0.00	5,248.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,400.00	0.00	0.00	5,348.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,500.00	0.00	0.00	5,448.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,600.00	0.00	0.00	5,548.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,700.00	0.00	0.00	5,648.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,800.00	0.00	0.00	5,748.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
5,900.00	0.00	0.00	5,848.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,000.00	0.00	0.00	5,948.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,100.00	0.00	0.00	6,048.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,200.00	0.00	0.00	6,148.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,300.00	0.00	0.00	6,248.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,400.00	0.00	0.00	6,348.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,436.41	0.00	0.00	6,385.04	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
<b>Top of 4.5" Liner @ 6436.41'</b>										
6,500.00	0.00	0.00	6,448.63	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
6,536.41	0.00	0.00	6,485.04	375.21	375.21	-375.15	0.00	0.00	0.00	0.00
<b>KOP @ 6536.41' DLS=10°/100'</b>										
6,600.00	6.36	270.01	6,548.50	375.21	371.69	-371.62	10.00	10.00	0.00	270.01
6,700.00	16.36	270.01	6,646.42	375.22	352.02	-351.95	10.00	10.00	0.00	0.00
6,800.00	26.36	270.01	6,739.43	375.22	315.64	-315.58	10.00	10.00	0.00	0.00
6,900.00	36.36	270.01	6,824.72	375.23	263.67	-263.61	10.00	10.00	0.00	0.00
7,000.00	46.36	270.01	6,899.68	375.24	197.68	-197.61	10.00	10.00	0.00	0.00
7,044.32	50.79	270.01	6,929.00	375.25	164.45	-164.39	10.00	10.00	0.00	0.00
<b>Sharon Springs</b>										
7,100.00	56.36	270.01	6,962.05	375.26	119.67	-119.60	10.00	10.00	0.00	0.00
7,133.94	59.75	270.01	6,980.00	375.26	90.88	-90.81	10.00	10.00	0.00	0.00
<b>Niobrara A</b>										
7,200.00	66.36	270.01	7,009.92	375.27	32.02	-31.95	10.00	10.00	0.00	0.00
7,300.00	76.36	270.01	7,041.84	375.29	-62.62	62.68	10.00	10.00	0.00	0.00
7,360.63	82.42	270.01	7,053.00	375.30	-122.18	122.24	10.00	10.00	0.00	0.00
<b>Niobrara B</b>										
7,400.00	86.36	270.01	7,056.85	375.30	-161.36	161.42	10.00	10.00	0.00	0.00
7,437.69	90.13	270.01	7,058.00	375.31	-199.02	199.09	10.00	10.00	0.00	0.00
<b>End Build @ 7437.69' - Landing Target (Heel) - 7"</b>										
7,500.00	90.13	270.01	7,057.87	375.32	-261.33	261.40	0.00	0.00	0.00	0.00
7,600.00	90.13	270.01	7,057.64	375.34	-361.33	361.40	0.00	0.00	0.00	0.00
7,700.00	90.13	270.01	7,057.42	375.35	-461.33	461.40	0.00	0.00	0.00	0.00
7,800.00	90.13	270.01	7,057.20	375.37	-561.33	561.40	0.00	0.00	0.00	0.00
7,900.00	90.13	270.01	7,056.98	375.38	-661.33	661.40	0.00	0.00	0.00	0.00
8,000.00	90.13	270.01	7,056.75	375.40	-761.33	761.39	0.00	0.00	0.00	0.00
8,100.00	90.13	270.01	7,056.53	375.42	-861.33	861.39	0.00	0.00	0.00	0.00
8,200.00	90.13	270.01	7,056.31	375.43	-961.33	961.39	0.00	0.00	0.00	0.00
8,300.00	90.13	270.01	7,056.09	375.45	-1,061.33	1,061.39	0.00	0.00	0.00	0.00
8,400.00	90.13	270.01	7,055.87	375.47	-1,161.33	1,161.39	0.00	0.00	0.00	0.00
8,500.00	90.13	270.01	7,055.64	375.48	-1,261.33	1,261.39	0.00	0.00	0.00	0.00
8,600.00	90.13	270.01	7,055.42	375.50	-1,361.33	1,361.39	0.00	0.00	0.00	0.00
8,700.00	90.13	270.01	7,055.20	375.52	-1,461.33	1,461.39	0.00	0.00	0.00	0.00
8,800.00	90.13	270.01	7,054.98	375.53	-1,561.33	1,561.39	0.00	0.00	0.00	0.00
8,900.00	90.13	270.01	7,054.76	375.55	-1,661.33	1,661.39	0.00	0.00	0.00	0.00
9,000.00	90.13	270.01	7,054.53	375.56	-1,761.33	1,761.39	0.00	0.00	0.00	0.00
9,100.00	90.13	270.01	7,054.31	375.58	-1,861.33	1,861.39	0.00	0.00	0.00	0.00
9,200.00	90.13	270.01	7,054.09	375.60	-1,961.33	1,961.39	0.00	0.00	0.00	0.00

**Plan Report for FRANK 13N-31HZ - Rev A0 Permit**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
9,300.00	90.13	270.01	7,053.87	375.61	-2,061.33	2,061.39	0.00	0.00	0.00	0.00
9,400.00	90.13	270.01	7,053.65	375.63	-2,161.33	2,161.39	0.00	0.00	0.00	0.00
9,500.00	90.13	270.01	7,053.42	375.65	-2,261.33	2,261.39	0.00	0.00	0.00	0.00
9,600.00	90.13	270.01	7,053.20	375.66	-2,361.33	2,361.39	0.00	0.00	0.00	0.00
9,700.00	90.13	270.01	7,052.98	375.68	-2,461.33	2,461.39	0.00	0.00	0.00	0.00
9,800.00	90.13	270.01	7,052.76	375.70	-2,561.32	2,561.39	0.00	0.00	0.00	0.00
9,900.00	90.13	270.01	7,052.54	375.71	-2,661.32	2,661.39	0.00	0.00	0.00	0.00
10,000.00	90.13	270.01	7,052.31	375.73	-2,761.32	2,761.39	0.00	0.00	0.00	0.00
10,100.00	90.13	270.01	7,052.09	375.75	-2,861.32	2,861.39	0.00	0.00	0.00	0.00
10,200.00	90.13	270.01	7,051.87	375.76	-2,961.32	2,961.39	0.00	0.00	0.00	0.00
10,300.00	90.13	270.01	7,051.65	375.78	-3,061.32	3,061.39	0.00	0.00	0.00	0.00
10,400.00	90.13	270.01	7,051.43	375.79	-3,161.32	3,161.39	0.00	0.00	0.00	0.00
10,500.00	90.13	270.01	7,051.20	375.81	-3,261.32	3,261.39	0.00	0.00	0.00	0.00
10,600.00	90.13	270.01	7,050.98	375.83	-3,361.32	3,361.39	0.00	0.00	0.00	0.00
10,700.00	90.13	270.01	7,050.76	375.84	-3,461.32	3,461.39	0.00	0.00	0.00	0.00
10,800.00	90.13	270.01	7,050.54	375.86	-3,561.32	3,561.39	0.00	0.00	0.00	0.00
10,900.00	90.13	270.01	7,050.32	375.88	-3,661.32	3,661.39	0.00	0.00	0.00	0.00
11,000.00	90.13	270.01	7,050.09	375.89	-3,761.32	3,761.39	0.00	0.00	0.00	0.00
11,100.00	90.13	270.01	7,049.87	375.91	-3,861.32	3,861.39	0.00	0.00	0.00	0.00
11,200.00	90.13	270.01	7,049.65	375.93	-3,961.32	3,961.39	0.00	0.00	0.00	0.00
11,300.00	90.13	270.01	7,049.43	375.94	-4,061.32	4,061.39	0.00	0.00	0.00	0.00
11,400.00	90.13	270.01	7,049.21	375.96	-4,161.32	4,161.39	0.00	0.00	0.00	0.00
11,492.93	90.13	270.01	7,049.00	375.97	-4,254.25	4,254.32	0.00	0.00	0.00	0.00
<b>Total Depth (Toe)</b>										
11,492.94	90.13	270.01	7,049.00	375.97	-4,254.26	4,254.32	0.00	0.00	0.00	0.00
<b>TD Well @ 11492.94'</b>										

**Plan Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,400.00	1,400.00	0.00	0.00	Begin Nudge @ 1400.00'
3,950.00	3,903.01	330.95	330.95	Drop to Vertical @ 3950.00'
6,436.41	6,385.04	375.21	375.21	Top of 4.5" Liner @ 6436.41'
6,536.41	6,485.04	375.21	375.21	KOP @ 6536.41' DLS=10°/100'
7,437.69	7,058.00	375.31	-199.02	End Build @ 7437.69'
11,492.94	7,049.00	375.97	-4,254.26	TD Well @ 11492.94'

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	270.01	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
0.00	1,400.00	Rev A0 Permit	MWD
1,400.00	7,437.69	Rev A0 Permit	MWD
7,437.69	11,492.94	Rev A0 Permit	MWD

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**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,267.00	1,267.00	9 5/8"	9-5/8	12-1/4
7,437.69	7,058.00	7"	7	8-3/4

**Formation Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,217.00	1,217.00	Fox Hills Marker		0.00	
4,174.29	4,124.00	Sussex		0.00	
4,684.37	4,633.00	Shannon		0.00	
7,044.32	6,929.00	Sharon Springs		0.00	
7,133.94	6,980.00	Niobrara A		0.00	
7,360.63	7,053.00	Niobrara B		0.00	
7,437.69	7,058.00	Landing Target (Heel)		0.00	
11,492.93	7,049.00	Total Depth (Toe)		0.00	

***Targets associated with this wellbore***

Target Name	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Shape
FRANK 13N-31HZ SHL	0.00	0.00	0.00	Point
FRANK 12C-31HZ Sec. Line	-1.00	48.46	61.12	Polygon
FRANK 13N-31HZ BHL	7,049.00	375.97	-4,254.26	Point

**Directional Difficulty Index**

Average Dogleg over Survey:	0.99 °/100usft	Maximum Dogleg over Survey:	10.00 °/100usft at 7,437.69 usft
Net Tortousity applicable to Plans:	0.99 °/100usft	Directional Difficulty Index:	6.131

**Audit Info**

**North Reference Sheet for Sec. 31-T3N-R66W - FRANK 13N-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=17' @ 4948.00usft (DRILLING RIG). Northing and Easting are relative to FRANK 13N-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 -105.50°, Longitude Origin:0.000000°, Latitude Origin:40.783333°  
 False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99995687

Grid Coordinates of Well: 1,339,471.33 usft N, 3,160,513.41 usft E  
 Geographical Coordinates of Well: 40° 15' 49.75" N, 104° 55' 29.36" W  
 Grid Convergence at Surface is: 0.37°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,492.94usft  
 the Bottom Hole Displacement is 4,270.84usft in the Direction of 275.05° ( True).  
 Magnetic Convergence at surface is: -8.23° (31 March 2014, , BGGM2013)

