

# SPERRY-SUN DRILLING SERVICES

## CERTIFIED SURVEY WORK SHEET

OPERATOR:	Anadarko Petroleum Corp.
WELL:	Sack 37C-6HZ
FIELD:	<del>Sack</del> Wattenberg
RIG:	Xtreme 22
LEGALS:	Sec. 31-T1N-R67W
COUNTY:	Weld
STATE:	Colorado
CAL. METHOD:	Min Curvature
MAG. DECL. APPLIED:	8.44
VERTICAL SEC. DIR. :	178.030

SSDS Job Number :	901556384
Start Date of Job :	10/12/2014
End Date of Job :	10/24/2014
Lead Directional Driller:	Bryan Seghetti
Other SSDS DD's :	Jacob Suitter
	Bogdan Cristian
SSDS MWD Engineers :	Clay Wass
	Drew Macbeth
	Caleb Jones

	Main Hole =====>	1st Side Track =====>	2nd Side Track =====>	3rd Side Track =====>	4th Side Track =====>
	1291.00 Tie On				
First Survey Depth	1317.00 Gyro				
Last Survey Depth	1689.00 Gyro				
KOP Depth/Sidetrack MD	7420.00 KOP	KOP-ST1	KOP-ST2	KOP-ST3	KOP-ST4
First Survey Depth	1760.00 MWD	MWD	MWD	MWD	MWD
Last Survey Depth	12848.00 MWD	MWD	MWD	MWD	MWD
Bit Extrapolation to TD	12891.00 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 :	Bryan Seghetti	Print Name :	Bogdan Cristian	Print Name :	
Sign Name :	<i>Bryan Seghetti</i>	Sign Name :	BOGDAN CRISTIAN	Sign Name :	
Print Name :	Clay Wass	Print Name :	Drew Macbeth	Print Name :	
Sign Name :	<i>Clay Wass</i>	Sign Name :	<i>Drew Macbeth</i>	Sign Name :	

### Examples of Survey Types:

Tie On Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)

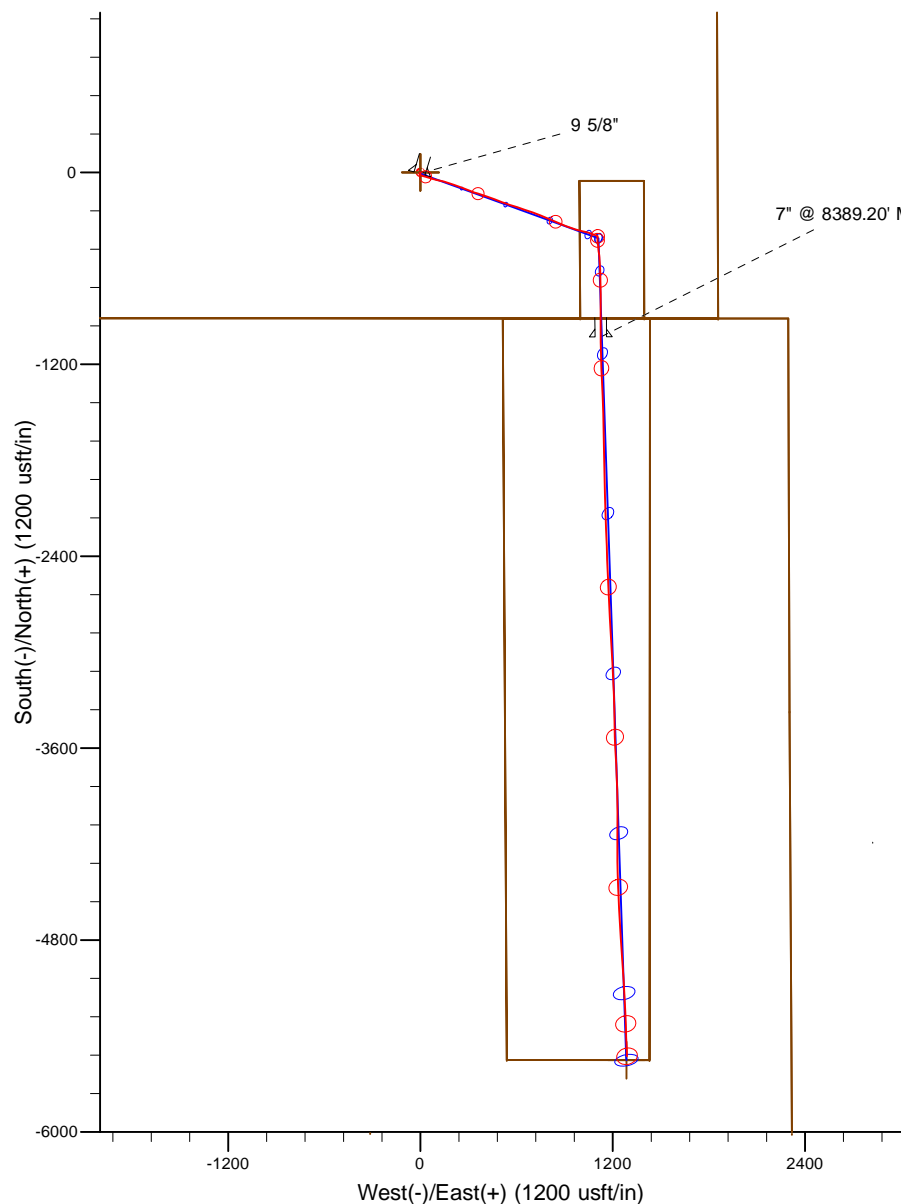
MWD Sperry Sun Drilling Services (SSDS) Measurement While Drilling (MWD) Survey's

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)

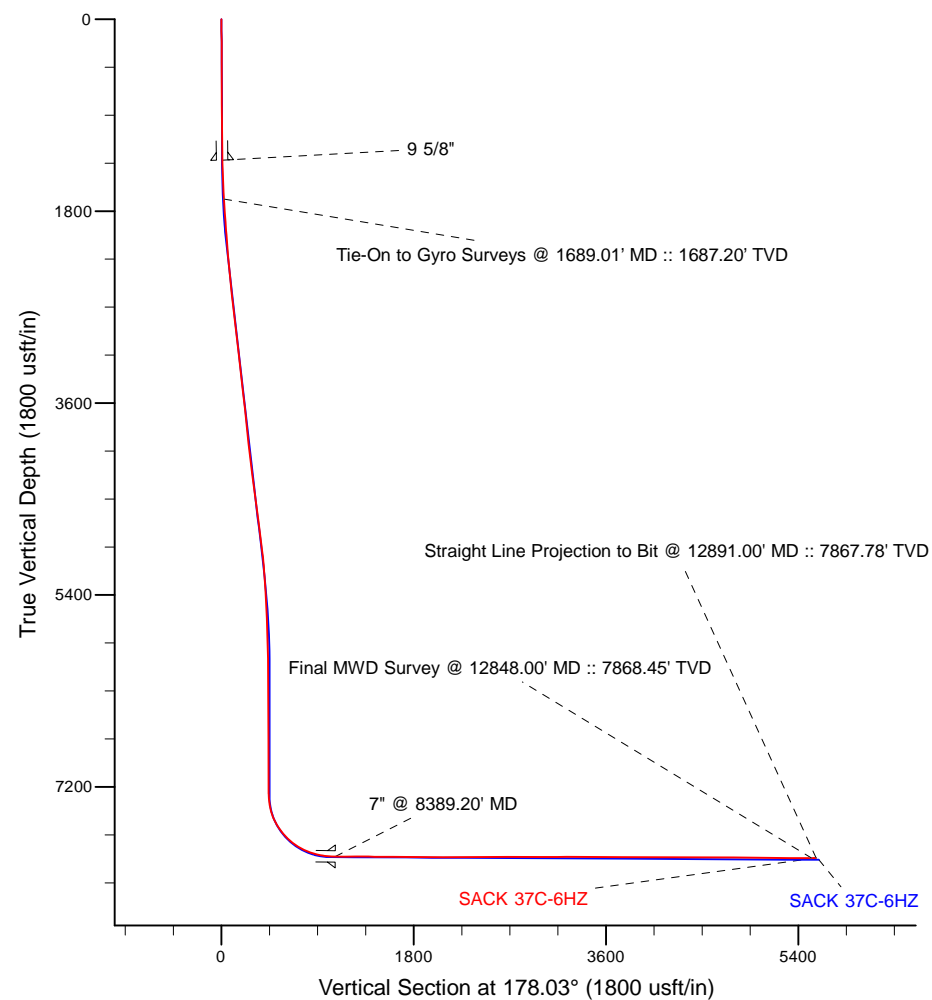
SS Single Shot (SS) Survey's ; Provided by Sperry Sun Drilling Services (SSDS) or third party vendor.

Project: Weld County, CO (NAD 83)  
 Site: Sec. 31-T1N-R67W  
 Well: SACK 37C-6HZ  
 Wellbore: Plan B  
 Design: Actual Field Surveys



LEGEND

SACK 37C-6HZ, Plan B, Rev B0 V0  
 Actual Field Surveys



7" Casing: ~115.75' FNL, ~1169.85' FEL  
 Lat/Long: 40.000021 N, -104.926302 E  
 State Planes - CO Northern: 1,243,374.46' N, 3,160,722.41' E  
 Location: Sec. 6-T1N-R67W

BHL: ~484.79 FSL, ~1026.26' FEL  
 Lat/Long: 39.987674 N, -104.925721 E  
 State Planes - CO Northern: 1,238,877.88' N, 3,160,914.36' E  
 Location: Sec. 6-T1N-R67W

WELL DETAILS: SACK 37C-6HZ	
Ground Level:	5040.00
RKB = 16' @ 5056.00usft (Xtreme 22)	
Design: Actual Field Surveys (SACK 37C-6HZ/Plan B)	
Created By: Katie Benner	Date: 1/27/2015
Reviewed: _____	Date: _____

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 31-T1N-R67W

SACK 37C-6HZ

API # 05-123-39424 JOB # 901536384

Plan B

Design: Actual Field Surveys

## Sperry Drilling Services

### Standard Report

27 January, 2015

Surface UWI : API # 05-123-39424 JOB # 901536384

Well Coordinates: 1,244,395.45 N, 3,159,590.14 E (40° 00' 10.24" N, 104° 55' 49.15" W)

Ground Level: 5,040.00 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 SACK 37C-6HZ

RKB = 16' @ 5056.00usft (Xtreme 22)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

**Design Report for SACK 37C-6HZ - Actual Field 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
<b>SACK 37C-6HZ_SHL - SACK 37C-6HZ_SEC - SACK 37C-6HZ_LD</b>							
116.00	0.44	213.60	116.00	-0.37	-0.25	0.36	0.38
216.00	0.43	215.04	216.00	-1.00	-0.68	0.98	0.01
316.00	0.36	241.95	315.99	-1.46	-1.17	1.42	0.20
416.00	0.45	226.82	415.99	-1.87	-1.73	1.81	0.14
516.00	0.40	231.54	515.99	-2.36	-2.29	2.28	0.06
616.00	0.38	227.00	615.99	-2.80	-2.80	2.70	0.03
716.00	0.42	198.11	715.98	-3.37	-3.16	3.26	0.20
816.00	0.32	233.35	815.98	-3.88	-3.50	3.76	0.24
916.00	0.43	205.42	915.98	-4.38	-3.88	4.25	0.21
1,016.00	0.54	224.84	1,015.98	-5.05	-4.37	4.90	0.20
1,116.00	0.47	225.21	1,115.97	-5.67	-4.99	5.50	0.07
1,216.00	0.45	230.28	1,215.97	-6.21	-5.58	6.01	0.05
1,317.00	0.93	207.86	1,316.96	-7.19	-6.27	6.97	0.54
1,322.10	1.05	197.25	1,322.06	-7.27	-6.30	7.05	4.26
<b>9 5/8"</b>							
1,353.00	2.13	168.09	1,352.95	-8.10	-6.26	7.88	4.26
1,384.00	2.66	157.03	1,383.92	-9.32	-5.86	9.12	2.26
1,414.00	3.15	146.99	1,413.88	-10.66	-5.14	10.47	2.35
1,504.00	4.86	124.08	1,503.67	-14.87	-0.64	14.84	2.57
1,597.00	7.31	109.77	1,596.14	-19.08	8.19	19.35	3.08
1,689.00	9.14	108.79	1,687.19	-23.41	20.62	24.11	1.99
1,689.01	9.14	108.79	1,687.20	-23.41	20.62	24.11	0.01
<b>Tie-On to Gyro Surveys @ 1689.01' MD :: 1687.20' TVD</b>							
1,760.00	10.03	107.03	1,757.20	-27.04	31.87	28.12	1.32
1,852.00	10.89	106.17	1,847.67	-31.80	47.88	33.43	0.95
1,943.00	12.99	106.32	1,936.69	-37.07	65.95	39.32	2.31
2,034.00	14.24	105.29	2,025.14	-42.90	86.56	45.85	1.40
2,125.00	15.43	101.76	2,113.10	-48.32	109.21	52.04	1.64
2,217.00	16.03	103.87	2,201.66	-53.86	133.53	58.42	0.90
2,308.00	16.93	106.24	2,288.92	-60.57	158.45	65.99	1.23
2,491.00	17.17	110.27	2,463.88	-77.38	209.37	84.54	0.66
2,674.00	17.02	110.12	2,638.80	-95.96	259.86	104.83	0.09
2,858.00	16.31	111.63	2,815.07	-114.74	309.16	125.30	0.45
3,042.00	16.90	106.55	2,991.40	-131.89	358.82	144.14	0.85
3,225.00	17.42	108.20	3,166.26	-148.02	410.34	162.04	0.39
3,403.00	17.75	111.20	3,335.94	-166.15	460.95	181.90	0.54
3,573.00	17.52	111.64	3,497.95	-184.96	508.89	202.34	0.16
3,744.00	16.57	107.71	3,661.45	-201.87	556.05	220.87	0.87
3,916.00	17.02	107.35	3,826.11	-216.84	603.44	237.45	0.27
4,087.00	17.75	109.46	3,989.30	-232.99	651.90	255.26	0.56
4,258.00	17.51	110.45	4,152.27	-250.66	700.59	274.59	0.22
4,428.00	16.66	111.34	4,314.76	-268.46	747.25	293.99	0.52
4,599.00	18.32	112.82	4,477.85	-287.81	794.85	314.96	1.00
4,770.00	17.47	112.20	4,640.58	-307.93	843.39	336.74	0.51
4,939.00	17.58	114.25	4,801.74	-327.99	890.15	358.40	0.37
5,110.00	18.89	108.11	4,964.16	-347.21	940.01	379.32	1.36
5,281.00	15.31	104.59	5,127.58	-361.50	988.18	395.26	2.18
5,452.00	13.09	103.47	5,293.35	-371.70	1,028.87	406.85	1.31

**Design Report for SACK 37C-6HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,623.00	9.88	110.05	5,460.91	-381.25	1,061.49	417.51	2.02
5,794.00	6.32	109.53	5,630.17	-389.42	1,084.15	426.46	2.08
5,964.00	3.79	108.36	5,799.50	-394.32	1,098.30	431.85	1.49
6,135.00	0.44	134.20	5,970.36	-396.56	1,104.14	434.28	1.99
6,305.00	0.54	133.86	6,140.35	-397.57	1,105.18	435.33	0.06
6,477.00	0.57	162.65	6,312.35	-398.95	1,106.02	436.74	0.16
6,648.00	0.54	211.52	6,483.34	-400.45	1,105.86	438.23	0.27
6,818.00	0.87	201.26	6,653.33	-402.33	1,104.97	440.08	0.21
6,989.00	0.44	350.16	6,824.32	-402.90	1,104.39	440.62	0.74
7,160.00	0.26	215.07	6,995.32	-402.57	1,104.05	440.28	0.38
7,331.00	0.33	131.13	7,166.32	-403.21	1,104.20	440.93	0.23
7,374.00	0.48	184.31	7,209.32	-403.47	1,104.28	441.19	0.90
7,417.00	0.54	176.60	7,252.31	-403.85	1,104.28	441.57	0.21
7,460.00	3.66	176.94	7,295.28	-405.43	1,104.36	443.15	7.26
7,503.00	6.46	178.73	7,338.11	-409.22	1,104.49	446.94	6.52
7,588.00	14.04	180.46	7,421.69	-424.33	1,104.51	462.05	8.92
7,631.00	19.34	173.94	7,462.87	-436.63	1,105.22	474.37	13.05
7,674.00	25.54	170.84	7,502.59	-452.88	1,107.45	490.68	14.67
7,717.00	28.85	173.19	7,540.84	-472.34	1,110.16	510.22	8.09
7,760.00	32.22	173.36	7,577.87	-494.03	1,112.72	531.99	7.84
7,802.00	36.68	173.26	7,612.49	-517.62	1,115.48	555.67	10.62
7,845.00	41.05	174.87	7,645.97	-544.46	1,118.26	582.58	10.43
7,888.00	44.26	176.52	7,677.59	-573.50	1,120.43	611.68	7.90
7,931.00	49.90	179.25	7,706.86	-604.96	1,121.56	643.15	13.91
7,973.00	53.64	179.29	7,732.85	-637.94	1,121.98	676.13	8.91
8,016.00	56.91	179.11	7,757.34	-673.27	1,122.47	711.46	7.61
8,058.00	61.56	179.71	7,778.82	-709.35	1,122.84	747.53	11.14
8,101.00	66.43	179.06	7,797.66	-747.98	1,123.26	786.15	11.41
8,143.00	70.04	179.11	7,813.23	-786.98	1,123.88	825.15	8.60
8,186.00	72.68	179.53	7,826.98	-827.71	1,124.36	865.88	6.21
8,228.00	77.65	180.17	7,837.73	-868.30	1,124.47	906.44	11.92
<b>Current MWD Survey @ 8228.00' MD :: 7837.73' TVD</b>							
8,271.00	81.26	179.74	7,845.60	-910.57	1,124.50	948.69	8.45
8,314.00	83.63	179.29	7,851.25	-953.19	1,124.86	991.30	5.61
8,353.00	88.55	179.29	7,853.91	-992.08	1,125.34	1,030.18	12.62
8,389.20	89.26	179.50	7,854.60	-1,028.28	1,125.72	1,066.37	2.05
<b>7" @ 8389.20' MD</b>							
8,414.00	89.75	179.65	7,854.81	-1,053.07	1,125.91	1,091.16	2.05
8,585.00	90.25	178.09	7,854.81	-1,224.03	1,129.28	1,262.13	0.96
8,755.00	89.20	176.99	7,855.63	-1,393.87	1,136.58	1,432.12	0.89
8,926.00	89.97	179.30	7,856.87	-1,564.76	1,142.11	1,603.10	1.42
9,097.00	89.04	178.84	7,858.34	-1,735.73	1,144.89	1,774.06	0.61
9,269.00	88.95	178.71	7,861.36	-1,907.67	1,148.56	1,946.02	0.09
9,440.00	90.65	178.46	7,861.96	-2,078.61	1,152.79	2,117.01	1.00
9,526.00	91.92	178.26	7,860.03	-2,164.55	1,155.25	2,202.98	1.49
9,611.00	90.09	176.94	7,858.54	-2,249.46	1,158.80	2,287.96	2.65
9,697.00	90.18	178.17	7,858.34	-2,335.38	1,162.47	2,373.96	1.43
9,782.00	90.43	177.91	7,857.88	-2,420.32	1,165.38	2,458.96	0.42
9,954.00	89.69	177.54	7,857.70	-2,592.19	1,172.21	2,630.95	0.48
10,040.00	89.88	177.02	7,858.03	-2,678.09	1,176.29	2,716.94	0.64
10,125.00	89.91	176.44	7,858.18	-2,762.95	1,181.14	2,801.92	0.68

**Design Report for SACK 37C-6HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,210.00	89.60	177.30	7,858.55	-2,847.82	1,185.78	2,886.90	1.08
10,296.00	90.34	176.75	7,858.59	-2,933.71	1,190.24	2,972.89	1.07
10,381.00	90.49	176.38	7,857.97	-3,018.55	1,195.33	3,057.86	0.47
10,466.00	90.52	178.00	7,857.23	-3,103.44	1,199.50	3,142.84	1.91
10,552.00	90.83	177.30	7,856.21	-3,189.36	1,203.03	3,228.83	0.89
10,638.00	90.18	177.87	7,855.45	-3,275.28	1,206.65	3,314.83	1.01
10,723.00	90.03	178.76	7,855.30	-3,360.24	1,209.15	3,399.82	1.06
10,894.00	89.01	178.27	7,856.73	-3,531.18	1,213.58	3,570.81	0.66
11,065.00	89.29	176.83	7,859.27	-3,702.00	1,220.89	3,741.78	0.86
11,150.00	89.17	177.66	7,860.41	-3,786.89	1,224.98	3,826.76	0.99
11,236.00	89.91	178.18	7,861.10	-3,872.83	1,228.10	3,912.76	1.05
11,321.00	90.40	180.33	7,860.87	-3,957.82	1,229.20	3,997.73	2.59
11,407.00	89.07	180.37	7,861.27	-4,043.81	1,228.68	4,083.66	1.55
11,492.00	89.60	179.77	7,862.25	-4,128.81	1,228.57	4,168.60	0.94
11,577.00	90.43	180.31	7,862.23	-4,213.81	1,228.51	4,253.55	1.16
11,663.00	90.12	178.64	7,861.82	-4,299.80	1,229.30	4,339.52	1.98
11,747.00	90.92	178.27	7,861.06	-4,383.76	1,231.57	4,423.51	1.05
11,833.00	90.25	178.55	7,860.18	-4,469.73	1,233.95	4,509.50	0.84
11,918.00	89.17	177.13	7,860.61	-4,554.66	1,237.16	4,594.50	2.10
12,004.00	89.69	176.99	7,861.47	-4,640.54	1,241.57	4,680.48	0.63
12,089.00	88.95	176.54	7,862.47	-4,725.40	1,246.36	4,765.45	1.02
12,175.00	89.42	176.83	7,863.70	-4,811.25	1,251.34	4,851.42	0.64
12,261.00	89.11	176.49	7,864.80	-4,897.09	1,256.35	4,937.39	0.53
12,346.00	89.51	176.05	7,865.82	-4,981.91	1,261.87	5,022.34	0.70
12,432.00	90.03	175.57	7,866.17	-5,067.68	1,268.16	5,108.28	0.82
12,517.00	89.35	177.05	7,866.63	-5,152.50	1,273.63	5,193.23	1.92
12,602.00	88.68	177.33	7,868.09	-5,237.38	1,277.79	5,278.21	0.85
12,688.00	89.91	178.30	7,869.15	-5,323.31	1,281.07	5,364.20	1.82
12,774.00	90.15	177.54	7,869.10	-5,409.25	1,284.19	5,450.20	0.93
12,848.00	90.89	177.85	7,868.43	-5,483.19	1,287.17	5,524.20	1.08
<b>Final MWD Survey @ 12848.00' MD :: 7868.45' TVD</b>							
12,891.00	90.89	177.85	7,867.76	-5,526.15	1,288.78	5,567.19	0.00
<b>Straight Line Projection to Bit @ 12891.00' MD :: 7867.78' TVD - SACK 37C-6HZ_BHL</b>							

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,689.01	1,687.20	-23.41	20.62	Tie-On to Gyro Surveys @ 1689.01' MD :: 1687.20' TVD
8,228.00	7,837.73	-868.30	1,124.47	Current MWD Survey @ 8228.00' MD :: 7837.73' TVD
12,848.00	7,868.43	-5,483.19	1,287.17	Final MWD Survey @ 12848.00' MD :: 7868.45' TVD
12,891.00	7,867.76	-5,526.15	1,288.78	Straight Line Projection to Bit @ 12891.00' MD :: 7867.78' TVD

**Vertical Section Information**

	Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
					+N/_S (usft)	+E/-W (usft)	
User		No Target (Freehand)	178.03	Slot	0.00	0.00	0.00



## Design Report for SACK 37C-6HZ - Actual Field Surveys

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
116.00	1,291.00	VES Gyro Surveys	NS-GYRO-MS
1,291.00	1,689.00	Additional Gyro Surveys	BLIND
1,760.00	8,353.00	MWD Vertical/Build Surveys	MWD+IFR1+SC
8,414.00	12,891.00	MWD Lateral Surveys	MWD+IFR1+SC

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,322.10	1,322.06	9 5/8"	9-5/8	13-1/2
8,389.20	7,854.60	7" @ 8389.20' MD	7	8-3/4

## Design Report for SACK 37C-6HZ - Actual Field 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
SACK 37C-6HZ_SEC	0.00	0.00	0.00	0.00	0.00	1,244,395.45	3,159,590.14	40.002844	-104.930320
- actual wellpath hits target center									
- Polygon									
Point 1				0.00	9,694.36	-3,435.08	1,254,067.22	3,156,092.97	
Point 2				0.00	9,671.16	-822.03	1,254,060.80	3,158,706.03	
Point 3				0.00	9,647.72	1,822.16	1,254,054.35	3,161,350.23	
Point 4				0.00	7,001.35	1,818.66	1,251,408.10	3,161,363.73	
Point 5				0.00	4,366.76	1,830.40	1,248,773.73	3,161,392.39	
Point 6				0.00	4,375.25	-806.76	1,248,765.28	3,158,755.32	
Point 7				0.00	4,383.73	-3,429.92	1,248,756.91	3,156,132.25	
Point 8				0.00	4,375.25	-806.76	1,248,765.28	3,158,755.32	
Point 9				0.00	4,366.76	1,830.40	1,248,773.73	3,161,392.39	
Point 10				0.00	1,727.02	1,847.33	1,246,134.25	3,161,426.28	
Point 11				0.00	-912.15	1,856.96	1,243,495.28	3,161,452.86	
Point 12				0.00	-911.94	-783.04	1,243,478.53	3,158,813.01	
Point 13				0.00	-911.66	-3,422.41	1,243,461.86	3,156,173.78	
Point 14				0.00	-911.94	-783.04	1,243,478.53	3,158,813.01	
Point 15				0.00	-912.15	1,856.96	1,243,495.28	3,161,452.86	
Point 16				0.00	-912.94	2,295.27	1,243,497.31	3,161,891.15	
Point 17				0.00	-3,371.29	2,302.67	1,241,039.14	3,161,914.35	
Point 18				0.00	-6,012.64	2,317.90	1,238,398.03	3,161,946.54	
Point 19				0.00	-6,008.34	-314.60	1,238,385.42	3,159,314.16	
Point 20				0.00	-6,004.40	-2,776.05	1,238,373.55	3,156,852.82	
Point 21				0.00	-3,398.60	-2,798.46	1,240,979.06	3,156,813.67	
Point 22				0.00	-911.28	-2,806.61	1,243,466.19	3,156,789.54	
Point 23				0.00	-911.66	-3,422.41	1,243,461.86	3,156,173.78	
Point 24				0.00	4,383.73	-3,429.92	1,248,756.91	3,156,132.25	
SACK 37C-6HZ_SHL	0.00	0.00	0.00	0.00	0.00	1,244,395.45	3,159,590.14	40.002844	-104.930320
- actual wellpath hits target center									
- Point									
SACK 37C-6HZ_LD	0.00	0.00	0.00	0.00	0.00	1,244,395.45	3,159,590.14	40.002844	-104.930320
- actual wellpath hits target center									
- Polygon									
Point 1				0.00	-52.06	992.67	1,244,349.77	3,160,583.10	
Point 2				0.00	-52.31	1,393.80	1,244,352.10	3,160,984.20	
Point 3				0.00	-912.12	1,396.93	1,243,492.36	3,160,992.86	
Point 4				0.00	-912.12	1,432.90	1,243,492.59	3,161,028.83	
Point 5				0.00	-5,551.03	1,428.72	1,238,853.90	3,161,054.45	
Point 6				0.00	-5,549.72	538.66	1,238,849.50	3,160,164.43	
Point 7				0.00	-912.05	512.85	1,243,486.75	3,160,108.83	
Point 8				0.00	-912.09	996.98	1,243,489.82	3,160,592.93	
SACK 37C-6HZ_BHL	0.00	0.00	7,884.00	-5,550.94	1,285.06	1,238,853.06	3,160,910.80	39.987606	-104.925734
- actual wellpath misses target center by 29.87usft at 12891.00usft MD (7867.76 TVD, -5526.15 N, 1288.78 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	1.52 °/100usft	Maximum Dogleg over Survey:	14.67 °/100usft at 7,674.00 usft
Net Tortousity applicable to Plans:	0.54 °/100usft	Directional Difficulty Index:	6.308

**Audit Info**

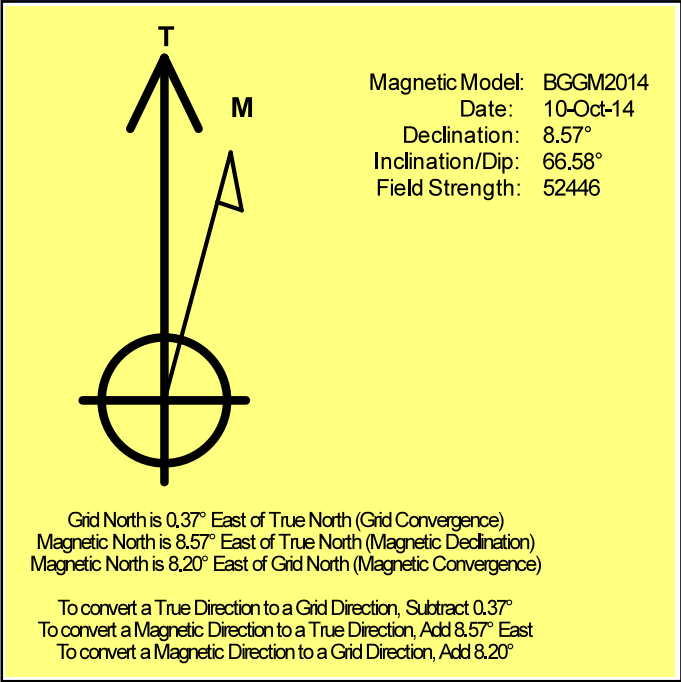


**North Reference Sheet for Sec. 31-T1N-R67W - SACK 37C-6HZ - Plan B**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.  
 Vertical Depths are relative to RKB = 16' @ 5056.00usft (Xtreme 22). Northing and Easting are relative to SACK 37C-6HZ  
 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: 0.99996616

Grid Coordinates of Well: 1,244,395.45 usft N, 3,159,590.14 usft E  
 Geographical Coordinates of Well: 40° 00' 10.24" N, 104° 55' 49.15" W  
 Grid Convergence at Surface is: 0.37°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,891.00usft  
 the Bottom Hole Displacement is 5,674.45usft in the Direction of 166.87° ( True).  
 Magnetic Convergence at surface is: -8.20° (10 October 2014, , BGGM2014)



# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 31-T1N-R67W

SACK 37C-6HZ

API # 05-123-39424 JOB # 901536384

Plan B

Design: Actual Field Surveys

## Sperry Drilling Services

### Geodetic Report

27 January, 2015

Well Coordinates: 1,244,395.45 N, 3,159,590.14 E (40° 00' 10.24" N, 104° 55' 49.15" W)

Ground Level: 5,040.00 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 SACK 37C-6HZ

RKB = 16' @ 5056.00usft (Xtreme 22)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for SACK 37C-6HZ - Actual Field 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	40.002844	-104.930320	1,244,395.45	3,159,590.14
116.00	0.44	213.60	116.00	-0.37	-0.25	40.002843	-104.930321	1,244,395.08	3,159,589.90
216.00	0.43	215.04	216.00	-1.00	-0.68	40.002841	-104.930323	1,244,394.44	3,159,589.48
316.00	0.36	241.95	315.99	-1.46	-1.17	40.002840	-104.930324	1,244,393.98	3,159,588.98
416.00	0.45	226.82	415.99	-1.87	-1.73	40.002839	-104.930326	1,244,393.56	3,159,588.42
516.00	0.40	231.54	515.99	-2.36	-2.29	40.002838	-104.930328	1,244,393.08	3,159,587.87
616.00	0.38	227.00	615.99	-2.80	-2.80	40.002836	-104.930330	1,244,392.63	3,159,587.36
716.00	0.42	198.11	715.98	-3.37	-3.16	40.002835	-104.930332	1,244,392.06	3,159,587.00
816.00	0.32	233.35	815.98	-3.88	-3.50	40.002833	-104.930333	1,244,391.54	3,159,586.67
916.00	0.43	205.42	915.98	-4.38	-3.88	40.002832	-104.930334	1,244,391.04	3,159,586.29
1,016.00	0.54	224.84	1,015.98	-5.05	-4.37	40.002830	-104.930336	1,244,390.37	3,159,585.81
1,116.00	0.47	225.21	1,115.97	-5.67	-4.99	40.002828	-104.930338	1,244,389.74	3,159,585.19
1,216.00	0.45	230.28	1,215.97	-6.21	-5.58	40.002827	-104.930340	1,244,389.20	3,159,584.61
1,317.00	0.93	207.86	1,316.96	-7.19	-6.27	40.002824	-104.930343	1,244,388.22	3,159,583.93
1,322.10	1.05	197.25	1,322.06	-7.27	-6.30	40.002824	-104.930343	1,244,388.14	3,159,583.89
1,353.00	2.13	168.09	1,352.95	-8.10	-6.26	40.002822	-104.930343	1,244,387.31	3,159,583.93
1,384.00	2.66	157.03	1,383.92	-9.32	-5.86	40.002818	-104.930341	1,244,386.09	3,159,584.34
1,414.00	3.15	146.99	1,413.88	-10.66	-5.14	40.002815	-104.930339	1,244,384.76	3,159,585.07
1,504.00	4.86	124.08	1,503.67	-14.87	-0.64	40.002803	-104.930323	1,244,380.58	3,159,589.60
1,597.00	7.31	109.77	1,596.14	-19.08	8.19	40.002792	-104.930291	1,244,376.43	3,159,598.46
1,689.00	9.14	108.79	1,687.19	-23.41	20.62	40.002780	-104.930247	1,244,372.17	3,159,610.92
1,689.01	9.14	108.79	1,687.20	-23.41	20.62	40.002780	-104.930247	1,244,372.17	3,159,610.92
1,760.00	10.03	107.03	1,757.20	-27.04	31.87	40.002770	-104.930206	1,244,368.62	3,159,622.19
1,852.00	10.89	106.17	1,847.67	-31.80	47.88	40.002757	-104.930149	1,244,363.95	3,159,638.23
1,943.00	12.99	106.32	1,936.69	-37.07	65.95	40.002742	-104.930085	1,244,358.80	3,159,656.33
2,034.00	14.24	105.29	2,025.14	-42.90	86.56	40.002726	-104.930011	1,244,353.11	3,159,676.98
2,125.00	15.43	101.76	2,113.10	-48.32	109.21	40.002711	-104.929930	1,244,347.83	3,159,699.66
2,217.00	16.03	103.87	2,201.66	-53.86	133.53	40.002696	-104.929844	1,244,342.45	3,159,724.01
2,308.00	16.93	106.24	2,288.92	-60.57	158.45	40.002678	-104.929755	1,244,335.89	3,159,748.97
2,491.00	17.17	110.27	2,463.88	-77.38	209.37	40.002632	-104.929573	1,244,319.41	3,159,800.00
2,674.00	17.02	110.12	2,638.80	-95.96	259.86	40.002581	-104.929393	1,244,301.17	3,159,850.60
2,858.00	16.31	111.63	2,815.07	-114.74	309.16	40.002529	-104.929217	1,244,282.70	3,159,900.03
3,042.00	16.90	106.55	2,991.40	-131.89	358.82	40.002482	-104.929039	1,244,265.87	3,159,949.79
3,225.00	17.42	108.20	3,166.26	-148.02	410.34	40.002438	-104.928856	1,244,250.07	3,160,001.41
3,403.00	17.75	111.20	3,335.94	-166.15	460.95	40.002388	-104.928675	1,244,232.27	3,160,052.14
3,573.00	17.52	111.64	3,497.95	-184.96	508.89	40.002336	-104.928504	1,244,213.77	3,160,100.20
3,744.00	16.57	107.71	3,661.45	-201.87	556.05	40.002290	-104.928335	1,244,197.16	3,160,147.46
3,916.00	17.02	107.35	3,826.11	-216.84	603.44	40.002249	-104.928166	1,244,182.50	3,160,194.94
4,087.00	17.75	109.46	3,989.30	-232.99	651.90	40.002204	-104.927993	1,244,166.66	3,160,243.51
4,258.00	17.51	110.45	4,152.27	-250.66	700.59	40.002156	-104.927820	1,244,149.31	3,160,292.30
4,428.00	16.66	111.34	4,314.76	-268.46	747.25	40.002107	-104.927653	1,244,131.80	3,160,339.08
4,599.00	18.32	112.82	4,477.85	-287.81	794.85	40.002054	-104.927483	1,244,112.76	3,160,386.80

## Design Report for SACK 37C-6HZ - Actual Field 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)
4,770.00	17.47	112.20	4,640.58	-307.93	843.39	40.001999	-104.927310	1,244,092.96	3,160,435.47
4,939.00	17.58	114.25	4,801.74	-327.99	890.15	40.001944	-104.927143	1,244,073.19	3,160,482.35
5,110.00	18.89	108.11	4,964.16	-347.21	940.01	40.001891	-104.926965	1,244,054.30	3,160,532.33
5,281.00	15.31	104.59	5,127.58	-361.50	988.18	40.001852	-104.926793	1,244,040.31	3,160,580.60
5,452.00	13.09	103.47	5,293.35	-371.70	1,028.87	40.001824	-104.926648	1,244,030.38	3,160,621.34
5,623.00	9.88	110.05	5,460.91	-381.25	1,061.49	40.001797	-104.926531	1,244,021.04	3,160,654.03
5,794.00	6.32	109.53	5,630.17	-389.42	1,084.15	40.001775	-104.926450	1,244,013.01	3,160,676.74
5,964.00	3.79	108.36	5,799.50	-394.32	1,098.30	40.001762	-104.926400	1,244,008.20	3,160,690.92
6,135.00	0.44	134.20	5,970.36	-396.56	1,104.14	40.001755	-104.926379	1,244,006.00	3,160,696.77
6,305.00	0.54	133.86	6,140.35	-397.57	1,105.18	40.001753	-104.926375	1,244,005.00	3,160,697.82
6,477.00	0.57	162.65	6,312.35	-398.95	1,106.02	40.001749	-104.926372	1,244,003.63	3,160,698.67
6,648.00	0.54	211.52	6,483.34	-400.45	1,105.86	40.001745	-104.926373	1,244,002.13	3,160,698.51
6,818.00	0.87	201.26	6,653.33	-402.33	1,104.97	40.001740	-104.926376	1,244,000.23	3,160,697.64
6,989.00	0.44	350.16	6,824.32	-402.90	1,104.39	40.001738	-104.926378	1,243,999.67	3,160,697.06
7,160.00	0.26	215.07	6,995.32	-402.57	1,104.05	40.001739	-104.926379	1,243,999.99	3,160,696.72
7,331.00	0.33	131.13	7,166.32	-403.21	1,104.20	40.001737	-104.926379	1,243,999.35	3,160,696.87
7,374.00	0.48	184.31	7,209.32	-403.47	1,104.28	40.001736	-104.926379	1,243,999.09	3,160,696.96
7,417.00	0.54	176.60	7,252.31	-403.85	1,104.28	40.001735	-104.926379	1,243,998.71	3,160,696.96
7,460.00	3.66	176.94	7,295.28	-405.43	1,104.36	40.001731	-104.926378	1,243,997.14	3,160,697.05
7,503.00	6.46	178.73	7,338.11	-409.22	1,104.49	40.001721	-104.926378	1,243,993.35	3,160,697.20
7,588.00	14.04	180.46	7,421.69	-424.33	1,104.51	40.001679	-104.926378	1,243,978.24	3,160,697.32
7,631.00	19.34	173.94	7,462.87	-436.63	1,105.22	40.001645	-104.926375	1,243,965.94	3,160,698.11
7,674.00	25.54	170.84	7,502.59	-452.88	1,107.45	40.001601	-104.926367	1,243,949.71	3,160,700.45
7,717.00	28.85	173.19	7,540.84	-472.34	1,110.16	40.001547	-104.926358	1,243,930.27	3,160,703.28
7,760.00	32.22	173.36	7,577.87	-494.03	1,112.72	40.001488	-104.926349	1,243,908.59	3,160,705.97
7,802.00	36.68	173.26	7,612.49	-517.62	1,115.48	40.001423	-104.926339	1,243,885.02	3,160,708.89
7,845.00	41.05	174.87	7,645.97	-544.46	1,118.26	40.001349	-104.926329	1,243,858.21	3,160,711.84
7,888.00	44.26	176.52	7,677.59	-573.50	1,120.43	40.001270	-104.926321	1,243,829.17	3,160,714.20
7,931.00	49.90	179.25	7,706.86	-604.96	1,121.56	40.001183	-104.926317	1,243,797.73	3,160,715.53
7,973.00	53.64	179.29	7,732.85	-637.94	1,121.98	40.001093	-104.926315	1,243,764.75	3,160,716.16
8,016.00	56.91	179.11	7,757.34	-673.27	1,122.47	40.000996	-104.926314	1,243,729.42	3,160,716.88
8,058.00	61.56	179.71	7,778.82	-709.35	1,122.84	40.000897	-104.926312	1,243,693.35	3,160,717.48
8,101.00	66.43	179.06	7,797.66	-747.98	1,123.26	40.000791	-104.926311	1,243,654.72	3,160,718.15
8,143.00	70.04	179.11	7,813.23	-786.98	1,123.88	40.000684	-104.926309	1,243,615.73	3,160,719.02
8,186.00	72.68	179.53	7,826.98	-827.71	1,124.36	40.000572	-104.926307	1,243,575.00	3,160,719.76
8,228.00	77.65	180.17	7,837.73	-868.30	1,124.47	40.000460	-104.926307	1,243,534.42	3,160,720.13
8,271.00	81.26	179.74	7,845.60	-910.57	1,124.50	40.000344	-104.926307	1,243,492.15	3,160,720.43
8,314.00	83.63	179.29	7,851.25	-953.19	1,124.86	40.000227	-104.926305	1,243,449.54	3,160,721.07
8,353.00	88.55	179.29	7,853.91	-992.08	1,125.34	40.000121	-104.926304	1,243,410.65	3,160,721.80
8,389.20	89.26	179.50	7,854.60	-1,028.28	1,125.72	40.000021	-104.926302	1,243,374.46	3,160,722.41
8,414.00	89.75	179.65	7,854.81	-1,053.07	1,125.91	39.999953	-104.926302	1,243,349.66	3,160,722.76
8,585.00	90.25	178.09	7,854.81	-1,224.03	1,129.28	39.999484	-104.926290	1,243,178.73	3,160,727.23

## Design Report for SACK 37C-6HZ - Actual Field 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)
8,755.00	89.20	176.99	7,855.63	-1,393.87	1,136.58	39.999018	-104.926263	1,243,008.95	3,160,735.61
8,926.00	89.97	179.30	7,856.87	-1,564.76	1,142.11	39.998549	-104.926244	1,242,838.11	3,160,742.25
9,097.00	89.04	178.84	7,858.34	-1,735.73	1,144.89	39.998079	-104.926234	1,242,667.16	3,160,746.12
9,269.00	88.95	178.71	7,861.36	-1,907.67	1,148.56	39.997607	-104.926221	1,242,495.26	3,160,750.90
9,440.00	90.65	178.46	7,861.96	-2,078.61	1,152.79	39.997138	-104.926206	1,242,324.36	3,160,756.22
9,526.00	91.92	178.26	7,860.03	-2,164.55	1,155.25	39.996902	-104.926197	1,242,238.44	3,160,759.23
9,611.00	90.09	176.94	7,858.54	-2,249.46	1,158.80	39.996669	-104.926184	1,242,153.56	3,160,763.34
9,697.00	90.18	178.17	7,858.34	-2,335.38	1,162.47	39.996433	-104.926171	1,242,067.67	3,160,767.56
9,782.00	90.43	177.91	7,857.88	-2,420.32	1,165.38	39.996200	-104.926161	1,241,982.74	3,160,771.01
9,954.00	89.69	177.54	7,857.70	-2,592.19	1,172.21	39.995728	-104.926137	1,241,810.93	3,160,778.94
10,040.00	89.88	177.02	7,858.03	-2,678.09	1,176.29	39.995492	-104.926122	1,241,725.06	3,160,783.57
10,125.00	89.91	176.44	7,858.18	-2,762.95	1,181.14	39.995259	-104.926105	1,241,640.24	3,160,788.97
10,210.00	89.60	177.30	7,858.55	-2,847.82	1,185.78	39.995026	-104.926088	1,241,555.40	3,160,794.15
10,296.00	90.34	176.75	7,858.59	-2,933.71	1,190.24	39.994791	-104.926072	1,241,469.55	3,160,799.17
10,381.00	90.49	176.38	7,857.97	-3,018.55	1,195.33	39.994558	-104.926054	1,241,384.74	3,160,804.81
10,466.00	90.52	178.00	7,857.23	-3,103.44	1,199.50	39.994325	-104.926039	1,241,299.88	3,160,809.52
10,552.00	90.83	177.30	7,856.21	-3,189.36	1,203.03	39.994089	-104.926027	1,241,213.99	3,160,813.60
10,638.00	90.18	177.87	7,855.45	-3,275.28	1,206.65	39.993853	-104.926014	1,241,128.10	3,160,817.77
10,723.00	90.03	178.76	7,855.30	-3,360.24	1,209.15	39.993620	-104.926005	1,241,043.15	3,160,820.82
10,894.00	89.01	178.27	7,856.73	-3,531.18	1,213.58	39.993151	-104.925989	1,240,872.26	3,160,826.35
11,065.00	89.29	176.83	7,859.27	-3,702.00	1,220.89	39.992682	-104.925963	1,240,701.49	3,160,834.75
11,150.00	89.17	177.66	7,860.41	-3,786.89	1,224.98	39.992449	-104.925948	1,240,616.63	3,160,839.38
11,236.00	89.91	178.18	7,861.10	-3,872.83	1,228.10	39.992213	-104.925937	1,240,530.72	3,160,843.05
11,321.00	90.40	180.33	7,860.87	-3,957.82	1,229.20	39.991979	-104.925933	1,240,445.74	3,160,844.71
11,407.00	89.07	180.37	7,861.27	-4,043.81	1,228.68	39.991743	-104.925935	1,240,359.75	3,160,844.73
11,492.00	89.60	179.77	7,862.25	-4,128.81	1,228.57	39.991510	-104.925936	1,240,274.76	3,160,845.17
11,577.00	90.43	180.31	7,862.23	-4,213.81	1,228.51	39.991277	-104.925936	1,240,189.76	3,160,845.66
11,663.00	90.12	178.64	7,861.82	-4,299.80	1,229.30	39.991041	-104.925933	1,240,103.78	3,160,847.00
11,747.00	90.92	178.27	7,861.06	-4,383.76	1,231.57	39.990810	-104.925925	1,240,019.83	3,160,849.81
11,833.00	90.25	178.55	7,860.18	-4,469.73	1,233.95	39.990574	-104.925916	1,239,933.89	3,160,852.74
11,918.00	89.17	177.13	7,860.61	-4,554.66	1,237.16	39.990341	-104.925905	1,239,848.98	3,160,856.49
12,004.00	89.69	176.99	7,861.47	-4,640.54	1,241.57	39.990105	-104.925889	1,239,763.13	3,160,861.46
12,089.00	88.95	176.54	7,862.47	-4,725.40	1,246.36	39.989872	-104.925872	1,239,678.31	3,160,866.80
12,175.00	89.42	176.83	7,863.70	-4,811.25	1,251.34	39.989637	-104.925854	1,239,592.50	3,160,872.32
12,261.00	89.11	176.49	7,864.80	-4,897.09	1,256.35	39.989401	-104.925837	1,239,506.69	3,160,877.88
12,346.00	89.51	176.05	7,865.82	-4,981.91	1,261.87	39.989168	-104.925817	1,239,421.92	3,160,883.95
12,432.00	90.03	175.57	7,866.17	-5,067.68	1,268.16	39.988933	-104.925794	1,239,336.19	3,160,890.79
12,517.00	89.35	177.05	7,866.63	-5,152.50	1,273.63	39.988700	-104.925775	1,239,251.41	3,160,896.80
12,602.00	88.68	177.33	7,868.09	-5,237.38	1,277.79	39.988467	-104.925760	1,239,166.56	3,160,901.52
12,688.00	89.91	178.30	7,869.15	-5,323.31	1,281.07	39.988231	-104.925748	1,239,080.66	3,160,905.35
12,774.00	90.15	177.54	7,869.10	-5,409.25	1,284.19	39.987995	-104.925737	1,238,994.74	3,160,909.02
12,848.00	90.89	177.85	7,868.43	-5,483.19	1,287.17	39.987792	-104.925727	1,238,920.83	3,160,912.47

## Design Report for SACK 37C-6HZ - Actual Field 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)
12,891.00	90.89	177.85	7,867.76	-5,526.15	1,288.78	39.987674	-104.925721	1,238,877.88	3,160,914.36

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,689.01	1,687.20	-23.41	20.62	Tie-On to Gyro Surveys @ 1689.01' MD :: 1687.20' TVD
8,228.00	7,837.73	-868.30	1,124.47	Current MWD Survey @ 8228.00' MD :: 7837.73' TVD
12,848.00	7,868.43	-5,483.19	1,287.17	Final MWD Survey @ 12848.00' MD :: 7868.45' TVD
12,891.00	7,867.76	-5,526.15	1,288.78	Straight Line Projection to Bit @ 12891.00' MD :: 7867.78' TVD

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	178.03	Slot	0.00	0.00	0.00

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
116.00	1,291.00	VES Gyro Surveys	NS-GYRO-MS
1,291.00	1,689.00	Additional Gyro Surveys	BLIND
1,760.00	8,353.00	MWD Vertical/Build Surveys	MWD+IFR1+SC
8,414.00	12,891.00	MWD Lateral Surveys	MWD+IFR1+SC

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,322.10	1,322.06	9 5/8"	9-5/8	13-1/2
8,389.20	7,854.60	7" @ 8389.20' MD	7	8-3/4



---

Design Report for SACK 37C-6HZ - Actual Field Surveys

---

**Design Targets**

Shape	Target Name	TVD ( )	Northing ( )	Easting ( )	+N/-S	+E/-W	Created	Updated
-------	-------------	------------	-----------------	----------------	-------	-------	---------	---------

**Directional Difficulty Index**

Average Dogleg over Survey:	1.52 °/100usft	Maximum Dogleg over Survey:	14.67 °/100usft at 7,674.00 usft
Net Tortousity applicable to Plans:	0.54 °/100usft	Directional Difficulty Index:	6.308

**Audit Info**

**North Reference Sheet for Sec. 31-T1N-R67W - SACK 37C-6HZ - Plan B**

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

Vertical Depths are relative to RKB = 16' @ 5056.00usft (Xtreme 22). Northing and Easting are relative to SACK 37C-6HZ

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: 0.99996616

Grid Coordinates of Well: 1,244,395.45 usft N, 3,159,590.14 usft E

Geographical Coordinates of Well: 40° 00' 10.24" N, 104° 55' 49.15" W

Grid Convergence at Surface is: 0.37°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,891.00usft

the Bottom Hole Displacement is 5,674.45usft in the Direction of 166.87° (True).

Magnetic Convergence at surface is: -8.20° (10 October 2014, , BGGM2014)

