

# CERTIFIED SURVEY SHEET

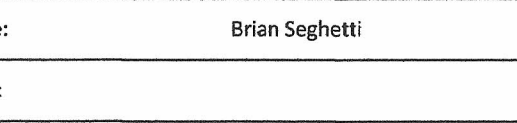
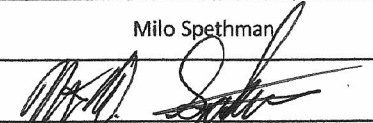

**HALLIBURTON**  
Sperry Drilling

<b>OPERATOR:</b>	Anadarko		
<b>WELL:</b>	Pettinger 30C-18HZ		
<b>FIELD:</b>	Wattenburg		
<b>GRADED ELEVATION:</b>	5007	ft. above MSL	
<b>RIG FLOOR (KB) HEIGHT:</b>	13		
<b>TVD REFERENCE:</b>	5020	ft. above MSL	
<b>RIG:</b>	Ensign 123		
<b>LEGALS:</b>	Sec. 18	Twn. 1N	Rng. 65W
<b>COUNTY:</b>	Weld		
<b>STATE:</b>	Colorado		
<b>CAL. METHOD:</b>	Minimum Curvature		
<b>NORTH REFERENCE:</b>	True	<b>Declination:</b>	8.5
<b>VERTICAL SEC. DIR.:</b>	359.37		

<b>SSDS Job Number:</b>	900984317
<b>Start Date of Job:</b>	1/22/2014
<b>End Date of Job:</b>	1/30/2014
<b>Lead Directional Driller:</b>	Brian Seghetti
<b>Other SSDS DDs:</b>	Milo Spethman
<b>SSDS MWDs:</b>	James Tilley Evan Ponder Cameron Denning

Hole Section	Surface	Intermediate	Production	1st Sidetrack	2nd Sidetrack	3rd Sidetrack	4th Sidetrack
Hole Size	13.25	8.75	6.125				
Casing Size	9 5/8	7	4.5				
Casing Depth	1204	7803					
Survey Type	Gyro	MWD+IFR	MWD+IFR				
Tie-On Depth	0	1106	7766				
First Survey Depth	13	1305	7849				
Last Survey Depth	1106	7766	12429				
Bit Projection			12475				

The following Halliburton - Sperry Drilling personnel, do certify the above information to be accurate:

Print Name: Brian Seghetti	Print Name: Milo Spethman
Sign Name: 	Sign Name: 
Print Name: Evan Ponder	Print Name: Cameron Denning
Sign Name:  484566	Sign Name:

Examples of Survey Types:

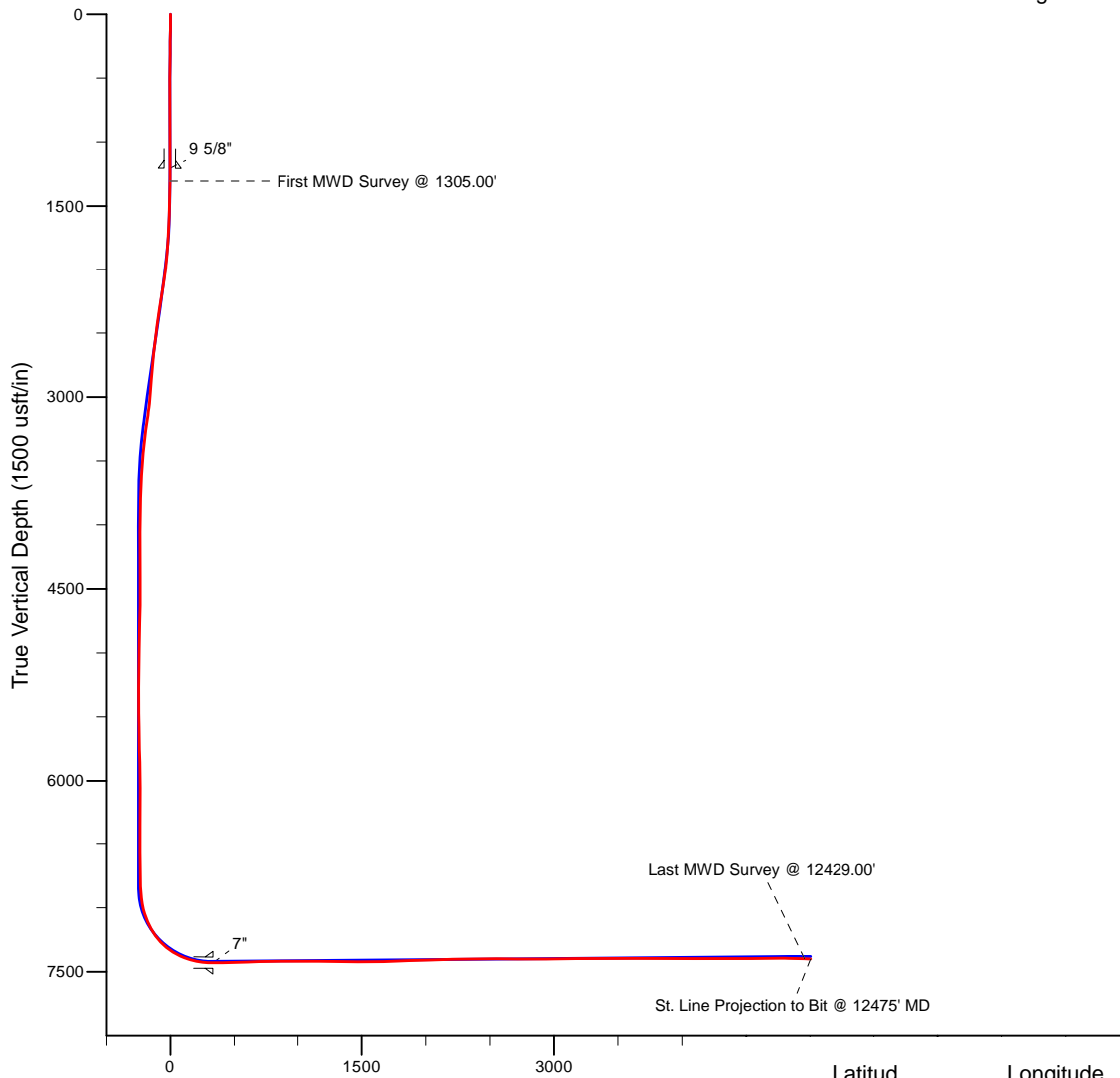
Tie-On to Surface Casing (Assumed Vertical), Tie-On to existing MWD Survey (prior drilled hole)  
Gyro Surveys - Provided by third party vendor  
MWD - Halliburton-Sperry Drilling - Measurement While Drilling Surveys  
MWD+IFR - Measurement While Drilling Surveys + In-Field Referencing services

Project: Weld County, CO (NAD 83)  
 Site: Sec. 18-T1N-R65W  
 Well: Pettinger 30C-18HZ  
 Wellbore: Plan B  
 Design: Actual Surveys



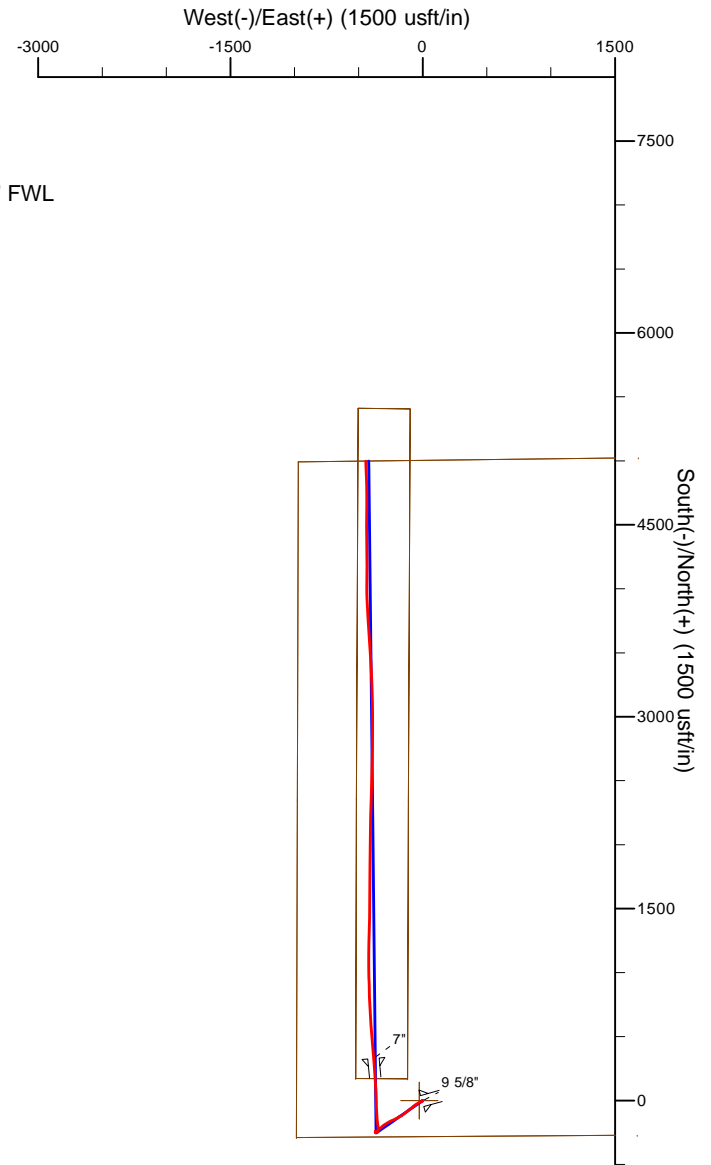
LEGEND

- ▲ Pettinger 30C-18HZ, Plan B, Rev B0 V0
- Actual Surveys



~BHL: 2' FNL:: 527' FWL

~7" Casing: 614' FSL:: 600' FWL



Vertical Section at 359.31° (1500 usft/in)

7" Casing: 40.045793  
 BHL: 40.058608

Latitude: 40.045793  
 Longitude: -104.713895  
 Latitude: 40.058608  
 Longitude: -104.714113

Northing: 1,260,503.48  
 Easting: 3,220,079.46  
 Northing: 1,265,170.91  
 Easting: 3,219,976.93

WELL DETAILS: Pettinger 30C-18HZ	
Ground Level:	5007.00
RKB= @ 5007.00usft (Original Well Elev)	
Design: Actual Surveys (Pettinger 30C-18HZ/Plan B)	
Created By: Pari Amanlou	Date: 2-21-2014

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T1N-R65W

Pettinger 30C-18HZ

Job # 900984317:: API:05-123-38019

Plan B

Design: Actual Surveys

## Sperry Drilling Services

### Standard Report

21 August, 2014

Surface UWI : Job # 900984317:: API:05-123-38019

Well Coordinates: 1,260,178.02 N, 3,220,465.28 E (40° 02' 41.60" N, 104° 42' 45.10" W)

Ground Level: 5,007.00 usft

Local Coordinate Origin:

Centered on Well Pettinger 30C-18HZ

Viewing Datum:

RKB= @ 5007.00usft (Original Well Elev)

TVDs to System:

N

North Reference:

True

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

**HALLIBURTON**

**Design Report for Pettinger 30C-18HZ - 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
13.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00
113.00	0.55	217.91	113.00	-0.38	-0.29	-0.38	0.55
213.00	0.35	178.30	213.00	-1.06	-0.58	-1.06	0.36
313.00	0.45	252.73	312.99	-1.48	-0.95	-1.47	0.49
413.00	0.39	226.51	412.99	-1.84	-1.57	-1.82	0.20
513.00	0.16	77.63	512.99	-2.04	-1.68	-2.02	0.53
613.00	0.47	220.57	612.99	-2.32	-1.81	-2.30	0.61
713.00	0.51	167.89	712.99	-3.07	-1.98	-3.05	0.44
813.00	0.31	136.10	812.98	-3.70	-1.70	-3.68	0.30
913.00	0.58	242.53	912.98	-4.13	-1.96	-4.10	0.73
1,013.00	0.45	270.95	1,012.98	-4.35	-2.81	-4.32	0.28
1,106.00	0.32	271.72	1,105.98	-4.34	-3.43	-4.30	0.14
<b>Tie-On to Surface Gyro @ 1106.00 FT</b>							
1,204.00	0.20	254.42	1,203.97	-4.38	-3.87	-4.33	0.15
<b>9 5/8"</b>							
1,305.00	0.13	205.47	1,304.97	-4.53	-4.08	-4.48	0.15
<b>First MWD Survey @ 1305.00'</b>							
1,399.00	1.34	258.93	1,398.97	-4.83	-5.21	-4.78	1.35
1,494.00	3.10	239.49	1,493.89	-6.35	-8.51	-6.26	1.99
1,589.00	4.33	240.81	1,588.69	-9.40	-13.85	-9.25	1.30
1,683.00	6.64	239.55	1,682.25	-13.89	-21.64	-13.65	2.46
1,776.00	7.43	245.63	1,774.55	-19.10	-31.75	-18.75	1.17
1,869.00	9.73	239.71	1,866.51	-25.54	-44.02	-25.06	2.65
1,963.00	11.02	235.26	1,958.97	-34.67	-58.26	-34.03	1.61
2,056.00	13.13	231.87	2,049.91	-46.26	-73.87	-45.44	2.39
2,150.00	14.44	230.44	2,141.20	-60.32	-91.31	-59.31	1.44
2,243.00	13.90	230.16	2,231.37	-74.86	-108.83	-73.66	0.59
2,337.00	13.16	230.26	2,322.76	-88.93	-125.72	-87.54	0.79
2,430.00	13.47	233.44	2,413.26	-102.15	-142.57	-100.58	0.85
2,524.00	11.70	235.38	2,505.00	-114.09	-159.20	-112.33	1.94
2,618.00	13.94	241.99	2,596.66	-124.82	-177.05	-122.87	2.84
2,711.00	14.17	241.22	2,686.87	-135.56	-196.91	-133.39	0.32
2,898.00	10.08	247.39	2,869.67	-152.88	-232.10	-150.32	2.29
2,992.00	11.29	246.09	2,962.04	-159.78	-248.10	-157.04	1.31
3,085.00	11.96	241.84	3,053.13	-168.01	-264.92	-165.09	1.17
3,179.00	14.33	234.94	3,144.67	-179.29	-283.04	-176.17	3.02
3,272.00	11.75	237.06	3,235.26	-191.06	-300.41	-187.74	2.82
3,366.00	12.02	229.43	3,327.25	-202.63	-315.88	-199.14	1.69
3,456.00	8.99	226.39	3,415.73	-213.58	-328.09	-209.95	3.42
3,546.00	7.00	226.76	3,504.86	-222.18	-337.18	-218.46	2.21
3,636.00	5.75	226.55	3,594.30	-229.04	-344.44	-225.24	1.39
3,726.00	3.96	226.15	3,683.97	-234.29	-349.96	-230.43	1.99
3,816.00	2.98	229.58	3,773.80	-237.96	-353.98	-234.06	1.11
3,906.00	2.47	232.24	3,863.70	-240.67	-357.30	-236.73	0.58
3,996.00	1.01	273.21	3,953.66	-241.81	-359.62	-237.84	2.03
4,266.00	1.33	293.54	4,223.61	-240.43	-364.87	-236.40	0.19
4,356.00	1.40	290.10	4,313.58	-239.63	-366.86	-235.58	0.12
4,446.00	0.70	150.62	4,403.57	-239.73	-367.62	-235.68	2.21
4,536.00	0.35	212.42	4,493.57	-240.45	-367.50	-236.39	0.69

**Design Report for Pettinger 30C-18HZ - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,626.00	0.42	265.84	4,583.57	-240.70	-367.98	-236.64	0.39
4,716.00	1.69	184.91	4,673.55	-242.05	-368.42	-237.98	1.86
4,806.00	1.43	200.04	4,763.52	-244.42	-368.92	-240.35	0.54
4,896.00	1.23	200.07	4,853.50	-246.39	-369.63	-242.31	0.22
4,986.00	1.24	188.97	4,943.47	-248.26	-370.12	-244.17	0.27
5,076.00	0.92	185.25	5,033.46	-249.94	-370.33	-245.85	0.36
5,256.00	0.10	121.07	5,213.45	-251.46	-370.33	-247.37	0.49
5,347.00	1.42	95.07	5,304.44	-251.60	-369.14	-247.52	1.46
5,436.00	1.26	85.87	5,393.42	-251.63	-367.07	-247.57	0.30
5,526.00	1.14	69.74	5,483.40	-251.24	-365.24	-247.21	0.40
5,616.00	1.23	42.16	5,573.38	-250.22	-363.75	-246.20	0.64
5,706.00	1.19	25.10	5,663.36	-248.66	-362.71	-244.65	0.40
5,796.00	1.30	11.76	5,753.34	-246.81	-362.10	-242.81	0.34
5,886.00	1.45	359.59	5,843.31	-244.67	-361.90	-240.68	0.36
5,976.00	1.56	346.99	5,933.28	-242.34	-362.19	-238.34	0.39
6,066.00	1.29	71.13	6,023.26	-240.82	-361.50	-236.83	2.13
6,156.00	2.38	84.31	6,113.21	-240.30	-358.69	-236.35	1.29
6,246.00	2.21	117.26	6,203.15	-240.91	-355.28	-236.99	1.46
6,336.00	1.18	127.08	6,293.11	-242.27	-353.00	-238.37	1.18
6,427.00	1.48	107.57	6,384.08	-243.19	-351.13	-239.31	0.59
6,516.00	0.70	17.49	6,473.07	-243.02	-349.87	-239.15	1.84
6,607.00	0.81	30.12	6,564.06	-241.93	-349.38	-238.07	0.22
6,696.00	1.29	42.13	6,653.05	-240.64	-348.40	-236.80	0.59
6,787.00	1.47	45.19	6,744.02	-239.06	-346.88	-235.23	0.21
6,877.00	1.20	18.35	6,834.00	-237.35	-345.77	-233.54	0.75
6,922.00	4.20	347.03	6,878.94	-235.30	-345.99	-231.48	7.19
6,967.00	6.75	2.29	6,923.74	-231.05	-346.25	-227.23	6.48
7,012.00	10.39	357.67	6,968.23	-224.35	-346.31	-220.53	8.23
7,057.00	14.06	352.88	7,012.20	-214.87	-347.15	-211.04	8.45
7,102.00	18.05	354.13	7,055.44	-202.50	-348.54	-198.66	8.90
7,147.00	21.81	352.57	7,097.73	-187.27	-350.34	-183.41	8.44
7,192.00	27.00	351.47	7,138.70	-168.87	-352.94	-164.98	11.58
7,237.00	31.51	352.78	7,177.95	-147.09	-355.93	-143.17	10.12
7,282.00	35.33	355.79	7,215.50	-122.44	-358.37	-118.49	9.25
7,327.00	39.67	357.95	7,251.20	-95.09	-359.84	-91.13	10.08
7,372.00	45.54	358.04	7,284.31	-64.66	-360.90	-60.69	13.05
7,417.00	51.81	358.30	7,314.01	-30.90	-361.97	-26.92	13.94
7,462.00	57.24	358.86	7,340.11	5.72	-362.88	9.71	12.11
7,507.00	61.71	358.54	7,362.96	44.46	-363.76	48.46	9.95
7,552.00	67.33	356.88	7,382.31	85.03	-365.39	89.05	12.92
7,597.00	70.83	356.98	7,398.38	127.00	-367.64	131.04	7.78
7,642.00	75.82	356.70	7,411.29	170.03	-370.02	174.09	11.10
7,687.00	79.38	355.39	7,420.95	213.87	-373.06	217.96	8.41
7,732.00	84.08	355.15	7,427.42	258.23	-376.73	262.36	10.46
7,766.00	88.34	354.96	7,429.67	292.03	-379.65	296.18	12.54
7,803.00	89.66	354.88	7,430.32	328.87	-382.93	333.06	3.56
<b>7"</b>							
7,849.00	91.29	354.78	7,429.94	374.68	-387.07	378.92	3.56
7,894.00	91.14	354.85	7,428.98	419.49	-391.14	423.77	0.37
7,984.00	91.17	355.61	7,427.17	509.16	-398.62	513.51	0.84
8,074.00	91.85	356.59	7,424.80	598.92	-404.74	603.33	1.33

**Design Report for Pettinger 30C-18HZ - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,164.00	92.07	357.53	7,421.72	688.75	-409.35	693.21	1.07
8,254.00	91.20	358.00	7,419.15	778.64	-412.86	783.13	1.10
8,344.00	90.03	357.56	7,418.18	868.57	-416.35	873.09	1.39
8,435.00	90.71	358.93	7,417.60	959.52	-419.13	964.07	1.68
8,524.00	90.00	359.40	7,417.04	1,048.51	-420.43	1,053.07	0.96
8,614.00	89.32	0.17	7,417.58	1,138.50	-420.77	1,143.06	1.14
8,704.00	88.33	1.32	7,419.42	1,228.47	-419.60	1,233.01	1.69
8,794.00	88.71	1.94	7,421.75	1,318.41	-417.04	1,322.91	0.81
8,884.00	89.38	0.99	7,423.25	1,408.36	-414.74	1,412.84	1.29
8,974.00	91.17	0.93	7,422.82	1,498.35	-413.23	1,502.80	1.99
9,064.00	90.96	0.30	7,421.14	1,588.32	-412.27	1,592.76	0.74
9,154.00	91.23	0.08	7,419.42	1,678.31	-411.97	1,682.74	0.39
9,244.00	91.94	0.38	7,416.94	1,768.27	-411.61	1,772.69	0.86
9,334.00	91.69	1.04	7,414.08	1,858.22	-410.49	1,862.62	0.78
9,514.00	92.53	0.19	7,407.46	2,038.08	-408.56	2,042.45	0.66
9,604.00	92.10	0.85	7,403.82	2,128.01	-407.74	2,132.36	0.87
9,694.00	90.06	1.82	7,402.13	2,217.96	-405.65	2,222.28	2.51
9,784.00	90.86	1.31	7,401.40	2,307.92	-403.19	2,312.22	1.05
9,874.00	90.00	1.30	7,400.73	2,397.89	-401.14	2,402.16	0.96
9,964.00	91.17	1.83	7,399.81	2,487.85	-398.68	2,492.09	1.43
10,054.00	90.34	1.65	7,398.62	2,577.80	-395.95	2,582.00	0.94
10,144.00	88.98	1.18	7,399.16	2,667.77	-393.73	2,671.94	1.60
10,234.00	90.34	1.10	7,399.69	2,757.75	-391.94	2,761.89	1.51
10,324.00	89.51	0.16	7,399.81	2,847.74	-390.95	2,851.87	1.39
10,414.00	90.28	0.12	7,399.97	2,937.74	-390.73	2,941.86	0.86
10,504.00	90.03	359.55	7,399.73	3,027.74	-390.99	3,031.86	0.69
10,595.00	90.43	358.73	7,399.36	3,118.73	-392.35	3,122.86	1.00
10,685.00	91.23	358.43	7,398.06	3,208.69	-394.58	3,212.84	0.95
10,775.00	90.22	357.32	7,396.92	3,298.62	-397.92	3,302.80	1.67
10,865.00	90.62	357.05	7,396.26	3,388.51	-402.34	3,392.73	0.54
10,955.00	90.96	356.49	7,395.02	3,478.36	-407.41	3,482.63	0.73
11,045.00	89.29	356.42	7,394.83	3,568.18	-412.97	3,572.51	1.86
11,135.00	89.94	356.07	7,395.43	3,657.99	-418.87	3,662.37	0.82
11,225.00	88.89	356.14	7,396.35	3,747.77	-424.98	3,752.22	1.17
11,315.00	88.83	357.09	7,398.14	3,837.60	-430.29	3,842.10	1.06
11,405.00	90.22	358.05	7,398.89	3,927.51	-434.11	3,932.04	1.88
11,495.00	90.59	359.48	7,398.25	4,017.48	-436.05	4,022.03	1.64
11,585.00	90.12	0.96	7,397.69	4,107.48	-435.70	4,112.02	1.73
11,675.00	90.28	0.32	7,397.38	4,197.47	-434.70	4,202.00	0.73
11,765.00	90.15	359.40	7,397.04	4,287.47	-434.92	4,291.99	1.03
11,855.00	89.91	358.79	7,396.99	4,377.46	-436.34	4,381.99	0.73
11,945.00	89.69	0.01	7,397.31	4,467.45	-437.28	4,471.99	1.38
12,035.00	90.31	0.53	7,397.31	4,557.45	-436.86	4,561.98	0.90
12,125.00	90.77	0.28	7,396.46	4,647.44	-436.22	4,651.96	0.58
12,215.00	91.11	359.45	7,394.98	4,737.43	-436.43	4,741.94	1.00
12,305.00	88.30	358.60	7,395.45	4,827.40	-437.97	4,831.93	3.26
12,429.00	88.09	357.60	7,399.35	4,951.27	-442.07	4,955.83	0.82
<b>Last MWD Survey @ 12429.00'</b>							
12,475.00	88.09	357.60	7,400.88	4,997.21	-444.00	5,001.79	0.00
<b>St. Line Projection to Bit @ 12475' MD</b>							

**Design Report for Pettinger 30C-18HZ - Actual Surveys****Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,106.00	1,105.98	-4.34	-3.43	Tie-On to Surface Gyro @ 1106.00 FT
1,305.00	1,304.97	-4.53	-4.08	First MWD Survey @ 1305.00'
12,429.00	7,399.35	4,951.27	-442.07	Last MWD Survey @ 12429.00'
12,475.00	7,400.88	4,997.21	-444.00	St. Line Projection to Bit @ 12475' MD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	359.37	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,106.00	Surface GYRO Surveys	NS-GYRO-MS
1,305.00	7,766.00	MWD Surveys- Intermeidate	MWD+IFR1+SC
7,849.00	12,429.00	MWD Surveys- Lateral	MWD+IFR1+SC

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,204.00		9 5/8"	9-5/8	12-3/4
7,803.00		7"	7	8-3/4

**Design Report for Pettinger 30C-18HZ - 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
Pettinger Pad 460' SB	0.00	0.00	0.00	-0.34	-26.04	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 26.04usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	4,538.44	-485.47	1,264,711.23	3,219,913.51		
Point 2			0.00	4,563.79	1,707.93	1,264,756.06	3,222,106.52		
Point 3			0.00	4,589.01	3,899.55	1,264,800.74	3,224,297.75		
Point 4			0.00	2,397.70	3,895.38	1,262,609.56	3,224,313.03		
Point 5			0.00	207.73	3,891.76	1,260,419.72	3,224,328.86		
Point 6			0.00	188.59	1,699.60	1,260,381.12	3,222,137.04		
Point 7			0.00	173.76	-497.41	1,260,346.78	3,219,940.33		
Point 8			0.00	2,356.69	-491.08	1,262,529.60	3,219,927.27		
Point 9			0.00	4,538.44	-485.47	1,264,711.23	3,219,913.51		
Pettinger 30C-5HZ SH	0.00	0.00	0.00	0.03	0.00	1,260,178.04	3,220,465.28	40° 2' 41.604 N	104° 42' 45.097 W
- actual wellpath misses target center by 0.03usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Pettinger 30C-18HZ_L	0.00	0.00	0.00	-0.34	-26.04	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 26.04usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	5,410.43	-477.72	1,265,583.23	3,219,913.51		
Point 2			0.00	2,356.69	-491.08	1,262,529.60	3,219,927.27		
Point 3			0.00	173.76	-497.41	1,260,346.78	3,219,940.33		
Point 4			0.00	170.16	-91.41	1,260,346.78	3,220,346.33		
Point 5			0.00	2,353.09	-85.08	1,262,529.60	3,220,333.27		
Point 6			0.00	5,406.83	-71.73	1,265,583.23	3,220,319.51		
Pettinger Pad Sec Lin	0.00	0.00	0.00	-0.34	-26.04	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 26.04usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	4,993.18	-944.31	1,265,161.86	3,219,450.66		
Point 2			0.00	5,023.85	1,708.86	1,265,216.09	3,222,103.36		
Point 3			0.00	5,054.36	4,360.46	1,265,270.15	3,224,754.49		
Point 4			0.00	2,401.97	4,355.40	1,262,617.91	3,224,772.98		
Point 5			0.00	-248.30	4,351.02	1,259,967.81	3,224,792.14		
Point 6			0.00	-271.45	1,698.78	1,259,921.11	3,222,140.30		
Point 7			0.00	-289.38	-958.77	1,259,879.58	3,219,483.12		
Point 8			0.00	2,352.37	-951.11	1,262,521.19	3,219,467.32		
Point 9			0.00	4,993.18	-944.31	1,265,161.86	3,219,450.66		
Pettinger 30C-5HZ BH	0.00	0.00	7,380.00	4,998.08	-420.44	1,265,171.98	3,220,000.48	40° 3' 30.996 N	104° 42' 50.504 W
- actual wellpath misses target center by 31.48usft at 12474.19usft MD (7400.86 TVD, 4996.40 N, -443.97 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	1.75 °/100usft	Maximum Dogleg over Survey:	13.94 °/100usft at 7,417.00 usft
Net Tortosity applicable to Plans:	0.76 °/100usft	Directional Difficulty Index:	6.322

**Audit Info**

**North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 30C-18HZ - 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= @ 5007.00usft (Original Well Elev). Northing and Easting are relative to Pettinger 30C-18HZ

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° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996327

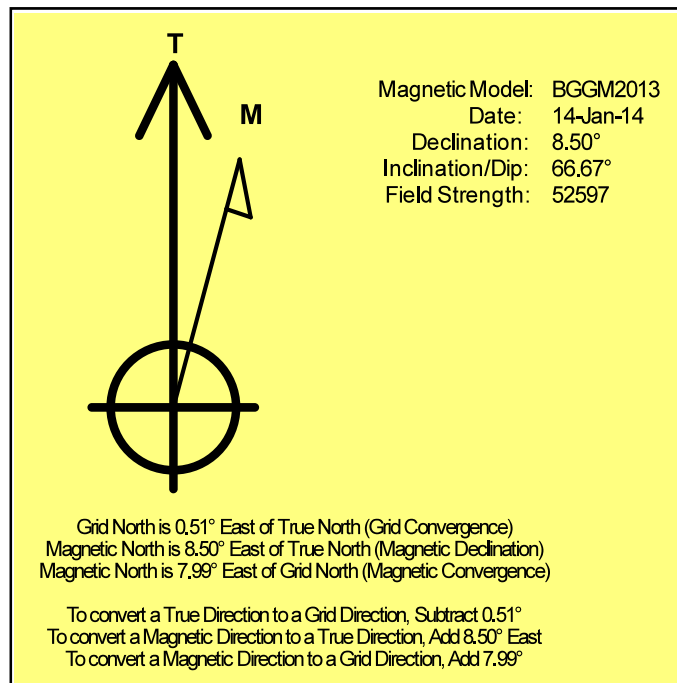
Grid Coordinates of Well: 1,260,178.02 usft N, 3,220,465.28 usft E

Geographical Coordinates of Well: 40° 02' 41.60" N, 104° 42' 45.10" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,475.00usft  
the Bottom Hole Displacement is 5,016.89usft in the Direction of 354.92° ( True).

Magnetic Convergence at surface is: -7.99° (14 January 2014, , BGGM2013)



# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T1N-R65W

Pettinger 30C-18HZ

Job # 900984317:: API:05-123-38019

Plan B

Design: Actual Surveys

## Sperry Drilling Services

### Geodetic Report

21 August, 2014

Well Coordinates: 1,260,178.02 N, 3,220,465.28 E (40° 02' 41.60" N, 104° 42' 45.10" W)

Ground Level: 5,007.00 usft

Local Coordinate Origin:

Centered on Well Pettinger 30C-18HZ

Viewing Datum:

RKB= @ 5007.00usft (Original Well Elev)

TVDs to System:

N

North Reference:

True

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

**HALLIBURTON**

**Design Report for Pettinger 30C-18HZ - Actual Surveys**

Measured			Vertical	Local Coordinates		Geographic Coordinates		UTM Coordinates	
Depth (usft)	Inclination (°)	Azimuth (°)	Depth (usft)	+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° 2' 41.604 N	104° 42' 45.097 W	1,260,178.02	3,220,465.28
13.00	0.00	0.00	13.00	0.00	0.00	40° 2' 41.604 N	104° 42' 45.097 W	1,260,178.02	3,220,465.28
113.00	0.55	217.91	113.00	-0.38	-0.29	40° 2' 41.600 N	104° 42' 45.101 W	1,260,177.64	3,220,464.98
213.00	0.35	178.30	213.00	-1.06	-0.58	40° 2' 41.593 N	104° 42' 45.105 W	1,260,176.95	3,220,464.70
313.00	0.45	252.73	313.99	-1.48	-0.95	40° 2' 41.589 N	104° 42' 45.109 W	1,260,176.53	3,220,464.34
413.00	0.39	226.51	412.99	-1.84	-1.57	40° 2' 41.586 N	104° 42' 45.117 W	1,260,176.17	3,220,463.72
513.00	0.16	77.63	512.99	-2.04	-1.68	40° 2' 41.584 N	104° 42' 45.119 W	1,260,175.97	3,220,463.61
613.00	0.47	220.57	612.99	-2.32	-1.81	40° 2' 41.581 N	104° 42' 45.120 W	1,260,175.68	3,220,463.49
713.00	0.51	167.89	712.99	-3.07	-1.98	40° 2' 41.573 N	104° 42' 45.123 W	1,260,174.93	3,220,463.32
813.00	0.31	136.10	812.98	-3.70	-1.70	40° 2' 41.567 N	104° 42' 45.119 W	1,260,174.31	3,220,463.61
913.00	0.58	242.53	912.98	-4.13	-1.96	40° 2' 41.563 N	104° 42' 45.122 W	1,260,173.88	3,220,463.35
1,013.00	0.45	270.95	1,012.98	-4.35	-2.81	40° 2' 41.561 N	104° 42' 45.133 W	1,260,173.64	3,220,462.51
1,106.00	0.32	271.72	1,105.98	-4.34	-3.43	40° 2' 41.561 N	104° 42' 45.141 W	1,260,173.65	3,220,461.88
1,204.00	0.20	254.42	1,203.97	-4.38	-3.87	40° 2' 41.560 N	104° 42' 45.147 W	1,260,173.61	3,220,461.45
1,305.00	0.13	205.47	1,304.97	-4.53	-4.08	40° 2' 41.559 N	104° 42' 45.150 W	1,260,173.46	3,220,461.23
1,399.00	1.34	258.93	1,398.97	-4.83	-5.21	40° 2' 41.556 N	104° 42' 45.164 W	1,260,173.14	3,220,460.11
1,494.00	3.10	239.49	1,493.89	-6.35	-8.51	40° 2' 41.541 N	104° 42' 45.207 W	1,260,171.59	3,220,456.82
1,589.00	4.33	240.81	1,588.69	-9.40	-13.85	40° 2' 41.511 N	104° 42' 45.275 W	1,260,168.49	3,220,451.51
1,683.00	6.64	239.55	1,682.25	-13.89	-21.64	40° 2' 41.466 N	104° 42' 45.375 W	1,260,163.94	3,220,443.76
1,776.00	7.43	245.63	1,774.55	-19.10	-31.75	40° 2' 41.415 N	104° 42' 45.505 W	1,260,158.64	3,220,433.70
1,869.00	9.73	239.71	1,866.51	-25.54	-44.02	40° 2' 41.351 N	104° 42' 45.663 W	1,260,152.09	3,220,421.49
1,963.00	11.02	235.26	1,958.97	-34.67	-58.26	40° 2' 41.261 N	104° 42' 45.846 W	1,260,142.84	3,220,407.33
2,056.00	13.13	231.87	2,049.91	-46.26	-73.87	40° 2' 41.147 N	104° 42' 46.047 W	1,260,131.11	3,220,391.82
2,150.00	14.44	230.44	2,141.20	-60.32	-91.31	40° 2' 41.008 N	104° 42' 46.271 W	1,260,116.90	3,220,374.51
2,243.00	13.90	230.16	2,231.37	-74.86	-108.83	40° 2' 40.864 N	104° 42' 46.496 W	1,260,102.20	3,220,357.12
2,337.00	13.16	230.26	2,322.76	-88.93	-125.72	40° 2' 40.725 N	104° 42' 46.714 W	1,260,087.98	3,220,340.35
2,430.00	13.47	233.44	2,413.26	-102.15	-142.57	40° 2' 40.594 N	104° 42' 46.930 W	1,260,074.61	3,220,323.63
2,524.00	11.70	235.38	2,505.00	-114.09	-159.20	40° 2' 40.476 N	104° 42' 47.144 W	1,260,062.53	3,220,307.10
2,618.00	13.94	241.99	2,596.66	-124.82	-177.05	40° 2' 40.370 N	104° 42' 47.374 W	1,260,051.63	3,220,289.35
2,711.00	14.17	241.22	2,686.87	-135.56	-196.91	40° 2' 40.264 N	104° 42' 47.629 W	1,260,040.72	3,220,269.58
2,898.00	10.08	247.39	2,869.67	-152.88	-232.10	40° 2' 40.093 N	104° 42' 48.082 W	1,260,023.09	3,220,234.55
2,992.00	11.29	246.09	2,962.04	-159.78	-248.10	40° 2' 40.025 N	104° 42' 48.287 W	1,260,016.05	3,220,218.61
3,085.00	11.96	241.84	3,053.13	-168.01	-264.92	40° 2' 39.943 N	104° 42' 48.504 W	1,260,007.67	3,220,201.86
3,179.00	14.33	234.94	3,144.67	-179.29	-283.04	40° 2' 39.832 N	104° 42' 48.736 W	1,259,996.23	3,220,183.85
3,272.00	11.75	237.06	3,235.26	-191.06	-300.41	40° 2' 39.716 N	104° 42' 48.960 W	1,259,984.31	3,220,166.59
3,366.00	12.02	229.43	3,327.25	-202.63	-315.88	40° 2' 39.601 N	104° 42' 49.159 W	1,259,972.60	3,220,151.22
3,456.00	8.99	226.39	3,415.73	-213.58	-328.09	40° 2' 39.493 N	104° 42' 49.316 W	1,259,961.55	3,220,139.11
3,546.00	7.00	226.76	3,504.86	-222.18	-337.18	40° 2' 39.408 N	104° 42' 49.433 W	1,259,952.86	3,220,130.10
3,636.00	5.75	226.55	3,594.30	-229.04	-344.44	40° 2' 39.340 N	104° 42' 49.526 W	1,259,945.94	3,220,122.89
3,726.00	3.96	226.15	3,683.97	-234.29	-349.96	40° 2' 39.288 N	104° 42' 49.597 W	1,259,940.64	3,220,117.42
3,816.00	2.98	229.58	3,773.80	-237.96	-353.98	40° 2' 39.252 N	104° 42' 49.649 W	1,259,936.93	3,220,113.43
3,906.00	2.47	232.24	3,863.70	-240.67	-357.30	40° 2' 39.225 N	104° 42' 49.691 W	1,259,934.20	3,220,110.14

**Design Report for Pettinger 30C-18HZ - 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)
3,996.00	1.01	273.21	3,953.66	-241.81	-359.62	40° 2' 39.214 N	104° 42' 49.721 W	1,259,933.03	3,220,107.83
4,266.00	1.33	293.54	4,223.61	-240.43	-364.87	40° 2' 39.228 N	104° 42' 49.789 W	1,259,934.37	3,220,102.57
4,356.00	1.40	290.10	4,313.58	-239.63	-366.86	40° 2' 39.236 N	104° 42' 49.814 W	1,259,935.15	3,220,100.57
4,446.00	0.70	150.62	4,403.57	-239.73	-367.62	40° 2' 39.235 N	104° 42' 49.824 W	1,259,935.04	3,220,099.81
4,536.00	0.35	212.42	4,493.57	-240.45	-367.50	40° 2' 39.228 N	104° 42' 49.822 W	1,259,934.33	3,220,099.94
4,626.00	0.42	265.84	4,583.57	-240.70	-367.98	40° 2' 39.225 N	104° 42' 49.829 W	1,259,934.07	3,220,099.47
4,716.00	1.69	184.91	4,673.55	-242.05	-368.42	40° 2' 39.212 N	104° 42' 49.834 W	1,259,932.72	3,220,099.03
4,806.00	1.43	200.04	4,763.52	-244.42	-368.92	40° 2' 39.188 N	104° 42' 49.841 W	1,259,930.34	3,220,098.56
4,896.00	1.23	200.07	4,853.50	-246.39	-369.63	40° 2' 39.169 N	104° 42' 49.850 W	1,259,928.37	3,220,097.86
4,986.00	1.24	188.97	4,943.47	-248.26	-370.12	40° 2' 39.150 N	104° 42' 49.856 W	1,259,926.50	3,220,097.39
5,076.00	0.92	185.25	5,033.46	-249.94	-370.33	40° 2' 39.134 N	104° 42' 49.859 W	1,259,924.81	3,220,097.19
5,256.00	0.10	121.07	5,213.45	-251.46	-370.33	40° 2' 39.119 N	104° 42' 49.859 W	1,259,923.29	3,220,097.20
5,347.00	1.42	95.07	5,304.44	-251.60	-369.14	40° 2' 39.117 N	104° 42' 49.844 W	1,259,923.16	3,220,098.40
5,436.00	1.26	85.87	5,393.42	-251.63	-367.07	40° 2' 39.117 N	104° 42' 49.817 W	1,259,923.15	3,220,100.47
5,526.00	1.14	69.74	5,483.40	-251.24	-365.24	40° 2' 39.121 N	104° 42' 49.793 W	1,259,923.55	3,220,102.29
5,616.00	1.23	42.16	5,573.38	-250.22	-363.75	40° 2' 39.131 N	104° 42' 49.774 W	1,259,924.59	3,220,103.77
5,706.00	1.19	25.10	5,663.36	-248.66	-362.71	40° 2' 39.146 N	104° 42' 49.761 W	1,259,926.16	3,220,104.80
5,796.00	1.30	11.76	5,753.34	-246.81	-362.10	40° 2' 39.165 N	104° 42' 49.753 W	1,259,928.01	3,220,105.39
5,886.00	1.45	359.59	5,843.31	-244.67	-361.90	40° 2' 39.186 N	104° 42' 49.751 W	1,259,930.15	3,220,105.57
5,976.00	1.56	346.99	5,933.28	-242.34	-362.19	40° 2' 39.209 N	104° 42' 49.754 W	1,259,932.48	3,220,105.27
6,066.00	1.29	71.13	6,023.26	-240.82	-361.50	40° 2' 39.224 N	104° 42' 49.745 W	1,259,934.01	3,220,105.94
6,156.00	2.38	84.31	6,113.21	-240.30	-358.69	40° 2' 39.229 N	104° 42' 49.709 W	1,259,934.55	3,220,108.75
6,246.00	2.21	117.26	6,203.15	-240.91	-355.28	40° 2' 39.223 N	104° 42' 49.665 W	1,259,933.97	3,220,112.16
6,336.00	1.18	127.08	6,293.11	-242.27	-353.00	40° 2' 39.210 N	104° 42' 49.636 W	1,259,932.64	3,220,114.45
6,427.00	1.48	107.57	6,384.08	-243.19	-351.13	40° 2' 39.200 N	104° 42' 49.612 W	1,259,931.73	3,220,116.33
6,516.00	0.70	17.49	6,473.07	-243.02	-349.87	40° 2' 39.202 N	104° 42' 49.596 W	1,259,931.92	3,220,117.59
6,607.00	0.81	30.12	6,564.06	-241.93	-349.38	40° 2' 39.213 N	104° 42' 49.590 W	1,259,933.01	3,220,118.07
6,696.00	1.29	42.13	6,653.05	-240.64	-348.40	40° 2' 39.226 N	104° 42' 49.577 W	1,259,934.30	3,220,119.04
6,787.00	1.47	45.19	6,744.02	-239.06	-346.88	40° 2' 39.241 N	104° 42' 49.557 W	1,259,935.90	3,220,120.54
6,877.00	1.20	18.35	6,834.00	-237.35	-345.77	40° 2' 39.258 N	104° 42' 49.543 W	1,259,937.62	3,220,121.64
6,922.00	4.20	347.03	6,878.94	-235.30	-345.99	40° 2' 39.278 N	104° 42' 49.546 W	1,259,939.67	3,220,121.40
6,967.00	6.75	2.29	6,923.74	-231.05	-346.25	40° 2' 39.320 N	104° 42' 49.549 W	1,259,943.91	3,220,121.10
7,012.00	10.39	357.67	6,968.23	-224.35	-346.31	40° 2' 39.387 N	104° 42' 49.550 W	1,259,950.61	3,220,120.98
7,057.00	14.06	352.88	7,012.20	-214.87	-347.15	40° 2' 39.480 N	104° 42' 49.561 W	1,259,960.09	3,220,120.06
7,102.00	18.05	354.13	7,055.44	-202.50	-348.54	40° 2' 39.602 N	104° 42' 49.579 W	1,259,972.44	3,220,118.56
7,147.00	21.81	352.57	7,097.73	-187.27	-350.34	40° 2' 39.753 N	104° 42' 49.602 W	1,259,987.65	3,220,116.63
7,192.00	27.00	351.47	7,138.70	-168.87	-352.94	40° 2' 39.935 N	104° 42' 49.635 W	1,260,006.03	3,220,113.87
7,237.00	31.51	352.78	7,177.95	-147.09	-355.93	40° 2' 40.150 N	104° 42' 49.674 W	1,260,027.78	3,220,110.68
7,282.00	35.33	355.79	7,215.50	-122.44	-358.37	40° 2' 40.394 N	104° 42' 49.705 W	1,260,052.41	3,220,108.02
7,327.00	39.67	357.95	7,251.20	-95.09	-359.84	40° 2' 40.664 N	104° 42' 49.724 W	1,260,079.74	3,220,106.31
7,372.00	45.54	358.04	7,284.31	-64.66	-360.90	40° 2' 40.965 N	104° 42' 49.738 W	1,260,110.16	3,220,104.98
7,417.00	51.81	358.30	7,314.01	-30.90	-361.97	40° 2' 41.298 N	104° 42' 49.751 W	1,260,143.91	3,220,103.60

**Design Report for Pettinger 30C-18HZ - 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)
7,462.00	57.24	358.86	7,340.11	5.72	-362.88	40° 2' 41.660 N	104° 42' 49.763 W	1,260,180.52	3,220,102.38
7,507.00	61.71	358.54	7,362.96	44.46	-363.76	40° 2' 42.043 N	104° 42' 49.774 W	1,260,219.25	3,220,101.15
7,552.00	67.33	356.88	7,382.31	85.03	-365.39	40° 2' 42.444 N	104° 42' 49.795 W	1,260,259.80	3,220,099.15
7,597.00	70.83	356.98	7,398.38	127.00	-367.64	40° 2' 42.859 N	104° 42' 49.824 W	1,260,301.75	3,220,096.53
7,642.00	75.82	356.70	7,411.29	170.03	-370.02	40° 2' 43.284 N	104° 42' 49.855 W	1,260,344.75	3,220,093.77
7,687.00	79.38	355.39	7,420.95	213.87	-373.06	40° 2' 43.717 N	104° 42' 49.894 W	1,260,388.56	3,220,090.35
7,732.00	84.08	355.15	7,427.42	258.23	-376.73	40° 2' 44.156 N	104° 42' 49.941 W	1,260,432.89	3,220,086.28
7,766.00	88.34	354.96	7,429.67	292.03	-379.65	40° 2' 44.490 N	104° 42' 49.979 W	1,260,466.65	3,220,083.06
7,803.00	89.66	354.88	7,430.32	328.87	-382.93	40° 2' 44.854 N	104° 42' 50.021 W	1,260,503.47	3,220,079.46
7,849.00	91.29	354.78	7,429.94	374.68	-387.07	40° 2' 45.306 N	104° 42' 50.074 W	1,260,549.24	3,220,074.91
7,894.00	91.14	354.85	7,428.98	419.49	-391.14	40° 2' 45.749 N	104° 42' 50.127 W	1,260,594.00	3,220,070.44
7,984.00	91.17	355.61	7,427.17	509.16	-398.62	40° 2' 46.635 N	104° 42' 50.223 W	1,260,683.60	3,220,062.16
8,074.00	91.85	356.59	7,424.80	598.92	-404.74	40° 2' 47.522 N	104° 42' 50.301 W	1,260,773.30	3,220,055.25
8,164.00	92.07	357.53	7,421.72	688.75	-409.35	40° 2' 48.410 N	104° 42' 50.361 W	1,260,863.08	3,220,049.84
8,254.00	91.20	358.00	7,419.15	778.64	-412.86	40° 2' 49.298 N	104° 42' 50.406 W	1,260,952.93	3,220,045.53
8,344.00	90.03	357.56	7,418.18	868.57	-416.35	40° 2' 50.187 N	104° 42' 50.451 W	1,261,042.82	3,220,041.25
8,435.00	90.71	358.93	7,417.60	959.52	-419.13	40° 2' 51.086 N	104° 42' 50.487 W	1,261,133.74	3,220,037.65
8,524.00	90.00	359.40	7,417.04	1,048.51	-420.43	40° 2' 51.965 N	104° 42' 50.503 W	1,261,222.71	3,220,035.57
8,614.00	89.32	0.17	7,417.58	1,138.50	-420.77	40° 2' 52.855 N	104° 42' 50.508 W	1,261,312.70	3,220,034.43
8,704.00	88.33	1.32	7,419.42	1,228.47	-419.60	40° 2' 53.744 N	104° 42' 50.493 W	1,261,402.67	3,220,034.80
8,794.00	88.71	1.94	7,421.75	1,318.41	-417.04	40° 2' 54.633 N	104° 42' 50.460 W	1,261,492.62	3,220,036.56
8,884.00	89.38	0.99	7,423.25	1,408.36	-414.74	40° 2' 55.521 N	104° 42' 50.430 W	1,261,582.59	3,220,038.06
8,974.00	91.17	0.93	7,422.82	1,498.35	-413.23	40° 2' 56.411 N	104° 42' 50.411 W	1,261,672.58	3,220,038.77
9,064.00	90.96	0.30	7,421.14	1,588.32	-412.27	40° 2' 57.300 N	104° 42' 50.398 W	1,261,762.56	3,220,038.94
9,154.00	91.23	0.08	7,419.42	1,678.31	-411.97	40° 2' 58.189 N	104° 42' 50.395 W	1,261,852.54	3,220,038.44
9,244.00	91.94	0.38	7,416.94	1,768.27	-411.61	40° 2' 59.078 N	104° 42' 50.390 W	1,261,942.50	3,220,038.00
9,334.00	91.69	1.04	7,414.08	1,858.22	-410.49	40° 2' 59.967 N	104° 42' 50.376 W	1,262,032.45	3,220,038.31
9,514.00	92.53	0.19	7,407.46	2,038.08	-408.56	40° 3' 1.745 N	104° 42' 50.351 W	1,262,212.32	3,220,038.65
9,604.00	92.10	0.85	7,403.82	2,128.01	-407.74	40° 3' 2.633 N	104° 42' 50.340 W	1,262,302.24	3,220,038.67
9,694.00	90.06	1.82	7,402.13	2,217.96	-405.65	40° 3' 3.522 N	104° 42' 50.314 W	1,262,392.21	3,220,039.96
9,784.00	90.86	1.31	7,401.40	2,307.92	-403.19	40° 3' 4.411 N	104° 42' 50.282 W	1,262,482.18	3,220,041.62
9,874.00	90.00	1.30	7,400.73	2,397.89	-401.14	40° 3' 5.300 N	104° 42' 50.256 W	1,262,572.17	3,220,042.87
9,964.00	91.17	1.83	7,399.81	2,487.85	-398.68	40° 3' 6.189 N	104° 42' 50.224 W	1,262,662.14	3,220,044.53
10,054.00	90.34	1.65	7,398.62	2,577.80	-395.95	40° 3' 7.078 N	104° 42' 50.189 W	1,262,752.11	3,220,046.47
10,144.00	88.98	1.18	7,399.16	2,667.77	-393.73	40° 3' 7.967 N	104° 42' 50.160 W	1,262,842.09	3,220,047.89
10,234.00	90.34	1.10	7,399.69	2,757.75	-391.94	40° 3' 8.856 N	104° 42' 50.137 W	1,262,932.08	3,220,048.88
10,324.00	89.51	0.16	7,399.81	2,847.74	-390.95	40° 3' 9.746 N	104° 42' 50.125 W	1,263,022.08	3,220,049.07
10,414.00	90.28	0.12	7,399.97	2,937.74	-390.73	40° 3' 10.635 N	104° 42' 50.122 W	1,263,112.07	3,220,048.49
10,504.00	90.03	359.55	7,399.73	3,027.74	-390.99	40° 3' 11.525 N	104° 42' 50.125 W	1,263,202.06	3,220,047.43
10,595.00	90.43	358.73	7,399.36	3,118.73	-392.35	40° 3' 12.424 N	104° 42' 50.143 W	1,263,293.03	3,220,045.26
10,685.00	91.23	358.43	7,398.06	3,208.69	-394.58	40° 3' 13.313 N	104° 42' 50.171 W	1,263,382.96	3,220,042.23
10,775.00	90.22	357.32	7,396.92	3,298.62	-397.92	40° 3' 14.202 N	104° 42' 50.214 W	1,263,472.86	3,220,038.10

**Design Report for Pettinger 30C-18HZ - 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)
10,865.00	90.62	357.05	7,396.26	3,388.51	-402.34	40° 3' 15.090 N	104° 42' 50.271 W	1,263,562.70	3,220,032.88
10,955.00	90.96	356.49	7,395.02	3,478.36	-407.41	40° 3' 15.978 N	104° 42' 50.336 W	1,263,652.49	3,220,027.01
11,045.00	89.29	356.42	7,394.83	3,568.18	-412.97	40° 3' 16.865 N	104° 42' 50.408 W	1,263,742.26	3,220,020.65
11,135.00	89.94	356.07	7,395.43	3,657.99	-418.87	40° 3' 17.753 N	104° 42' 50.484 W	1,263,832.01	3,220,013.96
11,225.00	88.89	356.14	7,396.35	3,747.77	-424.98	40° 3' 18.640 N	104° 42' 50.562 W	1,263,921.73	3,220,007.05
11,315.00	88.83	357.09	7,398.14	3,837.60	-430.29	40° 3' 19.528 N	104° 42' 50.631 W	1,264,011.50	3,220,000.94
11,405.00	90.22	358.05	7,398.89	3,927.51	-434.11	40° 3' 20.416 N	104° 42' 50.680 W	1,264,101.37	3,219,996.32
11,495.00	90.59	359.48	7,398.25	4,017.48	-436.05	40° 3' 21.305 N	104° 42' 50.705 W	1,264,191.32	3,219,993.58
11,585.00	90.12	0.96	7,397.69	4,107.48	-435.70	40° 3' 22.195 N	104° 42' 50.700 W	1,264,281.32	3,219,993.13
11,675.00	90.28	0.32	7,397.38	4,197.47	-434.70	40° 3' 23.084 N	104° 42' 50.688 W	1,264,371.31	3,219,993.34
11,765.00	90.15	359.40	7,397.04	4,287.47	-434.92	40° 3' 23.974 N	104° 42' 50.690 W	1,264,461.30	3,219,992.32
11,855.00	89.91	358.79	7,396.99	4,377.46	-436.34	40° 3' 24.863 N	104° 42' 50.709 W	1,264,551.27	3,219,990.10
11,945.00	89.69	0.01	7,397.31	4,467.45	-437.28	40° 3' 25.752 N	104° 42' 50.721 W	1,264,641.25	3,219,988.36
12,035.00	90.31	0.53	7,397.31	4,557.45	-436.86	40° 3' 26.642 N	104° 42' 50.715 W	1,264,731.24	3,219,987.98
12,125.00	90.77	0.28	7,396.46	4,647.44	-436.22	40° 3' 27.531 N	104° 42' 50.707 W	1,264,821.23	3,219,987.82
12,215.00	91.11	359.45	7,394.98	4,737.43	-436.43	40° 3' 28.420 N	104° 42' 50.710 W	1,264,911.21	3,219,986.81
12,305.00	88.30	358.60	7,395.45	4,827.40	-437.97	40° 3' 29.309 N	104° 42' 50.730 W	1,265,001.17	3,219,984.48
12,429.00	88.09	357.60	7,399.35	4,951.27	-442.07	40° 3' 30.533 N	104° 42' 50.783 W	1,265,124.99	3,219,979.27
12,475.00	88.09	357.60	7,400.88	4,997.21	-444.00	40° 3' 30.987 N	104° 42' 50.807 W	1,265,170.90	3,219,976.93

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,106.00	1,105.98	-4.34	-3.43	Tie-On to Surface Gyro @ 1106.00 FT
1,305.00	1,304.97	-4.53	-4.08	First MWD Survey @ 1305.00'
12,429.00	7,399.35	4,951.27	-442.07	Last MWD Survey @ 12429.00'
12,475.00	7,400.88	4,997.21	-444.00	St. Line Projection to Bit @ 12475' MD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	359.37	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool

**Design Report for Pettinger 30C-18HZ - Actual Surveys**

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,106.00	Surface GYRO Surveys	NS-GYRO-MS
1,305.00	7,766.00	MWD Surveys- Intermeidate	MWD+IFR1+SC
7,849.00	12,429.00	MWD Surveys- Lateral	MWD+IFR1+SC

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,204.00	1,203.97	9 5/8"	9-5/8	12-3/4
7,803.00	7,430.32	7"	7	8-3/4

**Design Targets**

Shape	Target Name	TVD (usft)	Northing (usft)	Easting (usft)	+N/-S usft	+E/-W usft	Created	Updated
Polygon	Pettinger 30C-18HZ_LD	0.00	1,260,177.45	3,220,439.24	-0.34	-26.04	1/3/2014	1/3/2014
Polygon	Pettinger Pad Sec_line (S)	0.00	1,260,177.45	3,220,439.24	-0.34	-26.04	1/3/2014	1/3/2014

**Directional Difficulty Index**

Average Dogleg over Survey:	1.75 °/100usft	Maximum Dogleg over Survey:	13.94 °/100usft at 7,417.00 usft
Net Tortousity applicable to Plans:	0.76 °/100usft	Directional Difficulty Index:	6.322

**Audit Info**

## North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 30C-18HZ - 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= @ 5007.00usft (Original Well Elev). Northing and Easting are relative to Pettinger 30C-18HZ

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° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996327

Grid Coordinates of Well: 1,260,178.02 usft N, 3,220,465.28 usft E

Geographical Coordinates of Well: 40° 02' 41.60" N, 104° 42' 45.10" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,475.00usft

the Bottom Hole Displacement is 5,016.89usft in the Direction of 354.92° ( True).

Magnetic Convergence at surface is: -7.99° (14 January 2014, , BGGM2013)

