SPERRY-SUN DRILLING SERVICES

CERTIFIED SURVEY WORK SHEET

OPERATOR:	Anadarko
WELL:	Pettinger 30N-18HZ
FIELD:	Wattenberg
RIG:	Ensign 123
LEGALS:	Sec. 18-T1N-R65W
COUNTY:	Weld
STATE:	CO
CAL. METHOD:	True North
MAG. DECL. APPLIED:	8.5
VERTICAL SEC. DIR. :	359.710

SSDS Job Number :	900930449
Start Date of Job :	1/13/2014
End Date of Job :	1/21/2014
Lead Directional Driller:	Jordan Timbs
Directional Driller	
Directional Trainee	
SSDS MWD Engineers :	James Tilley
MWD :	
MWD Trainee	

	Main Hole ==========>		1st Side Track ========>		2nd Side Track ========>		3rd Side Track ========>		4th Side Track ========>	
Surface Casing	1206.00	Tie-on		Tie On		Tie On		Tie On		Tie On
First Wireline Survey	113.00	Gyro		MWD						
Last Wireline Survey	1113.00	Gyro								
KOP Depth/Sidetrack MD	6744.00	KOP		KOP-ST1		KOP-ST2		KOP-ST3		KOP-ST4
MWD Tie-on	1113.00	Gyro								
First MWD Survey Depth	1241.00	MWD		MWD		MWD		MWD		MWD
Last MWD Survey Depth	12254.00	MWD		MWD		MWD		MWD		MWD
Bit Extrapolation @ TD	12300.00	T.D.		T.D.		T.D.		T.D.		T.D.

The following Sperry Drilling Services personnel, certify the above survey information to be accurate to the best of our knowledge:

Print Name : Jordan Timbs	Print Name : James Tilley	Print Name :
Sign Name : Jordan Timbs	Sign Name :	Sign Name :
Print Name :	Print Name :	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.

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

Anadarko Petroleum Corporation

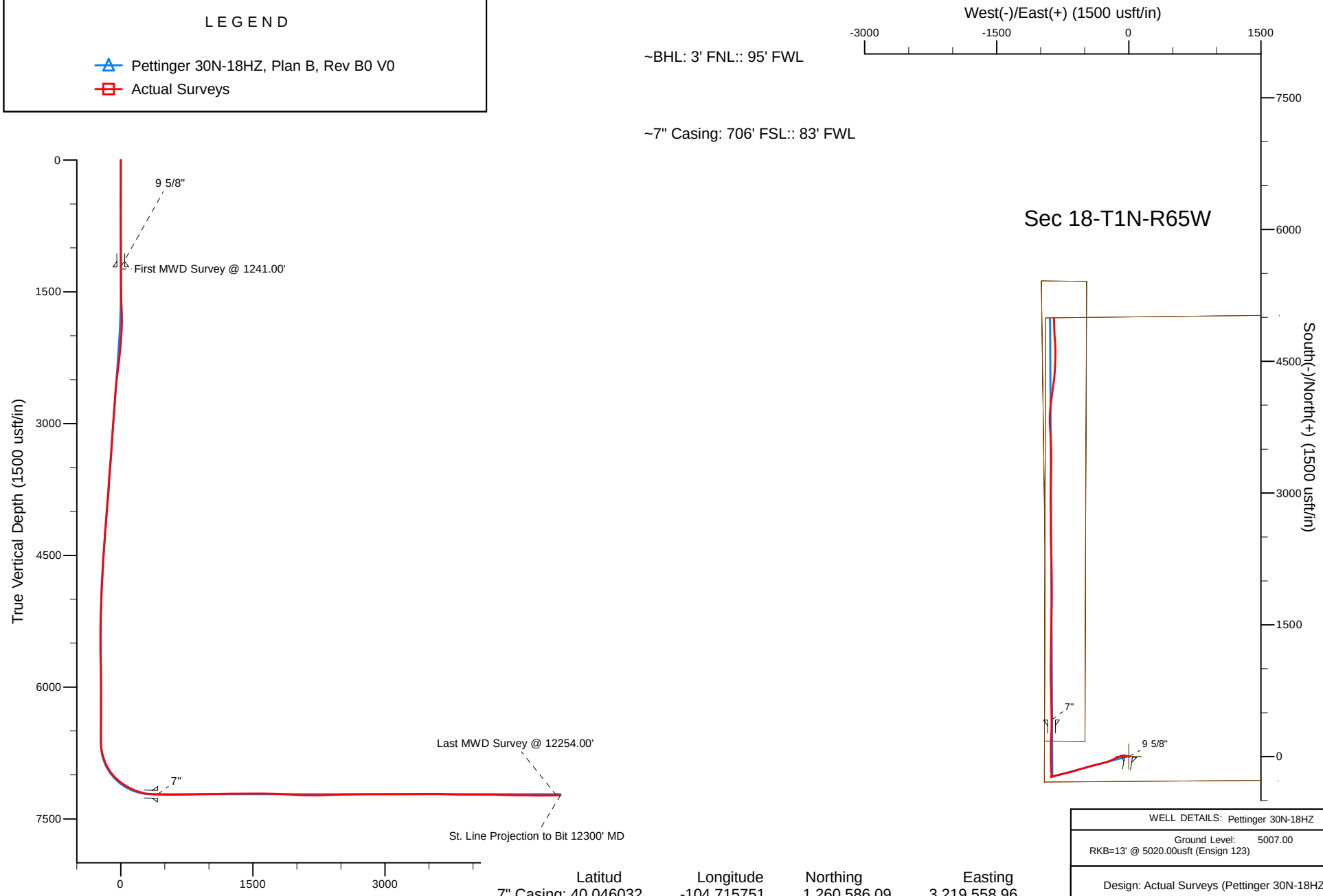
HALLIBURTON
Sperry Drilling

LEGEND

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

~BHL: 3' FNL:: 95' FWL

~7" Casing: 706' FSL:: 83' FWL



	Latitud	Longitude	Northing	Easting
7" Casing:	40.046032	-104.715751	1,260,586.09	3,219,558.96
BHL:	40.058591	-104.715654	1,265,161.02	3,219,545.65

WELL DETAILS: Pettinger 30N-18HZ

Ground Level: 5007.00
RKB=13' @ 5020.00usft (Ensign 123)

Design: Actual Surveys (Pettinger 30N-18HZ/Plan B)

Created By: Pari Amanlou Date: 2-21-2014

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)
Sec. 18-T1N-R65W
Pettinger 30N-18HZ
Job # 900930449::API:05-123-38022
Plan B

Design: Actual Surveys

Sperry Drilling Services

Standard Report

21 August, 2014

Surface UWI : Job # 900930449::API:05-123-38022

Well Coordinates: 1,260,177.42 N, 3,220,439.24 E (40° 02' 41.60" N, 104° 42' 45.43" W)
Ground Level: 5,007.00 usft

Local Coordinate Origin:	Centered on Well Pettinger 30N-18HZ
Viewing Datum:	RKB=13' @ 5020.00usft (Ensign 123)
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 30N-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	0.44	265.61	113.00	-0.03	-0.38	-0.03	0.44
213.00	0.20	312.25	213.00	0.06	-0.89	0.06	0.34
313.00	0.59	325.53	312.99	0.60	-1.32	0.61	0.40
413.00	0.40	244.61	412.99	0.88	-1.92	0.88	0.66
513.00	0.16	171.14	512.99	0.59	-2.22	0.60	0.39
613.00	0.30	146.80	612.99	0.23	-2.05	0.24	0.17
713.00	0.32	138.38	712.99	-0.20	-1.72	-0.19	0.05
813.00	0.29	39.85	812.99	-0.21	-1.37	-0.20	0.46
913.00	0.32	18.71	912.99	0.25	-1.12	0.25	0.12
1,013.00	0.20	82.68	1,012.99	0.53	-0.86	0.54	0.29
1,113.00	0.39	11.52	1,112.98	0.89	-0.62	0.89	0.38
Tie-On to Surface Gyro @ 1113.00 FT							
1,217.00	0.18	8.91	1,216.98	1.40	-0.52	1.40	0.20
9 5/8"							
1,241.00	0.13	7.10	1,240.98	1.46	-0.51	1.46	0.20
First MWD Survey @ 1241.00'							
1,304.00	0.19	59.64	1,303.98	1.58	-0.42	1.59	0.24
1,398.00	2.92	281.81	1,397.94	2.15	-2.62	2.17	3.26
1,493.00	5.04	283.09	1,492.71	3.59	-9.06	3.64	2.23
1,588.00	7.36	284.37	1,587.15	6.05	-19.02	6.15	2.45
1,682.00	9.45	286.30	1,680.13	9.71	-32.26	9.87	2.24
1,775.00	10.00	275.09	1,771.80	12.57	-47.63	12.81	2.12
1,869.00	10.39	265.90	1,864.33	12.69	-64.22	13.01	1.78
1,962.00	10.80	253.59	1,955.75	9.63	-80.94	10.04	2.47
2,056.00	12.07	249.95	2,047.89	3.77	-98.62	4.27	1.55
2,150.00	14.24	247.91	2,139.41	-3.95	-118.57	-3.35	2.36
2,243.00	15.99	245.09	2,229.19	-13.65	-140.79	-12.94	2.04
2,337.00	15.66	243.86	2,319.63	-24.69	-163.92	-23.86	0.50
2,430.00	14.95	242.82	2,409.33	-35.70	-185.86	-34.76	0.82
2,524.00	15.15	244.75	2,500.11	-46.48	-207.76	-45.43	0.57
2,617.00	15.88	249.26	2,589.72	-56.17	-230.65	-55.00	1.52
2,711.00	17.21	257.86	2,679.84	-63.65	-256.28	-62.35	2.96
2,804.00	15.61	255.75	2,769.05	-69.62	-281.86	-68.19	1.84
2,898.00	15.99	254.82	2,859.50	-76.13	-306.61	-74.57	0.49
2,991.00	14.33	252.77	2,949.26	-82.89	-329.97	-81.22	1.88
3,085.00	15.45	255.43	3,040.11	-89.49	-353.20	-87.70	1.40
3,178.00	15.98	257.48	3,129.63	-95.38	-377.68	-93.46	0.83
3,272.00	16.23	257.47	3,219.94	-101.03	-403.14	-98.99	0.27
3,365.00	15.28	255.73	3,309.45	-106.87	-427.70	-104.71	1.14
3,455.00	15.82	253.91	3,396.15	-113.20	-450.98	-110.91	0.81
3,545.00	14.36	252.03	3,483.05	-120.04	-473.39	-117.64	1.71
3,635.00	15.64	254.92	3,569.98	-126.64	-495.72	-124.13	1.65
3,725.00	15.33	256.09	3,656.71	-132.66	-518.98	-130.03	0.49
3,816.00	13.89	253.60	3,744.77	-138.63	-541.14	-135.89	1.73
3,906.00	14.17	250.52	3,832.09	-145.35	-561.88	-142.51	0.89
3,995.00	16.36	253.39	3,917.94	-152.57	-584.17	-149.61	2.60
4,086.00	14.20	251.77	4,005.72	-159.73	-607.05	-156.65	2.42
4,176.00	16.11	253.92	4,092.59	-166.64	-629.54	-163.45	2.21

Design Report for Pettinger 30N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,265.00	14.52	252.74	4,178.42	-173.37	-652.06	-170.07	1.82
4,355.00	17.24	256.37	4,264.98	-179.86	-675.80	-176.44	3.22
4,445.00	16.87	257.03	4,351.02	-185.94	-701.49	-182.38	0.46
4,535.00	16.65	256.51	4,437.20	-191.88	-726.75	-188.19	0.30
4,625.00	15.39	255.05	4,523.70	-197.96	-750.83	-194.16	1.47
4,716.00	13.51	257.74	4,611.82	-203.34	-772.88	-199.42	2.19
4,896.00	11.64	257.23	4,787.50	-211.82	-811.14	-207.71	1.04
4,986.00	10.05	253.59	4,875.89	-216.04	-827.53	-211.85	1.92
5,076.00	9.60	252.92	4,964.57	-220.46	-842.24	-216.20	0.52
5,166.00	8.22	257.69	5,053.48	-224.04	-855.70	-219.71	1.74
5,256.00	6.30	249.63	5,142.76	-227.13	-866.62	-222.74	2.41
5,346.00	4.30	236.39	5,232.37	-230.72	-874.06	-226.29	2.59
5,436.00	2.61	242.72	5,322.21	-233.53	-878.69	-229.08	1.92
5,526.00	1.51	306.05	5,412.16	-233.77	-881.47	-229.30	2.62
5,616.00	0.31	328.90	5,502.14	-232.86	-882.55	-228.39	1.37
5,706.00	0.91	342.88	5,592.14	-231.97	-882.89	-227.50	0.68
5,795.00	1.16	349.38	5,681.12	-230.41	-883.26	-225.94	0.31
5,885.00	1.53	355.15	5,771.10	-228.32	-883.53	-223.84	0.44
5,975.00	0.67	64.09	5,861.08	-226.89	-883.16	-222.42	1.59
6,065.00	1.14	36.82	5,951.07	-225.94	-882.15	-221.47	0.69
6,156.00	0.82	79.02	6,042.06	-225.09	-880.97	-220.63	0.84
6,246.00	1.22	135.27	6,132.05	-225.65	-879.66	-221.20	1.14
6,336.00	1.59	125.50	6,222.02	-227.06	-877.97	-222.61	0.49
6,426.00	1.29	60.59	6,312.00	-227.28	-876.07	-222.85	1.74
6,516.00	0.69	152.29	6,401.99	-227.27	-874.94	-222.84	1.65
6,606.00	1.29	118.68	6,491.97	-228.23	-873.80	-223.81	0.90
6,696.00	0.68	42.48	6,581.96	-228.33	-872.55	-223.91	1.45
6,741.00	1.44	340.24	6,626.96	-227.60	-872.56	-223.18	2.83
6,787.00	5.23	343.76	6,672.87	-225.04	-873.34	-220.62	8.25
6,832.00	9.29	347.40	6,717.50	-219.52	-874.71	-215.09	9.08
6,877.00	13.52	349.92	6,761.60	-210.79	-876.42	-206.36	9.46
6,922.00	18.65	351.36	6,804.83	-198.49	-878.42	-194.05	11.43
6,967.00	22.08	354.91	6,847.01	-182.95	-880.26	-178.49	8.10
7,012.00	25.15	356.78	6,888.24	-164.97	-881.54	-160.51	7.02
7,057.00	30.10	358.94	6,928.10	-144.13	-882.29	-139.66	11.22
7,102.00	36.08	359.69	6,965.78	-119.58	-882.57	-115.11	13.32
7,147.00	41.02	359.65	7,000.96	-91.54	-882.73	-87.07	10.98
7,192.00	44.97	359.14	7,033.87	-60.86	-883.06	-56.39	8.81
7,237.00	49.56	358.88	7,064.40	-27.82	-883.64	-23.35	10.21
7,282.00	53.99	358.58	7,092.24	7.51	-884.42	11.99	9.86
7,327.00	57.80	358.24	7,117.46	44.75	-885.46	49.23	8.49
7,372.00	61.63	359.87	7,140.15	83.59	-886.09	88.08	9.07
7,417.00	65.75	0.88	7,160.09	123.92	-885.82	128.40	9.37
7,462.00	68.23	3.21	7,177.69	165.31	-884.33	169.78	7.29
7,507.00	72.67	4.32	7,192.74	207.61	-881.54	212.07	10.14
7,552.00	75.37	2.40	7,205.13	250.79	-879.01	255.24	7.27
7,597.00	81.16	0.56	7,214.28	294.81	-877.88	299.25	13.47
7,642.00	86.67	0.74	7,219.05	339.54	-877.37	343.98	12.25
7,671.00	87.94	0.84	7,220.41	368.51	-876.97	372.94	4.39
7,719.00	88.38	359.92	7,221.95	416.48	-876.66	420.91	2.13
7"							

Design Report for Pettinger 30N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7,753.00	88.70	359.27	7,222.81	450.47	-876.90	454.90	2.13
7,843.00	88.34	358.56	7,225.14	540.42	-878.60	544.86	0.88
7,933.00	91.02	359.35	7,225.64	630.39	-880.24	634.84	3.10
8,023.00	91.17	358.41	7,223.92	720.36	-882.00	724.81	1.06
8,113.00	91.11	358.00	7,222.13	810.30	-884.82	814.77	0.46
8,203.00	90.96	359.11	7,220.50	900.25	-887.09	904.73	1.24
8,293.00	91.26	0.51	7,218.76	990.23	-887.39	994.71	1.59
8,383.00	90.96	1.09	7,217.02	1,080.21	-886.13	1,084.68	0.73
8,563.00	90.74	0.54	7,214.35	1,260.17	-883.57	1,264.62	0.33
8,653.00	89.72	0.81	7,213.99	1,350.16	-882.51	1,354.61	1.17
8,833.00	91.08	1.02	7,212.73	1,530.13	-879.63	1,534.56	0.76
8,923.00	88.18	1.35	7,213.31	1,620.10	-877.77	1,624.52	3.24
9,103.00	88.83	1.37	7,218.01	1,799.98	-873.50	1,804.38	0.36
9,193.00	86.27	359.17	7,221.85	1,889.89	-873.08	1,894.28	3.75
9,283.00	86.67	359.38	7,227.40	1,979.71	-874.21	1,984.11	0.50
9,373.00	88.27	359.54	7,231.37	2,069.62	-875.06	2,074.02	1.79
9,553.00	91.39	358.68	7,231.90	2,249.57	-877.86	2,253.98	1.80
9,643.00	91.54	358.29	7,229.60	2,339.51	-880.24	2,343.93	0.46
9,733.00	91.51	357.74	7,227.21	2,429.42	-883.35	2,433.86	0.61
9,823.00	92.47	359.59	7,224.08	2,519.34	-885.45	2,523.79	2.31
9,913.00	91.14	0.42	7,221.25	2,609.29	-885.44	2,613.74	1.74
10,003.00	90.22	359.80	7,220.18	2,699.28	-885.27	2,703.73	1.23
10,093.00	89.69	359.12	7,220.25	2,789.28	-886.12	2,793.73	0.96
10,273.00	89.94	0.25	7,220.83	2,969.27	-887.11	2,973.72	0.64
10,363.00	90.19	0.75	7,220.73	3,059.27	-886.32	3,063.71	0.62
10,453.00	90.28	1.57	7,220.36	3,149.25	-884.50	3,153.68	0.92
10,633.00	90.71	0.95	7,218.80	3,329.20	-880.54	3,333.61	0.42
10,723.00	90.37	359.41	7,217.96	3,419.19	-880.26	3,423.60	1.75
10,813.00	90.46	358.52	7,217.30	3,509.17	-881.88	3,513.59	0.99
10,903.00	88.67	357.08	7,217.99	3,599.10	-885.34	3,603.53	2.55
10,993.00	88.74	356.63	7,220.02	3,688.94	-890.27	3,693.40	0.51
11,083.00	88.74	356.86	7,222.00	3,778.77	-895.38	3,783.25	0.26
11,173.00	89.97	1.61	7,223.01	3,868.73	-896.58	3,873.22	5.45
11,263.00	90.06	4.71	7,222.99	3,958.58	-891.62	3,963.04	3.45
11,354.00	90.28	8.20	7,222.72	4,048.99	-881.39	4,053.40	3.84
11,444.00	89.54	6.43	7,222.86	4,138.25	-869.94	4,142.60	2.13
11,534.00	89.78	9.90	7,223.40	4,227.33	-857.16	4,231.61	3.86
11,624.00	86.83	4.98	7,226.06	4,316.49	-845.51	4,320.71	6.37
11,714.00	87.99	2.86	7,230.13	4,406.18	-839.36	4,410.37	2.68
11,804.00	90.52	2.51	7,231.30	4,496.07	-835.15	4,500.24	2.84
11,894.00	89.26	0.63	7,231.47	4,586.03	-832.68	4,590.18	2.51
11,984.00	88.71	356.82	7,233.06	4,675.97	-834.68	4,680.14	4.28
12,074.00	89.20	356.04	7,234.71	4,765.78	-840.29	4,769.98	1.02
12,164.00	91.08	358.29	7,234.49	4,855.66	-844.74	4,859.88	3.26
12,254.00	92.22	357.95	7,231.89	4,945.58	-847.69	4,949.80	1.32
Last MWD Survey @ 12254.00'							
12,300.00	92.22	357.95	7,230.11	4,991.51	-849.33	4,995.75	0.00
St. Line Projection to Bit 12300' MD							

Design Report for Pettinger 30N-18HZ - Actual Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,113.00	1,112.98	0.89	-0.62	Tie-On to Surface Gyro @ 1113.00 FT
1,241.00	1,240.98	1.46	-0.51	First MWD Survey @ 1241.00'
12,254.00	7,231.89	4,945.58	-847.69	Last MWD Survey @ 12254.00'
12,300.00	7,230.11	4,991.51	-849.33	St. Line Projection to Bit 12300' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	359.71	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,113.00	Surface Gyro Surveys	NS-GYRO-MS
1,241.00	7,671.00	MWD Surveys- Intermediate	MWD+IFR1+SC
7,753.00	12,254.00	MWD Survey-Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,217.00	1,216.98	9 5/8"	9-5/8	12-3/4
7,719.00	7,221.95	7"	7	8-3/4

Design Report for Pettinger 30N-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 30N-18HZ_L	0.00	0.00	0.00	0.03	0.00	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 0.03usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	5,410.43	-477.73	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	177.84	-957.41	1,260,346.78	3,219,480.33		
Point 5			0.00	2,360.77	-951.08	1,262,529.60	3,219,467.27		
Point 6			0.00	5,415.00	-991.73	1,265,583.23	3,219,399.51		
Pettinger 30N-18HZ SI	0.00	0.00	0.00	0.01	0.00	1,260,177.43	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Pettinger 4NE-18HZ_L	0.00	0.00	0.00	0.38	52.08	1,260,178.26	3,220,491.31	40° 2' 41.604 N	104° 42' 44.762 W
- actual wellpath misses target center by 52.08usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	169.78	-140.48	1,260,346.78	3,220,349.33		
Point 2			0.00	161.63	776.51	1,260,346.78	3,221,266.33		
Point 3			0.00	2,344.56	782.84	1,262,529.60	3,221,253.27		
Point 4			0.00	5,398.31	796.20	1,265,583.23	3,221,239.52		
Point 5			0.00	6,270.30	803.95	1,266,455.22	3,221,239.53		
Point 6			0.00	6,278.45	-113.05	1,266,455.23	3,220,322.52		
Pettinger Pad 460' SB_	0.00	0.00	13.00	0.03	0.00	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 0.03usft at 13.00usft MD (13.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			13.00	4,538.44	-485.47	1,264,711.23	3,219,913.51		
Point 2			13.00	4,563.79	1,707.93	1,264,756.06	3,222,106.52		
Point 3			13.00	4,589.01	3,899.55	1,264,800.73	3,224,297.75		
Point 4			13.00	2,397.70	3,895.38	1,262,609.55	3,224,313.04		
Point 5			13.00	207.73	3,891.76	1,260,419.72	3,224,328.86		
Point 6			13.00	188.59	1,699.60	1,260,381.12	3,222,137.04		
Point 7			13.00	173.76	-497.41	1,260,346.78	3,219,940.33		
Point 8			13.00	2,356.69	-491.08	1,262,529.60	3,219,927.27		
Point 9			13.00	4,538.44	-485.47	1,264,711.23	3,219,913.51		
Pettinger Pad Sec_lin	0.00	0.00	13.00	0.03	0.00	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 0.03usft at 13.00usft MD (13.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			13.00	4,993.18	-944.31	1,265,161.86	3,219,450.67		
Point 2			13.00	5,023.85	1,708.86	1,265,216.09	3,222,103.37		
Point 3			13.00	5,054.36	4,360.46	1,265,270.14	3,224,754.49		
Point 4			13.00	2,401.97	4,355.40	1,262,617.91	3,224,772.98		
Point 5			13.00	-248.30	4,351.02	1,259,967.80	3,224,792.14		
Point 6			13.00	-271.45	1,698.78	1,259,921.10	3,222,140.30		
Point 7			13.00	-289.38	-958.77	1,259,879.58	3,219,483.11		
Point 8			13.00	2,352.37	-951.11	1,262,521.20	3,219,467.32		
Point 9			13.00	4,993.18	-944.31	1,265,161.86	3,219,450.67		
Pettinger 30N-18HZ BI	0.00	0.00	7,220.00	4,992.63	-894.35	1,265,161.73	3,219,500.63	40° 3' 30.938 N	104° 42' 56.934 W
- actual wellpath misses target center by 46.16usft at 12300.00usft MD (7230.11 TVD, 4991.51 N, -849.33 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	2.08 °/100usft	Maximum Dogleg over Survey:	13.47 °/100usft at 7,597.00 usft
Net Tortousity applicable to Plans:	1.05 °/100usft	Directional Difficulty Index:	6.429

Audit Info

North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 30N-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=13' @ 5020.00usft (Ensign 123). Northing and Easting are relative to Pettinger 30N-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: 1,260,177.42 usft N, 3,220,439.24 usft E

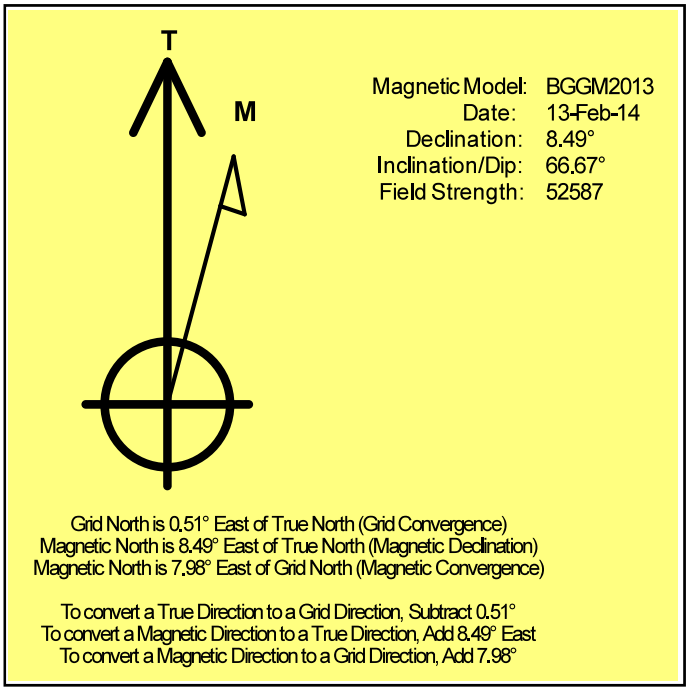
Geographical Coordinates of Well: 40° 02' 41.60" N, 104° 42' 45.43" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,300.00usft

the Bottom Hole Displacement is 5,063.26usft in the Direction of 350.34° (True).

Magnetic Convergence at surface is: -7.98° (13 February 2014, , BGGM2013)



Anadarko Petroleum Corp.

Weld County, CO (NAD 83)
Sec. 18-T1N-R65W
Pettinger 30N-18HZ
Job # 900930449::API:05-123-38022
Plan B

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

21 August, 2014

Well Coordinates: 1,260,177.42 N, 3,220,439.24 E (40° 02' 41.60" N, 104° 42' 45.43" W)
Ground Level: 5,007.00 usft

Local Coordinate Origin:	Centered on Well Pettinger 30N-18HZ
Viewing Datum:	RKB=13' @ 5020.00usft (Ensign 123)
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 30N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude	Geographic Coordinates Longitude	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40° 2' 41.600 N	104° 42' 45.432 W	1,260,177.42	3,220,439.24
13.00	0.00	0.00	13.00	0.00	0.00	40° 2' 41.600 N	104° 42' 45.432 W	1,260,177.42	3,220,439.24
113.00	0.44	265.61	113.00	-0.03	-0.38	40° 2' 41.600 N	104° 42' 45.437 W	1,260,177.39	3,220,438.86
213.00	0.20	312.25	213.00	0.06	-0.89	40° 2' 41.601 N	104° 42' 45.444 W	1,260,177.47	3,220,438.35
313.00	0.59	325.53	312.99	0.60	-1.32	40° 2' 41.606 N	104° 42' 45.449 W	1,260,178.01	3,220,437.92
413.00	0.40	244.61	412.99	0.88	-1.92	40° 2' 41.609 N	104° 42' 45.457 W	1,260,178.28	3,220,437.31
513.00	0.16	171.14	512.99	0.59	-2.22	40° 2' 41.606 N	104° 42' 45.460 W	1,260,177.99	3,220,437.02
613.00	0.30	146.80	612.99	0.23	-2.05	40° 2' 41.602 N	104° 42' 45.458 W	1,260,177.63	3,220,437.19
713.00	0.32	138.38	712.99	-0.20	-1.72	40° 2' 41.598 N	104° 42' 45.454 W	1,260,177.21	3,220,437.52
813.00	0.29	39.85	812.99	-0.21	-1.37	40° 2' 41.598 N	104° 42' 45.450 W	1,260,177.20	3,220,437.87
913.00	0.32	18.71	912.99	0.25	-1.12	40° 2' 41.603 N	104° 42' 45.446 W	1,260,177.66	3,220,438.12
1,013.00	0.20	82.68	1,012.99	0.53	-0.86	40° 2' 41.605 N	104° 42' 45.443 W	1,260,177.95	3,220,438.38
1,113.00	0.39	11.52	1,112.98	0.89	-0.62	40° 2' 41.609 N	104° 42' 45.440 W	1,260,178.30	3,220,438.62
1,217.00	0.18	8.91	1,216.98	1.40	-0.52	40° 2' 41.614 N	104° 42' 45.439 W	1,260,178.81	3,220,438.71
1,241.00	0.13	7.10	1,240.98	1.46	-0.51	40° 2' 41.614 N	104° 42' 45.439 W	1,260,178.88	3,220,438.72
1,304.00	0.19	59.64	1,303.98	1.58	-0.42	40° 2' 41.616 N	104° 42' 45.437 W	1,260,179.00	3,220,438.81
1,398.00	2.92	281.81	1,397.94	2.15	-2.62	40° 2' 41.621 N	104° 42' 45.466 W	1,260,179.55	3,220,436.60
1,493.00	5.04	283.09	1,492.71	3.59	-9.06	40° 2' 41.636 N	104° 42' 45.548 W	1,260,180.93	3,220,430.15
1,588.00	7.36	284.37	1,587.15	6.05	-19.02	40° 2' 41.660 N	104° 42' 45.677 W	1,260,183.30	3,220,420.17
1,682.00	9.45	286.30	1,680.13	9.71	-32.26	40° 2' 41.696 N	104° 42' 45.847 W	1,260,186.84	3,220,406.90
1,775.00	10.00	275.09	1,771.80	12.57	-47.63	40° 2' 41.724 N	104° 42' 46.044 W	1,260,189.57	3,220,391.50
1,869.00	10.39	265.90	1,864.33	12.69	-64.22	40° 2' 41.725 N	104° 42' 46.258 W	1,260,189.54	3,220,374.92
1,962.00	10.80	253.59	1,955.75	9.63	-80.94	40° 2' 41.695 N	104° 42' 46.473 W	1,260,186.33	3,220,358.22
2,056.00	12.07	249.95	2,047.89	3.77	-98.62	40° 2' 41.637 N	104° 42' 46.700 W	1,260,180.31	3,220,340.59
2,150.00	14.24	247.91	2,139.41	-3.95	-118.57	40° 2' 41.561 N	104° 42' 46.957 W	1,260,172.42	3,220,320.72
2,243.00	15.99	245.09	2,229.19	-13.65	-140.79	40° 2' 41.465 N	104° 42' 47.242 W	1,260,162.52	3,220,298.59
2,337.00	15.66	243.86	2,319.63	-24.69	-163.92	40° 2' 41.356 N	104° 42' 47.540 W	1,260,151.28	3,220,275.55
2,430.00	14.95	242.82	2,409.33	-35.70	-185.86	40° 2' 41.247 N	104° 42' 47.822 W	1,260,140.07	3,220,253.71
2,524.00	15.15	244.75	2,500.11	-46.48	-207.76	40° 2' 41.141 N	104° 42' 48.103 W	1,260,129.10	3,220,231.91
2,617.00	15.88	249.26	2,589.72	-56.17	-230.65	40° 2' 41.045 N	104° 42' 48.398 W	1,260,119.21	3,220,209.11
2,711.00	17.21	257.86	2,679.84	-63.65	-256.28	40° 2' 40.971 N	104° 42' 48.727 W	1,260,111.50	3,220,183.55
2,804.00	15.61	255.75	2,769.05	-69.62	-281.86	40° 2' 40.912 N	104° 42' 49.056 W	1,260,105.30	3,220,158.03
2,898.00	15.99	254.82	2,859.50	-76.13	-306.61	40° 2' 40.848 N	104° 42' 49.374 W	1,260,098.58	3,220,133.33
2,991.00	14.33	252.77	2,949.26	-82.89	-329.97	40° 2' 40.781 N	104° 42' 49.675 W	1,260,091.61	3,220,110.04
3,085.00	15.45	255.43	3,040.11	-89.49	-353.20	40° 2' 40.716 N	104° 42' 49.973 W	1,260,084.81	3,220,086.87
3,178.00	15.98	257.48	3,129.63	-95.38	-377.68	40° 2' 40.657 N	104° 42' 50.288 W	1,260,078.70	3,220,062.44
3,272.00	16.23	257.47	3,219.94	-101.03	-403.14	40° 2' 40.602 N	104° 42' 50.616 W	1,260,072.82	3,220,037.03
3,365.00	15.28	255.73	3,309.45	-106.87	-427.70	40° 2' 40.544 N	104° 42' 50.931 W	1,260,066.76	3,220,012.52
3,455.00	15.82	253.91	3,396.15	-113.20	-450.98	40° 2' 40.481 N	104° 42' 51.231 W	1,260,060.23	3,219,989.30
3,545.00	14.36	252.03	3,483.05	-120.04	-473.39	40° 2' 40.414 N	104° 42' 51.519 W	1,260,053.19	3,219,966.96
3,635.00	15.64	254.92	3,569.98	-126.64	-495.72	40° 2' 40.349 N	104° 42' 51.806 W	1,260,046.39	3,219,944.69
3,725.00	15.33	256.09	3,656.71	-132.66	-518.98	40° 2' 40.289 N	104° 42' 52.105 W	1,260,040.17	3,219,921.48

Design Report for Pettinger 30N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude	Geographic Coordinates Longitude	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
3,816.00	13.89	253.60	3,744.77	-138.63	-541.14	40° 2' 40.230 N	104° 42' 52.390 W	1,260,033.99	3,219,899.38
3,906.00	14.17	250.52	3,832.09	-145.35	-561.88	40° 2' 40.164 N	104° 42' 52.657 W	1,260,027.09	3,219,878.69
3,995.00	16.36	253.39	3,917.94	-152.57	-584.17	40° 2' 40.092 N	104° 42' 52.943 W	1,260,019.67	3,219,856.47
4,086.00	14.20	251.77	4,005.72	-159.73	-607.05	40° 2' 40.022 N	104° 42' 53.238 W	1,260,012.31	3,219,833.65
4,176.00	16.11	253.92	4,092.59	-166.64	-629.54	40° 2' 39.953 N	104° 42' 53.527 W	1,260,005.20	3,219,811.23
4,265.00	14.52	252.74	4,178.42	-173.37	-652.06	40° 2' 39.887 N	104° 42' 53.816 W	1,259,998.27	3,219,788.77
4,355.00	17.24	256.37	4,264.98	-179.86	-675.80	40° 2' 39.823 N	104° 42' 54.121 W	1,259,991.57	3,219,765.09
4,445.00	16.87	257.03	4,351.02	-185.94	-701.49	40° 2' 39.762 N	104° 42' 54.452 W	1,259,985.27	3,219,739.46
4,535.00	16.65	256.51	4,437.20	-191.88	-726.75	40° 2' 39.704 N	104° 42' 54.777 W	1,259,979.11	3,219,714.25
4,625.00	15.39	255.05	4,523.70	-197.96	-750.83	40° 2' 39.644 N	104° 42' 55.086 W	1,259,972.80	3,219,690.23
4,716.00	13.51	257.74	4,611.82	-203.34	-772.88	40° 2' 39.591 N	104° 42' 55.370 W	1,259,967.24	3,219,668.22
4,896.00	11.64	257.23	4,787.50	-211.82	-811.14	40° 2' 39.507 N	104° 42' 55.862 W	1,259,958.42	3,219,630.04
4,986.00	10.05	253.59	4,875.89	-216.04	-827.53	40° 2' 39.465 N	104° 42' 56.072 W	1,259,954.05	3,219,613.69
5,076.00	9.60	252.92	4,964.57	-220.46	-842.24	40° 2' 39.421 N	104° 42' 56.261 W	1,259,949.49	3,219,599.03
5,166.00	8.22	257.69	5,053.48	-224.04	-855.70	40° 2' 39.386 N	104° 42' 56.435 W	1,259,945.80	3,219,585.60
5,256.00	6.30	249.63	5,142.76	-227.13	-866.62	40° 2' 39.355 N	104° 42' 56.575 W	1,259,942.61	3,219,574.71
5,346.00	4.30	236.39	5,232.37	-230.72	-874.06	40° 2' 39.320 N	104° 42' 56.671 W	1,259,938.96	3,219,567.30
5,436.00	2.61	242.72	5,322.21	-233.53	-878.69	40° 2' 39.292 N	104° 42' 56.730 W	1,259,936.11	3,219,562.70
5,526.00	1.51	306.05	5,412.16	-233.77	-881.47	40° 2' 39.290 N	104° 42' 56.766 W	1,259,935.84	3,219,559.92
5,616.00	0.31	328.90	5,502.14	-232.86	-882.55	40° 2' 39.299 N	104° 42' 56.780 W	1,259,936.74	3,219,558.82
5,706.00	0.91	342.88	5,592.14	-231.97	-882.89	40° 2' 39.308 N	104° 42' 56.784 W	1,259,937.63	3,219,558.48
5,795.00	1.16	349.38	5,681.12	-230.41	-883.26	40° 2' 39.323 N	104° 42' 56.789 W	1,259,939.19	3,219,558.09
5,885.00	1.53	355.15	5,771.10	-228.32	-883.53	40° 2' 39.344 N	104° 42' 56.792 W	1,259,941.28	3,219,557.80
5,975.00	0.67	64.09	5,861.08	-226.89	-883.16	40° 2' 39.358 N	104° 42' 56.788 W	1,259,942.71	3,219,558.16
6,065.00	1.14	36.82	5,951.07	-225.94	-882.15	40° 2' 39.367 N	104° 42' 56.775 W	1,259,943.66	3,219,559.17
6,156.00	0.82	79.02	6,042.06	-225.09	-880.97	40° 2' 39.375 N	104° 42' 56.759 W	1,259,944.52	3,219,560.34
6,246.00	1.22	135.27	6,132.05	-225.65	-879.66	40° 2' 39.370 N	104° 42' 56.743 W	1,259,943.98	3,219,561.65
6,336.00	1.59	125.50	6,222.02	-227.06	-877.97	40° 2' 39.356 N	104° 42' 56.721 W	1,259,942.58	3,219,563.35
6,426.00	1.29	60.59	6,312.00	-227.28	-876.07	40° 2' 39.354 N	104° 42' 56.697 W	1,259,942.37	3,219,565.26
6,516.00	0.69	152.29	6,401.99	-227.27	-874.94	40° 2' 39.354 N	104° 42' 56.682 W	1,259,942.40	3,219,566.39
6,606.00	1.29	118.68	6,491.97	-228.23	-873.80	40° 2' 39.344 N	104° 42' 56.667 W	1,259,941.45	3,219,567.54
6,696.00	0.68	42.48	6,581.96	-228.33	-872.55	40° 2' 39.344 N	104° 42' 56.651 W	1,259,941.36	3,219,568.79
6,741.00	1.44	340.24	6,626.96	-227.60	-872.56	40° 2' 39.351 N	104° 42' 56.651 W	1,259,942.09	3,219,568.77
6,787.00	5.23	343.76	6,672.87	-225.04	-873.34	40° 2' 39.376 N	104° 42' 56.661 W	1,259,944.64	3,219,567.97
6,832.00	9.29	347.40	6,717.50	-219.52	-874.71	40° 2' 39.431 N	104° 42' 56.679 W	1,259,950.15	3,219,566.55
6,877.00	13.52	349.92	6,761.60	-210.79	-876.42	40° 2' 39.517 N	104° 42' 56.701 W	1,259,958.86	3,219,564.76
6,922.00	18.65	351.36	6,804.83	-198.49	-878.42	40° 2' 39.638 N	104° 42' 56.727 W	1,259,971.14	3,219,562.65
6,967.00	22.08	354.91	6,847.01	-182.95	-880.26	40° 2' 39.792 N	104° 42' 56.750 W	1,259,986.67	3,219,560.68
7,012.00	25.15	356.78	6,888.24	-164.97	-881.54	40° 2' 39.970 N	104° 42' 56.767 W	1,260,004.63	3,219,559.23
7,057.00	30.10	358.94	6,928.10	-144.13	-882.29	40° 2' 40.176 N	104° 42' 56.776 W	1,260,025.47	3,219,558.30
7,102.00	36.08	359.69	6,965.78	-119.58	-882.57	40° 2' 40.418 N	104° 42' 56.780 W	1,260,050.02	3,219,557.80
7,147.00	41.02	359.65	7,000.96	-91.54	-882.73	40° 2' 40.695 N	104° 42' 56.782 W	1,260,078.05	3,219,557.39

Design Report for Pettinger 30N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude	Geographic Coordinates Longitude	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
7,192.00	44.97	359.14	7,033.87	-60.86	-883.06	40° 2' 40.998 N	104° 42' 56.786 W	1,260,108.72	3,219,556.79
7,237.00	49.56	358.88	7,064.40	-27.82	-883.64	40° 2' 41.325 N	104° 42' 56.794 W	1,260,141.75	3,219,555.92
7,282.00	53.99	358.58	7,092.24	7.51	-884.42	40° 2' 41.674 N	104° 42' 56.804 W	1,260,177.08	3,219,554.82
7,327.00	57.80	358.24	7,117.46	44.75	-885.46	40° 2' 42.042 N	104° 42' 56.817 W	1,260,214.30	3,219,553.46
7,372.00	61.63	359.87	7,140.15	83.59	-886.09	40° 2' 42.426 N	104° 42' 56.825 W	1,260,253.14	3,219,552.48
7,417.00	65.75	0.88	7,160.09	123.92	-885.82	40° 2' 42.825 N	104° 42' 56.822 W	1,260,293.47	3,219,552.39
7,462.00	68.23	3.21	7,177.69	165.31	-884.33	40° 2' 43.234 N	104° 42' 56.803 W	1,260,334.86	3,219,553.51
7,507.00	72.67	4.32	7,192.74	207.61	-881.54	40° 2' 43.652 N	104° 42' 56.767 W	1,260,377.19	3,219,555.92
7,552.00	75.37	2.40	7,205.13	250.79	-879.01	40° 2' 44.078 N	104° 42' 56.735 W	1,260,420.39	3,219,558.07
7,597.00	81.16	0.56	7,214.28	294.81	-877.88	40° 2' 44.513 N	104° 42' 56.720 W	1,260,464.42	3,219,558.81
7,642.00	86.67	0.74	7,219.05	339.54	-877.37	40° 2' 44.955 N	104° 42' 56.714 W	1,260,509.14	3,219,558.92
7,671.00	87.94	0.84	7,220.41	368.51	-876.97	40° 2' 45.242 N	104° 42' 56.708 W	1,260,538.11	3,219,559.06
7,719.00	88.38	359.92	7,221.95	416.48	-876.66	40° 2' 45.716 N	104° 42' 56.704 W	1,260,586.08	3,219,558.96
7,753.00	88.70	359.27	7,222.81	450.47	-876.90	40° 2' 46.052 N	104° 42' 56.707 W	1,260,620.07	3,219,558.41
7,843.00	88.34	358.56	7,225.14	540.42	-878.60	40° 2' 46.940 N	104° 42' 56.729 W	1,260,710.00	3,219,555.91
7,933.00	91.02	359.35	7,225.64	630.39	-880.24	40° 2' 47.830 N	104° 42' 56.750 W	1,260,799.95	3,219,553.47
8,023.00	91.17	358.41	7,223.92	720.36	-882.00	40° 2' 48.719 N	104° 42' 56.773 W	1,260,889.89	3,219,550.91
8,113.00	91.11	358.00	7,222.13	810.30	-884.82	40° 2' 49.607 N	104° 42' 56.809 W	1,260,979.80	3,219,547.30
8,203.00	90.96	359.11	7,220.50	900.25	-887.09	40° 2' 50.496 N	104° 42' 56.839 W	1,261,069.73	3,219,544.23
8,293.00	91.26	0.51	7,218.76	990.23	-887.39	40° 2' 51.386 N	104° 42' 56.843 W	1,261,159.70	3,219,543.13
8,383.00	90.96	1.09	7,217.02	1,080.21	-886.13	40° 2' 52.275 N	104° 42' 56.826 W	1,261,249.68	3,219,543.59
8,563.00	90.74	0.54	7,214.35	1,260.17	-883.57	40° 2' 54.053 N	104° 42' 56.794 W	1,261,429.65	3,219,544.55
8,653.00	89.72	0.81	7,213.99	1,350.16	-882.51	40° 2' 54.943 N	104° 42' 56.780 W	1,261,519.64	3,219,544.81
8,833.00	91.08	1.02	7,212.73	1,530.13	-879.63	40° 2' 56.721 N	104° 42' 56.743 W	1,261,699.62	3,219,546.09
8,923.00	88.18	1.35	7,213.31	1,620.10	-877.77	40° 2' 57.610 N	104° 42' 56.719 W	1,261,789.60	3,219,547.15
9,103.00	88.83	1.37	7,218.01	1,799.98	-873.50	40° 2' 59.388 N	104° 42' 56.664 W	1,261,969.51	3,219,549.82
9,193.00	86.27	359.17	7,221.85	1,889.89	-873.08	40° 3' 0.276 N	104° 42' 56.659 W	1,262,059.41	3,219,549.45
9,283.00	86.67	359.38	7,227.40	1,979.71	-874.21	40° 3' 1.164 N	104° 42' 56.674 W	1,262,149.22	3,219,547.52
9,373.00	88.27	359.54	7,231.37	2,069.62	-875.06	40° 3' 2.052 N	104° 42' 56.685 W	1,262,239.11	3,219,545.87
9,553.00	91.39	358.68	7,231.90	2,249.57	-877.86	40° 3' 3.831 N	104° 42' 56.721 W	1,262,419.02	3,219,541.48
9,643.00	91.54	358.29	7,229.60	2,339.51	-880.24	40° 3' 4.720 N	104° 42' 56.751 W	1,262,508.93	3,219,538.30
9,733.00	91.51	357.74	7,227.21	2,429.42	-883.35	40° 3' 5.608 N	104° 42' 56.791 W	1,262,598.81	3,219,534.39
9,823.00	92.47	359.59	7,224.08	2,519.34	-885.45	40° 3' 6.497 N	104° 42' 56.818 W	1,262,688.70	3,219,531.49
9,913.00	91.14	0.42	7,221.25	2,609.29	-885.44	40° 3' 7.386 N	104° 42' 56.818 W	1,262,778.65	3,219,530.70
10,003.00	90.22	359.80	7,220.18	2,699.28	-885.27	40° 3' 8.275 N	104° 42' 56.816 W	1,262,868.64	3,219,530.08
10,093.00	89.69	359.12	7,220.25	2,789.28	-886.12	40° 3' 9.164 N	104° 42' 56.827 W	1,262,958.62	3,219,528.43
10,273.00	89.94	0.25	7,220.83	2,969.27	-887.11	40° 3' 10.943 N	104° 42' 56.840 W	1,263,138.59	3,219,525.84
10,363.00	90.19	0.75	7,220.73	3,059.27	-886.32	40° 3' 11.832 N	104° 42' 56.830 W	1,263,228.58	3,219,525.83
10,453.00	90.28	1.57	7,220.36	3,149.25	-884.50	40° 3' 12.722 N	104° 42' 56.806 W	1,263,318.57	3,219,526.85
10,633.00	90.71	0.95	7,218.80	3,329.20	-880.54	40° 3' 14.500 N	104° 42' 56.756 W	1,263,498.54	3,219,529.21
10,723.00	90.37	359.41	7,217.96	3,419.19	-880.26	40° 3' 15.389 N	104° 42' 56.752 W	1,263,588.53	3,219,528.69
10,813.00	90.46	358.52	7,217.30	3,509.17	-881.88	40° 3' 16.278 N	104° 42' 56.773 W	1,263,678.49	3,219,526.27

Design Report for Pettinger 30N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude (usft)	Geographic Coordinates Longitude (usft)	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
10,903.00	88.67	357.08	7,217.99	3,599.10	-885.34	40° 3' 17.167 N	104° 42' 56.817 W	1,263,768.38	3,219,522.02
10,993.00	88.74	356.63	7,220.02	3,688.94	-890.27	40° 3' 18.055 N	104° 42' 56.881 W	1,263,858.17	3,219,516.28
11,083.00	88.74	356.86	7,222.00	3,778.77	-895.38	40° 3' 18.943 N	104° 42' 56.947 W	1,263,947.95	3,219,510.38
11,173.00	89.97	1.61	7,223.01	3,868.73	-896.58	40° 3' 19.832 N	104° 42' 56.962 W	1,264,037.89	3,219,508.38
11,263.00	90.06	4.71	7,222.99	3,958.58	-891.62	40° 3' 20.720 N	104° 42' 56.898 W	1,264,127.78	3,219,512.54
11,354.00	90.28	8.20	7,222.72	4,048.99	-881.39	40° 3' 21.613 N	104° 42' 56.767 W	1,264,218.28	3,219,521.97
11,444.00	89.54	6.43	7,222.86	4,138.25	-869.94	40° 3' 22.495 N	104° 42' 56.620 W	1,264,307.63	3,219,532.63
11,534.00	89.78	9.90	7,223.40	4,227.33	-857.16	40° 3' 23.375 N	104° 42' 56.455 W	1,264,396.81	3,219,544.62
11,624.00	86.83	4.98	7,226.06	4,316.49	-845.51	40° 3' 24.257 N	104° 42' 56.306 W	1,264,486.07	3,219,555.47
11,714.00	87.99	2.86	7,230.13	4,406.18	-839.36	40° 3' 25.143 N	104° 42' 56.227 W	1,264,575.81	3,219,560.82
11,804.00	90.52	2.51	7,231.30	4,496.07	-835.15	40° 3' 26.031 N	104° 42' 56.172 W	1,264,665.73	3,219,564.24
11,894.00	89.26	0.63	7,231.47	4,586.03	-832.68	40° 3' 26.920 N	104° 42' 56.141 W	1,264,755.71	3,219,565.90
11,984.00	88.71	356.82	7,233.06	4,675.97	-834.68	40° 3' 27.809 N	104° 42' 56.166 W	1,264,845.63	3,219,563.10
12,074.00	89.20	356.04	7,234.71	4,765.78	-840.29	40° 3' 28.697 N	104° 42' 56.239 W	1,264,935.38	3,219,556.70
12,164.00	91.08	358.29	7,234.49	4,855.66	-844.74	40° 3' 29.585 N	104° 42' 56.296 W	1,265,025.21	3,219,551.46
12,254.00	92.22	357.95	7,231.89	4,945.58	-847.69	40° 3' 30.473 N	104° 42' 56.334 W	1,265,115.09	3,219,547.71
12,300.00	92.22	357.95	7,230.11	4,991.51	-849.33	40° 3' 30.927 N	104° 42' 56.355 W	1,265,161.01	3,219,545.65

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,113.00	1,112.98	0.89	-0.62	Tie-On to Surface Gyro @ 1113.00 FT
1,241.00	1,240.98	1.46	-0.51	First MWD Survey @ 1241.00'
12,254.00	7,231.89	4,945.58	-847.69	Last MWD Survey @ 12254.00'
12,300.00	7,230.11	4,991.51	-849.33	St. Line Projection to Bit 12300' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	359.71	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,113.00	Surface Gyro Surveys	NS-GYRO-MS

Design Report for Pettinger 30N-18HZ - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
1,241.00	7,671.00	MWD Surveys- Intermediate	MWD+IFR1+SC
7,753.00	12,254.00	MWD Survey-Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,217.00	1,216.98	9 5/8"	9-5/8	12-3/4
7,719.00	7,221.95	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 30N-18HZ_LD	0.00	1,260,177.45	3,220,439.24	0.03	0.00	1/3/2014	1/3/2014
Polygon	Pettinger Pad Sec_line (S	13.00	1,260,177.45	3,220,439.24	0.03	0.00	1/3/2014	1/3/2014

Directional Difficulty Index

Average Dogleg over Survey:	2.08 °/100usft	Maximum Dogleg over Survey:	13.47 °/100usft at 7,597.00 usft
Net Tortousity applicable to Plans:	1.05 °/100usft	Directional Difficulty Index:	6.429

Audit Info

North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 30N-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=13' @ 5020.00usft (Ensign 123). Northing and Easting are relative to Pettinger 30N-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: 1,260,177.42 usft N, 3,220,439.24 usft E

Geographical Coordinates of Well: 40° 02' 41.60" N, 104° 42' 45.43" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,300.00usft

the Bottom Hole Displacement is 5,063.26usft in the Direction of 350.34° (True).

Magnetic Convergence at surface is: -7.98° (13 February 2014, , BGGM2013)