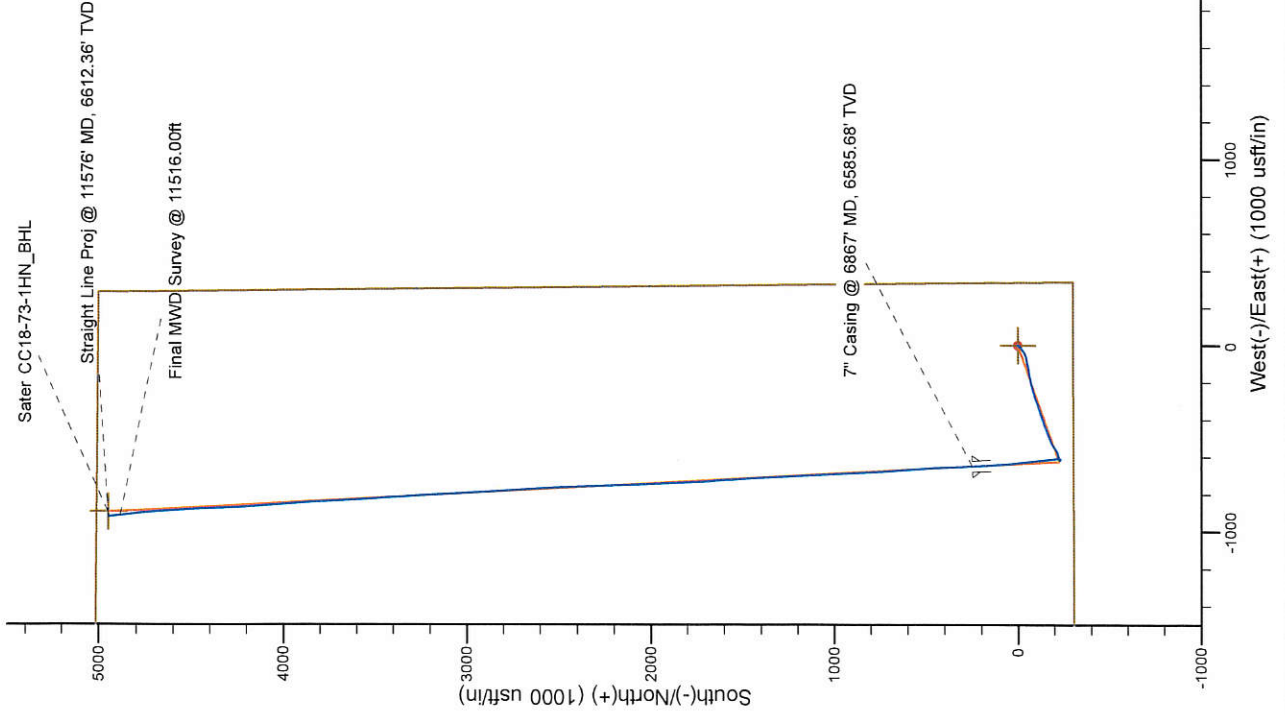


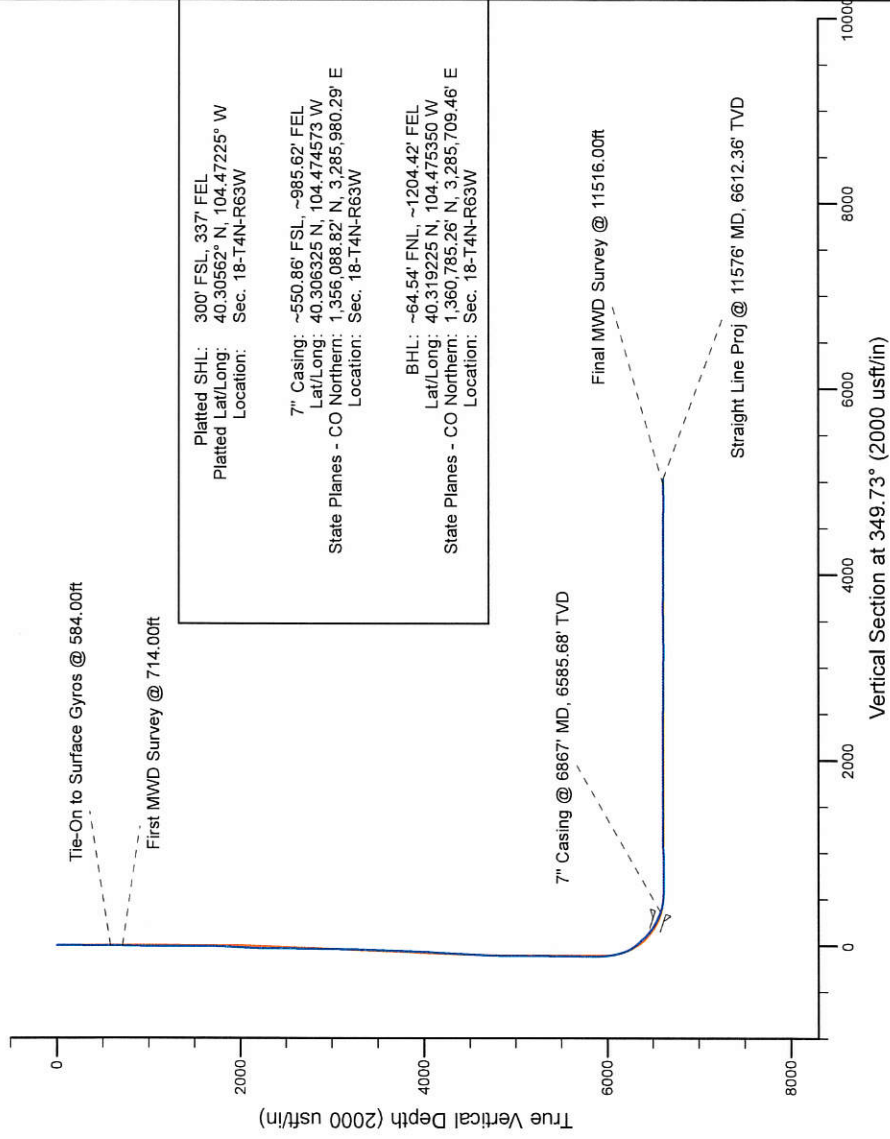
Project: Weld County, CO (NAD 83)  
 Site: Sec. 18-T4N-R63W (Sater CC-18-16-A Pad)  
 Well: Sater CC-18-73-1HN  
 Wellbore: Plan B  
 Design: Final Surveys

# Noble Energy



## LEGEND

- Sater CC-18-73-1HN, Plan B, Rev B0 - PROPOSAL V0
- Final Surveys



Platted SHL: 300' FSL, 337' FEL  
 Platted Lat/Long: 40.30562° N, 104.47225° W  
 Location: Sec. 18-T4N-R63W

7" Casing: ~550.86' FSL, ~985.62' FEL  
 Lat/Long: 40.306325° N, 104.474573° W  
 State Planes - CO Northern: 1,356,088.82' N, 3,285,980.29' E  
 Location: Sec. 18-T4N-R63W

BHL: ~64.54' FNL, ~1204.42' FEL  
 Lat/Long: 40.319225° N, 104.475350° W  
 State Planes - CO Northern: 1,360,785.26' N, 3,285,709.46' E  
 Location: Sec. 18-T4N-R63W

WELL DETAILS: Sater CC-18-73-1HN  
 Ground Level: 4875.00  
 RKB = 24 @ 4702.00usft (H&P 315)

Created By: Fred Hartmann  
 Created On: 03/28/2014

# Noble Energy

Weld County, CO (NAD 83)

Sec. 18-T4N-R63W (Sater CC18-16-A Pad)

Sater CC18-73-1HN

Design: Final Surveys

## Sperry Drilling Services

### Final Survey Report

28 March, 2014

Well Coordinates: 1,355,839.43 N, 3,286,631.09 E (40° 18' 20.23" N, 104° 28' 20.10" W)

Ground Level: 4,678.00 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 Sater CC18-73-1HN

RKB = 24 @ 4702.00usft (H&P 315)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for Sater CC18-73-1HN - Final 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
278.00	0.70	250.10	277.99	-0.58	-1.60	-0.28	0.25
584.00	0.70	162.20	583.98	-2.99	-2.78	-2.45	0.32
<b>Tie-On to Surface Gyros @ 584.00ft</b>							
714.00	0.40	204.01	713.97	-4.16	-2.72	-3.61	0.37
<b>First MWD Survey @ 714.00ft</b>							
809.00	0.32	198.60	808.97	-4.72	-2.94	-4.12	0.09
901.00	0.37	234.87	900.97	-5.13	-3.27	-4.47	0.24
993.00	0.46	216.21	992.97	-5.60	-3.73	-4.85	0.18
1,180.00	0.62	243.91	1,179.96	-6.65	-5.08	-5.64	0.16
1,457.00	0.72	239.08	1,456.94	-8.21	-7.92	-6.66	0.04
1,552.00	0.62	239.57	1,551.93	-8.77	-8.88	-7.05	0.11
1,646.00	0.48	252.24	1,645.93	-9.15	-9.69	-7.28	0.20
1,741.00	2.48	217.03	1,740.89	-10.91	-11.31	-8.72	2.22
1,836.00	4.19	215.27	1,835.73	-15.39	-14.55	-12.55	1.80
1,931.00	5.17	237.09	1,930.42	-20.55	-20.15	-16.63	2.12
2,026.00	7.13	232.54	2,024.87	-26.46	-28.42	-20.97	2.12
2,121.00	8.02	235.06	2,119.04	-33.84	-38.53	-26.43	1.00
2,216.00	8.56	252.01	2,213.06	-39.82	-50.69	-30.14	2.62
2,311.00	10.24	251.59	2,306.78	-44.67	-65.43	-32.29	1.77
2,406.00	10.87	261.01	2,400.18	-48.74	-82.29	-33.28	1.93
2,500.00	11.77	260.14	2,492.35	-51.77	-100.49	-33.02	0.97
2,595.00	13.14	259.49	2,585.11	-55.39	-120.66	-32.99	1.45
2,690.00	15.45	259.16	2,677.16	-59.74	-143.70	-33.16	2.43
2,785.00	15.47	258.62	2,768.73	-64.62	-168.55	-33.53	0.15
2,880.00	14.85	257.68	2,860.42	-69.72	-192.87	-34.21	0.70
2,975.00	12.79	256.41	2,952.66	-74.79	-214.98	-35.25	2.19
3,070.00	14.46	252.83	3,044.99	-80.76	-236.54	-37.29	1.97
3,165.00	12.16	254.45	3,137.43	-86.95	-257.51	-39.63	2.45
3,260.00	11.80	254.23	3,230.36	-92.27	-276.50	-41.48	0.38
3,355.00	11.82	247.26	3,323.36	-98.67	-294.82	-44.52	1.50
3,449.00	13.20	250.76	3,415.12	-105.93	-313.84	-48.27	1.67
3,544.00	13.79	250.55	3,507.50	-113.27	-334.75	-51.76	0.62
3,639.00	14.44	251.18	3,599.63	-120.87	-356.64	-55.33	0.70
3,734.00	15.04	251.63	3,691.51	-128.57	-379.55	-58.83	0.64
3,829.00	14.06	251.54	3,783.46	-136.11	-402.20	-62.21	1.03
3,923.00	12.11	252.73	3,875.01	-142.65	-422.44	-65.03	2.09
4,018.00	13.85	250.41	3,967.58	-149.43	-442.67	-68.09	1.91
4,113.00	13.53	249.55	4,059.88	-157.12	-463.80	-71.89	0.40
4,207.00	13.78	246.45	4,151.23	-165.44	-484.37	-76.41	0.82
4,302.00	11.98	247.46	4,243.83	-173.74	-503.85	-81.10	1.91
4,397.00	14.26	245.05	4,336.35	-182.45	-523.56	-86.16	2.47
4,492.00	11.22	238.65	4,429.00	-192.20	-542.07	-92.45	3.52
4,587.00	9.32	231.48	4,522.48	-201.80	-555.98	-99.42	2.41
4,682.00	9.09	241.60	4,616.26	-210.16	-568.60	-105.40	1.72
4,777.00	6.92	253.69	4,710.34	-215.34	-580.70	-108.33	2.88
4,872.00	6.07	253.05	4,804.73	-218.41	-591.00	-109.52	0.90
4,967.00	6.17	247.79	4,899.19	-221.80	-600.53	-111.16	0.60
5,062.00	4.79	250.35	4,993.75	-225.07	-608.99	-112.86	1.47
5,157.00	2.26	272.01	5,088.57	-226.34	-614.60	-113.11	2.96



## Design Report for Sater CC18-73-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,252.00	0.35	306.92	5,183.54	-226.10	-616.70	-112.50	2.09
5,347.00	0.31	154.44	5,278.54	-226.15	-616.82	-112.53	0.67
5,441.00	0.66	120.00	5,372.54	-226.65	-616.25	-113.13	0.47
5,536.00	1.17	148.27	5,467.52	-227.75	-615.26	-114.38	0.70
5,631.00	0.79	144.53	5,562.51	-229.11	-614.37	-115.88	0.41
5,726.00	0.31	172.13	5,657.50	-229.90	-613.96	-116.73	0.56
5,821.00	0.87	120.00	5,752.50	-230.51	-613.30	-117.45	0.76
5,915.00	0.83	83.47	5,846.49	-230.79	-612.00	-117.96	0.57
5,979.00	0.74	86.78	5,910.48	-230.72	-611.13	-118.04	0.16
6,102.00	7.53	7.95	6,033.12	-222.68	-609.22	-110.47	6.03
6,150.00	13.71	0.51	6,080.28	-213.87	-608.73	-101.89	13.16
6,197.00	16.78	354.40	6,125.62	-201.54	-609.35	-89.65	7.36
6,245.00	20.31	352.41	6,171.12	-186.38	-611.12	-74.42	7.47
6,292.00	24.11	352.19	6,214.63	-168.78	-613.51	-56.67	8.09
6,340.00	28.35	353.07	6,257.67	-147.75	-616.21	-35.49	8.87
6,387.00	34.75	354.78	6,297.71	-123.30	-618.78	-10.98	13.75
6,435.00	39.33	353.78	6,336.01	-94.54	-621.68	17.83	9.62
6,481.00	42.74	352.78	6,370.70	-64.56	-625.22	47.97	7.55
6,529.00	44.99	352.29	6,405.31	-31.58	-629.54	81.19	4.74
6,576.00	47.19	354.08	6,437.90	2.04	-633.55	114.98	5.43
6,624.00	50.04	355.45	6,469.64	37.90	-636.83	150.85	6.31
6,671.00	54.63	355.78	6,498.35	74.98	-639.67	187.85	9.78
6,719.00	59.97	356.04	6,524.27	115.26	-642.54	227.99	11.13
6,766.00	63.32	356.45	6,546.59	156.53	-645.25	269.08	7.17
6,814.00	66.87	355.97	6,566.80	199.96	-648.13	312.33	7.45
6,867.00	71.39	357.75	6,585.68	249.39	-650.83	361.45	9.08
<b>7" Casing @ 6867' MD, 6585.68' TVD</b>							
6,880.00	72.50	358.17	6,589.71	261.74	-651.27	373.69	9.08
7,003.00	85.06	357.08	6,613.59	382.05	-656.28	492.95	10.25
7,084.00	88.92	356.39	6,617.84	462.79	-660.89	573.22	4.84
7,131.00	89.29	356.42	6,618.58	509.69	-663.84	619.90	0.79
7,226.00	89.82	356.27	6,619.32	604.49	-669.89	714.26	0.58
7,321.00	91.29	355.96	6,618.40	699.27	-676.33	808.67	1.58
7,415.00	90.83	356.66	6,616.66	793.05	-682.38	902.03	0.89
7,510.00	92.28	356.92	6,614.08	887.87	-687.70	996.27	1.55
7,605.00	91.70	357.09	6,610.78	982.68	-692.66	1,090.45	0.64
7,700.00	90.28	357.76	6,609.14	1,077.57	-696.92	1,184.58	1.65
7,795.00	89.01	357.51	6,609.73	1,172.48	-700.84	1,278.67	1.36
7,890.00	90.46	357.52	6,610.17	1,267.39	-704.96	1,372.79	1.53
7,985.00	89.45	356.60	6,610.24	1,362.26	-709.84	1,467.01	1.44
8,079.00	90.59	356.48	6,610.21	1,456.09	-715.51	1,560.34	1.22
8,174.00	89.82	356.64	6,609.87	1,550.92	-721.21	1,654.67	0.83
8,269.00	90.03	355.23	6,609.99	1,645.68	-727.94	1,749.11	1.50
8,364.00	90.96	357.06	6,609.17	1,740.45	-734.33	1,843.51	2.16
8,459.00	90.12	357.57	6,608.28	1,835.34	-738.78	1,937.67	1.03
8,554.00	88.43	357.83	6,609.48	1,930.25	-742.59	2,031.74	1.80
8,649.00	89.23	358.02	6,611.42	2,025.17	-746.03	2,125.75	0.87
8,744.00	89.88	356.93	6,612.16	2,120.07	-750.22	2,219.88	1.34
8,838.00	89.69	358.37	6,612.51	2,213.99	-754.07	2,312.98	1.55
8,933.00	88.86	358.26	6,613.71	2,308.94	-756.86	2,406.90	0.88
9,028.00	91.20	358.13	6,613.66	2,403.89	-759.85	2,500.86	2.47

## Design Report for Sater CC18-73-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,123.00	88.83	357.28	6,613.64	2,498.81	-763.66	2,594.93	2.65
9,218.00	90.62	357.44	6,614.09	2,593.70	-768.03	2,689.09	1.89
9,313.00	90.09	356.19	6,613.50	2,688.55	-773.31	2,783.36	1.43
9,408.00	89.69	354.94	6,613.69	2,783.26	-780.66	2,877.86	1.38
9,503.00	89.45	357.08	6,614.40	2,878.02	-787.27	2,972.28	2.27
9,598.00	89.94	357.53	6,614.90	2,972.92	-791.73	3,066.45	0.70
9,692.00	89.26	356.80	6,615.56	3,066.80	-796.38	3,159.66	1.06
9,787.00	89.88	356.66	6,616.27	3,161.64	-801.80	3,253.95	0.67
9,882.00	91.42	356.28	6,615.20	3,256.45	-807.65	3,348.28	1.67
9,977.00	90.49	356.45	6,613.61	3,351.25	-813.67	3,442.63	1.00
10,072.00	90.34	356.36	6,612.92	3,446.06	-819.63	3,536.98	0.18
10,167.00	88.61	356.96	6,613.80	3,540.89	-825.16	3,631.28	1.93
10,261.00	89.63	356.91	6,615.24	3,634.74	-830.19	3,724.52	1.09
10,356.00	91.85	356.52	6,614.01	3,729.57	-835.63	3,818.81	2.37
10,451.00	90.22	356.69	6,612.30	3,824.38	-841.26	3,913.10	1.73
10,546.00	88.21	355.37	6,613.60	3,919.14	-847.83	4,007.51	2.53
10,641.00	90.00	355.60	6,615.08	4,013.83	-855.31	4,102.02	1.90
10,736.00	90.52	356.61	6,614.65	4,108.61	-861.76	4,196.43	1.20
10,831.00	90.25	356.89	6,614.01	4,203.45	-867.15	4,290.71	0.41
10,926.00	88.49	357.91	6,615.06	4,298.34	-871.46	4,384.85	2.14
11,021.00	89.01	357.89	6,617.13	4,393.26	-874.94	4,478.86	0.55
11,116.00	91.36	356.78	6,616.82	4,488.15	-879.36	4,573.02	2.74
11,211.00	89.94	356.71	6,615.74	4,582.98	-884.75	4,667.30	1.50
11,306.00	90.34	354.70	6,615.51	4,677.71	-891.86	4,761.78	2.16
11,401.00	90.49	353.47	6,614.82	4,772.20	-901.65	4,856.50	1.30
11,516.00	90.96	353.41	6,613.37	4,866.44	-914.79	4,971.25	0.41
<b>Final MWD Survey @ 11516.00ft</b>							
11,576.00	90.96	353.41	6,612.36	4,946.04	-921.67	5,031.12	0.00
<b>Straight Line Proj @ 11576' MD, 6612.36' TVD</b>							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
584.00	583.98	-2.99	-2.78	Tie-On to Surface Gyros @ 584.00ft
714.00	713.97	-4.16	-2.72	First MWD Survey @ 714.00ft
11,516.00	6,613.37	4,886.44	-914.79	Final MWD Survey @ 11516.00ft
11,576.00	6,612.36	4,946.04	-921.67	Straight Line Proj @ 11576' MD, 6612.36' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Sater CC18-73-1HN_BHL	349.73	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
278.00	584.00	Surface Gyros	Flexi-Shot
714.00	6,814.00	MWD Surveys - Intermediate	MWD+SC
6,880.00	11,516.00	MWD Surveys - Production	MWD+SC

## Design Report for Sater CC18-73-1HN - Final Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,867.00	6,585.68	7" Casing @ 6867' MD, 6585.68' TVD	7	8-3/4

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
Sater CC18-73-1HN_4	0.00	0.00	0.00	0.00	0.00	1,355,839.44	3,286,631.09	40.305620	-104.472250
- actual wellpath hits target center									
- Polygon									
Point 1			0.00	4,591.43	-4,453.67	1,360,430.67	3,282,177.61		
Point 2			0.00	145.53	-4,398.11	1,355,984.96	3,282,233.17		
Point 3			0.00	161.59	-119.06	1,356,001.02	3,286,512.04		
Point 4			0.00	4,538.24	-177.73	1,360,377.48	3,286,453.37		
Point 5			0.00	4,591.43	-4,453.67	1,360,430.67	3,282,177.61		
Sater CC18-73-1HN_ξ	0.00	0.00	0.00	0.00	0.00	1,355,839.44	3,286,631.09	40.305620	-104.472250
- actual wellpath hits target center									
- Polygon									
Point 1			0.00	5,051.45	-4,913.69	1,360,890.67	3,281,717.61		
Point 2			0.00	-314.49	-4,858.13	1,355,524.96	3,281,773.17		
Point 3			0.00	-298.43	340.96	1,355,541.02	3,286,972.04		
Point 4			0.00	4,998.26	282.29	1,360,837.48	3,286,913.37		
Point 5			0.00	5,051.45	-4,913.69	1,360,890.67	3,281,717.61		
Sater CC18-73-1HN_ε	0.00	0.00	0.00	0.00	0.00	1,355,839.44	3,286,631.09	40.305620	-104.472250
- actual wellpath hits target center									
- Point									
Sater CC18-73-1HN_κ	0.00	0.00	5,978.15	-224.35	-624.44	1,355,615.09	3,286,006.68	40.305024	-104.474498
- actual wellpath misses target center by 14.80usft at 6046.77usft MD (5978.19 TVD, -228.25 N, -610.16 E)									
- Circle (radius 35.00)									
Sater CC18-73-1HN_E	0.00	0.00	6,617.00	4,948.17	-896.76	1,360,787.40	3,285,734.37	40.319230	-104.475260
- actual wellpath misses target center by 25.42usft at 11575.19usft MD (6612.38 TVD, 4945.23 N, -921.58 E)									
- Point									
Sater CC18-73-1HN_L	0.00	0.00	6,617.00	0.00	0.00	1,355,839.44	3,286,631.09	40.305620	-104.472250
- actual wellpath misses target center by 654.30usft at 6645.65usft MD (6483.23 TVD, 54.69 N, -638.14 E)									
- Polygon									
Point 1			6,617.00	389.31	-691.85	1,356,228.73	3,285,939.27		
Point 2			6,617.00	389.31	-621.85	1,356,228.73	3,286,009.27		
Point 3			6,617.00	4,948.16	-861.76	1,360,787.39	3,285,769.37		
Point 4			6,617.00	4,948.16	-931.76	1,360,787.39	3,285,699.37		
Point 5			6,617.00	389.31	-691.85	1,356,228.73	3,285,939.27		

Directional Difficulty Index

Average Dogleg over Survey:	1.90 °/100usft	Maximum Dogleg over Survey:	13.75 °/100usft at 6,387.00 usft
Net Tortosity applicable to Plans:	0.88 °/100usft	Directional Difficulty Index:	6.354

Audit Info



**North Reference Sheet for Sec. 18-T4N-R63W (Sater CC18-16-A Pad) - Sater  
CC18-73-1HN**

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

Vertical Depths are relative to RKB = 24 @ 4702.00usft (H&P 315). Northing and Easting are relative to Sater CC18-73-1HN

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: 0.99995730

Grid Coordinates of Well: 1,355,839.43 usft N, 3,286,631.09 usft E

Geographical Coordinates of Well: 40° 18' 20.23" N, 104° 28' 20.10" W

Grid Convergence at Surface is: 0.66°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,576.00usft  
the Bottom Hole Displacement is 5,031.18usft in the Direction of 349.44° (Grid).

Magnetic Convergence at surface is: -7.71° ( 2 March 2014, , BGGM2013)

