



Planning Report

Database: USA EDM 5000 Multi Users DB
Company: K. P. Kauffman Company, Inc.
Project: Wattenberg
Site: S18-T4N-R66W (Bernhardt)
Well: Bernhardt #18-8H
Wellbore: HZ
Design: Plan #2

Local Co-ordinate Reference: Well Bernhardt #18-8H
TVD Reference: WELL @ 4730.0ft (Original Well Elev)
MD Reference: WELL @ 4730.0ft (Original Well Elev)
North Reference: True
Survey Calculation Method: Minimum Curvature

Project Wattenberg

Map System: US State Plane 1983
Geo Datum: North American Datum 1983
Map Zone: Colorado Northern Zone

System Datum: Mean Sea Level

Site S18-T4N-R66W (Bernhardt)

Site Position:	Northing:	1,354,998.15 ft	Latitude:	40.305920
From: Lat/Long	Easting:	3,187,108.12 ft	Longitude:	-104.829130
Position Uncertainty: 0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.43 °

Well Bernhardt #18-8H

Well Position	+N/-S	0.0 ft	Northing:	1,354,947.11 ft	Latitude:	40.305780
	+E/-W	0.0 ft	Easting:	3,187,105.72 ft	Longitude:	-104.829140
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,718.0 ft

Wellbore HZ

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	7/18/2013	8.61	66.89	52,856

Design Plan #2

Audit Notes:

Version: Phase: PLAN Tie On Depth: 0.0

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	89.83

Plan Sections

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
4,000.0	0.00	0.00	4,000.0	0.0	0.0	0.00	0.00	0.00	0.00	
4,194.8	1.95	335.01	4,194.7	3.0	-1.4	1.00	1.00	0.00	335.01	
6,544.8	1.95	335.01	6,543.4	75.4	-35.1	0.00	0.00	0.00	0.00	
7,458.3	90.55	89.50	7,124.1	98.6	543.1	10.00	9.70	12.53	114.46	
9,958.3	90.55	89.50	7,100.1	120.4	3,042.9	0.00	0.00	0.00	0.00	Bernhardt #18-8H TG
10,325.0	90.55	95.00	7,096.6	106.0	3,409.1	1.50	0.00	1.50	89.97	
11,229.0	90.55	95.00	7,087.9	27.2	4,309.6	0.00	0.00	0.00	0.00	
11,495.7	90.55	91.00	7,085.3	13.3	4,575.8	1.50	0.00	-1.50	-89.98	

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Project:	Wattenberg	MD Reference:	WELL @ 4730.0ft (Original Well Elev)
Site:	S18-T4N-R66W (Bernhardt)	North Reference:	True
Well:	Bernhardt #18-8H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	
2,100.0	0.00	0.00	2,100.0	0.0	0.0	0.0	0.00	0.00	
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.0	0.00	0.00	
2,300.0	0.00	0.00	2,300.0	0.0	0.0	0.0	0.00	0.00	
2,400.0	0.00	0.00	2,400.0	0.0	0.0	0.0	0.00	0.00	
2,500.0	0.00	0.00	2,500.0	0.0	0.0	0.0	0.00	0.00	
2,600.0	0.00	0.00	2,600.0	0.0	0.0	0.0	0.00	0.00	
2,700.0	0.00	0.00	2,700.0	0.0	0.0	0.0	0.00	0.00	
2,800.0	0.00	0.00	2,800.0	0.0	0.0	0.0	0.00	0.00	
2,900.0	0.00	0.00	2,900.0	0.0	0.0	0.0	0.00	0.00	
3,000.0	0.00	0.00	3,000.0	0.0	0.0	0.0	0.00	0.00	
3,100.0	0.00	0.00	3,100.0	0.0	0.0	0.0	0.00	0.00	
3,200.0	0.00	0.00	3,200.0	0.0	0.0	0.0	0.00	0.00	
3,300.0	0.00	0.00	3,300.0	0.0	0.0	0.0	0.00	0.00	
3,400.0	0.00	0.00	3,400.0	0.0	0.0	0.0	0.00	0.00	
3,500.0	0.00	0.00	3,500.0	0.0	0.0	0.0	0.00	0.00	
3,600.0	0.00	0.00	3,600.0	0.0	0.0	0.0	0.00	0.00	
3,700.0	0.00	0.00	3,700.0	0.0	0.0	0.0	0.00	0.00	
3,800.0	0.00	0.00	3,800.0	0.0	0.0	0.0	0.00	0.00	
3,900.0	0.00	0.00	3,900.0	0.0	0.0	0.0	0.00	0.00	
4,000.0	0.00	0.00	4,000.0	0.0	0.0	0.0	0.00	0.00	KOP @ 400'
4,100.0	1.00	335.01	4,100.0	0.8	-0.4	-0.4	1.00	1.00	
4,194.8	1.95	335.01	4,194.7	3.0	-1.4	-1.4	1.00	1.00	EOB; Inc=2°
4,200.0	1.95	335.01	4,200.0	3.2	-1.5	-1.5	0.00	0.00	
4,300.0	1.95	335.01	4,299.9	6.2	-2.9	-2.9	0.00	0.00	
4,400.0	1.95	335.01	4,399.8	9.3	-4.3	-4.3	0.00	0.00	
4,500.0	1.95	335.01	4,499.8	12.4	-5.8	-5.7	0.00	0.00	
4,600.0	1.95	335.01	4,599.7	15.5	-7.2	-7.2	0.00	0.00	
4,700.0	1.95	335.01	4,699.7	18.6	-8.7	-8.6	0.00	0.00	
4,800.0	1.95	335.01	4,799.6	21.6	-10.1	-10.0	0.00	0.00	
4,900.0	1.95	335.01	4,899.6	24.7	-11.5	-11.5	0.00	0.00	
5,000.0	1.95	335.01	4,999.5	27.8	-13.0	-12.9	0.00	0.00	

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Project:	Wattenberg	MD Reference:	WELL @ 4730.0ft (Original Well Elev)
Site:	S18-T4N-R66W (Bernhardt)	North Reference:	True
Well:	Bernhardt #18-8H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

Planned Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
5,100.0	1.95	335.01	5,099.4	30.9	-14.4	-14.3	0.00	0.00	
5,200.0	1.95	335.01	5,199.4	34.0	-15.8	-15.7	0.00	0.00	
5,300.0	1.95	335.01	5,299.3	37.0	-17.3	-17.2	0.00	0.00	
5,400.0	1.95	335.01	5,399.3	40.1	-18.7	-18.6	0.00	0.00	
5,500.0	1.95	335.01	5,499.2	43.2	-20.1	-20.0	0.00	0.00	
5,600.0	1.95	335.01	5,599.2	46.3	-21.6	-21.4	0.00	0.00	
5,700.0	1.95	335.01	5,699.1	49.4	-23.0	-22.9	0.00	0.00	
5,800.0	1.95	335.01	5,799.0	52.4	-24.4	-24.3	0.00	0.00	
5,900.0	1.95	335.01	5,899.0	55.5	-25.9	-25.7	0.00	0.00	
6,000.0	1.95	335.01	5,998.9	58.6	-27.3	-27.1	0.00	0.00	
6,100.0	1.95	335.01	6,098.9	61.7	-28.8	-28.6	0.00	0.00	
6,200.0	1.95	335.01	6,198.8	64.8	-30.2	-30.0	0.00	0.00	
6,300.0	1.95	335.01	6,298.7	67.9	-31.6	-31.4	0.00	0.00	
6,400.0	1.95	335.01	6,398.7	70.9	-33.1	-32.9	0.00	0.00	
6,500.0	1.95	335.01	6,498.6	74.0	-34.5	-34.3	0.00	0.00	
6,544.8	1.95	335.01	6,543.4	75.4	-35.1	-34.9	0.00	0.00	Start build/turn @ 6544' MD
6,600.0	5.04	68.92	6,598.5	77.1	-33.3	-33.0	10.00	5.59	
6,700.0	14.82	82.76	6,696.9	80.3	-16.4	-16.2	10.00	9.78	
6,800.0	24.78	85.64	6,790.9	83.5	17.2	17.5	10.00	9.96	
6,900.0	34.76	86.93	6,877.6	86.7	66.7	66.9	10.00	9.98	
7,000.0	44.74	87.69	6,954.4	89.6	130.5	130.8	10.00	9.99	
7,100.0	54.73	88.23	7,018.9	92.3	206.7	206.9	10.00	9.99	
7,200.0	64.73	88.65	7,069.3	94.6	292.9	293.2	10.00	9.99	
7,300.0	74.72	89.00	7,103.9	96.5	386.5	386.8	10.00	9.99	
7,400.0	84.72	89.32	7,121.7	98.0	484.8	485.1	10.00	10.00	
7,458.3	90.55	89.50	7,124.1	98.6	543.1	543.4	10.00	10.00	LP @ 7124' TVD; 90.55°
7,500.0	90.55	89.50	7,123.7	98.9	584.7	585.0	0.00	0.00	
7,600.0	90.55	89.50	7,122.7	99.8	684.7	685.0	0.00	0.00	
7,700.0	90.55	89.50	7,121.8	100.7	784.7	785.0	0.00	0.00	
7,800.0	90.55	89.50	7,120.8	101.6	884.7	885.0	0.00	0.00	
7,900.0	90.55	89.50	7,119.9	102.4	984.7	985.0	0.00	0.00	
8,000.0	90.55	89.50	7,118.9	103.3	1,084.7	1,085.0	0.00	0.00	
8,100.0	90.55	89.50	7,117.9	104.2	1,184.7	1,185.0	0.00	0.00	
8,200.0	90.55	89.50	7,117.0	105.1	1,284.7	1,285.0	0.00	0.00	
8,300.0	90.55	89.50	7,116.0	105.9	1,384.7	1,385.0	0.00	0.00	
8,400.0	90.55	89.50	7,115.1	106.8	1,484.7	1,485.0	0.00	0.00	
8,500.0	90.55	89.50	7,114.1	107.7	1,584.6	1,584.9	0.00	0.00	
8,600.0	90.55	89.50	7,113.1	108.5	1,684.6	1,684.9	0.00	0.00	
8,700.0	90.55	89.50	7,112.2	109.4	1,784.6	1,784.9	0.00	0.00	
8,800.0	90.55	89.50	7,111.2	110.3	1,884.6	1,884.9	0.00	0.00	
8,900.0	90.55	89.50	7,110.3	111.2	1,984.6	1,984.9	0.00	0.00	
9,000.0	90.55	89.50	7,109.3	112.0	2,084.6	2,084.9	0.00	0.00	
9,100.0	90.55	89.50	7,108.3	112.9	2,184.6	2,184.9	0.00	0.00	
9,200.0	90.55	89.50	7,107.4	113.8	2,284.6	2,284.9	0.00	0.00	
9,300.0	90.55	89.50	7,106.4	114.7	2,384.6	2,384.9	0.00	0.00	
9,400.0	90.55	89.50	7,105.5	115.5	2,484.6	2,484.9	0.00	0.00	
9,500.0	90.55	89.50	7,104.5	116.4	2,584.6	2,584.9	0.00	0.00	
9,600.0	90.55	89.50	7,103.5	117.3	2,684.6	2,684.9	0.00	0.00	
9,700.0	90.55	89.50	7,102.6	118.1	2,784.5	2,784.9	0.00	0.00	
9,800.0	90.55	89.50	7,101.6	119.0	2,884.5	2,884.9	0.00	0.00	
9,900.0	90.55	89.50	7,100.7	119.9	2,984.5	2,984.9	0.00	0.00	
9,958.3	90.55	89.50	7,100.1	120.4	3,042.9	3,043.2	0.00	0.00	Start Turn 1.50

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Project:	Wattenberg	MD Reference:	WELL @ 4730.0ft (Original Well Elev)
Site:	S18-T4N-R66W (Bernhardt)	North Reference:	True
Well:	Bernhardt #18-8H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
10,000.0	90.55	90.12	7,099.7	120.5	3,084.5	3,084.9	1.50	0.00	
10,100.0	90.55	91.62	7,098.7	119.0	3,184.5	3,184.8	1.50	0.00	
10,200.0	90.55	93.12	7,097.8	114.9	3,284.4	3,284.7	1.50	0.00	
10,300.0	90.55	94.63	7,096.8	108.1	3,384.2	3,384.5	1.50	0.00	
10,325.0	90.55	95.00	7,096.6	106.0	3,409.1	3,409.4	1.50	0.00	End of turn @ 10325' MD
10,400.0	90.55	95.00	7,095.9	99.5	3,483.8	3,484.1	0.00	0.00	
10,500.0	90.55	95.00	7,094.9	90.8	3,583.4	3,583.7	0.00	0.00	
10,600.0	90.55	95.00	7,093.9	82.0	3,683.0	3,683.2	0.00	0.00	
10,700.0	90.55	95.00	7,093.0	73.3	3,782.6	3,782.8	0.00	0.00	
10,800.0	90.55	95.00	7,092.0	64.6	3,882.3	3,882.4	0.00	0.00	
10,900.0	90.55	95.00	7,091.1	55.9	3,981.9	3,982.0	0.00	0.00	
11,000.0	90.55	95.00	7,090.1	47.2	4,081.5	4,081.6	0.00	0.00	
11,100.0	90.55	95.00	7,089.1	38.5	4,181.1	4,181.2	0.00	0.00	
11,200.0	90.55	95.00	7,088.2	29.8	4,280.7	4,280.8	0.00	0.00	
11,229.0	90.55	95.00	7,087.9	27.2	4,309.6	4,309.7	0.00	0.00	Start Turn -1.50
11,300.0	90.55	93.93	7,087.2	21.7	4,380.4	4,380.4	1.50	0.00	
11,400.0	90.55	92.43	7,086.3	16.1	4,480.2	4,480.2	1.50	0.00	
11,495.7	90.55	91.00	7,085.3	13.3	4,575.8	4,575.8	1.50	0.00	TD at 11495.7

Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
Bernhardt 8H PBHL	0.00	0.46	7,035.0	-45.3	9,937.2	1,354,976.95	3,197,042.93	40.305650	-104.793510
- plan misses target center by 5361.9ft at 11495.7ft MD (7085.3 TVD, 13.3 N, 4575.8 E)									
- Point									
Bernhardt #18-8H TGT.	0.00	0.00	7,100.1	120.4	3,042.9	1,355,090.53	3,190,147.59	40.306110	-104.818230
- plan hits target center									
- Point									
Bernhardt #18-8H TGT	0.00	0.00	7,064.0	-190.7	6,803.9	1,354,807.89	3,193,910.84	40.305254	-104.804745
- plan misses target center by 2237.5ft at 11495.7ft MD (7085.3 TVD, 13.3 N, 4575.8 E)									
- Point									

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
4,000.0	4,000.0	0.0	0.0	KOP @ 400'
4,194.8	4,194.7	3.0	-1.4	EOB; Inc=2°
6,544.8	6,543.4	75.4	-35.1	Start build/turn @ 6544' MD
7,458.3	7,124.1	98.6	543.1	LP @ 7124' TVD; 90.55°
9,958.3	7,100.1	120.4	3,042.9	Start Turn 1.50
10,325.0	7,096.6	106.0	3,409.1	End of turn @ 10325' MD
11,229.0	7,087.9	27.2	4,309.6	Start Turn -1.50
11,495.7	7,085.3	13.3	4,575.8	TD at 11495.7