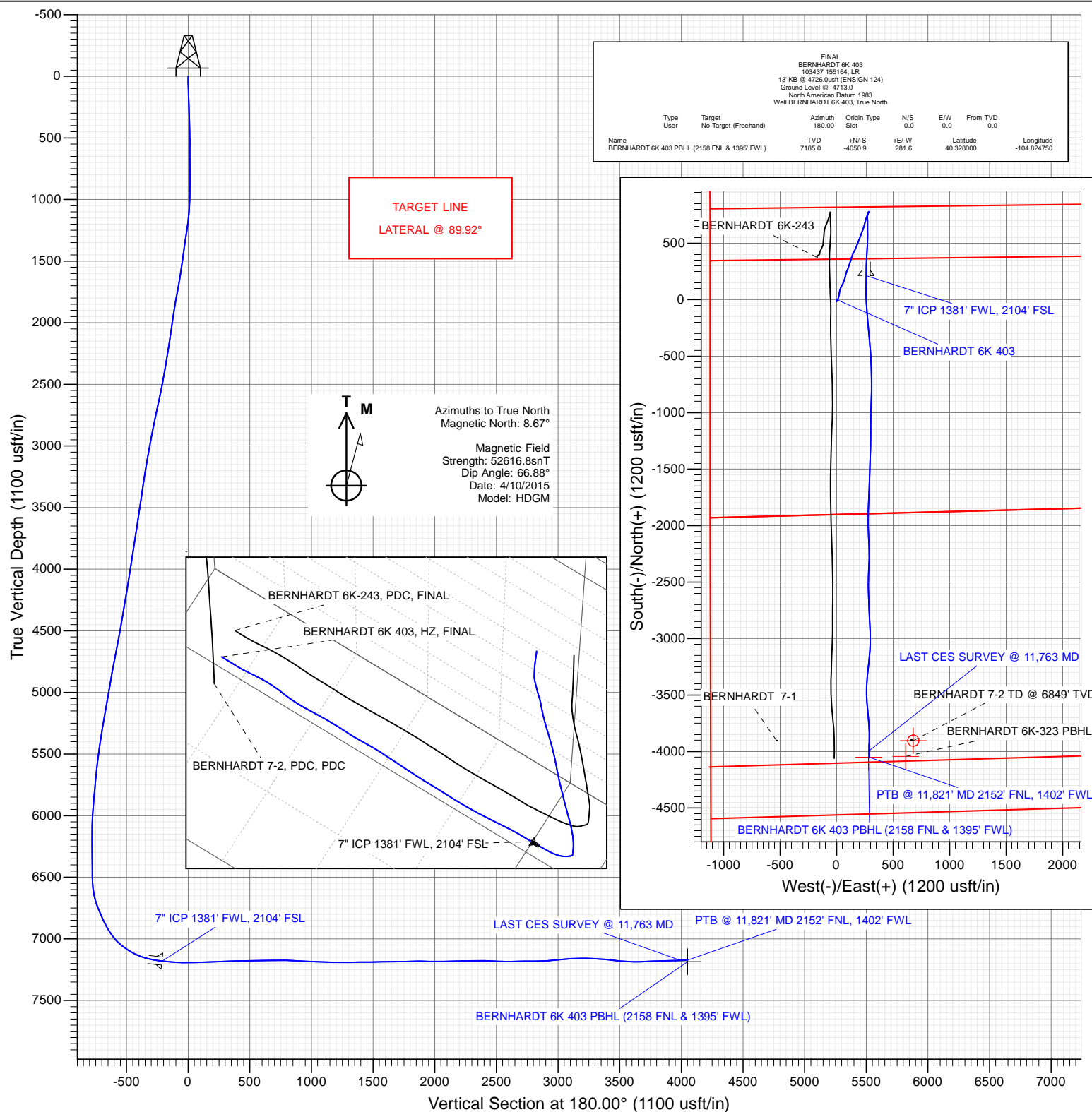




Petroleum Development Corporation

Project: Weld County
Site: S6-T4N-R66W
Well: BERNHARDT 6K 403
Wellbore: HZ
Design: FINAL



CATHEDRAL

WELL DETAILS: BERNHARDT 6K 403

Ground Level: 4713.0
+N/-S +E/-W Northing Easting Latitude Longitude
0.0 0.0 1367096.68 3187949.64 40.339120 -104.825760



Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 6K 403
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 6K 403	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Weld County		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		S6-T4N-R66W			
Site Position:		Northing:	1,367,096.68 usft	Latitude:	40.339120
From:	Lat/Long	Easting:	3,187,949.64 usft	Longitude:	-104.825760
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.44 °

Well	BERNHARDT 6K 403					
Well Position	+N/-S	0.0 usft	Northing:	1,367,096.68 usft	Latitude:	40.339120
	+E/-W	0.0 usft	Easting:	3,187,949.64 usft	Longitude:	-104.825760
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,713.0 usft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	4/10/2015	8.67	66.88	52,617

Design	FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	180.00	

Survey Program	Date	4/23/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
149.0	11,821.0	Survey #1 (HZ)	MWD	Geolink MWD	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
149.0	2.20	194.10	149.0	-2.8	-0.7	2.8	1.48	1.48		
337.0	1.60	183.30	336.9	-8.9	-1.7	8.9	0.37	-0.32		
523.0	1.20	180.80	522.8	-13.4	-1.9	13.4	0.22	-0.22		
708.0	1.00	71.40	707.8	-14.9	-0.4	14.9	0.97	-0.11		
926.0	1.10	44.20	925.7	-12.7	2.9	12.7	0.23	0.05		
1,004.0	1.00	54.80	1,003.7	-11.8	3.9	11.8	0.28	-0.13		
1,035.0	1.40	40.10	1,034.7	-11.4	4.4	11.4	1.62	1.29		
1,082.0	4.00	34.80	1,081.7	-9.6	5.7	9.6	5.55	5.53		
1,128.0	7.10	32.00	1,127.5	-5.9	8.1	5.9	6.76	6.74		
1,221.0	9.10	12.60	1,219.5	6.2	12.8	-6.2	3.61	2.15		
1,313.0	9.10	13.60	1,310.4	20.4	16.1	-20.4	0.17	0.00		
1,406.0	8.10	11.70	1,402.3	33.9	19.1	-33.9	1.12	-1.08		

Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 6K 403
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 6K 403	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
1,499.0	7.90	11.00	1,494.4	46.6	21.7	-46.6	0.24	-0.22	
1,591.0	8.40	5.50	1,585.5	59.5	23.5	-59.5	1.01	0.54	
1,684.0	11.10	12.00	1,677.2	75.0	26.1	-75.0	3.13	2.90	
1,776.0	11.20	17.30	1,767.4	92.2	30.5	-92.2	1.12	0.11	
1,868.0	10.10	30.60	1,857.8	107.7	37.3	-107.7	2.92	-1.20	
1,960.0	9.80	27.10	1,948.5	121.6	45.0	-121.6	0.73	-0.33	
2,052.0	9.40	26.00	2,039.2	135.3	51.8	-135.3	0.48	-0.43	
2,144.0	9.10	22.60	2,130.0	148.8	57.9	-148.8	0.68	-0.33	
2,236.0	8.80	22.10	2,220.9	162.1	63.4	-162.1	0.34	-0.33	
2,328.0	10.50	16.10	2,311.6	176.6	68.4	-176.6	2.14	1.85	
2,420.0	10.60	14.30	2,402.0	192.9	72.8	-192.9	0.37	0.11	
2,516.0	10.30	13.20	2,496.4	209.8	76.9	-209.8	0.38	-0.31	
2,611.0	12.80	15.30	2,589.5	228.2	81.6	-228.2	2.67	2.63	
2,707.0	13.00	22.10	2,683.1	248.5	88.5	-248.5	1.59	0.21	
2,802.0	12.50	21.30	2,775.7	268.0	96.2	-268.0	0.56	-0.53	
2,897.0	12.40	19.90	2,868.5	287.1	103.5	-287.1	0.33	-0.11	
2,993.0	11.70	19.60	2,962.4	306.0	110.2	-306.0	0.73	-0.73	
3,088.0	10.10	17.60	3,055.6	323.0	116.0	-323.0	1.73	-1.68	
3,183.0	9.90	17.90	3,149.2	338.7	121.0	-338.7	0.22	-0.21	
3,279.0	9.00	16.20	3,243.9	353.8	125.6	-353.8	0.98	-0.94	
3,374.0	8.70	15.40	3,337.8	367.8	129.6	-367.8	0.34	-0.32	
3,470.0	9.70	20.80	3,432.5	382.4	134.4	-382.4	1.38	1.04	
3,565.0	9.30	22.30	3,526.2	397.0	140.2	-397.0	0.50	-0.42	
3,660.0	8.50	22.50	3,620.1	410.6	145.8	-410.6	0.84	-0.84	
3,756.0	10.50	28.30	3,714.8	424.8	152.6	-424.8	2.31	2.08	
3,851.0	10.20	28.00	3,808.2	439.9	160.7	-439.9	0.32	-0.32	
3,946.0	9.80	27.90	3,901.8	454.5	168.4	-454.5	0.42	-0.42	
4,042.0	9.80	19.40	3,996.4	469.4	175.0	-469.4	1.51	0.00	
4,137.0	8.40	18.50	4,090.2	483.6	179.8	-483.6	1.48	-1.47	
4,233.0	11.00	21.20	4,184.8	498.8	185.4	-498.8	2.75	2.71	
4,328.0	10.50	19.90	4,278.1	515.4	191.6	-515.4	0.58	-0.53	
4,424.0	9.80	21.60	4,372.6	531.2	197.6	-531.2	0.79	-0.73	
4,519.0	11.30	21.90	4,466.0	547.3	204.0	-547.3	1.58	1.58	
4,615.0	10.70	20.10	4,560.3	564.4	210.6	-564.4	0.72	-0.62	
4,710.0	11.90	21.10	4,653.4	581.9	217.2	-581.9	1.28	1.26	
4,805.0	11.70	19.50	4,746.4	600.1	223.9	-600.1	0.40	-0.21	
4,901.0	10.60	20.60	4,840.6	617.5	230.3	-617.5	1.17	-1.15	
4,997.0	10.10	21.50	4,935.0	633.6	236.5	-633.6	0.55	-0.52	
5,092.0	10.80	14.90	5,028.5	650.0	241.8	-650.0	1.46	0.74	
5,187.0	9.90	13.20	5,121.9	666.5	246.0	-666.5	1.00	-0.95	
5,283.0	10.80	17.00	5,216.4	683.2	250.5	-683.2	1.18	0.94	
5,378.0	9.60	17.50	5,309.9	699.2	255.5	-699.2	1.27	-1.26	
5,474.0	8.40	16.90	5,404.7	713.6	259.9	-713.6	1.25	-1.25	
5,569.0	8.10	11.80	5,498.7	726.8	263.3	-726.8	0.83	-0.32	
5,664.0	7.10	25.20	5,592.9	738.6	267.2	-738.6	2.13	-1.05	
5,760.0	6.30	22.90	5,688.2	748.8	271.7	-748.8	0.88	-0.83	
5,855.0	5.50	22.60	5,782.7	757.9	275.5	-757.9	0.84	-0.84	
5,950.0	5.10	22.20	5,877.3	766.0	278.9	-766.0	0.42	-0.42	
6,046.0	4.90	25.10	5,972.9	773.6	282.2	-773.6	0.34	-0.21	
6,141.0	1.90	32.60	6,067.7	778.6	284.8	-778.6	3.19	-3.16	
6,236.0	0.50	251.20	6,162.7	779.8	285.2	-779.8	2.43	-1.47	
6,332.0	0.70	212.80	6,258.7	779.2	284.5	-779.2	0.46	0.21	
6,427.0	0.40	191.90	6,353.7	778.4	284.1	-778.4	0.37	-0.32	

Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 6K 403
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 6K 403	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
6,522.0	1.50	246.50	6,448.7	777.6	282.9	-777.6	1.38	1.16	
6,569.0	1.60	235.70	6,495.7	776.9	281.8	-776.9	0.66	0.21	
6,618.0	2.60	212.50	6,544.7	775.6	280.7	-775.6	2.64	2.04	
6,665.0	7.90	207.40	6,591.4	771.9	278.6	-771.9	11.31	11.28	
6,713.0	12.20	200.70	6,638.7	764.2	275.3	-764.2	9.27	8.96	
6,760.0	15.70	188.80	6,684.3	753.2	272.6	-753.2	9.59	7.45	
6,808.0	19.90	184.30	6,730.0	738.7	270.9	-738.7	9.20	8.75	
6,855.0	22.40	175.80	6,773.9	721.8	271.0	-721.8	8.41	5.32	
6,904.0	25.10	175.80	6,818.7	702.1	272.4	-702.1	5.51	5.51	
6,951.0	25.80	181.60	6,861.1	681.9	272.9	-681.9	5.51	1.49	
6,999.0	27.90	178.80	6,904.0	660.2	272.8	-660.2	5.11	4.37	
7,046.0	33.60	179.40	6,944.3	636.2	273.2	-636.2	12.15	12.13	
7,095.0	37.40	179.50	6,984.2	607.8	273.5	-607.8	7.76	7.76	
7,142.0	44.30	181.30	7,019.8	577.0	273.2	-577.0	14.89	14.68	
7,190.0	51.30	179.70	7,052.0	541.5	272.9	-541.5	14.79	14.58	
7,237.0	56.60	180.60	7,079.6	503.5	272.8	-503.5	11.38	11.28	
7,286.0	59.30	184.00	7,105.6	462.0	271.2	-462.0	8.06	5.51	
7,333.0	65.00	184.90	7,127.6	420.6	267.9	-420.6	12.25	12.13	
7,381.0	70.40	182.60	7,145.8	376.3	265.0	-376.3	12.09	11.25	
7,428.0	75.10	181.50	7,159.7	331.5	263.4	-331.5	10.25	10.00	
7,476.0	79.50	180.50	7,170.3	284.7	262.6	-284.7	9.39	9.17	
7,513.0	82.10	181.20	7,176.2	248.2	262.1	-248.2	7.27	7.03	
7,549.0	83.39	180.87	7,180.7	212.5	261.4	-212.5	3.69	3.58	7" ICP 1381' FWL, 2104' FSL
7,622.0	86.00	180.20	7,187.5	139.8	260.8	-139.8	3.69	3.58	
7,669.0	86.00	181.00	7,190.8	92.9	260.3	-92.9	1.70	0.00	
7,717.0	89.60	181.00	7,192.6	45.0	259.4	-45.0	7.50	7.50	
7,812.0	91.90	174.80	7,191.4	-49.9	262.9	49.9	6.96	2.42	
7,908.0	91.90	175.50	7,188.2	-145.5	271.0	145.5	0.73	0.00	
8,004.0	91.80	174.40	7,185.1	-241.1	279.5	241.1	1.15	-0.10	
8,099.0	91.90	174.60	7,182.0	-335.6	288.6	335.6	0.24	0.11	
8,194.0	92.20	176.20	7,178.6	-430.2	296.2	430.2	1.71	0.32	
8,290.0	89.70	176.30	7,177.0	-526.0	302.5	526.0	2.61	-2.60	
8,385.0	91.40	178.50	7,176.1	-620.9	306.8	620.9	2.93	1.79	
8,481.0	91.10	178.50	7,174.0	-716.8	309.3	716.8	0.31	-0.31	
8,576.0	87.50	181.90	7,175.2	-811.8	308.9	811.8	5.21	-3.79	
8,672.0	87.50	182.50	7,179.4	-907.6	305.3	907.6	0.62	0.00	
8,767.0	86.90	181.40	7,184.0	-1,002.5	302.0	1,002.5	1.32	-0.63	
8,863.0	87.50	180.00	7,188.7	-1,098.4	300.9	1,098.4	1.59	0.62	
8,958.0	90.40	180.10	7,190.4	-1,193.3	300.8	1,193.3	3.05	3.05	
9,054.0	90.50	181.90	7,189.7	-1,289.3	299.1	1,289.3	1.88	0.10	
9,149.0	90.40	181.30	7,188.9	-1,384.3	296.5	1,384.3	0.64	-0.11	
9,244.0	90.70	182.20	7,188.0	-1,479.2	293.6	1,479.2	1.00	0.32	
9,339.0	90.80	181.60	7,186.8	-1,574.2	290.4	1,574.2	0.64	0.11	
9,435.0	90.80	182.00	7,185.4	-1,670.1	287.4	1,670.1	0.42	0.00	
9,530.0	91.50	182.00	7,183.5	-1,765.0	284.1	1,765.0	0.74	0.74	
9,625.0	90.10	182.20	7,182.2	-1,859.9	280.6	1,859.9	1.49	-1.47	
9,721.0	88.70	179.90	7,183.2	-1,955.9	278.8	1,955.9	2.80	-1.46	
9,816.0	90.80	177.80	7,183.6	-2,050.9	280.7	2,050.9	3.13	2.21	
9,911.0	91.10	177.30	7,182.1	-2,145.8	284.8	2,145.8	0.61	0.32	
10,007.0	92.20	179.20	7,179.3	-2,241.7	287.7	2,241.7	2.29	1.15	
10,102.0	90.50	183.00	7,177.1	-2,336.6	285.9	2,336.6	4.38	-1.79	
10,198.0	87.70	181.90	7,178.6	-2,432.5	281.8	2,432.5	3.13	-2.92	
10,293.0	87.40	180.10	7,182.6	-2,527.4	280.1	2,527.4	1.92	-0.32	

Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 6K 403
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 6K 403	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
10,388.0	91.10	177.20	7,183.9	-2,622.4	282.4	2,622.4	4.95	3.89	
10,484.0	90.80	178.00	7,182.3	-2,718.3	286.4	2,718.3	0.89	-0.31	
10,579.0	89.90	177.70	7,181.7	-2,813.2	290.0	2,813.2	1.00	-0.95	
10,674.0	94.50	176.90	7,178.1	-2,908.0	294.4	2,908.0	4.91	4.84	
10,770.0	95.80	179.80	7,169.4	-3,003.5	297.2	3,003.5	3.30	1.35	
10,865.0	93.80	183.70	7,161.5	-3,098.1	294.3	3,098.1	4.60	-2.11	
10,961.0	89.82	186.60	7,158.4	-3,193.7	285.7	3,193.7	5.13	-4.15	
11,056.0	87.60	186.40	7,160.6	-3,288.0	274.9	3,288.0	2.35	-2.34	
11,152.0	84.50	183.50	7,167.2	-3,383.4	266.7	3,383.4	4.42	-3.23	
11,247.0	83.20	179.50	7,177.4	-3,477.8	264.2	3,477.8	4.40	-1.37	
11,342.0	87.10	175.00	7,185.4	-3,572.3	268.7	3,572.3	6.25	4.11	
11,438.0	92.10	174.20	7,186.1	-3,667.9	277.8	3,667.9	5.27	5.21	
11,533.0	92.80	176.50	7,182.0	-3,762.5	285.5	3,762.5	2.53	0.74	
11,628.0	91.40	180.30	7,178.5	-3,857.3	288.1	3,857.3	4.26	-1.47	
11,724.0	91.80	180.40	7,175.9	-3,953.3	287.5	3,953.3	0.43	0.42	
11,763.0	92.10	179.90	7,174.5	-3,992.3	287.4	3,992.3	1.49	0.77	LAST CES SURVEY @ 11,763 MD
11,821.0	92.10	179.90	7,172.4	-4,050.2	287.5	4,050.2	0.00	0.00	PTB @ 11,821' MD 2152' FNL, 1402' FWL

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BERNHARDT 6K 403 PI	0.00	0.00	7,185.0	-4,050.9	281.6	1,363,048.02	3,188,262.04	40.328000	-104.824750
- hit/miss target									
- Shape									
- survey misses target center by 13.9usft at 11821.0usft MD (7172.4 TVD, -4050.2 N, 287.5 E)									
- Point									

Casing Points						Casing Diameter (")	Hole Diameter (")
Measured Depth (usft)	Vertical Depth (usft)	Name					
7,549.0	7,180.7	7" ICP 1381' FWL, 2104' FSL				0	0

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
11,763.0	7,174.5	-3,992.3	287.4	LAST CES SURVEY @ 11,763 MD	
11,821.0	7,172.4	-4,050.2	287.5	PTB @ 11,821' MD 2152' FNL, 1402' FWL	

Checked By: _____ Approved By: _____ Date: _____