

BISON EXPLORATION

**ARAPAHOE COUNTY, COLORADO (NAD 83)
SE NE SEC. 22 T4S R64W 6th P.M.
HOULIHAN 4-64 22A 23-24-1**

ORIGINAL WELLBORE

30 March, 2017

Plan: PROPOSAL #1



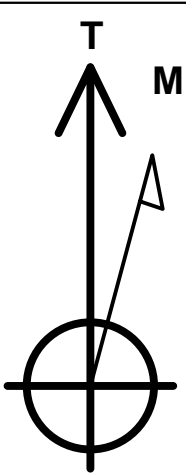
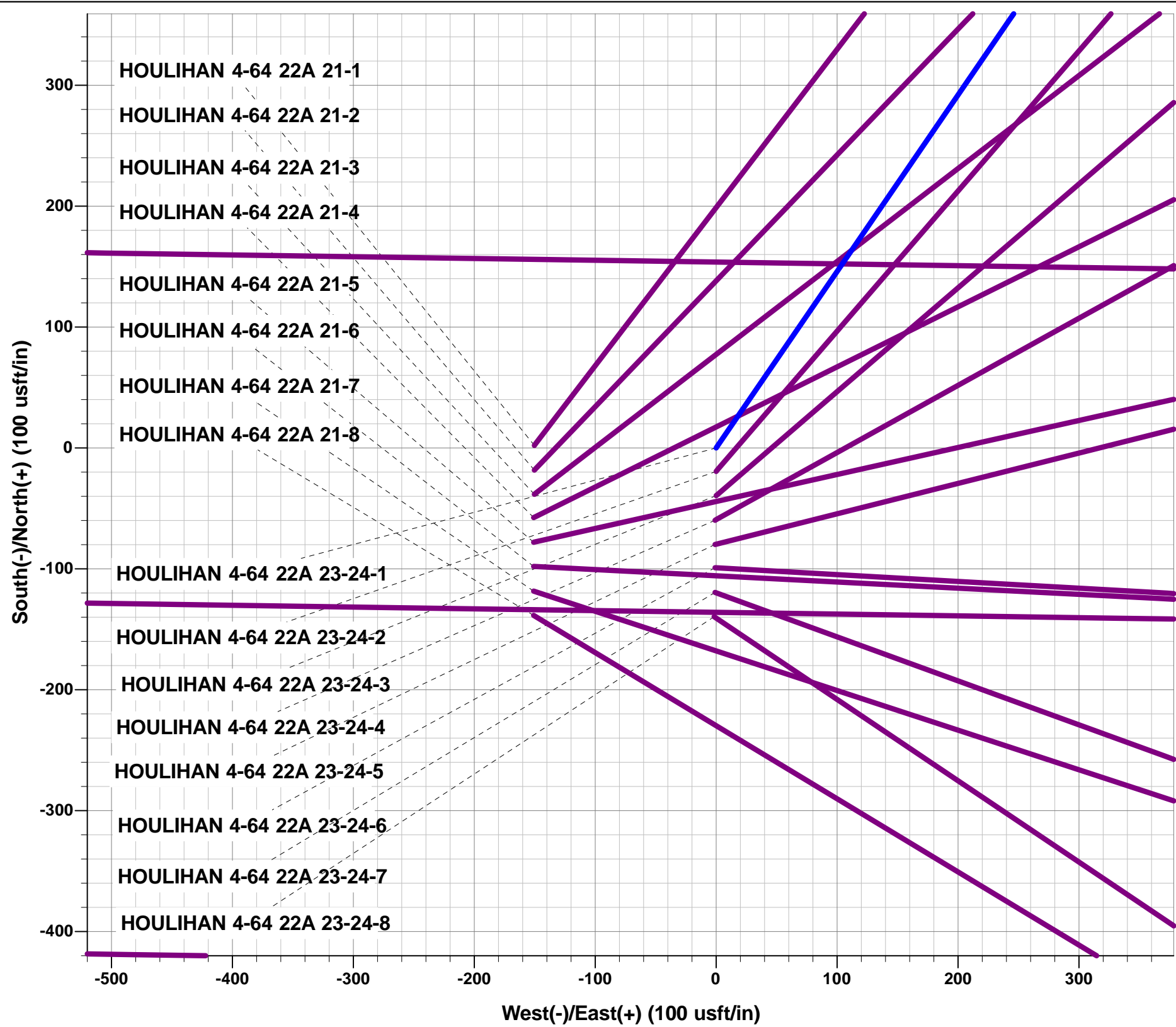
Project: ARAPAHOE COUNTY, COLORADO (NAD 83)
Site: SE NE SEC. 22 T4S R64W 6th P.M.
Well: HOULIHAN 4-64 22A 23-24-1
Wellbore: ORIGINAL WELLBORE
Design: PROPOSAL #1

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Dep	Annotation
0.0	0.0	0.00	0.00	0.0	0.0	0.0	0.0	SHL: 1773ft FNL & 855ft FEL of Sec 22
100.0	100.0	0.00	0.00	0.0	0.0	0.0	0.0	START NUDGE (2°/100ft BUR)
807.5	814.9	14.30	34.41	73.2	50.2	56.8	88.7	EOB TO 14.3° INC
6302.7	6485.8	14.30	34.41	1228.6	841.6	953.8	1489.2	END OF TANGENT
7010.2	7200.6	0.00	0.00	1301.8	891.8	1010.6	1578.0	EOD TO VERTICAL
7040.2	7230.6	0.00	0.00	1301.8	891.8	1010.6	1578.0	KOP (10°/100ft BUR)
7596.3	7991.3	76.07	91.52	1290.3	1326.6	1442.4	2013.0	BEGIN PROD INTERVAL
7613.2	8130.6	90.00	91.52	1286.6	1464.6	1579.4	2150.9	HZ LP *NEW*: 460ft FNL & 598ft FWL of Sec 23
7613.2	17597.5	90.00	91.52	1035.5	10928.1	10977.1	11617.8	BHL: 460ft FNL & 460ft FEL of Sec 24

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
KOP - HOULIHAN 4-64 22A 23-24-1	7040.2	1301.8	891.8	39.693985	-104.527503
BHL - HOULIHAN 4-64 22A 23-24-1	7613.2	1035.4	10928.1	39.693247	-104.491839
HZ LP *NEW* - HOULIHAN 4-64 22A 23-24-1	7613.2	1286.6	1464.6	39.693943	-104.525467



Azimuths to True North
Magnetic North: 8.05°

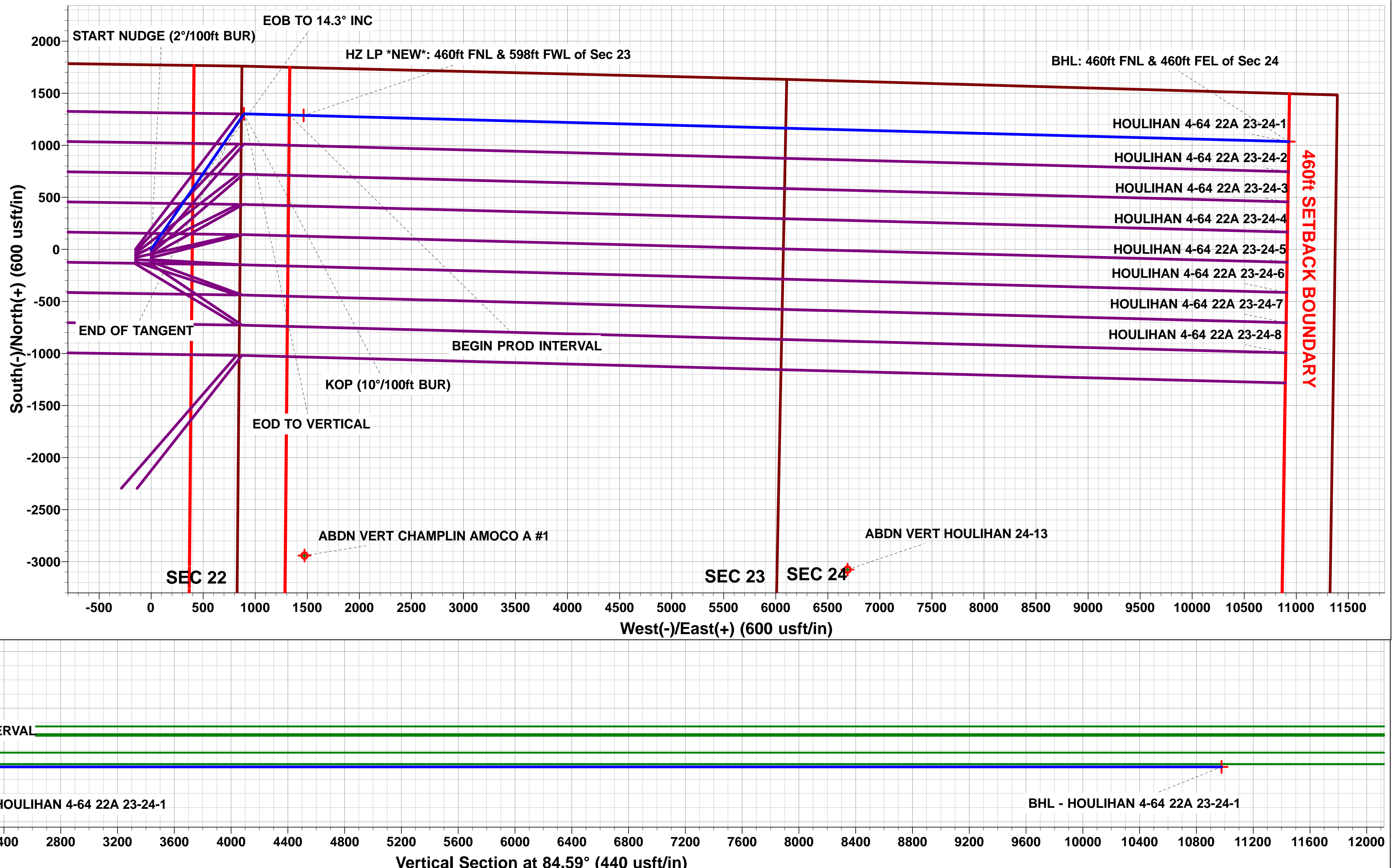
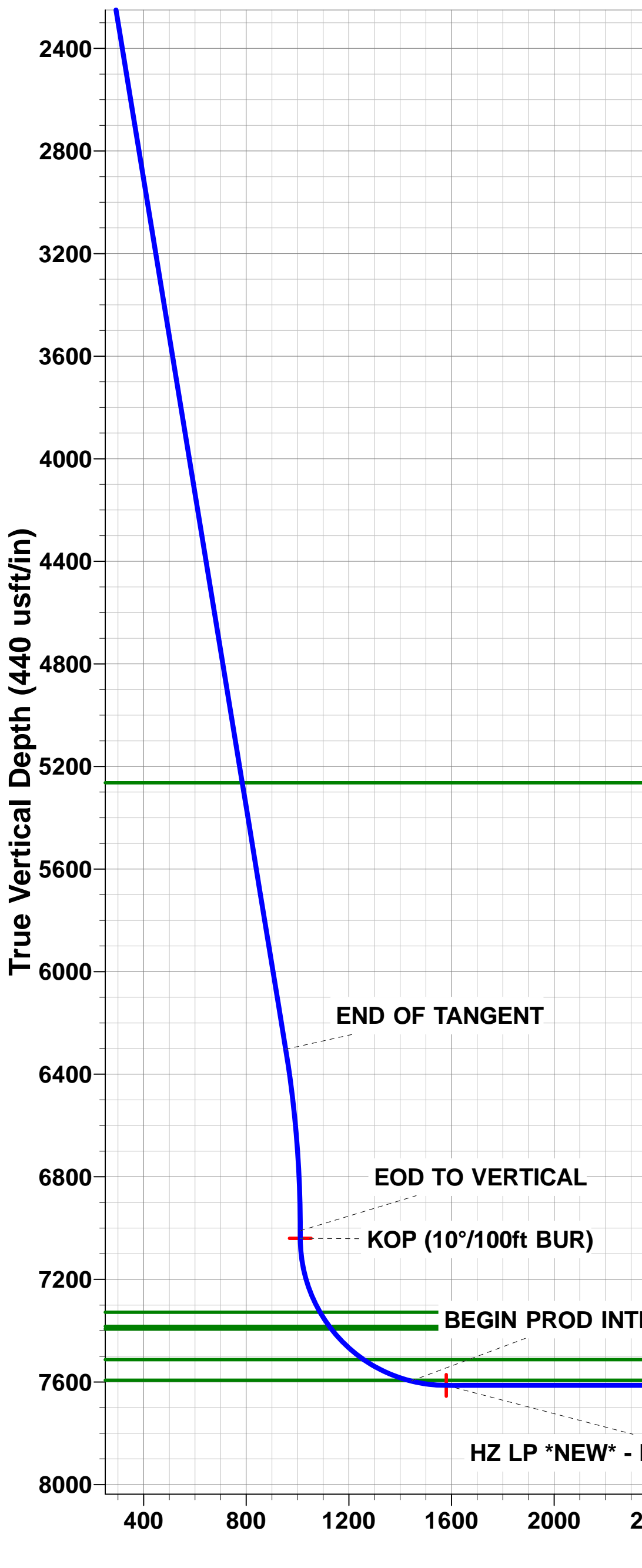
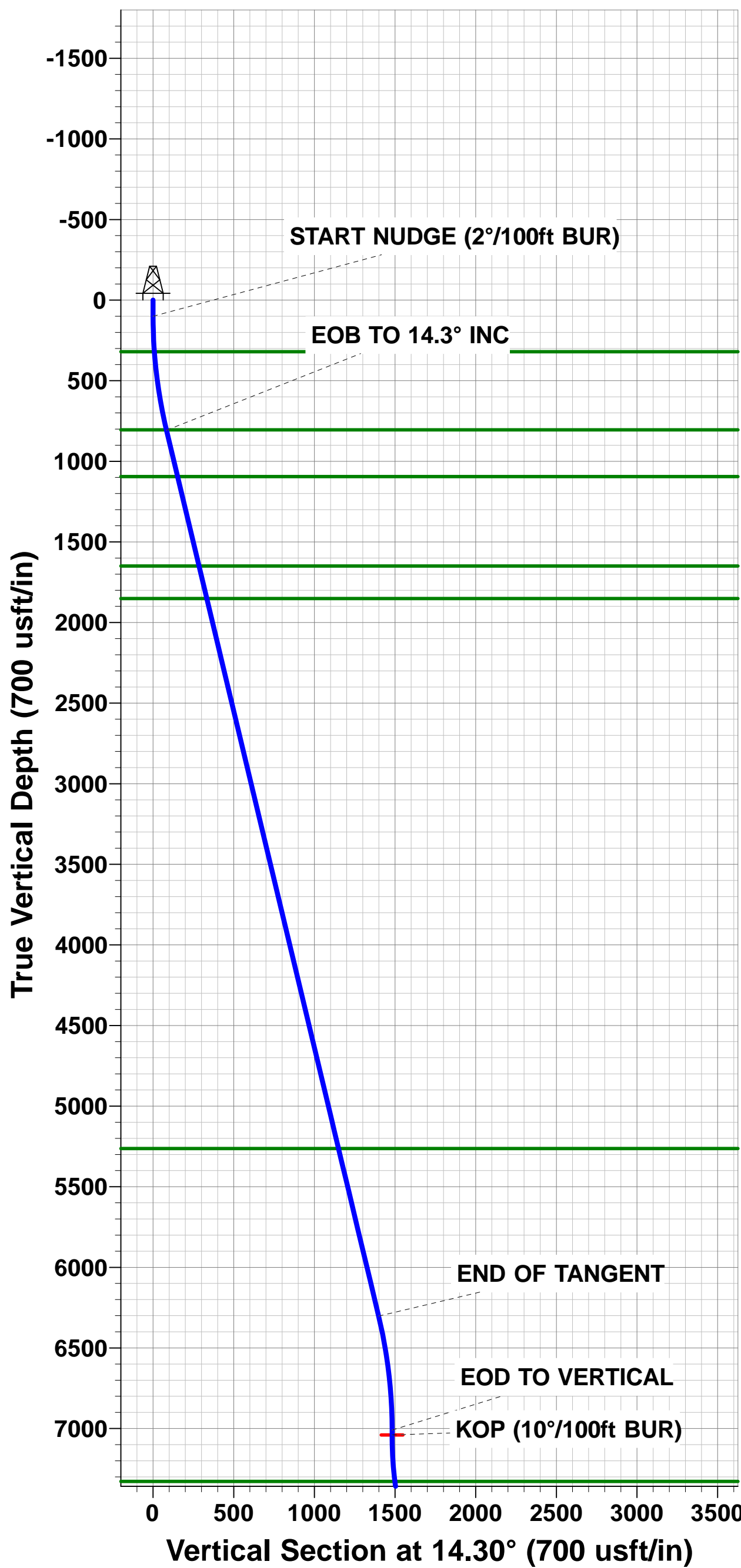
Magnetic Field
Strength: 52062.9snT
Dip Angle: 66.33°
Date: 30/03/2017
Model: IGRF2015

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
320.2	320.4	DENVER
805.2	812.5	UPPER ARAPAHOE
1095.2	1111.8	LOWER ARAPAHOE
1649.2	1683.5	LARAMIE - FOX HILLS
1851.2	1892.0	PIERRE SH (BASE FOX HILLS)
5263.2	5413.0	SHANNON SANDSTONE MBR
7328.2	7532.4	SHARON SPRINGS SHALE
7383.2	7598.4	NIOBRARA FORMATION
7393.2	7611.0	NIOBRARA A CHALK
7513.2	7787.1	NIOBRARA B CHALK
7593.2	7979.0	NIOBRARA C CHALK

PROPOSED LOCAL COORDINATES:

SHL: 1773ft FNL & 855ft FEL of Sec 22
BEGIN PROD INT: 460ft FNL & 460ft FWL of Sec 23
HZ LP: 460ft FNL & 598ft FWL of Sec 23
BHL: 460ft FNL & 460ft FEL of Sec 24



Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 23-24-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 23-24-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Project	ARAPAHOE COUNTY, COLORADO (NAD 83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		Using geodetic scale factor

Site	SE NE SEC. 22 T4S R64W 6th P.M.		
Site Position:		Northing:	1,677,817.09 usft
From:	Lat/Long	Easting:	3,272,633.76 usft
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000ft
		Latitude:	39.690417
		Longitude:	-104.531206
		Grid Convergence:	0.61 °

Well	HOULIHAN 4-64 22A 23-24-1		
Well Position	+N-S	-2.2 usft	Northing:
	+E-W	150.3 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	39.690411
		Longitude:	-104.530672
		Ground Level:	5,708.2 usft

Wellbore	ORIGINAL WELLBORE				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	30/03/2017	8.05	66.33	52,063

Design	PROPOSAL #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	84.59

Plan Sections											
MD (usft)	Inc (°)	Azi (°)	Vertical Depth	SS (usft)	+N-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	-5,733.2	0.0	0.0	0.00	0.00	0.00	0.00	
100.0	0.00	0.00	100.0	-5,633.2	0.0	0.0	0.00	0.00	0.00	0.00	
814.9	14.30	34.41	807.5	-4,925.7	73.2	50.2	2.00	2.00	0.00	34.41	
6,485.8	14.30	34.41	6,302.7	569.5	1,228.6	841.6	0.00	0.00	0.00	0.00	
7,200.6	0.00	0.00	7,010.2	1,277.0	1,301.8	891.8	2.00	-2.00	0.00	180.00	
7,230.6	0.00	0.00	7,040.2	1,307.0	1,301.8	891.8	0.00	0.00	0.00	0.00	KOP - HOULIHAN 4
8,130.6	90.00	91.52	7,613.2	1,880.0	1,286.6	1,464.6	10.00	10.00	0.00	91.52	
17,597.5	90.00	91.52	7,613.2	1,880.0	1,035.4	10,928.1	0.00	0.00	0.00	0.00	BHL - HOULIHAN 4

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Well:	HOULIHAN 4-64 22A 23-24-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey

MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
SHL: 1773ft FNL & 855ft FEL of Sec 22										
0.0	0.00	0.00	0.0	5,733.20	0.0	0.0	0.0	0.00	0.00	0.00
START NUDGE (2°/100ft BUR)										
100.0	0.00	0.00	100.0	5,633.20	0.0	0.0	0.0	0.00	0.00	0.00
200.0	2.00	34.41	200.0	5,533.22	1.4	1.0	1.1	2.00	2.00	0.00
300.0	4.00	34.41	299.8	5,433.36	5.8	3.9	4.5	2.00	2.00	0.00
DENVER										
320.4	4.41	34.41	320.2	5,413.00	7.0	4.8	5.4	2.00	2.00	0.00
400.0	6.00	34.41	399.5	5,333.75	12.9	8.9	10.1	2.00	2.00	0.00
500.0	8.00	34.41	498.7	5,234.50	23.0	15.8	17.9	2.00	2.00	0.00
600.0	10.00	34.41	597.5	5,135.73	35.9	24.6	27.9	2.00	2.00	0.00
700.0	12.00	34.41	695.6	5,037.58	51.6	35.4	40.1	2.00	2.00	0.00
800.0	14.00	34.41	793.1	4,940.14	70.2	48.1	54.5	2.00	2.00	0.00
UPPER ARAPAHOE										
812.5	14.25	34.41	805.2	4,928.00	72.7	49.8	56.5	2.00	2.00	0.00
EOB TO 14.3° INC										
814.9	14.30	34.41	807.5	4,925.70	73.2	50.2	56.8	2.00	2.00	0.00
900.0	14.30	34.41	890.0	4,843.23	90.5	62.0	70.3	0.00	0.00	0.00
1,000.0	14.30	34.41	986.9	4,746.33	110.9	76.0	86.1	0.00	0.00	0.00
1,100.0	14.30	34.41	1,083.8	4,649.43	131.3	89.9	101.9	0.00	0.00	0.00
LOWER ARAPAHOE										
1,111.8	14.30	34.41	1,095.2	4,638.00	133.7	91.6	103.8	0.00	0.00	0.00
1,200.0	14.30	34.41	1,180.7	4,552.53	151.7	103.9	117.7	0.00	0.00	0.00
1,300.0	14.30	34.41	1,277.6	4,455.62	172.0	117.9	133.6	0.00	0.00	0.00
1,400.0	14.30	34.41	1,374.5	4,358.72	192.4	131.8	149.4	0.00	0.00	0.00
1,500.0	14.30	34.41	1,471.4	4,261.82	212.8	145.8	165.2	0.00	0.00	0.00
1,600.0	14.30	34.41	1,568.3	4,164.92	233.2	159.7	181.0	0.00	0.00	0.00
LARAMIE - FOX HILLS										
1,683.5	14.30	34.41	1,649.2	4,084.00	250.2	171.4	194.2	0.00	0.00	0.00
1,700.0	14.30	34.41	1,665.2	4,068.01	253.5	173.7	196.8	0.00	0.00	0.00
1,800.0	14.30	34.41	1,762.1	3,971.11	273.9	187.6	212.6	0.00	0.00	0.00
PIERRE SHALE (BASE FOX HILLS)										
1,892.0	14.30	34.41	1,851.2	3,882.00	292.6	200.5	227.2	0.00	0.00	0.00
1,900.0	14.30	34.41	1,859.0	3,874.21	294.3	201.6	228.5	0.00	0.00	0.00
2,000.0	14.30	34.41	1,955.9	3,777.31	314.7	215.6	244.3	0.00	0.00	0.00
2,100.0	14.30	34.41	2,052.8	3,680.40	335.0	229.5	260.1	0.00	0.00	0.00
2,200.0	14.30	34.41	2,149.7	3,583.50	355.4	243.5	275.9	0.00	0.00	0.00
2,300.0	14.30	34.41	2,246.6	3,486.60	375.8	257.4	291.7	0.00	0.00	0.00
2,400.0	14.30	34.41	2,343.5	3,389.70	396.2	271.4	307.5	0.00	0.00	0.00
2,500.0	14.30	34.41	2,440.4	3,292.79	416.5	285.3	323.4	0.00	0.00	0.00
2,600.0	14.30	34.41	2,537.3	3,195.89	436.9	299.3	339.2	0.00	0.00	0.00
2,700.0	14.30	34.41	2,634.2	3,098.99	457.3	313.3	355.0	0.00	0.00	0.00
2,800.0	14.30	34.41	2,731.1	3,002.09	477.7	327.2	370.8	0.00	0.00	0.00
2,900.0	14.30	34.41	2,828.0	2,905.18	498.0	341.2	386.6	0.00	0.00	0.00
3,000.0	14.30	34.41	2,924.9	2,808.28	518.4	355.1	402.4	0.00	0.00	0.00
3,100.0	14.30	34.41	3,021.8	2,711.38	538.8	369.1	418.3	0.00	0.00	0.00
3,200.0	14.30	34.41	3,118.7	2,614.48	559.2	383.0	434.1	0.00	0.00	0.00
3,300.0	14.30	34.41	3,215.6	2,517.57	579.5	397.0	449.9	0.00	0.00	0.00
3,400.0	14.30	34.41	3,312.5	2,420.67	599.9	411.0	465.7	0.00	0.00	0.00
3,500.0	14.30	34.41	3,409.4	2,323.77	620.3	424.9	481.5	0.00	0.00	0.00
3,600.0	14.30	34.41	3,506.3	2,226.87	640.6	438.9	497.3	0.00	0.00	0.00
3,700.0	14.30	34.41	3,603.2	2,129.96	661.0	452.8	513.2	0.00	0.00	0.00
3,800.0	14.30	34.41	3,700.1	2,033.06	681.4	466.8	529.0	0.00	0.00	0.00

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Well:	HOULIHAN 4-64 22A 23-24-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey										
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
3,900.0	14.30	34.41	3,797.0	1,936.16	701.8	480.7	544.8	0.00	0.00	0.00
4,000.0	14.30	34.41	3,893.9	1,839.26	722.1	494.7	560.6	0.00	0.00	0.00
4,100.0	14.30	34.41	3,990.8	1,742.35	742.5	508.7	576.4	0.00	0.00	0.00
4,200.0	14.30	34.41	4,087.7	1,645.45	762.9	522.6	592.2	0.00	0.00	0.00
4,300.0	14.30	34.41	4,184.7	1,548.55	783.3	536.6	608.1	0.00	0.00	0.00
4,400.0	14.30	34.41	4,281.6	1,451.65	803.6	550.5	623.9	0.00	0.00	0.00
4,500.0	14.30	34.41	4,378.5	1,354.74	824.0	564.5	639.7	0.00	0.00	0.00
4,600.0	14.30	34.41	4,475.4	1,257.84	844.4	578.4	655.5	0.00	0.00	0.00
4,700.0	14.30	34.41	4,572.3	1,160.94	864.8	592.4	671.3	0.00	0.00	0.00
4,800.0	14.30	34.41	4,669.2	1,064.04	885.1	606.4	687.2	0.00	0.00	0.00
4,900.0	14.30	34.41	4,766.1	967.13	905.5	620.3	703.0	0.00	0.00	0.00
5,000.0	14.30	34.41	4,863.0	870.23	925.9	634.3	718.8	0.00	0.00	0.00
5,100.0	14.30	34.41	4,959.9	773.33	946.3	648.2	734.6	0.00	0.00	0.00
5,200.0	14.30	34.41	5,056.8	676.43	966.6	662.2	750.4	0.00	0.00	0.00
5,300.0	14.30	34.41	5,153.7	579.52	987.0	676.2	766.2	0.00	0.00	0.00
5,400.0	14.30	34.41	5,250.6	482.62	1,007.4	690.1	782.1	0.00	0.00	0.00
SHANNON SANDSTONE MBR										
5,413.0	14.30	34.41	5,263.2	470.00	1,010.0	691.9	784.1	0.00	0.00	0.00
5,500.0	14.30	34.41	5,347.5	385.72	1,027.8	704.1	797.9	0.00	0.00	0.00
5,600.0	14.30	34.41	5,444.4	288.82	1,048.1	718.0	813.7	0.00	0.00	0.00
5,700.0	14.30	34.41	5,541.3	191.91	1,068.5	732.0	829.5	0.00	0.00	0.00
5,800.0	14.30	34.41	5,638.2	95.01	1,088.9	745.9	845.3	0.00	0.00	0.00
5,900.0	14.30	34.41	5,735.1	-1.89	1,109.3	759.9	861.1	0.00	0.00	0.00
6,000.0	14.30	34.41	5,832.0	-98.79	1,129.6	773.9	877.0	0.00	0.00	0.00
6,100.0	14.30	34.41	5,928.9	-195.70	1,150.0	787.8	892.8	0.00	0.00	0.00
6,200.0	14.30	34.41	6,025.8	-292.60	1,170.4	801.8	908.6	0.00	0.00	0.00
6,300.0	14.30	34.41	6,122.7	-389.50	1,190.7	815.7	924.4	0.00	0.00	0.00
6,400.0	14.30	34.41	6,219.6	-486.40	1,211.1	829.7	940.2	0.00	0.00	0.00
END OF TANGENT										
6,485.8	14.30	34.41	6,302.7	-569.50	1,228.6	841.6	953.8	0.00	0.00	0.00
6,500.0	14.01	34.41	6,316.5	-583.31	1,231.5	843.6	956.0	2.00	-2.00	0.00
6,600.0	12.01	34.41	6,413.9	-680.74	1,250.0	856.3	970.4	2.00	-2.00	0.00
6,700.0	10.01	34.41	6,512.1	-778.89	1,265.8	867.1	982.7	2.00	-2.00	0.00
6,800.0	8.01	34.41	6,610.9	-877.66	1,278.7	876.0	992.7	2.00	-2.00	0.00
6,900.0	6.01	34.41	6,710.1	-976.90	1,288.8	882.9	1,000.5	2.00	-2.00	0.00
7,000.0	4.01	34.41	6,809.7	-1,076.51	1,296.0	887.8	1,006.1	2.00	-2.00	0.00
7,100.0	2.01	34.41	6,909.6	-1,176.37	1,300.3	890.8	1,009.5	2.00	-2.00	0.00
7,200.0	0.01	34.41	7,009.6	-1,276.35	1,301.8	891.8	1,010.6	2.00	-2.00	0.00
EOD TO VERTICAL										
7,200.6	0.00	0.00	7,010.2	-1,277.00	1,301.8	891.8	1,010.6	2.00	-2.00	0.00
KOP (10°/100ft BUR)										
7,230.6	0.00	0.00	7,040.2	-1,307.00	1,301.8	891.8	1,010.6	0.00	0.00	0.00
7,300.0	6.94	91.52	7,109.4	-1,376.18	1,301.7	896.0	1,014.8	10.00	10.00	0.00
7,400.0	16.94	91.52	7,207.1	-1,473.90	1,301.1	916.6	1,035.3	10.00	10.00	0.00
7,500.0	26.94	91.52	7,299.7	-1,566.54	1,300.2	953.9	1,072.3	10.00	10.00	0.00
SHARON SPRINGS SHALE										
7,532.4	30.18	91.52	7,328.2	-1,595.00	1,299.7	969.4	1,087.7	10.00	10.00	0.00
NIOBRARA FORMATION										
7,598.4	36.77	91.52	7,383.2	-1,650.00	1,298.8	1,005.8	1,123.8	10.00	10.00	0.00
7,600.0	36.94	91.52	7,384.5	-1,651.30	1,298.7	1,006.7	1,124.8	10.00	10.00	0.00
NIOBRARA A CHALK										
7,611.0	38.03	91.52	7,393.2	-1,660.00	1,298.6	1,013.4	1,131.4	10.00	10.00	0.00
7,700.0	46.94	91.52	7,458.8	-1,725.59	1,297.0	1,073.5	1,191.0	10.00	10.00	0.00

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 23-24-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 23-24-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey

MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
NIORARA B CHALK										
7,787.1	55.64	91.52	7,513.2	-1,780.00	1,295.2	1,141.3	1,258.4	10.00	10.00	0.00
7,800.0	56.94	91.52	7,520.4	-1,787.17	1,294.9	1,152.1	1,269.1	10.00	10.00	0.00
7,900.0	66.94	91.52	7,567.4	-1,834.16	1,292.6	1,240.2	1,356.6	10.00	10.00	0.00
NIORARA C CHALK										
7,979.0	74.83	91.52	7,593.2	-1,860.00	1,290.6	1,314.7	1,430.6	10.00	10.00	0.00
BEGIN PROD INTERVAL										
7,991.3	76.07	91.52	7,596.3	-1,863.10	1,290.3	1,326.6	1,442.4	10.00	10.00	0.00
8,000.0	76.94	91.52	7,598.3	-1,865.13	1,290.0	1,335.1	1,450.8	10.00	10.00	0.00
8,100.0	86.94	91.52	7,612.3	-1,879.14	1,287.4	1,433.9	1,549.0	10.00	10.00	0.00
HZ LP *NEW*: 460ft FNL & 598ft FWL of Sec 23										
8,130.6	90.00	91.52	7,613.2	-1,879.96	1,286.6	1,464.6	1,579.4	10.00	10.00	0.00
8,200.0	90.00	91.52	7,613.2	-1,879.96	1,284.8	1,533.9	1,648.2	0.00	0.00	0.00
8,300.0	90.00	91.52	7,613.2	-1,879.96	1,282.1	1,633.8	1,747.5	0.00	0.00	0.00
8,400.0	90.00	91.52	7,613.2	-1,879.96	1,279.5	1,733.8	1,846.8	0.00	0.00	0.00
8,500.0	90.00	91.52	7,613.2	-1,879.96	1,276.8	1,833.8	1,946.0	0.00	0.00	0.00
8,600.0	90.00	91.52	7,613.2	-1,879.96	1,274.2	1,933.7	2,045.3	0.00	0.00	0.00
8,700.0	90.00	91.52	7,613.2	-1,879.96	1,271.5	2,033.7	2,144.6	0.00	0.00	0.00
8,800.0	90.00	91.52	7,613.2	-1,879.96	1,268.8	2,133.7	2,243.8	0.00	0.00	0.00
8,900.0	90.00	91.52	7,613.2	-1,879.96	1,266.2	2,233.6	2,343.1	0.00	0.00	0.00
9,000.0	90.00	91.52	7,613.2	-1,879.96	1,263.5	2,333.6	2,442.4	0.00	0.00	0.00
9,100.0	90.00	91.52	7,613.2	-1,879.96	1,260.9	2,433.6	2,541.6	0.00	0.00	0.00
9,200.0	90.00	91.52	7,613.2	-1,879.96	1,258.2	2,533.5	2,640.9	0.00	0.00	0.00
9,300.0	90.00	91.52	7,613.2	-1,879.96	1,255.6	2,633.5	2,740.2	0.00	0.00	0.00
9,400.0	90.00	91.52	7,613.2	-1,879.96	1,252.9	2,733.5	2,839.5	0.00	0.00	0.00
9,500.0	90.00	91.52	7,613.2	-1,879.96	1,250.3	2,833.4	2,938.7	0.00	0.00	0.00
9,600.0	90.00	91.52	7,613.2	-1,879.96	1,247.6	2,933.4	3,038.0	0.00	0.00	0.00
9,700.0	90.00	91.52	7,613.2	-1,879.96	1,245.0	3,033.4	3,137.3	0.00	0.00	0.00
9,800.0	90.00	91.52	7,613.2	-1,879.96	1,242.3	3,133.3	3,236.5	0.00	0.00	0.00
9,900.0	90.00	91.52	7,613.2	-1,879.96	1,239.7	3,233.3	3,335.8	0.00	0.00	0.00
10,000.0	90.00	91.52	7,613.2	-1,879.96	1,237.0	3,333.2	3,435.1	0.00	0.00	0.00
10,100.0	90.00	91.52	7,613.2	-1,879.96	1,234.4	3,433.2	3,534.3	0.00	0.00	0.00
10,200.0	90.00	91.52	7,613.2	-1,879.96	1,231.7	3,533.2	3,633.6	0.00	0.00	0.00
10,300.0	90.00	91.52	7,613.2	-1,879.96	1,229.1	3,633.1	3,732.9	0.00	0.00	0.00
10,400.0	90.00	91.52	7,613.2	-1,879.96	1,226.4	3,733.1	3,832.1	0.00	0.00	0.00
10,500.0	90.00	91.52	7,613.2	-1,879.96	1,223.8	3,833.1	3,931.4	0.00	0.00	0.00
10,600.0	90.00	91.52	7,613.2	-1,879.96	1,221.1	3,933.0	4,030.7	0.00	0.00	0.00
10,700.0	90.00	91.52	7,613.2	-1,879.96	1,218.4	4,033.0	4,130.0	0.00	0.00	0.00
10,800.0	90.00	91.52	7,613.2	-1,879.96	1,215.8	4,133.0	4,229.2	0.00	0.00	0.00
10,900.0	90.00	91.52	7,613.2	-1,879.96	1,213.1	4,232.9	4,328.5	0.00	0.00	0.00
11,000.0	90.00	91.52	7,613.2	-1,879.96	1,210.5	4,332.9	4,427.8	0.00	0.00	0.00
11,100.0	90.00	91.52	7,613.2	-1,879.96	1,207.8	4,432.9	4,527.0	0.00	0.00	0.00
11,200.0	90.00	91.52	7,613.2	-1,879.96	1,205.2	4,532.8	4,626.3	0.00	0.00	0.00
11,300.0	90.00	91.52	7,613.2	-1,879.96	1,202.5	4,632.8	4,725.6	0.00	0.00	0.00
11,400.0	90.00	91.52	7,613.2	-1,879.96	1,199.9	4,732.8	4,824.8	0.00	0.00	0.00
11,500.0	90.00	91.52	7,613.2	-1,879.96	1,197.2	4,832.7	4,924.1	0.00	0.00	0.00
11,600.0	90.00	91.52	7,613.2	-1,879.96	1,194.6	4,932.7	5,023.4	0.00	0.00	0.00
11,700.0	90.00	91.52	7,613.2	-1,879.96	1,191.9	5,032.7	5,122.6	0.00	0.00	0.00
11,800.0	90.00	91.52	7,613.2	-1,879.96	1,189.3	5,132.6	5,221.9	0.00	0.00	0.00
11,900.0	90.00	91.52	7,613.2	-1,879.96	1,186.6	5,232.6	5,321.2	0.00	0.00	0.00
12,000.0	90.00	91.52	7,613.2	-1,879.96	1,184.0	5,332.5	5,420.4	0.00	0.00	0.00
12,100.0	90.00	91.52	7,613.2	-1,879.96	1,181.3	5,432.5	5,519.7	0.00	0.00	0.00
12,200.0	90.00	91.52	7,613.2	-1,879.96	1,178.7	5,532.5	5,619.0	0.00	0.00	0.00

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 23-24-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 23-24-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey										
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
12,300.0	90.00	91.52	7,613.2	-1,879.96	1,176.0	5,632.4	5,718.3	0.00	0.00	0.00
12,400.0	90.00	91.52	7,613.2	-1,879.96	1,173.4	5,732.4	5,817.5	0.00	0.00	0.00
12,500.0	90.00	91.52	7,613.2	-1,879.96	1,170.7	5,832.4	5,916.8	0.00	0.00	0.00
12,600.0	90.00	91.52	7,613.2	-1,879.96	1,168.0	5,932.3	6,016.1	0.00	0.00	0.00
12,700.0	90.00	91.52	7,613.2	-1,879.96	1,165.4	6,032.3	6,115.3	0.00	0.00	0.00
12,800.0	90.00	91.52	7,613.2	-1,879.96	1,162.7	6,132.3	6,214.6	0.00	0.00	0.00
12,900.0	90.00	91.52	7,613.2	-1,879.96	1,160.1	6,232.2	6,313.9	0.00	0.00	0.00
13,000.0	90.00	91.52	7,613.2	-1,879.96	1,157.4	6,332.2	6,413.1	0.00	0.00	0.00
13,100.0	90.00	91.52	7,613.2	-1,879.96	1,154.8	6,432.2	6,512.4	0.00	0.00	0.00
13,200.0	90.00	91.52	7,613.2	-1,879.96	1,152.1	6,532.1	6,611.7	0.00	0.00	0.00
13,300.0	90.00	91.52	7,613.2	-1,879.96	1,149.5	6,632.1	6,710.9	0.00	0.00	0.00
13,400.0	90.00	91.52	7,613.2	-1,879.96	1,146.8	6,732.1	6,810.2	0.00	0.00	0.00
13,500.0	90.00	91.52	7,613.2	-1,879.96	1,144.2	6,832.0	6,909.5	0.00	0.00	0.00
13,600.0	90.00	91.52	7,613.2	-1,879.96	1,141.5	6,932.0	7,008.7	0.00	0.00	0.00
13,700.0	90.00	91.52	7,613.2	-1,879.96	1,138.9	7,031.9	7,108.0	0.00	0.00	0.00
13,800.0	90.00	91.52	7,613.2	-1,879.96	1,136.2	7,131.9	7,207.3	0.00	0.00	0.00
13,900.0	90.00	91.52	7,613.2	-1,879.96	1,133.6	7,231.9	7,306.6	0.00	0.00	0.00
14,000.0	90.00	91.52	7,613.2	-1,879.96	1,130.9	7,331.8	7,405.8	0.00	0.00	0.00
14,100.0	90.00	91.52	7,613.2	-1,879.96	1,128.3	7,431.8	7,505.1	0.00	0.00	0.00
14,200.0	90.00	91.52	7,613.2	-1,879.96	1,125.6	7,531.8	7,604.4	0.00	0.00	0.00
14,300.0	90.00	91.52	7,613.2	-1,879.96	1,123.0	7,631.7	7,703.6	0.00	0.00	0.00
14,400.0	90.00	91.52	7,613.2	-1,879.96	1,120.3	7,731.7	7,802.9	0.00	0.00	0.00
14,500.0	90.00	91.52	7,613.2	-1,879.96	1,117.6	7,831.7	7,902.2	0.00	0.00	0.00
14,600.0	90.00	91.52	7,613.2	-1,879.96	1,115.0	7,931.6	8,001.4	0.00	0.00	0.00
14,700.0	90.00	91.52	7,613.2	-1,879.96	1,112.3	8,031.6	8,100.7	0.00	0.00	0.00
14,800.0	90.00	91.52	7,613.2	-1,879.96	1,109.7	8,131.6	8,200.0	0.00	0.00	0.00
14,900.0	90.00	91.52	7,613.2	-1,879.96	1,107.0	8,231.5	8,299.2	0.00	0.00	0.00
15,000.0	90.00	91.52	7,613.2	-1,879.96	1,104.4	8,331.5	8,398.5	0.00	0.00	0.00
15,100.0	90.00	91.52	7,613.2	-1,879.96	1,101.7	8,431.5	8,497.8	0.00	0.00	0.00
15,200.0	90.00	91.52	7,613.2	-1,879.96	1,099.1	8,531.4	8,597.1	0.00	0.00	0.00
15,300.0	90.00	91.52	7,613.2	-1,879.96	1,096.4	8,631.4	8,696.3	0.00	0.00	0.00
15,400.0	90.00	91.52	7,613.2	-1,879.96	1,093.8	8,731.3	8,795.6	0.00	0.00	0.00
15,500.0	90.00	91.52	7,613.2	-1,879.96	1,091.1	8,831.3	8,894.9	0.00	0.00	0.00
15,600.0	90.00	91.52	7,613.2	-1,879.96	1,088.5	8,931.3	8,994.1	0.00	0.00	0.00
15,700.0	90.00	91.52	7,613.2	-1,879.96	1,085.8	9,031.2	9,093.4	0.00	0.00	0.00
15,800.0	90.00	91.52	7,613.2	-1,879.96	1,083.2	9,131.2	9,192.7	0.00	0.00	0.00
15,900.0	90.00	91.52	7,613.2	-1,879.96	1,080.5	9,231.2	9,291.9	0.00	0.00	0.00
16,000.0	90.00	91.52	7,613.2	-1,879.96	1,077.9	9,331.1	9,391.2	0.00	0.00	0.00
16,100.0	90.00	91.52	7,613.2	-1,879.96	1,075.2	9,431.1	9,490.5	0.00	0.00	0.00
16,200.0	90.00	91.52	7,613.2	-1,879.96	1,072.6	9,531.1	9,589.7	0.00	0.00	0.00
16,300.0	90.00	91.52	7,613.2	-1,879.96	1,069.9	9,631.0	9,689.0	0.00	0.00	0.00
16,400.0	90.00	91.52	7,613.2	-1,879.96	1,067.3	9,731.0	9,788.3	0.00	0.00	0.00
16,500.0	90.00	91.52	7,613.2	-1,879.96	1,064.6	9,831.0	9,887.5	0.00	0.00	0.00
16,600.0	90.00	91.52	7,613.2	-1,879.96	1,061.9	9,930.9	9,986.8	0.00	0.00	0.00
16,700.0	90.00	91.52	7,613.2	-1,879.96	1,059.3	10,030.9	10,086.1	0.00	0.00	0.00
16,800.0	90.00	91.52	7,613.2	-1,879.96	1,056.6	10,130.9	10,185.4	0.00	0.00	0.00
16,900.0	90.00	91.52	7,613.2	-1,879.96	1,054.0	10,230.8	10,284.6	0.00	0.00	0.00
17,000.0	90.00	91.52	7,613.2	-1,879.96	1,051.3	10,330.8	10,383.9	0.00	0.00	0.00
17,100.0	90.00	91.52	7,613.2	-1,879.96	1,048.7	10,430.8	10,483.2	0.00	0.00	0.00
17,200.0	90.00	91.52	7,613.2	-1,879.96	1,046.0	10,530.7	10,582.4	0.00	0.00	0.00
17,300.0	90.00	91.52	7,613.2	-1,879.96	1,043.4	10,630.7	10,681.7	0.00	0.00	0.00
17,400.0	90.00	91.52	7,613.2	-1,879.96	1,040.7	10,730.6	10,781.0	0.00	0.00	0.00
17,500.0	90.00	91.52	7,613.2	-1,879.96	1,038.1	10,830.6	10,880.2	0.00	0.00	0.00
BHL: 460ft FNL & 460ft FEL of Sec 24										

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 23-24-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5733.2usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 23-24-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey

MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
17,597.5	90.00	91.52	7,613.2	-1,879.96	1,035.5	10,928.1	10,977.1	0.00	0.00	0.00

Formations

MD (usft)	TVD (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
320.4	320.2	DENVER			
812.5	805.2	UPPER ARAPAHOE			
1,111.8	1,095.2	LOWER ARAPAHOE			
1,683.5	1,649.2	LARAMIE - FOX HILLS			
1,892.0	1,851.2	PIERRE SHALE (BASE FOX HILLS			
5,413.0	5,263.2	SHANNON SANDSTONE MBR			
7,532.4	7,328.2	SHARON SPRINGS SHALE			
7,598.4	7,383.2	NIOBRARA FORMATION			
7,611.0	7,393.2	NIOBRARA A CHALK			
7,787.1	7,513.2	NIOBRARA B CHALK			
7,979.0	7,593.2	NIOBRARA C CHALK			

Plan Annotations

MD (usft)	TVD (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
0.0	0.0	0.0	0.0	SHL: 1773ft FNL & 855ft FEL of Sec 22
100.0	100.0	0.0	0.0	START NUDGE (2°/100ft BUR)
814.9	807.5	73.2	50.2	EOB TO 14.3° INC
6,485.8	6,302.7	1,228.6	841.6	END OF TANGENT
7,200.6	7,010.2	1,301.8	891.8	EOD TO VERTICAL
7,230.6	7,040.2	1,301.8	891.8	KOP (10°/100ft BUR)
7,991.3	7,596.3	1,290.3	1,326.6	BEGIN PROD INTERVAL
8,130.6	7,613.2	1,286.6	1,464.6	HZ LP *NEW*: 460ft FNL & 598ft FWL of Sec 23
17,597.5	7,613.2	1,035.5	10,928.1	BHL: 460ft FNL & 460ft FEL of Sec 24