

BISON EXPLORATION

**ARAPAHOE COUNTY, COLORADO (NAD 83)
SE NE SEC. 22 T4S R64W 6th P.M.
HOULIHAN 4-64 22A 21-4**

ORIGINAL WELLBORE

30 March, 2017

Plan: PROPOSAL #1



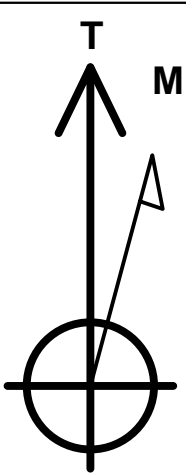
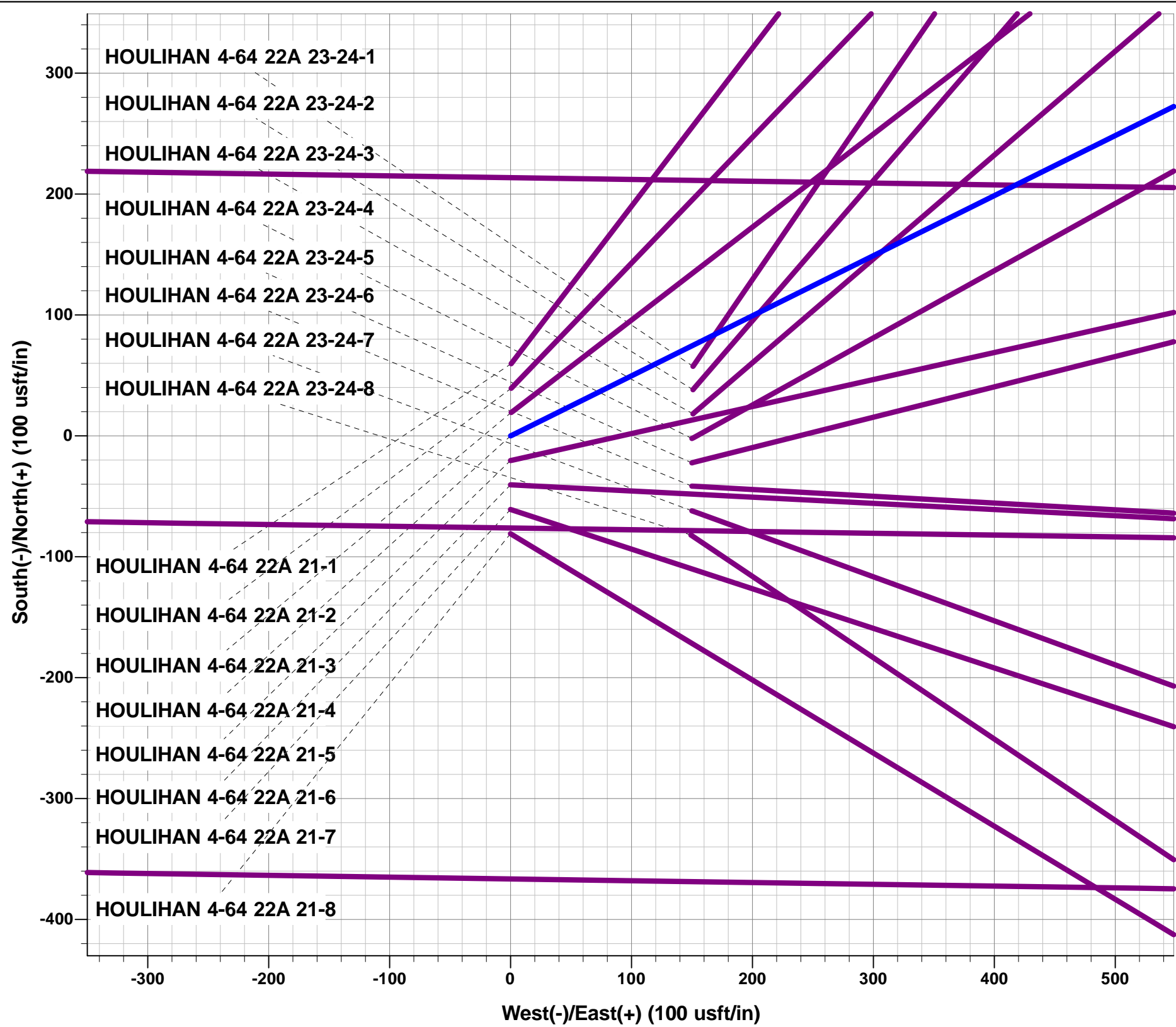
Project: ARAPAHOE COUNTY, COLORADO (NAD 83)
Site: SE NE SEC. 22 T4S R64W 6th P.M.
Well: HOULIHAN 4-64 22A 21-4
Wellbore: ORIGINAL WELLBORE
Design: PROPOSAL #1

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: 1834ft FNL & 1005ft FEL of Sec 22
400.0	400.0	0.00	0.00	0.0	0.0	0.0	0.0	START NUDGE (2°/100ft BUR)
995.8	1000.2	12.00	63.58	27.9	56.1	-54.0	62.6	EOB TO 12° INC
5580.3	5687.2	12.00	63.58	461.5	929.1	-894.5	1037.4	END OF TANGENT
6176.1	6287.3	0.00	0.00	489.4	985.2	-948.5	1100.1	EOD TO VERTICAL
6966.1	7077.3	0.00	0.00	489.4	985.2	-948.5	1100.1	KOP (10°/100ft BUR)
7522.2	7838.1	76.08	270.84	495.8	550.2	-514.1	1535.2	BEGIN PROD INTERVAL
7539.1	7977.3	90.00	270.84	497.8	412.3	-376.4	1673.0	HZ LP *NEW*: 1330ft FNL & 597.9ft FEL of Sec 22
7539.1	17457.1	90.00	270.84	636.9	-9066.4	9088.8	11152.8	BHL: 1330ft FNL & 460ft FWL of Sec 21

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
KOP - HOULIHAN 4-64 22A 21-4	6966.1	489.4	985.2	39.691596	-104.527707
BHL - HOULIHAN 4-64 22A 21-4	7539.1	636.9	-9066.4	39.691997	-104.563425
HZ LP *NEW* - HOULIHAN 4-64 22A 21-4	7539.1	497.8	412.3	39.691620	-104.529743



Azimuths to True North
Magnetic North: 8.05°

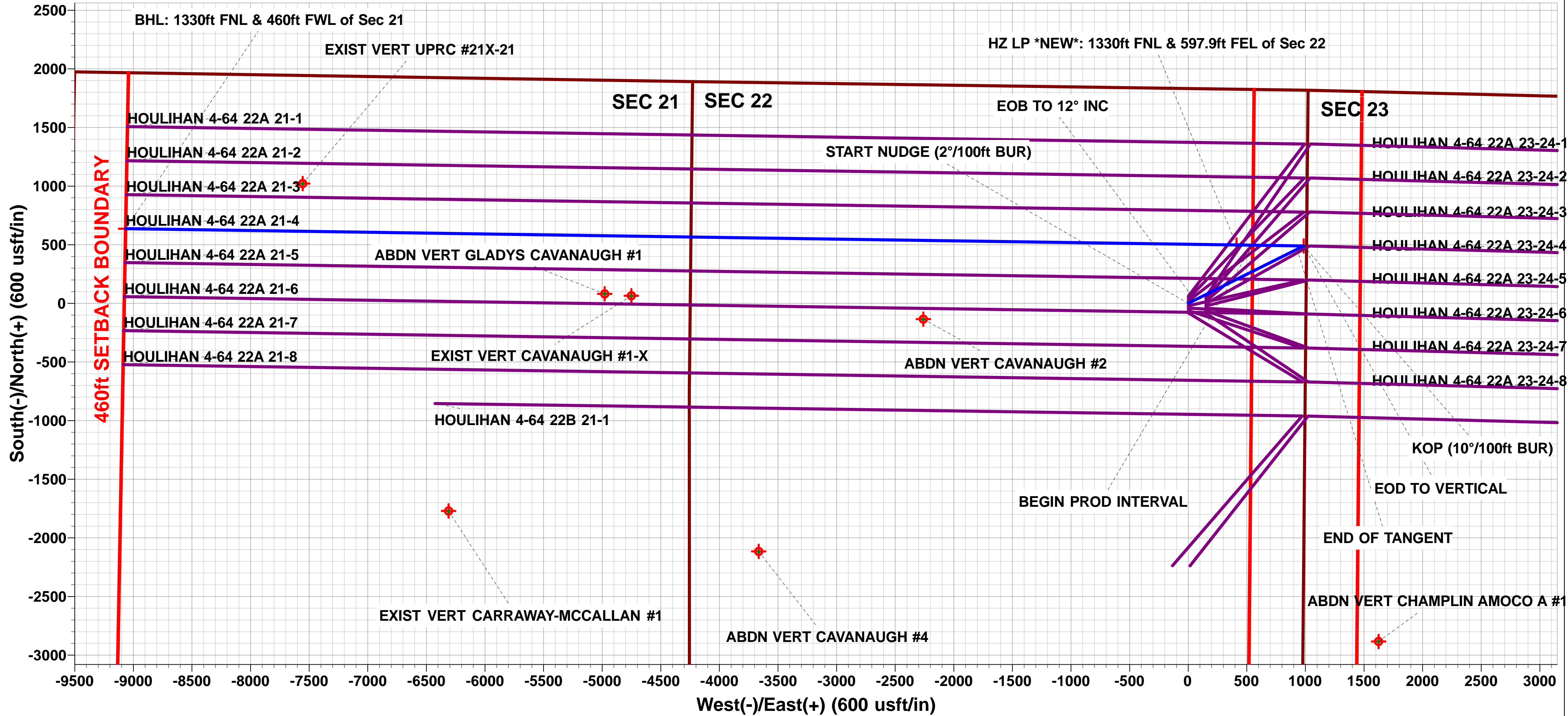
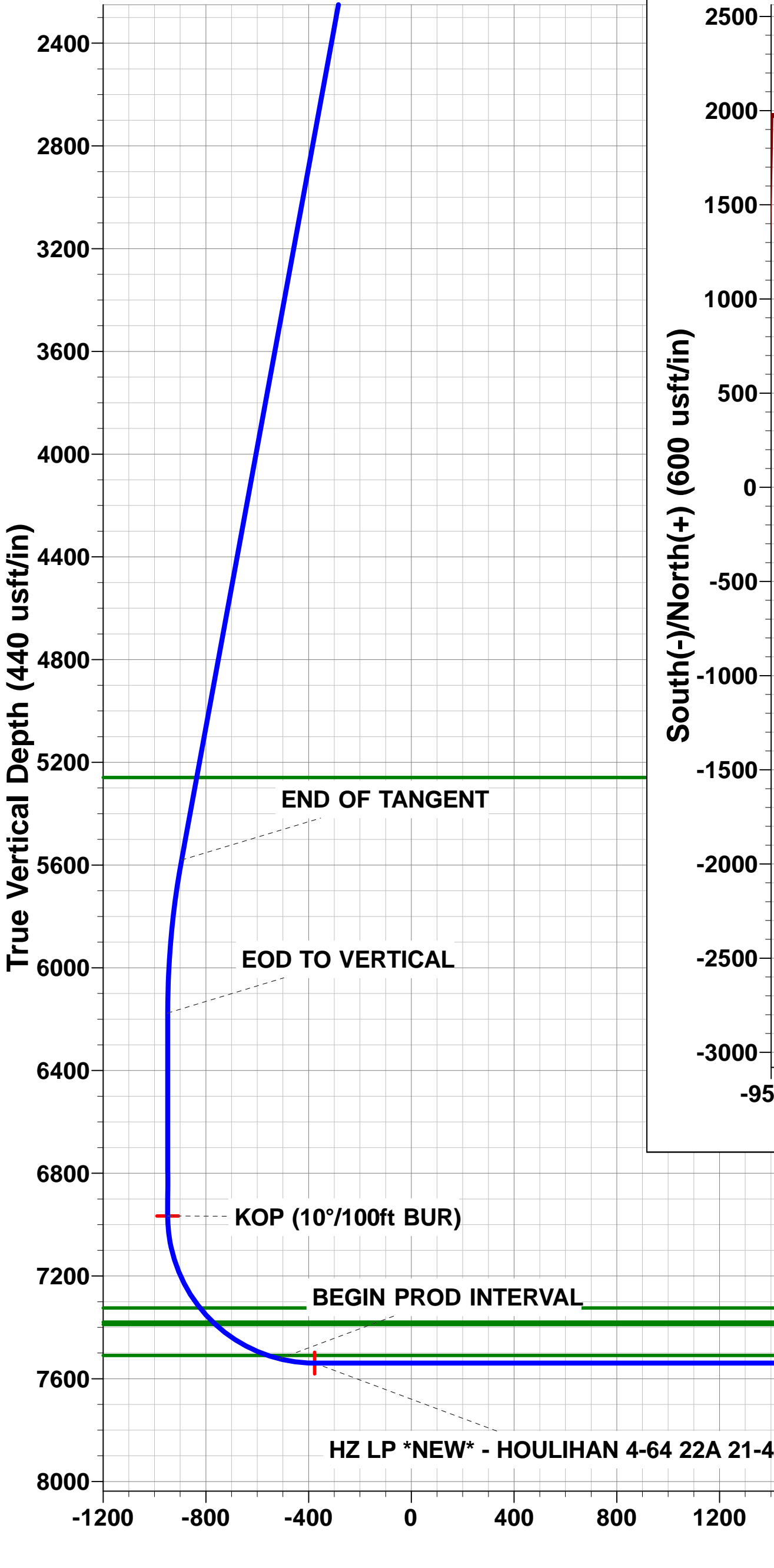
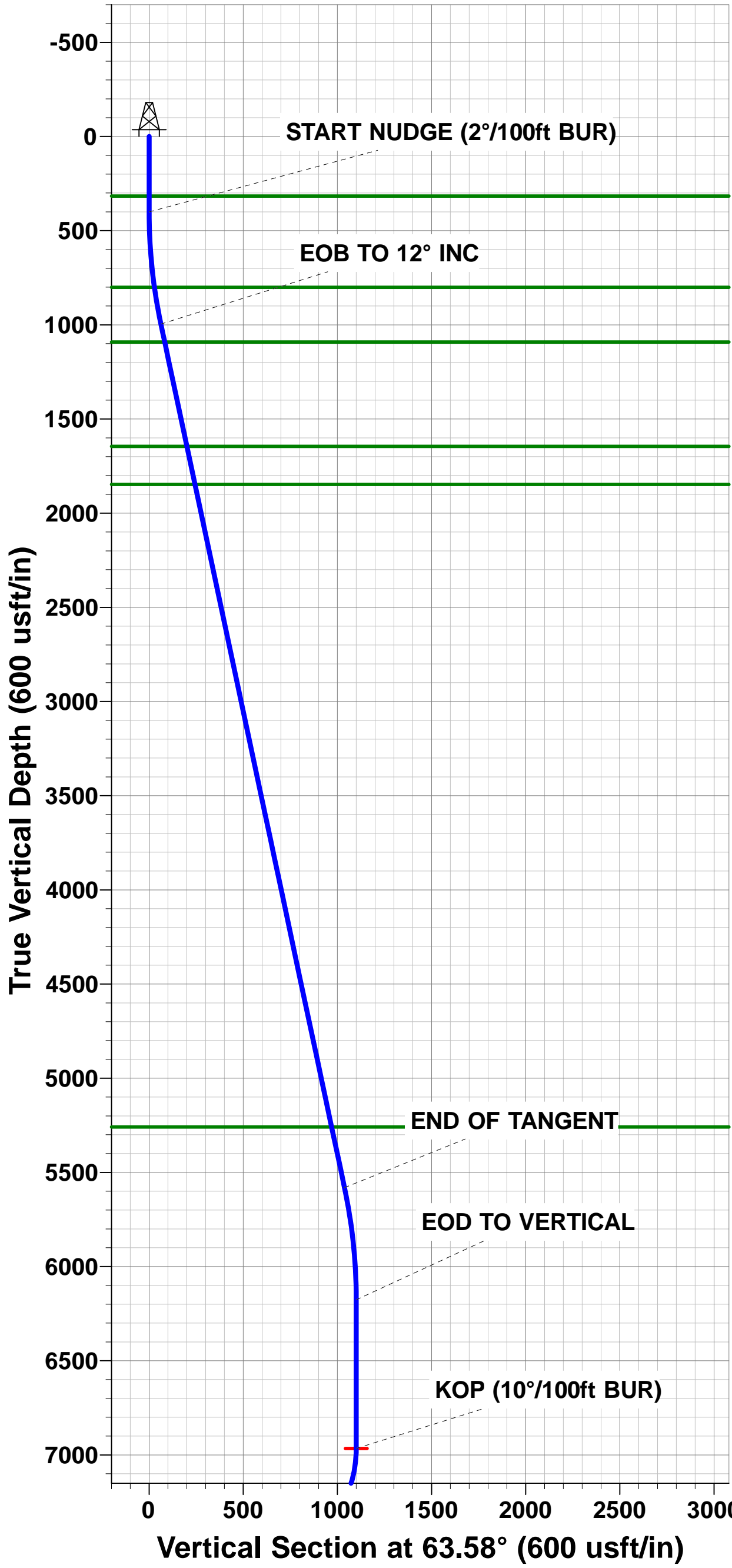
Magnetic Field
Strength: 52062.8snT
Dip Angle: 66.33°
Date: 30/03/2017
Model: IGRF2015

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
316.1	316.1	DENVER
801.1	802.4	UPPER ARAPAHOE
1091.1	1097.6	LOWER ARAPAHOE
1645.1	1664.0	LARAMIE - FOX HILLS
1847.1	1870.5	PIERRE SHALE
5259.1	5358.8	SHANNON SANDSTONE MBR
7324.1	7464.0	SHARON SPRINGS SHALE
7379.1	7538.6	NIOBRARA FORMATION
7389.1	7553.2	NIOBRARA A CHALK
7509.1	7791.2	NIOBRARA B CHALK

PROPOSED LOCAL COORDINATES:

SHL: 1834ft FNL & 1005ft FEL of Sec 22
BEGIN PROD INT: 1330ft FNL & 460ft FEL of Sec 22
HZ LP: 1330ft FNL & 597.9ft FEL of Sec 22
BHL: 1330ft FNL & 460ft FWL of Sec 21



Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-4
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-4	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	Latitude:	39.690417
From:	Lat/Long	Easting:	3,272,633.76 usft	Longitude:	-104.531206
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000ft	Grid Convergence:	0.61 °

Well	HOULIHAN 4-64 22A 21-4					
Well Position	+N-S	-59.7 usft	Northing:	1,677,757.34 usft	Latitude:	39.690253
	+E-W	-0.6 usft	Easting:	3,272,633.84 usft	Longitude:	-104.531208
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	5,704.1 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 (°)
	7,539.1	0.0	0.0	274.02

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	-5,729.1	0.0	0.0	0.00	0.00	0.00	0.00	
400.0	0.00	0.00	400.0	-5,329.1	0.0	0.0	0.00	0.00	0.00	0.00	
1,000.2	12.00	63.58	995.8	-4,733.3	27.9	56.1	2.00	2.00	0.00	63.58	
5,687.2	12.00	63.58	5,580.3	-148.8	461.5	929.1	0.00	0.00	0.00	0.00	
6,287.3	0.00	0.00	6,176.1	447.0	489.4	985.2	2.00	-2.00	0.00	180.00	
7,077.3	0.00	0.00	6,966.1	1,237.0	489.4	985.2	0.00	0.00	0.00	0.00	KOP - HOULIHAN 4
7,977.3	90.00	270.84	7,539.1	1,810.0	497.8	412.3	10.00	10.00	0.00	270.84	
17,457.1	90.00	270.84	7,539.1	1,810.0	636.9	-9,066.4	0.00	0.00	0.00	0.00	BHL - HOULIHAN 4

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Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-4	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: 1834ft FNL & 1005ft FEL of Sec 22										
0.0	0.00	0.00	0.0	5,729.10	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	5,629.10	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	5,529.10	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	5,429.10	0.0	0.0	0.0	0.00	0.00	0.00
DENVER										
316.1	0.00	0.00	316.1	5,413.00	0.0	0.0	0.0	0.00	0.00	0.00
START NUDGE (2°/100ft BUR)										
400.0	0.00	0.00	400.0	5,329.10	0.0	0.0	0.0	0.00	0.00	0.00
500.0	2.00	63.58	500.0	5,229.12	0.8	1.6	-1.5	2.00	2.00	0.00
600.0	4.00	63.58	599.8	5,129.26	3.1	6.2	-6.0	2.00	2.00	0.00
700.0	6.00	63.58	699.5	5,029.65	7.0	14.1	-13.5	2.00	2.00	0.00
800.0	8.00	63.58	798.7	4,930.40	12.4	25.0	-24.0	2.00	2.00	0.00
UPPER ARAPAHOE										
802.4	8.05	63.58	801.1	4,928.00	12.6	25.3	-24.3	2.00	2.00	0.00
900.0	10.00	63.58	897.5	4,831.63	19.4	39.0	-37.5	2.00	2.00	0.00
1,000.0	12.00	63.58	995.6	4,733.48	27.9	56.1	-54.0	2.00	2.00	0.00
EOB TO 12° INC										
1,000.2	12.00	63.58	995.8	4,733.29	27.9	56.1	-54.0	2.00	2.00	0.00
LOWER ARAPAHOE										
1,097.6	12.00	63.58	1,091.1	4,638.00	36.9	74.2	-71.5	0.00	0.00	0.00
1,100.0	12.00	63.58	1,093.4	4,635.66	37.1	74.7	-71.9	0.00	0.00	0.00
1,200.0	12.00	63.58	1,191.2	4,537.85	46.4	93.3	-89.8	0.00	0.00	0.00
1,300.0	12.00	63.58	1,289.1	4,440.04	55.6	111.9	-107.8	0.00	0.00	0.00
1,400.0	12.00	63.58	1,386.9	4,342.22	64.9	130.6	-125.7	0.00	0.00	0.00
1,500.0	12.00	63.58	1,484.7	4,244.41	74.1	149.2	-143.6	0.00	0.00	0.00
1,600.0	12.00	63.58	1,582.5	4,146.60	83.4	167.8	-161.6	0.00	0.00	0.00
LARAMIE - FOX HILLS										
1,664.0	12.00	63.58	1,645.1	4,084.00	89.3	179.7	-173.0	0.00	0.00	0.00
1,700.0	12.00	63.58	1,680.3	4,048.78	92.6	186.4	-179.5	0.00	0.00	0.00
1,800.0	12.00	63.58	1,778.1	3,950.97	101.9	205.1	-197.4	0.00	0.00	0.00
PIERRE SHALE (BASE FOX HILLS)										
1,870.5	12.00	63.58	1,847.1	3,882.00	108.4	218.2	-210.1	0.00	0.00	0.00
1,900.0	12.00	63.58	1,875.9	3,853.16	111.1	223.7	-215.4	0.00	0.00	0.00
2,000.0	12.00	63.58	1,973.8	3,755.34	120.4	242.3	-233.3	0.00	0.00	0.00
2,100.0	12.00	63.58	2,071.6	3,657.53	129.6	261.0	-251.2	0.00	0.00	0.00
2,200.0	12.00	63.58	2,169.4	3,559.72	138.9	279.6	-269.2	0.00	0.00	0.00
2,300.0	12.00	63.58	2,267.2	3,461.90	148.1	298.2	-287.1	0.00	0.00	0.00
2,400.0	12.00	63.58	2,365.0	3,364.09	157.4	316.8	-305.0	0.00	0.00	0.00
2,500.0	12.00	63.58	2,462.8	3,266.28	166.6	335.5	-323.0	0.00	0.00	0.00
2,600.0	12.00	63.58	2,560.6	3,168.46	175.9	354.1	-340.9	0.00	0.00	0.00
2,700.0	12.00	63.58	2,658.5	3,070.65	185.1	372.7	-358.8	0.00	0.00	0.00
2,800.0	12.00	63.58	2,756.3	2,972.84	194.4	391.3	-376.8	0.00	0.00	0.00
2,900.0	12.00	63.58	2,854.1	2,875.02	203.6	410.0	-394.7	0.00	0.00	0.00
3,000.0	12.00	63.58	2,951.9	2,777.21	212.9	428.6	-412.6	0.00	0.00	0.00
3,100.0	12.00	63.58	3,049.7	2,679.40	222.2	447.2	-430.5	0.00	0.00	0.00
3,200.0	12.00	63.58	3,147.5	2,581.58	231.4	465.8	-448.5	0.00	0.00	0.00
3,300.0	12.00	63.58	3,245.3	2,483.77	240.7	484.5	-466.4	0.00	0.00	0.00
3,400.0	12.00	63.58	3,343.1	2,385.96	249.9	503.1	-484.3	0.00	0.00	0.00
3,500.0	12.00	63.58	3,441.0	2,288.14	259.2	521.7	-502.3	0.00	0.00	0.00
3,600.0	12.00	63.58	3,538.8	2,190.33	268.4	540.3	-520.2	0.00	0.00	0.00
3,700.0	12.00	63.58	3,636.6	2,092.52	277.7	559.0	-538.1	0.00	0.00	0.00
3,800.0	12.00	63.58	3,734.4	1,994.70	286.9	577.6	-556.1	0.00	0.00	0.00

Planning Report



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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	12.00	63.58	3,832.2	1,896.89	296.2	596.2	-574.0	0.00	0.00	0.00
4,000.0	12.00	63.58	3,930.0	1,799.07	305.4	614.8	-591.9	0.00	0.00	0.00
4,100.0	12.00	63.58	4,027.8	1,701.26	314.7	633.5	-609.9	0.00	0.00	0.00
4,200.0	12.00	63.58	4,125.7	1,603.45	323.9	652.1	-627.8	0.00	0.00	0.00
4,300.0	12.00	63.58	4,223.5	1,505.63	333.2	670.7	-645.7	0.00	0.00	0.00
4,400.0	12.00	63.58	4,321.3	1,407.82	342.4	689.4	-663.7	0.00	0.00	0.00
4,500.0	12.00	63.58	4,419.1	1,310.01	351.7	708.0	-681.6	0.00	0.00	0.00
4,600.0	12.00	63.58	4,516.9	1,212.19	360.9	726.6	-699.5	0.00	0.00	0.00
4,700.0	12.00	63.58	4,614.7	1,114.38	370.2	745.2	-717.5	0.00	0.00	0.00
4,800.0	12.00	63.58	4,712.5	1,016.57	379.4	763.9	-735.4	0.00	0.00	0.00
4,900.0	12.00	63.58	4,810.3	918.75	388.7	782.5	-753.3	0.00	0.00	0.00
5,000.0	12.00	63.58	4,908.2	820.94	398.0	801.1	-771.3	0.00	0.00	0.00
5,100.0	12.00	63.58	5,006.0	723.13	407.2	819.7	-789.2	0.00	0.00	0.00
5,200.0	12.00	63.58	5,103.8	625.31	416.5	838.4	-807.1	0.00	0.00	0.00
5,300.0	12.00	63.58	5,201.6	527.50	425.7	857.0	-825.0	0.00	0.00	0.00
SHANNON SANDSTONE MBR										
5,358.8	12.00	63.58	5,259.1	470.00	431.1	867.9	-835.6	0.00	0.00	0.00
5,400.0	12.00	63.58	5,299.4	429.69	435.0	875.6	-843.0	0.00	0.00	0.00
5,500.0	12.00	63.58	5,397.2	331.87	444.2	894.2	-860.9	0.00	0.00	0.00
5,600.0	12.00	63.58	5,495.0	234.06	453.5	912.9	-878.8	0.00	0.00	0.00
END OF TANGENT										
5,687.2	12.00	63.58	5,580.3	148.81	461.5	929.1	-894.5	0.00	0.00	0.00
5,700.0	11.75	63.58	5,592.9	136.24	462.7	931.5	-896.8	2.00	-2.00	0.00
5,800.0	9.75	63.58	5,691.1	38.00	471.0	948.2	-912.8	2.00	-2.00	0.00
5,900.0	7.75	63.58	5,789.9	-60.83	477.8	961.8	-925.9	2.00	-2.00	0.00
6,000.0	5.75	63.58	5,889.2	-160.13	483.0	972.3	-936.1	2.00	-2.00	0.00
6,100.0	3.75	63.58	5,988.9	-259.79	486.7	979.7	-943.2	2.00	-2.00	0.00
6,200.0	1.75	63.58	6,088.8	-359.67	488.8	984.0	-947.3	2.00	-2.00	0.00
EOD TO VERTICAL										
6,287.3	0.00	0.00	6,176.1	-447.00	489.4	985.2	-948.5	2.00	-2.00	0.00
6,300.0	0.00	0.00	6,188.8	-459.65	489.4	985.2	-948.5	0.00	0.00	0.00
6,400.0	0.00	0.00	6,288.8	-559.65	489.4	985.2	-948.5	0.00	0.00	0.00
6,500.0	0.00	0.00	6,388.8	-659.65	489.4	985.2	-948.5	0.00	0.00	0.00
6,600.0	0.00	0.00	6,488.8	-759.65	489.4	985.2	-948.5	0.00	0.00	0.00
6,700.0	0.00	0.00	6,588.8	-859.65	489.4	985.2	-948.5	0.00	0.00	0.00
6,800.0	0.00	0.00	6,688.8	-959.65	489.4	985.2	-948.5	0.00	0.00	0.00
6,900.0	0.00	0.00	6,788.8	-1,059.65	489.4	985.2	-948.5	0.00	0.00	0.00
7,000.0	0.00	0.00	6,888.8	-1,159.65	489.4	985.2	-948.5	0.00	0.00	0.00
KOP (10°/100ft BUR)										
7,077.3	0.00	0.00	6,966.1	-1,237.00	489.4	985.2	-948.5	0.00	0.00	0.00
7,100.0	2.27	270.84	6,988.7	-1,259.65	489.4	984.8	-948.0	10.00	10.00	0.00
7,200.0	12.27	270.84	7,087.8	-1,358.72	489.6	972.1	-935.4	10.00	10.00	0.00
7,300.0	22.27	270.84	7,183.2	-1,454.09	490.0	942.5	-905.8	10.00	10.00	0.00
7,400.0	32.27	270.84	7,272.0	-1,542.87	490.7	896.7	-860.1	10.00	10.00	0.00
SHARON SPRINGS SHALE										
7,464.0	38.67	270.84	7,324.1	-1,595.00	491.2	859.6	-823.1	10.00	10.00	0.00
7,500.0	42.27	270.84	7,351.5	-1,622.35	491.6	836.3	-799.8	10.00	10.00	0.00
NIORRARA FORMATION										
7,538.6	46.12	270.84	7,379.1	-1,650.00	492.0	809.4	-772.9	10.00	10.00	0.00
NIORRARA A CHALK										
7,553.2	47.58	270.84	7,389.1	-1,660.00	492.1	798.7	-762.3	10.00	10.00	0.00
7,600.0	52.27	270.84	7,419.2	-1,690.13	492.7	762.9	-726.5	10.00	10.00	0.00
7,700.0	62.27	270.84	7,473.2	-1,744.13	493.9	678.9	-642.6	10.00	10.00	0.00

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-4
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-4	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										
7,791.2	71.39	270.84	7,509.1	-1,780.00	495.1	595.1	-559.0	10.00	10.00	0.00
7,800.0	72.27	270.84	7,511.8	-1,782.73	495.2	586.8	-550.7	10.00	10.00	0.00
BEGIN PROD INTERVAL										
7,838.1	76.08	270.84	7,522.2	-1,793.12	495.8	550.2	-514.1	10.00	10.00	0.00
7,900.0	82.27	270.84	7,533.8	-1,804.74	496.7	489.4	-453.4	10.00	10.00	0.00
HZ LP *NEW*: 1330ft FNL & 597.9ft FEL of Sec 22										
7,977.3	90.00	270.84	7,539.1	-1,809.96	497.8	412.3	-376.4	10.00	10.00	0.00
8,000.0	90.00	270.84	7,539.1	-1,809.96	498.1	389.7	-353.8	0.00	0.00	0.00
8,100.0	90.00	270.84	7,539.1	-1,809.96	499.6	289.7	-253.9	0.00	0.00	0.00
8,200.0	90.00	270.84	7,539.1	-1,809.96	501.1	189.7	-154.1	0.00	0.00	0.00
8,300.0	90.00	270.84	7,539.1	-1,809.96	502.5	89.7	-54.3	0.00	0.00	0.00
8,400.0	90.00	270.84	7,539.1	-1,809.96	504.0	-10.3	45.6	0.00	0.00	0.00
8,500.0	90.00	270.84	7,539.1	-1,809.96	505.5	-110.3	145.4	0.00	0.00	0.00
8,600.0	90.00	270.84	7,539.1	-1,809.96	506.9	-210.3	245.3	0.00	0.00	0.00
8,700.0	90.00	270.84	7,539.1	-1,809.96	508.4	-310.3	345.1	0.00	0.00	0.00
8,800.0	90.00	270.84	7,539.1	-1,809.96	509.9	-410.3	445.0	0.00	0.00	0.00
8,900.0	90.00	270.84	7,539.1	-1,809.96	511.3	-510.2	544.8	0.00	0.00	0.00
9,000.0	90.00	270.84	7,539.1	-1,809.96	512.8	-610.2	644.7	0.00	0.00	0.00
9,100.0	90.00	270.84	7,539.1	-1,809.96	514.3	-710.2	744.5	0.00	0.00	0.00
9,200.0	90.00	270.84	7,539.1	-1,809.96	515.7	-810.2	844.4	0.00	0.00	0.00
9,300.0	90.00	270.84	7,539.1	-1,809.96	517.2	-910.2	944.2	0.00	0.00	0.00
9,400.0	90.00	270.84	7,539.1	-1,809.96	518.7	-1,010.2	1,044.1	0.00	0.00	0.00
9,500.0	90.00	270.84	7,539.1	-1,809.96	520.1	-1,110.2	1,143.9	0.00	0.00	0.00
9,600.0	90.00	270.84	7,539.1	-1,809.96	521.6	-1,210.2	1,243.7	0.00	0.00	0.00
9,700.0	90.00	270.84	7,539.1	-1,809.96	523.1	-1,310.2	1,343.6	0.00	0.00	0.00
9,800.0	90.00	270.84	7,539.1	-1,809.96	524.5	-1,410.2	1,443.4	0.00	0.00	0.00
9,900.0	90.00	270.84	7,539.1	-1,809.96	526.0	-1,510.1	1,543.3	0.00	0.00	0.00
10,000.0	90.00	270.84	7,539.1	-1,809.96	527.5	-1,610.1	1,643.1	0.00	0.00	0.00
10,100.0	90.00	270.84	7,539.1	-1,809.96	528.9	-1,710.1	1,743.0	0.00	0.00	0.00
10,200.0	90.00	270.84	7,539.1	-1,809.96	530.4	-1,810.1	1,842.8	0.00	0.00	0.00
10,300.0	90.00	270.84	7,539.1	-1,809.96	531.9	-1,910.1	1,942.7	0.00	0.00	0.00
10,400.0	90.00	270.84	7,539.1	-1,809.96	533.3	-2,010.1	2,042.5	0.00	0.00	0.00
10,500.0	90.00	270.84	7,539.1	-1,809.96	534.8	-2,110.1	2,142.4	0.00	0.00	0.00
10,600.0	90.00	270.84	7,539.1	-1,809.96	536.2	-2,210.1	2,242.2	0.00	0.00	0.00
10,700.0	90.00	270.84	7,539.1	-1,809.96	537.7	-2,310.1	2,342.1	0.00	0.00	0.00
10,800.0	90.00	270.84	7,539.1	-1,809.96	539.2	-2,410.0	2,441.9	0.00	0.00	0.00
10,900.0	90.00	270.84	7,539.1	-1,809.96	540.6	-2,510.0	2,541.8	0.00	0.00	0.00
11,000.0	90.00	270.84	7,539.1	-1,809.96	542.1	-2,610.0	2,641.6	0.00	0.00	0.00
11,100.0	90.00	270.84	7,539.1	-1,809.96	543.6	-2,710.0	2,741.4	0.00	0.00	0.00
11,200.0	90.00	270.84	7,539.1	-1,809.96	545.0	-2,810.0	2,841.3	0.00	0.00	0.00
11,300.0	90.00	270.84	7,539.1	-1,809.96	546.5	-2,910.0	2,941.1	0.00	0.00	0.00
11,400.0	90.00	270.84	7,539.1	-1,809.96	548.0	-3,010.0	3,041.0	0.00	0.00	0.00
11,500.0	90.00	270.84	7,539.1	-1,809.96	549.4	-3,110.0	3,140.8	0.00	0.00	0.00
11,600.0	90.00	270.84	7,539.1	-1,809.96	550.9	-3,210.0	3,240.7	0.00	0.00	0.00
11,700.0	90.00	270.84	7,539.1	-1,809.96	552.4	-3,309.9	3,340.5	0.00	0.00	0.00
11,800.0	90.00	270.84	7,539.1	-1,809.96	553.8	-3,409.9	3,440.4	0.00	0.00	0.00
11,900.0	90.00	270.84	7,539.1	-1,809.96	555.3	-3,509.9	3,540.2	0.00	0.00	0.00
12,000.0	90.00	270.84	7,539.1	-1,809.96	556.8	-3,609.9	3,640.1	0.00	0.00	0.00
12,100.0	90.00	270.84	7,539.1	-1,809.96	558.2	-3,709.9	3,739.9	0.00	0.00	0.00
12,200.0	90.00	270.84	7,539.1	-1,809.96	559.7	-3,809.9	3,839.8	0.00	0.00	0.00
12,300.0	90.00	270.84	7,539.1	-1,809.96	561.2	-3,909.9	3,939.6	0.00	0.00	0.00
12,400.0	90.00	270.84	7,539.1	-1,809.96	562.6	-4,009.9	4,039.4	0.00	0.00	0.00

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-4
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-4	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)
12,500.0	90.00	270.84	7,539.1	-1,809.96	564.1	-4,109.9	4,139.3	0.00	0.00	0.00
12,600.0	90.00	270.84	7,539.1	-1,809.96	565.6	-4,209.9	4,239.1	0.00	0.00	0.00
12,700.0	90.00	270.84	7,539.1	-1,809.96	567.0	-4,309.8	4,339.0	0.00	0.00	0.00
12,800.0	90.00	270.84	7,539.1	-1,809.96	568.5	-4,409.8	4,438.8	0.00	0.00	0.00
12,900.0	90.00	270.84	7,539.1	-1,809.96	570.0	-4,509.8	4,538.7	0.00	0.00	0.00
13,000.0	90.00	270.84	7,539.1	-1,809.96	571.4	-4,609.8	4,638.5	0.00	0.00	0.00
13,100.0	90.00	270.84	7,539.1	-1,809.96	572.9	-4,709.8	4,738.4	0.00	0.00	0.00
13,200.0	90.00	270.84	7,539.1	-1,809.96	574.4	-4,809.8	4,838.2	0.00	0.00	0.00
13,300.0	90.00	270.84	7,539.1	-1,809.96	575.8	-4,909.8	4,938.1	0.00	0.00	0.00
13,400.0	90.00	270.84	7,539.1	-1,809.96	577.3	-5,009.8	5,037.9	0.00	0.00	0.00
13,500.0	90.00	270.84	7,539.1	-1,809.96	578.8	-5,109.8	5,137.8	0.00	0.00	0.00
13,600.0	90.00	270.84	7,539.1	-1,809.96	580.2	-5,209.7	5,237.6	0.00	0.00	0.00
13,700.0	90.00	270.84	7,539.1	-1,809.96	581.7	-5,309.7	5,337.4	0.00	0.00	0.00
13,800.0	90.00	270.84	7,539.1	-1,809.96	583.2	-5,409.7	5,437.3	0.00	0.00	0.00
13,900.0	90.00	270.84	7,539.1	-1,809.96	584.6	-5,509.7	5,537.1	0.00	0.00	0.00
14,000.0	90.00	270.84	7,539.1	-1,809.96	586.1	-5,609.7	5,637.0	0.00	0.00	0.00
14,100.0	90.00	270.84	7,539.1	-1,809.96	587.6	-5,709.7	5,736.8	0.00	0.00	0.00
14,200.0	90.00	270.84	7,539.1	-1,809.96	589.0	-5,809.7	5,836.7	0.00	0.00	0.00
14,300.0	90.00	270.84	7,539.1	-1,809.96	590.5	-5,909.7	5,936.5	0.00	0.00	0.00
14,400.0	90.00	270.84	7,539.1	-1,809.96	592.0	-6,009.7	6,036.4	0.00	0.00	0.00
14,500.0	90.00	270.84	7,539.1	-1,809.96	593.4	-6,109.6	6,136.2	0.00	0.00	0.00
14,600.0	90.00	270.84	7,539.1	-1,809.96	594.9	-6,209.6	6,236.1	0.00	0.00	0.00
14,700.0	90.00	270.84	7,539.1	-1,809.96	596.4	-6,309.6	6,335.9	0.00	0.00	0.00
14,800.0	90.00	270.84	7,539.1	-1,809.96	597.8	-6,409.6	6,435.8	0.00	0.00	0.00
14,900.0	90.00	270.84	7,539.1	-1,809.96	599.3	-6,509.6	6,535.6	0.00	0.00	0.00
15,000.0	90.00	270.84	7,539.1	-1,809.96	600.8	-6,609.6	6,635.4	0.00	0.00	0.00
15,100.0	90.00	270.84	7,539.1	-1,809.96	602.2	-6,709.6	6,735.3	0.00	0.00	0.00
15,200.0	90.00	270.84	7,539.1	-1,809.96	603.7	-6,809.6	6,835.1	0.00	0.00	0.00
15,300.0	90.00	270.84	7,539.1	-1,809.96	605.2	-6,909.6	6,935.0	0.00	0.00	0.00
15,400.0	90.00	270.84	7,539.1	-1,809.96	606.6	-7,009.6	7,034.8	0.00	0.00	0.00
15,500.0	90.00	270.84	7,539.1	-1,809.96	608.1	-7,109.5	7,134.7	0.00	0.00	0.00
15,600.0	90.00	270.84	7,539.1	-1,809.96	609.5	-7,209.5	7,234.5	0.00	0.00	0.00
15,700.0	90.00	270.84	7,539.1	-1,809.96	611.0	-7,309.5	7,334.4	0.00	0.00	0.00
15,800.0	90.00	270.84	7,539.1	-1,809.96	612.5	-7,409.5	7,434.2	0.00	0.00	0.00
15,900.0	90.00	270.84	7,539.1	-1,809.96	613.9	-7,509.5	7,534.1	0.00	0.00	0.00
16,000.0	90.00	270.84	7,539.1	-1,809.96	615.4	-7,609.5	7,633.9	0.00	0.00	0.00
16,100.0	90.00	270.84	7,539.1	-1,809.96	616.9	-7,709.5	7,733.8	0.00	0.00	0.00
16,200.0	90.00	270.84	7,539.1	-1,809.96	618.3	-7,809.5	7,833.6	0.00	0.00	0.00
16,300.0	90.00	270.84	7,539.1	-1,809.96	619.8	-7,909.5	7,933.4	0.00	0.00	0.00
16,400.0	90.00	270.84	7,539.1	-1,809.96	621.3	-8,009.4	8,033.3	0.00	0.00	0.00
16,500.0	90.00	270.84	7,539.1	-1,809.96	622.7	-8,109.4	8,133.1	0.00	0.00	0.00
16,600.0	90.00	270.84	7,539.1	-1,809.96	624.2	-8,209.4	8,233.0	0.00	0.00	0.00
16,700.0	90.00	270.84	7,539.1	-1,809.96	625.7	-8,309.4	8,332.8	0.00	0.00	0.00
16,800.0	90.00	270.84	7,539.1	-1,809.96	627.1	-8,409.4	8,432.7	0.00	0.00	0.00
16,900.0	90.00	270.84	7,539.1	-1,809.96	628.6	-8,509.4	8,532.5	0.00	0.00	0.00
17,000.0	90.00	270.84	7,539.1	-1,809.96	630.1	-8,609.4	8,632.4	0.00	0.00	0.00
17,100.0	90.00	270.84	7,539.1	-1,809.96	631.5	-8,709.4	8,732.2	0.00	0.00	0.00
17,200.0	90.00	270.84	7,539.1	-1,809.96	633.0	-8,809.4	8,832.1	0.00	0.00	0.00
17,300.0	90.00	270.84	7,539.1	-1,809.96	634.5	-8,909.3	8,931.9	0.00	0.00	0.00
17,400.0	90.00	270.84	7,539.1	-1,809.96	635.9	-9,009.3	9,031.8	0.00	0.00	0.00
BHL: 1330ft FNL & 460ft FWL of Sec 21										
17,457.1	90.00	270.84	7,539.1	-1,810.00	636.9	-9,066.4	9,088.8	0.00	0.00	0.00

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-4
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5729.1usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-4	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Formations					
MD (usft)	TVD (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
316.1	316.1	DENVER			
802.4	801.1	UPPER ARAPAHOE			
1,097.6	1,091.1	LOWER ARAPAHOE			
1,664.0	1,645.1	LARAMIE - FOX HILLS			
1,870.5	1,847.1	PIERRE SHALE (BASE FOX HILLS			
5,358.8	5,259.1	SHANNON SANDSTONE MBR			
7,464.0	7,324.1	SHARON SPRINGS SHALE			
7,538.6	7,379.1	NIOBRARA FORMATION			
7,553.2	7,389.1	NIOBRARA A CHALK			
7,791.2	7,509.1	NIOBRARA B 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: 1834ft FNL & 1005ft FEL of Sec 22
400.0	400.0	0.0	0.0	START NUDGE (2°/100ft BUR)
1,000.2	995.8	27.9	56.1	EOB TO 12° INC
5,687.2	5,580.3	461.5	929.1	END OF TANGENT
6,287.3	6,176.1	489.4	985.2	EOD TO VERTICAL
7,077.3	6,966.1	489.4	985.2	KOP (10°/100ft BUR)
7,838.1	7,522.2	495.8	550.2	BEGIN PROD INTERVAL
7,977.3	7,539.1	497.8	412.3	HZ LP *NEW*: 1330ft FNL & 597.9ft FEL of Sec 22
17,457.1	7,539.1	636.9	-9,066.4	BHL: 1330ft FNL & 460ft FWL of Sec 21