

## NORDIC USERS CONFERENCE 2009

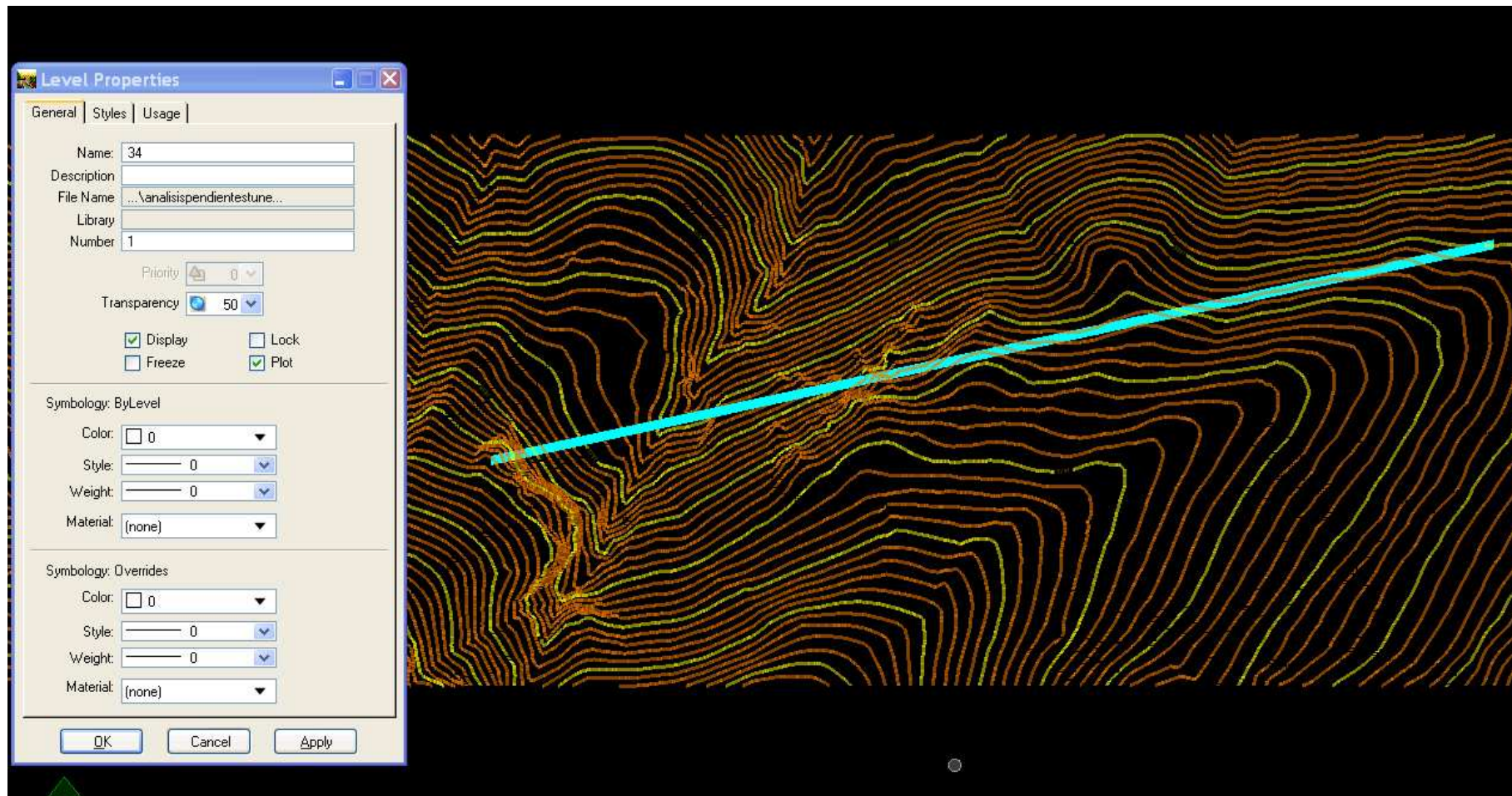


# Modeling Tunnels with Roadway Designer & Bentley Rail Track

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# Tunnel Planning stage

- MicroStation XM : Level Transparency



# Existing Tunnel Survey – Data Collector

The screenshot displays the Bentley Rail Track Suite interface. A Notepad window titled 'PerfilesCoironEntrada-2.txt' contains the following data:

Stationing	Offset	Elevation
2.00	0.00	901.524
2.00	-2.24	901.634
2.00	-2.62	901.920
2.00	-2.78	902.334
2.00	-2.84	902.773
2.00	-2.85	903.225
2.00	-2.85	903.700
2.00	-2.79	904.194
2.00	-2.61	904.672
2.00	-2.43	905.206
2.00	-2.13	905.710
2.00	-1.73	906.168
2.00	-1.22	906.530
2.00	-0.64	906.803
2.00	0.00	906.894
2.00	0.65	906.872
2.00	1.23	906.568
2.00	1.75	906.204
2.00	2.16	905.751
2.00	2.45	905.227
2.00	2.61	904.672
2.00	2.80	904.199
2.00	2.85	903.701

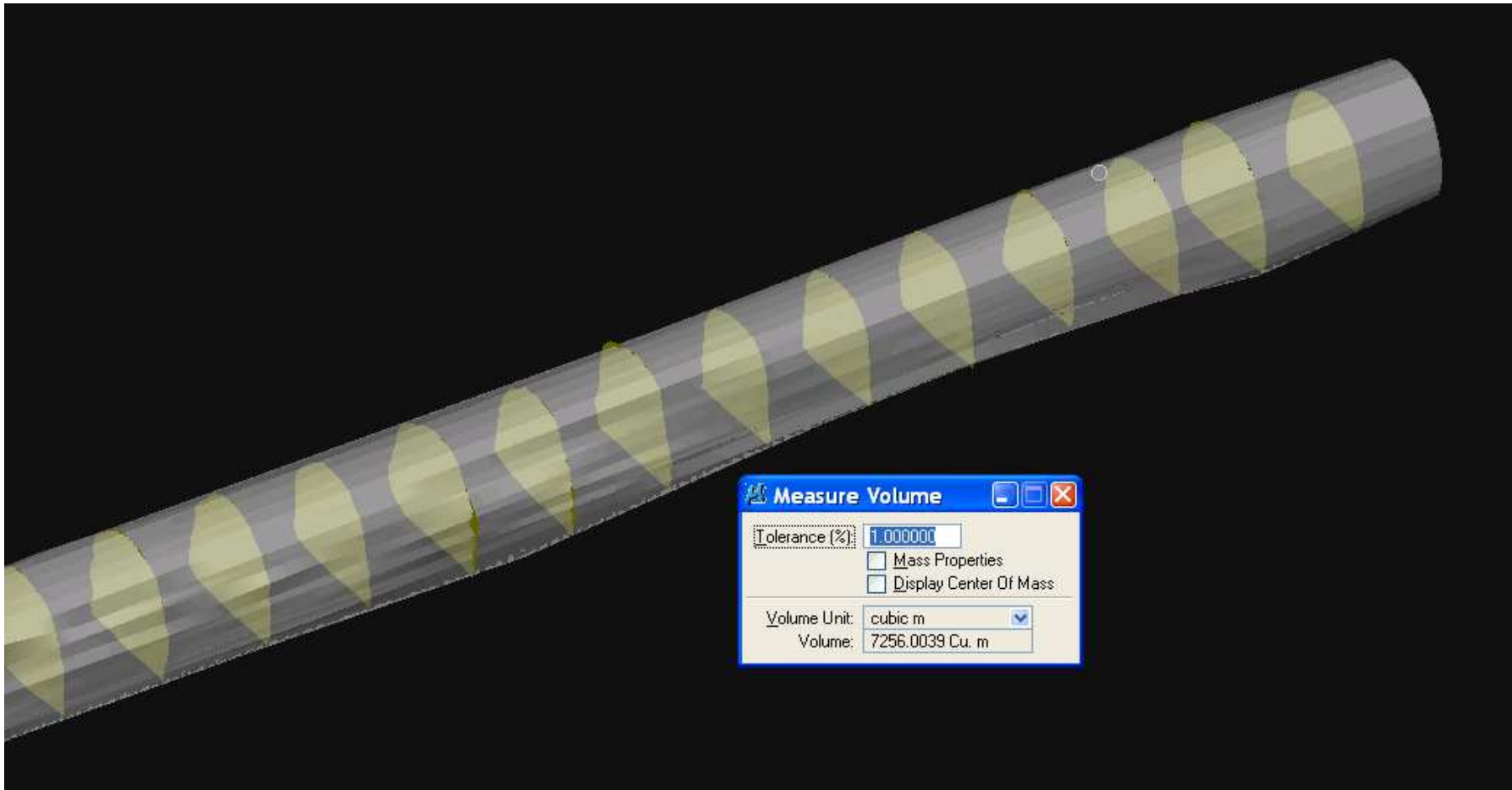
The 'Surface Options' dialog box is open, showing the following settings:

- Surface: ExTunnelSurf
- Fence Mode: Ignore
- Features:
  - Seed Name: 1
  - Feature Style: BORDER
  - Point Type: Exterior
  - Pen Order: One then Zeros
  - Parent: (empty)
  - Exclude from Triangulation
- Relative Alignment:
  - Geometry Project: Pelambres
  - Horizontal Alignment: Tunnel
  - Vertical Alignment: Tunnel



# Existing Tunnel Survey – Data Collector

- True modeling and volumetrics from data collector (InRoads & MStation)



# Proposed Tunnel Sections

- Simple, efficient design

The screenshot shows the MicroStation V8 XM Edition interface. The main window displays a 2D plot of a tunnel section with 17 numbered points (1-17) connected by a white line. The plot is on a grid with a vertical axis from 0.0 to -4.5 and a horizontal axis from 0.0 to 2.6. A 'Create Template' dialog box is open, showing the 'Import Template from Graphics' tab. The dialog includes fields for 'Default Style' (Asphalt Base Course 1), 'Type' (Template), 'Vertical Exaggeration of Graphics' (1.000), and 'Minimum Chord Length of Curved Elements' (0.200). The 'Current Template' section shows 'Name: New Template' and 'Description:'. The 'Display' section has radio buttons for 'Components' and 'Constraints', and checkboxes for 'Display Point Names' (checked) and 'Display All Components'. A 'Preview' window at the bottom shows a smaller version of the tunnel section plot.

# Proposed Tunnel Modeling

Roadway Designer - C:\Tuneles\Pelambres\Pelambres.ird

File Corridor Superelevation Tools

Close Help

Off: -1.725, Elev: 897.980, Slip: 90.1547%

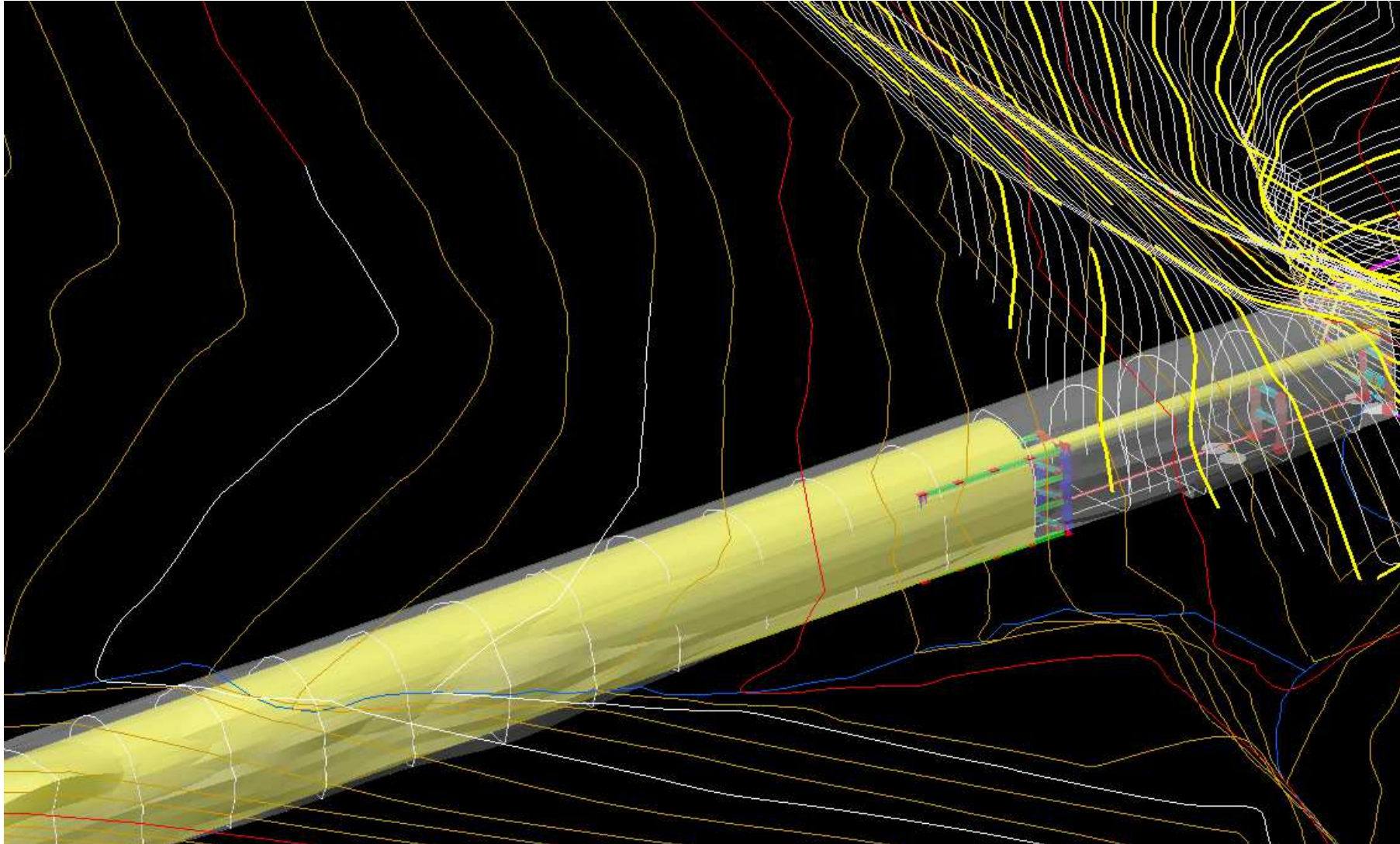
Section Cut Area: 0.00, Volume: 0.00  
Section Fill Area: 22.16, Volume: 443.27  
Total Net Volume: 21468.09 Fill

Corridor: Tunnel Principal  
Active Surface: BaseTunnelPrincipal

Station: 0+980.000  
Interval: 20.000  
Template: Tunnel

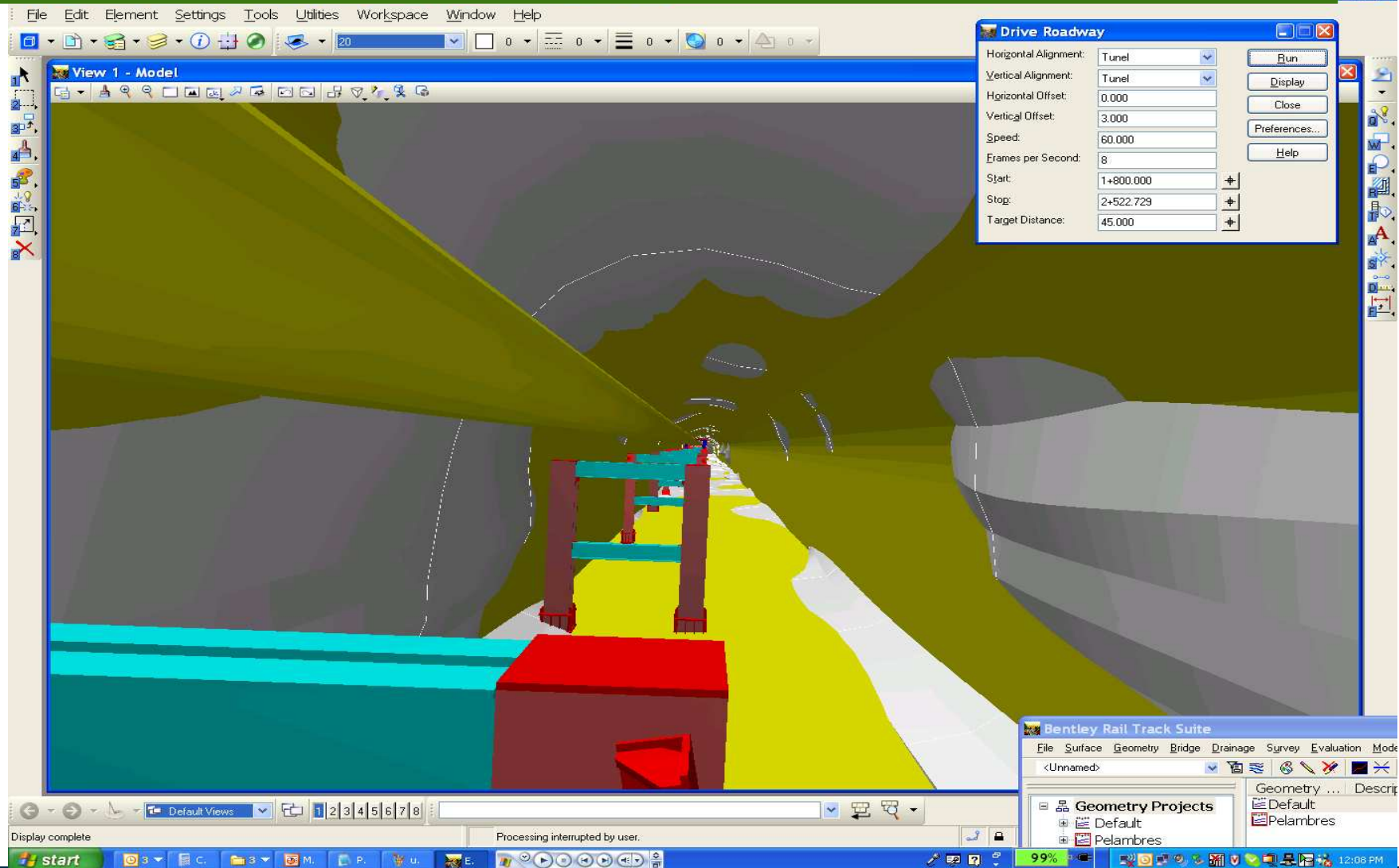
Display Superelevation  
Process All  
Process Visible Range

# Proposed vs Existing Tunnel Sections , Multi-discipline model



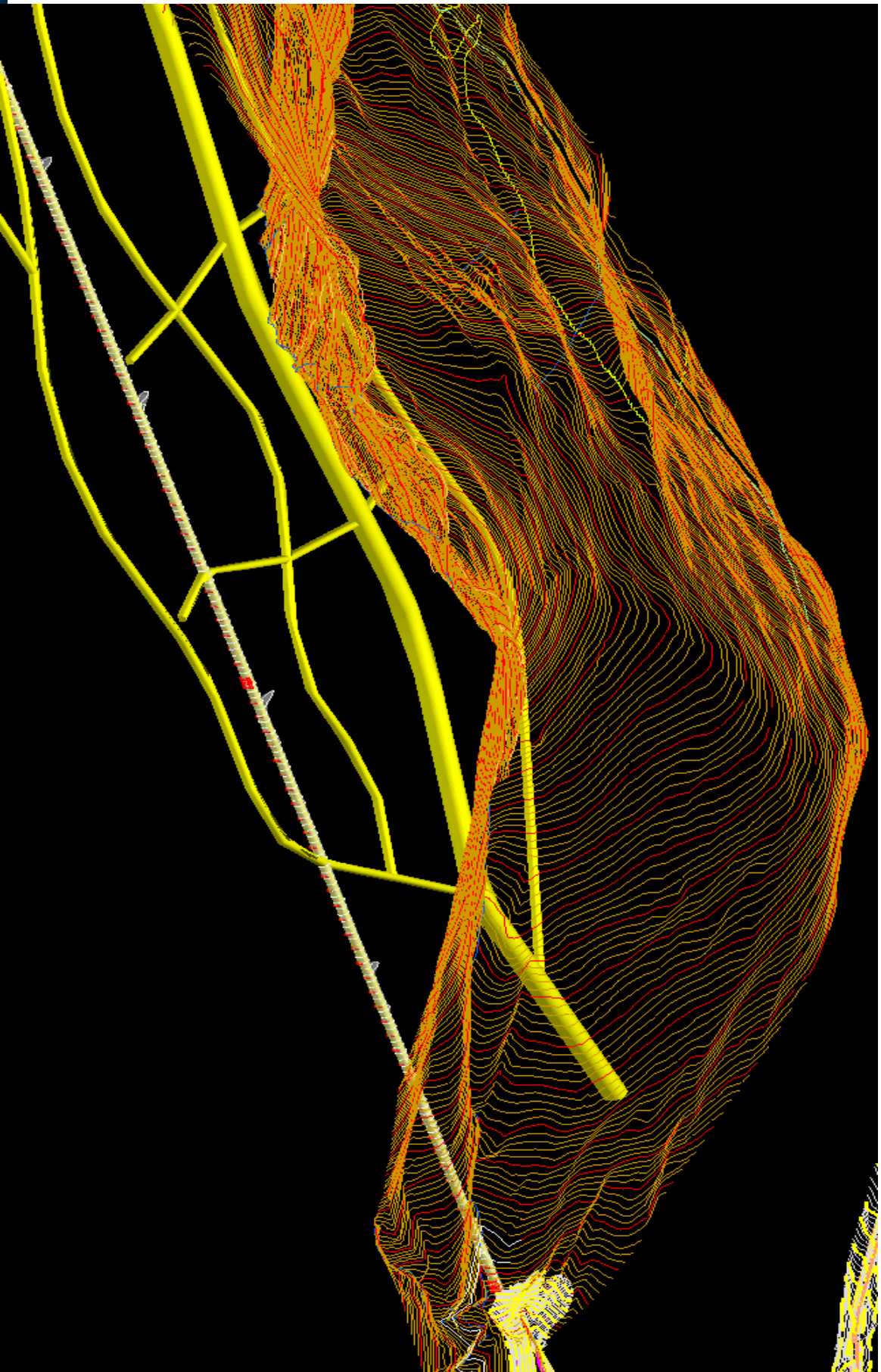


# Proposed vs Existing Tunnel Sections , Multi-discipline model

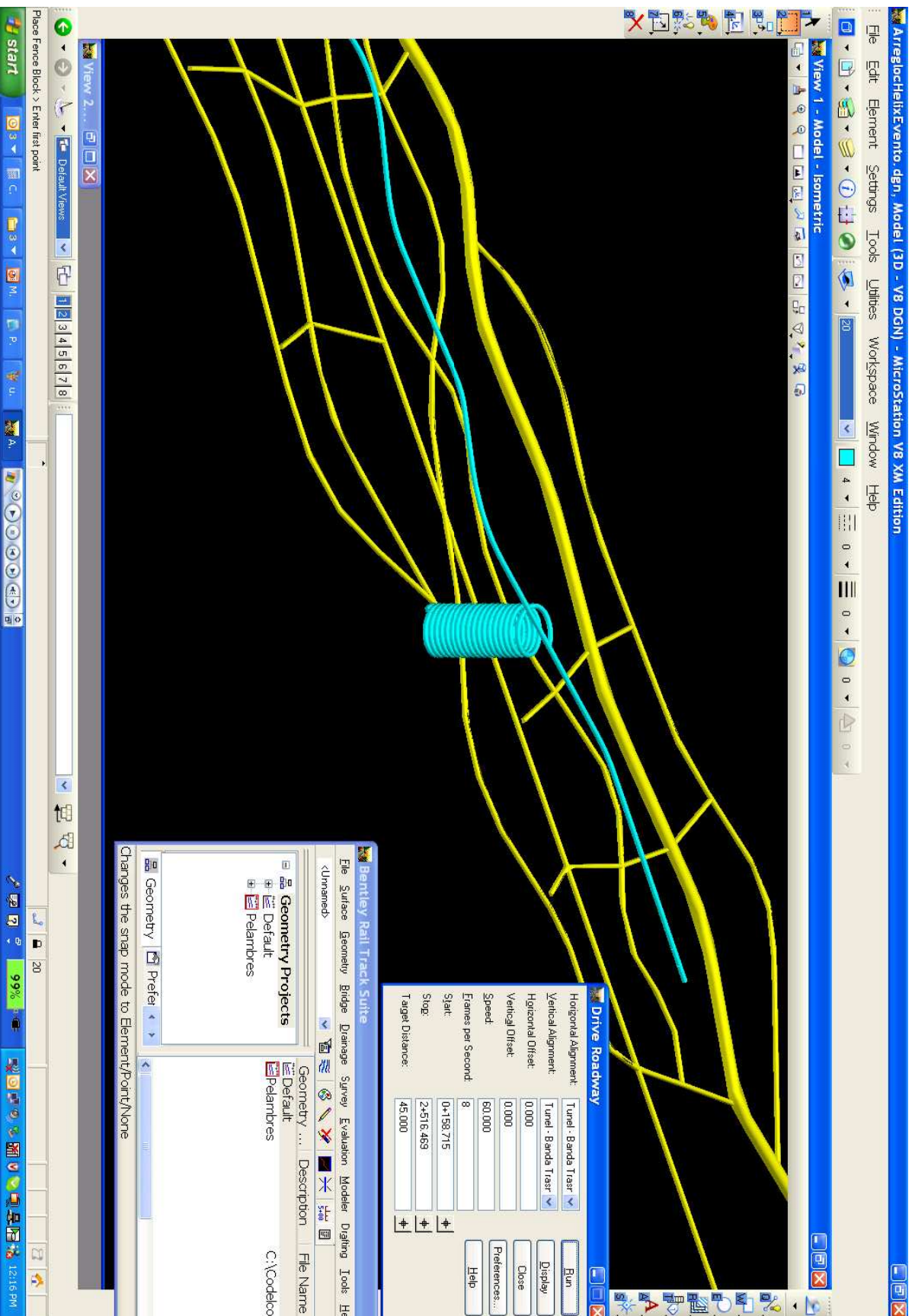




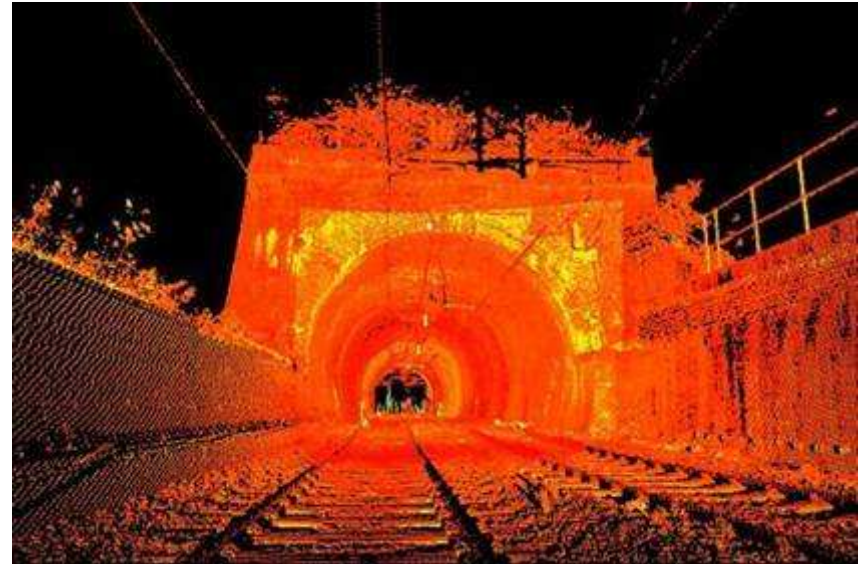
# Tunnel Network



# Tunnel Network



# Existing Tunnel Survey – Scanner





# Existing Tunnel Survey – Scanner

## Bentley Rail Track

Scanned Tunnels

Objectives:

- Compute Cut/Fill differences between existing & proposed sections
- Compute Volumes between surfaces
- Compute critical Cut/Fill areas
- Report generation on critical areas



# Existing Tunnel Survey – Scanner

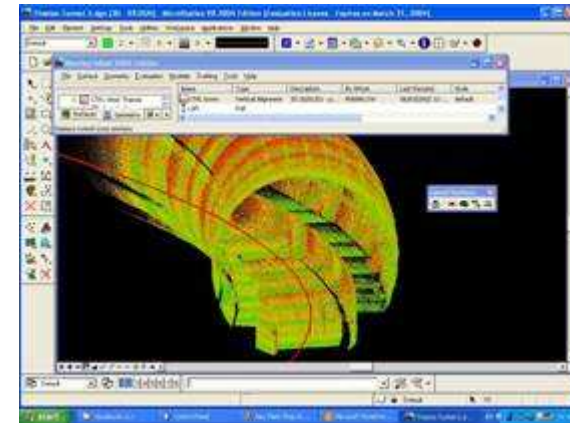


**CYRAX  
Scanner**

## Tunnel Survey



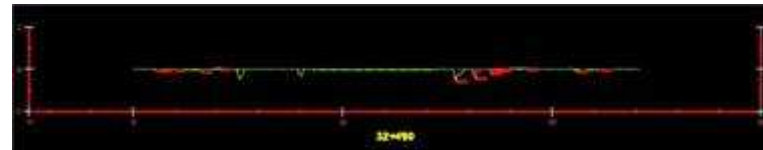
Model Visualization using  
MicroStation and Bentley  
Rail Track



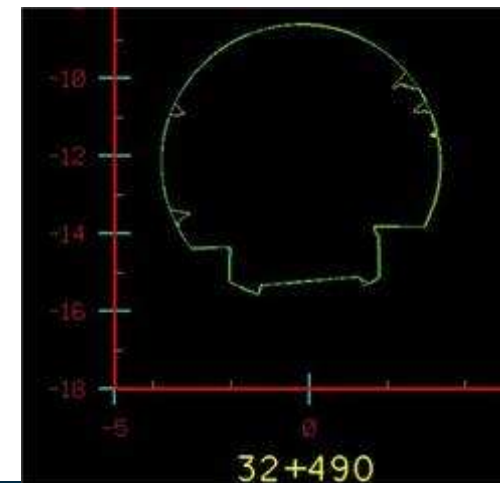
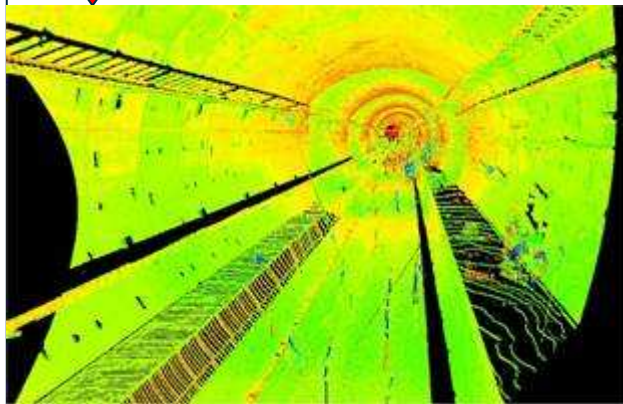
Surface Extension using new  
Bentley Rail Track Commands



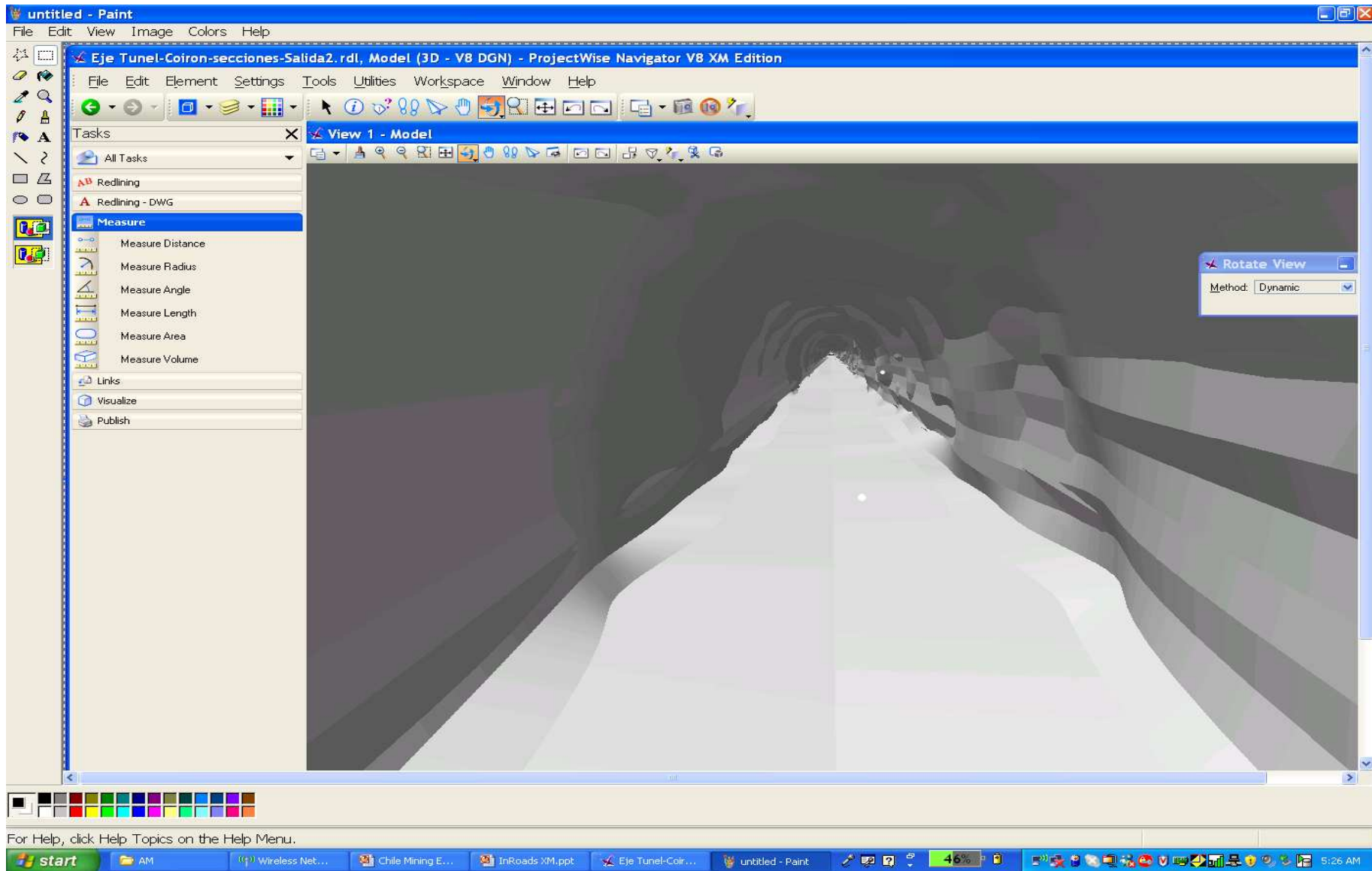
ASCII file created by  
Scanner and imported to  
suraces using Bentley Rail  
Track



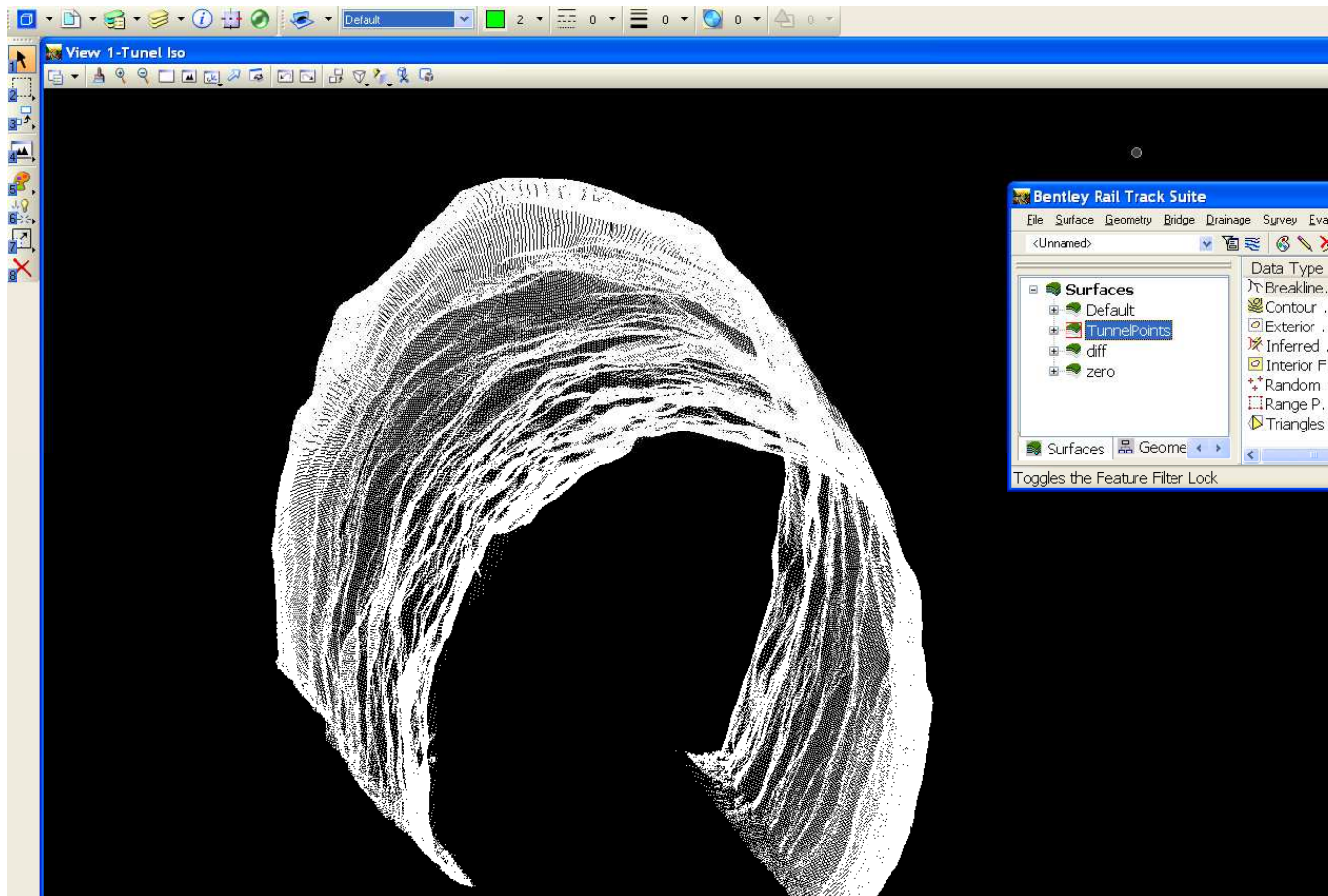
Cross  
Section  
Surface  
Generation  
using  
Bentley Rail  
Track



# ProjectWise Navigator



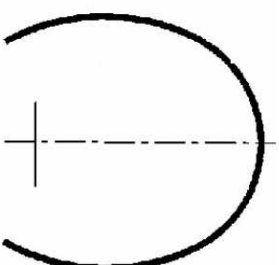
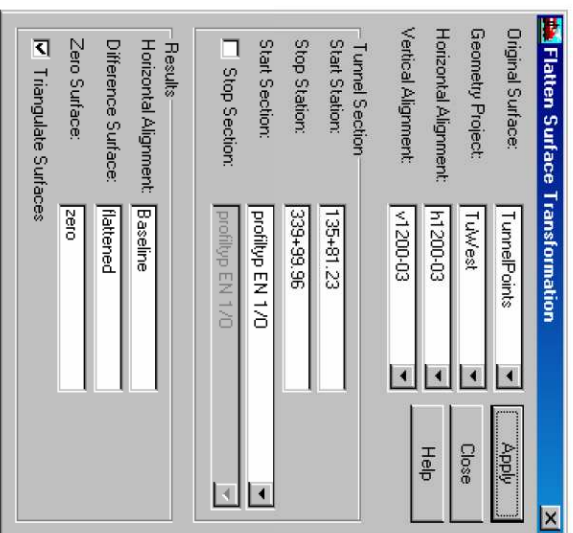
# Existing Tunnel Survey – Scanner



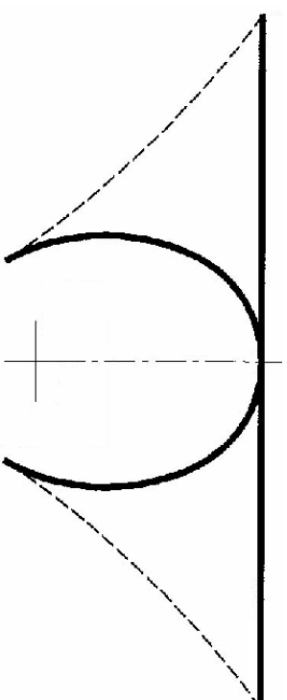
- Approximately 450,000 points in 40 meters of tunnel

# Tunnel Surface

## Flatten Surface Transformation



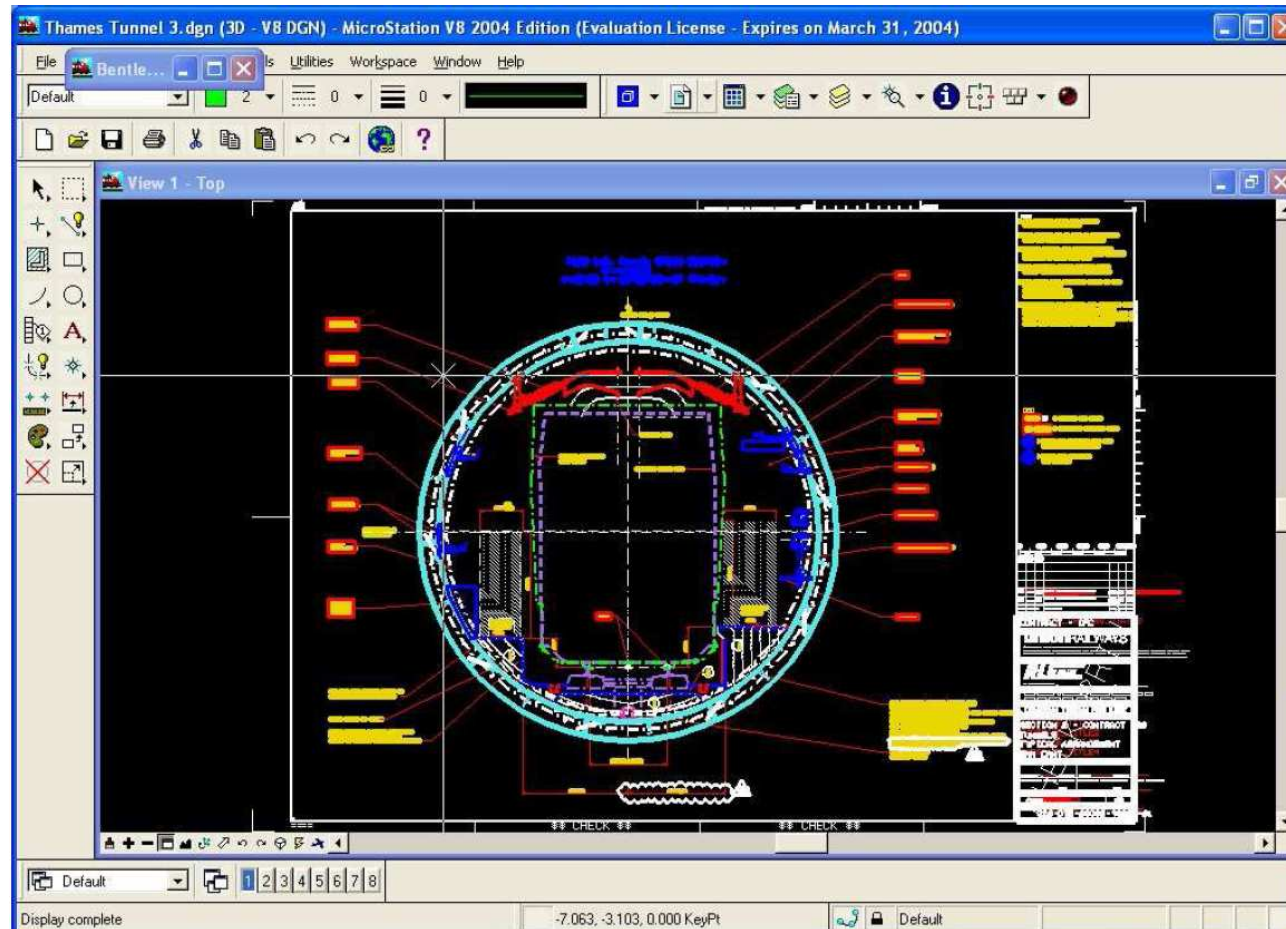
Original Section



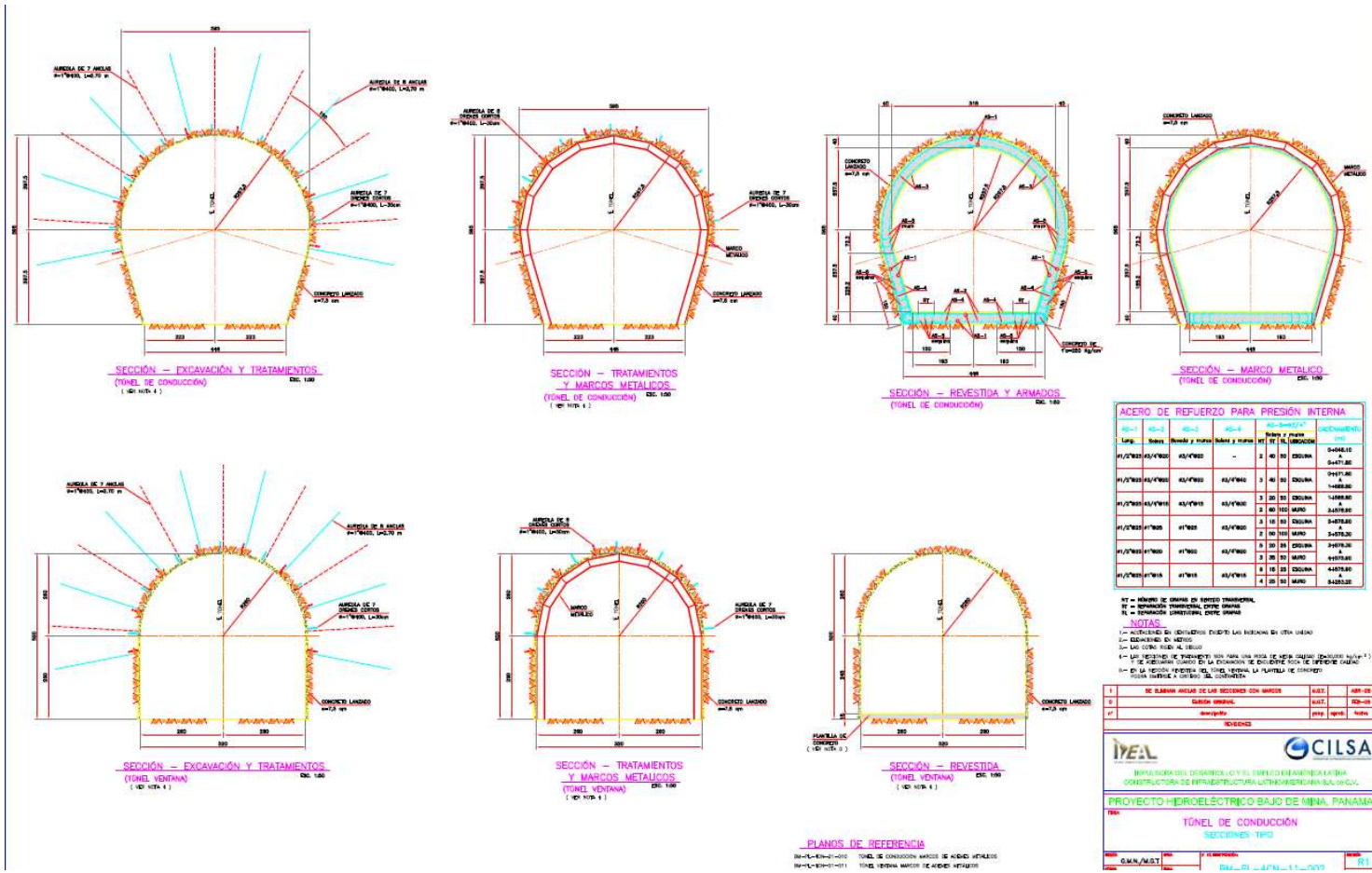
Transformed



# Designed Tunnel Sections



# Designed Tunnel Sections



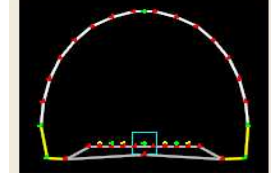
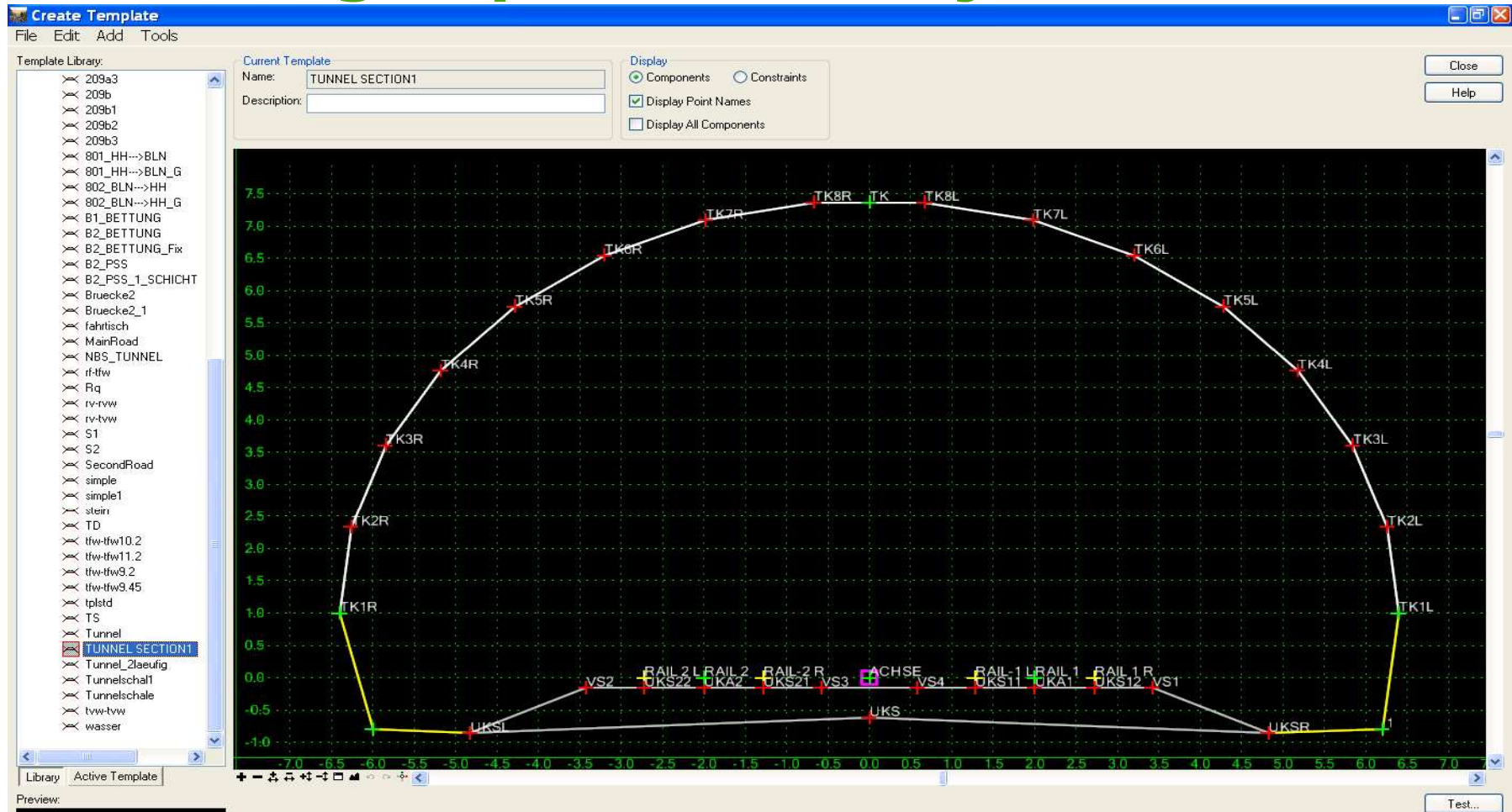
# Existing Tunnel Survey – Scanner

The screenshot displays the Bentley MicroStation V8 XM Edition interface. The main window shows a plot titled "Tunnel Sections" with a grid. The vertical axis (elevation) ranges from 790.000 to 815.000. The horizontal axis is labeled "21+805.00". A yellow tunnel profile is plotted. An "Annotate Cross Section Minimums a..." dialog box is open, showing options for "Cross Section Set" (transform), "Surface" (diff), and checkboxes for "Display Minimum Values" and "Display Maximum Values". A "Bentley Rail Track Suite" window is also open, showing a list of surfaces and their active status.

Surfaces	Data Type	Active	Features
Default	Breakline...	0	0
TunnelPoints	Contour ...	0	0
diff	Exterior ...	0	0
zero	Inferred ...	0	0
	Interior F...	0	0
	Random ...	453251	1
	Range P...	0	1
	Triangles	0	0

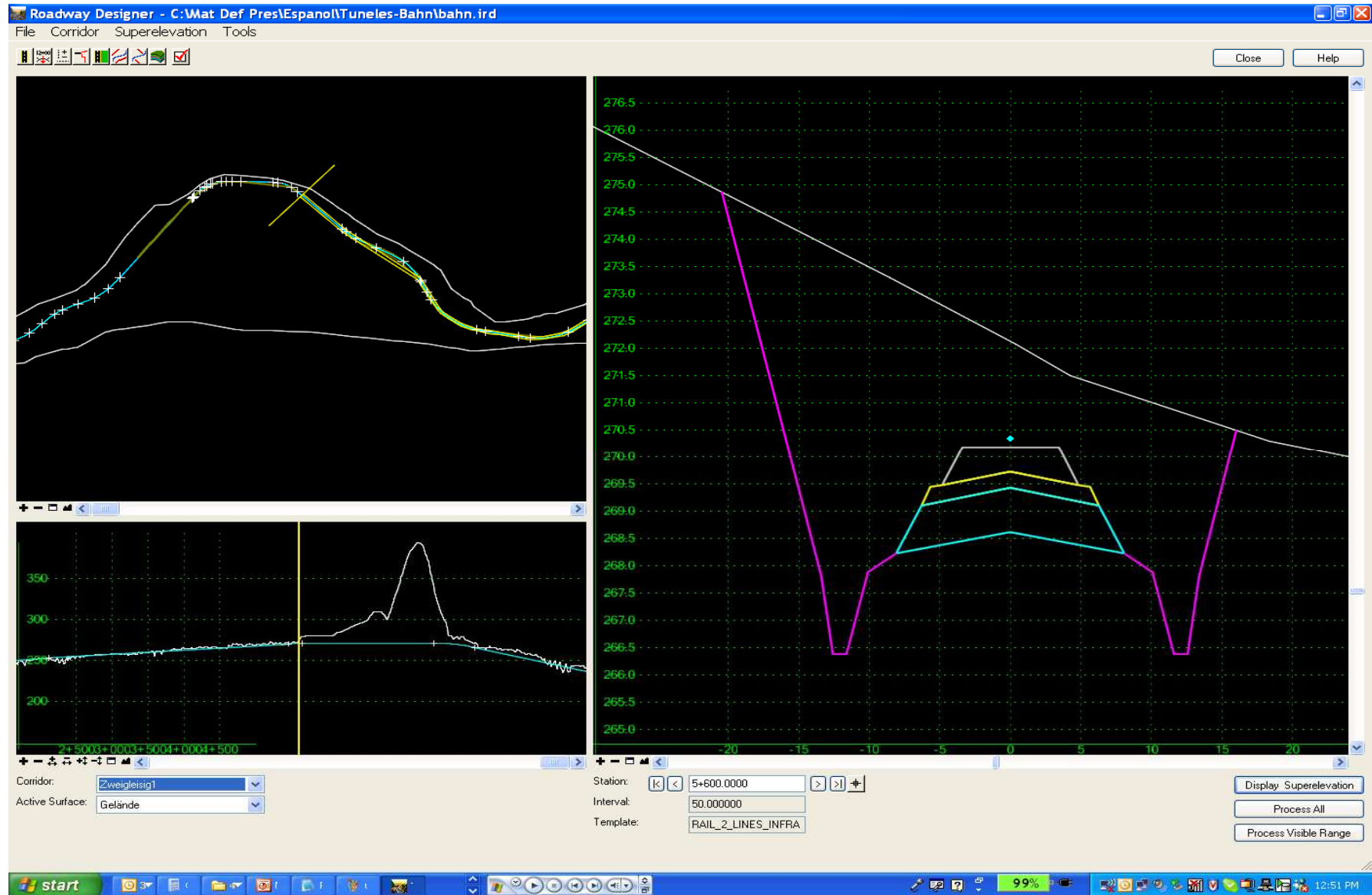


# High Speed Rail Projects

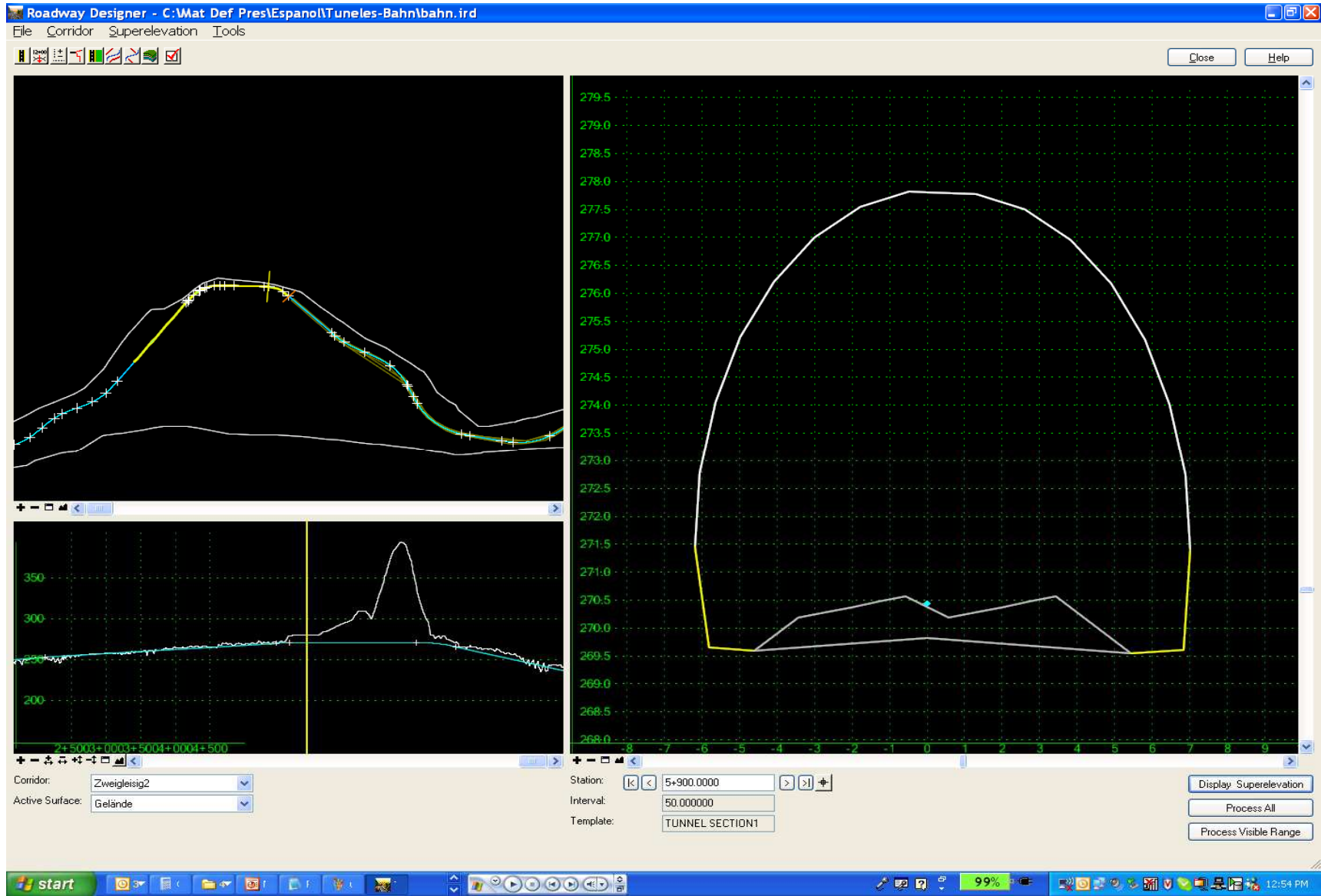




# High Speed Rail Projects



# High Speed Rail Projects



# High Speed Rail Projects

