Rail Design from Geometry to Modeling

Richard W. Bradshaw
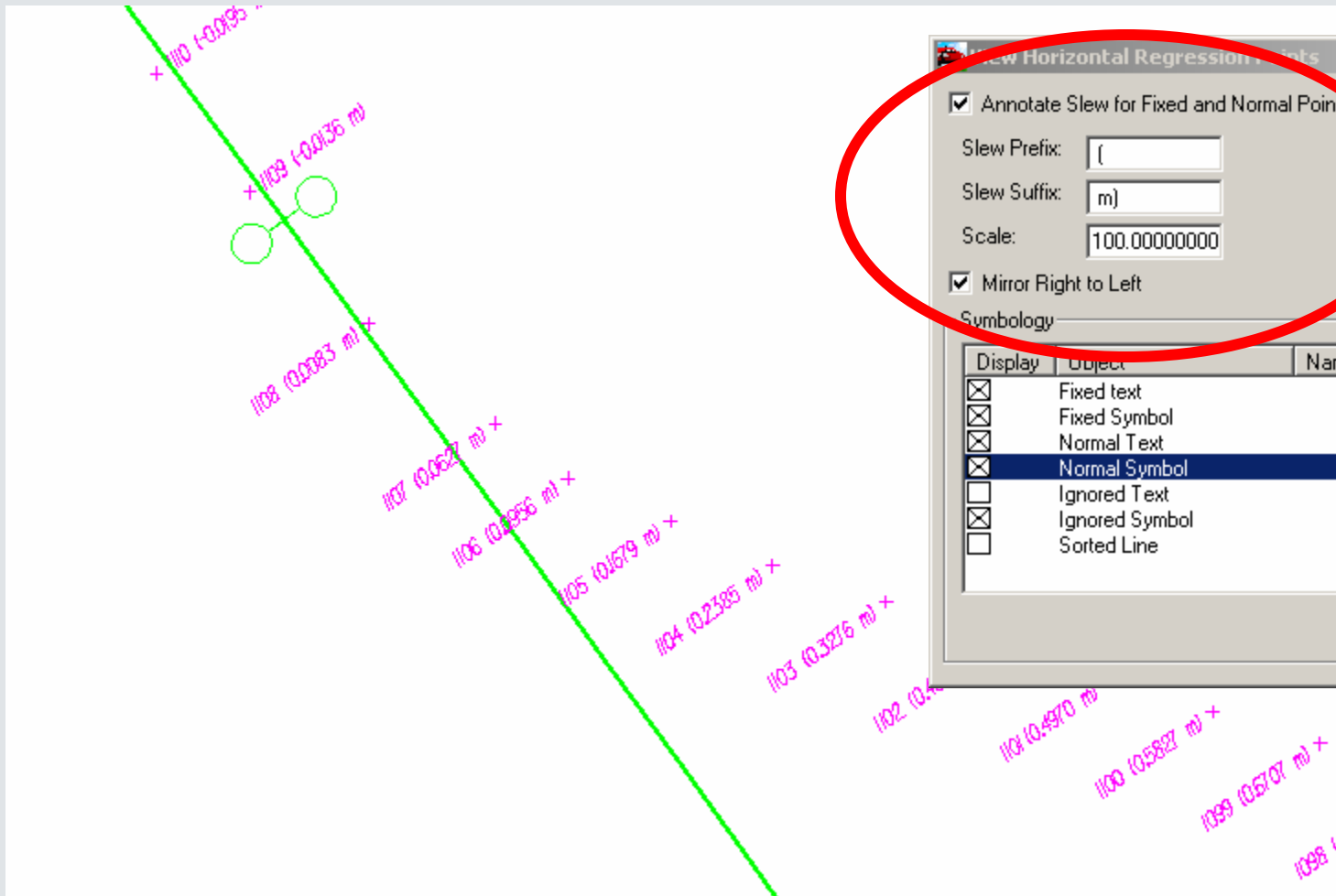
Bentley Civil - Development

Various Enhancements

- Production Enhancements
    - *Display Regression Points*
    - *Display Turnouts*
    - *Display Turnouts in Profile*
    - *Profile Annotation*
- Design Enhancements
    - Regression
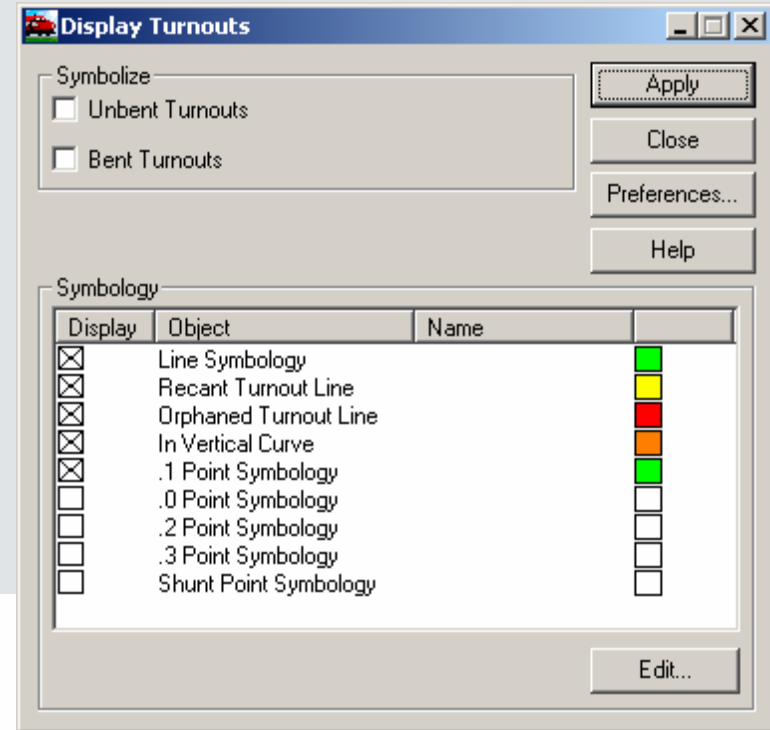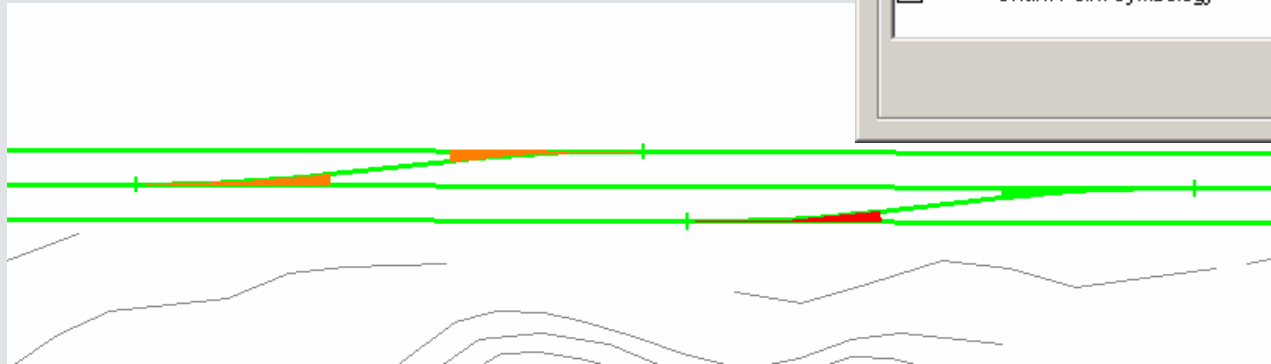   - Turnouts
    - Cant

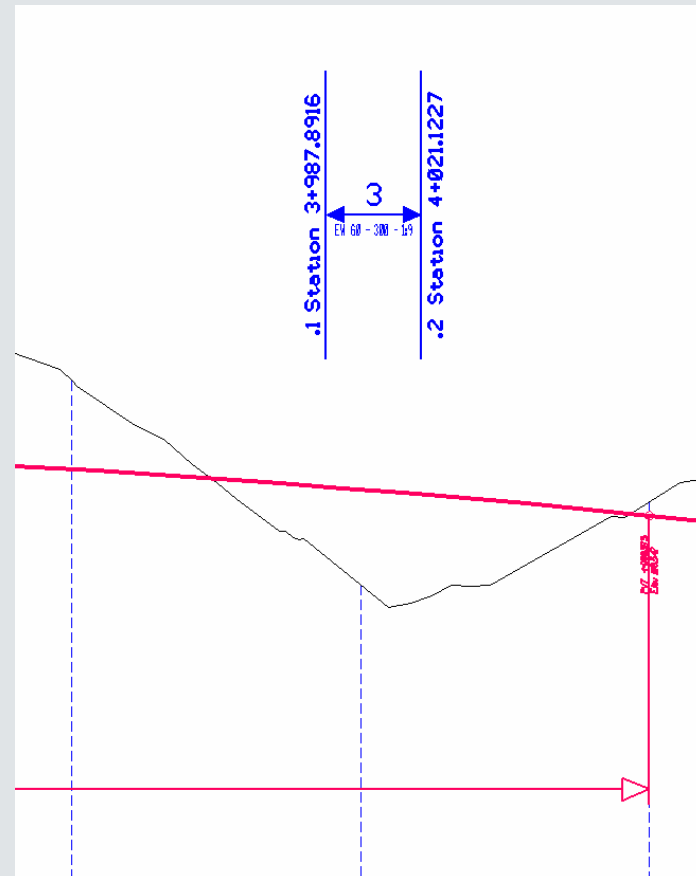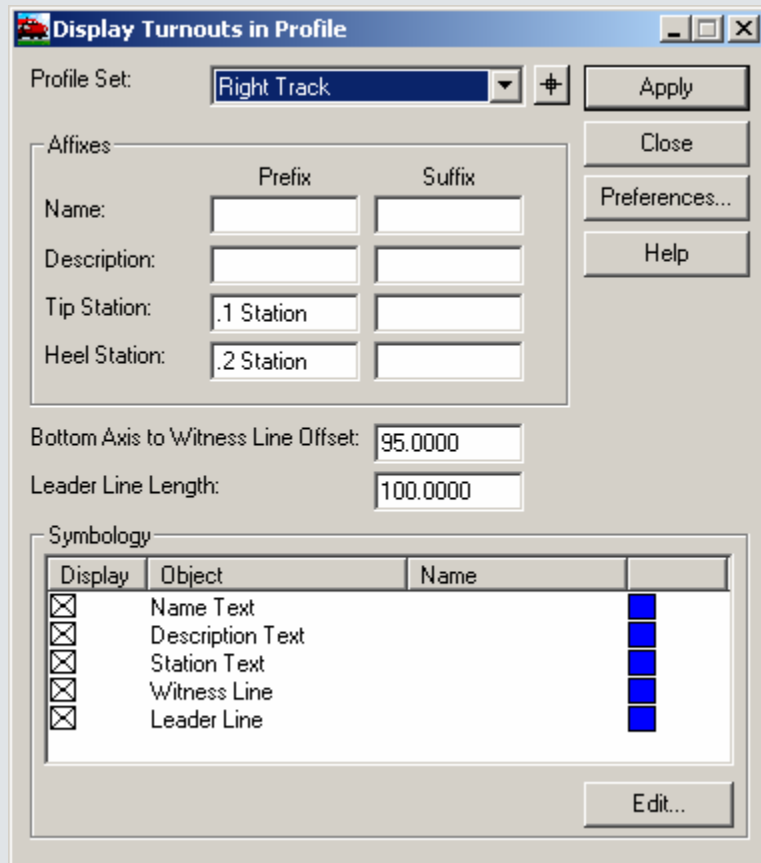BENTLEY®

Display Regression Points

Display Turnouts

- Viewing
- Integrity Checking
  - Recant?
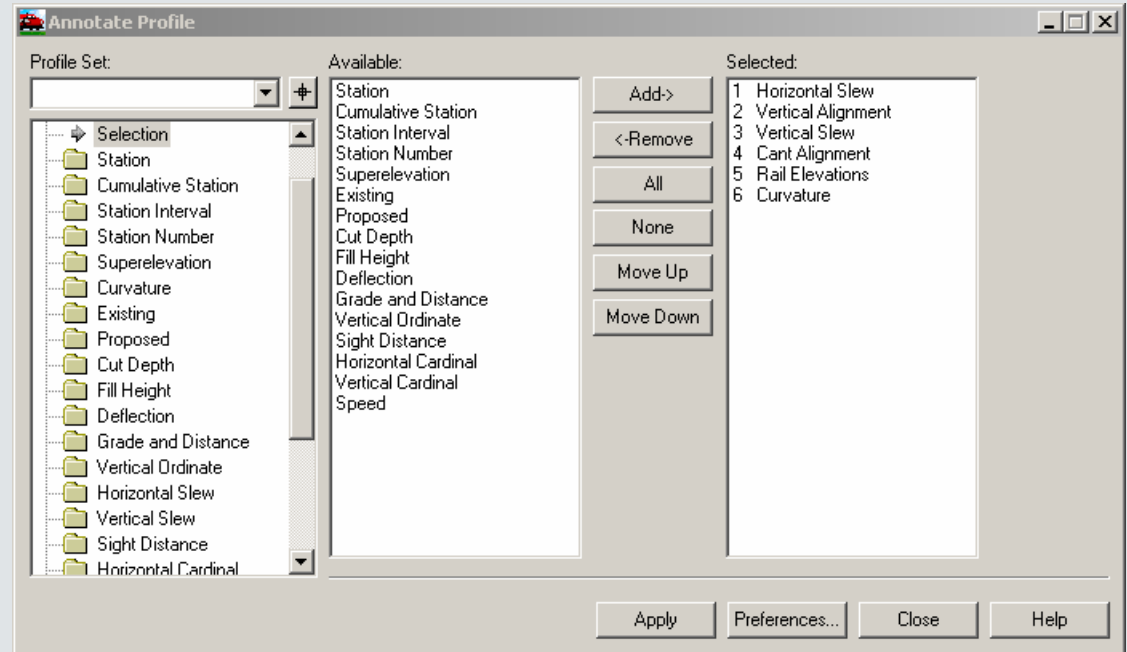 - Orphaned
  - In Vertical?

Display Turnouts in Profiles

Annotate Profile

- ## Includes slews
  - Horizontal & vertical

- ## Includes rail elevations
  - Utilizing vertical alignment and cant

Regression Enhancements

- ***Add Point*** includes *near* points
  - Minor changed to the workflow
    - » Select first and second points from the dialog
- ***Review / Edit***
  - **Select** and **Regress**
    - » By pass ***Single Element Regression*** dialog (but it is still available!)
    - » Auto determines the element type
    - » Includes a heads-up mode
      - *<Ctrl> <Spacebar> Select*
      - A faster way to create the geometry!

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Turnouts Enhancements

- ## *Turnout Library*
  - Schematic view
  - Curve calculator build into edit element dialog

- ## *Create Turnouts*
  - Offset from
    - » Define a minimum distance between a turnout

- ## *Connection Editor*
  - Turnout to fixed element
    - » Allows the user to slide a turnout in an existing connection (a complex turnout to turnout case)

Cant

- Cant is now an attribute of horizontal curves
  - Using the **Cant Calculator** will assign the cant and speed to the horizontal circular arc
  - Used by the **Cant Alignment Editor**

- Cant Calculator
  - Additional methods to compute horizontal data

- Cant Alignment Editor
  - Indicates *dirty* stations
  - Uses results from **Cant Calculator**
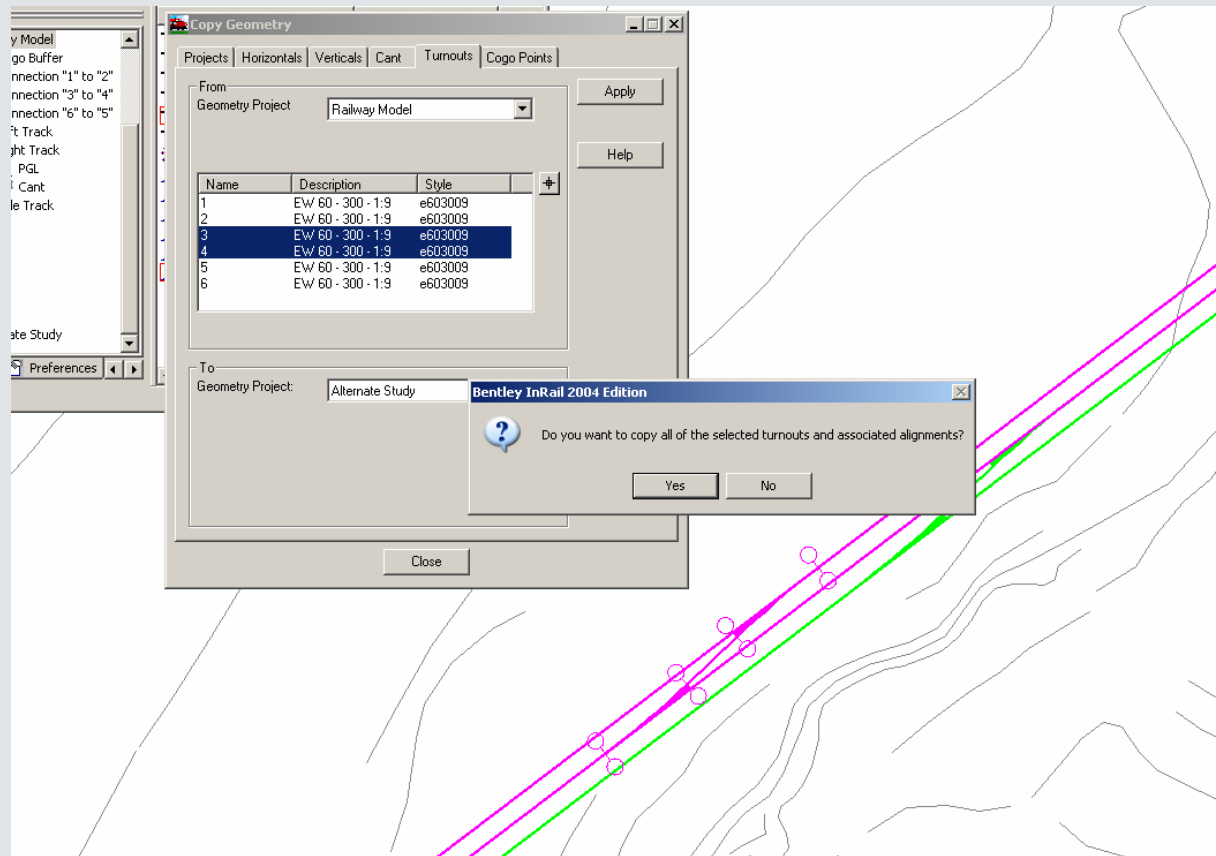
Adding Cant to Horizontal Elements

Utilities

- Copy Geometry
  - Copy Vertical
    » Includes a projected option
  - Copy Turnouts
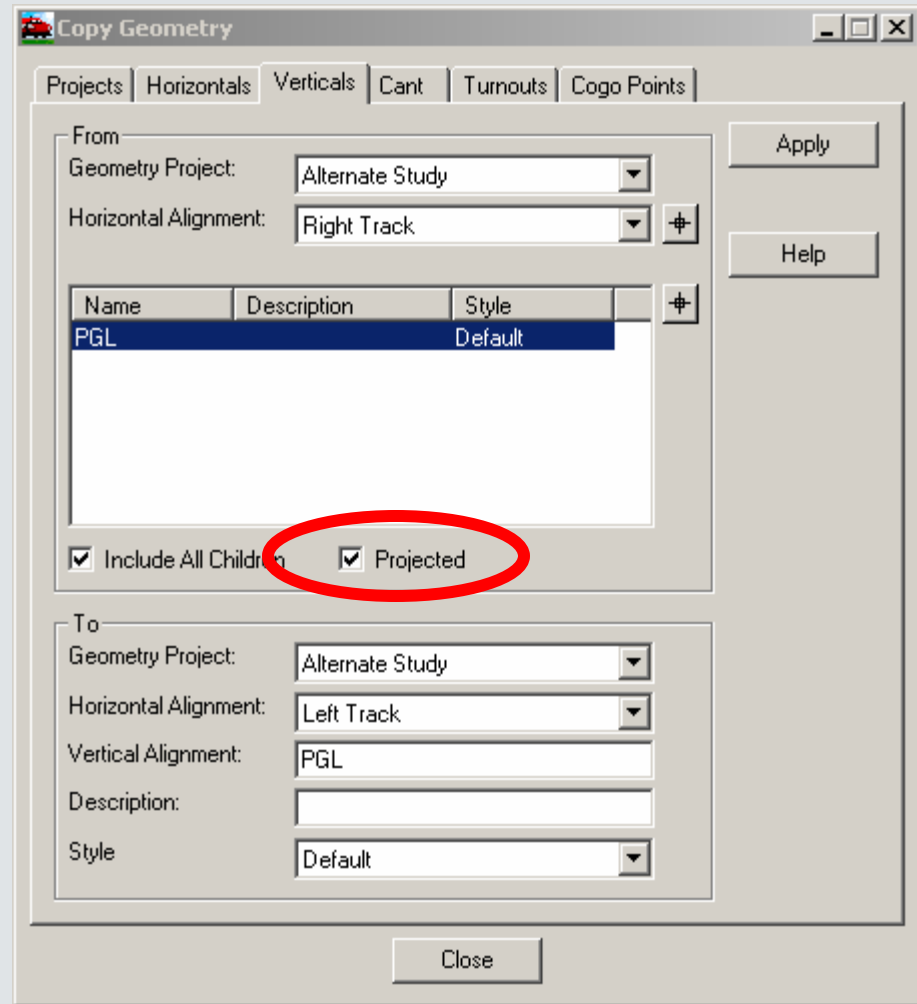
Copy Turnouts for an Alternate Design

LRM

- Reporting of rail positions with *LRM Reporting*
  - Station
  - offset
  - x, y, z
  - cant

Design Checking

- Includes
  - Roadways
  - German
  - Danish
  - Austrian
  - Transrapid
  - CEN, new with InRail 8.7

Design Checks

| Danish Rail | German Rail | Transrapid | Interactive |
| General Roads | CEN Standards | | Austrian Rail |

Traffic Category: IIa

Geometry Project: Railway Model

Horizontal Alignment: Right Track

Vertical Alignment: Profile

Cant: Cant

Min. Speed (kmph): 120.0000

Max. Speed (kmph): 160.0000

Traffic Subcategory: ○ Freight ● Passenger

Gauge: ● 1.435   ○ 1.668

☐ Upgraded Alignment

☐ Passengers May Be Standing

☐ Non-ballasted Track

Apply   Help

Preferences...   Close

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Modeling

- We will look at several different cases
  - Single track – ballasted
    - » Template creation with **Create Template**
    - » Modeling with **Roadway Designer**
  - Double track - ballasted
    - » Template creation
    - » Modeling with **Roadway Designer**
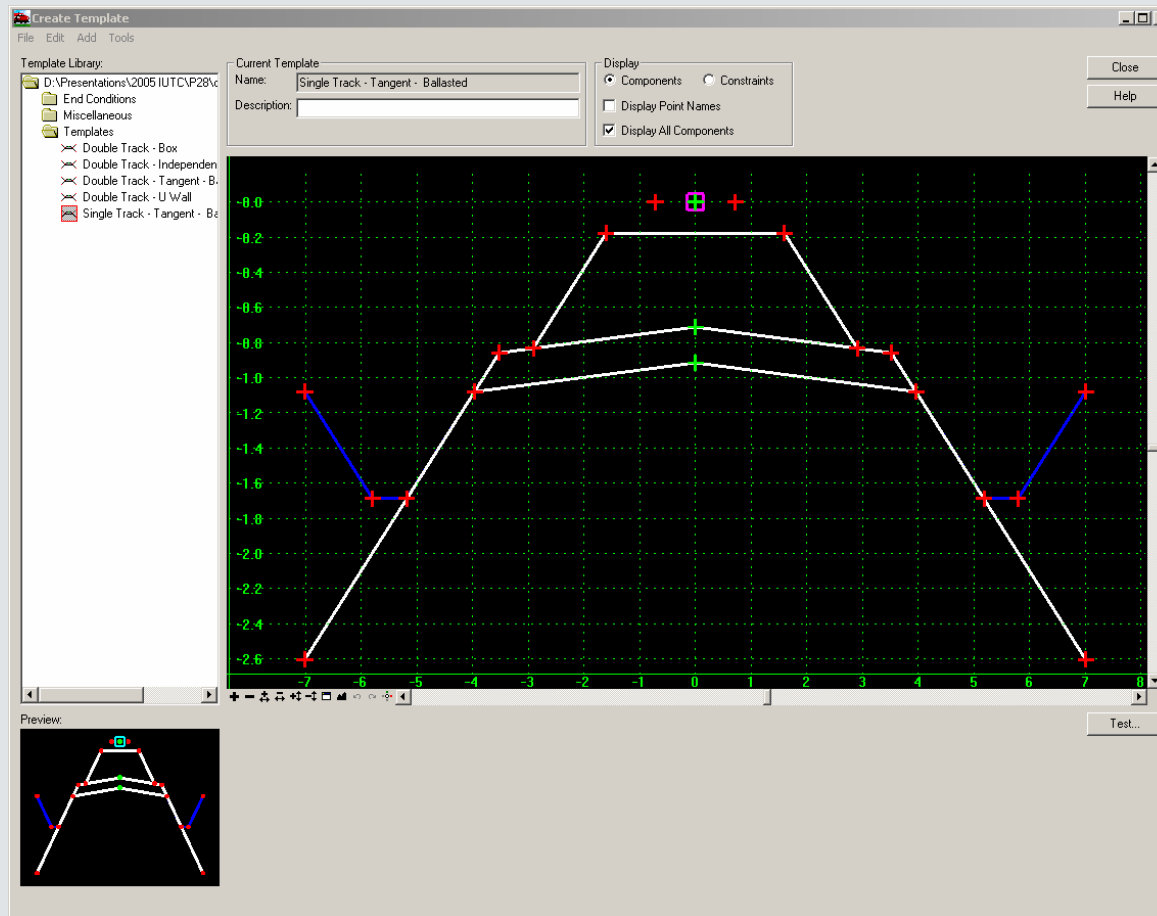   - » Cross sections and volumes

Modeling Requirements

- Single template
  - Utilizing cant / rail superelevation
  - Utilizing cant rotation point (i.e. inside low rail)
  - Enabling subgrade widening (i.e. high side ballast)
  - Separate quantities for subballast and ballast as well as the typical excavation / embankment
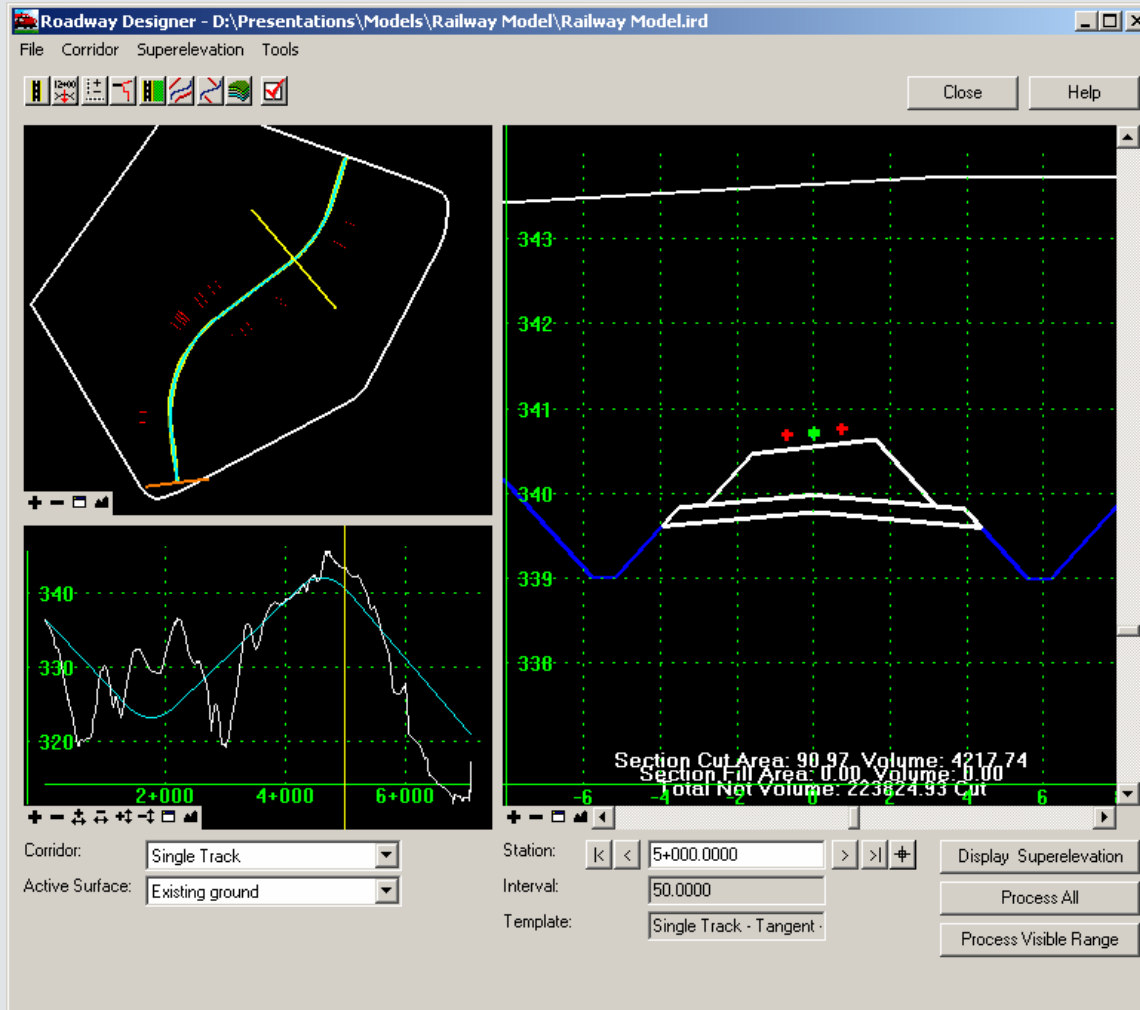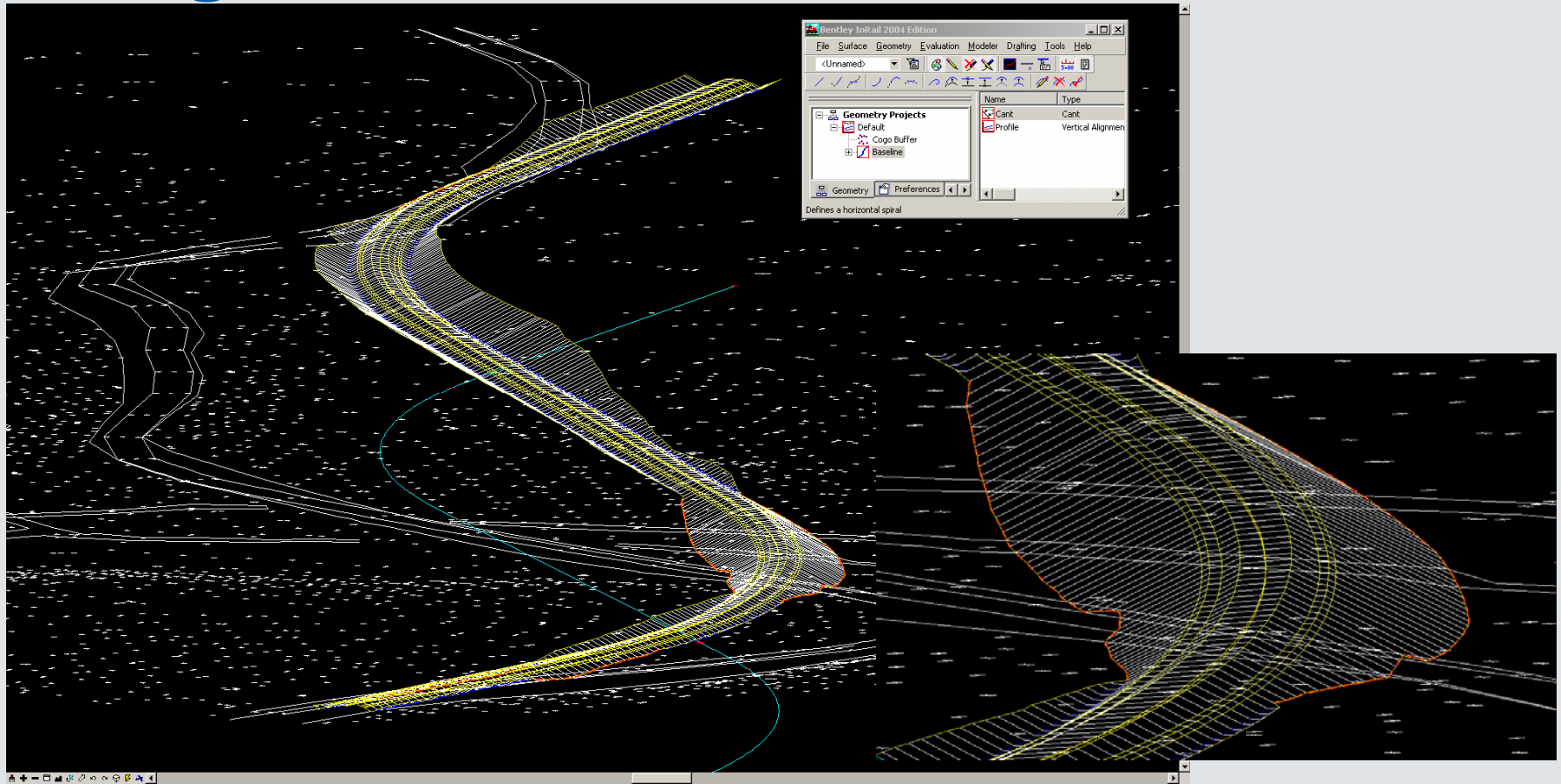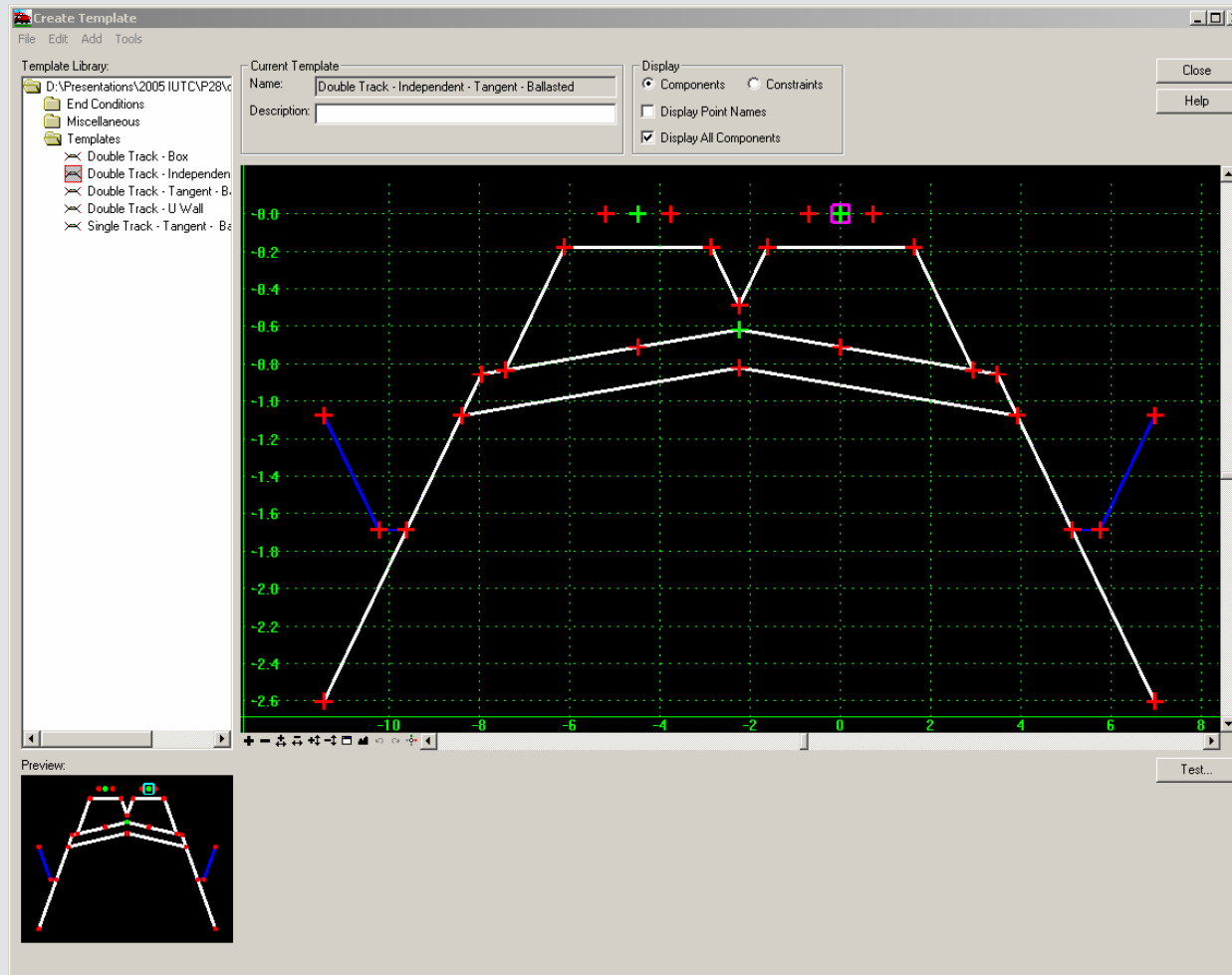
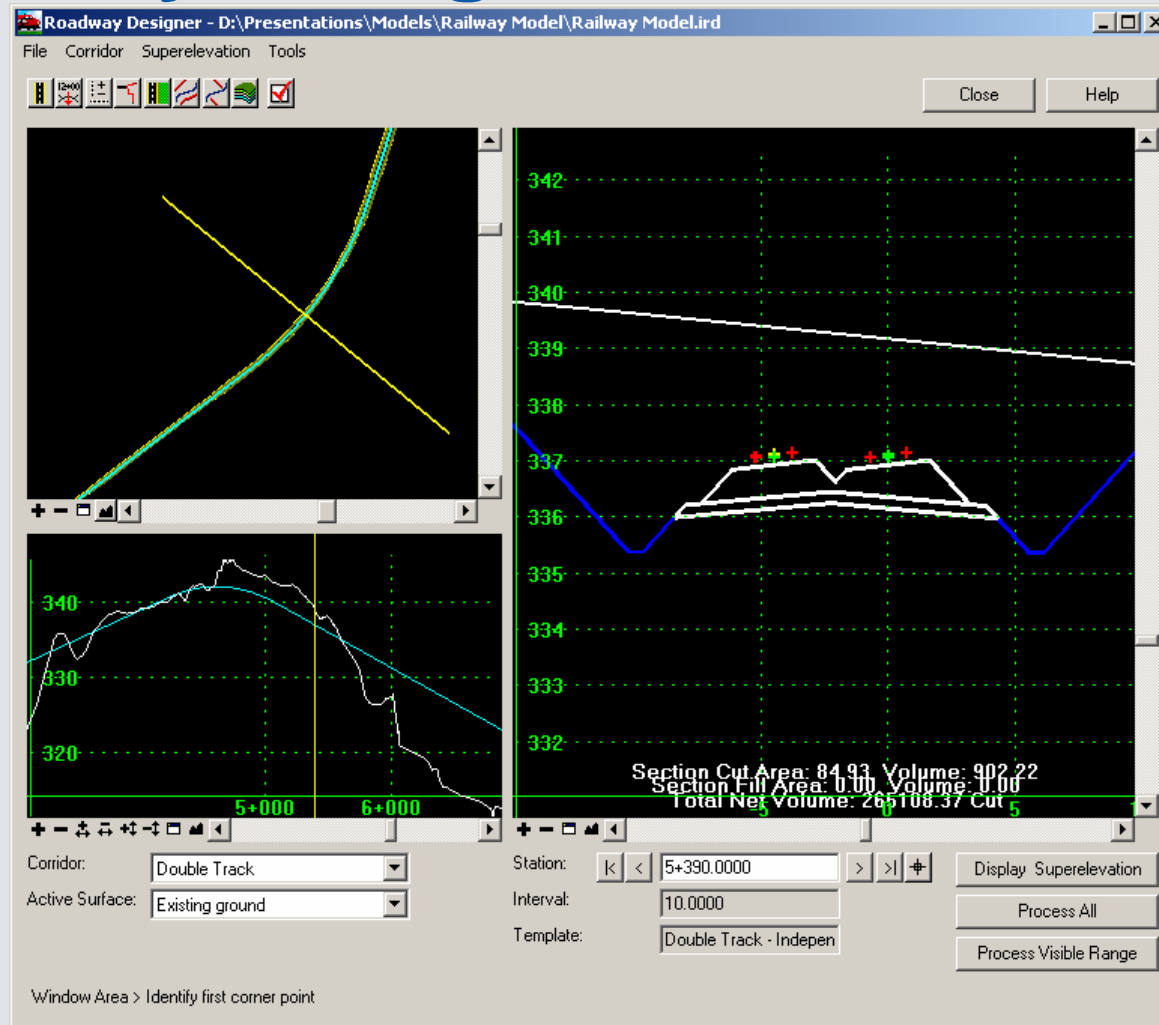# Create Template & Single Track

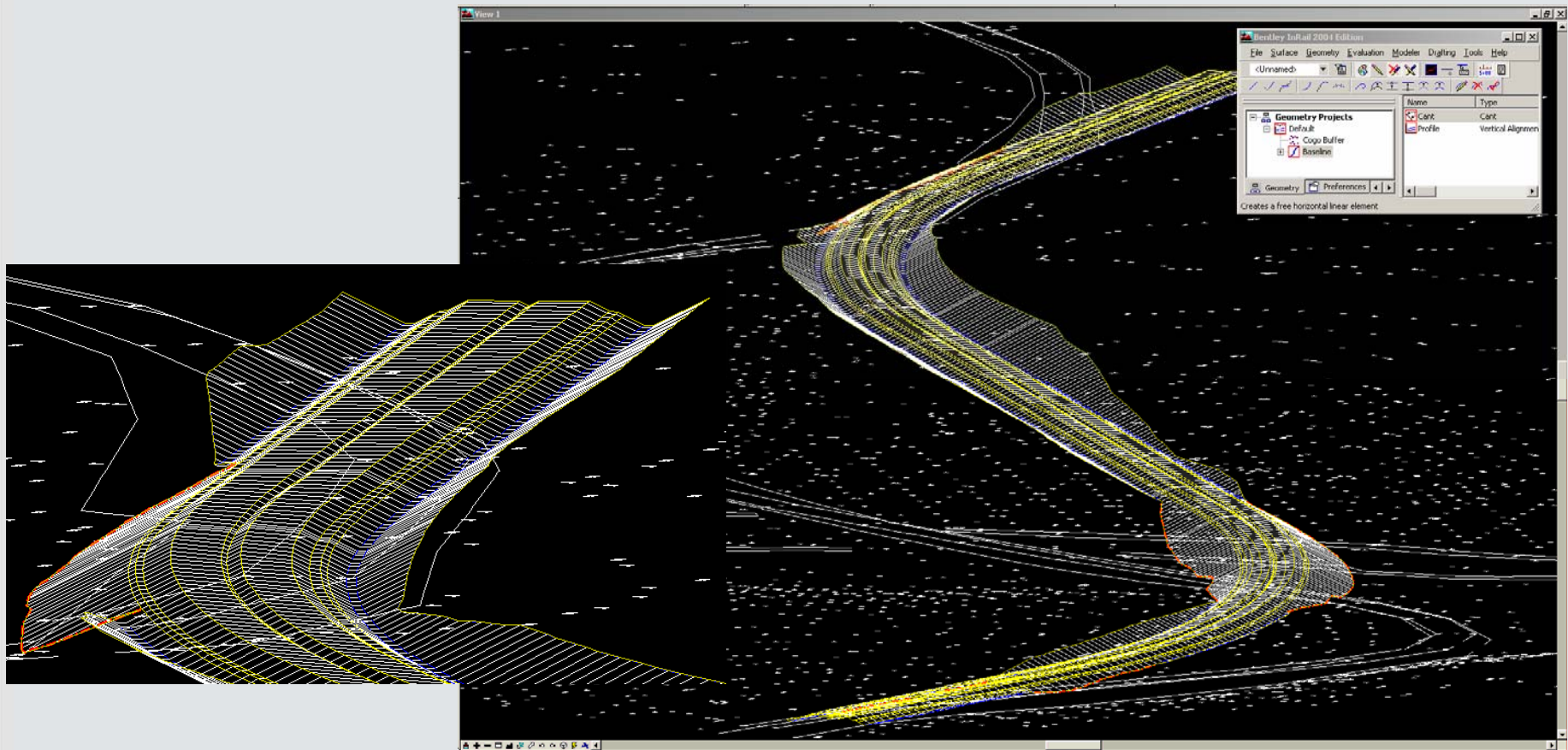# Roadway Designer & Single Track

Single track demo…

Create Template & Double Track

Roadway Designer & Double Track

Double track demo…

Reporting

- Typical reporting
  - XML / XSL
  - Geometry
  - Surfaces
  - Cross sections
  - Volumes
- Additional reporting
  - Turnouts
  - Cant

Data Exchange with the Field

- Added **_Export to Matisa_** tamper to complement **_Export to Plasser & Theurer_**
  - Horizontal, vertical and cant

- LandXML and cant
  - Version 1.0 supports a Bentley extension for cant (InRail 8.5 Sp1)
  - Version 1.1 supports the LandXML standard for cant (new with InRail 8.7)

Summary

Built on top of InRoads

Geometric layout of horizontal, vertical and cant alignments for many types of railways

Surface Modeling

Design Checking

Data exchange from / to field