

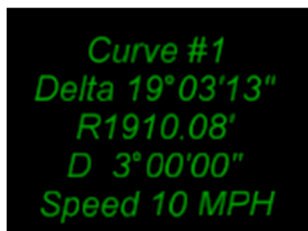
OpenRail Designer Known Issues and Workarounds

The delivered UPRR OpenRail Designer workspace aims to replace all annotation functions available within InRoads SS2, in-kind, consistent with UPRR CAD standards. The document summarizes current software deficiencies within OpenRail Release 2024 that require extensive workarounds to function similarly. These items are all current service items within Bentley's roadmap for future releases.

Horizontal Curve Information

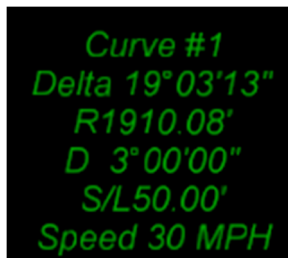
InRoads SS2's Curve Set Annotation Dialogue can generate robust curve notes for an array of geometry types using a single preference. Curve numbers are incremented for each successive curve.

Simple Curve (No Spirals)

A black rectangular box containing green text representing a simple curve annotation. The text is centered and reads: Curve #1, Delta 19°03'13", R1910.08', D 3°00'00", Speed 10 MPH.

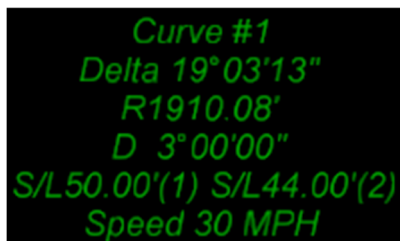
Curve #1
Delta 19°03'13"
R1910.08'
D 3°00'00"
Speed 10 MPH

Complex Curve (With Even Spirals)

A black rectangular box containing green text representing a complex curve annotation with even spirals. The text is centered and reads: Curve #1, Delta 19°03'13", R1910.08', D 3°00'00", S/L50.00', Speed 30 MPH.

Curve #1
Delta 19°03'13"
R1910.08'
D 3°00'00"
S/L50.00'
Speed 30 MPH

Complex Curve (With Different Entry and Exit Spiral)

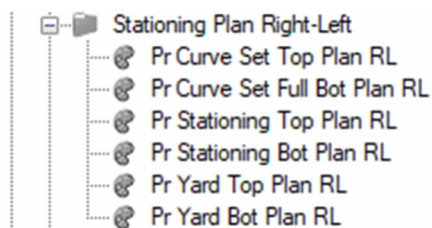
A black rectangular box containing green text representing a complex curve annotation with different entry and exit spirals. The text is centered and reads: Curve #1, Delta 19°03'13", R1910.08', D 3°00'00", S/L50.00'(1) S/L44.00'(2), Speed 30 MPH.

Curve #1
Delta 19°03'13"
R1910.08'
D 3°00'00"
S/L50.00'(1) S/L44.00'(2)
Speed 30 MPH

Compound Curve with Intermediate Spiral

Curve #1
Delta 32° 22' 18"
R1910.08'(1) R1146.28'(2)
D 3° 00' 00"(1) D 5° 00' 00"(2)
S/L50.00'(1) S/L50.00'(2) S/L100.00'(3)
Speed 30 MPH(1) Speed 30 MPH(2)

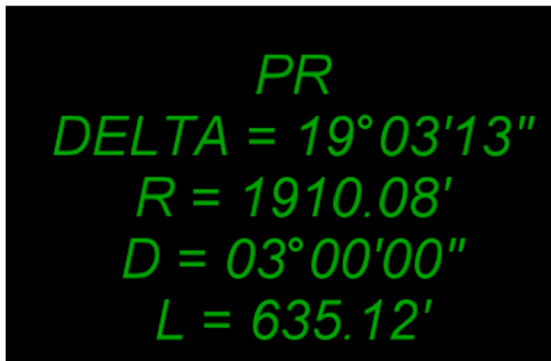
Unfortunately, OpenRail's annotation fields are a lot more rigid, currently. A curve set (curve with spirals) is considered a different element than an arc (simple curve). The annotation group needs to anticipate an exact format for curve notes that does not flex to the type of geometry used. For example, an entry and exit spiral will not automatically separate into two separate labels if the lengths are dissimilar. It is difficult to annotate compound curves and curve numbers are not a named asset that can be used within annotation groups. Civil labeler can be used to supplement gaps within the current annotation fields. Curve labels may take more time to generate for a given project, but the following Annotation Groups have been developed based on project type.



- Pr Curve Set – Intended for use on typical mainline projects with spirals and minimal simple curves (simple curves will not annotate to prevent redundant callouts)

PR
DELTA = 19° 03' 13"
R = 1910.08'
D = 03° 00' 00"
S/L(1) = 50.00'
S/L(2) = 50.00'
SUPER ELEV = 1"
SPEED = 0 MPH

- Pr Stationing – Tick marks and major stations only
- Pr Yard – Low-speed yard or industrial projects where alignments do not typically contain spirals and spiral fields are omitted.



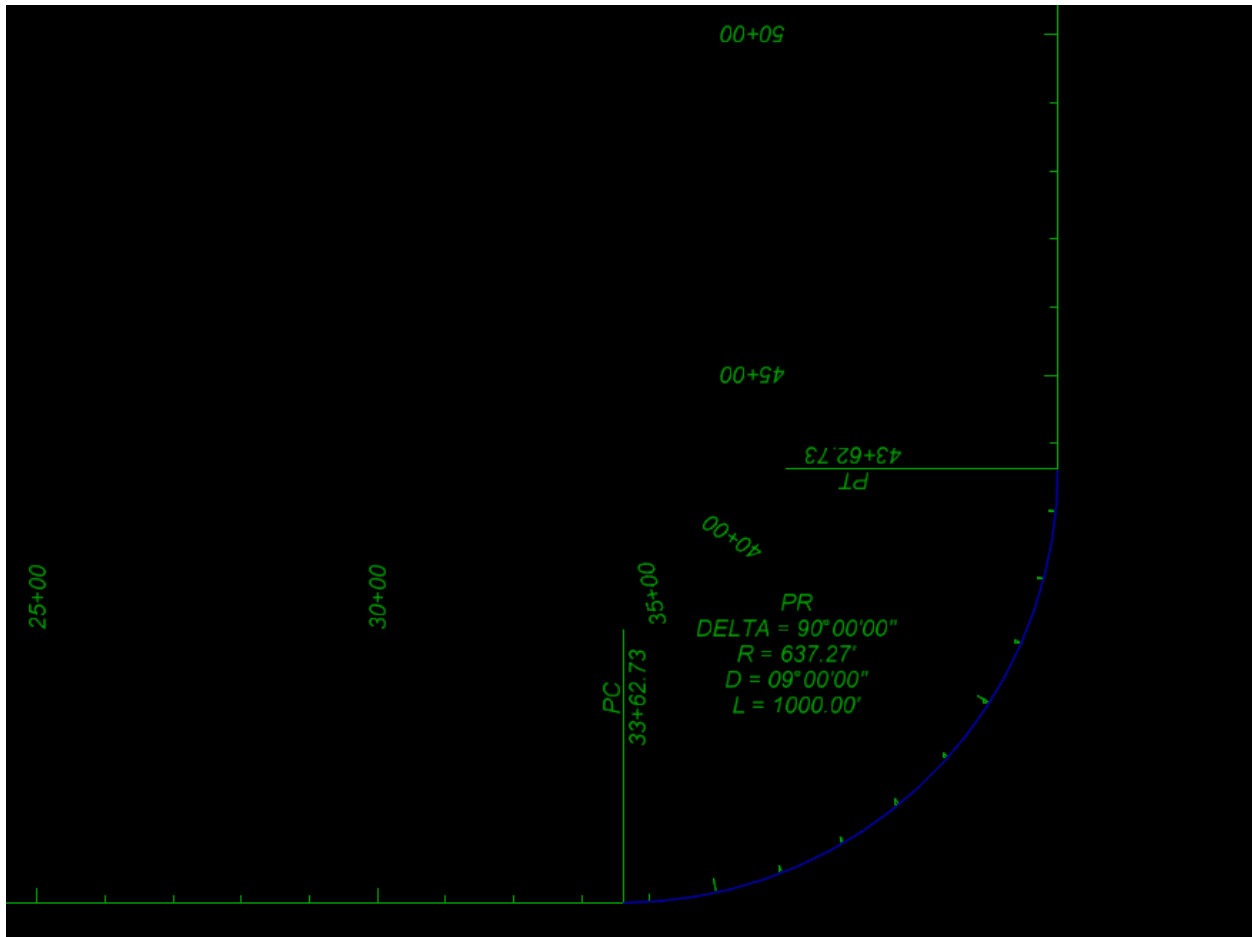
PR
DELTA = 19°03'13"
R = 1910.08'
D = 03°00'00"
L = 635.12'

Arc/Chord Distortion

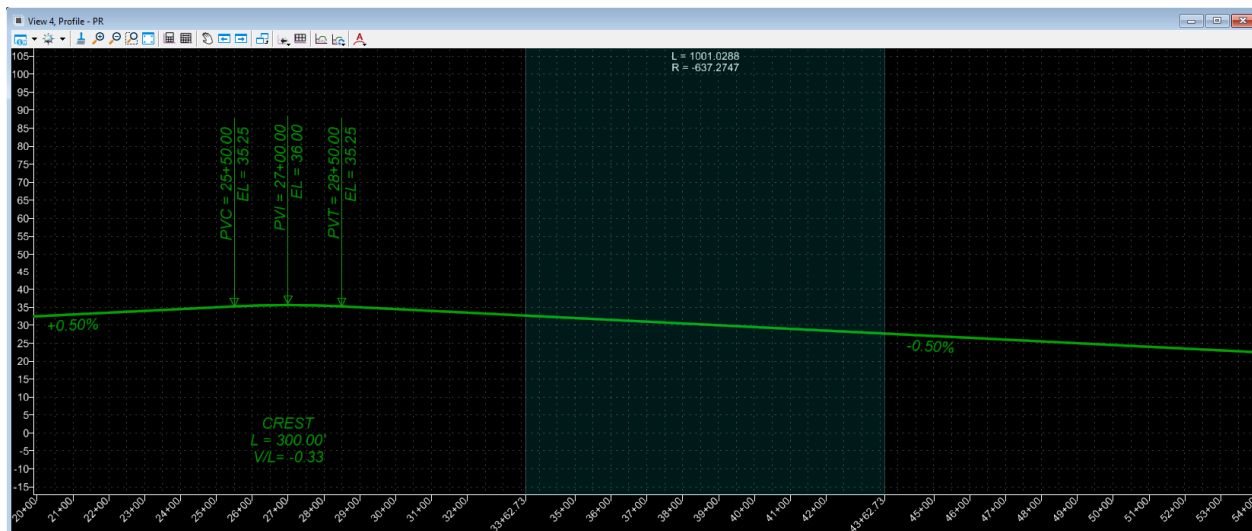
Significant headway has been made in OpenRail 2023 and OpenRail 2024 to limit arc/chord distortion issues throughout design. Previously, chord defined stationing (100' linear chords to inside of curves) would be honored for an alignment's horizontal geometry only. Station inputs in table editor or a profile window for vertical design would distort to the arc definition equivalent. For a single return curve on a siding extension project, this difference in length may only be a fraction of an inch and appear to be a rounding or snapping issue. However, for large-bodied sharp curves or multi-curved alignments this difference could amount to several feet over the length of the alignment and cause large station discrepancies. There are still some remaining issues with Arc/Chord distortion even though most of vertical design has been corrected. These issues will be monitored with each subsequent release of OpenRail.

Horizontal/Vertical Curvature Overlap

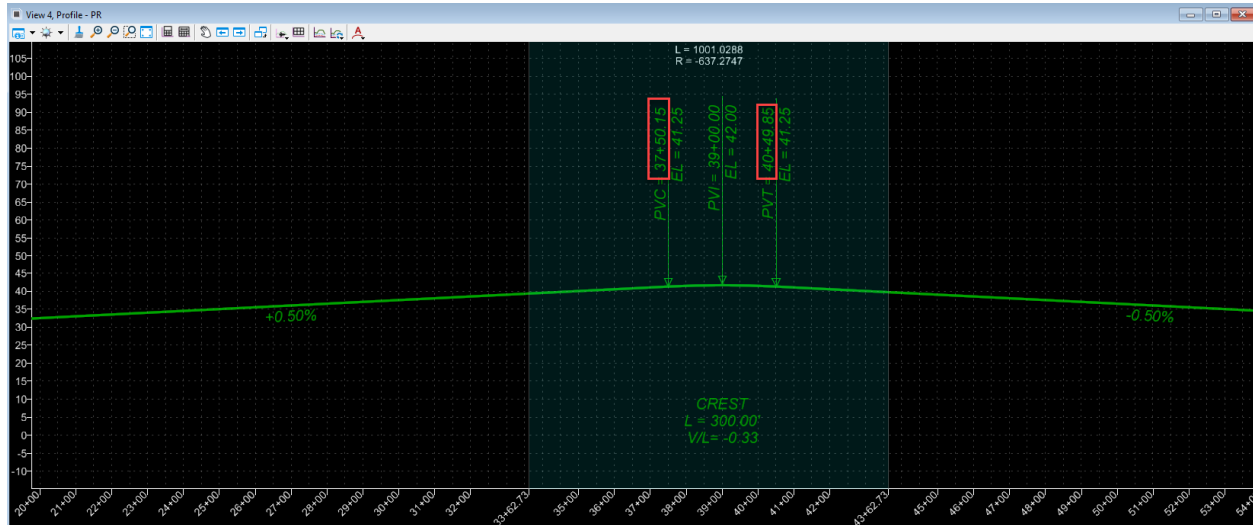
The example below shows an example where cardinal points display properly on either side of a curve, but an overlapping horizontal and vertical curve distorts the length of the vertical curve.



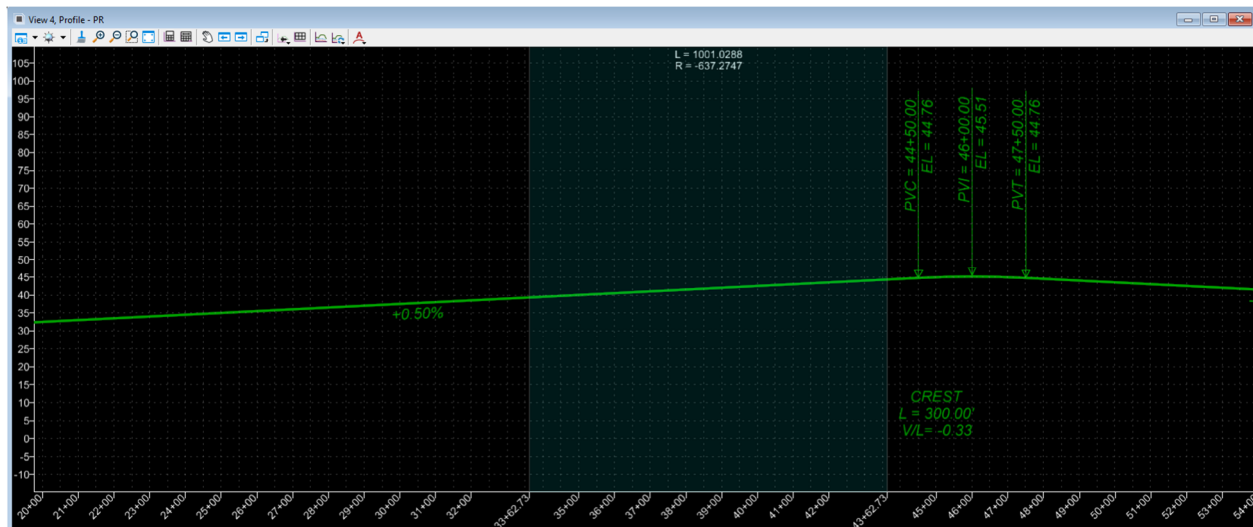
Vertical Curve Preceding Horizontal Curve



Overlapping Horizontal and Vertical Curve (300' vertical curve shows 299.7 on cardinal points)

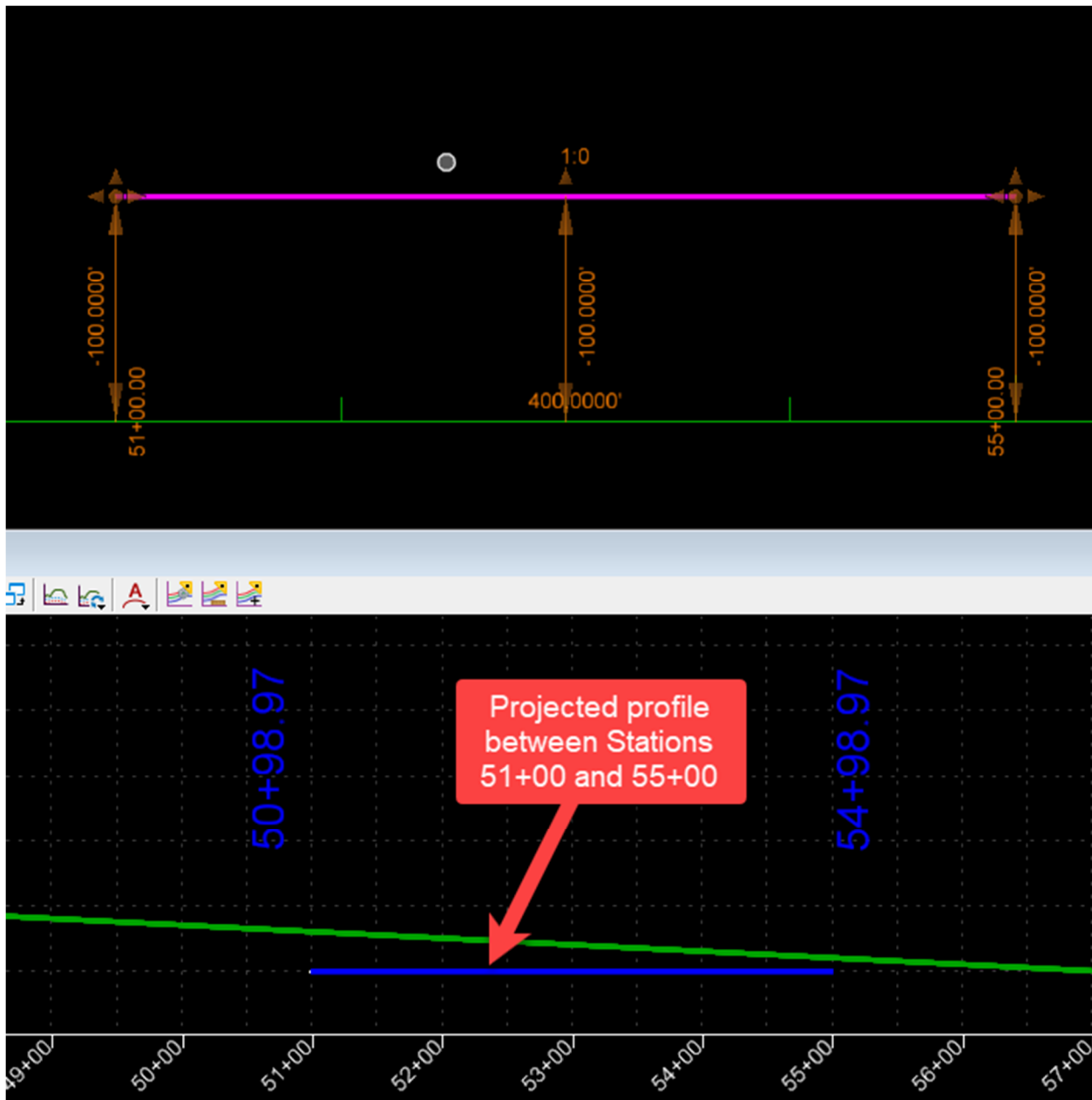


Vertical Curve After Horizontal Curve



Projected Profiles

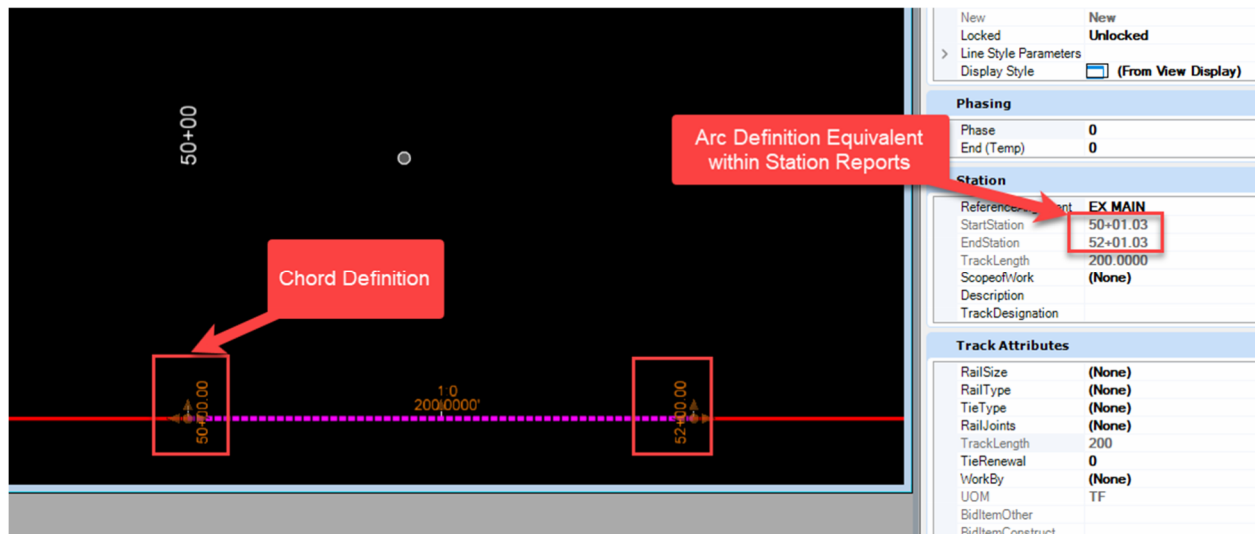
Projecting profiles (e.g adjacent track or existing top of rail at tie-ins) to other alignments will overcorrect and subtract out the station difference between chord and arc resulting in lower stations for the projection. However, this is not expected to cause noticeable discrepancies in elevation based on cross slope across rail. A station discrepancy of 1' would be considered significant and a grade of 1% would also be considered significant resulting in an elevation bust of only ~1/8" at a rail tie-in.



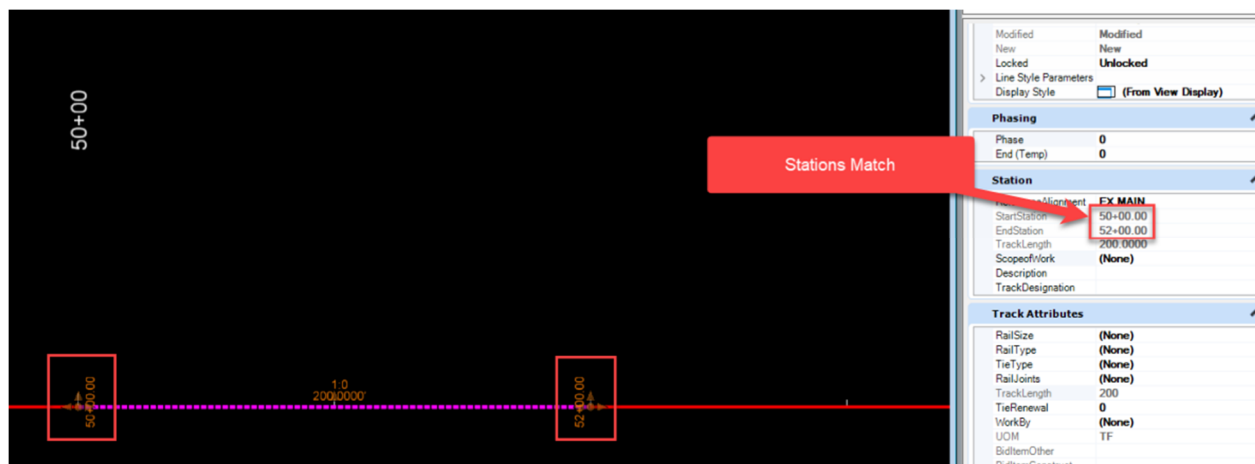
Civil Expressions

Civil Expressions for stationing appears to reference arc definition equivalent by default. A workaround to export an XML and then reimport it into a .dgn after the alignment has already been created synchronizes the civil expression to chord definition.

Created Natively Within ORD



Following Reimport Procedure



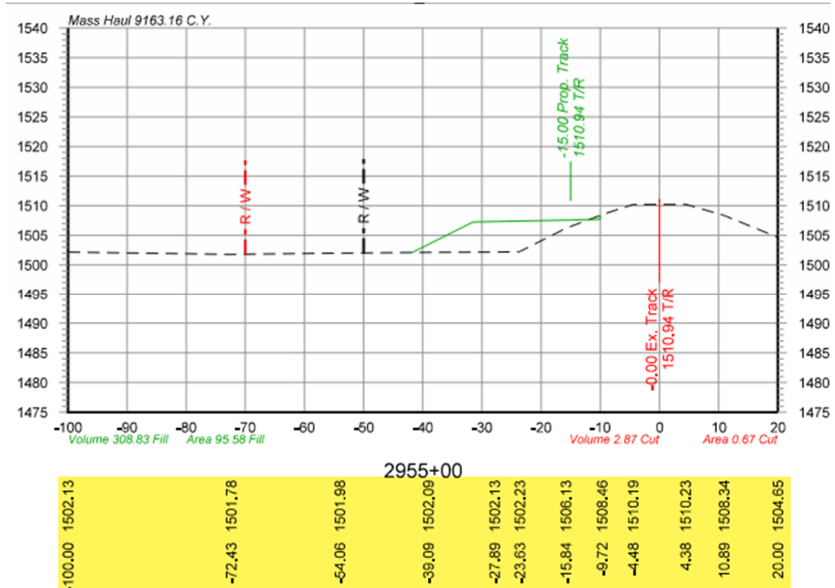
Existing Ground Elevation Points on Cross Sections

InRoads SS2 created cross sections by extracting 2D graphics of intersected surfaces at each cross section such as proposed surface and existing surface. The existing surface lines would plot a vertex based on where each cross section intersected a triangle of the ground surface. These points were all available to annotate with the “Annotate Cross Section Command” and delivered .xin preference file.

OpenRail cross sections work differently where the cross sections are thin orthoviews of the 3D model. As a result, the out-of-the-box features in OpenRail will only annotate ground points where there is a corridor crossing feature (e.g. subgrade crown, subgrade shoulder, toe of slope). The lack of points outside the rail corridor can make it difficult to analyze daylight grading, parallel ditches, and evaluate positive drainage for reviewers

between cross sections. The following workflow demonstrates how meaningful breaklines from a survey can be established as crossing features and draped on existing ground.

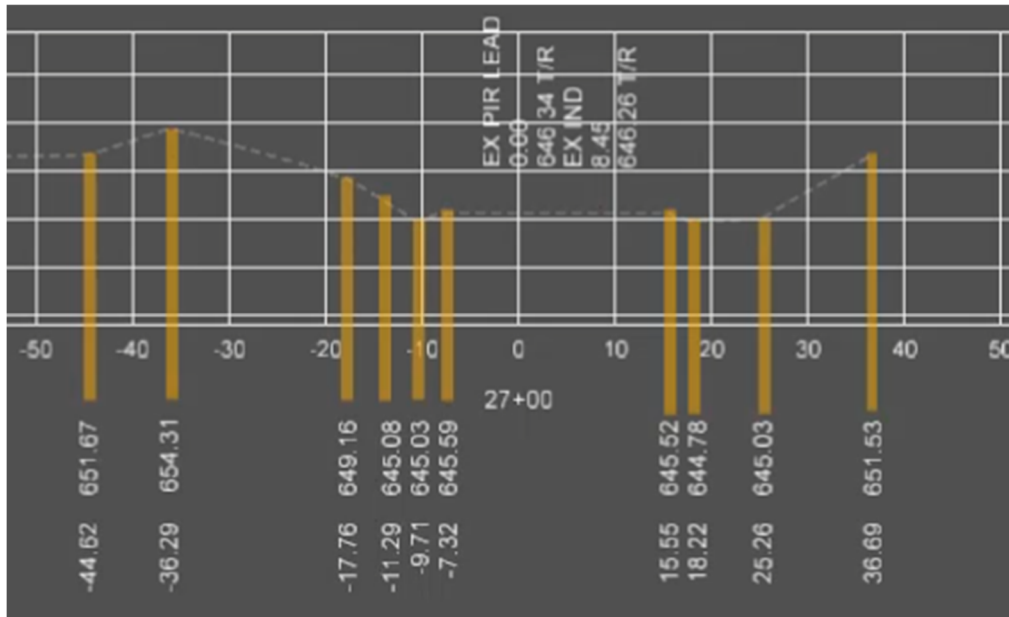
InRoads SS2 Example



ORD Survey File with Breaklines (yellow)



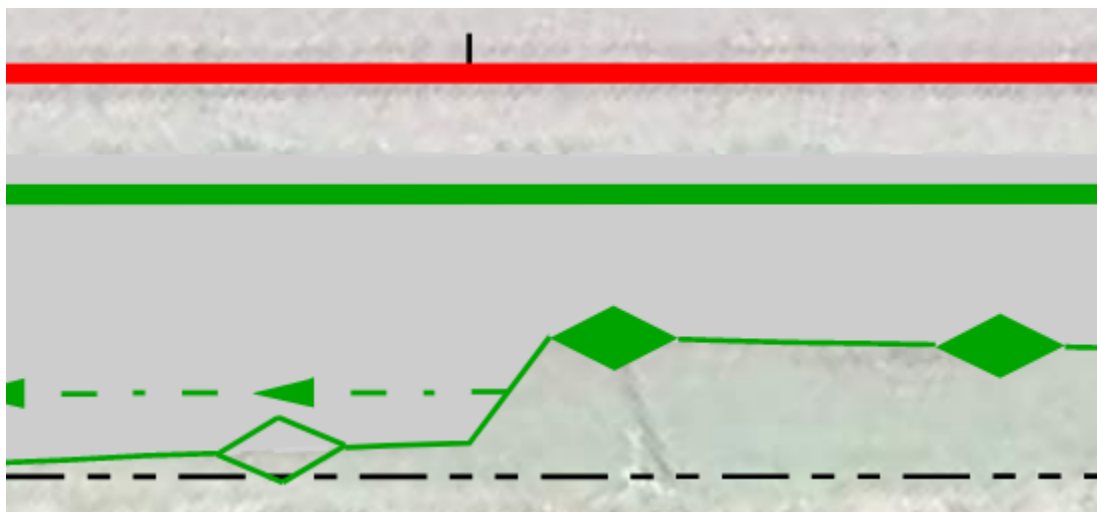
Annotation Group with Existing Breaklines Added



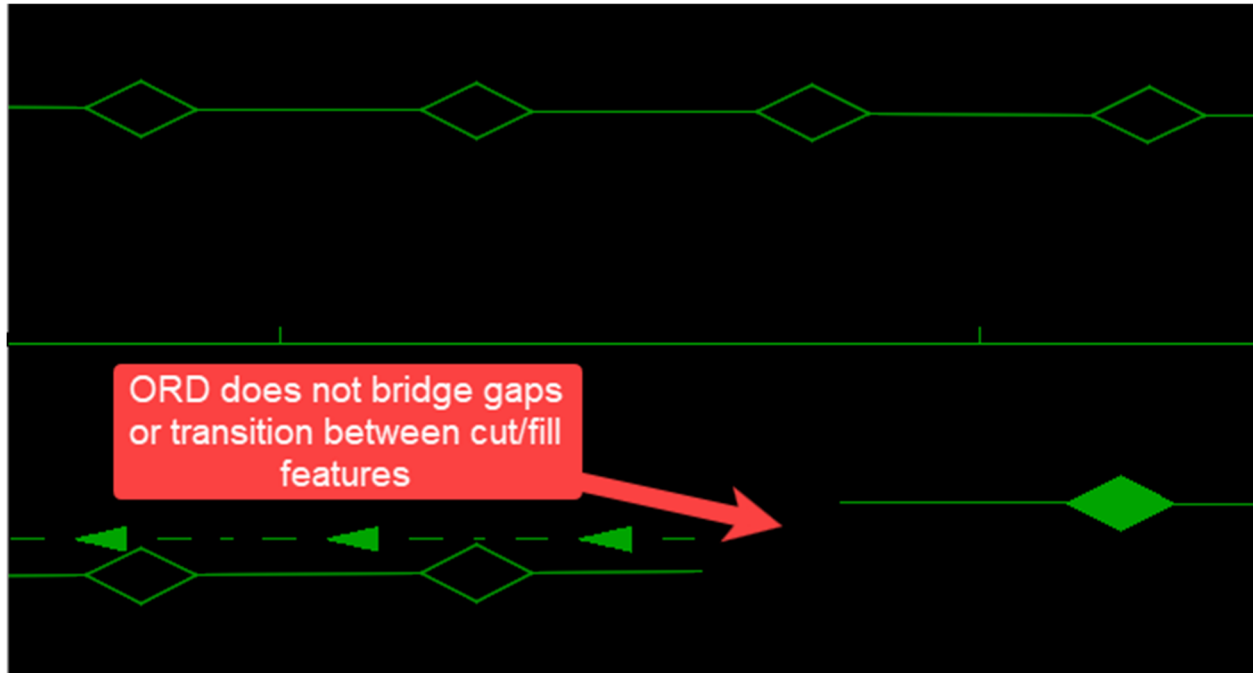
Replacing the existing ground option natively within the software is being considered for inclusion in future releases. This method will report ground values at known points only (breaklines) and avoid excessive flooding of the bottom axis.

Cut/Fill Discontinuity

InRoads SS2 automatically bridges transitions between cut and fill template drops resulting in a cleaner appearance of grading features.



OpenRail does not map features the same way and creates a gap. This omission was also noted within the Federal Highway Administration (FHWA) guidance documents and is a known issue. Adding a redundant grading limits feature irrespective of cut/fill may be a potential workaround pending resolution.



FHWA Reference

NOTE: The software currently does NOT have an automatic method for creating *transition* lines between Cut and Fill elements. If *transition* lines between Cut and Fill elements must be shown in the plan set, the User will have to manually draft them.