



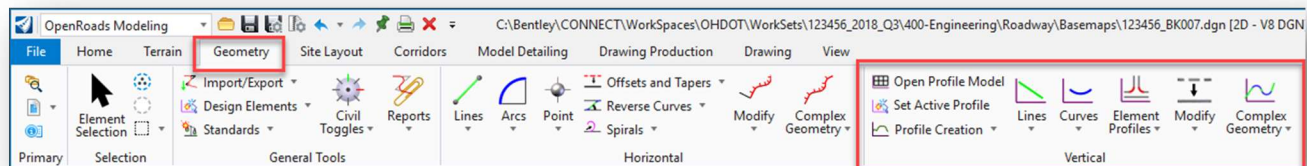
OpenRoads Designer: Vertical Geometry

Vertical Geometry

OpenRoads Designer stores vertical alignments as a component of the horizontal alignment in the same design file as the horizontal geometry. This is true for both existing vertical alignments, which are extracted from an OpenRoads Terrain Model, and proposed vertical alignments.

Although the vertical geometry is stored in the design file, the graphical display of the vertical alignment information is not plotted in the design file. Vertical alignments are displayed in a profile window for review and editing.

Vertical geometry tools are accessed from the **Geometry** tab of the **OpenRoads Modeling** workflow, as shown below.

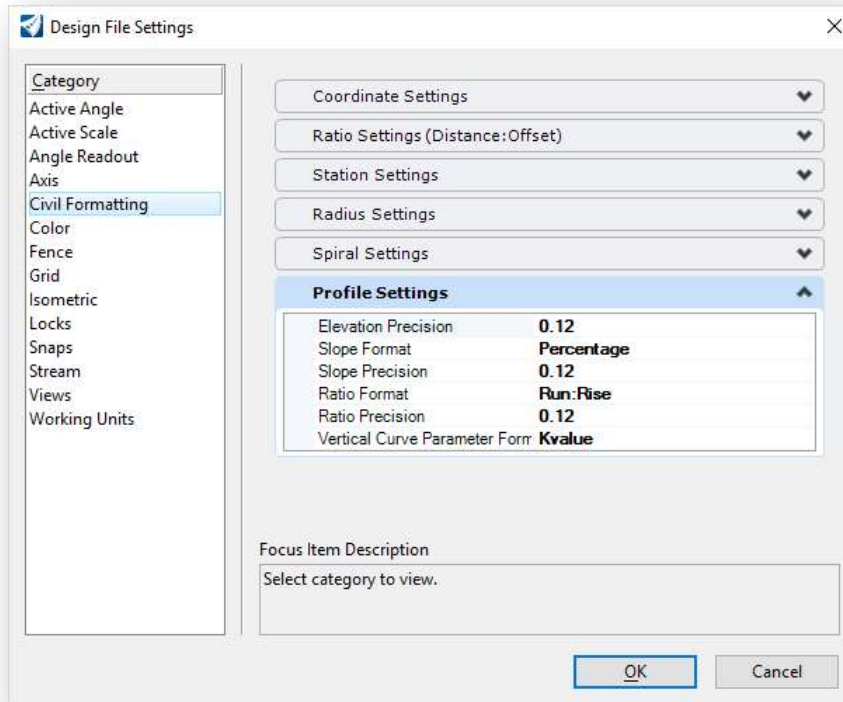


This training guide will not document each geometry tool that is available in the OpenRoads interface. See the online help for commands not detailed in this document.



Profile Settings

The Design File settings contain parameters for formats as you work with vertical alignments. Select **File > Settings > File > Design File Settings** and then click the **Civil Formatting** item from the list on the left of the dialog. The **Profile Settings** are set to the values shown below in the ODOT seed files.



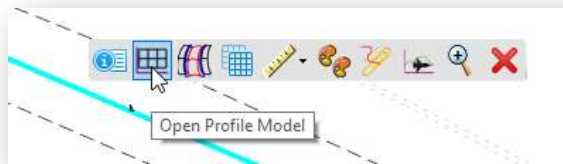


Existing Ground Profiles

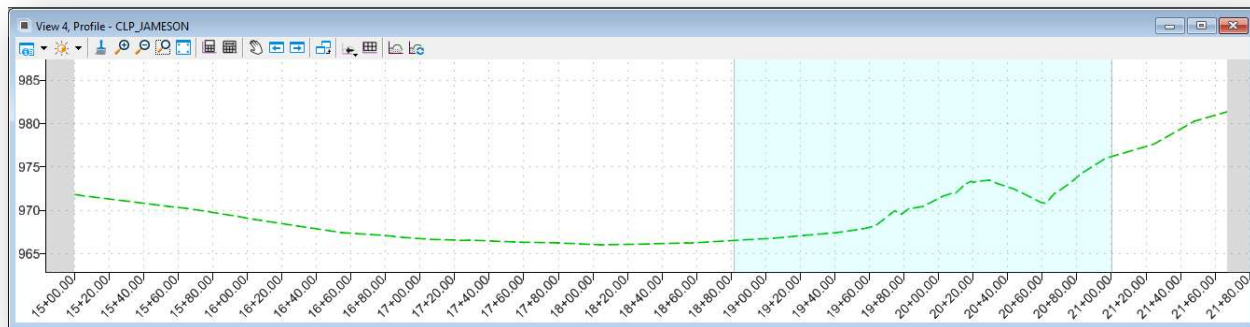
Existing ground profiles are extracted along the selected civil geometry element from the active terrain model. The active terrain model is set by selecting the terrain element and choosing the **Set As Active Terrain Model** icon as shown below.



To display the existing profile, select the alignment graphics and let the cursor rest on the graphic element until the pop-up menu appears. Choose the **Open Profile Model** icon as shown below.



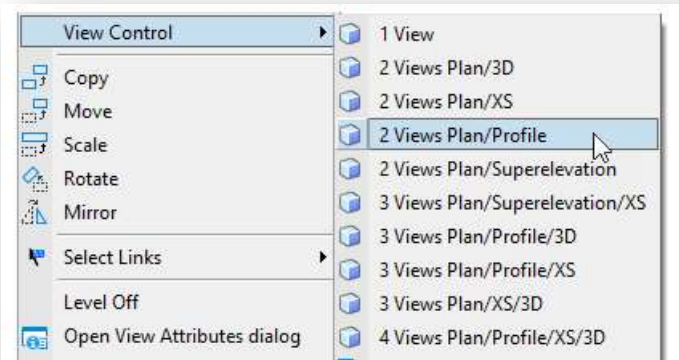
You are prompted to select or open a view window to use for the profile display. Open a new view window and then left click in the view window to display the profile. An example is shown below.



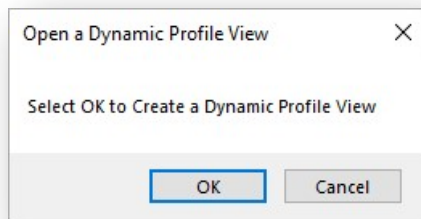
Note: The profile is displayed in the profile view for review and editing; however, the profile is not written to the design file. The selected view window is used as a temporary display of all the profiles associated with the selected alignment. The selected view window is not specifically associated with an alignment/profile and can be used to display the profiles from different geometric alignments as needed.



Alternately, a profile can be displayed by holding down the left mouse button in the view window until the pop-up menu shown below is opened. Select the **2 Views Plan/Profile** option.



You are prompted to create a dynamic profile view as shown below. Select **OK** to continue.



After selecting **OK**, the View 4 window is opened to display the profile graphics.

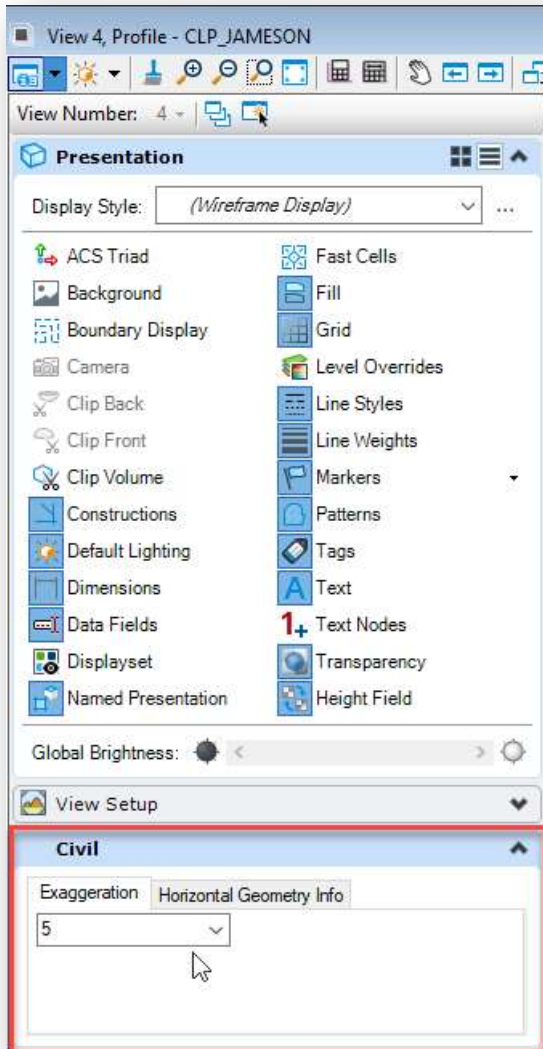
When prompted to select the plan element that will be used to display the profile. You are next prompted to **Select or Open View**. Left click in the newly opened View 4 widow to select this view to display the profile.



The Profile Window

View Attributes

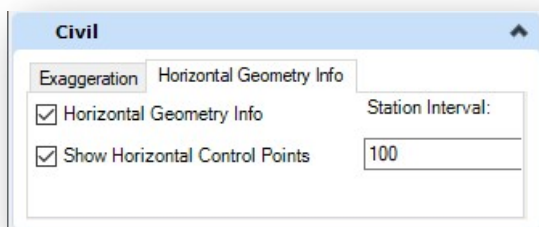
The View Attributes for a profile view contain an additional parameter to control the vertical exaggeration of the profile display, as shown below.



To change the profile display exaggeration factor, select the desired exaggeration factor from the drop-down list.

Tip: With the cursor in the profile view, holding down the shift key while scrolling the mouse wheel will dynamically change the profile exaggeration.

Version 10.10 adds additional controls for the profile view attributes under the **Horizontal Geometry Info** tab shown below.

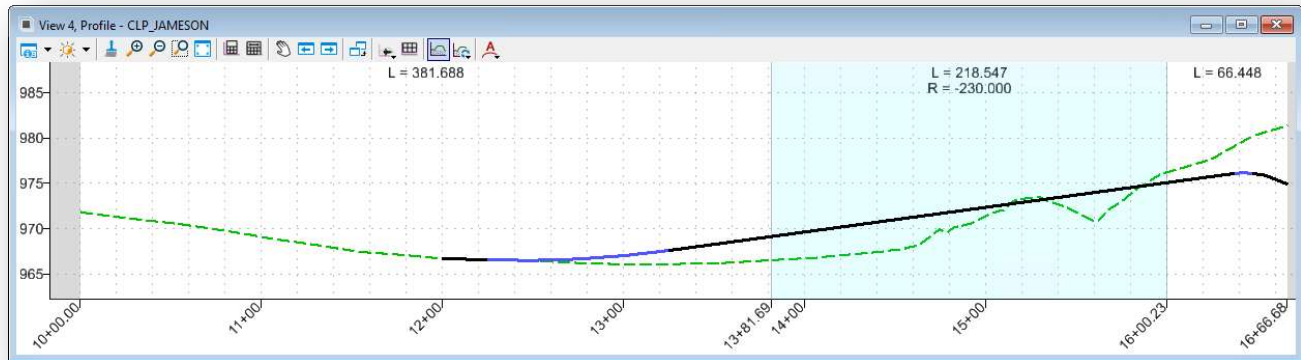


The **Horizontal Geometry Info** option toggles on the display of the geometry tangent length, and length and radius for horizontal curves. This information is displayed across the top of the profile window as shown below.



The **Show Horizontal Control Points** toggles on the display of the station of any key-points in the horizontal alignment across the bottom of the profile view.

The **Station interval** allows keying in an incremental value to show stations across the bottom of the profile window. A value of 100 is shown below.





Profile Commands

The **Profile** view window contains command icons specific to a profile view window as shown below.

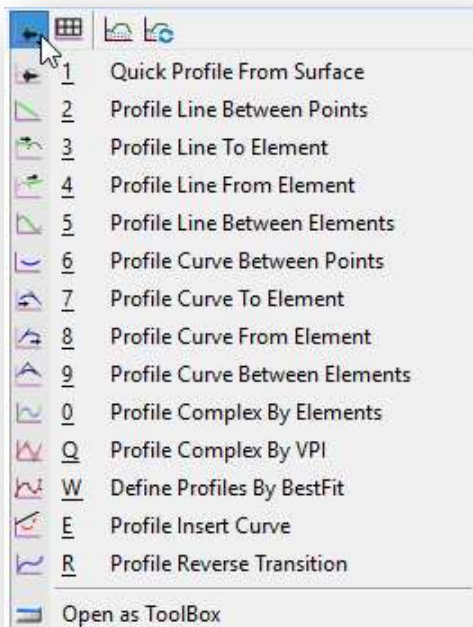


The following commands are available:

- Fit Plan Extents
- Fit Profile Elements
- Vertical Geometry Tools
- Attach All Profile Views
- Create 3d Cut
- Refresh 3d Cut
- Dynamic Annotation: Annotate Element

Vertical Geometry Tools

The vertical geometry tools can be accessed from the profile view's **Vertical Geometry Tools** icon as shown below.



See the online help for information on the individual **Vertical Geometry** commands.

These commands are also available in the OpenRoads ribbon menu by selecting **OpenRoads Modeling > Geometry**



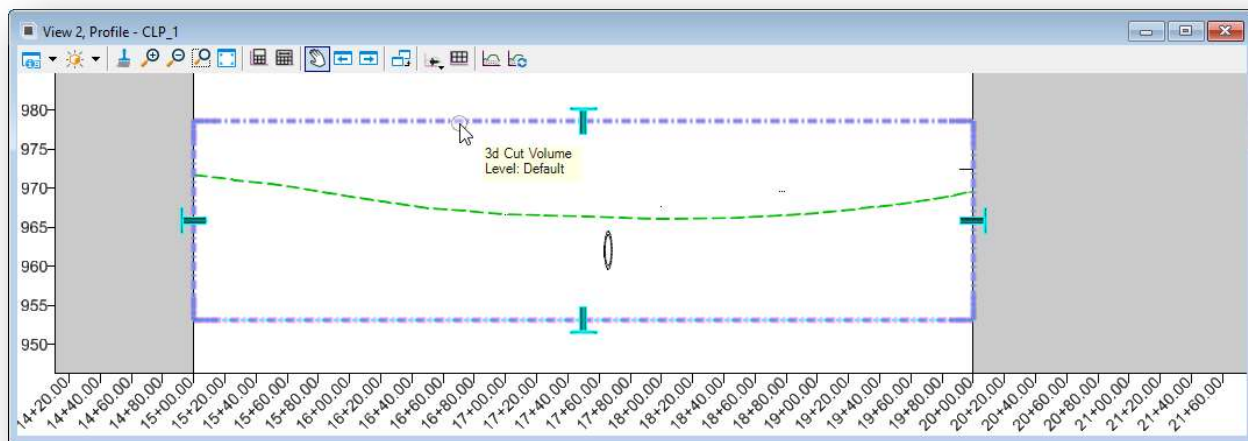
Create 3d Cut/Refresh 3d Cut

3D elements that cross the currently displayed profile, such as underground utilities, another corridor or bridge that passes over the active profile, can be displayed on the profile by choosing the **Create 3d Cut** or **Refresh 3d Cut** commands.

When the 3d profile is created, two Placement Methods are available:

- **Corners** - The **Corners** option allows the user to define a bounding box that defines both the horizontal and vertical extent of the 3D cut.
- **Full Profile** - The **Full Profile** options automatically sets the extents of the 3d cut.

In either case, a bounding box is drawn in the profile view line the example shown below.



When the element is selected, four handles appear that allow adjusting the extents of the bounding area, as shown above.

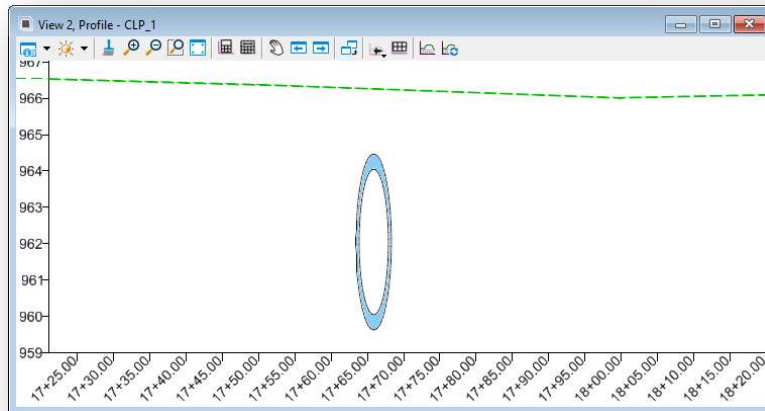
Delete the bounding box to remove the 3d cut from the view.

Use the MicroStation **Select Element** to select the bounding box. Allow the cursor to rest over the bounding element until the pop-up menu appears. Two options are available: **Properties** and **Delete**. Select **Properties** to access the parameters shown below.

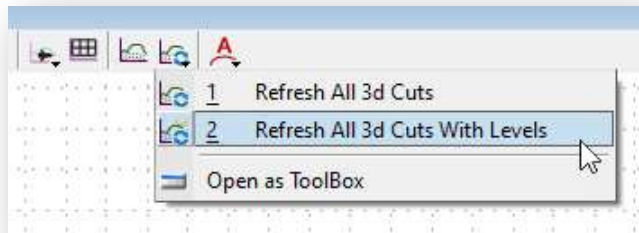
Clip Start Station	True
Start Station	15+00.00
Clip Top Elevation	True
Top Elevation	978.580
Clip End Station	True
End Station	20+00.00
Clip Bottom Elevation	True
Bottom Elevation	953.112
Cut Offset	0.000'



The example below shows an existing 48" pipe that passes under the profile.



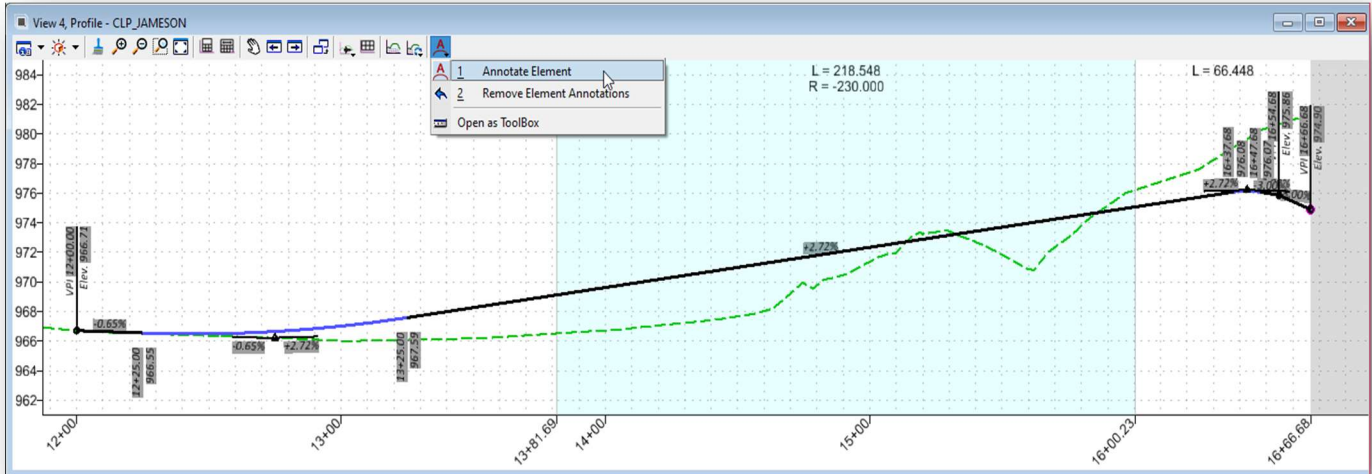
The 3d Cut graphics are a static representation of the elements in the 3d model at the time the 3d cut graphics were generated. To update the 3d cut graphics, the following commands are available in the Profile View window.





Annotate Profile Element

OpenRoads 10.10 adds the ability to annotate a profile directly in the profile window. Commands to **Annotate Element** and **Remove Element Annotations** are available as shown below.



Notes:

These annotations can be useful when working in the profile view, however, the same annotations will be placed in the drawing models when sheets are created.



Profile Pop-Up Menu

Selecting a profile graphic and allowing the cursor to rest on the element reveals a pop-up menu with commonly used commands as shown below.

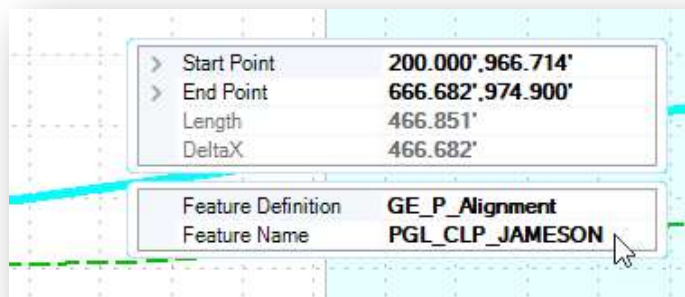


The following commands are available. See the online help for more information not covered in this document

- Properties
- Set as Active profile
- Rules
- Create Best Fit Profile
- Profile Report
- Annotate Element
- Delete

Properties

Select the **Properties** item to access the menu shown below. This is commonly used to edit the **Feature Definition** or the **Feature Name** for the selected profile.



Set as Active Profile

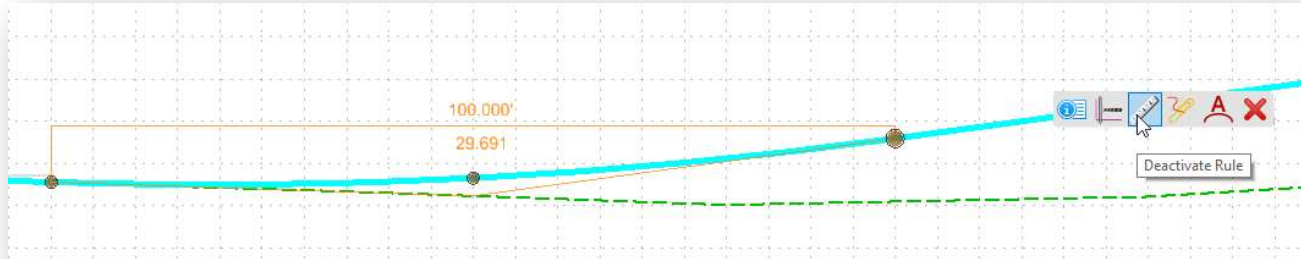
This option is used to set the selected profile as the active profile. Once a profile is set active, it is used as the default profile for subsequent actions such as the corridor modeling process.



Rules

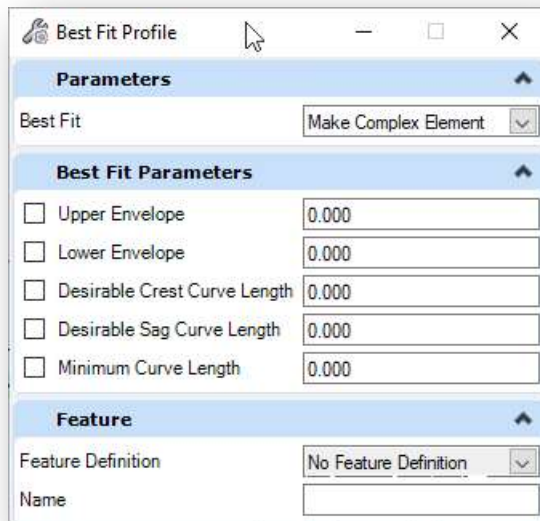
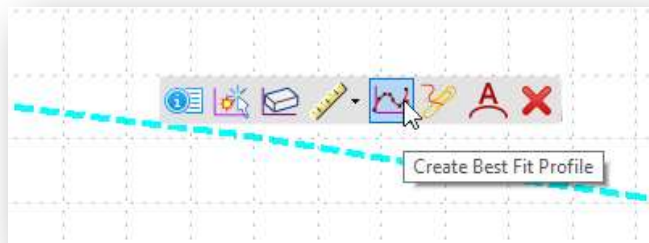
Like the Horizontal Geometry, profile elements have a set of rules that define the element parameters. In the example below, the rules for a vertical curve are shown.

The rules may be activated (unlocked) or deactivated (locked) from the pop-up menu for the selected profile like the example below.



Create Best Fit Profile

For existing alignments, the pop-up menu includes the option to create a best fit profile as shown below.



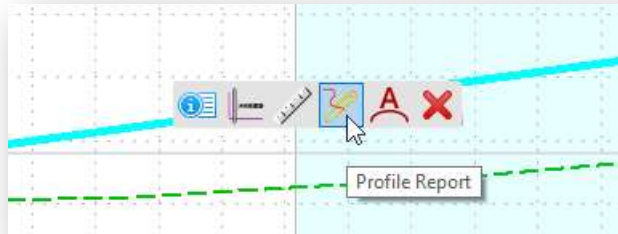
The dialog shown at left is opened.

Various parameters are available to refine the best fit profile that is to be created. See the online help for more information.



Profile Report

Various vertical alignment reports can be generated by selecting the profile using the **Home > Element Selection** tool, and then choosing the **Profile Report** icon from the pop-up menu as shown below.



The default **Vertical Alignment Review Report** is shown below.

Bentley Civil Report Browser - C:\Users\ethomas\AppData\Local\Temp\2\RPTjefgdlk.xml

File Tools

CivilGeometry

- Aquaplaning.xml
- GeometryPoints.xml
- GeometryPointsASCII_CommaDelimited.xml
- GeometryPoints_FeatureNoPath.xml
- HorizontalAlignmentArea.xml
- HorizontalAlignmentCheckIntegrity.xml
- HorizontalAlignmentControlLineDataTable.xml
- HorizontalAlignmentCurveDataTable.xml
- HorizontalAlignmentCurveSetElementReview.xml
- HorizontalAlignmentCurveSetReview.xml
- HorizontalAlignmentEventPointList.xml
- HorizontalAlignmentIntervalXYZ.xml
- HorizontalAlignmentLength.xml
- HorizontalAlignmentReview.xml
- HorizontalAlignmentReviewASCII.xml
- HorizontalAlignmentReviewWithPL.xml
- HorizontalAlignmentStationEquations.xml
- HorizontalAlignmentToTIW.xml
- HorizontalAndVerticalAlignmentReview.xml
- HorizontalElementsTable.xml
- HorizontalElementsTableSimplified.xml
- HorizontalElementsXYZ.xml
- HorizontalRegressionPointsNSlews.xml
- HorizontalRegressionPointsReview.xml
- SettingOutTable.xml
- SettingOutTableDeflection.xml
- Traverse.xml
- TraverseCurveASCII.xml
- TraverseCurveASCII2.xml
- TraverseCurveASCII3.xml
- TraverseEditASCII.xml
- TraversePoints.xml
- VerticalAlignmentCheckIntegrity.xml
- VerticalAlignmentIntervalStationElevationGrade.xml
- VerticalAlignmentIntervalStationElevationGradeAS
- VerticalAlignmentPointsXYZ.xml
- VerticalAlignmentReview.xml**
- VerticalAlignmentReviewASCII.xml
- VerticalAlignmentReviewXY.xml
- VerticalAlignmentSightDistanceReview.xml
- VerticalAlignmentToTIW.xml
- VerticalRegressionLiftsNLower.xml

Vertical Alignment Review Report

Report Created: Monday, October 4, 2021
Time: 9:17:05 AM

Project: Design

Description:

File Name: C:\Bentley_CONNECT\WorkSpaces\OHDOTCEv2\WorkSets\123456\400-Engineering\Roadway\Basemaps\123456_BK005.dgn

Last Revised: 10/4/2021 09:10:25

Note: All units in this report are in feet unless specified otherwise.

Horizontal Alignment: CLP_JAMESON
Horizontal Description:
Horizontal Style: Alignment\GE_P_Alignment

Vertical Alignment: PGL_CLP_JAMESON
Vertical Description:
Vertical Style: Alignment\GE_P_Alignment

		Station	Elevation
Element: Linear	POT	12+00.00	966.71
	VPC	12+25.00	966.55
	Tangent Grade:	1--154	
	Tangent Length:	25.00	
Element: Symmetrical Parabola	VPC	12+25.00	966.55
	VPI	12+75.00	966.23
	VPT	13+25.00	967.59
	VLP	12+44.30	966.49
	Length:	100.00	
	Entrance Grade:	1--154	
	Exit Grade:	1-37	

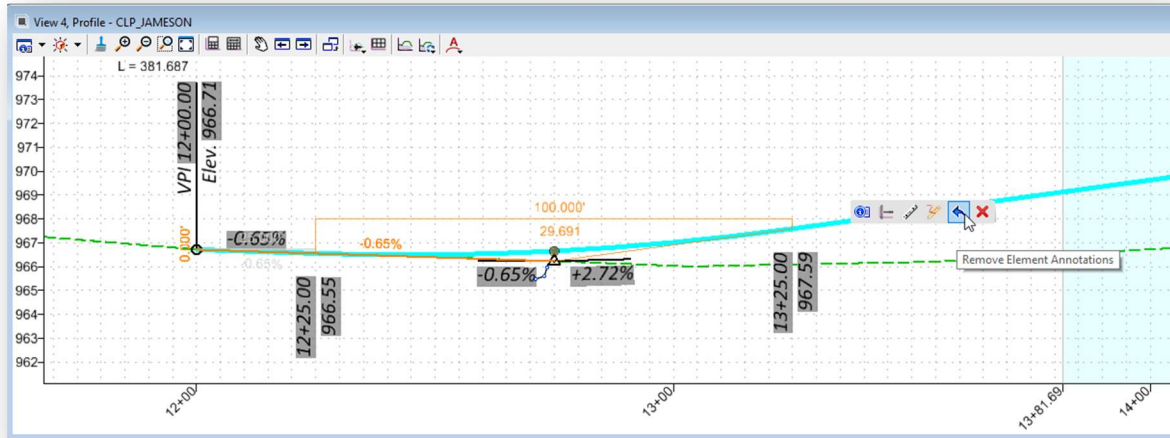
Various report formats can be selected from the list at the left of the dialog.



Annotate Element

The pop-up menu also provides the profile annotation commands, documented previously in this document, that are available from the profile window menu.

The annotations can be removed from a profile that has been previously annotated by choosing the **Remove Element Annotation** option, shown below.





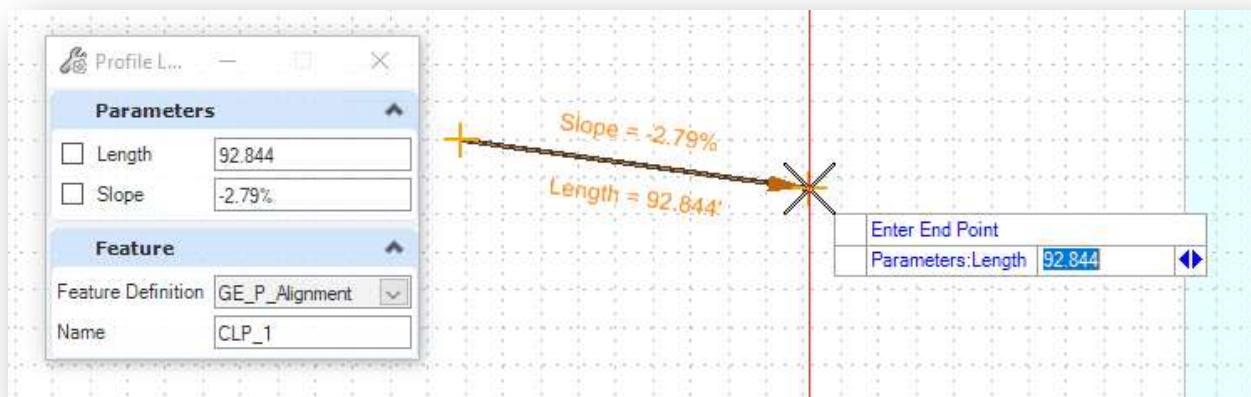
Profile Feature Definitions

The symbology of vertical geometry is defined by Feature Definitions. The vertical geometry feature definitions define the symbology for the profile lines and vertical curves as well as the annotation parameters.

Feature definitions for vertical alignments are typically defined as follows:

- Existing vertical alignments inherit their display parameters from the feature definition that has been assigned to the terrain model that was used to extract the profile.
- Proposed vertical alignments inherit their display parameters from the feature definition that has been assigned to the horizontal geometry that the vertical geometry is associated with.

In the example below, a proposed profile line is drawn using the **Profile Line Between Points** command. The **Feature Definition** option is set to use the **Alignment > GE_P_Alignment** feature. This sets the symbology for the vertical geometry since the alignment feature definition also includes the profile feature parameters.

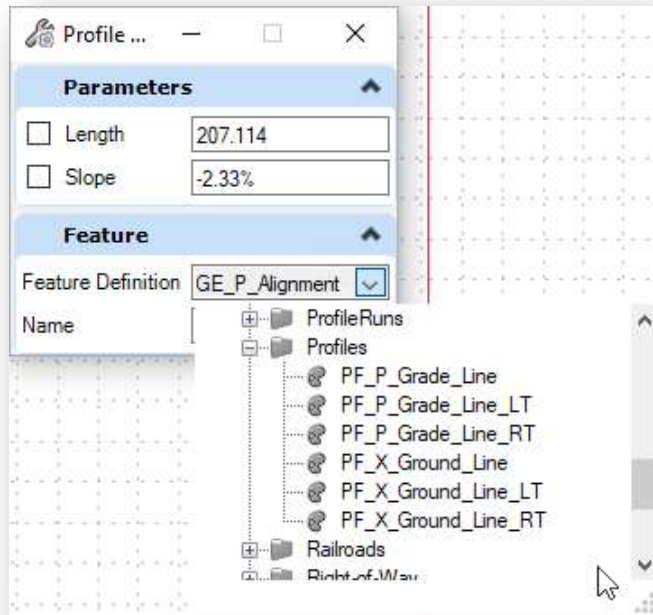


The feature definition is defined to differentiate between the tangent lines and vertical curves. Proposed profiles are defined to display the vertical curves with color 58, and tangent lines with color 0, as shown below.





There are cases where the user may need to display the profile information using different symbology other than the parameters defined with the horizontal geometry feature definition. The OHDOT Workspace includes additional features for profiles in the **Linear > Profiles** category as shown below.



Linear > Profiles > PF_P_Grade_Line

This option is typically used for utility profiles with no annotation definitions for vertical curve data

Linear > Profiles > PF_P_Grade_Line_LT

Linear > Profiles > PF_P_Grade_Line_RT

Linear > Profiles > PF_X_Grade_Line_LT

Linear > Profiles > PF_X_Grade_Line_RT

These features are used for divided highways to draw the profile graphics on separate levels with different symbology's. This allows the user to turn on/off the levels for a specific left or right profile while designing the proposed vertical geometry with less clutter onscreen.

There are also profile definitions under the **Linear > Profile Runs** category. These features are used with Drainage and Utilities functions and are not used for vertical alignments.



OpenRoads Software Version

This document was prepared using the following software version:

OpenRoads Designer CONNECT Edition – 2021 Release 1 Update 10 – Version 10.10.01.03

This document was updated using the following software version:

OpenRoads Designer CONNECT Edition – 2021 Release 2 Update 10 – Version 10.10.21.04

Contacts

For any questions, suggestions, or problems with this document please contact the ODOT Office of CADD and Mapping Services by use of the following form on the ODOT website:

https://odot.formstack.com/forms/cadd_servicerequest
