INDOTWISE 5.2

Plans Production Guide

INDOT CAD Support

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1. OpenRoads Designer Basics

OpenRoads technologies are integrated with ProjectWise. As such, the ProjectWise Managed Workspace delivers OpenRoads configurations and template files within the managed ProjectWise environment. Throughout this document, specific functionality of OpenRoads with ProjectWise will be called out and expanded on in a workflow specific manner.

1.1 OpenRoads Designer vs. InRoads: What is the Difference?

It is important to distinguish the differences between the current OpenRoads Designer environment and the InRoads environment that has existed up to this point. This document will try to highlight some of these differences, but the following items will shed some light on the specifics.

InRoads and Native Tools – These are the tools and file formats that would be recognizable from the SS2, SS4, and SS10 versions of InRoads. Native tools are those that are located on the InRoads Explorer, so items like Annotations, Plan and Profile Generator, and the like. These references may also include the old file formats such as ALGs, DTMs, etc.

OpenRoads and OpenRoads Technologies – While working with the OpenRoads Designer application, there is no need for a separate application such as InRoads to create alignments (ALG's), terrains (DTM's), sheets, etc. OpenRoads Designer is designed to handle all aspects of roadway modeling and plan sheet creation in one application. For INDOT purposes, the major areas where this functionality will be used are items such as OpenRoads Survey, Terrains, Civil Geometry, Corridor Modeling, and Cross Sections—features that are not found in the old InRoads toolset.

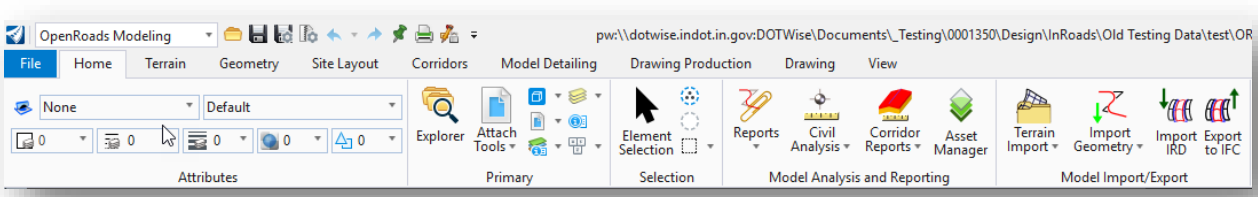
1.2 The OpenRoads Designer UI

The following sections will review the specific interface Workflows and Project Explorer items that you can expect to see when working with OpenRoads Designer. Note that most of these are OpenRoads specific and will not be available in other MicroStation Platform products.

1.2-1 OpenRoads Designer Workflows

For a more in-depth discussion of the MicroStation Platform interface, and additional information on interacting with workflows, please refer to the INDOTWise 5.2 MicroStation module.

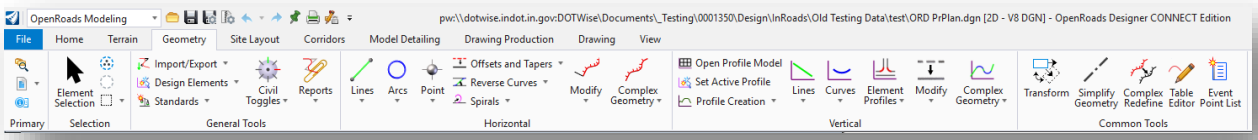
This subsection will cover each of the workflows in OpenRoads Designer, along with a brief description of their purpose. Before doing so, it should be noted that each workflow—with the exception of the SignCAD workflow—has a Home tab that has commonly used tools/functionality such as the assignment of attributes, reference attachment, model display, element selection, etc.



Home Tab

1.2-1a OpenRoads Modeling Workflow

The OpenRoads Modeling workflow is designed to guide the user in modeling various design elements such as terrain, geometry, parcels, corridors, etc. Each of these design elements has its own specific tab in the workflow.



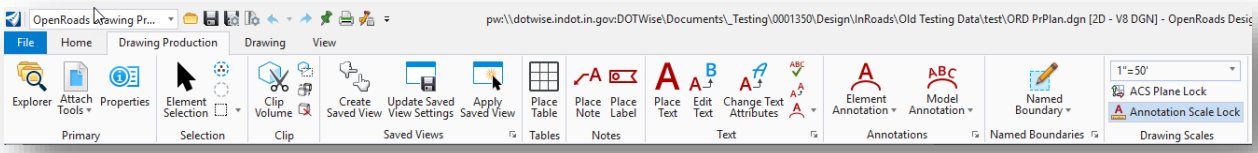
OpenRoads Modeling Workflow

The Drawing Production, Drawing, and View tabs are more specific towards the production of drawings—which will be covered next in the discussion of the OpenRoads Drawing Production workflow.

1.2-1b OpenRoads Drawing Production Workflow

The OpenRoads Drawing Production workflow contains three workflow-specific tabs:

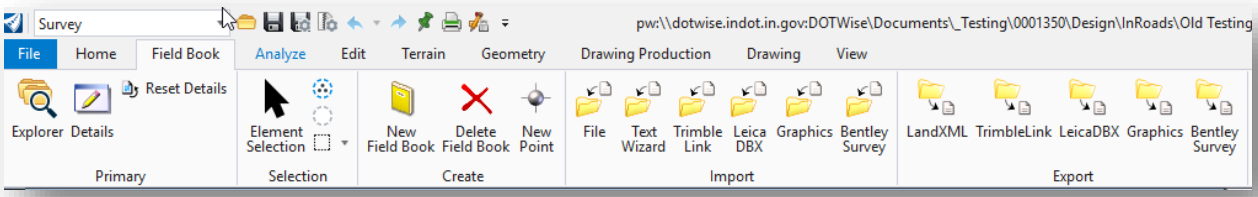
- Drawing Production: Used to place text, annotations, create named boundaries that are used to cut sheets, set the drawing scale, etc.
- Drawing: Used for general drafting work on a drawing.
- View: Used to manipulate the display of the current view.



OpenRoads Drawing Production Workflow

1.2-1c Survey Workflow

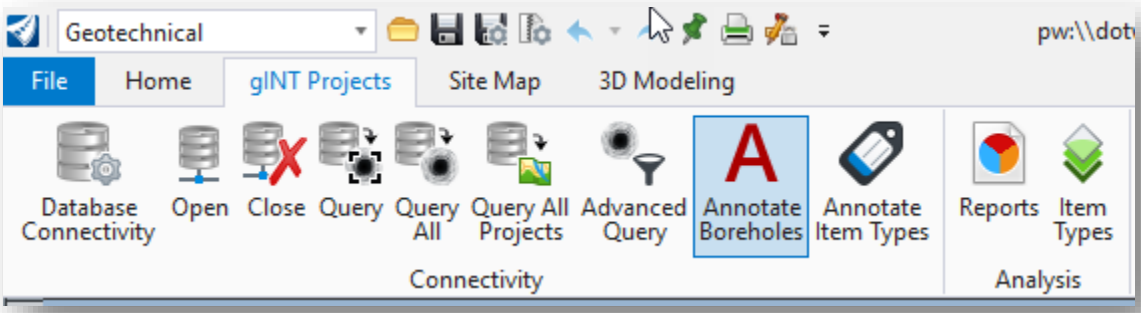
The Survey workflow contains tools that are specifically geared towards generating survey data such as field books, terrain, survey annotations, etc.



Survey Workflow

1.2-1d Geotechnical Workflow

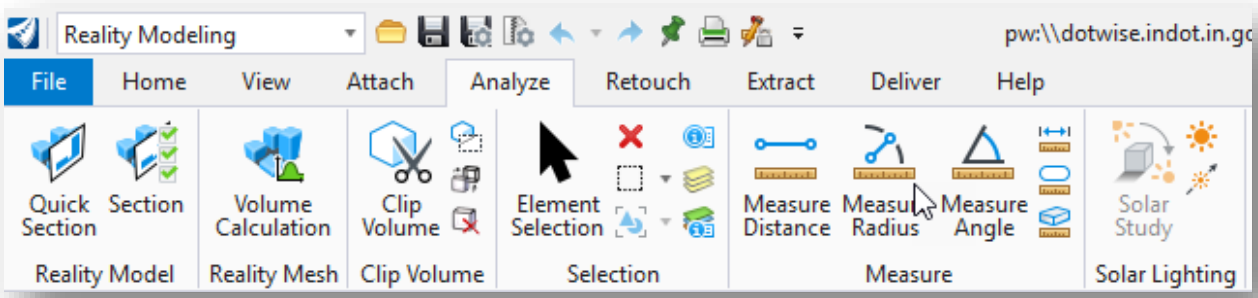
The Geotechnical workflow is designed to assist with adding geotechnical information to a design model.



Geotechnical Workflow

1.2-1e Reality Modeling Workflow

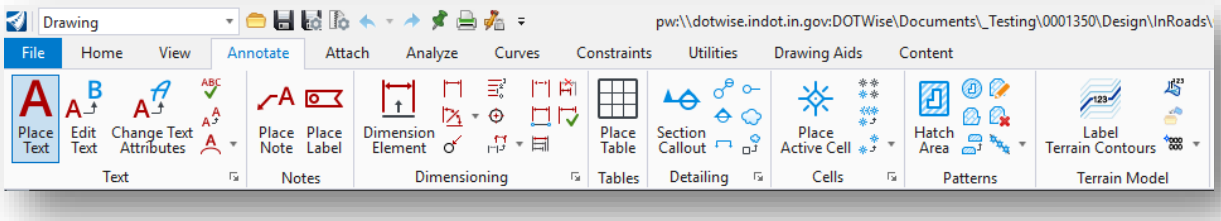
The Reality Modeling Workflow provides tools to enhance the design model with various effects such as reality meshes and models, raster images, and point clouds.



Reality Modeling Workflow

1.2-1f Drawing Workflow

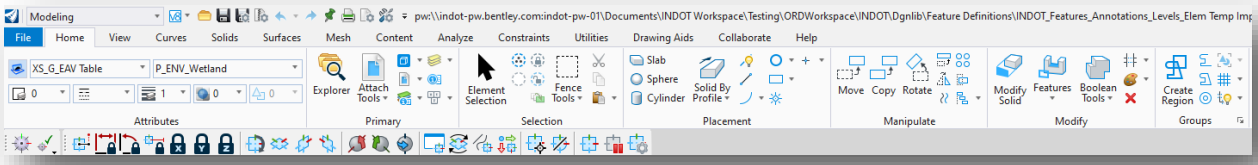
The Drawing workflow provides tools to draw elements in a model, annotate a model, measure specific elements, among many other tools.



Drawing Workflow

1.2-1g Modeling Workflow

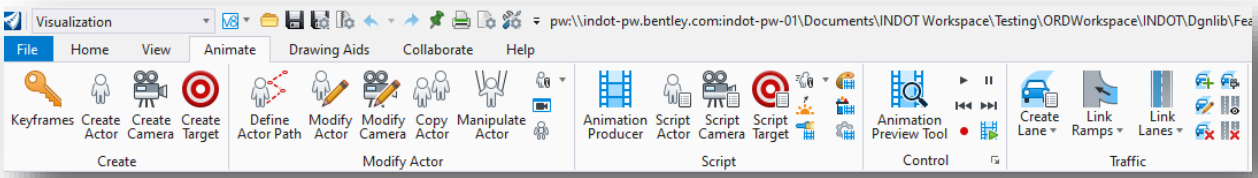
Only visible in 3D models/files, the Modeling workflow provides tools to create and/or modify various 3D elements.



Modeling Workflow

1.2-1h Visualization Workflow

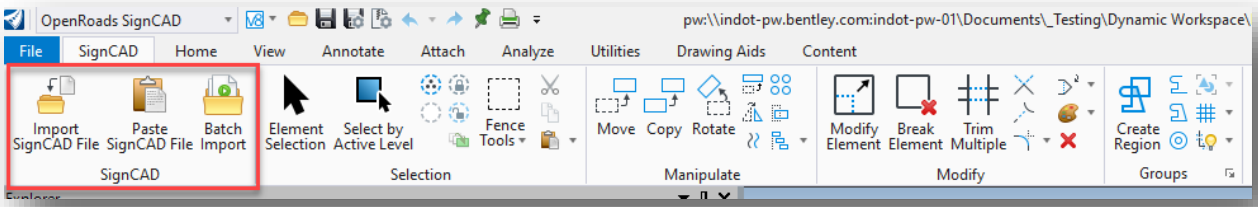
Only visible in 3D models/files, the Visualization workflow allows you to create animations for your design content.



Visualization Workflow

1.2-1i OpenRoads SignCAD Workflow

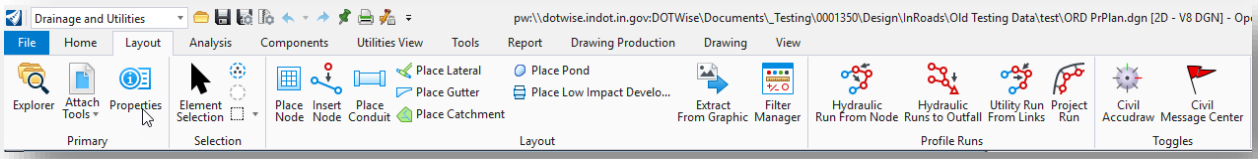
The OpenRoads SignCAD workflow—if enabled for an individual user—provides tools to import and paste sign files (.sgn) directly from the OpenRoads SignCAD sign libraries. Of particular interest for this purpose is the SignCAD tab in this workflow.



OpenRoads SignCAD Workflow

1.2-1j Drainage and Utilities Workflow

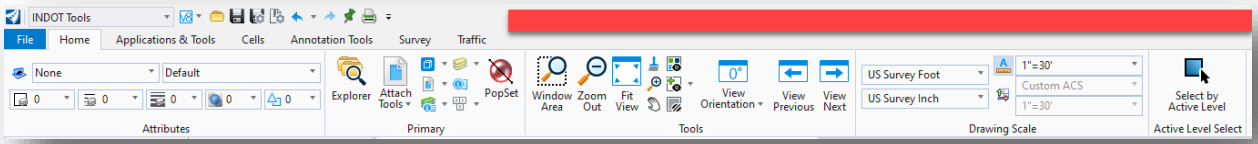
The Drainage and Utilities workflow contains tools to create and place various drainage and utility-related elements to a design model.



Drainage and Utilities Workflow

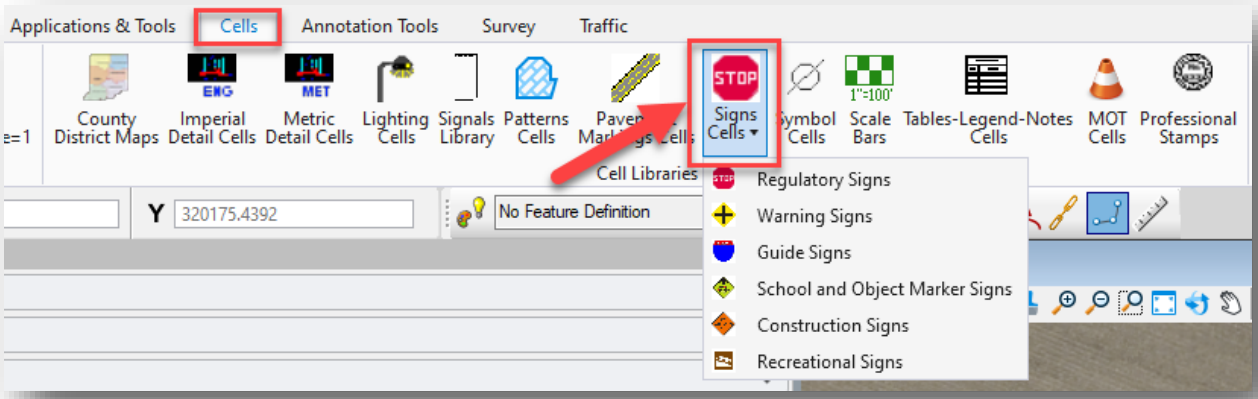
1.2-1k INDOT Tools Workflow

The INDOT Tools workflow contains INDOT-specific tools that are specific to the workspace. From this workflow, users can launch the AutoTurn application, add title block integration, connect to INDOT cell libraries, among many other tasks.



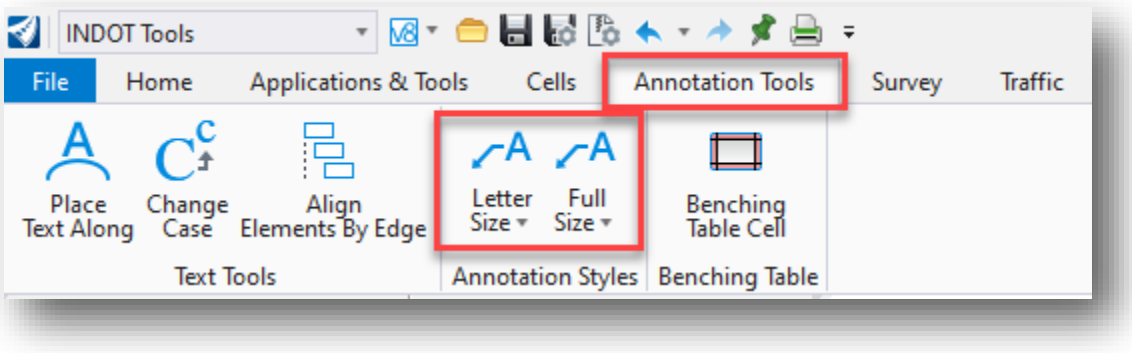
INDOT Tools Workflow

There are a few dropdown menus in this workflow to pay attention to. The first is the Signs Cells dropdown on the Cells tab—which provides a connection to each of the traffic sign cell libraries.



Signs Cells Dropdown Menu

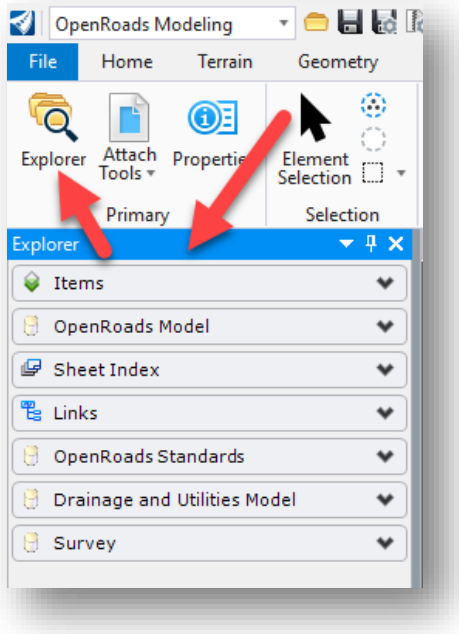
The other two are the Letter Size and Full Size dropdown menus on the Annotation Tools tab—which provide specific annotation styles for Letter Size and Full Size Sheets respectively.



Letter Size and Full Size Dropdown Menus

1.2-2 Project Explorer

The Project Explorer interface allows you to browse and manage content within an OpenRoads Designer file.



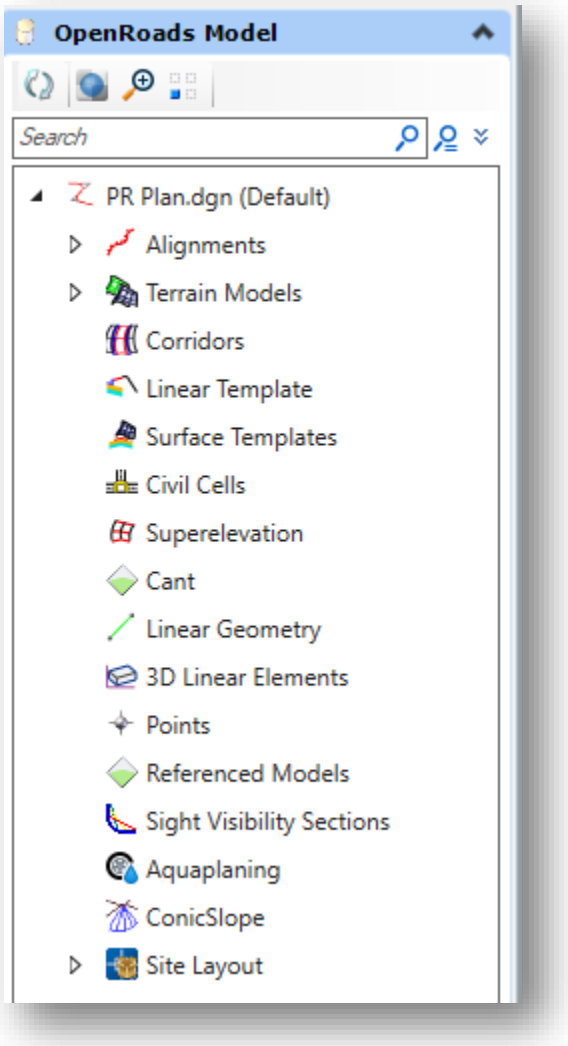
Project Explorer (docked on left side of user interface)

Note: If the Project Explorer interface does not display automatically upon opening OpenRoads Designer, you can open it manually by navigating to the Primary button group in most workflows, which should contain an Explorer button to launch Project Explorer. Once opened, you can then dock it on the interface as desired.

The remainder of this section will give a brief overview of the different tabs in Project Explorer.

1.2-2a OpenRoads Model Tab

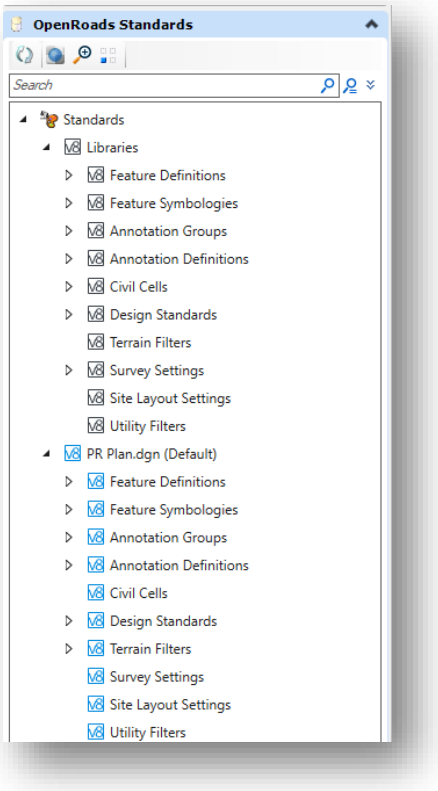
The OpenRoads Model tab displays information on any modeling components (alignments, terrains, corridors, templates, etc.) that are contained within the file.



OpenRoads Model Tab

1.2-2b OpenRoads Standards Tab

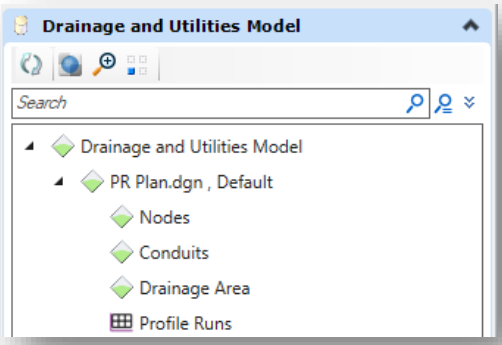
The OpenRoads Standards tab shows the various CAD standards that have been applied within your active design file. It also allows you to see the components of the various standards libraries that have been implemented into the workspace.



OpenRoads Standards Tab

1.2-2c Drainage and Utilities Model Tab

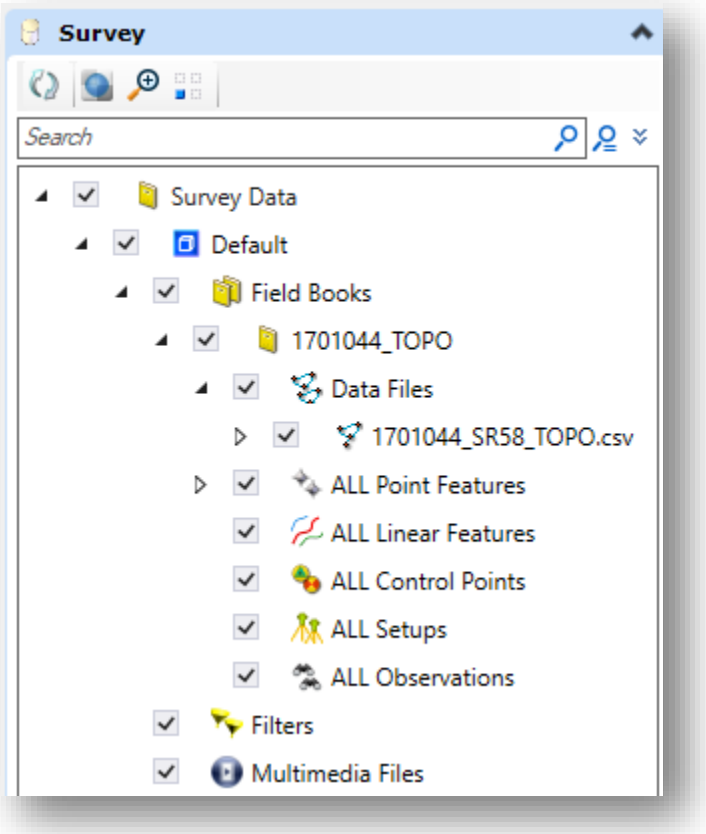
The Drainage and Utilities model tab lists all the drainage and utility-related elements that have been added to the file via the Drainage and Utilities workflow.



Drainage and Utilities Model Tab

1.2-2d Survey Tab

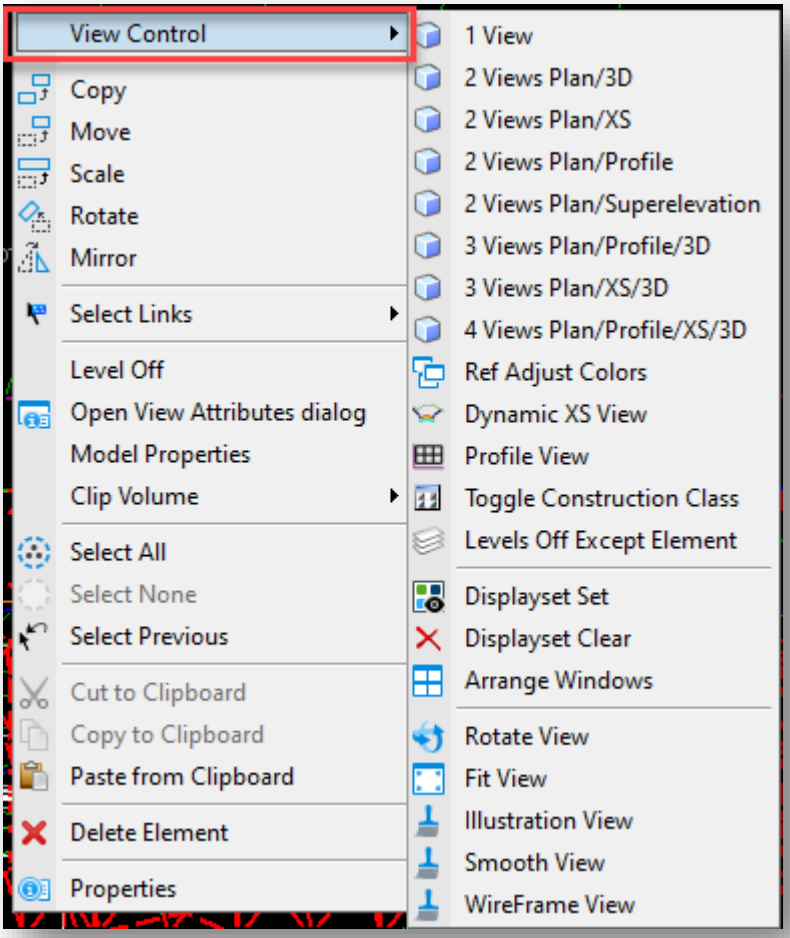
The Survey tab shows all the survey data that has been imported into the file. It lists the name of the fieldbook that was created, the data file it was created from, and all the features, control points, setups, and observations that are associated with the survey data. More information on how to import survey data into an OpenRoads Designer file is covered in Chapter 6.



Survey Tab

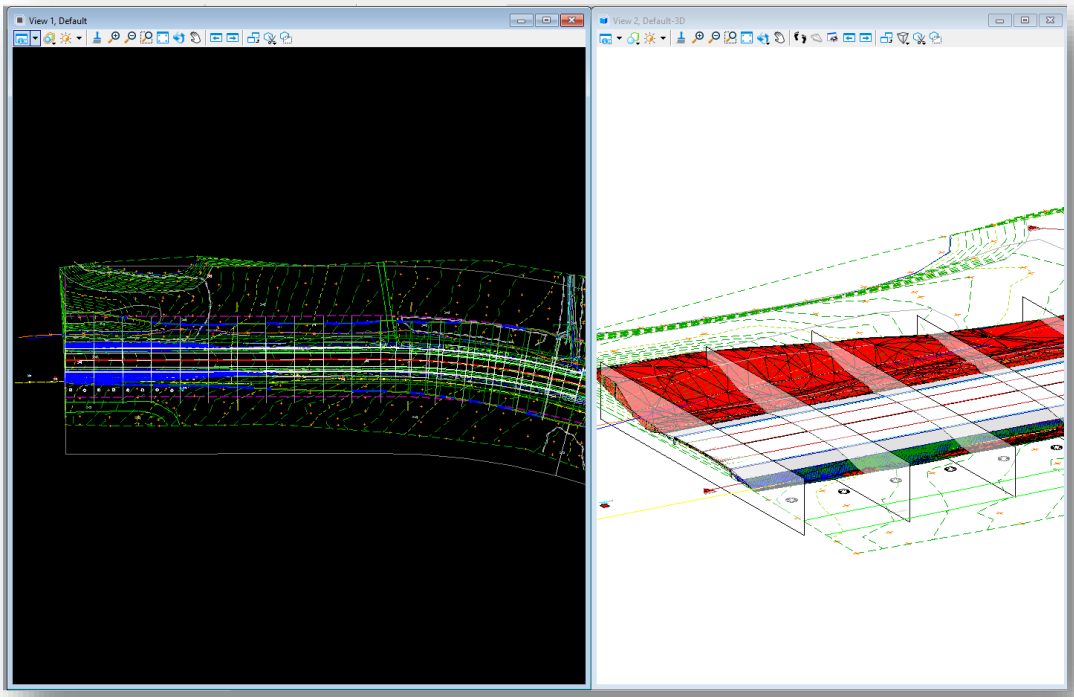
1.2-3 The View Control Right Click Menu

The View Control Menu in OpenRoads Designer allows the user to view a design from many different perspectives. From this menu, users can open a new view to view designs in 3D, in cross section view, in profile view, along with various other view commands such as quickly toggling the view presentation, toggling construction elements, and various zoom and rotation commands. To access this menu, simply click and hold the right mouse button in the active view. Then hover over the arrow in the View Control field in the menu that appears to access the view options.



View Control Menu

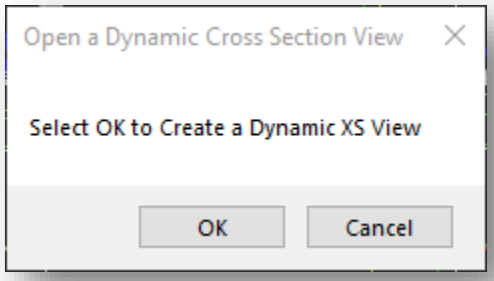
As you can see, there are several options to choose from. To illustrate an example, here is what happens to the display when the 2 Views Plan/3D option is selected when you only have a plan view currently displayed:



2 Views Plan/3D

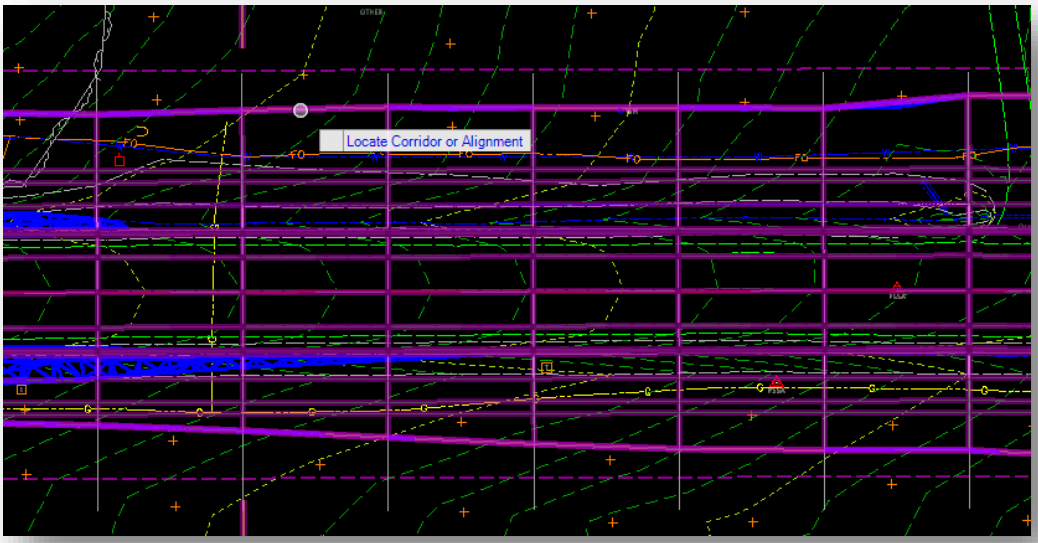
As you can see, ORD splits the display into the standard 2D plan view and a 3D view. For future reference, this is the view display that is necessary to create cut cross sections from, as you need to have a 3D view open and active to perform the operation.

To illustrate another example, here is what happens with the 2 Views Plan/XS option. Note that upon selecting this option, you will first be prompted to create a dynamic cross section view. Click OK at the prompt to proceed. A new view will be opened.



Create a Dynamic Cross Section View

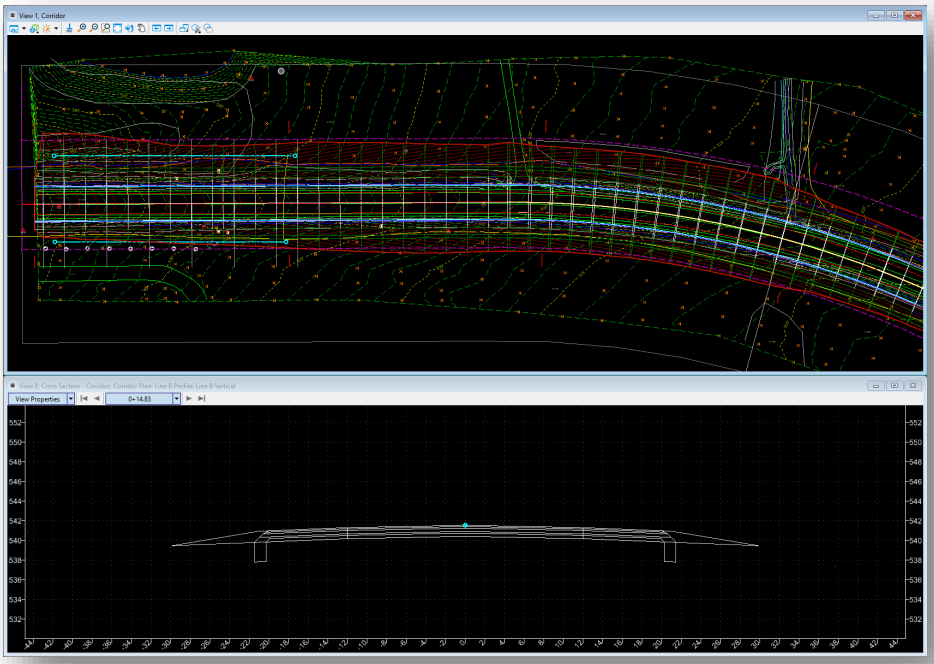
You will then be prompted to locate your corridor or alignment to view cross sections along. Select your corridor or alignment.



Selecting Corridor or Alignment

Finally, you will be prompted to select/open a view to place the dynamic cross section view in. In this example, select the view that was automatically opened.

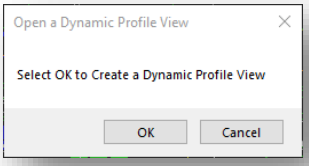
Then click in the open view to place the dynamic cross section viewer. Your views will then be tiled to show both views and their respective content.



2 Views Plan/XS

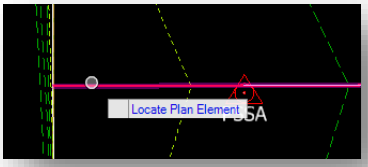
Note that the cross-section view being displayed is dynamic, where you can adjust the stationing as necessary to display the cross sections along a corridor or alignment.

The final example is the 2 Views Plan/Profile option. As its name implies, it will place a profile view in conjunction with the plan view. Note that you upon selecting this option, you will first be prompted to create a dynamic profile view. Click OK to proceed. A new view will be opened.



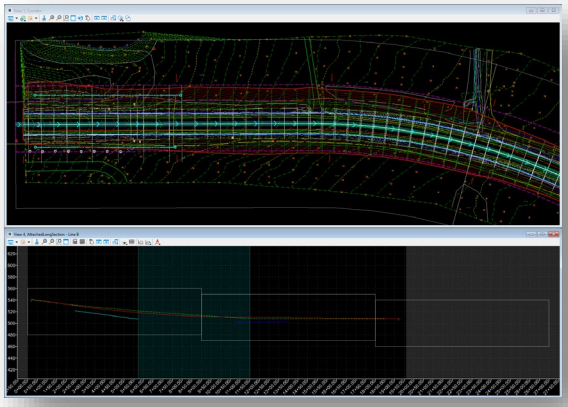
Create Dynamic Profile View

You will then be prompted to select your horizontal alignment (or "Plan Element" as it is referred to in the prompt).



Selecting Horizontal Alignment

Once the horizontal alignment is selected, you will be prompted to select an open view to place the profile viewer into. In this example, the newly opened view will be selected. Then click inside the new view to place the profile display.



2 Views Plan/Profile

The remainder of the options pertaining to the number of views to display are variations of these examples that have been shown. The rest of the options in the menu after that are self-explanatory and perform the function listed.

1.3 OpenRoads Designer Standards and Seed Files

This section will discuss the location of INDOT-specific OpenRoads Designer standards and seed files for use with the application. All OpenRoads Designer files except DGN seed files will be found under folders within the following ProjectWise path: Documents\Template Documents\ORD-Connect Seed. It is highly advised that users do not interact directly with files under this location as the underlying OpenRoads technology requires that the workspace maintains a high degree of integration.

1.3-1 ITL File

As of the release of the InRoads/OpenRoads SS4 workspace, a customized agency template library has been created and is now available. It contains several default templates configured with agency specific feature, component, and point naming. It also contains the relevant templates used by the agency civil cells.

These templates can be found under the Template Library folder, in the INDOT.itl file. Like the XIN file that was used with InRoads, this library is automatically attached at startup.

1.3-2 Civil Cells

With the migration to InRoads SS4 and OpenRoads technology, the workspace now contains several Civil Cells. These can be found under the Civil Cells folder and are attached automatically at startup. Note that these are DGNLib files, and direct customization will not be available.

1.3-3 Cell Libraries

All INDOT cells for use with OpenRoads Designer can be found under the Cell folder. There are several cell libraries in use under this folder:

- IN_InRoads.cel
- IN_MOTCells.cel
- IN_PE-LS-Stamps.cel
- IN_Signs_Construction.cel
- IN_Signs_Guide.cel
- IN_Signs_Recreational.cel
- IN_Signs_Regulatory.cel
- IN_Signs_School-ObjectMarkers.cel
- IN_Signs_Warning.cel

The first library is used by the Aerial Survey group for topographical collection. The second library is used for the display of point features in the topographical surface and other items such as cells placed for title sheet integration and north arrows. The third library contains cells that are specific to denoting Maintenance of Traffic (MOT) operations on plan sheets. The fourth library contains cells with digital versions of Professional Engineer and Land Surveyor stamps. The remaining libraries contain traffic sign cells, categorized by sign type.

1.3-4 Plans Production – Sheet Borders

The files located under Sheet Borders are used in the creation of all plan sheets. Discussion of these files will be expanded with their usage in the Plans Production workflow.

1.3-5 OpenRoads Designer DGN Seed Files and the Importance of File Associations

OpenRoads Designer allows for any DGN or model in a DGN to be a container for OpenRoads elements at any time. As such, the first item required when starting an OpenRoads Designer project is the appropriate unit DGN seed file. For all new projects that are created after the Fall 2013 release of the Indiana Design Manual Part 1 (Ch. 106, Section 26-1.01 memo requiring Geo-Coordinated seed files), you will be provided a Survey seed file in the pw:\\indot-pw.bentley.com:indot-pw-01 \Documents\District\Des No.\ Survey\Project Files folder of your project with the following naming convention: Des #_SRxx Seed 2D.dgn and Des #_SRxx Seed 3D.dgn. These seed files are used to set the coordinate system for every OpenRoads Designer-based file in your project. Each will already have the properly selected working units for your project. If you are a consultant working on an INDOT project and do not have access to the Survey\Project Files folder, please contact your surveyor to request the newly required geo-coordinated seed files.

Your project might fall outside the requirement window of the new design memo, so you may continue to use the previous method of creating your own seed file (or possibly ask the Surveyor if they can create one for you). The files you will need are located with the rest of the INDOT-specific ProjectWise seed files. They can be found at pw:\\indot-pw.bentley.com:indot-pw-01\Documents\Template Documents\ORD-Connect Seed\.

At the root of this location, 2 seed files have been provided, corresponding to the units of measurement used in current INDOT projects. These are:

- INDOT_US_SVFT_3Dseed.dgn
- INDOT_US_SVFT_2Dseed.dgn

Please note that both 2D and 3D versions of each file have been made available. OpenRoads technology allows for the full use of civil data regardless of the availability of the Z axis. For instance, when showing 3D OpenRoads elements in a 2D seed file, a 3D model will automatically be created as needed. Throughout the remaining chapters, care should be given to what seed file a particular function would best function in. For example, if working with survey and terrains, users need to utilize 3D seed files. Also, if working with corridor modeling, users should be utilizing 2D seed files.

These files are configured with Design History disabled to remove compatibility errors caused by the rapid display and deletion of elements during the design process.

Finally, as OpenRoads Designer is integrated with ProjectWise, these seeds are configured with their application association set to OpenRoads Designer, causing OpenRoads Designer to launch when the files are checked out and opened.

1.3-6 ProjectWise

1.3-6a Project Creation

The first step in working with OpenRoads Designer and ProjectWise is the creation of your project. At this time, the Design project template has been set up to have distinct OpenRoads Designer folders separate your data. As always, if your project does not yet have a Design folder, please create the project/folder using the DOTWise Project Creator.

1.3-6b Survey Provided Files

When starting an OpenRoads Designer project, you can expect having access to the following files:

FOR ORD PROJECTS

1. Des #_SRxx Survey Fieldbook.dgn - Contains Fieldbook information for TOPO and Control Points in the OpenRoads Format (survey fieldbook) along with the existing terrain model. This will be done in a 3D model.
2. Des #_SRxx Survey Alignment.dgn - Contains Survey alignment(s) in the OpenRoads Format (civil data – linear elements). This will be done in a 2D model.
3. Des #_SRxx LCRS Plat.dgn - MicroStation plat DGN

To begin a project, it is recommended to copy the Alignment and Terrain DGNs that Survey provides into your Design\OpenRoads Designer folder in ProjectWise. These are the base files you will start your project from and should be available in a read-write location as you will be directly interacting with them.

With these files copied into your project, it is suggested to rename the DGN containing the survey alignment to Des #_SRxx Design Alignment.dgn. This will alleviate confusion and specifically denote that this file is for the proposed alignments while maintaining the collected information from the Survey alignment.

1.3-6c Base Drawing Creation

To start creating a project, the only item required is a base DGN to start the product with. Using the advanced document creation wizard, you can create your base drawings using the unit appropriate seed file as noted in Section 1.3-5. The INDOT base drawing naming convention will still be used.

Project information will be organized into several base drawings. The information is separated based on categories of information included. These base drawings are the locations for all line work. Most base drawings will be created while in OpenRoads Designer. By using OpenRoads-based referencing tools, a base drawing can be enhanced to view other base drawing information as a backdrop. Please refer to the INDOT Wise MicroStation module for a summary of base drawings and recommended naming. Below is a list of Standard Base Drawings to be used at INDOT and descriptions of their contents. Other names are possible based on project needs.

Standard Base Drawings		
Drawing Names / Logical Names	*Descriptions / Reference Descriptions*	*Examples*
Survey Alignment	Survey Centerline	Des #_SRxx Survey Alignment.dgn
Survey Section Corner	US Government Section Corners	Des #_SRxx Survey Section Corner.dgn
Survey Fieldbook	Survey Existing Topography and Contours	Des #_SRxx Survey Fieldbook.dgn
Prplan	Proposed Design Strings	Prplan.dgn
RW Existing scale	Existing Right of Way	RW Existing.dgn
Design Alignments	Design Alignments	Design Alignments.dgn

If your project is anticipated to require multiple scales, it may be desirable to create multiple base drawings at those scales. Creating the multiple scaled drawings is easily done by creating a new plan display titled appropriately for the scale to be created, and then displaying the appropriate models at the desired scale. Some examples of scales and various usages are presented below.

Using this procedure makes it extremely easy to vary the scale of a sheet by simply picking the base drawings that have the desired scaling when referencing into the OpenRoads Designer drawings. From this point forward, the 1” = 30’ scale will primarily be used in this documentation. Note that the scale will vary with projects, and other scales can be developed using the same procedures as described.

US Scales

Scale	***Typical Uses***
1” = 20’	Construction details and other detail drawings.
1” = 30’	Bridge Layouts and Constuction Details and Plan profiles
1” = 50’	Most common scale used in plan and profile sheets and plan drawings.
1” = 100’	Pavement marking plans, and other miscellaneous sheets. Pavement markings are unreadable at this scale.

Note: OpenRoads technologies make substantive use of the Annotation Scaling tools for element and feature display. When discussing multiple scaled base drawings, it may be beneficial to create a single base drawing and then scale the content through using the scaling settings available on reference files.

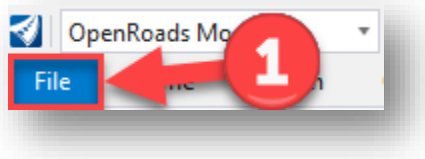
1.4 Opening, Closing and Saving OpenRoads Files from ProjectWise

With the integration of OpenRoads Designer and ProjectWise, procedures for opening, closing, and saving files in OpenRoads Designer differs from these functions as shown in training. As with MicroStation and other integrated applications, standard Open and Save dialogs are replaced with ProjectWise integrated dialogs with extended functionality. Please keep in mind that these options will be used when working with the legacy file formats of the InRoads software.

1.4-1 Opening Existing Files

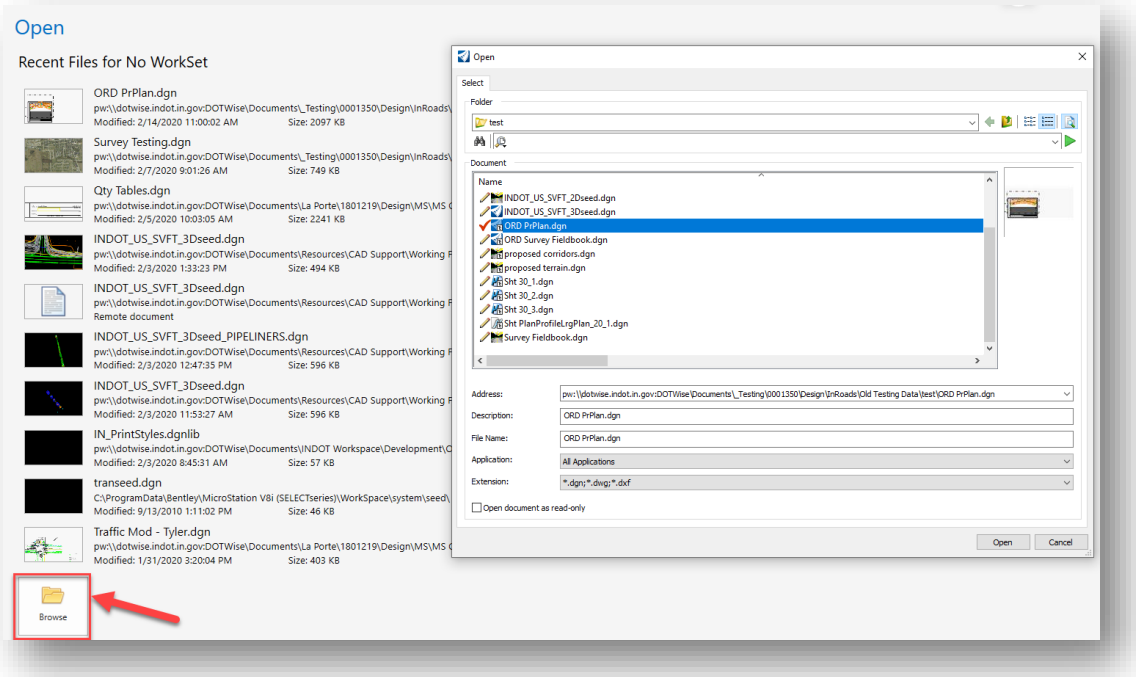
Note: In most cases, OpenRoads files will be opened directly from the ProjectWise Explorer. The following method can be used when switching between files, but it should be noted that doing so could result in being prompted to reload the workspace/application.

To open a file from within OpenRoads Designer, first click on the File tab.



File tab

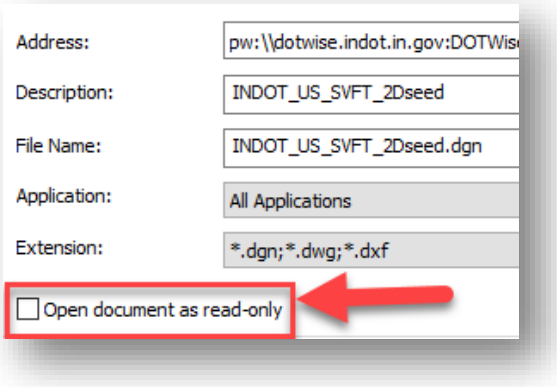
Then on the File menu, the Open command should be automatically selected, and a list of recently opened files for the current WorkSet will then appear. If the desired file to open is in the list, clicking on it will open it. If the desired file is not in the list, click the Browse button to open the Open dialog:



Opening ProjectWise-Based Files from OpenRoads Designer

If you wish to narrow down the list of files by application, that application can be selected from the Application field—which contains a list of applications that have been defined in the ProjectWise environment.

Additionally, you may selectively open a file in a read only mode by selecting it in the Open dialog and enabling the check box for open it as read only:

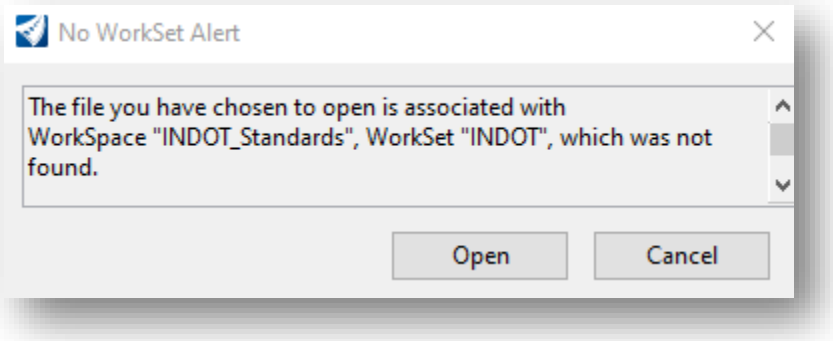


Adding Files to an Open list/Read Only

1.4-1a Workspace/Workset Association Warning

In OpenRoads Designer, users will find that all files have the workspace/workset definition for their project burned into the DGN as it is used. With the myriad of external firms that INDOT works with, it will be very common to find files that are associated with different workspaces/worksets than what is made available in the ProjectWise Managed Workspace.

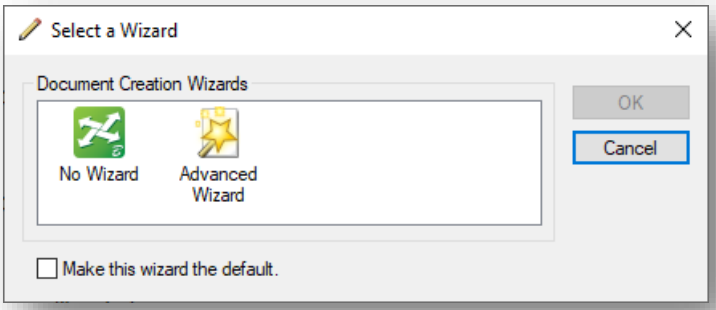
The following warning will be common if you're starting with files that were created using a version of our external workspace, or another firm's modification of the workspace made available publicly. Most often, this will be seen when starting with survey data provided by an external firm.



This is simply a message indicating that the file is associated with a different workspace and workset than what we have configured in ProjectWise and will not prevent you from opening or working with the files as you typically would. If you want to unassociate and reassociate the files from/to the ProjectWise workspace, a pair of key-ins are available to perform this action and can be found in the linked technote: [How to remove the workset association in a dgn file - OpenRoads | OpenSite Wiki - OpenRoads | OpenSite - Bentley Communities]

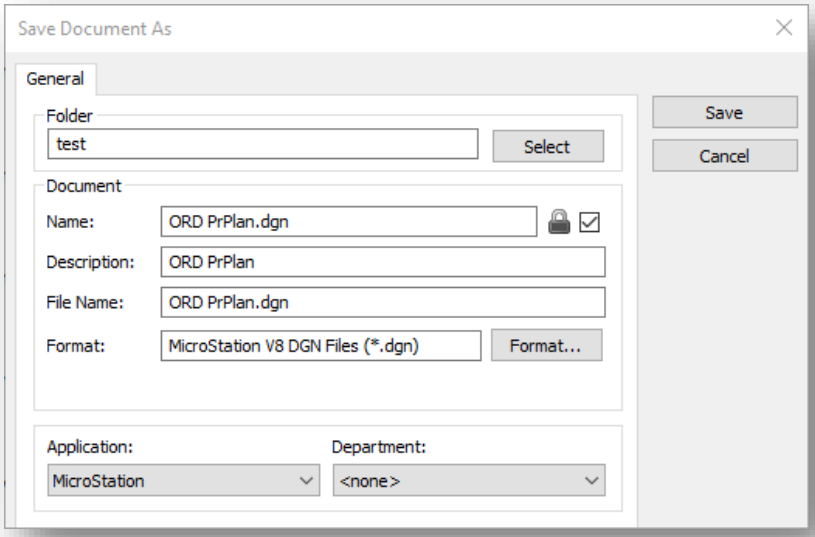
1.4-2 Saving New Files

When performing a Save for the first time, or a Save As on an existing file, you will be presented with an OpenRoads Designer/ProjectWise specific Select a Wizard dialog, as shown below:



Select a Wizard Dialog

It is suggested to select the No Wizard option and click OK to bring up the Save Document As dialog:

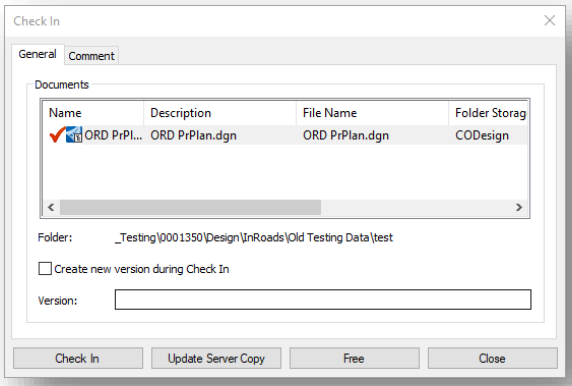


Save Document As Dialog

All ProjectWise Save dialogs require you to define your project folder, document name, file name, and description. It is still recommended that you maintain the same naming convention—at least for the document and file names. Also, it is very important to make sure the application is appropriately set to the file type you're attempting to save to, as the dialog does not assume the file type you're saving.

1.4-3 Closing Files

When closing files from within OpenRoads Designer, the user will be presented with the ProjectWise Check In dialog:



ProjectWise Check In Dialog

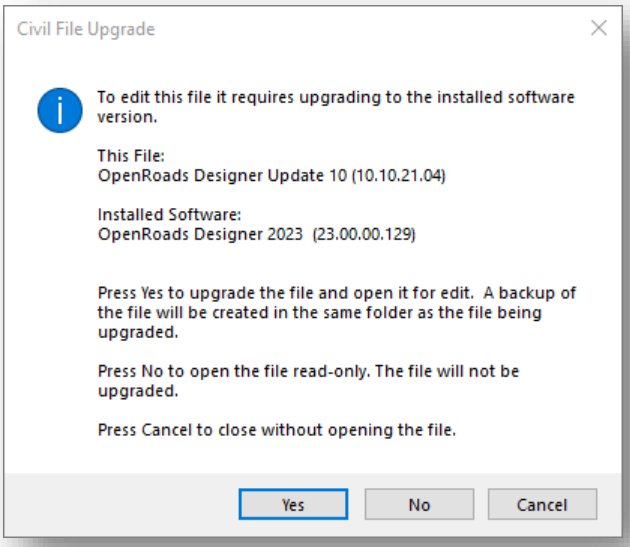
It is recommended that each check in be accompanied by good comments to allow quick review of anything that may have been done.

1.4-4OpenRoads File Versions and Civil File Manager

As part of using OpenRoads Designer, all files with civil content have what's referred to as a civil branding applied to it. This branding is a combination of the civil product in use, along with the version of the civil schema that is applied to the DGN file. The civil schema in particular is very important as part of moving a file between versions and is largely where improvement in subsequent versions of each civil product are contained.

1.4-4a Opening Files from a Previous Version

When first opening a file that originated in an older version of OpenRoads Designer, users can expect a prompt similar to the following:



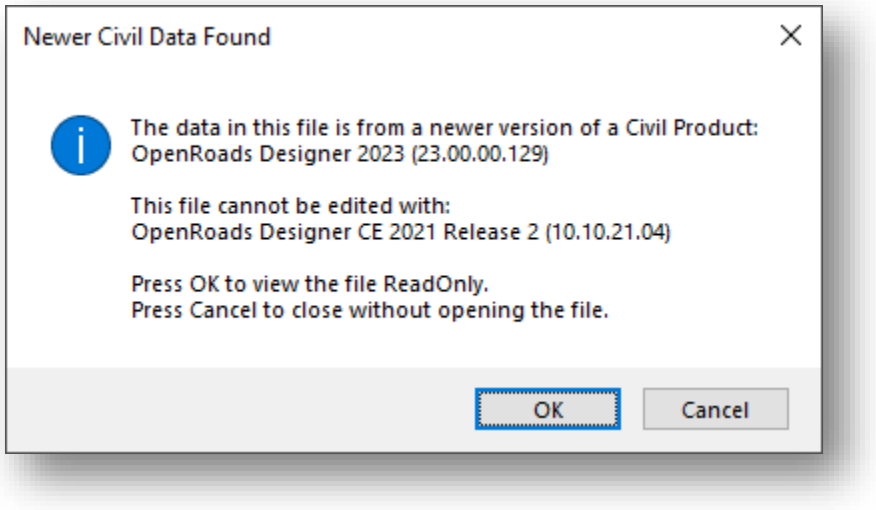
OpenRoads Civil File Upgrade

The preceding dialog offers a number of things to consider when opening a file in a newer version of OpenRoads Designer. First, it informs you of the original product version that the file was last edited in and the version the file is currently being opened in. The above example illustrates what one can expect when opening a file from OpenRoads Designer 21R2 in OpenRoads Designer 2023. The provided options as shown control what ultimately happens with the file from that point. Selecting Yes will upgrade the civil schema of the file to the opening application version—which in this case is OpenRoads Designer 2023. Selecting No will open the file read only, and not upgrade the civil schema. No file modifications will be permitted if this option is chosen. Selecting Cancel will not open the file and close the application.

In most situations, selecting Yes will be advised as files will need their civil schema updated to continue working with the data. Users should validate the file content after performing this upgrade and can free the file if any data appears to have not come over cleanly. In cases such as this, CAD Support should be contacted to investigate what may not have been upgraded properly.

1.4-4b Opening Files from a Newer Version

Just as files from an older version behave, OpenRoads Designer can also open files from versions newer than what is currently being used in a Read Only fashion for viewing. When opening files from a newer version, one will be prompted with a similar dialog to the one shown:



Newer Civil Data

In this instance, a file from the 2023 version of OpenRoads Designer was opened with OpenRoads Designer 21R2, resulting in the information shown. Selecting OK will proceed to open the file Read Only and allow limited information to be gathered from the civil content. Selecting Cancel will close the file and application.

This situation is a potential scenario where the file could be downgraded by the Civil File Manager tool in the current application platform.

1.4-4c Civil File Manager

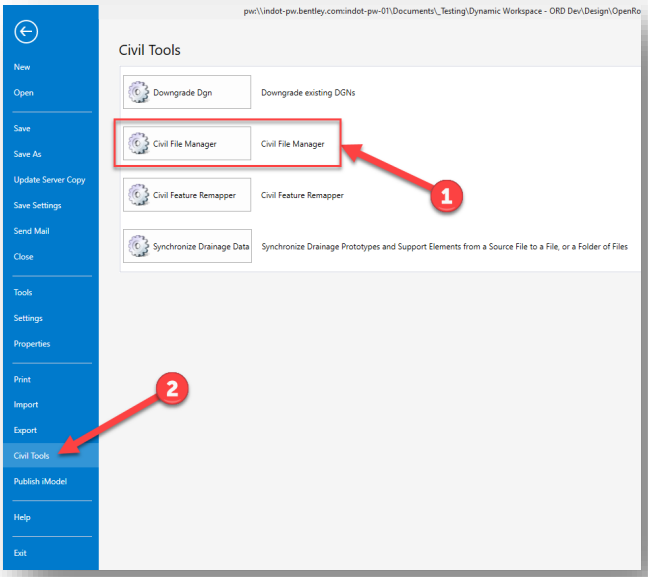
Both preceding scenarios deal with interacting with files on a one-on-one basis. Due to the nature of recommended file federation and other file organization considerations, there may be benefit to bulk upgrading or downgrading of civil content files. In this section, the Civil File Manager tool will be discussed, and example processes will be covered on how to bulk upgrade and downgrade OpenRoads Designer files.

Note: The Civil File Manager tool also performs other functions to civil content files that are outside the scope of this document. For more in-depth information on the covered processes or if the additional functionality may be needed, please contact CAD Support to receive assistance specific to the data in question.

Opening the Civil File Manager

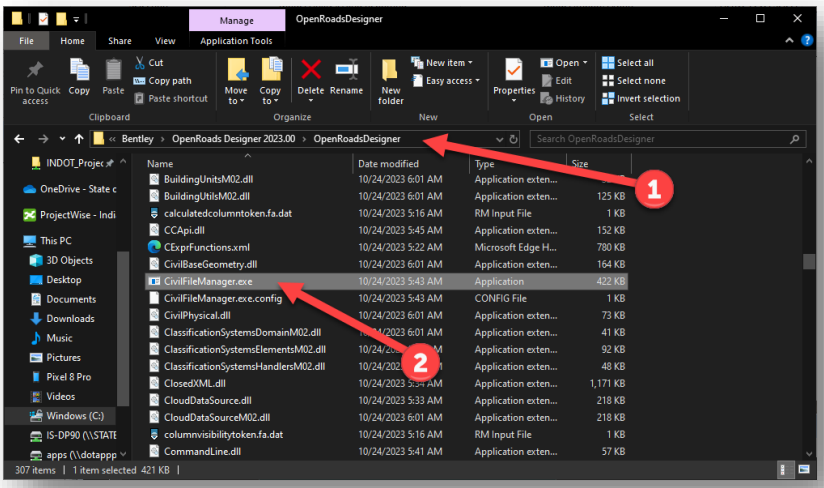
The Civil File Manager can be accessed through two different means. The first is through the OpenRoads UI, and the second through the Windows File Explorer.

To open the Civil File Manager through the OpenRoads UI, first open a file in OpenRoads Designer 2023. This can be editable or Read Only. In the Backstage menu, through the File Ribbon, locate Civil Tools on the lower left. Under the Civil Tools, select the Civil File Manager.



Civil Tools > Civil File Manager

The Civil File Manager can also be launched directly from Windows File Explorer by browsing to C:\Program Files\Bentley\OpenRoads Designer 2023.00\OpenRoadsDesigner, and double clicking on the CivilFileManager.exe file located in the directory. Note that the file extension may be hidden.



Civil File Manager in Windows Explorer

Both methods will launch the Civil File Manager for use.

Bulk Upgrading Project Data through Civil File Manager

With the Civil File Manager open, the following process can be used to bulk upgrade files to a selected version of OpenRoads Designer.

Notes for Using Civil File Manager:

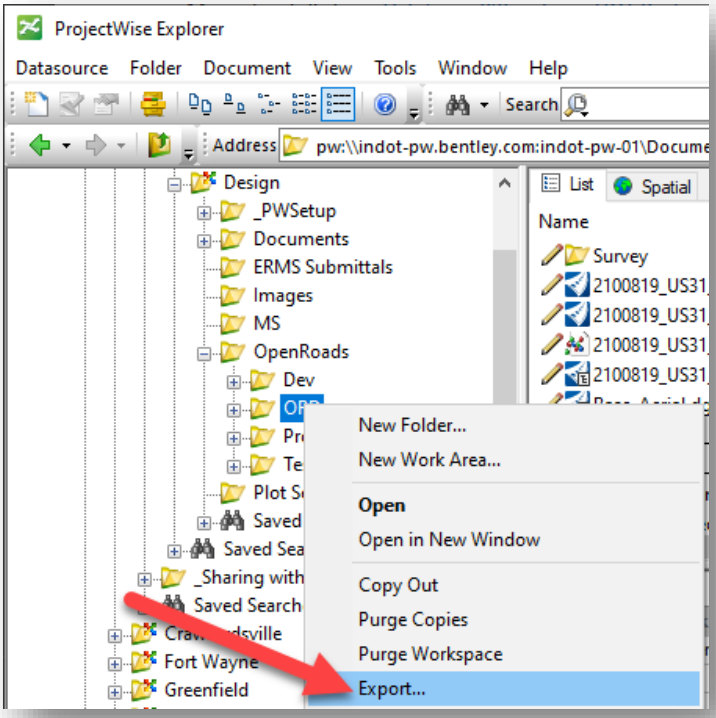
The Civil File Manager can also be used to force upgrade civil content from InRoads SS4/SS10. This is limited to civil content that is part of the DGN and includes survey fieldbooks, civil geometry, terrains, etc. This tool will not upgrade any InRoads specific files such as ALGs, DTMs, etc. Care should be exercised when performing an upgrade from SS4/SS10 InRoads files, and files should be checked extensively to ensure that all content was upgraded properly.

Consideration should be used for the location of files when performing the Export of files discussed in the following process. It may be beneficial to separate ORD content from legacy SS10 content to both expedite the process and minimize chances of upgrading files unintentionally.

To minimize potential errors with the upgrade process, DO NOT attempt to directly perform the upgrade process on files directly in ProjectWise. Any ProjectWise dialogs should be canceled and the use of local file/folder paths should be used.

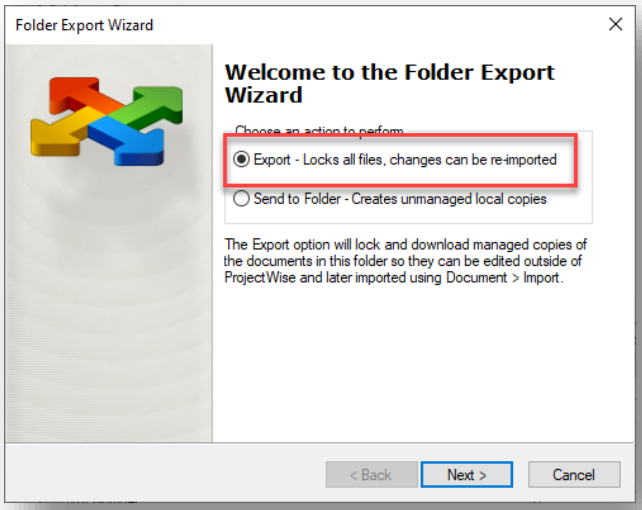
To upgrade files:

1. Locate the folder structure in ProjectWise that is a candidate to upgrade. Right click on the folder and select Export.



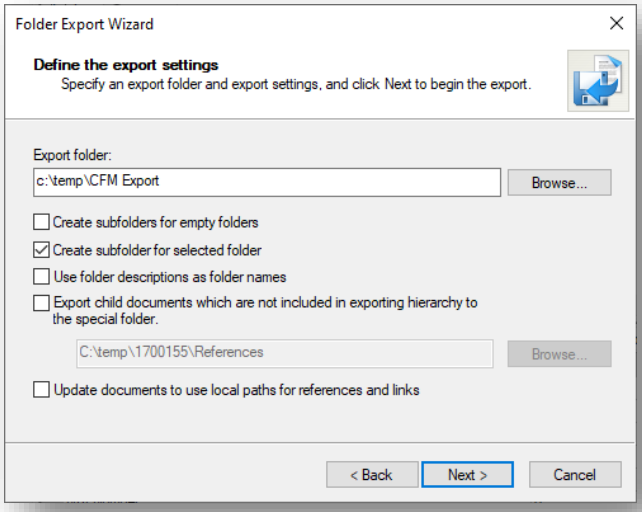
Export Folder

2. For the Export process, the following steps should be followed:
    a. First, the Export will be performed as a managed export where the files can be brought back into the system. Select the Export option on the Folder Export Wizard



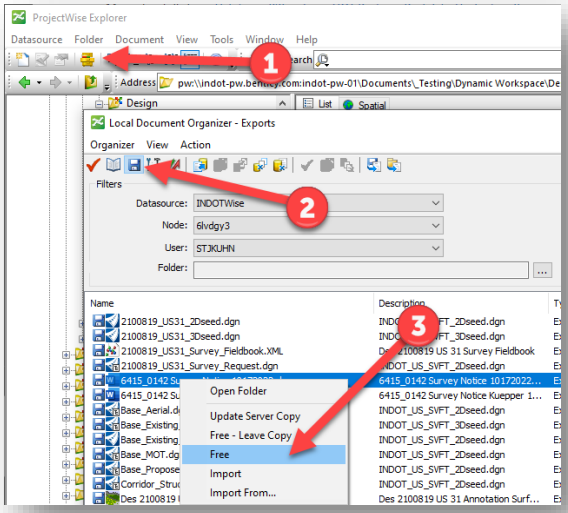
Folder Export Wizard – Export Option

    b. Next, find a location on your local computer. Suggestions would be for something similar to C:\temp\ORD Upgrade, or some location that is otherwise easily identifiable. As with all other Export suggestions, DO NOT use a location that is automatically synched with OneDrive such as Documents or Desktop. For the process, the following should also be enabled/disabled as shown. Select Next when prepared.



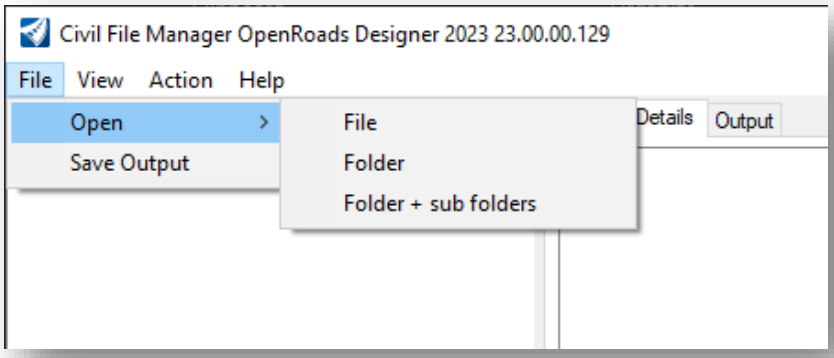
Selecting Export Folder and Settings

c. All documents in the ProjectWise folder path will be exported—many of which may be unnecessary for the upgrade process. At this time, one may open the Local Document Organizer, select the Exports option, and free the unneeded documents prior to proceeding with the upgrade. The Free option should be used, not the Free – Leave Copy as the latter will leave a copy in the exported path and may interfere with the upgrade process.



Freeing Unneeded Documents for File Upgrade

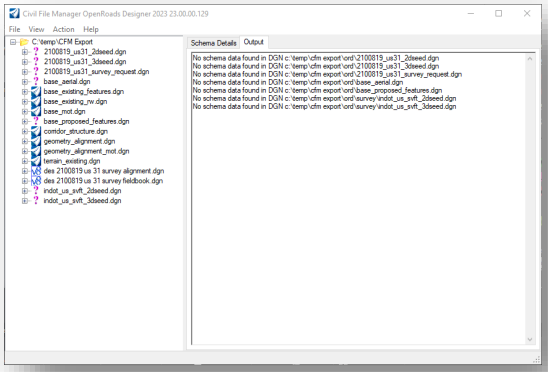
3. Go to the File > Open > …. Menu entry, and select the appropriate option from File, Folder, and Folder + sub folders. Note that the Folder, and Folder + sub folders options will select ALL DGN files in the selected paths.



File > Open

4. Select the file(s) or folders that need upgraded. The following steps will assume a Folder + Subfolders was selected.

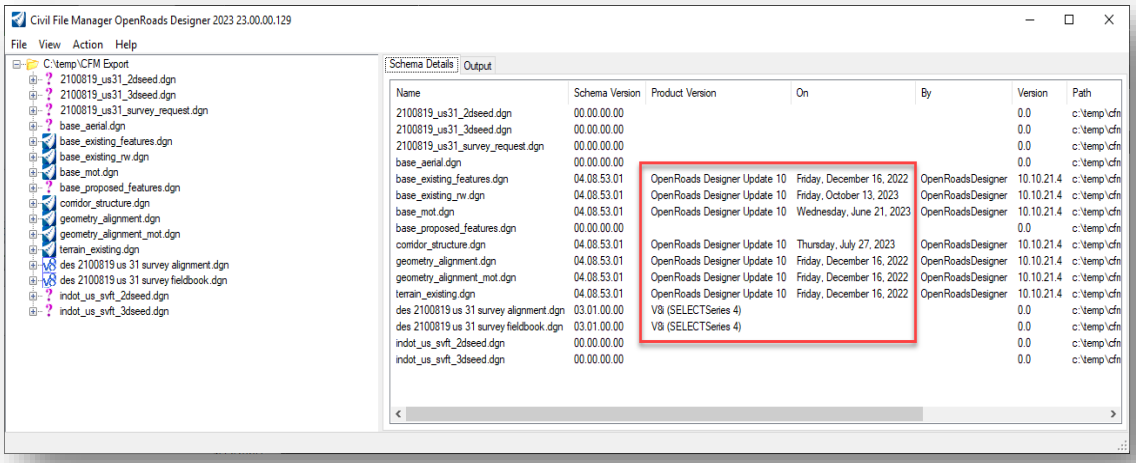
5. With the folder selected, all DGN files in the path will be listed in the Civil File Manager document tree, as shown below. Be sure to expand out the folder contents.



Civil File Manager Document Tree

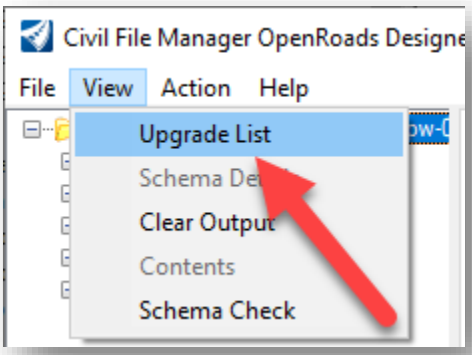
Note: All DGNs in the selected path get added to the Civil File Manager. For this example, notice that there are files showing icons for OpenRoads Designer, V8i, and question marks. These denote the platform the file originated in, and in the case of the question marks, they denote that there is no civil schema that can be read in the file. These files will be ignored during the upgrade process.

6. Selecting a file from this list will display the contents of the Civil Schema of the file and show which application and version the file is aligned with. The files in this example show OpenRoads Designer and a version of 10.10.21.04, denoting the OpenRoads Designer 21R2 version. Note that these applications and versions can be different depending on the last used product and version—especially in situations where an external user may be supplying content. For internal project data, one can expect to see OpenRoads Designer or V8i (SELECTSeries 4) depending on the file selected.



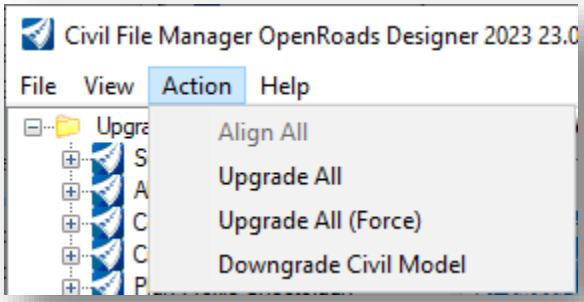
Civil Schema Information

7. With the appropriate content loaded, select View > Upgrade List to switch to the Upgrade view. Note that the Document Tree will switch to the Upgrade Group view.



Upgrade List

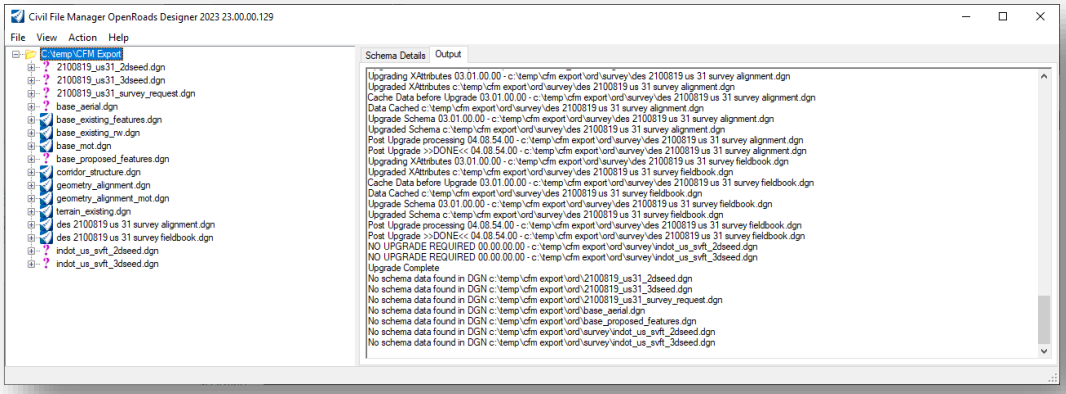
8. At this time, select the Action menu and the appropriate process to proceed with. The options are as follows:
    a. Align All – Will set the base product to the current application. Useful if files branded from another application such as OpenBridge or OpenRail are used. Will not be available if the product is not changing.
    b. Upgrade All – Will upgrade the Civil Schema of the files to the current application release. Will not process if the files have missing references.
    c. Upgrade All (Force) -- Will upgrade the Civil Schema of the files to the current application release regardless if the files are missing references. *This will be the method that is necessary for upgrading files using this process.*
    d. Downgrade Civil Model – Will allow for the downgrade of the Civil Schema to a prior version, useful if collaborative users may not have the same application version.



Civil File Manager > Actions

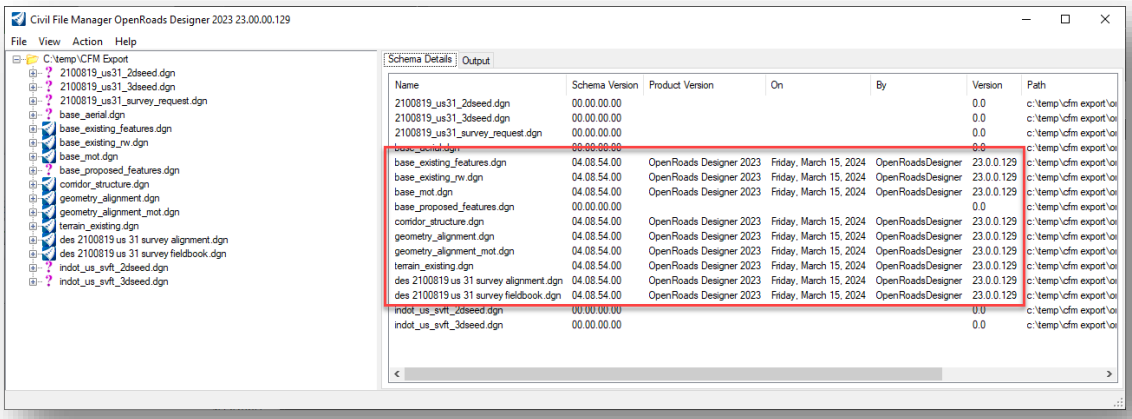
9. For this example, the Upgrade All (Force) will be selected. The files will then process in the background and show a status output and state of the upgrade process. Upon completion, users will be prompted to check the files back in, and if desired, to upload backup copies of the

files in the event the upgrade did not process properly. In this case, the files will be checked back in with their backup copies.



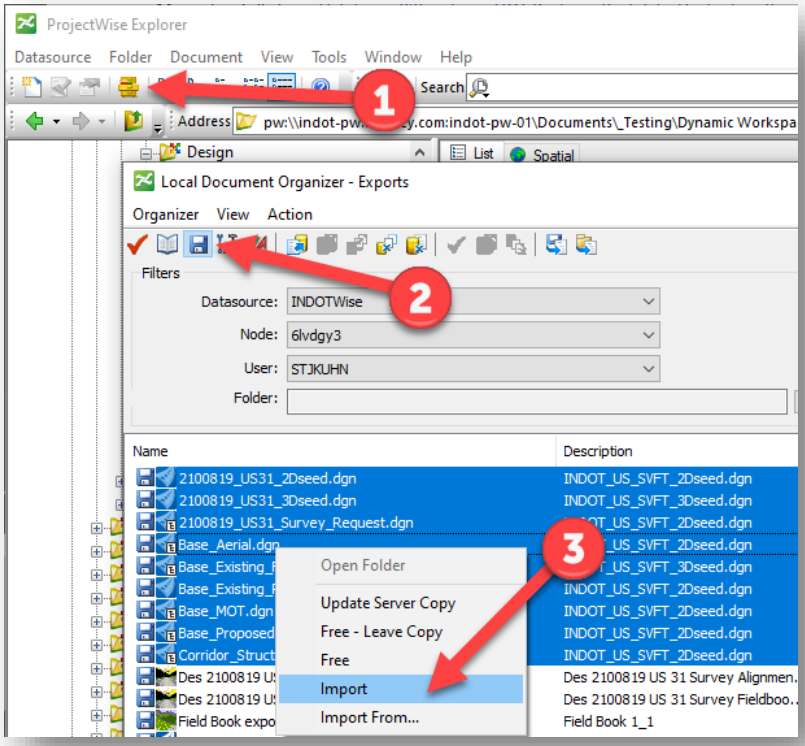
Civil File Manager Output

10. Post upgrade, the Civil File Manager will update and show the Civil Schema and version that the files have been upgraded to. This can be compared to the initial illustration in step 6. For this example, note that those files that were listed as SelectSeries 4 have been upgraded to OpenRoads Designer.



Post Upgrade Civil Schema

11. With the upgrade complete, the Civil File Manager can be closed. Going back to the Local Document Organizer in ProjectWise, select the Exports entry, and then select the appropriate files to re-import. Right click on the selected files and select the Import option.



Importing Upgraded Files

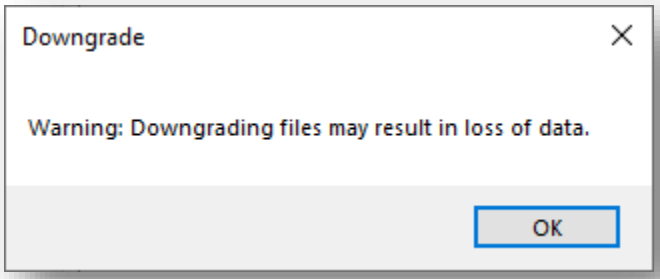
12. When the Import is selected, enter any relevant comments and select OK to begin the Import process. Once imported, files should be checked to ensure that all referencing, civil links between federated files, and other relationships between files have been preserved.

Note: Post upgrade files should open normally with the current version of OpenRoads Designer. This process will also eliminate the file upgrade prompt upon opening. If there are SS4/SS10 files that are run through this process, please keep in mind that they will need to have their application association changed to OpenRoads Designer in ProjectWise so the compatible platform opens. If this is not done, files will be limited to Read Only in SS10 as the legacy applications cannot translate the updated civil information. A prompt will be received notifying of this case.

Downgrading Civil Files

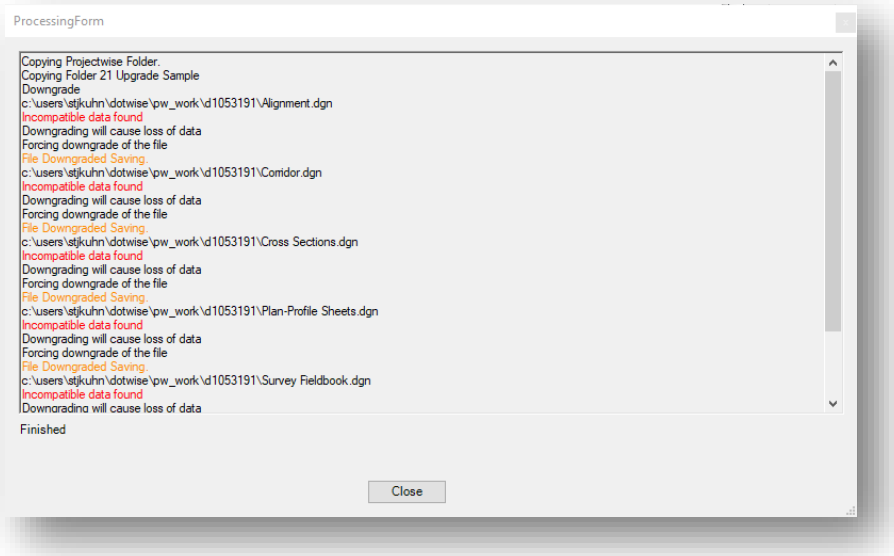
The previous process can also be used to downgrade files for collaborative users who may not have the same version of OpenRoads Designer in use in the agency. All steps through step 7 in the previous section are the same. To downgrade:

1. Select the Action > Downgrade Civil Model option. A prompt will display warning of data loss. Consideration should be given as not all civil content will be available in older versions. Other translational methods may be preferred such as LandXML, etc. to share data backwards.



Downgrade Civil Model Warning

2. After selecting OK on the warning, the Downgrade Civil Model dialog will display showing the source and then the Target Versions that can be accommodated. Note that not all OpenRoads Designer versions may be available. Of some use however may be the option to remove the Civil Model if a file containing only the elements with no civil intelligence is desired. Select the appropriate option and select OK.
3. When prompted, select where the files should be placed on downgrade. Note that the downgraded files cannot be placed in the same folder as the source files.
4. The Downgrade process will begin. It may appear that no activity is occurring initially, as the background process is performing file copies to the destination location. When complete, a document downgrade status will be shown, along with a prompt to Check In the files.



Downgrade Civil File

Upon completion, downgraded copies of the files will be placed in the selected destination. A backup file is not provided as the source files are not modified during this process. Again, as with the upgrade process, files should be checked to ensure that all necessary content is showing in the downgraded files. To do so, open in the current version, but not do upgrade when opening, allow the files to be opened Read Only.

1.5 OpenRoads Technologies

1.5-1 Using 2D Seed Files/Models for Design

In a departure from previous versions and guidance, OpenRoads technologies highly emphasize the use of 2D models for the design process. Throughout this document, many instances that previously referred to the use of a 3D seed file/model configuration have been amended to reflect this change in software philosophy.

As part of using a 2D seed file, the OpenRoads product will automatically create a 3D model on the fly. Bentley advises that when performing operations, all work be done in the 2D model with a view of the 3D model open so that modifications can be seen as they occur. This 3D model will only be created once a terrain model has been generated or attached and activated.

A proposed workflow would be to process all survey in a 3D seed file, and then attach this 3D content to a 2D seed file for alignment and design purposes.

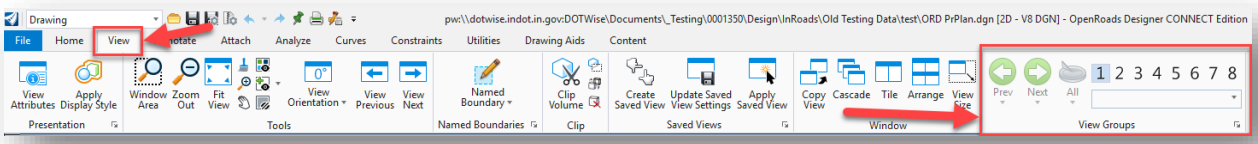
1.5-2 Alignment Naming in OpenRoads

Within the following chapters, in many cases you will see references to how alignments are or should be named. Convention up to this point has been to name these Line ”A”, Line “B”, etc*. However, as of the transition to ORD, please be advised that CAD Support strongly recommends that users no longer use quotation marks in alignment names. Continuing to do so can cause instability/crashing behavior in plans production processes that cannot process alignments that contain them.* Should you import any source data into your design file that contains an alignment name with quotation marks, the first step should be to rename the alignment to eliminate the quotation marks.

1.5-3 OpenRoads and MicroStation Multi-View Configurations

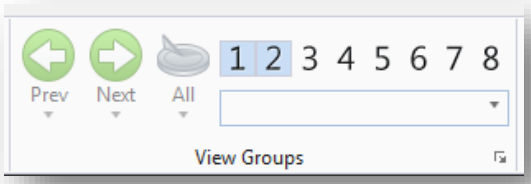
As discussed in the previous section, OpenRoads Designer will automatically create 3D models when started from a 2D seed. In these instances, and others such as profile creation and dynamic cross section review, it may be advantageous or required to open multiple views. The following steps will cover how to open additional views, and then, if necessary, how to display content from a different model.

1. When in OpenRoads Designer, locate the View tab in the current workflow. Then locate the View Groups Group.



View Groups Group

2. By default, most files will open with view 1 active as your active display. To open an additional display, select one of the other views so the button is depressed.

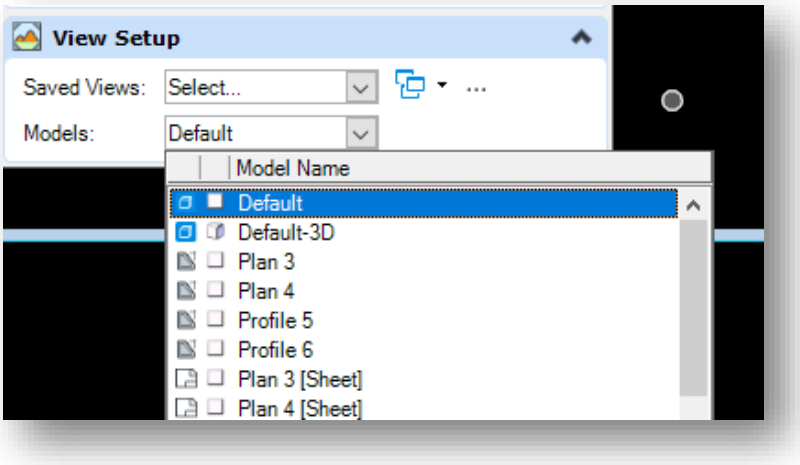


Second View Opened

3. At this point, depending on the tool in use or if you are modifying the display, the steps will branch off. If the tool prompts to select an active display to show content (profile creation, dynamic cross sections), place a data point in the display as requested. If wanting to display content from a different model, continue on.
4. With the view open, select the View Attributes button.

View Attributes

5. On the View Attributes, expand the View Setup leaf. Under the Models dropdown, select the appropriate -3D model. These models will name themselves after the base DGN model that the terrain is created in.



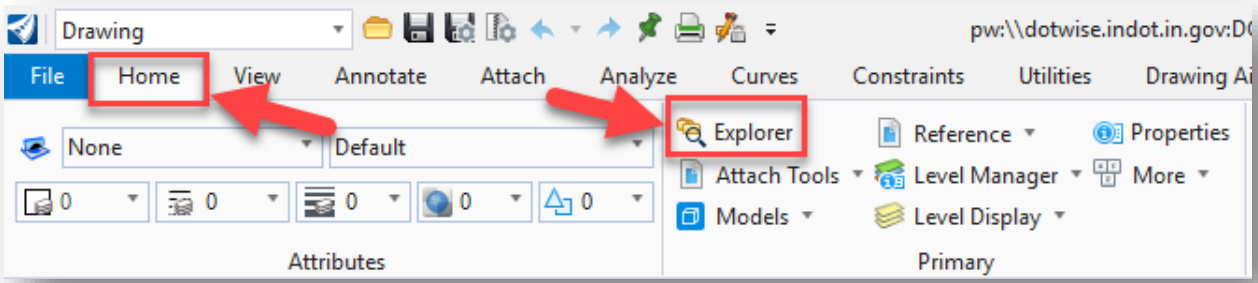
Selecting 3D Model

6. At this time, two models would be displayed. View 1 would presumably have the 2D Default model displayed, and the Default-3D model will display in View 2.

1.5-4 Project Explorer

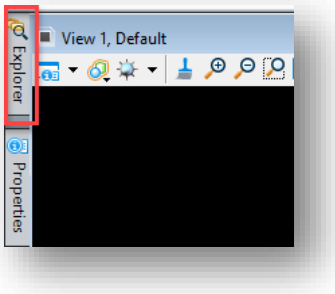
In OpenRoads Designer, file types such as DTM, ALG, and FWD are no longer required for many of the tools. Bentley has now made the DGN file the container for much of this data. To access this data, OpenRoads Designer uses the Project Explorer.

When starting OpenRoads Designer you may need to enable the Project Explorer. To do so, go to the Home tab for the current workflow, and select Explorer from the Primary Group.



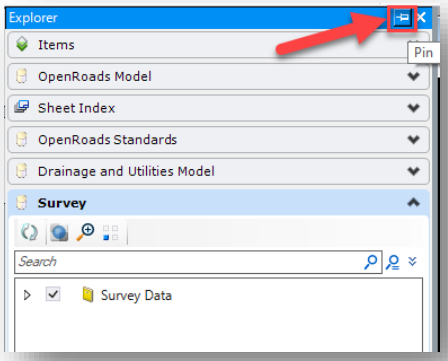
Starting the Project Explorer

An Explorer tab should then appear on the far left side of the interface.



Explorer Tab

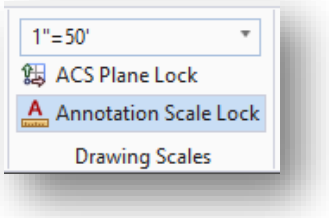
Hover over the Explorer tab to display the Project Explorer's contents, and then click on the pin icon to pin it to the display.



The Project Explorer in OpenRoads Designer

1.5-5 Drawing Scale

OpenRoads Designer leverages the MicroStation-based Drawing Scale Tools. These tools are in the Drawing Scales Group at several locations throughout all of the workflows:



The Drawing Scale and Annotation Scale Lock

As shown, this tool controls the scaling of all Annotation enabled elements including linestyles, text, dimensions, and cells. This tool should be used to control the scaling of any OpenRoads data. Care should be given to using this in addition to other manual scaling factors as the results could be incorrect.

With the Annotation Scale Lock enabled (highlighted in light blue as shown above), changing the scaling value above it will dynamically rescale all elements by the defined value.

With the frequency that these controls in particular will be used, it's advised that this particular set of tools be pinned to all workflows using the process discussed in the INDOTWise 5.1 MicroStation Platform document.

Note: Initially all items should be drawn up at a Full Scale 1:1 setting. Drawing items up at higher scales may cause them to improperly display in your drawing. This can be resolved by setting the scale back to Full Scale 1:1 and then selecting the desired scale from the listing.

The following table shows the various drawing scales configured in our workspace, along with their equivalent direct scale factors.

Scale Name	***Scale Factor***
Full Size 1=1	1:1
6"=1'-0"	2:1
3"=1'-0"	4:1
1 1/2"=1'-0"	8:1
1"=1'-0"	12:1
3/4"=1'-0"	16:1
1/2"=1'-0"	21:1
3/8"=1'-0"	32:1
1/4"=1'-0"	48:1
3/16"=1'-0"	64:1
1/8"=1'-0"	96:1
1/16"=1'-0"	192:1
1/32"=1'-0"	384:1
1"=10'	120:1
1"=20'	240:1
1"=30'	360:1
1"=40'	480:1
1"=50'	600:1
1"=60'	720:1
1"=100'	1200:1
1"=200'	2400:1
1"=300'	3600:1
1"=400'	4800:1
1"=500'	6000:1
1"=600'	7200:1
1"=1000'	12000:1
1”=2000’	24000:1
1”=3000’	36000:1

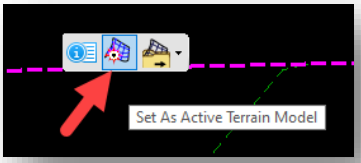
Drawing Scale Chart

1.5-6 File Referencing

As discussed previously, OpenRoads data is now all stored directly in DGN files. One major advantage of this functionality is that standard MicroStation referencing allows for OpenRoads data to be visible through the reference documents. Examples of this functionality will be discussed further in the coming chapters, particularly in areas such as the creation of a terrain model from a referenced survey field book, and in the modeling of a corridor from referenced terrain and geometry files.

1.5-7 ORD Heads-Up Display (HUD)

New to OpenRoads Designer is the heads-up display (HUD). The HUD provides a menu of options for various elements when they are selected. To activate the HUD for a particular element, left click on it and then hover the mouse pointer over it. In the below example, the boundary of a terrain is selected—which activates the HUD where you can activate the terrain in the model.

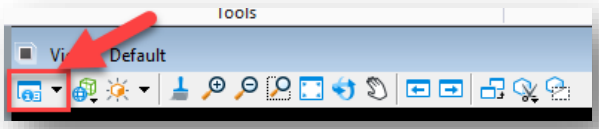


Using the HUD to Activate Terrain

1.6 Built-in Imagery in OpenRoads Designer

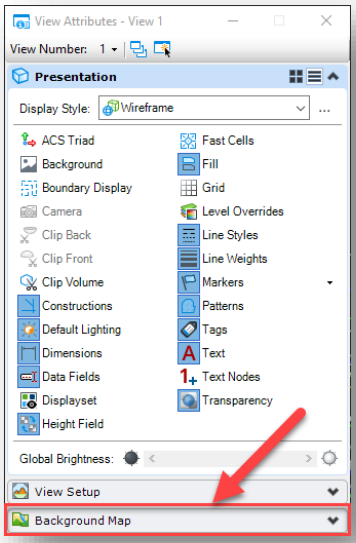
As of the release of OpenRoads Designer, Bentley has provided functionality to allow a user to apply background map imagery to a geocoordinated design file via Bing Maps. This section will outline the process to apply this imagery:

1. With a geocoordinated design file open, click on the View Attributes button in the top left corner of the view window.



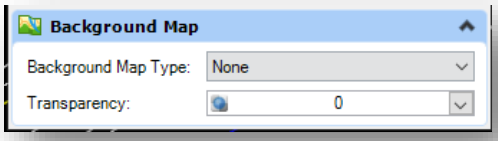
View Attributes Button

2. On the View Attributes window that appears, locate the Background Map dropdown menu at the bottom of the window.



Background Map

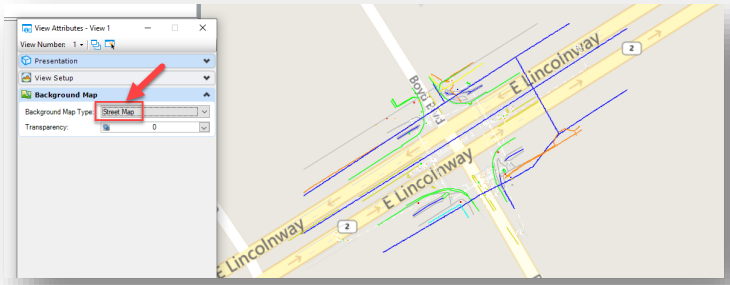
3. Click on the menu, which will open to show two settings: Background Map Type, and Transparency.



Background Map Settings

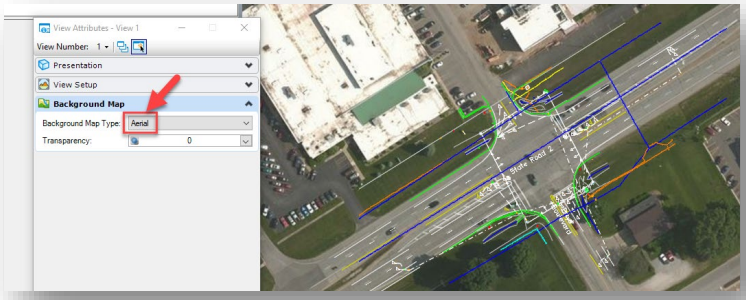
4. The Background Map Type setting provides four options, which are explained below. Select from one of the options as needed:

- None: No background map imagery is displayed.
- Street Map: Displays a street map in the background.



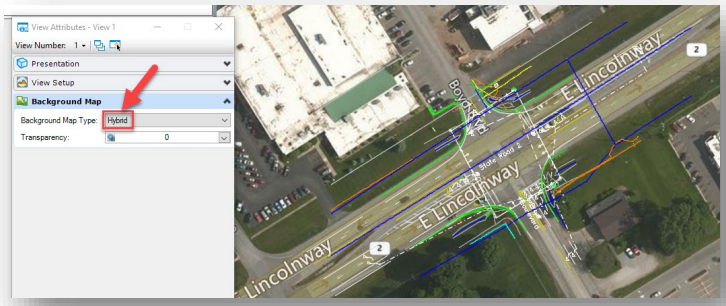
Street Map Background

- Aerial: Displays aerial imagery in the background.



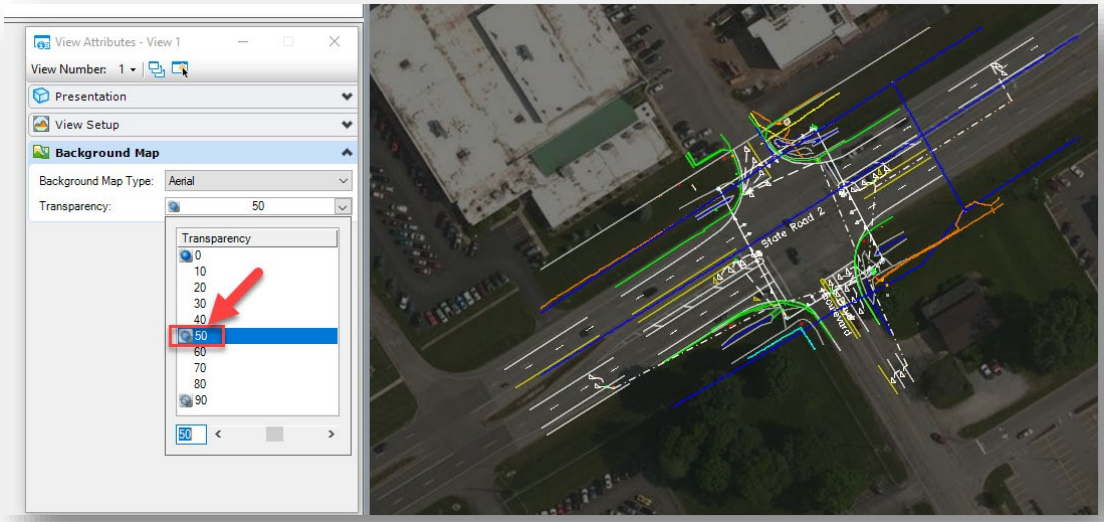
Aerial Background

- Hybrid: Displays a combination of aerial and map imagery in the background.



Hybrid Background

5. With the desired background map type selected, the transparency of the imagery can be adjusted via the Transparency setting:

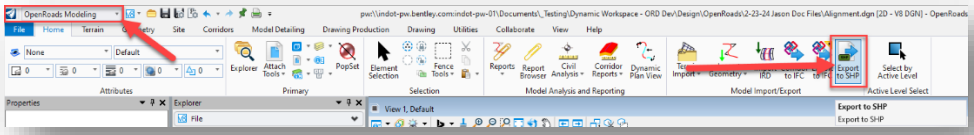


Aerial Background with 50% Transparency

Note: The provided Bing maps imagery should only be used as a reference guide. The imagery is not survey grade and you may notice inconsistency and inaccuracy when comparing to the Best Available WMS imagery, or when looking at survey provided data.

1.7 Export to SHP File

Starting with OpenRoads Designer 2023, Bentley has re-incorporated a rudimentary GIS Shapefile export tool. This new tool can be found on the OpenRoads Modeling workflow on the Home ribbon in the Model Import/Export section.



Export to SHP

Note: When exporting data through the Export to SHP tool, the following should be considered:

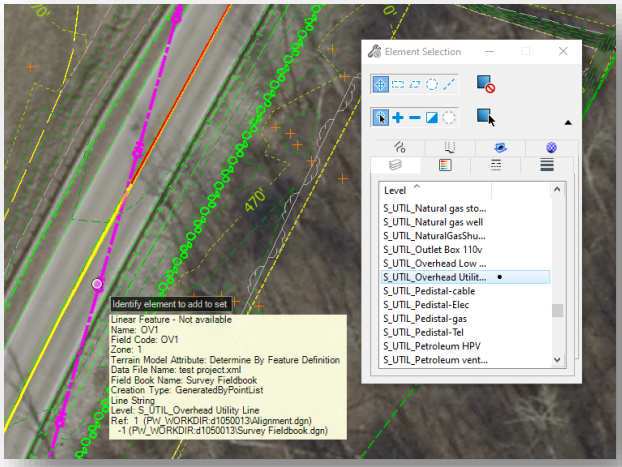
1. *This tool is currently implemented only in a Technical Preview mode; expect further changes to its functionality in newer iterations of the software.*
2. *Currently, exports should not be sent directly to ProjectWise. The tool does not accommodate the SHP file and its associated content as currently developed. A support case has been submitted to Bentley regarding this functionality. The process as defined will be to export the*

content to a local drive (i.e. C:\temp\GIS Export or similar) and then drag/drop into ProjectWise to share with other users.

3. *The active selection set will be used to export. This can be a combination of content and element types, but it's strongly advised that a single feature type be exported to a shapefile to aid in identification and resymbolization adjustments in ESRI.*
4. *When exported, the shapefile and associated files will default to the name of the active file. Easily identifiable naming should be used at the time of Export to simplify content identification.*
5. *On the ESRI side, the shape file content will not by default be visible. ArcGIS Pro users will need to toggle on the Enable symbol layer drawing toggle in their Symbology settings for the exported content to be visible.*
6. *Again, in ArcGIS Pro, exported content will be assigned a default symbology. The export from OpenRoads Designer does not send across its symbology definition. The ArcGIS Pro user will need to adjust the symbology once added and displayed in their ArcGIS Pro project.*

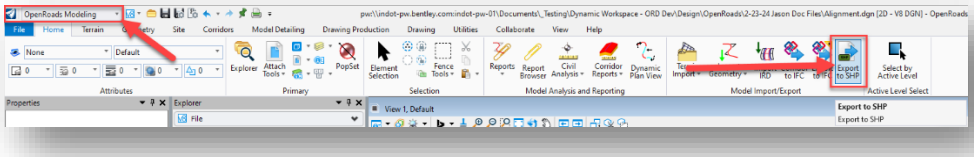
To use the Export to SHP tool:

1. Select content in the file that should be sent to GIS. The below illustration shows the selection of the surveyed overhead utility line.



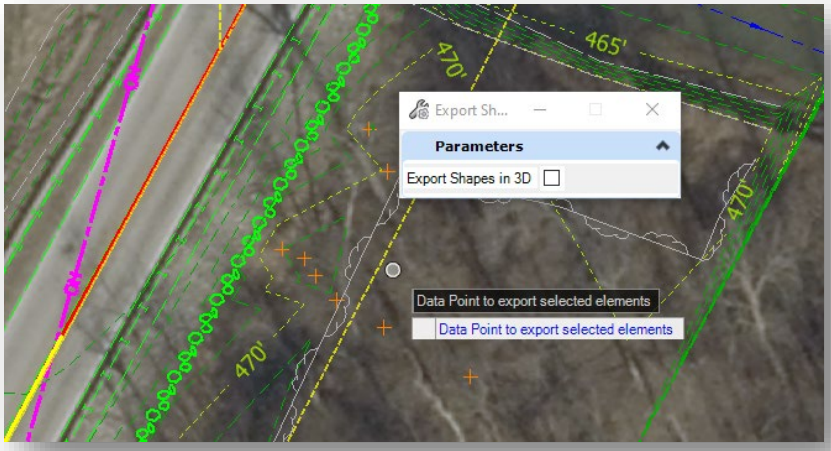
Element Selection

2. With the appropriate elements selected, select the Export to SHP command on the OpenRoads Modeling workflow, Home ribbon.



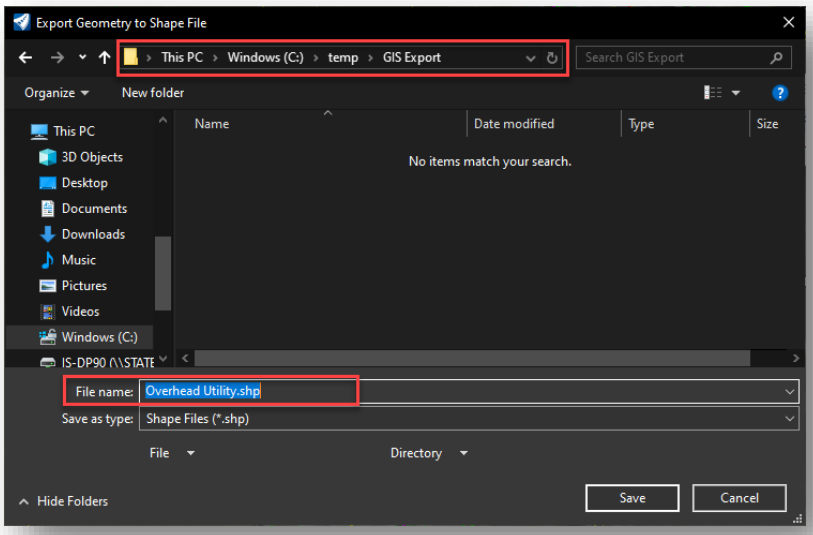
Export to SHP

3. When presented the Export to SHP dialog, unless needed, the Export Shapes in 3D can stay disabled. Select a datapoint in the display to confirm the export.



Export to SHP

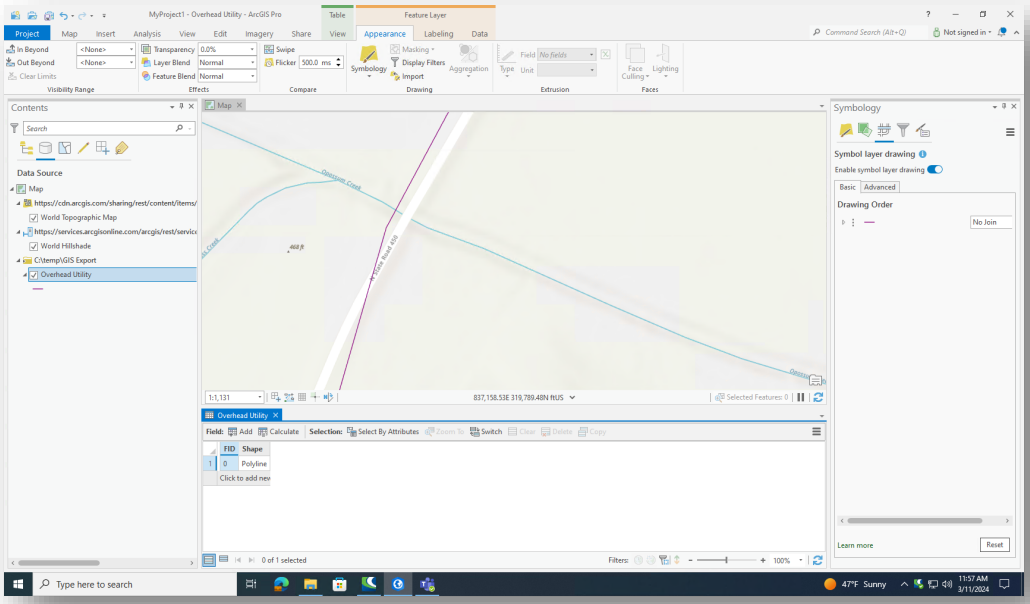
4. The export process will then prompt to set a location and filename for the shapefile. As mentioned in the notes, do not perform this export directly to ProjectWise, select a location on the local drive. To bypass the ProjectWise creation, select Cancel when prompted to use the standard Windows browser. This example will use C:\temp\GIS Export; and for the filename, will use Overhead Utility.shp. Select Save to complete the export.



Export to SHP – Local Drive

5. Review the exported content at the path previous specified. In this location, one should see a number of files named consistently with that set in the previous step. All of these files are necessary for inclusion in a GIS project and should be provided together to the next user.

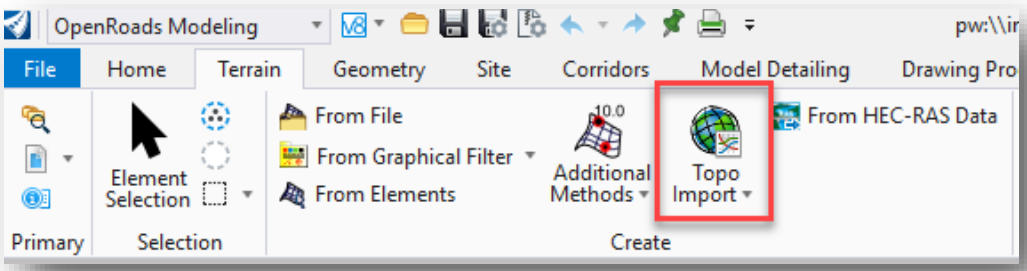
To illustrate what might be seen in ArcGIS Pro, the shapefile can be attached to a project and resymbolized to differentiate it from other date. It should be noted that this tool will export generic element data and not include any level or symbology information. If the elements have any item type information however, this will be processed and sent over for further investigation. Below is an example of what this data could be illustrated as:



Exported Shapefile in ArcGIS Pro

1.8 Importing ESRI Terrain into ORD

OpenRoads Designer allows users to import terrain directly from ESRI. The *Topo Import* tool—found on the *Terrain* tab of the *OpenRoads Modeling* and *Survey* workflows—can accomplish this task.



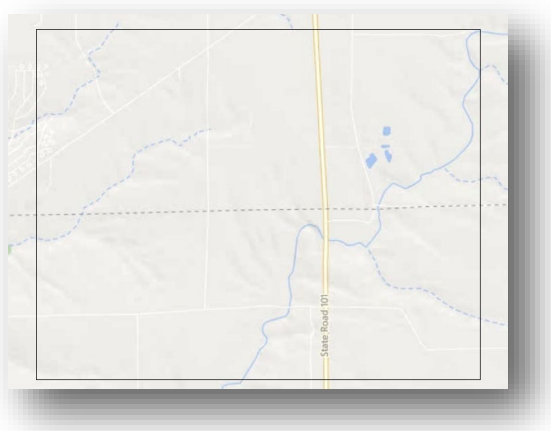
Topo Import Tool in OpenRoads Modeling Workflow

Before discussing the use of the tool itself, there are a few things to know before using it.

- You MUST be in a 3D model for it to work.
- The bounding element you create to bring in the terrain must be an actual element—it CANNOT be a fence.
- Be very careful in how dense you make the terrain that you import. Making a terrain that is too dense can severely affect the processing speed of the Topo Import tool and adversely affect the overall performance of your file.
- Keep in mind that this functionality is in a Technology Preview phase at this time—so the functionality is not set in stone, and can thus be modified by Bentley at any time.

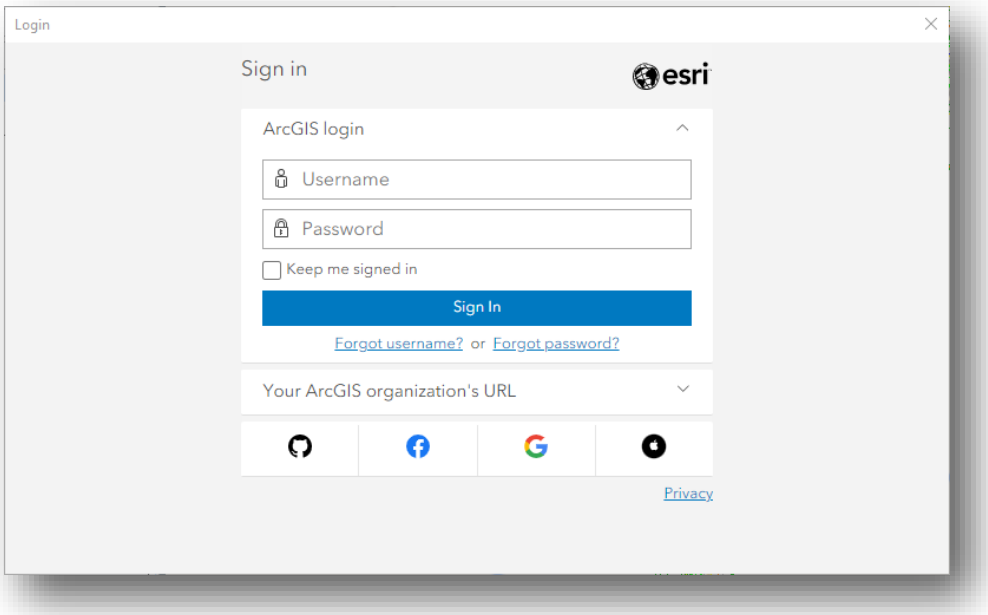
The process to use the tool is as follows:

1. The first step is to create the bounding element that you will use to bring in the terrain. In this example, a simple block will be used.



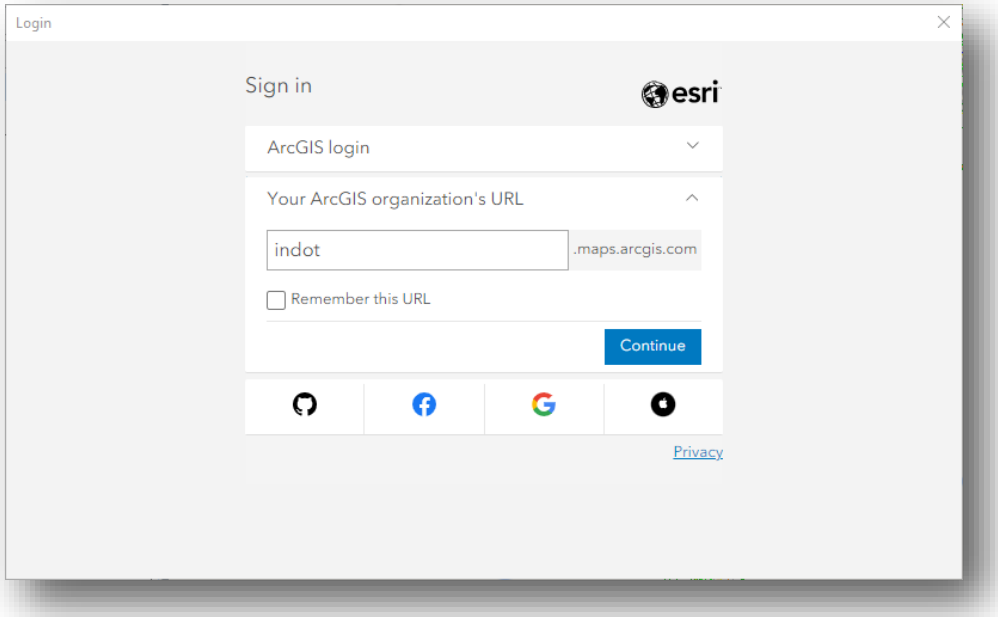
Bounding Element for Imported ESRI Terrain

2. Next, click on the *Topo Import* tool to activate it. You will then be provided with an ArcGIS login window.



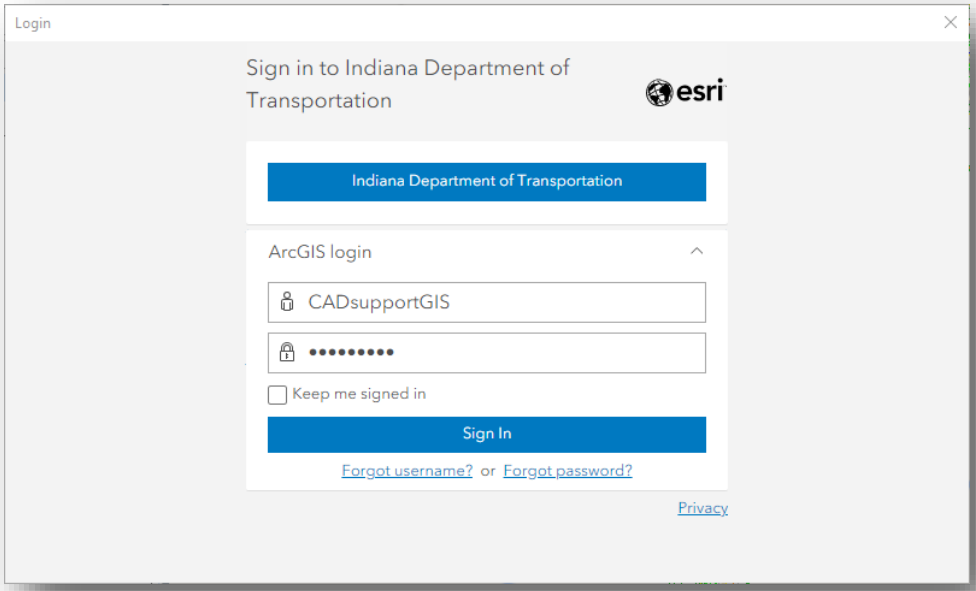
ArcGIS Login Window

3. On the ArcGIS login window, select the dropdown for *Your ArcGIS organization's URL*, and enter "*indot*" in the provided field. Then click Continue to proceed.



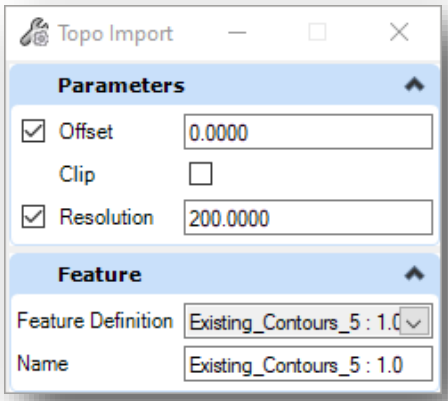
Entering "indot" for Your ArcGIS organization's URL Field

4. On the next screen that appears, click on the *ArcGIS login* dropdown. Proceed to enter the following credentials and sign in:
    - **Username:** CADsupportGIS
    - **Password:** MIS28!cad



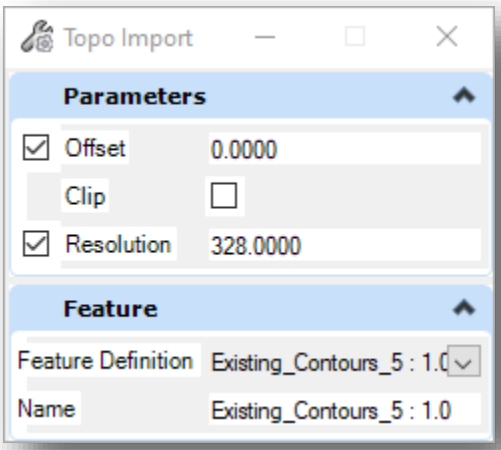
Login Credentials for ArcGIS Login

5. Once you've signed in, you'll be prompted for your area of interest. Before you select your bounding element, take note of the settings in the Topo Import dialog box.

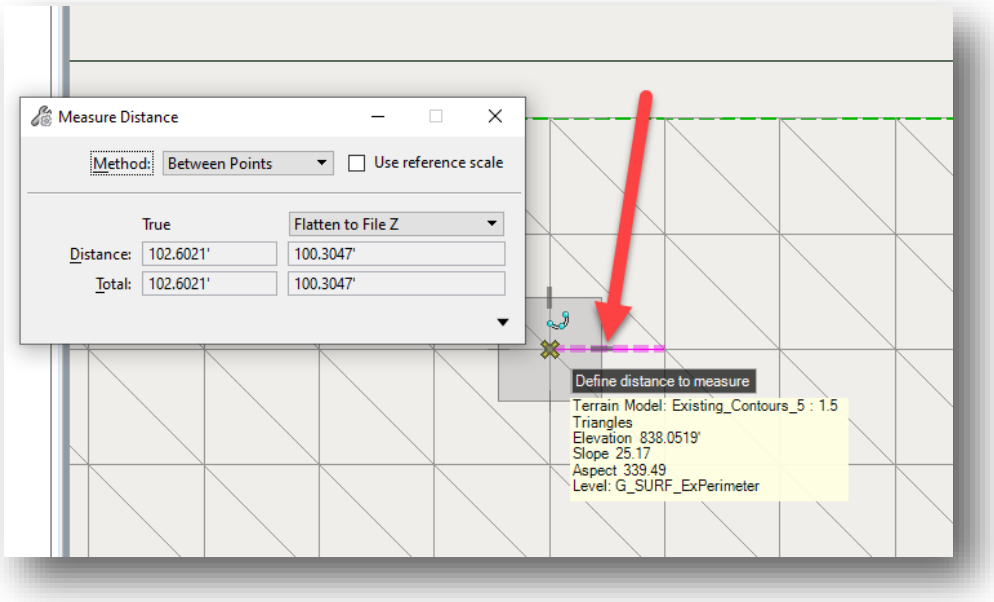


Topo Import Dialog Box

- **Offset**: Allows you to import terrain outside of your bounding element. You can specify a distance to offset if you wish to do so. Otherwise, specifying a value of 0 will only import the terrain within the bounding element. ***Be sure to enable the setting via the checkbox to lock it in place when you select your bounding element***.
- **Clip:** The intent of this setting is to remove unnecessary points from the imported terrain. The underlying calculations/analysis being performed are unknown at this time. What we have observed is that enabling this setting cuts down the estimated point count for the specified resolution value by an approximate factor of 10. We will provide more information on this setting once it is officially implemented in a future release.
- **Resolution**: Defines the density of the terrain what will be imported into your file. Specifically, it defines the approximate width of one square within the bounding element that will be split into two triangles to form the terrain. **Note: There is currently a defect with this setting, where the value you provide is converted to metric, and the resulting square width uses that converted value, but in feet. To avoid this issue, you will need to utilize a conversion factor of 3.28 to get the square width that you actually want. For example, if you would want a square width of approximately 100 ft to establish your terrain, you would specify a value of 100 x 3.28 = 328 for this setting. See illustration of this example below:**



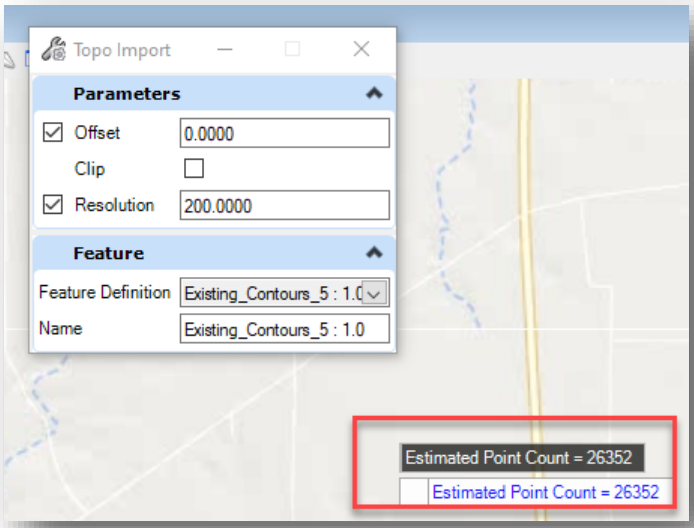
Resolution Setting to Obtain an Approximate Square Width of 100 ft



Measured Distance of Square Width

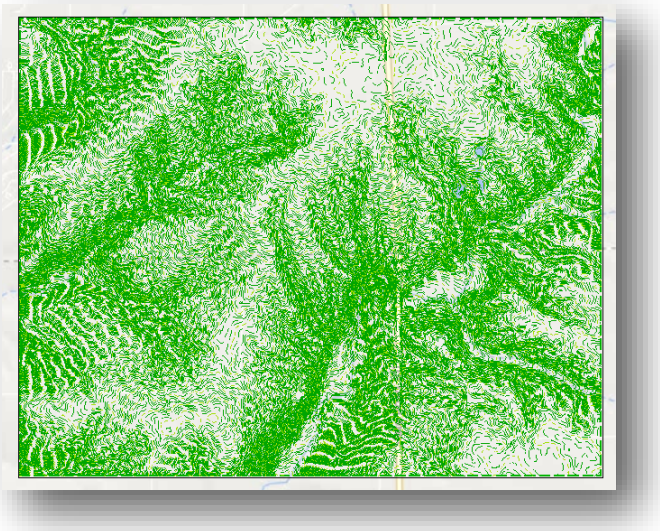
- **Feature Definition**: Specifies the feature definition that will be applied to the imported terrain. In this example, we are specifying the Existing_Contours_5 : 1.0 feature definition.
- **Name**: Specifies the name you want to give the imported terrain.

6. Once you have your desired settings specified in the Topo Import dialog box, select the bounding element. You can take note of the estimated point count that is then shown in the heads-up display (HUD).



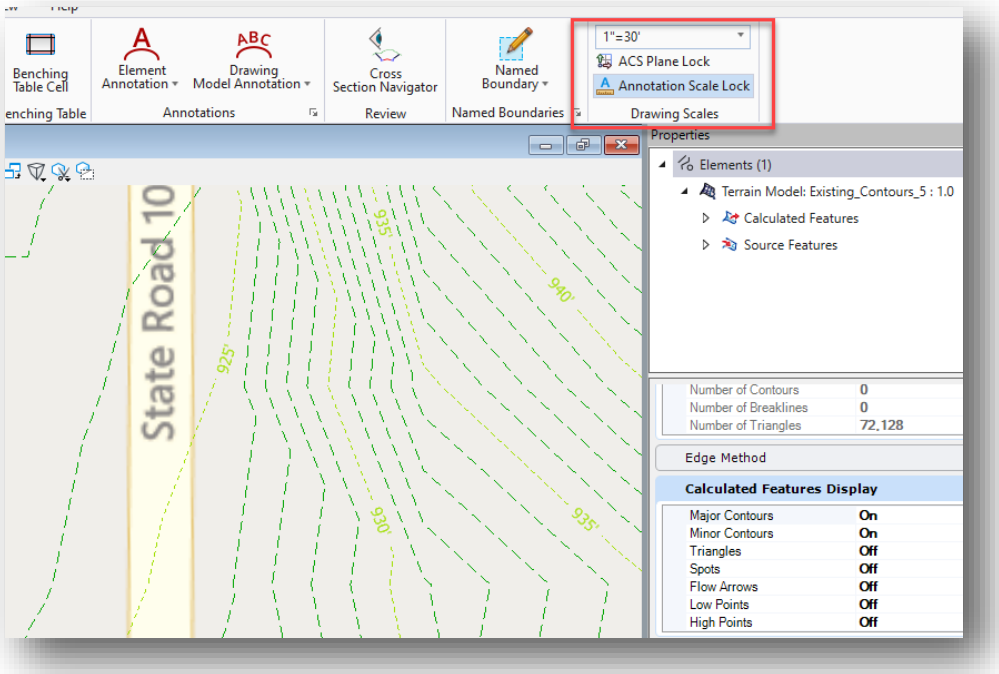
Estimated Point Count in Heads-Up Display

7. Left-click twice more to accept the import operation, and the ESRI terrain will then be imported into your file.



Imported ESRI Terrain

8. As a final step, you can apply an annotation scale to your 3D model such that you can view the contour label annotation.

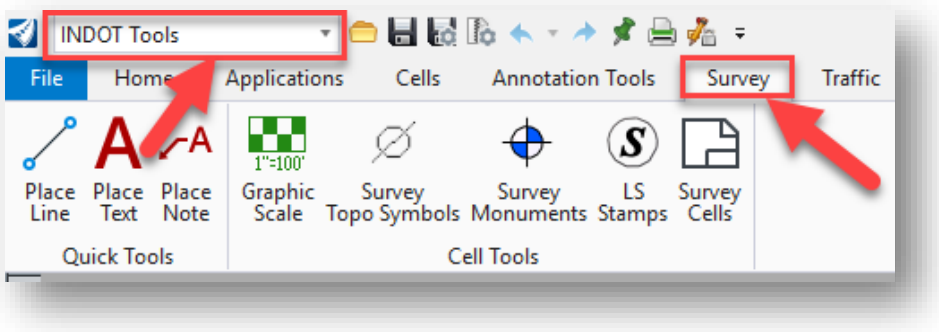


Annotation Scale Applied to Imported Terrain

2. Using OpenRoads Designer for Survey/Routeplat Production

The following sections discuss the usage of OpenRoads Designer for Routeplat development. These procedures should be used for the development of survey deliverables as noted in Chapter 106 (formerly chapter 26) of the INDOT Design Manual. More in-depth discussion of these procedures can be found in the 2020 - INDOT ORD for Survey learning path published on the Bentley Learning Network.

In addition to the OpenRoads Designer-specific tools noted throughout this section, also keep in mind the Survey tools provided in the Survey tab of the INDOT Tools workflow.



Survey Tools in INDOT Tools Workflow

2.1 What's Changed with Survey in OpenRoads

With the release of OpenRoads Survey, the following coding changes have been necessitated:

New Control Codes have been incorporated to replace the +O, +D, +H InRoads offset note commands. Note that the (-) indicates which direction would be a negative value:

- AD* is for vertical offsets, Up/Down(-)
  - Example: AD*-2 UE02 B would result in UE02 2 feet below the observation at the start of the string.
- NF* is for distance offset, Front(-)/Back
  - Example: NF*4.5 PTCS would result in PTCS 4.5 feet back from the observation.
- LR* are for left/right offsets, Up/Down(-)
  - Example: LR*-7 TB04 would result in TB04 7 feet to the left of the observation.

The EXTARC code can no longer be used to create a closed 3 point circle. Advisement from Bentley is that circles should have 4 shots, with the fourth shot being near the first shot so only a small linear element closes out the circle.

OpenRoads will automatically draw up and place text consistent with the old planimetric graphics. However, these do not dynamically scale and now rely on MicroStation Drawing Scale tools.

NOTE: There is a known defect with ORD where survey graphics sometimes do no respond to changes in annotation scale. Bentley and CAD Support are aware of this. If this issue occurs, instead of being able to create the survey fieldbook first and then adjust the annotation scale on the fly as needed, you will need to set the annotation scale first and then redraw the survey data.

2.2 Creating OpenRoads Survey Deliverable Files

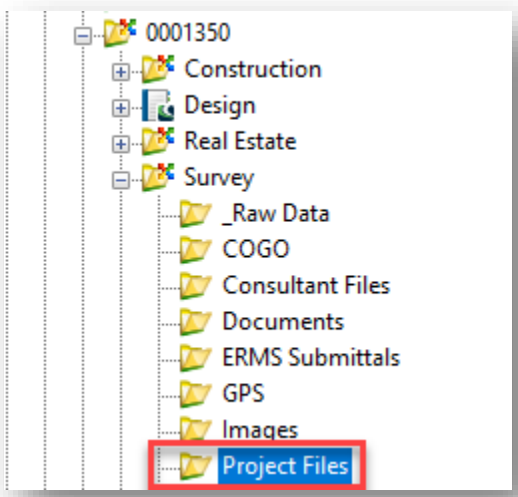
With the move to OpenRoads technology for Survey, there are some slight changes to the project deliverables when compared to SS4 and SS10. The following workflow will step through the process of creating each file for a survey project. It is assumed that the user will be working from the Survey workflow in OpenRoads Designer.

As the intent is that every project should now be geocoordinated, the first document in the workflow will be the geocoordinated seed files. These will allow for all project files to be created and based off the same coordinate system, allowing the file content to be shown spatially without the need to configure each individual file.

2.2-1 Creating the Geocoordinated Seed Files (2D and 3D)

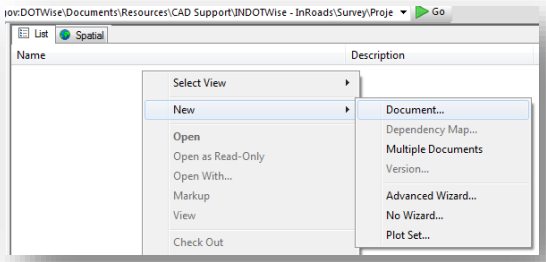
The following procedure steps through the process for creating the geocoordinated seed file for use through the project lifecycle. The creation of these files allows for any CAD files based on the created seed file to be instantly consumed by the ESRI ArcGIS Products and made available for a variety of other uses. With OpenRoads changes to document handling and civil information, these steps should be performed for both a 2D and 3D file (shown).

1. After creating your Survey Work Area in your Des No. specific project via the DOTWise project creator, navigate to the Project Files folder:



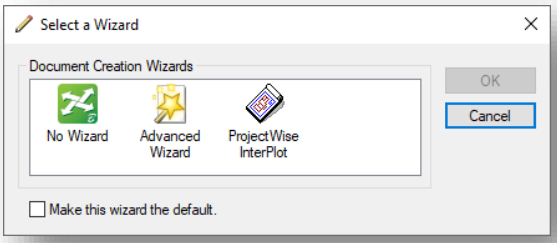
Survey Project Files Location

2. With the Project Files folder selected and its contents displayed in the Document pane, right click in the document pane and select *New -> Document*.



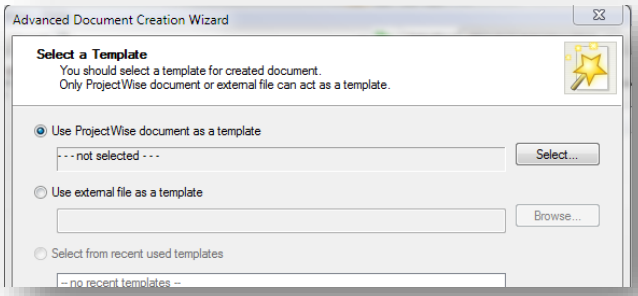
Starting the New Document Wizard

3. You will then be presented with a series of options; select the Advanced Wizard option.



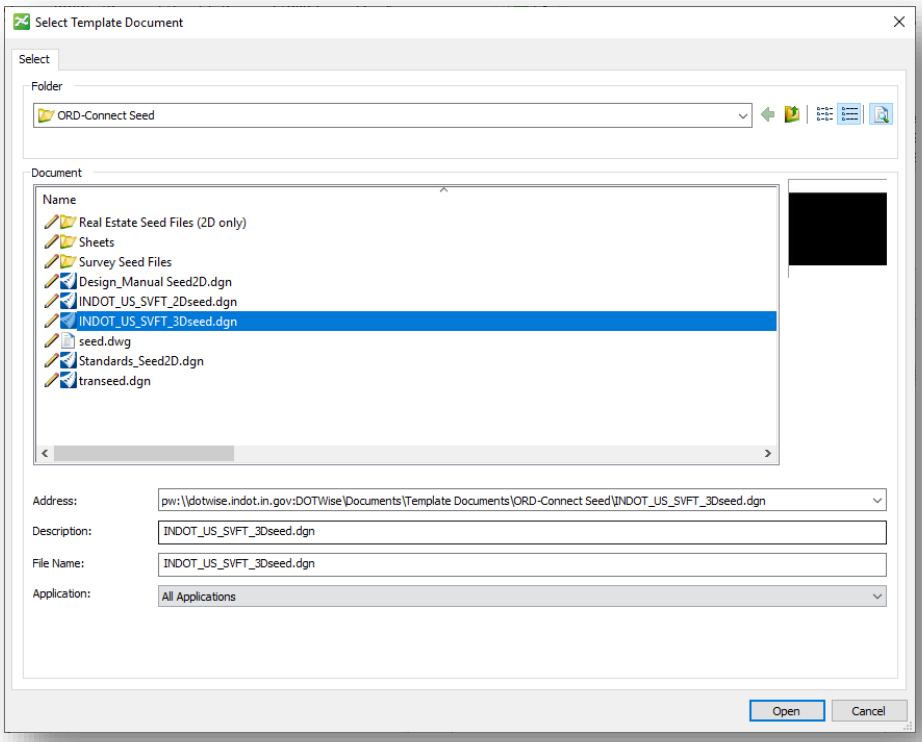
Using OpenRoads Designer for Design/Plans Production

4. This will start the Advanced Documentation Creation Wizard. The first panel is informational and can be bypassed. The second panel confirms your location. If for some reason you did not have the correct folder active in your document panel, you can select it now or confirm the path shown.
5. The next panel allows selection of the template document. On the first line *"Use a ProjectWise document as a template"* option and then press the select button.



Select a Template dialog

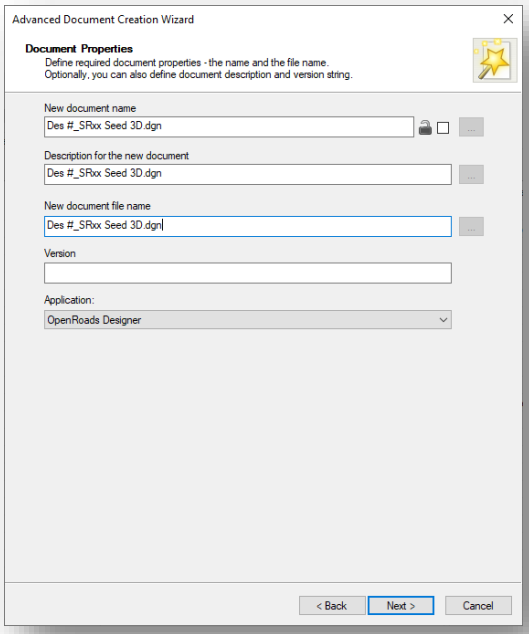
6. In the *"Select Template Document"* panel, navigate to the ORD-Connect Seed files in the ProjectWise System and select the appropriate unit files for your project and that the file you select is the 3D version: pw:\\indot-pw.bentley.com:indot-pw-01\Documents\Template Documents\ORD-Connect Seed\



Selecting a US Survey Foot OpenRoads Designer Seed File

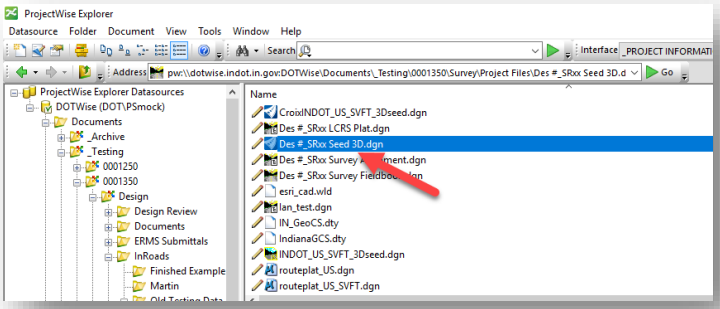
7. With your file selected, you can then proceed to the next screen. If you are prompted for Document Attributes, you may proceed beyond this screen as well.

8. The final step in creating the document is to provide a name. Seed drawings should be titled with the following format: Des #_SRxx Seed 3D.dgn. To ease document searches and for consistency purposes, all three names should be the same as shown. Also worth noting is the Application dropdown, as it illustrates the OpenRoads Designer association as shown in the following screen capture.



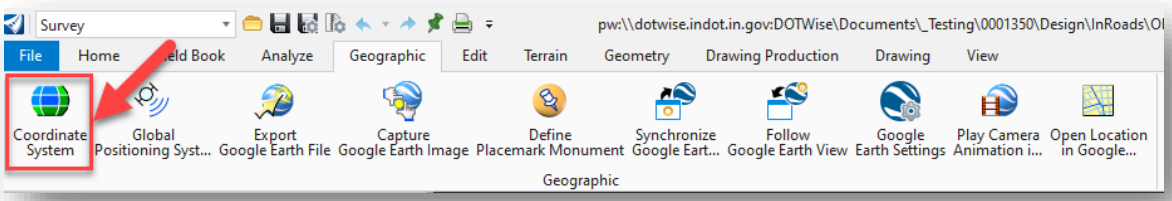
Document Properties and Naming

9. Select Next to complete the document naming process. On the final two pages of the wizard, confirm the document properties and create the document. Proceed through these and then continue in the same Project Files folder.
10. Navigate to your newly created seed file in the Survey\Project Files folder & double click on the file to open it in OpenRoads Designer. (Allow for Managed Workspace to download).



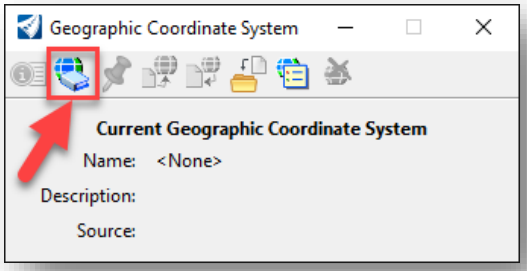
Created Seed File

11. Open the Geographic Coordinate System dialog by clicking on the Coordinate System tool on the Geographic tab (assumed the user is in the Survey workflow).



Coordinate System Tool

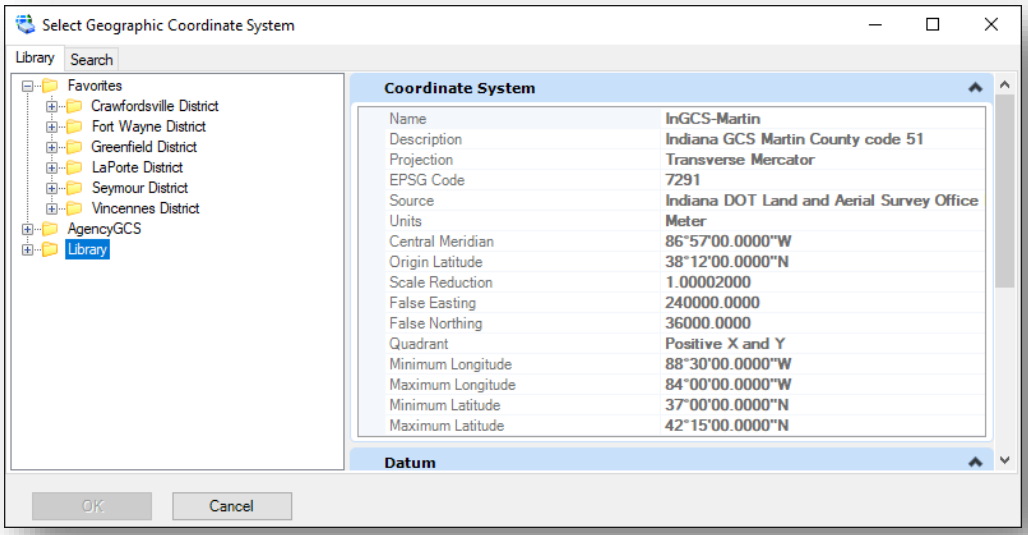
12. In the Geographic Coordinate System dialog, click on the From Library button.



From Library Button in Geographic Coordinate System Dialog

At this point, the Select Geographic Coordinate System dialog is displayed. The Library tab in this dialog contains folders with all the available coordinate systems. The Favorites, ProjectGCS, AgencyGCS, and Library are the folders you will see. In the ProjectGCS as well as the AgencyGCS folders, there will be a list of coordinate Systems for Indiana State Plane East and West and the Local Ground Coordinate System (LGCS) templates..

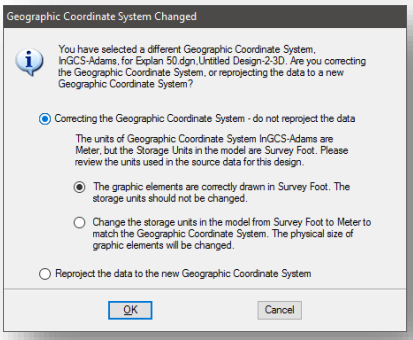
13. At this point in the process, you may have data that can use one of the county coordinate systems located under one of the district folders under Favorites—which contains the coordinate systems for all of the counties that reside in their respective district. Alternatively, you can select the county coordinate system under the AgencyGCS folder. If your data conforms to this configuration, please select and apply the correct coordinate system at this time.



Select Geographic Coordinate System Dialog

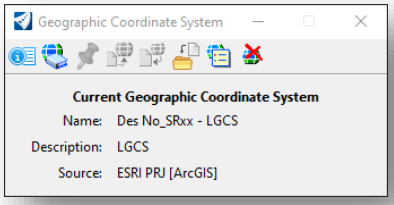
Note: As of OpenRoads Designer 2023, Survey Foot based Geographic Coordinate Systems have been incorporated into the platform and will be available with newly created data. The following dialog shown on the next page will only be visible if the ProjectGCS from a legacy project is being used or the coordinate system is imported from a file created from the legacy Metric coordinate systems. These systems are compatible, and project data can be a mix of the Survey Foot and legacy Metric systems with no impact to geospatial relationships between CAD files. All other spatial data such as imagery or imported GIS data will reproject as necessary between the coordinate systems without issue as well.

14. A pop-up dialog may appear asking you to choose whether you want to reproject the data based on this newly applied coordinate system. Be sure to select the option to keep the storage units as they are (should not be changed) as shown below.



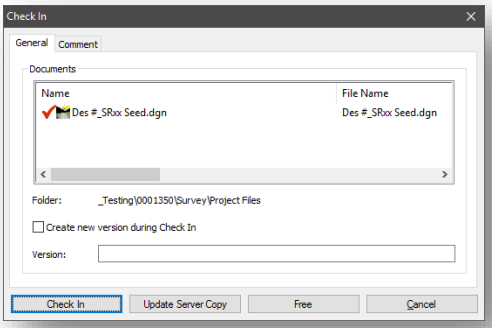
Keeping Storage Units

15. The newly selected Coordinate System will now appear in the Geographic Coordinate System dialog window as shown:



Applied Coordinate System

16. Upon completion of these steps, you will need to exit OpenRoads Designer and check in your CAD file. Please add comments upon check-in.



Checking In CAD File

With the LGCS defined within the dgn file the survey can be processed through InRoads in the typical manner. The only difference is that MicroStation knows the parameters to convert data in any other standard coordinate system to the LGCS. This means that ortho-imagery, GIS files, etc. can be referenced to the dgn file and MicroStation will re-project them to the LGCS on-the-fly so that the data is all spatially referenced.

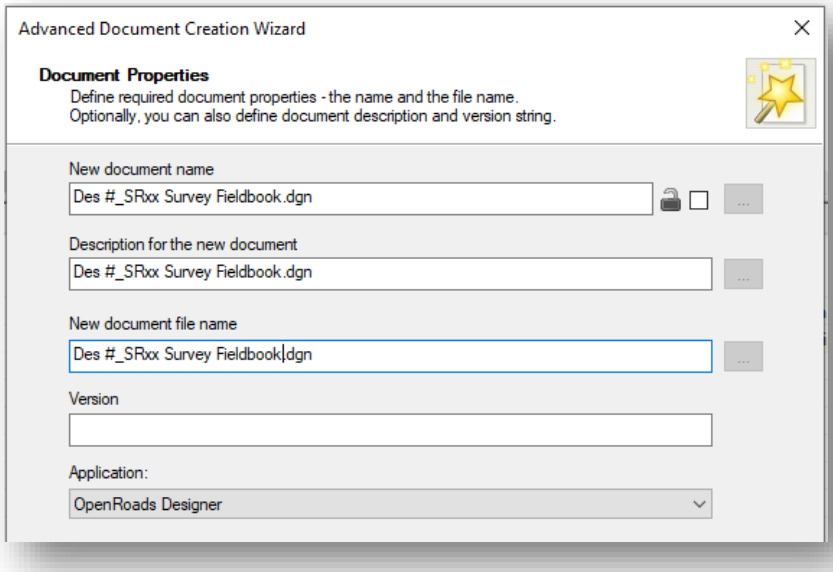
2.2-2 Creating the Survey Fieldbook DGN file

Creating the fieldbook DGN file is the first instance where you will find the need to choose a particular seed file. In this instance, you will need to start with the 3D geocoordinated seed file you created in the previous section.

Note: Provided the supplied data correctly adheres to the county coordinate systems that are provided in the geocoordination library, you may also apply the appropriate GCS to the file directly as shown in the previous section.

1. Using the Des #_SRxx Seed 3D.dgn you created in the previous section, create a new document under your Survey\Project Files folder. Use the Advanced Document Wizard and instead of pointing to a pre-existing seed file, point back to the Des #_SRxx Seed 3D.dgn. Name this file Des #_SRxx Survey Fieldbook.dgn.

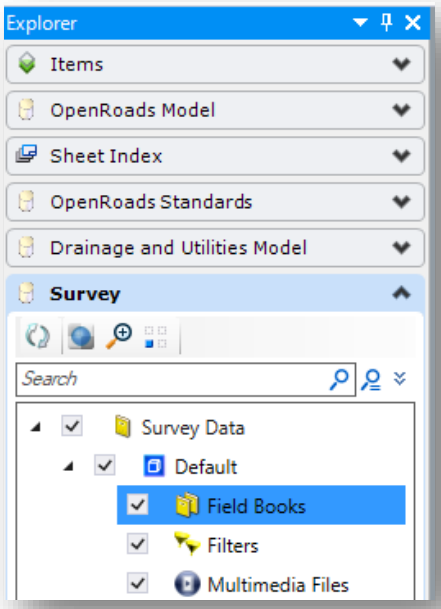
   Note: By using the seed file created in the previous steps you will ensure starting off with a correctly geocoordinated file. All subsequent DGNs should be created using this seed as your starting file.



Creating the Survey Fieldbook DGN

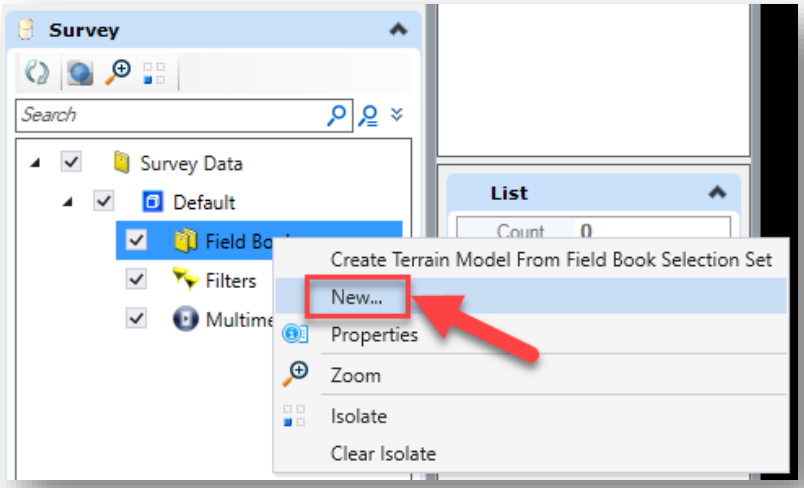
2. Launch the DGN file from the ProjectWise Explorer by double clicking on it.

3. With OpenRoads Designer loaded, locate the Project Explorer and navigate to the Survey section. Expand the Default tab so that Field Books are visible.



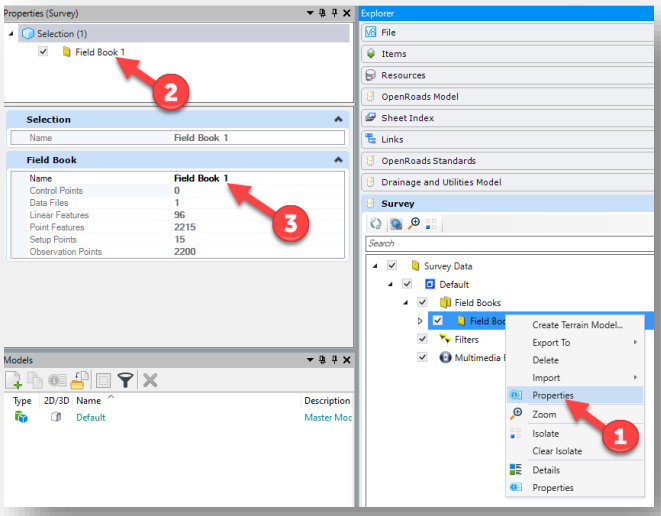
Survey Project Explorer

4. With the Field Books shown, right click on their entry. Select New...



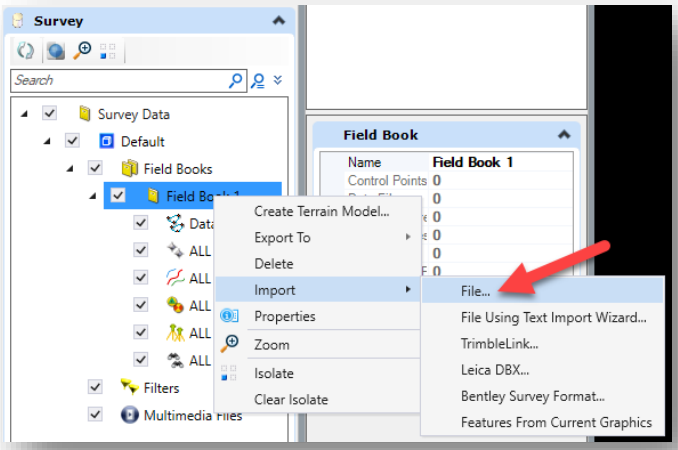
Creating a New Field Book

5. A field book will then be created. *Note that you are not initially given the option to give it a name, as it will be automatically created as Field Book 1.* To change this, right click on the field book and select Properties. The field book information will then show up in the OpenRoads Designer Element Information panel, like any other OpenRoads element. You can rename it in the Name field—and it is recommended to maintain the Des #_SRxx convention.



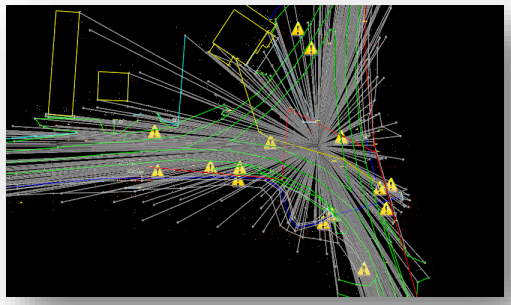
Renaming a Field Book

6. With the field book renamed, you can now import your data. Right click on the field book and select Import > File… OpenRoads field books allow for the import of a wide variety of data types and formats. Additionally, existing FWD surveys from SS2 can be directly imported into the OpenRoads environment using this tool.



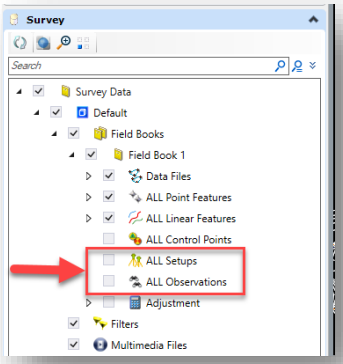
Importing Survey Data

7. On the presented ProjectWise Open dialog, navigate to your Survey_Raw Data folder and locate your data collector file(s) to attach them.
8. With your data files attached, you will see output similar to the following.



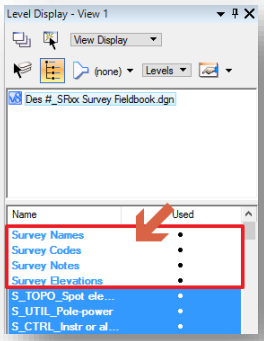
Raw Survey Data in OpenRoads Designer

9. As you can see, there appear to be numerous issues with the TOPO display.
    a. First are the points denoted with the exclamation point (!) icon. These are points that the OpenRoads environment does not have codes for. These should be adjusted to known codes within the environment.
    b. Point symbols and linestyles are not displaying properly. Using the Drawing Scale tools mentioned in section 1.5-5 of this document, first enable Annotation Scale Lock, and then pick your required scale. This example will proceed with using 1” = 50’. *To reiterate the note from the beginning of the chapter, as of this writing, in the current ORD version (ORD 2021 R2) your survey data may not respond to changing the annotation scale. If this happens, you will need to set the annotation scale FIRST, and then redraw the survey data.*
    c. Linework denoting both the observations themselves, along with the instrument setups will be displayed. In the Survey section of Project Explorer, disable these two options prior to handing your data to design.

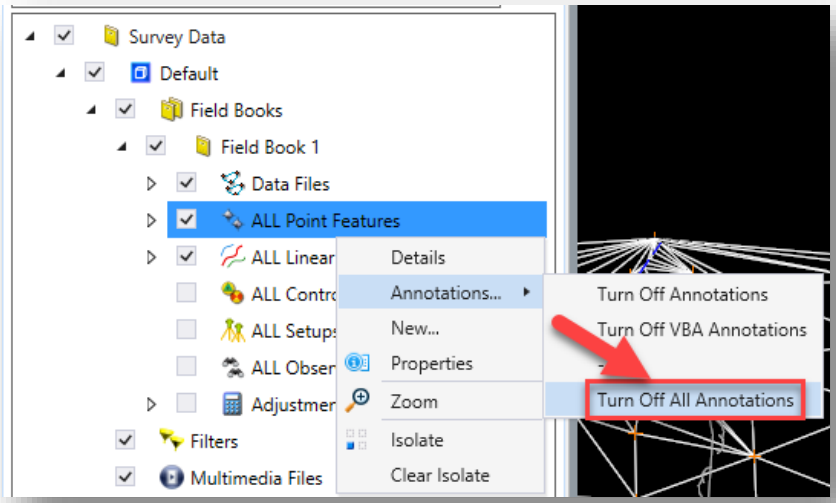


Disabling Setups and Observations

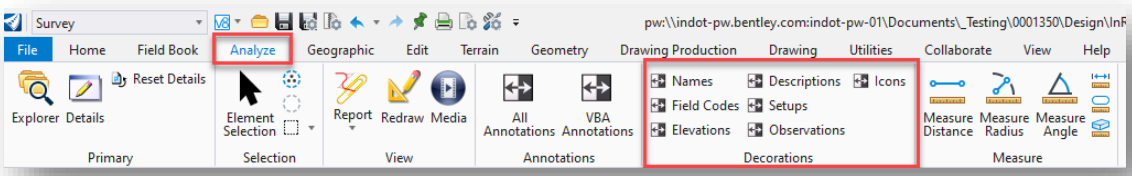
d. Finally, survey notation information will appear around each point, like the old planimetric graphics in SS2. To disable these, open the Level Display and disable the levels shown. Alternatively, you can right click on the ALL Point Features in the Survey Fieldbook and select Annotations -> Turn Off All Annotations. You can also turn them off from the Decorations section of the Analyze tab in the ribbon.



Disable Survey Notation Graphics

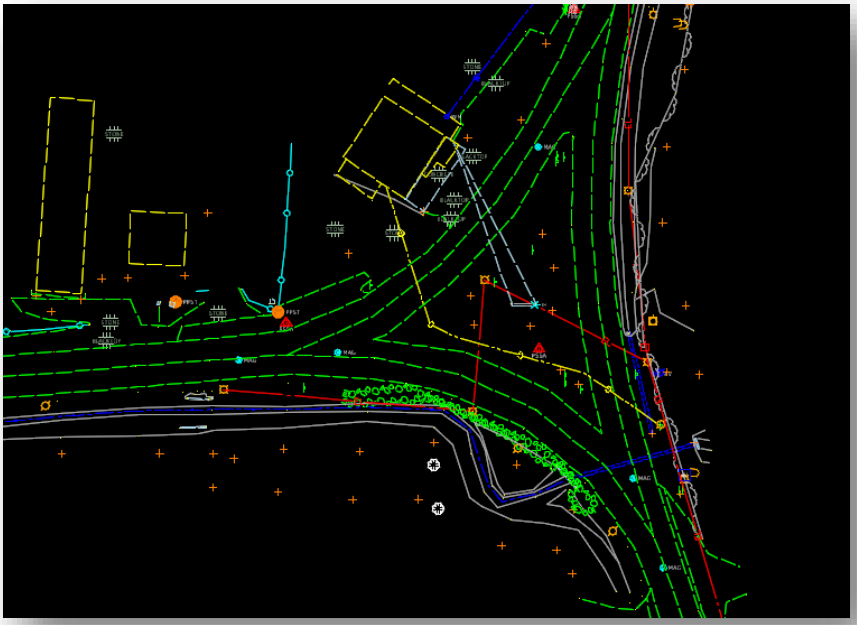


Turn Off All Annotations



Decorations Section of Analyze Tab

10. With these previous items resolved, your TOPO display will now look like the following and in line with expectations.



Cleaned up TOPO Display

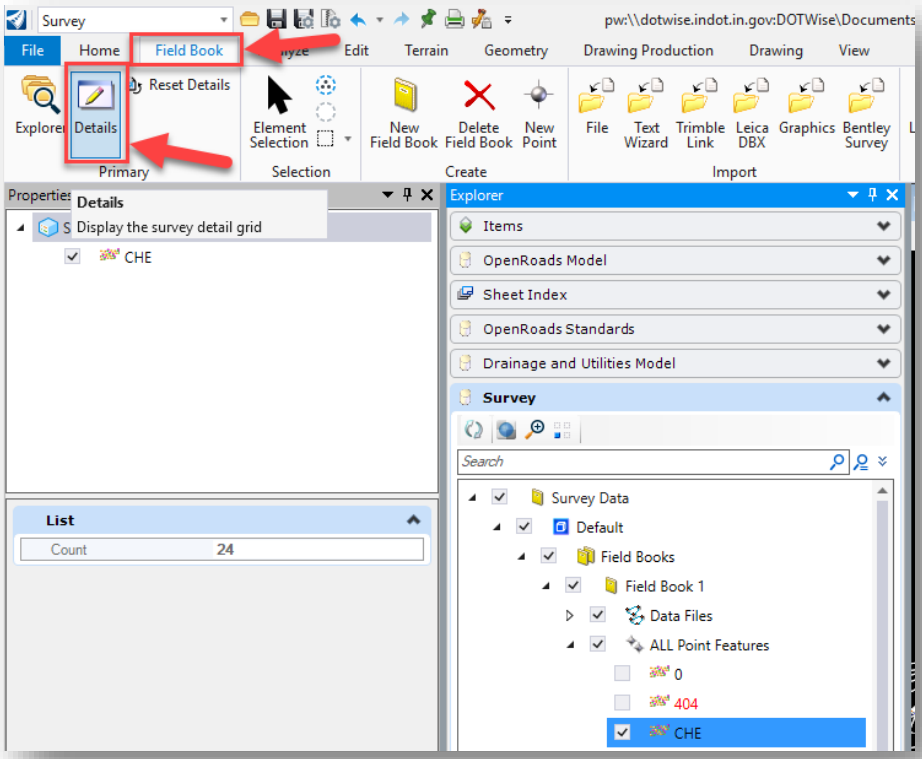
NOTE: From time to time, the line styles that contain embedded text may not appear correctly, with the text symbol being disproportionately large. If this happens, please refer to the INDOTWise 5.2 Technotes document, in the CAD Workspace/MicroStation Platform section.

11. With the fieldbook now created, you can proceed to saving your file back to ProjectWise. Before closing the document, first save the settings. This can be done by clicking on the Save Settings button on the Quick Access toolbar, or via selecting Save Settings from the File menu/Backstage View. Then close the application and check in your file.

2.2-2a Editing Fieldbook Features

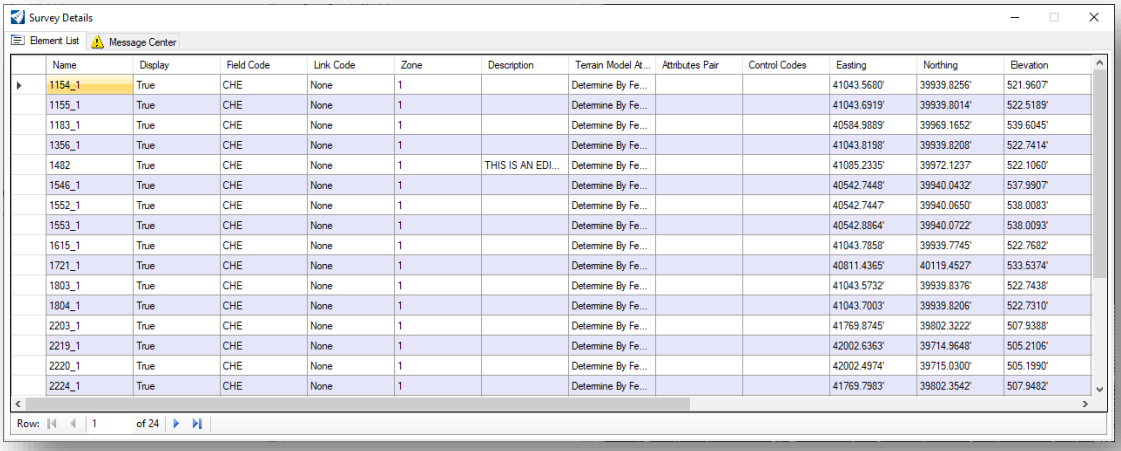
Unlike the previous version where all features were edited in the fieldbook in line with how they were shot, OpenRoads Survey prioritizes the individual features from an editing standpoint. To interrogate individual features, you have multiple options on how to interact with them. This section will take a brief look at two of the more immediate methods.

First up is the table-based editor. With your fieldbook open and selected, drill down to either the ALL Point or ALL Linear Features and select one of the codes. Keep in mind that all breaklines will also have point definitions as that's how OpenRoads defines them. With a point or linear feature selected, go to the Details tool in the Primary Group of the Field Book tab.



Survey Details Tool

This will open a tabular view of the selected feature. Depending on the feature selected, you can change the name of the feature or shot, if it is included in the triangulation, or northing/easting/elevations, and other items. To modify any field, place your cursor within it. If it is a dropdown, you will be presented with the applicable options. If it is a text entry field, enter the appropriate information. In both instances, once complete, hit the Tab key to confirm the change.



Survey Details

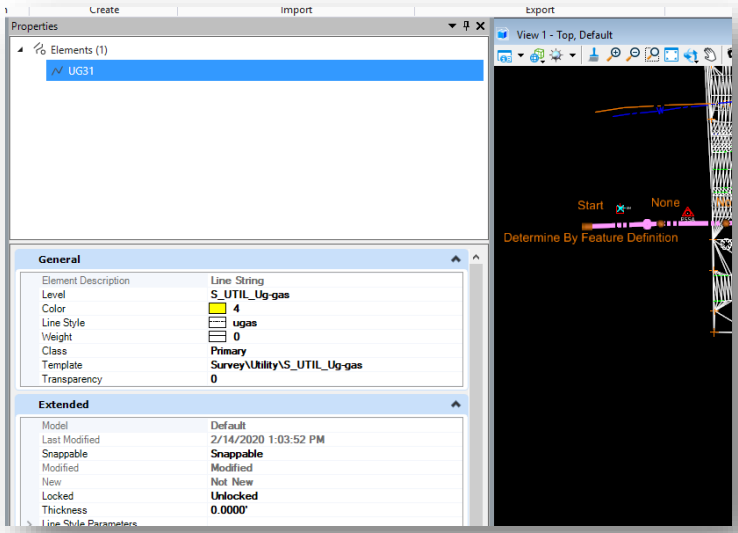
Element List | Message Center

Name	Display	Field Code	Link Code	Zone	Description	Terrain Model At...	Attributes Pair	Control Codes	Easting	Northing	Elevation
1154_1	True	CHE	None	1		Determine By Fe...			41043.5680'	39939.8256'	521.9607'
1155_1	True	CHE	None	1		Determine By Fe...			41043.6919'	39939.8014'	522.5189'
1183_1	True	CHE	None	1		Determine By Fe...			40584.9889'	39969.1652'	539.6045'
1356_1	True	CHE	None	1		Determine By Fe...			41043.8198'	39939.8208'	522.7414'
1482	True	CHE	None	1	THIS IS AN EDI...	Determine By Fe...			41085.2335'	39972.1237'	522.1060'
1546_1	True	CHE	None	1		Determine By Fe...			40542.7448'	39940.0432'	537.9907'
1552_1	True	CHE	None	1		Determine By Fe...			40542.7447'	39940.0650'	538.0083'
1553_1	True	CHE	None	1		Determine By Fe...			40542.8864'	39940.0722'	538.0093'
1615_1	True	CHE	None	1		Determine By Fe...			41043.7858'	39939.7745'	522.7682'
1721_1	True	CHE	None	1		Determine By Fe...			40811.4365'	40119.4527'	533.5374'
1803_1	True	CHE	None	1		Determine By Fe...			41043.5732'	39939.8376'	522.7438'
1804_1	True	CHE	None	1		Determine By Fe...			41043.7003'	39939.8206'	522.7310'
2203_1	True	CHE	None	1		Determine By Fe...			41769.8745'	39802.3222'	507.9388'
2219_1	True	CHE	None	1		Determine By Fe...			42002.6363'	39714.9648'	505.2106'
2220_1	True	CHE	None	1		Determine By Fe...			42002.4974'	39715.0300'	505.1990'
2224_1	True	CHE	None	1		Determine By Fe...			41769.7983'	39802.3542'	507.9482'

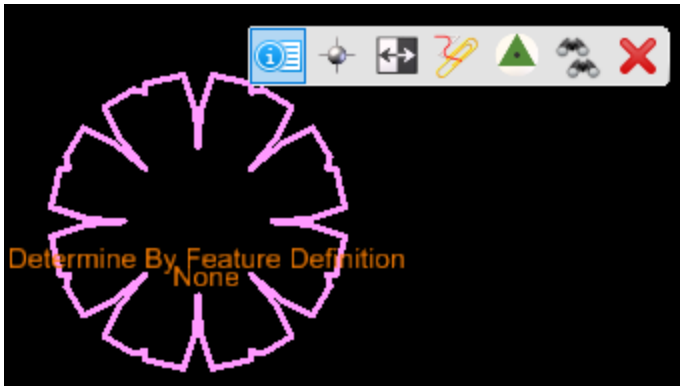
Row: 1 of 24

Survey Details

The other method of editing surveyed features is graphically. In the main display that shows your TOPO elements, you can select on any feature and review its properties in the Element Information panel. In this view you can edit the same data as you can in the details. Additionally, in the graphical side, all elements will be given heads up element handles that you can grab and manipulate.



Graphically Editing Survey Data

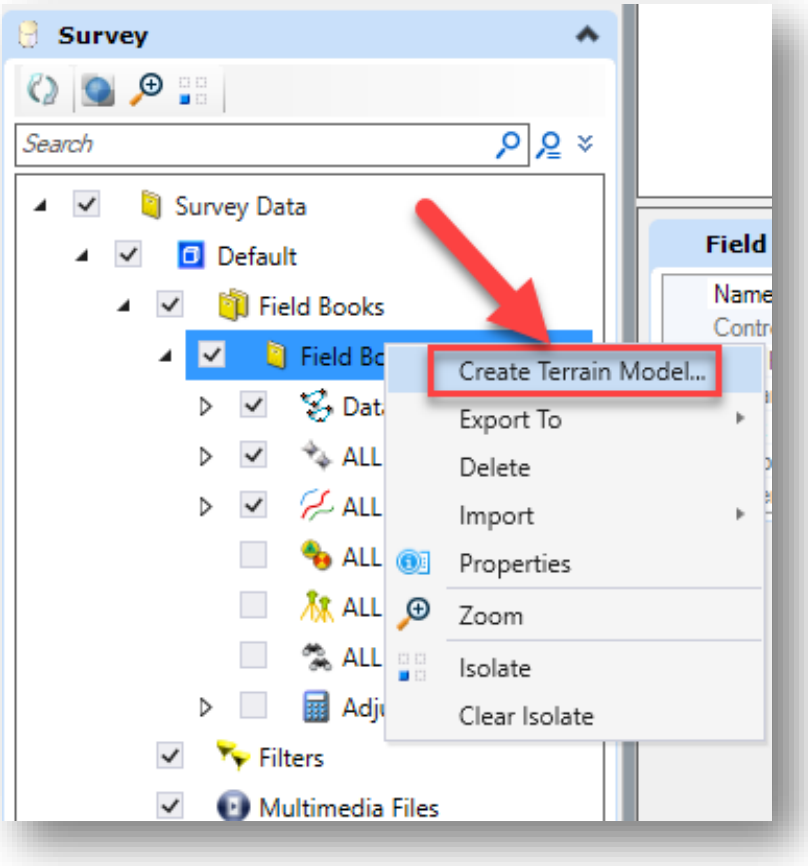


Heads-Up Display on Deciduous Tree Survey Feature

2.2-3 Creating the Terrain Model

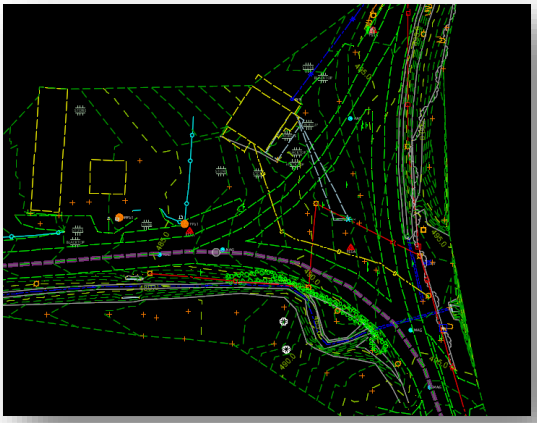
With the Survey Fieldbook now created, you will need to create the OpenRoads Terrain model. Note that it is no longer necessary to create a boundary surface as it is automatically created when the terrain model is generated. This boundary is automatically defined by the extents of the triangulation and will automatically update as you are editing features or the triangulation itself.

1. To proceed with terrain generation, re-open your survey field book DGN from the previous steps.
2. Navigate to the Survey section on the Project Explorer. Right click on your Des #_SRxx field book and select the Create Terrain Model… option.



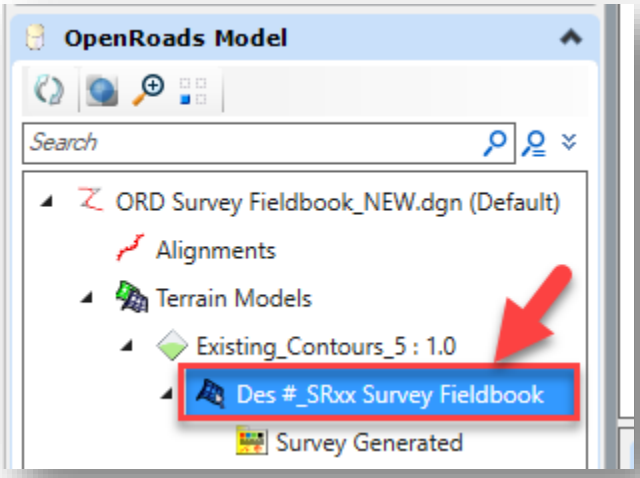
Create Terrain Model

3. When processing is completed, the terrain model will be created and displayed. The default display style is to show Existing Contours at a 5:1 scale. The display will look like the following.



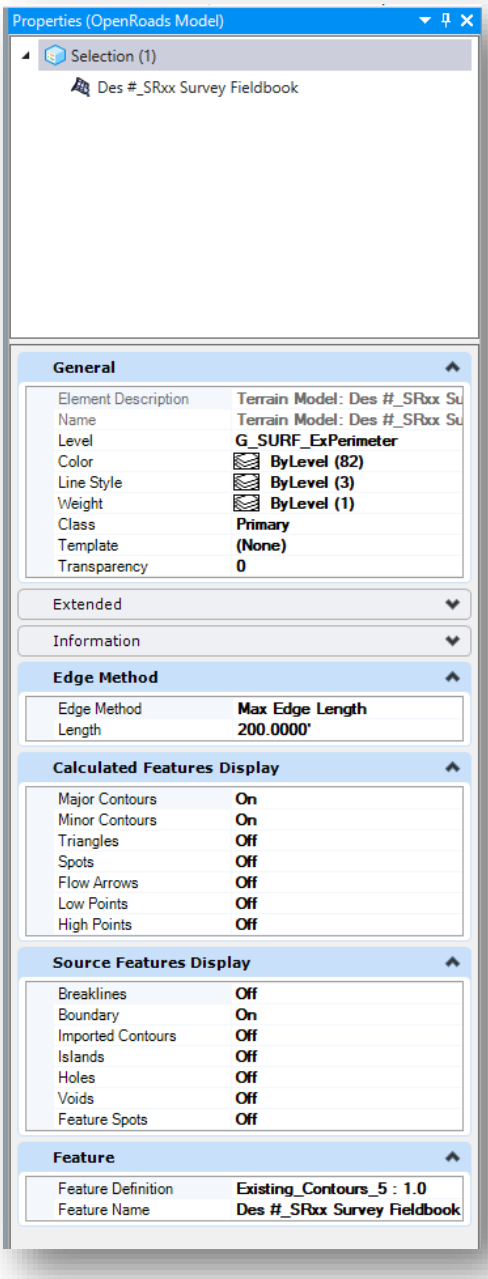
Survey with Created Terrain Model

4. At this time, you can investigate the terrain model. To select it, go to the OpenRoads Model section on the Project Explorer. Expand out the Terrain Models listing on the tree and select Des #_SRxx Survey Fieldbook.



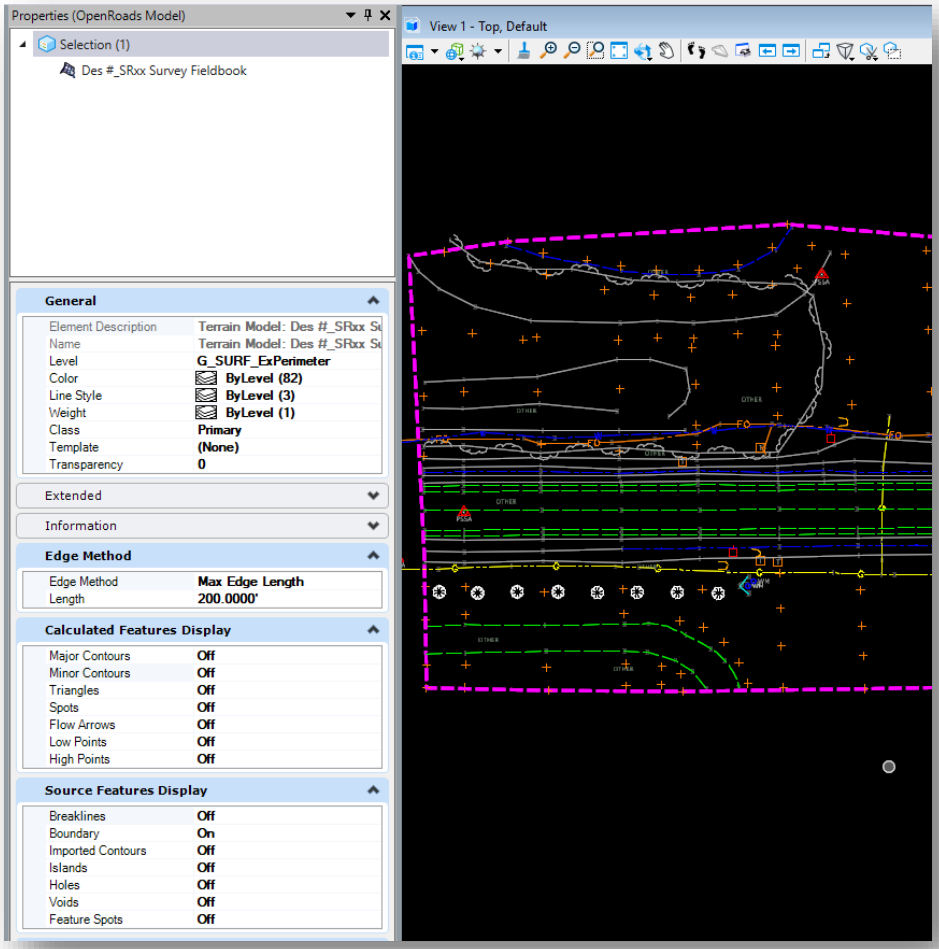
The Terrain Model

5. By selecting the Terrain Model, you can then interrogate its properties in the Properties panel. Reviewing the terrain in the panel allows you to control display items such as the maximum length of triangles, whether contours should be displayed, displaying the triangulation, etc. The following shows all the relevant settings for controlling the terrain display.



Terrain Model Element Information

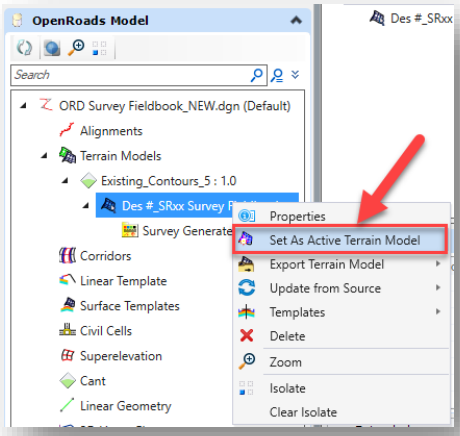
6. With the terrain model now having display settings for items such as the perimeter, contours and triangulation, it is no longer necessary to use the Level Display to disable these items. Simply use the Element information panel to shut these items off in preparation for the final deliverables.



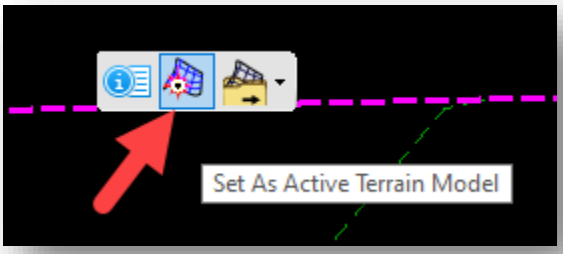
TOPO Display with Terrain Display Off

7. At any time, these features can be redisplayed simply by toggling the relevant feature on.

8. For the terrain to correctly display in referenced documents, make sure it has been activated. Again, on the OpenRoads Model section in Project Explorer, right click on your terrain and select the Set As Active Terrain Model option. Alternatively, you can activate it via the heads-up display (HUD).



Set Active Terrain Model in ProjectWise Explorer



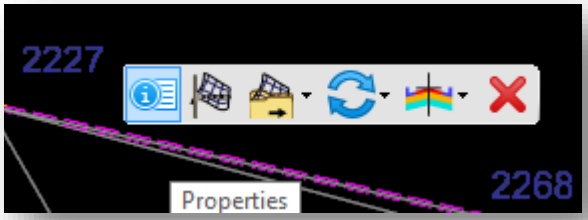
Set Active Terrain in Heads-Up Display

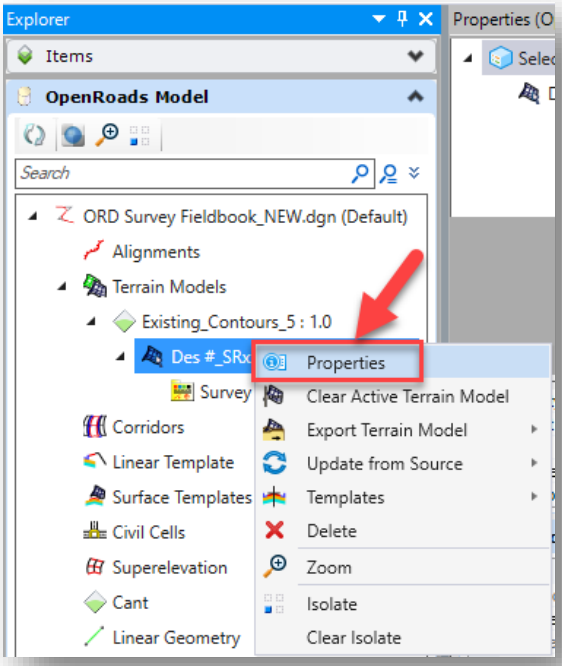
Note: This workflow no longer allows for the editing of features once they have been sent to the terrain model as it becomes a "ruled" feature. If any changes are needed to surveyed features, the terrain should be deleted and recreated from the field book once the changes have been made.

2.2-3a Triangulation Clean Up and Terrain Editing

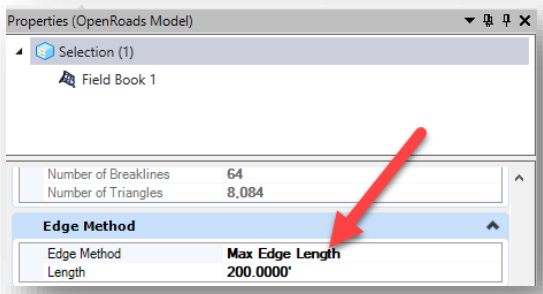
OpenRoads terrains have similar commands to the previous version of InRoads allowing for the modification of a triangulated terrain. The first option to clean up the triangulation extents is to adjust the max length of the triangles it creates.

In the software, select your terrain either from the Project Explorer, or graphically select the terrain perimeter on the screen. In either instance, select the Properties button.





On the Properties panel for your terrain, locate the Edge Method heading and from there you can adjust the max length as you did when triangulating a DTM in the old version. From here, you can tighten up the triangle lengths to get a more defined perimeter for your project without editing the terrain content.

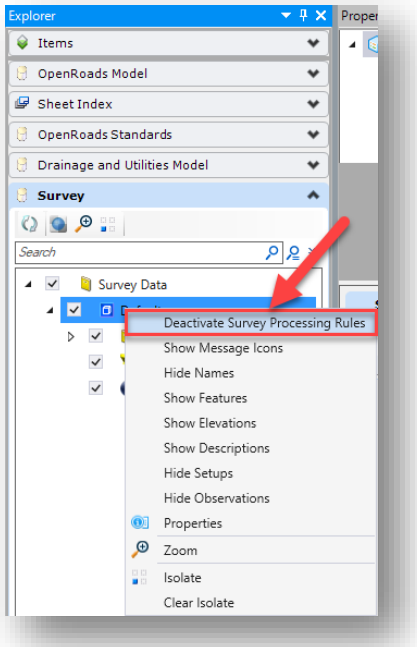


Max Edge Length Setting

Note: Changing the triangles max length will force the full triangulation to re-process. Please make sure to have this value finalized prior to performing any further terrain edits.

Additionally, you can directly edit the terrain by disconnecting the survey processing rules to allow for such functions as cleaning up any unnecessary triangles. These steps will look at how to disconnect the terrain from the survey for editing.

1. Locate the Survey section on the Project Explorer. Right click on the model name (in this example, Default)
2. Select the Deactivate Survey Processing Rules option.

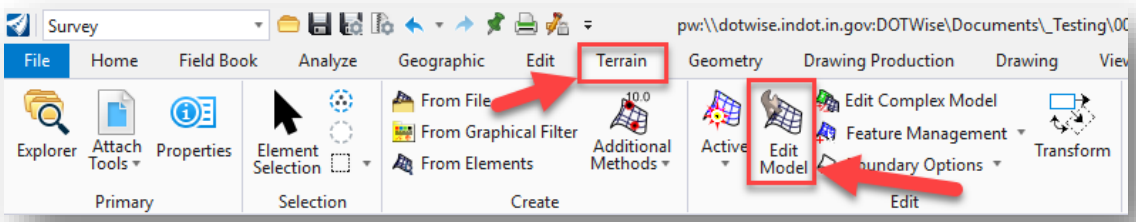


Deactivate Survey Processing Rules

This process disconnects your field book and terrain completely. Changes made to the field book will no longer automatically be reflected to the terrain. This is like how the DTM and FWD were disconnected outside the Survey Data to Surface process. Although they are in the same file, they co-exist as two separate entities.

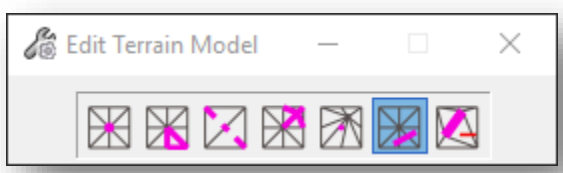
With this disconnection completed, you can then use the terrain editing tools to interact with the terrain for functions such as cleaning up triangles. Please keep in mind that all terrain edits must occur in a 3D model. For instance, to delete triangles:

1. Continuing from the previous steps where the survey and terrain model were disconnected, click on the Edit Model tool from the Edit Group in the Terrain tab.



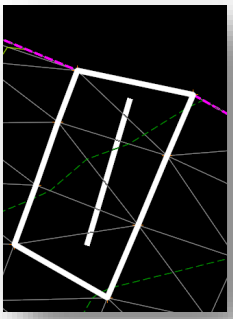
Edit Model Tool

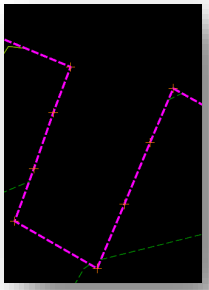
2. At this point you can modify the triangulation in a number of ways. One of the most useful is the ability to remove triangles with a crossing line. The 6th tool on this panel (highlighted) is the Delete Triangle by Line command. Select it and then click on your terrain model.



Delete Triangle by Line

3. With the terrain selected, draw a line as prompted across all the triangles that you wish to remove. The bold lines indicate the crossing line as well as the outline of the triangles to be removed. Confirm what's to be cut with a single data point click.

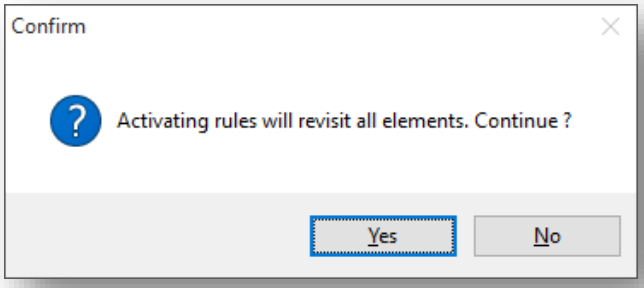




Before Trimming **Trimmed Result**

This same methodology can be applied to most of the terrain editing tools. It is imperative however, that as we did earlier in this chapter that the survey and terrain be disconnected through the survey rule deactivation.

Throughout this section you have looked at how terrain editing works with the survey disconnected. As an extension of this, one may ask what happens if you turn the survey rules back on. To do so, reverse the process in the first part of this section and you will receive the following prompt:

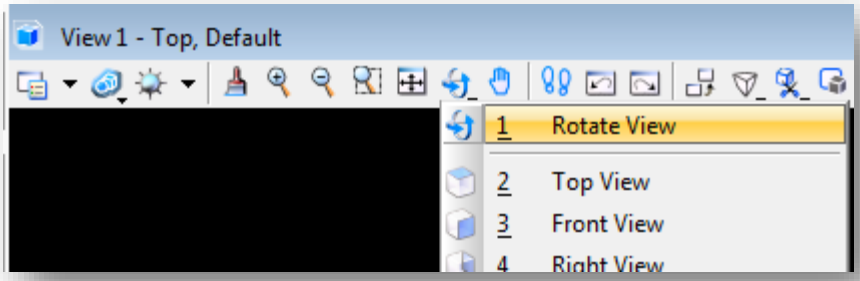


Reactivation of Survey Rules

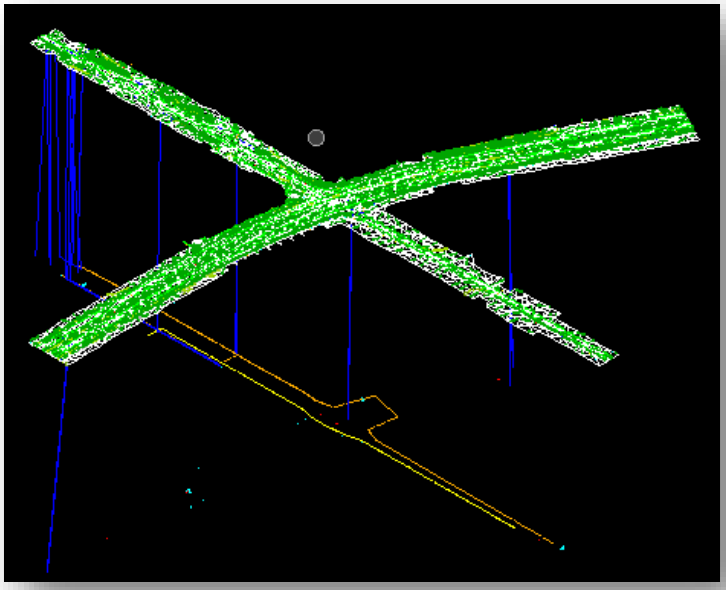
Selecting Yes will cause the terrain and survey to relink. It will also re-establish the terrain back to how it was created from the survey, removing any changes or cleanup performed.

2.2-4 Verifying Topo using 3D Rotation and Shading the Triangulation

The View toolbar (located in the upper left of the view window) gives access to rotate 3D drawings to any one of 9 predefined Views. Isometric View and Right Isometric View are the most useful to rotate quickly to a 3D orientation. Option number 1 – Rotate View allows dynamic view rotation.

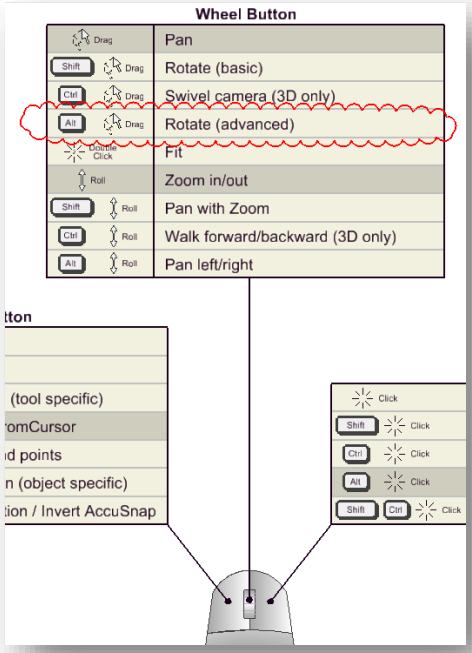


Results will be similar to below.

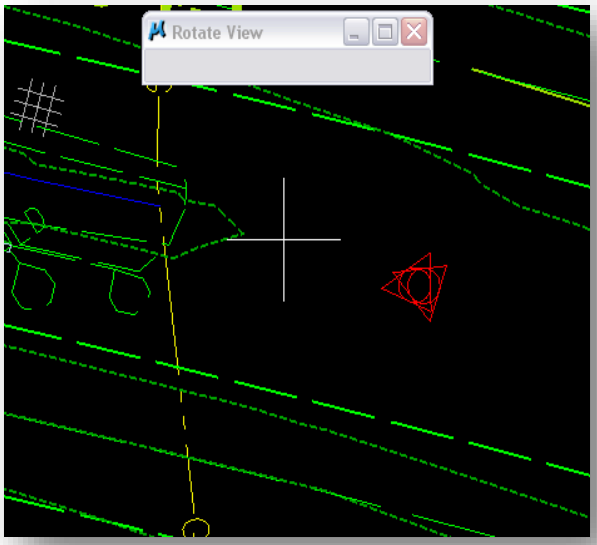


Note: Alternate access to 3D rotation can be obtained from mouse functions. This involves the Alt-Middle dynamic rotation. This is also the same as Option 1 Rotate View - dynamically

Alt & Middle click

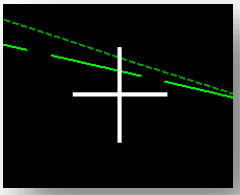


The Drawing View will have a crosshair placed in the drawing. This is automatically placed at the center of the graphical elements in the drawings.



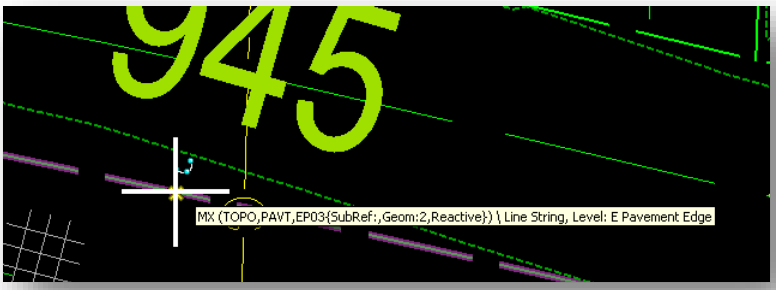
Any subsequent rotation will be about this point unless you dictate otherwise. (This is rarely the desired location.)

The rotation origin can be modified by tentatively snapping to the desired location (left right chord) or by graphically dragging the cursor to a new location. When the cursor is moved over the crosshairs they become highlighted as shown.

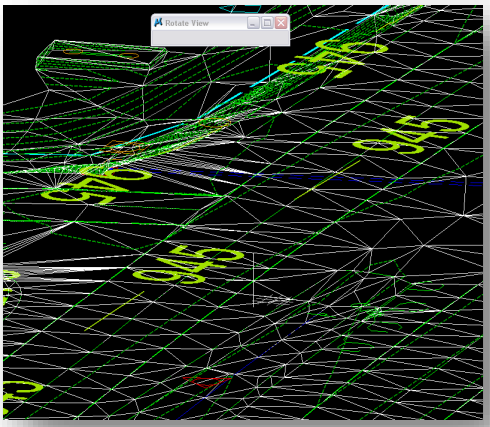


Press and hold the left mouse to graphically drag to a new rotation origin. AccuSnap is particularly useful in this operation. When the left button is released, so is the cursor at the new location.

Subsequent left mouse dragging will dynamically rotate the drawing. (Make sure you are no longer over the origin.)



Results of left drag with triangulation displayed as reference:

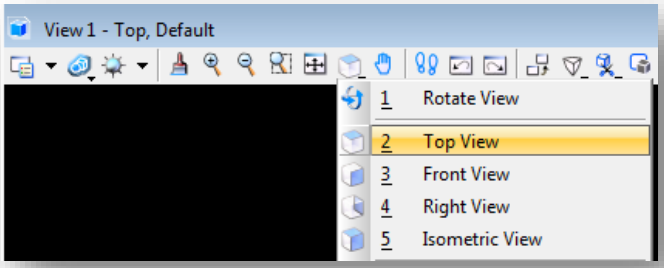


Note: Subsequent panning and additional Dynamic rotation will change the perspective, allowing you to see any portion of the project from any angle

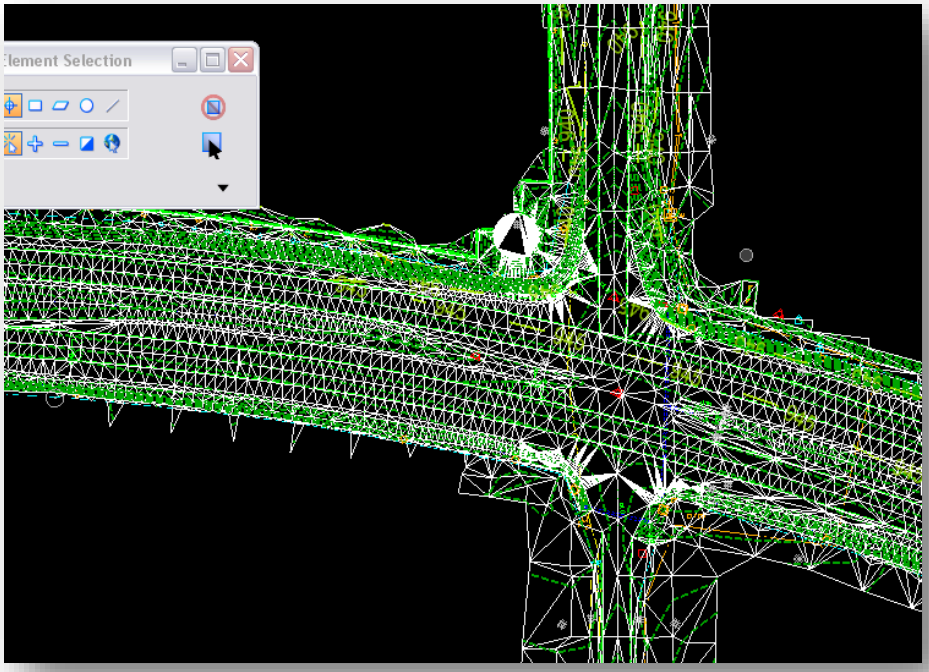
Returning to Plan View

In CAD, the normal Plan View is referred to as Top View.

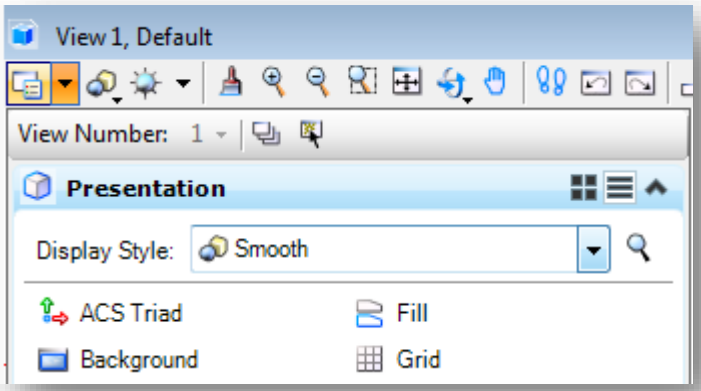
Simply select the icon to the right of Fit view.



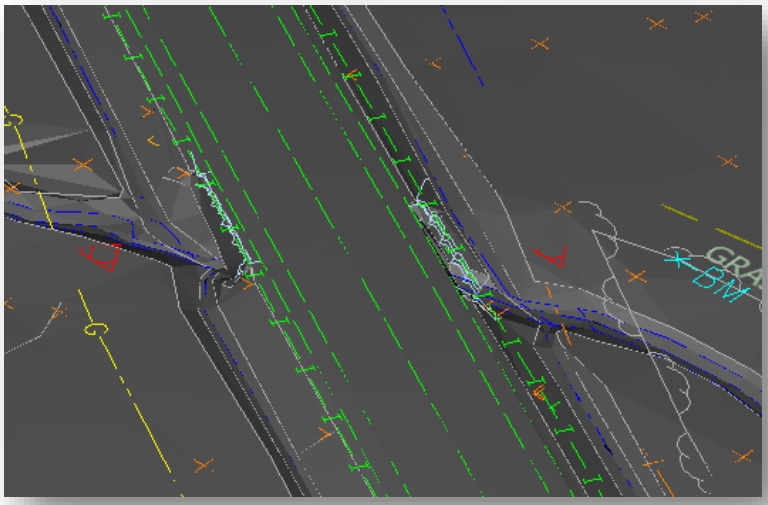
Resulting view:



You also may wish to verify the triangulation by applying shading to see if any holes exist. With your triangulation displayed, click on the View Attributes button on the upper left hand corner of your active MicroStation view. The very top option for presentation will be listed as wireframe by default. Change this setting to smooth as shown, and your triangulation will look as shown.



Smooth Shading on View Attributes



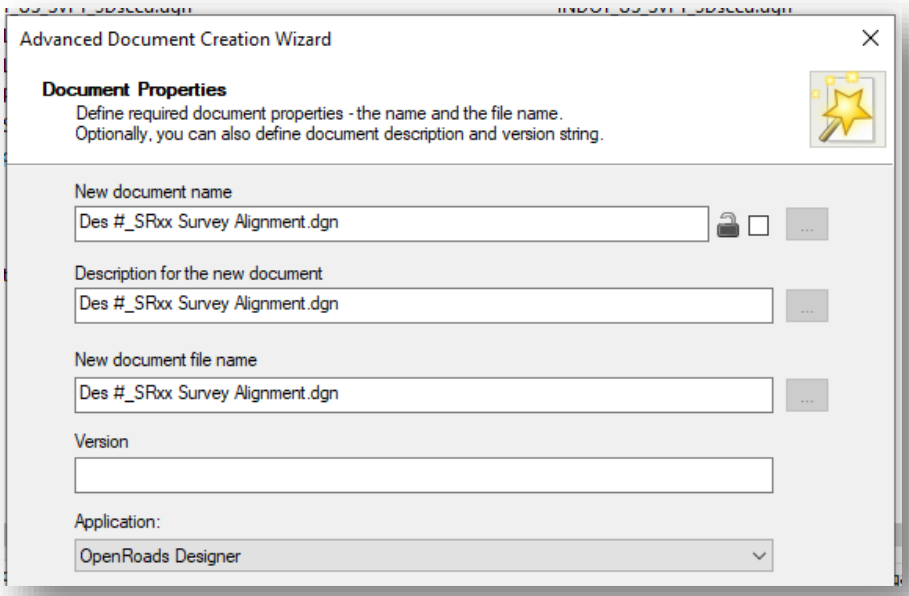
Topo with Smooth Shading

You can switch back to the wireframe display by performing the same steps, changing from Smooth and back to Wireframe. Note that there are additional display styles available that can also be used.

2.2-5 Creating the Survey Alignment File

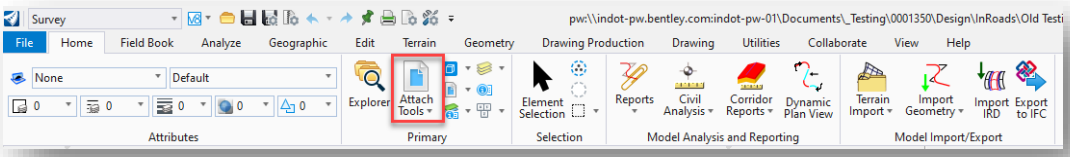
To create a survey alignment file, the first step is to create a new 2D geocoordinated seed file per the instructions in section 2.2-1. Then proceed with the following instructions:

7. Using the Des #_SRxx Seed 2D.dgn that you should have already created, create a new document under your Survey\Project Files folder. Use the Advanced Document Wizard and instead of pointing to a pre-existing seed file, point back to the Des #_SRxx Seed 2D.dgn. Name this file Des #_SRxx Survey Alignment.dgn.

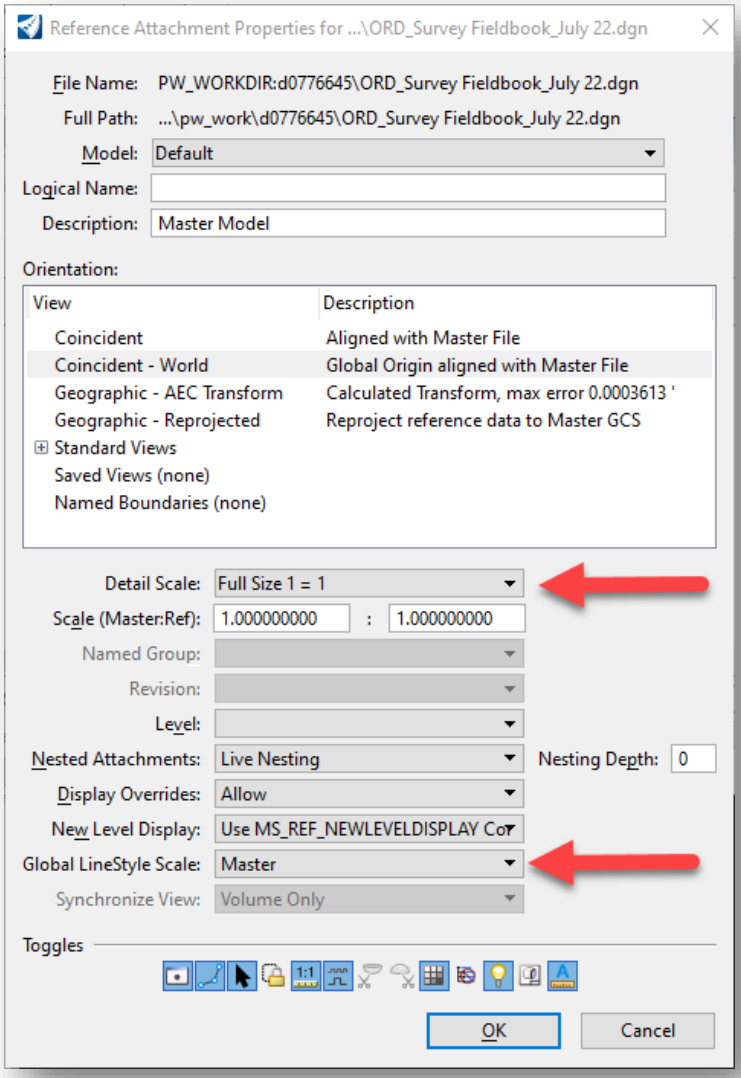


Creating Survey Alignment File

8. Launch this newly created file from ProjectWise Explorer.
9. Once in the survey alignment file, proceed to attach the survey fieldbook file to access the terrain model and topo features. In the Primary tool group on the Home tab, click on the Attach Tools button and proceed to attach the survey fieldbook file.



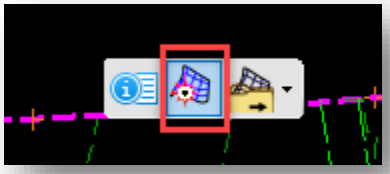
Attach Tools Button



Survey Fieldbook Attachment Settings

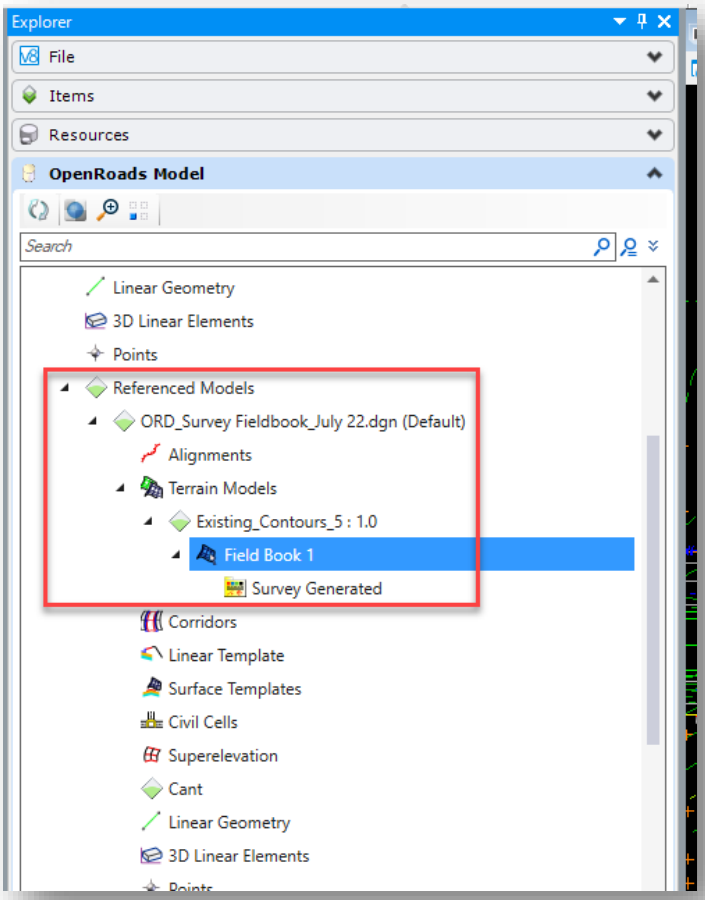
10. As shown above, the Detail Scale and Global LineStyle Scale settings are specifically called out. These two settings should always be set as shown for Drawing Scale to scale them correctly. Proceed to attach the survey fieldbook with these settings. Then, set the Annotation Scale in the alignment file to be consistent with the fieldbook (1” = 50’) in this case.

11. With the fieldbook attached, activate the terrain associated with it. This will create and reference attach an additional model with a “-3D” added to its name.



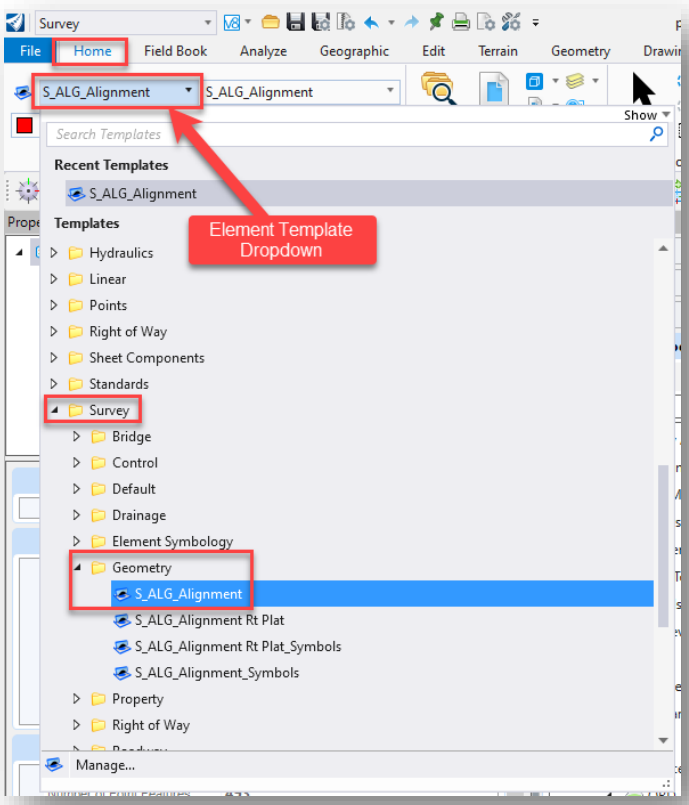
Activating the Attached Terrain from Fieldbook

6. With the fieldbook attached and terrain activated, you will now see the terrain model on the OpenRoads Model tab in Project Explorer under Referenced Models.



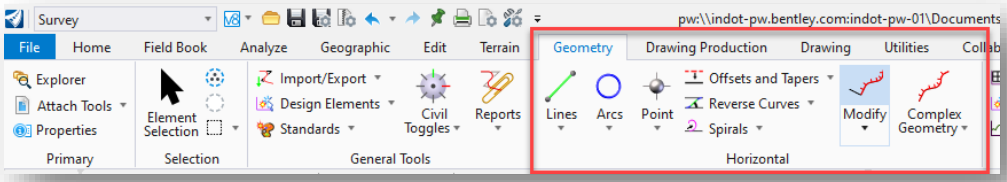
Activated Terrain Model in Project Explorer

7. At this point, you can start creating your survey alignment. The first step in the process is to set the appropriate element template for the alignment. To do this, navigate to the *Home* tab, and in the Attributes tool group select the Element Template dropdown. Then on the Element Template dropdown, navigate to *Survey > Geometry > S_ALG_Alignment*. This will automatically set the correct properties (level, color, line style, etc.) for the alignment you will be creating.



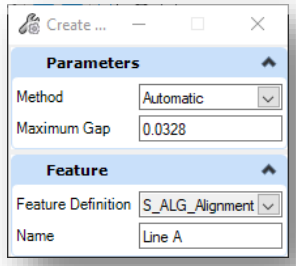
Setting Element Template for Survey Alignment

8. After setting the element template, you can navigate to the *Geometry* tab and use the Horizontal Geometry tools to create your alignment.



Horizontal Geometry Tools

9. Upon the completion of creating the alignment, you will need to create a complex element out of it. In this example, the Complex By Element tool will be used. Ensure the S_ALG_Alignment feature definition is selected. If it is not, click on the Feature Definition dropdown and navigate to *Alignment > S_ALG_Alignment* to select it. Then enter the name of your alignment. Line A is used in this example. Once the name is entered, proceed to select the individual elements of your alignment to create the single complex element.



Create Complex Element with Alignment Name

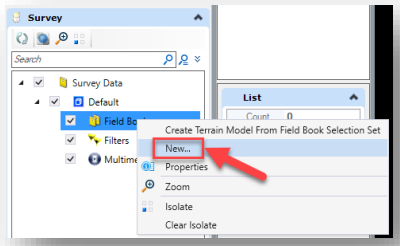
2.2-6 Updating Older Survey Data to OpenRoads Designer

Importing a field book from older survey data can be a very straightforward process. This section will cover two methods to accomplish this. The first method to be discussed is to import an FWD file directly. The second method is to take an existing survey in SS10, convert its data to LandXML and then import it into ORD.

2.2-6a Importing Survey Data from FWD Files

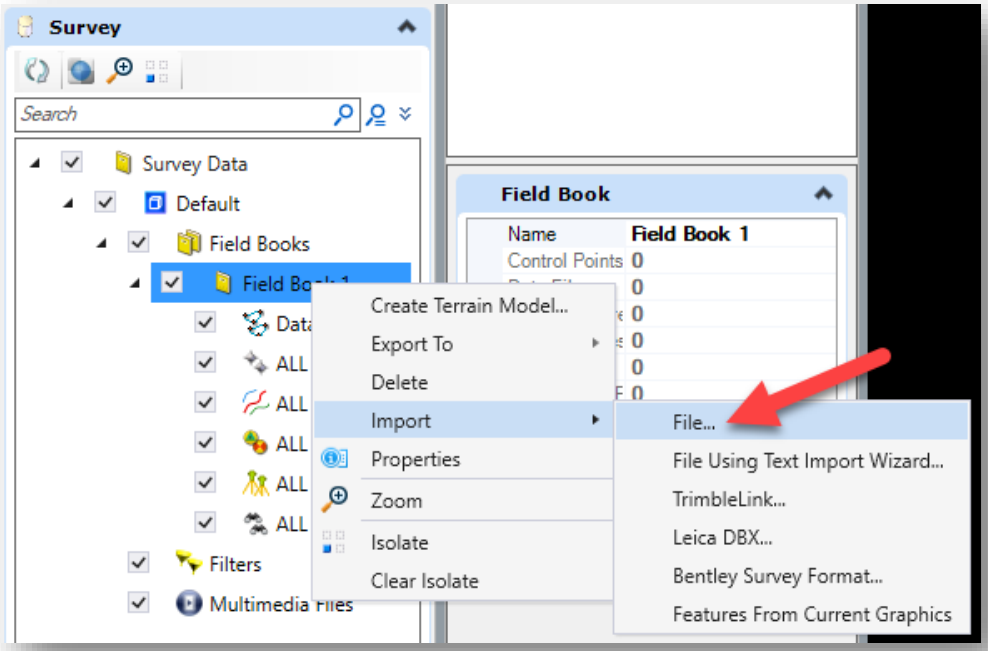
This section will cover how to import survey data into ORD directly from FWD files. Please keep in mind that while reviewing these instructions, the extent of additional cleanup that will need to occur will depend heavily on if 3-point circles were created using the EXTARC command or if offsets were coded as part of the notes (+O, +D, +H). The following steps will cover how to import FWD files, and in the case of the offsets, how to find and modify the shot so the output is correct.

1. To import an FWD field book file, navigate to the Survey section on the Project Explorer.
2. On the Field Books heading, right click and create your Field Book. Please use the standard Des #_SRXX naming conventions.



New Field Book

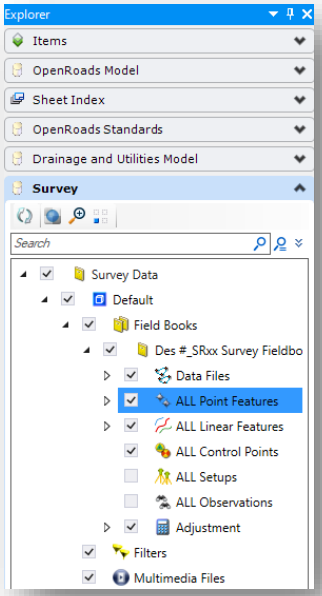
3. Right click on the newly created field book entry and select the Import -> File… option. Navigate to your FWD file and open it.



Import Field Book from File

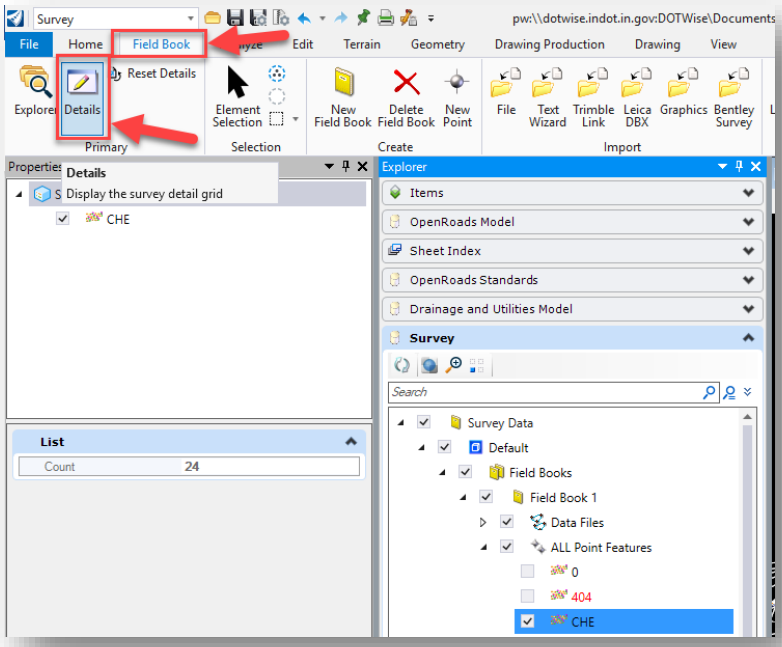
4. OpenRoads Survey will now import this data and create the field book and graphics.
5. If your survey did not use any offsets in the Note field (Descriptions in OpenRoads), you can proceed to work with the survey using the OpenRoads tools as you have throughout this chapter.
6. If your survey contains offset notes, at this time these will need cleaned up so your data is consistent across versions. Continue for how to resolve these changes.

7. Select the All Point Features from the field book on the Project Explorer.



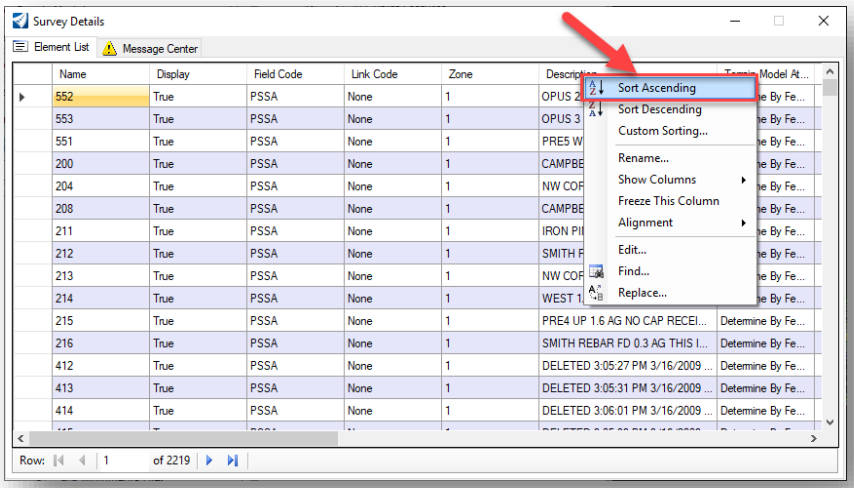
ALL Point Features Selected

8. On the Field Book tab in the Ribbon, select the Details tool from the Primary Group. This will open the table view with all your points.



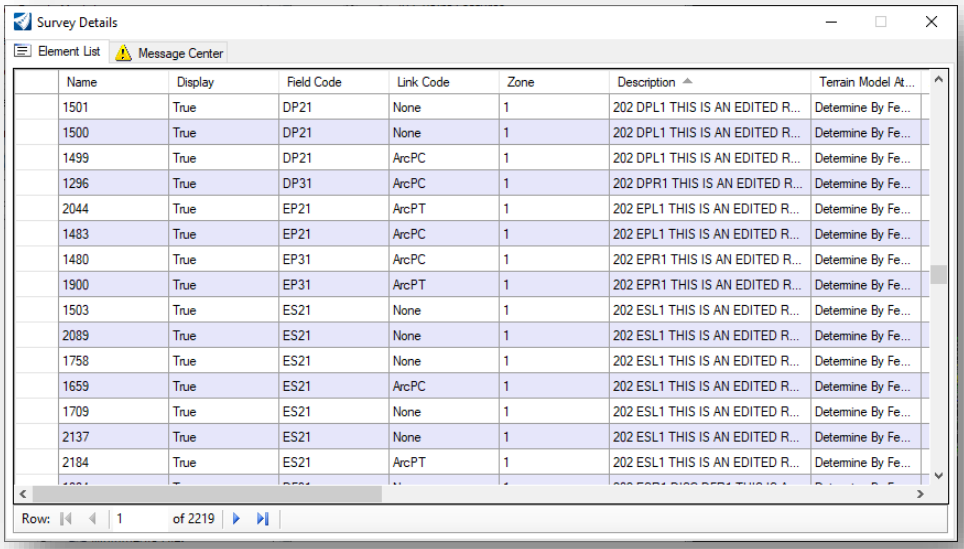
Details Tool on Field Book Tab

9. On the table view, right click on the Description field and use one of the sorting methods. Be advised that this is just a single method, and you can also use the find commands, or even drill down to specific features and perform similar steps. For this example, you will be using the Sort Ascending command.



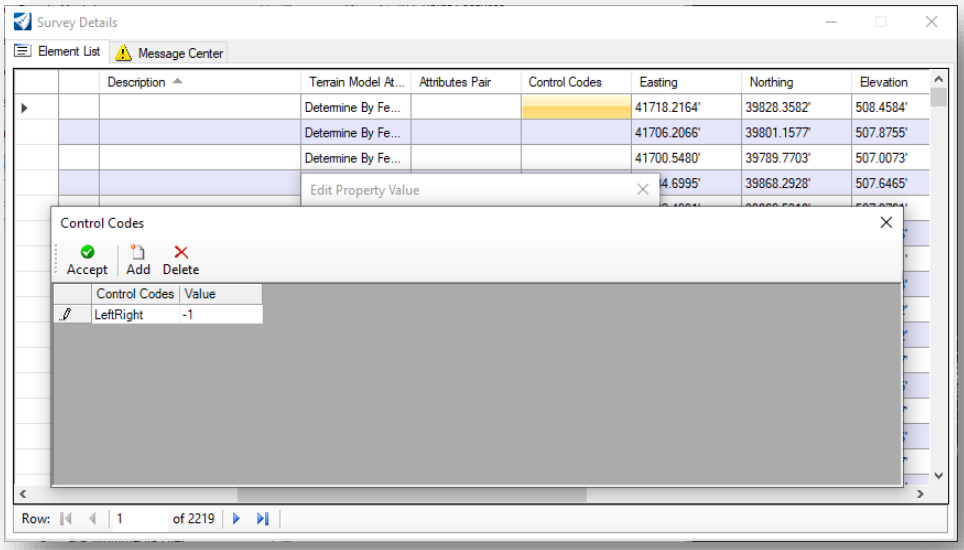
Sorting Point Features

10. With the list sorted, all common offset notes in the Description field will be grouped together. You may either scroll down to where these are or use the Find… command to quickly jump to these in the list.



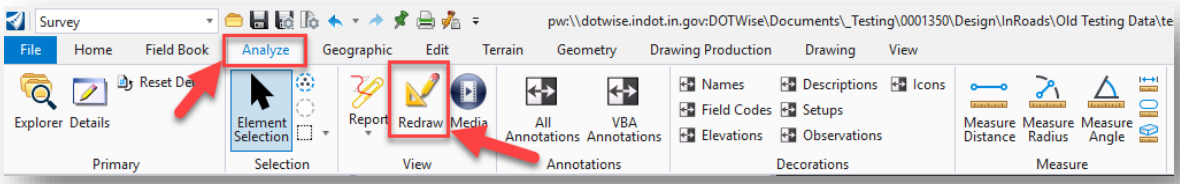
Sorted by Description

11. Click on the Control Codes field for one of the entries. Unfortunately, this tool does not support bulk edits. In the case of the following example, you have a left offset of 1 foot, so the Control Code will be set to LeftRight and a value of -1 entered. Please keep in mind that you must use the Tab Key in the Value field for the record to be confirmed. Repeat this step for any point necessary.



Modifying/Adding a Control Code for Left/Right Offsets

12. Locating your point in the display, it will appear that it has not moved to the offset entered. Much like InRoads before, the display will need redrawn. To do so, go to the Analyze Tab, and in the View Group, select the Redraw tool. Your observation will then be reflected in the TOPO.



Redraw the Survey

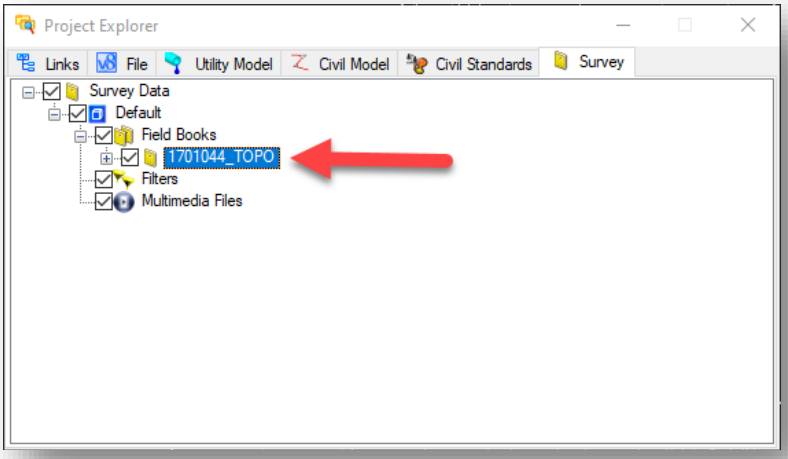
At this point you will have the survey migrated over to OpenRoads Designer. Note that there will still be clean up needed, such as resolving any 3-point circles or other coding issues that the above did not fix. In many instances, bringing the survey forward should be a quick and painless process.

2.2-6b Importing Survey Data in LandXML Format

This section will cover how to take an existing survey in SS10 and convert it to LandXML format to import into ORD.

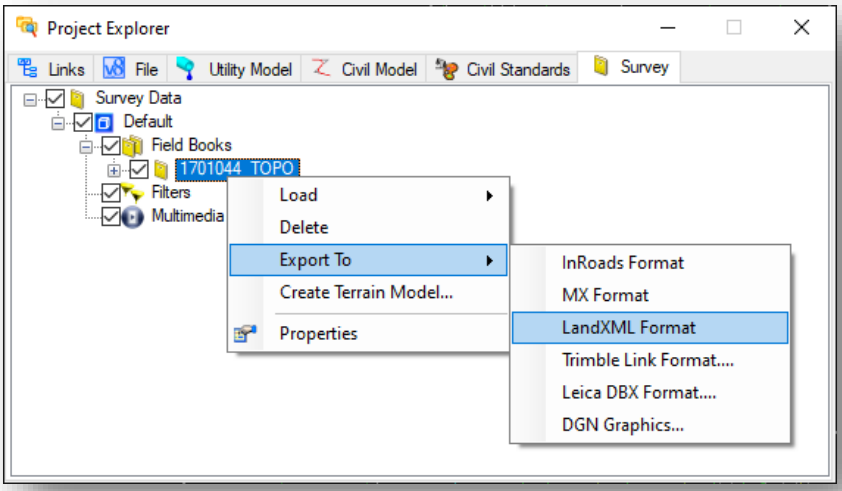
Note: When exporting survey data from SS10, make sure to disable the Setups and Observations entries under the fieldbook. A defect has been found and logged, and having these enabled will prevent survey notes (descriptions) from properly coming across.

1. With your survey fieldbook file open in InRoads SS10, navigate to the Survey tab in Project Explorer and expand the Field Books folder to show the created fieldbook.



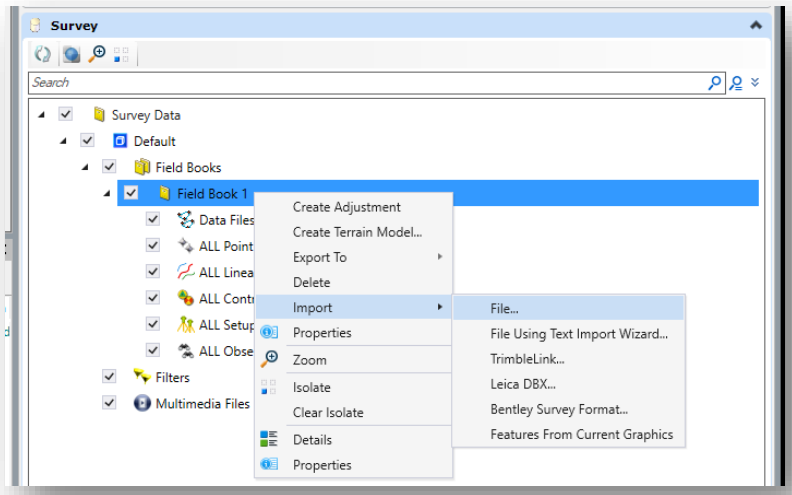
Survey Field Book

2. Right-click on the field book listing and select *Export To > LandXML Format*.



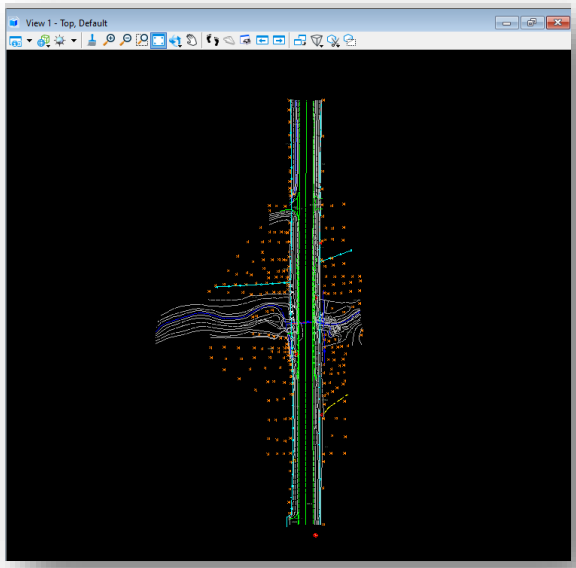
Export to LandXML Format

3. You will then be prompted to provide a name for the exported file and its saved location in either ProjectWise or locally on your computer. Specify these settings as desired.
4. In a brand-new survey fieldbook file in ORD, create a new field book as specified is section 2.2-2.
5. Right-click on the new fieldbook listing in Project Explorer and select *Import > File* from the menu.



Importing LandXML File

6. Select the LandXML file you exported out from SS10 and proceed with the import. The survey data will now be imported into the file.



Imported Survey in LandXML Format

2.3 Routeplat, Reference Box and Section Corner Card Creation

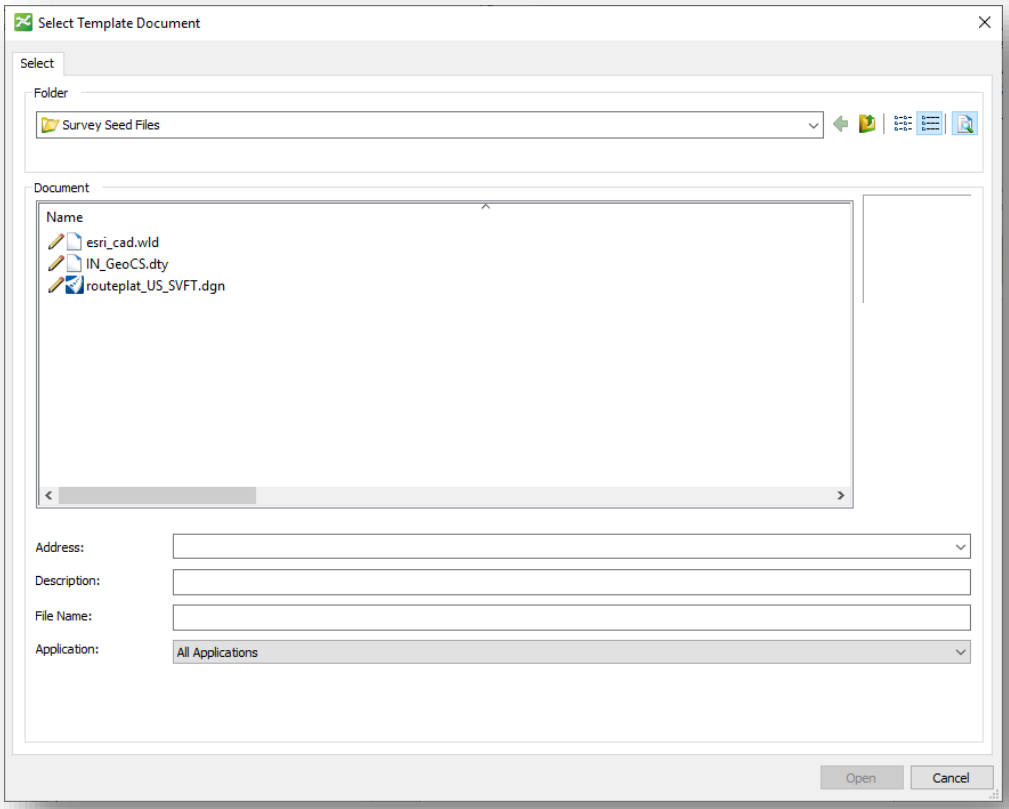
The following sections will walk through the process to create a complete route plat sheet. This will include creating the file in ProjectWise, examining its contents, and working with/referencing section corners.

2.3-1 Creating the Route Plat .dgn File

Prior to placing any content into the route plat, you need to create a drawing to work in. This process will be same to the steps performed in section 2.2-2.

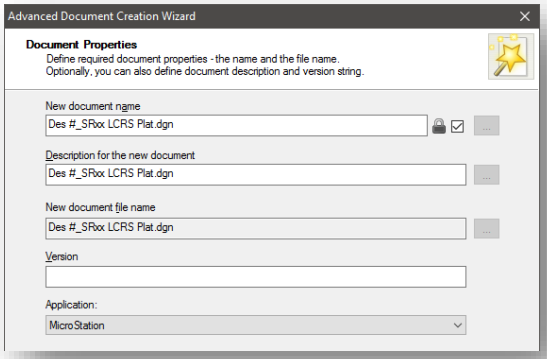
Using these steps, you will need to make two adjustments.

1. When selecting your seed file, select the appropriate unit file from: pw:\\indot-pw.bentley.com:indot-pw-01\Documents\Template Documents\ORD-Connect Seed\Survey Seed Files\



Selecting a Route Plat Seed

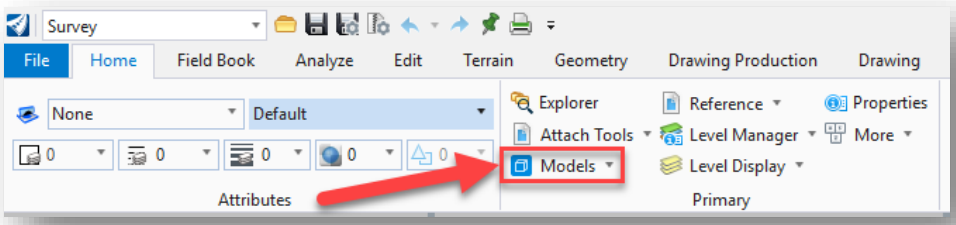
2. Your document name, description and file name should all be set in the Des #_SRxx LCRS Plat.dgn format.



Route Plat Naming

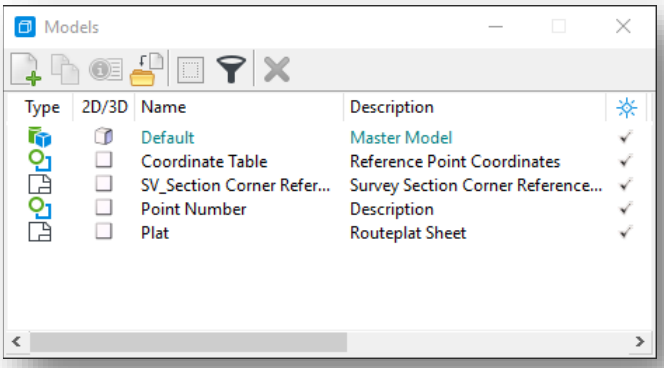
2.3-2 Contents of the Route Plat Template Files

Each of the route plat templates contains five models. These can be accessed by going to the Models icon in the OpenRoads Designer Ribbon:



Accessing the Models Dialog

By selecting this icon, you will be presented with the following window and list of available models:



Available Models in the Template

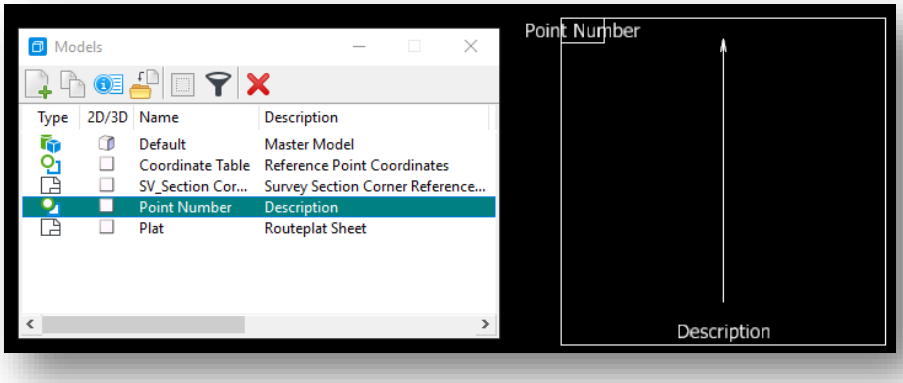
The five models available are:

1. Coordinate Table – This is the template Reference Point Coordinate Table.
2. Default – This is the default MicroStation model and is available in all .dgn files.
3. Plat – This is the template route plat sheet model.
4. Point Number – This is the template reference box model.
5. SV_Section Corner Reference Card Sheet – This is the template Section Corner Reference Card Model.

2.3-3 Creating Reference Boxes

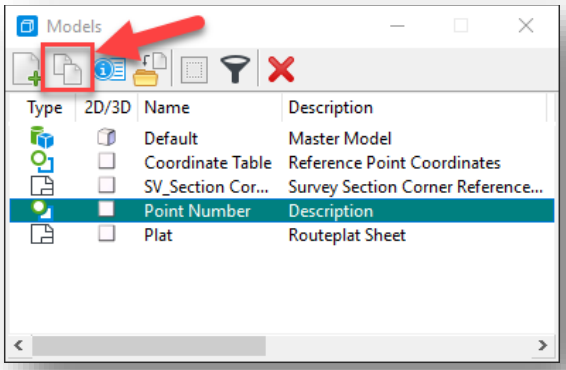
The following steps go through the process of creating a model containing the control point reference box for use in either Route Plat Sheets or the Section Corner Reference Card.

1. Open your Des #_SRxx LCRS Plat.dgn from ProjectWise.
2. As shown in the previous section, open the Models dialog from the toolbar icon.
3. On the Models dialog, double click on the Point Number model to open it.



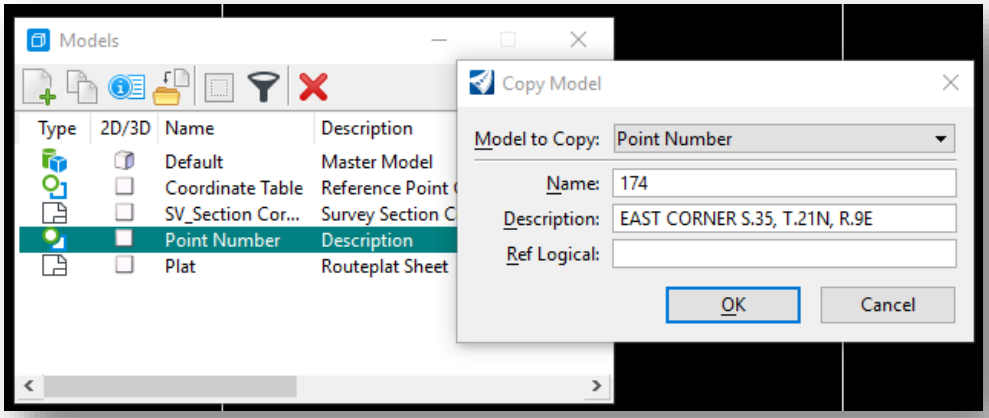
The Point Number Model

4. Select the Copy Model icon from the Models dialog.



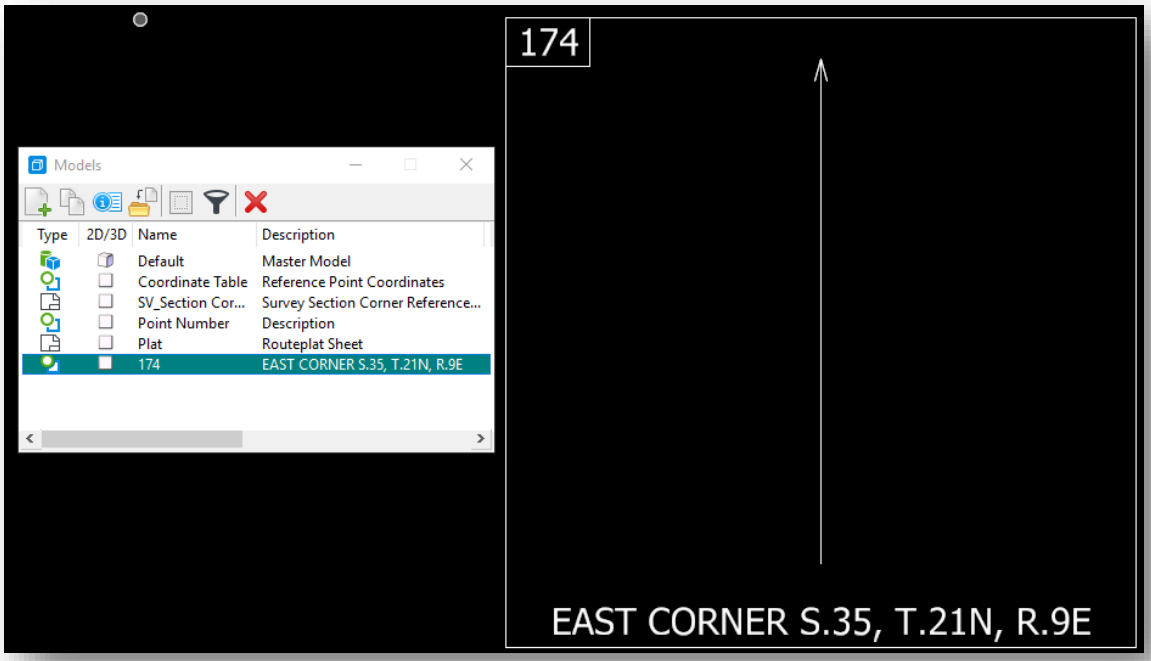
Copying a Model

5. The Point Number model has active field as shown in the earlier capture (the gray shaded areas for Point Number and Description). During the model copying process, you will be prompted to create the new model with a new name and description. The values for point name and description should be entered as you would like them to appear on the completed control point.



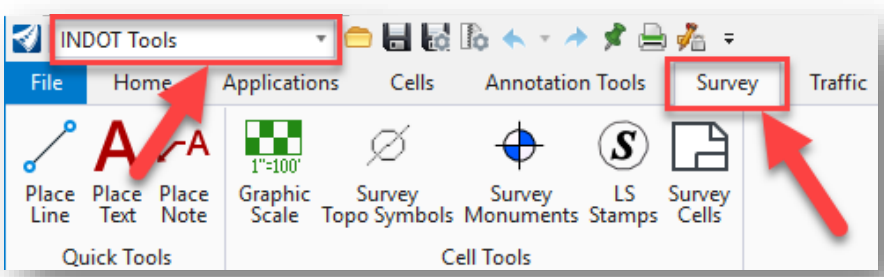
Point Number Model Copy

6. Once the model information has been entered, select OK. The completed model copy will become active and will show the name and description in the control point as shown. Repeat steps 4 and 5 for each additional reference box you require.



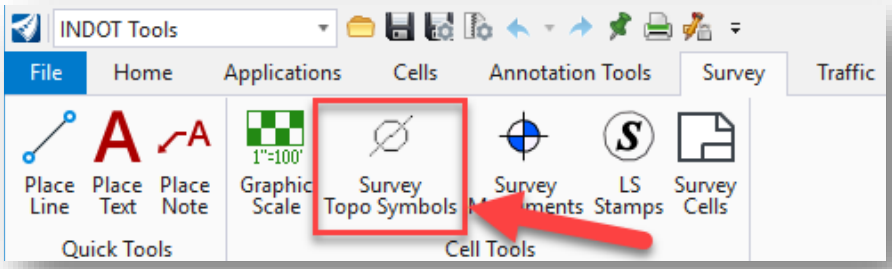
Completed Point Number Model Copy

7. Next, the control point content needs created. If not active from the previous steps, enter your control point model by double clicking on its listing in the Models dialog. Once in the appropriate model, open the INDOT Tools workflow in MicroStation, and locate the Survey tab:



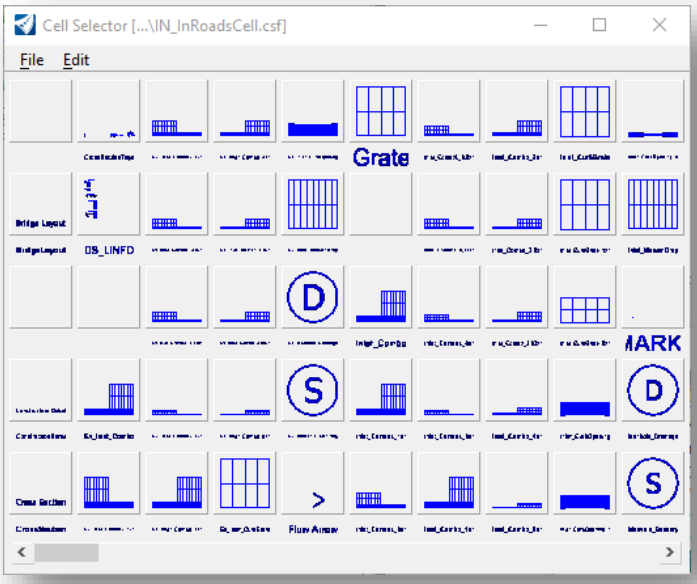
Survey Tab in INDOT Tools Workflow

8. First, you will add the north arrow. Load the Survey Symbols library from the Survey Topo Symbols tool.



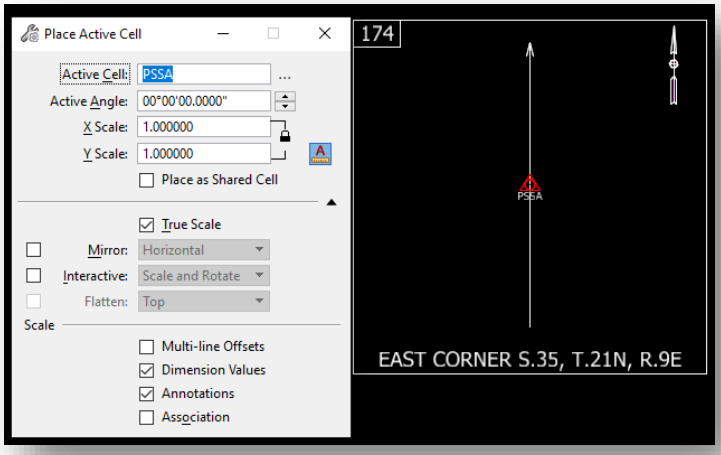
Survey Symbols

9. This will load the Survey Cell Selector. On the displayed panel, locate the cell called northsy. *Do not use northsymb as it is scaled differently.* Clicking on the northsy button will bring up the cell placement tools at the appropriate scale. Place the cell in the correct spot in the control point border. Note that cells are sorted by letter case then alphabetical order. (PSSA would show up in the list before northsy as the capital P takes precedence)



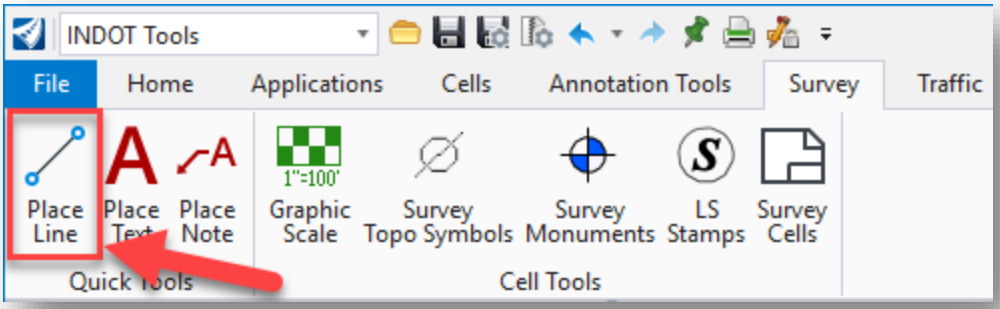
The Survey Cell Selector

10. Next locate the cells for the traverse station cell (PSSA) and any other object that needs placed. In each of these instances, a scale of 1 should be used. Snap this cell to the center of the provided centerline.



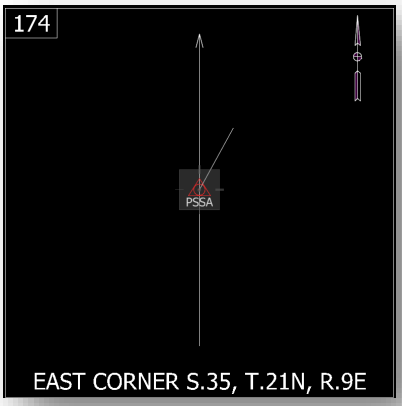
PSSA Cell Placement

11. After placing additional cells such as power poles (PPWP), you will need to place the lines for the dimension ties. From the Quick Tools group in the Survey Tab, select the Place Line tool.



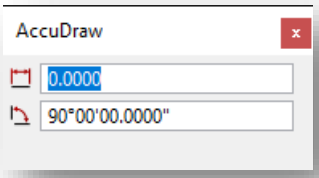
Place Line

12. While in the place line command, you will want to snap your initial point to the center of the PSSA symbol on the centerline.



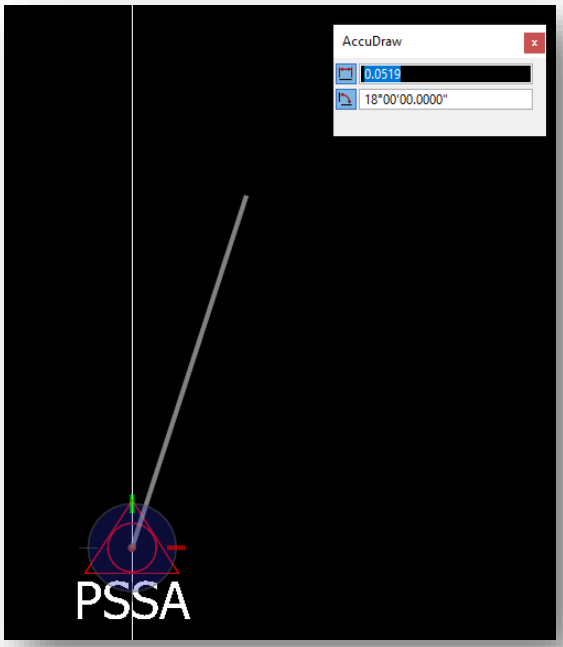
Drawing Dimension Ties

13. Next, in your AccuDraw toolbar/window, place your cursor in any of the fields and hit the "M" key to set it to angular mode.



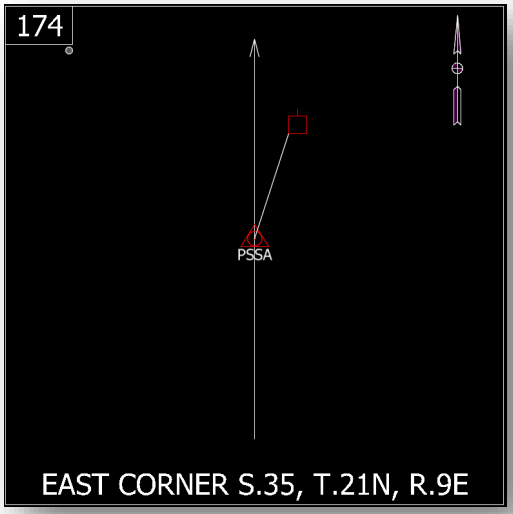
AccuDraw Angular Mode

14. Place your cursor in the angle field and enter the appropriate value. This will also lock the angular value in allowing you to draw the line along the bearing you have specified. Remember to specify degrees, using the ^ symbol (shift key + 6).



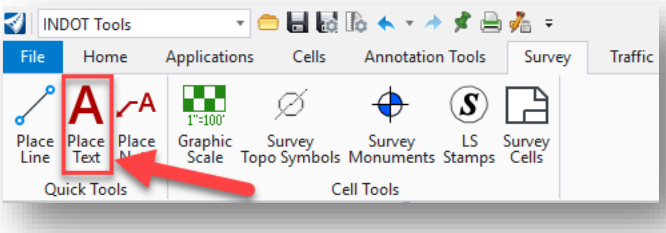
Dimension Tie

15. With the lines drawn, you can now adjust the placement of any cells that you've placed, and your resulting reference box should look similar to the following:



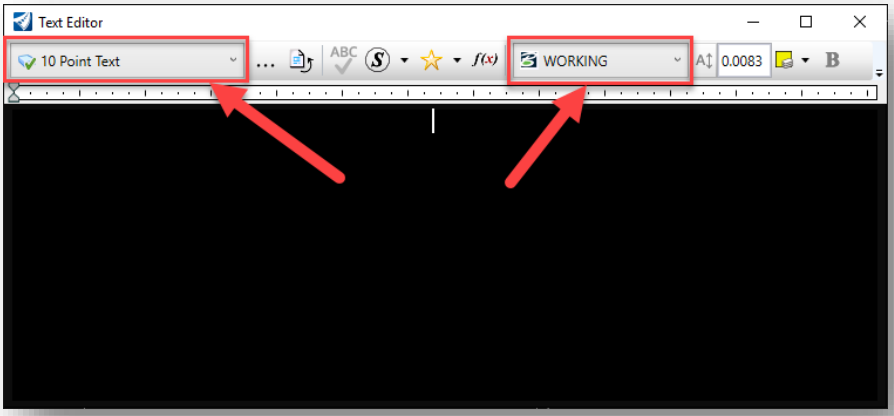
Reference Box

16. Next, you will need to add the text labels to the Reference Box. Start by selecting the Place Text tool from the Quick Tools Group on the Survey tab.



Place Text

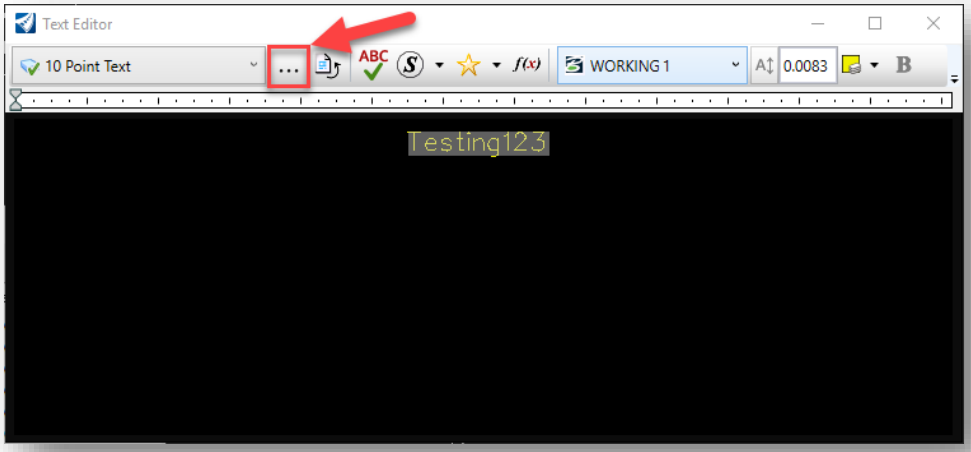
17. With the Text Editor dialog now active, first set your Text Style to 10 Point Text. This will initiate the appropriate justifications and sizes. Due to the constrained size of the reference boxes, you will adjust your font to the Bentley WORKING font as shown. Expand the dialog by clicking on the arrow in the font selection dropdown in the upper right-hand corner and select WORKING.

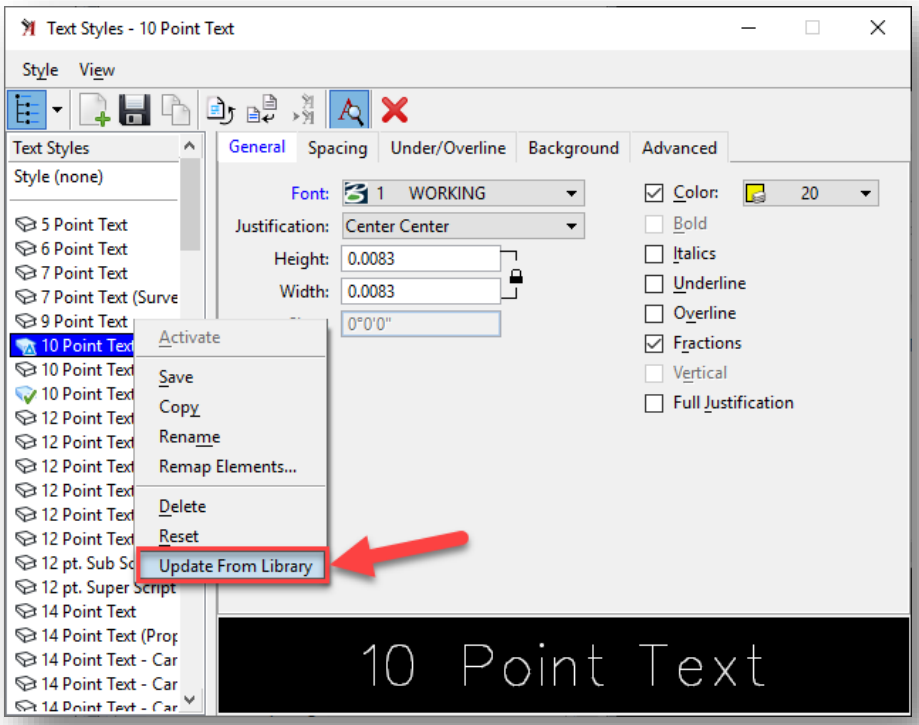


Place Text Settings

A Note on Text Styles

As shown in the previous steps, you are deviating from the standard font applied to the 10 Point Text style, which will cause your text styles to become out of sync with the dgnlib. To revert your text style to the appropriate values, you can reset the style from the Text Styles dialog (indicated by an ellipsis icon) located *next to the text style selection box*. When you locate the style that no longer matches (it will be denoted with a blue font), right click on it and select "Update from Library".



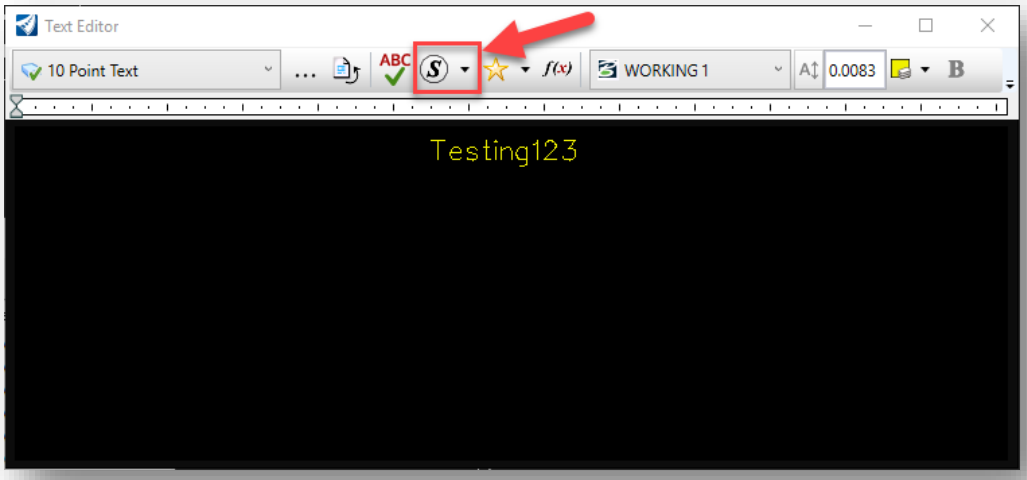


Update from Library

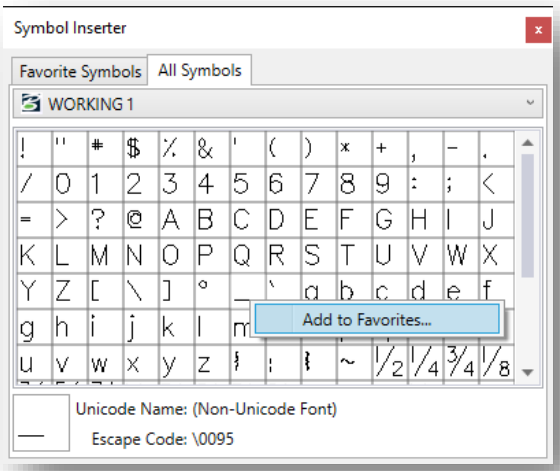
In addition to adjusting the font, it may also be desirable to adjust the Justification options to more appropriately place your text along, above or below elements. You can revert to the default text style settings by selecting the Reset option on the menu shown above.

More Notes on Text Placement

Various notes may require the use of special characters not directly accessible via the keyboard, such as the degree symbol. There are two ways to place this and other symbols. The first method is via the Insert Symbol button on the Text Editor. Selecting this button will bring up the Symbol Inserter dialog. Via this dialog, you can find either place a symbol from the Favorite Symbols tab or you can use the All Symbols tab to search for the symbol you want (available in your selected font). Then you can insert it into your text and quickly add it to the symbols favorite list.



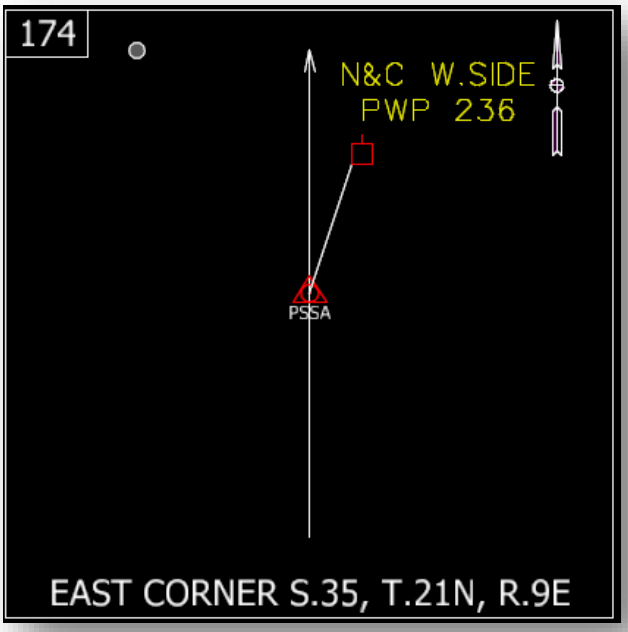
The Insert Symbol Tool



The Symbol Inserter Dialog and Adding to Favorites

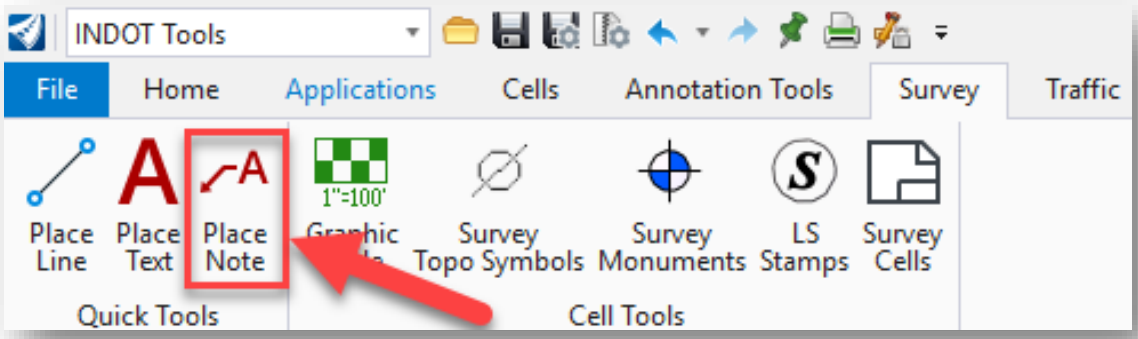
Additionally, if you know the appropriate key-in sequence, you can type the symbol in. In the case of the degree symbol and the Working font, you can type it in by holding down the ALT key, then typing 9 then 4. This will place a ^ in the text editor, however when going to place the line of text, a degree symbol will appear.

18. After placing the appropriate labels, your reference box should look like the following.



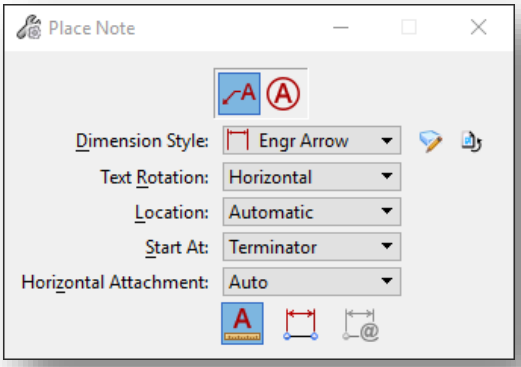
Reference Box with Labels

19. Finally, you need to place the note describing the monument type. Like the Place Text tool, you will need to start the Place Note tool. This tool can also be found in the location mentioned in step 16.



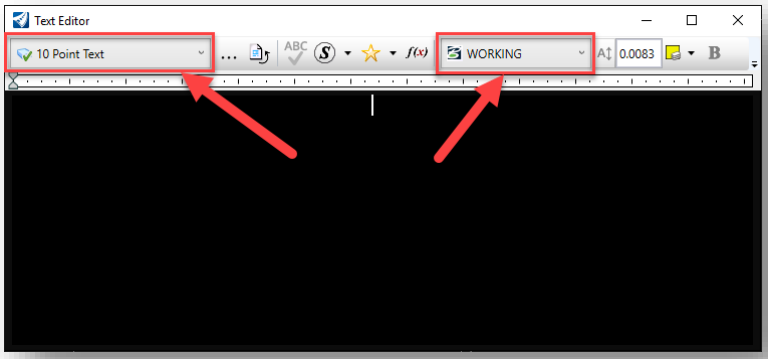
Place Note

20. With the place note tool active, set the Dimension Style to Engr Arrow as shown.



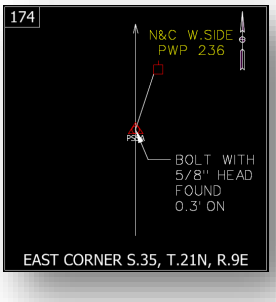
Place Note Settings.

21. Next, on the Text Editor, change your active font from Tahoma to the Bentley WORKING font, and make sure the text style is set to 10 Point Text.



Setting the WORKING Font

22. With the Place Note tool configured, type the monument information into the Text Editor. When the text is typed, place your cursor on the monument in the reference box and select the location where you would like to start the terminator. A second placement will determine the leader length and direction and place the text box. The resulting reference box will appear as follows:



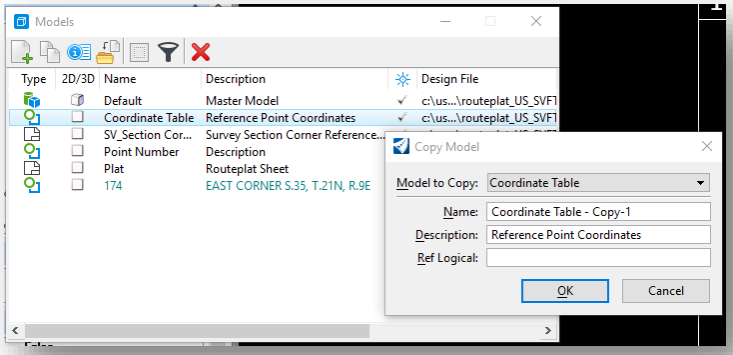
Completed Reference Box

23. At this time, you may need to restore your text and dimension settings to their default configuration. These steps are noted in tips throughout this section and are similar for text and dimension styles. With this first reference box created, you can now create additional reference boxes for each point in the plat.

2.3-4 Creating the Reference Point Coordinate Table

Since the coordinates for the Reference Points are no longer contained in the Reference Box, a Coordinate Table will need to be created. It is recommended to create one overall coordinate table for the Route Plat. The following steps go through the process of creating a Coordinate Table.

1. As with the reference box, you are going to use the Models dialog to copy the template model included in the .dgn file. Open the Models dialog and copy the Coordinate Table model.



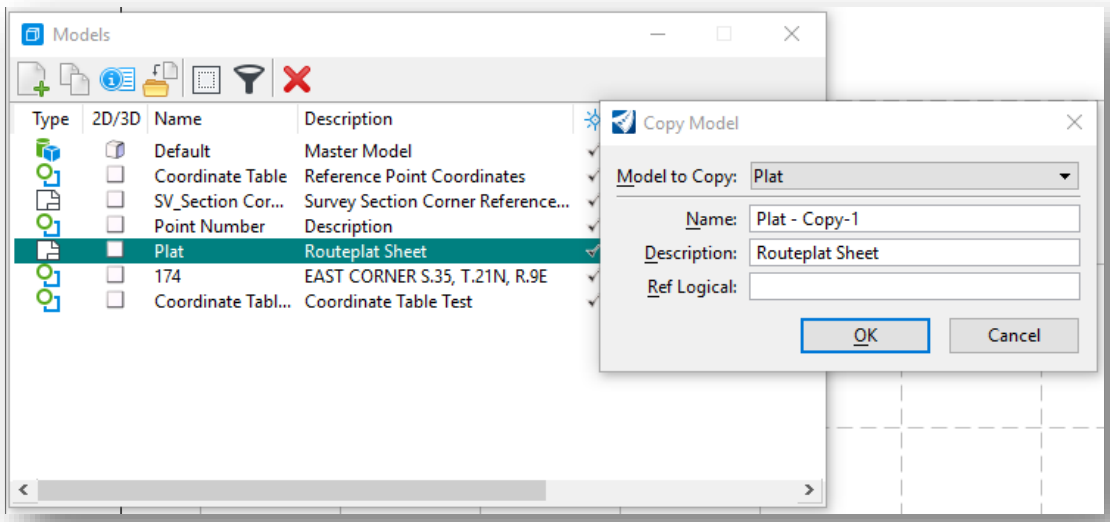
Copying the Coordinate Table

2. With your table copied, make sure the new model you created is active. If not, double click on it in the Models dialog to activate it.
3. All the text in this table is editable via the standard text editing tools in OpenRoads Designer. Using either the Edit Text tool, or by double clicking on the pieces of text, edit the values for your coordinate table accordingly.

2.3-5 Adding the TOPO to the Routeplat Sheet

With the reference boxes and coordinate tables created, you can now begin the process of creating the route plat sheets and populating the file with content.

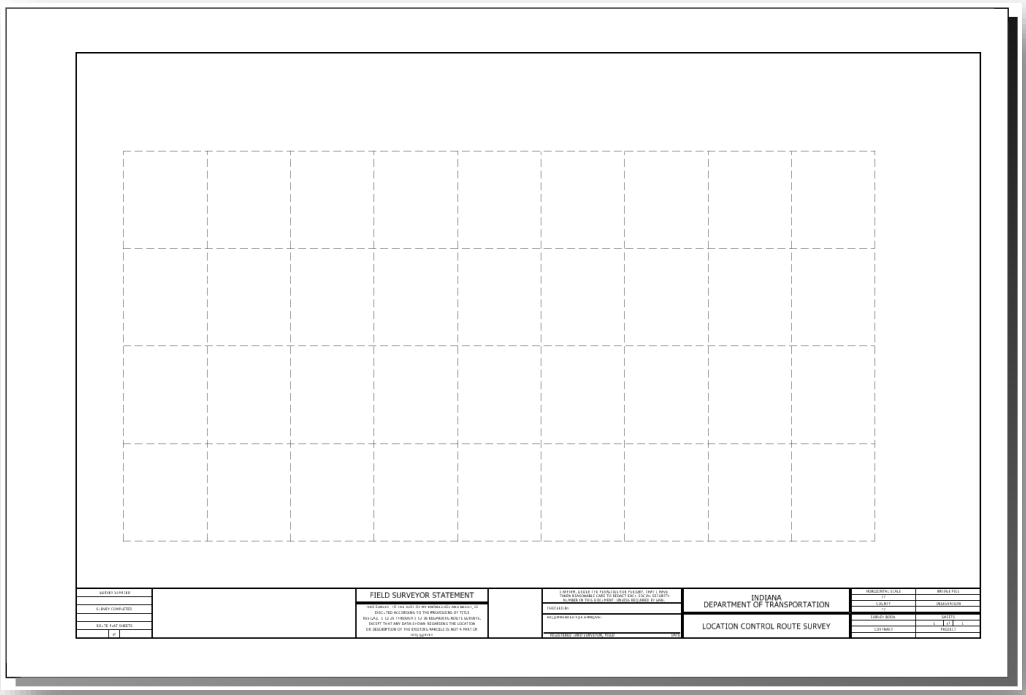
1. As in the previous two examples, take the template routeplat provided in the .dgn and copy it to a new model.



Copying the Plat Model

2. If not opened automatically, double click on your newly created model to activate it. Should you need additional plat sheets, repeat step 1 as needed.

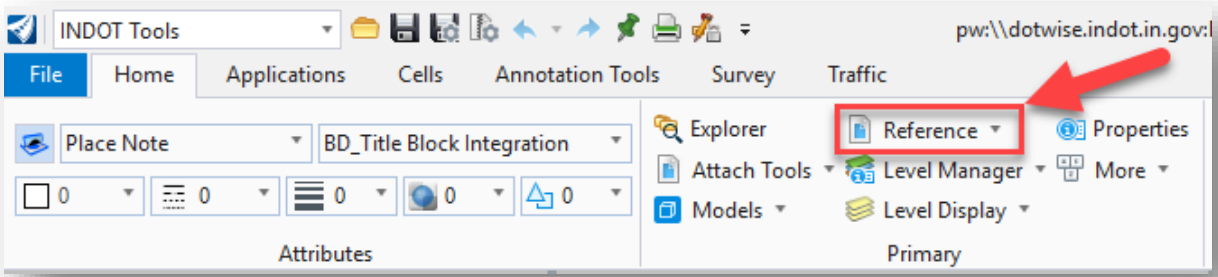
3. Now that a new routeplat model is created and opened, you can begin adding the various pieces of content. When first entering the new routeplat model, you will see the following template information:



The Template Routeplat

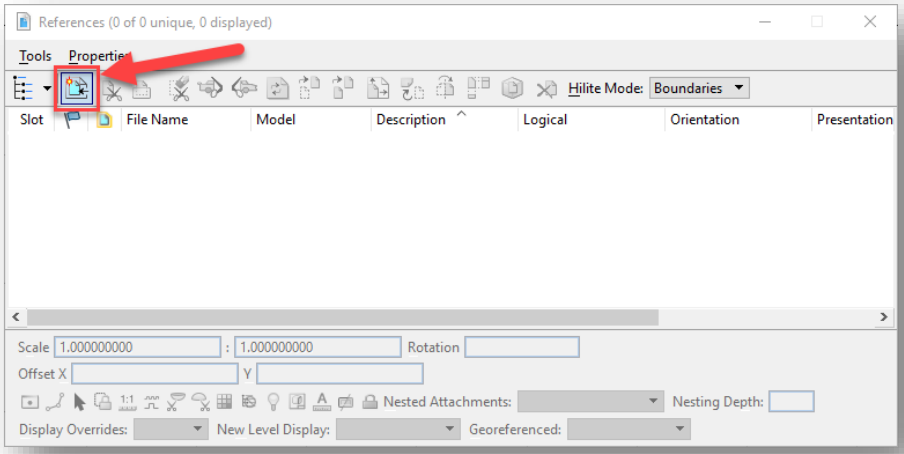
As you can see in the preceding illustration, the template contains the appropriate border file and a grayscale border all in a sheet model (denoted by the virtual paper size around the border).

4. You are now ready to begin adding content to this file. Most of the content being added will be via OpenRoads Designer references. Open the Reference dialog from the Primary Group of the Home tab.



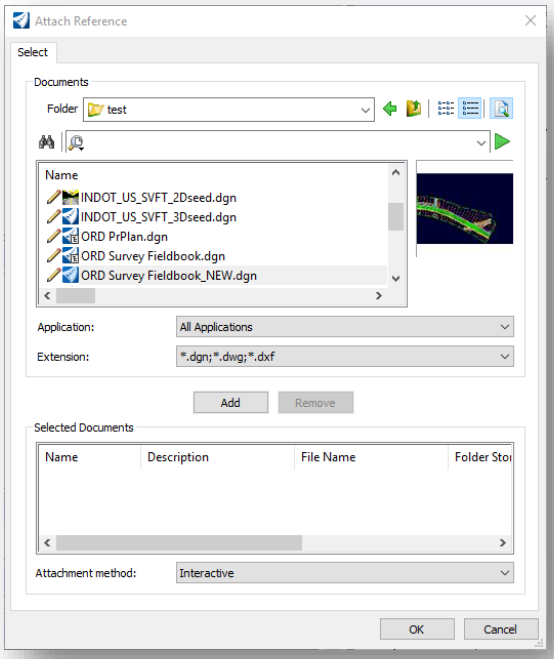
OpenRoads Designer References

5. The first item to attach is the topo drawing that has been created for the project. Start by selecting the Attach Reference button from the Reference dialog.



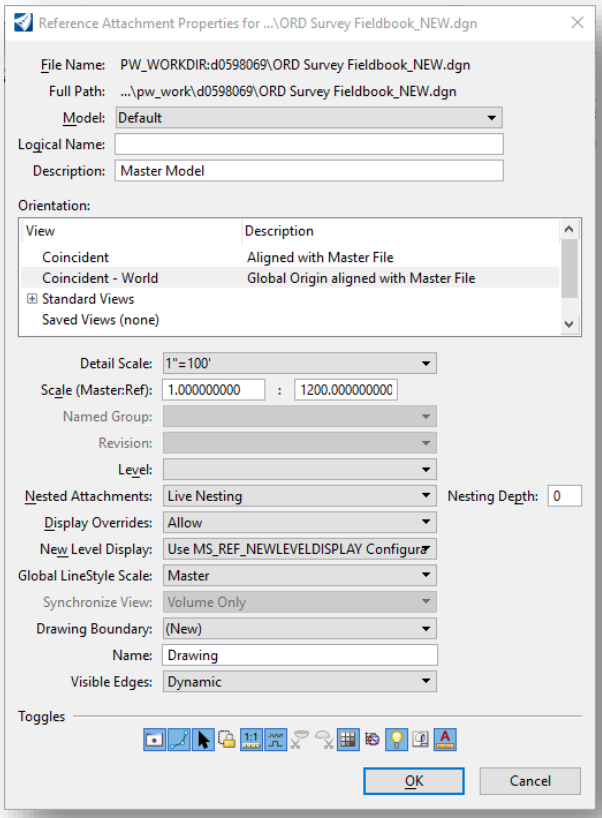
Attaching References

6. Unlike the prior version of the referencing procedures, all the content resides in a single survey fieldbook DGN. As such, when prompted for the file you would like to attach, select your single topo drawing as shown. Make sure to set the attachment method to Interactive so you can adjust the scaling and view orientation.



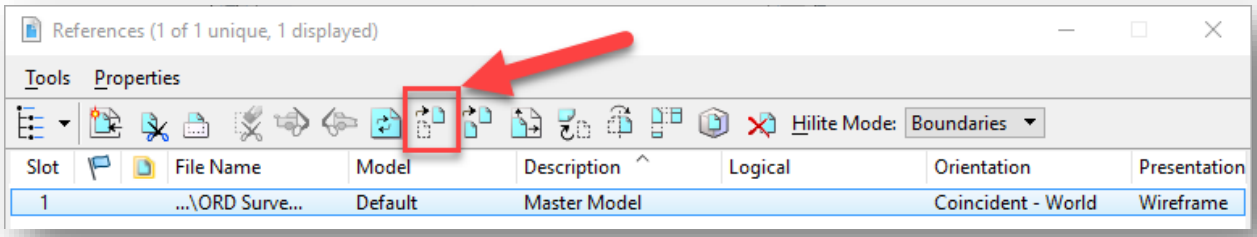
Reference Attachment

7. With your topo selected, select OK and configure the additional settings for your attachment. The following illustration shows the attachment made at 1”=100’. Please note that on this panel that Coincident-World is selected as the Orientation.



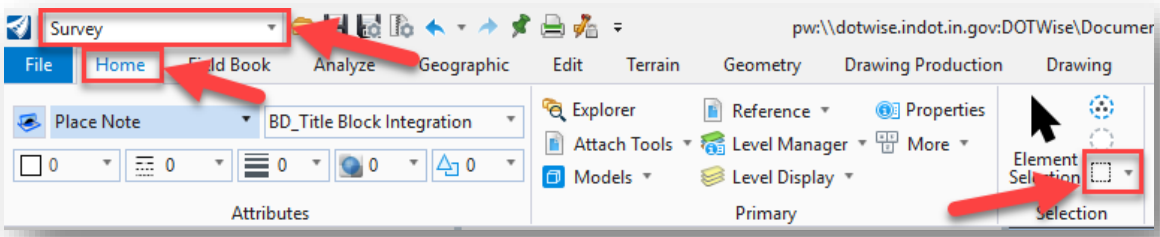
Attachment Settings

8. With the attachment set to Coincident - World, the topo will not appear within the border. As such, you need to move the topo back into the border. Start by zooming extents, and then in the References dialog box, choose all the attached reference filenames you want to move, and select the *Move Reference* button.



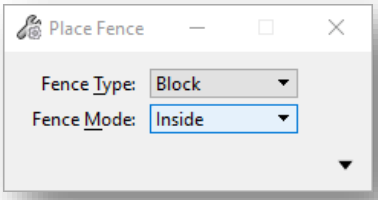
Move Reference

9. Left click at the location in the drawing you want to move the files from and then left click at the location in the drawing you want to move the files to. This will move all the selected files to the new location.
10. Be sure to save settings by hitting *Ctrl + F*, or selecting *File -> Save Settings*. This will ensure that the changes you made to the reference files will be saved for next time.
11. If you need to clip the reference, the easiest way is to use a fence. Select the Fence tool from the Home tab of the Survey workflow.



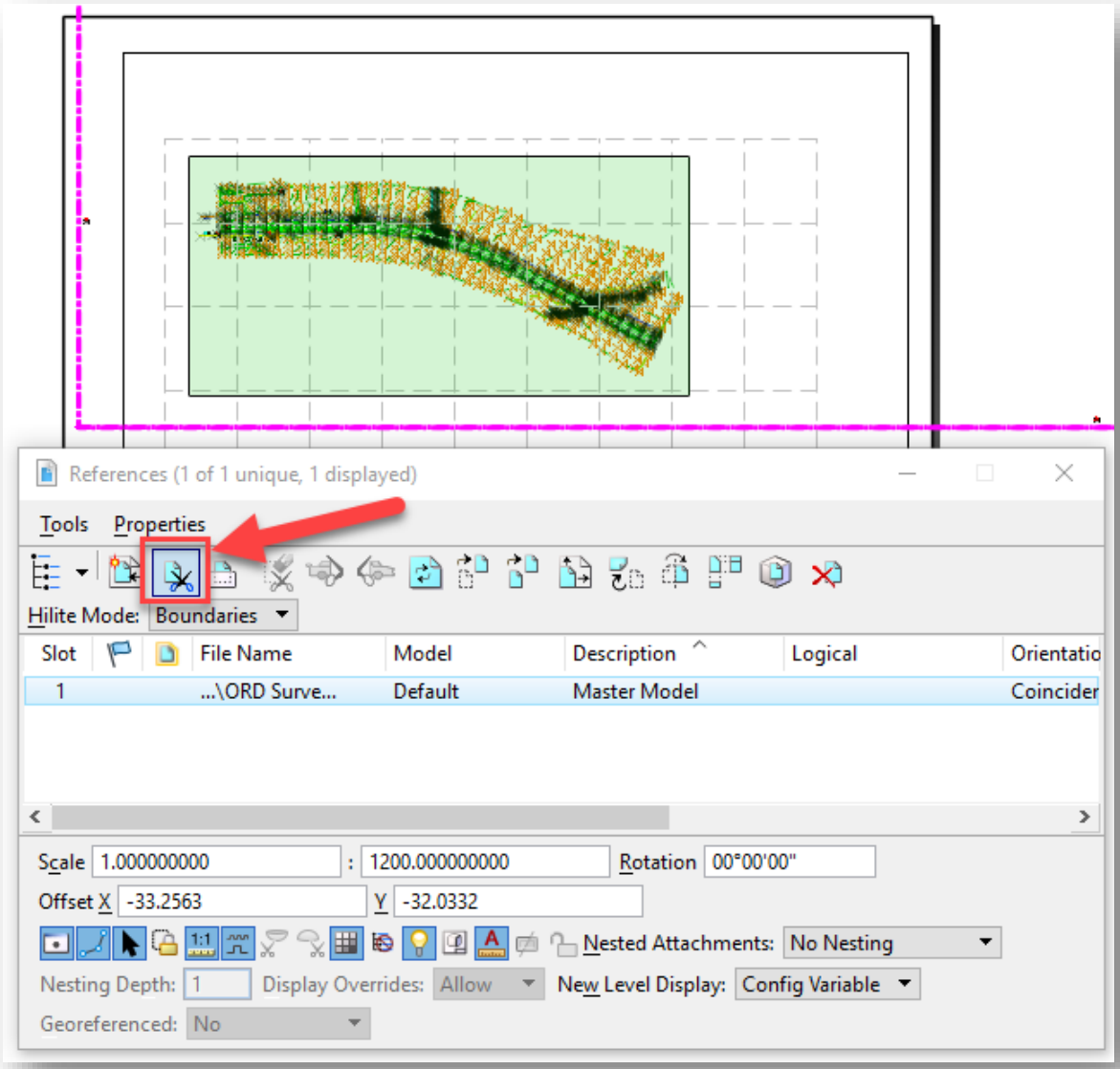
Place Fence

12. On the Place Fence tool, make sure your Fence Mode is set to Inside. In most instances, you can leave the Fence Type set to Block, however it may be advantageous to use one of the other fence methods to achieve a tighter clip around your topo.



Place Fence Tool Settings

13. With your fence placed around your topo, you now need to select Clip Reference from the References dialog as shown. On the Set Reference Clip Boundary dialog, make sure the Method is set to Active Fence. When satisfied with the boundary fence you've defined and the clipping settings, left click in the drawing area to accept the clipped reference settings.



Reference Clipping

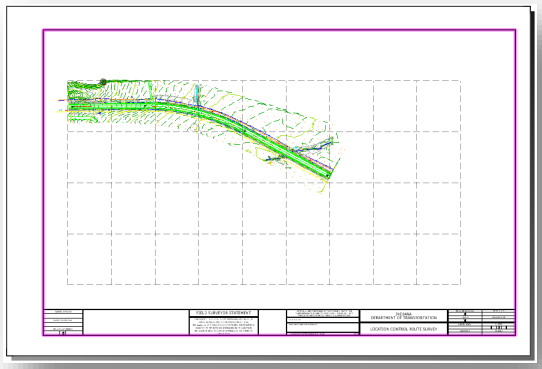
Note: You could draw a polygon and change its Class to Construction. Then by changing the Fence Type to Element you can create the fence by selecting the polygon. This would give you a way of recreating the same clip area for additionally attached reference files.

14. Be sure to save settings by hitting *Ctrl + F*, or selecting *File -> Save Settings*. This will ensure that the changes you made to the reference files will be saved for next time.

2.3-6 Adding Reference Boxes to the Routeplat Sheet

Now that the topo has been added to the route plat, you need to add the reference boxes to the sheet. Continuing from the previous set of steps, make sure that you are in the appropriate Plat model; otherwise open it via the Models dialog as noted in step 2 of the previous section.

1. With the plat sheet showing in the MicroStation view, you should see the frame of your topo and a dashed grid setup in the sheet. If you do not see the dashed grid, it needs to enabled with the following steps.

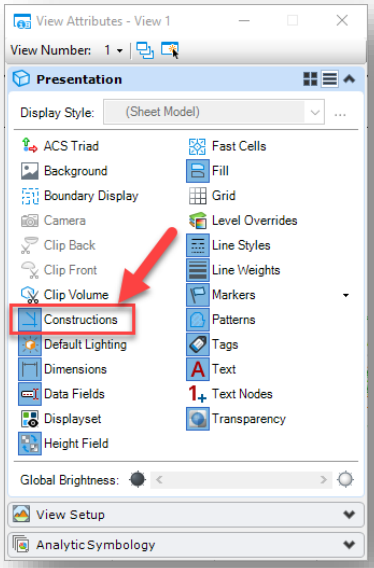


Routeplat with Topo and Grid

2. If the grid is not visible, enable the Constructions option on the View Attribute panel. This panel can be found on the View toolbar.

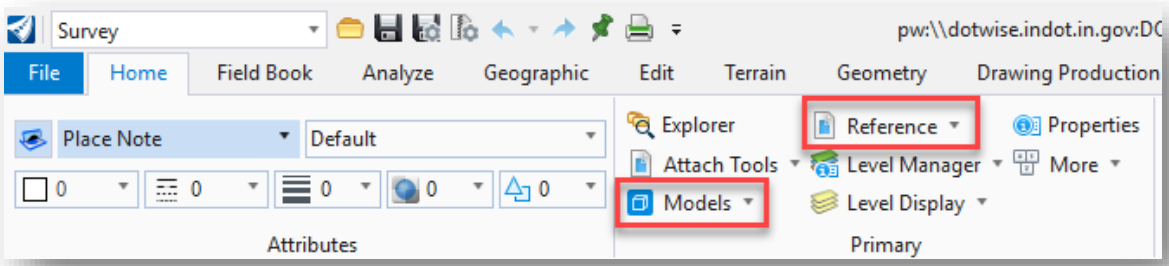
View Attributes

3. The Constructions item can be found on the left side of the panel. Make sure it is highlighted as shown in the following capture:



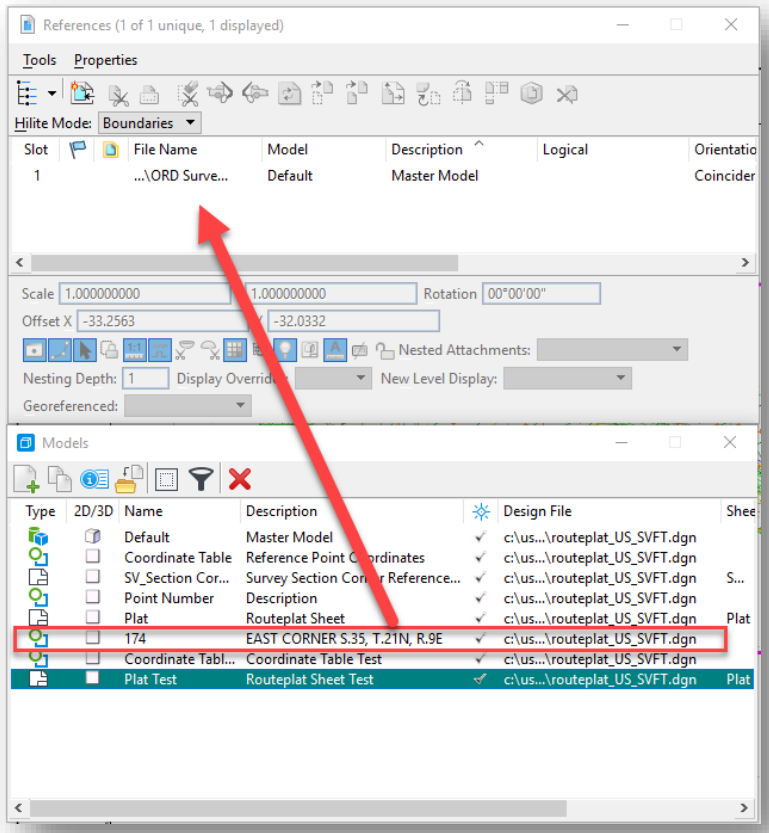
Construction Elements Enabled

4. At this time, you want to open both the Models and References dialog boxes from the Home tab of the Survey workflow:



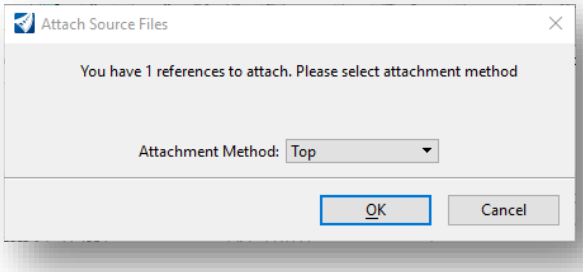
Models and References

5. With both the References and Models dialogs open, you can now drag the Reference Box models from the Models dialog and directly attach them to the Plat as references. Note that you can drag and drop multiple references boxes at the same time on this dialog. For this example, you will only be attaching a single reference box.



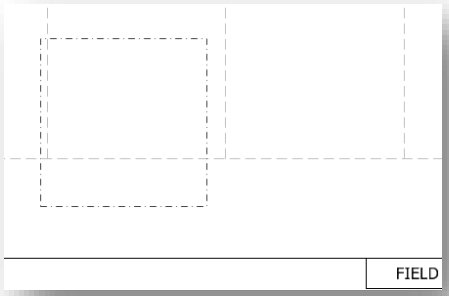
Reference Box Attachment Drag and Drop

6. Upon completion of the drag and drop, you will be prompted with the *Attach Source Files* dialog requesting you to adjust the alignment of the references being attached. For the reference boxes, you want to use the Top attachment method as shown:



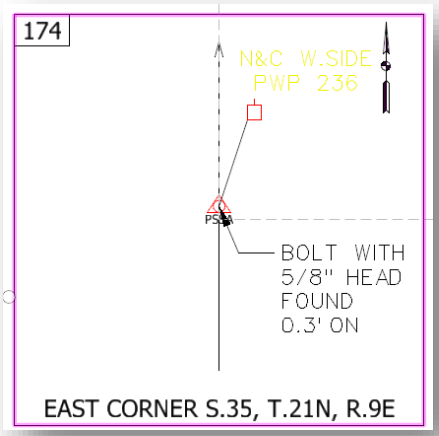
Attach Source Files

7. After accepting the attachment method, you will see an outline of the reference extents that you are trying to attach. Note that the attachment point is the center of the reference.



Reference Attaching

8. You need to position your cursor and snap to the appropriate grid location where you would like to place the reference box. When satisfied with your location, place the reference by a left click.



Placed Reference Box

9. Repeat steps 5-8 for each successive reference box. Finally, to disable the reference grid, disable the Constructions view attribute that you enabled in step 3.

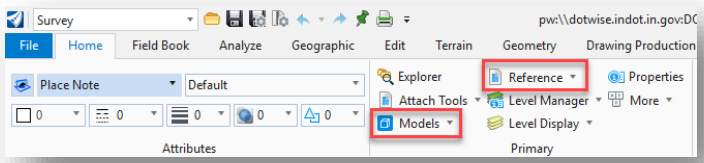
2.3-7 Adding the Coordinate Table to the Route Plat

Next, you need to add the Coordinate Table to the plat sheet.

1. If not open and active, open your route plat and make sure the plat sheet is open in OpenRoads Designer.
2. Make sure you have fit the entire sheet in your view. Do this by either performing a Fit View Zoom from the View toolbar or by double clicking your middle/mouse button.

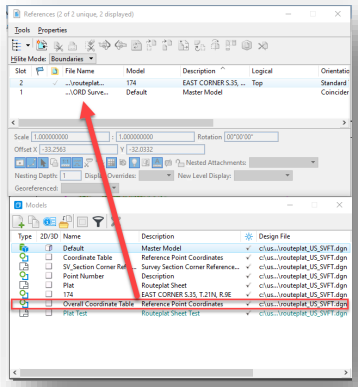
Fit View

3. At this time, you want to open both the Models and References dialog boxes from the Home tab of the Survey Workflow.



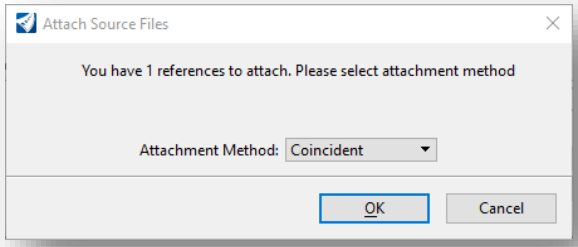
Models and References

4. With both dialogs open, you can now drag the Overall Coordinate Table model from the Models dialog and directly attach it to the Plat as a reference.



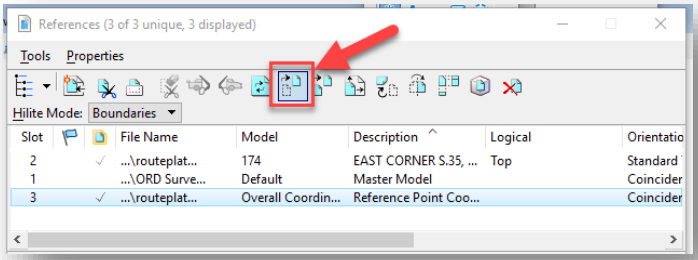
Attaching the Overall Coordinate Table

5. When prompted with the *Attach Source Files* dialog, set your attachment method to Coincident.



Coincident Attachment

6. This will attach the coordinate table to your routeplat sheet. You can adjust this reference placement by highlighting it on the Reference dialog and selecting the Move References tool and moving the reference as you would any other element.

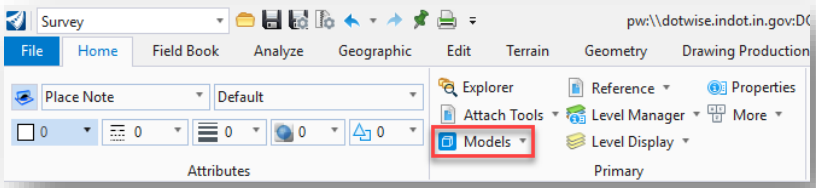


Move References

2.3-8 Creating Section Corner Cards

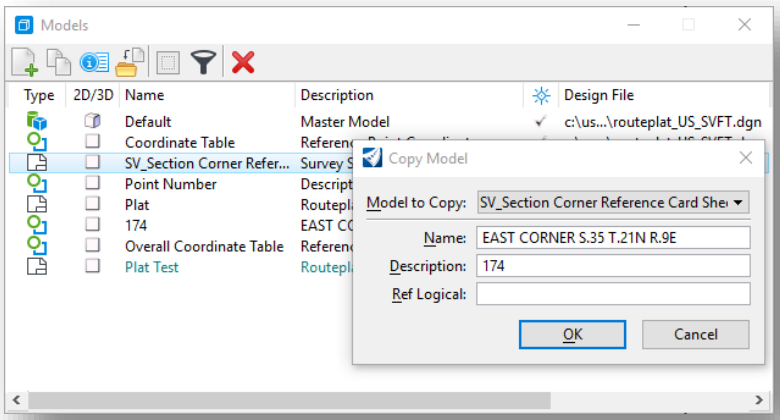
This section will walk you through the creation of Section Corner Cards and attaching the appropriate reference boxes.

1. Make sure your route plat file is open. You do not need to be in a specific model.
2. Open the Models dialog. As you have done in previous examples, you will be copying the template Section Corner Reference Card Sheet model as you did with both the reference boxes and the plat sheet.



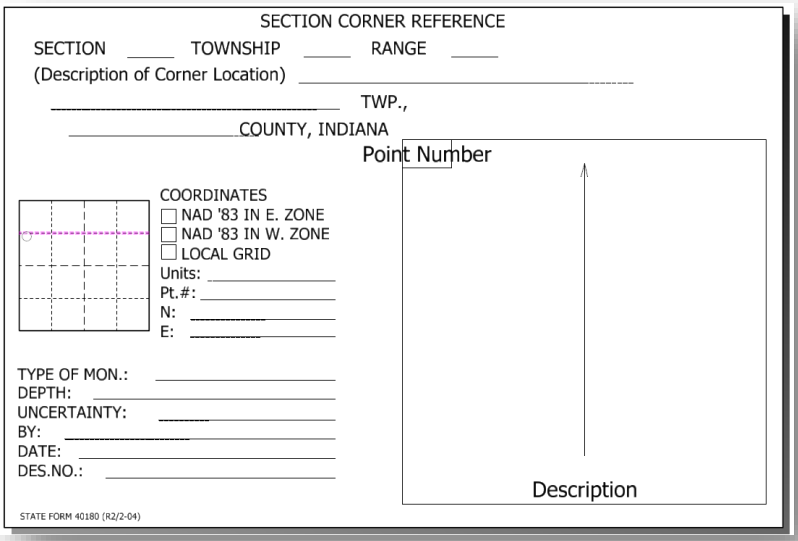
Accessing the Models Dialog

3. With the Models dialog open, highlight the Section Corner Reference Card Sheet model, then select the Copy Models button from the toolbar.



Copying the Section Corner Reference

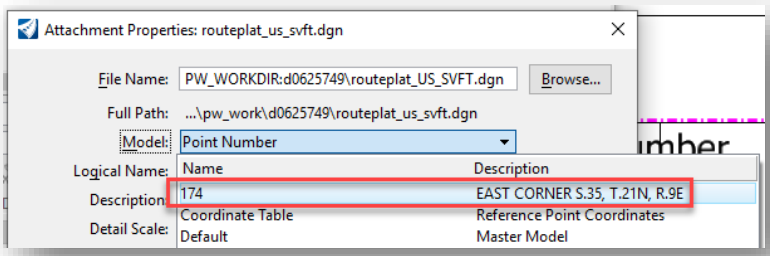
4. In the Copy Model dialog, type the name and description of the reference card as shown in the previous illustration and hit OK. This will copy the model and should open it in the OpenRoads Designer session. If it does not open automatically, switch to it by double left-clicking on the model in the Models dialog.



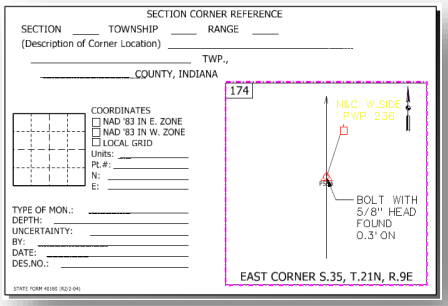
Section Corner Card with Reference Box

5. Open the References dialog. You will find that this model already has a reference back to the blank Point Number model in your active file. This is pre-attached to appropriately place the reference and allow you to quickly select the appropriate point number attachment.

6. In the References dialog, double-click on the reference with the Model named Point Number and when prompted, change the model on the Attachment Settings to the appropriate reference box as shown.

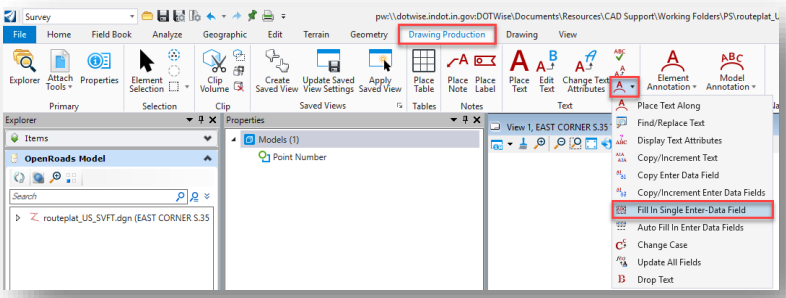


Adjusting Reference Box Attachments



Reference Box Attachment

7. At this time, you may conclude filling in the fields on the reference box and moving the section corner elements as needed. To edit the text, use the Fill In Single Enter-Data Field tool found in the Text Group under the Drawing Production tab of the Survey workflow.



Editing Section Corner Fields

8. Repeat the previous steps for each reference box as needed.

2.4 Exporting/Reporting OpenRoads Survey Data

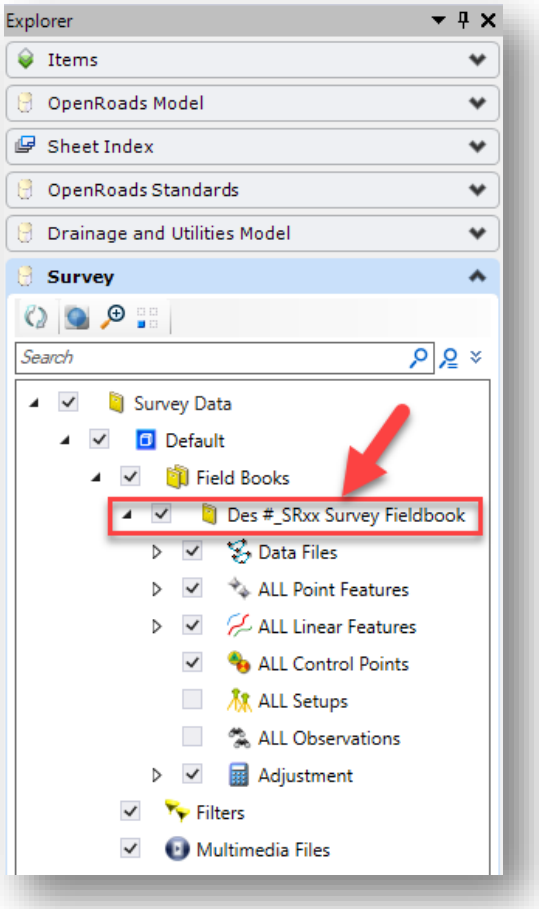
Using the built-in survey processing and display tools, reporting can be far more specific--down to the feature level—when compared to the previous reporting functionality with using InRoads. This section will look at two different export methods: direct export to .csv and usage of the OpenRoads reporting tools.

Please keep in mind that these methods are not a way to directly export data to a ready-made format and are more akin to a direct coordinate export. Any output that these methods produce may need some clean up and modification if the intention is to use the data these provide in other ways.

2.4-1 Reporting on Survey Information

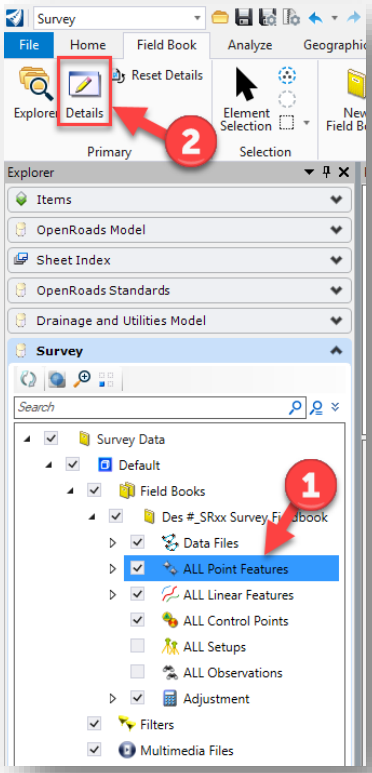
The following steps look at how to turn OpenRoads survey information into a reported format like those provided in SS2. This example will show reporting on Point Features.

1. With your DGN open, navigate to the Survey section of the Project Explorer. Locate your fieldbook.



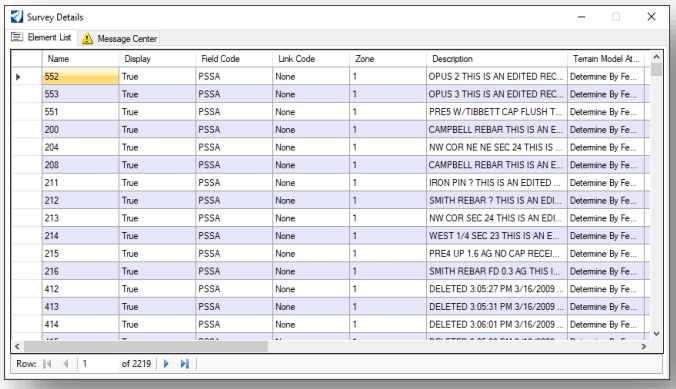
Survey Fieldbook

2. Locate the ALL Point Features list under the fieldbook entry. In the Primary section of the Field Book tab, select the Details tool.



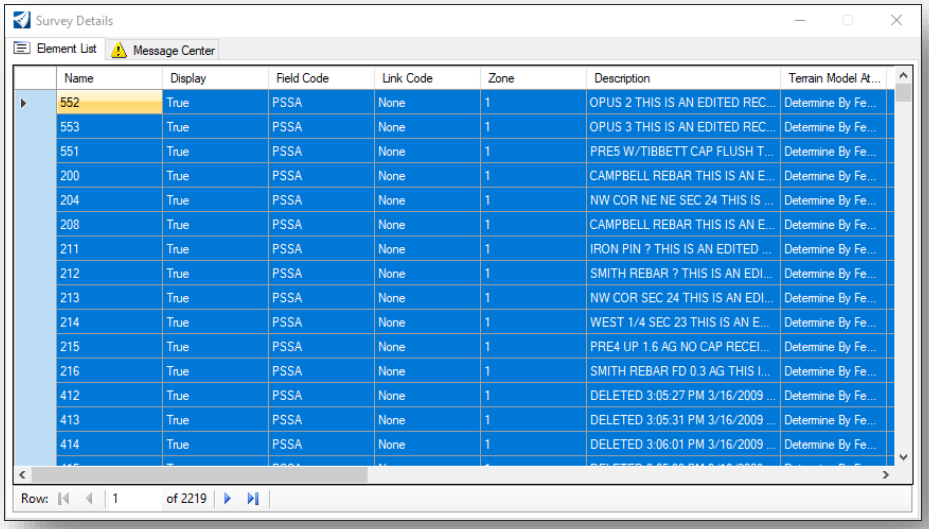
Survey Details for All Point Features

3. This will bring up the Survey Details for all the points. Should you wish to only report on a certain feature, or subset thereof, you can continue to drill down under the All Point Features on the Project Explorer to the feature you'd like.



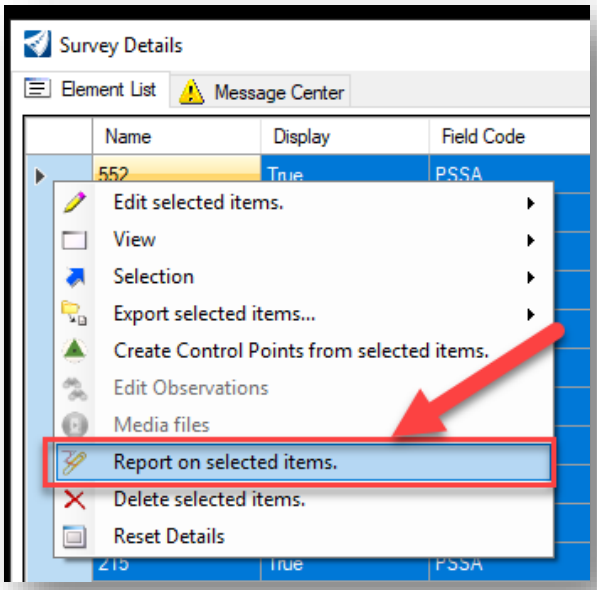
Survey Details

4. On the Survey Details display, you can select as much or a little, as necessary. This dialog adheres to standard Windows conventions of Ctrl-click and Shift-click methods to select multiple entries either one at a time or in a sequence. For this example, all points have been selected by using the Ctrl+A (select all) command.



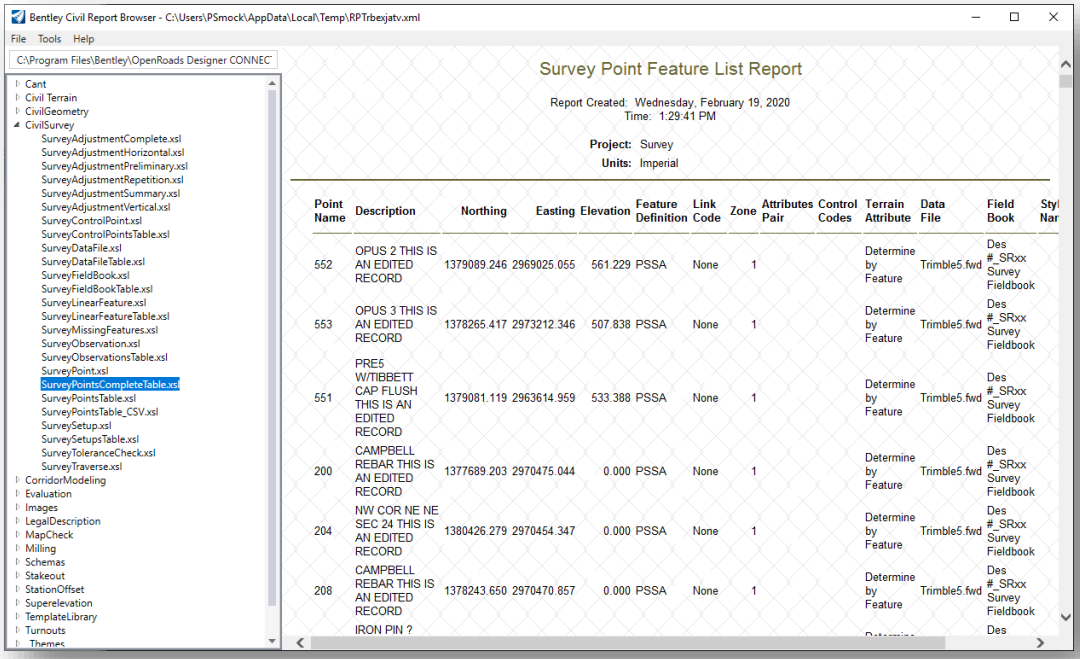
Selecting All Points

5. With your points selected, right click on the far-left hand column (to the left of the point names, the upper left box will not work), and select *Report on selected items*.



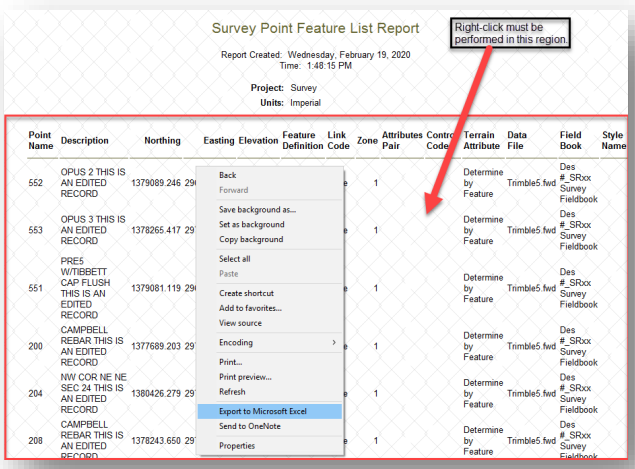
Report on Selected Items

6. This will start the Bentley Civil Report Browser and initialize the SurveyPointsCompleteTable.xsl.



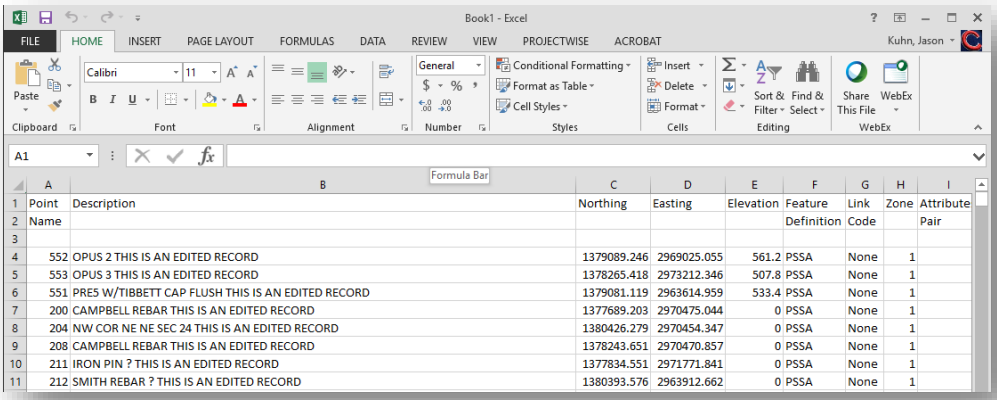
Survey Point Feature List Report

7. You can then save the output to several formats, along with printing it to a printer or PDF file. Additionally, by right-clicking on the report background, you can bring up a context menu that allows you to export the format directly to Excel. *NOTE: To have the table exported correctly to Excel, you must perform a right-click in the area containing the point feature information. Then, select the Export to Microsoft Excel from the menu.*



Export to Microsoft Excel

By exporting to Excel, you will get a tabular file with all the data in the report shown in their appropriate columns. This will allow for the data to be quickly adjusted, and then if needed, saved to a .csv or other needed formats.



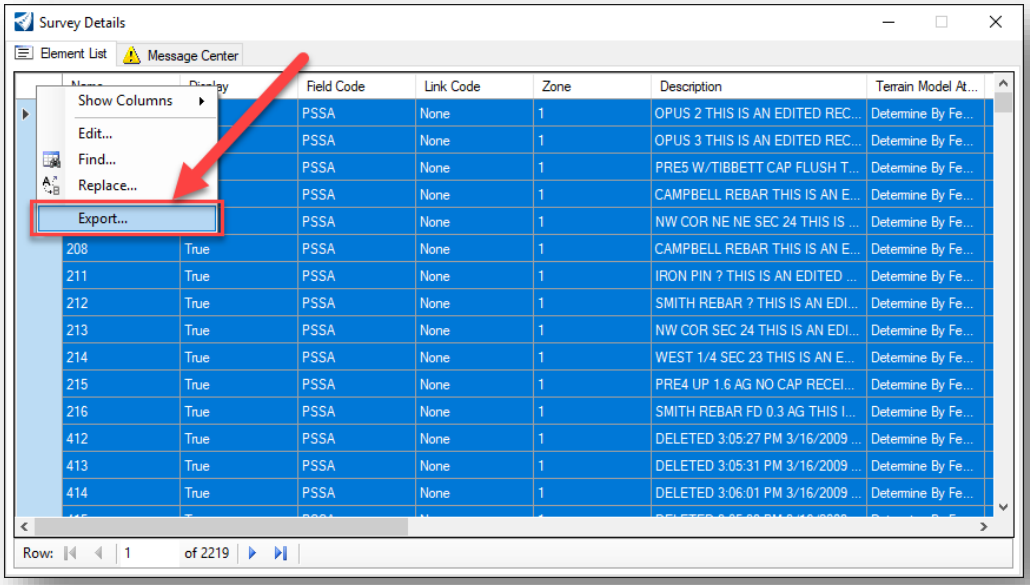
Point Name	Description	Northing	Easting	Elevation	Feature Definition	Link Code	Zone	Attribute Pair
552	OPUS 2 THIS IS AN EDITED RECORD	1379089.246	2969025.055	561.2	PSSA	None	1	
553	OPUS 3 THIS IS AN EDITED RECORD	1378265.418	2973212.346	507.8	PSSA	None	1	
551	PRE5 W/TIBBETT CAP FLUSH THIS IS AN EDITED RECORD	1379081.119	2963614.959	533.4	PSSA	None	1	
200	CAMPBELL REBAR THIS IS AN EDITED RECORD	1377689.203	2970475.044	0	PSSA	None	1	
204	NW COR NE NE SEC 24 THIS IS AN EDITED RECORD	1380426.279	2970454.347	0	PSSA	None	1	
208	CAMPBELL REBAR THIS IS AN EDITED RECORD	1378243.651	2970470.857	0	PSSA	None	1	
211	IRON PIN ? THIS IS AN EDITED RECORD	1377834.551	2971771.841	0	PSSA	None	1	
212	SMITH REBAR ? THIS IS AN EDITED RECORD	1380393.576	2963912.662	0	PSSA	None	1	

Exported Point Feature Information

2.4-2 Direct Export

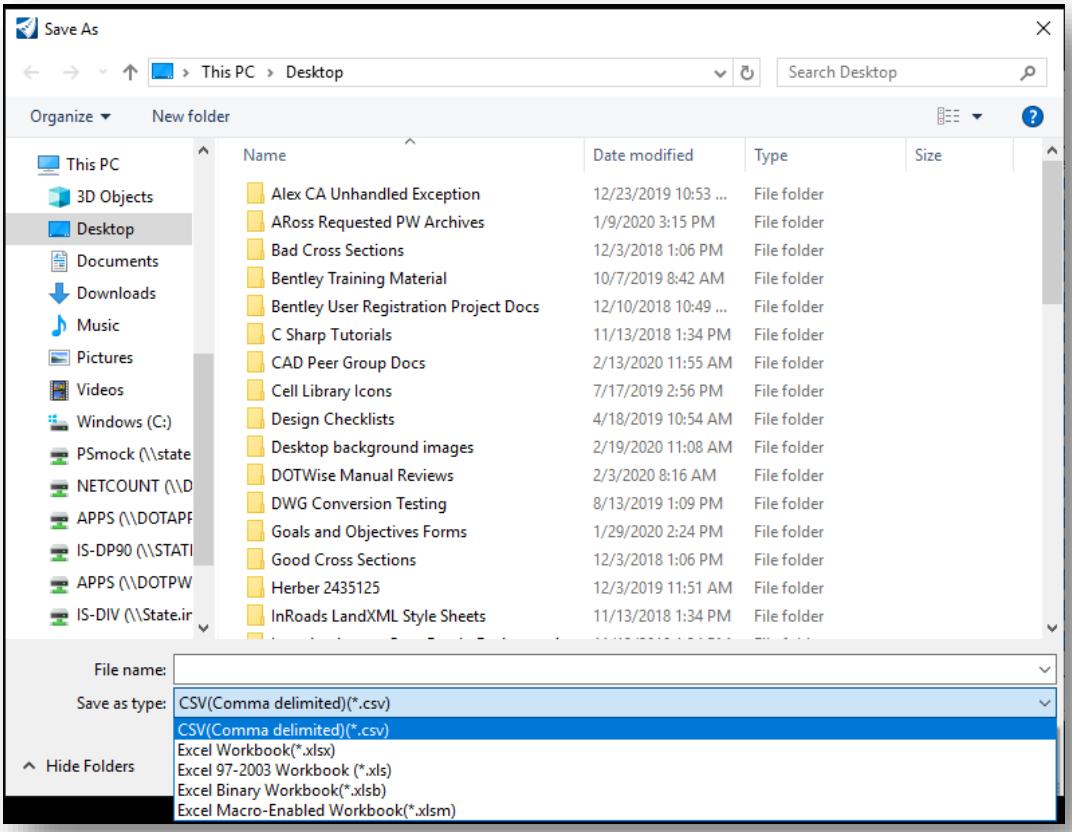
The steps for this process are like those in the previous section. Perform steps 1 through 3 as explained in the previous section.

1. To export the points directly out without reporting, you'll right click on the upper left-hand cell in the table (to the left of the Name field header). Select the Export option shown.



Direct Export

2. You will be presented a Save As dialog. Selecting the Save as type field will present the different options you can save your file out as.



Exporting File

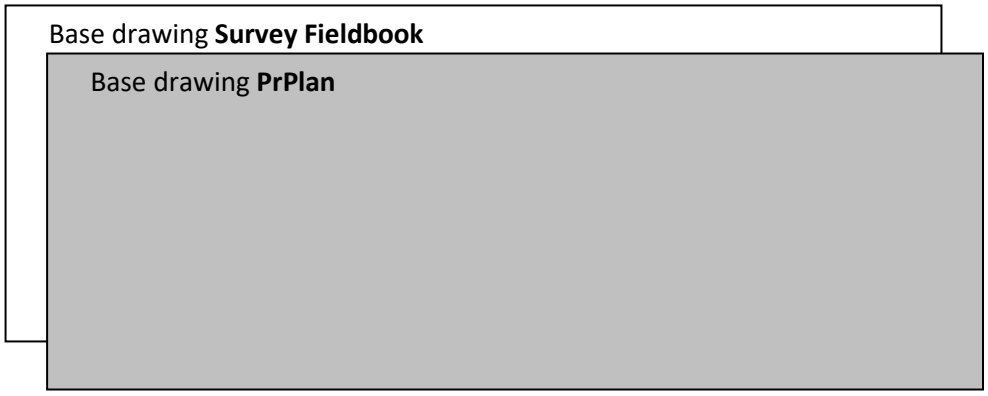
Depending on the format chosen, you can then open the file either directly in Excel, a text editor, or several different applications.

3. Plans Production for Design in OpenRoads Designer

The following sections discuss the usage of OpenRoads Designer for INDOT Plans Production purposes. The same federated approach to the drawing composition process that is recommended by Bentley will be used. These sections discuss how the drawings are created, layered, and pieced together to form a fully realized data set that can then be turned into a plan set.

3.1 Referenced Base Drawings

As previously mentioned, a layered drawing process allowing for maximum flexibility in configuring data to be displayed, referenced, and reused is employed. The base drawings for all these steps can be easily referenced together. The only possible difficulty might be differences in coordinate systems between the files. This may be resolved using OpenRoads Designer tools. This problem is not likely unless you have drawings (OpenRoads Designer, MicroStation or AutoCAD) with information from sources outside of INDOT. Despite this problem, it can be fixed. The following figure displays how base drawings are placed together.

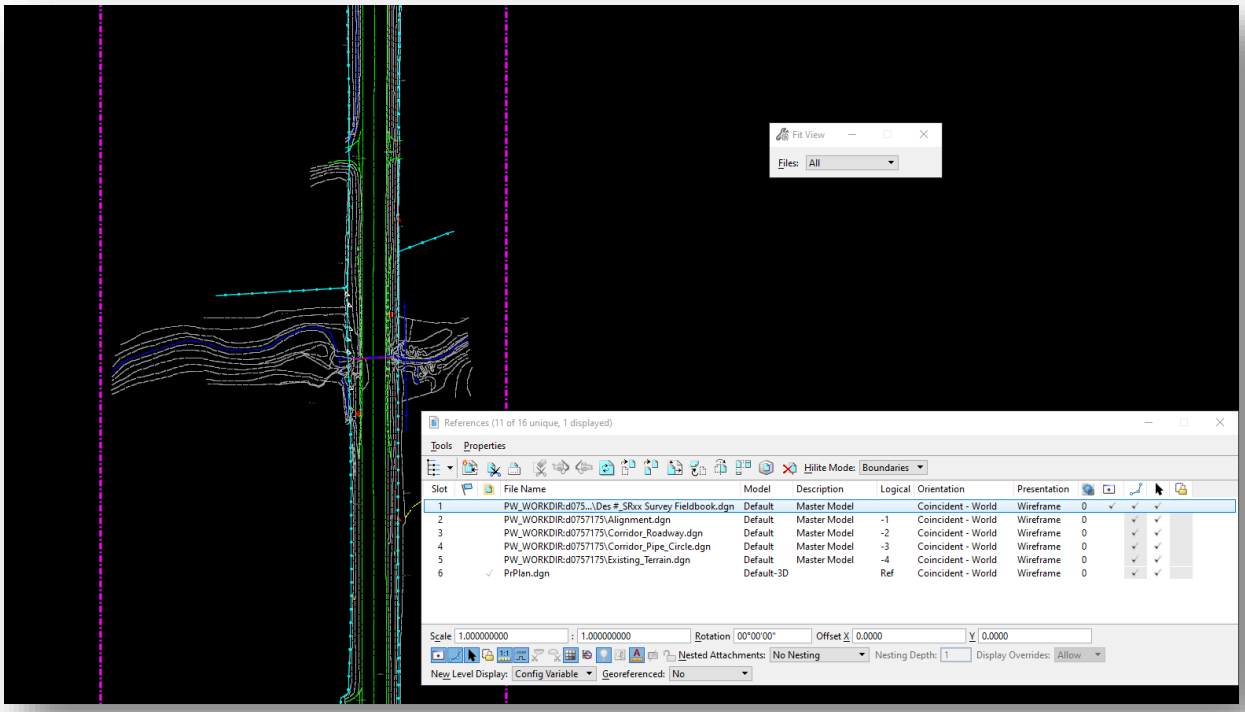


Conceptual View of Base Drawings Referenced Together

Note: With the combination of the Survey TOPO and Terrain model information being in a single DGN, it is no longer necessary to create discreet contour drawings. The following workflow will describe the process of acquiring and using this data for your project.

The above figure displays a view with the PrPlan dgn set as the active drawing and with the Survey Fieldbook dgn referenced into PrPlan.

An example illustrating this concept would look like what is shown below:



PrPlan with Survey Fieldbook Referenced

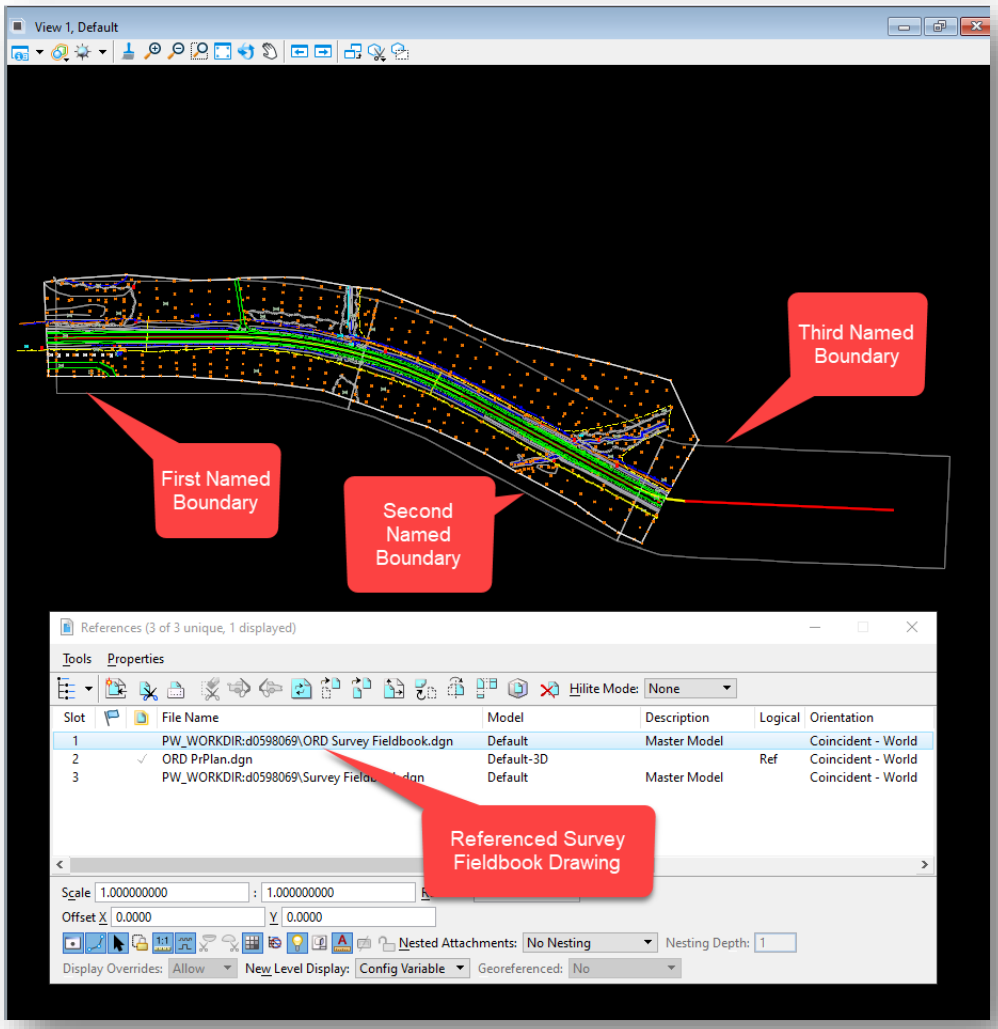
3.2 Introduction to Named Boundaries

New to OpenRoads Designer is the concept of named boundaries. Simply put, named boundaries help define the plotting extents of your design content. This section will give a brief introduction to named boundaries and their application in creating plan sheets.

Users can refer to Section 3.6 of this document for more detailed information about named boundaries and how to create them.

3.2-1 Named Boundaries for Plan and Profile Views

From the perspective of plan and profile views, named boundaries set the plotting extents for use in the creation of plan-profiles, bridge layouts, construction details, and other drawings. All content—including content from references—that is displayed within the named boundaries will show through on the sheets created from them. The following figure displays an example of how named boundaries will display content from referenced base drawings:



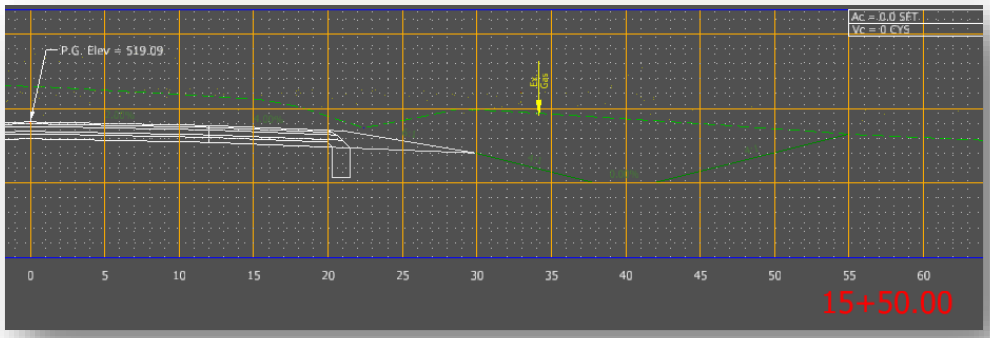
Base Drawing Referenced into an Active Drawing with Named Boundaries

The above figure displays a view with PrPlan set as the active drawing and a Survey Fieldbook referenced as a base drawing.

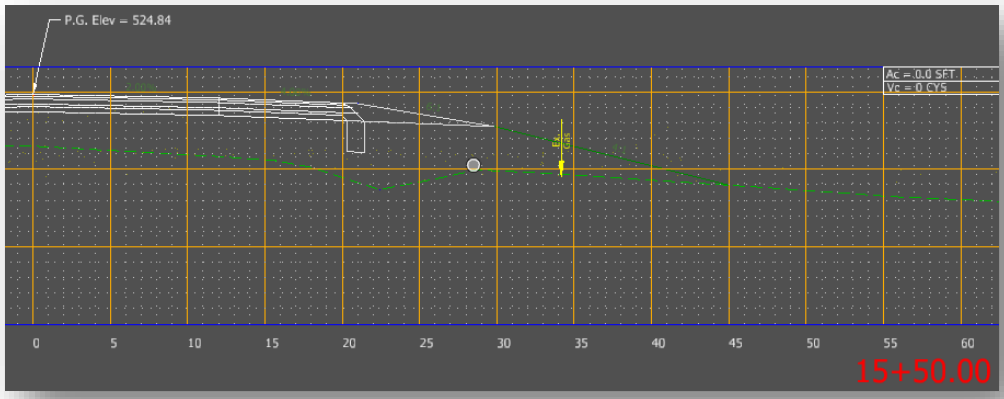
Each of the named boundaries represents a plan view area that is clipped into a given plan profile sheet. This same concept also applies to the profile view area of these sheets. Other drawings—such as Construction Details and Bridge Layouts—use these same principles, but with different view sizes and layouts for each, depending on the desired sheet type and scaling.

3.2-2 Named Boundaries for Cross Section Views

In the context of cross sections, named boundaries define the extents of each of the individual cross sections. It is important to note that the named boundaries for cross sections are "live" snapshots, in that they will update automatically based on the content they interact with. For example, say there is a proposed change to the vertical profile of an alignment. The design content contained within the cross section named boundary will change automatically to accommodate the profile change.



Cross Section Before Profile Change

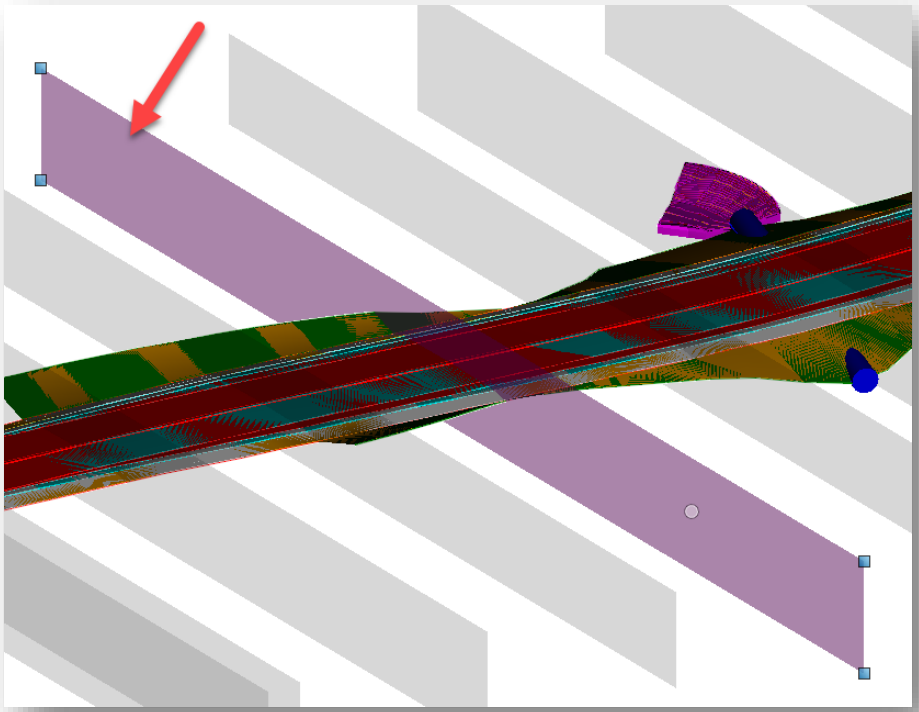


Cross Section After Profile Change

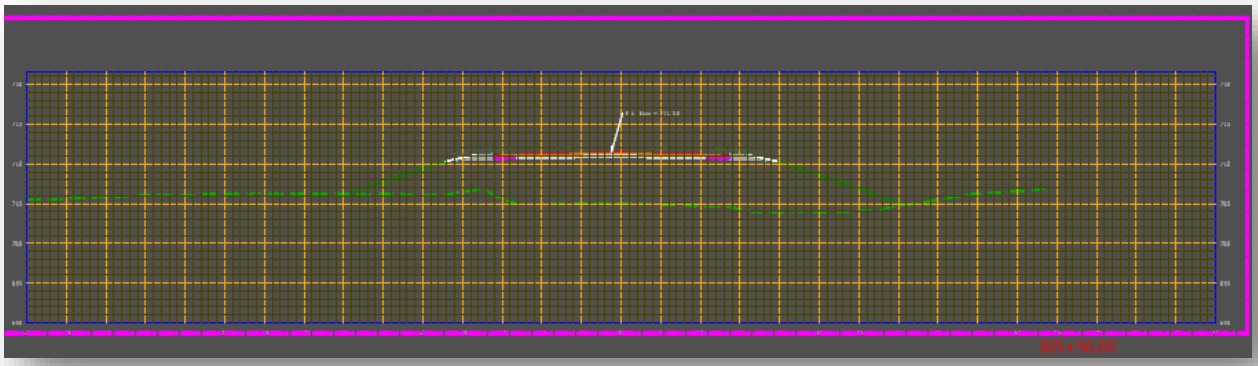
Note that in this specific scenario, you would have to remove and reapply the drawing model annotations to update the profile grade annotation. You can refer to section 4.1 of this document for instructions on working with these annotations.

3.3 Drawing Models

As of the release of OpenRoads Designer, the plans production process directly incorporates the use of drawing models. Drawing models are created using named boundaries to show a snapshot of the contents of the design model that reside within them.



3-D View of Cross Section Named Boundary



Drawing Model Containing the Cross Section Named Boundary Shown Above

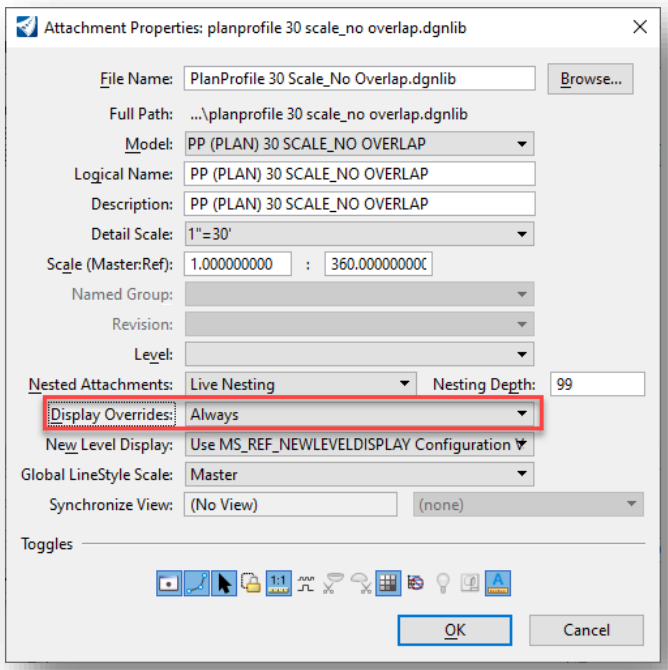
The Named Boundary tool in OpenRoads Designer—explained in further detail later in this chapter—automatically creates drawing and sheet models for Plan and Profiles, Layouts, Construction Details, and other types of sheets. The drawing models reference in the named boundaries that are created from the design model, and then have the desired annotation applied to them. These finished drawing models are then referenced into the sheet models in conjunction with the appropriate border file.

A very important aspect of drawing models to keep in mind during the plans production process is the relationship to their corresponding design models when it comes to the display of your design. As

explained above, drawing models reference in the named boundaries that are created from the design model. Taking it one step further, sheet models then use these drawing models as references and place them within a specified sheet border. How the design elements are displayed in the drawing and sheet models is controlled by two different reference attachment settings: one in the sheet model, and the other in the drawing model. These settings will be explained in the following two sections.

3.3-1 Display Overrides Setting

The first reference attachment setting that controls the appearance of design elements in sheet models is the *Display Overrides* setting. This setting—set for the drawing model attachments to your sheet model—controls how nested references (i.e., design models) are displayed in your active sheet model. Per the request of our Design group, we have set this setting to the *Always* option by default in all of the preconfigured sheet seeds that CAD Support makes available. No additional action is required by users for this setting.



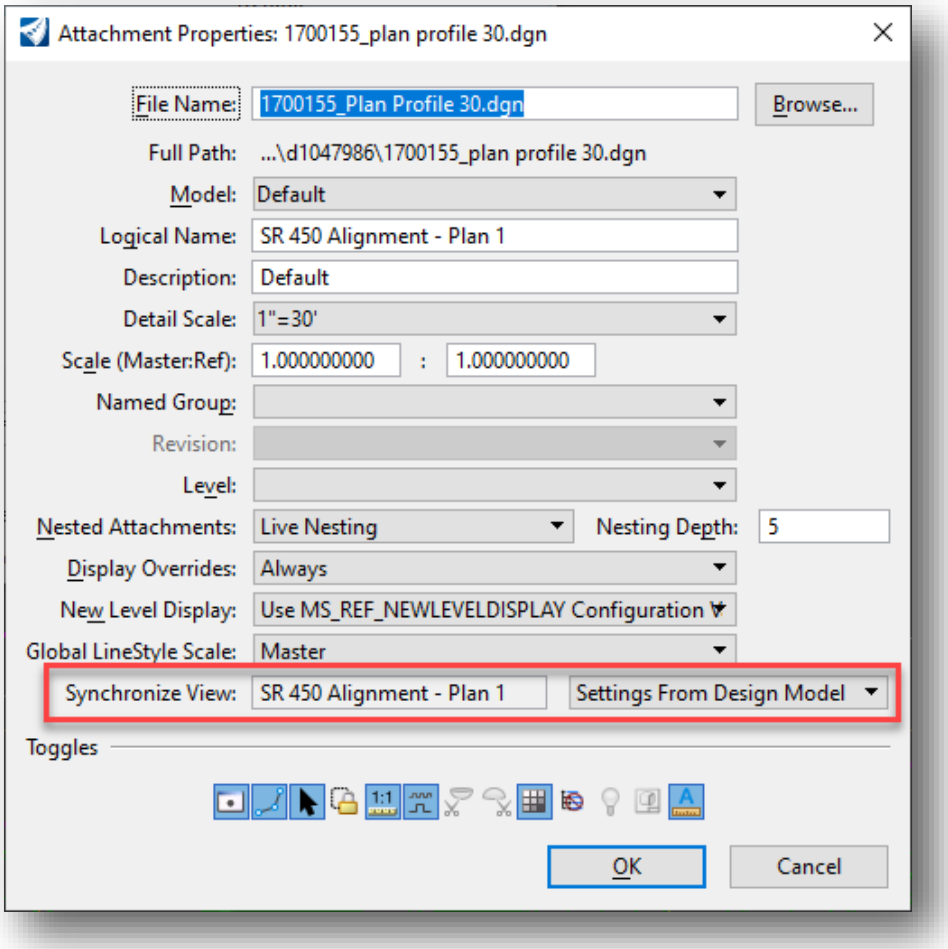
Always Display Overrides Setting in Drawing Model Attachment to Sheet Model

What the *Always* option enforces is that no matter what changes you make to the display settings in your direct attachment (i.e., drawing model) for your nested attachment (i.e., design model), those setting changes will be ignored in the sheet model. In other words, whatever display settings are set directly in the sheet model for the design model will be honored regardless of any display settings that are set in the drawing and/or design models.

3.3-2 Synchronize View Setting

The other reference attachment setting that controls the display of design elements in sheet models is the *Synchronize View* setting. This setting—set for the design model reference attachment in your drawing model—controls how the drawing model processes display changes to the referenced design

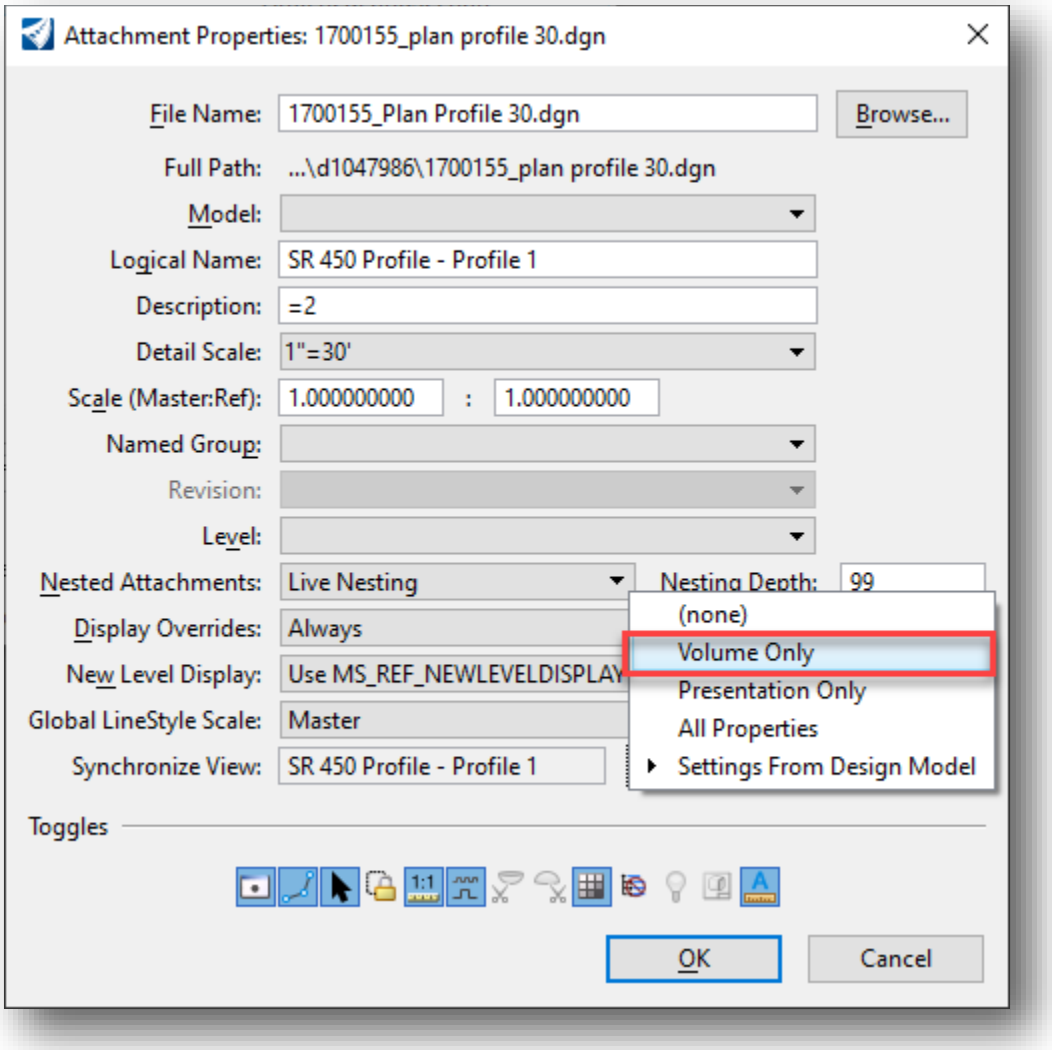
model. To access this setting, open up a drawing model in your file and then open the References dialog. From there, open up the Properties dialog for the attachment, which in this case would be your design model. Note the Synchronize View setting as shown below:



Synchronize View Setting

For the purposes of plans production, there are different options for this setting that need to be used—depending on the type of drawing model you are working with.

- If you are working with a drawing model of a plan view, the *Settings from Design Model* option (as shown in the example above) is the appropriate one to use—as it will recognize any display changes to the design model and cascade them down to the drawing and sheet models accordingly.
- If you are working with a drawing model of a profile view OR a cross section view, the appropriate option to use is the *Volume Only* option. This is per guidance from Bentley, as it was discovered that the *Settings from Design Model* option produced erratic results for these drawing model types.



Volume Only Option for Synchronize View Setting

NOTE: *The Synchronize View setting ultimately overrules the Display Overrides setting when it comes to controlling your display. For example, when you have the Settings from Design Model option set for the Synchronize View setting, it for all intents and purposes ignores the Display Overrides setting in the sheet model, and all display changes would have to be made in the design model.*

3.4 Creating Base Drawings

With the move to OpenRoads technology, several changes have been made to the base drawing process. The most obvious change is that some of the supplemental files that were used by InRoads are no longer necessary for the creation of the base sheets—particularly the DTM file (surface).

As the DTM content has now been split into various data containers within the DGN, there is some additional flexibility that has come about. First, contours and triangles are no longer separate drawing steps. Instead, they are displayable portions of the terrain model that can be enabled/disabled with a toggle. Additionally, as the DGN is now the container, standard MicroStation referencing can be used to make data available across files.

This section looks at creating comparable base drawings to how processes in the past have compiled them. This allows us to maintain a vast majority of the current workflow while maintaining flexibility in providing the base data across the project. In that regard, the biggest change is that a drawing for existing contours will no longer be created separately.

Next, a note on scaling. OpenRoads tools are no longer dependent on a specific scale being assigned at the time they are drawn and are now using Drawing Scale instead. This allows for the scaling of data to be done on the fly as discussed in Section 1.5-5 of this document. For the purposes of this document, CAD Support will continue advocating that—if possible—a scale be given to the file. Should multiple scales be unnecessary, the omission of the scaling will be acceptable (ex. PrPlan 50.dgn becomes PrPlan.dgn).

As a reminder and reinforcement from the previous sections, please pay special attention to the seed files that are recommended for use throughout this chapter. Geometry elements drawn in a 3D seed file will cause issues with cross section generation even after a vertical profile has been applied. As such, it is very important that content is placed in the right file to eliminate potential issues.

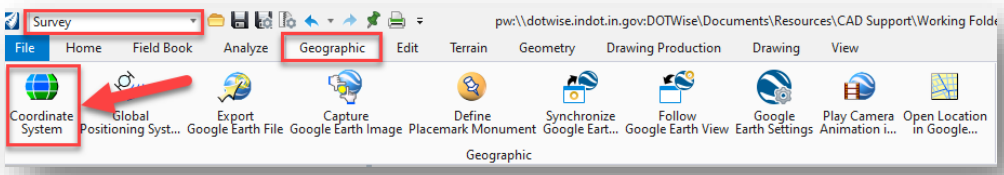
3.4-1 Geocoordinating Base Drawings

Depending on the methodology used to start your base drawings, you may opt to start from fresh seed files. The following documentation assumes the usage of already provided files that will be preset with the appropriate geocoordination information. This section, however, covers the process of geocoordinating individual files and may not apply/be necessary in all workflow situations.

One can easily geocoordinate a DGN file through the following process in a regular OpenRoads Designer session.

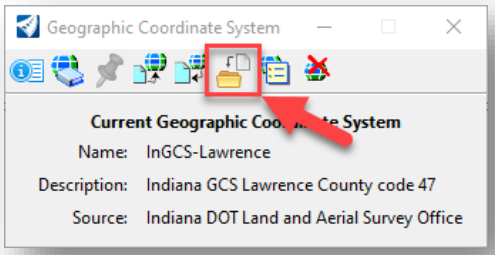
Note: As of OpenRoads Designer 2023, Survey Foot based Geographic Coordinate Systems have been incorporated into the platform and will be available with newly created data. The dialog covered in step 5 below, will only be shown if the ProjectGCS from a legacy project is being used or the coordinate system is imported from a file created from the legacy Metric coordinate systems. These systems are compatible, and project data can be a mix of the Survey Foot and legacy Metric systems with no impact to geospatial relationships between CAD files. All other spatial data such as imagery or imported GIS data will reproject as necessary between the coordinate systems without issue as well.

1. In OpenRoads Designer, go to the Geographic tab of the Survey workflow, and select the Coordinate System tool.



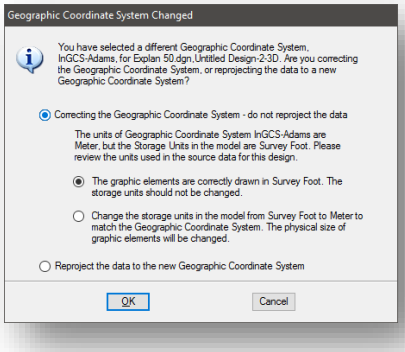
Coordinate System Tool

2. On the Geographic Coordinate System window, select the From File option.



From File Option

3. This will present a ProjectWise file browser. Navigate to your Survey/Project Files folder and select the Des #_SRxx Seed 3D.dgn or the 2D version.
4. With the .dgn highlighted, select Open and the geocoordinated definition for the selected file will be imported into your active DGN.
5. A pop-up dialog may appear asking you to choose whether you want to reproject the data based on this newly applied coordinate system. Be sure to select the option to keep the storage units as they are (should not be changed) as shown below.



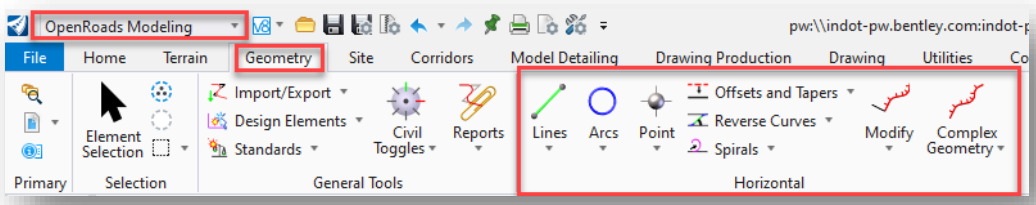
Keeping Storage Units

3.4-2 Creating a Geometry DGN/PrPlan

Corridor modeling in OpenRoads means that alignments must exist as information within a civil model instead of part of an ALG file. The expectation for projects surveyed in OpenRoads is that a Des #_SRxx Survey Alignments.dgn will be provided as part of the project. As with the other survey deliverables, this file and content will be geocoordinated and based off the provided Des #_SRxx Seed.dgn that's part of the survey project.

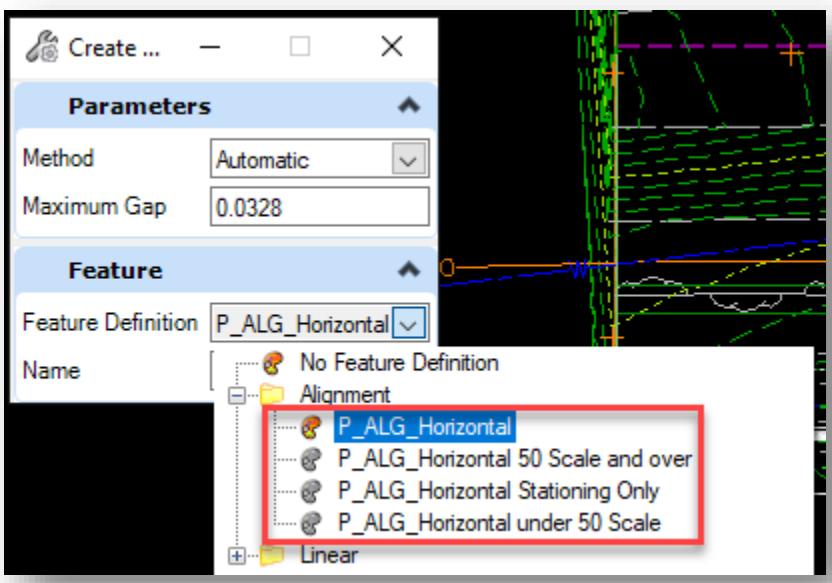
Please keep in mind that whether you have a survey provided alignment in a DGN or ALG, the model with the alignment in it should be a 2D file, or if creating from legacy data, based on the provided 2D seed file for your project.

As it pertains to the horizontal alignment itself, it should be created with the Horizontal toolset on the Geometry tab of the OpenRoads Modeling workflow.



Horizontal Geometry Tools

Also, when creating the horizontal alignment, be sure to set it to the appropriate horizontal alignment feature definition.



Setting the Horizontal Alignment Feature Definition

For the purposes of this example, you will be looking at keeping a separate DGN file for the alignment information and then creating the model and terrain in the PrPlan XX.dgn, which you will create later.

To create the file, you can use the process outlined in section 2.2-1. For this file however, your base file will be Des #_SRxx Survey Alignments.dgn. With this file created and named *Design Alignments.dgn*, you can then proceed with modifying your survey alignments or creating additional alignments. Again, with the ability to reference the DGNs together to share the civil data, this alignment file can then be attached as needed for the purposes of corridor modeling.

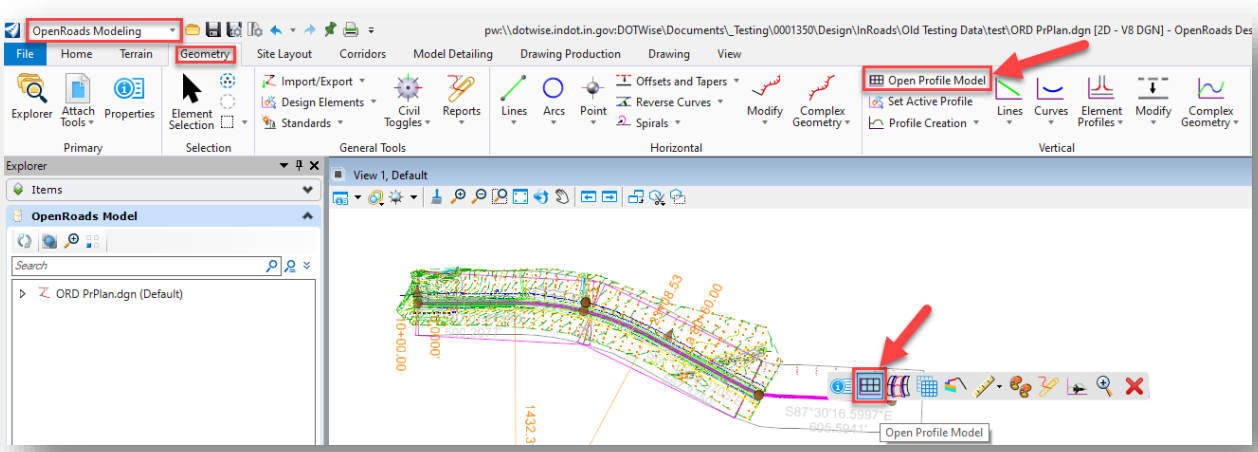
3.4-2a Drawing the Proposed Profile to the Design Alignments.dgn

Moving to OpenRoads technology requires a new mindset when it comes to working with profiles. In InRoads, all profile work was used drawing directly on top of profile graphics in your base drawing file. This was possible as the ALG file was portable across any file that was open with InRoads. Due to the change of how an alignment is stored, you will look at the process of creating a profile using the OpenRoads Designer tools in preparation for plans production. This example will assume that you are starting with a Des #_SRxx Survey Alignment.dgn file that you have copied and renamed to Design Alignments.dgn.

Please keep in mind that this file should be 2D in nature. A 3D model will be automatically created by the software and is reference attached as soon as a terrain is referenced and made active and when a vertical profile is being displayed. OpenRoads Designer will automatically generate the 3D geometry elements from the 2D information.

To create a profile display in OpenRoads Designer:

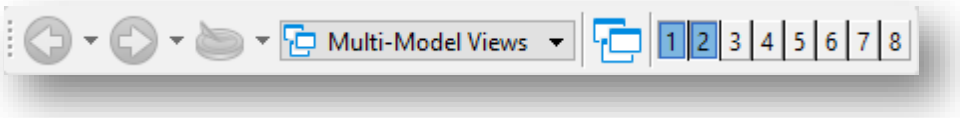
1. From the Geometry tab of the OpenRoads Modeling workflow, select Open Profile Model from the Vertical group. Alternatively, you can locate this tool by highlighting the alignment and selecting the tool from the heads-up display when hovering over the alignment.



Open Profile Model

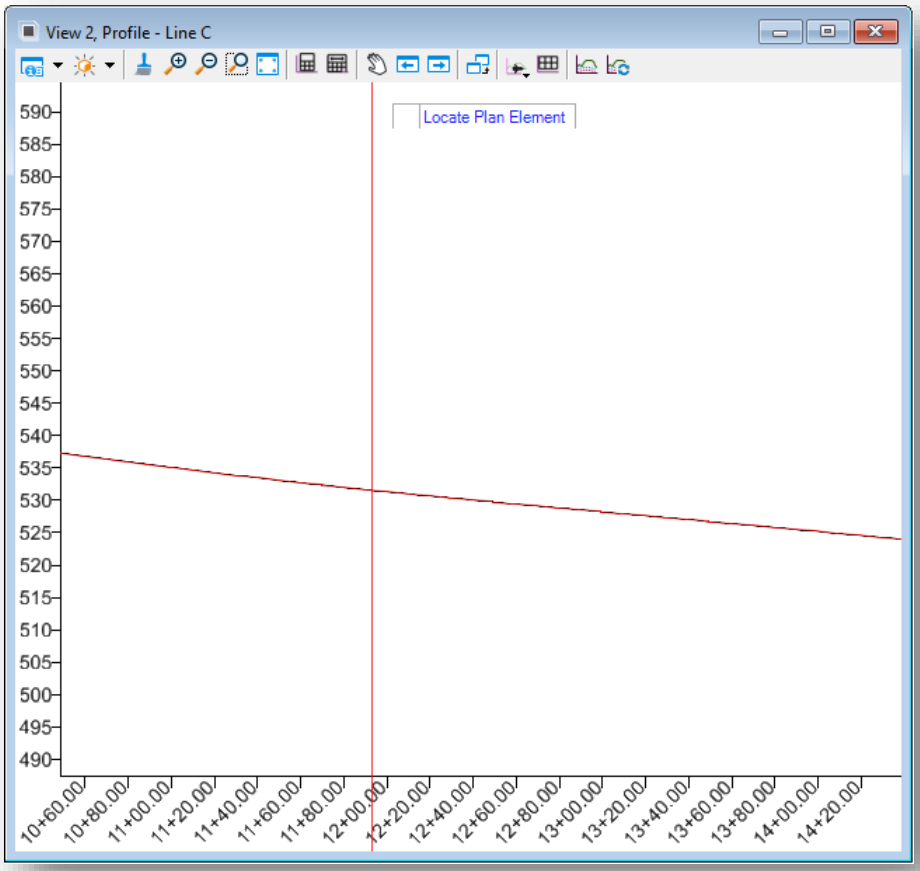
2. If selected from the Task Navigation panel, the tool will prompt you to first locate the plan element. Select the plan view representation of your alignment.

3. With the alignment selected, OpenRoads will then prompt for a view to be selected or opened.



Select or Open View for Profile

4. Use the View Groups toolbar to open an additional view. Any of the views from 2 through 8 are acceptable. Left click in the opened display to confirm the profile creation. Note that the tool will redisplay in any view you select potentially erasing any data displayed. In the event you overwrite a profile display, know that only the graphics are lost. The actual alignment information will persist as part of the civil model.



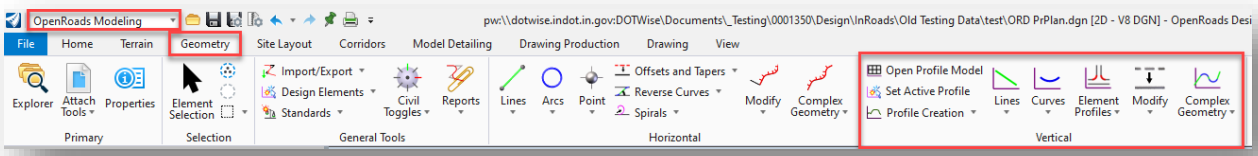
Profile Display

Note: In the previous version of InRoads, it was necessary to manually select the feature that the existing surface was on to have it display properly in profile. In OpenRoads Designer, this is no longer necessary as the terrain model uses the same feature for the boundary and profile display.

With the existing profile now displayed, you can proceed to creating a proposed profile. Please keep in mind that this profile display is not actually part of the base model in the DGN itself; rather, it is a dynamic view that allows for the creation of the civil data that makes up the profile.

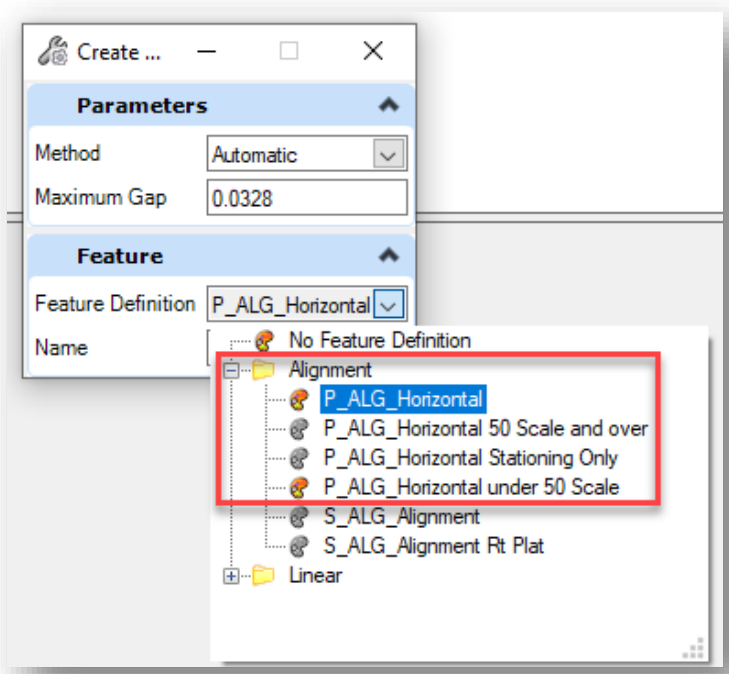
3.4-2b Adding the Proposed Vertical Alignment

With the profile now displayed in its own view, you can now begin placing the elements that will be used for the vertical profile. For this process, you'll continue to use the Vertical toolset in the Geometry tab of the OpenRoads Modeling workflow.



Vertical Geometry Tools

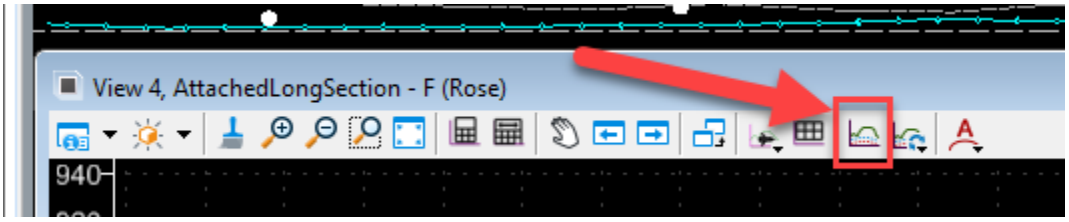
Note that when creating your vertical alignment, be sure to select the appropriate *P_ALG_Horizontal* alignment feature definition from the *Alignment* category as shown below.



Selecting Vertical Alignment Feature Definition

3.4-2c Creating 3D Cut Sections in Profile Models

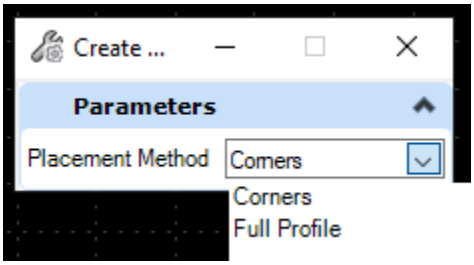
There may be situations where you'd like to show crossing features along your profile model. This can be accomplished with the *Create 3D Cut* tool on the toolbar of the profile model.



Location of Create 3D Cut Tool on Profile Model Toolbar

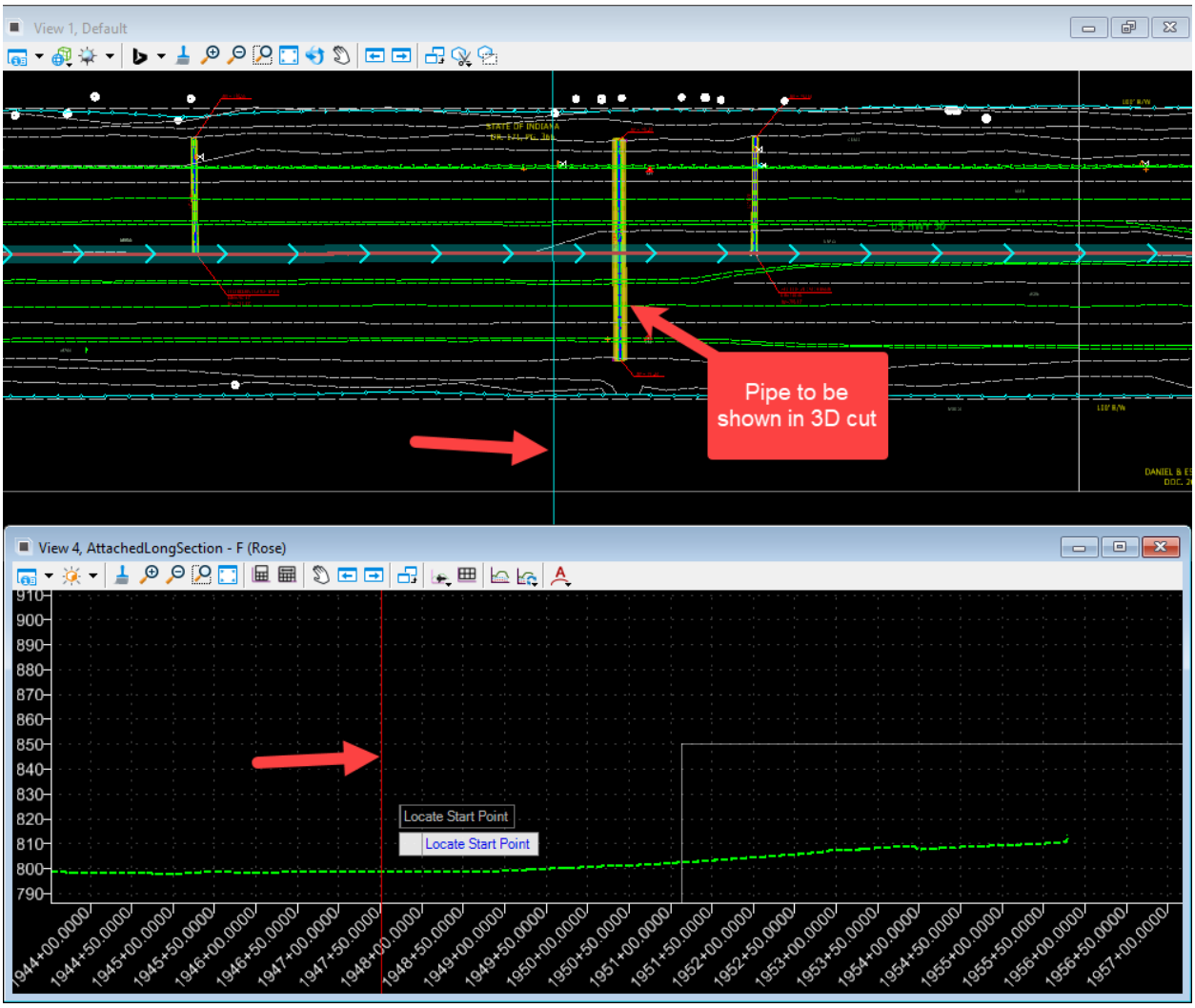
The process to use this tool is as follows:

1. In your profile model, select the *Create 3D Cut* tool.
2. You will be prompted for a placement method for the 3D cut. There are two options: *Corners* and *Full Profile*. The *Corners* method lets you define a rectangular area along your profile that you want the 3D cut to be performed. The *Full Profile* method automatically makes a 3D cut along the entire profile with no real flexibility for location, settings, etc. For the purposes of this example, we will demonstrate the *Corners* method, as it provides more flexibility.



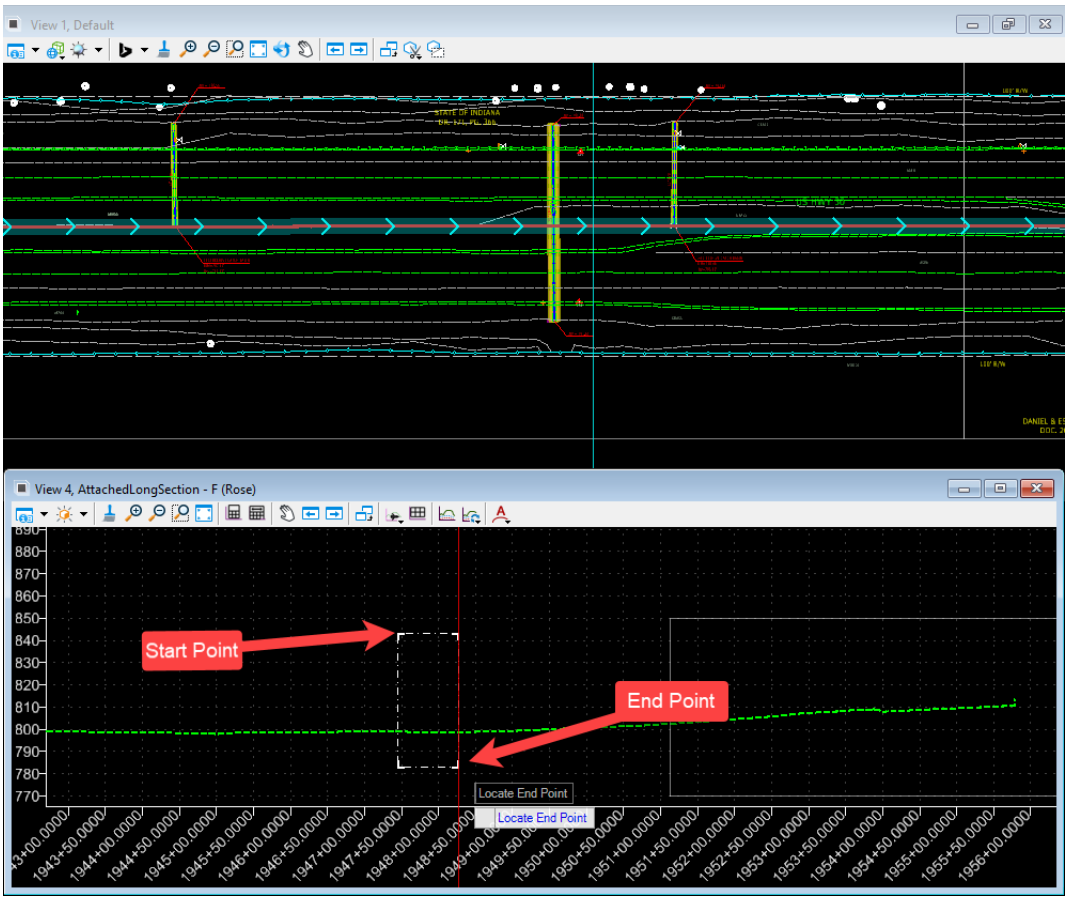
Placement Method Options for 3D Cut

3. With the *Corners* method selected, left-click to confirm the selection. You will then be asked to provide a start point for your 3D cut section. It would be most beneficial to have both your plan and profile views displayed simultaneously, as you are provided a visual cue in both views to show you the horizontal location of where you are placing the points. In this example, we will create a 3D cut section in the vicinity of a pipe that is crossing the alignment. The exact location of this point is mostly arbitrary. The only real requirement is that the start point occurs before the object you want to cut through. Left-click to confirm the placement of the start point.



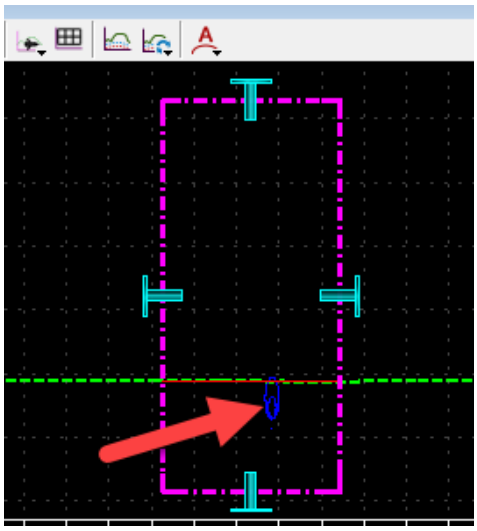
Location of Start Point for the 3D Cut

4. With the start point selected, you will then be asked to locate the end point of the 3D cut section. As with the start point, the exact placement is mostly arbitrary. The only requirement is to be sure that the end point of the cut section would completely cut through the object you're wanting to display. Left-click to accept the placement of the end point.



Location of End Point for the 3D Cut

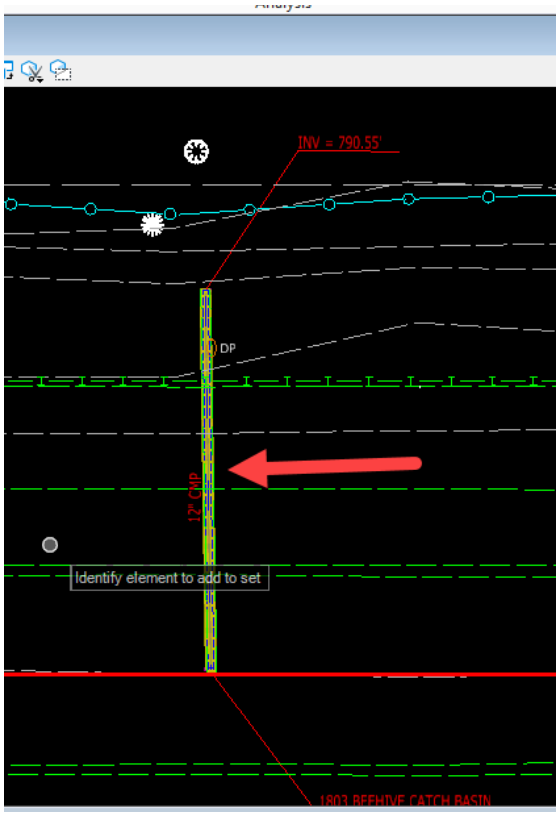
5. A 3D cut section should now be placed in your profile model, with your crossing feature included within it—which in this case, is a pipe.



3D Cut Section in Profile Model (with Crossing Feature)

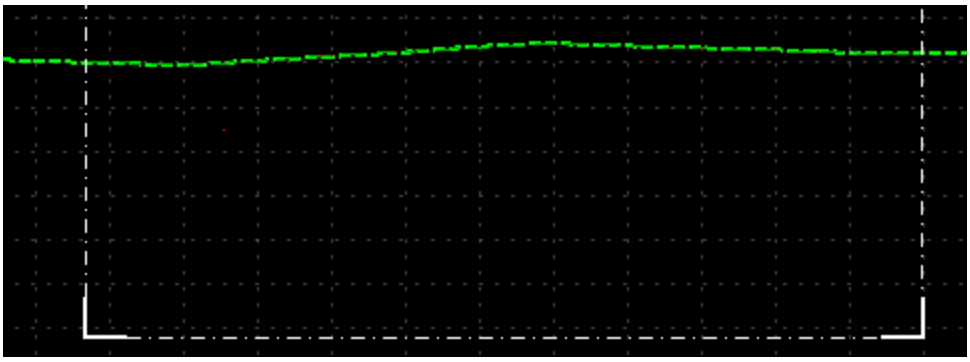
Creating 3D Cut Sections in a Profile Model for Features that Don't Cross the Mainline Alignment

There may be situations where you would like to show a crossing feature in your profile that does not cross the mainline alignment itself. To demonstrate this, we will use the example scenario shown below with a pipe that doesn't cross the mainline.



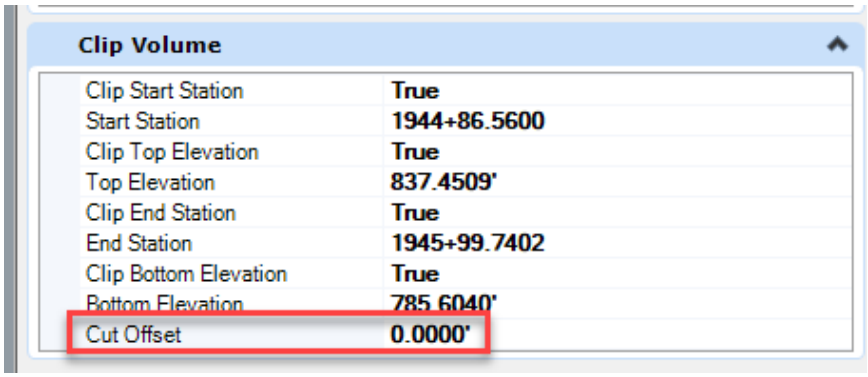
Crossing Feature that Doesn't Cross Mainline

For this scenario, you would create the 3D cut section like you normally would. However, since the pipe does not cross the mainline alignment, the cut section will not initially show the crossing feature in the profile model.



Initial 3D Cut Section

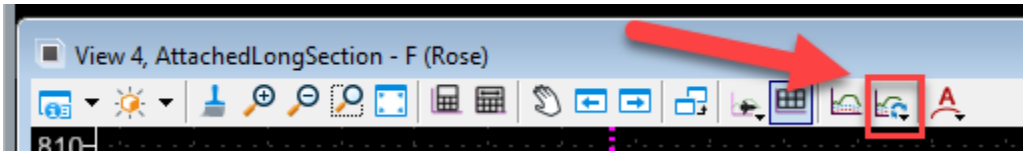
To show the crossing feature in this scenario, select the 3D cut section itself in the profile model, and note its Properties. Locate the *Cut Offset* property under Clip Volume.



Cut Offset Property of 3D Cut Section

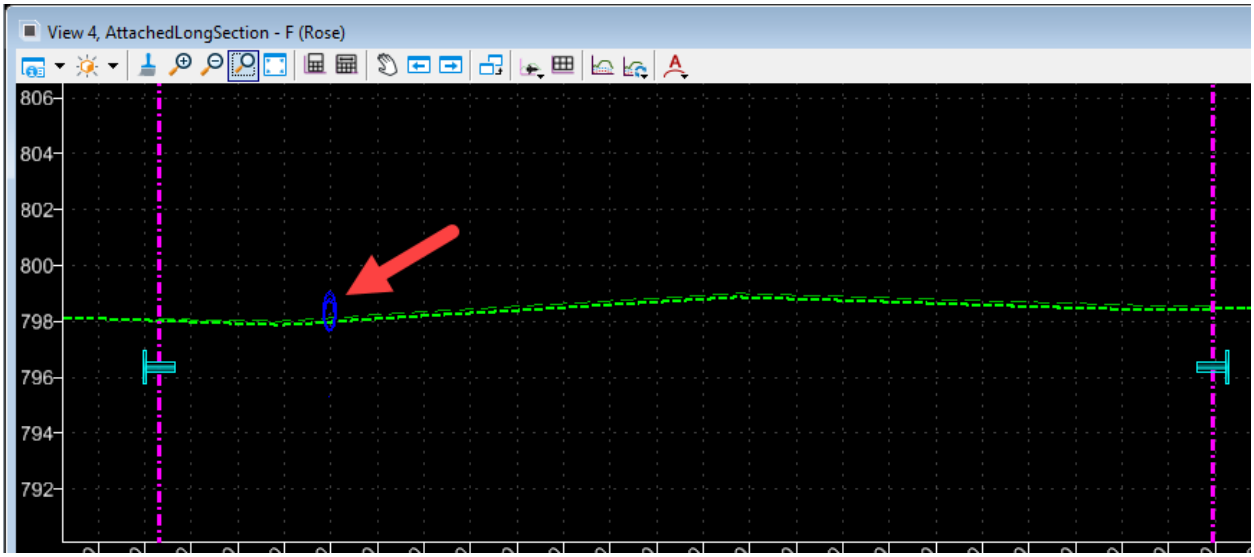
The *Cut Offset* property defines the horizontal (left/right) offset along the alignment where you would like the 3D cut to be performed. In this example, since the pipe is to the left of the alignment, we will provide a negative value for the offset. As such, we will enter a value of -1 foot for this property.

Once the *Cut Offset* property has been changed, you will need to select the *Refresh 3D Cut* tool in the profile model toolbar to update the display of the 3D cut section.



Location of Refresh 3D Cut Tool in Profile Model Toolbar

Upon clicking on the tool to activate the refresh process, the crossing feature is now displayed.



Refreshed 3D Cut Section with Modified Cut Offset Property

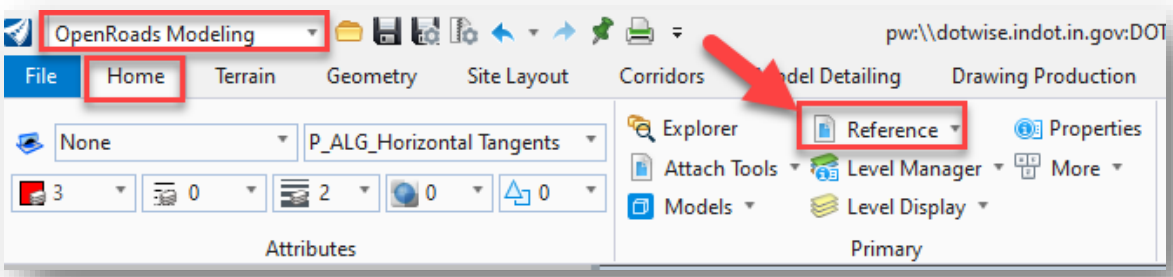
3.4-3 Creating the Proposed Plan Drawing

With the survey fieldbook and design *alignments* in separate DGNs, it is time to bring the base sheets together as preparation for plans production. The following steps assume that the corridor model and proposed terrain have been created and are prepared to be attached to the proposed plan drawing.

You can refer to section 3.4-1 for instructions on how to create a new document from a template seed file using the Advanced Wizard in ProjectWise. Open the file once created.

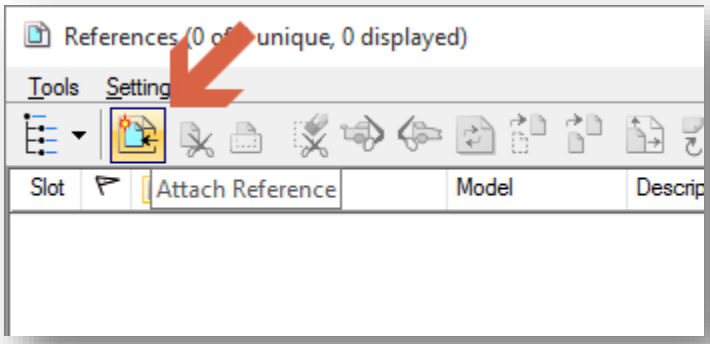
At this time, you can begin by referencing your Survey Fieldbook and Survey/Design Alignment DGN files.

1. Open the References dialog from the Home tab of the OpenRoads Modeling workflow.



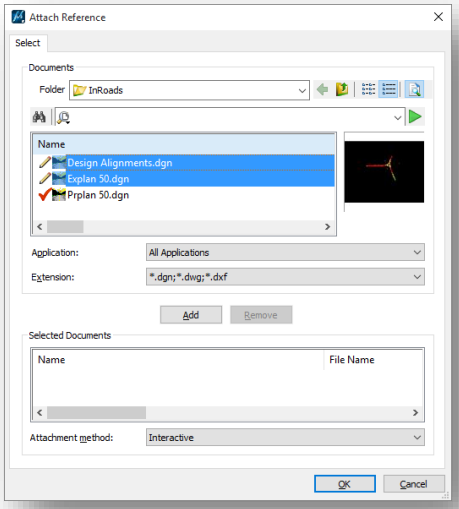
References

2. On the References window, select the Attach References button.



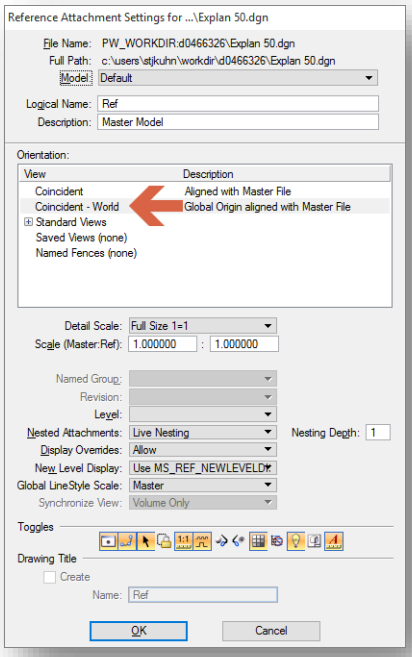
Attaching References

3. Select both the Survey Fieldbook and Design Alignments DGN files. This can be done by holding the Ctrl key on the keyboard while left clicking on each file. Select OK when ready to proceed.



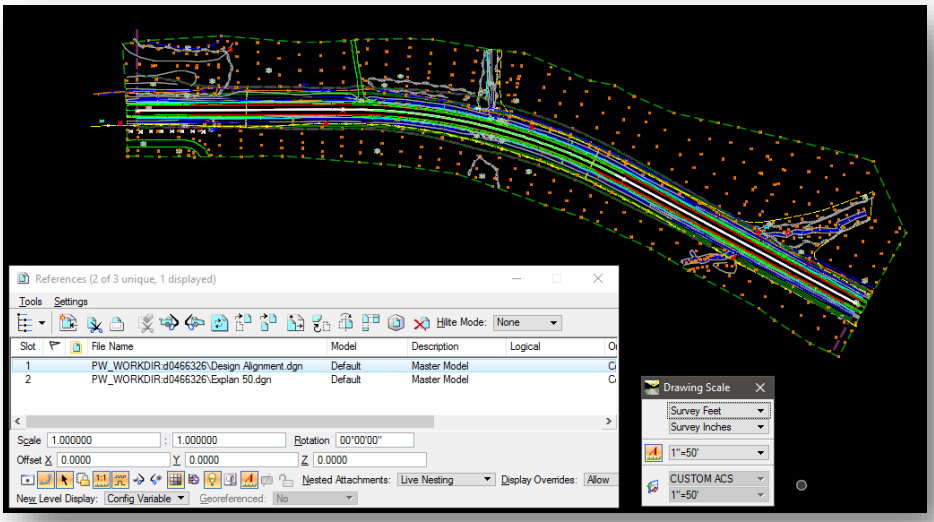
Selecting the File to Attach

4. As all files should be in the same coordinate system, the Coincident – World orientation setting should be used. All other settings can be left to their default values. When ready select the OK button.



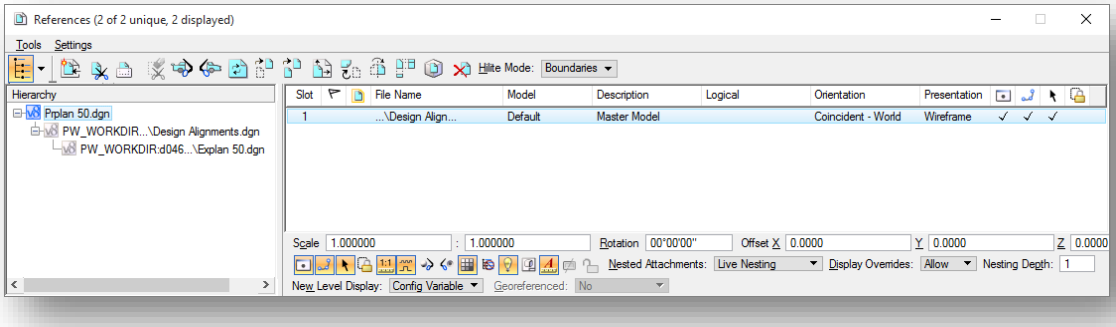
Attachment Settings

5. Repeat this process for all the files you are attaching.
6. Finally, adjust your Drawing Scale to the appropriate value. For this example you will be using 1”=50’.

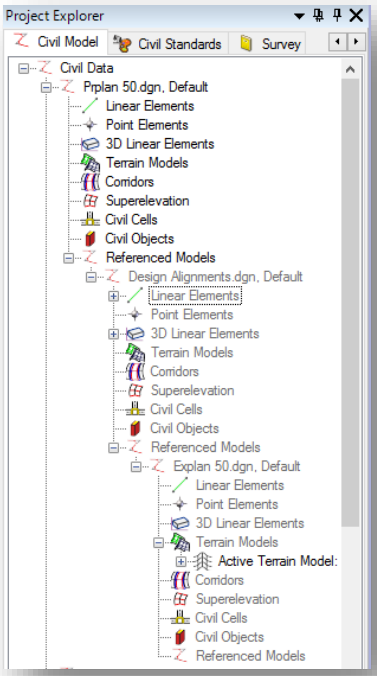


References Attached and Displayed a 1” = 50’

As an alternative to attaching each file specifically, you could also use Live Nesting to attach Explan XX.dgn to the Design Alignments.dgn and then into Prplan XX.dgn. Just make sure that the Nested Attachments are set to Live Nesting and that the depth is 1 or greater depending on your project needs. In that instance, your reference dialog may look like the following:



Using Nested References



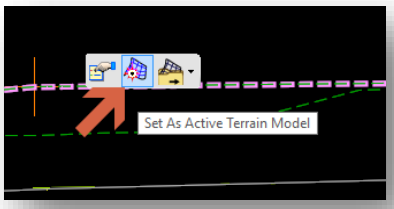
Civil Model with Nested References

At this point you will have the required data to begin the corridor modeling process. Upon completion of your modeling, you will be prepared to continue in Prplan XX.dgn.

Corridor Modeling with Referenced Geometry and Terrains

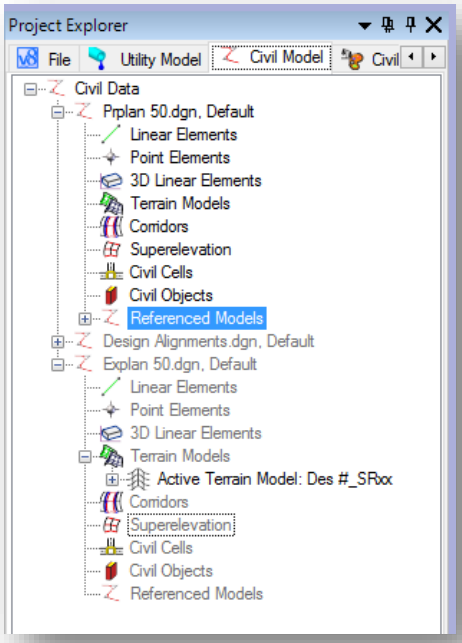
As discussed at numerous points throughout this document, OpenRoads allows for the separation of design items by placing them in separate DGN files and then referencing them back together. While a very powerful tool to have, there are a few items to keep in mind while working with referenced elements.

The first item to keep in mind is making sure you activate the terrain properly. In the above example you have attached the Explan 50.dgn which contains the terrain model that will be targeted. Prior to performing any modeling process, you must first make sure it is the active terrain model. Unfortunately, it will not show up in the civil model dialog until activated. To do so, hover over the perimeter of the terrain. When the heads-up display appears, select the Set As Active Terrain Model option.



Set As Active Terrain Model

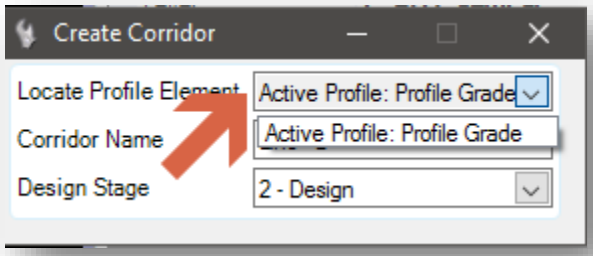
With the terrain activated, your Civil Model tab will then populate with the referenced in information and look like the following:



Civil Model with Active Reference Data

At this point, a new 3D model will be created and referenced back in. Please keep in mind the view control process from section 1.2-3 of this document as having both 2D and 3D views will be beneficial.

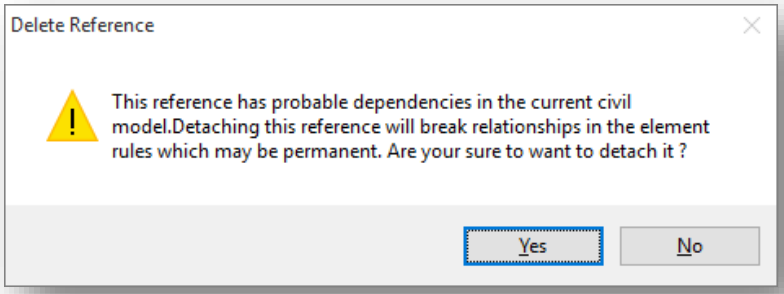
Next, while modeling with referenced alignment information, know that you will not be able to graphically pick vertical profiles as they will not be able to be drawn up from a referenced file. To further that, please keep in mind that the horizontal alignment and its vertical profile *MUST* reside in the same DGN file. When creating a corridor, you will first select the plan view alignment. On the following dialog requesting the Profile Element, select the appropriate vertical from the Locate Profile Element dialog.



Selecting the Vertical Profile

With the terrain active, and the horizontal and vertical profiles selected, you can then proceed to create your corridor in Prplan XX.dgn

Note: One thing to be very careful about when working with referenced civil data is the detaching of references. All civil data is based on an ever-evolving set of rules and connections to available data in your project. Should you have civil data that is connected in this manner and then go to detach a file, you may see the following dialog.



Civil Dependencies and References

This message means that there are civil dependencies that exist with your data. Special care should be used, and best practice is to avoid detaching references when possible, so as not to break any civil references.

Finally, special care should be taken when specifying the Nesting Depth setting for your nested references. Due to a known defect that CAD Support has brought to Bentley's attention, entering an arbitrary high value for this setting—which we have suggested previously—could produce duplicated displays of your references in drawing models when you create your plan sheets. At this time, we advise being judicious in choosing the right values that correctly encapsulate your nested referencing, as entering an arbitrarily high number could produce undesirable results. If you do experience a duplication of your references when you create your plan sheets, you will likely need to adjust this setting to address the issue.

With your design completed and being displayed over your existing terrain, you can now begin the final preparation steps for creating cut sheets.

3.5 Adjusting your Design Stage for Plans Generation

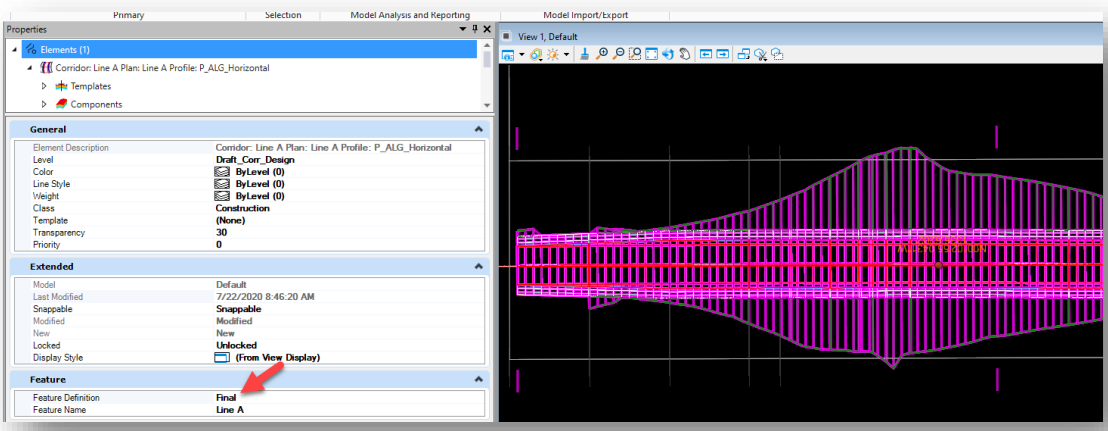
As you work on your design, much of the display control on your corridor will be via the use of the Feature Definition options in the corridor's properties. These feature definitions (which function in much the same way as "Design Stages" in previous versions of OpenRoads) are a combined set of rules that govern how your corridor is displayed and the level of accuracy which it is modeled.

As you complete your design, you will notice that there are several different feature definitions that you can apply to a corridor:

- 0 - Functional
- 1 - Preliminary

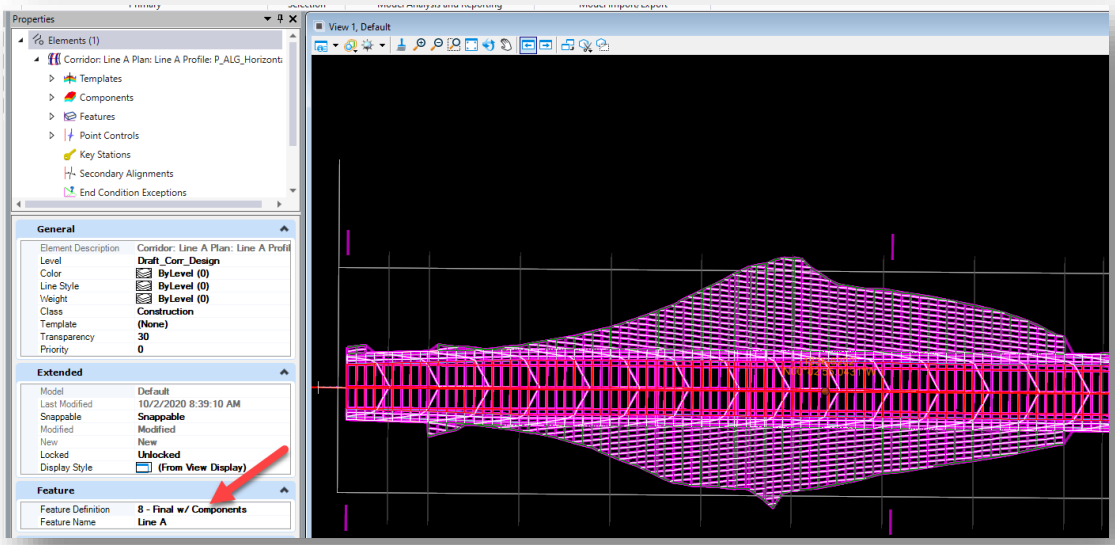
- 2 - Design
- 3 - Final
- 4 - Final w/ Meshes
- 5 - Final w/ Top Mesh
- 6 - Final w/ Bottom Mesh
- 7 - Final w/ Linear Features
- 8 - Final w/ Linear Features and Contours
- 9 - Final w/ Components

These options all allow for different representations of the corridor and how it displays in the plan view. While each of these have different uses, the 3 - Final feature definition is the one that will be used most—as it allows for the most thorough display of all corridor information. However, this display setting contains far more information than is needed for plans generation:



Corridor Using 3 - Final Feature Definition

For the purposes of plans generation, most instances will need to display the final linear elements of the corridor. The recommended Design Stage to display just this information is 9 – Final w/ Components. This corridor stage has been modified to display both the components and linear features allowing for the display of the components in cross sections.



Corridor Using 9 – Final w/ Components

This is the most appropriate display for plans generation and should be used when displaying the corridor to cut plan sheets and cross section and will be reflected in the ModelName-3D that's created. At this point you can control the display of any subgrade features by shutting the relevant levels off in the level display.

3.6 Sheet Layout and Creation (Plan Profile Sheets)

One of the major items that has been changed with the release of OpenRoads Designer is the use of named boundaries in the creation of sheet drawings.

This section covers how to create the named boundaries themselves, and then how to create Plan and Profile sheets from them.

Note: As of the INDOTWise 5.1 Workspace, OpenRoads Designer now has Workset functionality enabled. This functionality allows for the use of the Workset Sheet Index, and sheets can be directly cut to the Index through OpenRoads Designer. Please see Section 3.9 of this document for further information on using this functionality.

3.6-1 Files Required for Plans Production

Before beginning the process of creating plan sheets, make sure you have the following items created and set up properly:

- Your survey fieldbook file with the terrain included.
- Your Prplan XX.dgn (which references your survey fieldbook file) that contains your proposed design elements.
- An alignment to create the named boundaries along. The alignment can be created in the PrPlan directly, or it can be included in the PrPlan via reference. The alignment must also have a vertical profile associated with it.

- A blank geocoordinated 2D seed file. This file is to be used as needed as the foundation for cutting your various plan sheets.

3.6-2 Named Boundary Creation

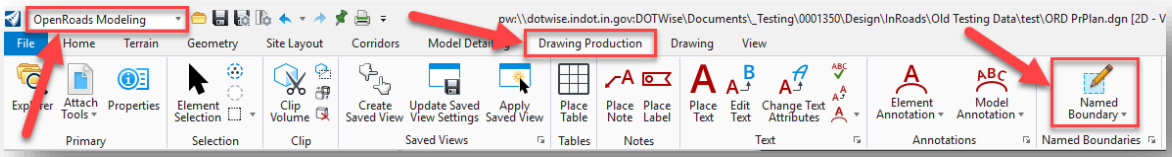
The first step in the creation of Plan and Profile sheets in OpenRoads Designer is to first open a blank 2D geocoordinated seed file and reference your PrPlan XX.dgn into it. From there, you can adjust the necessary level and display settings within the file as desired prior to creating your plan sheets. Then once your preliminary setup is complete, you can create named boundaries to determine the extents of your plan and profile sheet(s). To accomplish this, separate named boundaries are created for the plan view and the profile view to create the sheet. This section will cover how to create named boundaries for each view.

Note: Once named boundaries have been created, they can be reused if further iterations of the sheets need cut. Please see section 3.8-4c *of this document for a discussion of this process in the context of cross section sheets. The process described there is also applicable to other named boundary types used in the plans production process.*

3.6-2a Creating Named Boundaries for the Plan View

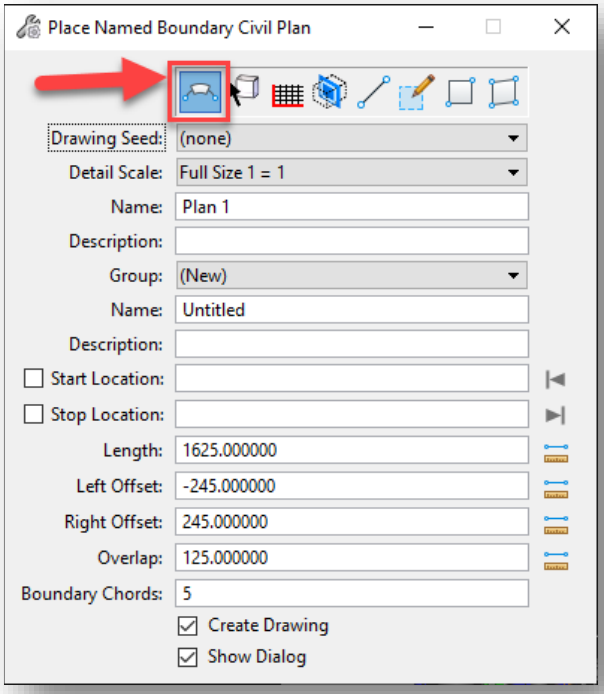
With a blank 2D geocoordinated seed file open, perform the following steps:

1. Reference your PrPlan XX.dgn into the file. This will bring in all your design information into the file.
2. Before creating named boundaries and cutting your sheets, proceed to adjust the level display, presentation settings, etc. within the file as desired to have the plan sheets look the way you want when they are created.
3. With the preliminary setup completed, navigate to the OpenRoads Modeling workflow, click on the Drawing Production tab, and then click on the Named Boundary tool.



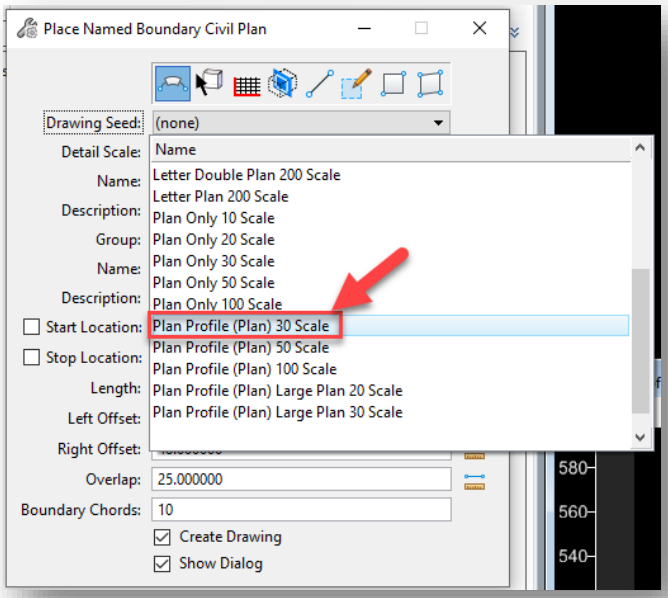
Named Boundary Tool

4. The Place Named Boundary dialog will then appear. Along the top, there are several options to choose from to create named boundaries. In this case, select the first option: Civil Plan.



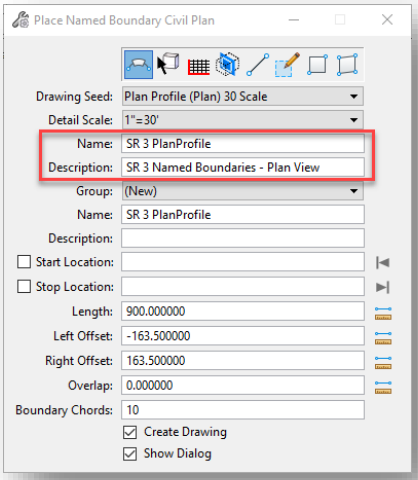
Civil Plan Option in Place Named Boundary Tool

5. The first setting to configure is the Drawing Seed. This setting contains several preconfigured drawing seeds that set the Detail Scale, Length, Left Offset, Right Offset, and Overlap values for the desired plan view. Plan view options include those needed for Bridge Layouts, Double Plan, Plan Only, Letter Plan, and Plan and Profile sheets. For this example, the Plan Profile (Plan) 30 Scale drawing seed will be used.



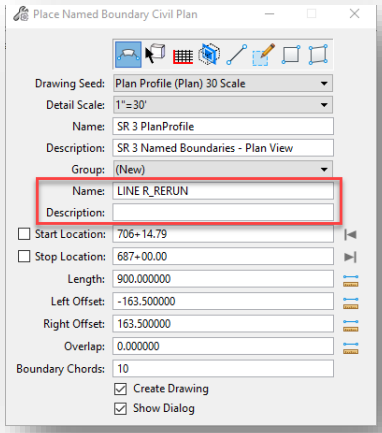
Selecting a Drawing Seed

6. At this point, you can fill in the Name and Description fields for the Named Boundary:



Name and Description for Named Boundaries

7. The next settings to fill in are the Name and Description fields for the Plan Group. The Name can either be entered in manually, or by clicking on the path element (i.e., alignment) that you are placing the sheets along—which will automatically populate the Name field with the name of the alignment. The Description in either case is optional. Be sure to make note of the Name, as it will come into play when it comes time to create the corresponding named boundaries for the profile view.

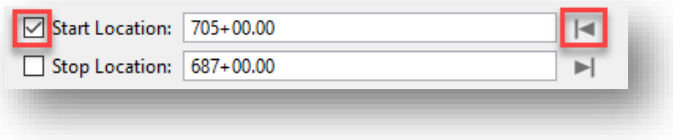


Name and Description for the Plan Group

8. The next settings to address are the Start Location and Stop Location. If not already selected from the previous step, select the alignment that you are wanting to create the sheets along. Once the alignment is selected, the Start Location can be chosen interactively anywhere along the alignment—which follows your mouse pointer as indicated by a gray line perpendicular to the alignment.

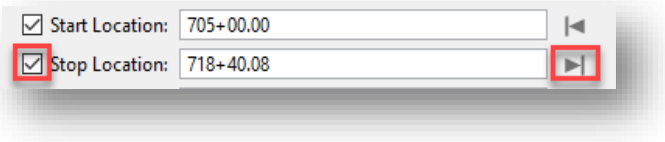
Selecting a Start Location

Alternatively, click the button to the right of the Start Location field to lock it to the beginning of the chosen alignment. A check mark will then appear to indicate that it is locked.



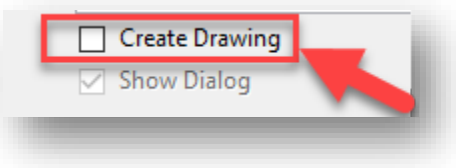
Locking the Start Location to Beginning of Alignment

9. In a similar fashion as selecting the Start Location, the Stop Location can be selected interactively, or by clicking on the button to the right of the field to lock it to the end of the chosen alignment.



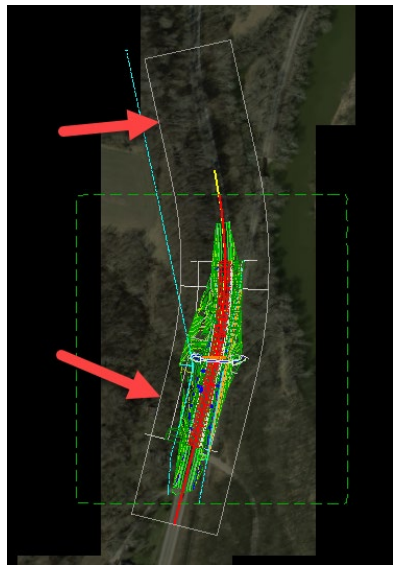
Locking the Stop Location to End of Alignment

10. At this point, all the settings should be in place to create the Named boundaries. The last remaining step is to disable/uncheck the Create Drawing setting—as at this point, you do not want to create the drawing yet without having your profile named boundaries defined.



Disabling the Create Drawing Setting

11. To proceed with creating the named boundaries, click anywhere within the view to accept the Named Boundary settings. The named boundaries (outlined in gray) will now appear in the view, and click again to accept the placement.

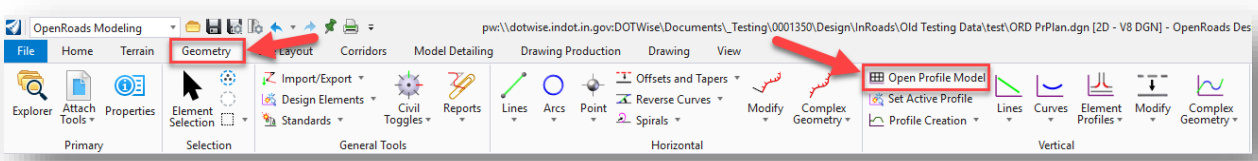


Named Boundaries Created

3.6-2b Creating Named Boundaries for the Profile View

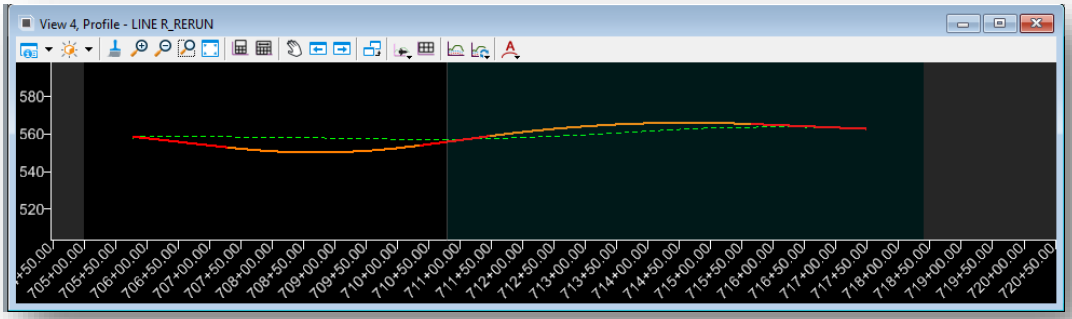
With the named boundaries created for the plan view, you are now ready to create the named boundaries for the profile view.

1. The first step in the process is to display the profile of the alignment. While still in the OpenRoads Modeling workflow, select the Geometry tab, and click on Open Profile Model from the Vertical group.



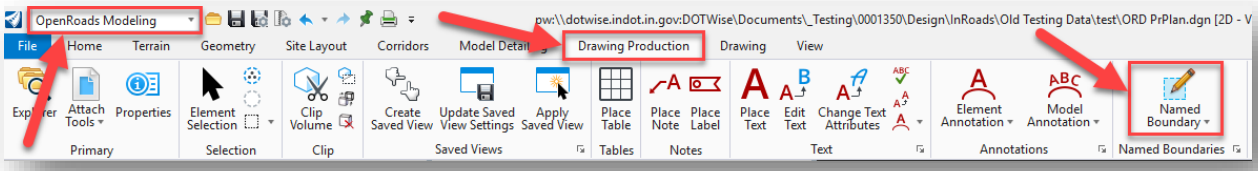
Open Profile Model

2. Select the alignment to get the profile for, open a new view to place the profile in (in this example, View 4), and click within the view to place the profile.



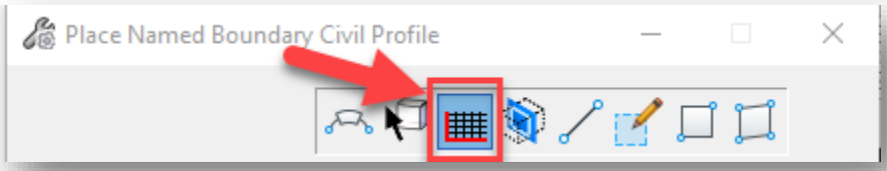
Profile Placed within a New View

3. With the profile placed in the new view, go back to the Drawing Production tab and open the Named Boundary dialog once again.



Opening Named Boundary Dialog

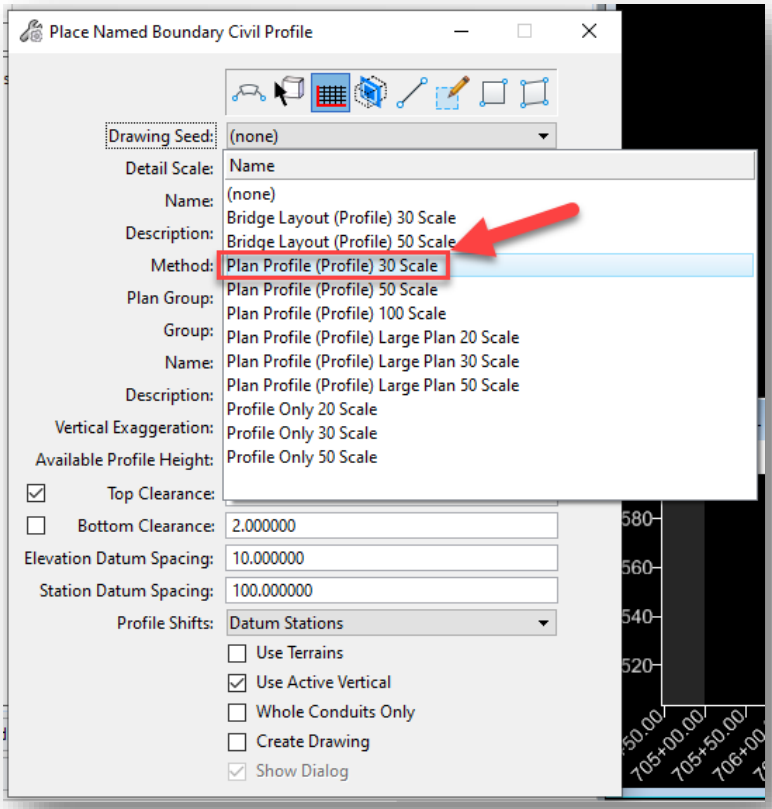
4. This time, select the third option: Civil Profile.



Civil Profile Option in Place Named Boundary Tool

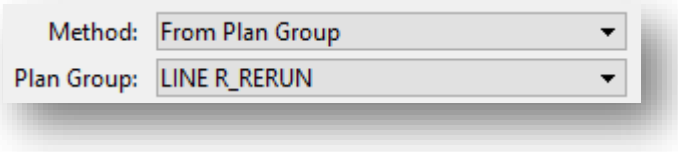
5. In much the same fashion as for the named boundaries in the plan view, Drawing Seeds have been preconfigured for different profile preferences as well, including Bridge Layouts, Profile only, and Plan and Profile sheets. For profiles, the Drawing Seeds preconfigure the Detail Scale,

Vertical Exaggeration, Available Profile Height, Top Clearance, and Bottom Clearance settings. In this example, the Plan Profile (Profile) 30 Scale Drawing Seed will be chosen.



Selecting a Drawing Seed

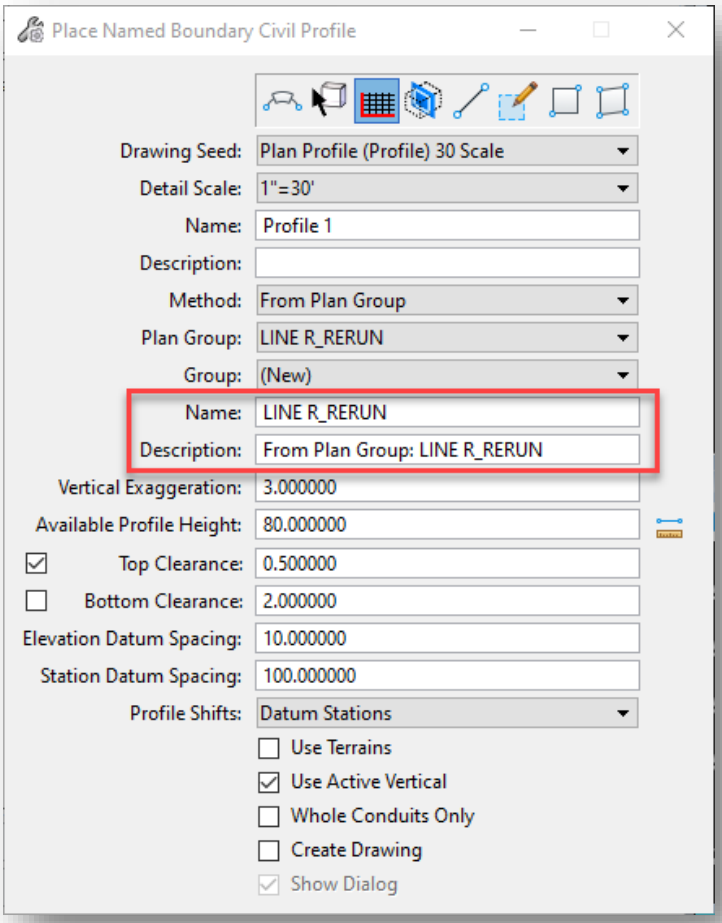
6. After the Drawing Seed is selected, note the Method and Plan Group settings.



Method and Plan Group Settings

By default, the Plan Group that is selected is the one that is associated with the most recently created named boundaries in the plan view. The Method chosen by default is From Plan Group, which essentially sets the profile named boundaries to share the same station limits as specified for the selected Plan Group. There is also a "Station Limits" method, which allows you to set specific start and end stations for the profile limits.

7. In the same way as for the Plan Group, you can specify the Name and Description for the Profile Group.



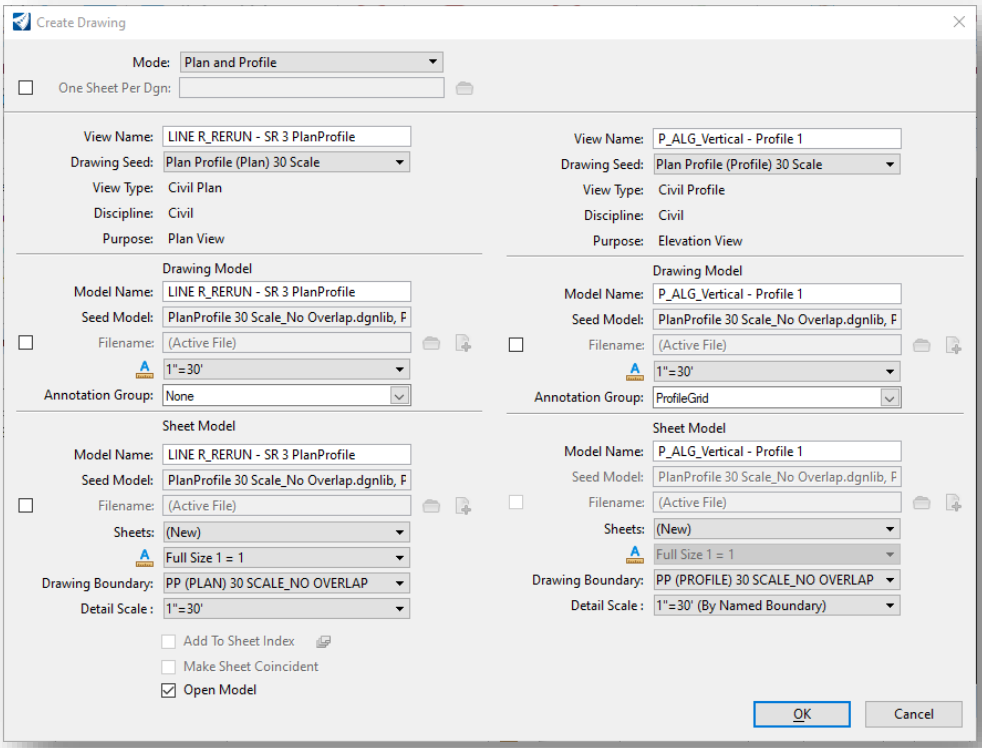
Name and Description for Profile Group

8. With the settings configured as desired, you are ready to create the named boundaries for the profile and create the Plan and Profile sheets. Note these checkboxes at the bottom:
    - Use Terrains: Places the active terrain into the profile view of the sheet.
    - Use Active Vertical: Places the active vertical profile on the sheet.
    - Create Drawing: Enable to proceed with creating the Plan and Profile Sheets
    - Show Dialog: If enabled, will show a dialog with additional Drawing Seed parameters prior to sheet creation.

    For the purpose of this demonstration, all the above settings will be enabled.

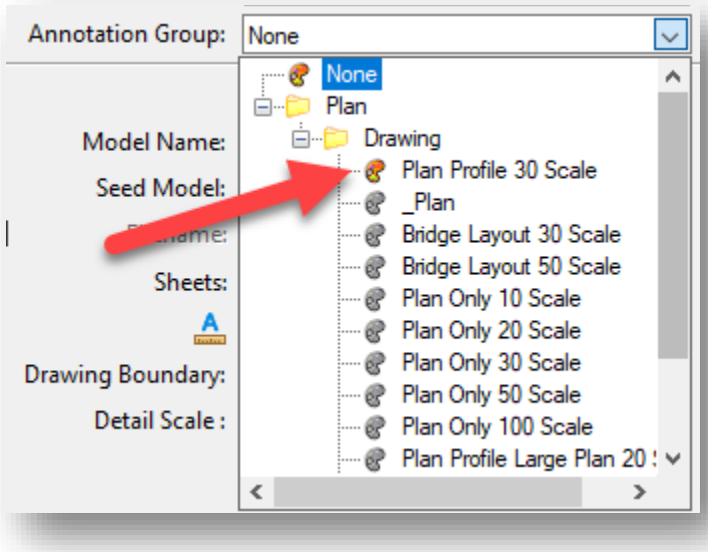
9. At this point, select the profile created in the secondary view (in step 2), and click once again in the profile view window to accept. A Create Drawing dialog will then be displayed as shown:

3.6-3 Completion of the Plans Production Process – Creating Sheets



Create Drawing Dialog

The Create Drawing dialog provides you with a chance to review the settings specified in the creating of the named boundaries in the plan and profile views. In this case, the Plan and Profile mode should be selected, and in the View Name and Model Name fields, proceed to enter a different name if you would like to change the default naming given. Then for the Annotation Group setting for the plan view, select the appropriate Plan annotation group. In this case, you would select the Plan Profile 30 Scale annotation group by navigating to *Plan → Drawing → Plan Profile 30 Scale*.

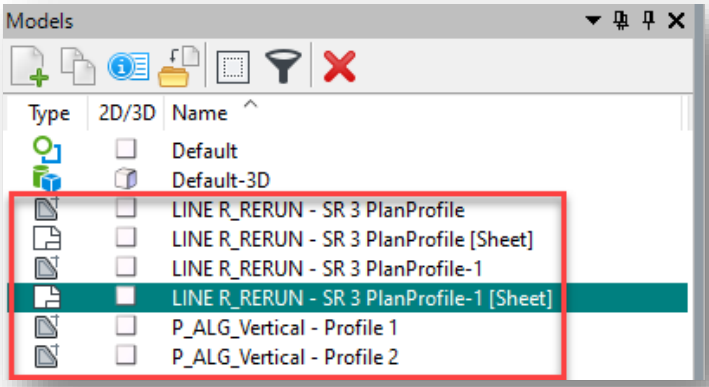


Plan Annotation Group

Finally, pay special attention to the One Sheet Per Dgn setting which, when enabled, will create each resulting plan and profile sheet to a separate dgn file. What follows is the procedure going forward for each case (disabled vs. enabled).

3.6-3a One Sheet Per Dgn Setting Disabled:

10. When you are satisfied with the settings (One Sheet Per Dgn Setting disabled), click OK to create the drawings. Note the two sets of files that get created: a set of Drawing models and a corresponding set of Sheet models.

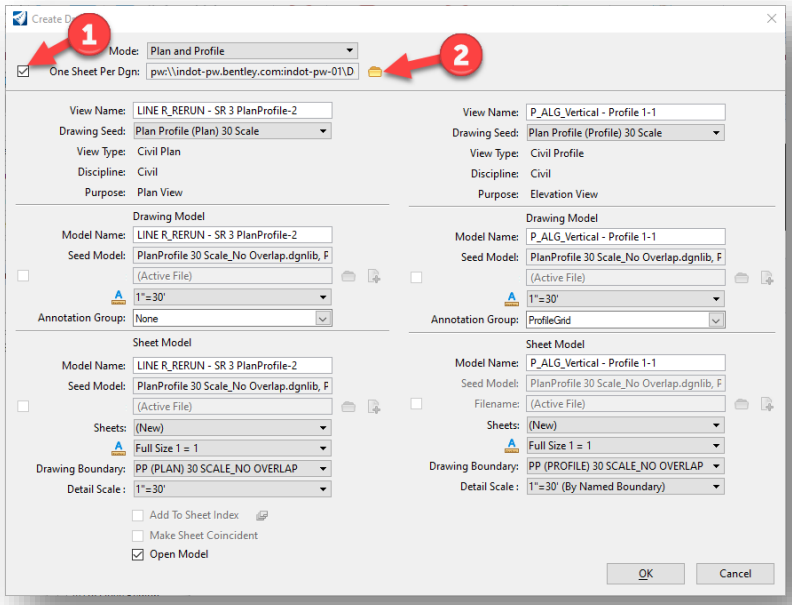


Newly Created Models

In this example with two Plan and Profile sheets being created, two Sheet models are created that contain the Plan and Profile sheets, and four Drawing models: one Drawing model for each Plan view and Profile view, respectively. These Drawing models are then referenced into the Sheet models to create the Plan and Profile sheets.

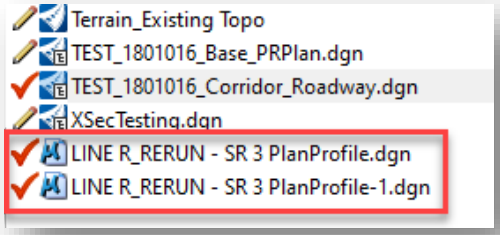
3.6-3b One Sheet Per Dgn Setting Enabled:

10. If you wish to have the plan and profile sheets created and placed in separate dgn files, click on the checkbox to enable the One Sheet Per Dgn setting. Then click on the folder icon to select a location in either ProjectWise or your local computer to save the files to.



One Sheet Per Dgn Setting Enabled

11. One final setting to consider is the Open Model setting at the bottom of the dialog. If you do not wish to have your current OpenRoads Designer session ended when the sheet creation process is over, *disable this setting.* Otherwise, the current OpenRoads Designer session will be ended, and the latest plan and profile sheet dgn to be created will be opened in its place.
12. Once satisfied with all the settings, click OK. The plan and profile sheets will then be created at the specified location (ProjectWise in this example). ***NOTE: When initially created, the new dgn files will be associated with MicroStation by default. To open these new files with ORD, you will need to modify the files' properties such that it is associated with ORD instead of MicroStation.***



Plan and Profile Sheets Created in Separate DGN Files

3.7 Adding Other Base Drawings to Sheets

Other base drawings such as Existing Right of Way can be added to OpenRoads created sheets such as Plan Profiles, Layout sheets, etc. The user must first obtain right of way drawings from whatever sources are available. For most projects, the existing right of way information will come from Route Survey Plat drawings and these should exist in the same coordinate system for any new projects and will line up automatically. (These are provided by your surveyor). Other sources may include CAD drawings from Real Estate consultants (following complete abstracting and title searches). Throughout this section, Existing Right of Way drawings are referenced as being created. The same processes work for adding any additional information to the sheets.

Depending on your surveyor, it is entirely possible that you may receive your Existing Right of Way in InRoads or OpenRoads Designer native surface features or as alignments. Be aware you may still have to graphically convert either of these data types into the other for the purpose of cross section display (Right of Way must be a surface feature if you wish for it to display on cross sections).

3.7-1 Combine multiple drawings into one base drawing

If you have more than one existing right of way drawing for your project, you will want to combine all the drawings into one. Reference the drawings into each other. If the drawings do not line up automatically, you will need to move the files based on corresponding coordinates present in both drawings. Next copy the reference files into the base drawing. Repeat this procedure if you have multiple files to copy in.

When you have completed the above steps, the desired result is one combined existing right of way drawing.

3.7-2 Move to same coordinates system as PrPlan.dgn

For the combined existing right of way drawing to be used in the plan profile sheets, the elements must exist in the same coordinate system. To accommodate this, you will reference in the PrPlan drawing. If the drawings do not line up automatically, you will need to move the files based on corresponding coordinates present in both drawings.

The resulting existing right of way drawing is now ready to be added into other proposed drawings.

3.7-3 Graphically Importing Existing Right of Way

As the procedures necessary vary depending on the source of your Right of Way data, you will examine a few of the more common methods for importing this data and working with it in OpenRoads Designer and making it available to others.

Data which is graphical in nature can be converted to a format OpenRoads Designer will interact with. MicroStation, AutoCAD, and DXF files are all supported for this process. Utilizing the File import tools available allows vector graphics data to be converted to geometry or surface features. Often-times the largest barrier to conversion is the sheer volume of data in the CAD file provided. Disseminating the contents requires patience and organization.

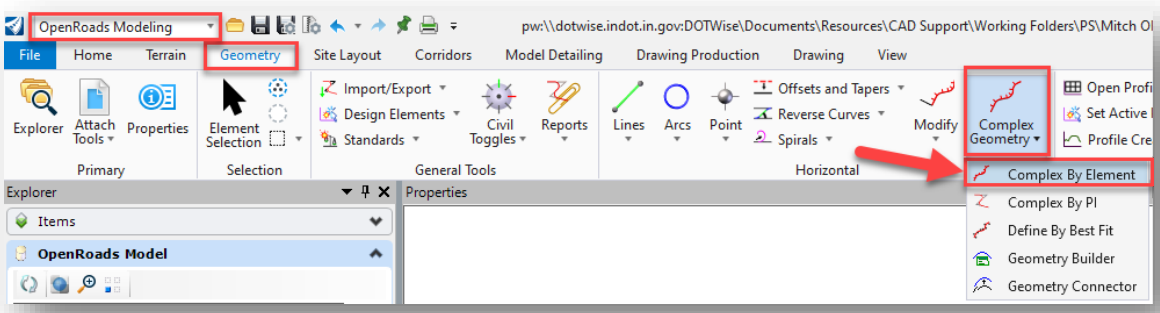
In both instances, be aware that the element must be drawn up graphically, as there is no direct translation method from Surface Features to Geometry Alignments.

3.7-3a Importing to Geometry

Using an existing CAD file provided by either Survey or a Consultant, you will convert the vector graphics representing Right of Way elements to OpenRoads Designer geometry. If the data provider is an INDOT employee, then the file is accessible through ProjectWise from the design folder structure. Files provided by external consultants can be imported to a convenient location in ProjectWise by dragging and dropping. Select No Wizard for the creation option.

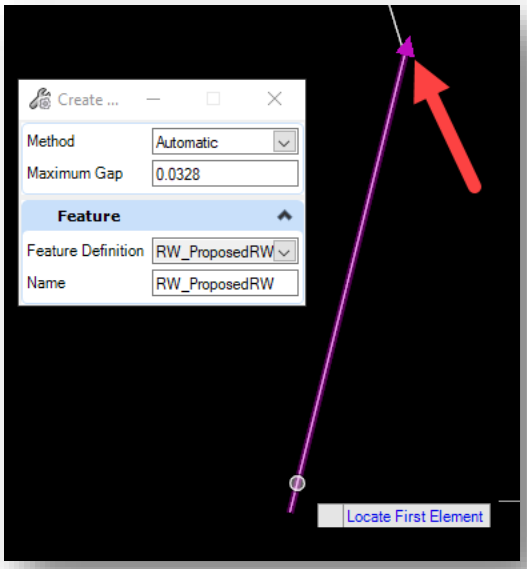
First you need to reference and possibly merge your data into the base drawing (alignments can be imported from reference elements). Attach your file using the References tool from the Home tab of the OpenRoads Modeling workflow. With the References dialog open, attach the file containing your right-of-way. This may be the LCRS Plat provided by survey or another file provided by a consultant. Note that the file you attach may have additional data displayed that you do not wish to import. Should this be the case, you can use your level display to disable the levels of features you do not wish to display.

At this point, you will no doubt recognize the right-of-way elements in the drawing. Elements can be converted to OpenRoads Designer geometry. Careful inspections of right-of-way elements may show elements that have been constructed, segmented, and are not joined. For convenience in later operations, you may wish to join them to be continuous. To join these elements using OpenRoads Designer, use the Complex By Element tool, which is found on the Geometry tab of the Drawing workflow. Locate the Horizontal tool group, and click on *Complex Geometry > Complex By Element*.

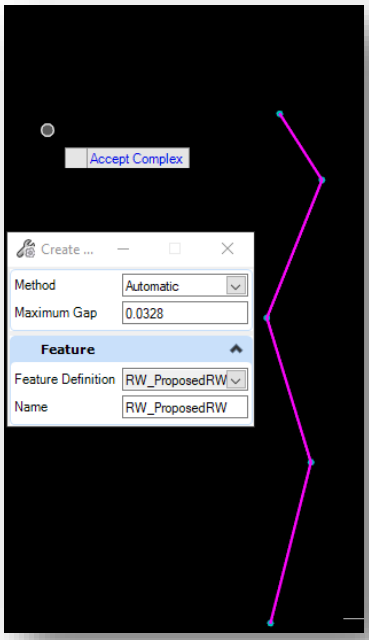


Complex By Element Tool

On the dialog that appears, you will be given a choice between Manual and Automatic for the Method setting. With the Manual method, you will choose each element to be joined manually. With the Automatic method, you choose the first element that you would like to have joined, and then the tool automatically detects/selects the remaining elements to be joined. In either case, be very careful with the direction the element chain is going. While hovering over the elements to be selected, pay close attention to the arrows that appear to indicate which direction the chain is going. In this example, the Automatic method will be used, and the element chain is to be going upward.

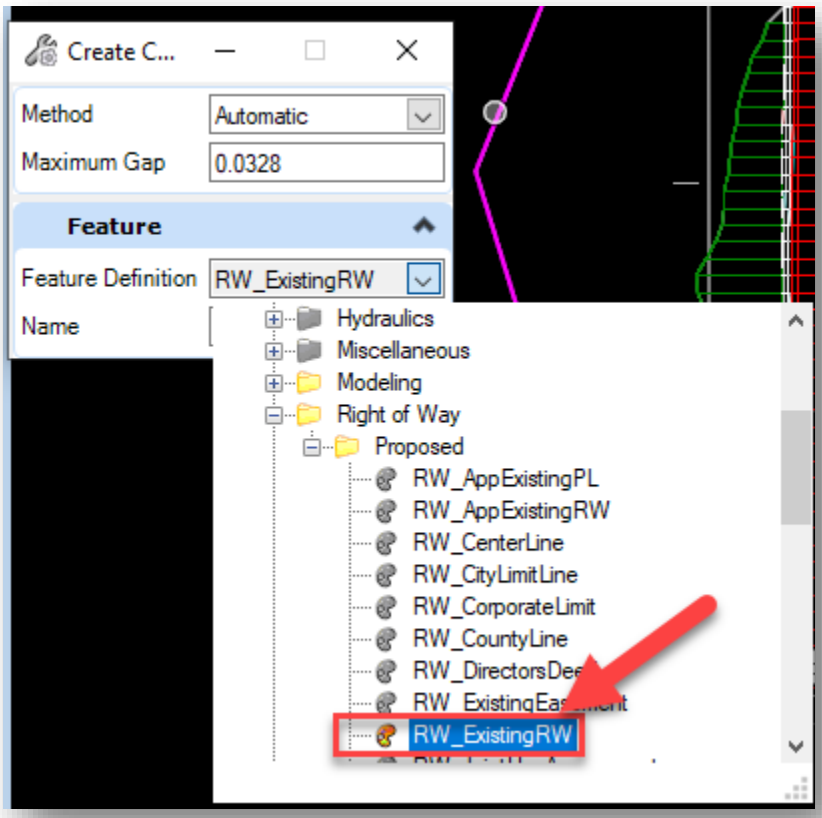


Selecting First Element with Automatic Method



All Elements Selected After Selecting First Element in Chain

With all the desired elements in the chain selected, you can apply the appropriate feature definition to the complex element chain. In this case, click on the dropdown arrow in the Feature Definition field and navigate to Linear > Right of Way > Proposed > RW_ExistingRW.



Selecting the RW_ExistingRW Feature Definition

With the feature definition selected, you can then give the element chain an appropriate name. Finally, click in the drawing to accept the creation of the complex element chain.

3.8 Cross Sections

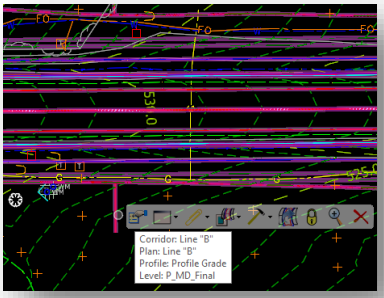
As of the release of OpenRoads Designer, cross sections are created via the use of named boundaries. Named boundaries for cross sections determine the extents of the sections of themselves, and you can also specify where you want the sections created along a selected alignment. This section will first cover how to prepare your PrPlan drawing for cross section creation. It will then cover how to create named boundaries for your desired cross sections, and how to cut the sheets containing them.

Note: As of the INDOTWise 5.1 Workspace, OpenRoads Designer now has Workset functionality enabled. This functionality allows for the use of the Workset Sheet Index, and sheets can be directly cut to the Index through OpenRoads Designer. Please see Section 3.9 of this document for further information on using this functionality.

3.8-1 Preparing PrPlan.dgn for Cross Sections

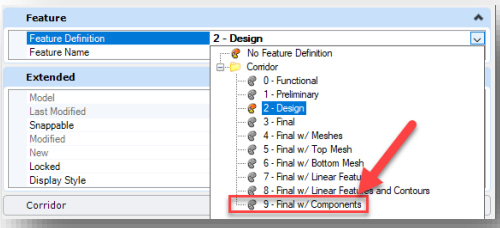
As discussed in the previous section on changes, for the proposed corridor to display on your sections, it must be displayed with the proper Design Stage in the PrPlan.dgn. To adjust the setting accordingly:

1. Open your Prplan XX.dgn.
2. Select the corridor model by its handle.



Selecting the Corridor

3. Examine the corridor in the Element Information panel. Locate the Feature Definition setting.
4. Set the Feature Definition to 9 – Final w/ Components.

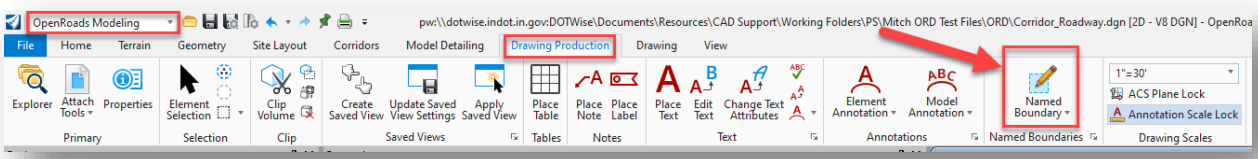


Feature Definitions

5. With the setting adjusted, save your settings and check your file back into ProjectWise.

3.8-2 Cross Section Creation via Named Boundaries

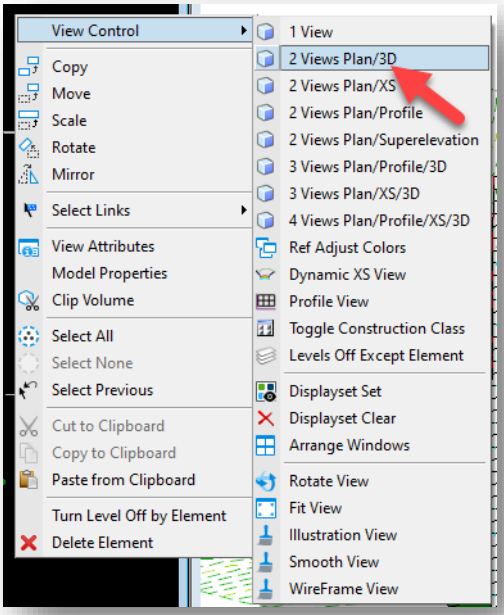
With your corridor model displayed using the correct feature definition, sections can now be cut via the Named Boundary tool—which is in the Drawing Production tab of the OpenRoads Modeling workflow.



Named Boundary Tool

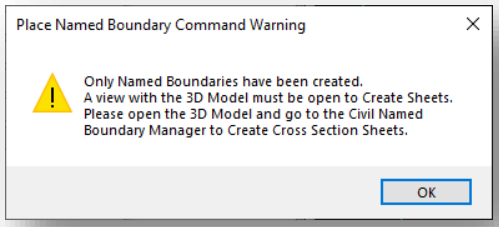
With the Named Boundary tool open, perform the following steps to create your cross sections and resulting sheets:

1. As a preliminary step, you will need to create a 3D model in the PrPlan drawing—which is necessary for creating sheets from the cross section named boundaries. Right-click and hold in your current view, and then select View Control > 2 Views Plan/3D in the menu that appears. This will open a 3D view of your PrPlan drawing.



Opening a 3D View of PrPlan

NOTE: If you do not open a 3D view of PrPlan prior to creating your cross section sheets, you will get the following warning when you try to create them—which prompts you to create the 3D model before sheets can be created:

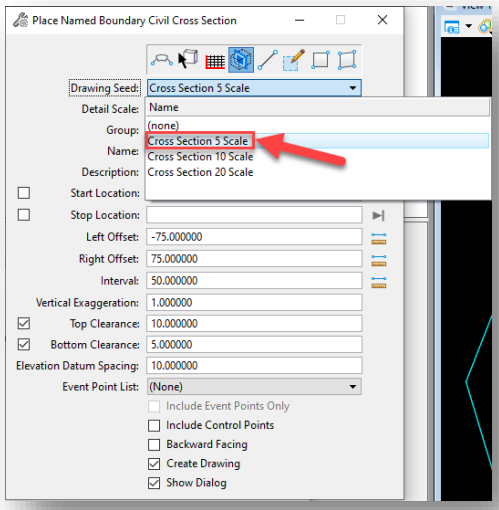


Sheet Creation Warning

2. With the 3D view created, select the Civil Cross Section option in the Place Named Boundary dialog (fourth from the left).

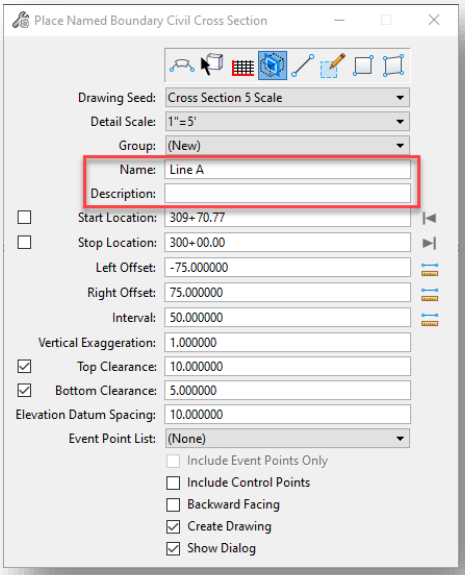
Civil Cross Section Option

3. Next, select the desired drawing seed from the dropdown list. The drawing seed in this case determines both the scale and the left/right offsets for the created sections. For this example, the Cross Section 5 Scale drawing seed will be chosen.



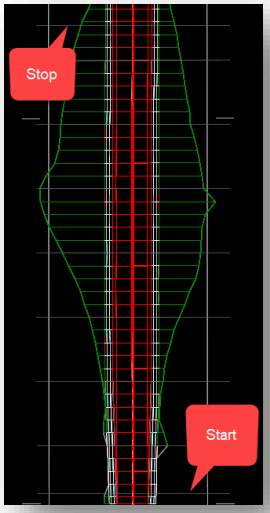
Selecting a Drawing Seed

4. In the drawing, dynamically select the alignment that you wish to cut the sections along. The Name field in the Place Named Boundary dialog becomes populated with the name of the alignment, and a Description (if desired) can be entered as well. The Name and Description fields are for the cross section named boundary group that will be created.

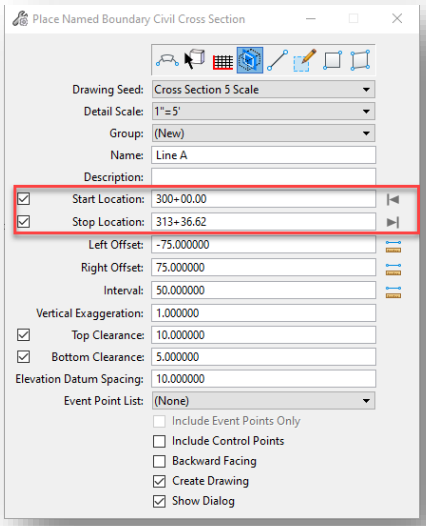


Name and Description Fields for the Cross Section Group

5. Next, set the start and stop locations along the alignment for which you want to cut sections. This can be done either dynamically in the drawing or entered in manually in the dialog.



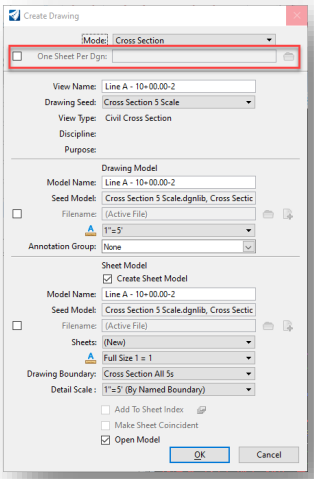
Dynamically Entering Cross Section Start and Stop Locations (50 ft interval between sections shown)



Start and Stop Locations Set in Dialog (Arrows clicked on right side of each field to lock to start and end of selected alignment, respectively)

6. The Left and Right Offset fields are preset by the selected drawing seed, so these settings as a general rule do not need to be changed.
7. Adjust the cross section interval as desired. In this example, an interval of 50 ft will be used.
8. The vertical exaggeration (set to 1 by default), should be acceptable in most situations.
9. The top clearance (minimum distance between the top of the data in the section to the top of the cross section grid; set to 5 by default), bottom clearance (minimum distance between the bottom of the data in the section and the bottom of the cross section grid; set to 5 by default), and elevation datum spacing (interval of starting elevations on cross sections; set to 5 by default) should also be acceptable, but can be altered as desired.
10. The checkboxes at the bottom of the dialog are as follows:
    - Include Control Points: If control points have been configured for the horizontal curves on the alignment, enabling this setting will add cross sections at the stations where the control points are located. In most cases, though, this can be left disabled.
    - Backward Facing: If enabled, the cross sections would be cut as if you are facing backward in relation to the direction the alignment is going. In essence, the left and right sides of a "normal" cross section would be reversed. By default, all cross sections are cut from a forward-facing perspective.
    - Create Drawing: When enabled, this indicates you want to proceed with creating cross section sheet drawings. In this example, this setting will be enabled. *NOTE: If you wish to include end area volumes on your cross sections, leave this setting disabled, and proceed to the following section on creating end area volumes for further instructions.*
    - Show Dialog: When enabled, this setting will bring up the Create Drawing dialog once you are satisfied with the Named boundaries to be drawn. In this example, the setting will be enabled.

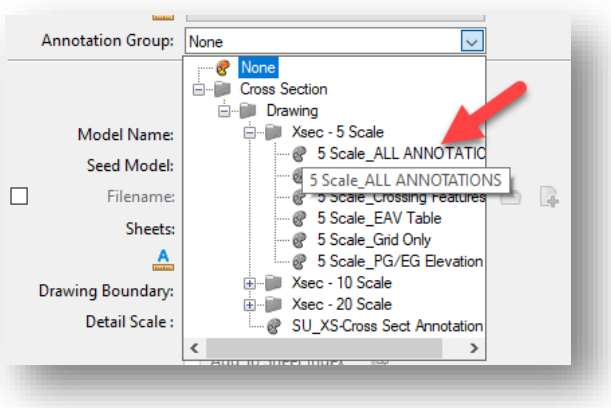
11. Once the settings are configured as desired, click in the drawing to confirm the named boundary placement. The Create Drawing dialog will then appear. Review the settings as needed.
12. On the Create Drawing dialog, pay special attention to the One Sheet Per Dgn setting. This setting tells OpenRoads Designer to create a separate dgn file for each cross section sheet that gets created. The process to follow for each scenario (with this setting disabled vs. enabled) going forward is explained next.



One Sheet Per Dgn Setting

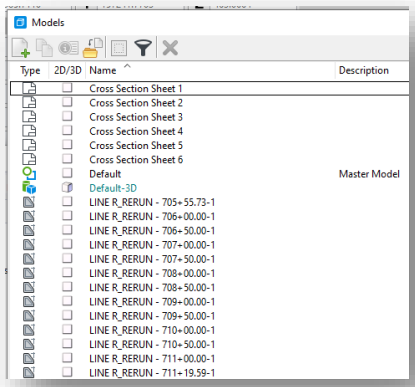
One Sheet Per DGN Setting Disabled:

13. With the One Sheet Per Dgn setting left disabled, proceed to give an appropriate name to the first created cross section sheet in the Model Name field in the Sheet Model section. In this example, Cross Section Sheet 1 will be used as shown above.
14. Apply the appropriate annotation group to the cross sections in the Annotation Group field. In the dropdown, navigate to *Cross Section > Drawing > (Annotation Scale) > (Annotation Group).* In this case, the *XSec – 5 Scale > 5 Scale_ALL ANNOTATIONS* annotation group will be used.



Select Annotation Group

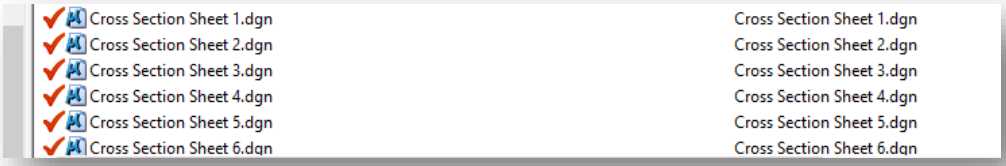
15. Once all the settings in the Create Drawing dialog have been confirmed, proceed to click OK to create the named boundaries/cross sections. The process may take some time if there are several cross sections to be created. Shown below is an example of what is produced—with drawing models created for each section, and sheet models on which the drawing models are placed.



Cross Section Sheets and Associated Drawing Models

One Sheet Per DGN Setting Enabled:

15. After enabling the One Sheet Per Dgn setting, click on the folder icon to select where you want the new sheets to be placed—which can either be inside or outside of ProjectWise. In this example, they will be placed inside of ProjectWise.
16. Select an appropriate name in the Model Name field under Sheet Model as your first sheet. In this example, a simple name of Cross Section Sheet 1 is used.
17. Apply the appropriate annotation group to the cross sections in the Annotation Group field. In the dropdown, navigate to *Cross Section > Drawing > (Annotation Scale) > (Annotation Group).* In this case, the *Xsec – 5 Scale > 5 Scale_ALL ANNOTATIONS* annotation group will be used.
18. Also note the Open Model setting at the bottom of the dialog. If you do not wish to have your current OpenRoads Designer session ended when the sheet creation process is over, *disable this setting.* Otherwise, the current OpenRoads Designer session will be ended, and the latest cross section sheet dgn to be created will be opened in its place.
19. Once all the settings are confirmed, click OK to proceed with sheet creation.
20. Once processed, the sheets will be created and placed at the selected location.



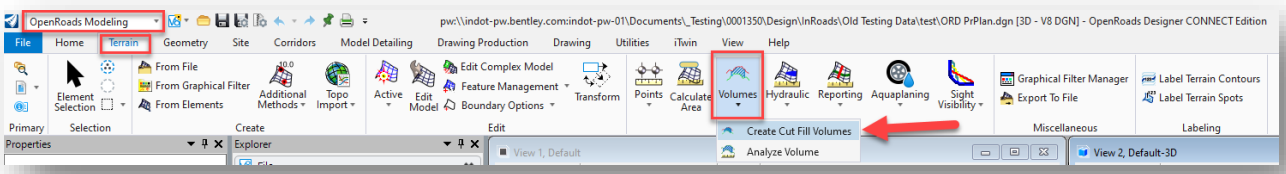
Created Cross Section Sheets in ProjectWise

NOTE: When initially created, the new dgn files will be associated with MicroStation by default. In order to open these new files with ORD, you will need to modify the files' properties such that it is associated with ORD instead of MicroStation.

3.8-3 End Area Volumes

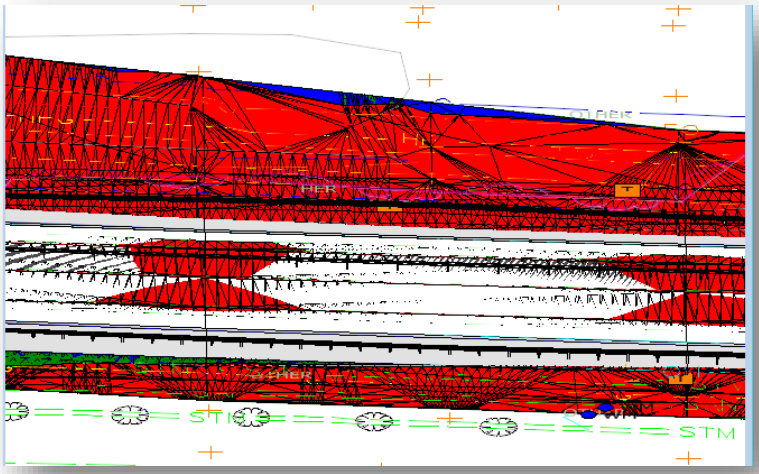
To create end area volumes for your cross sections, you must first create cross section named boundaries as discussed in the previous section. As explained in the previous section, DO NOT enable the Create drawing setting in the Place Named Boundary dialog—leave this disabled, as you just want to create the named boundaries themselves at this point. Before the cross section drawings get created, you need to first create the end area volume data to be placed into the cross sections. This process is explained in this section.

1. With the named boundaries created, the first step is to create the cut fill volumes. To do this, navigate to the Terrain tab in the OpenRoads Modeling workflow, and in the Analysis section click on *Volumes > Create Cut Fill Volumes*.



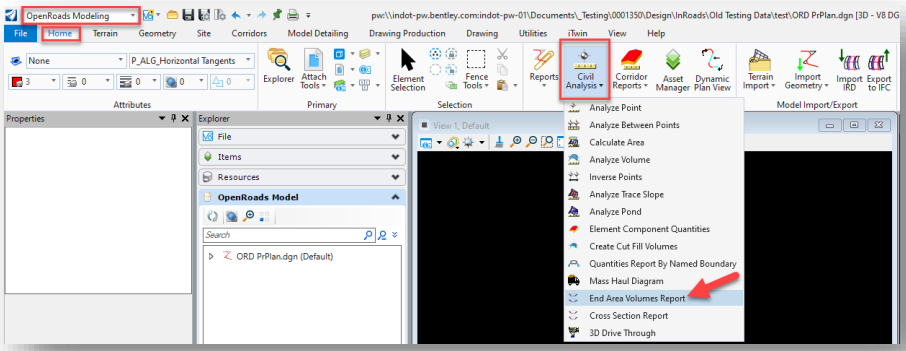
Create Cut Fill Volumes

2. Data point in the drawing to accept the default settings for cut fill volumes, then data point to accept. The cut fill volumes will then be calculated and created in the 3D view. Note that red indicates cut volume, and blue indicates fill volume. Also note that the outline of these meshes will appear in the cross sections themselves—however, these are set to not plot so as not to obscure other data.



3D View of Cut Fill Volumes

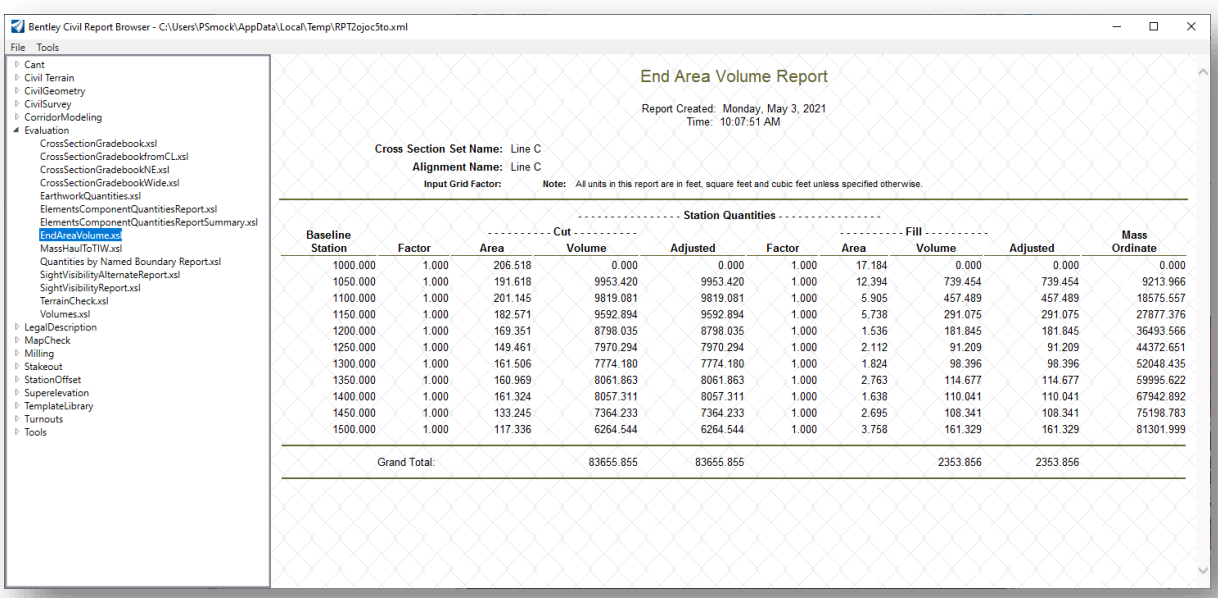
3. With the cut fill volumes created, the next step is to create an end area volumes report. This compiles the end area volume data for each section and populates the end area volume tables that will get placed on the cross section sheets. To do this, with the OpenRoads Modeling workflow still active, go to the Home tab, and in the Model Analysis and Reporting section click on *Civil Analysis > End Area Volumes Report*.



End Area Volumes Report

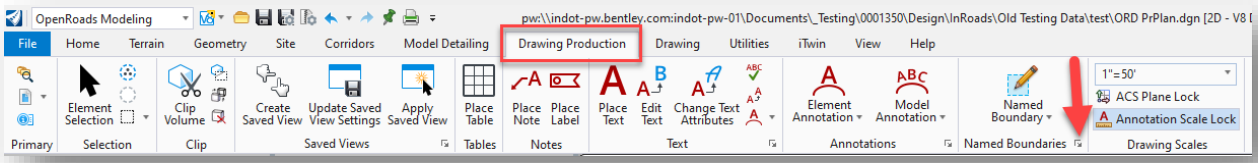
4. In the Named Boundary Group dialog that appears, the name of your recently created named boundary group should automatically populate. Data point to accept it.

5. You will then be presented with the option to select starting and ending cross section named boundaries if you want to create a volume exception. If a volume exception is desired, proceed to select the named boundaries in the drawing as prompted. Otherwise, right-click to complete. The Bentley Civil Report Browser will then create the End Area Volume Report.



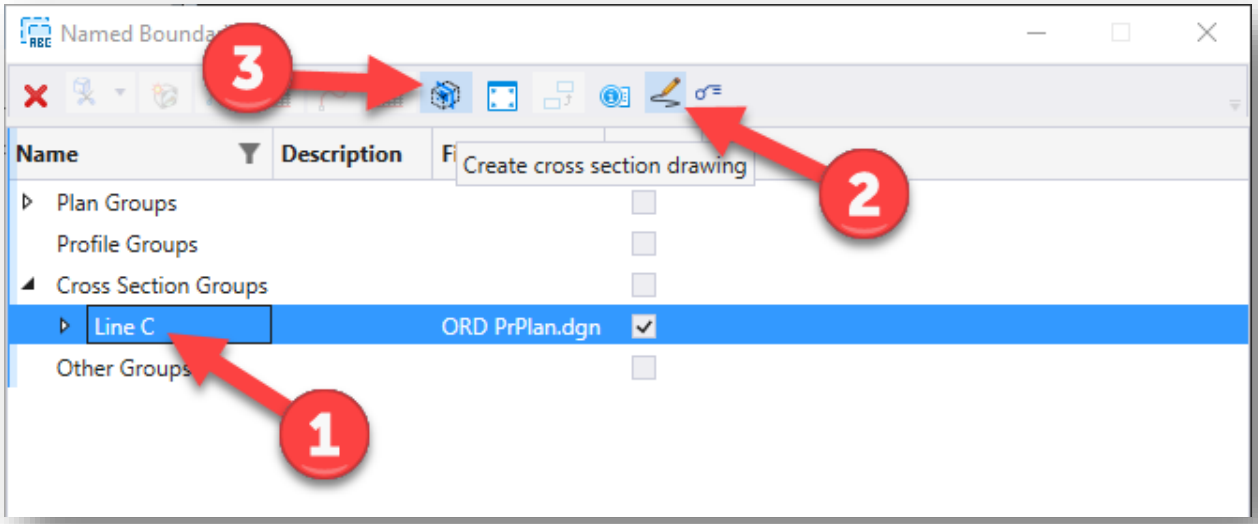
End Area Volume Report in Report Browser

6. With the End Area Volume Report created, you can now proceed to create the cross section drawings. From the Drawing Production tab, click on the icon in the bottom right corner of the Named Boundaries section to bring up the Named Boundaries dialog.



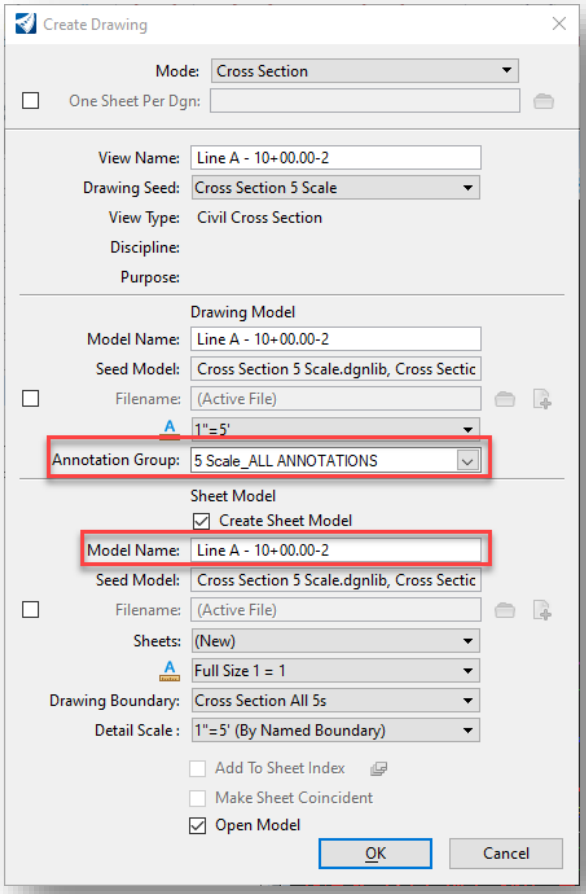
Accessing Named Boundaries Dialog

7. In the Named boundaries dialog, navigate to and then select the Cross Section Group you have created. Proceed to click on the Show the Create Drawing Dialog button, followed by the Create Cross Section Drawing button.



Named Boundaries Dialog

8. On the Create Drawing dialog, select an appropriate name for the cross section sheets in the Model Name field under Sheet Model, and be sure to select the appropriate annotation group.



Create Drawing Dialog

9. With the settings in place, click OK to create the cross section drawings. Once the drawings are created, you will see the end area volume annotation located at the top right corner of each cross section grid.

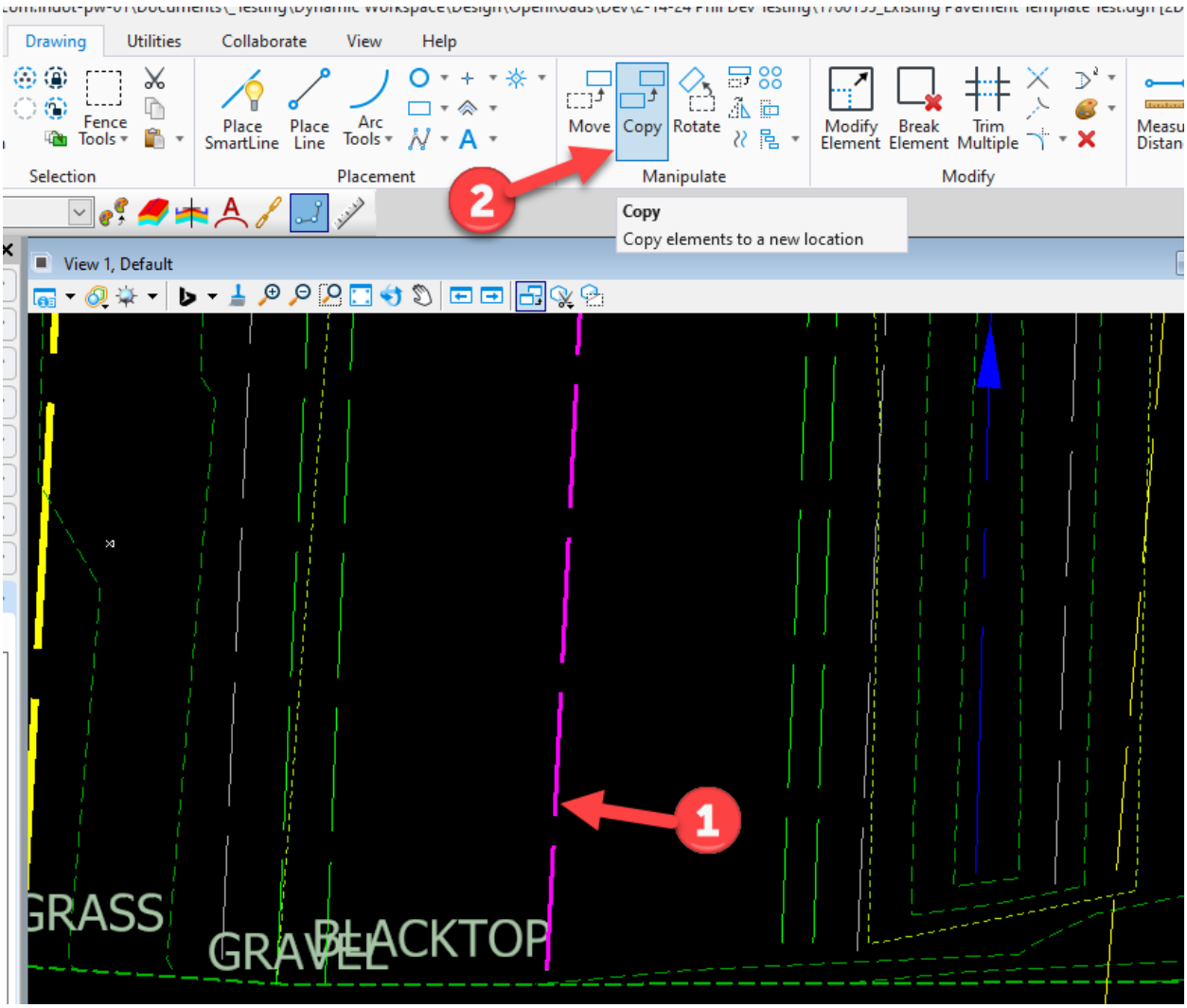
Ac = 681.9 SFT	Af = 0.0 SFT
Vc = 1189 CYS	Vf = 0 CYS

End Area Volume Annotation

3.8-4 Cutting Cross Sections of Existing Pavement to Show Existing Cross Slopes

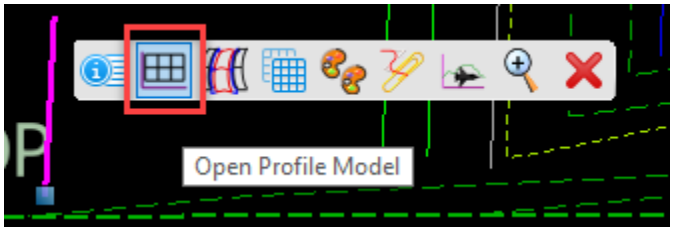
There may be instances where you need to cut cross sections of the existing pavement to show the existing cross slopes. This section will take you through the process of creating an "alignment" from the existing road crown, running a corridor along it, and then create point controls for the specified corridor to target the existing edges of pavement—and if necessary, additional points along the pavement surface. Finally, once you've established the corridor of your existing pavement surface, then you can cut cross sections that annotate the existing cross slopes.

1. The first step of the process is to reference your survey fieldbook file (containing your existing terrain) into a blank 2D, geocoordinated seed file.
2. Activate the existing terrain that you've referenced into the file.
3. Select the existing road crown string from your survey and copy it in place.



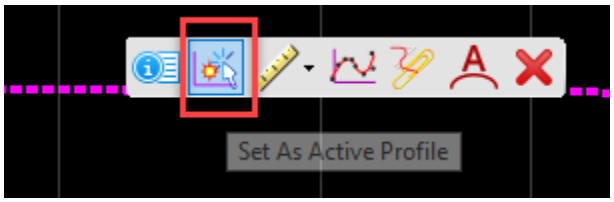
Copying Existing Road Crown String

4. Select the road crown string you just copied, and hover over it to view the heads-up display. Select the second option (Open Profile Model), and proceed to select the view to place the profile model.



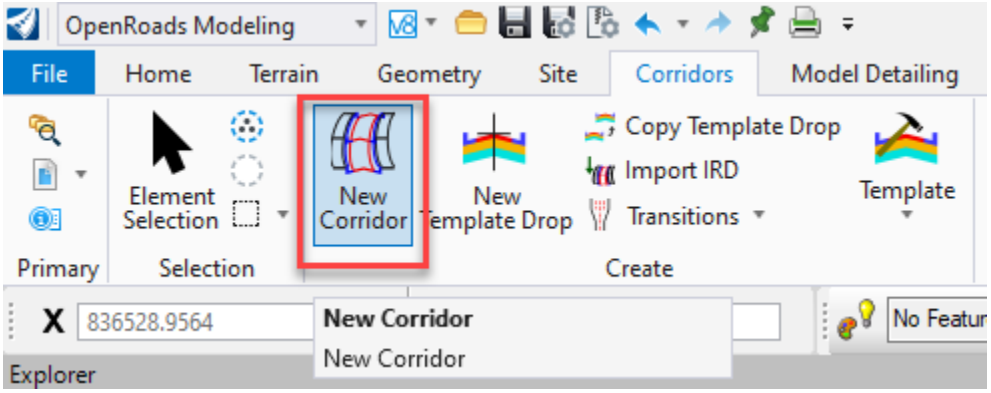
Open Profile Model

5. You should now see a profile view representing the profile of your existing road crown. Select the existing profile, and set it as active. Once you've set the profile as active, close the profile model/view.



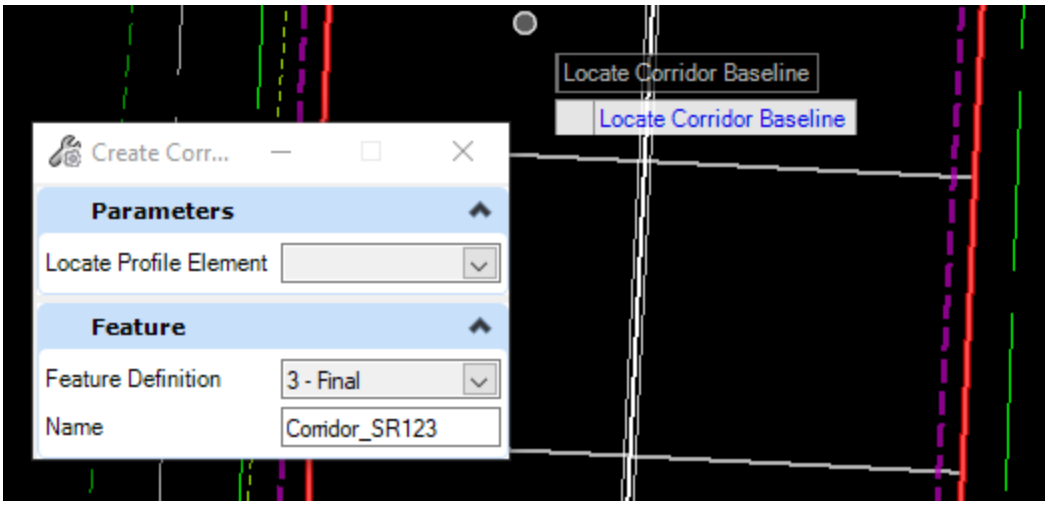
Set Existing Road Crown Profile as Active

6. Via the *Corridors* tab of the *OpenRoads Modeling* workflow, create a new corridor along your existing road crown "alignment". First, select the *New Corridor* tool.



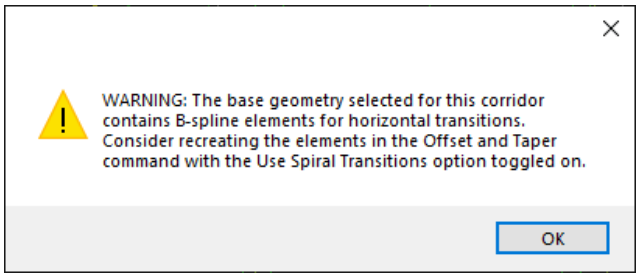
New Corridor Tool

7. With the tool selected, proceed to follow the prompts to select your existing road crown as the corridor baseline, right-click/reset to set the profile as the active profile, and provide a name for the corridor. You can also specify the feature definition/design stage for the corridor in the Create Corridor dialog. In most cases, you will want to specify the *3 – Final* feature definition/design stage—though there could be cases where a different feature definition/design stage could be used.



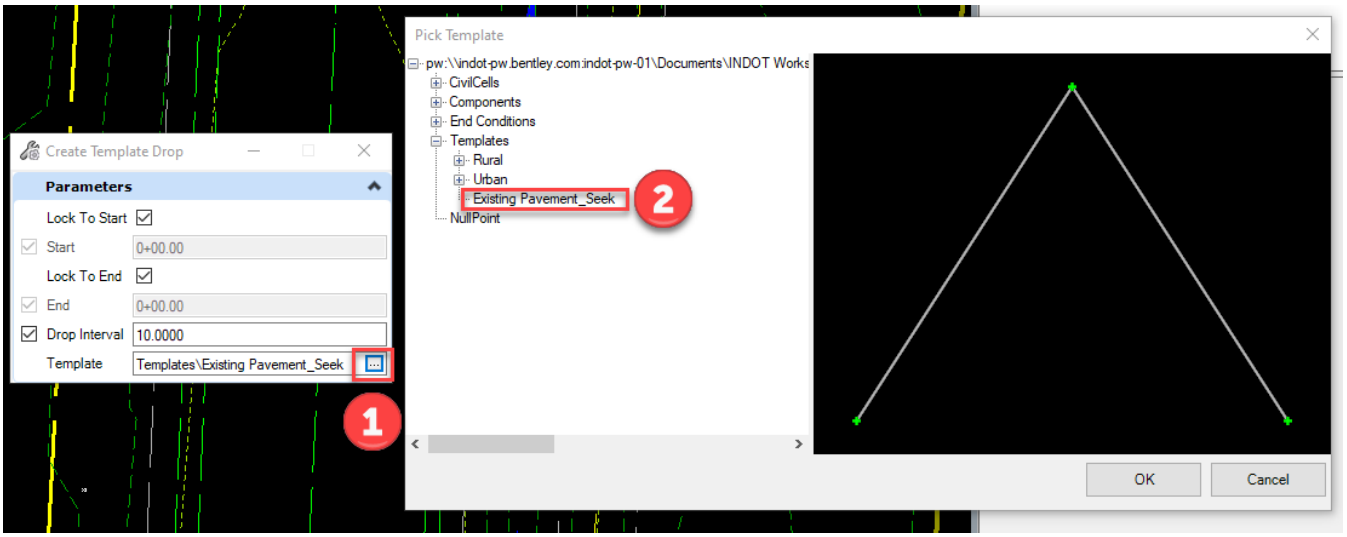
Creating the Corridor

NOTE: If your existing road crown string contains a B-spline curve element within it, you will receive a warning message upon selecting your road crown string as your corridor baseline. For the purposes of this process, this message can be ignored.



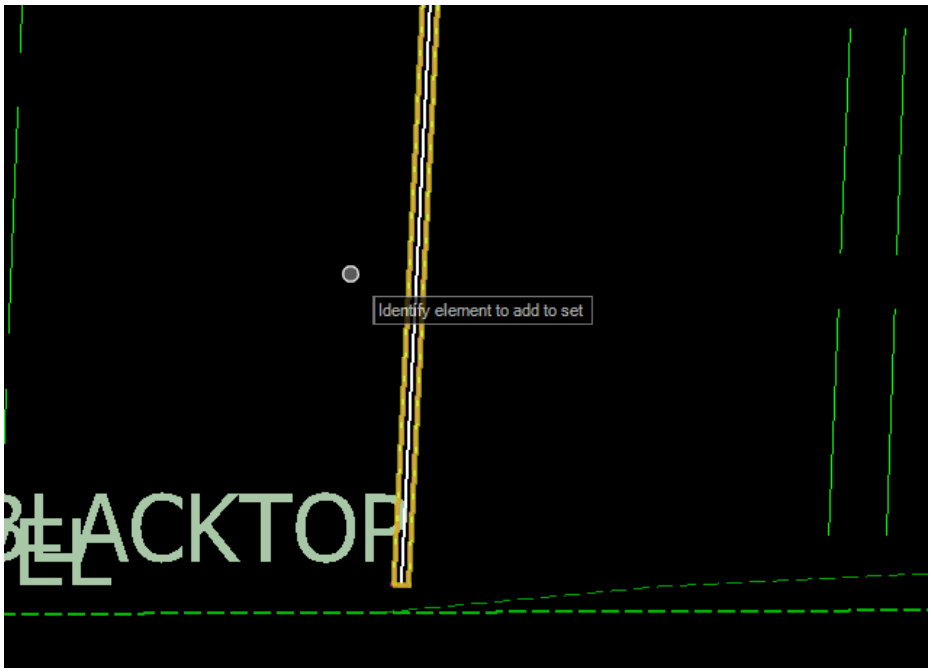
B-Spline Curve Warning Message

8. With the corridor now created, you will be presented with the Create Template Drop dialog. For the Template setting, click on the ellipsis button to select your template. Proceed to select the *Templates\Existing Pavement_Seek* template.



Selecting the Existing Pavement_Seek Template

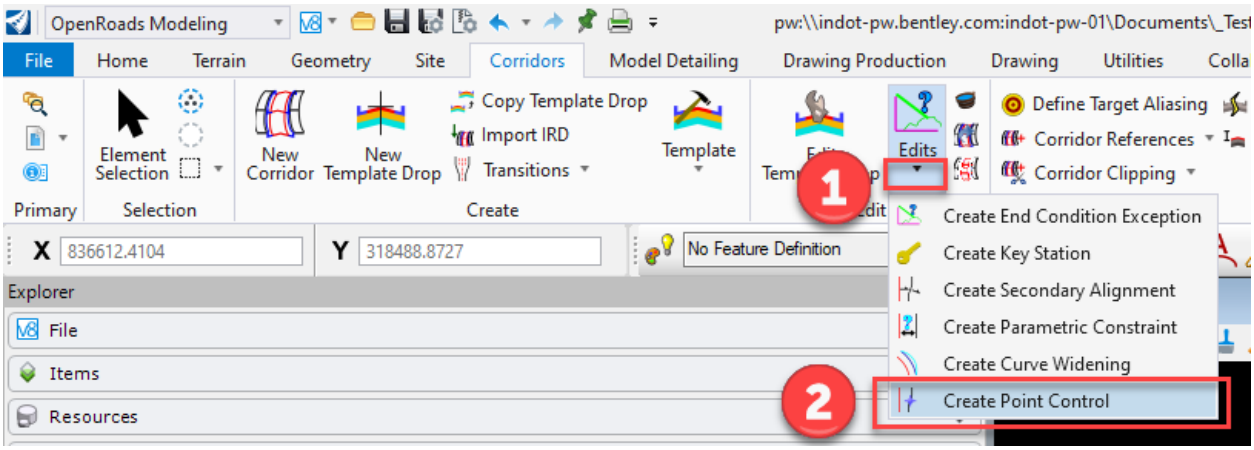
9. With the *Existing Pavement_Seek* template selected, proceed through the prompts to select your start and end stations for the template drop (in most cases, you would enable the Lock to Start and Lock to End settings), and your desired template drop interval. In most cases, an interval of 10 ft should suffice. The resulting corridor will look like the following:



Created Corridor with Existing Pavement_Seek Template

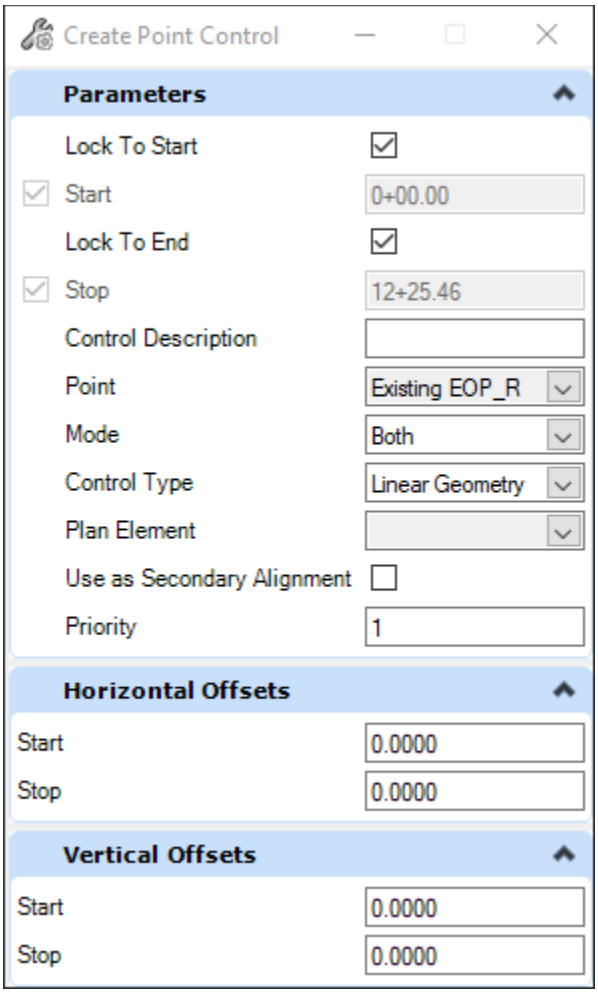
Note that the corridor is very narrow—which is by design. This is done to reduce any confusion about the visual cues that ORD gives when you add a point control to a template point. This will become apparent later in the process.

10. At this point, you need to create point controls to have the left and right template points match their respective edges of pavement. In the Edit section of the *Corridors* tab, select *Edits dropdown > Create Point Control*.



Create Point Control Tool

11. Proceed through the prompts as follows:
    - Locate Corridor: Select your corridor.
    - Start/End Stations: Lock to Start and Lock to End options should be enabled in most cases.
    - Control Description: Enter a description for your point control (optional).
    - Locate Point: Select the left/right side of your corridor.
    - Mode: Select the Both option, which will direct the point control to target the respective existing edge of pavement both horizontally and vertically.
    - Control Type: Select the Linear Geometry option, which specifies that you are going to select a linear feature as the point control target.
    - Locate Plan or Profile Element: Select the left/right edge of existing pavement corresponding with the side of the corridor you've selected.
    - Priority: Default is 1, which is fine.
    - Horizontal/Vertical Offsets: These can be left at a value of 0. Click to proceed through these settings.



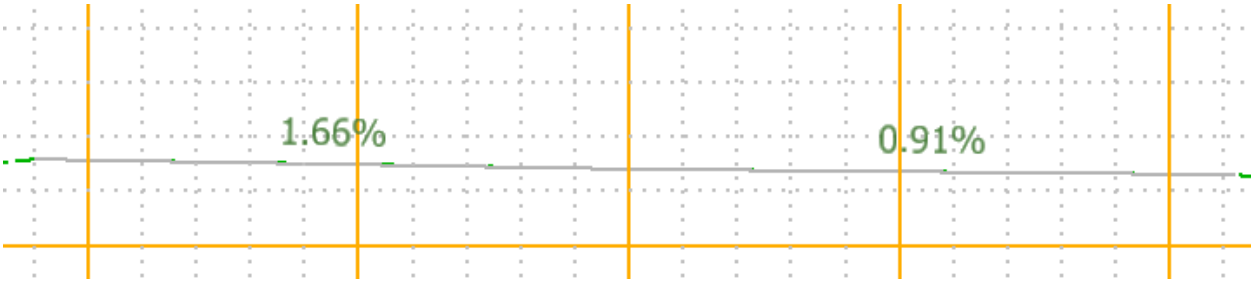
Create Point Control Settings

12. Upon creating point controls that target the edges of pavement, your corridor edges of pavement should line up with what's existing.

Corridor Edges of Pavement Matching Existing

NOTE: You will see two white lines that represent the original location of the EOP points from the Existing Pavement_Seek template. While these are construction elements that can easily be turned off, we made the left and right EOP points on the template with very small offsets to reduce any sort of visual confusion on what they're actually representing.

13. With the corridor now matching the existing pavement, you can proceed to create cross sections as specified earlier in the chapter. Upon applying an appropriate annotation group that contains cross slopes, you can observe the calculated existing cross slopes.

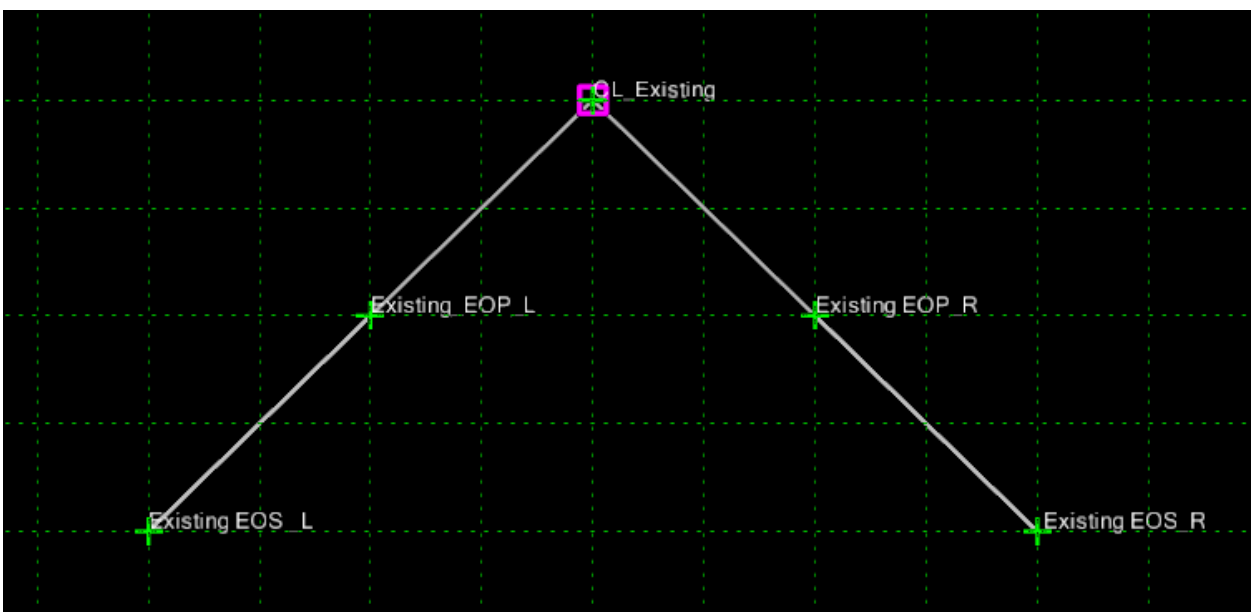


Existing Cross Slopes Annotated on Cross Sections

3.8-4a Adding Additional Points to the Existing Pavement_Seek Template

There may be situations when you want the existing pavement template to seek out additional points along the existing pavement surface (edge of paved shoulder, edge of gravel/unpaved shoulder, etc.). In order to accomplish this, you will need to add unconstrained components to the *Existing Pavement_Seek* template. This section will give a brief step-by-step description of the process.

1. Make a copy of our provided INDOT.ITL template library from our workspace.
2. In the copy of the library, make a copy of the *Existing Pavement_Seek* template.
3. In the copy of the template, add the necessary additional points via unconstrained components. In this example, components representing the shoulders are added.



Existing Pavement Template with Shoulder Components/Edge of Shoulder Points

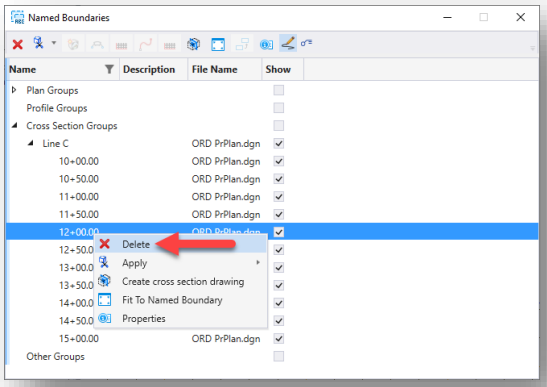
4. Proceed through steps 6 – 13 of the previous section to create a corridor with the newly created template. Then add the necessary point controls to the corridor that target the correct elements.

3.8-5 Cross Section Tips and Tricks

When creating cross sections, there are some scenarios that may arise which require special attention during the cross section creation process. This section will cover those scenarios.

3.8-5a Excluding Individual Cross Sections

Situations may arise where you want to exclude individual cross sections from a Named Boundary Group. To accomplish this, open the Named Boundaries dialog, and expand the Cross Section Group that contains the cross sections you want to be excluded. To exclude a section from a group, simply right-click on the section you want to exclude, and then select Delete.



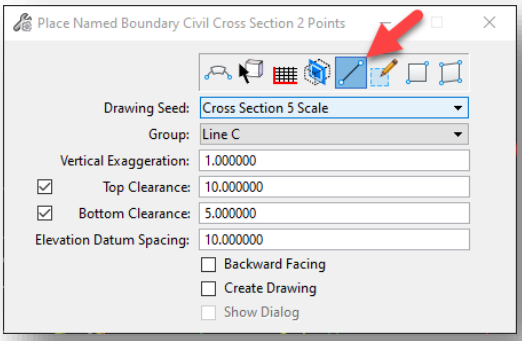
Excluding/Deleting Individual Cross Sections

Once the section is excluded/deleted, proceed to create the cross sections as you would normally, and the deleted section will no longer appear on the cross section drawings.

3.8-5b Cutting Individual Cross Sections Along a Skew

Situations may arise where you need to cut individual cross sections along a skew. This can be accomplished with the Civil Cross Section 2 Points option in the Place Named Boundary dialog.

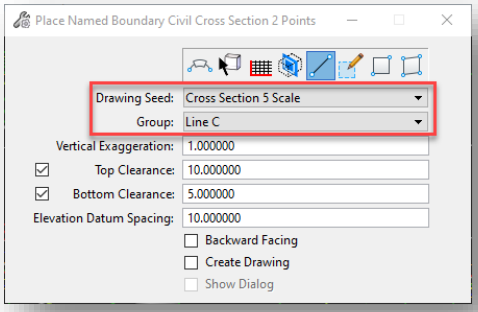
1. Open the Place Named Boundary dialog and select the Civil Cross Section 2 Points option.



Civil Cross Section 2 Points Option

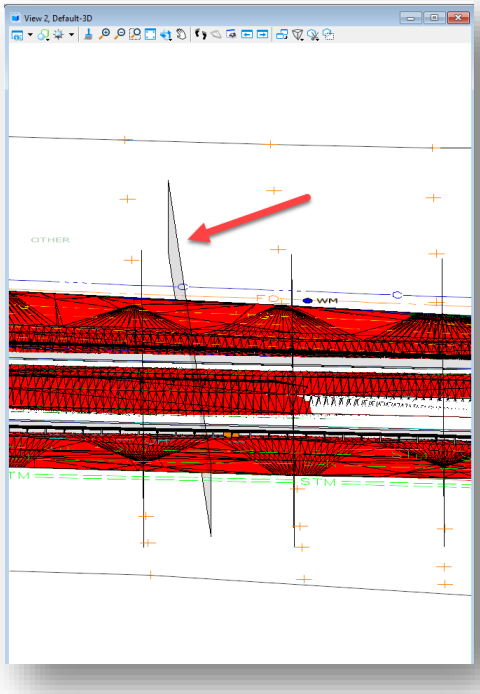
2. Data point on the alignment to select it as the drawing path.

3. Be sure to have the appropriate drawing seed selected, as well as the name of the cross section group you would like this section to be added to.



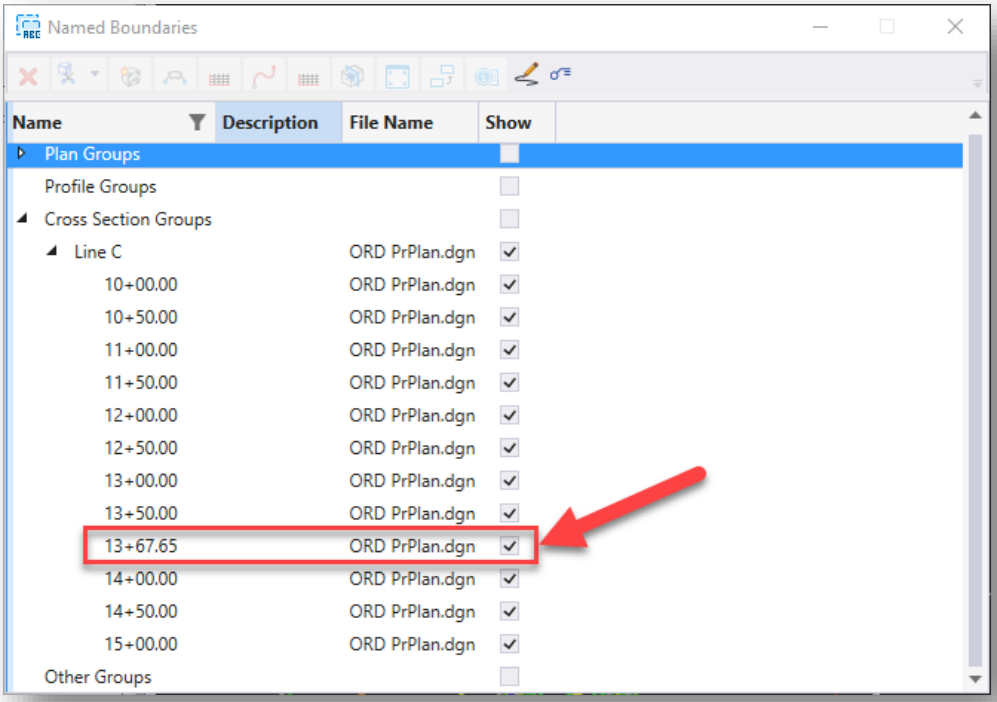
Drawing Seed and Group Selection

4. You will then be prompted to enter the two end points for the skewed section. Proceed to select the two end points of the skewed section in the 2D view, and then data point to accept. A new named boundary will be created, which can be seen in the 3D view. *NOTE: It will most likely be necessary to manually draw out the skewed section in the drawing first before creating its associated named boundary.*



Skewed Cross Section Named Boundary

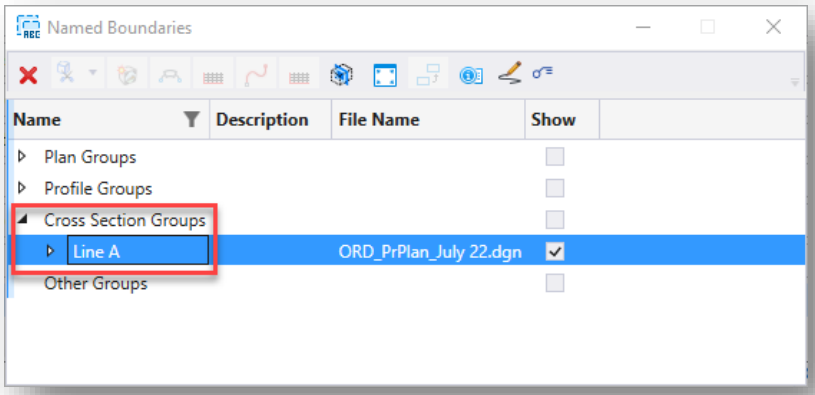
10. To verify the station of the named boundary in relation to the selected alignment, you can go to the Named Boundaries dialog.



Skewed Cross Section in Named Boundaries Dialog

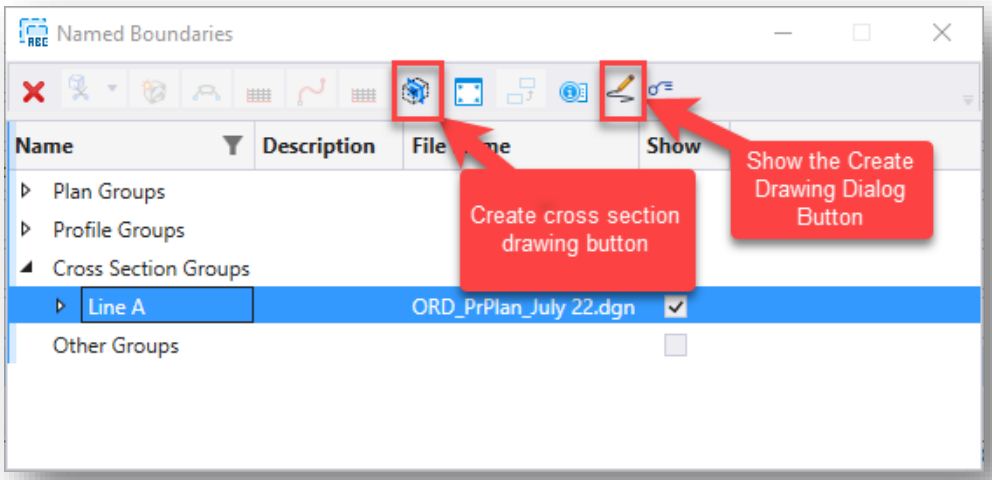
3.8-5c Recutting Existing Cross Sections

If you've already created some cross sections that you wish to recut, you can easily do so via the Named Boundaries dialog. First, make sure you have a 3D view open that contains the cross section named boundaries. Then, select the Cross Section Groups section, and select your desired cross section group.



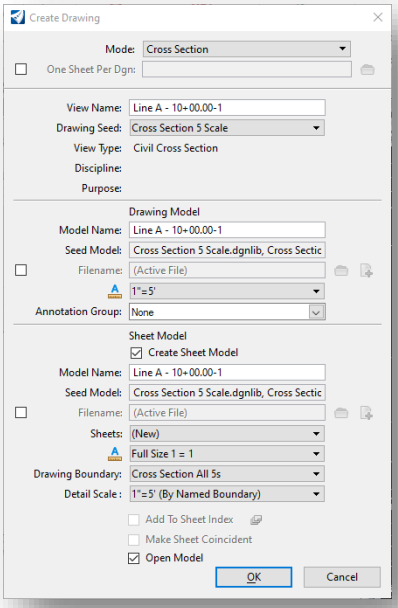
Selecting Cross Section Group

Then with the cross section group selected, click on the Show the Create Drawing Dialog button, followed by the Create cross section drawing button.



Create Drawing Dialog and Create Cross Section Drawing Buttons

This will bring up the Create Drawing dialog, where you can adjust the settings for your cross sections as desired.



Create Drawing Dialog

Note: As previously mentioned, this process can similarly be applied to other sheet types in the Plans Production process. Repeat the listed steps with the appropriate named boundary groups selected.

3.8-5d PG/EG Elevation

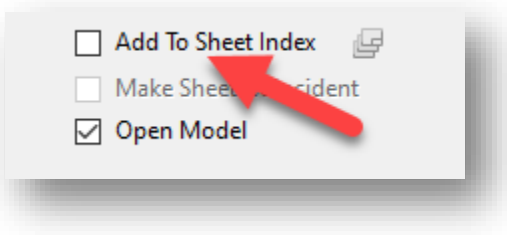
The default annotation groups locate the PG elevation annotation based on the CL point definition in the applied corridor template. In the event that the EG annotation should be used, one should go into their template drop and change the CL Point to EG which will then change the annotation. Note that drawings will need re-annotated in order for this change to be displayed.

3.9 Adding Cut Sheets to the Sheet Index

As covered in the INDOTWise 5.2 MicroStation document, the INDOT Workspace for OpenRoads Designer now includes Workset functionality, and along with it, Sheet Indexing. Adding this functionality into the mix allows for OpenRoads Designer to place cut sheets directly into the Sheet Index automatically.

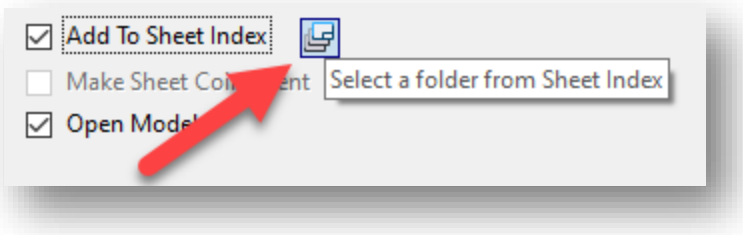
Note: When placing sheets directly into the Sheet Index, one may see additional check out/in functionality occur in the background. This is intended behavior as OpenRoads interacts with ProjectWise to automatically check out the Workset so sheets can be added to it. Please keep in mind that there will be instances where the INDOT_WS.dgnws will prompt to be checked back in manually, as this portion of the process cannot be done automatically. It does however provide an opportunity to free it should unintended settings be enabled.

With the Workset functionality enabled, on the bottom of the Create Drawing window for both Plan Profiles and Cross Sections, the Add to Sheet Index button is now able to be selected.

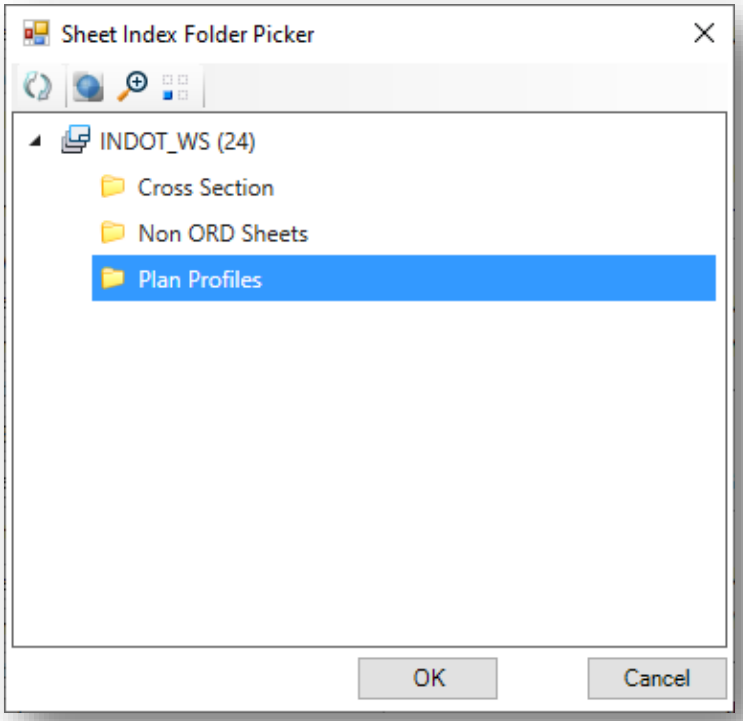


Add to Sheet Index

By selecting this, ORD will then place all the sheet model that it cuts directly into the Sheet Index without the need to manually add these sheets. When the Add to Sheet Index option is enabled, the button to the right side (Select a folder from Sheet Index) will also be enabled—which allows for the placement of the cut sheets into a folder in the Sheet Index if so desired.

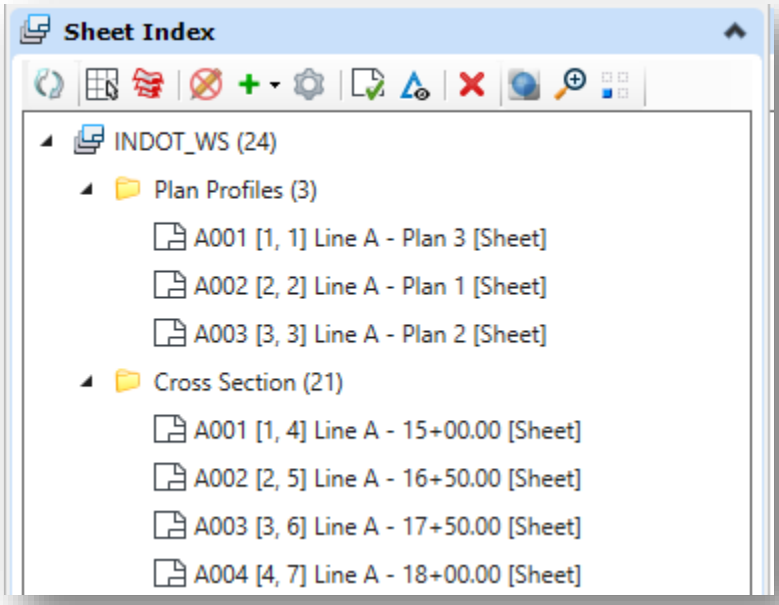


Select folder from Sheet Index



Sheet Index Folder Picker

When used, and all sheets cut to the Sheet Index, a configured Sheet Index could look similar to the following:



Sample Sheet Index

3.10 Bringing Legacy Data into OpenRoads Designer

It is possible to bring legacy data (i.e., civil content from SelectSeries releases) into OpenRoads Designer. To accomplish this, you will need the following necessary files:

- A .dgn file containing the survey fieldbook and symbols drawn up in the SS4/10 OpenRoads format, this could also be provided as a pre-OpenRoads .fwd format survey file.
- A .dgn containing the survey terrain model in the SS4/SS10 OpenRoads format, this could also be a .dtm file containing the terrain as modified by Survey (triangulation cleanup, etc.)
- A ..dgn containing the survey alignment as a SS4/SS10 OpenRoads element, this could also be provided as an .alg file containing the horizontal survey alignment
- Appropriately geocoordinated seed files

For a project that was surveyed and provided to INDOT standards, the above files should already be available. If you do not have these files, the following subsections will cover what steps may need to be done—including alternate steps to create the necessary items. In addition to these necessary items, there are supplemental items that can also be brought into ORD.

- ITL template libraries: These can be brought forward but note that they will need to be updated to take into account adjustments to features, naming, and targeting.
- IRD corridor file: If available from an older SS2 project, these can also be brought forward, with the same caveat as the ITL template libraries.

3.10-1 Working with Legacy Data in ORD

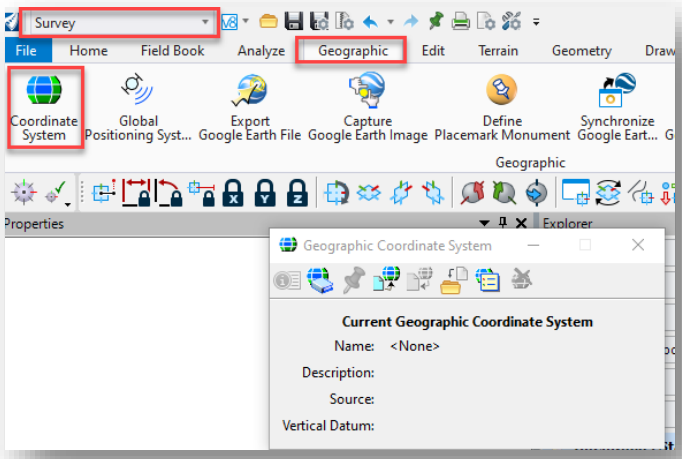
As mentioned in the previous section, it is necessary to have appropriately geocoordinated seed files to import the legacy data into. This section will guide you through the process of taking the geocoordinated seed files and referencing the legacy data into them. If no geocoordinated seed files exist, alternate steps will be provided as needed.

3.10-1a Working with the Survey Fieldbook and DTM/Terrain

5. As outlined in section 2.2-6 of this document, import your old survey data into your 3D ORD Survey Fieldbook file. This will create your survey fieldbook in ORD.
6. Create a brand new DGN file from the 3D geocoordinated seed file provided to you. If an appropriate seed file is not provided, the default 3D seed file from our workspace can be used, and the geocoordination can be imported directly from the survey fieldbook file. See section 3.4-1 for instructions on this process.
7. In the new DGN file, attach the survey fieldbook.

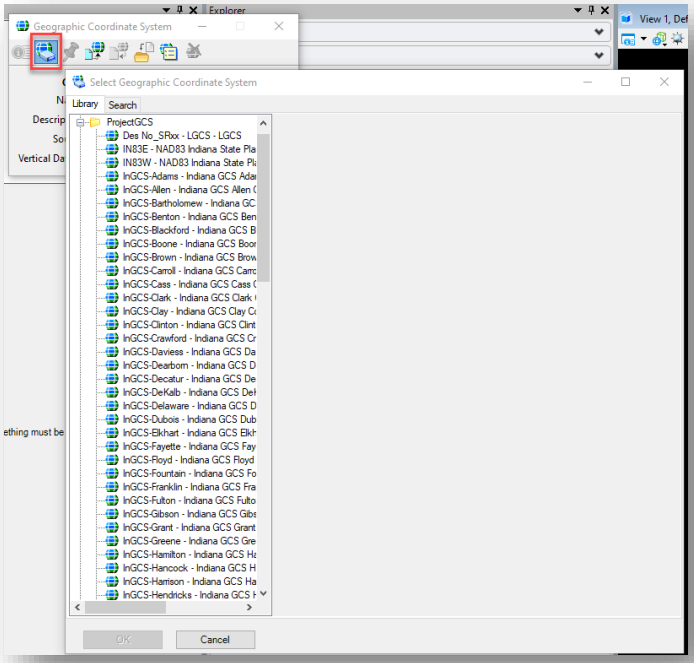
NOTE: Steps 4 through 7 below are only applicable if you were not provided a 3D geocoordinated seed file from Survey. If you were provided with the seed file, disregard these steps and proceed to step 8.

8. If the 3D geocoordinated seed file was not provided (i.e., you are working from the default 3D seed file), apply the geocoordination via the Geographic Coordinate System dialog. This can be accessed in various locations—shown below is the Geographic tab of the Survey workflow.



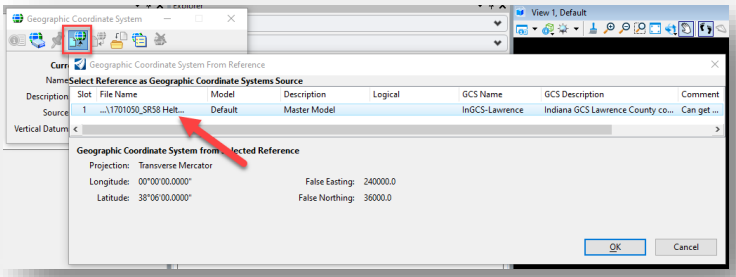
Accessing Geographic Coordinate System Dialog

9. There are two ways to apply the geocoordination from this dialog. The first is by clicking on the From Library button and then selecting it from a GCS library, as shown below. Upon making your selection, click OK.



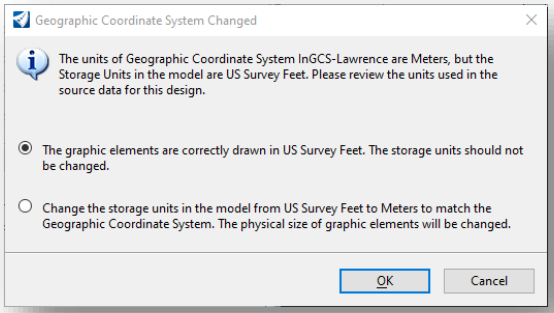
Selecting GCS from Library

10. The second way to apply geocoordination is by clicking on the From Reference button. Select the referenced survey fieldbook file on the Geographic Coordinate System from Reference dialog, and click OK.



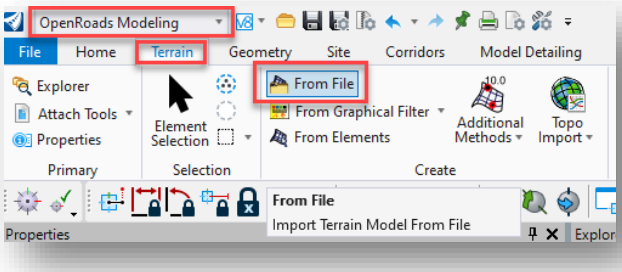
Applying GCS from Reference

11. Upon applying the geocoordination, you will be presented with a warning that the selected GCS has metric units, while the storage units in the current model are US Survey Feet. ***Select the first option to keep the storage units in US Survey Feet.*** Then click OK to proceed.



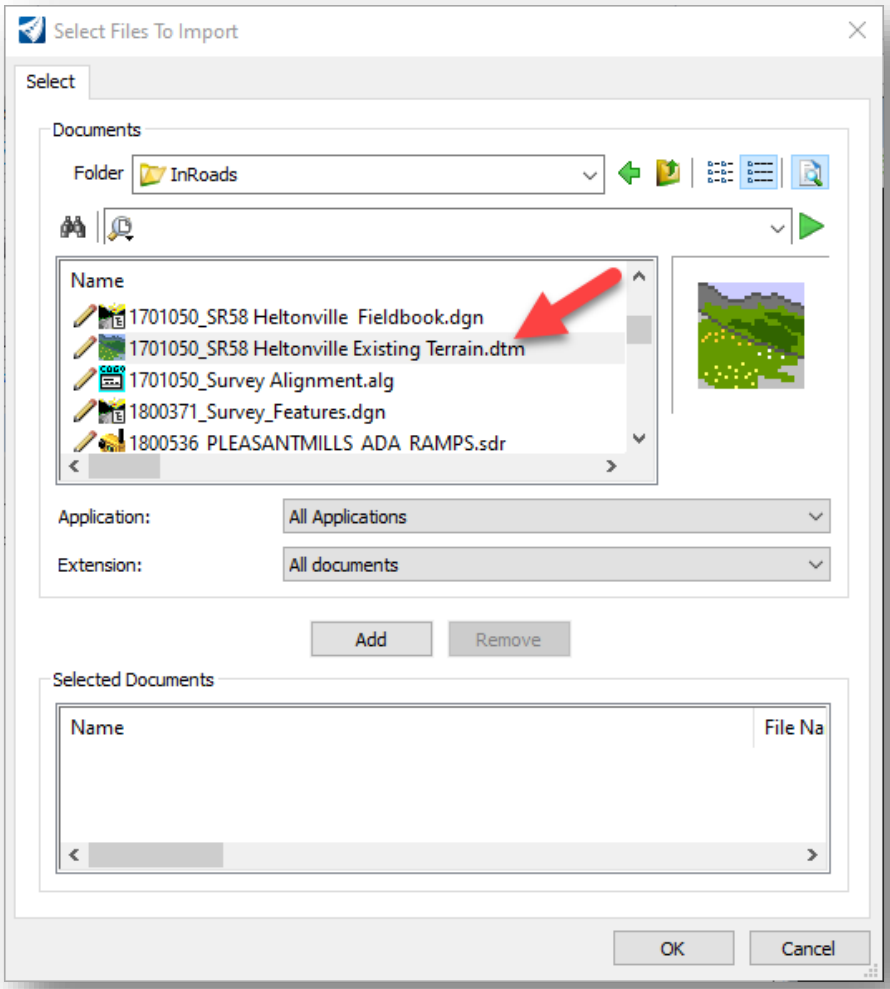
GCS Storage Units Warning

12. The next step of the process is to import the terrain from the Survey-provided DTM. To do this, go to the OpenRoads Modeling workflow, and on the Create tool group of the Terrain tab, select the From File option.



Creating Terrain from File

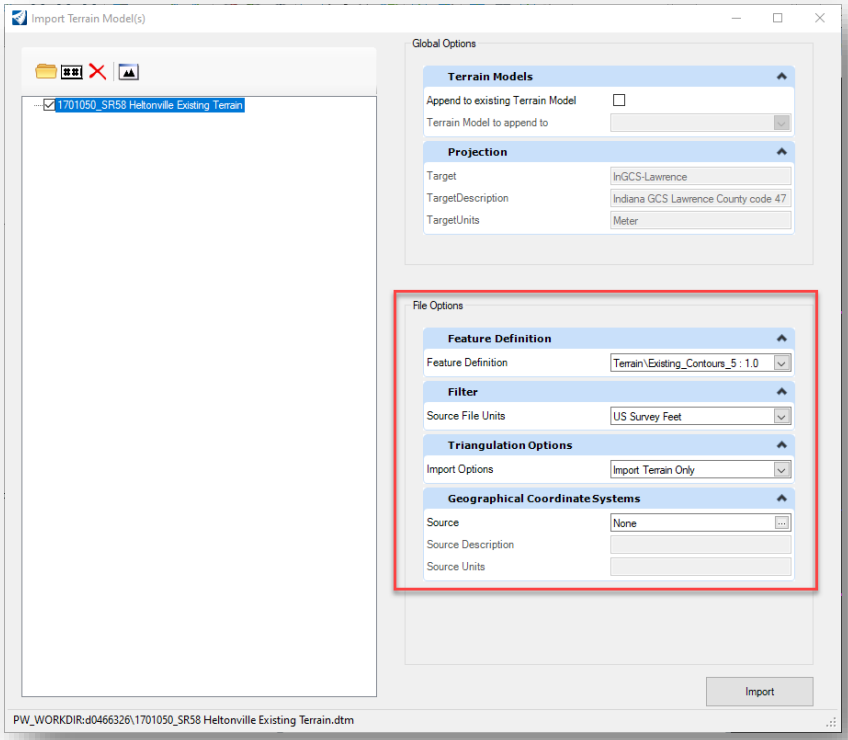
9. Select the Survey-provided DTM on the Select Files to Import dialog and click OK.



Selecting File to Import

10. You will then be presented with the Import Terrain Model(s) dialog. The settings you need to be concerned with are in the File Options section of the dialog:
    - *Feature Definition*: Specifies your desired feature definition for the terrain you are importing. There are several possible options for this—in the case of this example, *Existing_Contours_5 : 1.0* is selected from the list.
    - *Source File Units*: Specifies the units of the source file, which in this case is US Survey Feet.
    - *Import Options*: Specifies what components from the DTM that you would like to import. There are three options. Import Terrain Only will only have the terrain component of the DTM imported into the file. Import Features Only will only have the survey features contained in the DTM imported into the file. Import Both will import both the terrain and the survey features into the file. In this example, we only want the terrain, so Import Terrain Only will be selected.

- *Source*: Used to specify the source of geocoordination for the terrain. We already have the geocoordination specified, so this setting can be left at None.



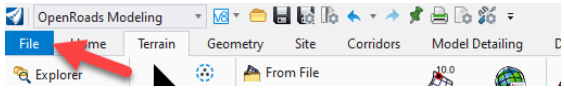
Importing Terrain Model from DTM

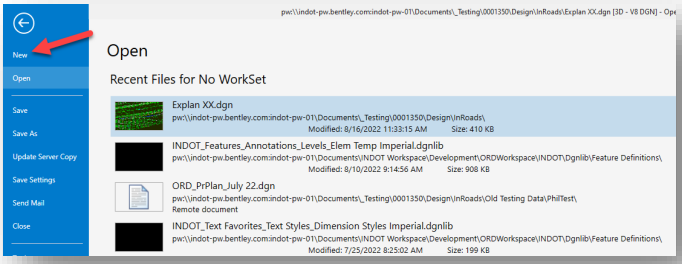
11. With your desired options selected, click Import to proceed with the terrain import.

NOTE: If you choose the Import Features Only option when importing the terrain model, be advised that all of the survey features found in the DTM will be placed on the Default level and lose their featurization. This issue has been filed with Bentley by CAD Support as an Enhancement Request. To address this scenario, you have two options. You can either manually featurize them after the import, or you can copy the features as line strings and featurize them from there.

3.10-1b Working with the ALG/Alignment

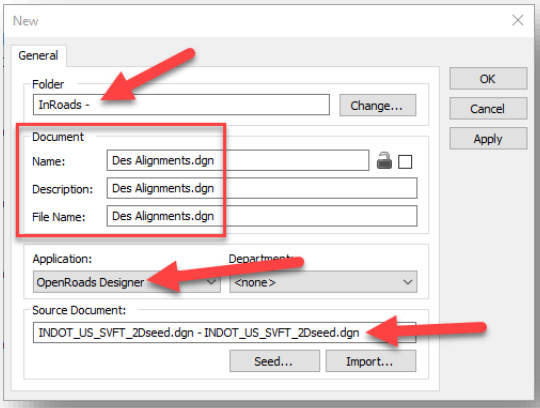
12. With the terrain now imported, the next step is to create a brand new 2D file from a seed file to bring in our ALG data (alignment). The easiest way to do this is to click on the File tab to open the Backstage view in ORD, and then click on New.





Creating a New File in ORD

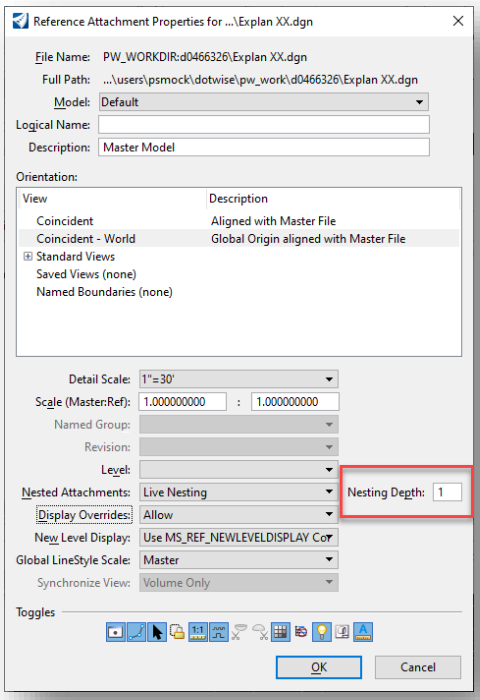
13. Select No Wizard at the next prompt and click OK.
14. Then on the next dialog, specify a destination folder for the new file, an appropriate name and description for the new file, the application to be associated with the new file (which in this case is OpenRoads Designer), and finally, the INDOT_US_SVFT_2D seed.dgn file from Template Documents as the Source Document (chosen by clicking on the Seed… button).



Settings for New 2D File

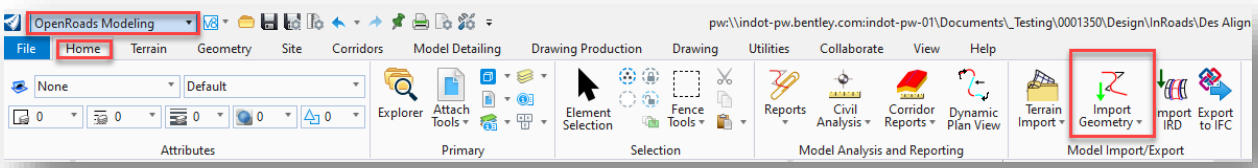
15. You will then be prompted to check in the file you've been working on up to this point, proceed to do so.
16. With the new 2D DGN file open, proceed to attach the 3D file with the survey and terrain as a reference. *Note: Considering that the 3D file you created has a reference itself, you will need to*

set the Nesting Depth setting in the Reference Attachment Properties to a value of 1 so that you can see all of the content.



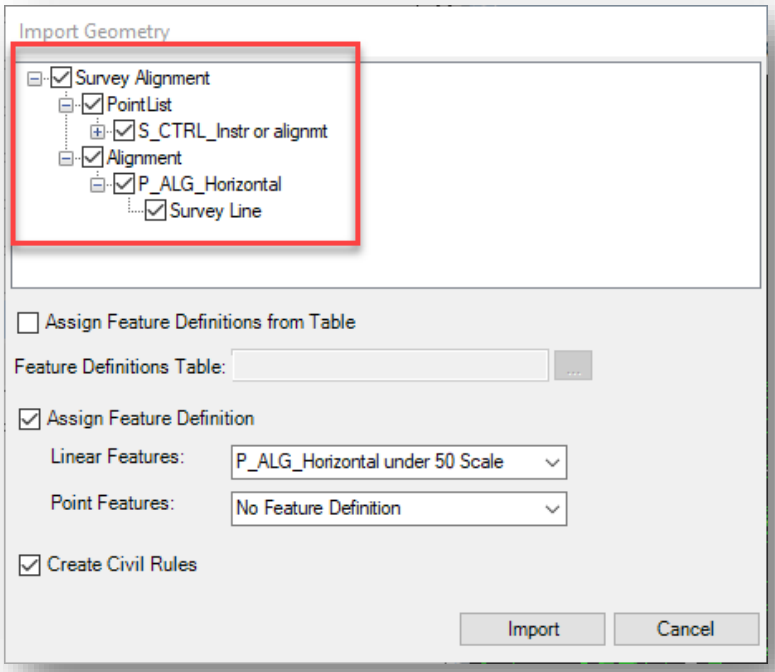
Attaching Survey and Terrain as a Reference with Nesting Depth of 1

17. With the terrain now attached to the file, proceed to make it active. This will create a 3D model in the file.
18. You are now ready to import the geometry from an ALG file. With the 2D model open, go to the OpenRoads Modeling workflow if not already open and on the Home tab select the *Import Geometry* tool from the Model Import/Export tool group.



Import Geometry Tool

19. Select the desired ALG file from its location in ProjectWise and click Open.
20. You will then be prompted to select the various components of the ALG that you would like to import. In most cases, it should be acceptable to select all of the components.



Selecting ALG Components to Import

21. At the bottom of this dialog are two very important settings:
    - *Assign Feature Definition → Linear Features*: For the alignment feature (linear feature), set the appropriate feature definition from the dropdown list. In this example, the *Alignment > P_ALG_Horizontal under 50 Scale* feature definition is chosen.
    - *Create Civil Rules*: Creates all of the necessary civil rules for your imported alignment. It is strongly recommended that this setting always be enabled.
22. With the import settings set as desired, click Import to import the ALG/alignment.
23. With the alignment imported, perform steps 4 through 7 in this file to apply geocoordination.

4. Drawing/Sheet Annotation in OpenRoads Designer

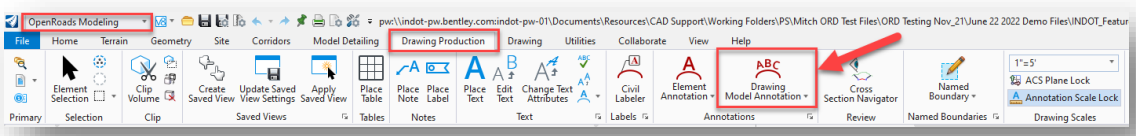
Upon creating your plan sheets per the processes discussed in the previous chapter, several annotations need to be added to convey the necessary information on them. This chapter covers the processes for creating these annotations in OpenRoads Designer using the following three methods: Drawing Model Annotation, Element Annotation, and the Civil Labeler tool.

Note: OpenRoads Designer is heavily leveraging the use of Drawing models as an intermediate container between the design and sheet models. Unless otherwise specified, all annotations should now be placed on the content in the drawing models. This is necessary for the more advanced annotation tools that read, report, and annotate information directly from the civil content. Using the drawing models plus the appropriate drawing scales and a combination of the below listed tools and other text and dimension placement tools should provide a flexible process for adding appropriate annotations.

Note: Any linear annotations (horizontal alignments and vertical profiles) have had new settings applied that should allow for their annotation text to be moved and retain their placement if the element is re-annotated. For information on how to update and apply this change to existing files, please see section 4.5 in the INDOTWise Technotes document.

4.1 Drawing Model Annotations

The Drawing Model Annotation tool in ORD allows you to add annotations to either an individual, or all drawing models in a design file. The tool can be found on the Drawing Production tab in either the OpenRoads Modeling or OpenRoads Drawing Production workflows, as shown below.



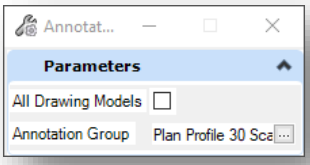
Drawing Model Annotation Tool

The remainder of this section will cover how to use the Drawing Model Annotation tool to apply annotations to various design elements in the drawing models of your plan sheets.

4.1-1 Plan View Annotations

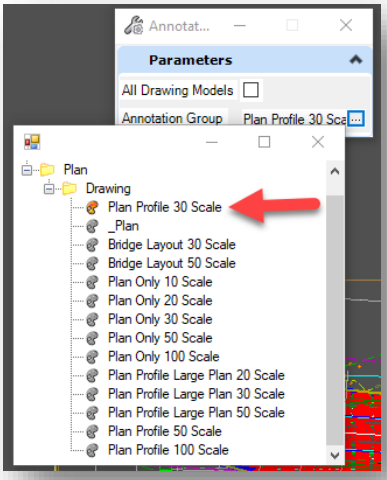
As specified in the previous chapter, the drawing model annotation should already be applied at sheet creation time when selecting an annotation group for the plan view of a plan sheet. If not already applied, you can use the Drawing Model Annotation tool to add this annotation—which only consists of the north arrow, and a border representing the plan view border extents for use when applying annotation of survey features.

To add the annotation, have the drawing model of the plan view open, and select the Drawing Model Annotation tool to bring up the Annotate Drawing Model dialog:



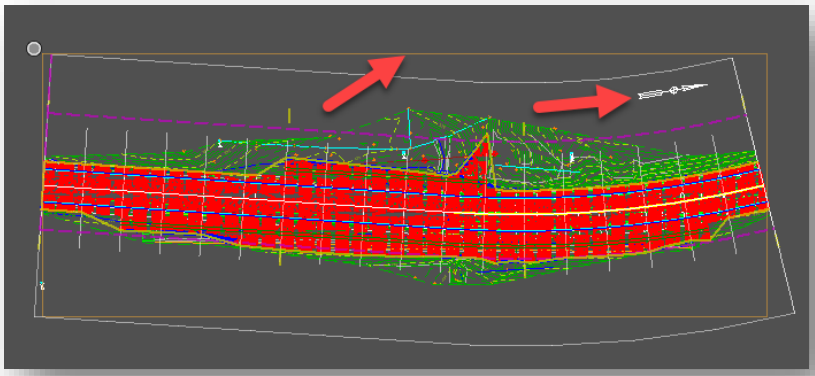
Annotate Drawing Model Dialog

Then to add the annotation, select the ellipsis button, which will present a dialog where you can select the appropriate annotation group for your situation. For example, for a 30 scale plan view on a plan and profile sheet, you would select *Plan > Drawing > Plan Profile 30 Scale*.



Selecting Plan Annotation Group

If you would also want to apply this annotation to all drawing models in the file, you can select the checkbox for All Drawing Models. Then to apply the annotation, click once to confirm the All Drawing Models setting, and then once more to confirm your selection of annotation group to apply to the drawing model(s). The annotation will then be applied to the drawing model(s), as denoted by the arrows in the screen capture below:



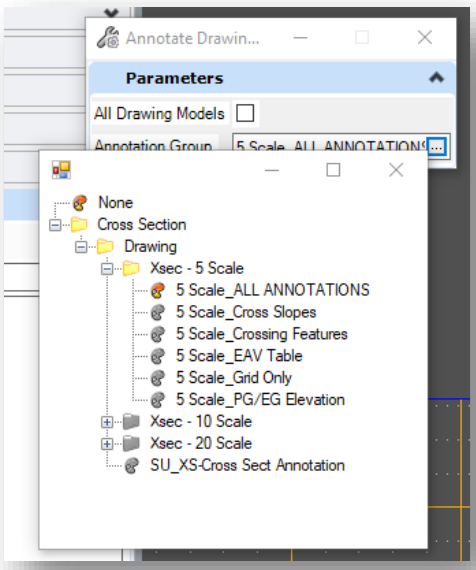
Drawing Model Annotation Applied to Plan View

4.1-2 Profile View Annotations

As currently configured, there are no annotations that need to be added to a profile view of a plan sheet via the Drawing Model Annotation tool. Such annotations are covered by either the Element Annotation tool or the Civil Labeler tool, which are discussed later.

4.1-3 Cross Section Annotations

To add annotations to a drawing model of a cross section, click on the Drawing Model Annotation tool. Click on the ellipsis button in the dialog, navigate to *Cross Section > Drawing* and note the following layout has been created for cross section annotation groups.



Cross Section Annotation Group Layout

The available cross section annotation groups have been broken down first by scale, and then the individual annotations for each scale.

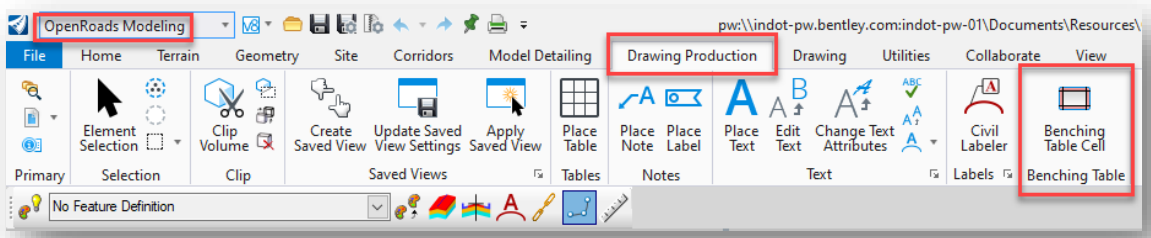
4.1-3a Breakout Drawing Annotations

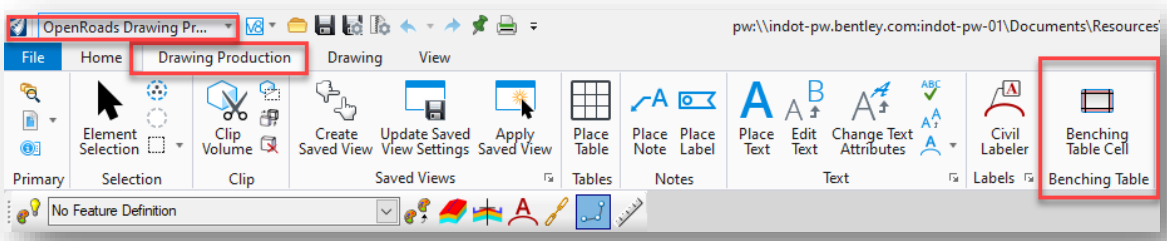
As shown in the previous screen capture, there are six available annotation groups for each scale:

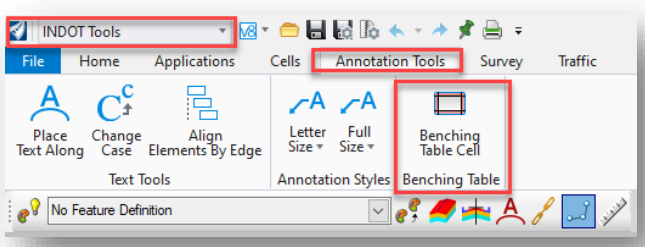
- ALL ANNOTATIONS: Contains all the available annotations.
- Cross Slopes: Only contains the cross slopes for the relevant design elements.
- Crossing Features: Only contains the annotation of various crossing/survey features that are commonly encountered (utilities, R/W, guardrail, etc.).
- EAV table: Only contains the end area volumes table to be placed at the top right corner of each section. See the subsection below for information on how to append the benching volumes to this table.
- Grid Only: Only contains the cross section grid.
- PG/EG Elevation: Only contains the PG or EG annotation (with leader) for each section.

4.1-3b Benching Table Placement

To append benching annotation to the EAV table on the cross sections, you will need to do so via placing it as a cell in your drawing model. You will be able to do this via the *Benching Table Cell* tool, located in the *Drawing Production* tab of either the *OpenRoads Modeling* or *OpenRoads Drawing Production* workflows, OR the *Annotation Tools* tab of the *INDOT Tools* workflow.

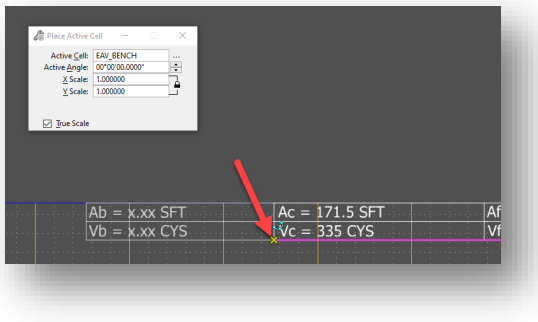






Benching Table Cell Tool Locations

Clicking on the tool automatically opens the Place Active Cell dialog with the global *EAV_BENCH* cell already selected. Then simply place the cell at the bottom left corner of the existing EAV table cell.



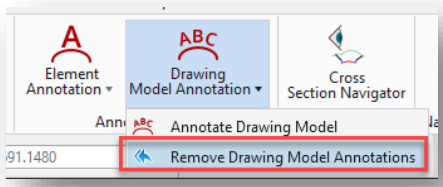
Placing Benching Table Cell

To edit the values, simply double click to start the text editor and replace the provided template values. Note that this table element will not be removed as part of the drawing model annotation.

4.1-4 Removing Drawing Model Annotations

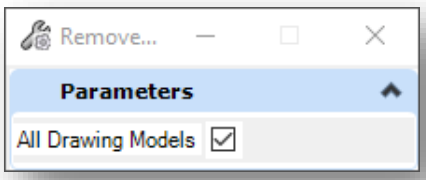
Removing drawing model annotations is a simple process. ***However, be very careful in using this functionality, as it removes ALL drawing model annotations in a model/drawing. There is no option for removing individual drawing annotations.***

To remove drawing model annotations, click on the Drawing Model Annotation dropdown and select the Remove Drawing Model Annotations option.



Remove Drawing Model Annotations

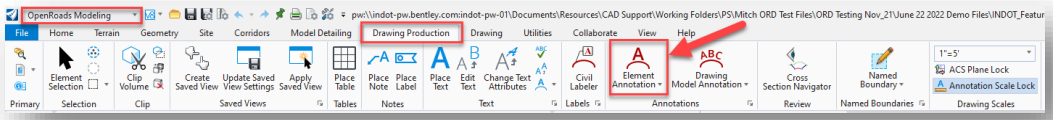
You will then be presented with a dialog providing a single option, which is to apply the annotation removal for all the drawing model annotations from all the drawing models in the file. With your desired option selected, a single left click in the view will remove all drawing annotations.



Remove Drawing Model Annotations

4.2 Element Annotations

The Element Annotation tool in ORD allows you to add annotations to individual design elements. The tool can be found on the Drawing Production tab in either the OpenRoads Modeling or OpenRoads Drawing Production workflows, as shown below.

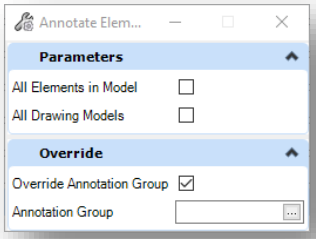


Element Annotation Tool

This section will cover the annotations applied with this tool. For the purposes of the plan production process, you will solely focus on annotating the horizontal and vertical alignment elements.

4.2-1 Annotating Horizontal Alignments

To annotate a horizontal alignment, be sure to first have a drawing model with a plan view opened. Then select the Element Annotation tool to open the Annotate Element dialog:



Annotate Element Dialog

Note the settings in this dialog:

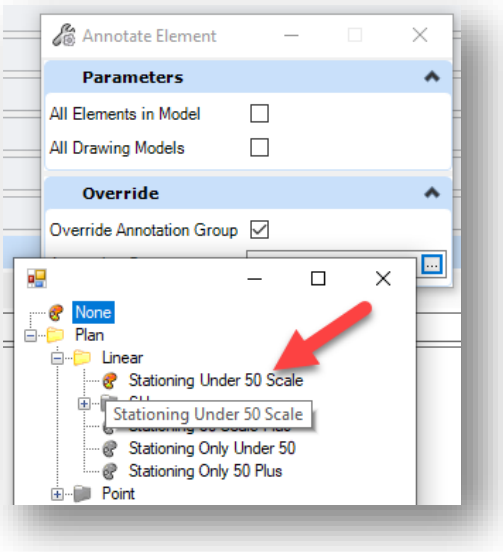
- All Elements in Model: Enable this setting to annotate all the elements in the model with the same annotation group.
- All Drawing Models: Enable this setting to apply the annotation group to all the drawing models in the file that contain the selected element.
- Override Annotation Group: Enable this setting to override any existing annotation groups that are being applied to a selected element.
- Annotation Group: The annotation group that you wish to be applied to a selected element.

Note: If the Override Annotation Group option is unchecked/disabled, the Annotation Group setting will not be displayed. In this scenario, the default annotation group associated with the feature symbology of the selected element would be applied. If no default annotation group exists for the selected element,

no annotation will be applied—and the protocol would then be to check/enable the Override Annotation Group setting and select the appropriate annotation group to be applied.

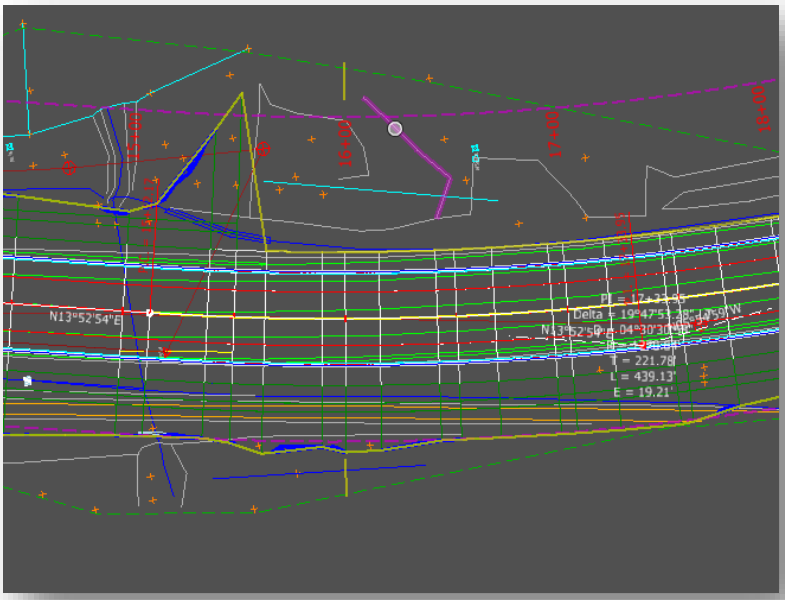
Note: When using the Annotate Element tool, usage throughout this document covers using this tool with the All Elements in Model selection unchecked. The current workflow is to allow the end user to apply their annotation to specific elements on an as-needed basis and allows for flexibility when they are necessary. If the All Elements in Model option is checked, OpenRoads Designer will interrogate every element visible in the current drawing model (and potentially all associated drawing models in the active DGN if All Drawing Models is selected), and annotate them according to whatever annotation groups are applied to the assigned feature symbology. This could cause a number of unwanted or unneeded annotations to be placed and should rarely be used in the current workflow.

For the purposes of this example, you will have a created horizontal alignment that does NOT have an annotation group assigned to it via its feature symbology. This would thus necessitate the enabling of the Override Annotation Group setting and the selection of an annotation group. With the Override Annotation Group setting enabled, click on the ellipsis button in the Annotation Group field to select the desired annotation group. In this example, you are working with a 30 scale plan view, so select the *Plan > Linear > Stationing Under 50 Scale* annotation group.



Selecting Annotation Group for Horizontal Alignment

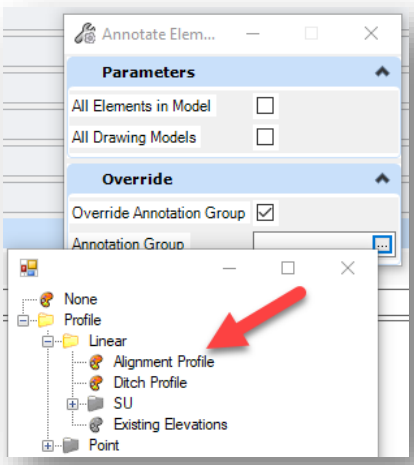
With the annotation group selected, left click in the drawing to accept the current settings (leaving the other settings disabled). You will then be prompted to select the elements to annotate. Proceed to select your alignment(s) and then right click to accept. The desired annotation will then be applied to the alignment. Note that the selected annotation group includes station labels, tangent bearings, PC/PT stations, curve data, etc.



Applied Element Annotation to Horizontal Alignment

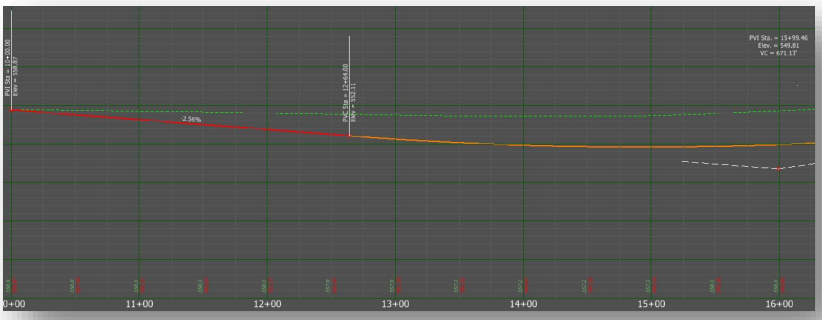
4.2-2 Annotating Vertical Alignments

In much the same way as for horizontal alignments, vertical alignments can also be annotated via the Element Annotation tool. To accomplish this, open a drawing model containing a profile view and select the Element Annotation tool. With the first two settings in the dialog disabled, and the Override Annotation Group setting enabled, click on the ellipsis button in the Annotation Group field to select an annotation group to apply to the vertical alignment. In this case, select the *Profile > Linear > Alignment Profile* annotation group.



Selecting Annotation Group for Vertical Alignment

Upon selecting the desired annotation group, you will be prompted to left click twice to confirm the current settings and then to select the vertical alignment(s) you wish to annotate. Right-click to accept the selected alignments and the desired annotation will then be applied. Note that the selected annotation group includes proposed elevation labels, vertical curve data, PVC/PVT points, vertical tangent grades, etc.



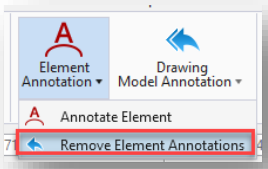
Applied Annotations to Vertical Alignment

If additional vertical alignment annotations are needed, the process can be repeated accordingly.

4.2-3 Removing Element Annotations

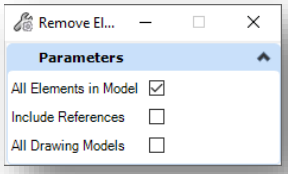
Removing element annotations is a very similar process to removing drawing model annotations. Unlike the removal of drawing model annotations, you have the flexibility to be more specific in removing annotations for specific elements.

To remove drawing model annotations, click on the Element Annotation dropdown and select the Remove Element Annotations option.



Remove Element Annotations

You will then be presented with a dialog that presents you with two options initially: All Elements in Model and All Drawing Models.



Remove Element Annotation Options

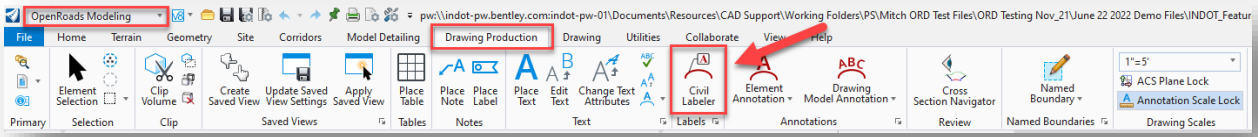
The All Elements in Model option allows you to remove the element annotations for all elements in the model. When this option is selected, a secondary option for including references in the annotation removal is also provided. The final option is to remove all element annotations in all drawing models in the file. With your desired options selected, proceed through the prompts to select the desired elements you wish to remove annotation from and right-click/reset to complete the process.

4.3 Civil Labeler

New to OpenRoads Designer is a tool called Civil Labeler—which allows for customizable labels to be created and applied for annotation purposes. There are several potential uses for this tool, and what will be described in this section is likely just scratching the surface of what may be possible and useful as we continue to learn more about its usage. This section will cover how to access and navigate the tool, and then will cover how to use it to apply annotation to your drawings.

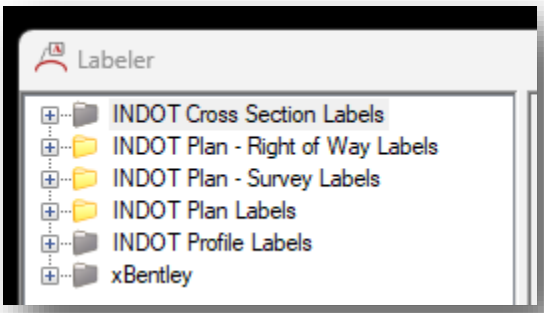
4.3-1 Introduction to Civil Labeler

The Civil Labeler tool can be found in the Drawing Production tab in either the OpenRoads Modeling or OpenRoads Drawing Production workflows, as shown below:



Civil Labeler Tool

Upon opening the Civil Labeler Tool, you will be presented with a dialog with only a Civil Labels folder. Expanding the folder will present the following categories/subfolders:



Civil Label Categories

- INDOT Cross Section Labels: Labels for annotating various points in cross sections—mainly for points pertaining to structures and hydraulics.
- INDOT Plan – Right of Way Labels: Labels for annotating right-of-way points along an alignment.
- INDOT Plan – Survey Labels: Labels for annotating various survey features in a plan view.
- INDOT Plan Labels: Labels for annotating various points in a plan view (e.g., Begin/end of project, Begin/end of incidental construction, station-offset of points, etc.).
- INDOT Profile Labels: Labels for annotating various points in a profile view (e.g., begin/end of project, station-elevation of points, etc.).
- xBentley: Default labels that Bentley has provided with OpenRoads Designer. While we believe we have covered at least most of the labels that you might need, you are more than welcome to investigate these labels and experiment with them as needed.

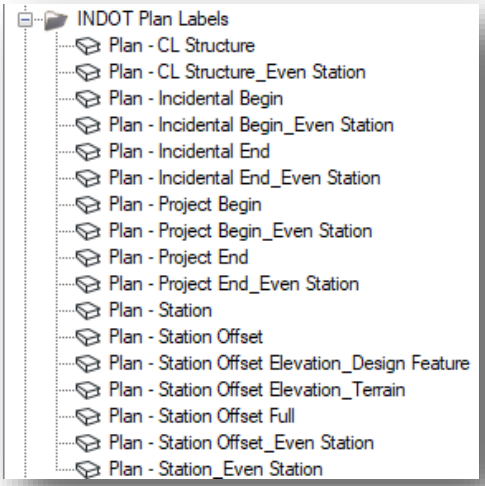
4.3-2 Plan Civil Labels

This section will cover the civil labels that can be placed in a plan view of a drawing. We have broken these labels up into three separate categories: INDOT Plan Labels, INDOT Plan – Survey Labels, and INDOT Plan – Right of Way Labels.

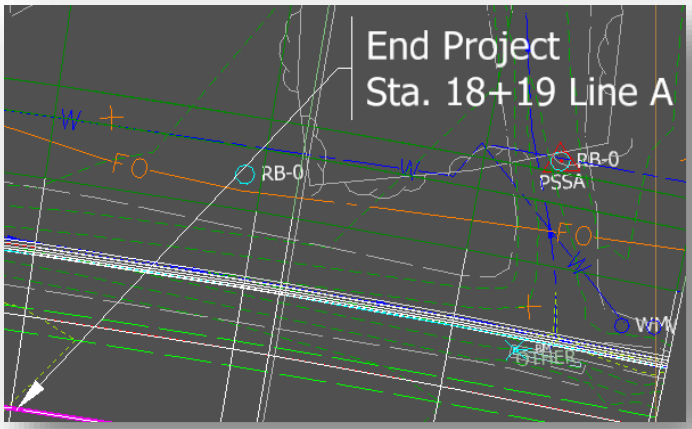
For discussion on the format/creation of civil labels, please see the INDOTWise 5.1 Technotes document, OpenRoads section. This covers the various options when creating/customizing these labels outside the provided default labels.

4.3-2a INDOT Plan Labels

The INDOT Plan Labels category contains labels for annotating general reference points along an alignment, such as begin/end project, begin/end incidental construction, and station-offset of right-of-way points. Note that most of the labels come in pairs—one that provides for even stationing, and the other for a standard stationing accuracy of two decimal places.



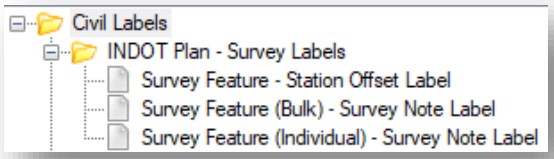
INDOT Plan Labels



Plan – Project End_Even Station Civil Label

4.3-2b INDOT Plan – Survey Labels

The INDOT Plan – Survey Labels category contains labels for annotating survey features along an alignment. These labels are the equivalent of the station-offset annotation of survey features created in MicroStation/InRoads SS10 and then placed along the top and bottom of the plan view.

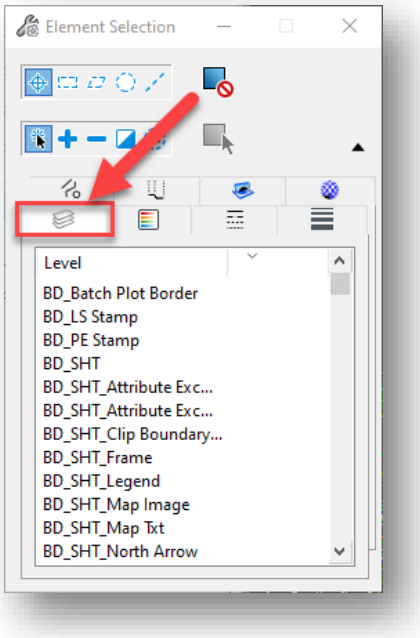


INDOT Plan – Survey Labels

Survey Feature – Station Offset Label

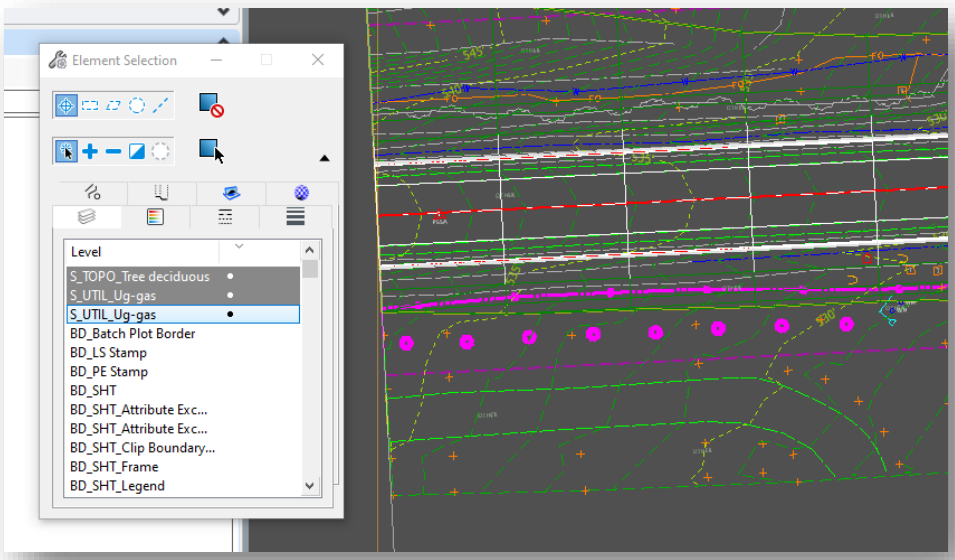
Note that prior to the process being described below, it is assumed that you a) have already created the plan sheets that these annotations will go on, and b) you are in a drawing model of a plan view of one of these sheets.

1. In your drawing model, open the Element Selection tool if not opened already.
2. On the Element Selection tool, select the Levels tab—as you will select the survey features you wish to annotate by level.



Levels Tab on Element Selection Tool

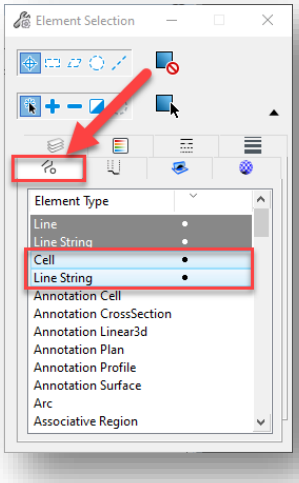
3. On the Levels tab, proceed to select the levels of the survey features you want to annotate. In this example, we will select the S_TOPO_Tree deciduous and S_UTIL_Ug-gas levels.



Selected Levels in Element Selection

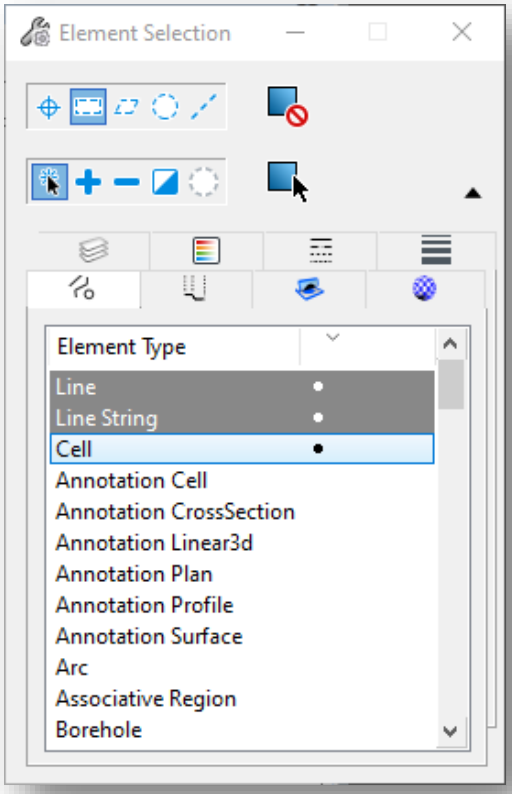
NOTE: In the event that no elements are actually selected when you select their associated levels in the Element Selection tool, please refer to section 4.4 of the Technotes section of our DOTWise manual for instructions on how to resolve this issue.

4. With your desired survey features selected, navigate to the Element Type tab in the Element Selection tool. Note the Cell and the Line String element types are currently selected.



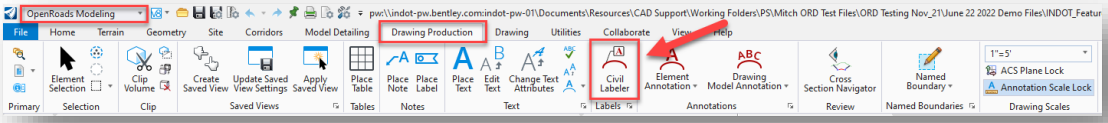
Element Type Tab in Element Selection Tool

7. On the Element Type tab, click on the Line String element type (***denoted with the blue background, NOT the gray one***) to deselect it. This prevents the Civil Labeler from labeling any line strings associated with linear survey features—which in this case, is a gas line. The way we have the civil label currently configured, each of the individual points along the linear feature will be annotated. Note that if you are not annotating any linear features (i.e., solely point features), then you can skip this step.



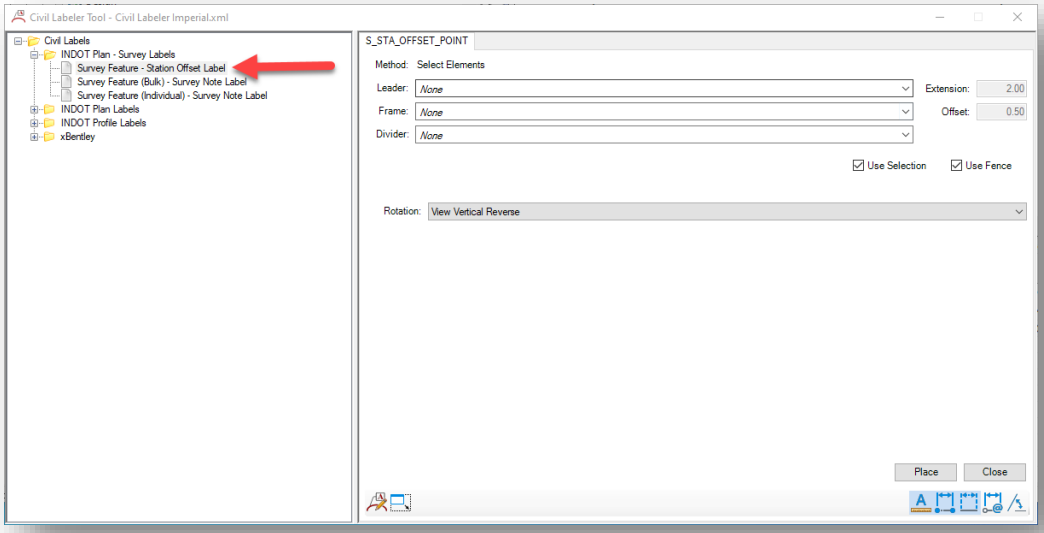
Element Type Tab with Line String Element Type Deselected

8. With your survey features now selected, open the Civil Labeler tool from the Drawing Production tab.



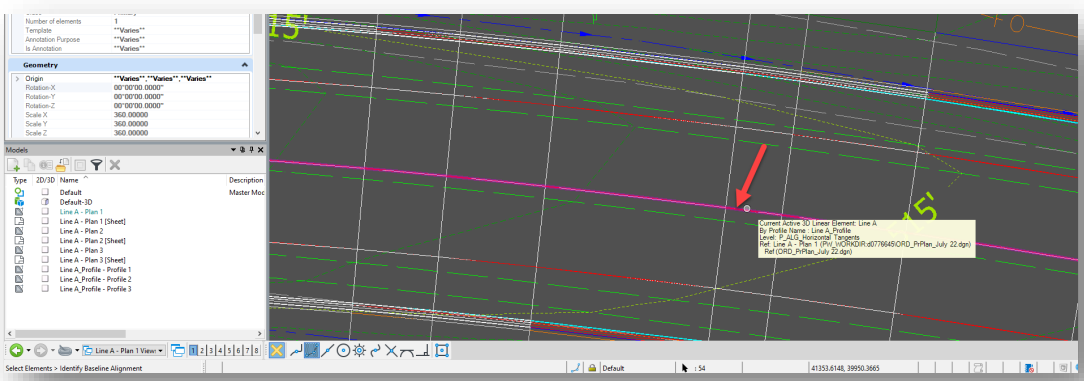
Civil Labeler Tool

9. In the Civil Labeler Tool, go to *Civil Labels > INDOT Plan – Survey Labels > Survey Feature – Station Offset Label*.



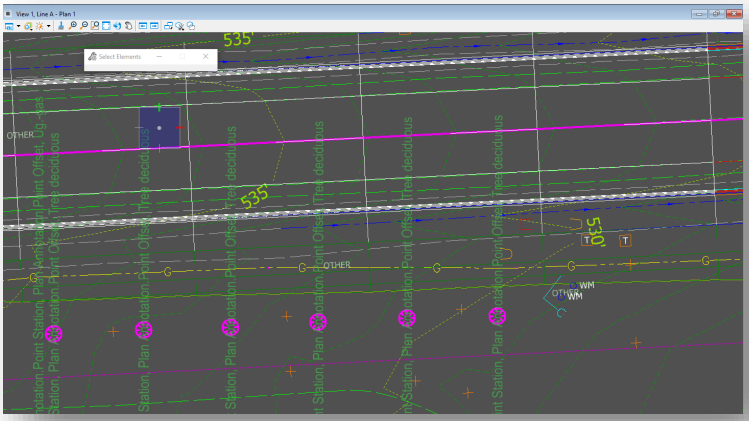
Survey Feature – Station Offset Label

10. With your survey features still selected, click on the Place button.
11. You will first be prompted to identify the baseline alignment—proceed to do so. *NOTE: You will not be able to right-click to locate the actual alignment if there are multiple elements coincident with it—as it will cancel the operation. It is thus suggested to turn off any conflicting levels so that you can easily select the alignment.*



Selecting Baseline Alignment

12. You will then be prompted to accept the point(s). Left click once to accept the current selection; note that the labels will now appear, ready to be placed.

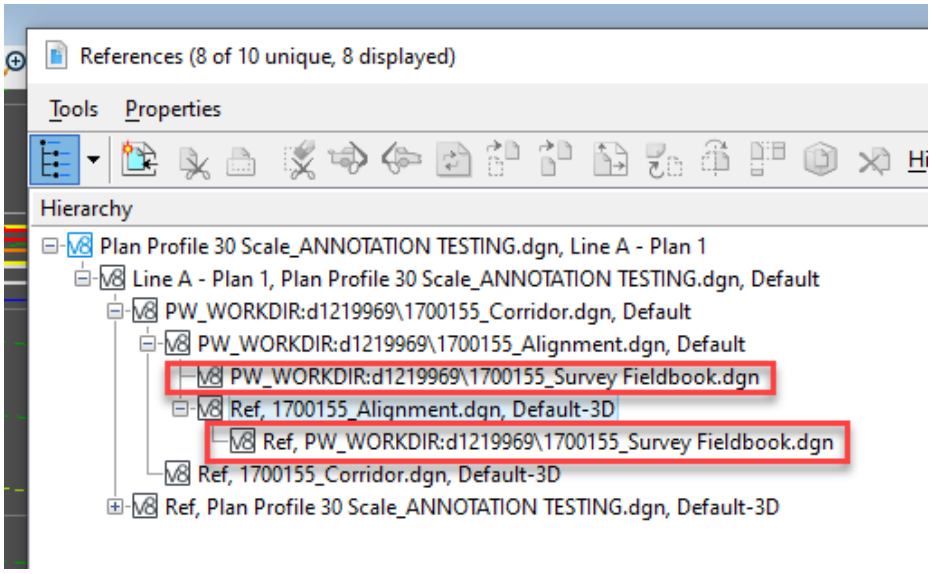


Accept Points

13. You will then be prompted to confirm the label placement. Left click once again in the same location to place the labels in the drawing. Depending on how many survey features are being annotated, it may take a bit of time to process.

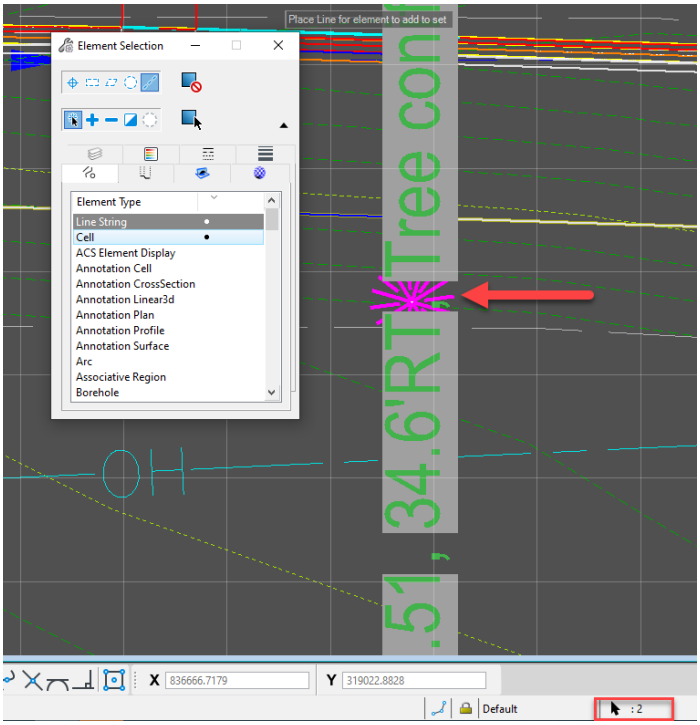
Station Offset Label Cleanup

Due to how the file federation workflow works within OpenRoads Designer, the survey fieldbook file is referenced into the drawing model twice—once from the Default model of the alignment file, and the other from the Default-3D model of the alignment file (created via activating the terrain in the Default model of the alignment file). See below for an illustration of the reference hierarchy in this scenario and notice the duplicate references of the Survey Fieldbook file.

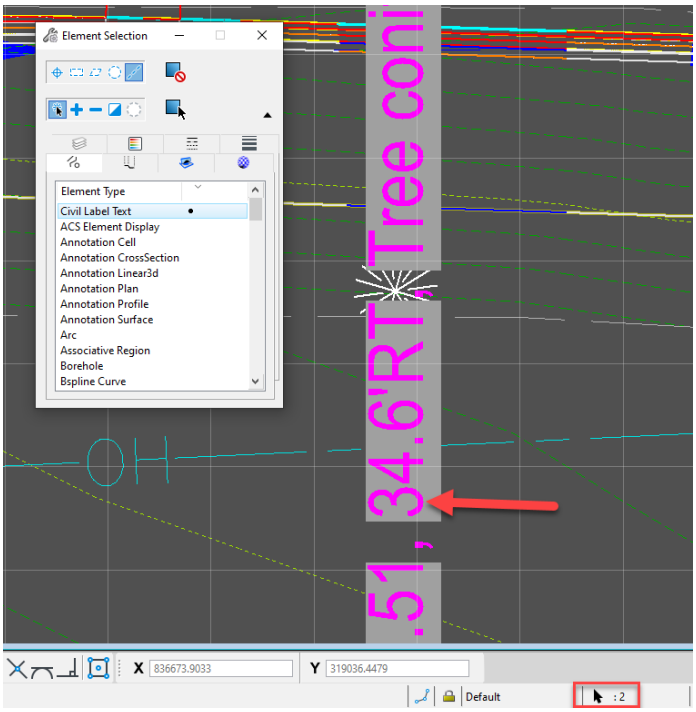


Duplicate References of Survey Fieldbook File

As a result of this scenario, civil labels created from survey features will be duplicated—as there are duplicate survey features in the drawing model. See the example below of a coniferous tree survey feature being selected, and the resulting duplicated civil label that is created.

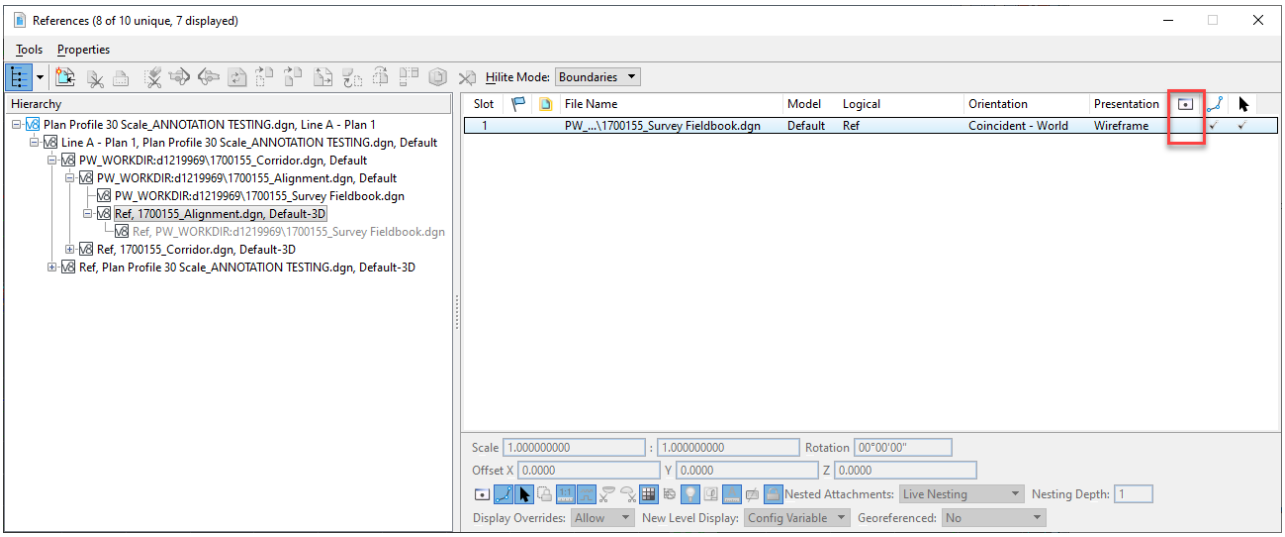


Duplicated Survey Feature



Duplicated Civil Label of Survey Feature

This situation can be addressed in one of two ways. First, it can simply be ignored—and if you have to manually move individual civil labels, you can simply delete the duplicated civil label at that point. Second, if you wish to resolve this situation before you actually create the civil labels, you can go into the References dialog of the drawing model and turn off the display of one of the instances of the Survey Fieldbook reference.

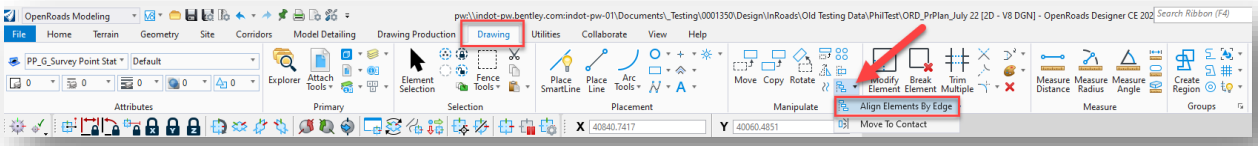


Turning off Display of Duplicated Survey Fieldbook Reference

Then once the display of the duplicate Survey Fieldbook reference is turned off, you can proceed to create civil labels that will not be duplicated.

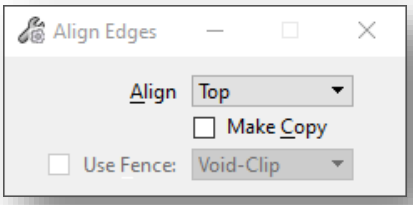
With your civil label annotations placed in the drawing model, you are now ready to align them to the top and bottom of the plan view border. For this example, we will start with the labels to align to the top of the border, and then the ones that align to the bottom.

1. The first step will be to select all the labels corresponding with points/features to the left of the alignment.
2. With the labels selected, select the *Align Elements by Edge* tool, which can be found on the Manipulate section of the Drawing tab in various workflows. You will likely need to click on the dropdown arrow on the bottom right corner of the section to access the tool.



Align Elements by Edge Tool

3. On the Align Edges dialog that appears, set the Align setting to Top.

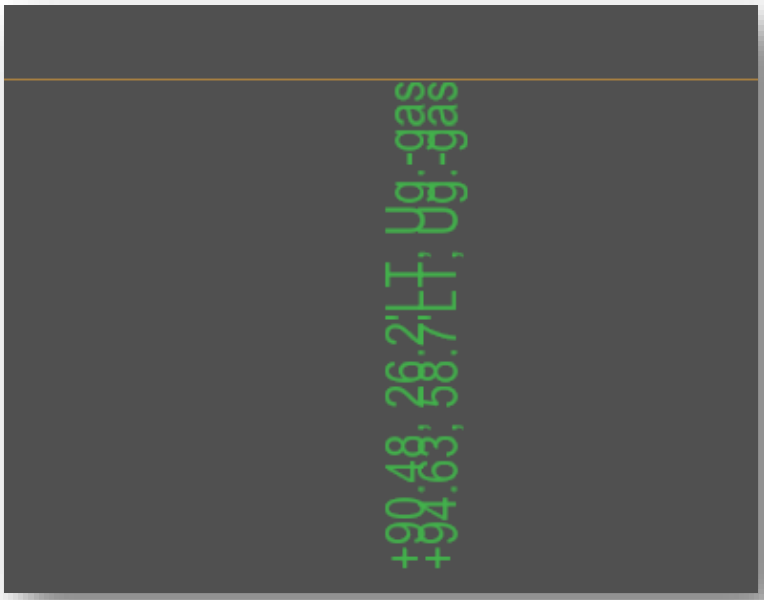


Align Edges Tool – Set Label Alignment to Top

4. You will be prompted to select a base element for alignment. Select the yellow border representing the plan view extents for the sheet.

Select Plan View Border

5. With the plan view border selected you will be given a preview of the realignment of the labels. Once you are satisfied, left click to accept the realignment. The labels will then be aligned to the top of the border.



Aligned Labels to Top of Plan View Border

6. Repeat steps 1 through 5 to align the labels for the features to the right of the alignment to the bottom of the border. The only differences would be to select the labels to the right of the alignment, and then to set the Align setting in the Align Edges tool to Bottom instead of Top.
7. As necessary, you can manually move individual labels around so that they can all be clearly seen.

Survey Feature (Bulk) – Survey Note Label

The purpose of the *Survey Feature (Bulk) – Survey Note Label* is to annotate several survey features at once with just their feature description. The process for placing these labels is virtually the same as for the *Station Offset Label.* The only real difference is that in this case, you do not need to select a baseline alignment to place the labels. All you would need to do is have the features selected and then use the Civil Labeler tool to place the labels.

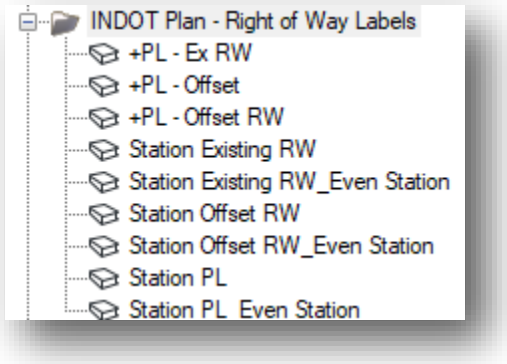
Survey Feature (Individual) – Survey Note Label

The purpose of the *Survey Feature (Individual) – Survey Note Label* is the same as for the bulk version, but just for one-off/individual usage. Note that there is a leader associated with the label for the Individual version, whereas for the Bulk version there is not.

NOTE: As it pertains to the survey feature labels, keep in mind that not all survey features have a note/description that is associated with them. As such, users should investigate the survey elements they wish to label to be sure they have a note associated with them. Hovering over a survey element should show whether it contains a note/description.

4.3-2c INDOT Plan – Right of Way Labels

The INDOT Plan – Right of Way category of labels are configured for the purposes of annotating the station and offset of right-of-way points along a given alignment.



INDOT Plan – Right of Way Labels

4.3-3 Profile Civil Labels

This section will cover the civil labels that can be placed in a profile view of a drawing. In its current form, we have labels configured for begin/end of project and for design information such as the slope for the tangent sections of the profile, and station and elevation of individual points along the profile (PVC/PVT, begin/end of ditches, etc.). Note that for the profile labels that contain stationing, we have provided options for even stationing and standard two decimal accuracy.

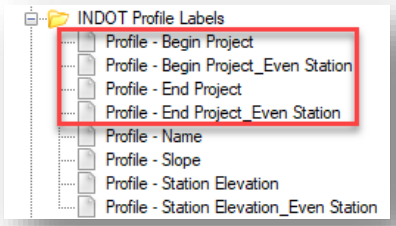
Profile Civil Labels

The remainder of this section will provide a general overview of how to place these labels. Note that prior to placing these labels, it is assumed that you a) have already created the plan sheets that these annotations will go on, and b) you are in a drawing model of a profile view of one of these sheets.

4.3-3a Begin/End Project Labels

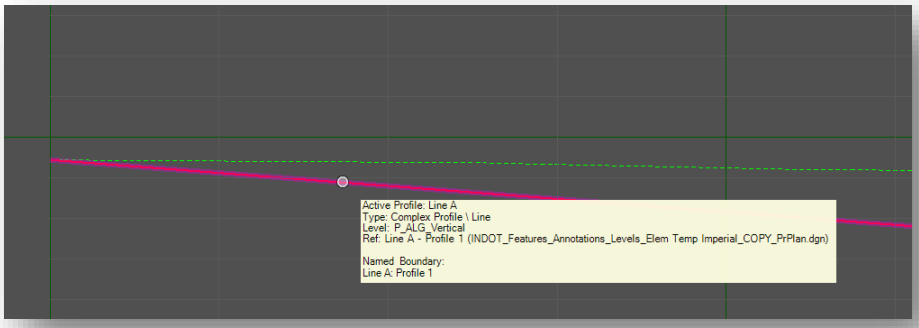
To add Begin/End Project labels to the mainline profile, perform the following steps:

1. Open the Civil Labeler Tool and navigate to *Civil Labels > INDOT Profile Labels* and select one of the Begin or End project options.



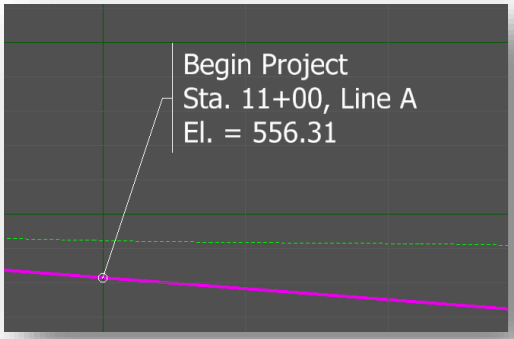
Profile – Begin (or End) Project Label

2. Click the Place button in the Civil Labeler Tool.
3. You will be asked to identify the baseline alignment—which in this example is the mainline profile.



Selecting Baseline Alignment

4. You will then be asked to select a point on the baseline alignment to place the Begin/End Project Label. Proceed to select the desired point on your profile.
5. Once the desired point is selected, the placeholder for the label will appear, and will allow you to place it as desired in conjunction with a leader. When you are satisfied with the location of the label, left click to accept the placement.



Begin Project Label

4.3-3b Labeling Design Information on Profiles

There are various aspects of a profile design that can be annotated with a civil label. For the purposes of this document, we will cover two use cases: *Profile – Station Elevation* and *Profile Slope*.

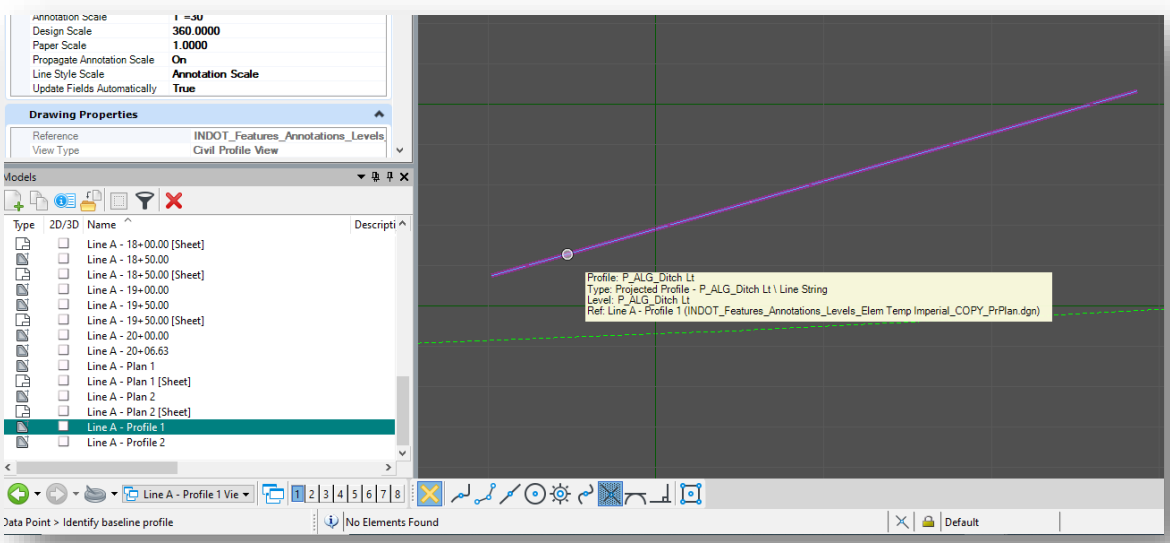
Profile – Station Elevation Labels

The *Profile-Station Elevation* label can be used to annotate the station and elevation of any desired point on a profile. Note that we also have a companion *Profile – Station Elevation – Even Stations* label for use when the station of the point you wish to annotate is on an even station—whereas the other label has two decimal places for the stationing. The following example will show how to annotate the station and elevation of a point on a secondary ditch profile.

1. Open the Civil Labeler Tool and navigate to *Civil Labels > INDOT Profile Labels > Profile – Station Elevation*.

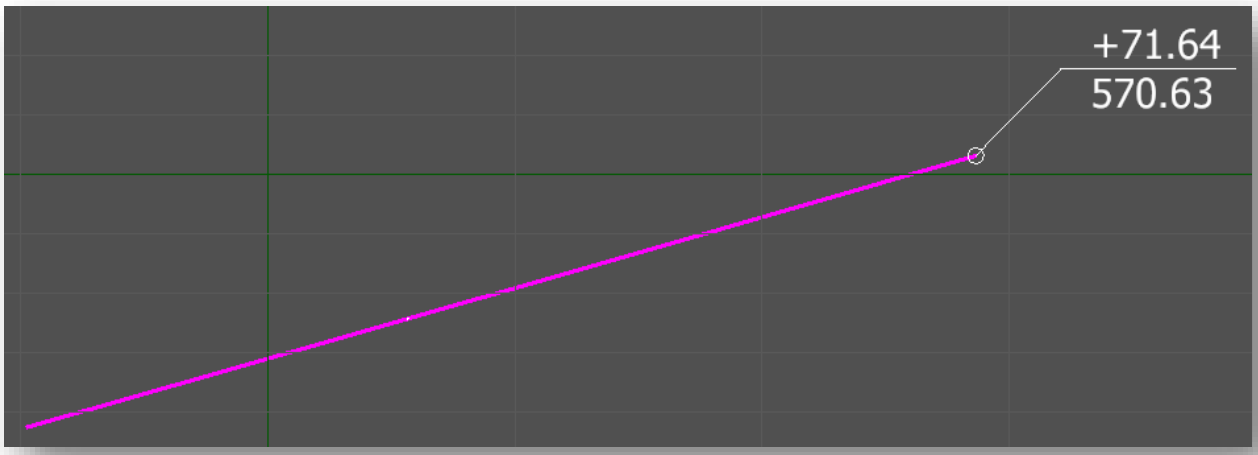
Profile – Station Elevation Label

2. Click the Place button in the Civil Labeler Tool.
3. You will be asked to identify a baseline profile, which in this case will be a ditch profile.



Selecting Baseline Profile

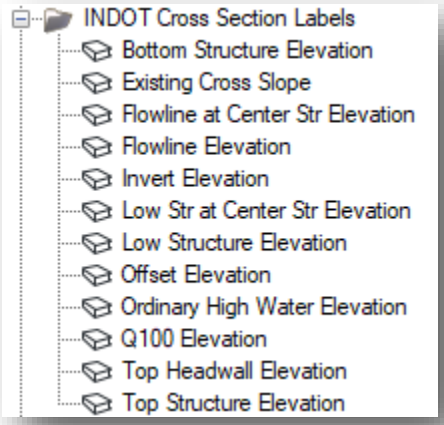
4. You will then be asked to select a point on the baseline profile you wish to annotate. Proceed to select the point.
5. Once the desired point is selected, the placeholder for the label will appear, and will allow you to place it as desired in conjunction with a leader. When you are satisfied with the location of the label, left click to accept the placement.



Profile – Station Elevation Label

4.3-4 Cross Section Civil Labels

This section will cover the civil labels that can be placed on cross section sheets. As it stands at the present time, we have civil labels configured for annotating various structure-related points (Bottom Structure, Top Structure, Invert, etc.), as well as hydraulics-related points (flowline). Future labels will likely be created per user request and feedback.

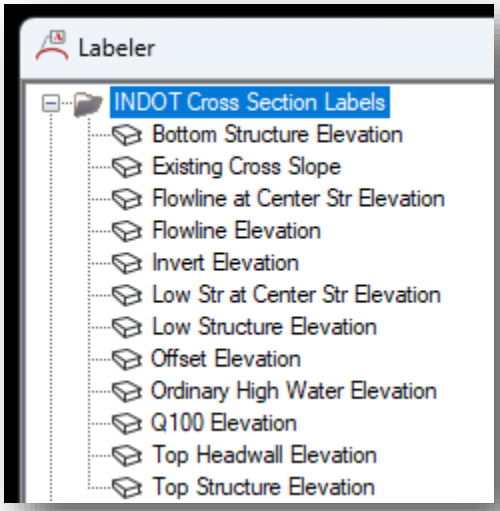


Cross Section Civil Labels

The remainder of this section will cover how to place a civil label in a cross section drawing model. Note that prior to placing these labels, it is assumed that you a) have already created the cross section sheets that these annotations will go on, and b) you are in a drawing model of one of these cross sections.

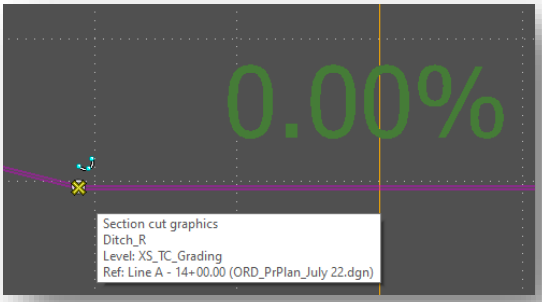
In the following example, we will place a standard offset-elevation label at a ditch bottom point.

1. With the cross section drawing model open, open the Civil Labeler Tool and navigate to *Civil Labels > INDOT Cross Section Labels > Offset Elevation*.



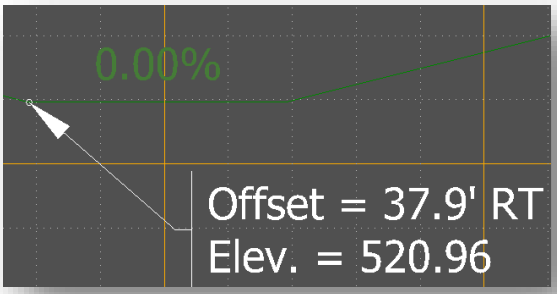
Offset Elevation Civil Label

2. Click the Place button to begin the placement of the label.
3. You will first be asked to select an offset element. In this case, you will select the ditch bottom point.



Selecting Ditch Bottom Point

4. A preview of the label will appear and will allow you to move it to a desired location. Once you find a desired location for the label, data point/left-click to accept.



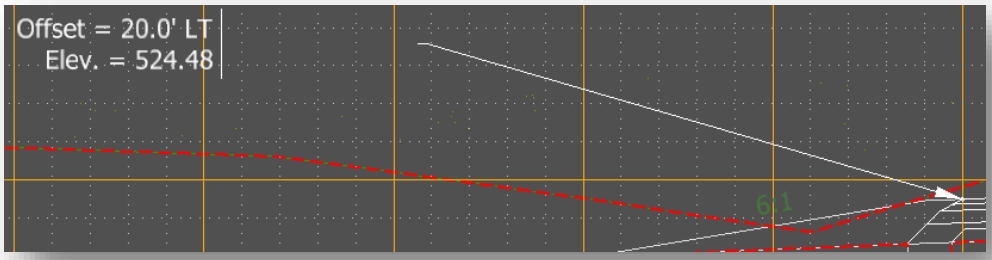
Placed Offset Elevation Civil Label

4.3-5 Known Issues with Civil Labeler

CAD Support is currently aware of a few issues that users may encounter when placing civil labels. This section will cover these issues and—when applicable—how to address them.

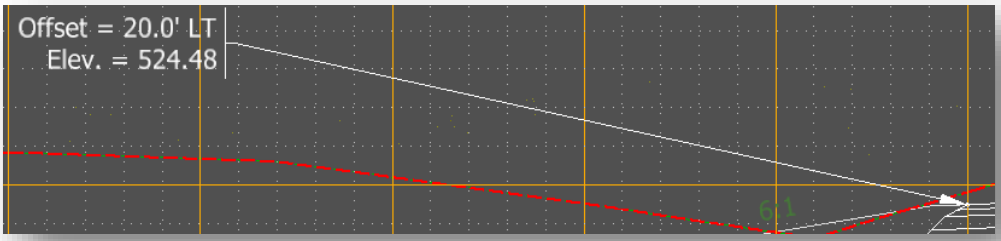
4.3-5a Detached Frame from Leader

There may be times when the text frame of the civil label becomes detached from the leader. See example below.



Detached Frame from Leader

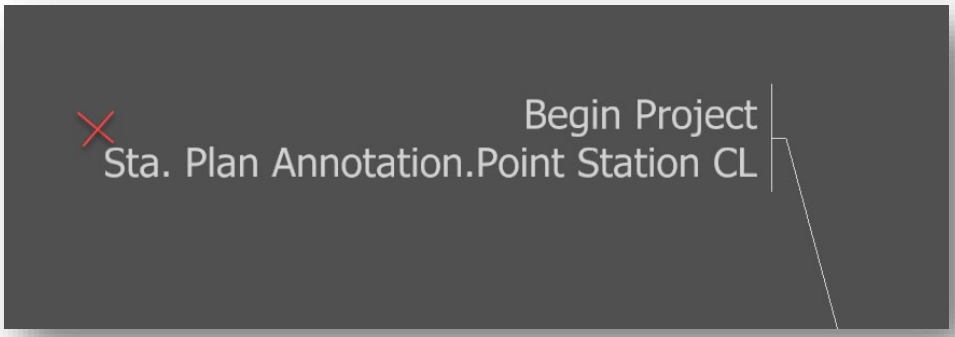
One known example of when this can occur is using civil labels on cross sections where the text is placed to the left of the leader (as shown above). To fix this, simply select the text frame of the label and drag it slightly to a new location—which will snap the leader into the proper place.



Reattached Frame to Leader

4.3-5b Shifting Leader when Placing Label to the Left

Before confirming the placement of a label to the left, the reference point of placement of the text frame is on the left side of the placeholder text as denoted with an "X" in the screen capture below.



Label Preview Before Confirming Placement

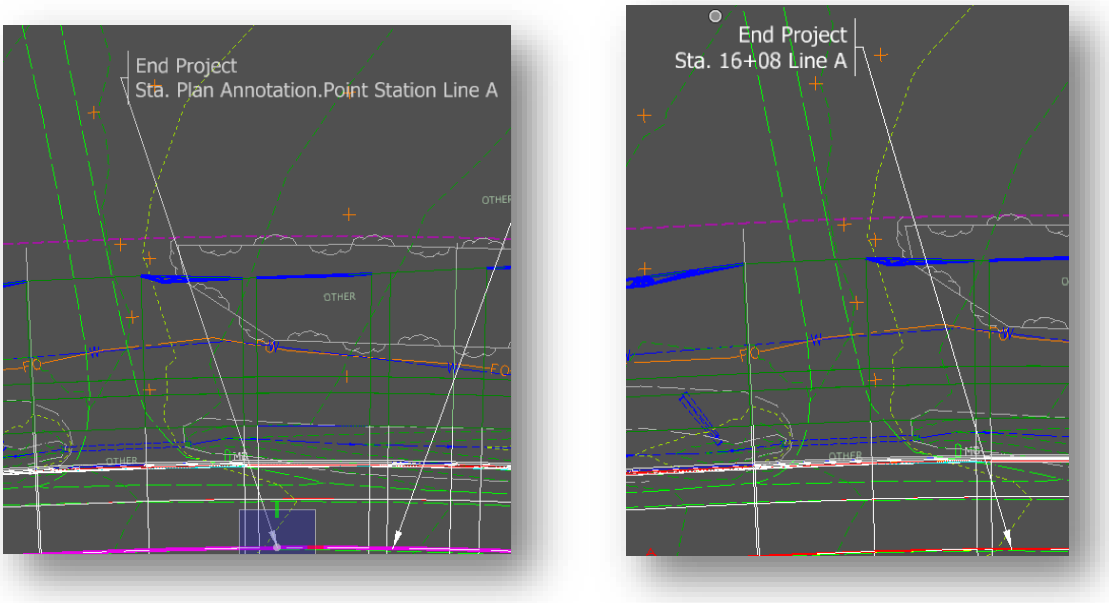
However, upon confirming the reference point to place the label, the text frame adjusts its length to fit the actual length of the text it contains. In so doing, the leader ends up shifting over to the left to make up for this length adjustment. See the example below with the same label once its placement was confirmed. The "X" shown is in the exact same location as shown in the previous screen capture.

Label After Confirming Placement

Note how the leader component of the label has shifted over to the left upon confirming the label placement. This is not desired behavior, and CAD Support has made Bentley aware of the issue.

4.3-5c Placeholder Label Showing Incorrect Orientation

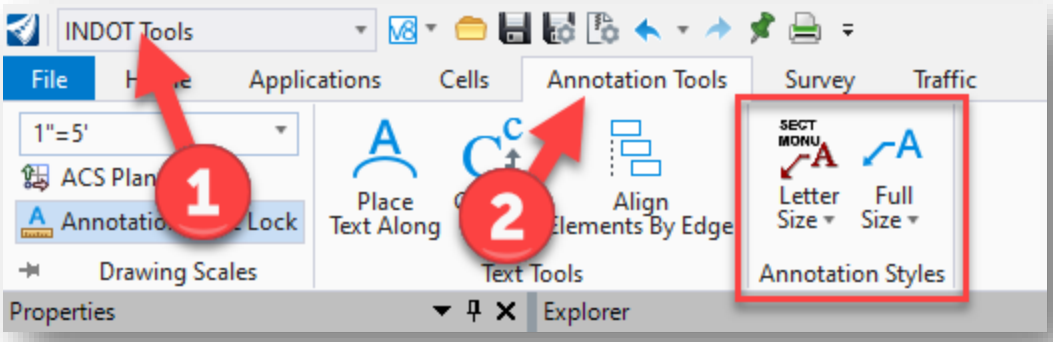
When a placing a label just slightly to the left, the placeholder label that appears will display an inaccurate orientation. However, once placement is confirmed, the label text and leader should correct themselves automatically. See below for a before and after example scenario.



Before and After Confirming Placement of Civil Label

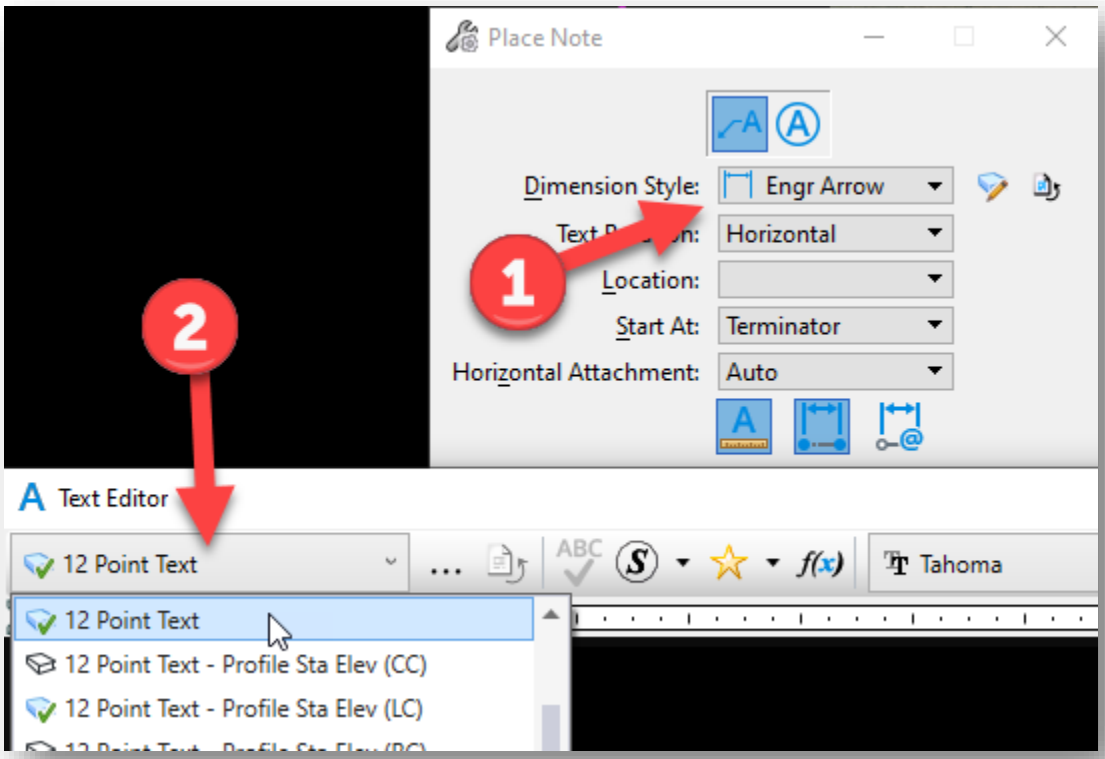
4.4 The Place Note Tool

For a number of annotations, the usage of the previously mentioned tools may not be necessary. For these processes, a number of legacy Place Note options can be found on the *Annotation Tools* tab in the *INDOT Tools* workflow:



The benefit of these tools is that they are pre-configured to place the notes on the appropriate level and with the correct dimension and text styles. Please note that these are legacy tools and if they need updated, INDOT CAD Support should be contacted to make appropriate adjustments.

Note: There is currently an outstanding bug with the Place Note tool. If you do not use the pre-configured notes referenced above and instead use the Place Note tool directly, you will experience an issue where selecting your dimension style does not set the appropriate associated text style. To alleviate this issue, the appropriate text style must be manually selected from the Text Editor as shown below:



Make sure that when switching between dimension styles while using Place Note, you're always ensuring that the correct text style is also selected. This issue only affects the Place Note tool, and not the other Dimension tools. Those tools correctly apply the text style defined in the dimension style.