



# OpenRoads Designer: 200 Working with ORD Survey Files

## Survey Basemaps

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Survey mapping processed with the OpenRoads Survey tools is written directly to a MicroStation design file without the use of any external databases. This “field book” (**FB**) design file is in the following folder within the ODOT WorkSet folder structure:

```
..\PID\300-Survey\Basemaps\
```

The Survey information is processed in a 3D design file. Designers will work in 2D files and will attach the 3D survey information as a reference attachment.

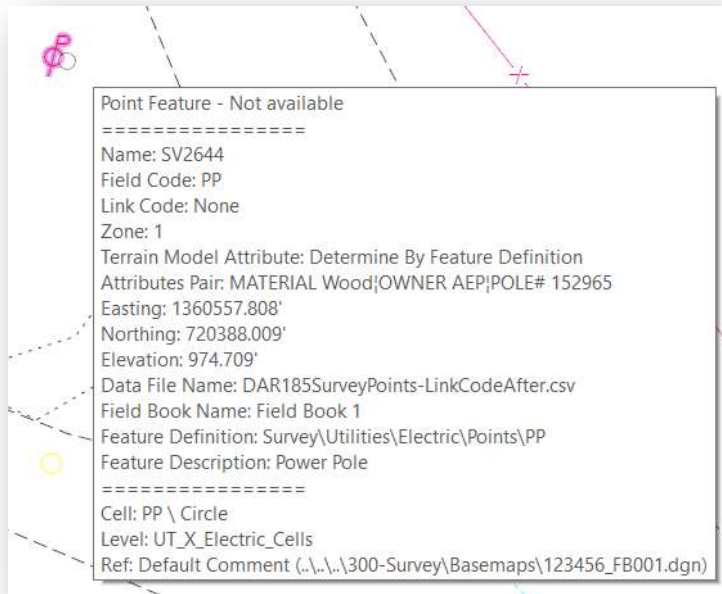
An existing ground terrain model is typically generated from the survey information. The terrain model is typically contained in the **FB** design file in cases where the terrain is comprised of only the ground survey information. In cases where the survey information is combined with other terrain data, such as LiDAR data, the combined terrain model is usually stored in a separate design file using the “**FD**” two-character code in the file name. Contact the survey personnel for clarification on which design file contains the terrain model that is to be used for the project, particularly in cases where a complex terrain model is generated from multiple sources in a separate **FD** design file.

## Survey Data Integrity

Protecting the integrity of the survey information has always been a concern for ODOT’s Survey personnel. The accuracy of the Survey information is the responsibility of the surveyor and therefore the original survey information should not be edited by design personnel. ***Under no circumstances should design personnel edit the survey data contained in the Survey field book FB design file.*** If changes need to be made to the survey files, these changes should be coordinated with the originator of the survey data.

## Survey Point Features

When survey data is processed, each field shot is stored as a **Point Feature** in a **Field Book** within the survey field book FB design file. For example, the field code “PP” is used to designate a power pole. When the survey data is processed, the power pole code is plotted in the design file using an ODOT standard cell element as shown below:



When the survey field book is attached as a reference, the data for an individual point can be reviewed as follows:

From the **Home** tab, choose the **Element Selection** command. Float the cursor over a referenced survey point and allow the cursor to rest over the element.

A pop-up dialog will appear showing the survey information for the point as shown at left.

With the December 2020 update to the OHDOT CADD Standards, macros have been added to annotate points like GEOPAK Survey. An example of the annotation placed by OHDOT Geometry Points VBA Macro for a point is shown below.



These annotations are placed as text elements in the file on the levels listed below.

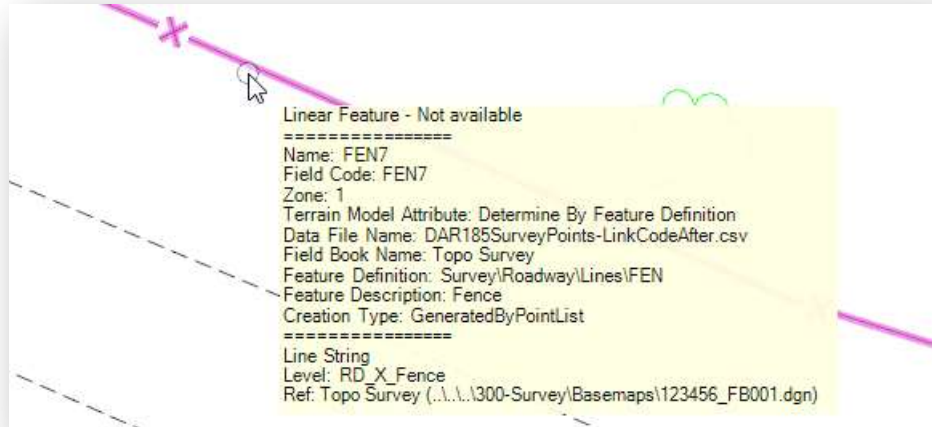
| Annotation      | MicroStation Level  |
|-----------------|---------------------|
| Point Name      | SV_X_Text_Name      |
| Point Elevation | SV_X_Text_Elevation |
| Field Code      | SV_X_Text_Comment   |

The display size of the annotations is based on the **Annotation Scale** parameter.



## Linear Features

A series of survey points representing curvilinear features can be connected as a **Linear Feature** as shown in the example below.



With the **Element Selection** tool active, floating your cursor over the referenced linear feature will open a pop-up menu with information about the feature line as shown in the example above.

## Field Attributes

Many of the ODOT field codes allow for the use of attributes to store additional information with a specific survey shot. For example, the feature code “PP”, used to specify a Power Pole, has the following attributes:

- Material
- Owner
- Pole#

The attributes may or may not be plotted in the file depending on whether the survey personnel have elected to annotate the model. Annotations are not automatically placed in the design file as they were with previous software.



In the example at left, the annotation is placed in the file on the level SV\_X\_Text. These annotations are intended for information only. See the [Annotating Survey Elements](#) section for more information.

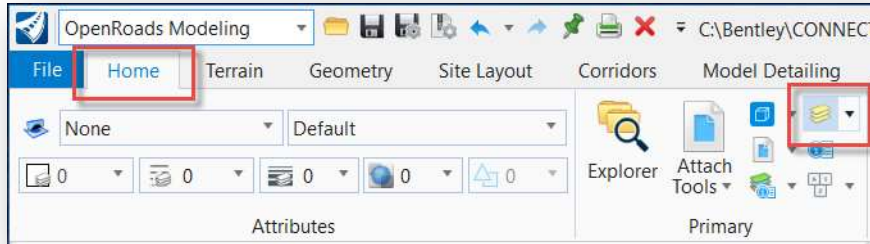
Attributes can also be reviewed in the pop-up dialog that is displayed when floating the cursor over a point as described on the previous page.



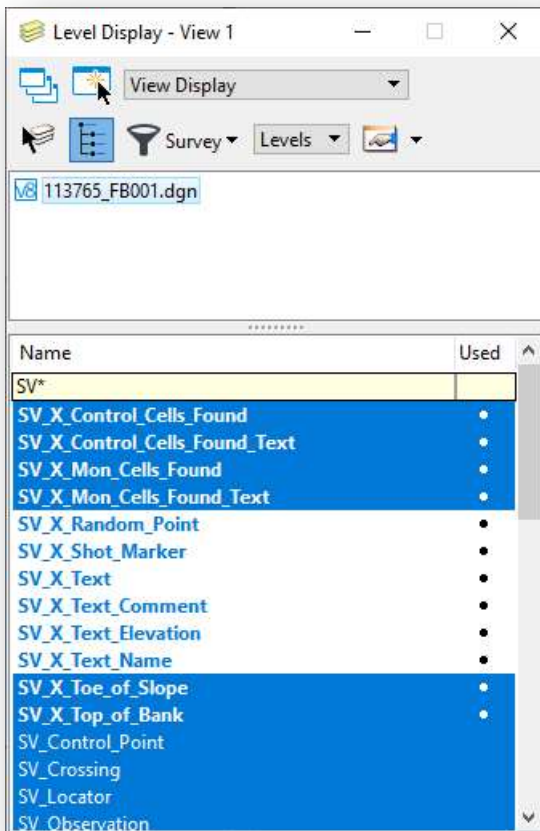
## Design File Levels for Survey Data

The OHDOT CADD Standards include several MicroStation levels that are specific to survey information. These levels are grouped in the level library using the prefix “SV”.

The levels can be turned on/off using the **Level Display** dialog. The **Level Display** dialog can be opened in all the various **Workflows** by selecting icon in the **Primary** group of the **Home** tab as shown below.



The **Level Display** dialog includes the ability to filter the dialog to only show specific levels. By selecting the Survey filter, the dialog will show only the survey levels.



The following levels are typically not shown on the plan and should normally be turned off after the survey basemap has been attached as a reference.

- PV\_X\_COP (center of pavement)
- SV\_X\_Break\_Lines
- SV\_X\_Random\_Point
- SV\_X\_Shot\_Marker
- SV\_X\_Text\_Comment
- SV\_X\_Text\_Elevation
- SV\_X\_Text\_Name
- SV\_X\_Text



## Annotating Survey Elements

Annotation for Survey elements is not automatically placed in the FB design file when the survey data is processed as is was in PowerGEOPAK.

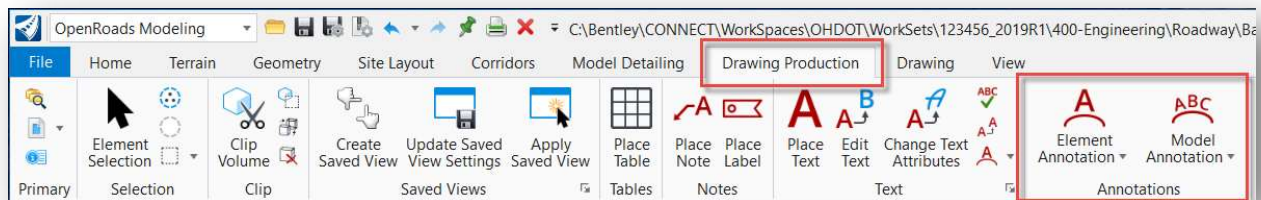
Survey elements can be annotated in the Field Book (FB) design file by the surveyor, or in any file that the FB design file is attached as a reference.

In the example below, the attributes for the building were entered by the surveyor as the data was collected in the field.



The **Feature Definition** assigned to the element controls how each Survey item is annotated. The annotation is also depended on whether the surveyor entered any attribute data in the field as the survey data is collected.

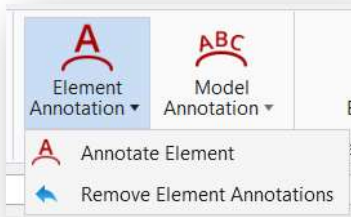
Annotation is placed in the active model by selecting an individual element, by a selection set, or for all the civil elements in the active mode by use of the annotation commands shown below:



An example of the annotation that is placed for a building using the **Element Annotation** command is shown below.



Annotations can be removed by manually deleting the text, or by use of the **Remove Element Annotation** or the **Remove Model Annotations** command.







## Geographic Coordinate Systems

A Geographic Coordinate System (GCS) is used to define the position of the survey and design information on the Earth's surface. Once the position of the data has been established, the design can be easily coordinated with other data for which the geographic location is known such as Google Earth, Bing Maps, Geo-Referenced Imagery, or GIS systems.

Defining the Geographic Coordinate System is a requirement of the OHDOT CADD Standards. See the **OHDOT CADD Standards Manual, Section 305** for more information.

A library of predefined GCS is available in ORD. Optionally, a custom GCS can be defined for projects that have been mapped to ground coordinates, if required.

The process to create a custom GCS for Grid-to-Ground conversions is the responsibility of ODOT's Survey personnel and is not covered in this manual. This manual will cover the basics to review the GCS and create new design files using the same GCS that has been defined by the Survey personnel.

**Note: The purpose of the GCS is to define the location of the data on the earth's surface. ODOT does not recommend changing the GCS to re-project the data.**

### WorkSet Seed Files and Geographic Coordinate Systems

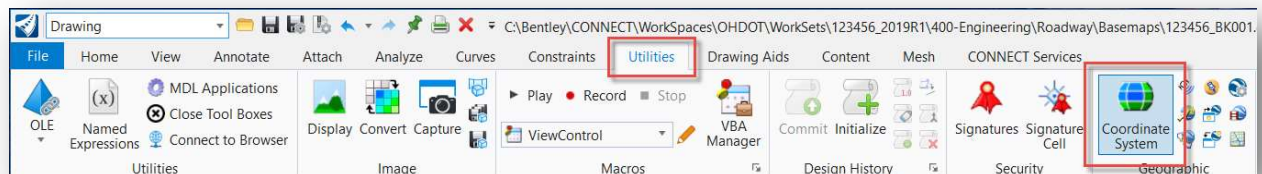
A seed file is an empty MicroStation design file that has been configured to meet ODOT requirements. The seed file is used as a template when new design files are created. The seed file selected by the user is copied and renamed to create the new file.

When a new project is created, 2D and 3D seed files are copied from the CADD Standards folder to the project's **990-WorkSetStandards\seed\** folder. If necessary, the WorkSet seed files can then be modified by the survey personnel to define a custom GCS definition that is used to facilitate Grid-to-Ground projection.

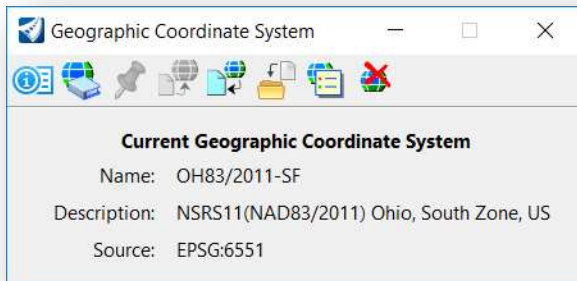
It is the responsibility of the Surveyor to define the appropriate GCS for the project data. As the designer for the project, it is your responsibility to ensure that all new design files created for the project use the same GCS as defined by the Surveyor.

### Reviewing/Selecting the GCS Definition

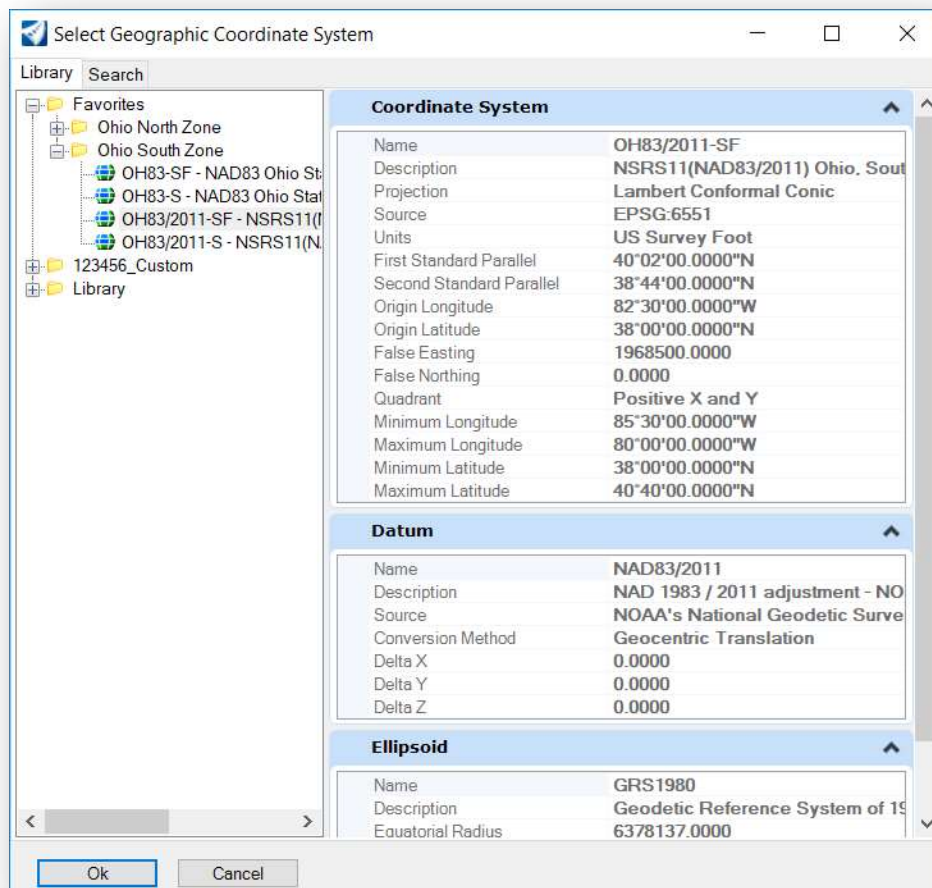
The GCS can be reviewed by selecting the **Drawing WorkFlow, Utilities > Coordinate System** as shown below.



The **Geographic Coordinate System** dialog shown below is opened.



To choose a GCS from the library, select the second icon, **From Library**. The **Select Geographic Coordinate System** dialog shown below is opened.



The OHDOT workspace defines the State Plane coordinate systems typically used on ODOT projects in the **Favorites** folder as shown above. Choose the appropriate GCS from the list. A different GCS can be selected by browsing the Library folder. The GCS definitions for Ohio shown below are available by selecting **Library > Projected (northing, easting) > North America > United States of America > Ohio**.

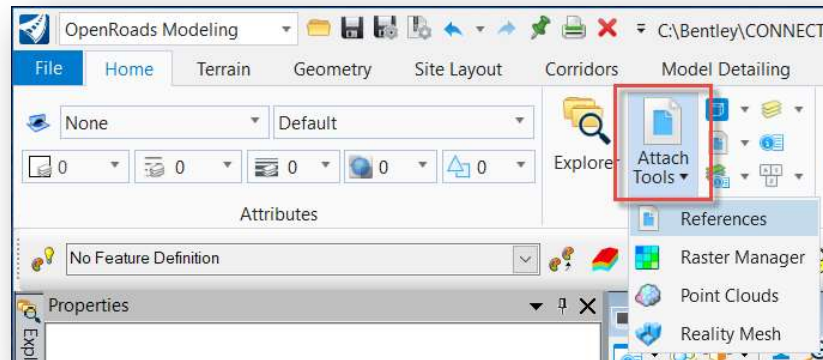
When a GCS is initially selected, you are simply telling MicroStation where the data resides. It is important to note that choosing a GCS when one has not been previously defined does not re-project existing data in the design file to the selected GCS. The data is only re-projected when changing from one GCS to another.



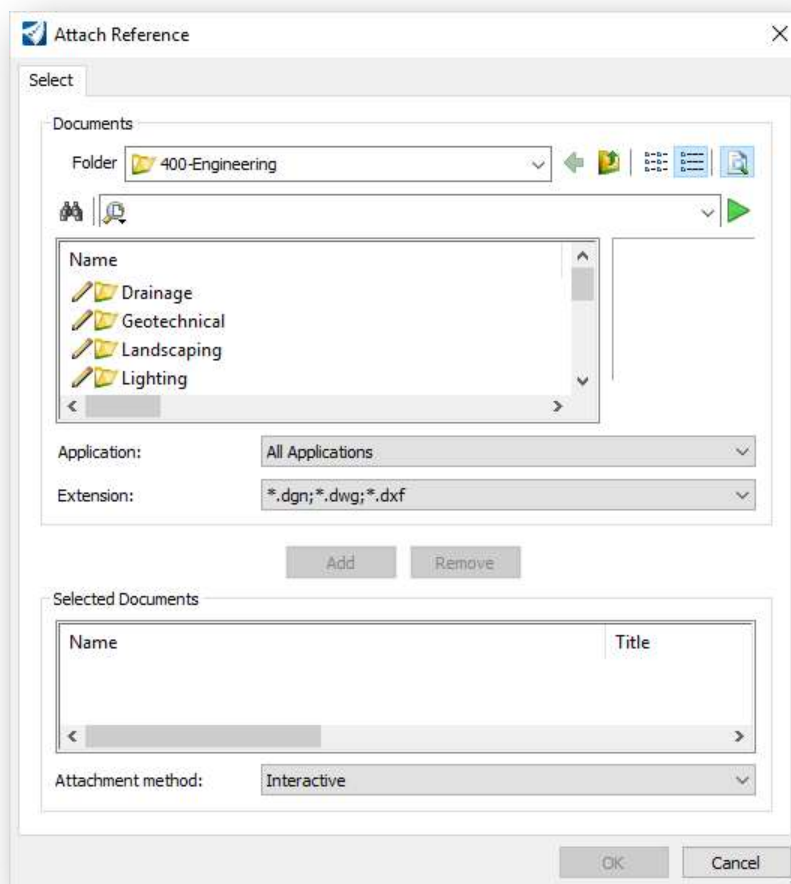


## Reference Attachments

References are used to display the contents of another DGN file within the current ORD model. The **Home** tab in each WorkFlow contains the reference tools as shown below.



When attaching references in ProjectWise, the **Attach Reference** dialog shown below is opened.



The **Attachment Method** can be specified at the bottom of the dialog. If one of the methods is selected, the attachment is made without accessing the normal MicroStation dialog.

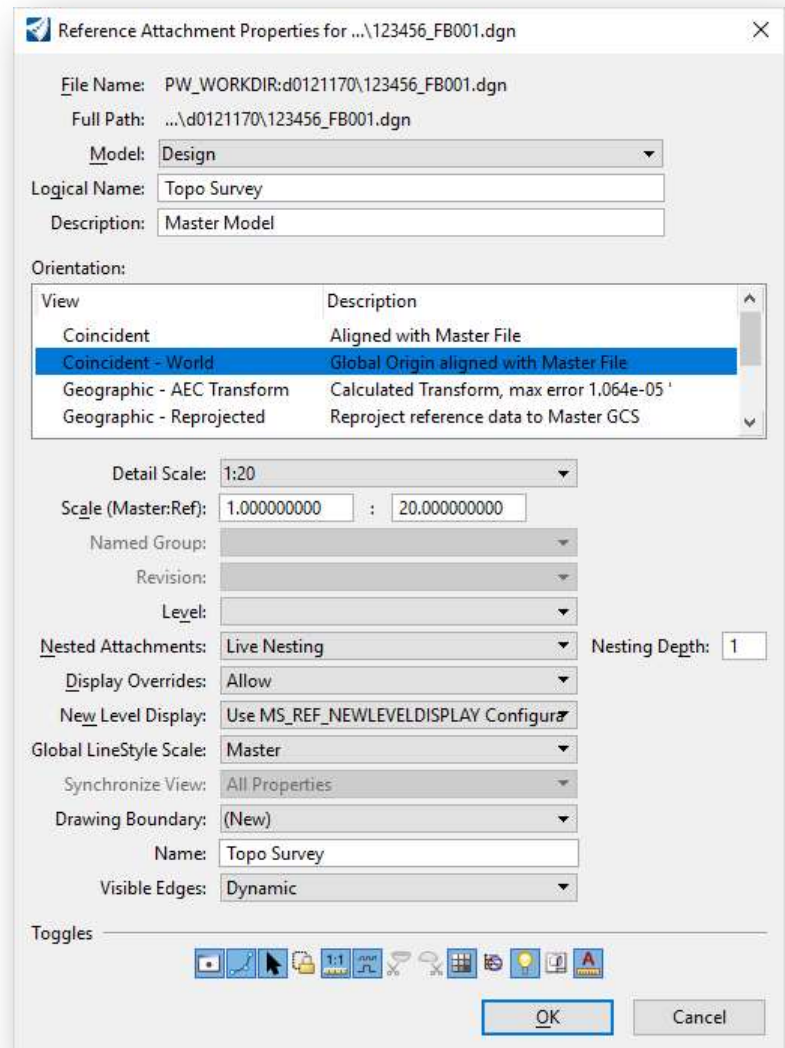
Browse to the file to be attached. Choose the Interactive method to access the MicroStation **Reference Attachment Properties** dialog, shown below, when the **OK** button is selected.



The various options available on the **Reference Attachment Properties** dialog are not covered in this manual. See the online help for more information.

When attaching the survey design file, the **Coincident - World** option is typically used since all the files in the project should be using the same GCS.

- Choose the **Geographic - Reprojected** option to re-project the referenced model to the coordinate system that is defined in the active model if the file being referenced uses a different GCS definition.
- If a GCS is not defined, choose the **Coincident - World** option.



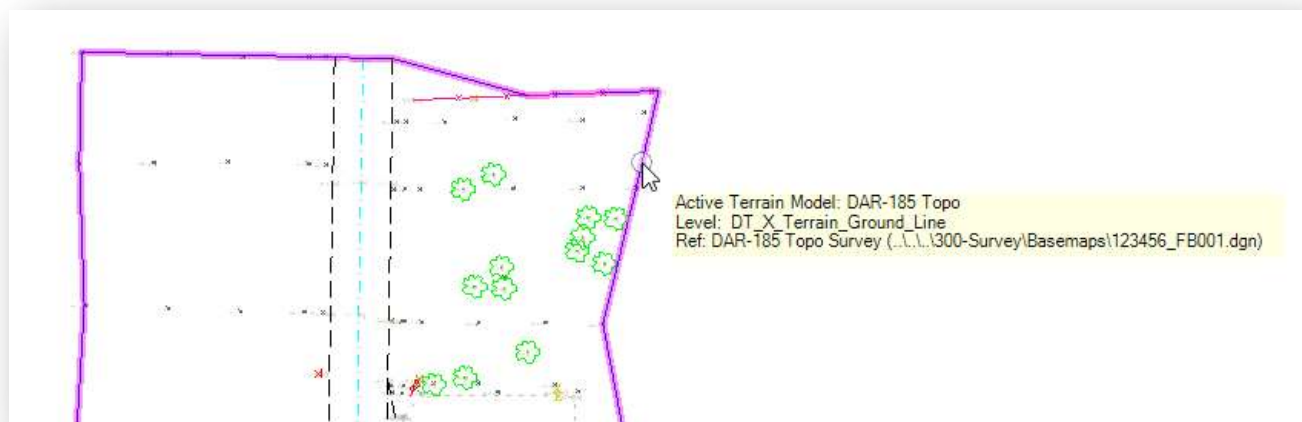


## Terrain Models

Terrain models generated by OpenRoads Survey are stored in a design file as a Terrain Model element type.

The terrain model can be accessed by design personnel by attaching the survey Field Book (FB) design file as a reference attachment. Depending on the project, the terrain model may be created in a separate Field Terrain design file (FD). Contact the survey personnel for clarification on which design file contains the terrain model that is to be used for the project, particularly in cases where a complex terrain model is generated from multiple sources and an FD file is used.

In the example below, the active file is **123456\_BK001.dgn**. The terrain model is contained in the file **123456\_FB001.dgn** which has been attached as a reference file.



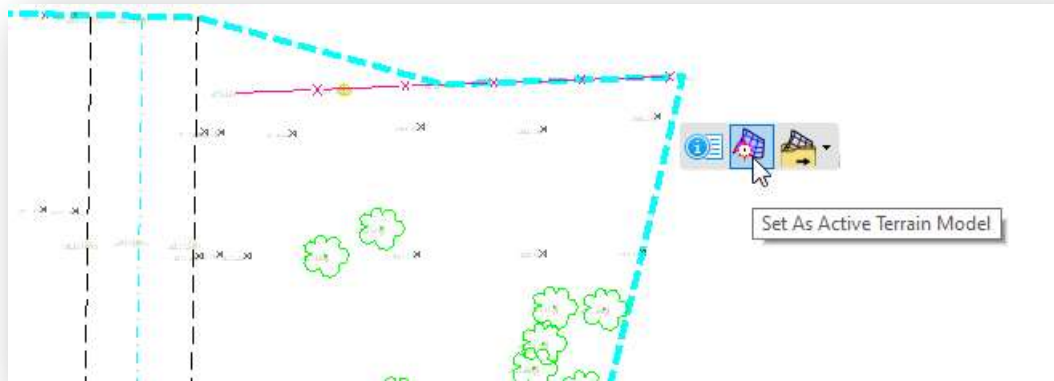
### Defining the Active Terrain

After attaching the design file containing the terrain model element, it is a best practice to set the ground terrain model as the “Active Terrain”. The active terrain model is used to define the existing ground for profiles and cross sections.

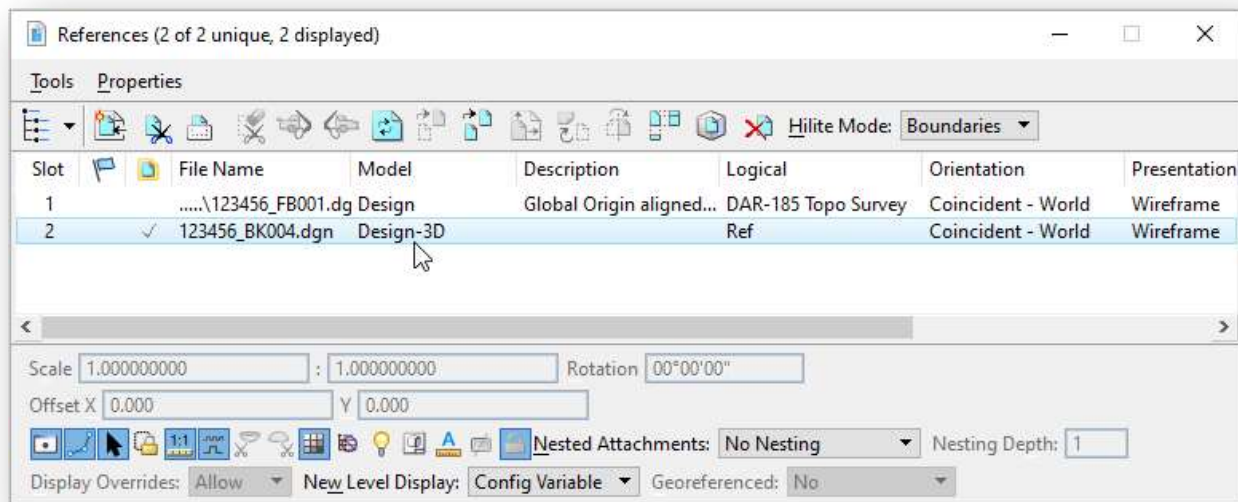
To define the active terrain, from the **Terrain** tab, choose **Active > Set Active**. Select the terrain model when prompted.



The active terrain can also be defined by selecting the **Set As Active Terrain Model** command from the pop-up menu when the terrain is selected using the **Element Selection** tool, as shown below.



When the terrain is activated, the software will automatically create a 3D model in the active design file. This 3D model is attached as a self-reference to the active file as shown below.

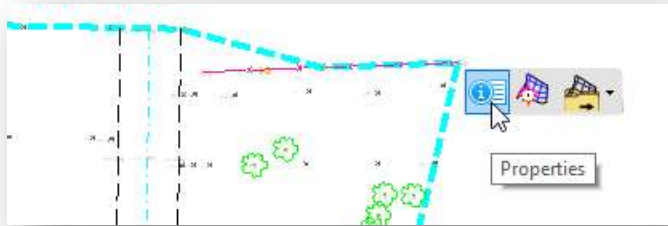


## Terrain Model Display Settings

The display of the terrain model is controlled by the feature definition that is assigned in the design file that contains the terrain element. In the example above, the terrain is displayed using the **X\_Boundary** feature definition.

The terrain display can be defined uniquely for the active file as follows:

- Use the **Element Selection** tool to select the terrain model element.
- Allow the cursor to rest over the terrain element. The menu shown below appears. Choose the **Properties** command.



The properties dialog appears as a pop-up dialog as shown below.

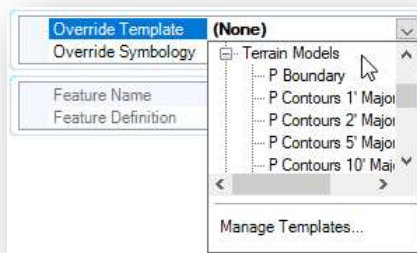
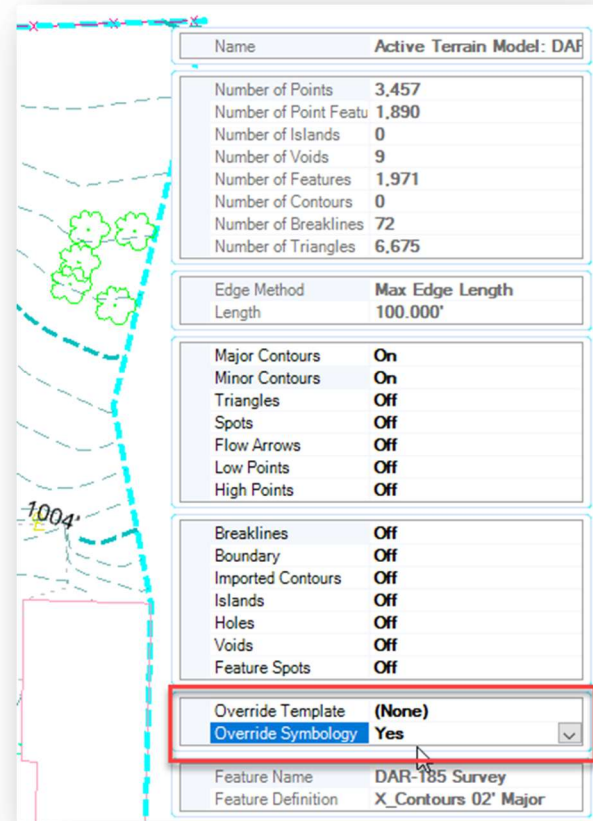
Since the terrain model is contained in a reference attachment, all the fields are ghosted and cannot be edited.

The user may wish to override the assigned feature definition to turn on/off contours and triangles or change the contour interval settings. This is accomplished as follows:

- Set the **Override Symbology** option to **Yes** to allow editing the terrain model properties.

After setting the **Override Symbology** setting to **Yes**, the display of the terrain features can be toggled on/off using the options shown at right for turning on/off contours, triangles, etc. Note that the interval for the contours is controlled by the feature definition assigned to the terrain model, which cannot be edited across references.

The **Override Template** option is used to select a different element template for the terrain display. The OHDOT Standards contain several element templates for terrain display in the **Terrain Models** category, as shown below.

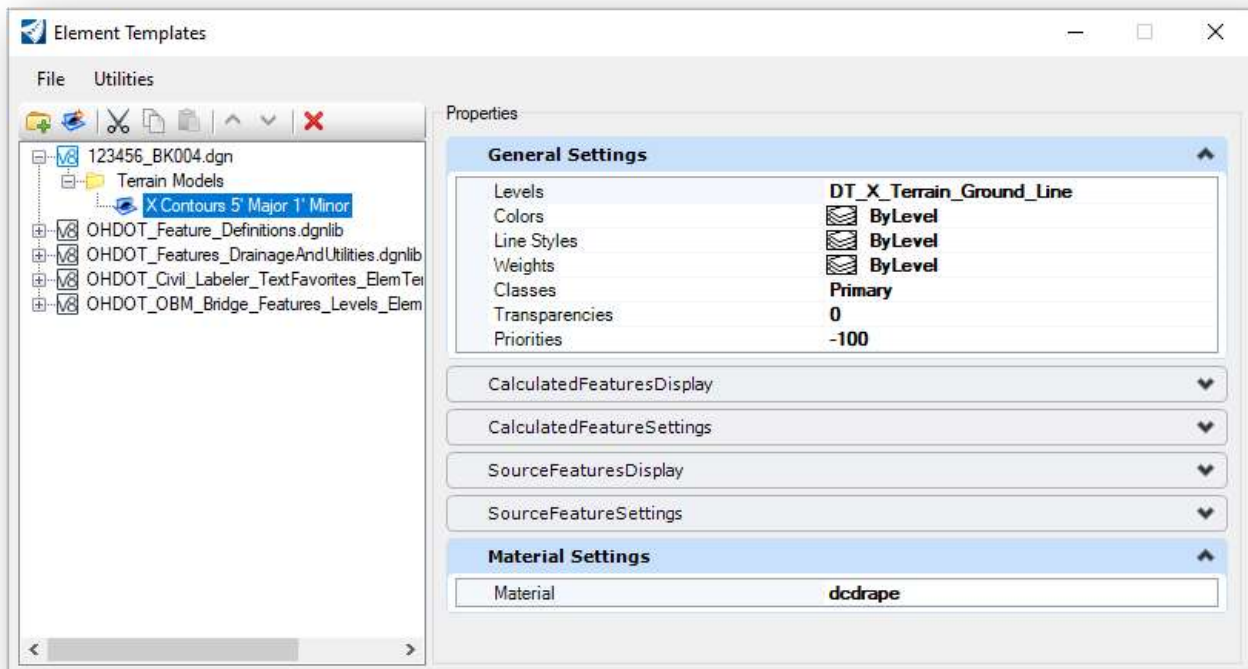






When one of the element templates is selected from the library, the element template definition is copied from the library to the active file. If necessary, the terrain display can be further customized by editing the local copy of the element template, as follows:

- From the **Home** tab, select the **Manage** option from the **Element Template** drop-down list (located in the **Attributes** group). This opens the **Element Templates** dialog.
- The **Element Templates** dialog, shown below, lists any element templates that has been copied into the active file. Expand the active file to access the **Terrain Models** group. The settings for the element template can be edited in this dialog.

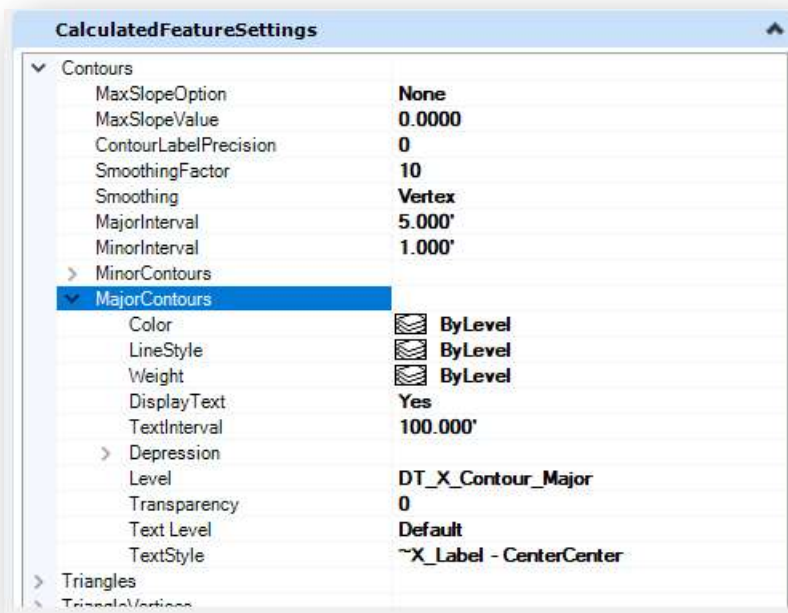


The **General Settings** group controls how the terrain is displayed in the cross sections. These values should not be changed.

The **Calculated Features Display** group allows turning on/off which features (contours, triangles, etc.) are displayed. Note that is the feature display is turned on, the display can also be turned on/off in the **Level Display** dialog.

The **Calculated Features Settings** group contains the settings for contour intervals and symbology settings.





**Note:** The major contour text labels are placed at an interval along the contour line, defined by the **DisplayText** and **TextInterval** parameters. This may result in contour labels falling in locations where they may overlap other elements or annotations. The **Label Terrain Contours** command (**OpenRoads Modeling > Terrain > Labeling**) can be used to annotate the major contour lines at user defined locations in the active file.



## OpenRoads Software Version

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This document was prepared using the following software version:

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

## Contacts

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

[https://odot.formstack.com/forms/cadd\\_servicerequest](https://odot.formstack.com/forms/cadd_servicerequest)

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