Practice Workbook

This workbook is designed for use in Live instructor-led training and for OnDemand self study. OnDemand videos for this course are available through *CONNECT Advisor* and on the *LEARNserver*.

QuickStart for Terrain Display

This course is suitable for the **2020 Release 1 (10.08.00.88)** *version of:*

OpenRoads Designer CONNECT Edition

OpenRail Designer CONNECT Edition

About this Practice Workbook...

- This PDF file includes bookmarks providing an overview of the document. Click on the bookmark to quickly jump to any section in the file.

- Both Imperial and Metric files are included in the dataset. Throughout this practice workbook Imperial values are specified first and the metric values second with the metric values enclosed in square brackets. For example: *12' [3.4m]*

- This course workbook uses the *Training and Examples* workspace delivered with the software.

- The terms *Left-click, Click, Select* and *Data* are used interchangeably to represent pressing the left mouse button. The terms *Right-click* and *Reset* are also used interchangeably. If your mouse buttons are assigned differently, such as for left-handed use, you will need to adjust accordingly.

Have a Question? Need Help?

If you have questions while taking this course, search in *CONNECT Advisor* for related courses and topics. You can also submit questions to the Civil Design Forum on Bentley Communities where peers and Bentley subject matter experts are available to help.

Course Level: **Fundamental**

Course Overview

In this course you will be displaying and annotating the features of an existing terrain model using the properties and terrain tools. You will learn how to work directly in both a 3D terrain model file, and in a 2D referenced file, to display features using default standards, and how to modify the default parameters to change the display. You will also learn how to display a background map and label elevations.
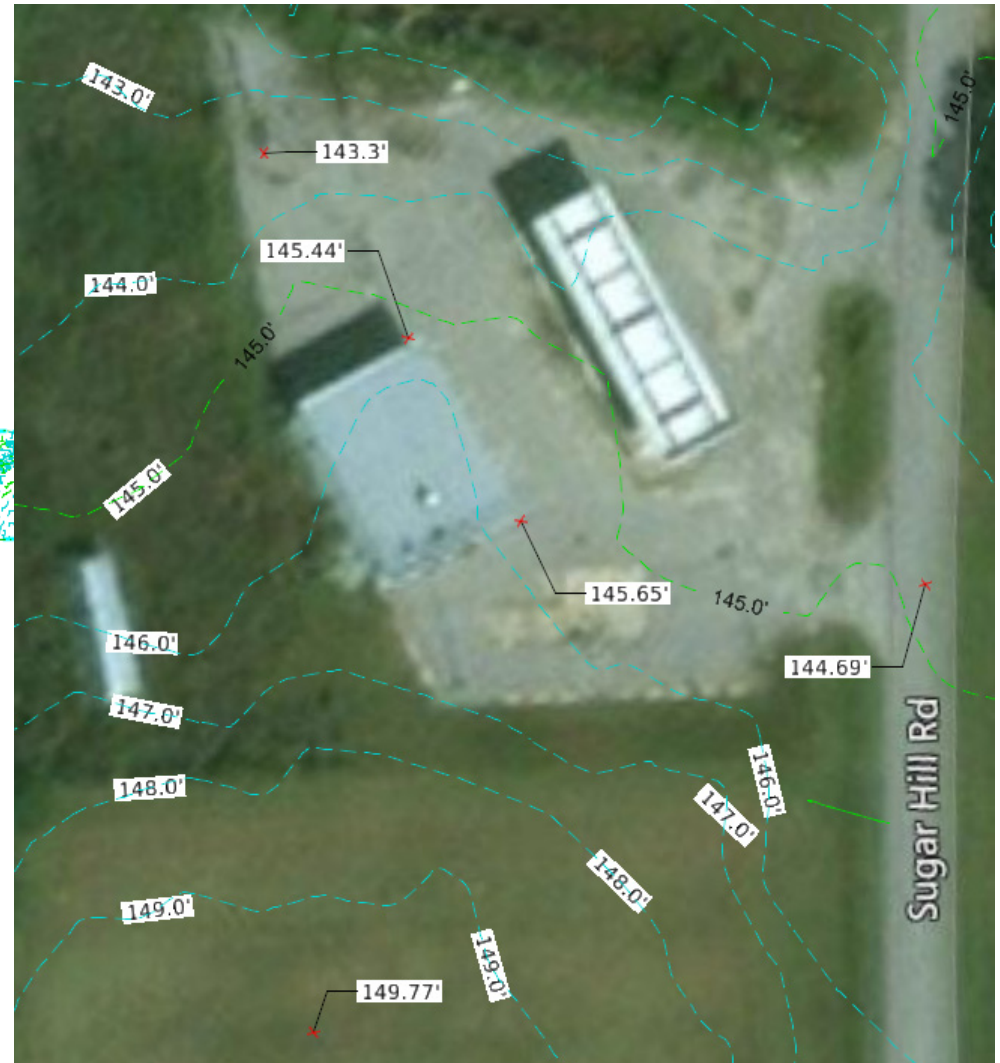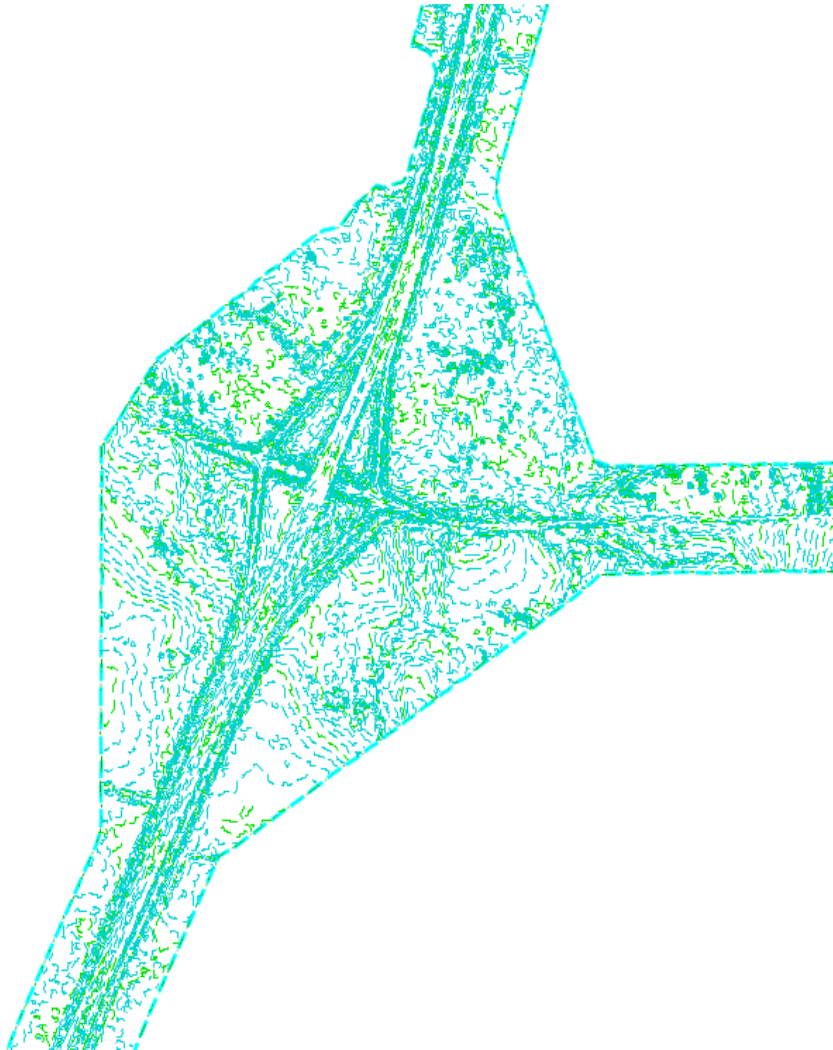
What is a Terrain Model?

A terrain model is a set of triangles mathematically computed from point data collected from the surface being modeled. They are typically used to model highly irregular surfaces, like the surface of the earth. A terrain model is created from 3D features such as points, breaklines, and contours. Terrain models are also referred to as digital terrain models (DTMs), triangulated irregular networks (TINs), or triangulated surfaces.

A terrain model is stored as a 3D mesh element in an OpenRoads/OpenRail Designer 3D design (.dgn) file, similar to what used to be stored in a GEOPAK TIN, InRoads DTM, or MX FIL file. When you select a terrain model in the design file, the Element Selection tool recognizes it as a Terrain Model, and the Properties and Explorer Windows will show it as a Terrain Model Element. The display of a terrain model in the product is controlled by using a Feature Definition and Element Template.

Being an element stored in a 3D design file, terrain models are easily shared and used by anyone using any DGN based application like OpenBuildings Designer (formerly AECOsim Building Designer), OpenPlant Modeler, or MicroStation CONNECT Edition.
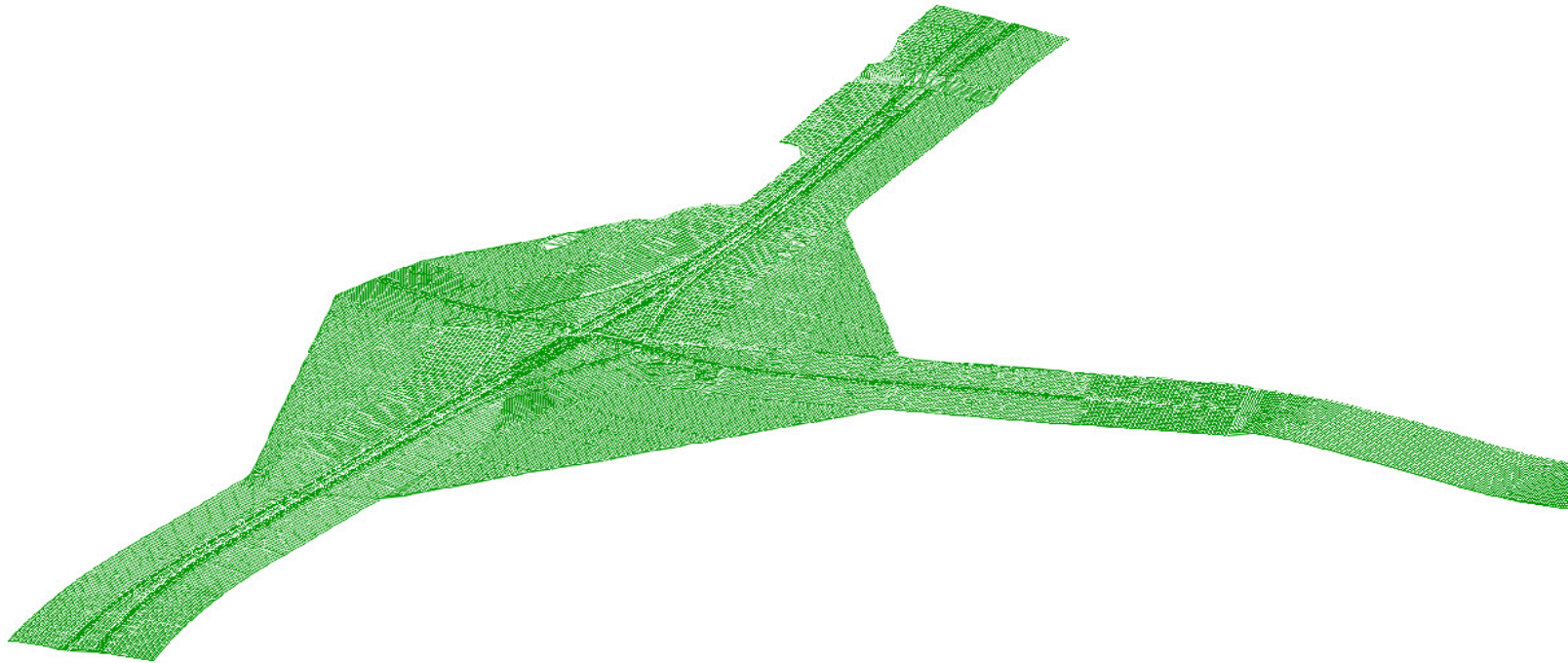
Note: MicroStation is Bentley's base CAD platform (MicroStation DGN Files, *.dgn) that all other Bentley products utilize.

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Exercise 1: Open a Design File and Display Terrain Data

In this exercise, you will learn how to select the proper workspace and workset, open an existing terrain model, review the ribbon interface, display terrain model features and change the default display parameters.

Skills Taught

- Select a workspace and workset

- Open an existing 3D terrain model

- Review the ribbon interface

- Display terrain features including triangles and contours

- Use the quick access menu and properties dialog

- Change default terrain display parameters

- Use Feature Definitions to change displays

Select the WorkSpace & WorkSet and Open a 3D Terrain Model

In this section, you will select the training workspace and workset and open an existing 3D terrain model file.

1. Start the software.

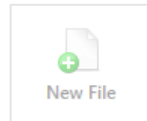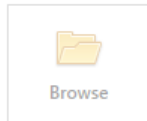2. Set the WorkSpace and WorkSet.

   The WorkSpace and WorkSet define standards that are used by the software. The WorkSpace and WorkSet used for this training are installed during the software installation.

   a. Select **Training and Examples** from the *WorkSpace* menu.

   b. Select **Training-Imperial** *[Training-Metric]* from the *WorkSet* menu.

3. Open the 3D terrain model file.

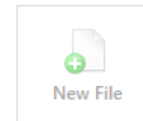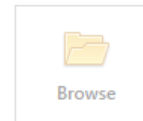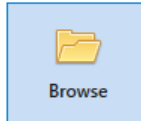a. Select **Browse**.

Training and Examples ▾ Training-Imperial ▾
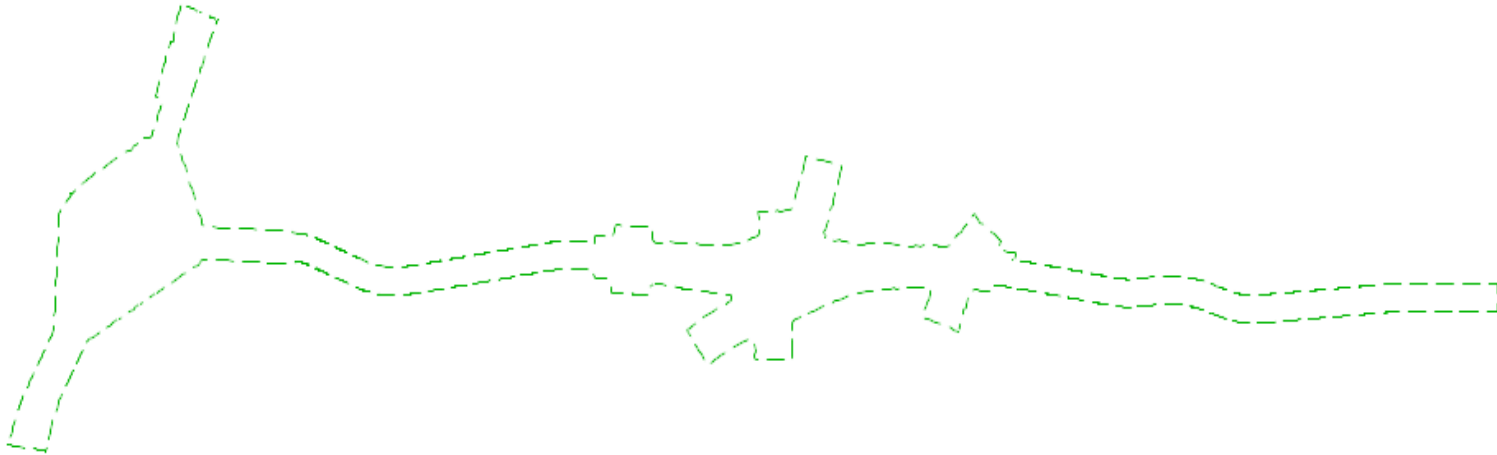
Recent Files

You haven't opened any files recently. To browse for a file, start by clicking on Browse.

Browse   New File

b. Browse to *C:\Bentley Training\QuickStart for Terrain Display* or other folder where you unzipped the dataset files.

c. Select the file named **Terrain_Existing.dgn** *[Metric-Terrain_Existing.dgn]* and select **Open**.

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Review the Interface

In this section, you will review the product interface and become familiar with the location of the commands and tools.

1. Activate the **OpenRoads Modeling** or **OpenRail Modeling** workflow from the pick list in the upper left corner if it is not already active.

The ribbon menu will change to the **OpenRoads Modeling** or **OpenRail Modeling** tools.
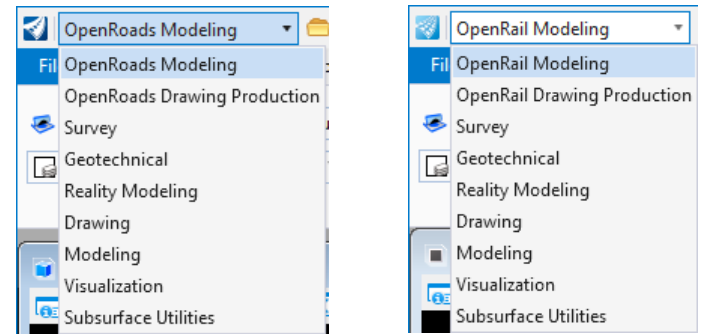
The tools are organized into categories on the *Ribbon tabs*.
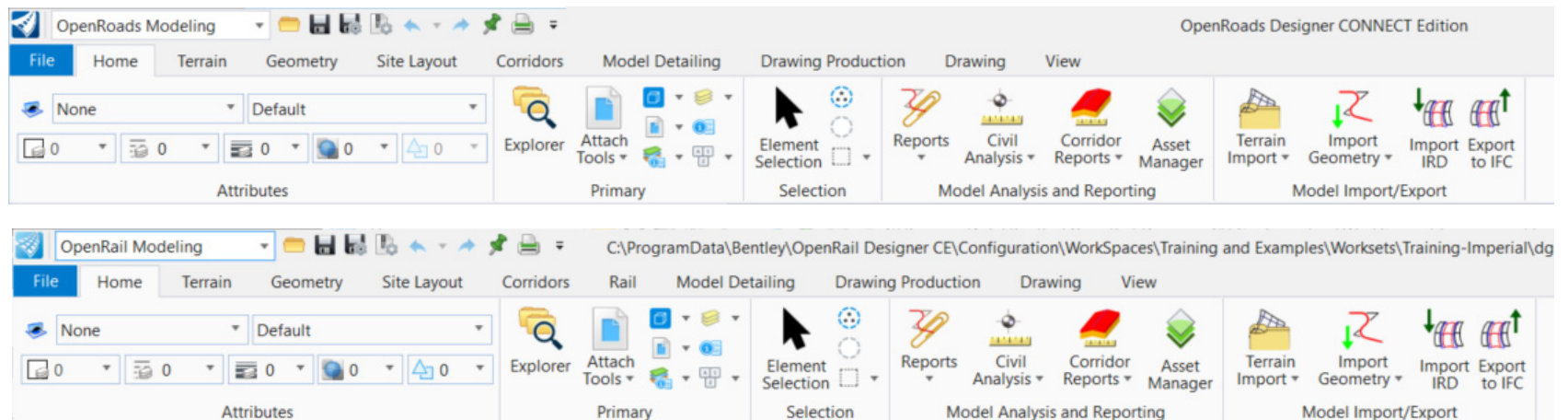
- **Home** - Common tools such as Attributes, Explorer, Attach Reference Tools, Models, Properties, Level Display and Element Selection.

- **Terrain** - Element selection and terrain modeling tools.

- **Geometry** - Element selection, Civil AccuDraw and geometry tools.

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- **Site Layout** - Parking, Parceling, Pad, Pathways, Grading Proposed, Modify and other tools are available.

- **Corridors** - Element selection, superelevation and corridor modeling tools.

- **Rail** - Element selection, Regression, Cant, Turnouts and Track tools.

- **Model Detailing** - Element selection, Civil Cells and 3D tools (Linear Templates, Surface Templates, etc.).

- **Drawing Production** - Element selection, saved views, notes, text, annotations, and plans production (cross section, plan, and profile) tools.

- **Drawing** - Commonly used MicroStation drawing tools. To access the complete set of MicroStation tools change the active workflow to Drawing, Modeling (3D only) or Visualization (3D only).

- **View** - Commonly used view control tools.

2. **Click** on each of the *Ribbon tabs* and notice how each tab has a different set of tools.

Also, notice the tools to the right of the **OpenRoads/OpenRail Modeling** workflow drop down list. Tools such as Create New File, Open File, Save Settings, Compress File, Undo, Redo, Print, Explorer and Properties can be found here. Use the drop down menu at the right end of the tools to customize the Quick Access ToolBar.
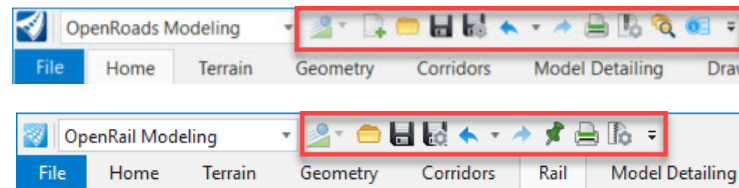
A Search Ribbon tool is also available to assist with finding tools on the ribbon interface. When you are not sure where to find a tool on the ribbon interface simply key in the command in the *Search Ribbon* field and a search will be performed across all ribbon menus.
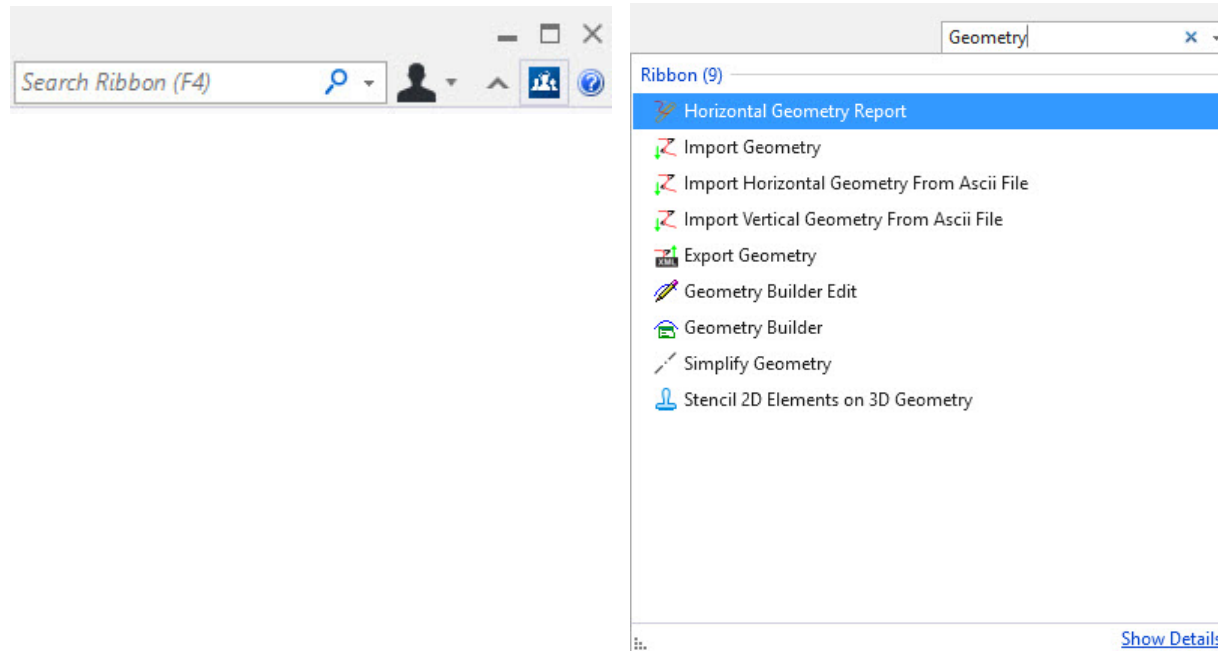
3. Search for a tool using the search ribbon. Key in **Arc** in the *Search Ribbon* field.
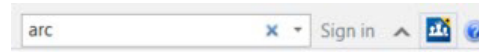
4. Notice the results of the ribbon search are displayed in a dialog below the *Search Ribbon* field.
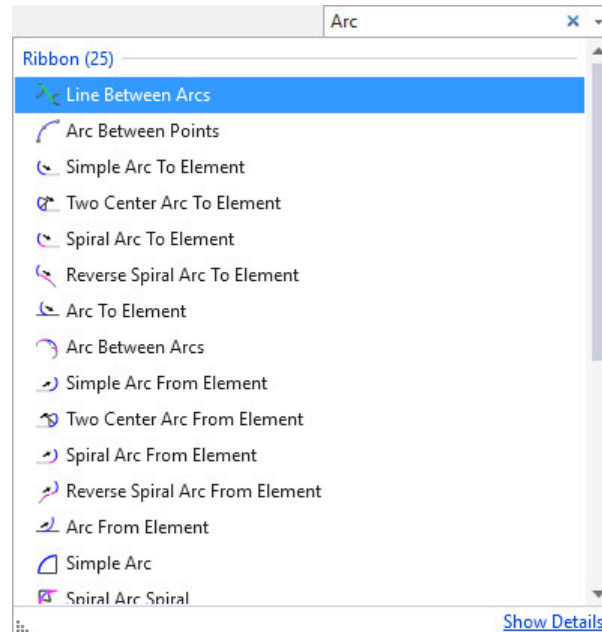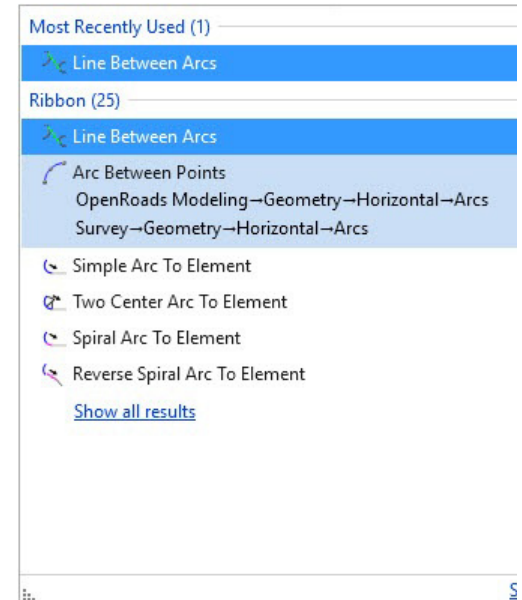
5. **Hover** over *Arc Between Points*.

The search results expands showing where the *Arc Between Points* tool is located on the ribbon:

- **OpenRoads Modeling > Geometry > Horizontal > Arcs**

- **Survey > Geometry > Horizontal > Arcs.**

Note that the location results includes the workflow, ribbon tab, category and then the command.

6. From the search results dialog, **Left-click**, *Arc Between Points* to launch the command.

7. **Right-click** to close the Arc Between Points toolbox.

8. Introduction to the Back Stage View.

   a. Activate the *Back Stage View* by clicking **File** in the ribbon menu.

   b. Notice the various other options on this screen such as *New*, *Open*, *Save*, *Save Settings*, etc. Whenever you need to open a file or create a new file you will have to access the *Back Stage View*.

   c. Select **Settings**.

   Design File settings, preferences, customizations, etc. are found in the *Back Stage View*, keeping the ribbon menus focused on the tools.

   d. **Click** the Arrow in the upper left corner to return to the main ribbon interface.

Display 3D Terrain Model

In this section, you will learn how to display the terrain model Source Features and Calculated Features. Source features include the data that was collected and used to create the 3D terrain model, such as breaklines, boundary and spot elevations. Calculated Features are items that are calculated from the data in the 3D terrain model, such as contours, and triangles.

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1. **Click** the **Element Selection** tool.

2. Set the **Element Selection** tool to the individual mode by selecting the **Individual** and **New** icons in the *Element Selection* tool setting window.
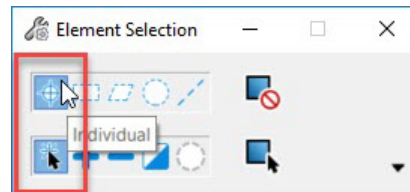
3. **Left-click** anywhere on the green shape that outlines the terrain model.

    Move the cursor slightly and **hover** the cursor over the selected outline for a few seconds and the context sensitive toolbar appears displaying tools commonly used with terrain models. More terrain model tools can be found on the Terrain ribbon menu.
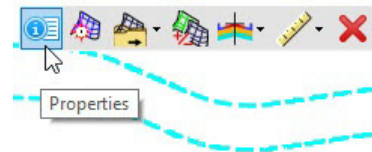
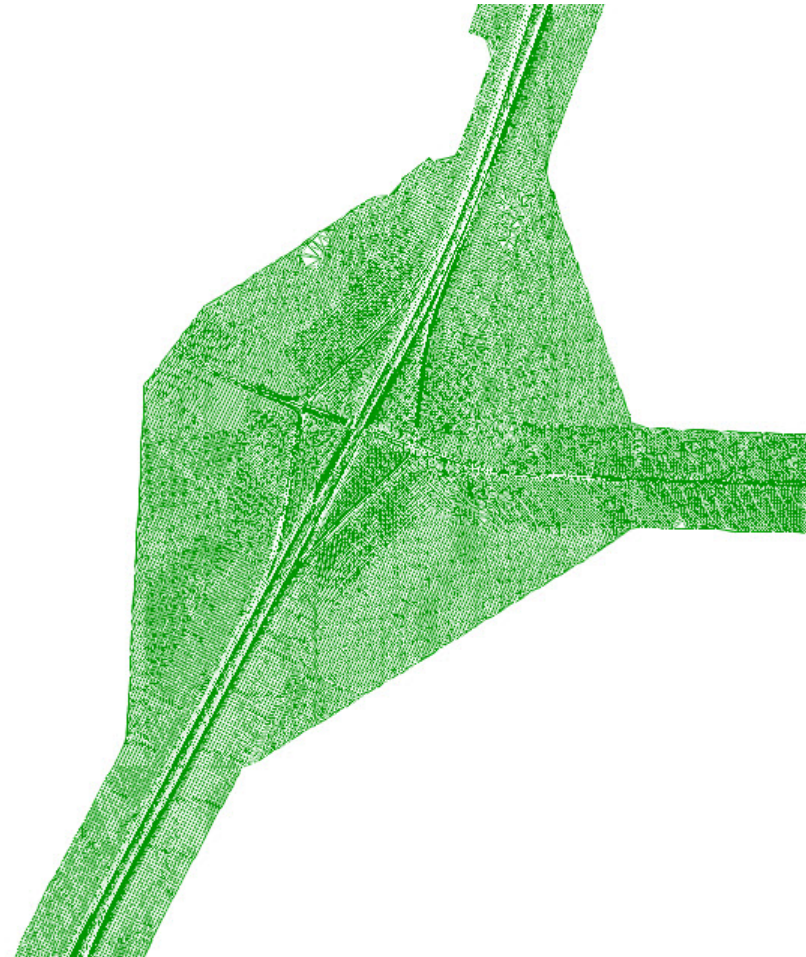4. **Select** the *Properties* tool.

    The context sensitive Properties dialog is displayed near your cursor. Move your cursor over the dialog to select different parameters. Moving your cursor off the dialog will dismiss it.

5. **Select** the *Triangles* option and toggle it **On** ... keep your cursor over the dialog to keep it active.

   The display updates to display the terrain triangles.

6. Toggle the *Triangles* **Off** and the *Breaklines* **On** and notice how the display changes.

   If the properties dialog dismissed, just use the Element Selector tool to select the terrain, hover and select Properties on the context sensitive menu again.
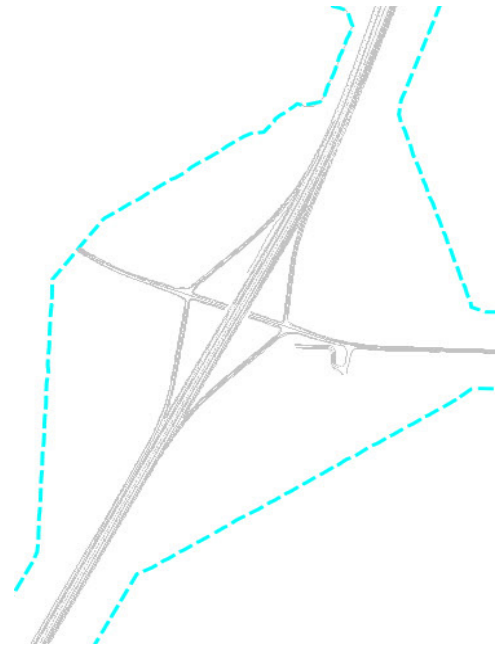
7. Practice with toggling **On/Off** other terrain features.

   Notes:

   - In this terrain model, as in many terrain models, you will find that all of the different source features may not exist.

   - In the dialog, you can double-click on a feature name or the On/Off indicator to toggle that feature display on/off.

   - If you toggle all the feature displays off, the boundary feature will still be displayed. At least one feature has to be displayed in order for the terrain to be selected and the boundary is the default feature that will be displayed if all the features are toggled off.

Terrain Model Features

Terrain Models contain two types of features.

- **Source Features** are created from the source data imported to create the terrain model and include Breaklines, Boundary, Imported Contours, Islands, Holes, Voids, and Feature Spots.

- **Calculated Features** are derived or calculated from the source features and include Contours, Triangles, Spots, Flow Arrows, Low Points, and High Points.

Terrain Models also contain two types of 'spot' points, Feature Spots and Spots.

Feature Spots are a *Source Feature* and contain the x,y,z information from imported point data.

Spots are a *Calculated Feature* and contain the x,y,z information at all of the triangle vertices in the terrain model.

In an existing terrain model, it is possible and often likely that the Feature Spots and Spots will be the same. In a complexed terrain model where an existing terrain model and a proposed design terrain model have been combined, you will see differences in the points.

In the following pictures from a complexed terrain model, **Feature Spots** are displayed on the *left* and **Spots** are displayed on the *right*.

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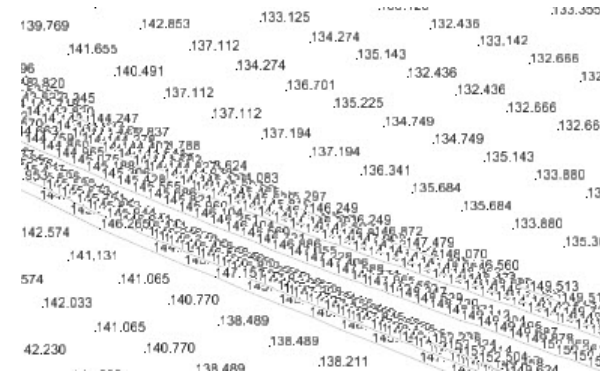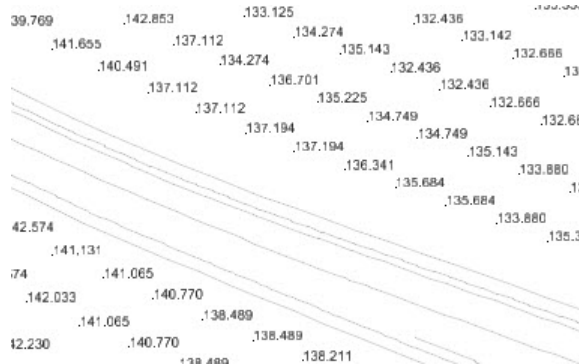
Changing the Default Display Parameters

In this section, you will learn how to use the Properties Window to display features, and to change the default intervals for major and minor contours.

1. Display features using the *Properties Window*.

   a. Open the *Properties Window* for viewing and modifying the properties of elements by going to **Home > Primary > Properties**.

   The *Properties Window* is docked on the left side of your screen. The window will be blank if the terrain model is not selected, and will display information about the terrain model if it is currently selected.

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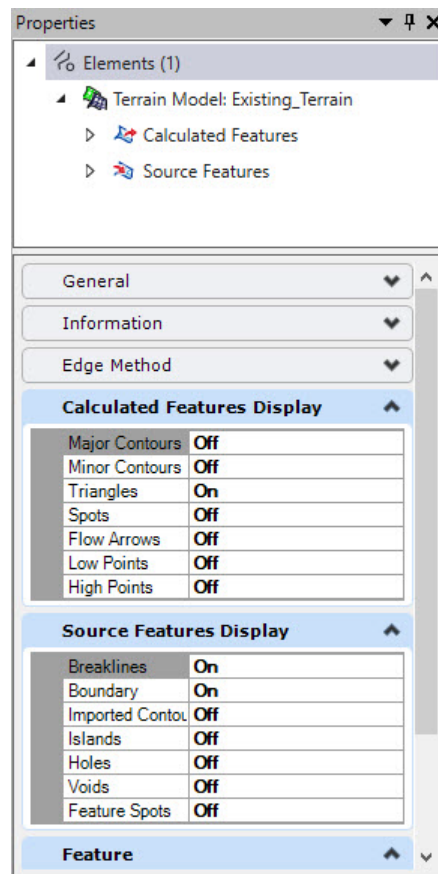
b. If the *Properties Window* is blank, use the **Element Selector** tool to select the terrain model.

c. **Toggle** the *Major Contours, Minor Contours and Boundary* features **On**, and *all other features* **Off**.

d. **Zoom** into the view to see the major and minor contours and the labeling on the major contours.

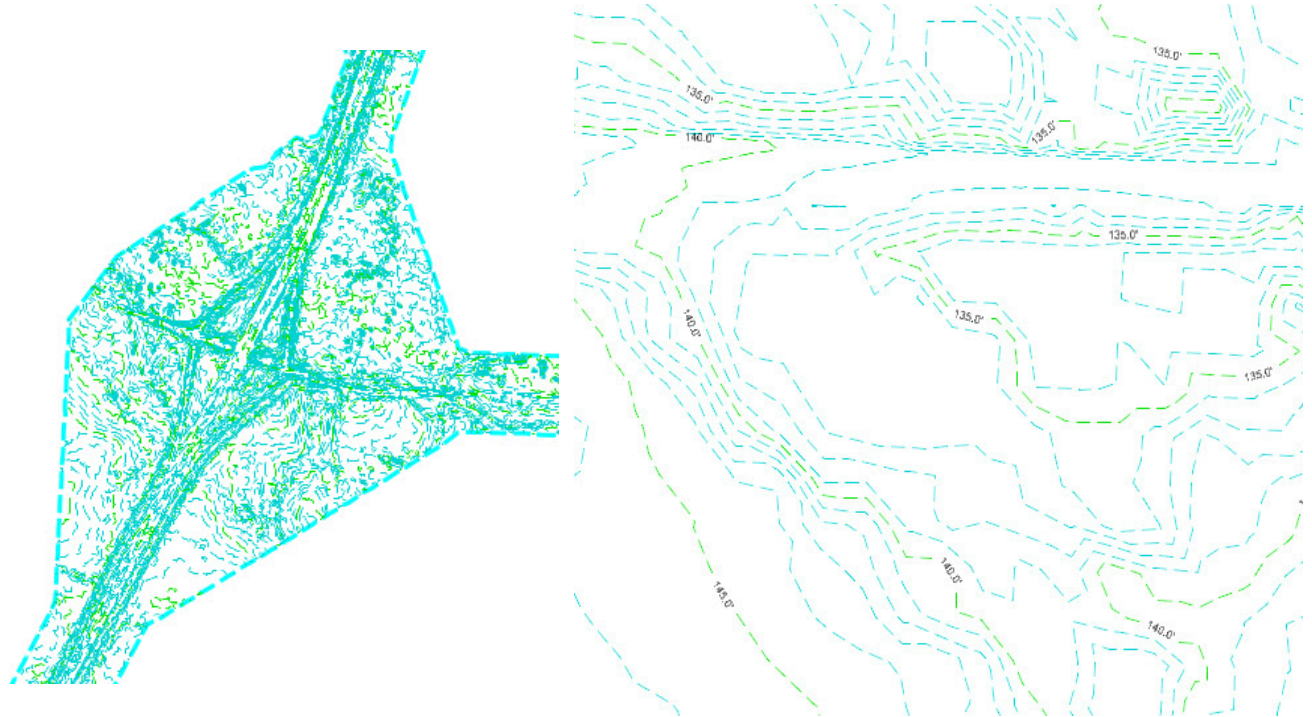Note that all of the same information about the terrain model is available in the *Properties Window* and that the feature display options function the same as in the *Properties dialog* that was accessed from the context sensitive menu.

2. Change the Major and Minor Contour intervals.

a. In the top of the Properties Window, expand **Terrain Model: Existing_Terrain > Calculated Features > Contours**.

b. In the top of the Properties Window select **Contours** to display the Contours information box.

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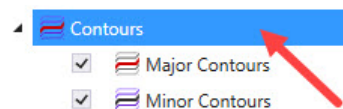
c. In the *Contours* section, change the *Major Interval* to **20** *[5]* and the *Minor Interval* to **5** *[1]*.

Note that the contour display immediately updates as you change the values.

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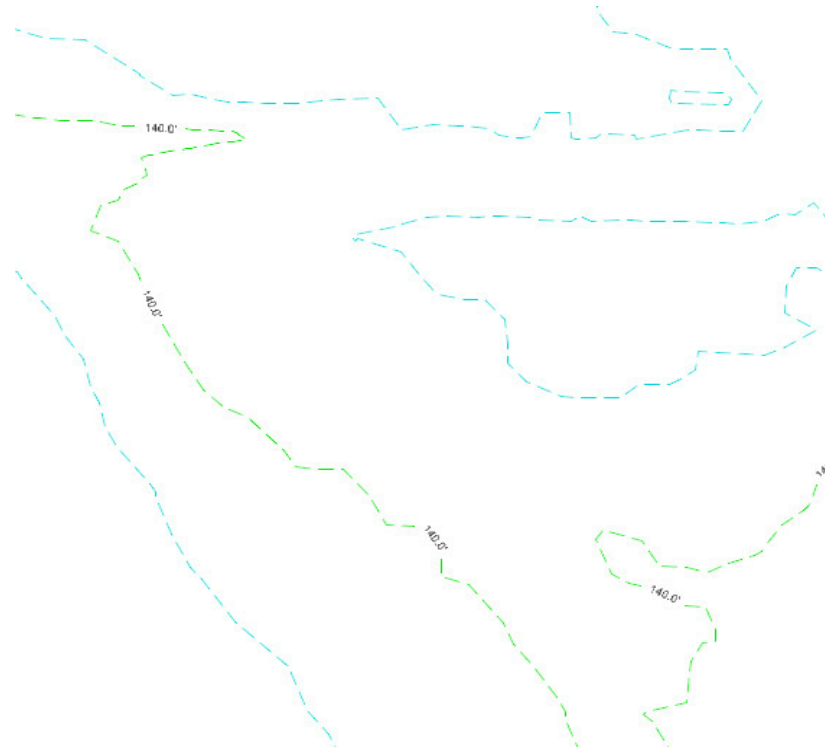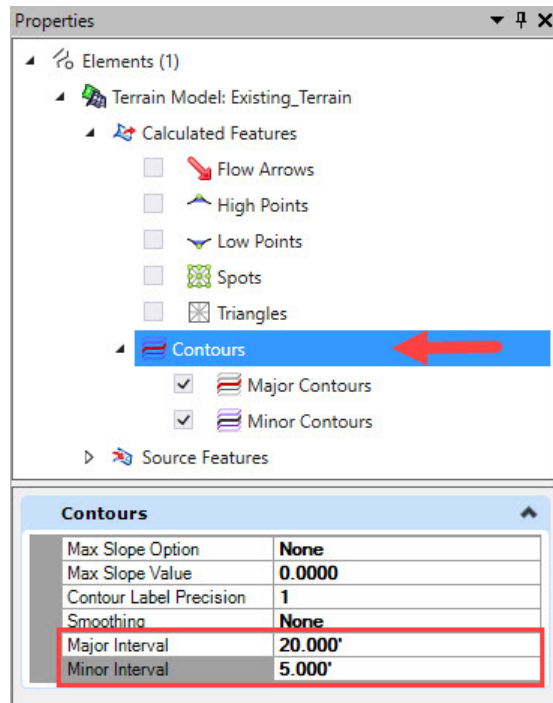
Feature Definitions and Feature Symbologies

An important concept to understand ...

When a Terrain Model is used with the product, it is linked to a Feature Definition which provides additional intelligence such as the terrain models role in volume calculations (design, existing, none, subgrade, substrata) and links to a Feature Symbology that links to three Element Templates that define how the terrain model appears in plan, profile and 3D views. These Element Template links define the default display for the terrain model, but they can be overridden as necessary.

"What something is and what something looks like are separate things."

- *Feature Definition* defines "**what**" an item is.

- *Feature Symbology* defines "**how**" the item is displayed.

- *Element Templates* and *Annotation Groups* define the **detailed display settings**.
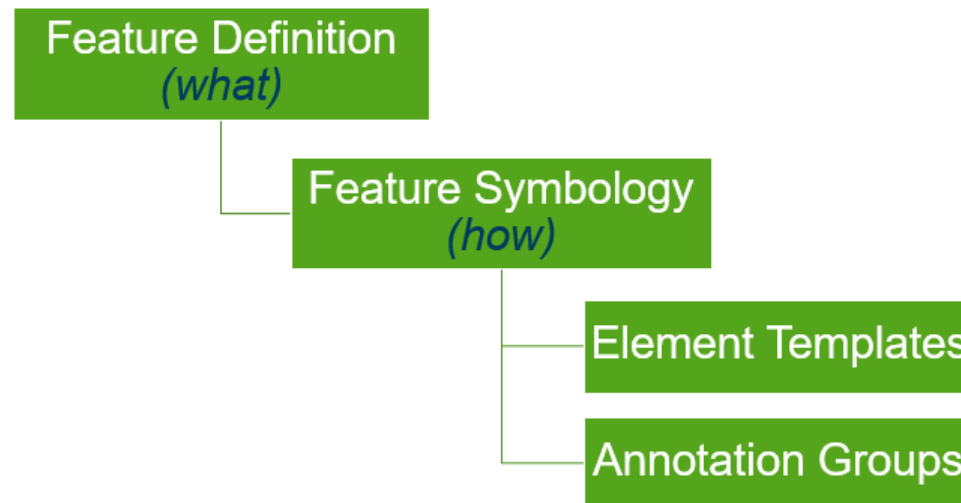
Using Feature Definitions

In the previous sections, you have changed the terrain display by manually turning on and off different features and changing parameter values. As just discussed above, a feature definition defines *what* an item is and points to *how* it will be displayed. Using a feature definition is a quick way to change the display parameters without having to change each individual setting.

1. Select a Feature Definition to define the display parameters.

   a. In the top of the Properties Window select **Terrain Model: Existing_Terrain**.

   b. In the *Feature* section, change the *Feature Definition* from Existing Boundary to **Terrain > Existing > Existing Contours and Triangles**.
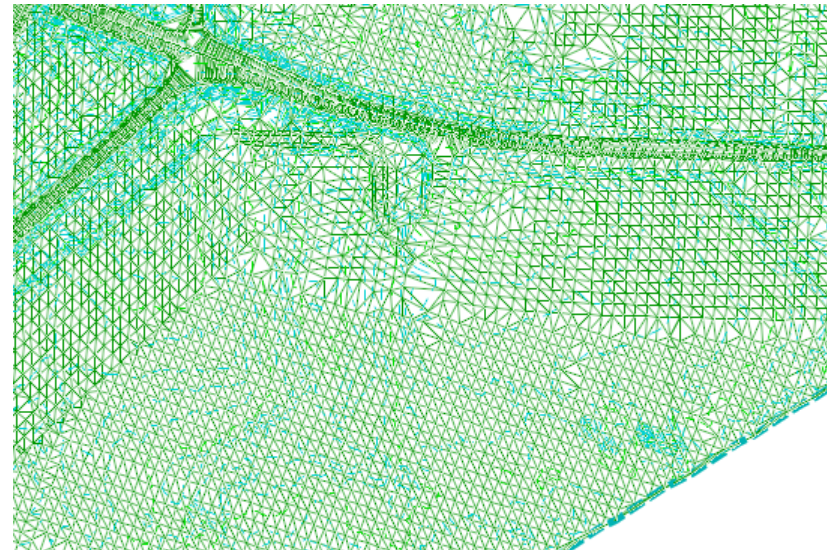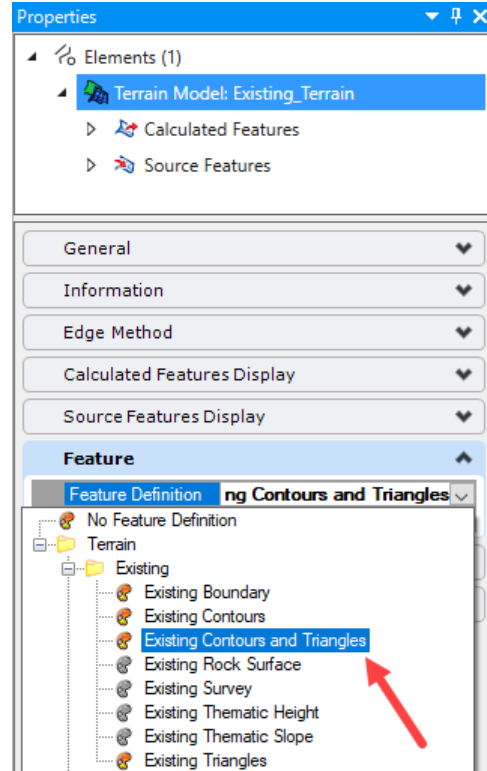
Note that the triangles are now displayed in addition to the contours.

2. **Zoom** into the view so that you can see the *elevation labels* on the major contours.

3. In the *Feature* section, set the *Feature Definition* to **Existing Contours**.

4. Change the text size.

   a. Select the *Drawing* tab and then in the *Drawing Scales* category, select the **drop-down menu** and change the drawing scale to *1"=100' [1:1000]*.
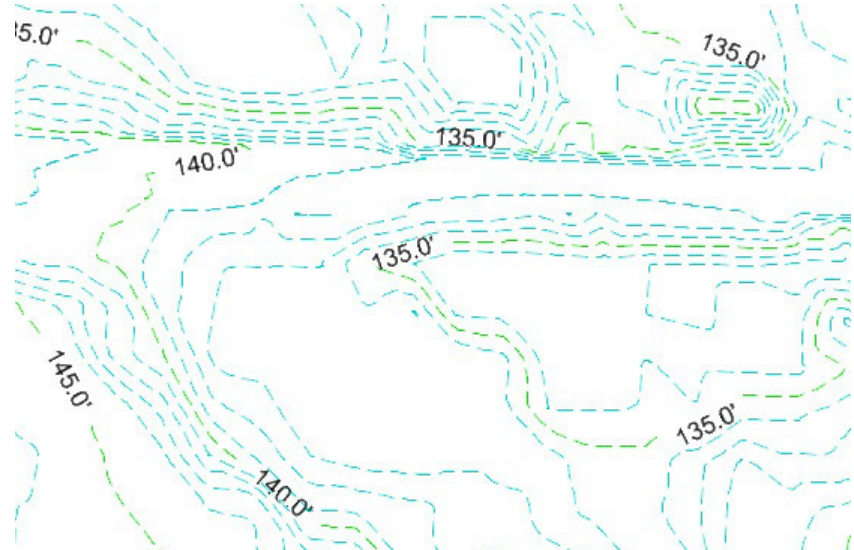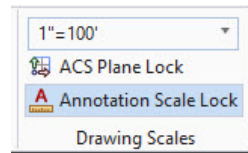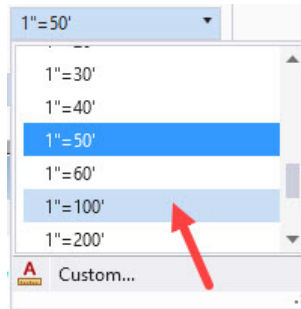
   Note that the text size of the major contour labels increases.

   b. Experiment with **selecting** different *Feature Definitions* and setting different *scales* for the text.

5. Set the final terrain model parameters.

   a. In the *Feature* section, set the *Feature Definition* to **Existing Boundary**.

   This will define *what* the terrain element is and the default values for *how* it will be displayed.

   b. Select **Fit View** at the top of the view window.

   c. **OPTIONAL**: **Close** the **Properties** window that is docked on the left side of your view.

   d. Select **Save Settings** from the Quick Access ToolBar.

Exercise 2: Using an Existing Terrain Model with 2D Project Files

In this exercise you will learn how to attach the existing 3D terrain model file to a 2D design file. You'll learn how to set the terrain as the active terrain model, define 2D & 3D views and also how to display and review the terrain model features.

Skills Taught

- Create a 2D design file

- Attach 3D Terrain Model

- Set Terrain Model Active

- Define 2D & 3D Views

- Review Design File Models

- Display and Review Terrain Model Features

- Use Override Symbology and Element Templates

Create 2D Design File and Attach Terrain Model

In this section, you will learn to create a new 2D design file and attach a terrain model to your design file. Terrain models are stored in 3D design files. Any time you need to use a terrain model within your project or working design file, you need to attach the terrain model as a reference.

1. Use the *Back Stage View* to create a new 2D design file.

   File

   a. Select **File** on the ribbon menu to go to the Back Stage View and select **New**.

   b. Browse to *C:\Bentley Training\QuickStart for Terrain Display* or other folder where you unzipped the dataset files.

   c. Verify that the *Seed* is set to **Seed2D - Imperial Training.dgn** *[Seed 2D - Metric Training.dgn]*.

   d. Create a new file named **Display_Terrain.dgn** *[Metric-Display_Terrain.dgn*].
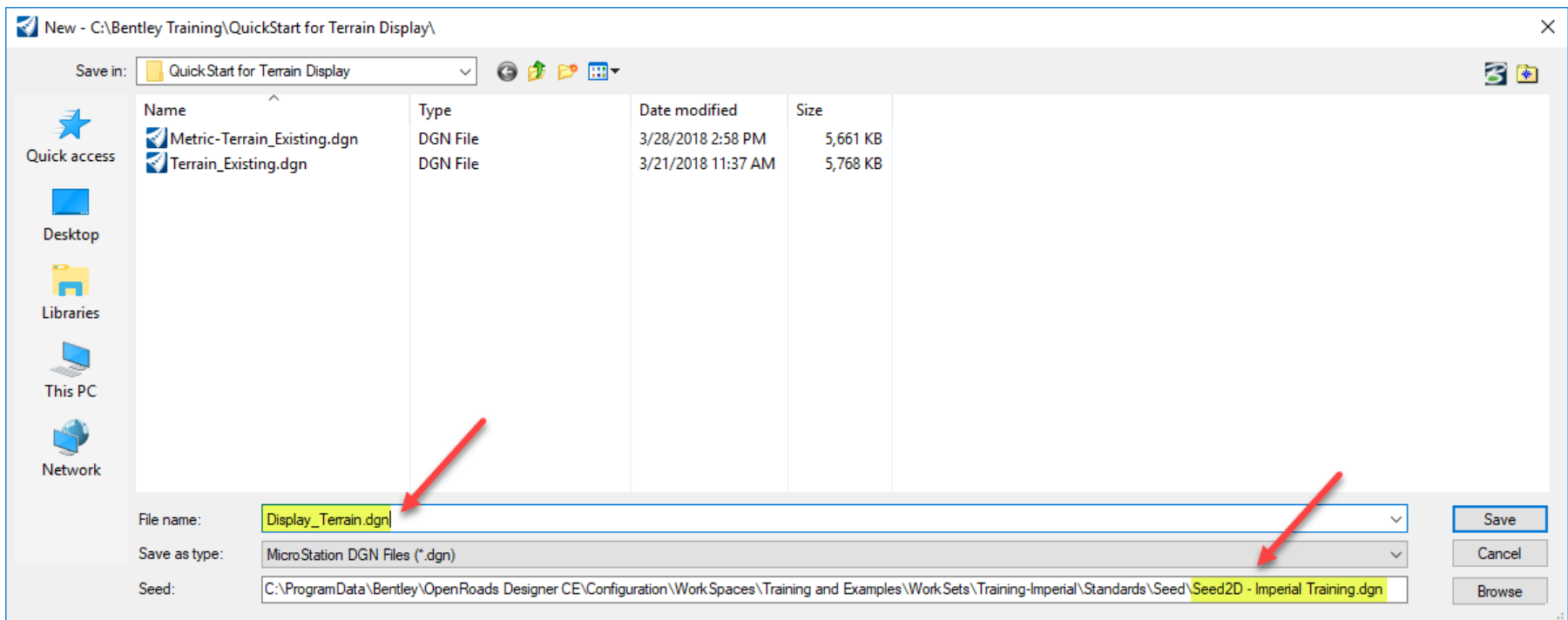
Best Practice: Reference Terrain Model to Project File

With terrain model elements stored in 3D design files, they are easily shared and used by many users. The most common workflow for design projects is to simply reference the 3D design file that contains the terrain model to your 2D working or project file. Once the terrain model is attached, the terrain data is accessible by all other commands.

As a reference file, the terrain model can be displayed differently each time its referenced allowing contours to be viewed by one reference, while another drawing or user views triangles or contours at a different interval. Because everyone using the terrain model is referencing the same source, any updates to the terrain model are automatically propagated to all users.
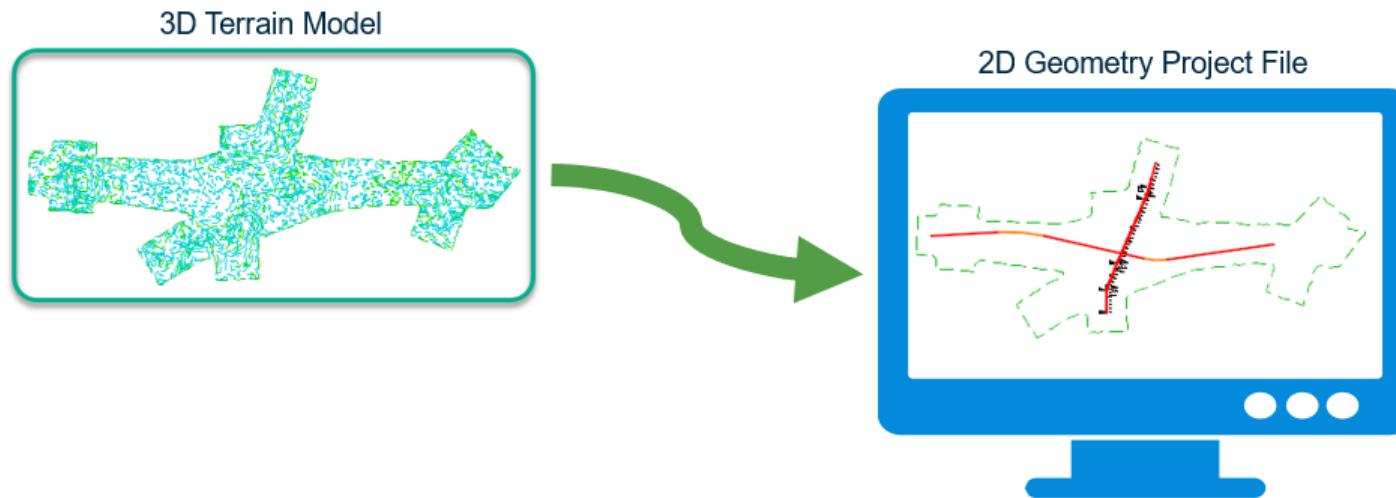
2. Attach *Terrain_Existing.dgn [Metric-Terrain_Existing.dgn]* as a reference.

   a. **Click** on **Home > Primary > Attach Tools > References**..
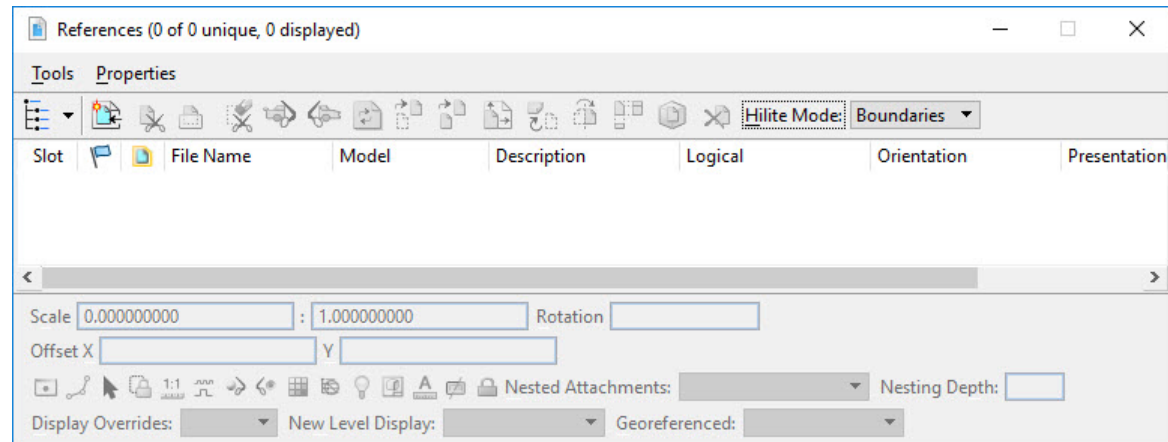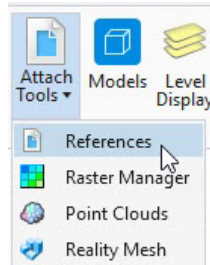
   b. From the References dialog, select the **Attach Reference** icon or select **Tools > Attach**.

   c. **Select** the file *Terrain_Existing.dgn [Metric-Terrain_Existing]*.

   d. Set the *Attachment Method* to **Coincident-World**.

   e. **Click** *Open*.

   Note: Reference file attachment is made to the Active View. If you have multiple Views open, make sure the correct View is active (click in the view) *prior* to attaching a reference file.
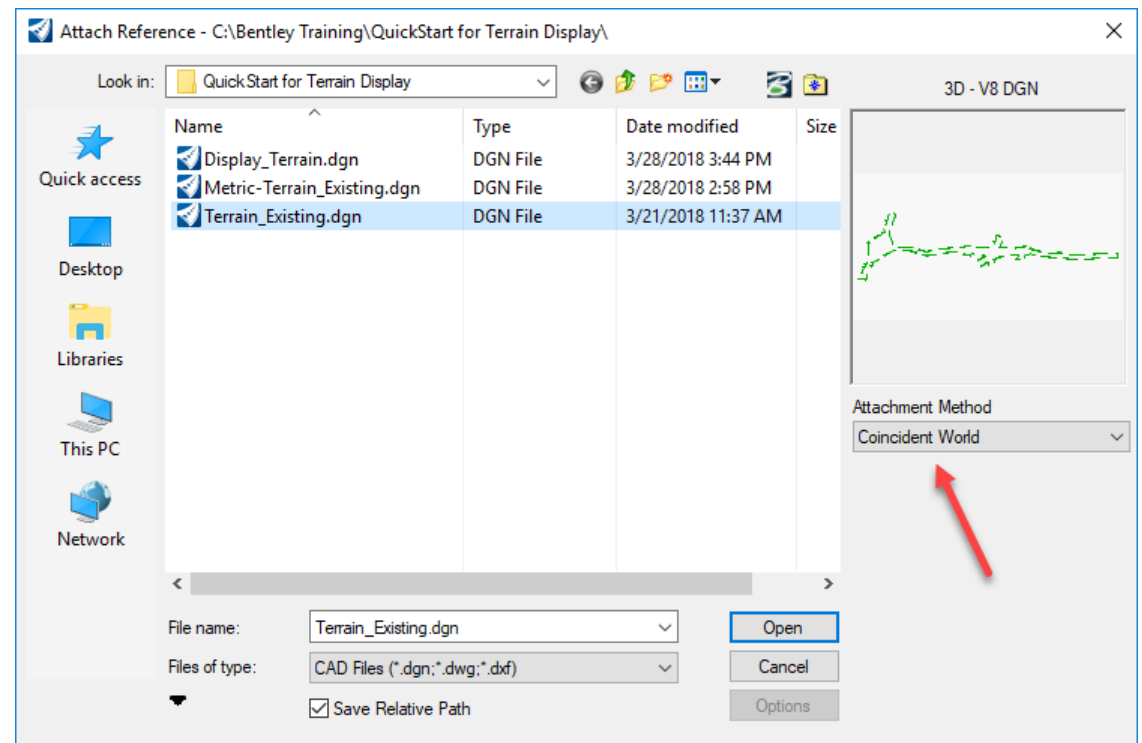
f. The terrain model, *Terrain_Existing.dgn [Metric-Terrain_Existing]* is now attached to the file.
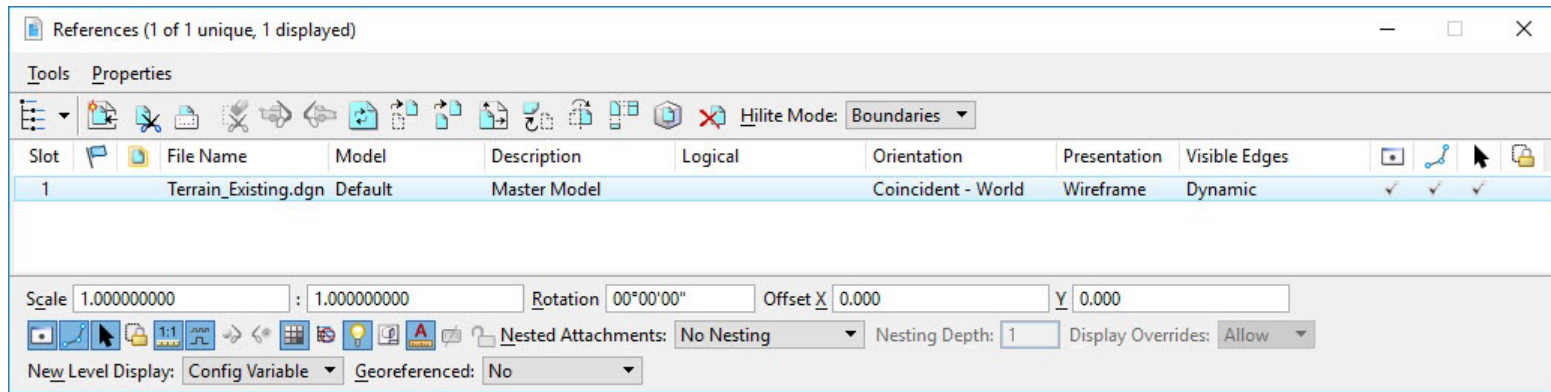
3. **Close** the References dialog box.

4. **Click** the *Fit View* icon in the top of the view window so you can see all of the graphics in the design file.

Notice the green shape that is now present in the design file. This green shape represents the boundary of the existing terrain model.

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Setting the Active Terrain Model

The active terrain model is the model which is displayed by default in profile and cross section models, and is the default target for corridor modeler. Only one terrain model can be active at any given time, however, multiple terrain models can be referenced to the same design file.

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1. **Click** the **Element Selection** tool.

2. Set the **Element Selection** tool to the individual mode by selecting the **Individual** and **New** icons in the *Element Selection* tool setting window.

3. **Left-click** anywhere on the green shape that outlines the terrain model.

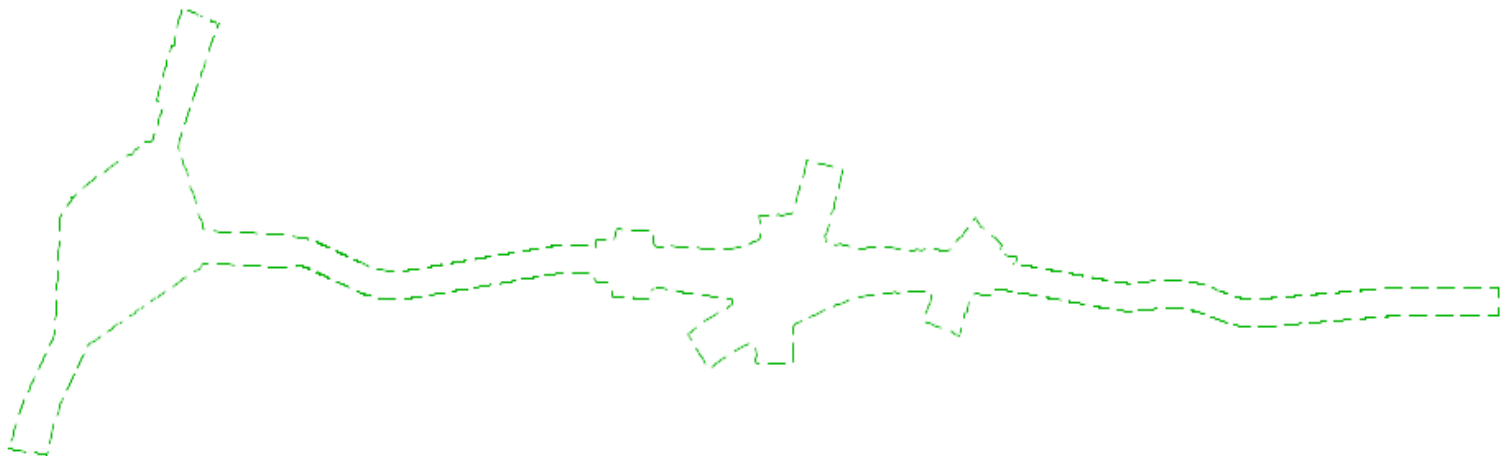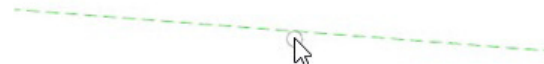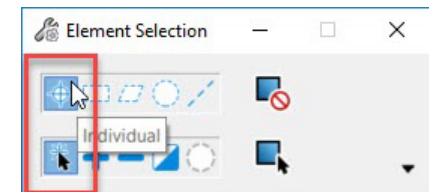4. **Hover** the cursor at this location for a few seconds and context sensitive toolbar appears displaying tools commonly used with terrain models. More terrain model tools can be found on the Terrain ribbon menu.

5. **Select** the *Set As Active Terrain Model* tool.

   Setting the terrain model active instructs the software to use the active terrain model as the default terrain model when using other design tools. You can always change or clear the active terrain model at any time.

   Also, when setting the *Active Terrain Model* the software will **automatically** create a *3D model* inside of your 2D design file. Do **not** try to create this 3D model independently as it will not work properly within the product. The 3D model is used for the display of 3D data.
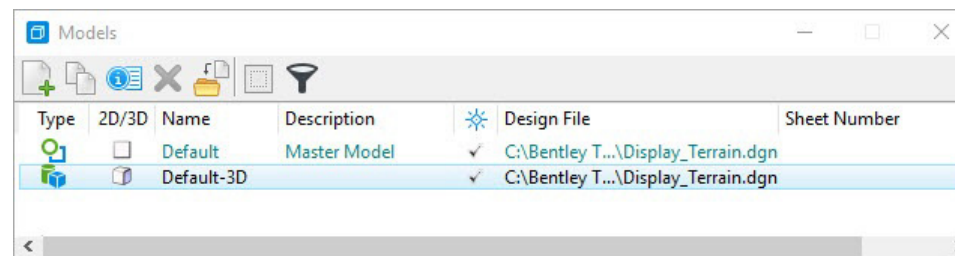
Setup and Review 2D and 3D Views and Models

In this section, you will open a new view in the design file to display the 3D model that was automatically created with the Set Active Terrain command. You will also look at the models in the design file and their association to the displayed views.

1. **Right-click** in *View 1* and hold down the right mouse button to access special view control tools.

   a. **Select** *View Control > 2 Views Plan/3D.*

   Notice the views change, you now have 2 view windows open. *View 1* on the left is the **2D model view** that you started with, and *View 2* on the right is the **3D model view** that was automatically created when you set the terrain model active.
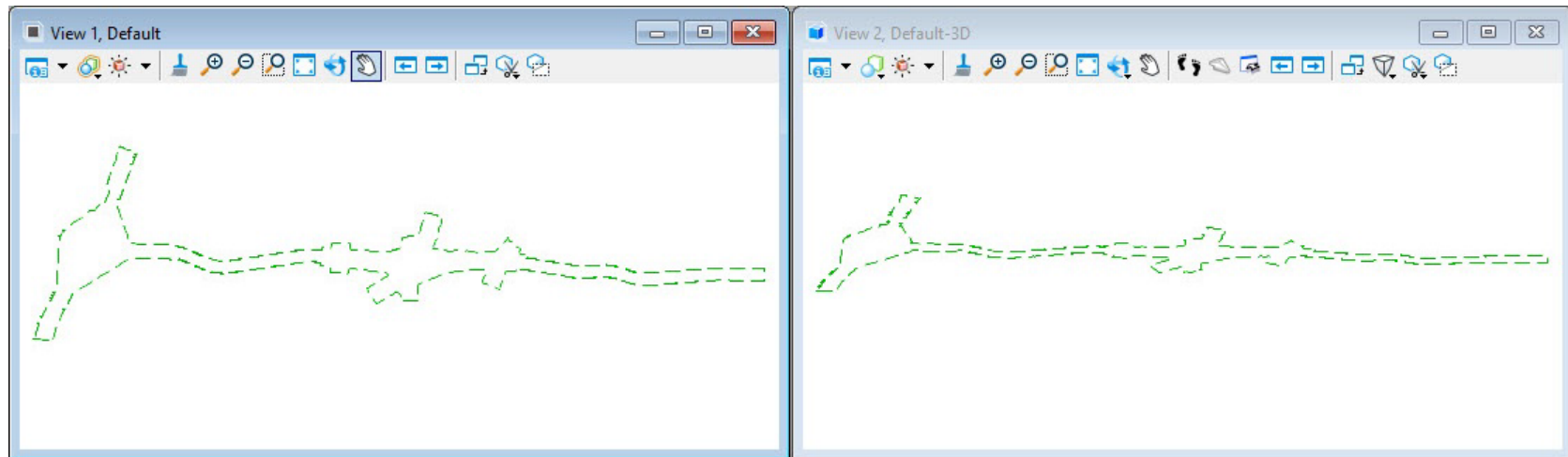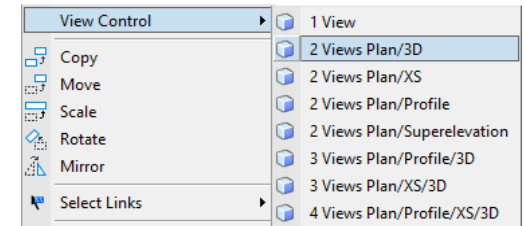
Also, observe the existing terrain model boundary is displayed in 2D and 3D. The terrain model triangles are not displayed at this time. Triangles, breaklines, feature spots and contours can be displayed via the terrain model properties as needed.

Note: Pressing the **F9** key on your keyboard automatically configures the *2 Views Plan/3D* view setup for you, 2D on the left and 3D on the right. This will come in handy as you move through the design process.

2. From the ribbon menu select **Home > Primary > Models**.

3. Review the **Models** dialog, notice there are 2 models available, *Default* and *Default 3D*.
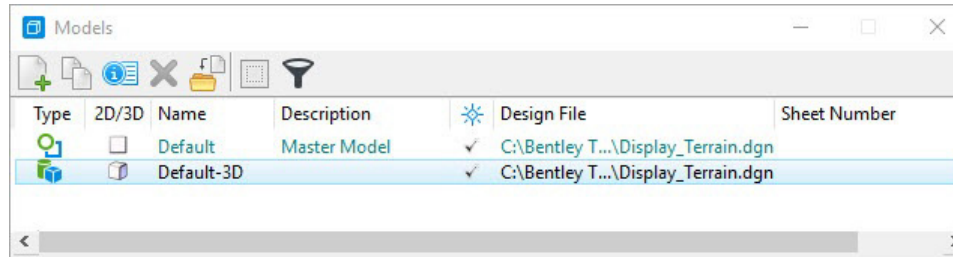
Models can be 2D or 3D. It's very important to realize that even though you started with a 2D design file it is possible to have a 3D model also available in the same design file. Recall that setting a terrain model active *automatically* creates a 3D model for you.
The 3D model **must** be created *by the software*. Do not create your own model named *Default 3D*, it will not work properly.

Also, the 2D and 3D models are directly related to the model views, recall *View 1* is named *Default* and *View 2* is named *Default 3D*.
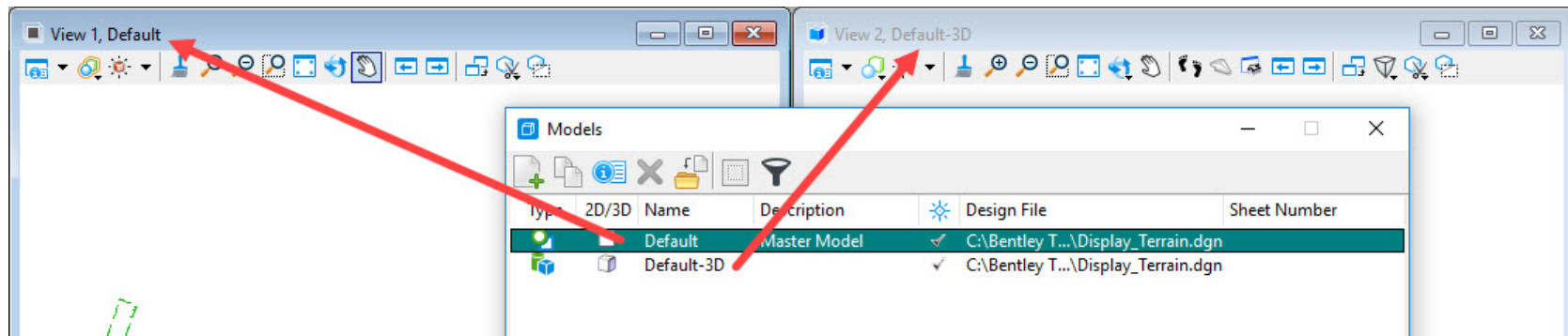
4. **Close** the *Models* dialog.

Using Override Symbology and Element Templates

This section will explain how to use override symbology and element templates to modify the display of the terrain model features when the 3D terrain model design file is referenced into a 2D project design file.

1. Use the context sensitive menu to display the properties dialog.

    a. **Click** in **View 1** (Default, 2D model) to make it active. (**Hint**: The border of the active view will be darker in color.)

    b. **Click** the **Element Selection** tool.

    c. Set the **Element Selection** tool to the individual mode by selecting the **Individual** and **New** icons in the *Element Selection* tool setting window.

    d. **Left-click** anywhere on the green shape that outlines the terrain model.

    e. **Hover** the cursor at this location for a few seconds and context sensitive toolbar appears displaying tools commonly used with terrain models. More terrain model tools can be found on the Terrain ribbon menu.
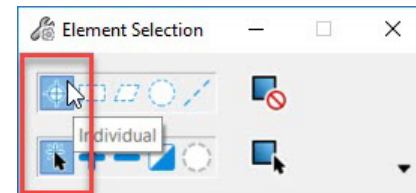
    f. **Select** the *Properties* tool and move your cursor onto the Properties dialog. Notice that almost all the fields are grayed out and cannot be toggled On/Off.

Major Contours	Off
Minor Contours	Off
Triangles	Off
Spots	Off
Flow Arrows	Off
Low Points	Off
High Points	Off

    The fields are grayed out because the terrain model is referenced, and as is common with references, it is read only. However, terrain models have a special setting to override the symbology (display) even though the reference is read only. The override allows the terrain model to display differently in the reference file without changing the source file.

2. Set the **Override Symbology** option to allow modification of the terrain display.

   a. On the *Properties dialog* or the *Properties window*, **select** *Override Symbology* and set to **Yes**.
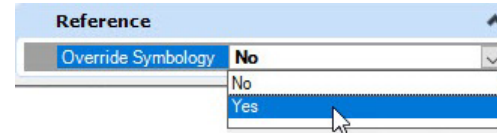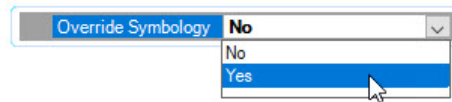
   The Calculated Features Display and Source Features Display fields in the dialog or window are now accessible and function the same as when in a 3D terrain model file. Note that the Feature Name and Feature Definition fields are grayed out. These cannot be altered when the terrain is referenced.

   b. Toggle the *Triangle* features **On/Off**.

   c. Toggle the *Major Contour* and *Minor Contour* features **On/Off**.

   d. Toggle other features **On/Off** as desired.

You will notice that as you toggle features on and off, only the view on the left, the 2D view, is updated.
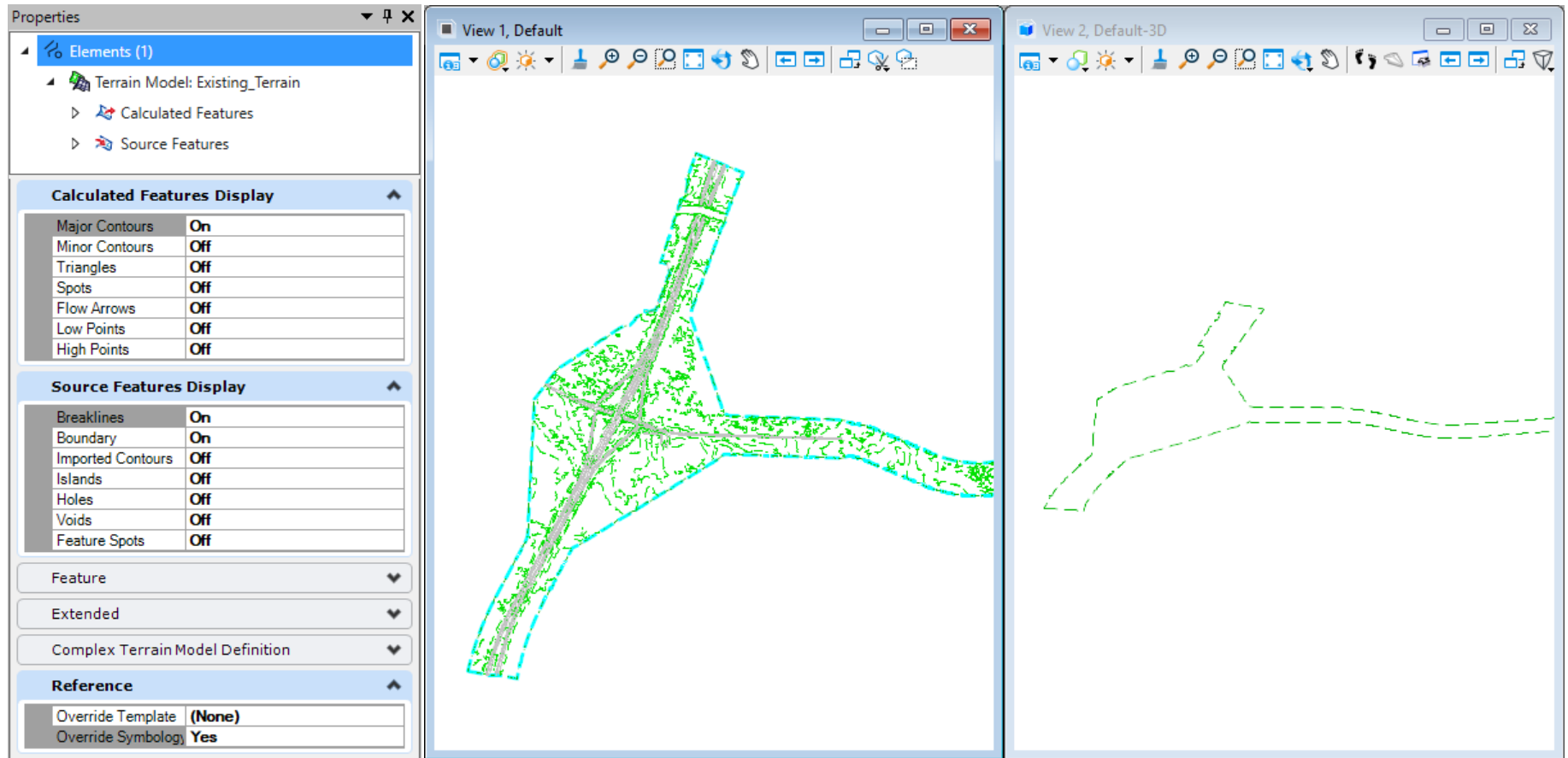
The override symbology controls are view dependent, allowing you to separately control how each view is displayed.

We will look at controlling the 3D view later in this section.

3. Use **Element Templates** to control the terrain display in View 1 (2D model).

When Override Symbology was enabled, in addition to making the display fields active, a new field called *Override Template* was added. The Override Template option allows you to select an *Element Template* from the list to set the display parameters for the terrain model in the reference file. This does not change the display settings in the source terrain model, only the display in the reference file.

a. **Click** in **View 1** (Default, 2D model) to make sure it is active.

b. In the *Properties dialog* or *Properties Window*, select the **Override Template** drop-down arrow and select **Terrain\Existing_Contours** from the list.

c. Select the *Override Template* drop-down again and select **Terrain\Existing_Triangles** from the list.

Notice that selecting a different element template changes the display of the terrain reference file in View 1.

Note: See Appendix A for additional information on Element Templates and the Element Template Manager.

4. Use **Element Templates** to control the terrain display in View 2 (3D model).
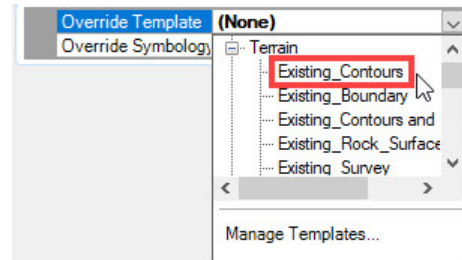
a. **Click** in **View 2** (Default-3D model) to make it active.

b. Use the **Element Selection** tool to select the terrain boundary.

c. In the *Properties dialog* or *Properties Window*, set the following

- *Override Symbology:* **Yes**

- *Override Template:* **Terrain\Existing_Triangles**.
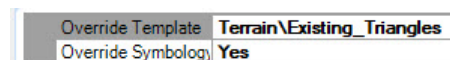
d. Select the **Window Area** command or use the mouse wheel to zoom into the view to see the triangle display.
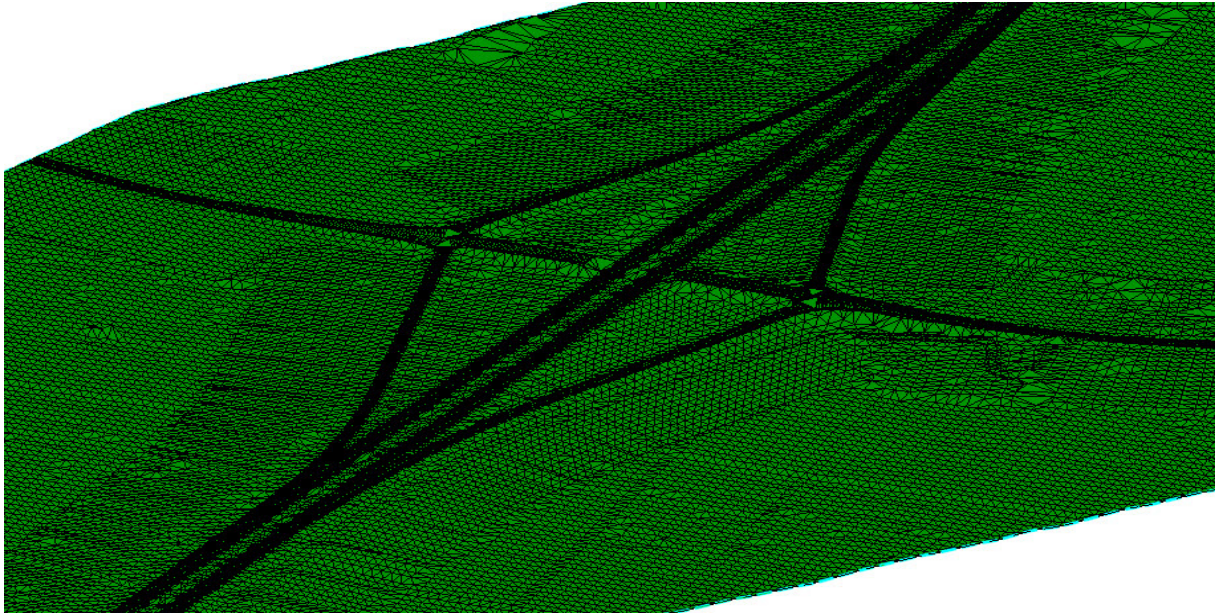
Note that the triangle display in this view is different from the display in View 1.

The *Display Style* for View 1 is set to **Wireframe**.

The *Display Style* for View 2 is set to **Illustration: Ignore Lighting**

e. On the *View 2* window, select the **View Attributes** drop-down, then the **Display Style** drop-down to see the list of available display styles.

f. Select several of the display styles to see how the view changes.
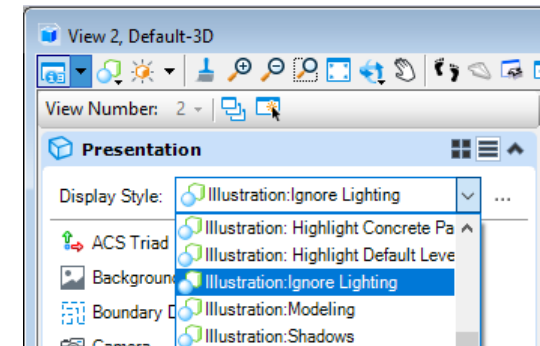
The majority of your work in the product will take place in the 2D model (View 1), with the 3D model showing the results of modeling commands. The rest of the exercises in this course will be done in the 2D model. You may leave the 3D model view open, or close it.

5. **Close** the *View 2* window (3D model) and **maximize** *View 1* (2D model).

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Exercise 3: Label and Analyze Terrain Data

When reviewing a terrain model, you may find that you want some additional information or specific information in a certain area of the model.

In this exercise, you will learn how to label terrain contours and spots, view a background map, and analyze points.

Skills Taught

- Label Terrain Contours

- View Background Map

- Label Terrain Spots

- Analyze Points

Label Terrain Contours

The display of major and minor contours have an option to label the contour elevations at a specified interval. When you are reviewing an area of a terrain model you may find that there are no contour labels in that specific area. The Label Terrain Contours command will quickly label the displayed contours along a specified line.

---

1. Use an element template to display the major and minor contours.

   a. **Click** in **View 1** to make it active.

   b. Use the *Element Selector* tool to select the **terrain model**, then hover and select the *Properties* tool.

   c. On the Properties dialog, set the *Override Template* to **Terrain\Existing_Contours**.
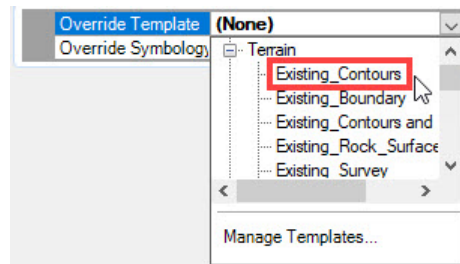
2. Zoom into the area on the southeast side of the interchange.

   a. Select the *Window Area* command from the View 1 toolbar and place two data points to select the area indicated below.

3. Label the terrain contours.

a. Select *Terrain > Labeling > Label Terrain Contours* from the ribbon menu and set the options in the dialog box as follows:

- *Annotation mode*: **All Contours**

- *Text Alignment*: **Follow Line**

- *Dimension Style*: **_Lbl_Pln_Terrain Contour Elevations**
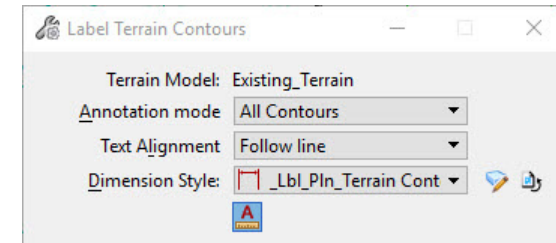
b. **Click** on a *contour line* to select the terrain model and follow the prompts (in the prompt field in lower left corner).

- *Select From Point:* **Left click** at the foot of the hill

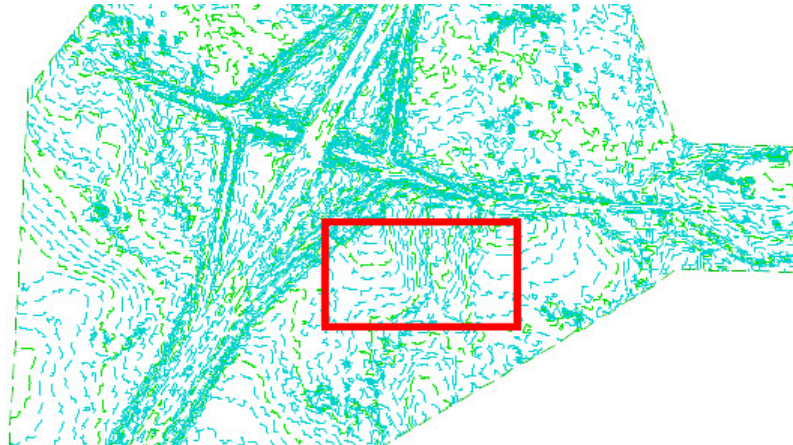- *Select To Point or Reset to complete:* Move your cursor to the top of the hill and **Left click** to define the end point.

c. Continue placing **Data points** to label additional contours or **Reset** to *exit*.

Notes:

- The terrain contours must be displayed in the view for the Label Terrain Contours command to function.

- The elevation text is placed as a dimension element and is independent of the terrain display. Changing the terrain display will not alter the graphics placed with this command. To delete the graphics placed, use the Element Selection tool to select the text and then press the delete key.
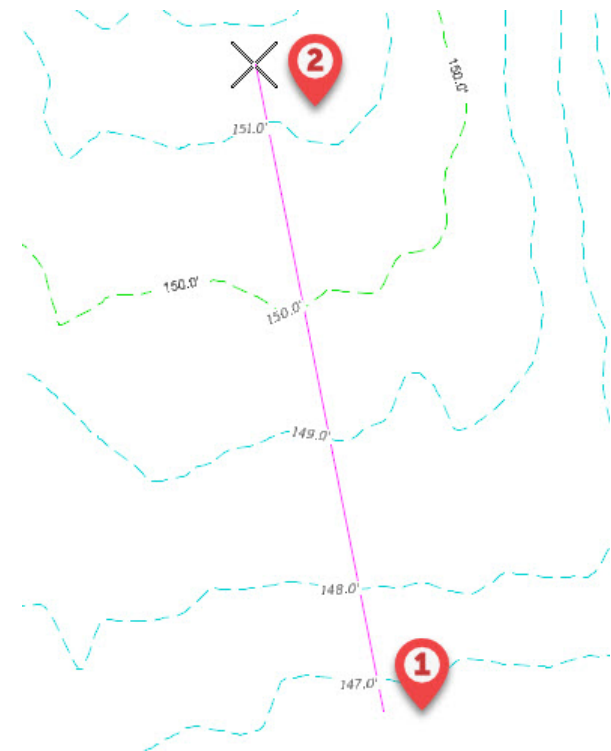
View Background Map

1. View a background map.

   (**Note: An internet connection is required for this section.**)

   a. Select the *View Attributes drop-down arrow* for View 1.

   b. In the *Background Map* section of the View Attributes dialog, set the *Background Map Type* to **Hybrid**.
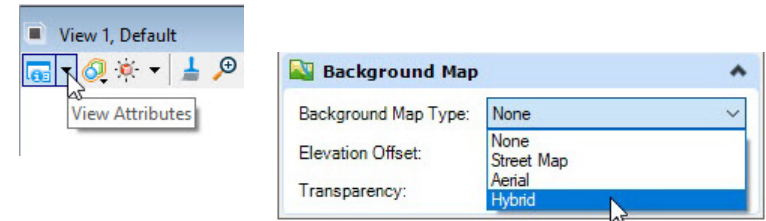
   A street map and aerial image are displayed behind your graphics based on an attached Geographic Coordinate System. Microsoft Bing Maps are used for the background data.

   Note: The background map will display only if you have a Geographic Coordinate System (GCS) defined in the design file. If a GCS has not been defined, the background map will not display.

Label Terrain Spots

The Label Terrain Spots command will quickly label the elevation of a single point in a terrain model.

1. **Window Area** or **Zoom** in to where you can see a building.

2. Select *Terrain > Labeling > Label Terrain Spots* from the ribbon menu.

3. Set the following parameters in the Label Terrain Spots dialog box:

   - *Text Style*: **Label - Center Center**

   - *Dimension Style*: **_Lbl_Pln_Terrain Spot Elevations**

   - *Text Rotation*: **Horizontal**

   - *Location*: **Automatic**

   - *Horizontal Attachment*: **Auto**

4. At the prompt *Identify Terrain Model*, click on a **contour line**.
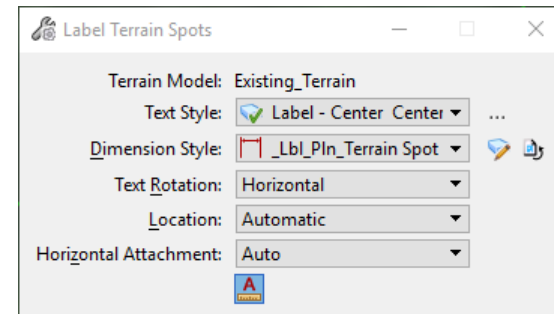
As you move your cursor in the view a label with the elevation will be dynamically updated.

- *Select Spot:* **Click** to select a *spot* to be labeled.

- *Accept/Reject:* Move your cursor and *click* to **accept** and place the label annotation and leader line.

5. Place several elevation labels.

6. *Reset* or *Esc* to exit the command.

Notes:

- The terrain contours or triangles do not have to be displayed for the Label Terrain Spots command to function, but you do have to be able to select the terrain.

- The elevation text and leader line is placed as a note element with an associated dimension element and is independent of the terrain display. Changing the terrain display will not alter the graphics placed with this command. To delete the graphics placed, use the Element Selection tool to select the graphics and then press the delete key.
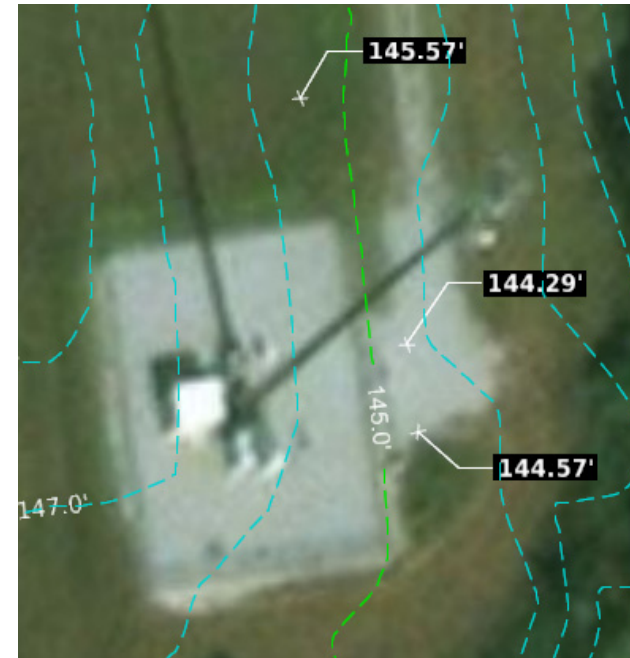
Analyze Points

When you need detailed information at a specific location on the terrain, the Analyze Point command will quickly provide the elevation, slope and aspect of a single triangle in the terrain model.

---

1. Select **Terrain > Analysis > Points > Analyze Point** from the ribbon menu.

   - *Select Element To Analyze Point*: click on a **contour line**

2. Toggle the Display Settings in the Analyze Point dialog to:

   - *Display Contours*: **Off**

   - *Display Contours in View*: **Off**

   - *Display Slope*: **On**

   - *Display Triangle*: **Off**

Display Settings	
Display Contours	☐
Display Contours only in View	☐
Display Slope	☑
Display Triangle	☐
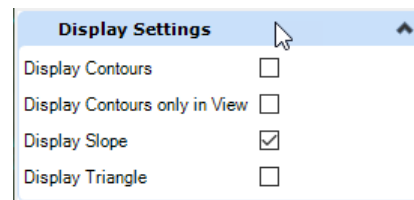
As you move your cursor in the view, a label with the slope and a directional arrow are dynamically updated and the heads-up display will show the elevation, slope and aspect.

   - *Alt to toggle Displayed Info:* Click to select the **location** for the slope to be labeled.

3. Toggle the *Display Triangle* option **On** and *click* again to label another location.
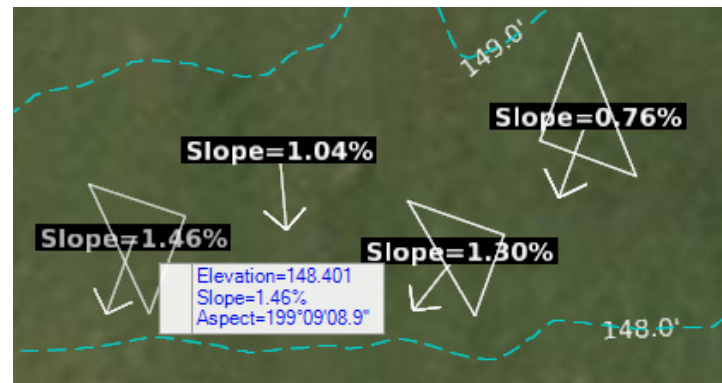
4.   Label several locations.

5.   *Reset* or *Esc* to exit the command.

Notes:

- The terrain contours or triangles do not have to be displayed for the Analyze Point command to function, but you do have to be able to select the terrain.

- The slope annotation symbology is controlled by the active *Text Style*. In the Label Terrain Spots activity above, the *Label - Center Center* text style was selected and that is controlling the display. You can change the active text style in the Label Terrain Spots command, or go to the Drawing Production > Text > Place Text command and select a text style.

- The slope text, direction arrow and triangle are multiple types of elements and are independent of the terrain display. Changing the terrain display will not alter the graphics placed with this command. To delete the graphics placed, use the Element Selection tool to select the graphics and then press the delete key.

- When the command is active, the ALT key can be used to toggle the Display Settings options on and off.

Analyze Between Two Points

The Analyze Between Points command will quickly annotate the slope on the terrain between two specified points. Additionally the heads-up display provides the elevation of the points, elevation difference, slope, distance and angle.

---

1. Select **Terrain > Analysis > Points > Analyze Between Points** from the ribbon menu and follow the heads-up prompts.

   - *Select Terrain Model element*: **Click** on a *contour line* to identify the terrain model

   - *Select Start Point*: **Click** a location in the terrain to define the first point

     As you move your cursor in the view, a line with the slope and a directional arrow are dynamically updated and the heads-up display will show the elevations, elevation difference, slope, distance and angle.
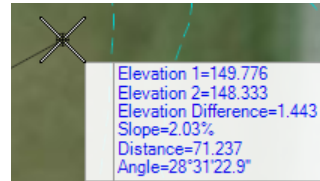
   - *Alt selects a different Terrain*: **Click** a second location to define the second point and place the annotation
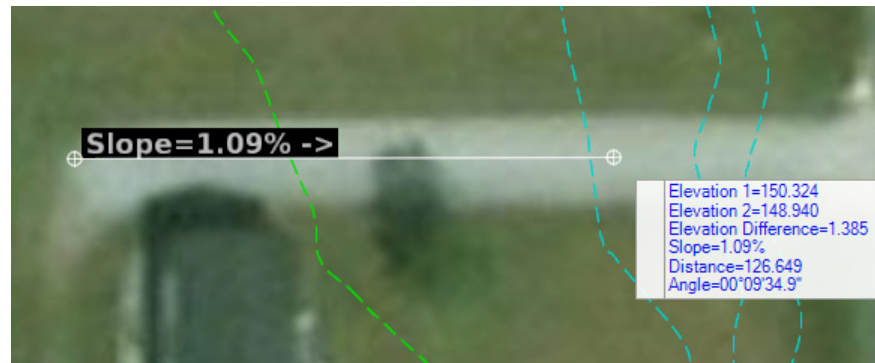
2. Select another set of points and label the slope.

3. *Reset* or *Esc* to exit the command.

Notes:

- The terrain contours or triangles do not have to be displayed for the Analyze Between Points command to function, but you do have to be able to select the terrain.

- The slope annotation symbology is controlled by the active *Text Style*. In the Label Terrain Spots activity above, the *Label - Center Center* text style was selected and that is controlling the display. You can change the active text style in the Label Terrain Spots command, or go to the Drawing Production > Text > Place Text command and select a text style.

- The slope text, direction arrow and line are multiple types of elements and are independent of the terrain display. Changing the terrain display will not alter the graphics placed with this command. To delete the graphics placed, use the Element Selection tool to select the graphics and then press the delete key.

Summary

In this course you have learned what a terrain model is and how to display and annotate the features of an existing terrain model using the properties and terrain tools. You have learned how to work directly in both a 3D terrain model file, and in a 2D project file (with the terrain referenced) to display features using default standards, and how to modify the default parameters to change the display. You also learned how to display a background map, label contours and spots, and analyze the terrain between points.

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Appendix A - Element Template Manager

Remember that a **Feature Definition** defines "*what*" an item is, and a **Feature Symbology**, along with its Element Templates and Annotation Groups, define "*how*" an item is displayed.

The *Element Template Manager* is where you set all the parameters for an **Element Template**. These parameters include which features are displayed and the symbology used to display each feature type. Some features have additional settings such as contours which have settings for smoothing, major and minor intervals, and labeling.

Element Templates are stored in DGN Libraries making it easy to setup standard display configurations that can be deployed and managed across large groups of users.

When an Element Template is used it is copied to the active design file model so that the model appears and behaves correctly even when the original DGN Library that defined the standard is not present.

The Element Templates dialog is accessed from the templates selection drop-down menu be clicking "Manage Templates...".