

CDOT Workflow IR 24 – Creating A Design Terrain Model

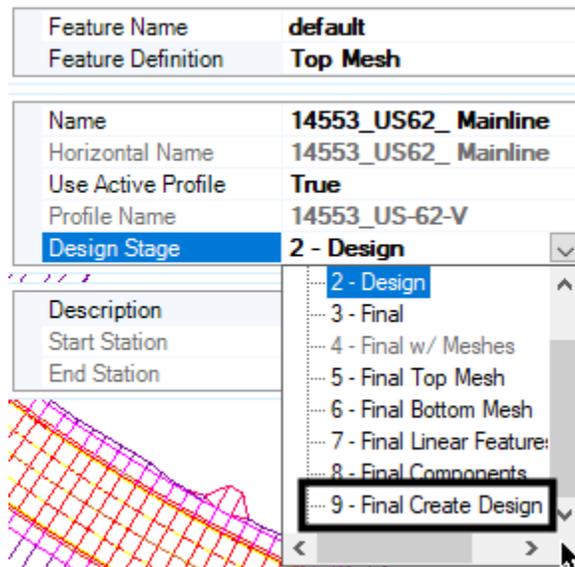
This workflow demonstrates how to create a terrain model from a corridor model.

Creating A Design Terrain Model Using A Graphical Filter

Set The Corridor Design Stage

The corridor design stage determines how the corridor elements are displayed in MicroStation. Since the corridor elements are used to create the design terrain Model, it is important to have them displayed properly. To set the Design Stage:

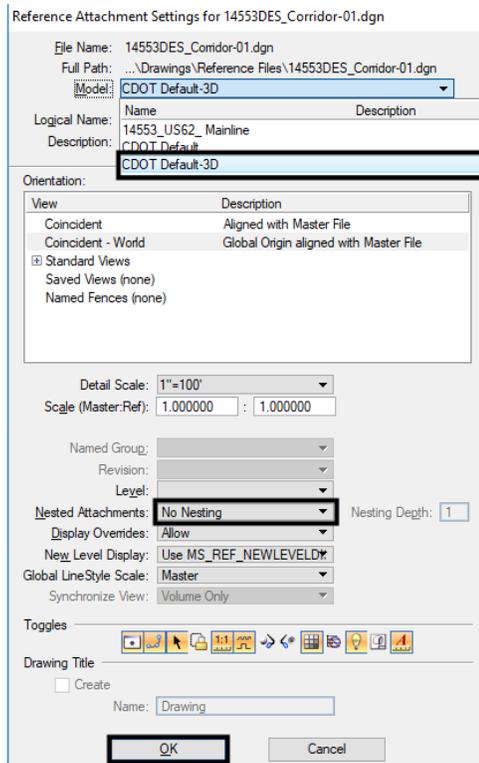
1. Open the DGN file containing the corridor using InRoads SS4.
2. Using the **Element Selector**, **Left Click and hold** on the corridor graphic to display the corridor context menu.
3. **Left Click** the **Properties** button. This displays the **Properties** dialog box.
4. In the **Properties** dialog box, change the **Design Stage** to **9 – Create Design Surface**. This option displays the corridor top mesh and the linear features. These elements are used to create the Design Terrain Model.



Set Up The File For The Terrain Model

Because the Design Terrain Model will contain 3 dimensional data, a 3D DGN file is used.

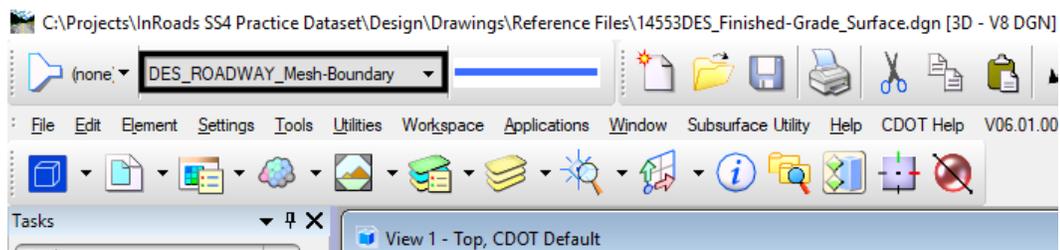
1. Create a new DGN file using the **3D-Seed_CDOT.dgn** file.
2. Attach the project geographic coordinate system. For more information on this process see [Workflow MS-24 – Using Geographic Coordinate Systems at CDOT.](#)
3. Reference the DGN file containing the corridor using the **CDOT Default-3D** model and **No Nesting**.



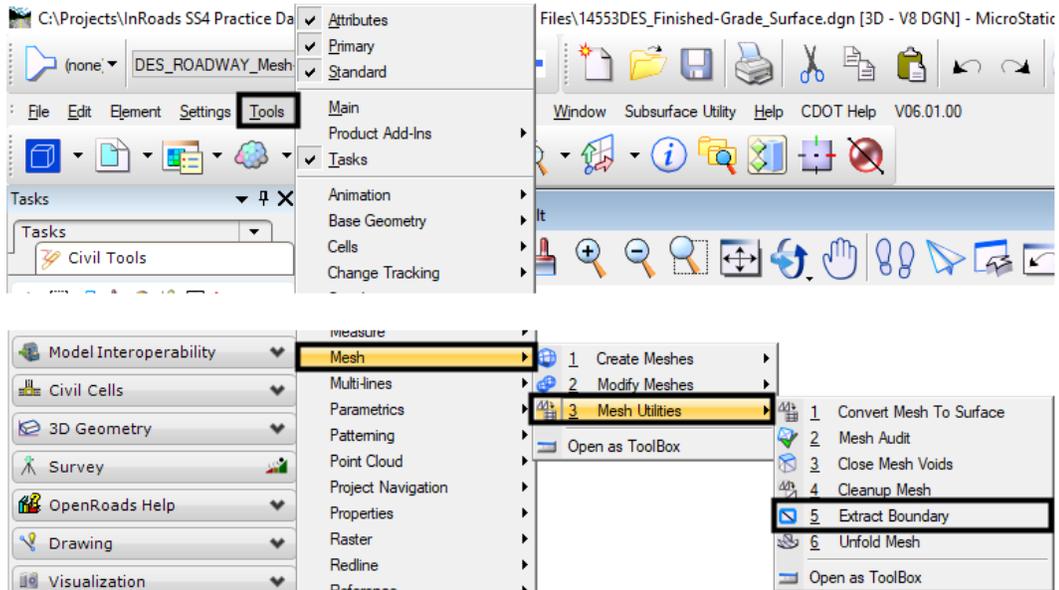
Displaying The Mesh Boundary

The purpose of a boundary is to prevent triangles from being created outside of the design area.

1. Set the active **Level** to **DES_ROADWAY_Mesh-Boundary**.



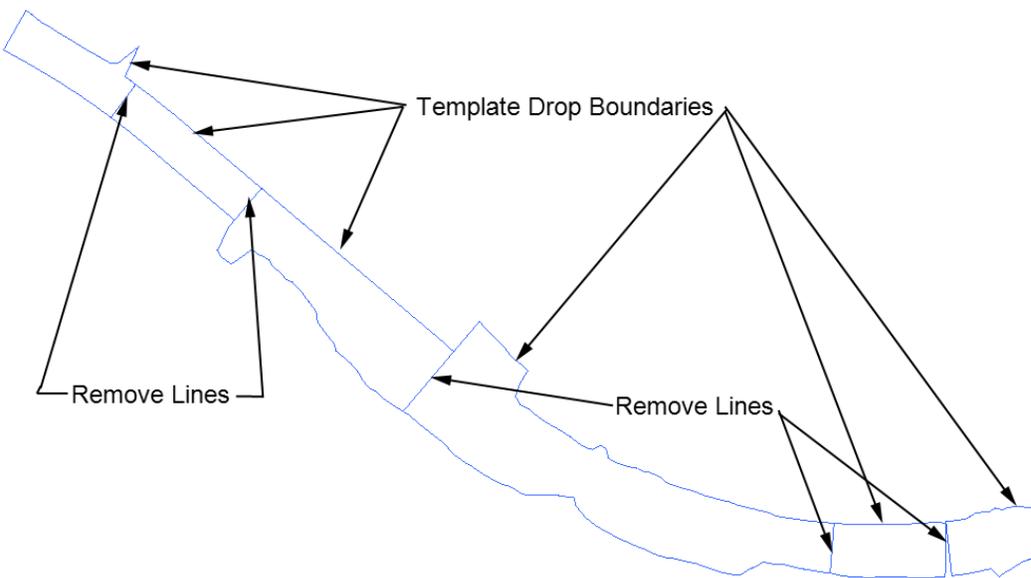
- From the MicroStation menu bar, select **Tools > Mesh > Mesh Utilities > Extract Boundary**.



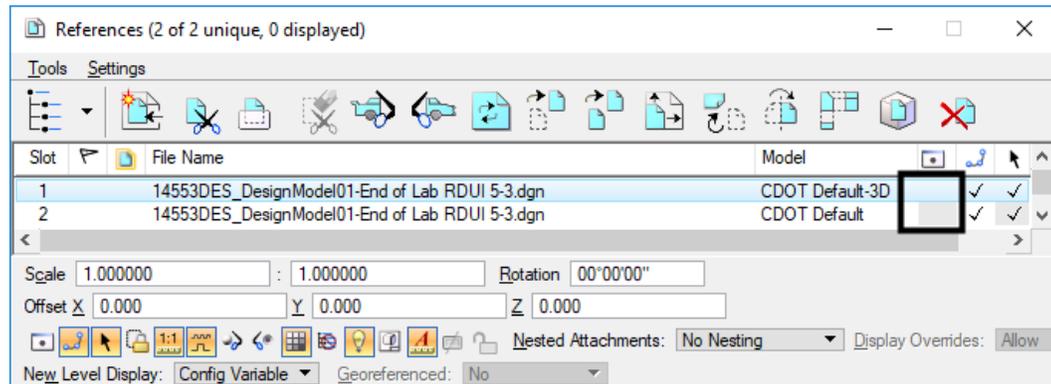
- Left Click** on the design mesh then **Left Click** in an open area to accept the selection and create the boundary element.

Editing The Mesh Boundary

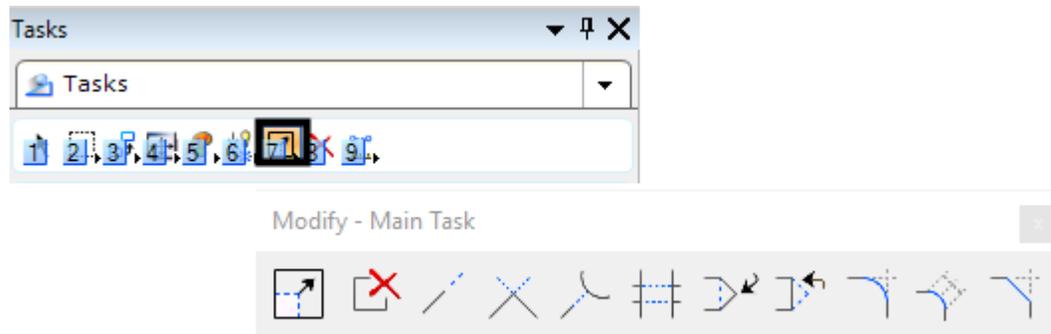
If the corridor contains multiple template drops, a boundary element may be created for individual template drops. This happens when template drops with no transition are separated to prevent two templates from displaying on one cross section. If this occurs, the boundary elements must be modified to create a single line, encircling the mesh. Then the elements are combined into a single closed shape.



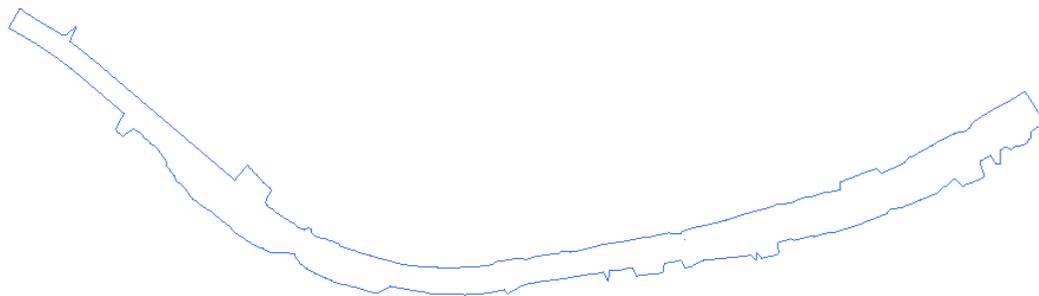
1. Turn off the corridor reference file display so that only the boundary elements are visible.



2. Using the MicroStation **Modify Element** tools

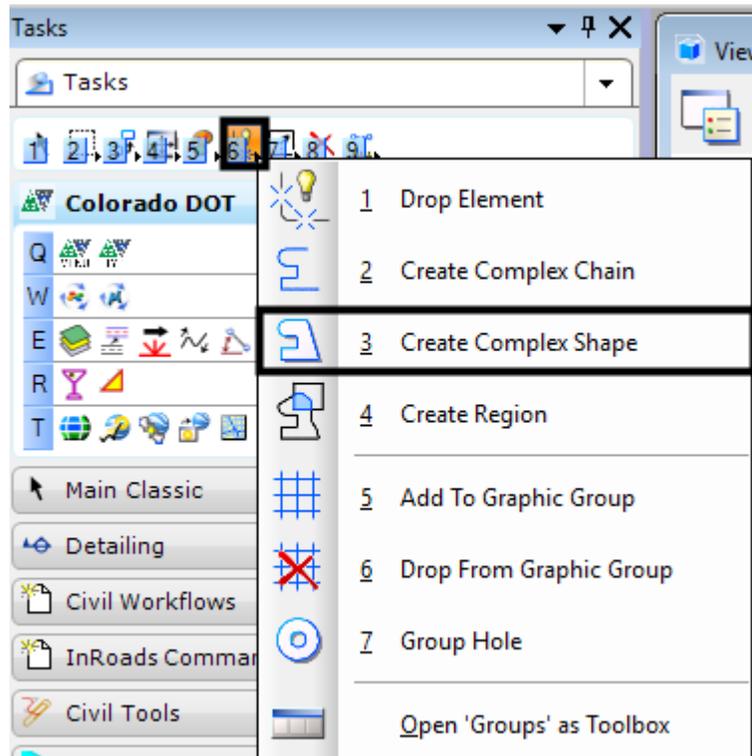


Below is the sample boundary, from the illustration above, after editing.

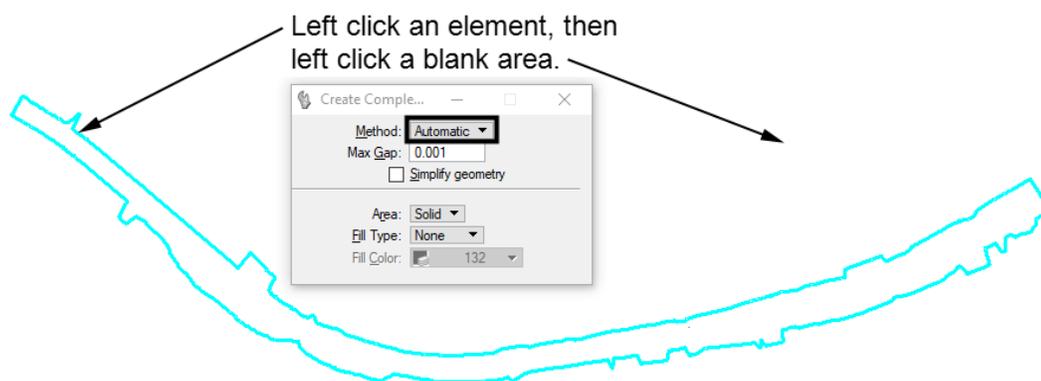


Next the modified elements are made into a shape.

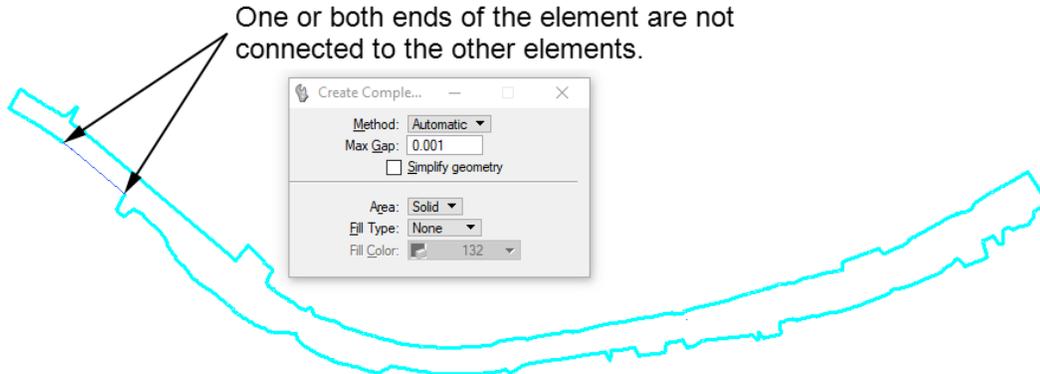
3. From the **Tasks** menu, select **Create Complex Shape**.



4. In the **Create Complex Shape** tool settings dialog box, set the **Method** to **Automatic**.
5. **Left Click** on one of the boundary elements, then left click in a blank area to create the shape.



6. If the highlighting stops before closing the shape, the place where the highlighting stops is not connected to the next element. If this occurs, **Right Click** to abort the command, then use the **Modify Element** tools to connect the elements.

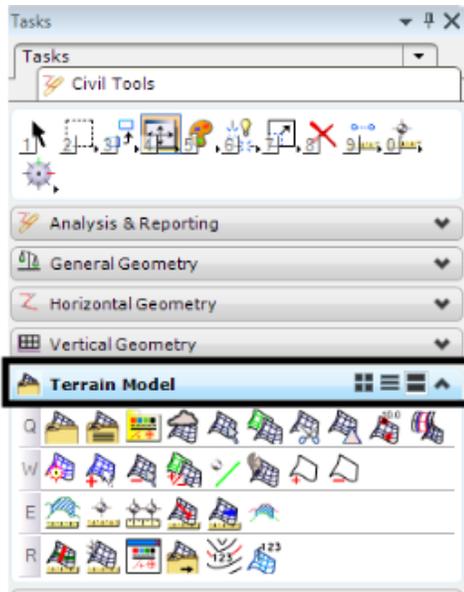


7. Once the boundary shape is created, turn on the corridor reference file display.

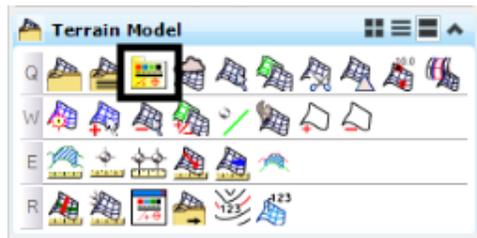
Creating The Design Terrain Model Using A Graphical Filter

The design terrain model is created from the linear features contained in the corridor model and the boundary element created in the section above.

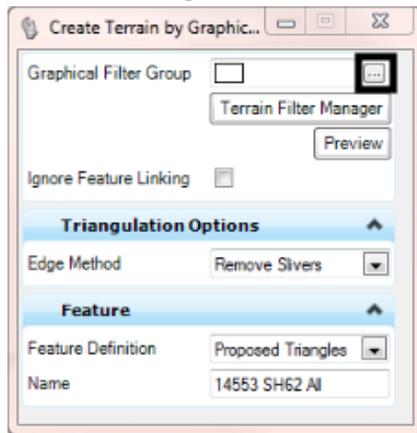
1. From the **Tasks** toolbar, expand the **Terrain Model** task.



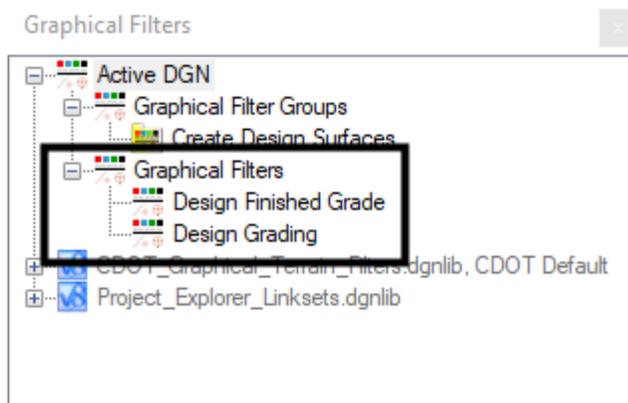
2. In the **Terrain Model** taskbar, select the **Create Terrain Model By Graphical** task. This displays the **Create Terrain Model By Graphical** task dialog box.



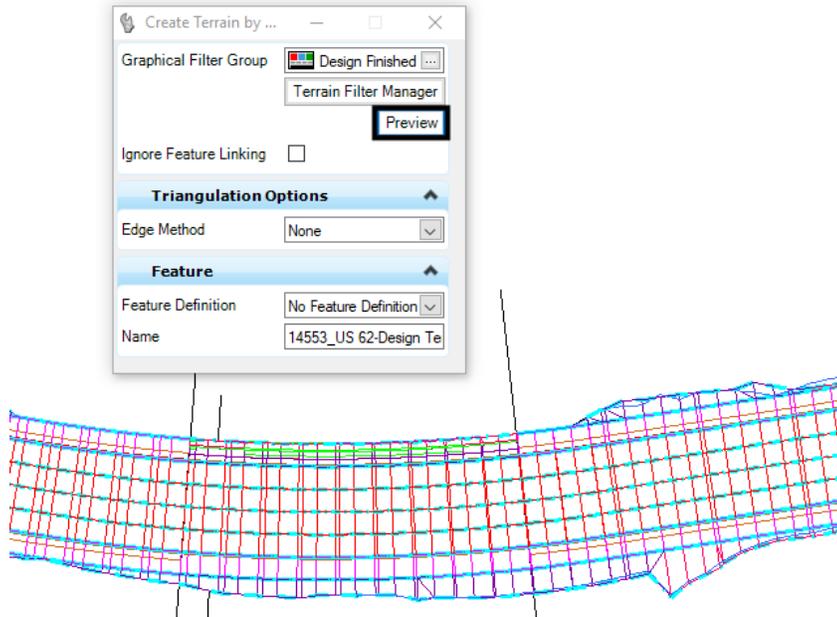
3. From the **Create Terrain Model By Graphical** task dialog box, **Left Click** the ellipsis button for the **Graphical Filter Group**. This displays the **Graphical Filters** dialog box.



4. In the **Graphical Filters** dialog box, **Left Click** on the desired filter. This selects the filter and dismisses the **Graphical Filters** dialog box.

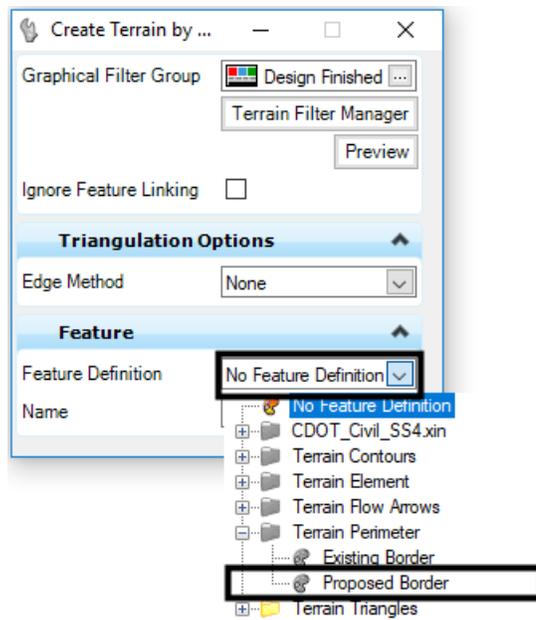


5. **Left Click** the **Preview** button. This highlights all of the elements that pass through the filter and are used to create the design terrain model.

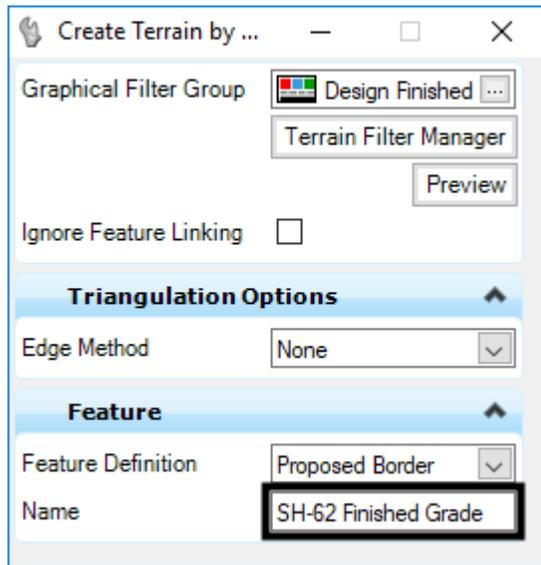


NOTE: If required features are not highlighted, an existing filter can be copied and edited or a new filter can be made. See the last section of this document **Creating A Graphical Filter** which includes the steps on how to modify or create a graphical filter.

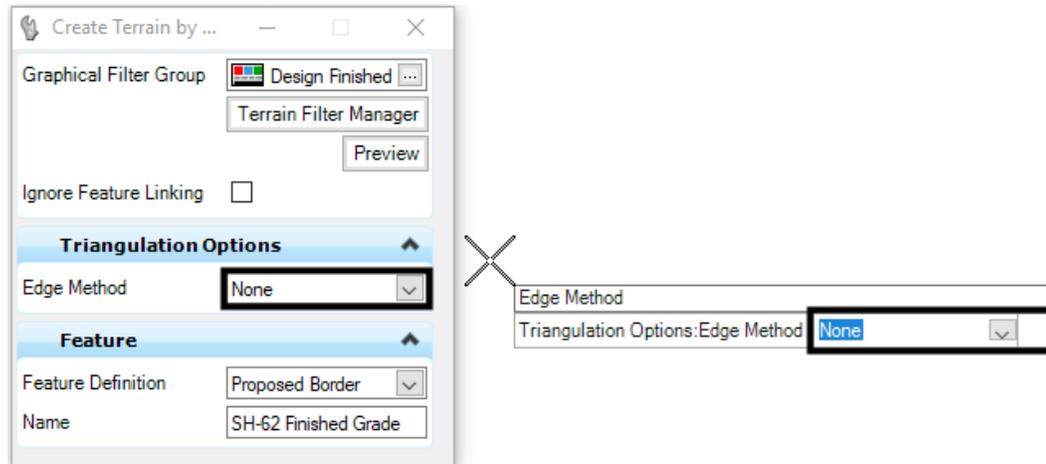
6. In the **Feature** area of the **Create Terrain Model By Graphical task** dialog box, select the desired feature definition from the drop down menu. In this example **Proposed Border** is selected. This sets the display style for the finished grade terrain model.



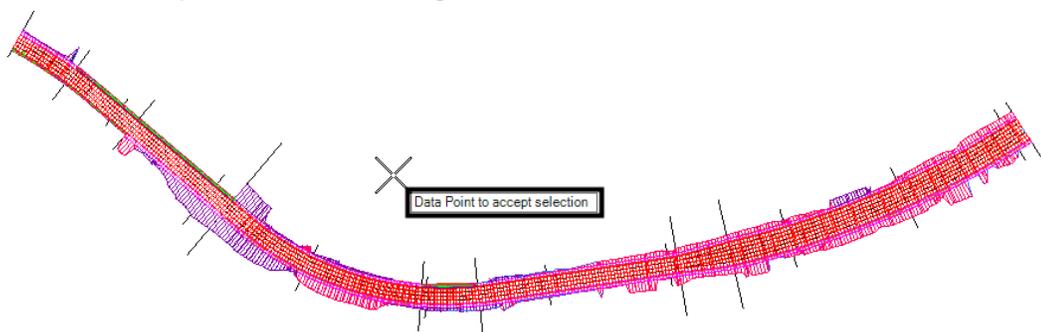
7. In the **Name** field, key in the desired name for the terrain Model to be created. In this example **SH-62 Finished Grade** was entered.



8. The cursor prompt now reads **Triangulation Options: Edge Method**. Use the down arrow to select the **None** option. This can also be set using the drop down menu on the dialog box. **Left Click** to accept the entry.

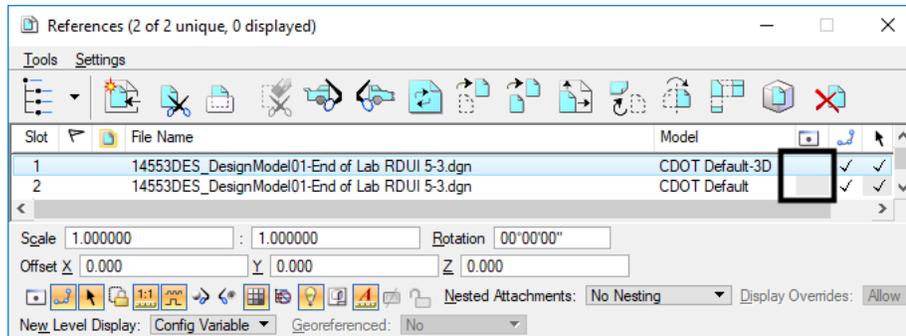


9. The final prompt reads **Data point to accept the selection**. Left Click in a blank area to accept the menu settings and create the surface.

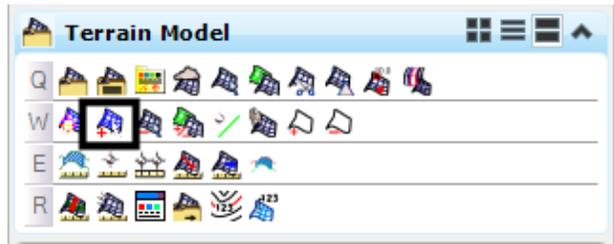


10. **Right Click** to exit the **Create Terrain Model By Graphical** command.
Next, the border element created above is added to the design terrain Model.

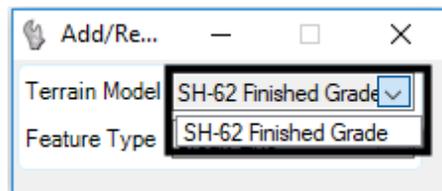
11. Turn off the corridor reference file display so that only the boundary element is visible.



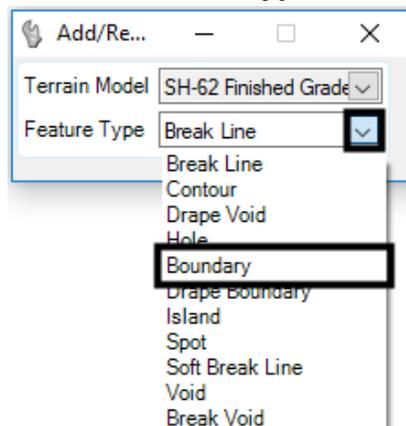
12. In the **Terrain Model** taskbar, select the **Add Features** task. This displays the **Create Terrain Model By Graphical** task dialog box.



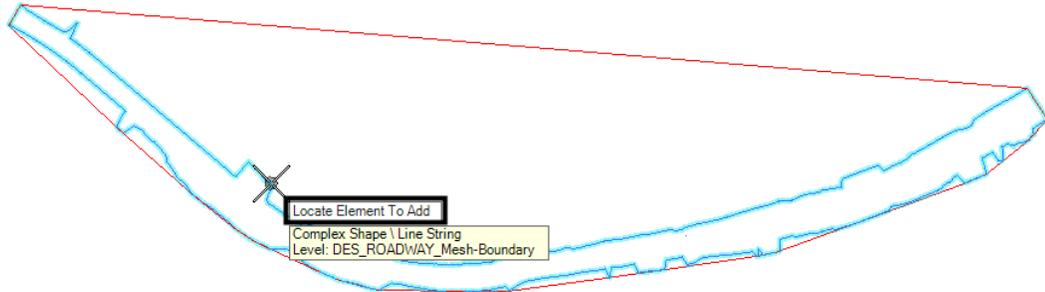
13. From the **Add Features** task dialog box, Set the **Terrain Model** to the one created above.



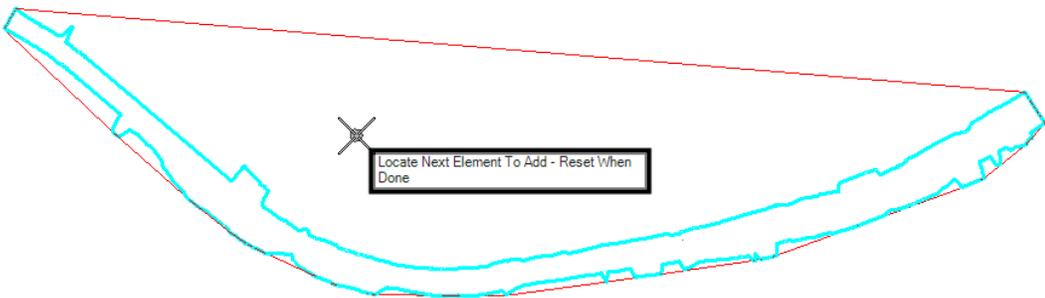
14. Set the **Feature Type** to the **Boundary**.



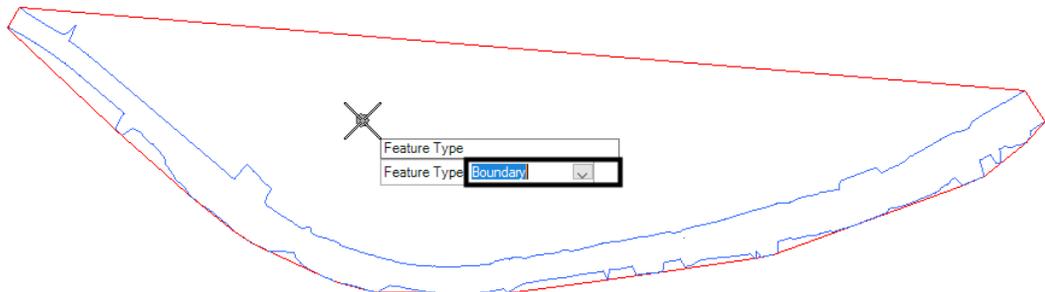
15. The prompt reads **Locate Element To Add**. **Left Click** on the boundary element.



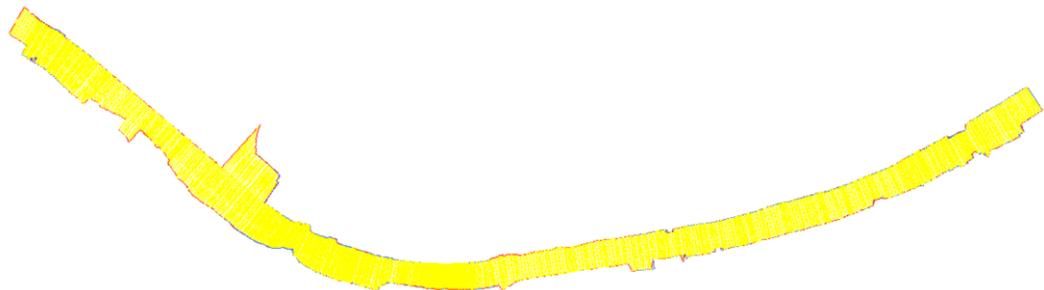
16. The next prompt reads **Locate Next Element To Add – Reset When Done**. **Right Click** to advance to the next prompt.



17. The next prompt reads **Feature Type**. Use the down arrow to select **Boundary** if it is not already selected. **Left Click** to complete the command.

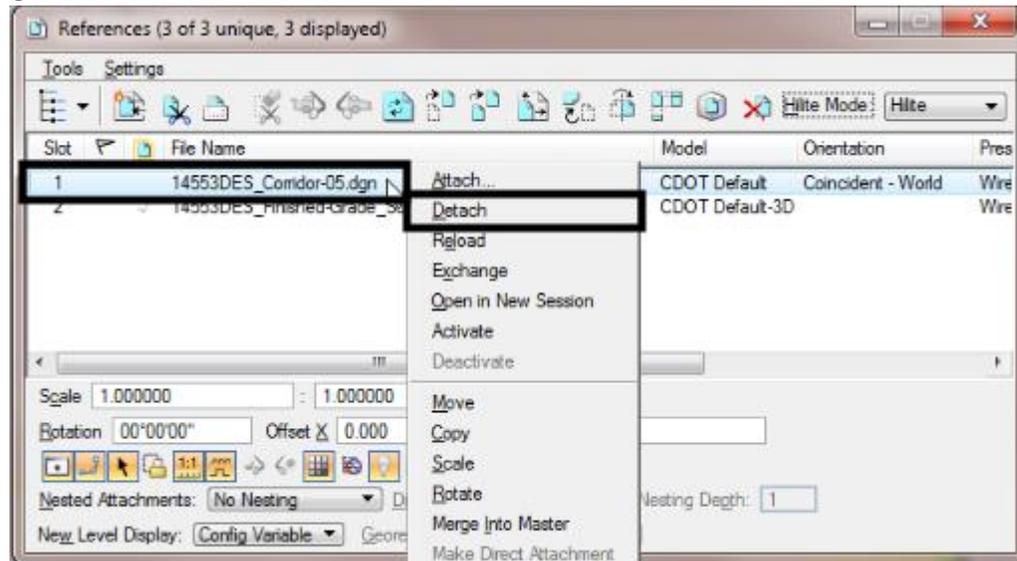


The illustration below shows the terrain model with triangles displayed so that the addition of the boundary can be seen. The boundary prevents data from being created outside of the model area.



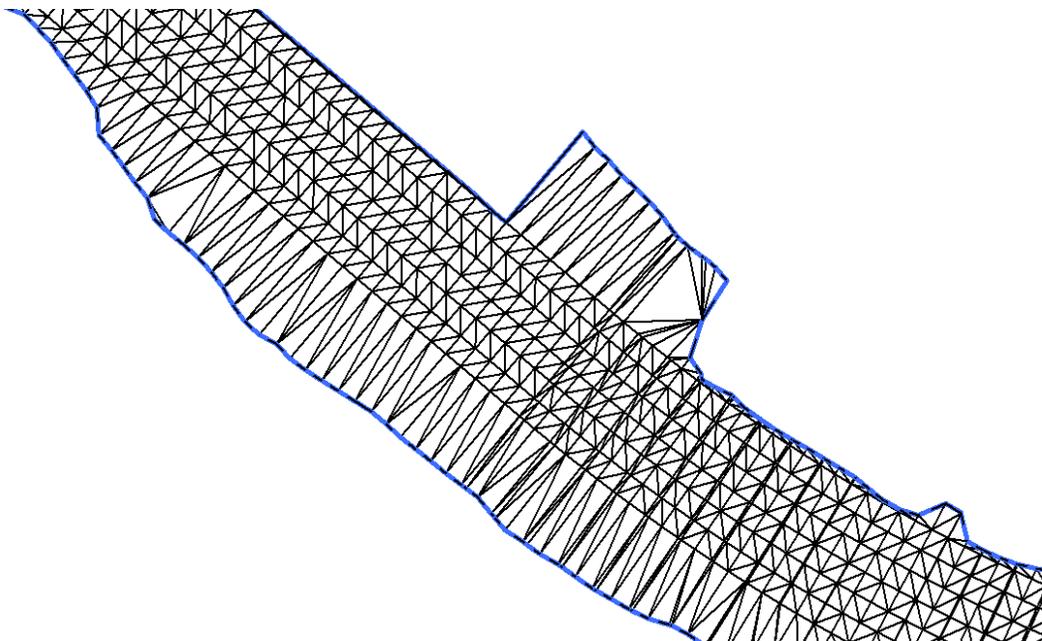
Now that the finished grade surface has been created, the reference file can be detached.

18. Open the **References** dialog box.
19. **Right Click** on the **14553DES_Corridor-05.dgn** and select **Detach** from the fly-out menu. This removes the corridor reference file, leaving only the finished grade terrain Model.



20. Dismiss the **References** dialog box.
21. Using the **Terrain Properties** dialog box, set the display as desired. In this example, triangles are displayed.

The illustration below shows the design terrain model with triangles displayed. Notice that the triangles are inside the border element.



Creating A Terrain Model Using Create From Elements Command

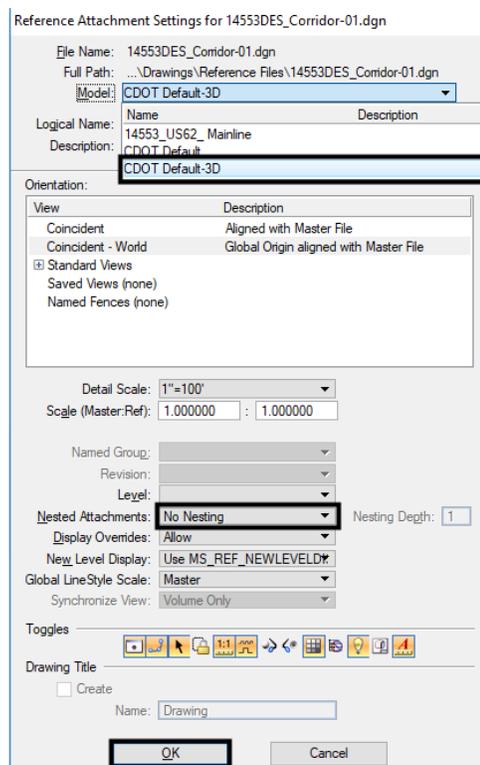
A design surface can be created using the corridor mesh and the mesh boundary. The steps for displaying the mesh boundary are the same as those outlined above. This section describes the process of creating the terrain Model from the mesh and mesh boundary.

Note: Before following the steps below, the corridor’s **Design Stage** must be set to **5 – Final Top Mesh** and the Mesh Boundary must be displayed.

The steps below use the mesh boundary and the corridor mesh to create the terrain model. In this example, the mesh boundary is used first to create the design terrain model. The top mesh is then added to this terrain model.

Create A DGN File To Contain The Terrain Element

1. Create a new DGN file using the **3D-Seed_CDOT.dgn** file.
2. Attach the project geographic coordinate system. For more information on this process see [Workflow MS-24 – Using Geographic Coordinate Systems at CDOT](#).
3. Reference the DGN file containing the corridor using the **CDOT Default-3D** model and **No Nesting**.

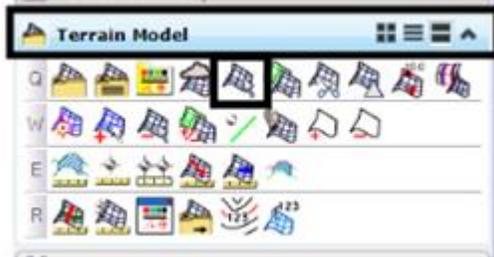


Displaying The Mesh Boundary

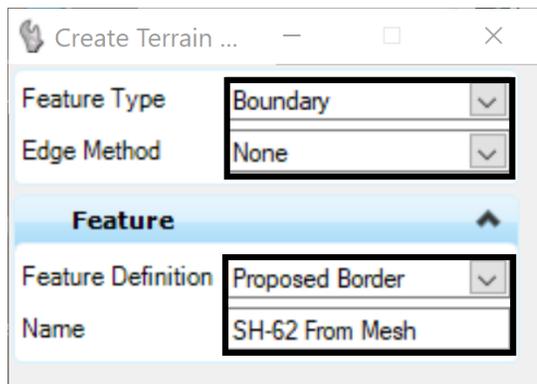
Refer to the sections **Displaying The Mesh Boundary** (page 2) and **Editing The Mesh Boundary** (page 3) for instructions on displaying and editing the mesh boundary.

Creating The Design Terrain Element

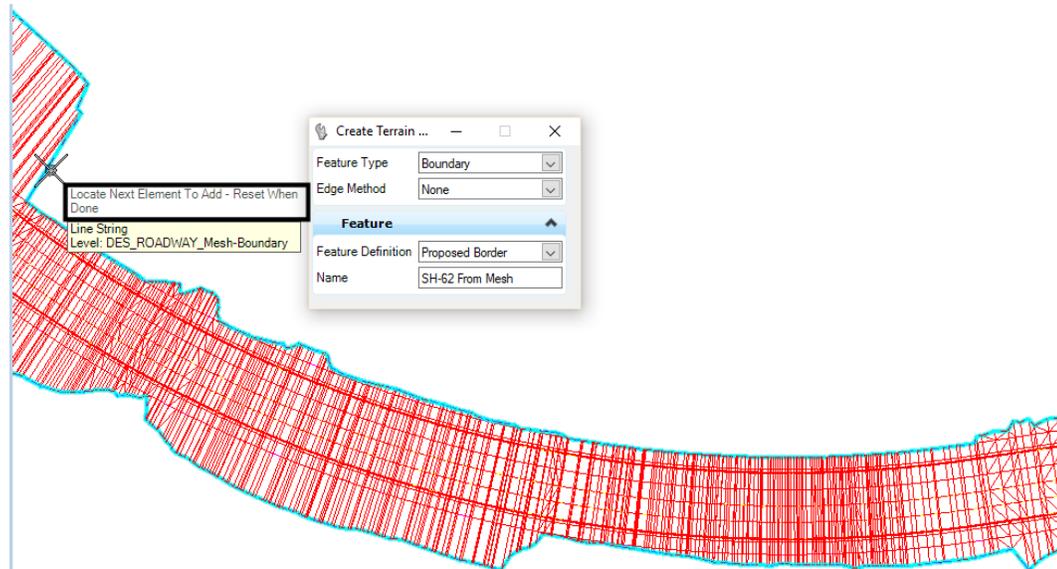
1. From the **Tasks** toolbar, expand the **Terrain Model** task.
2. In the **Terrain Model** taskbar, select the **Create From Elements** button. This displays the **Create Terrain From Elements** dialog box.



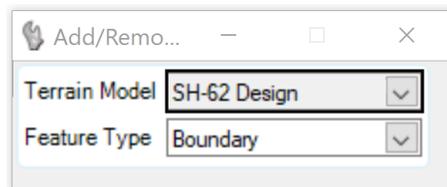
3. In the **Create Terrain From Elements** dialog box, set the **Feature Type** to the desired option. In this example **Boundary** is used.
4. Set the **Edge Method** to **None**.
5. In the **Feature** area, set the **Feature Definition** to the desired option. Here, **Proposed Border** is used.
6. In the **Name** field, key in the desired name. In this example, **SH-62 From Mesh** is entered.



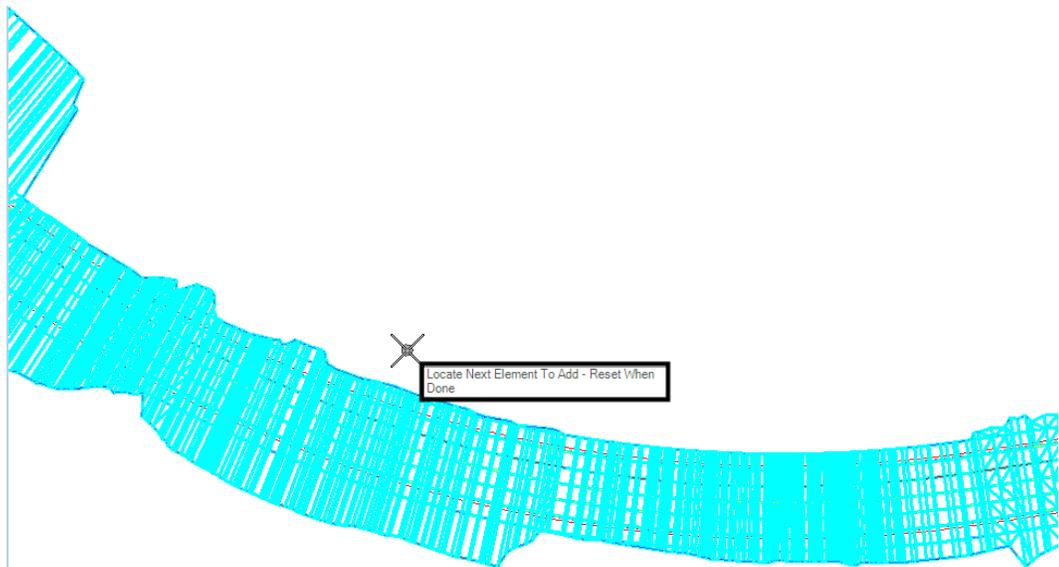
7. **Left Click** on the element to be included in the terrain model. In this example, the boundary element is selected.
8. **Right Click** to move to the next prompt.



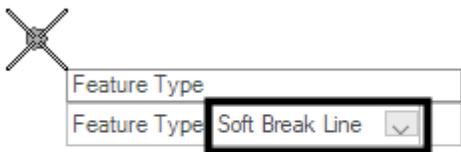
9. **Left Click** through the remaining prompts to complete the command. This creates the design terrain model and launches the **Add Features** command. This command is used to import the design top mesh. If the **Add Features** is not launched, it can be started from the task menu. If the **Add Features** command is launched from the Task Menu, select the **Terrain Model** created above in the dialog box.



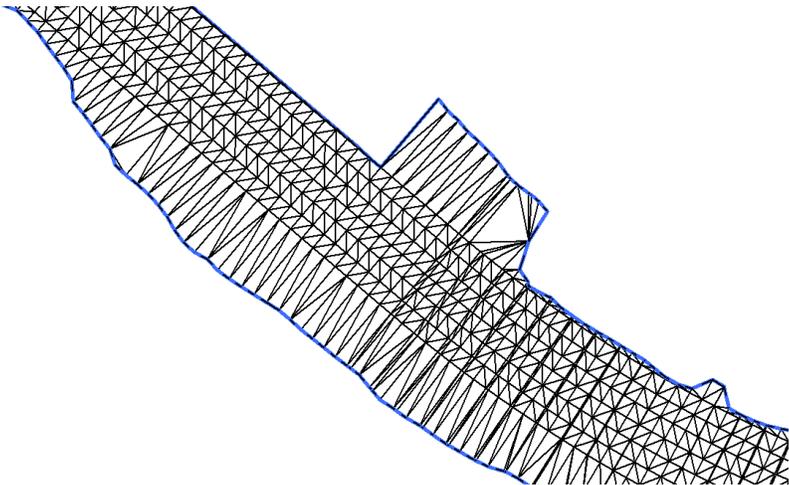
10. The prompt reads **Locate Element To Add**. **Left Click** on the desired element. In this example, the design top mesh is selected.
11. The second prompt reads **Locate Next Element To Add -Reset When Done**. For this example, no other items are used, so **Right Click** to move to the next prompt.



12. The third prompt reads **Feature Type**. Use the down arrow to select the desired feature type. For the design top mesh, **Soft Breakline** is used. **Left Click** to complete the step.



13. If this is the last item to be added, **Right Click** to exit the **Add Features** command. In this example, only the boundary and design top mesh are used. This completes the design terrain model.



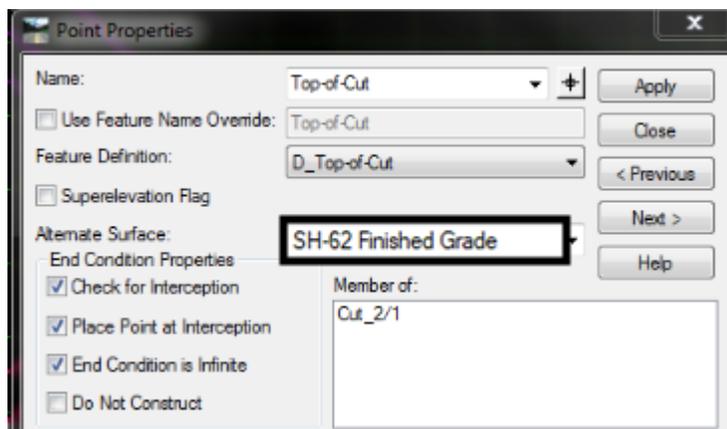
Creating A Terrain Model From Alternate Surface

A design surface can be created using the Alternate Surface points defined in the template. Using this option to create the design terrain model in the corridor DGN file allows a DTM or LandXML file to be exported that contains the Feature Definitions for the design data.

Creating a design model from Alternate Surface will require a boundary created from the design mesh as defined above. The following steps assumes that the boundary has already been displayed. The mesh boundary must be displayed in the 3D Model containing the corridor. The remaining steps are done in the 2D Model.

Updating The Template To Make An Alternate Surface

To create a design terrain model from Alternate Surface, the points used for the alternate surface must be specified in the template. The illustration below shows the Top-of-Cut point with the Alternate Surface label (SH-62 Finished Surface) applied.



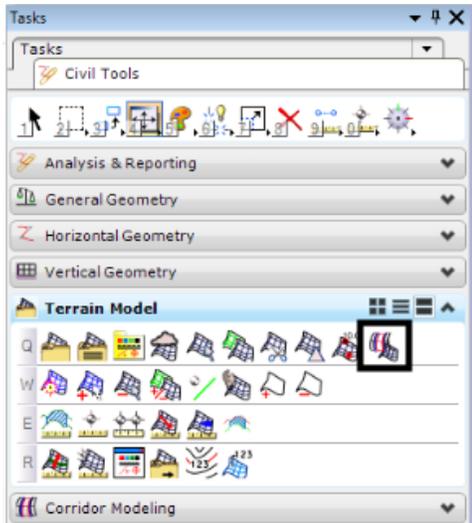
All template points to be used for a single Alternate Surface must have the same Alternate Surface label. A separate Alternate Surface will be created for each unique label found in each template of the corridor.

Note: If the Alternate Surface labels are applied after the corridor has been defined, the corridor has to be reprocessed before the alternate surface can be created.

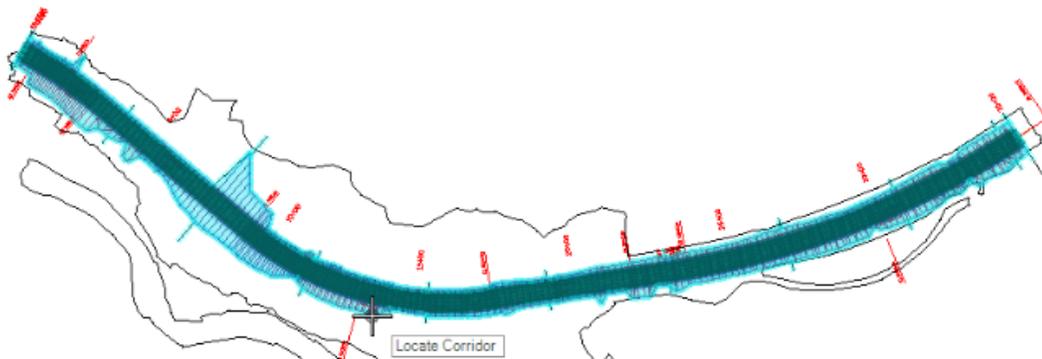
Creating The Alternate Surface

Creating the complete alternate surface requires two commands; Create Corridor Alternate Surfaces and Add Features. The first command creates the design terrain model from the template features and the second adds the boundary element to that surface.

1. From the **Tasks** toolbar, expand the **Terrain Model** task.
2. Select the **Create Corridor Alternate Surfaces** button.

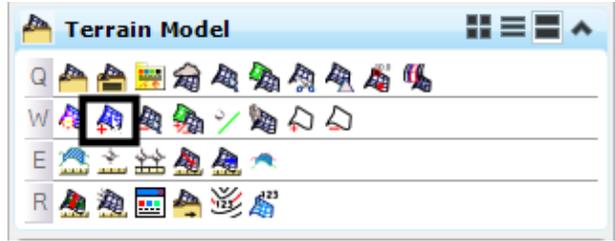


3. There is no dialog box associated with this command. The first prompt reads **Locate Corridor**. Move the cursor on to the corridor and **Left Click**. This creates the alternate surface terrain model.

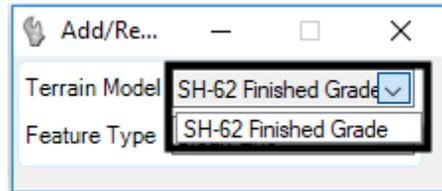


Next, the boundary is added to the design terrain model.

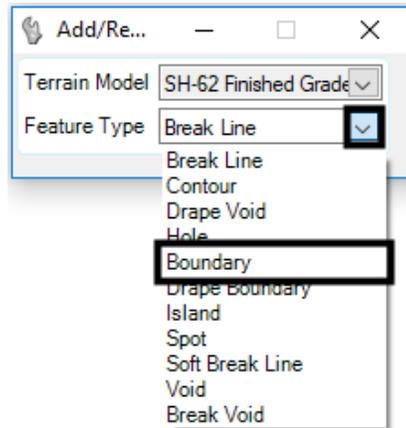
4. In the **Terrain Model** taskbar, select the **Add Features** task. This displays the task dialog box.



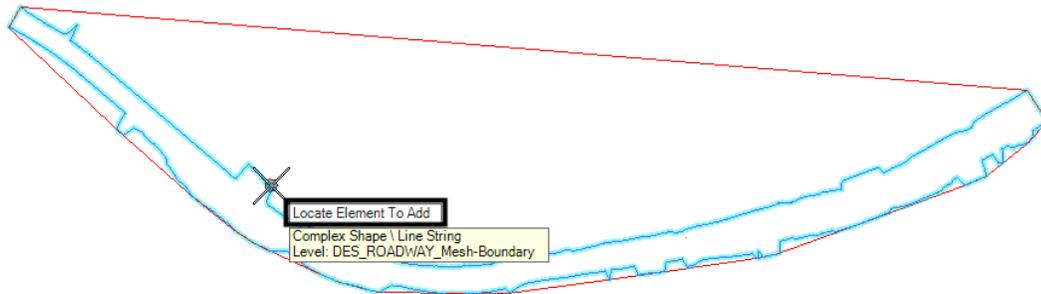
5. From the **Add Features** task dialog box, Set the **Terrain Model** to the one created above.



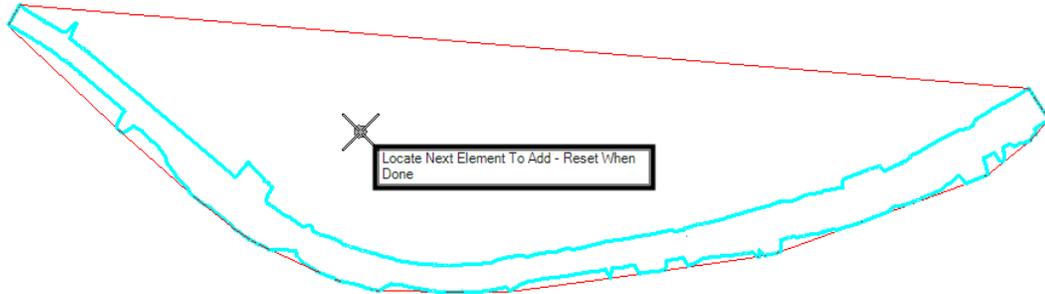
6. Set the **Feature Type** to the **Boundary**.



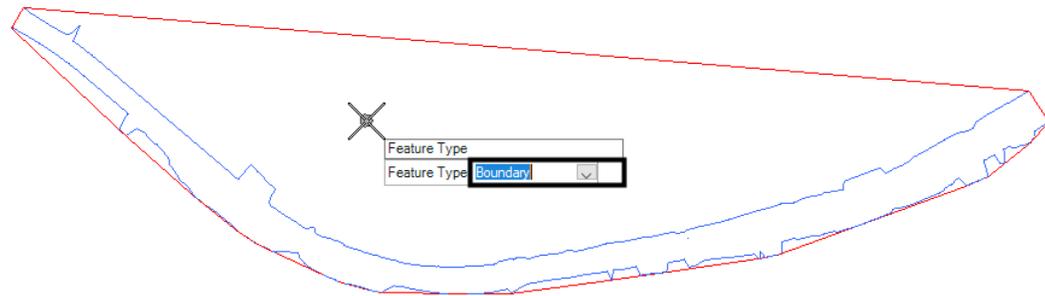
7. The prompt reads **Locate Element To Add**. Left Click on the boundary element.



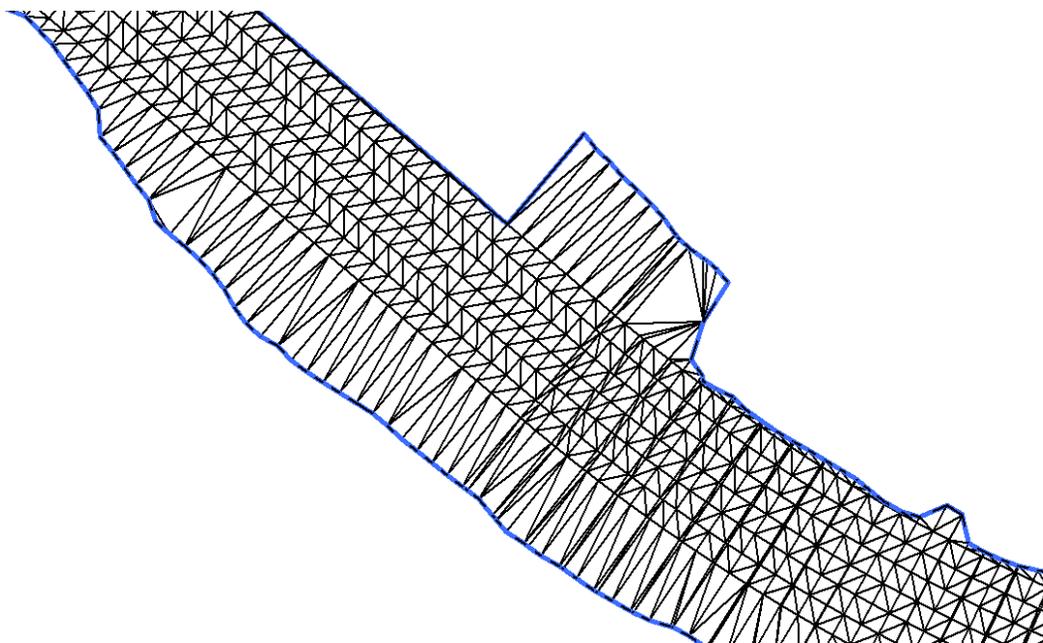
- The next prompt reads **Locate Next Element To Add – Reset When Done**. **Right Click** to advance to the next prompt.



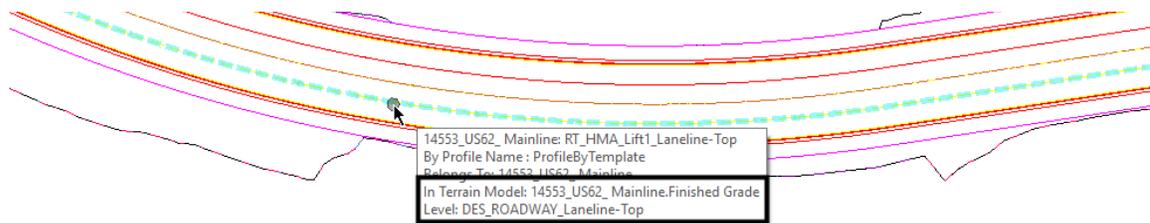
- The next prompt reads **Feature Type**. Use the down arrow to select **Boundary** if it is not already selected. **Left Click** to complete the command.



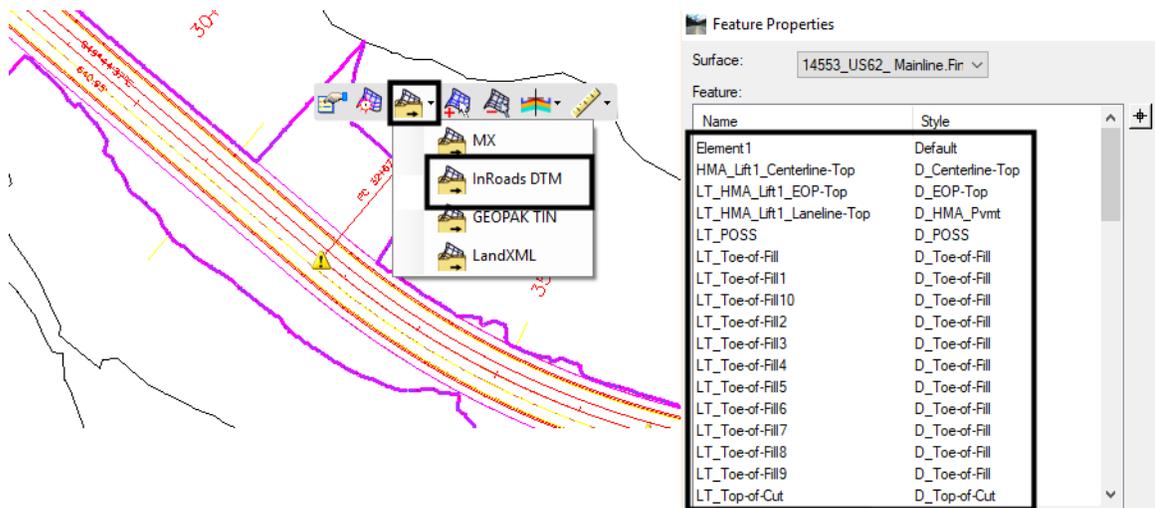
This completes the design terrain model. The illustration below shows the model set to display triangles.



When a terrain model is created as described in this section, the Feature Names and Feature Definitions are attached to the linear features. The illustration below shows the RT_HMA_Lift1_Laneline-Top feature highlighted. Notice that it belongs to the terrain element and that it is on the correct level for that feature.



When exporting the terrain model to a DTM or LandXML file, the Feature Names and Feature Definitions are included in the exported data.



The illustration above shows the Feature Properties of the exported terrain from alternate surface. Notice that the feature names and feature styles are included. Element1 is the boundary. The Add Feature command used to create it does not allow for the feature to be named or given a feature definition so default values were used.

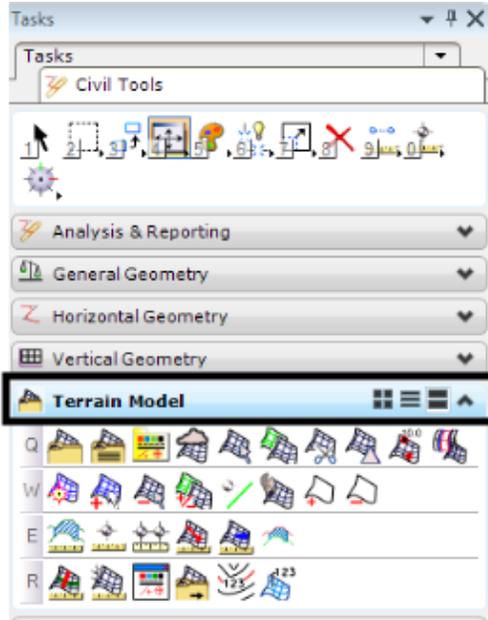
Working With Graphical Filters

Graphical Filters allow the user to create a terrain element based on a predetermined set of criteria. Some graphical filters are included in the workspace. These cannot be edited. However, they can be copied from the dgnlib to the active dgn file for editing.

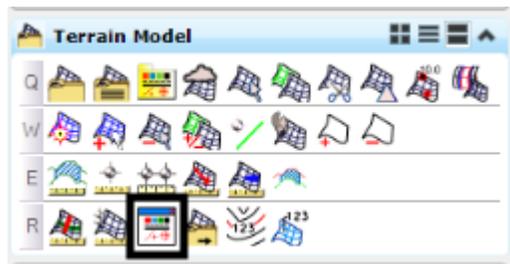
Editing An Existing Graphical Filter

Graphical Filters can be copied from the dgnlib to the active dgn file for editing.

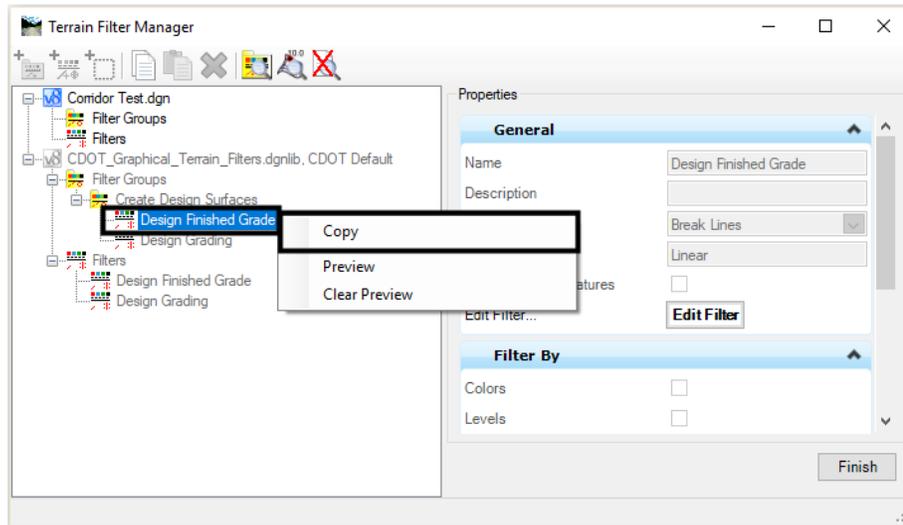
1. From the **Tasks** toolbar, expand the **Terrain Model** task.



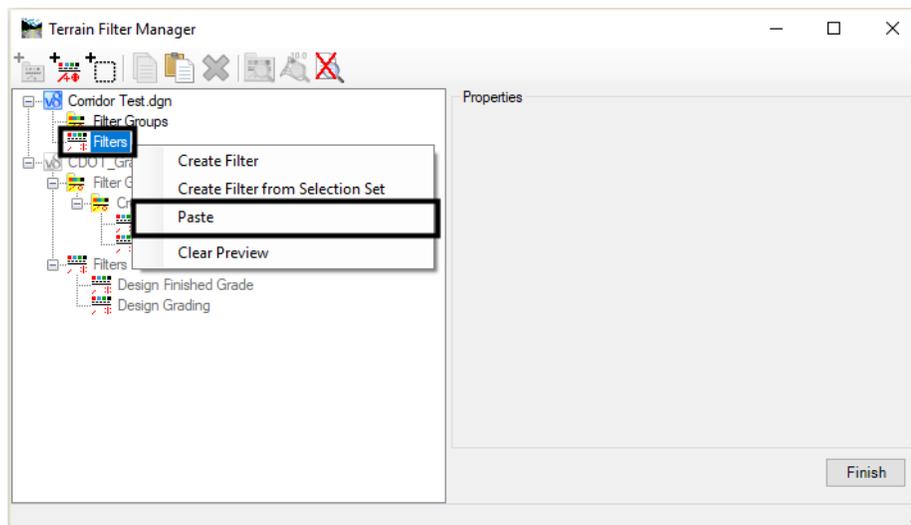
2. In the **Terrain Model** taskbar, select the **Graphical Filter Manager** Task. This displays the **Terrain Filter Manager** dialog box.



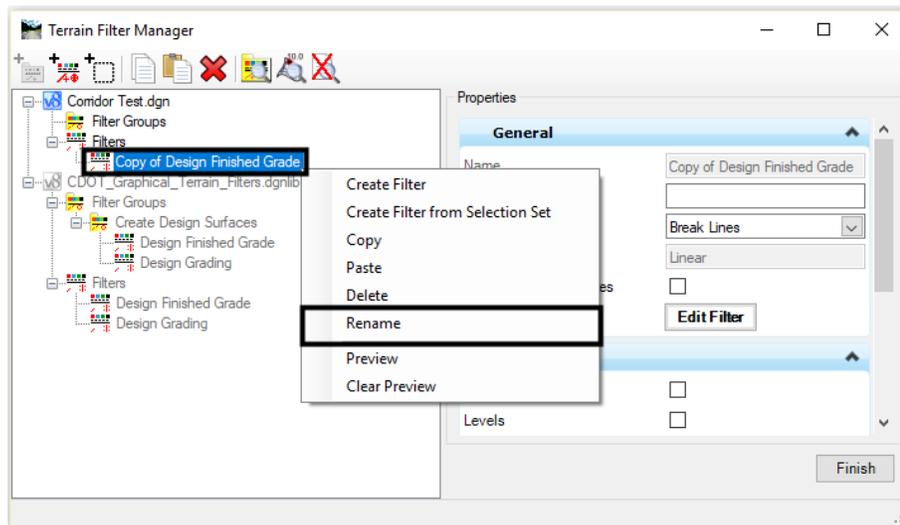
3. In the **Terrain Filter Manager** dialog box, **Right Click** on the filter and select **Copy** from the menu.



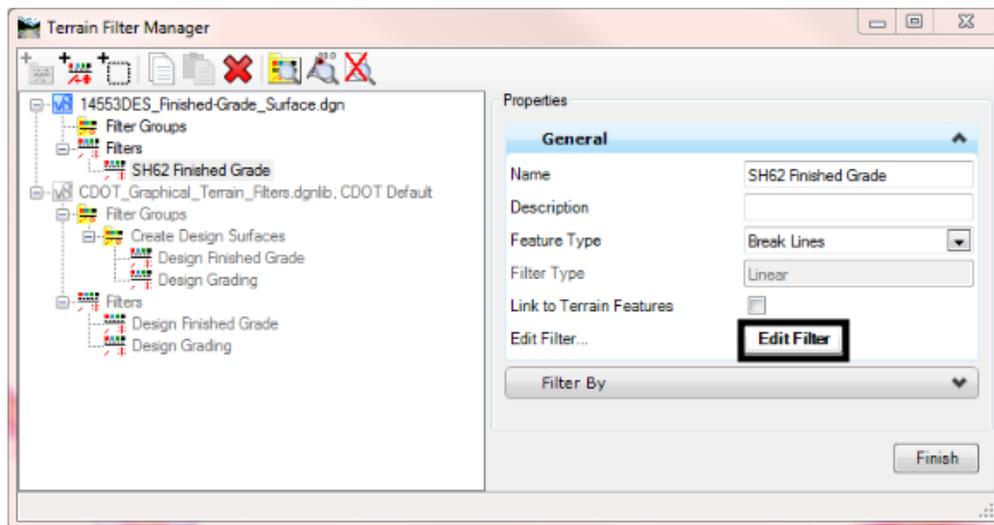
4. **Right Click** on **Filters** under the active DGN file and select **Paste**. This creates an editable copy of the graphical filter.



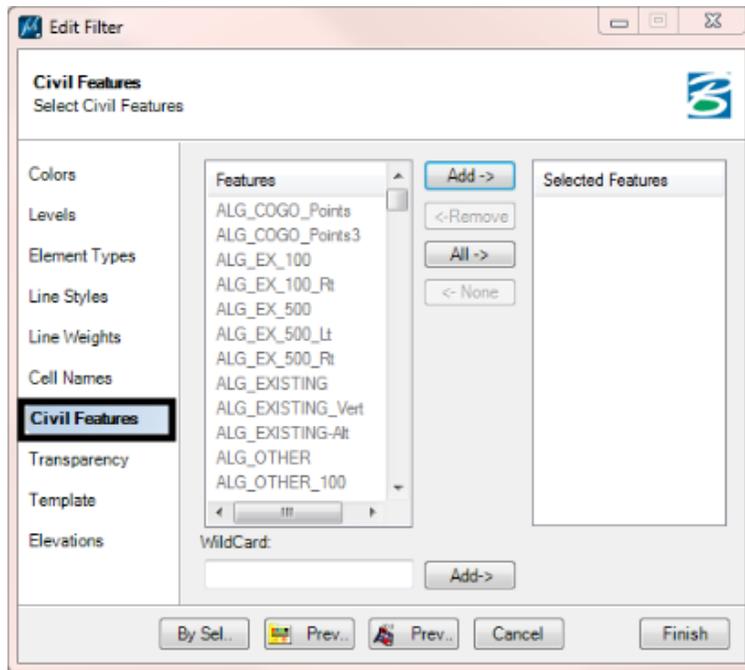
5. **Right Click** on the copied **Filter** under the active DGN file and select **Rename**. Key in the desired name.



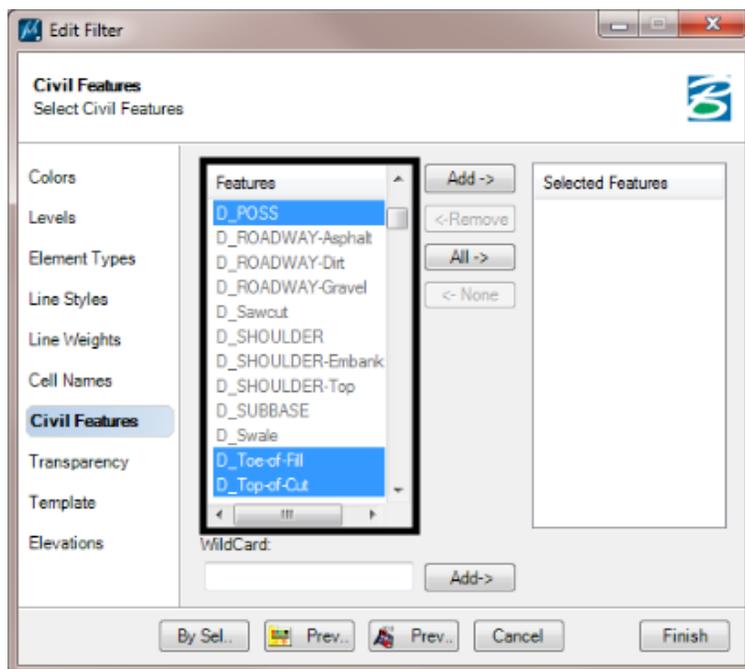
6. **Left Click** the **Edit Filter** button on the right side of the dialog box. This displays the **Edit Filter** dialog box.



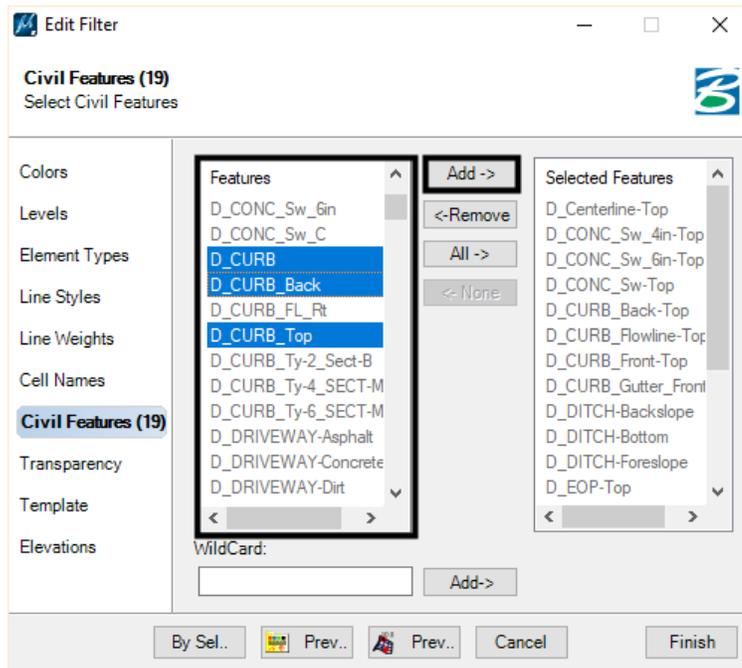
- In the **Edit Filter** dialog box, left click on the **Civil Features** option on the left side of the dialog box. From here, **Feature Definitions** used to define the finished grade are selected.



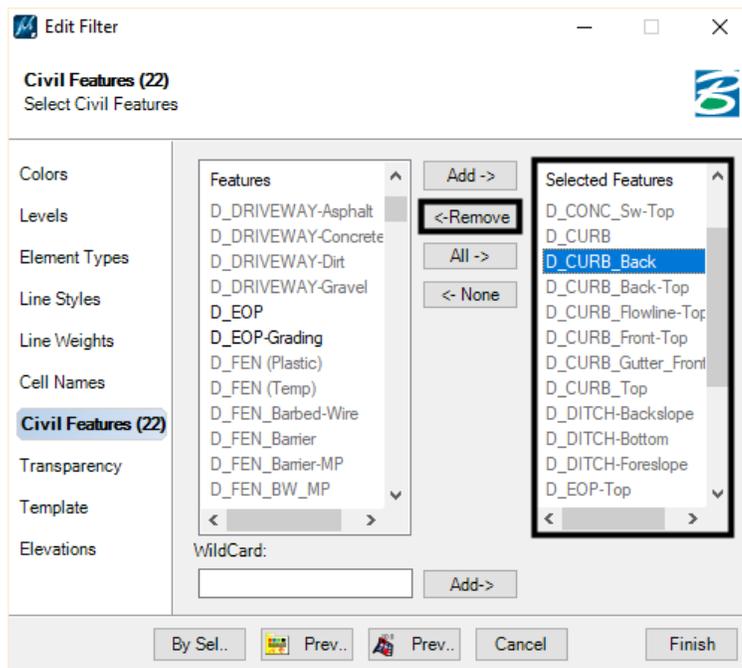
- In the **Features** menu (on the left), highlight the desired items (hold down the **Ctrl** key to select multiple items). The feature definitions selected need to match the feature definitions used on the template points required to create the design terrain model.



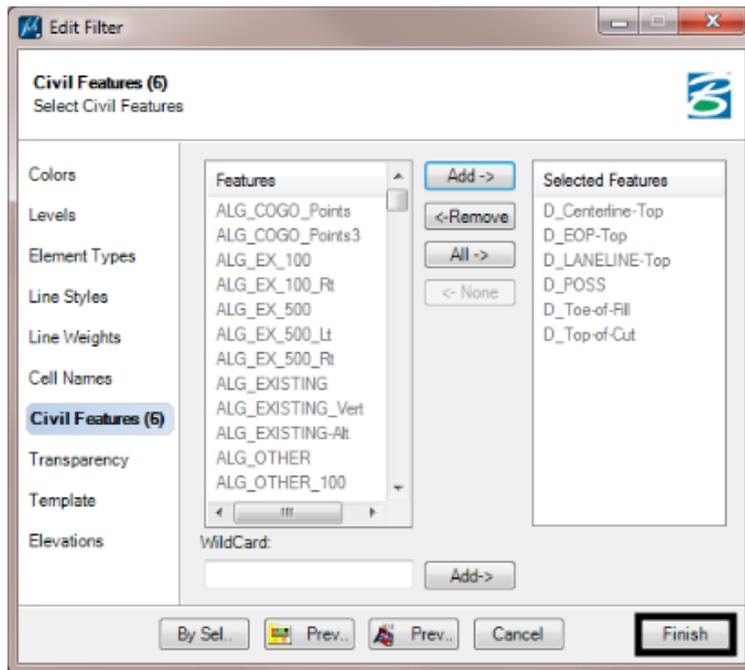
9. **Left Click** the **Add** button to add the selected **Feature Definitions** to the **Selected Features** list.



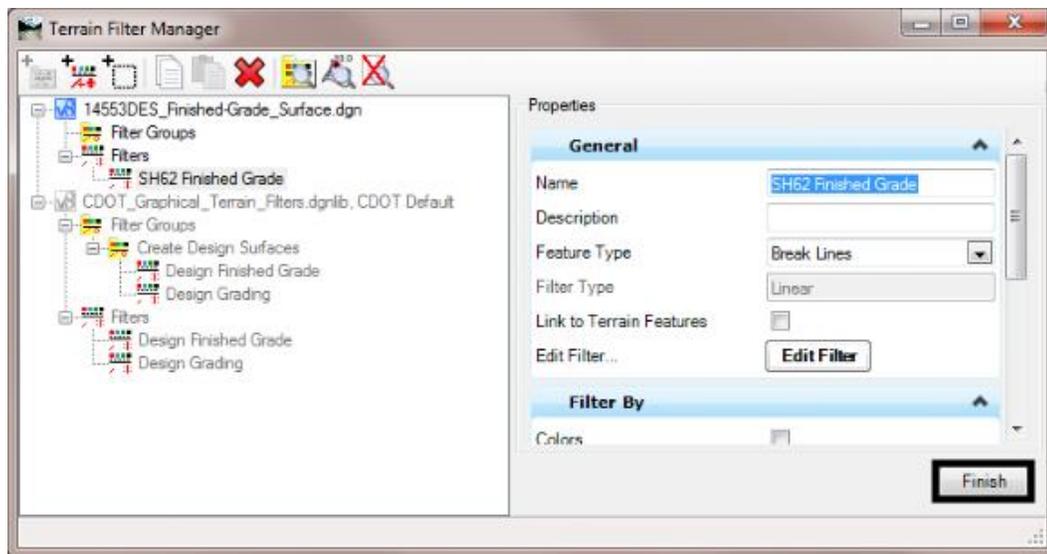
10. To remove items from the **Selected Features** list, Highlight the desired items in the **Selected Features** list.
11. **Left Click** the **Remove** button to delete the selected items from the **Selected Features** list.



12. **Left Click** the **Finish** button to complete the filter definition. This dismisses the **Edit Filter** dialog box.

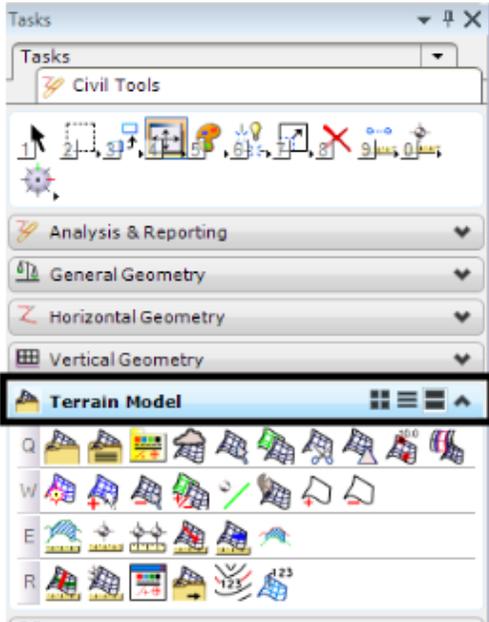


13. In the **Terrain Filter Manager** dialog box, **Left Click** the **Finish** button. This completes the graphical filter.

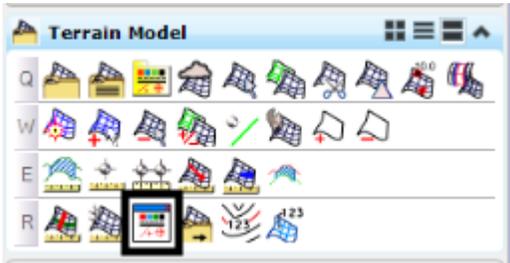


Creating A New Graphical Filter

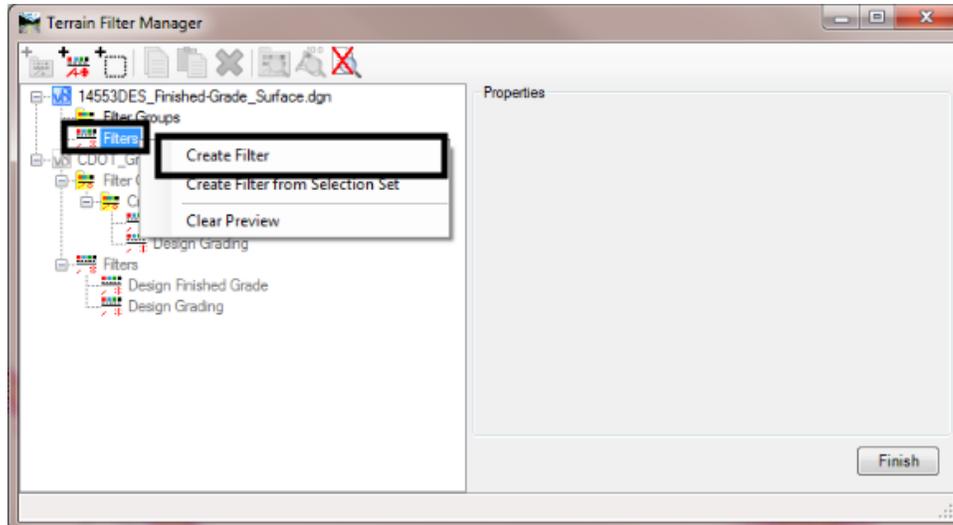
- 1. From the **Tasks** toolbar, expand the **Terrain Model** task.



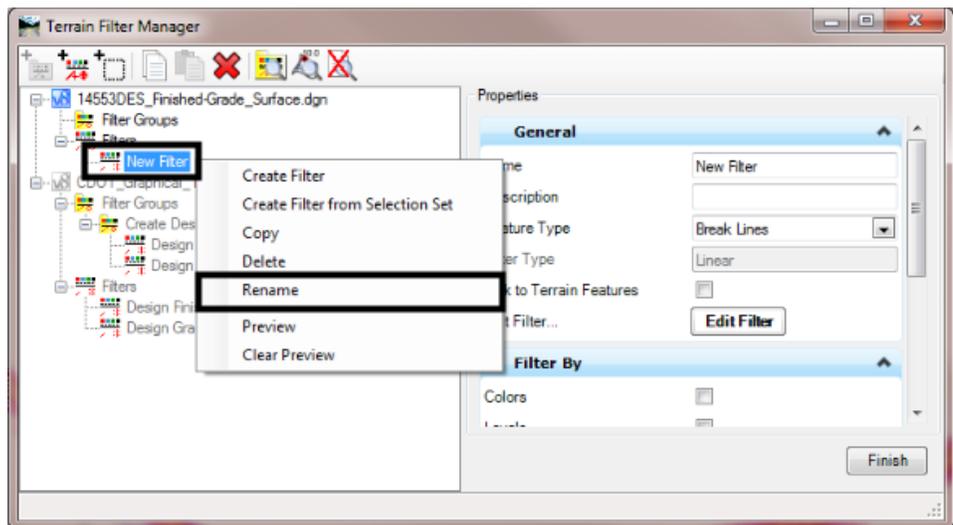
- 2. In the **Terrain Model** taskbar, select the **Graphical Filter Manager** Task. This displays the **Terrain Filter Manager** dialog box.



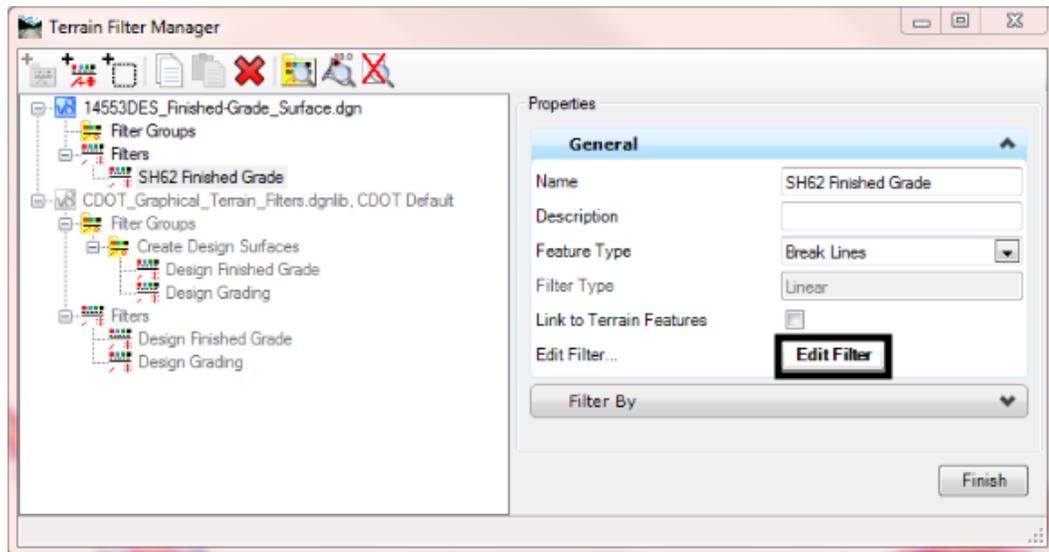
3. In the **Terrain Filter Manager** dialog box, in the folder tree on the left, **Right Click** on the **Filters** Folder.
4. Select **Create Filter** from the flyout menu. This places a **New Filter** under the **Filters** folder.



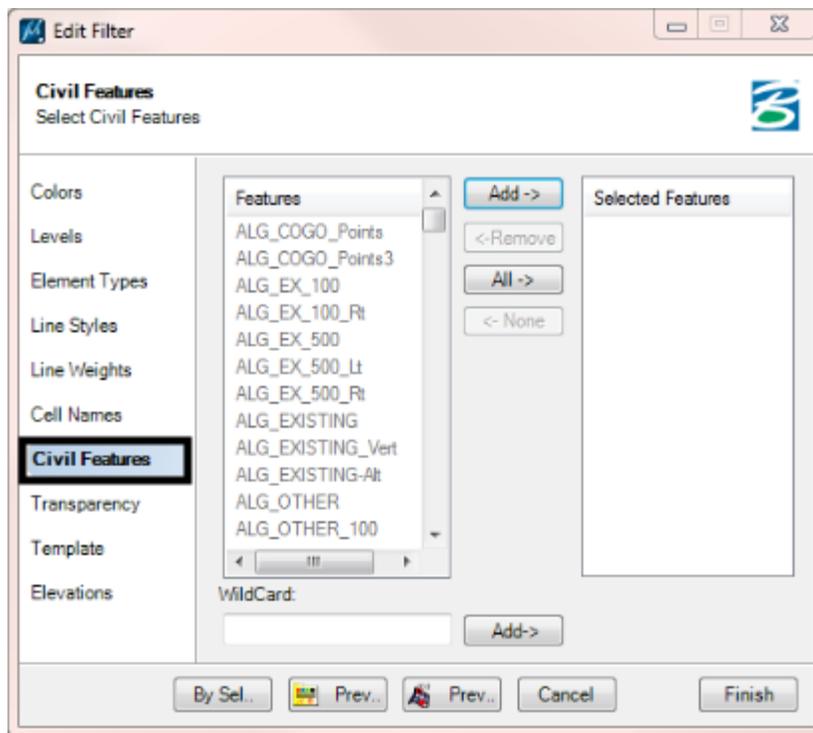
5. **Right Click** on the **New Filter** and select **Rename** from the flyout menu.



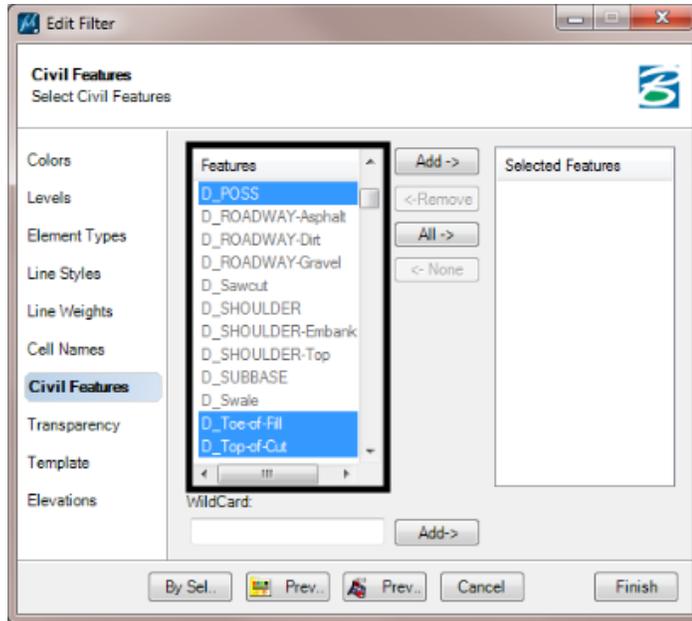
6. Key in the desired name and tap the **Enter** key.
7. **Left Click** the **Edit Filter** button on the right side of the dialog box. This displays the **Edit Filter** dialog box.



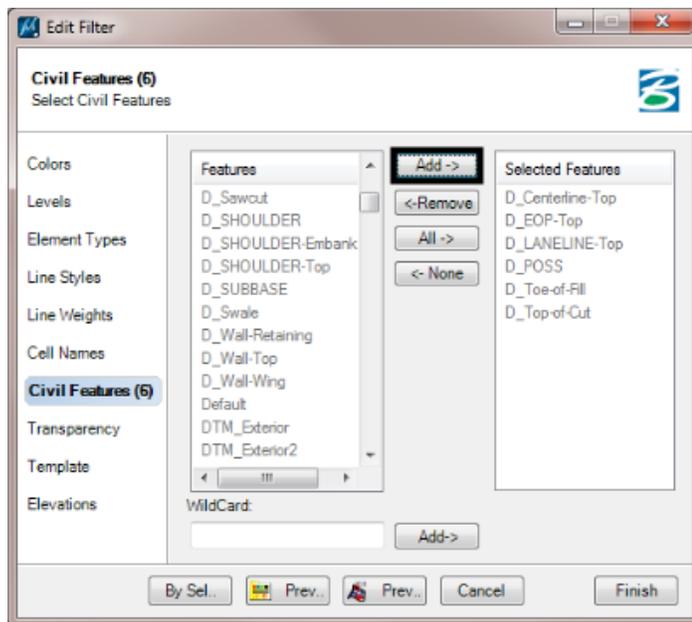
8. In the **Edit Filter** dialog box, **Left Click** on the **Civil Features** option on the left side of the dialog box. From here, **Feature Definitions** used to define the finished grade are selected.



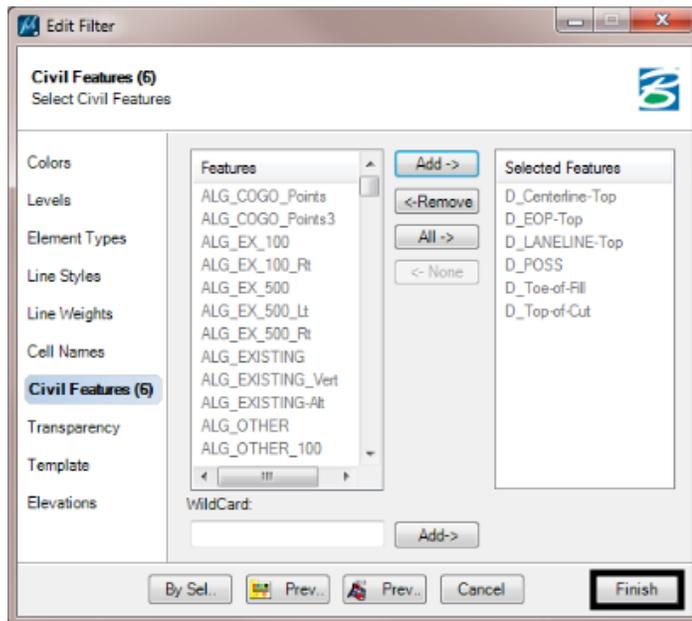
- In the **Features** menu (on the left), highlight the desired items (hold down the **Ctrl** key to select multiple items). The feature definitions selected need to match the feature definitions used on the template points required to create the design terrain model.



- Left Click the **Add** button to add the selected **Feature Definitions** to the **Selected Features** list.



11. **Left Click** the **Finish** button to complete the filter definition. This dismisses the **Edit Filter** dialog box.



12. In the **Terrain Filter Manager** dialog box, **Left Click** the **Finish** button. This completes the graphical filter.

