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## Chapter 6

# Creating an Aggregate Base

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## 6.1 Objectives

The purpose of this chapter is to show the user how to create alternate surfaces including aggregate layers for the purposes of automated machine guidance or stage construction.

## 6.2 Adding Aggregate Components to a Template

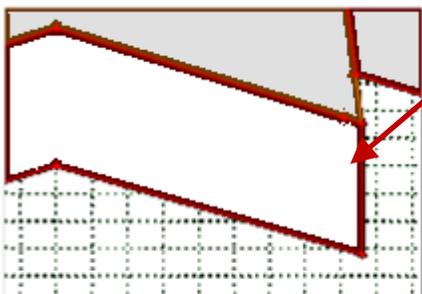
In order to provide more flexibility to the designer, all templates in the default MoDOT library were created without aggregate layers.

Aggregate components are located under the “Base” folder in the MoDOT default template library. All base layers are closed shape components, but can be modified to do the following:

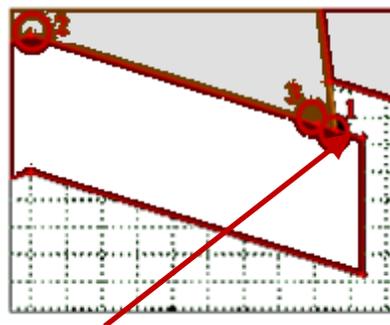
1. Simple flushed aggregate base underneath the pavement.
2. 18”aggregate extensions, or
3. Daylight to proposed design slopes.

### 6.2.1 Adding Base Layers with Aggregate Extension

1. Open the project template library and make the desired template active in the current template window.
2. Drag and drop the base layer.
3. Modify the layer to create the 18 in aggregate extension if that is desired on each side.
  - a. Right click on vertical edge of aggregate, and select insert point.
  - b. Right click on newly created point, and select edit point.
  - c. Set a horizontal constraint of 18 inches (1.5’), select the appropriate parent point. Type in a label called “aggregate\_extension”.
  - d. Set a vector-offset constraint with a value of zero, and select the appropriate parent points. (Parents point should define the slope of the aggregate extension)



Right-click on edge and select “insert point”

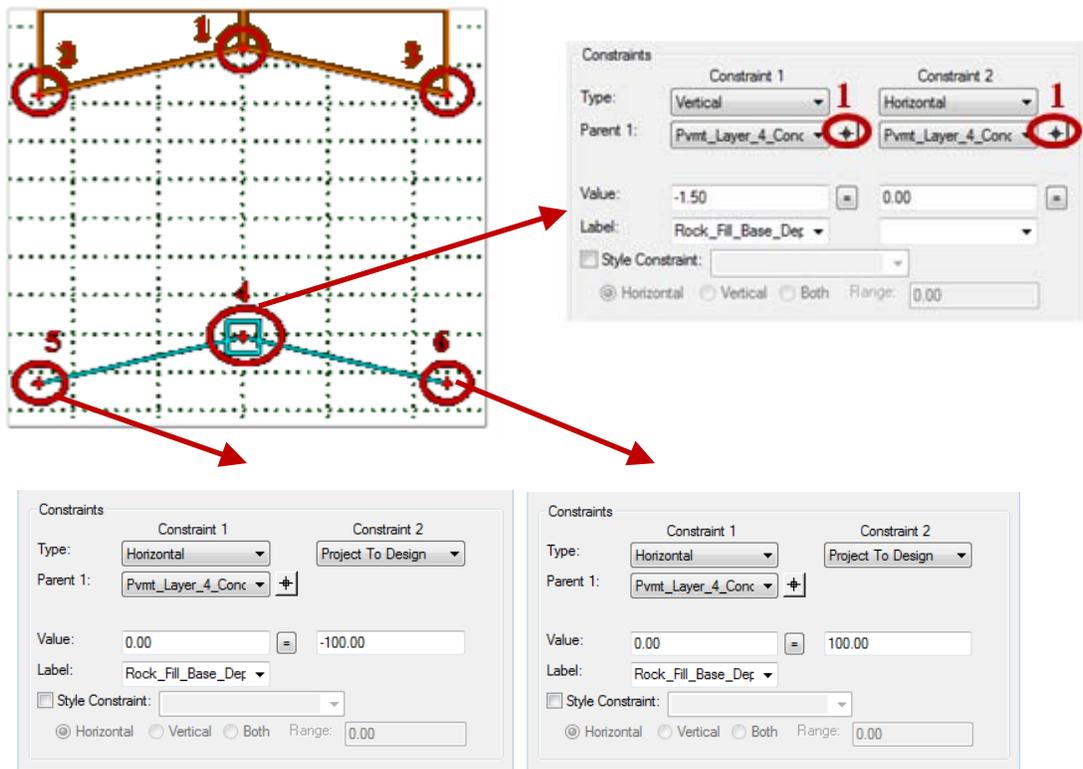


4. Save template.
5. Test template.

Newly created point, fully constrained:  
 Parent point (horizontal constraint): 1  
 Value = 1.5’  
 Label: Aggregate\_Extension.  
 Parent points (vector-offset): 2 & 3  
 Value: = 0

### 6.2.2 Adding Base Layer to Daylight

1. Open the project template library and make the desired template active in the current template window.
2. Drag and drop the base layer to an area in your template, but do not attach to any other element. (Set dynamic settings and turn mirror on).
3. Modify the component to daylight
  - a. Merge component.
  - b. Edit component, uncheck “closed shape”. This action makes the component a simple line.
  - c. Delete all top points.
  - d. Fully constraint all remaining points. There are many options for constraints, pick something that works for you template. Below is shown one way to fully constraint all the points in that template.



- e. Add point at the end of the open base layer component.
  - f. Set first constraint: slope using the appropriate parents point to define slope.
  - g. Set second constraint: project to design.
4. Save template.
  5. Test template.

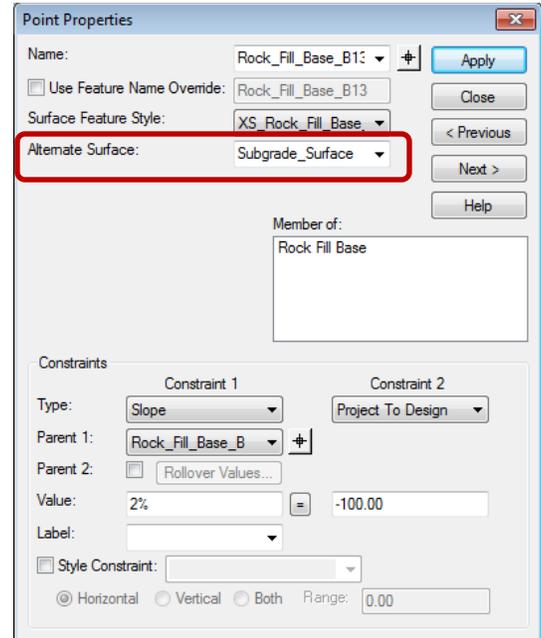
**NOTE:** If end condition does not provide adequate depth for day lighting, the component will not create a solution.

### 6.3 Defining the Alternate Surface(s)

Each template point must be predefined as an alternate surface prior to applying a template drop in a corridor. Therefore, all alternate surface points must be defined in the template stored in the project template library.

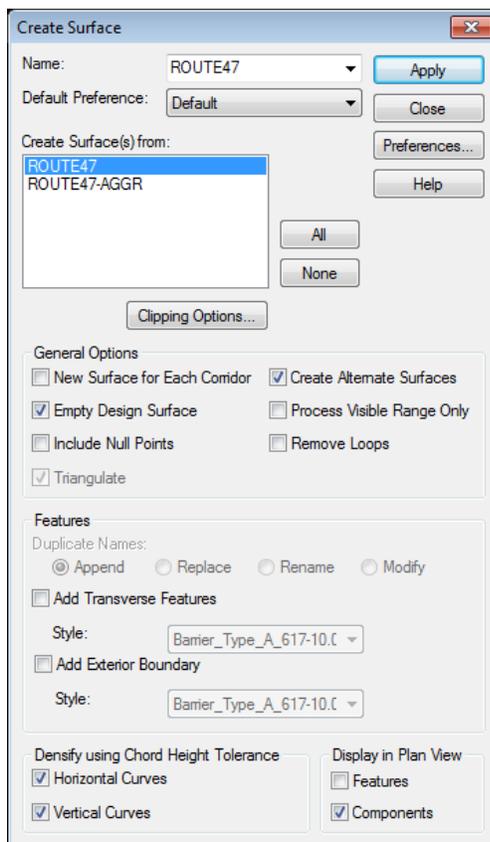
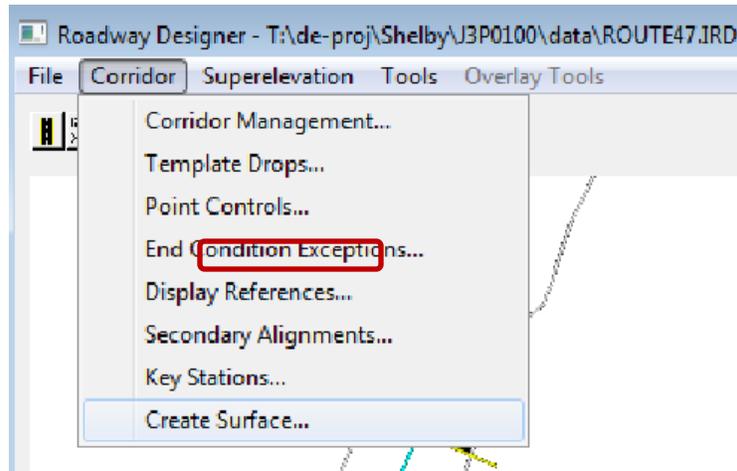
Each point property along the desired alternate surface path needs to activate the alternate surface option by assigning an alternate surface name. Below are some key points to keep in mind when defining an alternate surface:

1. Alternate surface name must be consistent. Use the same name for the entire surface being created, for example: “Subgrade\_Surface” or “Class\_4\_Excavation”, etc.
2. No vertical lines allowed in the alternate surface path.
3. Alternate surface will not show in testing, but only in surface creation. So, it is imperative to review the surface carefully before providing it to anyone else.
4. Set different styles for each surface to see the difference clearly once surfaces are created.



## 6.4 Creating the Alternate Surface(s)

Once the template is set up with alternate surface points, creating the actual alternate surfaces is quite simple. Creating a surface is the last step in the design process within Roadway Designer. The tool is located under **Corridor>>Create Surfaces**.



**Name** - Type in the name of your proposed finished grade surface.

**Default Preference** - Leave it to default.

**Select the surface(s) from** - This option allows the user to select multiple surfaces when creating a 3D model containing more than one corridor. For example in the case of a mainline, side roads, etc.

**New Surface for Each Corridor** - Only check if wanting to generate 3D surfaces separate for each corridor instead of “merging” them all.

**Process Visible Range Only** - This should be always checked. When checked, it processes the surfaces for only what is being displayed in the plan view of the roadway designer dialog.

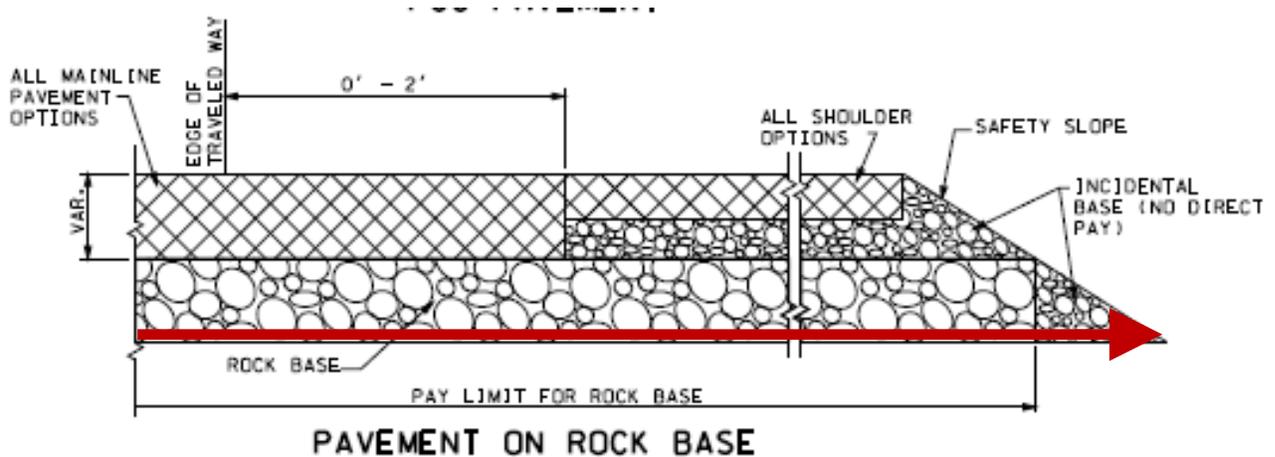
**Remove Loops** - This option allows Roadway Designer to trim features to prevent overlapping of lines.

**Features** - This only applies to InRoads DTM’s

**Densify using Chord Height Tolerance** - Allows for closer intervals to be process for horizontal and vertical curves in the corridor. It should be checked to create a more accurate model.

**Display in Plan View** - Components allows to “render” all the components in the 3D Model based on the styles set in the template library. This option produces a nicer 3D picture than the “Features” only.

### 6.5 Group Exercise 6-1: Adding a Rock Fill Base Road 1

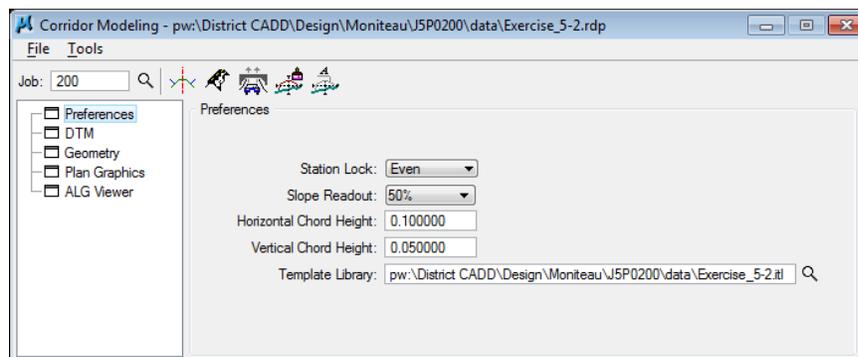


1. Open the following MicroStation file:

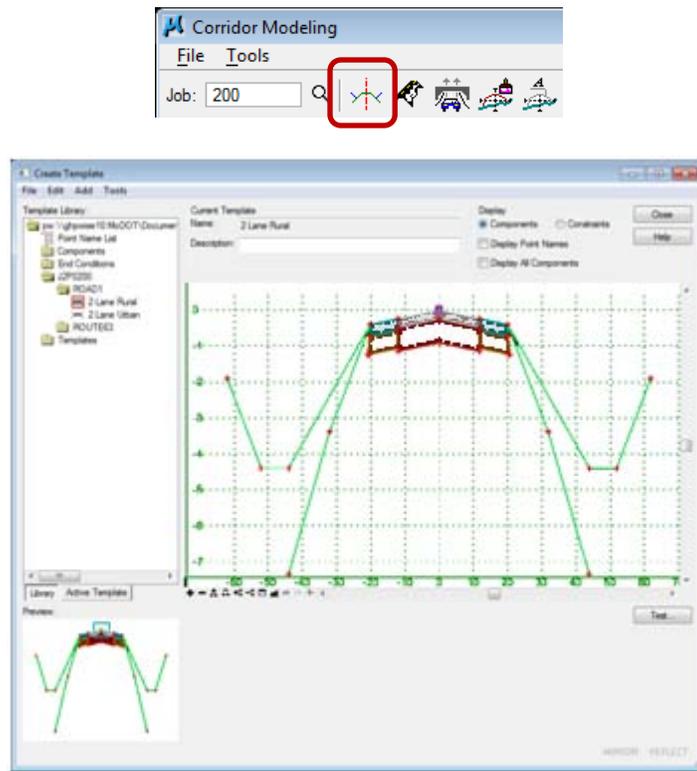
`pw://MoDOT/Documents/District CADD/Design/Randolph/J2P0200/data/plan.dgn`

2. Open Corridor Modeler.

Load the preference file: `pw:\District CADD\Design\Randolph\J2P0200\data\ J2P0200.rdp`

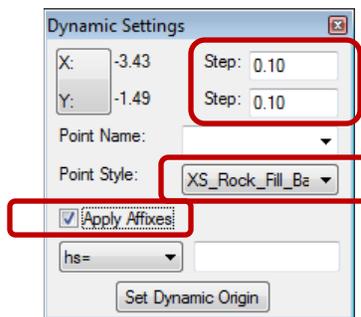


3. Select the Open Create Template Tool. Navigate to the **2 Lane Rural** template located within the **Road1** folder under the **J2P0200** folder then make it the active template.

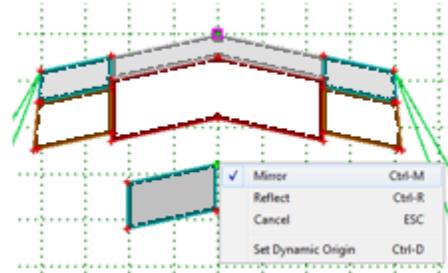
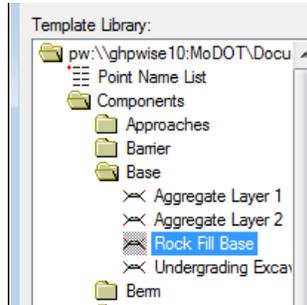


4. Set the dynamic settings for **X and Y** steps to **0.10**

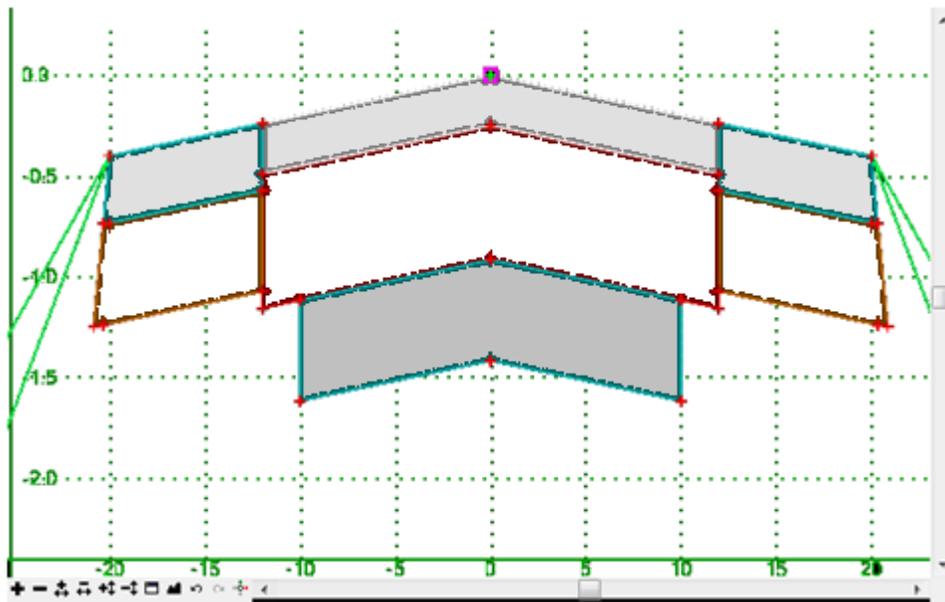
Also set the Point Style to: **XS\_Rock\_Fill\_Base\_Subsurface** and click on the “**Apply Affixes**”.



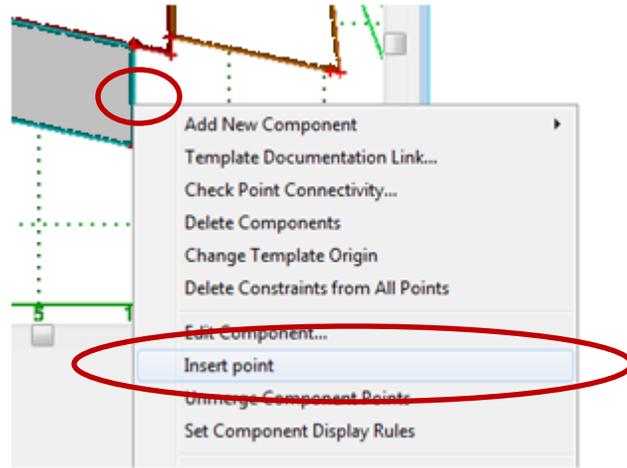
5. In the Template Library tree folder, navigate to: **Components > Base > Rock Fill Base**.
  - a. Drag and drop the **Rock Fill Base** component below the lowest pavement layer, but not attached to it.
  - b. Before dropping the component, right click and turn on mirror option, then drop



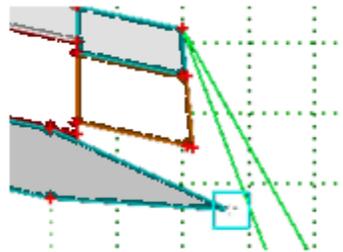
6. Attach the component to the centerline of the lowest subsurface and merge the **Rock Fill Base** component.



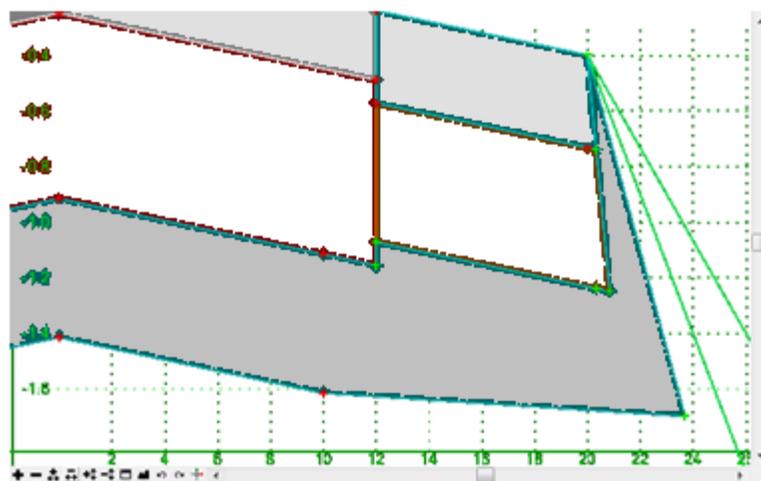
- Zoom in to the template so you can see the rock fill base component. Right click on the edge of the component between and select **“Insert point”**



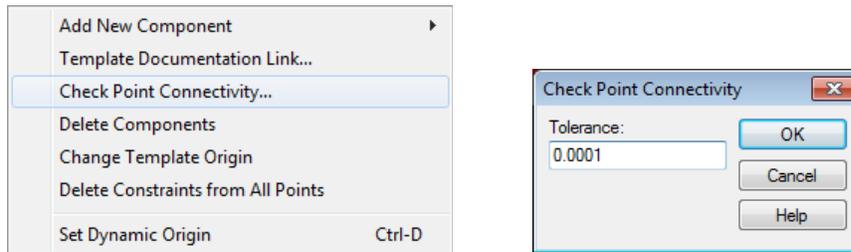
- Insert the point to the outer limits but not beyond the end conditions.



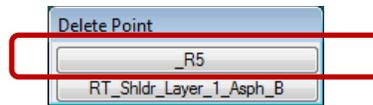
Continue placing points tracing the existing points to create the boundary of the Rock Fill Base component.



- Clean up the duplicate points by using the **Check Point Connectivity** tool. Right click in a blank area of the screen and choose the option “**Check Point Connectivity.**”

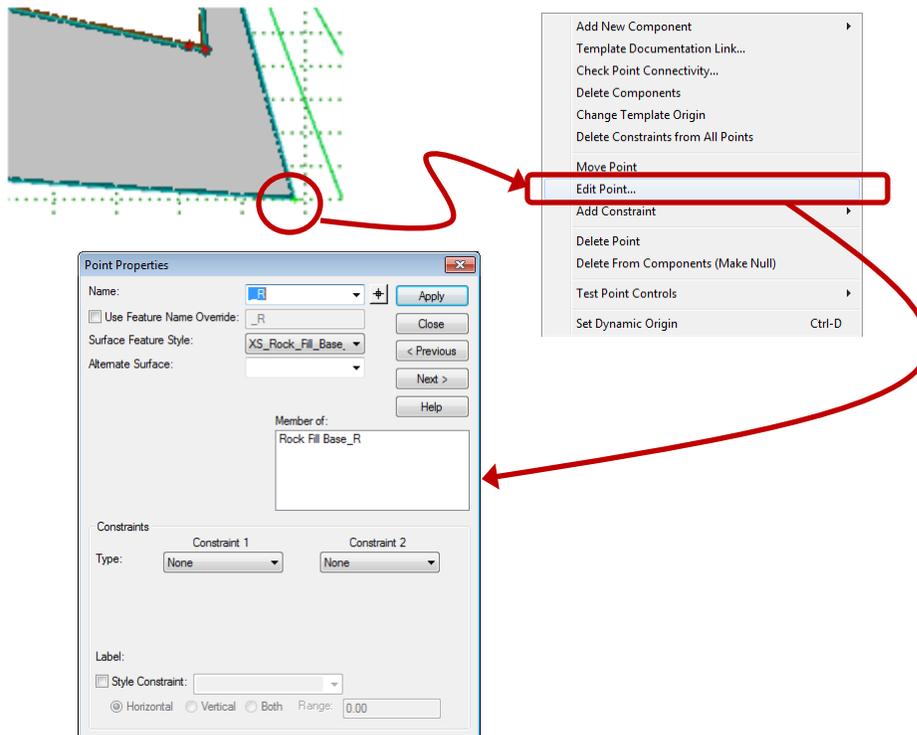


You can utilize the tolerance to search for points that are closer than the given value. This process will delete points but leave the component in place.

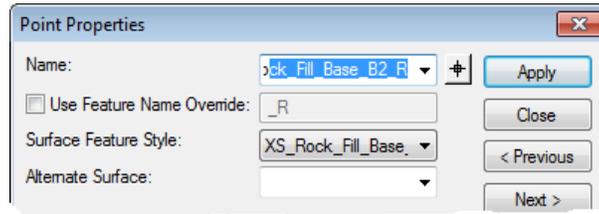


Delete the newly placed points leaving the original point names.

- In the next few steps add constraints and if needed a point name to the base bottom outside points. To edit these points right click the point to bring up the Point Properties dialog.



- Utilizing the point name from another point used in the component you can copy, paste and rename a part of the point name.

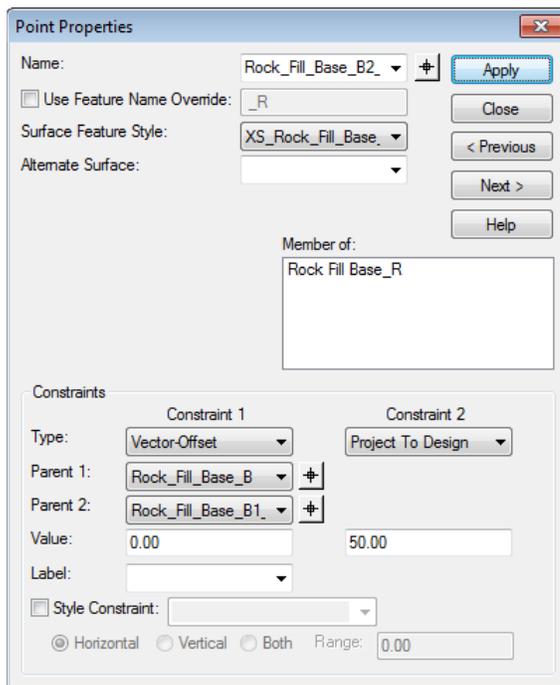


- Apply constraints to the point.

Constraint 1 will use a Vector Offset between existing points Rock\_Fill\_Base\_B\_R and Rock\_Fill\_Base\_B1\_R with a value of 0 so that the point runs along the vector of the two selected parent points.



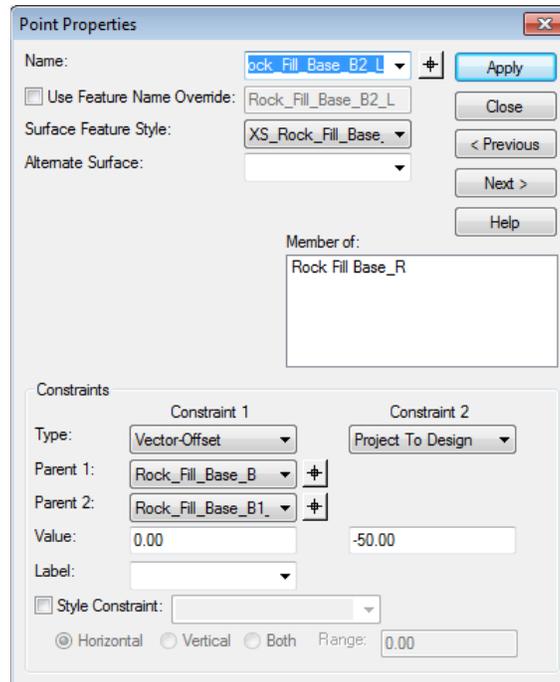
Constraint 2 will use the Project to Design constraint. The value field needs a maximum search value to search for any interception with an end condition so we will use 50.



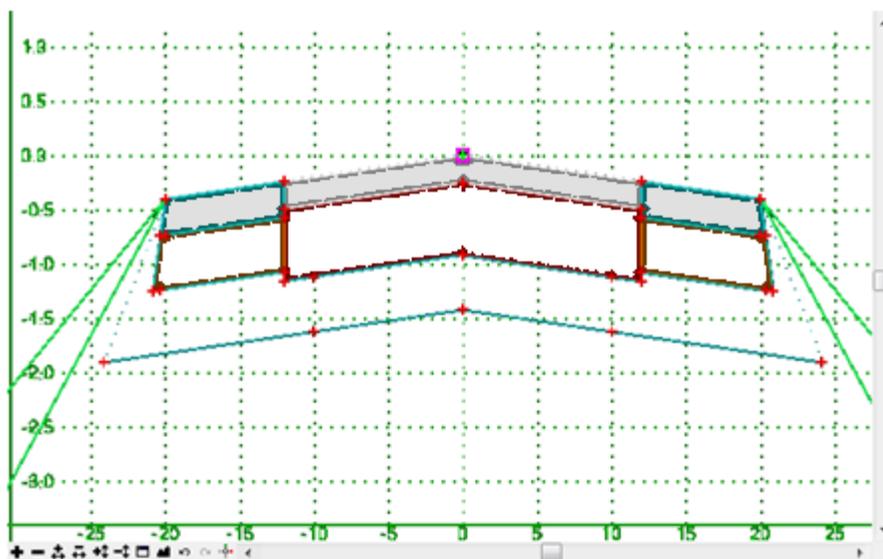
Select apply and notice that the filled in component has disappeared. It is not sure what the correct solution is so it does not draw in the shape until we test it.

This finishes the right side.

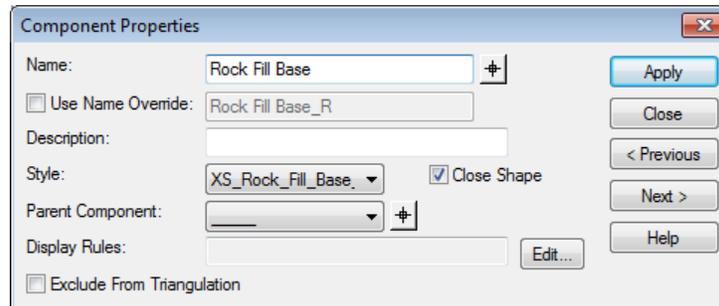
- Using the same technique that was just completed on the right side modify the Rock Fill Base component's left side adding the points going in a counterclockwise motion. Set up the constraints using the Vector-Offset (0.00) and Project to Design (-50 to search left) options.



You can turn off the point names and see that we have a solid line for the bottom and a dashed line for the sides since it doesn't know the correct solution also indicating that we have selected a "Project to Design" constraint. You can faintly see the blue line that traces the bottom of our sub surfaces of our pavement and shoulder.



14. Click on the component to see it highlight. Double click the component to open the Component Properties Dialog where editing is possible. Rename the component to Rock Fill Base.



15. Test the solution.

**6.6 Individual Exercise 6-2: Adding a Rock Fill Base to Route 63**

1. Using the **Exercise 6-1: Adding a Rock Fill Base Road 1** as an example, create a Rock Fill Base component for both roadbeds in the **Route 63** template located in the **J2P0200 \ Route63** folder.

2. Test the solution.