



Module 11

Detailed Modeling



Module 11 - Detailed Modeling

Table Of Contents

OVERVIEW	3
MODEL DETAILING RIBBON.....	3
TERRAIN RIBBON	3
KEY CONCEPTS, TOOLS AND TERMINOLOGY	3
DESIGN INTENT	3
LINEAR TEMPLATES	3
SURFACE TEMPLATES.....	4
TERRAIN MODELING.....	4
EXERCISE 1 - STREET TURNOUT MODELING	4
1. Launch OpenRoads Designer CONNECT Edition	4
2. Set the Workspace and Workset.....	4
3. Open the Exercise 1 Corridor (CMD) dgn file and zoom in closely to the Y8 Corridor	4
4. Load Civil AccuDraw and the Feature Definition Toggle Bar.....	5
5. Adjust the level and reference file display as needed to better facilitate design/modeling	5
6. Open an additional 3D view to better facilitate 3D modeling.....	6
7. Layout the Horizontal Geometry for the Street Turnout.....	7
8. Demonstrate the Horizontal Design Intent associated with the Street Turnout.....	14
9. Shear the Y8 pavement through the Y8A Side Street intersection	17
10. Profile the Side Street (Y8A) EOT lines.....	20
11. Complex the Side Street (Y8A) EOT lines	28
12. Apply Linear Templates to the Left and Right Y8A EOT lines	31
13. Create a Proposed Terrain for the Side Street (Y8A).....	33
14. Apply Pavement Surface Template to the Side Street (Y8A) Terrain Model	37
15. Add a Concrete Channelization Island to the Side Street (Y8A).....	39
16. Adjust the berms and slopes of the Side Street (Y8A) Radius Returns to match Y8	50
17. Clean up the breaks in the intersection using Key-Stations	53
EXERCISE 2 – DIRECTIONAL CROSSOVER WITH MEDIAN U-TURNS MODELING.....	54
1. Launch OpenRoads Designer CONNECT Edition	54
2. Set the Workspace and Workset.....	54
3. Open the Exercise 2 Corridor (CMD) dgn file and zoom in closely to the Super Street Intersection	55
4. Remove the grass median and display pavement within the Super Street Intersection limits	56
5. Model the bulb-out on the right side of the Y8 corridor	57
6. Shear the Y8 pavement through the Bulb-Out limits.....	60
7. Apply a Linear Template to the proposed Bulb-Out linear element	62
8. Create a Proposed Terrain for the Proposed Bulb-Out	64
9. Model the Concrete Islands for Median U-Turns.....	73
10. Layout the Radius Returns for the Northern side of the Y8/Y18 Intersection	83
11. Apply Linear Templates to the Radius Returns for the Northern side of the Y8/Y18 Intersection	93
12. Create Terrain Model for the Northern side of the Y8/Y18 Intersection.....	94
13. Apply Pavement Surface Template to the Y8/Y18 Intersection Terrain Model.....	101
14. Add Concrete Channelization Island to the Northern side of the Y8/Y18 Intersection.....	103
15. Finalize the Directional Crossover with Median U-Turns Modeling by using a combination of Key-Stations and Parametric Constraints to seamlessly connect all the Corridors as shown below.....	111

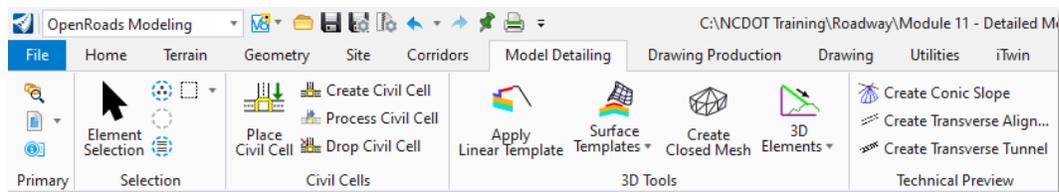


Module 11 - Detailed Modeling

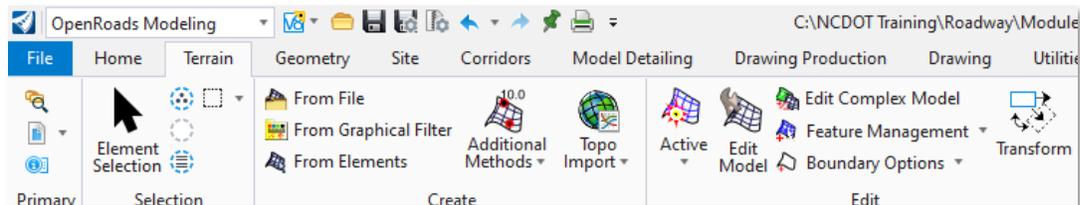
Overview

The intent of the Detailed Modeling module is to move beyond template-based modeling and focus on detail-oriented modeling. Because of the complexity of detail-oriented modeling, the module will focus on a wide range of concepts. This includes traditional corridor modeling, complex plan geometry, proposed terrain model development, and the introduction to a number of additional tools/techniques that fall outside of the traditional template-based modeling scope. By leveraging these tools and techniques, the user can take the traditional template-based corridor to a whole new level of detail and complexity. In addition to the tools that were introduced in the previous Corridor Modeling modules, the Terrain and Model Detailing ribbons will also play a major role throughout the Detailed Modeling module.

Model Detailing Ribbon



Terrain Ribbon



Key Concepts, Tools and Terminology

Design Intent

Design Intent is the act of preserving rules and relationships established during the design process in order to realize downstream benefits of automatic updates.

Linear Templates

Templates that can be applied quickly and easily to 3D linear elements but with less functionality when compared to corridor templates.



Module 11 - Detailed Modeling

Surface Templates

A template made of components with an associated depth. These components are closed shapes such as asphalt, concrete, aggregate, grass etc. Surface Templates are used to apply material thickness to the surface of a terrain.

Terrain Modeling

A set of three-dimensional triangles mathematically computed from point data collected on the surface being modeled. Models are used to define highly irregular surfaces, particularly the surface of the earth, but can be generated for proposed surfaces, subsurface geotechnical layers, etc. Terrain models are also referred to as digital terrain models (DTMs), triangulated irregular networks (TINs), or triangulated surfaces.

Exercise 1 - Street Turnout Modeling

In this exercise, you will learn how to model a **Side Street Turnout** and **Concrete Channelization Island**. This includes the mainline pavement shearing, horizontal/vertical layout, application of linear templates, proposed terrain model development, surface template application, and various element profiling techniques. Design Intent will continue to be a major focus.

Throughout this exercise you will be working with NCDOT 2D dgn files exclusively. All design and corridor manipulation will be carried out within a 2-dimensional design plane.

1. Launch OpenRoads Designer CONNECT Edition

Double-click on the NCDOT Roadway OpenRoads icon on your desktop to launch OpenRoads Designer into the NCDOT Roadway workspace.



2. Set the Workspace and Workset

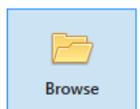
Select DOT-US North Carolina from the Workspace menu.
Select NCDOT R-2635C (Training) from the Workset menu.

OpenRoads Designer CONNECT Edition

DOT-US North Carolina ▾ R-2635C (Training) ▾

3. Open the Exercise 1 Corridor (CMD) dgn file and zoom in closely to the Y8 Corridor

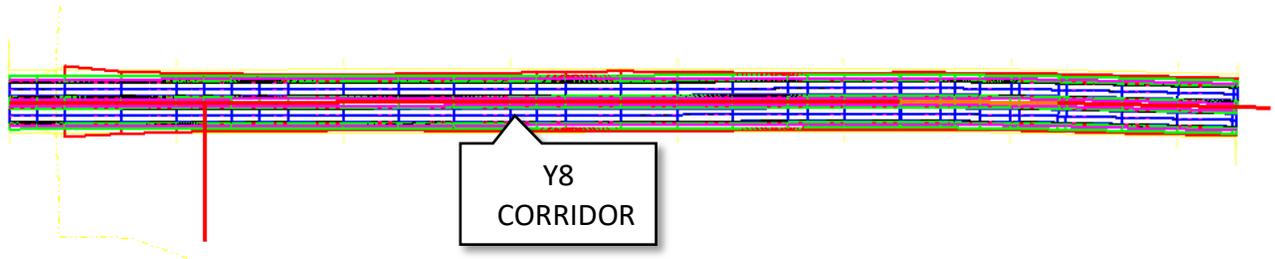
- Click the browse button and path to the **Module 11 (Detailed Modeling)** folder and open the **R-2635C-RDY_CMD_Exercise1.dgn** file.





Module 11 - Detailed Modeling

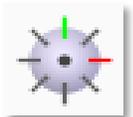
- B. Zoom in near the **Y8 Corridor** as shown below. Notice that the Y8 alignment already has a base corridor. This base Y8 corridor will serve as a starting point for the Detailed Modeling exercise. See **the Initial Corridor Modeling Module** for detailed instructions for initial corridor development.



Note: All reference files that are required for the Detailed Modeling module have already been attached to the R-2635C_RDY_CMD_Exercise1.dgn file.

4. Load Civil AccuDraw and the Feature Definition Toggle Bar

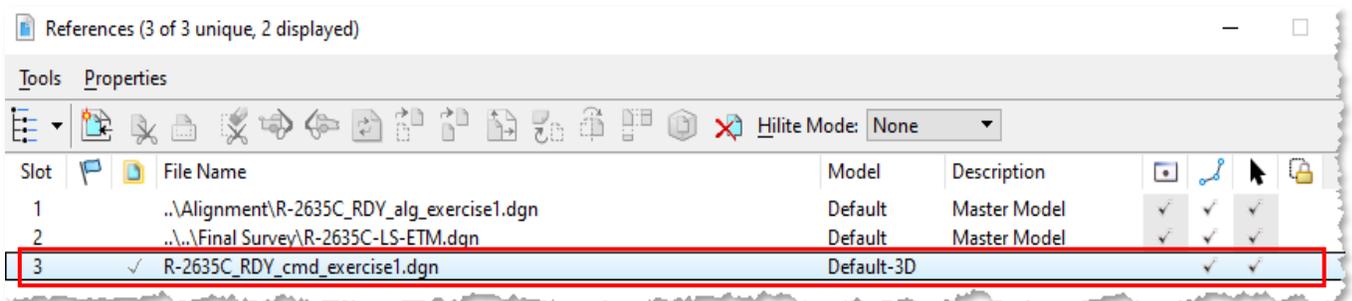
- A. Click on the Civil AccuDraw button (**Geometry > General Tools > Civil Toggles > Civil AccuDraw**) to load the **Civil AccuDraw** toolbar.
- B. Click on the Feature Definition Toggle Bar button (**Geometry > General Tools > Standards > Feature Definition Toggle Bar**) to load the **Feature Definition Toggle Bar**.



Tip: Both of these toolbars will be used throughout the design/modeling process. Because of this, it's recommended that both are docked for easy access.

5. Adjust the level and reference file display as needed to better facilitate design/modeling

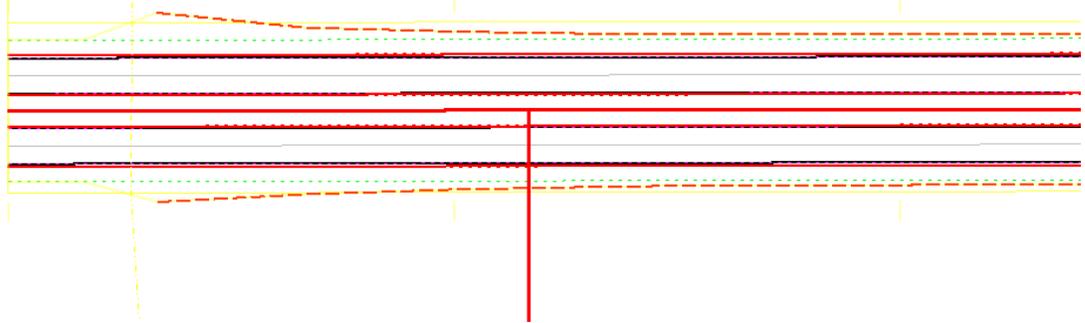
- A. With the **View 1, Default** view in focus, turn the display of the **Default-3D** view off as shown below.





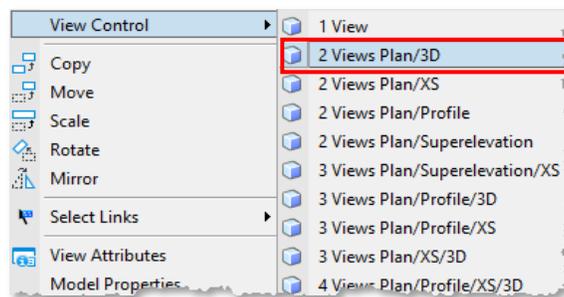
Module 11 - Detailed Modeling

- B. Notice that the 3D model has been turned off, leaving just the linework. Depending on your preference, you may choose to turn off additional linear elements to avoid confusion.

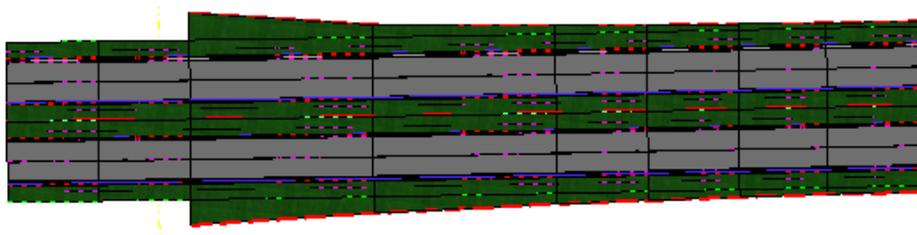


6. Open an additional 3D view to better facilitate 3D modeling

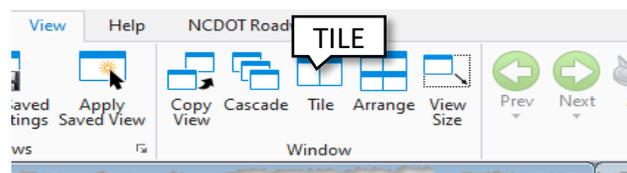
- A. Right-click within the **View 1, Default** view and hold to load the **View Control** menu. From there, select the **2 Views Plan/3D** option as shown below.



- B. This will load the **View 2, Default-3D** view in addition to the standard **View 1, Default** view as shown below. As you continue to develop your model you can now easily visualize it.



- C. Then, click the **Tile** button (**View > Window > Tile**) as shown below to tile the two (2) windows. This will make it easier to focus on both views at the same time.

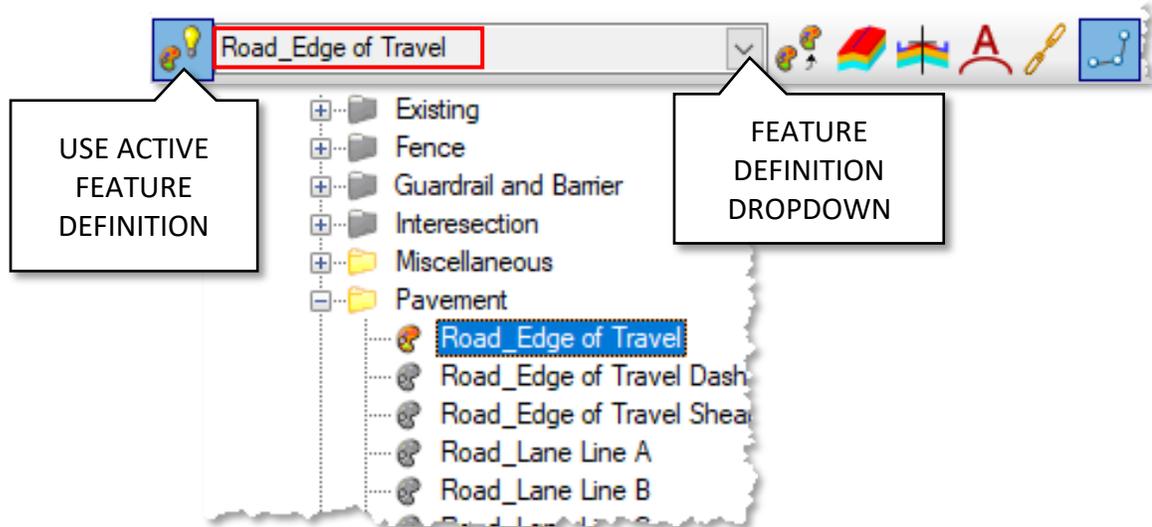




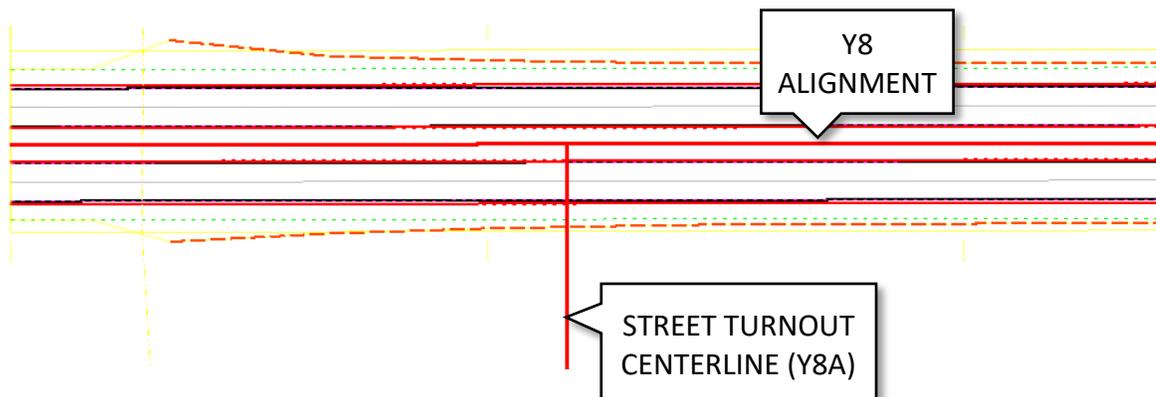
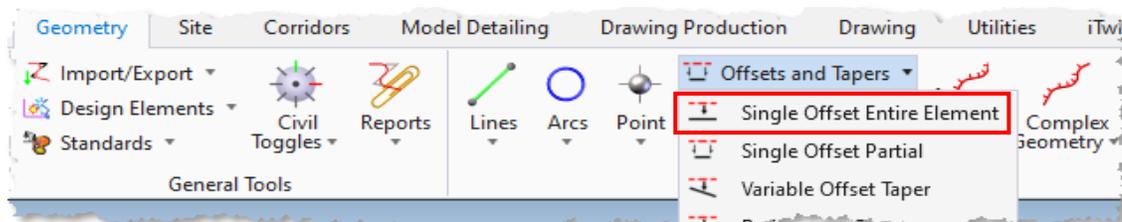
Module 11 - Detailed Modeling

7. Layout the Horizontal Geometry for the Street Turnout

- A. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and then select the **Road_Edge of Travel** feature from the (**Linear > Roadway > Pavement**) folder as shown below. Keep this **Feature** active throughout all steps that follow.



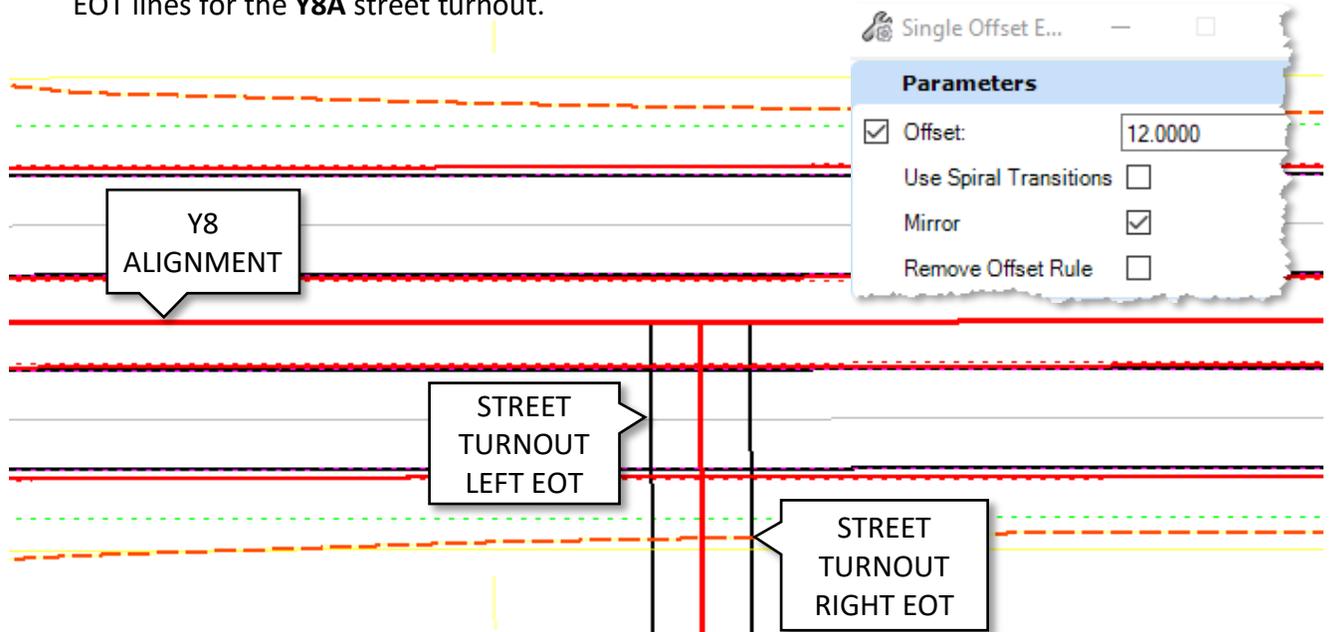
- B. Next, select the **Single Offset Entire Element** tool (**Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element**) and then select the street turnout centerline (**Y8A**) when prompted to locate element.



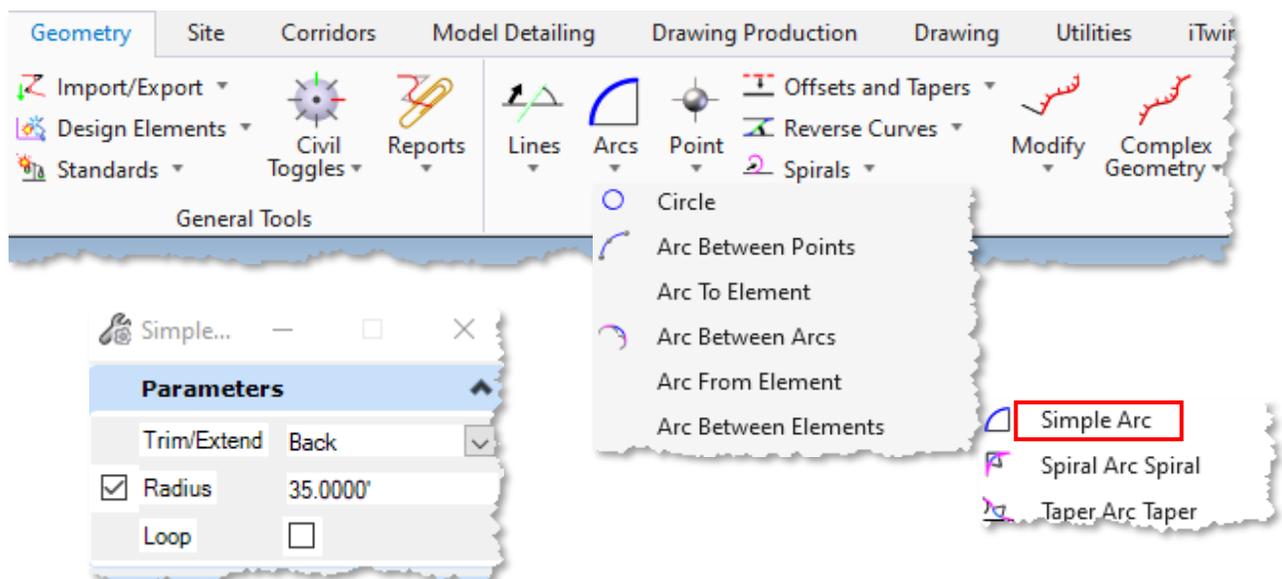


Module 11 - Detailed Modeling

- C. Set the **Offset** parameter to **12.0000** and toggle on the **Mirror** option within the **Single Offset Entire Element** dialog and click through the prompts to accept. This will draw the left and right EOT lines for the **Y8A** street turnout.



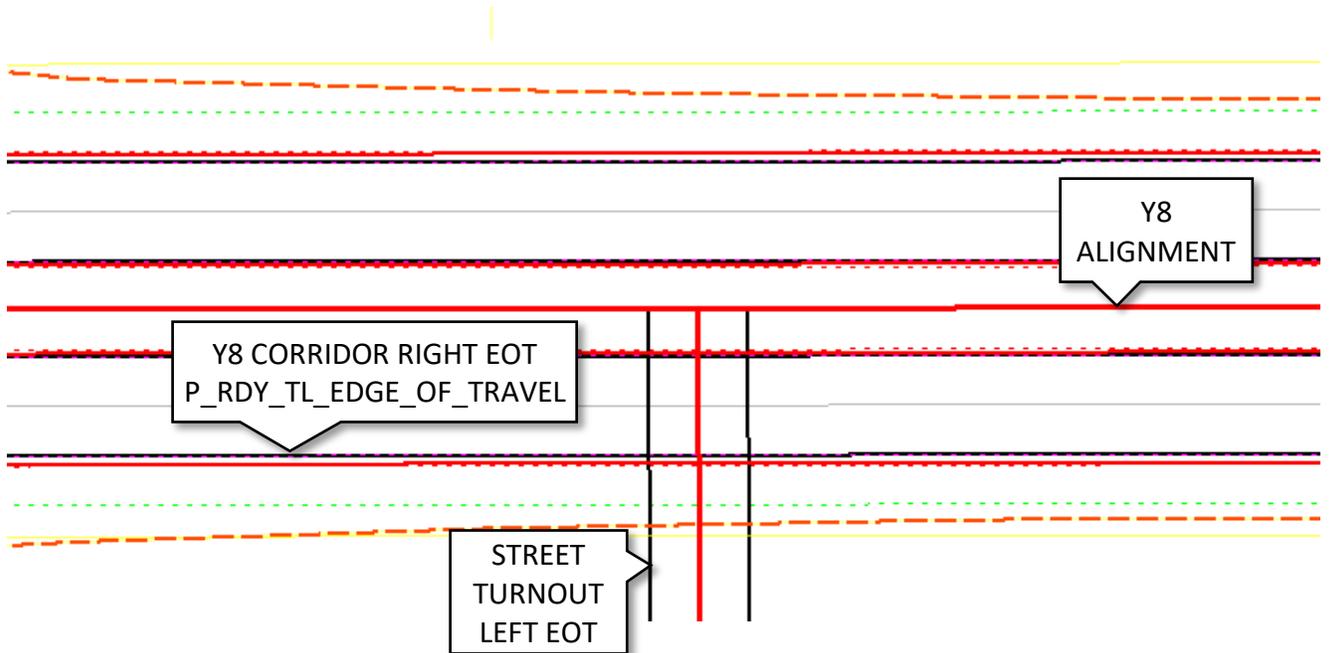
- D. Now, select the **Simple Arc** tool (**Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc**). Set the **Radius** parameter to **35.0000'** and the **Trim/Extend** parameter to **Back** within the **Simple Arc** dialog as shown below.



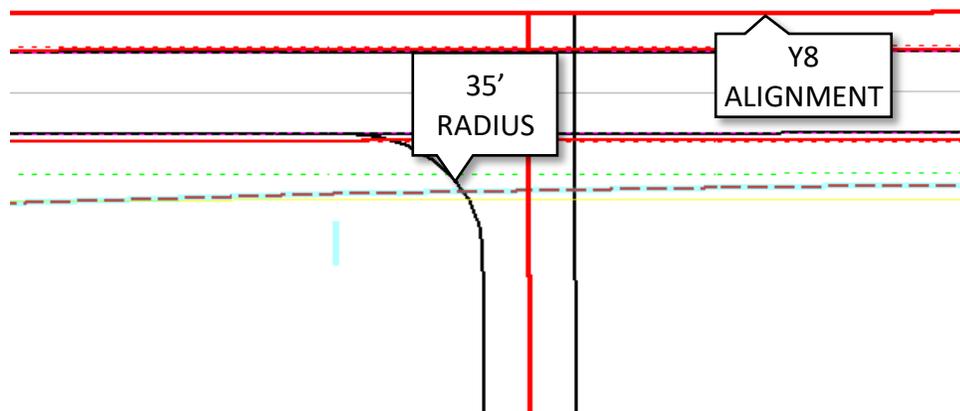


Module 11 - Detailed Modeling

- E. When prompted to **Locate First Element**, select the **Left EOT** line for the street turnout (**Y8A**) and then select the **Right EOT** line for the **Y8 Corridor** as the **Second Element**. When selecting the **Y8 Corridor Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



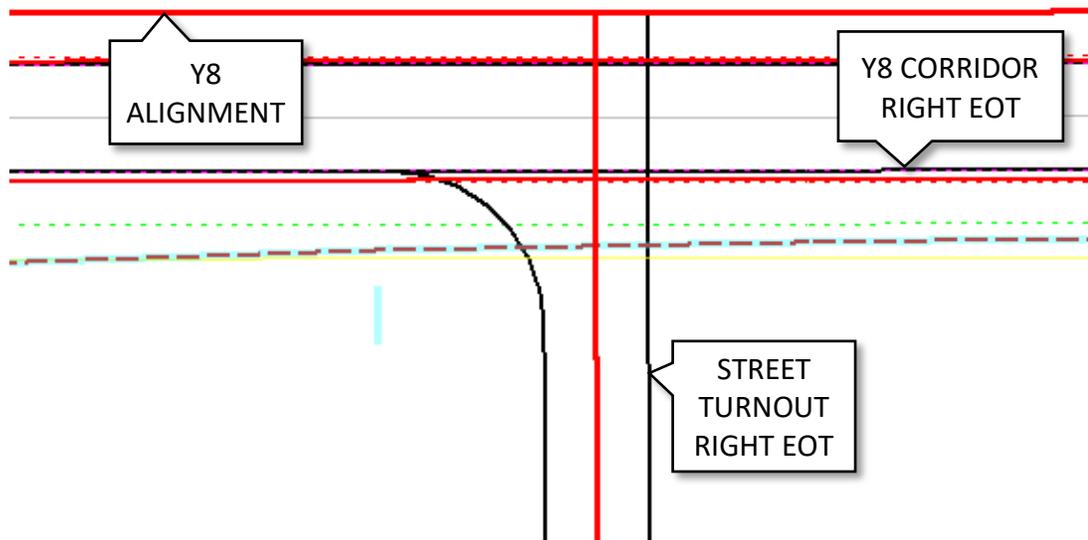
- F. After selecting both elements, click through the additional prompts to place the **35'** radius as shown below.



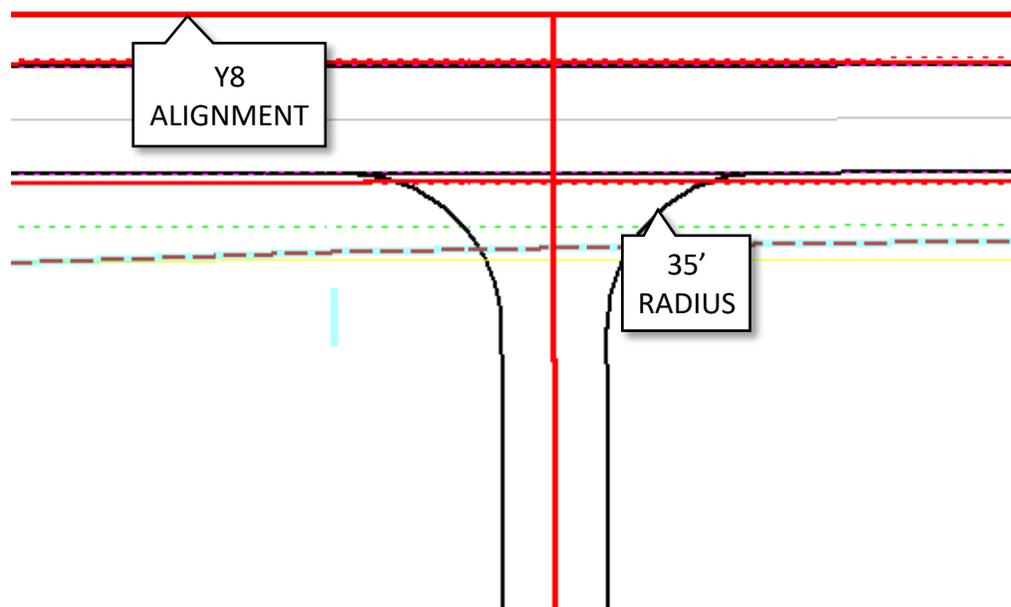


Module 11 - Detailed Modeling

- G. Now, place a **35'** radius return on the other side of the street turnout following the previous steps. This time select the **Right EOT** of the street turnout (**Y8A**) when prompted to **Locate First Element** and then the **Right EOT** line for the **Y8 Corridor** as the second.



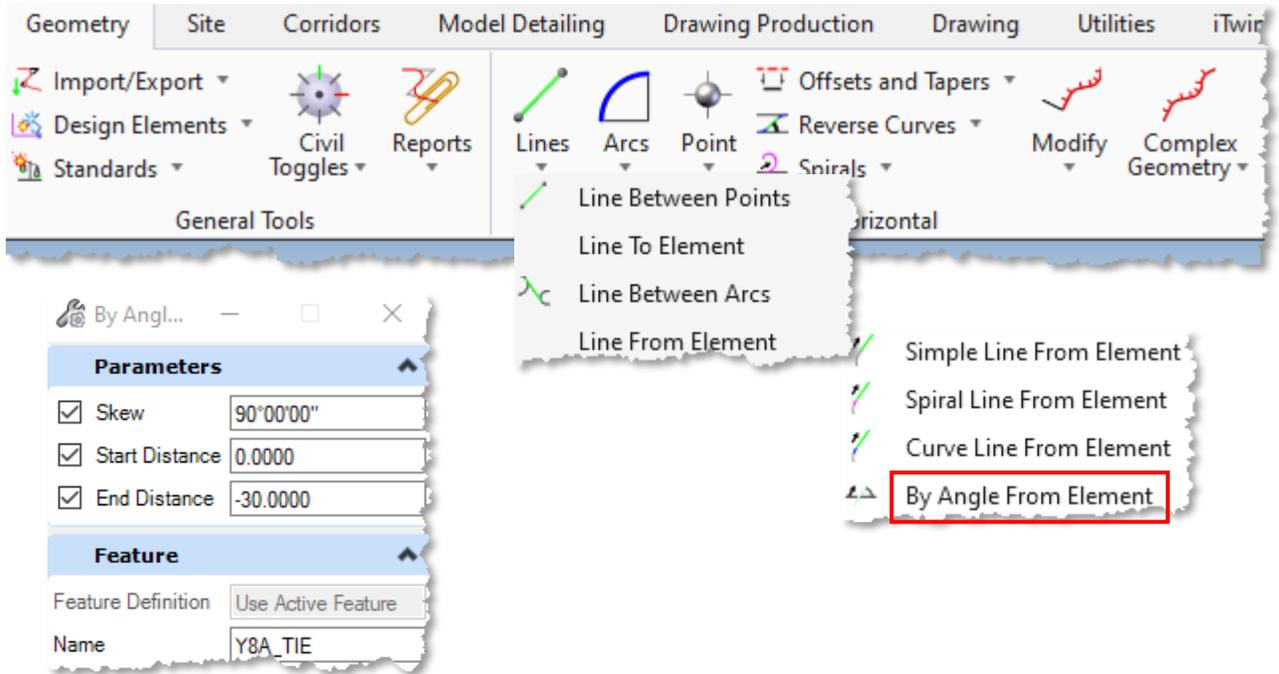
- H. After selecting both elements, click through the additional prompts to place the **35'** radius as shown below.



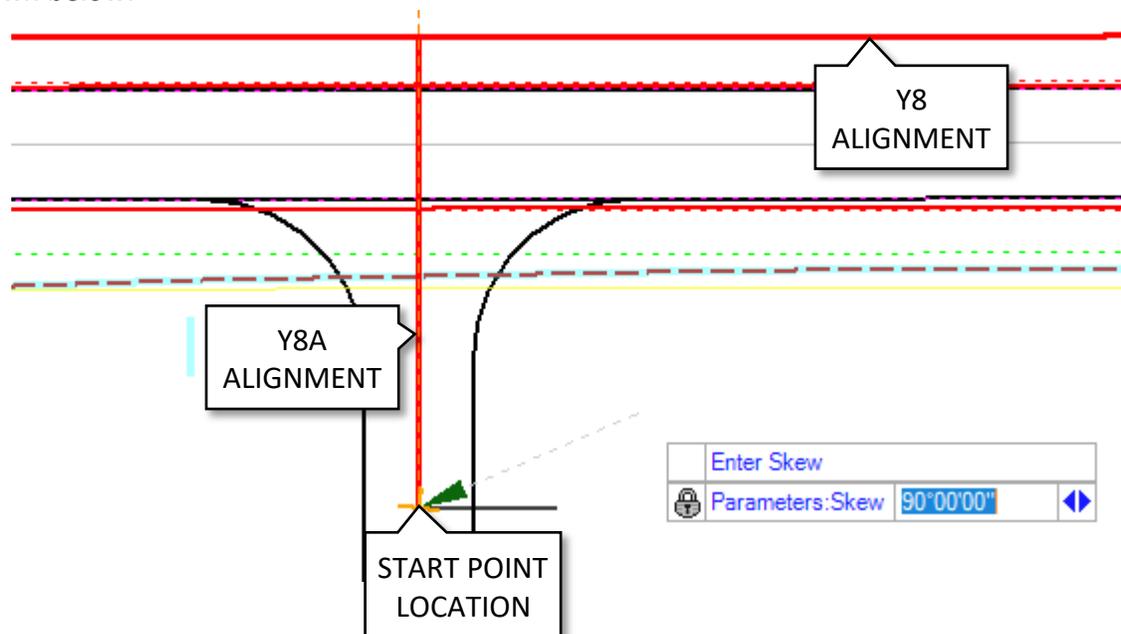


Module 11 - Detailed Modeling

- I. Next, select the **By Angle From Element** tool (**Geometry > Horizontal > Lines > Line From Element > By Angle From Element**). Set and lock the **Skew** parameter to **90° 00' 00"**, the **Start Distance** parameter to **0.0000**, **End Distance** parameter to **-30.0000**, and **Name** to **Y8A TIE** within the **By Angle From Element** dialog as shown below.



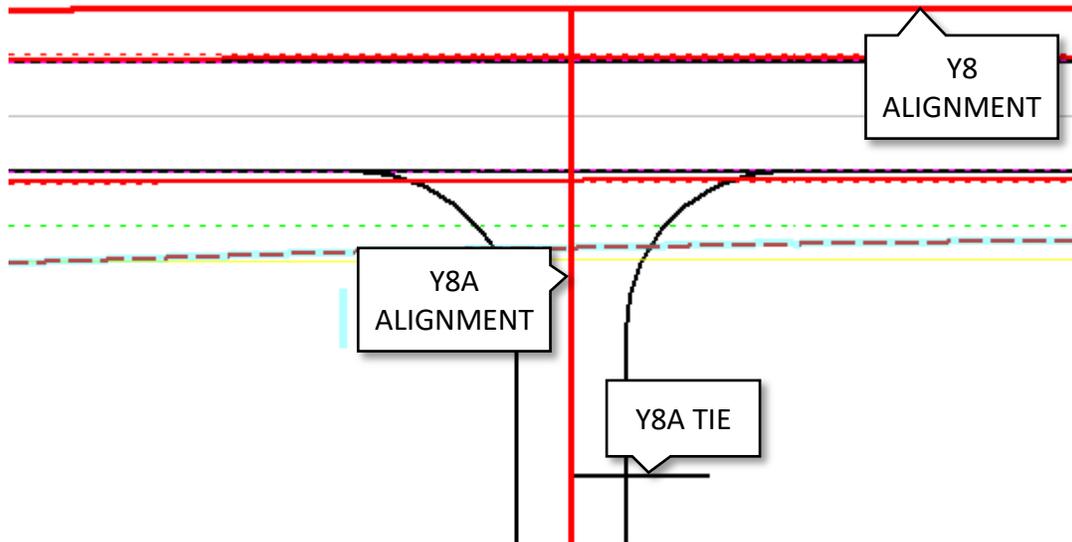
- J. When prompted to **Locate Element**, select the centerline of the street turnout (**Y8A**). Drag your mouse just beyond the radius returns and **Left-Click** the screen when prompted to **Enter Start Point**. This will define the start point of a line from the **Y8A** alignment at a **90°** skew as shown below.



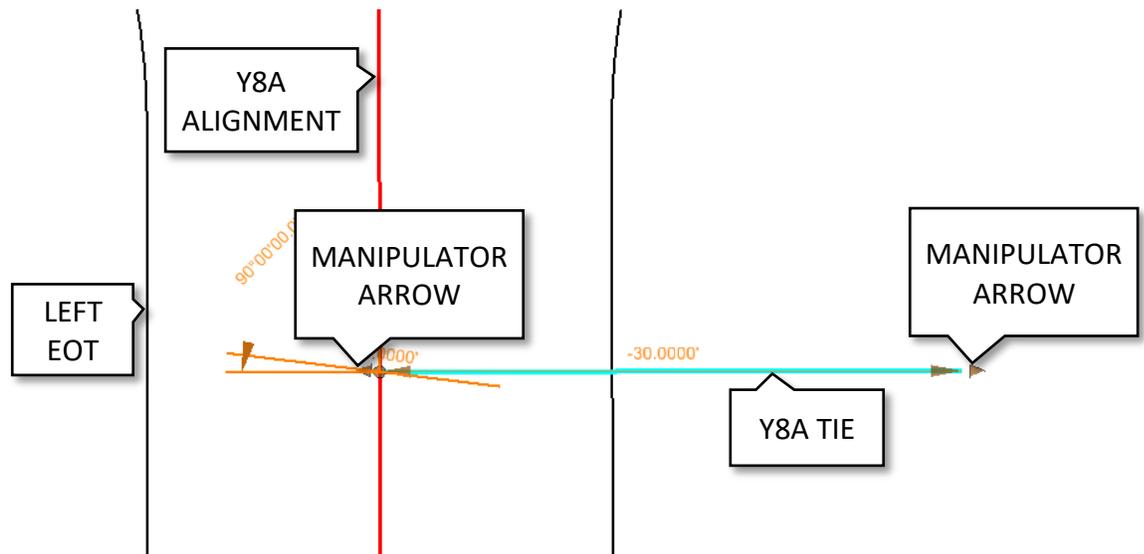


Module 11 - Detailed Modeling

- K. Then, click through the additional prompts to finish placing the **Y8A TIE** line as shown below.



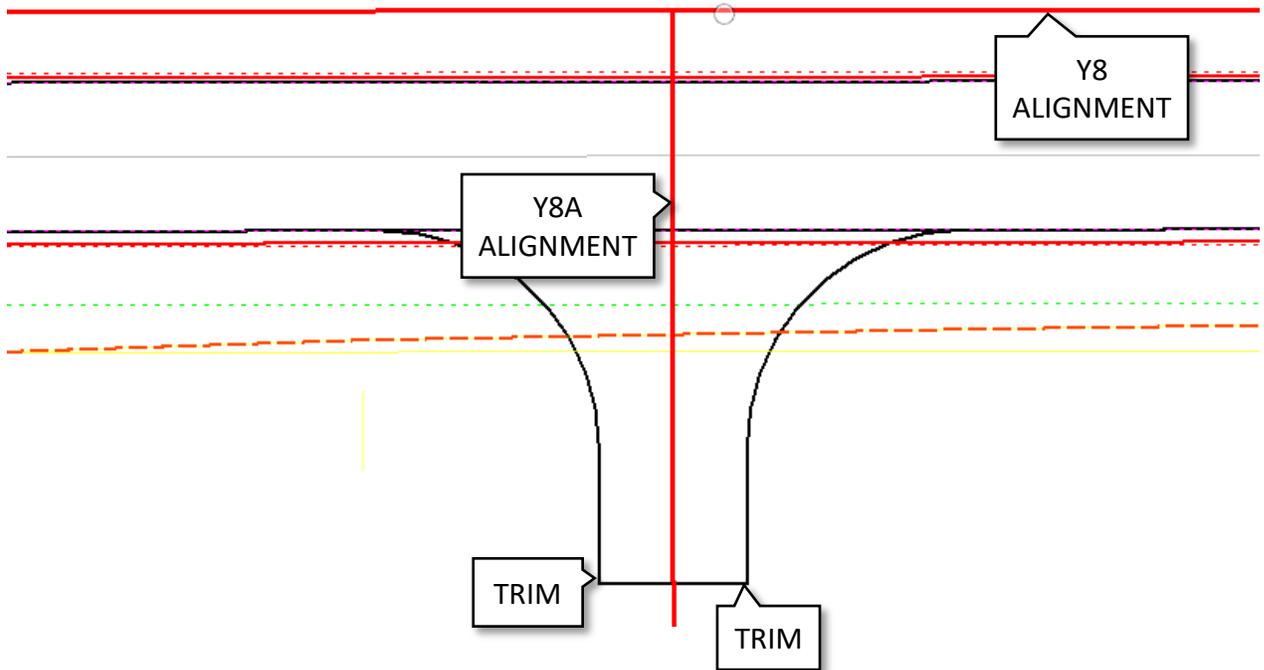
- L. Now, click on the line that was just placed and notice the **Small Arrows** that are displayed on the outer end of each side. These **Arrows** can be used to manipulate the element they are associated with.





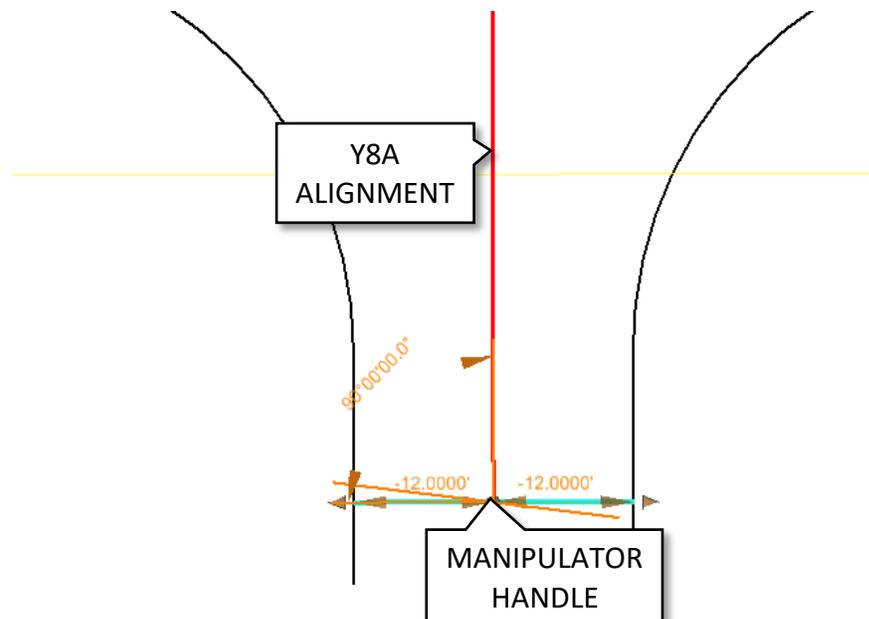
Module 11 - Detailed Modeling

- O. Next, select the **Trim To Intersection** tool (**Drawing > Modify > Trim To Intersection**) and trim the **Street Turnout (Y8A)** EOT and TIE lines and as shown below.



8. Demonstrate the Horizontal Design Intent associated with the Street Turnout

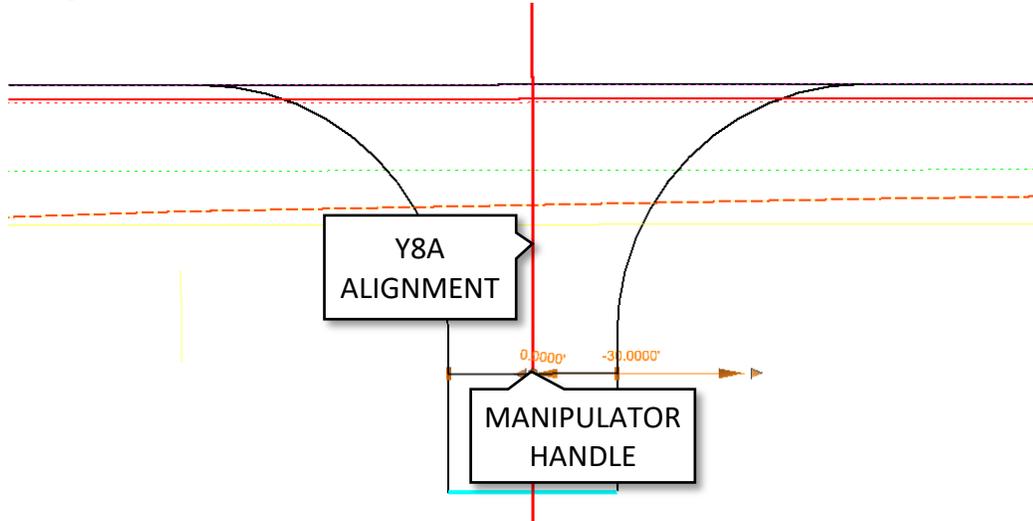
- A. When the **EOT** lines were **Trimmed** in the previous step, a **Rule** was created. Click the **EOT** line that was drawn at a **90°** degree angle from the **Y8A** alignment as shown below. Notice the **Manipulator Handle** that is displayed in the center.



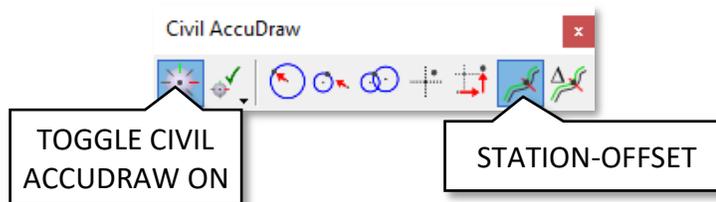


Module 11 - Detailed Modeling

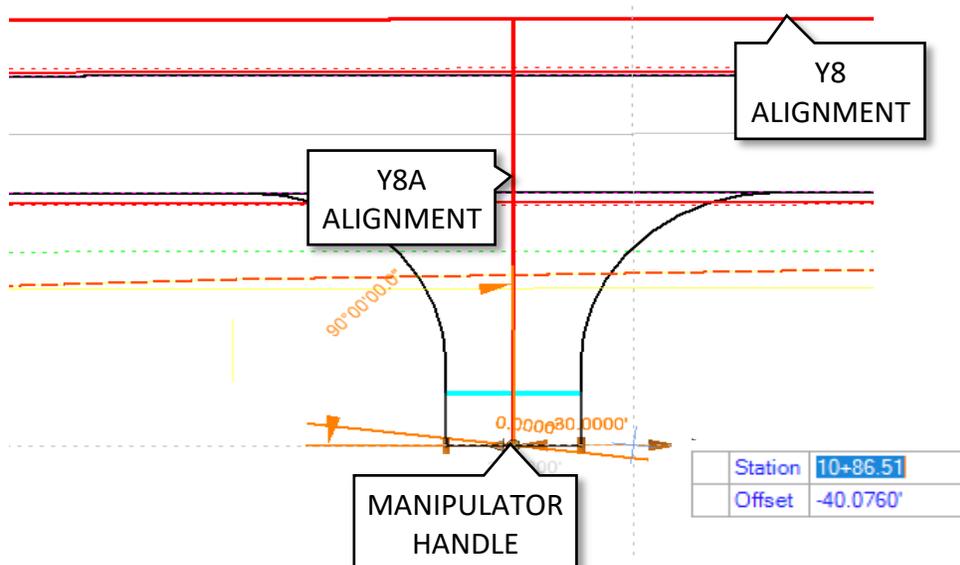
- B. Next, click, hold, and drag the **Manipulator Handle** at the intersection up and down along the **Y8A** alignment and notice that the line moves as well.



- C. Now, Toggle **Civil AccuDraw** on and select the **Station-Offset** icon as show below.



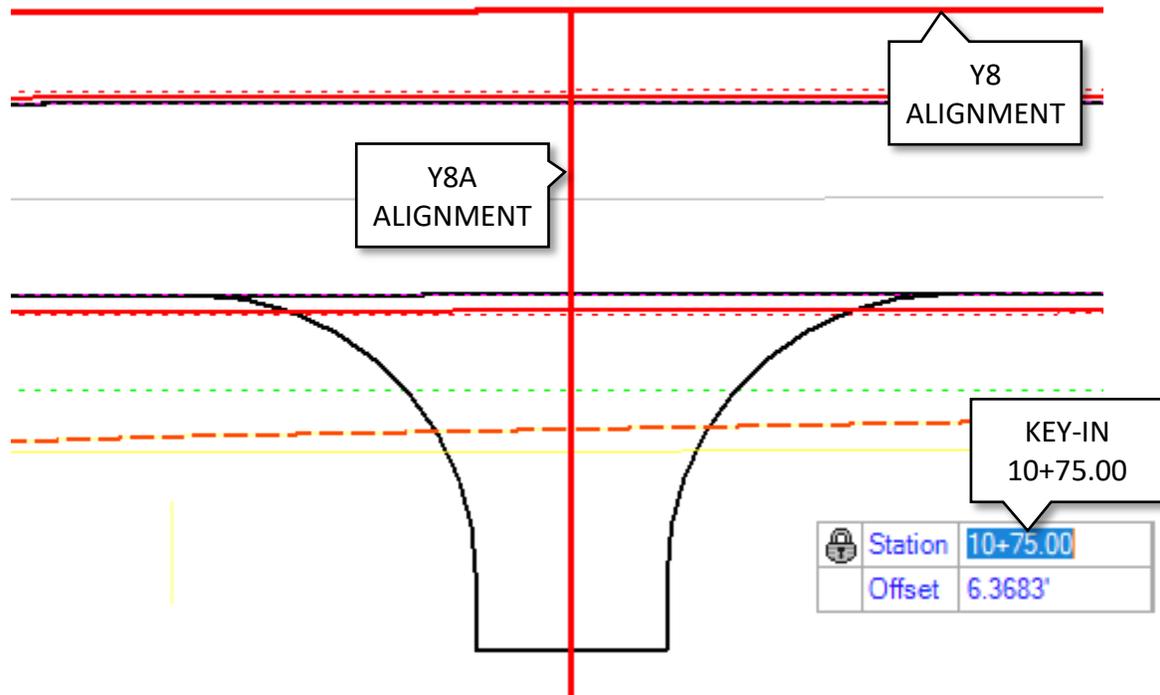
- D. After activating **Civil AccuDraw**, click, hold, and drag the **Manipulator Handle** at the intersection again. Notice that the **Civil AccuDraw** dialog now loads as well, and is tracking your movement along the **Y8A** alignment as show below.



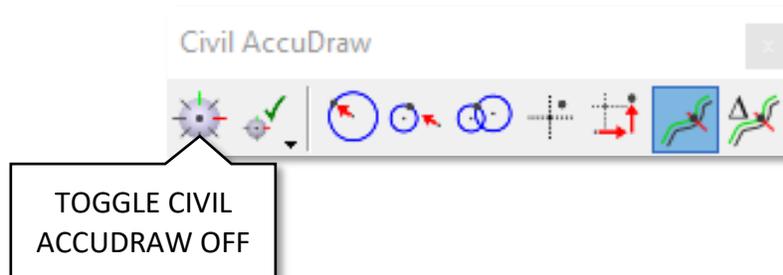


Module 11 - Detailed Modeling

- E. Key-in **10+75.00** and then left click the screen to place the line as shown below. Notice that the left and right EOT lines move as well because of the rule that was created previously when using the **Trim To Intersection** command.



- F. Toggle **Civil AccuDraw** off as shown below but keep the **Civil AccuDraw** toolbar loaded.

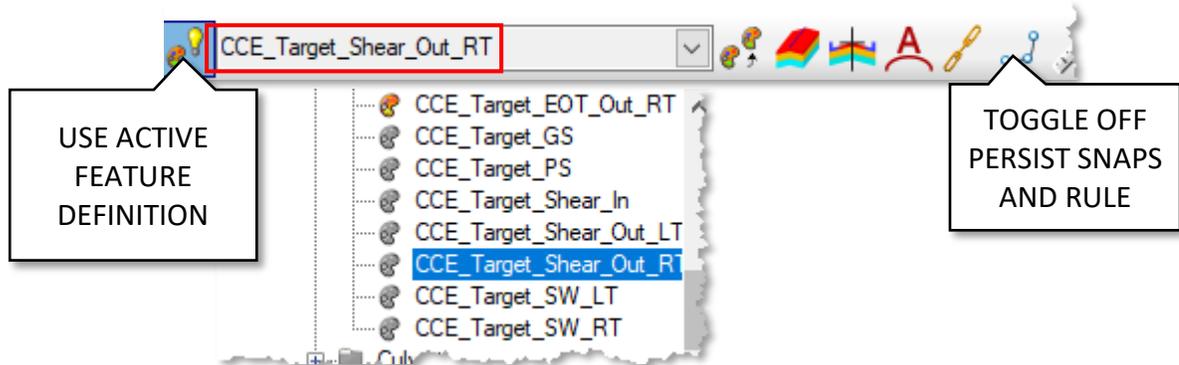




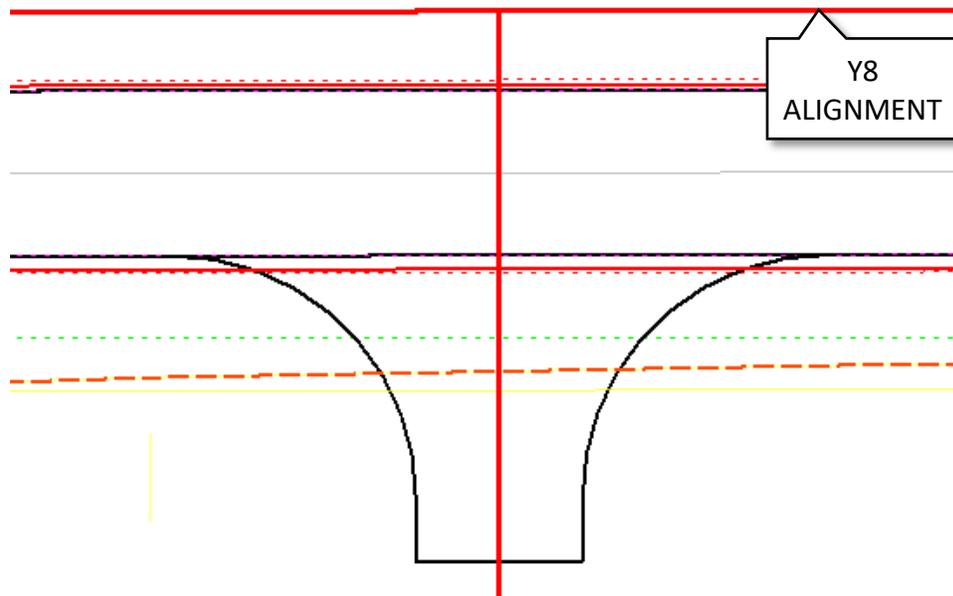
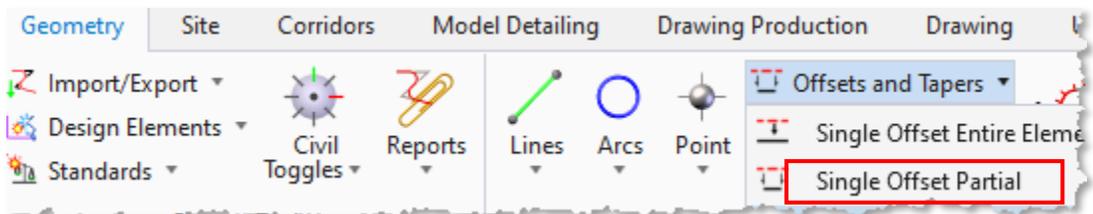
Module 11 - Detailed Modeling

9. Shear the Y8 pavement through the Y8A Side Street intersection

- A. From the Feature Definition Toggle Bar, toggle **On** the **Use Active Feature Definition** button and then select the **CCE_Target_EOT_Shear_Out_RT** feature from the **(Linear > Roadway > Construction Class Element)** folder as shown below.



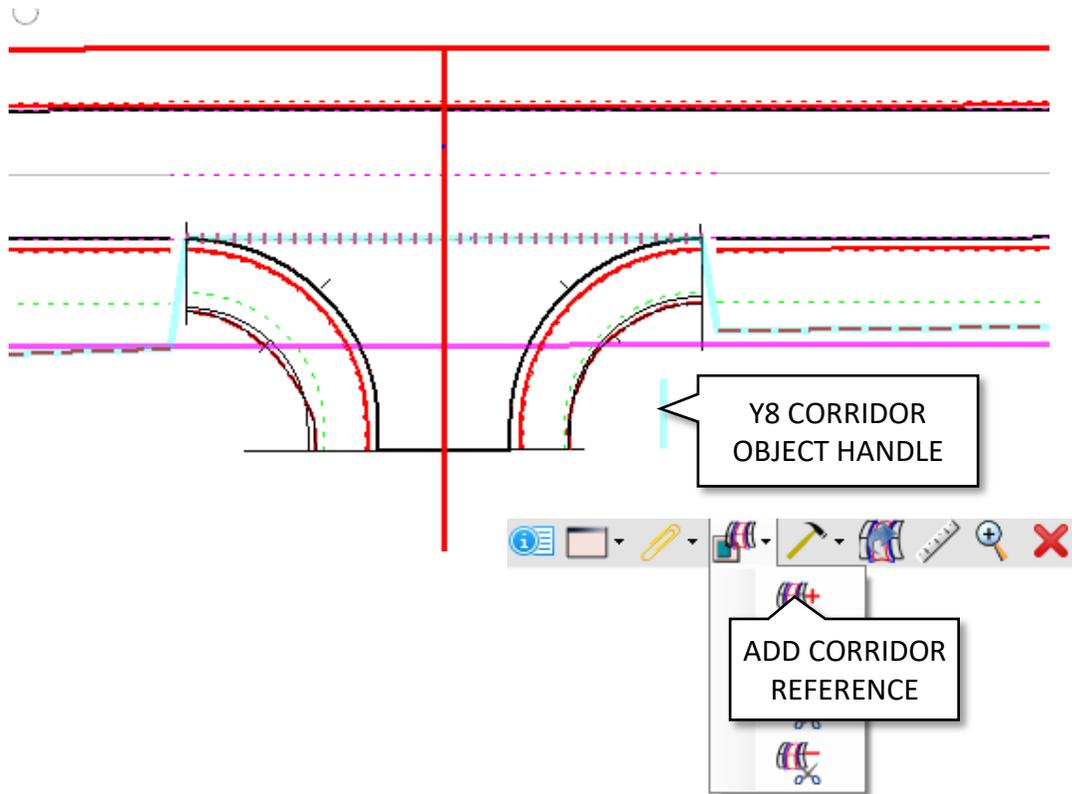
- B. Select the **Single Offset Partial** option (**Geometry > Horizontal > Offsets and Tapers > Single Offset Partial**) as shown below and select the **Y8 Alignment** when prompted to **Locate Element**.



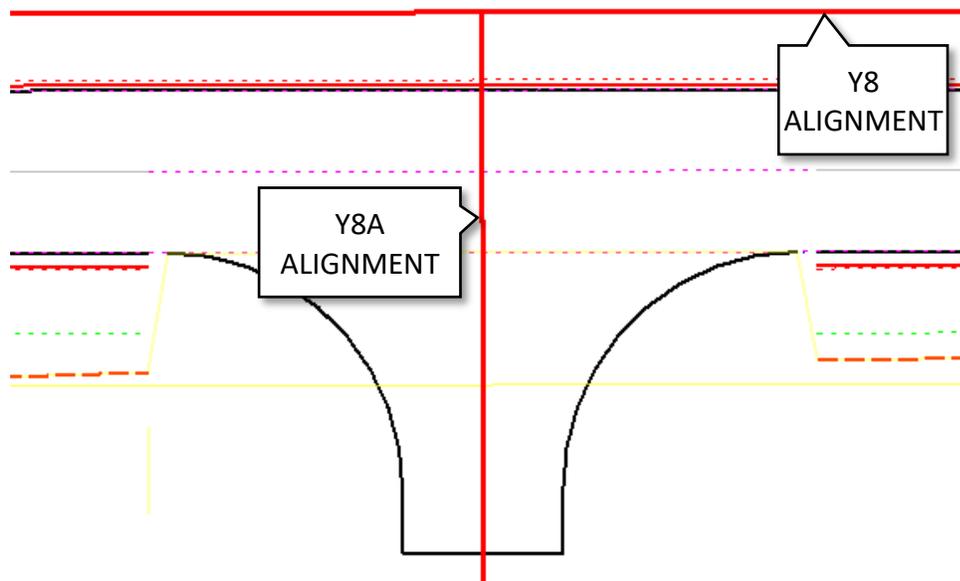


Module 11 - Detailed Modeling

- E. Click the **Y8 Corridor** Object Handle, hover for a moment to display the menu, and then select the **Add Corridor Reference** option as shown below.



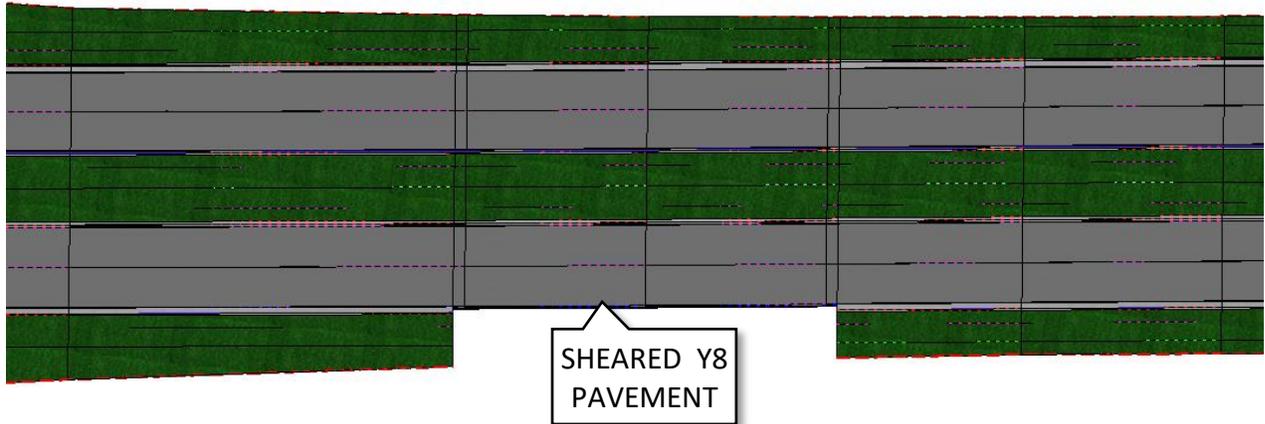
- F. After adding the **Shear** line as a **Corridor Reference**, the **EOT** is sheared as shown below.





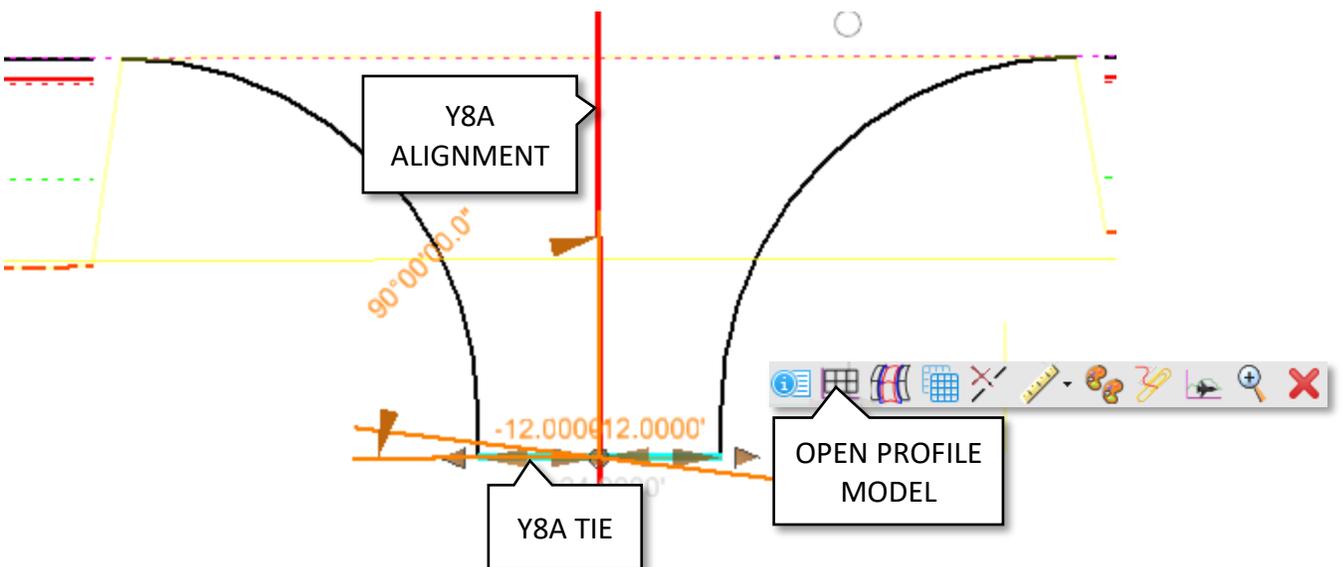
Module 11 - Detailed Modeling

G. Notice that the pavement has also been sheared within the **View 2, Default-3D** view as well.



10. Profile the Side Street (Y8A) EOT lines

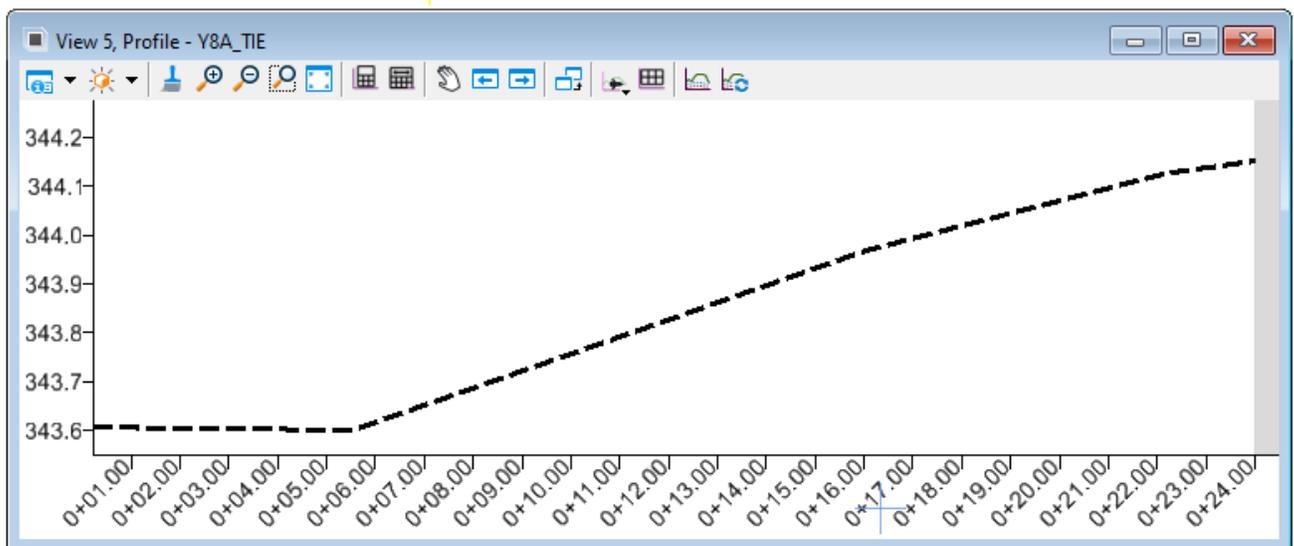
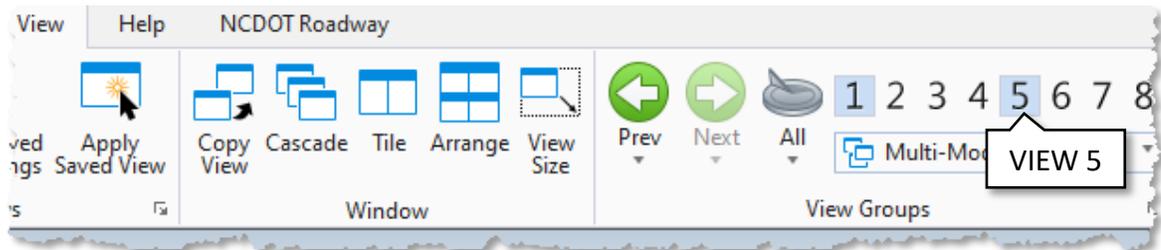
A. Click the **Y8A TIE** line shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option.



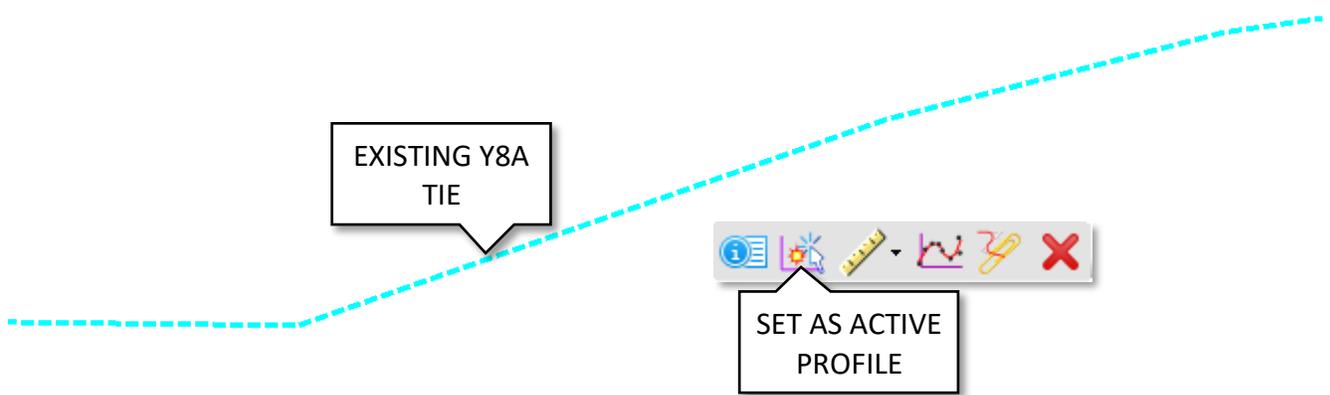


Module 11 - Detailed Modeling

- B. When prompted to **Select or Open View**, click the **View 5** option, within the **View Groups** group (**View > View Groups**) and then, left click within the view to open the **Y8A TIE** line profile view as shown below.



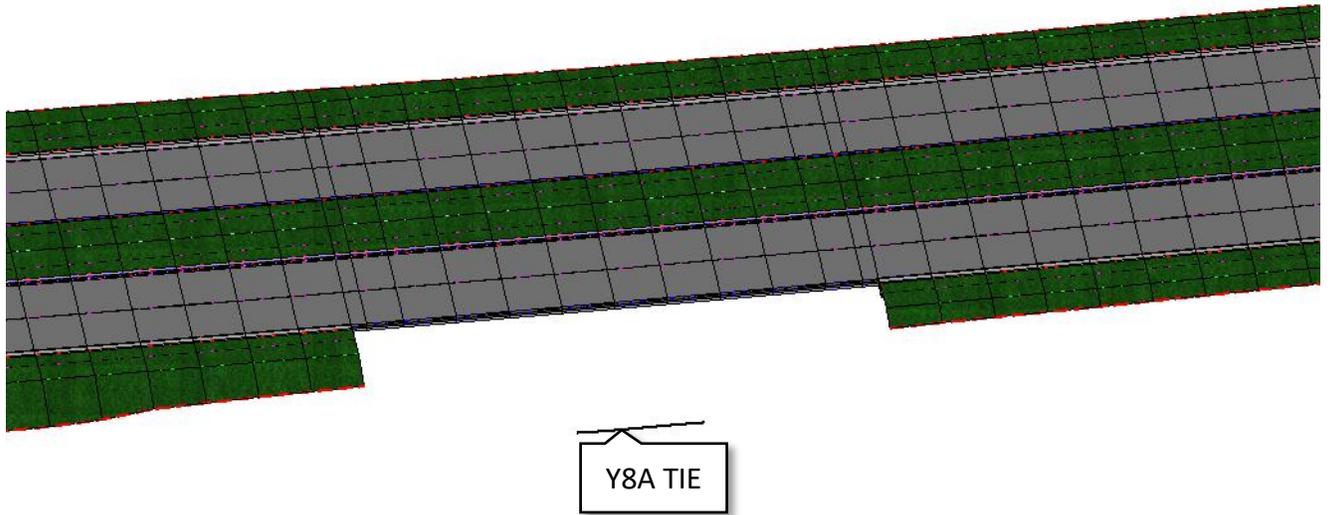
- C. Now, Click the existing **Y8A TIE** line shown below, hover for a moment to display the **Profile Menu** as shown below, then select the **Set as Active Profile** option.



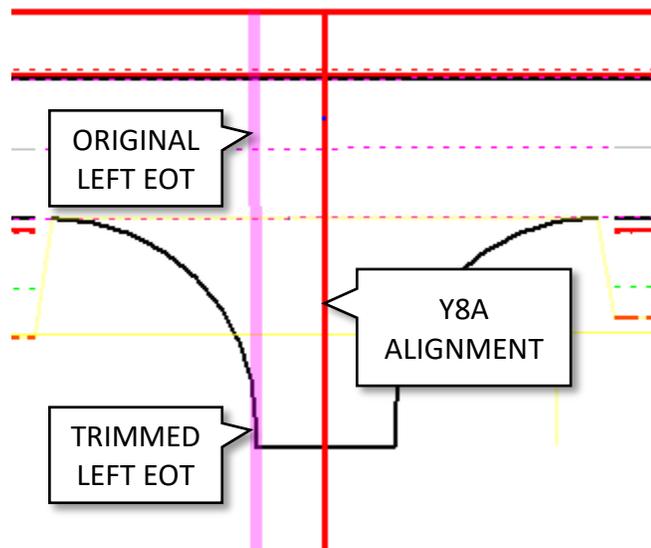


Module 11 - Detailed Modeling

- D. Notice in the **View 2, Default 3D** window that the **Y8A TIE** line is now displayed in the 3D model. This is because it now has a vertical attribute associated with it.



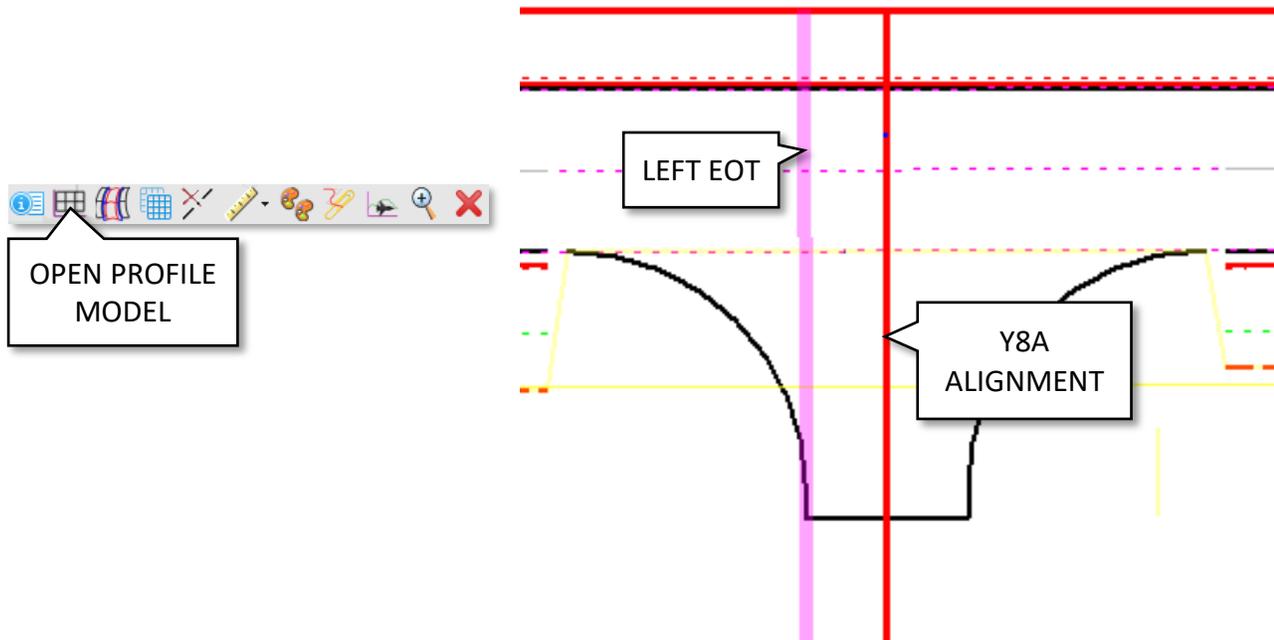
- E. Move your mouse **12'** to the left of the **Y8A** alignment and notice the pink line as displayed below. This line represents the **Y8A** left **EOT** line in its original state before it was trimmed. This line acts as a parent to the small, trimmed EOT section that is still visible.





Module 11 - Detailed Modeling

- F. Click the **Left EOT** line shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option.



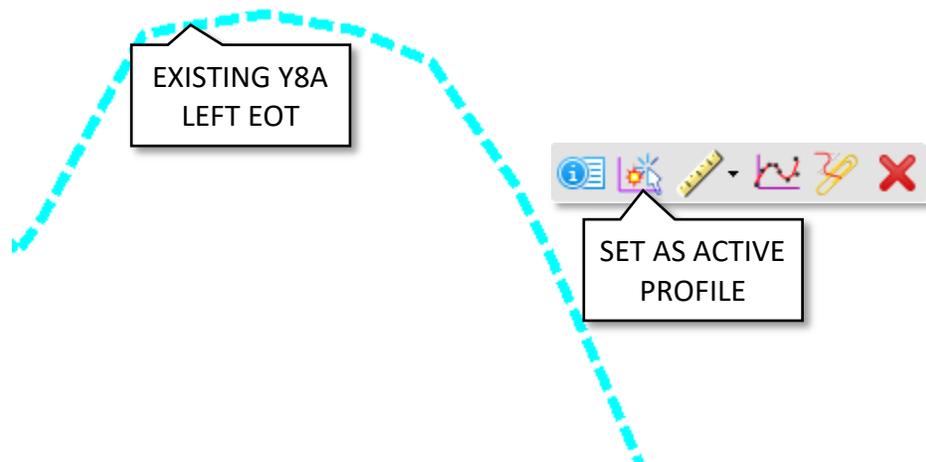
- G. When prompted to **Select or Open View**, click the **View 5** option, within the **View Groups** group (**View > View Groups**) and then, left click within the view to open the **LEFT EOT** profile.



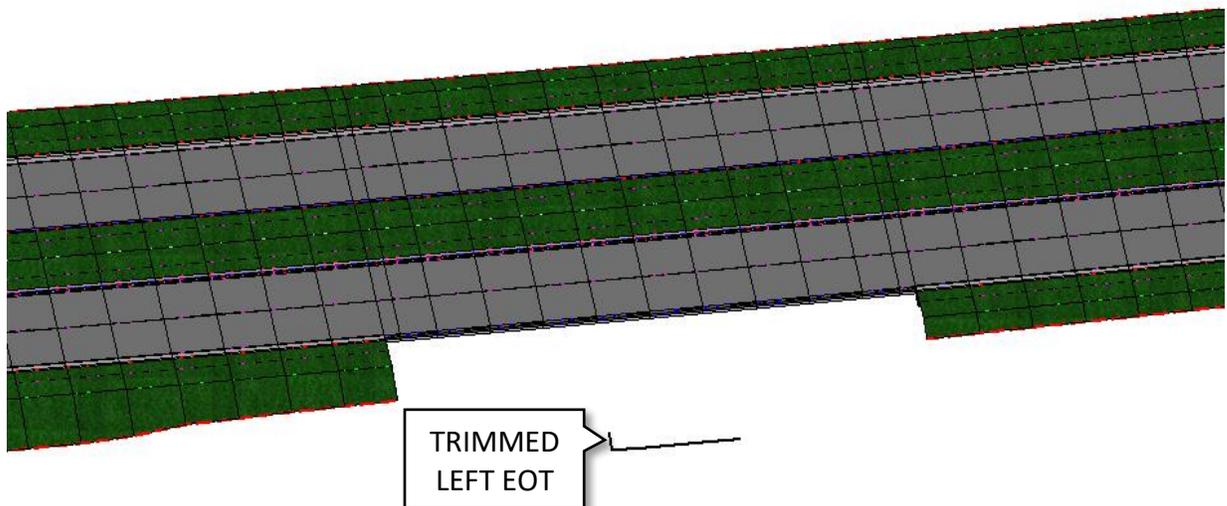


Module 11 - Detailed Modeling

- H. Now, click the existing **Y8A LEFT EOT** line shown below, hover for a moment to display the **Profile Menu** as shown below, then select the **Set as Active Profile** option.



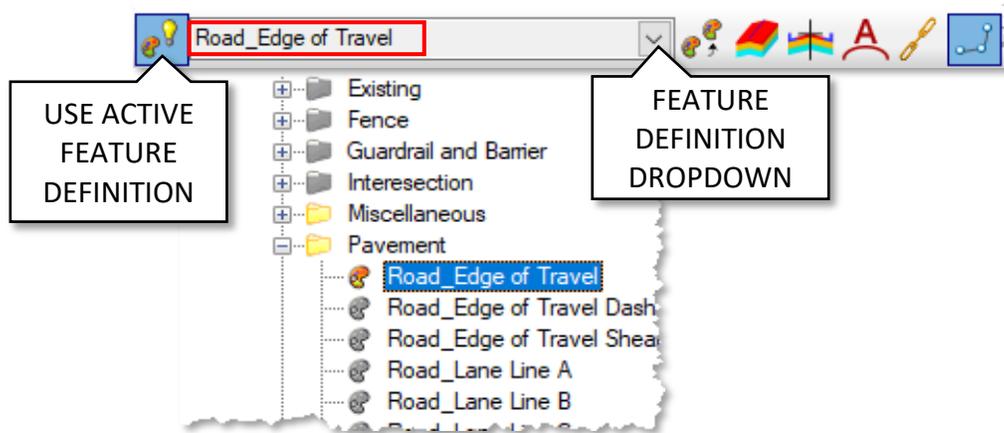
- I. Notice in the **View 2, Default 3D** window that the **TRIMMED LEFT EOT** line is now displayed in the 3D model. This is because the **LEFT EOT** now has a vertical attribute associated with it and there is a **Parent/Child** relationship between the **LEFT EOT** line and the **TRIMMED LEFT EOT** line.



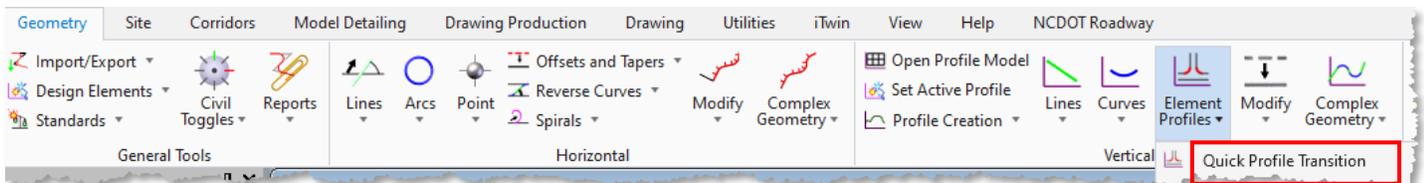


Module 11 - Detailed Modeling

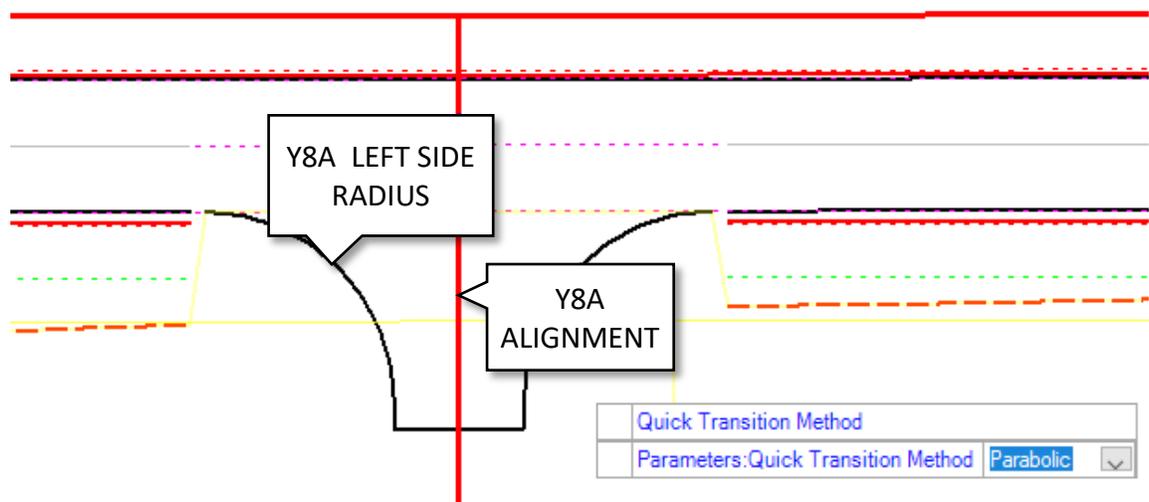
- J. From the **Feature Definition Toggle Bar**, toggle on the Use **Active Feature Definition** button and then select the **Road_Edge of Travel** feature from the (**Linear > Roadway > Pavement**) folder as shown below. Keep this **Feature** active throughout all steps that follow.



- K. Next, select the **Quick Profile Transition** tool (**Geometry > Vertical > Element Profiles > Quick Profile Transition**) as shown below.



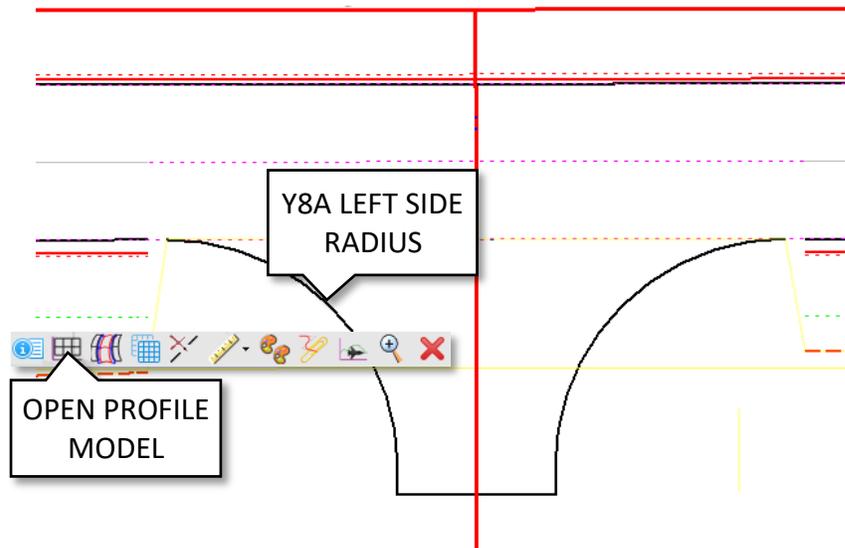
- L. Then, set the **Quick Transition Method** to **Parabolic**, left click to accept, and then select the **Y8A Left Side Radius** on the left side of the **Y8A alignment** as shown below.



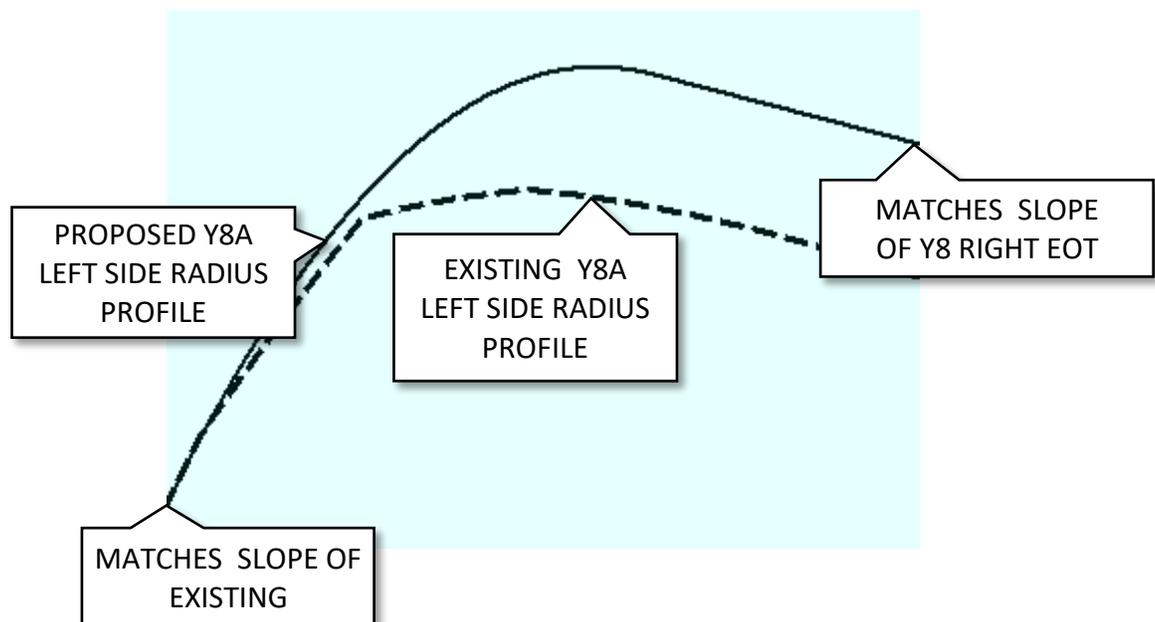


Module 11 - Detailed Modeling

- M. Click the **Y8A Left Side Radius** shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option to open the **Proposed Y8A Radius** profile.



- N. Notice the **Proposed Y8A Radius** profile that was created using the **Quick Profile Transition** tool. The **Quick Profile Transition** tool created a best-fit profile for the **Y8A Left Side Radius**.

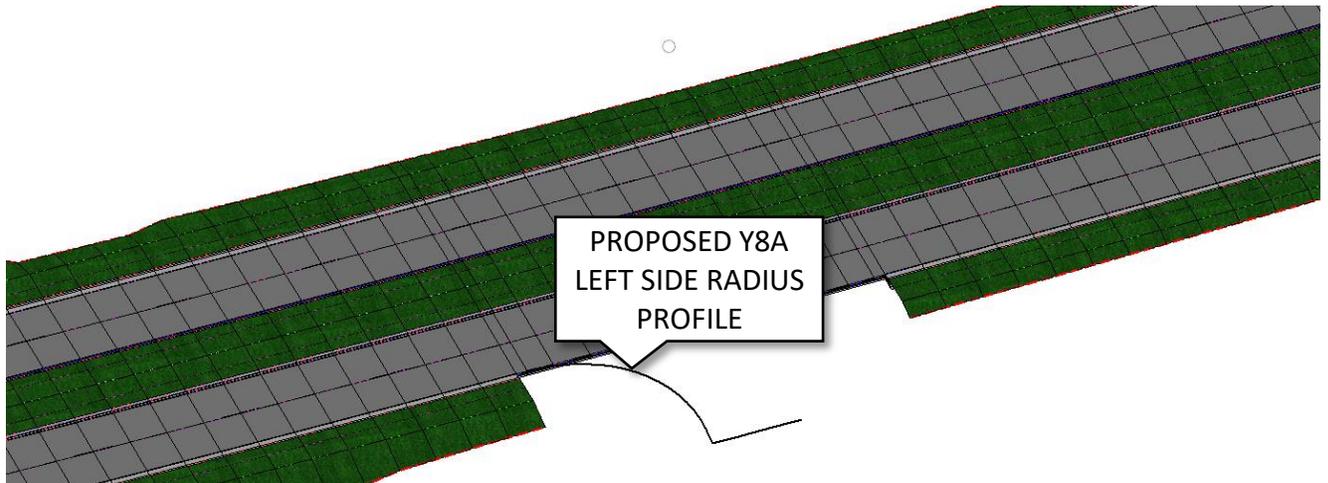


Note: This profile is dynamic. If the Y8 profile is changed, the Proposed Y8A Left Side Radius will reflect this change.

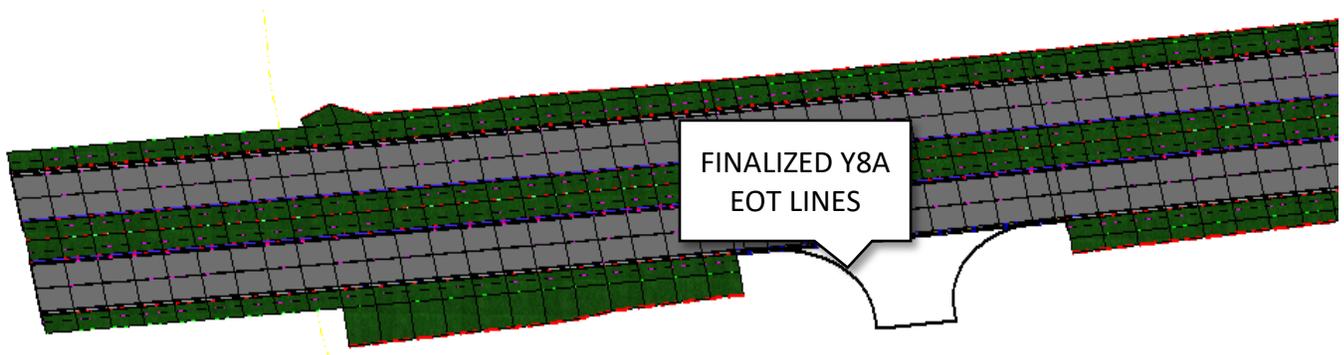


Module 11 - Detailed Modeling

- O. Notice in the **View 2, Default 3D** window that the **Proposed Y8A Left Side Radius** is now displayed in the 3D model.



- P. After profiling the **Y8A Left EOT** lines, follow these same steps and profile the **Y8A Right EOT** lines to finalize the **Side Street (Y8A)** vertical as shown below.



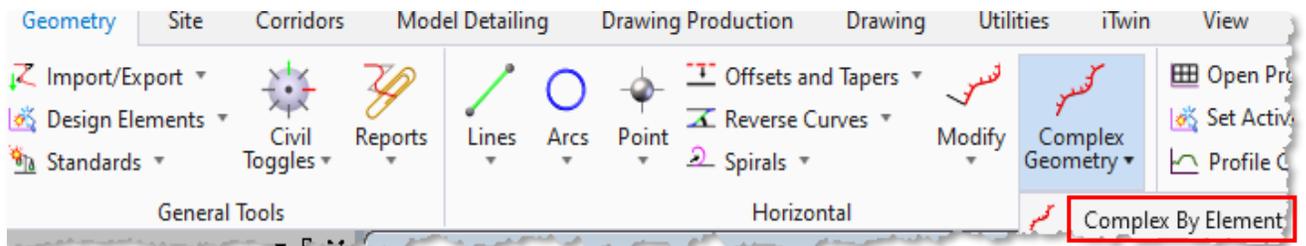
Note: The methodology used to profile the Y8A EOT lines is just one of several ways using OpenRoads Designer. See the Vertical Alignment module for more detailed information on OpenRoads Designer Vertical Geometry tools and methodology.



Module 11 - Detailed Modeling

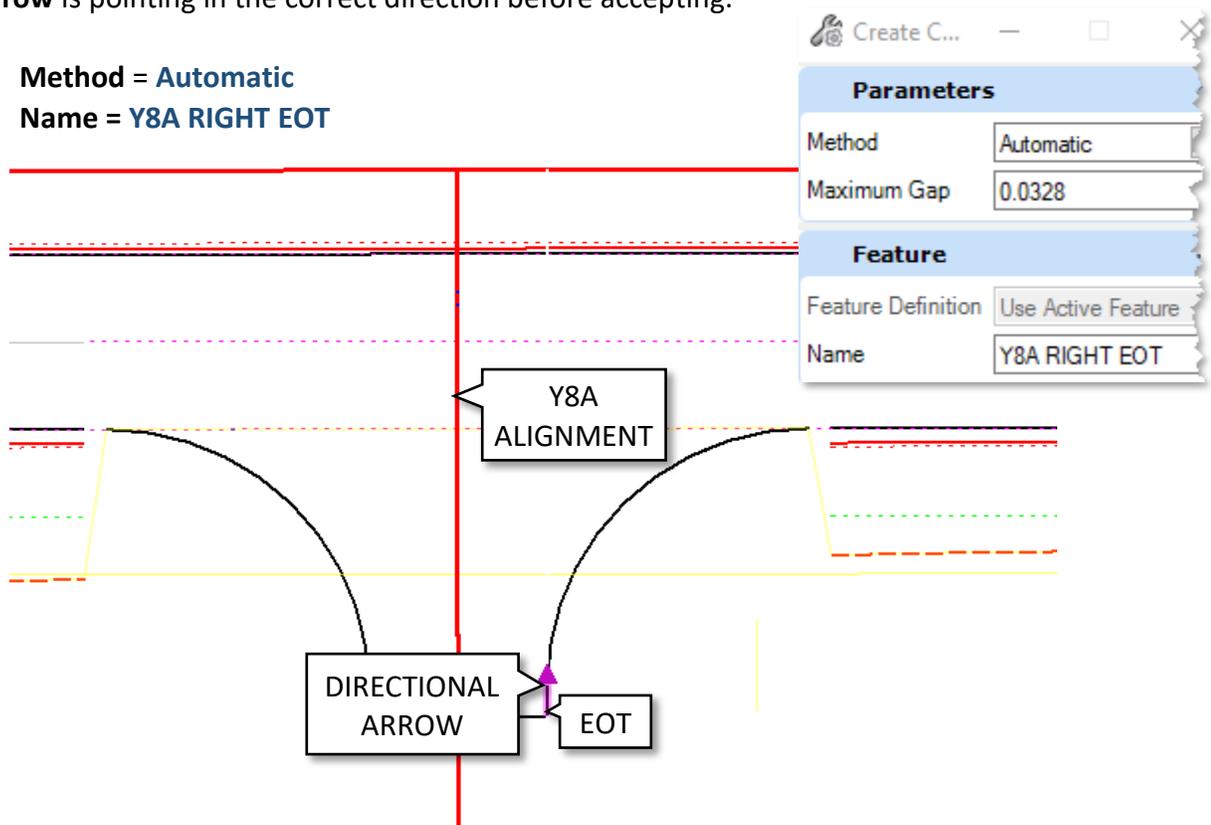
11. Complex the Side Street (Y8A) EOT lines

- A. Select the **Complex By Element** tool (**Geometry > Horizontal > Complex Geometry > Complex By Element**) as shown below.



- B. Then, Key the following parameters into the **Create Complex Element** dialog and select the small tangent **EOT** as shown below. When selecting the **EOT** line, make sure the **Directional Arrow** is pointing in the correct direction before accepting.

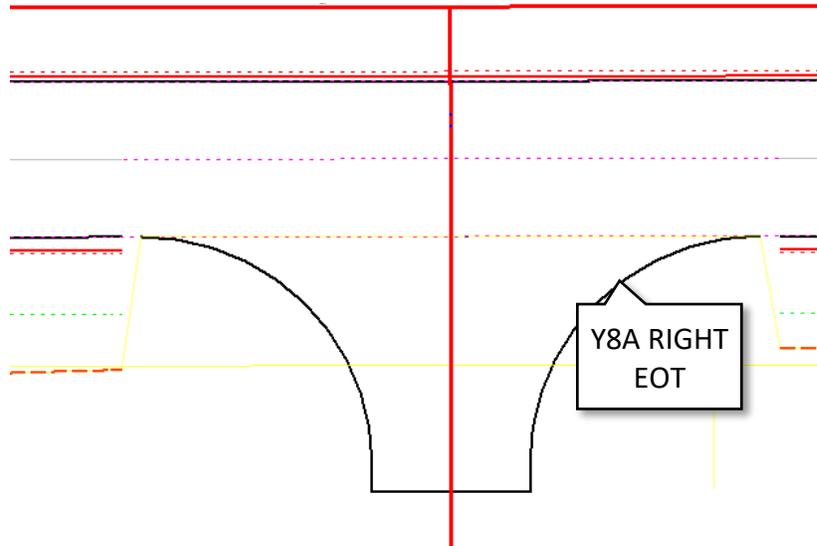
- **Method = Automatic**
- **Name = Y8A RIGHT EOT**



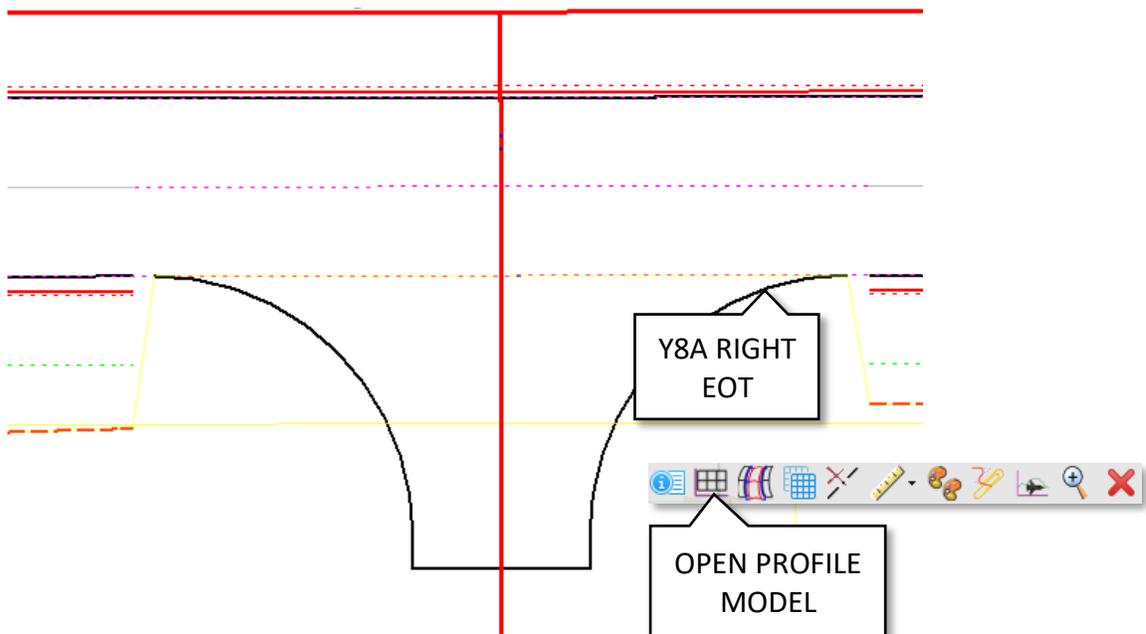


Module 11 - Detailed Modeling

C. This creates a new complex element called **Y8A RIGHT EOT** as shown below.



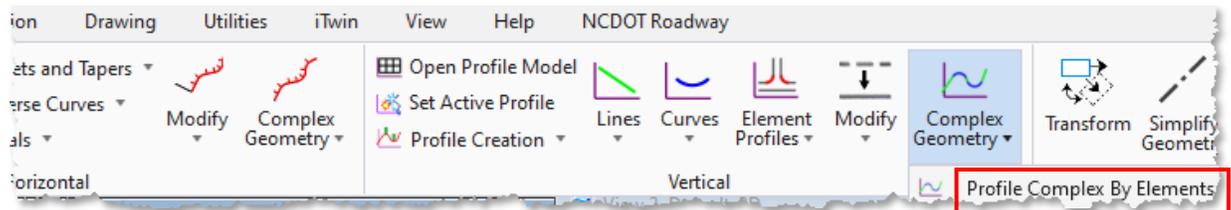
D. Click the **Y8A Right EOT** shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option to open the **Y8A Right EOT** profile.





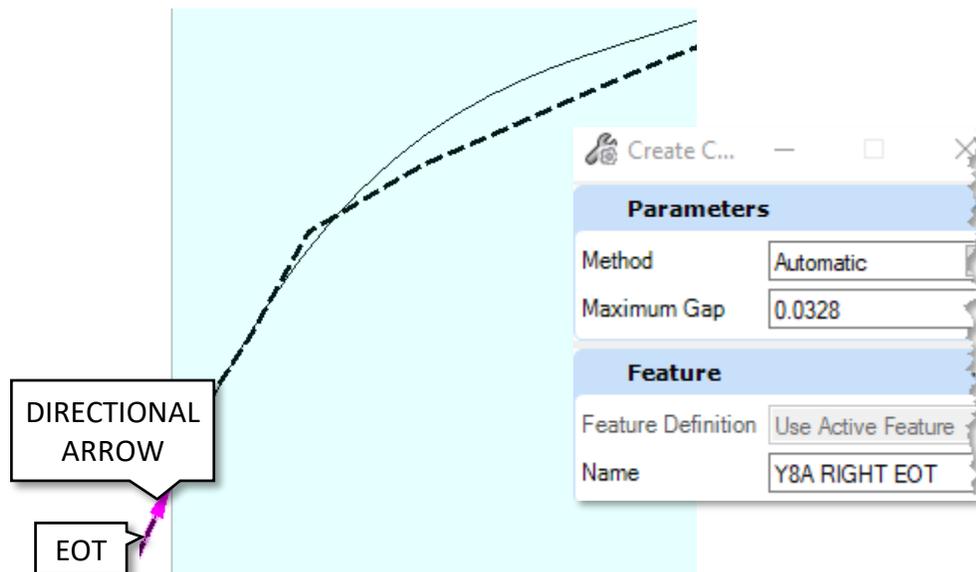
Module 11 - Detailed Modeling

- E. Select the **Profile Complex By Element** tool (**Geometry > Vertical > Complex Geometry > Profile Complex By Element**) as shown below.



- F. Then, similar to how the horizontal **Y8A Right EOT** was complexed, Key the following parameters into the **Create Complex Profile Element** dialog and select the small tangent **EOT** as shown below. When selecting the **EOT** line, make sure the **Directional Arrow** is pointing in the correct direction before accepting. It may be helpful to turn the existing ground line off if you have trouble selecting the tangent **EOT**.

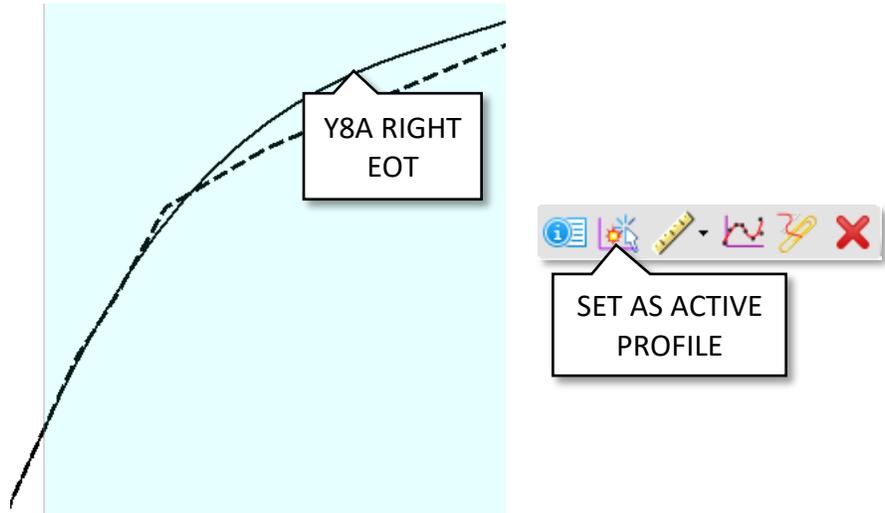
- **Method = Automatic**
- **Name = Y8A RIGHT EOT**





Module 11 - Detailed Modeling

- G. This creates a new complex vertical element called **Y8A RIGHT EOT** as shown below. Set **Y8A Right EOT** as the **Active Profile**.

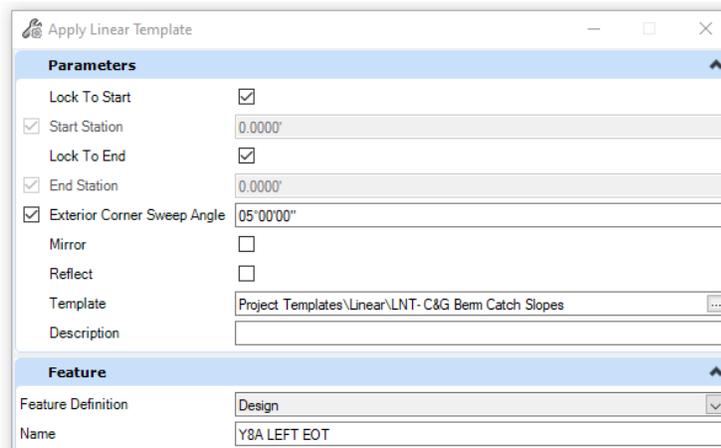
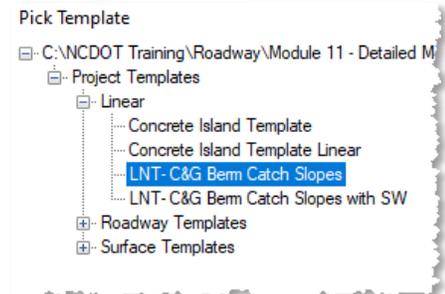
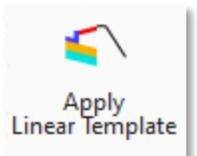


- H. After complexing the **Y8A Right EOT** lines, follow these same steps and complex the **Y8A Left EOT** lines.

12. Apply Linear Templates to the Left and Right Y8A EOT lines

- A. Select the **Apply Linear Template** tool (**Model Detailing > Apply Linear Template**).
- B. Key the following parameters into the **Apply Linear Template** dialog.

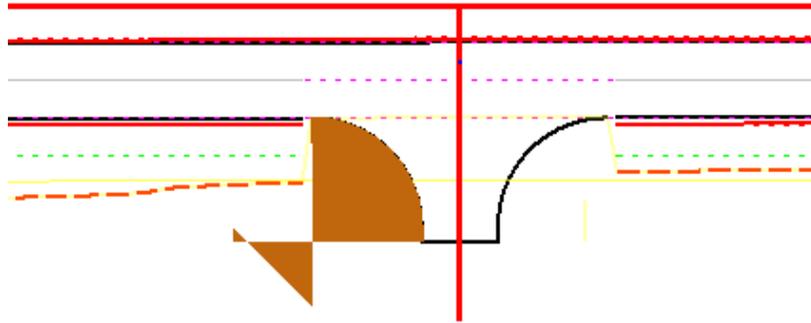
- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00' 00"**
- **Template** = **LNT - C&G Berm Catch Slopes**
- **Feature Definition** = **Design**
- **Name** = **Y8A LEFT EOT**



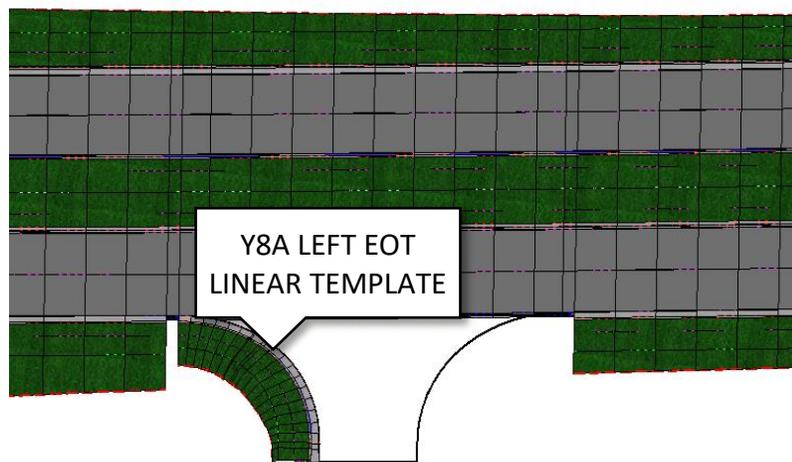


Module 11 - Detailed Modeling

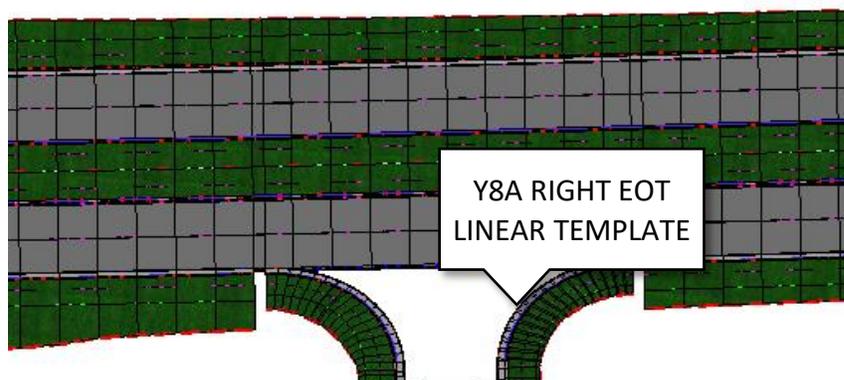
- C. When prompted to **Locate Element To Apply Template**, select the **Y8A LEFT EOT** and begin clicking through the prompts. When prompted to **Select Side**, move your cursor as shown below and then continue clicking through the prompts to place the **Linear Template**.



- D. Notice in the **View 2, Default 3D** window that the **Y8A Left EOT Linear Template** is now displayed in the 3D model as shown below.



- E. After applying the **Linear Template** to **Y8A Left EOT**, follow these same steps and apply the to the same **Linear Template** to **Y8A Right EOT** as shown below.

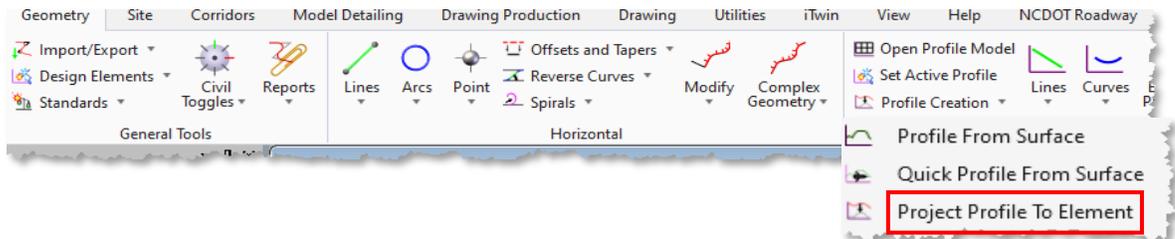




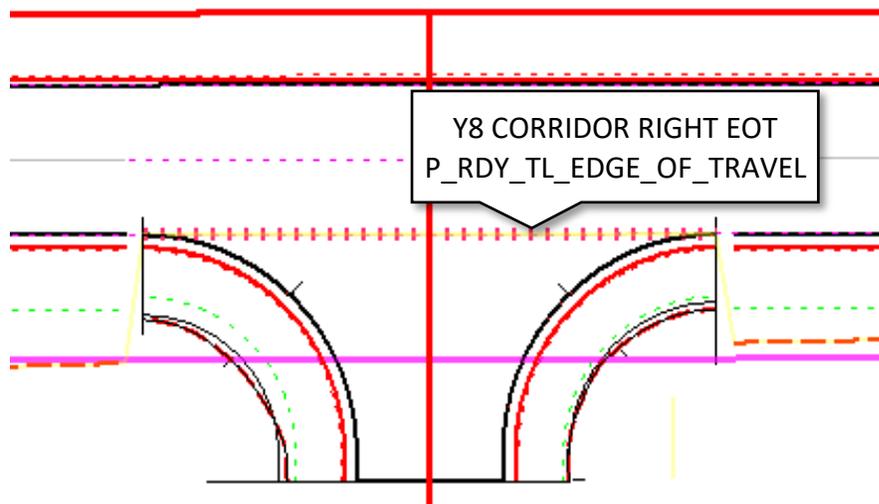
Module 11 - Detailed Modeling

13. Create a Proposed Terrain for the Side Street (Y8A)

- A. First, select the **Project Profile To Element** tool (**Geometry > Vertical > Profile Creation > Project Profile to Element**) as shown below.



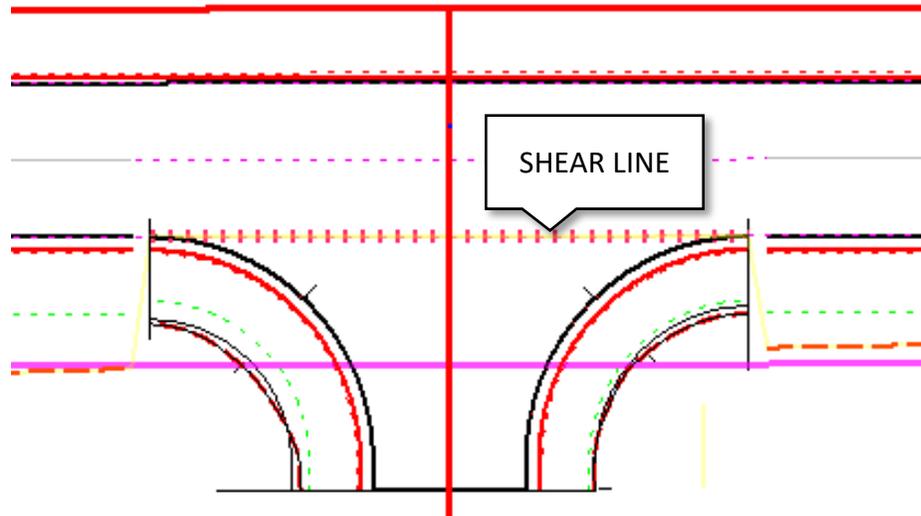
- B. When prompted to **Select Element To Project**, select the **Right EOT** line for the **Y8 Corridor**. When selecting the **Y8 Corridor Reft EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



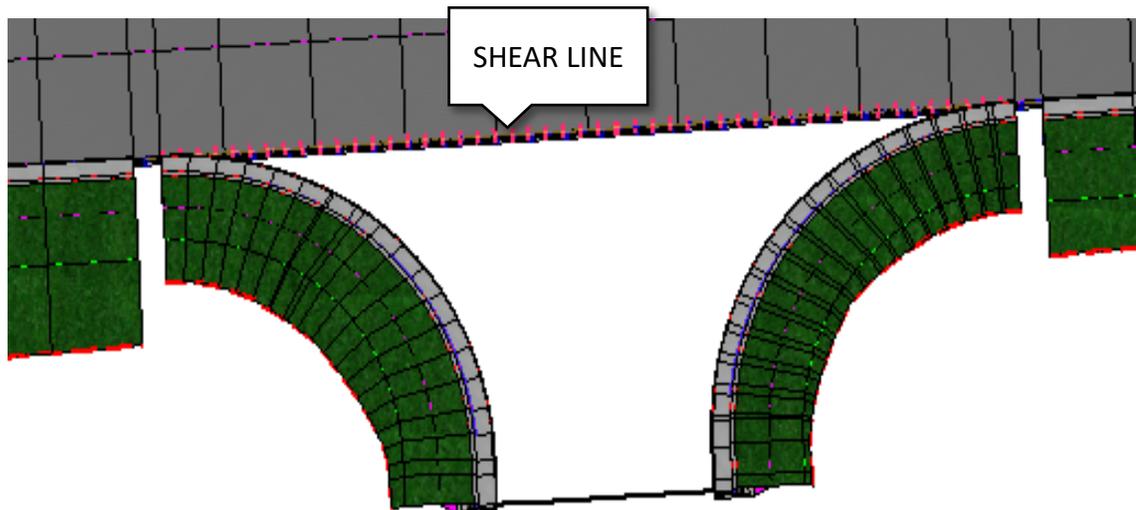


Module 11 - Detailed Modeling

- C. Then select the **Shear Line** on level **Draft_RDY_Construction_Element** when prompted to **Select Plan Element To Project Onto**.



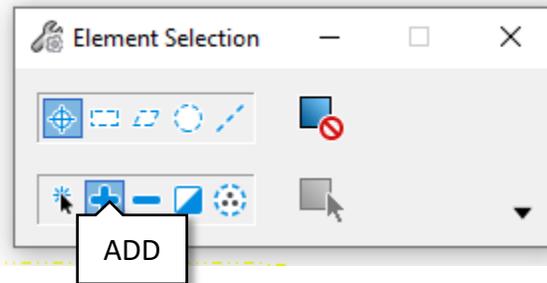
- D. Notice in the **View 2, Default 3D** window that the **Shear Line** is now displayed in the 3D model matching the **Y8 EOT** as shown below.



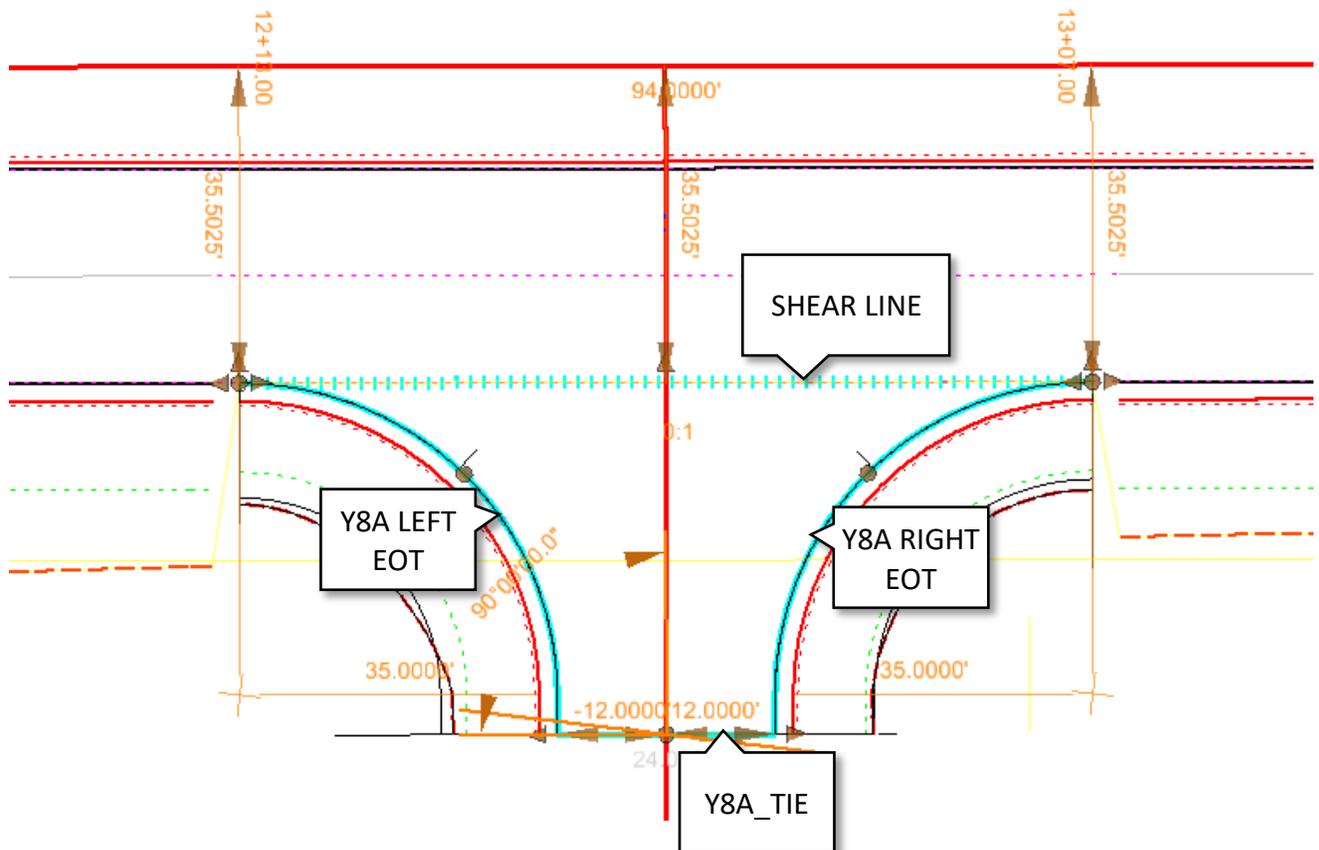


Module 11 - Detailed Modeling

- E. Now, select the **Element Selection** tool (**Terrain > Selection > Element Selection**) and **Toggle ON** the **Add** option as shown below.



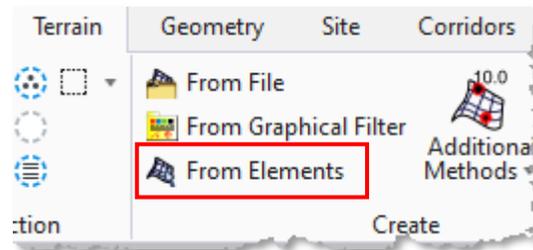
- F. Then, select the four (4) elements **Highlighted in Blue** below. Because there are multiple elements sitting on top of one another, you may need to **Right-Click** through the elements to select the ones you need. If you're still having trouble, try turning off some of the additional levels.





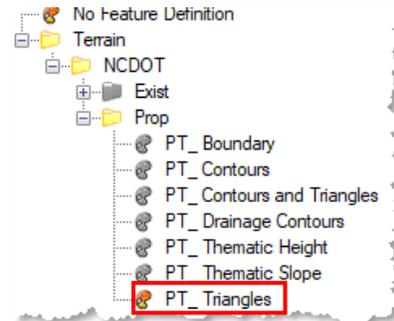
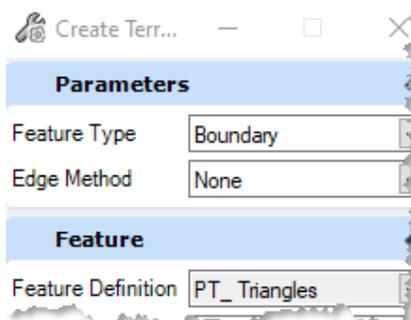
Module 11 - Detailed Modeling

- G. Now, select the **Create Terrain From Elements** tool (**Terrain > Create > From Elements**) as shown below.

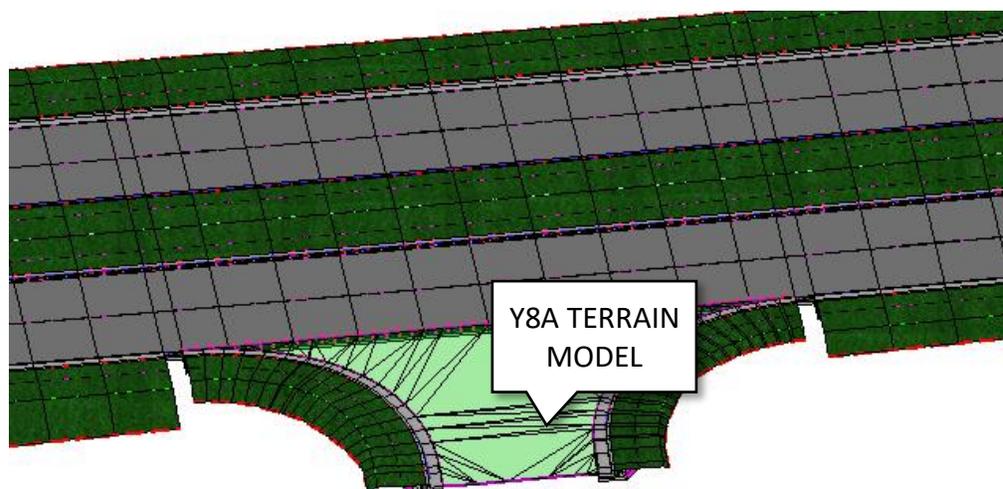


- H. Still keeping those four (4) elements selected, key the following parameters into the **Create Terrain From Elements** dialog.

- **Feature Type = Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



- I. Finally, **Left-Click** through the prompts to create the **Side Street (Y8A) Terrain Model** as shown below.

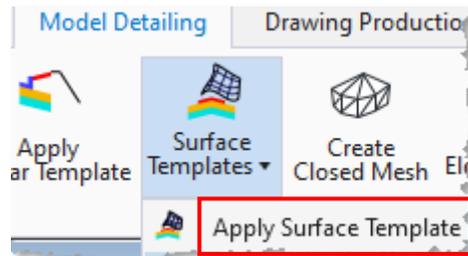




Module 11 - Detailed Modeling

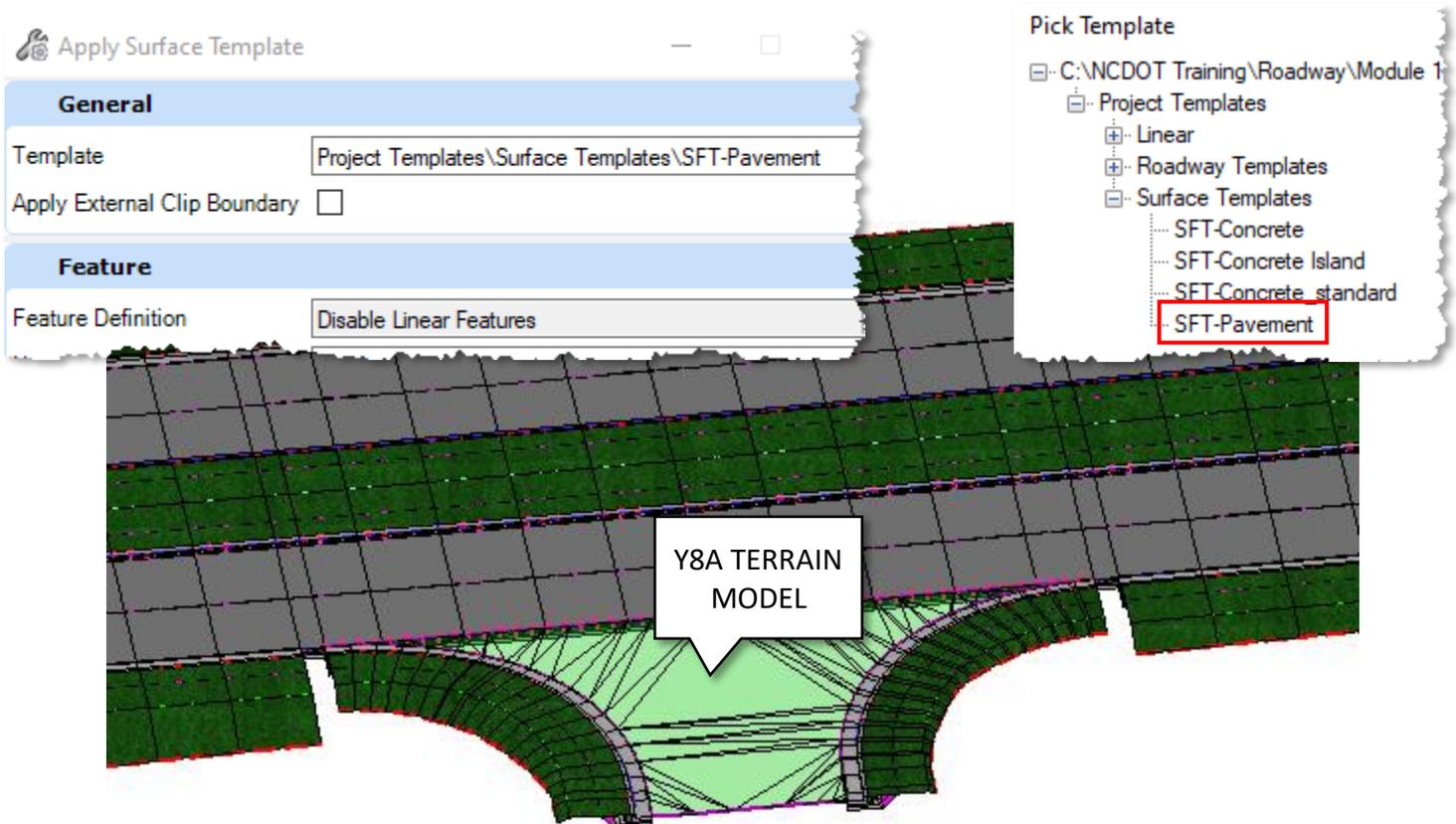
14. Apply Pavement Surface Template to the Side Street (Y8A) Terrain Model

- A. Select the **Apply Surface Template** tool (**Model Detailing > Surface Templates > Apply Surface Template**) as shown below.



- B. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Y8A Terrain Model** from within the **View 2, Default 3D** window when prompted to **Locate Terrain Model**.

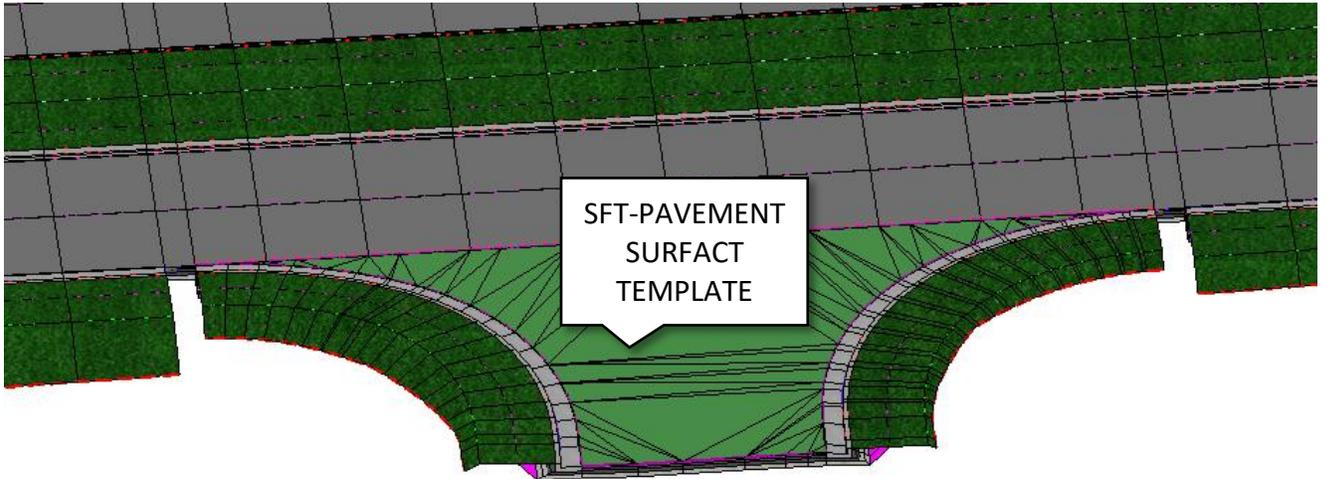
- **Template = SFT-Pavement**
- **Feature Definition = Disable Linear Features**



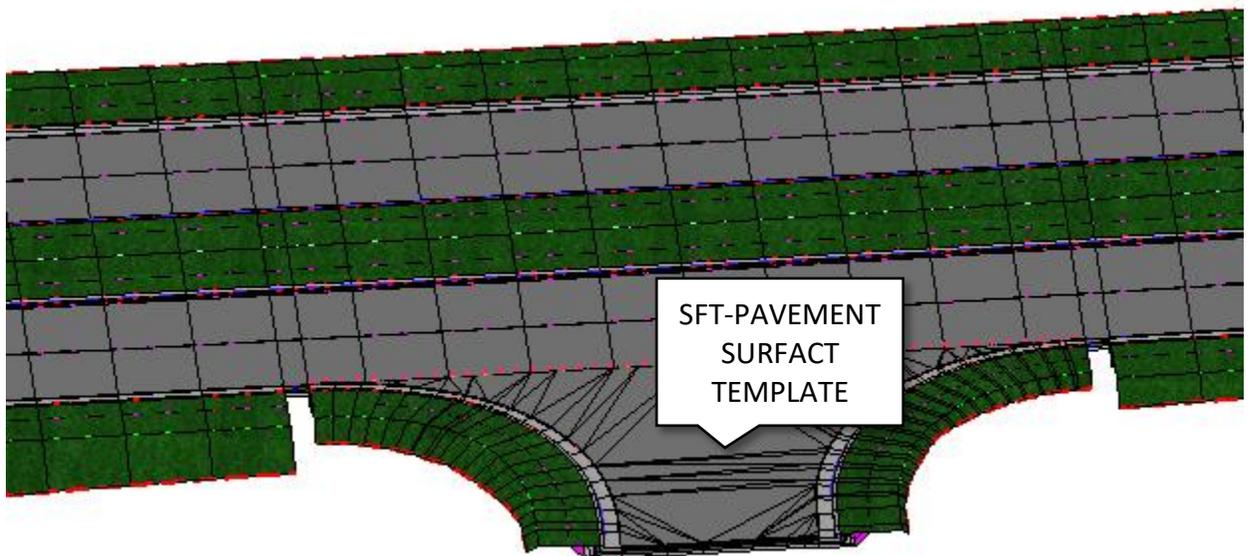


Module 11 - Detailed Modeling

- C. Continue left clicking through the prompts to apply the **SFT-Pavement Surface Template** to the **Y8A Terrain** as shown below.



- D. Turn off the Terrain Levels to better see the **SFT-Pavement Surface Template** as shown below.

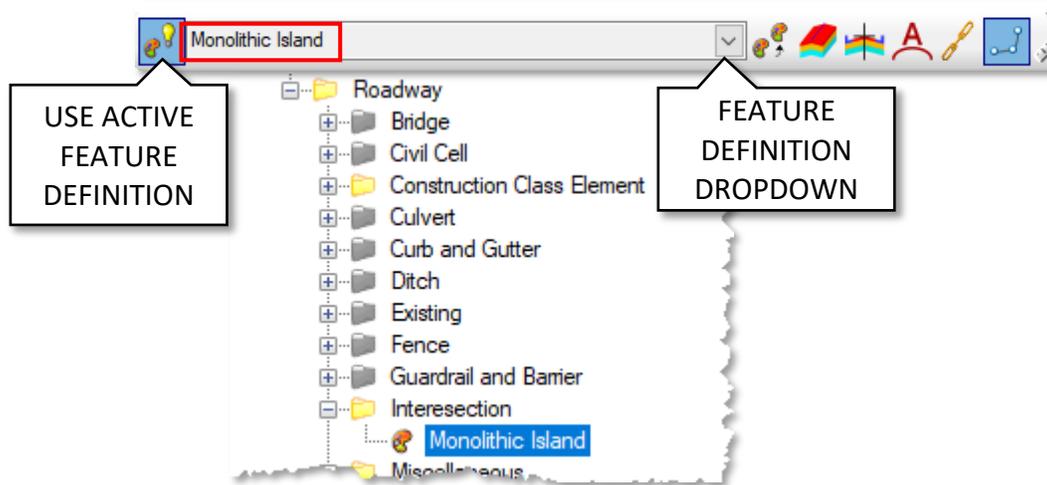




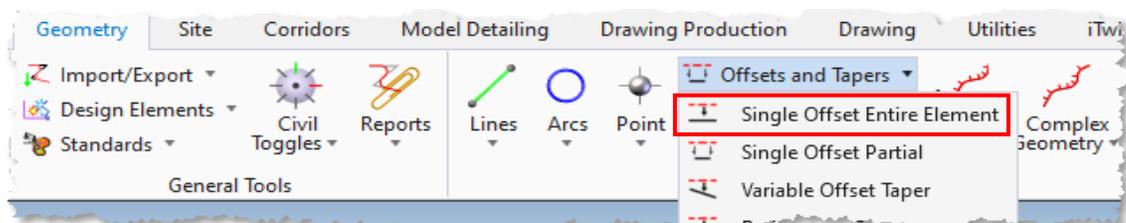
Module 11 - Detailed Modeling

15. Add a Concrete Channelization Island to the Side Street (Y8A)

- A. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and then select the **Monolithic Island** feature from the (**Linear > Roadway > Intersection**) folder as shown below. Keep this **Feature** active throughout all steps that follow.



- B. Next, select the **Single Offset Entire Element** tool (**Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element**) and key the following parameters into the as shown below.



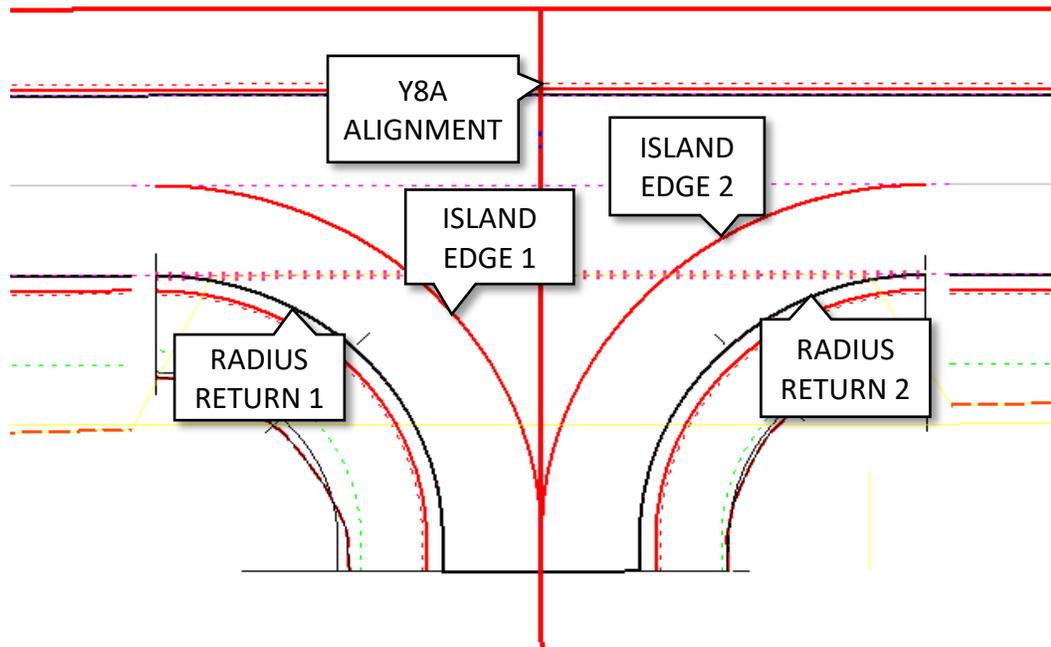
- **Offset = 12.0000**
- **Use Spiral Transitions = Unchecked**
- **Mirror = Unchecked**
- **Remove Offset Rule = Unchecked**



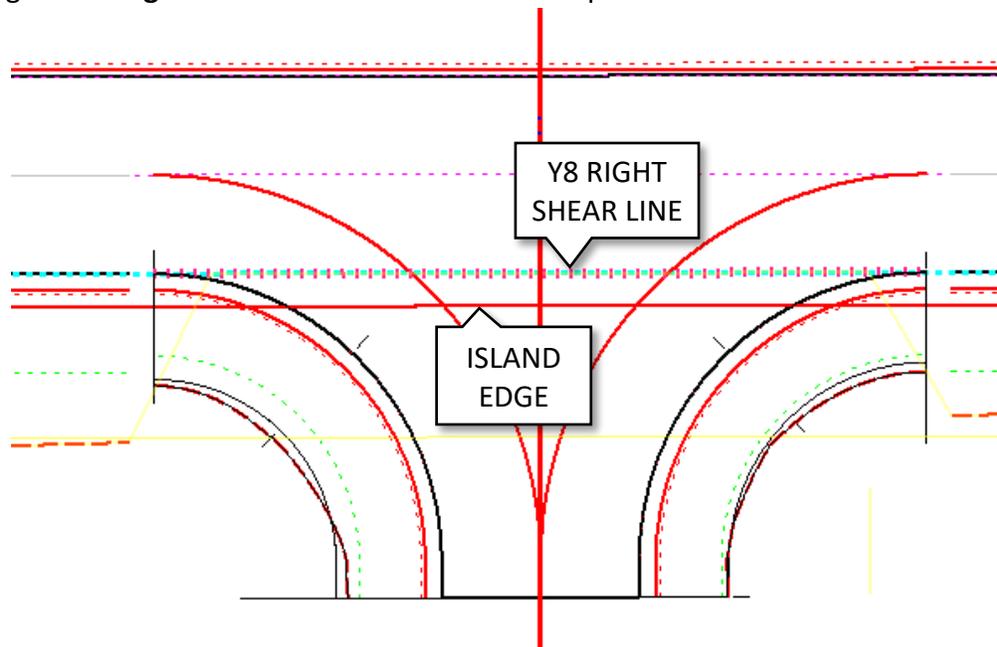


Module 11 - Detailed Modeling

- C. Then, select the two (2) **Y8A EOT** radius returns and follow the prompts to place the two (2) **Island Edges** as shown below.



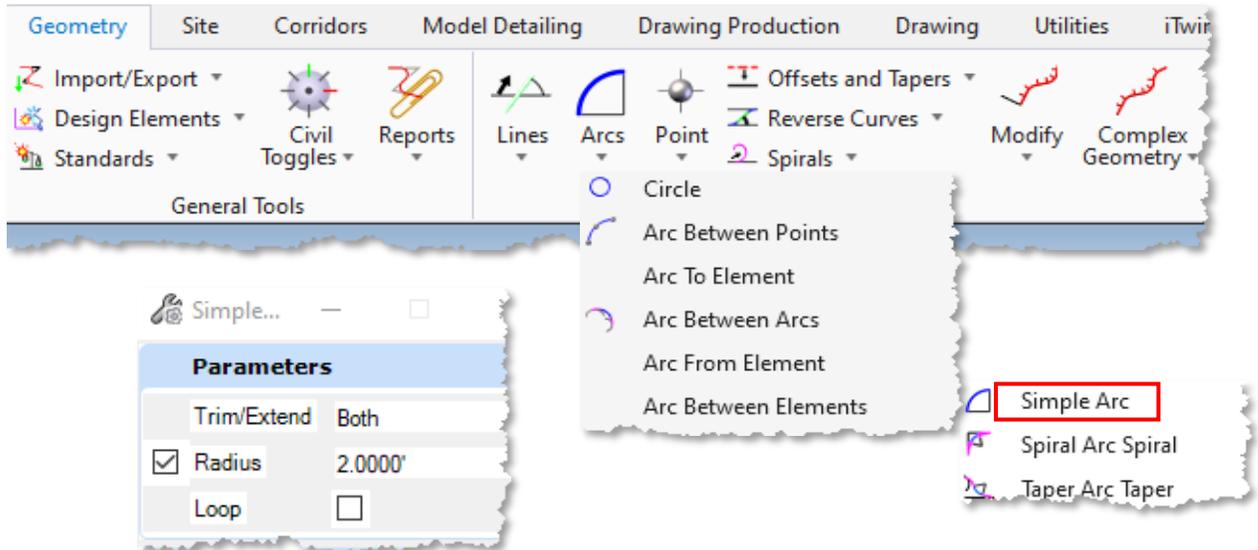
- D. Change the **Offset** value to **4'** within the **Single Offset Entire Element** dialog, this time selecting the **Y8 Right Shear Line** as shown below to place the 3rd and final **Island Edge** line.



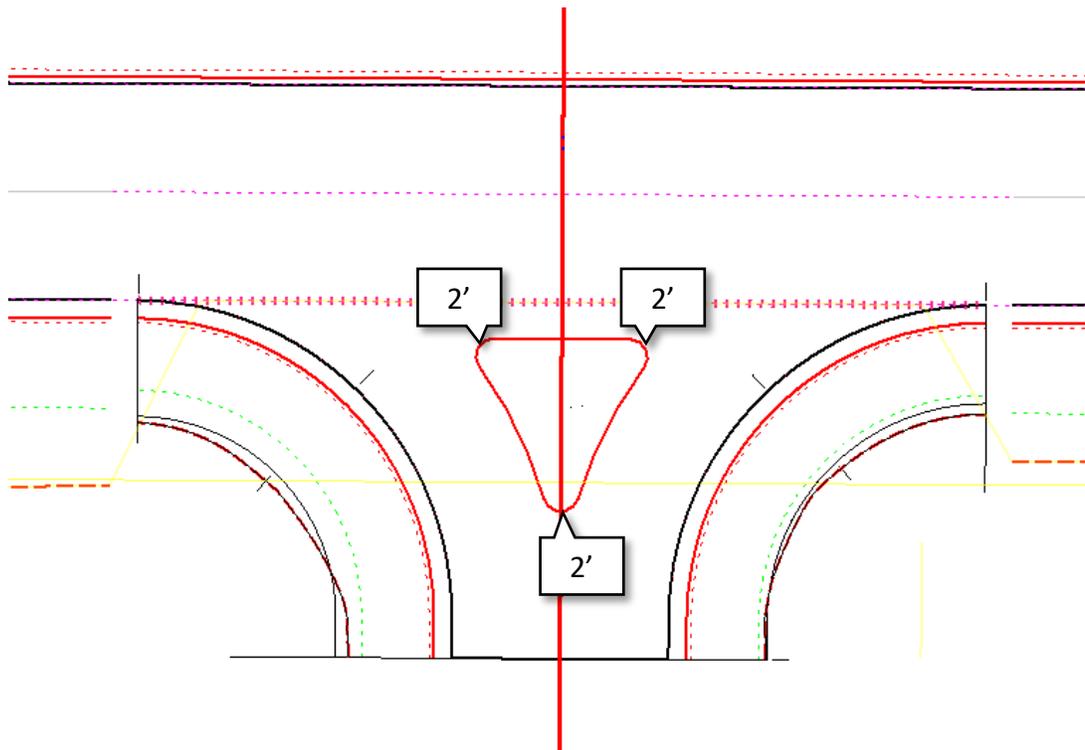


Module 11 - Detailed Modeling

- E. Next, select the **Simple Arc** tool (**Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc**). Set the **Radius** parameter to **2'** and the **Trim/Extend** parameter to **Both** within the dialog as shown below.



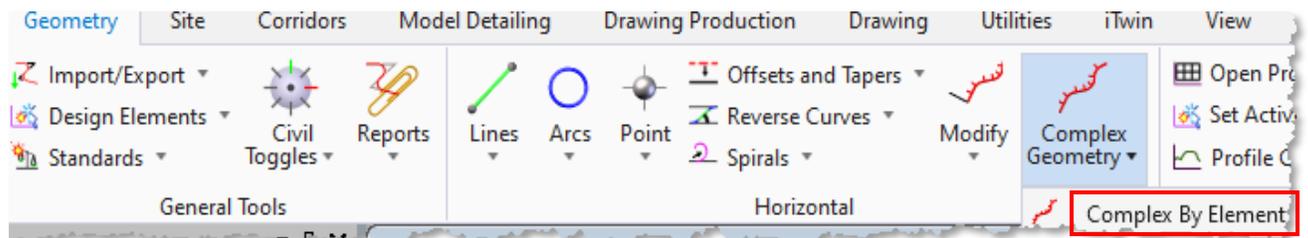
- F. Now, use the **Simple Arc** tool to fillet the three (3) corners of the concrete island as shown below.



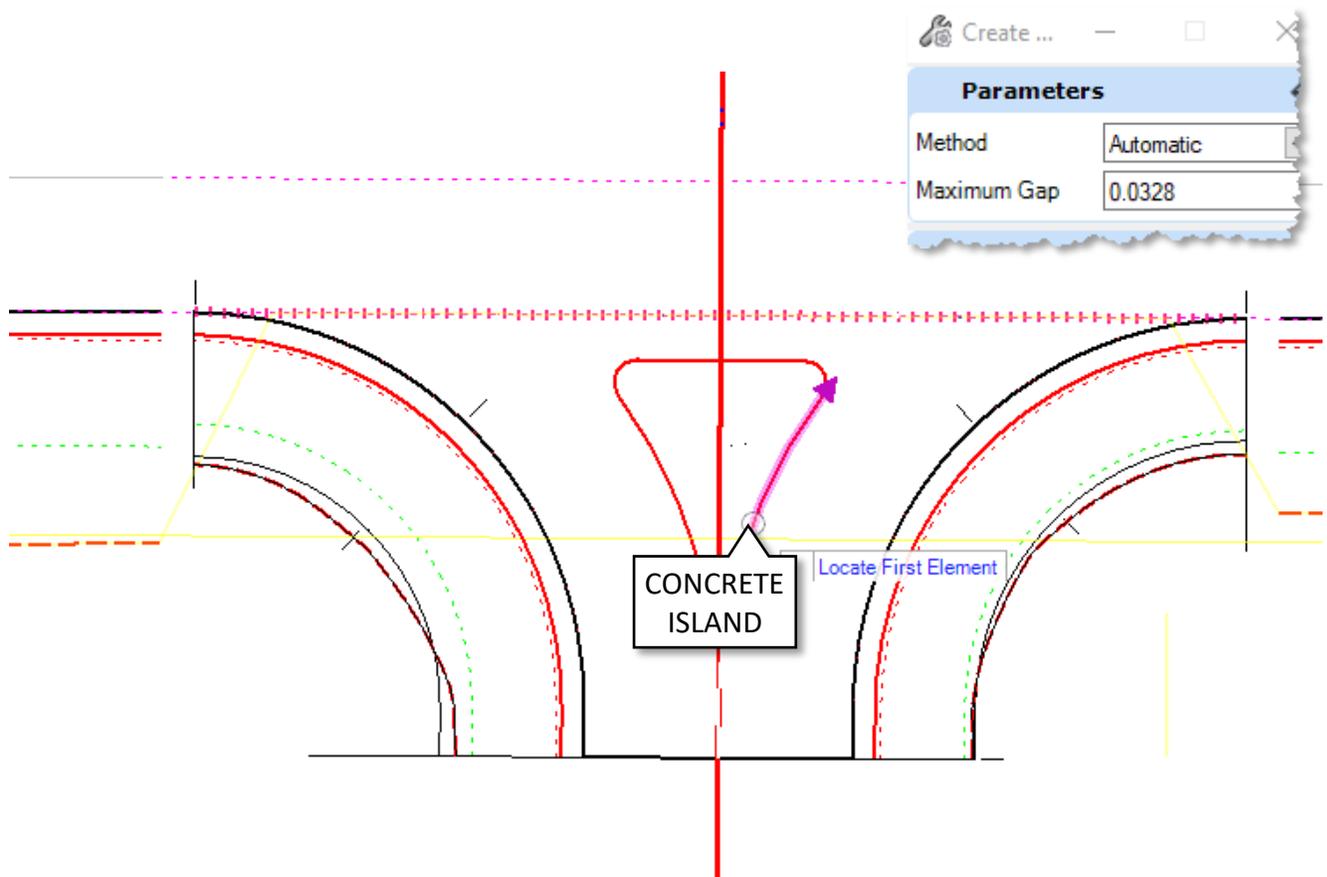


Module 11 - Detailed Modeling

- G. Select the **Complex By Element** tool (**Geometry > Horizontal > Complex Geometry > Complex By Element**). Set the **Method** to **Automatic** and click on the **Concrete Island** when prompted.



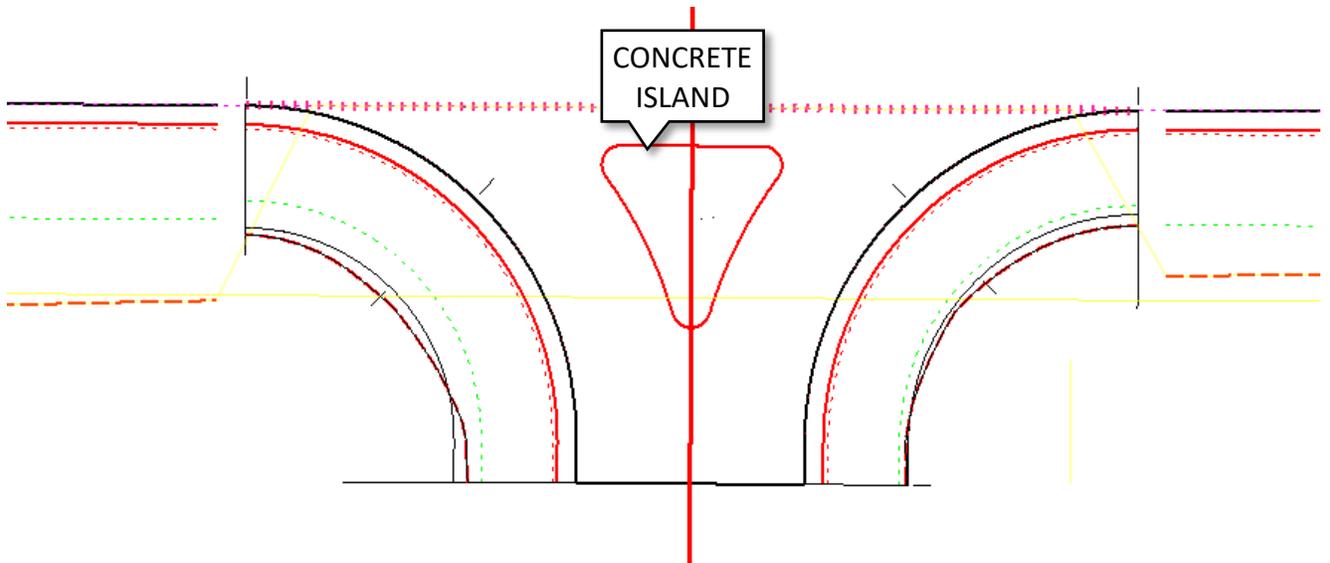
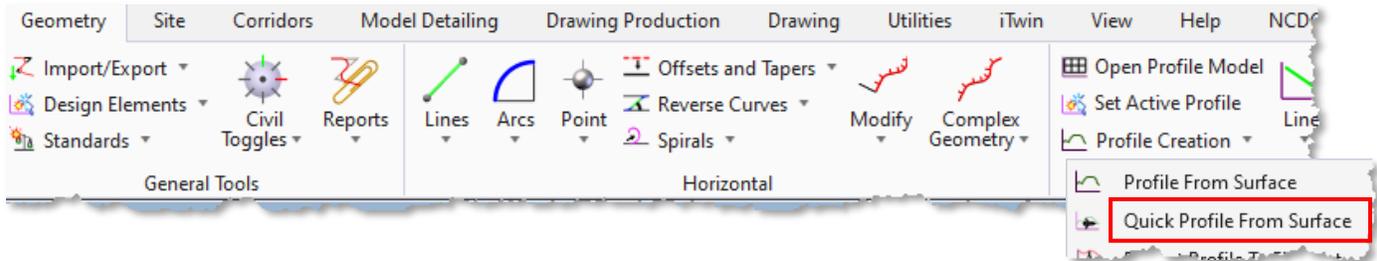
- H. Click through the additional prompts to complex the **Concrete Island**, making it a single complex element.



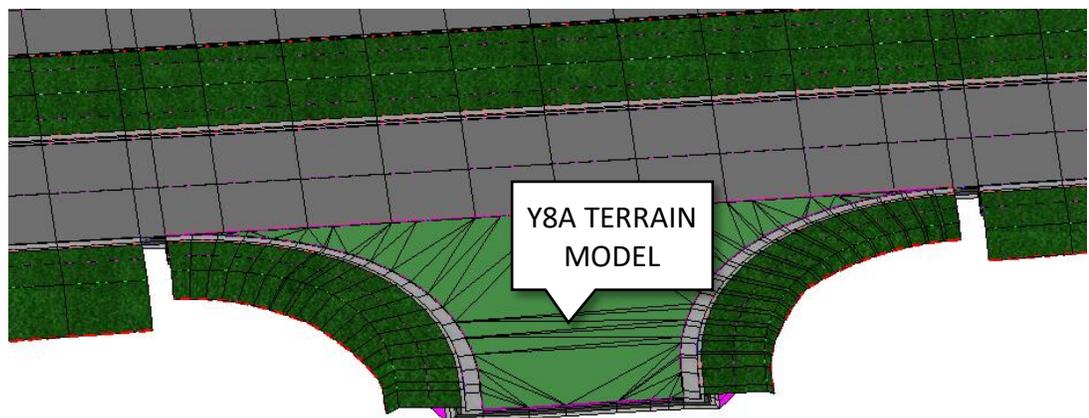


Module 11 - Detailed Modeling

- I. Next, select the **Quick Profile From Surface** tool (**Geometry > Vertical > Profile Creation > Quick Profile From Surface**) and select the **Concrete Island** when prompted to **Locate Reference Element**.



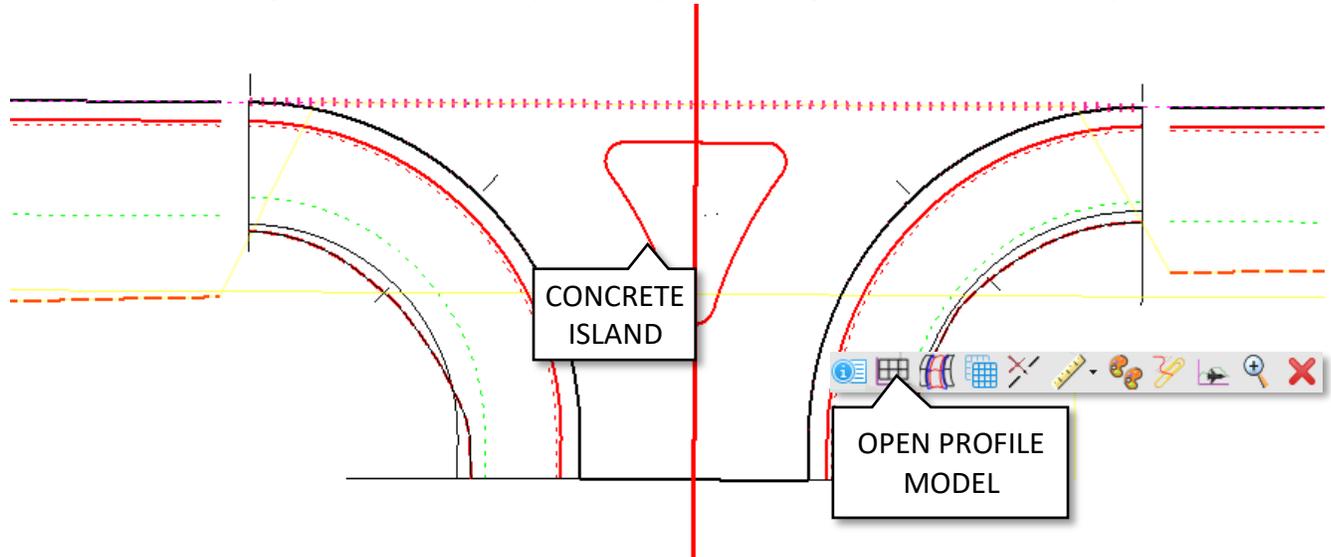
- J. Then, select the **Side Street (Y8A) Terrain Model** when prompted to **Locate Reference Surface**. Right click to reset and finalize the command.



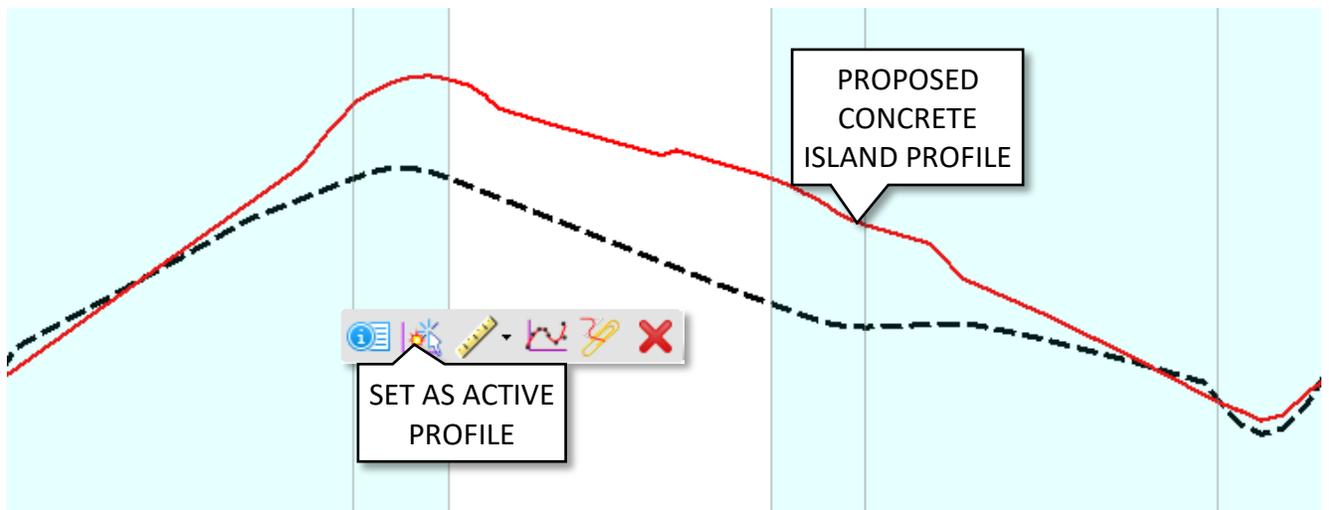


Module 11 - Detailed Modeling

- K. Click the **Concrete Island** shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option to open the **Proposed Concrete Island** profile.



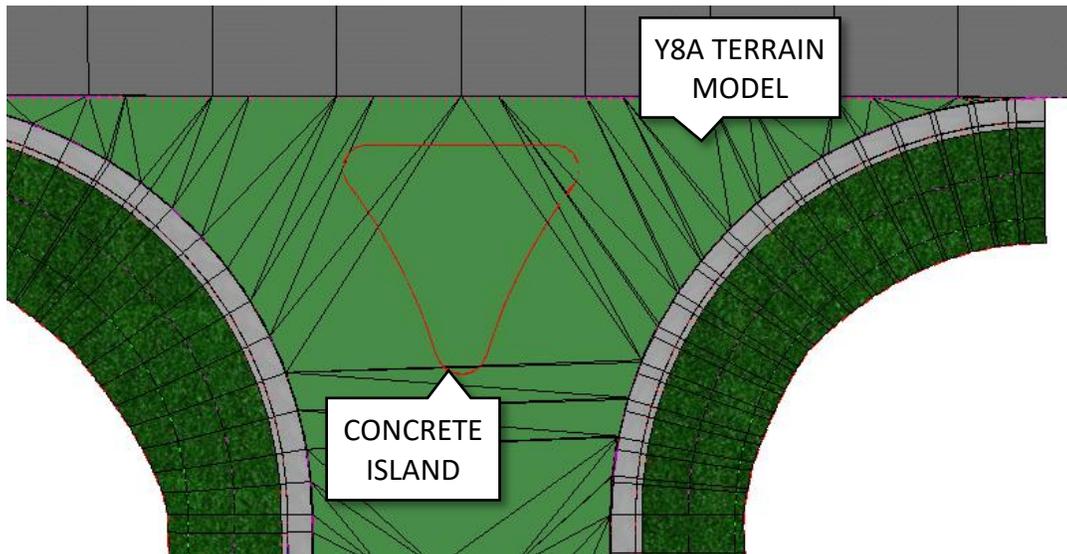
- M. Notice the proposed **Concrete Island** profile that was created using the **Side Street (Y8A) Terrain Model** as shown below. Set this as the **Active Profile** and then close out of the profile window.



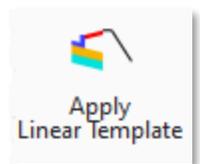


Module 11 - Detailed Modeling

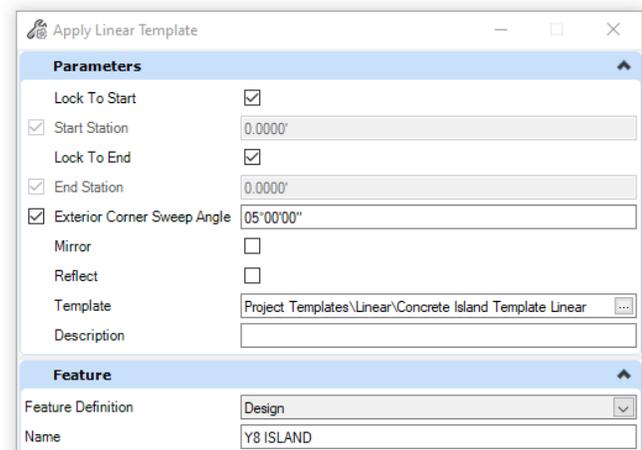
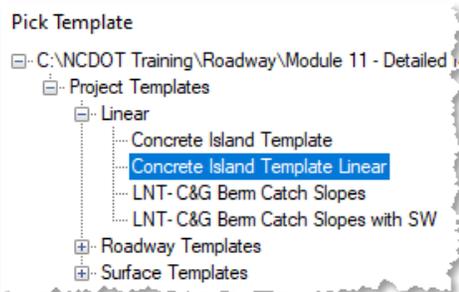
- N. Notice in the **View 2, Default 3D** window that the **Proposed Concrete Island** is now displayed in the 3D model matching the surface of the **Side Street (Y8A) Terrain Model** as shown below.



- O. Select the **Apply Linear Template** tool (**Model Detailing > Apply Linear Template**) and key the following parameters into the **Apply Linear Template** dialog.



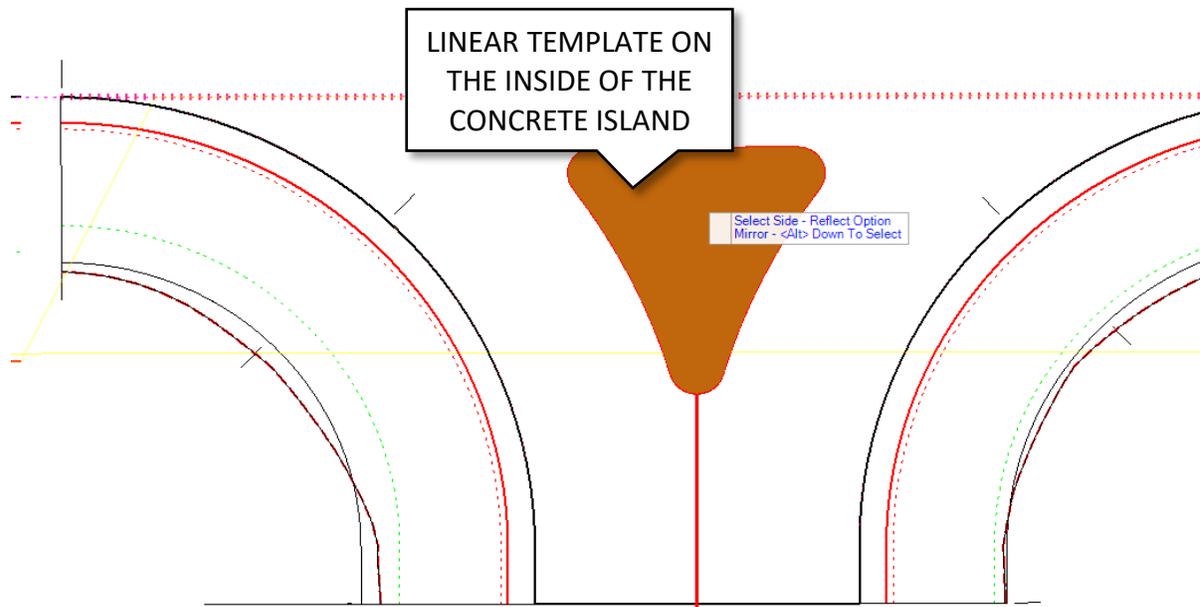
- **Start = Lock To Start**
- **End = Lock To End**
- **Exterior Corner Sweep Angle = 05° 00' 00"**
- **Template = Concrete Island Template Linear**
- **Feature Definition = Design**
- **Name = Y8A ISLAND**



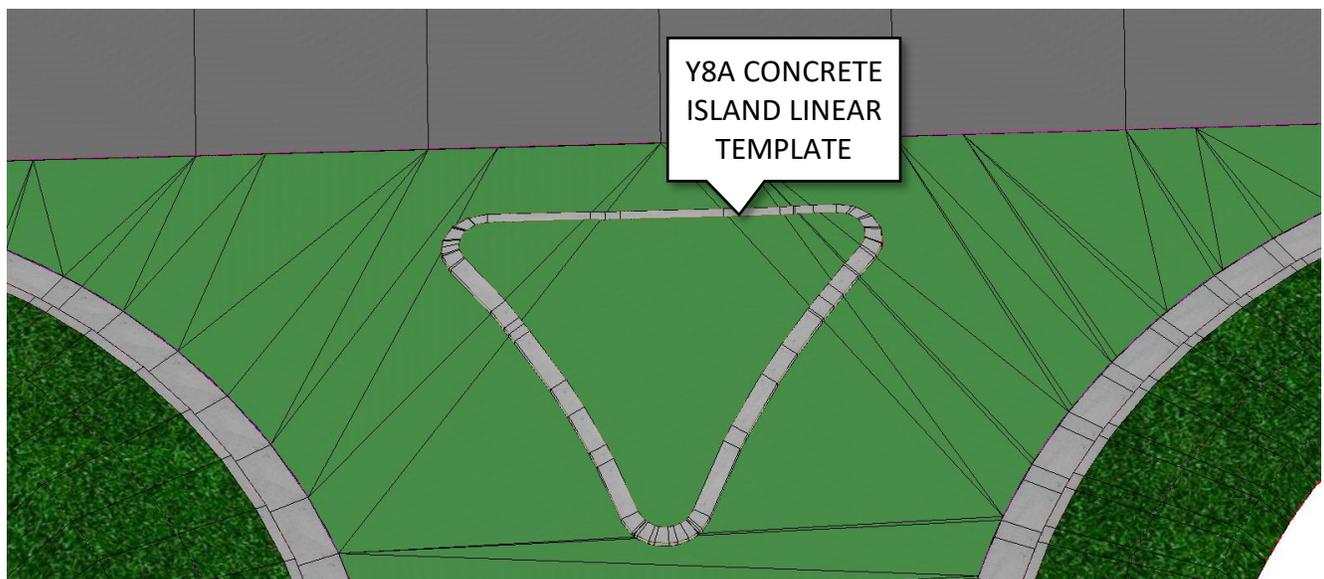


Module 11 - Detailed Modeling

- P. When prompted to **Locate Element To Apply Template**, select the **Concrete Island** and begin clicking through the prompts. When prompted to **Select Side**, move your **Cursor** to the inside of the **Concrete Island** as shown below and then continue clicking through the prompts to place the **Linear Template**.



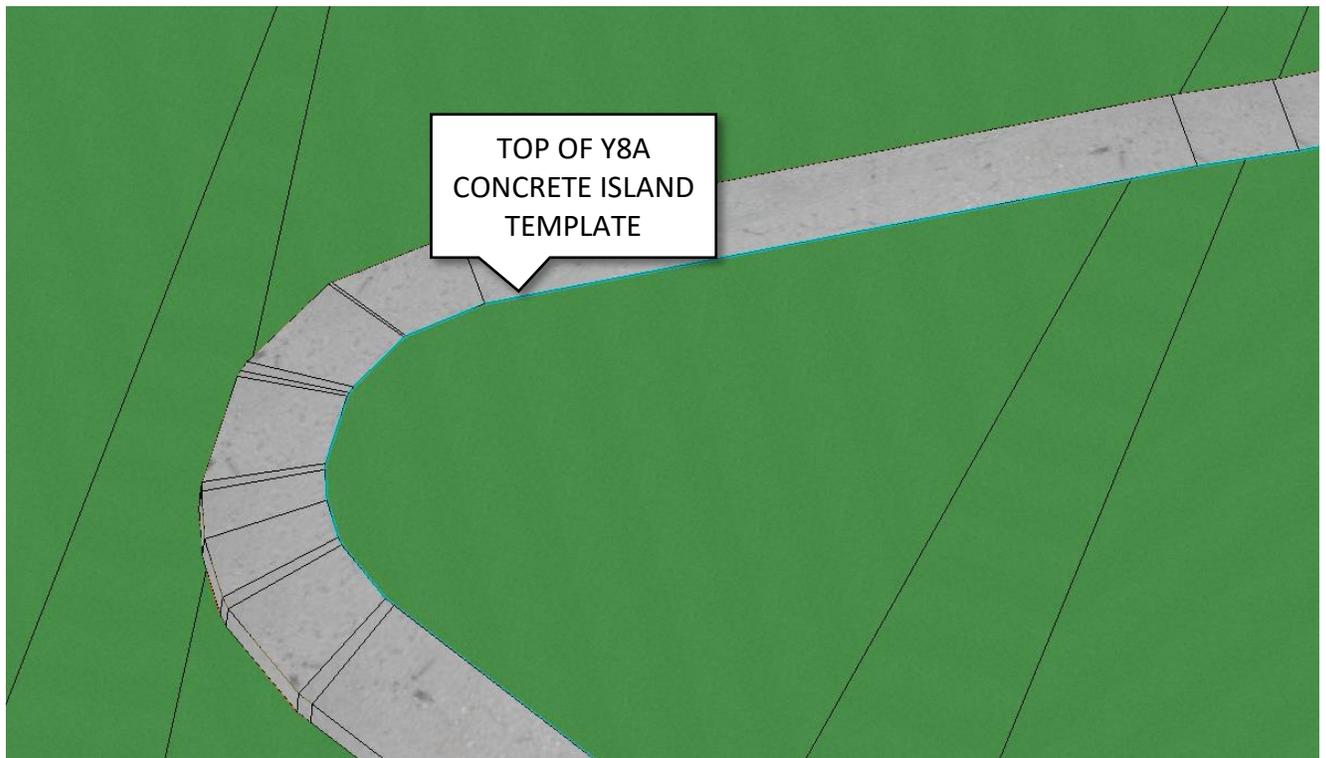
- Q. Notice in the **View 2, Default 3D** window that the **Y8A Concrete Island Linear Template** is now displayed in the **3D Model** as shown below.





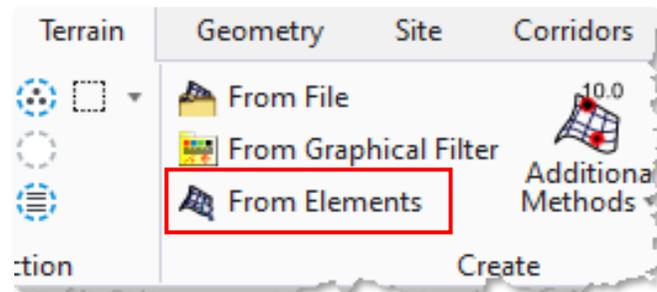
Module 11 - Detailed Modeling

- R. Next, select the Element Selection tool (**Terrain > Selection > Element Selection**) and select the top of the **Y8A Concrete Island Linear Template**. See the element highlighted in blue below.



Tip: Zoom in closely and right click to tab through until you get the correct line.

- S. Now, select the **Create Terrain From Elements** tool (**Terrain > Create > From Elements**) as shown below.

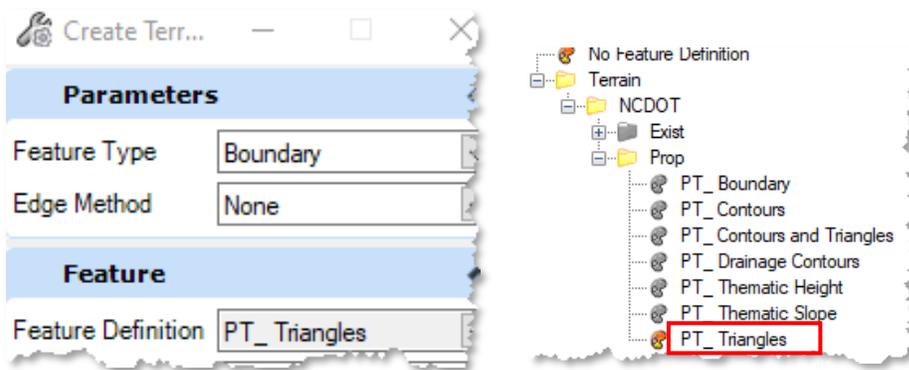




Module 11 - Detailed Modeling

T. Still keeping the **Concrete Island Linear Template** selected, key the following parameters into the **Create Terrain From Elements** dialog.

- **Feature Type = Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



U. Left click through the prompts to create the **Y8A Concrete Island Terrain Model** as shown below.

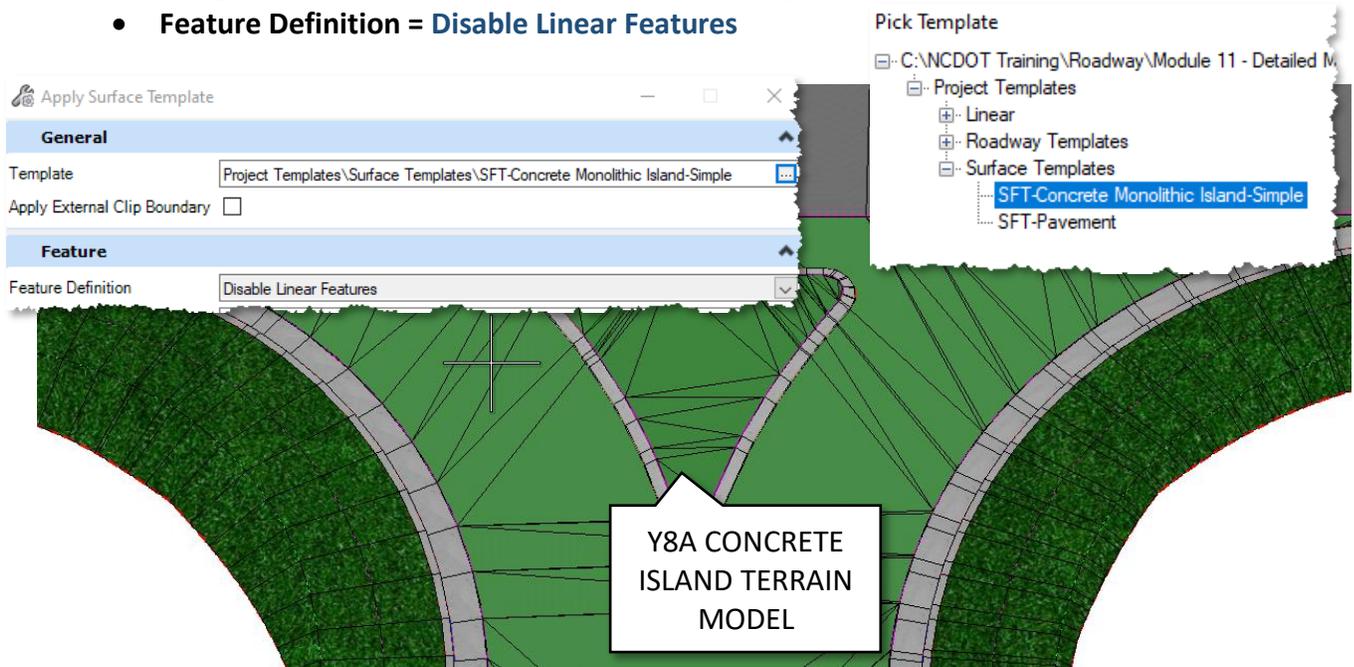




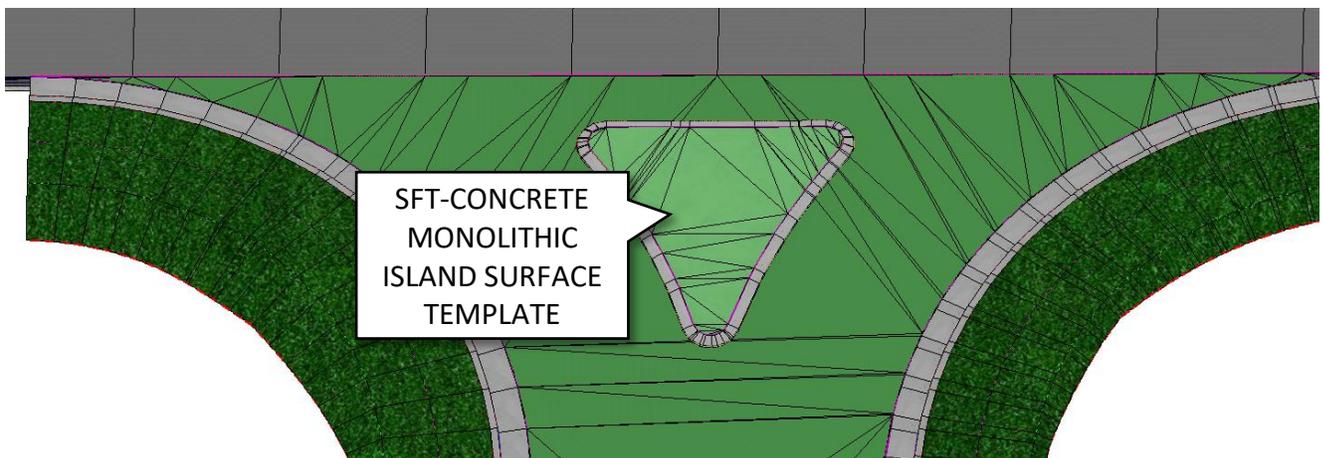
Module 11 - Detailed Modeling

- V. Select the **Apply Surface Template** tool (**Model Detailing > Surface Templates > Apply Surface Template**).
- W. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Y8A Concrete Island Terrain Model** from within the **View 2, Default 3D** window when prompted to **Locate Terrain Model**.

- **Template = SFT-Concrete Monolithic Island-Simple**
- **Feature Definition = Disable Linear Features**



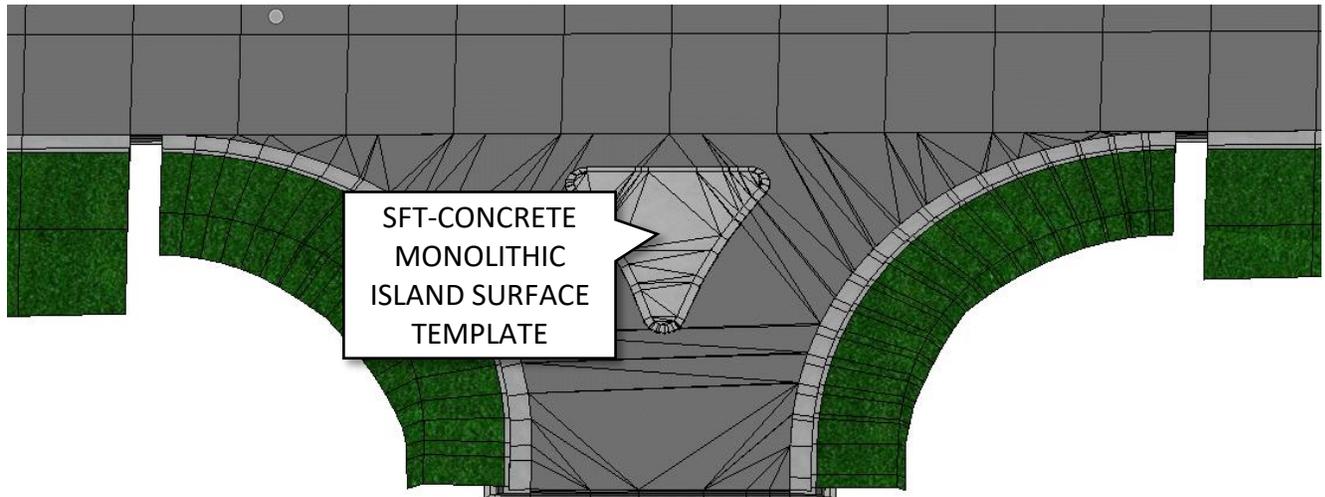
- X. Continue left clicking through the prompts to apply the **SFT_Concrete Monolithic Island-Simple Surface Template** to the **Y8A Concrete Island Terrain** as shown below.





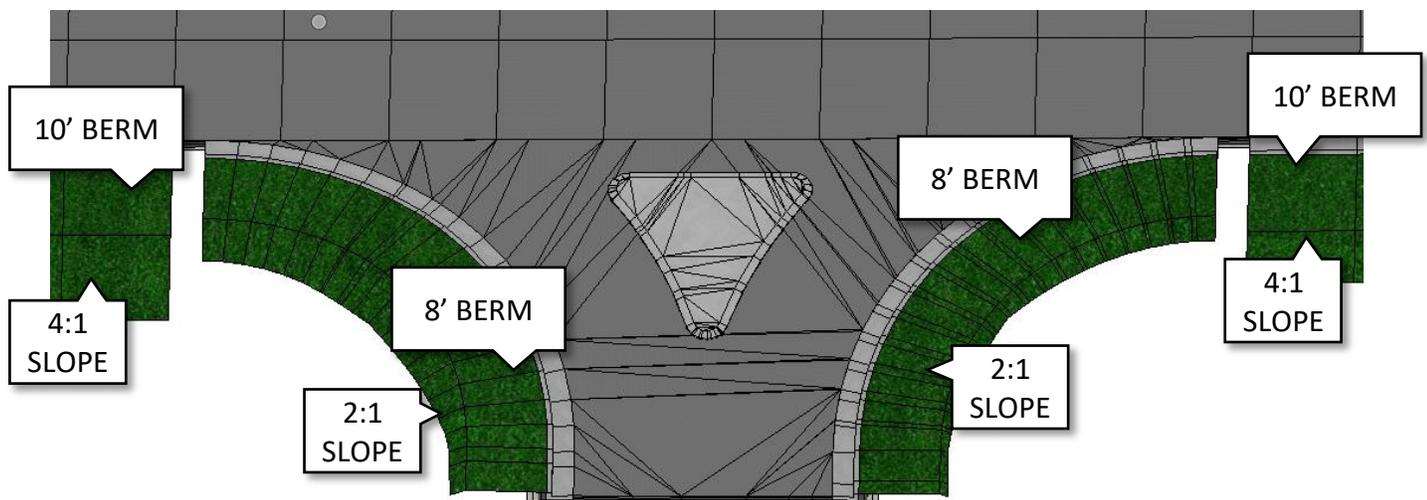
Module 11 - Detailed Modeling

- Y. Turn off the Terrain Levels to better see the applied **SFT_Concrete Monolithic Island-Simple Surface Template**.



16. Adjust the berms and slopes of the Side Street (Y8A) Radius Returns to match Y8

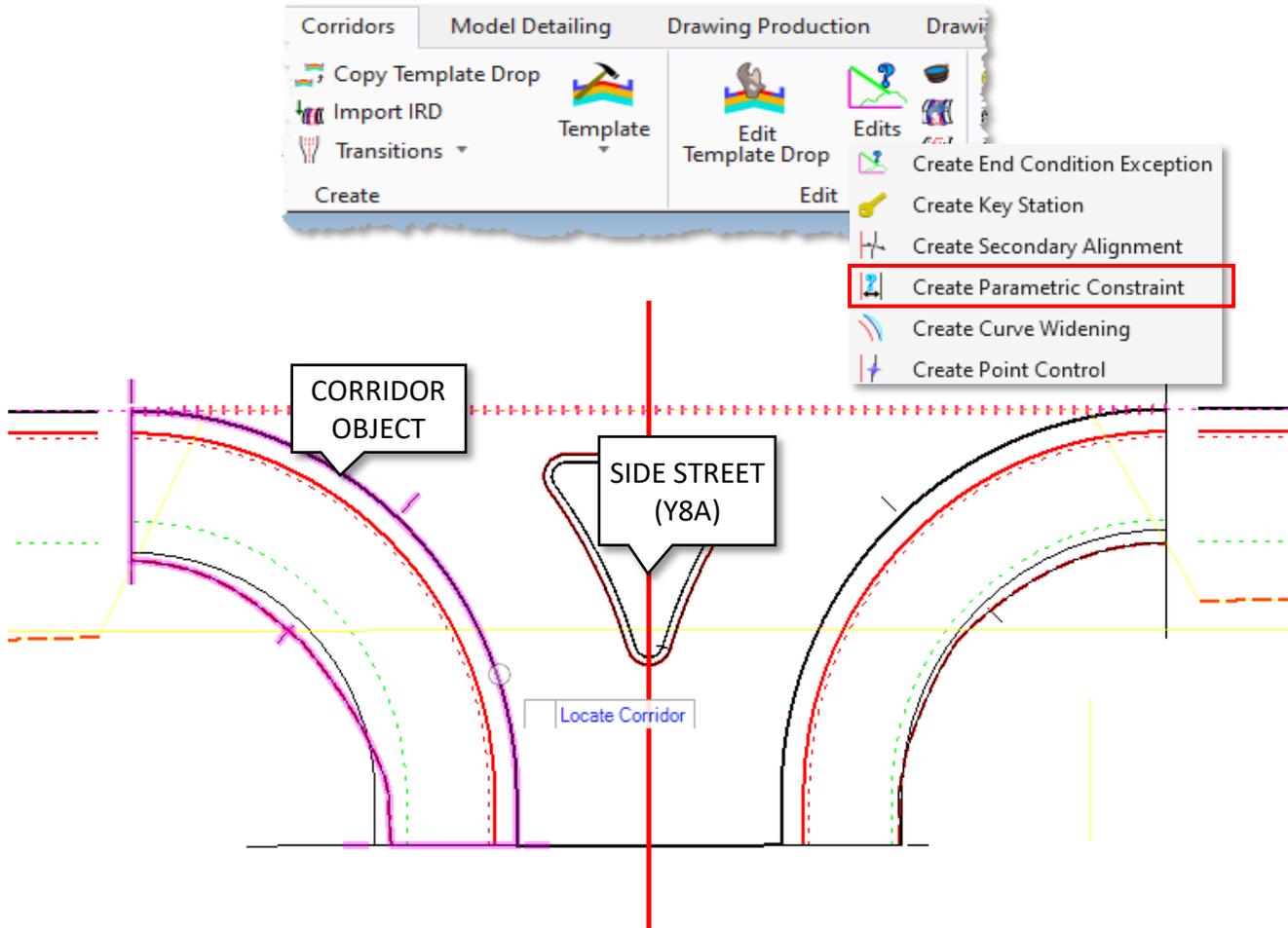
- A. Notice that the berm and slopes of the **Side Street (Y8A)** do not match the **Y8** as shown below. This can easily be resolved by using **Parametric Constraints**.





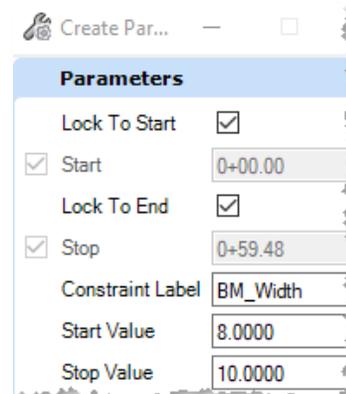
Module 11 - Detailed Modeling

- B. Select the **Create Parametric Constraint** option (**Corridors > Edit > Edits > Create Parametric Constraint**) and then select the **Side Street (Y8A)** radius return **Corridor Object** when prompted to **Locate Corridor**.



- C. Key the following **Parameters** into the **Create Parametric Constraint** dialog and click through the prompts to set the **BM_Width** Parametric Constraint and transition the **Berm Width** from **8'** to **10'** over the length of the **Radius Return** to match the **Y8 Berm**.

- **Start = Lock to Start**
- **Stop = Lock to End**
- **Constraint Label = BM_Width**
- **Start Value = 8.0000**
- **Stop Value = 10.0000**

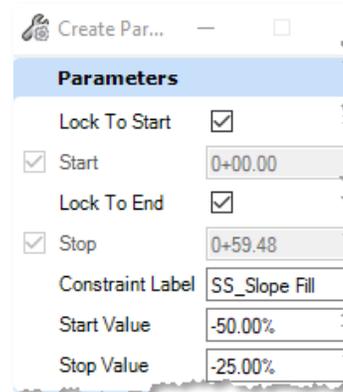




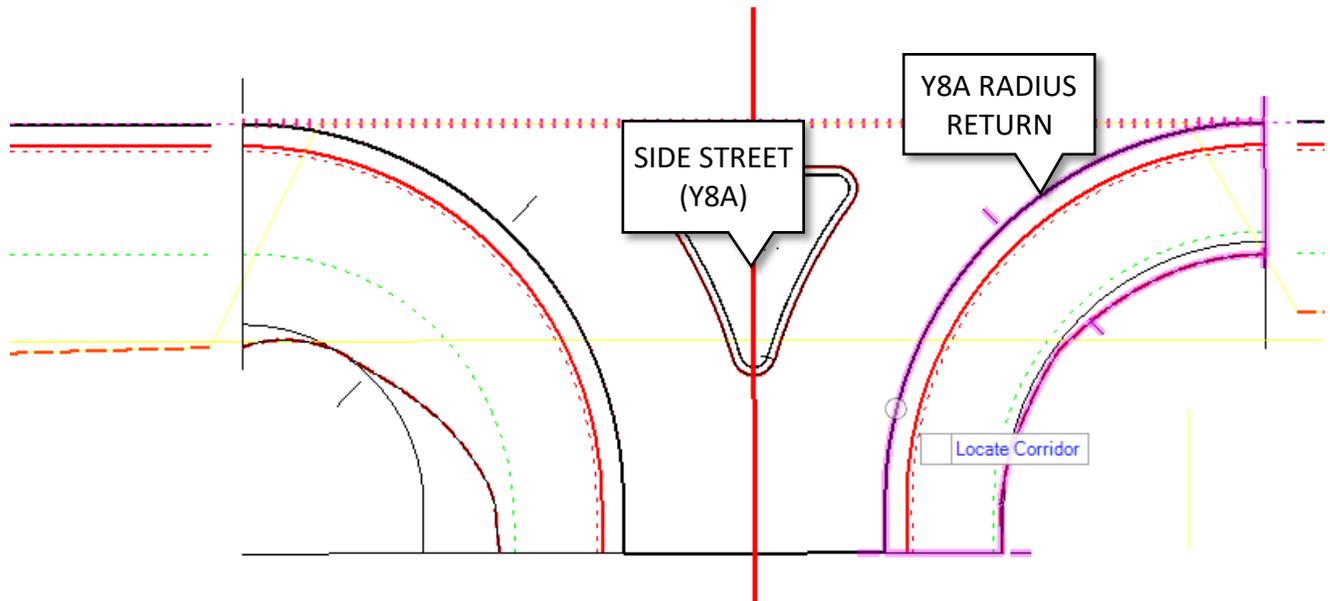
Module 11 - Detailed Modeling

D. Next, use the **SS_Slope Fill Parametric Constraint** to transition the **Y8A Fill Slope** from **2:1** to **4:1** over the length of the **Radius Return** to match the **Y8 Fill Slope**.

- **Start = Lock to Start**
- **Stop = Lock to End**
- **Constraint Label = SS_Slope Fill**
- **Start Value = -50.00%**
- **Stop Value = -25.00%**



E. Now, follow these same steps and do the same for the other **Y8A Radius Return** as shown below.

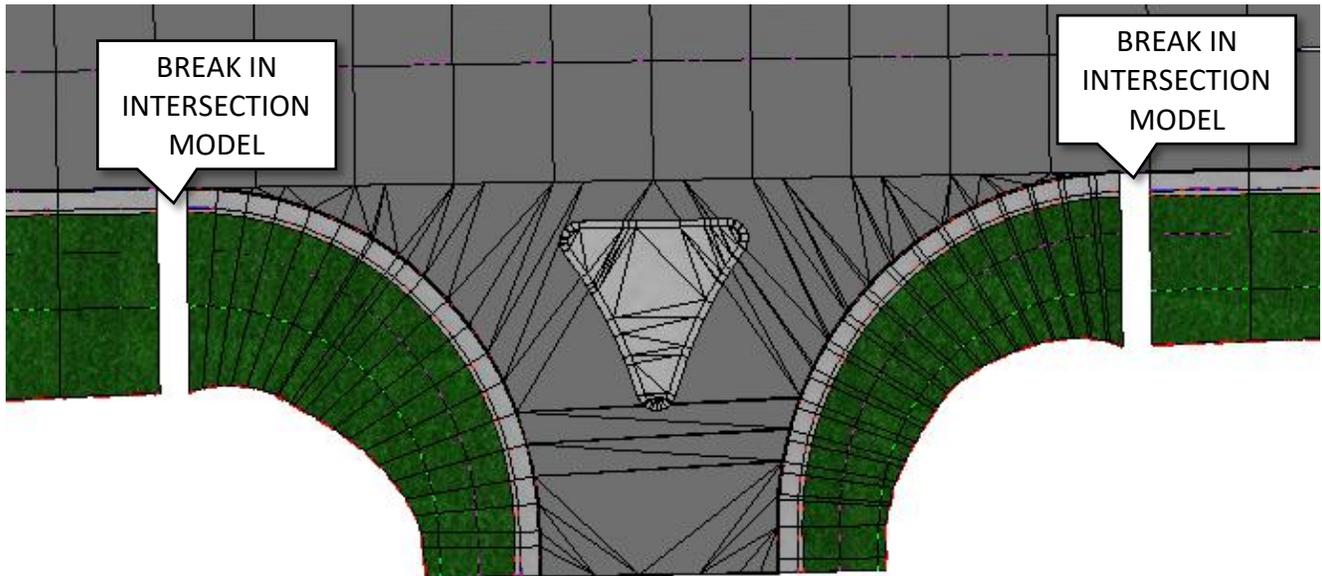




Module 11 - Detailed Modeling

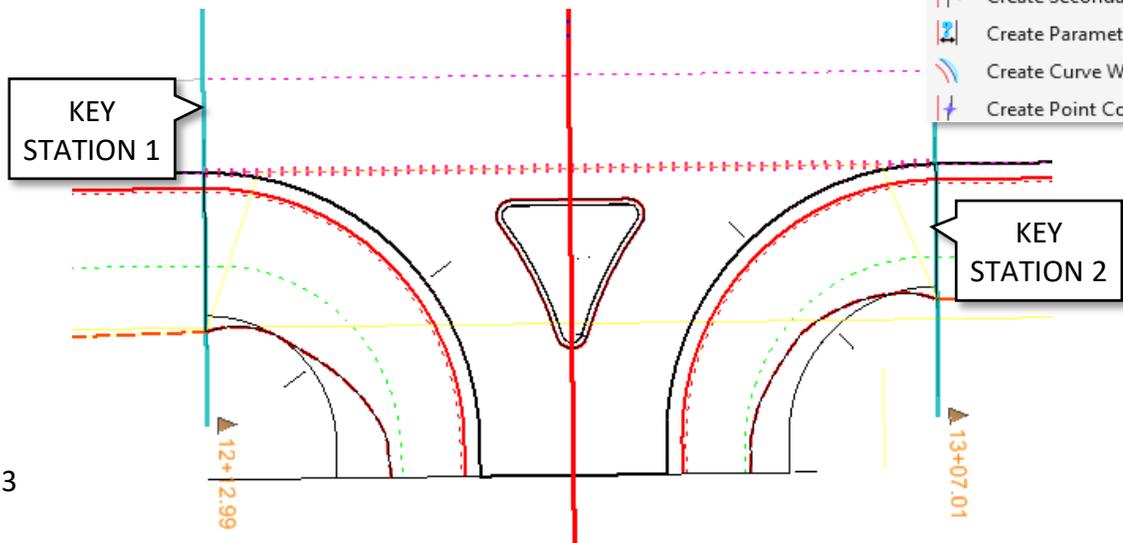
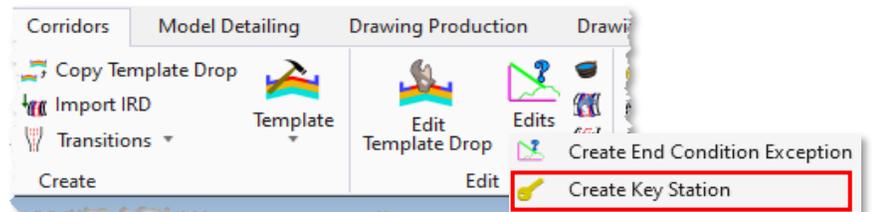
17. Clean up the breaks in the intersection using Key-Stations

- A. Notice the breaks in the intersection model as shown below. This can be resolved by adding **Key Stations**.



- B. Select the **Create Key Station** tool (**Corridors > Edit > Edits > Create Key Station**) and add the following two (2) **Key Stations**.

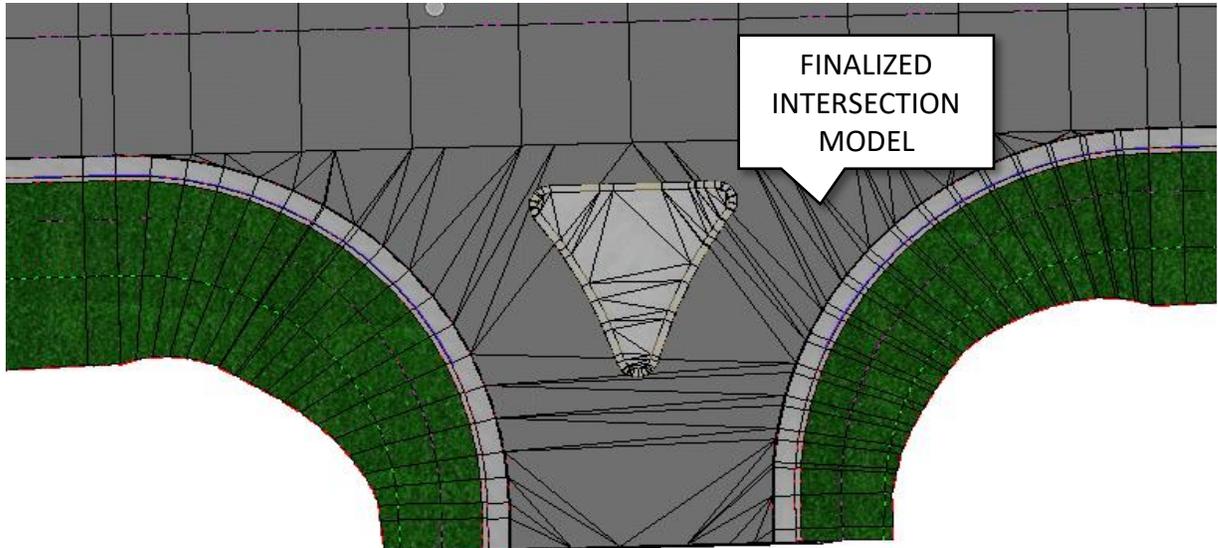
- **Key Station 1 = 12+12.99**
- **Key Station 2 = 13+07.01**





Module 11 - Detailed Modeling

C. This finalizes the **Side Street (Y8A)** intersection model as shown below.



Exercise 2 – Directional Crossover with Median U-Turns Modeling

In this exercise, you will learn how to model a **Directional Crossover with Median U-Turns**. This includes pavement shearing, median/pavement switching, bulb-outs, directional median cross-over modeling, intersection radius modeling, application of linear templates, proposed terrain model development, surface template application, and various element profiling techniques. Design Intent will continue to be a major focus.

Throughout this exercise you will be working with NCDOT 2D dgn files exclusively. All design and corridor manipulation will be carried out within a 2-dimensional design plane.

1. Launch OpenRoads Designer CONNECT Edition

Double-click on the NCDOT Roadway OpenRoads icon on your desktop to launch OpenRoads Designer into the NCDOT Roadway workspace.



2. Set the Workspace and Workset

Select DOT-US North Carolina from the Workspace menu.
Select NCDOT R-2635C (Training) from the Workset menu.

OpenRoads Designer CONNECT Edition

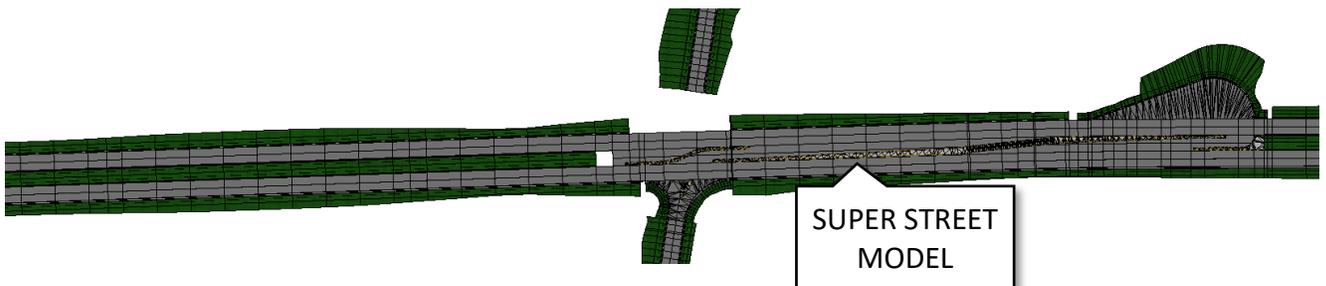
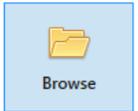
DOT-US North Carolina ▾ R-2635C (Training) ▾



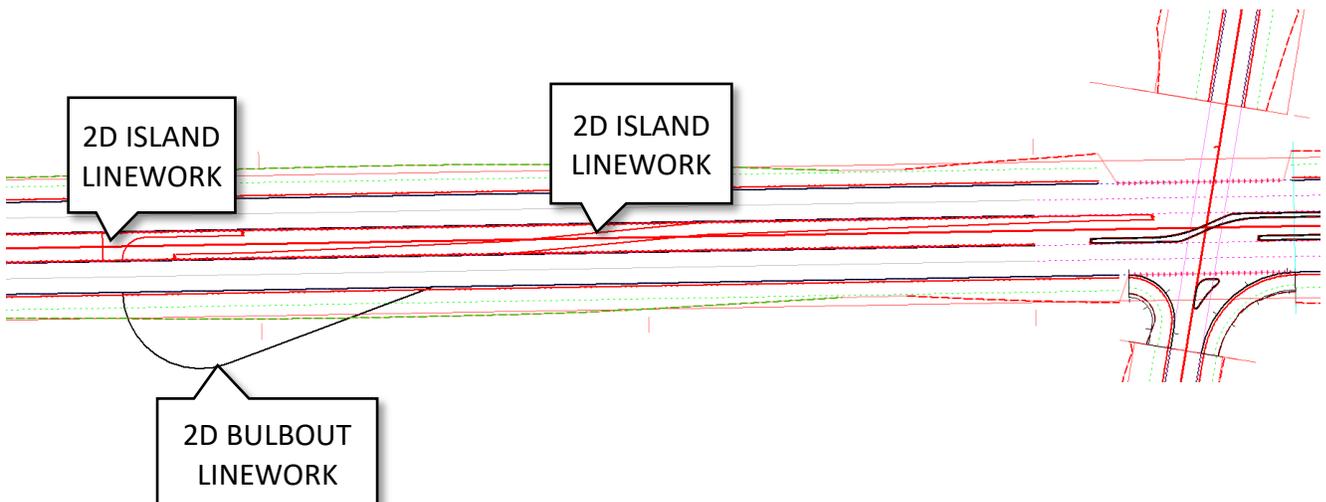
Module 11 - Detailed Modeling

3. Open the Exercise 2 Corridor (CMD) dgn file and zoom in closely to the Super Street Intersection

- Click the browse button and path to the **Module 11 (Detailed Modeling)** folder and open the **R-2635C-RDY_CMD_Exercise2.dgn** file.
- Zoom in close to the intersection as shown below. For the sake of time and the avoidance of redundancy a number of elements have already been modeled. The end result after finishing **Exercise 2** will be a completed **Super Street** model.



- In addition to the preemptive modeling, notice that some of the 2D linework has already been designed allowing this module to focus more on **Detailed Modeling**. See the **Plan Geometry Module** for detailed instructions on 2D plan geometry development.

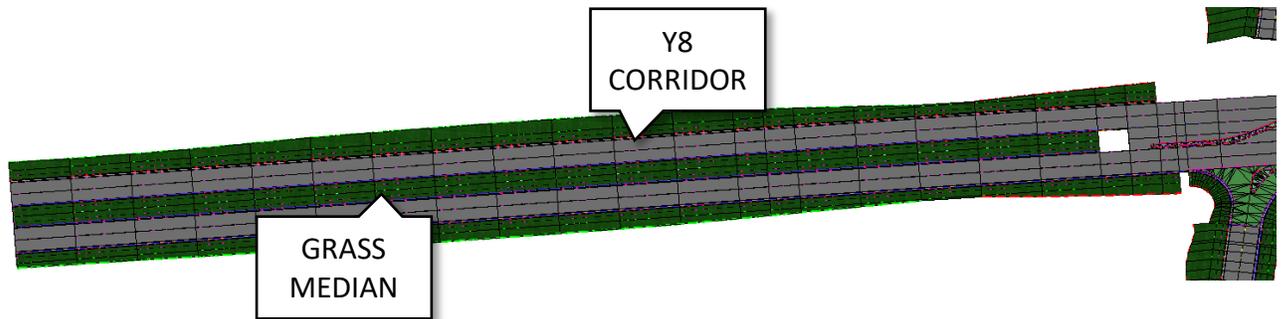




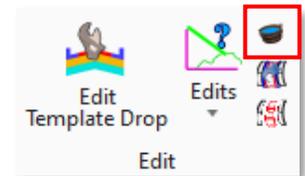
Module 11 - Detailed Modeling

4. Remove the grass median and display pavement within the Super Street Intersection limits

- A. Notice that a portion of the **Y8 Corridor** has a grass median within the limits of the **Super Street Intersection**. This can be addressed using **Paramtric Constraints** that are included within the attached **NCDOT** template.



- B. Select the **Corridor Objects “The Bucket”** tool (**Corridors > Edit > Corridor Objects**) and then select the **Y8** corridor when prompted to **Locate Corridor**.



- C. Notice the three (3) **Parametric Constraints** that have already been defined as shown below.

Constraint Label	Enabled	Start Value	Stop Value	Start Station	End Station
X_Over_Switch	True	1.0000	1.0000	20+75.00	30+37.86
PV_Shear Inside LT	True	-1.0000	-1.0000	20+75.00	30+37.86
PV_Shear Inside RT	True	1.0000	1.0000	20+75.00	30+37.86

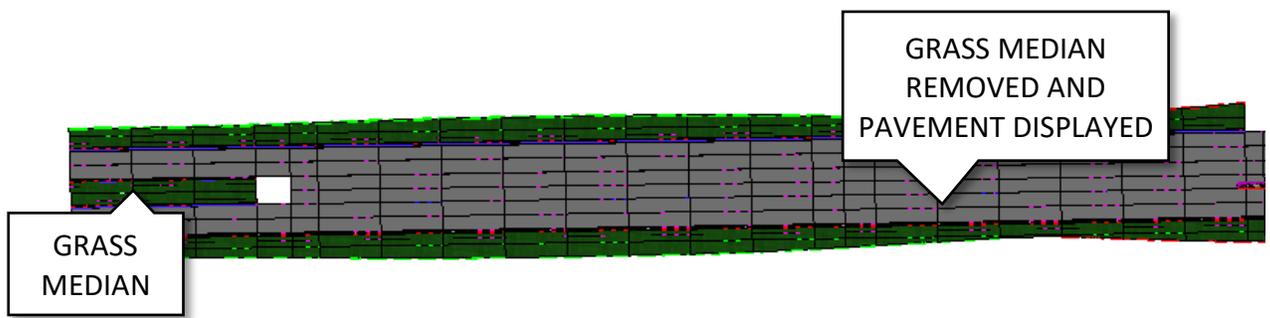
- **PV_Shear_Inside LT** = Shears the left Inside curb and median when set to -1
- **PV_Shear_Inside RT** = Shears the right inside curb and median when set to 1
- **X_Over_Switch** = Displays the median pavement when set to 1



Module 11 - Detailed Modeling

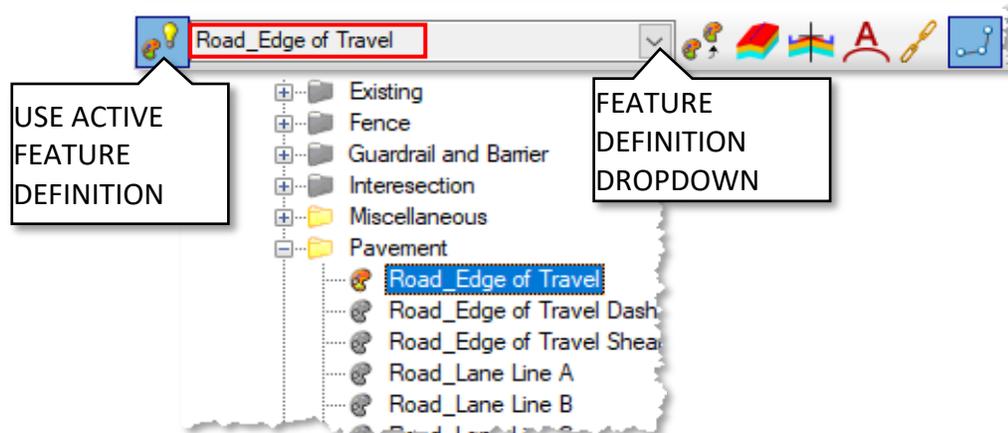
- D. Adjust the start station value for all three (3) **Parametric Constraints** to **13+27.86** as shown below. This will remove the median and display the pavement throughout the limits of the **Super Street Intersection**.

Constraint Label	Enabled	Start Value	Stop Value	Start Station	End Station
PV_Median_X_Over_...	True	1.0000	1.0000	13+27.86	30+37.86
PV_Shear Inside LT	True	-1.0000	-1.0000	13+27.86	30+37.86
PV_Shear Inside RT	True	1.0000	1.0000	13+27.86	30+37.86



5. Model the bulb-out on the right side of the Y8 corridor

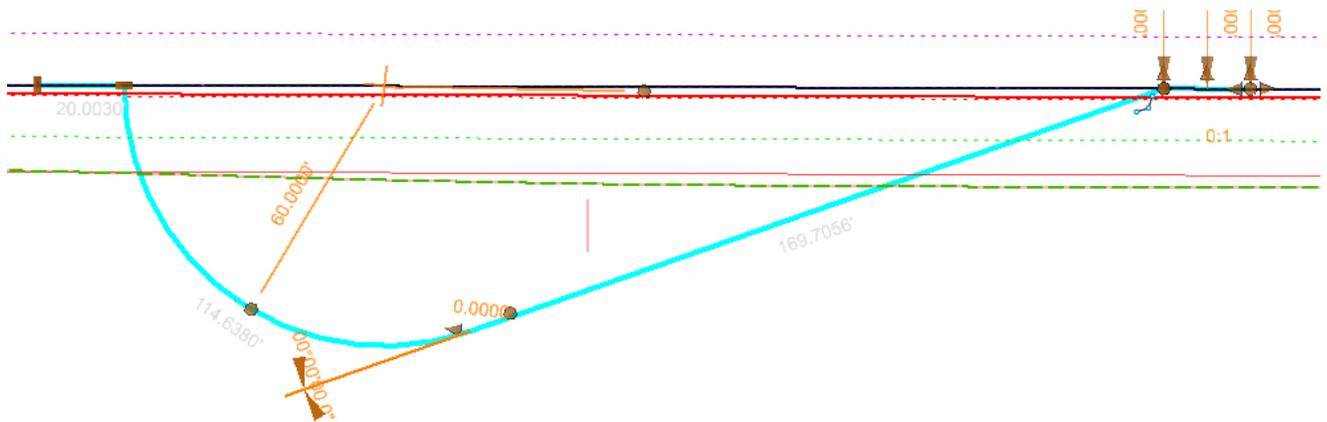
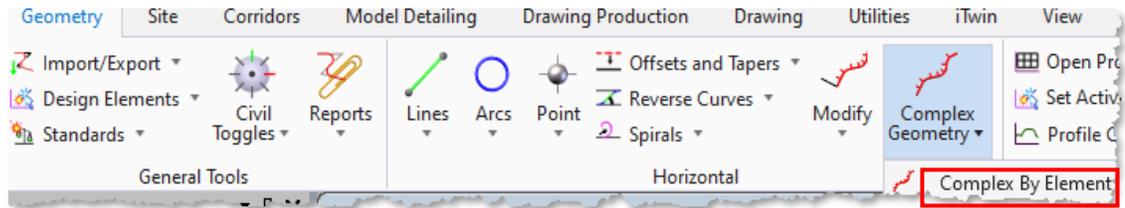
- A. From the **Feature Definition Toggle Bar**, toggle on the Use Active Feature Definition button and then select the **Road_Edge of Travel** feature from the **(Linear > Roadway > Pavement)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



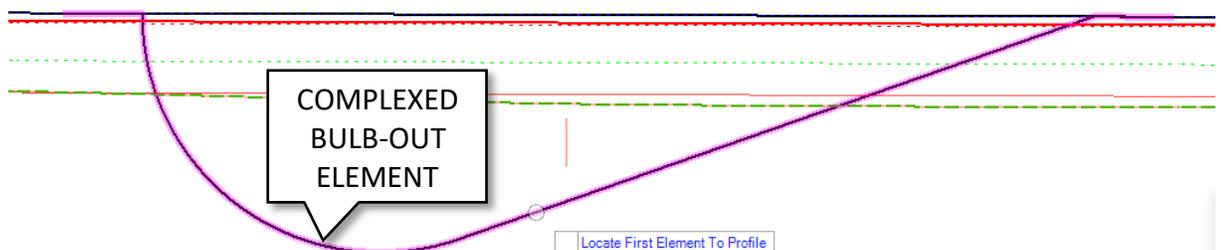
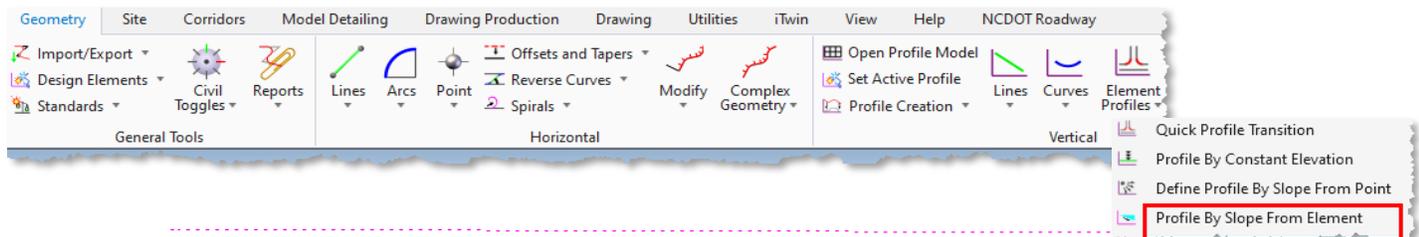


Module 11 - Detailed Modeling

- B. Use the **Complex By Element** tool (**Geometry > Horizontal > Complex Geometry > Complex By Element**) to complex the individual **2D Elements** that make up the bulb-out as shown below. Combining these and making a single complex element will be more efficient for modeling.



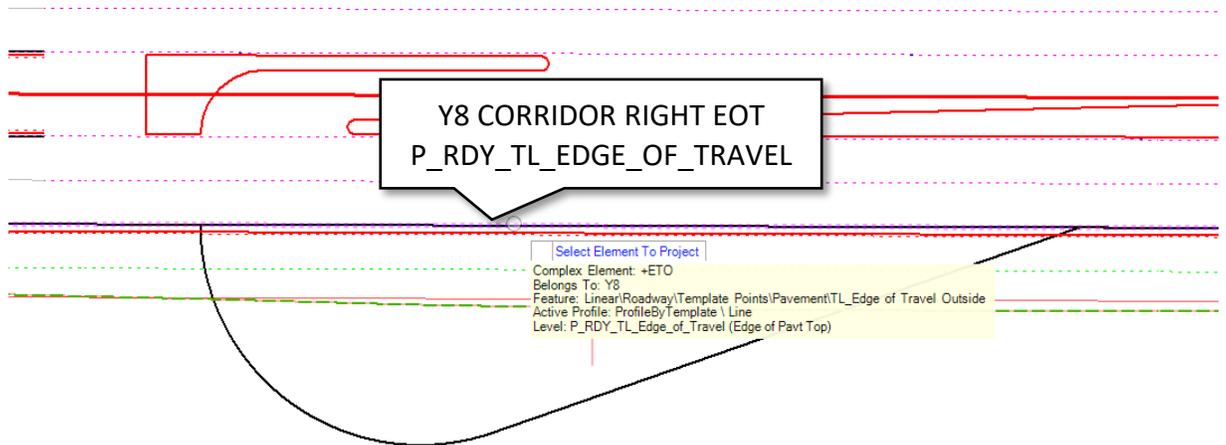
- C. Next, select the **Profile By Slope From Element** tool (**Geometry > Vertical > Element Profiles > Profile By Slope From Element**) and select the **Complexed Bulb-Out Element** when prompted to **Locate First Element To Profile**. Then **Right-Click to Reset And Complete**.





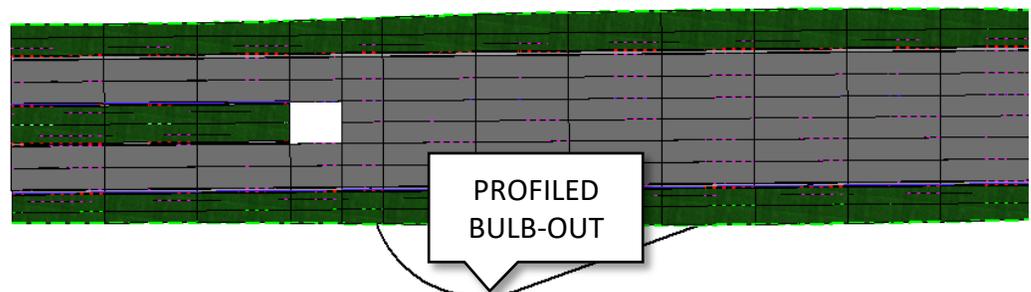
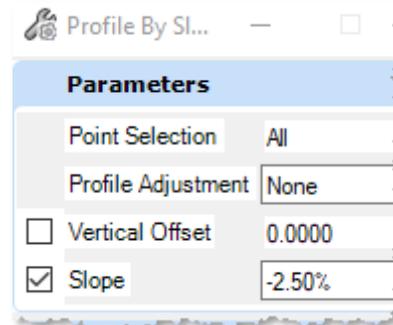
Module 11 - Detailed Modeling

- D. When prompted to **Locate Reference Element**, select the **Right EOT** line for the **Y8 Corridor**. When selecting the **Y8 Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



- E. Then, key the following parameters into the **Profile By Slope From Element** dialog and click through the prompts to **Profile** the **Bulb-Out** element using a **-2.5%** slope from the **Y8 EOT** as shown below.

- **Point Selection = All**
- **Profile Adjustment = None**
- **Vertical Offset = 0.0000**
- **Slope = -2.50%**

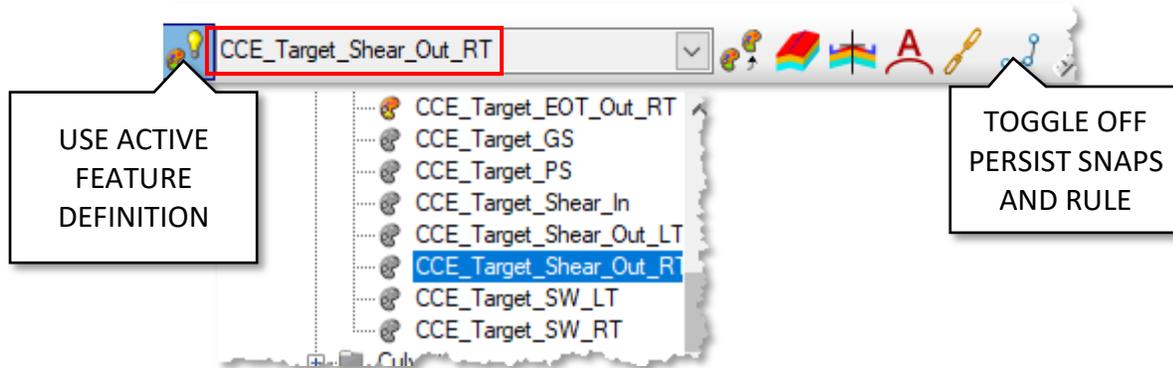




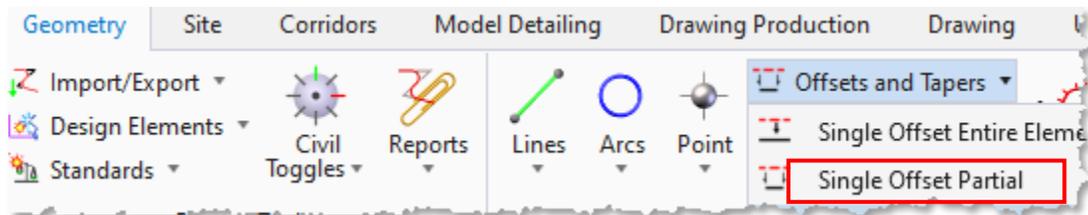
Module 11 - Detailed Modeling

6. Shear the Y8 pavement through the Bulb-Out limits

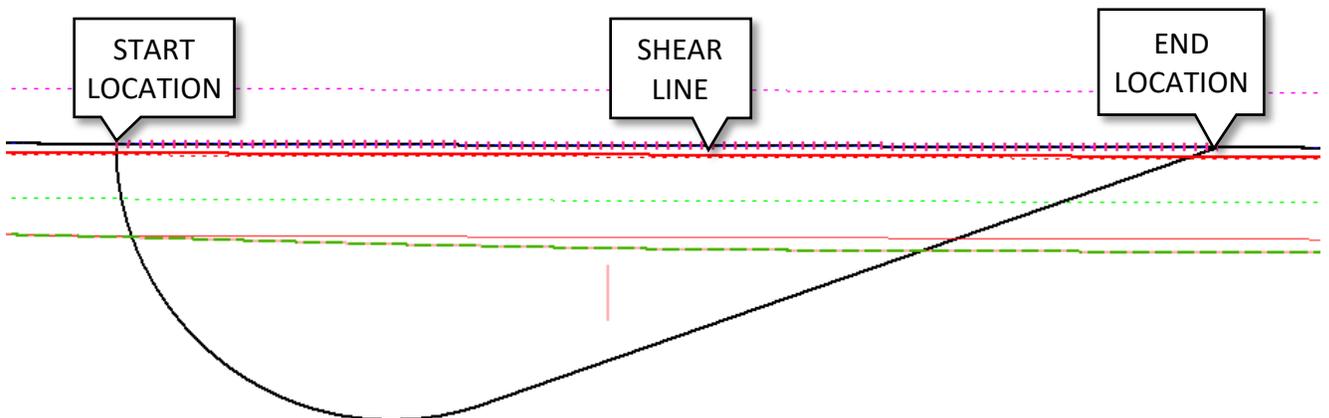
- A. From the **Feature Definition Toggle Bar**, toggle **On** the **Use Active Feature Definition** button and then select the **CCE_Target_EOT_Shear_Out_RT** feature from the (**Linear > Roadway > Construction Class Element**) folder as shown below.



- B. Select the **Single Offset Partial** option (**Geometry > Horizontal > Offsets and Tapers > Single Offset Partial**) as shown below and select the **Y8** alignment when prompted to **Locate Element**.



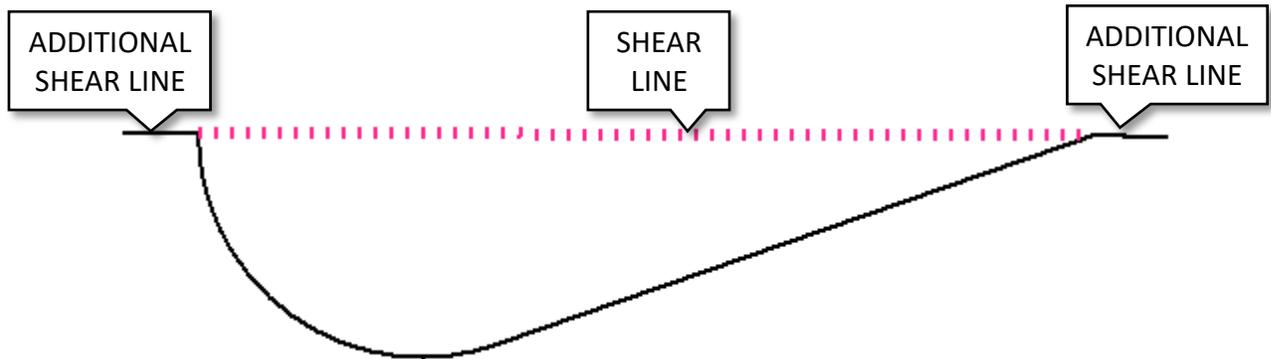
- C. When prompted for a **Start** and **End Location**, snap to the following locations as shown below. This places the **Shear Line**.





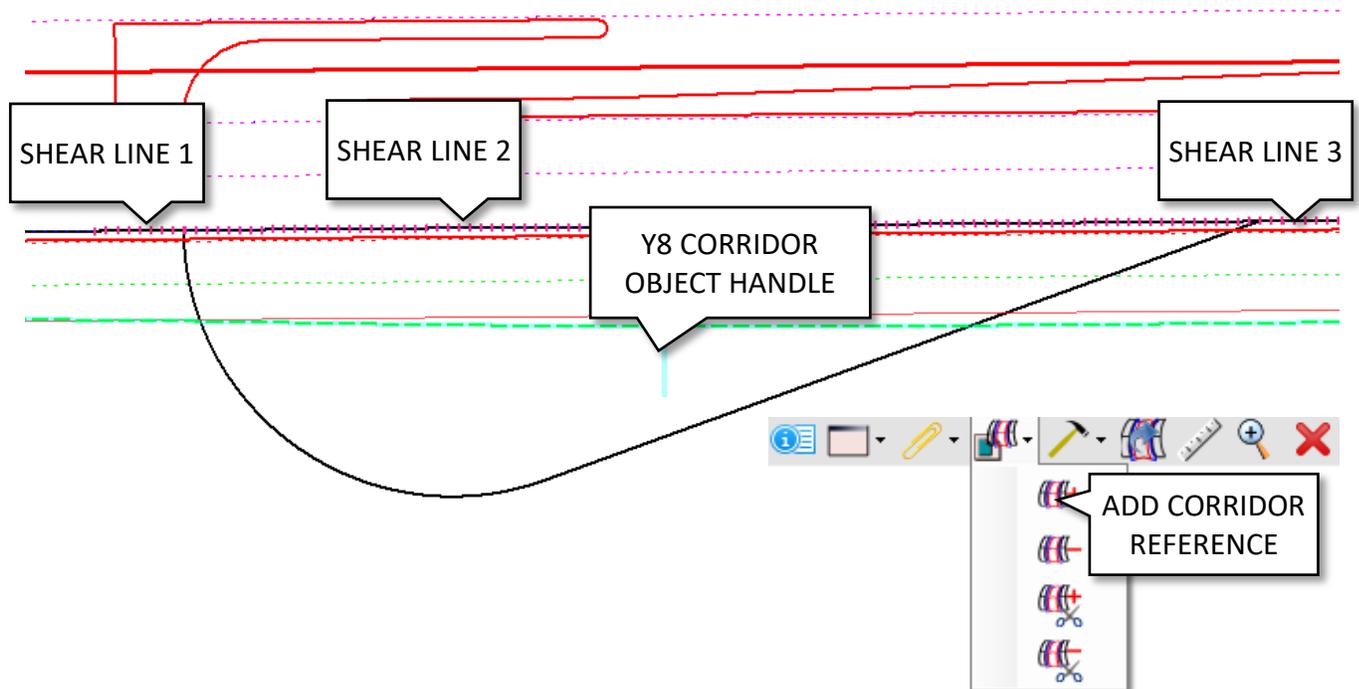
Module 11 - Detailed Modeling

- D. Then, follow the same steps to add two (2) additional **Shear Lines** that match the limits of the **20'** tangent lines at the beginning and end of the **Bulb-Out** as shown below.



Note: These shear lines are broken up because the longer one in the middle will be used to build a terrain later in the module.

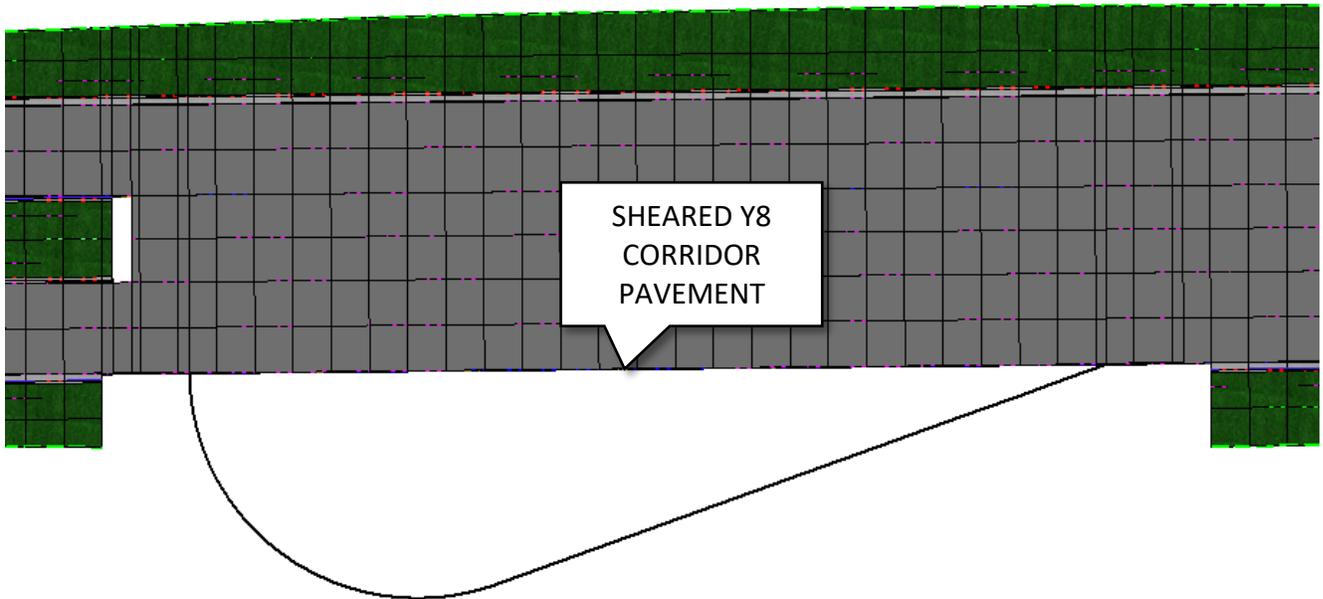
- E. Next, click the **Y8 Corridor** Object Handle, hover for a moment to display the menu, and then select the **Add Corridor Reference** option and add the three (3) **Shear Lines** as shown below.





Module 11 - Detailed Modeling

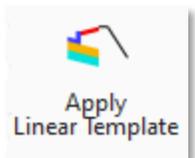
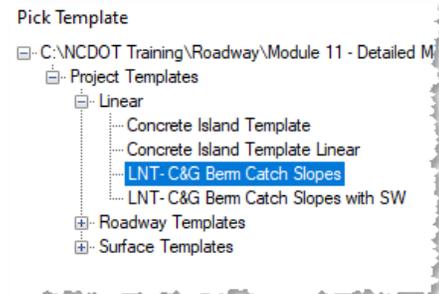
- F. The **Y8** corridor pavement has been sheared to accommodate the proposed **Bulb-Out** as shown below.



7. Apply a Linear Template to the proposed Bulb-Out linear element

- A. Select the **Apply Linear Template** tool (**Model Detailing > Apply Linear Template**).
- B. Key the following parameters into the **Apply Linear Template** dialog.

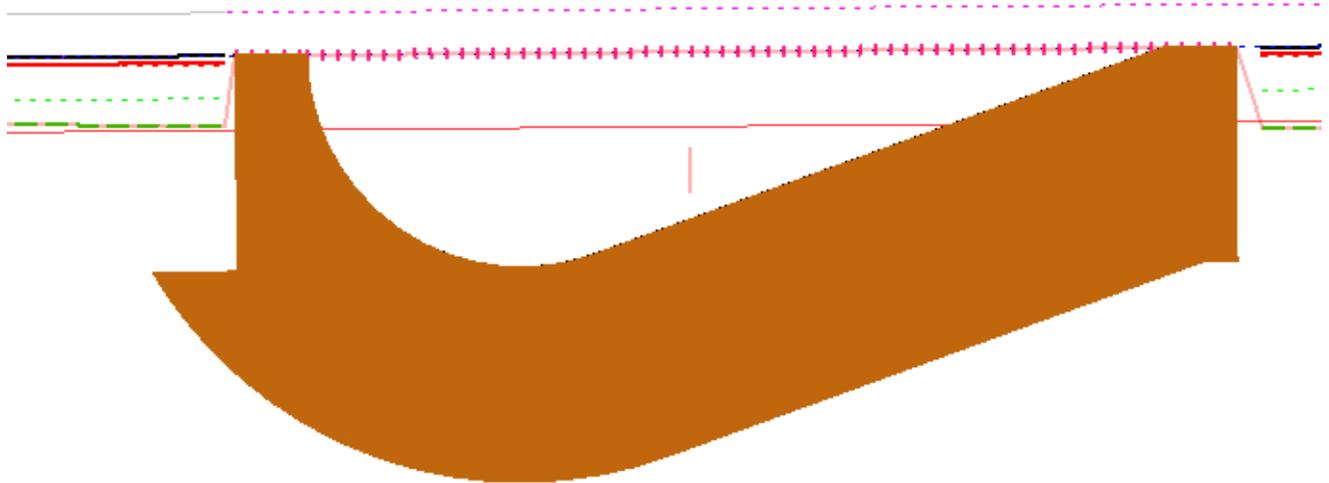
- **Start = Lock To Start**
- **End = Lock To End**
- **Exterior Corner Sweep Angle = 05° 00' 00"**
- **Template = LNT - C&G Berm Catch Slopes**
- **Feature Definition = Design**
- **Name = Y8 Bulb-Out 1**





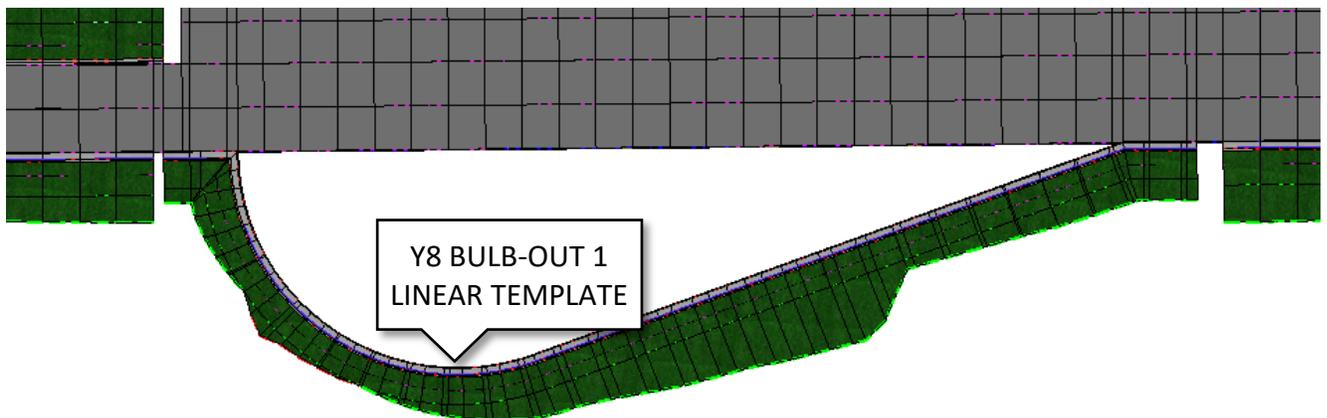
Module 11 - Detailed Modeling

- C. When prompted to **Locate Element To Apply Template**, select the proposed **Bulb-Out** and begin clicking through the prompts. When prompted to **Select Side**, move your cursor as shown below and then continue clicking through the prompts to place the **Linear Template**.



Select Side - Reflect Option
Mirror - <Alt> Down To Select

- D. Notice in the **View 2, Default 3D** window that the **Y8 Bulb-Out 1 Linear Template** is now visible in the 3D model as shown below.

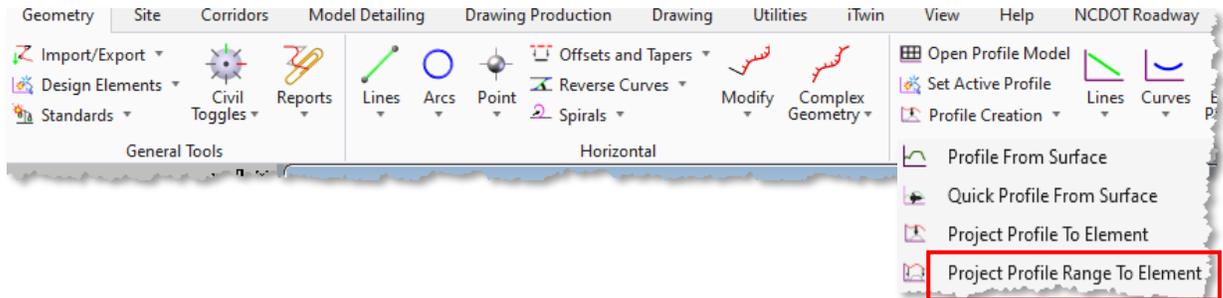




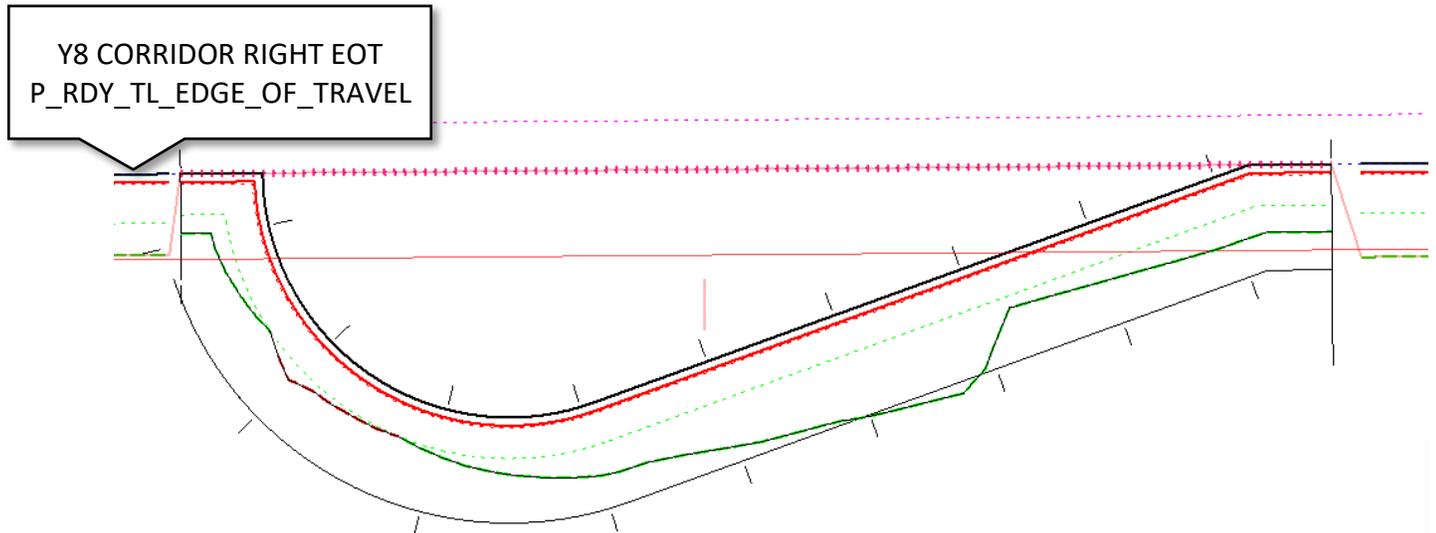
Module 11 - Detailed Modeling

8. Create a Proposed Terrain for the Proposed Bulb-Out

- A. First, select the **Project Profile Range To Element** tool (**Geometry > Vertical > Profile Creation > Project Profile Range To Element**) as shown below.



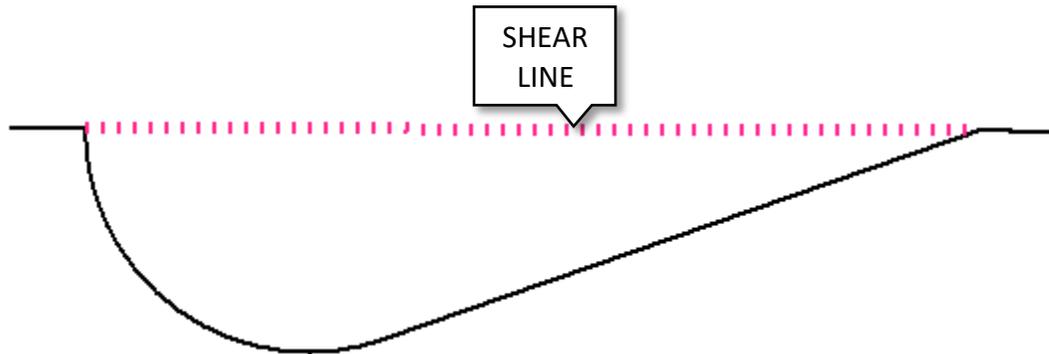
- B. When prompted to **Select Element To Project**, select the **Right EOT** line for the **Y8 Corridor**. When selecting the **Y8 Corridor Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



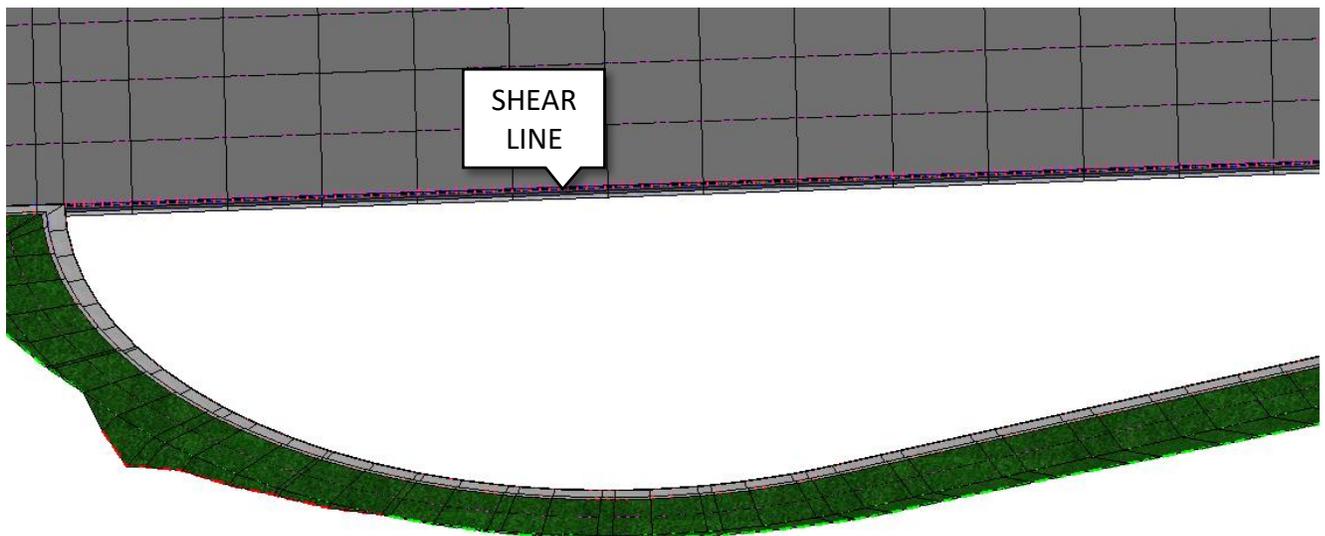


Module 11 - Detailed Modeling

- C. When prompted to **Select Plan Element To Project Onto**, select the **Shear Line** that was placed in the previous step. Use the **Alt-Key** to Lock the **Start/End** locations of the **Shear Line** and click through the prompts to finalize the profile projection.



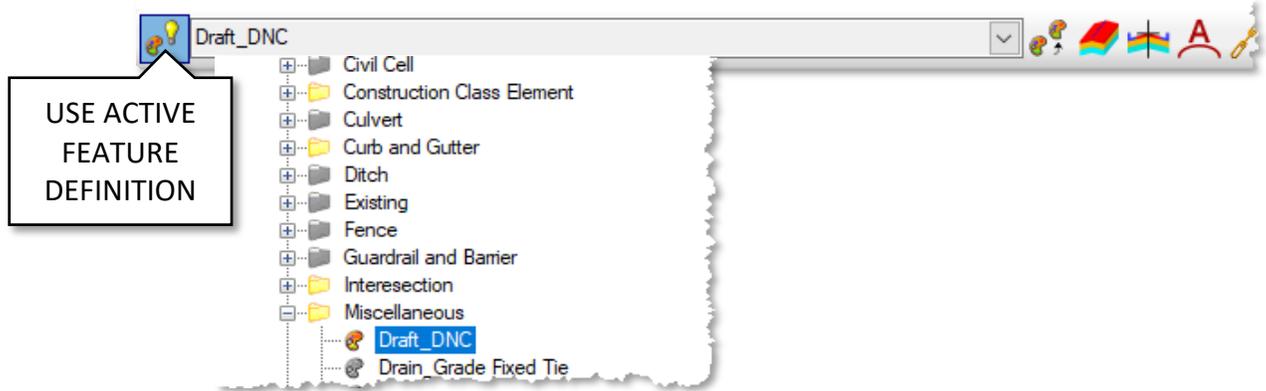
- D. Notice in the **View 2, Default 3D** window that the **Shear line** is now visible in the 3D model as shown below. This will be used to produce a proposed terrain for the **Bulb-Out**.



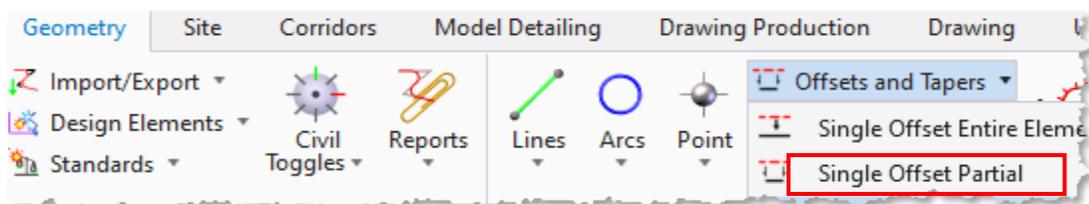


Module 11 - Detailed Modeling

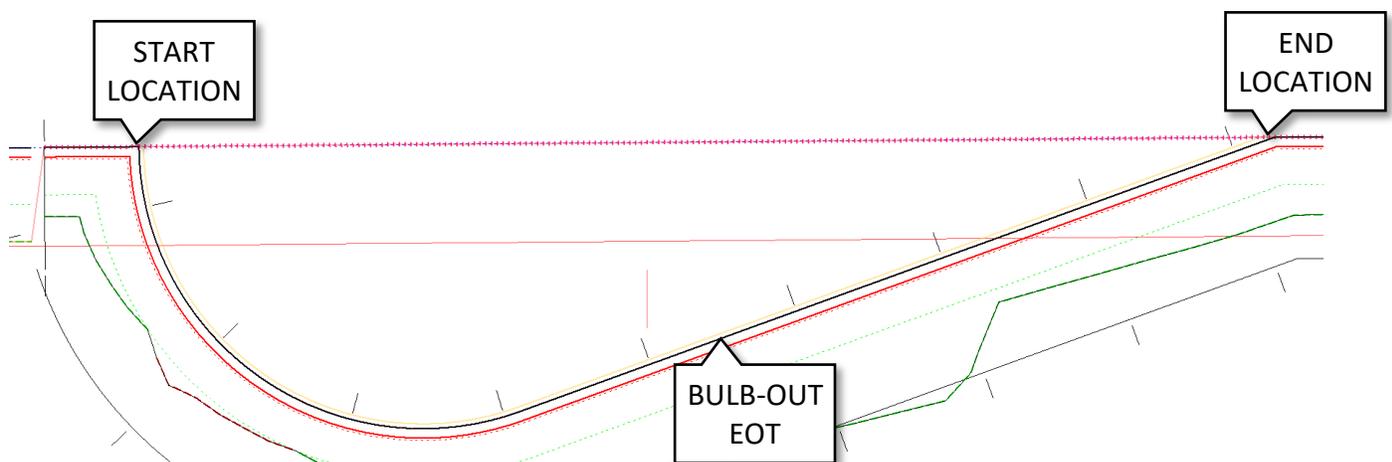
- E. From the **Feature Definition Toggle Bar**, toggle On the **Use Active Feature Definition** button and then select the **Draft_DNC** feature from the (**Linear > Roadway > Miscellaneous**) folder as shown below.



- F. Select the **Single Offset Partial** option (**Geometry > Horizontal > Offsets and Tapers > Single Offset Partial**) as shown below and then set the **Offset** parameter within the **Single Offset Partial** dialog to **1.000**.



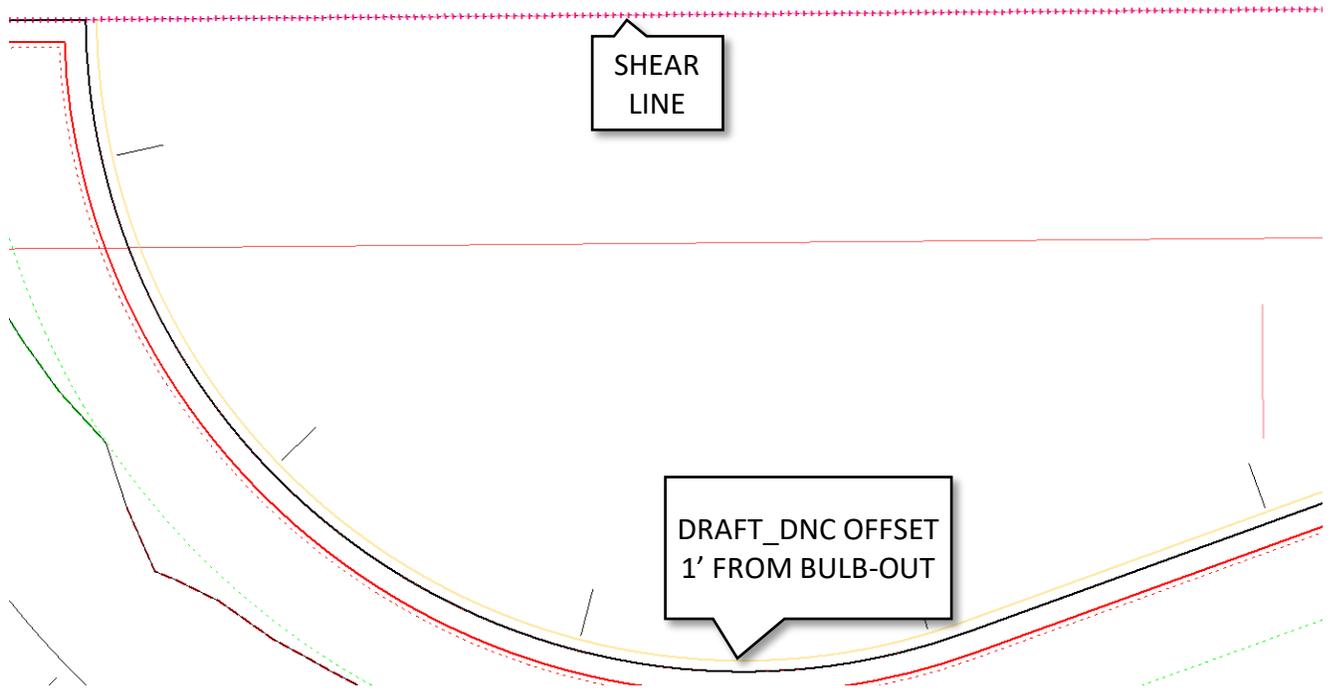
- G. Select the **Bulb-Out EOT** when prompted to **Locate Element** and **Snap** to the **Beginning** and **End** locations of the shear line when prompted for a **Start** and **End Location** as shown.





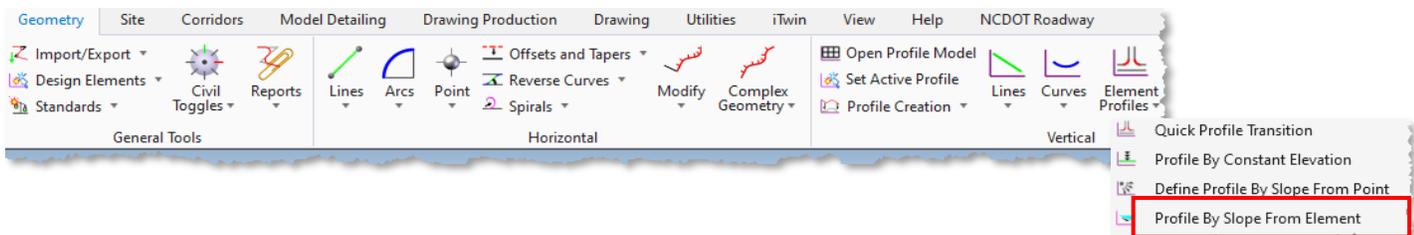
Module 11 - Detailed Modeling

- H. This will place a **Draft_DNC** construction class element with a **1'** offset from the **Bulb-Out** along the length of the **Shear Line** as shown below.



Note: The 1' offset is temporary and was used to make it easier to work with the Draft_DNC element.

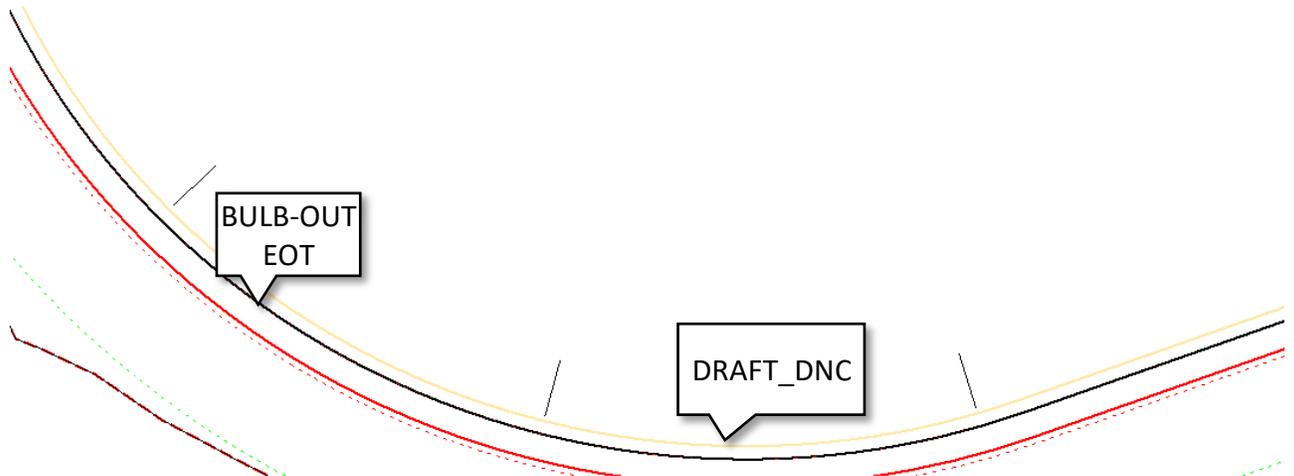
- I. Next, select the **Profile By Slope From Element** tool (**Geometry > Vertical > Element Profiles > Profile By Slope From Element**) as shown below.





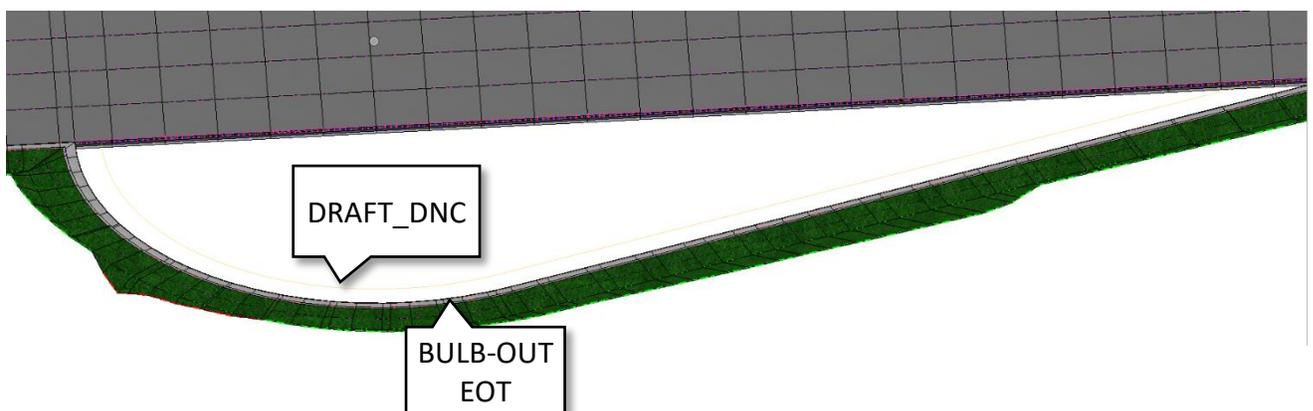
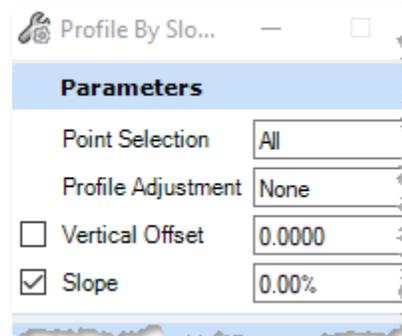
Module 11 - Detailed Modeling

- J. Select the **Draft_DNC** element when prompted to **Locate First Element To Profile**, then **Right-Click to Reset And Complete**. When prompted to **Locate Reference Element**, select the **Bulb-Out EOT** element.



- K. Then, key the following parameters into the **Profile By Slope From Element** dialog and click through the prompts to **Profile** the **Bulb-Out** element using a **0.00%** slope from the **Bulb-Out EOT** as shown below.

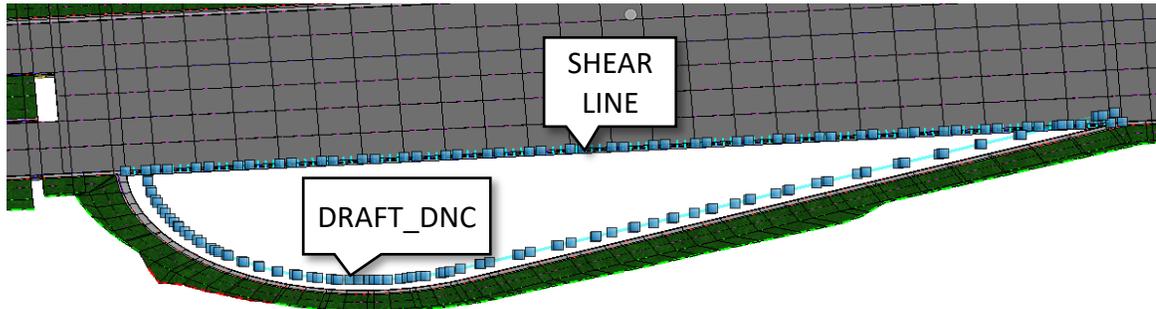
- **Point Selection = All**
- **Profile Adjustment = None**
- **Vertical Offset = 0.0000**
- **Slope = 0.00%**





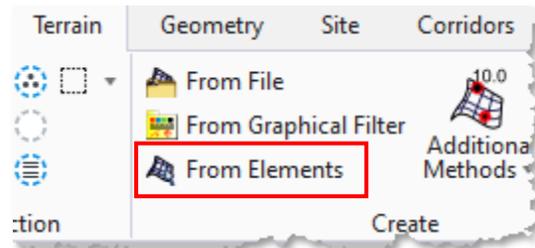
Module 11 - Detailed Modeling

- L. Next, select the **Element Selection** tool (**Terrain > Selection > Element Selection**). Select the **Shear Line** and **Draft_DNC** elements as shown below. Be sure to select the **Shear Line**. See **Tip** below.



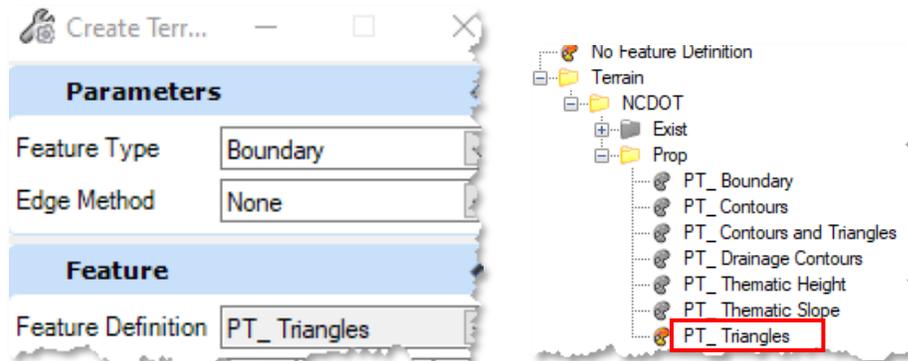
Tip: Zoom in closely and right click to tab through until you get the correct line.

- M. Then, select the **Create Terrain From Elements** tool (**Terrain > Create > From Elements**) as shown below.



- N. Still keeping the **Shear Line** and **Draft_DNC** elements selected, key the following parameters into the **Create Terrain From Elements** dialog.

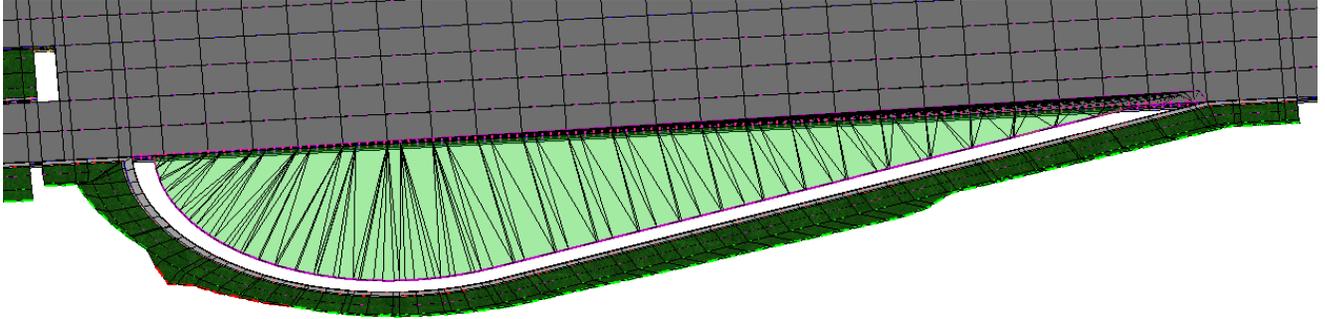
- **Feature Type = Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



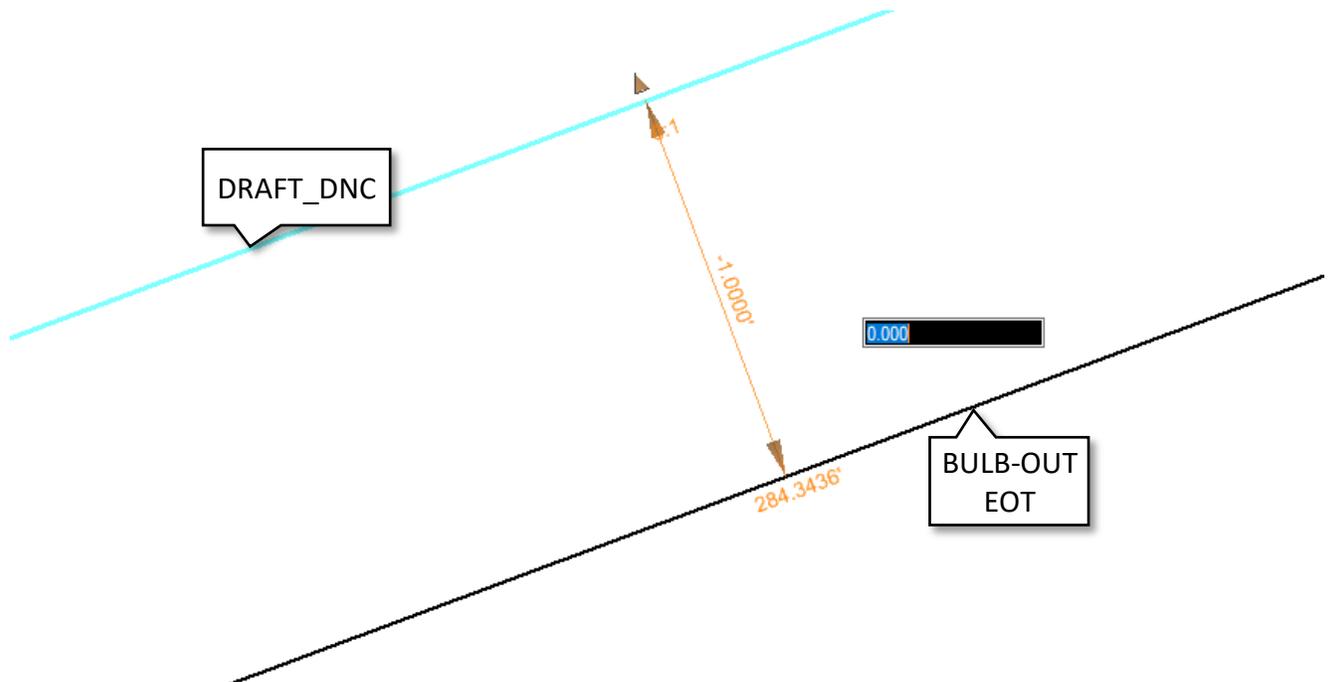


Module 11 - Detailed Modeling

- O. Left click through the prompts to create the **Bulb-Out Terrain Model** as shown below.



- P. After the **Bulb_Out Terrain Model** has been created, change the **Draft_DNC** offset to **0.000'**, so that it sits directly on top of the **Bulb-Out EOT**. See **Note** below.

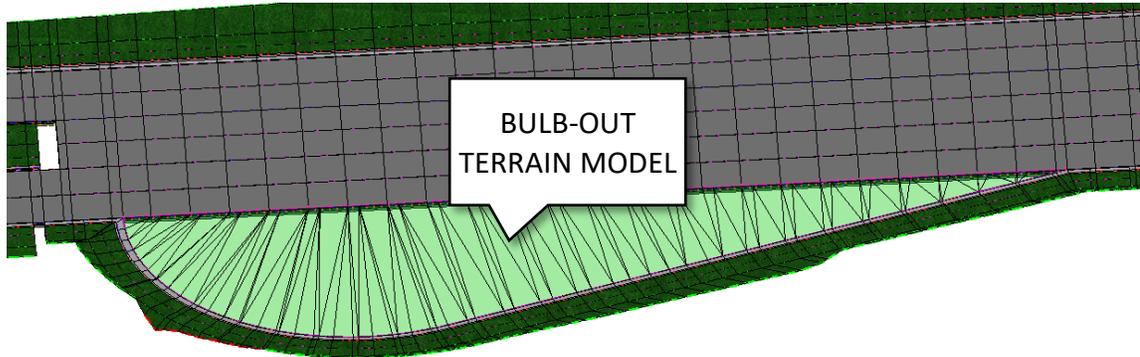


Note: As previously mentioned, the Draft DNC 1' offset was only temporary to make it easier to work with.

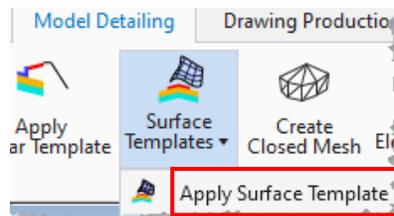


Module 11 - Detailed Modeling

- Q. Notice that the **Bulb-Out Terrain Model** has been adjusted and now runs along the **Bulb-Out EOT** line as shown below.

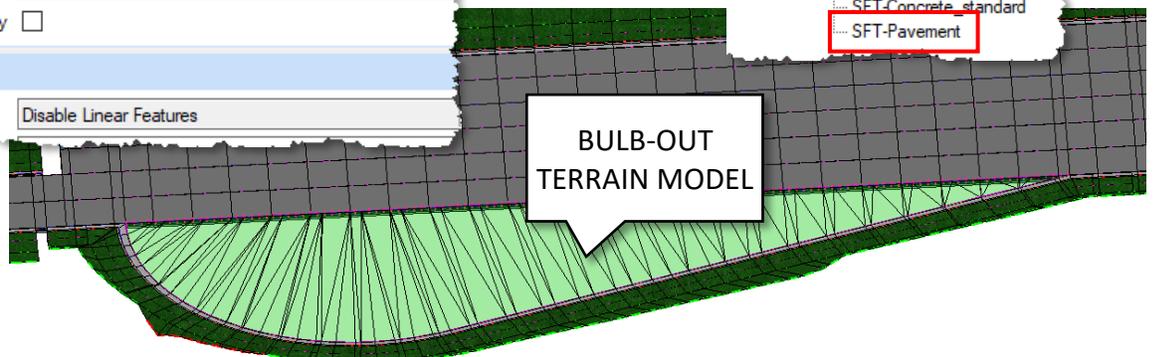
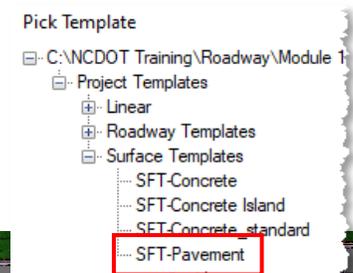
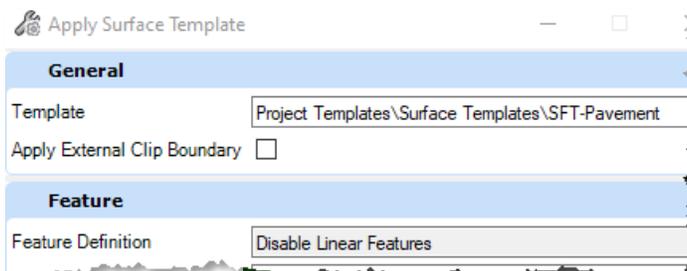


- R. Next, select the **Apply Surface Template** tool (**Model Detailing > Surface Templates > Apply Surface Template**) as shown below.



- S. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Bulb-Out Terrain Model** from within the **View 2, Default 3D** window when prompted to **Locate Terrain Model**.

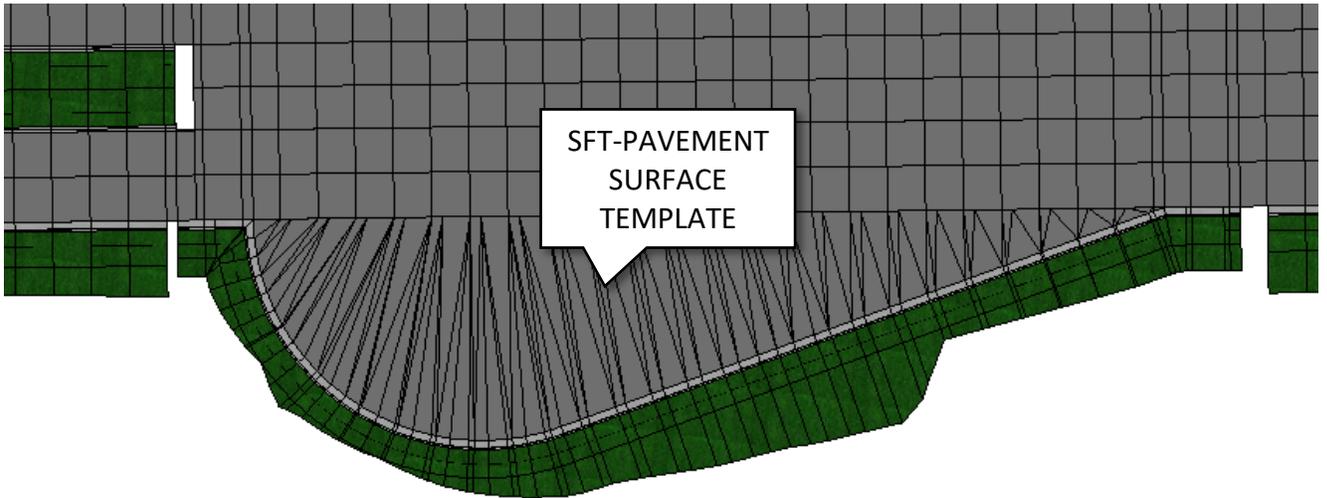
- **Template = SFT-Pavement**
- **Feature Definition = Disable Linear Features**



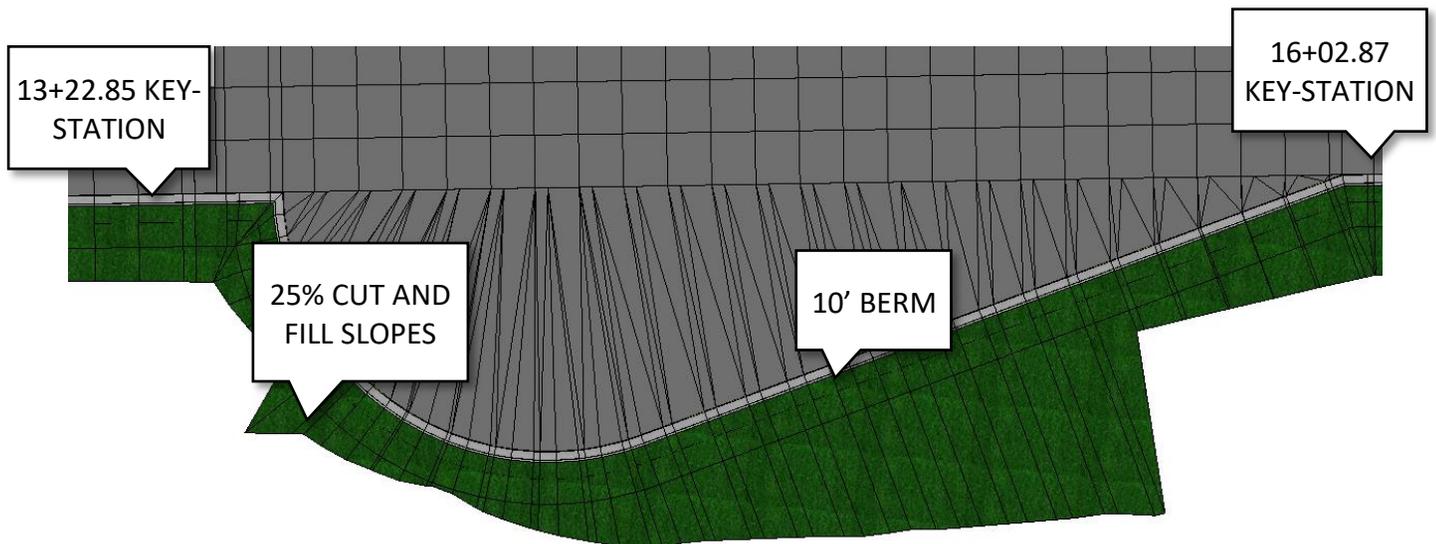


Module 11 - Detailed Modeling

- T. Continue left clicking through the prompts to apply the **SFT-Pavement Surface Template** to the **Bulb-Out Terrain Model** as shown below.



- U. Use a combination of **Key-Stations** and **Parametric Constraints** to seamlessly connect the **Bulb-Out** to the **Y8 Corridor** as shown below.

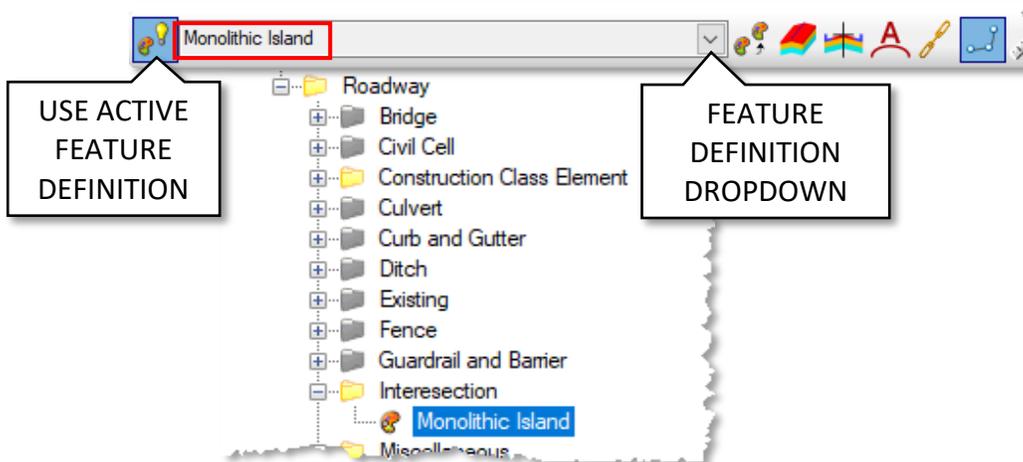




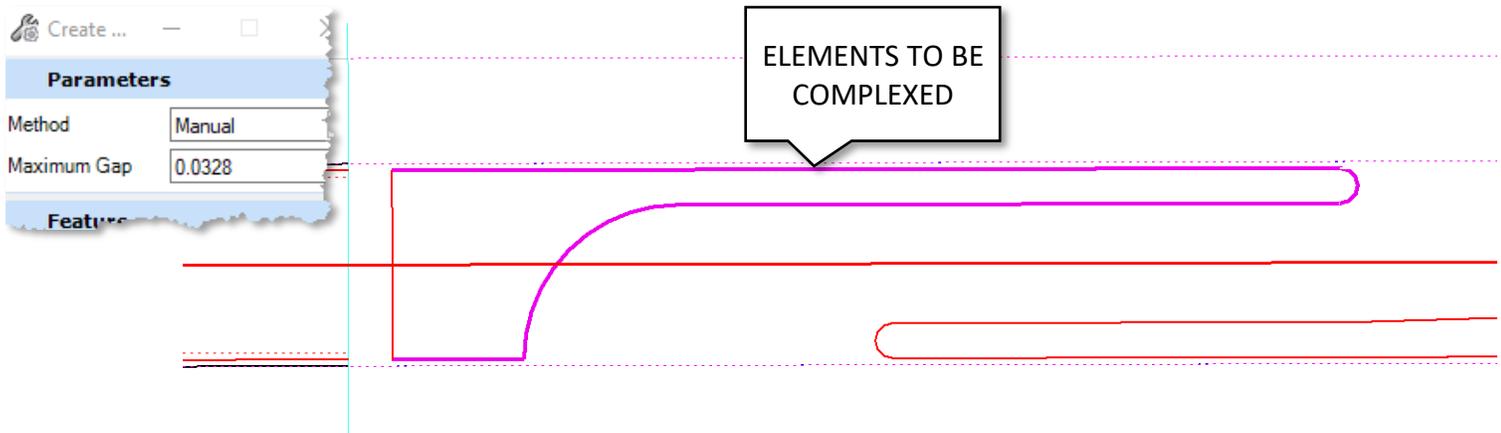
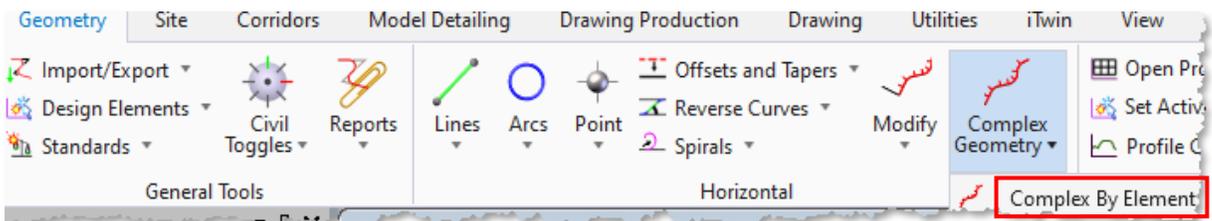
Module 11 - Detailed Modeling

9. Model the Concrete Islands for Median U-Turns

- A. From the Feature Definition Toggle Bar, toggle on the Use Active Feature Definition button and then select the **Monolithic Island** feature from the **(Linear > Roadway > Intersection)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



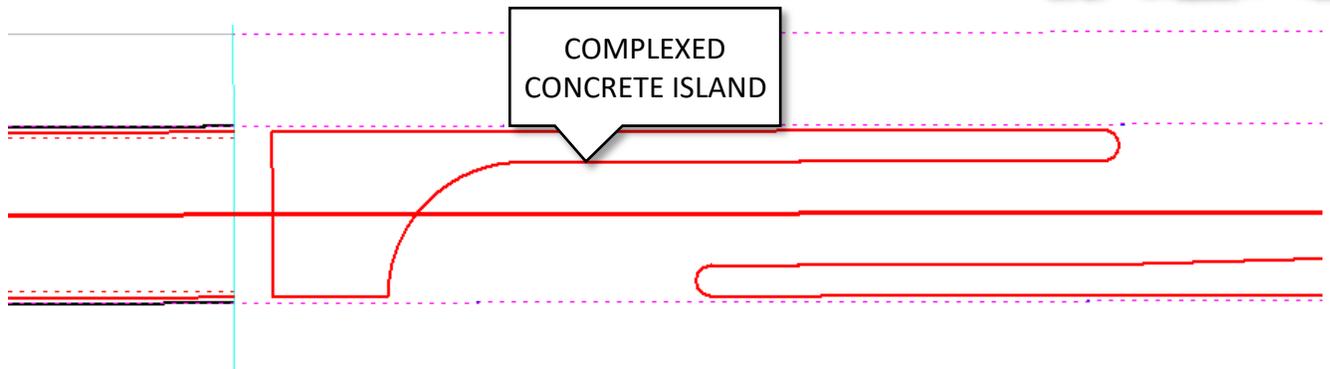
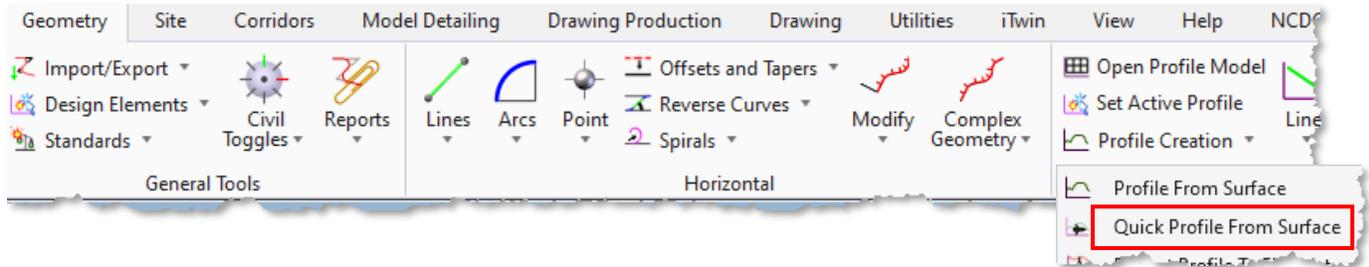
- B. Next, select the **Complex By Element** tool (**Geometry > Horizontal > Complex Geometry > Complex By Element**), set the **Method** Parameter to **Manual** and complex the elements highlighted in purple as shown below.



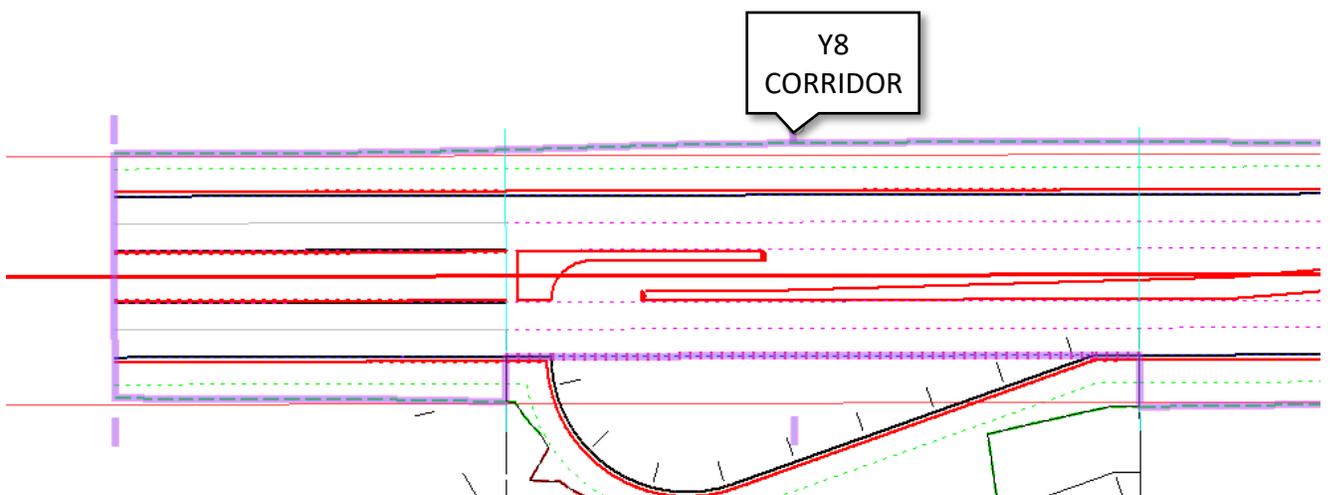


Module 11 - Detailed Modeling

- C. Next, select the **Quick Profile From Surface** tool (**Geometry > Vertical > Profile Creation > Quick Profile From Surface**) and select the **Complexed Concrete Island** when prompted to **Locate Reference Element**.



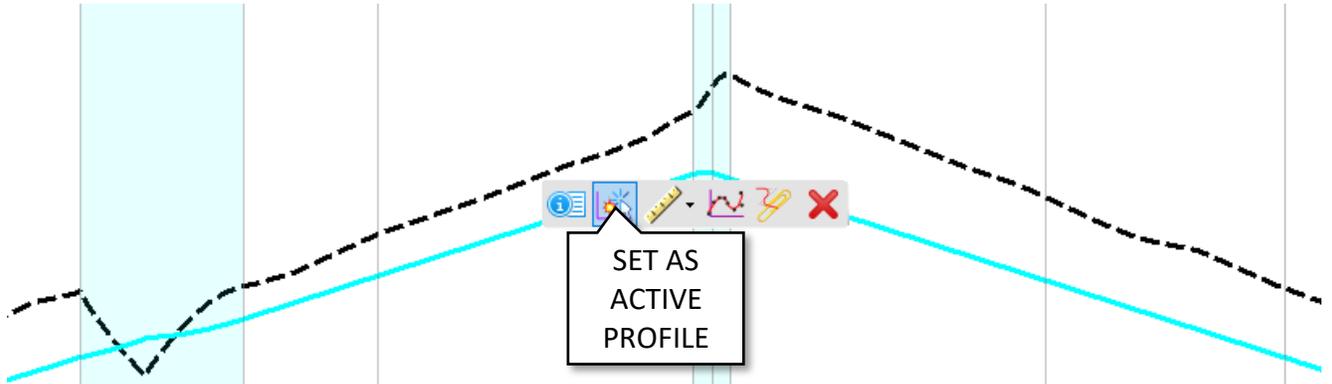
- D. Then, select the **Y8 Corridor** when prompted to **Locate Reference Surface**. **Right-click** to reset and finalize the command.



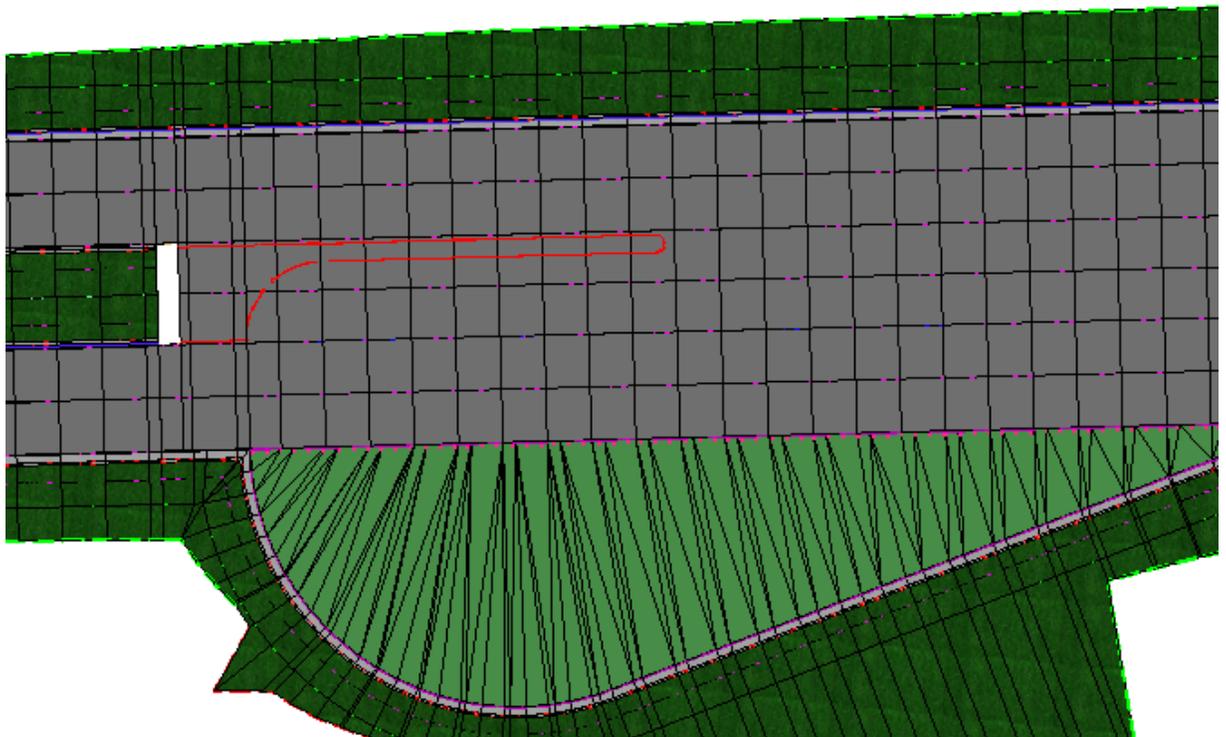


Module 11 - Detailed Modeling

- E. Now, open the **Profile View** for the **Complexed Concrete Island** and set the new profile to **Active** as shown below.



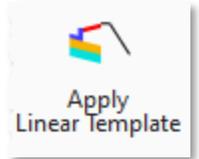
- F. Notice in the **View 2, Default 3D** window that the **Concrete Island** is now displayed in the 3D model as shown below.



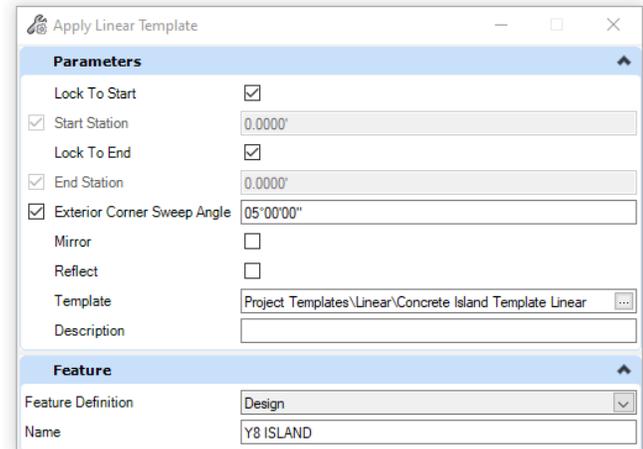
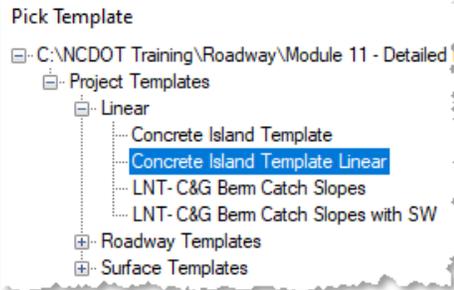


Module 11 - Detailed Modeling

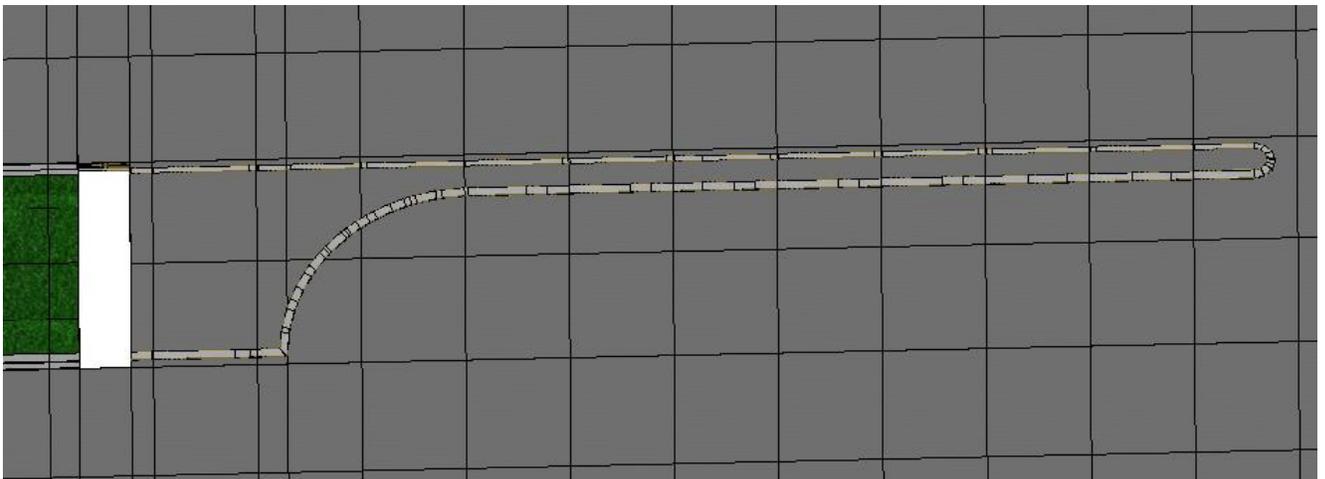
G. Next, select the **Apply Linear Template** tool (**Model Detailing > Apply Linear Template**) and key the following parameters into the **Apply Linear Template** dialog.



- **Start = Lock To Start**
- **End = Lock To End**
- **Exterior Corner Sweep Angle = 05° 00' 00"**
- **Template = Concrete Island Template Linear**
- **Feature Definition = Design**
- **Name = Y8 ISLAND**



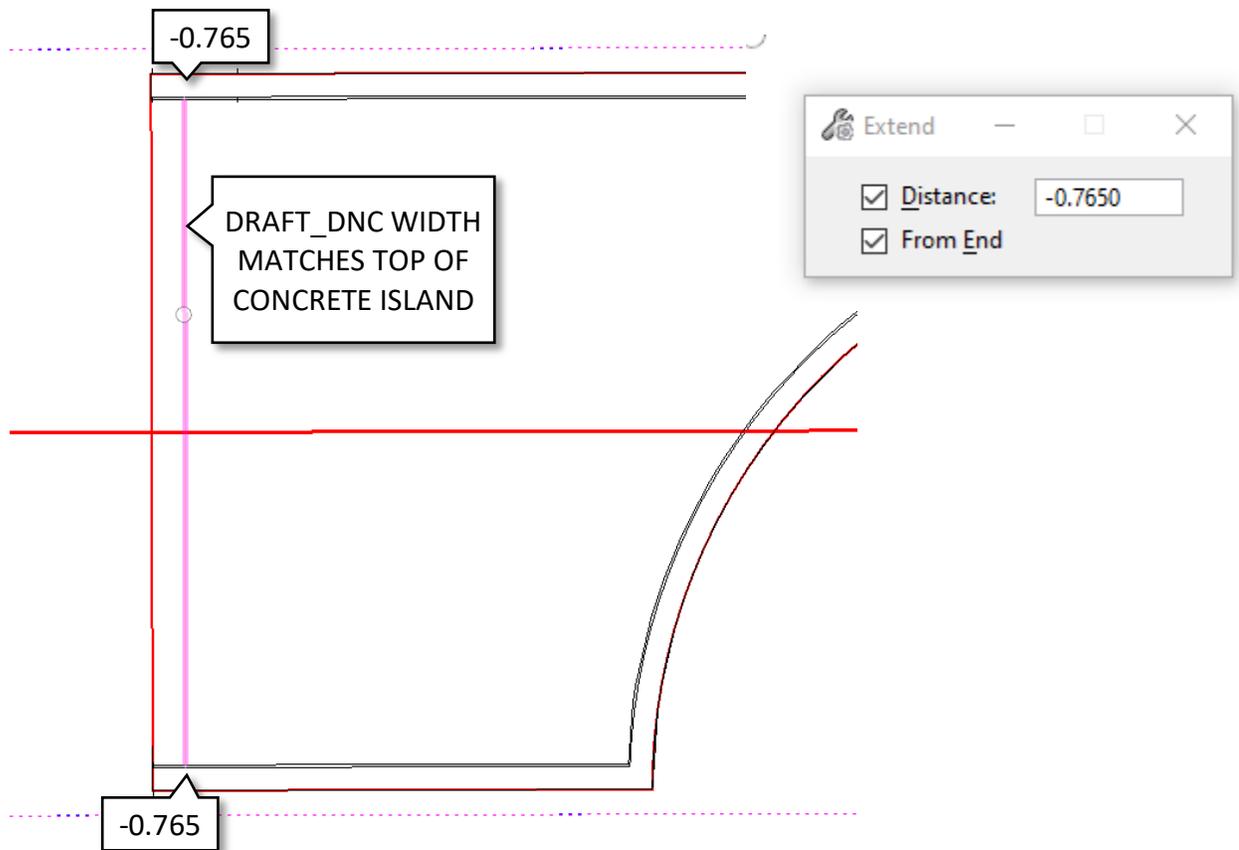
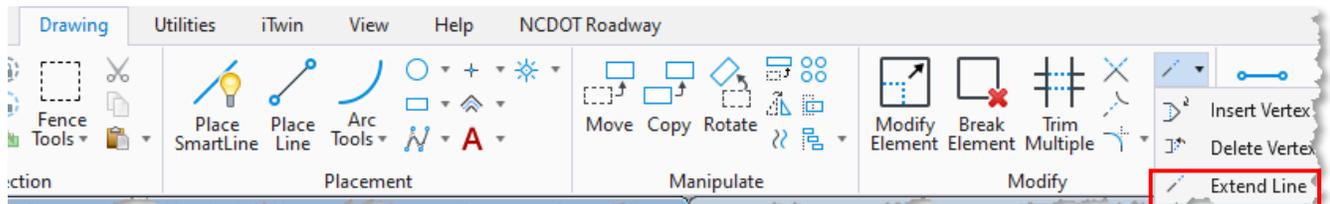
H. When prompted to **Locate Element To Apply Template**, select the **Concrete Island** and place the **Linear Template** as shown below.





Module 11 - Detailed Modeling

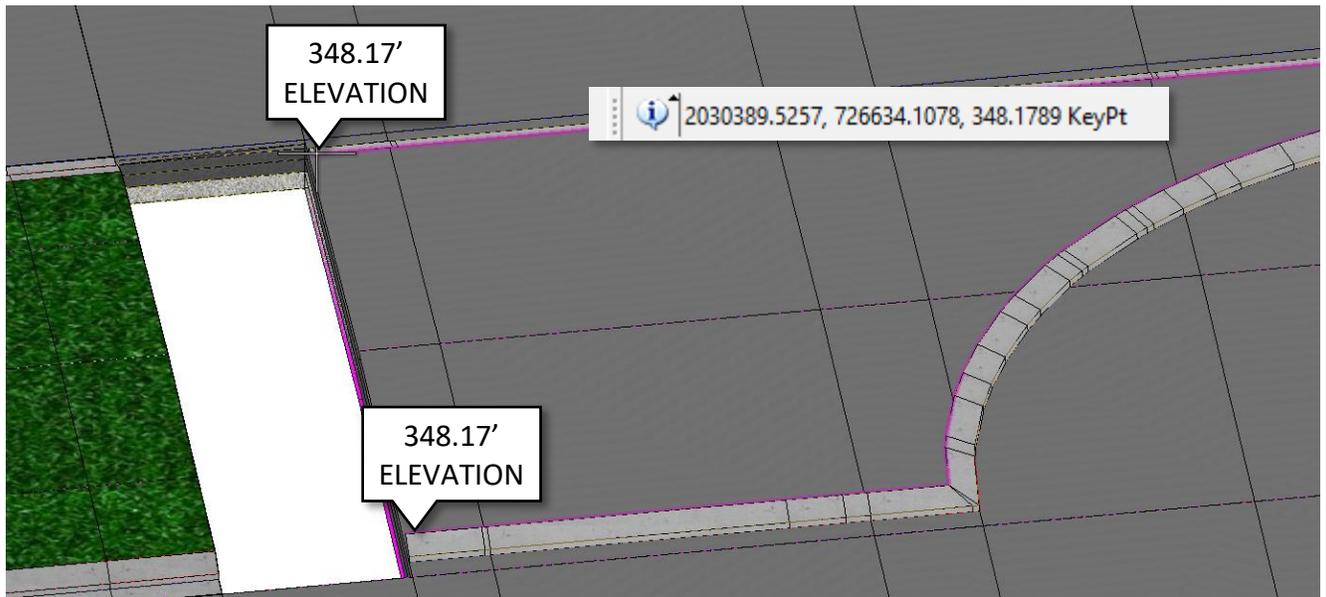
- K. Next, select the **Extend Line** tool (**Drawing > Modify > Extend Line**) and shorten the **Draft_DNC** element that was just offset in the previous step by **-0.765** from both ends to match the width of the top portion of the **Concrete Island**.



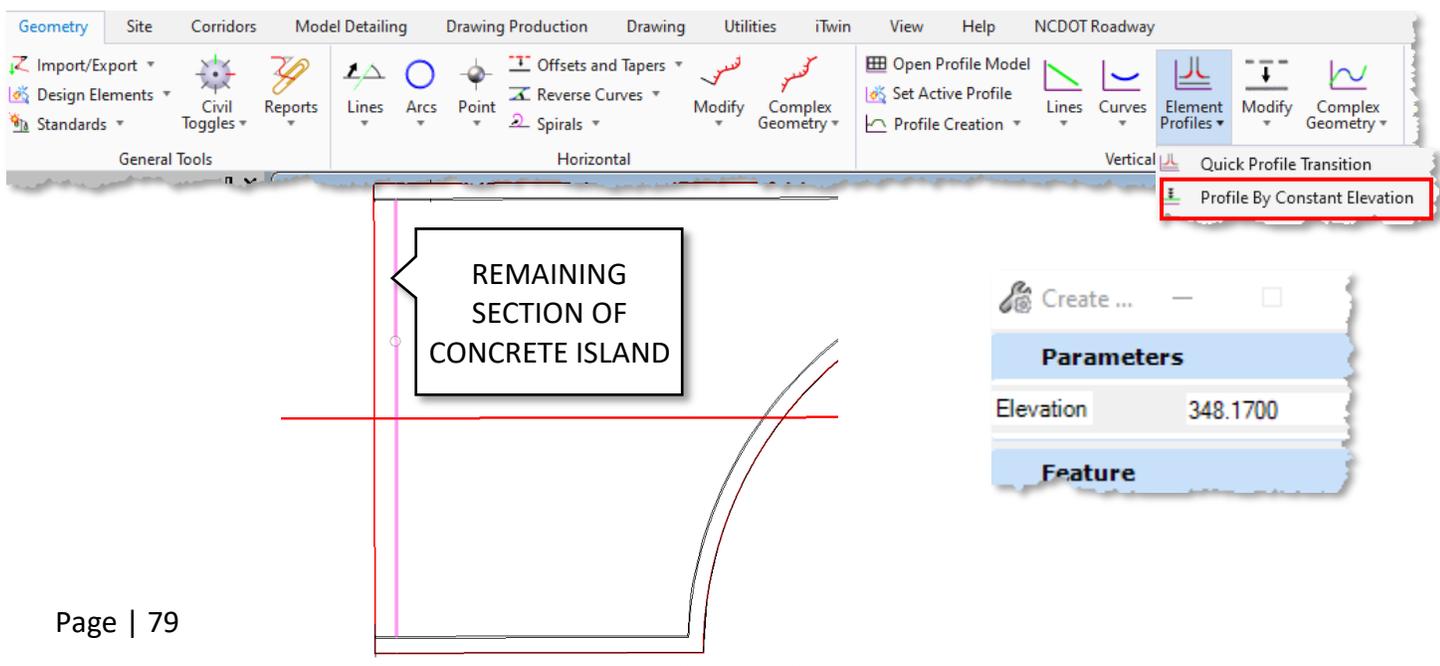


Module 11 - Detailed Modeling

- L. In the **View 2, Default 3D** window, **Snap** to the **Beginning** and **End** of the **Concrete Island** to determine the elevation at the top linear element. This will be used to set a **Profile** for the remaining section of the **Concrete Island**.



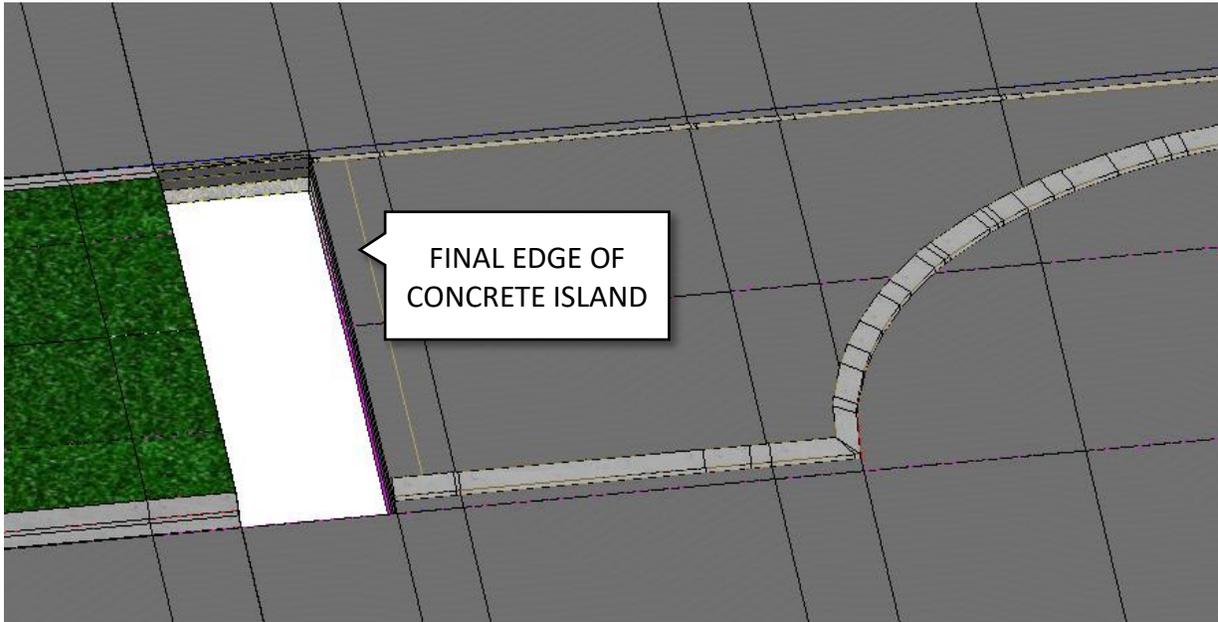
- M. Next, select the **Profile By Constant Elevation** tool (**Geometry > Vertical > Profile Creation > Profile By Constant Elevation**). Set the **Elevation** parameter to **348.17** and select the remaining section of the **Concrete Island** when prompted to **Locate Element**.



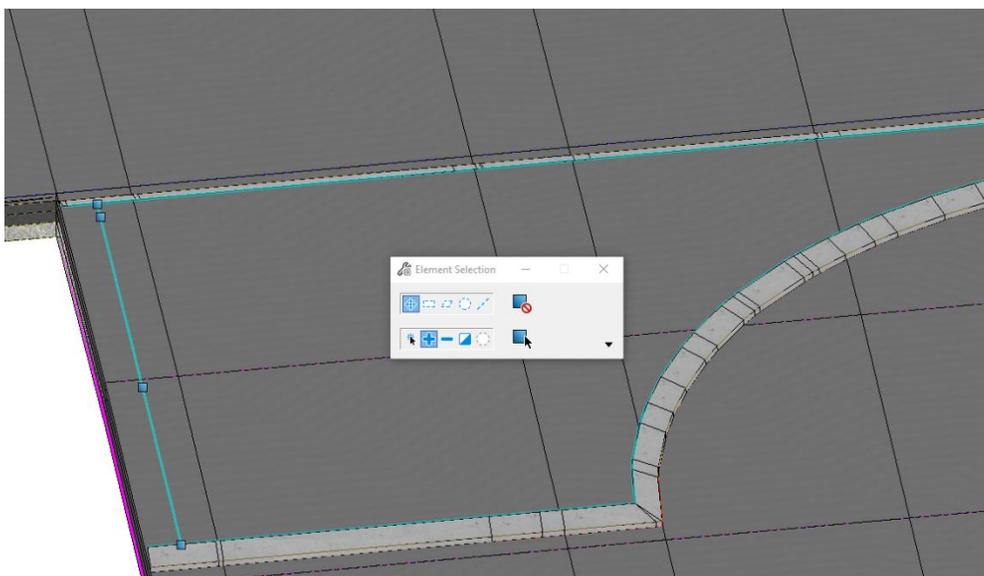


Module 11 - Detailed Modeling

- N. Notice in the **View 2, Default 3D** window that the final edge of the **Concrete Island** is now visible in the 3D model and matches the width and elevation of the previously modeled portion.



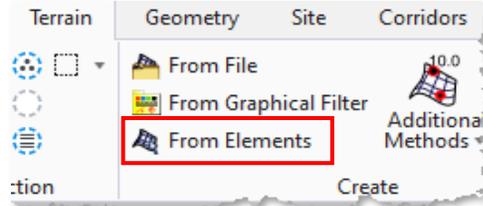
- O. Next, select the **Element Selection** tool (**Terrain > Selection > Element Selection**) and select the **Concrete Island** linear elements as shown below.





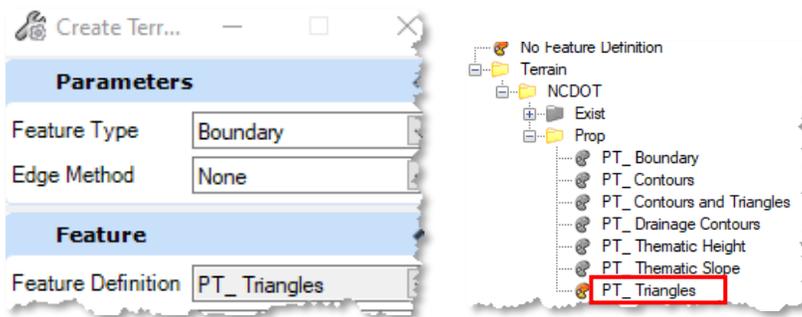
Module 11 - Detailed Modeling

- P. Then, select the **Create Terrain From Elements** tool (**Terrain > Create > From Elements**) as shown below.

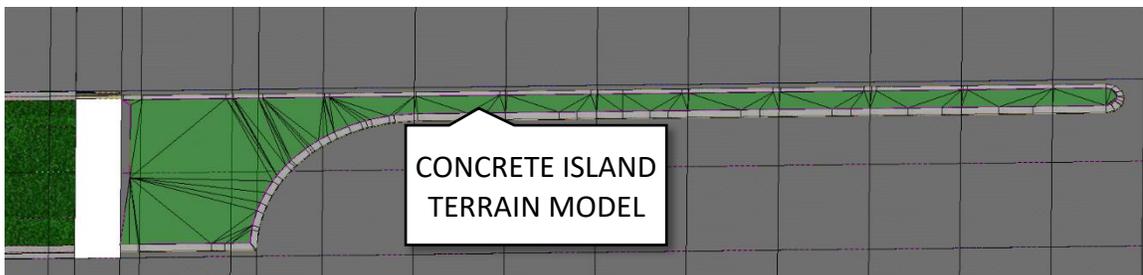


- Q. Still keeping the **Concrete Island** elements selected, key the following parameters into the **Create Terrain From Elements** dialog.

- **Feature Type = Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



- R. Left click through the prompts to create the **Concrete Island Terrain Model** as shown below. Notice that the **Terrain Model** doesn't look correct along the edge that was **Offset** by 1'. To correct this, simply change the **Offset** to 0'.

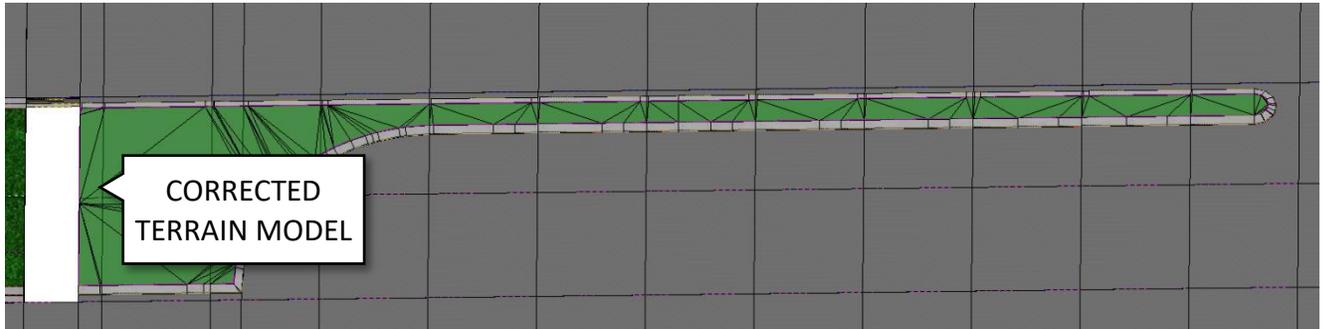


Note: The 1' offset was temporarily used to make it easier to manipulate the element.

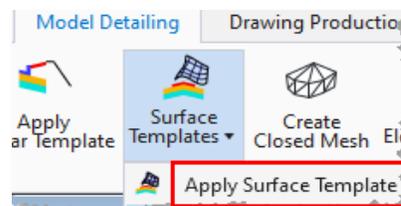


Module 11 - Detailed Modeling

S. After changing the **Offset** to **0'** the **Terrain Model** has been corrected as shown below.

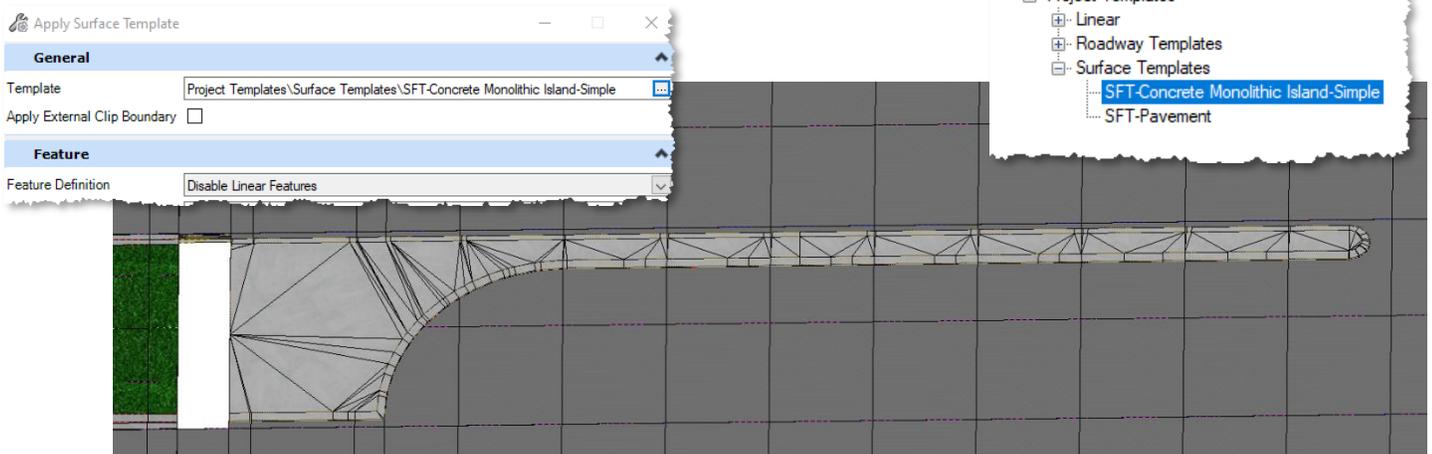


T. Select the **Apply Surface Template** tool (**Model Detailing > Surface Templates > Apply Surface Template**) as shown below.



U. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Concrete Island Terrain Model** when prompted to **Locate Terrain Model**. This finalizes the **Concrete Island**.

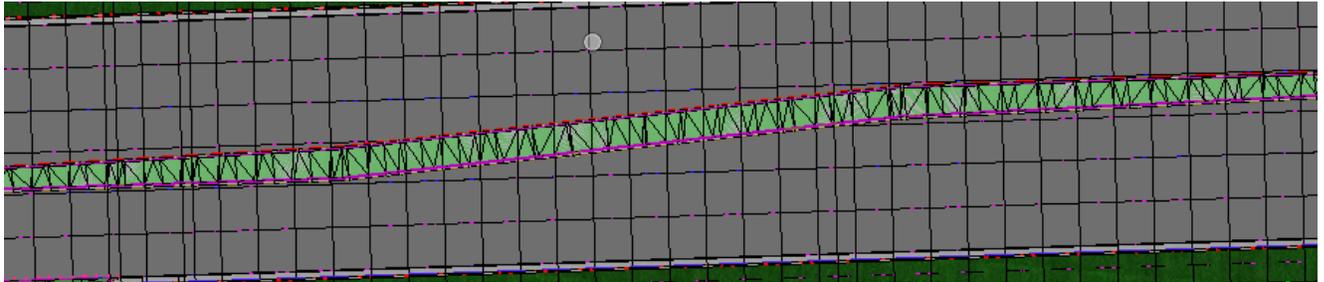
- **Template = SFT-Concrete Monolithic Island-Simple**
- **Feature Definition = Disable Linear Features**





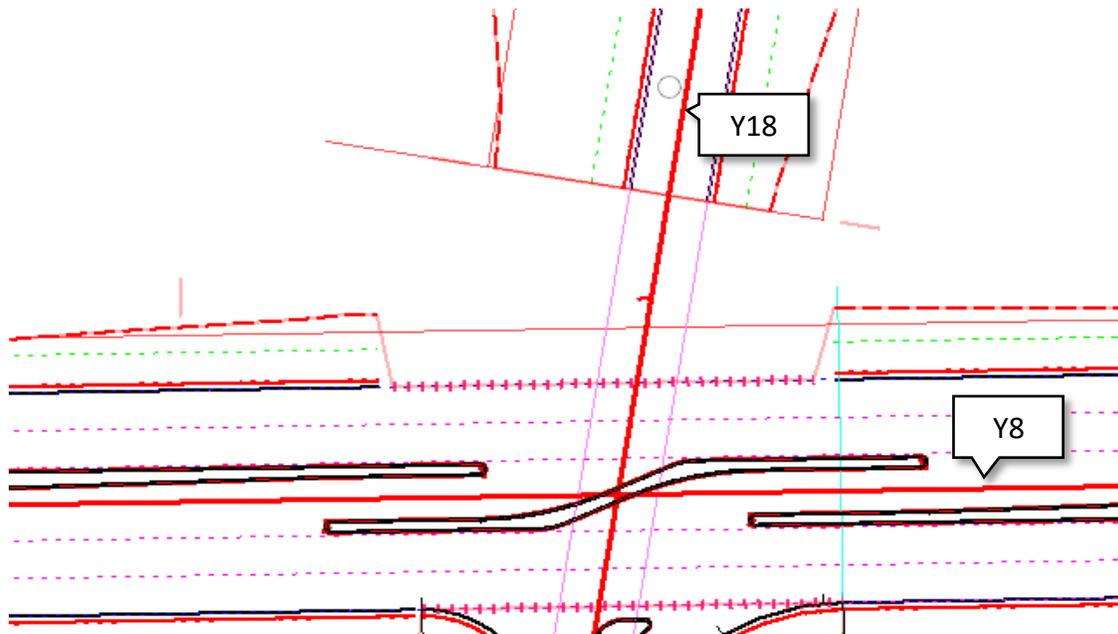
Module 11 - Detailed Modeling

- V. Using the skills taught throughout the **Detailed Modeling Module**, model the final **Concrete Island** that runs along the **Y8 Corridor** as shown below.



10. Layout the Radius Returns for the Northern side of the Y8/Y18 Intersection

- A. Zoom in closely to the **Northern** side of the **Y8/Y18** Intersection.

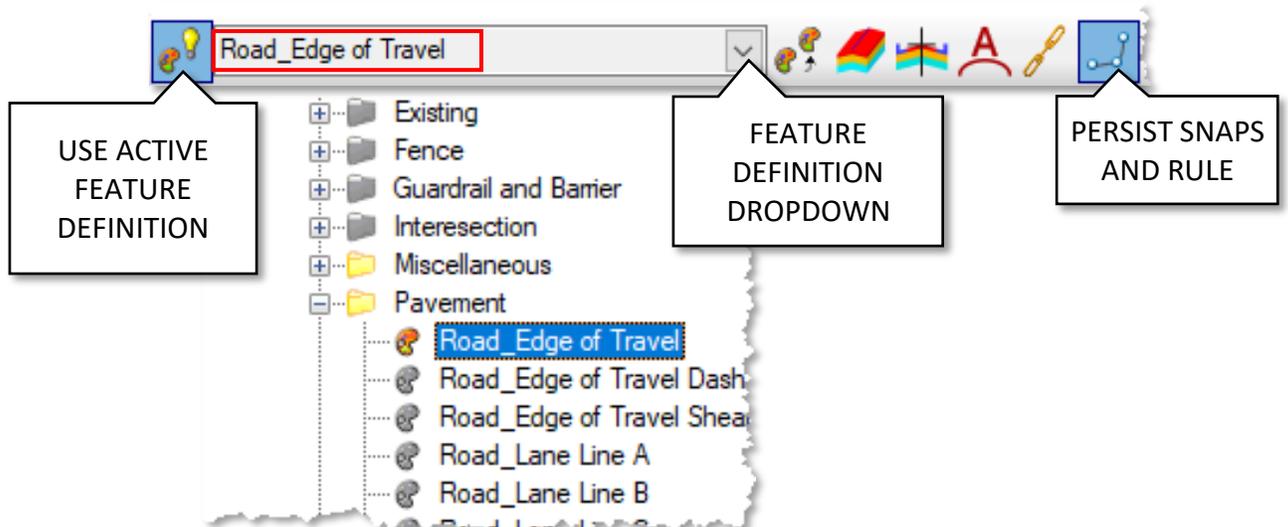


Note: Both Corridors are contained within a single CMD file for training purposes only. Typically, Detailed Intersection Modeling would be carried out within the Secondary Corridor CMD file. See File Management module for detailed information.

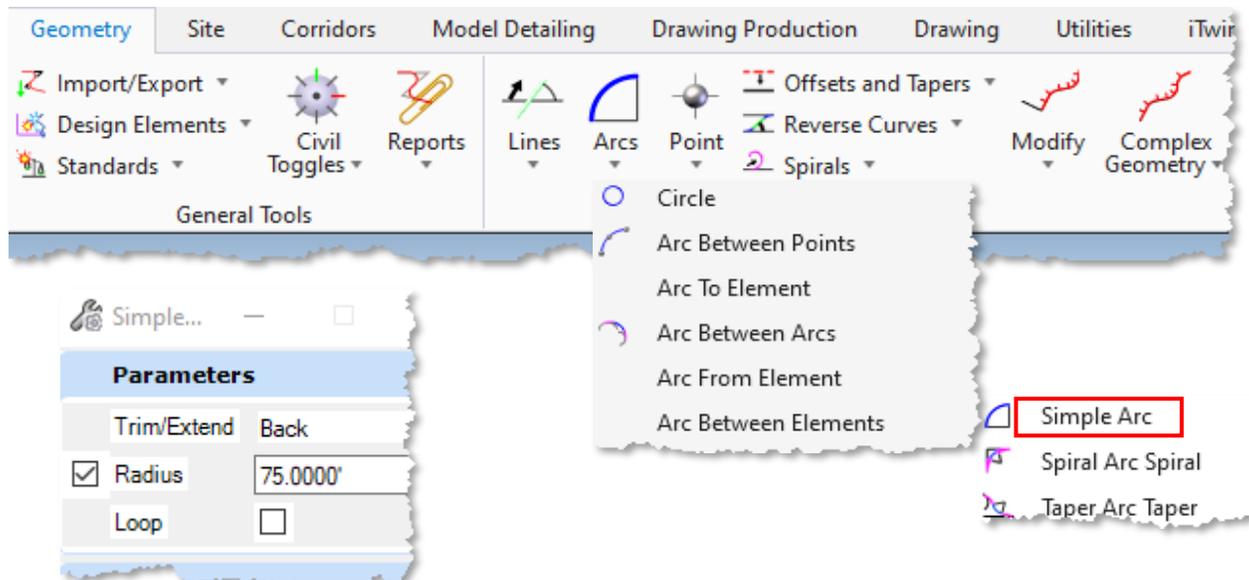


Module 11 - Detailed Modeling

- B. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and the **Persist Snaps and Rule** option. Select the **Road_Edge of Travel** feature from the **(Linear > Roadway > Pavement)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



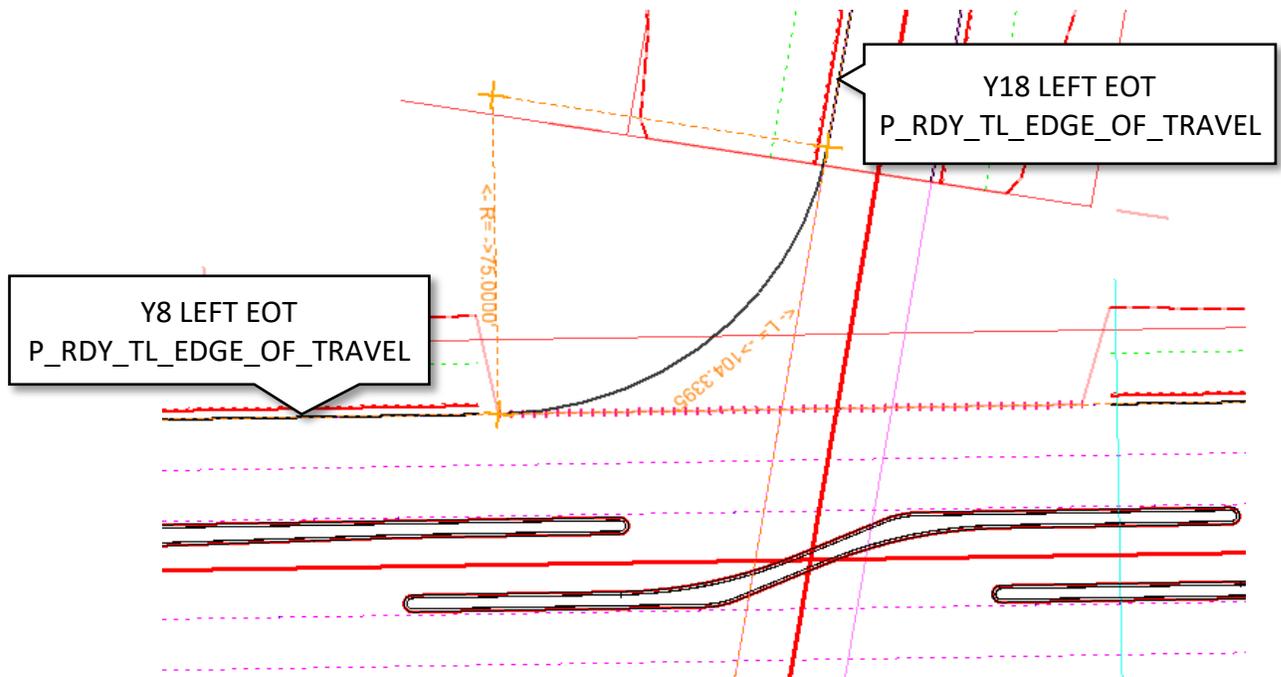
- C. Now, select the **Simple Arc** tool (**Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc**). Set the Radius parameter to **75.0000'** and the **Trim/Extend** parameter to **Back** within the **Simple Arc** dialog as shown below.



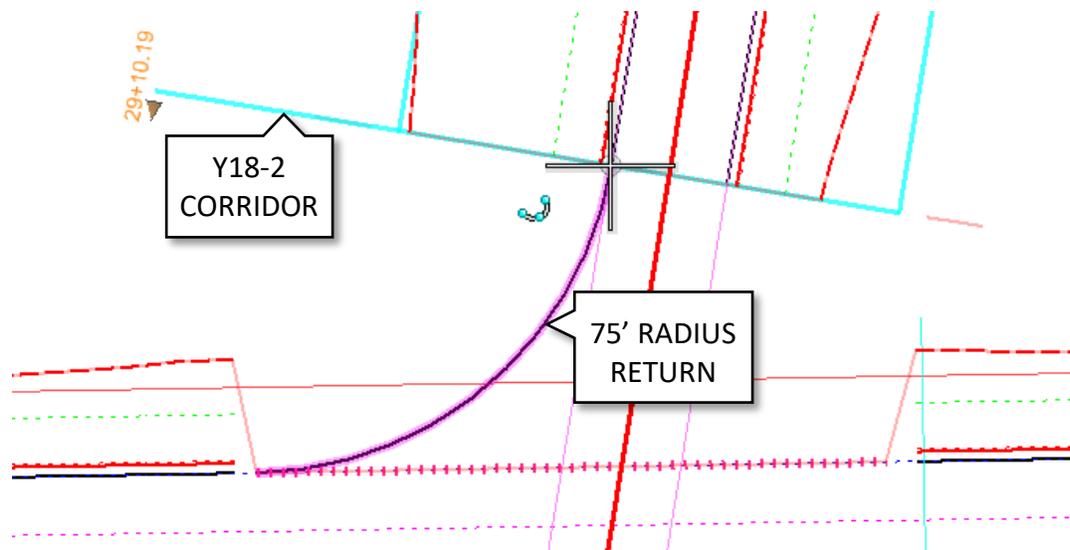


Module 11 - Detailed Modeling

- D. When prompted to **Locate First Element**, select the **Y18 Left EOT** line and then select the **Y8 Left EOT** line as the **Second Element**. When selecting the EOT lines you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's **IMPORTANT** to select the correct linear element. Continue **Left-Clicking** through the additional prompts that follow to place the **75' Radius Return** as shown below.



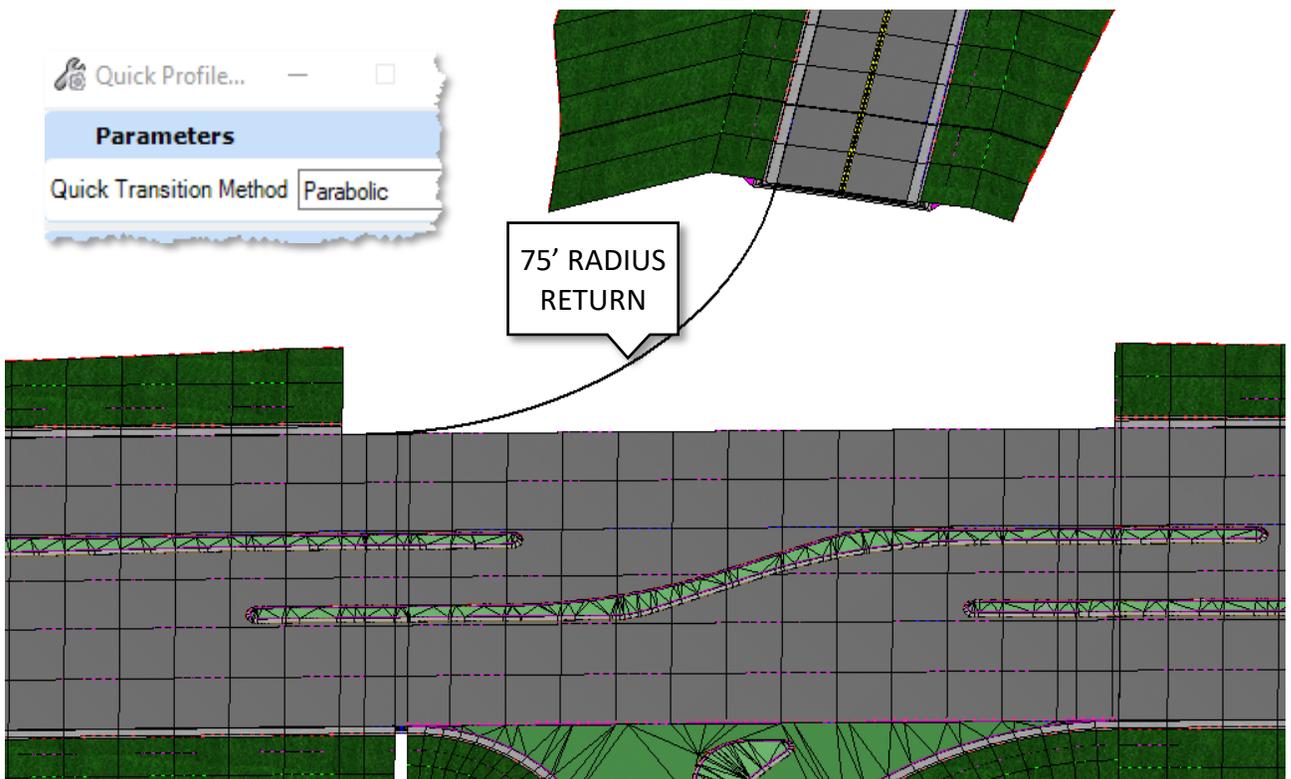
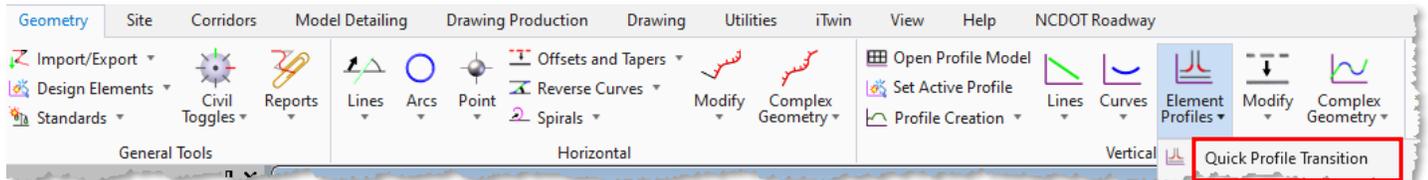
- E. Now, adjust the beginning of the **Y18-2 Corridor** by **Snapping** to the end of the **75' Radius Return**.





Module 11 - Detailed Modeling

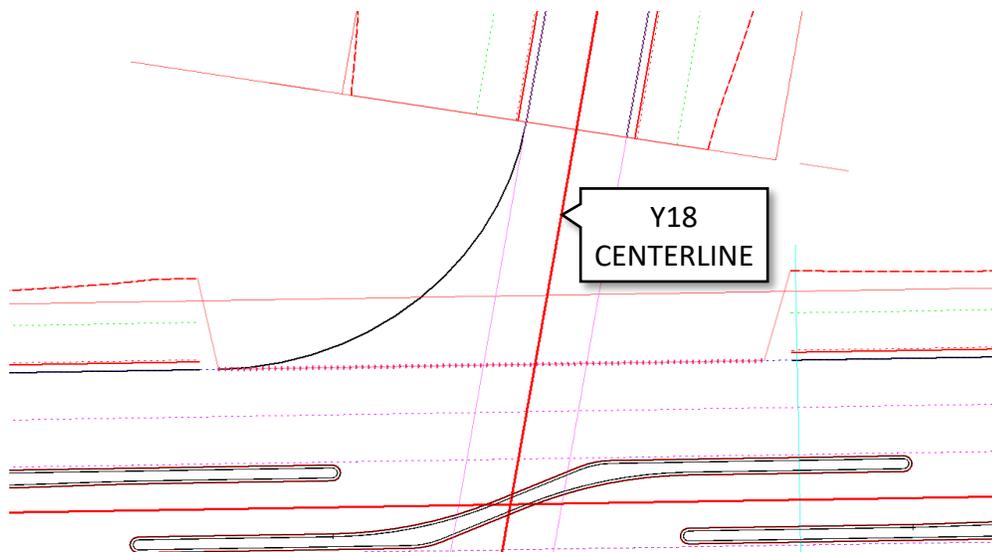
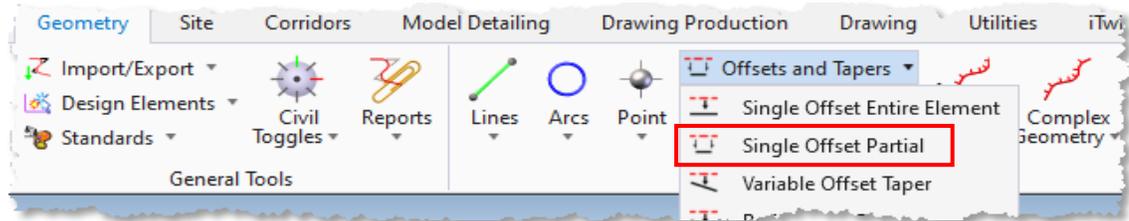
- F. Next, select the **Quick Profile Transition** tool (**Geometry > Vertical > Element Profiles > Quick Profile Transition**) and click the **75' Radius Return to Profile** it and add to the **3D Model** as shown below.





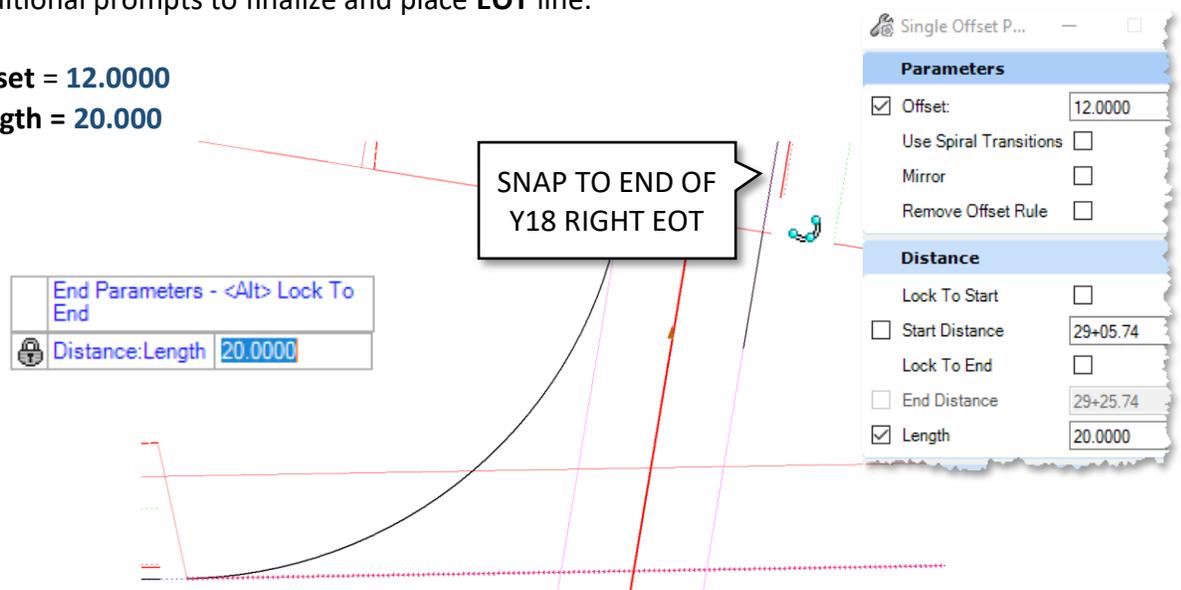
Module 11 - Detailed Modeling

- G. Then, select the **Single Offset Partial** tool (**Geometry > Horizontal > Offsets and Tapers > Single Offset Partial**) and click the **Y18 Centerline** when prompted to locate element.



- H. Set the following parameters within the **Single Offset Partial** dialog and then **Snap** to the end of the **Y18 Right EOT** line as shown below when prompted for a **Start** location. Click through the additional prompts to finalize and place **EOT** line.

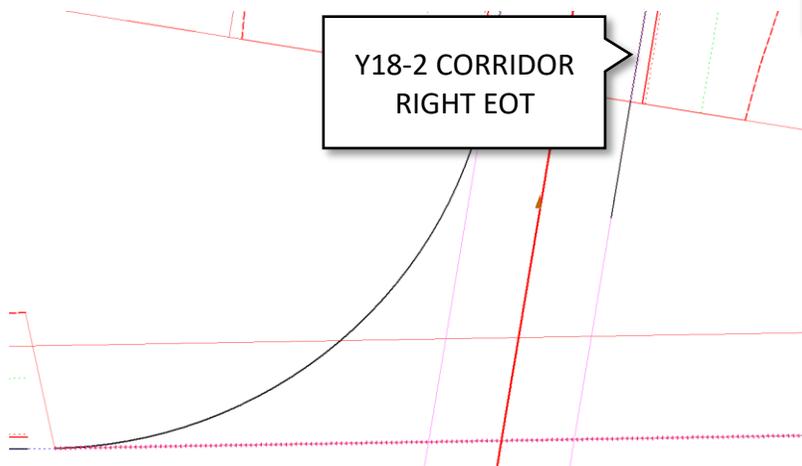
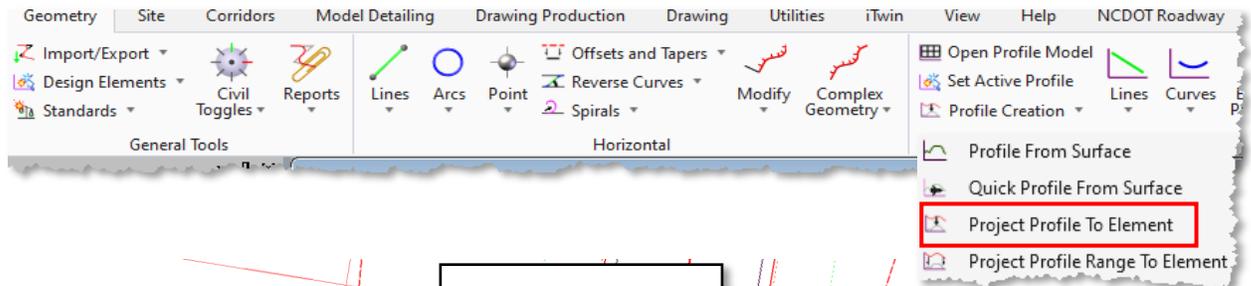
- **Offset = 12.0000**
- **Length = 20.0000**



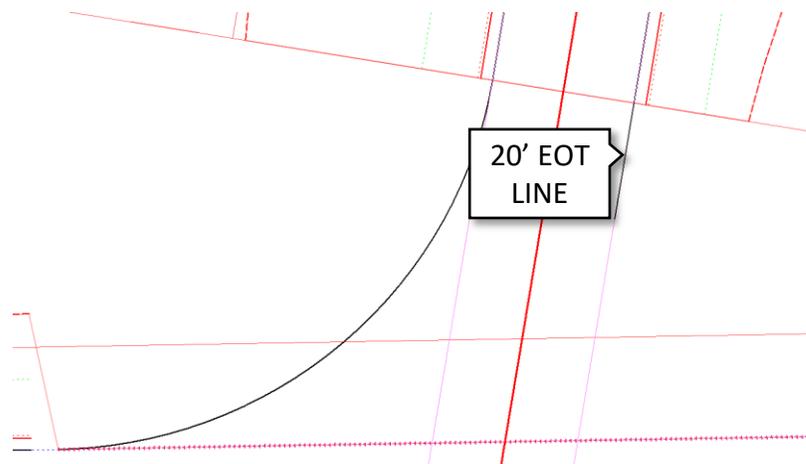


Module 11 - Detailed Modeling

- I. Next, select the **Project Profile To Element** tool (**Geometry > Vertical > Profile Creation > Project Profile To Element**) and click the **Right EOT** line from the **Y18-2 Corridor** as shown below when prompted to **Select Element To Project**.



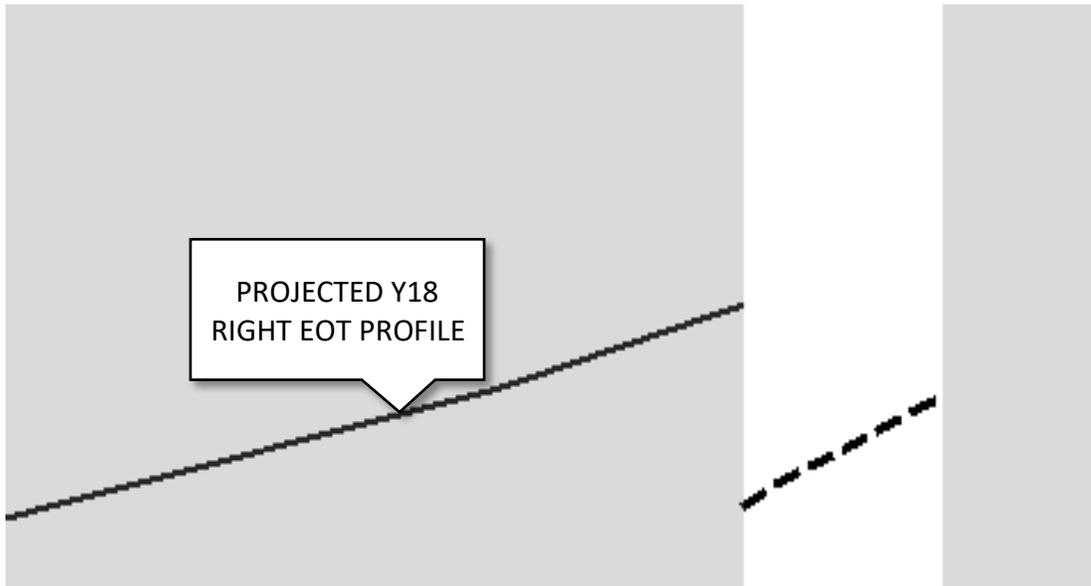
- J. When prompted to **Select Plan Element To Project Onto**, click on the previously placed **20' EOT** line as shown below.



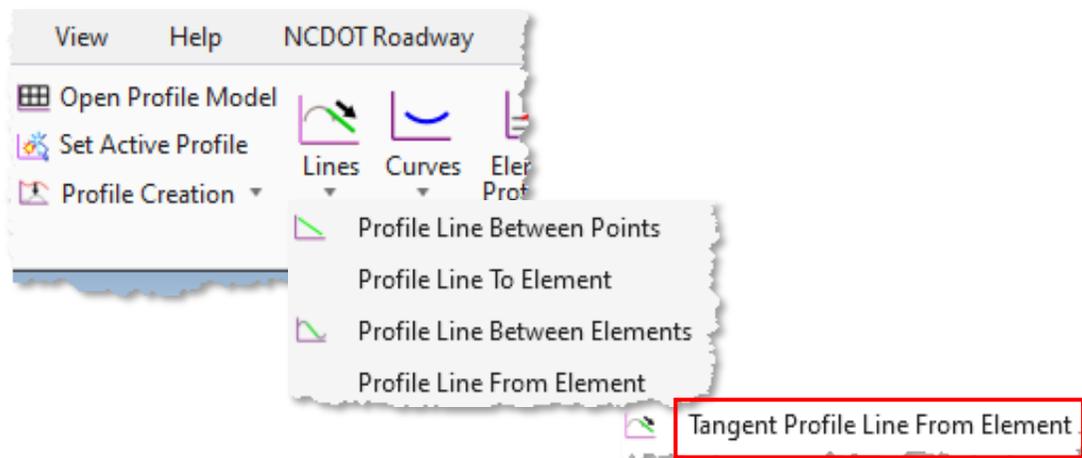


Module 11 - Detailed Modeling

- K. Then, open the **Profile** view for the **20' EOT** line and notice the **Projected Y18 Right EOT Profile** as shown below.



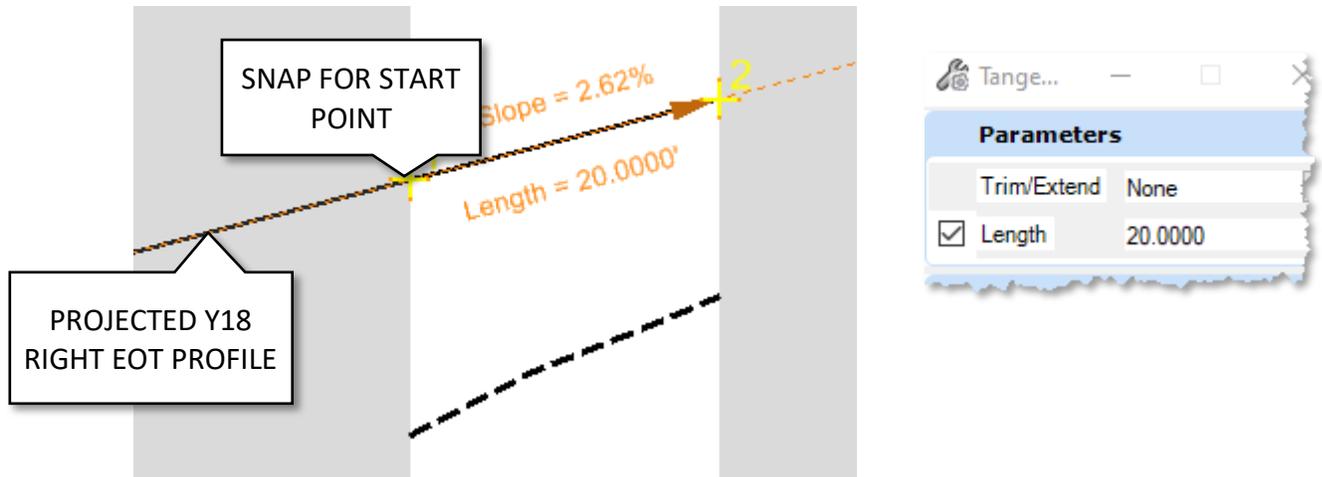
- L. Next, select the **Tangent Profile Line From Element** tool (**Geometry > Vertical > Lines > Profile Line From Element > Tangent Profile Line From Element**). Set the **Trim/Extend** parameter to **None** and the **Length** parameter to **20.000**.



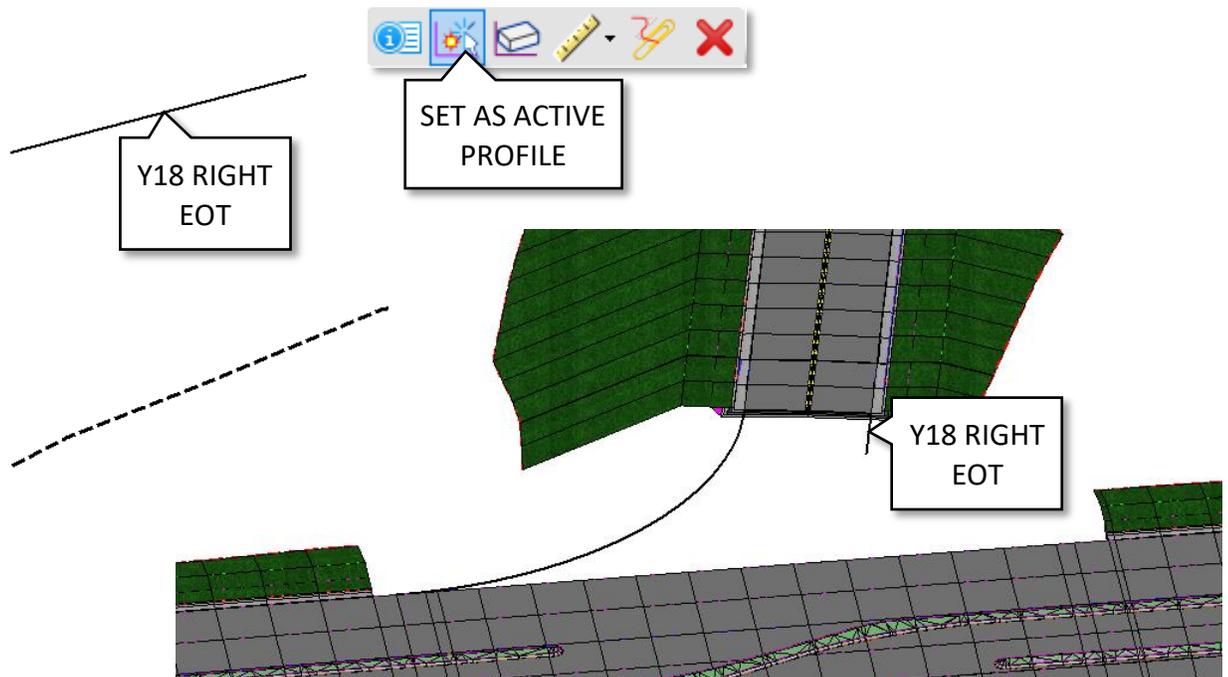


Module 11 - Detailed Modeling

- M. Then, select the **Projected Y18 Right EOT Profile** when prompted to **Locate Element** and **Snap** to the end of the **Projected Y18 Right EOT Profile** when prompted for a **Start Point**. **Left-click** through the additional prompts to place the new **20' Y18 Right EOT Profile** element as shown below.



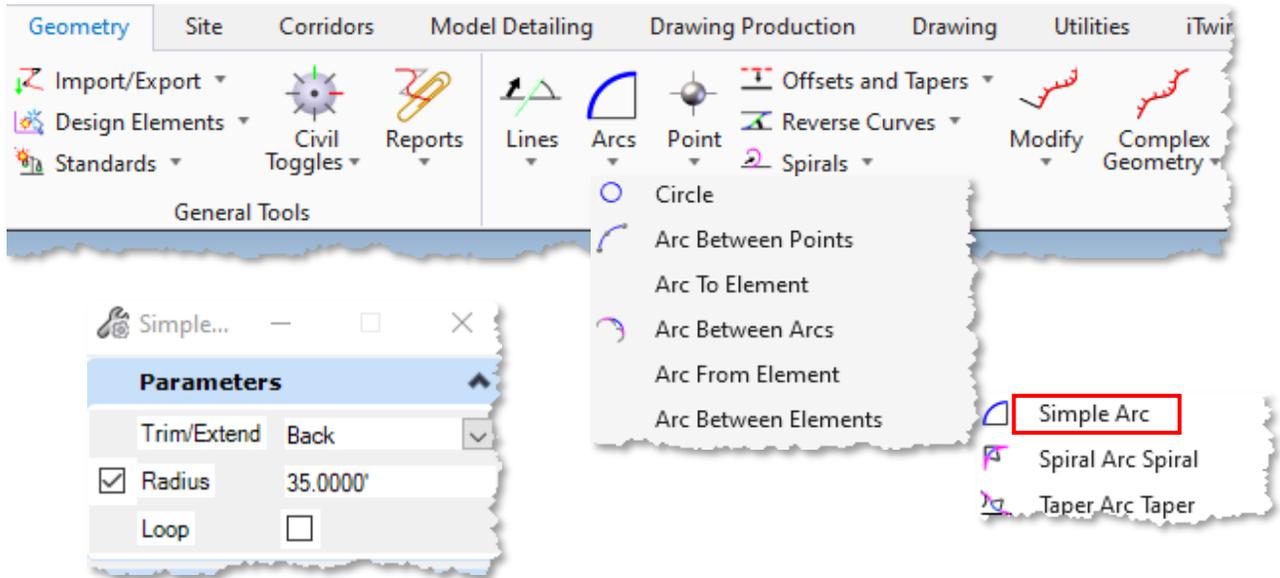
- N. Click on the new **Y18 Right EOT** profile and make it **Active**. This will add it to the **3D Model** as shown below.



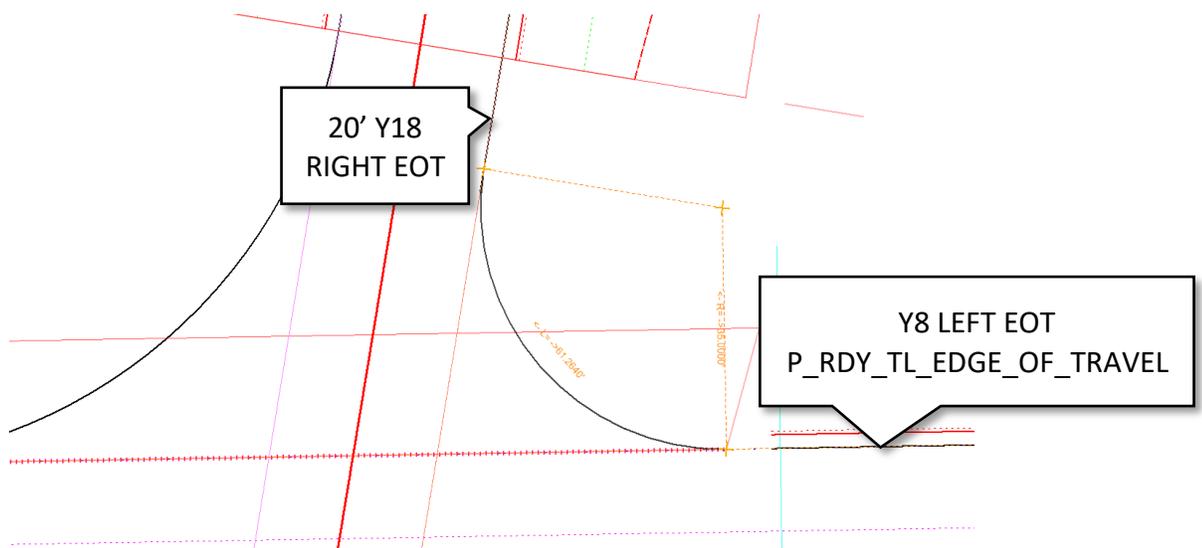


Module 11 - Detailed Modeling

- O. Now, select the **Simple Arc tool (Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc)**. Set the **Radius** parameter to **35.0000'** and the **Trim/Extend** parameter to **Back** within the **Simple Arc dialog** as shown below.



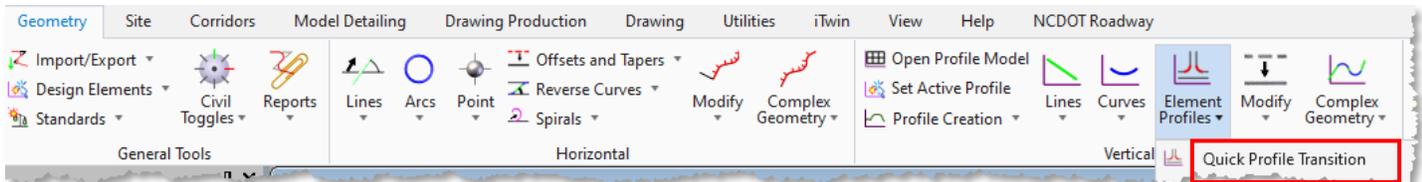
- P. When prompted to **Locate First Element**, select the **20' Y18 Right EOT** line and then select the **Y8 Left EOT** line as the **Second Element**. When selecting the **Y8 Left EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element. Continue **Left-Clicking** through the additional prompts that follow to place the **35' Radius Return** as shown below.





Module 11 - Detailed Modeling

- Q. Next, select the **Quick Profile Transition** tool (**Geometry > Vertical > Element Profiles > Quick Profile Transition**) and click on the **35' Radius Return to Profile** and add it to the **3D Model** as shown below.



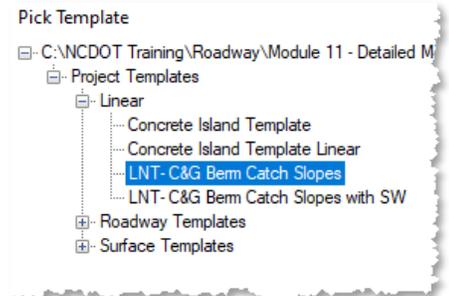
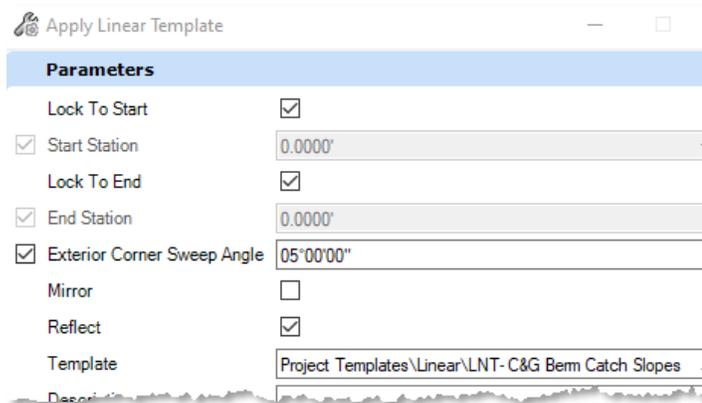


Module 11 - Detailed Modeling

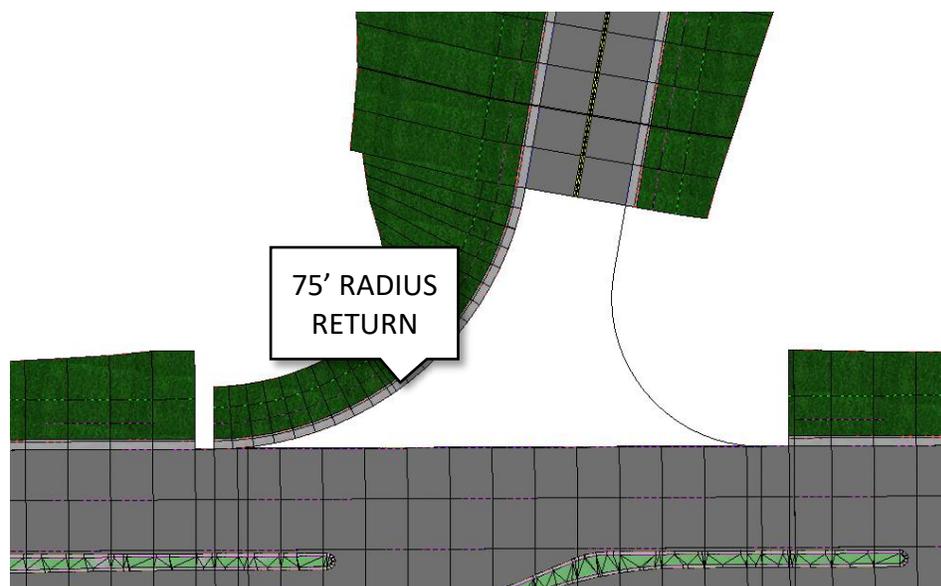
11. Apply Linear Templates to the Radius Returns for the Northern side of the Y8/Y18 Intersection

- Select the **Apply Linear Template** tool (**Model Detailing > Apply Linear Template**).
- Key the following parameters into the **Apply Linear Template** dialog.

- **Start = Lock To Start**
- **End = Lock To End**
- **Exterior Corner Sweep Angle = 05° 00' 00"**
- **Template = LNT - C&G Berm Catch Slopes**
- **Feature Definition = Design**



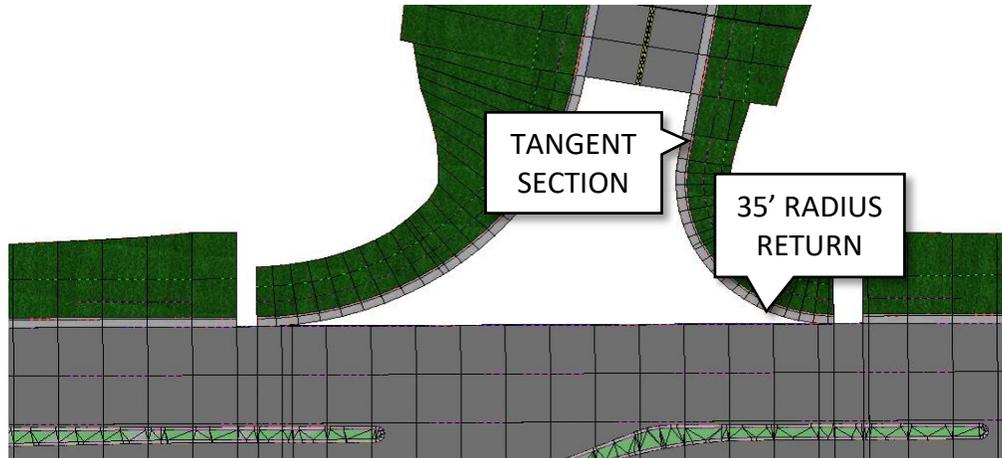
- When prompted to **Locate Element To Apply Template**, select the **75' Radius Return** and place the **Linear Template** as shown below.





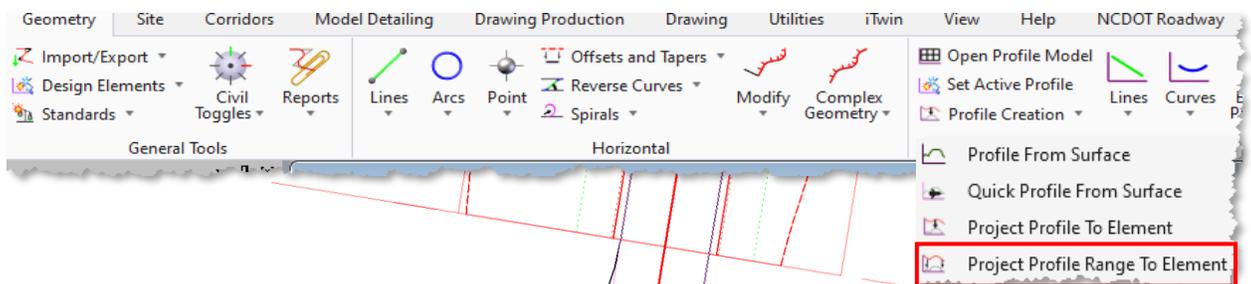
Module 11 - Detailed Modeling

D. Then do the same for the **35' Radius Return** and short **Tangent** section that it connects to.

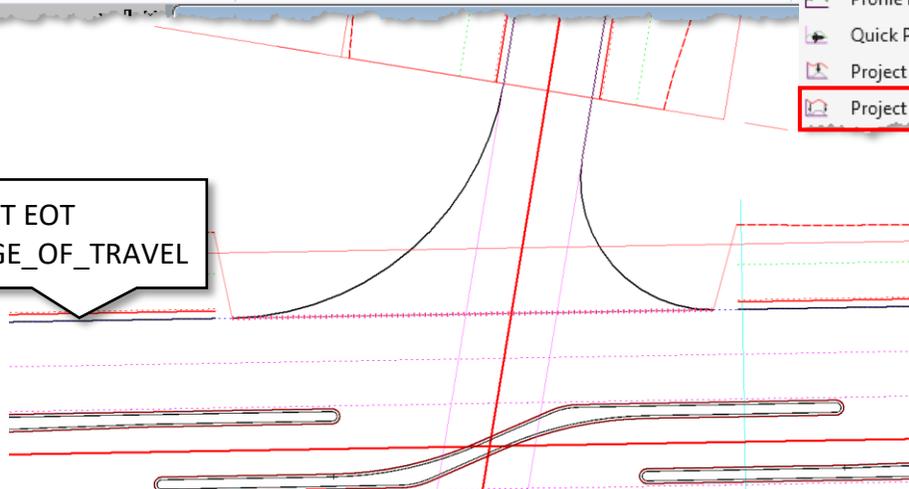


12. Create Terrain Model for the Northern side of the Y8/Y18 Intersection

A. Select the **Project Profile Range To Element** tool (**Geometry > Vertical > Profile Creation > Project Profile Range To Element**) and click the **Y8 Left EOT** line when prompted to **Select Element To Project**. When selecting the **Y8 Left EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



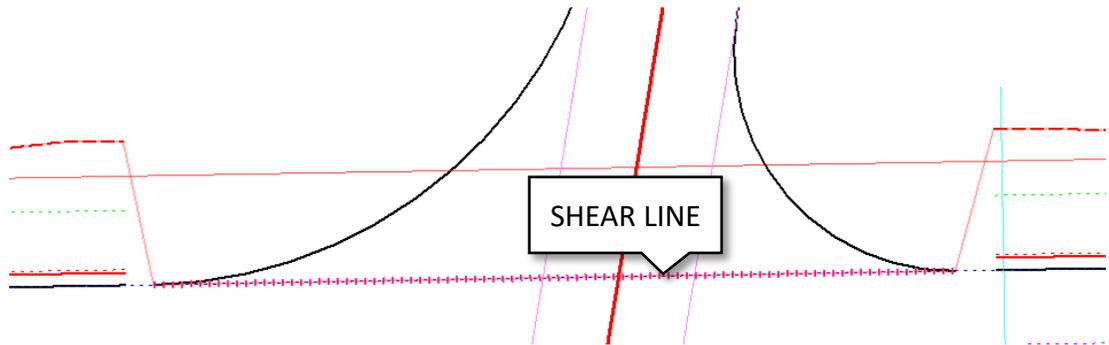
Y8 LEFT EOT
P_RDY_TL_EDGE_OF_TRAVEL



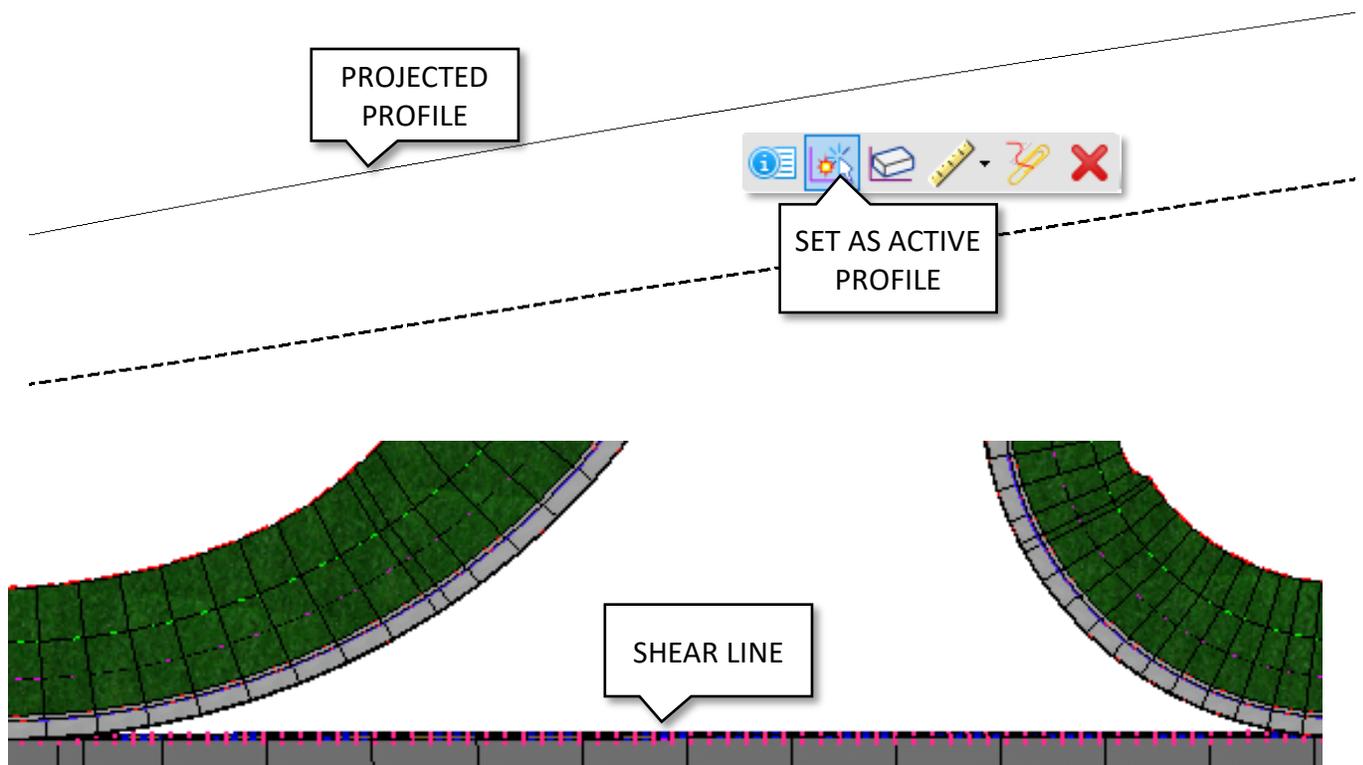


Module 11 - Detailed Modeling

- B. When prompted to **Select Plan Element To Project Onto**, select the **Shear Line** as shown below. Use the **Alt-Key** to Lock the **Start/End** locations of the **Shear Line** and click through the prompts to finalize the profile projection.



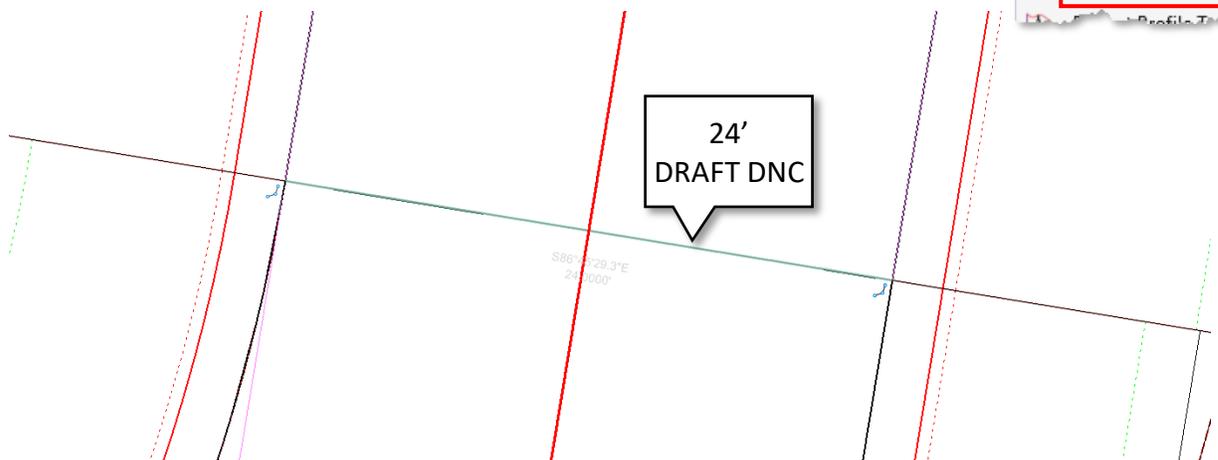
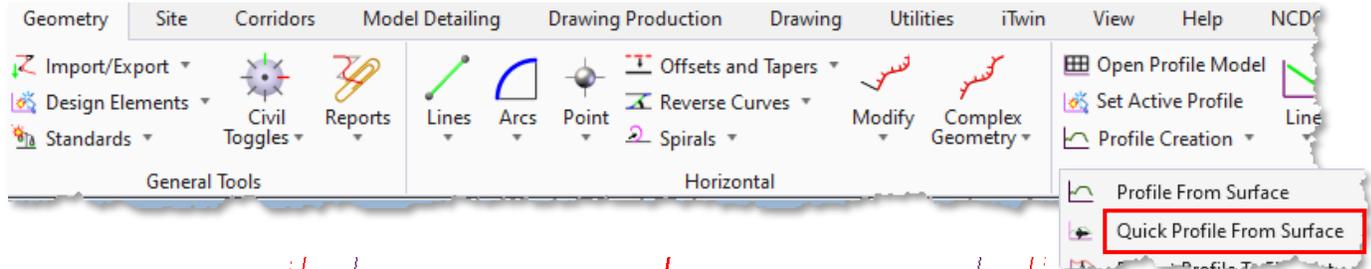
- C. Open the **Shear Line Profile View** and set the **Projected Profile To Active**. This will add it to the **3D Model** as shown below.



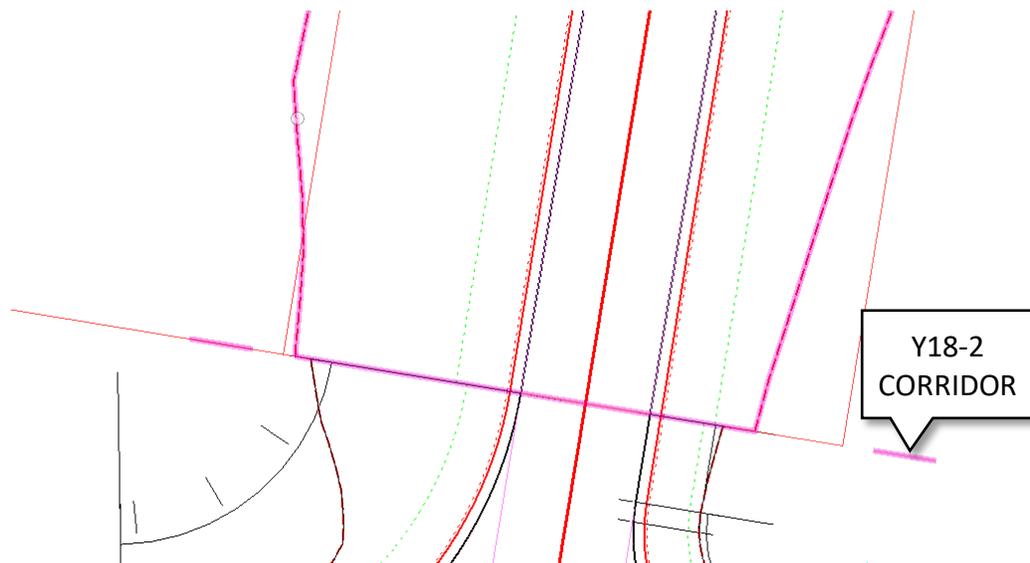


Module 11 - Detailed Modeling

- F. Next, select the **Quick Profile From Surface** tool (**Geometry > Vertical > Profile Creation > Quick Profile From Surface**) and select the **24' Draft_DNC** line placed in the previous step when prompted to **Locate Reference Element**.



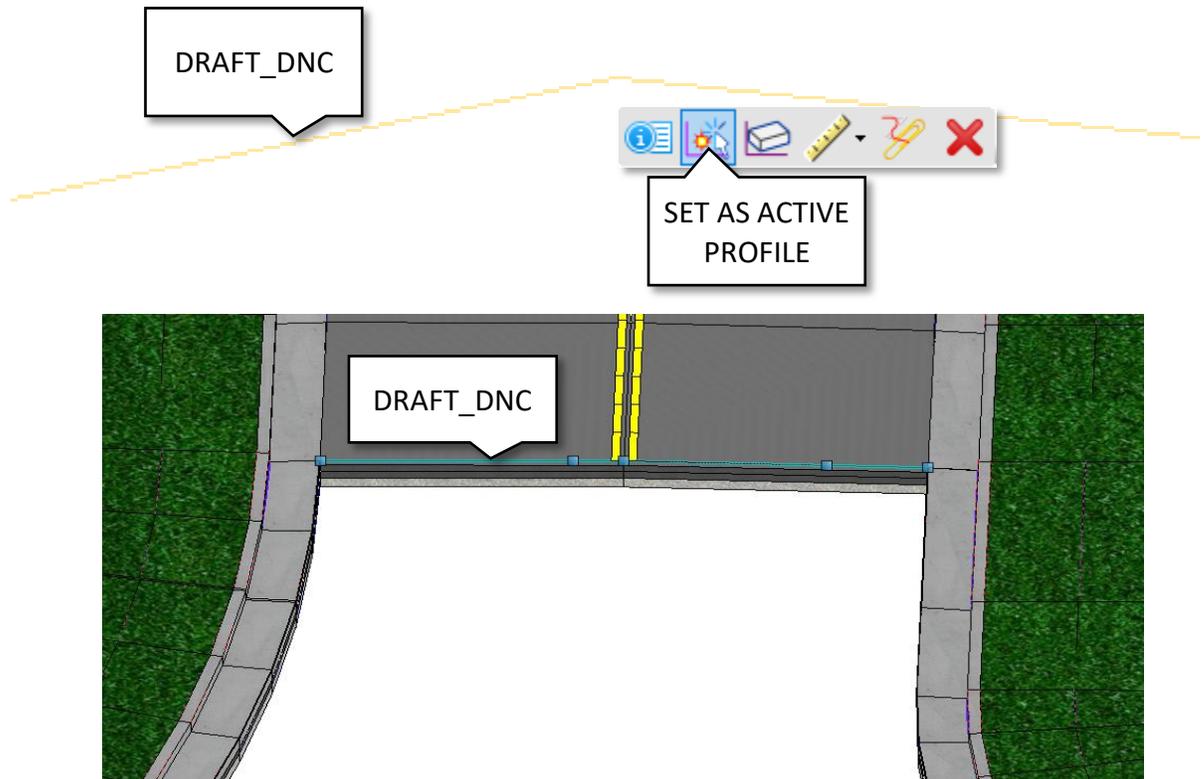
- G. Then, select the **Y18-2 Corridor** when prompted to **Locate Reference Surface**. **Right-click** to reset and finalize the command.



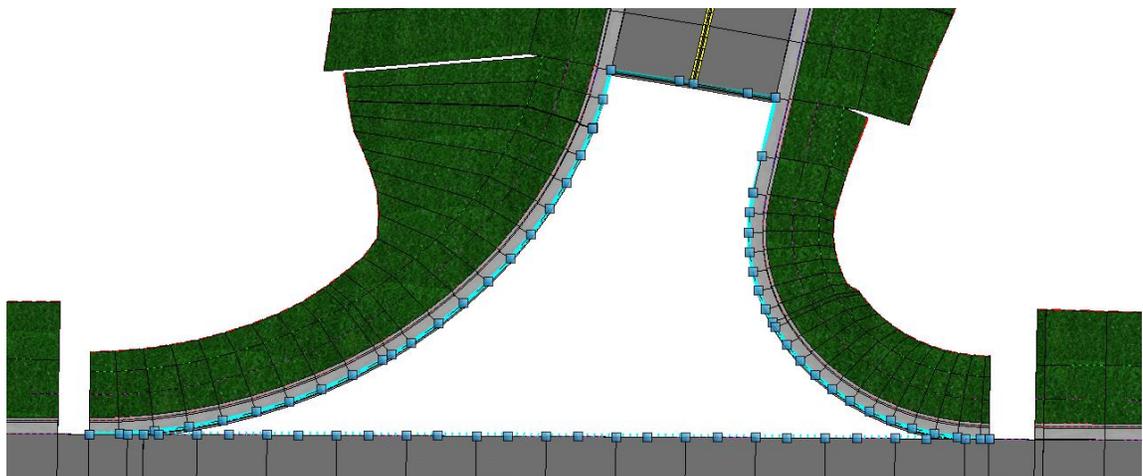


Module 11 - Detailed Modeling

- H. Open the **Draft_DNC Profile View** and set it as the **Active Profile**. This will add it to the **3D Model** as shown below.



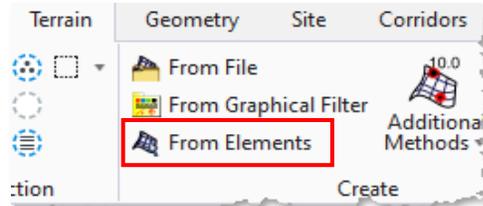
- I. Next, select the **Element Selection** tool (**Terrain > Selection > Element Selection**) and select the **Linear Elements** from the **Northern Side** of the **Y8/Y18 Intersection** as shown below.





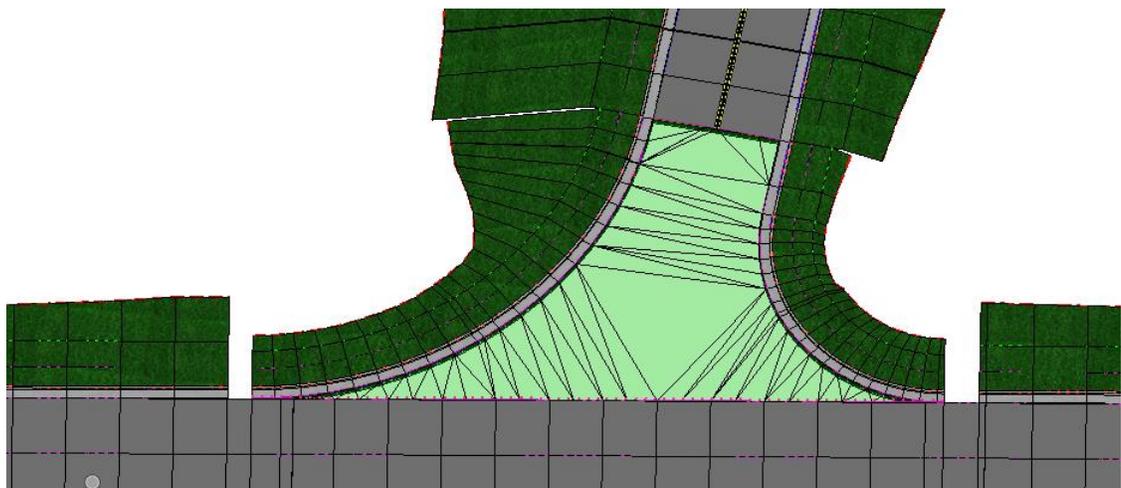
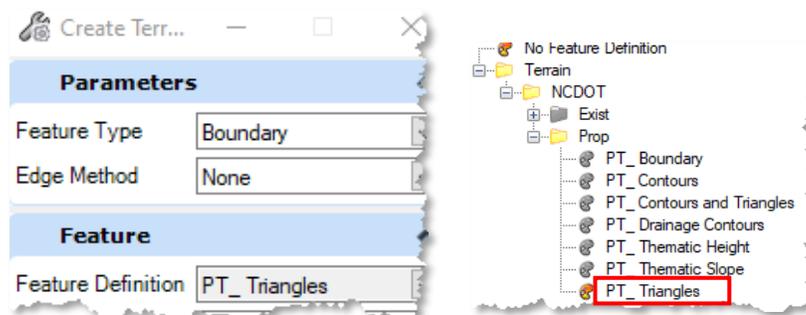
Module 11 - Detailed Modeling

- J. Then, select the **Create Terrain From Elements** tool (**Terrain > Create > From Elements**) as shown below.



- K. Still keeping the **Y8/Y18 Intersection** elements selected, key the following parameters into the **Create Terrain From Elements** dialog and **Left-Click** through the prompts to create the **Terrain Model** as shown below.

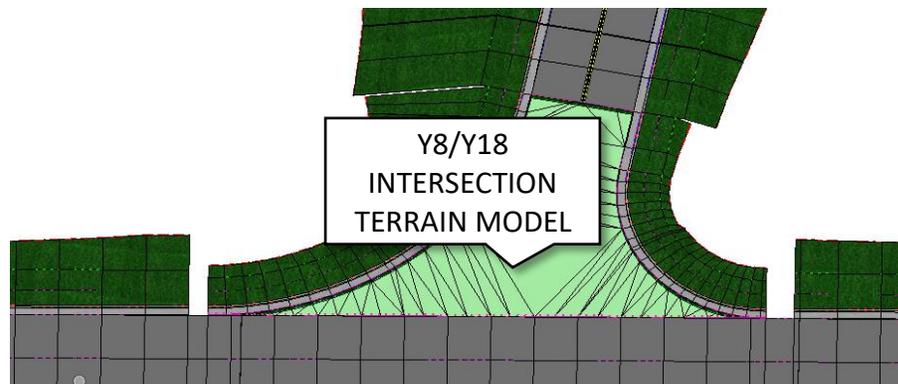
- **Feature Type = Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



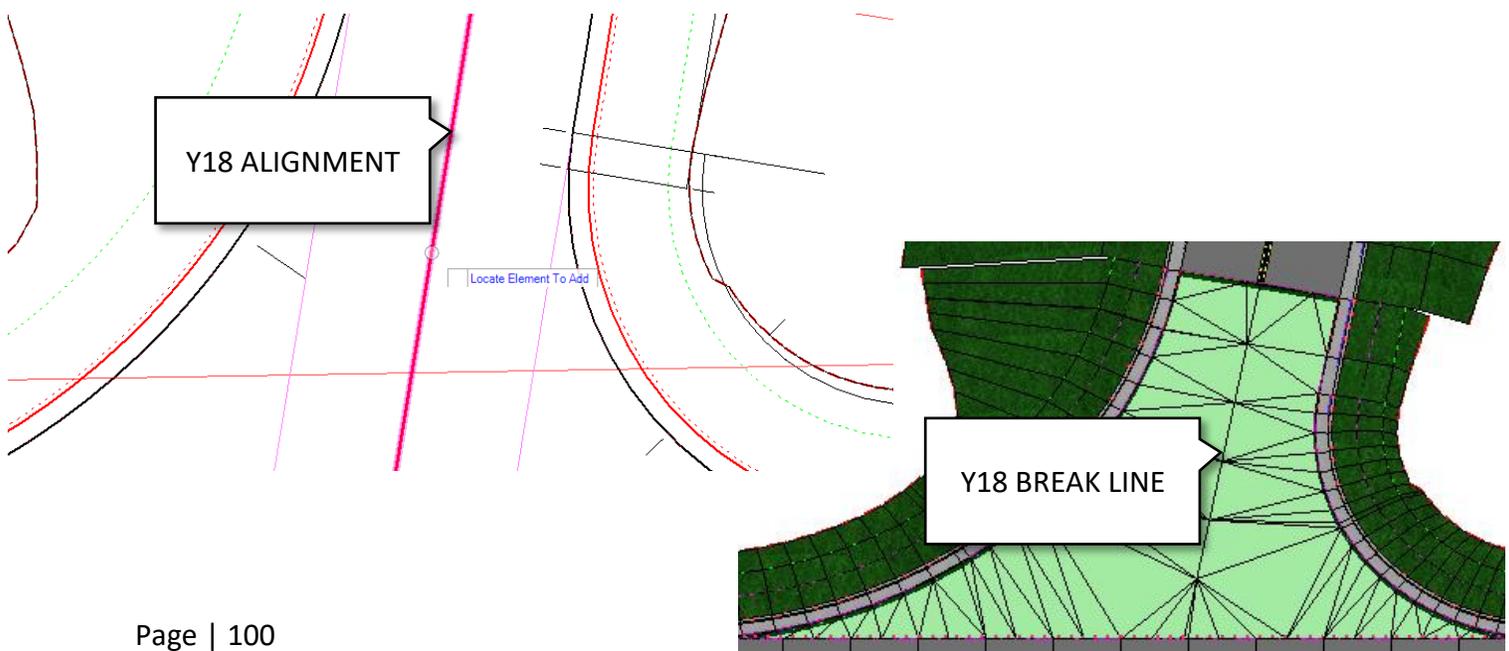


Module 11 - Detailed Modeling

- L. Next, select the **Add Features** tool (**Terrain > Edit > Feature Management > Add Features**), set the **Feature Type** to **Break Line** and select the **Y8/Y18 Intersection Terrain Model** when prompted to **Locate Terrain Model To Add Elements**.



- M. When prompted to **Locate Element To Add**, select the **Y18 Alignment** and **Click** through the prompts to add the **Break Line** to the **Terrain Model** as shown below.

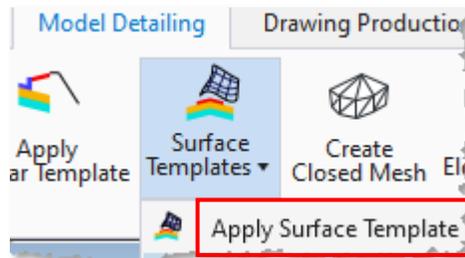




Module 11 - Detailed Modeling

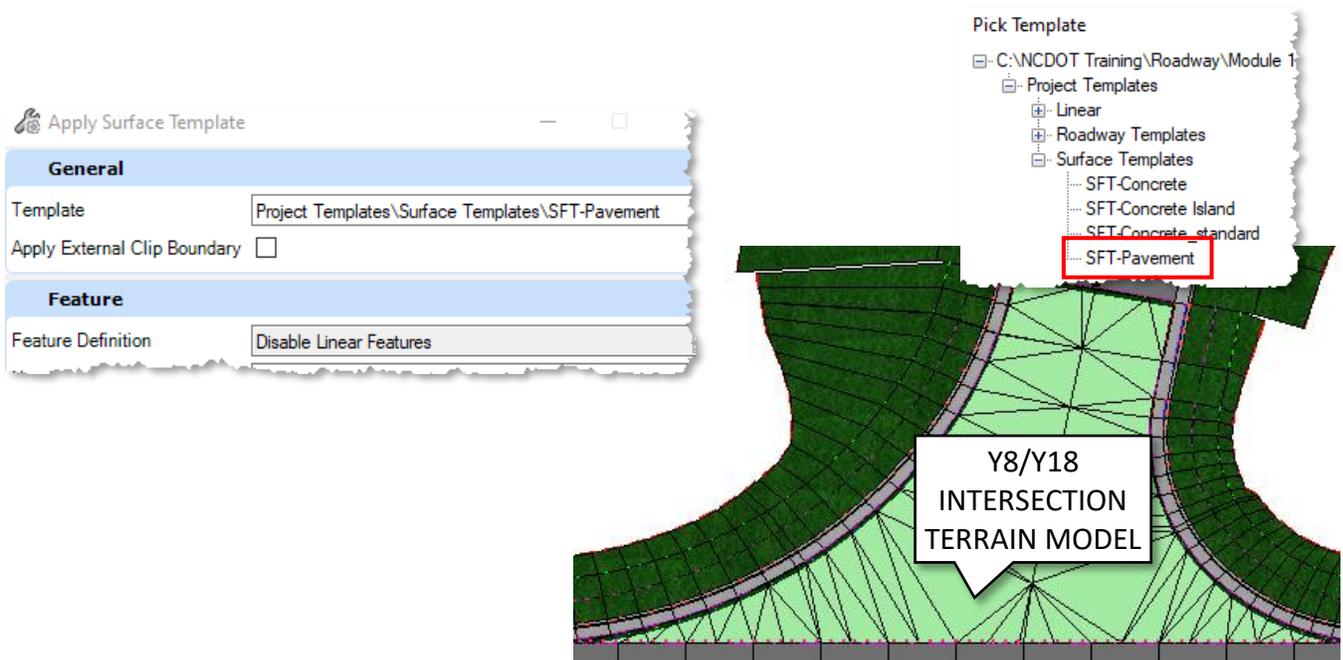
13. Apply Pavement Surface Template to the Y8/Y18 Intersection Terrain Model

- A. Select the **Apply Surface Template** tool (**Model Detailing > Surface Templates > Apply Surface Template**) as shown below.



- B. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Y8/Y18 Intersection Terrain Model** when prompted to **Locate Terrain Model**.

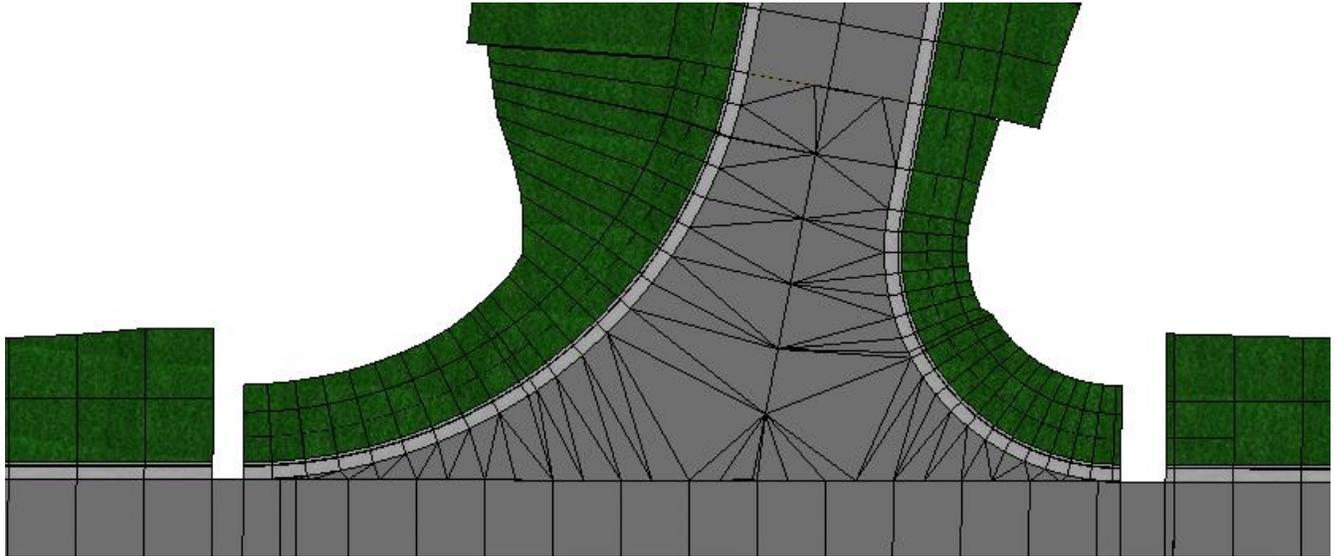
- **Template** = **SFT-Pavement**
- **Feature Definition** = **Disable Linear Features**



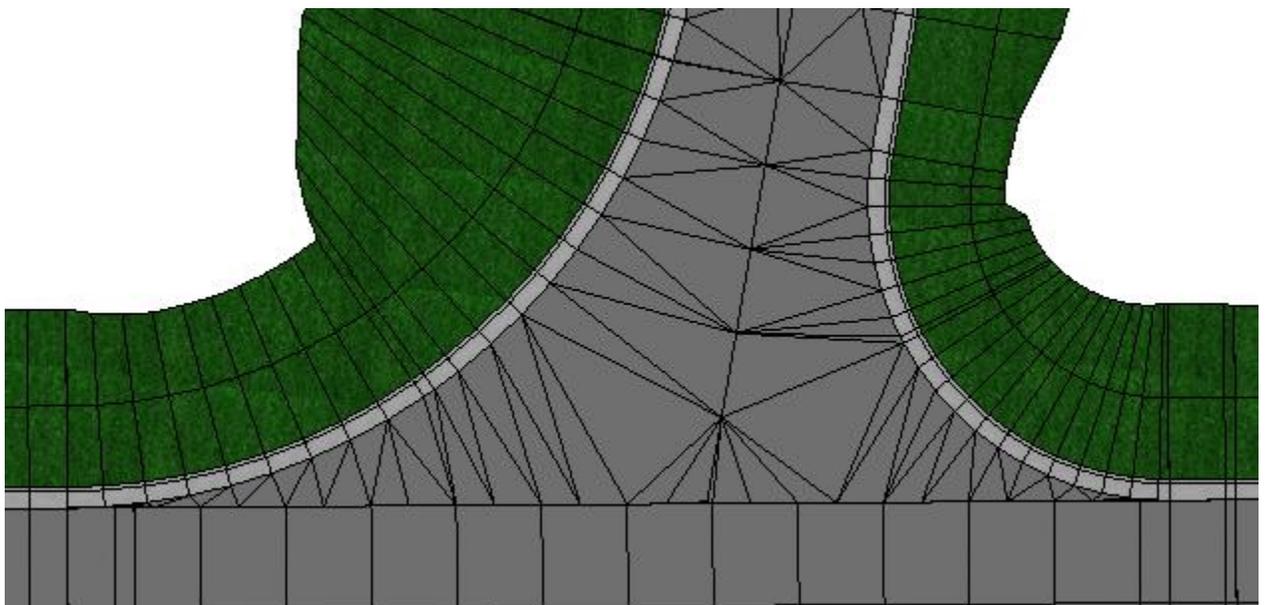


Module 11 - Detailed Modeling

- C. Continue clicking through the prompts to apply the **SFT-Pavement Surface Template** to the **Y8/Y18 Intersection Terrain Model** as shown below.



- D. Use a combination of **Key-Stations** and **Parametric Constraints** to seamlessly connect the **Y8/Y18 Intersection** to the **Y8 Corridor** as shown below.

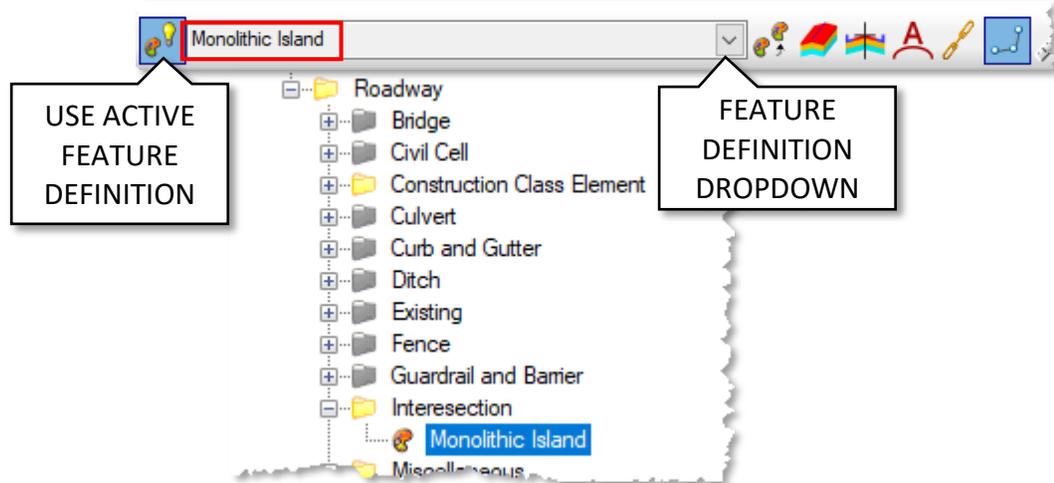




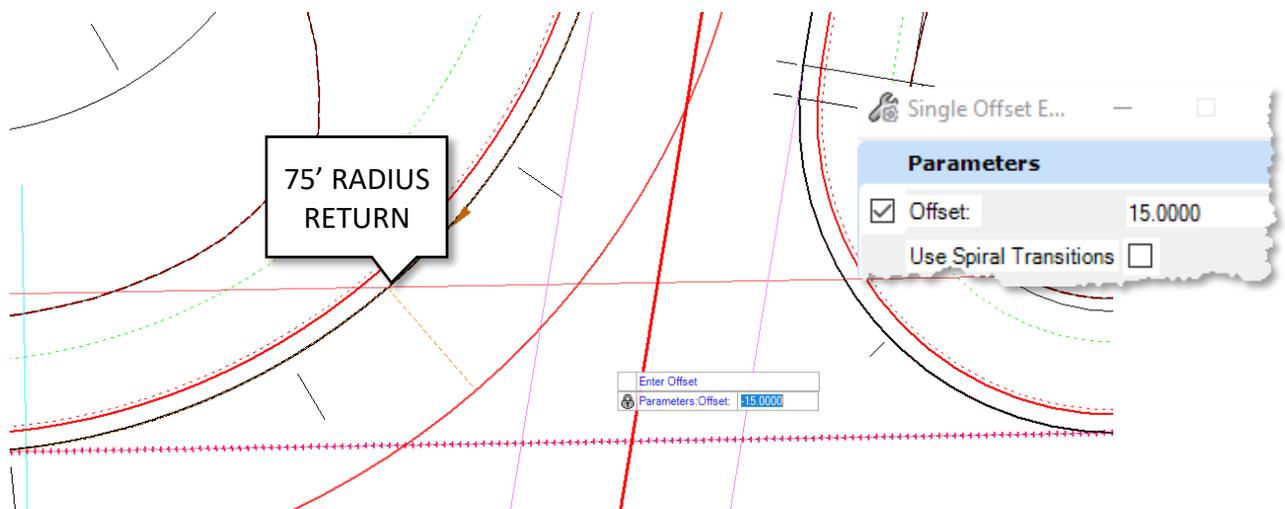
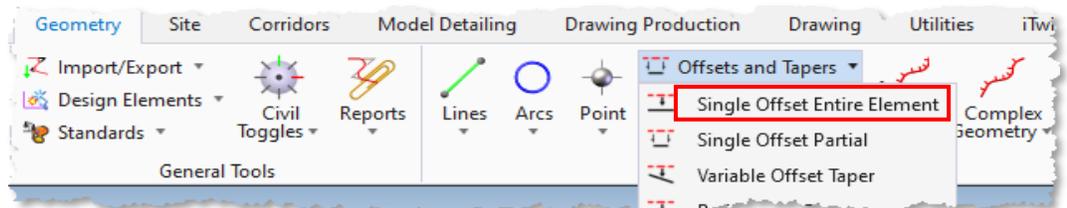
Module 11 - Detailed Modeling

14. Add Concrete Channelization Island to the Northern side of the Y8/Y18 Intersection

- A. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and then select the **Monolithic Island** feature from the **(Linear > Roadway > Intersection)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



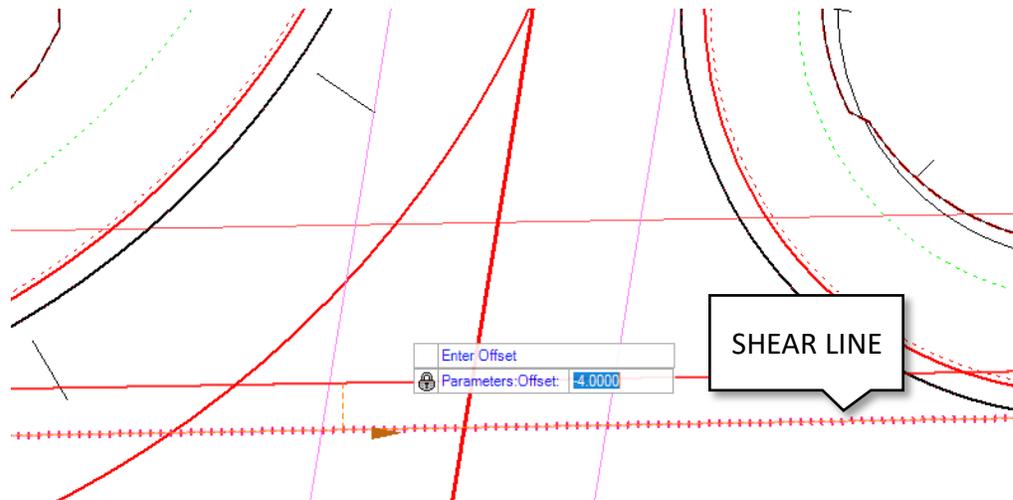
- B. Next, select the **Single Offset Entire Element** tool (**Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element**), set the **Offset** parameter to **15.0000** and select the **75' Radius Return** to place one (1) edge of the **Concrete Island** as shown below.





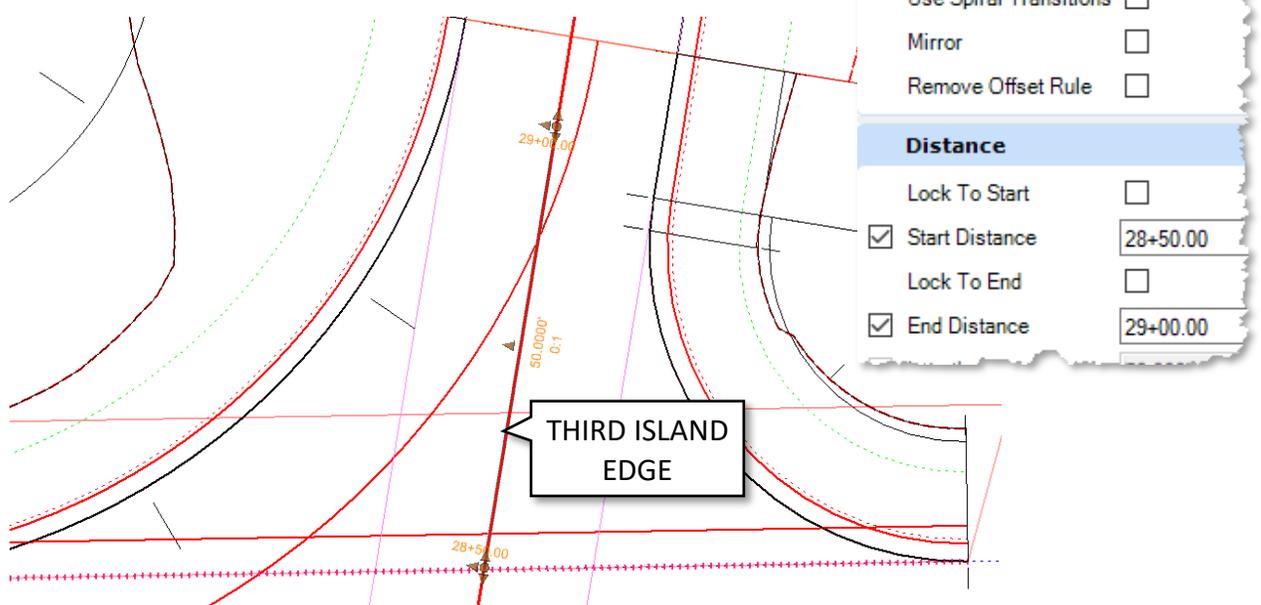
Module 11 - Detailed Modeling

- C. Then, continue using the **Single Offset Entire Element** tool and **Offset** the **Shear Line** by 4' as shown below.



- D. For the third **Concrete Island** edge, select the **Single Offset Partial** tool (**Geometry > Horizontal > Offsets and Tapers > Single Offset Partial**), set the following parameters within the **Single Offset Partial** dialog, select the **Y18 Alignment**, and click through the prompts to place the third **Concrete Island** edge.

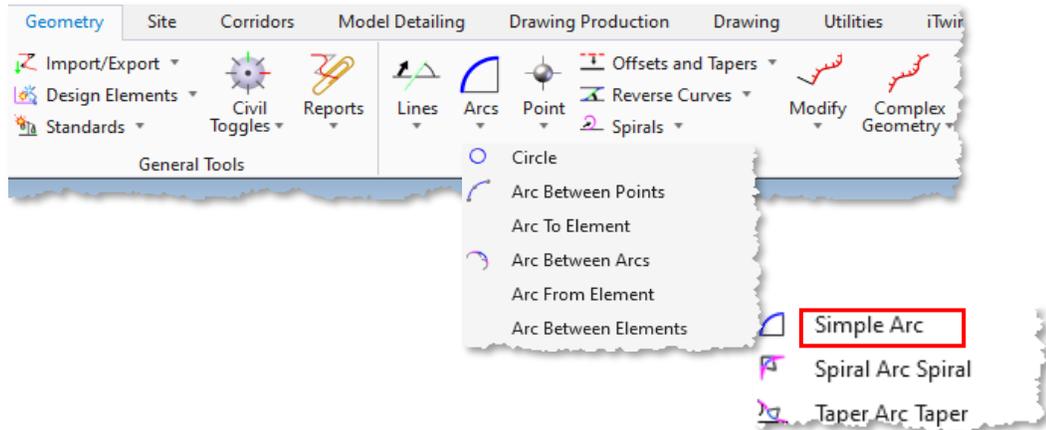
- **Offset = 0.0100**
- **Start Distance = 28+50.00**
- **End Distance = 29+00.00**



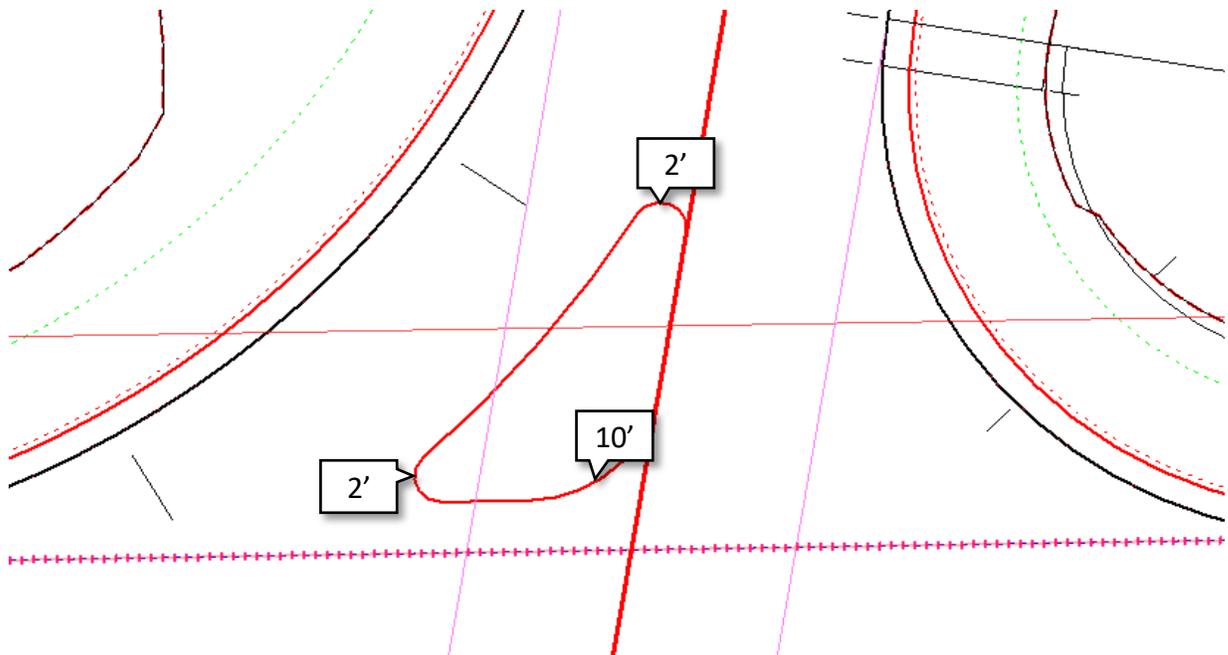


Module 11 - Detailed Modeling

- E. Next, select the **Simple Arc** tool (**Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc**). Set the **Trim/Extend** parameter to **Both** within the dialog as shown below.



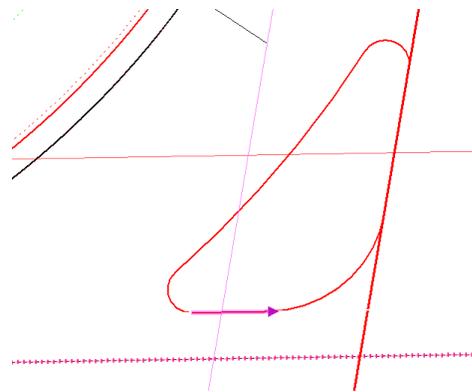
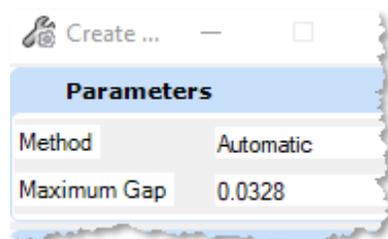
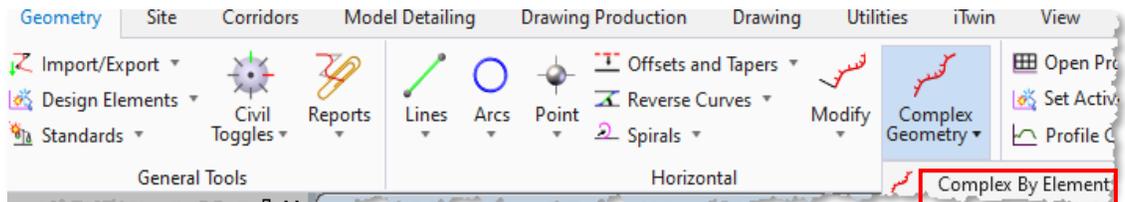
- F. Now, use the **Simple Arc** tool to fillet the three (3) corners of the **Concrete Island** as shown below.



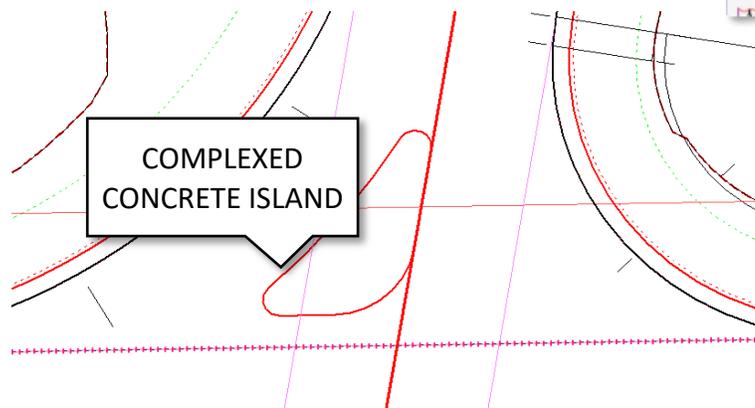
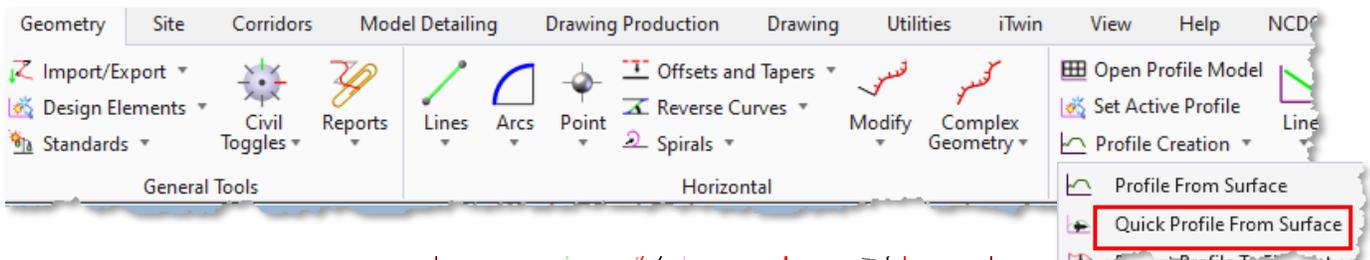


Module 11 - Detailed Modeling

- G. Use the **Complex By Element** tool (**Geometry > Horizontal > Complex Geometry > Complex By Element**), set the **Method** to **Automatic** and **Complex** the individual 2D elements that make up the **Concrete Island** as shown below.



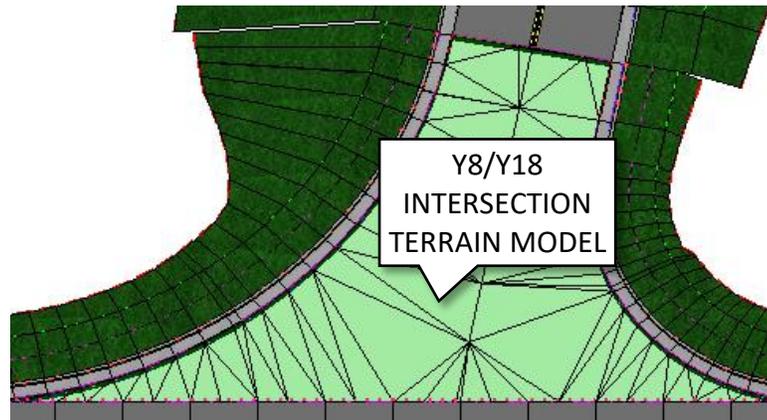
- H. Next, select the **Quick Profile From Surface** tool (**Geometry > Vertical > Profile Creation > Quick Profile From Surface**) and select the **Complexed Concrete Island** when prompted to **Locate Reference Element**.



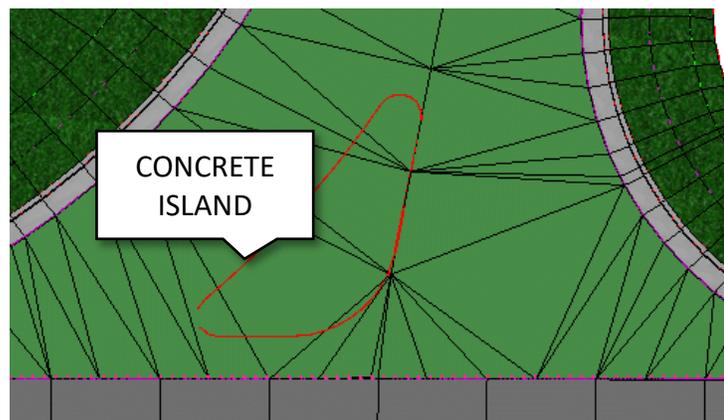


Module 11 - Detailed Modeling

- I. Then, select the **Y8/Y18 Intersection Terrain Model** when prompted to **Locate Reference Surface**. **Right-click** to reset and finalize the command.



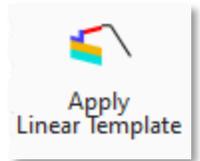
- J. Open the **Concrete Island Profile View** and set it as the **Active Profile**. This will add it to the **3D Model** as shown below.



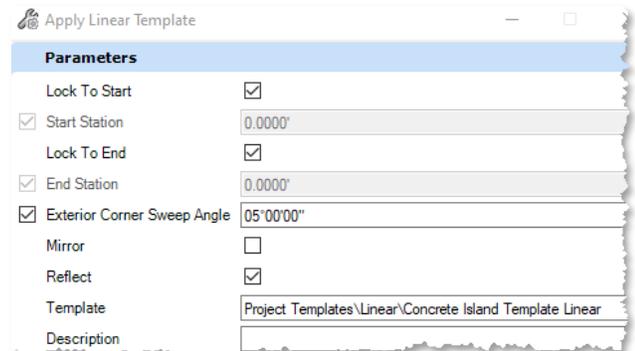
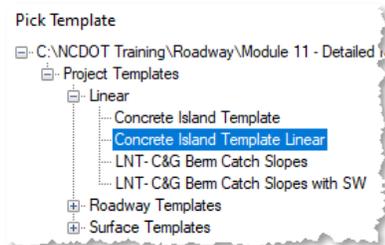


Module 11 - Detailed Modeling

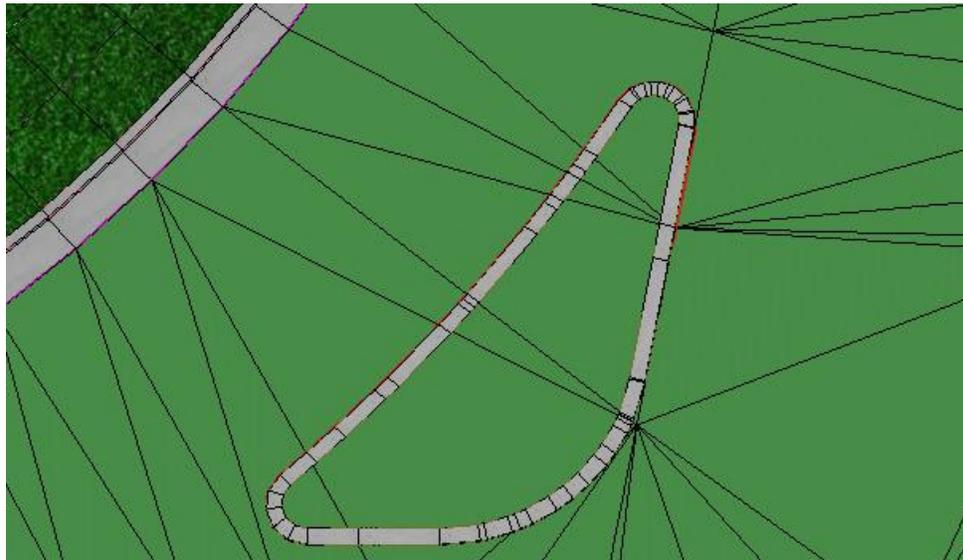
- K. Next, select the **Apply Linear Template** tool (**Model Detailing > Apply Linear Template**) and key the following parameters into the Apply Linear Template dialog.



- **Start = Lock To Start**
- **End = Lock To End**
- **Exterior Corner Sweep Angle = 05° 00' 00"**
- **Template = Concrete Island Template Linear**
- **Feature Definition = Design**



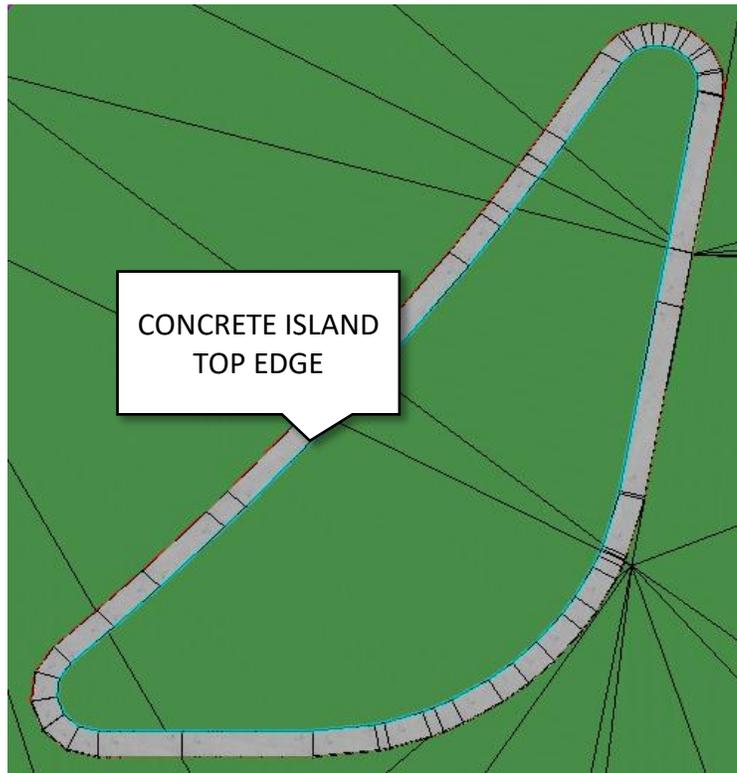
- L. When prompted to **Locate Element To Apply Template**, select the **Concrete Island** and place the **Linear Template** as shown below.



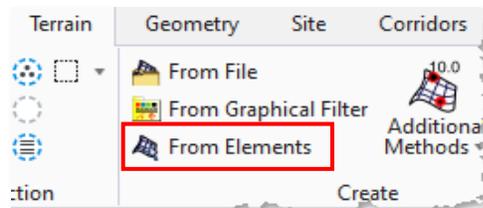


Module 11 - Detailed Modeling

- M. Next, select the **Element Selection** tool (**Terrain > Selection > Element Selection**) and select the **Top Edge** of the **Concrete Island** as shown below.



- N. Then, select the **Create Terrain From Elements** tool (**Terrain > Create > From Elements**) as shown below.

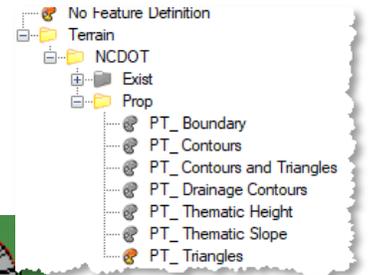
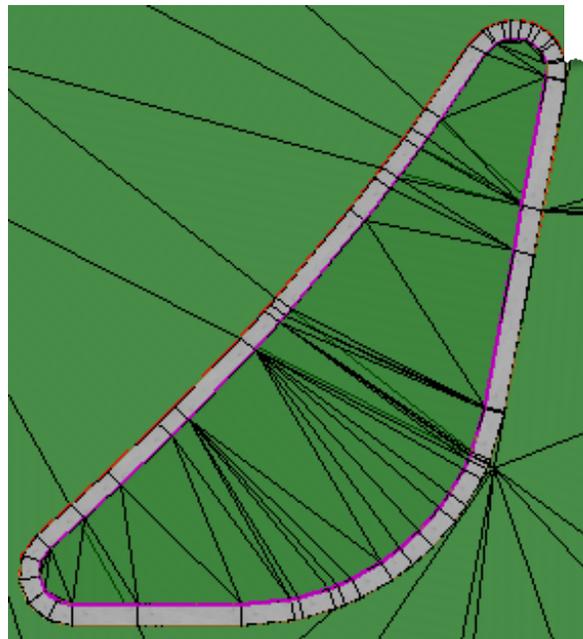
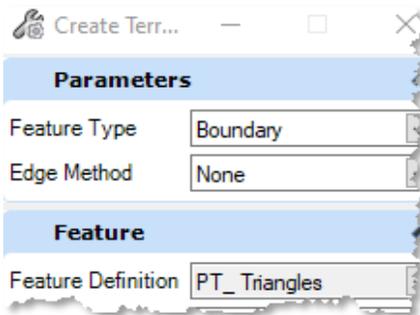




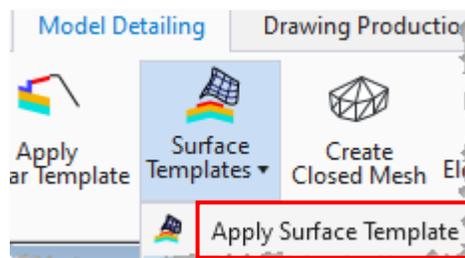
Module 11 - Detailed Modeling

- O. Still keeping the **Concrete Island** elements selected, key the following parameters into the **Create Terrain From Elements** dialog and **Left-Click** through the prompts to create the **Terrain Model** as shown below.

- **Feature Type = Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



- P. Select the **Apply Surface Template** tool (**Model Detailing > Surface Templates > Apply Surface Template**) as shown below.

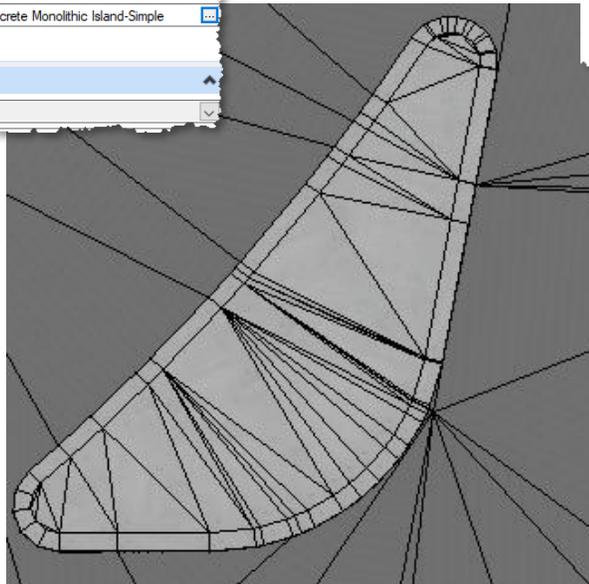
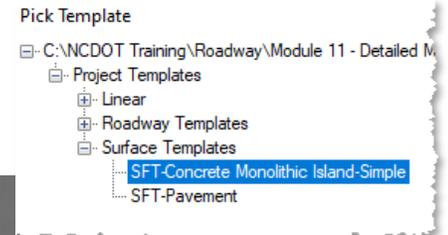
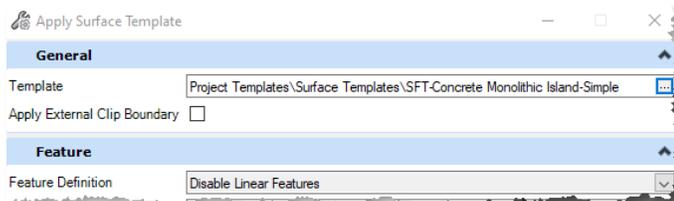




Module 11 - Detailed Modeling

Q. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Concrete Island Terrain Model** when prompted to **Locate Terrain Model**. This finalizes the **Concrete Island**.

- **Template = SFT-Concrete Monolithic Island-Simple**
- **Feature Definition = Disable Linear Features**



15. Finalize the Directional Crossover with Median U-Turns Modeling by using a combination of Key-Stations and Parametric Constraints to seamlessly connect all the Corridors as shown below.

