Chapter 11

Civil Cells

11.1 OBJECTIVES

- Understand the fundamental geometric principles behind Civil Cells
- Be aware of all Civil Cell commands
- Be familiar with VDOT's Civil Cell library
- Understand the reference element requirements of each Civil Cell type in VDOT's library
- Place and edit each Civil Cell type in VDOT's library
- Perform Horizontal and Vertical edits to match project specific geometry
- Understand and manage Surface and Linear Templates used in Civil Cells

11.2 CIVIL CELL OVERVIEW

Corridor Models use templates placed along an alignment to create a 3d model. There are areas in design where templates placed 90 degrees from the alignment will not adequately model the intended design. Some of these areas include:

- Intersections
- Merging and diverging Ramps
- Driveways and accesses
- Traffic calming features
- Traffic islands and pedestrian refuges
- Roundabouts
- Ponds
- Building pads

These areas though can be modeled with available Horizontal, Vertical, Terrain, Linear, and Surface template tools or much more simply, with a Civil Cell comprised of elements generated from these tools.

A civil cell is a collection of civil elements - geometry, templates, and terrain models - which can be placed repeatedly in a design. The collection of civil elements will have been created relative to one or more reference elements. When you place the civil cell, you choose the new reference elements, and a new collection of civil elements is then created relative to them. A civil cell can therefore be thought of as a copy of the original collection of civil elements, relative to the geometry of the new reference elements. Civil cells can be 2D or 3D. They can consist of 2D (plan) elements only, or 3D elements (2D elements with profiles), and can include terrains, linear templates, area templates, and simple corridors.

When the new civil elements are created, all of the rules associated to them are also created. This means that the new civil elements retain their relationships, both with each other and with the reference elements, and therefore know how to react when these relationships change. In addition, the Civil and MicroStation toolsets can still be used on the new civil elements, to adjust and further refine the design as required, because there is no difference between a civil element created by a civil tool, and one created by placing a civil cell.

Civil cells can save a lot of time and effort, because they replicate the complete series of steps needed to create the civil elements. They also help to ensure compliance with design standards, by making a civil cell available to the design team.

11.2.1 Civil Cell Library

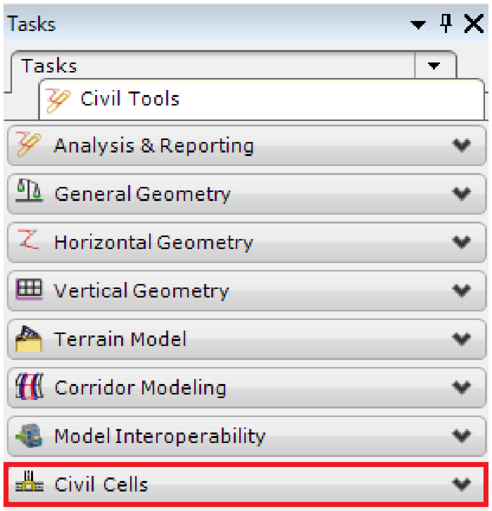
Consistently needed Civil Cells are developed and maintained in a Civil Cell library (*.DGNLIB). Generally, similar type Civil Cells are contained in one DGNLIB and all are displayed for use by users when selecting the Place Civil Cell command. VDOT's Civil Cell library will expand as Civil Cell needs are identified but the current Civil Cell categories are shown below:

- Abutment Replacement.dgnlib
- Bridge Pier.dgnlib
- Connector.dgnlib
- T Cells_Connections with CG-6 & Sidewalk.dgnlib
- T Cells_Connections with CTA Shoulders & CS-4.dgnlib
- T Cells_Connections with Paved + Graded Shoulders & CS-4.dgnlib
- T Cells_Core Defined Point Back Connections.dgnlib
- T Cells_Core Median Connections.dgnlib
- T Cells_Core Static Length Connections.dgnlib
- T Cells_Median Connections with CTA Shoulders & CS-4.dgnlib
- T Cells_Median Connections with Paved + Graded Shoulders & CS-4.dgnlib
- VDOT_ADA.dgnlib
- VDOT_Basins.dgnlib
- VDOT_Drives.dgnlib
- VDOT_Interchanges.dgnlib
- VDOT_Medians.dgnlib
- VDOT_Roundabouts.dgnlib
- VDOT_T-Intersections.dgnlib

NOTE: The T Cells category will eventually be removed from the library and it is recommended that the cells available in VDOT_T-Intersections.dgnlib be used for T-Intersection modeling.

11.2.2 Civil Cell Commands

Civil Cells commands are located in the Civil Tools task bar. The commands available are shown and described below.




Place Civil Cell Activates the browser to select the civil cell to be placed. Civil cells can be selected from the active dgn's graphics, or from the browser that provides a schematic preview of available civil cells from all design models in the current dgn, or via the currently defined configuration.


Process Civil Cell Reprocesses all linear templates and templates for the selected civil cell. This may be necessary where the active terrain has been changed or where reference file interaction needs to be refreshed

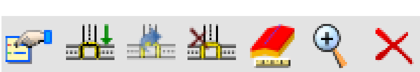

Create Civil Cell Activates the command. Prompts you to name the new civil cell and select reference elements. The dependent elements are identified and highlighted for verification.


Drop Civil Cell Activates the drop command and targets civil cells. The civil cell is dropped upon selection. It's best practice to not drop a civil cell during the design process so all elements within the civil cell remain categorized under the civil cell but it is a viable option if underlying geometry needs to be replaced.

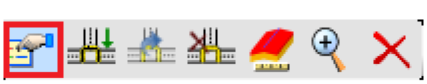
NOTE: All these commands will be detailed more in the following sections

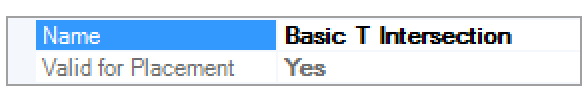
11.2.3 Context Menu

All the commands described above as well as a few more are available from the Context Menu of a civil cell.



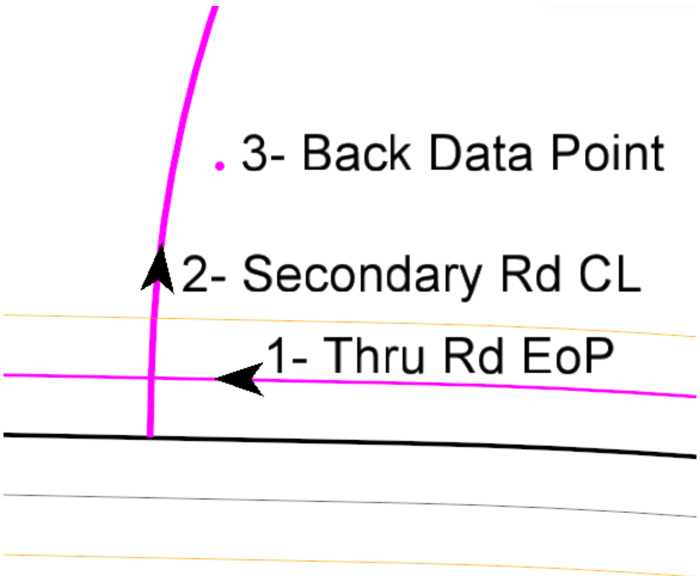
Properties shows the name and whether the cell is valid for placement.





11.2.4 Reference Elements

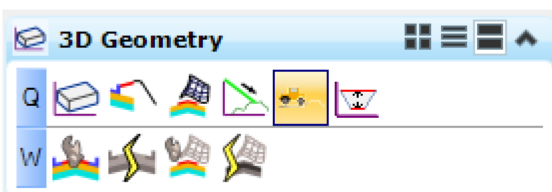
Civil Cells require "reference" elements for placement. For example, The T Intersection cells require the following elements be selected for placement.



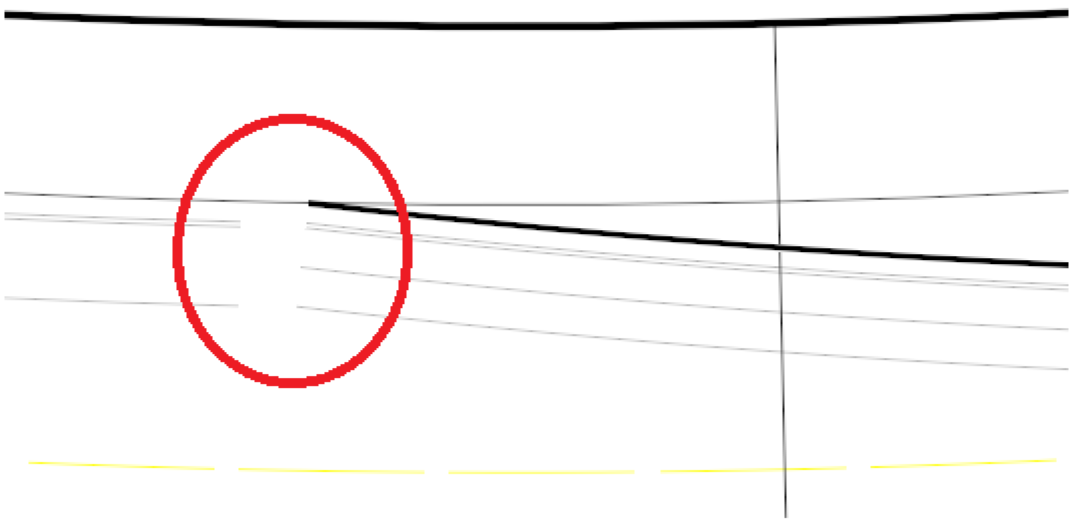
These elements may or may not have the requirement of being profiled but this is specified when the user is prompted to Locate Reference Element.

Some important notes about these reference elements:

1. It is ideal to turn off any reference files prior to placing the Civil Cells so non-profiled underlying elements are not inadvertently selected
2. Template produced graphics in the 2d view is ideal for being used as these reference elements. VDOT produces 2d graphics such as edge of pavement, shoulder, curb elements, etc. from templates. These are ideal to use as Civil Cell reference elements.
3. If template produced graphics is not available, use the following command (Plan by 3d) to generate 2d elements from 3d.



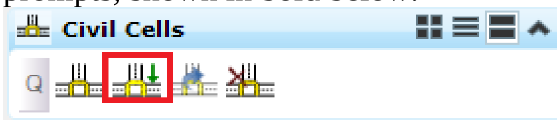
4. If there is a break in the templates graphics in the area where a Civil Cell is to be placed (See example below), use Horizontal commands to copy the template graphics, Vertical commands to profile (Project slope), trim to each other, and then complex both horizontally & vertically to build a reference element that is not broken.



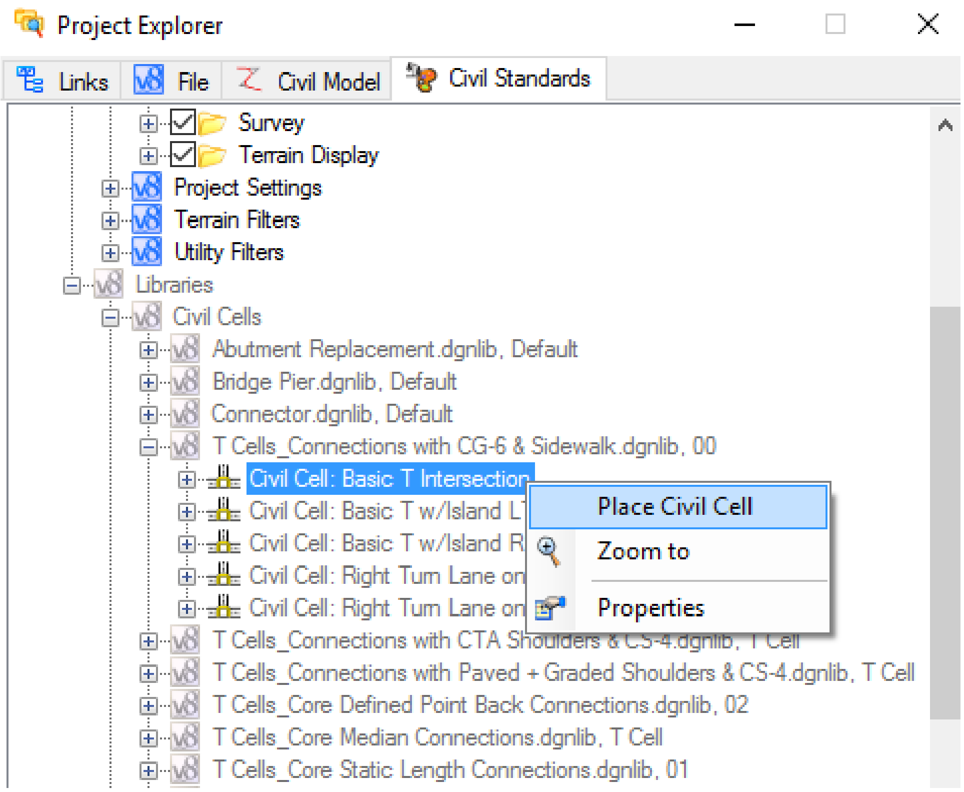
11.2.5 Placement of Civil Cells

Details of placing Civil Cells is discussed for each cell type in this document but placement can be initiated with one of the methods listed below.

- **To place a civil cell from the task list**, use the Place Civil Cell tool and follow the prompts, shown in bold below.



- **Project Explorer \ Civil Standards -** navigate to the civil cells library and right click the civil cell to place.



- **From a reference file.** If a Civil Cell has been created in a DGN file and this DGN file is referenced to the current DGN:

  1. Select Place Civil Cell from the Task Menu.
  2. Right Click when prompted with the Place Civil Cell dialog.
  3. Left Click the referenced Civil Cell when prompted to *Locate Civil Cell.*

- **From an existing civil cell created in the DGN**, use the Context Menu of the cell to select the Place Civil Cell option.

  NOTE: Once a Civil Cell is placed, it may no longer valid for subsequent placement although the Civil Cell can be dropped, re-created, and then placed successfully.

11.2.6 Civil Cells and Feature Definitions

Civil cell names used in a DGN file must be unique, and follows the same incremental naming used for civil feature naming. Civil cells provide a container for all geometry features and civil objects (linear templates, area templates and corridors) held inside.

Civil cells, acting as a unique container id, preserve feature definitions and feature names defined inside them, and carry the same names forward to each new instance. The resulting new features remain unchanged in each new instance of the civil cell because the civil cell names maintain the unique identification of all objects contained inside.

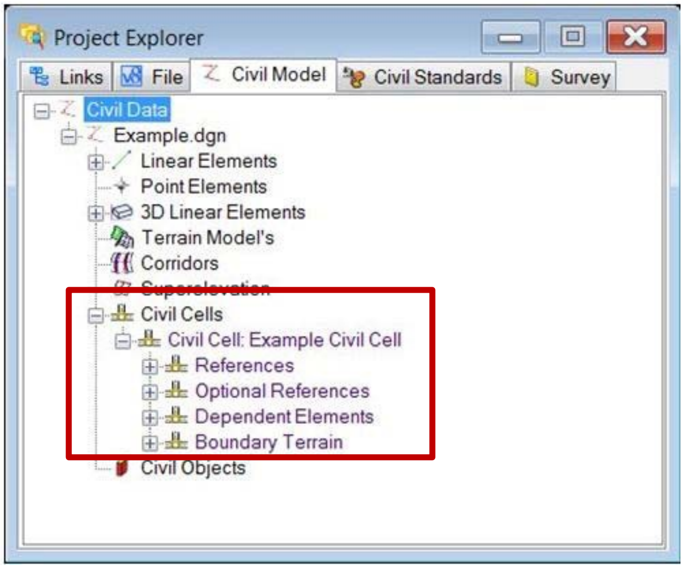
For example, horizontal geometry named "Approach" can reside in the current design model as well as any number of civil cells (for example in civil cells named Type 1, Type 2, and Type 3). Although in this example there are 4 instances of the same feature, they are all uniquely identifiable due to the additional instances residing in the civil cell whose name makes all instances unique. When the cells are dropped the features and objects contained in them are renamed according to the standard renaming increments and they adopt the next available name.

11.2.7 Exploring Civil Cells

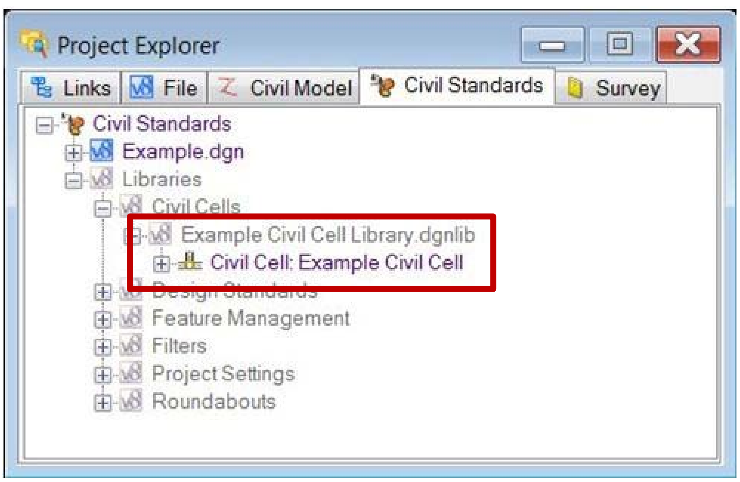
The content of a civil cell can be explored in several ways.

11.2.7.1 PROJECT EXPLORER

Cells in the current DGN file can be viewed in Project Explorer (Civil Model tab) and all related elements (references, dependent elements, etc,) are shown under each cell as shown below.



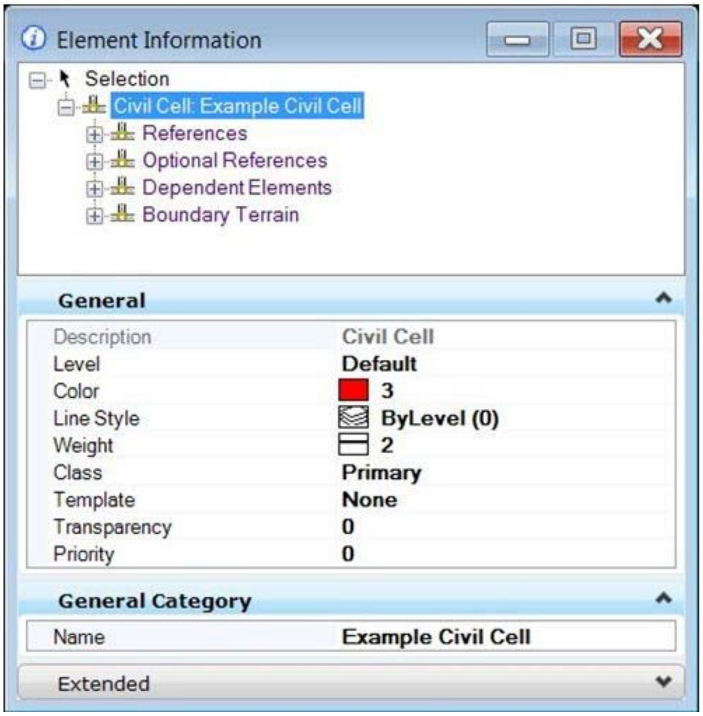
Any civil cells that have been loaded from DGNLibs are visible in the Civil Standards tab:



In both places, you can right click on the civil cell and choose the pop-up menu option to Place Civil Cell. You can also choose the Properties option from this pop-up menu, which invokes the Element Information dialog.

11.2.7.2 ELEMENT INFORMATION

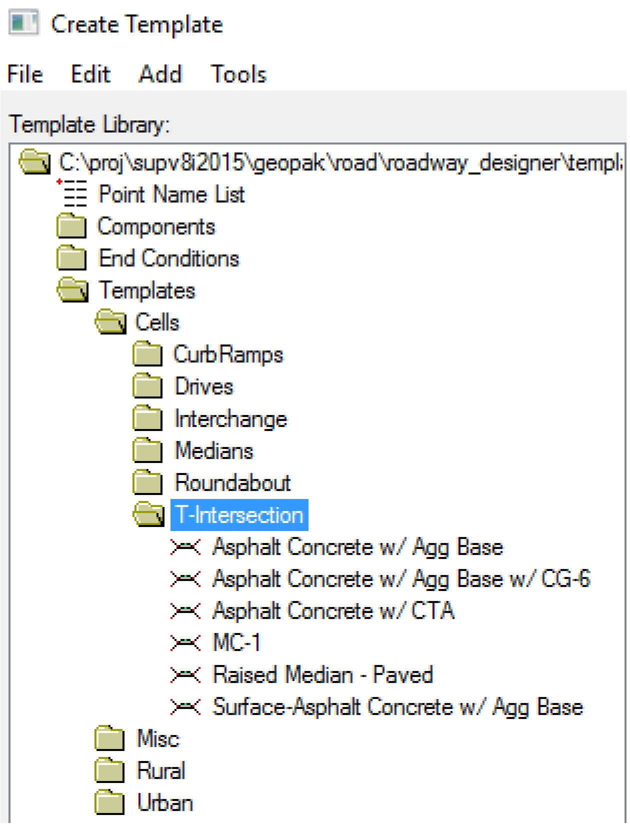
Element Information shows the structure of the civil cell:



You can change the name of the civil cell, and the names of the references, using this dialog.

11.2.8 Civil Cell Templates

As mentioned earlier, Civil Cells are comprised of Horizontal Geometry, Vertical Geometry, Linear Templates, and Surface Templates. The templates used in VDOT's Civil Cells are generally partial or modified templates created from VDOT's standard components and templates. They are available in VDOT's template library as shown below:

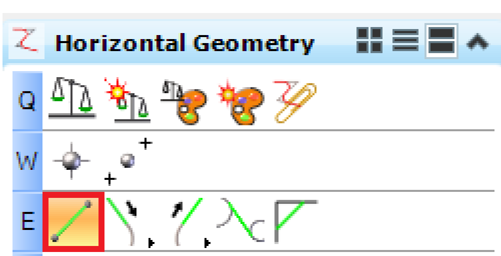


11.2.9 Creating a Civil Cell

The following steps show the tools and processes used to create a Civil Cell. In this exercise, we will create a simple T intersection. Open the DGN file **T-Cell.DGN** *(this is an empty 2D file which is provided in the dataset for this chapter.)*

11.2.9.1 BUILD THE REFERENCE ELEMENTS

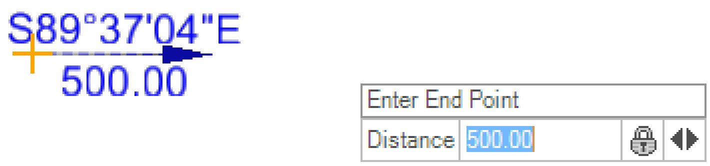
1. Choose the command **Line Between Points** from the Horizontal Geometry task menu.



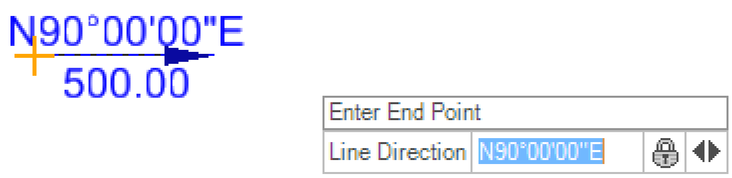
Although you can, do not set the feature or name on the Line Between Points dialog.

2. Left click (anywhere in DGN file as long as in positive x,y area) when prompted to *Enter Start Point.*

3. Enter **500’**when prompted to *Enter End Point* and hit the **Enter key** on your keyboard.



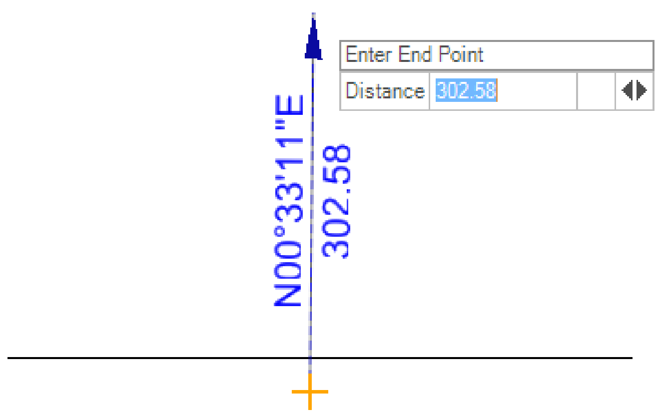
4. Hit the **left or right key** on your keyboard to change the *Enter End Point* dialog from the *Distance setting* to the *Line Direction setting*, enter **N90E**, and hit the **Enter key** on your keyboard. The line should be locked at 500’ and a bearing of N 90. E.



   This line represents the Edge of Pavement of the Thru Rd.

5. Left click to confirm the End Point.

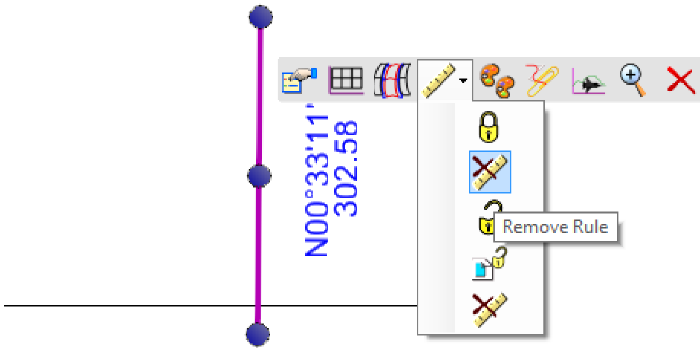
6. Remaining in the *Line Between Points* command, left click below the approximate center of the line just placed when prompted to *Enter Start Point* and then left click to create a line approximately 300’ in length and at a bearing of N 0. E.



   This line represents the Side Road CL. Building the reference elements needed for this civil cell is complete.

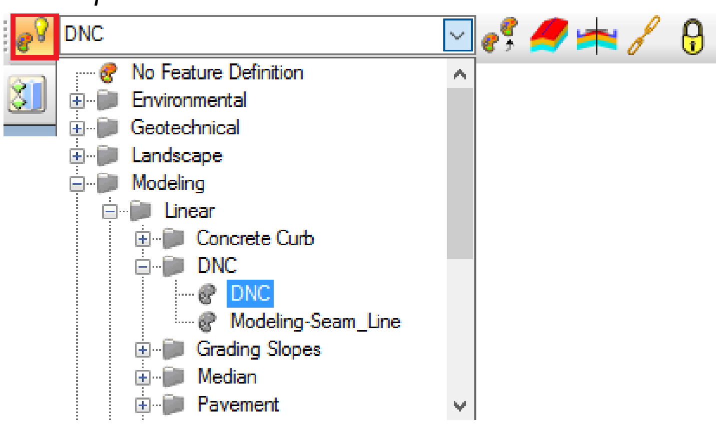
   NOTE: If you build a reference element off another reference element (for example, you snapped to the 1st line when placing the 2nd line above, you will need to remove rules from the 2nd line prior to creating the civil cell. Reference Elements cannot be dependent on one another.

7. Do not remove rules for this exercise because these elements are not dependent on one another, but select the 2nd line placed and from the context menu you can see how to remove a rule.



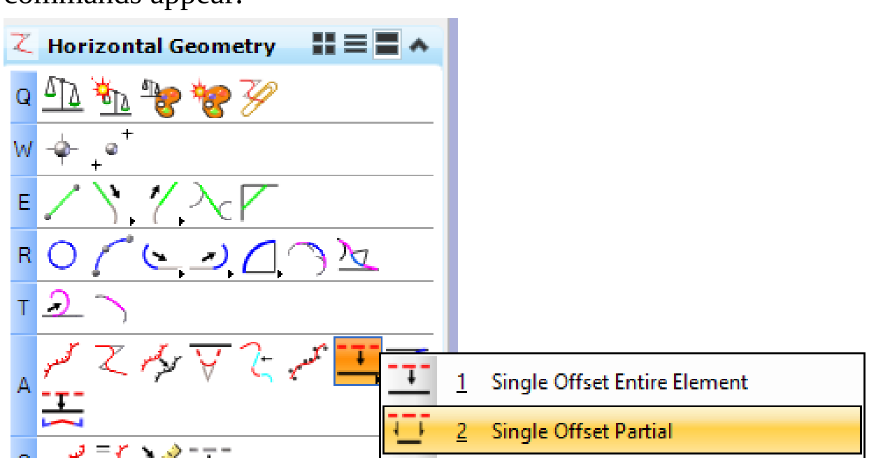
11.2.9.2 PLACING HORIZONTAL GEOMETRY

1. On the *Features Definition Toggle Bar*, **turn on Use Active Feature Definition** and set the *feature* to **DNC** as shown below.

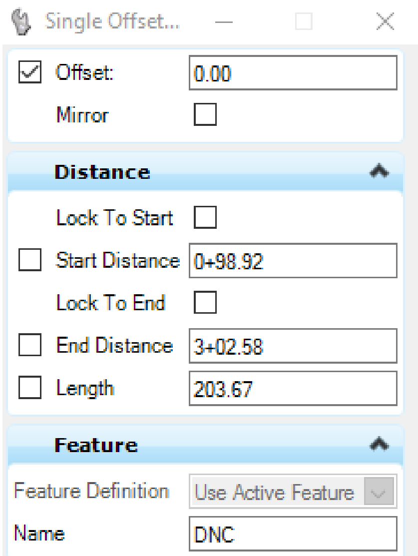


NOTE: This forces any Horizontal Geometry command to be pre-set with the selected feature.

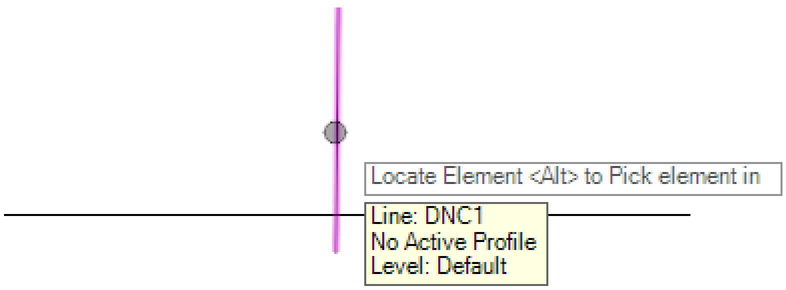
2. Hover over the Single Offset Entire Element command and press and hold your eft mouse button. Select the Partial Offset Parallel command when the underlying commands appear.



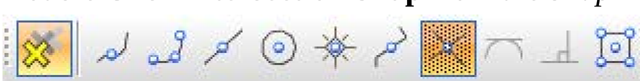
3. Enter **0** for *Offset* on the resulting dialog. The remainder of the dialog is not set at this point.



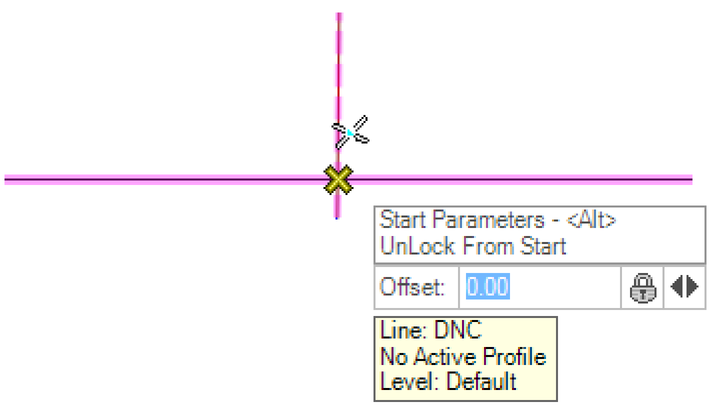
4. Select the N-S road (SideRoad) when prompted to **Locate Element.**



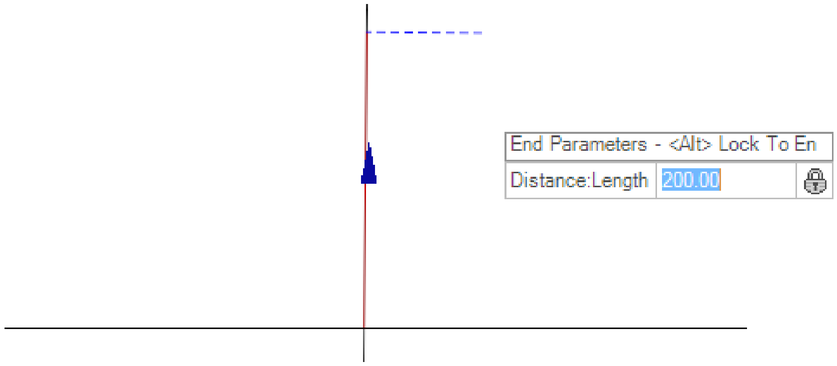
5. Double Click **Intersection Snap** from the *Snap* menu.



6. **Snap to the intersection** of the two lines and then left click when prompted for *Start Parameters.*

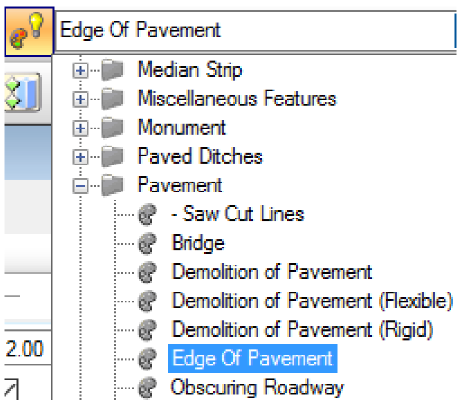


7. Hit the left or right key on your keyboard to move to the *Distance: Length* setting, enter **200’** for the length, and hit enter on your keyboard to lock this value.

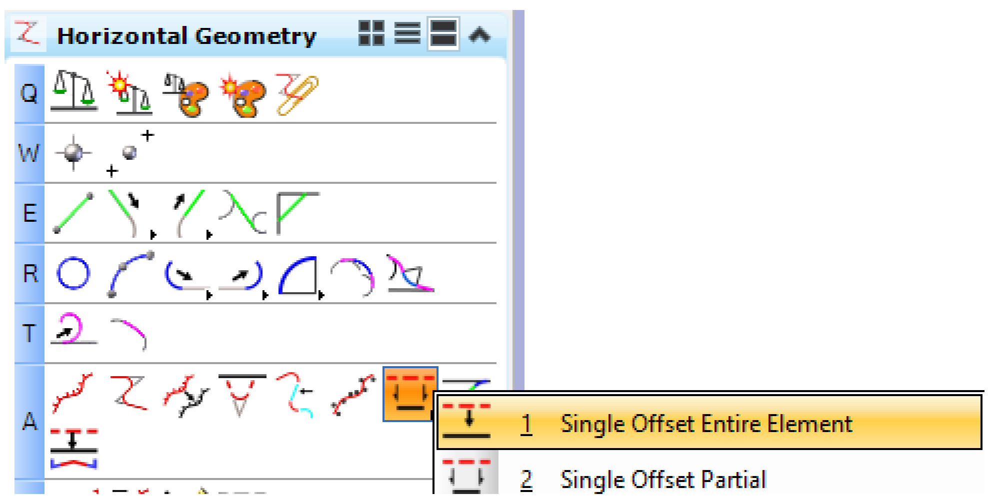


8. Left click to confirm the placement of the 200’ element.

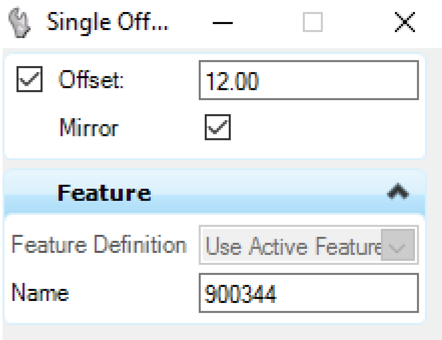
9. Select the **Edge of Pavement** feature (Under Roadway-> Pavement categories) on the *Features Definition Toggle Bar*.



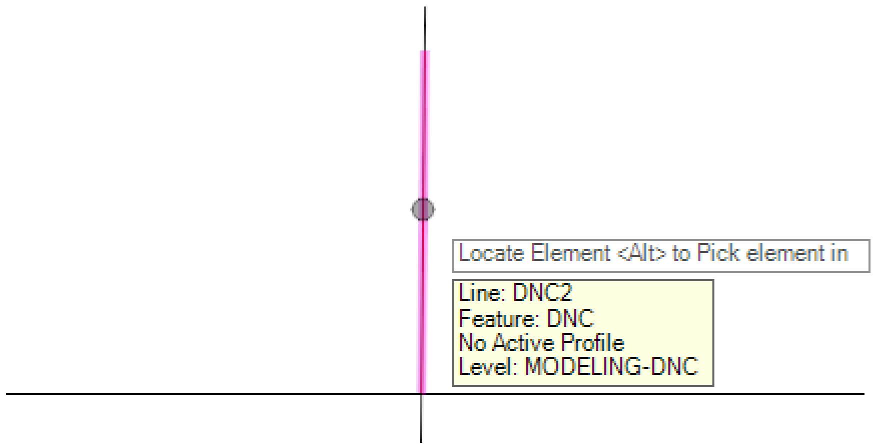
10. Select the Single Offset Entire Element command.



11. Set the dialog as shown below.

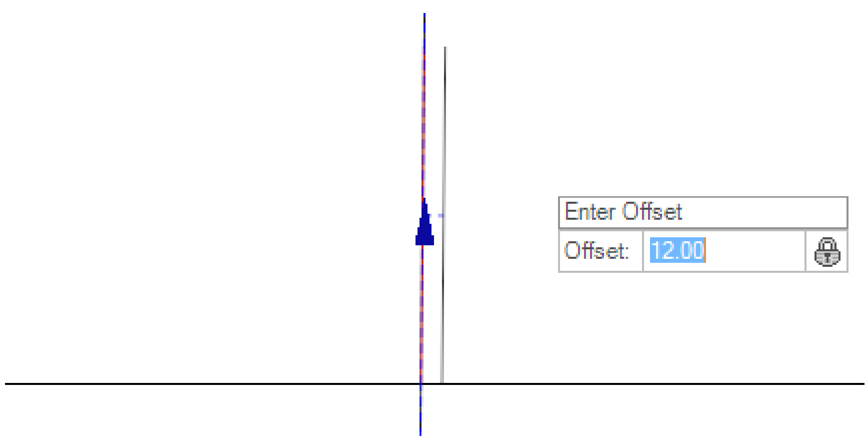


12. Select the DNC element created along the CL of the side-road.



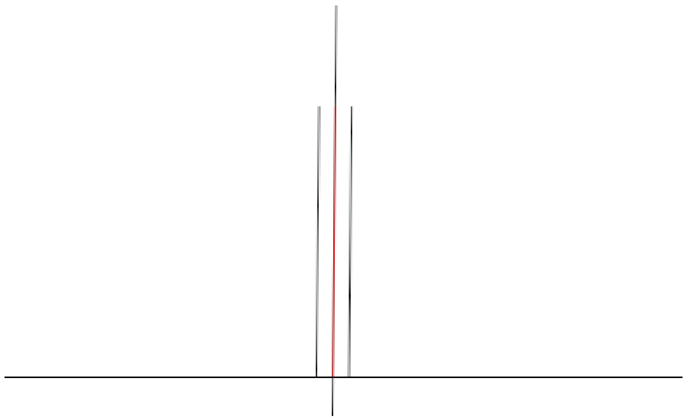
NOTE: You may have to right click to choose the DNC element instead of the side-road CL since these elements are on top of each other.

13. Left click to confirm *Enter Offset.*

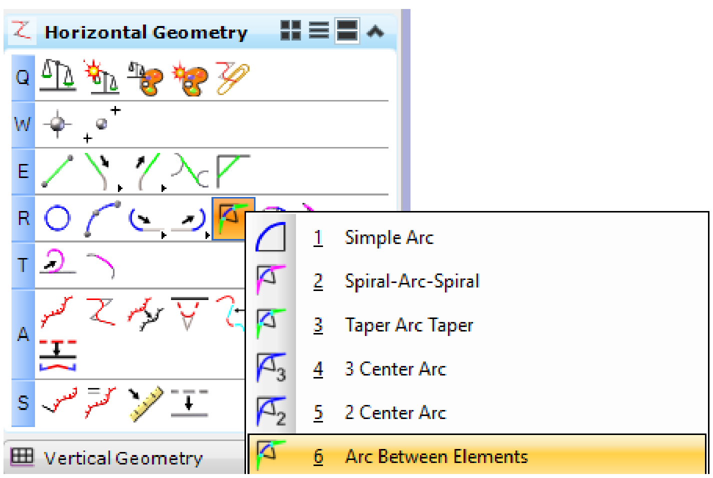


14. Left click to confirm *Mirror* to create the opposite EoP.

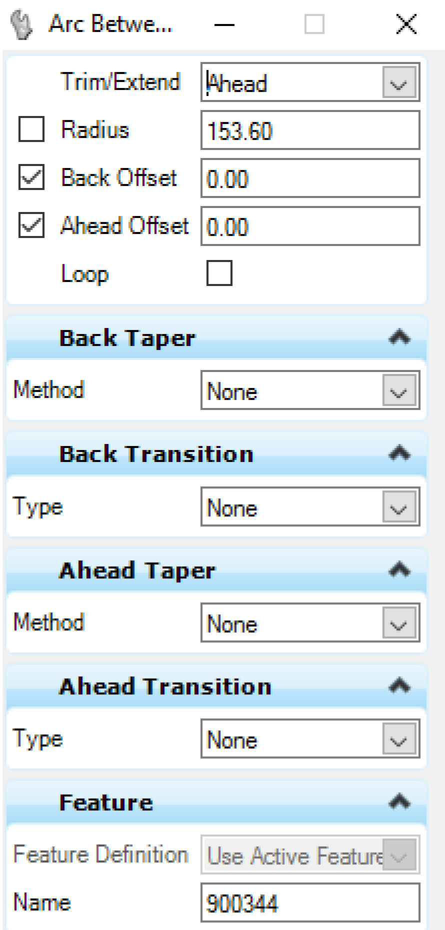
The drawing should appear as shown below.



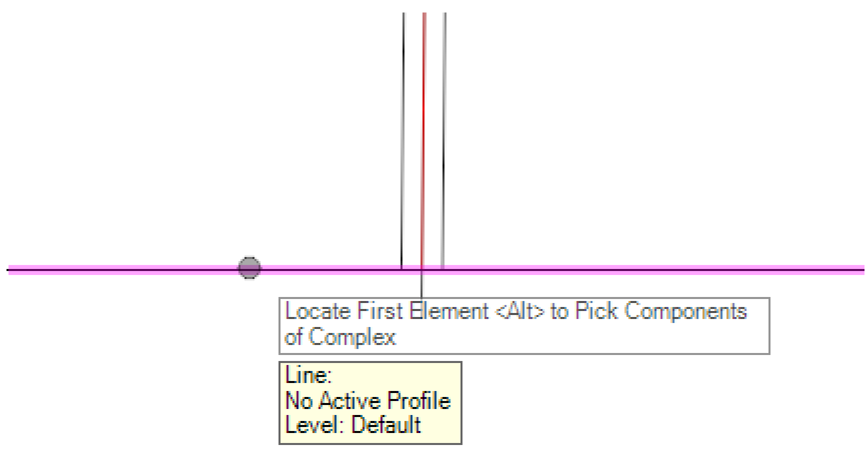
15. Select the **Arc between Elements** command as shown below.



16. Fill out the dialog as shown below.

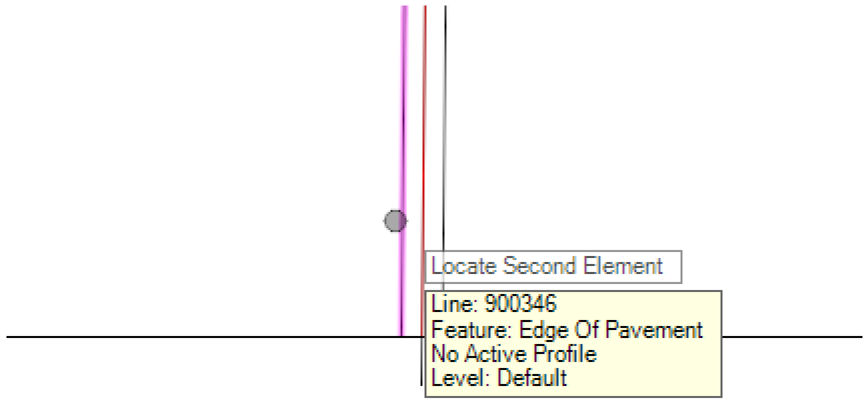


17. Select the **Thru Rd EoP** when prompted to *Locate First Element.*



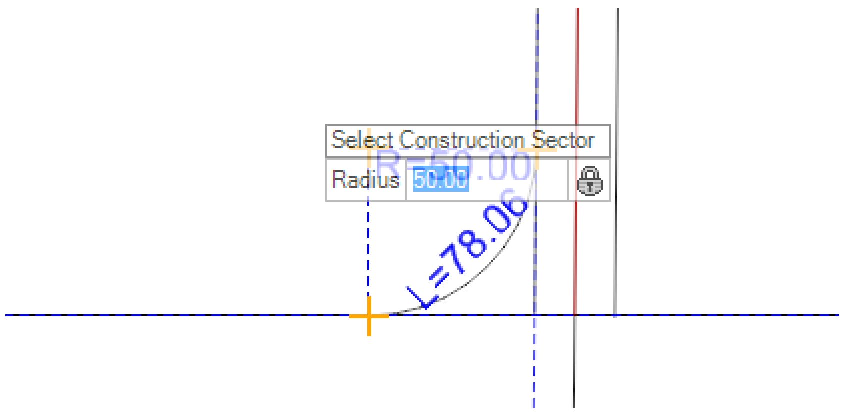
18. Left click to confirm the offset of 0 when prompted to Enter Back Offset.

19. Select the **Left EoP of the side-road** when prompted to *Locate Second Element.*

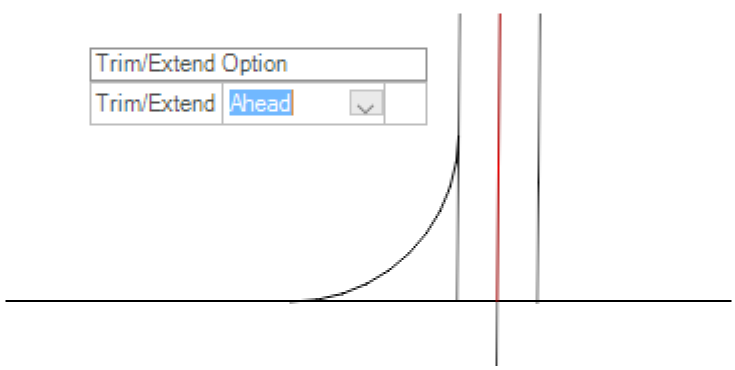


20. Left click to confirm the offset of 0 when prompted to Enter Ahead Offset.

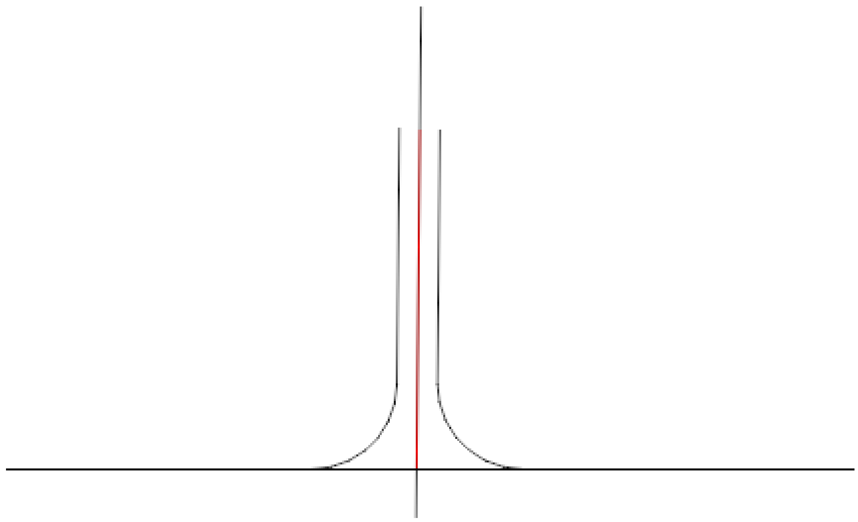
21. Move your cursor so the curve is positioned as shown below and left click to confirm the **Radius of 50'** when prompted to *Select* Construction Section.



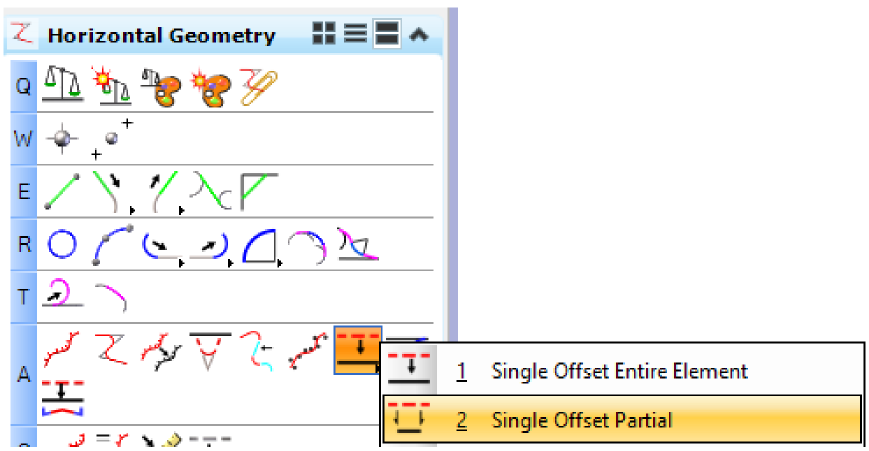
22. Left click to confirm the *Trim/Extend Option* of **Ahead** and to place the arc.



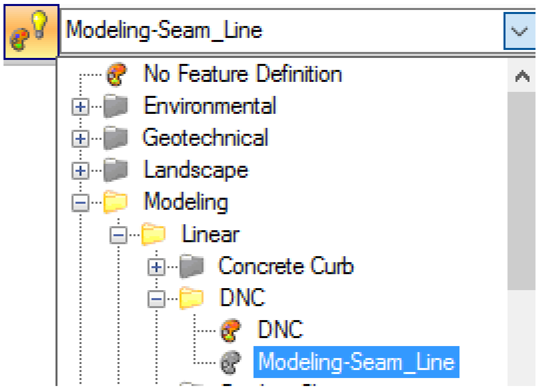
23. Perform the same steps to place an arc with a radius of 50’ in the opposite side of the Side Road. The intersection should be as shown below after this step.



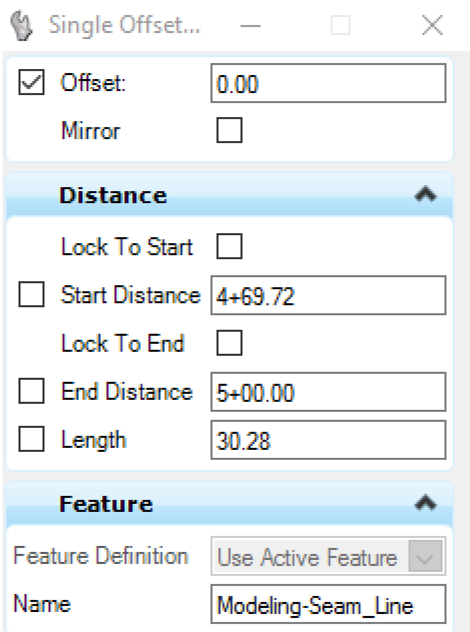
24. One last Horizontal command is to place an element between the PC’s of the arcs just placed along the Thru Rd EoP. Hover over the Single Offset Entire Element command and press and hold your eft mouse button. Select the Partial Offset Parallel command when the underlying commands appear.



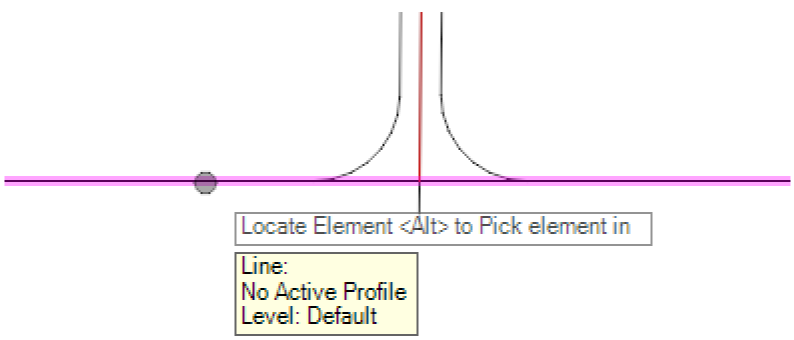
25. Set **Modeling-Seam_Line** as the feature on the *Feature Definition Toggle Bar*.



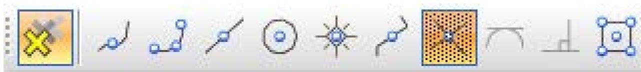
26. Enter **0** for *Offset* on the resulting dialog. The remainder of the dialog is not set at this point other than the feature.



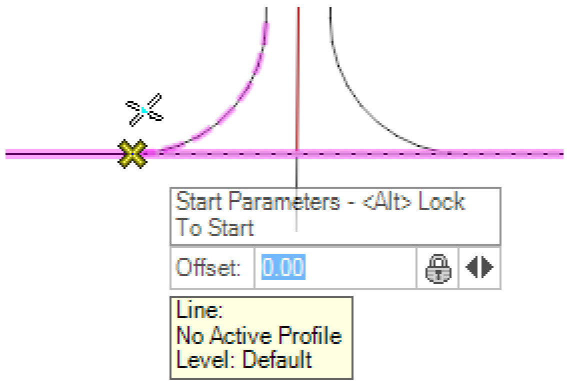
27. Select the **Thru Rd EoP** when prompted to *Locate Element.*



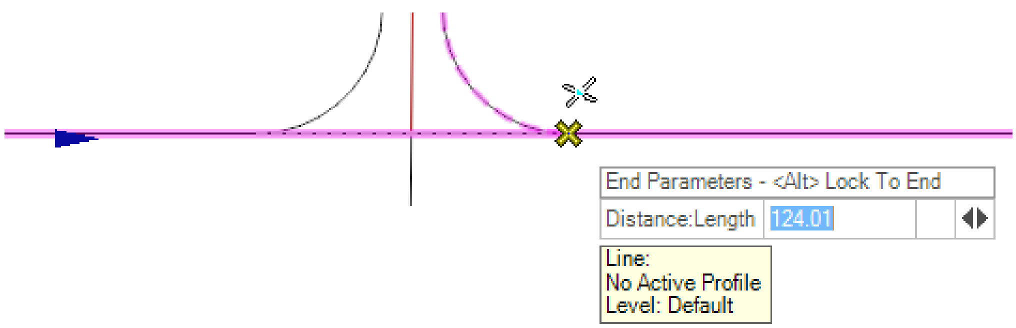
28. Double Click **Intersection Snap** from the *Snap* menu.



29. **Snap to the intersection** of the arc on the left and the Thru Rd EoP when prompted for the Start Parameter.



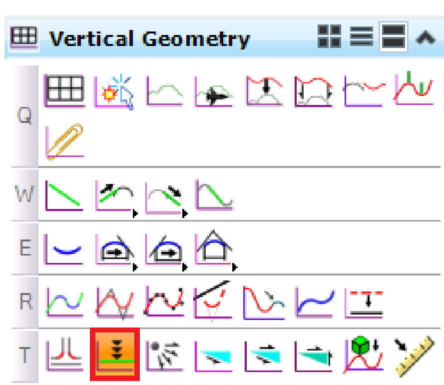
30. Hit the left or right key on your keyboard to move to the *Distance: Length* setting and **snap to the intersection** of the arc on the right and the Thru Rd EoP.



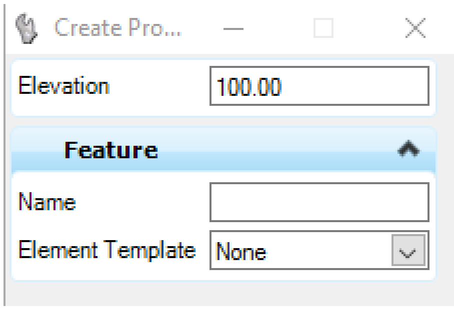
31. Left click to confirm the placement of the Modeling-Seam_Line.

11.2.9.3 VERTICAL PROCESS

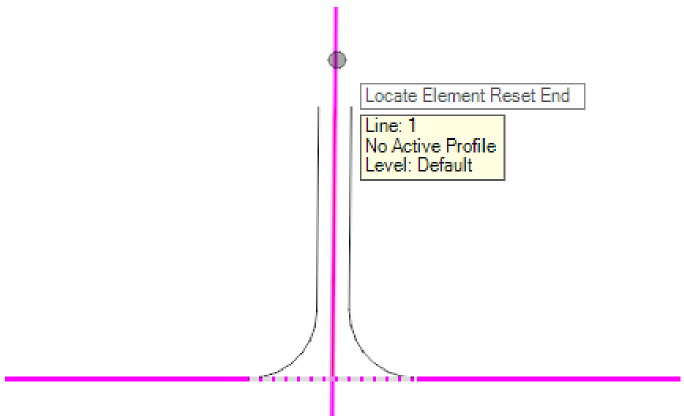
1. Select the Vertical Geometry command **Profile By Constant Elevation.**



2. Enter **100** for the *Elevation.*

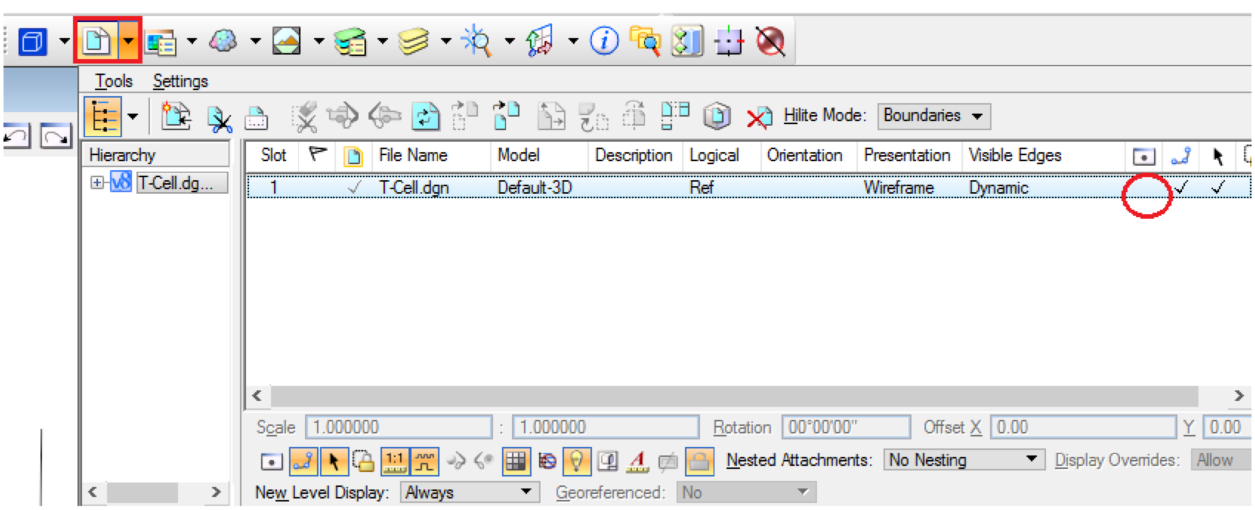


3. Locate the Thru Rd EoP and the Side Rd CL (The reference elements).

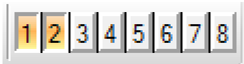


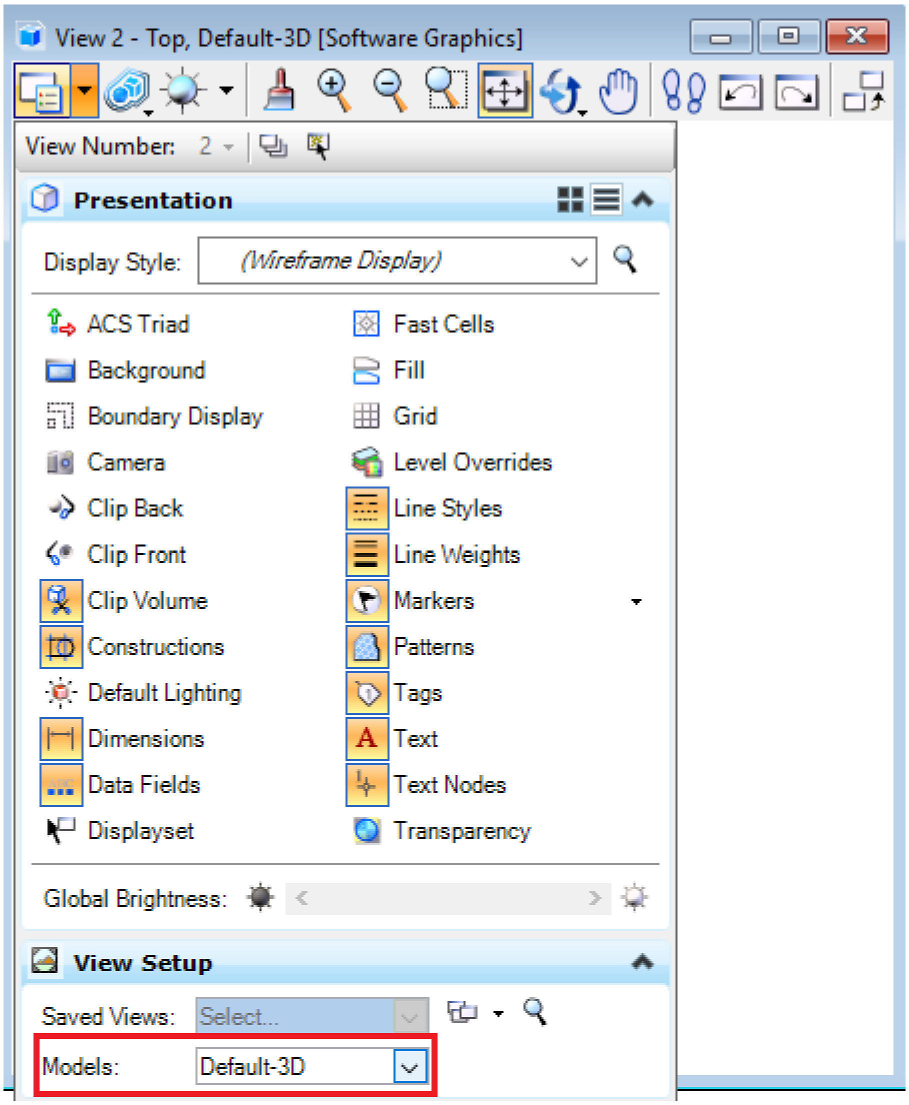
4. Right click to Reset and then left click to confirm the elevation of 100 and profile the elements.

5. Open the references dialog and turn off display of the Default-3d reference model created.

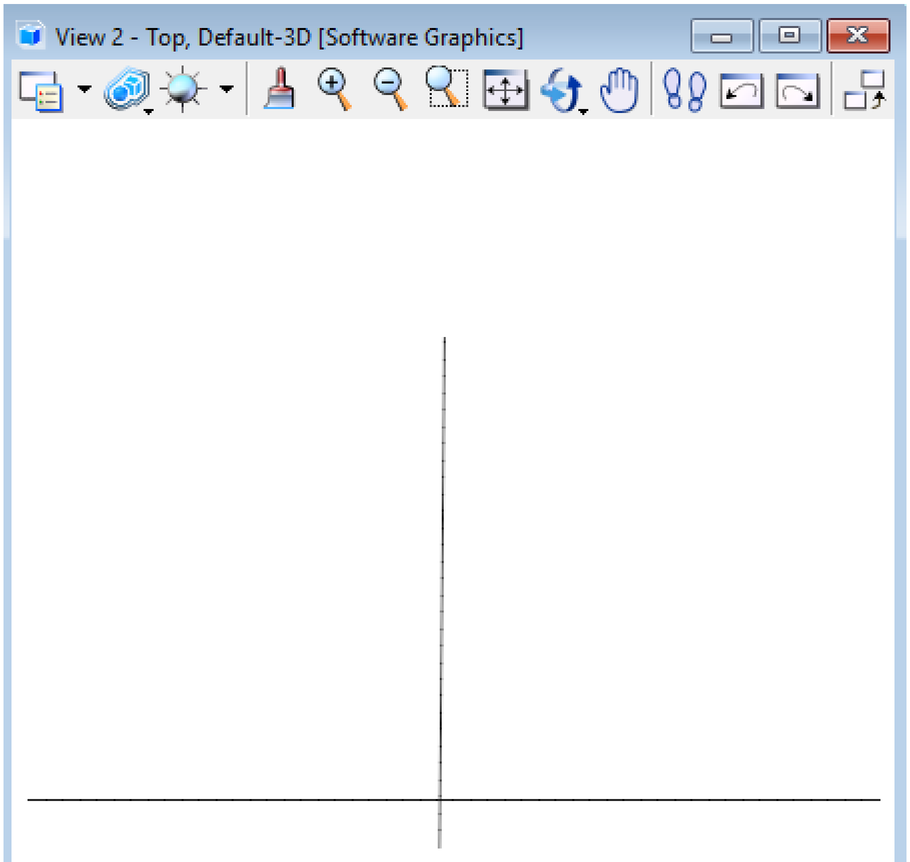


6. Turn On view 2 if it is not on and open the Default-3D model in view 2.

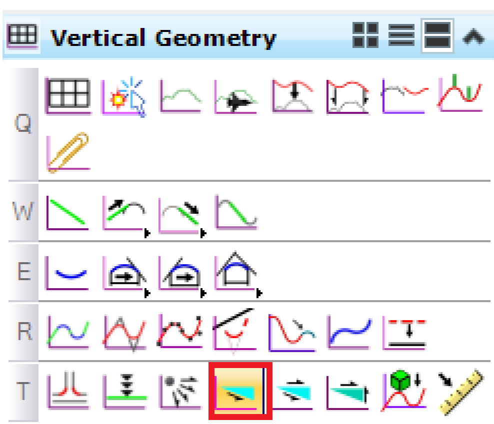




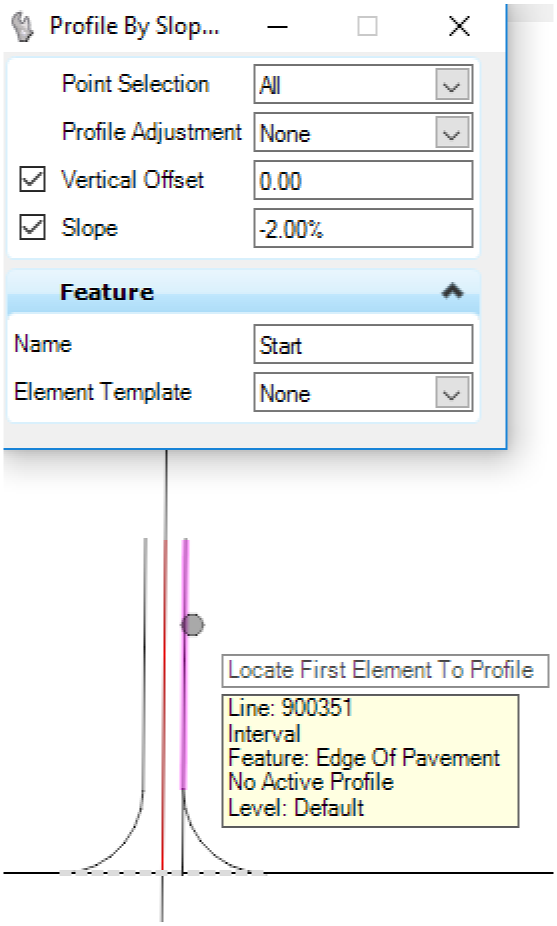
7. Fit View and you should see the two lines just profiled.



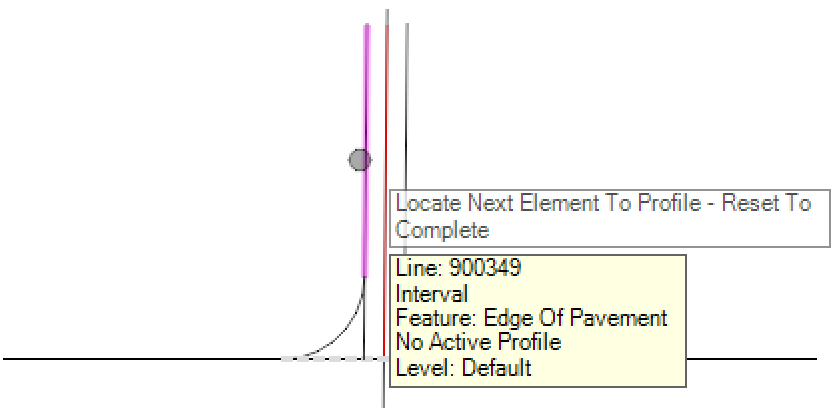
8. Select the vertical geometry command **Profile By Slope from Element.**



9. Fill out the dialog as shown below and select the **RT Side Rd EoP** when prompted to *Locate First Element To Profile.*

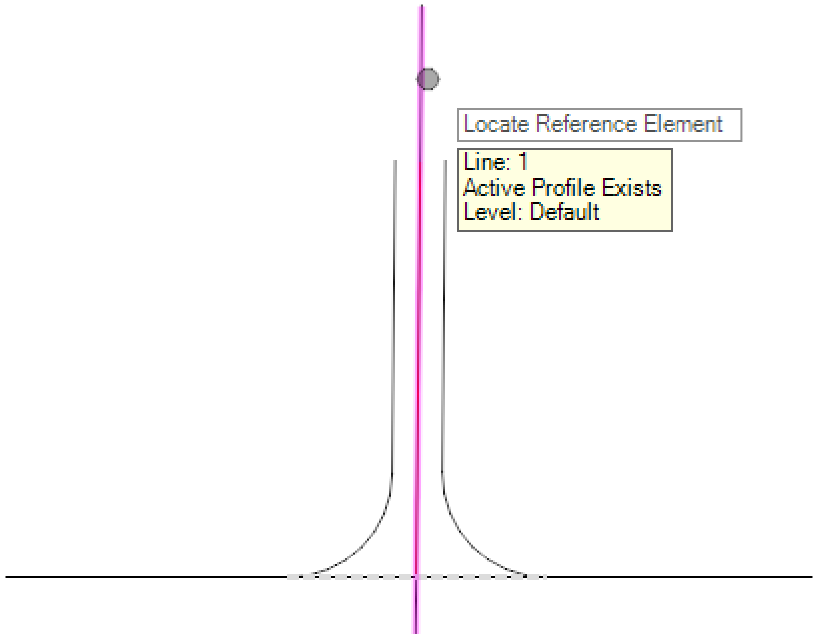


10. Select the **LT Side Road EoP** when prompted to *Locate Next Element To Profile.*



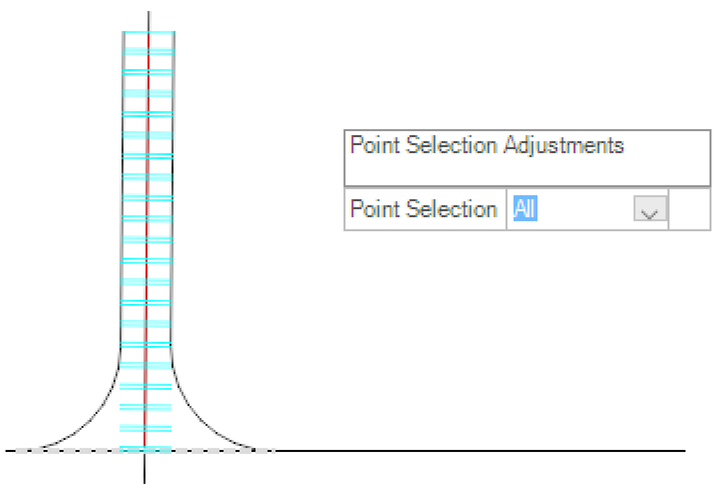
11. Right click to Reset.

12. Select the **Side Rd CL** when prompted to *Locate Reference Element.*

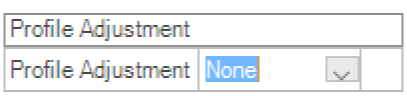


13. Left click to confirm the slope of -2%.

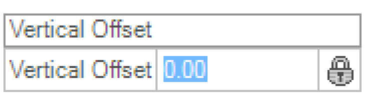
14. Left click to confirm **All** as the *Point Selection Adjustments.*



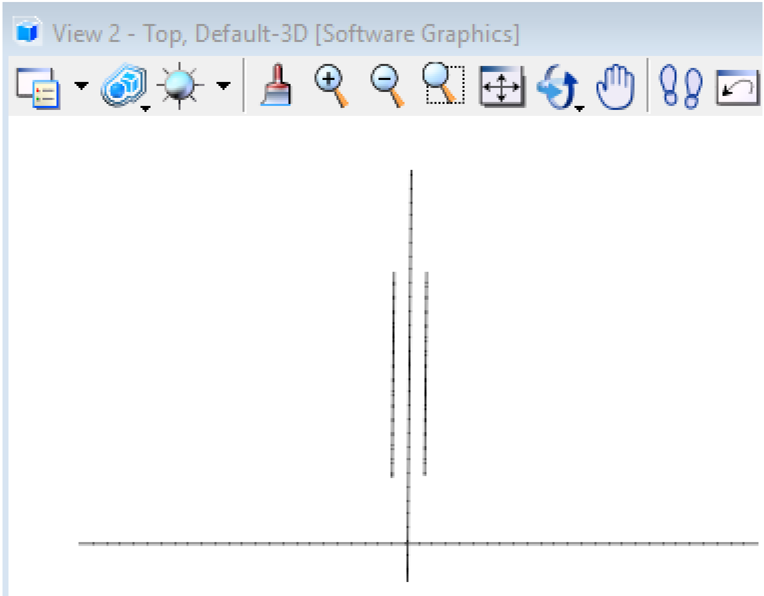
15. Left click to confirm **None** as the *Profile Adjustment.*



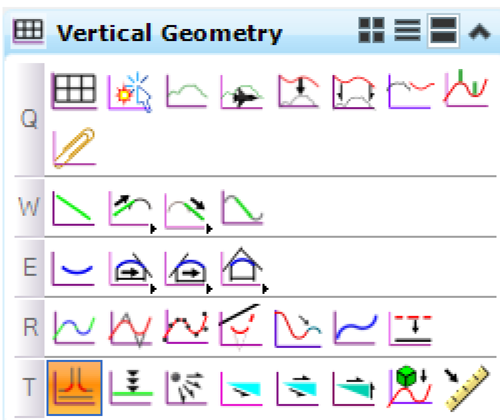
14. Left click to confirm the **Vertical Offset** of **0** and to profile these elements.



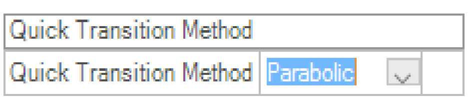
15. View the profiled elements in View 2 (3D view).



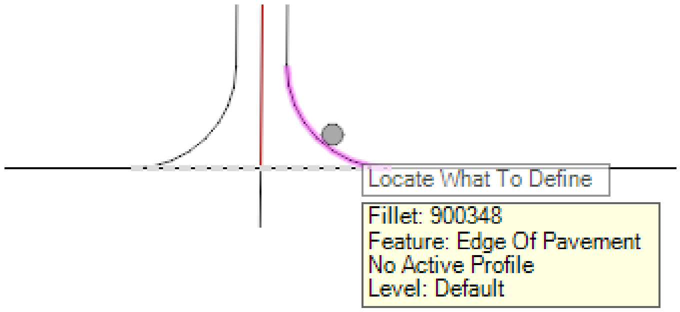
16. Select the Vertical Geometry command **Quick Profile Transition.**



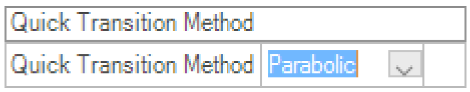
17. Confirm **Parabolic** as the *Quick Transition Method.*



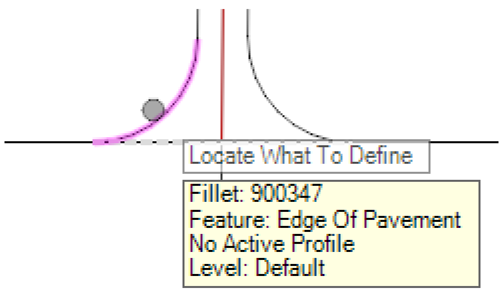
18. Select the RT arc.



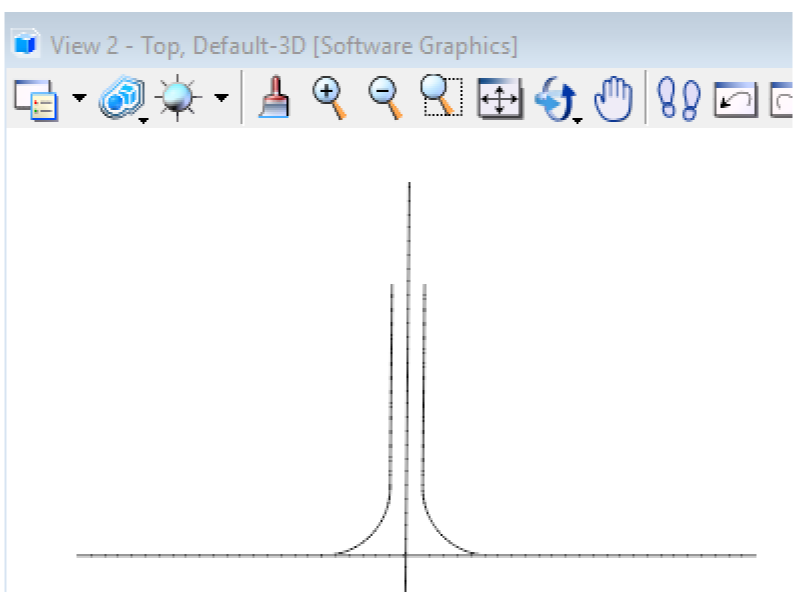
19. Confirm **Parabolic** as the *Quick Transition Method.*



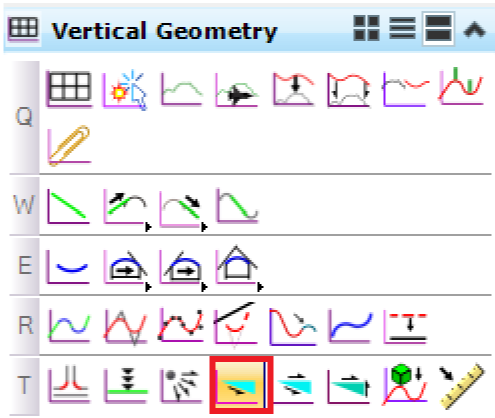
20. Select the LT arc.



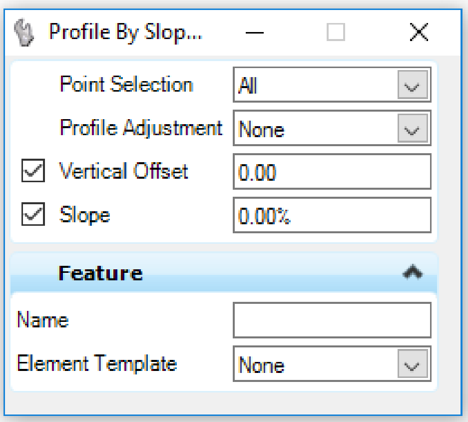
21. Verify the profiles were created in View 2 (3d view).

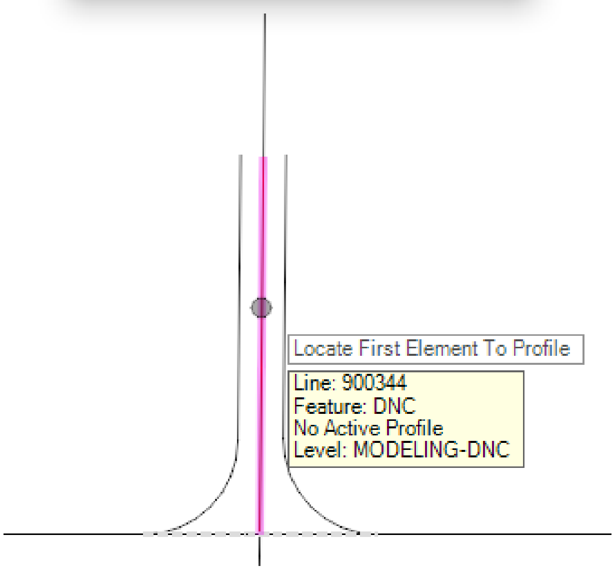


22. Select the vertical geometry command **Profile By Slope from Element.**



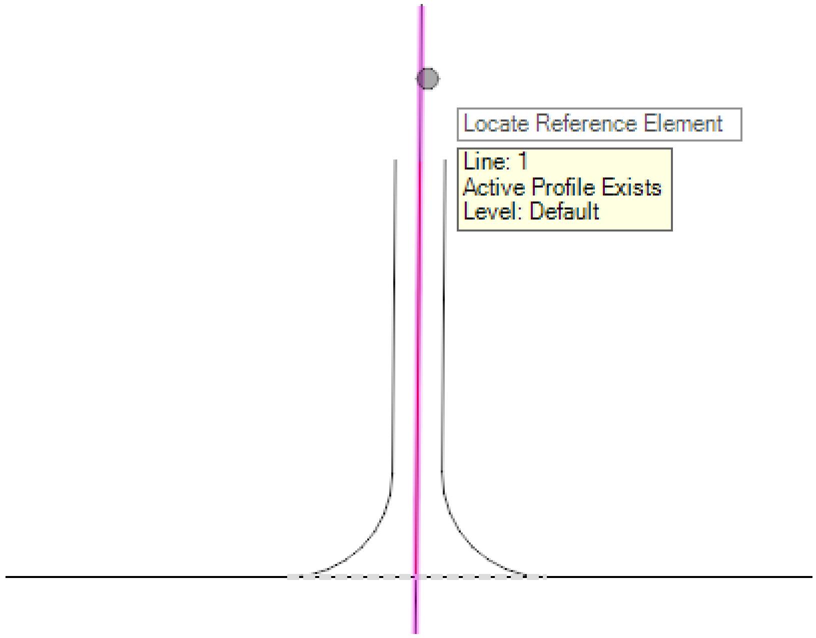
23. Fill out the dialog as shown below and select the **DNC element** when prompted to *Locate First Element To Profile.*





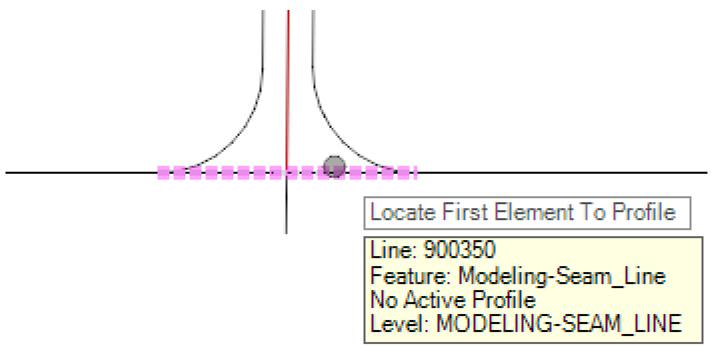
24. Right click to Reset.

25. Select the **Side Rd CL** when prompted to *Locate Reference Element.*



26. Left click to confirm the remaining prompts and profile the DNC element.

27. Perform the same command to profile the Model-Seam_Line (shown below being selected).



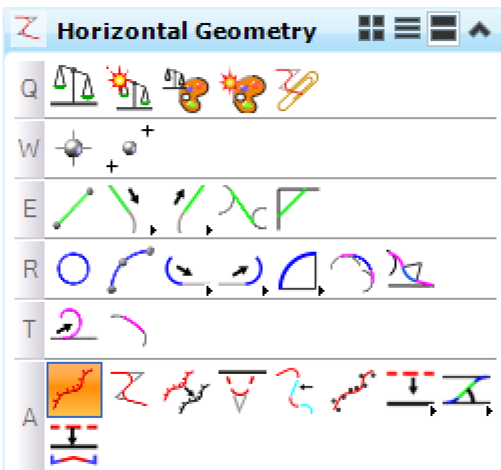
The reference element is the Thru Rd EoP.

11.2.9.4 COMPLEXING THE EOP'S

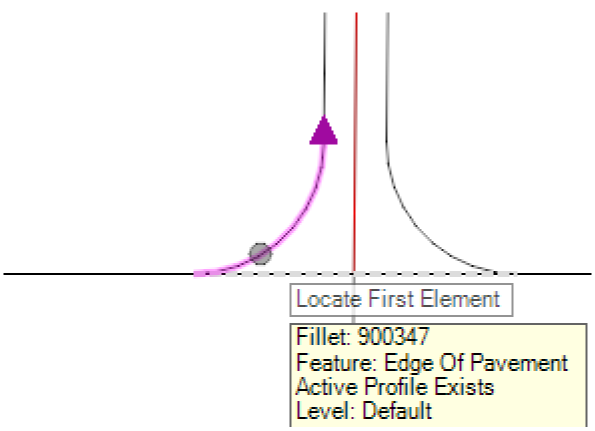
Complexing is not required as described in the following steps but it reduces the number of linear templates you have to apply.

1. Choose the feature **Edge of Pavement** on the *Feature Definition Toggle Bar*.

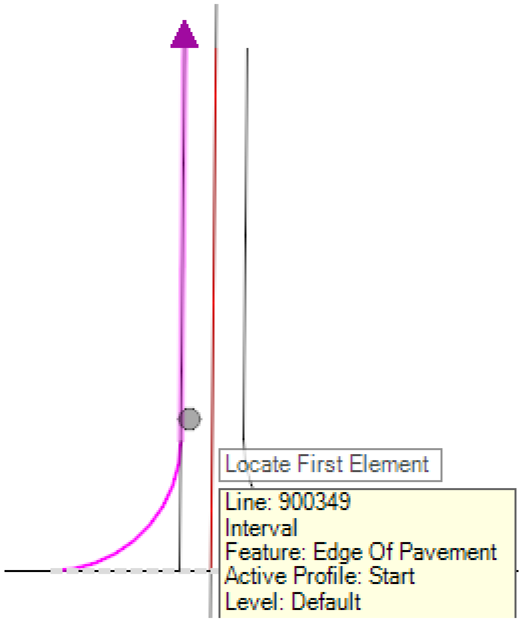
2. Select the Horizontal Geometry command **Create Complex.**



3. With the method set to Manual, select the arc on the left side as shown below.

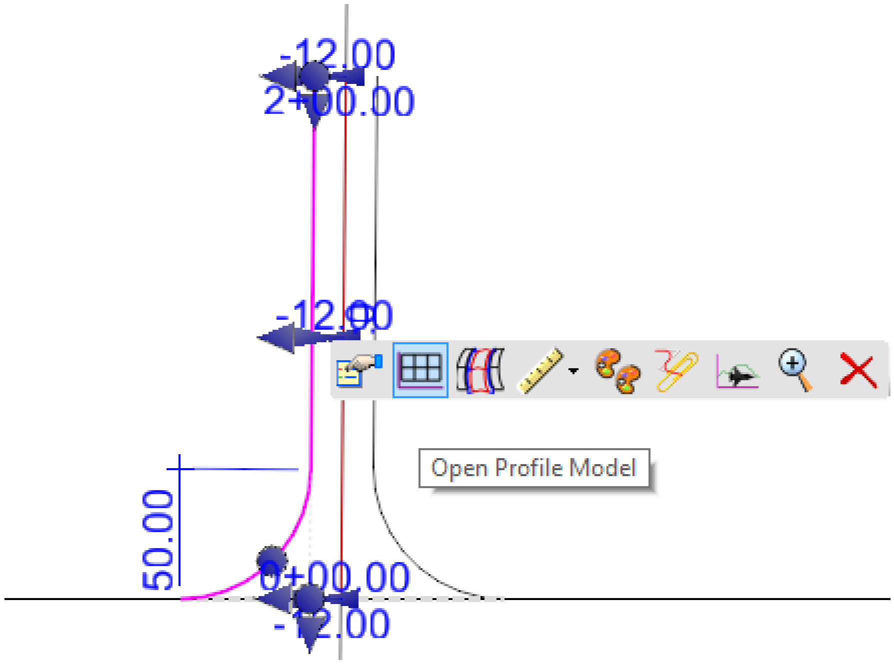


4. Select the LT Side Rd EoP as shown below as the 2nd element in the complex.

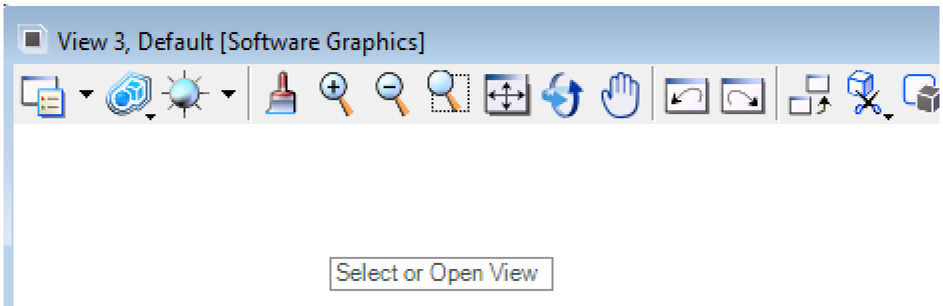


5. Left click to complex.

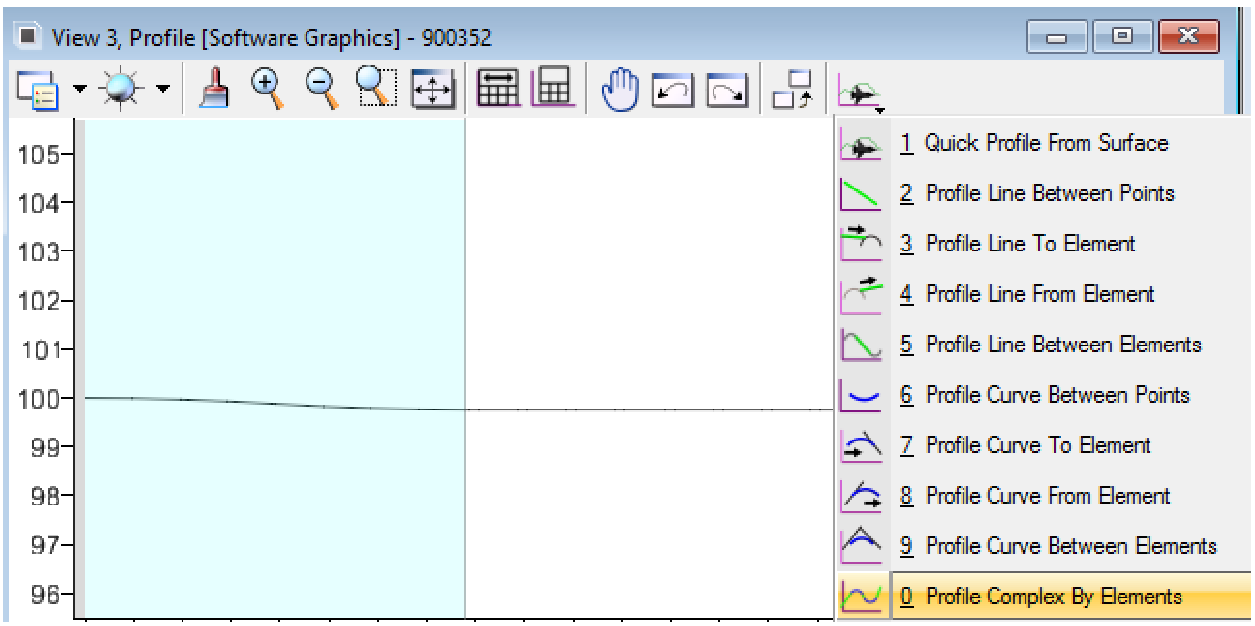
6. Select the element just complexed and from the context menu, choose **Open Profile Model.**



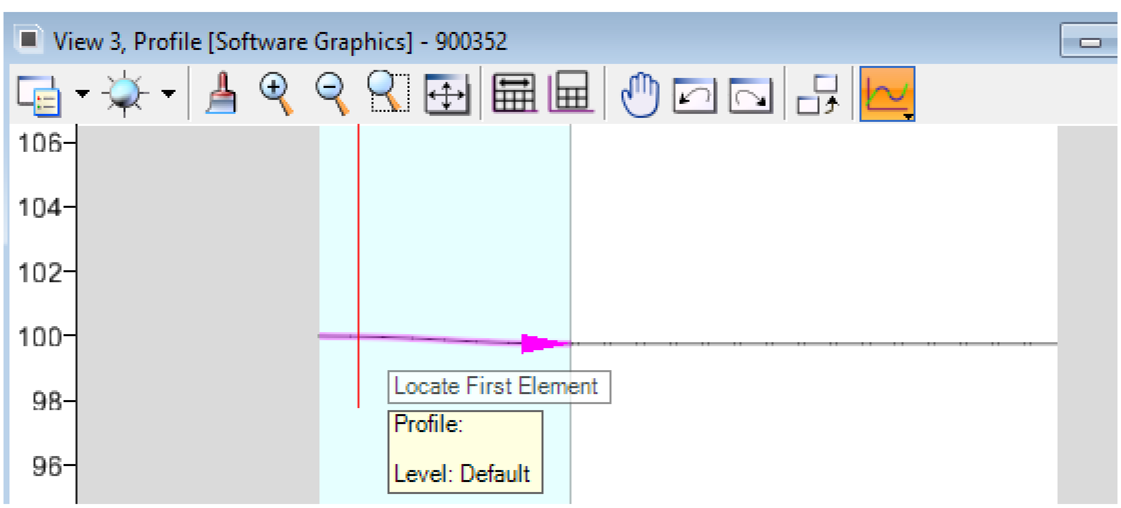
7. Open View 3 and left click in View 3 to open the profile.



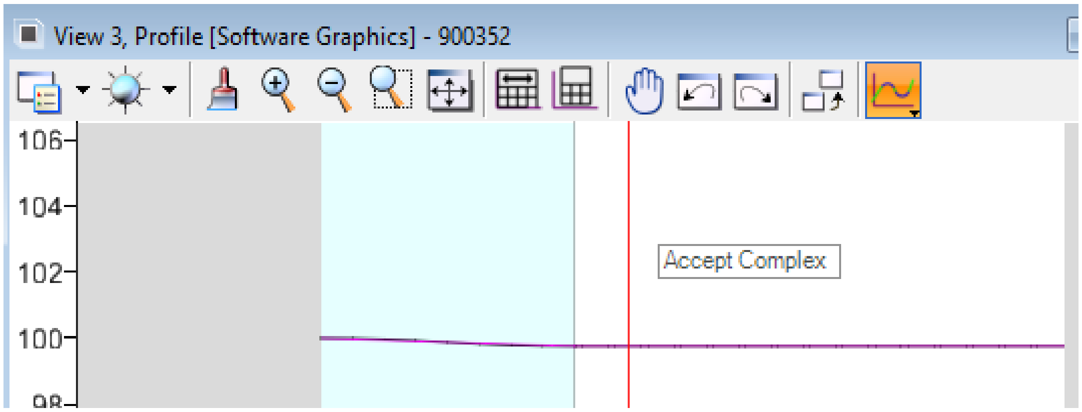
8. Select the Vertical Geometry command **Profile Complex By Elements.**



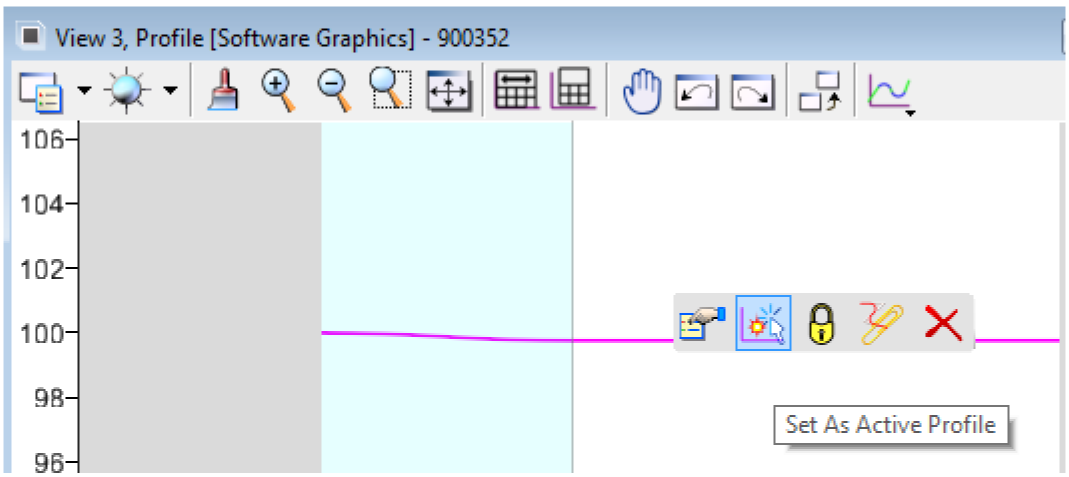
9. With the *mode* set to **Automatic**, select the 1st element as shown below.



10. Left click to Accept Complex.



11. Select the profile and from the context menu, choose Set Active Profile.



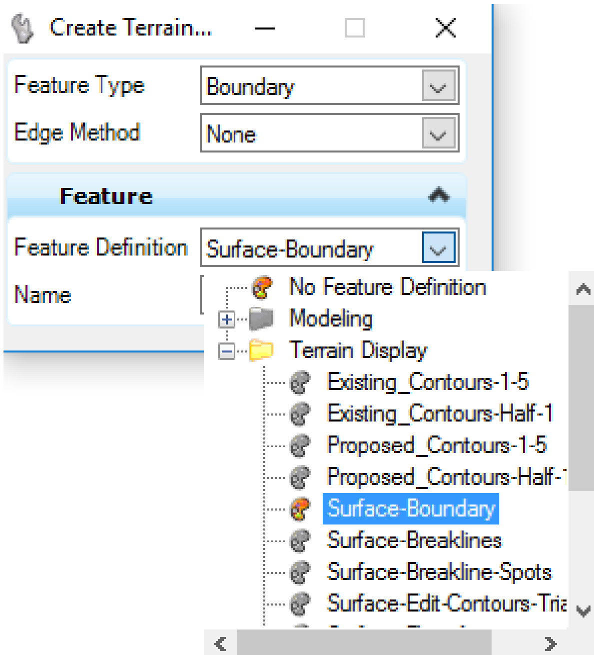
12. Perform the same process on the RT Side Road EoP (Complex it Horizontally & Vertically as well).

11.2.9.5 TERRAIN

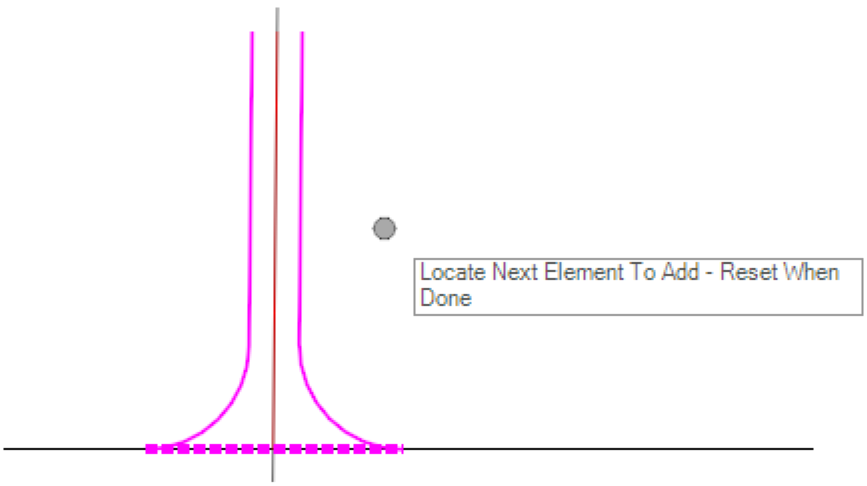
This section covers building a terrain of the side road pavement which a surface template can later be applied.

1. Select the *Terrain Model* command **Create From Elements.**

2. Select **Surface Boundary** as the *feature*, set the *Feature Type* to **Boundary**, enter **Int-Pave** as the *Feature Name*, and set *Edge Method* to **None** as shown below.

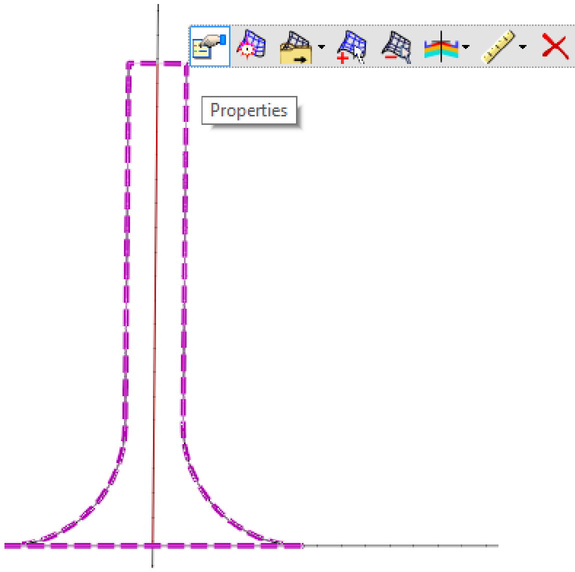


3. Select the following elements when prompted to *Locate Elements To Add* and then **Reset.**

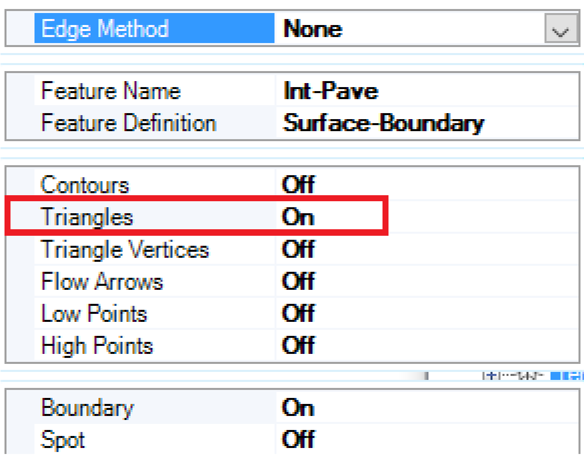


4. Confirm the remaining prompts with left clicks to create the terrain.

5. Select the terrain in View 2 (3d view) and from the context menu, choose **Properties.**

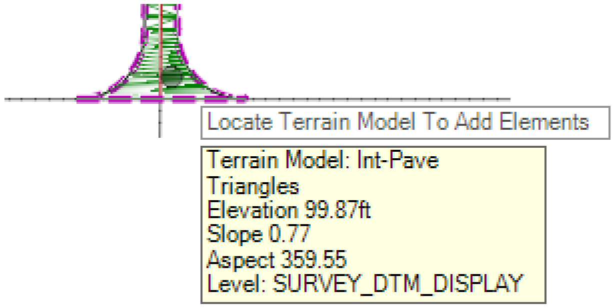


6. Turn Triangles On.

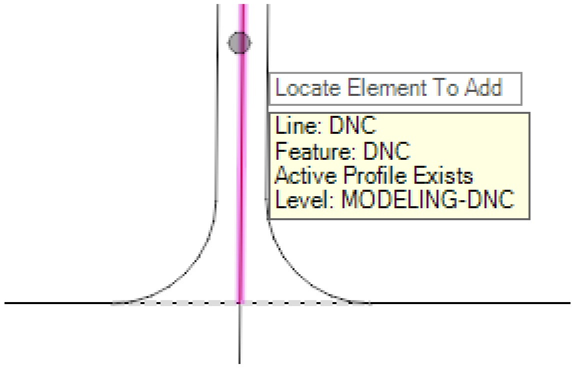


7. From the terrain menu, choose **Add Features** and set the Feature Type to **Breakline** on the resulting dialog.

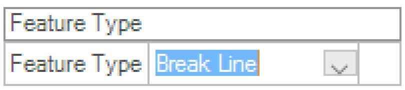
8. Select the terrain in View 2 when prompted to *Locate Terrain Model To Add Elements.*



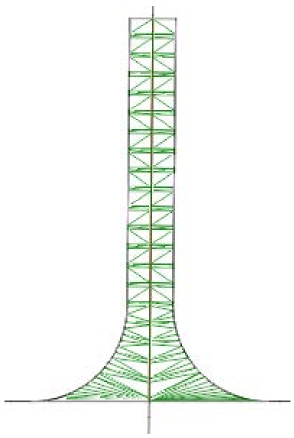
9. Select the **DNC** element (Partial offset of the Side Road CL) in View 1 when prompted to *Locate Element To Add.*



10. Right click to Reset and confirm the Feature Type of breakline with a left click.

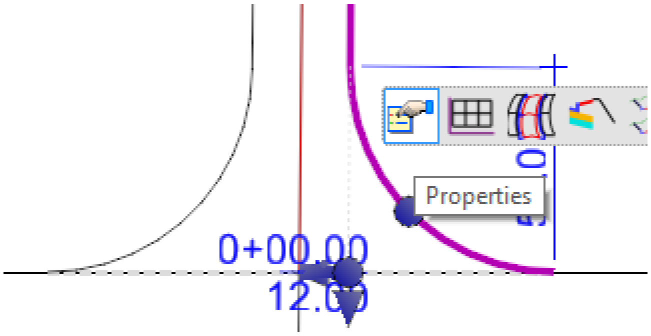


11. Turn the triangles back **On** in View 2 (Properties from the context menu of the terrain) and confirm the breakline was added.

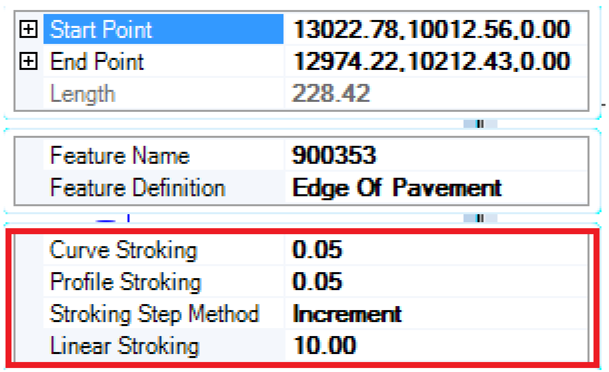


12. Turn **Off** Triangles.

13. Select the RT Side Road EoP in View 1 and choose Properties from the context menu.

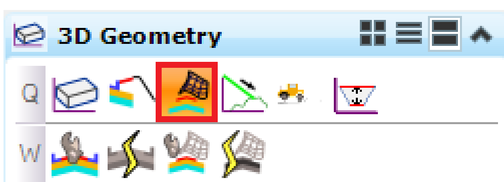


13. Observe the existing Stroking values which control the number of triangles. We will not make any edits in this exercise.

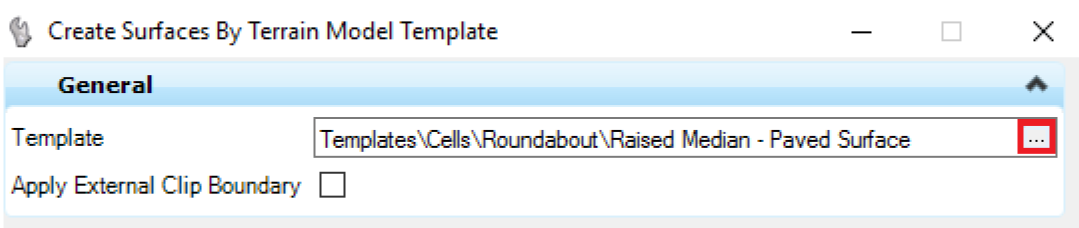


11.2.9.6 SURFACE TEMPLATE

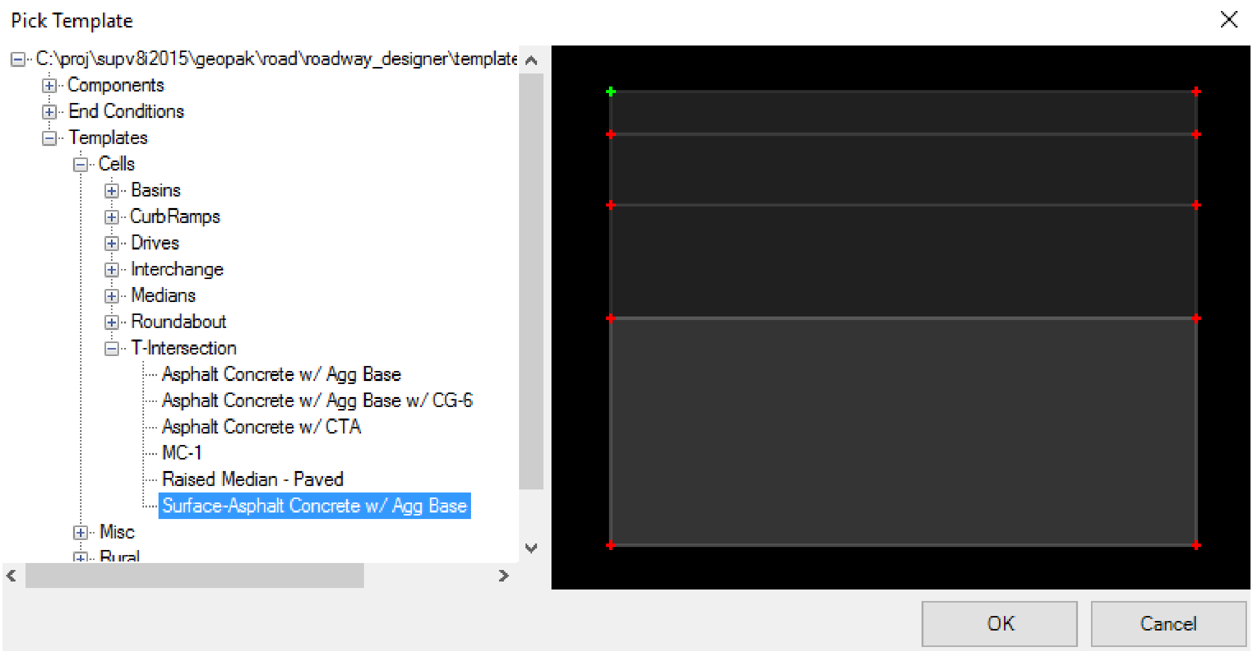
1. From the 3D Geometry menu, select **Apply Surface Template.**



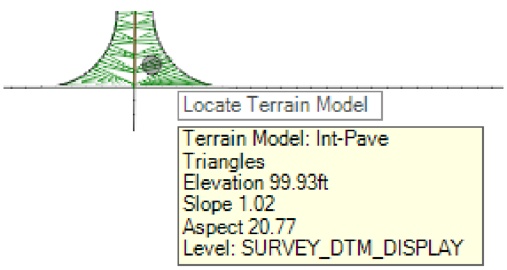
2. Choose the **Select** button on the resulting dialog.



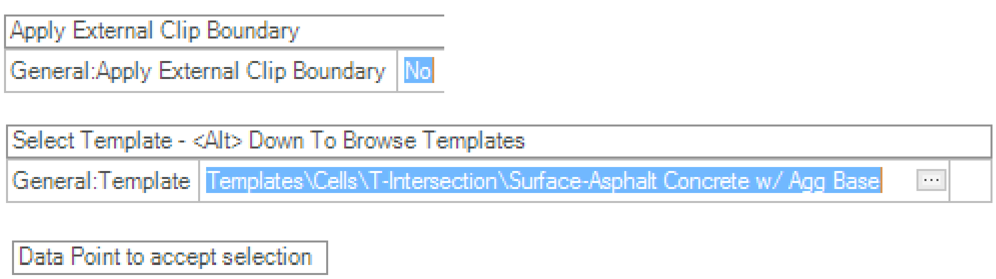
3. Choose the following template in the *Pick Template* dialog.



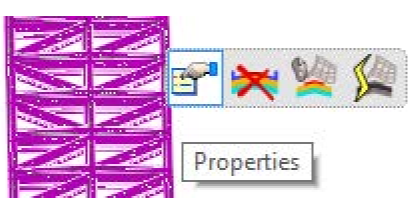
4. Select the terrain in View 2 when prompted to Locate Terrain Model.



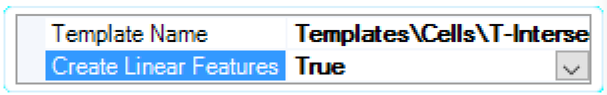
5. Left click to confirm the following:



6. Select the *Surface Template* in View 2 and choose **Properties** from the context menu.



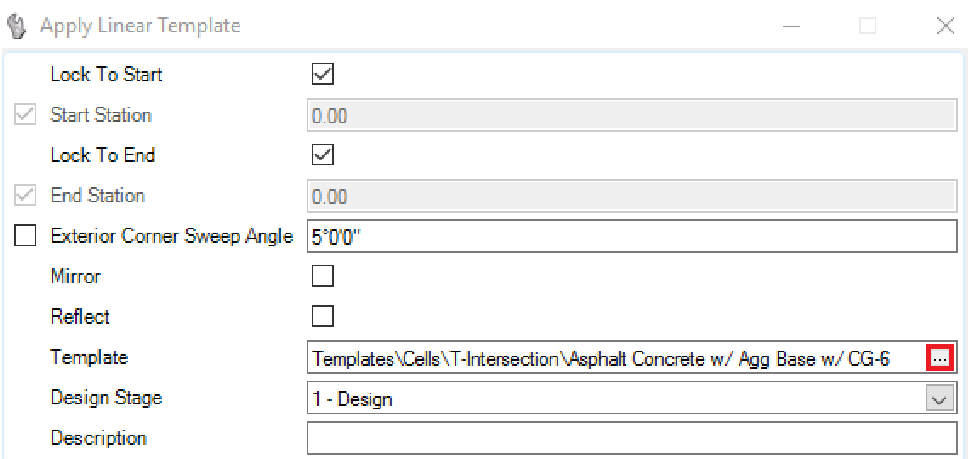
7. Set the *Create Linear Features* to **True.**



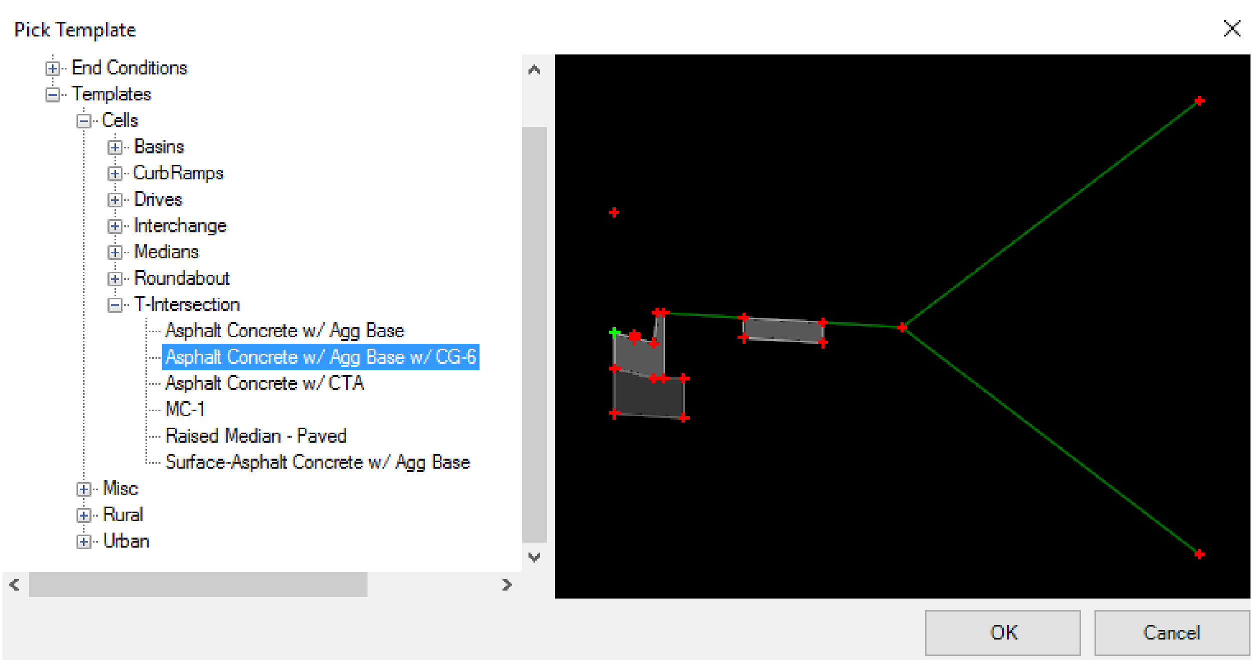
11.2.9.7 LINEAR TEMPLATE

1. Select the Apply Linear Template from the 3D Geometry task menu.

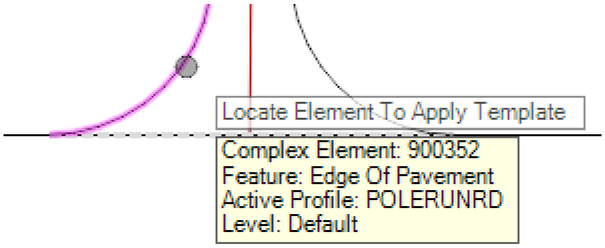
Fill out the dialog below and choose the Selector button.



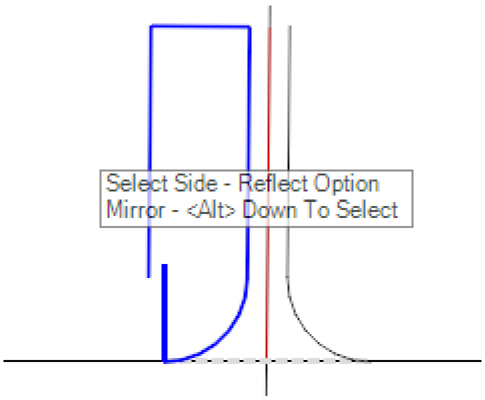
2. Choose the following Template and choose OK on the Pick Template dialog.



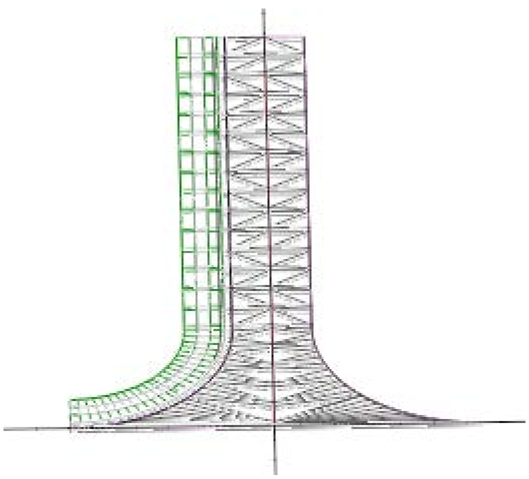
3. Locate the LT Side Road EoP in View 1 when prompted to *Locate Element To Apply Template.*



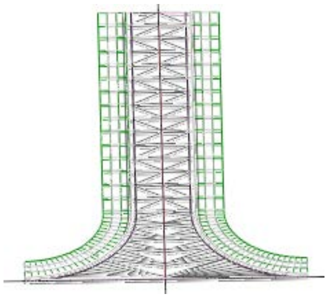
4. Confirm the Template chosen and the Start/End stations with left clicks. Next, move your cursor until the template is displayed to the **left** of the LT Side Rd EoP and confirm the *Side* with a left click.



5. Confirm the remaining prompts with a left click and the template is placed. Review in View 2.

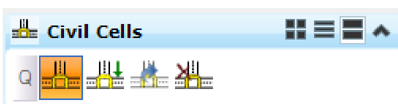


6. Apply the same linear template to the RT Side Road EoP. The result in View 2 should appear as shown below.

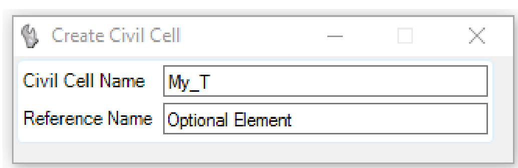


11.2.9.8 CREATE CIVIL CELL

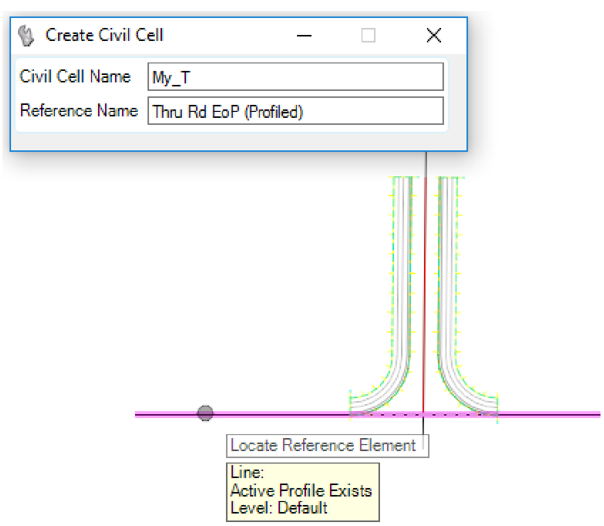
1. Select the **Create Civil Cell** command from the Civil Cell task menu.



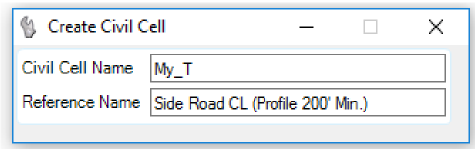
2. Enter **My_T** as the *Civil Cell Name*, tab or enter on your keyboard, and then left click to confirm the name.

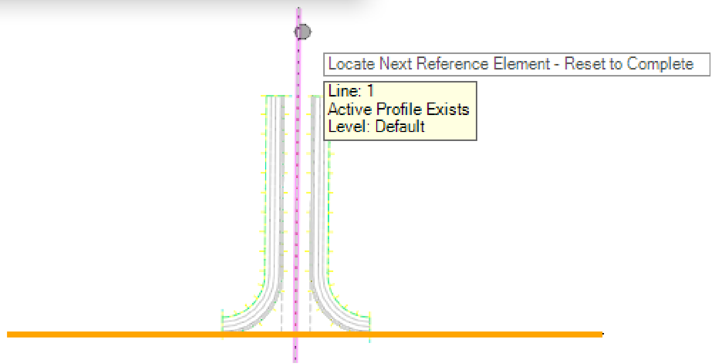


3. Enter **Thru Rd EoP (Profiled)** as the *Reference Name*, tab or enter on your keyboard, and then select the Thru Rd EoP as the reference.

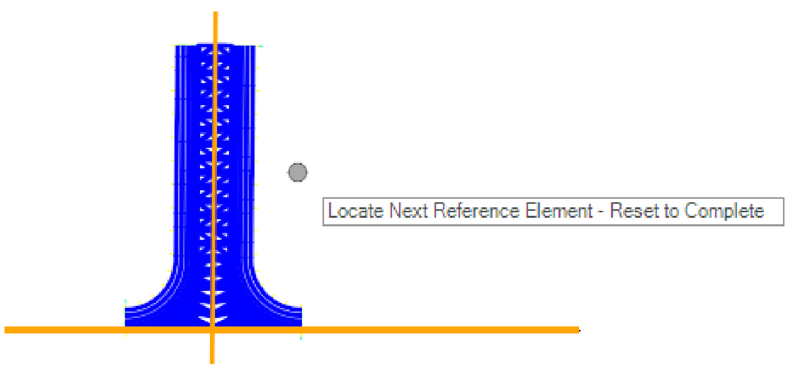


4. Enter **Side Road CL (Profiled 200’ Min.)** as the *Reference Name*, tab or enter on your keyboard, and then select the Side Road CL as the reference.

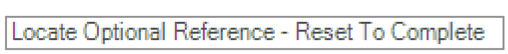




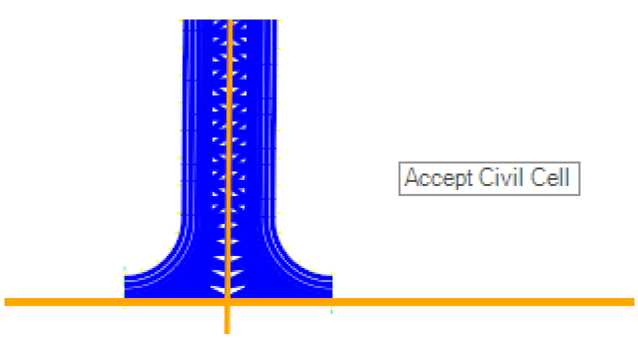
5. The Civil Cell components that are dependent on the two reference elements shown highlight as shown below. Right click to Reset.



6. Right click to reset on the following prompt.

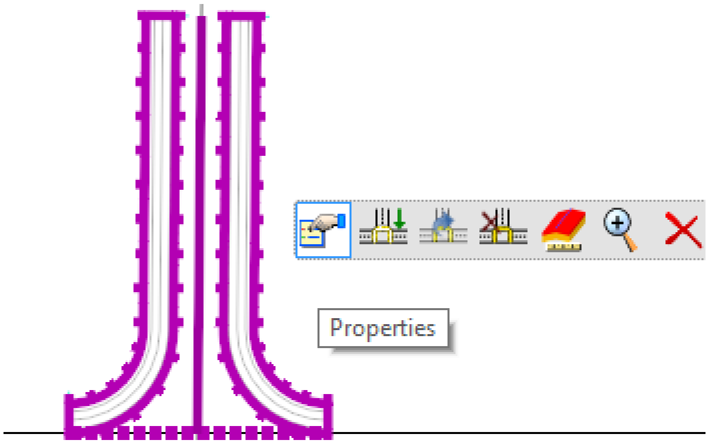


7. Left click to **Accept Civil Cell** and the Civil Cell is created.



11.2.9.9 OTHER CIVIL CELL TASK

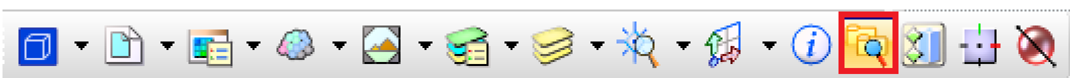
1. Select the civil cell in View 1 and from the context menu, choose **Properties.**



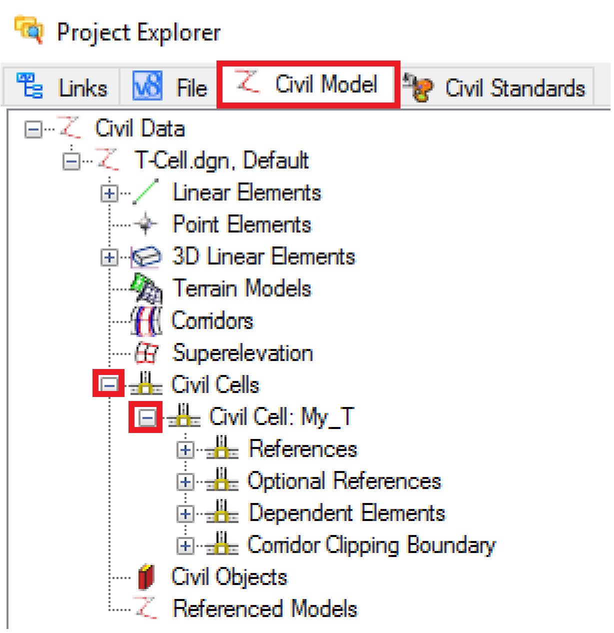
2. Verify the cell is *Valid for Placement.*

Name	**My_T**
Valid for Placement	Yes

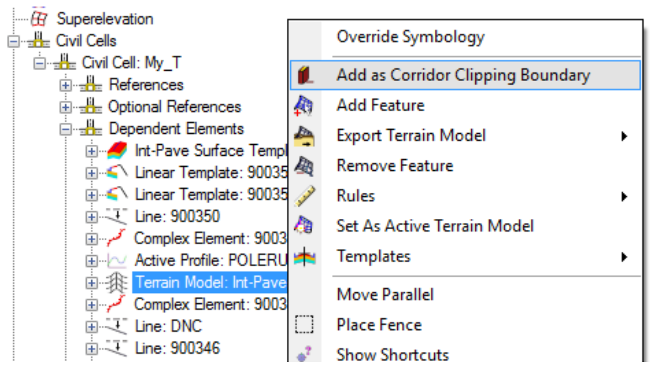
3. Open Project Explorer from MicroStation's Primary Tools menu.



4. Select the **Civil Model** tab, expand the Civil Cell category, and expand the Civil Cell: My_T category.

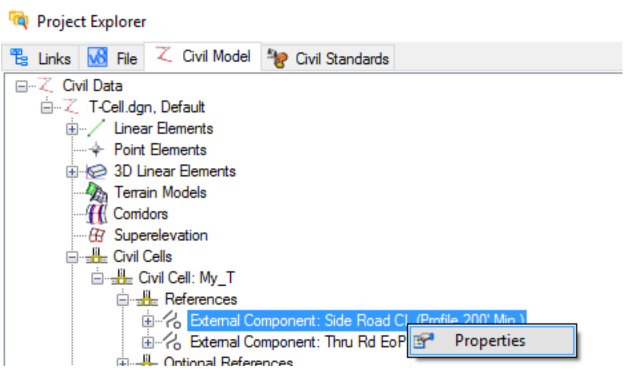


5. Expand the **Dependent Elements**, Right Click the Terrain Model, and choose **Add as Corridor Clipping Boundary.**

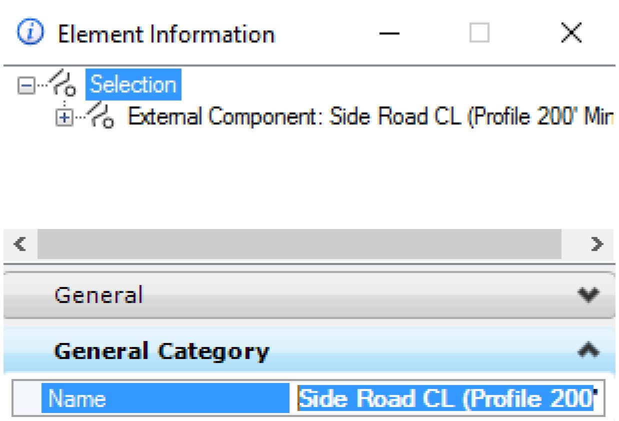


This sets the cell so the user is prompted to select corridor to be clipped when placing the civil cell.

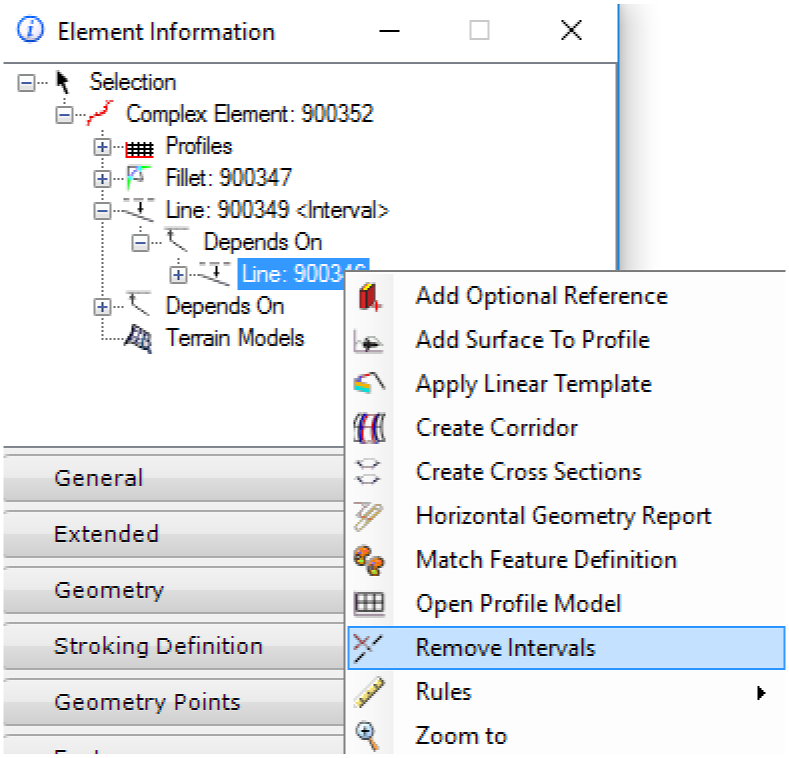
6. Open the References branch, right click the *Side Road CL* reference, and choose **Properties.**



7. The reference name can be changed here.



8. Select the LT side Rd EoP and choose **Element Information.** Expand the tree as shown below and right click the line. We will not make changes here and the user would need to drop the Civil Cell prior to making these types of changes but **Remove Interval and Replace Reference** commands are tools that may be needed at times in the creation of Civil Cells.



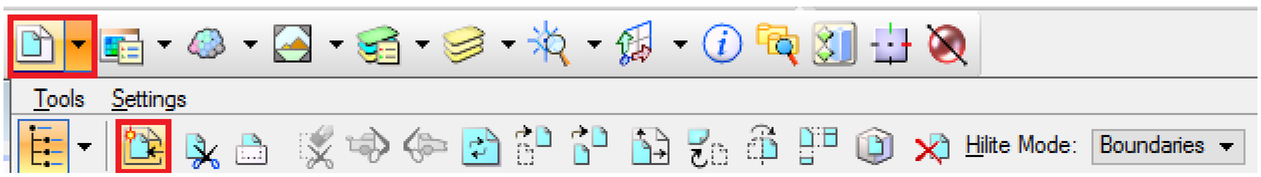
OTHER NOTES:

1. If you need to make changes to the Civil Cell, Drop the Civil Cell, make the changes, and Create the Civil Cell again.
2. Always consider potential different reference elements. We built this T Civil Cell on two lines. What if the Thru Rd EoP or Side Road CL was and arc? How would this impact the Civil Cell?
3. Station ranges for linear templates or corridors does not currently hold up in a Civil Cell so define Horizontal geometry for the length needed for the template drop. Snaps for corridor/linear template point controls do not hold up at this time but parametric constraints, point controls, etc. hold up fine in the cell if they are defined from start to end of the linear template.
4. Terrains can be created from linear produced templates for islands, medians, etc.
5. MicroStations Drop command can be used to drop complex elements created with the Horizontal Create Complex command.
6. Use MicroStation's Trim/Extend a limited amount in Civil Cells. These hold up but they should be tested well.

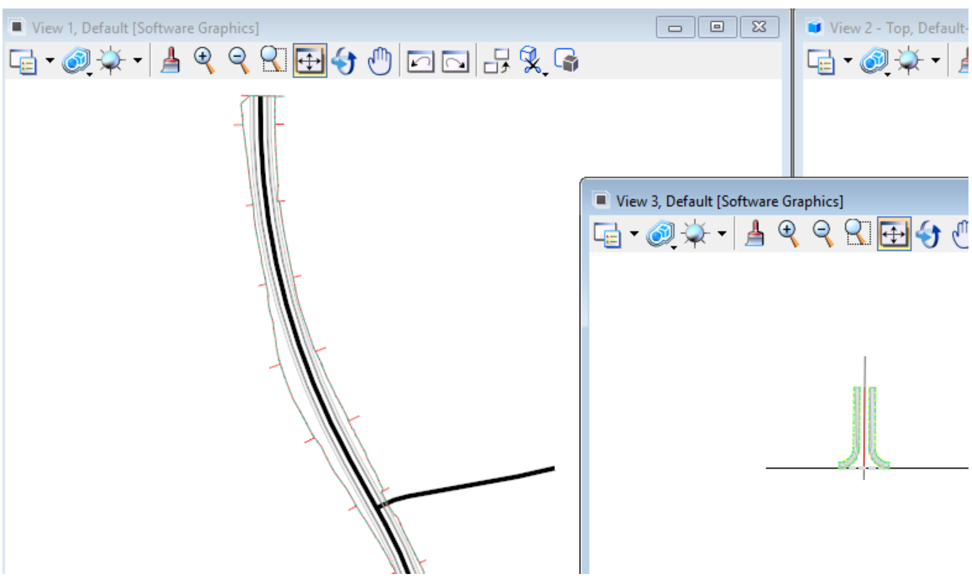
11.2.9.10 CIVIL CELL TEST

We will now test the My T Civil Cell just created. The commands below are not detailed steps of placing a Civil Cell but rather just steps to help us check if the cell we built holds up well with placement.

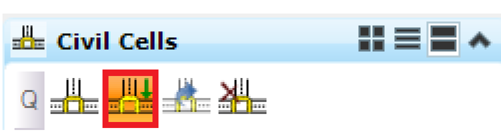
1. Open the DGN file **T-Cell_Test.DGN.**
2. Make sure View 1 is highlighted and reference the file T-Cell.DGN.



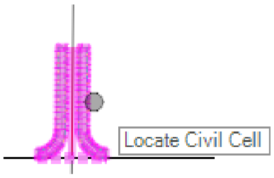
3. Open View 3, fit view, and zoom to find the referenced Civil Cell. View 1 and 3 should be set up on your screen as shown below.



4. Chose the **Place Civil Cell** command from the Civil Cell task menu.

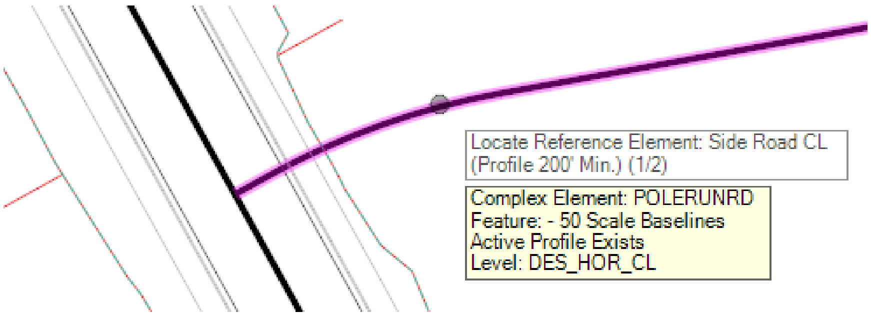


5. The last civil cell placed is remembered in this dialog so right click to Reset and you will be prompted to Locate Civil Cell. Select the My T Civil Cell in View 3.

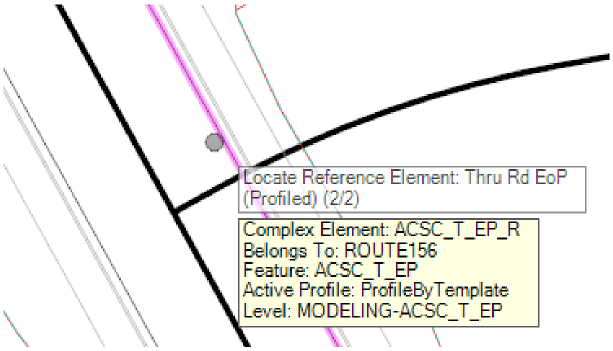


NOTE: Selection of reference elements may be in different order than presented in the next two steps.

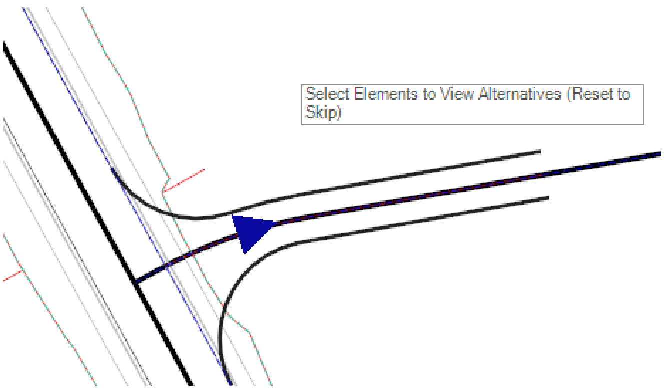
6. Select POLERUNRD when prompted the following:



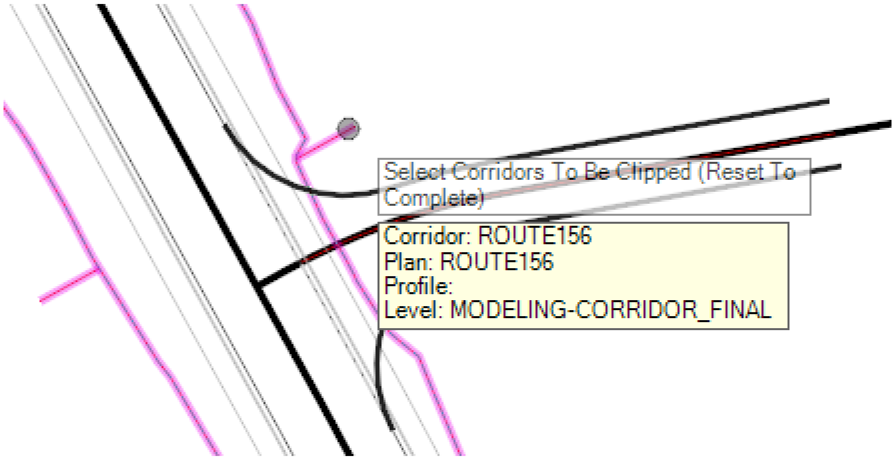
7. Select the ROUTE156 EoP as shown below when prompted to:



8. Review the Civil Cell geometry.

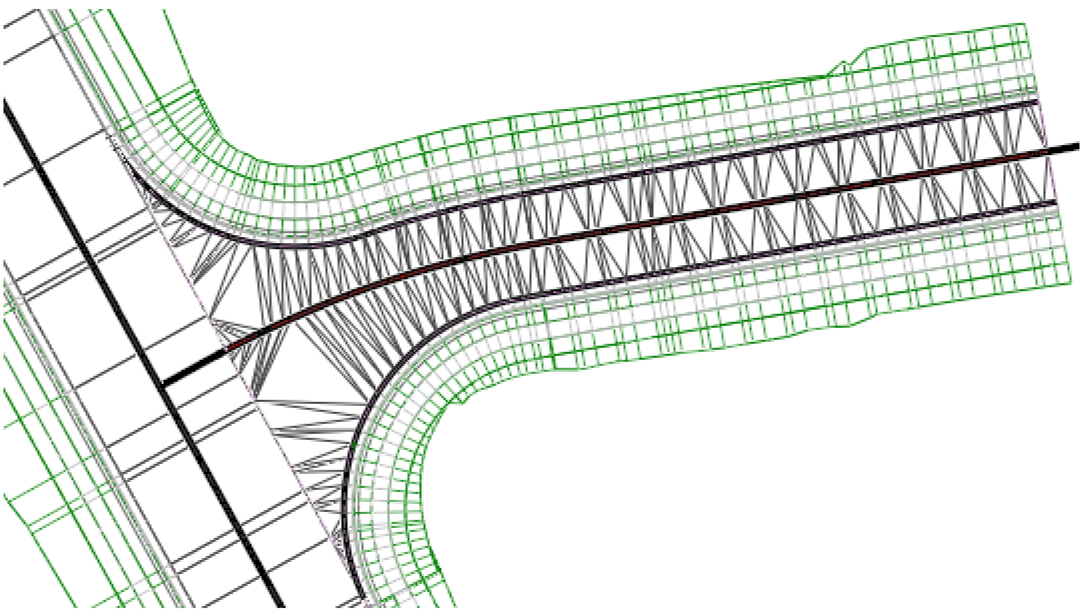


9. Reset at the prompt above.
10. Select the ROUTE156 corridor to be clipped.



11. Right Click to Reset and then Left Click to Accept Civil Cell Placement.

12. Review the Civil Cell in View 2 (3d view).

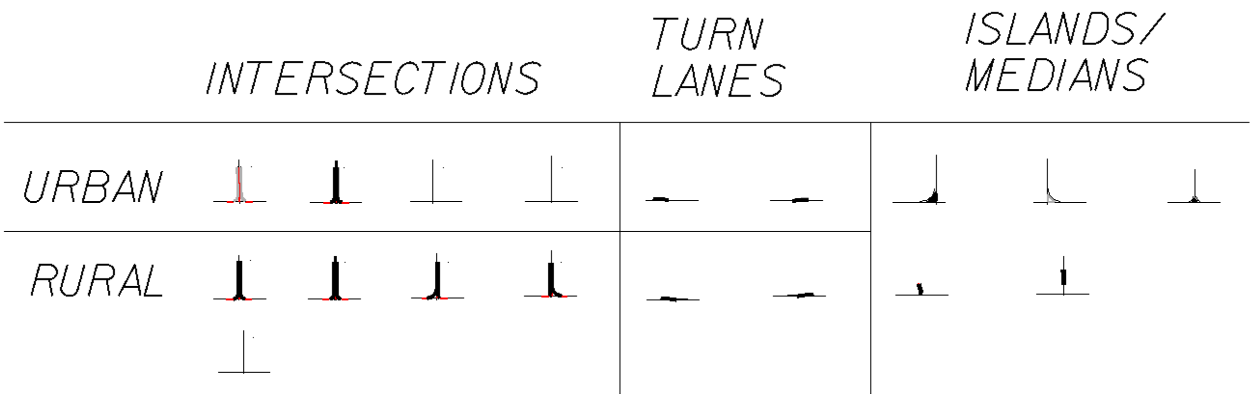


11.3 T-INTERSECTIONS

11.3.1 Available Cells

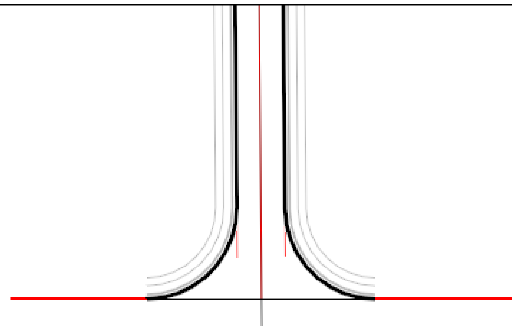
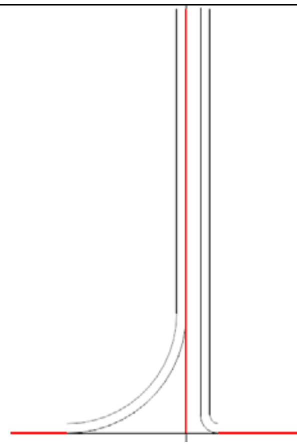
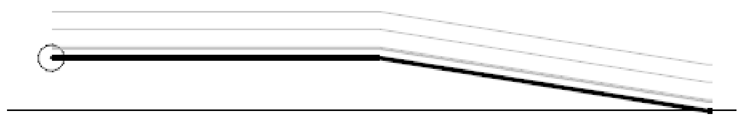
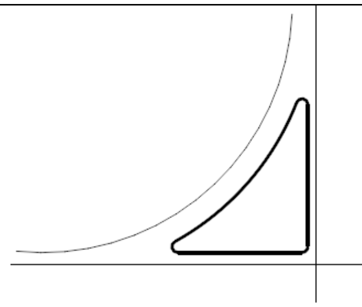
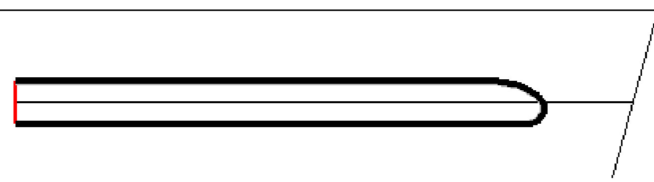
VDOT's T-Intersection cells are available in the VDOT_T-Intersections DGNLIB. These cells were built with a modular approach in mind meaning you use different cells to build the intersection you need. In other words, place the T-Intersection you need, then place a turn lane cell if needed, then place an island cell if needed, etc.

Available Cells are shown below:



Civil Cell: Basic T - Rural
Civil Cell: Basic T - Rural - Overlay & Widening
Civil Cell: Basic T - Urban
Civil Cell: Basic T - Urban - Overlay & Widening
Civil Cell: Island (Splitter)
Civil Cell: Island LT
Civil Cell: Island RT
Civil Cell: Median Nose
Civil Cell: Median Turn Lane_2D
Civil Cell: Ramp - Entry
Civil Cell: Ramp - Exit
Civil Cell: Turn Lane - Rural - Entry
Civil Cell: Turn Lane - Rural - Exit
Civil Cell: Turn Lane - Urban - Entry
Civil Cell: Turn Lane - Urban - Exit

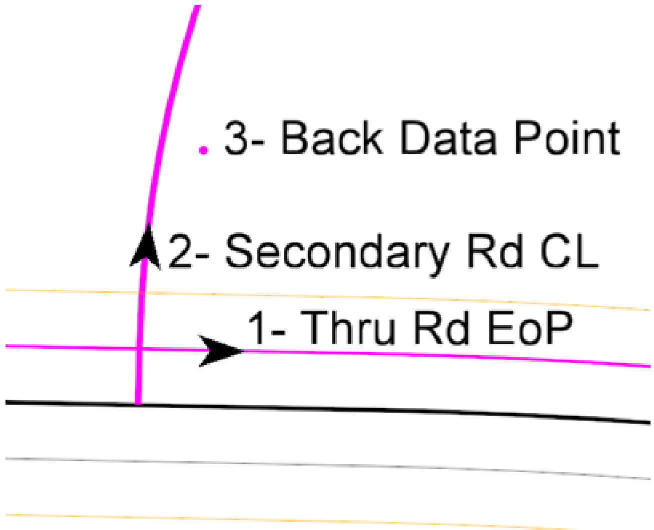
Below are examples of some of the cells shown in plan view mode. All cells are 3D w/ the exception of the Median Turn Lane Cell.

Basic T's	
Ramps	
Turn Lanes	
Islands	
Median	

11.3.2 References

11.3.2.1 BASIC T'S & RAMPS

1) Thru Rd EoP (Profiled) (1)
2) Secondary Rd CL (Profiled)
3) Back Data Point along Secondary Rd (Within Profile Limits, Rec. Min 50' from Thru Rd EP) (2)



NOTES:

(1) Use Template produced EOP from Corridor Model graphics

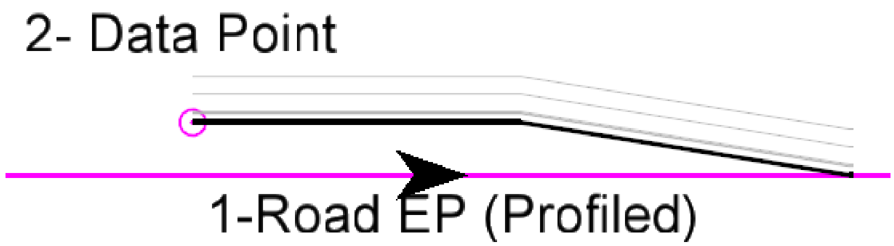
(2) Back data point should be within the limits of the Secondary Rd Profile and this distance (listed above as 50' Min.) varies per cell. Skew and geometry will increase the distance specified.

(3) Order may be different than shown here. Follow prompts.

(4) The *Basic T Overlay & Widening* Civil Cell references are discussed in section 11.3.21

11.3.2.2 TURN LANES

1) Road EP (Profiled Minimum 150' from Turn Lane Parallel Start)
2) Data Point @ Parallel Start Point



NOTES:

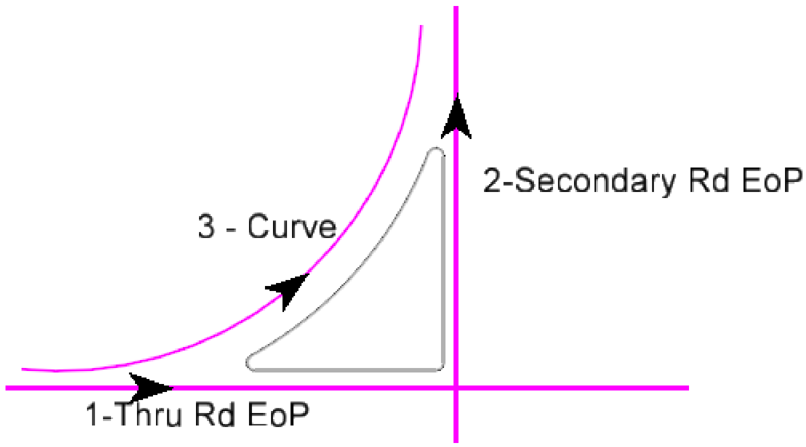
(1) Use Template produced EOP from Corridor Model graphics

(2) Order may be different than shown here. Follow prompts.

(3) Data Point at the PC of the Curve.

11.3.2.3 ISLANDS

1) Thru Rd EoP (Profiled)
2) Secondary Rd EoP (Profiled)
3) "Curve" EoP (90-100' Min. Radius, Profiled)



NOTES:

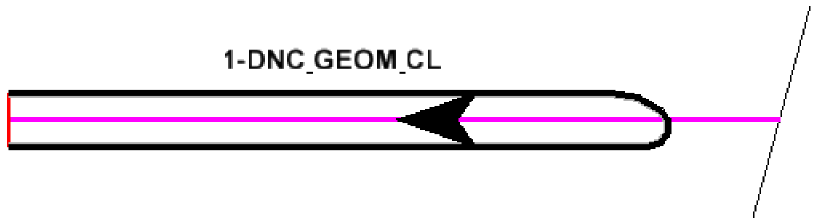
(1) Use Template produced EOP from Corridor Model graphics

(2) Order may be different than shown here. Follow prompts.

(3) Interval EP can be chosen as the Secondary EoP Ref.

11.3.2.4 MEDIAN NOSE

1) DNC_Geom_CL (Element along Sec. Rd CL Thru Cell, Profiled)

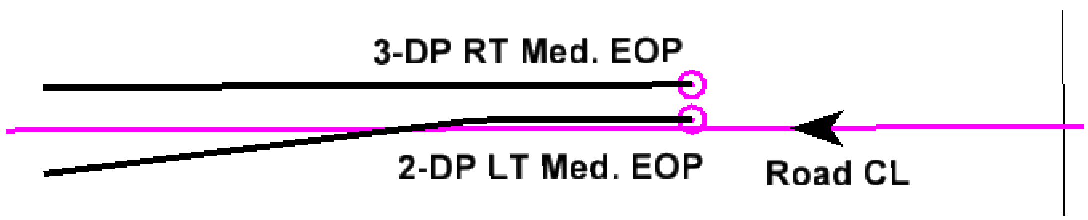


NOTES:

(1) Preferably use the DNC_GEOM_CL element in the Basic T cells.

11.3.2.5 MEDIAN TURN LANE

1) Road CL
2) DP LT Median EoP Start (LT Looking from Nose)
3) DP RT Median EoP Start (RT Looking from Nose)



NOTES:

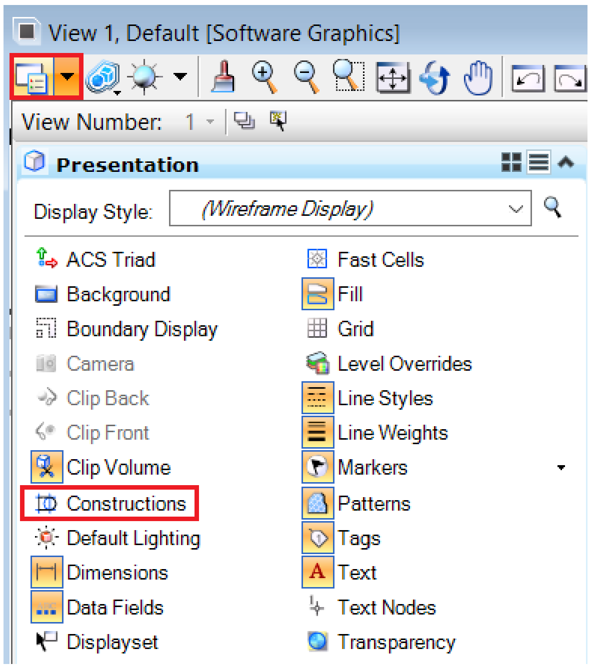
(1) Cell is generally used in conjunction with Median Nose.

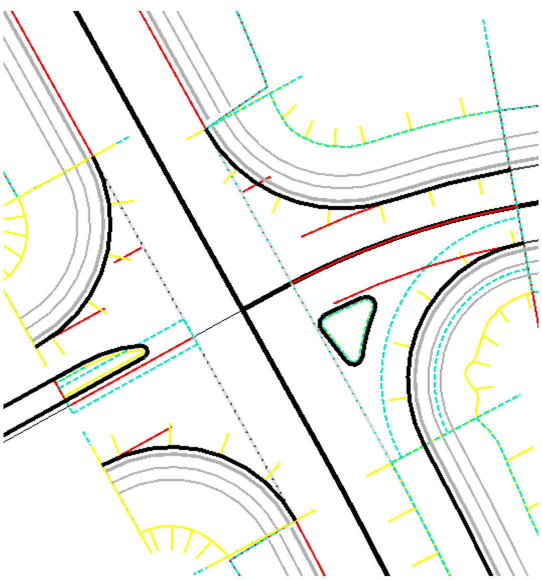
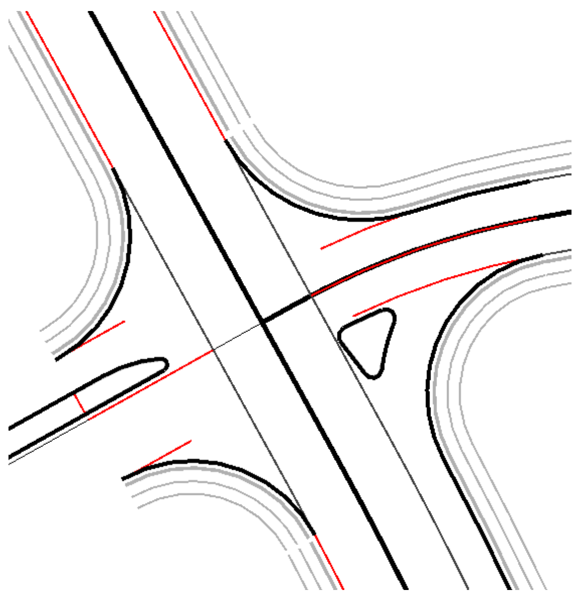
(2) Order may be different than shown here. Follow prompts.

(3) 2D Cell.

11.3.1 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits. To turn off Construction class elements, you will go to View Attributes as shown below.



Construction Class Elements ON	Construction Class Elements OFF
	

11.3.2 Basic T

11.3.2.1 PLACEMENT

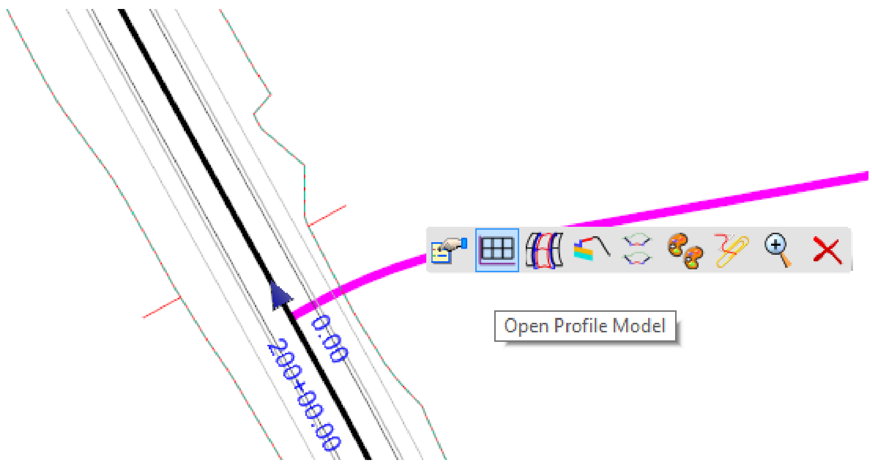
1. Open the **2-lane-Urban-Corridor.dgn.** This file contains alignment **ROUTE156** and around 110+60, a secondary intersecting roadway named **POLERUNRD.** A Corridor has been created for *ROUTE156* and a design grade established for *POLERUNRD.*

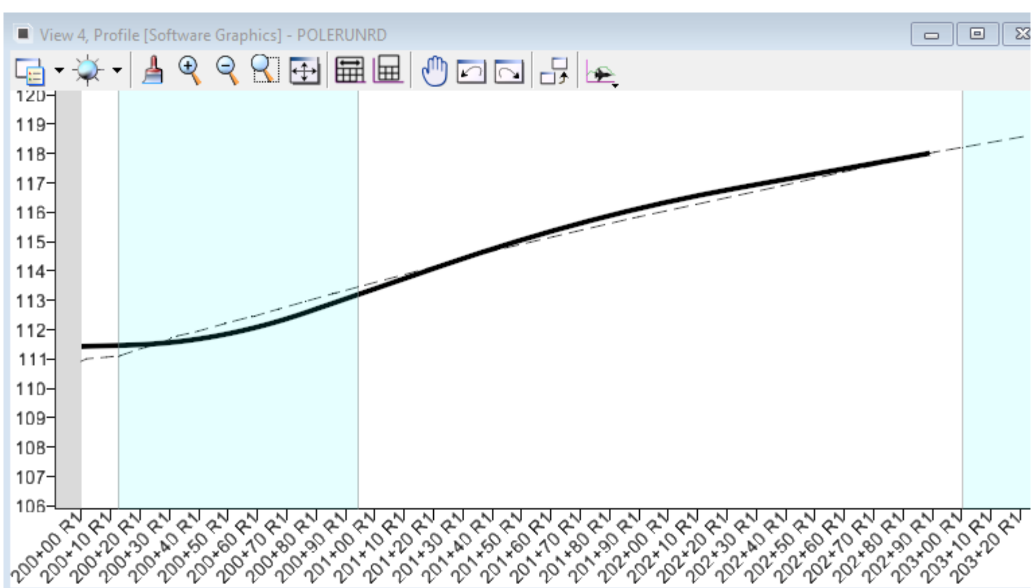
    a. Close the profile view and then verify the Default model is open in View 1 and the Default-3D model is open in View 2

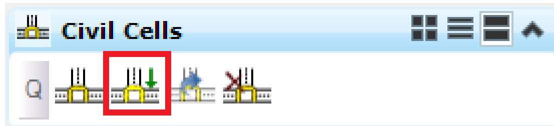
    b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

    c. Open the profile model of *POLERUNRD* in **View 4** to review its profile and verify the profile length. Make View 1 the active view by clicking the top of the view.

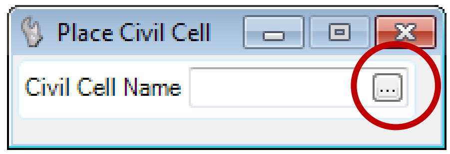




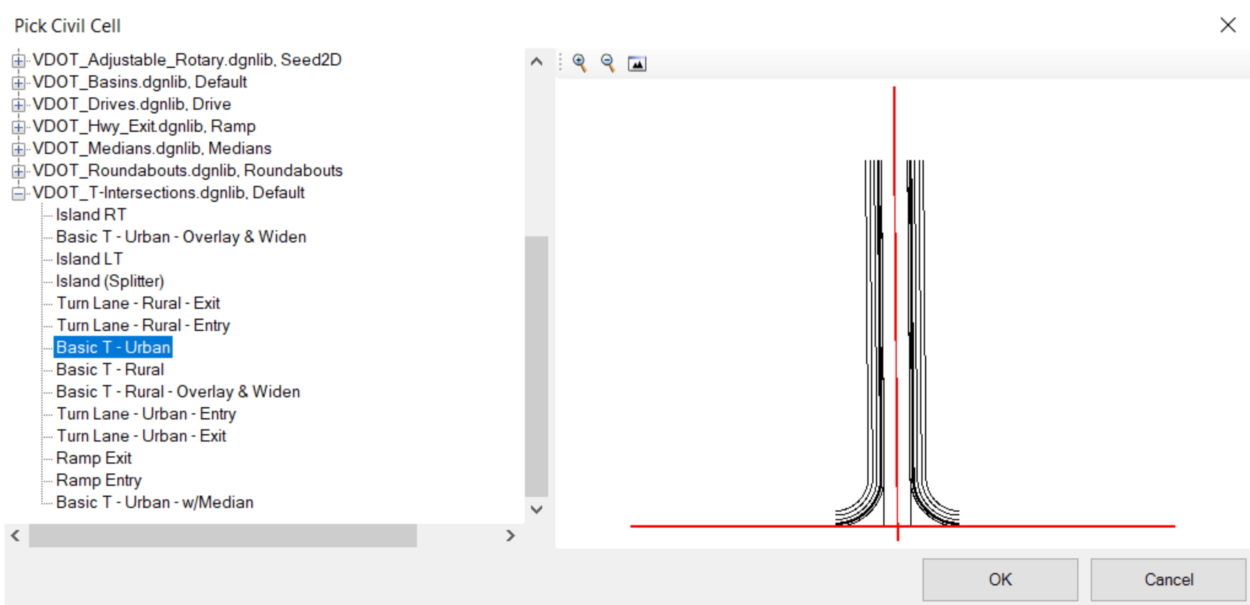
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

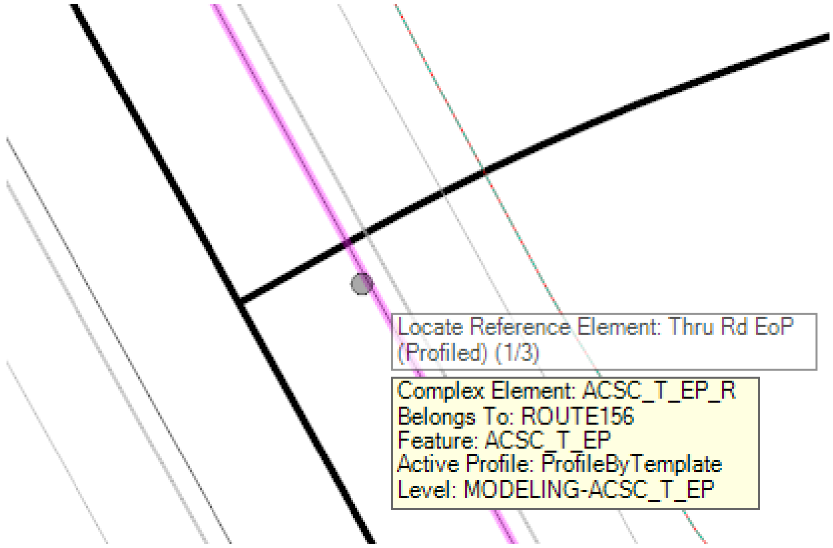


4. Select the **Basic T - Urban** civil cell from the **VDOT_T-Intersections** folder and click **OK.**

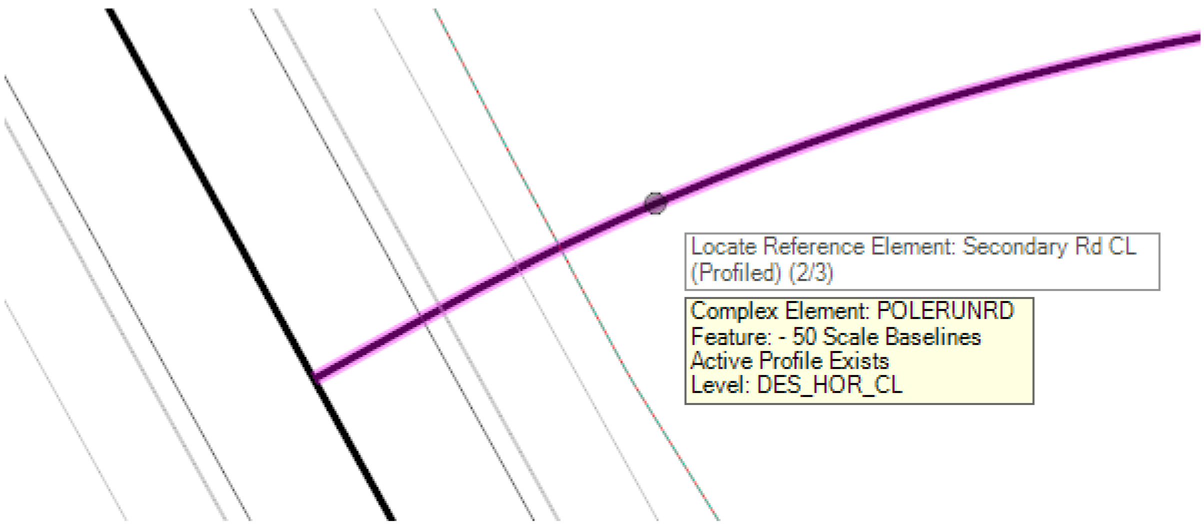


NOTE: The next three prompts may be in different order than listed in this manual.

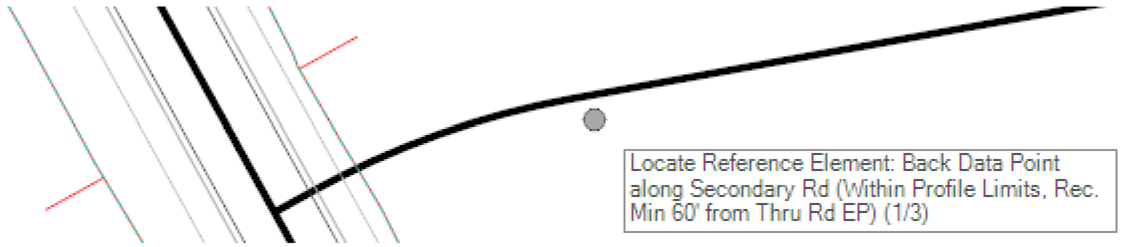
5. When prompted to *'Locate Reference Element: Thru Rd EoP (Profiled)'*, select the **ROUTE156 EOP** in View 1.



6. When prompted to *'Locate Reference Element: Secondary Rd CL (Profiled)'*, select the **Secondary Rd CL** in View 1.



7. When prompted to *'Locate Point: Back Data Point along secondary Rd (Within Profile Limits, Rec. Min. 50' from Thru Rd EoP)'* select a location where the intersection will end. DP just past the end of the curve on the secondary road.

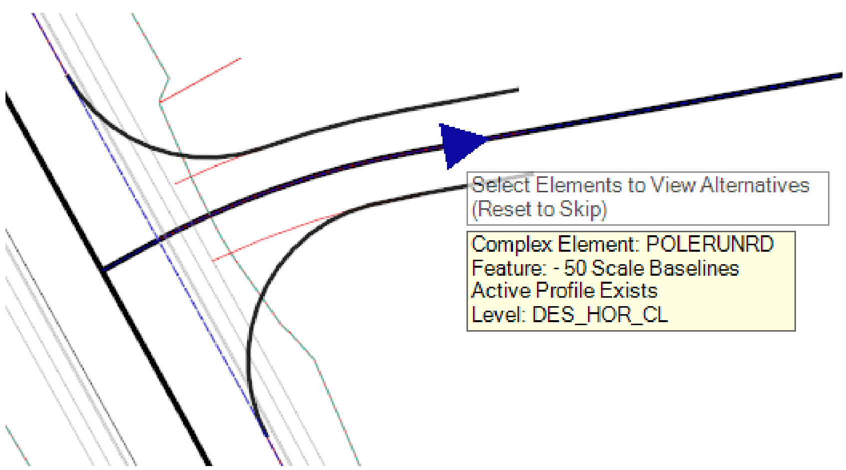


8. Observe the geometry being displayed.

   a) If the geometry appears correct and similar to the image below, move on to the next step.

   b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.3.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-click through the remainder of prompts to not place the cell and review the reference elements.



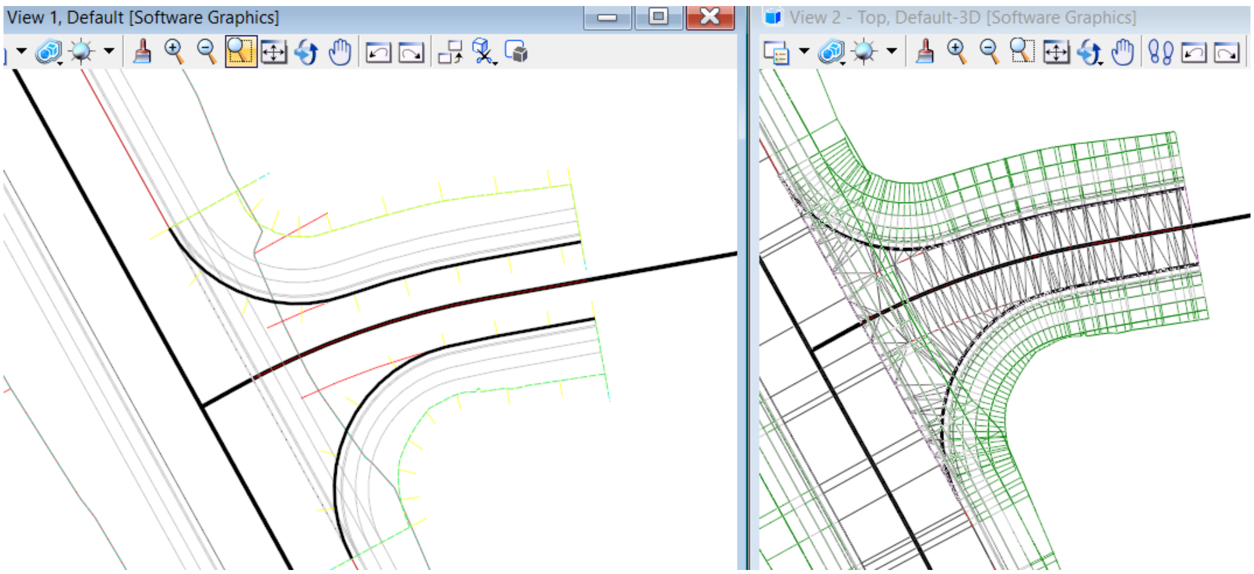
9. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

10. **Right-click** when prompted to 'Select Corridors To Be Clipped (Reset To Complete)'.

    NOTE: Clipping the Corridor is a viable option to remove underlying corridor elements such as the Thru Rd shoulder & end conditions. We will demonstrate another option in this manual of removing the Thru Rd overlapping elements (using Template Display rules and Parametric Constraints) but the user has the option to select the Thru Rd Corridor at this point to Clip.

11. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

    The image below shows the cell in 2d & 3d views.



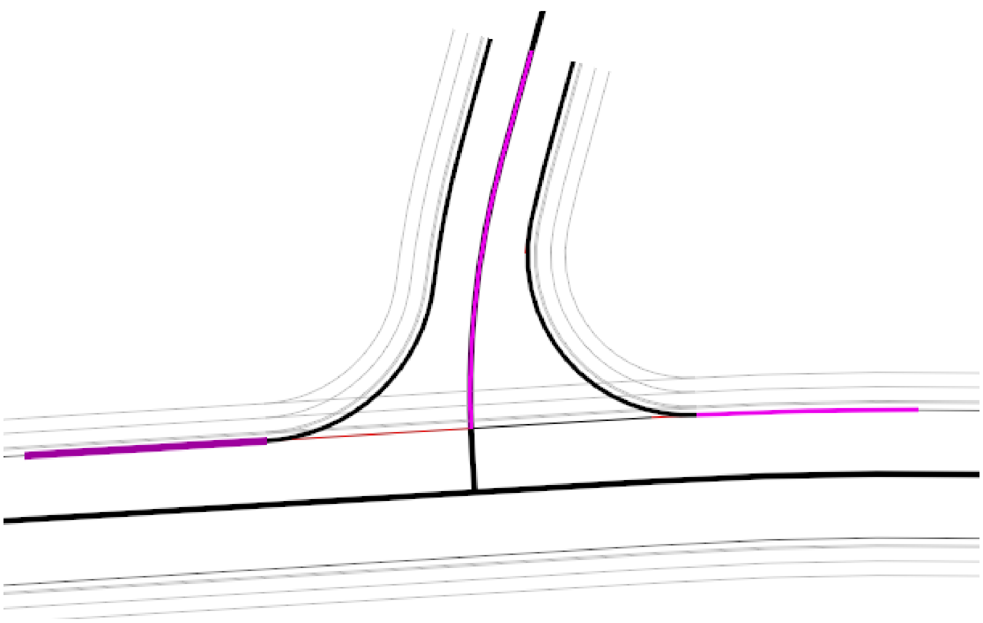
11.3.2.2 HORIZONTAL EDITS – OVERVIEW

The remaining sub-sections of the Basic T section will cover Horizontal edits once the T-Intersection is placed. Carefully pay attention to geometry (2d & 3d) as you perform edits of these cells. If you make a change that causes the cell geometry to exceed the requirements of the reference elements, the cell geometry will fail so you may have to possibly modify the reference elements prior to making excessive edits to the cell. You may also make edits that will cause a dependent element in the cell to fail just because it is not geometrically feasible. You may have to undo the edit and change the failing dependent geometry to something that will work with your intended edit.

NOTE: After discussing the Basic T Horizontal Edits, we will discuss Placement and Horizontal Edits for the Turn Lane Cells and Islands. Following these sections and beginning at section 11.3.5 we will discuss more relevant processes for the Basic T & associated cells including Secondary Road Corridors, Display Rule, Cross-Section View, Flow Arrows, Vertical Edits, Template Edits, Key Stations, etc.

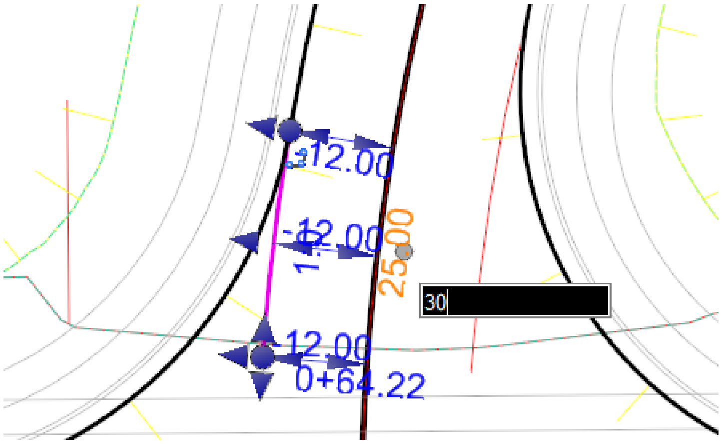
11.3.2.3 CONTROLLING ELEMENTS

The elements highlighted below are controlling elements of the Civil Cell. These elements will be discussed more in the steps below but it should be noted that edits of the cell geometry should not push any of the cell geometry beyond the ends of these elements although these elements can all be lengthened with edits.

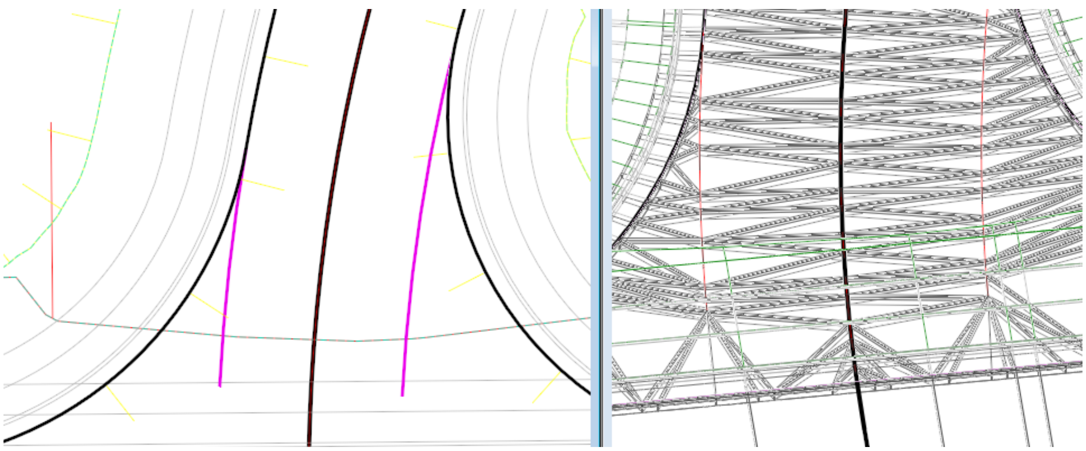


11.3.2.4 BREAKLINE EDITS

12. Select the element shown below and change its length from 25’ to 30’.



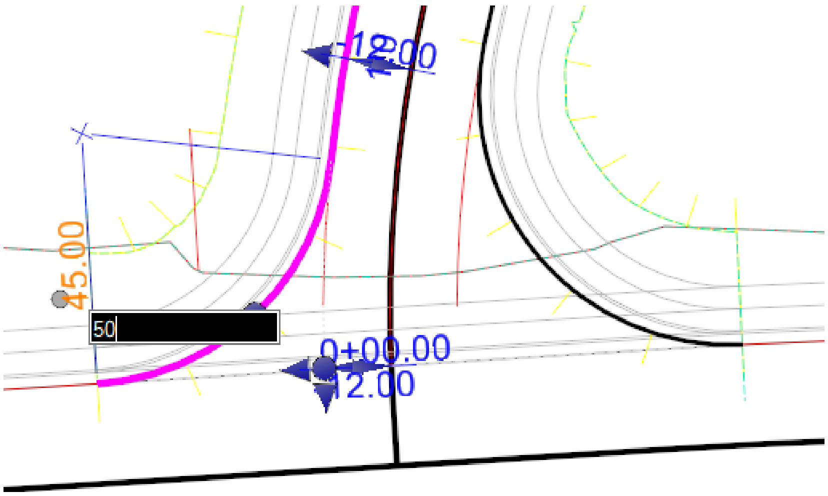
13. Note the change in the 3d view as these two breaklines are included in the Pvmt Surface terrain.



11.3.2.5 CURVE EDITS

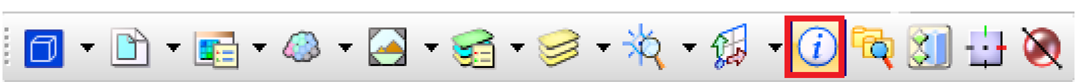
Curve radii can be edited by selecting the edge of pavement and editing the Manipulator text as shown below.

1. Change the radius of the following to 50'.

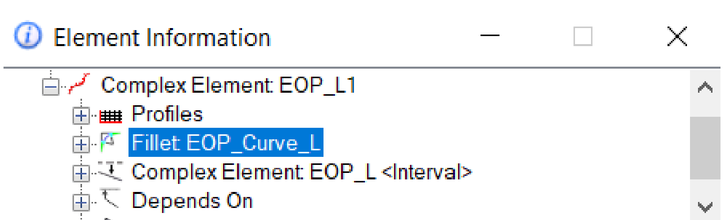


There is just one simple curve placed on each side of a T-Intersection. This simple curve can be changed to a 2 or 3-center curve and tapers can be added as well. In the next few steps, we will make the left curve a 2-center curve.

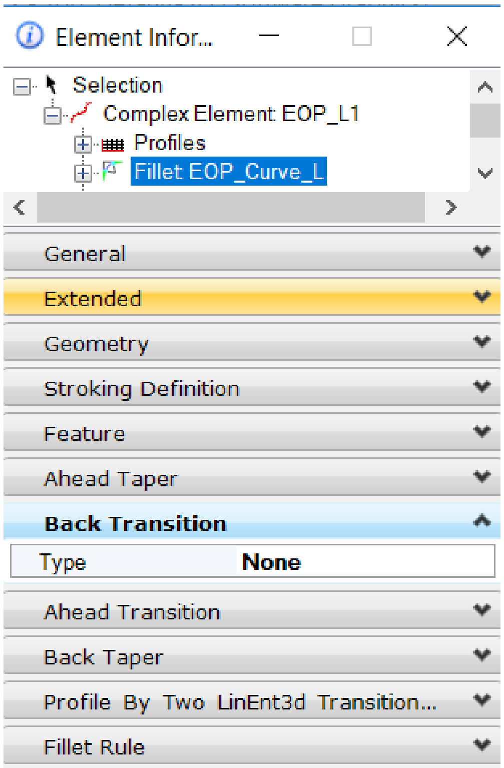
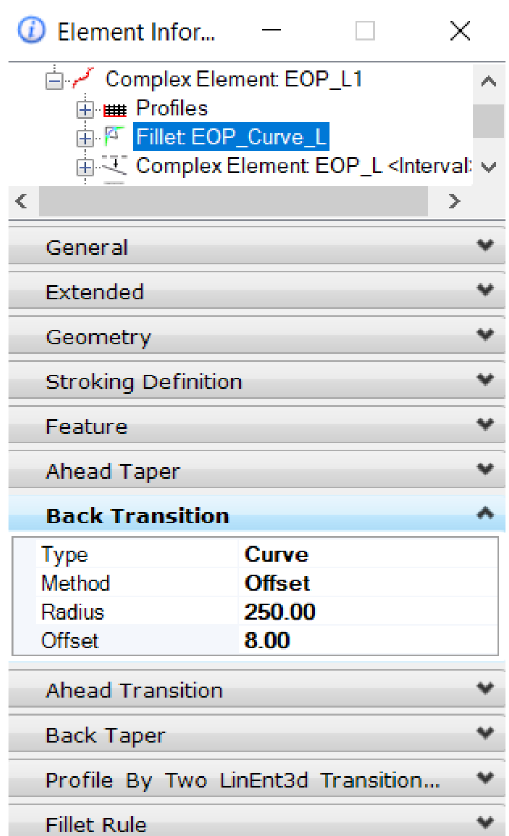
2. . With the left EoP selected, choose MicrosStation's **Element Information** tool.



3. Expand the Complex Element and select the **Fillet**.

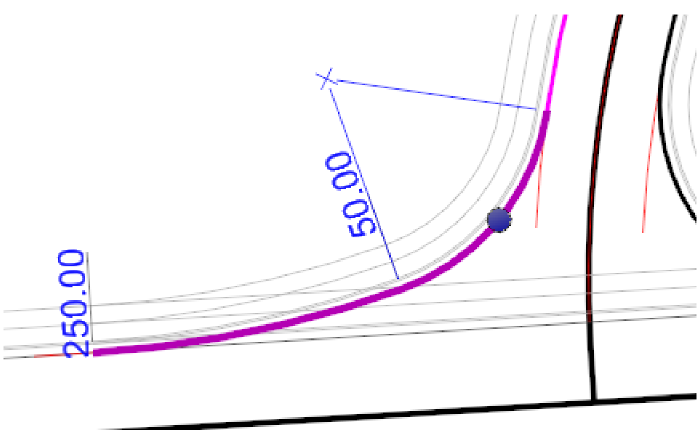


4. Change the *Back Transition* from **None to Curve** with a Method, Radius, & Offset as shown below**.**

Before	After
	

Note the other items available to edit in Element Information. Also note you may have to select the Fillet multiple times in this process.

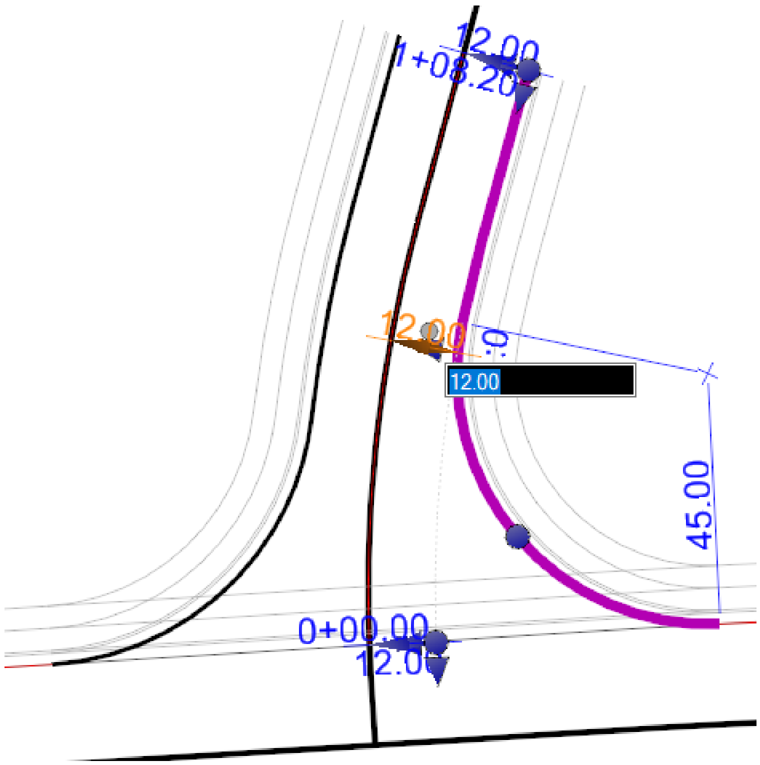
5. Review the curve in the plan view and notice the additional curve available to edit.



6. Change the *Back Transition* back to its original setting of **None.**

11.3.2.6 LANE WIDTH

To change lane width, just select the edge of pavement along the secondary road and edit the lane width. We will not make edits for this exercise. Note to always select the middle offset value as shown below to keep the selected element parallel.

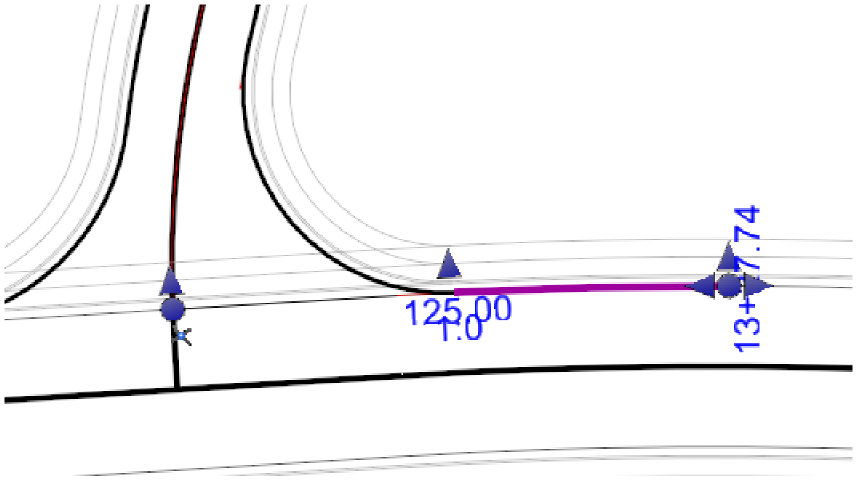


11.3.2.7 TURN LANE PREP

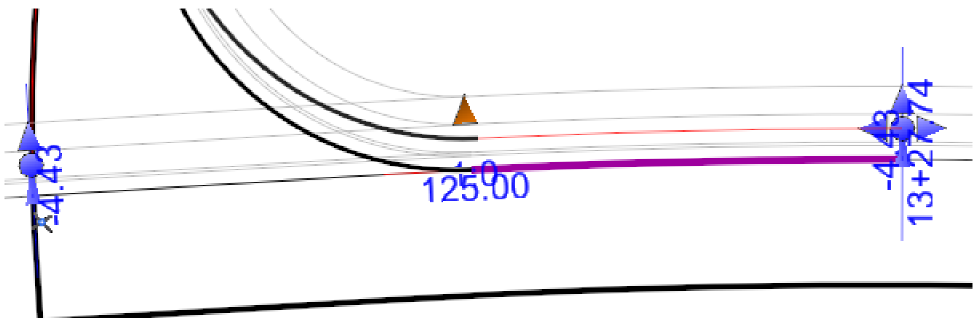
This section demonstrates the process to modify the cell to accommodate a turn lane.

<u>Turn Lane on Thru Rd.</u>

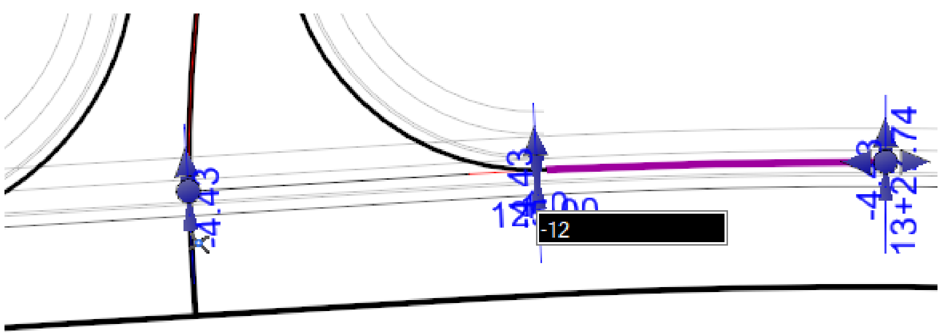
1. Select the **DNC_Geom_TurnLaneCtrl_R** element as shown below.



2. Select the **Offset** handler and Data Point a few feet outside the Thru Rd EoP .

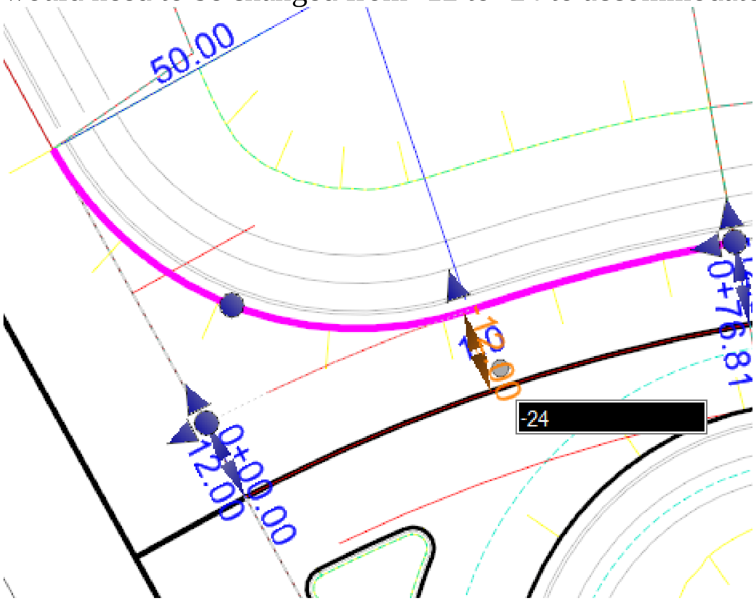


3. The offset is now displayed so select the offset as shown below and change its value to **-12’.**



Turn Lane on Secondary Rd

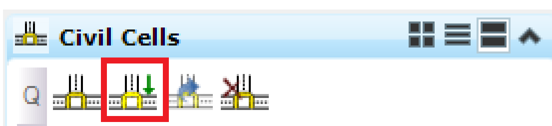
If a turn lane is needed for the secondary road, the offset of the curves ahead element should be changed to accommodate the turn lane. For example, the following value would need to be changed from -12 to -24 to accommodate the turn lane.



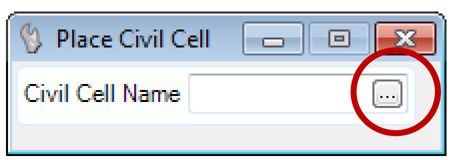
11.3.3 Turn Lane

11.3.3.1 PLACEMENT

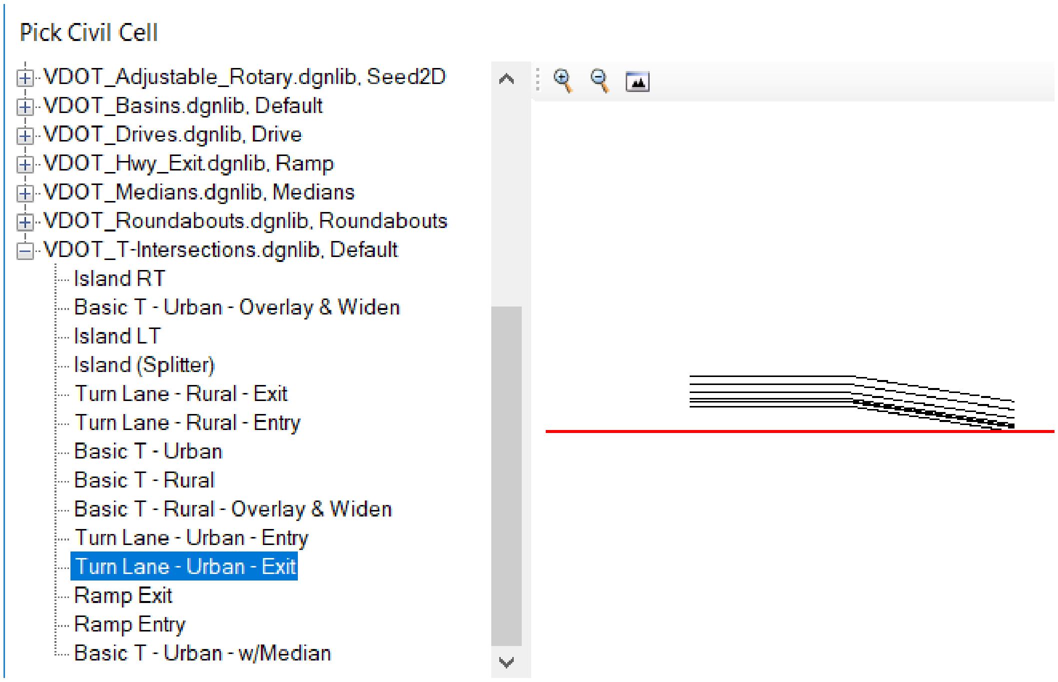
1. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



2. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

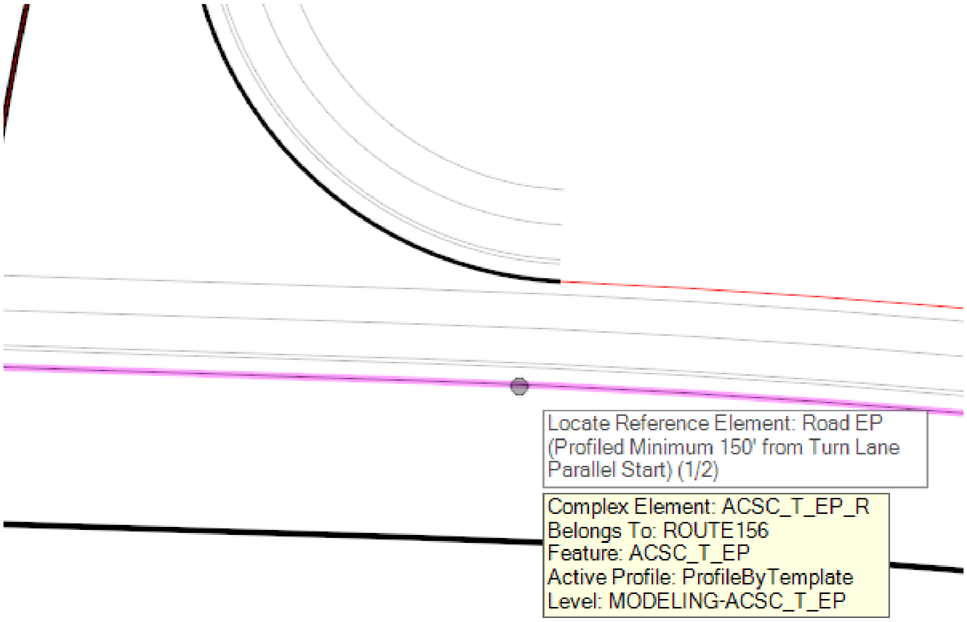


3. Select the **Turn Lane – Urban - Exit** civil cell from the **VDOT_T-Intersections** folder and click **OK.**

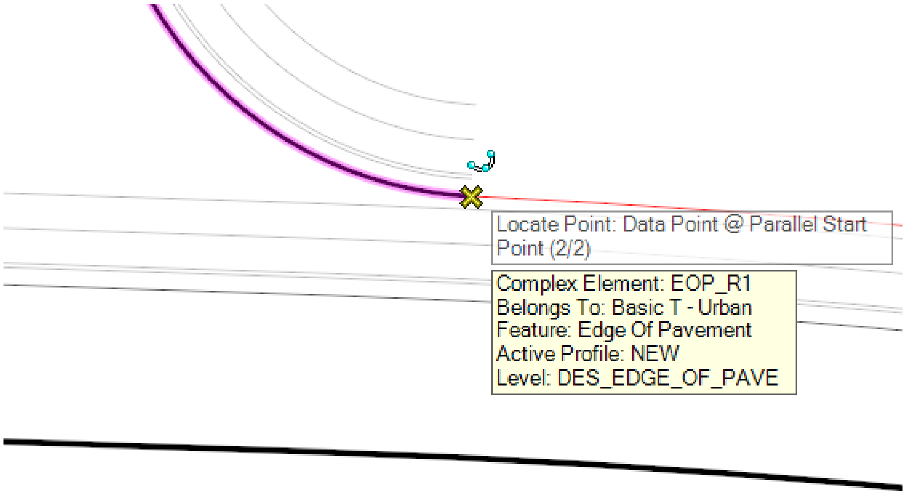


NOTE: The next two prompts may be in different order than listed in this manual.

4. When prompted to '*Locate Reference Element: Road EP (Profiled Minimum 150' from Turn Lane Parallel Start),* select the **ROUTE156 EOP** in View 1.



5. When prompted to *'Locate Point: Data Point @ Parallel Start Point'*, snap to the PC of the Curve in View 1.

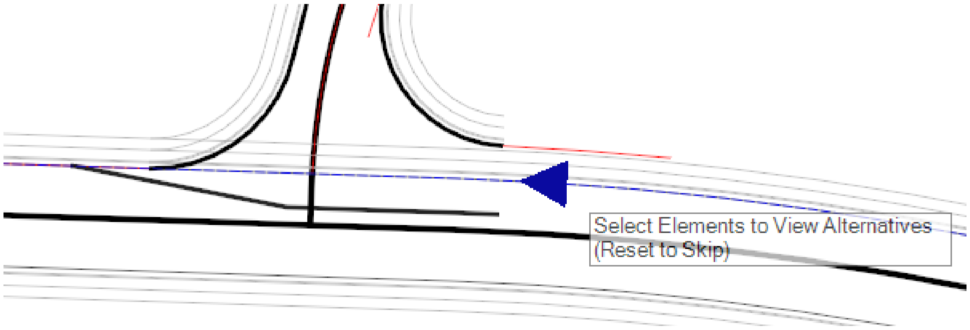


6. Observe the geometry being displayed.

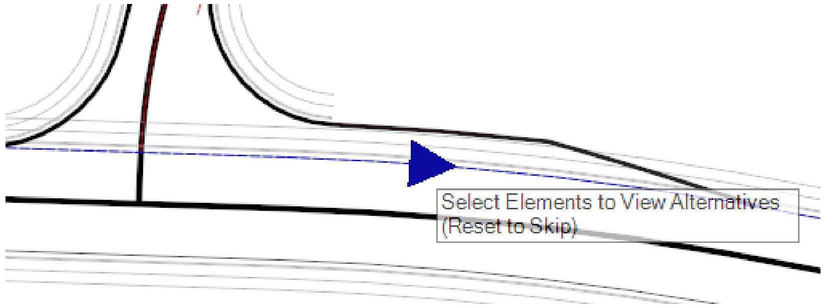
   a) If the geometry appears correct and similar to the image below, move on to the next step.

   b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.3.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-click through the remainder of prompts to not place the cell and review the reference elements.



7. In this case, we need to reverse direction of the Road EP so while hovering over the Road EP and left click to reverse the direction of the arrow.



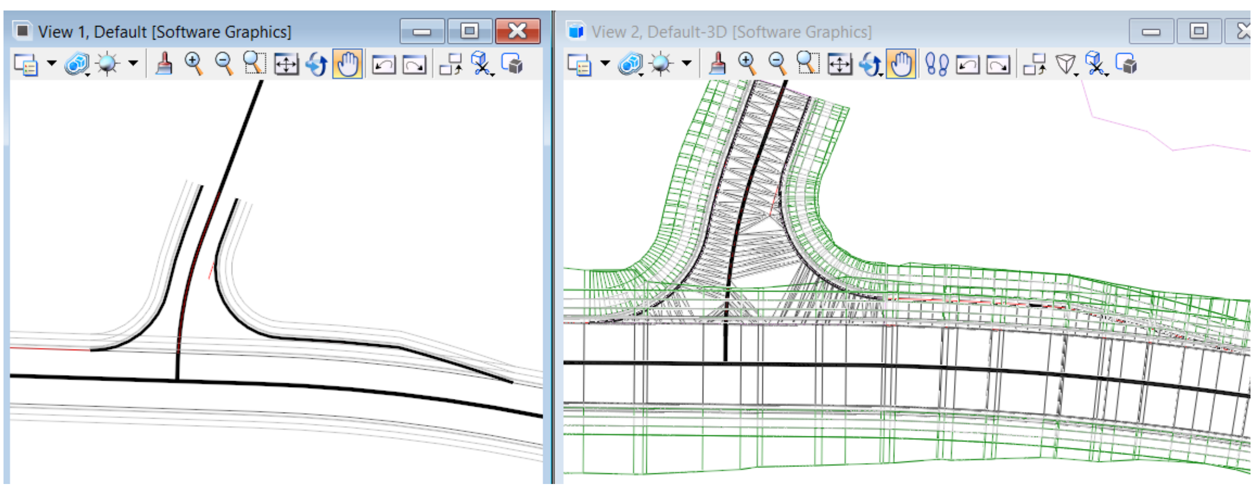
8. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

9. **Right-click** when prompted to 'Select Corridors To Be Clipped (Reset To Complete)'.

   NOTE: Clipping the Corridor is a viable option to remove underlying corridor elements such as the Thru Rd shoulder & end conditions. We will demonstrate another option in this manual of removing the Thru Rd overlapping elements (using Template Display rules and Parametric Constraints) but the user has the option to select the Thru Rd Corridor at this point to Clip.

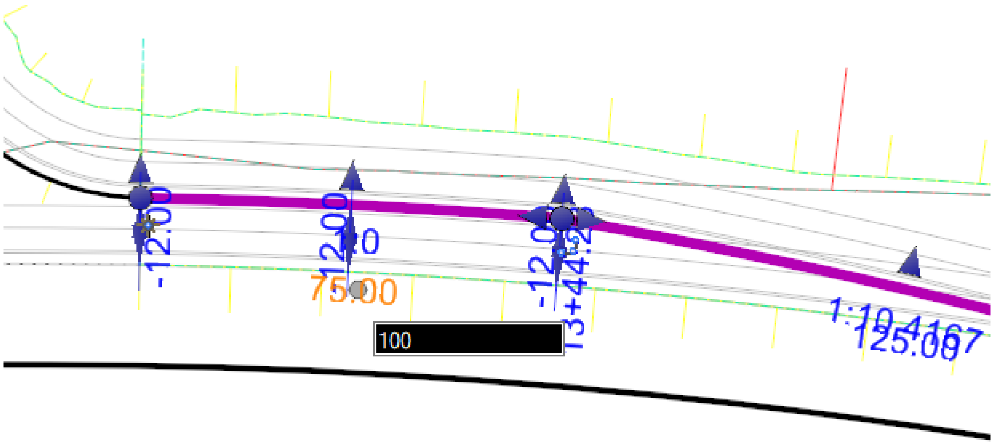
10. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

   The image below shows the cell in 2d & 3d views.

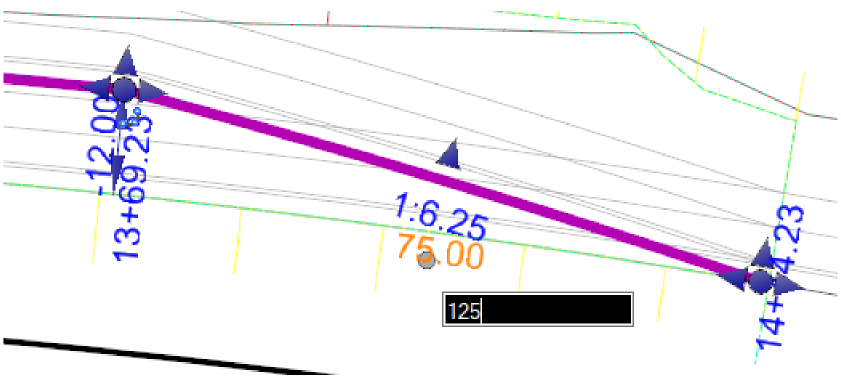


11.3.3.2 HORIZONTAL EDITS

1. Select the storage lane EoP and change the value of the storage lane length from **75’** to **100’**.



2. Change the taper length from **75’** to **125’.**

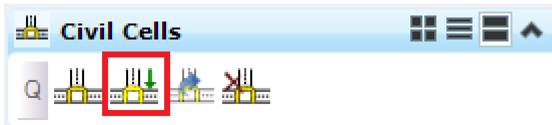


11.3.4 Islands

This section will cover placement & edits of an island cell.

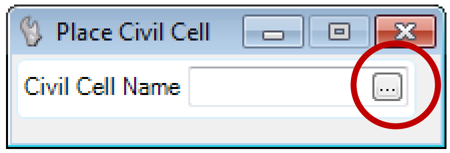
11.3.4.1 PLACEMENT

1. From the *Civil Cells* task group, select the **Place Civil Cell** icon.

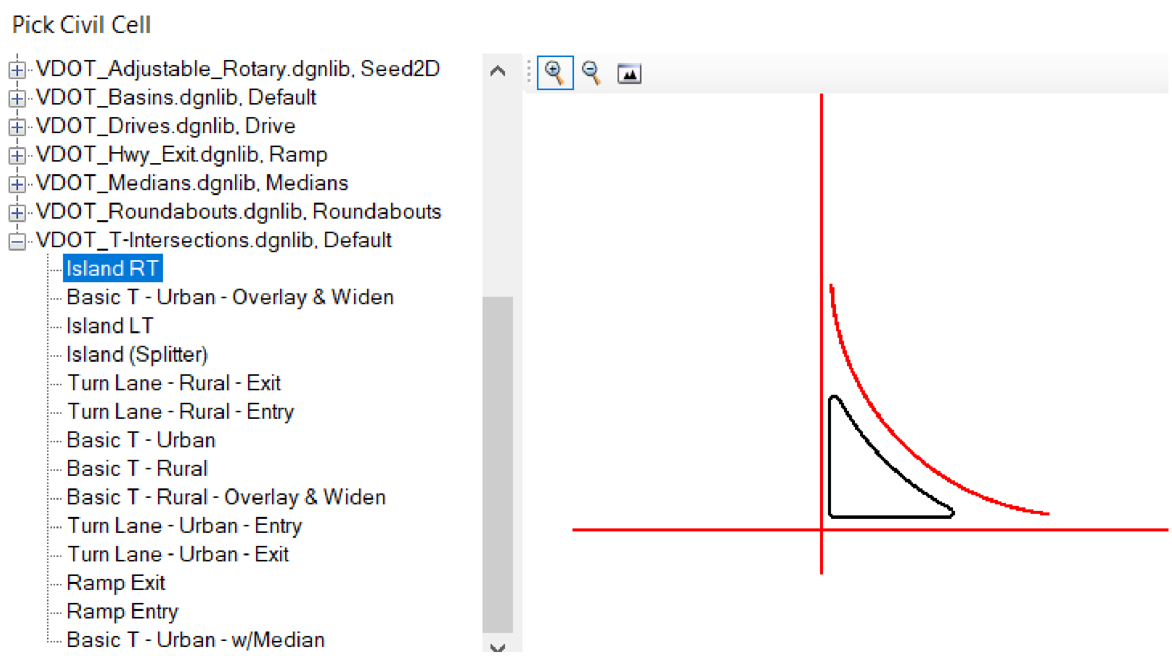


2. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

Island RT

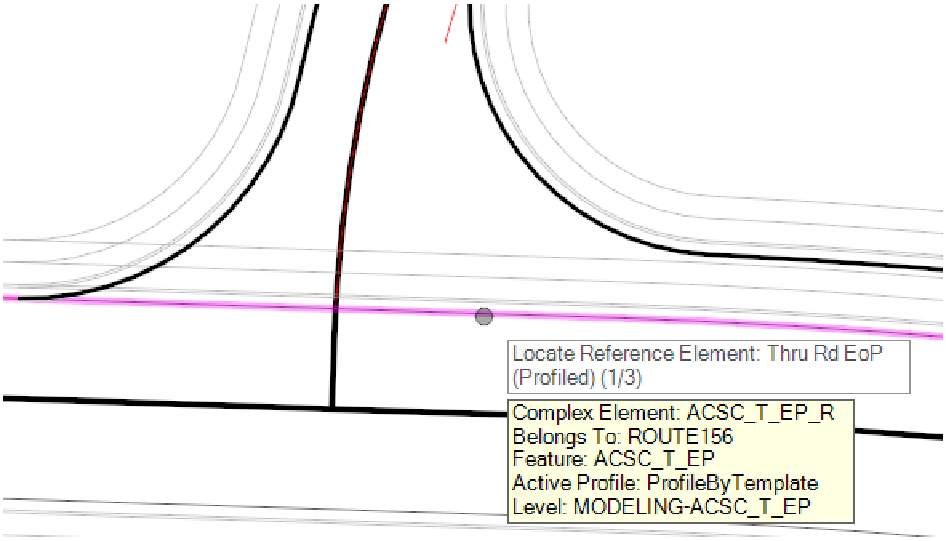


3. Select the **Turn Lane – Urban - Exit** civil cell from the **VDOT_T-Intersections** folder and click **OK.**

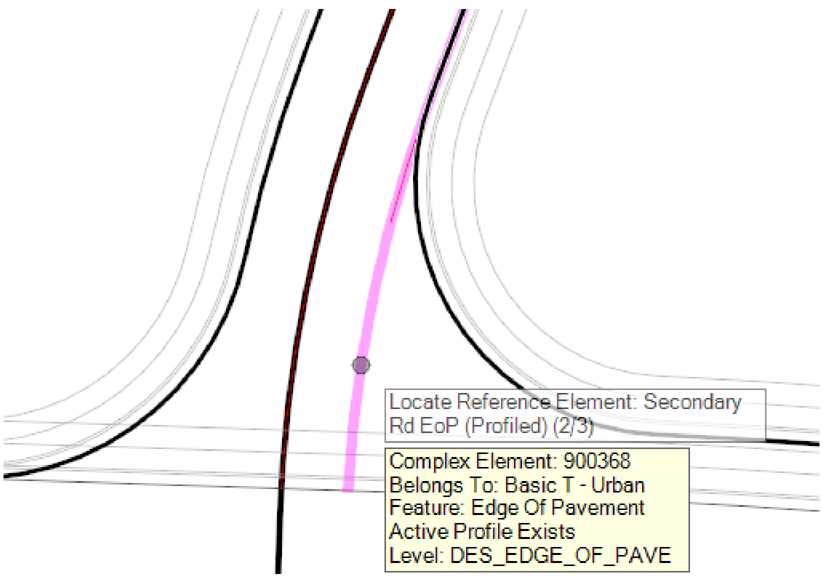


NOTE: The next three prompts may be in different order than listed in this manual.

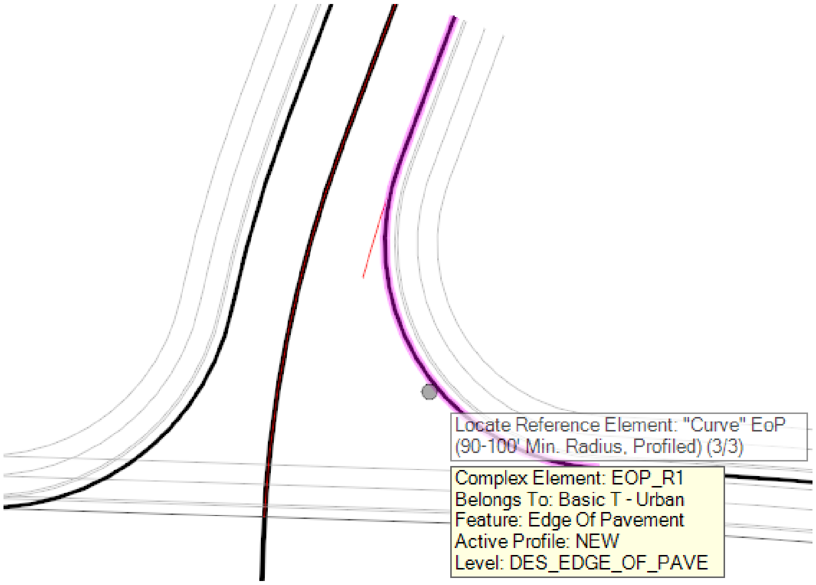
4. When prompted to '*Locate Reference Element: Thru Rd EoP (Profiled)'*, select the **ROUTE156 EOP** in View 1.



5. When prompted to '*Locate Reference Element: Secondary Rd EoP (Profiled)*, select the element shown below which is the trimmed (interval) EoP for PoleRunRd.



6. When prompted to *'Locate Reference Element: "Curve: EoP (90-100' Min. Radius, Profiled),* select the element shown below.



7. Observe the geometry being displayed.

   d) If the geometry appears correct and similar to the image below, move on to the next step.

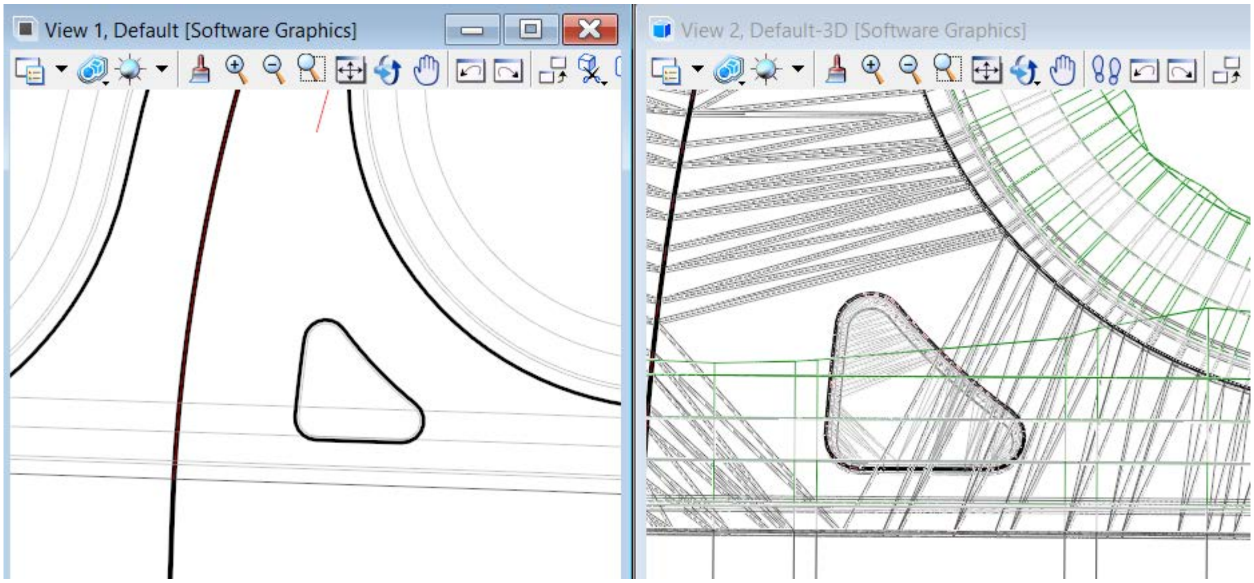
   e) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.3.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   f) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-click through the remainder of prompts to not place the cell and review the reference elements.

8. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

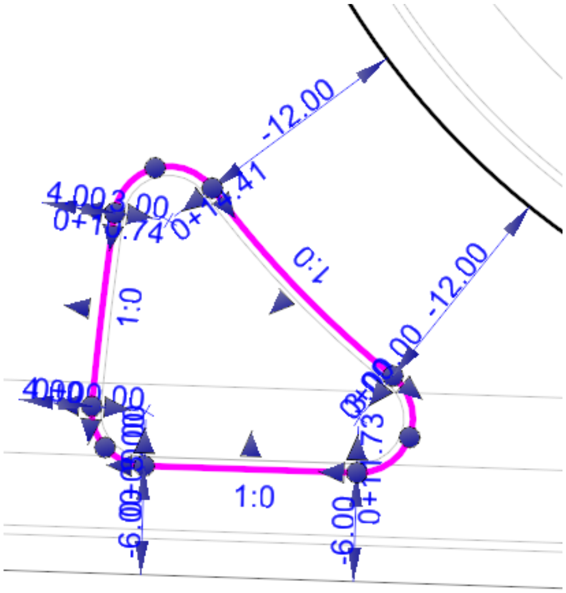
9. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

   The image below shows the cell in 2d & 3d views.

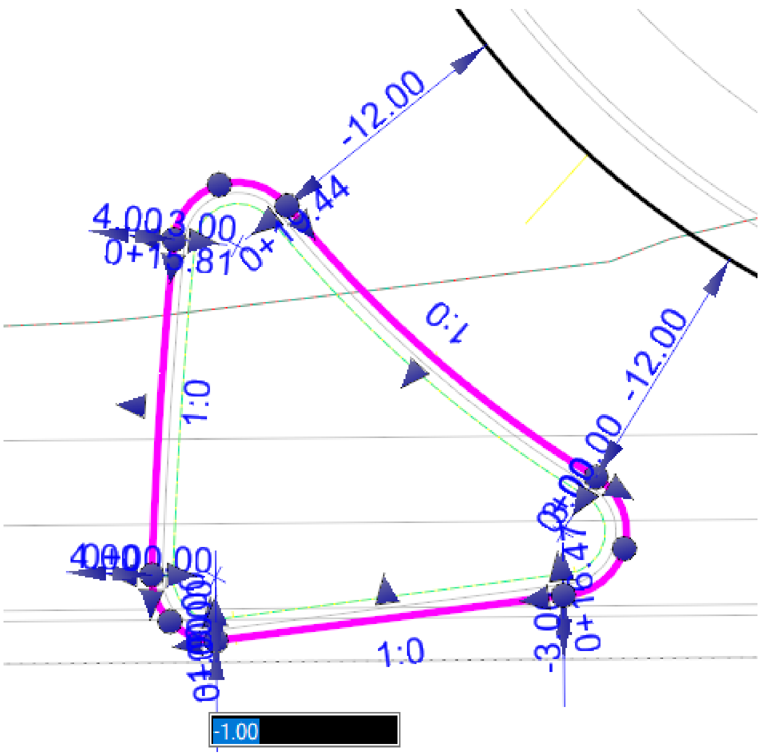


11.3.4.2 HORIZONTAL EDITS

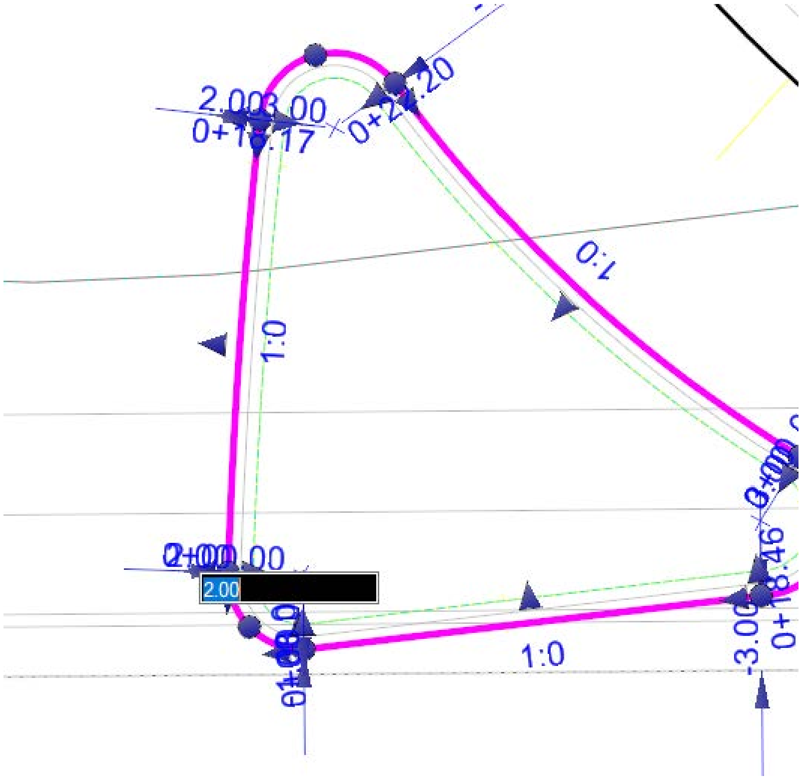
Island edits can be made by selecting the Island EoP and changing the manipulator text shown below.



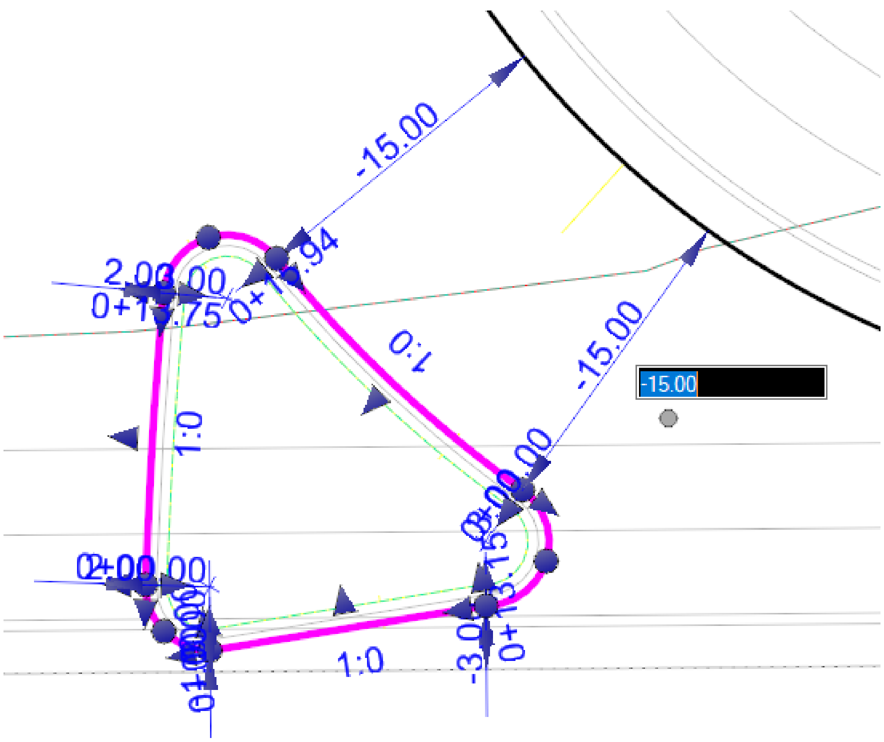
1. Change the offsets along ROUTE156 from -6 to -1 & -3 as shown below.



2. Change the offsets along the Secondary Road from 4 to 2.



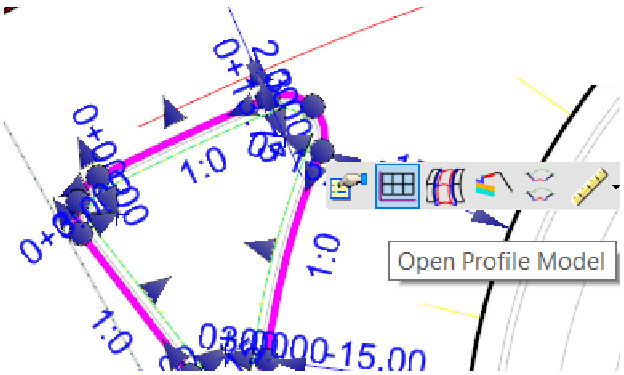
3. Change the offsets along the curve from -12’ to -15’.



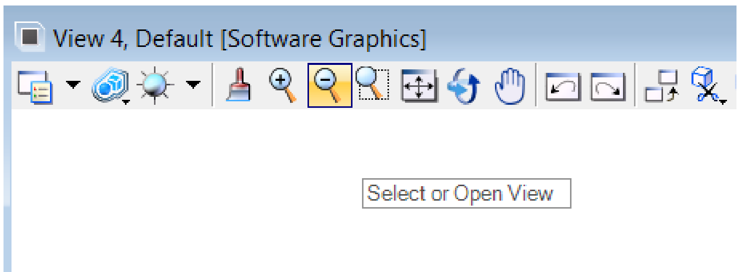
11.3.4.3 VERTICAL EDITS

Island EP's are initially profiled by projecting slopes off the reference elements and the island EP should be re-profiled from an embedded terrain in the intersection cell which represents the finished grade of the intersection. The steps below will take you through this process.

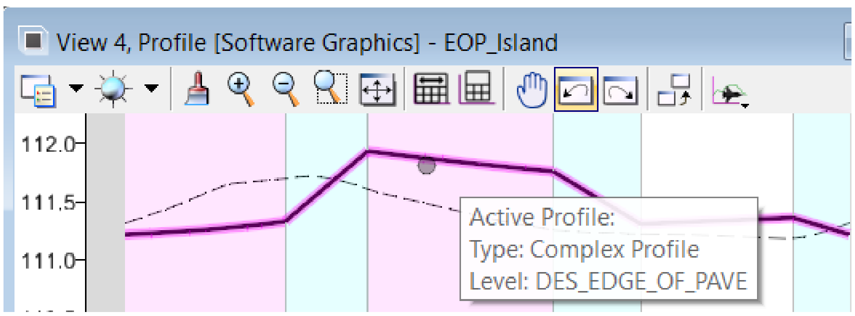
1. Open the profile view of the Island EoP.
   a. Open View 4.
   b. Select the Island EoP and from the context menu, choose, **Open Profile Model.**



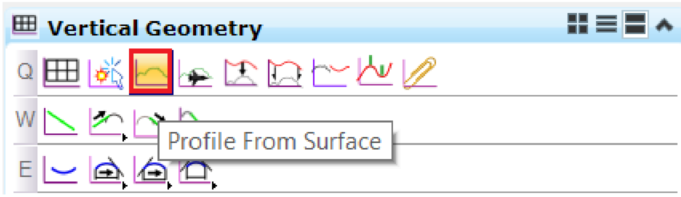
   c. Data Point in View 4 when prompted to Select or Open Profile View.



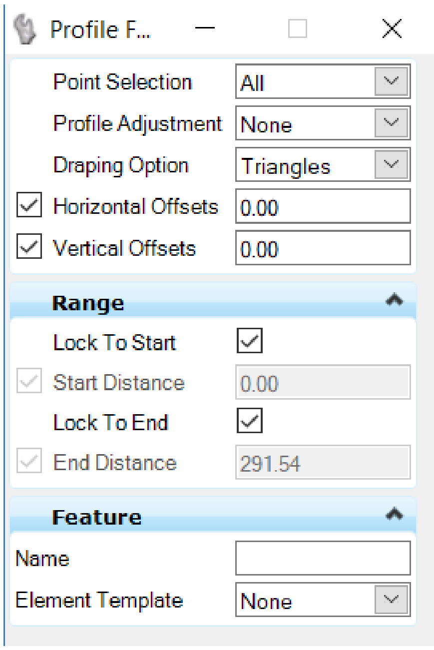
   d. Review the current active profile.



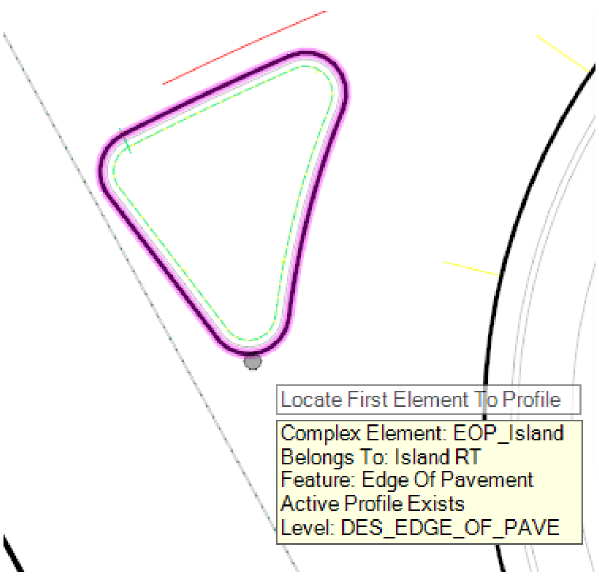
2. Select the *Vertical Geometry* command **Profile From Surface.**



3. Set the resulting dialog as shown below.

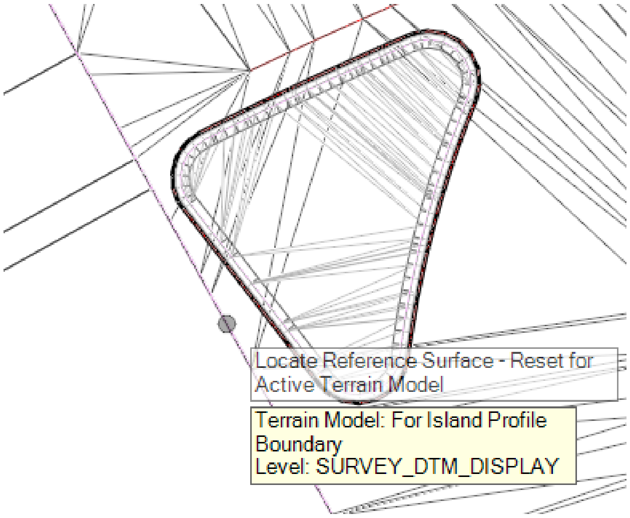


4. Select the **Island EP** when prompted to *Locate First Element to Profile.*



5. Reset when prompted to *Locate Next Element to Profile.*

6. In the 3D view, select the terrain **For Island Profile** when prompted to *Locate Reference Surface.*

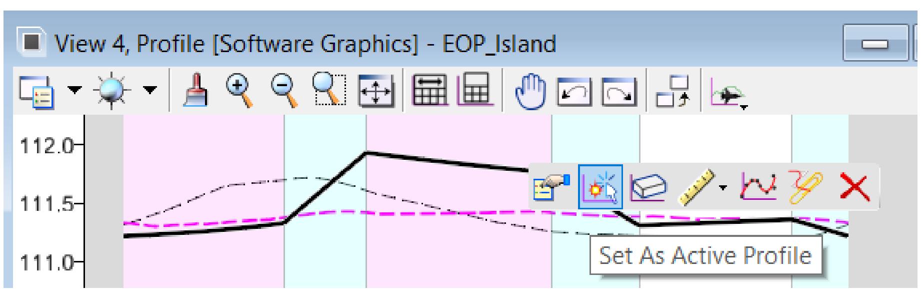


NOTE: You may have to reset several times before the For Island Profile terrain is highlighted.

7. **Reset** to end the selection process.

8. **Left click** to confirm the remaining command prompts confirming the dialog settings which will create a new profile in the Profile View.

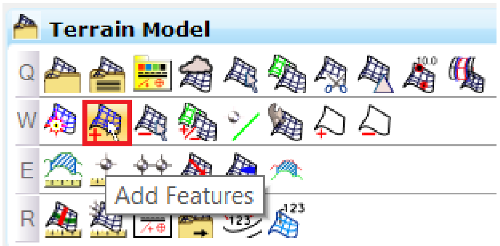
9. Select this new profile and from the context menu, choose **Set As Active Profile.**



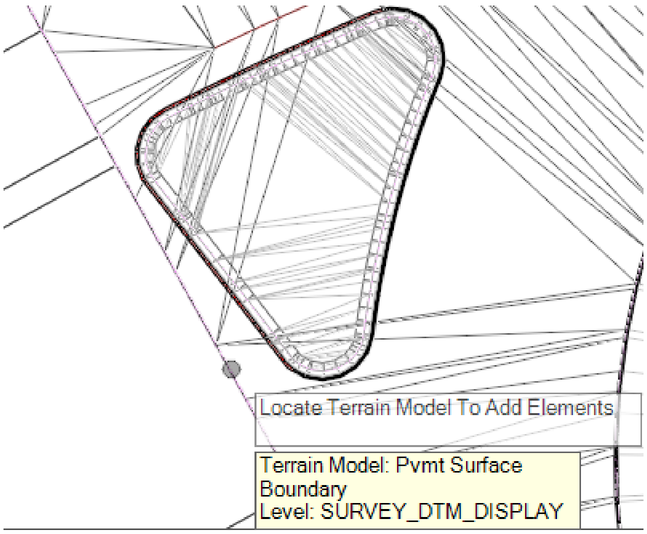
11.3.4.4 CLIP/VOID PROCESS.

In the following steps, we will add the Island EoP as a Void to the Intersection Pvmt Surface terrain to remove the pavement in the island area.

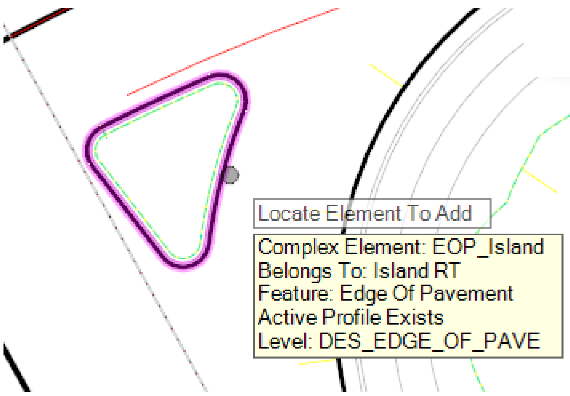
1. Select the command **Add Features** from the *Terrain Model* tools.



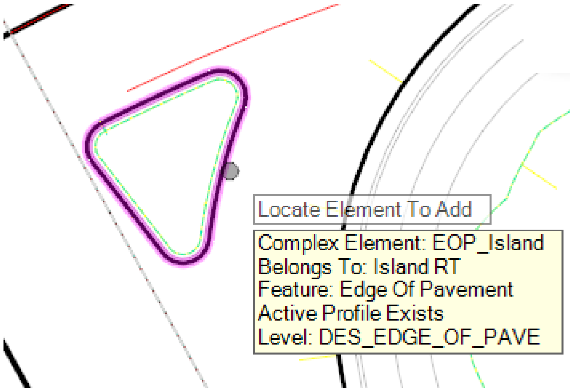
2. Select the **Pvmt Surface** terrain when prompted to *Locate Terrain Model To Add Elements.*



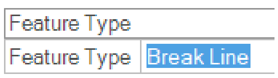
3. Select the **EOP_Island** element when prompted to *Locate Element To Add.*



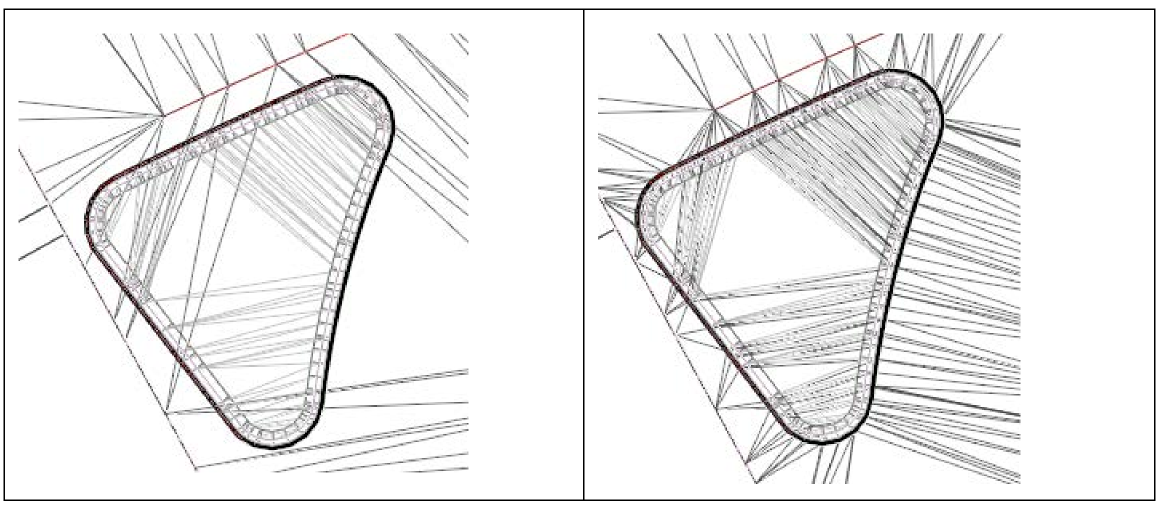
4. **Reset** when prompted to *Locate Next Element To Add.*



5. Choose (Use keyboard up or down arrows) **Break Line** as the *Feature Type* and then Data Point to confirm.



6. Before & after screenshots of the island:

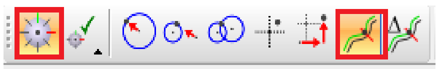


11.3.5 Secondary Road Corridor

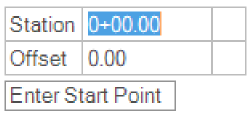
In this section we will go through the steps of modifying the length of the cell and then we will create a corridor for the secondary road.

11.3.5.1 ADJUST THE CELL ENDPOINT

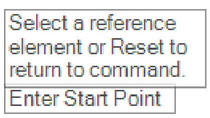
1. Invoke **Civil Accudraw** and ensure *Station-Offset* mode.



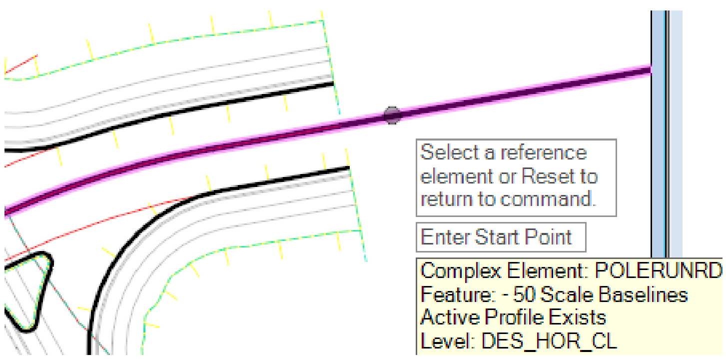
2. Choose the *Horizontal Geometry* command **Line Between Points.**
3. You should be prompted with the Civil Accudraw *Station/Offset Cursor* prompt as shown below.



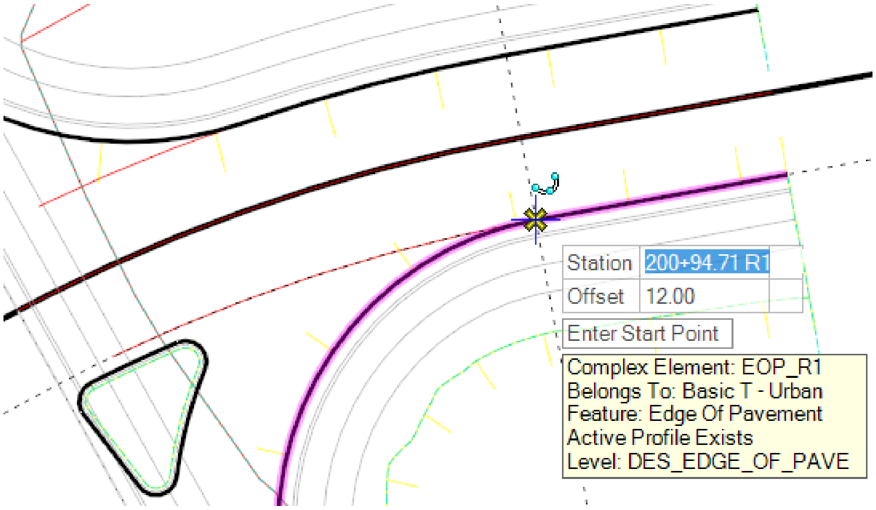
4. Hit the letter **"o"** key on your keyboard and Civil Accudraw will prompt you to *Select a Reference element* as shown below.



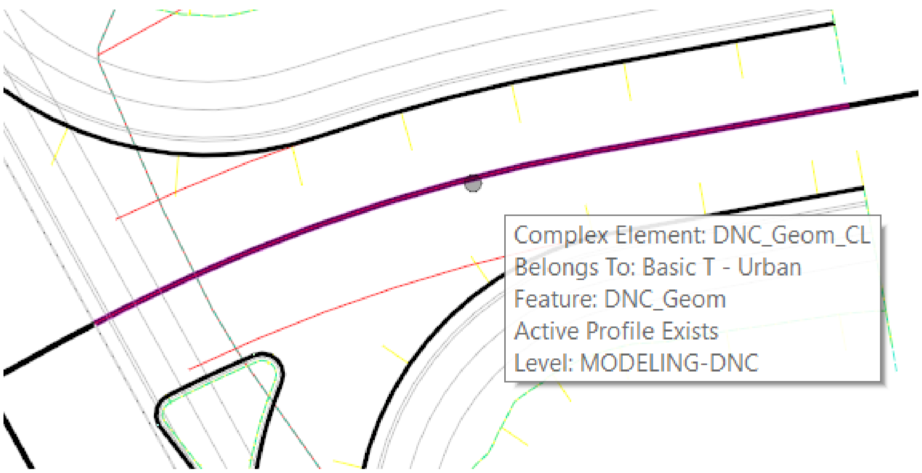
5. Select POLERUNRD.



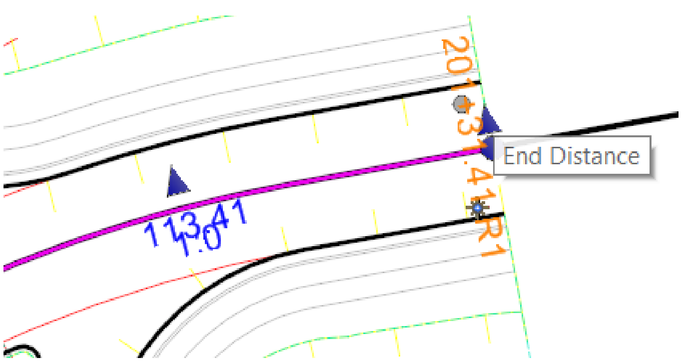
6. Snap to the Arc PC as shown below.



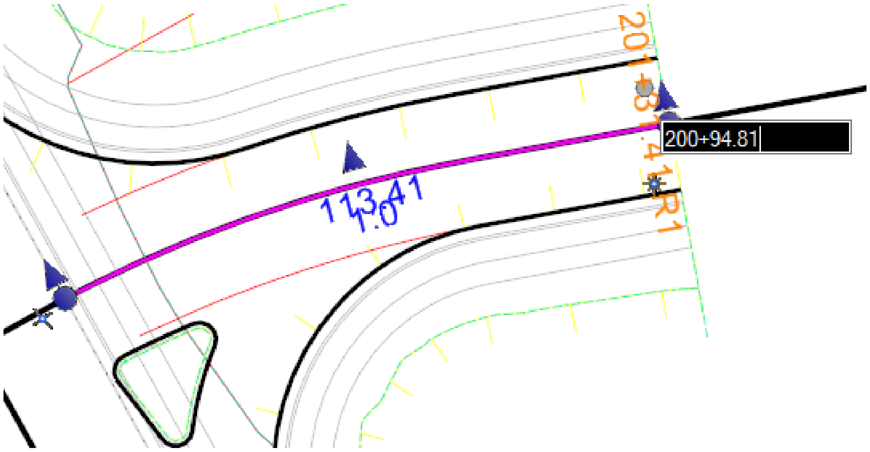
7. Note the station of **200+94.71** In the next few steps, we will change the length of the cell so that it ends just beyond this station.
8. Turn **Off** *Civil Accudraw*.
9. Choose Microstation's **Element Information** command.
10. Select the **DNC_Geom_CL** element.



11. Hover over the end of this element to see the **End Distance** station.

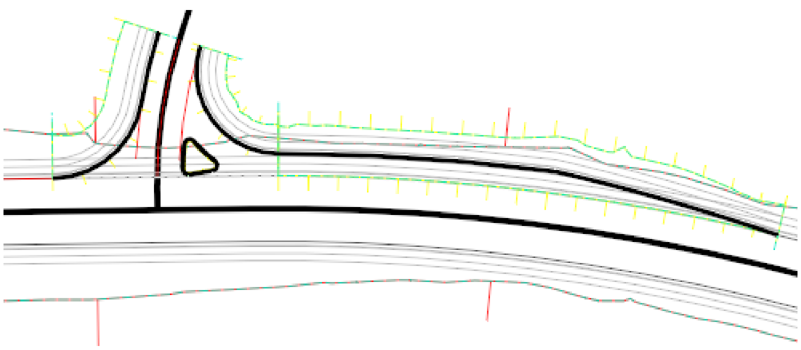


12. Select the *End Station* and change it to **200+94.81.**



NOTE: This is a little beyond the Curve PC and needs to be since changing this to the station of the Curve PC would remove the parallel element beyond the curve and invalidate the island cell.

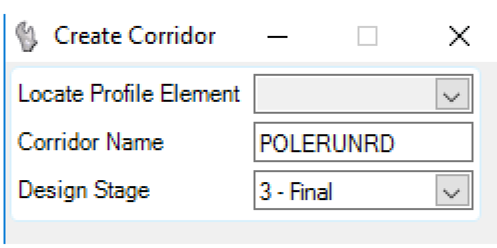
The cell at this point of edits is shown below.



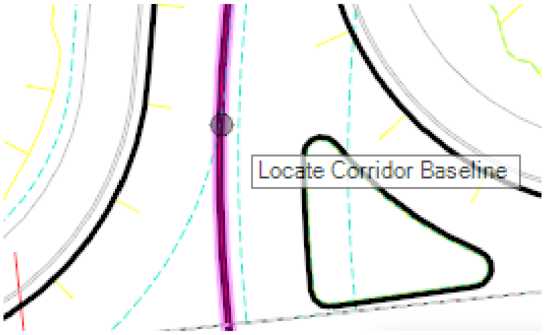
11.3.5.2 SECONDARY CORRIDOR

1. Select the **Create Corridor** command.

2. Complete the resulting dialog as shown below.

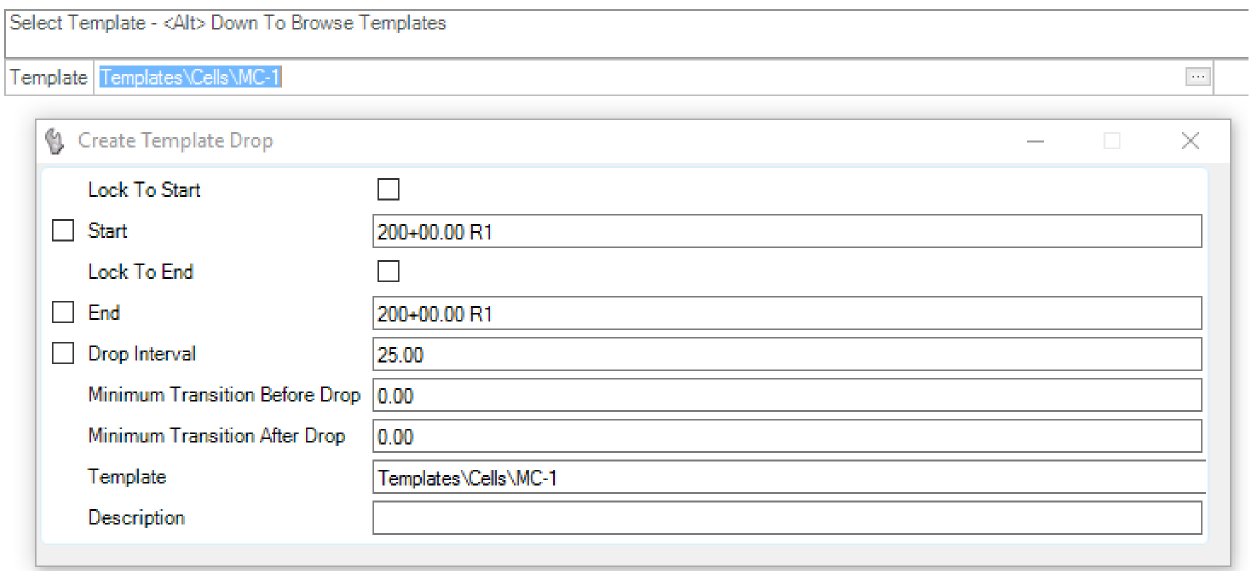


3. Locate the **POLERUNRD** alignment.



4. **Right click** when prompted to *'Locate Profile-Reset For Active Profile'*.
5. **Left Click** to confirm the *Corridor Name* and create the corridor.

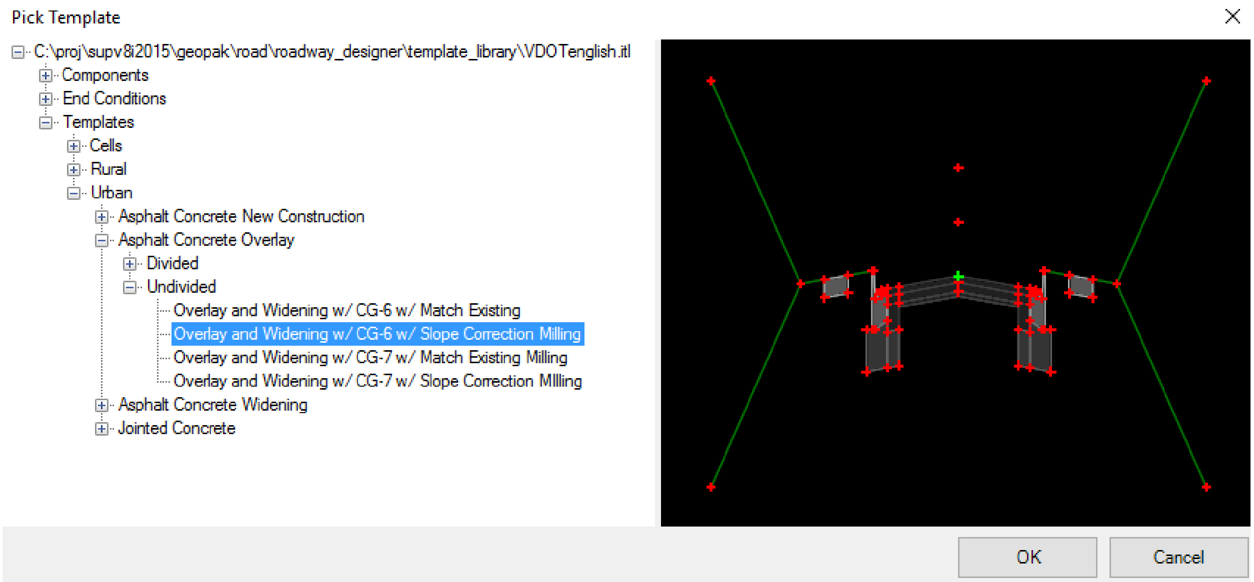
6. You are prompted with the following dialogs.



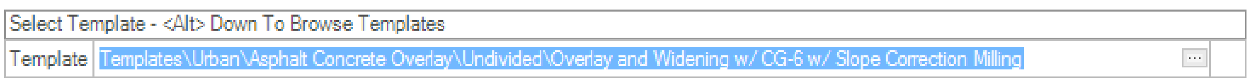
NOTE: If you are not prompted with the dialogs above, select the **Create Template** command and select the corridor created to invoke these dialogs.

7. Select **<ALT> Down** on your keyboard to browse for templates.

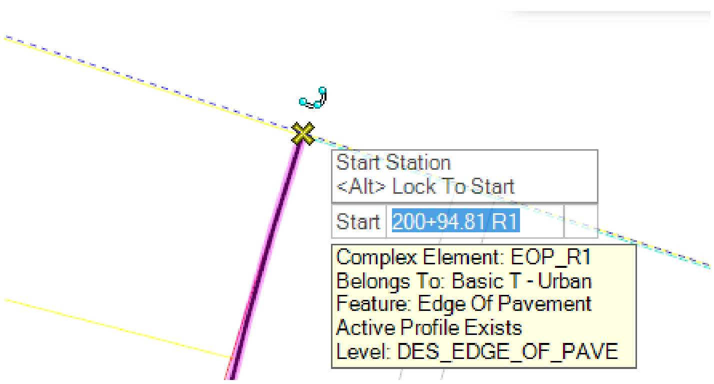
8. Select the template below and tag **OK.**



9. **Left Click** to confirm the template.



10. Snap to the end of the cell point when prompted for the *Start Station.* The Station should be **200+94.81.**

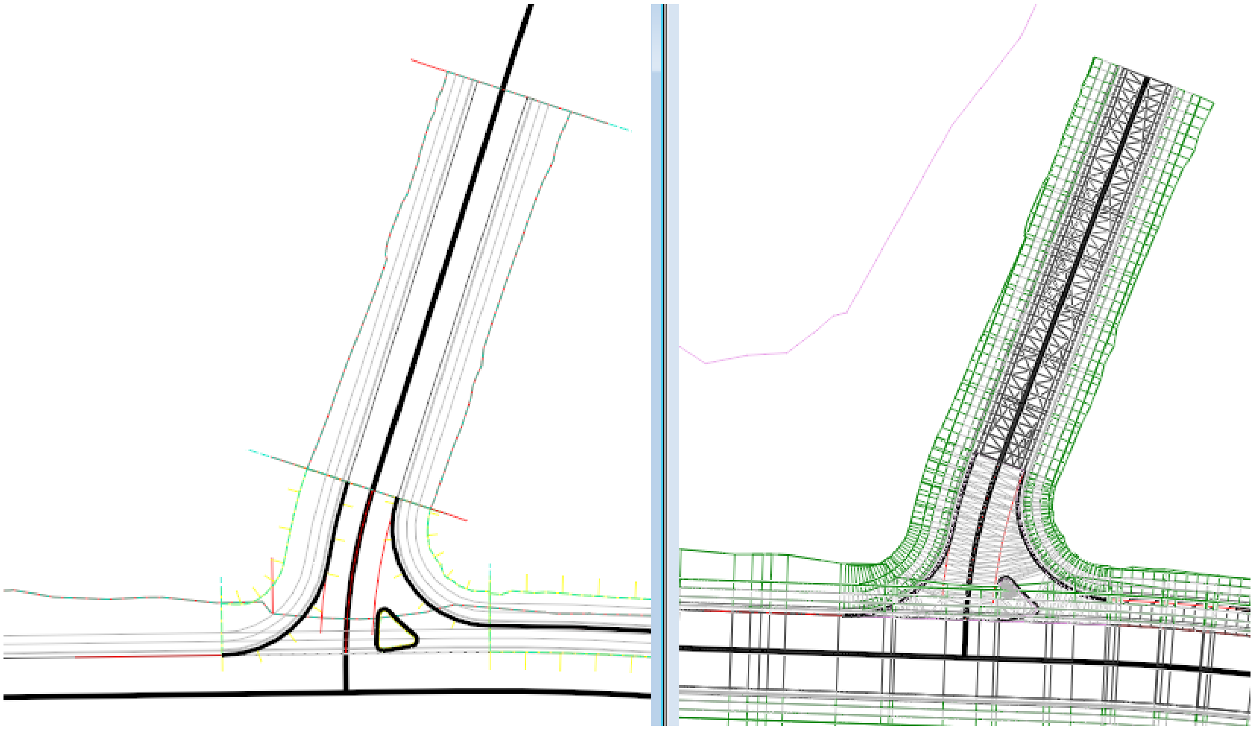


11. Enter **202+89.15** for the *End Station.*

12. Enter **5'** for the *Drop Interval.*

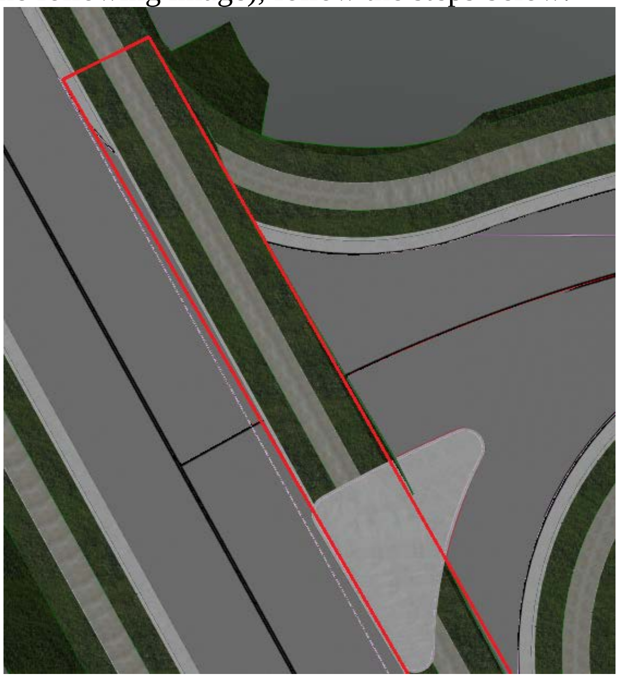
13. Confirm **0'** for the *Transition* prompts and **Left Click** when prompted for *Description* to place the templates.

14. See the POLERUNRD Corridor below.

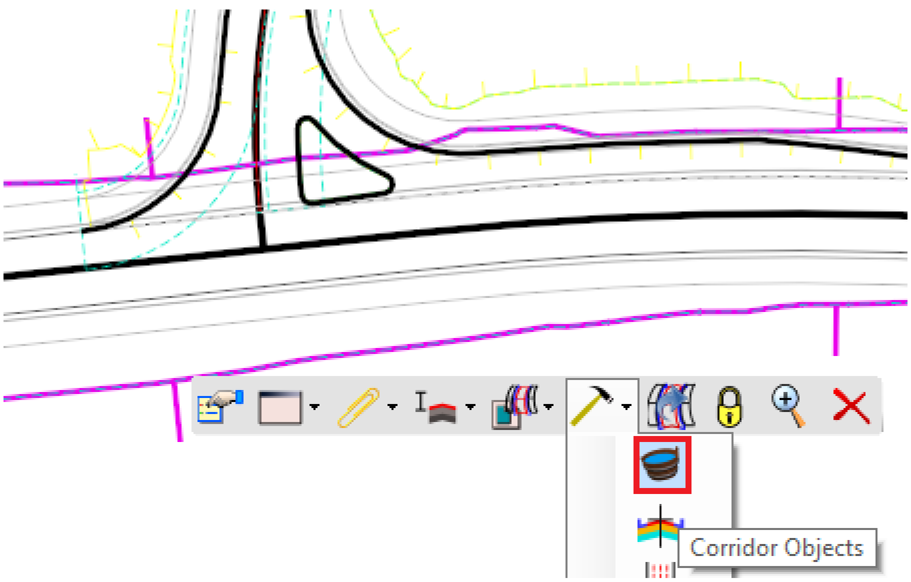


11.3.6 Display Rule

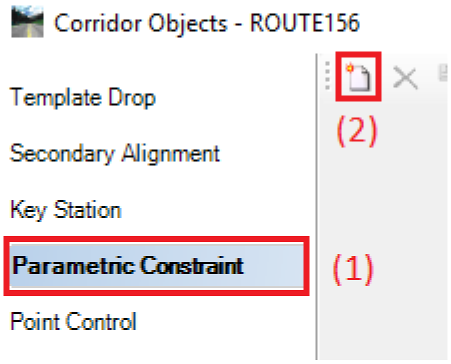
To turn off the Thru Rd shoulder and end conditions through the intersection (area highlighted in red in the following image), follow the steps below.



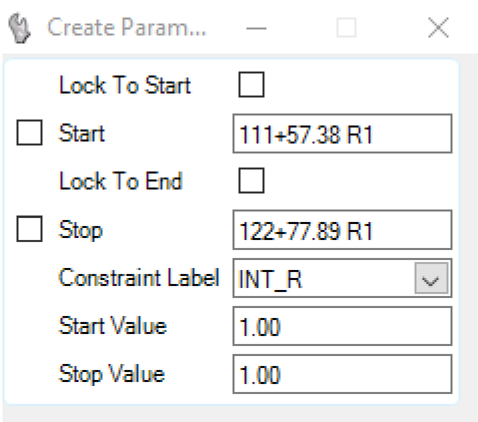
1. Select **Corridor Objects** from the context menu of the Thru Rd corridor.



2. Choose **Parametric Constraints** and tag **New.**

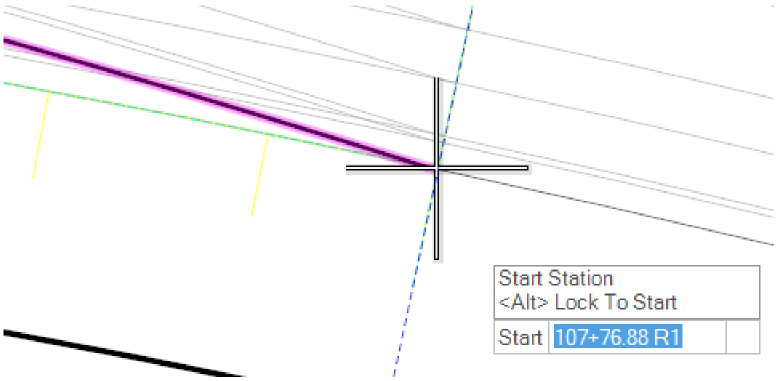


3. Fill out the resulting dialog as shown below disregarding the stations at this point.



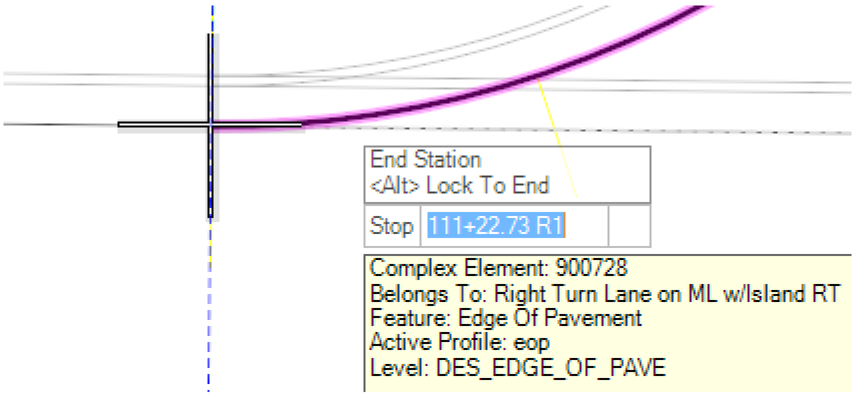
NOTE: If the intersection were to the left, INT_L would be chosen and -1 entered.

4. Snap and determine the Station of the beginning of the taper. Do not left click to accept this station but rather:
    a) **CTRL C** on your keyboard to copy the station
    b) Move your cursor off the point
    c) **CTRL V** to paste the station in the cursor prompt.
    d) Hit the **Tab** or **Ente**r on your keyboard to lock the station.
    e) **Left Click** on the screen to confirm this start station.

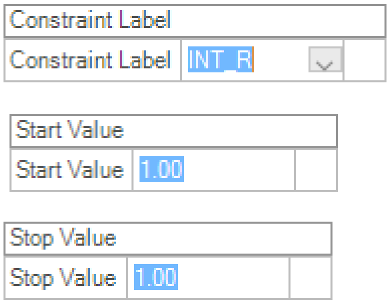


NOTE: There is a 1' segment at the end of the turn lane so be sure to snap to the end of this 1' segment and not at the taper end.

5. Snap and to the arc on the left hand side of the intersection where it ties to the Thru Rd EoP to identify the ending station. Do not confirm but follow the steps above to enter the station.



6. Left click to confirm the following.



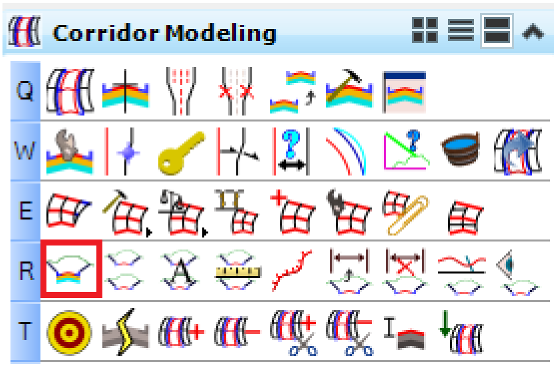
7. The parametric constraint is added and the Thru Rd shoulder and end conditions are turned off through the intersection.

11.3.7 Cross-Section View

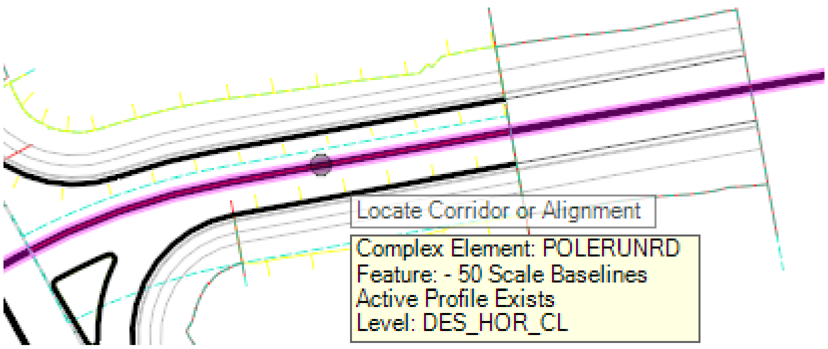
In this exercise, we will review the cross-sections along POLERUNRD. Since the secondary road corridor begins where the Civil Cell ends, we will open a cross-section view of the POLERUNRD alignment rather than open the cross-section view of the Corridor.

11.3.7.1 OPEN CROSS SECTION VIEW

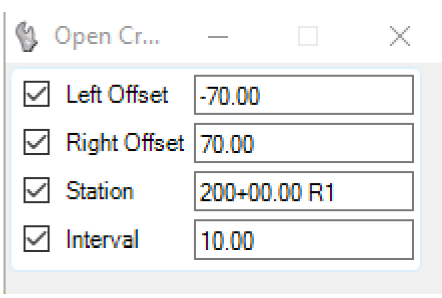
1. Select the **Open Cross Section View** command from the Corridor Modeling task.



2. Select the POLERUNRD alignment when prompted to *Locate Corridor or Alignment.*

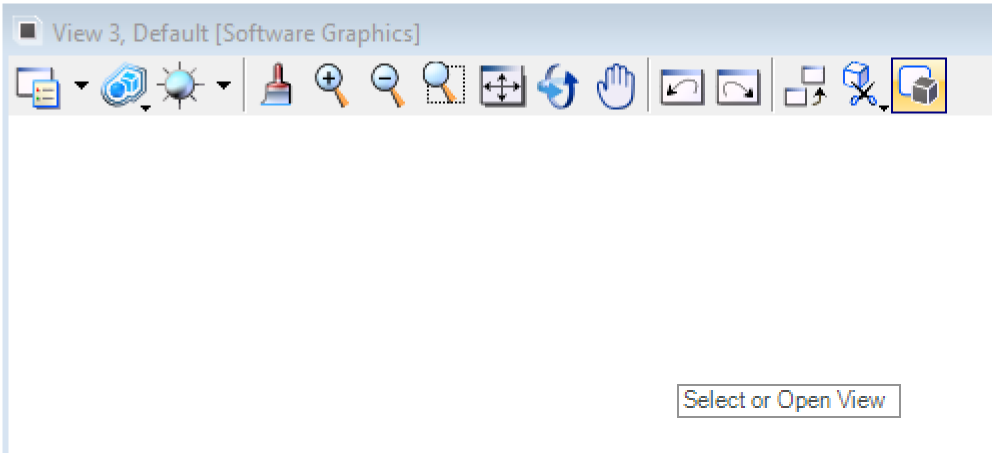


3. Fill out the dialog below and confirm these settings with left clicks making sure to be on the left side of the POLERUNRD alignment when confirming the left offset and right side of the alignment when confirming the right offset.

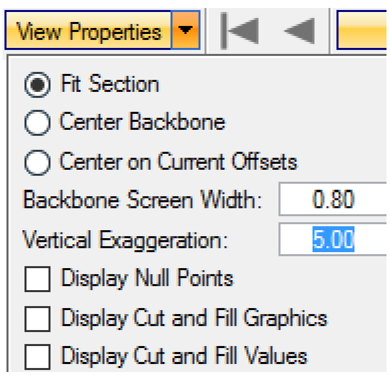


4. When prompted to *Select or Open View*, Open **View 3** from *MicroStations View* menu.

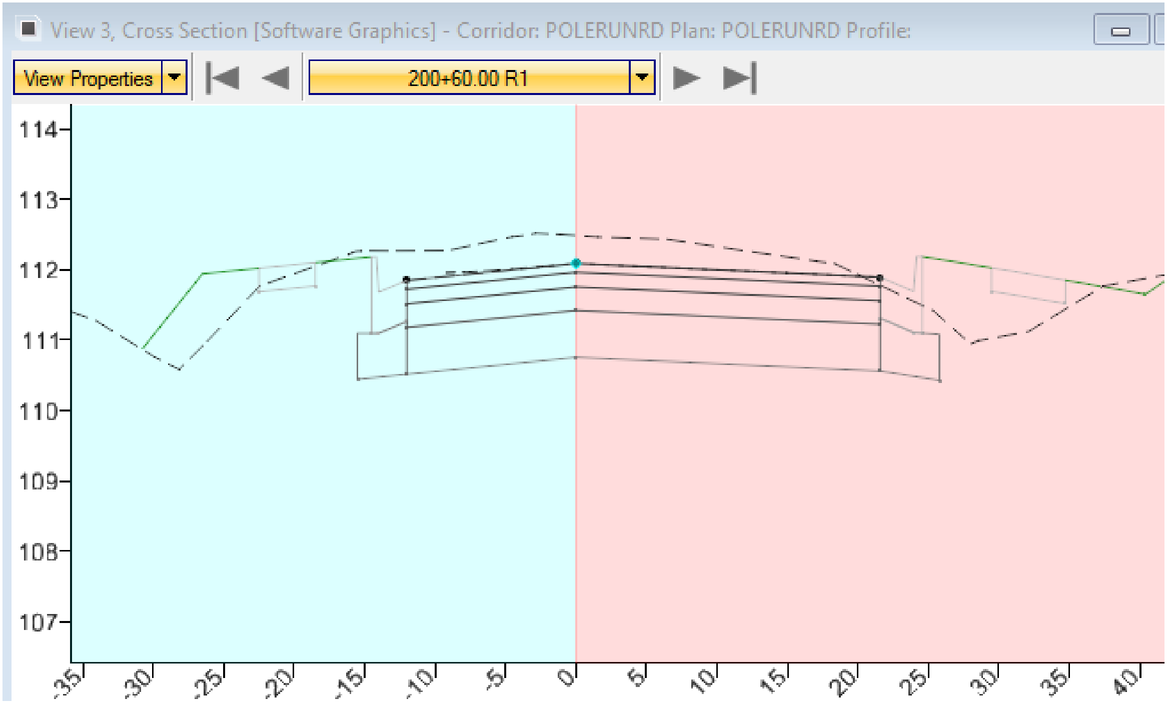
5. **Left Click** in the drawing area of *View 3*.



6. Scroll through the cross-sections to **200+50.**
7. Select **View Properties** and set the *Vertical Exaggeration* to **5.**

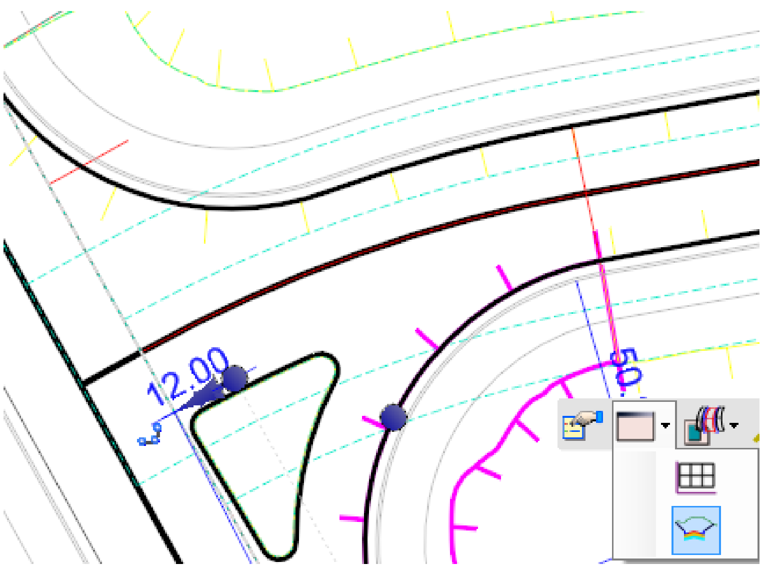


8. Go to station 200+60.



Review the slope on the right side of the CL which is relatively flat. We'll look at this area from a different perspective in the next few steps.

9. Open the cross-section model of the **EOP_R1** linear template as shown below. Note if the entire cell highlights when you hover over the corridor handler, reset to get to the underlying corridor handler.



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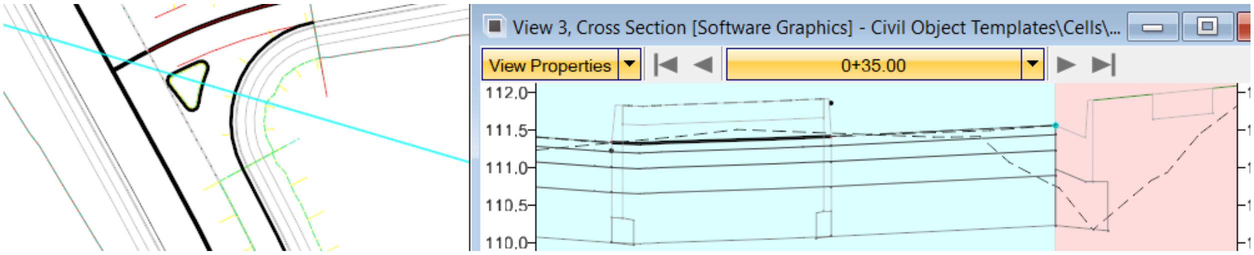
10. Go to approximately 0+35 of this linear. You can see the initial profile of the EoP is really reverse of what this slope should be (sloping towards the island nstead of away).

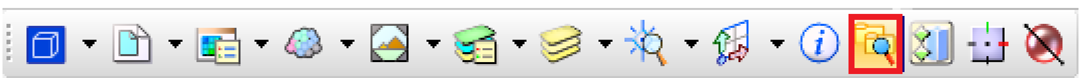


11.3.8 Flow Arrows & Slopes

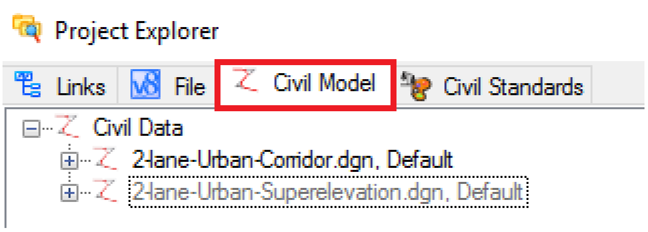
Other vertical inspection tools used prior to or while making vertical edits are discussed in this section. Flow arrows can displayed and slopes determined of the surface terrain stored in the cell as discussed below.

11.3.8.1 FLOW ARROWS

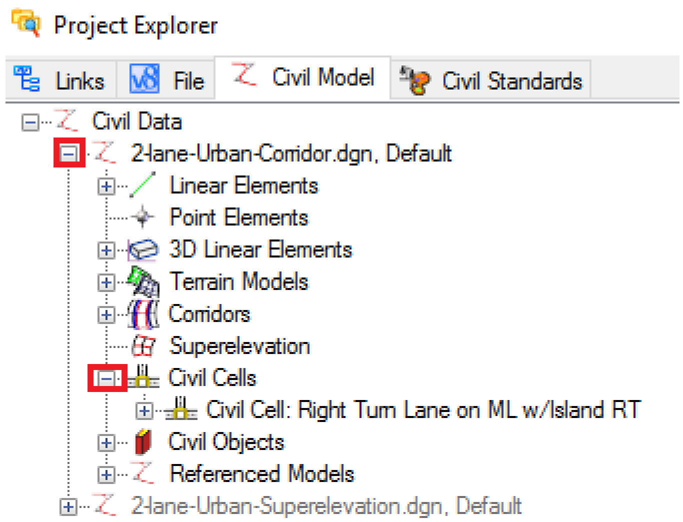
1. Choose **Project Explorer** from *MicroStation's Primary Toolbar.*



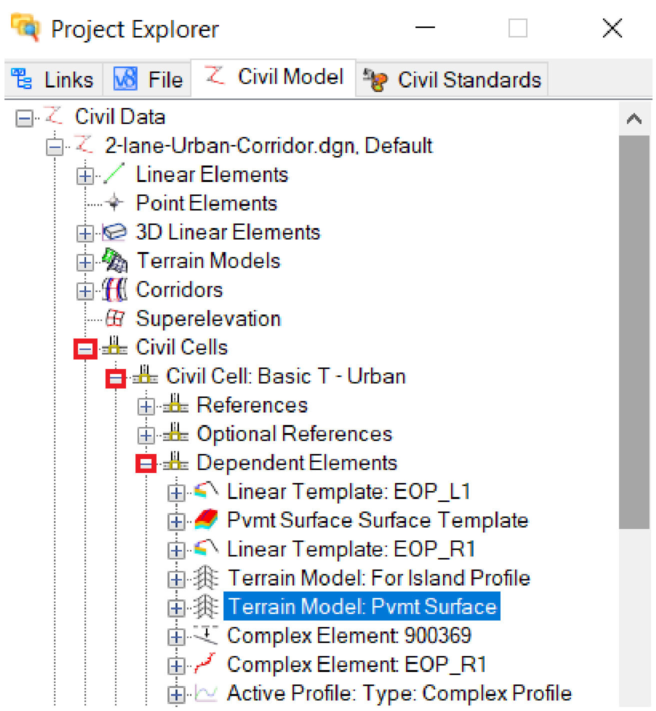
2. Once invoked, select the **Civil Model** tab.



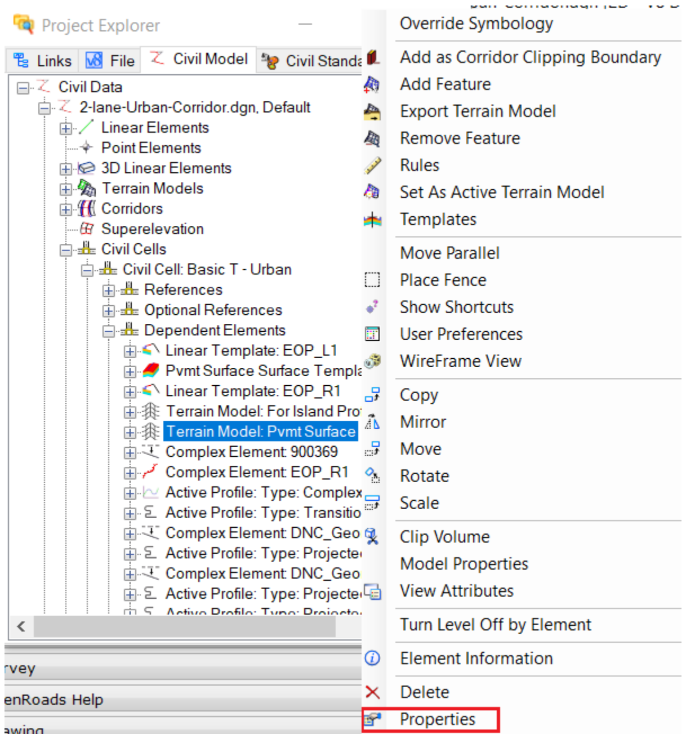
3. Expand the following to view the Civil Cells in the DGN file.



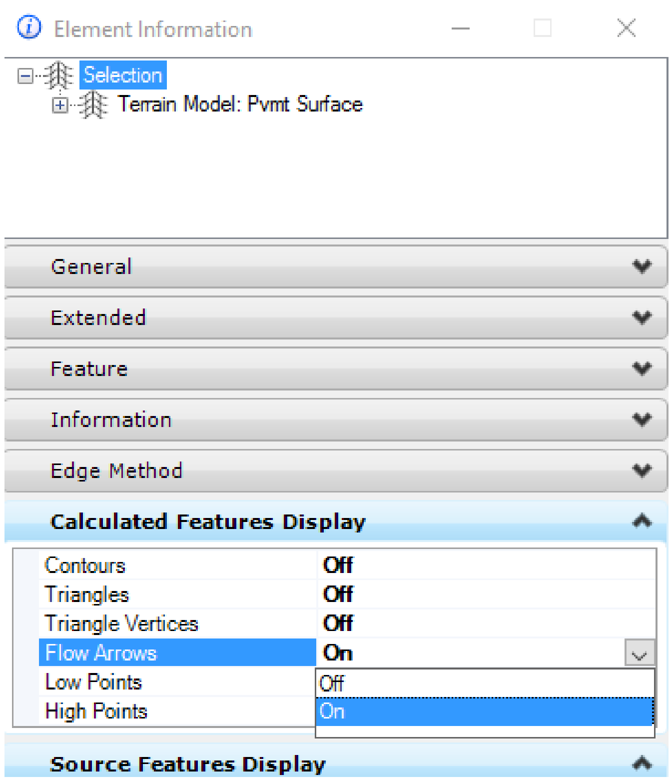
4. Expand **Civil Cell -> Basic T - Urban -> Dependent Elements**, and find the **Terrain Model: Pvmt Surface.**



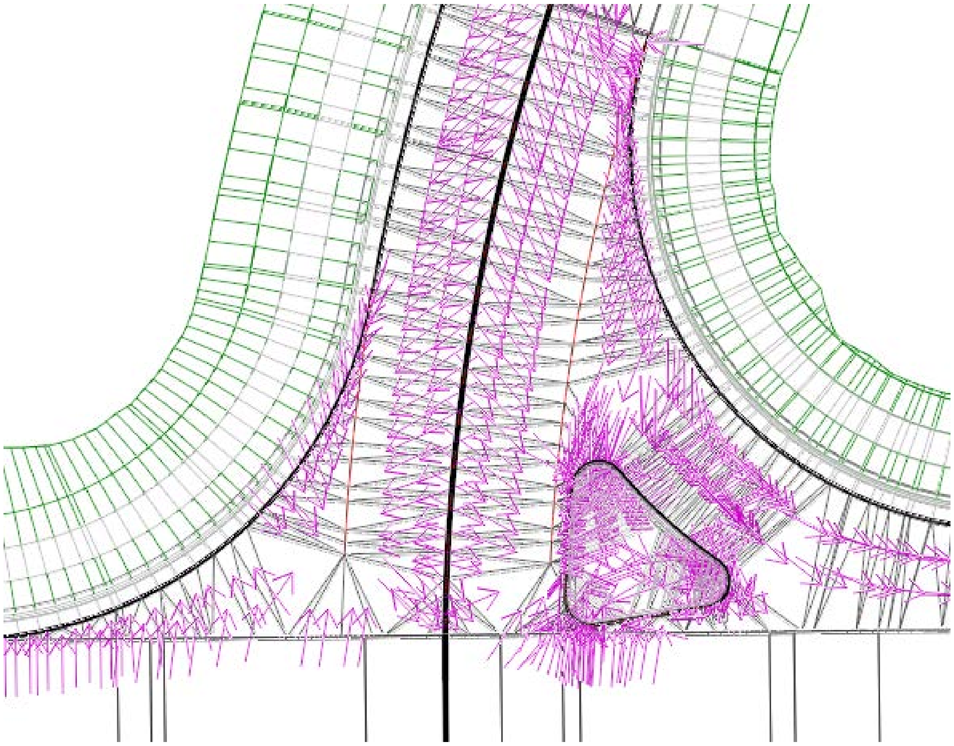
5. Right Click the *Terrain Model* and choose **Properties.**



6. On the *Properties* dialog, turn *Flow Arrows* **On.**



7. Review the Flow Arrows and make sure the slopes are as desired.

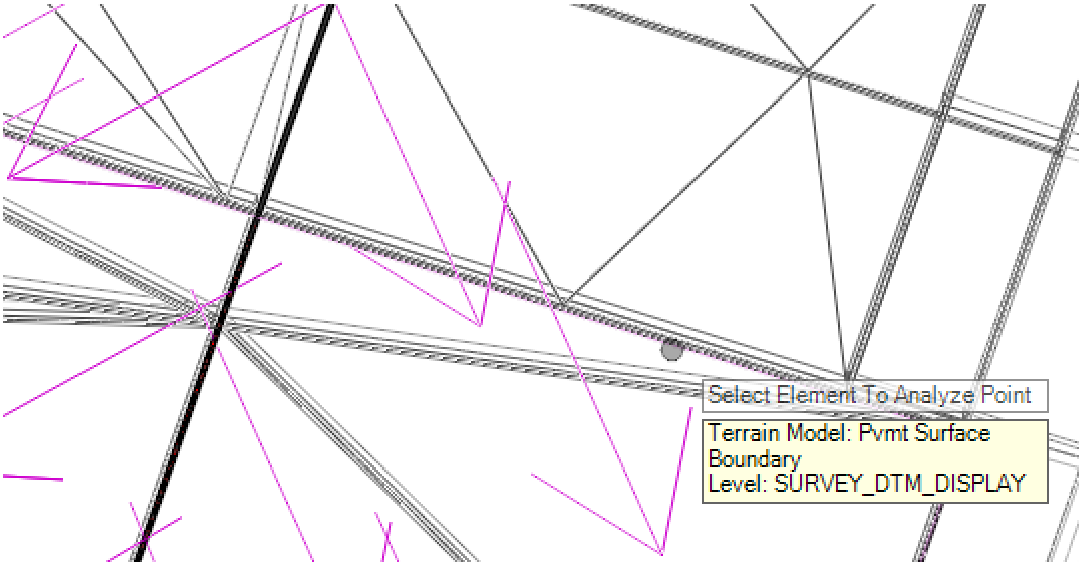


11.3.8.2 SLOPES

Slopes can be reviewed of the pavement surface as shown below.

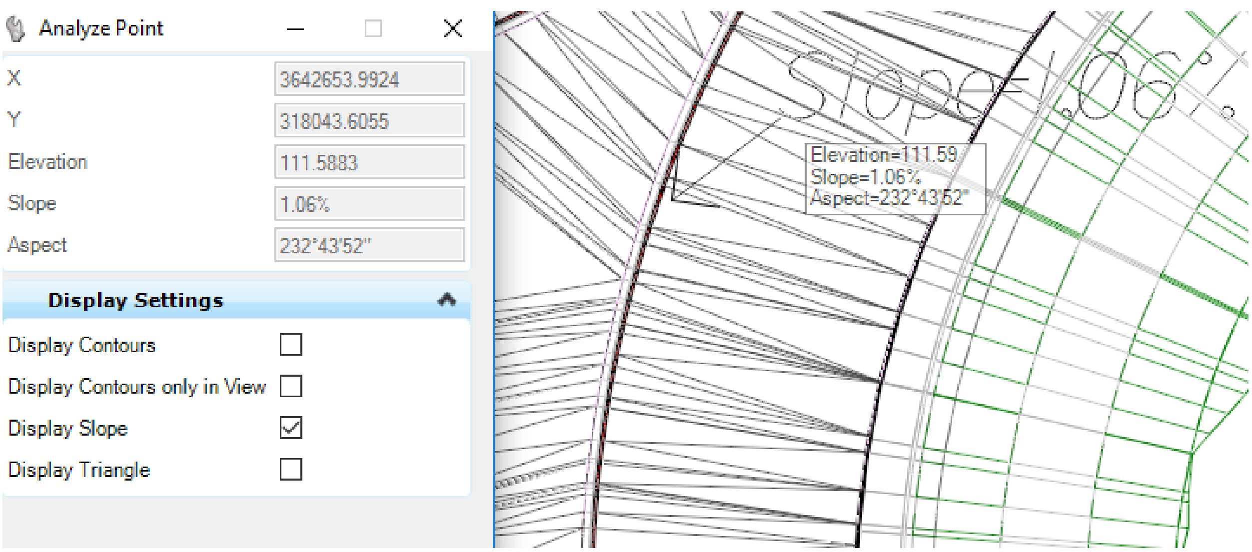
1. Select the Analyze Point command from the Terrain Model menu.

2. In the 3-D view, select the terrain **Pvmt Surface.** Note, hover over the edge of the pavement area, reset until the Pvmt Surface terrain is highlighted (this will take several resets and you may have to rotate the view some to better locate the terrain), and then left click to select it.



3. Set the 3D view to a Top view and then reset to exit the Top View commad.

4. Roll-over the pavement area to review slopes.



11.3.9 Vertical Edits

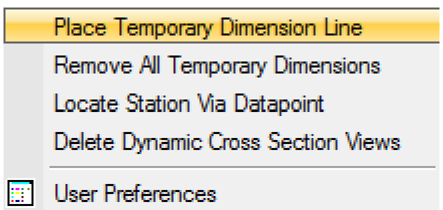
Vertical generated initially in the T Intersection Civil Cells is based off -2% slope projection from the secondary road centerline to its EoP's and a direct tie to the through road EoP or a -2% projection to the EoP if there is a turn lane involved. A quick profile transition is applied to the curves between the EoP's. This process does not always provide an ideal initial profile (See the Cross Section view image above) even if both the secondary and through roads are in normal crown because you generally need to slope the curve area away from the intersection and controlling grades make this criteria difficult to meet automatically. The following steps will guide you through general vertical edits which need to be made with practically every intersection cell placed.

11.3.9.1 TURN LANE

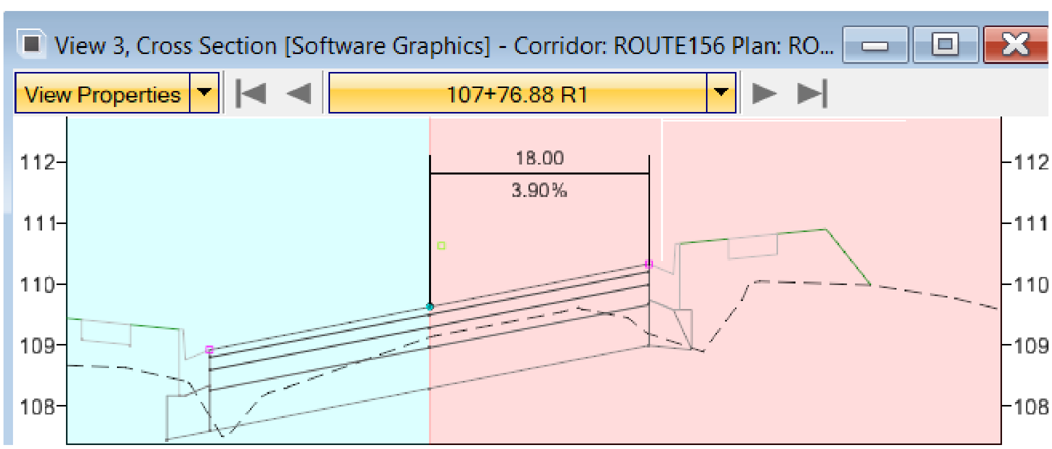
The profile of any element can be changed by utilizing vertical commands as needed and making the newly constructed profile the active profile. The steps below will go through some of the commands normally used to re-profile the Civil Cells RT EoP.

1. Open the Cross Section Model of Corridor ROUTE156 in View 5 and navigate to station 107+76.88 R1 which should be the start of the taper.

2. Hold down the Right mouse button in the cross-section view and choose **Place Temporary Dimension Line** from the resulting menu.



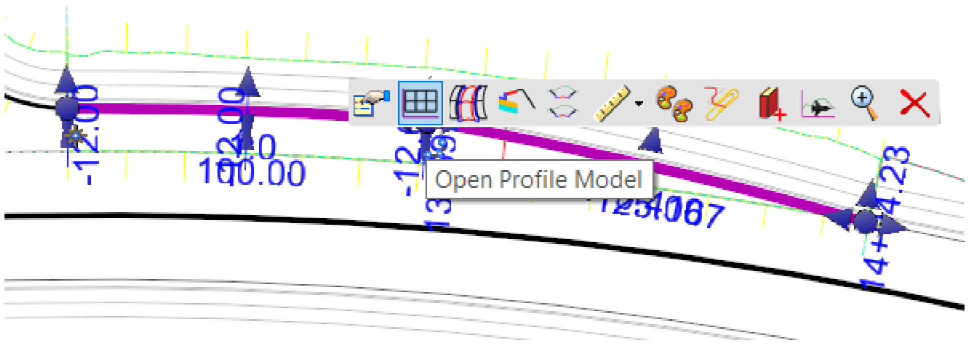
3. Place the temporary dimension between the CL to EoP of ROUTE156. Notice that the superelevation rate at this location is 3.9%.



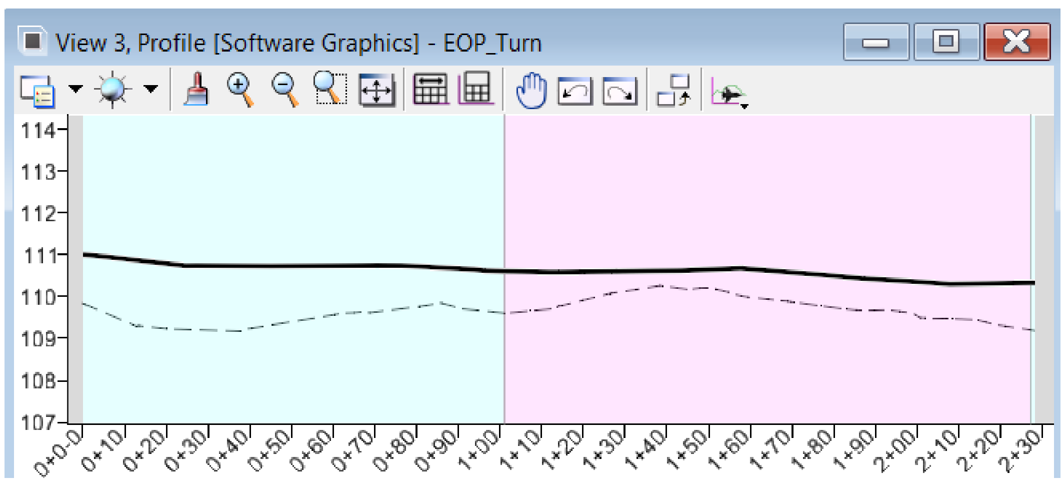
4. If you navigate towards the intersection you will notice the superelevation rate remains 3.9% to the location where the taper ends and the parallel lane begins. The slope then begins transitioning and is approximately 2% where the storage lane ends and the curve begins.

5. Open the profile view of the Turn Lane Civil Cell's EoP that runs along ROUTE156.

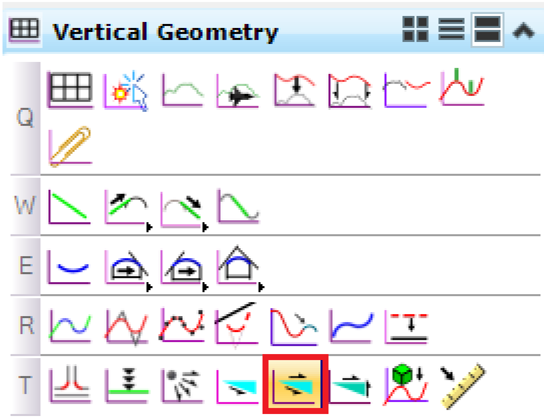
   a. Invoke the context menu of the Civil Cell RT EoP.



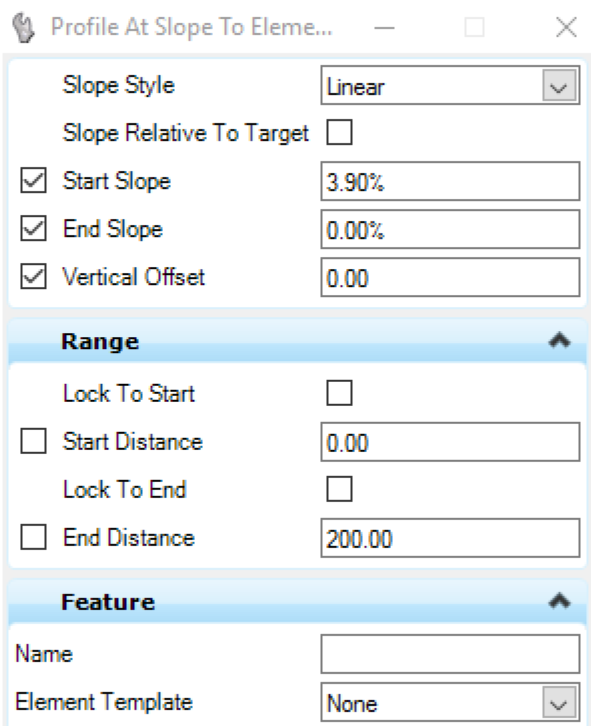
   b. Open *View 4* and then **Left Click** in this view to open the profile model which is shown below.



6. Select the profile command **Profile by Variable Slope from Element.**

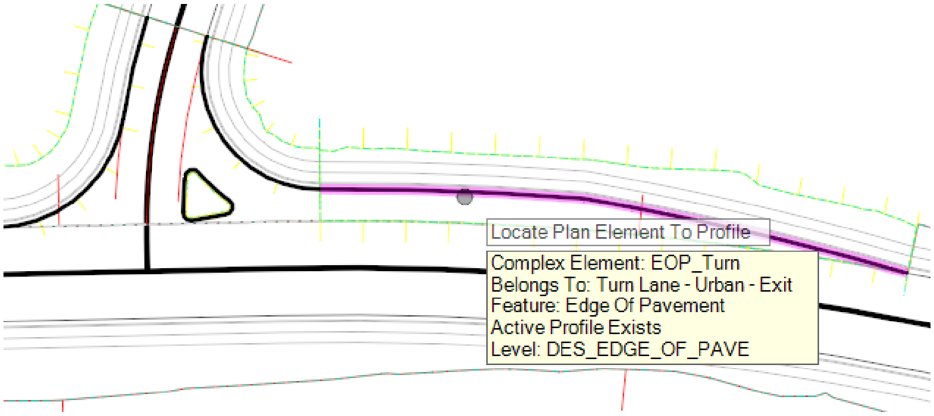


7. Fill out the dialog as shown below.

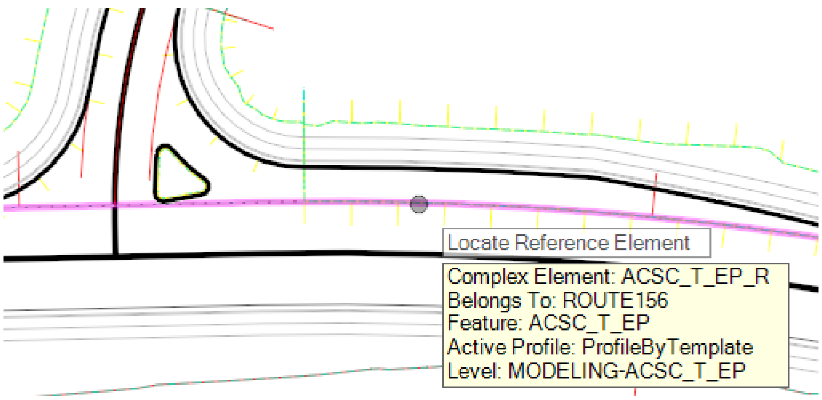


8. Confirm the *Slope Style of Linear* with a **Left Click** in View 1.

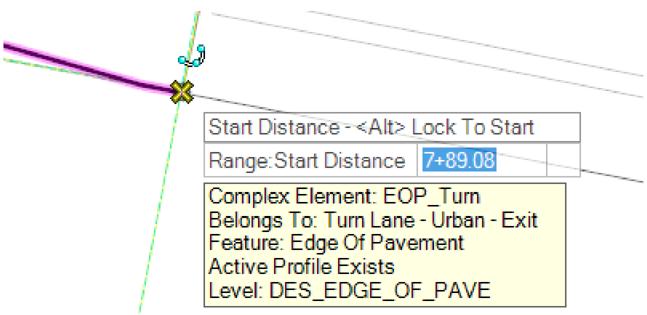
9. *Locate the Plan Element to Profile.*



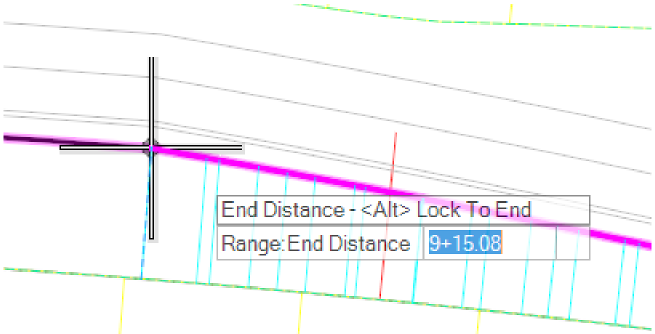
10. *Locate the Reference Element* (ROUTE156 EoP).



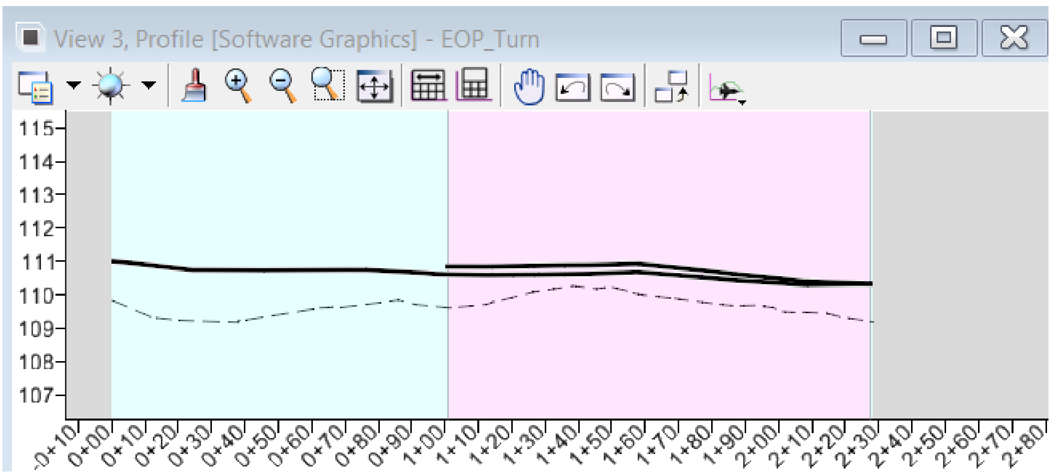
11. Snap to the beginning of the taper for the *Start Distance.*



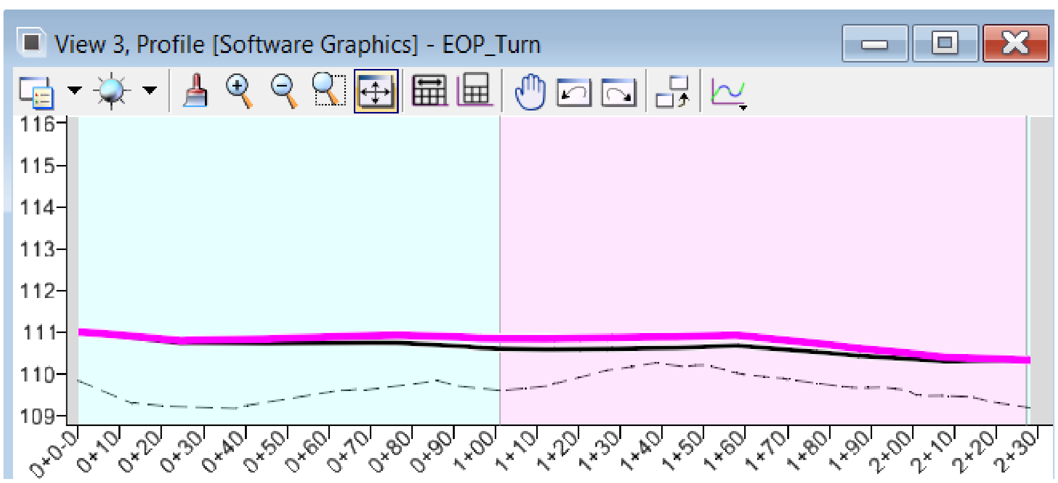
12. Snap to the end of the taper (start of storage lane) for the *End Distance.*



13. Confirm the remaining prompts (Start Slope 3.9%, End Slope 0%, & Vertical Offset 0) with **Left Clicks** in the view to generate a new profile in the view.

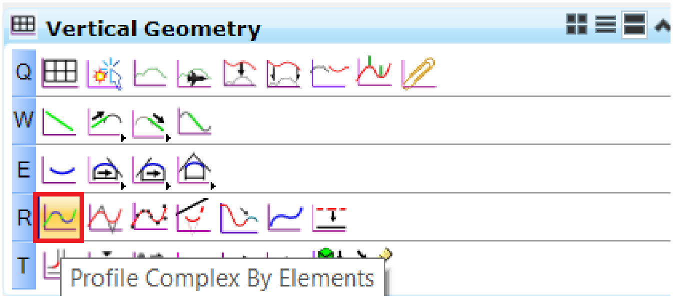


14. Project 0% to -2% from the end of the taper to the end of the storage lane (start of the curve) with the same basic steps as performed above. The profile should now have two segments as highlighted below:

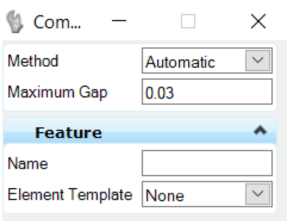


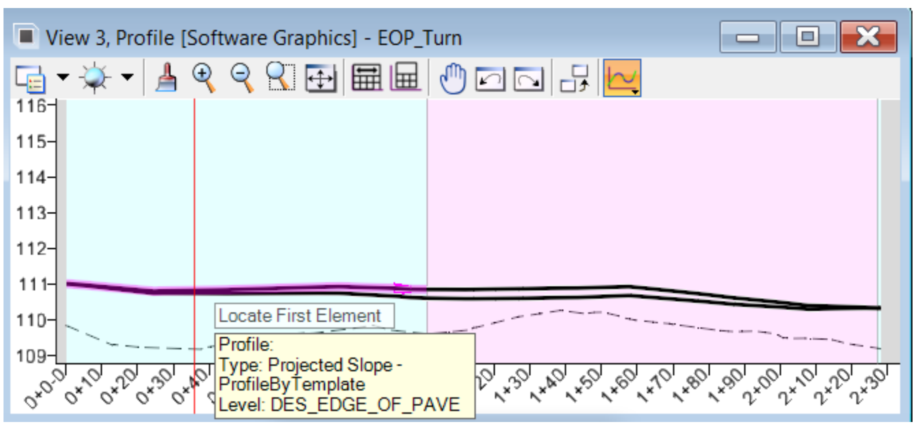
NOTE: Ensure there is no overlap where they are supposed to join.

15. Choose the *Vertical Geometry* command **Profile Complex By Elements.**

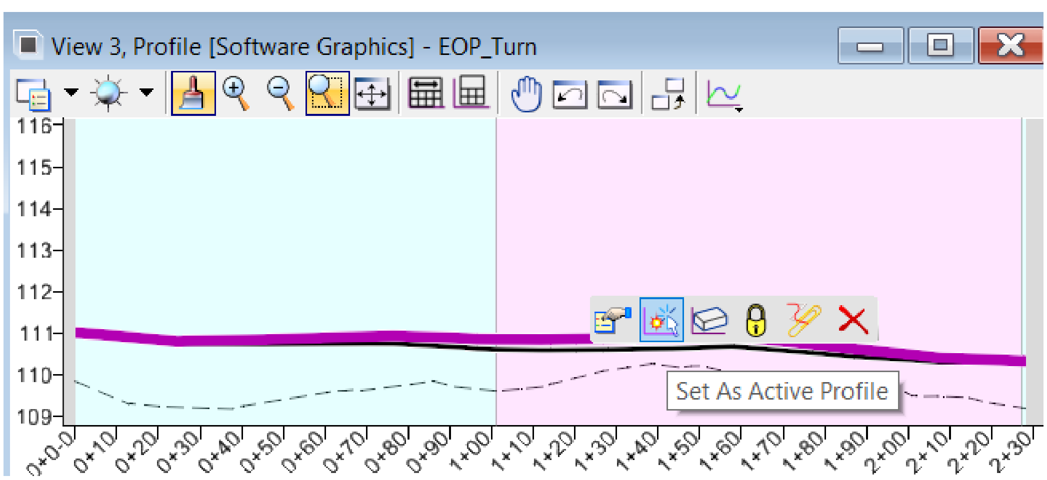


16. Set the dialog as shown below to a *Method* of **Automatic**, then select the 1st projected element when prompted to **Locate First Element**, and then data point to **Accept** and create one complex element from the two projected profiles.





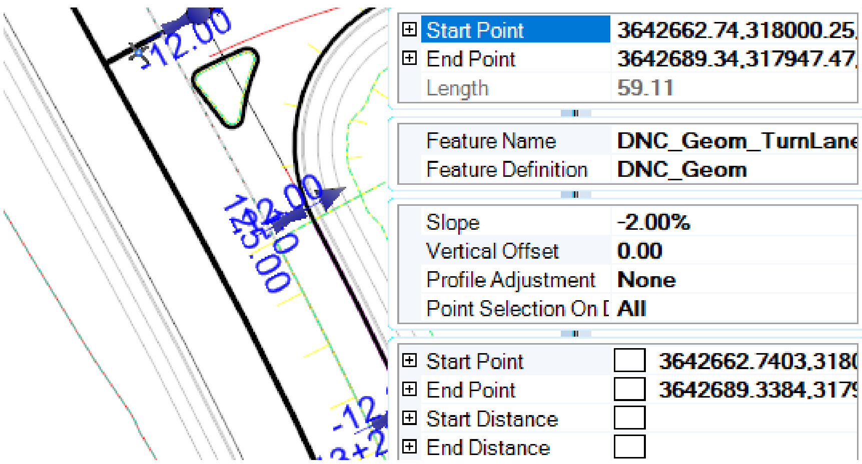
17. Select this complex element and from the context menu, **Set As Active Profile**.



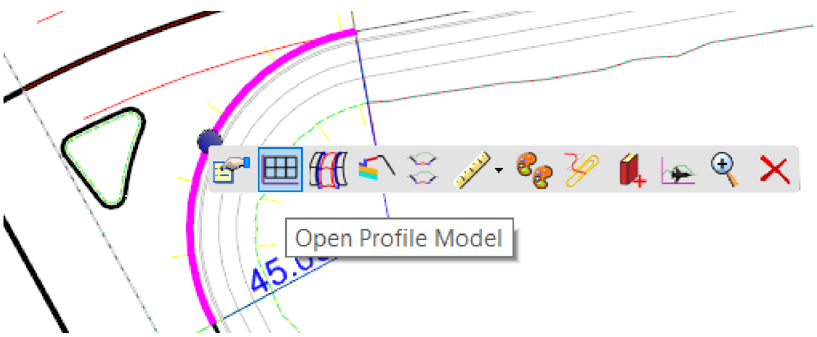
11.3.9.2 INTERSECTION CURVE

The intersection curve's initial vertical a Quick Profile Transition between the Edge of Pavement's which are initially profiled at -2% for the Secondary Rd & tying to the Thru Rd EoP if a turn lane hasn't been introduced. If a turn lane had been introduced, the element DNC_Geom_TurnLaneCtrl can be easily edited by going to properties to change the slope if needed. Any profile as needed can be drawn and made active as long as the Edge of Pavement ties are maintained.

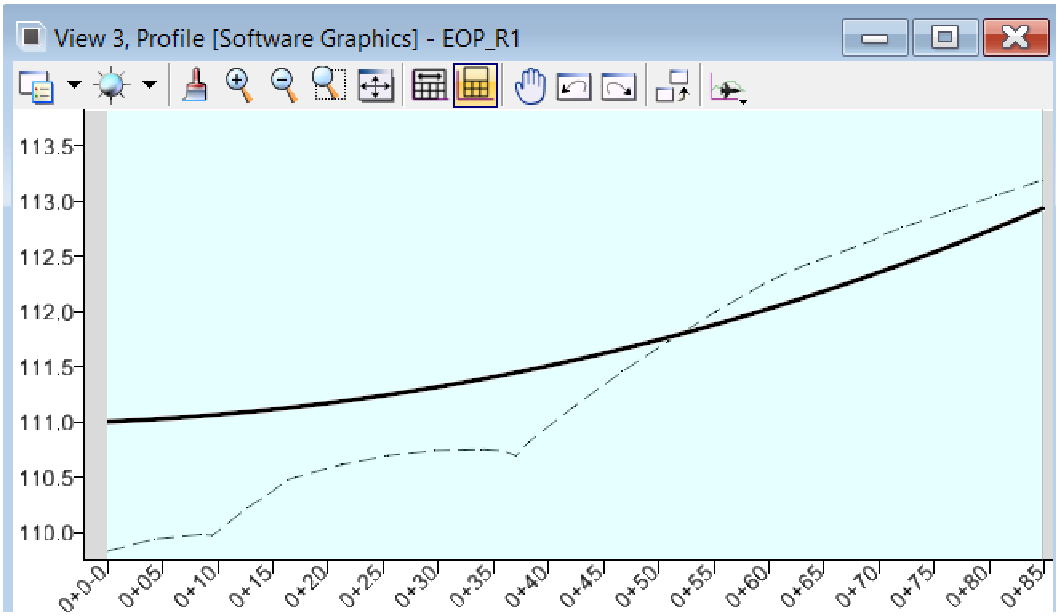
1. Go to Properties of the **DNC_Geom_TurnLaneCtrl_R** element and verify the slope of -2% which is the slope we want at the Curve PC so we will not make any changes for this exercise.



2. Open the profile model of the **Curve EoP**. Open the Profile in View **3.**

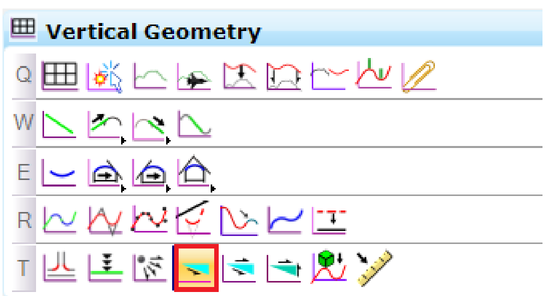


3. The initial profile is shown below.

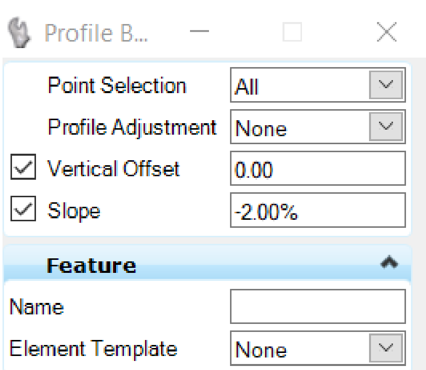


NOTE: In section 11.3.13 & 14 we reviewed cross-sections and flow arrows in this area and noticed the slope of this turn lane was towards the island. We will lower the grade of the curve in the next few steps to force water away from the island.

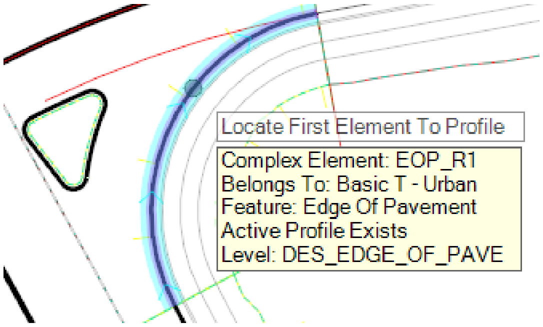
4. Select the *Vertical Geometry* profile command **Profile By Slope From Element.**



5. Set the dialog as shown below.

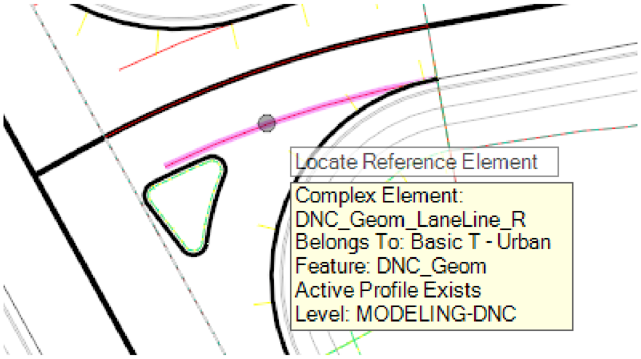


6. Select the **Curve EoP** element when prompted to *Locate First Element To Profile.*

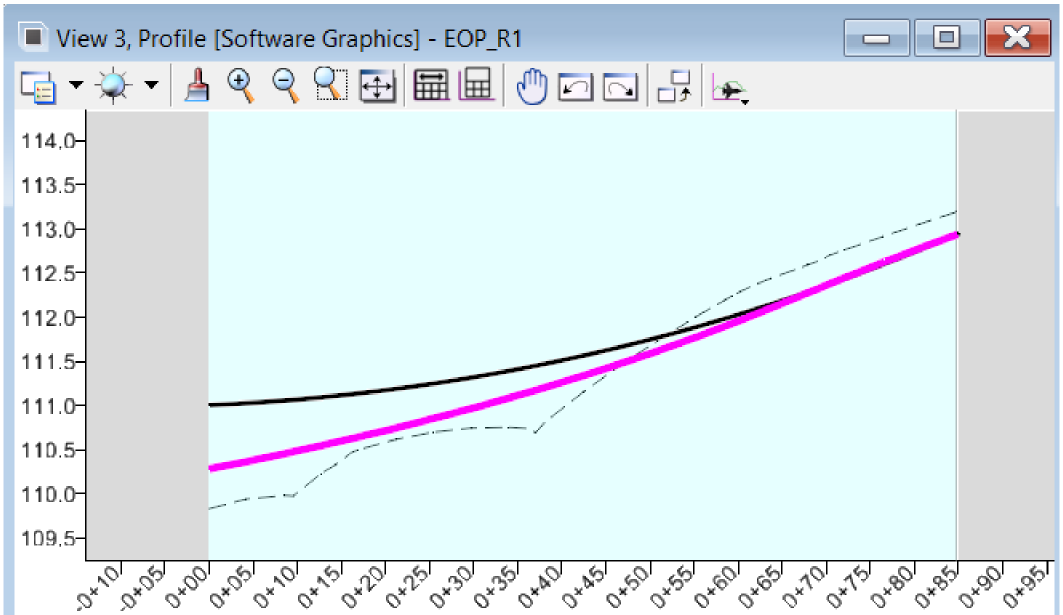


7. **Reset** when prompted to *Locate Next Element To Profile.*

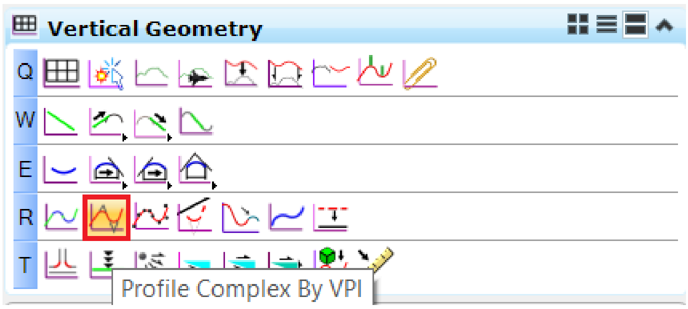
8. Select the **Lane Line** element when prompted to *Locate Reference Element.*



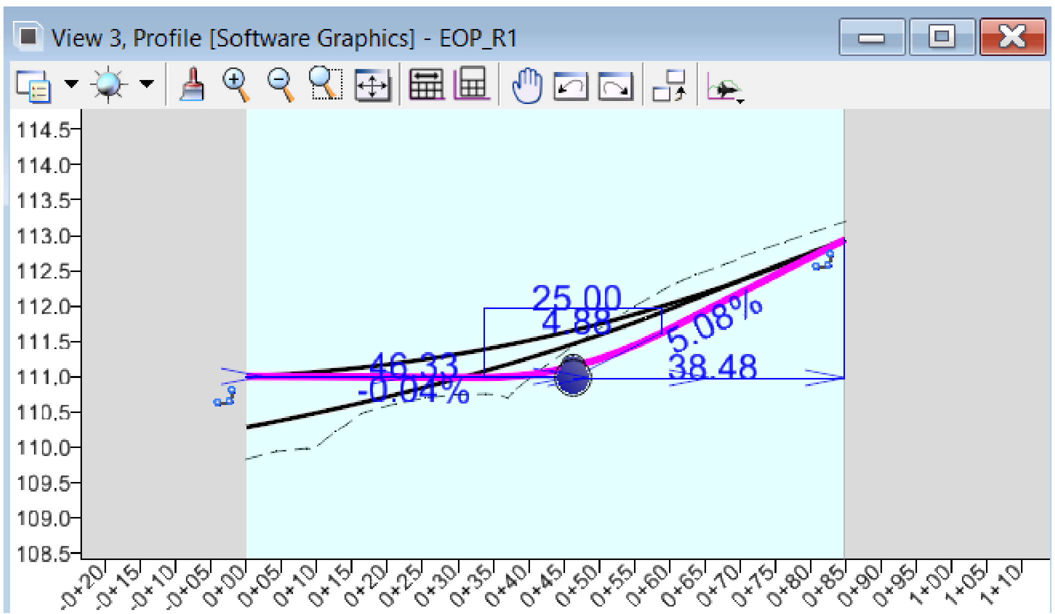
9. Confirm the remaining prompts and review the new profile which shows us what -2% off the Lane Line element would give us (Shown highlighted below). Make no changes here, just review.



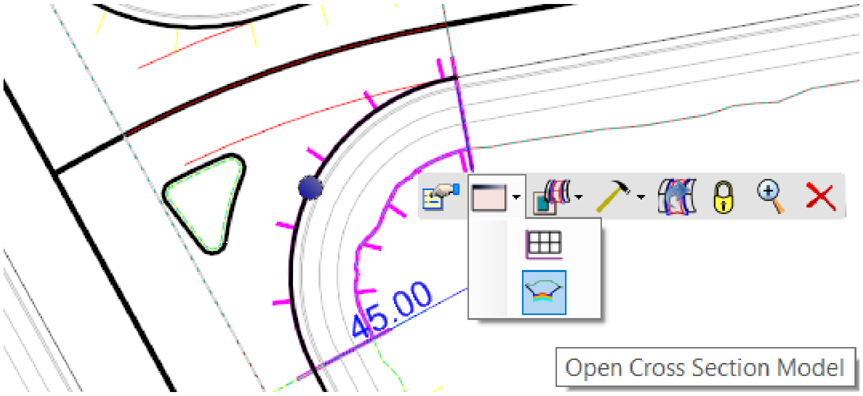
10. Select the *Vertical Geometry* command **Profile Complex By VPI.**



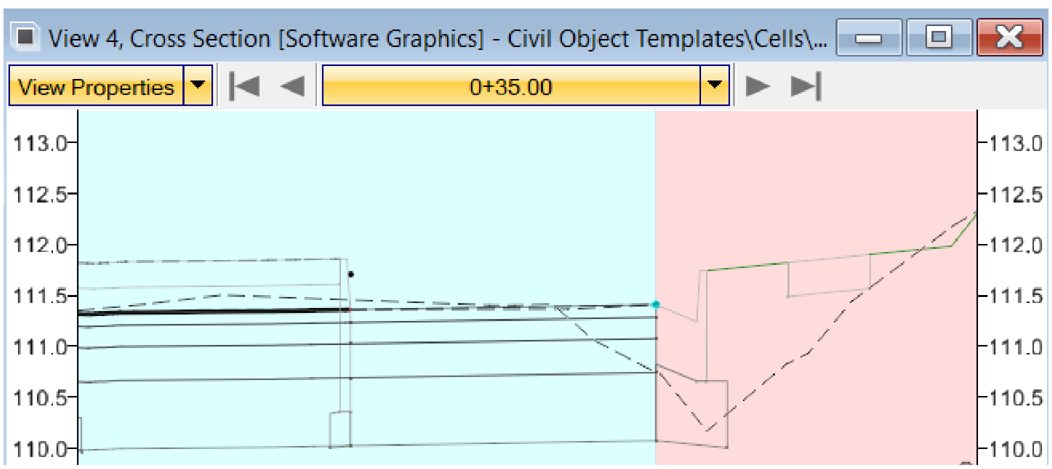
11. Set the Curve Length to 25' and draw the profile approximately as shown below making sure to snap to the end points of the current active profile.



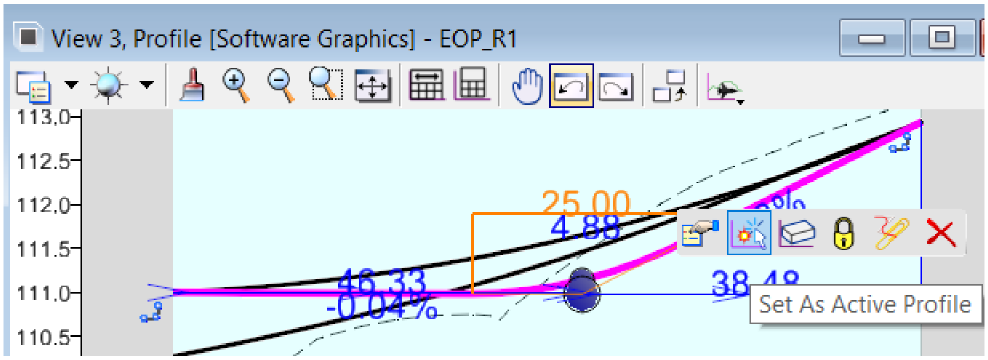
12. Open the Cross-Section view (in View 4) of the linear template EOP_R.



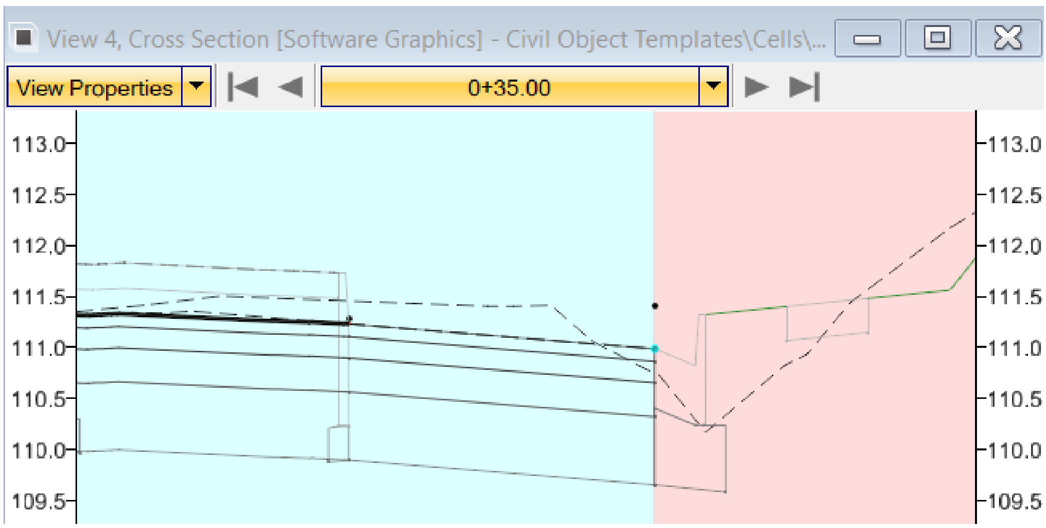
13. Navigate to approximately station **0+35** and observe the slope between the outside curb and Island.



14. In *View 3*, set the profile just complexed as active.



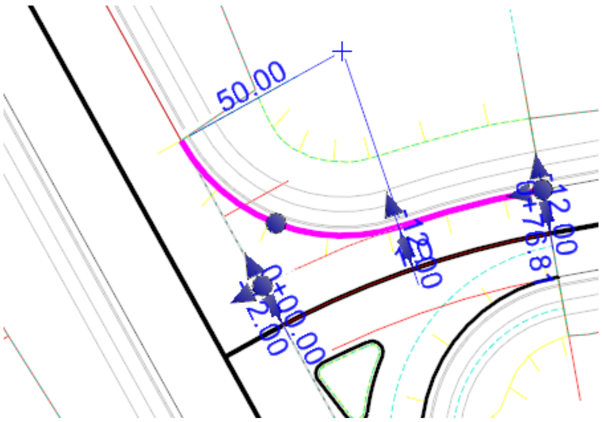
15. Observe the changed slope between the outside curb and island in the cross-section view.



11.3.9.3 EOP PROJECTED SLOPES

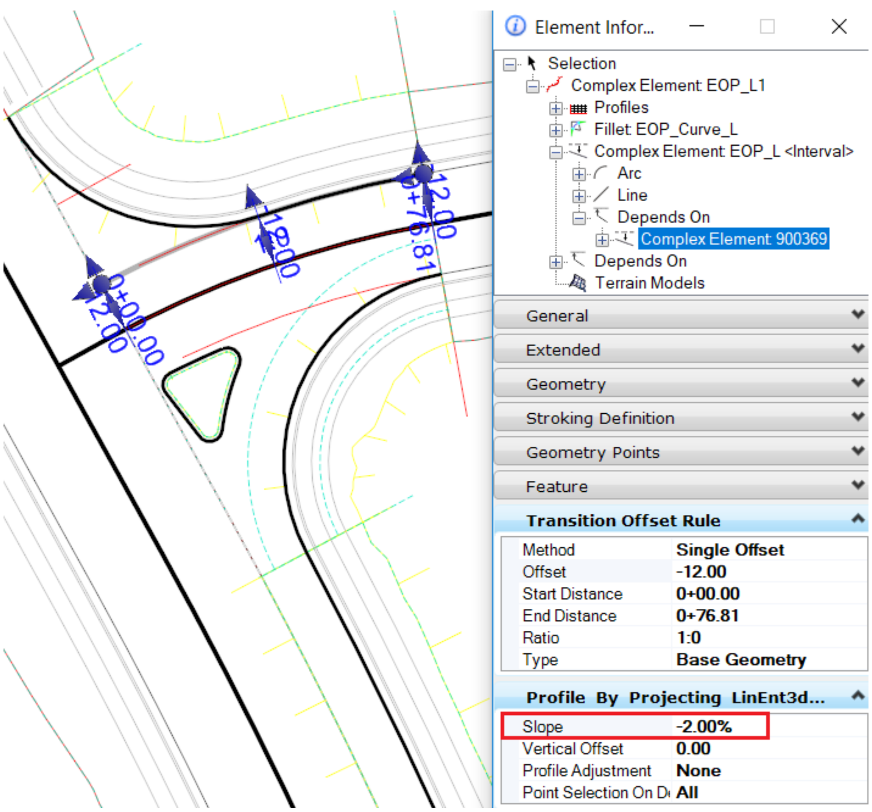
As shown above when we reviewed the **DNC_Geom_TurnLaneCtrl_R element**, a projected slope of -2% is initially set on fillet back & ahead tangents. We'll show how to access this slope on the secondary roadway if the secondary roadway is superelevated.

1. Select the following element.



2. Open MicroStation's **Element Information** command.

3. Drive down in the element tree until you find the element below. Note the slope can be changed here.

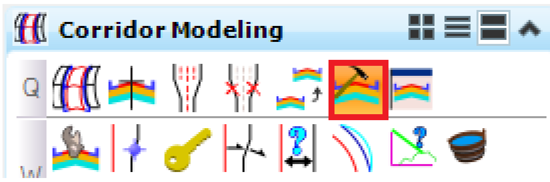


11.3.10 Template Edits

This section covers editing linear and surface templates that are a part of the cell. We will create a project folder initially to house the template associated with this ROUTE156 project.

11.3.10.1 PROJECT TEMPLATE FOLDER

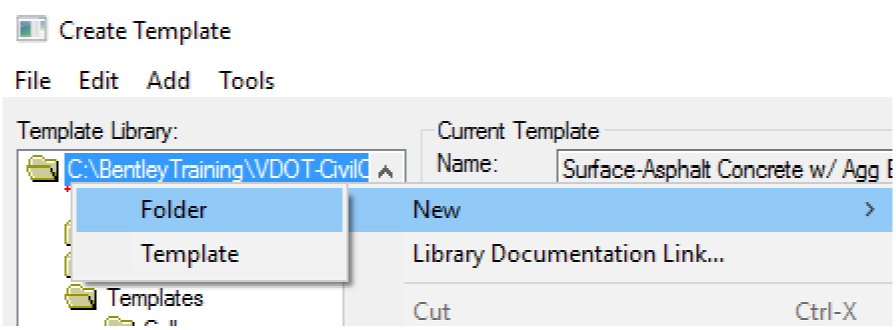
1. From the *Corridor Modeling* task, choose the **Create Template** tool.



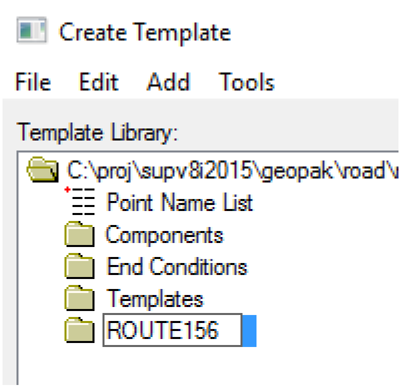
2. In the Create Template dialog, choose **File -> Save As** to save the VDOT*.ITL file pointed to by default to the class dataset folder with a filename of ROUTE156.itl

   This is a Project ITL where you can save your template work (if needed). It's recommended to edit templates in the DGN file but if you have multiple occurrences of a template, edit once, move from the DGN file to the ITL and then change the other similar templates that are in similar cells, to point to this edited template.

3. In the Create Template dialog, **right click the path of the ITL** and choose **New -> Folder.**



4. Key in **ROUTE156** for the name of the new folder.



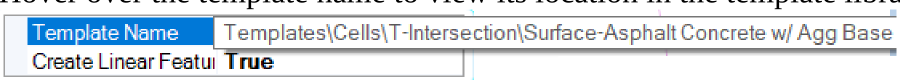
5. Close the Create Template dialog and save the changes.

11.3.10.2 SURFACE TEMPLATE EDITS

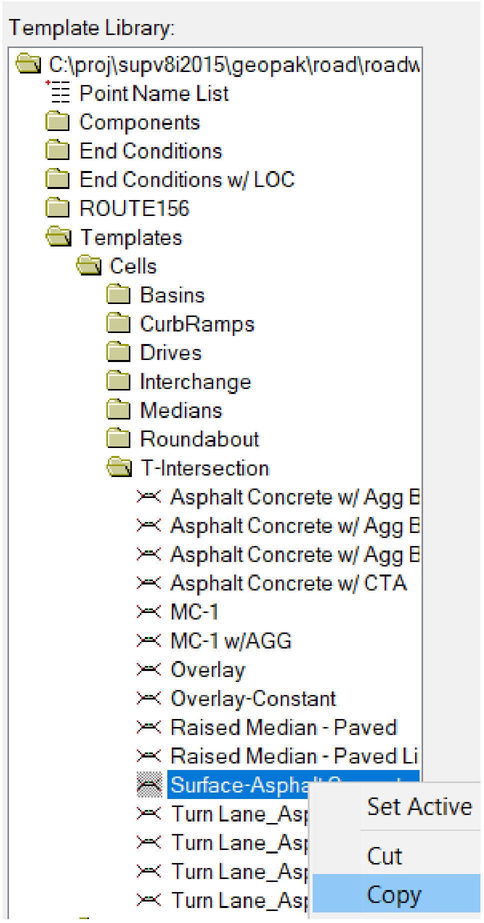
In this exercise, we will modify the aggregate base thickness for the pavement surface in the Civil Cell. Since we cannot copy Surface template edits from the DGN file, we will not edit the surface template in the DGN file but rather modify it in the template library and re-direct the surface template to this edited template. We could then re-direct other surface templates to this template rather than edit each one in the DGN file.

1. In View 2 (Default-3D model), invoke the Surface Template Context Menu of the pavement area surface and choose Properties.

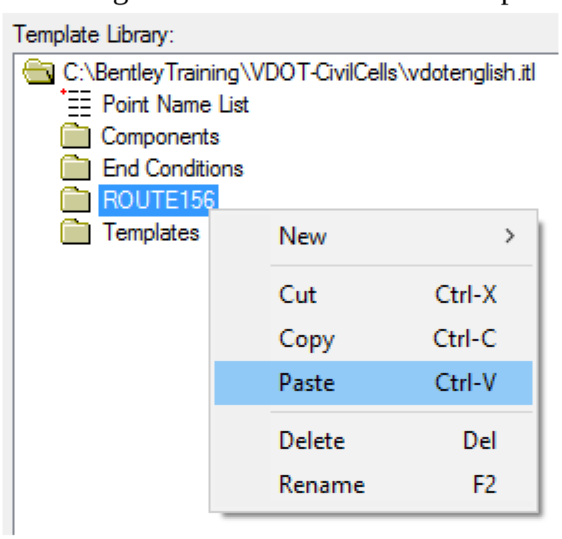
2. Hover over the template name to view its location in the template library.



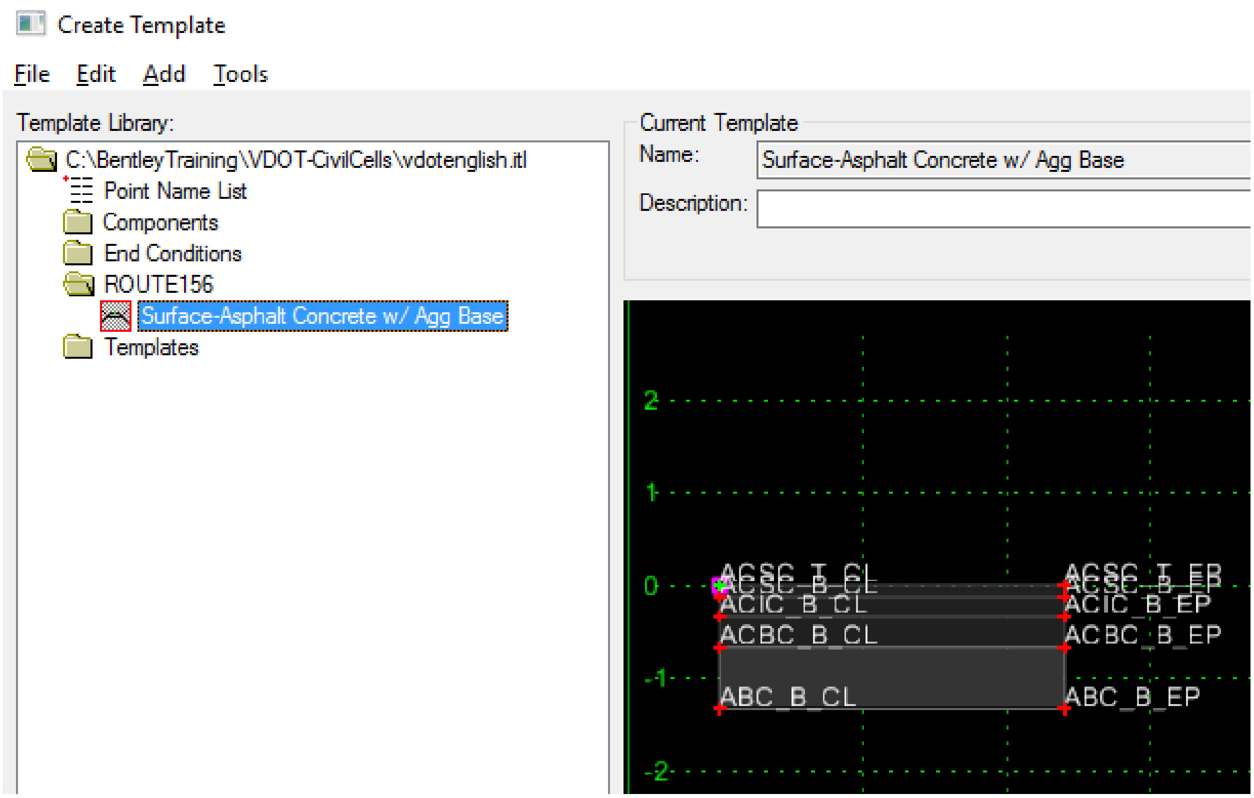
3. Open the Create Template tool again and **Copy this template**.



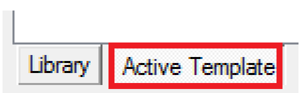
4. Navigate to the ROUTE156 folder previously created and **Paste the copied template**.



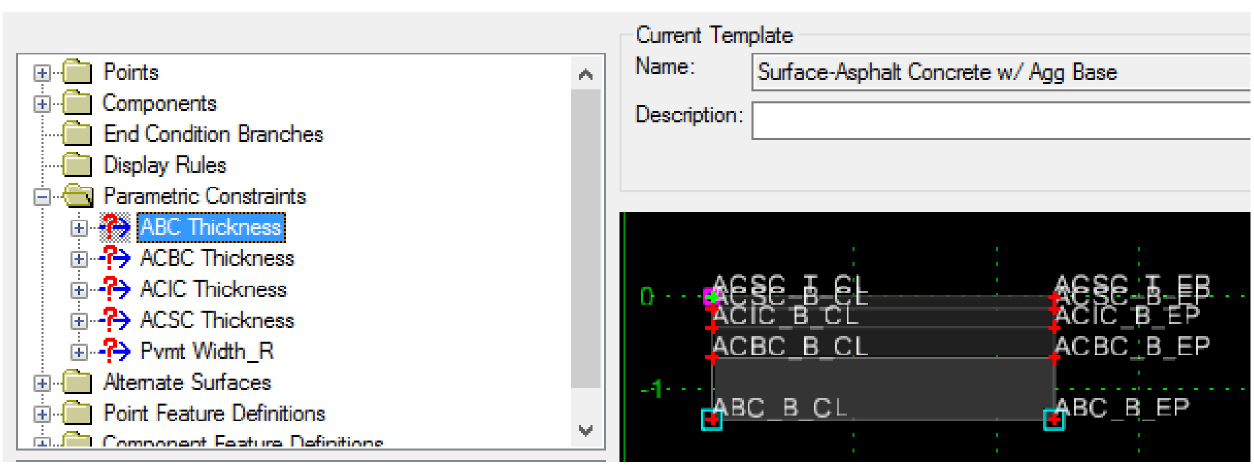
6. Open this folder and Double Click the template to make it the Current Template.



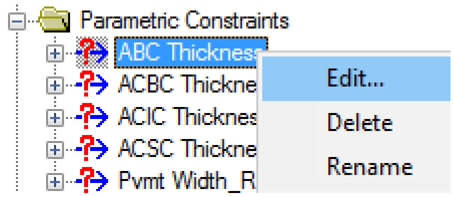
7. Select the **Active Template** tab.



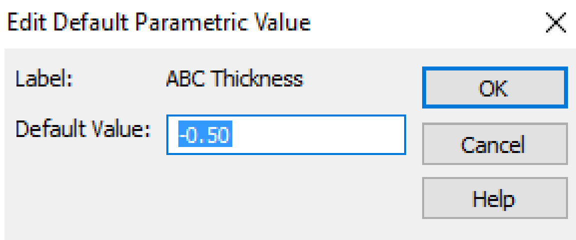
8. Open **Parametric Constraints** and select **ABC Thickness.**



9. **Right Click** *ABC Thickness* and choose **Edit.**

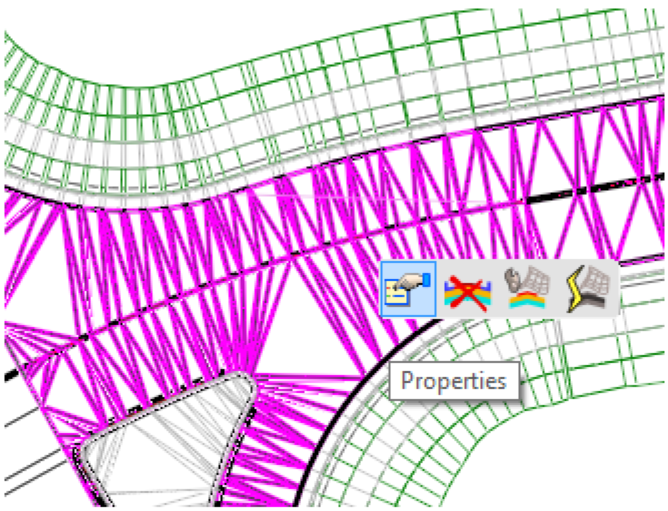


10. Change this value from **-0.67 to -0.5** and tag **OK**.

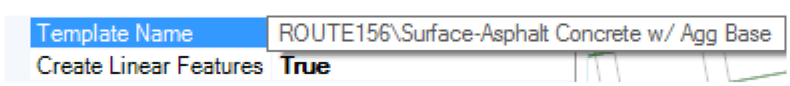


11. **Close** the Create Template dialog and save changes.

12. In View 2 (Default-3D model), invoke the Surface Template Context Menu of the pavement area surface and choose Properties.



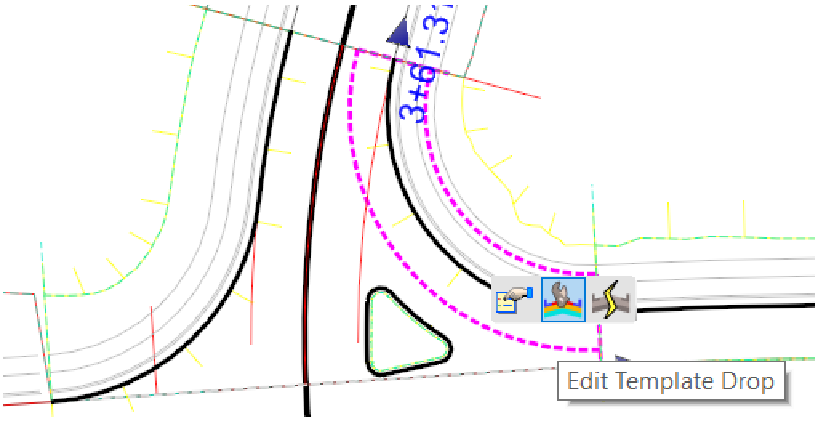
13. Re-direct the template to point to the revised template in ROUTE156.



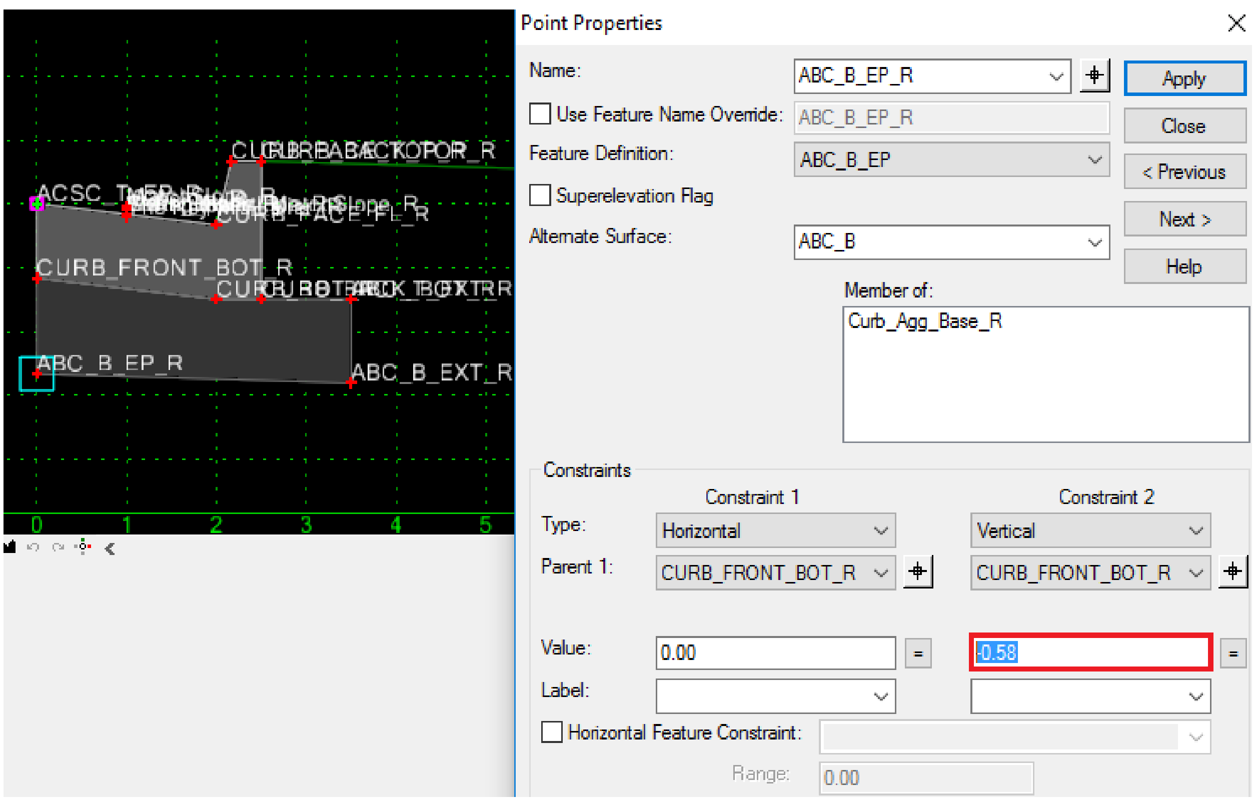
11.3.10.3 LINEAR TEMPLATES

In this exercise, we will modify the aggregate base thickness for the linear templates in the Civil Cell to match the change just made in the surface template.

1. Select the **Edit Template Drop** tool from the context menu of the Right Curve EOP template.



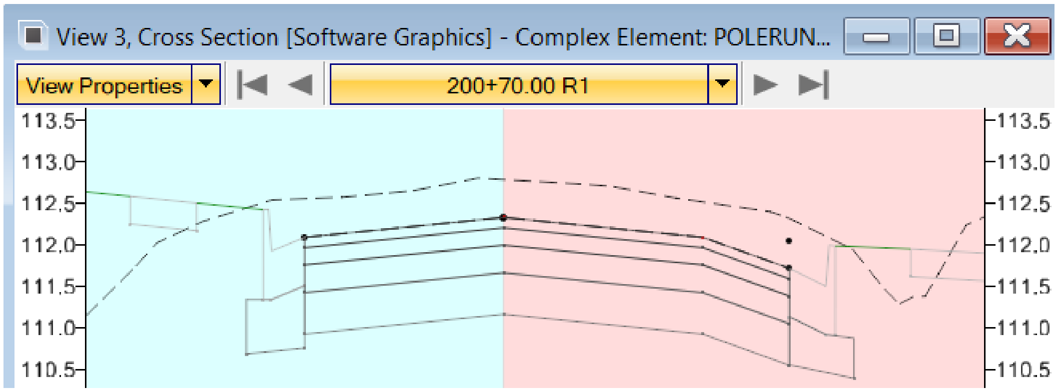
2. **Double Click** the *ABC_B_EP_R point* and change the **Vertical** value from **-0.75 to -0.58**.



NOTE: This value is -0.58 instead of the -0.5 used in the surface template because the ABC Thickness is being measured off the Curb Bottom.

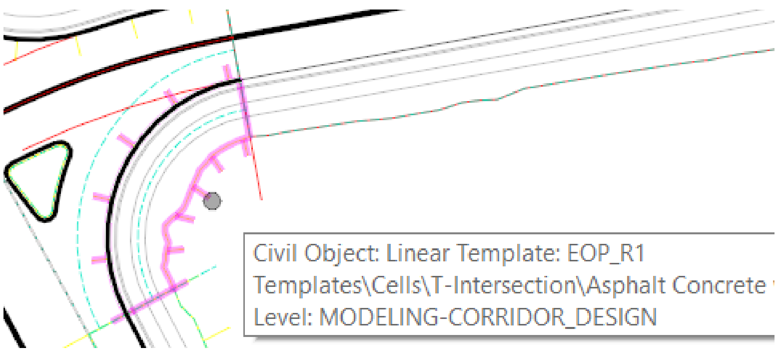
3. Tag **Apply** and then **Close**. Then choose **OK** on the *Create Template* dialog to close this dialog.

4. **Open the cross-section view** of the alignment POLERUNRD and navigate to approximately 200+70. Notice the aggregate base on the right matches the surface template but doesn't on the left.

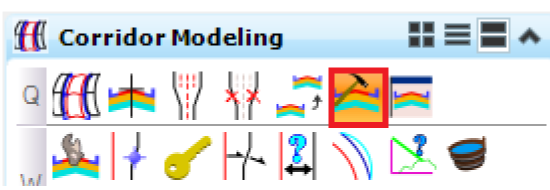


In the next few steps, we will move the template we just edited in the template library and then re-direct the remainder of the templates in this civil cell to use this revised template.

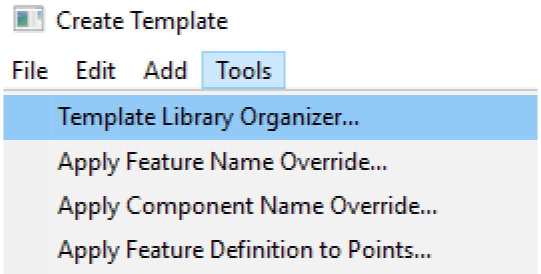
5. Determine the name of the template that was edited by hovering over the linear template. You may have to Right Click if the Civil Cell is highlighted first to get to the underlying linear template.



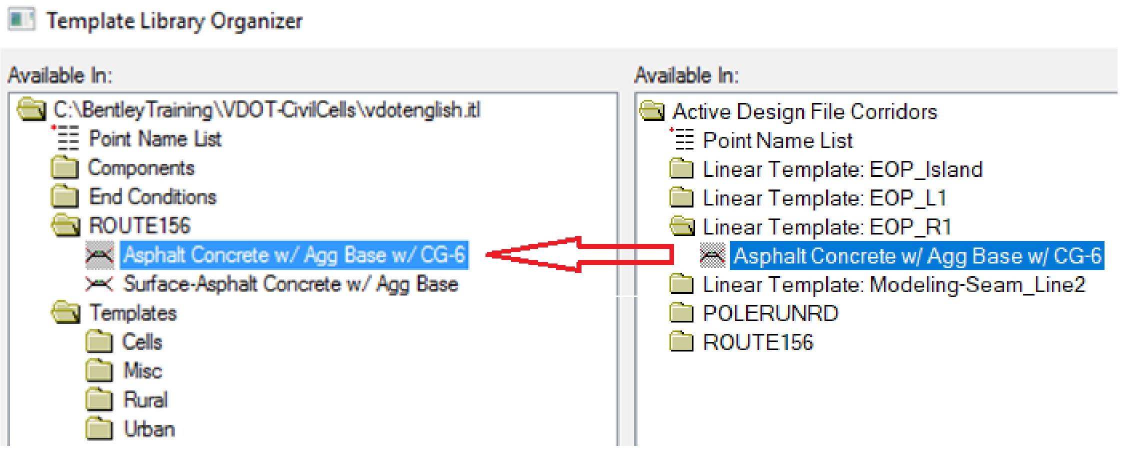
6. Open the **Create Template** dialog.



7. Select **Tools –> Template Library Organizer.**



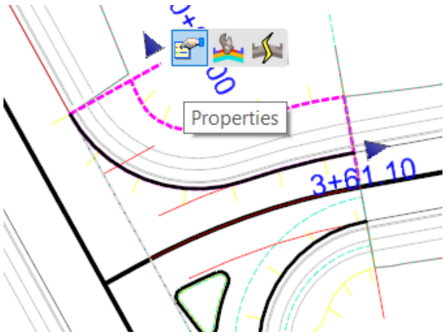
8. **Copy** the template from the *Active Design File Corridors* to the *ROUTE156 folder* in the active template library by dragging and dropping as shown below.



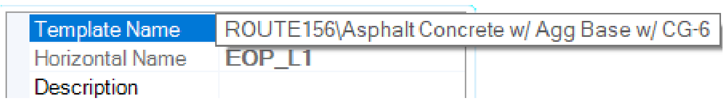
9. Tag **OK** on the *Template Library Organizer* dialog and **Save Changes** when prompted.

10. Close the Create Template dialog.

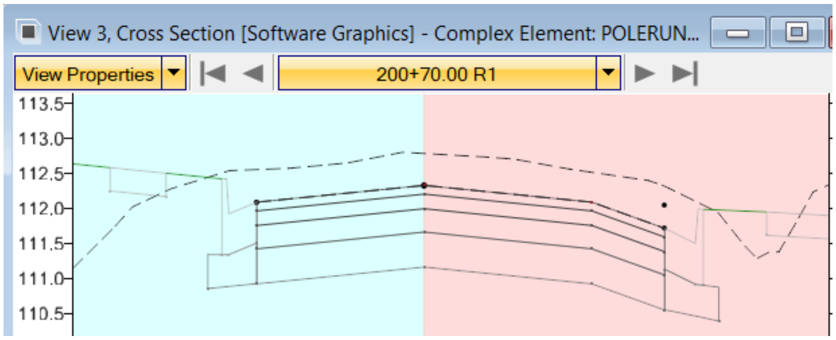
11. Select Properties after invoking the Context menu of the Civil Cell LT EoP linear template.



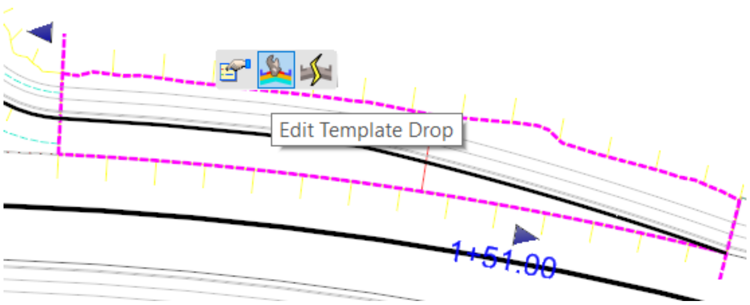
12. Change the template to point the template just copied to the ROUTE156 folder.



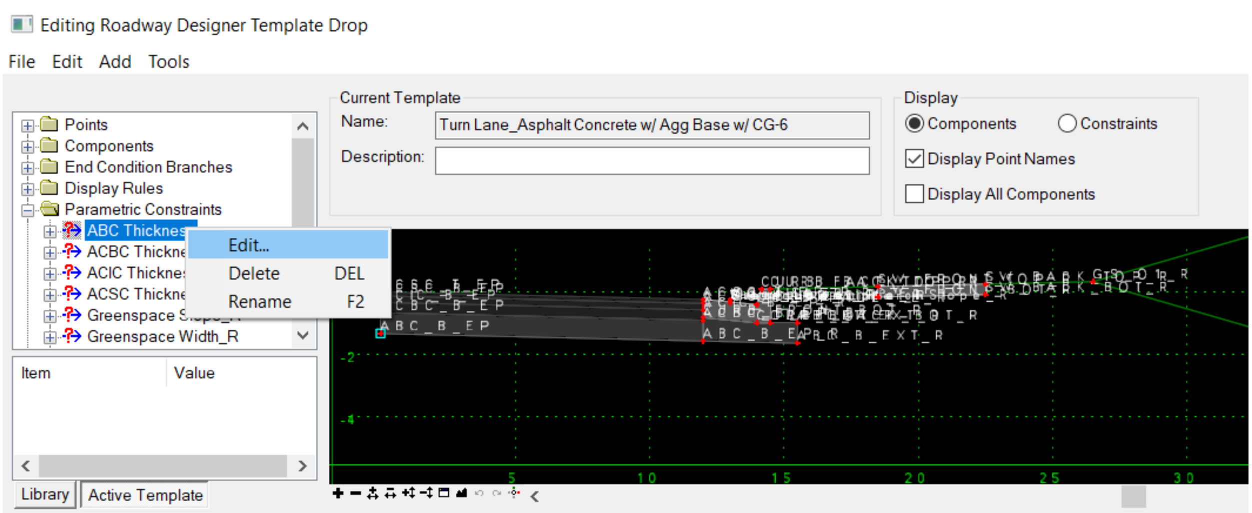
13. Select the cross section view and the aggregate base on the right of the screen should now match the thickness of the surface template.



14. Lastly, we need to change the Aggregate Thickness for the Turn Lane linear template. Select the Linear Template as shown below and choose Edit Template.



15. Similar to the edit made with the Surface Template (and shown below), Go to Active Template and edit the ABC Thickness to change it from -0.67 to -0.6



NOTE: The ROUTE156 template would need to be changed as well but this step is skipped in this exercise.

11.3.11 CELL - Median Nose

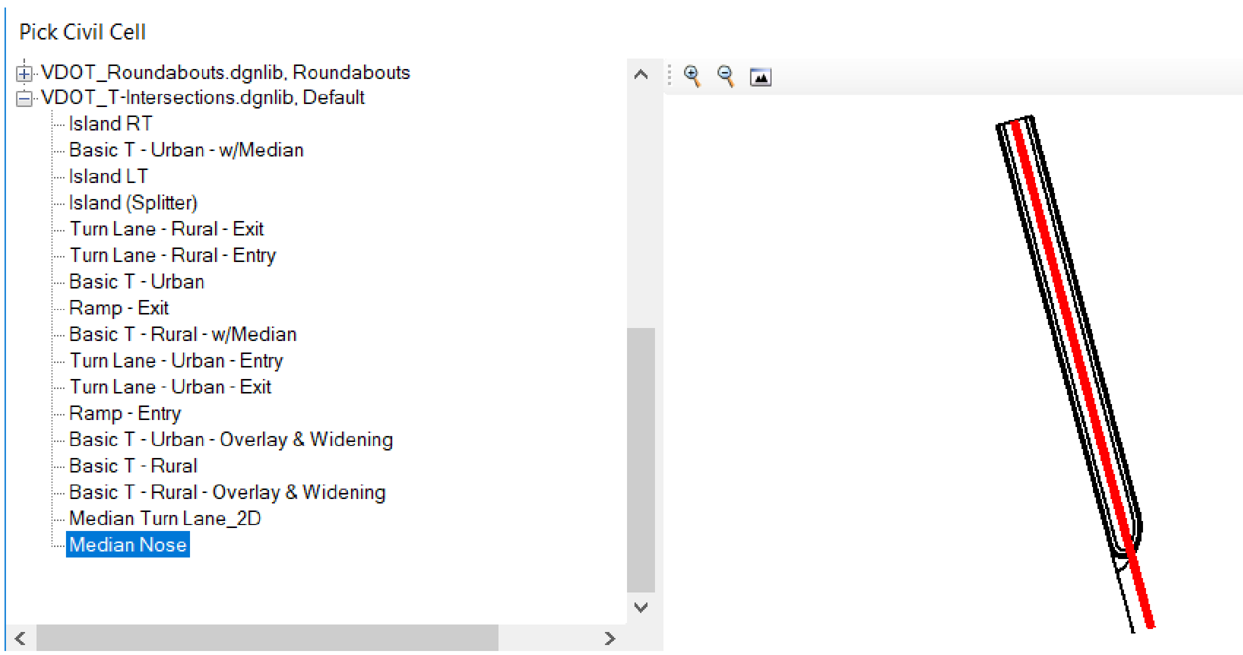
This section will discuss steps of adding median.

1. Open the file **2-lane-Urban-MedianT.dgn.** This file contains

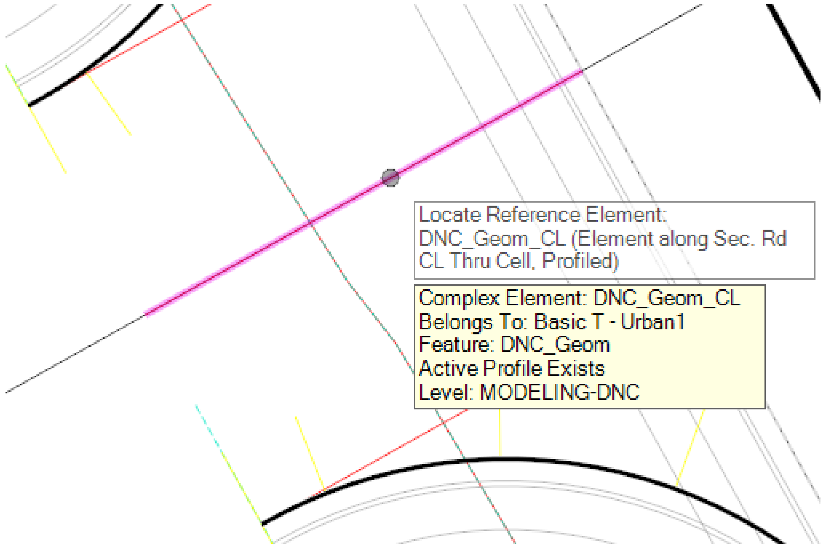
    - Alignment & Corridor for **ROUTE156**
    - Alignment, Corridor, & Basic T intersection for **POLERUNRD**
    - Alignment & Basic T for the alignment **NEWRD** which is located opposite and West of *POLERUNRD.*

    We will add a median turn lane to the NEWRD intersection.

2. Place the Civil Cell **Median-Nose** from the category *VDOT_T-Intersections.*



3. When prompted to *'Locate Reference Element: DNC_Geom_CL (Element along Sec. Rd CL Thru Cell, Profiled)'*, select the **DNC_Geom_CL** in View 1.



4. Observe the geometry being displayed.

   a) If the geometry appears correct and similar to the image below, move on to the next step.

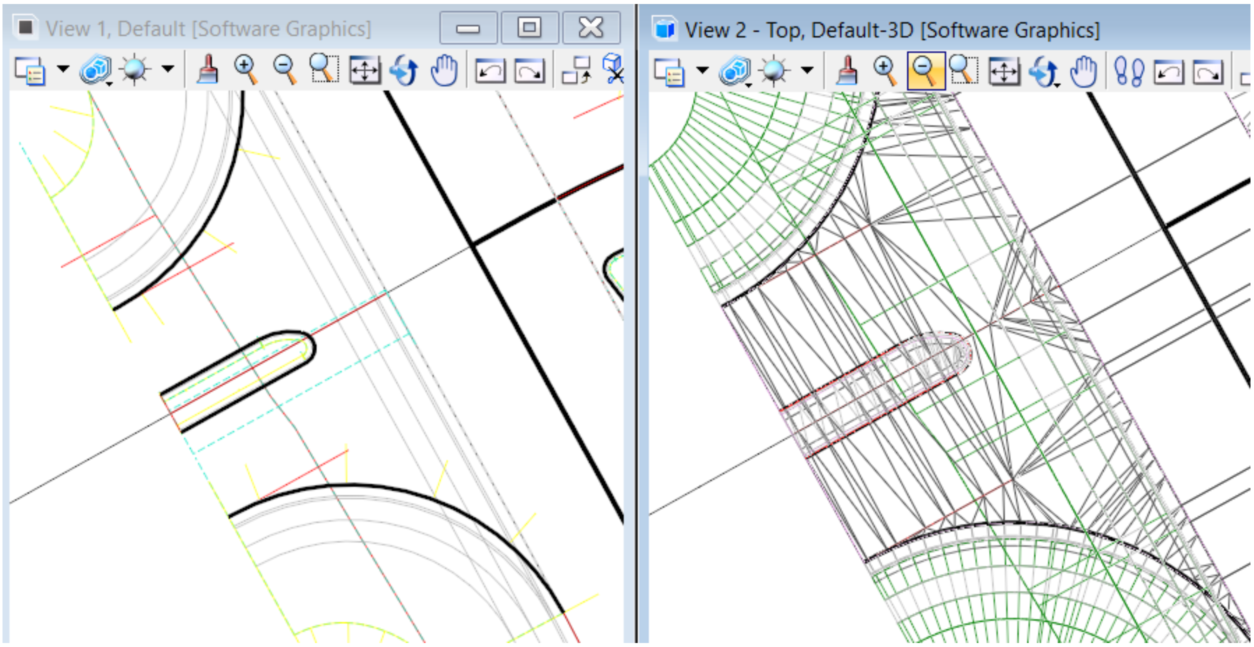
   b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.3.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-click through the remainder of prompts to not place the cell and review the reference elements.

5. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

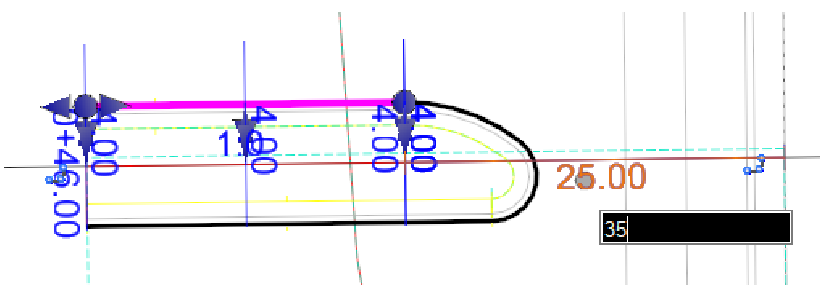
6. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

   The image below shows the cell in 2d & 3d views.

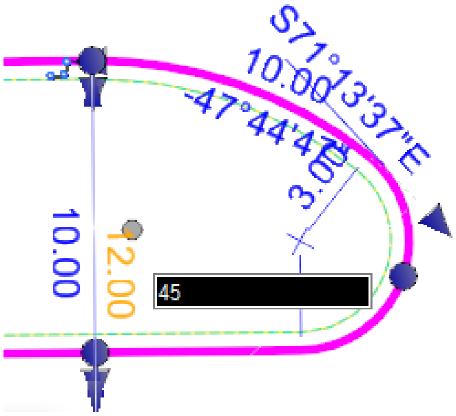


11.3.11.2 HORIZONTAL EDITS

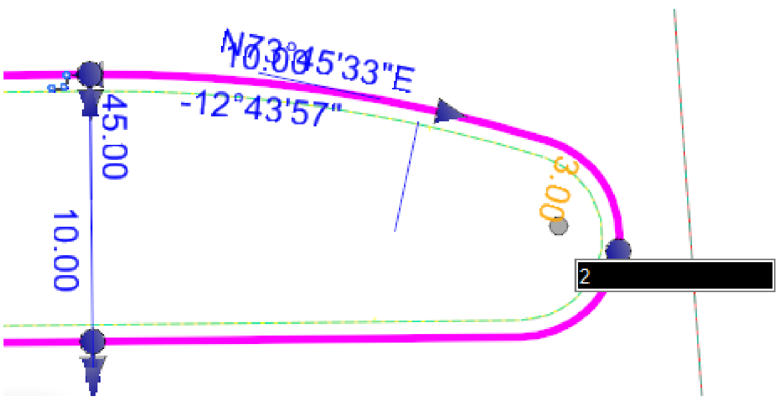
1. Move the location of the median nose from 25' to **35'** off the edge of pavement by selecting the line perpendicular to the secondary road close to the median nose as shown below.



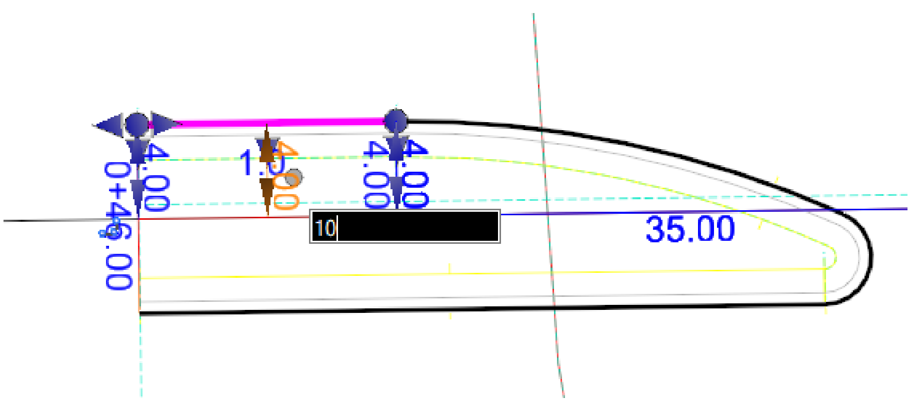
2. Select the Nose *Median Edge of Pavement* and change the following radius from 12' to **45**'.



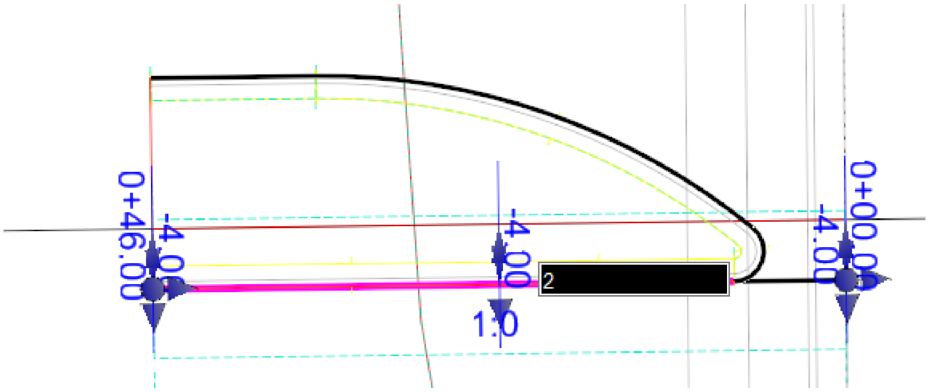
7. With the Nose *Median Edge of Pavement* still selected, change the following nose radius from 3' to **2'**.



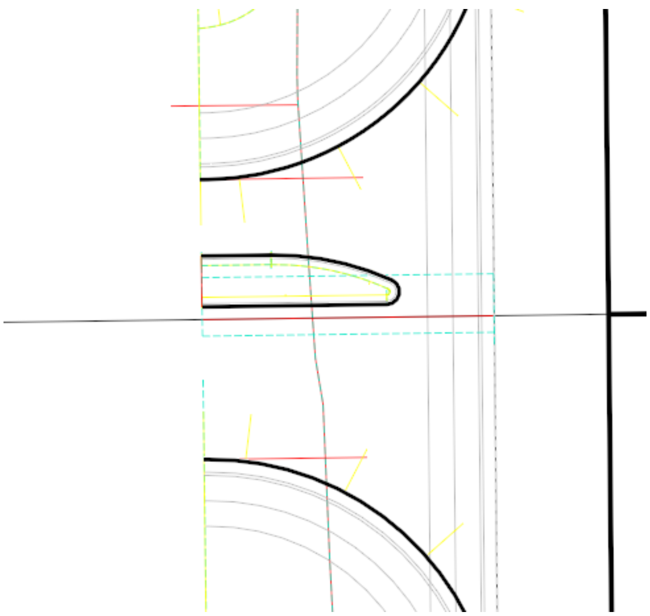
8. Select the *Median Edge of Pavement (Non-Taper side)* and change the taper end offset from 4 to **10.**



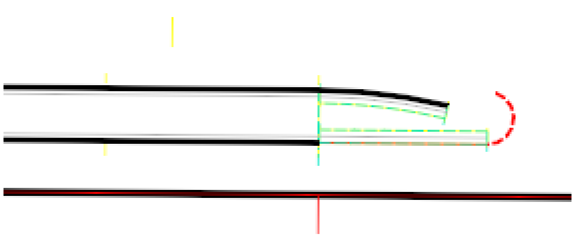
9. Select the *Median Edge of Pavement (Non-Taper side)* and change the taper end offset from -4 to **2.**



After edits, the cell should appear as shown below.



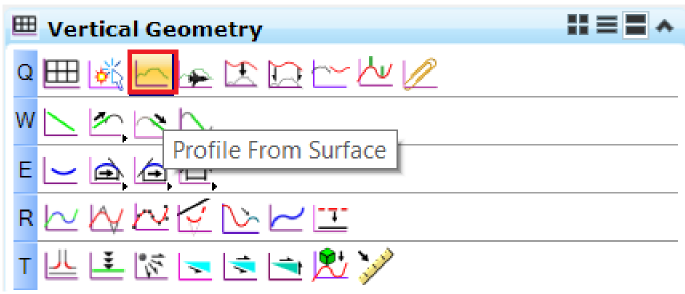
Pay close attention to horizontal edits as they are made as the following can happen with narrow median widths. If it does, undo the edit, change the nose geometry, and then make the edit again.



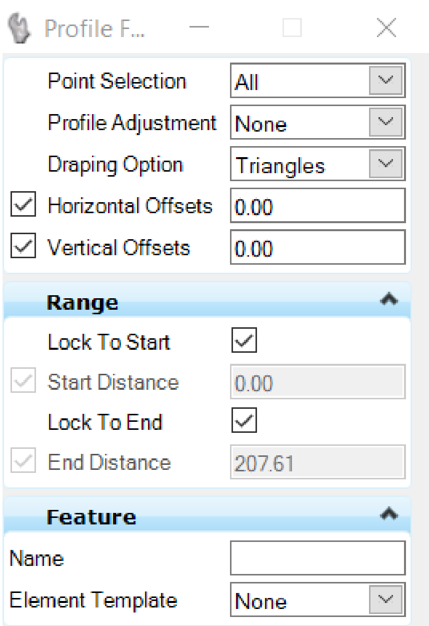
11.3.11.3 VERTICAL EDITS

The Median Nose Cell is placed initially with a -2% slope projected from the Secondary Rd CL. Similarly, to the island cells, this needs to be changed to match the pavement slope. We'll go through these steps below, add the median as a void to the Pavement Surface, and then also re-profile the median elements based on their location to the CL.

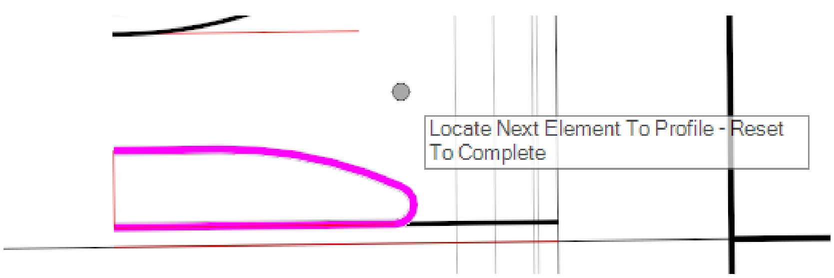
1. Choose the *Vertical Geometry* command **Profile from Surface.**



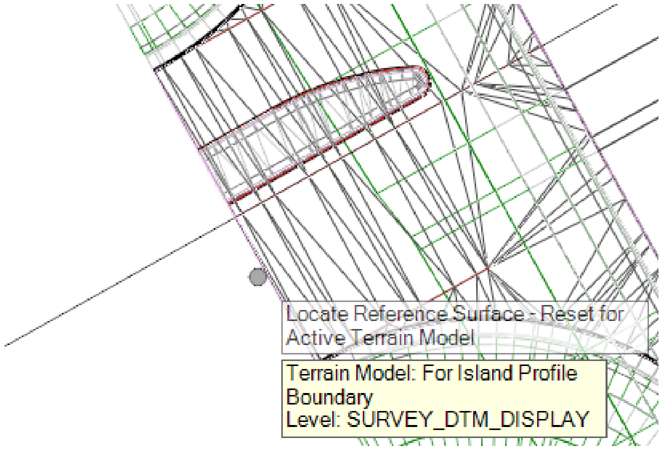
2. Set the *dialog* as shown below.



3. Select the following **three Median EOP** elements.



4. Reset and then select the **For Island Profile terrain** in the *3D view*.

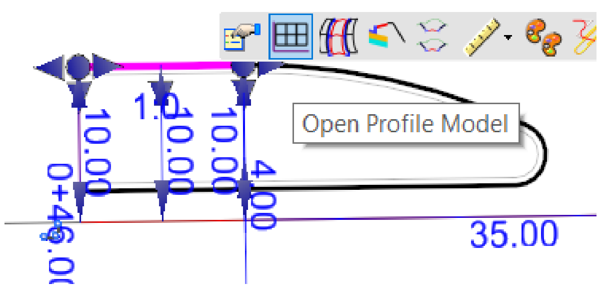


NOTE: You may have to reset a few times without moving the mouse to reach this terrain. Your cursor must be on the edge of the surface area as shown above.

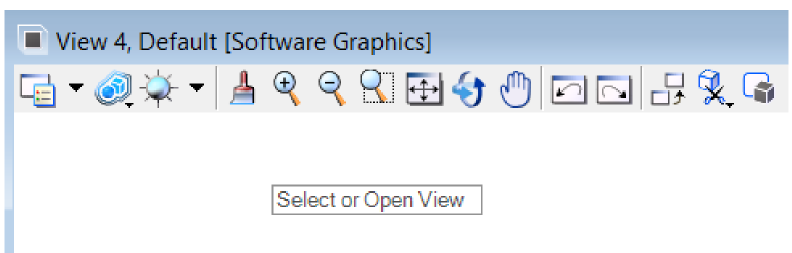
5. **Left Click** through the remaining prompts to create the profiles.

6. Open **View 4**, open the profile view of each of the three elements just profiles, and make these profile from surface profiles the active profile. This process if shown for just one of the elements below.

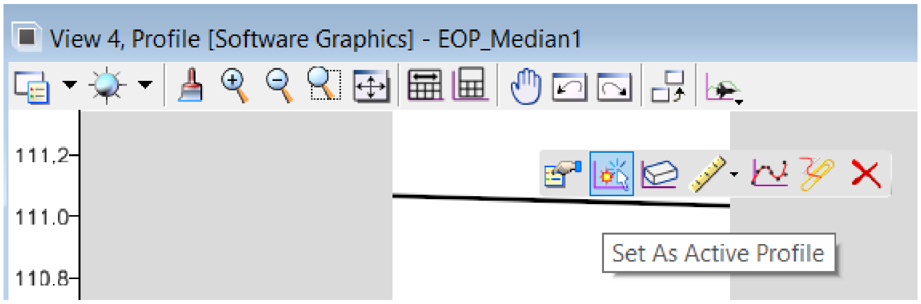
   a. Select the *Median EOP* and from the context menus, choose **Open Profile Model.**



   b. **Left Click in View 4** when prompted to *Select or Open View*.

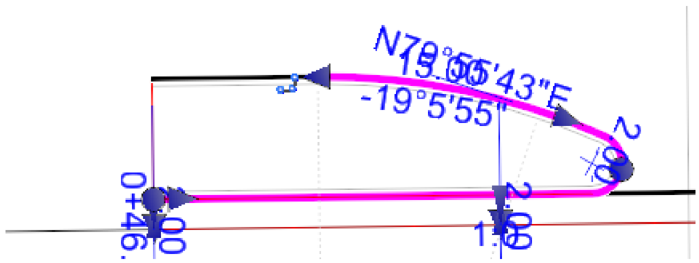


c. Select the profile just created and choose **Set As Active Profile** from the context menu.

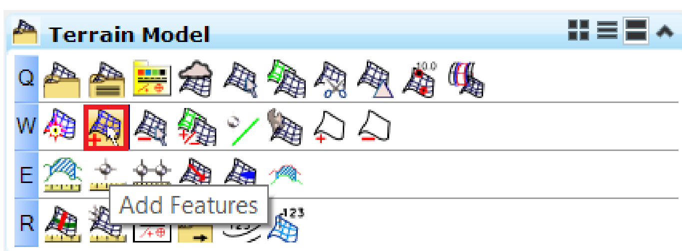


NOTE: The profile may be below the current active profile so you may have to reset to choose the profile just created.

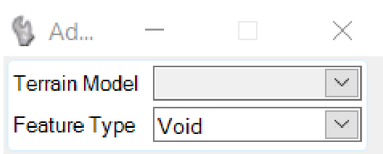
d. Perform the same steps for the other *two other Median EOP's.*



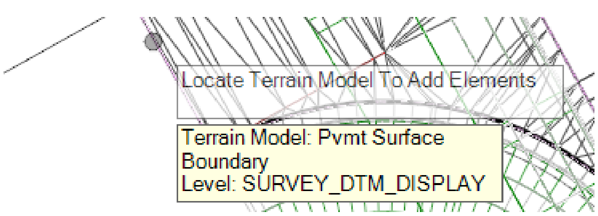
7. From the *Terrain Model* tools, choose **Add Feature.**



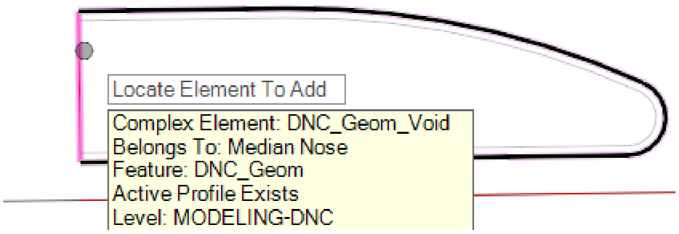
8. Set the *Feature Type* to **Void** in the dialog as shown below.



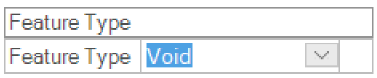
9. Select the **Pvmt Surface** terrain in the 3D view when prompted to *Locate Terrain Model To Add Elements.*



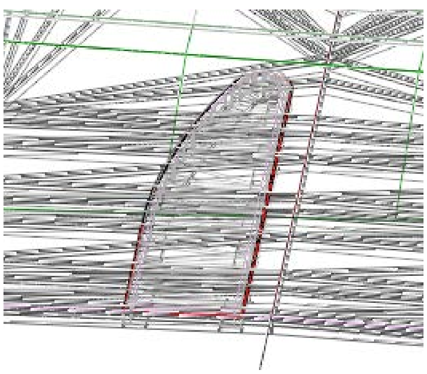
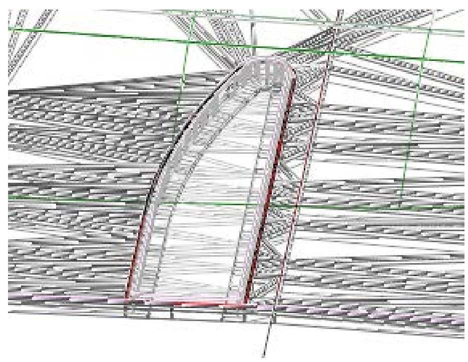
10. Select the element **DNC_Geom_Void** when prompted to *Locate Element To Add.*



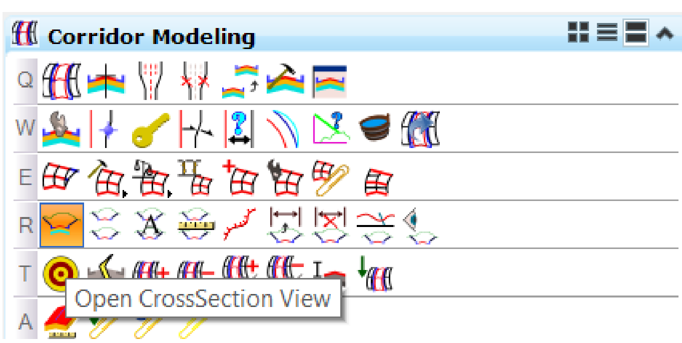
11. **Reset** when prompted to *Locate Next Element To Add – Reset When Done.*
12. **Data Point** in View 1 to confirm the *Feature Type of Void.*



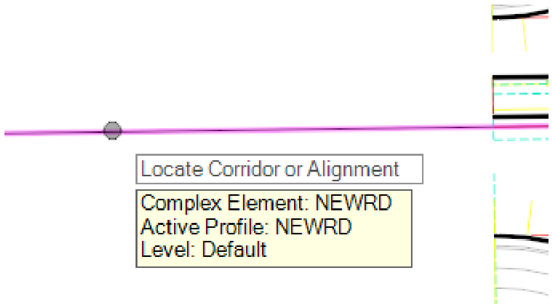
Below are images of the 3d view showing before and after adding voids.

Before Void Added	After Void Added
	

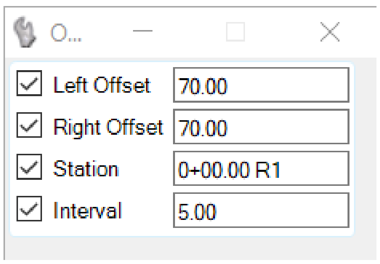
13. Open View 3 (if not already open).
14. Choose the **Open CrossSection View** from the *Corridor Modeling* tools.



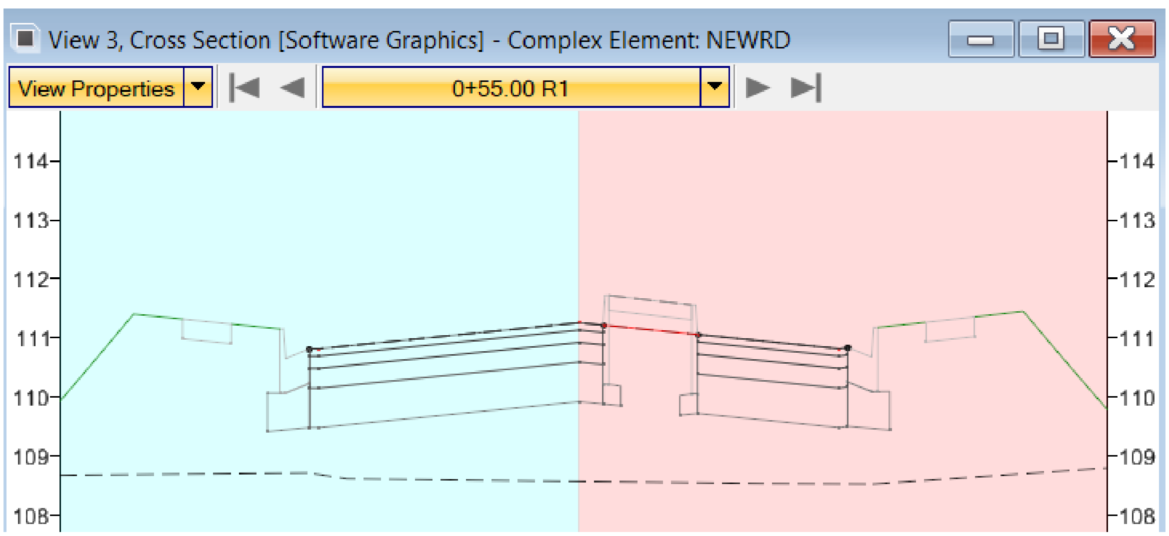
15. Select the **NEWRD** alignment when prompted to *Locate Corridor or Alignment*.



16. Use the following settings and proceed through the prompts making sure your data points for left and right offset are respectively, to the left and right of the alignment.

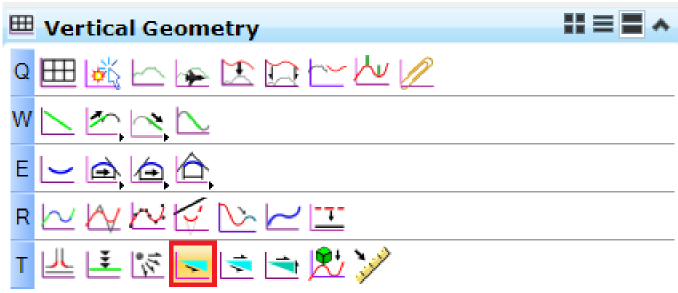


17. After clicking in View 3, navigate to station 0+55 and observe the island. Tag the arrow by View Properties and change the Vertical Exaggeration to 5.

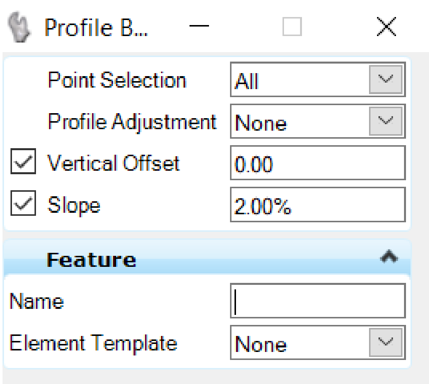


Notice the slope from the CL to the left median edge of pavement is -2%. We'll change this slope to +2% in the next few steps so that water is draining away from the island.

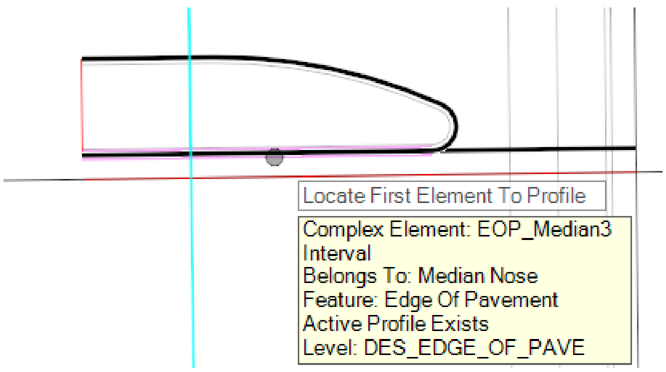
18. Select the *Vertical Geometry* command **Profile By Slope From Element.**



19. Set the dialog as shown below.

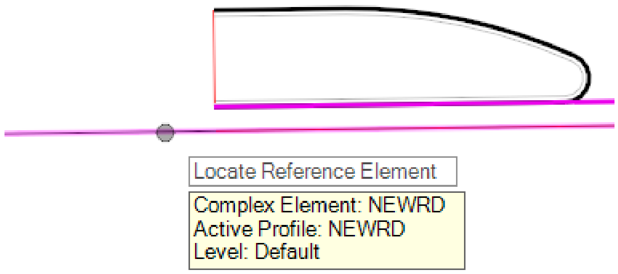


20. Select the **Median EOP** as shown below when prompted to *Locate First Element To Profile.*



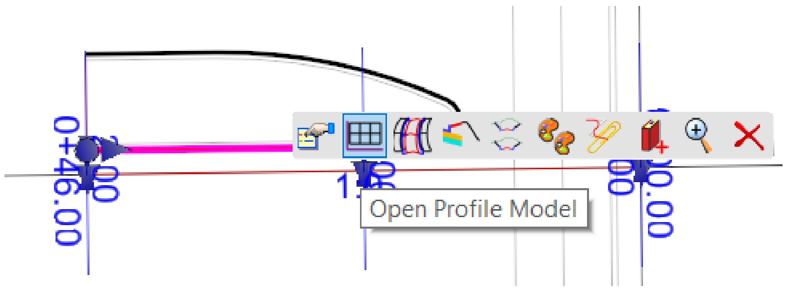
21. **Reset** when prompted to *Locate Next Element To Profile.*

22. Locate the alignment **NEWRD** when prompted to *Locate Reference Element.*

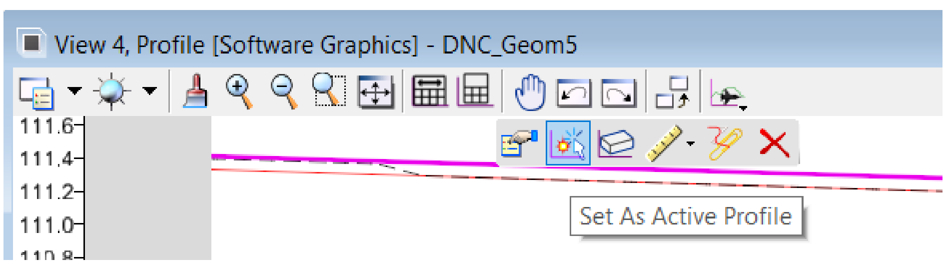


23. Conform the slope of **+2%** and confirm the remaining prompts with Data Points in the view.

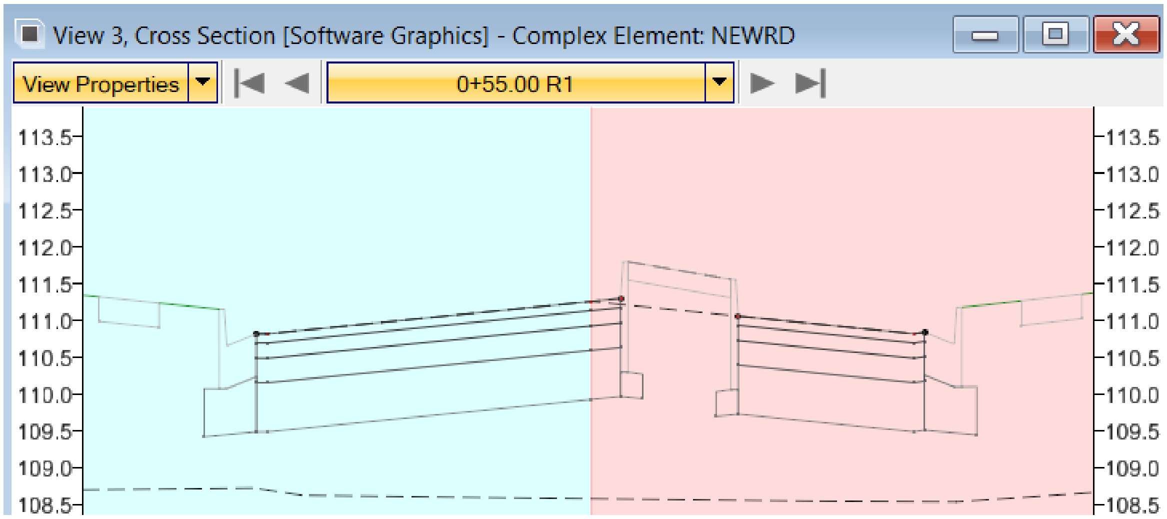
24. Select the Median EOP, choose **Open Profile Model** from the context menu, and open the profile in View 4.



25. Select this new projected profile in View 4 and choose **Set As Active Profile** from the context menu.



26. Click on View 3 if you still have it open as the Cross-Section View and observe the change to the slope being now away from the median.

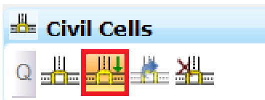


11.3.12 CELL - Median Turn Lane

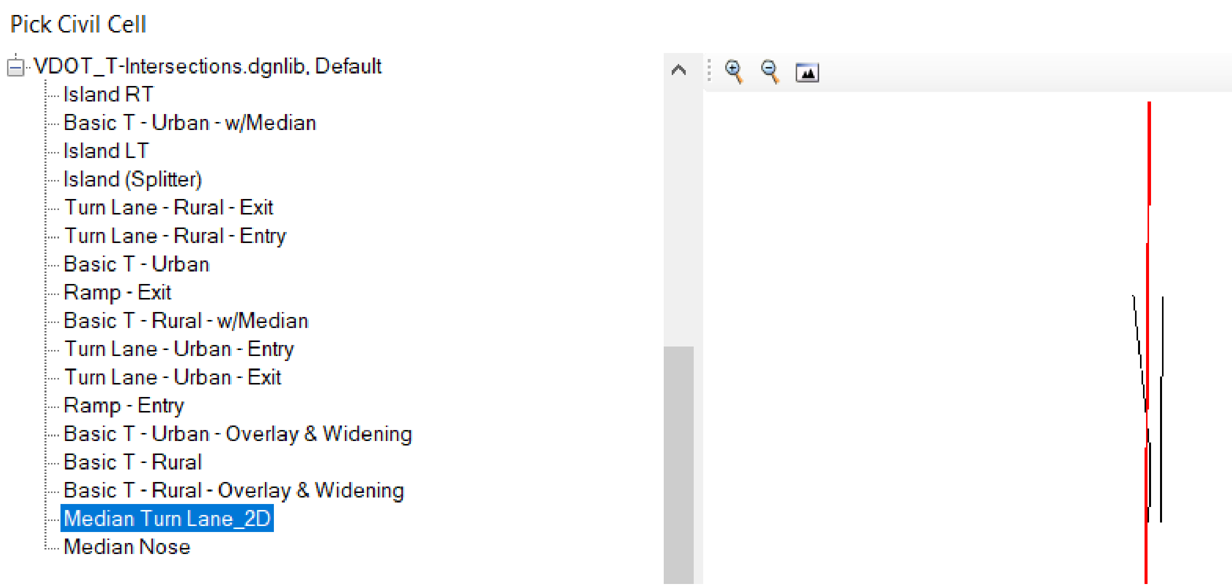
In the next few steps, we will add a median turn lane to tie to the Median Nose cell just placed. This is a 2d cell.

11.3.12.1 PLACEMENT

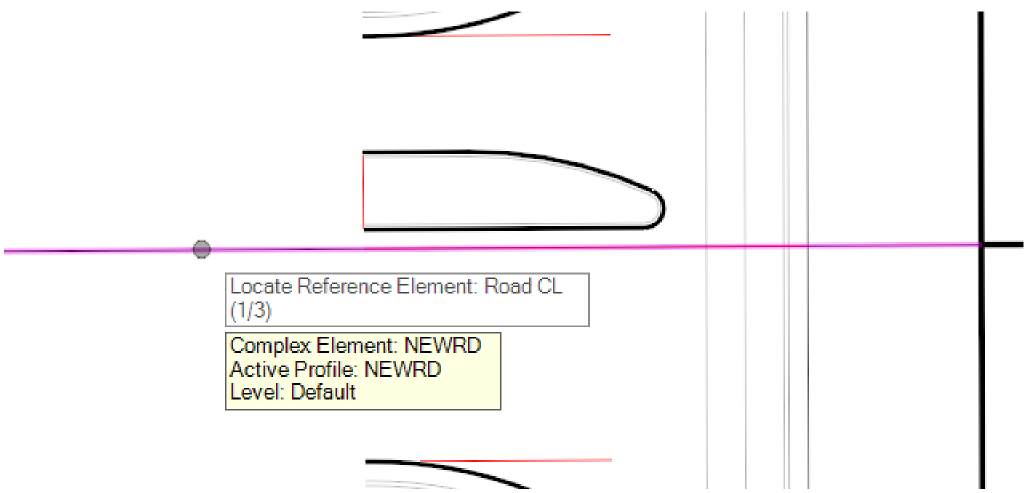
1. Choose the **Place Civil Cell** command from the Civil Cells tools.



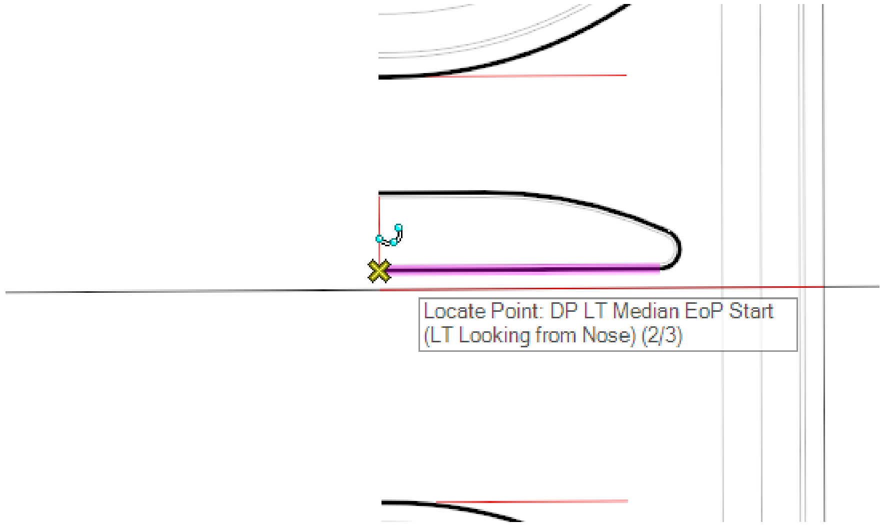
2. Select the **Median Turn Lane_2D** Civil Cell from the VDOT_T-Intersections category.



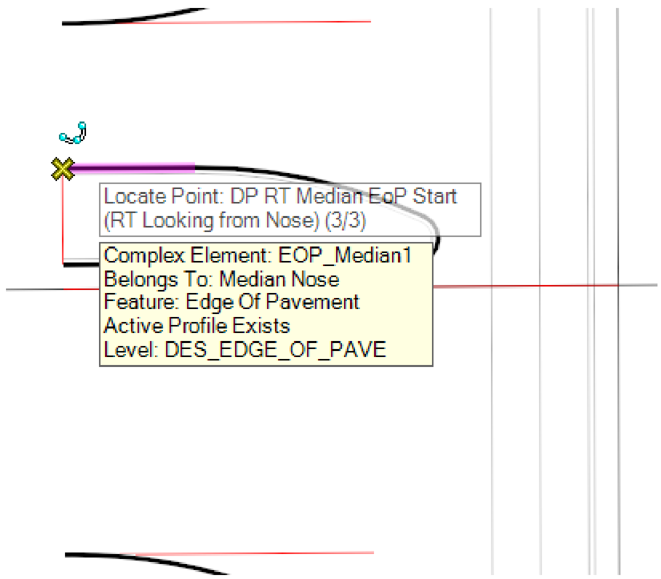
3. When prompted to '*Locate Reference Element: Road CL*', select the alignment **NEWRD** in View 1.



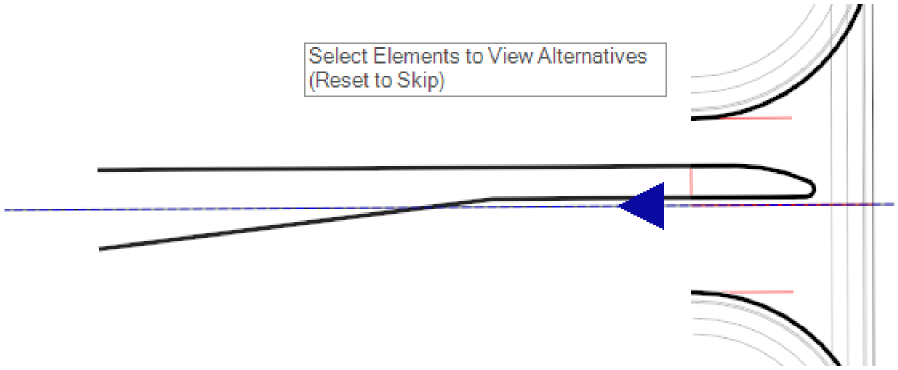
4. When prompted to '*Locate Point: DP LT Median EoP Start (LT looking from Nose)*', snap to the LT Median EOP as shown below and then data point.



5. When prompted to '*Locate Point: DP RT Median EoP Start (RT looking from Nose)*', snap to the RT Median EOP as shown below and then data point.



6. Observe the geometry being displayed.



a) If the geometry appears correct and similar to the image below, move on to the next step.

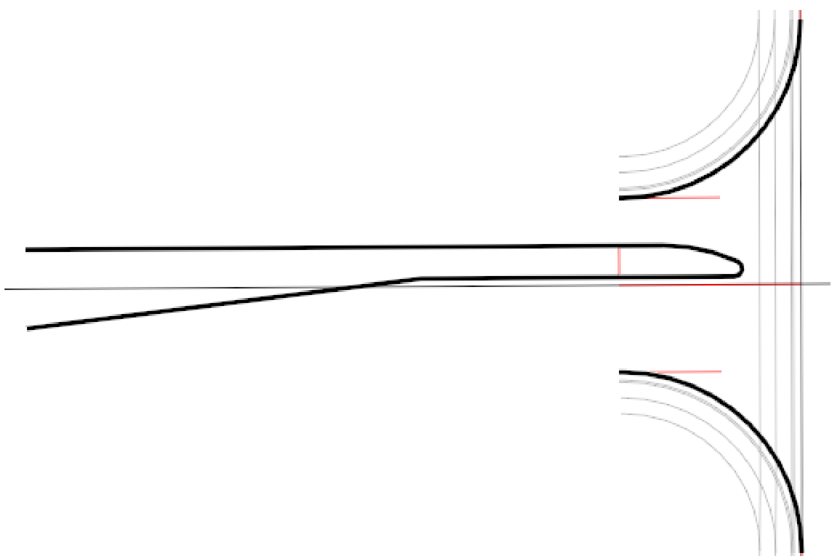
b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.3.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-click through the remainder of prompts to not place the cell and review the reference elements.

7. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

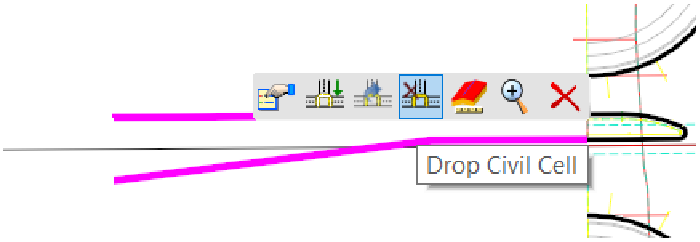
8. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

The image below shows the cell in 2d view. No 3d is created.



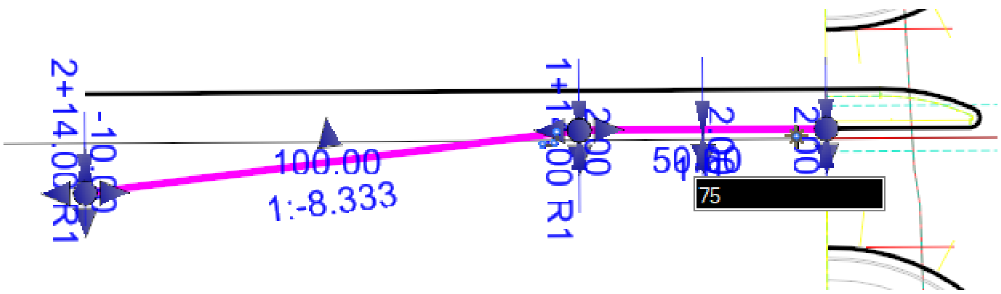
11.3.12.2 EDITS

1. Drop the Turn Lane cell.



NOTE: It's not ideal to drop cells but the Turn Lane cell is just a 2d cell with limited elements and we need to target the elements within it with Point Controls.

2. Select the *Median EOP (Tapered side)* and change the storage lane length from 50 to 75'.

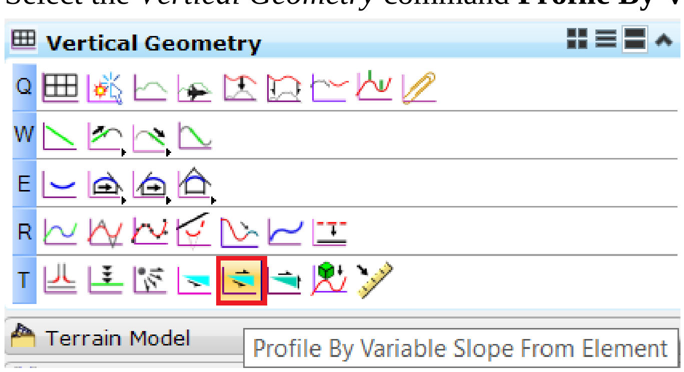


NOTES:

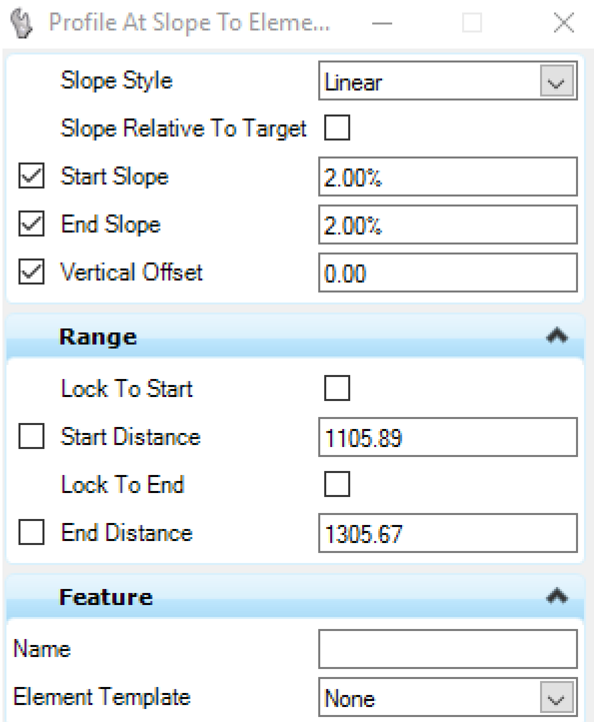
- You would need to add this value to what's available in the nose area for the total length of storage lane you wish to achieve.
- Taper edits are fairly straightforward with the heads-up value edits and we will make no edits to the taper.

Next, let's profile the taper side of the Median EOP, then we will create a Corridor for the NEWRD alignment, and finally we will add point controls and parametric constraints to match the dimensions in the cell area.

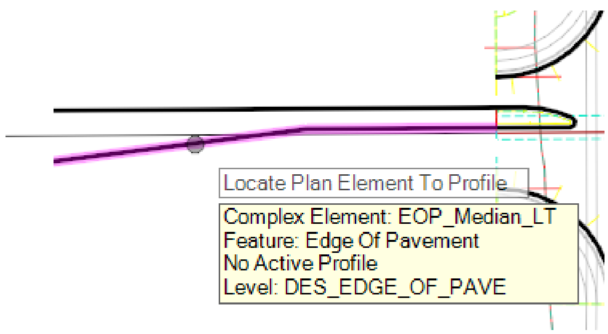
1. Select the *Vertical Geometry* command **Profile By Variable Slope From Element.**



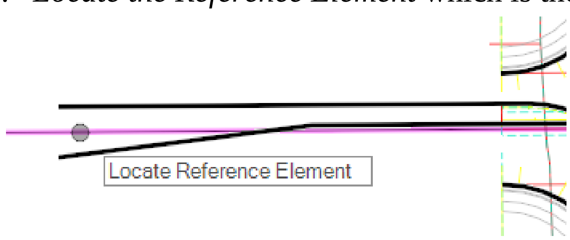
2. Fill out the resulting dialog as shown below.



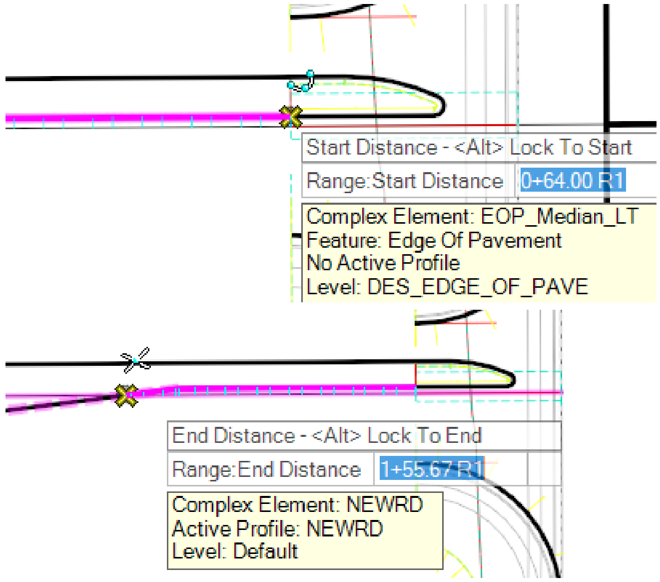
3. Left click in View 1 to confirm the *Linear Slope Style.*
4. *Locate the Plan Element to Profile* which is the ***Median EoP (Taper side).***



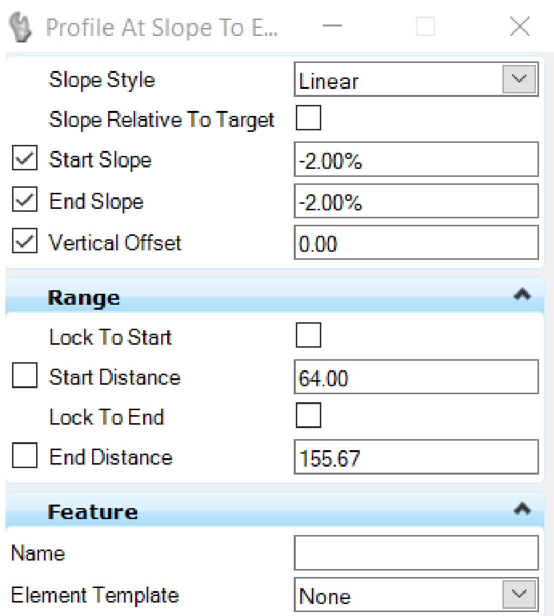
5. *Locate the Reference Element* which is the **NEWRD alignment.**



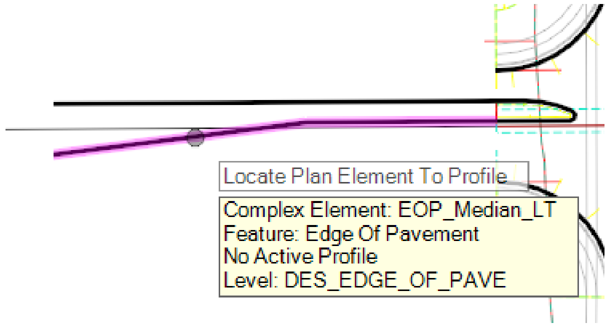
6. Snap and Data Point the Start and End Distance as shown below.



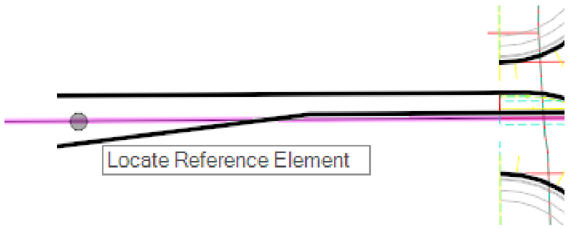
7. Confirm the Start & End Slopes of 2% and the Offset of 0 with Data Points to complete the command.
8. Remaining in the same command, change the Start and End Slope to -2%.



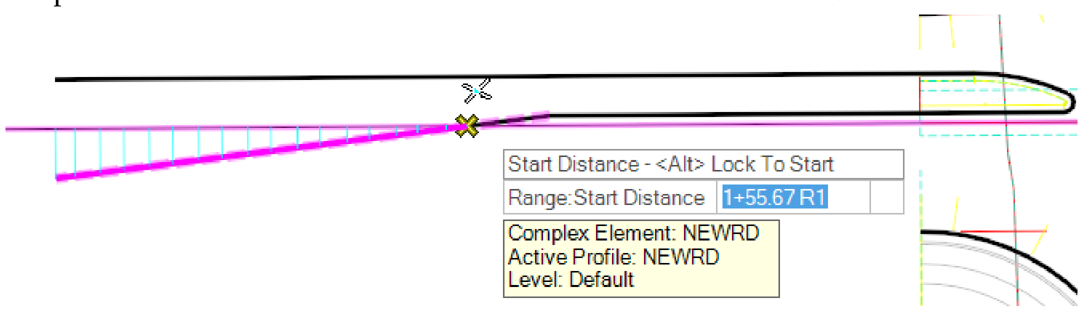
9. *Locate the Plan Element to Profile* which is the ***Median EoP (Taper side).***

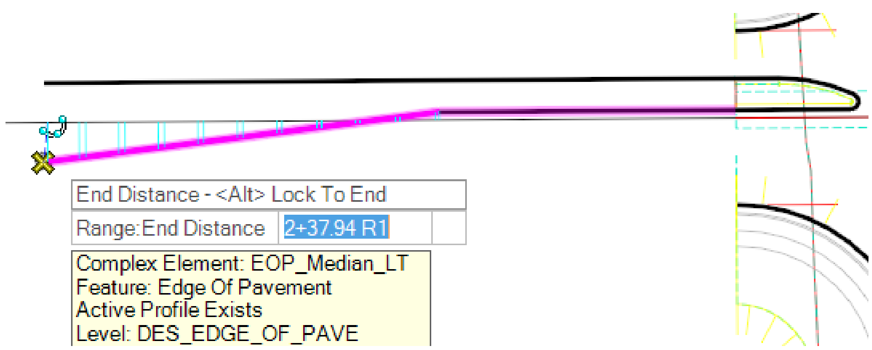


10. *Locate the Reference Element* which is the **NEWRD alignment.**



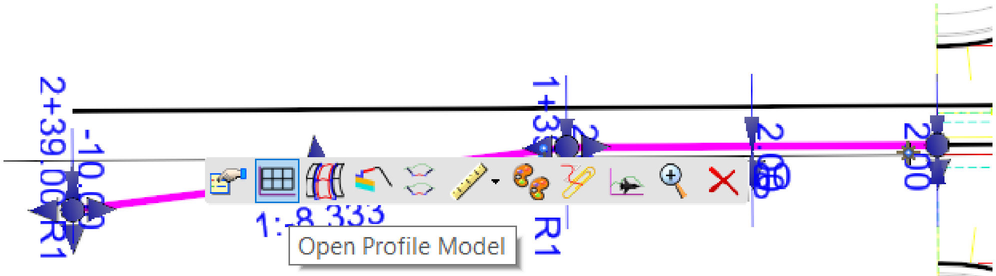
11. Snap and Data Point the *Start and End Distance* as shown below.



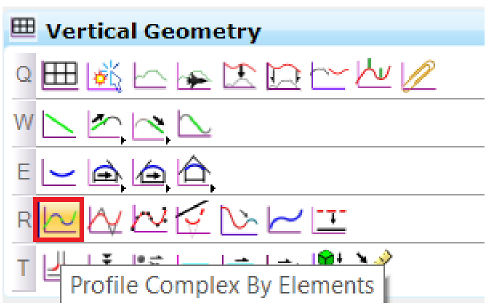


12. *Confirm the Start & End Slopes of 2% and the Offset of 0* with Data Points to complete the command.

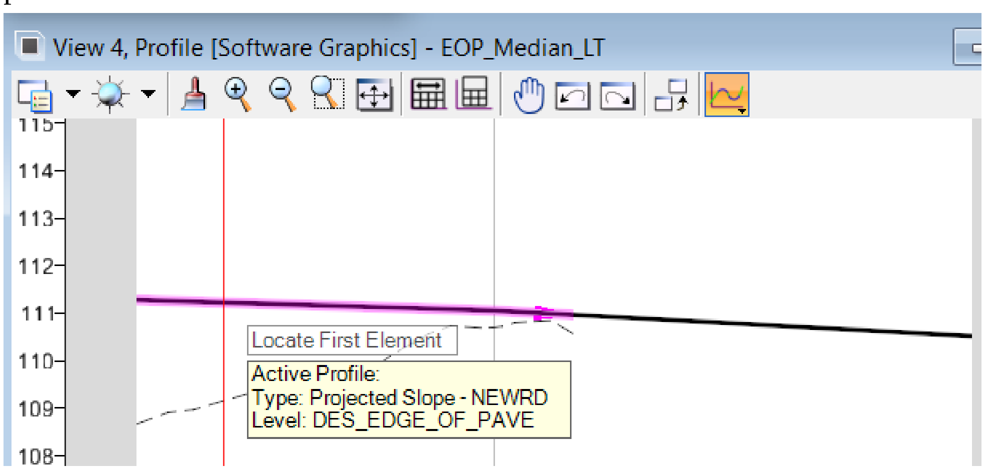
13. Open the **profile model** of the *median edge of pavement (taper side).* (Open in View 4).



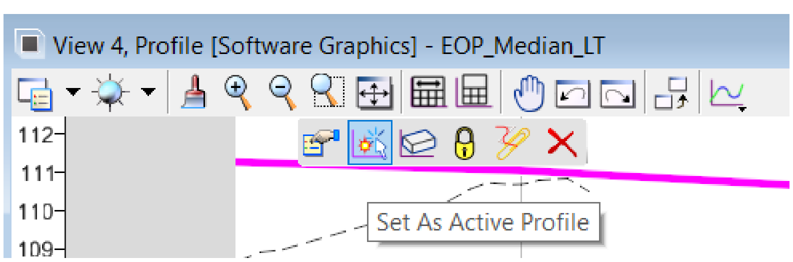
14. Choose the *Vertical Geometry* command **Profile Complex By Elements.**



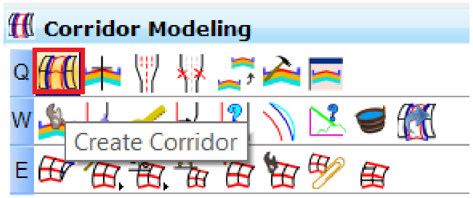
15. Set the *Complex Method* to **Automatic** and in View 4, complex the two projected profiles.



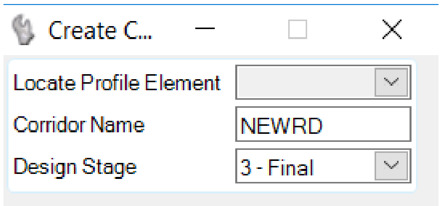
16. Select the complexed profile and choose **Set As Active Profile** from the Context Menu.



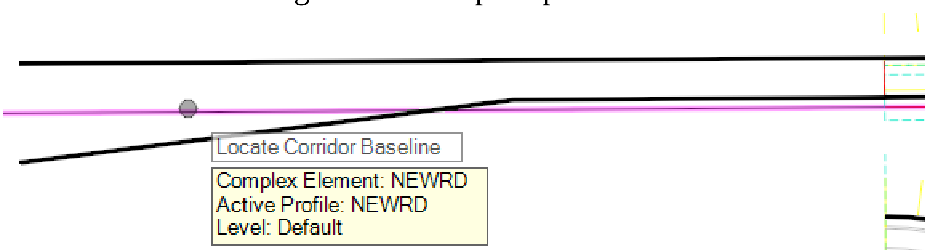
17. Close View 4 and choose the **Create Corridor** command from the *Corridor Modeling* tools.



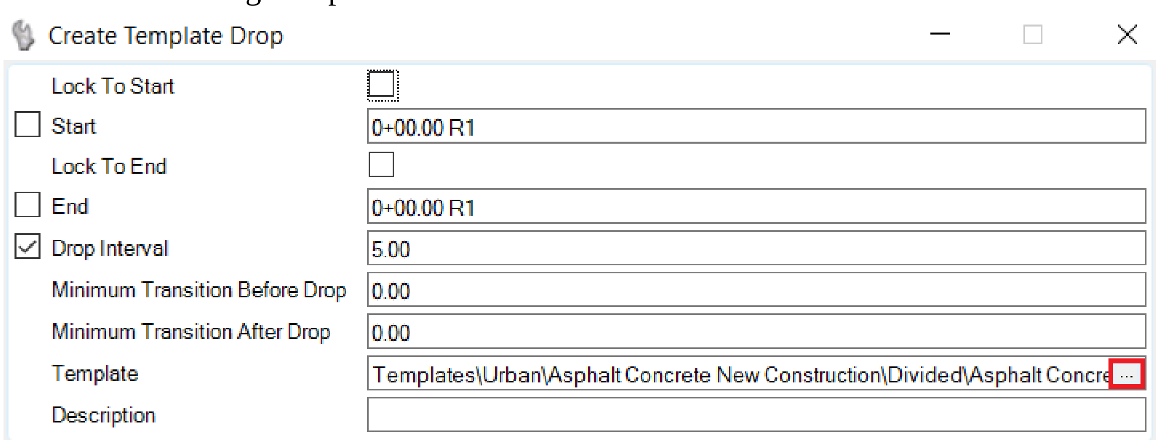
18. Set the resulting dialog as shown below.



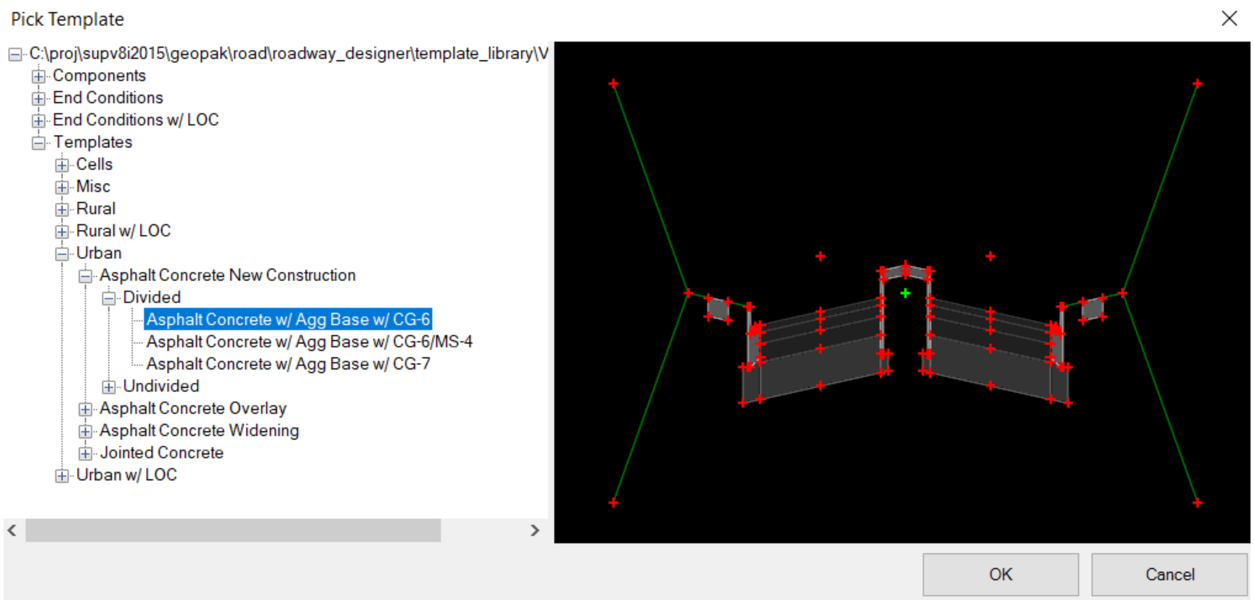
19. Select the NEWRD alignment when prompted to Locate Corridor Baseline.



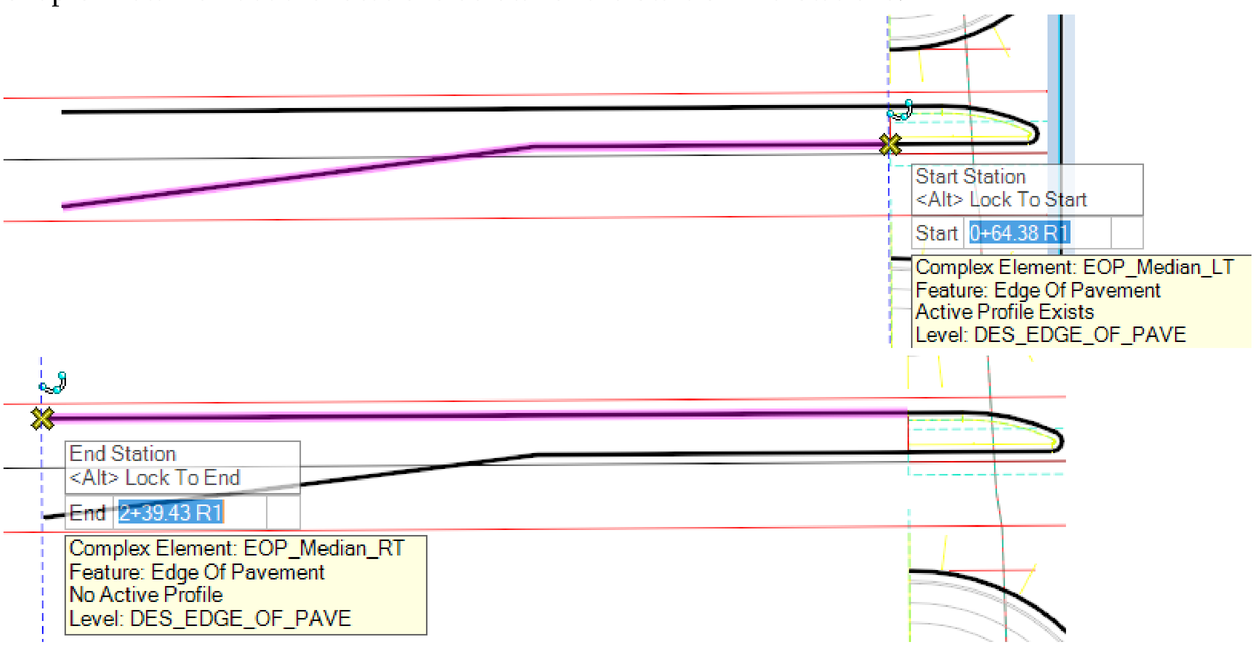
20. Reset for the Active Profile. And then confirm the Corridor name with a data point.
21. Select the following Template selection button.



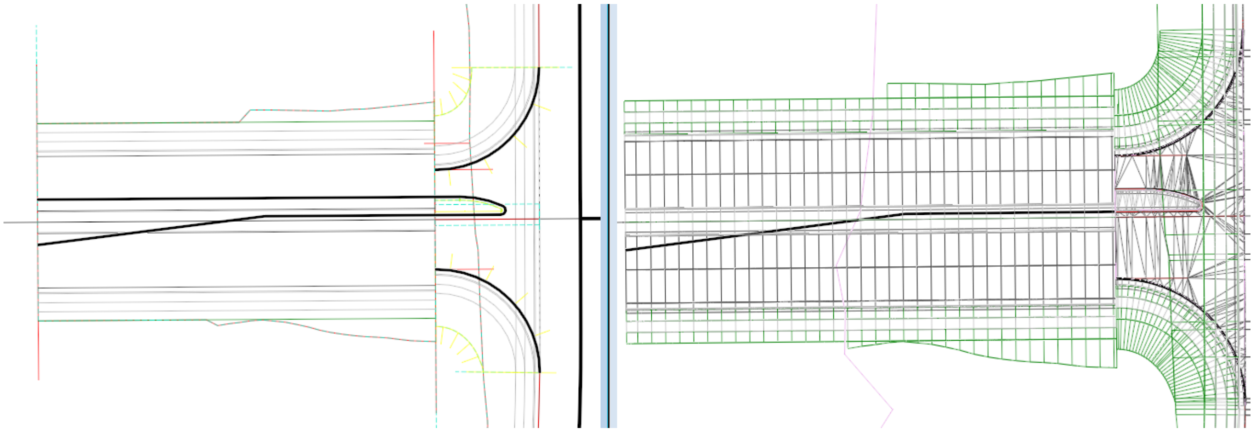
22. Choose the following template.



23. Snap & Data Point at the locations below for the Start & End Stations.

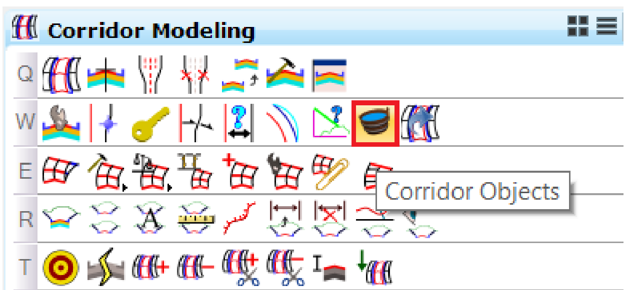


24. Confirm the remaining prompts with data points to place the template. Review the 2d & 3d images below.

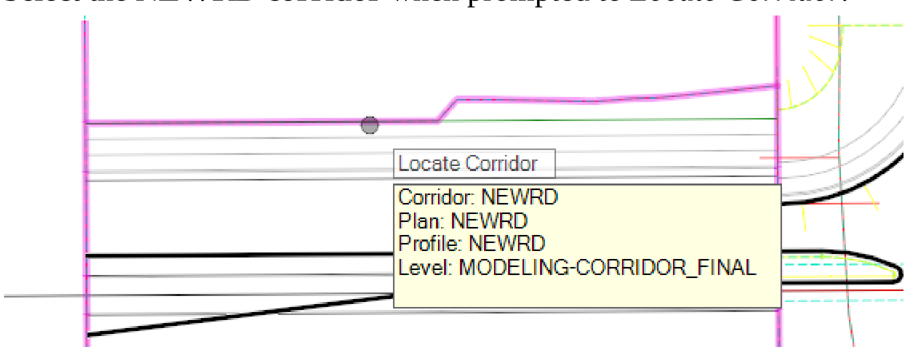


We now need to add point controls and parametric constraints to the corridor to align the Corridor EOP's to the Civil Cell EOP's.

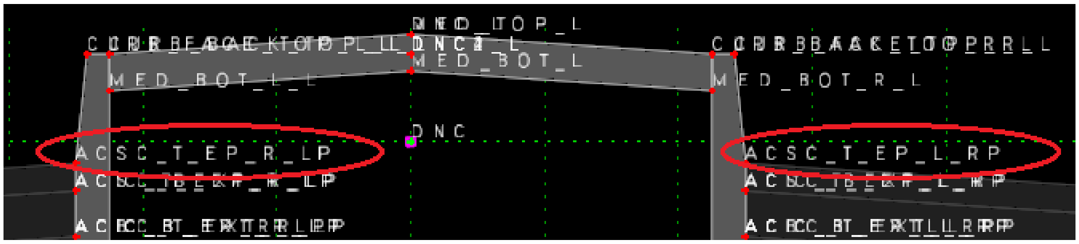
25. Select the **Corridor Objects** tool from the *Corridor Modeling* tools.



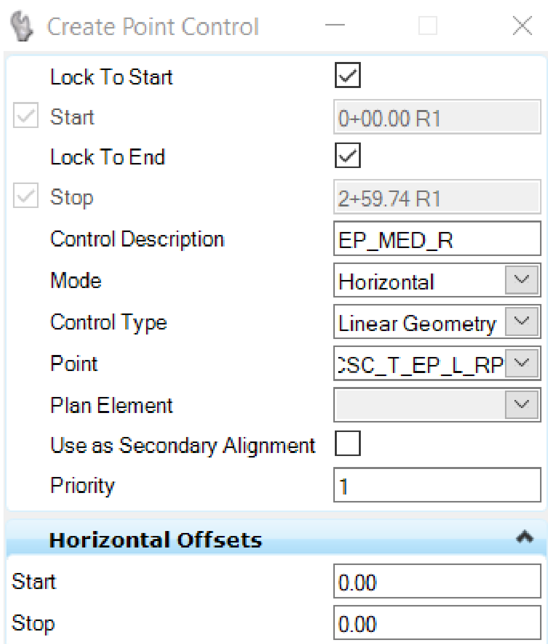
26. Select the **NEWRD corridor** when prompted to *Locate Corridor*.



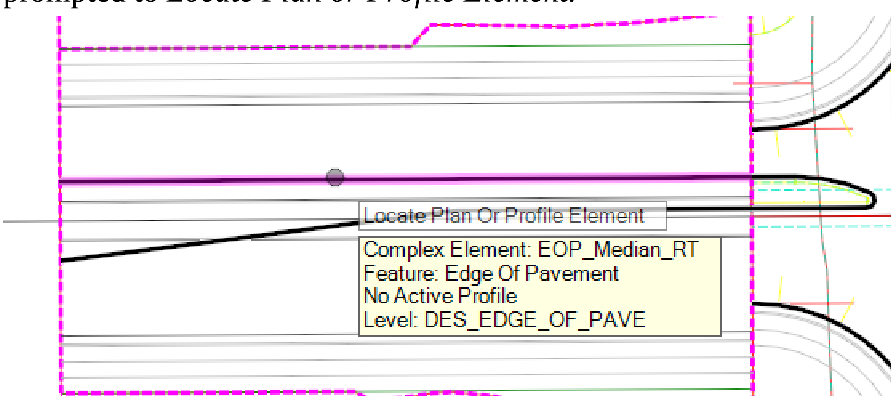
27. In the *Corridor Objects* dialog, choose **Point Control** and then choose **Add New.** We are adding Point Controls for points ACSC_T_EP_L_RP & ACSC_T_EP_R_LP.



28. Set the dialog as shown.

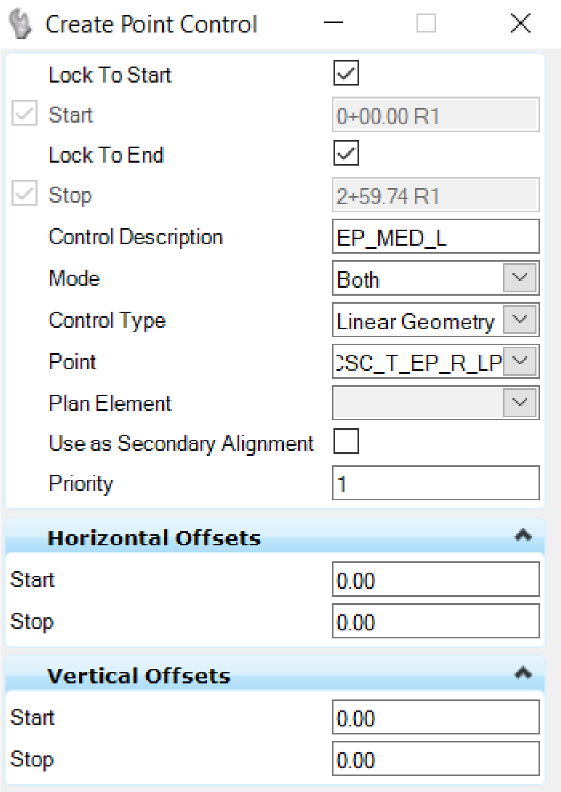


29. Accept the prompts and then choose the **RT Median EP** as shown below when prompted to *Locate Plan or Profile Element.*



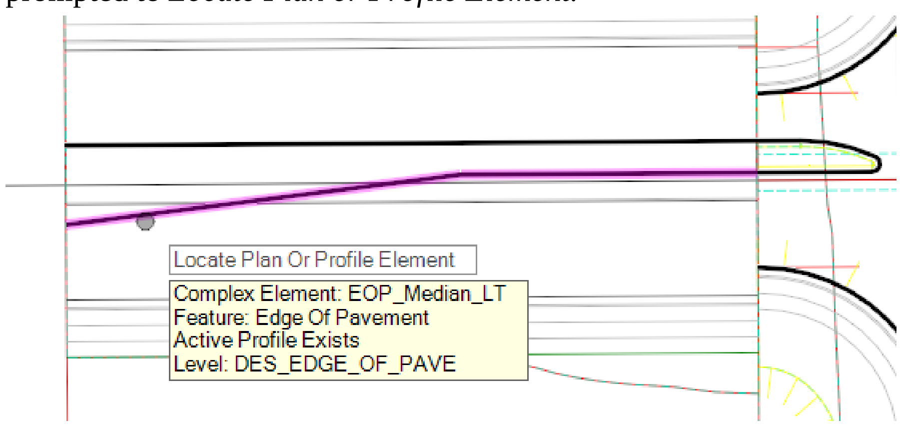
30. Accept the remaining prompts until the point control is added.
31. Choose **Add New** again in the *Corridor Objects* dialog.

32. Set the dialog as shown below.



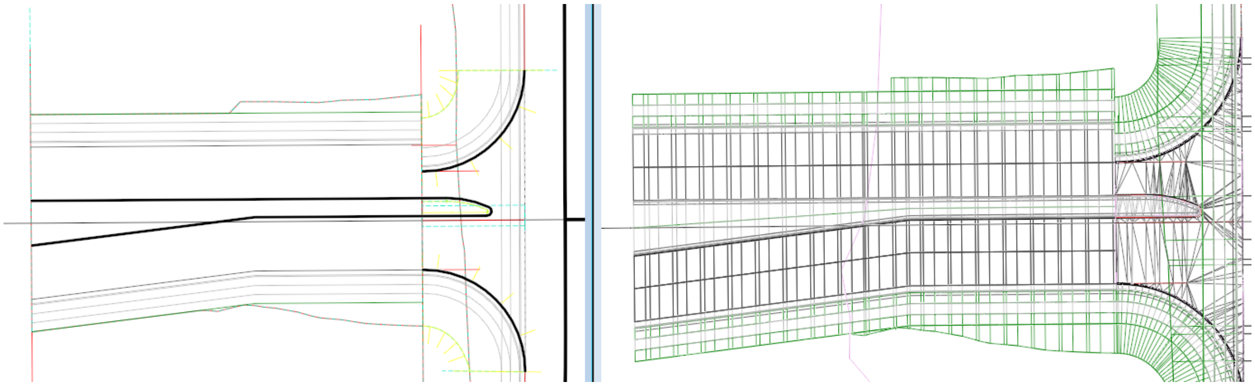
NOTE: The mode is set to Both.

33. Accept the prompts and then choose the **LT Median EP** as shown below when prompted to *Locate Plan or Profile Element.*



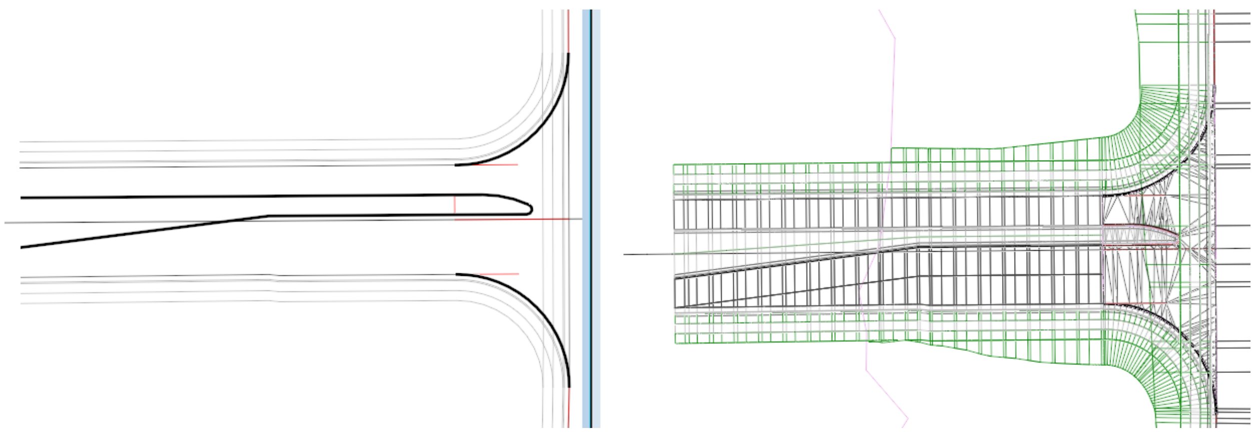
34. Accept the remaining prompts until the point control is added.

35. Review the median area. The Corridor Median EoP should now be aligned with the Civil Cell Median EoP.



36. We will not spend the time to align the Outside EoP's in this example as this is more of the corridor modeling process but Parametric Constraints, Point Controls, & possibly template edits could be used to achieve the modeling outside the cell. this section has been achieved which was to place and model the median nose area and turn lane civil cells.

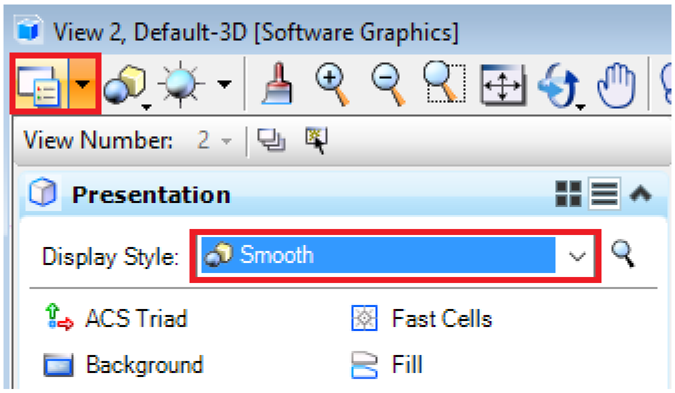
Finished Intersection if Outside EoP's corrected.



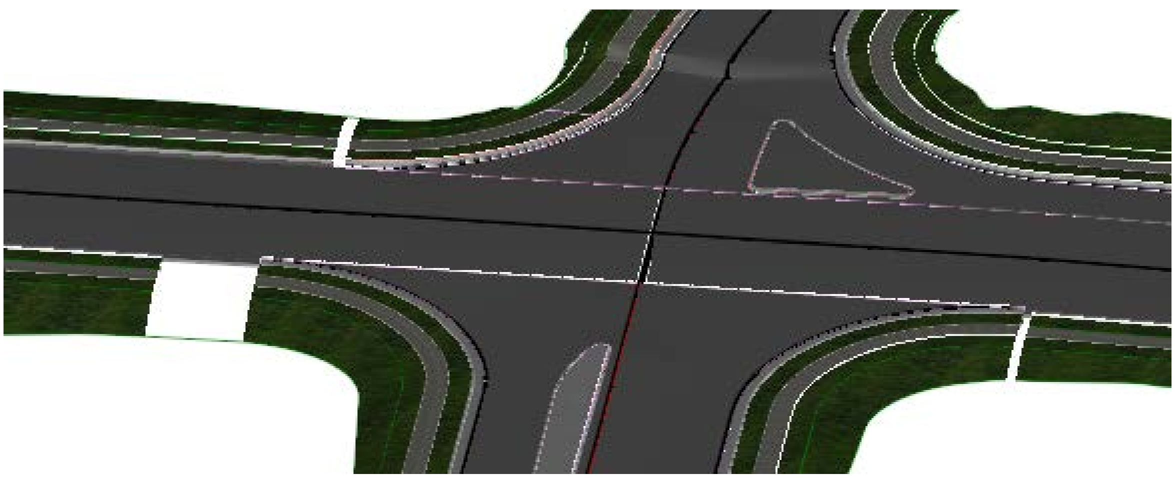
11.3.13 Display Rule

1. Add the parametric constraint **INT_L** to the *ROUTE156* corridor as discussed in section *11.3.14 Display Rule*. This is performed to turn off the mainline corridor shoulder and end condition through the Civil Cell limits.

2. Change the view settings of *View 2, Default-3d* model to **Smooth.**

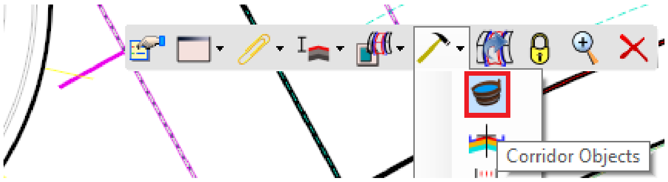


3. Notice the gaps where the T Intersection curves meet the *ROUTE156* corridor. In the next section, we will close these gaps by adding Key Stations.

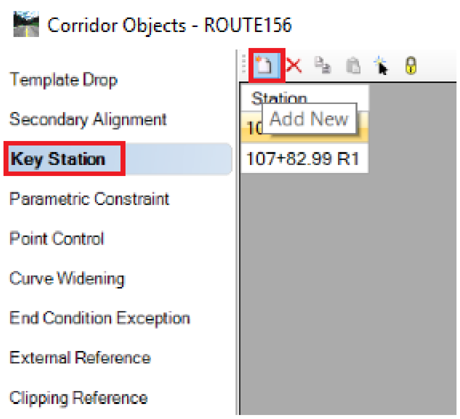


11.3.14 Key Stations

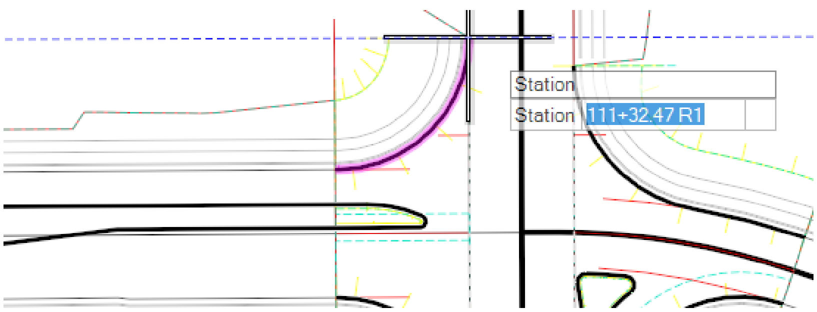
1. Select the **Corridor Objects** from the *ROUTE156* corridor context menu.



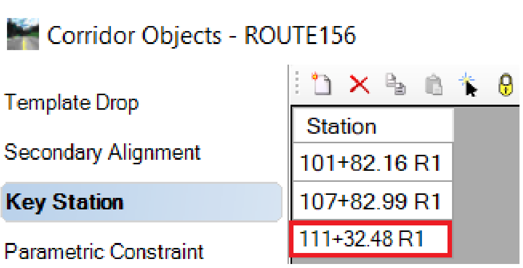
2. Select **Key Station** on the left hand side of the *Corridor Objects* dialog and then choose **New.**



3. Snap to the end of the curve and left click to accept the station and add the key station.

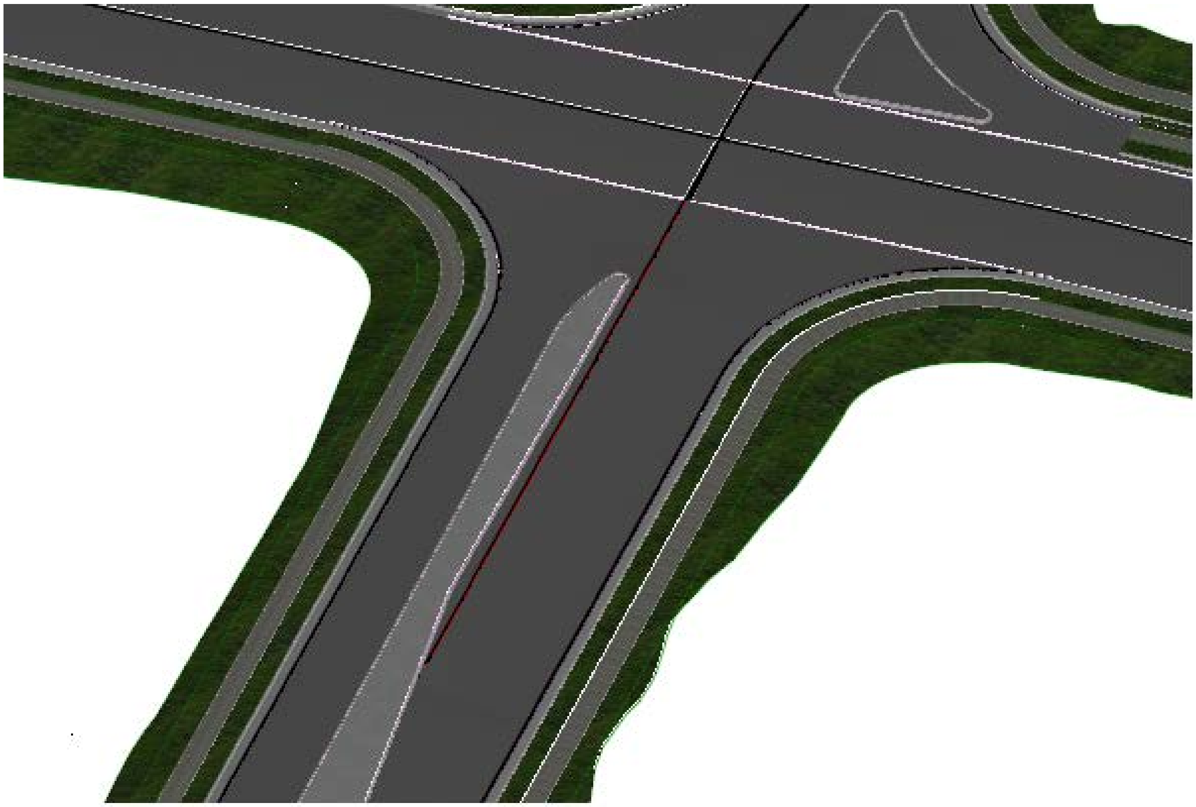


4. Add 0.01 to move this out of the display rule limits.



5. Add other key stations to close other gaps around the intersection.

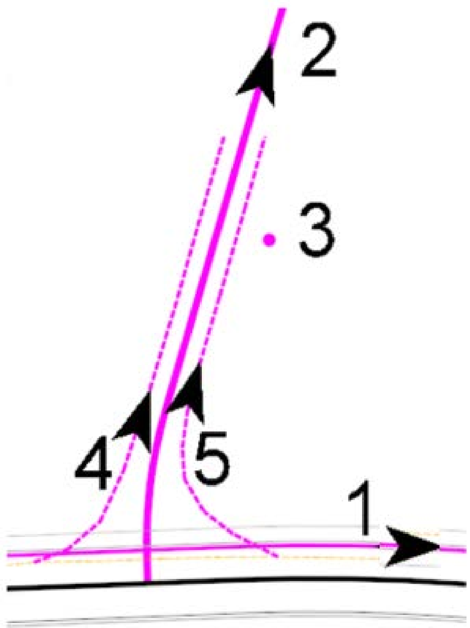
6. Review the intersection in View 2, Default-3D model.



11.3.15 CELL - Basic T Overlay & Widen

11.3.15.1 REFERENCES & DIRECTION OF REFERENCES

1) Thru Rd EoP (Profiled) (1)
2) Secondary Rd CL (Profiled)
3) Back Data Point along Secondary Rd (Within Profile Limits, Rec. Min 50' from Thru Rd EP) (2)
4) X_EOP LT (LT Looking from Thru Rd, 1 Element from Thru Rd EoP to at least Point Back)
5) X_EOP LT (RT Looking from Thru Rd, 1 Element from Thru Rd EoP to at least Point Back)



NOTES:

(1) Use Template produced EOP from Corridor Model graphics for the Thru Rd EoP ref.

(2) Back data point should be within the limits of the Secondary Rd Profile and this distance (listed above as 50' Min.) varies per cell. Skew and geometry will increase the distance specified.

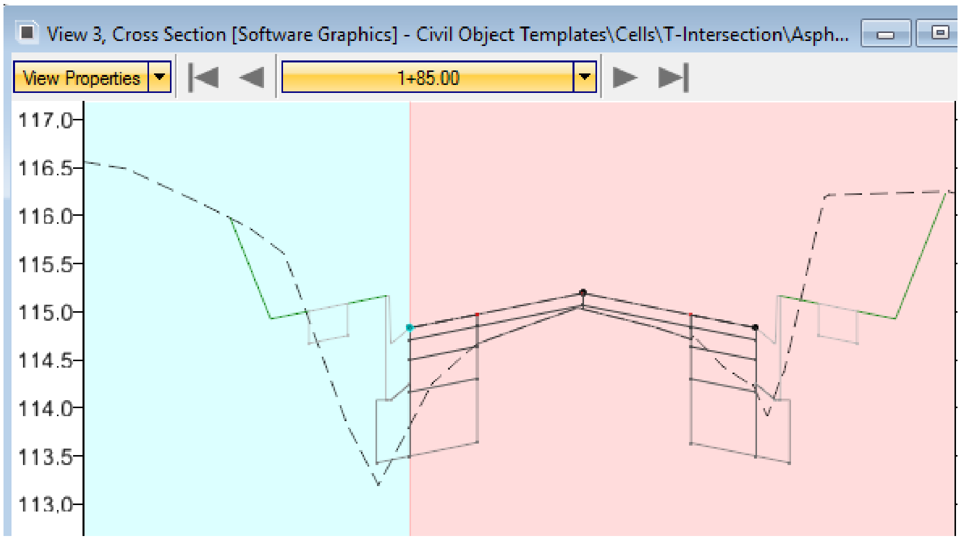
(3) Order may be different than shown here. Follow prompts.

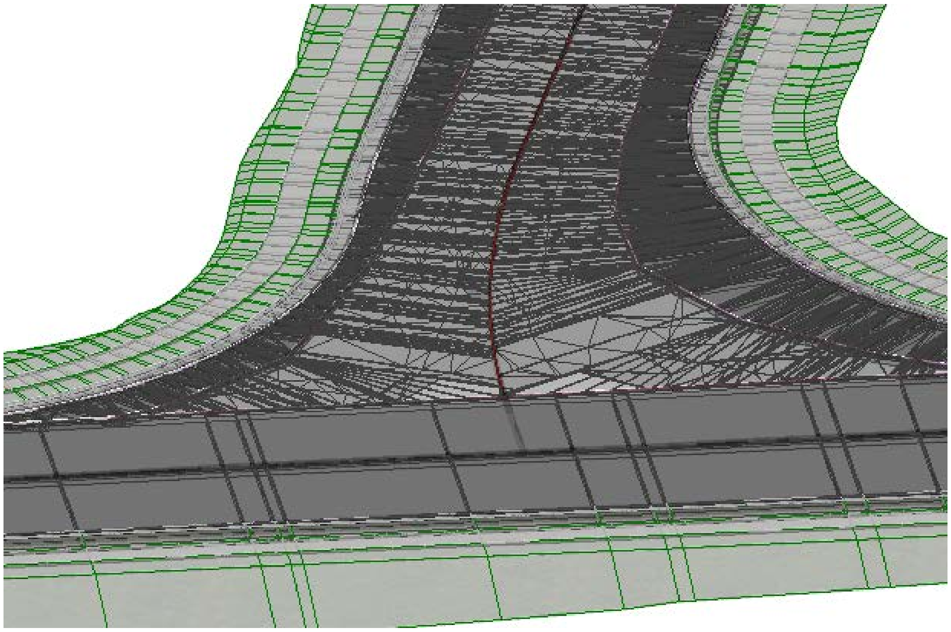
(4) Existing EOP must be a complex, within the boundaries of the proposed EoP, and be placed from the Thru Rd to just beyond the Back Data Point.

11.3.15.2 GEOMETRY, EDITS, & TEMPLATE

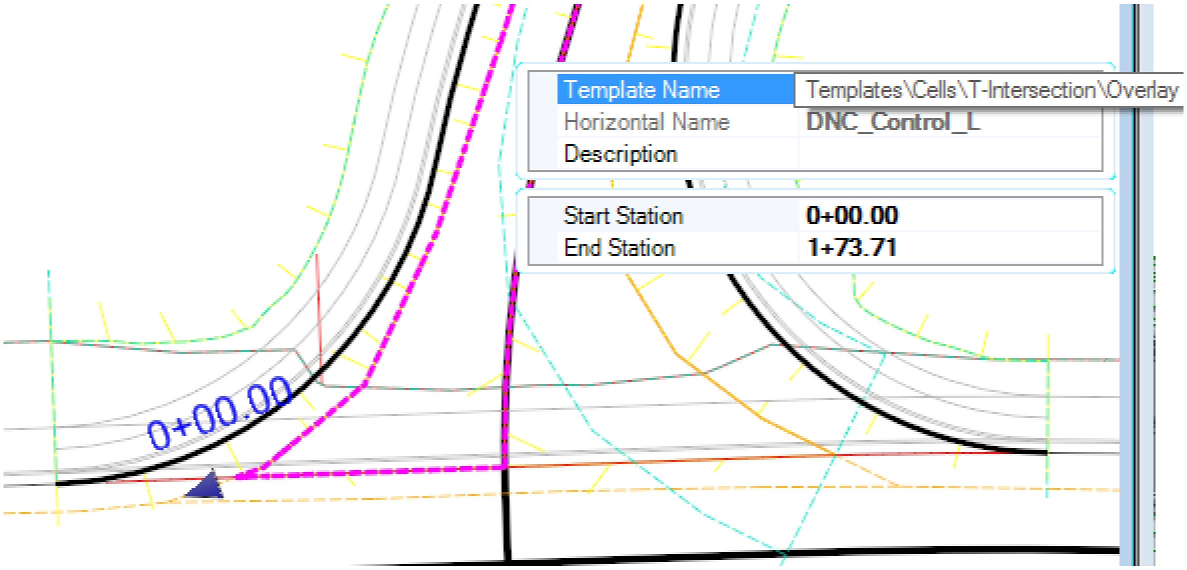
This Civil Cell is similar to the other T intersection cells with the exception that it places an overlay template through the secondary road intersection. This is a variable overlay where the slope & grade is being controlled by the designer (It's not a constant overlay). A milling component is included in the initial template.

Below shows the cross-section and 3d view of the cell after placement.





Horizontal, Vertical, and template edits are primarily the same for this overlay and widening cell as for the basic with the exception being the added linear templates placed on DNC elements which are partial offsets of 0 from the existing EOP's. This template is shown below for the left side of the intersection.



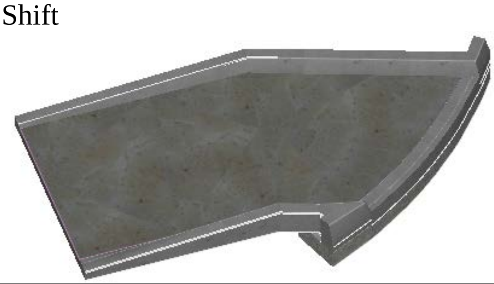
This linear template creates the surface area between the existing EoP and the Secondary Rd CL. There is a "mirror" linear template placed along the RT existing EoP.

11.4 ADA RAMPS

11.4.1 Available Cells

- VDOT ADA_"A"

- VDOT ADA_"B"

VDOT ADA_"B" 	VDOT ADA_"B" Curb'd SW 
VDOT ADA_"B" Diagonal_L w/Curb 	VDOT ADA_"B" Diagonal_R w/Curb 
VDOT ADA_"B" Diagonal_L No Buffer 	VDOT ADA_"B" Diagonal_R No Buffer 
VDOT ADA_"B" Diagonal_L No Buffer Shift 	VDOT ADA_"B" Diagonal_R No Buffer Shift 

VDOT ADA_"B" Diagonal_L No Buffer_OLDSTANDARD	VDOT ADA_"B" Diagonal_R No Buffer_OLDSTANDARD
	

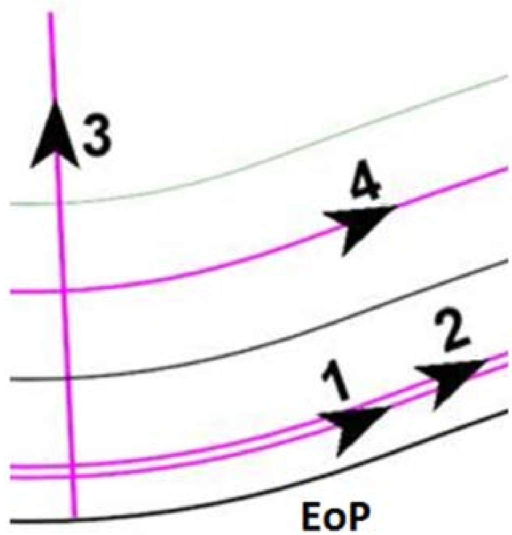
- VDOT ADA_"C"

VDOT ADA_"C" Parallel	VDOT ADA_"C" Perpendicular
	

- VDOT Curb Cut Ramp

11.4.2 References & Direction of References

<u>Type A</u>

1. Gutterline (Profiled) 2. Back Top of Curb (Profiled) 3. Curb Ramp CL (Placed from EP to just past Curb Ramp back) (1) 4. Line Beyond Landing (Profiled)	

NOTES:

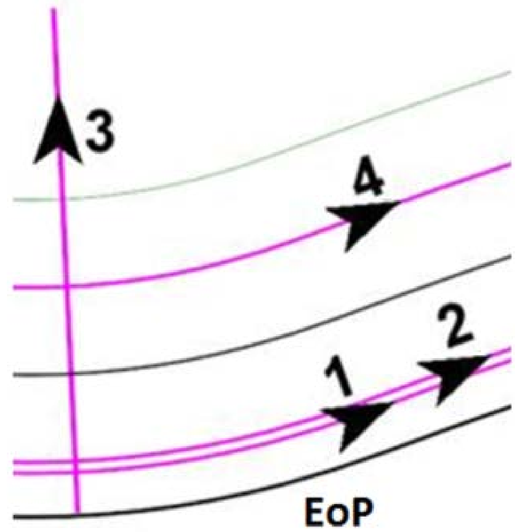
1) Place the reference <u>Drive CL</u> with the Horizontal command <u>Line from Element</u> so the drive location can easily be moved along the EP.
2) Order may be different than shown here. Follow prompts.
3) Type A projects an 8.33% ramp slope so the Line Beyond Landing reference, as the name describes, must be beyond its landing.

Type B

<table>
<tr><td>

1. Gutterline (Profiled)
2. Back Top of Curb (Profiled)
3. Curb Ramp CL (Placed from EP to just past Curb Ramp back) (1)
4. Back of SW (Profiled)

</td><td>



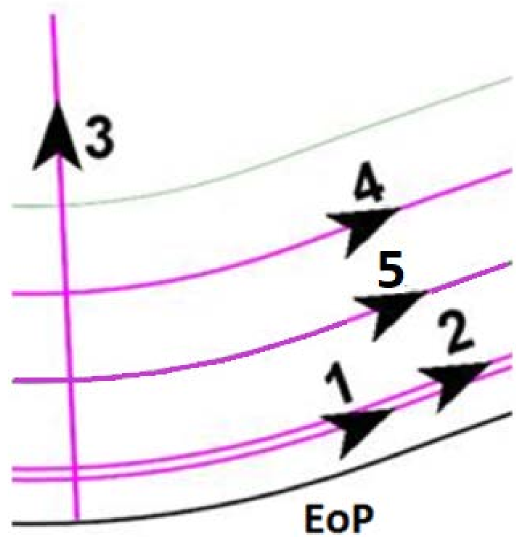
</td></tr>
</table>

Type B Curb'd SW & Type C

<table>
<tr><td>

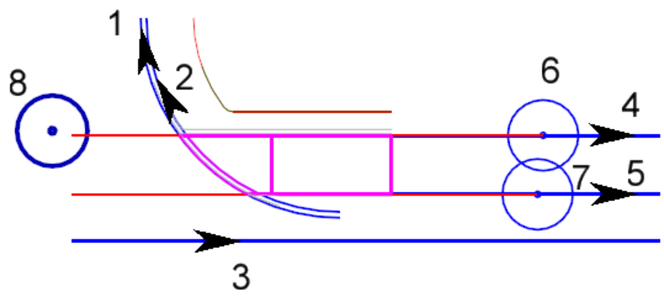
1. Gutterline (Profiled)
2. Back Top of Curb (Profiled)
3. Curb Ramp CL (Placed from EP to just past Curb Ramp back) (1)
4. Back of SW (Profiled)
5. Face of SW (Profiled)

</td><td>



</td></tr>
</table>

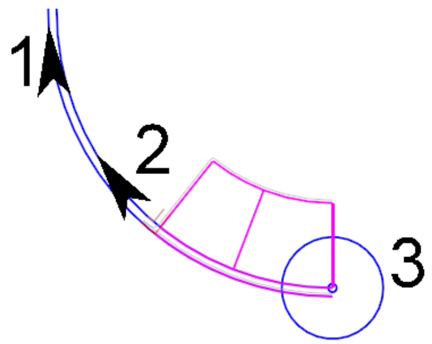
Type B Diagonals w/Curb



Ref's highlighted in blue in image above.

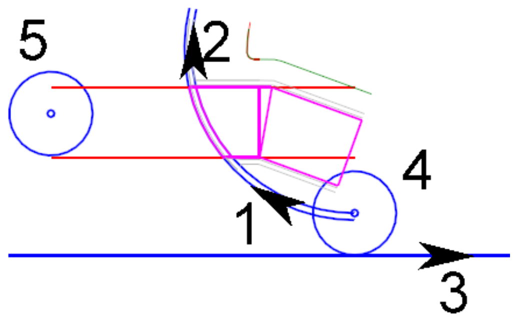
1. Gutterline (In Curve area, Profiled)
2. Back Top of Curb (In Curve Area, Profiled)
3. Thru Rd EoP (Profiled)
4. Back of SW (Beyond Curve, Profiled)
5. Face of SW (Beyond Curve, Profiled)
6. Near Snap & DP Back of SW Beyond Ramp Tie
7. Near Snap & DP Face of SW Beyond Ramp Tie
8. DP Close to Secondary Rd CL

Type B Diagonals No Buffer



1. Gutterline (Profiled)
2. Back Top of Curb (Profiled)
3. DP Back Top of Curb @ Ramp Start

Type B Diagonals No Buffer Shift

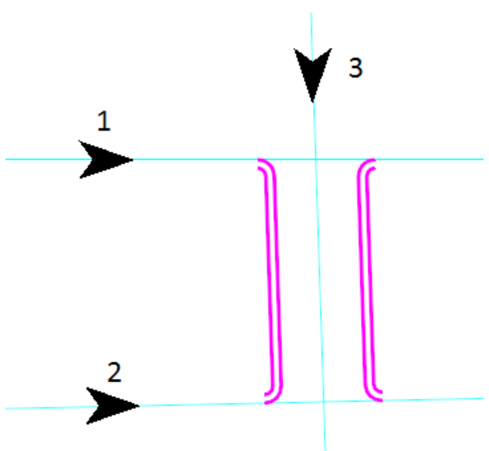


Ref's highlighted in blue in image above.

1. Gutterline (In Curve area, Profiled)
2. Back Top of Curb (In Curve Area, Profiled)
3. Thru Rd EoP (Profiled)
4. DP PC of Back Top of Curb
5. DP Close to Secondary Rd CL

Curb Cut Ramp Cell

1. LT Gutterline (Profiled)
2. RT Gutterline (Profiled)
3. Curb Cut Ramp CL



11.4.3 Placement – Type B

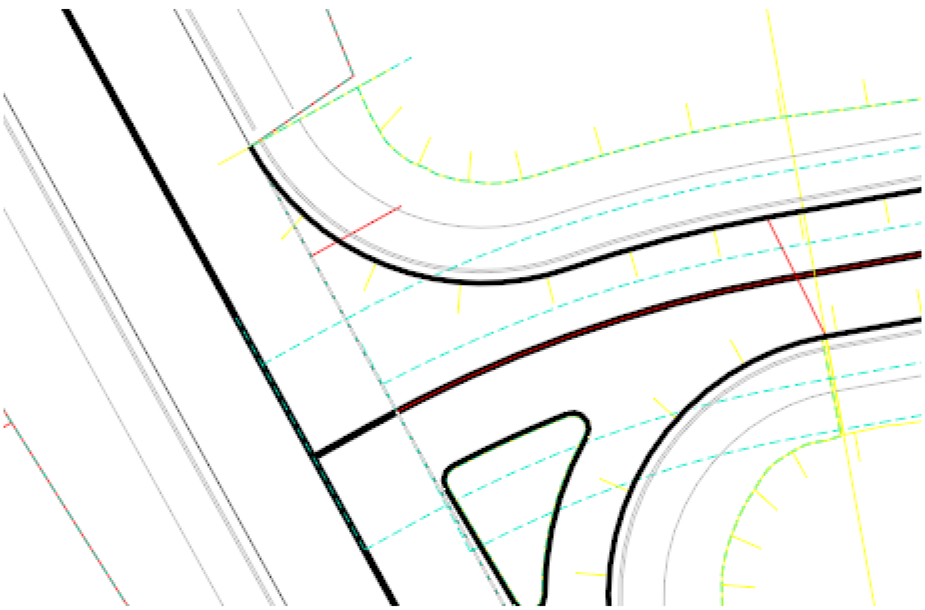
1. Open the file **2-lane-Urban-CurbRamp.dgn.** This file contains alignment *ROUTE156* and around 110+60, a secondary intersecting roadway named *POLERUNRD.* A Corridor has been created for *ROUTE156* and **POLERUNRD** as well as a T-Intersection Civil Cell at the intersection of these two alignments.

   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

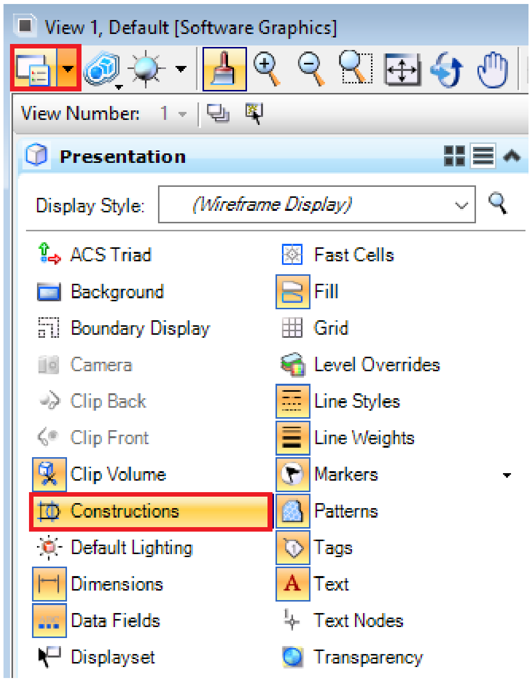
   c. Close the reference dialog and zoom to the NW quadrant of the intersection in View 1, Default model

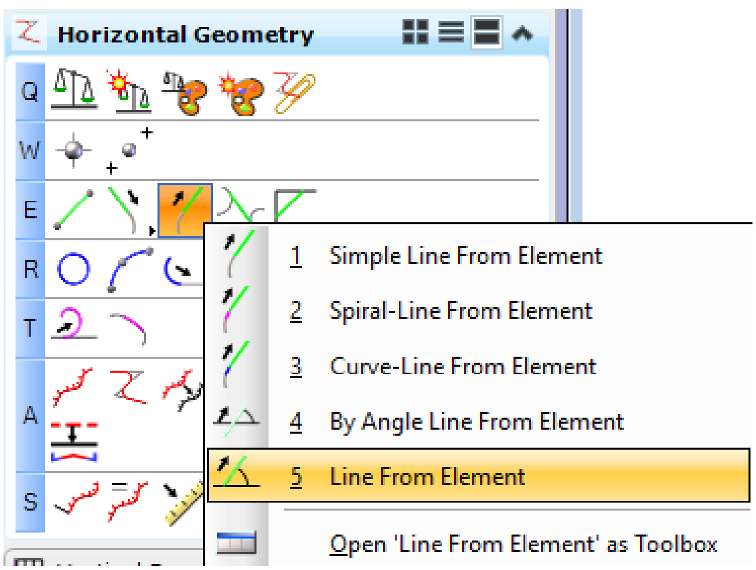
   Notice all the elements we need for the Curb Ramp civil cell references are in place and were created from template geometry except for the Curb Ramp CL which we will construct next.

2. Build the Curb Ramp CL reference.

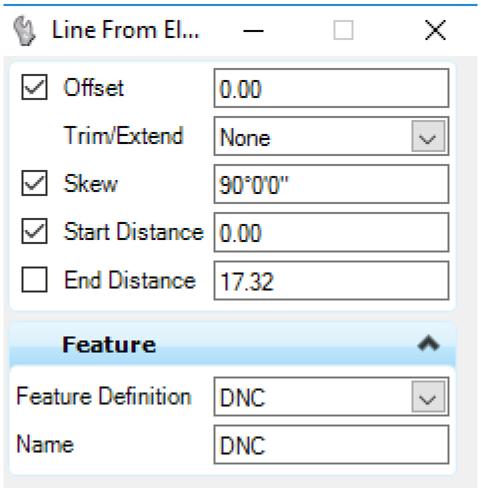
   a. Turn off Construction element display.



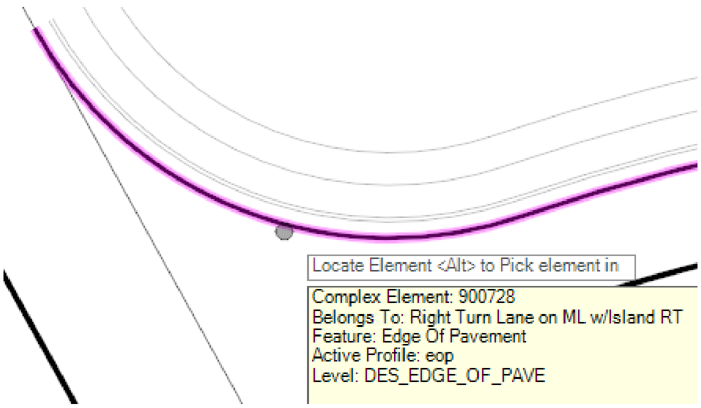
   b. **Select** the Horizontal Geometry Command **Line from Element.**



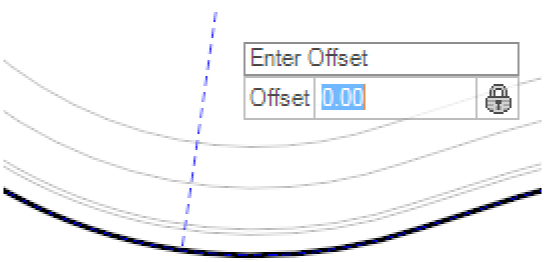
c. Enter the values shown below on the *Line from Element dialog*.



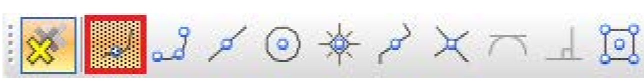
d. Select the T-Intersection Civil Cell's LT EoP as shown below.



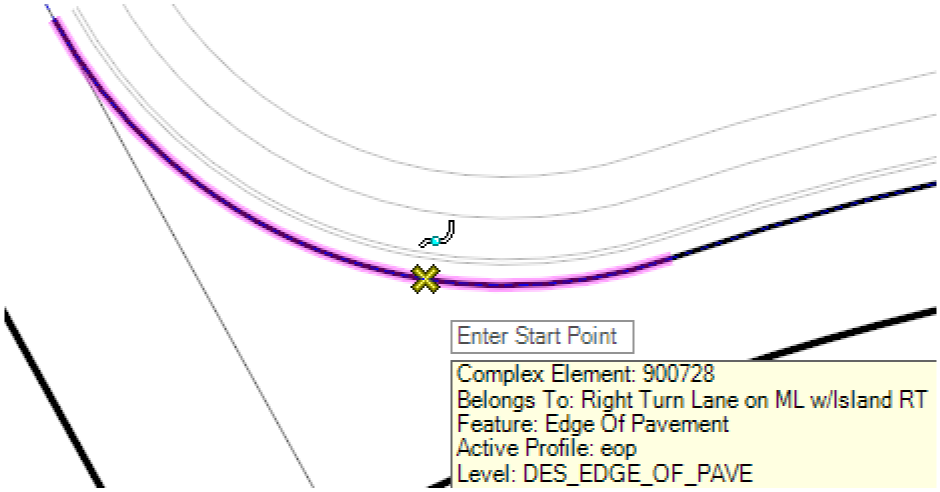
e. Confirm the offset of 0 by **Left Clicking** anywhere on the screen.



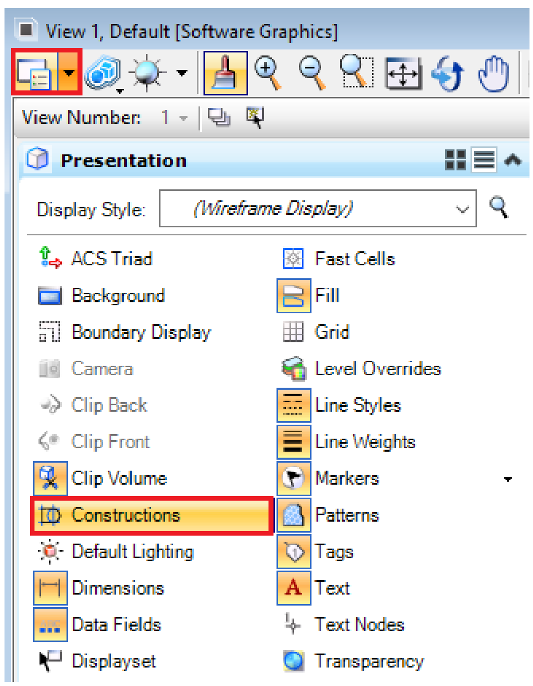
f. Set the MicroStation Snap button to **Near Snap Point** by double clicking it.



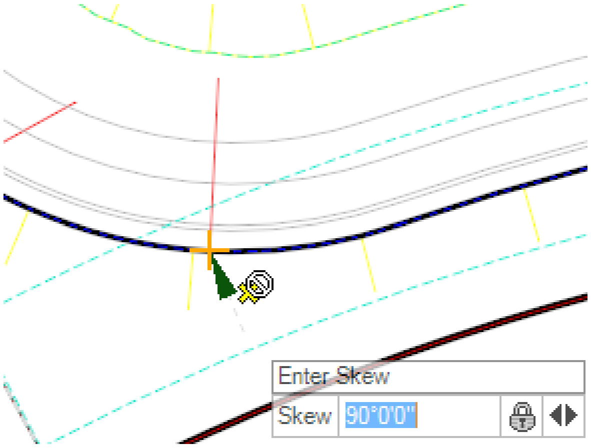
g. While being prompted to *Enter Start Point*, **Snap** to the EoP in a location approximate to the one shown below and then **Left Click** to set the start point.



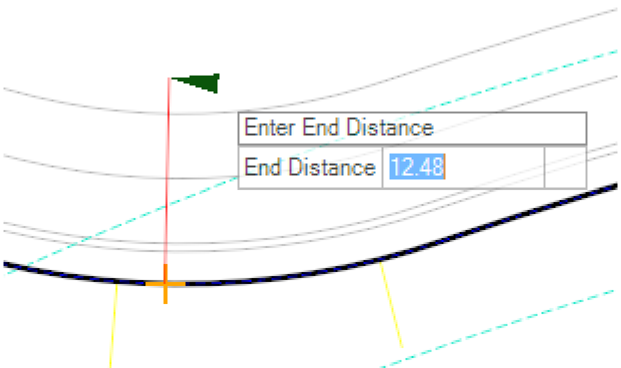
h. Turn ON Construction element display so you can see the line being placed.



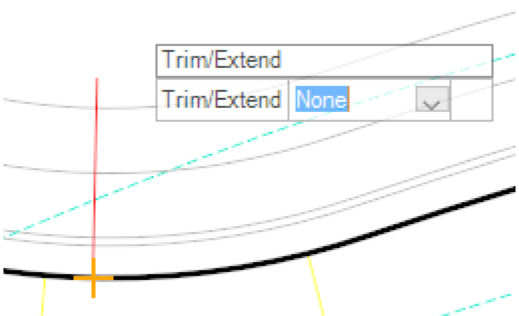
i. **Move** your cursor below the EoP and verify the *Enter Skew* value of 90 with a **Left Click.**



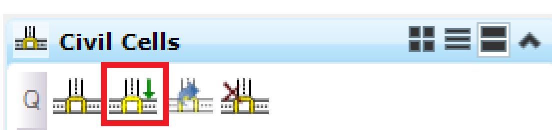
j. Move the cursor just past the *Back of Sidewalk* and confirm the *End Distance* with a **Left Click.**



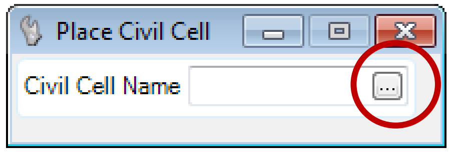
k. Confirm *None* for the *Trim/Extend* prompt with a **Left Click.**



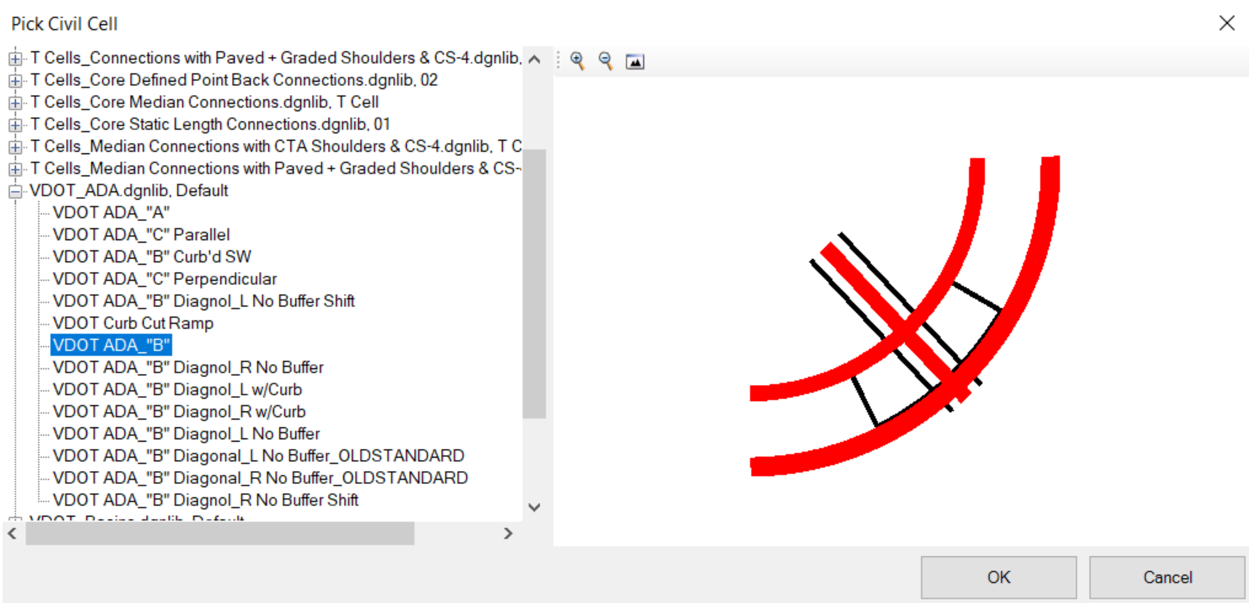
3. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



4. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

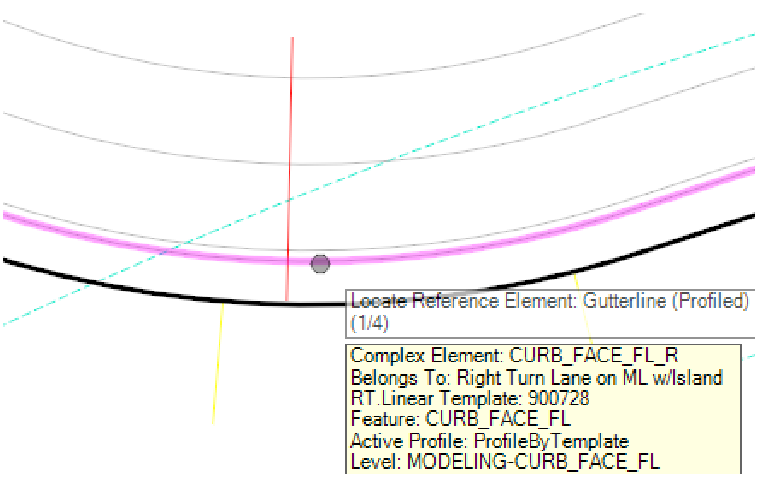


5. Select the **VDOT ADA_"B"** civil cell from the **VDOT_ADA.dgnlib** folder and click **OK.**

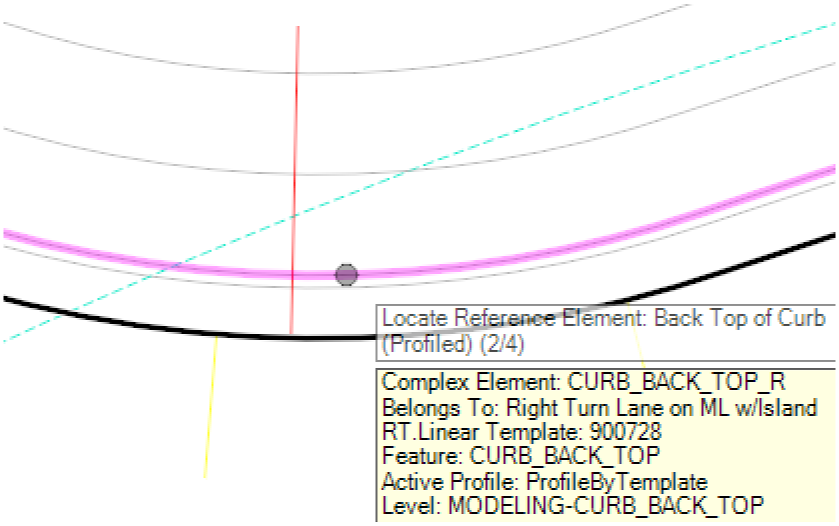


NOTE: The next four prompts may be in different order than listed in this manual.

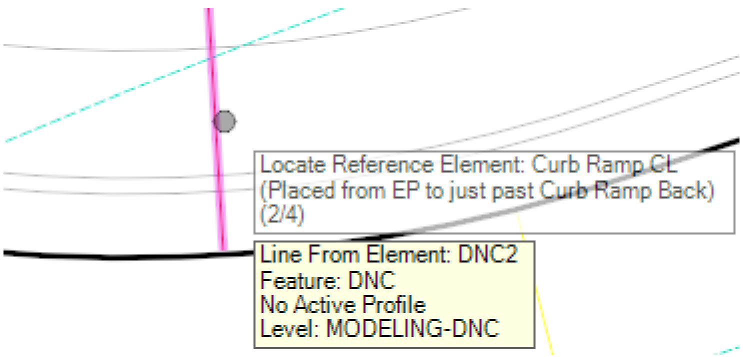
6. When prompted to *Locate Reference Element: 'Gutterline (Profiled)'*, select the **CURB_FACE_FL_R** element in View 1.



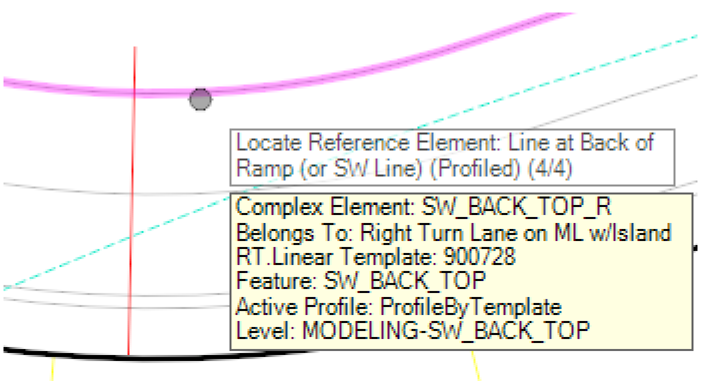
7. When prompted to *'Back Top of Curb (Profiled)'*, select the **CURB_BACK_TOP_R** element in View 1.



8. When prompted to *'Locate Reference Element: Curb Ramp CL (Placed from EP to just past Curb Ramp Back)'* select the **DNC** element in View 1.



9. When prompted to *'Locate Reference Element: Line at Back of Ramp (or SW Line) (Profiled)'* select the **Back of Sidewalk** element in View 1.

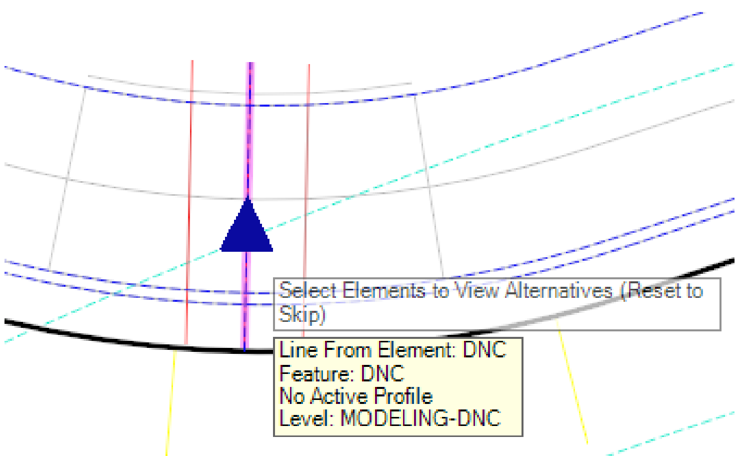


10. Observe the geometry being displayed.

    a) If the geometry appears correct and similar to the image below, move on to the next step.

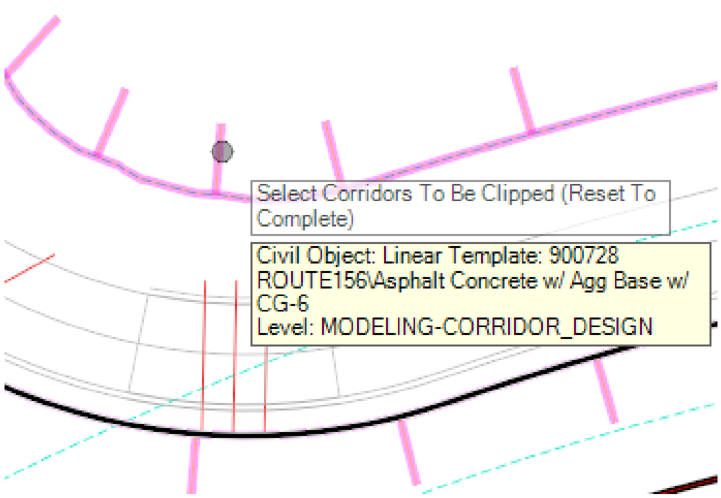
    b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.4.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

    c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.



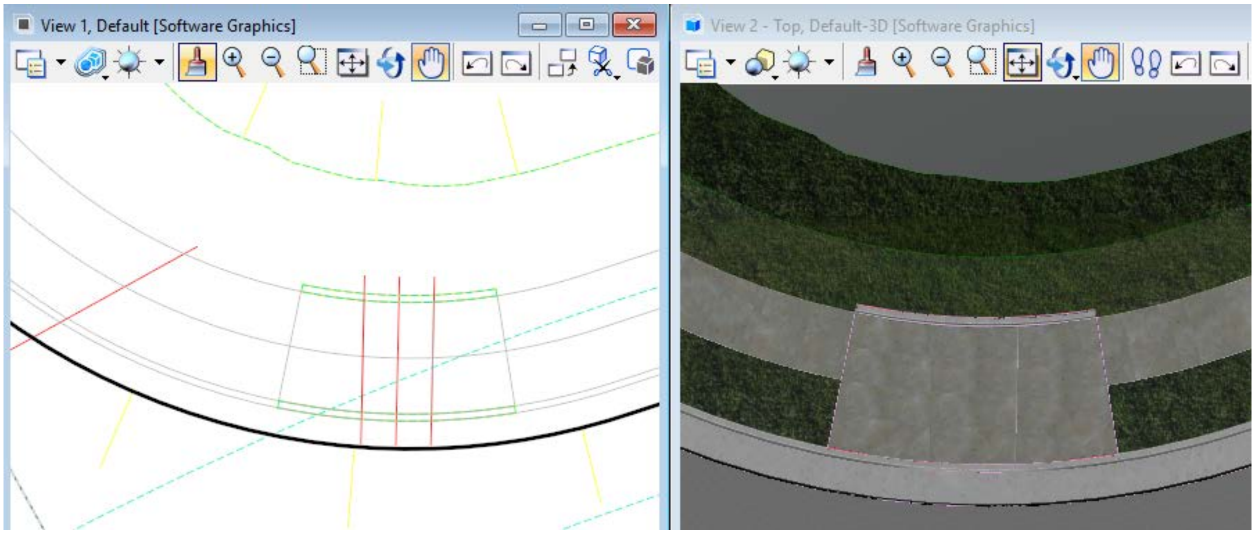
11. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

12. **Select the Linear Template of the EoP** when prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.



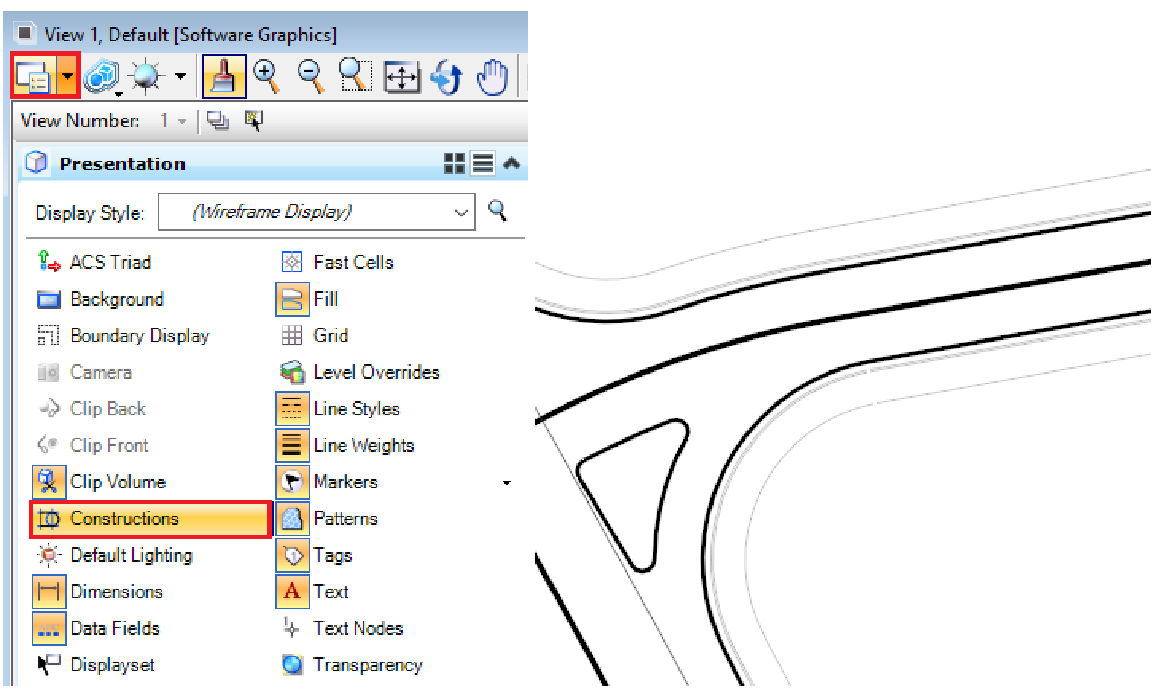
13. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

The image below shows the cell in 2d & 3d views.



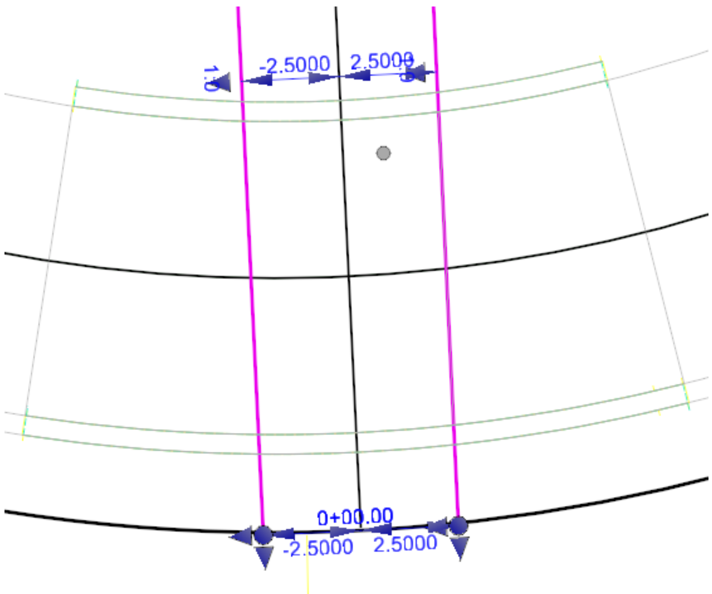
11.4.4 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off Construction class elements, you will go to View Attributes as shown below.

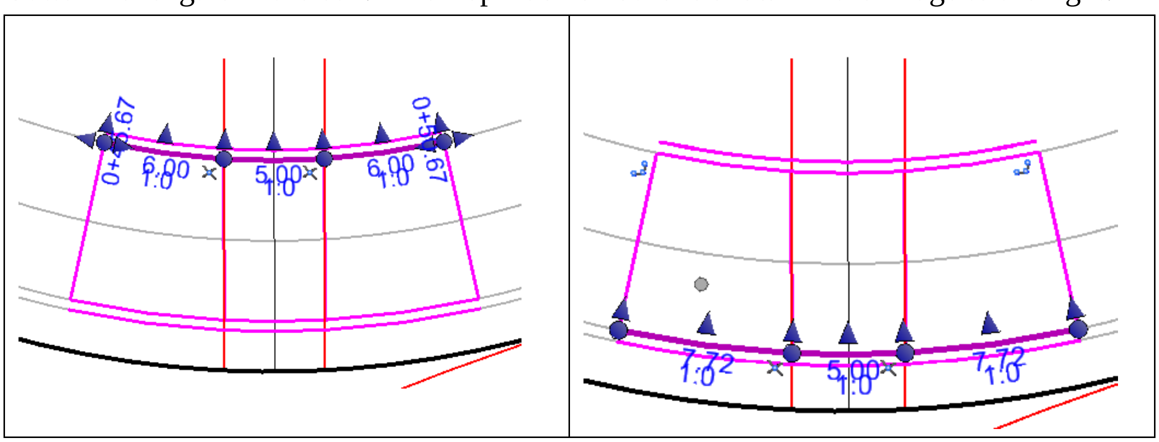


11.4.5 Horizontal Edits

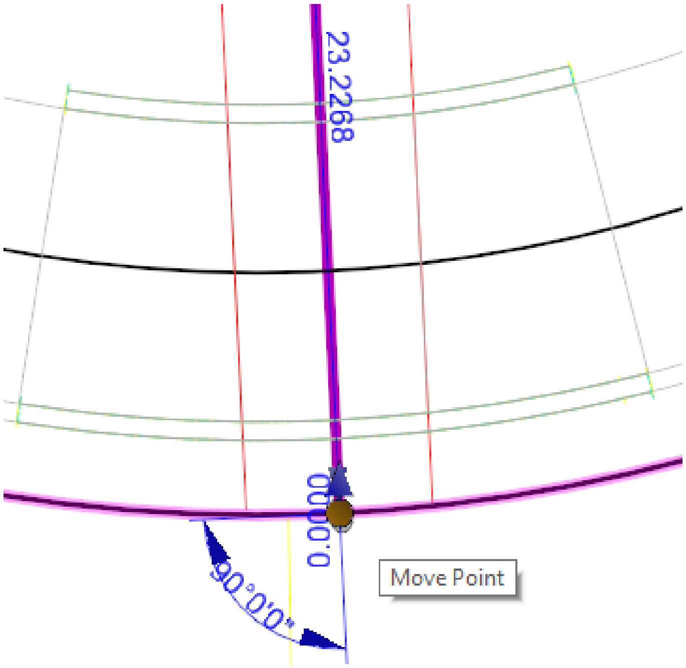
1. Sidewalk Width – The ramp width is initially 5' with edits as shown below.



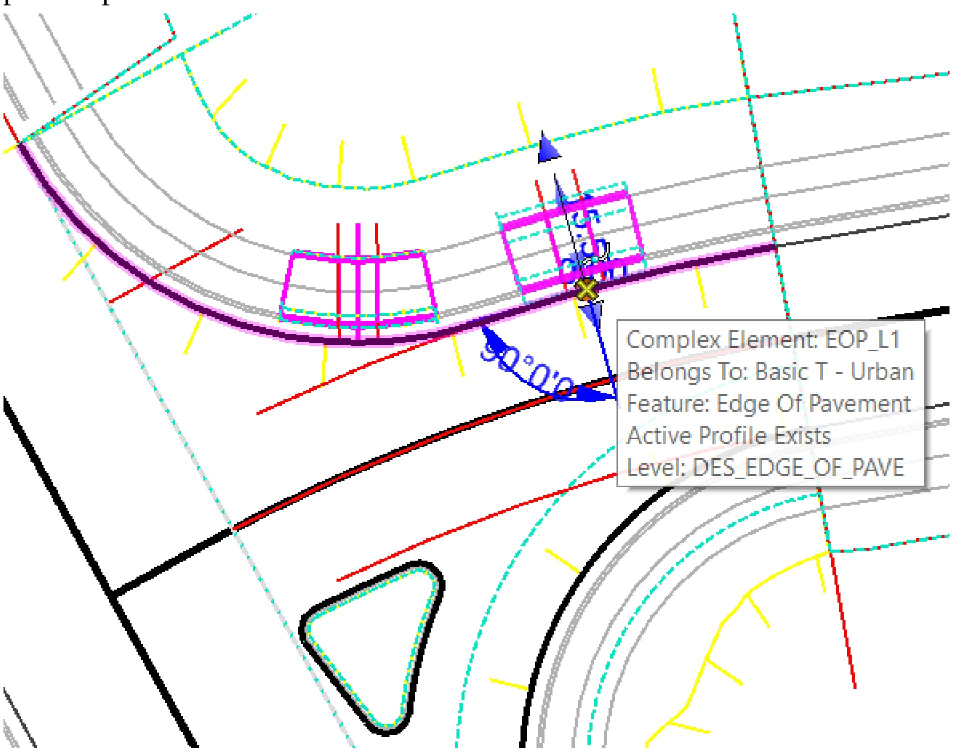
2. Curb/Sidewalk Transition Width – This width (6' initially) is controlled as shown in the image to the left below. It can be modified and profiles will be automatically adjusted as discussed in the Vertical Edits section. This element controls the Top Back of Curb & Gutterline lengths in the cell. The Top Back of Curb is shown in the image to the right.



3. If the Horizontal command *Line from Element* is used to create the Drive CL reference, the location of the Drive can be easily moved with the handler as shown below.

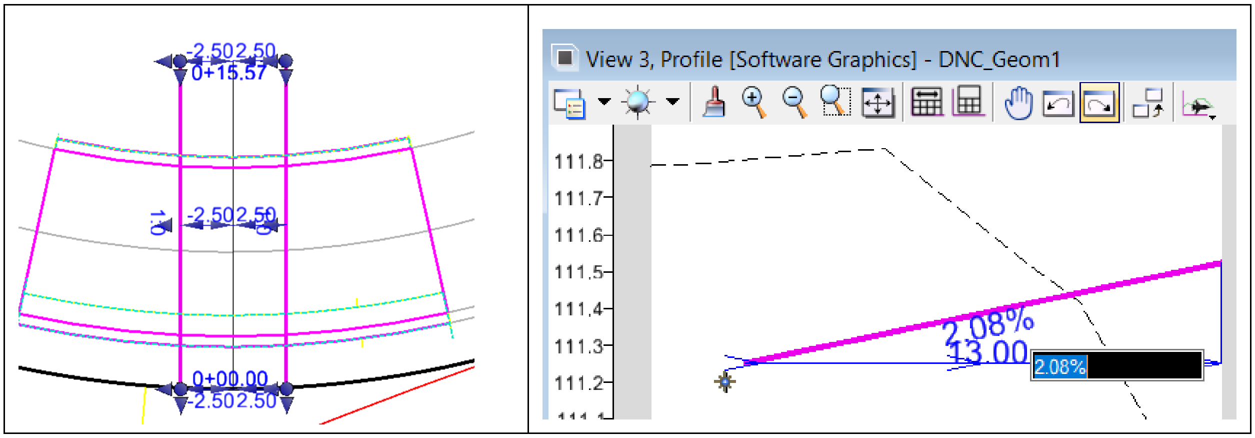


4. For this class, move the ramp to the approximate location as shown below using Near Snap to snap to the EOP.

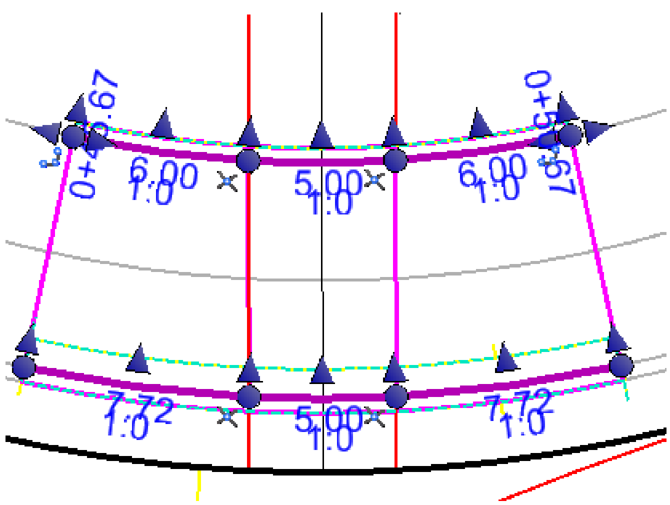


11.4.6 Vertical Edits

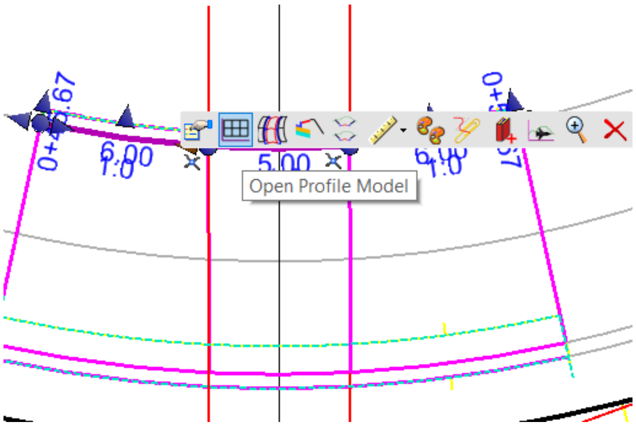
1. Slope of the ramp away from the roadway is set to 48:1 (2.08%) and can be changed by opening the profile view of the elements shown selected in the plan view below. The profile view of one of these elements is shown to the right. Modify this slope to change the slope of the ramp.



2. Slope of the Ramp along the sidewalk is controlled by the two elements shown selected below. This back length is set to 6' initially to transition the curb 6" on a 12:1 slope assuming a flat slope of the EoP in this area. Increasing/decreasing the 6' horizontal width shown below will control this slope. You can review the slope by opening the profile model of these two elements. You then adjust the length to decrease the slope if necessary.

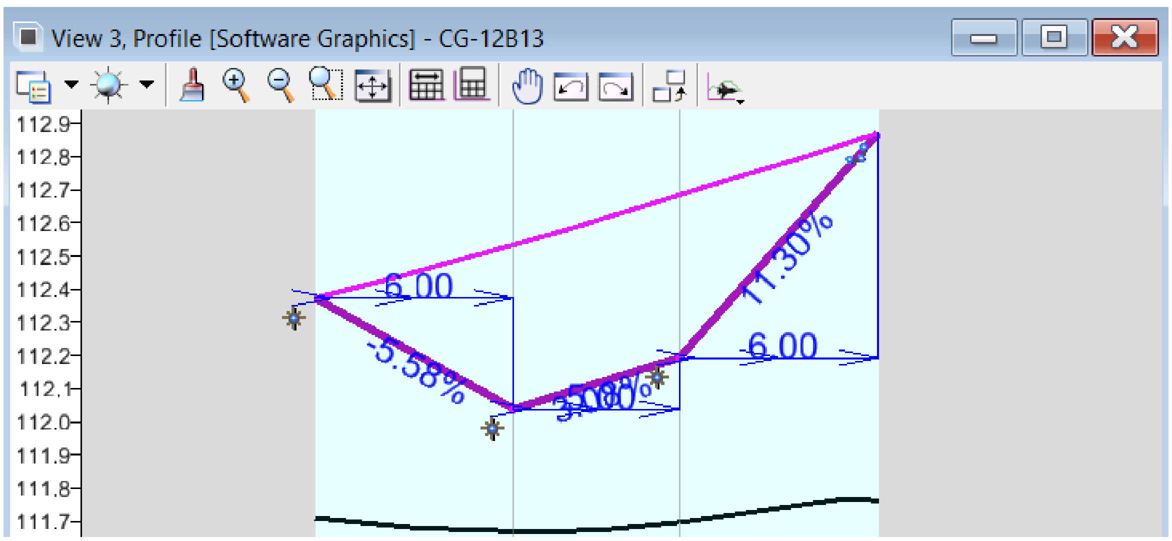


a. Select the back of the ramp element and choose **Open Profile Model** from the Context menu.



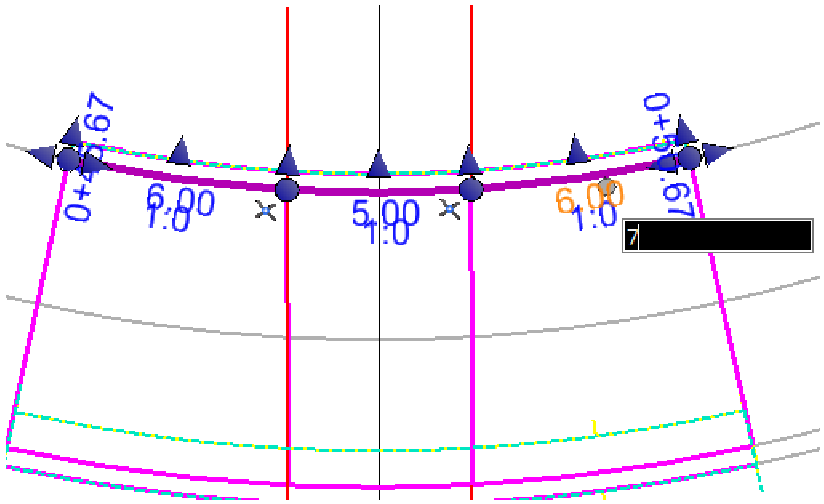
b. Open View 3 and click in View 3 when prompted to *Select or Open Profile View.*

c. Select the profile as sown below.

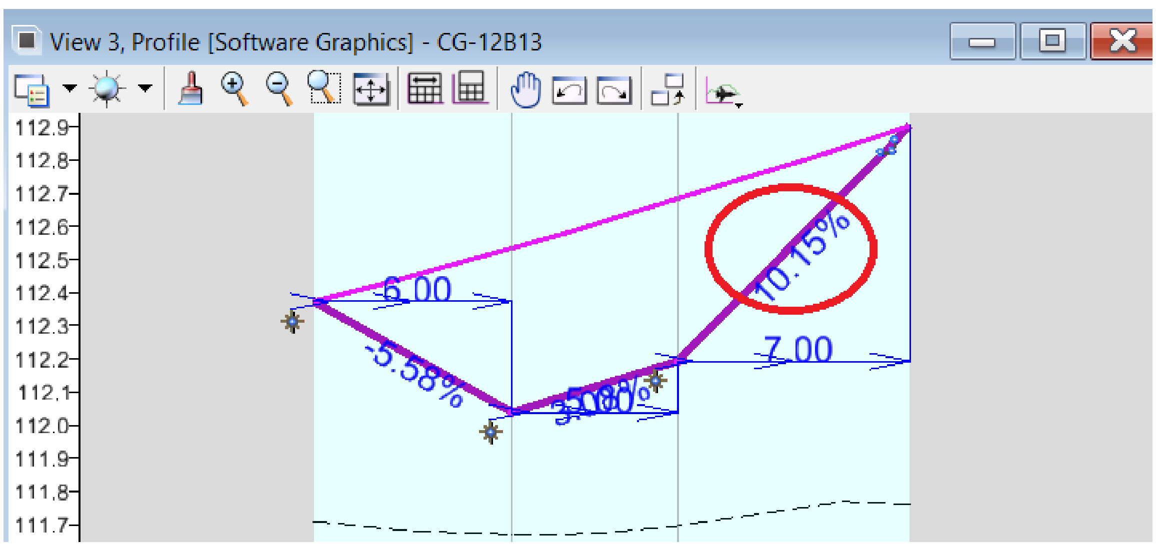


Notice we are less than 8.33% on the left but not on the right. We'll adjust the length of the right side of the sidewalk in the plan view in the next step.

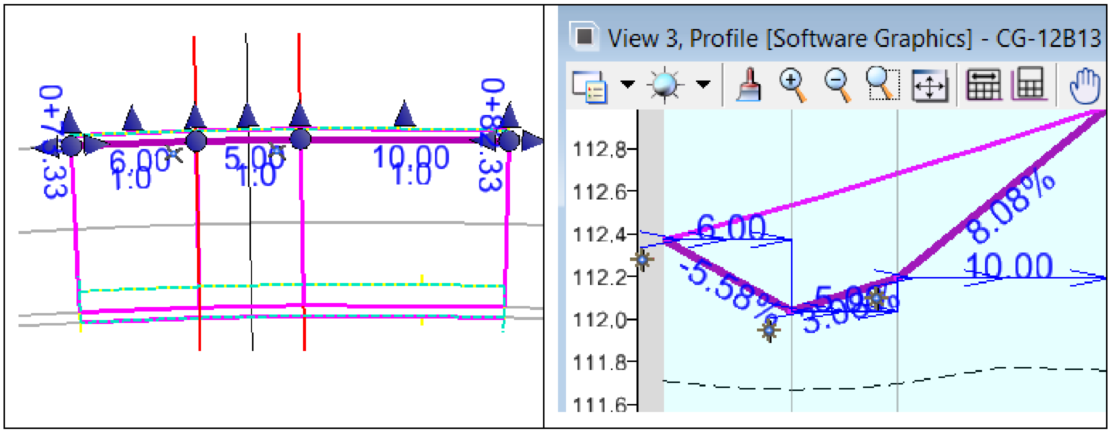
d. Change the length of the right side of the ramp in the plan view.



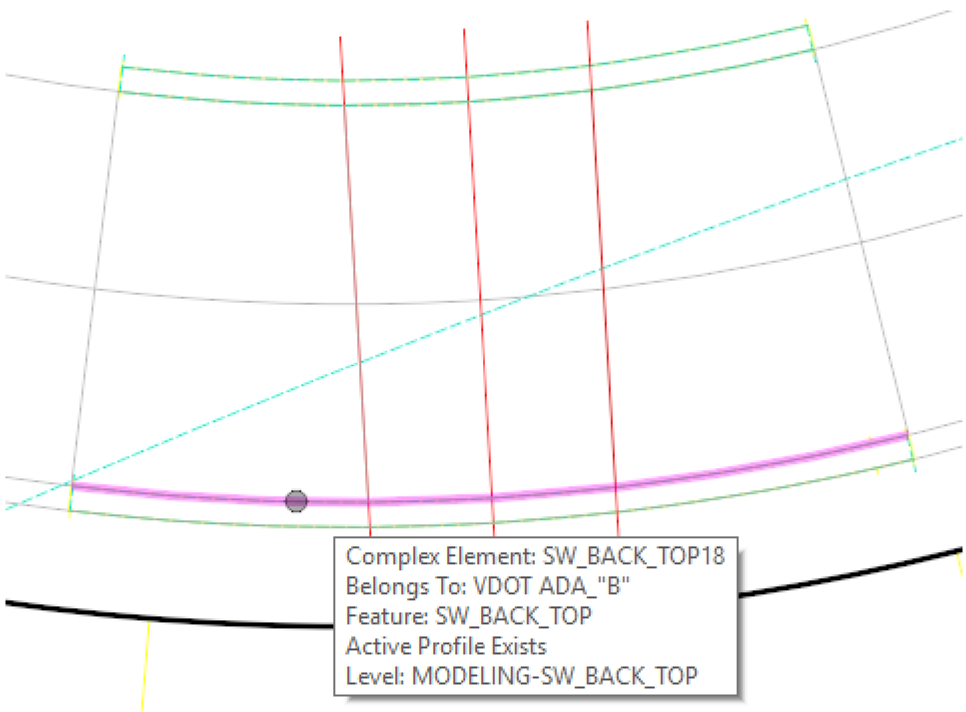
e. Select the profile in View 3 again and notice the slope is improved but still more than 8.33%.



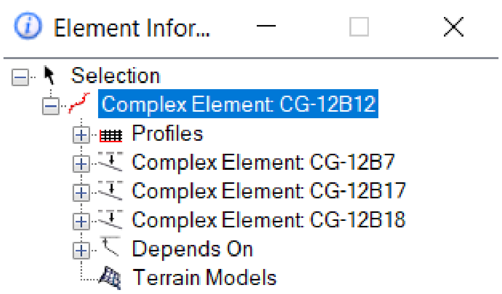
f. Continue changing the plan length on the right in increments of 1’ and checking the slope until you achieve a slope of 8.33% or less. This will vary some for this training example since the exact location the ramp was placed was not specified but the image below shows the approximate width needed (nearest 1’ increment) to achieve a maximum slope of 8.33%



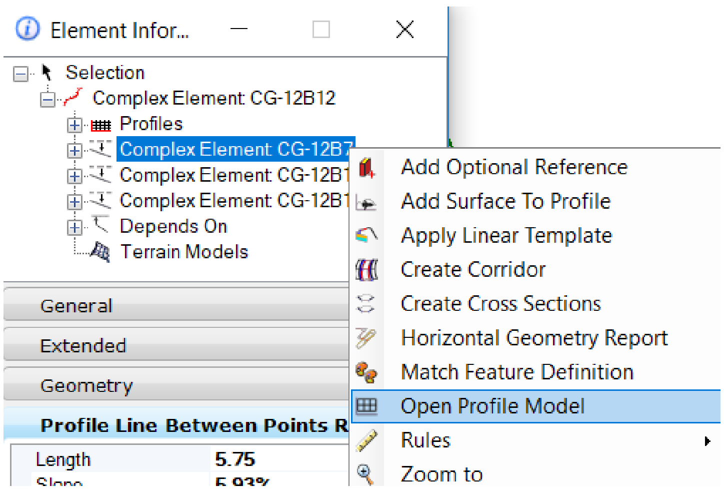
3. We will check the slope on the Back Top of Curb (shown selected in the image below) next. Each element in this complex is profiled so we will have to open the profile view of the side elements to determine if their slope is less than 8.33%. **Select** the **Back Top of Curb element.**



a. Choose MicroStation's **Element Information** command and expand the complex.

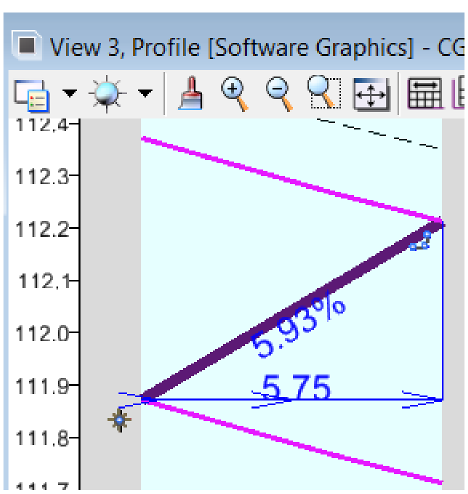


b. Right click the 1st element and choose **Open Profile Model**.

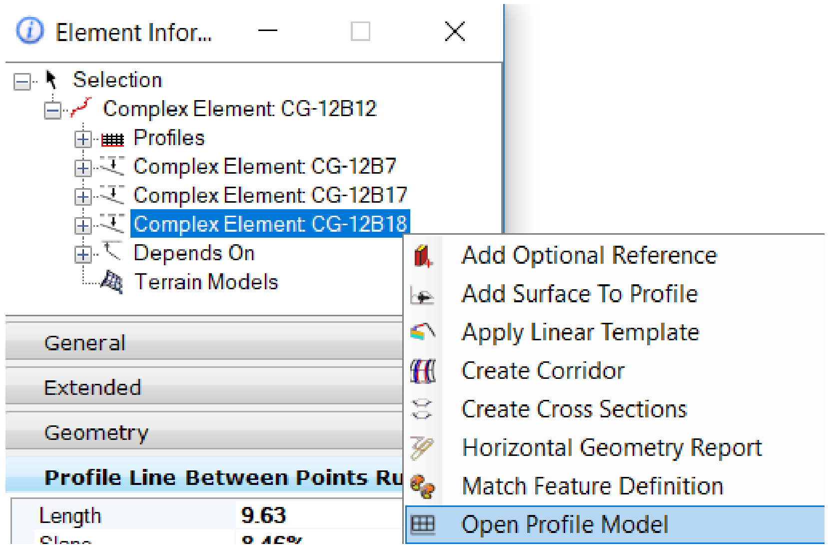


c. Open View 3 and **left click in View 3** when prompted to *Select or Open View.*

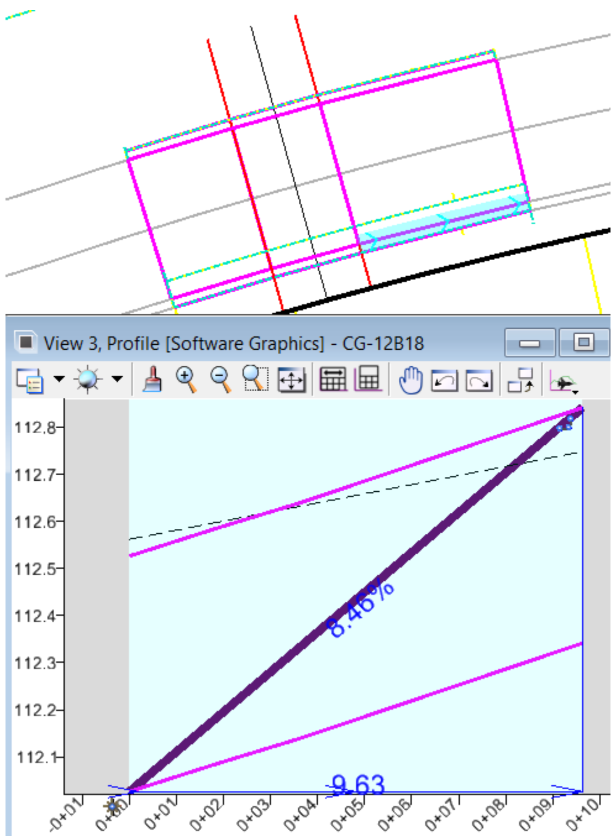
d. Select the Active Profile as shown below. Your slope may differ a little from the slope shown below but this slope is less than 8.333% and we will make no changes.



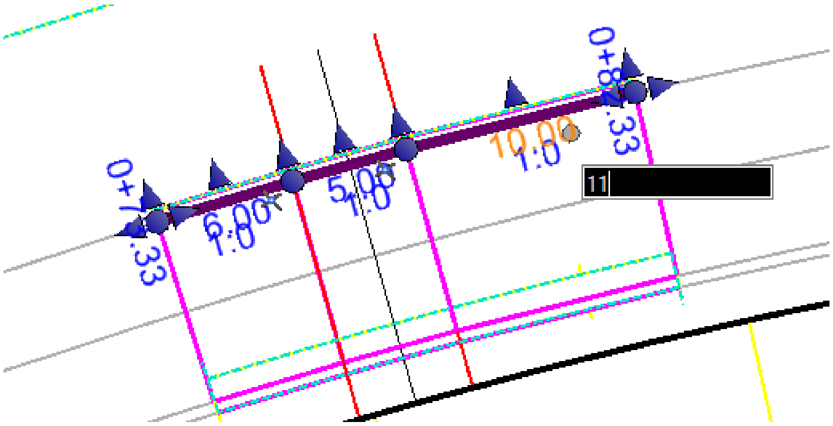
e. Go through steps 3a-3d again but this time open the profile model of right side which is element CG-12B18.



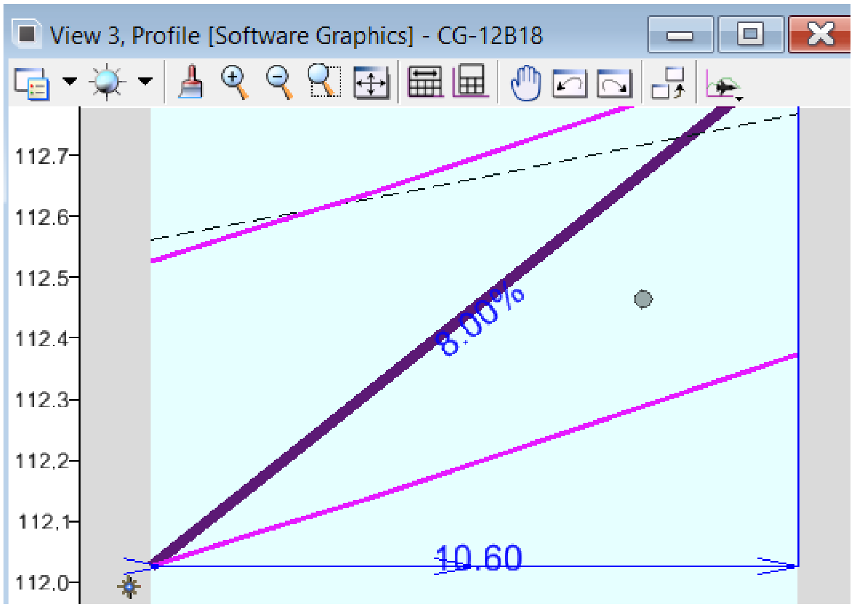
f. Select the Active Profile as shown below. Note this slope exceeds 8.33%.



g. In the Plan View, change the length of the right 10’ back segment to **11’.**



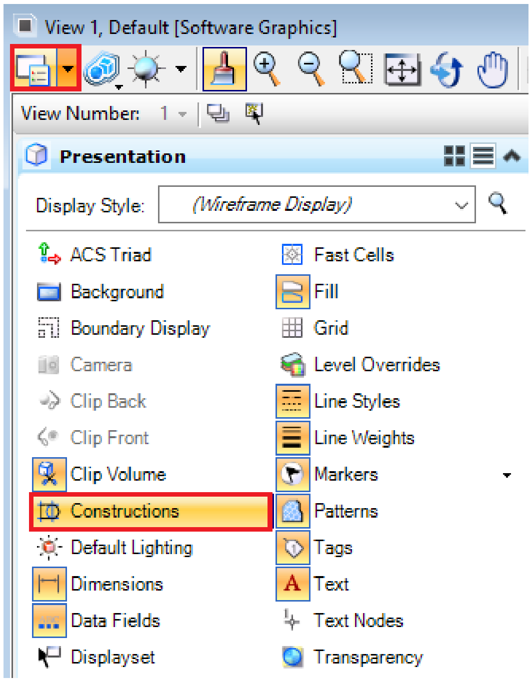
h. Go back to the Profile View and select the Active Profile as shown below.



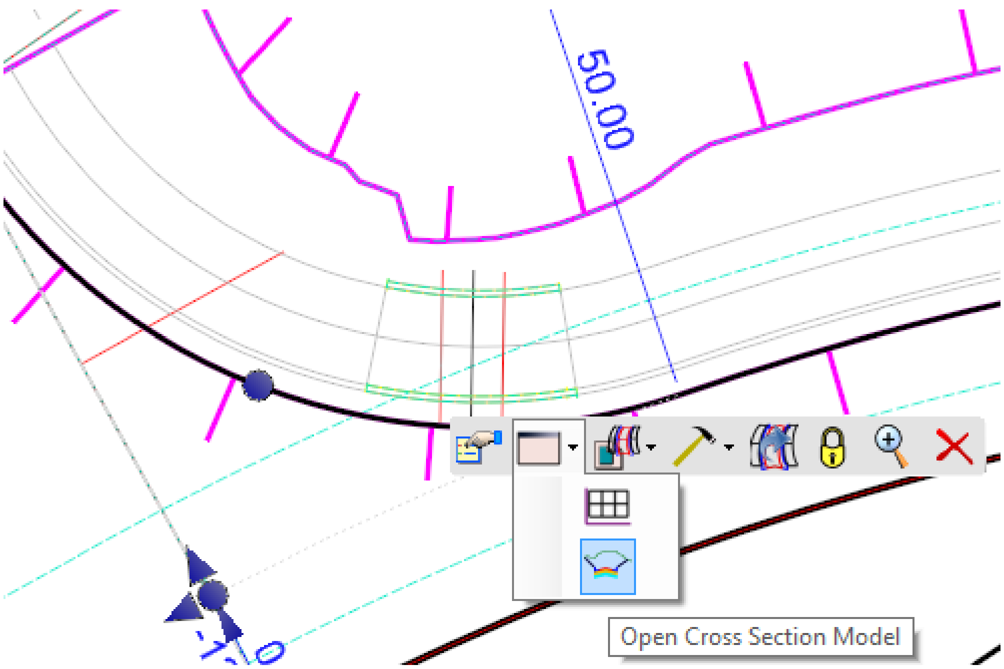
Notice the slope is less than 8.33%.

11.4.1 Cross-Section View

1. Turn on Construction elements.



2. Open the cross-section model of the **EoP** linear template as shown below. Note if the entire cell highlights when you hover over the corridor handler, reset to get to the underlying corridor handler.



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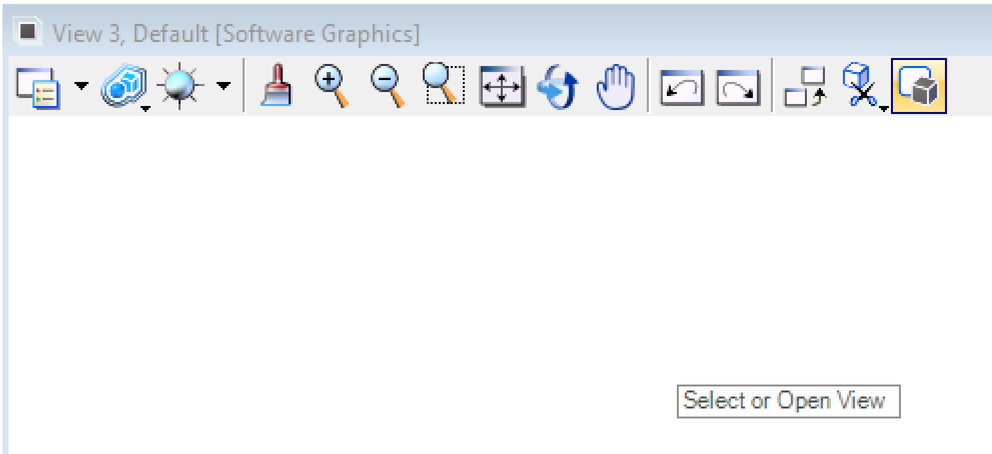
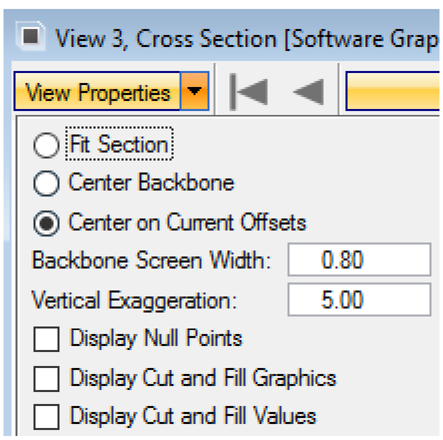
3. Open **View 3** from *MicroStations View* menu.

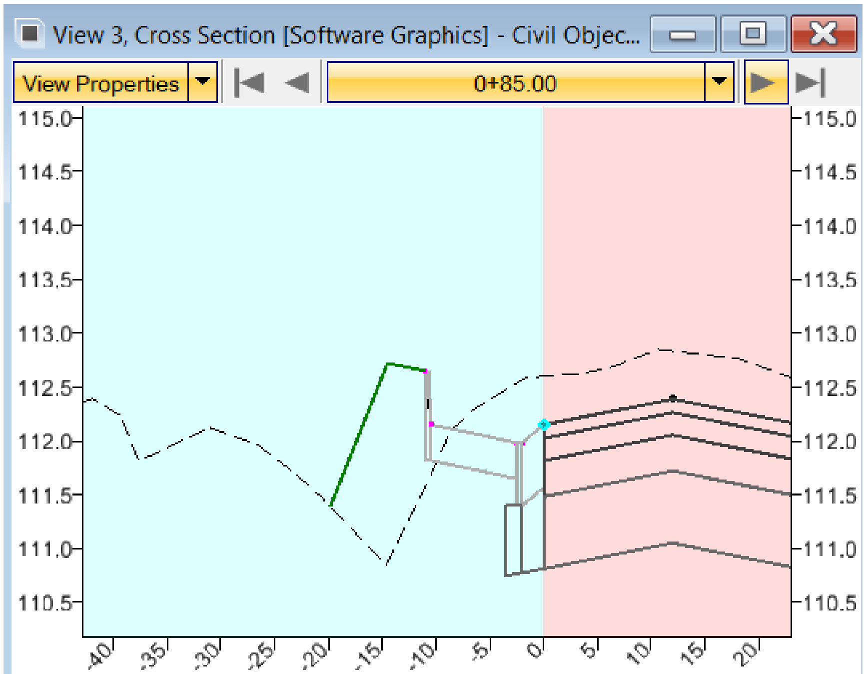
4. **Left Click** in the drawing area of *View 3.*



5. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



6. Use the *Next Station* button to move to a cross-section in the ramp area to review the curb ramp.



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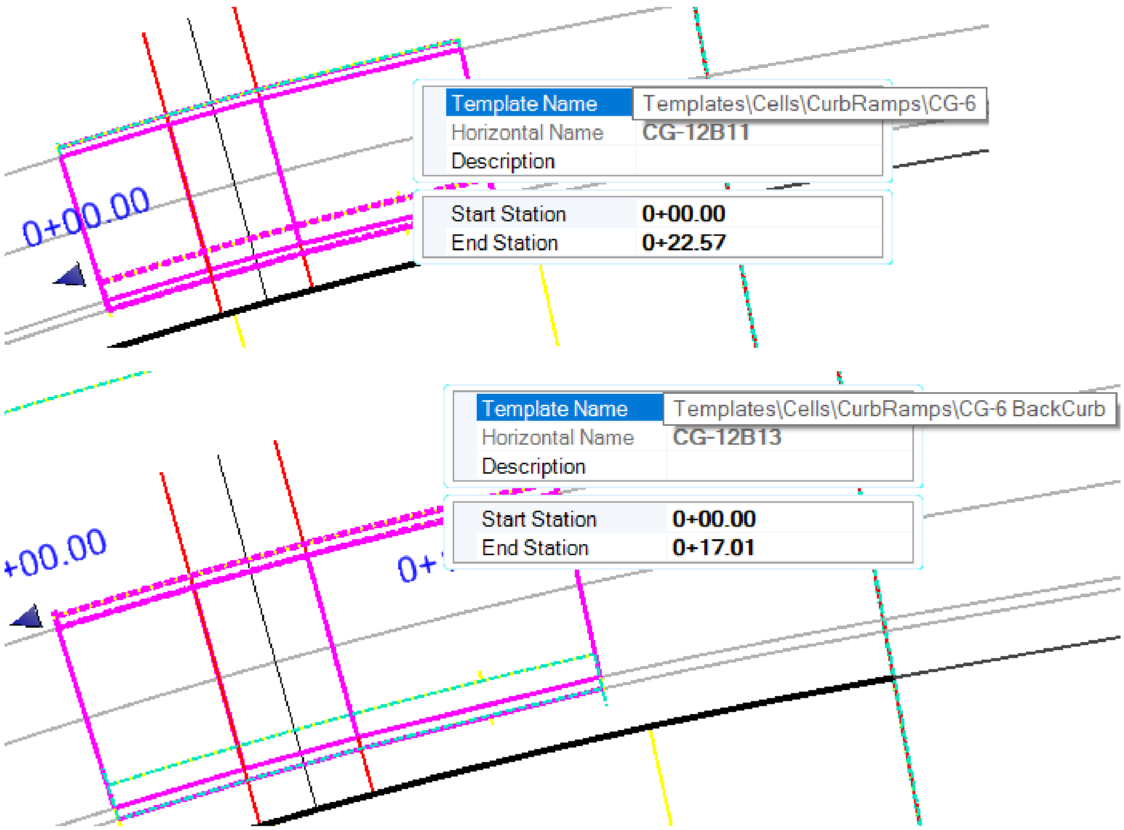
11.4.2 Template Edits

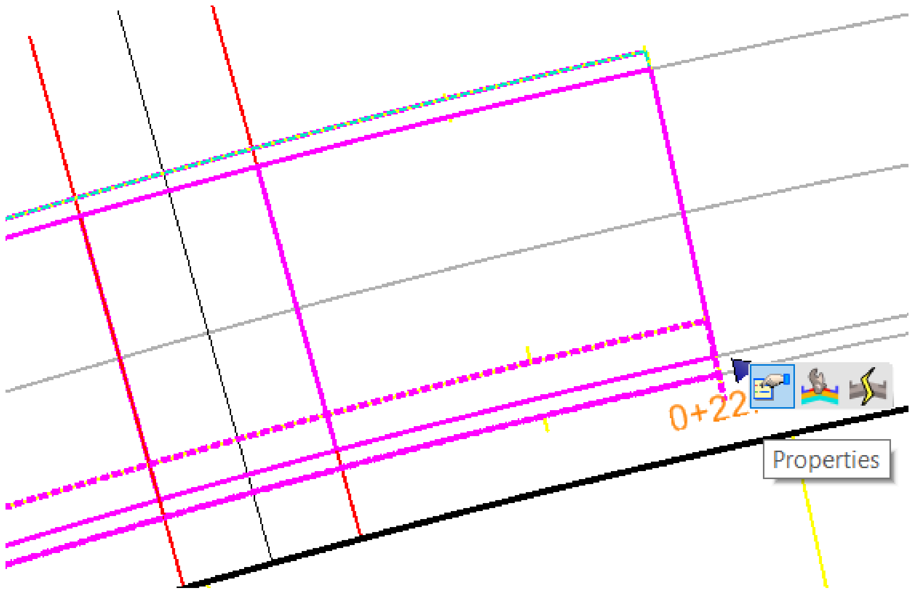
The linear templates used in the ADA Ramp Civil Cells are highlighted below. We will show the various tools in this section available for use and related to Linear and Surface Templates but no changes will be made in this exercise and you would need to refer to section 11.3.10 for examples of actually making edits.



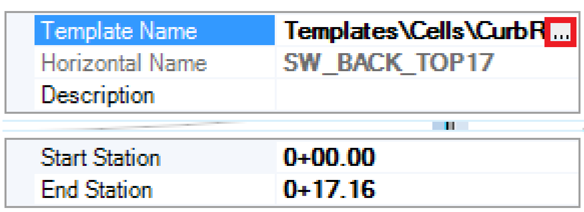
11.4.2.1 PROPERTIES

To re-direct the linear template along the gutterline to a new one in the ITL:

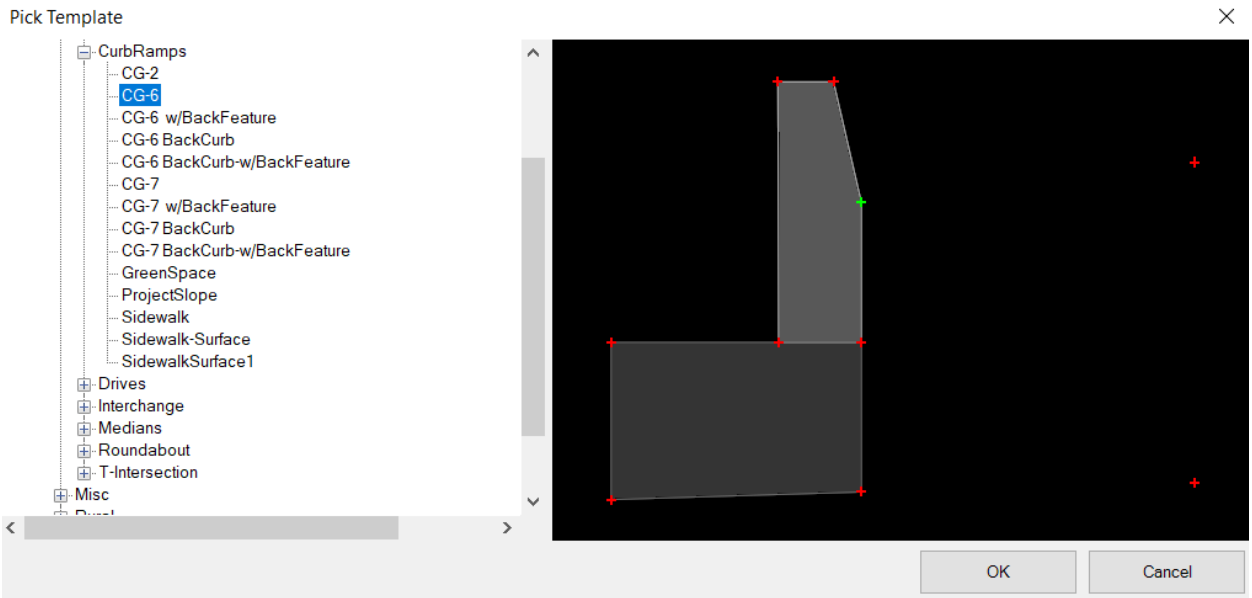
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Linear template used along gutterline in the ADA Ramp Civil Cells is shown below. Although we will not replace this template in this exercise, you would choose the template from the **Pick Template** dialog if you wanted to replace the given template.



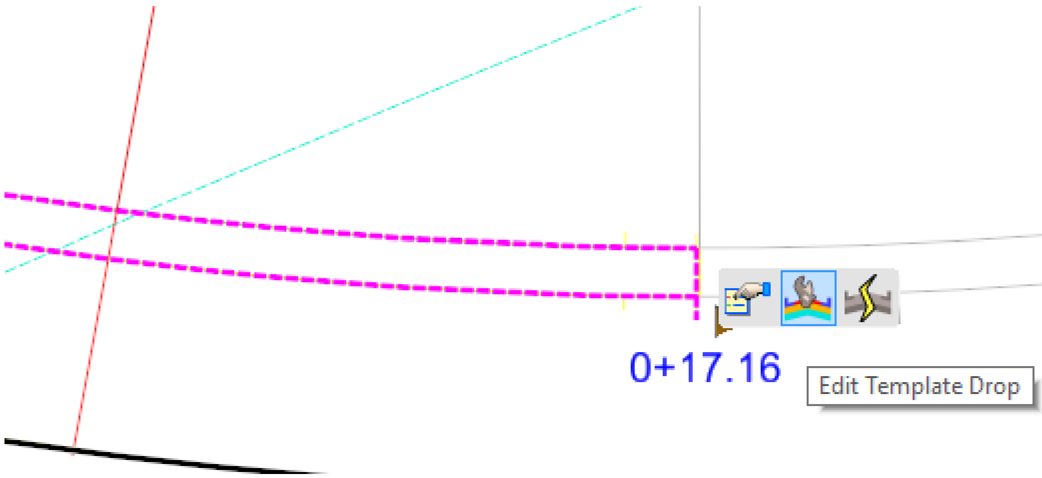
NOTE: Notice the CG-6 & CG-7 templates available.

4. Tag **Cancel** *(OK if you actually change the template.)*

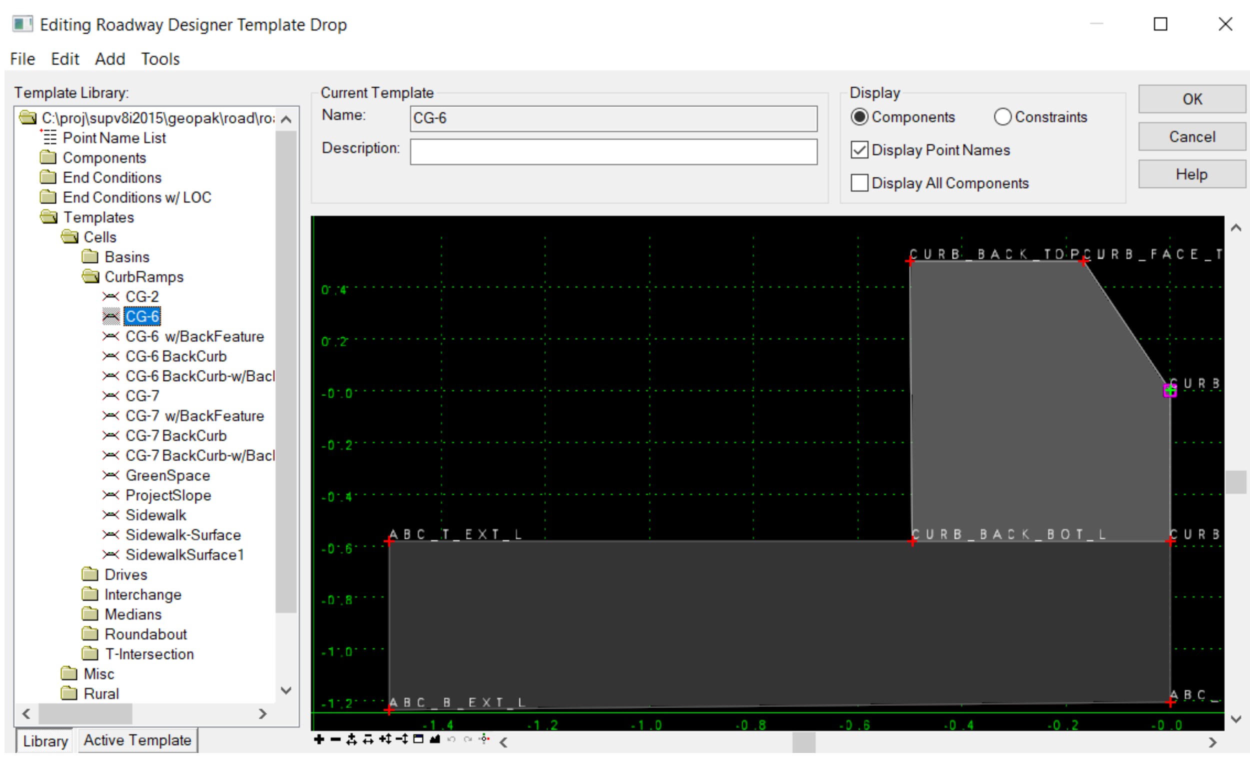
11.4.2.2 EDIT TEMPLATE

To edit the template:

1. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.



2. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.

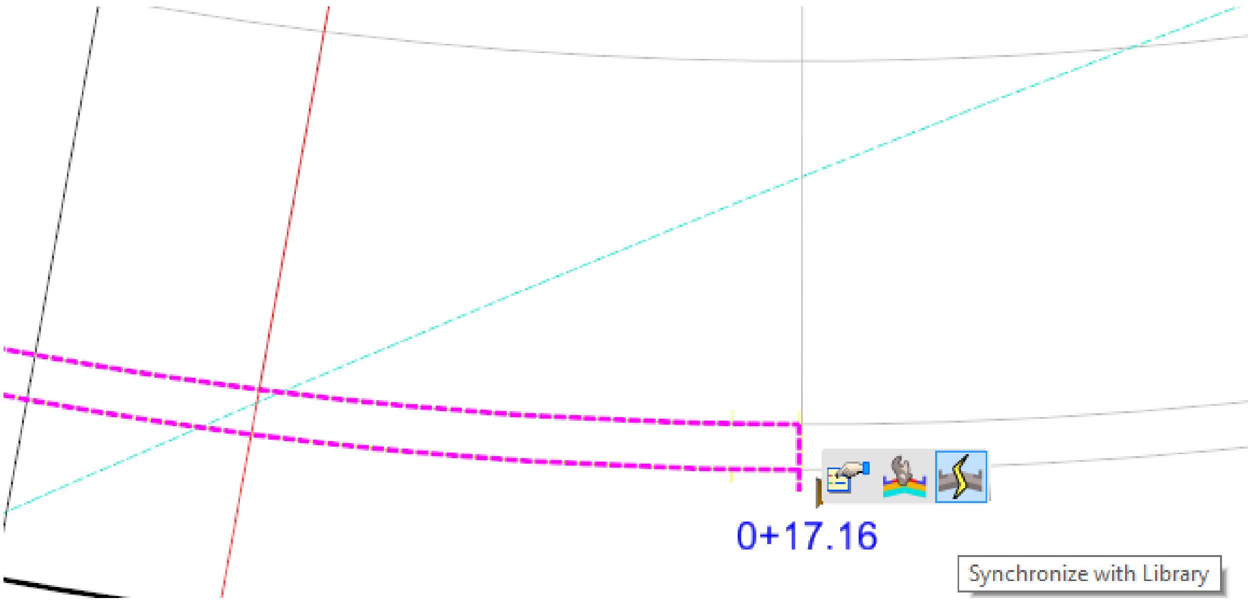


3. For this exercise, choose **Cancel.**

11.4.2.3 SYNCHRONIZE

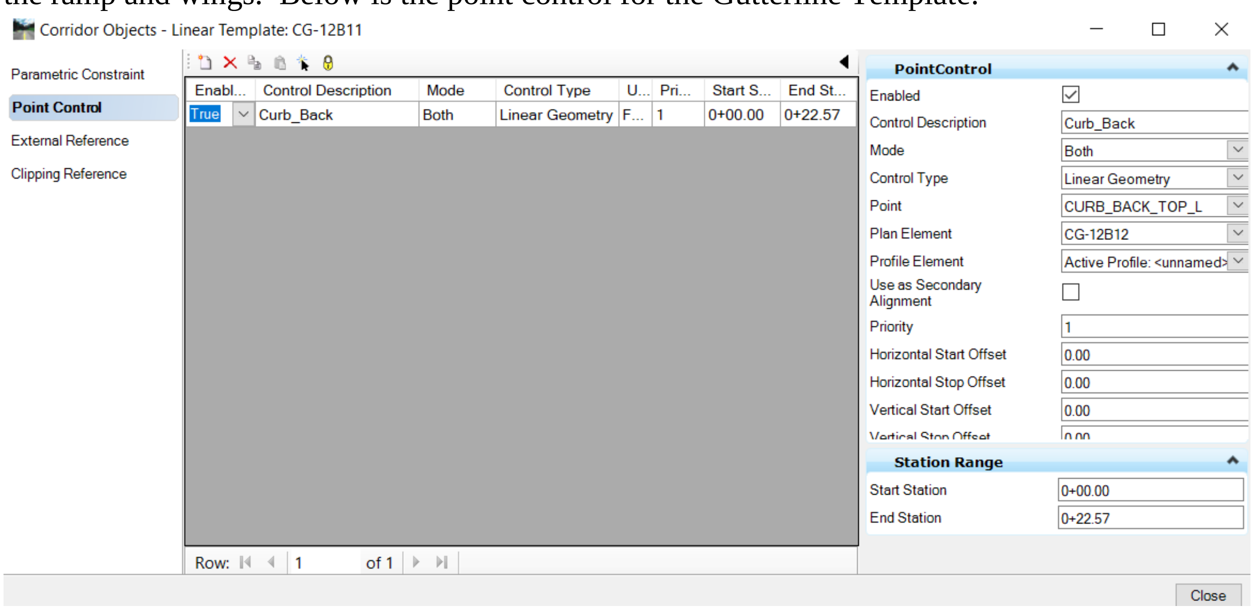
To synchronize a template if modified:

1. Select *Synchronize with Library* as shown below which applies any changes in the template to the linear template.



11.4.2.4 POINT CONTROLS

Point Controls are included in the templates to control the vertical transitions of the curb through the ramp and wings. Below is the point control for the Gutterline Template.

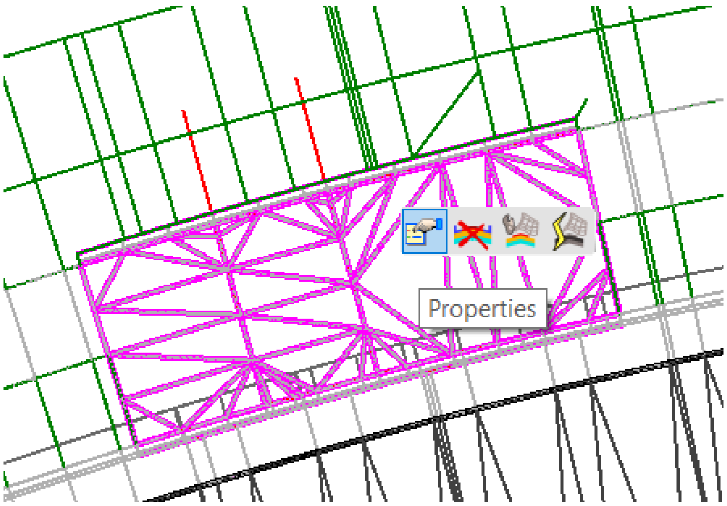


11.4.2.5 SURFACE TEMPLATE

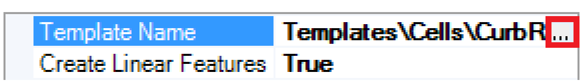
Commands available for Surface Template edits from the context menu are shown below and match the Linear Template commands described in the sections directly above with the exception of the Delete Template command.

NOTE: We'll just go through Properties here to show what Surface template is used by default in the ADA Ramp Civil Cells. Refer to section 11.3.10 for actual template edit steps.

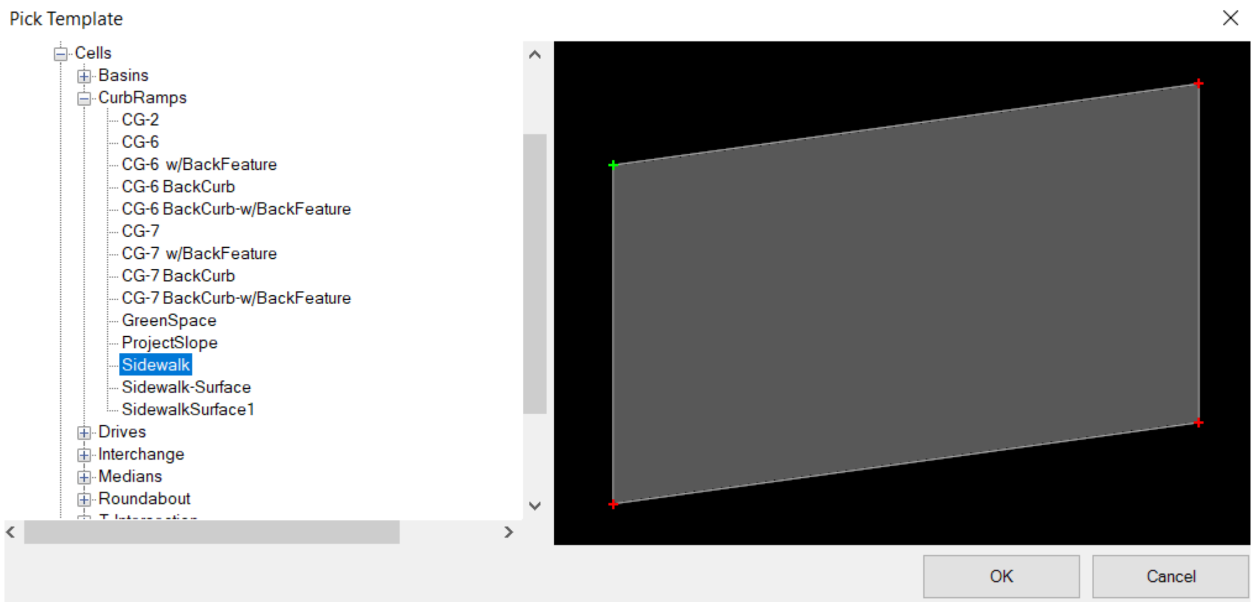
1. Select the Surface Template in the 3d view.
2. From the Context menu, choose **Properties.**



2. From the Properties menu, select the button below.



3. The **Pick Template** dialog is invoked and shown below. The Surface template used in the Urban Drive Civil Cell is shown below. Although we will not replace this template in this exercise, you would choose the template from the **Pick Template** dialog if you wanted to replace the given template.



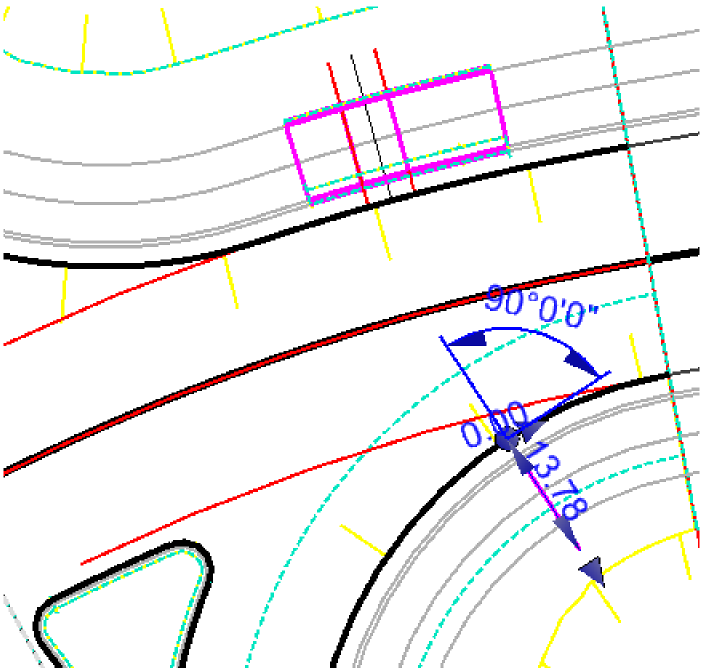
4. Tag **Cancel** *(OK if you were to actually change the template.)*

11.4.3 CELL– Type B Curb'd Sidewalk

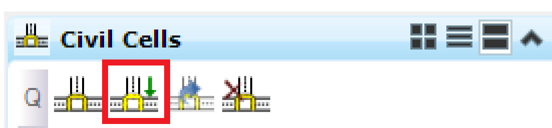
11.4.3.1 PLACEMENT

We will not go into great detail with commands since they have been already covered in the earlier parts of section 11.4 but we will place the Curb Ramp VDOT Type B Curb'd SW opposite of the VDOT Type B Ramp placed in the previous exercise & review some horizontal & vertical characteristics of the cell.

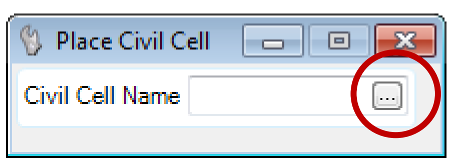
1. Use the *Horizontal Geometry* command **Line From Element** similar as described in section 11.4.3 to create a Ramp CL opposite of the Type B Ramp placed in the previous exercise. This element should be placed from the EP to past the Back of SW.



2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



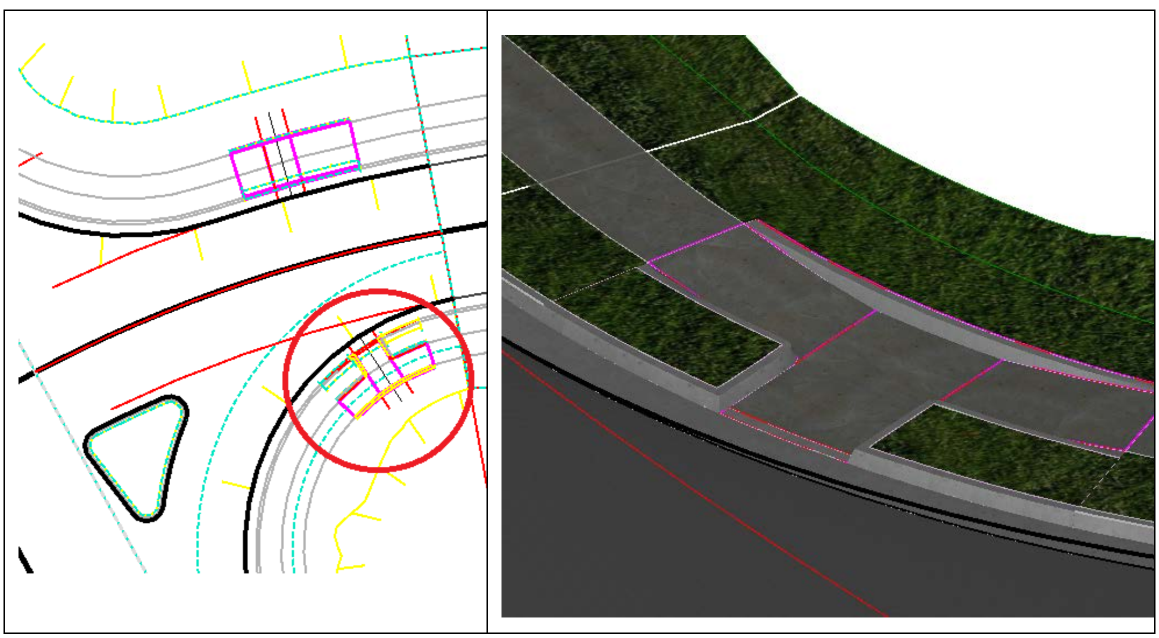
3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.



4. Select the **VDOT ADA_”B” Curb’d SW** civil cell from the **VDOT_ADA.dgnlib** folder and click **OK.**

5. Follow the prompts placing the cell and clipping the adjoining corridor.

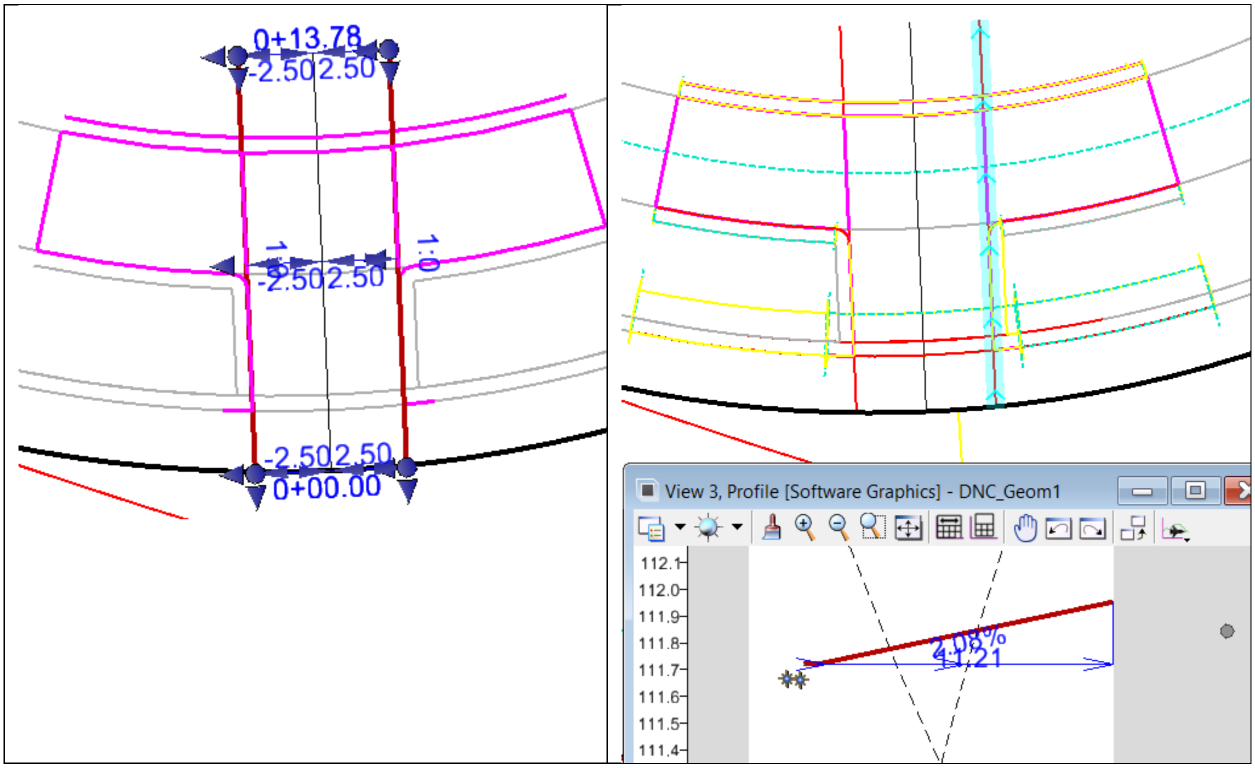
The Cell is shown below in 2d & 3d view.



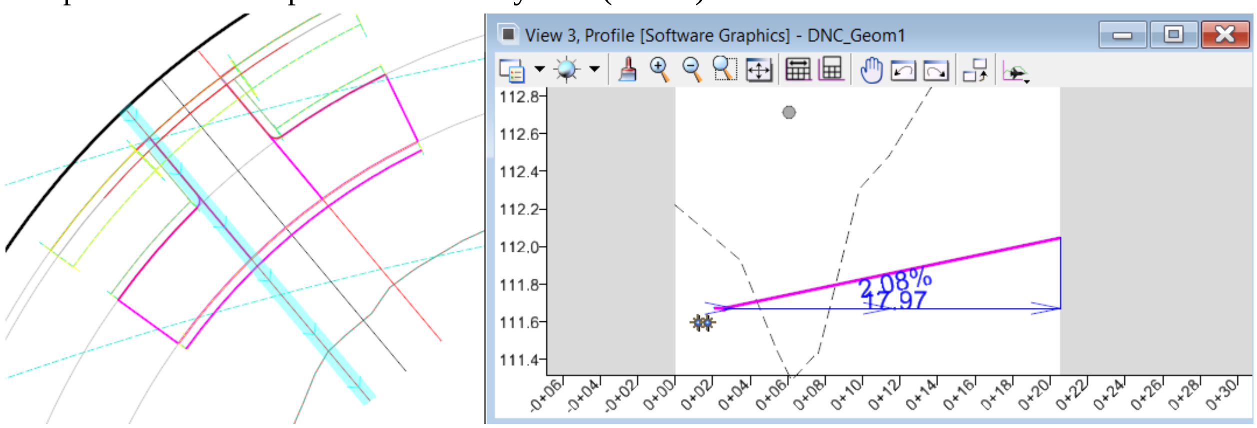
11.4.3.2 EDITS

Horizontal & Vertical edits are practically identical to those described in the sections above for the VDOT Type “B” cell so we will not go into great detail in this section.

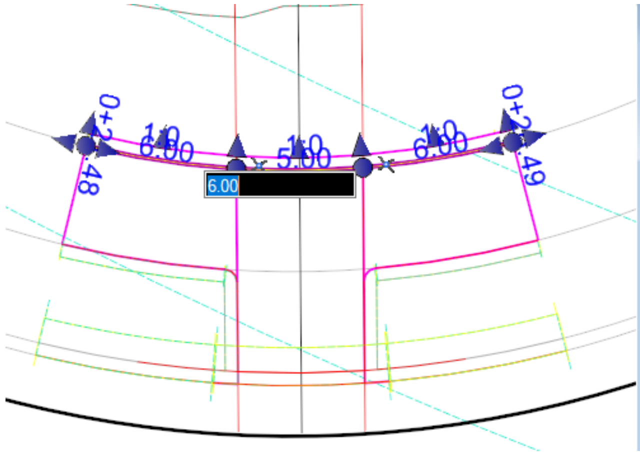
1. The DNC_Geom elements shown below are the primary control in the cells both horizontally & vertically.

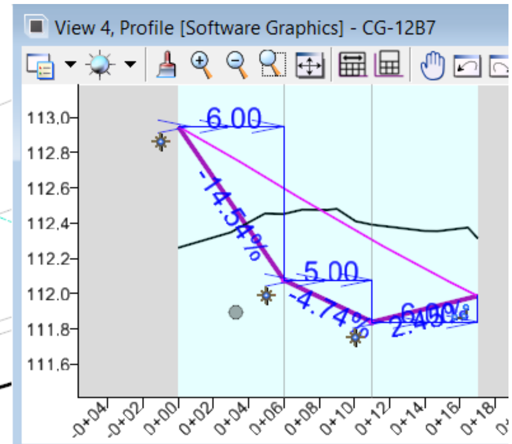


2. The profile of the ramp is drawn initially 1:48 (2.08%) as shown below.



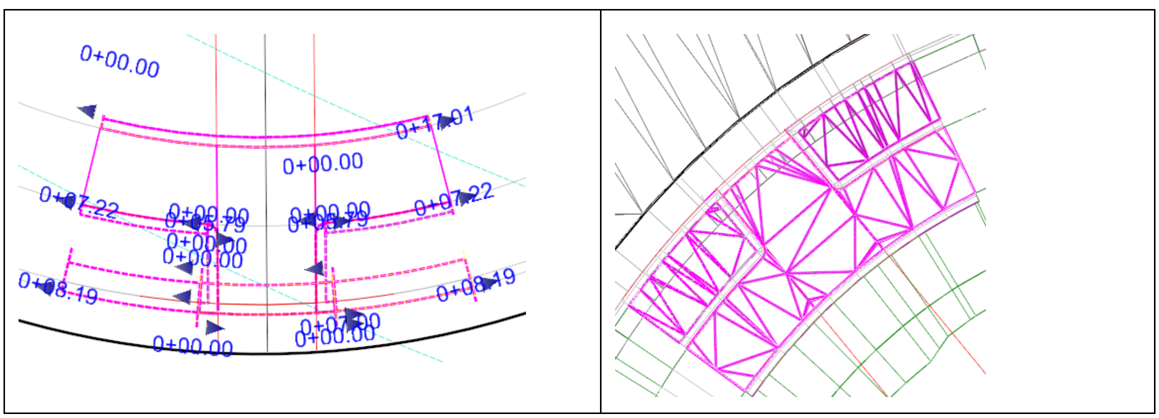
3. The profile along the flares is adjusted by changing the length of the flare in the plan view to meet a maximum grade of 1:12 (8.33%).



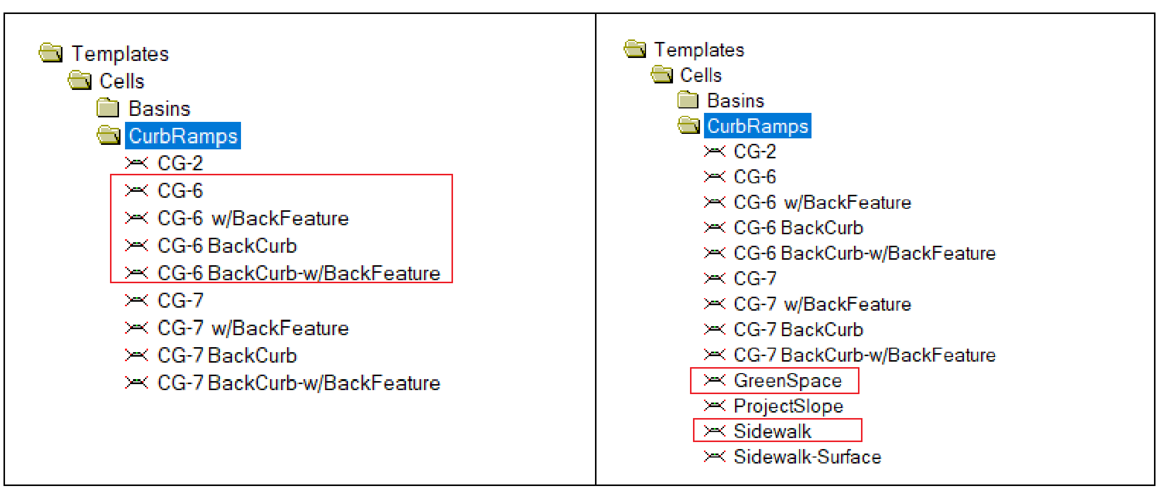


11.4.3.3 TEMPLATES

1. There are eight linear templates & three surface template in the Civil Cell with Point Controls and/or Parametric Constraints assigned in all.



2. Templates Used:

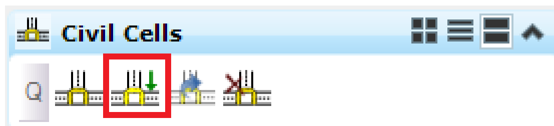


11.4.4 CELL – Type B Diagonal_R w/Curb

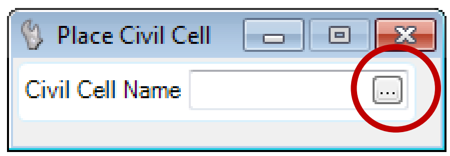
11.4.4.1 PLACEMENT

Review the direction of arrows & references in section 11.4.2 before placing the cell. Limitations would most likely be related to the length of the references along the secondary road. You need 20-25’ minimum of length along the gutter-line element for all the cell’s geometry to place correctly.

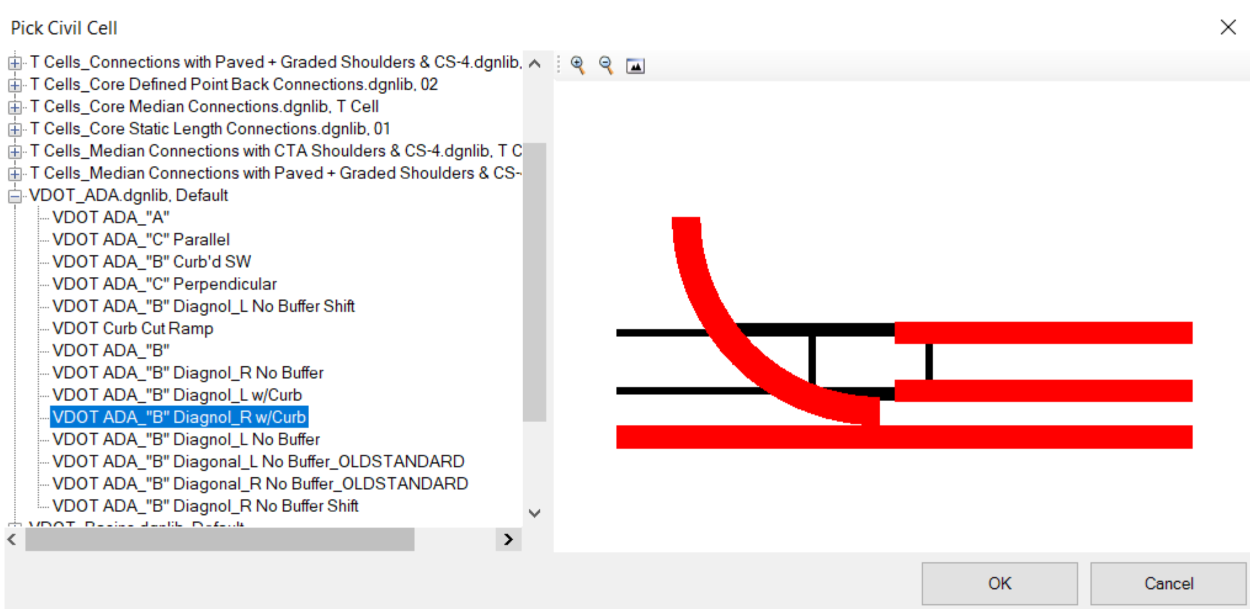
1. Open the file **2-lane-Urban-CurbRamp-Diagnol.dgn**
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



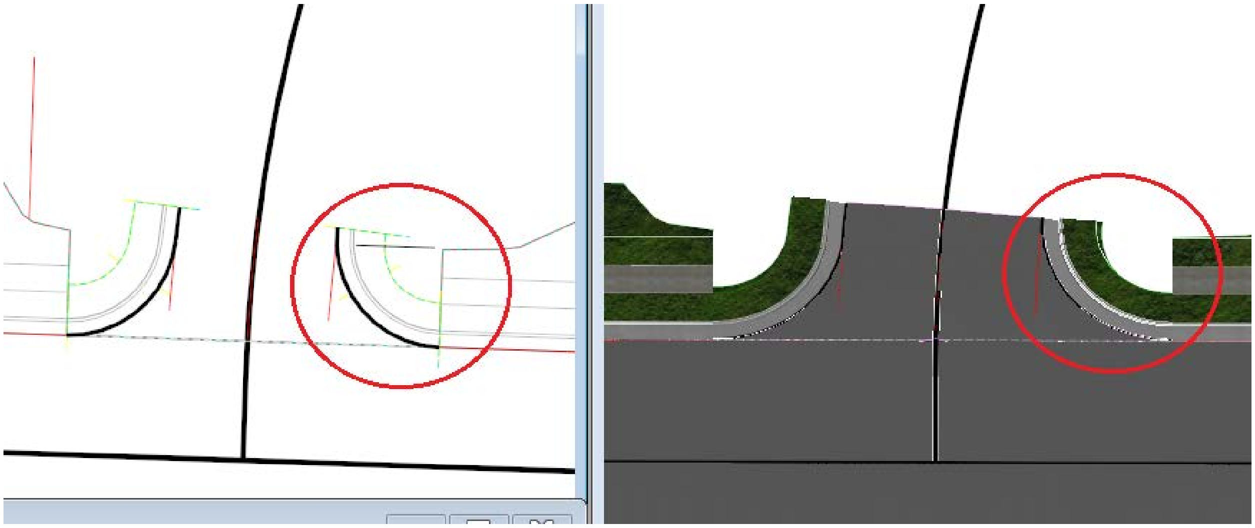
3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.



4. Select the **VDOT ADA_”B” Diagonal_R w/Curb** civil cell from the **VDOT_ADA.dgnlib** folder and click **OK.**

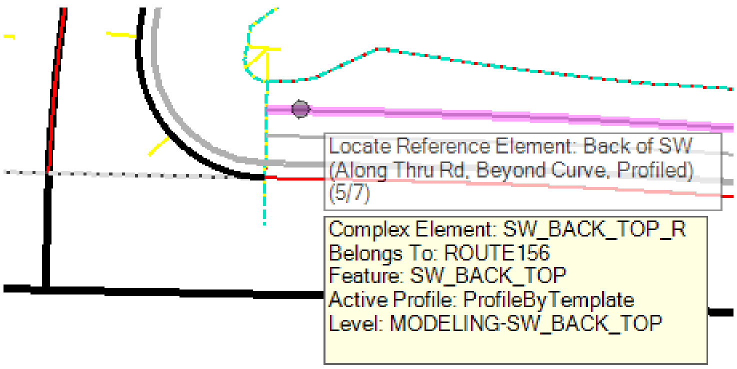


5. We will place the cell in the area circled below:

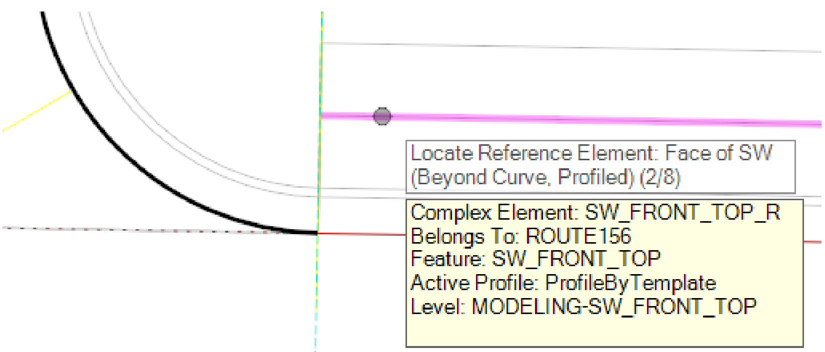


NOTE: The next eight prompts may be in different order than listed in this manual.

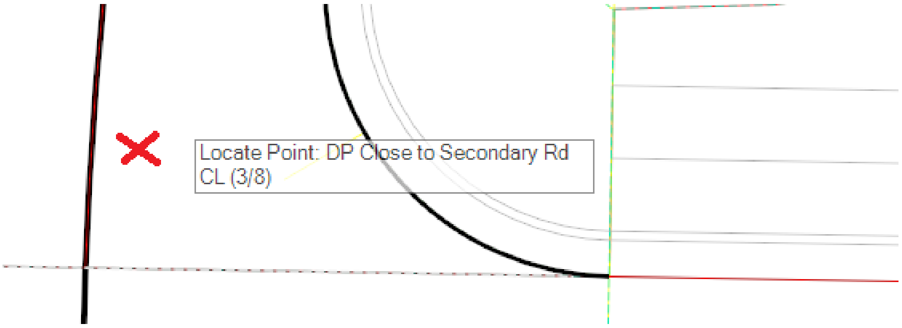
6. When prompted to *'Locate Reference Element: Back of SW (Beyond Curve, Profiled)'* select the **Back of Sidewalk** element in View 1.



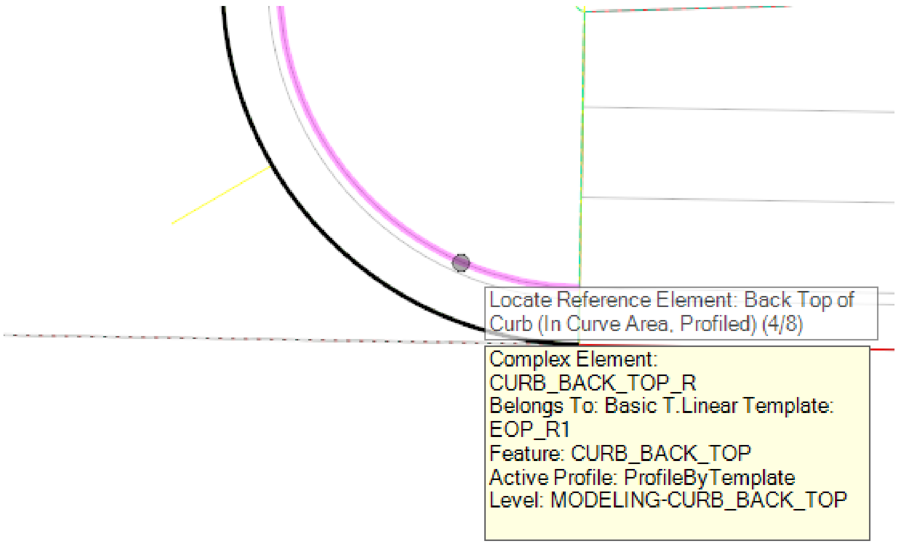
7. When prompted to *'Locate Reference Element: Face of SW (Beyond Curve, Profiled)'* select the **Back of Sidewalk** element in View 1.



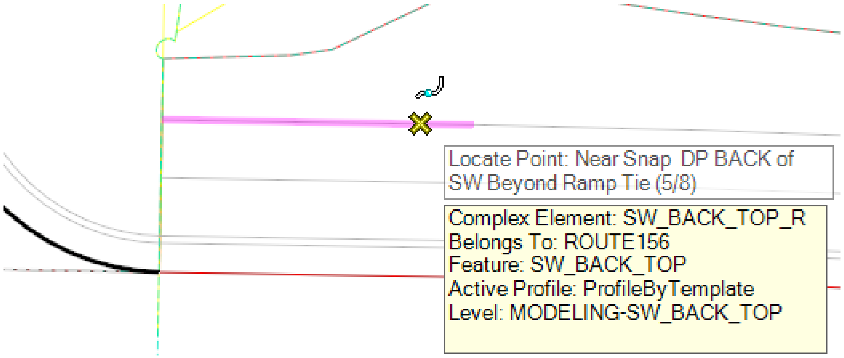
8. When prompted to *'Locate Point: DPClose to Secondary Rd CL'* Data Point close to the Secondary Rd alignment in View 1.



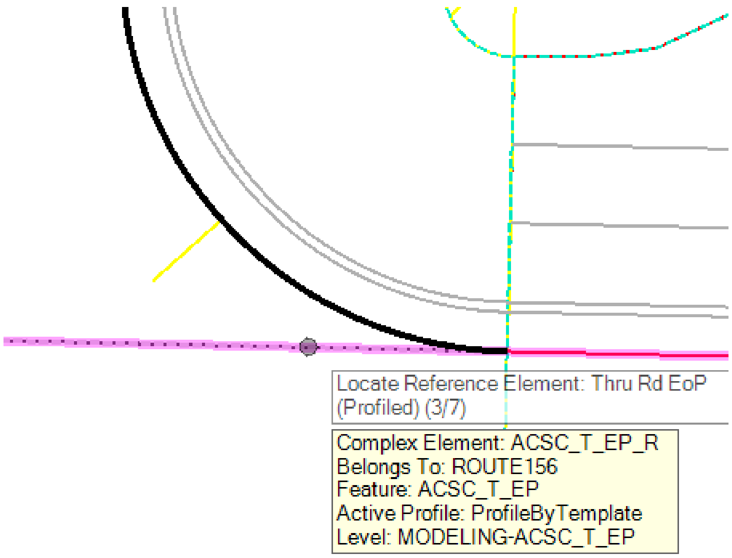
9. When prompted to *'Back Top of Curb (In Curve Area, Profiled)'*, select the **CURB_BACK_TOP_R** element in View 1.



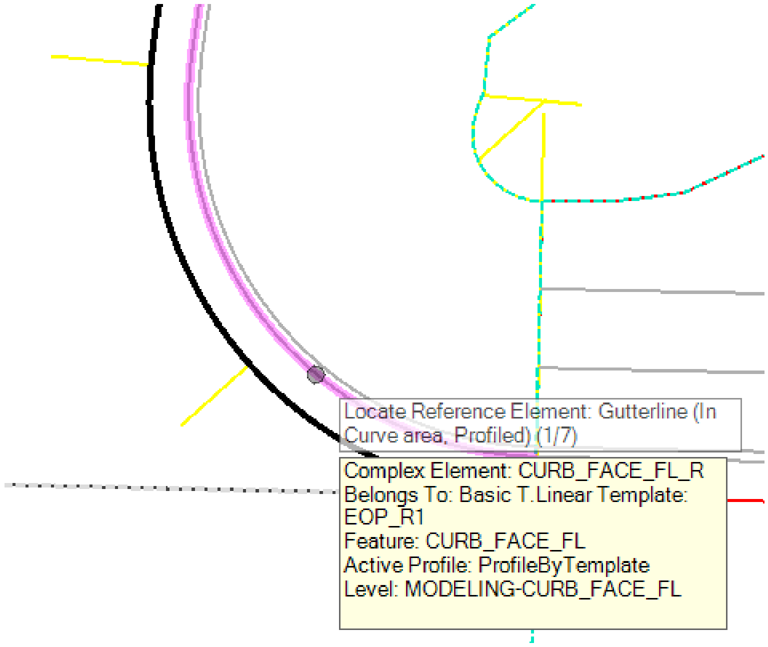
10. When prompted to *'Locate Point: Near Snap & DP BACK of SW Beyond Ramp Tie'* Near Point Snap & Data Point the Back of Sidewalk beyond the possible Ramp Tie.



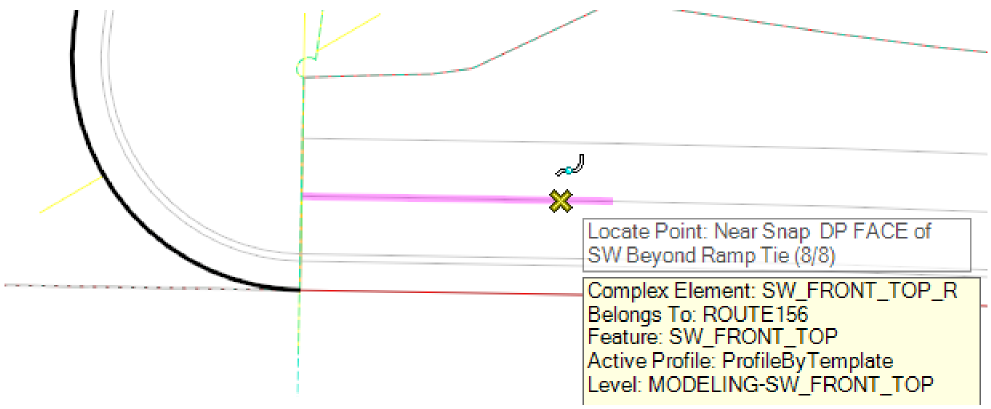
11. When prompted to *'Locate Reference Element: Thru Rd EoP (Profiled)'* select the **Thru Rd EoP** element in View 1.



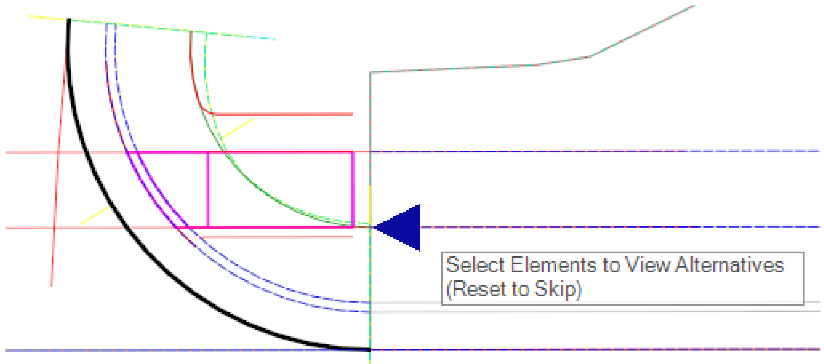
12. When prompted to *Locate Reference Element: 'Gutterline (In Curve Area, Profiled)'*, select the **CURB_FACE_FL_R** element in View 1.



13. When prompted to *'Locate Point: Near Snap & DP FACE of SW Beyond Ramp Tie'* Near Point Snap & Data Point the Back of Sidewalk beyond the possible Ramp Tie.

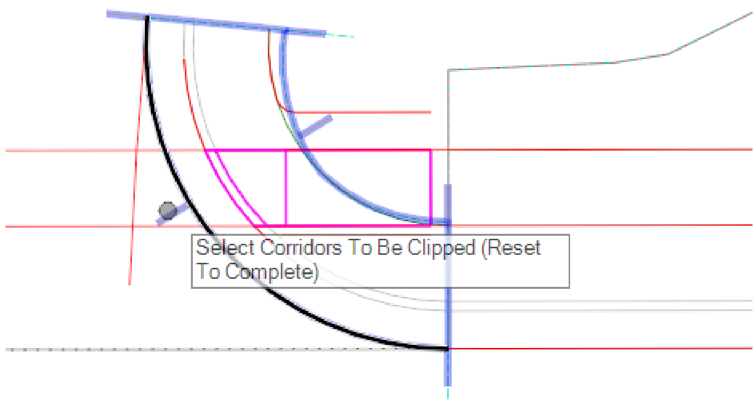


14. Observe the geometry being displayed.

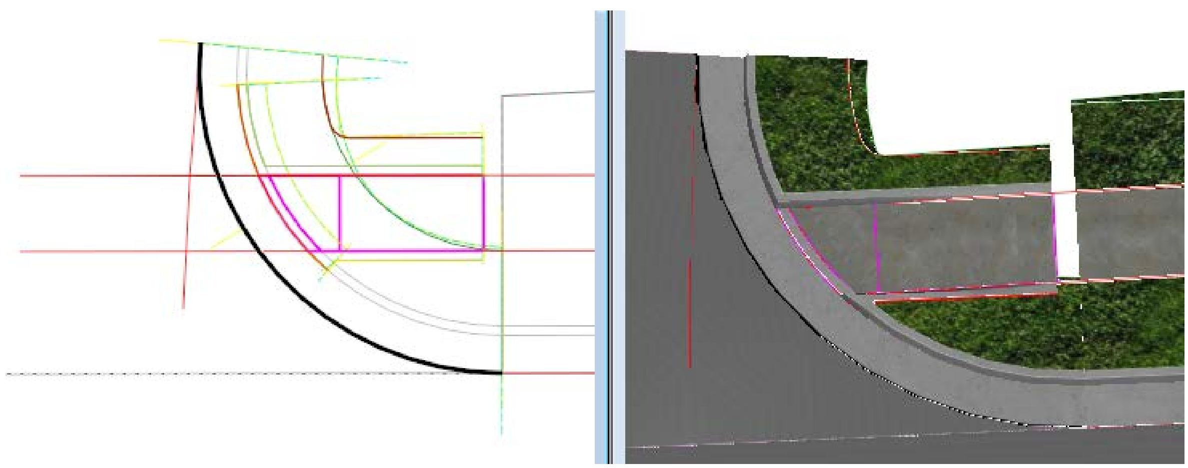


15. **Reset** when prompted to *Select Elements to View Alternates (Reset To Skip).*

16. Select the Basic T linear template when prompted to Select Corridors To Be Clipped (Reset To Complete).



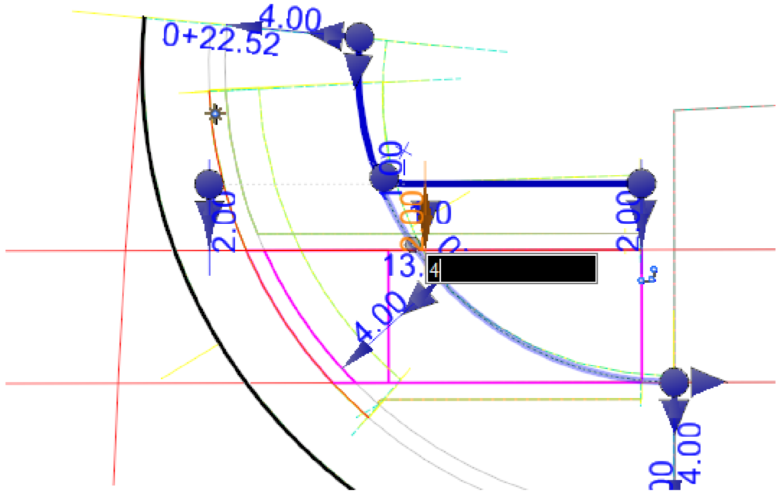
17. Reset and then Data Point to Accept the Civil Cell. The cell after placement is shown below.



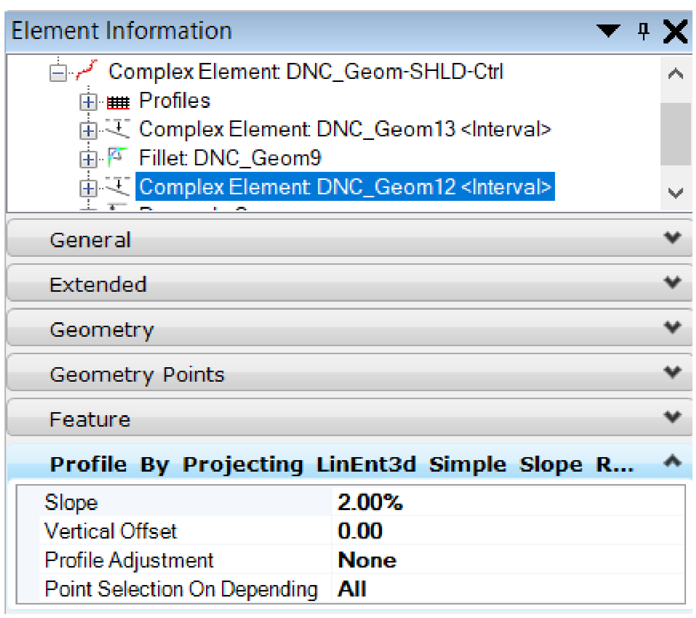
11.4.4.2 EDITS

We will not go into great detail but we will discuss a few of the key geometry elements and edits of the cell.

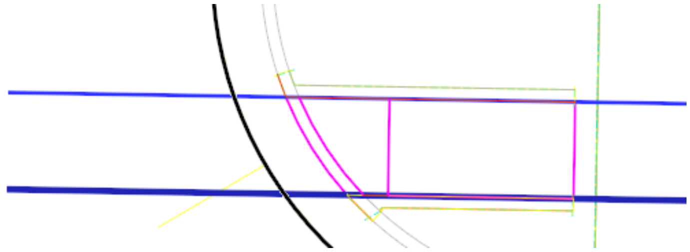
1. Select the element below to align the shoulders with the secondary road and through road shoulders. In this example, change the through road offset from 2 to 4'.



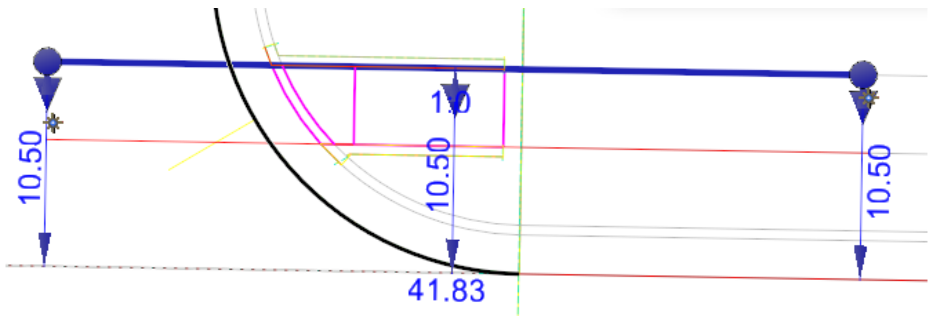
2. The profile of the shoulder is initially projected +2% and can be best edited by selecting the shoulder and modifying in MicroStation's Element Information command.



3. The DNC_Geom elements highlighted below (Blue Elements) are the primary horizontal & vertical control of the cell.

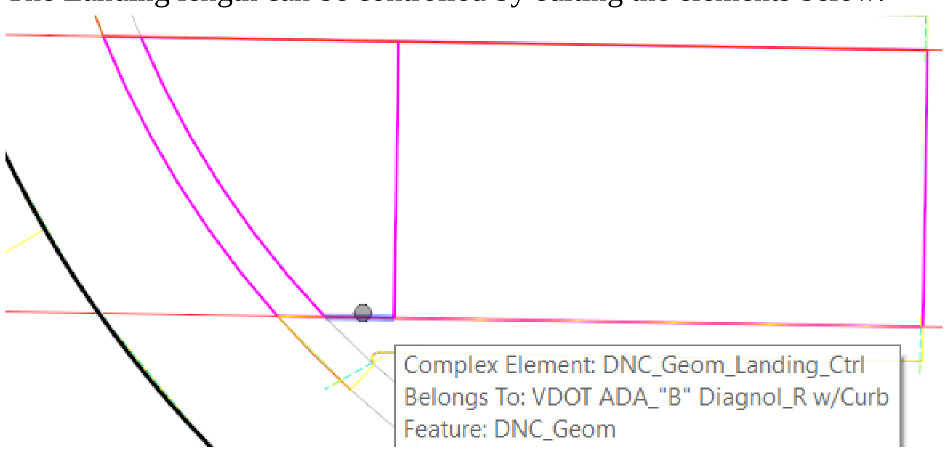


4. Selecting these elements, you can see that they are offsets of the Thru Rd EoP and these offsets can be edited but should not need to be as they align with the SW Snaps provided as references.

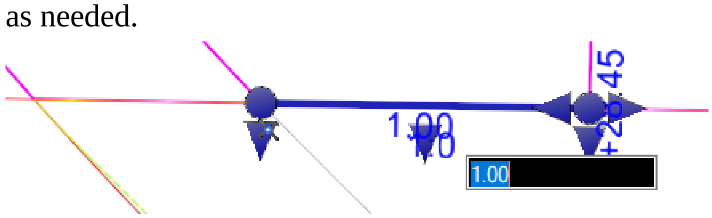


NOTE: We will discuss the vertical profile of these DNC_Geom elements after the discussion of a few more elements.

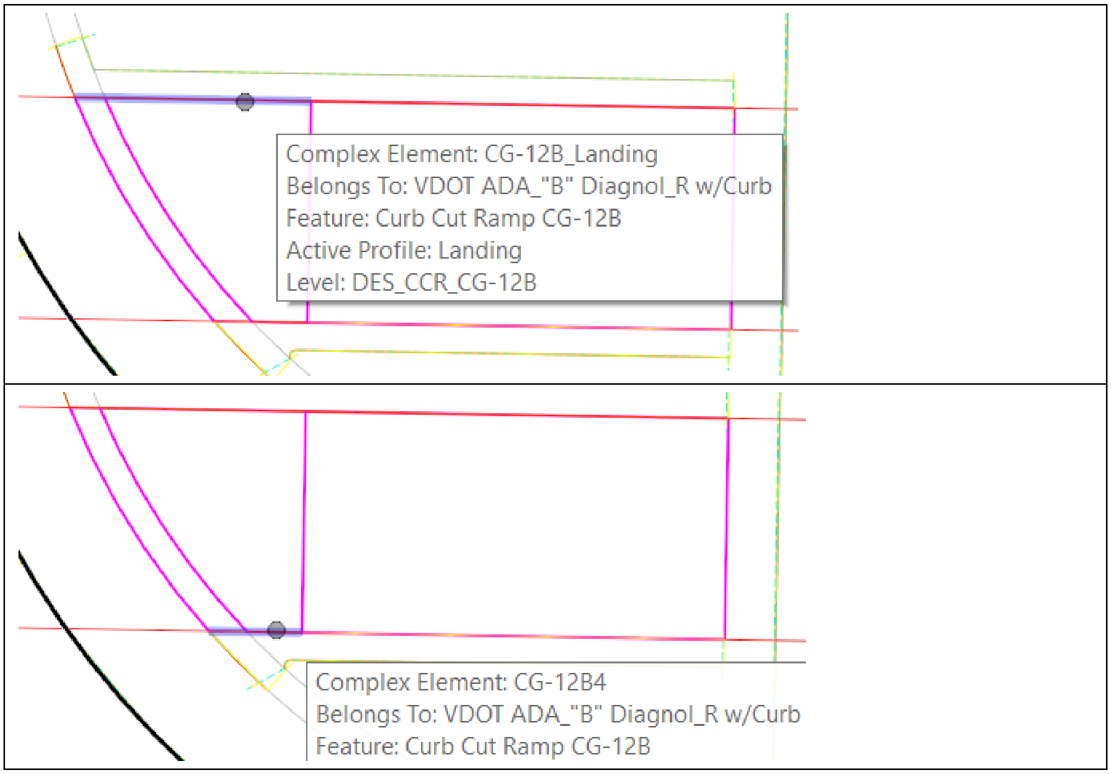
5. The Landing length can be controlled by editing the elements below.



This Landing Control is initially set to 1’ off the Back Top of Curb but can be edited as needed.

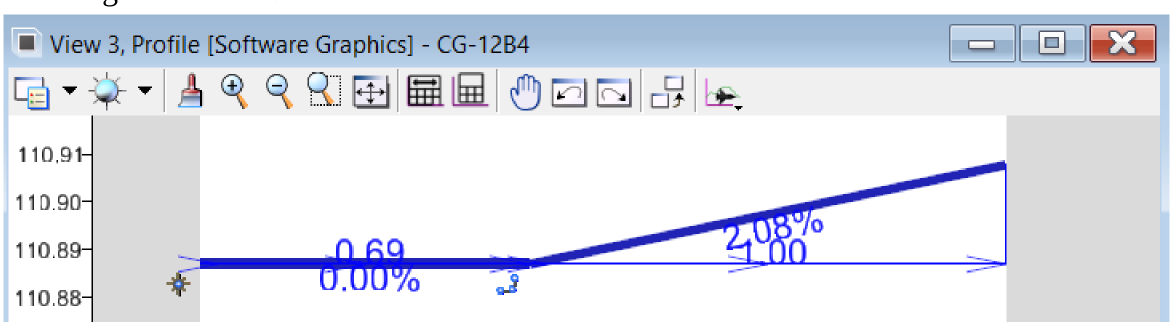


6. The Landing Vertical is controlled by the two elements highlighted below.

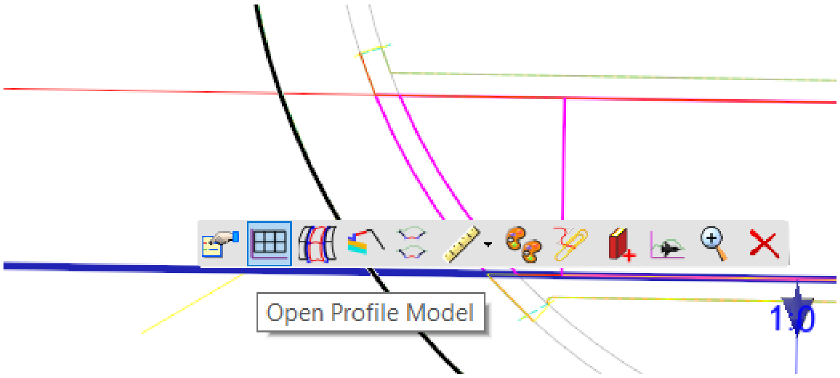


NOTE: These elements length is controlled with snaps to the 1' Landing Control element discussed in item 4 above.

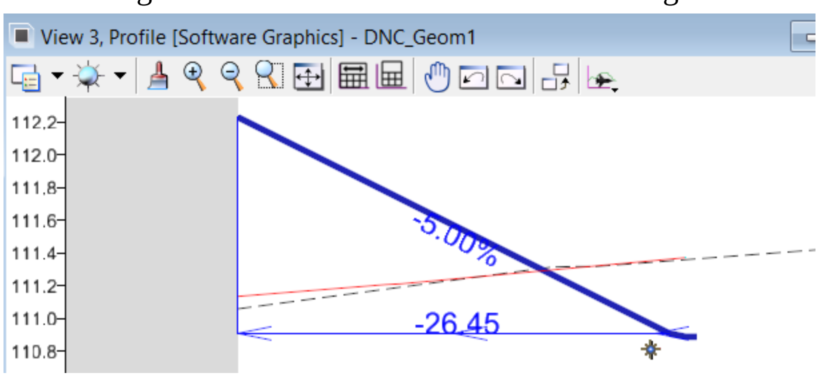
7. Opening the profile view of the element shown in the 2nd image above and then selecting the Active profile, you can see below that the landing slope is initially set to 1:48 (2.08%). This slope can be modified as needed for the landing slope but 1:48 is the design maximum.



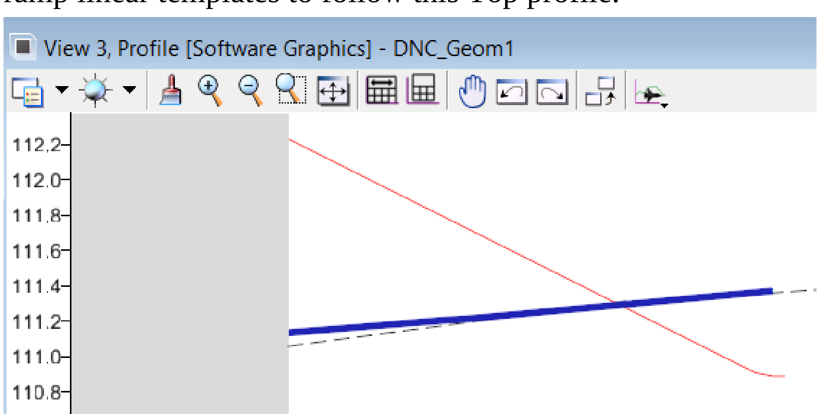
8. Select the DNC_Geom element which represents the Face of SW, choose Open Profile Model from the context menu, and data point in View 3 to open the profile model.



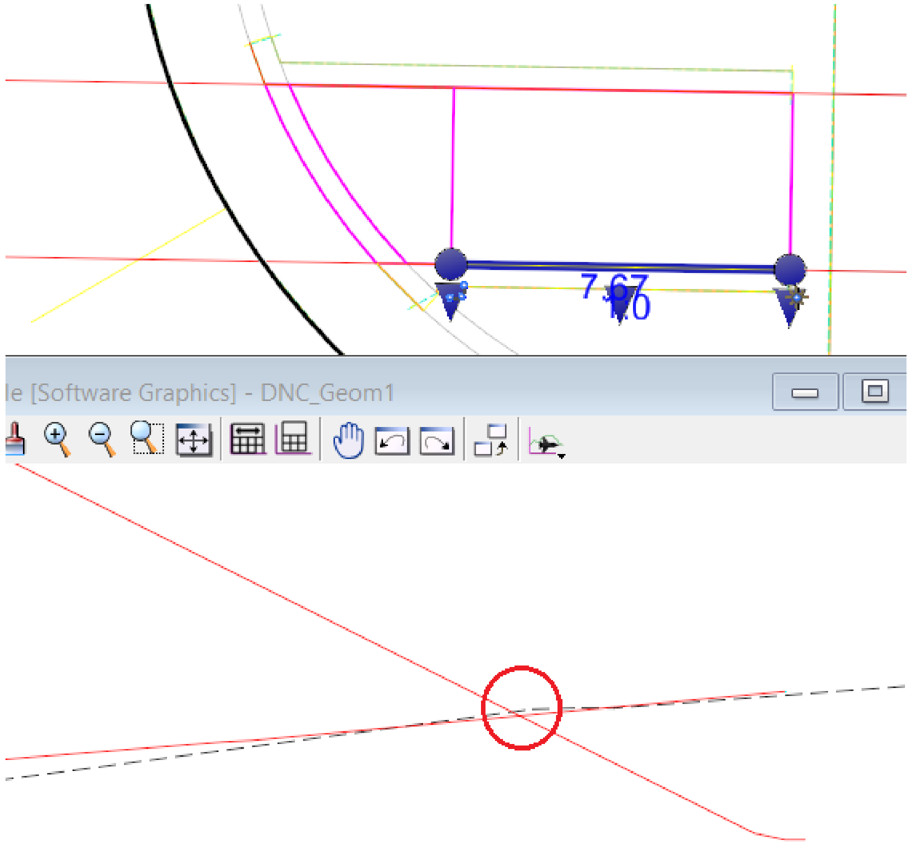
9. This element's Active Profile is shown below. Selecting the Active profile, the landing slope of 2.083% has been projected to this profile and the slope thereafter is initially set to 5%. This 5% grade represents an area that can be sloped up to 1:12 (8.33%) and can be modified as necessary to control the tie slope from the landing to the existing SW. This edit will also control the length of the Ramp.



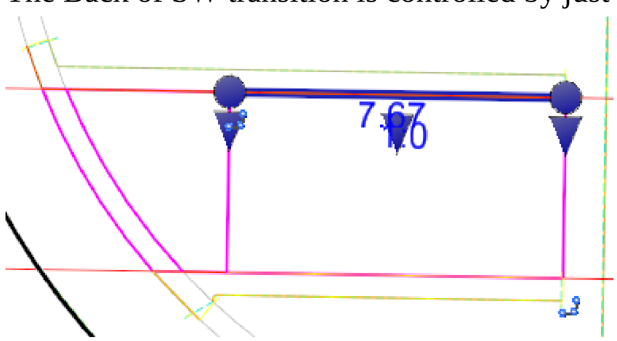
10. This element also has a profile named **Top** that represents the Back Top of Curb transition for the Back of the Ramp. Vertical Point Controls are set up in the back of ramp linear templates to follow this Top profile.



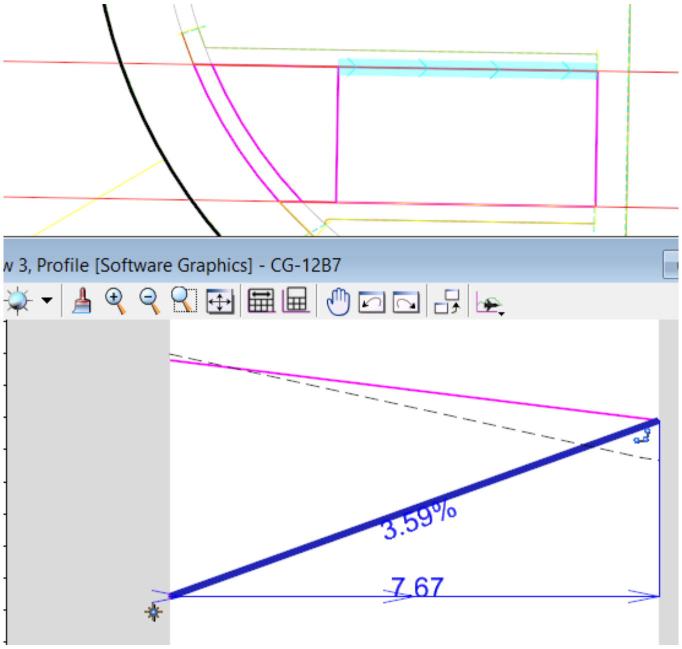
11. The length of the transition beyond the landing is controlled by snapping to the intersection of these two profiled.



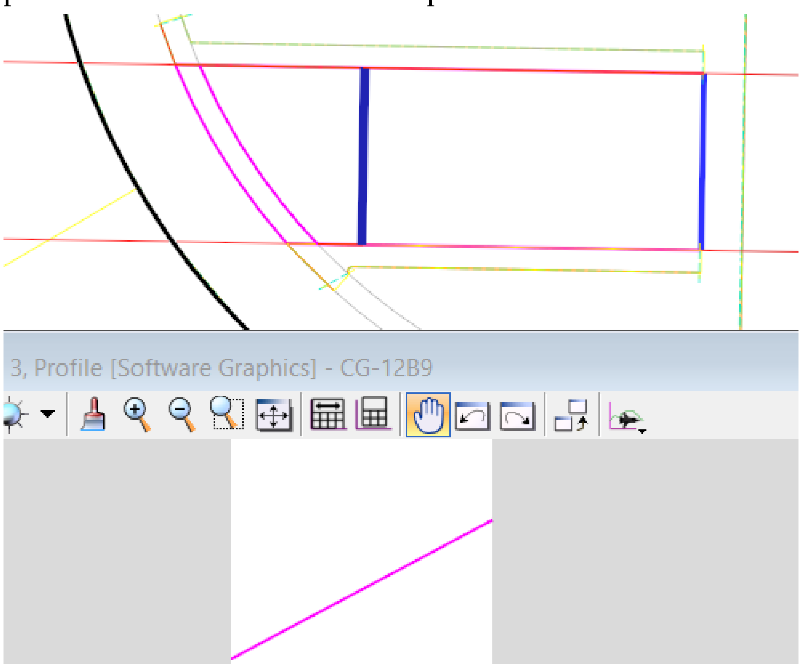
12. The Back of SW transition is controlled by just snapping to the Face of SW transition.



13. The profile view of this element should be opened and its slope should be checked to ensure it is less than 1:12.



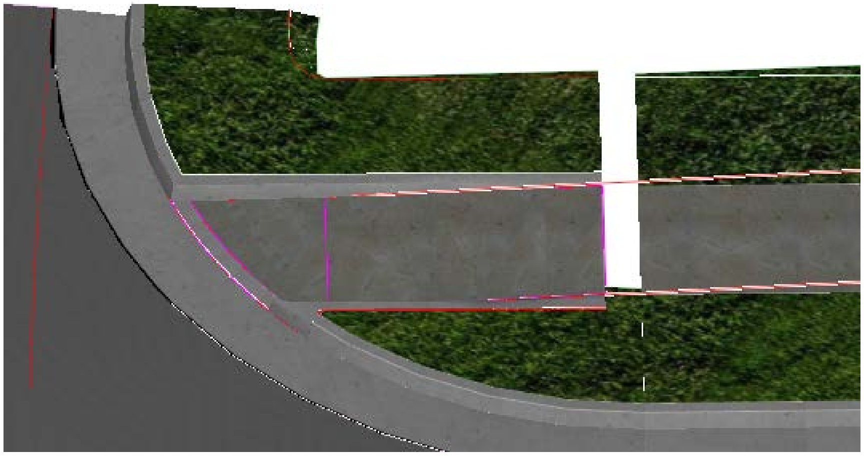
14. Profiles of the two transverse lines shown below should also be opened and their profiles checked for sidewalk slope.



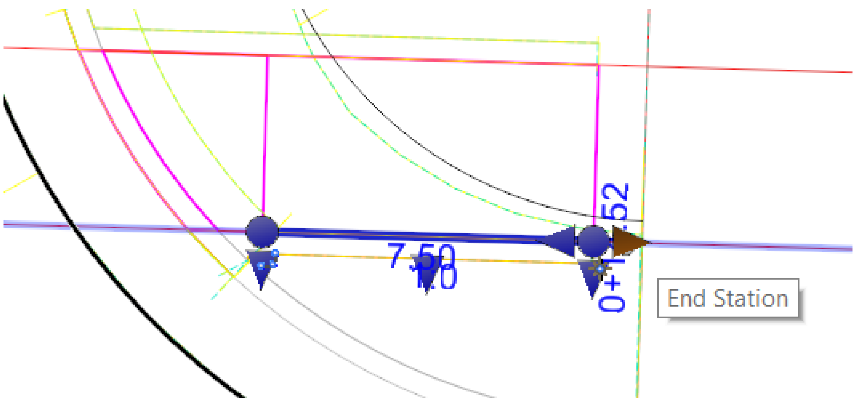
NOTE: You can draw a line on top of the profile to verify slope. Modify the landing slope of 2.08% or the initial 5% slope on the DNC_Geom_Face or Back of SW elements to adjust.

11.4.4.3 CLEANUP

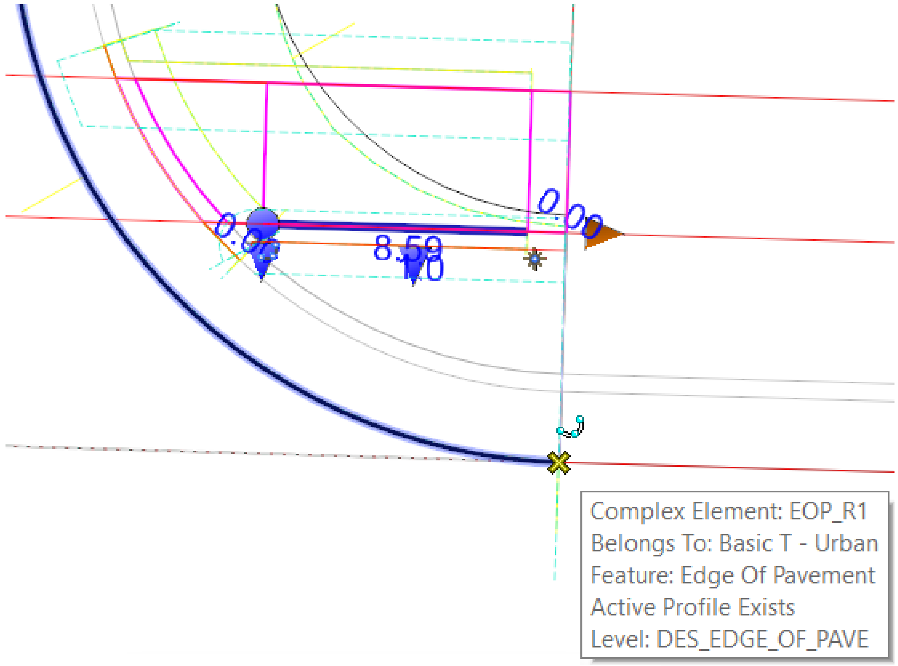
Modeling from this point forward will depend on where the SW is landing (within the curve limits or beyond the curve). In this example, we will force the cell to the PC of the curve to fill the gap shown below and then perform several additional steps to clean up the modeling around this cell.



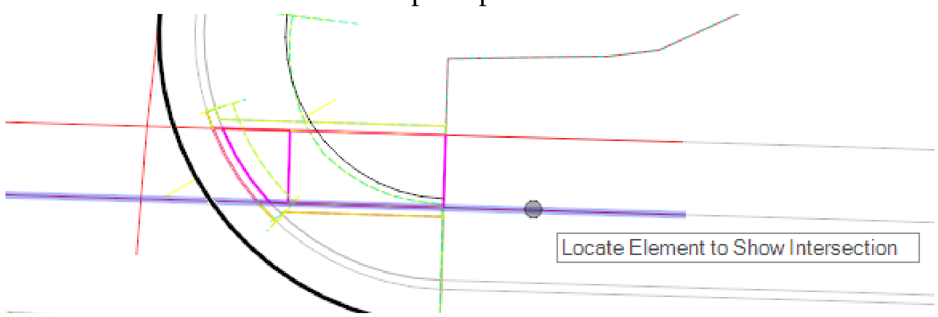
1. Select the element below and choose the **End Station** handler.



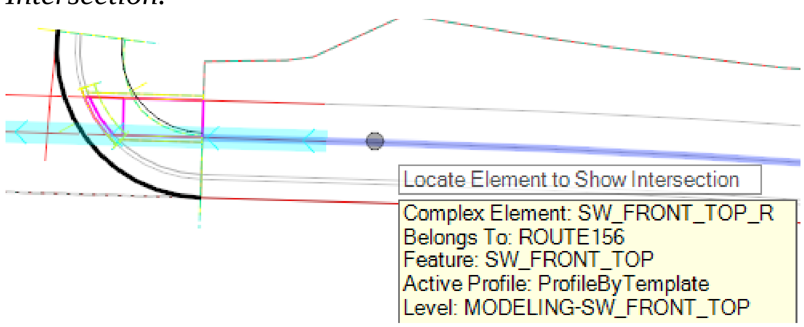
2. Snap to the Curve EoP PC for the End Station.



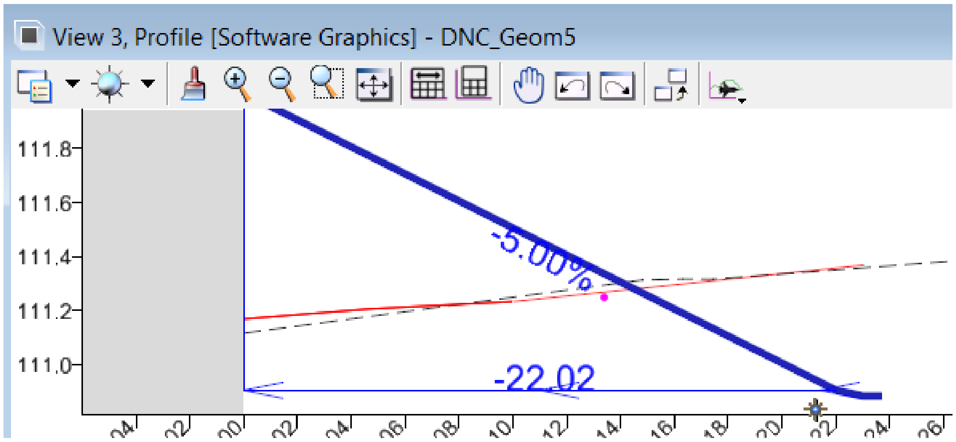
3. Rotating the 3D view, you can see the ramp does not match the elevation of the Thru Rd corridor sidewalk. We will fix this in the next few steps.
4. Open the **profile view** of the *DNC_Geom_Face* element.
5. Choose the profile command **Profile Intersection Point.**
6. Select the element below when prompted to *Locate Element to Show Intersection*

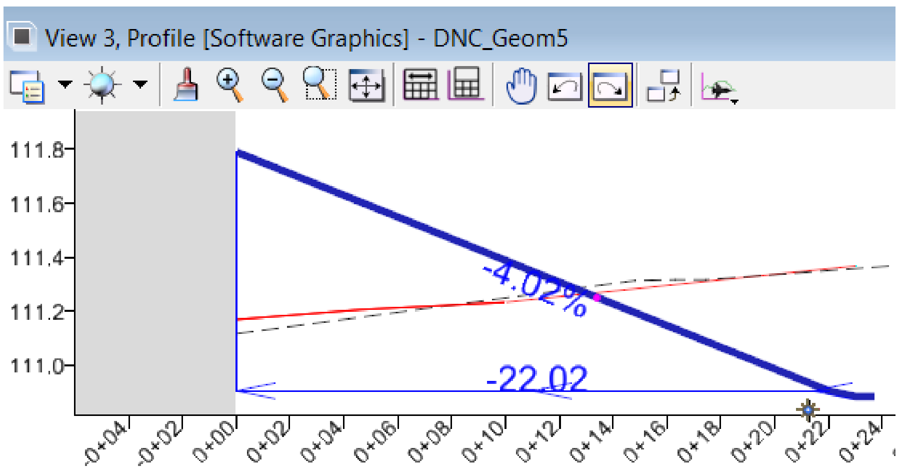


7. Select the Face of SW as shown below when prompted to *Locate Element to Show Intersection.*

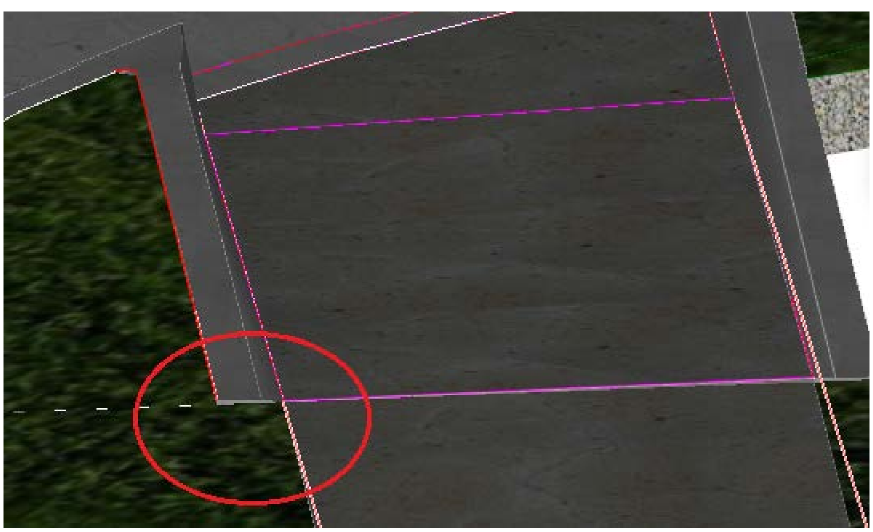


8. Modify the -5% slope so that it passes through the projected point. Change it from -5% to -4.02% in this example.





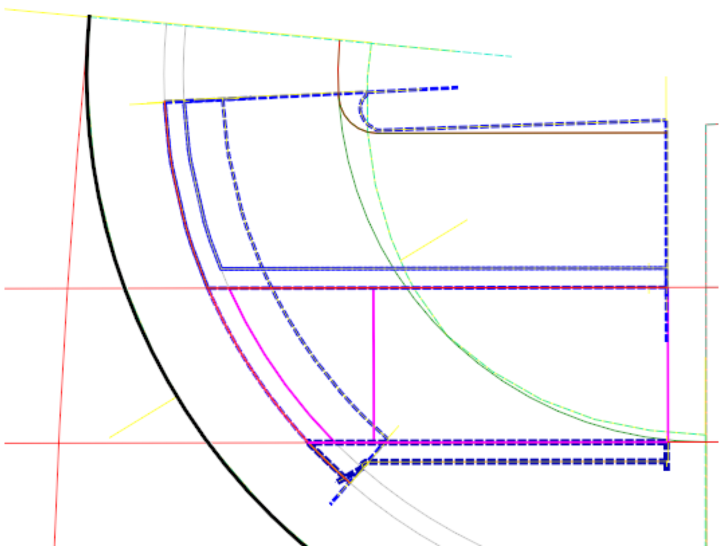
The 3d view after this edit:



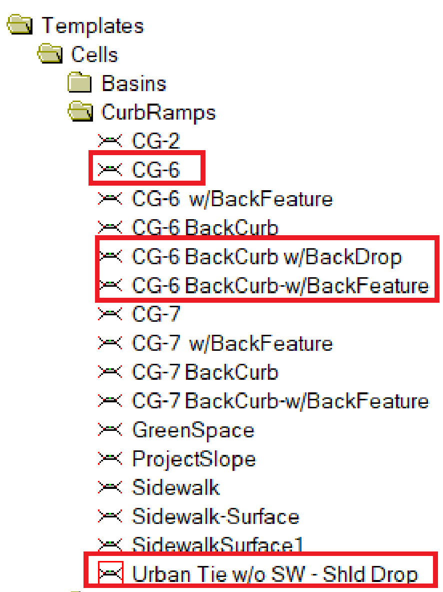
9. Perform the same process for the Back of SW.

11.4.4.4 TEMPLATES

1. There are four linear templates & one surface template in the Diagonal w/Curb Civil Cells as shown highlighted below. There are Point Controls and/or Parametric Constraints set up on all these.



2. The templates used in these linears are shown below.



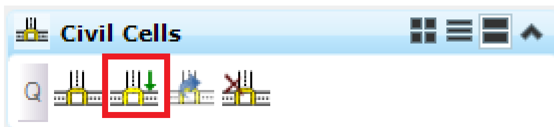
11.4.5 CELL – Type B Diagonal_L No Buffer Shift

11.4.5.1 PLACEMENT

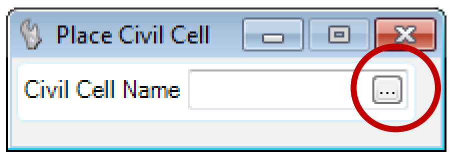
Review the direction of arrows & references in section 11.4.2 before placing the cell. Limitations would most likely be related to the length of the references along the secondary road. You need 20-25' minimum of length along the gutter-line element for all the cell's geometry to place correctly.

1. Move to the opposite side of the intersection in the file **2-lane-Urban-CurbRamp-Diagnol.dgn**

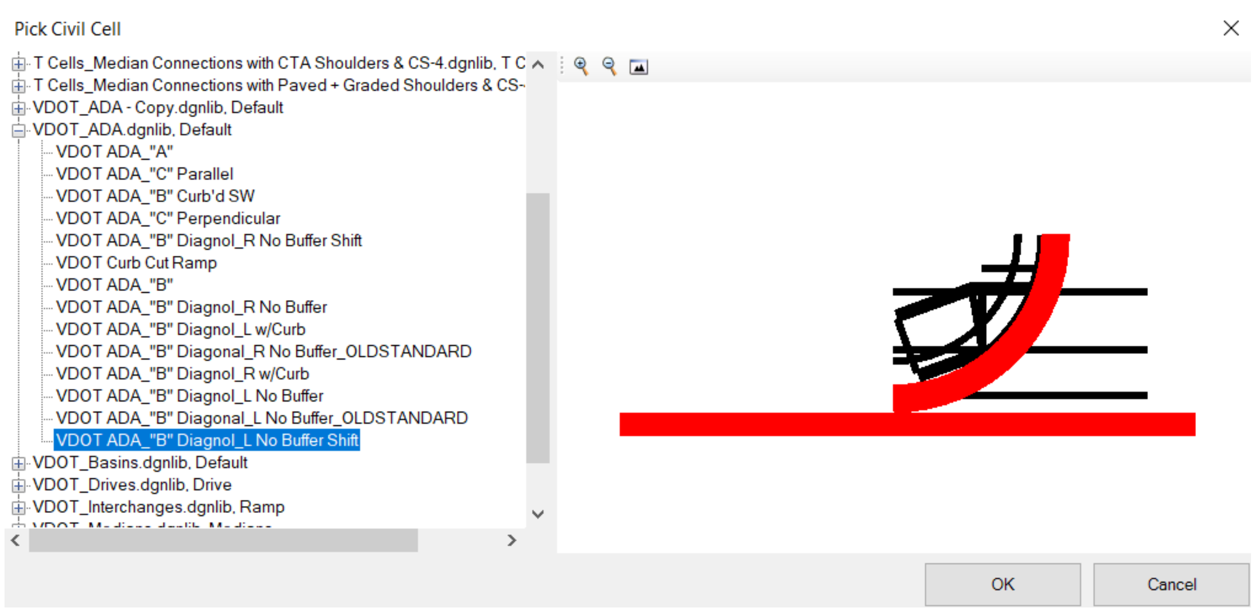
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



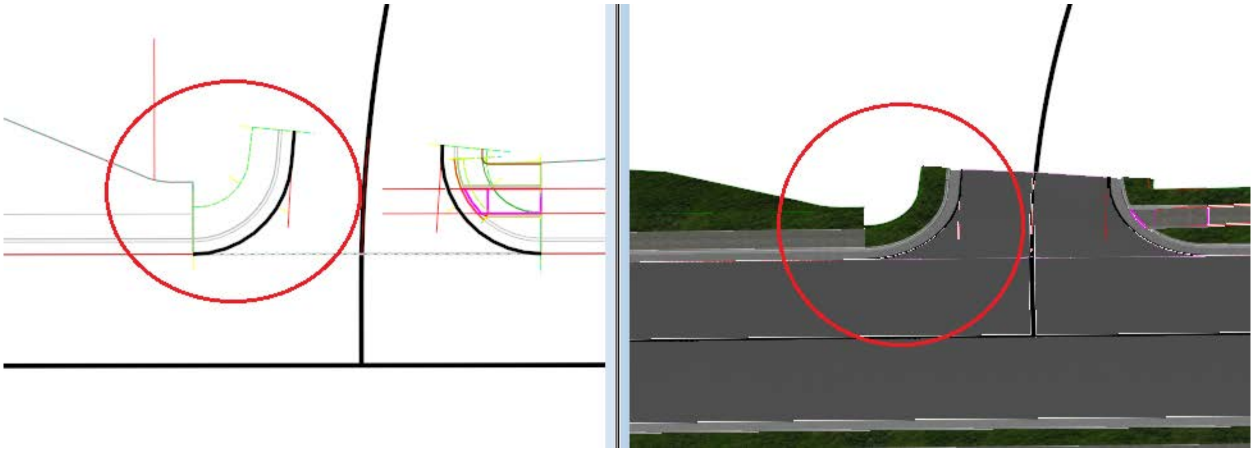
3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.



4. Select the **VDOT ADA_"B" Diagonal_L No Buffer Shift** civil cell from the **VDOT_ADA.dgnlib** folder and click **OK.**

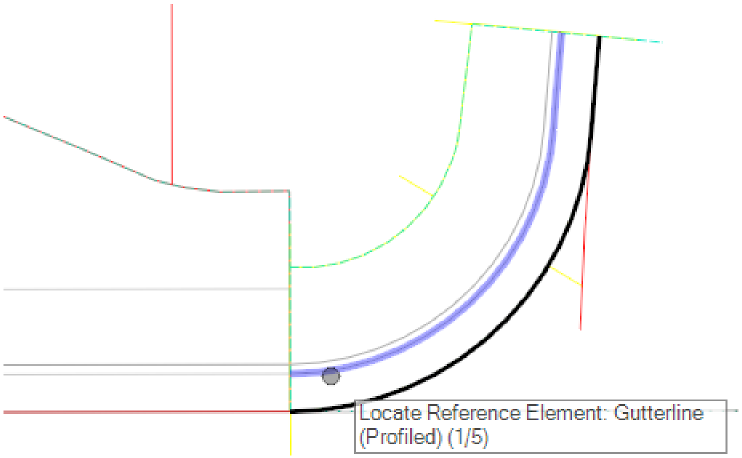


5. We will place the cell in the area circled below:

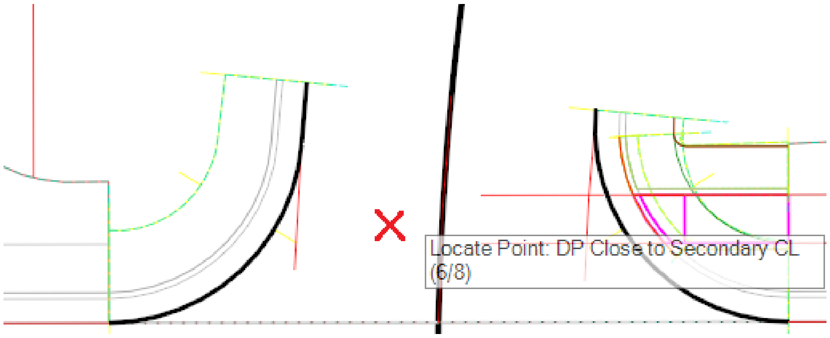


NOTE: The next five prompts may be in different order than listed in this manual.

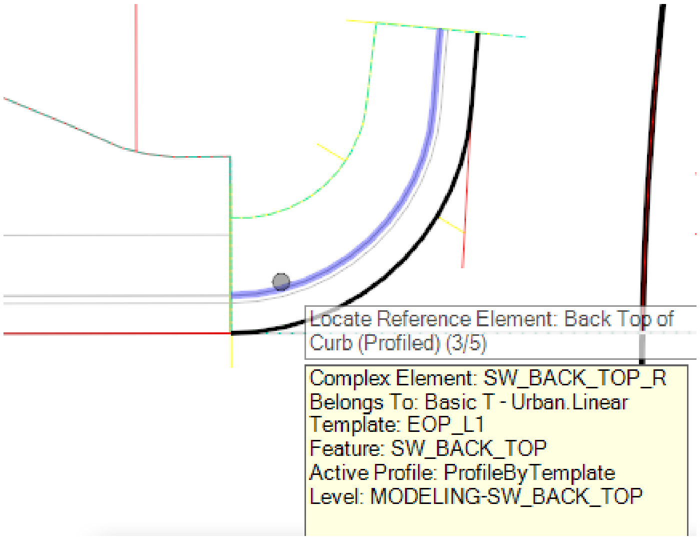
6. When prompted to *'Locate Reference Element: Gutterline (Profiled)'* select the **Curbe_Face_FL** element in View 1.



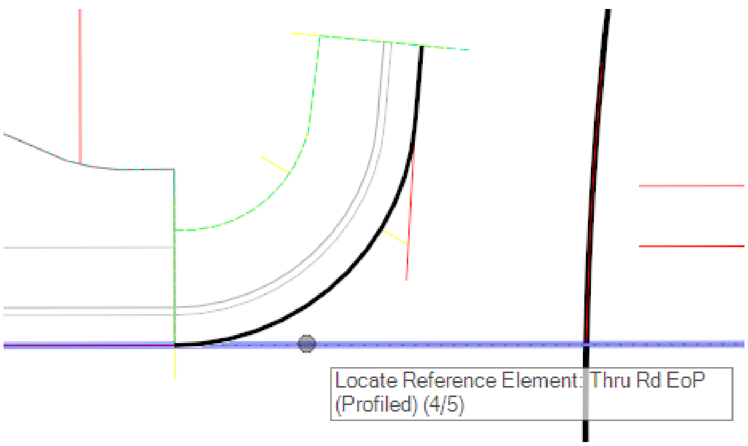
7. When prompted to *'Locate Point: DP Close to Secondary Rd CL'* Data Point close to the Secondary Rd alignment in View 1.



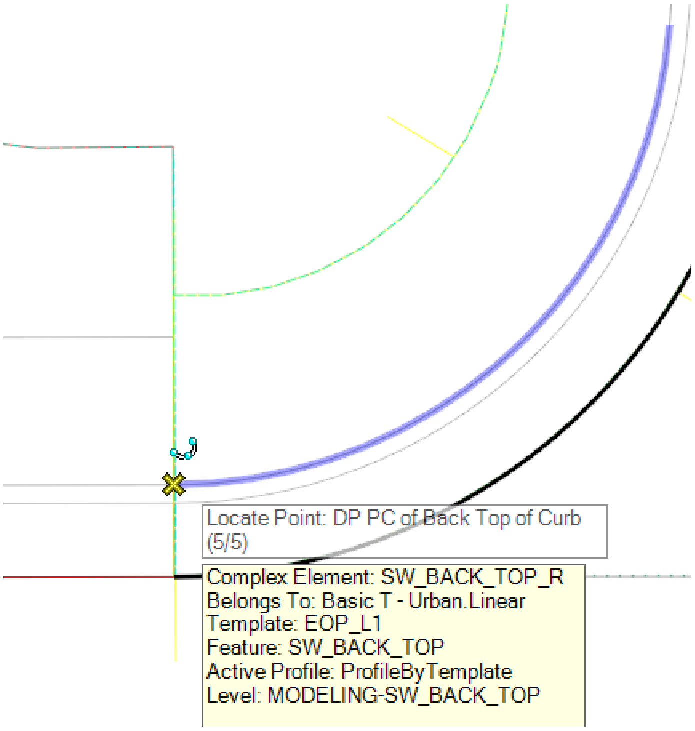
8. When prompted to *'Back Top of Curb (In Curve Area, Profiled)'*, select the **CURB_BACK_TOP_R** element in View 1.



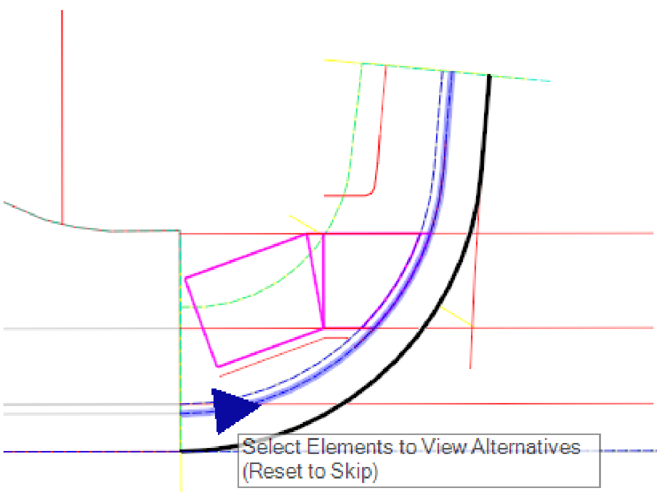
9. When prompted to *'Locate Reference Element: Thru Rd EoP, (Profiled)'* select the **Thru Rd EP** element in View 1.



10. When prompted to *'Locate Point: DP PC of Back To of Curb'* Key Point Snap & Data Point the PC of the Back Top of Curb.

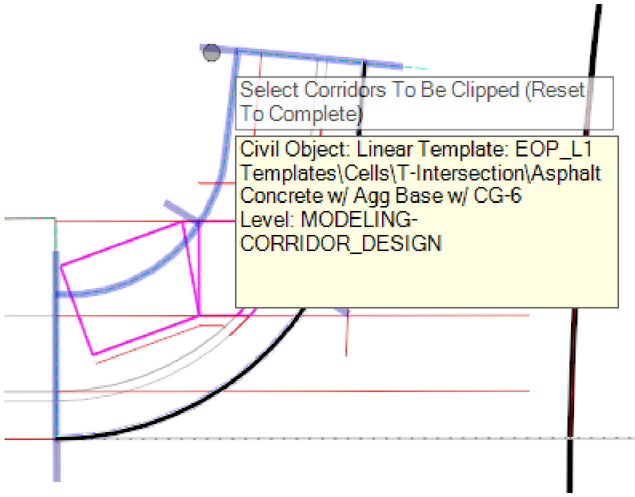


11. Observe the geometry being displayed.

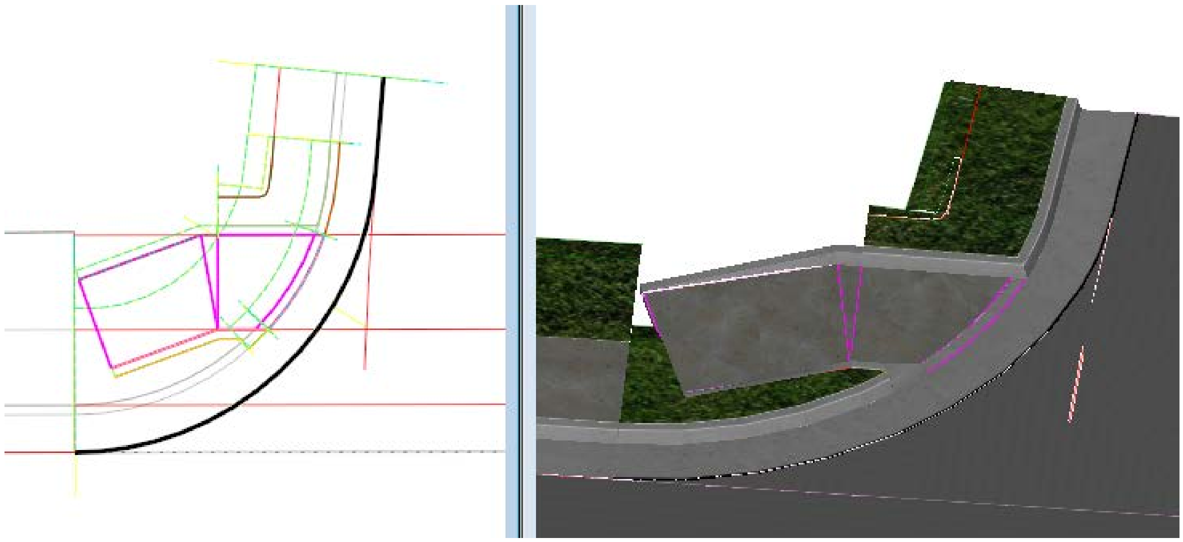


12. **Reset** when prompted to *Select Elements to View Alternates (Reset To Skip).*

13. Select the Basic T linear template when prompted to Select Corridors To Be Clipped (Reset To Complete).



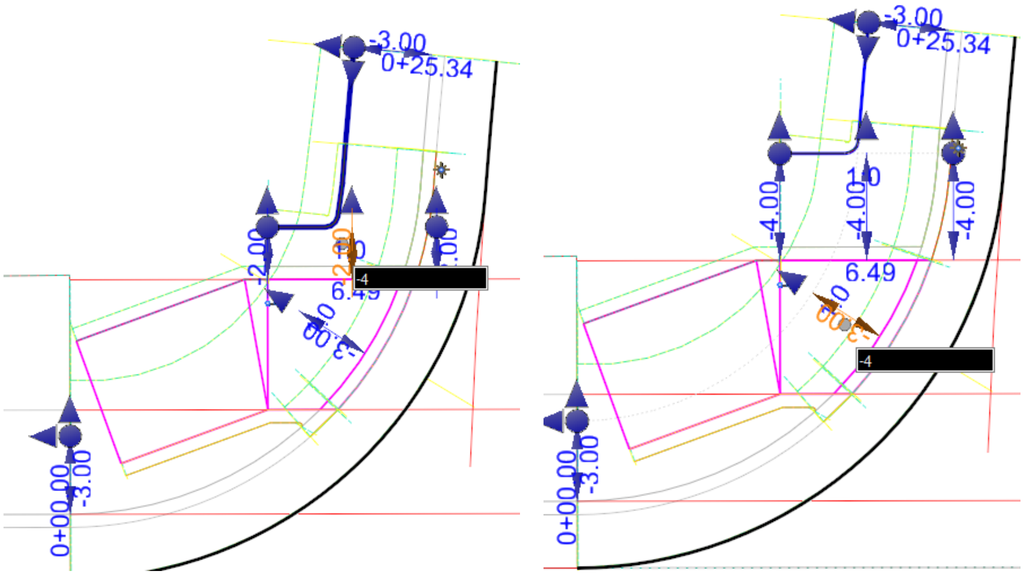
14. Reset and then Data Point to Accept the Civil Cell. The cell after placement is shown below.



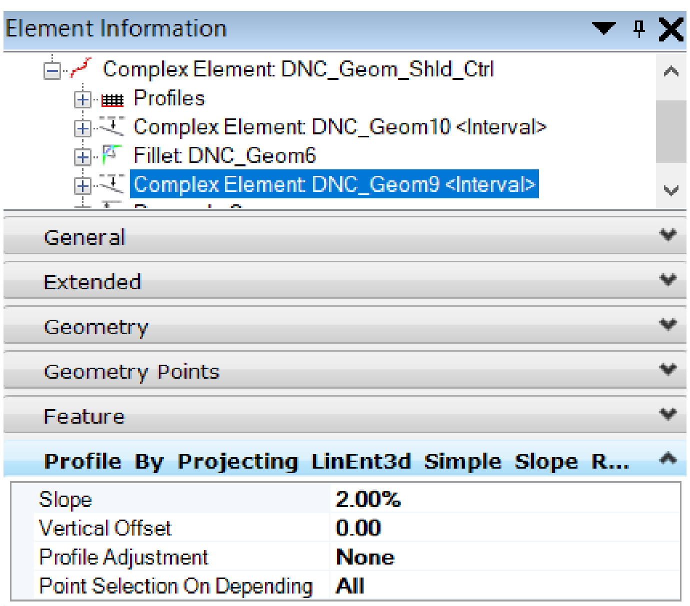
11.4.5.2 EDITS

We will not go into great detail but we will discuss a few of the key geometry elements and edits of the cell.

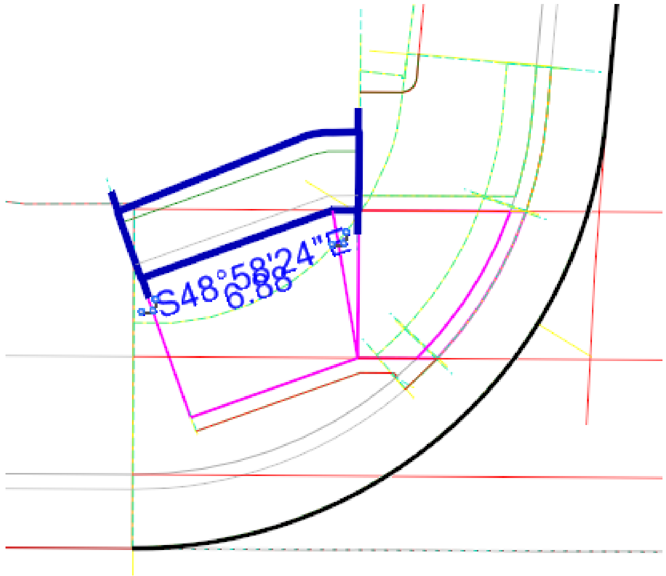
1. Select the element below to align the shoulders with the secondary road and through road shoulders. In this example, change the through road offset from -2 to -4' & change the secondary road shoulder from -3 to -4'.



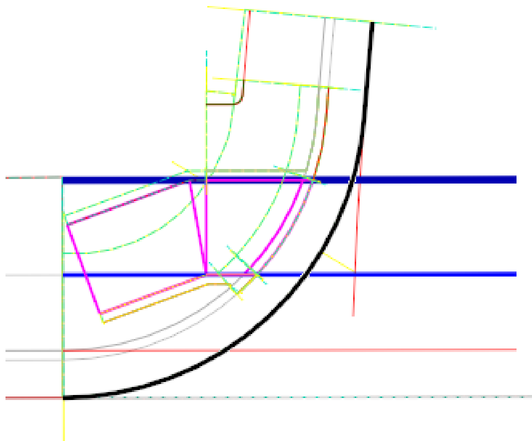
2. The profile of the shoulder is initially projected +2% and can be best edited by selecting the shoulder and modifying in MicroStation's Element Information command.



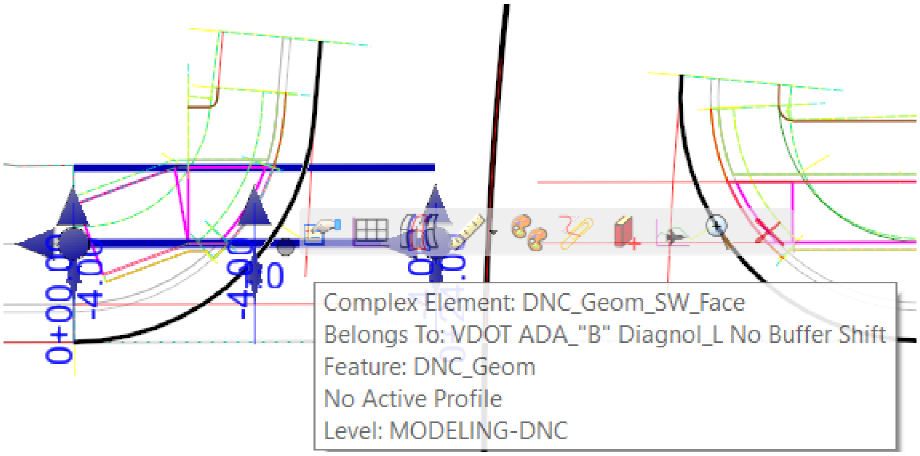
3. Choose the Corridor Objects command and select the Linear Template below.



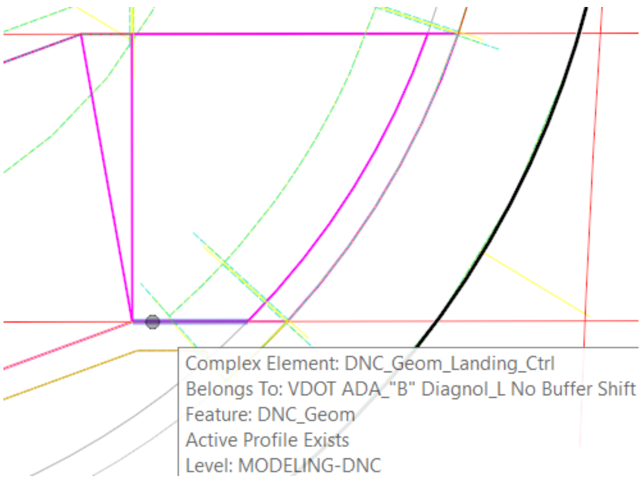
4. Add the Parametric Constraint Shld_Width_L setting its value to -3.5' aligning this shoulder with the landing area.
5. The DNC_Geom elements highlighted below (Blue Elements) are the primary horizontal control of the cell.



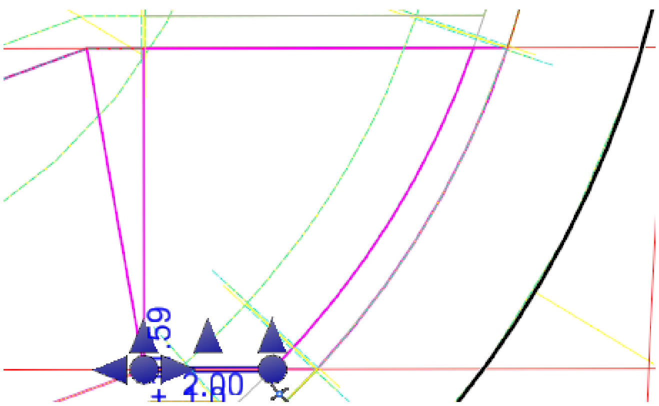
6. Selecting the **DNC_Geom_SW_Face** and you can see that it is offset -4' initially off the Thru Rd EoP. The DNC_Geom_SW_Back element is 5' from the DNC_Geom_SW_Face and represents the sidewalk width. These two values can be modified as needed.



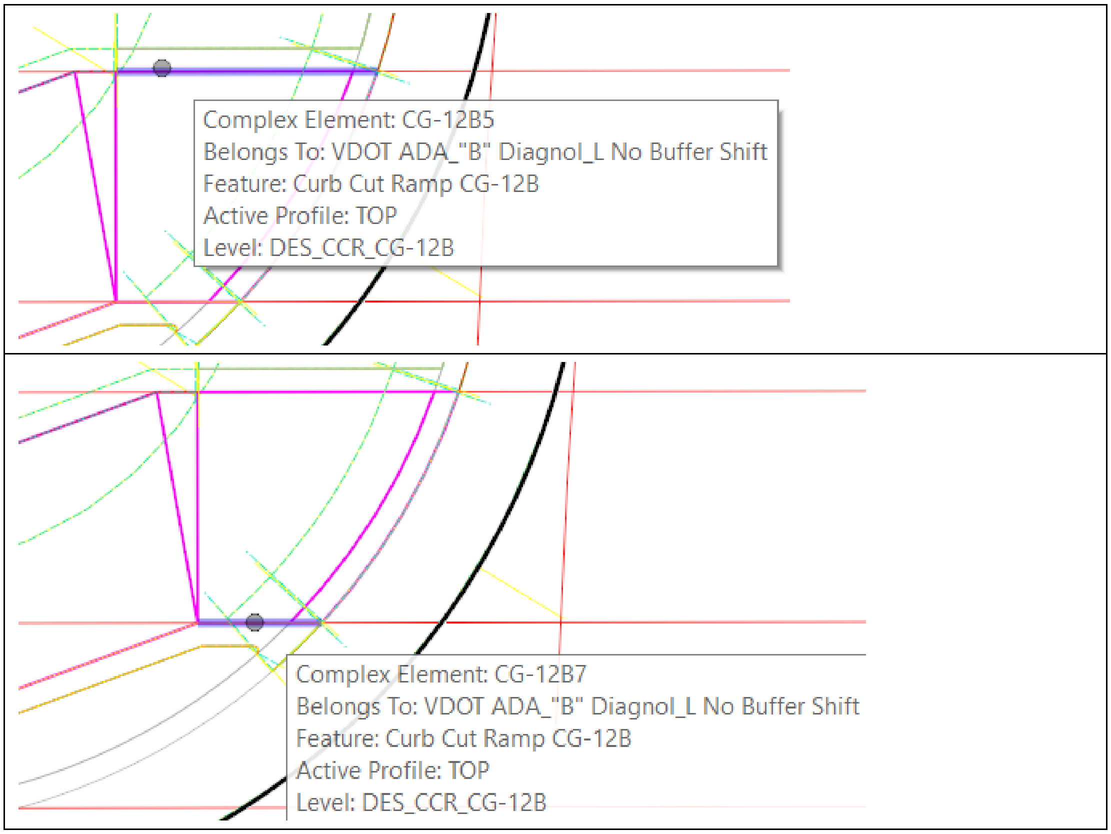
7. The Landing length can be controlled by editing the element below.



This Landing Control is initially set to 2' off the Back Top of Curb but can be edited as needed.

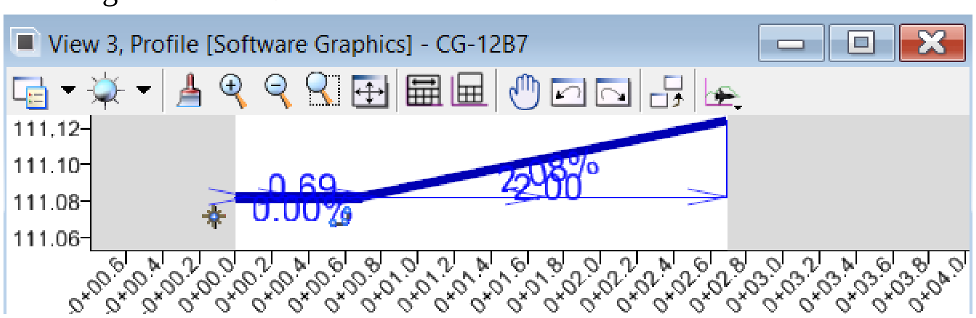


8. The Landing Vertical is controlled by the two elements highlighted below.

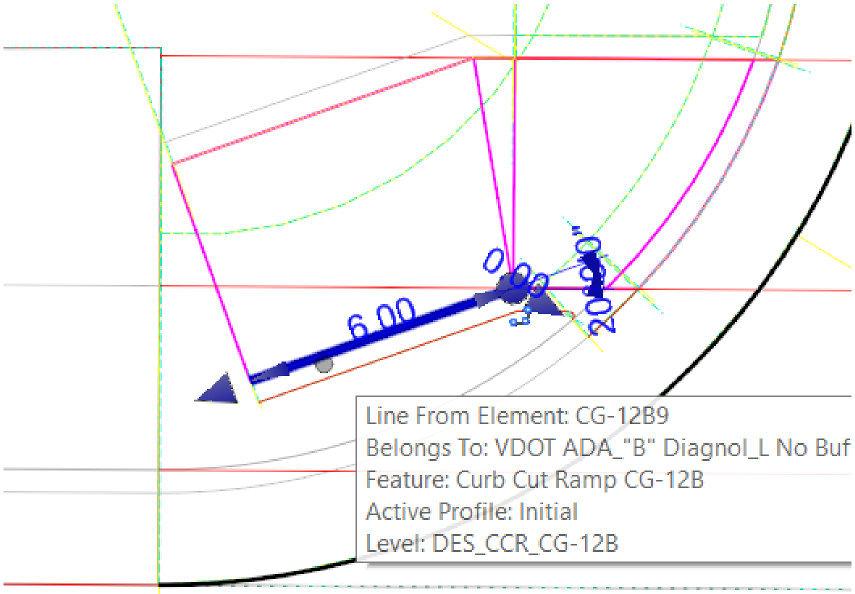


NOTE: These elements length is controlled with snaps to the 2' Landing Control element discussed in item 5 above.

9. Opening the profile view of the element shown in the 2nd image above and then selecting the Active profile, you can see below that the landing slope is initially set to 1:48 (2.08%). This slope can be modified as needed for the landing slope but 1:48 is the design maximum.



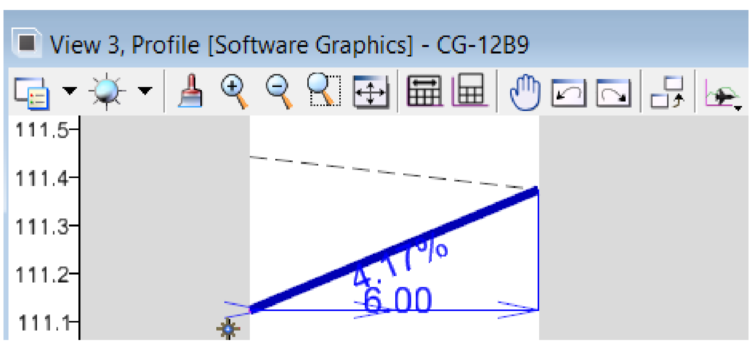
10. Select the element below.



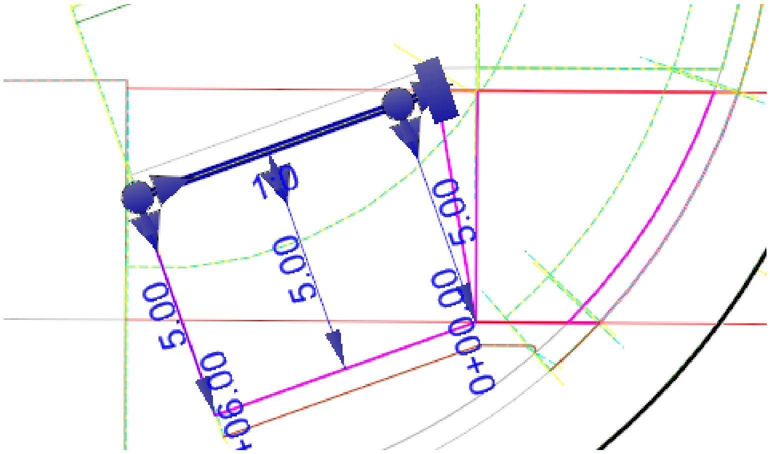
This is the primary element controlling the horizontal & vertical geometry of the ramp beyond the landing. It's initial values of 6' & 20 degrees skew can be modified as needed.

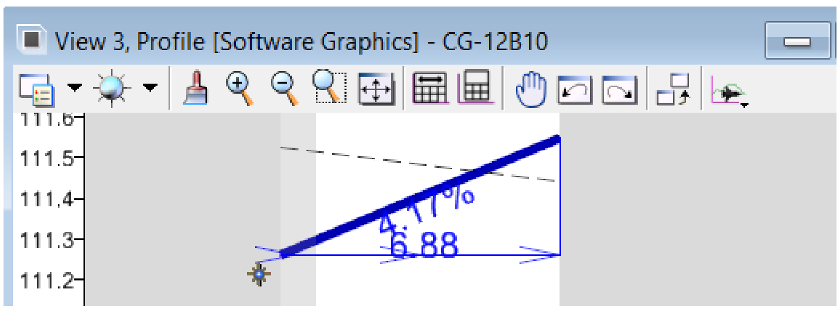
NOTE: We will extend this element in the Cleanup section (11.4.5.3).

11. Open the profile view of this element. The profile is initially drawn 1:24 (4.17%) off the landing but can be adjusted as needed up to its maximum allowed value of 1:12 (8.333%). Depending on where the ramp will tie, you may also want to project a slope off the Back Top of Curb to see where it needs to tie vertically to the adjoining SW.

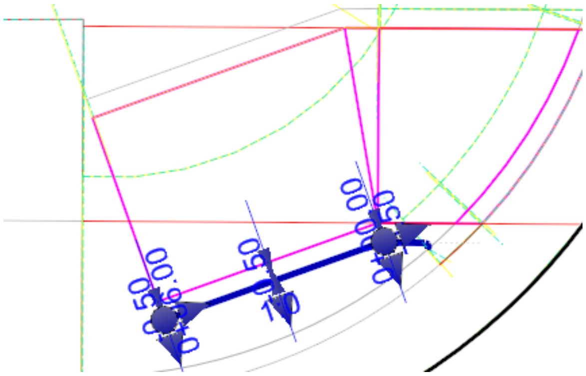


12. The SW width in the area beyond the landing can be modified by selecting the element below. It's vertical is initially set to 1:24 (4.17%) and can be modified as needed by opening its profile view and heads up editing the slope.

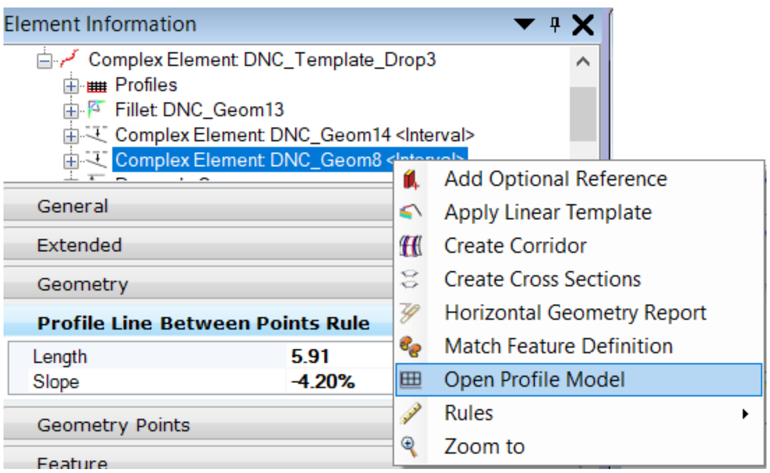




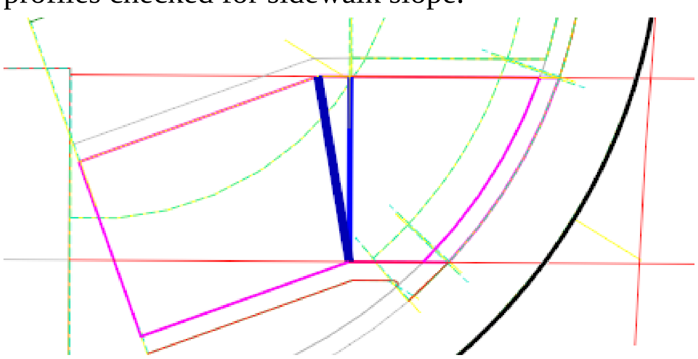
13. The following element is constructed as the Back Top of Curb and can be edited Horizontally & Vertically for different types of Curb.



It is ideal to access the vertical elements of this complex through Element Information to modify the profile.



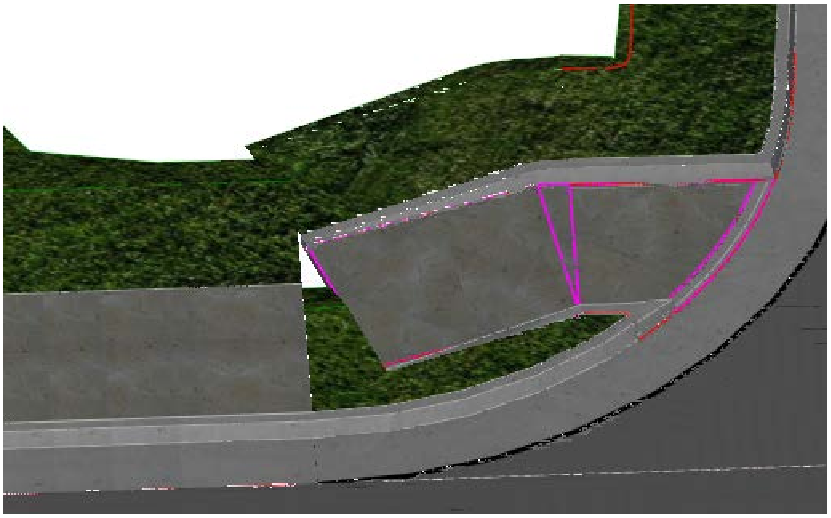
14. Profiles of the two transverse lines shown below should also be opened and their profiles checked for sidewalk slope.



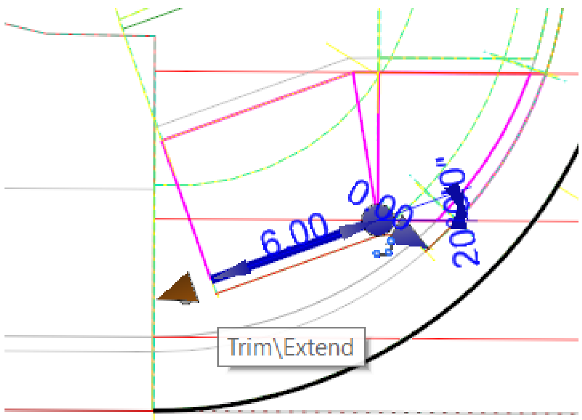
NOTE: You can draw a line on top of the profile to verify slope. Modify the landing slope of 2.08% or the initial 4.17% slope on the SW elements beyond the landing to adjust.

11.4.5.3 CLEANUP

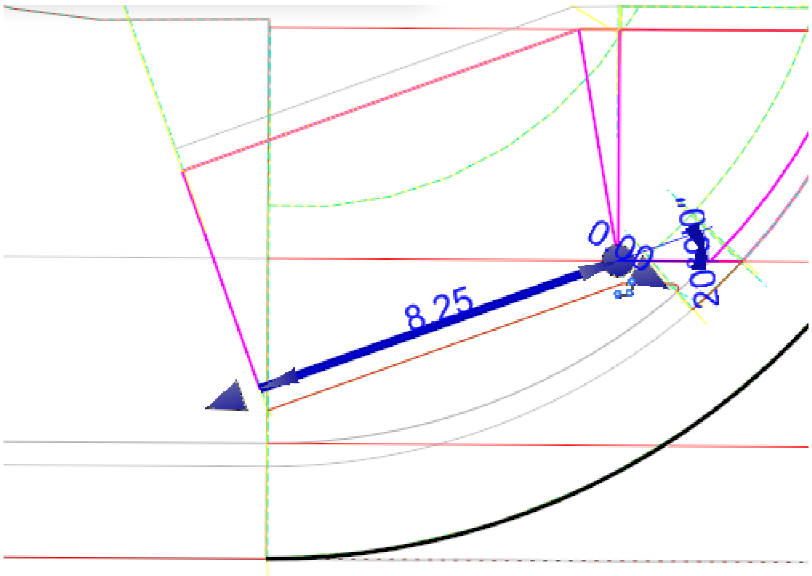
Modeling from this point forward can be variable based on project conditions and design preference so the steps below may not be used exactly as demonstrated in every case.



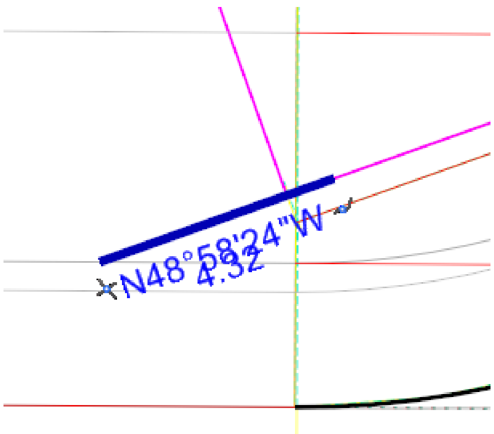
1. Select the element below and choose **Trim\Extend Station** handler.



2. Extend this element just past the Basic T PC. Change the value of 6' to 8.25'.

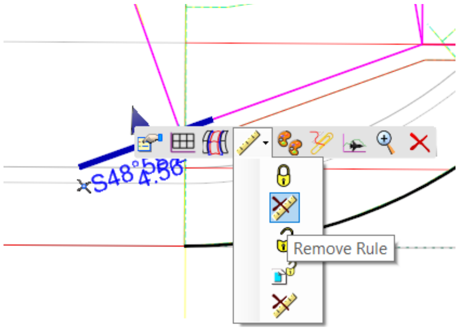


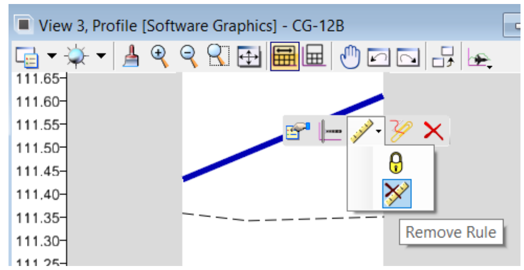
3. Use the Horizontal Geometry command Line Between Points command to place a line between a Near Snap of the line discussed in the step above (just inside the PC of the Basic T intersection PC) and to an intersection of this line and the Face of SW.



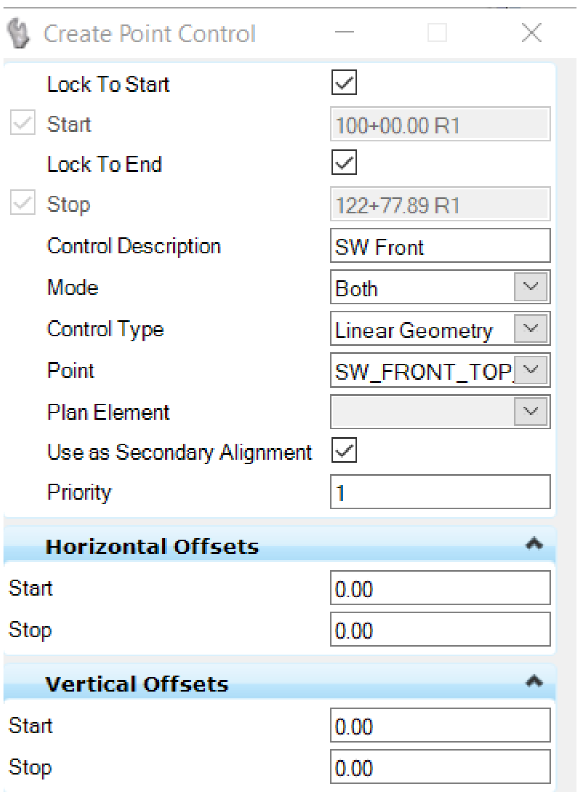
NOTE: You can use **Create 3D Automatically** command available on the *Feature Definition Toggle Bar* to automatically profile this element. If it is used, turn it off after line placement. If not used, profile after placement using vertical geometry commands as needed.

4. Before we can add a point control, remove the rules of the line just placed and its profile. This is done due to a circular dependency error when we try to add a point control in the next step.





5. Add a Point Control to the ROUTE156 Corridor targeting the line just placed.



Create Point Control

Lock To Start	☑
Start	100+00.00 R1
Lock To End	☑
Stop	122+77.89 R1
Control Description	SW Front
Mode	Both
Control Type	Linear Geometry
Point	SW_FRONT_TOP
Plan Element	
Use as Secondary Alignment	☑
Priority	1

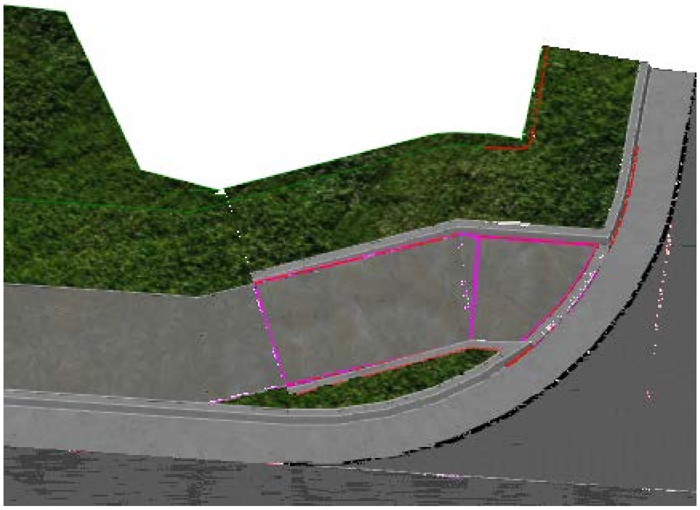
Horizontal Offsets

Start	0.00
Stop	0.00

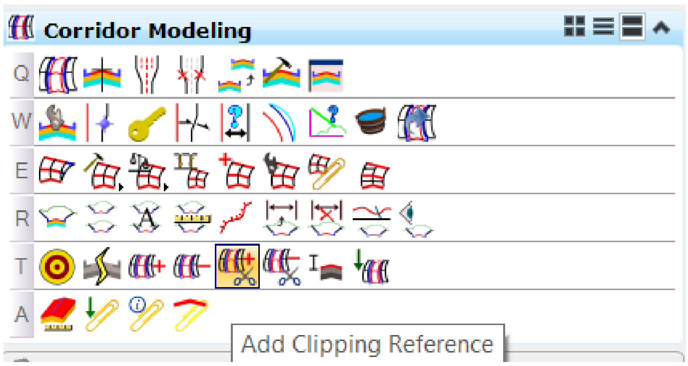
Vertical Offsets

Start	0.00
Stop	0.00

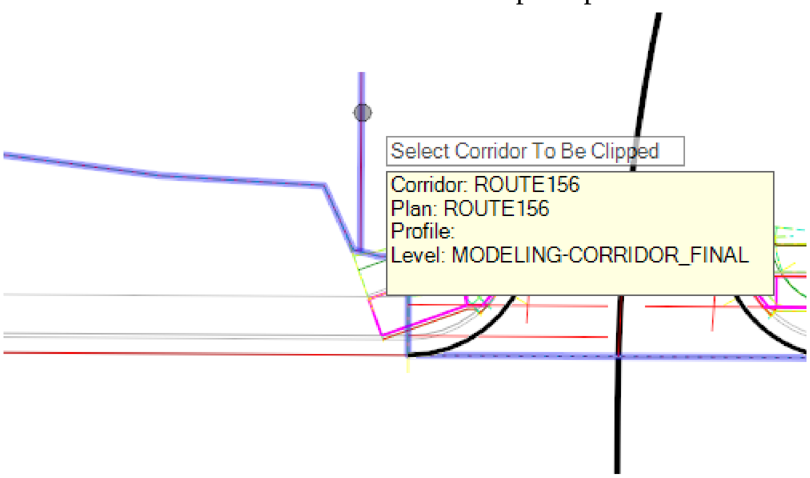
6. The cell at this point:



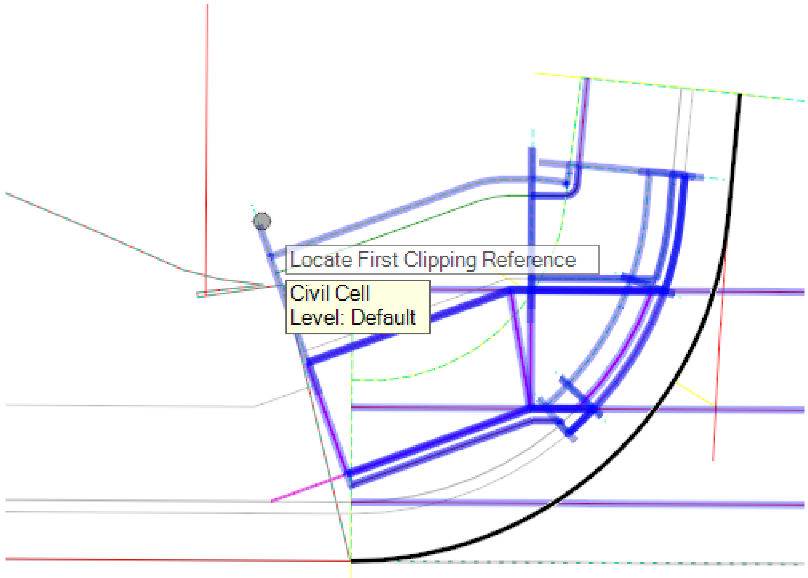
7. Choose the **Corridor Modeling -> Add Clipping Reference** command.



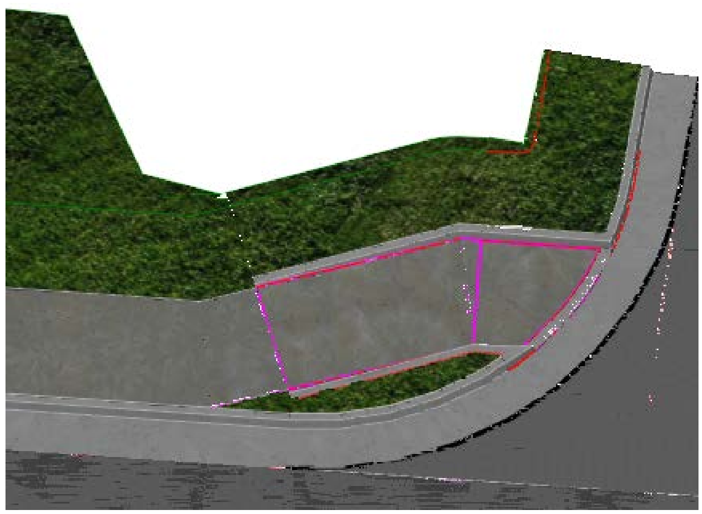
8. Select the **ROUTE156 Corridor** when prompted to *Select Corridor To Be Clipped.*



9. Locate the Ramp Civil Cell when prompted to *Locate First Clipping Reference.*

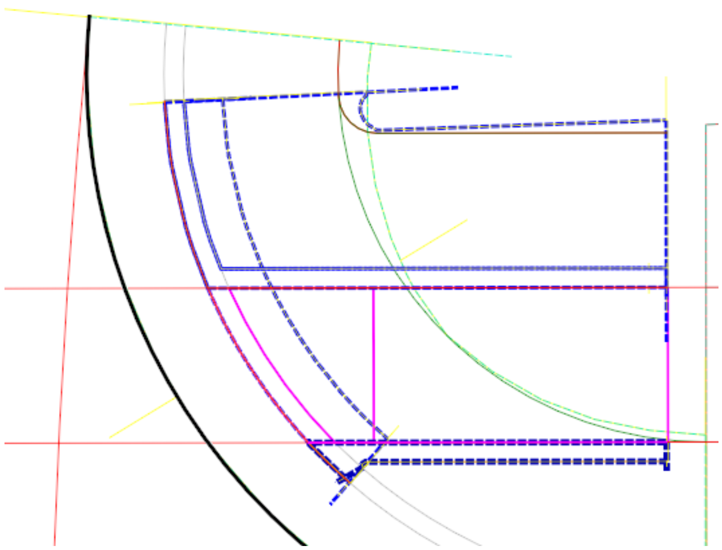


10. The finished modeling:

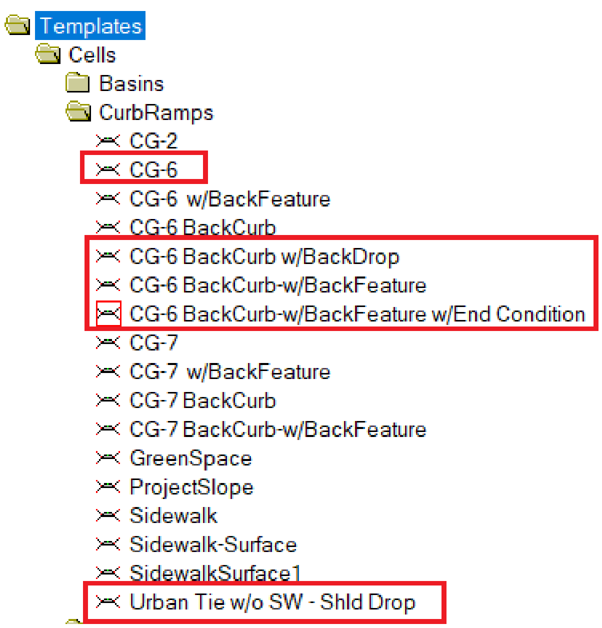


11.4.5.4 TEMPLATES

1. There are six linear templates & one surface template in the Diagonal w/Curb Civil Cells as shown highlighted below. There are Point Controls and/or Parametric Constraints set up on all these.



2. The templates used in these linears are shown below.



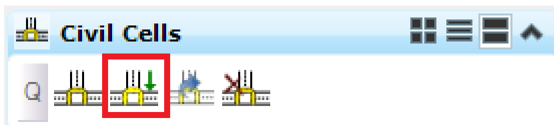
11.4.6 CELL – Type B Diagonal_L No Buffer

11.4.6.1 PLACEMENT

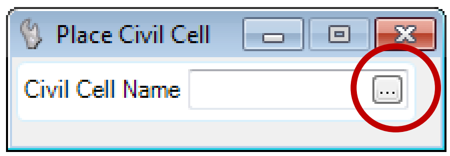
Review the direction of arrows & references in section 11.4.2 before placing the cell. Limitations would most likely be related to the length of the references along the secondary road. You need 20-25' minimum of length along the gutter-line element for all the cell's geometry to place correctly.

1. Delete the cell previously placed in the file **2-lane-Urban-CurbRamp-Diagnol.dgn**

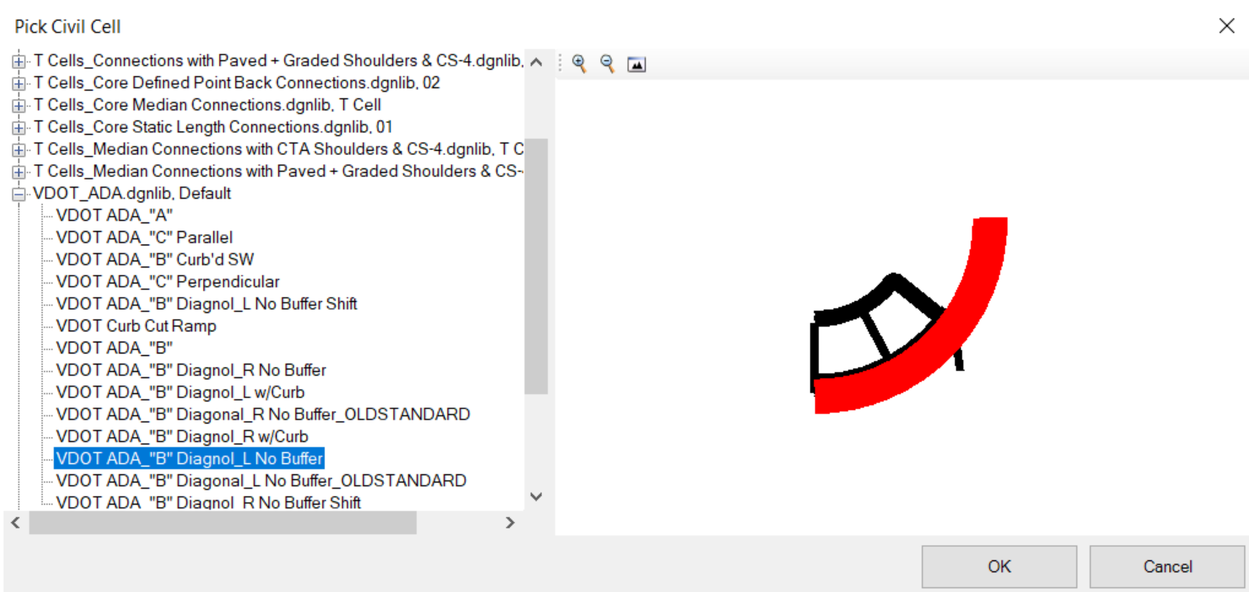
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



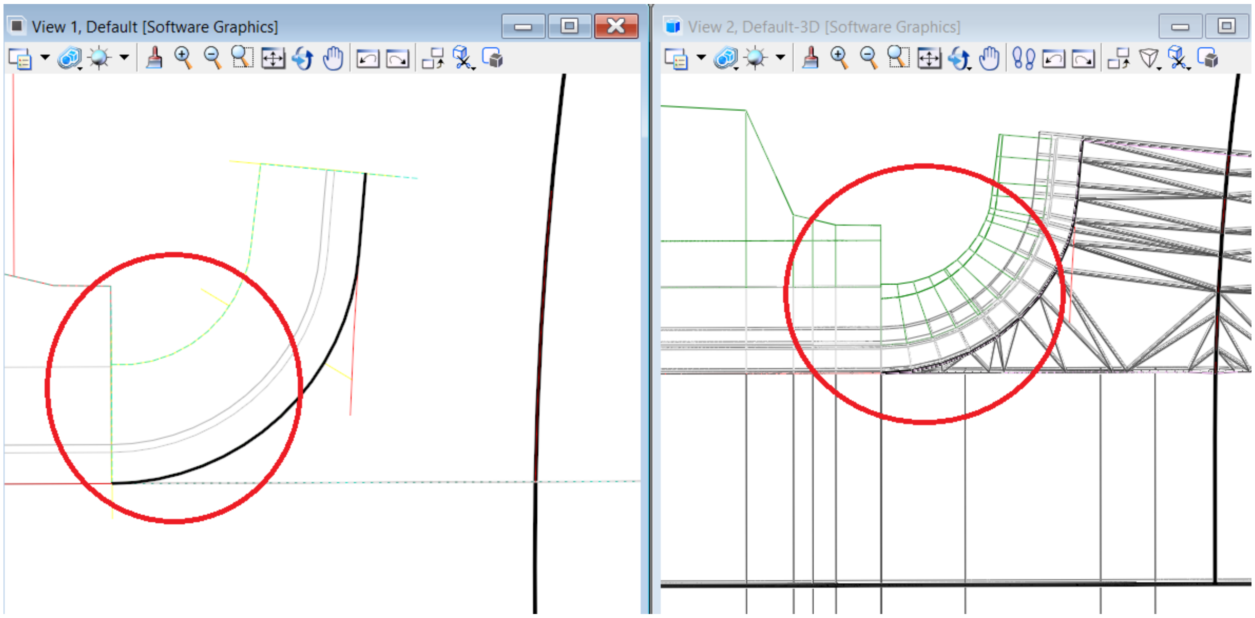
3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.



4. Select the **VDOT ADA_"B" Diagonal_L No Buffer** civil cell from the **VDOT_ADA.dgnlib** folder and click **OK.**

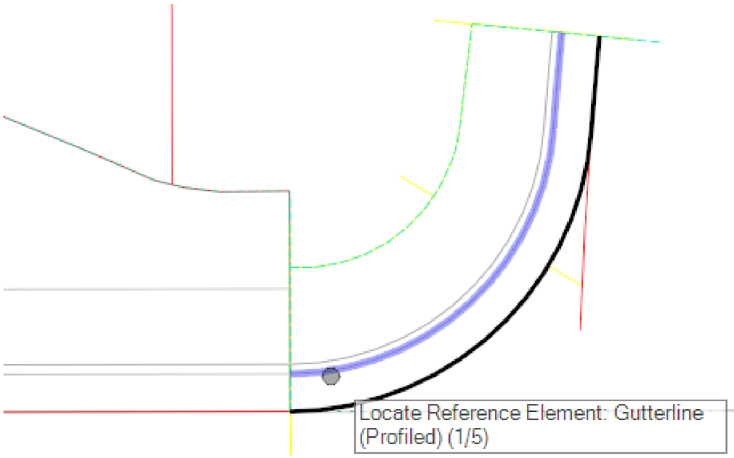


5. We will place the cell in the area circled below:

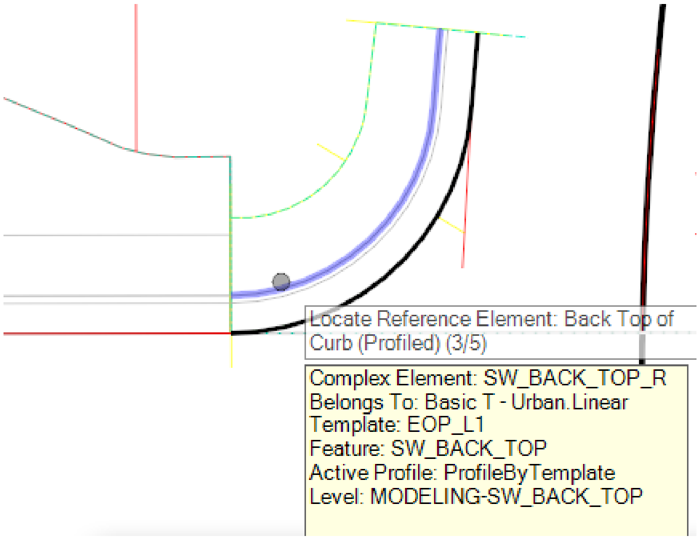


NOTE: The next three prompts may be in different order than listed in this manual.

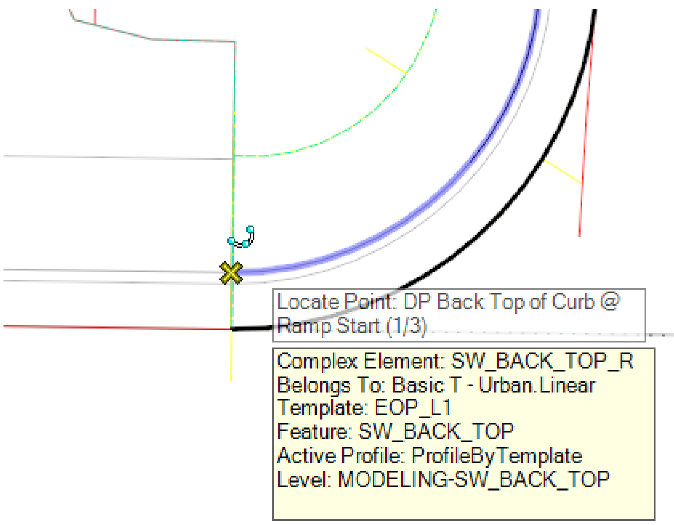
6. When prompted to *'Locate Reference Element: Gutterline (Profiled)'* select the **Curbe_Face_FL** element in View 1.



7. When prompted to *'Back Top of Curb (In Curve Area, Profiled)'*, select the **CURB_BACK_TOP_R** element in View 1.



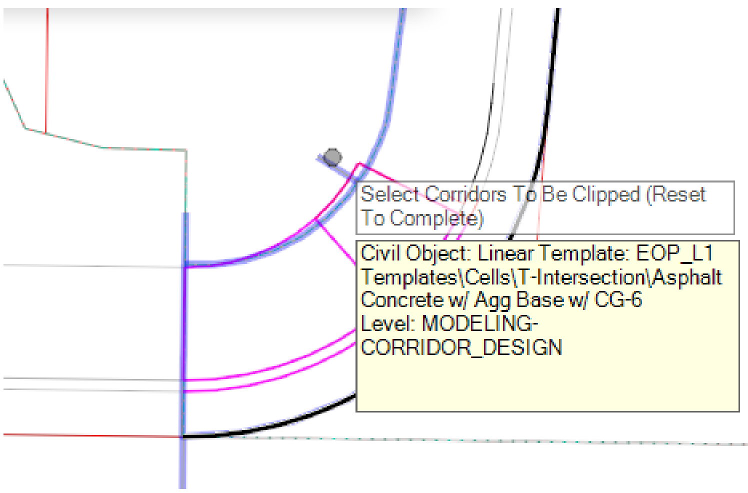
8. When prompted to *'Locate Point: DP Back Top of Curb @ Ramp Start'* Key Point Snap & Data Point the PC of the Back Top of Curb.



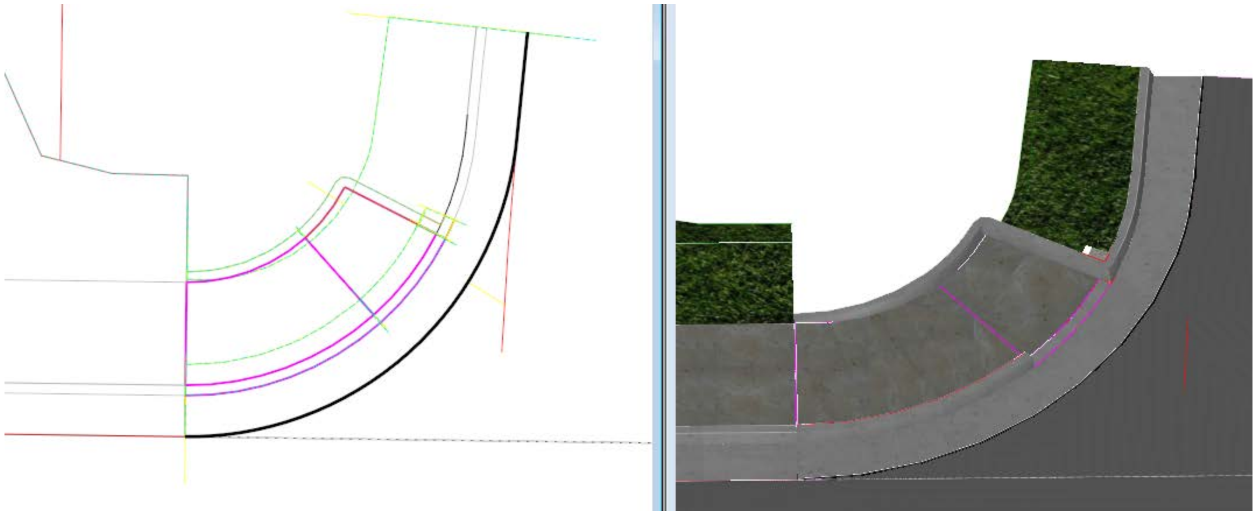
9. Observe the geometry being displayed.

10. **Reset** when prompted to *Select Elements to View Alternates (Reset To Skip).*

11. Select the Basic T linear template when prompted to Select Corridors To Be Clipped (Reset To Complete).



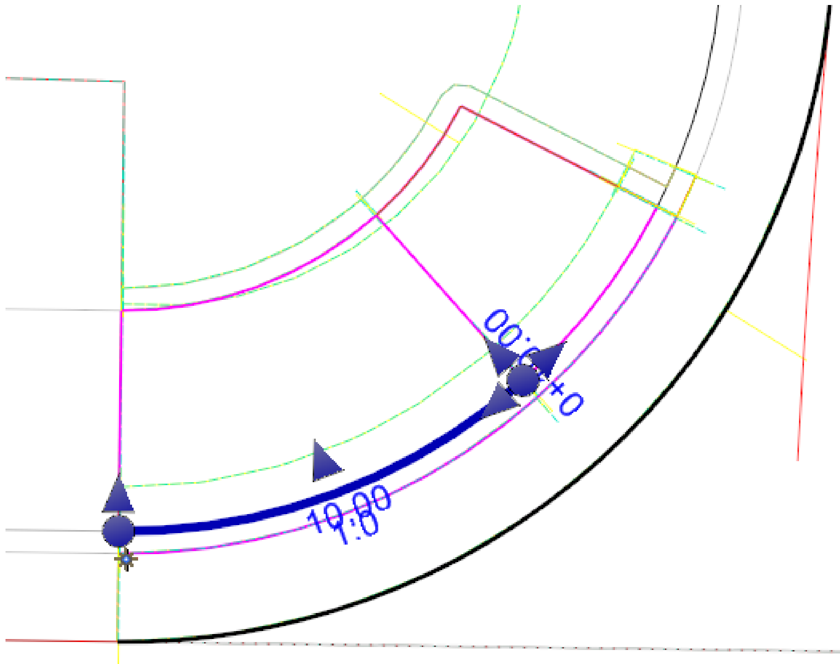
12. Reset and then Data Point to Accept the Civil Cell. The cell after placement is shown below.



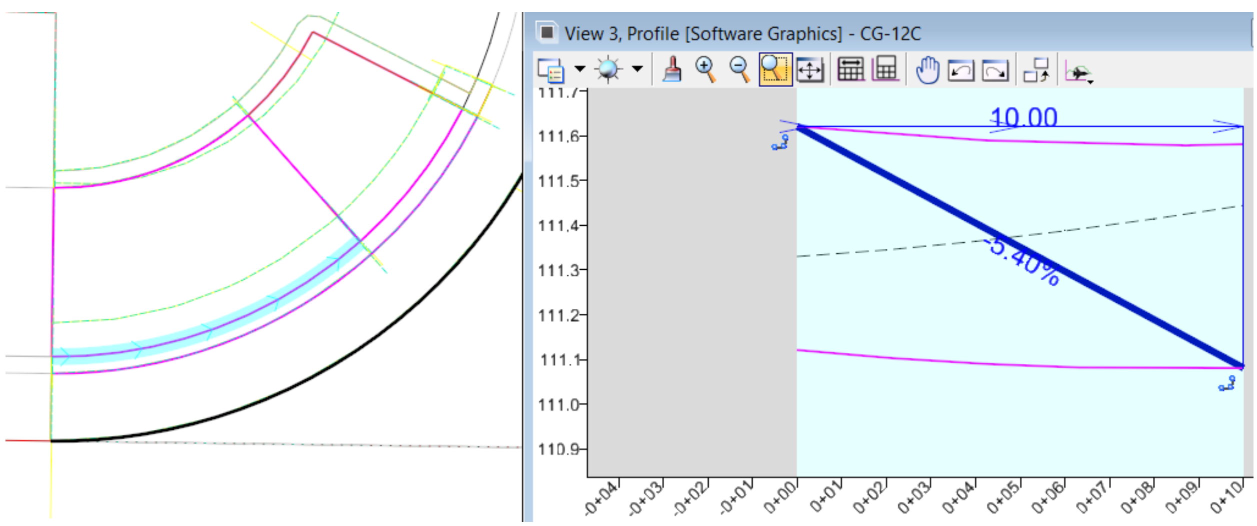
11.4.6.2 EDITS

We will not go into great detail but we will discuss a few of the key geometry elements and edits of the cell.

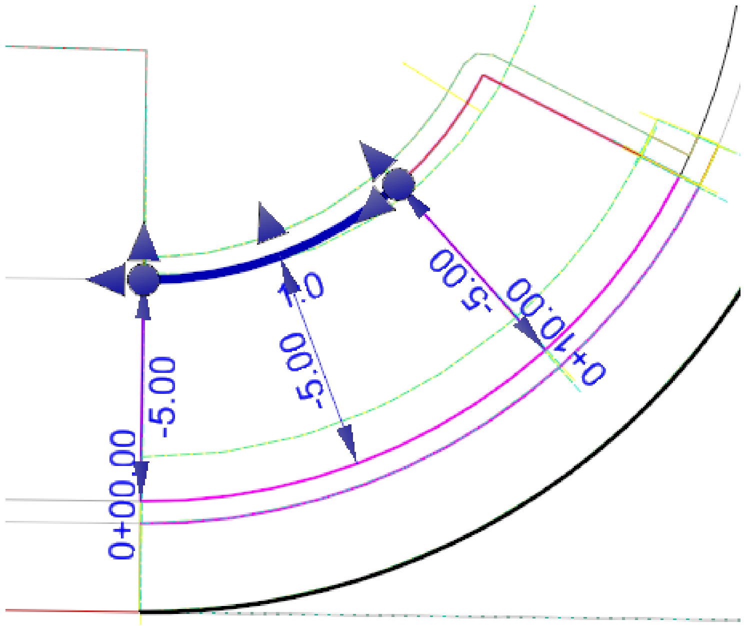
1. The length of the ramp beyond the landing is controlled with the element below.



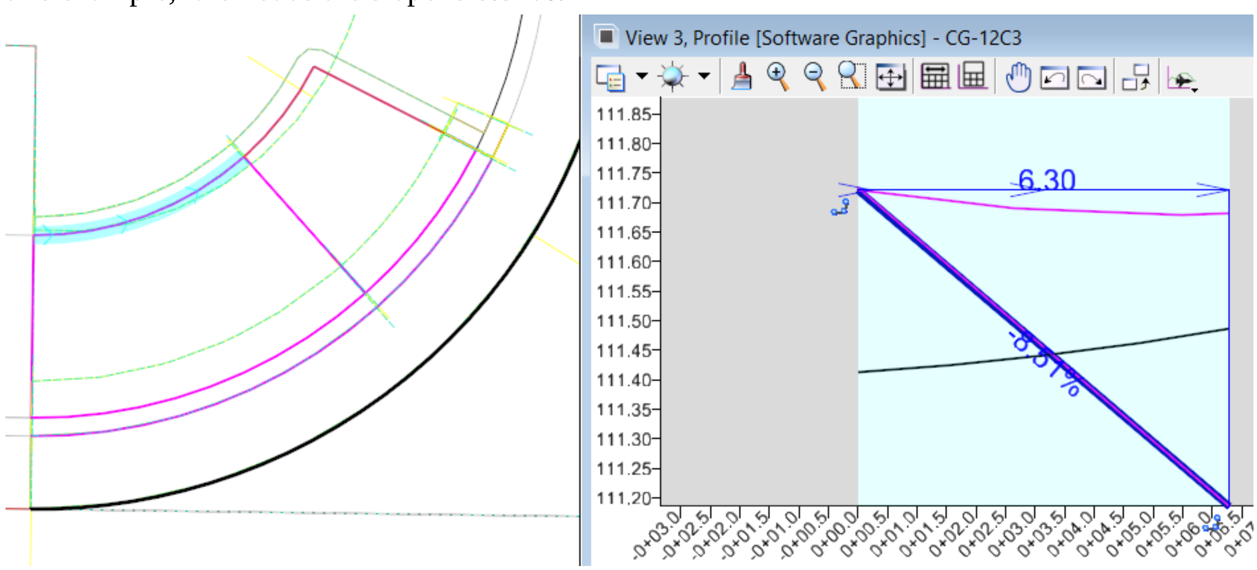
2. Open the profile view of this element and select the active profile to verify this slope is less than 8.333%.



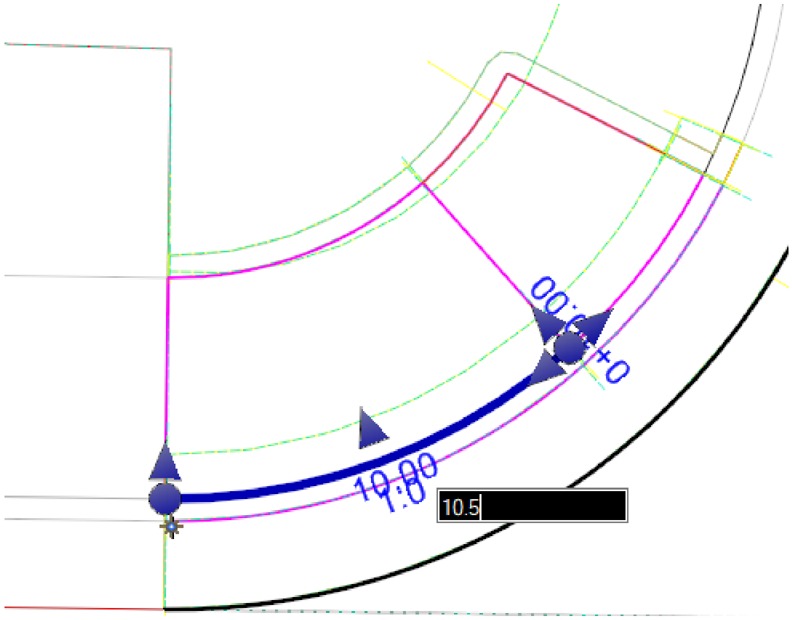
3. The width of the Sidewalk in this area is controlled with the element below.



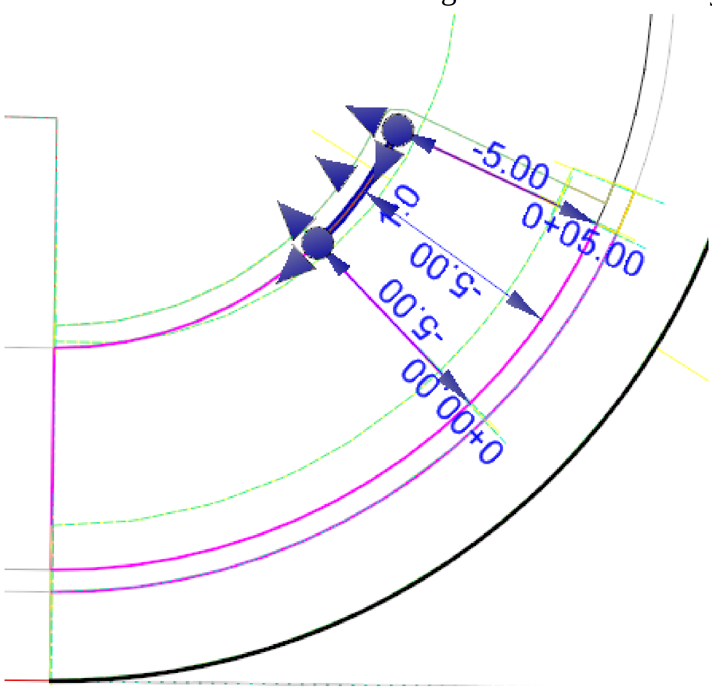
4. Open the profile model of this element and verify the slope is less than 8.333%. In this example, it is not as the slope is 8.51%.



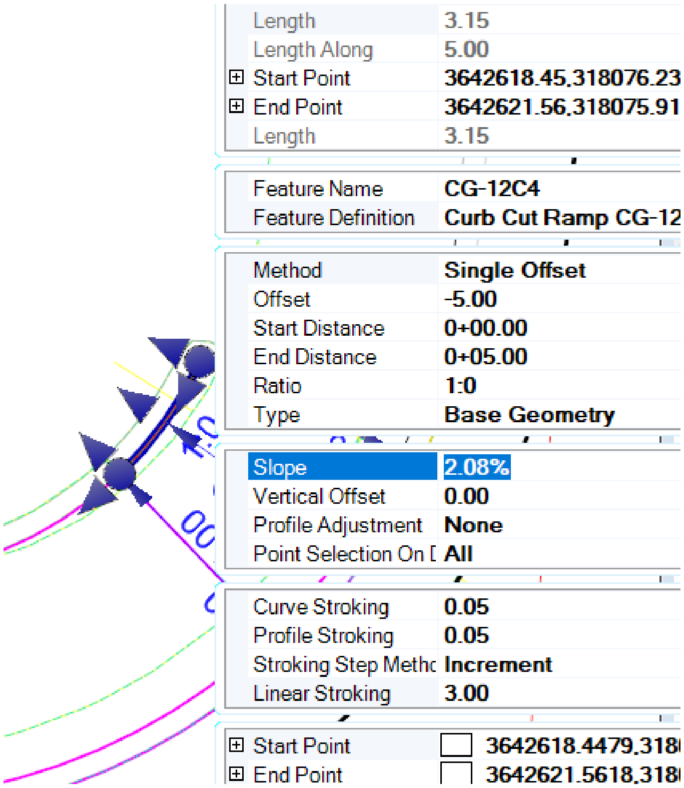
5. Leaving this profile view open, change the length of the element along the face of sidewalk from 10 to 10.5' which also lengthen the back of sidewalk and reduces the slope to below 8.333%.



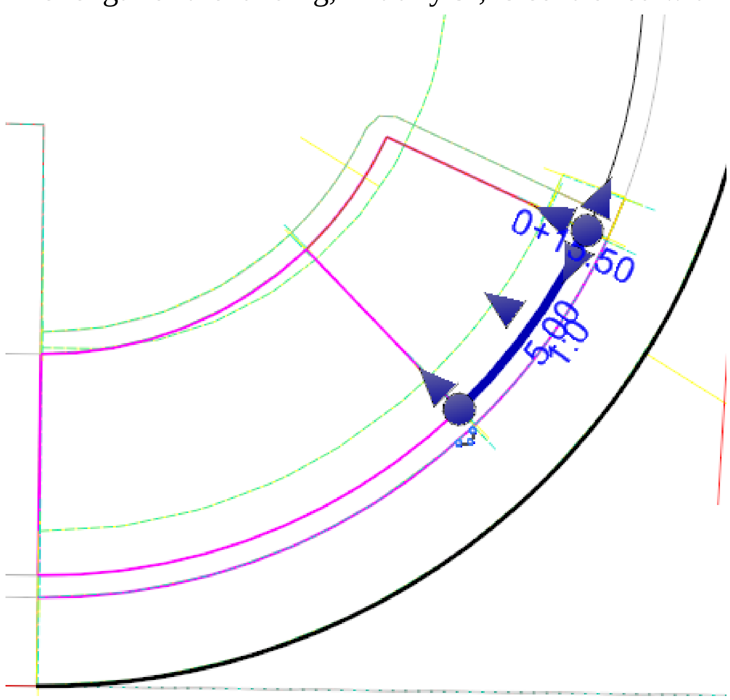
6. The width of the SW in the landing area is controlled by the element below:



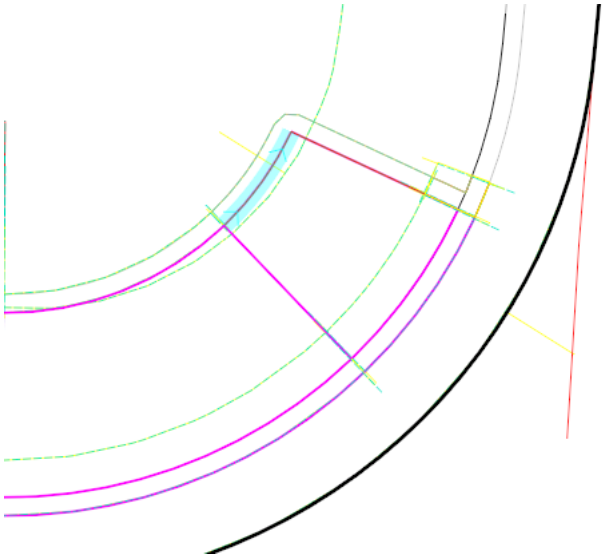
7. Looking at Propertied of this element, you can observe that the slope of the landing is set to 2.08% which is the maximum slope of the landing.

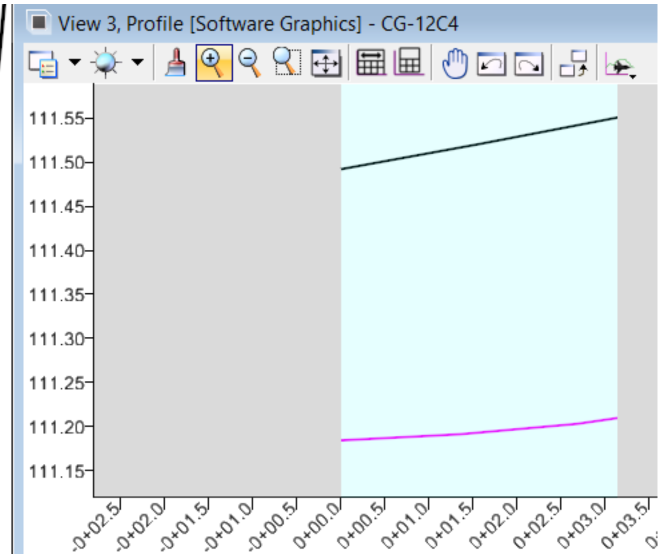


8. The length of the landing, initially 5’, is controlled with the element shown below.



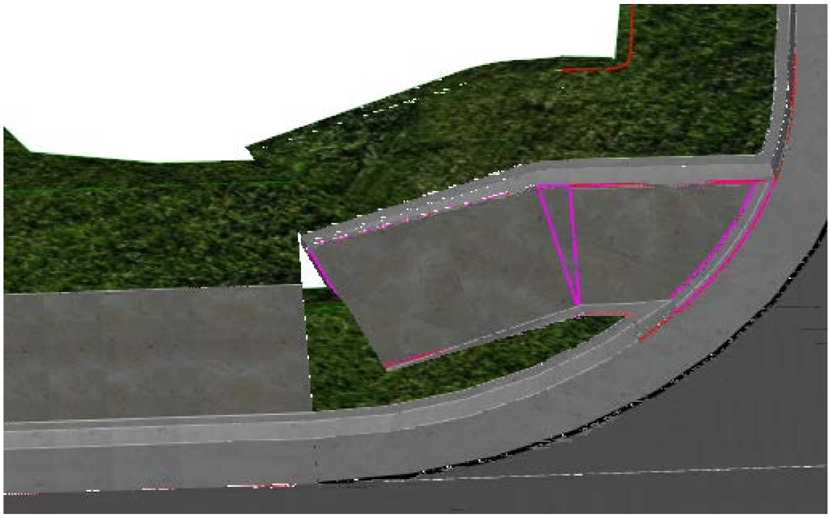
9. The slope of the landing parallel to the roadway is based on the gutterline slope which is based on the EP slope. You can open the profile view of the back and face of ramp elements to check to see if a maximum of 2.08% is met but the edge of pavement's profile of the roadway would need to be revised to correct the slope if needed.



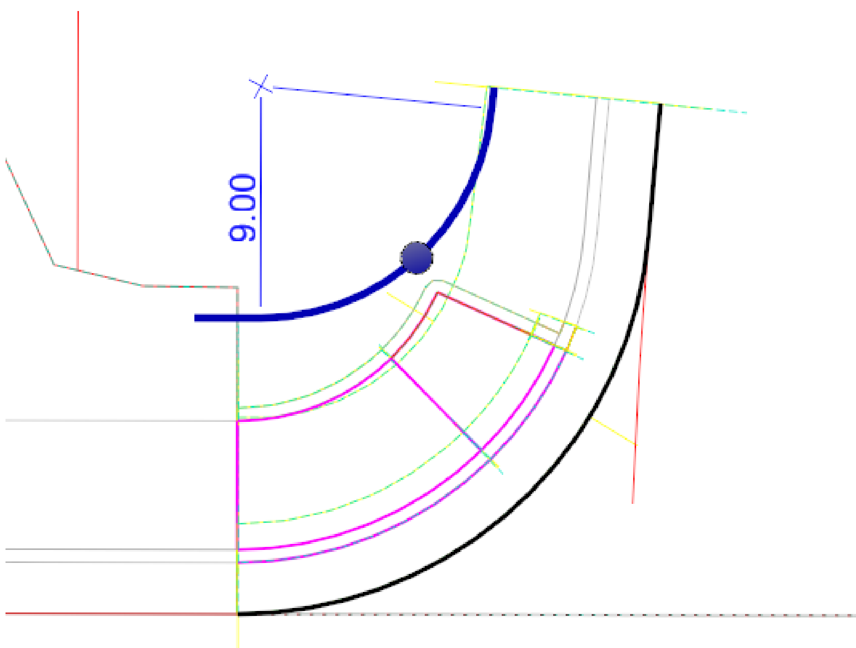


11.4.6.3 CLEANUP

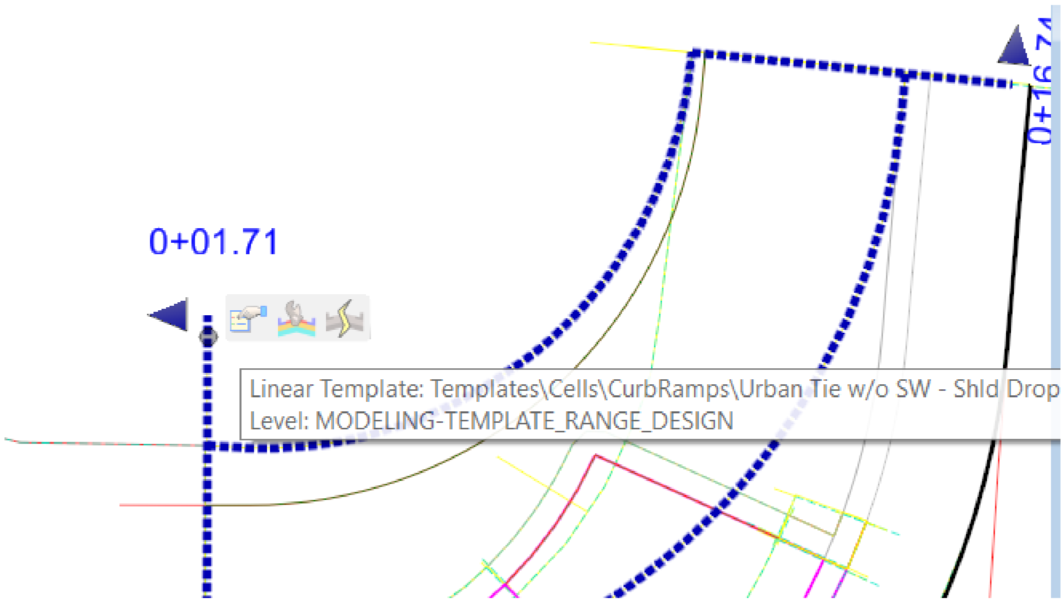
Modeling from this point forward can be variable based on project conditions, location of the ramp, & design preference so the shoulder transition modeling was not included in the Civil Cell. Steps below show just one method of modeling the shoulder transition in this example.



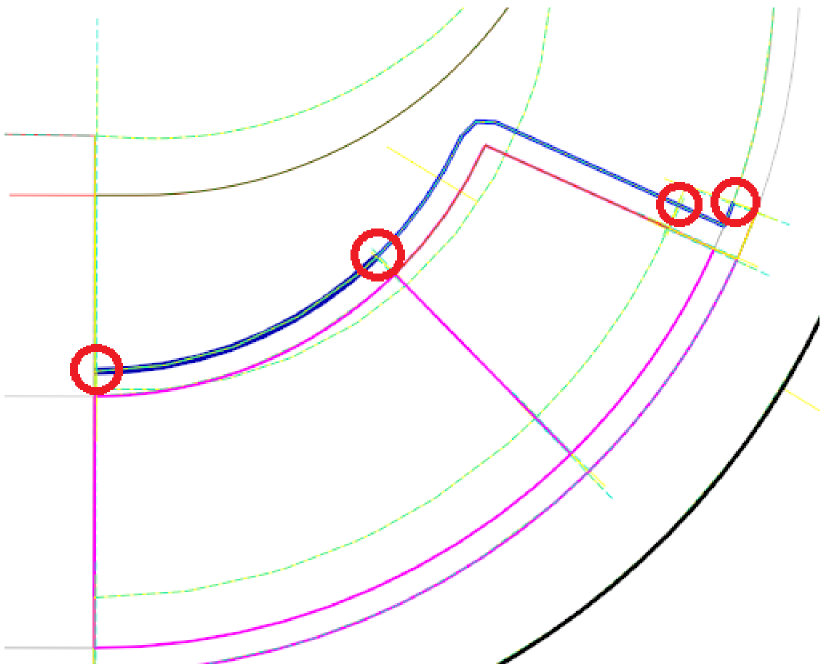
1. Create the shoulder transition geometry (Horizontal & Vertical). In this example, this was a 11.5’ offset from the Thru Rd EoP, a 6.5’ offset from the Curve EoP, and a 9’ curve between elements.



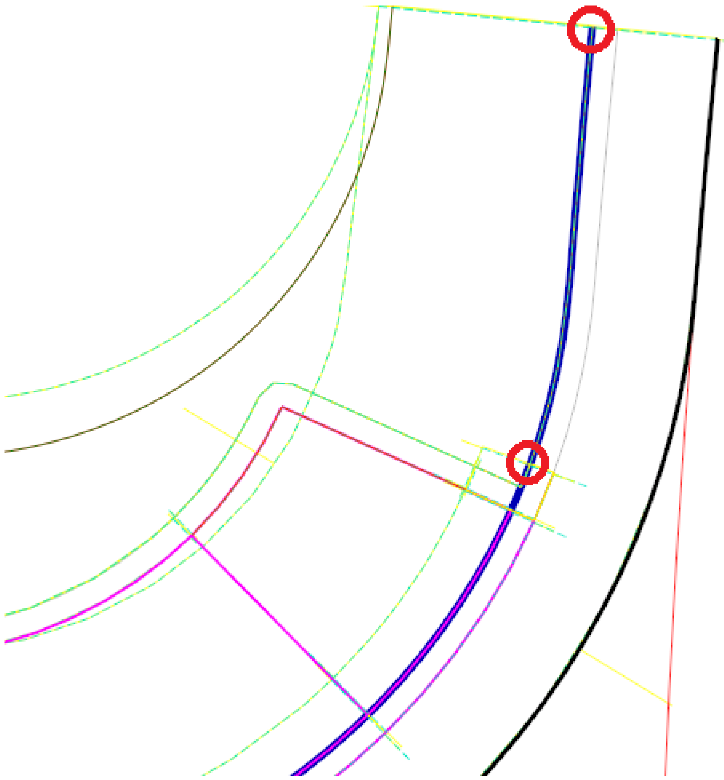
2. Place the following linear template along the shoulder transition area.



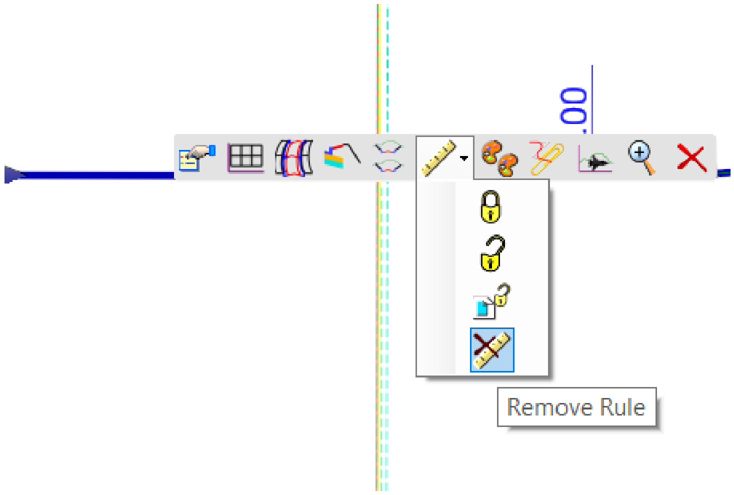
3. Add Point Controls to the Back Top of Curb. There needs to be three point controls through the cell area with start/stop stations shown below.



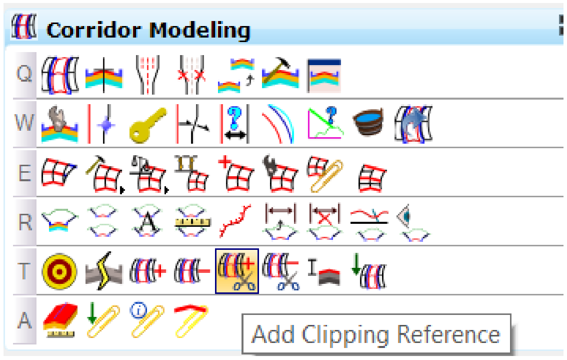
4. Add one more point control to the Back Top of Curb beyond the ramp civil cell.



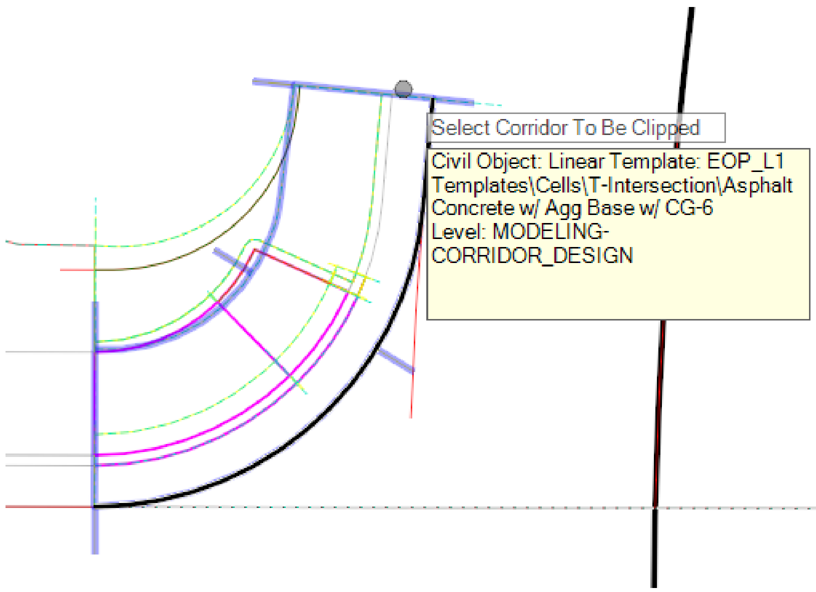
NOTE: If you have any issues adding point controls, remove rules from shoulder geometry (horizontal & vertical).



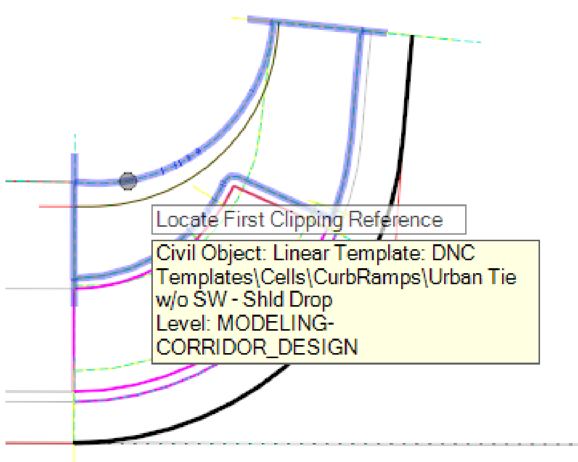
5. Choose Add Clipping Reference from the Corridor Modeling task.



6. Select the Corridor to be clipped.

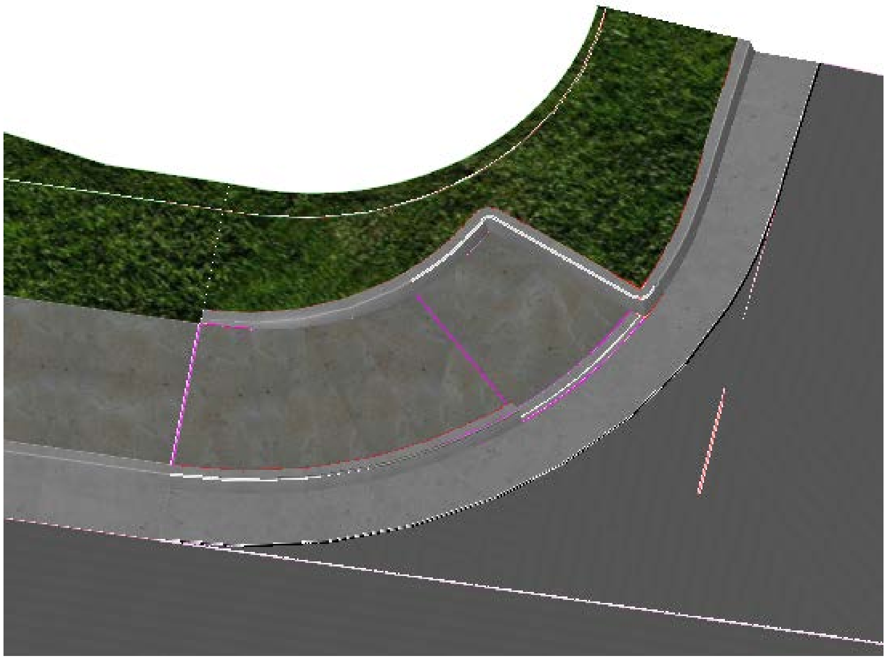


7. Select the First Clipping Reference which is the shoulder template.



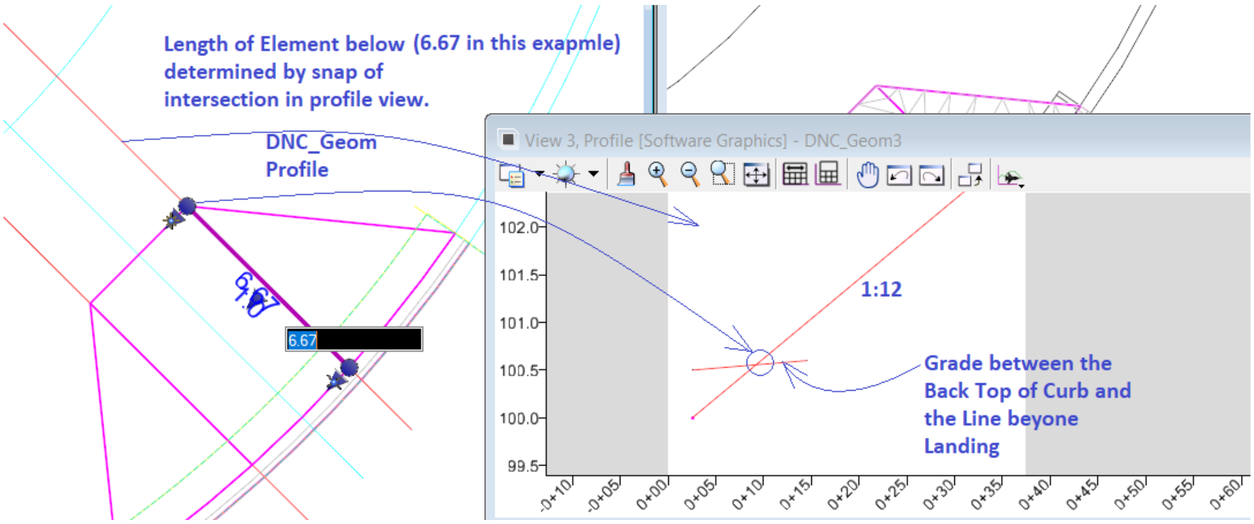
8. Reset to perform the clip.

9. Finished modeling is shown below.



11.4.7 CELL – Type A

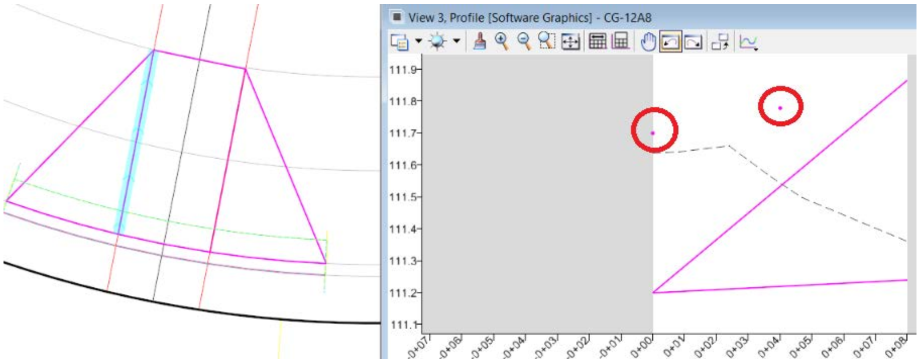
We will not go through placement or edits of the Type "A" Civil Cell but the one unique item with this Civil Cell is the ramp slope of 1:12 (2.08%) is projected so the length is variable based on where the 1:12 slope intersects between the Back Top of Curb and the reference element **Line beyond Landing (Profiled).** The mechanics behind this process is explained below.



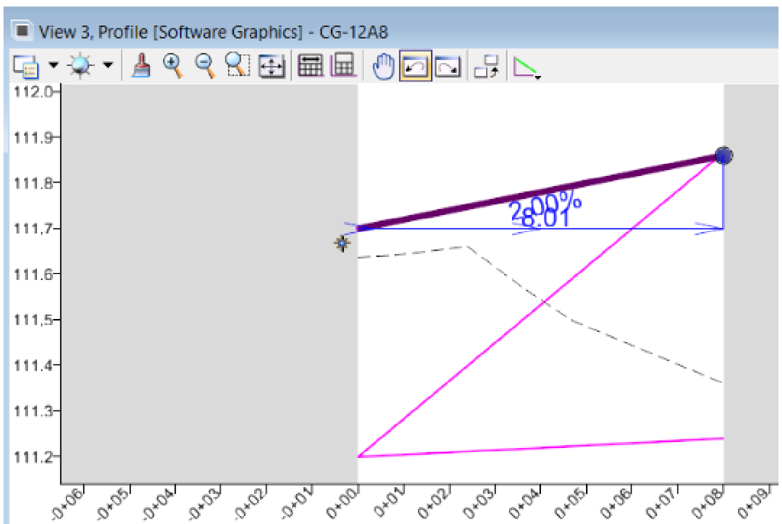
NOTES:

1. Editing the slope of the DNC_Geom element to something different will control the length in the plan view and will tie to the land area between the Back Top of Curb & the Line Beyond Landing.
2. The Line beyond Landing reference can be the Face of SW or Back of SW or a line beyond that profiled off the shoulder corridor mesh.
3. You can modify the length of this element in the plan view but the element will not tie to the landing area between the Back Top of Curb & the Line Beyond Landing. This is a feasible edit but the profile will need to be adjusted to tie to the landing area. Steps to do this:
   a. Open the Profile Model of the edge of ramp.

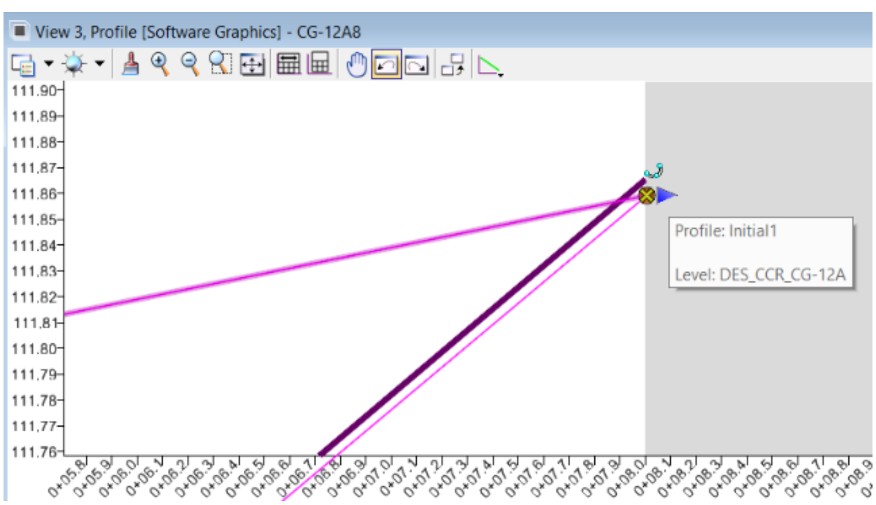
b. Use the Vertical Geometry command **Profile Intersection Point** to get the intersection points of the Back Top of Curb and the Face of SW.



c. Place a Line between these points and then extend to the limits of the profile.

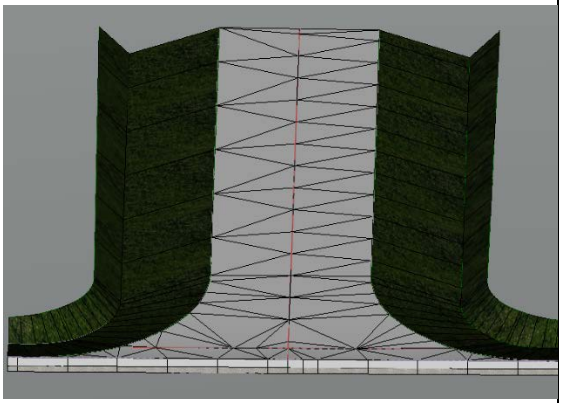
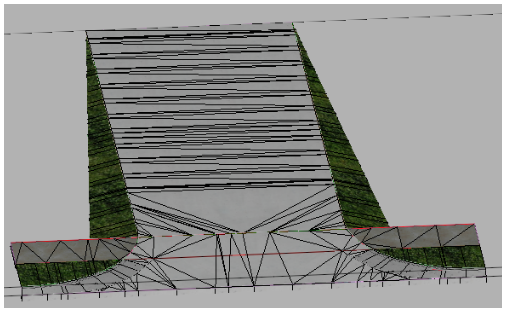
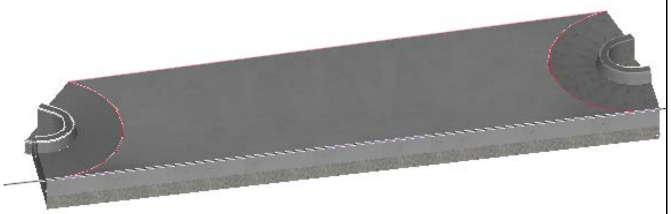
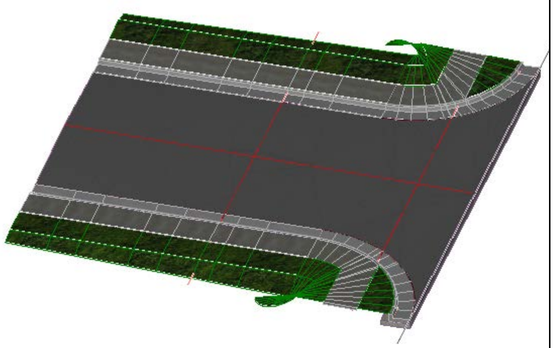


d. Modify the Active Profile to tie to the end of this line by selecting its Move Point handler to move the point to the end of the line drawn above. This will change the 1:12 grade to something less but will tie exactly to the Corridor surface.



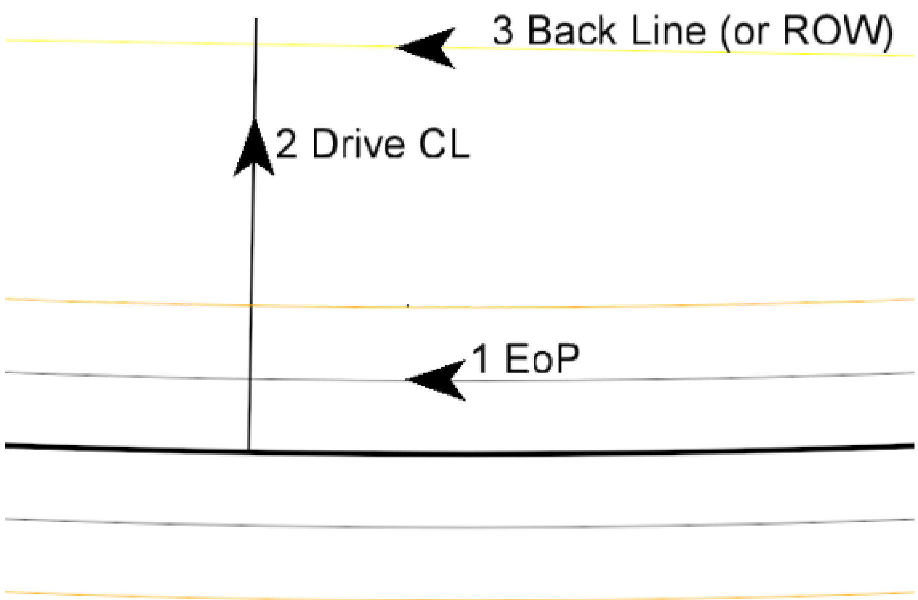
11.5 DRIVEWAY CIVIL CELLS

11.5.1 Available Cells

Drive Rural 	
Drive Urban (CG-9D) 	Drive Urban (CG-11, Variable Radius) 
Drive Urban (CG-11) 	

11.5.2 References & Direction of References

Rural	Urban (CG-9D)	Urban (CG-11)
1) Thru Rd EoP (Profiled) 2) Drive CL (Placed from EP to just past Drive Back line (1) 3) Line at Drive Back (Min. 20-25' from EOP)	1) Gutterline (Profiled) (3) 2) Back Top of Curb (Profiled) (3) 3) Drive CL (Placed from EoP to just past Drive Back line (1) 4) Line at Drive Back (Min. 12-15' from EOP)	1) Thru Rd EoP (Profiled) 2) Drive CL (Placed from EP to just past Drive Back line (1) 3) Line at Drive Back (Min. 25' from EOP)

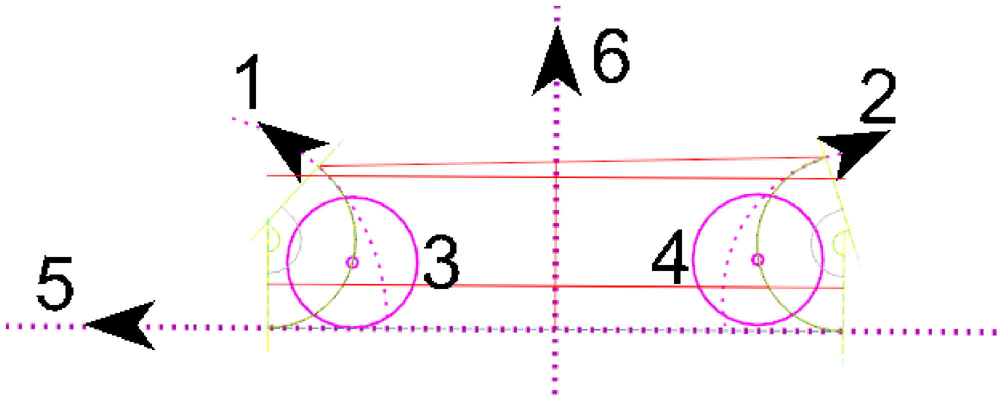


NOTES:

(1) Place the reference Drive CL with the Horizontal command Line from Element so the drive location can easily be moved along the EP.

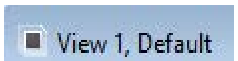
(2) Order may be different than shown here. Follow prompts.

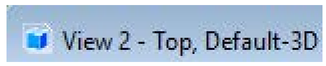
(3) Gutterline & Back Top of Curb instead of EOP shown in image above.

Drive Urban (CG-11, Variable Radius)
1) LT X-EOP 2) RT X-EOP 3) LT Curve Thru PNT (Approximate) 4) RT Curve Thru PNT (Approximate) 5) Thru Rd EoP (Profiled) 6) Drive CL (Placed from EP to Beyond Ramp Tie)


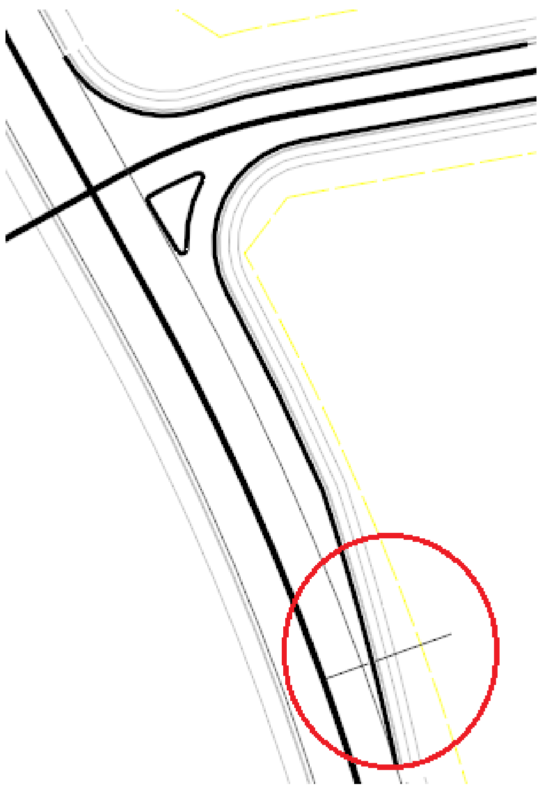
11.5.3 Placement (Drive Urban CG-9D)

1. Open the file **2-lane-Urban-Drive.dgn.** This file contains alignment *ROUTE156* and around 108+30, a secondary intersecting entrance named *DRIVE CL*. A Corridor has been created for *ROUTE156*. We will place an Urban Drive (or Entrance) at this location in the following steps.
   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

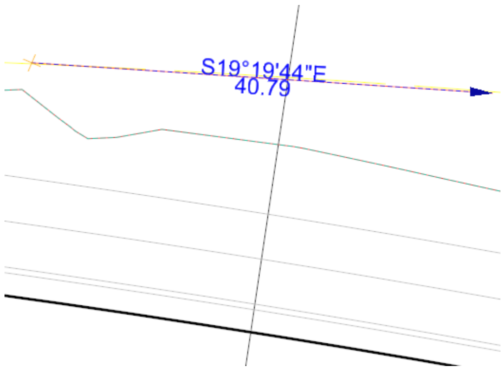
   

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)
   c. Close the reference dialog.
   d. Zoom to the area of the drive CL as shown below.

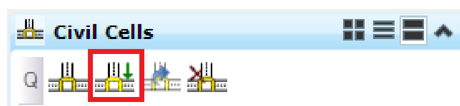
   

   Notice all the elements we need for the Drive civil cell placement are in place and were created from template geometry except for the Drive CL which was constructed with the Horizontal Geometry tool *Line from Element*..

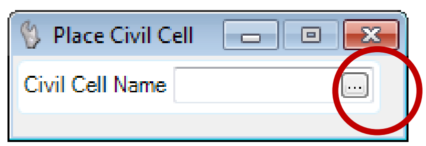
2. Using the Horizontal command **Line Between Points**, place a line approximately along the Existing ROW, approximately 40’ long and approximately centered about the Drive CL. Use the feature DNC. This line represents the Back of the Drive and can be adjusted after placement.



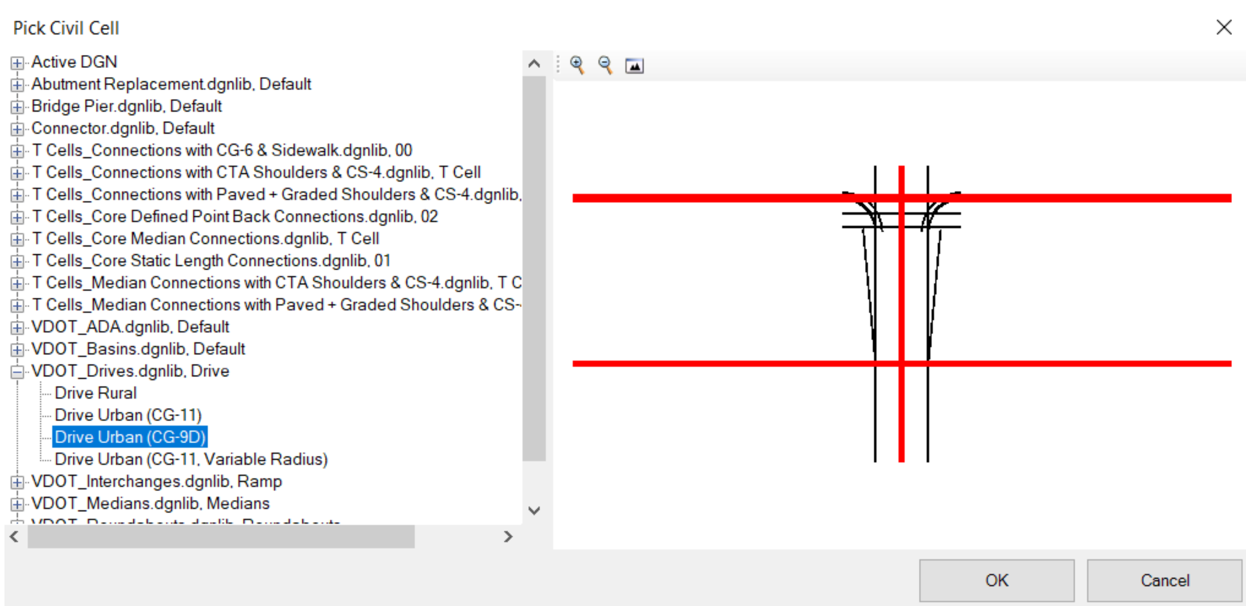
3. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



4. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

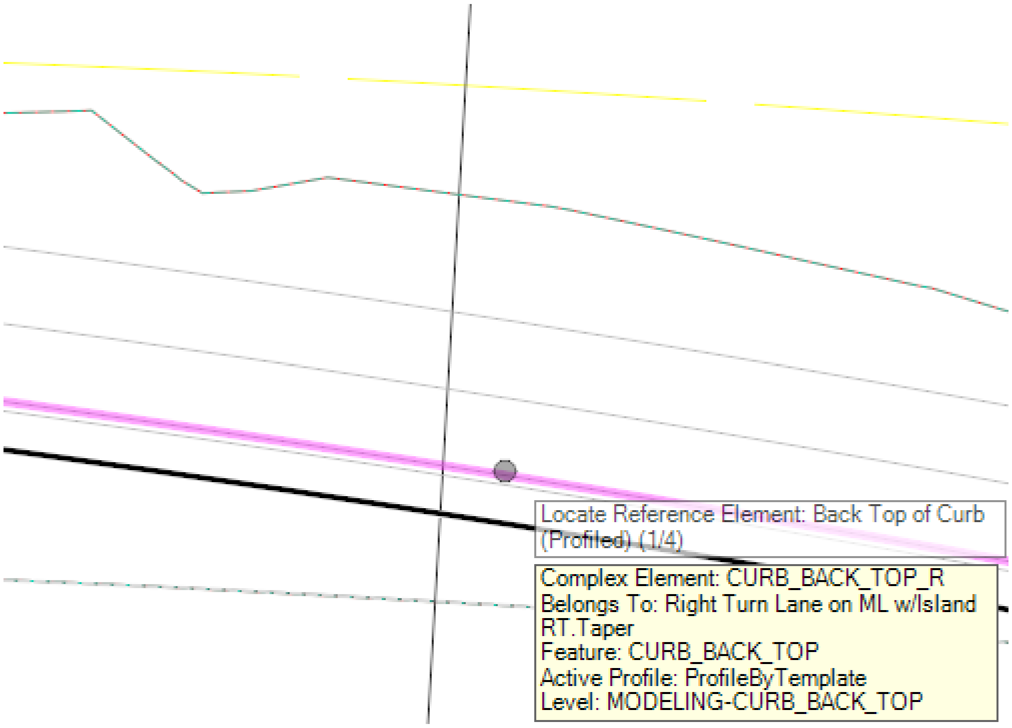


5. Select the **Drive Urban** civil cell from the **VDOT_Drives.dgnlib** folder and click **OK.**

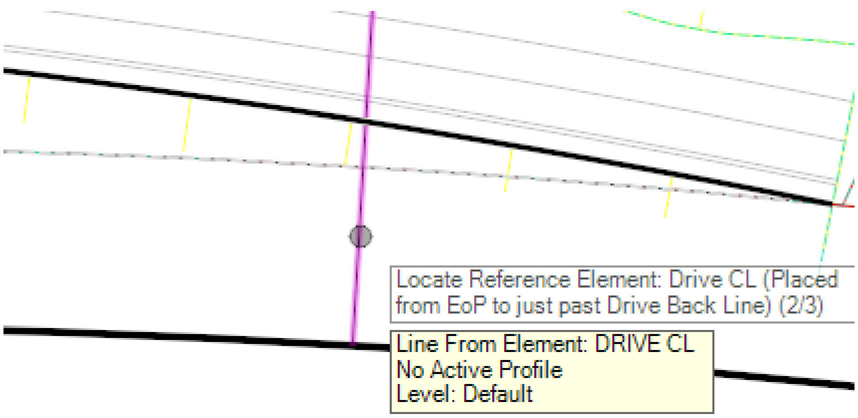


NOTE: The next four prompts may be in different order than listed in this manual.

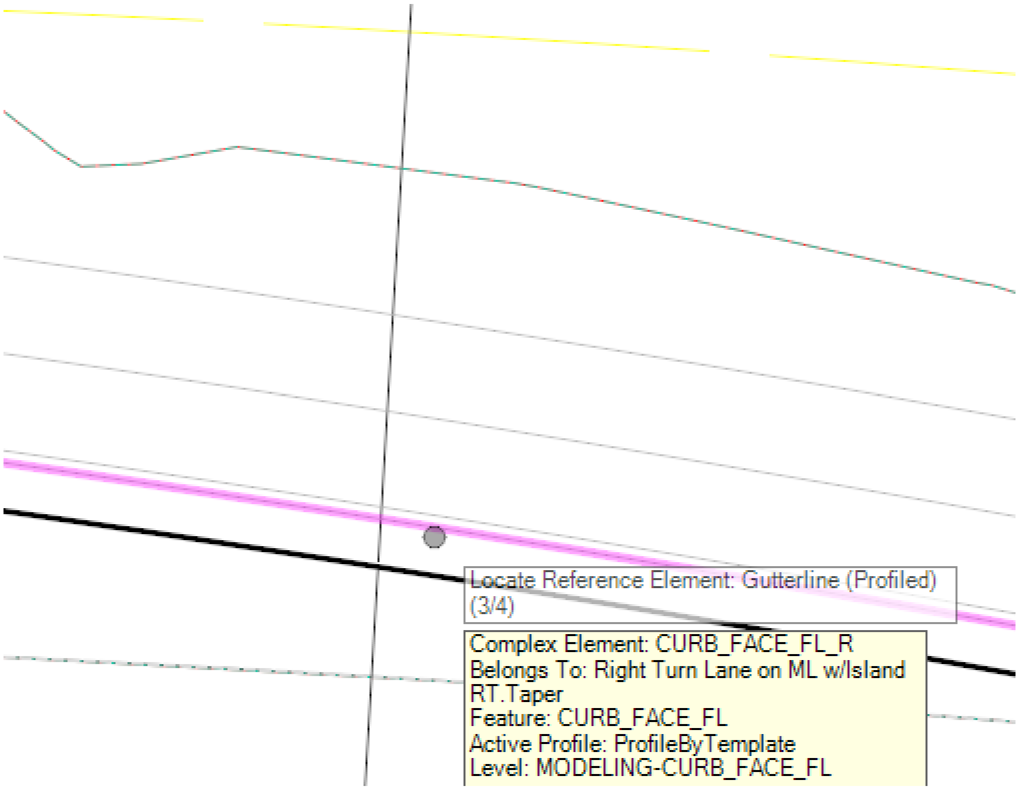
6. When prompted to *Locate Reference Element 'Back Top of Curb (Profiled)'*, select the **Back Top of Curb** element in View 1.



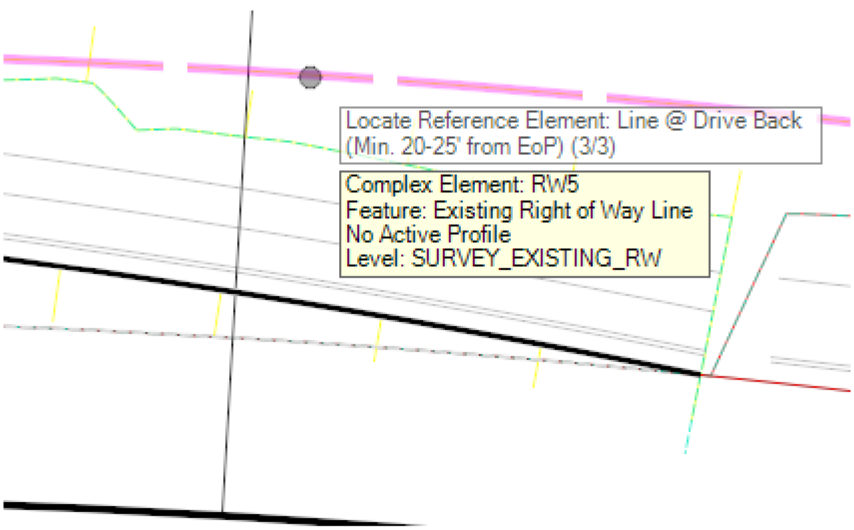
7. When prompted to *Locate Reference Element*:*'Drive CL Placed from EoP to just past Drive Back Line)*, select the **Drive CL** element in View 1.



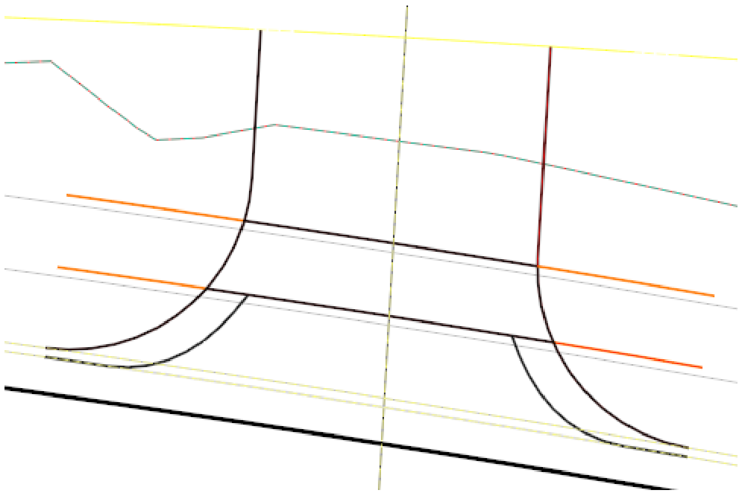
8. When prompted to *Locate Reference Element 'Gutterline (Profiled)'*, select the **Gutterline** element in View 1.



9. When prompted to *'Locate Reference Element: Line at Drive Back (Min. 12-15' from EoP)* select the **line placed along the existing ROW** in View 1.



10. Observe the geometry being displayed.



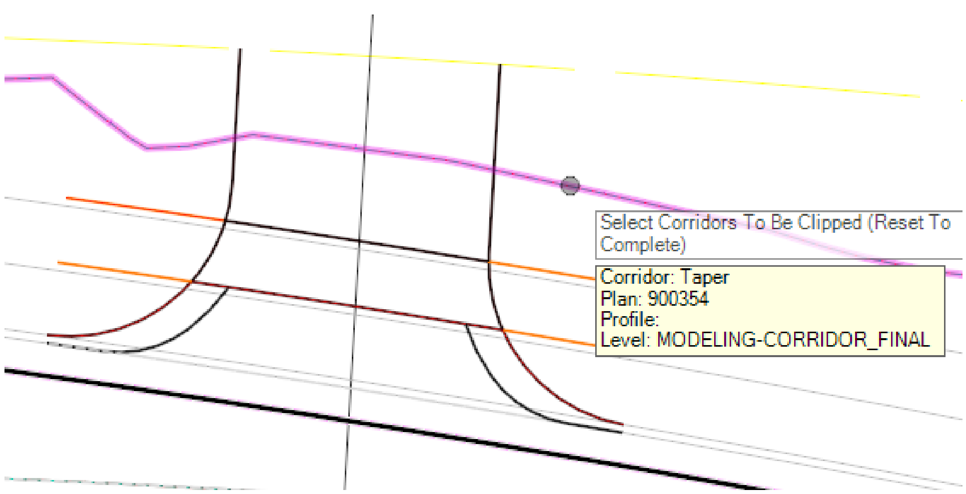
a) If the geometry appears correct and similar to the image above, move on to the next step.

b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.5.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

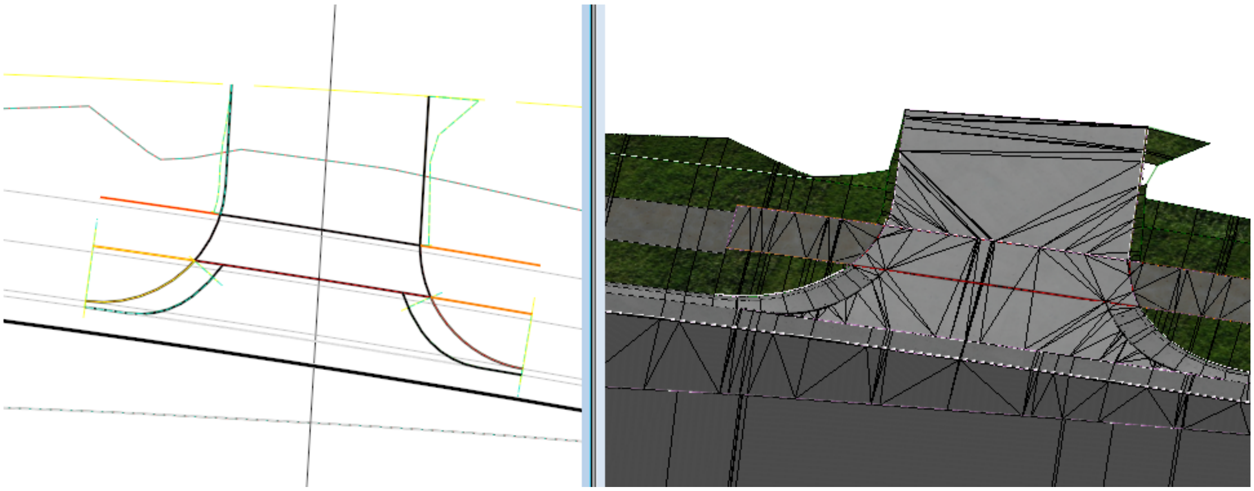
11. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

12. Select the **Taper corridor** when prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.



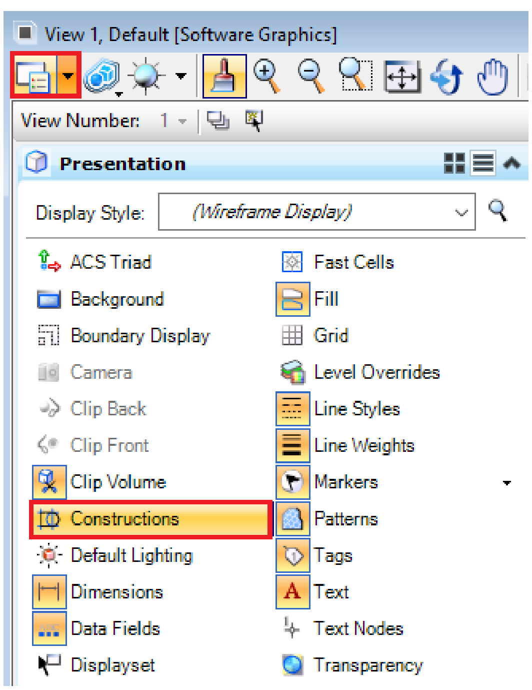
13. **Data Point** in the View when prompted to *'Accept Civil Cell Placement'*.

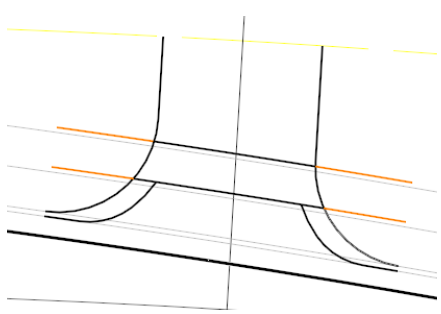
The image below shows the cell in 2d & 3d views.



11.5.4 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off/on Construction class elements, you will go to View Attributes as shown below. Do not turn this off for this lab.



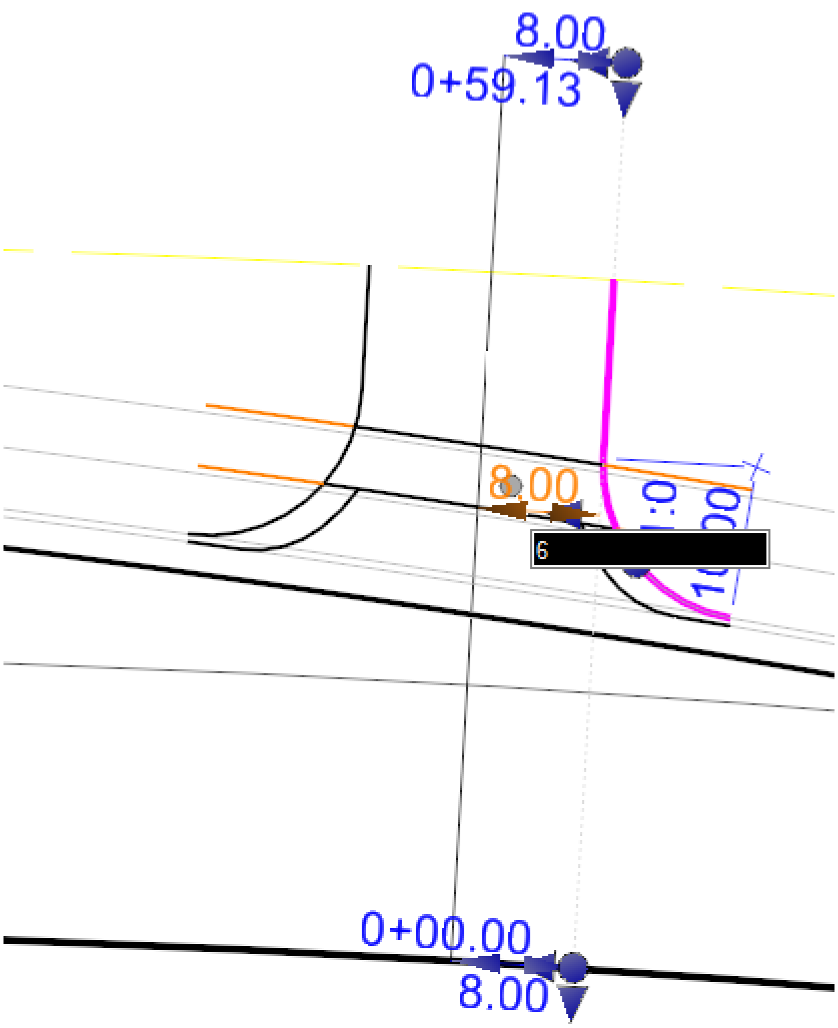


11.5.5 Horizontal Edits

The Drive Width is initially set to 16'. This width along with the radius can be changed by selecting the Drive EoP.

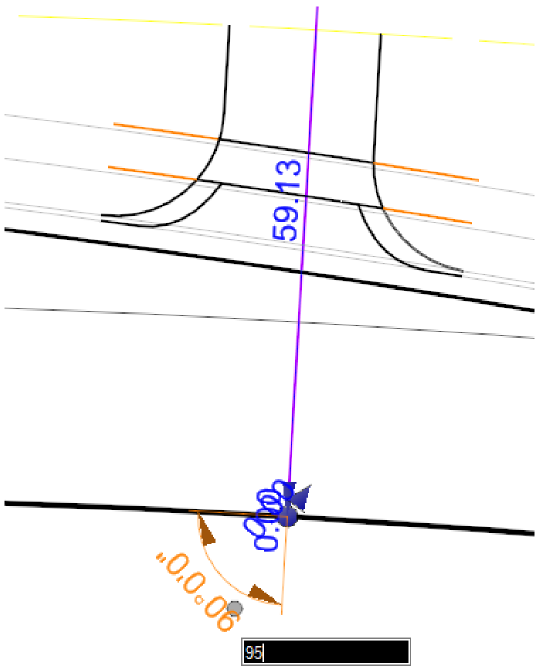
1. Change the width to **12'.**

   a) Select the right edge of drive. Change the middle value of 8' to **6'.**

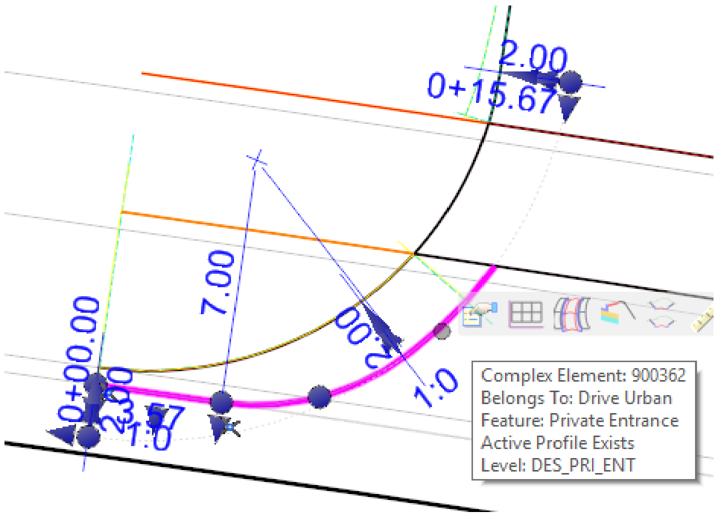


   b) Select the left edge of drive and perform the same edit (8' to 6').

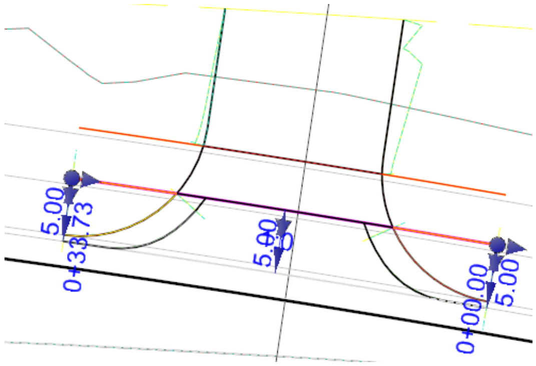
2. Drive Angle/Location – Since the Drive CL element was constructed with the Horizontal Geometry command *Line from Element*, this element can be selected to change the angle of the drive or the location.
   a. Select the *Drive CL* (element selected as the Drive CL reference).
   b. Change the angle from 90^ to **95^** as shown below.

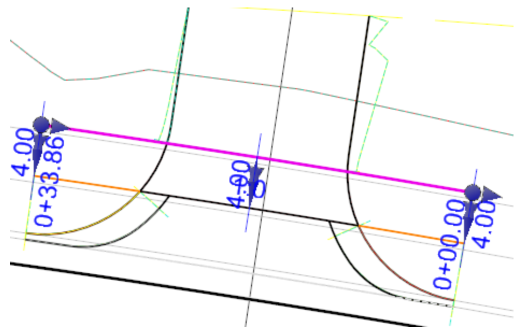


3. The Curb Transition area can be modified by selecting the element below.



4. The sidewalk offset from the Gutterline can be modified by selecting the elements below. You may have to reset to select these elements labeled as DNC.





5. If the drive back line reference is a line you can adjust this line as needed to determine the back location. We'll look at this edit in the Vertical Geometry Section.

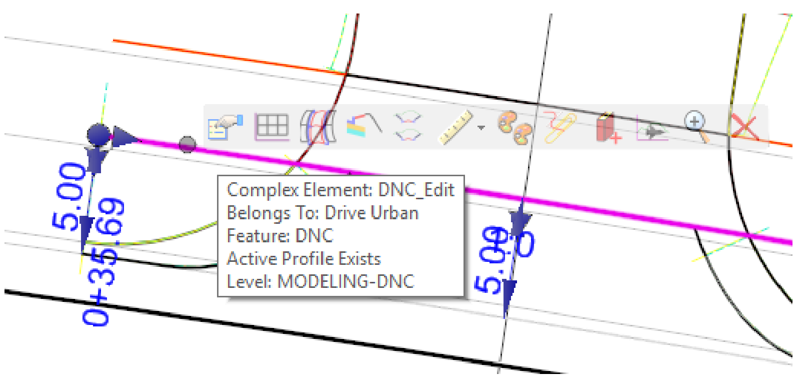
11.5.6 Clipping

It is ideal to Clip the adjoining corridor when placing this Civil Cell but Clipping can be done after placement of the cell by selecting the CLIP terrain and linear templates in the cell.

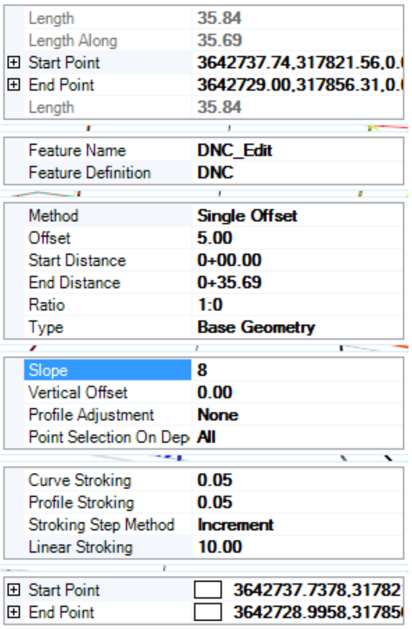
11.5.7 Vertical Edits

Vertical of the EP lines in the cell is controlled through the concrete apron by the DNC-Edit elements which parallel the EOP of the through road and which are profiled with slope projections. From the back of the apron, a profile line is initially drawn to existing ground at the back of the ramp. We'll review the vertical controls in the following steps.

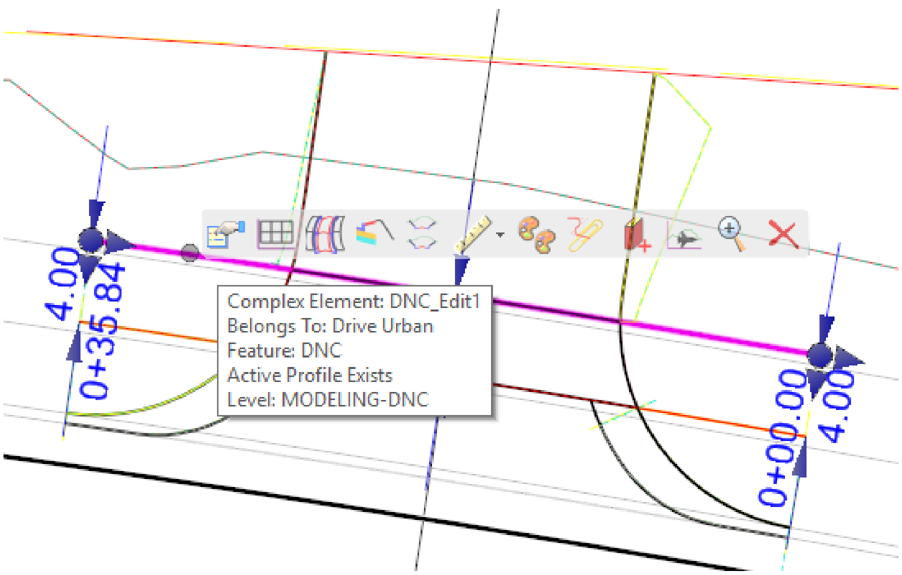
1. Select the **DNC_Edit** element as shown below and choose **Properties** from the context menu.



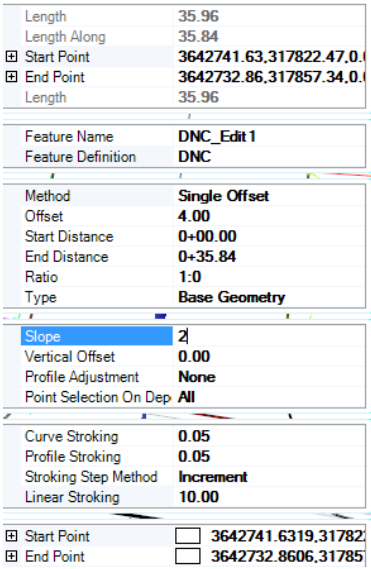
2. Change the slope from 8.333% to **8%.**



3. Select the **DNC_Edit1** element as shown below and choose **Properties** from the context menu.

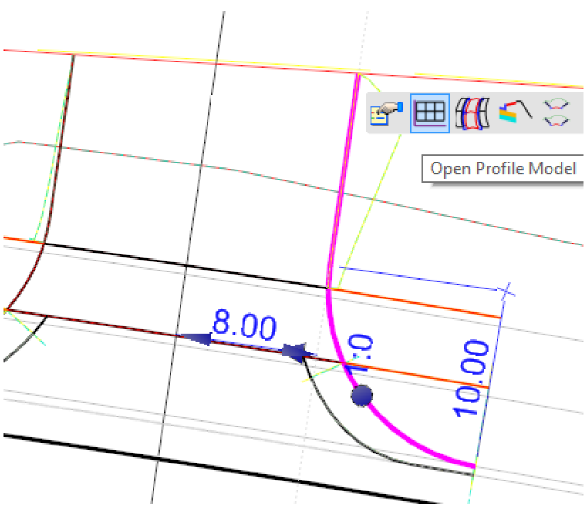


4. Change the slope from 1% to **2%.**



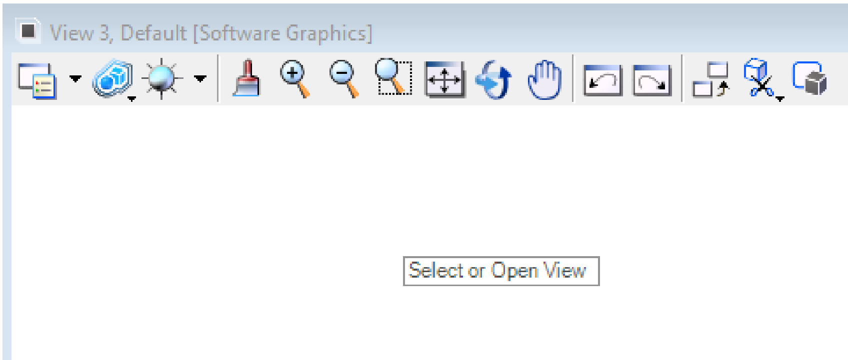
NOTE: The edits above have modified the profiles of the EoP of the drives. Next, we will review the EoP profiles which control the drive surface.

5. Open the RT Drive Edge of Pavement profile in View 3.
   a. Select the RT Drive Edge of Pavement as shown below and from the context menu, choose the command **Open Profile Model.**

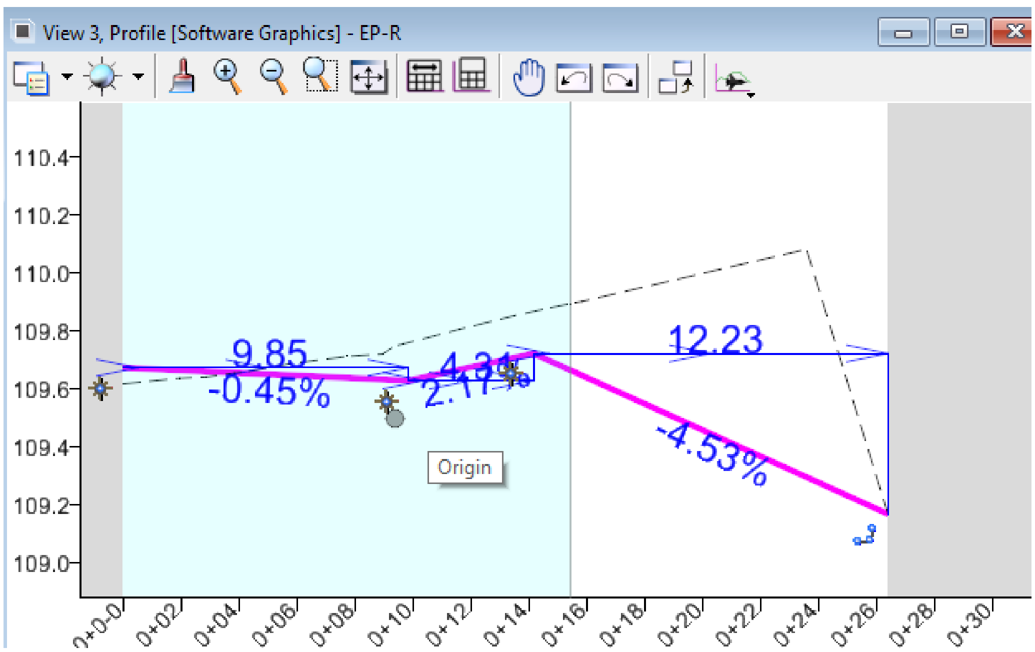


   b. Open **View 3** from the View Toggles bar.

c. Left click in View 3.



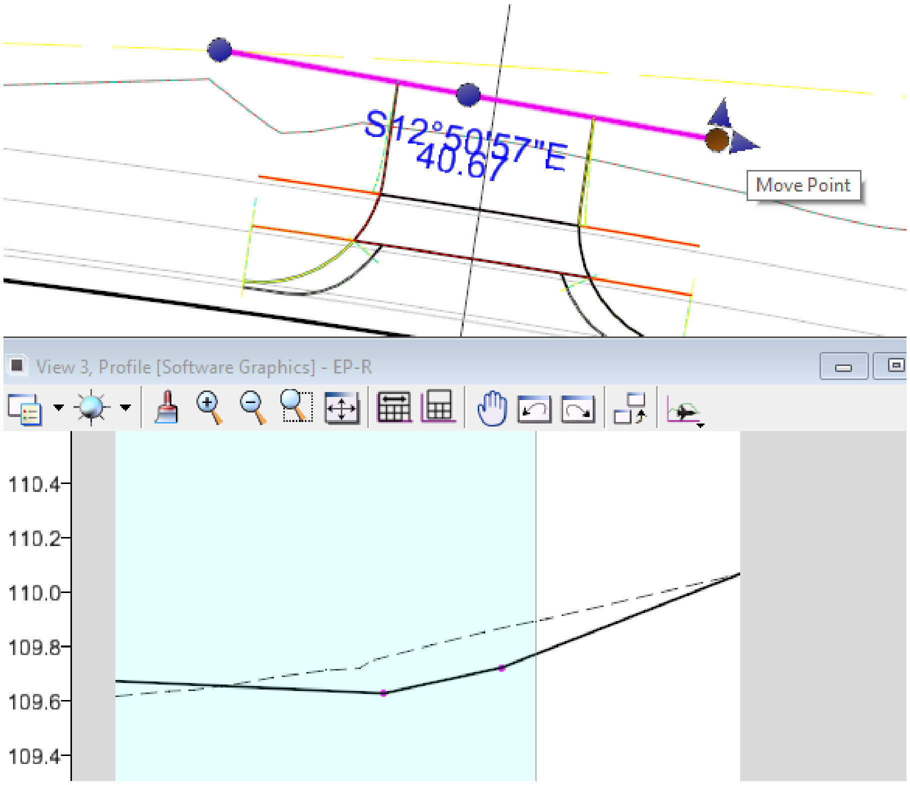
d. The profile is opened. Select the profile below.



NOTE: The slope of the DNC_Edit is a projected slope from the Thru Rd EoP. It was set to 8% in the steps above. Its shown above as -0.45% because of the curvature of the Drive EoP across this area. The DNC_Edit1 element was set to 2% and is shown as 2.17% because of the curvature of the Drive EoP across this area.

Next, modify the Line at Back of Drive to shorten the drive to where it ties prior to reach the ditch area shown above.

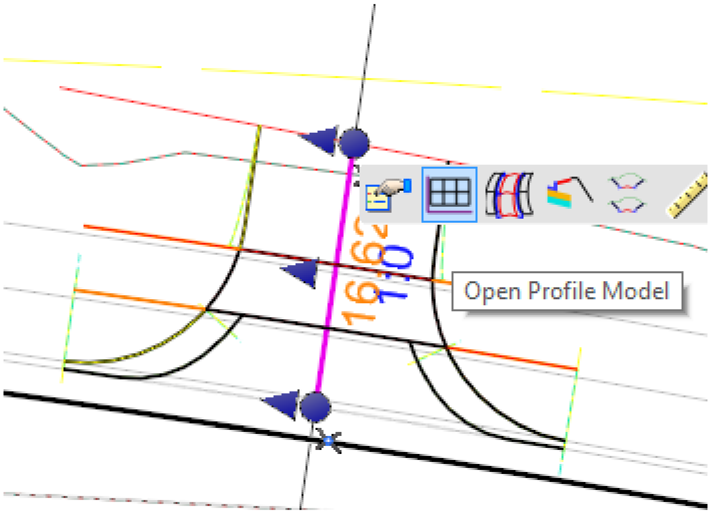
6. With the profile view still open, select the Line at Back of Drive reference element and move its right side about 5' inside the existing EOP.



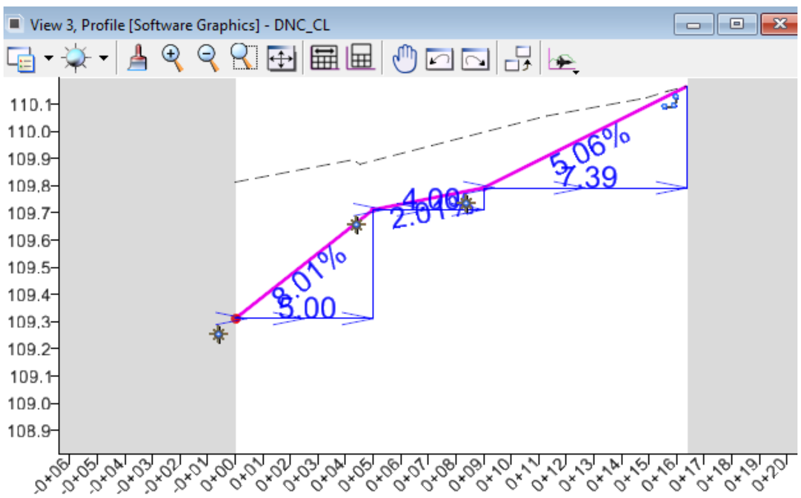
Notice the improvement in slope tying to the existing ground in the profile view.

NOTE: We will not review the EP-L profile in this lab but the process would be similar for the left side as well.

7. Open the profile view of the DNC_CL element.



8. Select the profile and review its slopes.

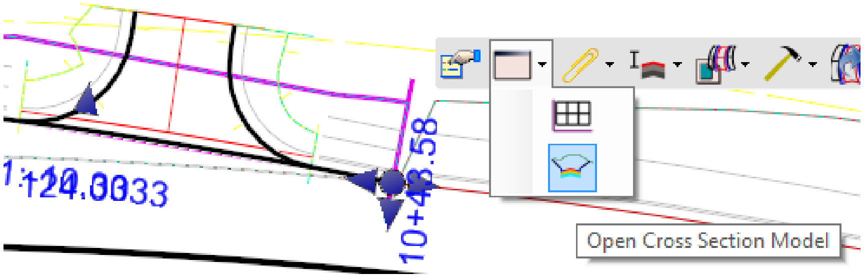


NOTE: The pavement surface is initially controlled by the outside EoP. The profile of the DNC_CL element is valid through the concrete apron but may be slightly different than the drive surface after the apron as it is not included in the drive surface terrain. It can be added as a break or can be re-profiled from the surface templates of the Civil Cell.

11.5.8 Cross-Section View

1. Open the cross-section model of the **Taper Corridor** as shown below.

   a. From the context menu, select **Open Cross Section Model**.



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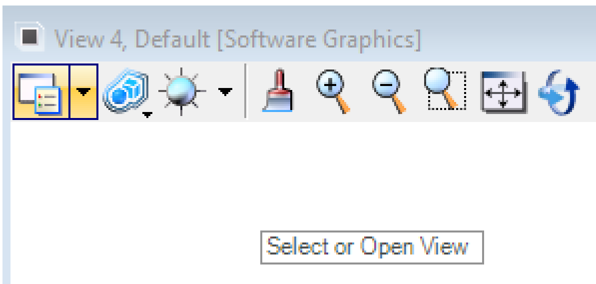
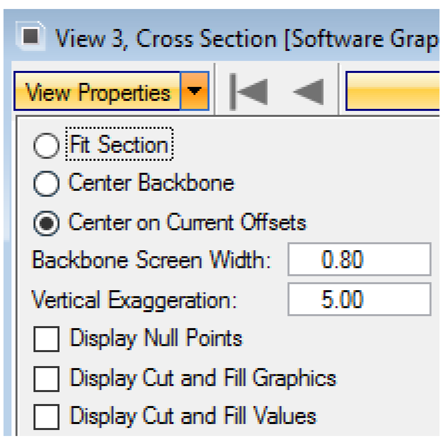
   b. Open **View 4** from *MicroStation's View Toggles* menu.

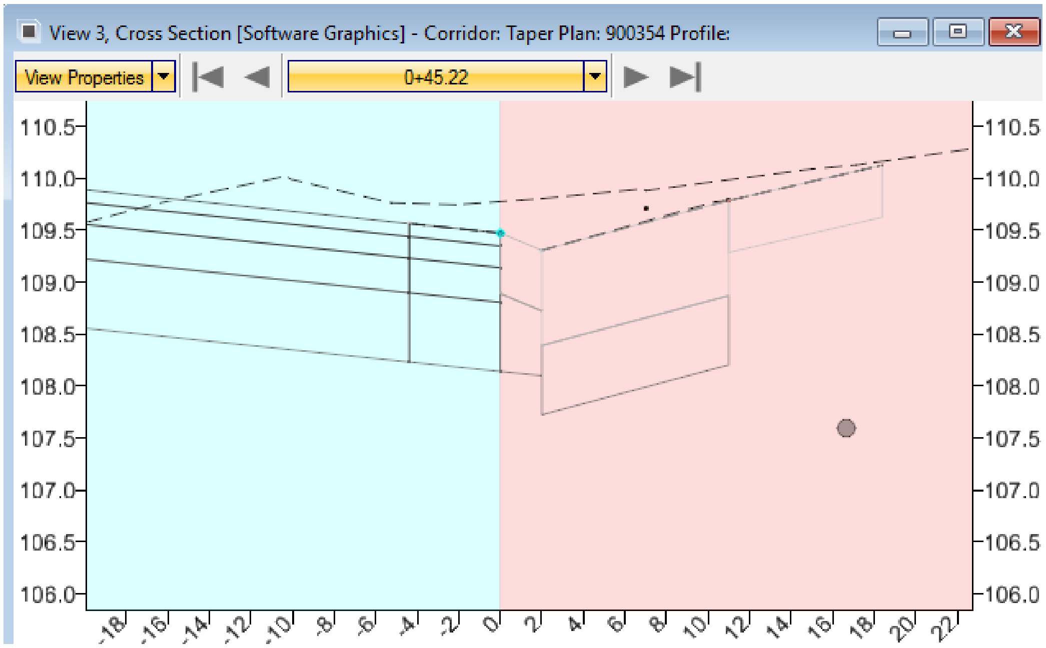
   c. **Left Click** in the drawing area of *View 4*.



2. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



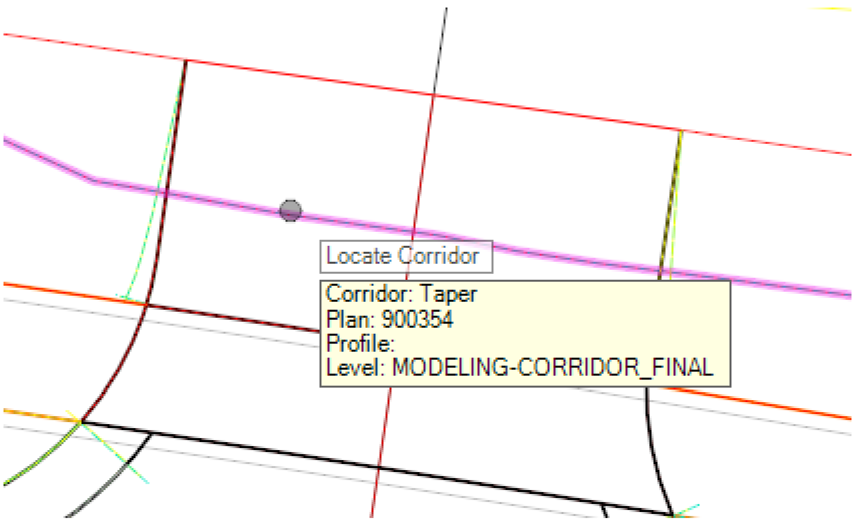
3. Use the *Next Station* button to move to approximately station 0+45 to review the driveway.



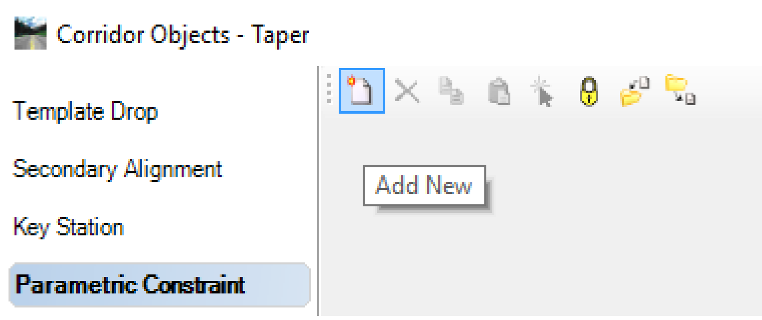
11.5.1 Sidewalk Edits

The sidewalk in the adjoining corridor can be transitioned to the sidewalk in the Civil Cell either through point controls or through parametric constraints as shown below.

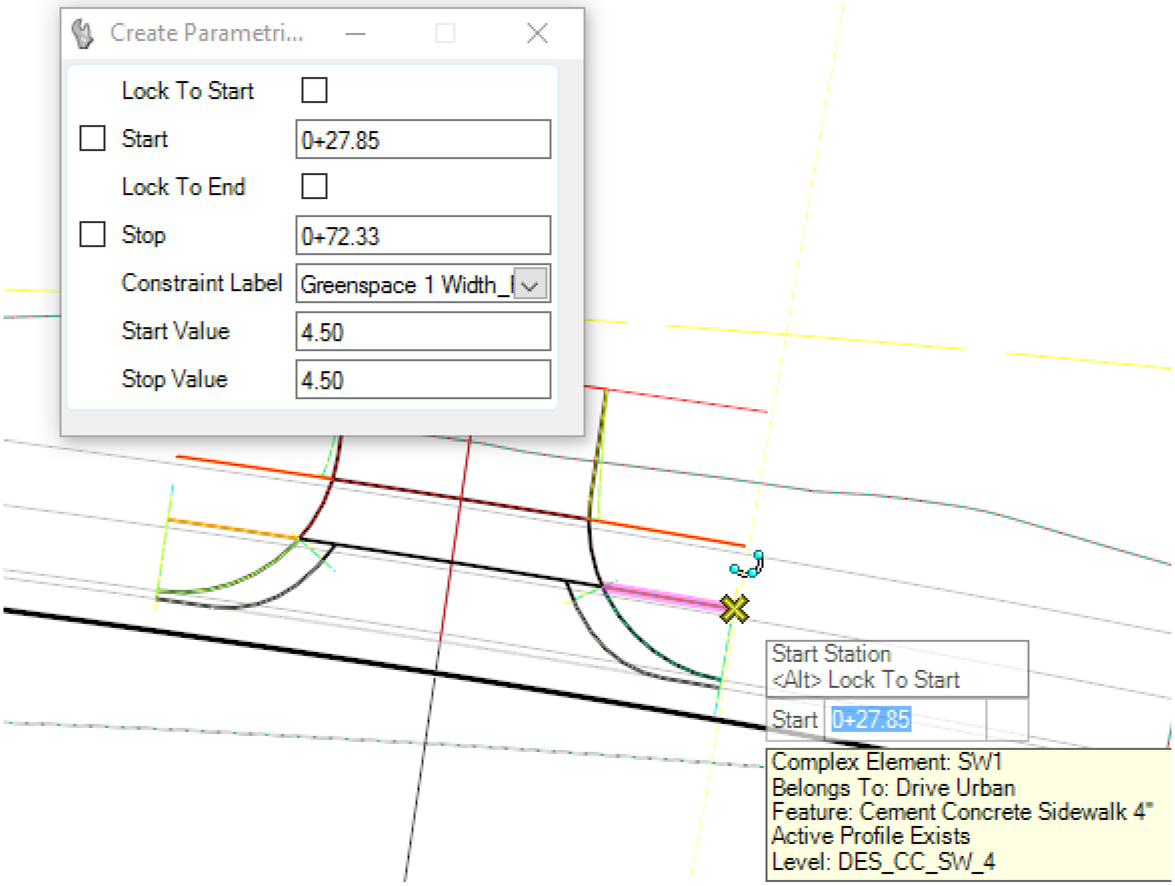
1. Select the **Corridor Objects** command and select the **Taper** Corridor when prompted to *Locate Corridor*.



2. Choose the **Parametric Constraints** tab and click **Add New.**

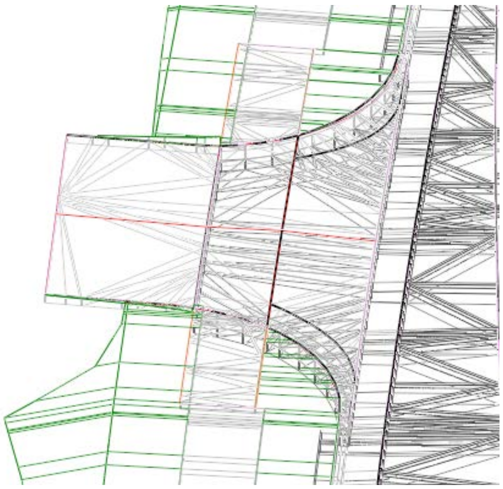


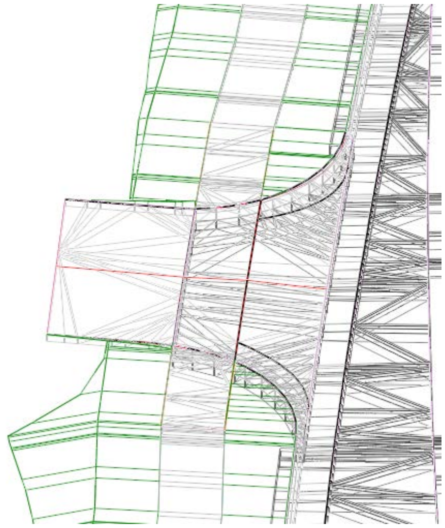
3. Select **Greenspace 1 Width_R** Label and set the value to **4.5** through the drive. The Start Station location snap is shown below. The End snap is not shown but would be on the opposite side of the drive.



NOTE: If this addition causes issues to the surface terrain in the cell, change the start/end station to 0.01 outside the drive area.

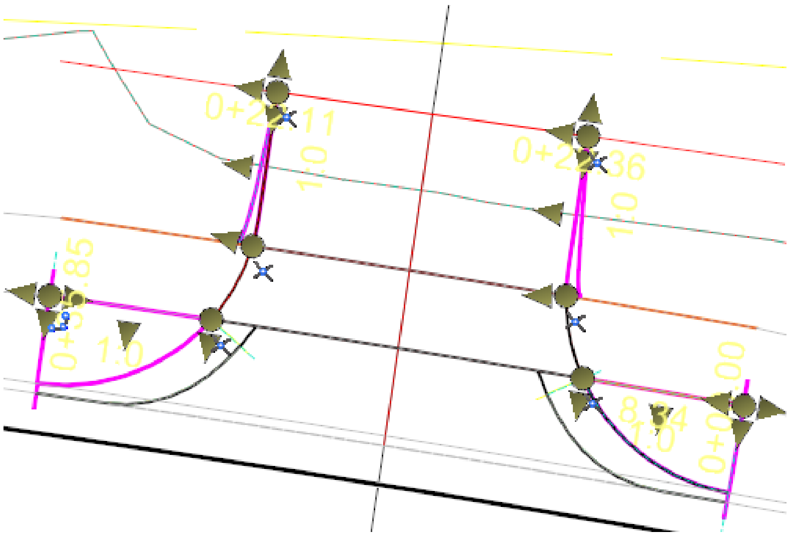
4. Next, add two more parametric constraints to transition Greenspace from 4.5' to 4' (sidewalk width in this example) about 10' outside each side of the drive area. Before and after images are shown below.





11.5.2 Template Edits

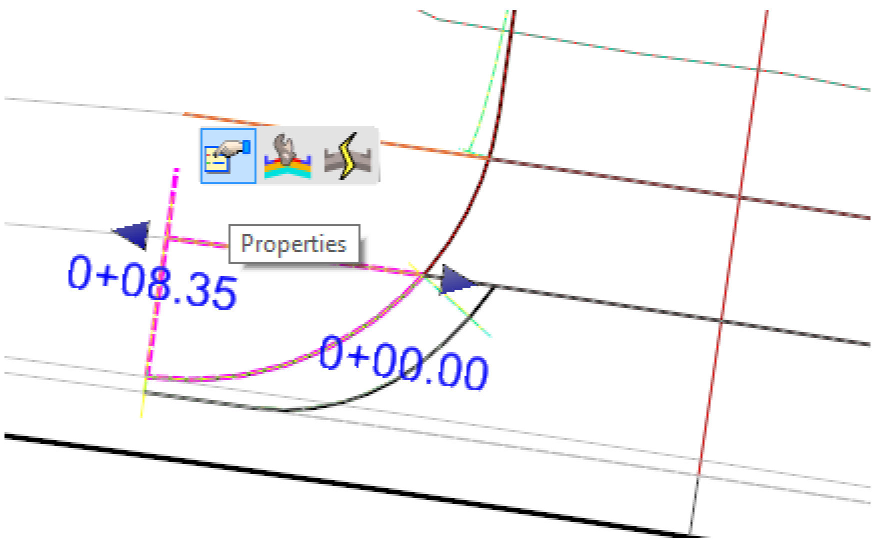
The linear templates used in the Urban Drive are highlighted below. These simply draw ground as the remainder of the cell is built with surface templates. We will show the various tools in this section available for use and related to Linear and Surface Templates but no changes will be made in this exercise and you would need to refer to section 11.3.10 for examples of actually making edits.



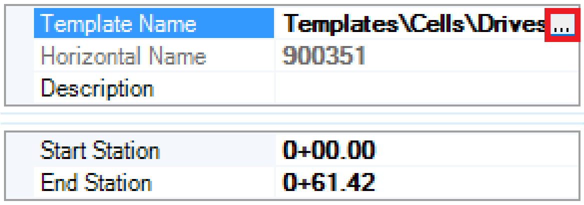
11.5.2.1 PROPERTIES

To re-direct one of these linear template to a new one in the ITL:

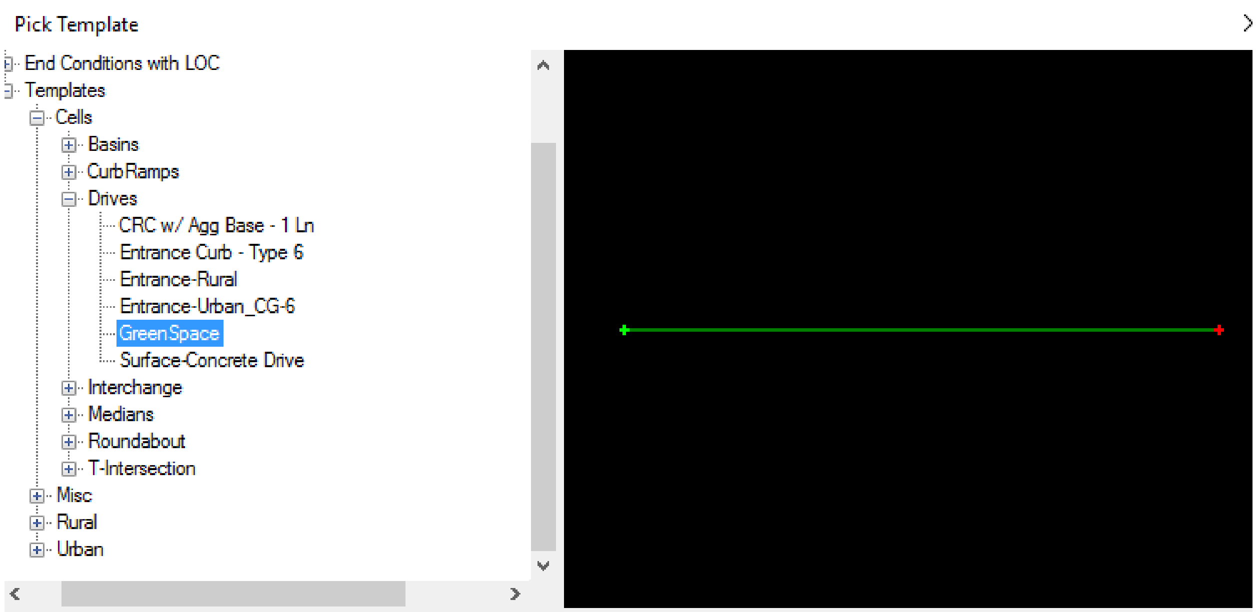
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Linear template used to draw greenspace at the front of this cell is shown below. Although we will not replace this template in this exercise, you would choose the template from the **Pick Template** dialog if you wanted to replace the given template.

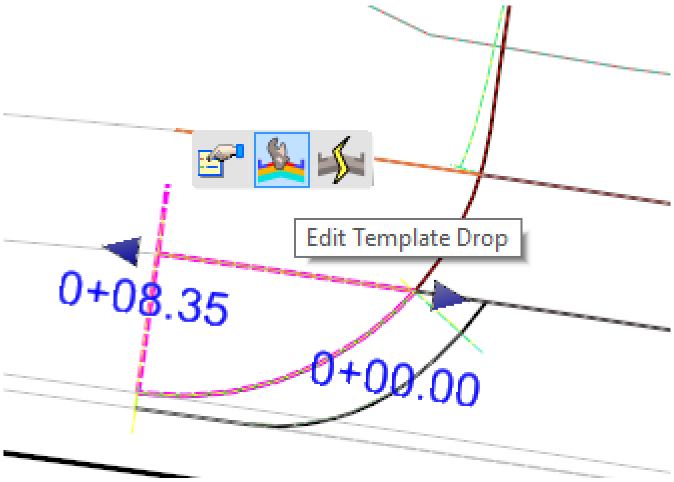


4. Tag **Cancel** *(OK if you actually change the template.)*

11.5.2.2 EDIT TEMPLATE

To edit the template:

5. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.



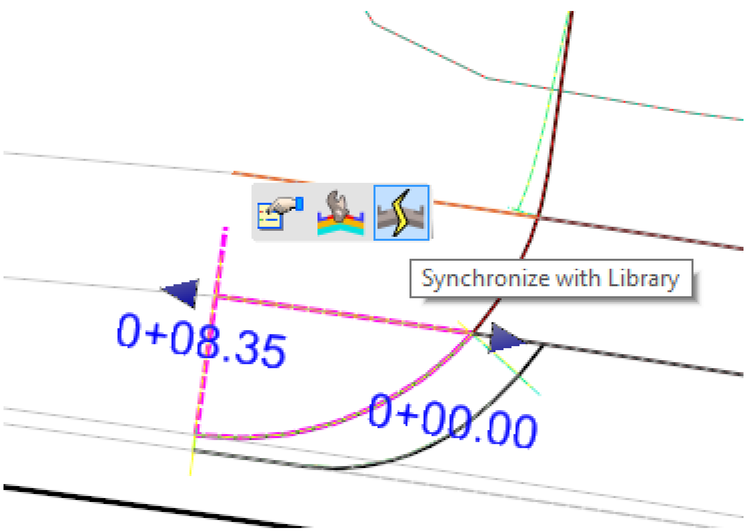
6. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.

7. For this exercise, choose **Cancel.**

11.5.2.3 SYNCHRONIZE

To synchronize a template if modified:

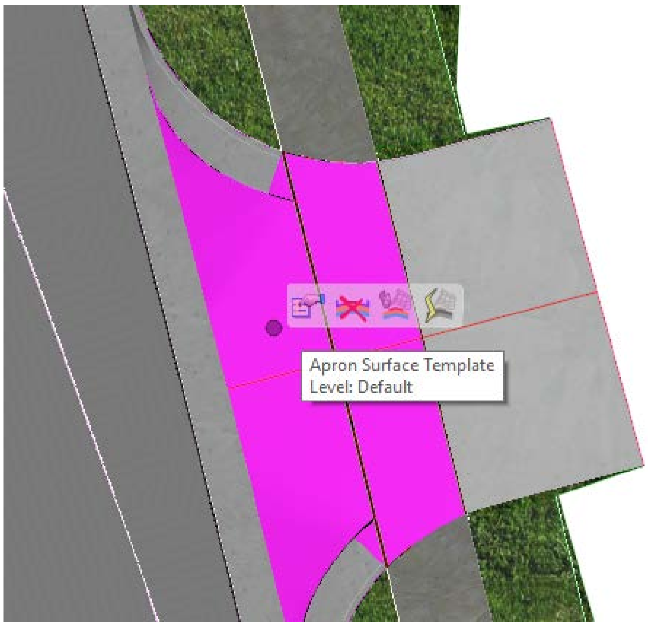
8. Select *Synchronize with Library* as shown below which applies any changes in the template to the linear template.

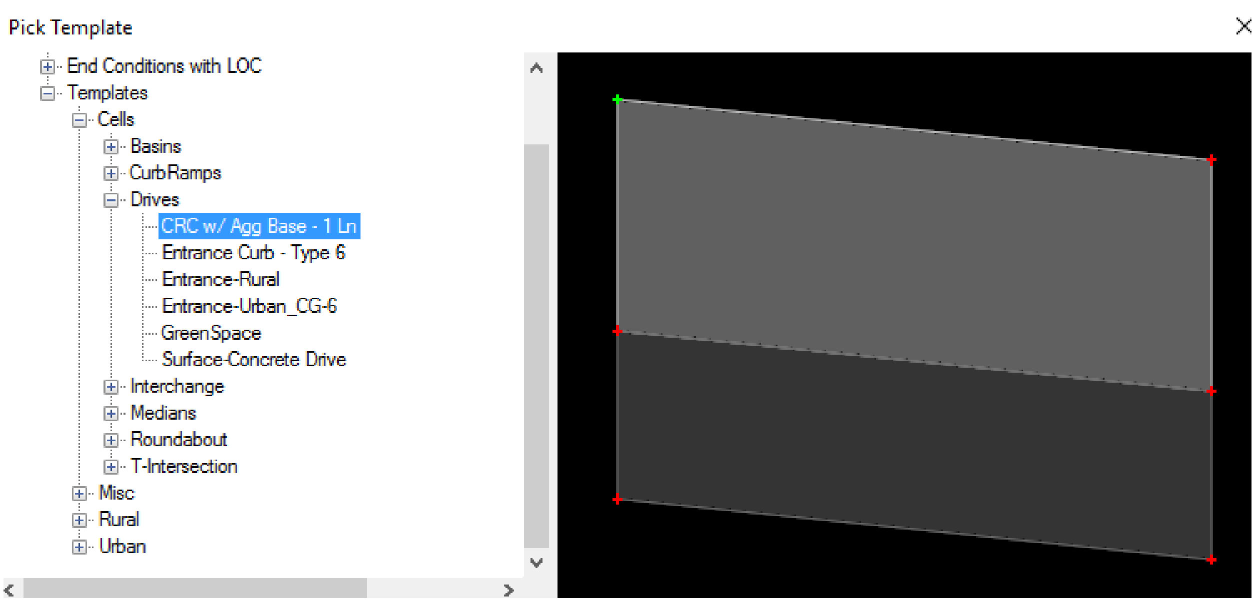


11.5.2.4 SURFACE TEMPLATE

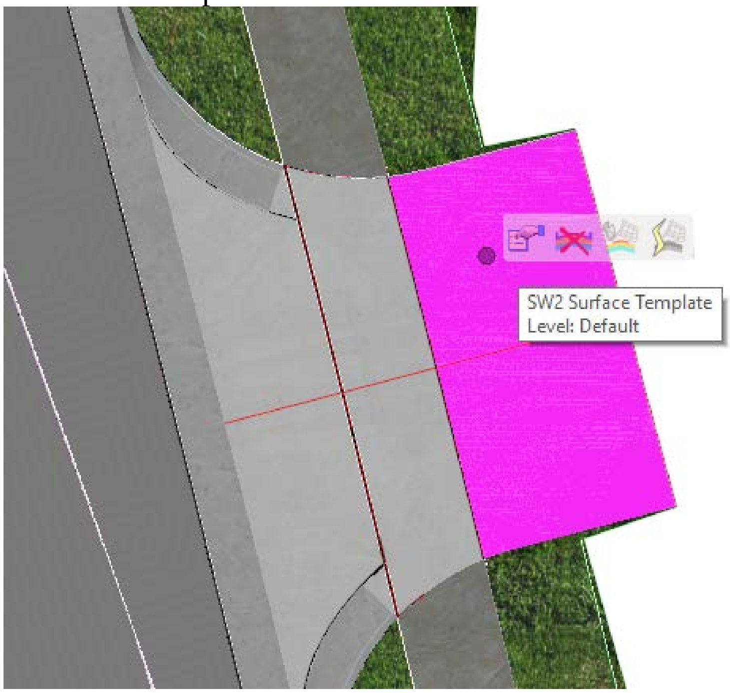
Surface Templates in the Civil Cell are shown below. Refer to section 11.3.10 for actual template edit, re-direct, or synchonize steps.

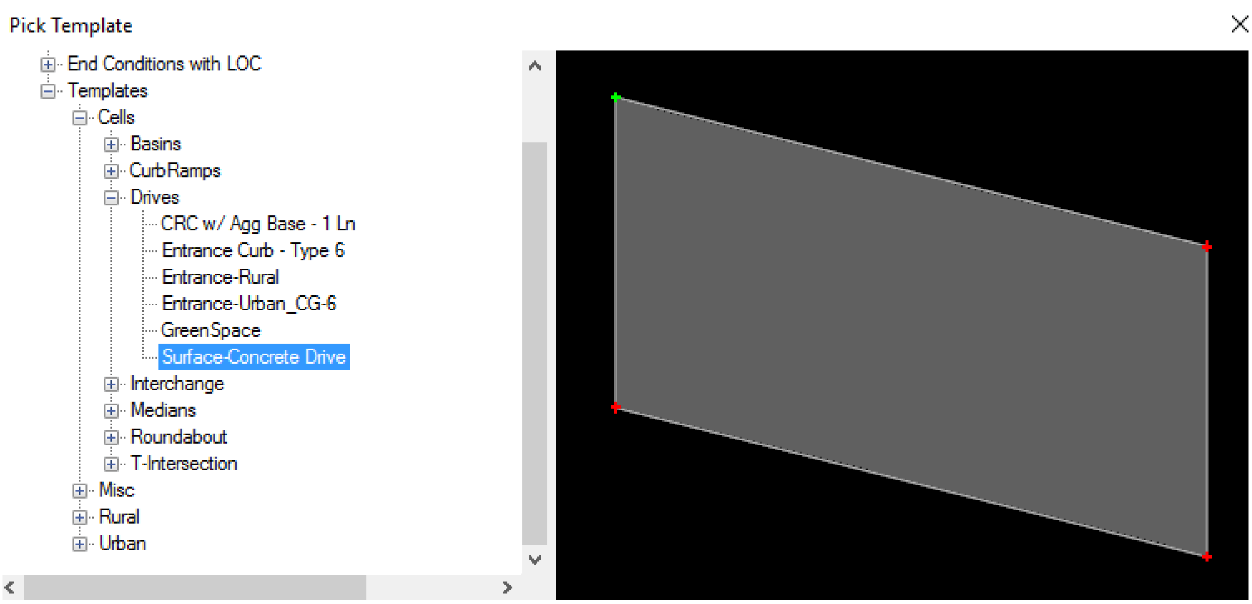
- Concrete Apron





- Drive behind Apron



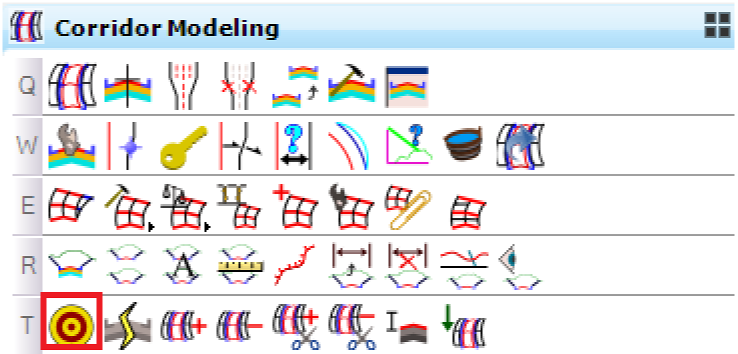


NOTE: This template would be replaced with a material type that matched the existing drive.

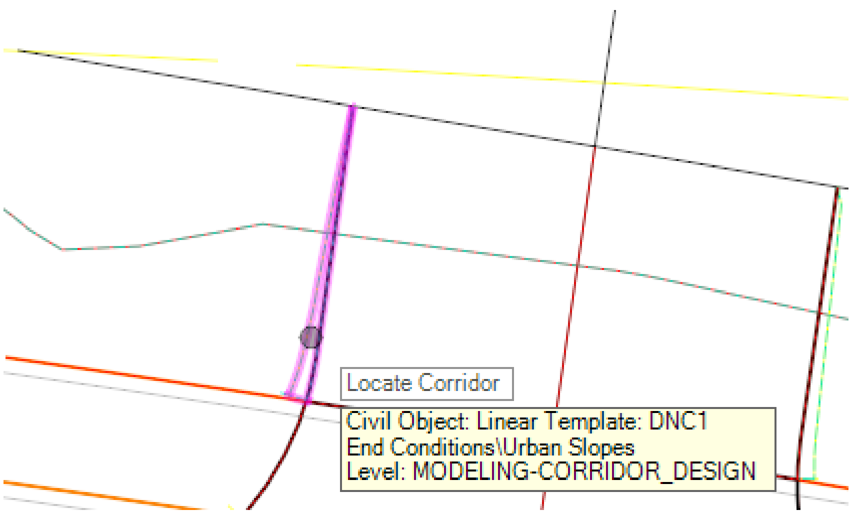
11.5.2.5 TARGET ALIASING

Target Aliasing can be used on the back templates to target the adjoining corridor.

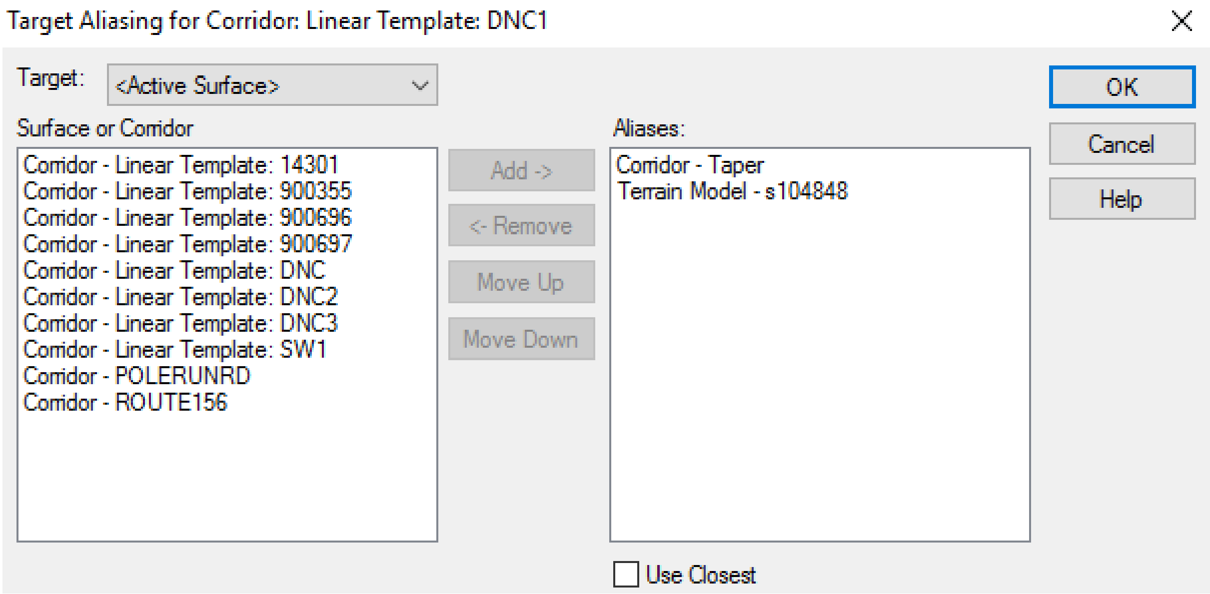
1. Select the Target Aliasing command from the Corridor Modeling task.



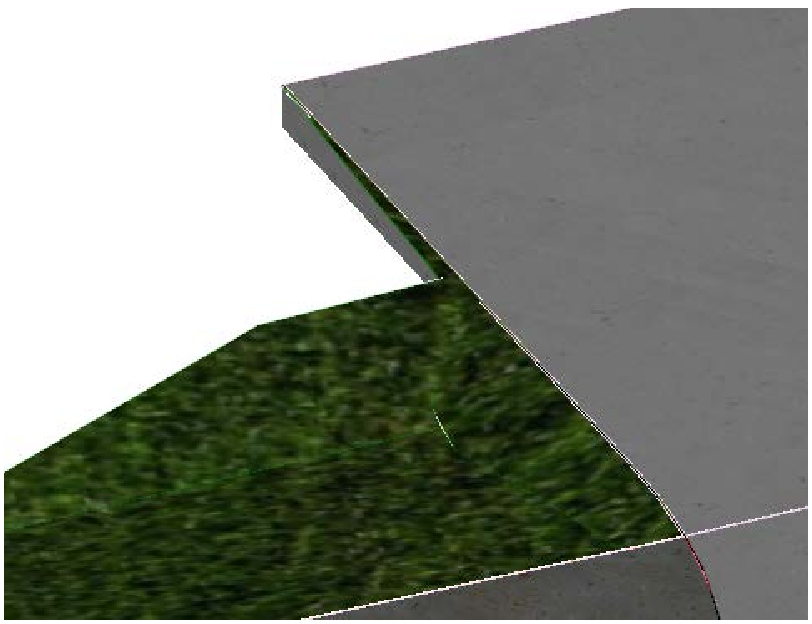
2. Select the LT Back linear template.



3. On the resulting dialog, select the Corridor-Taper and the existing ground Terrain Model as shown below and then tag OK.



The resulting model is shown below.



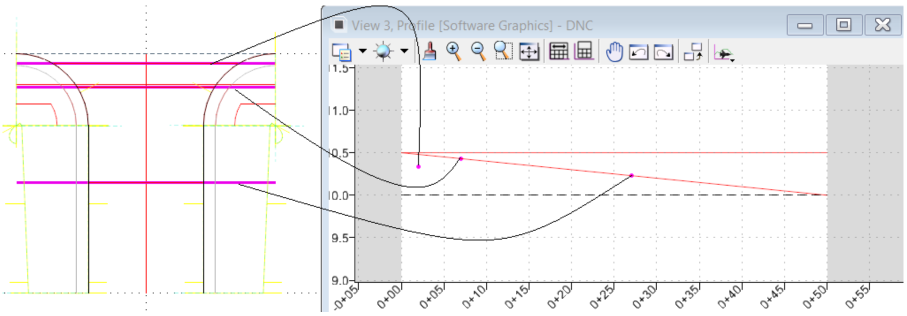
NOTE: The template was edited and fill/cut end condition priorities were reversed to achieve these results.

4. Perform the same process for the RT back linear template.

11.5.3 CELL – Drive Urban (CG-11)

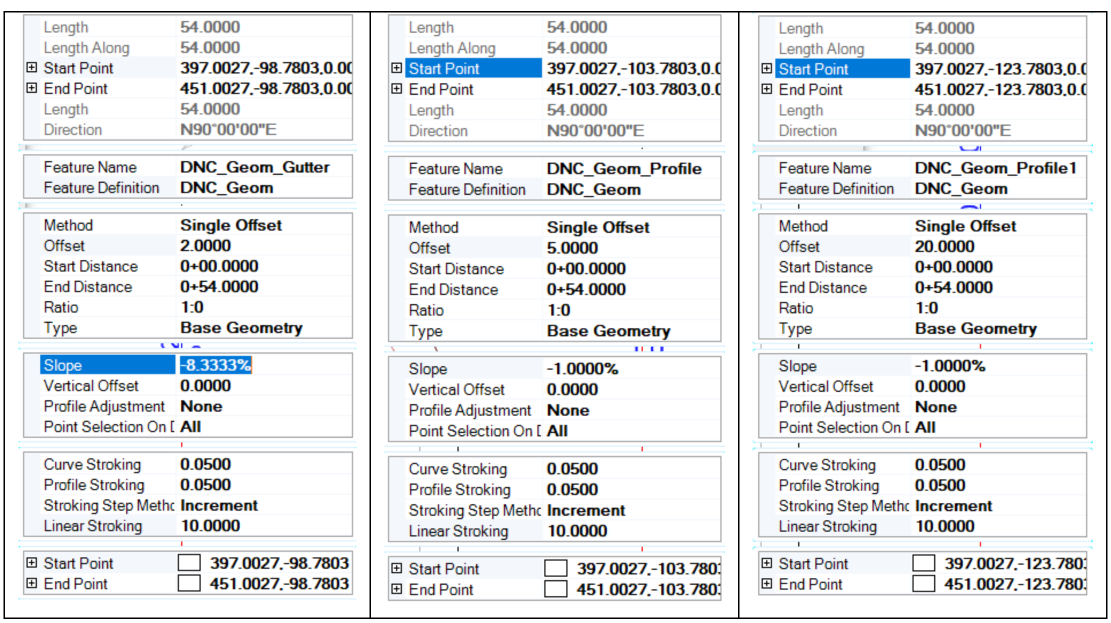
We will not cover this cell in detail but will go over a few of its characteristics that are different than the Urban Entry.

1. Profile of the CL & EoP's are controlled similarly to the Urban Drive with the two elements highlighted below in the plan view.



NOTES:

1. The offsets of the elements highlighted in the plan view above can be changed in the plan view to change the location of these elements in the profile. The graphical text to edit is not displayed in the image below.
2. These three elements profiles are built with slope projections off the EoP and the intersection points shown above will be modified if you change the slope properties of these elements as shown below. These will need to be change depending on a Cut or Fill Condition.
3. The 1st element off the EoP is projected the Gutter Slope of 8.33% but is not initially utilized in the profile. The profile can be re-drawn to go through this optional point.

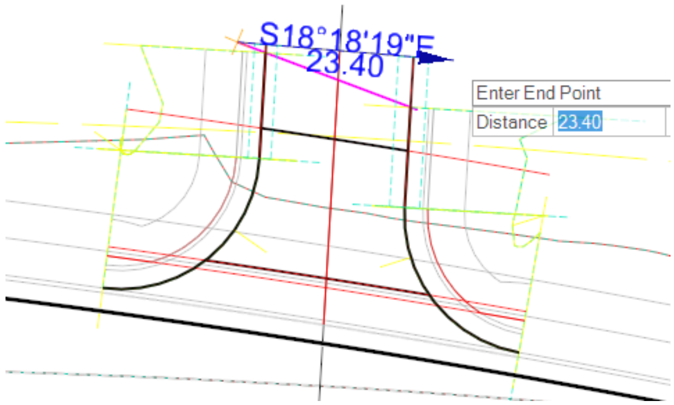


Length	54.0000
Length Along	54.0000
Start Point	397.0027,-98.7803,0.00
End Point	451.0027,-98.7803,0.00
Length	54.0000
Direction	N90°00'00"E
Feature Name	DNC_Geom_Gutter
Feature Definition	DNC_Geom
Method	Single Offset
Offset	2.0000
Start Distance	0+00.0000
End Distance	0+54.0000
Ratio	1:0
Type	Base Geometry
Slope	-8.3333%
Vertical Offset	0.0000
Profile Adjustment	None
Point Selection On [	All
Curve Stroking	0.0500
Profile Stroking	0.0500
Stroking Step Methc	Increment
Linear Stroking	10.0000
Start Point	397.0027,-98.7803
End Point	451.0027,-98.7803

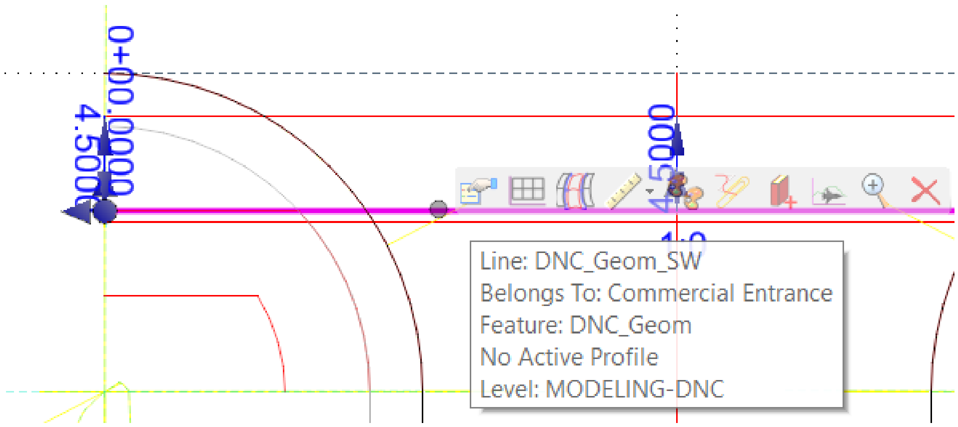
Length	54.0000
Length Along	54.0000
Start Point	397.0027,-103.7803,0.(
End Point	451.0027,-103.7803,0.(
Length	54.0000
Direction	N90°00'00"E
Feature Name	DNC_Geom_Profile
Feature Definition	DNC_Geom
Method	Single Offset
Offset	5.0000
Start Distance	0+00.0000
End Distance	0+54.0000
Ratio	1:0
Type	Base Geometry
Slope	-1.0000%
Vertical Offset	0.0000
Profile Adjustment	None
Point Selection On [	All
Curve Stroking	0.0500
Profile Stroking	0.0500
Stroking Step Methc	Increment
Linear Stroking	10.0000
Start Point	397.0027,-103.780:
End Point	451.0027,-103.780:

Length	54.0000
Length Along	54.0000
Start Point	397.0027,-123.7803,0.(
End Point	451.0027,-123.7803,0.(
Length	54.0000
Direction	N90°00'00"E
Feature Name	DNC_Geom_Profile1
Feature Definition	DNC_Geom
Method	Single Offset
Offset	20.0000
Start Distance	0+00.0000
End Distance	0+54.0000
Ratio	1:0
Type	Base Geometry
Slope	-1.0000%
Vertical Offset	0.0000
Profile Adjustment	None
Point Selection On [	All
Curve Stroking	0.0500
Profile Stroking	0.0500
Stroking Step Methc	Increment
Linear Stroking	10.0000
Start Point	397.0027,-123.780:
End Point	451.0027,-123.780:

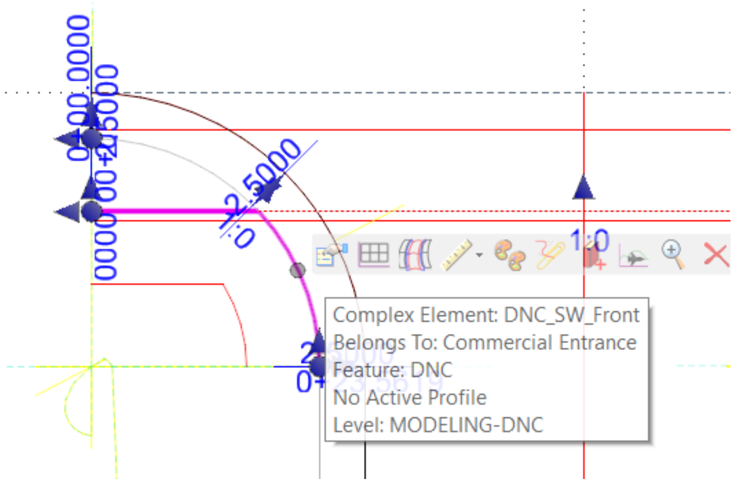
2. Modifying the reference Line at Entrance Back will also change the profile of the Entrance CL & EoP's.

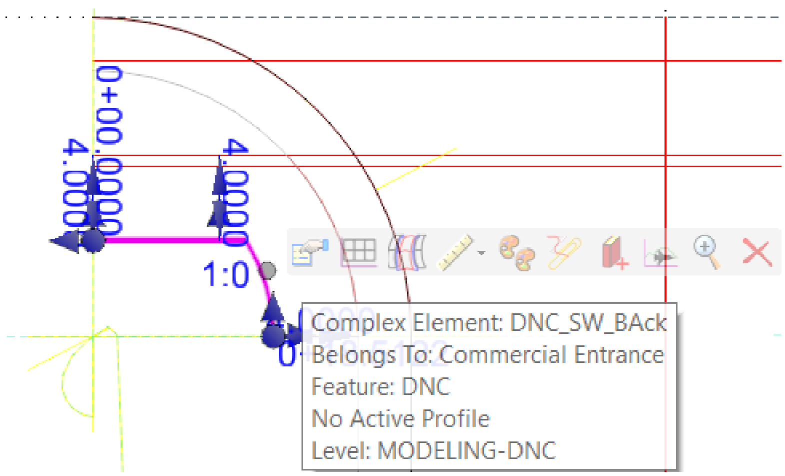


3. The element below should be aligned with the Front of SW of the Thru Rd Corridor by modifying the offset if needed.



4. The elements below are targeted by the Point Controls in the curve return template which controls the Sidewalk transition. The 2.5’ offset to the Face of SW in the 1st image below and the 4’ offset to the Back of SW in the 2nd image below may need to be changed if the type of C&G in this area is different than Type 6 and the sidewalk width is different than 4’.



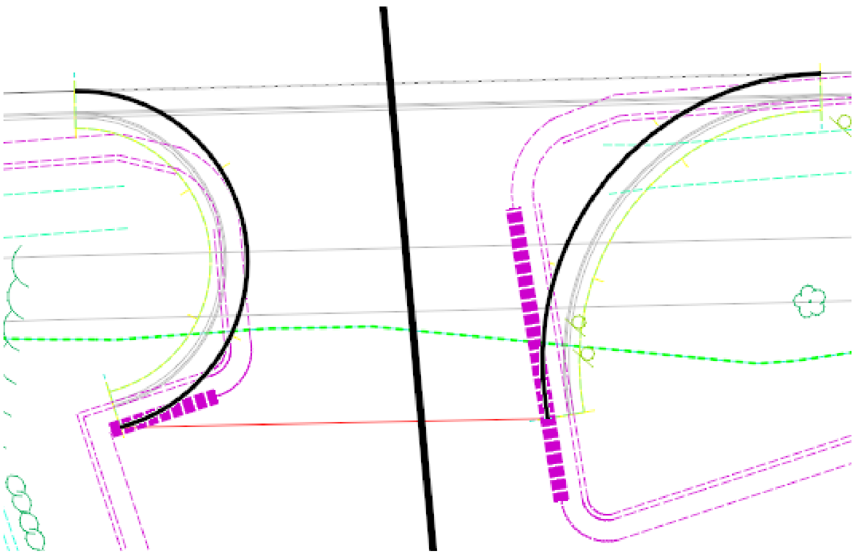


5. Although you can clip the overlapping corridors, it is ideal to use the INT_L or INT_R display rules to turn off C&G, SW, and End Conditions through the cell.

11.5.4 CELL – Drive Urban (CG-11, Variable Radius)

11.5.4.1 OVERVIEW

The Drive Urban (CG011, Variable Radius) cell is used when you need the radius returns to tie to existing EoP that is not parallel to a Drive CL. Below is a good example of this scenario with the two existing EoP elements which are references of the cell shown as the bolder highlighted elements.



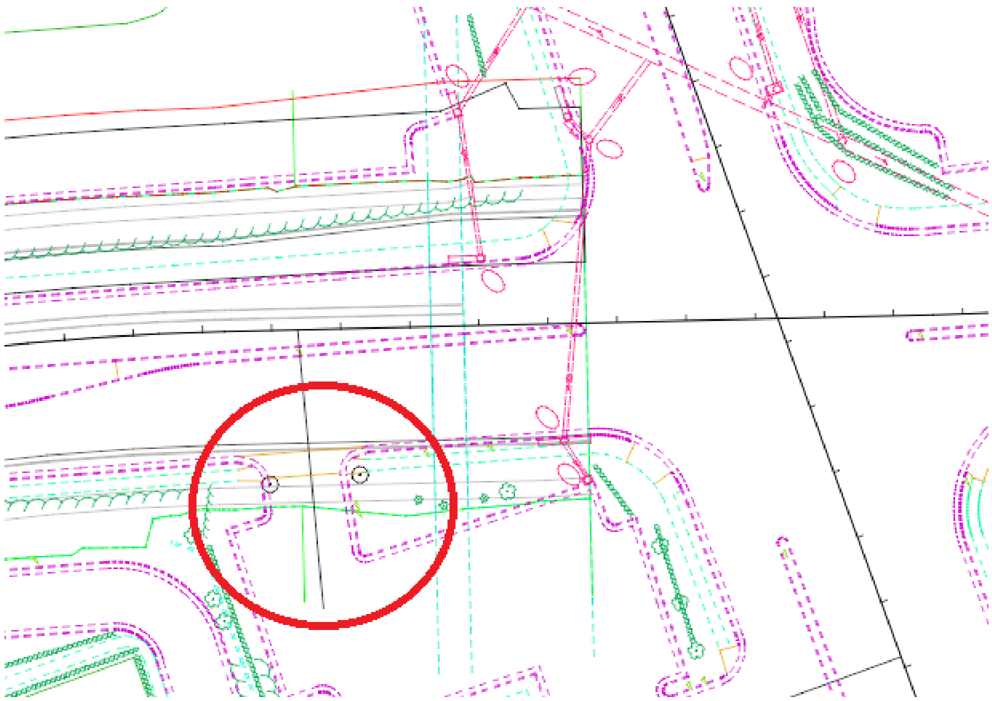
We will not cover this cell in detail but will go over a few of its characteristics that are different than the Urban Drive. This cell differs from the other drives in a couple of different ways.

- The Radius Ties in the cell are to the existing EoP.
- The Radius values are variable and based on Data Points by the user upon placement when prompted for the LT & RT Thru Points.

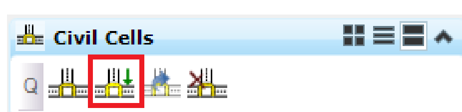
11.5.4.2 PLACEMENT

1. Open the file **Drive-Existing_Tie.dgn.**
   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

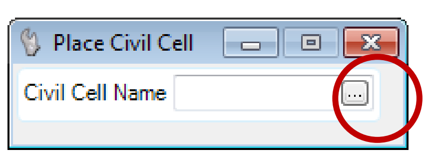
   b. Zoom to the area of the drive CL as shown below.



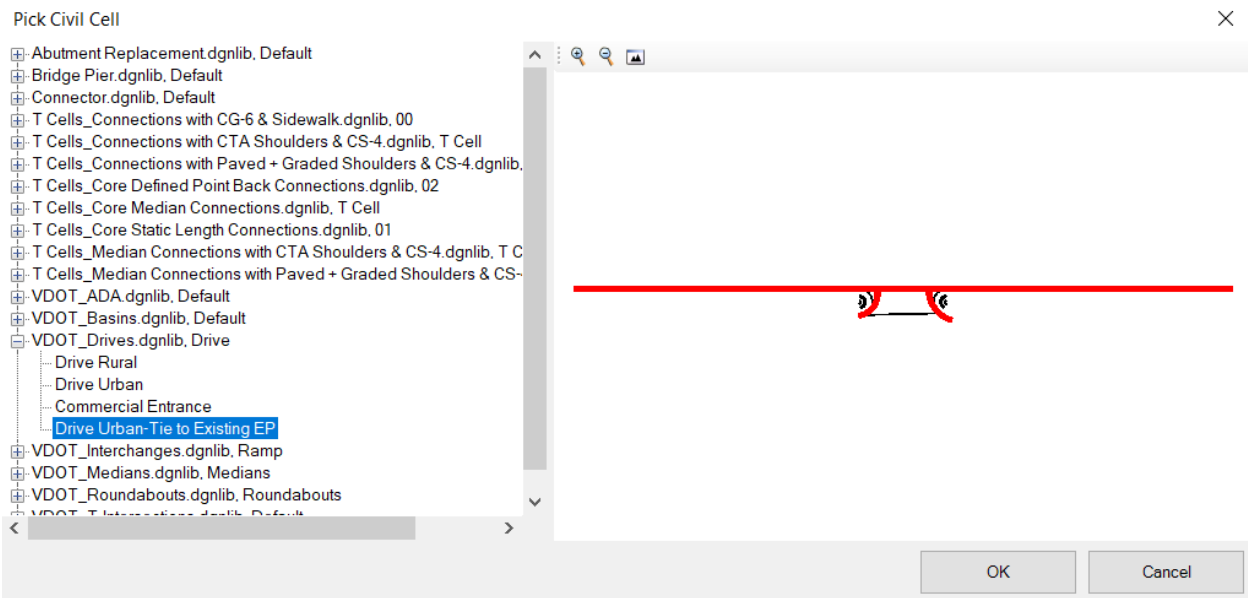
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

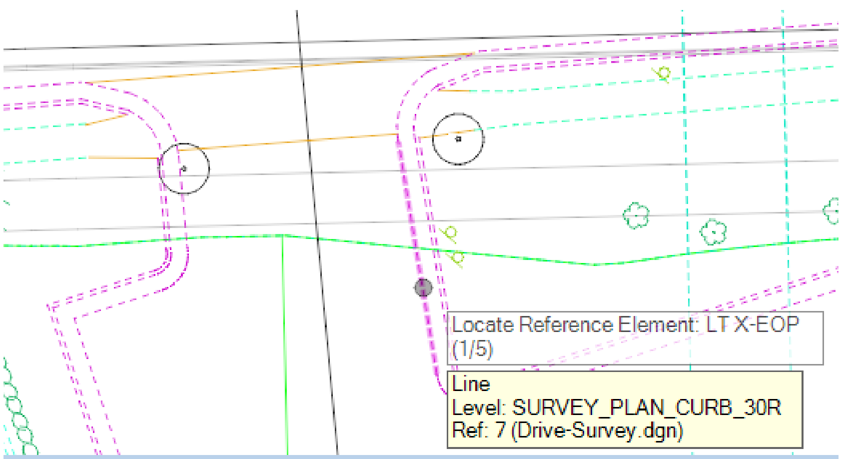


4. Select the **Drive Urban-Tie to Existing EP** civil cell from the **VDOT_Drives.dgnlib** folder and click **OK.**

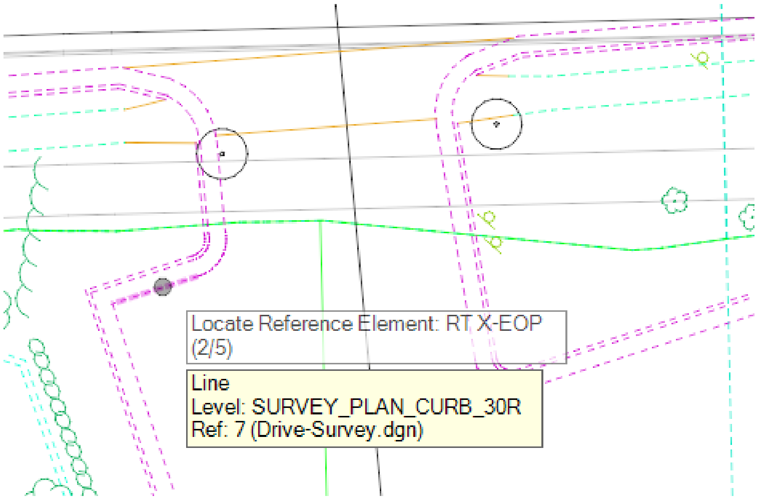


NOTE: The next five prompts may be in different order than listed in this manual.

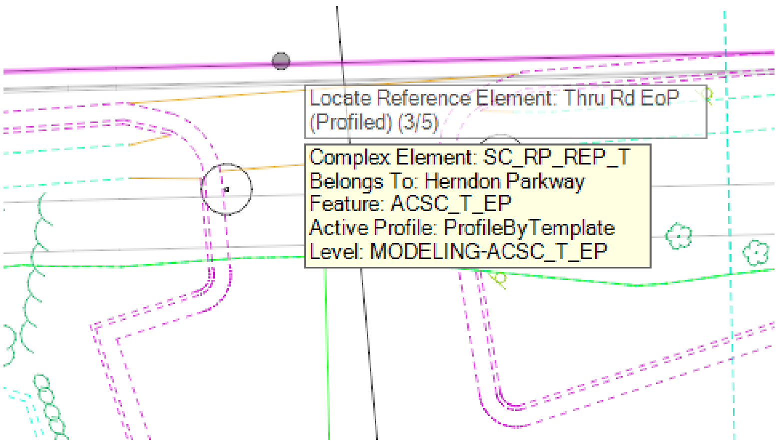
5. When prompted to *Locate Reference Element 'LT X-EOP'*, select the **existing EoP** element shown below.



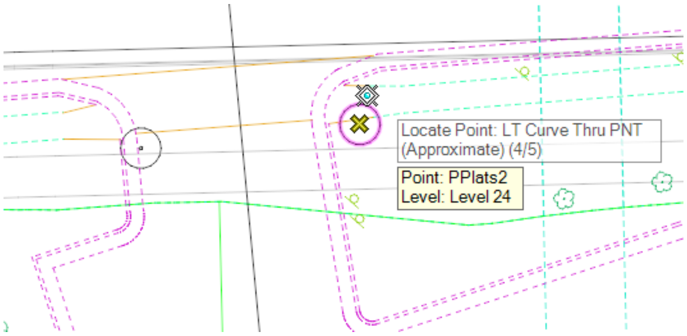
6. When prompted to *Locate Reference Element*:*'RT X-EOP'*, select the **existing EoP** element shown below.



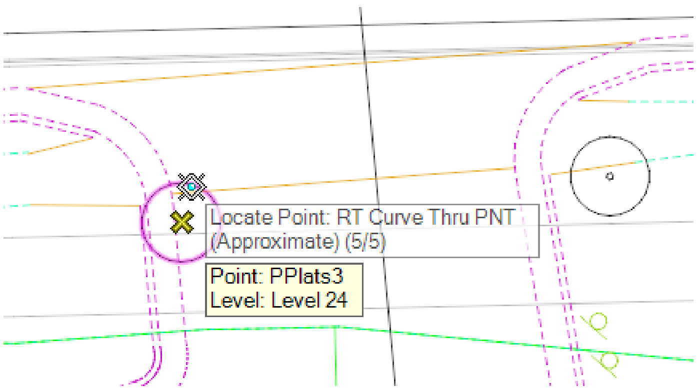
7. When prompted to *Locate Reference Element 'Thru Rd EoP (Profiled)'*, select the **Proposed EoP** shown below.



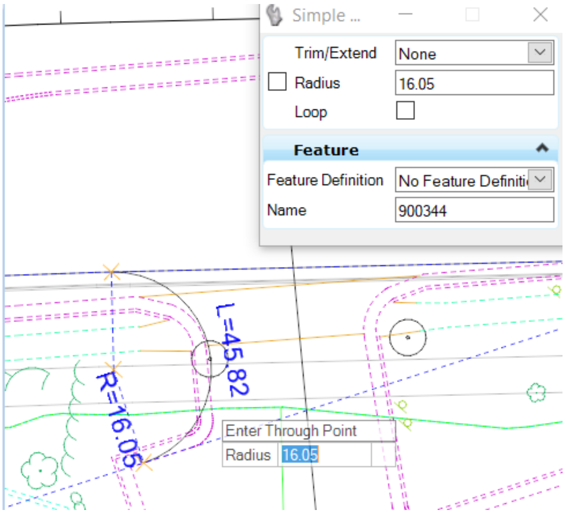
8. When prompted to *'Locate Point: LT Curve Thru PNT (Approximate)'* Origin Snap to the point below and the Data Point.



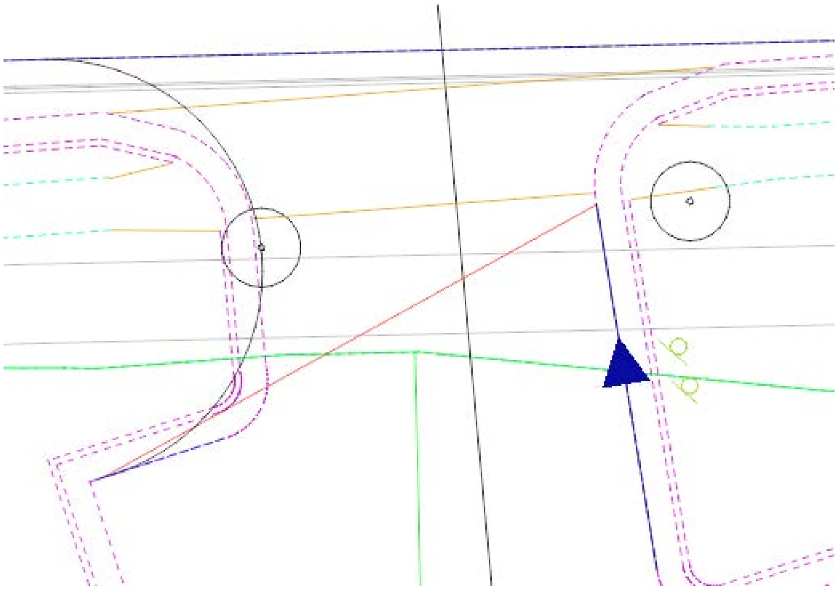
9. When prompted to *'Locate Point: RT Curve Thru PNT (Approximate)'* Origin Snap to the point below and the Data Point.



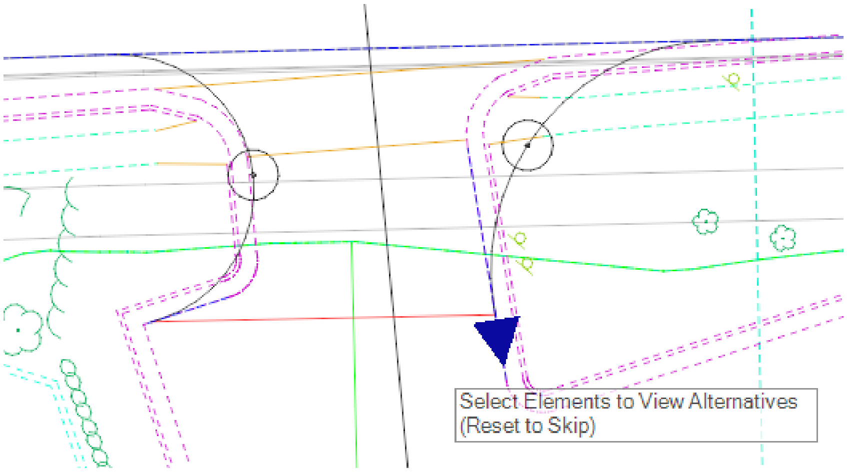
NOTE: These points snapped to in the last two commands were just placed so the user knows where to data point for this exercise so the points are not required for placement of the cell. It is ideal to use the Simple Arc Horizontal Geometry command prior to placement of the cell so you know approximately where the Thru PNT Data Points need to be issued. This process is demonstrated in the image below although this needs to be performed prior to choosing the Place Cell command.



10. Observe the geometry being displayed.

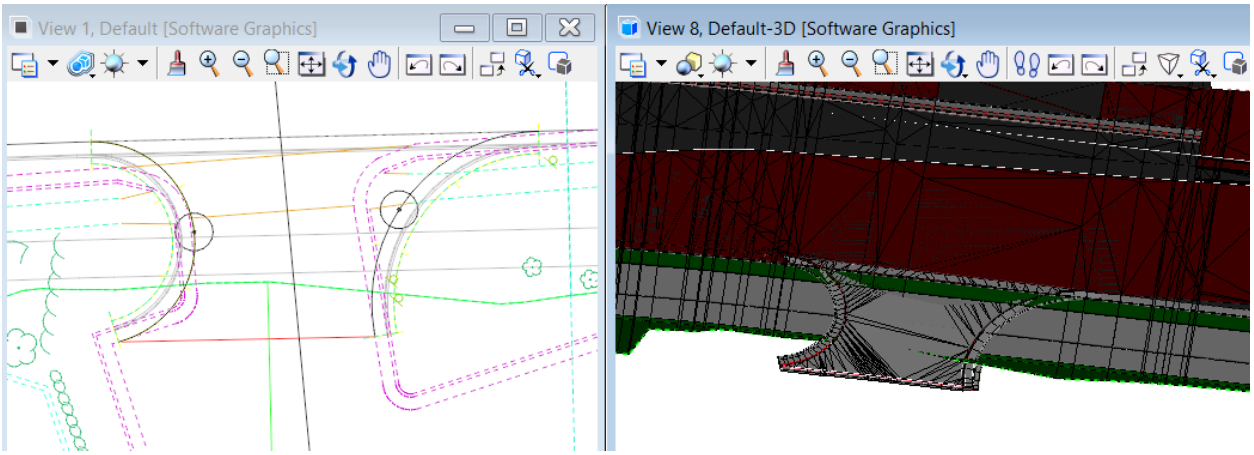


11. Reverse the LT X-EoP element by hovering over it and then issuing a Data Point. The image should now appear as shown below.



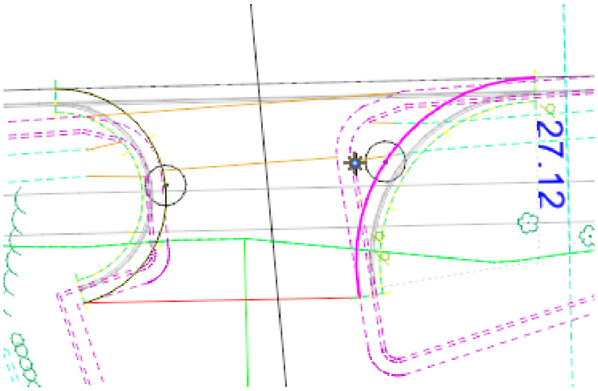
12. **Reset** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.
13. **Reset** when prompted to *Select Corridors To Be Clipped.*
14. **Data Point** in the View when prompted to *'Accept Civil Cell Placement'*.

    The image below shows the cell in 2d & 3d views.



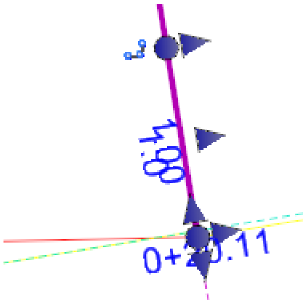
11.5.4.3 EDITS

1. Select the EOP_L element.

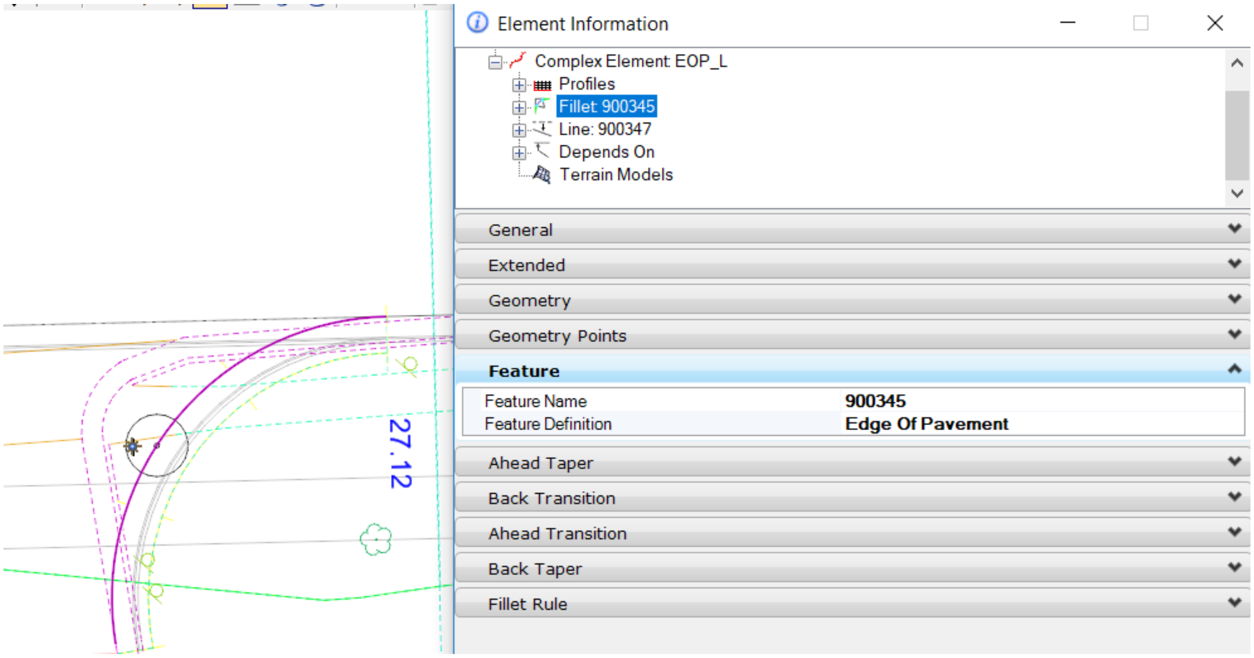


The radius value can be edited as needed although we will not make edits in this exercise.

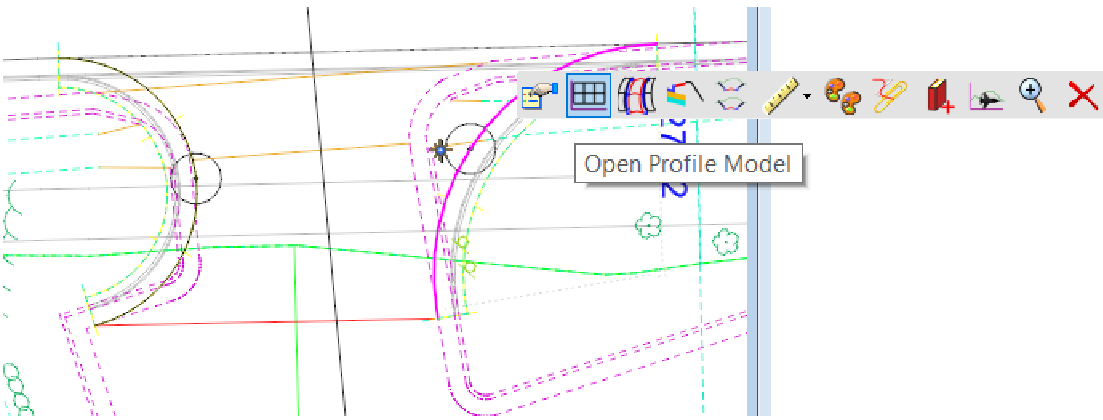
2. With the EOP_L element still selected, zoom in to the southern end of it. Notice the 1' long segment at the end of the EOP_L element. This can be modified to follow along the existing EOP as needed.



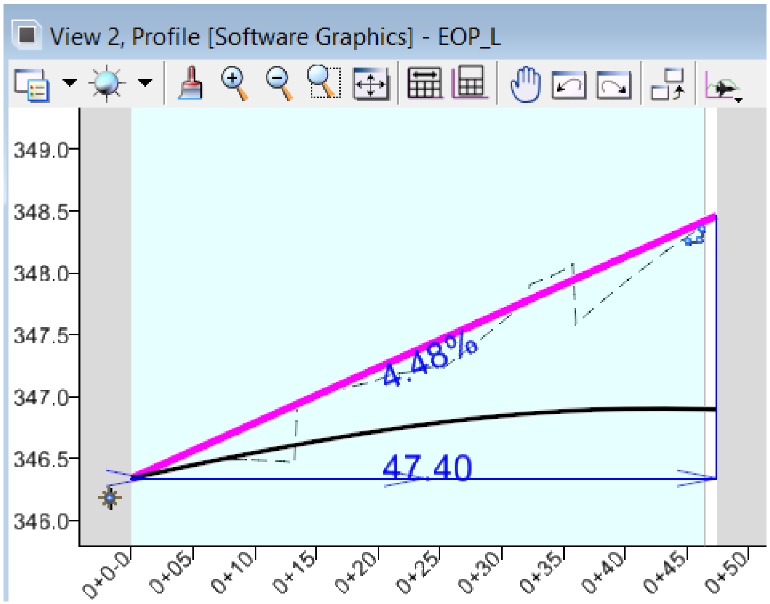
3. With the EOP_L element still selected, invoke MicroStation's Element information and expand the Complex Element: EOP_L. You can change the Fillet's Ahead & Back transitions to Curves as needed if 2 or 3-center curves are needed.



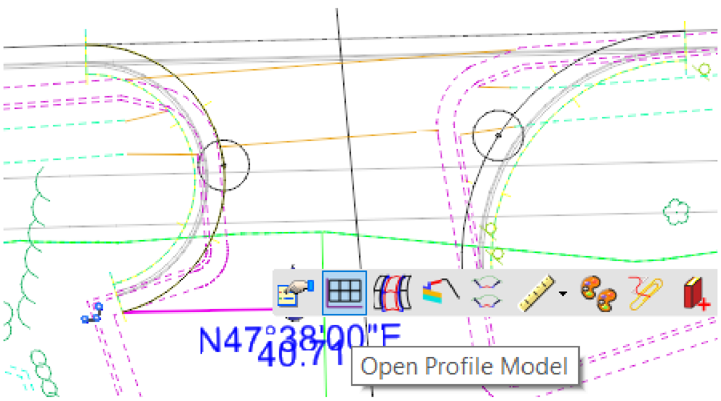
4. Open the Profile Model of the EOP_L element in View 3.



5. The Active Profile is highlighted below. This is just a straight line between the Proposed EoP & Existing EoP but a new profile can be drawn as needed (with the end points still tying to the same points as shown below) and made Active.

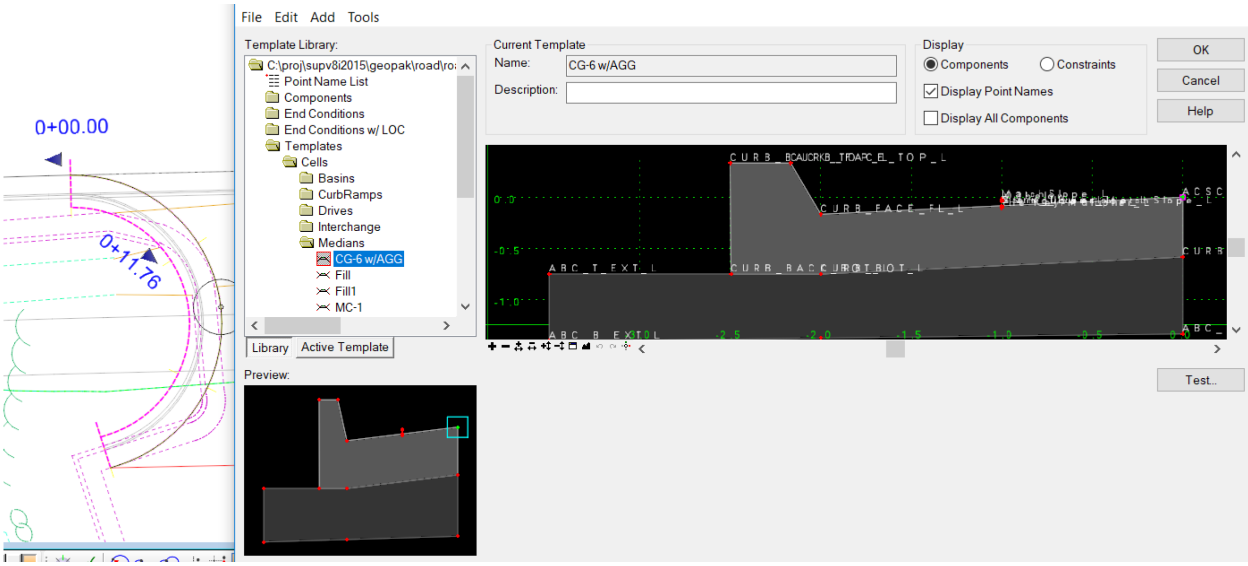


6. Open the Profile Model of the Back of Drive element.



7. Its Active Profile is generated from the Existing Ground Terrain.
8. Breaklines such as one running along the Gutterline through the intersection can be drawn, profiles and added to the PVMT Surface terrain in the cell as needed.
9. In lieu of using Clipping, it's suggested to use the INT_L or INT_R Parametric Constraints to turn off the Thru Rd Corridor C&G, Sidewalk, & End Conditions.

10. The linear templates initially included in the cell are just CG-6 with no end conditions. These can be easily replaced as described in other sections in this manual if an end condition is needed or the Back Top of Curb created in the Plan View can be utilized to create a terrain for grading purposes.

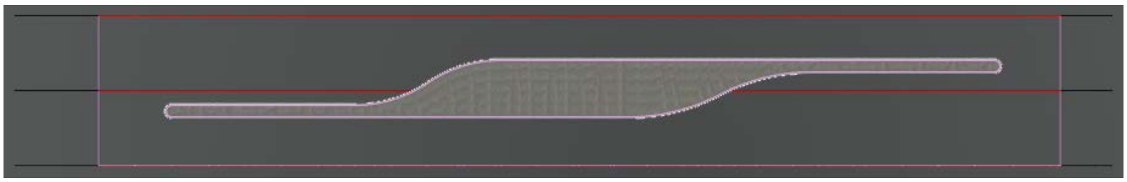


11.6 MEDIANS

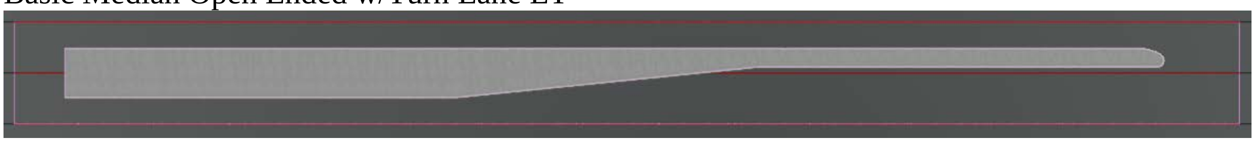
11.6.1 Available Cells

- Basic Median

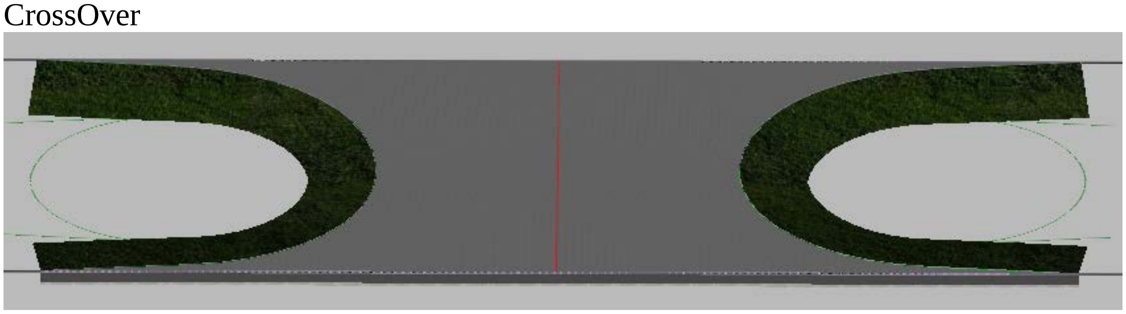
- Basic Median w/Turn Lanes LT & RT



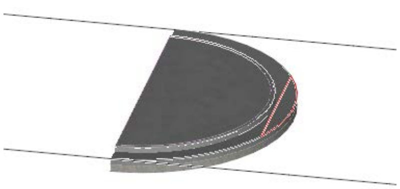
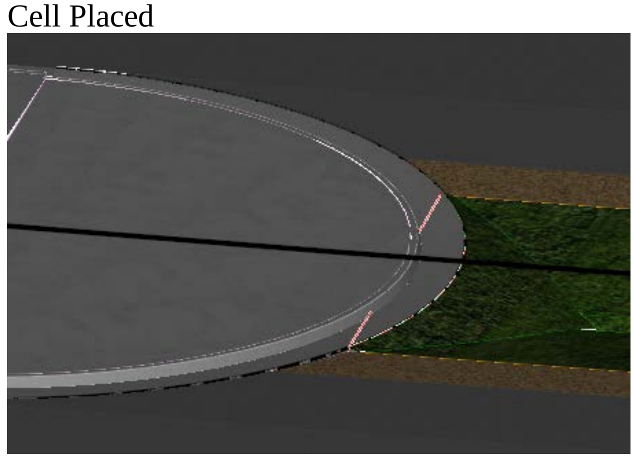
- Basic Median Open Ended w/Turn Lane LT



- CrossOver

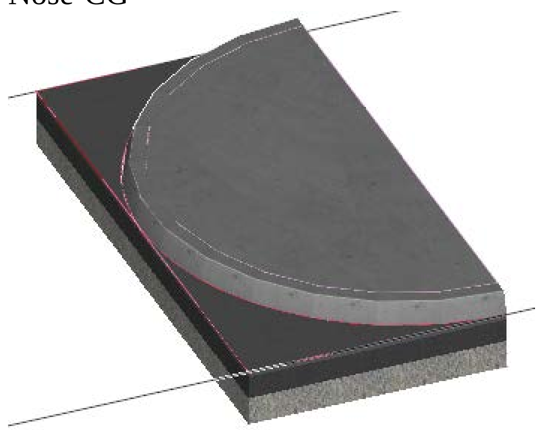
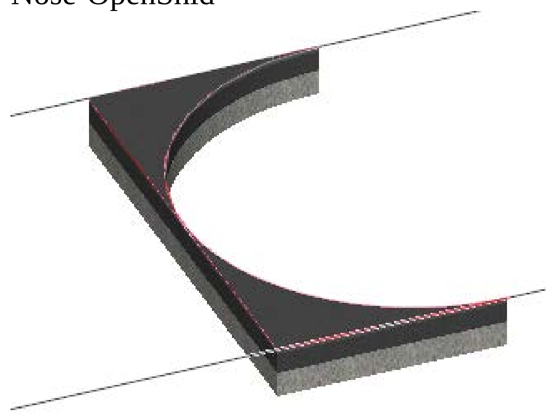


- Nose (Raised Median to Open Shld Transition)

Cell	Cell Placed
	

NOTE: Cell has Fill Condition which is set to target adjoining Open Shoulder Ditch as shown in the Cell Placed image above.

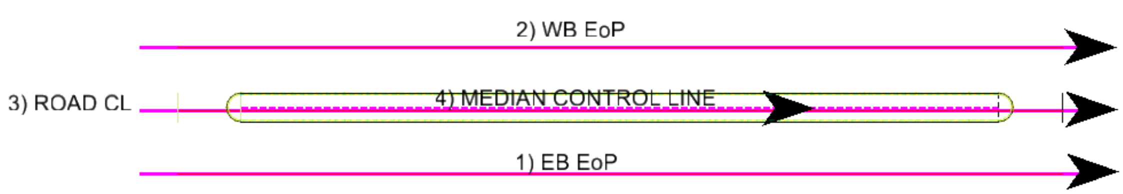
- Nose (CG & OpenShld)

Nose-CG	Nose-OpenShld
	

NOTES:

1) These cells can be used to place the Nose area only of a median and are intended to be used when the storage lane, taper, and cross-over areas are drawn with corridor templates.
2) This can be used with a divided or undivided corridor situation but the applicable EP's have to be drawn and profiled.
3) The OpenShld Nose Cell has a Linear Template with a Fill Condition which has to be set to Target the adjoining Open Shoulder Ditch.

11.6.2 References & Direction of References

Basic Medians
1) EB EoP (Profiled) 2) WB EoP (Profiled) 3) Road CL (Profiled) 4) Median Control Line(1)


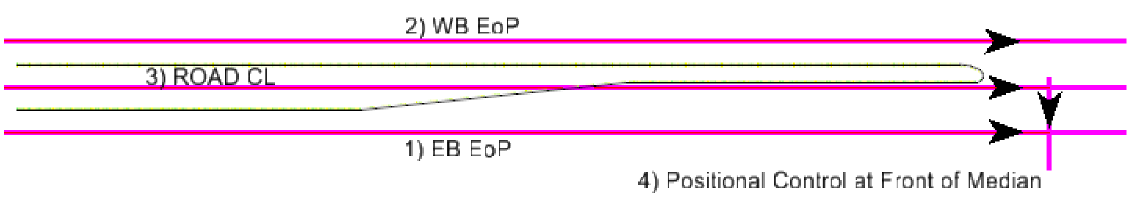
NOTES:

(1) The Median Control Line controls the length and location of the Median. This is generally placed as an Offset Partial along the Road CL but can be any geometry type.

(2) Order may be different than shown here. Follow prompts.

Basic Median Open Ended

1) EB EoP (Profiled)
2) WB EoP (Profiled)
3) Road CL (Profiled)
4) Positional Control at Front of Median



NOTES:

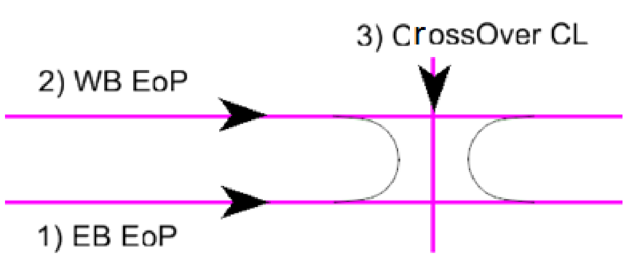
(1) The Median Control Line controls the length and location of the Median. This is generally placed as an Offset Partial along the Road CL but can be any geometry type.

(2) Order may be different than shown here. Follow prompts.

(3) You need a minimum of 500’ of EoP from the Positional Control element.

CrossOver

1) EB EoP (Profiled)
2) WB EoP (Profiled)
3) CrossOver CL

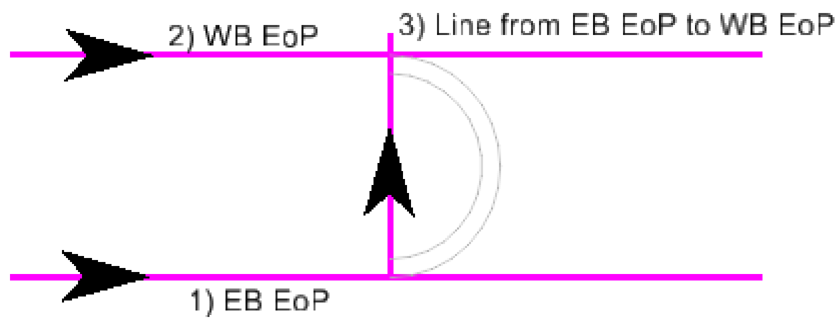


NOTES:

(1) Order may be different than shown here. Follow prompts.

(2) Minimum 30’ Edge of Shoulder to Edge of Shoulder Median Width Req’d.

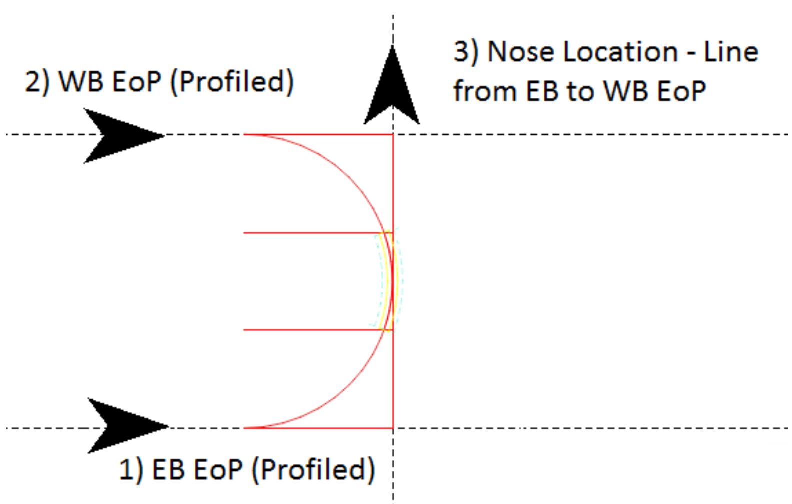
(3) User must target open shoulder corridor after placement to complete cell.

Nose (Raised Median to Open Shld Transition)
1) EB EoP (Profiled) 2) WB EoP (Profiled) 3) Line placed from EB EoP to WB EoP (Back of Nose)


NOTES:

(1) Order may be different than shown here. Follow prompts.

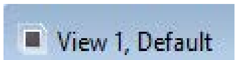
(2) User must target open shoulder corridor after placement to complete cell.

Nose-CG & Nose-OpenShld
1) EB EoP (Profiled) 2) WB EoP (Profiled) 3) Nose Location – Line from EB to WB EoP


11.6.3 Placement (Basic Median Open Ended)

1. Open the file **2-lane-Urban-Median.dgn.** This file contains alignment *ROUTE156* and around 110+60, a secondary intersecting roadway named **POLERUNRD.** A Corridor has been created for *ROUTE156* and a design grade established for *POLERUNRD.* We will place a **Raised Median Open End w/Turn Lane** Civil Cell near the *ROUTE156/POLERUNRD* intersection.

   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

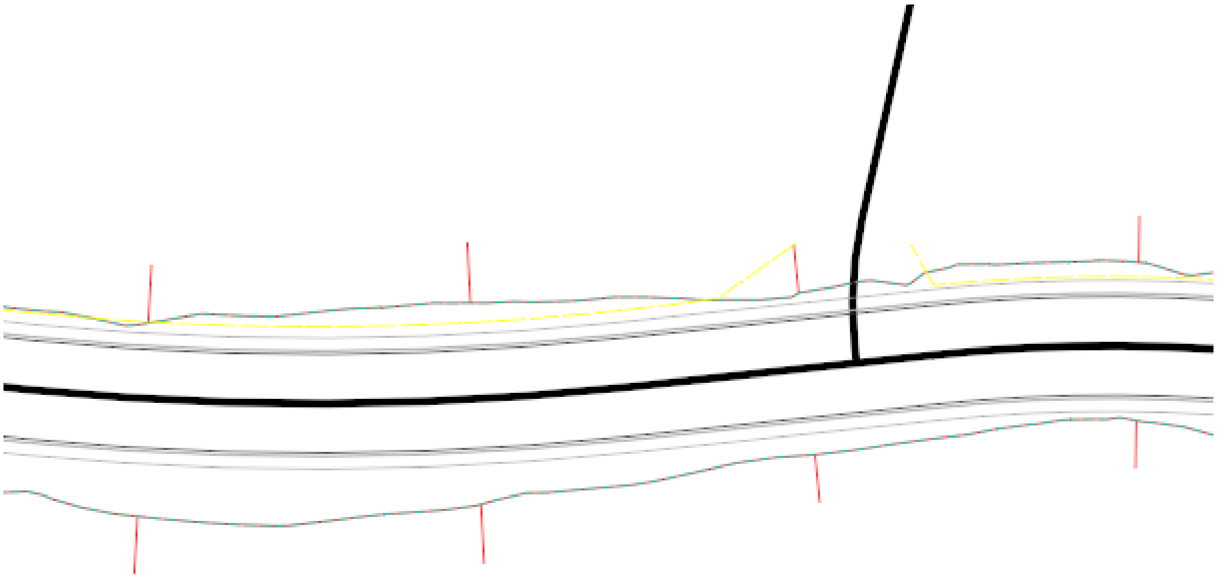
   

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

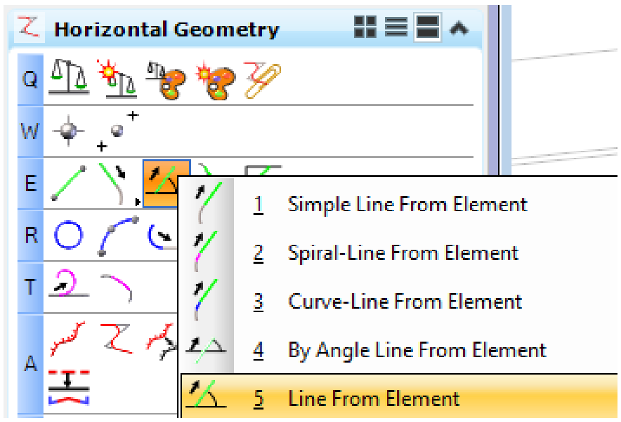
   c. Close the reference dialog.

   d. Zoom to the area of the drive CL as shown below.

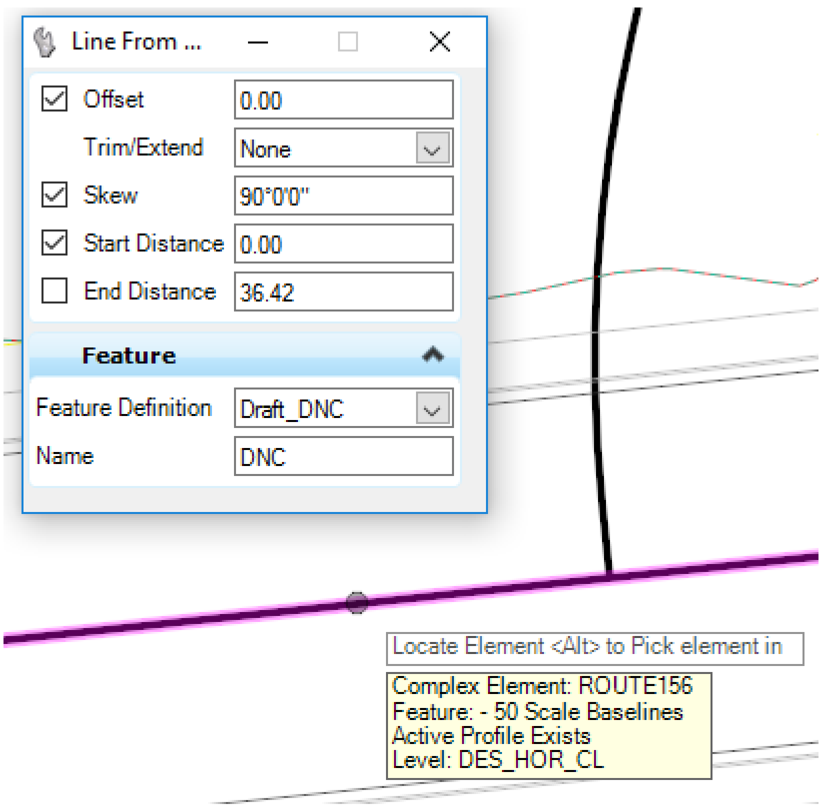


2. We will use template EoP graphics and the ROUTE156 CL as Civil Cell references but we need to draw the reference *Positional Control at Front of Median.*

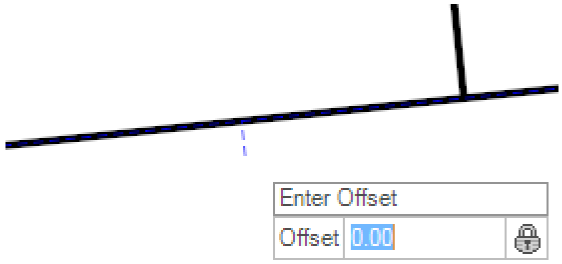
   a. Select the **Line from Element** command from the Horizontal Geometry menu.



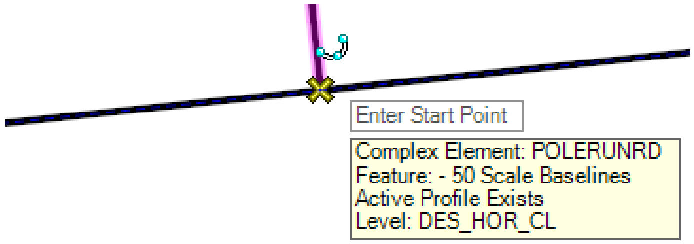
   b. Fill out the dialog as shown below and Left Click the *ROUTE156 CL* when prompted to **Locate Element.**



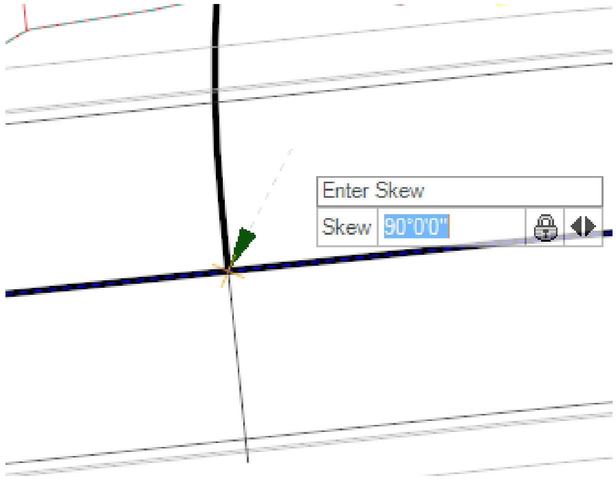
c. Left Click anywhere in View 1 to confirm the **Offset of 0.**



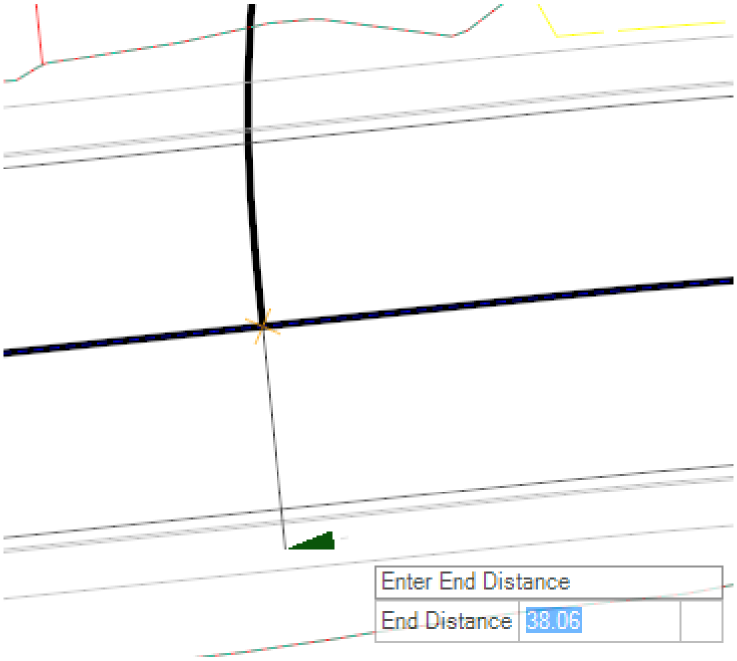
d. **Snap** to the *intersection of ROUTE156 and POLERUNRD* and confirm the **Enter Start Point** with a Left Click.



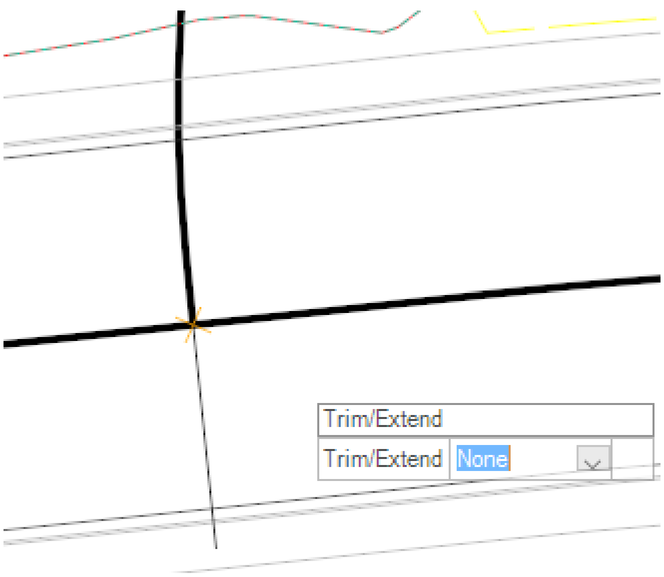
e. Left click anywhere on the North side of ROUTE156 when prompted to **Enter Skew.**



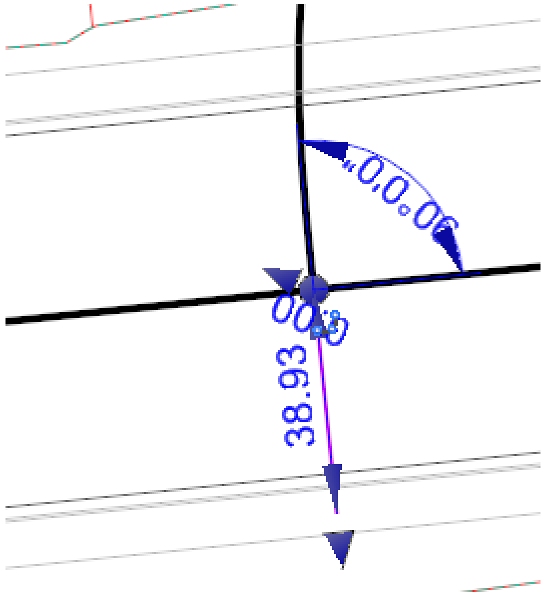
f. Left Click just past the opposite ROUTE156 EoP when prompted to **Enter End Distance**.



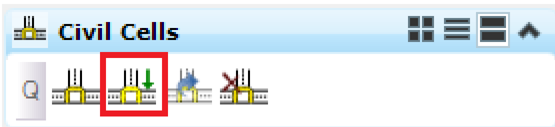
g. Confirm *Trim/Extend* of **None** with a left click anywhere to place the line.



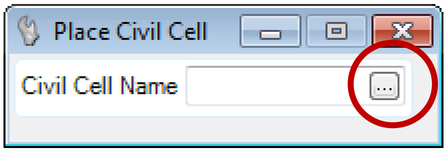
h. The line just placed is shown highlighted below.



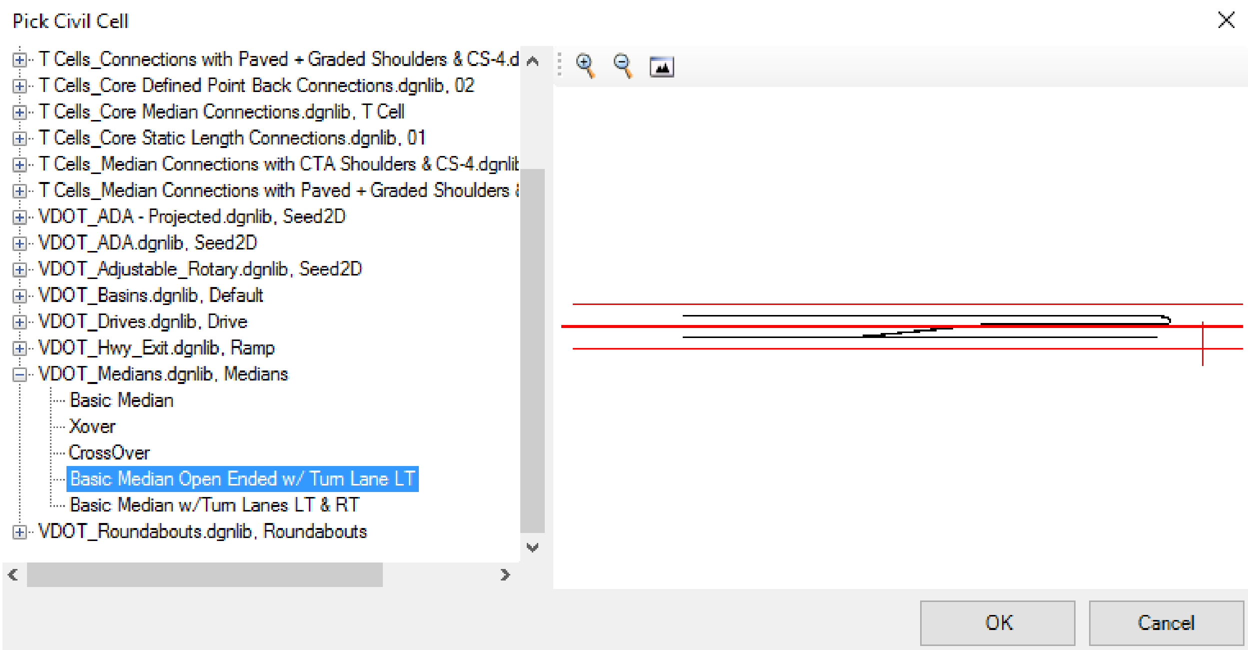
3. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



4. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

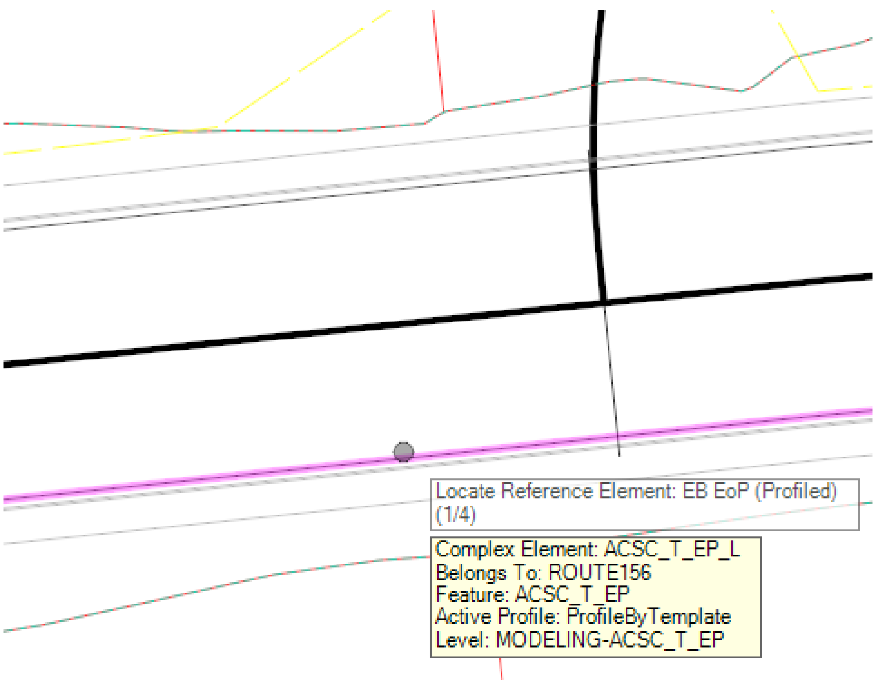


5. Select the **Basic Median Open Ended w/Turn Lane LT** civil cell from the **VDOT_Medians.dgnlib** folder and click **OK.**

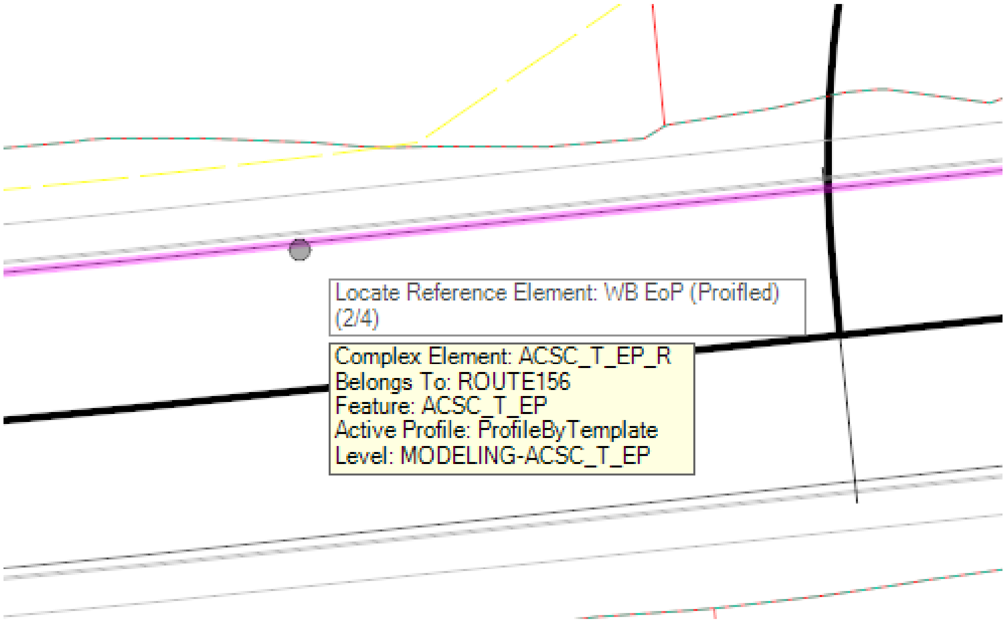


NOTE: The next three prompts may be in different order than listed in this manual.

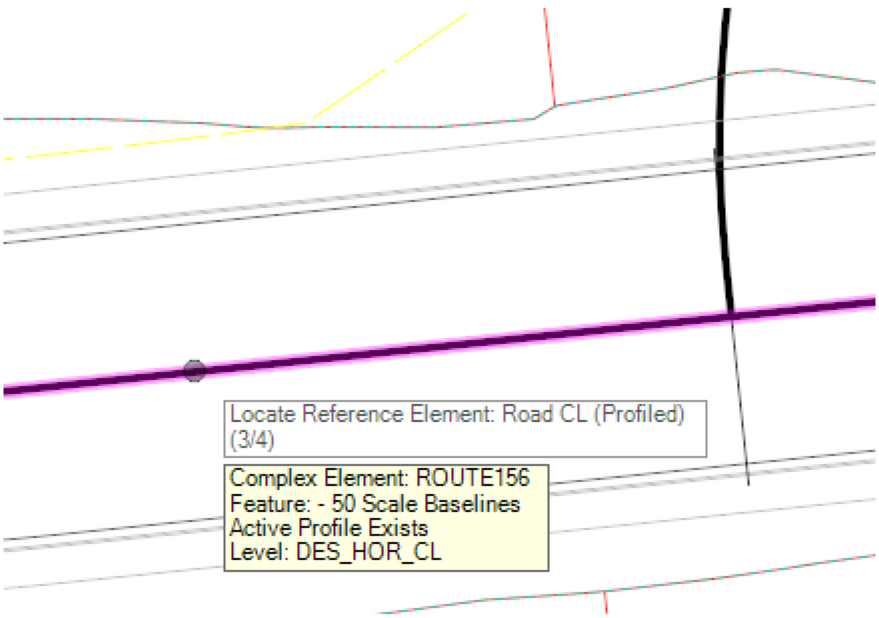
6. When prompted to *Locate Reference Element 'EB EoP (Profiled)'*, select the **Edge of Pavement** element in View 1 as shown below.



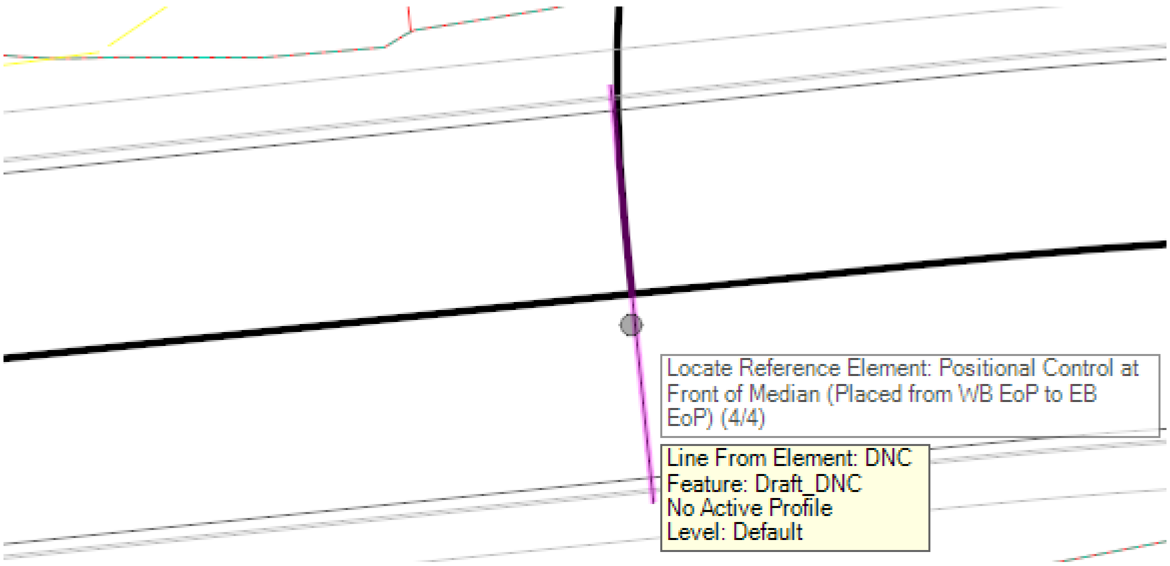
7. When prompted to *Locate Reference Element 'WB EoP (Profiled)'*, select the **Edge of Pavement** element in View 1 as shown below.



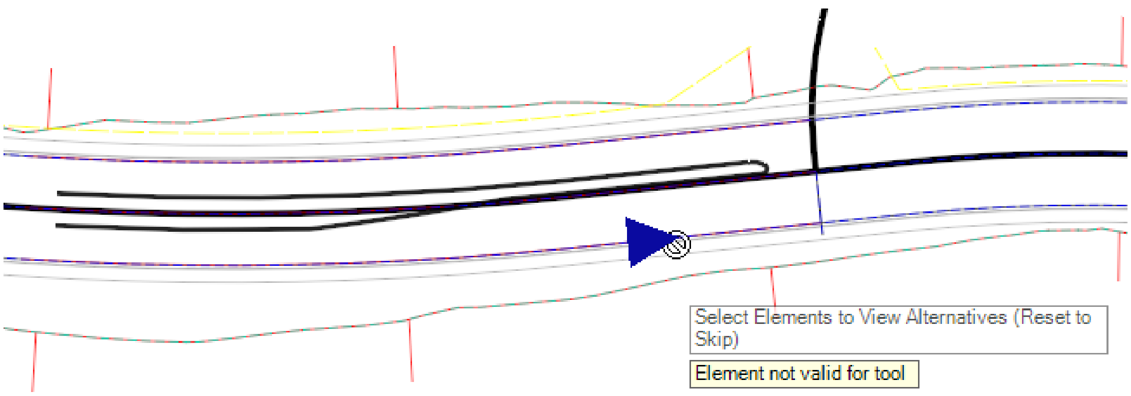
8. When prompted to *'Locate Reference Element: Road CL (Profiled)* select the **ROUTE156 CL** element in View 1.



9. When prompted to *'Locate Reference Element: Positional Control at Front of Median (Placed from WB EoP to EB EoP)* select the **line placed in step 2**.



10. Review the geometry being displayed.

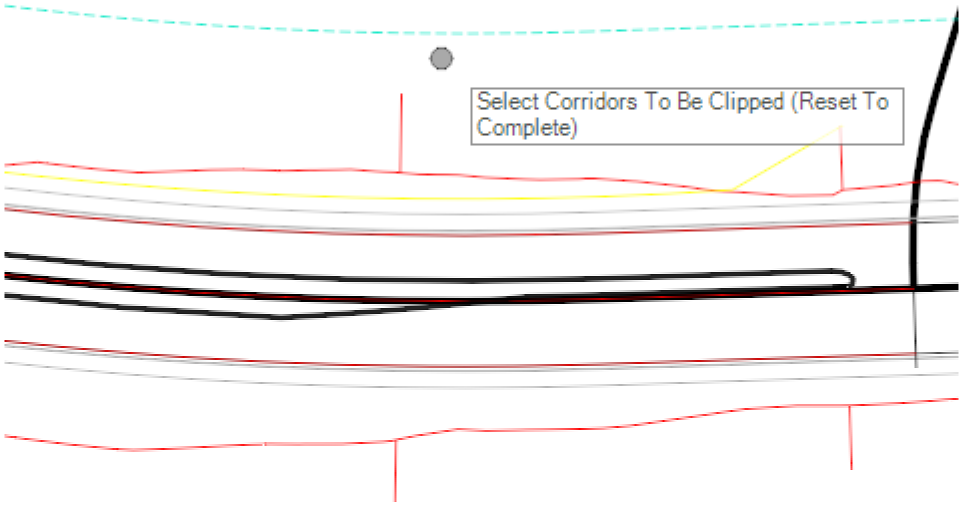


   a. If the geometry appears correct and similar to the image above, move on to the next step.

   b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.5.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

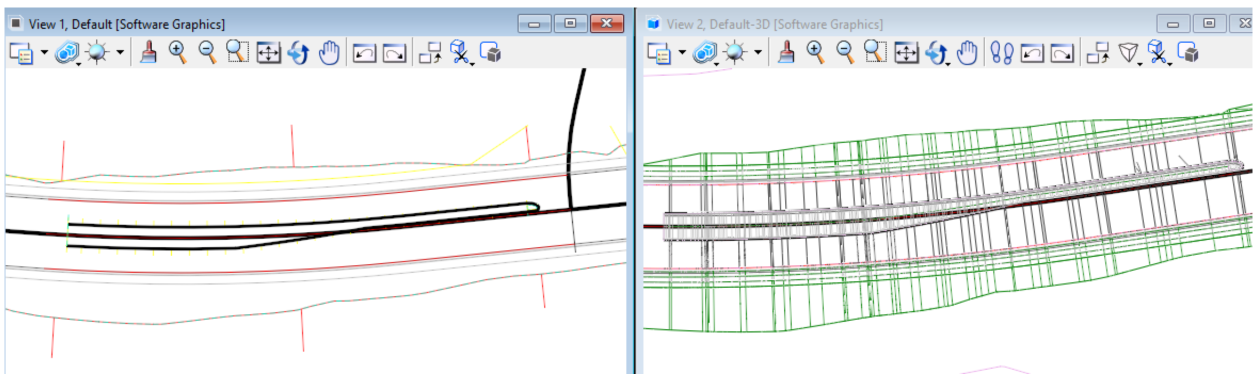
11. **Reset** when prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.



Selecting the *ROUTE156* corridor is an option at this time but we have many edits to perform so we will clip the corridor after these edits are made to improve processing time when performing the edits.

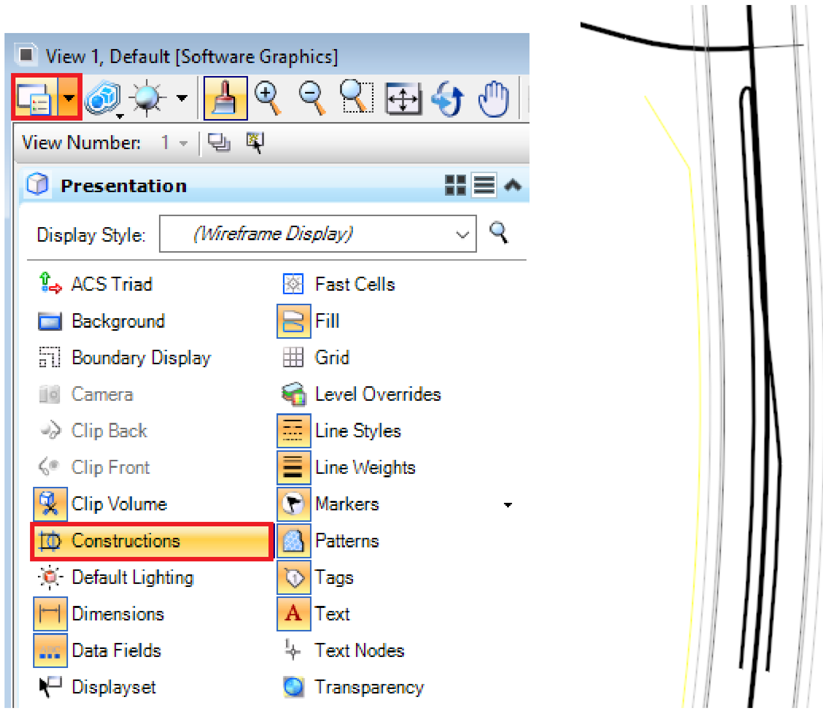
12. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

The image below shows the cell in 2d & 3d views.



11.6.4 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off Construction class elements, you will go to View Attributes as shown below.

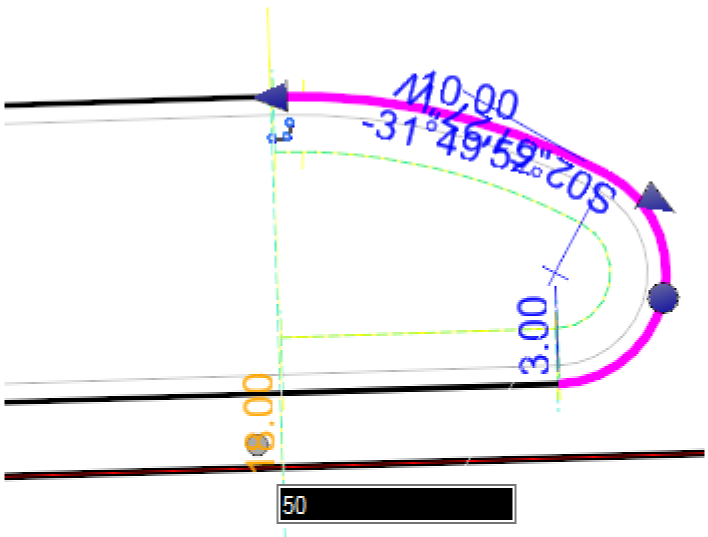


11.6.5 Horizontal Edits

The width of the median, taper length, storage lane width/length, nose location, etc. can all be adjusted as with graphical edits when these elements are selected. We'll go through some of these edits in the following steps.

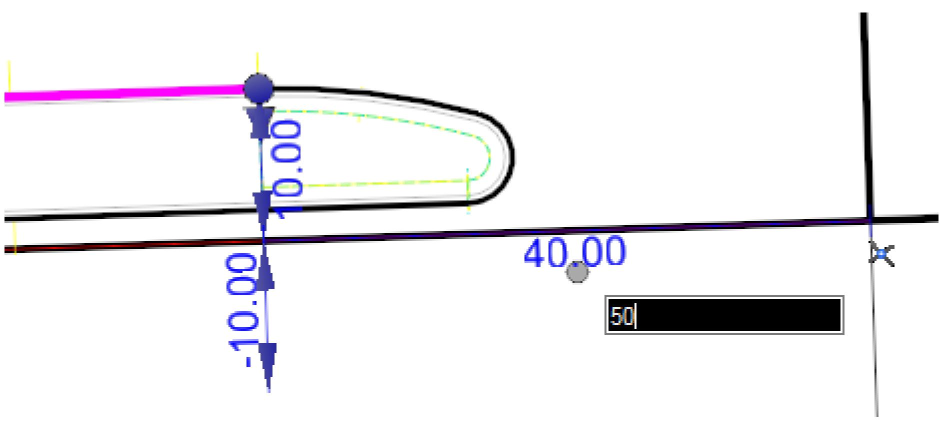
11.6.5.1 NOSE EDITS

1. Select the nose area EoP and change the radius of the flatter curve from 18' to **50'** as shown below**.**



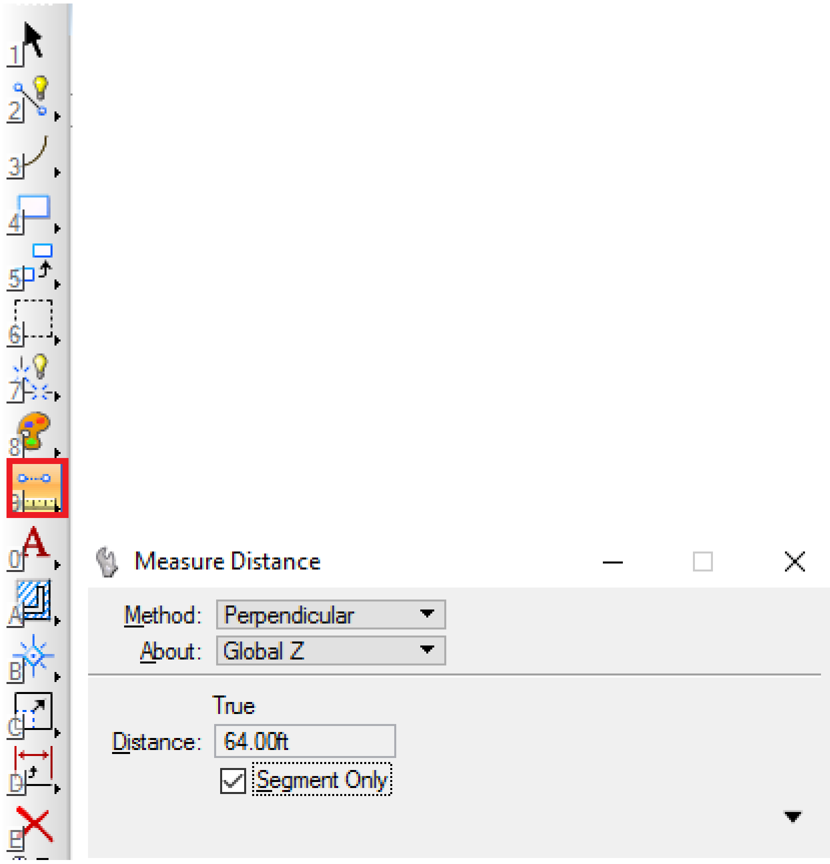
NOTE: Observe these edits in both the 2d and 3d views.

2. Select the EoP as shown below to change the nose location. Change the value of 40 to **50'.**

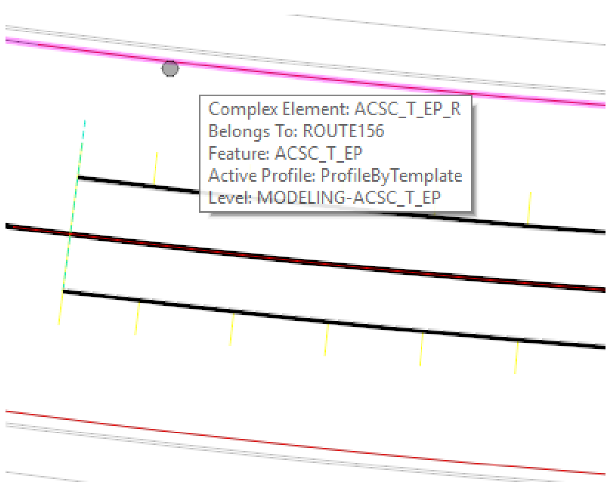


11.6.5.2 MEDIAN WIDTH EDITS

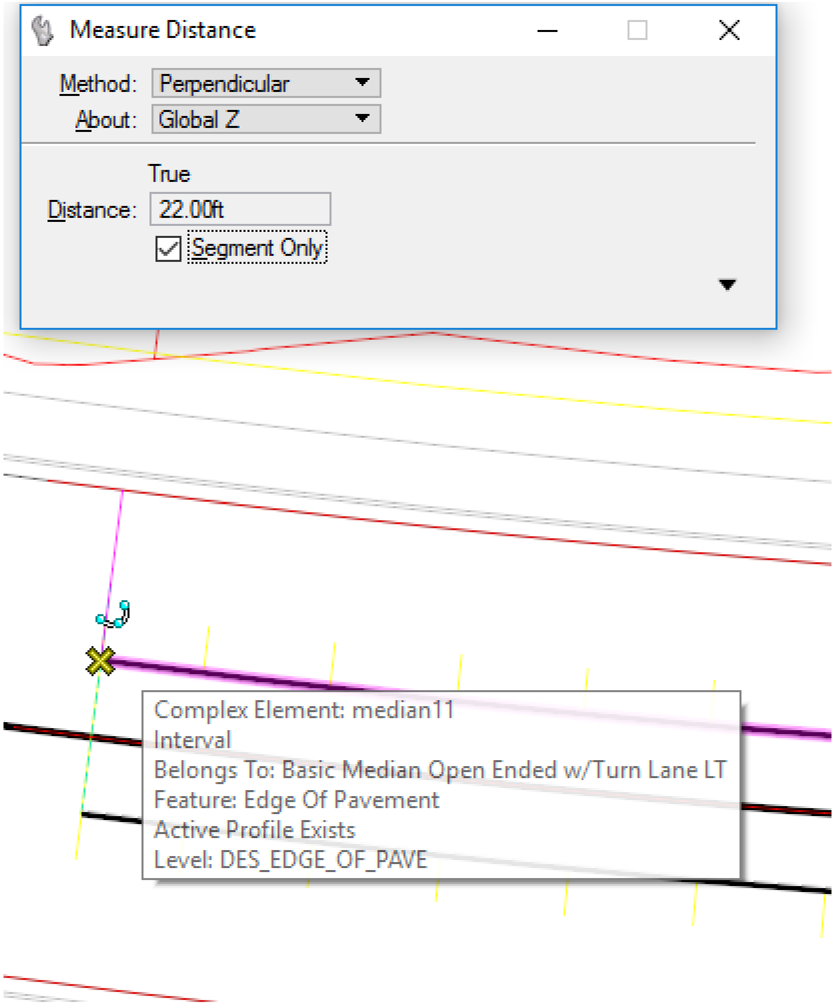
1. Measure the lane widths.
   a. Select MicroStation's **Measure** command and set the *Method* to **Perpendicular** on the *Measure Distance* dialog.



   b. Select the WB EoP.



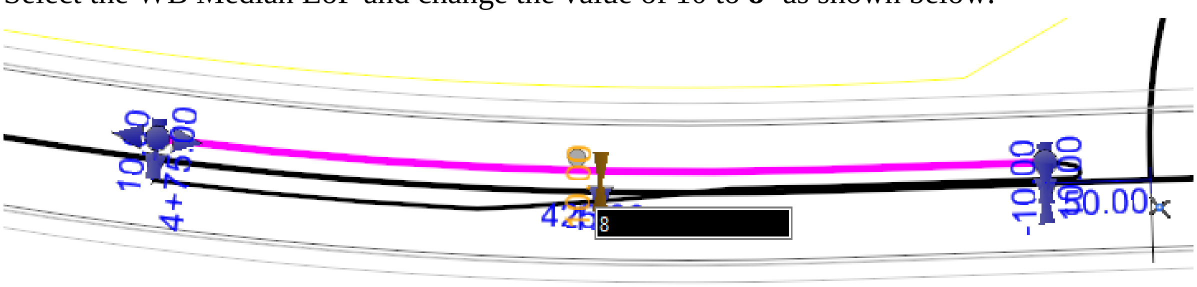
c. Snap to the median EoP and the current distance is 22’ as shown below.



d. Choose Element Selection to close the measure command.

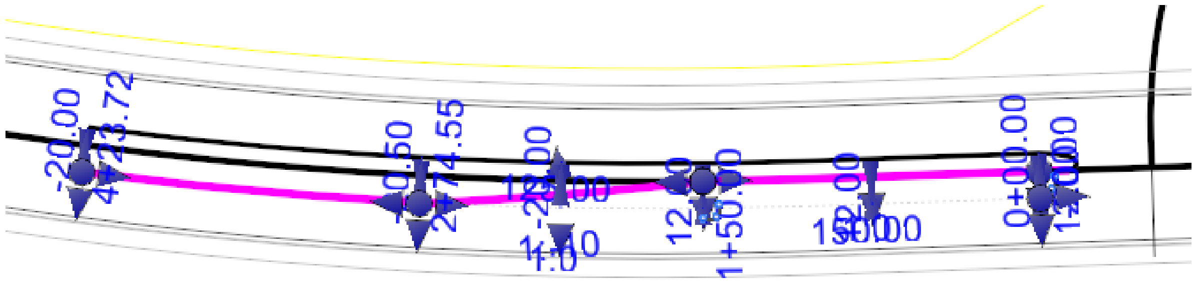
2. We will adjust the median width 2’ each side to have 24’ of travel width each side of the median.

   a. Select the WB Median EoP and change the value of 10 to **8’** as shown below.

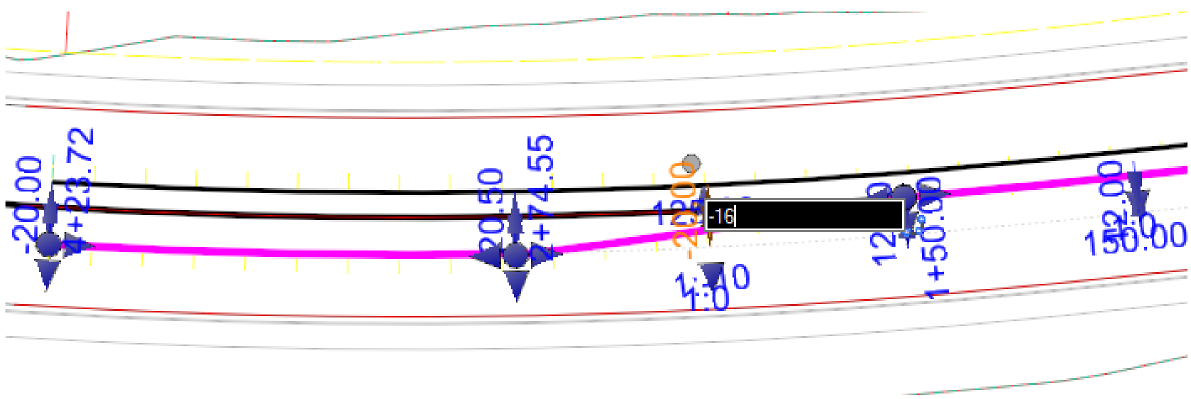


The above shifted the EB Median side 2’ as well. Next we will adjust the EB EoP to provide 24’ of travel-way width on that side as well.

b. Select the EB Median EOP as shown below.

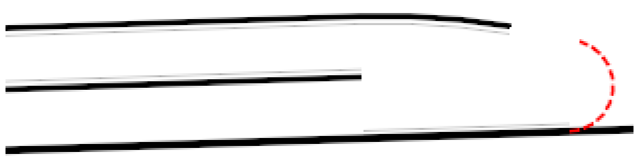


d. Change the *Offset* of -20 to **-16.**



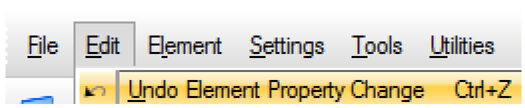
NOTE: This 20’ offset is found about mid-way of the taper area as shown above.

e. This changed the offset correctly but observe the nose area geometry was broken.

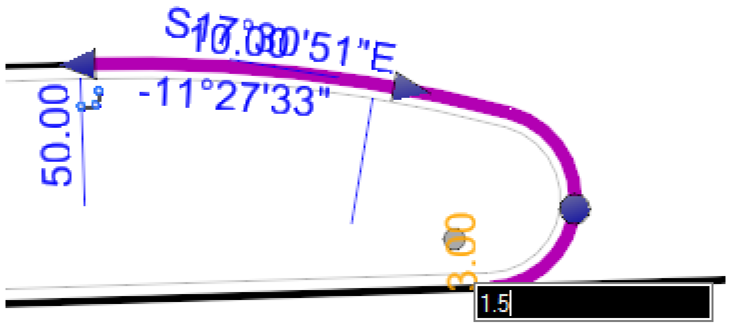


This is because we are reducing the Median Width to 4’ in the nose area and the geometry is unable to solve.

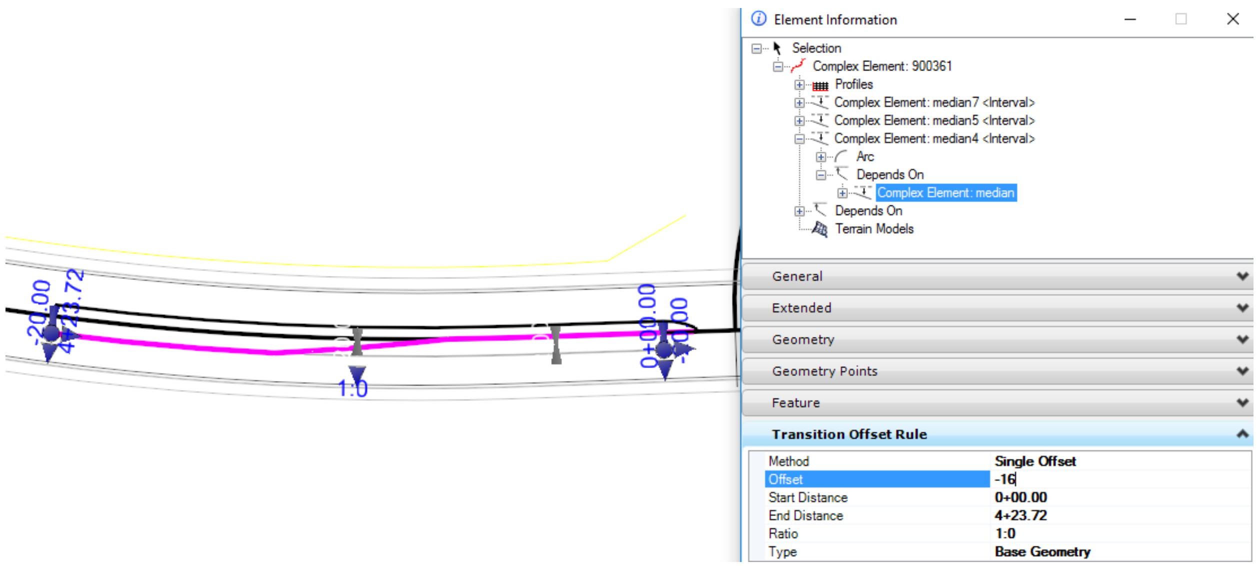
f. **Undo** this change.



g. Select the Nose area EoP again and change the 3’ radius to **1.5’** as shown below.



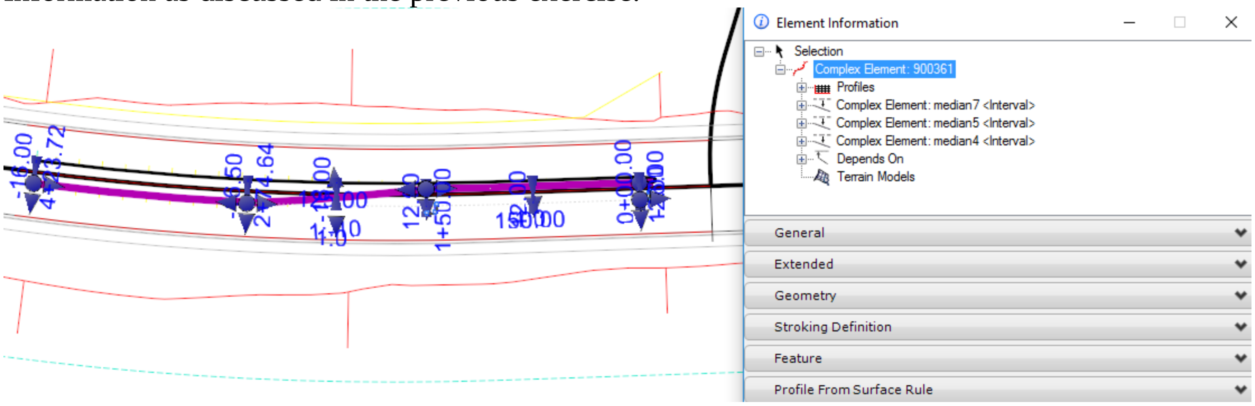
h. Select the EB Median EoP again, select MicroStation’s Element Information tool, expand the Complex Element tree again, and change the value of 20’ to 16’.



3. De-Select the element and zoom to the nose area again. The nose geometry should have remained intact.

11.6.5.3 TAPER & STORAGE LANE EDITS

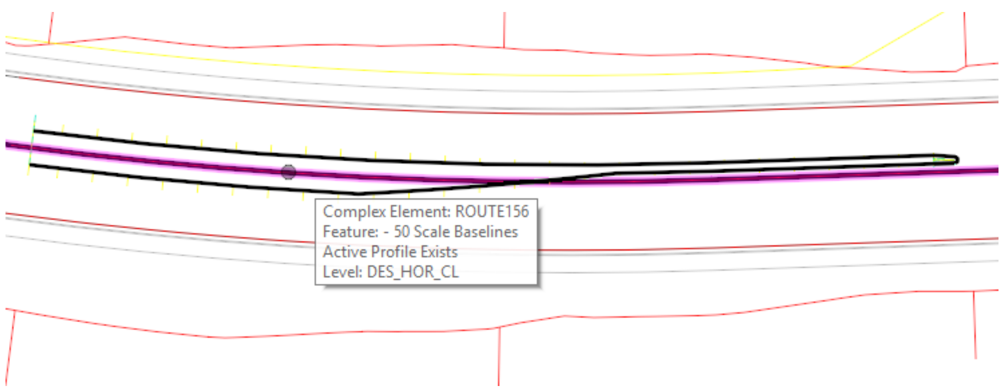
Taper Length/Ratio and Storage Lane length can be edits by selecting the EB Median EoP as shown below. Edits can be made heads-up graphically or the changes can be made in Element Information as discussed in the previous exercise.



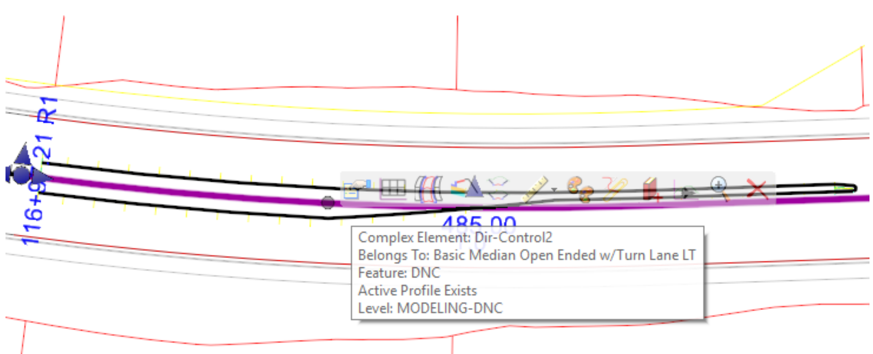
NOTE: These edits have a couple of constraint that may need to be edited prior to making any of the changes above if the taper/storage length needs to be lengthened. The total length of the storage lane and taper cannot push the taper end beyond the Dir-Control2 element whose initial length is set to 485’ and is shown below.

1. Select the Dir-Control2 element which lies below the ROUTE156 CL.

   a. With Element Selection chosen, hover over the ROUTE156 CL in the area below.

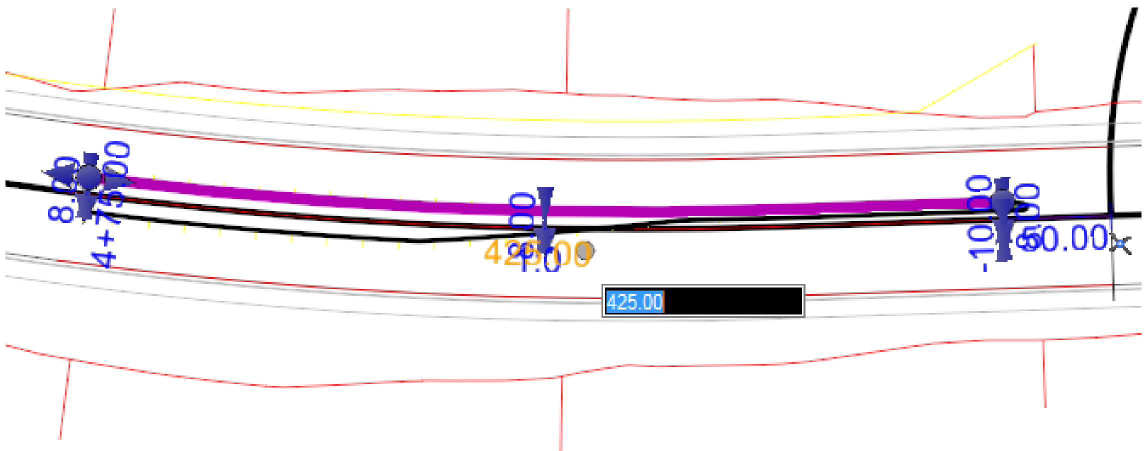


   b. Without moving your cursor, right click to get to the underlying *Dir-Control2* element and then left click to select this element.



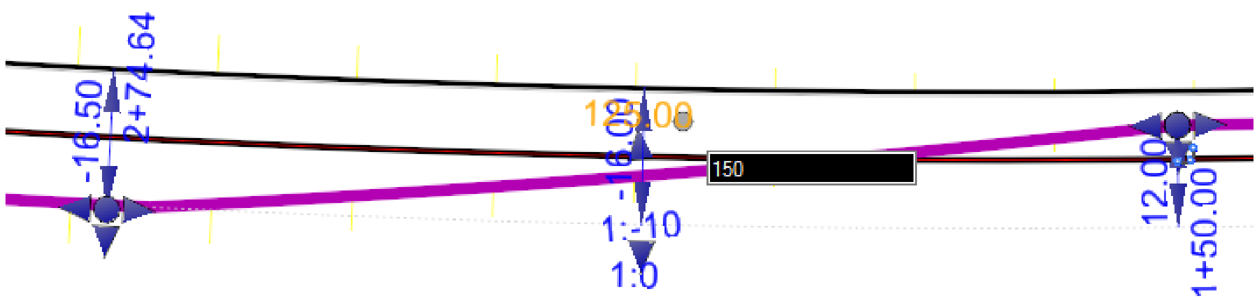
c. The following value of 485 needs to be changed if any proposed changes to the Taper/Storage length push the end of the Taper past this 485' distance. We will not change this in this exercise.

The other constraint mentioned above that may have to be edited if you have excessive taper/storage lengths is the WB Median EoP which controls the total length of the EB Median EoP. Select the **WB Median EoP**. This value of 425' would also need to be adjusted if you have excessive Taper/Storage lane lengths. We will not make changes to this value in this exercise.



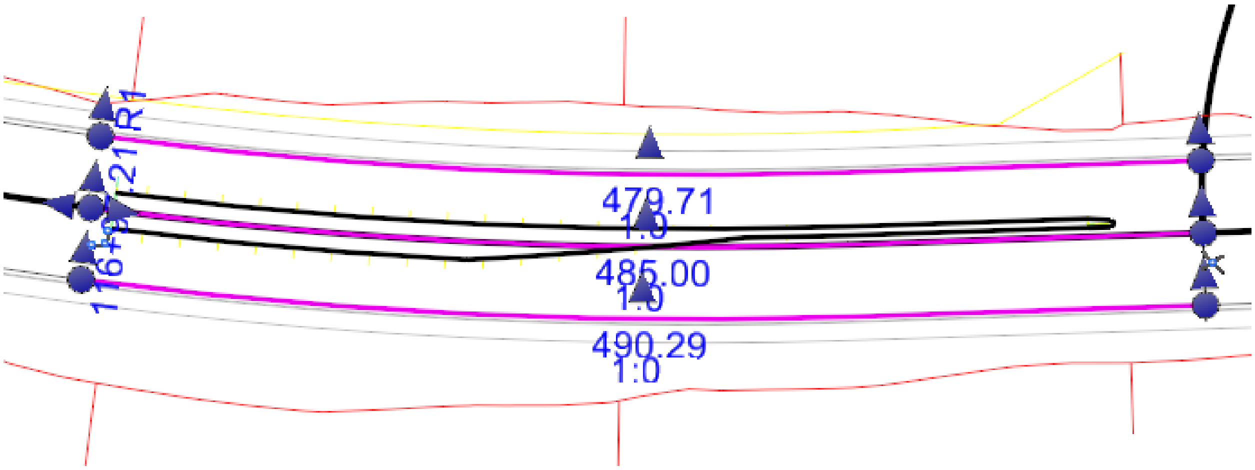
NOTE: This value can't extend past the Dir-Control2 element mentioned earlier.

2. Select the EB Median EoP again and change the *length of the taper* from 125' to **150'** as shown below.



11.6.1 Vertical Edits

A terrain named **Construction** is created based off EP-Control & Dir-Control (shown highlighted below) elements within the cell whose profiles are based off the Template EoP's and CL. The median EoP elements are profiled off this terrain.

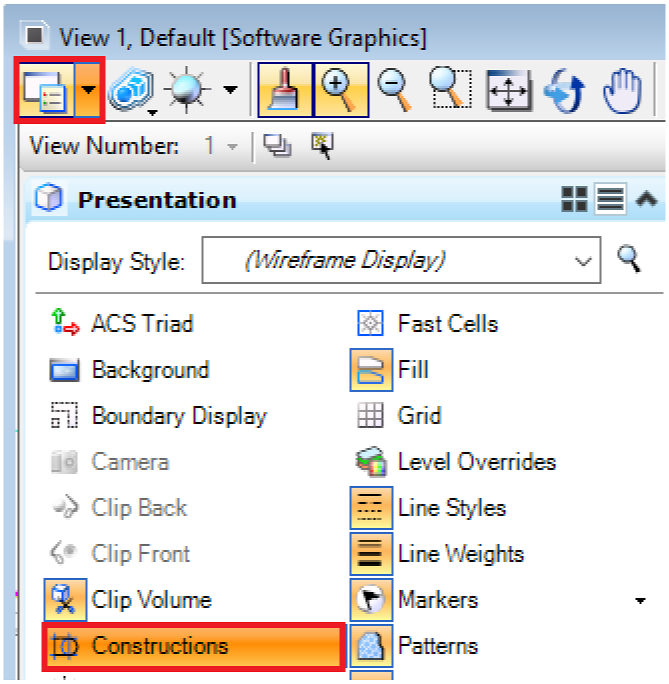


Median horizontal geometry location in relationship to the CL will vary per project so vertical edits may or may not be needed. Refer to section 11.3.11.3 (T Intersection w/Median) for the process to perform these edits if needed. A breakline will generally need to be added along the CL from Thru Rd EoP back to some point intersecting the median EoP.

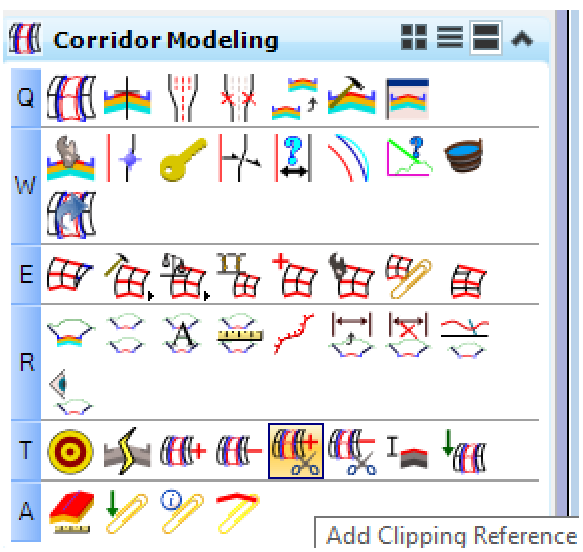
11.6.2 Clipping

The following steps Clip the ROUTE156 Corridor in the area of the Median Civil Cell.

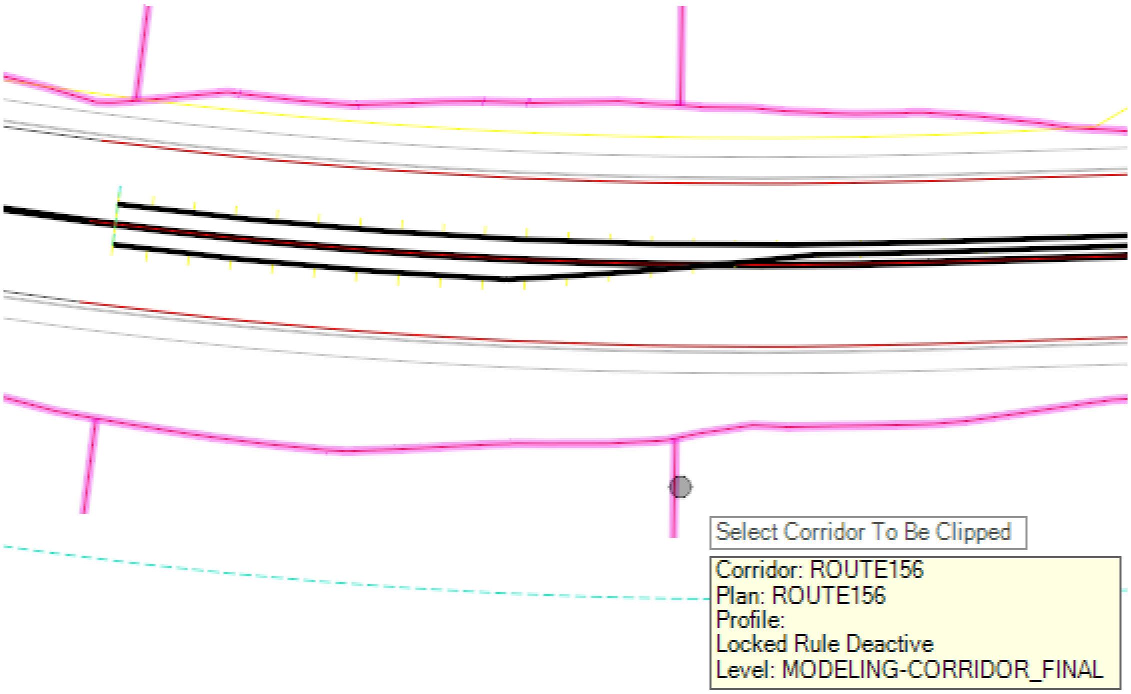
1. Turn Construction elements back on in View 1.



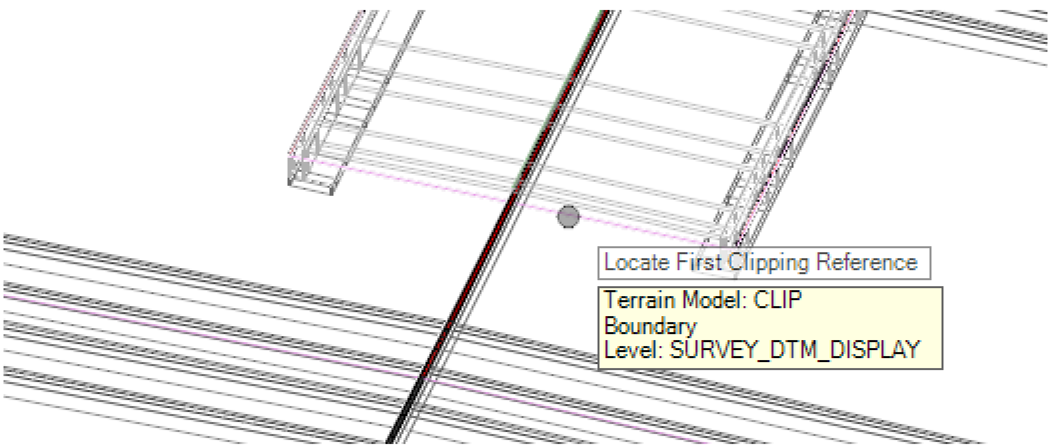
2. Select the **Add Clipping Reference** command from the *Corridor Modeling Task* menu.



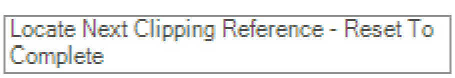
3. Select the ROUTE156 corridor when prompted to *Select Corridor To Be Clipped.*



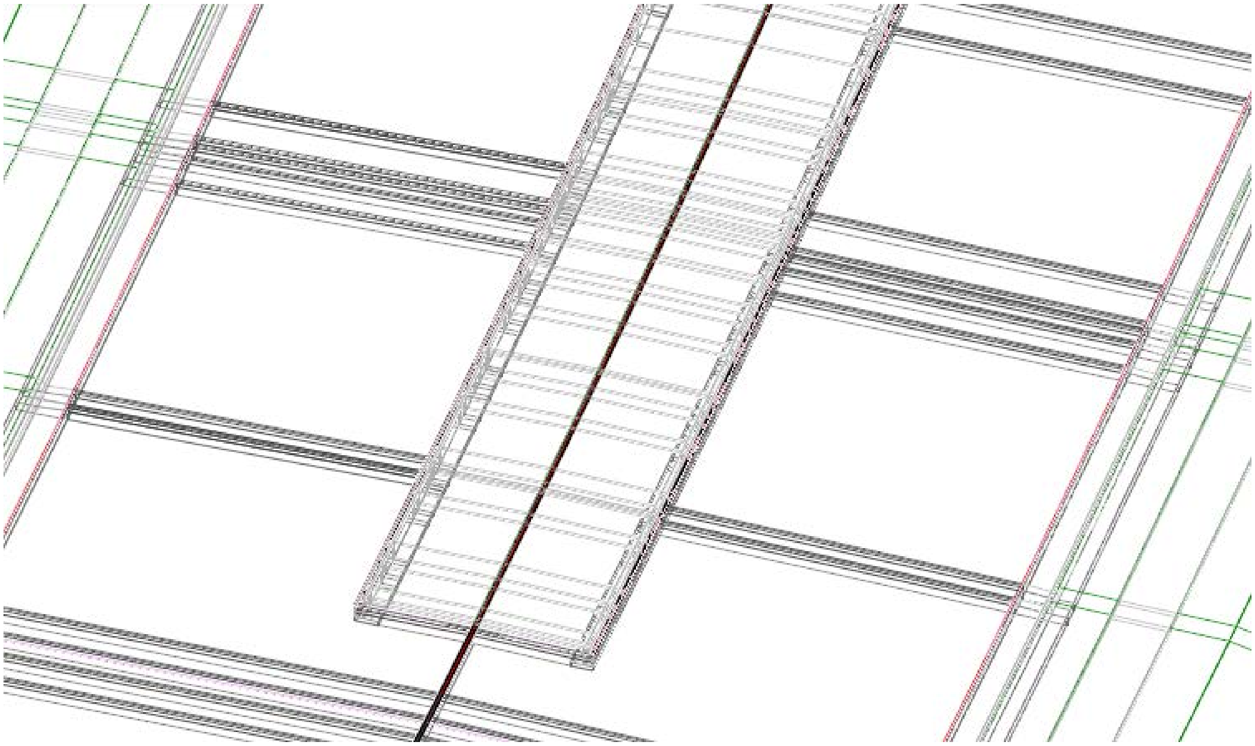
4. In the 3d View, select the **Terrain named CLIP** when prompted to *Locate First Clipping Reference.*



5. Right Click when prompted to *Locate Next Clipping Reference – Reset to Complete.*



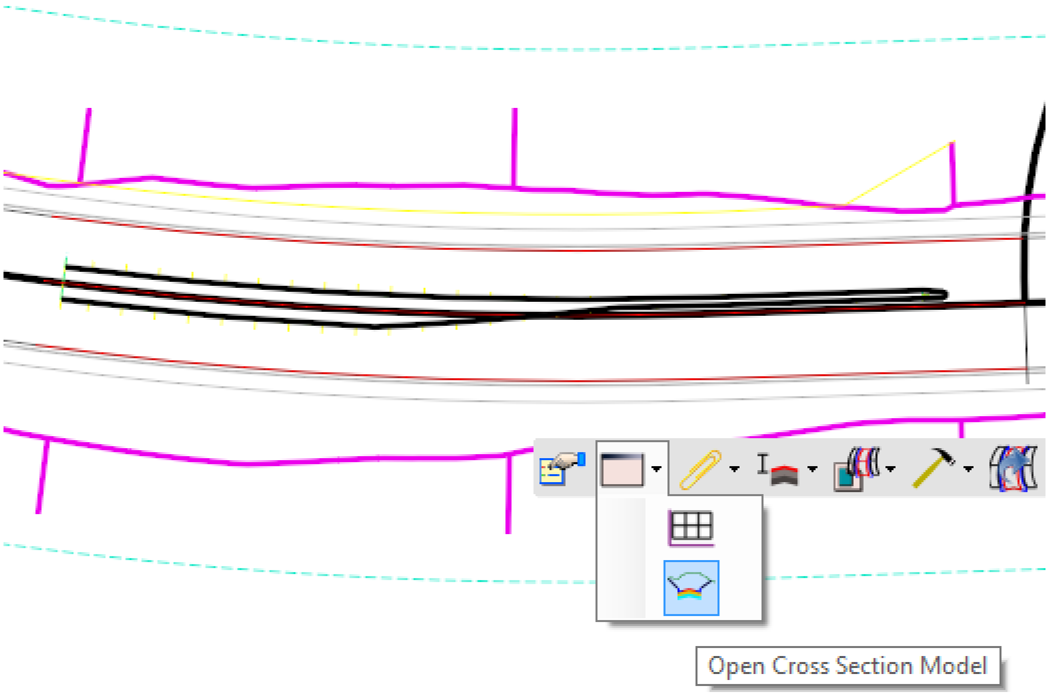
6. The corridor is clipped as shown below.



11.6.3 Cross-Section View

1. Open the cross-section model of the **ROUTE156** as shown below.

   a. From the context menu, select **Open Cross Section Model**.



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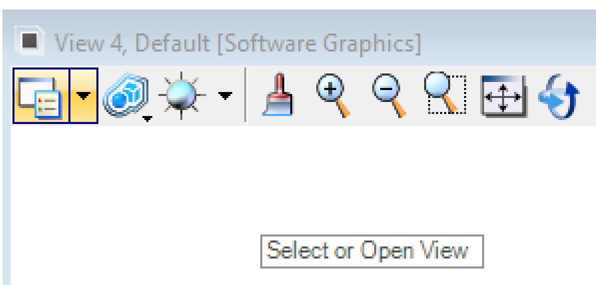
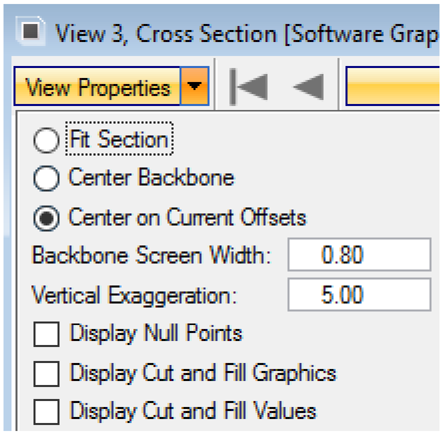
   b. Open **View 4** from *MicroStation's View Toggles* menu.

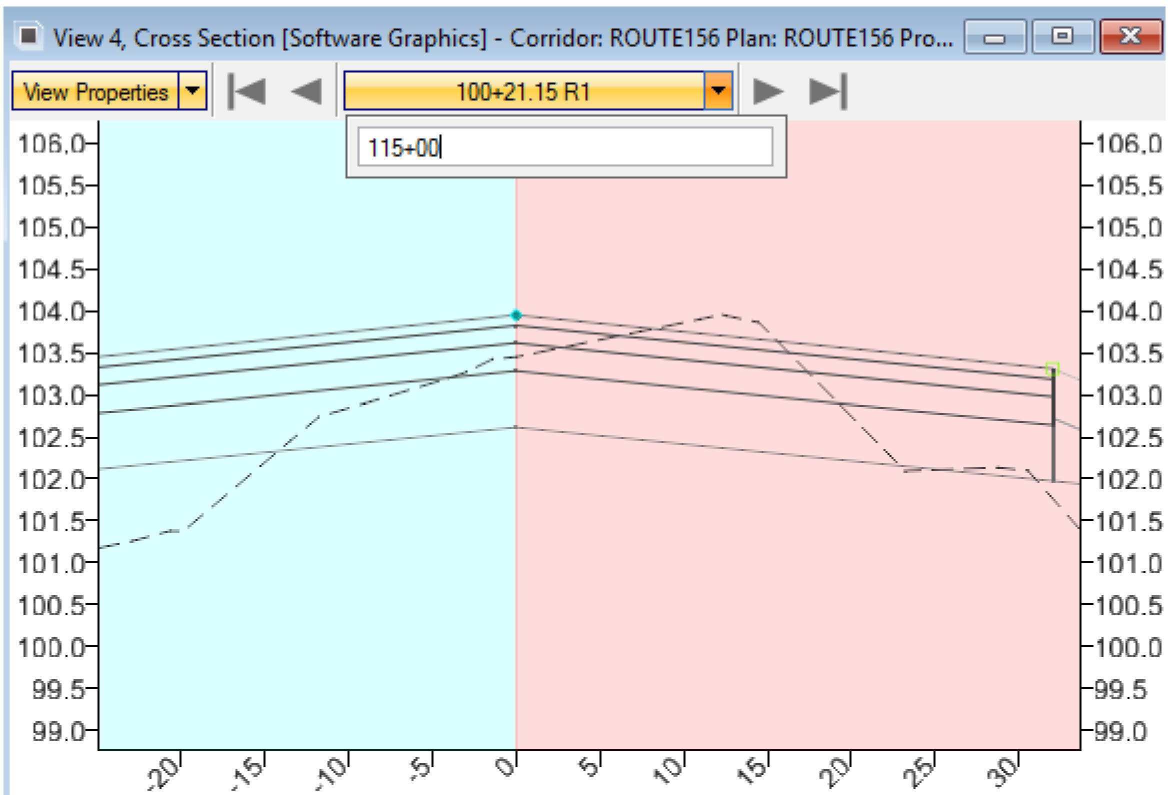
   c. **Left Click** in the drawing area of *View 4*.



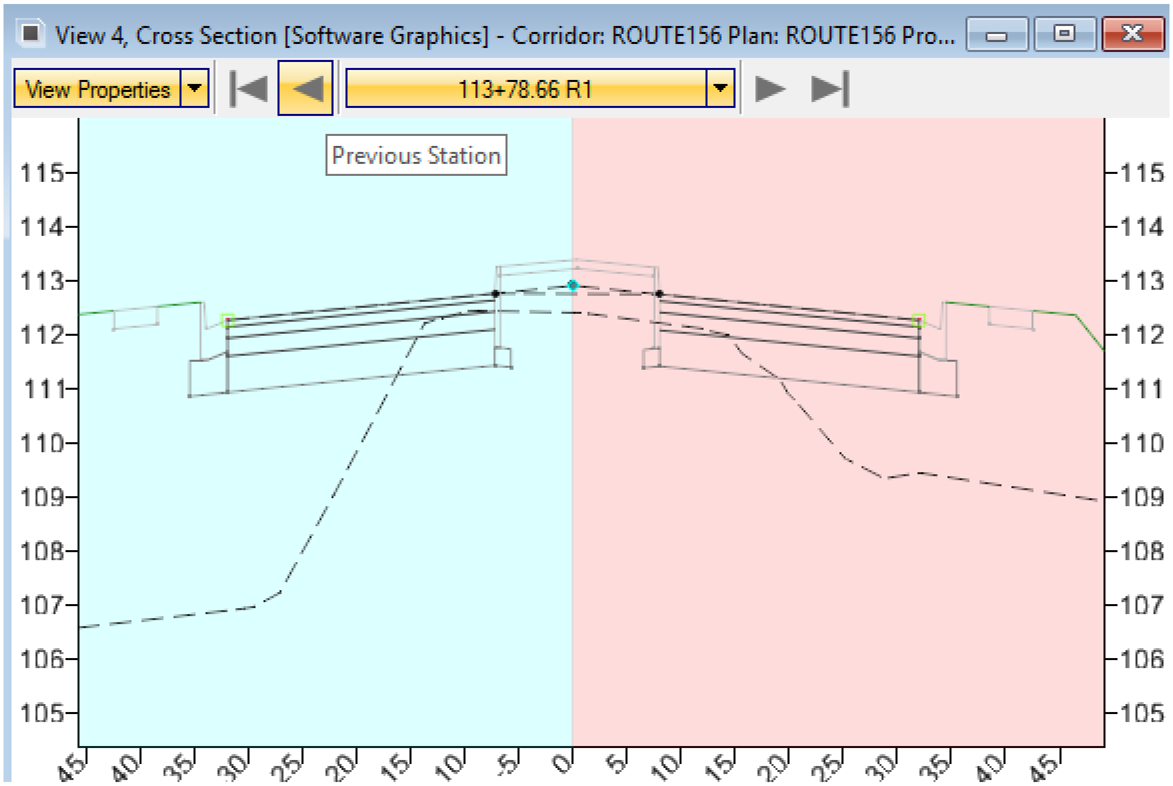
2. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



3. Key In station 115+00.



4. Use the **Next** and **Previous** buttons in the *Cross Section* view to review the median area.



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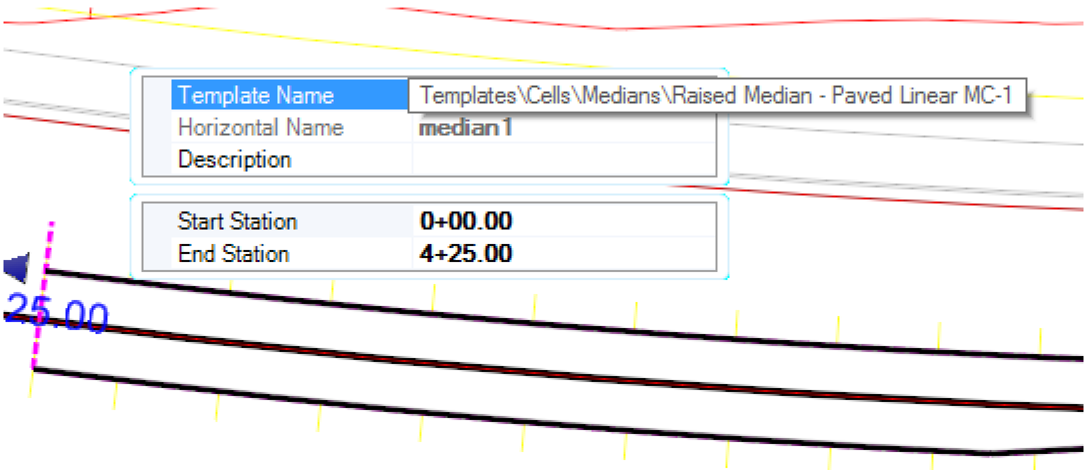
11.6.4 Template Edits

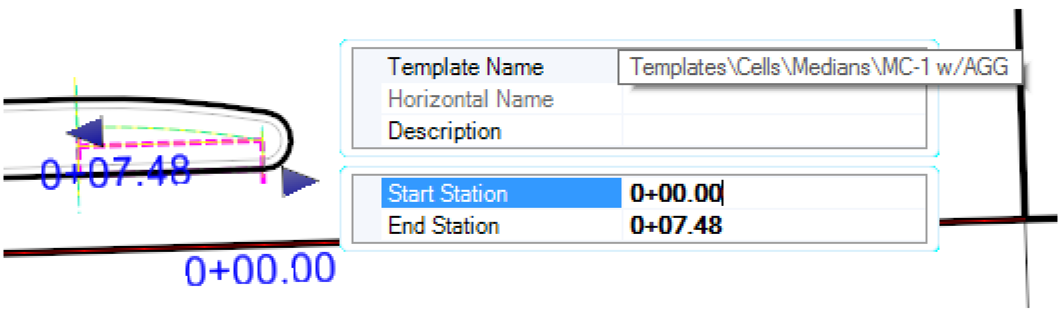
The linear templates used in the Raised Median Civil Cells are highlighted below. We will show the various tools in this section available for use and related to Linear and Surface Templates but no changes will be made in this exercise and you would need to refer to section 11.3.10 for examples of actually making edits.

11.6.4.1 LINEAR TEMPLATES

1. Majority of Civil Cell



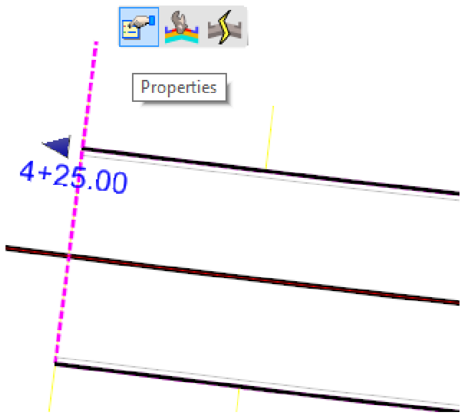
2. Nose Area



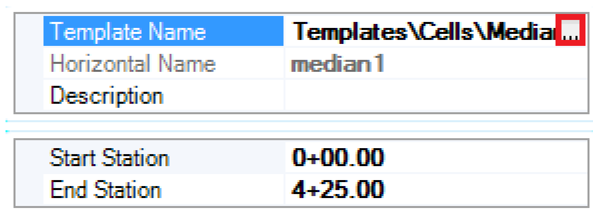
11.6.4.2 PROPERTIES

To re-direct these linear templates to different ones in the ITL.

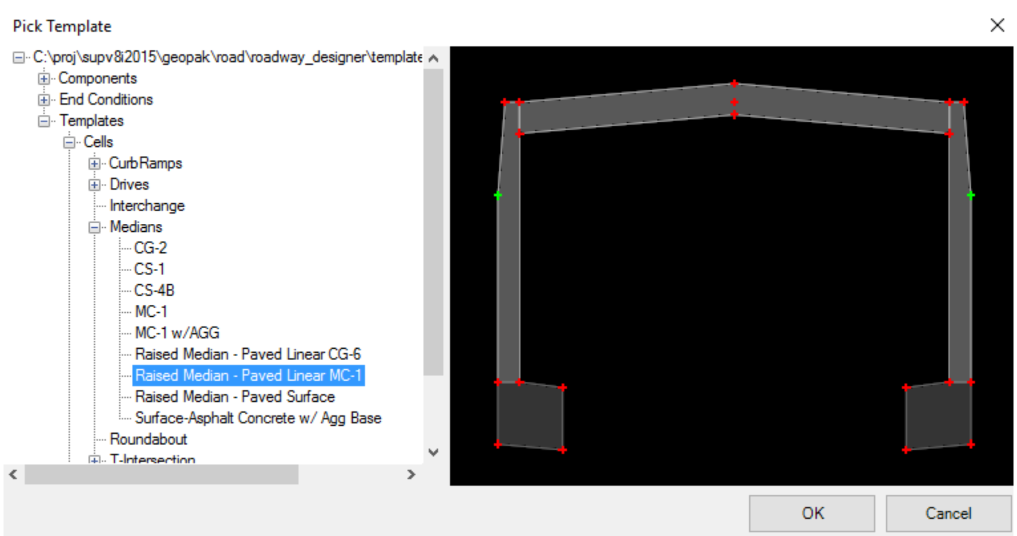
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Linear template used in the non-nose area of the Raised Median Civil Cells is shown below. Although we will not replace this template in this exercise, you would choose a template from the **Pick Template** dialog if you wanted to replace the given template.

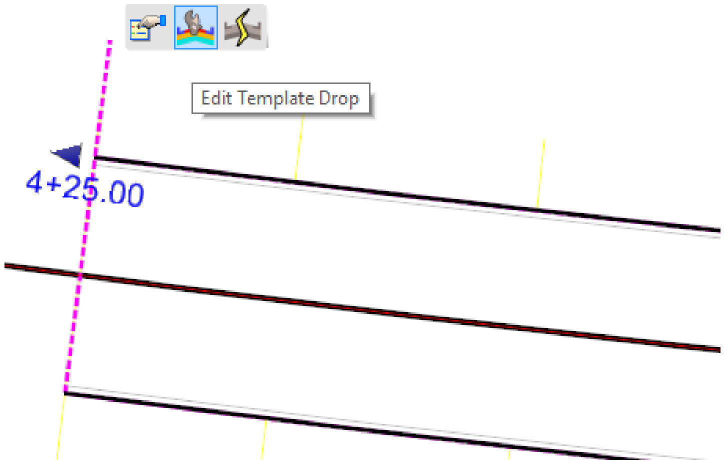


4. Tag **Cancel** *(OK if you actually change the template.)*

11.6.4.3 EDIT TEMPLATE

To edit the template:

1. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.



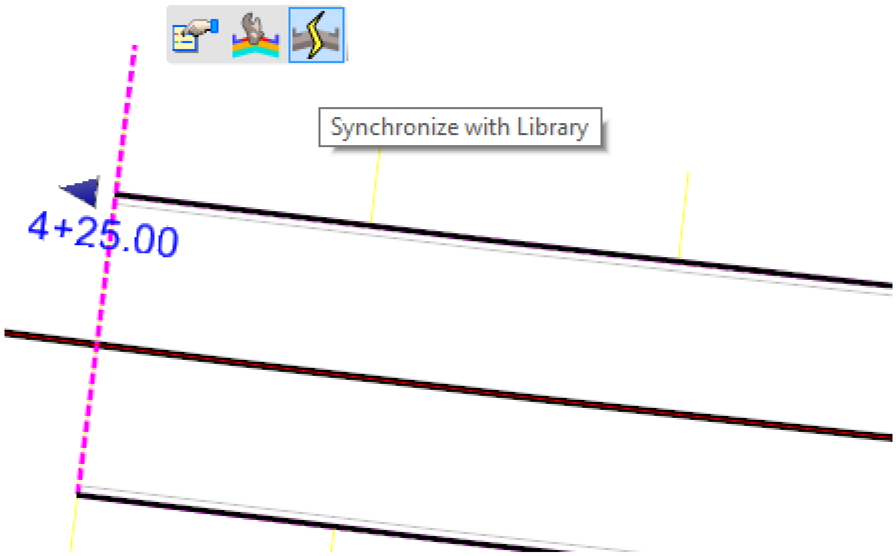
2. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.

3. For this exercise, choose **Cancel.**

11.6.4.4 SYNCHRONIZE

To synchronize a template if modified:

1. Select *Synchronize with Library* as shown below which applies any changes in the template to the linear template.

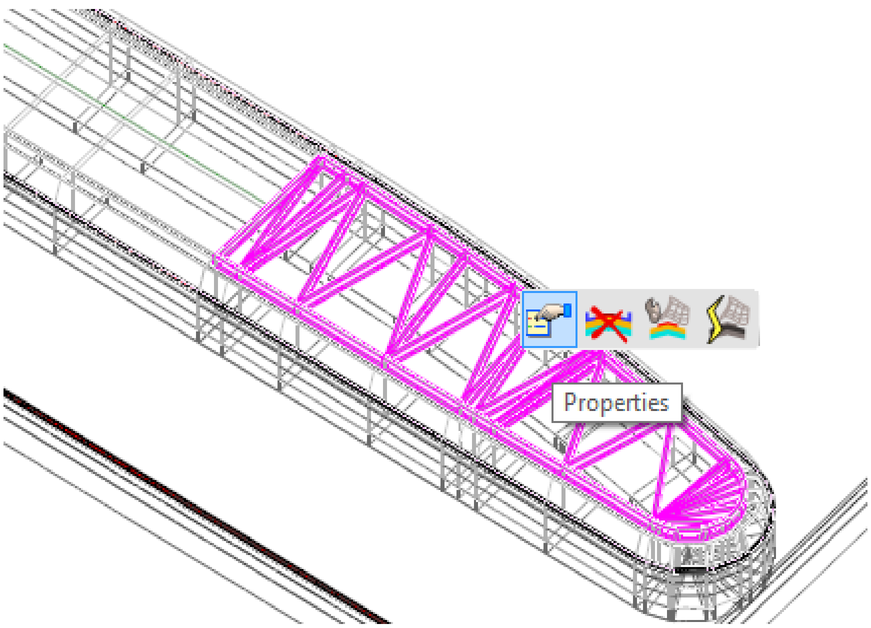


11.6.4.5 SURFACE TEMPLATE

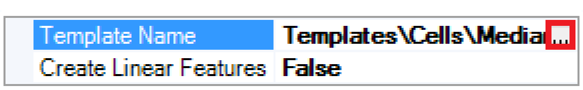
The only Surface Template in the Raised Median Civil Cells is in the nose area. Commands available for Surface Template edits from the context menu are shown below and match the Linear Template commands described in the sections directly above with the exception of Delete Template.

NOTE: We'll just go through Properties here to show what Surface template is used by default in the Raised Median Civil Cells. Refer to section 11.3.10 for actual template edit steps.

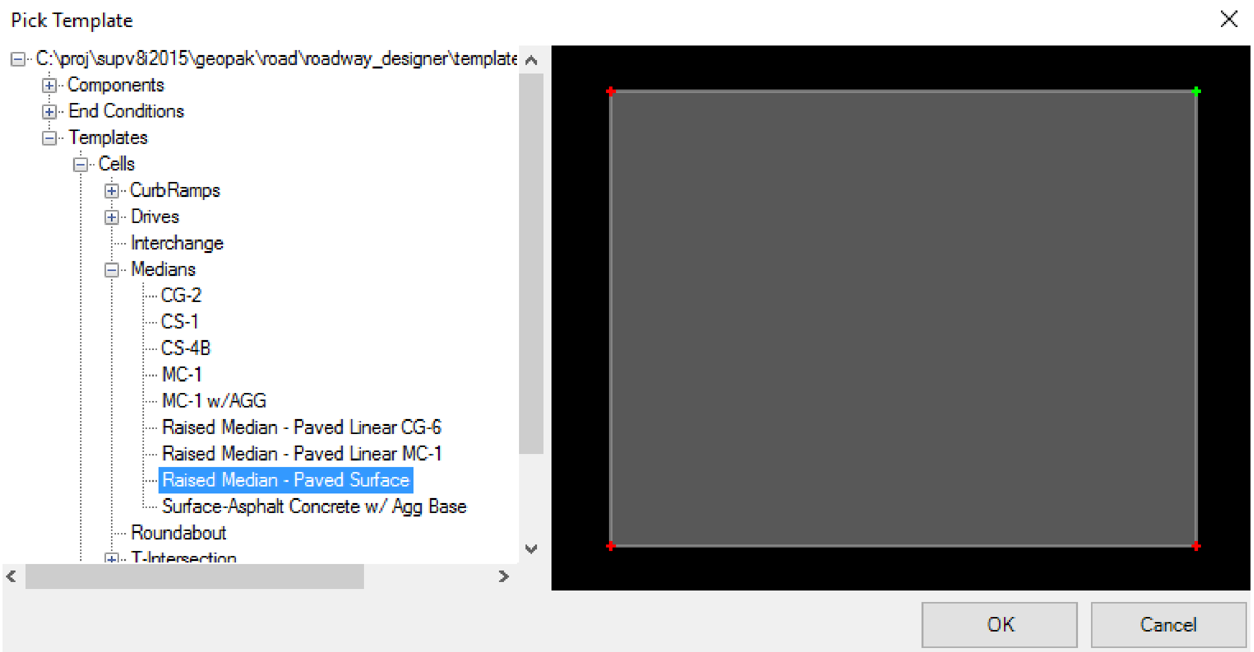
1. Select the Surface Template in the 3d view.
2. From the Context menu, choose **Properties.**



2. From the Properties menu, select the button below.



3. The **Pick Template** dialog is invoked and shown below. The Surface template used in the Urban Drive Civil Cell is shown below. Although we will not replace this template in this exercise, you would choose the template from the **Pick Template** dialog if you wanted to replace the given template.



4. Tag **Cancel** *(OK if you were to actually change the template.)*

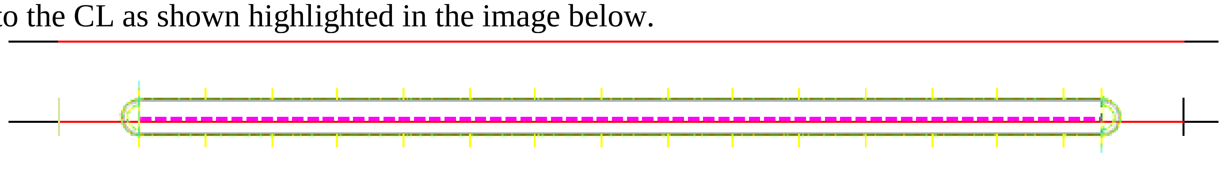
11.6.5 Other Cells – Basic Median

11.6.5.1 PLACEMENT & HORIZONTAL EDITS

The Basic Median Civil Cell has one different reference element as compared to the Basic Median Open Ended Civil Cell and that is the reference element controlling location of placement.

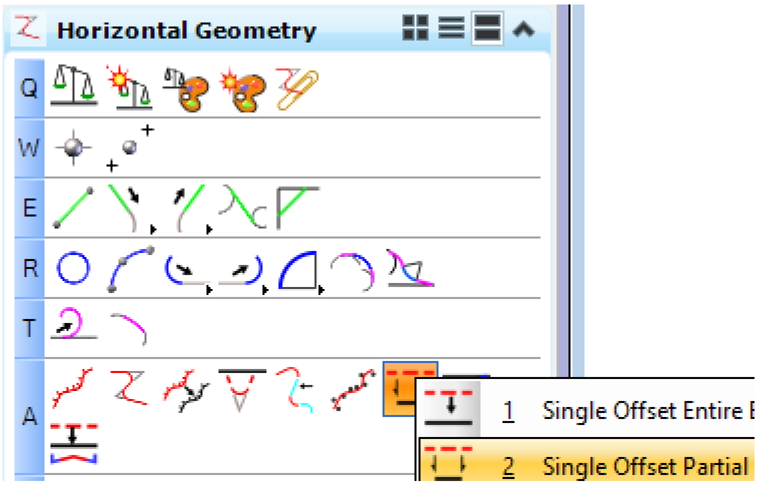
For the Basic Median Open Ended cell the positional reference, which was a line drawn basically perpendicular from the CL to EB EoP, was used to locate the nose and cell.

For the Basic Median, it's location and length is defined by an element drawn basically parallel to the CL as shown highlighted in the image below.

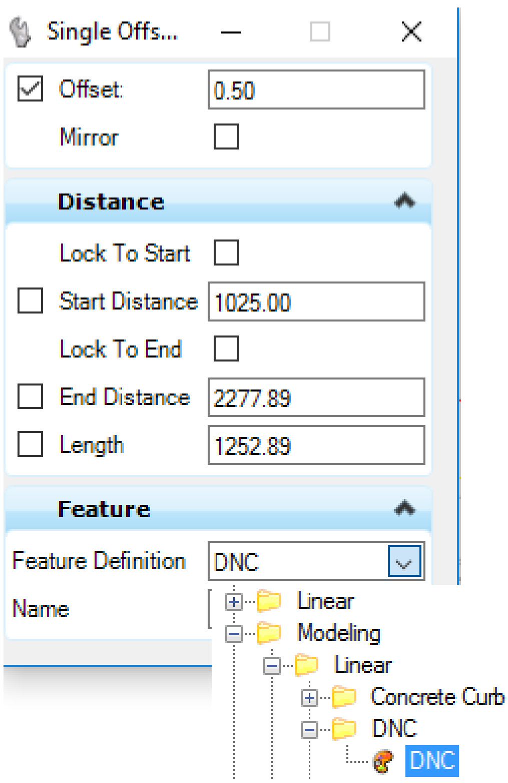


We'll create this reference element and then place this cell in the same DGN file as we placed the Basis Median Open Ended Civil Cell.

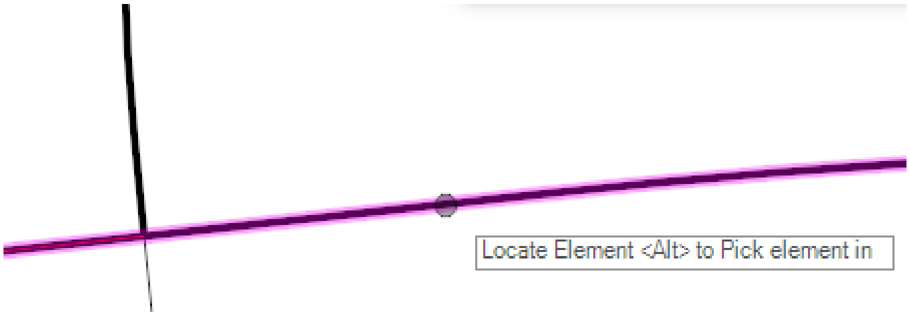
1. Select the command **Single Offset Partial** from the *Horizontal Task menu.*



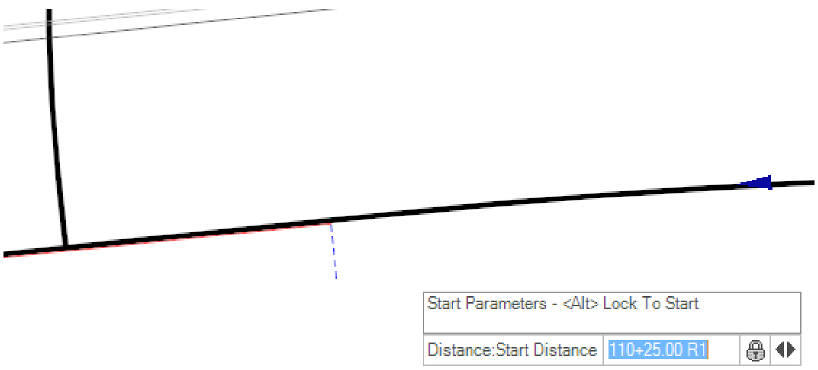
2. Enter **0.5** for the *Offset* and set the *Feature Definition* to **DNC.**



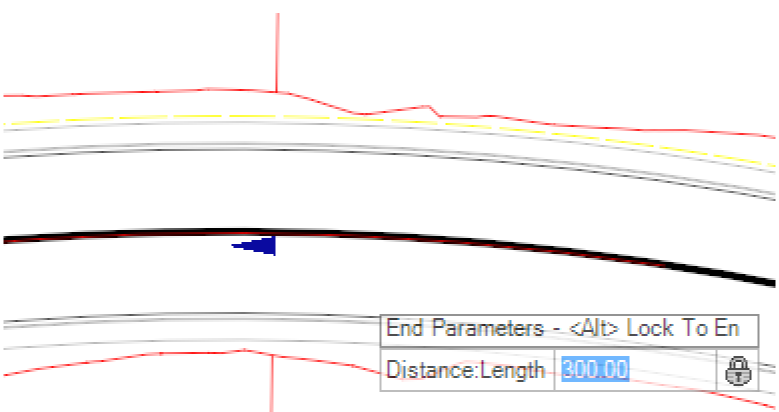
3. Locate **ROUTE156** when prompted to *Locate Element.*



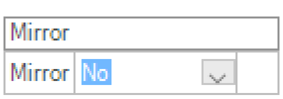
4. When prompted for the *Start Parameter* which should be showing an offset of 0.5, hit the **Right Arrow Key** on your keyboard to switch to the Start Distance. Enter 110+25 for the Start Distance and left click to confirm the Start Parameters.



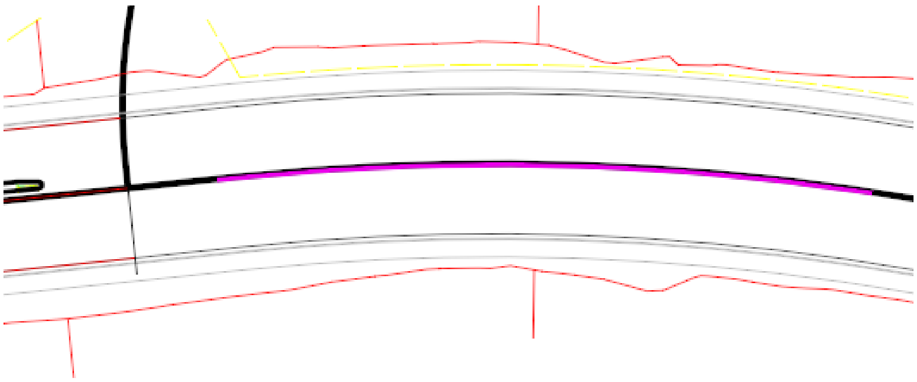
5. Move your cursor to the right, away from the intersection, hit the **Right Arrow Key** on your keyboard to switch the *End Parameters* prompt to *Length*, enter **300**, and then Left Click to confirm the *End Parameters* and place the element.



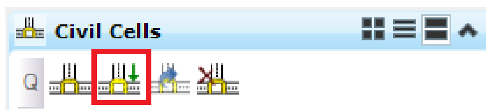
6. Left Click to confirm **No** *Mirror* and to place the element.



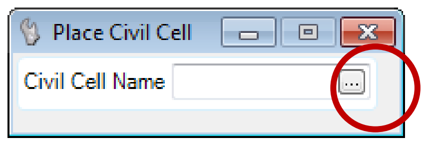
7. The element placed is shown highlighted below.



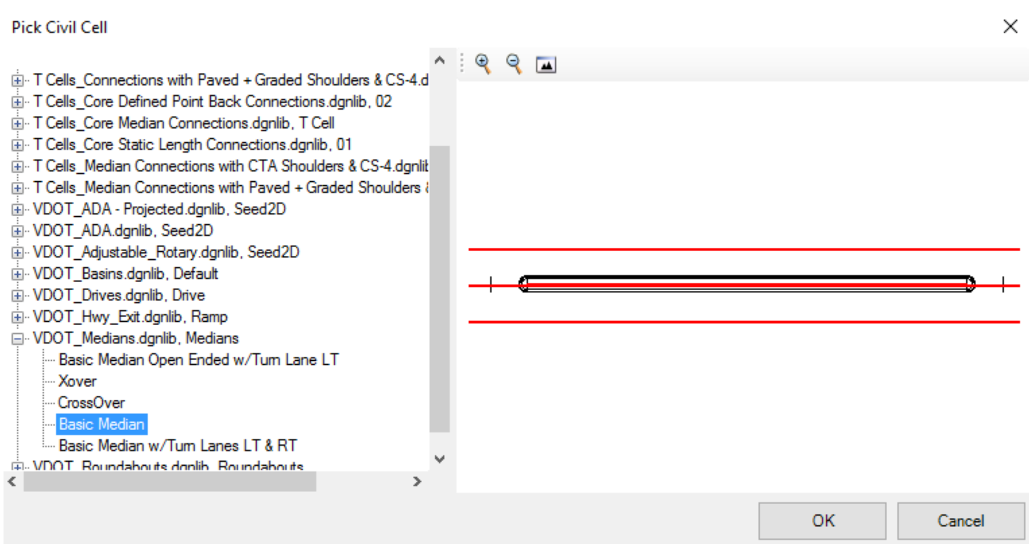
8. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



9. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

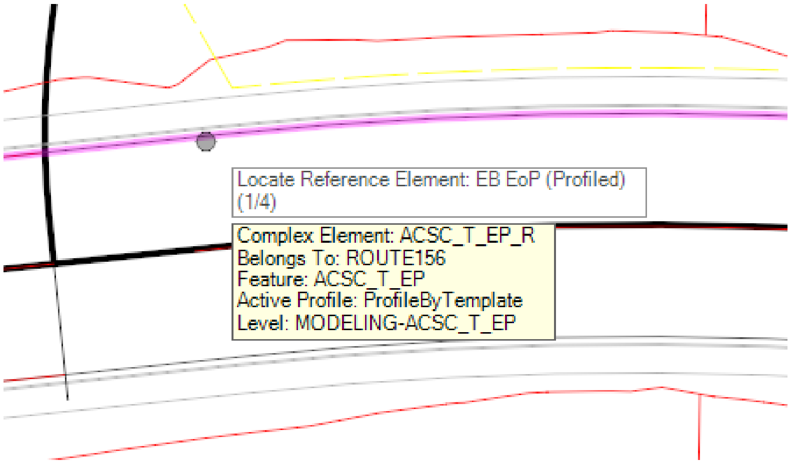


10. Select the **Basic Median** civil cell from the **VDOT_Medians.dgnlib** folder and click **OK.**

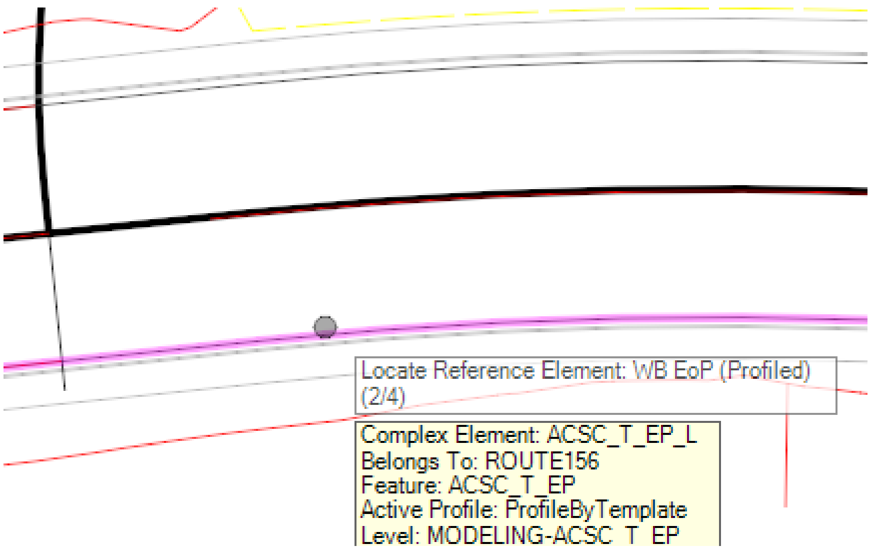


NOTE: The next three prompts may be in different order than listed in this manual.

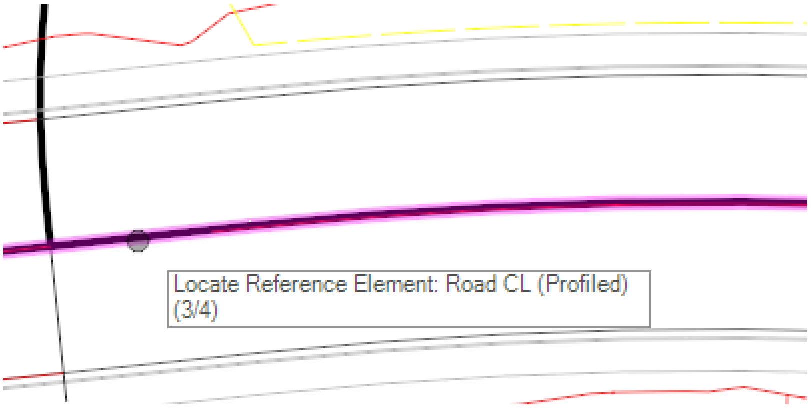
11. When prompted to *Locate Reference Element 'EB EoP (Profiled)'*, select the **Edge of Pavement** element in View 1 as shown below.



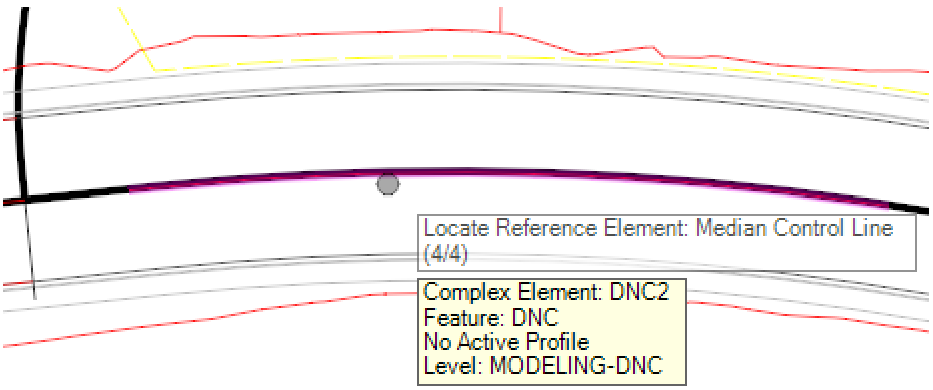
12. When prompted to *Locate Reference Element 'WB EoP (Profiled)'*, select the **Edge of Pavement** element in View 1 as shown below.



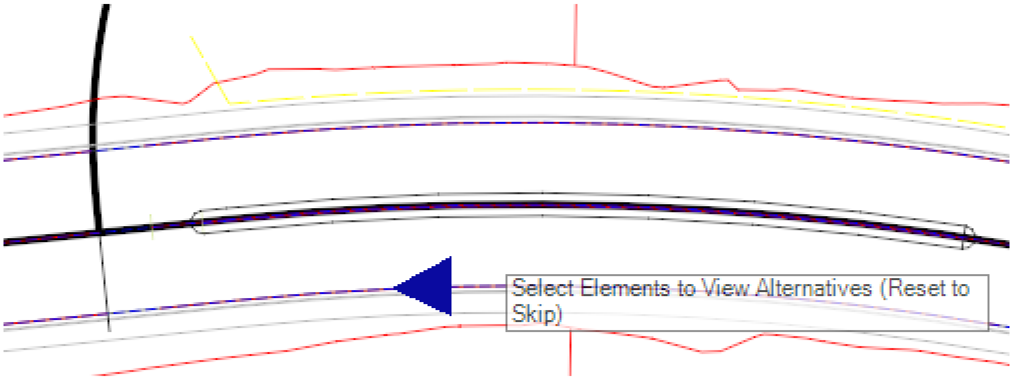
13. When prompted to *'Locate Reference Element: Road CL (Profiled)* select the **ROUTE156 CL** element in View 1.



14. When prompted to *'Locate Reference Element: Median Control Line* select the **DNC line** placed in the beginning steps of this section.



15. Review the geometry being displayed.

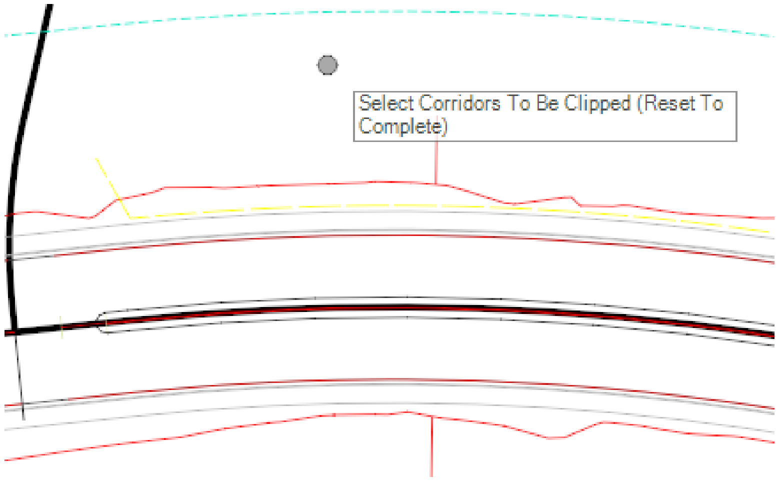


a. If the geometry appears correct and similar to the image above, move on to the next step.

b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.5.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

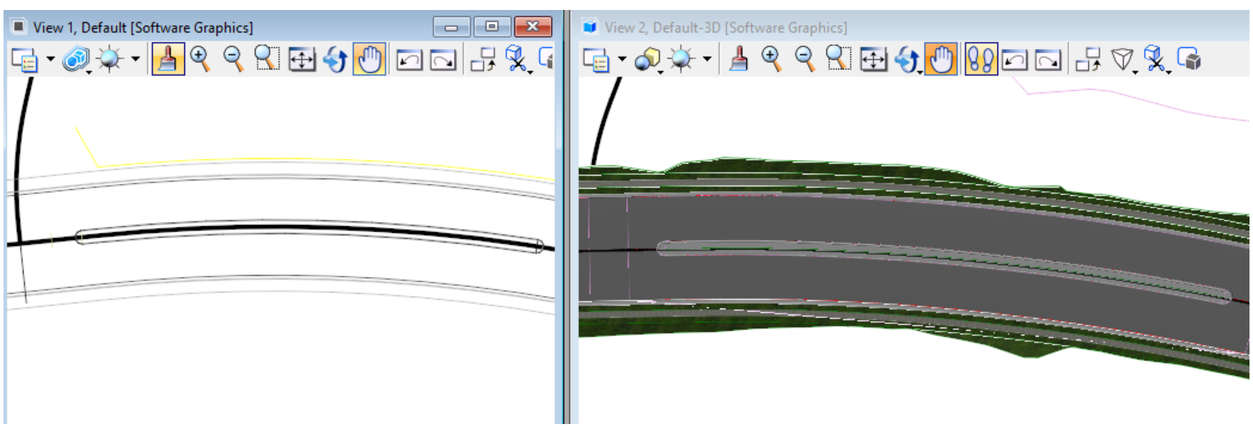
16. **Reset** when prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.



Selecting the *ROUTE156* corridor is an option at this time but we have many edits to perform so we will clip the corridor after these edits are made to improve processing time when performing the edits.

17. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

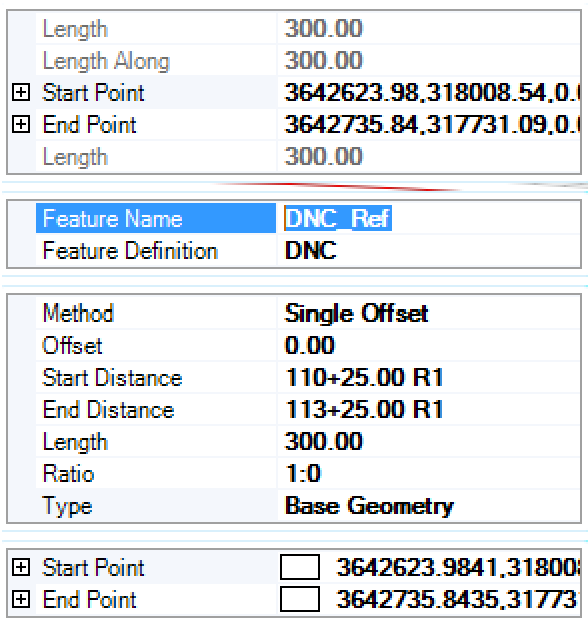
The image below shows the cell in 2d & 3d views.



18. Choose the **Element Selection** command to exit the Place Cell command.

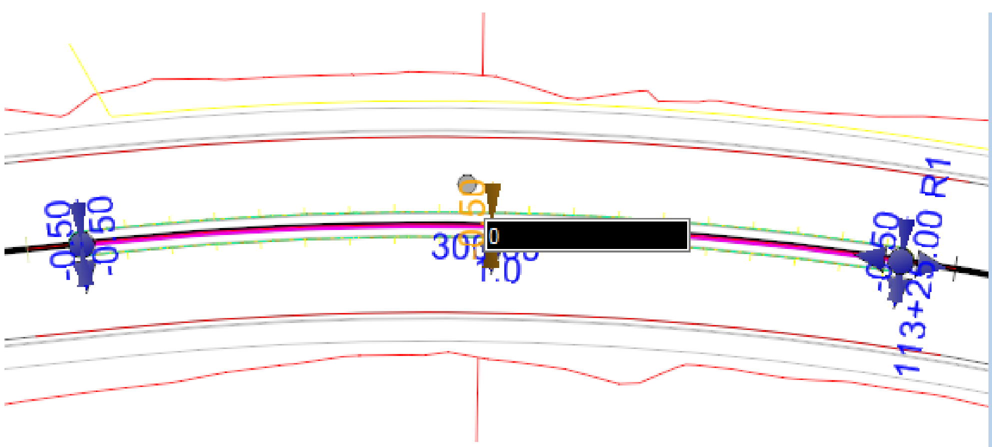
19. Select the DNC element constructed in the 1st few steps of this section and from the context menu, choose **Properties.**

20. On the *Properties* dialog, change the name of this feature to **DNC_Ref.**

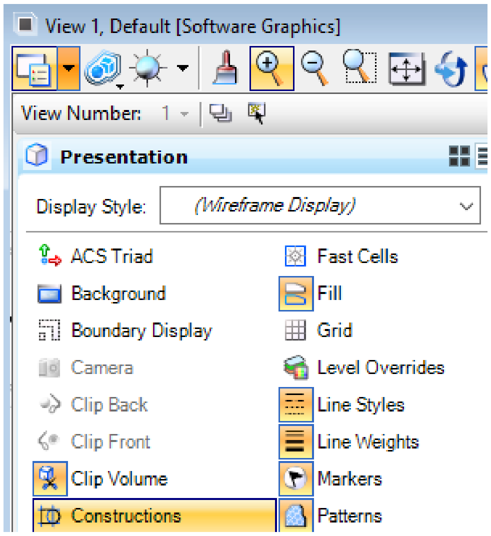


Length	300.00
Length Along	300.00
⊞ Start Point	3642623.98,318008.54,0.(
⊞ End Point	3642735.84,317731.09,0.(
Length	300.00
Feature Name	DNC_Ref
Feature Definition	DNC
Method	Single Offset
Offset	0.00
Start Distance	110+25.00 R1
End Distance	113+25.00 R1
Length	300.00
Ratio	1:0
Type	Base Geometry
⊞ Start Point	3642623.9841,31800ᵢ
⊞ End Point	3642735.8435,31773

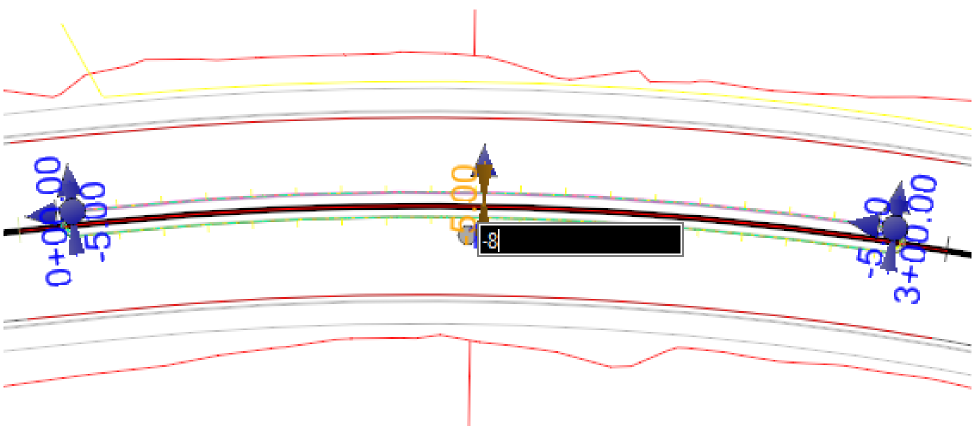
21. Select the *DNC_Ref* element and change the offset from -0.5 to **0.**



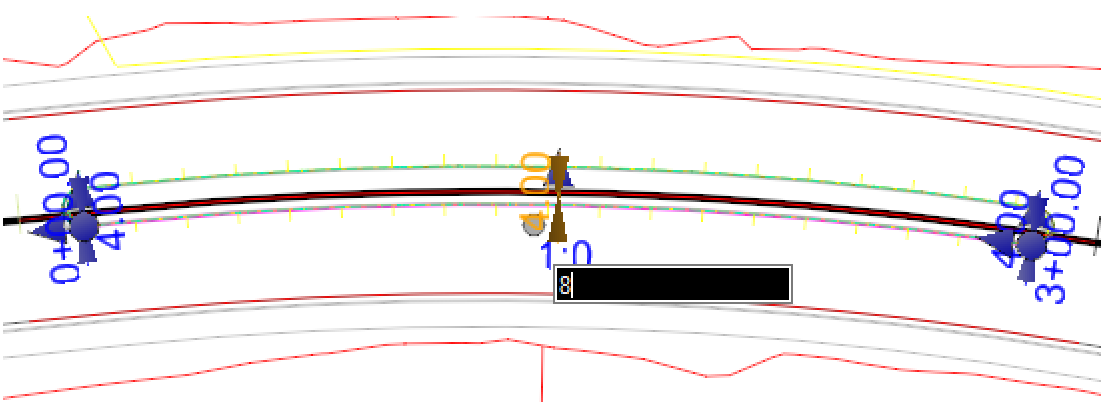
22. Turn **off** *Construction* elements in View 1.



23. Select the *Median EoP* shown below and change the offset from -5 to **-8.**

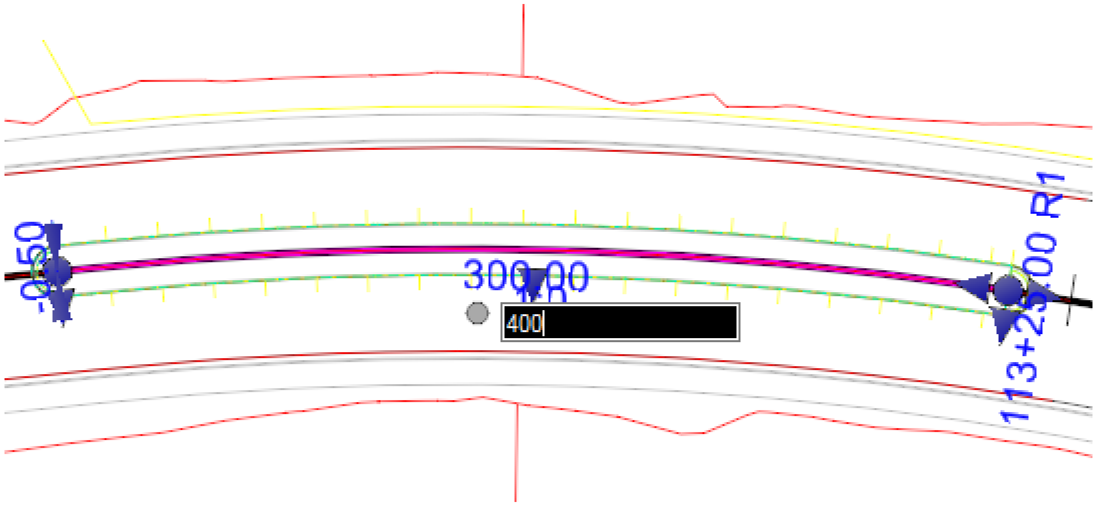


24. Select the opposite *Median EoP* as shown below and change this value from 4 to **8.**

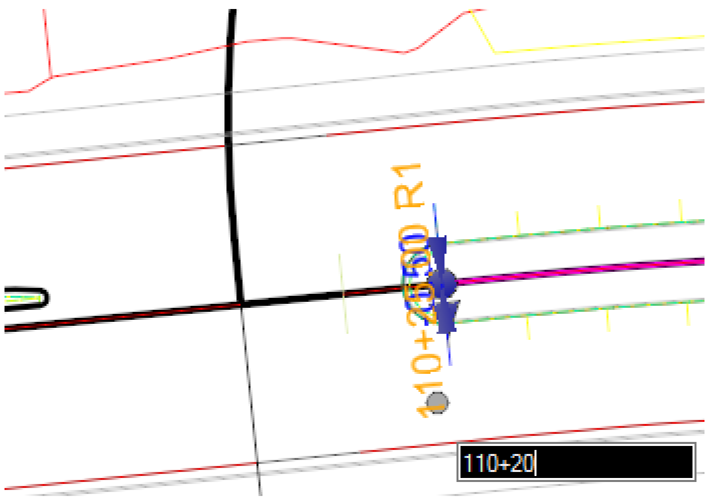


25. Hover over the ROUTE156 element in the Civil Cell area and reset until the DNC_Ref element is identified. Select the **DNC_Ref** element.

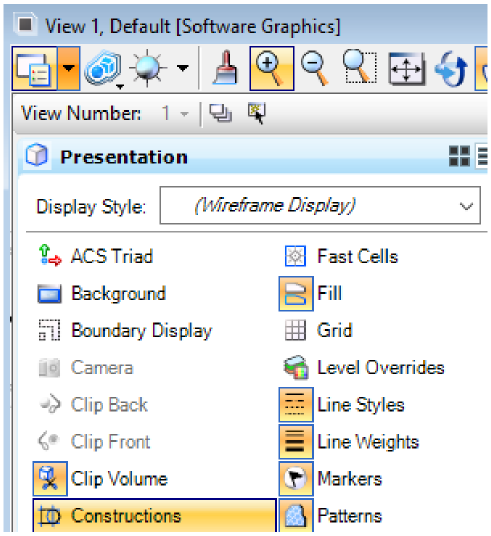
26. Change the *length* of this element from 300 to **400'.**



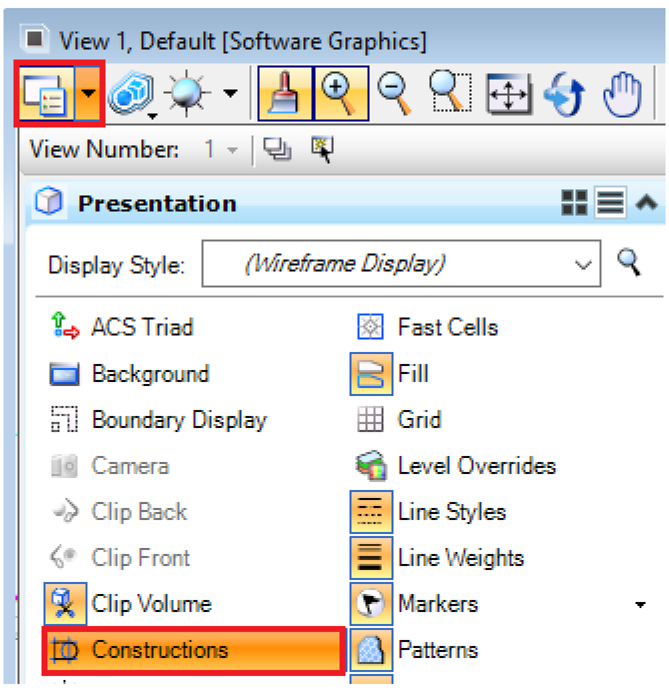
27. With the DNC_Ref element still chosen, change the *beginning station* value of 110+25 to **110+20.**



28. Turn **On** *Construction* elements in View 1.

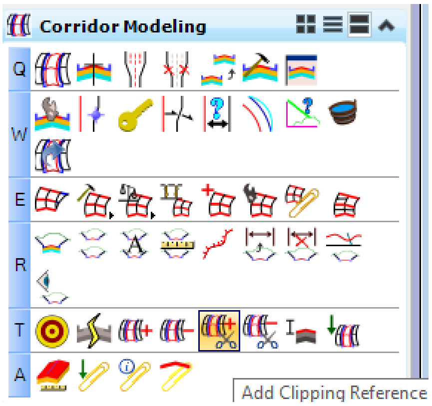


33. Turn **Construction** elements on in View 1.

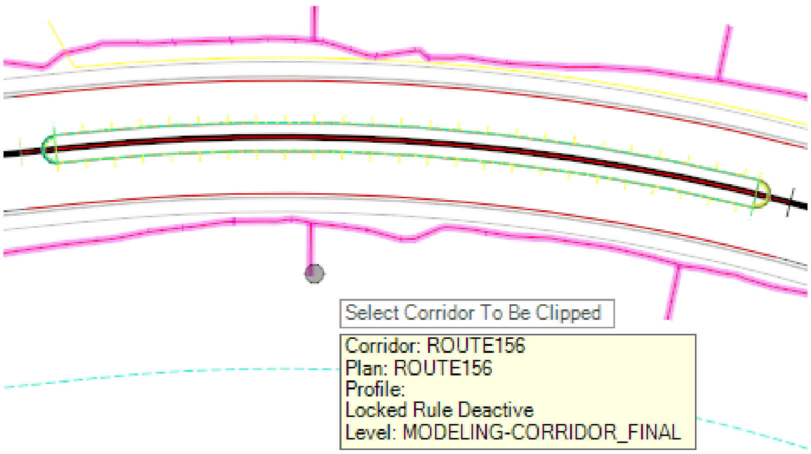


11.6.5.2 CLIPPING

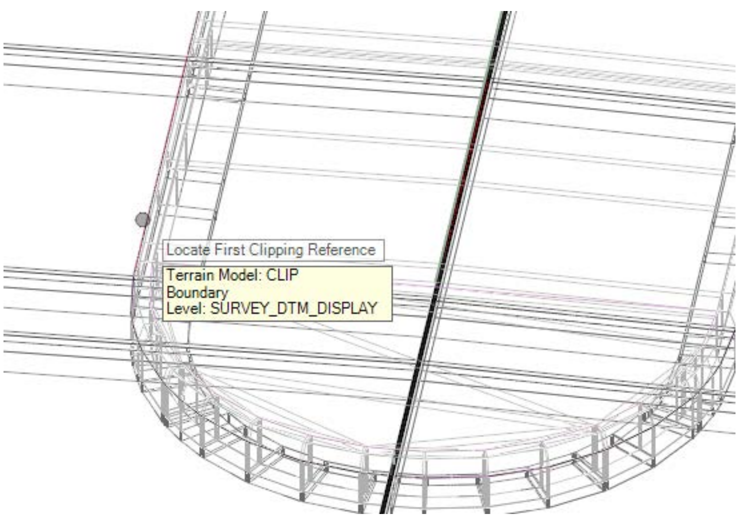
1. Select the **Add Clipping Reference** command from the *Corridor Modeling Task* menu.



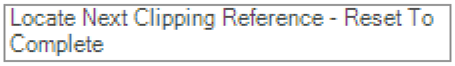
2. Select the ROUTE156 corridor when prompted to *Select Corridor To Be Clipped.*



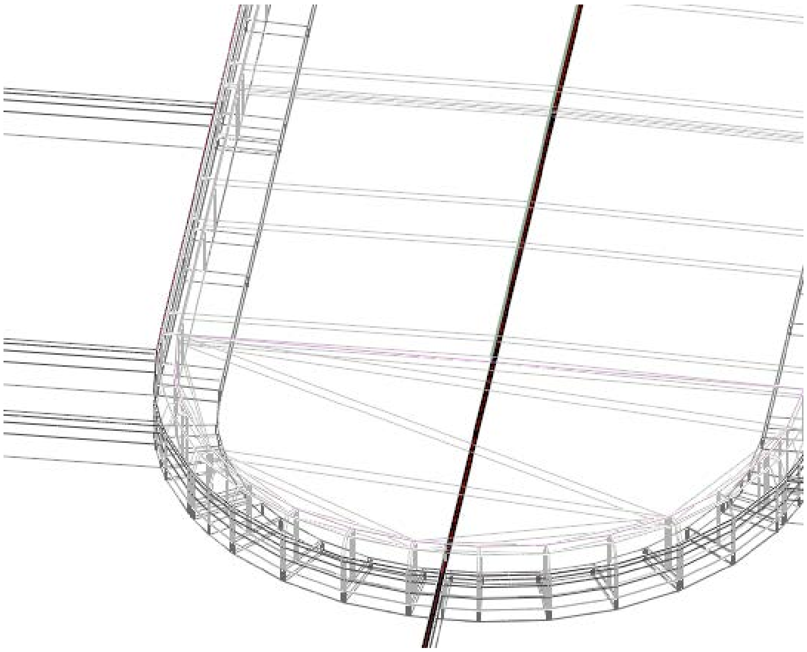
3. In the 3d View, select the **Terrain named CLIP** when prompted to *Locate First Clipping Reference.*



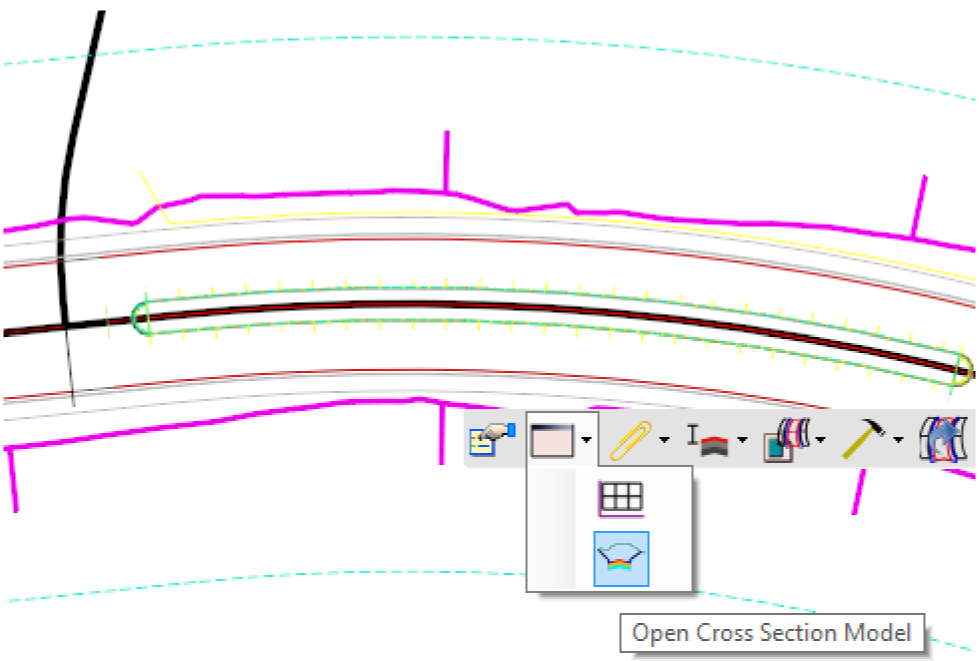
4. Right Click when prompted to *Locate Next Clipping Reference – Reset to Complete.*



5. The terrain is clipped as shown below.



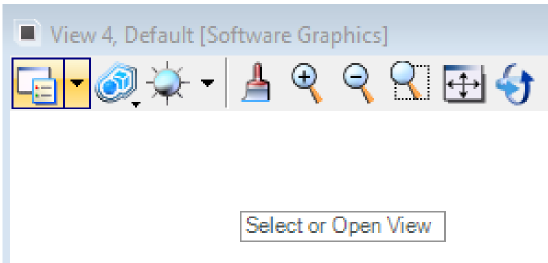
6. Open the cross-section model of the **ROUTE156** as shown below.
   a. From the context menu, select **Open Cross Section Model**.



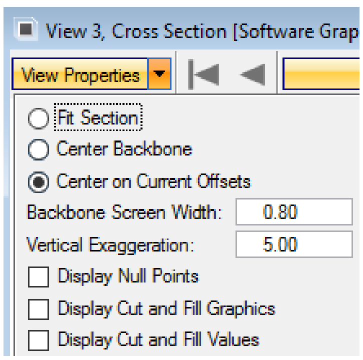
.

b. Open **View 4** from *MicroStation's View Toggles* menu.

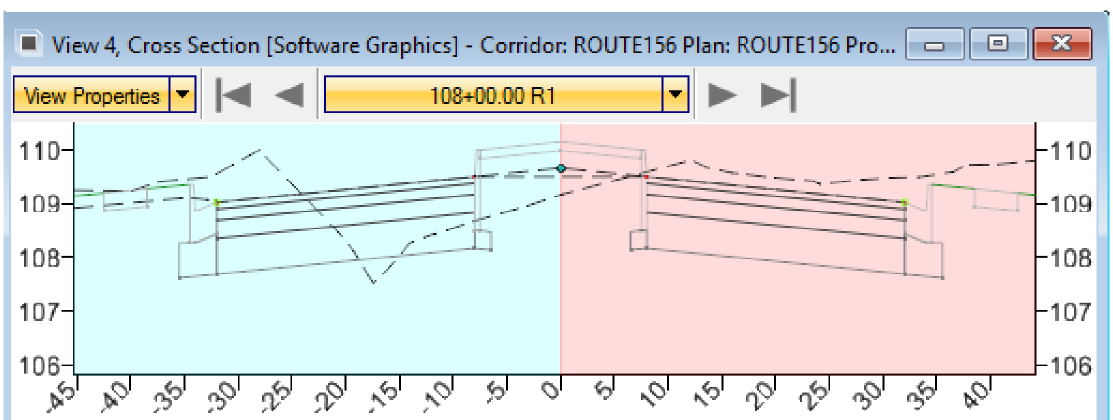
c. **Left Click** in the drawing area of *View 4*.



7. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



8. Key In station 108+00.



42. Use the **Next** and **Previous** buttons in the *Cross Section* view to review the median area.

11.6.5.3 VERTICICAL EDITS

There really are no Vertical edits needed with the Basic Median Civil Cells if the Template based EoP's and the CL were used as reference elements because the slope of the Median EoP is extracted from the Corridor pavement. A terrain named **Construction** is created based off EP-Control & Dir-Control elements within the cell whose profiles are based off the Template EoP's and CL.

11.6.5.4 TEMPLATE EDITS

Refer to section 11.6.4

11.6.6 Other Cells – CrossOver

The CrossOver Civil Cell currently available must be placed where the median shoulder to shoulder or EoP to EoP (whichever is used as a reference) distance is at least 30'. This is based on the default geometry in the Civil Cells.

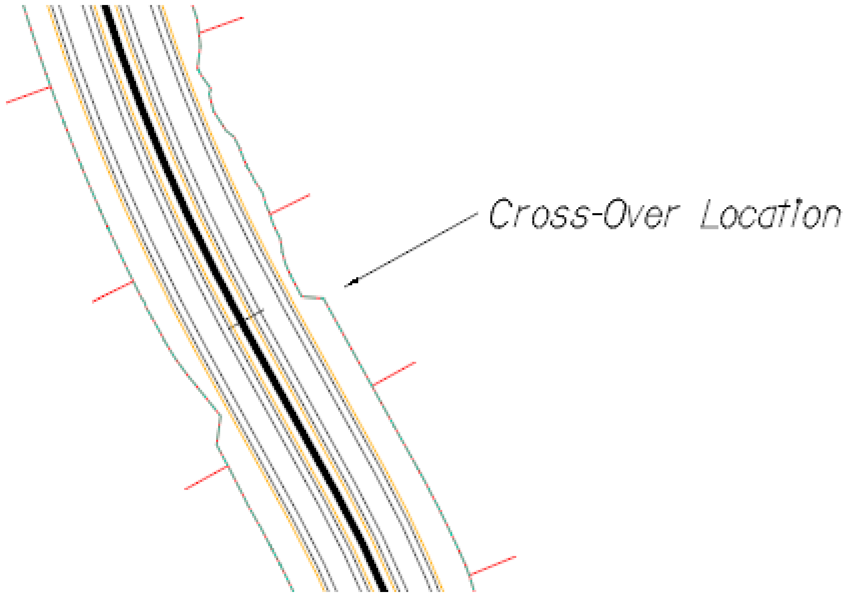
11.6.6.1 PLACEMENT

1. Open the file **4-lane-Corridor.dgn.** This file contains alignment *ROUTE156* and a Corridor has been created for *ROUTE156*. We will place a **Cross-Over** Civil Cell near 112+28 where a line that represents the Cross-Over CL has been placed.
   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

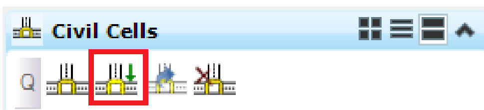
   

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)
   c. Close the reference dialog.

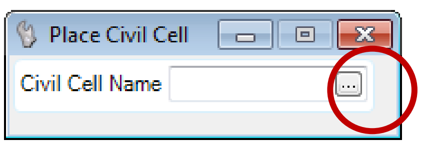
d. Zoom to the area of the Cross-Over CL (Around Station 112+28) and as shown below.



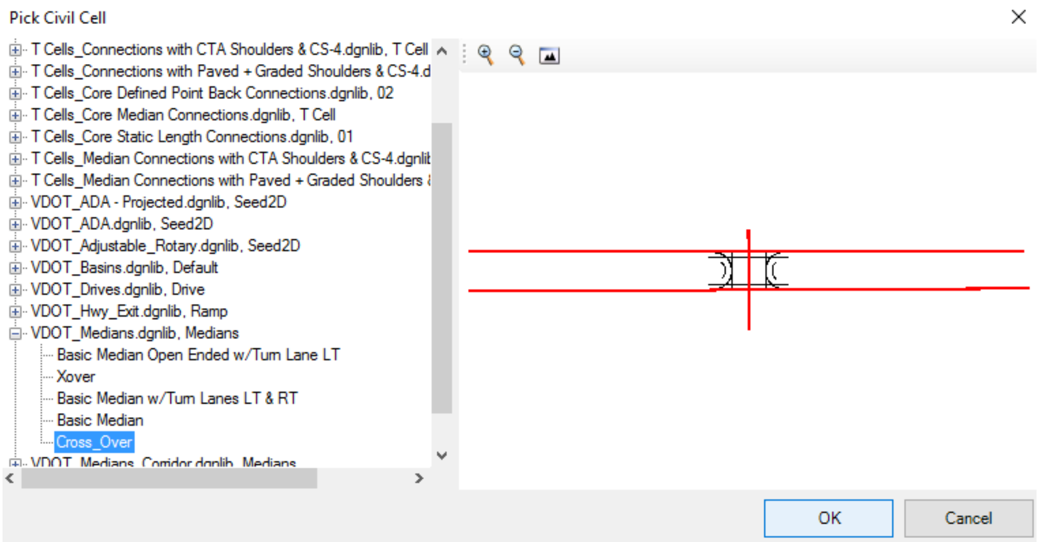
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

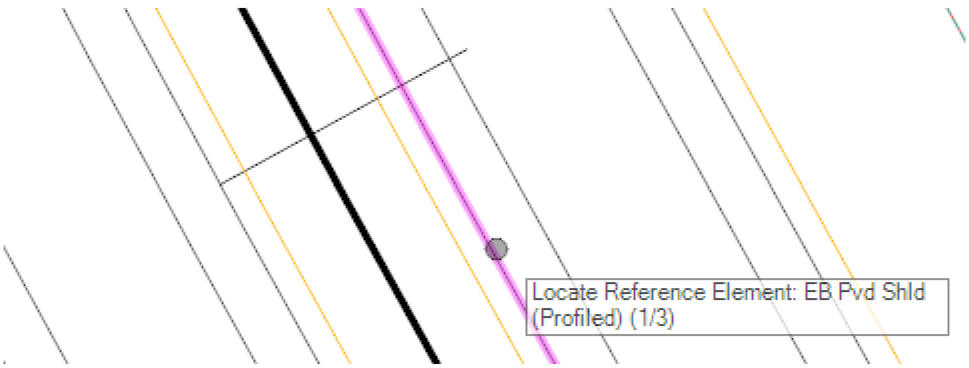


4. Select the **Basic Median** civil cell from the **VDOT_Medians.dgnlib** folder and click **OK.**

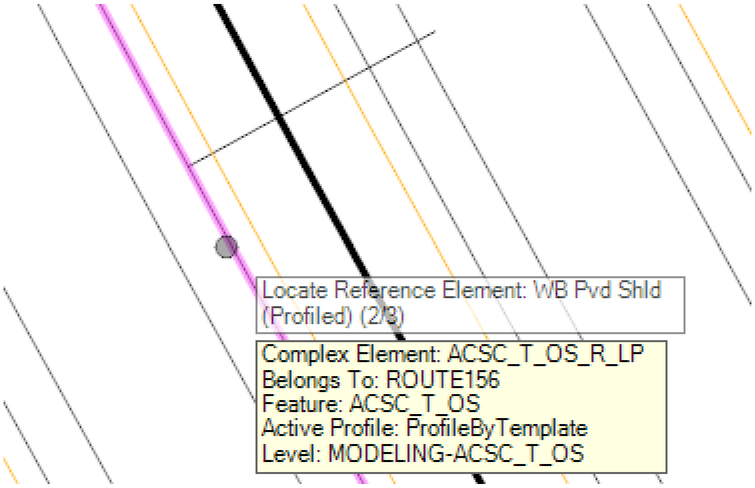


NOTE: The next three prompts may be in different order than listed in this manual.

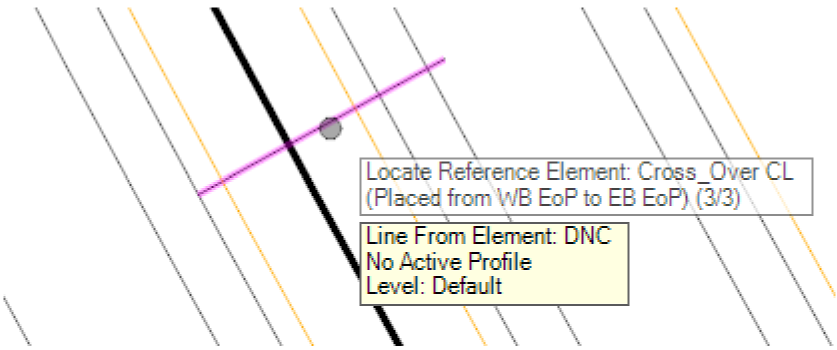
5. When prompted to *Locate Reference Element 'EB Pvd Shld (Profiled)'*, select the **Edge of Paved Shoulder** element in View 1 as shown below.



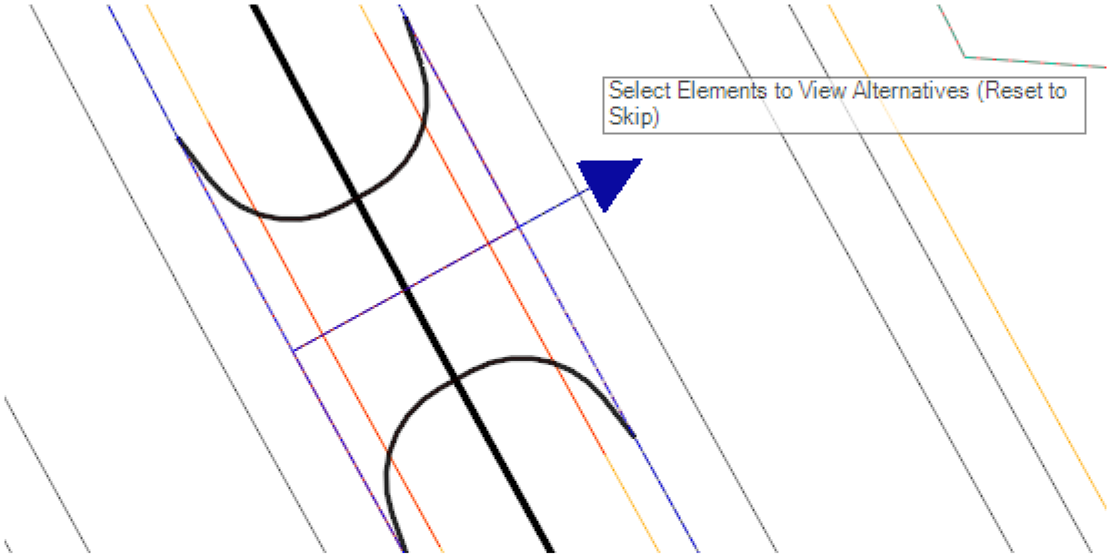
6. When prompted to *Locate Reference Element 'WB Pvd Shld (Profiled)'*, select the **Edge of Paved Shoulder** element in View 1 as shown below.



7. When prompted to *'Locate Reference Element: Cross_Over CL (Placed from WB EoP to EB EoP)* select the **line below** in View 1.



8. Review the geometry being displayed.



   a. If the geometry appears correct and similar to the image above, move on to the next step.

   b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.6.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

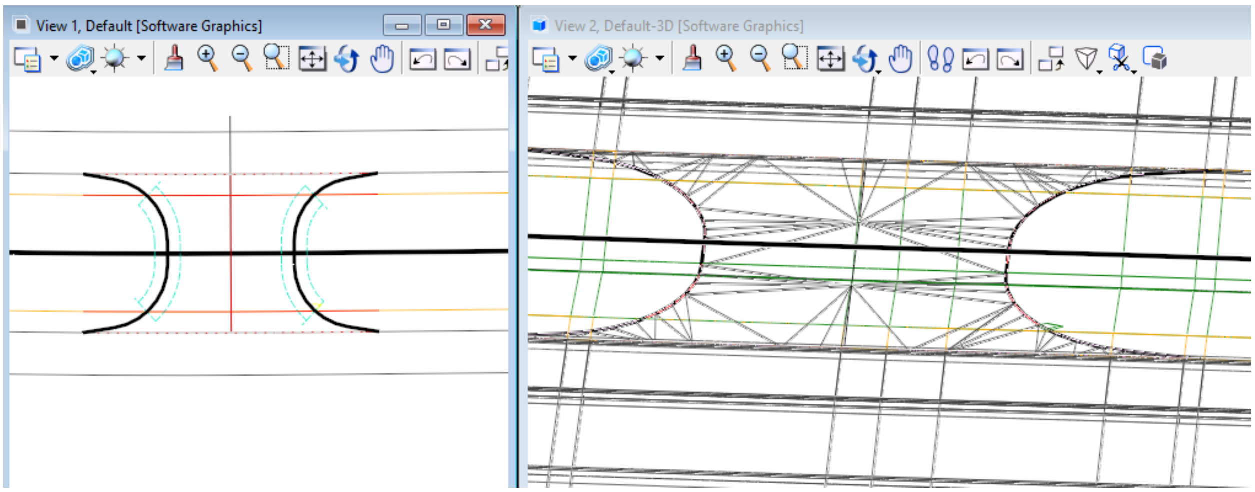
   d. There are linear templates within the Civil Cell but these are fill only and may not show up if the cross-over is in a cut section which is the case for this example. We will discuss these linear templates in the Templates sub-section below.

9. **Reset** when/if prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.

   We will clip the corridor after edits are made to improve processing time when performing the edits.

10. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

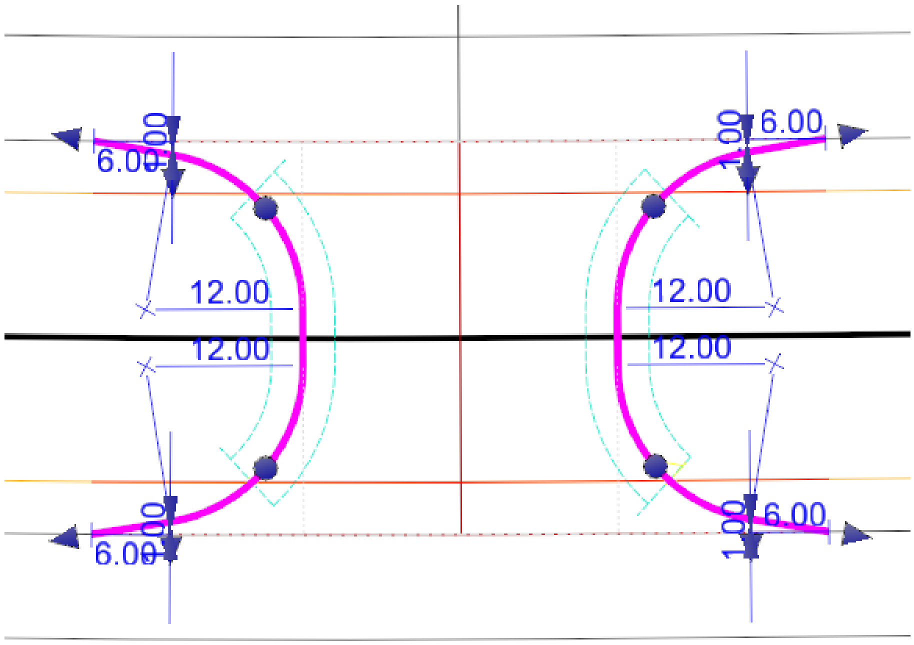
    The image below shows the cell in 2d & 3d views.



11. Choose the **Element Selection** command to exit the Place Cell command.

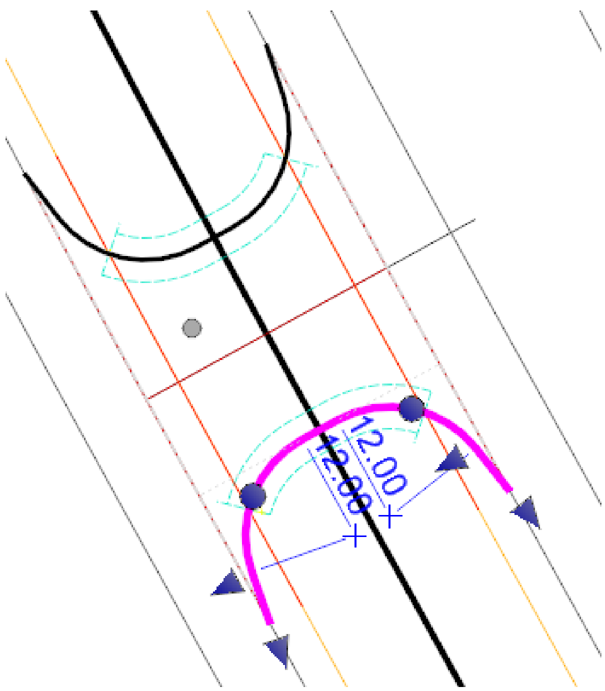
11.6.6.2 HORIZONTAL EDITS

1. Selecting the Cross-Over EoP allows the user to graphically make edits to the radii or tapers placed.



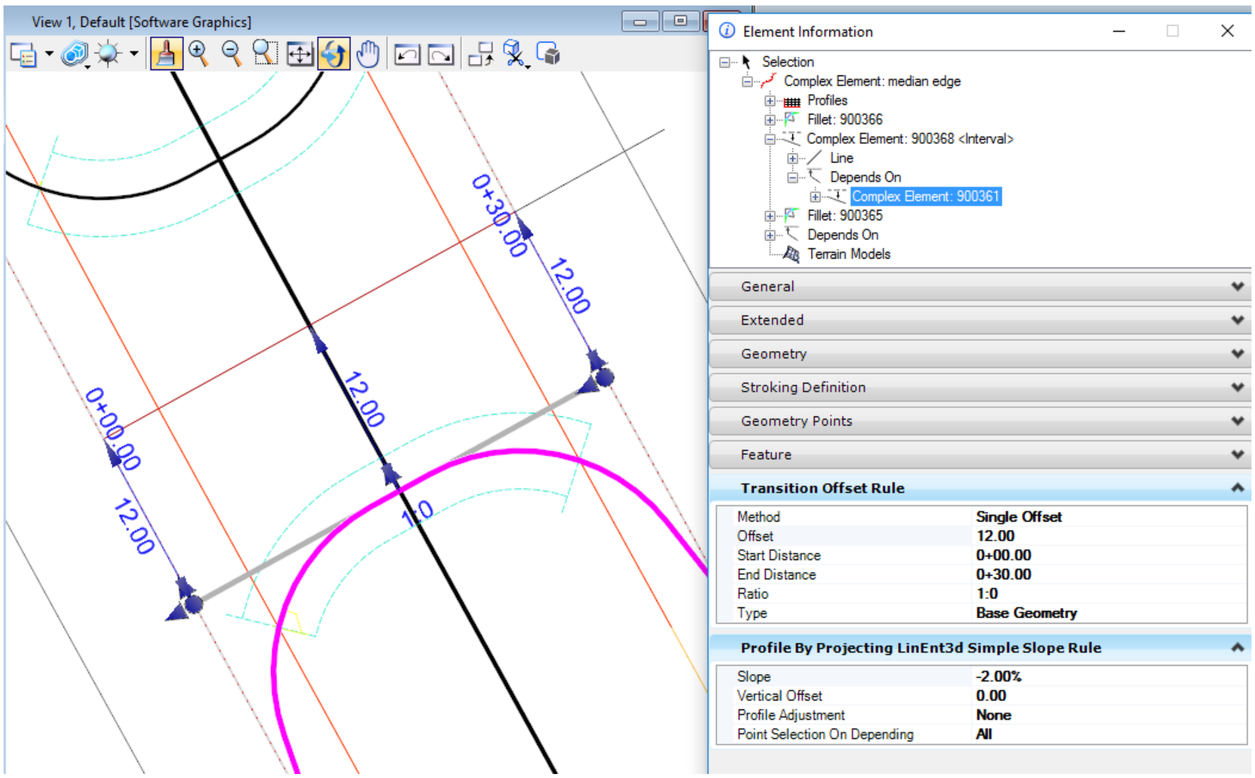
2. The width of the median can be adjusted by selecting the Cross-Over EoP and invoking Element Information as discussed below.

   a. Select the South most Cross-Over EoP.



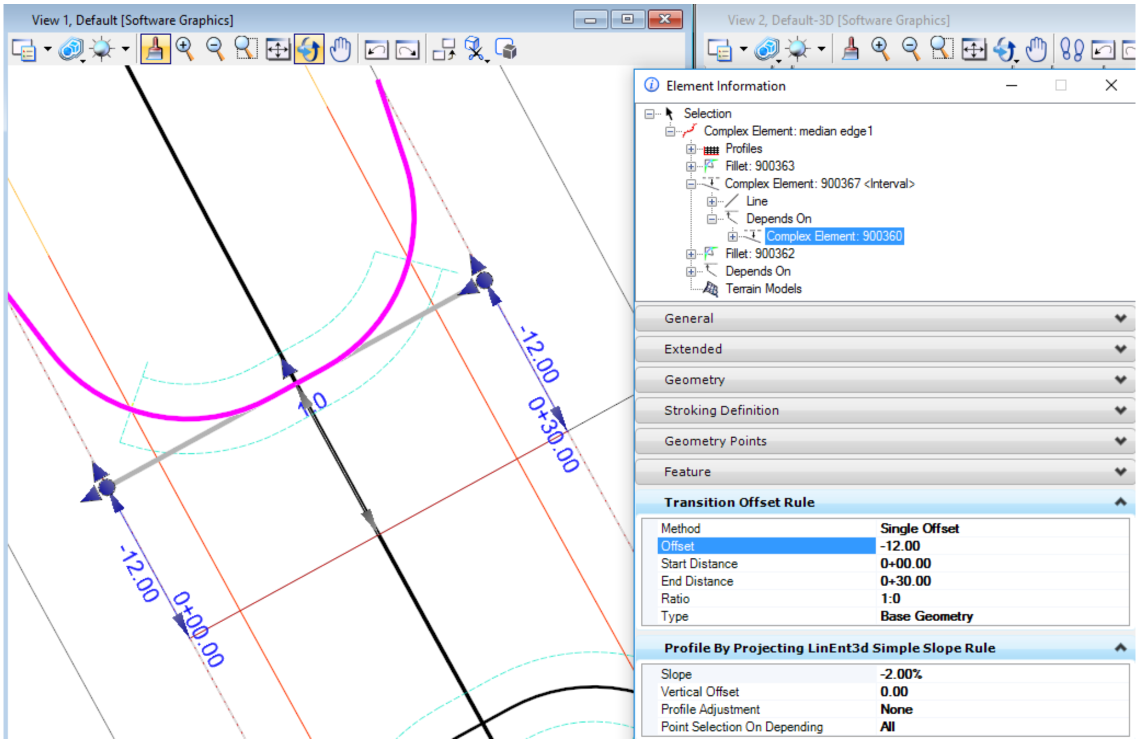
b. Choose **MicroStation's Element Information Tool** from the *Primary Tools* dialog.

c. Expand the Complex Element tree as shown below selecting the **Complex Element** under the Complex Element <Interval>.



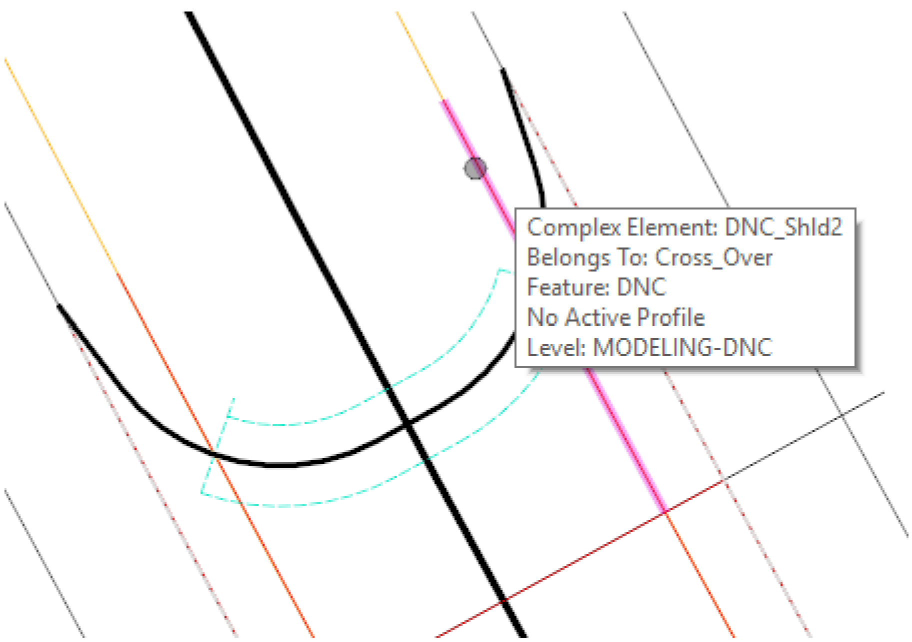
d. Change the *Offset* of 12 to **15** and the geometry is adjusted.

e. Select the opposite Cross-Over EoP and make this same change, making the full width of the median 30’.

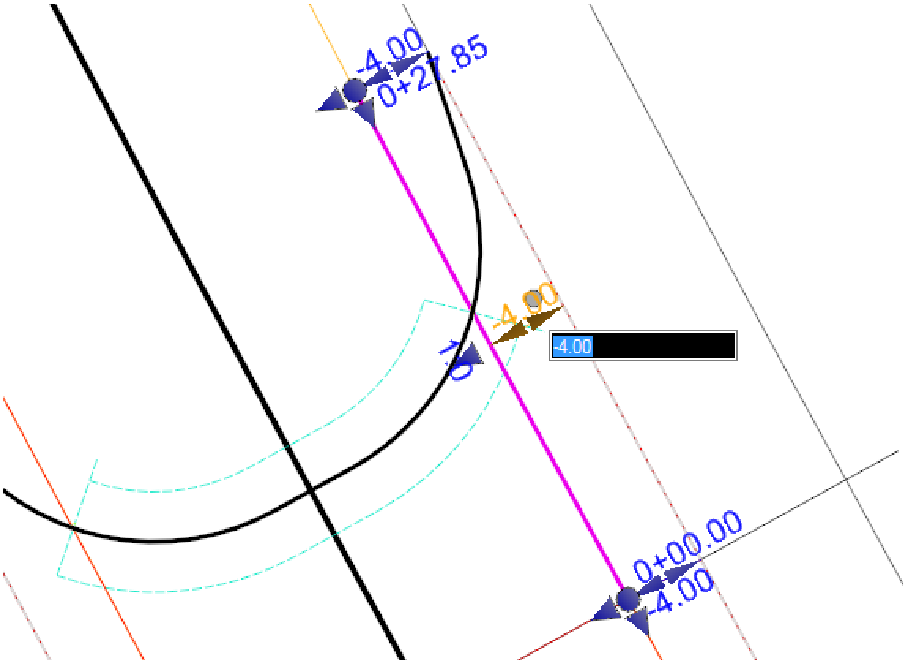


The last horizontal adjustment that will be discussed is matching the shoulder elements in the Civil Cell with the shoulder elements of the ROUTE156 corridor.

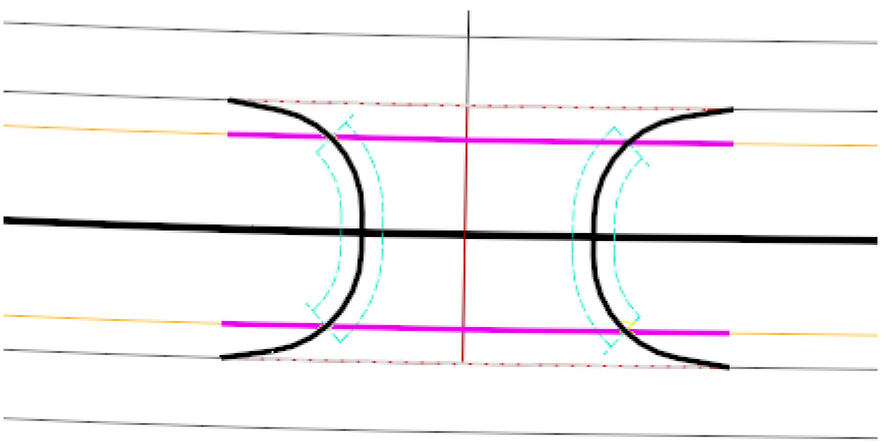
3. Hover over and select the **DNC_Shld*** element. You may have to reset to access this element which underlies the *ROUTE156 template graphics shoulder.*



4. This element is aligned with the template graphics shoulder. If it wasn't, you would make the edit shown below to make it align.



5. You would perform this edit to each of the four highlighted DNC_Shld's shown below.



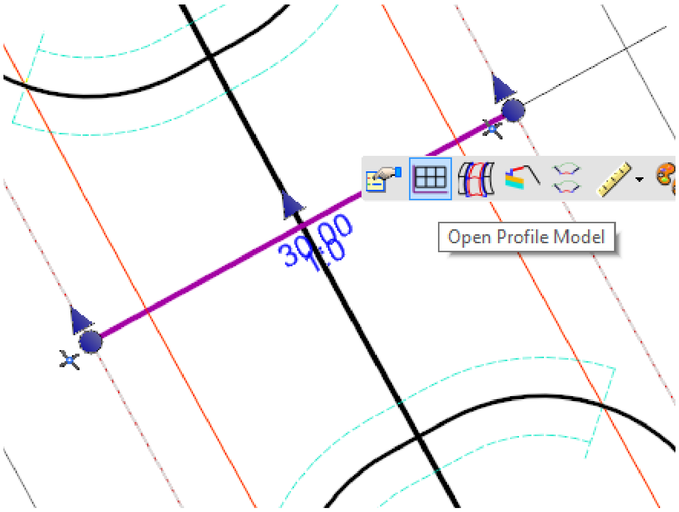
11.6.6.3 VERTICAL EDITS

There are basically only two vertical edits to make:

- To the Cross-Over CL grade
- To the Cross-Over EoP's

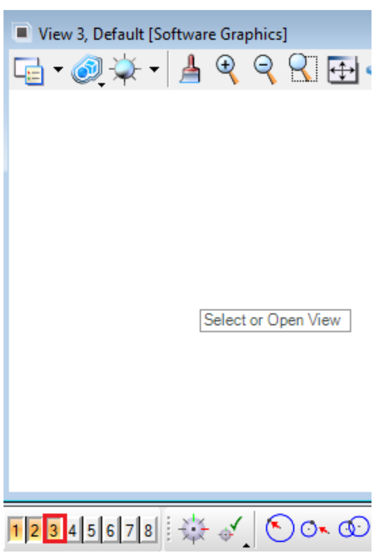
The steps below will cover these vertical edits.

1. Select the element **DNC_CrossOver-CL** and from the context menu choose **Open Profile Model.**

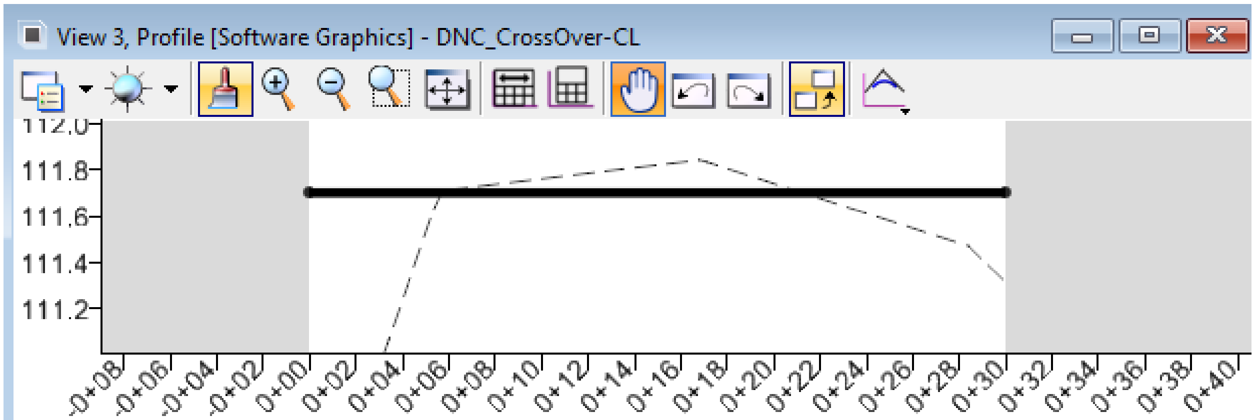


NOTE: You may have to hover over the Cross-Over CL and right click to access this element since there are a couple of elements present here. The reference element selected as the Cross-Over CL is not the correct element, the CL in the cell is.

2. Open **View 3** and the Left Click in View 3 when you are prompted to Select or Open View.

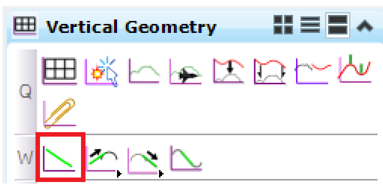


6. Review the profile.

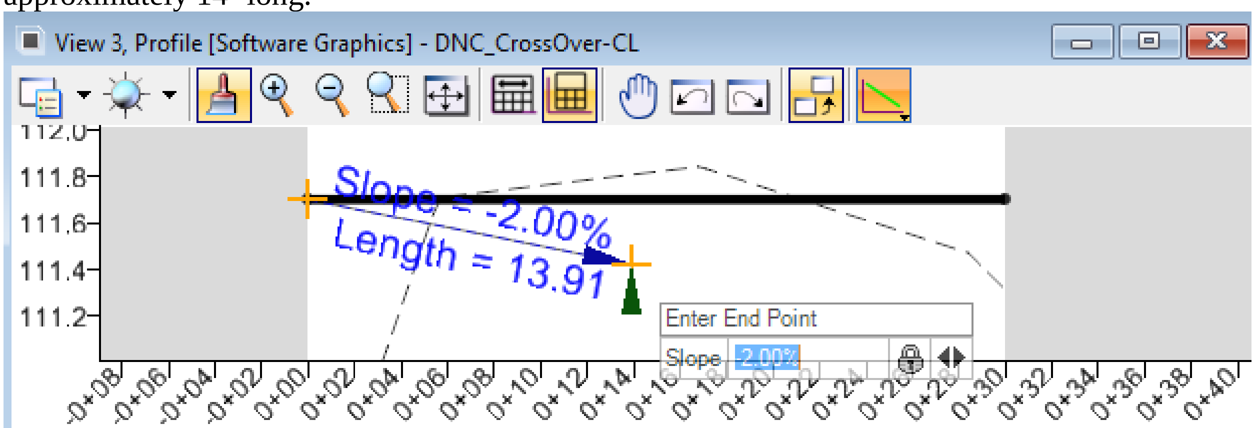


Next we will use Vertical Geometry commands to draw a new profile and make it the Active Profile.

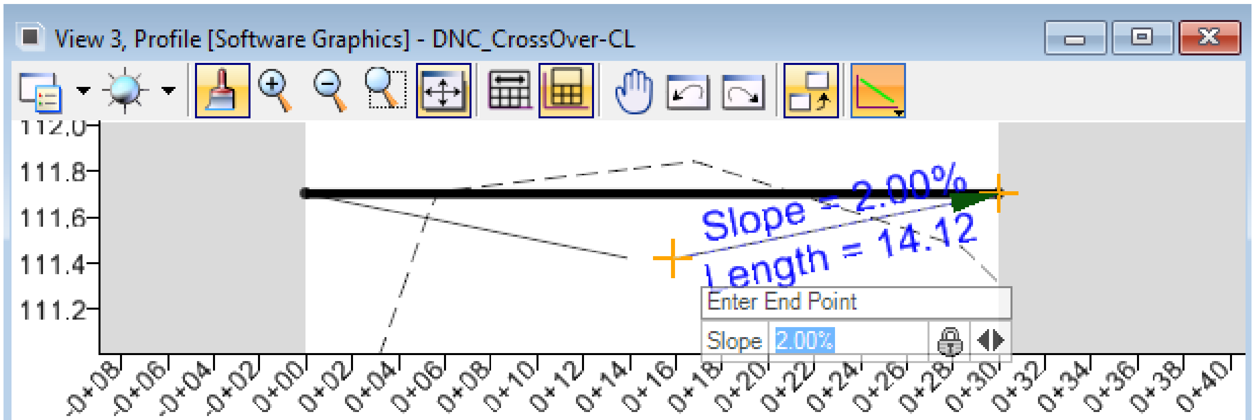
7. Select the Vertical Geometry command **Profile Line Between Points.**



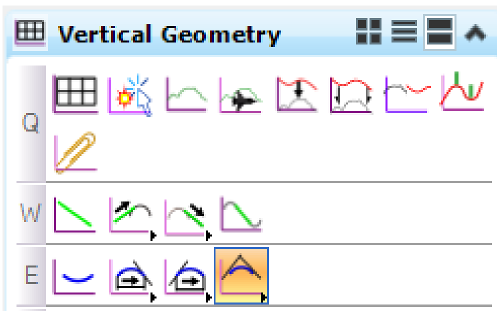
8. In the profile view, snap to the beginning of the active profile when prompter to Enter Start Point and place a line **-2%** away from the beginning of the active profile and approximately 14’ long.

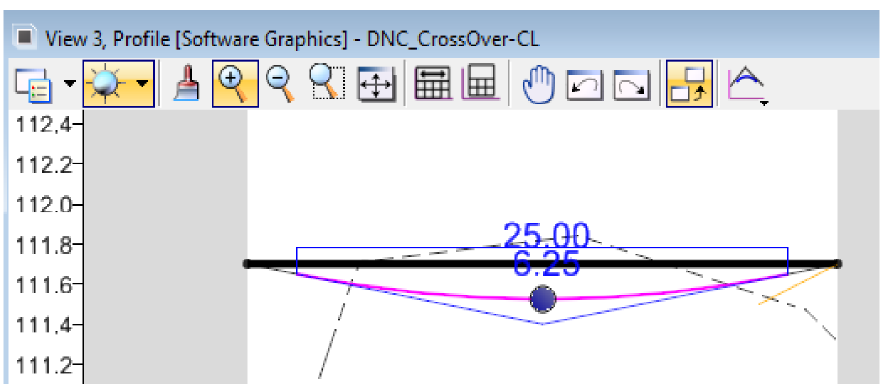


9. Using the same command, place another line from the end of the active profile at 2% and approximately 14’ long as shown below.

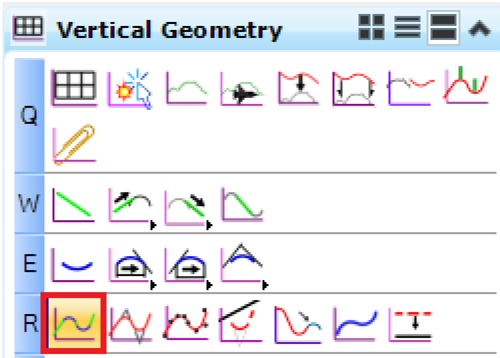


10. Select the **Profile Curve Between Elements** command and place a **25’** vertical curve between the last two lines just placed. *Trim* **Both** lines when prompted.

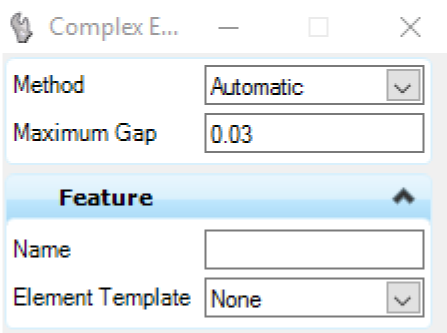




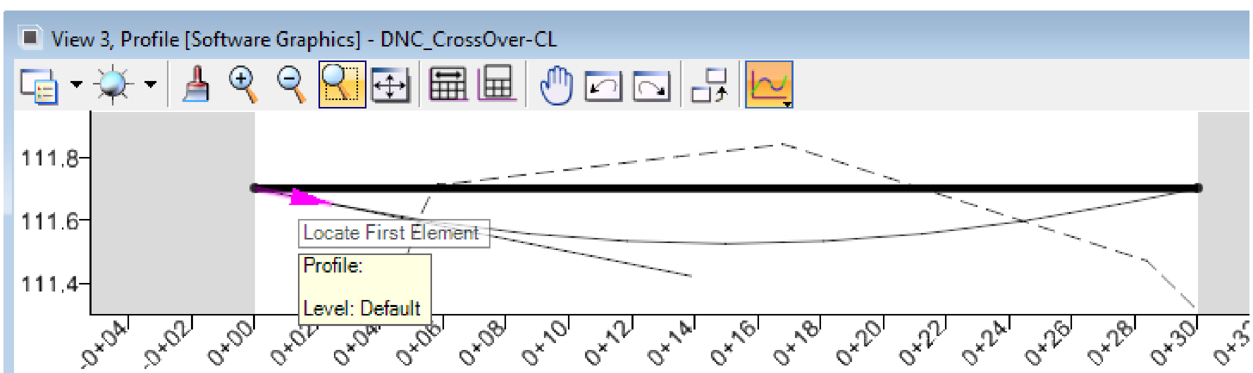
11. Choose the *Vertical Geometry* command **Profile Complex By Elements**.



12. Set the *Method* to **Automatic.**

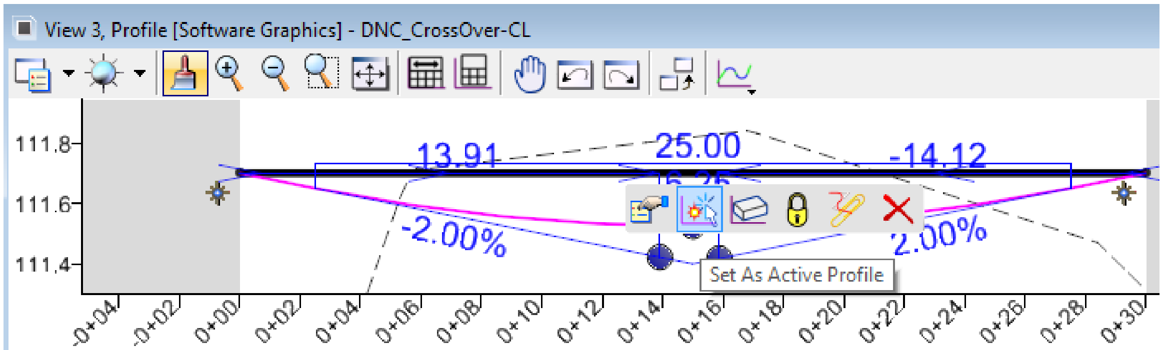


13. Select the 1st line placed with the arrow pointed below when prompted to Locate First Element.



14. Left Click to **Accept Complex.**

15. Select the newly created vertcal profile and from the context menu, choose **Set as Active Profile.**



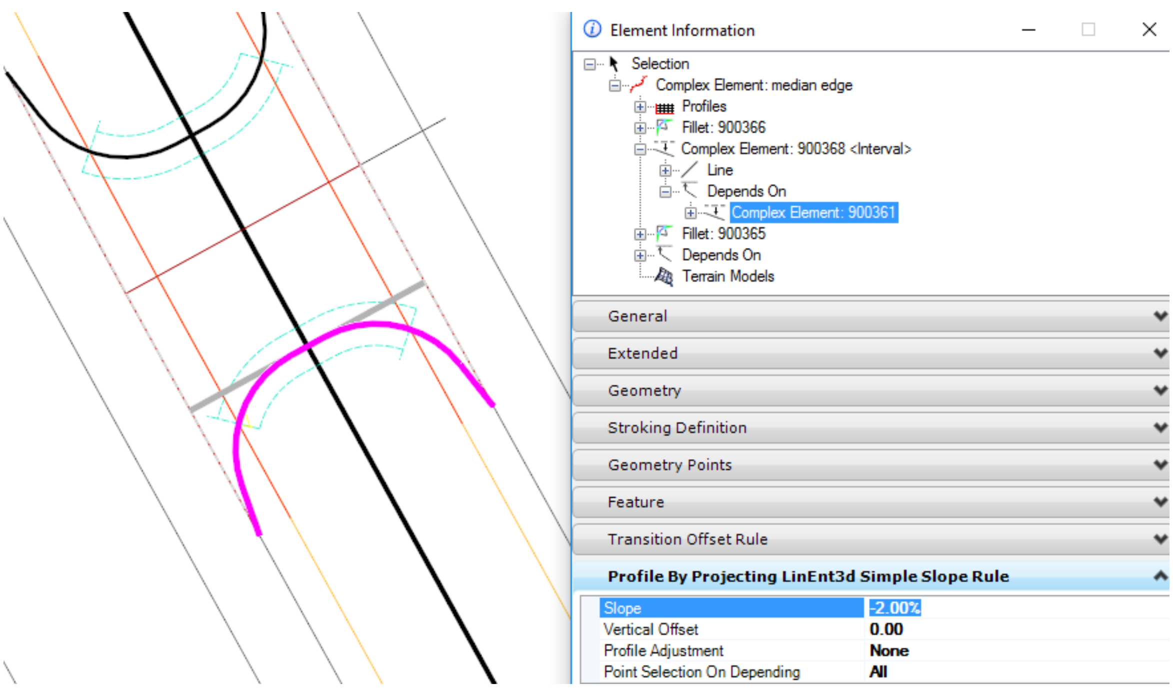
16. The Surface terrain in the Civil Cell is adjusted to the new CrossOver CL profile.

17. The CrossOver EoP Profiles are controlled by where they tie to the Edge of Shoulder and a 2% projection from the CrossOver CL to the CrossOver EoP's.

18. Select the southern CrossOver EoP.

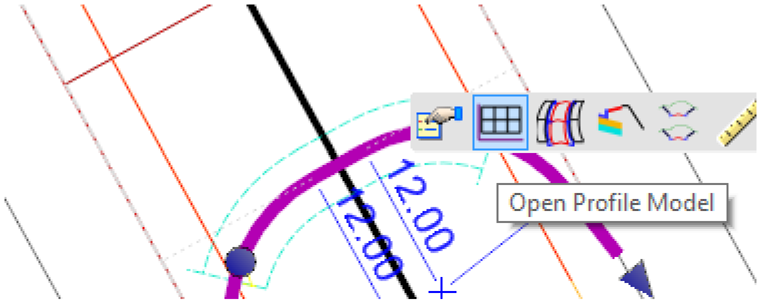
19. Choose MicroStation's Element Information Tool from the *Primary Tools* dialog.

20. In *Element Information*, expand the Complex Element tree as shown below selecting the **Complex Element** under the *Complex Element <Interval>*.

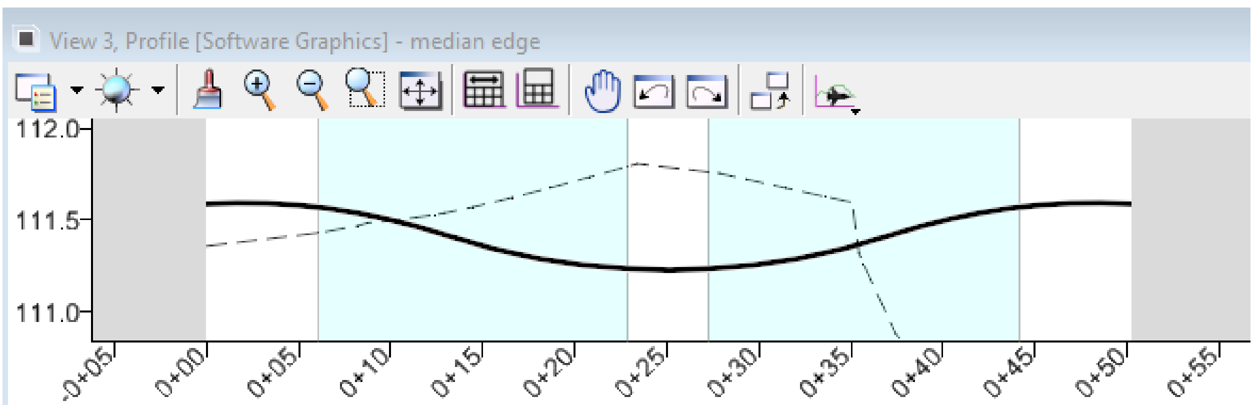


Slope can be modified here to adjust the profile although we wil not change it in this exercise.

21. Hover over the selected southern CrossOver EoP and from the context menu, choose Open Profile Model.

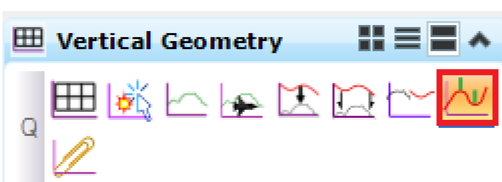


22. Left Click in View 3 when prompted to *Select or Open View*. The profile is displayed below.

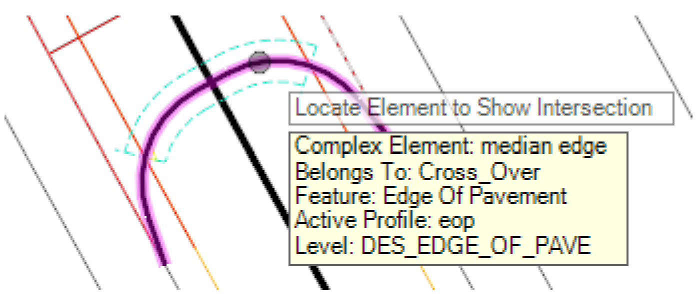


23. Review the ROUTE156 corridor unpaved shoulders intersection on this profile.

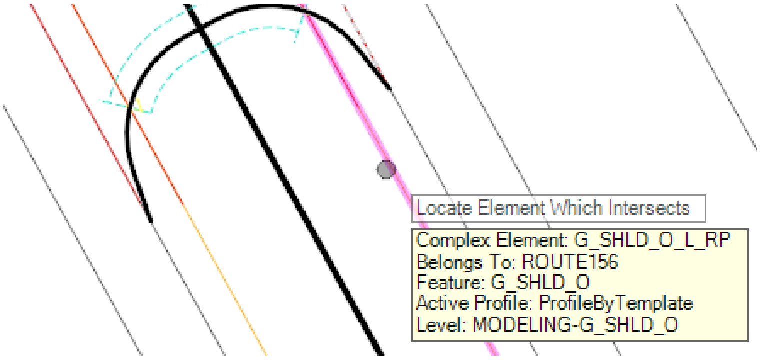
   a. Select the command Profile From Surface from the Vertical Geometry tasks.

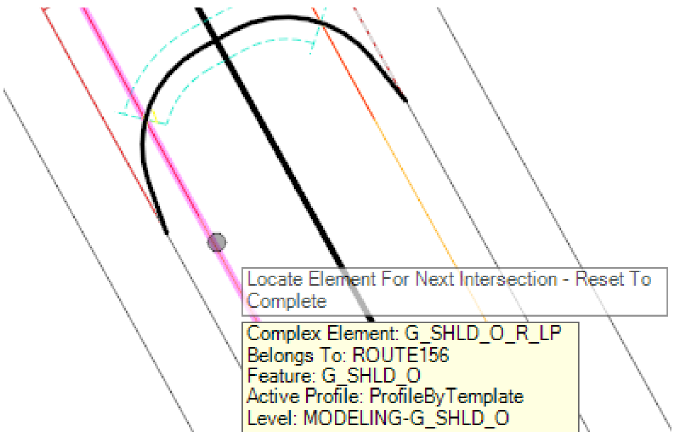


   b. Select the southern crossover EoP when prompted to *Locate Element to Show Intersection.*



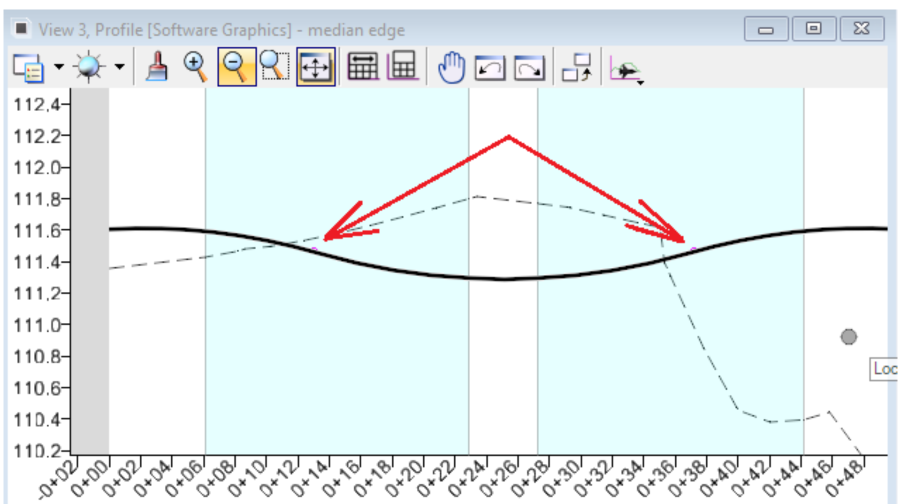
c. Select the ROUTE156 edge of shoulders when prompted to *Locate Element Which Intersects.*





d. Reset to Complete.

e. Review the intersection points in the profile view.

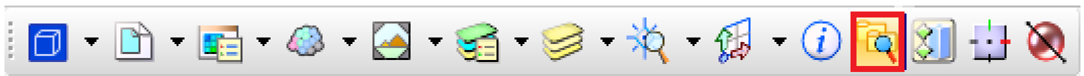


We will not make changes in this exercise because these points are withing 0.01 of the profile but the profile could be redrwn if needed or the shoulder slopes could be warped to match the profile point with parametric constraints if there was significant difference.

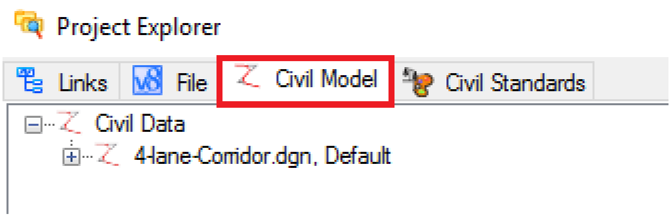
11.6.6.4 PROJECT EXPLORER

Another tool to view/access elements contained in the Civil Cell is Project Explorer. In this exercise, we will turn on Flow Arrows for the CrossOver pavement area through Project Explorer.

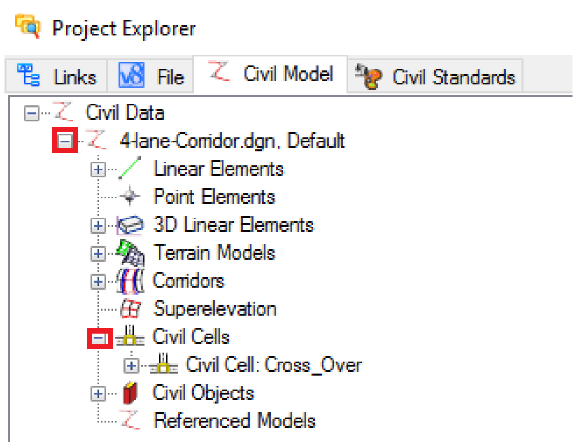
8. Choose **Project Explorer** from *MicroStation's Primary Toolbar*.



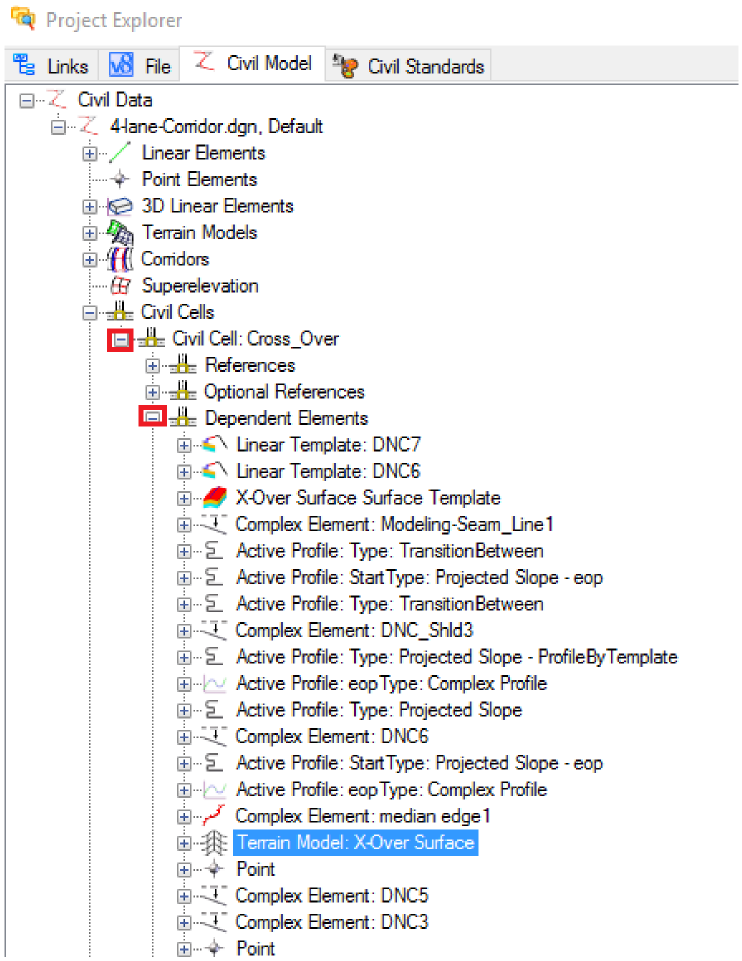
9. Once invoked, select the **Civil Model** tab.



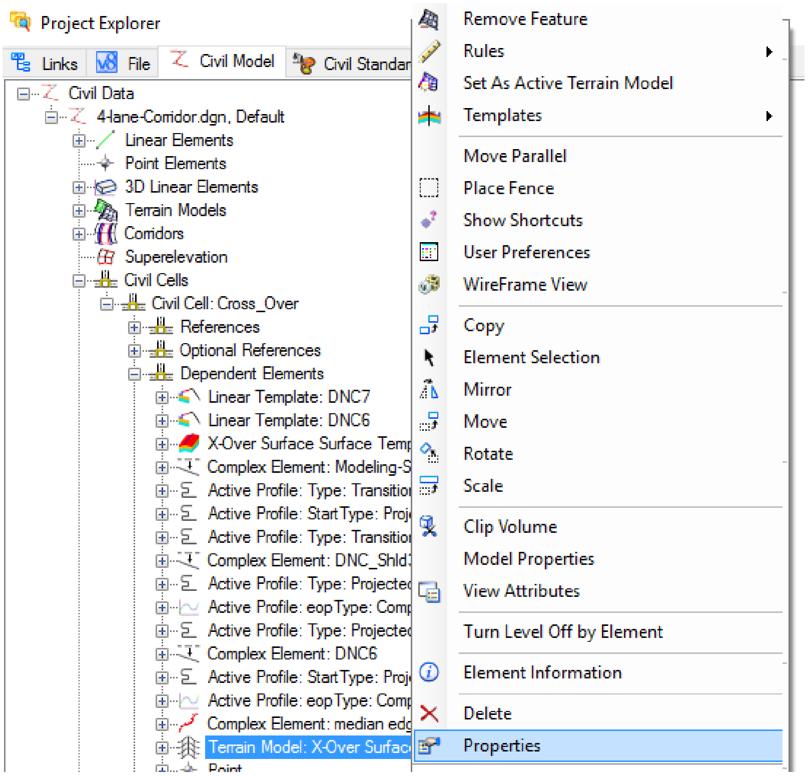
10. Expand the following to view the Civil Cells in the DGN file.



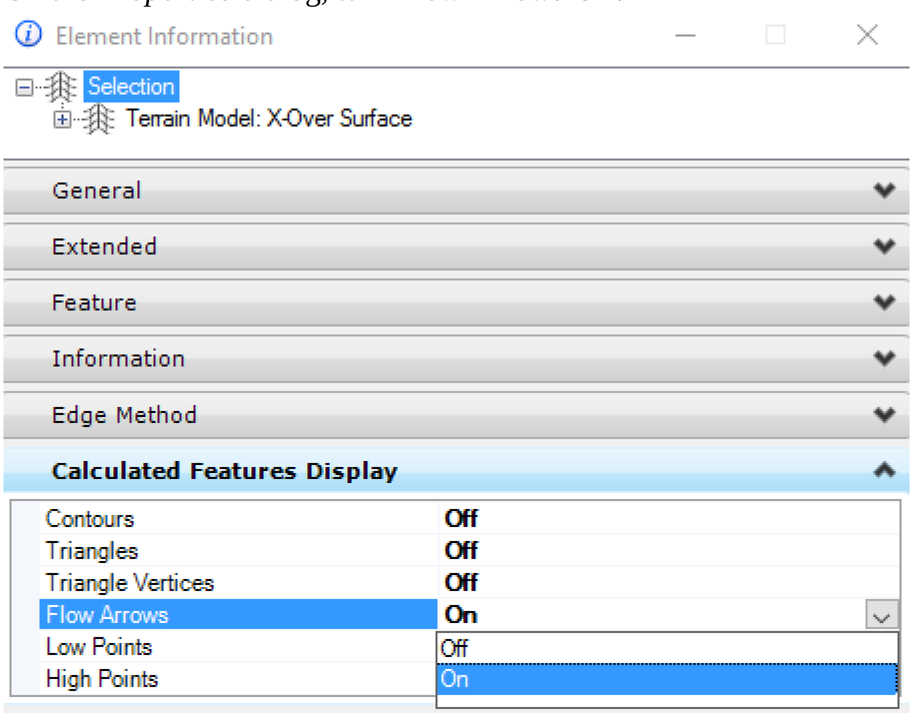
11. Expand the **Cross_Over Civil Cell,** expand **Dependent Elements**, and find the **Terrain Model: X-Over Surface.**



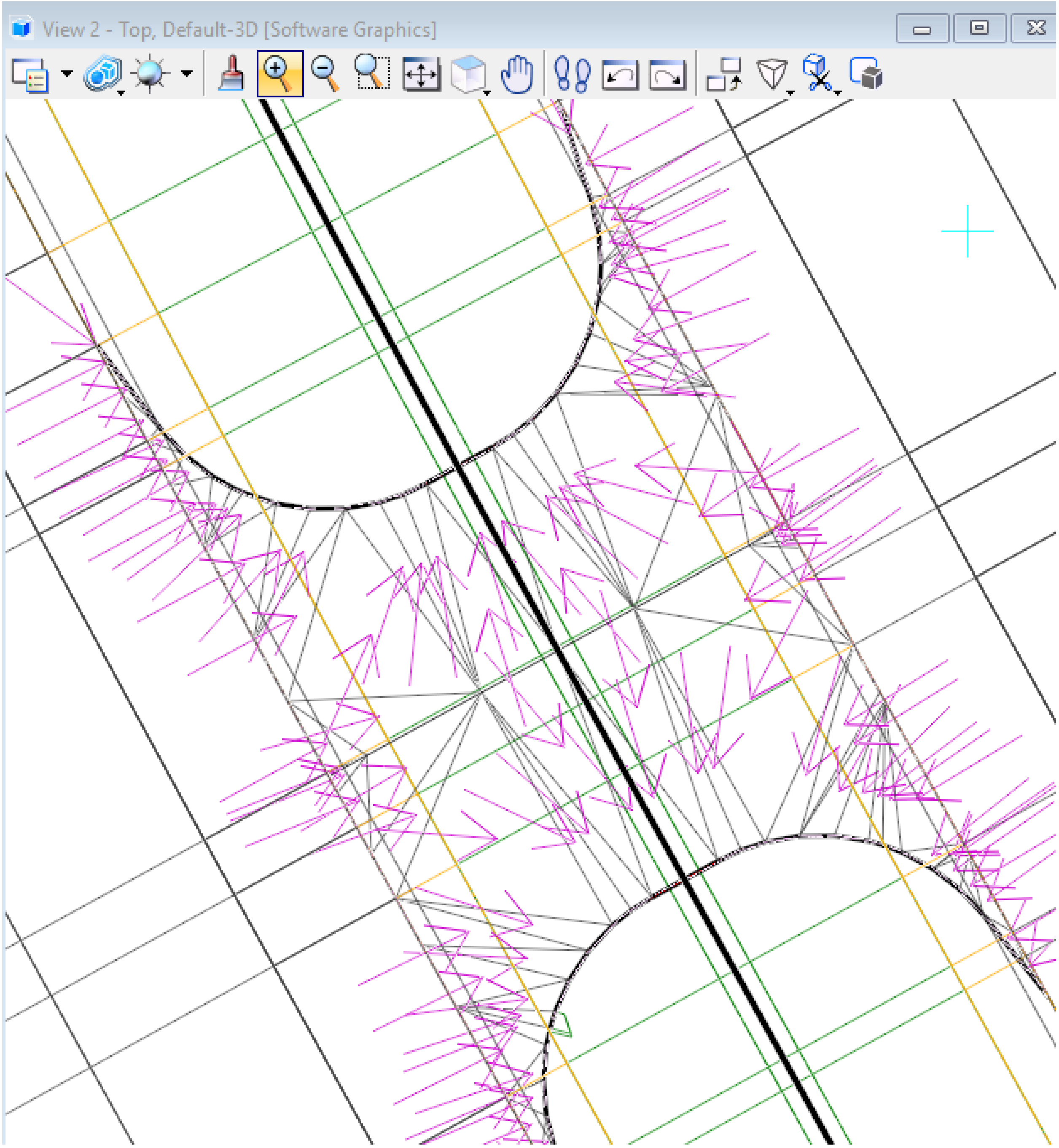
12. Right Click the *Terrain Model* and choose **Properties.**



13. On the *Properties* dialog, turn *Flow Arrows* **On.**



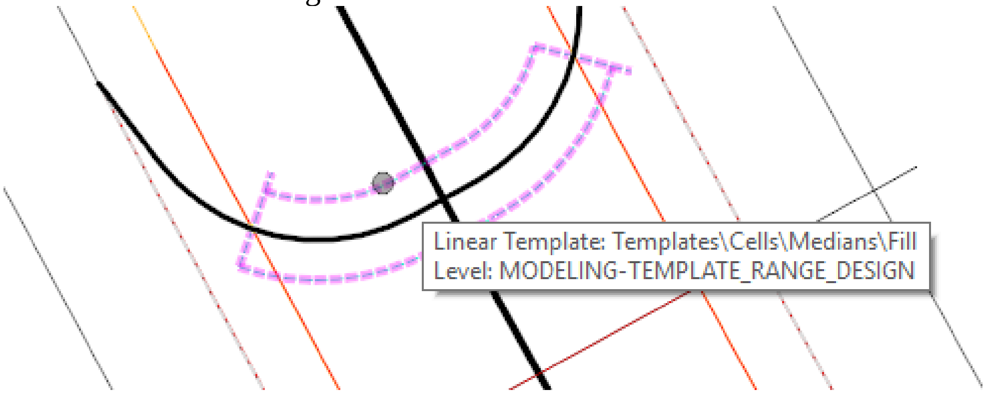
14. Review the Flow Arrows and make sure the slopes are as desired.



15. Turn **Off** the *Flow Arrows.*

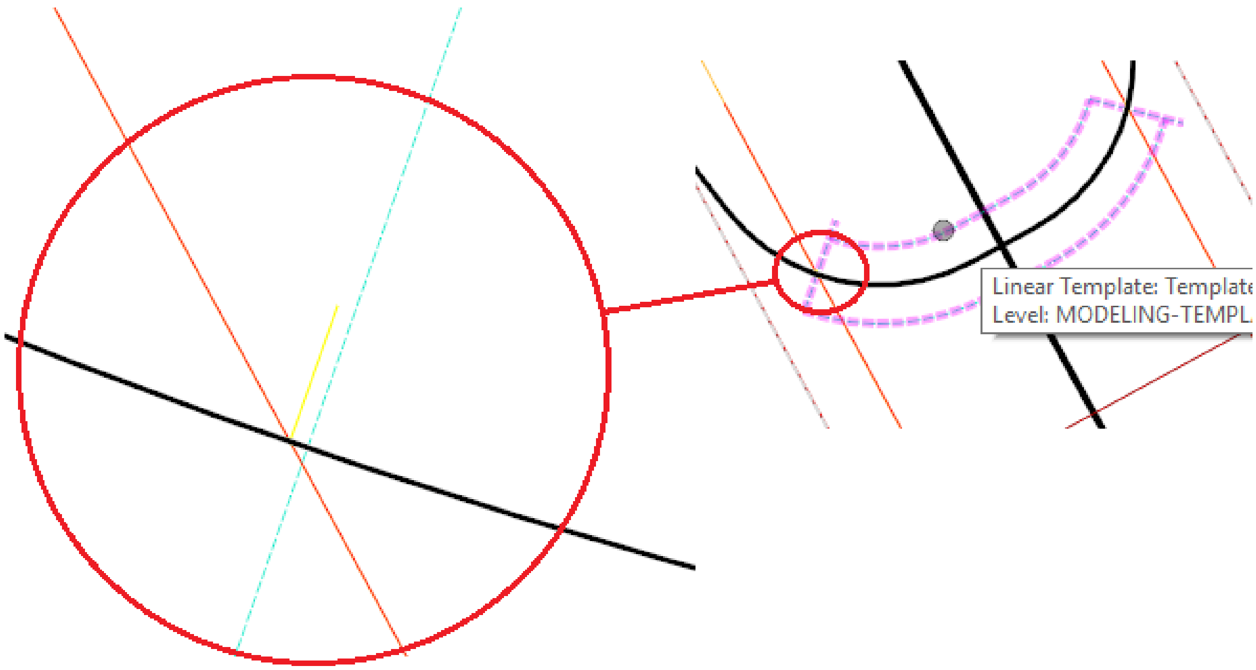
11.6.6.5 TEMPLATES

The only linear templates in this cell is placed partially on the nose area from edge of the mainline shoulder to edge of shoulder.

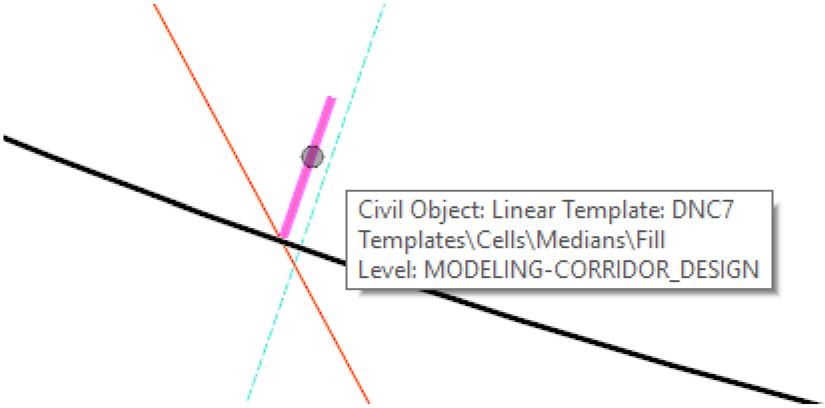


These are a Fill only end condition and if in cut, no ground will show up as is the case in this example. We will target the ROUTE156 corridor in the next few steps to tie this slope to the ROUTE156 slopes/ditch area.

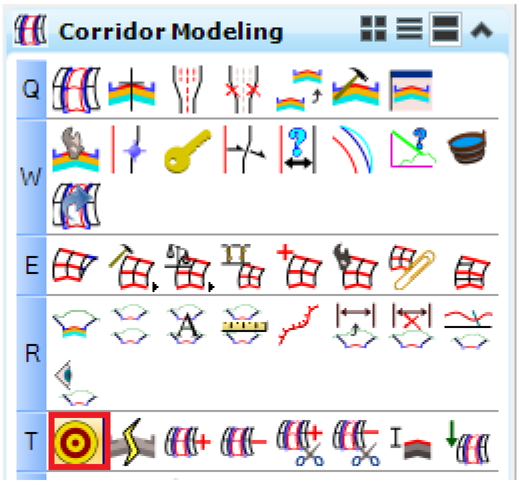
1. Zoom in close to the left side of the northern template.



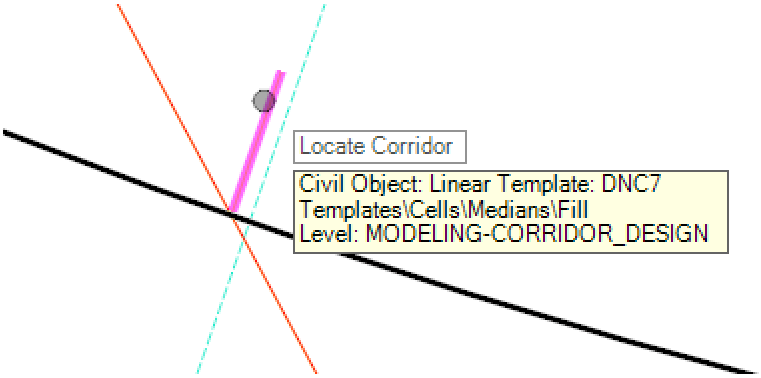
2. Notice the handler below. You may have to reset if the Civil Cell is highlighted to access this element.



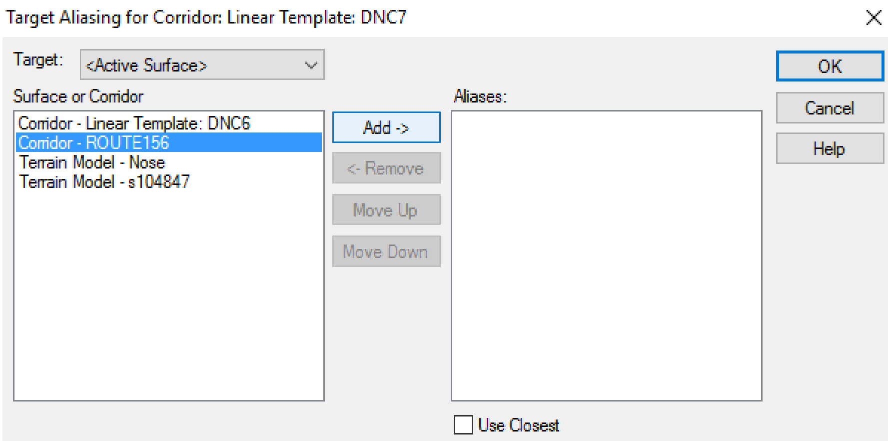
3. Select the **Define Target Aliasing** command from the *Corridor Modeling tasks.*



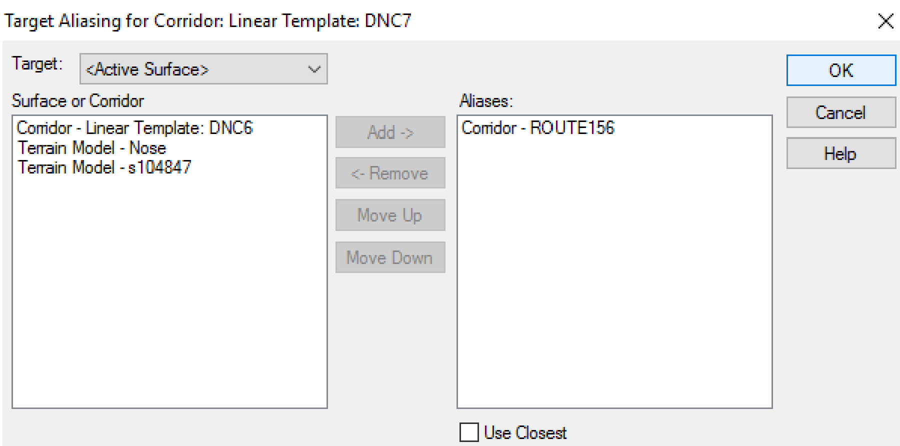
4. Select this handler when prompted to *Locate Corridor*.



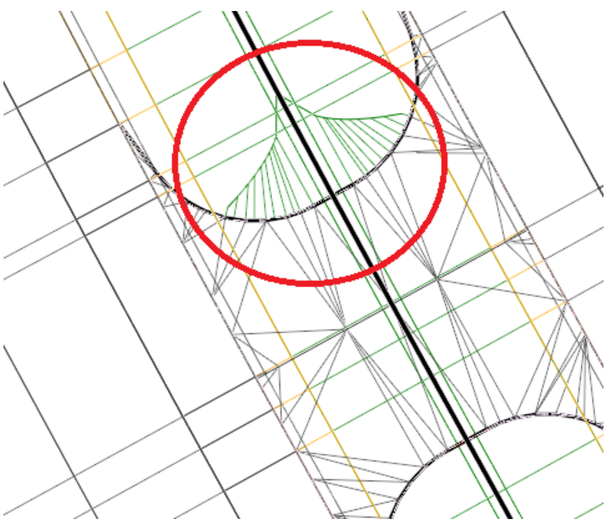
5. The following *Target Aliasing* dialog is invoked.



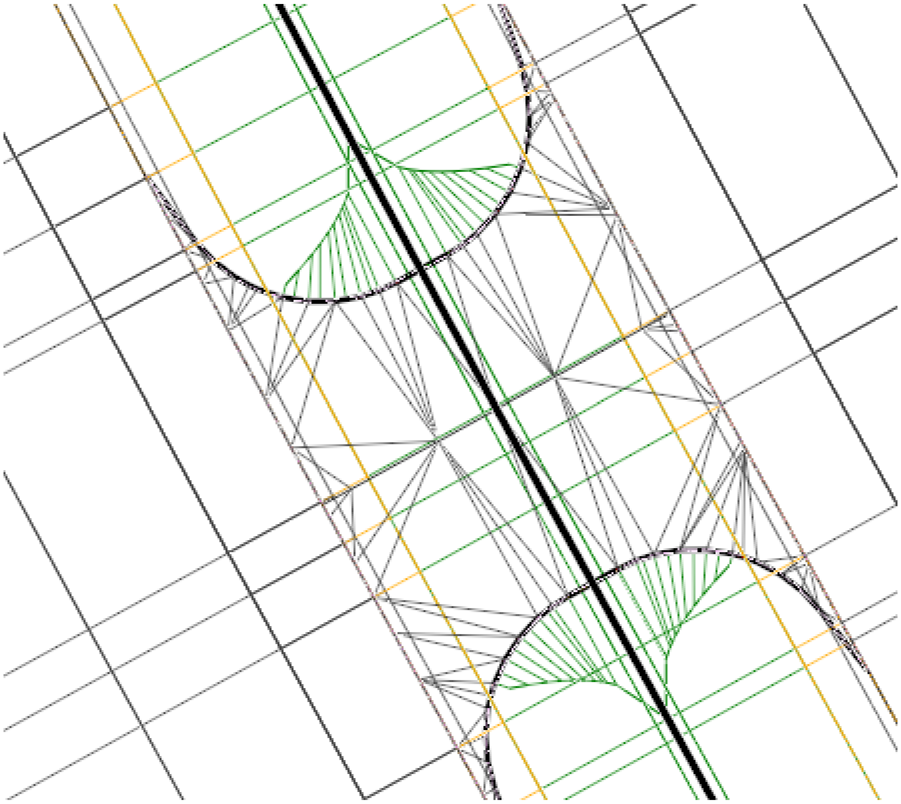
6. Select **Corridor – ROUTE156** and tag **Add.**



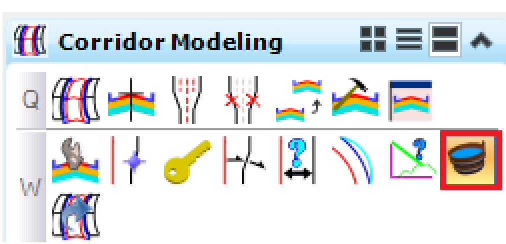
7. Tag OK and review the 3d view. The Fill should be projecting to the ROUTE156 corridor as shown below.



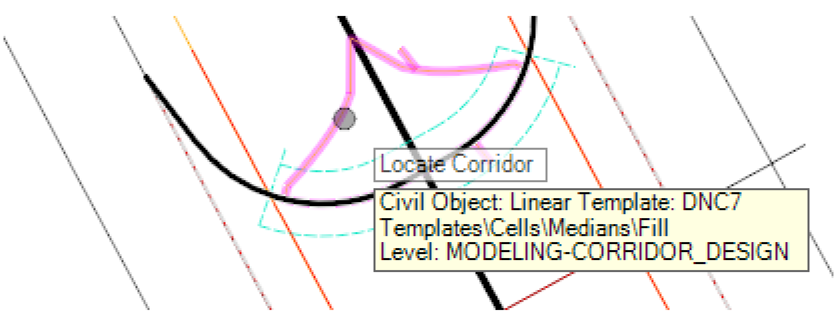
8. Perform the same Target Aliasing process on the southern linear template. Your results should appear as shown below.



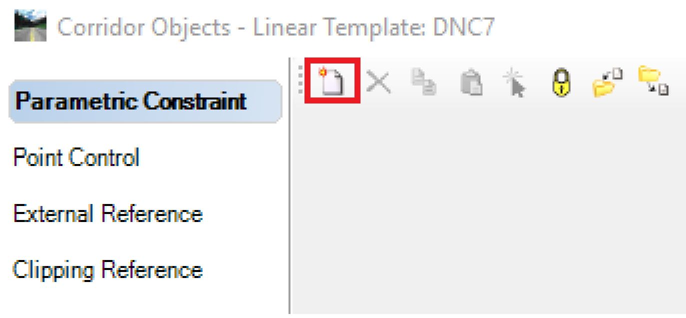
9. The slope of these templates (set initially to 6:1) can be changed by adding a parametric constraint. Select the **Corridor Objects** command from the *Corridor Modeling task menu.*



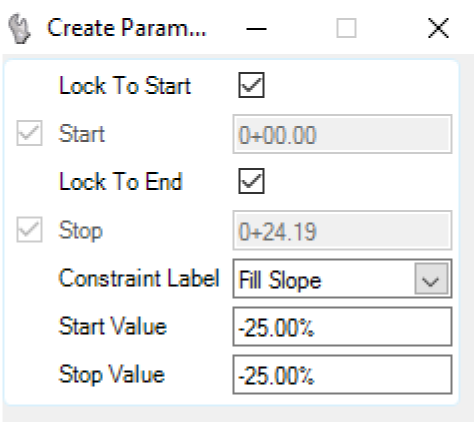
10. Select the Corridor when prompted to *Locate Corridor*.



11. On the Corridor Objects dialog, choose **New.**



12. Set the *Create Parametric Constraint* dialog as shown below.

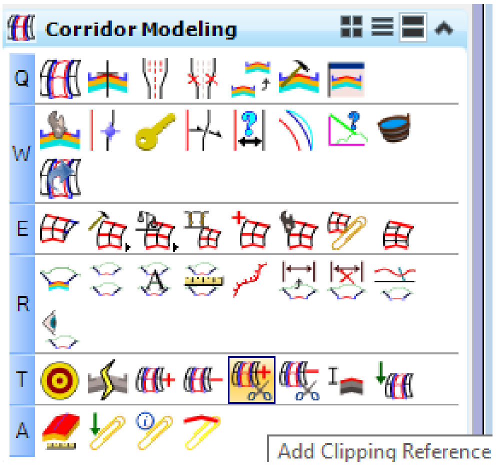


13. Left click through the prompts to change the slope from 6:1 to 4:1.
14. Undo this change for this exercise.

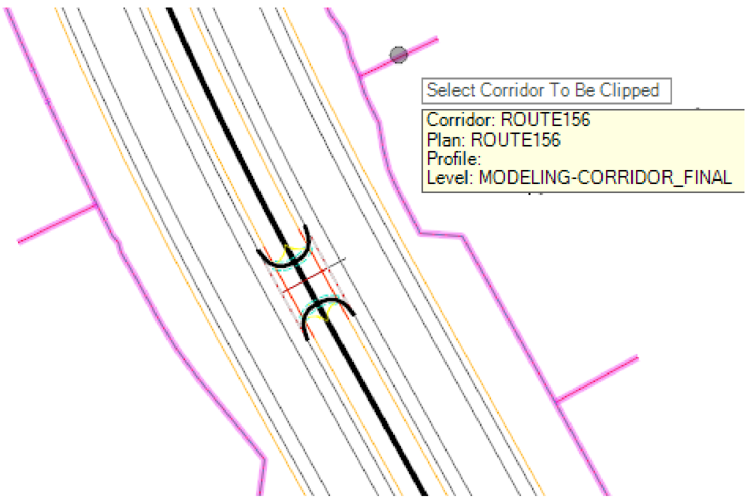
11.6.6.6 CLIPPING

Next, we will clip the ROUTE156 corridor.

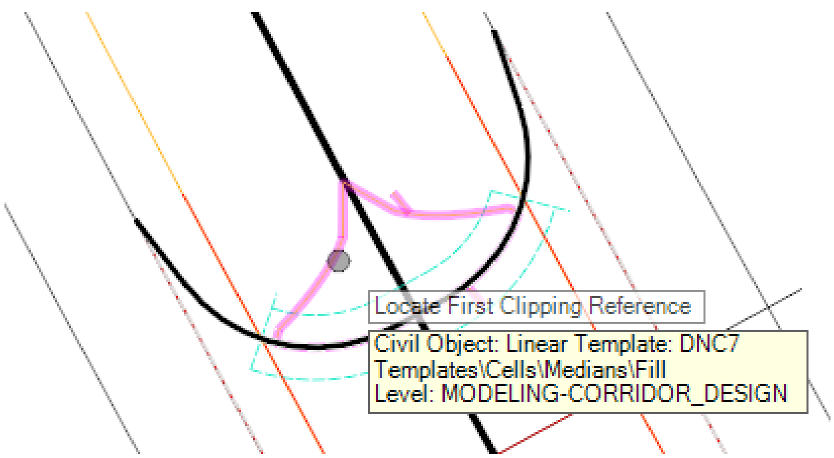
1. Select the **Add Clipping Reference** command from the *Corridor Modeling Task* menu.



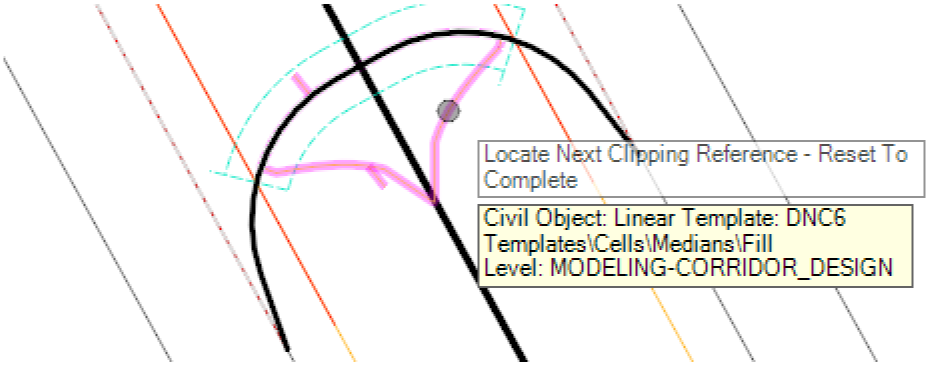
2. Select the **ROUTE156 corridor** when prompted to *Select Corridor To Be Clipped.*



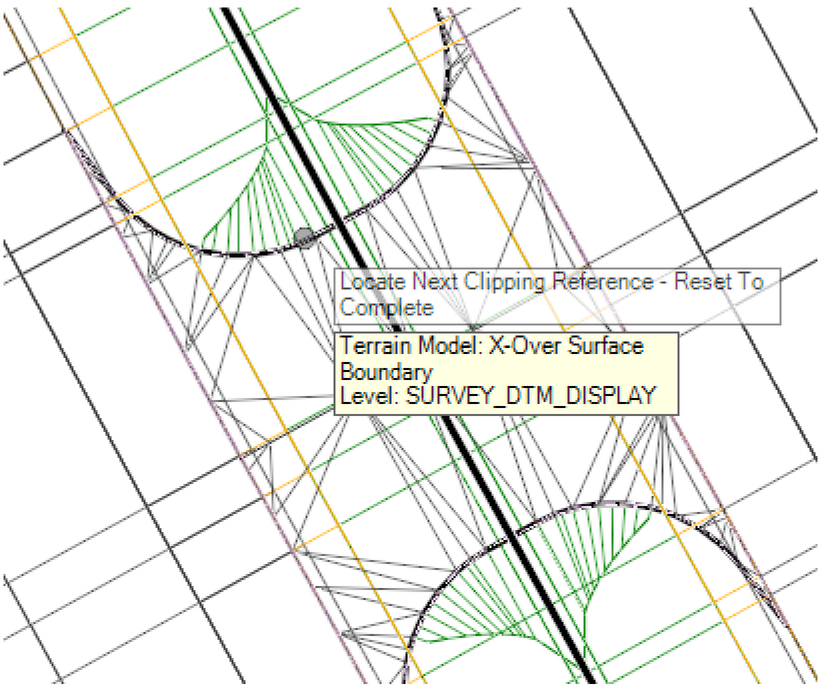
3. Locate the following linear template when prompted to *Locate First Clipping Reference.*



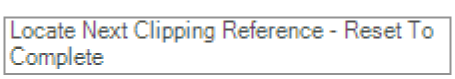
4. Locate the following linear template when prompted to *Locate Next Clipping Reference – Reset to Complete.*



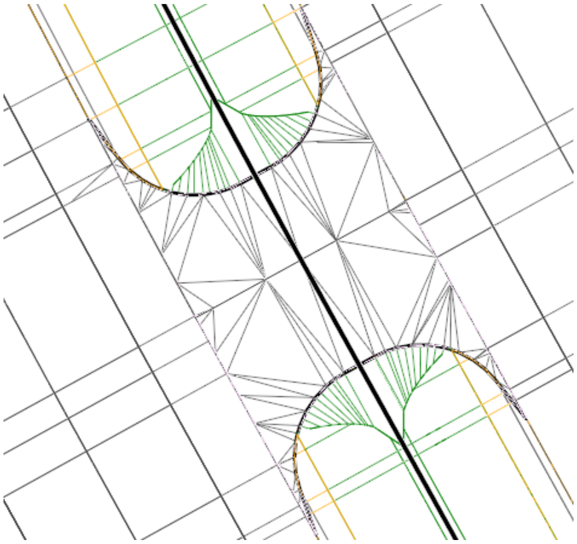
5. In the 3d View, select the **Terrain named X-Over Surface** when prompted to *Locate Next Clipping Reference – Reset to Complete.*



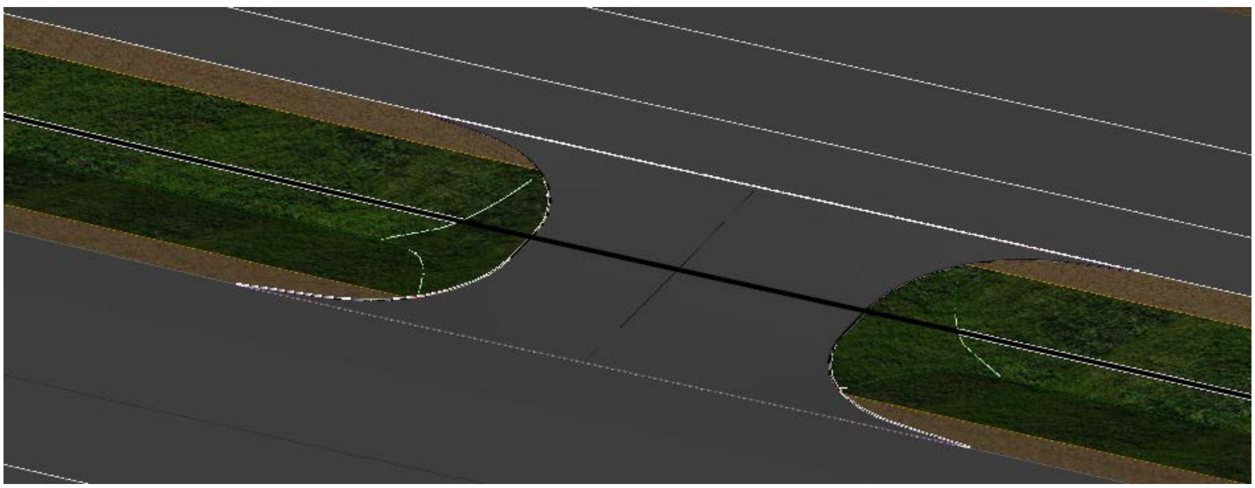
6. Right Click when prompted to *Locate Next Clipping Reference – Reset to Complete.*



7. The corridor is clipped as shown below.



8. Changing View 2 to Smooth, review the Civil Cell as shown below.



11.6.7 Other Cells – Nose (Raised Median to Open Shld Transition)

The Nose (Raised Median to Open Shld Transition) Civil Cell is used where the user has a template change from raised median to open shoulder. Intended use is for divided corridors. The cell has a linear template included in it which the user has to add target aliasing to in order to target the adjoining corridor similar to the CrossOver Civil Cell. We'll place one in this section and go over edits unique to the cell but many of the processes are very similar to the CrossOver cell so if not covered in detail here, refer to the *Other Cells – CrossOver* section.

11.6.7.1 PLACEMENT

1. In the file **4-lane-Corridor.dgn,** zoom to the area labeled *Raised Median Area***.** This file contains alignment *ROUTE156* and a Corridor has been created for *ROUTE156*. Two 4-lane divided templates have been placed in the file, an open shoulder and a raised median towards the north end of the alignment. We will place a **Cross-Over** Civil Cell near 112+28 where a line that represents the Cross-Over CL has been placed.

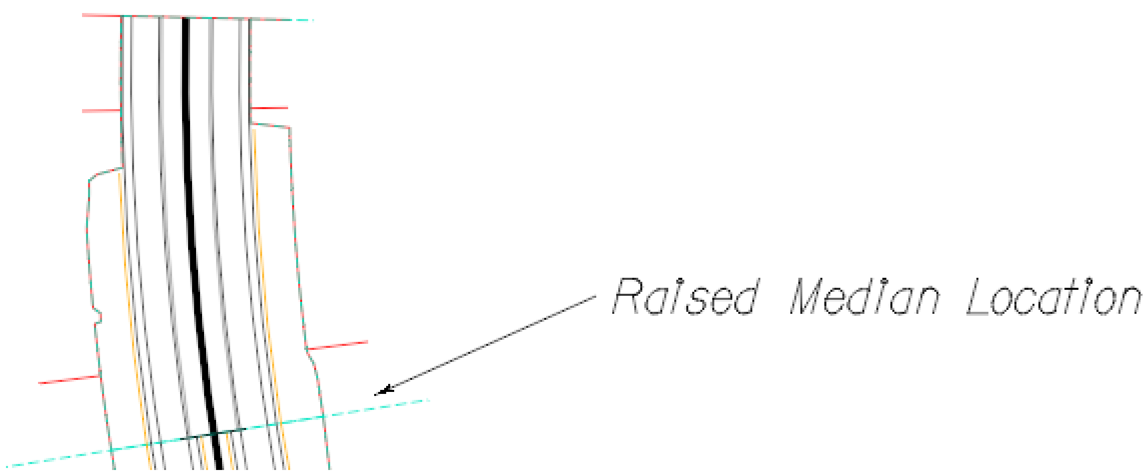
    a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

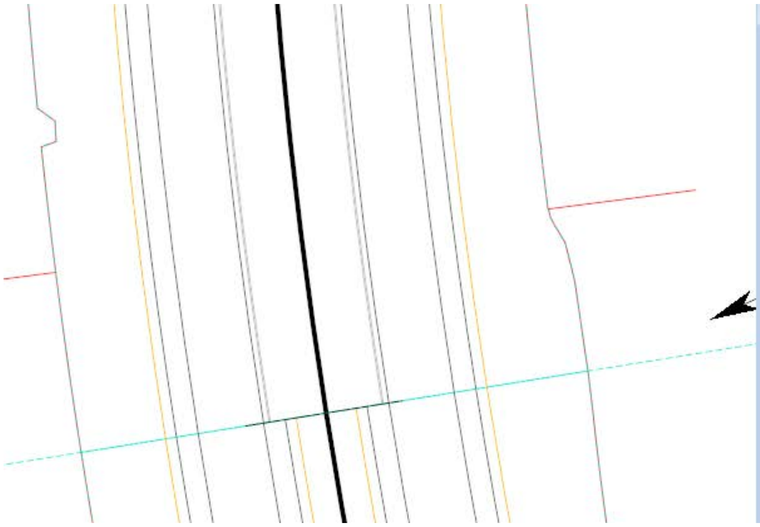
    b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

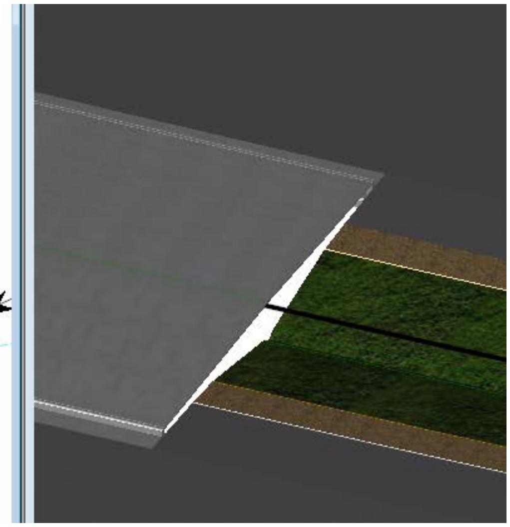
    c. Close the reference dialog.

    d. Zoom to the area labeled *Raised Median Location.*

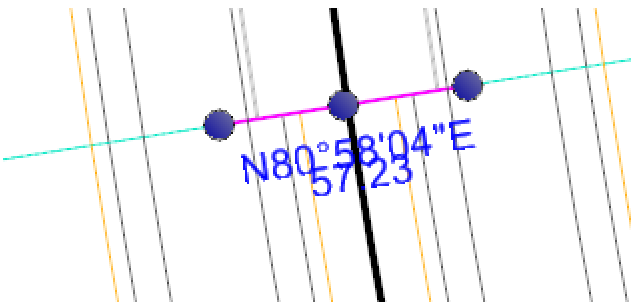


2. Review this area in 2d and the 3d view. You can easily see the raised island and open shoulder area we need to address in the 3d view.

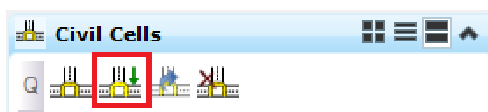




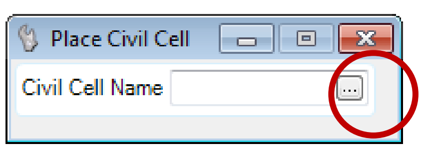
3. The reference elements are the Median EoP's and a line drawn from EB EoP to WB EoP. This line has already been constructed for you.



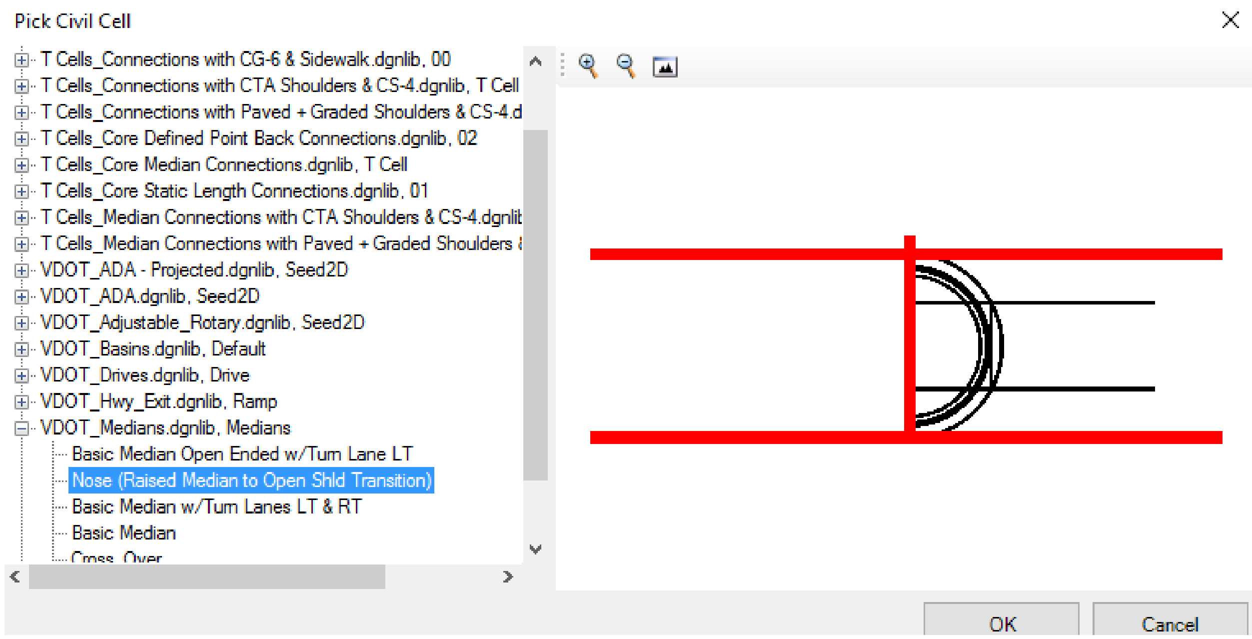
4. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



5. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

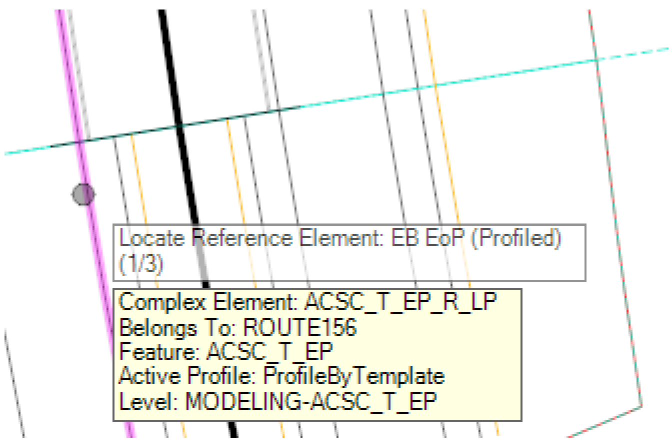


6. Select the **Nose (Raised Median to Open Shld Transition)** civil cell from the *VDOT_Medians.dgnlib* folder and click **OK.**

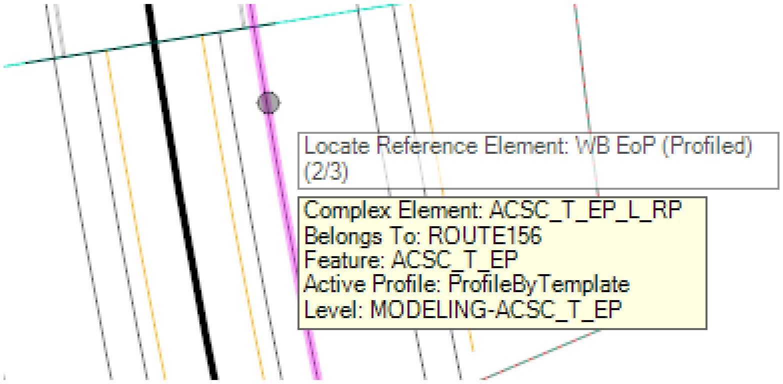


NOTE: The next three prompts may be in different order than listed in this manual.

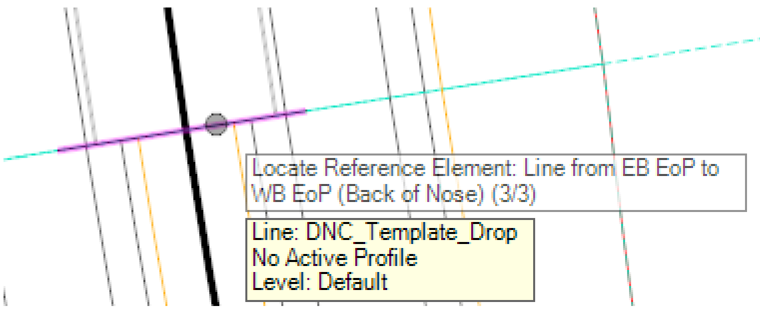
7. When prompted to *Locate Reference Element 'EB EoP (Profiled)'*, select the **Edge of Pavement** element in View 1 as shown below.



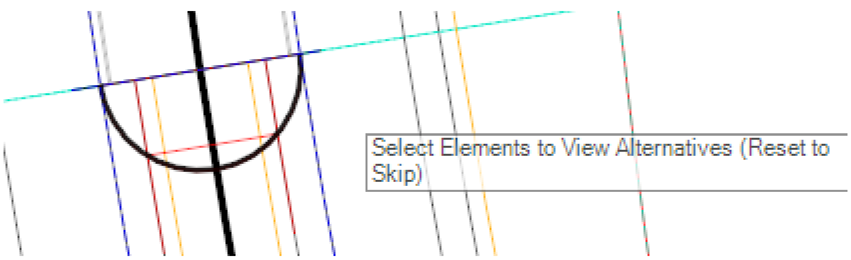
8. When prompted to *Locate Reference Element 'WB EoP (Profiled)'*, select the **Edge of Pavement** element in View 1 as shown below.



9. When prompted to *'Locate Reference Element: Line from EB EoP to WB EoP (Back of Nose)* select the **line below** in View 1.



10. Review the geometry being displayed.



   a. If the geometry appears correct and similar to the image above, move on to the next step by right-clicking to reset.

   b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.6.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

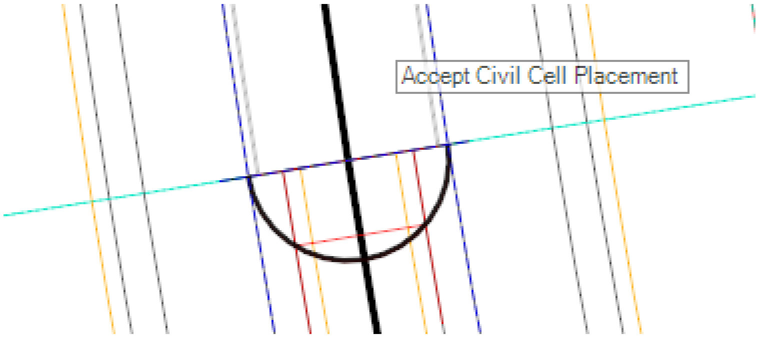
   c. If the geometry still does not appear correct, it's highly likely there are issues with the reference elements. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

d. There are linear templates within the Civil Cell but these are fill only and may not show up if the cross-over is in a cut section. We will discuss these linear templates in the Templates sub-section.

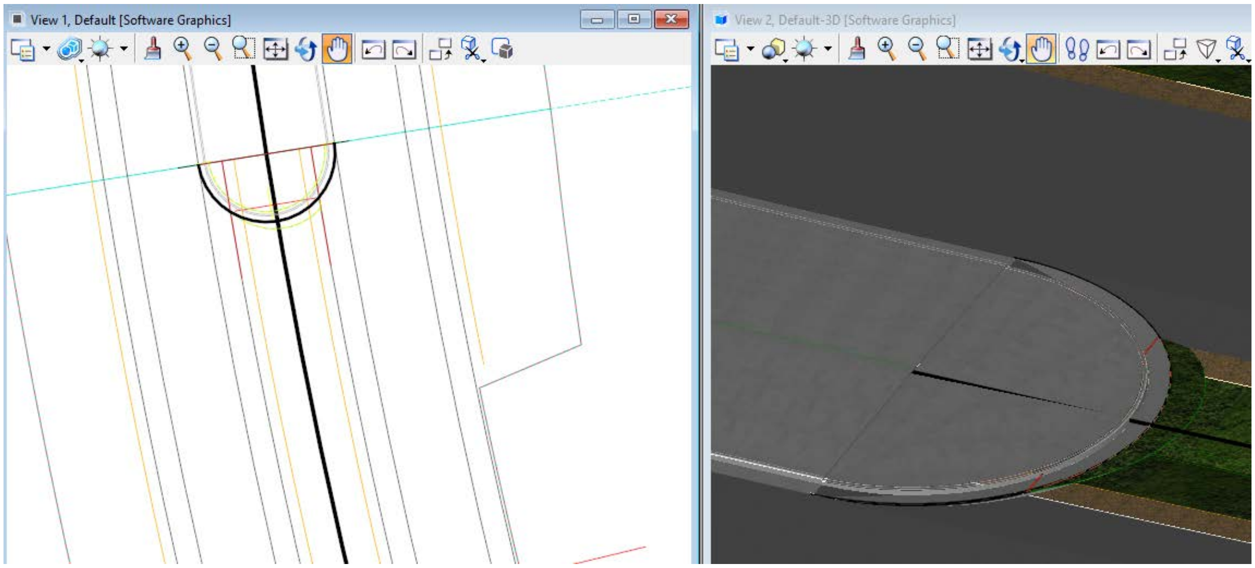
11. **Reset** when/if prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.

We will clip the corridor after edits are made to improve processing time when performing the edits.

12. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.



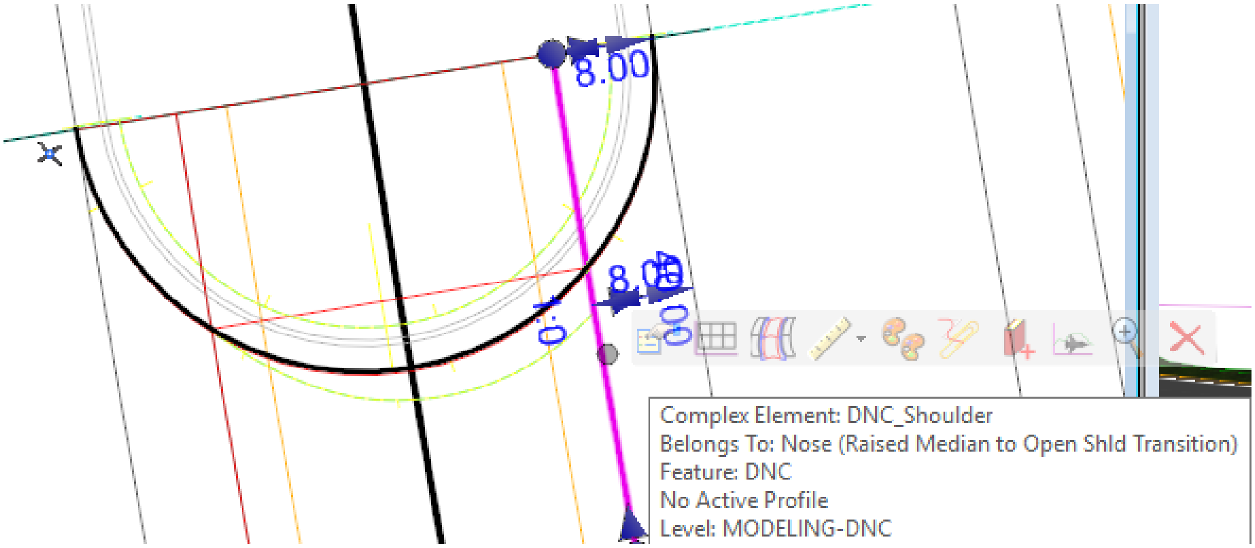
The image below shows the cell in 2d & 3d views.



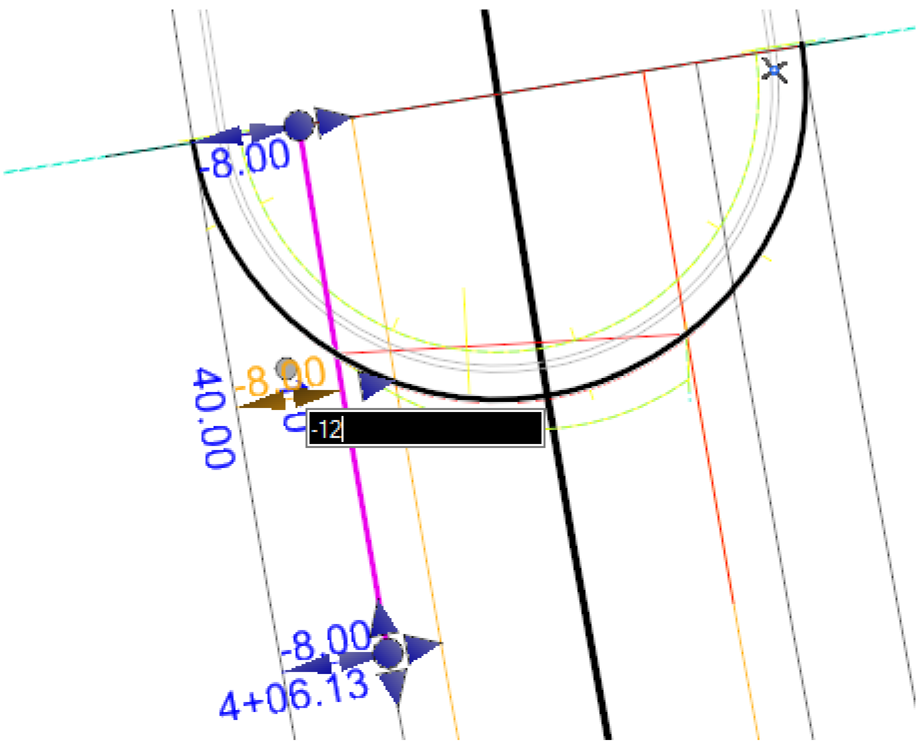
13. Choose the **Element Selection** command to exit the Place Cell command.

11.6.7.2 HORIZONTAL EDITS

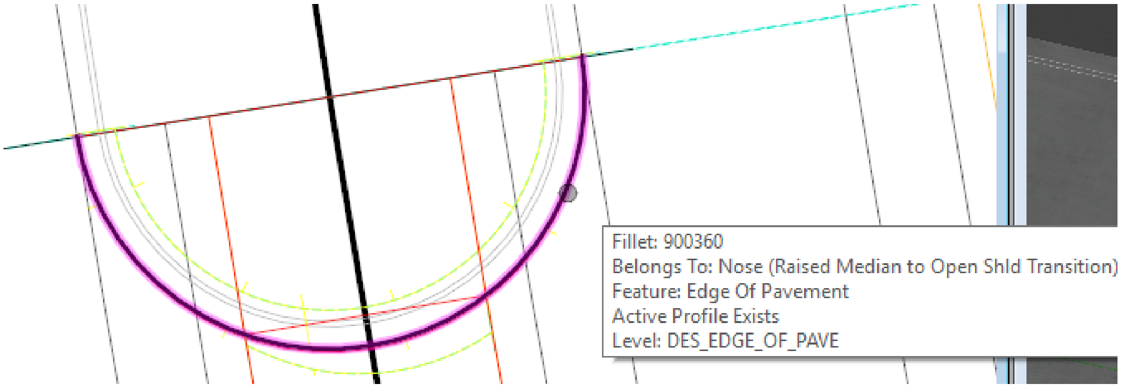
1. Select the *DNC_Shoulder* element below and change the offset of 8' to **12'** which aligns it with the *unpaved edge of shoulder in the ROUTE156* corridor. Note you may have to reset to access this underlying element.



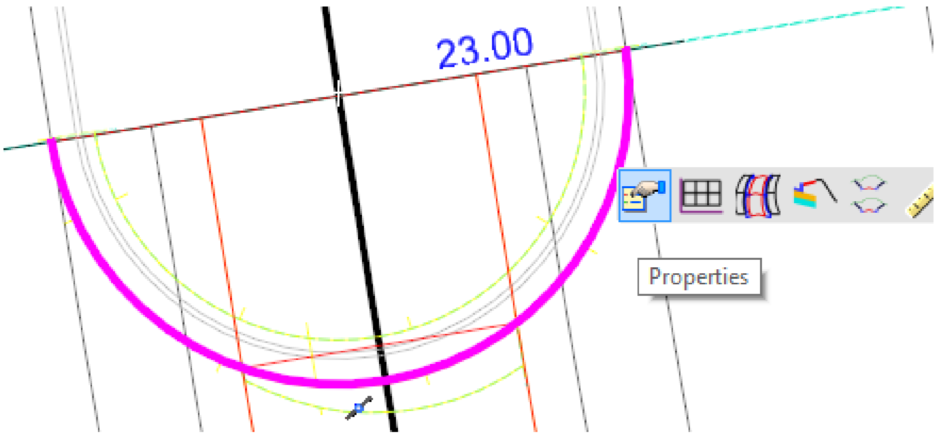
2. Perform the same function for the opposite *DNC_Shoulder* element.



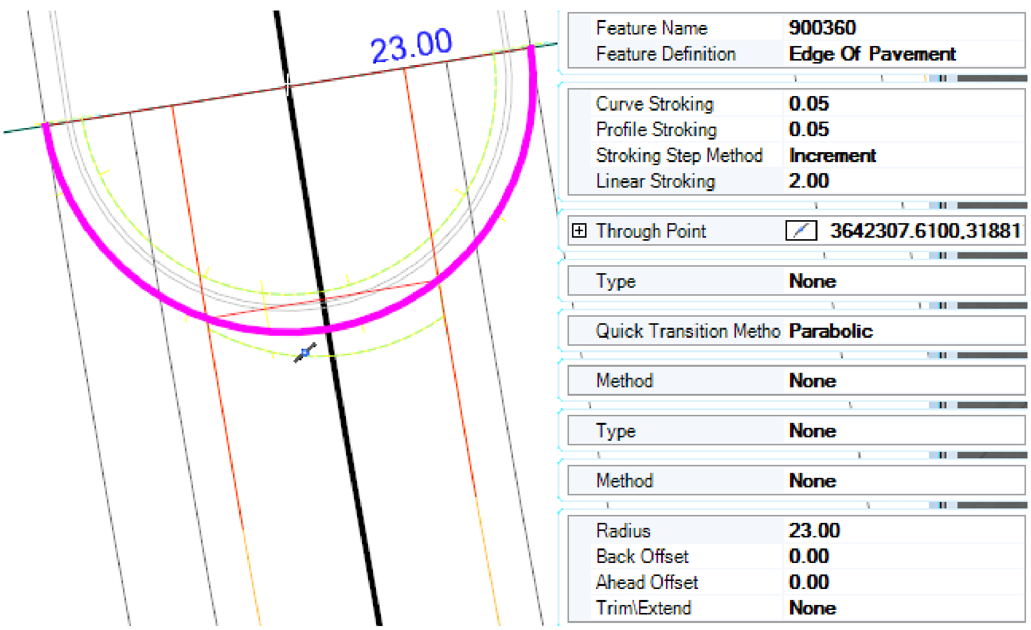
3. Select the *arc* (Edge of Pavement feature).



4. From the context menu choose **Properties.**

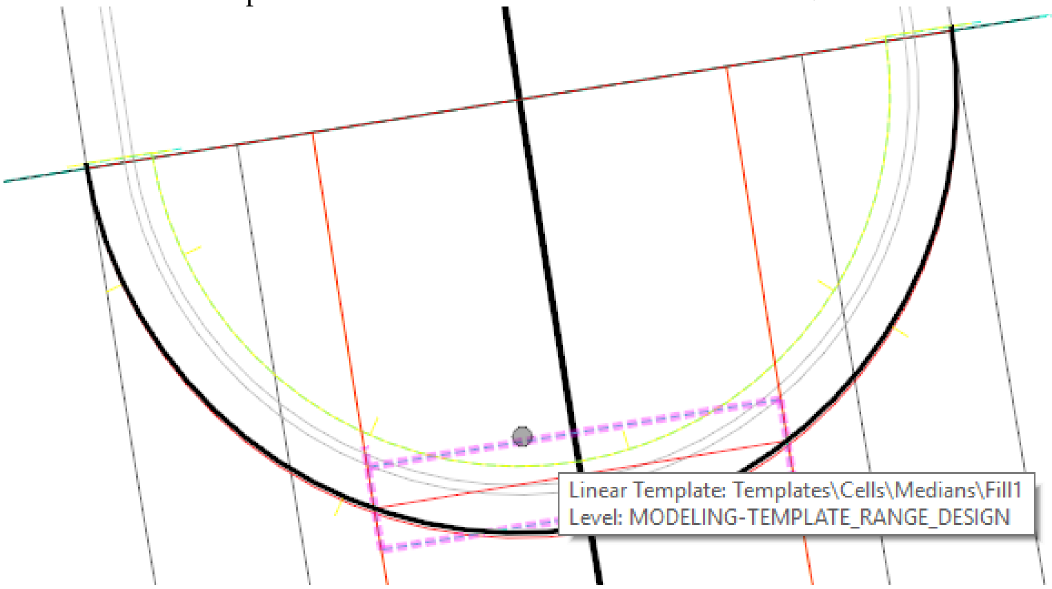


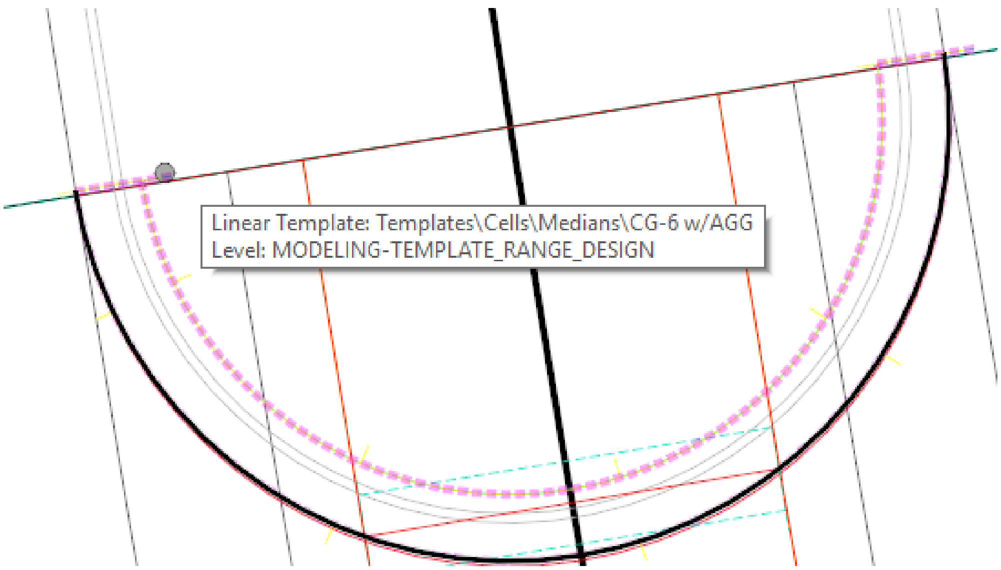
Notice you have the ability to make this a compound curve from the Properties dialog.



11.6.7.3 TEMPLATES

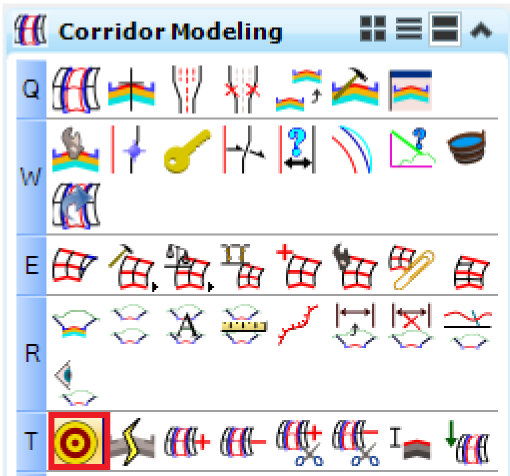
The two linear templates available in this cell are shown below.



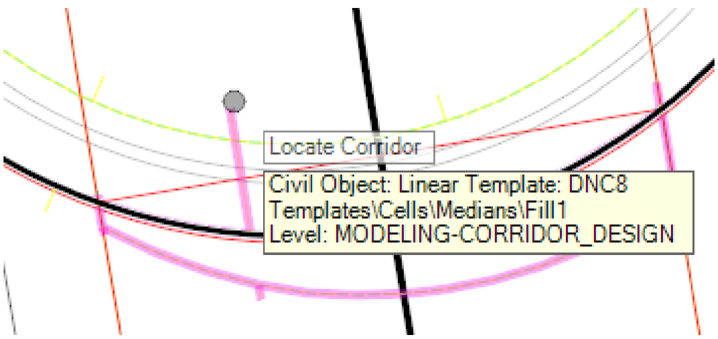


We will not change these in this exercise but we will target the ROUTE156 corridor with the Fill1 linear template in the steps below.

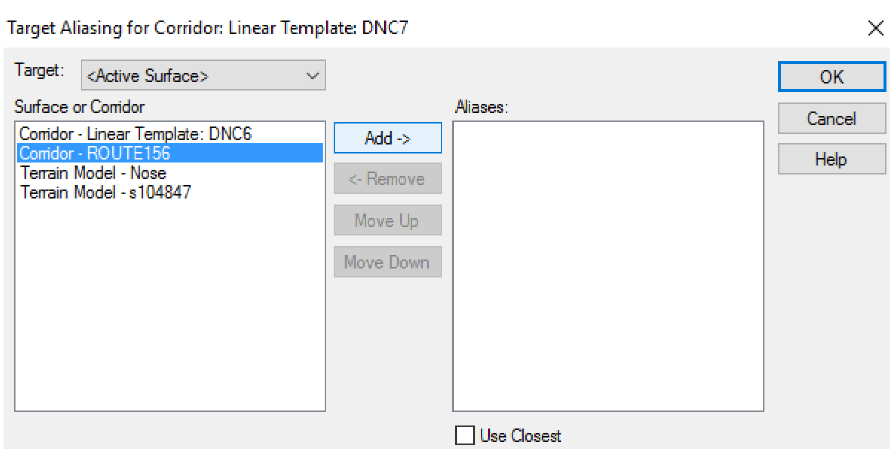
1. Select the **Define Target Aliasing** command from the *Corridor Modeling tasks.*



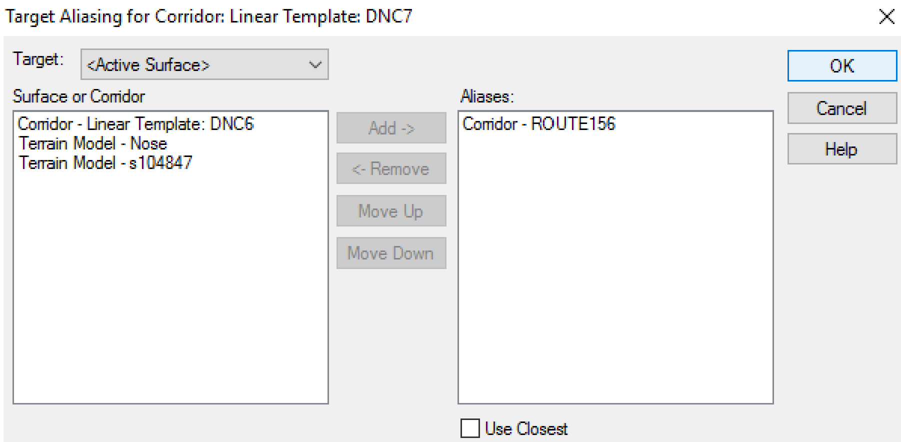
2. Select this handler when prompted to *Locate Corridor*.



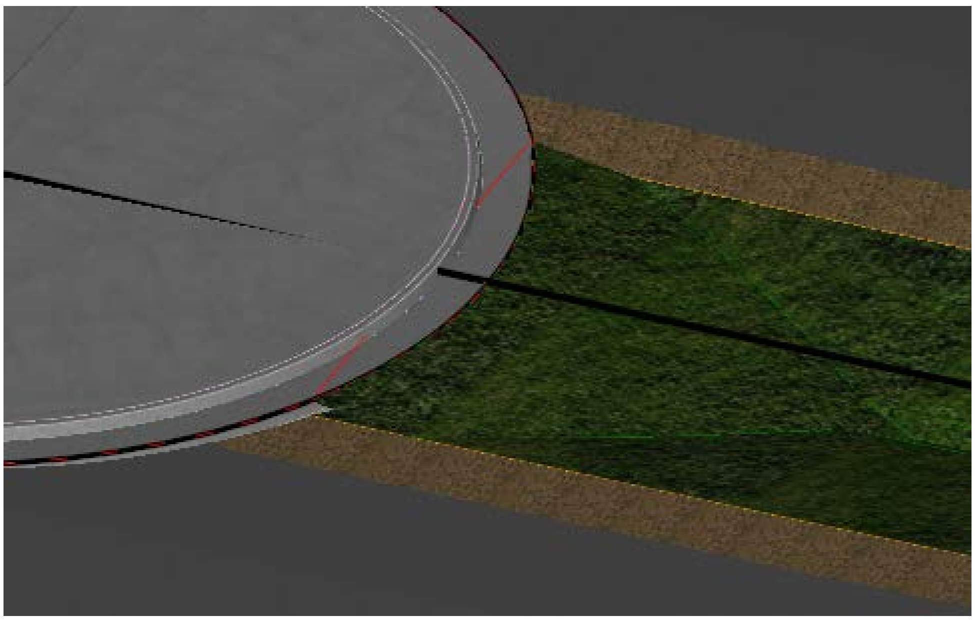
3. The following *Target Aliasing* dialog is invoked.



4. Select **Corridor – ROUTE156** and tag **Add.**

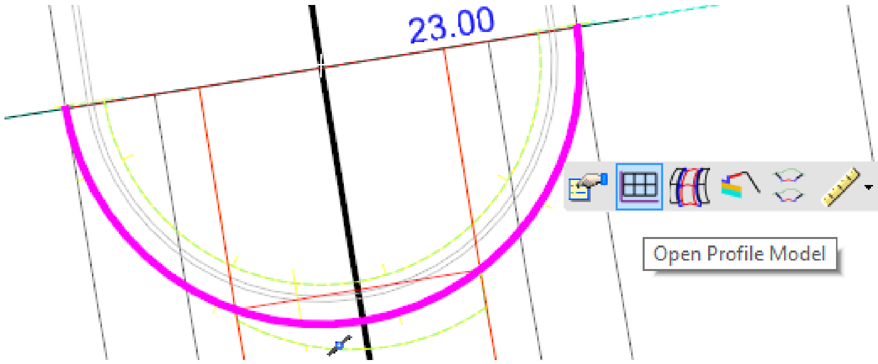


5. Tag OK and review the 3d view. The Fill should be projecting to the ROUTE156 corridor as shown below.

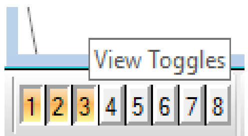


11.6.7.4 VERTICAL EDITS

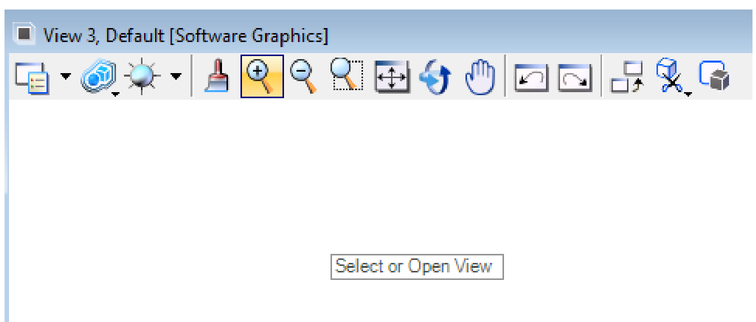
1. Open Profile Model of the *arc.*
   a. Select the arc and from the context menu choose **Open Profile Model.**



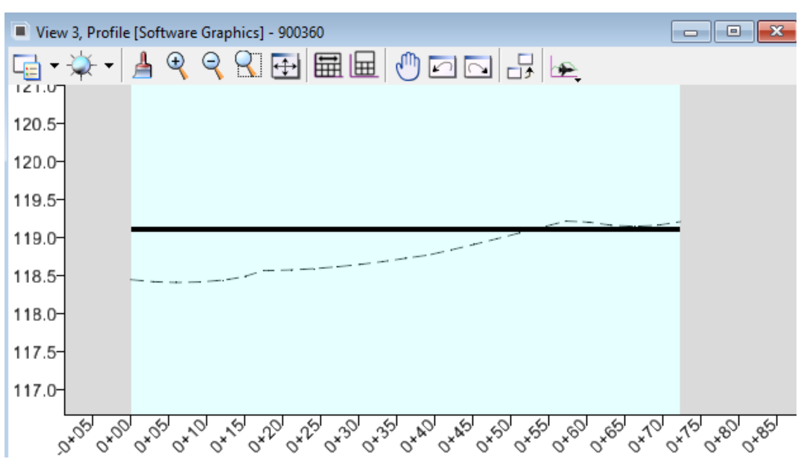
   b. Open View **3.**



   c. Left Click in View 3 when prompted to *Select or Open View.*

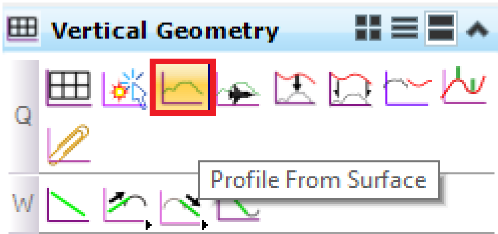


   d. The profile is a Quick Profile Transition between the 2 median EoP's.

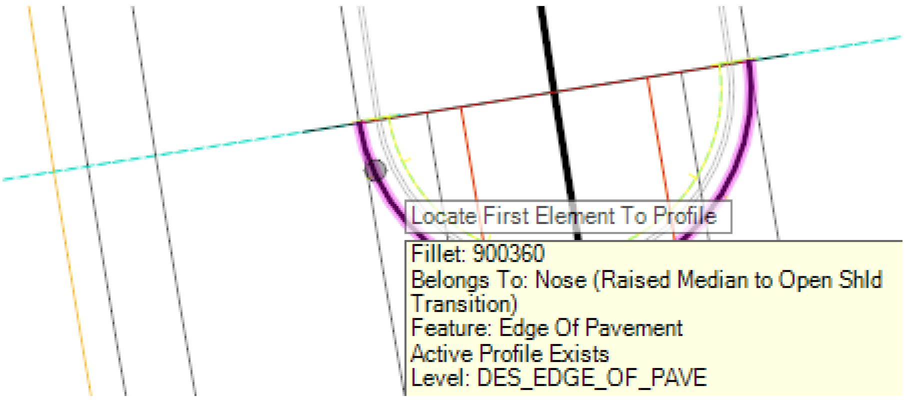


2. Let's see what the shoulders look like on this profile.

   a. Select the *Vertical Geometry* command **Profile from Surface.**

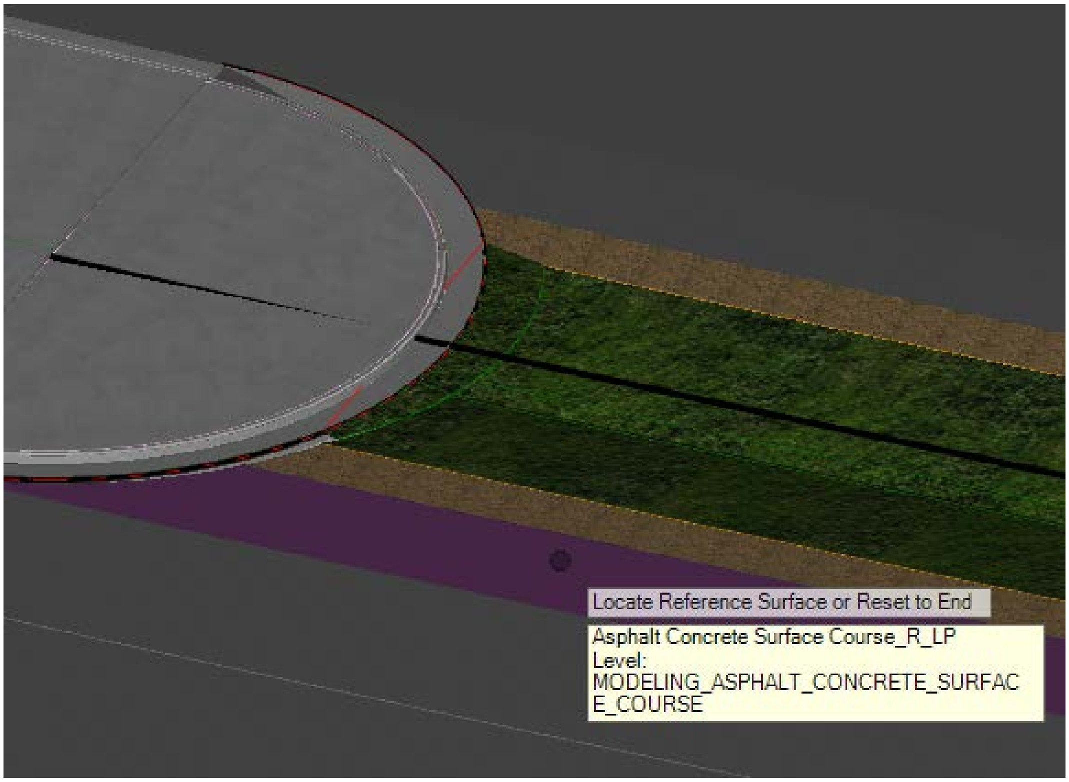


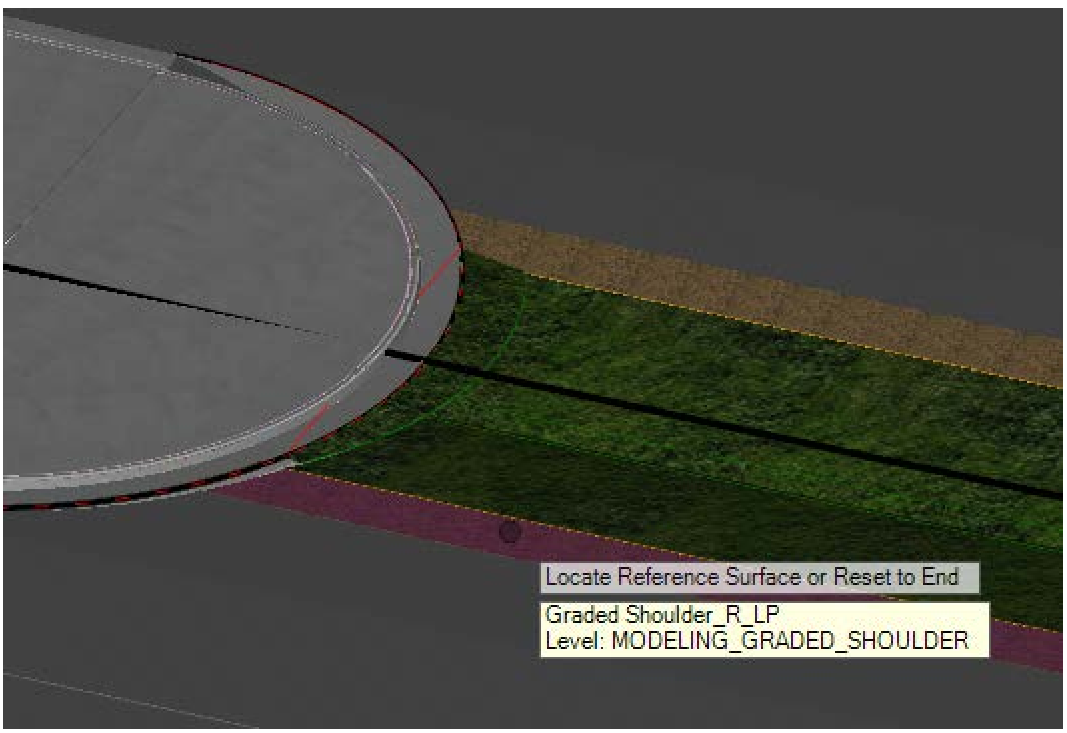
   b. Locate the arc in View 1 when prompted to *Locate First Element to Profile.*



   c. Reset when prompted to *Locate Next Element To Profile – Reset to Complete.*

d. In the 3d view, locate the paved shoulders and unpaved shoulders when prompted to

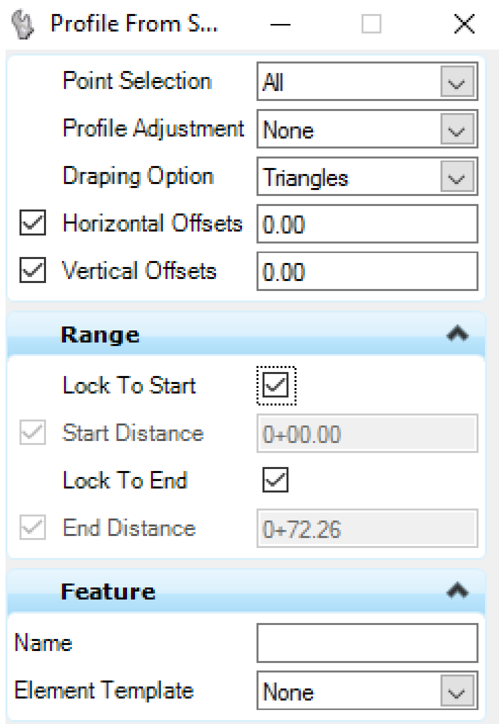




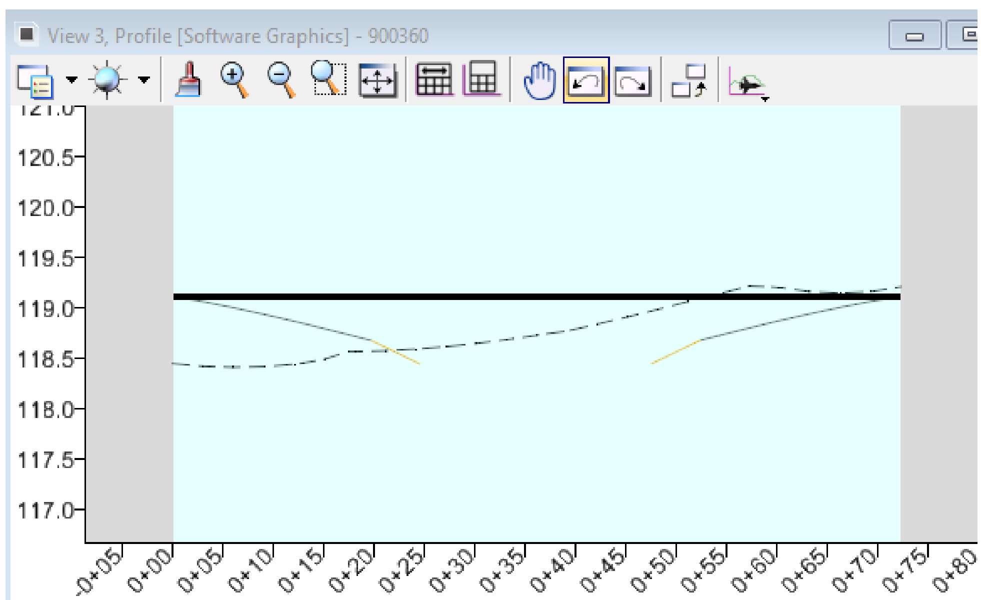
Select the shoulders on the opposite side of shown above as well.

e. Reset.

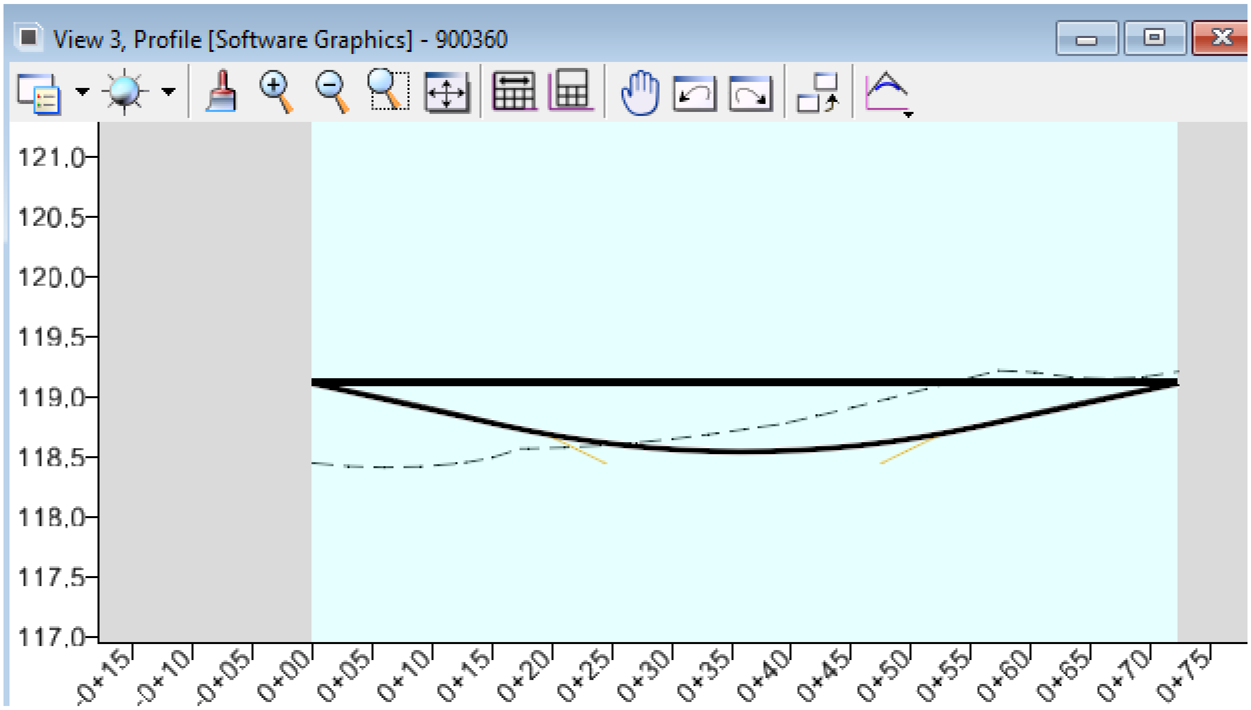
f. Left click to confirm the remaining prompts.



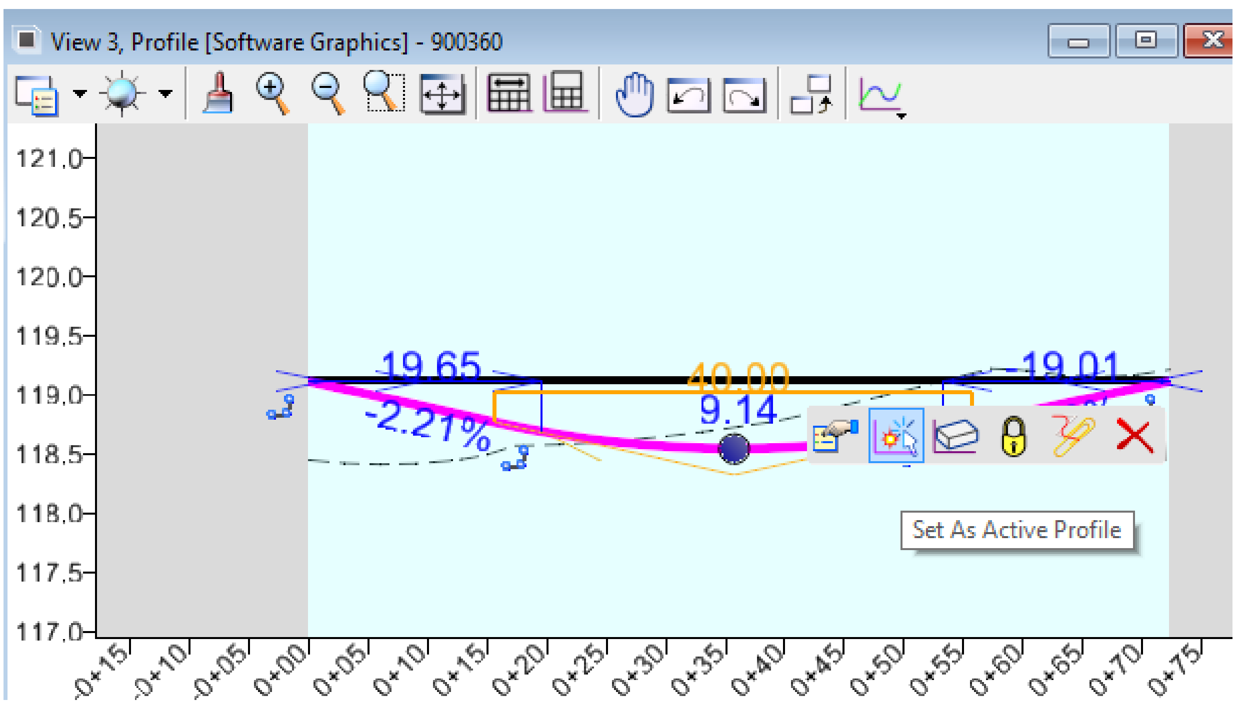
g. Review the profile. You should see the projected shoulders in the profile view.



3. Use *vertical geometry commands* to draw a new profile matching the grade of the paved shoulders and adding a **40'** vertical curve between these lines as shown below. Step by step processes are not offered here and the profile drawn is approximate.



4. **Complex** this profile and **Set As Active Profile** through the context menu.



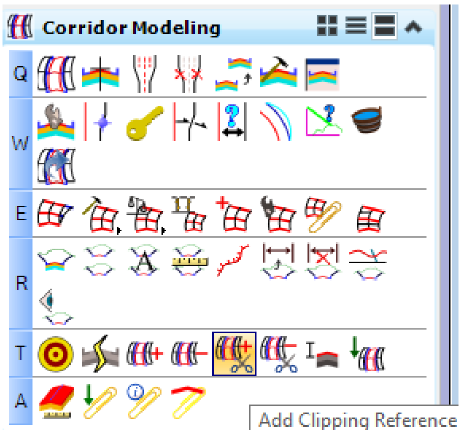
5. Add parametric constraints to the ROUTE156 corridor unpaved shoulders to transition from 5% to 2% from 100’ prior to their intersection with the arc to their intersection with the arc.

   NOTE: We will not perform this in these exercises but it is a necessary step in actual production. We’re wanting the shoulders to intersect vertically with the arc.

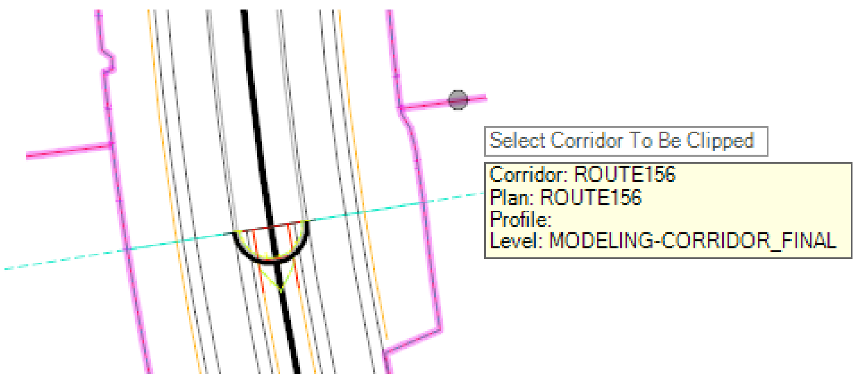
11.6.7.5 CLIPPING

Next, we will clip the ROUTE156 corridor.

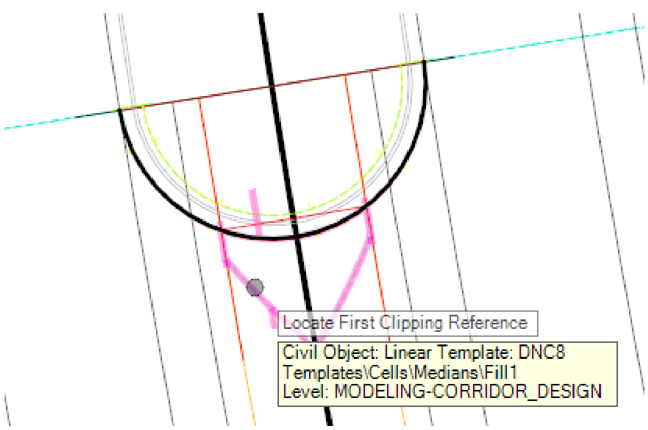
1. Select the **Add Clipping Reference** command from the *Corridor Modeling Task* menu.



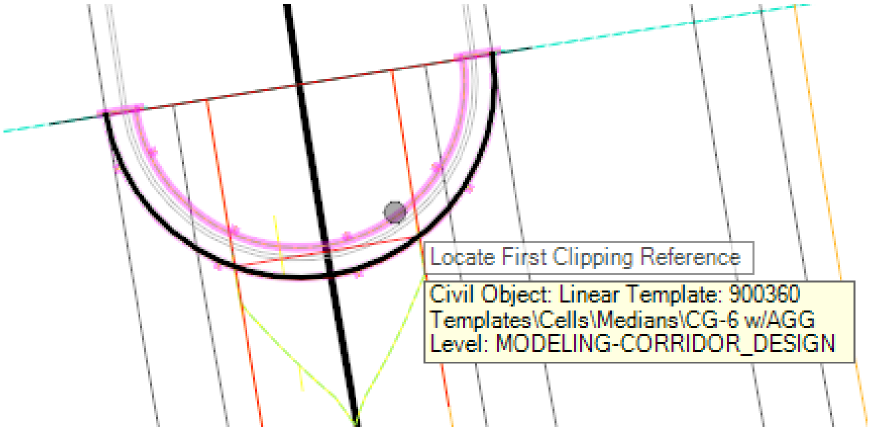
2. Select the **ROUTE156 corridor** when prompted to *Select Corridor To Be Clipped.*



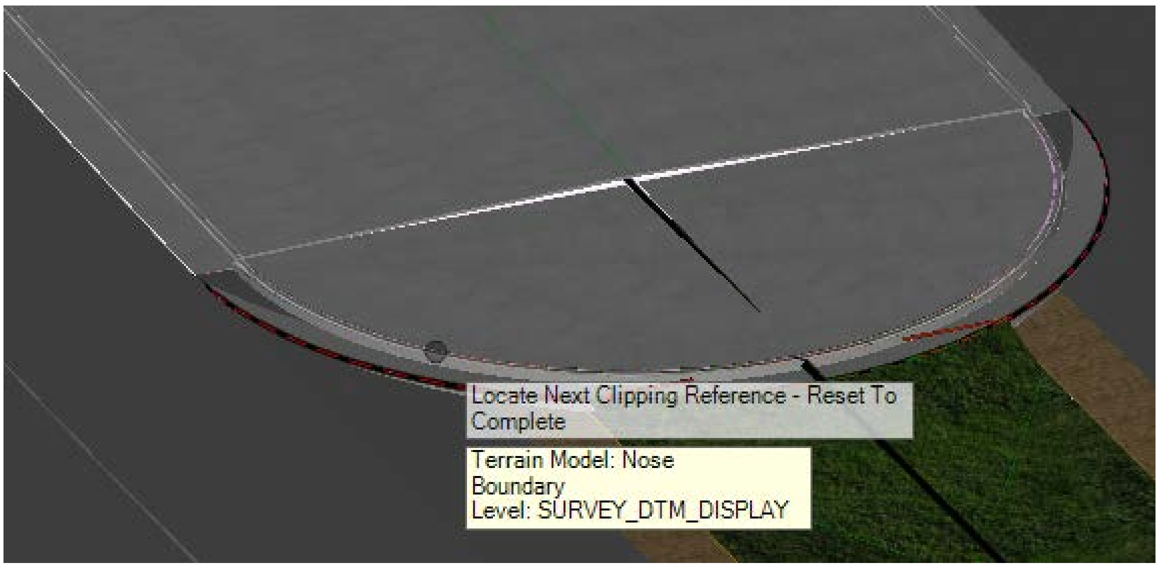
3. Locate the following linear template when prompted to *Locate First Clipping Reference.*



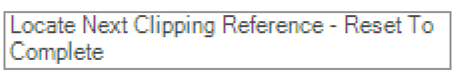
4. Locate the following linear template when prompted to *Locate Next Clipping Reference – Reset to Complete.*



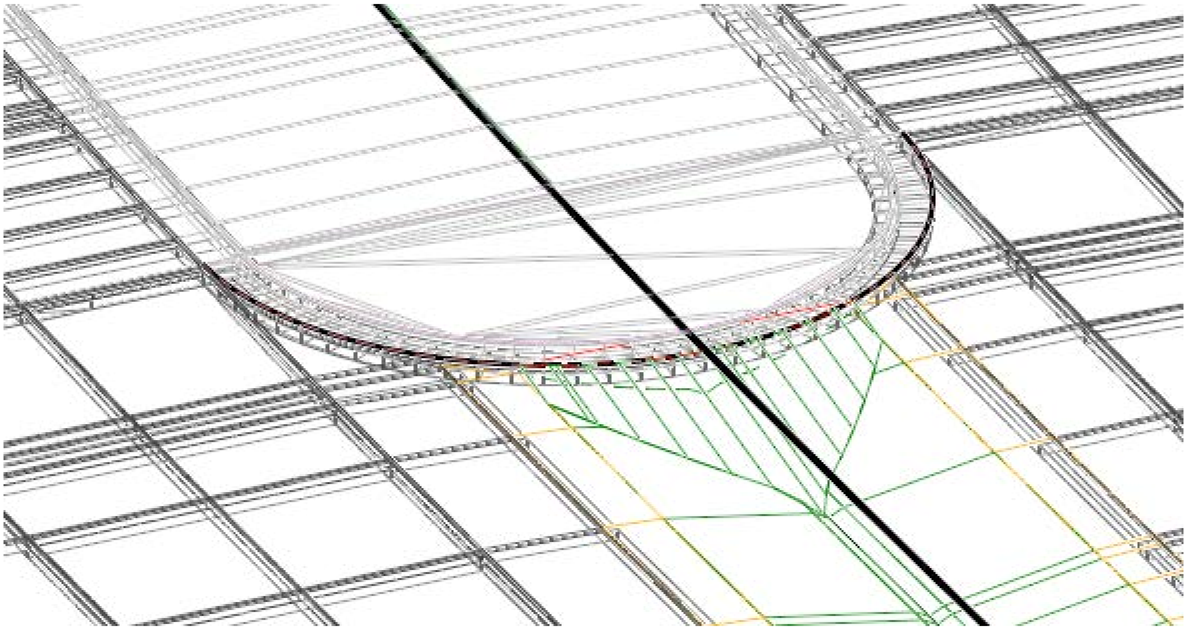
5. In the 3d View, select the **Terrain named X-Over Surface** when prompted to *Locate Next Clipping Reference – Reset to Complete.*



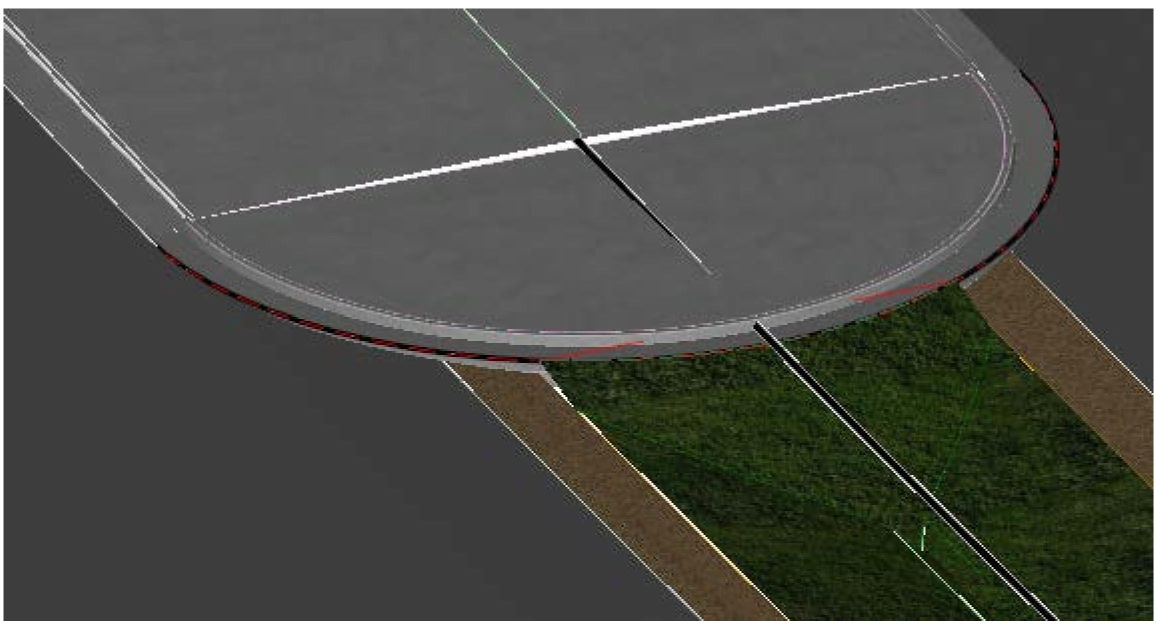
6. Right Click when prompted to *Locate Next Clipping Reference – Reset to Complete.*



7. The corridor is clipped as shown below.

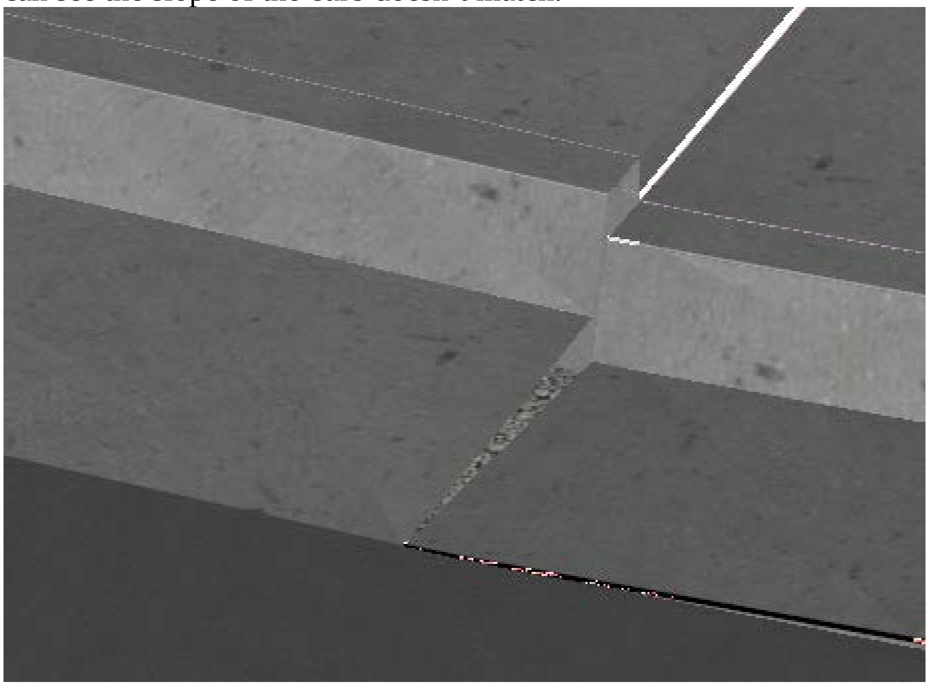


8. Changing View 2 to Smooth, review the Civil Cell as shown below.



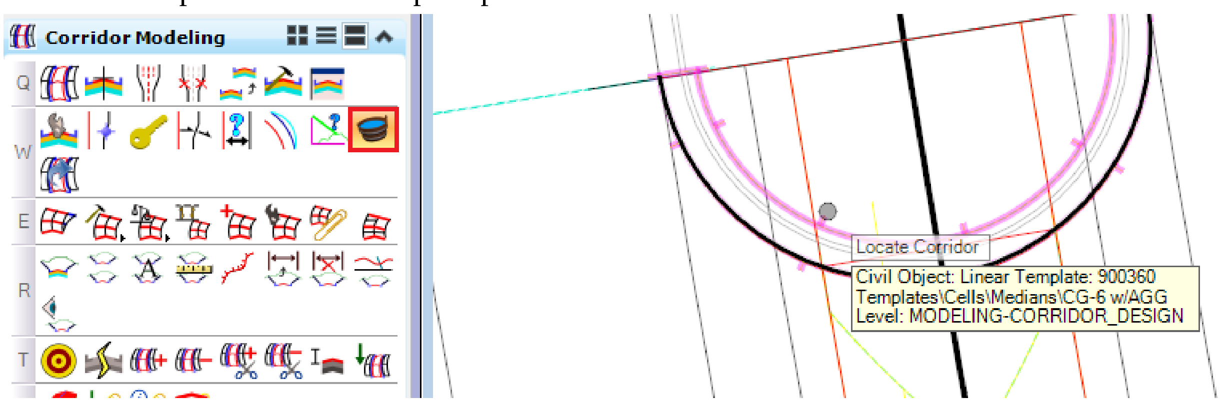
11.6.7.6 OTHER EDITS

Zooming in an reviewing where the C&G of ROUTE156 meets the C&G of the Civil Cell, we can see the slope of the curb doesn't match.

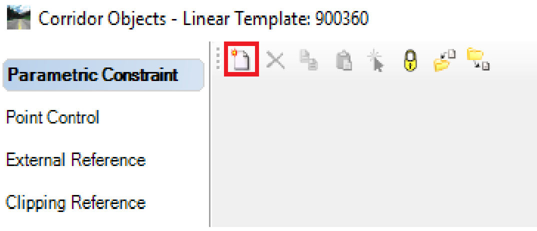


This is because the ROUTE156 median gutter is sloped 8.33% up and the gutter in the Civil Cell is sloped 8.33% down. To correct this:

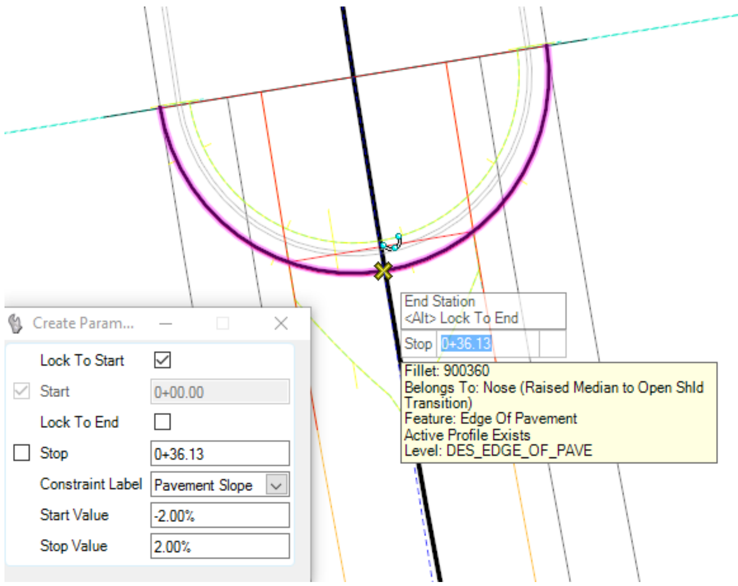
1. Choose the **Corridor Objects** command from the *Corridor Modeling task* and select the linear template below when prompted to **Locate Corridor.**



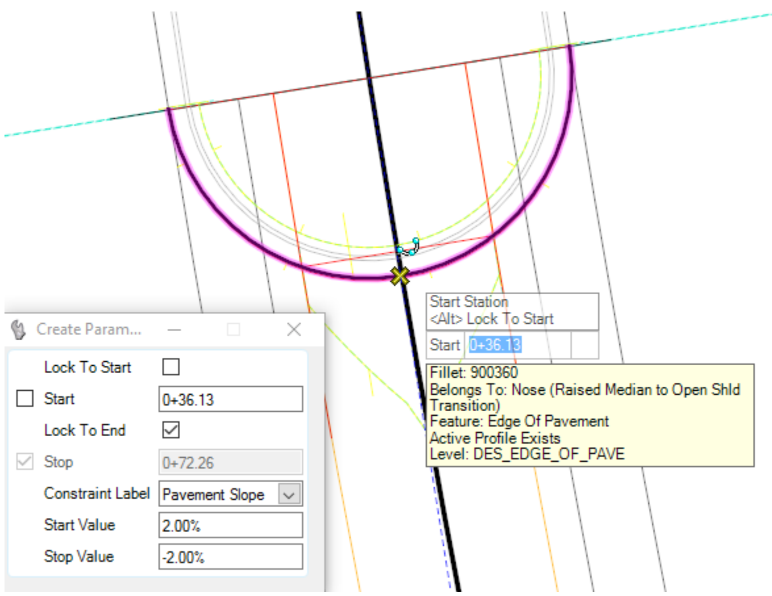
2. Choose **Add New** with *Parametric Constraint* selected in the *Corridor Objects* dialog.



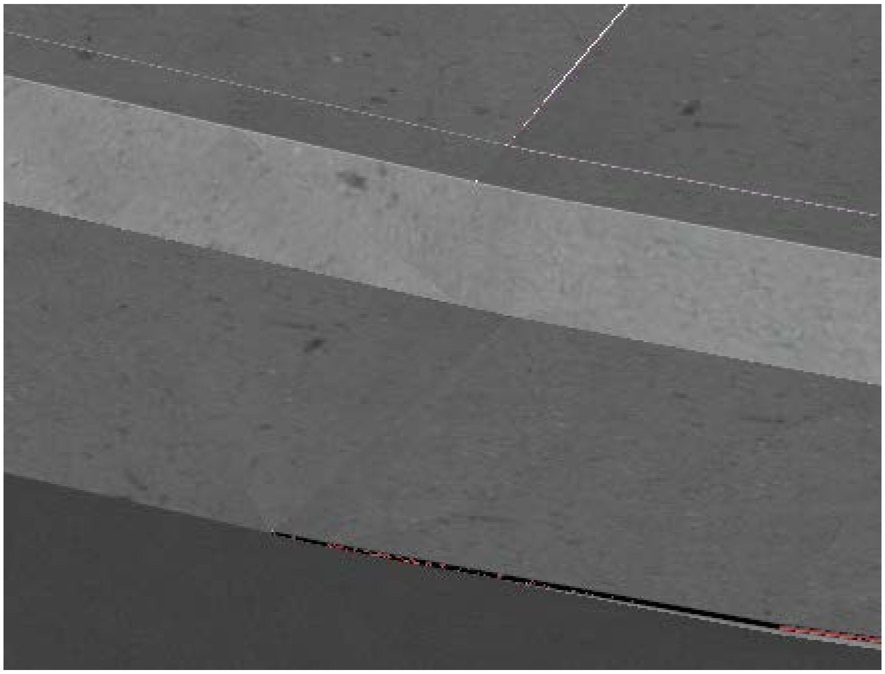
3. Set the Create Parametric Constraint dialog as follow and left click through the prompts snapping to the center of the arc for the *End Station* prompt.



4. Choose Add New again on the Corridor Objects dialog to add another Parametric Constraint.
5. Set the dialog as shown below snapping to the same point on the arc except for the Start Station this time.



6. The gutter slope in the Civil Cell should now match the ROUTE156 corridor gutter slope.



7. The last edit would be possibly drawing a line from the center of the arc to the ROUTE156 median crown line (if present), profiling it, and then adding it as a break line to the Nose terrain in the civil cell to transition the raised median slope to the back of the curb in the civil cell. We will not perform this edit in this exercise but it is an item that needs to be reviewed and possibly performed in production.

11.7 INTERCHANGE RAMPS

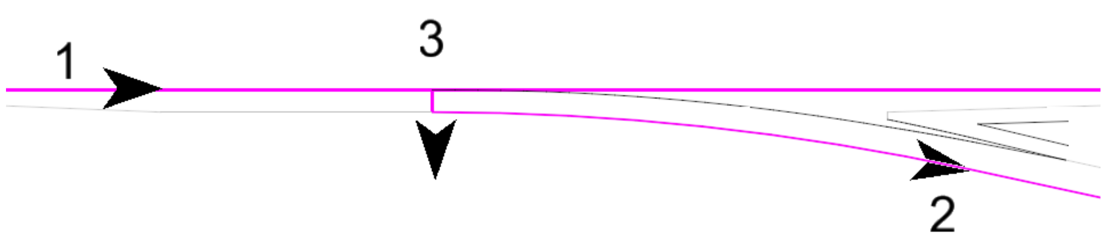
11.7.1 Available Cells

- Exit Ramp

- Entrance Ramp

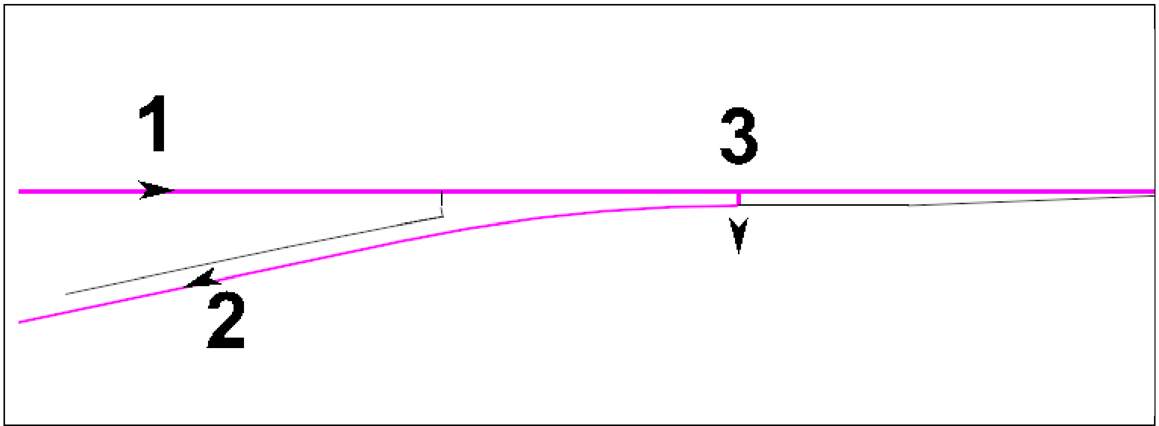
11.7.2 References & Direction of References

Exit Ramp



1. Thru Rd EoP (Profiled, Min. 750' each side of Ramp Start)
2. Ramp Ali (Min. 600’ Length)
3. Line @ Ramp Begin (Placed from Thru Rd Ali to Ramp Ali)

Entrance Ramp



1. Thru Rd EoP (Profiled, 600' Min. each side of Ramp Start)
2. Ramp Ali (Min. 600’ Length)
3. Line @ Ramp Begin (Placed from Thru Rd Ali to Ramp Ali)

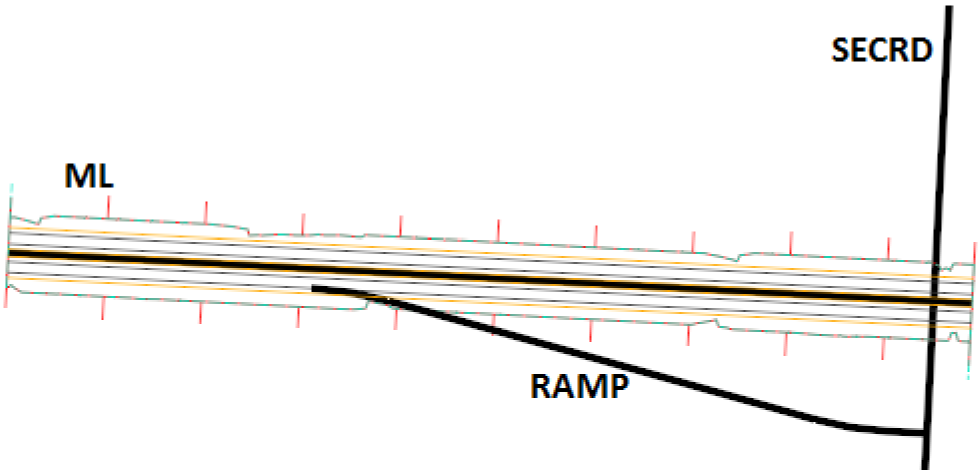
NOTES:

(1) Order may be different than shown here. Follow prompts.

(2) Ramp Alignment can continue on storage lane but Line @ Ramp Begin signifies PC of Ramp.

11.7.3 Placement

1. Open the file **Interchange-Corridor.dgn.** This file contains alignment *ML*, alignment *SECRD*, and alignment *RAMP*. A 4-lane divided corridor has been created for *ML, a* design profile has been established for the *SECRD*, and no profile has been created for alignment *RAMP*.



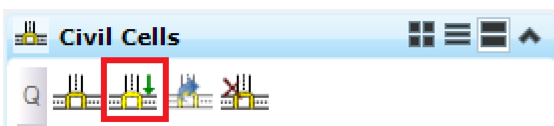
   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

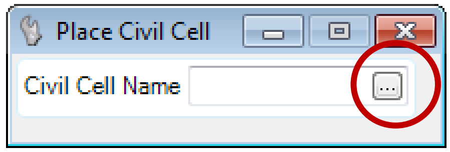
   c. Close the reference dialog and zoom to the Ramp/Thru Rd EoP intersection area.

   NOTE: The Ramp Inside EoP geometry, the Thru Rd EoP, and the Line @ Ramp Begin are required references of the Exit Ramp Civil Cell. These references exist so we will place the Civil Cell next.

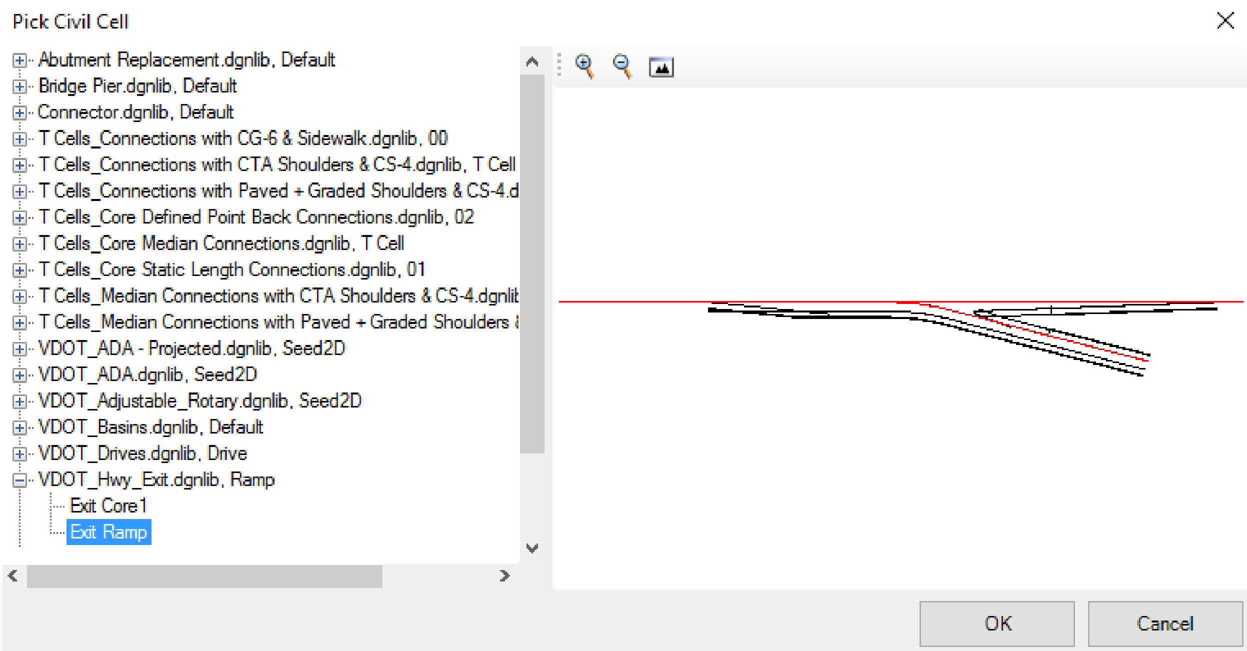
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

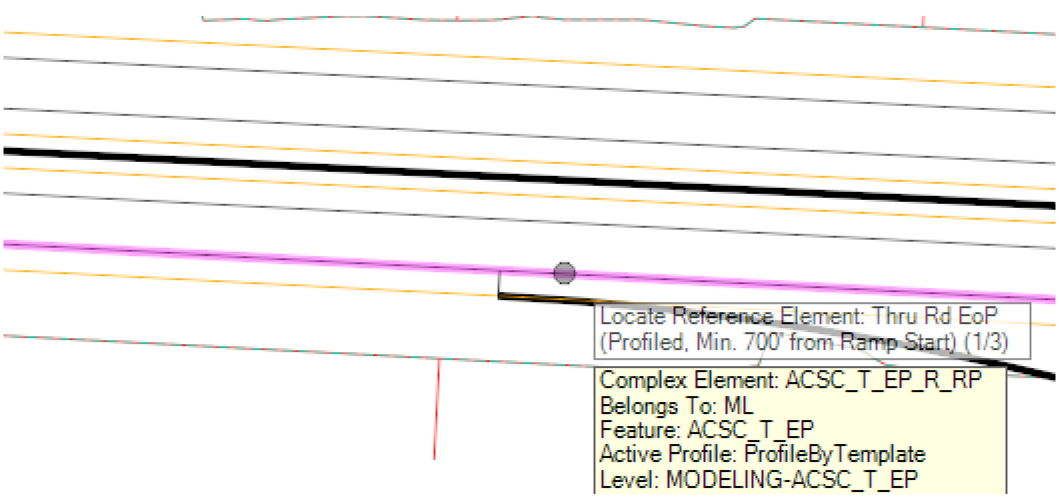


4. Select the **Exit Ramp** civil cell from the **VDOT_Interchanges.dgnlib** file and click **OK.**

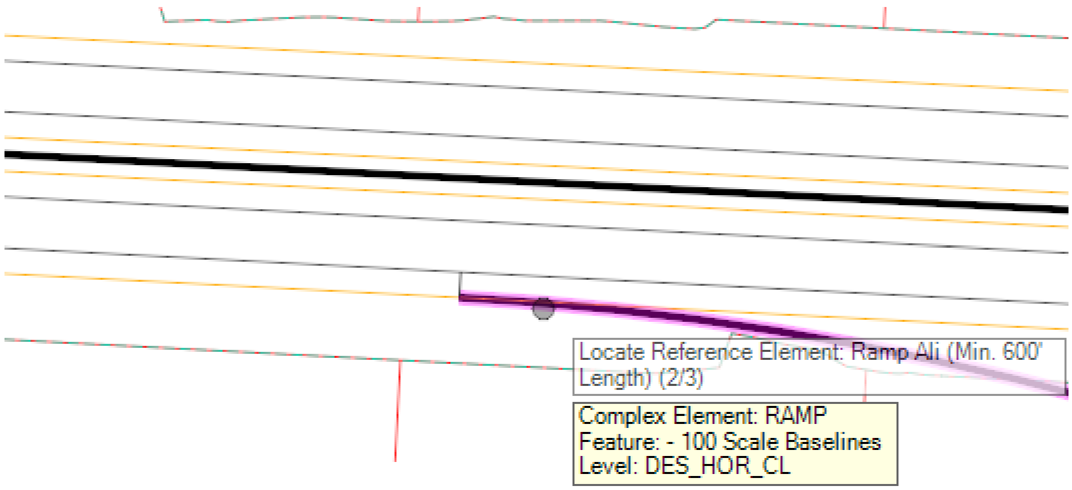


NOTE: The next three prompts may be in different order than listed in this manual.

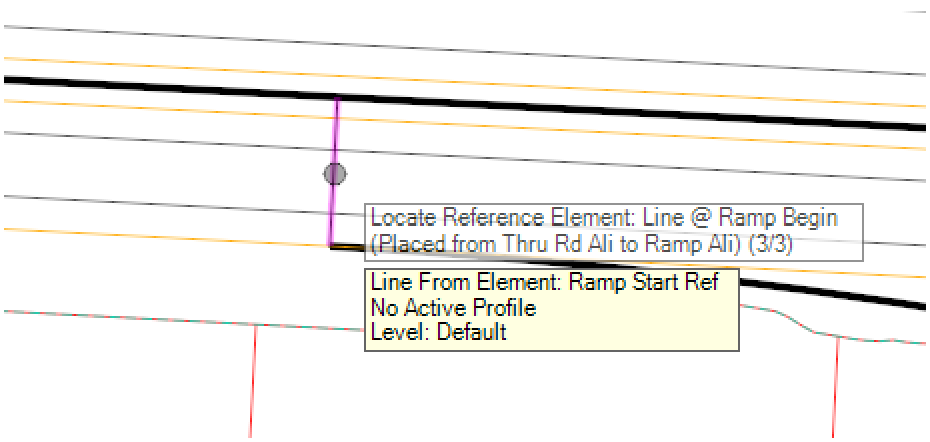
4. When prompted to *Locate Reference Element: 'Thru Rd EoP (Profiled, Min. 750' each side of Ramp Start)'* select the **template produced ML EoP** element in View 1.



5. When prompted to *'Ramp Ali (Min. 600' Length)'*, select the **RAMP alignment** in View 1.



6. When prompted to *'Line @ Ramp Begin (Placed from Thru Rd Ali to Ramp Ali)'*, select the **Line** at the Ramp beginning in View 1.

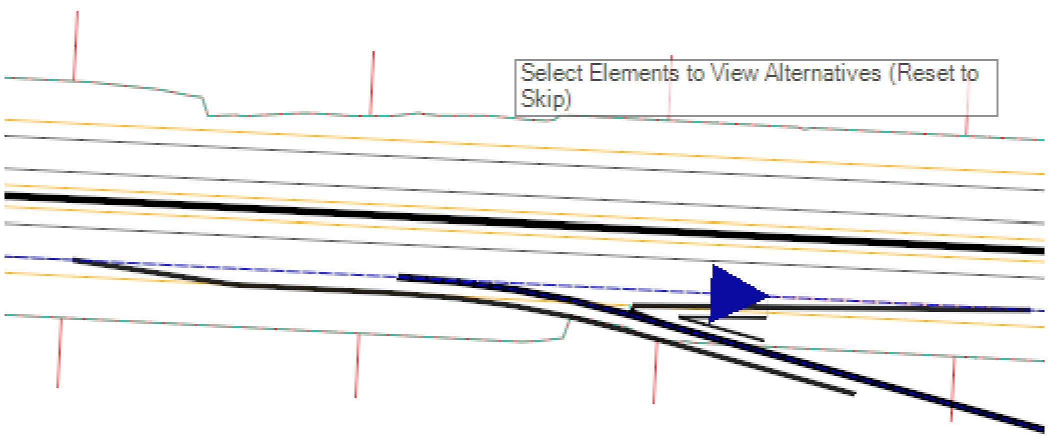


7. Observe the geometry being displayed.

   a) If the geometry appears correct and similar to the image below, move on to the next step.

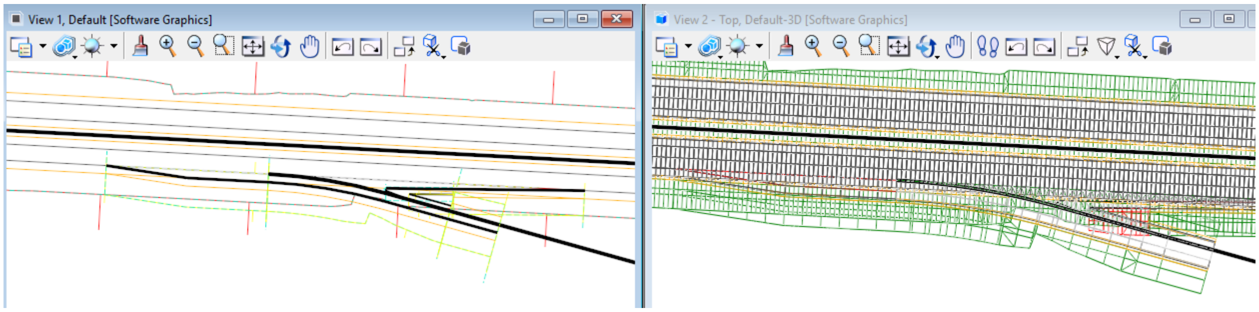
   b) If the geometry does not look correct, ensure the direction of arrows as shown in section 11.7.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.



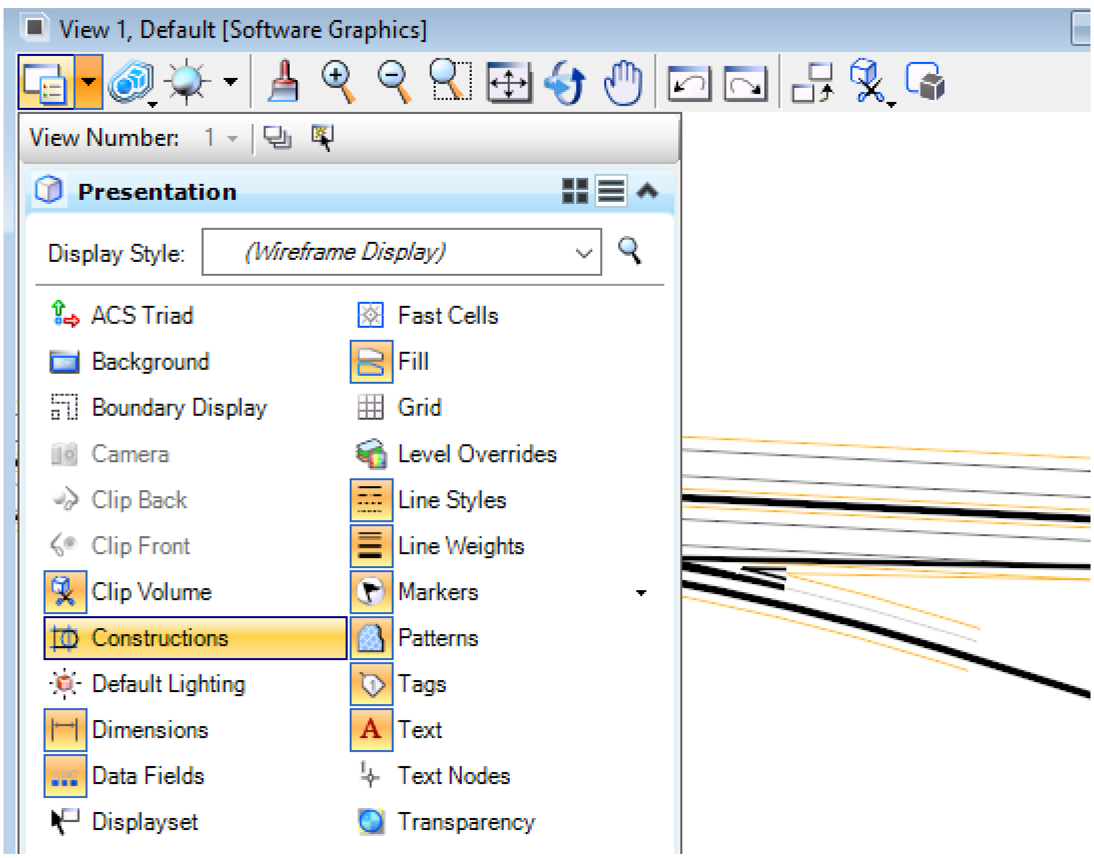
8. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.
9. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

   The image below shows the cell in 2d & 3d views.



11.7.4 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off Construction class elements, you will go to View Attributes as shown below.

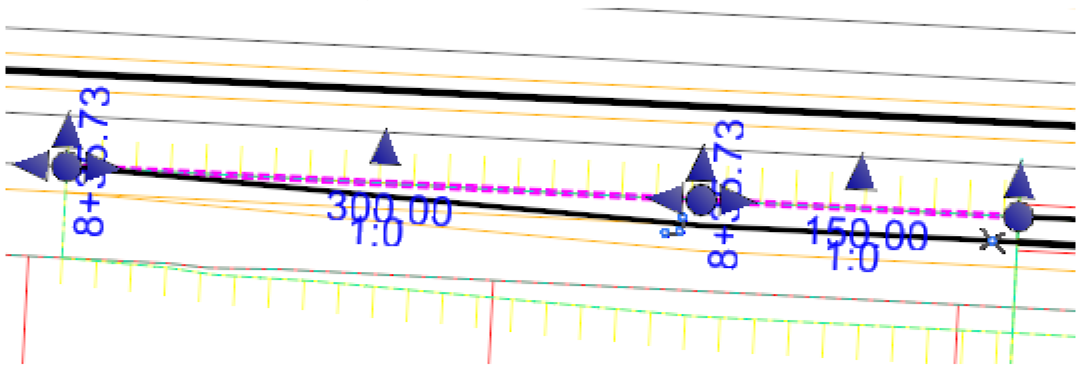


In the exercises below, turn this setting ON/OFF as needed to help identify elements.

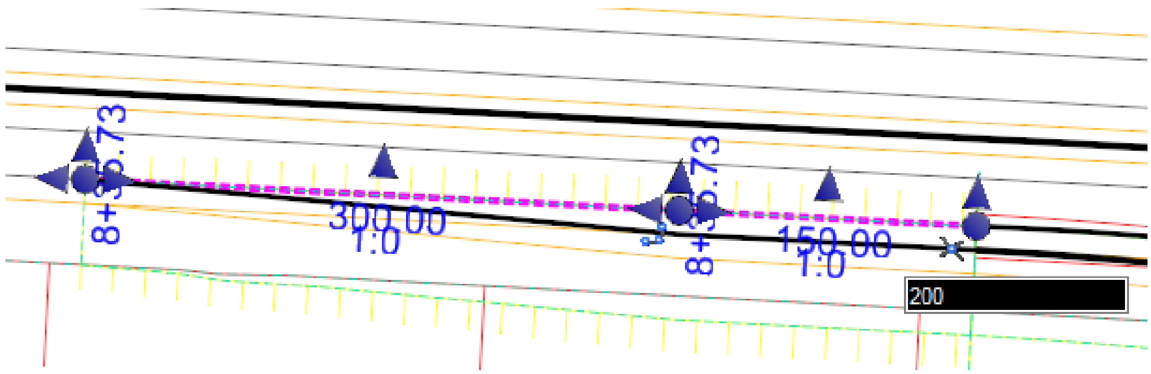
11.7.5 Horizontal Edits

11.7.5.1 STORAGE LANE/TAPER EDITS

1. The length of the storage lane/taper is controlled with the Modeling-Seam_Line feature. Select the Modeling-Seam_Line element.

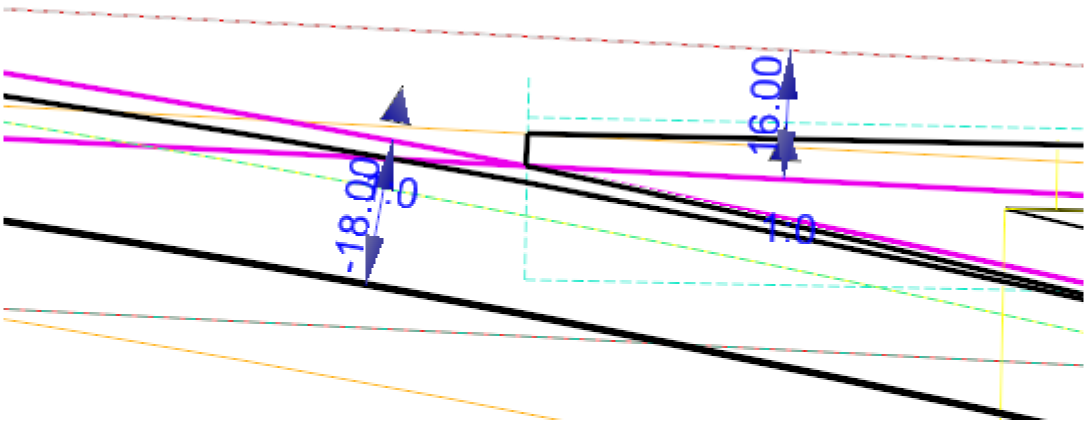


2. Change the storage lane length from 150’ to 200’.

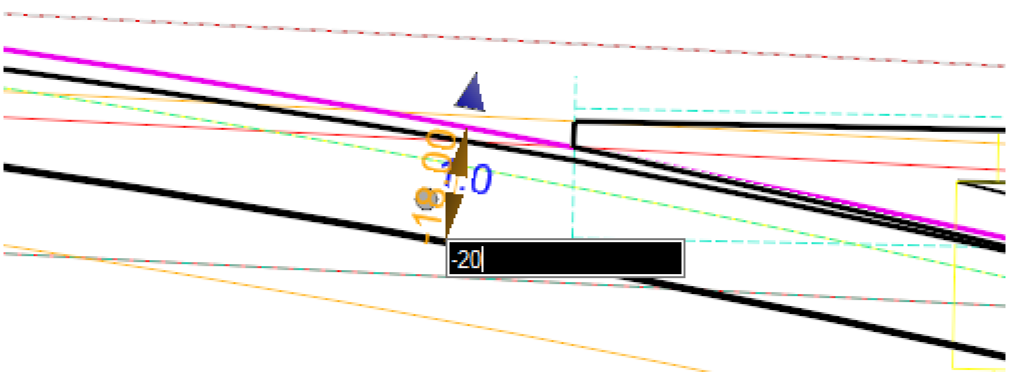


11.7.5.2 GORE AREA/RAMP WIDTH EDITS

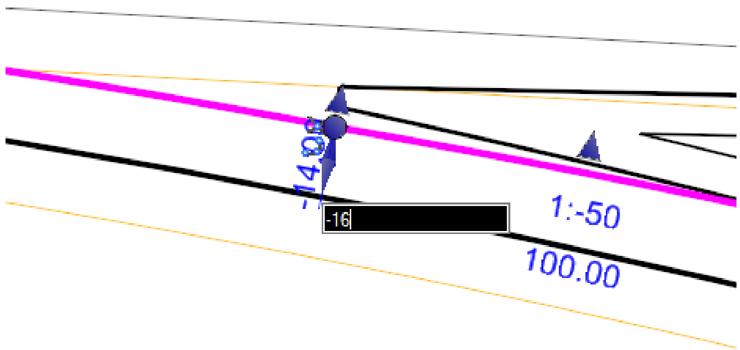
1. The Nose location is set by the two DNC_Nose_Control elements as shown below.



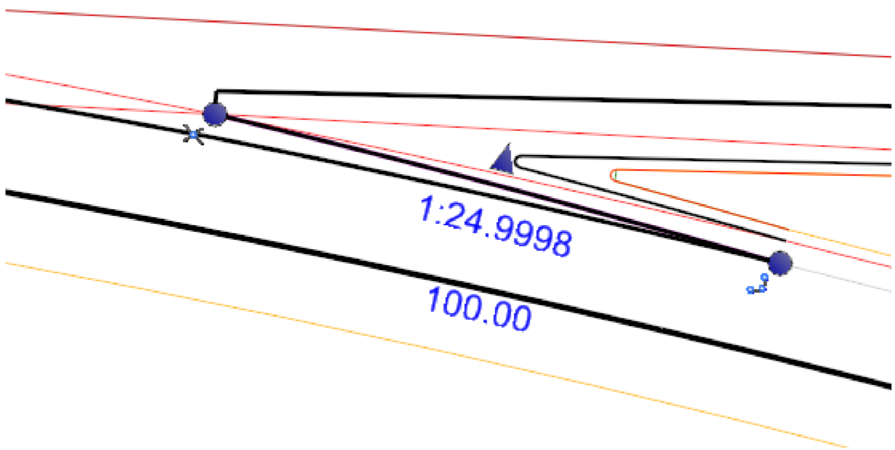
2. Select the **DNC_Nose_Control** element shown below and change the value from -18' to **-20'.**



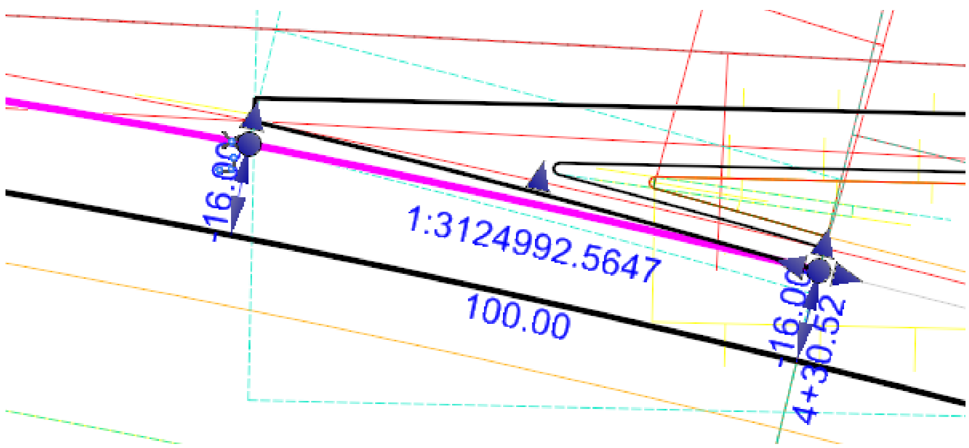
3. Change the *ramp width* at the nose from *14'* to **16'** by selecting the **Ramp Inside EoP element** and making the change graphically as shown below.



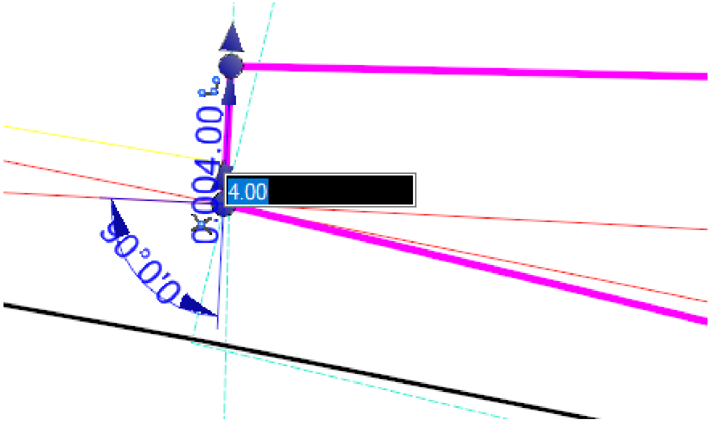
4. Select the DNC_Taper_Ramp. Note that you will probably need to Reset to select this element underlying the EOP1 element.



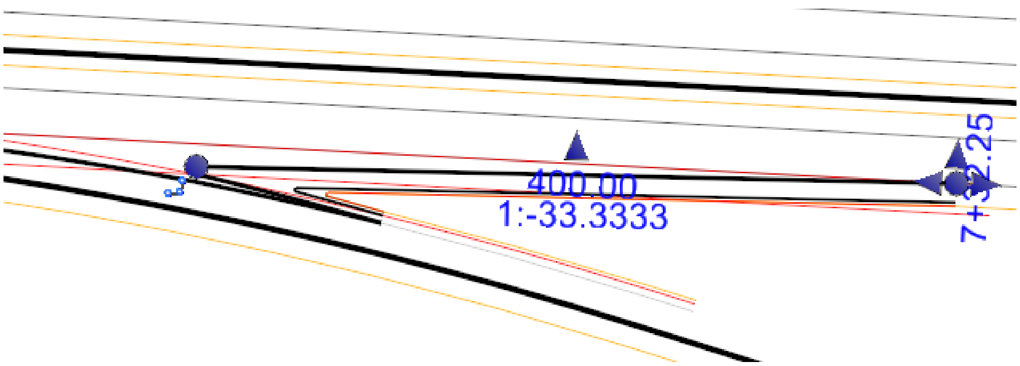
Notice the snaps on each end of the taper on the nose side. The length/ratio of this element is controlled by the element below. We will not make change in this exercise but changing the *100* value below would adjust the taper above.



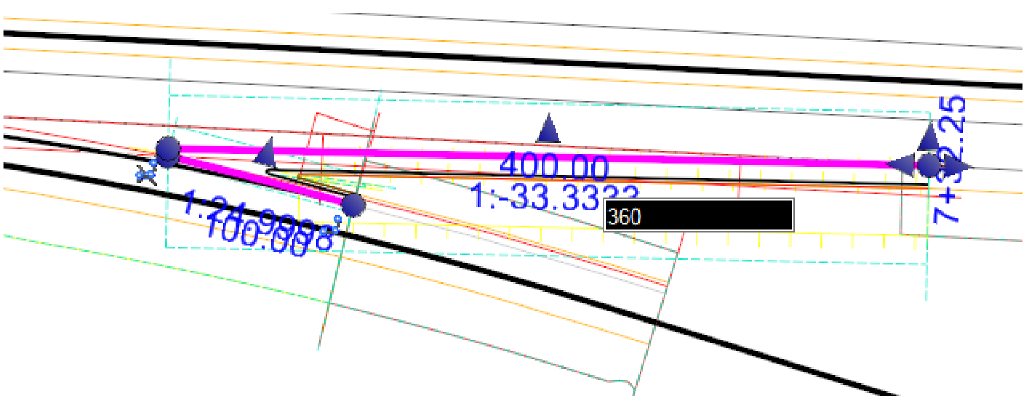
5. Select the **Nose** which is part of the complex EOP1 element**.** Although we will not make any change in this exercise, changing the value of *4* would adjust the length of the nose.



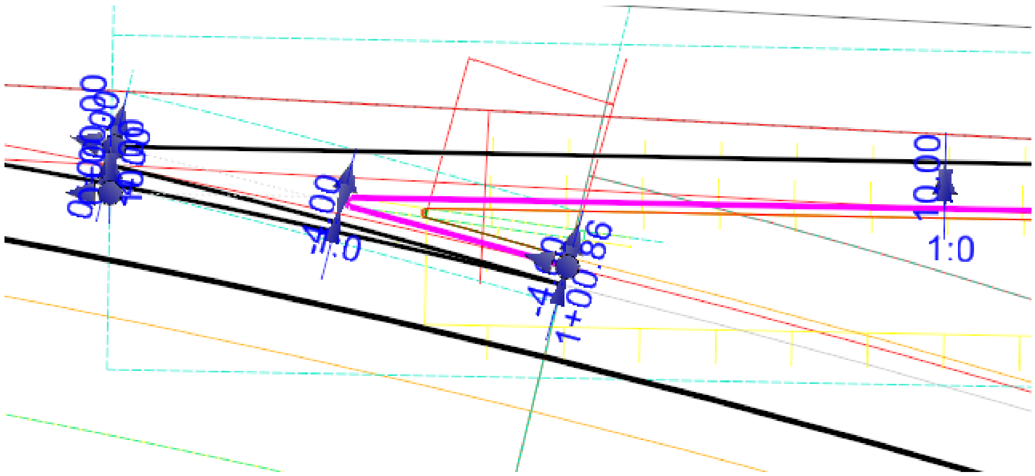
6. Select the element **DNC_Taper_ML**. Note that you will probably need to Reset to select this element underlying the EOP1 element.



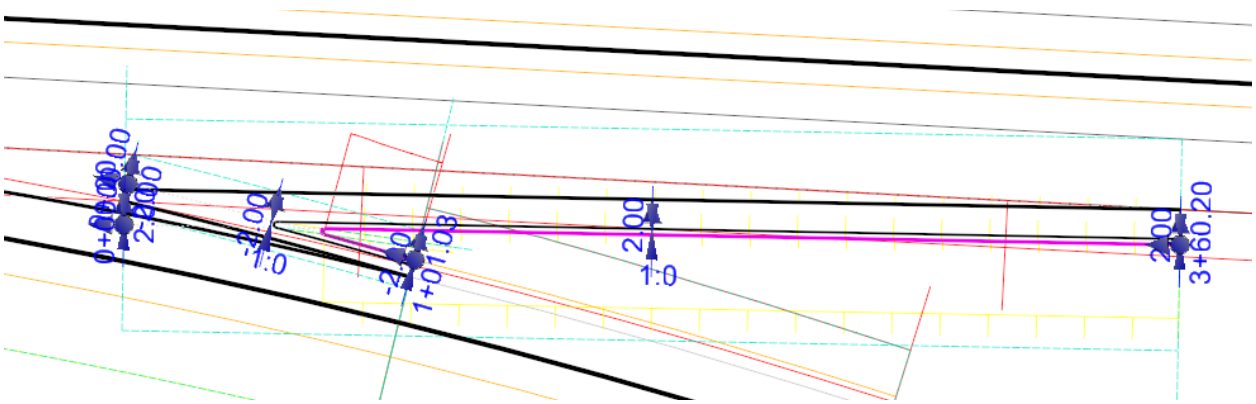
7. This is a ratio/offset taper placed from the nose. Change the *length of the taper* from 400' to **360'.**



8. Select the element **Shld_Paved** as shown below.



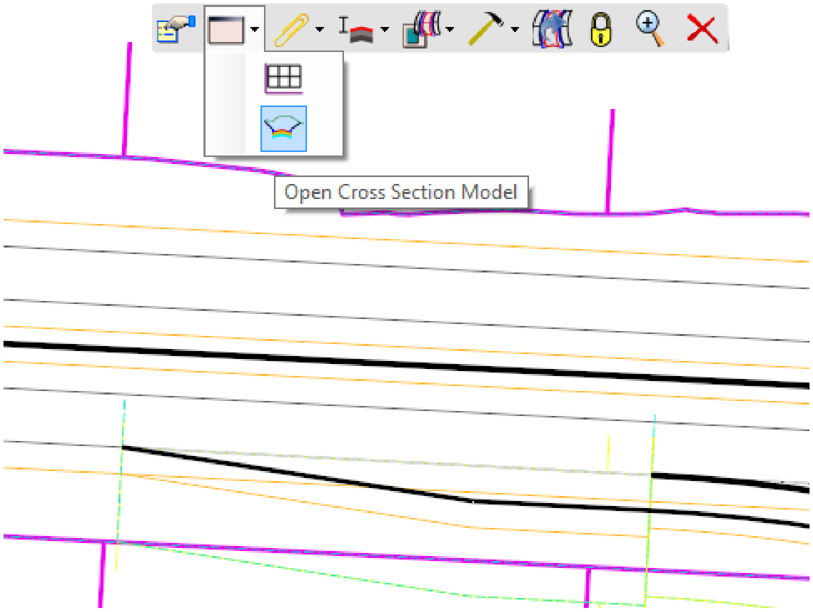
9. Although we will not make changes in this exercise, the paved shoulder widths from the Ramp (initially -4’) and along the Thru Rd (initially 10’) can be modified as needed.
10. Select the element **DNC_Geom_Shld_Unpaved** element shown highlighted below.



11. Although we will not make changes in this exercise, the unpaved shoulder widths from the Ramp (initially -2’) and along the Thru Rd (initially 2’) can be modified as needed.

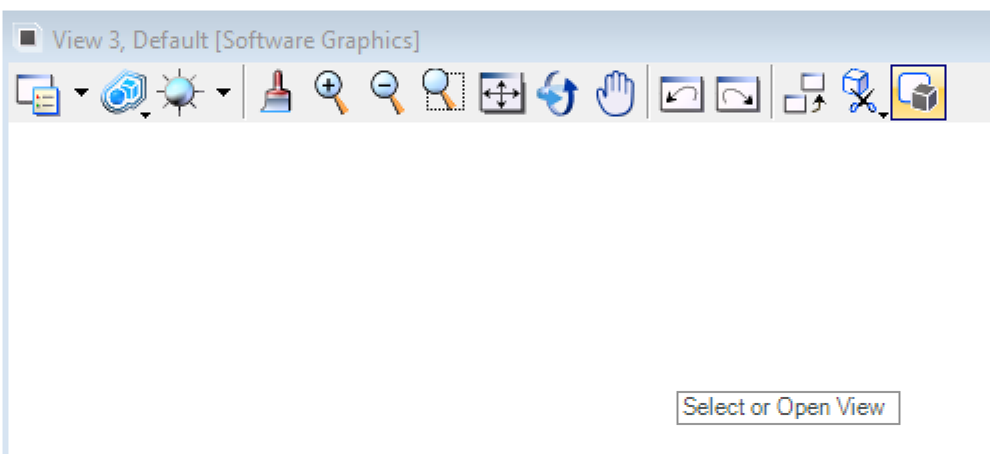
11.7.6 Cross-Section View

1. Open the cross-section model of the **ML corridor** as shown below.

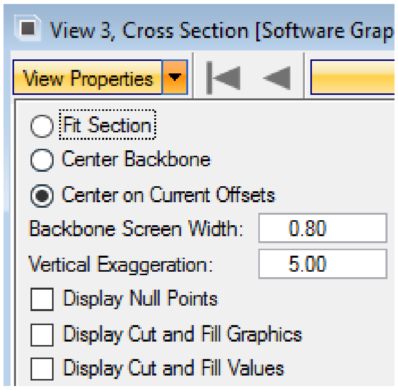


2. Open **View 3** from *MicroStations View* menu.

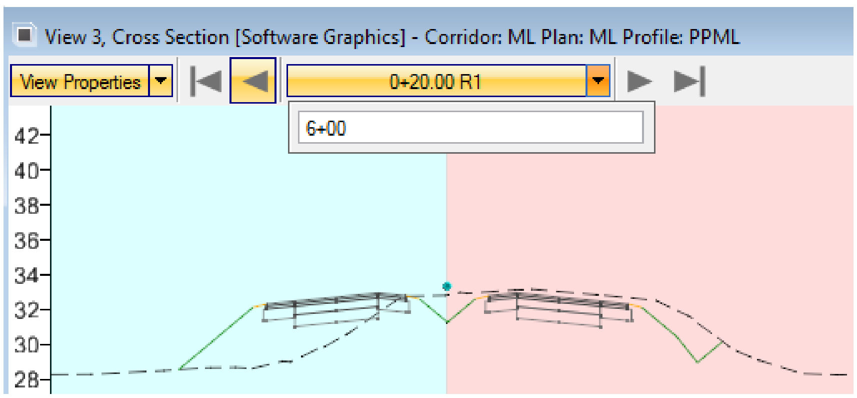
3. **Left Click** in the drawing area of *View 3*.



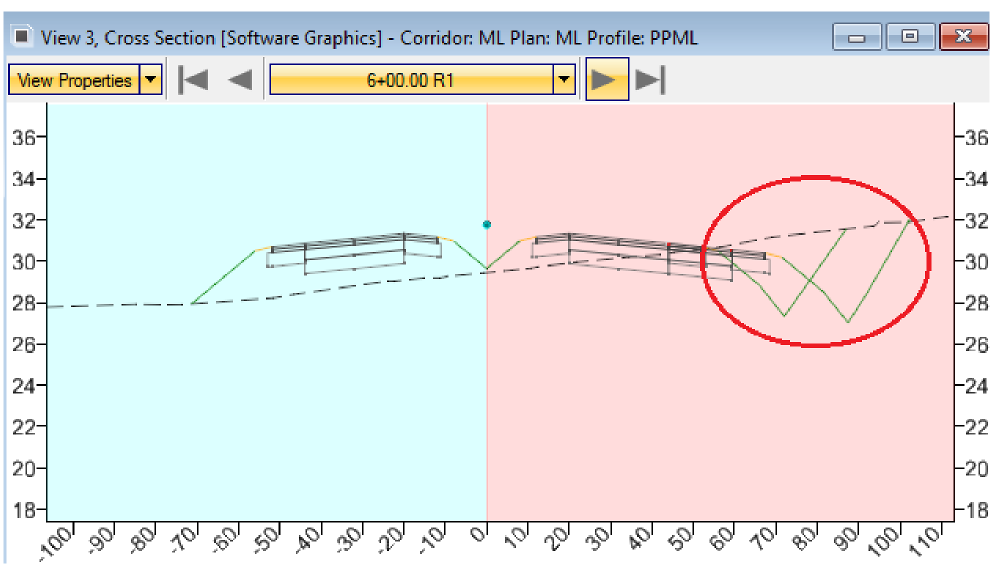
4. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



5. Use the *Next Station* button to move a few stations and then move to station **6+00** by keying this value in as shown below.



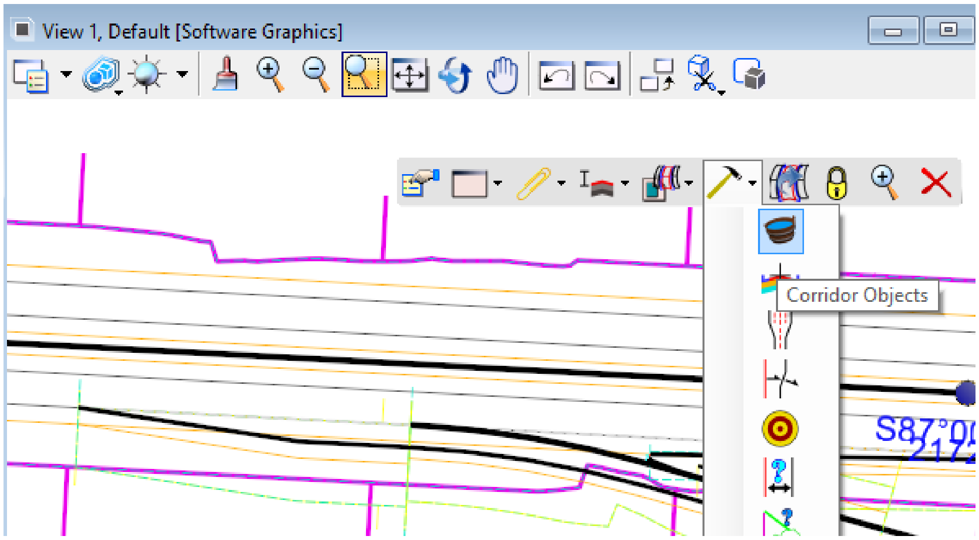
6. Station 6+00 should appear similar to below. You can see the overlap of the ML corridor and the corridor within the civil cell circled in red below. We will remove the ML corridor shoulder and end conditions through the Civil Cell limits in the next section.



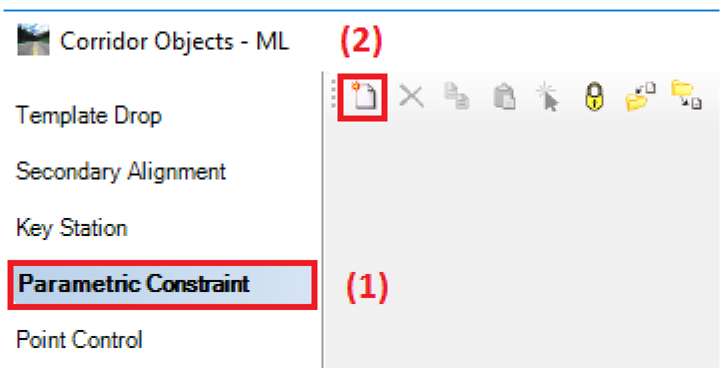
11.7.7 Display Rule

To turn off the ML shoulder and end conditions through the limits of the exit ramp civil cell, follow the steps below.

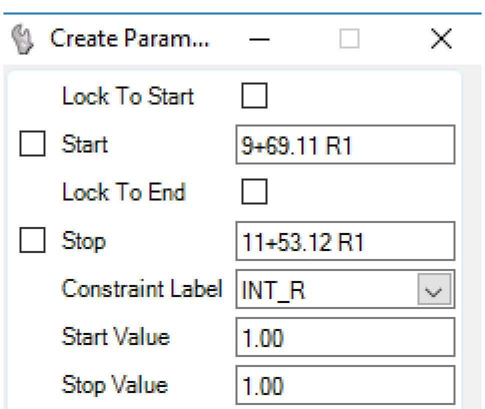
1. In View 1, Select **Corridor Objects** from the context menu of the ML corridor.



2. Choose **Parametric Constraints** and tag **New.**



3. Fill out the resulting dialog as shown below disregarding the stations at this point.



NOTE: If the intersection was to the left, INT_L would be chosen and -1 entered.

4. Snap and determine the *Station* of the beginning of the taper at the beginning of the exit ramp. Do not left click to accept this station but rather:

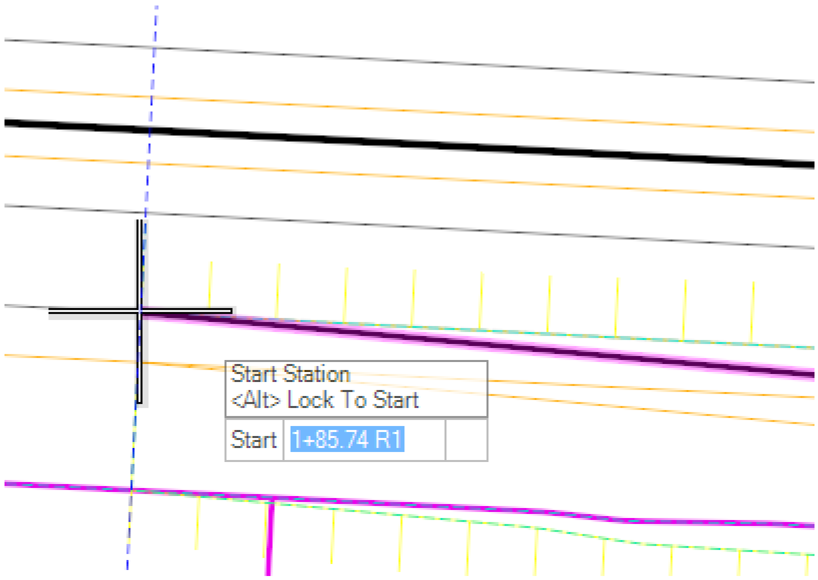
   a) **CTRL C** on your keyboard to copy the station

   b) Move your cursor off the point

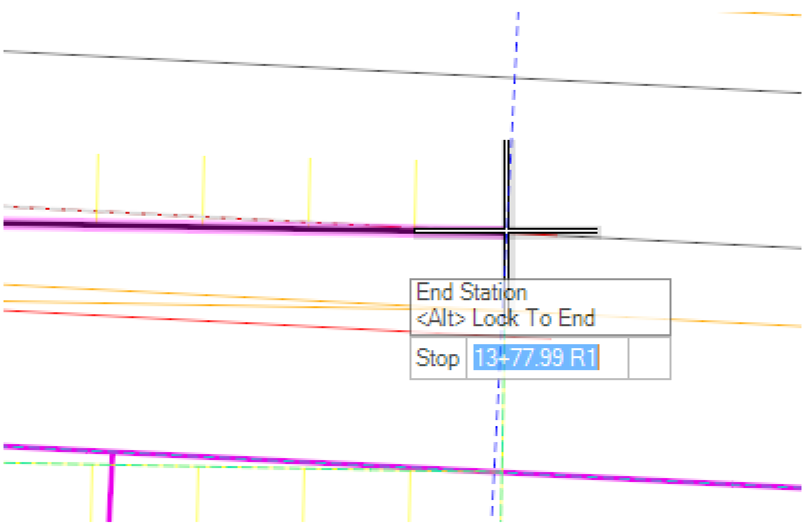
   c) **CTRL V** to paste the station in the cursor prompt.

   d) Hit the **Tab** or **Ente**r on your keyboard to lock the station.

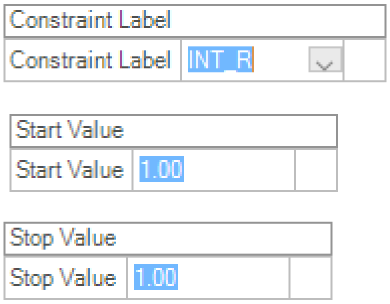
   e) **Left Click** on the screen to confirm this start station.



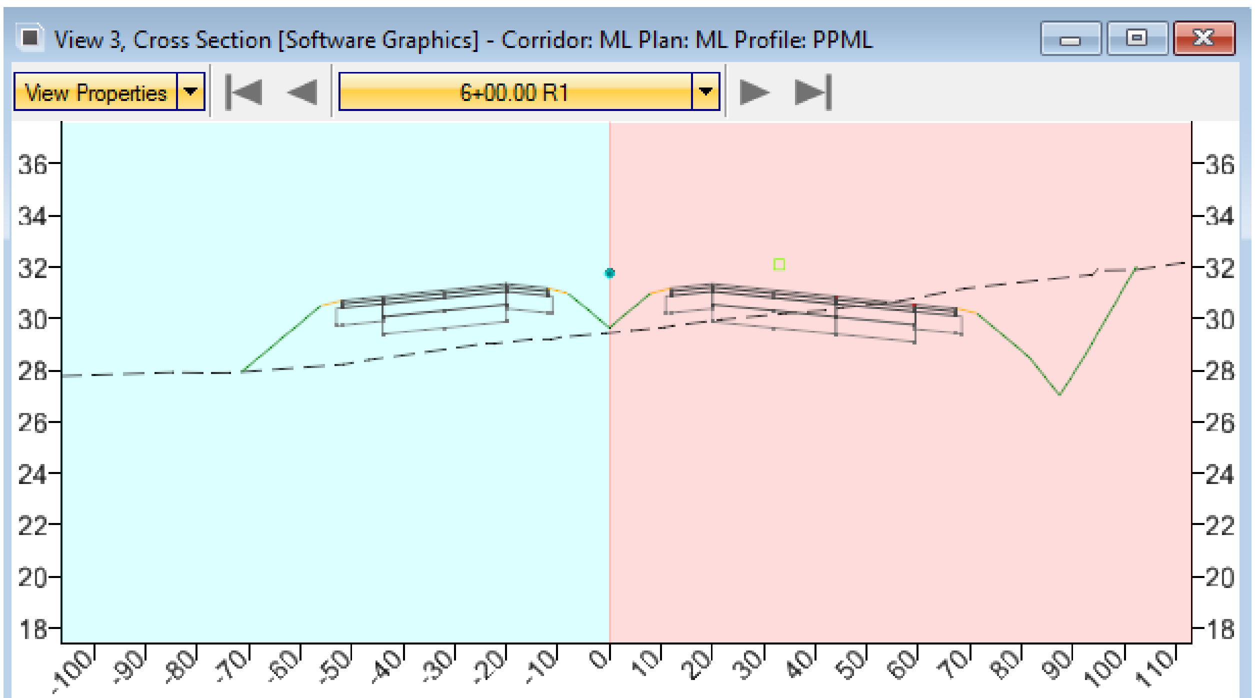
5. Snap and determine the *Station* of the end of the taper at the end of the exit ramp. Do not confirm but follow the steps above to enter the station.



6. Left click to confirm the following.



7. The parametric constraint is added and the ML shoulder and end conditions are turned off through the intersection. Review the cross-section at 6+00 to verify.

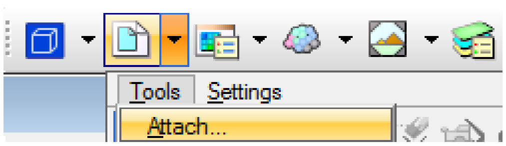


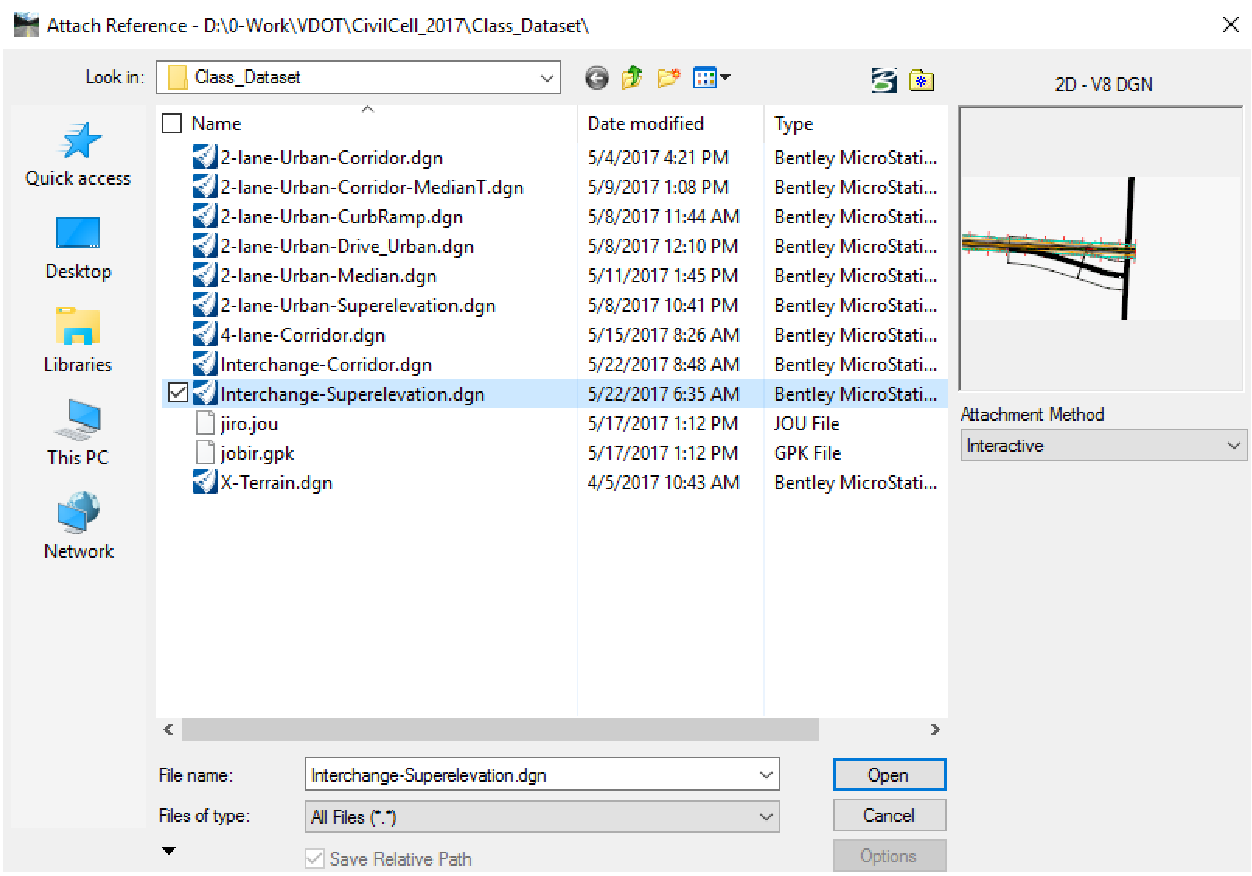
11.7.8 Vertical Edits

Slope projections have been used for most horizontal elements in this civil cell. 2% has been initially projected for most elements. We will reference the DGN file containing the Superelevation and project slopes based off it to profile the Ramp Alignment and other elements in the Civil Cell.

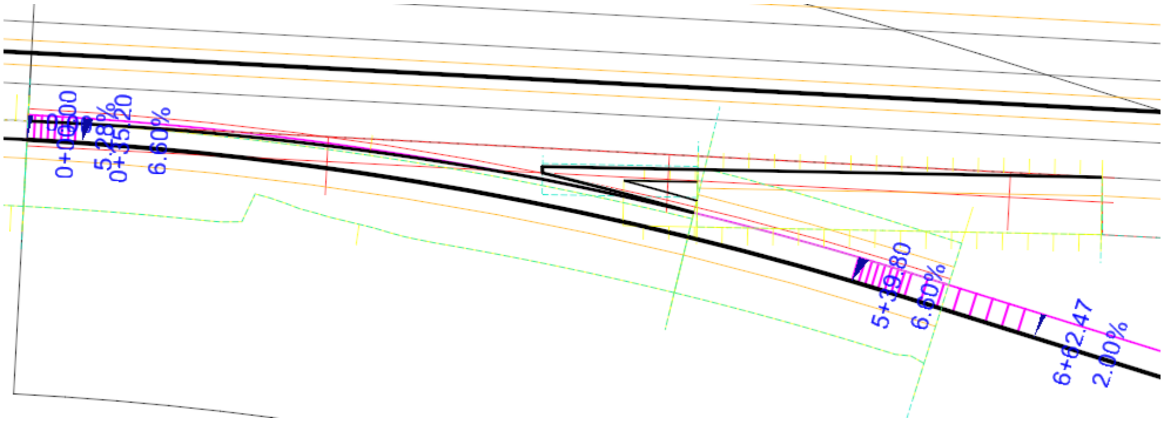
11.7.8.1 REFERENCING/REVIEWING SUPERELEVATION

1. With View 1 highlighted, reference the file **Interchange-Superelevation.dgn.**





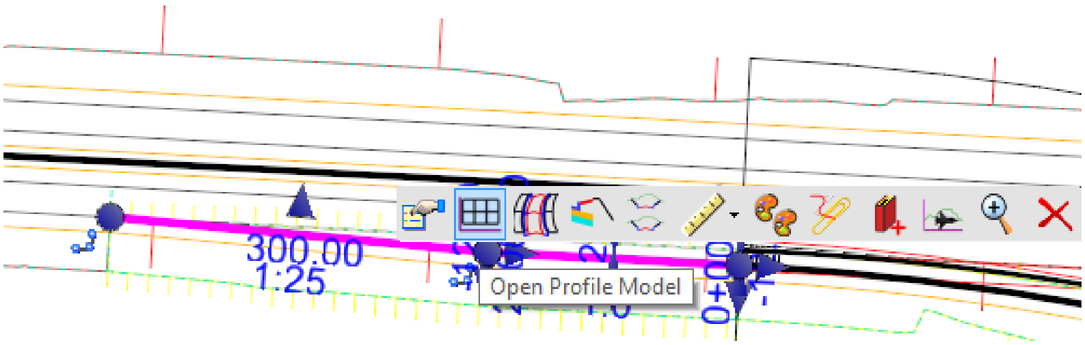
2. The Superelevation of the Ramp is shown below. You cannot select the Superelevation and view this information because it is referenced but you could open the Superelevation file and or use the Superelevation Report on the Corridor Modeling task to view the information.



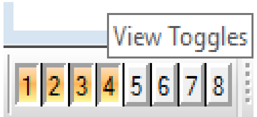
6.6% is the full Superelevation rate of the initial curve in the ramp. We will now project slopes and re-profile the Ramp Components as well as the Ramp alignment.

11.7.8.2 STORAGE LANE/TAPER

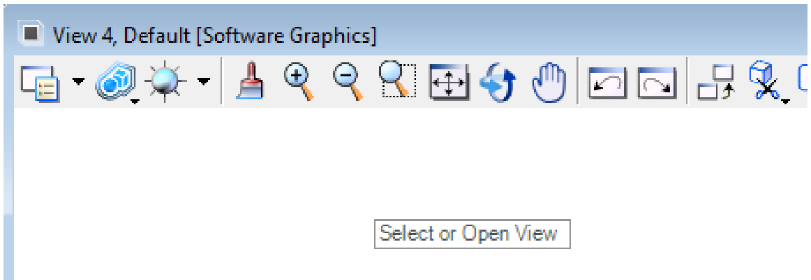
1. Open the profile view of the Ramp Taper/Storage element.
   a. Select the element below and from the context menu, choose **Open Profile Model.**



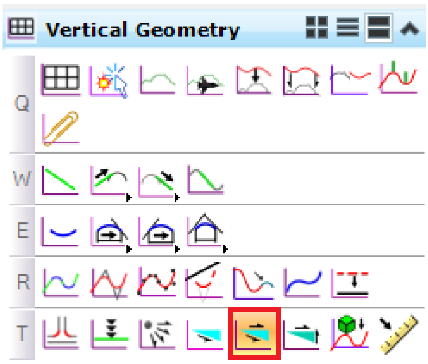
   b. Open View 4.



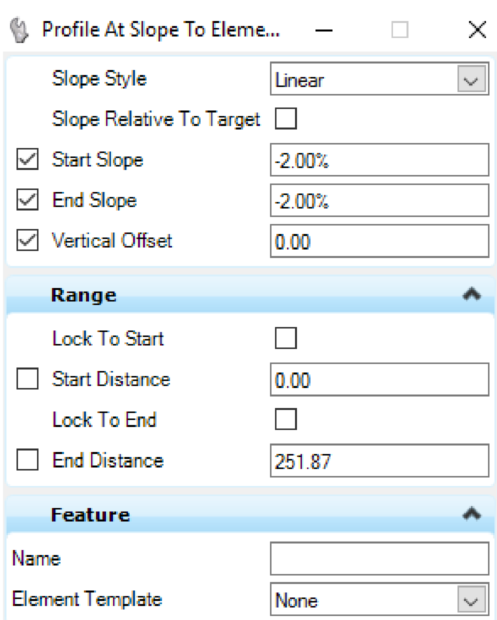
c. Left click in View 4 to open the profile model.



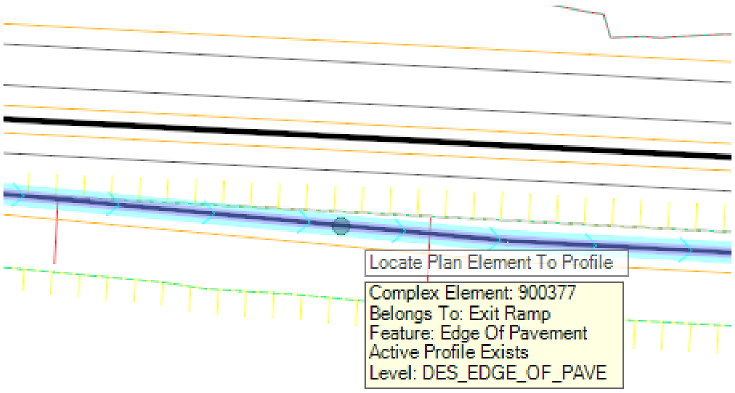
2. Select the command **Profile by Variable Slope from Element** from the *Vertical Geometry tasks*.



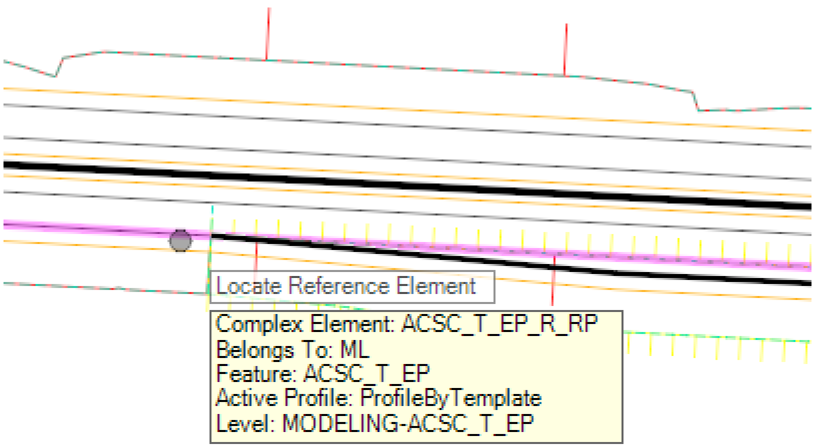
3. Fill out the dialog as shown below.



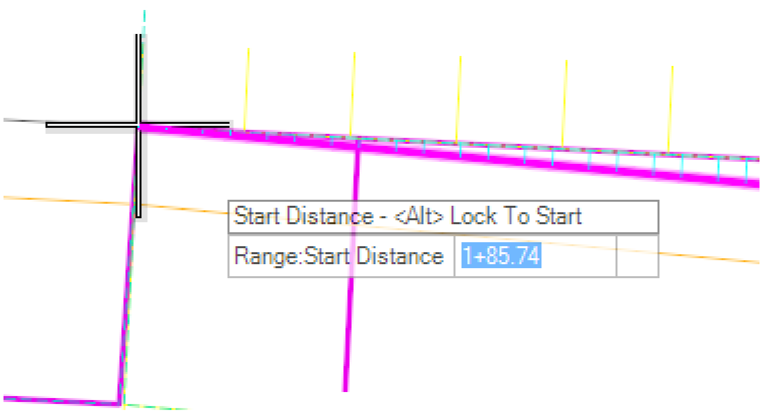
4. Confirm the *Slope Style* as **Linear** and then *Locate Plan Element to Profile* as shown below.



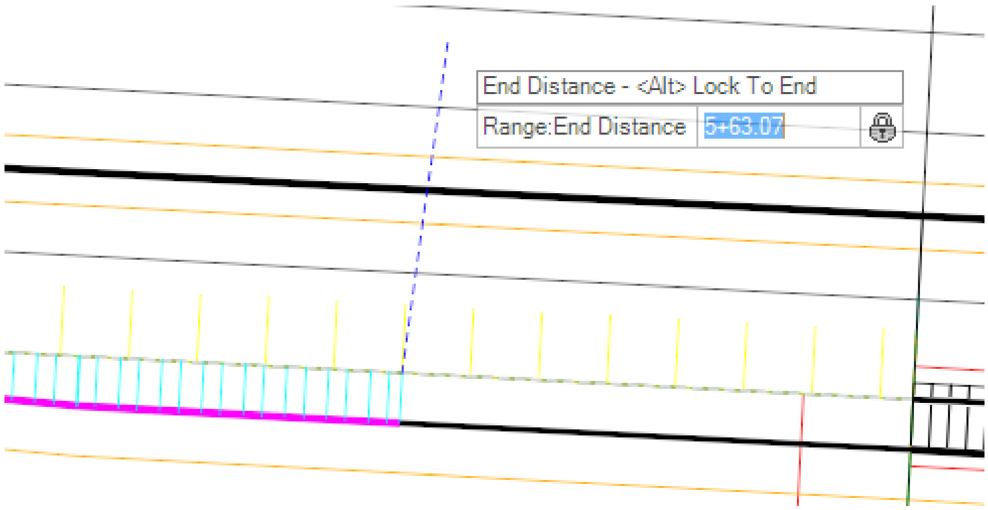
5. Locate the **ML EoP** as shown below when prompted to *Locate Reference Element.*



6. Snap to the beginning of the taper and then left click to confirm the **Start Distance.**

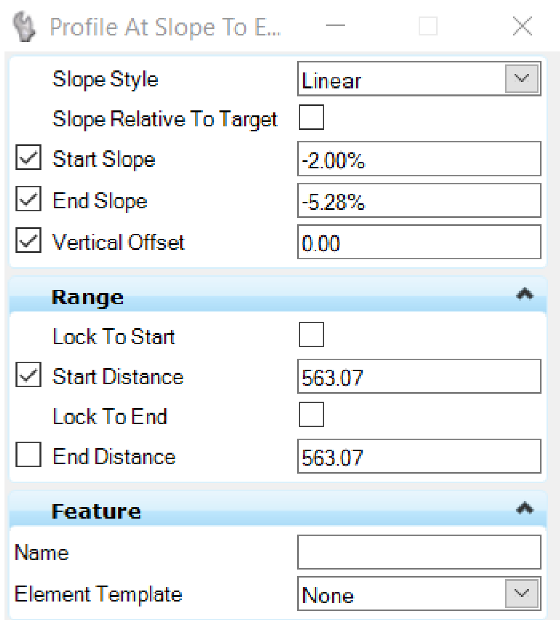


7. Key in **5+63.07** for the End Distance, tab or enter to lock, and then left click to confirm.



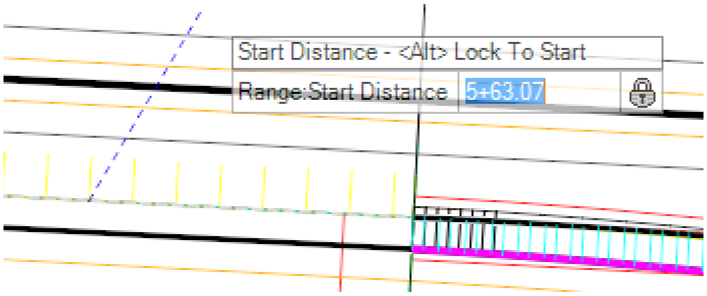
8. Left click to confirm the remaining prompts.

9. While in the same command, change the values in the dialog as shown below.

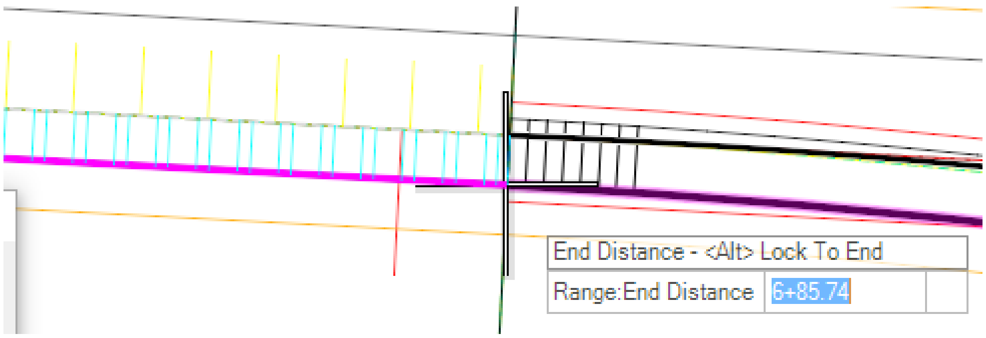


10. Left Click to confirm the Slope Style of Linear, select the same element to profile and select the same reference.

11. Key in **5+63.07** for the *Start Distance* and confirm with a left click.

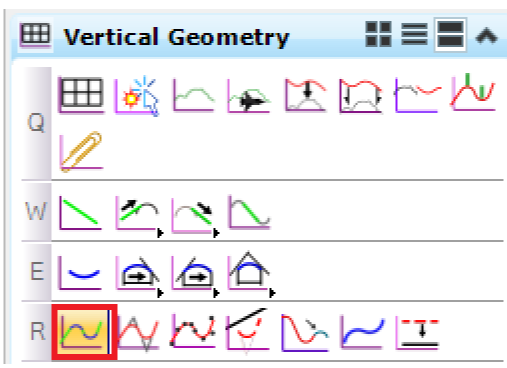


12. *Snap to the Ramp Alignment beginning* and left click to confirm the **End Distance.**

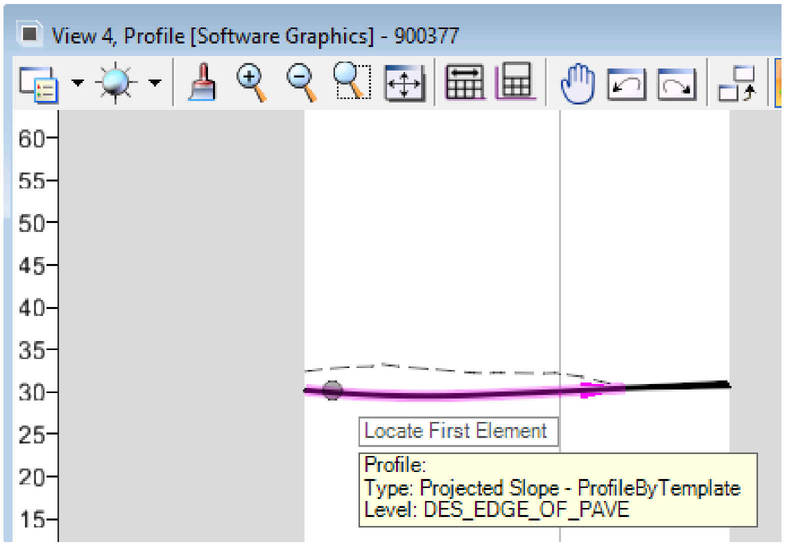


13. Left click to confirm the remaining slopes and project the slopes.

14. Select the Vertical Geometry command **Profile Complex By Elements.**

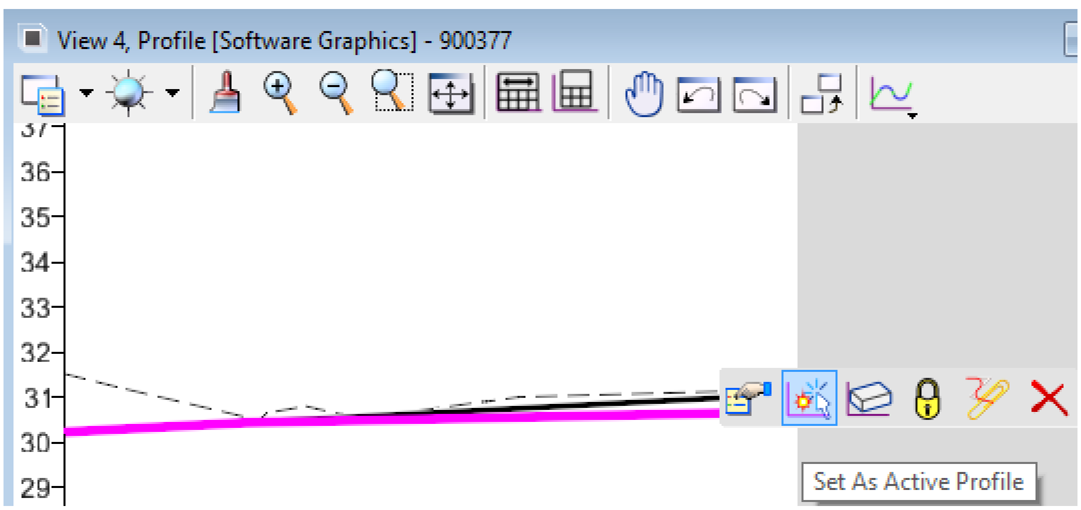


15. With the *Method* set to **Automatic**, hover over the beginning of the 1st projected element in View 4 and left click.



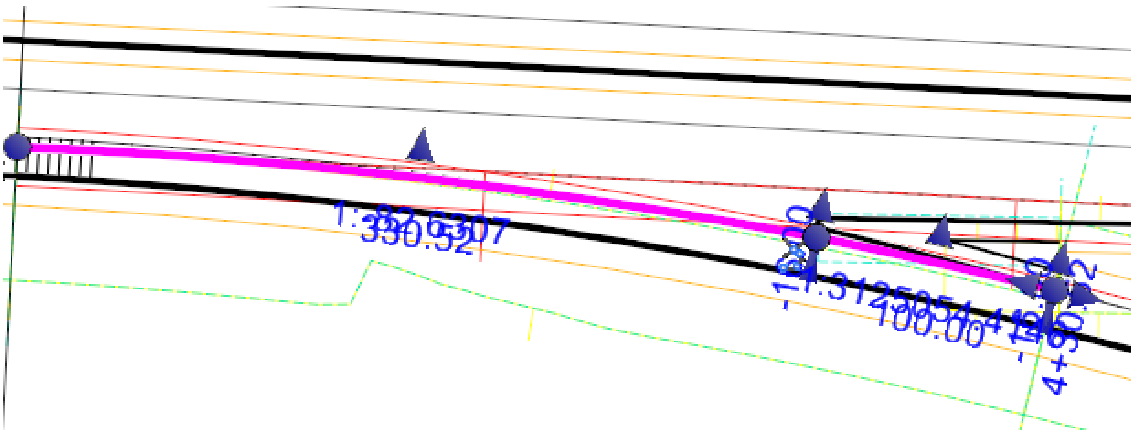
16. Left click again to confirm **Accept Complex.**

17. Select the complex element just created in View 4 and set it as the Active Profile.



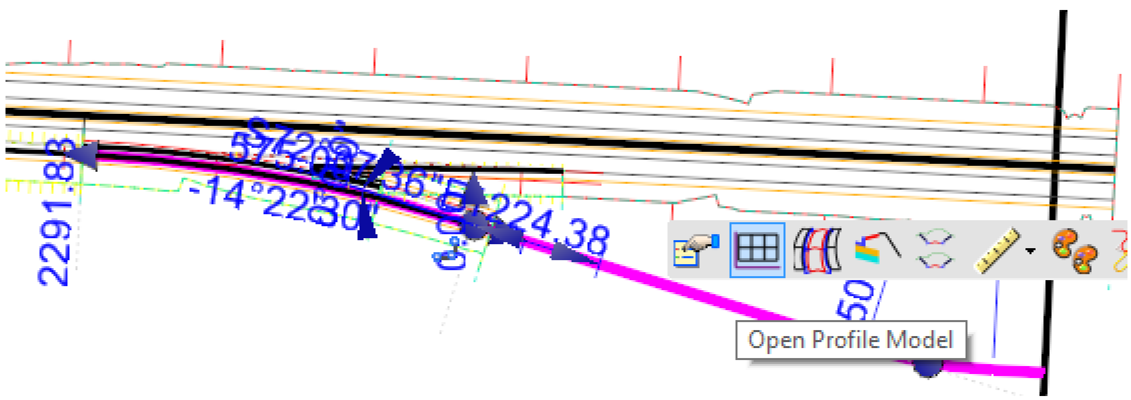
11.7.8.3 RAMP INSIDE EOP

Projections of slope similar to the steps above can be made for Ramp Inside EoP shown selected below. This complex element is comprised of two elements, one leading up to the nose and the other after the nose. The 1st element is a -2% projection off the ML EoP. The 2nd element is a +2% projection off the Ramp alignment. We will not make any edits to this profile in this exercise.

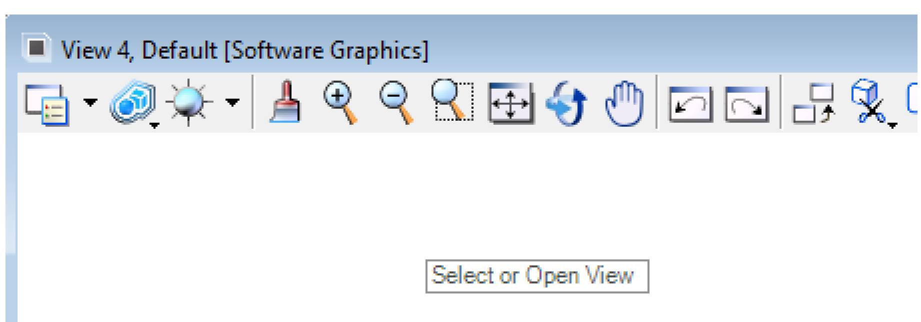


11.7.8.4 RAMP ALI

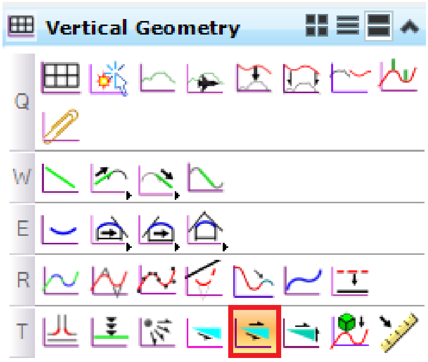
1. Open the profile view of the Ramp Ali element.
   a. Select the element below and from the context menu, choose **Open Profile Model.**



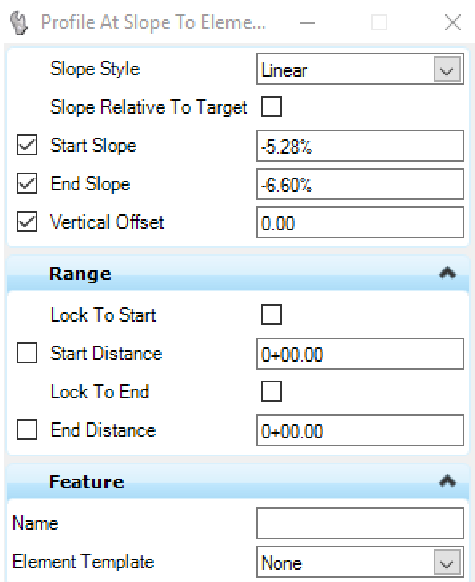
   b. Left click in View 4 to open the profile model.



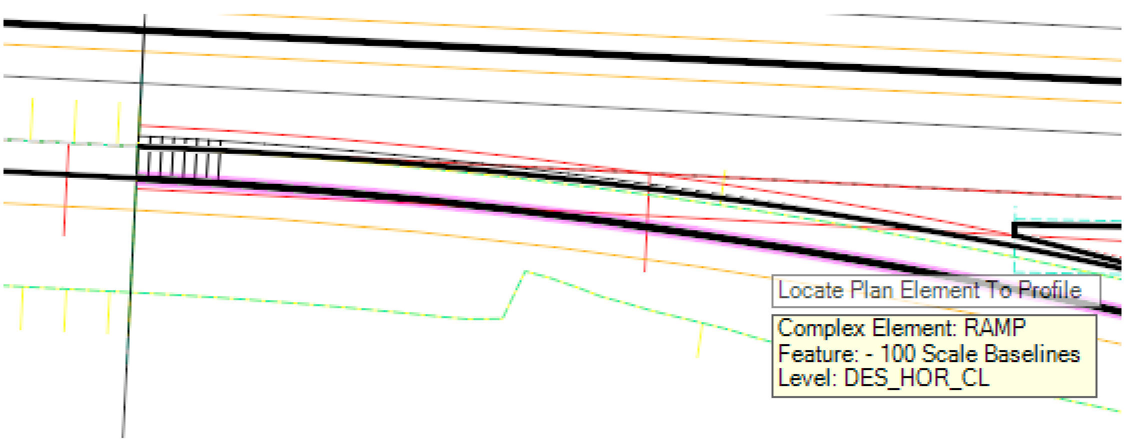
2. Select the command **Profile by Variable Slope from Element** from the *Vertical Geometry tasks*.



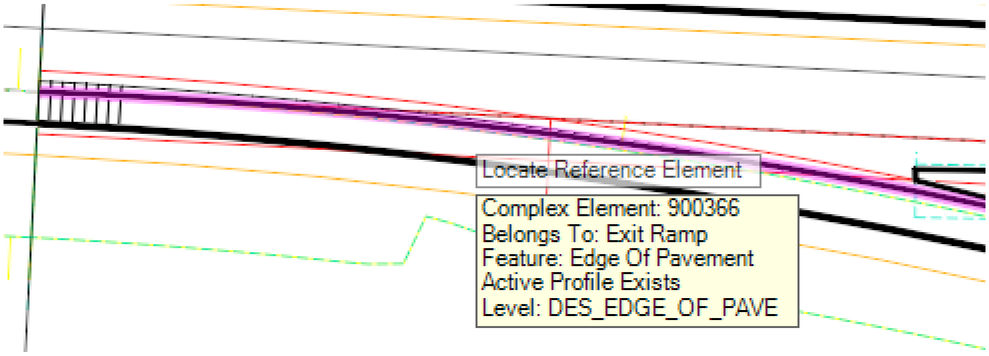
3. Fill out the dialog as shown below.



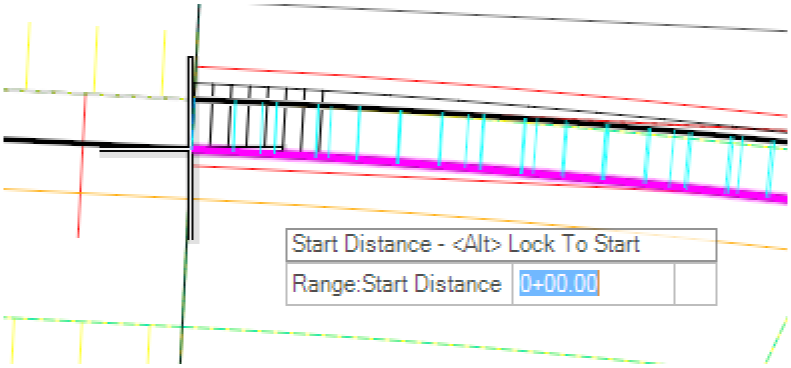
4. Confirm the *Slope Style* as **Linear** and then left click the **Ramp** *alignment* when prompted to *Locate Plan Element to Profile*. Note that you may have to reset to get to the underlying element.



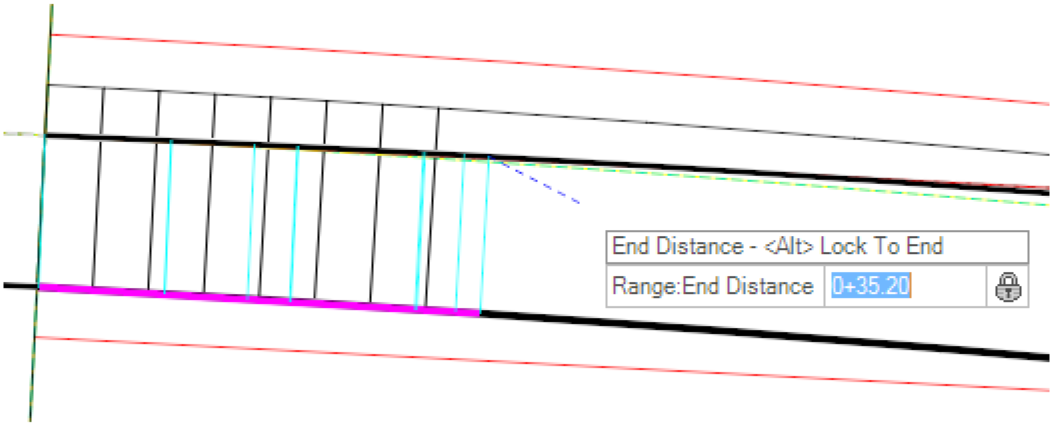
5. Locate the **Ramp Inside EoP** as shown below when prompted to *Locate Reference Element.*



6. Snap to the beginning of the Ramp Alignment and then left click to confirm the **Start Distance.**

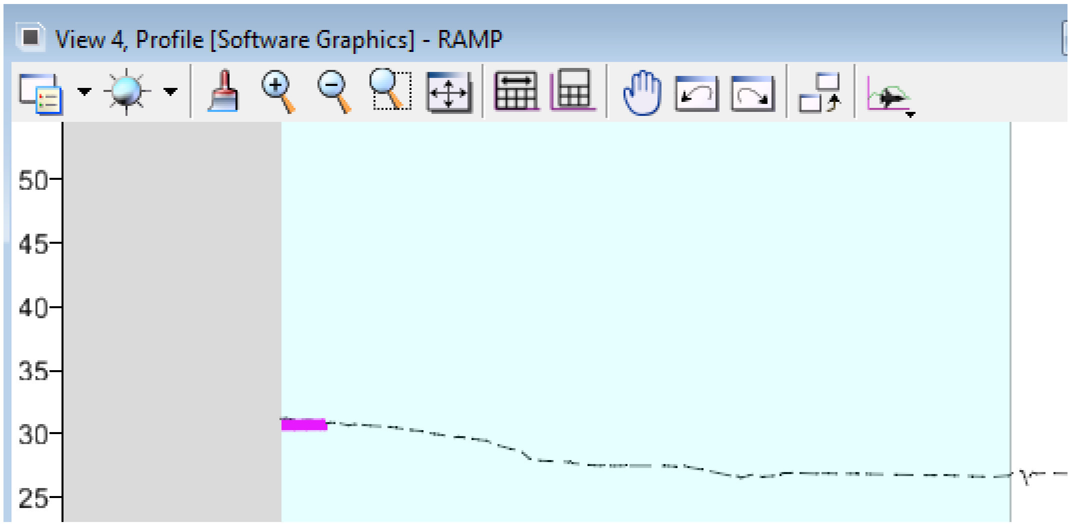


7. Key in **0+35.2** for the End Distance (full super location), tab or enter to lock, and then left click to confirm.

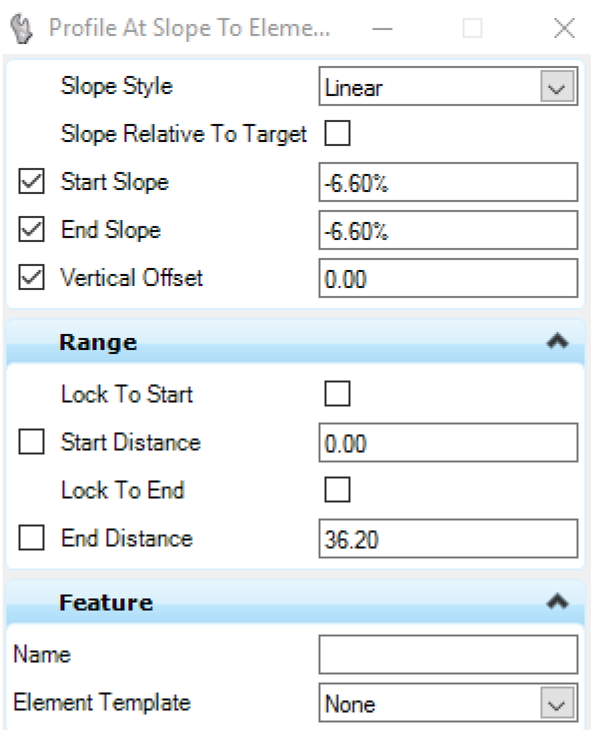


8. Left click to confirm the remaining prompts.

9. Review the projected profile in View 4.

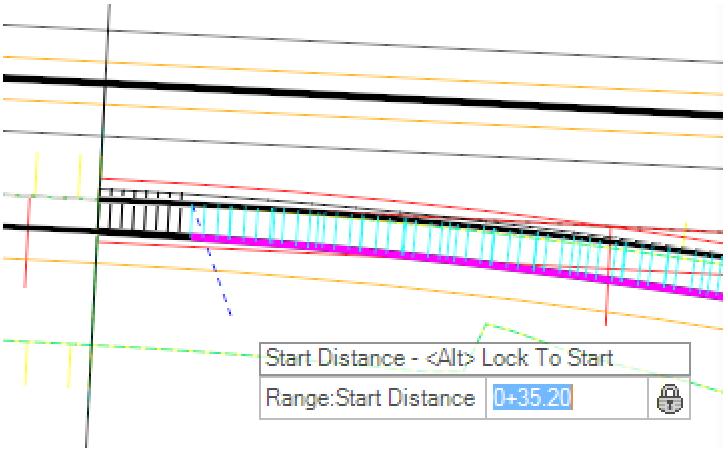


10. While in the same command, change the values in the dialog as shown below.

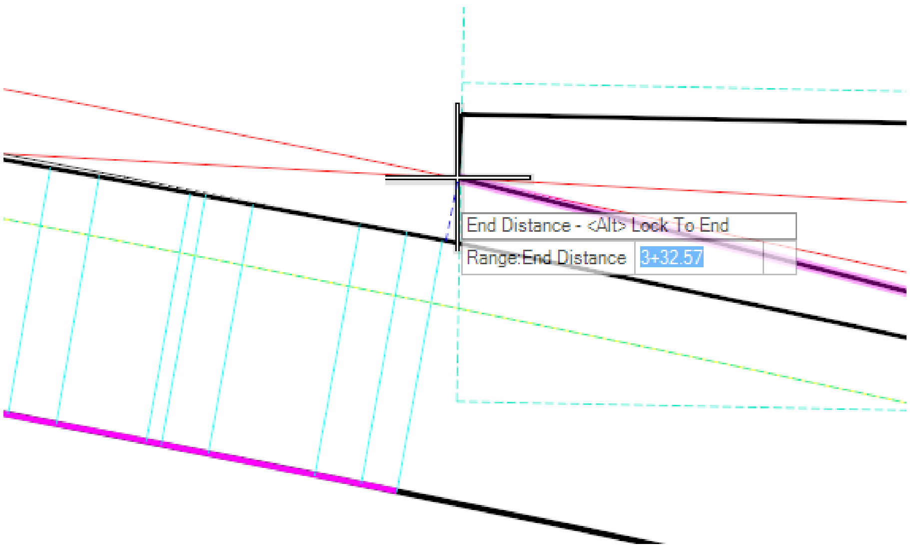


11. Left Click to confirm the Slope Style of Linear, select the same element to profile and select the same reference.

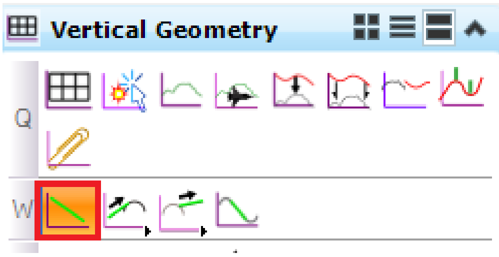
12. Key in **0+35.2** for the *Start Distance* and confirm with a left click.



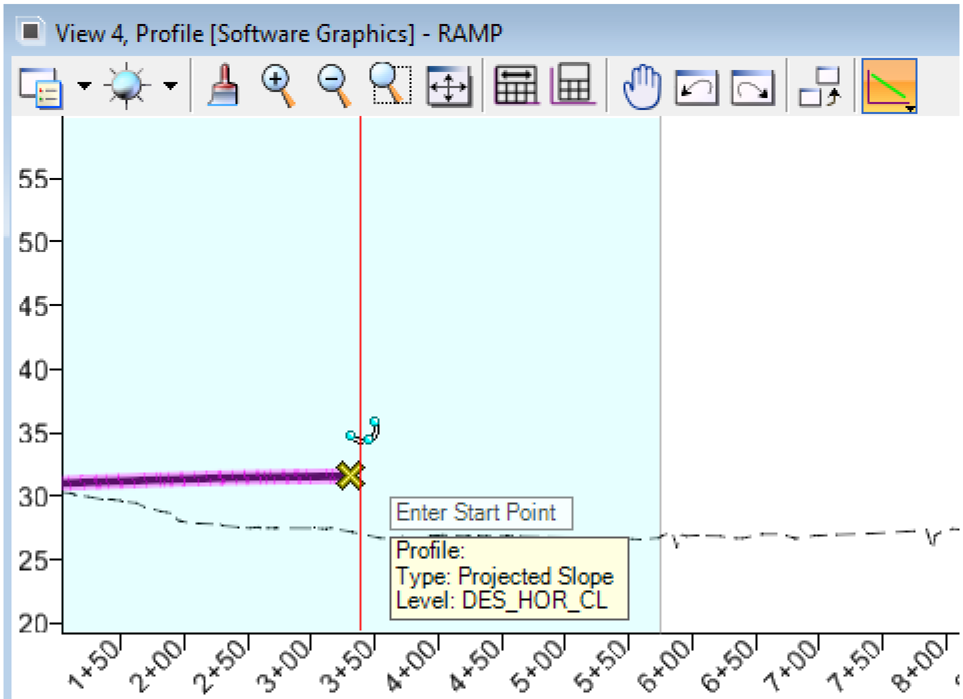
13. *Snap to the Nose* and left click to confirm the **End Distance.**



14. Left click to confirm the remaining slopes and project the slopes.
15. Select the Vertical Geometry Command **Profile Line Between Points.**

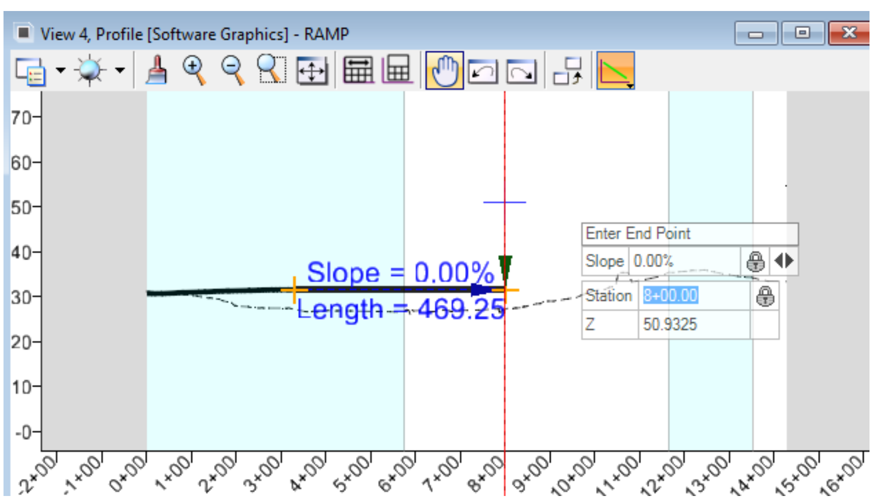


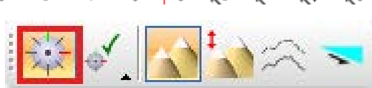
16. In View 4, snap to the end of the projected profile and left click when prompted to **Enter Start Point.**



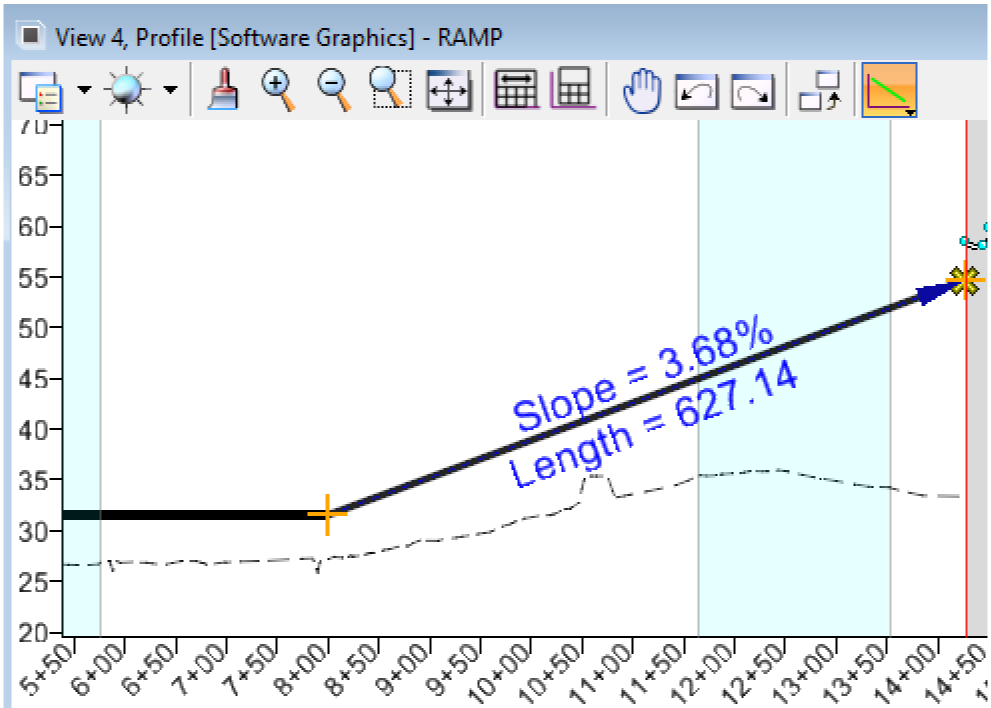
17. Hit the Right Arrow on your keyboard and key in a slope of 0%.
18. Invoke Civil Accudraw.

19. Key in 8+00 for the Station and left click to confirm the End Point.

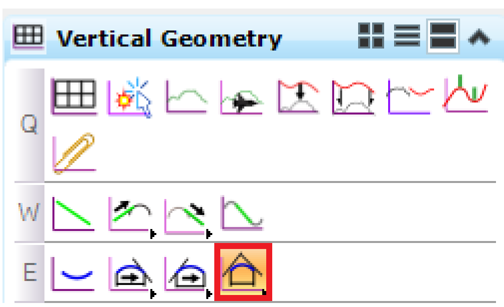


20. Turn Off Civil Accudraw. 

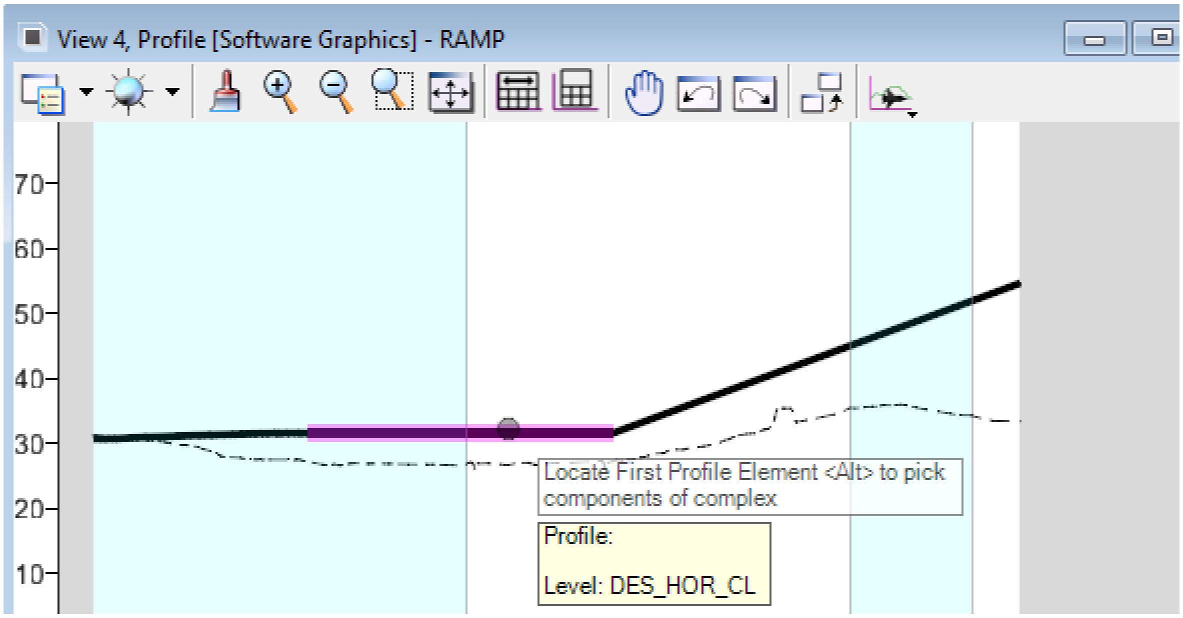
21. Using the same vertical command, draw a line between the end of this line and the point at the end of the Ramp profile. Note this point is a Profile Intersection of the Secondary Alignment. If we had placed the SecRd corridor already, it would be ideal to use the Profile from Surface command from the SecRd pavement so we could tie this profile to the SecRd EoP.



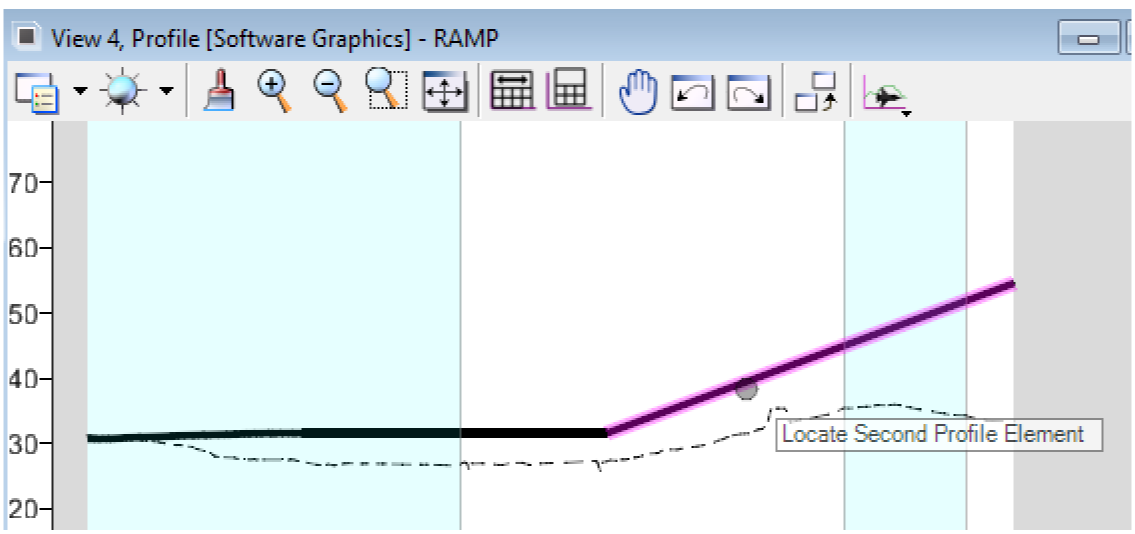
22. Select the Vertical Geometry command **Parabola Between Elements.**



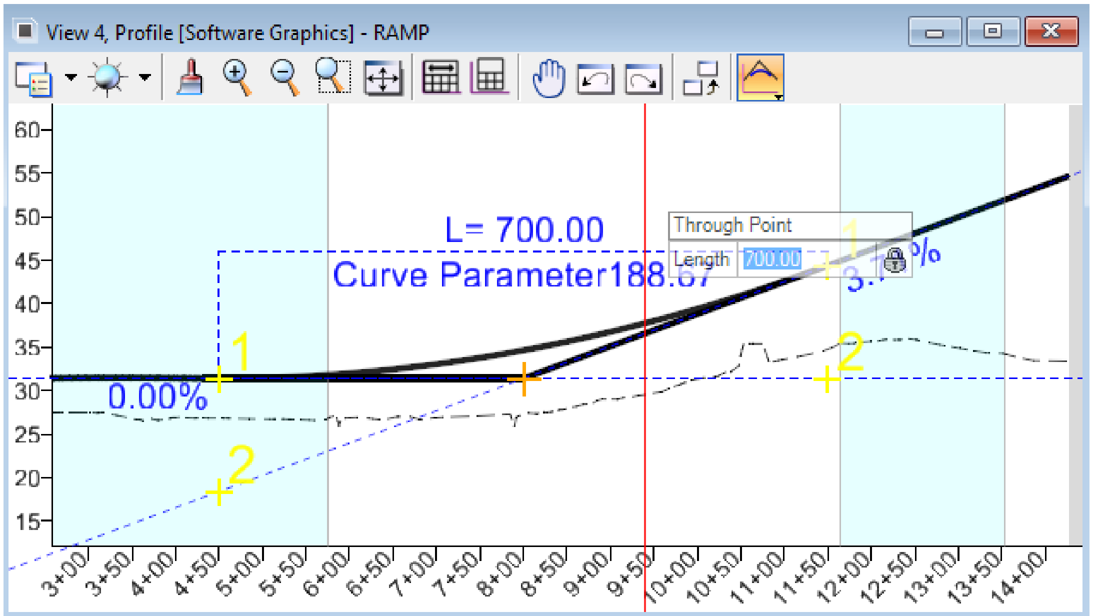
23. Continuing in View 4, select the 1st line placed in the steps above when prompted to **Locate First Profile Element.**



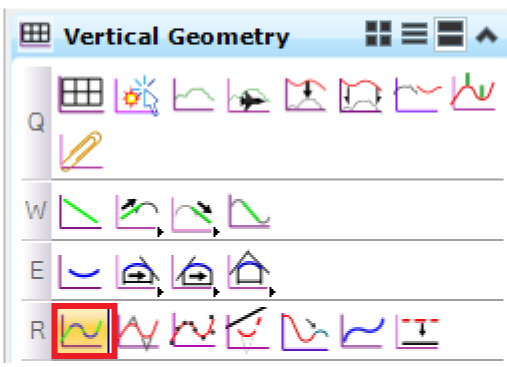
24. Locate the 2nd line placed in the steps above when prompted to **Locate Second Profile Element.**



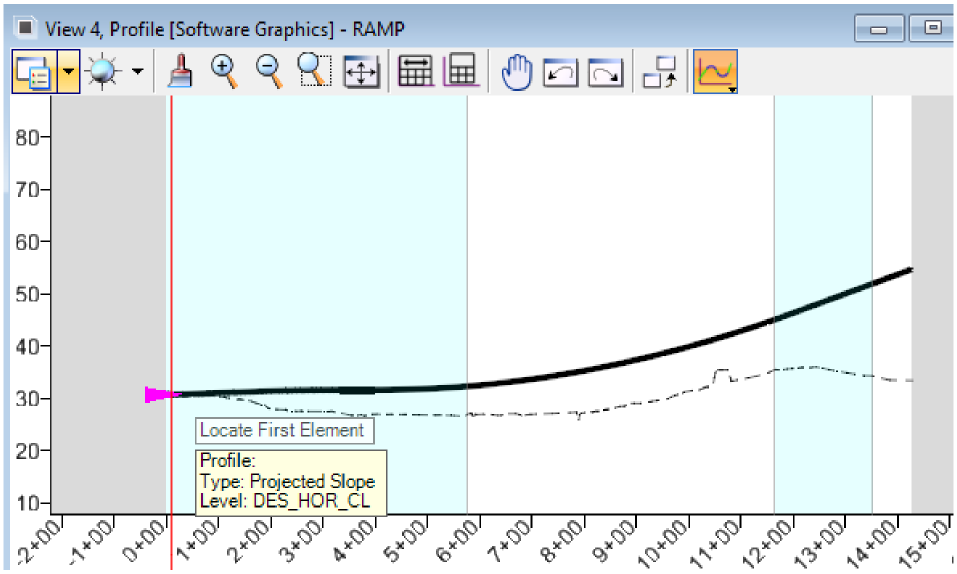
25. Place an **700’** Vertical curve and *Trim/Extend* **Both.**



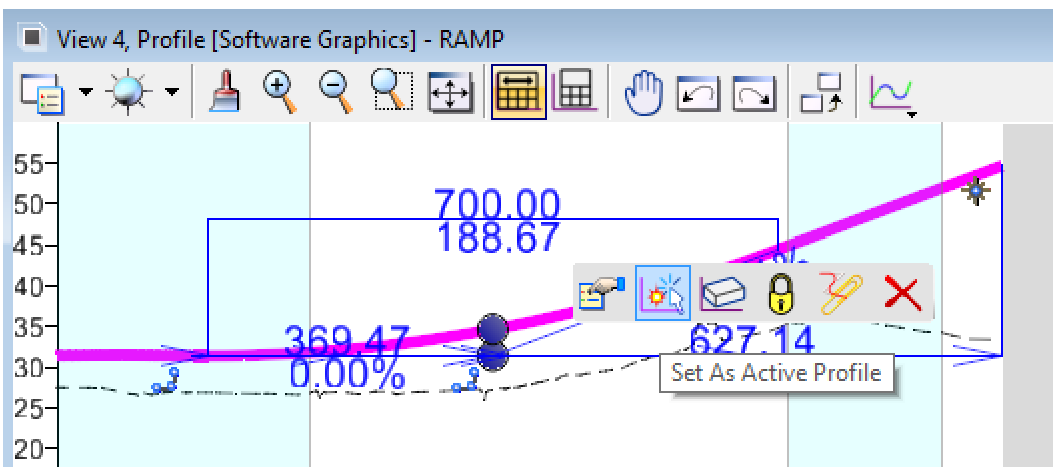
26. Select the Vertical Geometry command **Profile Complex By Elements.**



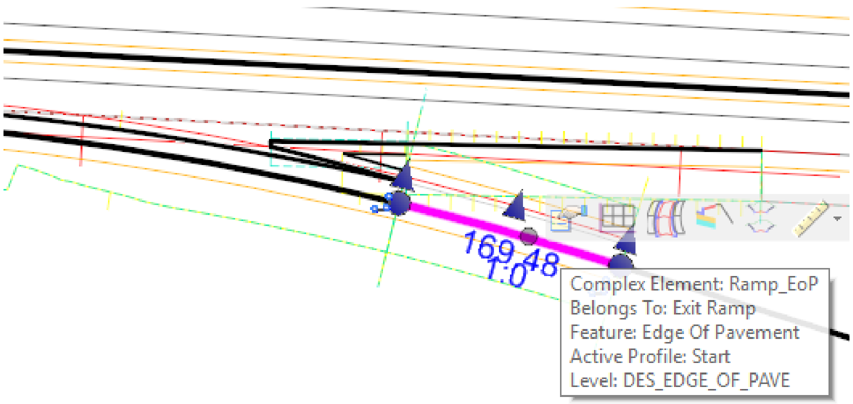
27. With the *Method* set to **Automatic**, hover over the beginning of the 1st projected element in View 4 and left click.



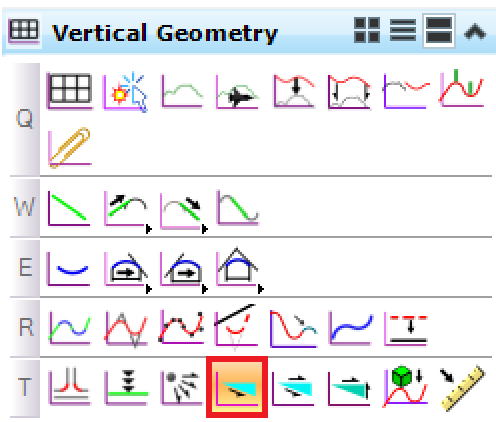
28. Left click again to confirm **Accept Complex.**
29. Select the complex element just created in View 4 and set it as the Active Profile.



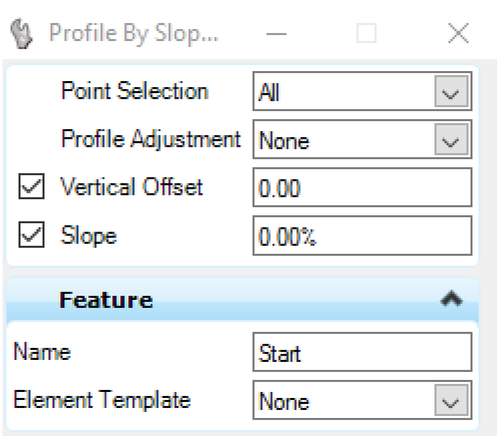
30. In View 1, hover over the area below and select **Ramp_EoP** which lies on top of the Ramp Ali. From the context menu, choose **Open Profile Model** and choose View 4 to open the profile in.



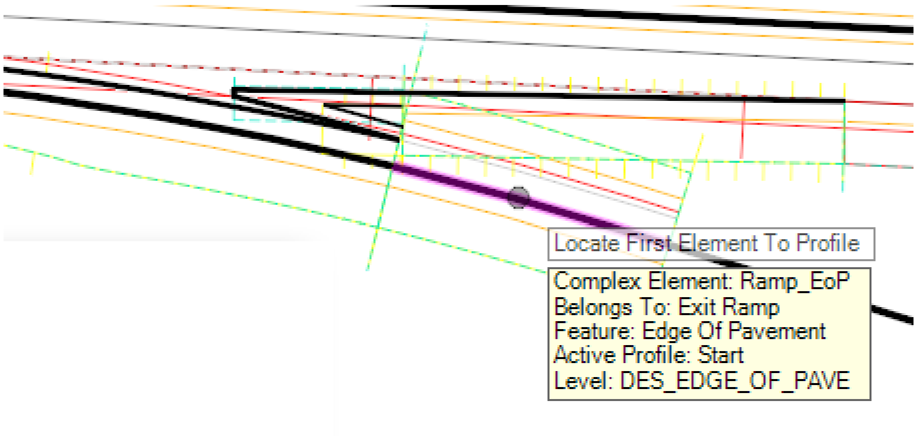
31. Select the Vertical Geometry Command **Profile By Slope From Element.**



32. Set the dialog as shown below.

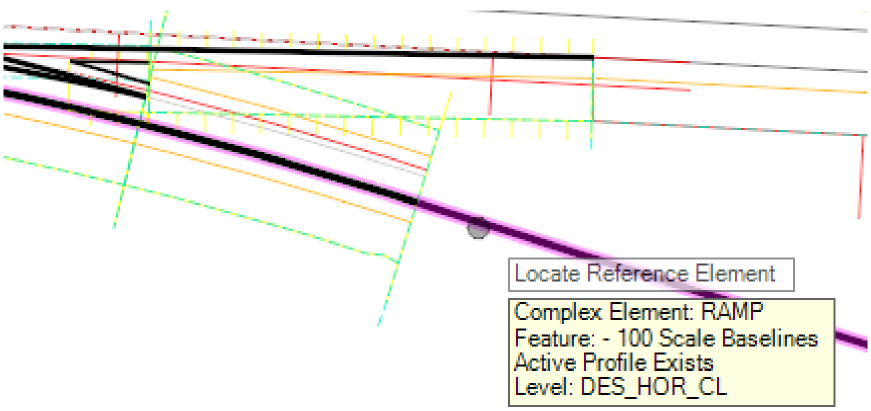


33. Select the **Ramp_EoP** when prompted to *Locate Plan Element To Profile.*



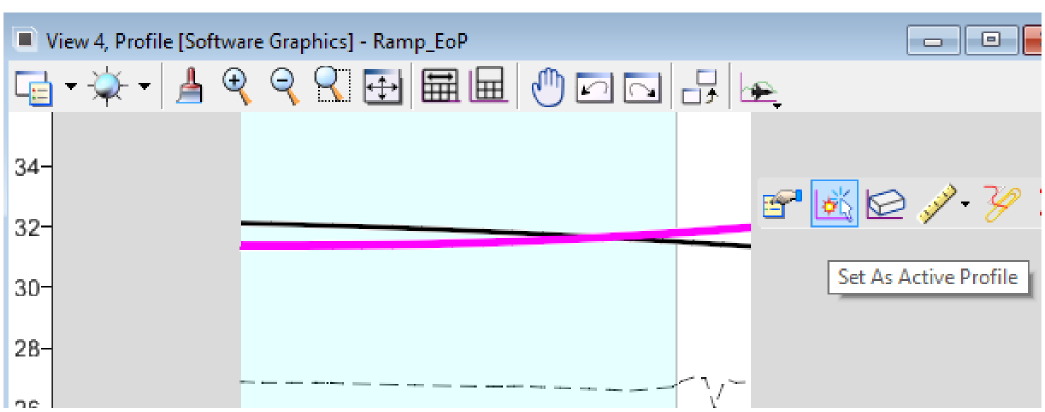
34. **Reset** when prompted to *Locate Next Element to Profile – Reset to Complete.*

35. Locate the **Ramp Alignment** when prompted to *Locate Reference Element.*

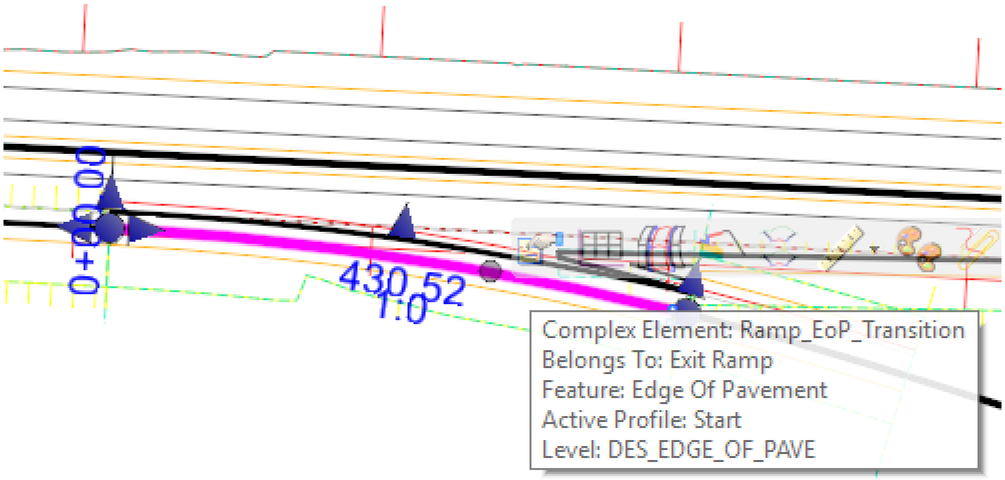


36. Confirm the remaining prompts with left clicks.

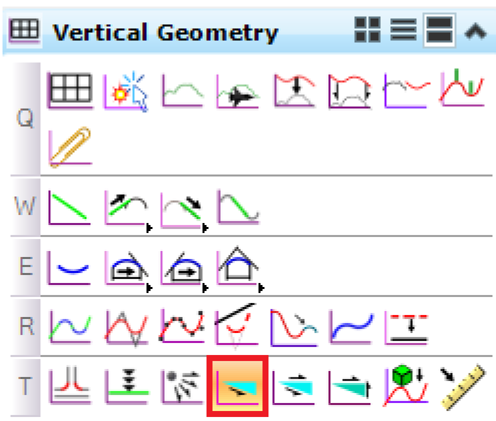
37. In the profile view, Make this projected profile active.



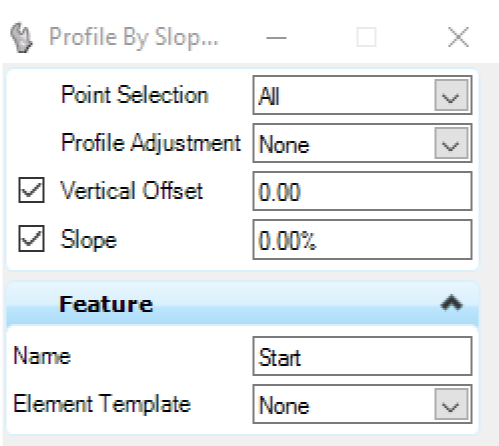
38. In View 1, hover over the area below and select **DNC_Ramp_EoP_Transition** which lies on top of the Ramp Ali. From the context menu, choose **Open Profile Model** and choose View 4 to open the profile in.



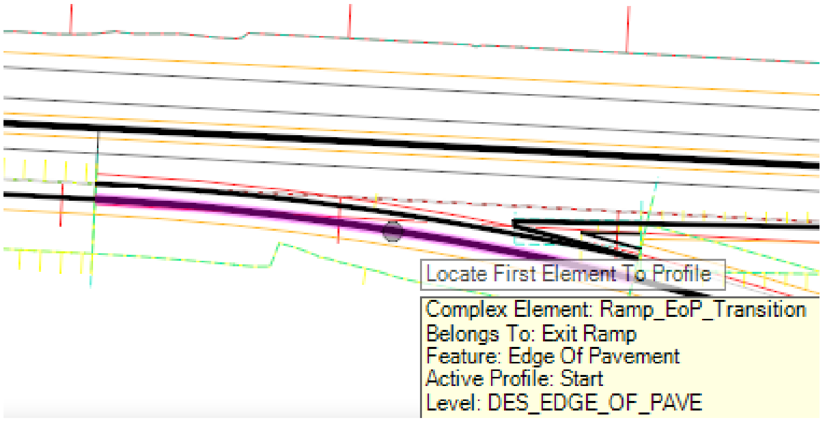
39. Select the Vertical Geometry Command **Profile By Slope From Element.**



40. Set the dialog as shown below.

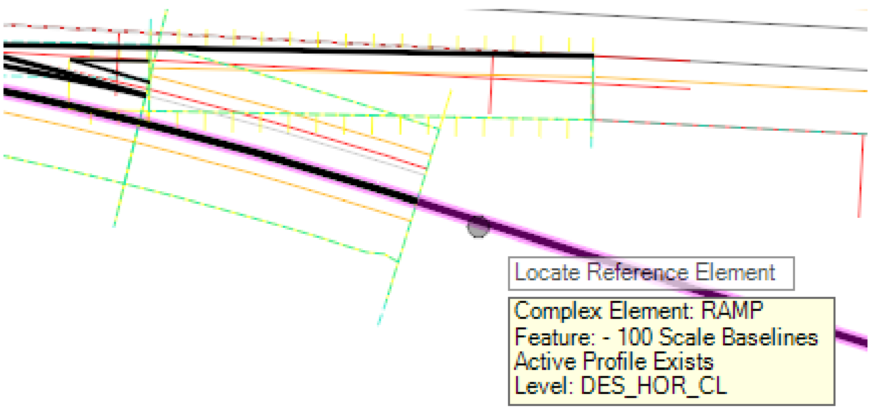


41. Select the **Ramp_EoP_Transition** when prompted to *Locate Plan Element To Profile.*



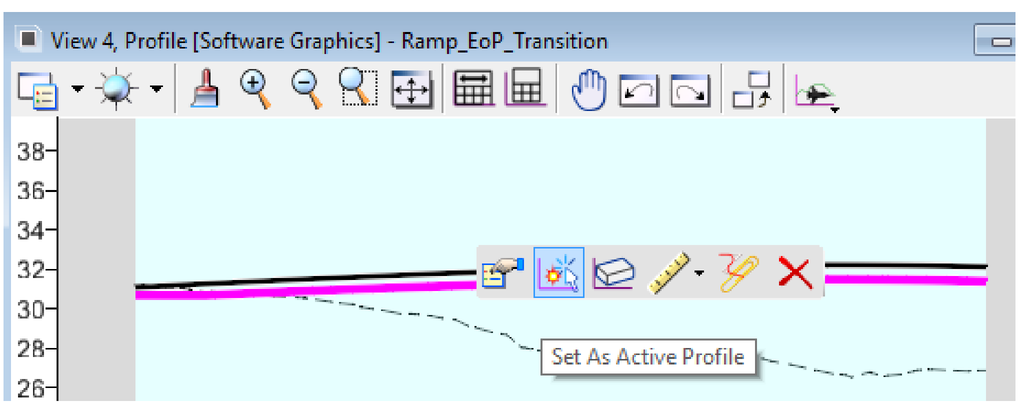
42. **Reset** when prompted to *Locate Next Element to Profile – Reset to Complete.*

43. Locate **the Ramp Alignment** when prompted to *Locate Reference Element.*



44. Confirm the remaining prompts with left clicks.

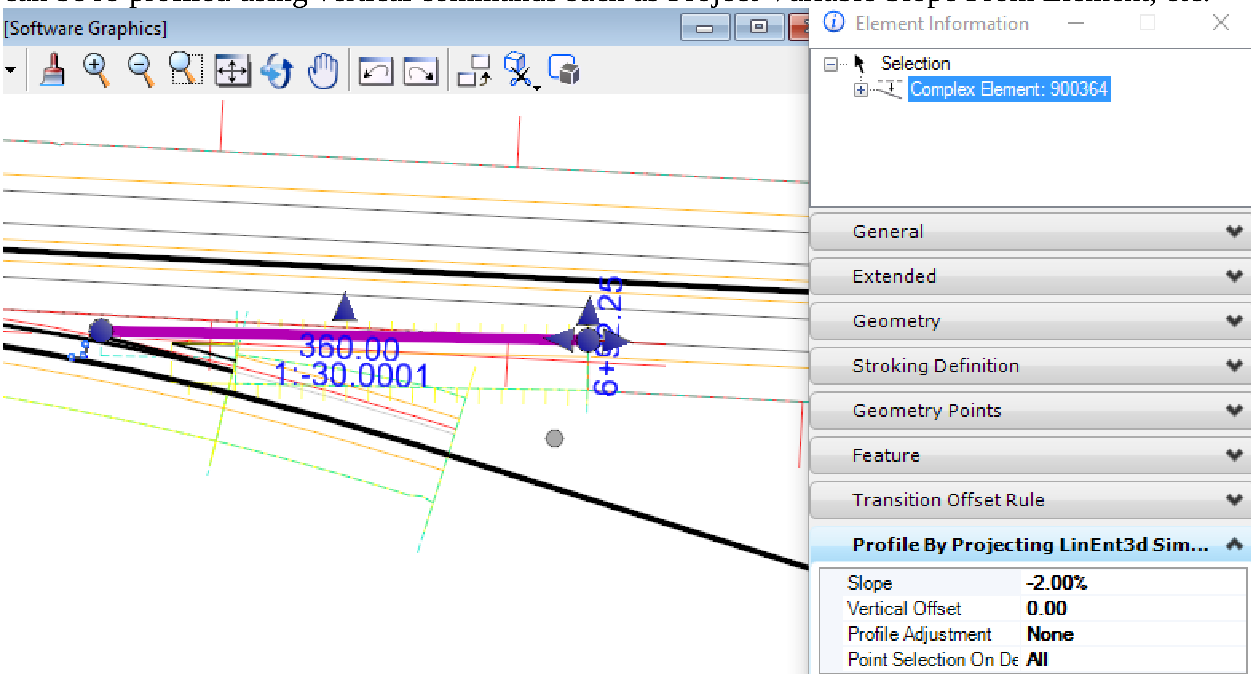
45. In the profile view, Make this projected profile active.



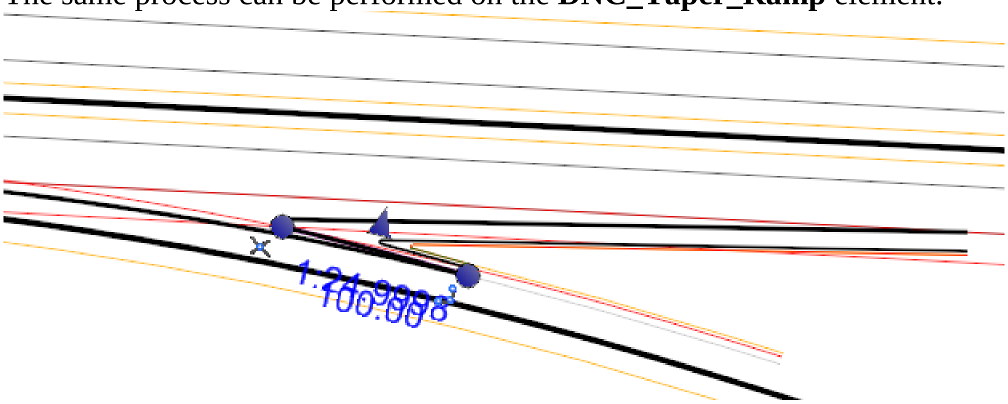
Templates within the civil cell are now controlled by the profile of the Ramp alignment.

11.7.8.5 TAPERS

The slope of the Re-Entry Taper past the gore can be edited heads up by selecting the **DNC_Taper_ML** element and changing the projected slope in Element Information or this taper can be re-profiled using vertical commands such as Project Variable Slope From Element, etc.

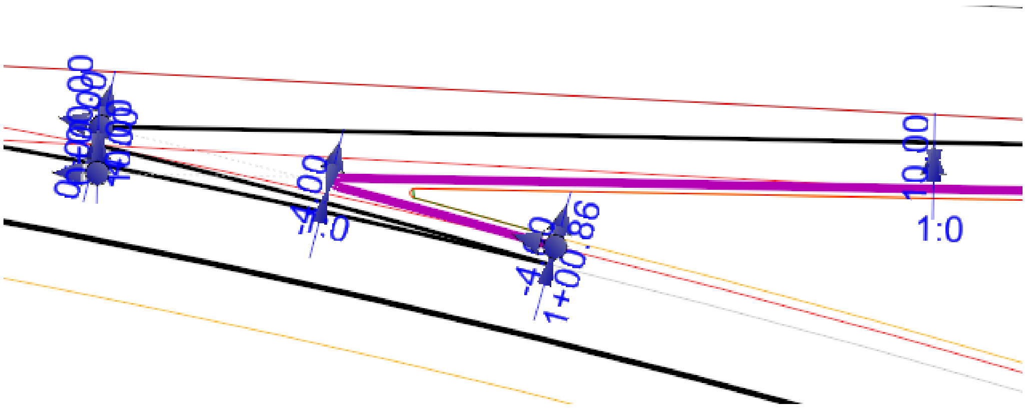


The same process can be performed on the **DNC_Taper_Ramp** element.



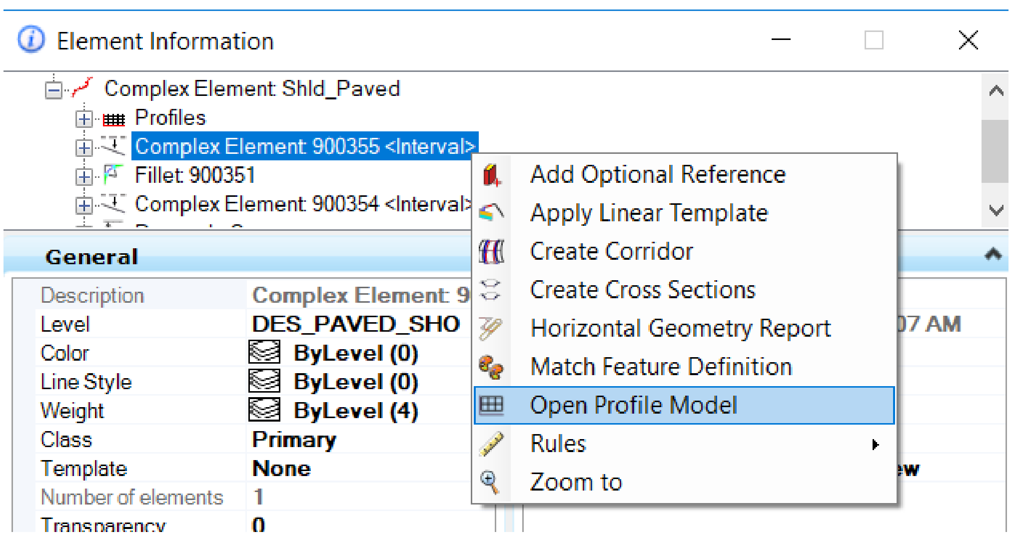
11.7.8.6 SHOULDERS

1. Select the **Shld_Paved** element.

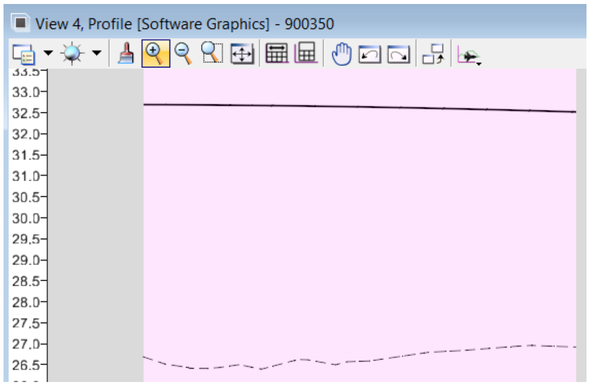


2. Invoke **Element Information.**

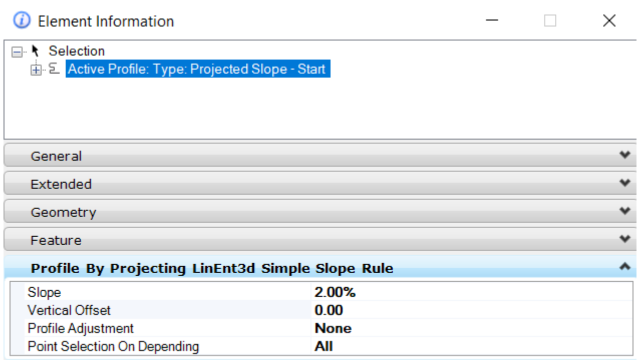
3. Expand the Complex Element, right click the **1st Complex Element <Interval>** in the list of three element elements, and choose **Open Profile Model.**



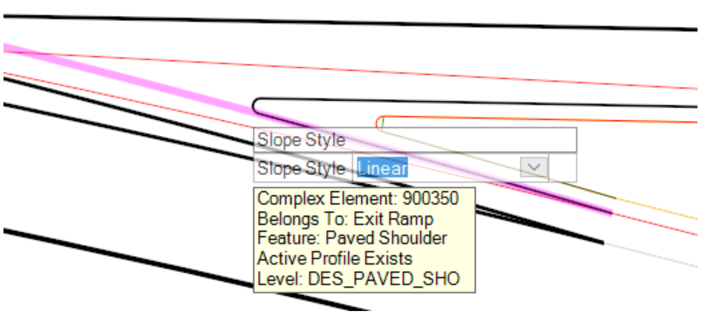
4. Open the profile in View 4.



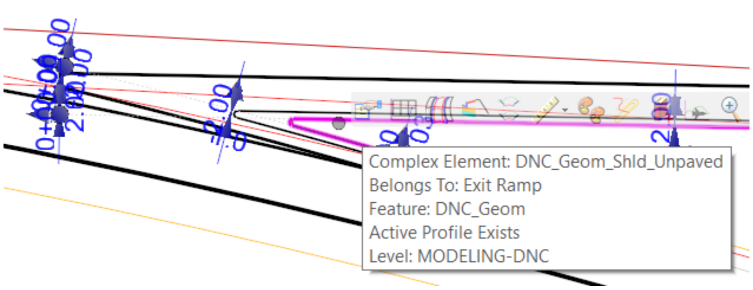
5. Select the profile and observe the slope projection can be edited in Element Information.



6. The element can also be re-profiled using one of the project slope commands and by selecting the parent of the interval as the element to be profiled.

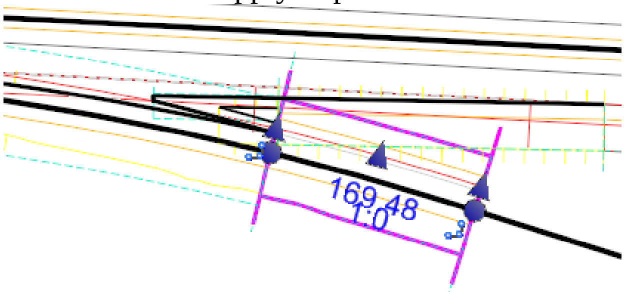


7. The DNC_Geom_Shld_Unpaved element can be selected and re-profiled similarly.



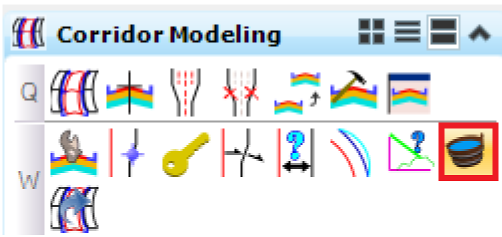
11.7.8.7 APPLYING SUPERELEVATION

We now need to apply Superelevation to the corridor shown below.

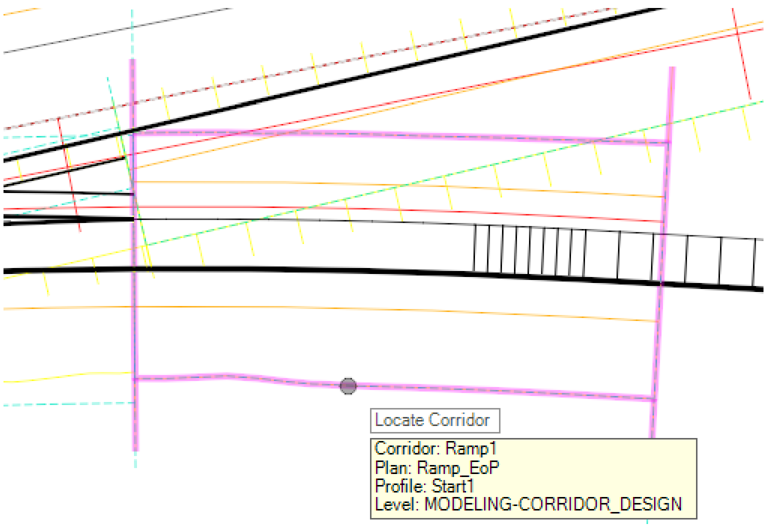


At this time, the software does not allow the referenced Superelevation calculated about the Ramp alignment to be applied to the embedded civil cell alignment named Ramp_EoP. The user could calculate the Superelevation in the corridor file and apply the Superelevation as a point control. Another method is to apply Parametric Constraints to control the pavement slope of this corridor since this is just a short section. We'll Apply Parametric Constraints in this exercise.

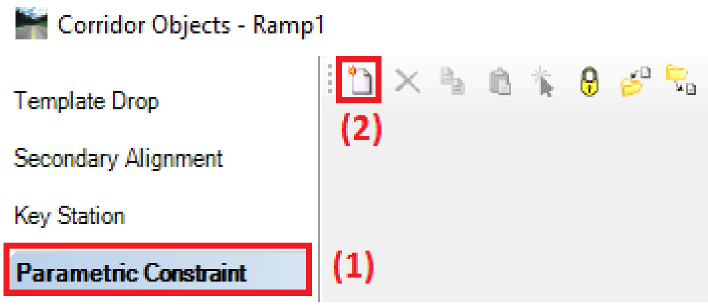
1. Select Corridor Objects from the Corridor Modeling task.



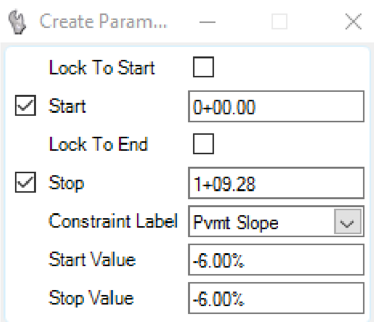
2. Locate the **Ramp1** Corridor.

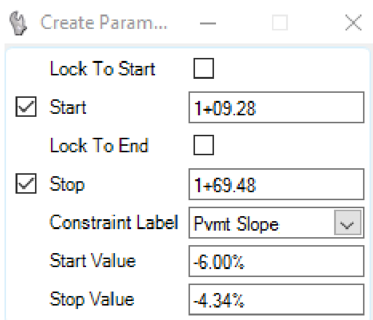


3. Select **Parametric Constraints** on the *Corridor Objects* dialog and then choose **New.**



4. Choose the *Constraint Label* **Pavt Slope_L** and create the following Parametric Constraints.

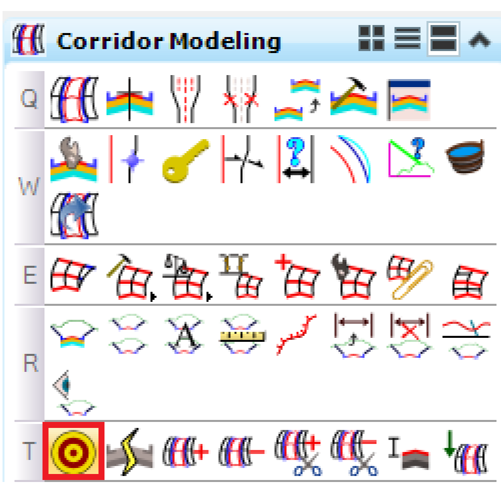




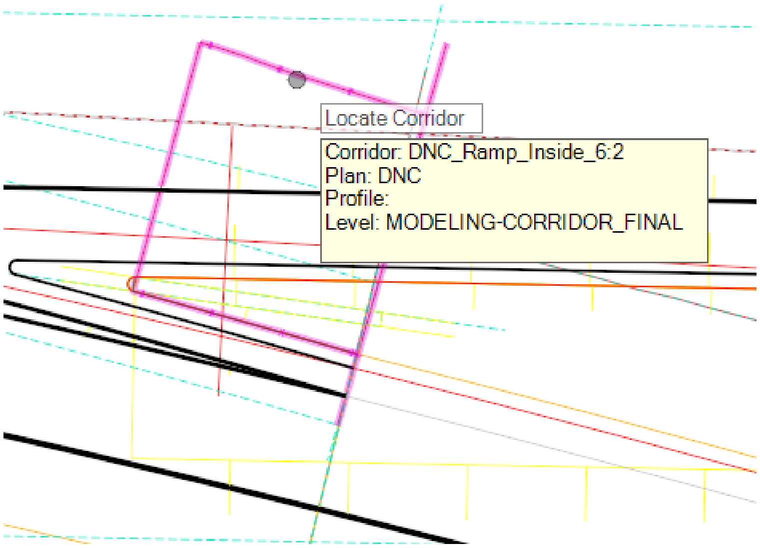
11.7.9 Target Aliasing & Clipping

Next, we will define Target Aliasing and Clipping References for the area behind the gore.

1. Select the **Define Target Aliasing** command from the *Corridor Modeling dialog.*



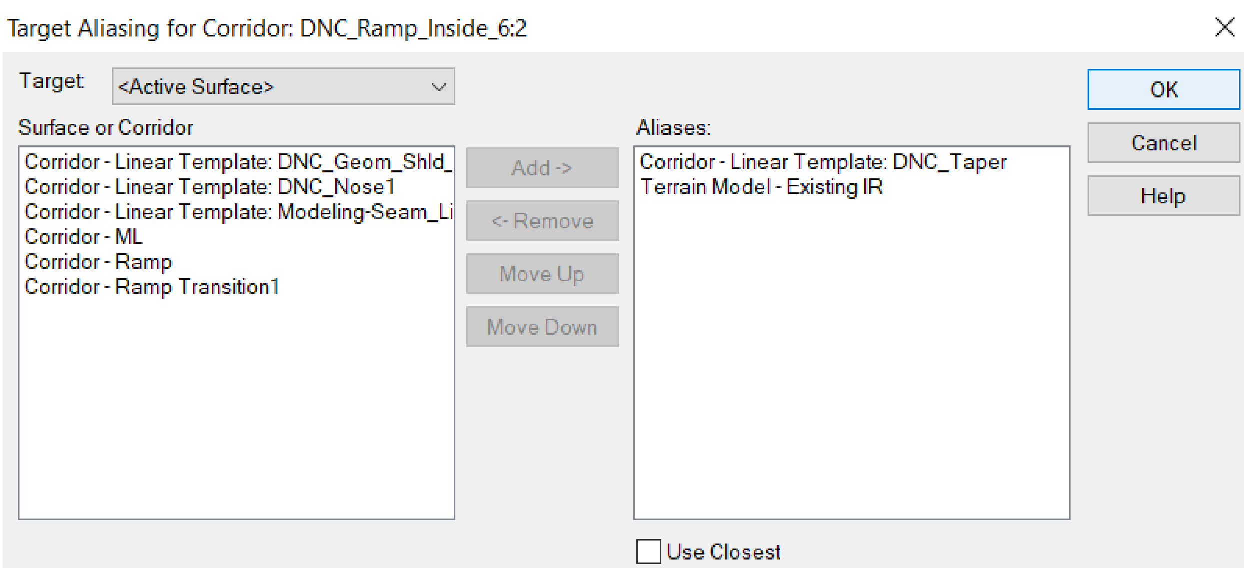
2. Select the **DNC_Ramp_Inside** element as shown below.



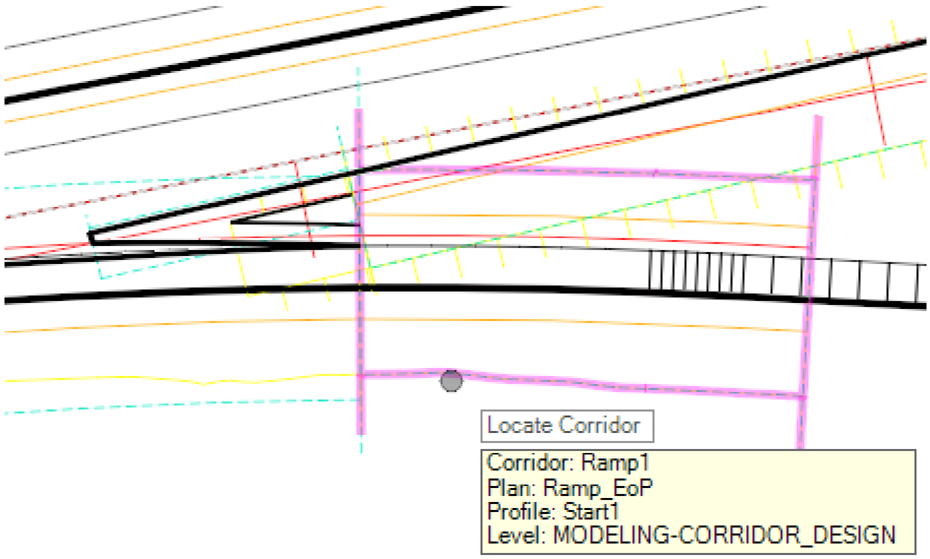
3. Select:

   a. The Corridor – Linear Template DNC_Taper, choose Add.

   b. The **Existing IR** terrain model and choose Add. The Target aliasing dialog should appear as shown below.



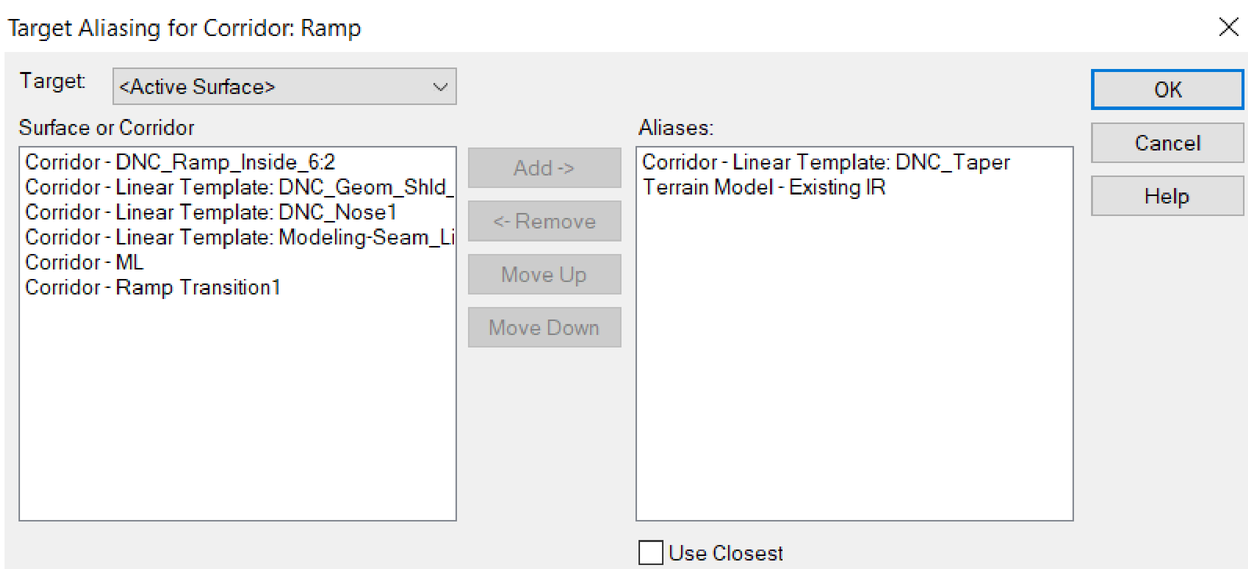
4. Remaining in the same command, Select the **Ramp** corridor when prompted to *Locate Corridor*.



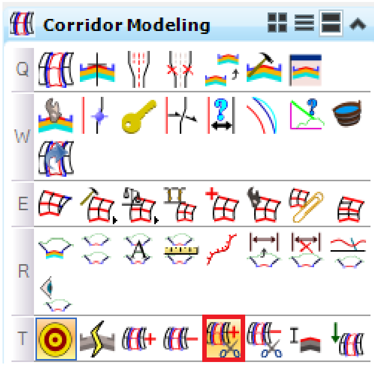
5. Select:

   a. The Corridor – Linear Template DNC_Taper, choose Add.

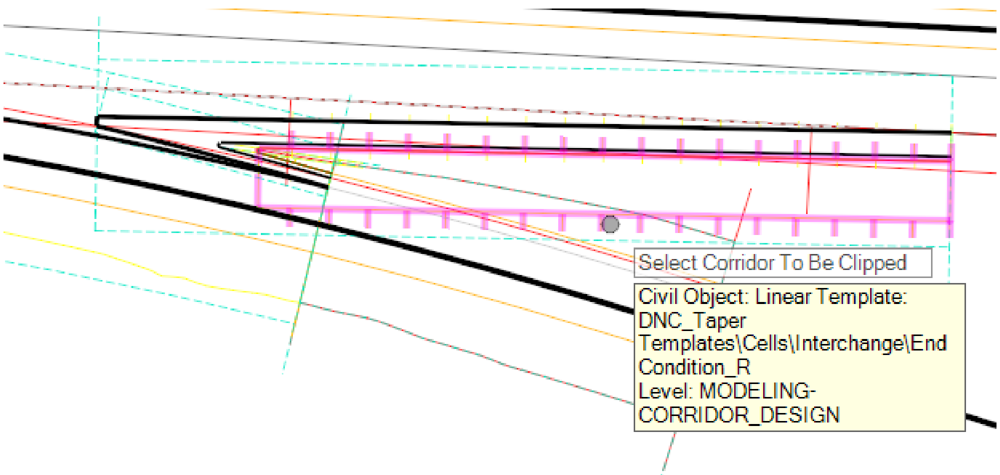
   b. The **Existing IR** terrain model and choose Add. The Target aliasing dialog should appear as shown below.



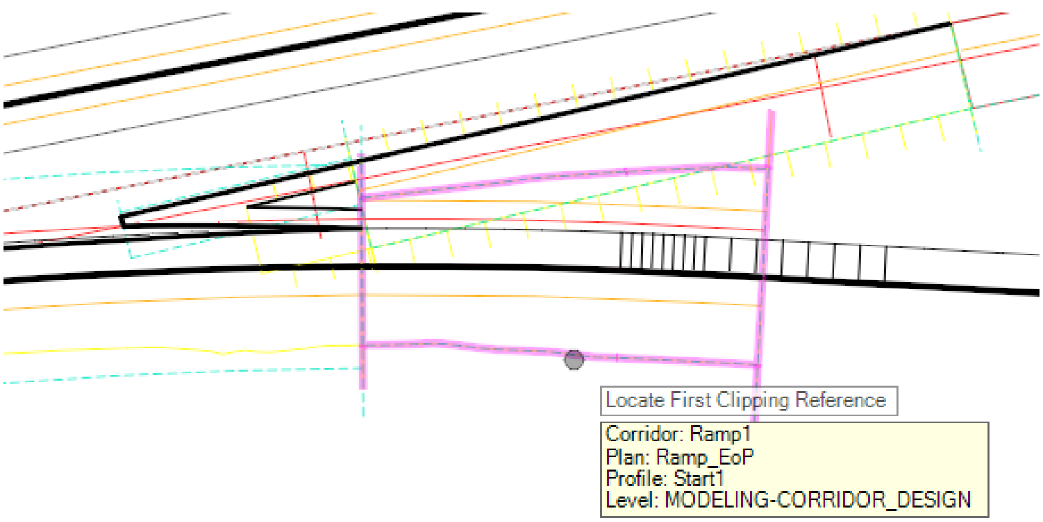
6. Select the Add Clipping Reference from the Corridor Modeling task.



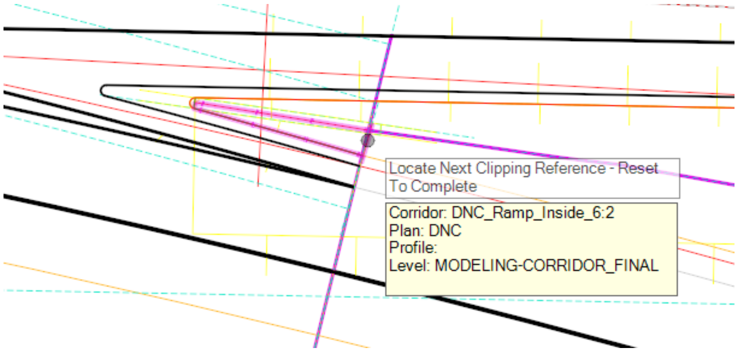
7. Select the **DNC_Taper** Civil Object when prompted to *Select the Corridor To Be Clipped.*



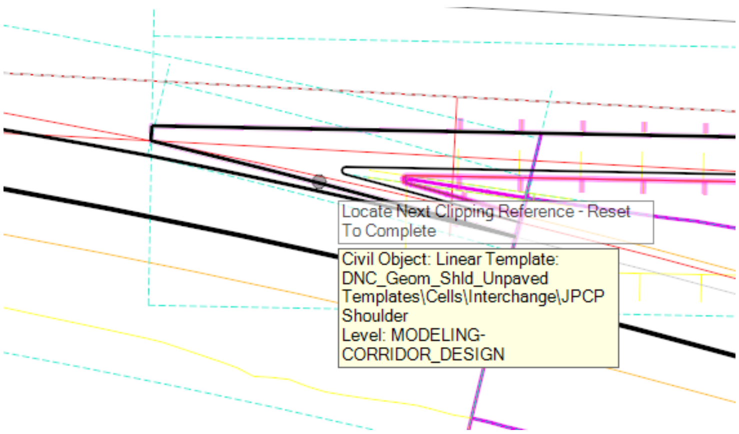
8. Select the **Ramp** corridor when prompted to *Locate First Clipping Reference.*



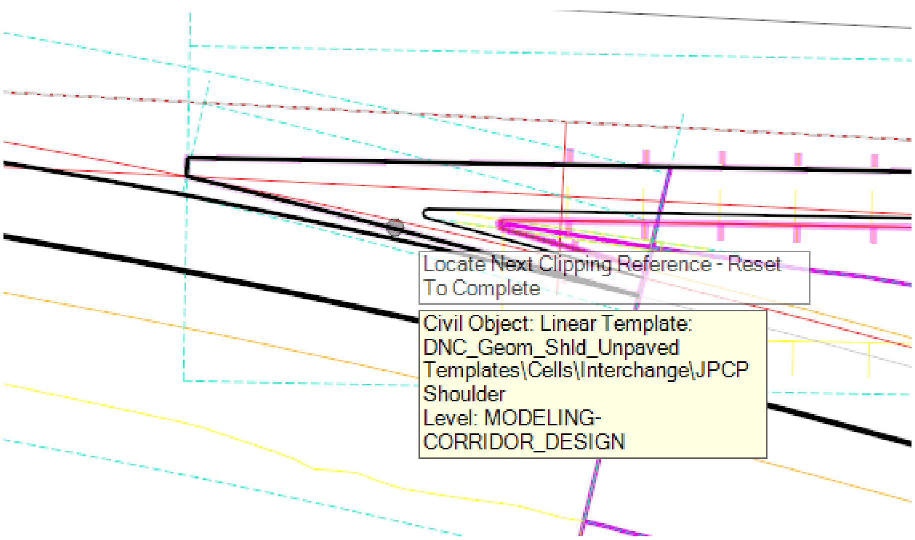
a. Select the **DNC_Ramp_Inside_6:2** element when prompted to *Locate Next Clipping Reference.*



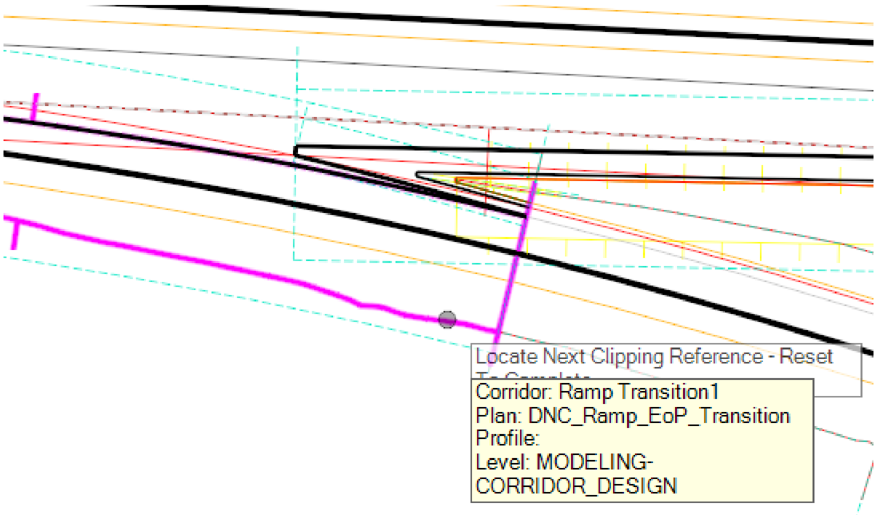
b. Select the **DNC_Geom_Shld_Unpaved** element when prompted to *Locate Next Clipping Reference.*



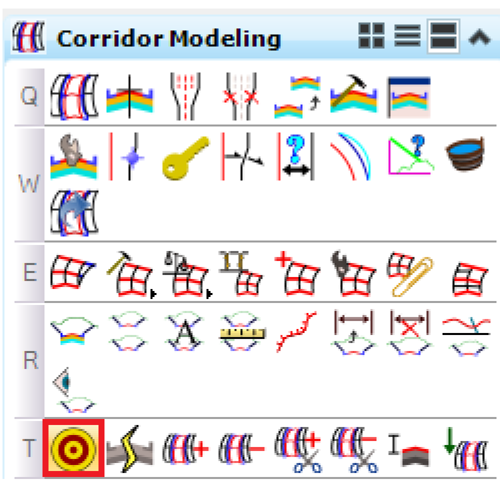
c. Select the **DNC_Geom_Shld_Unpaved** element when prompted to *Locate Next Clipping Reference.*



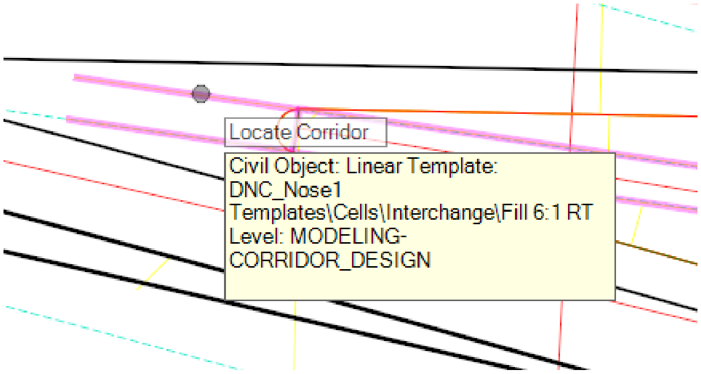
d. Select the **DNC_Ramp_EoP_Transition** element when prompted to *Locate Next Clipping Reference.*



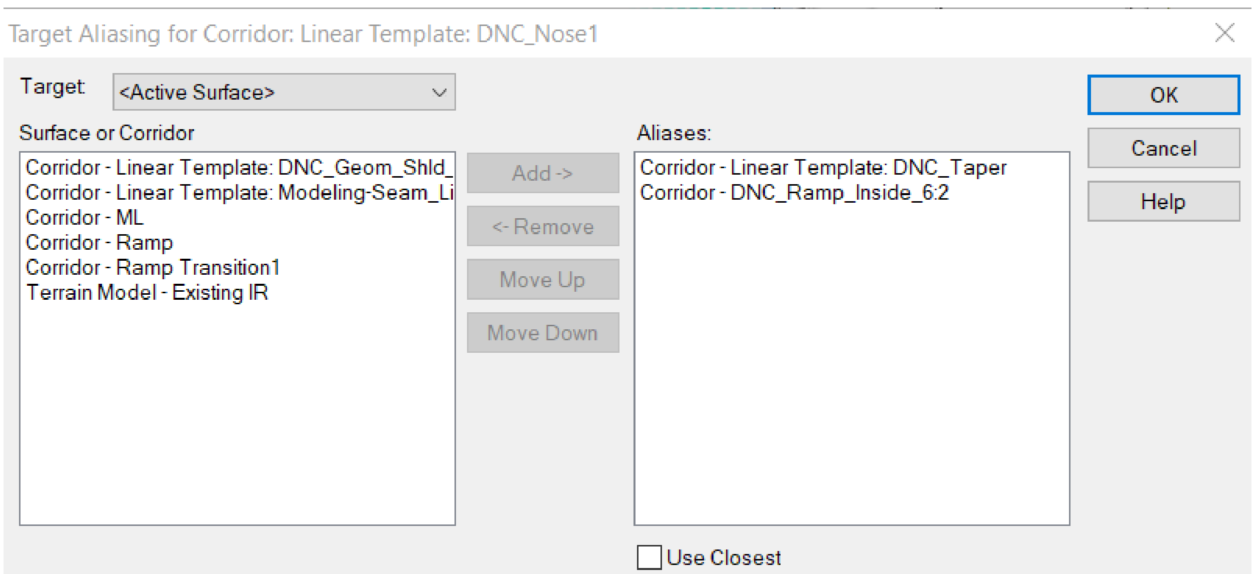
9. Right Click when prompted to *Locate Next Clipping Reference – Reset to Complete.*
10. Select the **Define Target Aliasing** command again from the *Corridor Modeling dialog.*



11. Select the **DNC_Ramp_Inside** element as shown below.

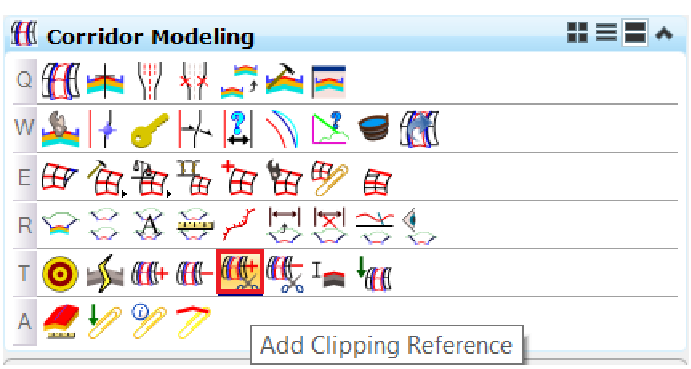


12. Select the following elements and tag OK:
    a. The Corridor – Linear Template DNC_Taper, choose Add.
    b. The Corridor – DNC_Ramp_Inside_6:2, choose Add.

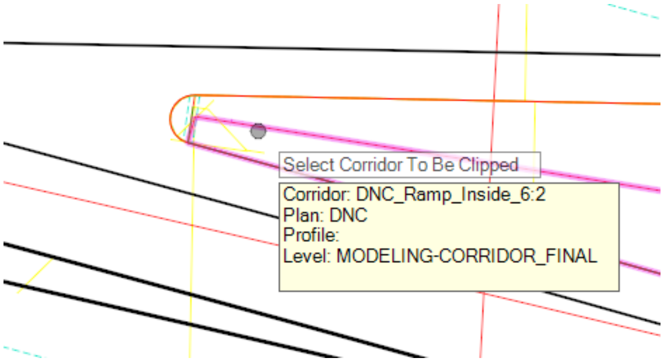


NOTE: A Parametric Constraint can be applied to this linear template to control the Fill Slope.

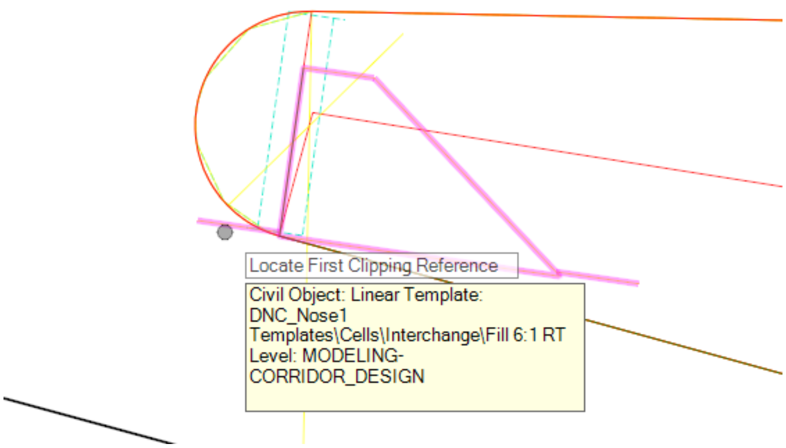
13. Select the **Add Clipping Reference** command again.



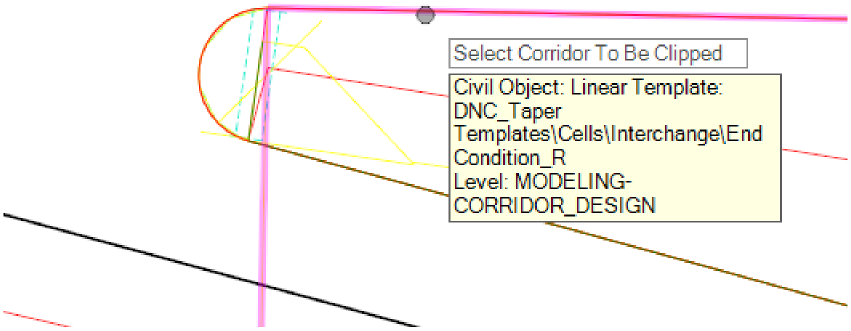
14. Select the element below when prompted to *Select Corridor To Be Clipped.*



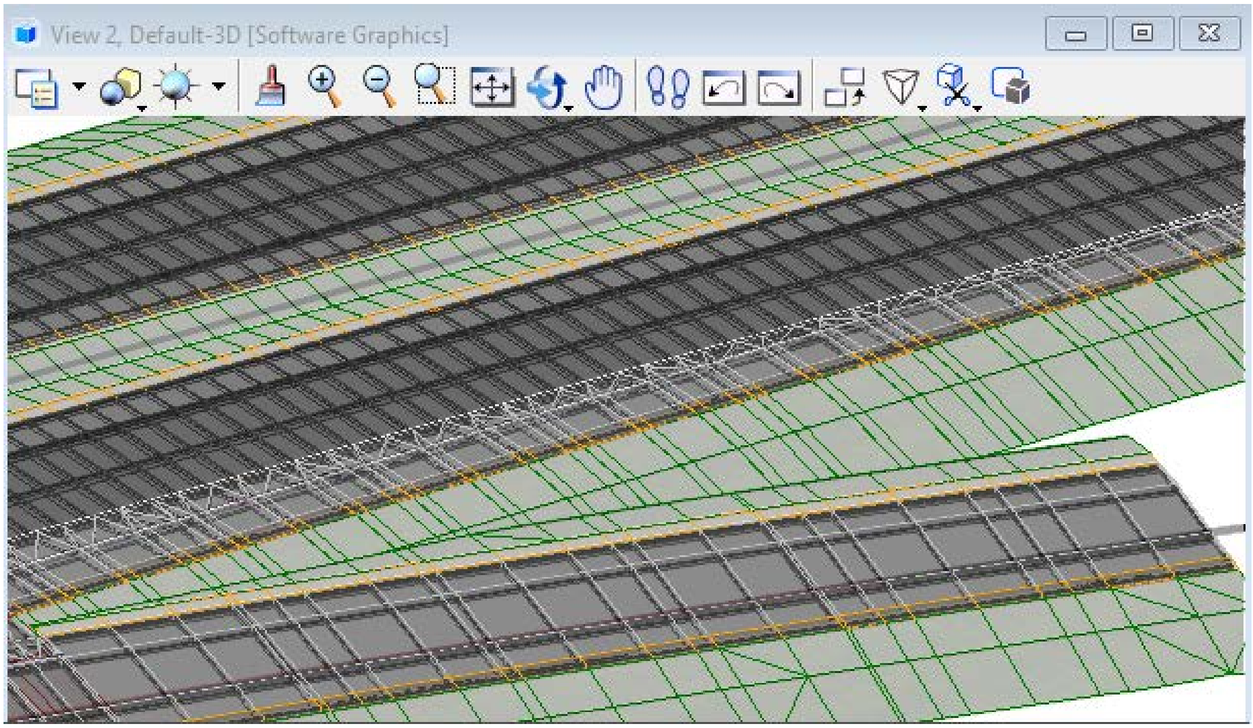
15. Select the **DNC_Nose** linear template when prompted to *Locate First Clipping Reference.*



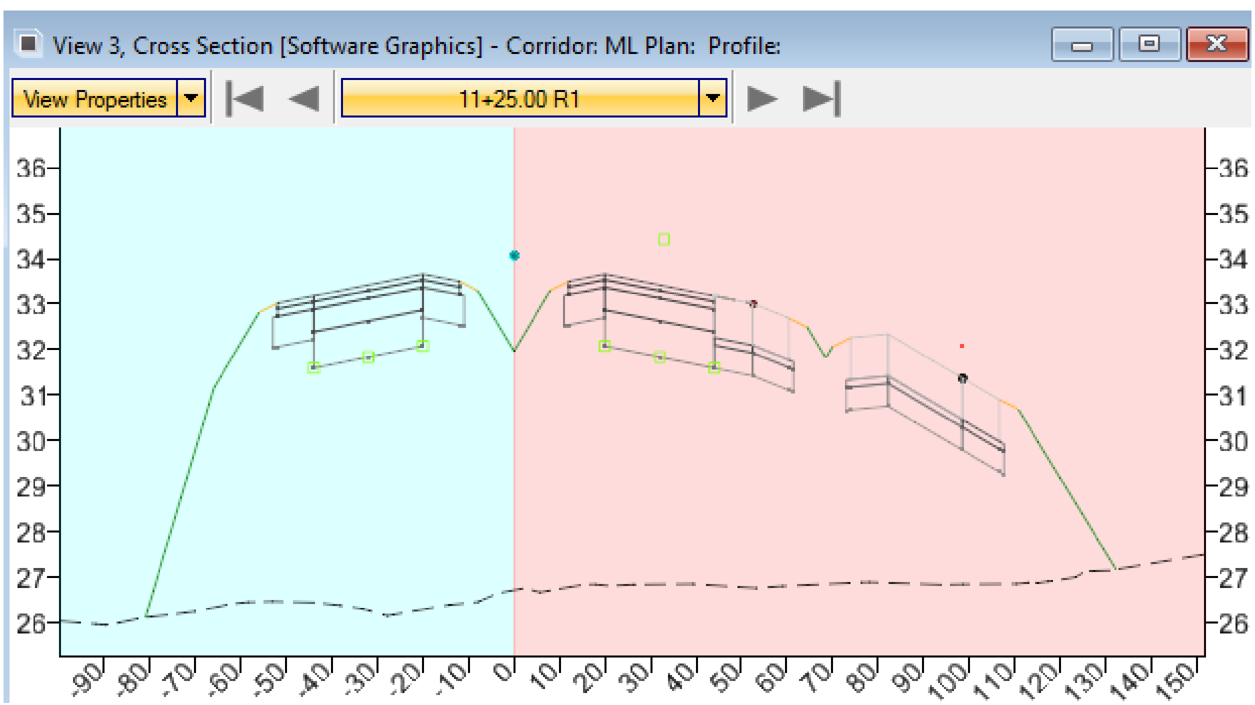
16. Perform the same process (Add Clipping Reference) on the following element.



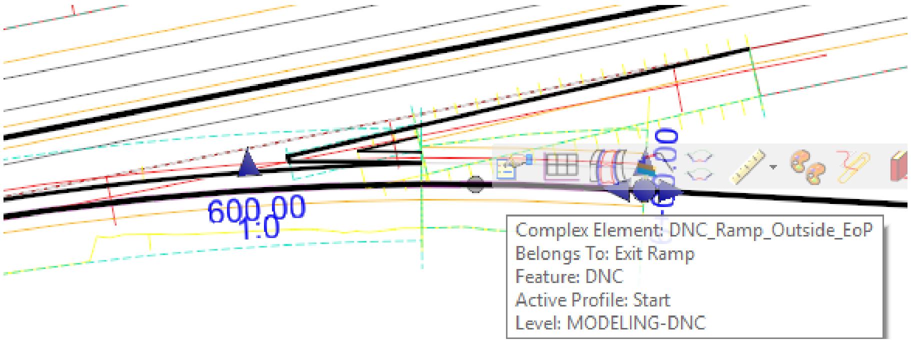
17. In View 2, review the area behind the gore to ensure the elements were targeted and clipped properly.



Open the cross-section view of the ML corridor to review as well. See station 11+25 below.



18. Next, we could change the length of the element shown below to make the Ramp corridor end closer or at the location where it no longer targets the Taper corridor and then add a template with a normal end condition for the remainder of the ramp. We will not in this exercise.

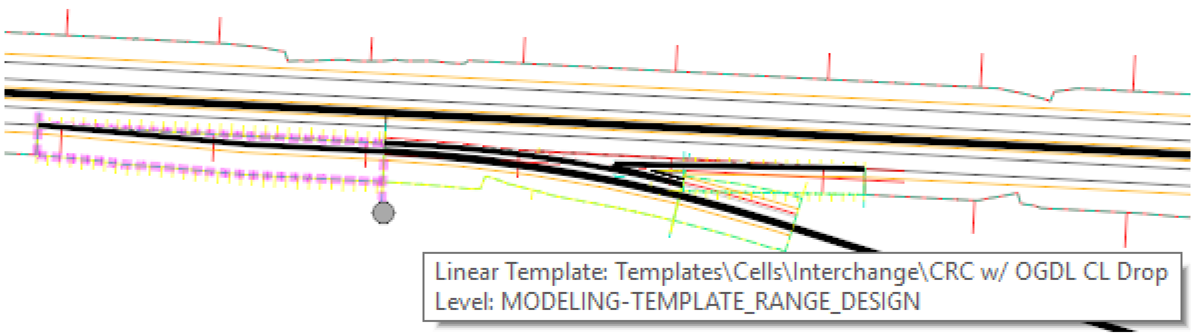


11.7.10 Template Edits

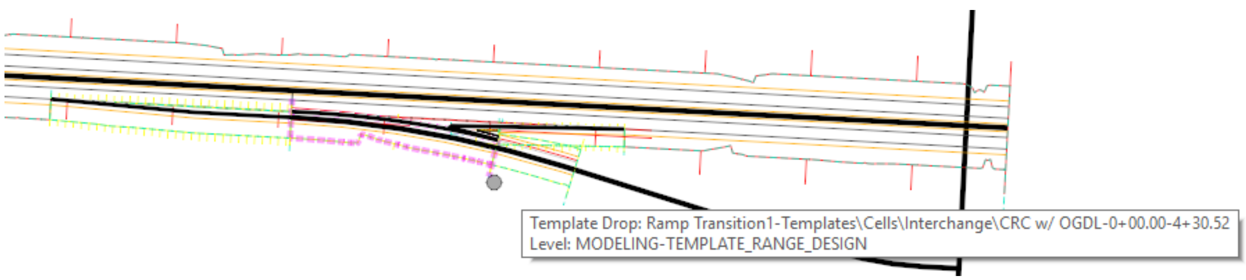
The linear templates used in the Exit Ramp Civil Cell are highlighted in the images below. We will show the various tools in this section available for use and related to Linear and Surface Templates but no changes will be made in this exercise and you would need to refer to section 11.3.10 for examples of actually making edits.

11.7.10.1 LINEAR TEMPLATES

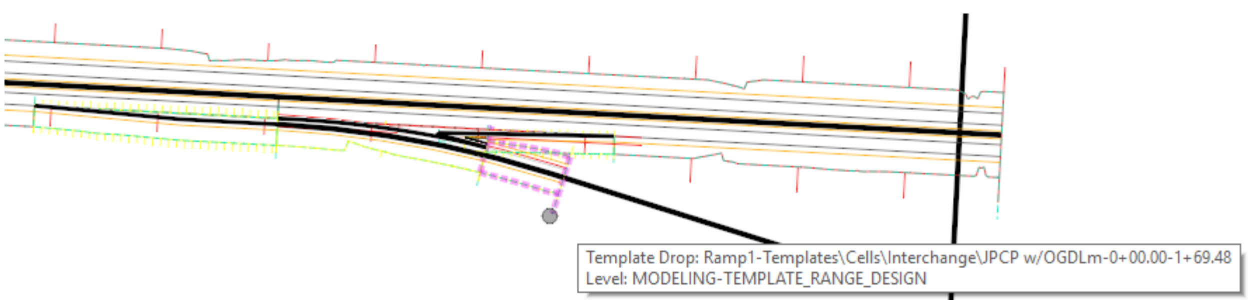
1. Taper/Storage



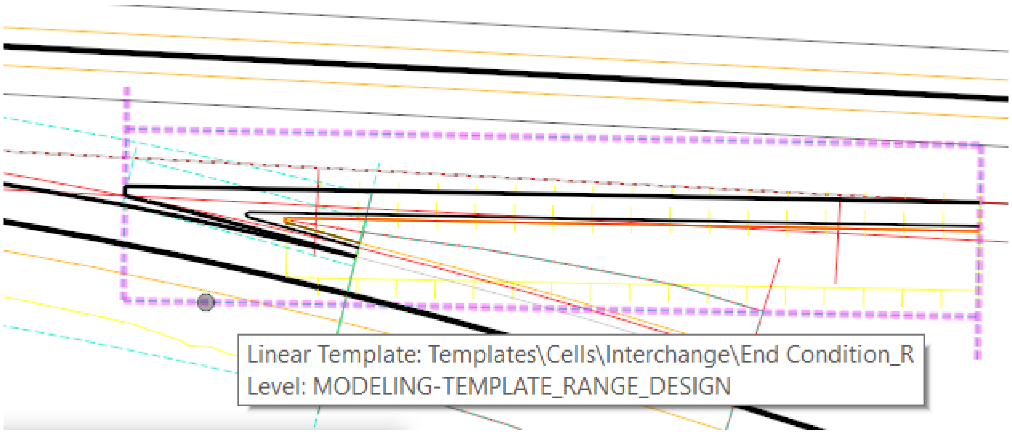
2. Ramp Transition



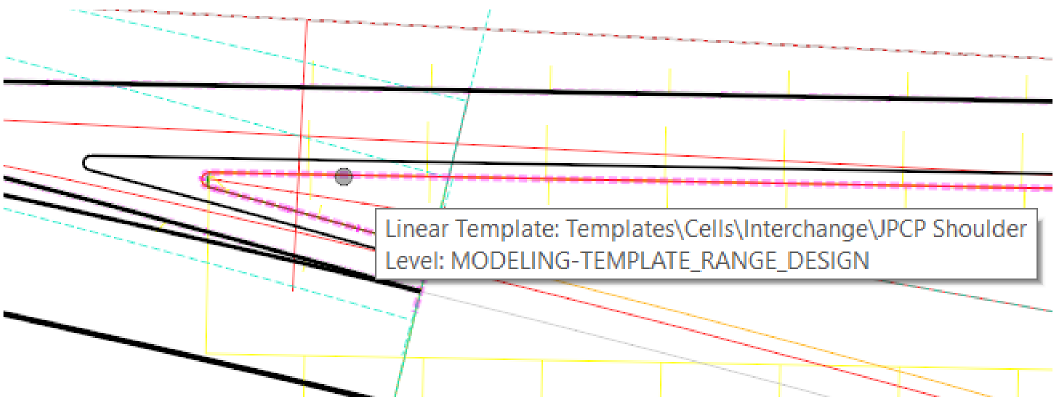
3. Ramp1



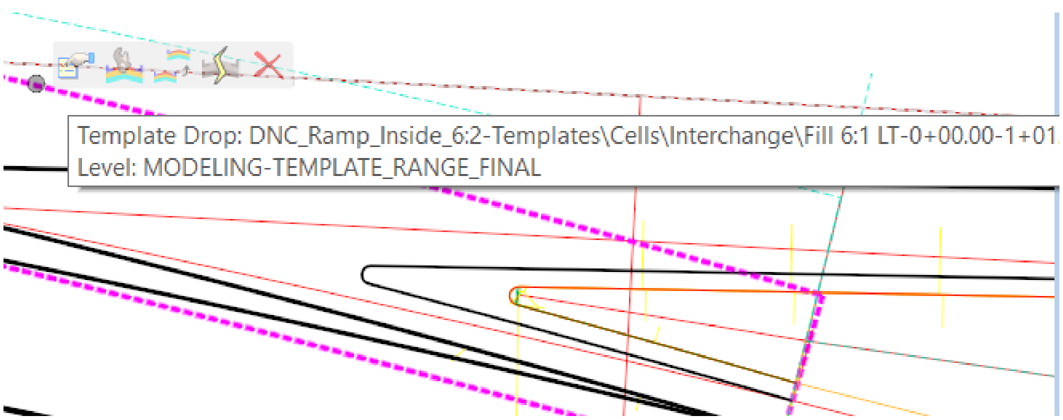
4. Re-Entry Taper



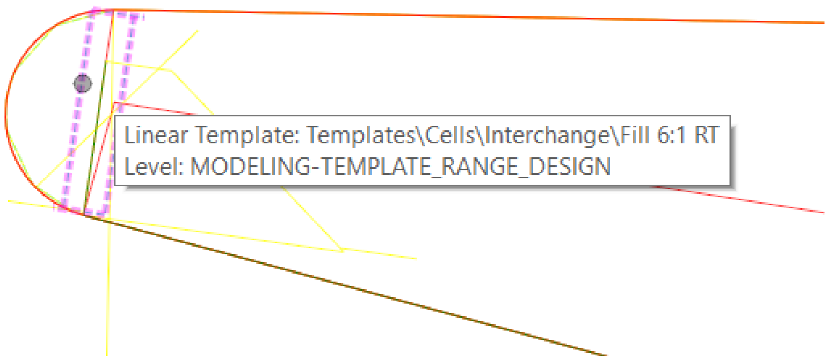
5. Shoulder area behind Gore (Draws entire shoulder area behind gore with point controls to the Paved and Unpaved shoulder geometry.



6. Fill 6:1 off the Ramp Inside Shoulder.

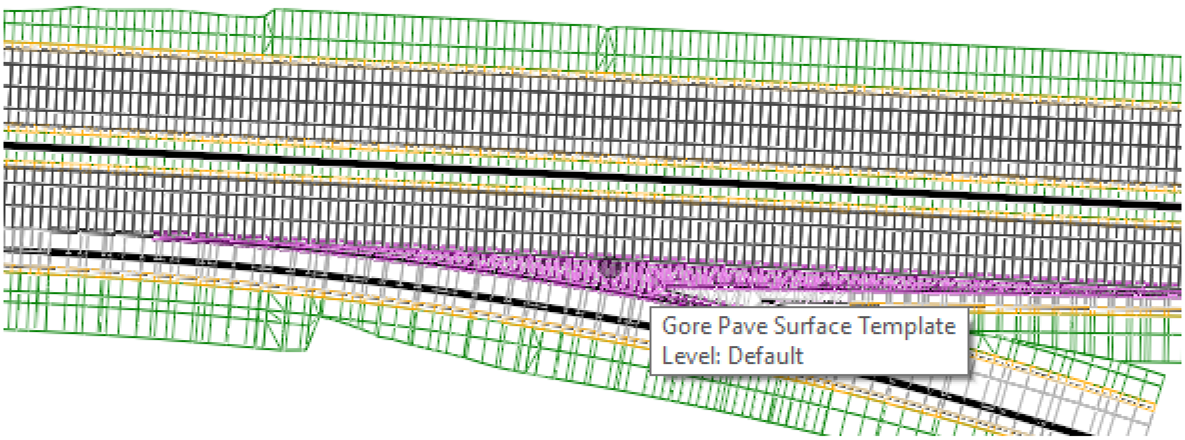


7. In the Nose area.

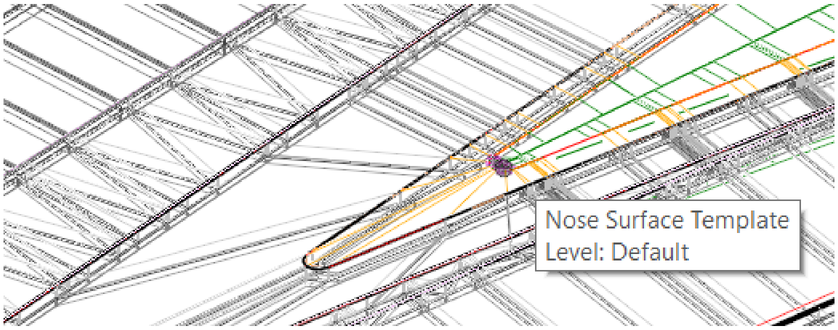


11.7.10.2 SURFACE TEMPLATES

1. Gore Pave



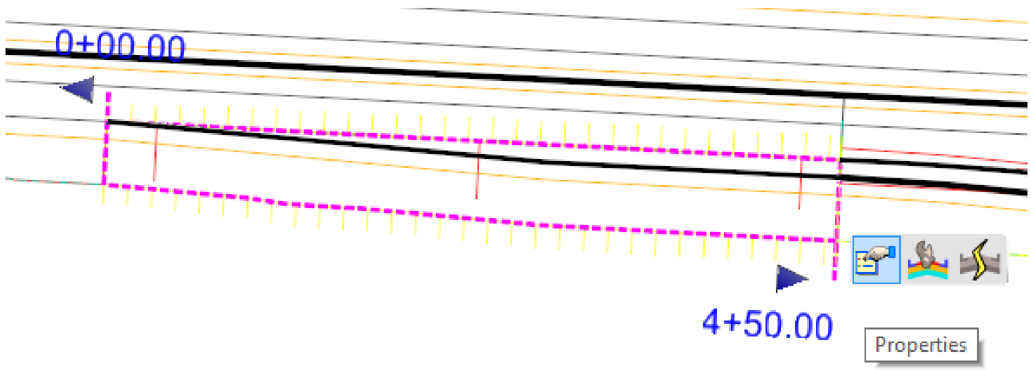
2. Nose



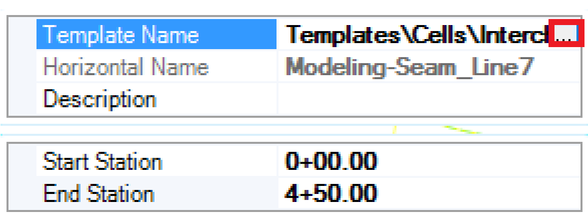
11.7.10.3 PROPERTIES

To re-direct these linear templates to different ones in the ITL.

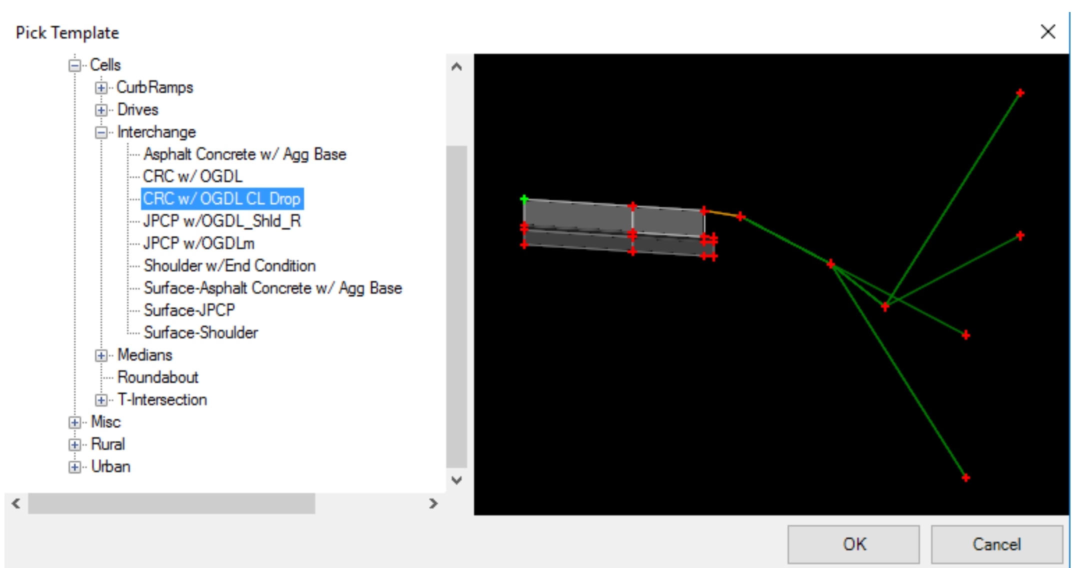
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Linear template used in the non-nose area of the Raised Median Civil Cells is shown below. Although we will not replace this template in this exercise, you would choose a template from the **Pick Template** dialog if you wanted to replace the given template.

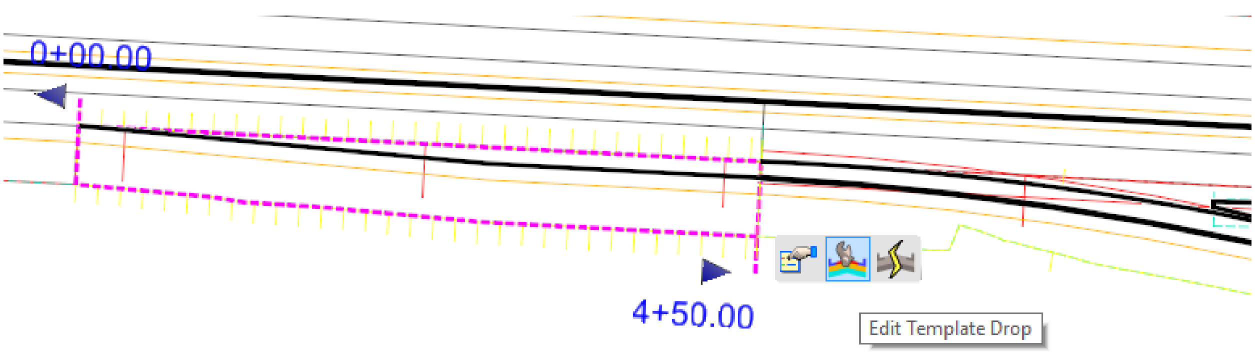


4. Tag **Cancel** *(OK if you actually change the template.)*

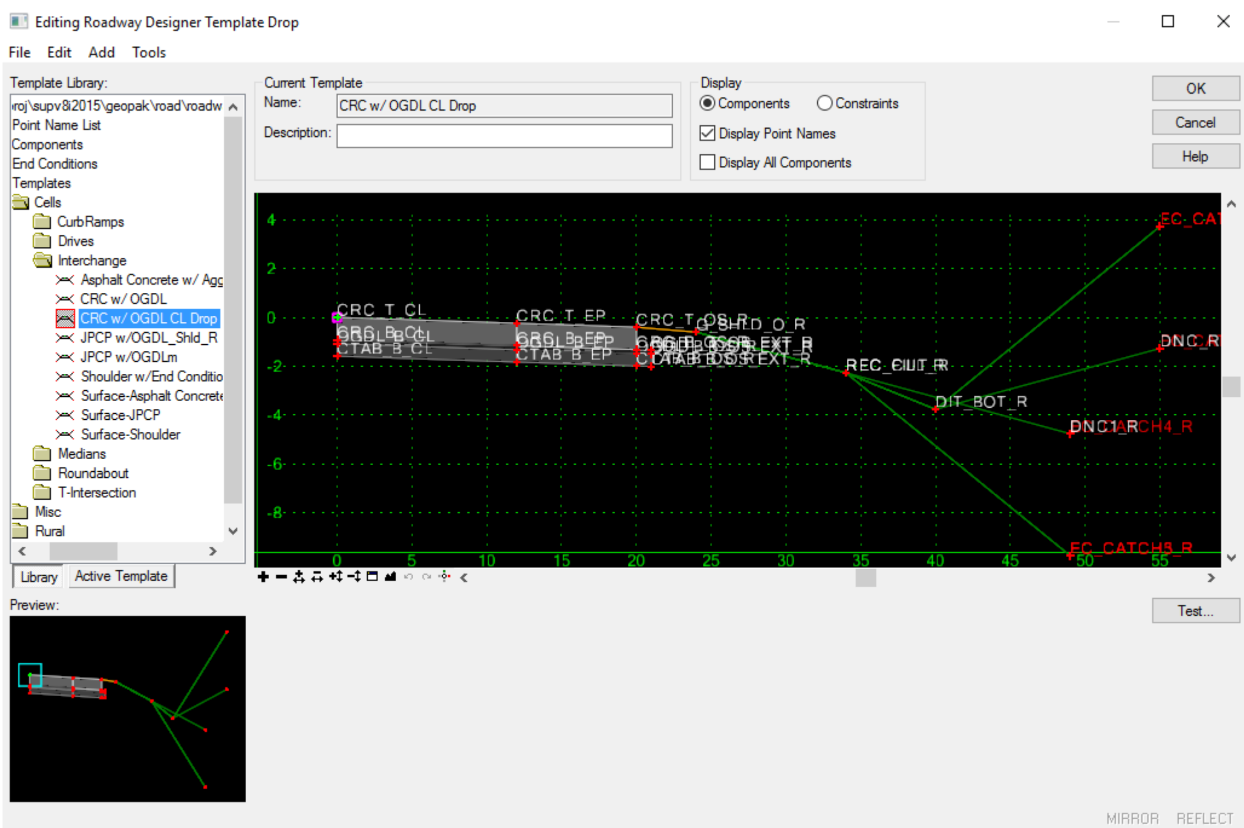
11.7.10.4 EDIT TEMPLATE

To edit the template:

1. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.



2. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.

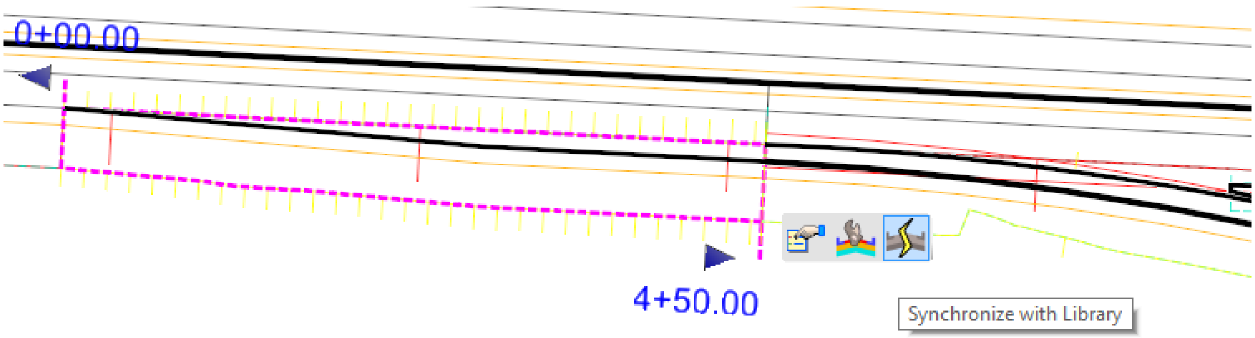


3. For this exercise, choose **Cancel.**

11.7.10.5 SYNCHRONIZE

To synchronize a template if modified:

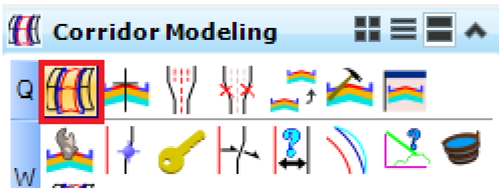
4. Select *Synchronize with Library* as shown below which applies any changes in the template to the linear template.



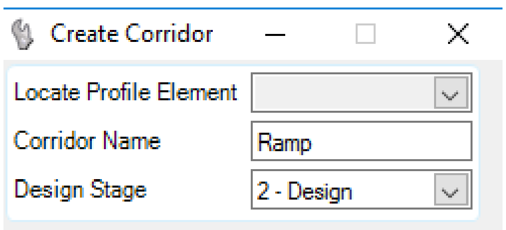
11.7.11 Ramp Corridor

In the following steps, we will create the Ramp Corridor which will begin where the Civil Cell ends.

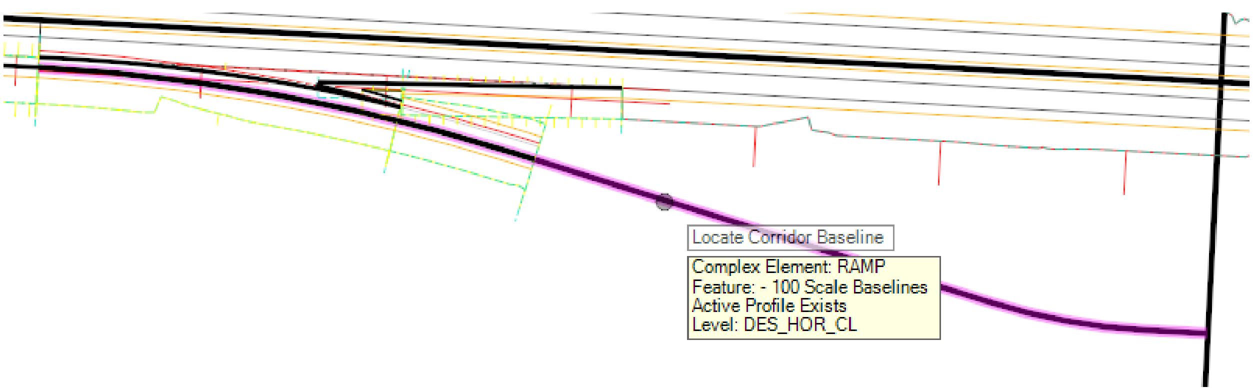
1. Select the **Create Corridor** command from the *Corridor Modeling* task.



2. Enter the name **Ramp** and set the *Design Stage* as shown in the *Create Corridor* dialog.



3. Locate the **Ramp** alignment when prompted to *Locate Corridor Baseline.*



4. Right click to reset when prompted:

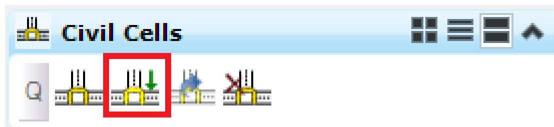
5. Left click to confirm the Corridor name and create the corridor.

6. Select the Ramp Template and place from where the Civil Cell ends to the end of the Ramp alignment.

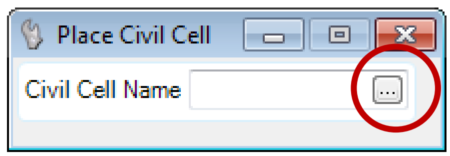
11.7.12 CELL – Entrance Ramp

1. Open the file **Interchange-Corridor-Entrance.dgn.** This is the same dataset as used with the Exit Ramp exercise above but the alignment Ramp-Entrance has been added on the North side of alignment ML.

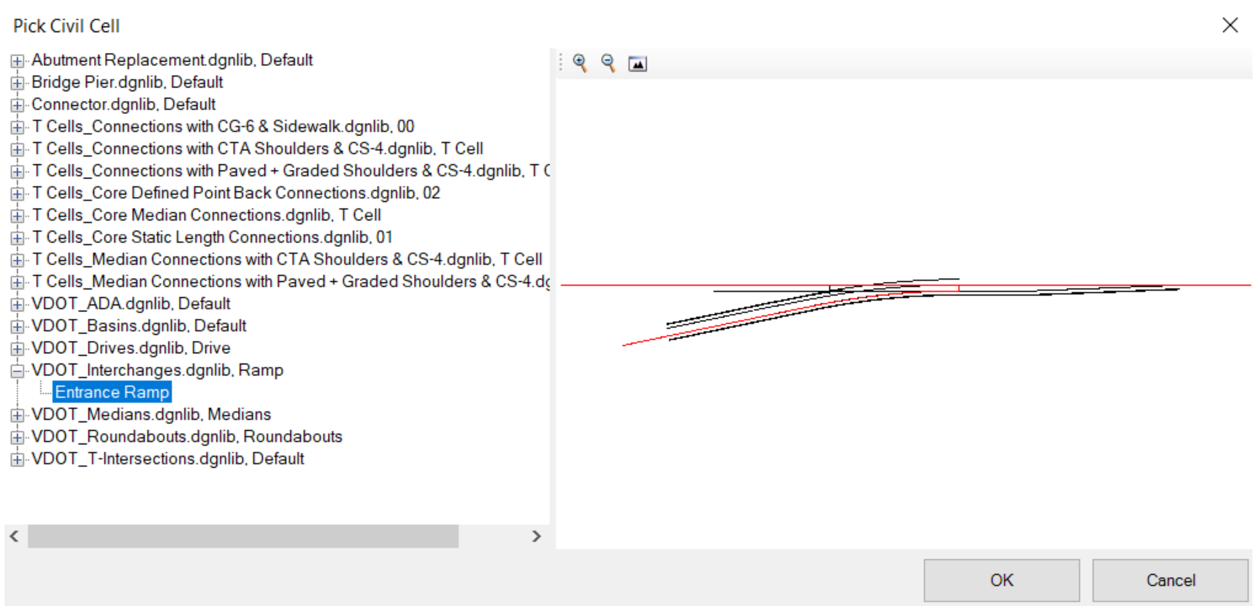
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

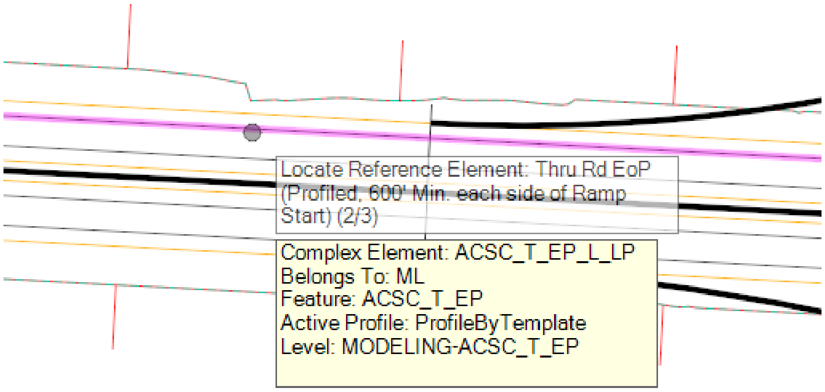


4. Select the **Entrance Ramp** civil cell from the **VDOT_Interchanges.dgnlib** file and click **OK.**

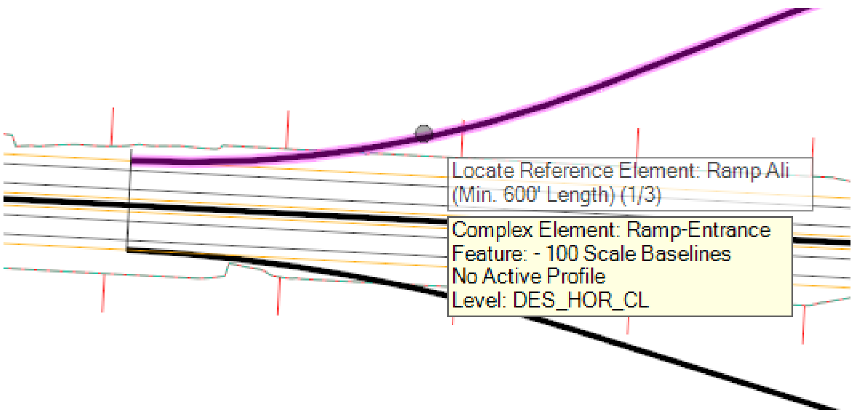


NOTE: The next three prompts may be in different order than listed in this manual.

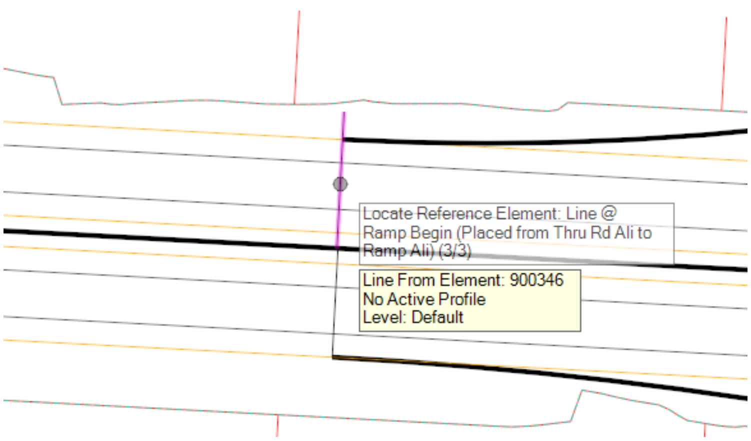
5. When prompted to *Locate Reference Element: 'Thru Rd EoP (Profiled, Min. 600' each side of Ramp Start)'* select the t**emplate produced ML EoP** element in View 1.



6. When prompted to *'Ramp Ali (Min. 600' Length)'*, select the **RAMP alignment** in View 1.



7. When prompted to *'Line @ Ramp Begin (Placed from Thru Rd Ali to Ramp Ali)'*, select the **Line** at the Ramp beginning in View 1.



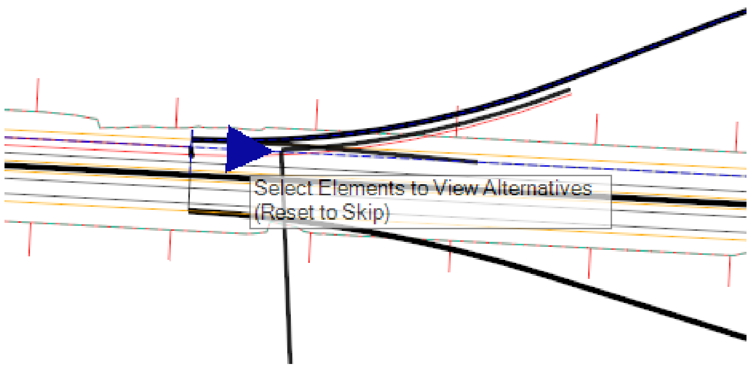
8. Observe the geometry being displayed.

   a) If the geometry does not look correct as shown in the image below, ensure the direction of arrows as shown in section 11.7.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

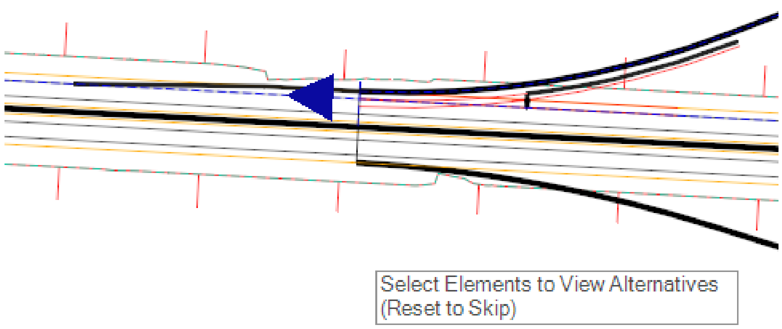
   b) If the geometry appears correct, move on to the next step.

   c) If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

9. *Change the direction of the Thru Rd EoP* by hovering over it and then sending a data point.



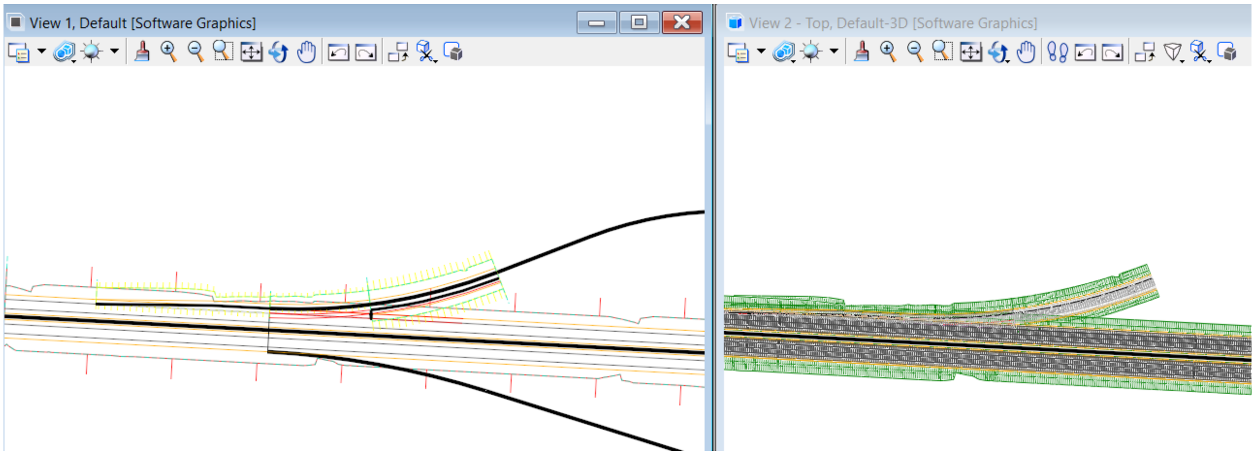
10. The geometry should now appear correctly.



11. **Right-click** when prompted to *'Select Elements to View Alternatives (Reset to Skip)'*.

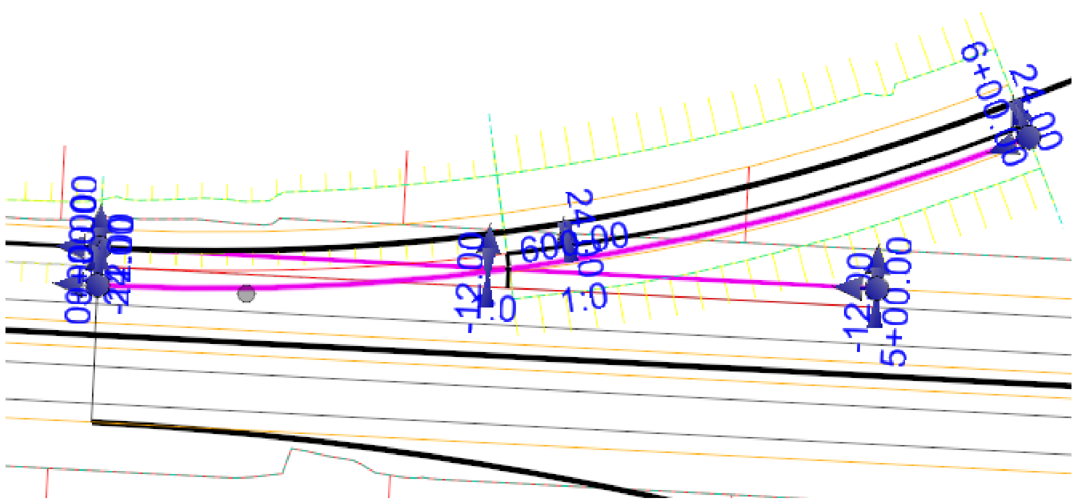
12. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

    The image below shows the cell in 2d & 3d views.

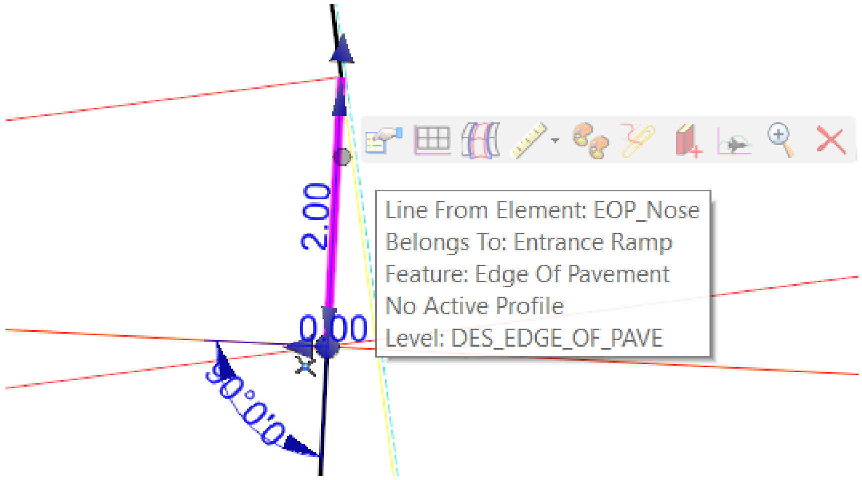


11.7.12.2 HORIZONTAL EDITS

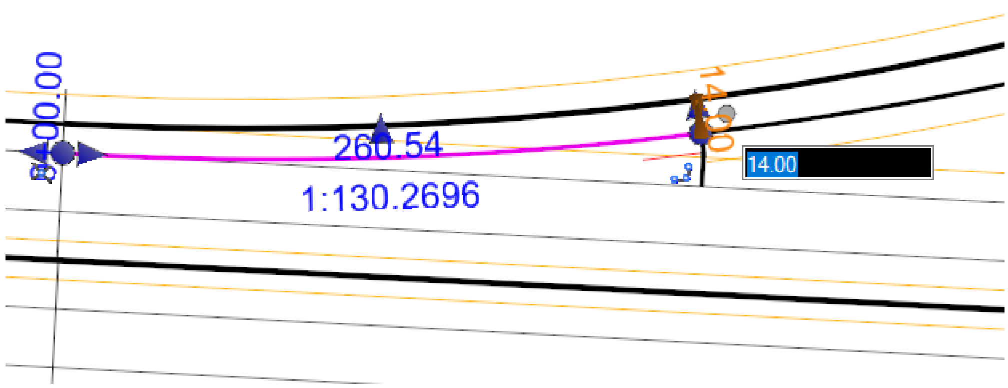
1. We will make no changes but the offset values of the two elements below (DNC_Nose_Control) represent the paved shoulder intersection location from their parents and can be modified to adjust the nose location.

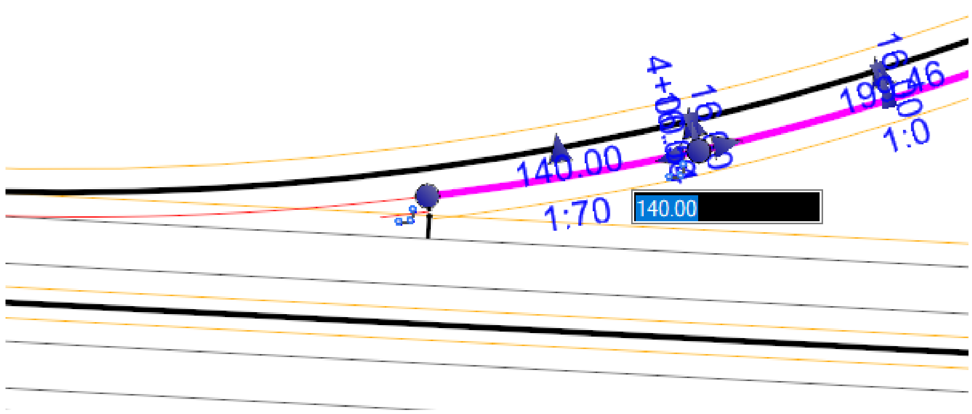


2. We will make no changes but the nose location can be modified by selecting the EOP_Nose element.

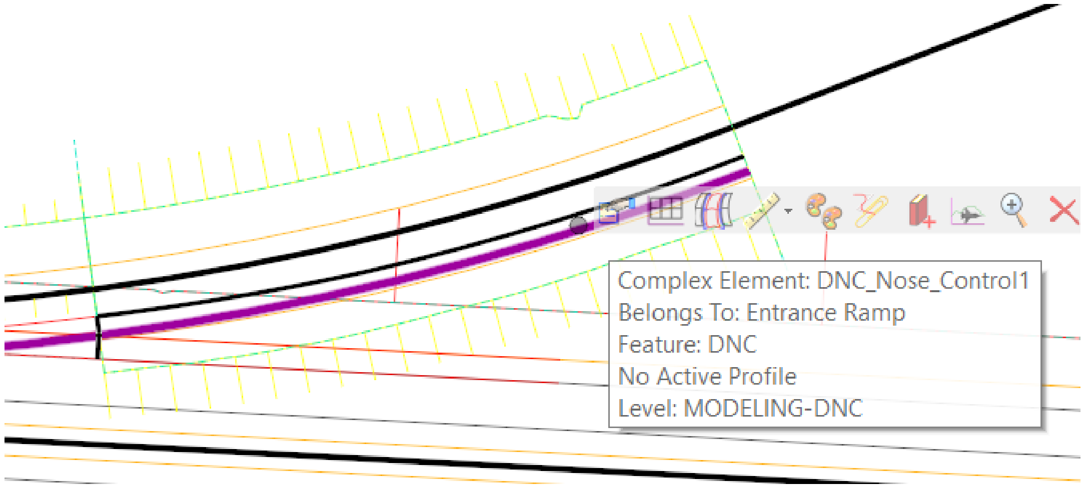


3. The Ramp Lane width transition can be controlled with the following elements.





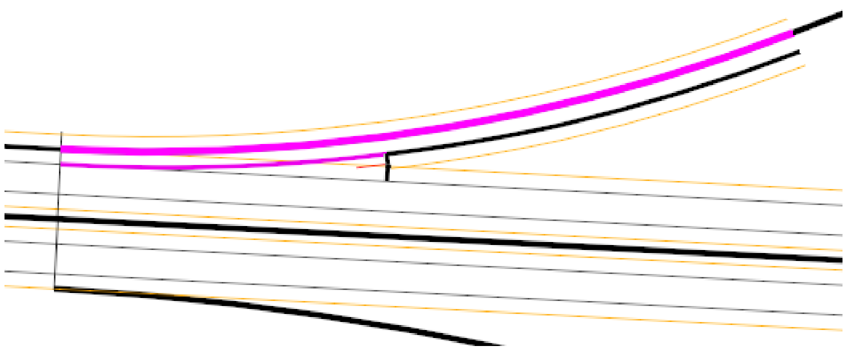
4. The length of the cell along the Ramp can be edited by changing the length of the DNC_Nose_Control element shown below. This needs to be done after we look at the ditch transition area behind the gore and we will perform this edit in the Target Aliasing and Clipping section.



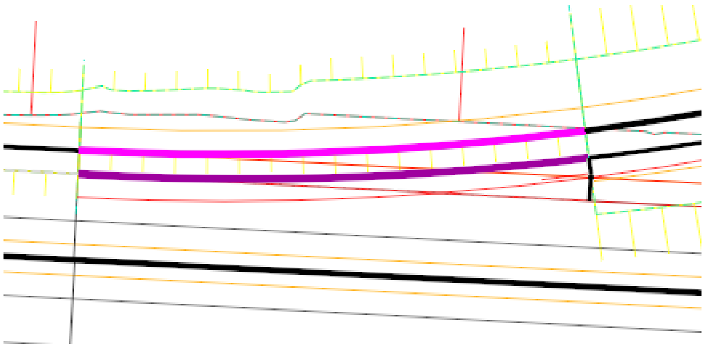
11.7.12.3 VERTICAL EDITS

We will not go into great detail in the steps below since this process is detailed in the Exit Ramp exercise but we will cover the basic process.

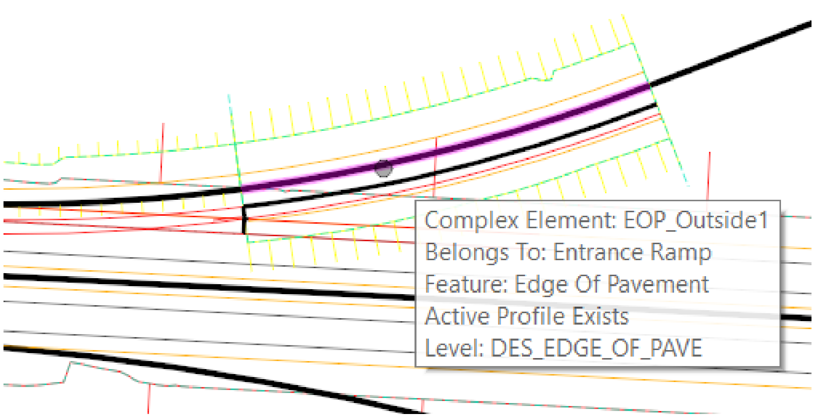
1. The following three elements are initially profiled at -2% from the Thru Rd EOP.



2. Superelevation information should be referenced and the following two elements should be re-profiled with the Vertical Geometry slope projection tools based on Superelevation and maximum rollover specifications.



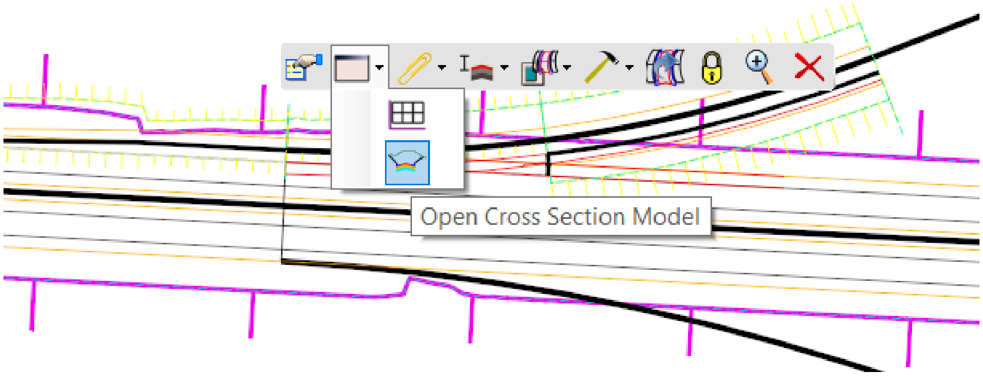
3. After the EOP_Outside element shown in the step above is profiled, its profile is then projected at a slope of 0% to the Ramp Alignment and will serve as the kick-off grade for the Ramp Alignment which is then profiled with vertical geometry line & curve commands to tie to the Secondary Rd. The projected profile & drawn vertical elements are then complexed and set as the Active Profile for the Ramp Alignment.
4. The EOP_Outside1 element shown below should be profiled by projecting a slope of 0% from the Ramp Alignment. This projected slope should then be set as the Active Profile of the EOP_Outside1 element.



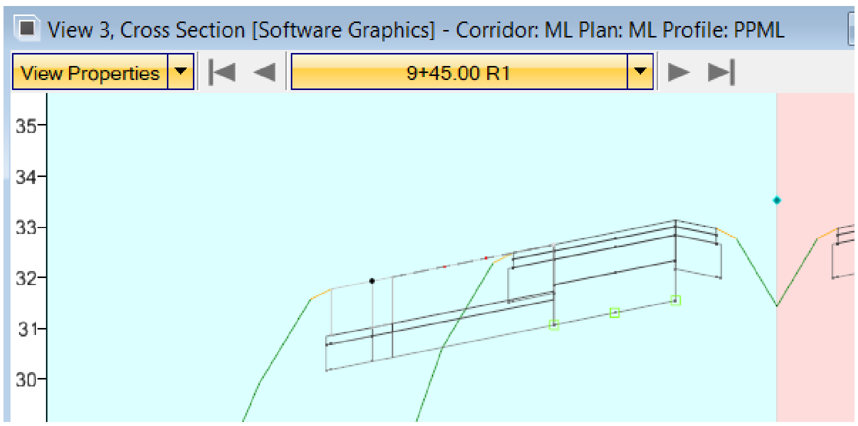
11.7.12.4 TARGET ALIASING & CLIPPING

As noted in the vertical section above, we will not go into a lot of detail with the following commands but we will go through the steps of applying Target Aliasing and Clipping to the ditch transition area behind the gore.

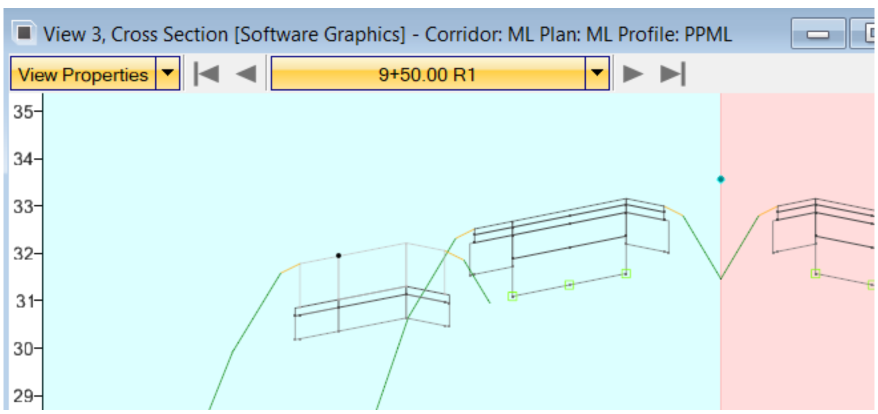
1. **Open Cross Section Model** in *View 3* for the *ML Corridor*.



2. Navigate to station **9+45.**



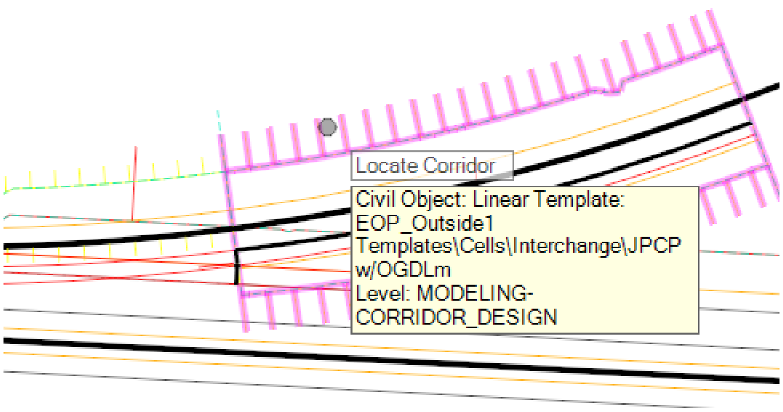
3. Navigate to 9+50.



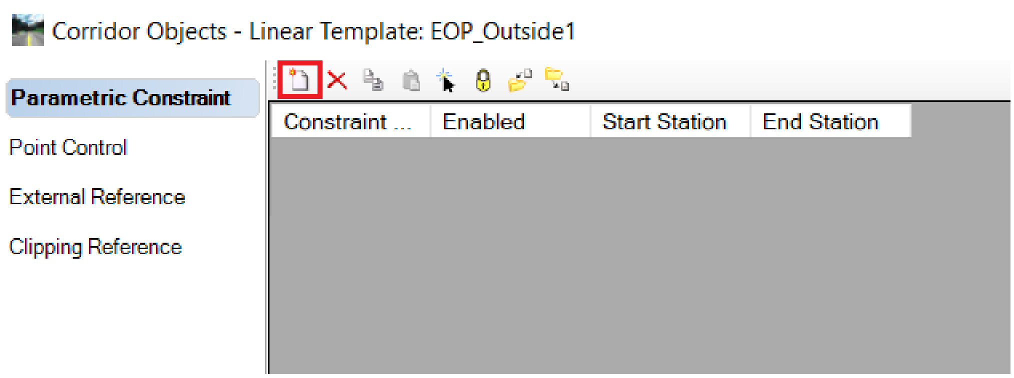
We will clean this overlapping ditch area up with Parametric Constraints, Target Aliasing, and Clipping in the next few steps.

4. Select the **Corridor Objects** tool from the *Corridor Modeling tools.*

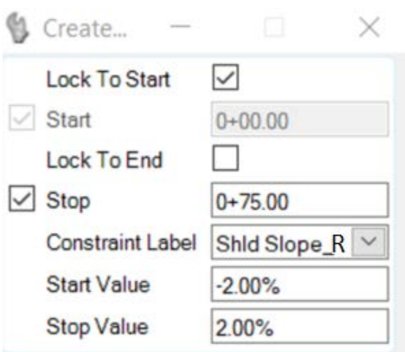
5. Select the **EOP_Outside1** corridor when prompted to *Locate Corridor*.

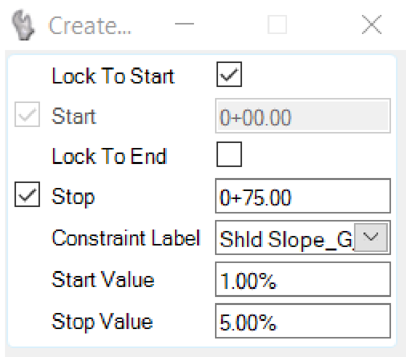


6. In the Corridor Objects dialog, select the **Parametric Constraint** tab and choose **Add New.**



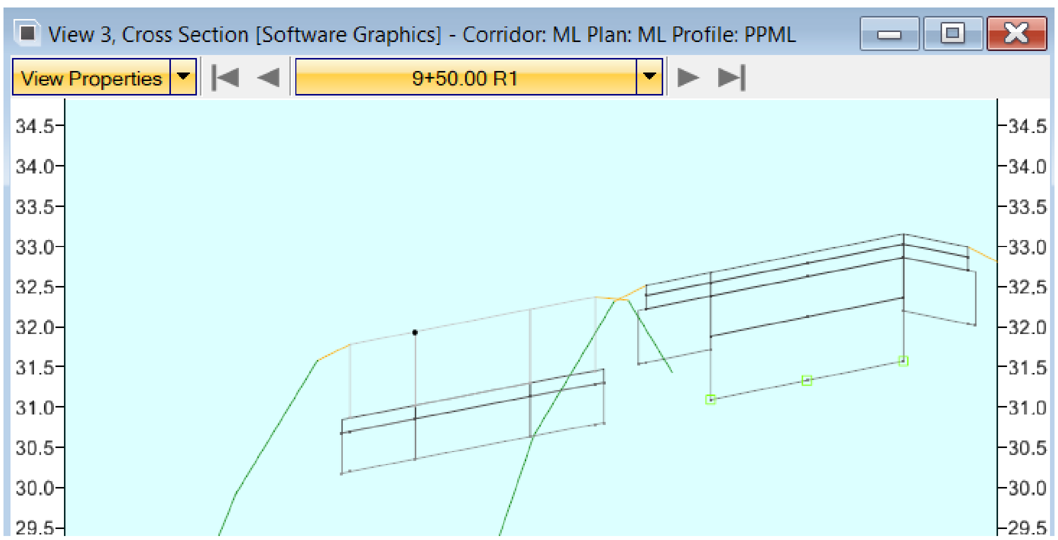
7. Add the following Parametric Constraints:



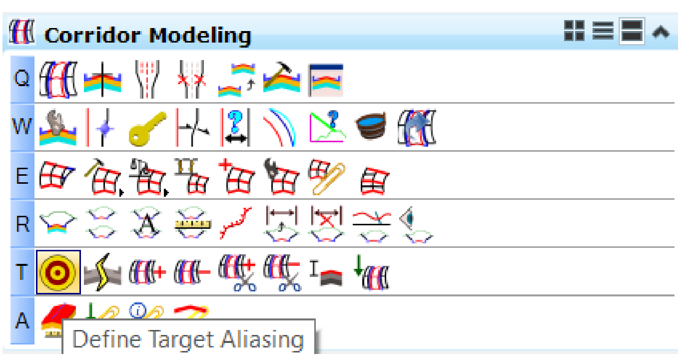


NOTE: Slope & transition length will vary per the Ramp Alignments Superelevation and in this example exercise, Superelevation is not taking into consideration.

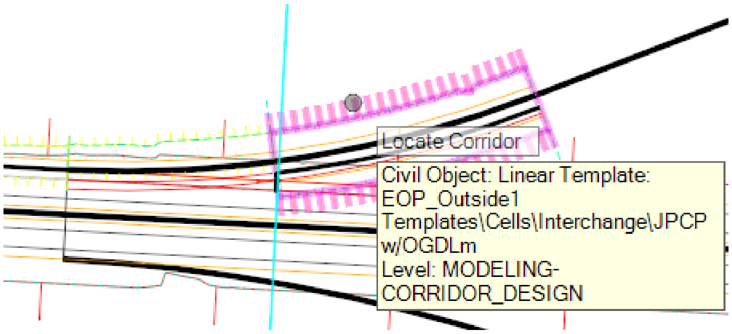
8. Review the Cross-Section view at station 9+50 and you should see the shoulders now intersect.



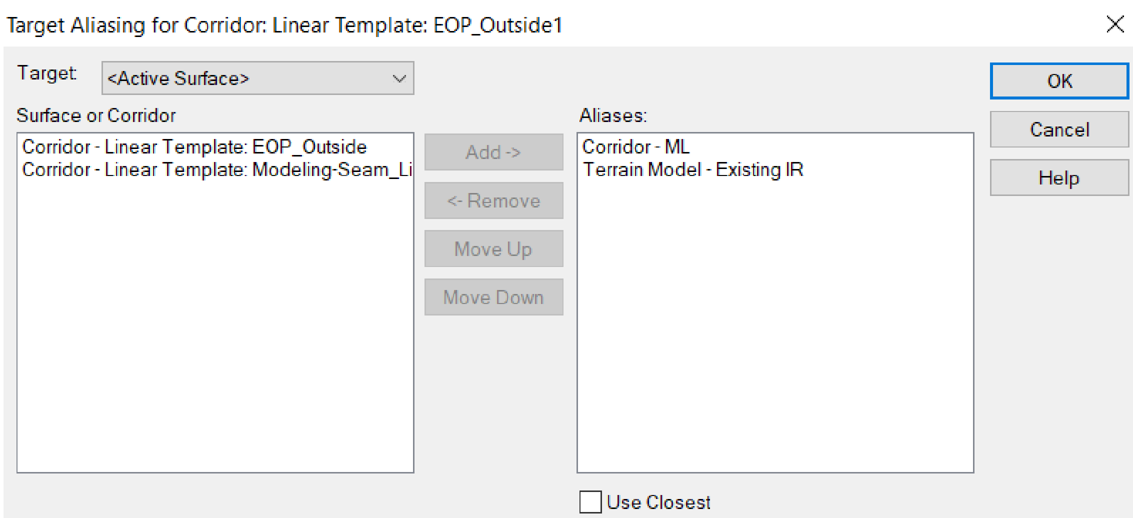
9. Choose the **Define Target Aliasing** command from the *Corridor Modeling* tools.



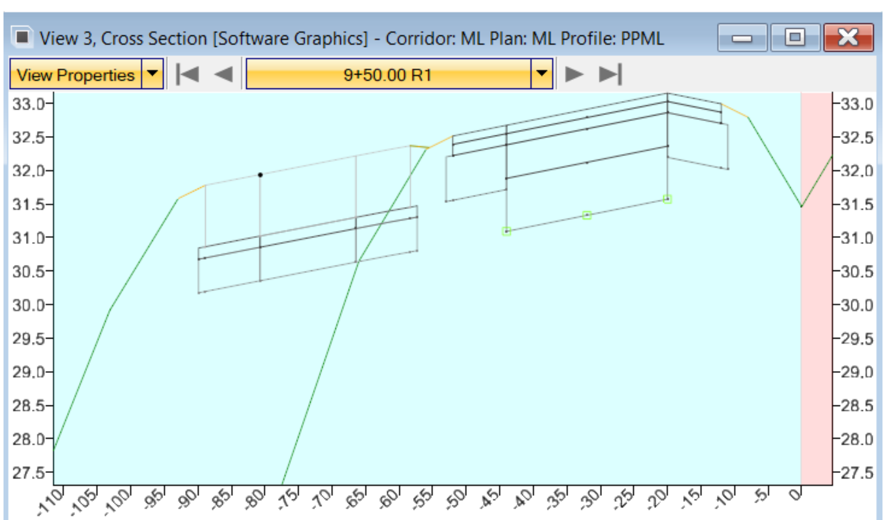
10. Select the **EOP_Outside1 corridor** shown below when prompted to *Locate Corridor.*



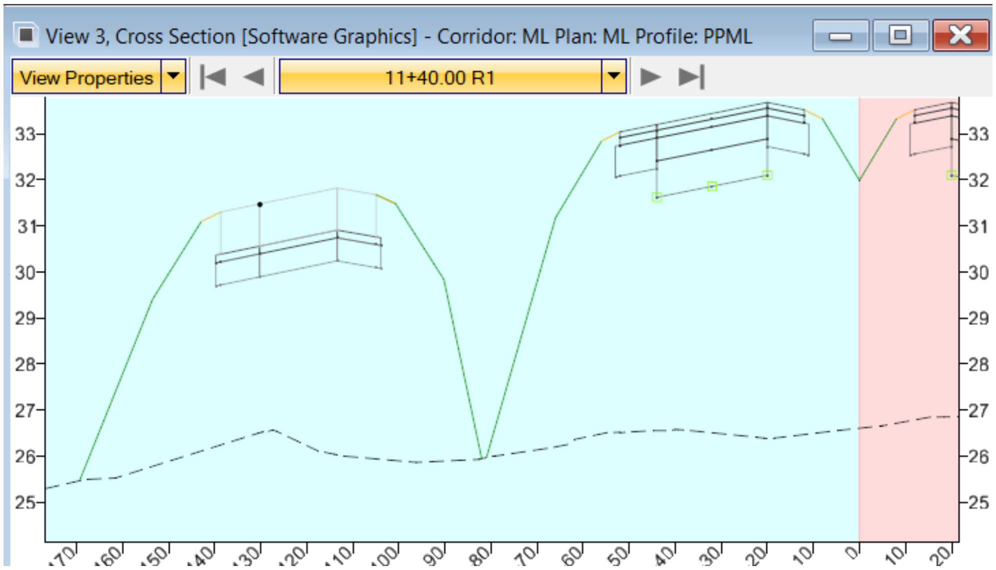
11. Select the **ML Corridor**, choose *Add* and then select the **Existing Ground Terrain Model** and choose *Add*. The dialog should be configured as shown below.



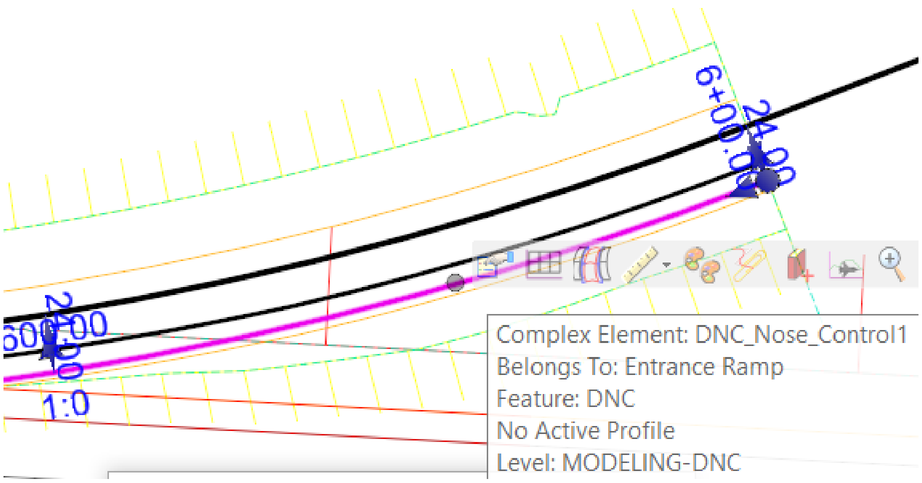
12. Tag OK and review make View 3 (Cross-Section view) the active view by selecting it. The Ramp has targeted the ML Corridor.



13. Scroll through the Cross Sections moving forward to station 11+40 which should be where the ditches separate.

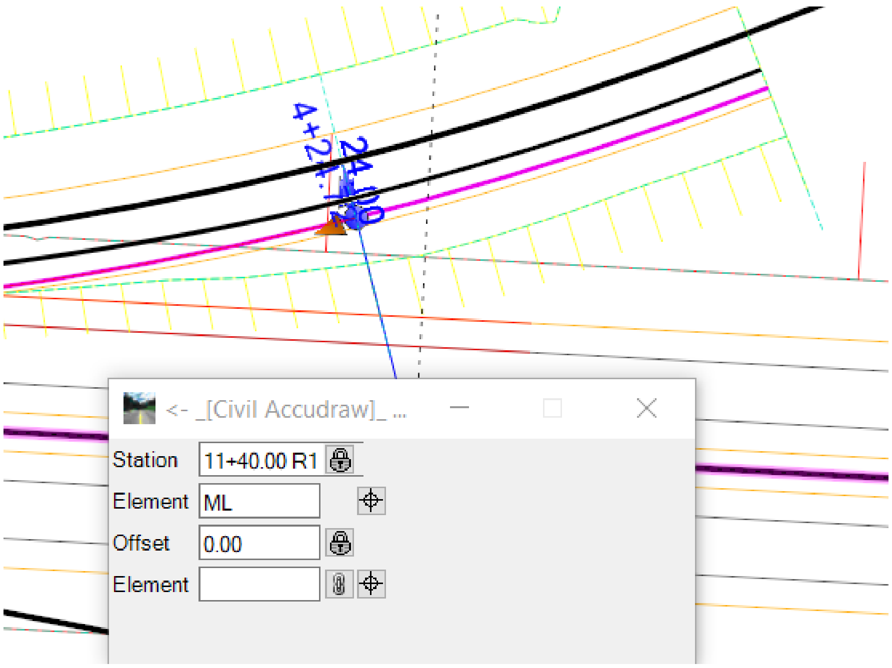


14. Select the DNC_Nose_Control1 element.

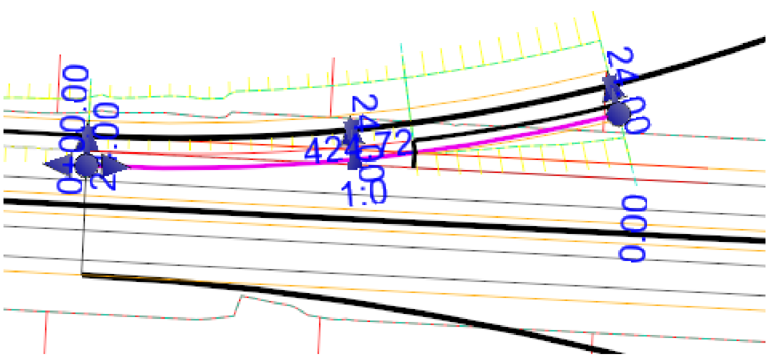


15. Invoke **Civil Accudraw** in Station-Offset mode and make the alignment ML Civil Accudraw's Origin.

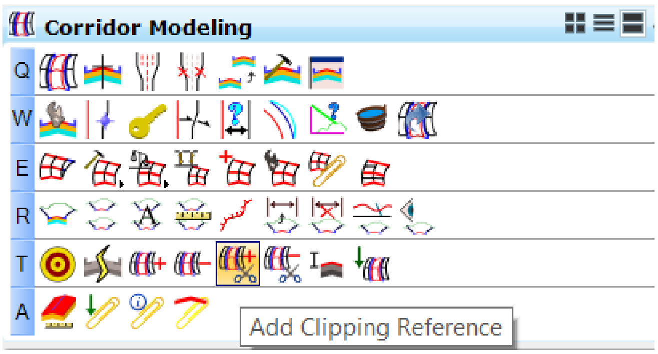
16. Select the **End Station** handler and move it to the ML station **11+40** utilizing Civil Accudraw to specify the station.



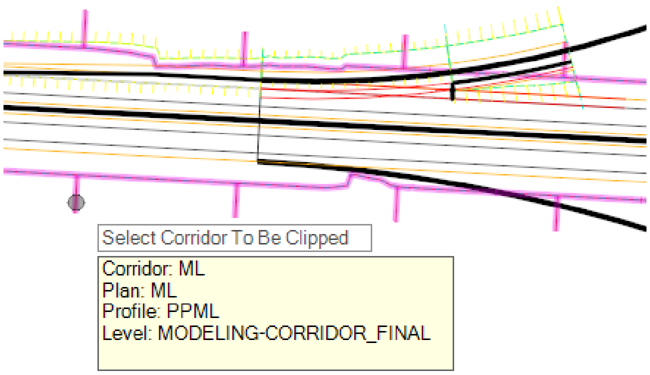
17. The Ramp EOP's were moved with this edit.



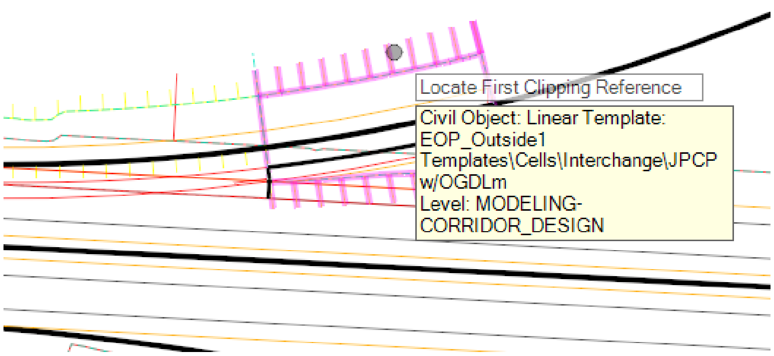
18. Select the Add Clipping Reference command from the Corridor Modeling task.



19. Select the **ML corridor** when prompted to *Select Corridor To Be Clipped.*

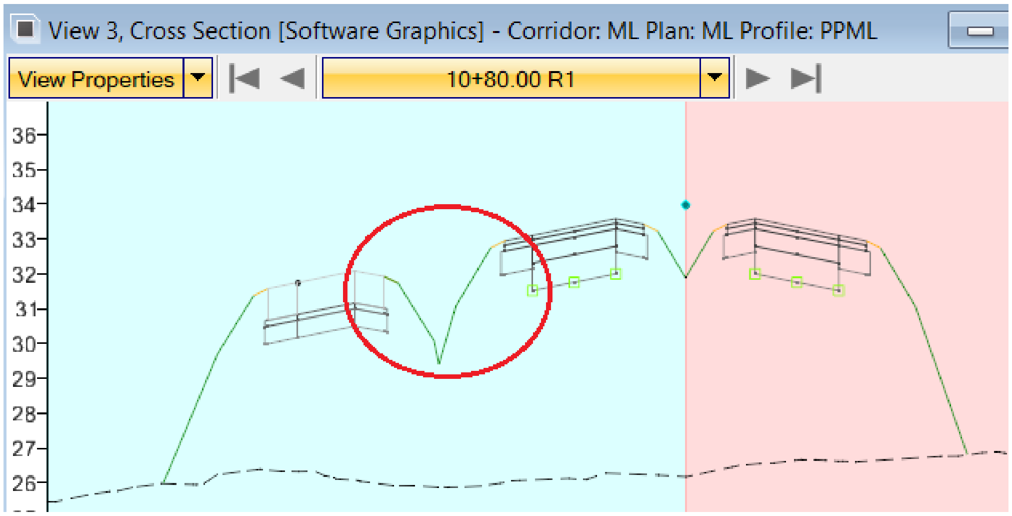


20. Select the **EOP_Outside1 corridor** when prompted to *Locate First Clipping Reference.*



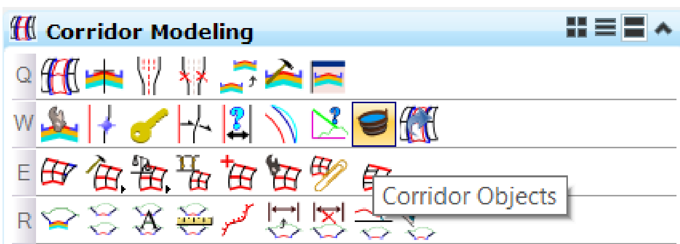
21. **Reset** to clip.

22. Navigate the Cross Section view to station 10+80 and review the ditch area that has been cleaned.

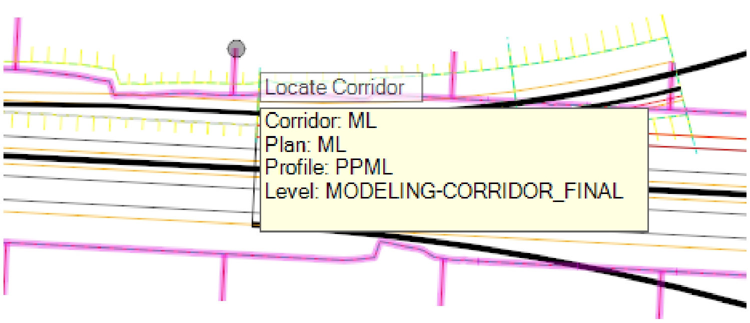


23. Navigate to 9+40 and you see the ML corridor shoulder and end conditions need to be removed in from this station back through the Auxiliary Lane taper.

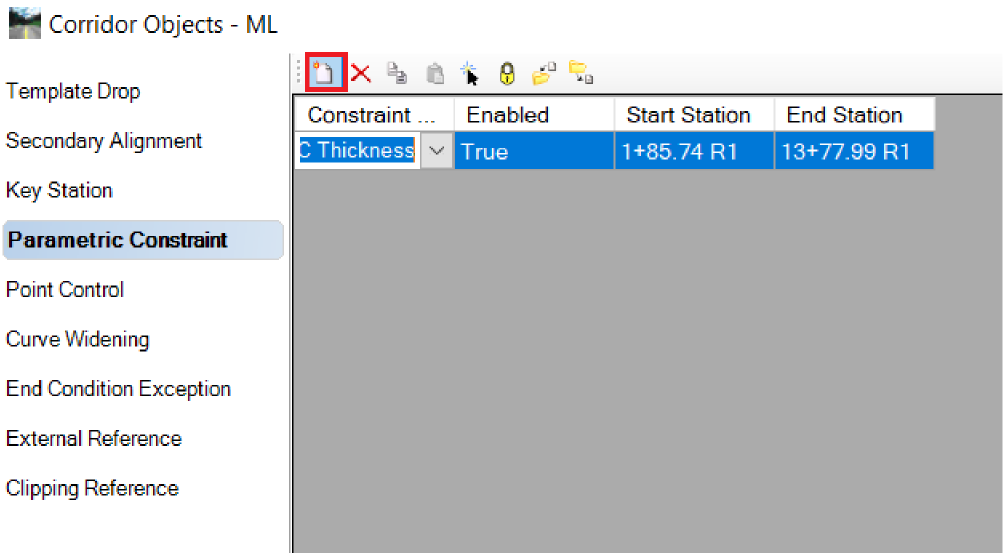
24. Select the **Corridor Objects** tool from the *Corridor Modeling tools.*



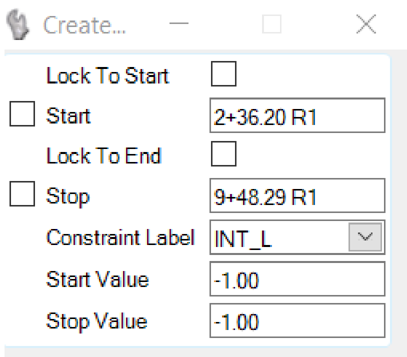
25. Select the **ML** corridor when prompted to *Locate Corridor.*



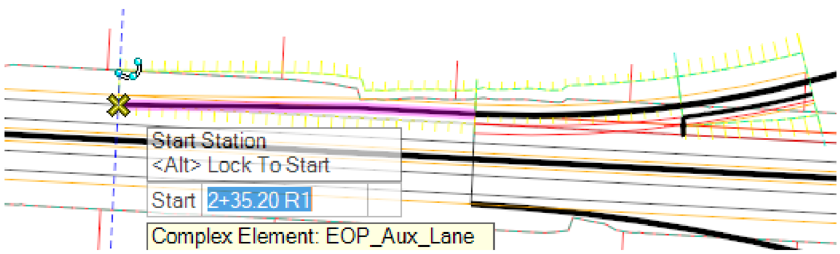
26. In the Corridor Objects dialog, select the **Parametric Constraint** tab and choose **Add New.**



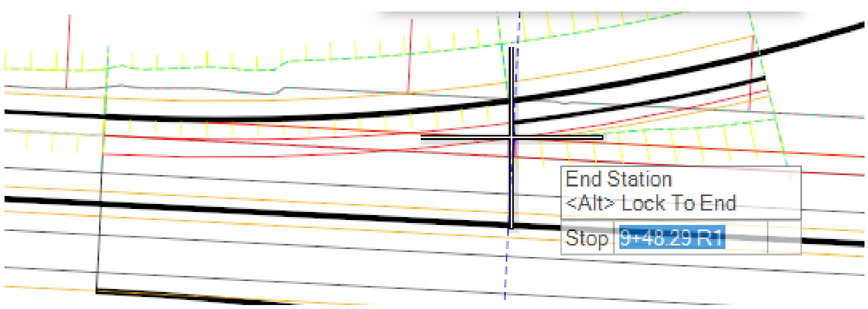
27. Set the following values (Ignore Stationing).



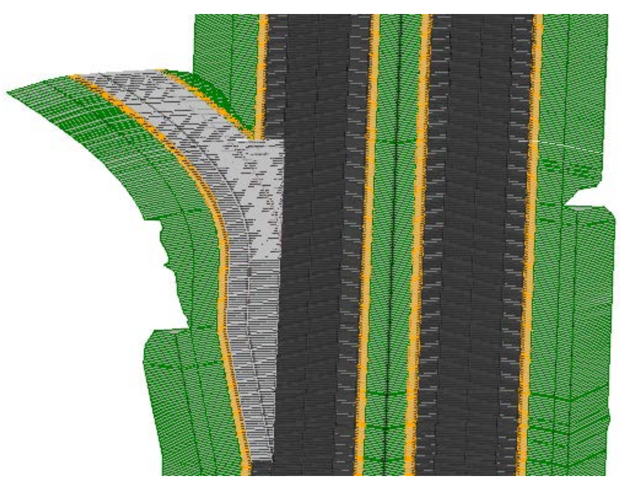
28. Snap to the Entrance Ramp Taper for the Start Station.



29. Snap to the Nose for the End Station.



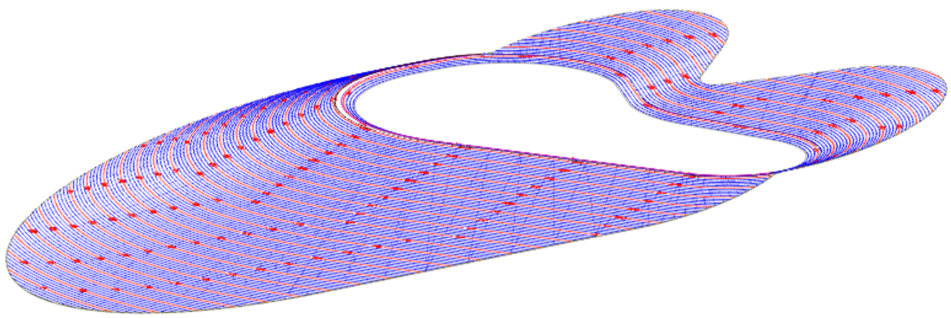
30. Modeling of the Ramp is complete for the terminal area.



11.8 STORM BASIN

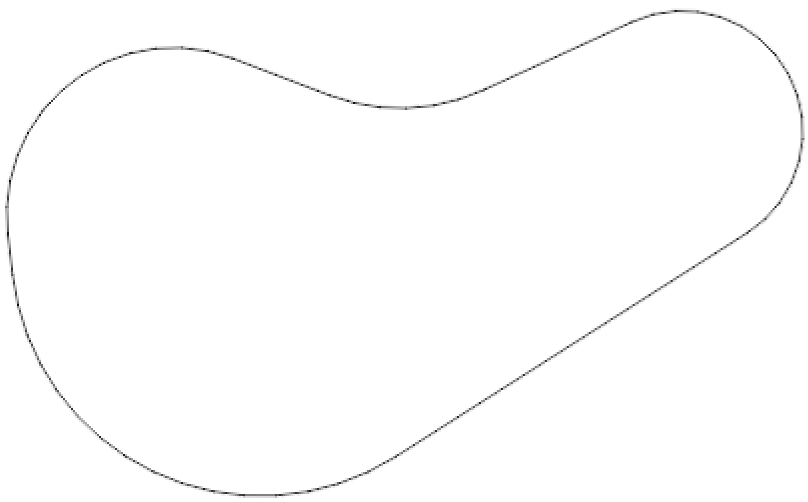
11.8.1 Available Cells

- Basin-200K



11.8.2 References & Direction of References

1. Bottom Outline of Basin



NOTES:

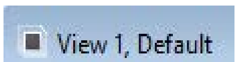
(1) Reference can be a closed Bspline Curve, MicroStation Complex, or Horizontal Geometry Complex.

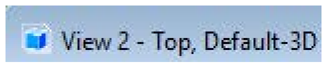
(2) Must be placed in a DGN with an Active Terrain surface.

11.8.3 Placement

1. Open the file **Storm Basin.DGN.** This file contains an active terrain, a couple of alignments, and in the North-East quadrant of the alignments, the bottom outline of a proposed basin.

   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

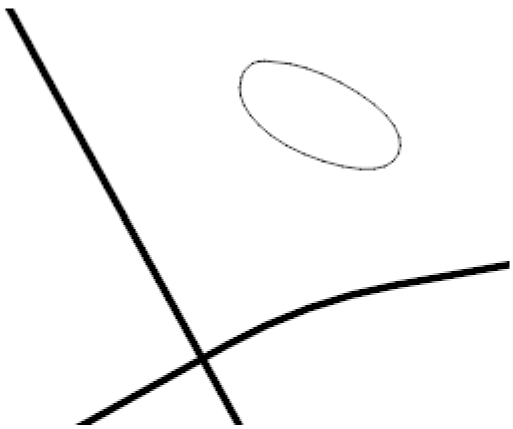
   

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

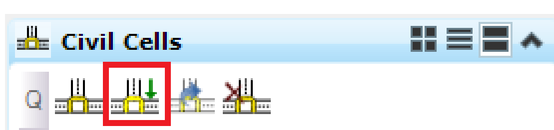
   c. Close the reference dialog.

   d. Zoom to the area of the Basin Bottom as shown below.

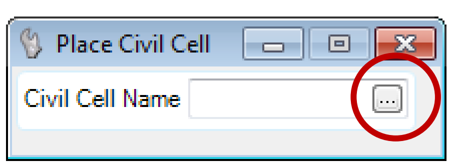
   

   NOTE: This element was created with MicroStation's Tools -> Curves -> Create Curves -> Bspline By Points command and is a closed curve.

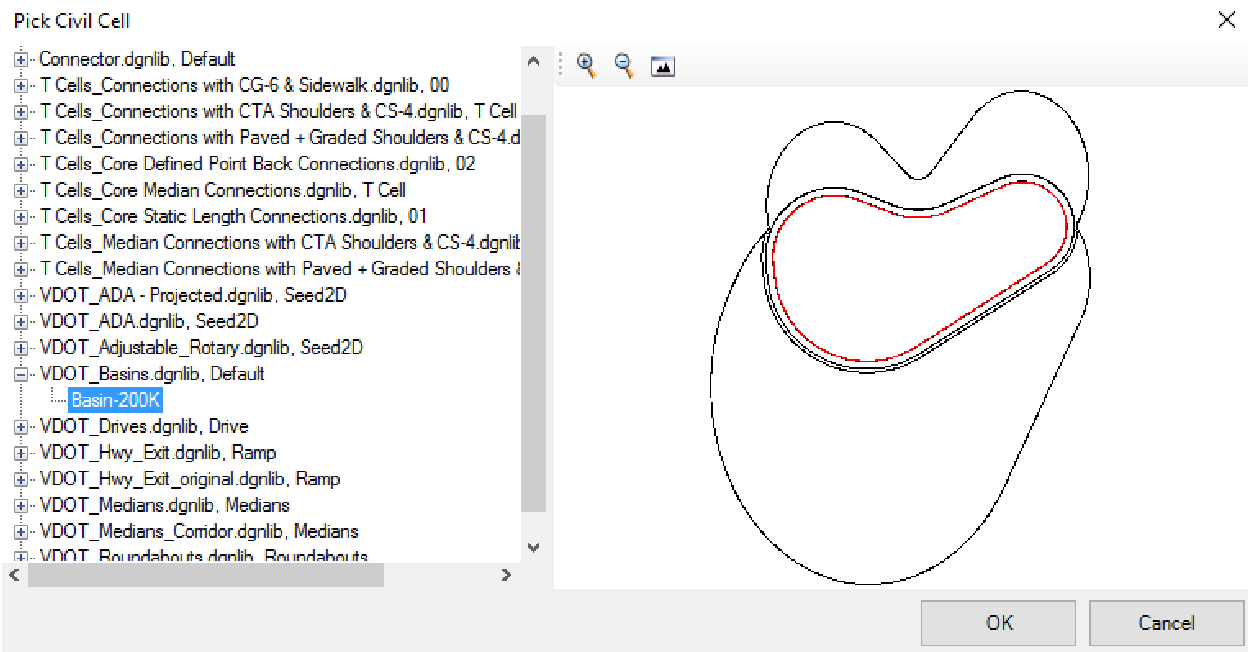
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.

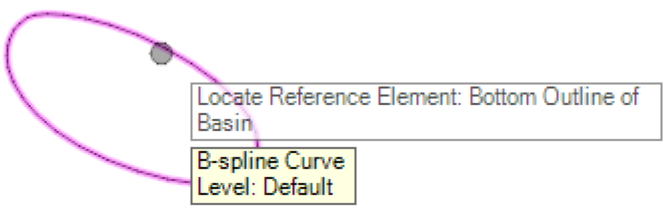
3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

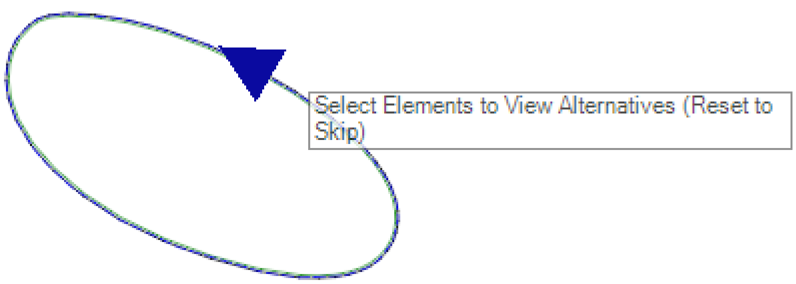
4. Select the **Basin-200K** civil cell from the **VDOT_Basins.dgnlib** folder and click **OK.**



5. When prompted to *Locate Reference Element 'Bottom Outline of Basin'*, select the **B-spline Curve** element in View 1.



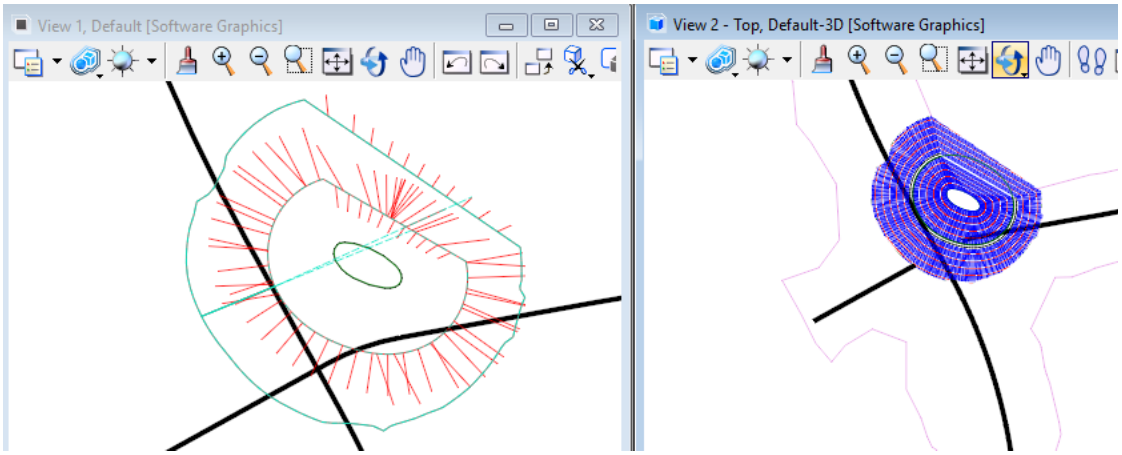
6. When prompted to *Select Elements to View Alternates (Reset to Skip)*, **right click** to reset.



NOTE: Direction of arrow doesn't matter for this cell.

7. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

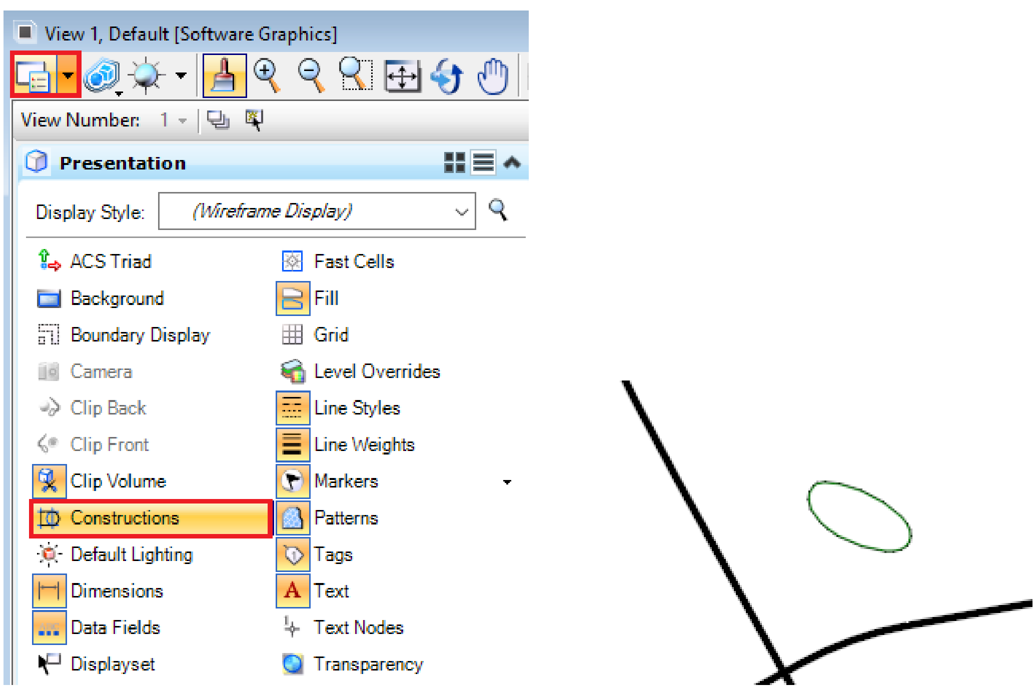
   The image below shows the cell in 2d & 3d views.



NOTE: If the terrain within the Civil Cell does not triangulate correctly upon placement (Boundary at elevation 0), shorten the length of the linear template slightly to correct the issue.

11.8.4 Construction Element Display

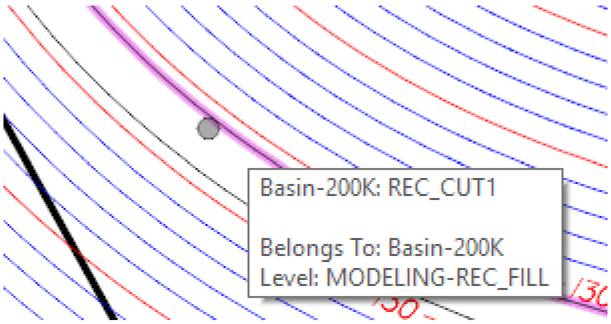
Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off Construction class elements, you will go to View Attributes as shown below.



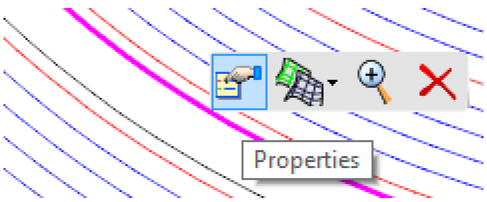
11.8.5 Volume Edit

The bottom is initially constructed -3.5' below the existing ground at a flat elevation and the height is controlled by the 33.333% slope up from the bottom to achieve a target volume of 300,000. To change this slope and volume.

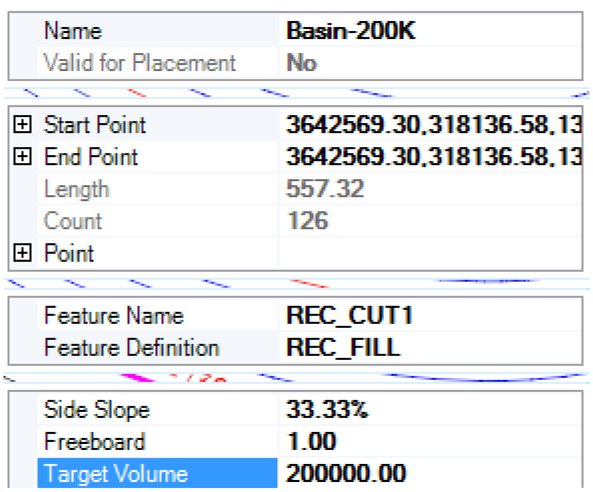
1. In View 2 (3d View) select the **REC_CUT1** element which is the top inside of the berm.



2. Choose **Properties** from the context menu.



3. The Properties of this element displays:

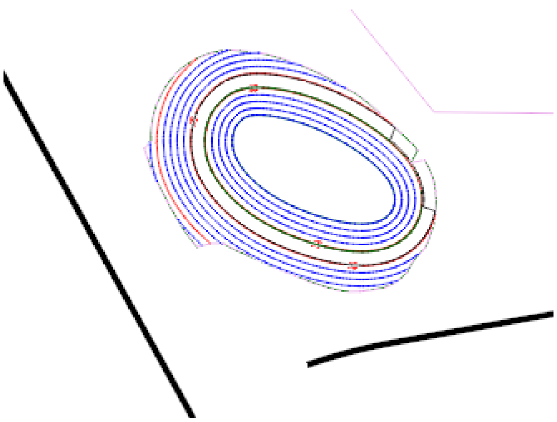


Name	Basin-200K
Valid for Placement	No
⊞ Start Point	3642569.30,318136.58,13
⊞ End Point	3642569.30,318136.58,13
Length	557.32
Count	126
⊞ Point	
Feature Name	REC_CUT1
Feature Definition	REC_FILL
Side Slope	33.33%
Freeboard	1.00
Target Volume	200000.00

4. Change the *Target Volume* to **10000.**

Name	Basin-200K
Valid for Placement	No
⊞ Start Point	3642612.16,318154.69,11
⊞ End Point	3642612.16,318154.69,11
Length	265.06
Count	126
⊞ Point	
Feature Name	REC_CUT1
Feature Definition	REC_FILL
Side Slope	33.33%
Freeboard	1.00
Target Volume	10000.00

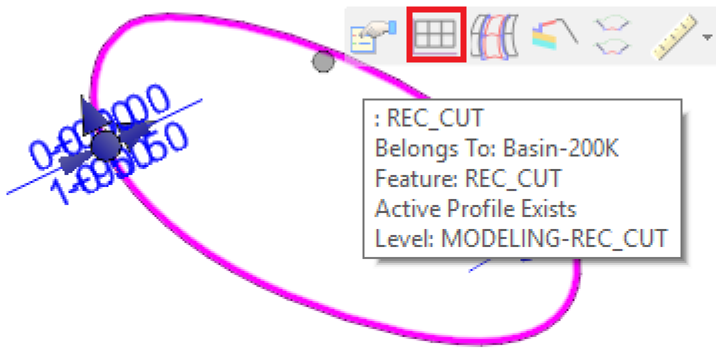
5. Notice the size of the pond shrink in the 3d view.



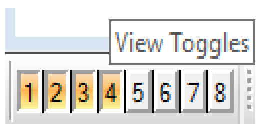
11.8.6 Pond Depth

As mentioned earlier, the pond is draped initially 3.5' below the existing ground a constant elevation. The steps below describing changing this depth.

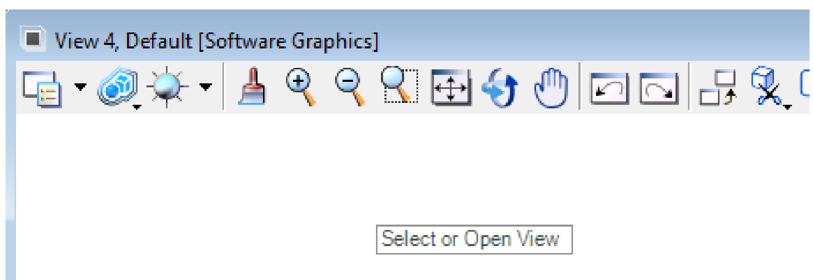
1. Select the **REC_CUT** element in View 1 (2d View) and choose **Open Profile Model** from the context menu.



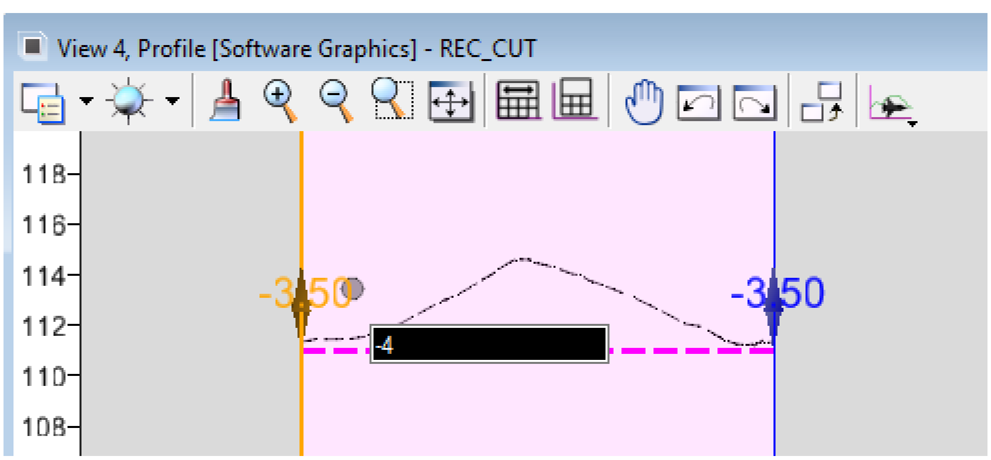
2. Open View 4.



3. Left click in View 4 to **Open** the profile model.

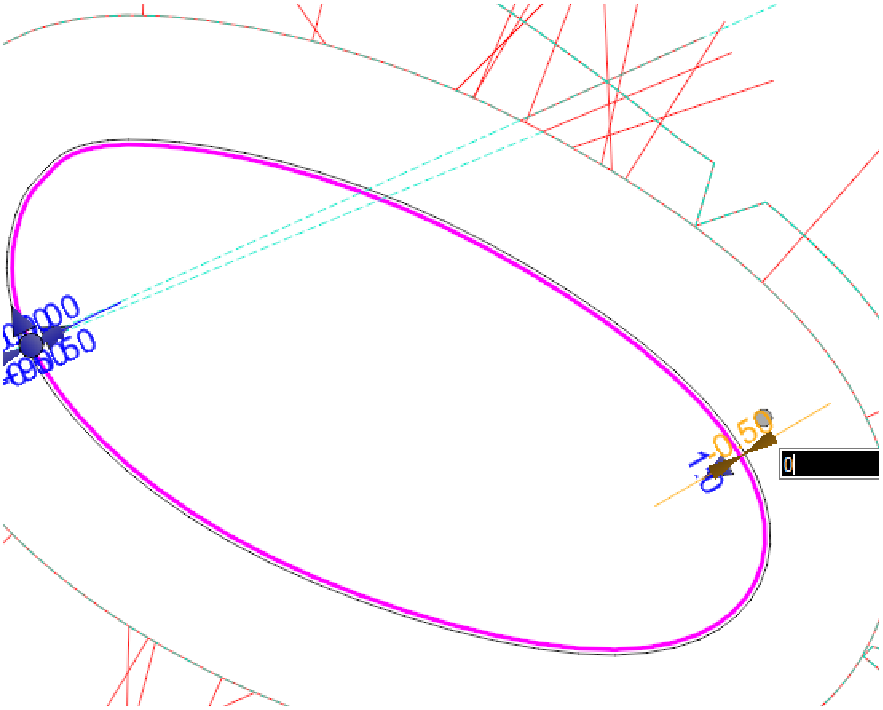


4. Select the profile and change *-3.5* to **-4** to adjust the bottom depth.



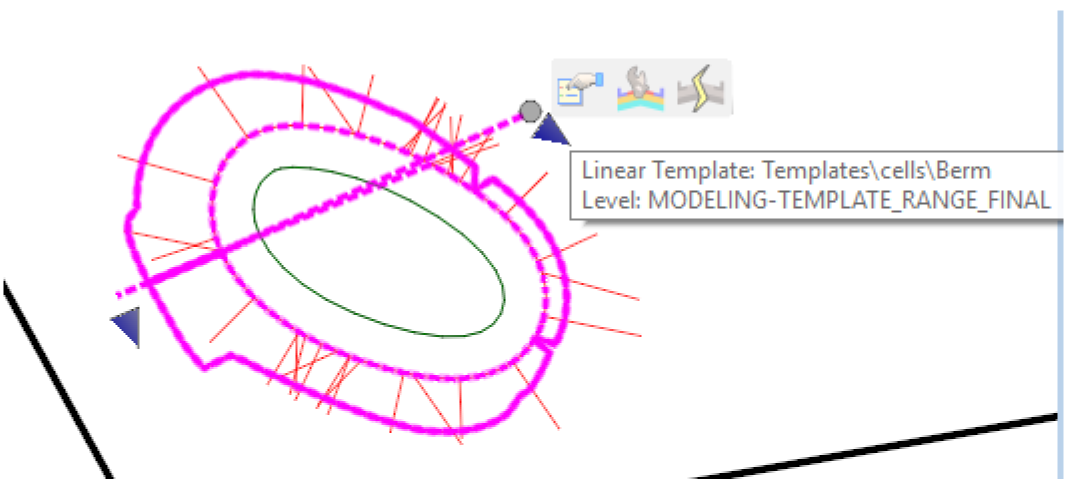
11.8.7 Horizontal Edits

1. Select the **REC_CUT** element in View 1 (2d View). Change the offset of *0.5* from the *Bottom Outline of Basin* to **0.**



11.8.8 Template Edits

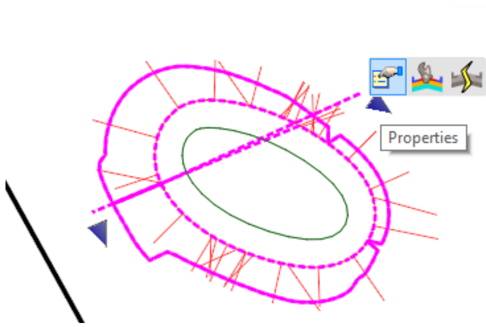
The linear template initially used in the civil cell is shown below. The context with available linear template commands is also shown. We will discuss these commands in the following sections.



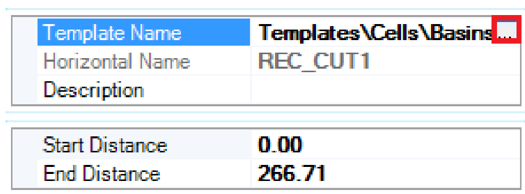
11.8.8.1 PROPERTIES

To re-direct these linear templates to different ones in the ITL.

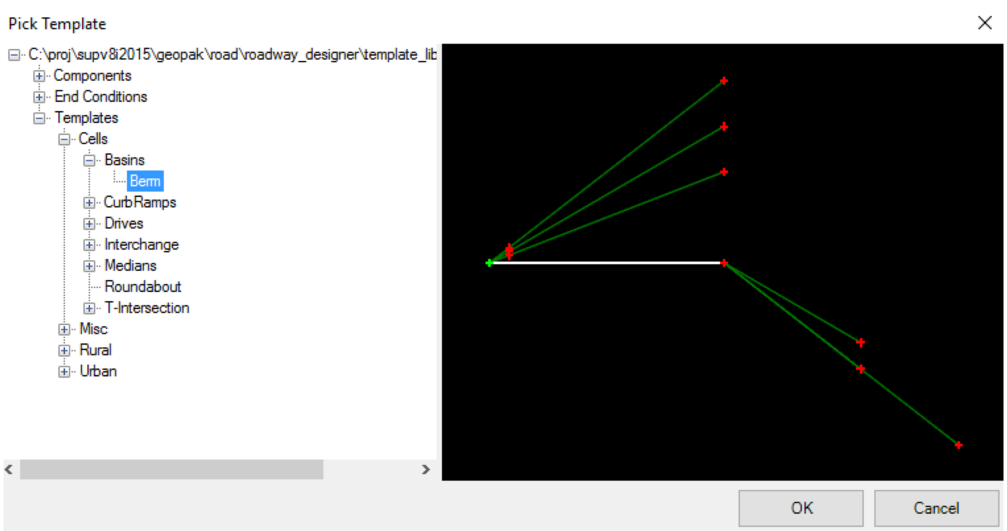
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Berm Linear template used in the Basin Civil Cell is shown below. Although we will not replace this template in this exercise, you would choose a template from the **Pick Template** dialog if you wanted to replace the given template. Refer to section 11.3.10 for the process of editing/switching to the local template library.

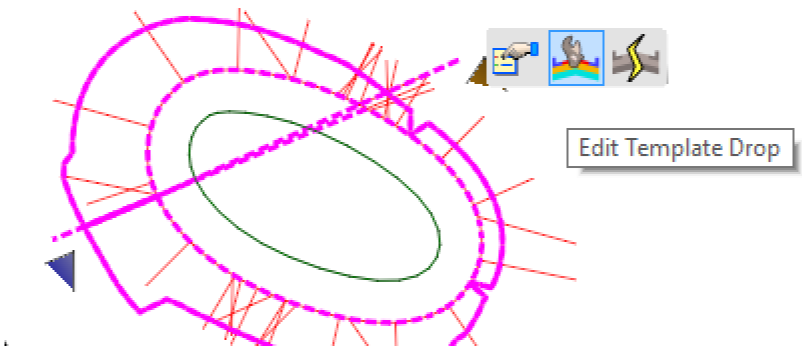


4. Tag **Cancel** *(OK if you actually change the template.)*

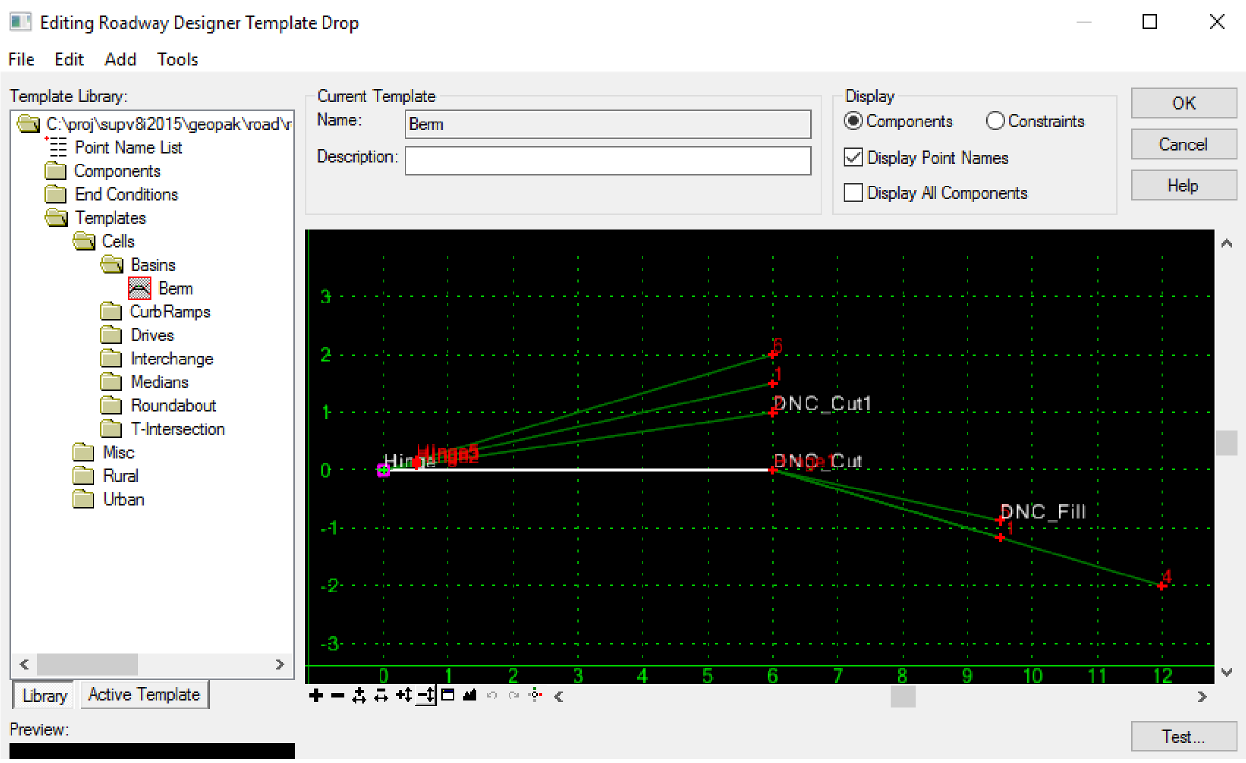
11.8.8.2 EDIT TEMPLATE

To edit the template:

1. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.



2. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.

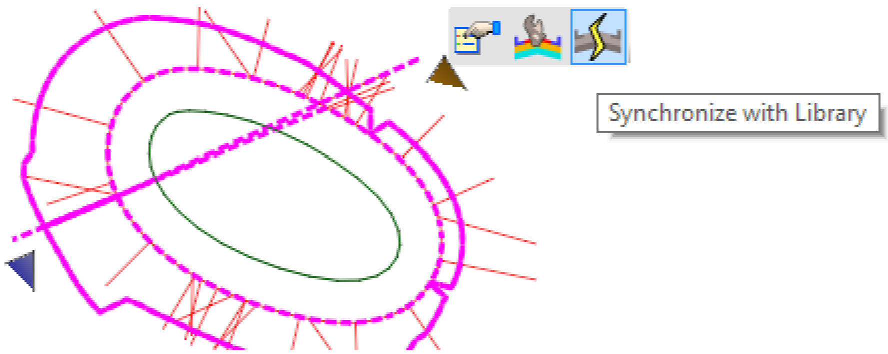


3. For this exercise, choose **Cancel.**

11.8.8.3 SYNCHRONIZE

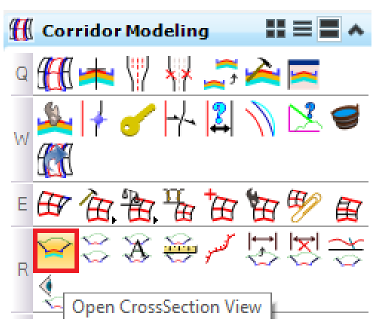
To synchronize a template if modified:

1. Select Synchronize with Library as shown below which applies any changes in the template to the linear template.

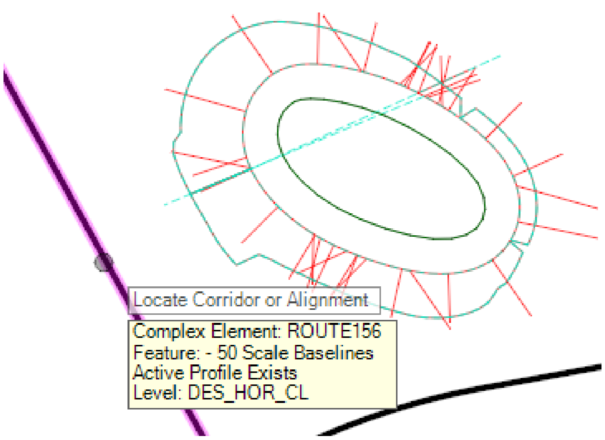


11.8.9 Cross-Section View

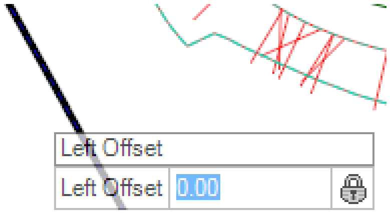
1. Select the Open CrossSection View command available on the Corridor Modeling task menu.



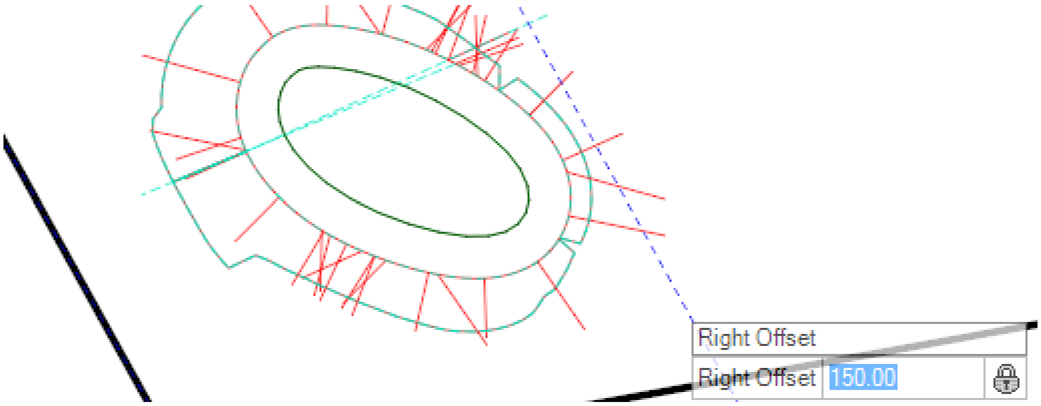
2. Select the **ROUTE156** alignment when prompted to *Locate Corridor or Alignment.*



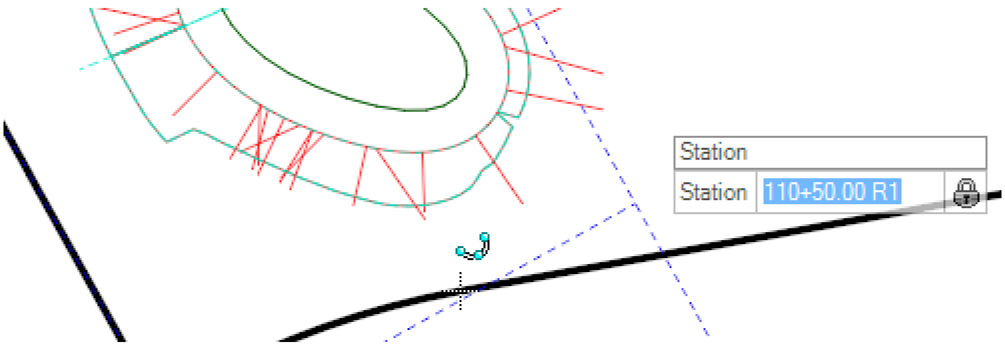
3. Enter **0** for *Left Offset* and left click to confirm.



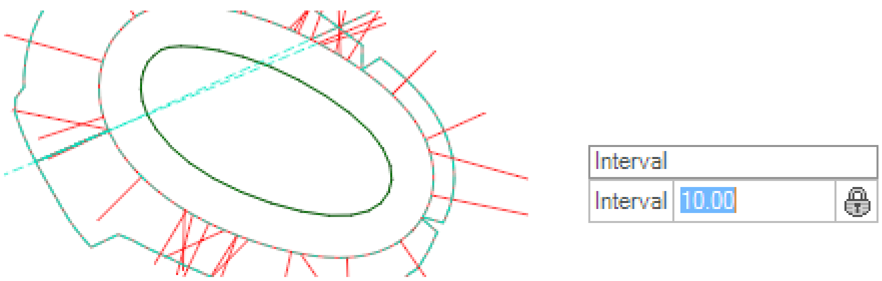
4. Enter **150** for the *Right Offset* and left click on the *right side of ROUTE156* to confirm.



5. Enter **110+50** for the *Station* and confirm with a left click.

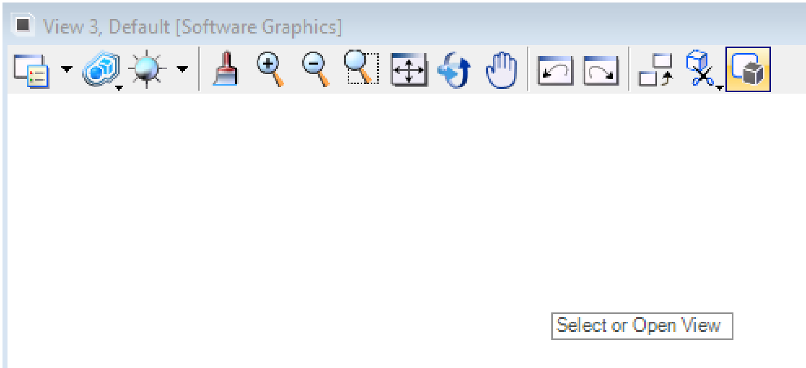


6. Confirm the *Interval* of **10.**

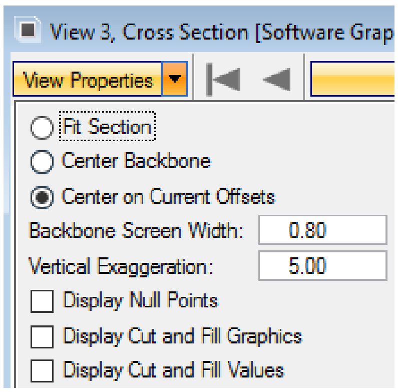


7. Open **View 3** from *MicroStations View* menu.

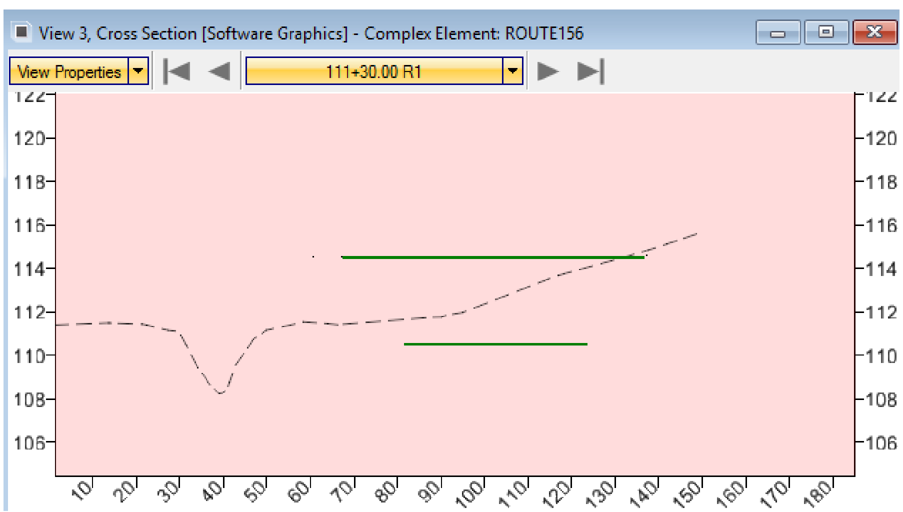
8. **Left Click** in the drawing area of *View 3*.



9. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



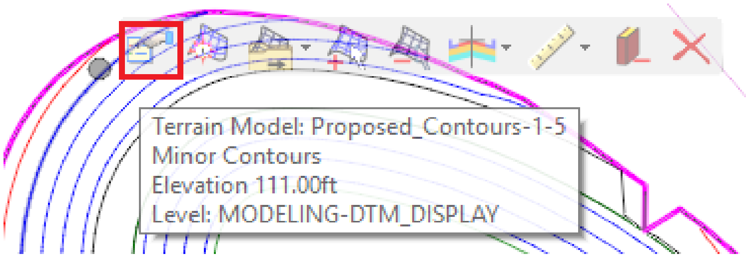
10. Use the *Next Station* button to move to station **11+30.**



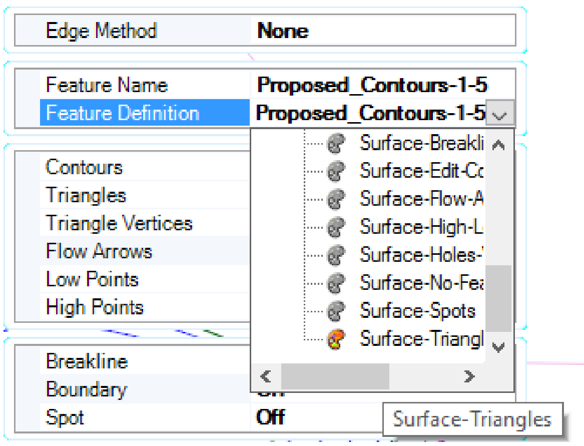
You are viewing the bottom and top of the pond. The corridor model is set to a design stage to draw linear elements only. The surface terrain of the pond is set to contours. To change this so you can view the pond in the cross-section view we will change the feature of the terrain.

11.8.10 Terrain Display

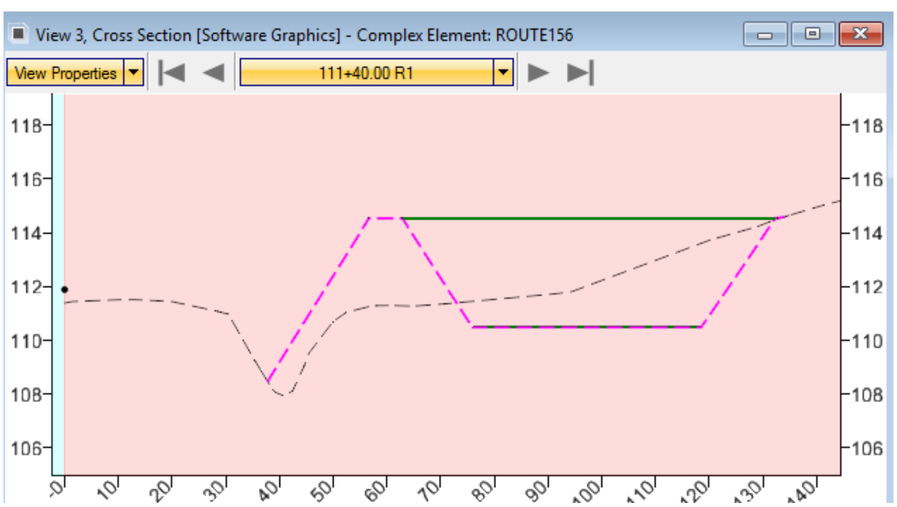
1. Select the terrain terrain model in View 2 (3d view) and select Properties from the Context Menu.



2. Change the *Feature Definition* to **Surface-Triangles.**



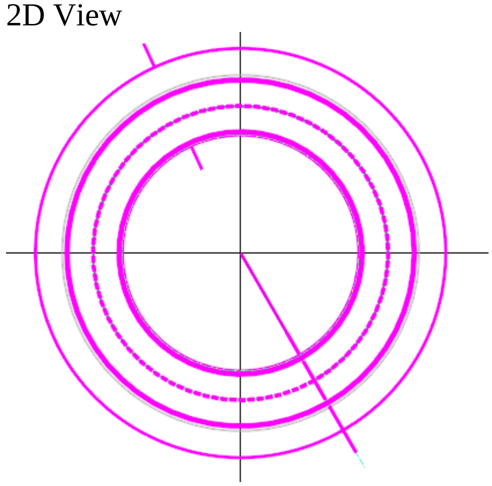
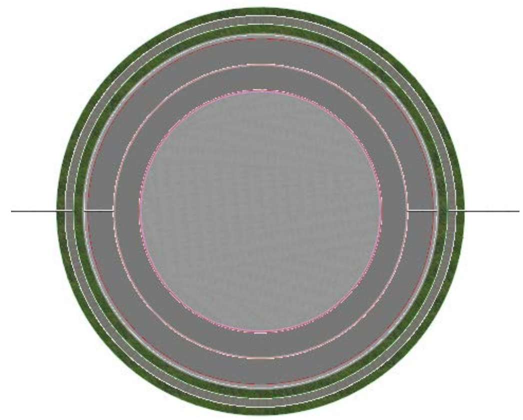
3. Go to the **Next Station** in the *Cross-Section View* and you should now see the pond which is highlighted below.



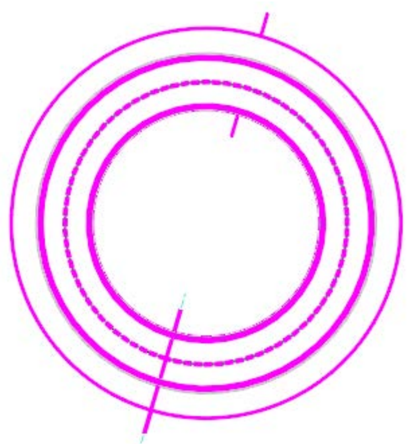
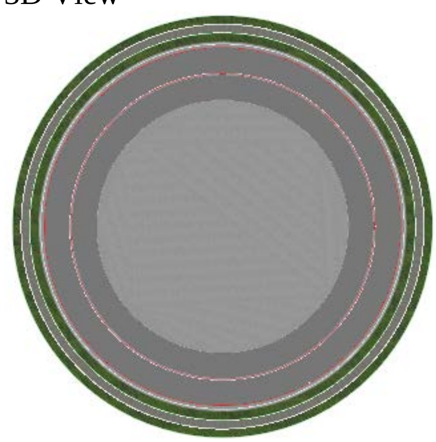
11.9 ROUNDABOUTS

11.9.1 Available Cells

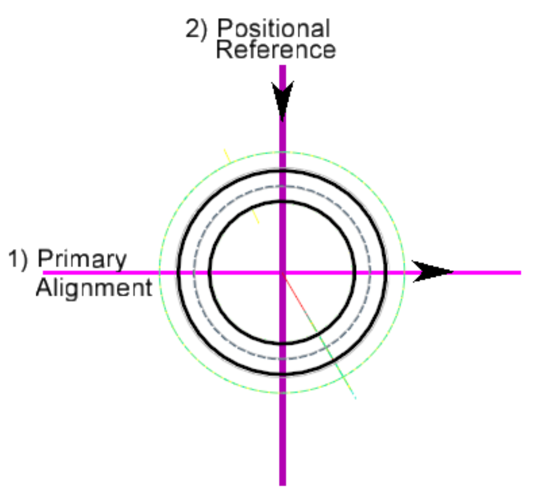
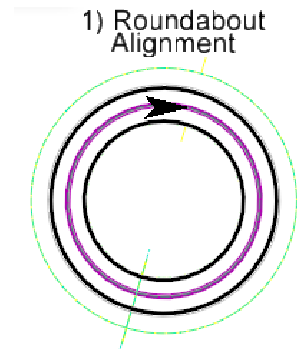
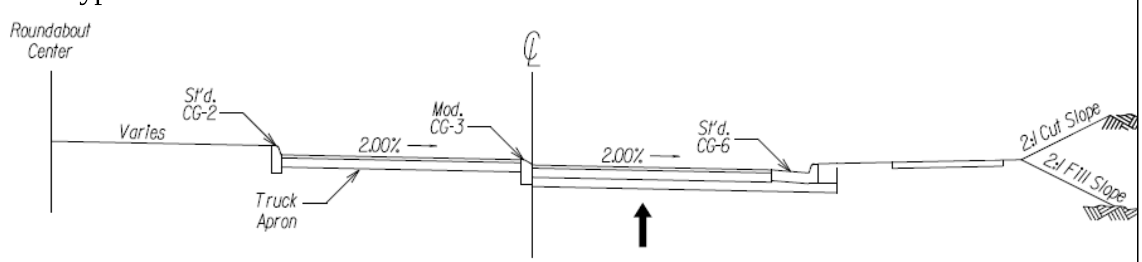
- Roundabout (Circular Placed on Alignments)

2D View	3D View
	

- Roundabout (Placed on Shape)

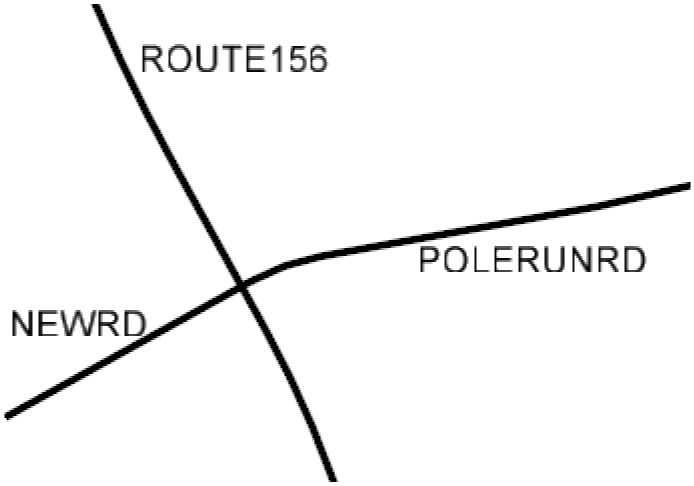
2D View	3D View
	

11.9.2 References & Direction of References

<table>
<tr><th>Roundabout (Circular Placed on Alignments)</th><th>Roundabout (Placed on Shape)</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td><u>References</u>
1) Primary Alignment (Profiled, Continuous through Roundabout)
2) Positional Reference or Intersecting Road Geometry</td><td><u>References</u>
1) Roundabout Alignment (Profiled)</td></tr>
<tr><td>NOTES:
(1) Primary Alignment must extend through Roundabout and at least through the proposed Roundabout outside EoP’s.
(2) Positional Reference needs to cross Primary Alignment.
(3) Direction of arrows can vary.
(4) Profile is set initially at Roundabout Outside EoP. This can be changed/adjusted after placement.</td><td>NOTES:
(1) CW Direction preferred but not required.
(2) Element does not have to be circular.</td></tr>
<tr><td colspan="2">The Typical used in the Civil Cells is shown below.

</td></tr>
</table>

11.9.3 Placement (Basic Median Open Ended)

1. Open the file **Roundabout.dgn.** This file contains the following alignments:



NOTE: ROUTE156 is profiled, the other two alignments aren't.

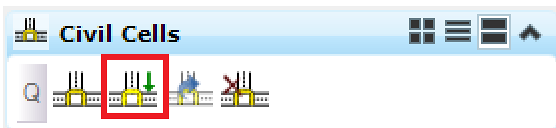
   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

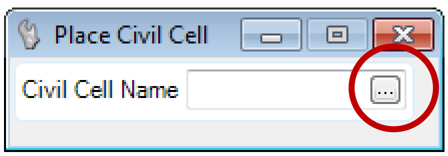
   c. Close the reference dialog.

   d. Zoom to the intersection area.

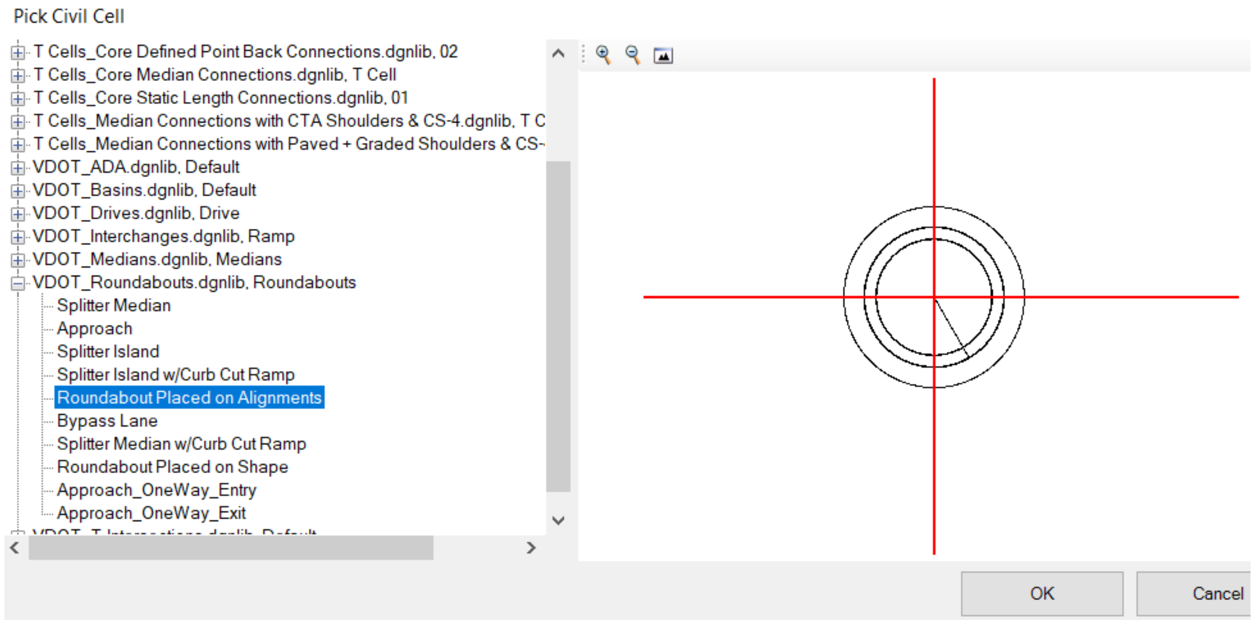
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

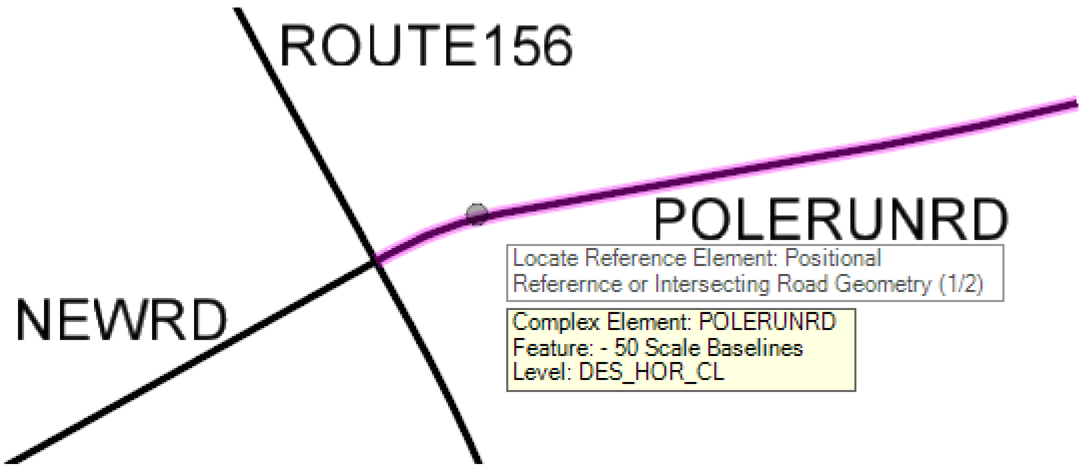


4. Select the **Roundabout (Circular Placed on Alignments)** civil cell from the **VDOT_Roundabouts.dgnlib** folder and click **OK.**

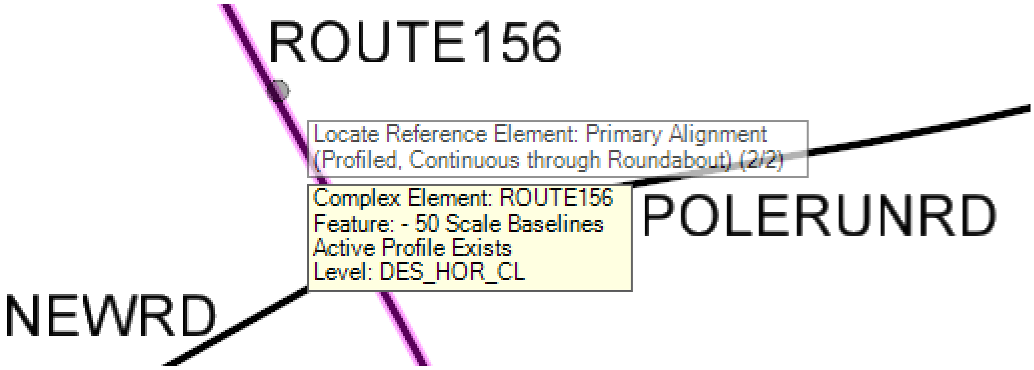


NOTE: The next two prompts may be in different order than listed in this manual.

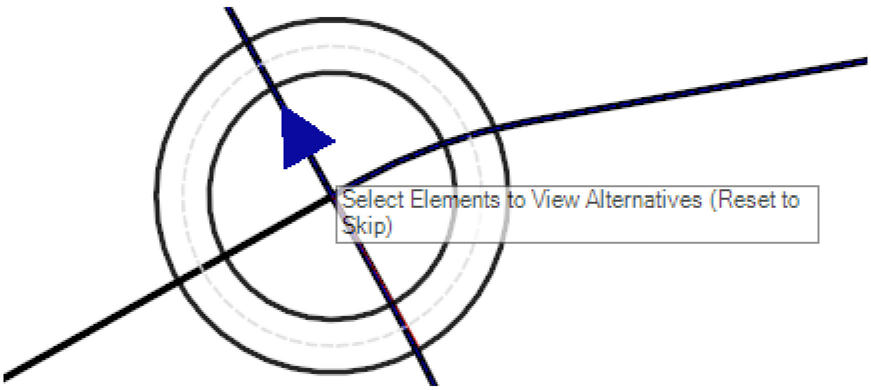
5. When prompted to *Locate Reference Element 'Positional Reference or Intersecting Road Geometry'*, select the **POLERUNRD** alignment in View 1 as shown below.



6. When prompted to *Locate Reference Element 'Primary Alignment (Profiled, Continuous through Roundabout'*, select the **ROUTE156** alignment in View 1 as shown below.



7. Review the geometry being displayed.



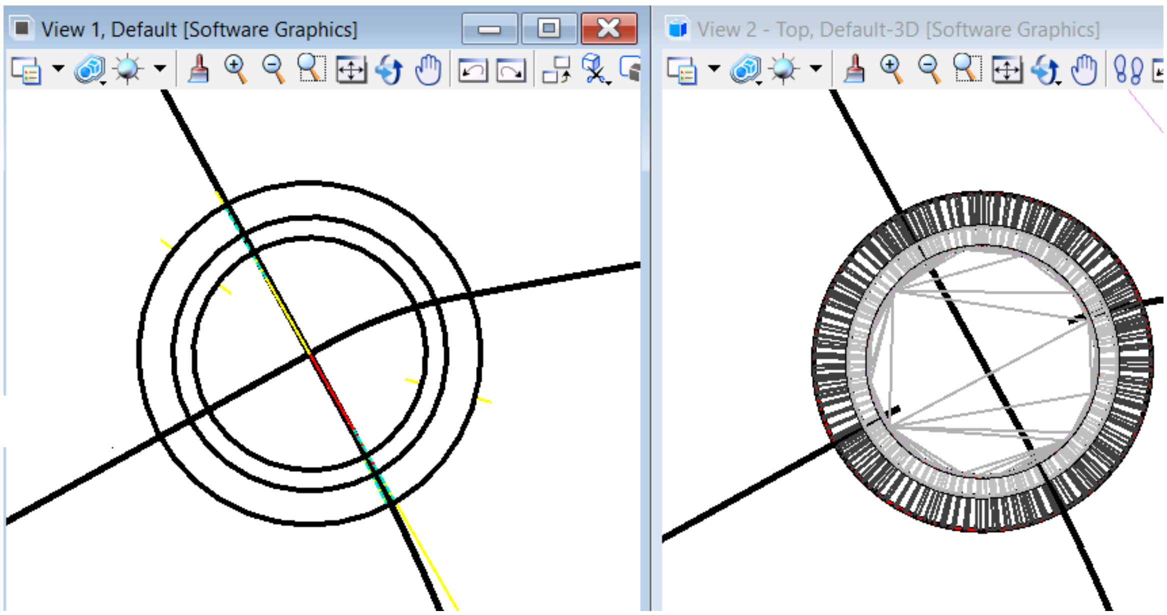
   a. If the geometry appears correct and similar to the image above, right click to reset and move on to the next step.

   b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.9.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

   c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

8. **Data Click** on the View when prompted to *'Accept Civil Cell Placement'*.

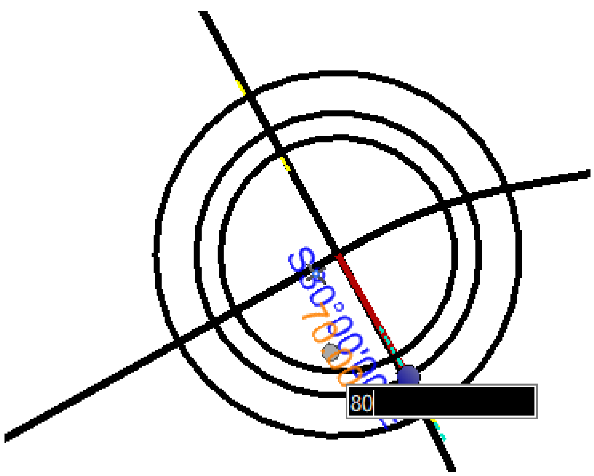
   The image below shows the cell in 2d & 3d views.



11.9.4 Horizontal Edits

11.9.4.1 RADIUS

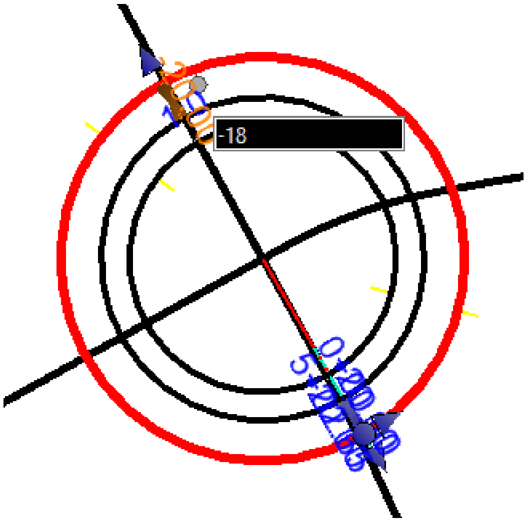
1. Do not select the inside EoP to change the radius for this Civil Cell. Select the **Radius Control** line as shown below. Change this value from 70 to **80'.**



Bearing of this line can also be modified if needed to determine the beginning location of the inside EoP (normally the Roundabout alignment).

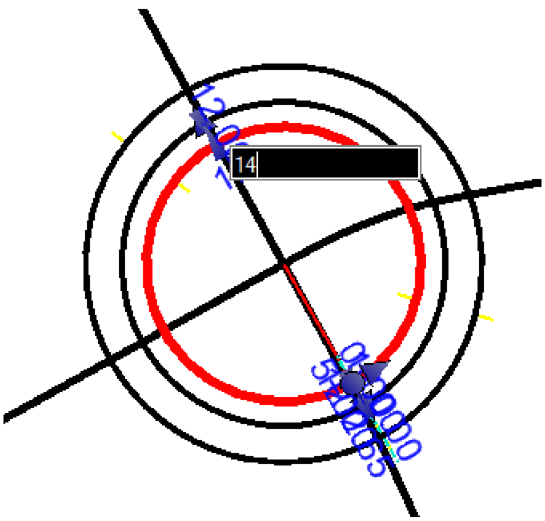
11.9.4.2 LANE WIDTH

1. Select the **EoP Outside.** Change the offset from the inside EoP from -20 to **-18'**. Make the edit on the opposite side of the Radius Control.



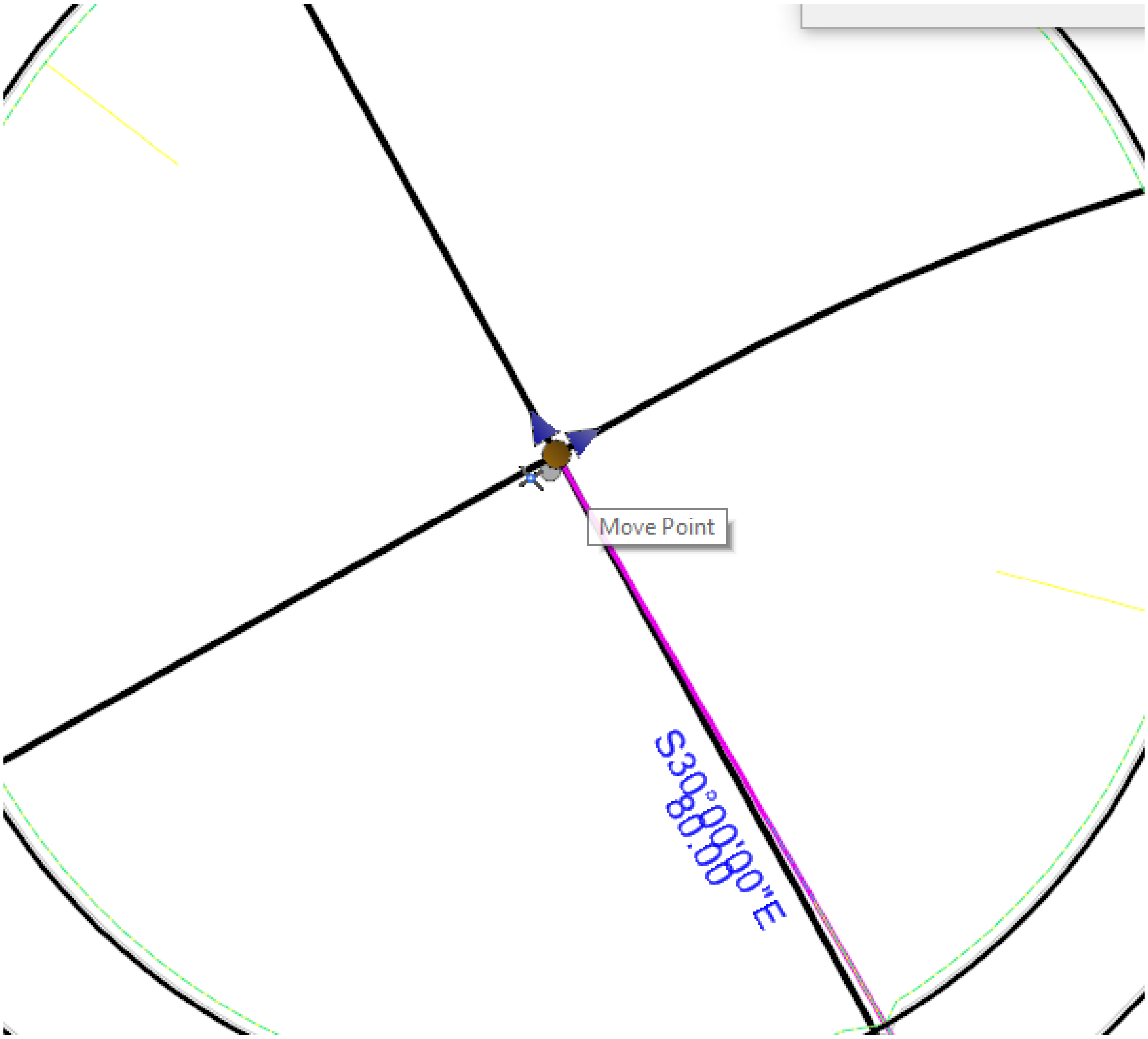
11.9.4.3 TRUCK APRON WIDTH

1. Select the **EoP (Truck Apron).** Change this offset from 12' to **14'.** Make the edit on the opposite side of the Radius Control.



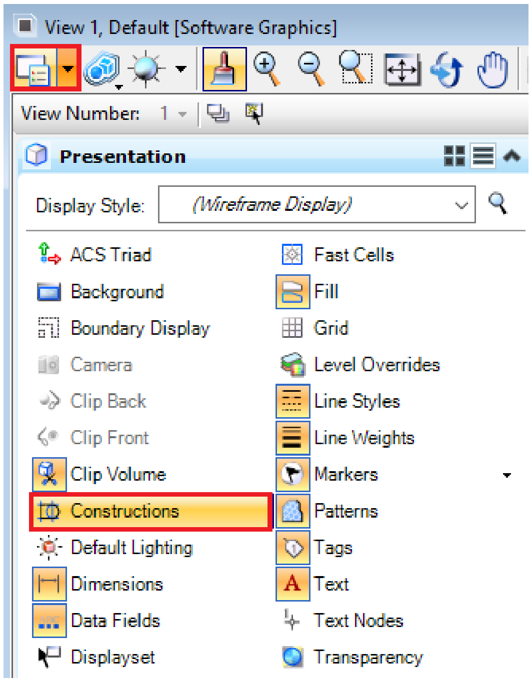
11.9.4.4 ROUNDABOUT LOCATION

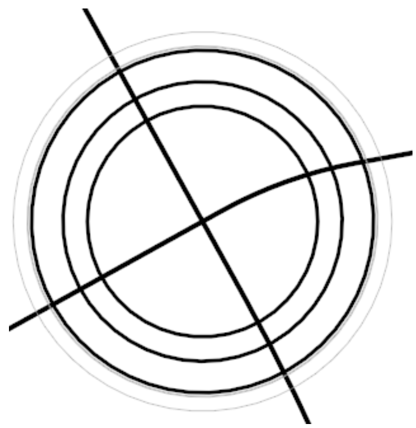
1. Select the Radius Control line again. The Roundabout center can be moved off the intersection of the two alignments by selecting the handler below and moving it to another location. We will not perform this change in this exercise.



11.9.1 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off Construction class elements, you will go to View Attributes as shown below.



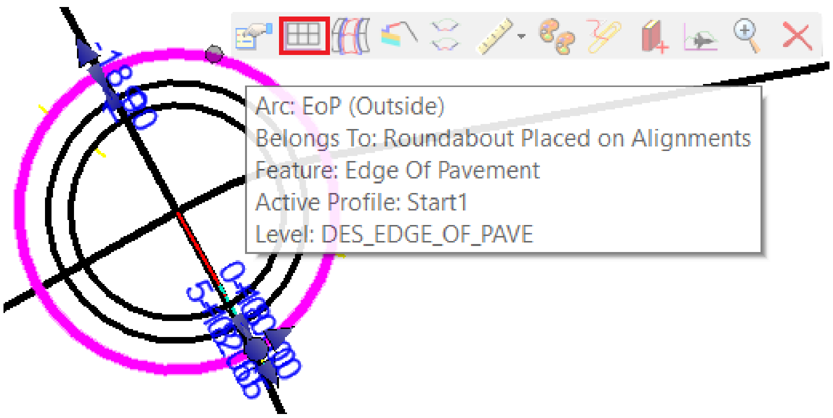


11.9.2 Vertical Edits

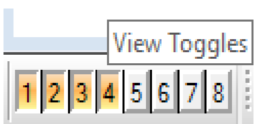
The EoP (Outside) element is the initial controlling vertical element of the Roundabout placed on alignments. Its profile is a projected profile of 0% from the Primary Alignment. The EoP (Inside) and EoP (Truck Apron) elements are projected slopes off this element. The Primary Alignment, other intersecting alignments, and all the Roundabout EoP elements will generally be adjusted to match grades at the intersections. We will go through some of these processes in the following steps although this is highly variable for each project and edits for this exercise will be limited.

11.9.2.1 EOP (OUTSIDE)

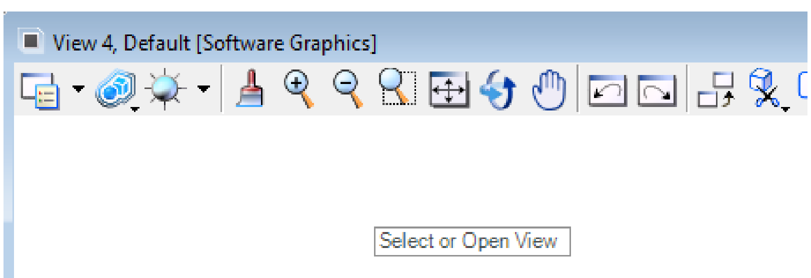
1. Select the **EoP (Outside)** element and choose **Open Profile Model** from the context menu.



   a. Open View 4.

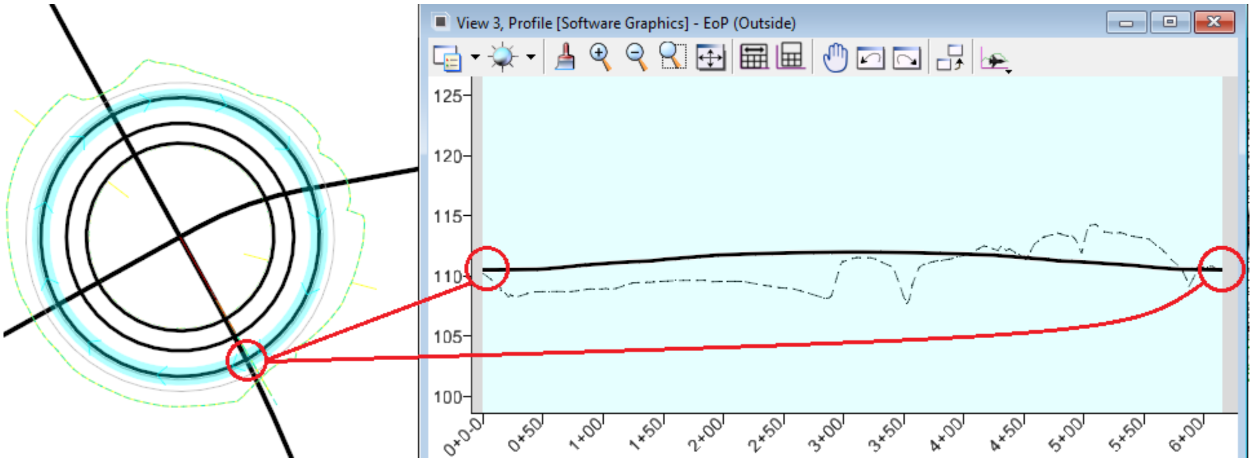


   b. Left click in View 4 to open the profile model.

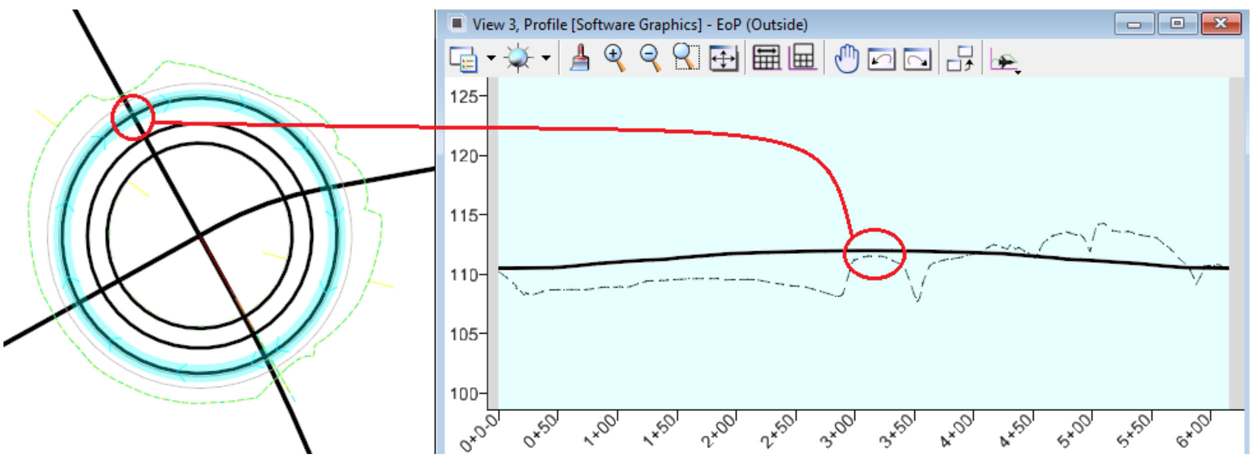


2. Let’s review the initial profile.

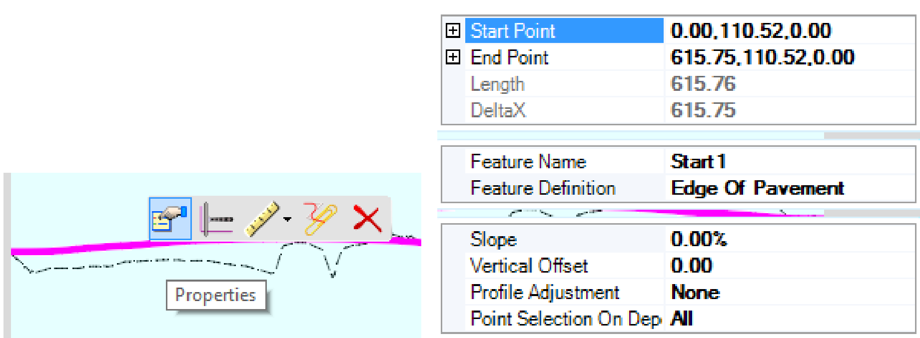
   a. The beginning/end points of the profile are the point where the EoP (Inside) begins/ends.



   b. The opposite Primary Rd Intersection is opposite of the Radius Control line so in this particular example, its approximately in the location below.



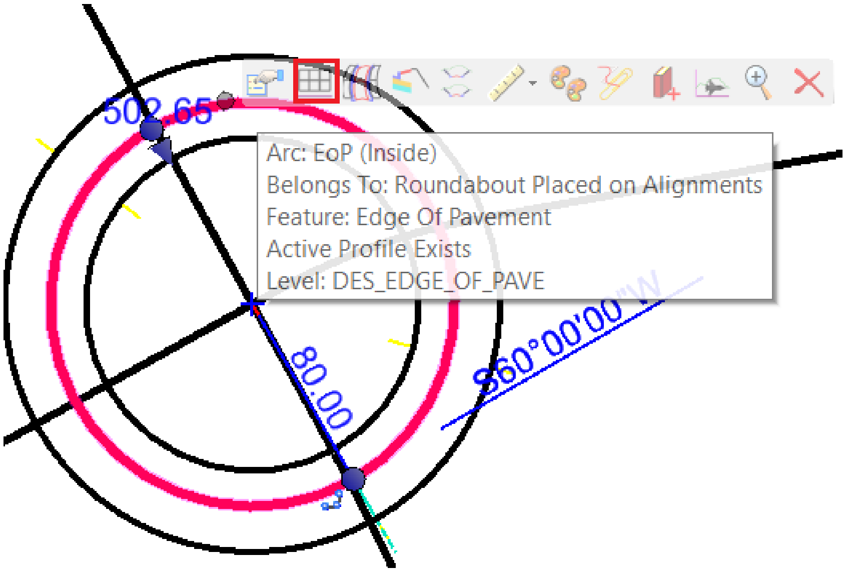
   c. Select the profile and choose **Properties** from the context menu. See the initial slope projection here where edits can be made although we will not make any changes here in this exercise.



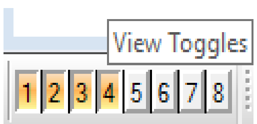
   This slope can be modified or an entirely new profile drawn and made active if so preferred.

11.9.2.2 EOP (INSIDE)

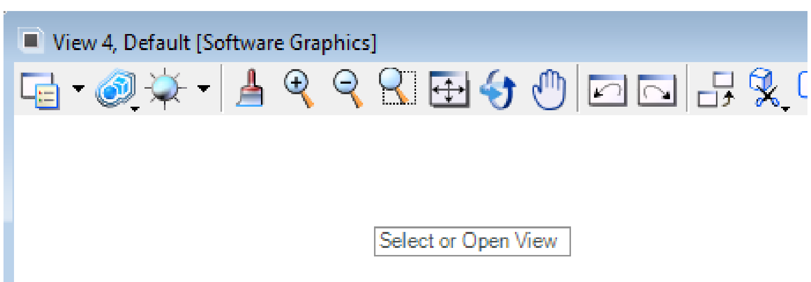
1. Select the **EoP (Inside)** element and choose **Open Profile Model** from the context menu.



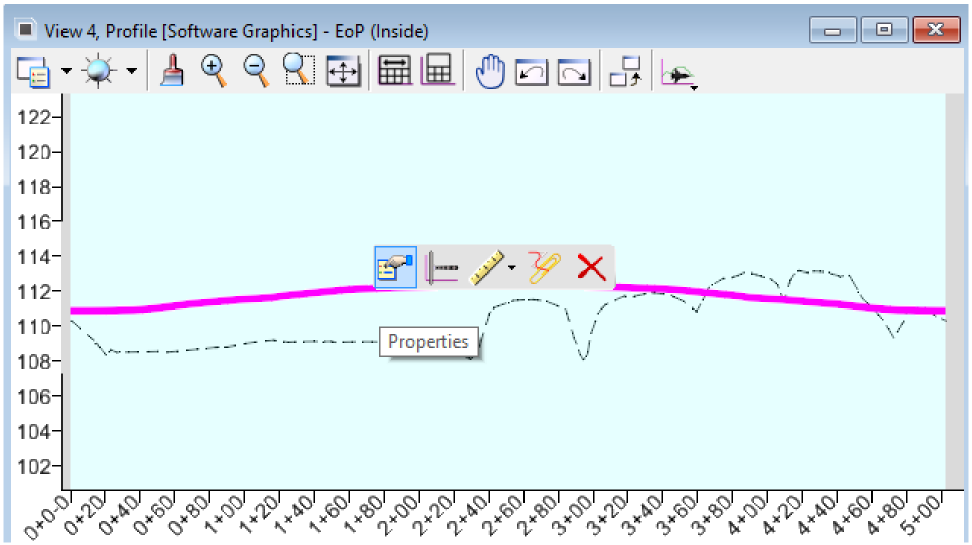
   a. Open View 4 if not already open.



   b. Left click in View 4 to open the profile model.



c. Select the **EoP (Inside)** profile and choose **Properties** from the context menu.

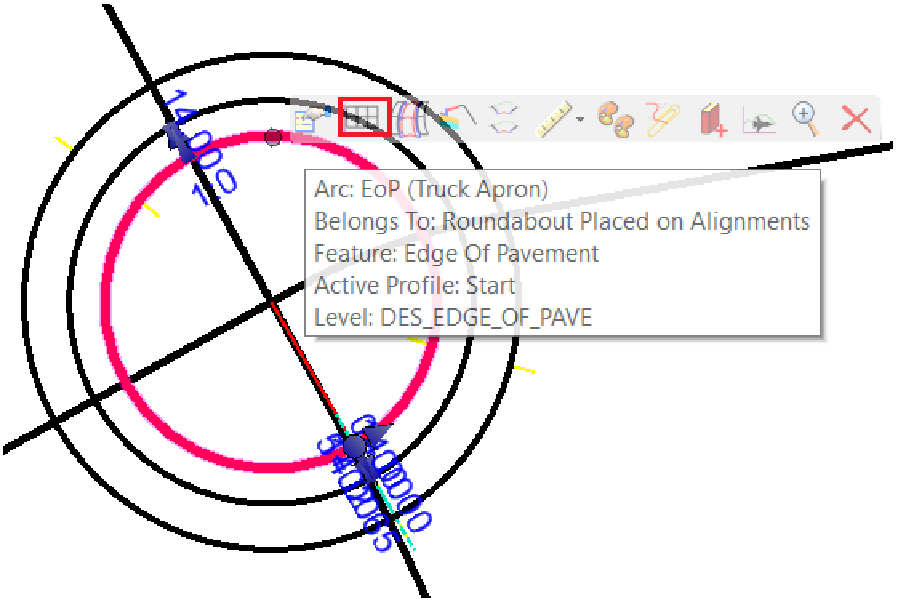


The Properties are shown below which is initially a 2% projection from the outside EoP. This slope can be modified or an entirely new profile drawn and made active if so preferred.

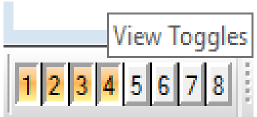
Start Point	0.00,110.88,0.00
End Point	502.65,110.88,0.00
Length	502.67
DeltaX	502.65
Feature Name	
Feature Definition	Edge Of Pavement
Slope Style	Linear
Start Reference Distanc	0+00.00
End Reference Distanc	5+02.65
Start Slope	2.00%
End Slope	2.00%
Vertical Offset	0.00
Slope relative to target	False

11.9.2.3 EOP (TRUCK APRON)

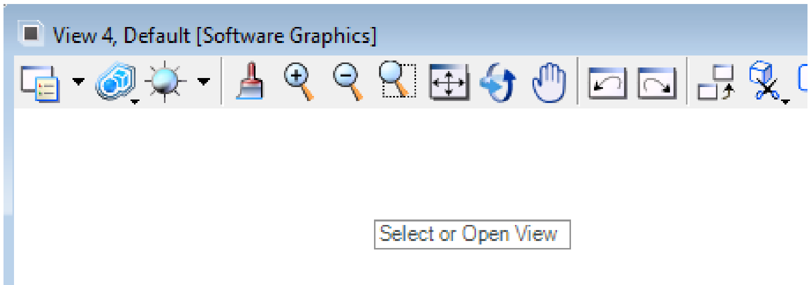
1. Select the **EoP (Truck Apron)** element and choose **Open Profile Model** from the context menu.



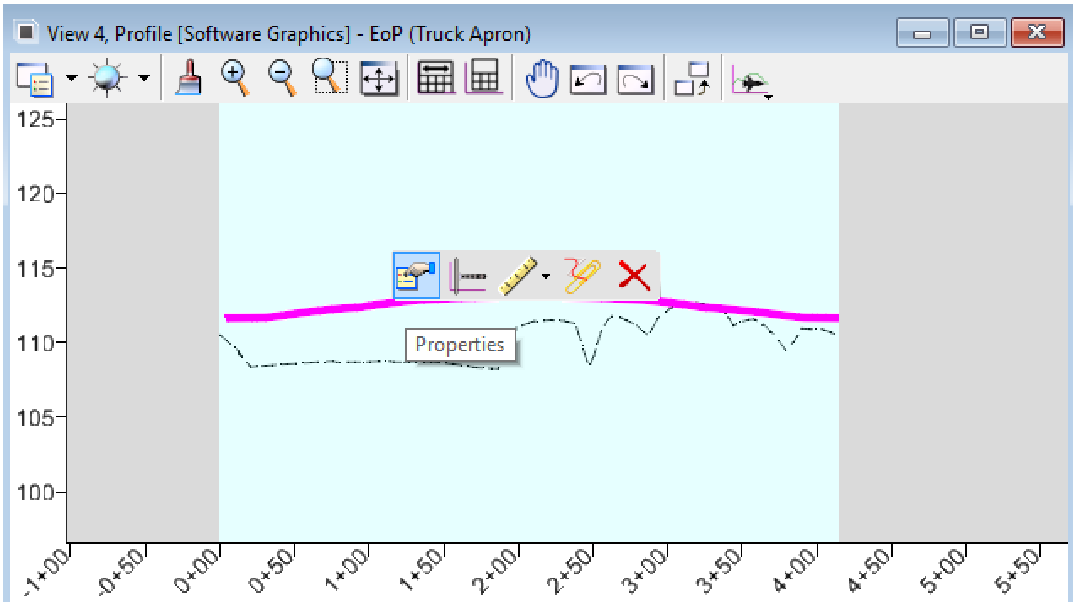
a. Open View 4 if not already open.



b. Left click in View 4 to open the profile model.



c. Select the **EoP (Inside)** profile and choose **Properties** from the context menu.

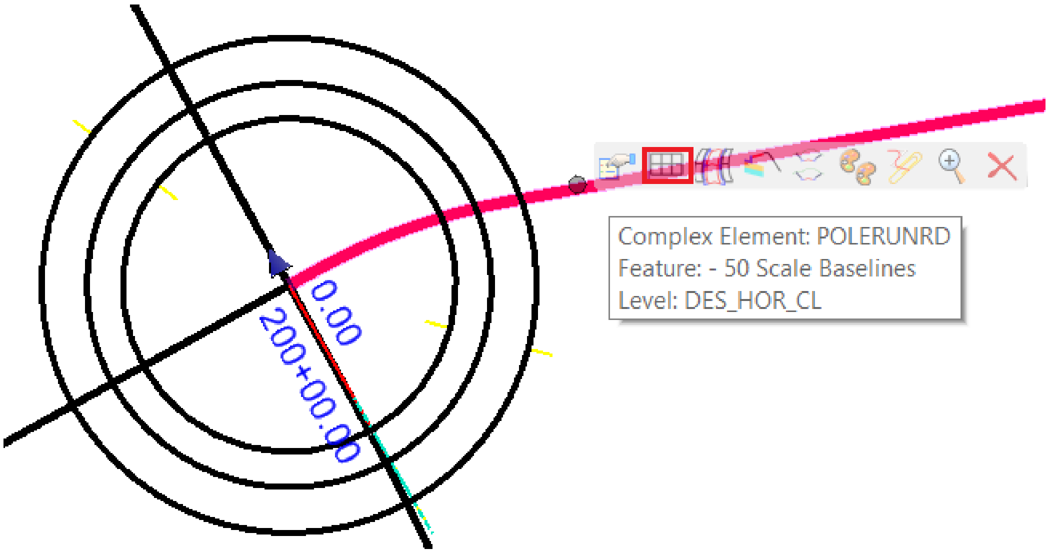


The Properties are shown below which is initially a 3% projection from the Inside EoP & a vertical offset of 0.33 to take in consideration the curb at the Inside EoP. This slope & vertical offset can be modified or an entirely new profile drawn and made active if so preferred.

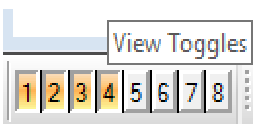
Feature Name	**EoP (Truck Apron)**
Feature Definition	**Edge Of Pavement**
Method	**Single Offset**
Offset	**14.00**
Start Distance	**0+00.00**
End Distance	**5+02.65**
Ratio	**1:0**
Type	**Base Geometry**
Slope	**3.00%**
Vertical Offset	**0.33**
Profile Adjustment	**None**
Point Selection On Dep	**All**
Curve Stroking	**0.05**
Profile Stroking	**0.05**
Stroking Step Method	**Increment**
Linear Stroking	**5.00**

11.9.2.4 INTERSECTING ALIGNMENTS

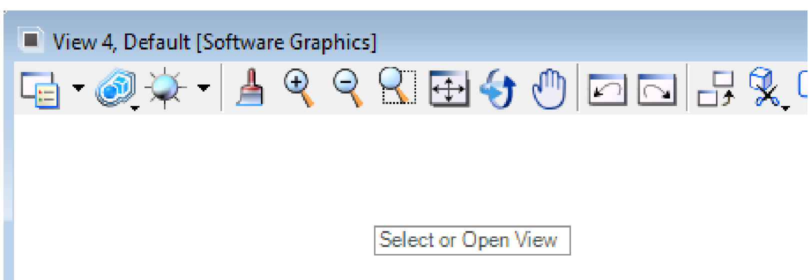
1. Select the **POLERUNRD** element and choose **Open Profile Model** from the context menu.



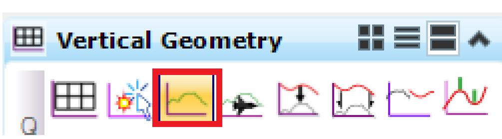
   a. Open View 4 if not already open.



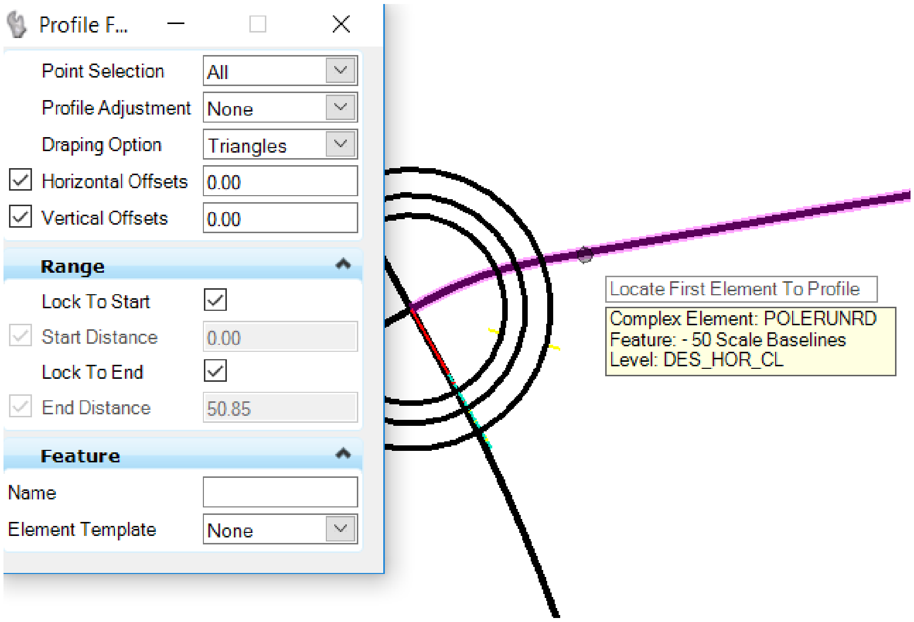
   b. Left click in View 4 to open the profile model.



2. Select the Vertical Geometry command **Profile by Surface.**

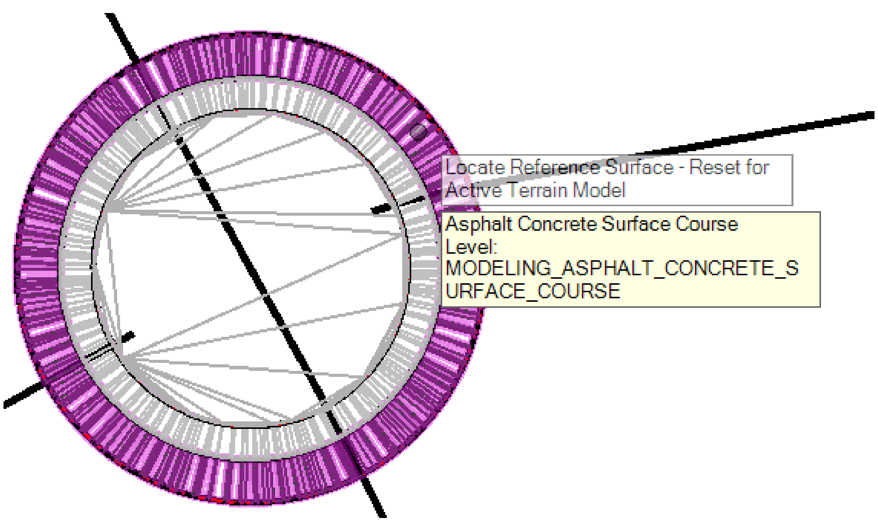


3. Fill out the dialog as shown below and select **POLERUNRD** when prompted to *Locate First Element to Profile.*

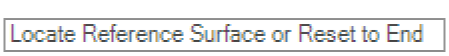


4. Right click to reset when prompted:

5. In View 2 (3d view) select the **roundabout pavement** when prompted to *Locate Reference Surface – Rest for Active Terrain Model.*

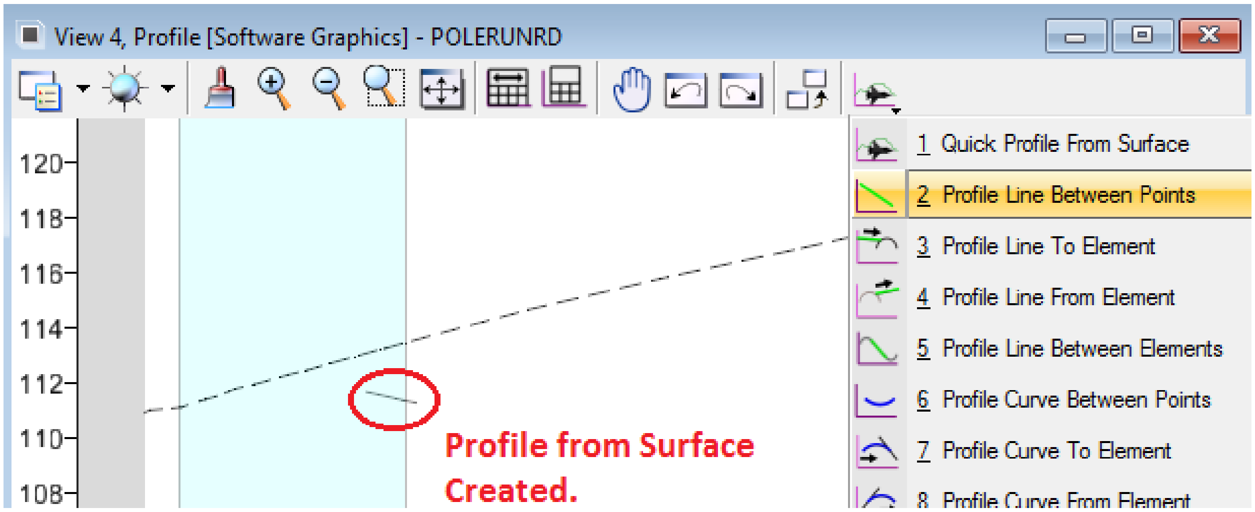


6. Right click to reset when prompted:

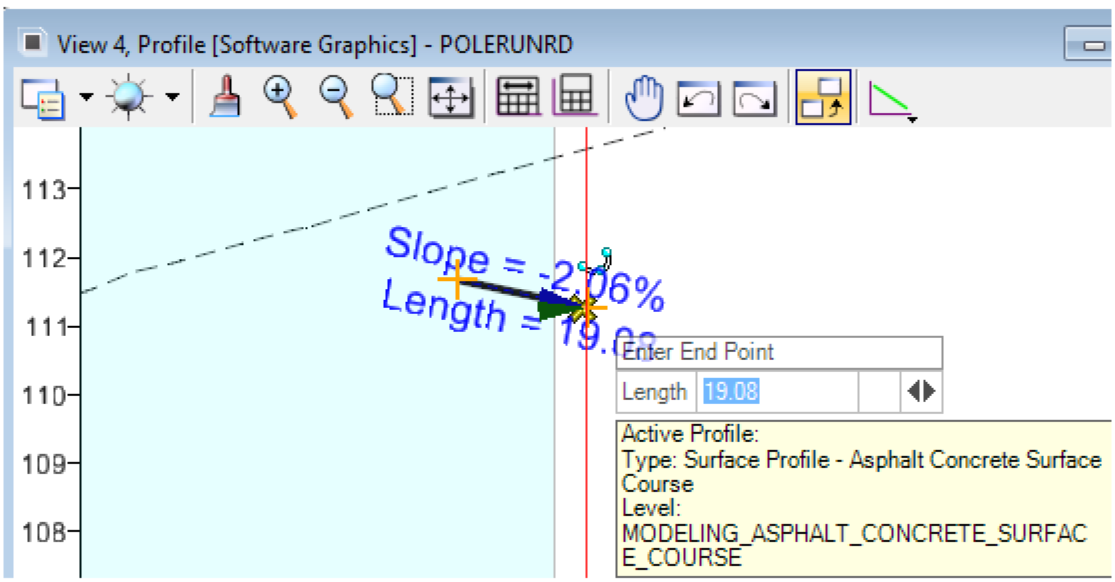


7. Left click to confirm the remaining prompts and create the profile.

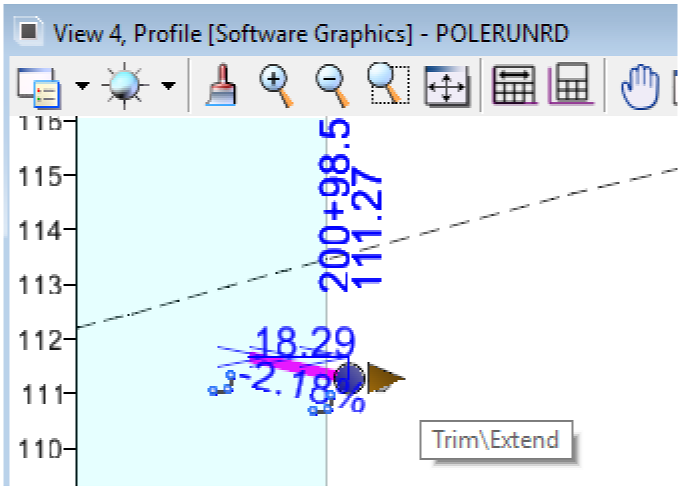
8. Choose the **Profile Line Between Points** command as shown below.



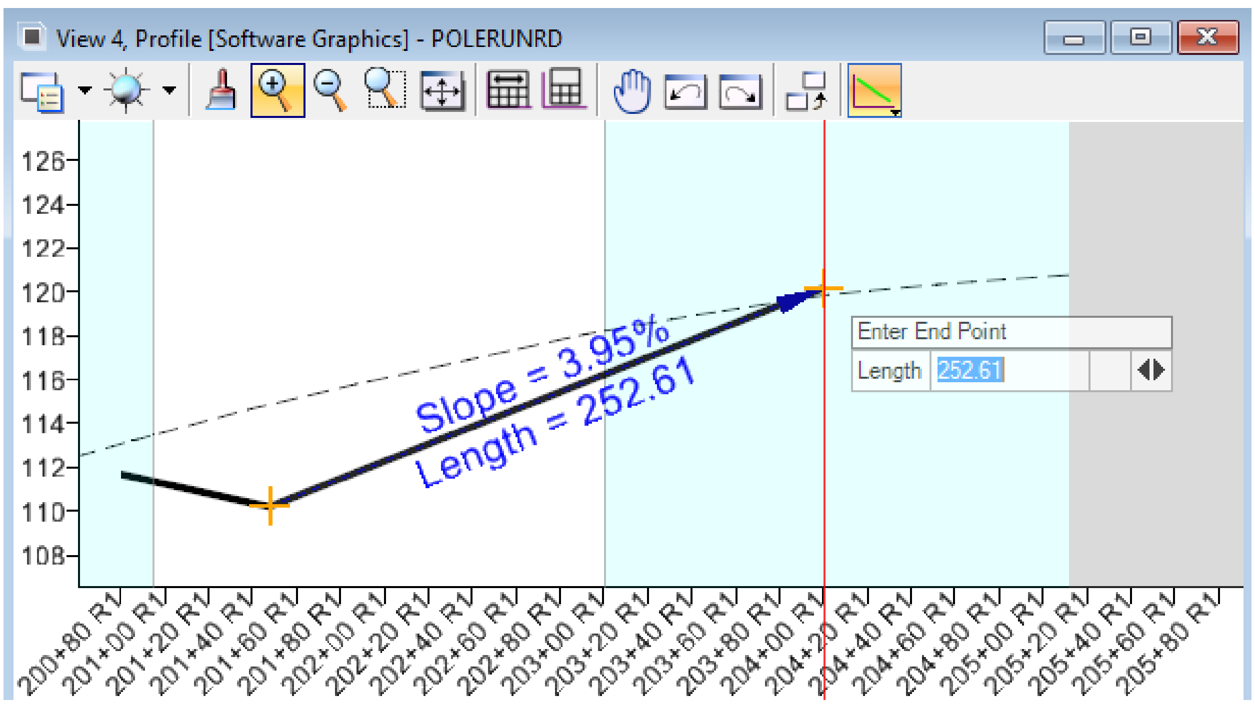
9. Place the profile line from start point to end point of the profile from surface line just created.



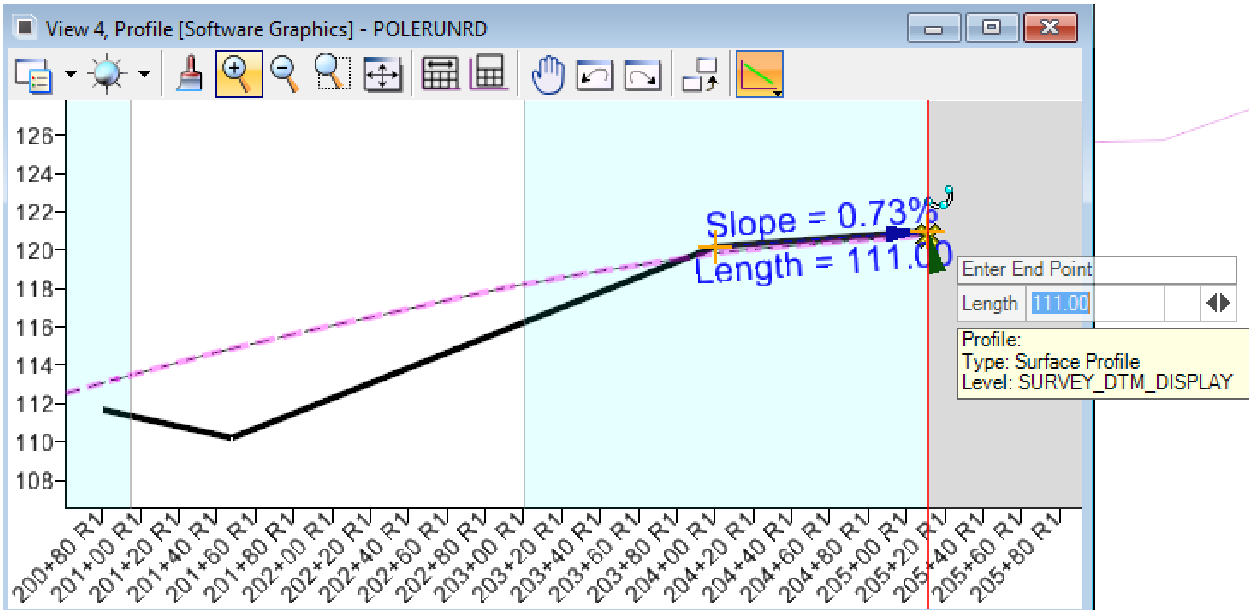
10. Select this line just placed, select the Trim/Extend handler and extend this line to approximately 201+50.



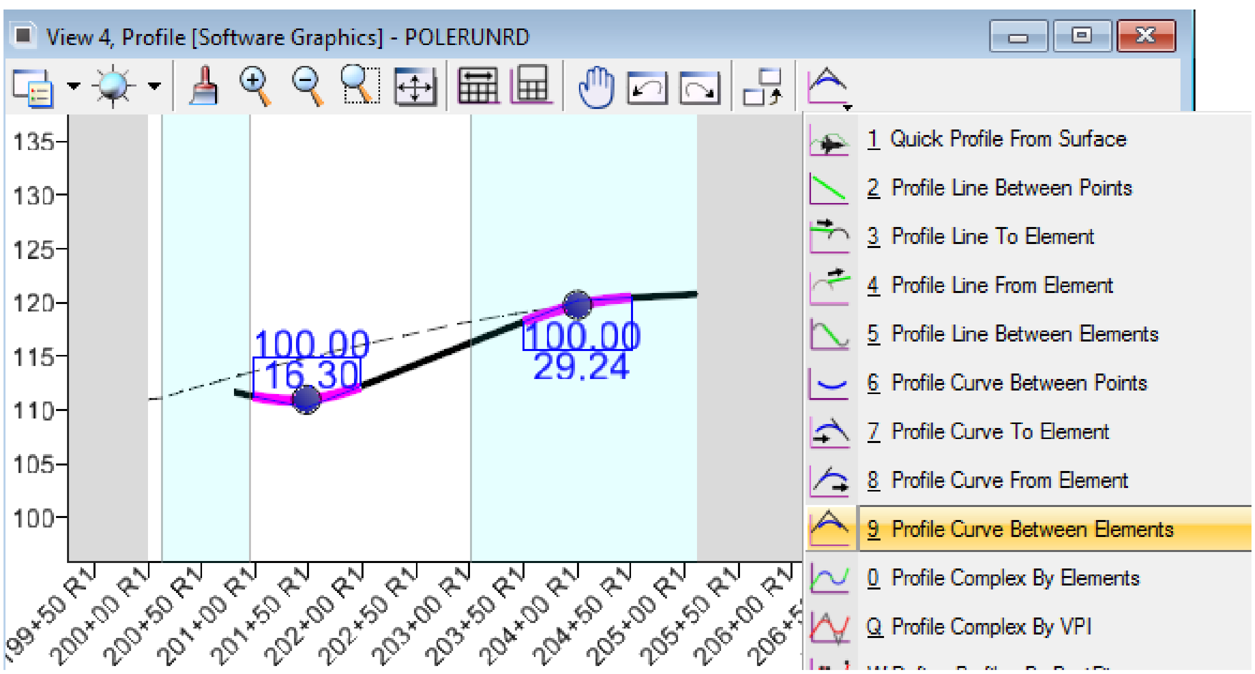
11. Place the next line as shown below (Approximate).



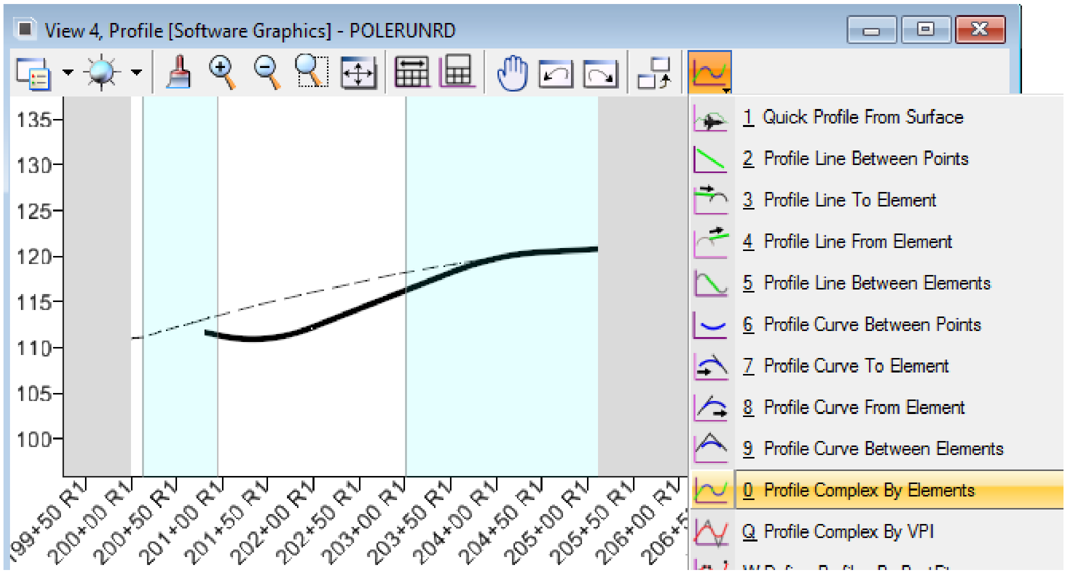
12. Place the next line as shown below (Approximate).

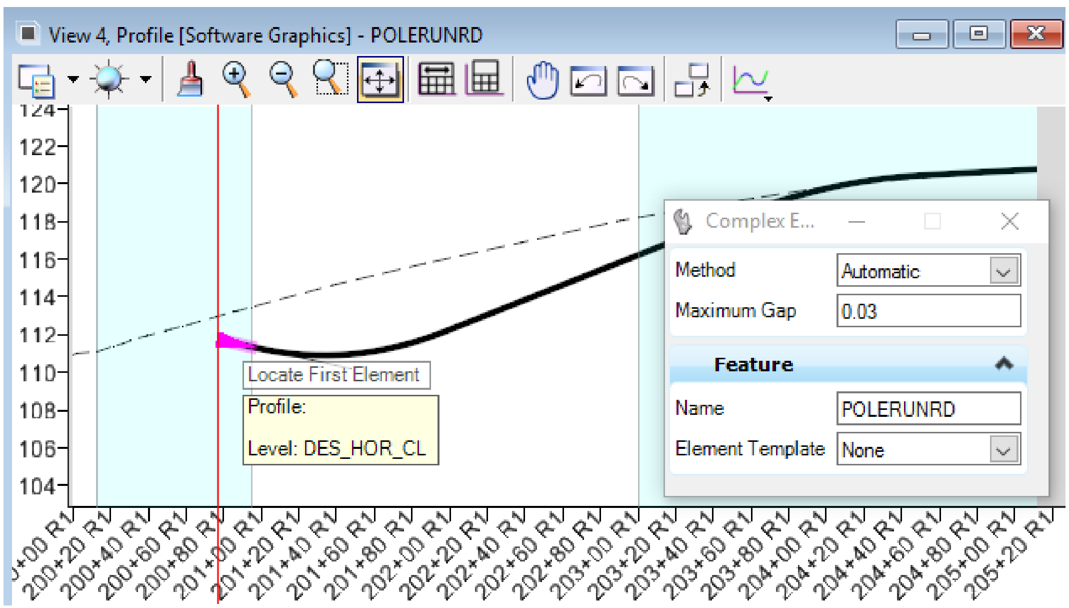


13. Select the following command and place two 100' vertical curves as shown below.

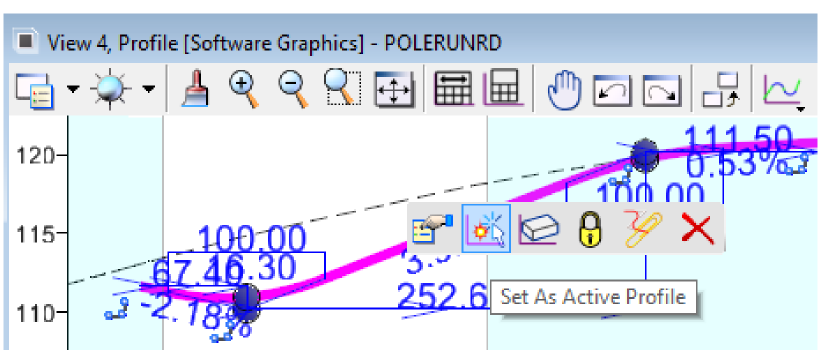


14. Select the following command and Complex the profile.





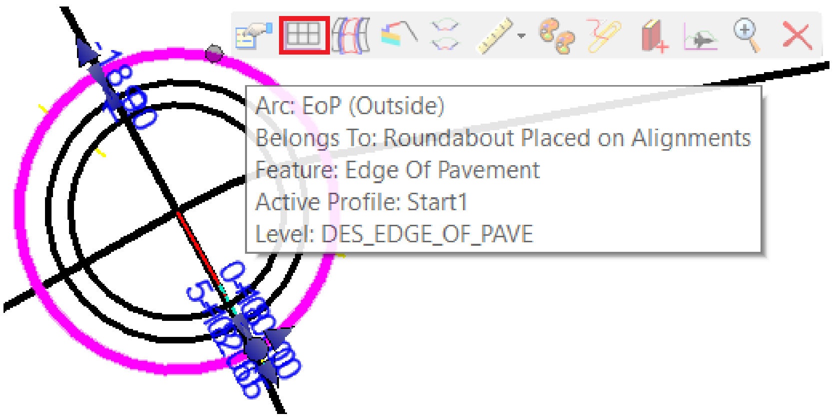
15. Make this profile active.



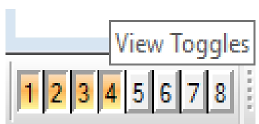
We will place an approach civil cell later in the Approach section of this guide.

11.9.2.5 PROFILE INTERSECTION TOOL

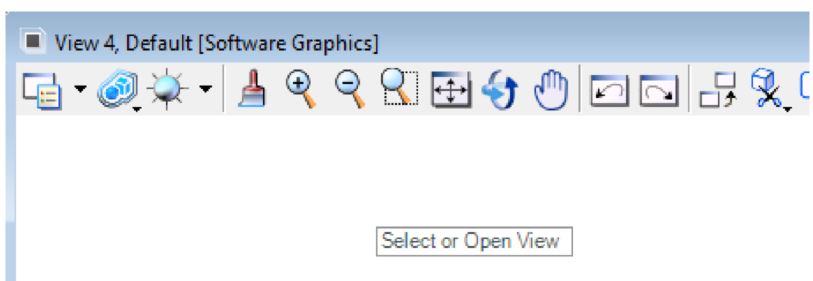
1. Select the **EoP (Outside)** element and choose **Open Profile Model** from the context menu.



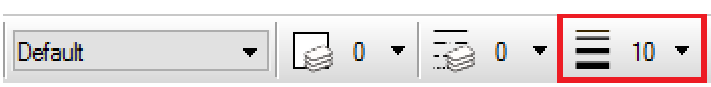
   a. Open View 4.



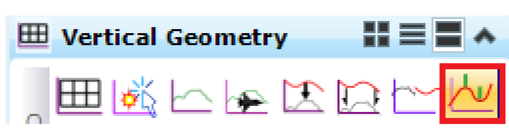
   b. Left click in View 4 to open the profile model.



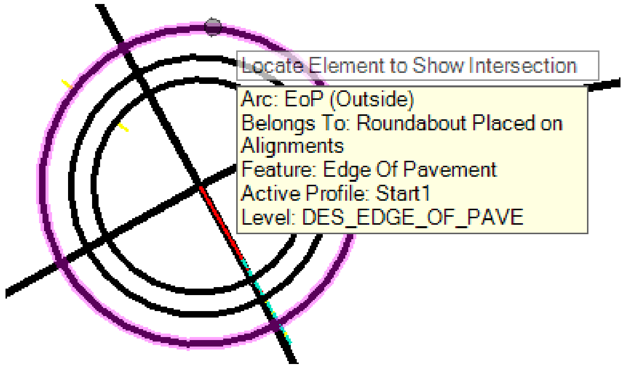
2. Bump the Weight up to 10 on MicroStation’s Attributes dialog.



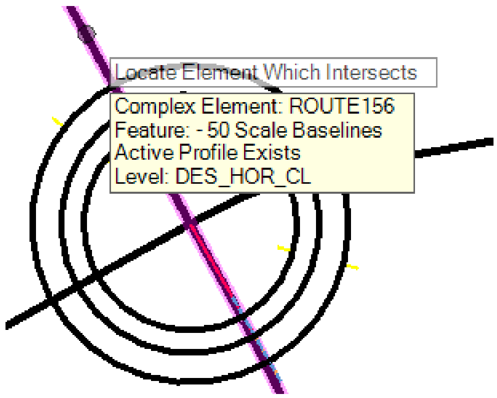
3. Select the **Profile Intersection Point** *Vertical Geometry* command.



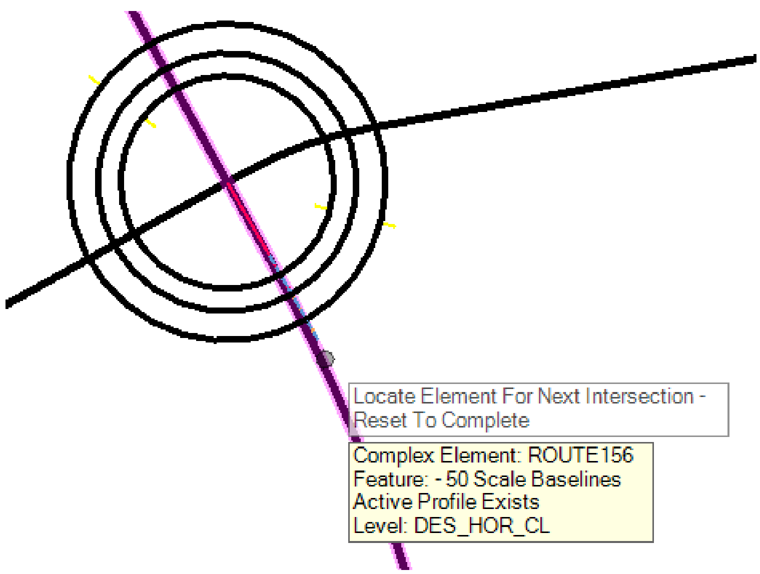
a. Locate the **EoP (Outside)** element when prompted to *Locate Element to Show Intersection.*



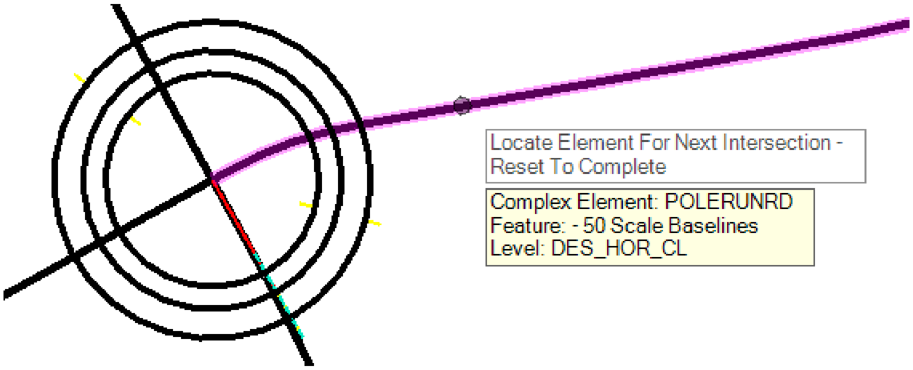
b. Left click the **ROUTE156 alignment close to the northern intersection** with the Roundabout when prompted to *Locate Element Which Intersects*.



c. Left click **ROUTE156 close to the southern intersection** with the Roundabout when prompted to *Locate Element Which Intersects – Reset To Complete*.

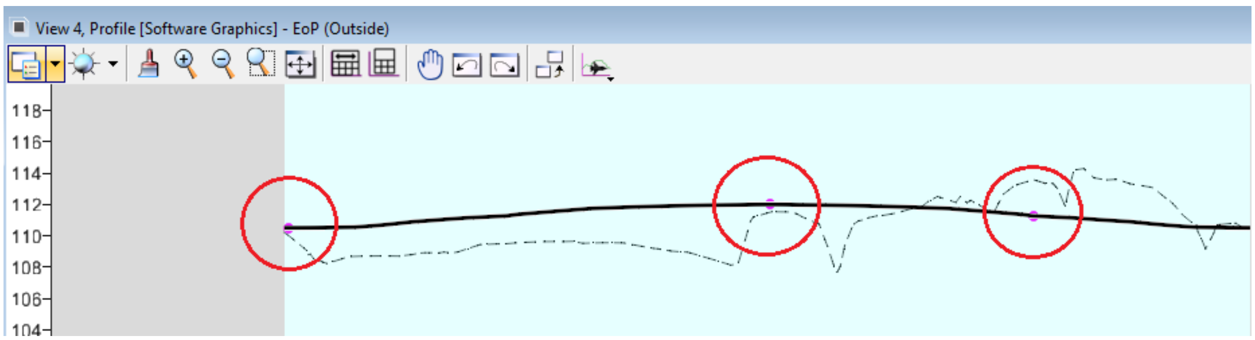


d. Left click POLERUNRD when prompted to *Locate Element Which Intersects – Reset To Complete*.



e. Reset to end.

f. Review the profile and make sure the profile passes through these points.



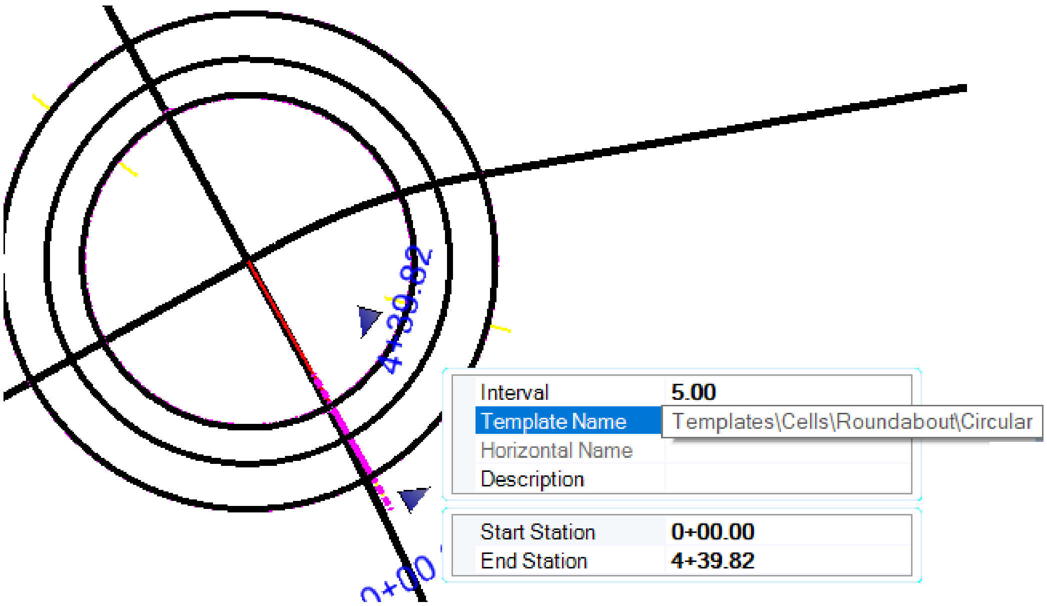
11.9.3 Template Edits

The template used in the Roundabout Civil Cells is highlighted below and contained within a corridor. We will show the various tools in this section available for use and related to Linear and Surface Templates but no changes will be made in this exercise and you would need to refer to section 11.3.10 for examples of actually making edits.

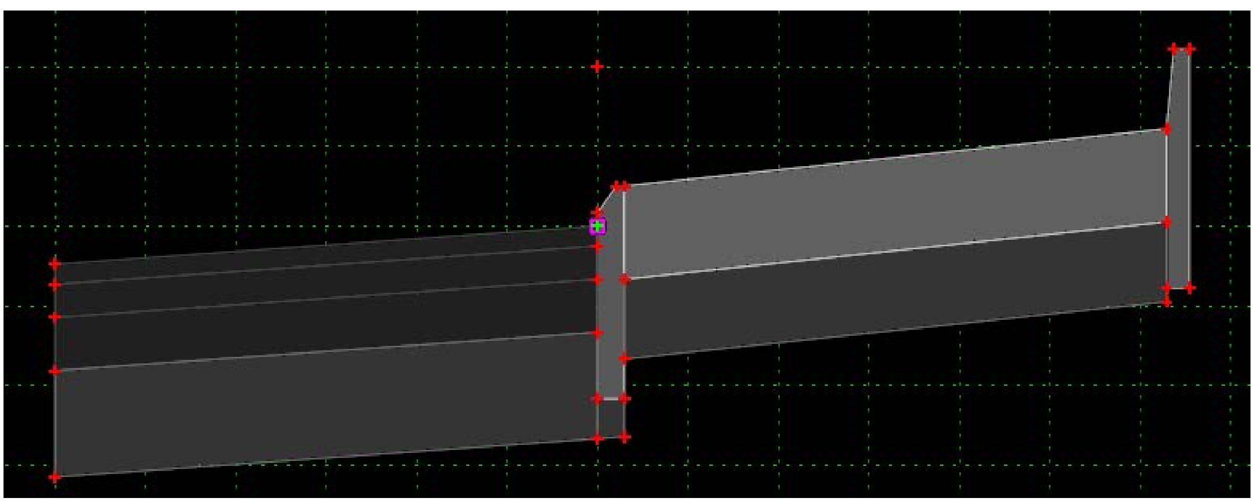
11.9.3.1 TEMPLATE

The template used in the Roundabout Civil Cell has no elements (C&G, SW, End Conditions) outside of the EoP (Outside) because most of this area would have to be turned off or clipped due to Approach overlap. Section 11.10.8 shows the process of adding a linear to the Rotary in areas between the approach ties (If needed).

1. Selected in Plan View.



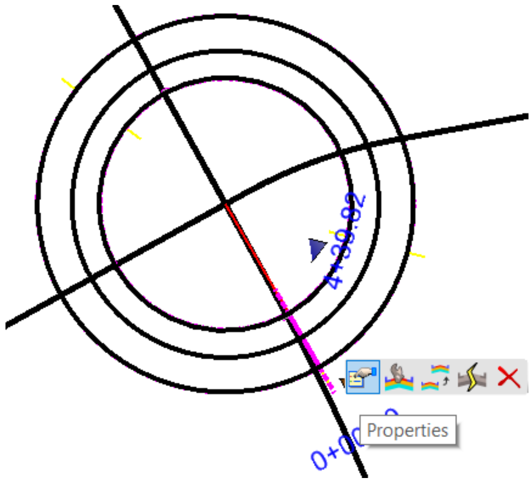
2. Template used.



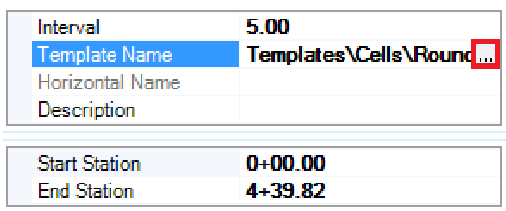
11.9.3.2 PROPERTIES

To re-direct this linear template to a different one in the ITL.

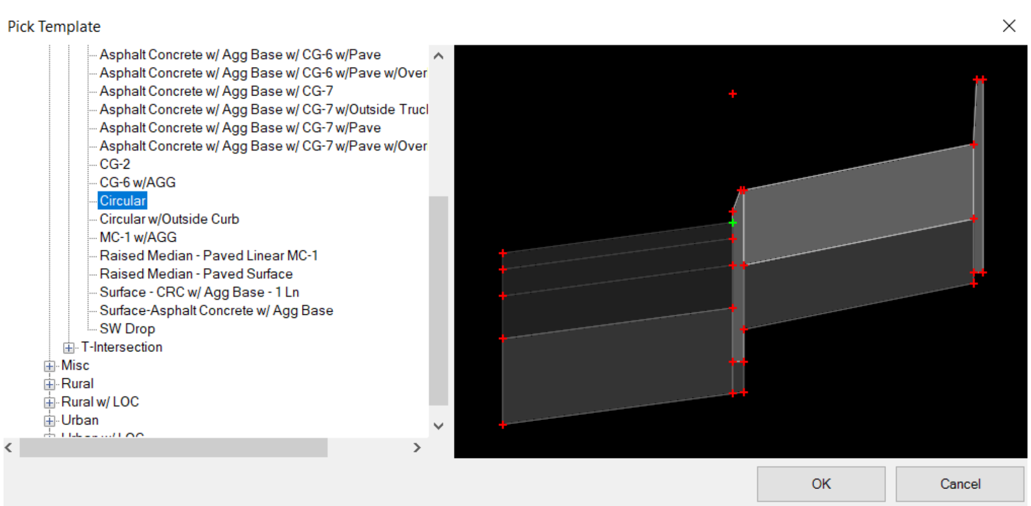
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Linear template used in the Roundabout cell is shown below. Although we will not replace this template in this exercise, you would choose a template from the **Pick Template** dialog if you wanted to replace the given template.

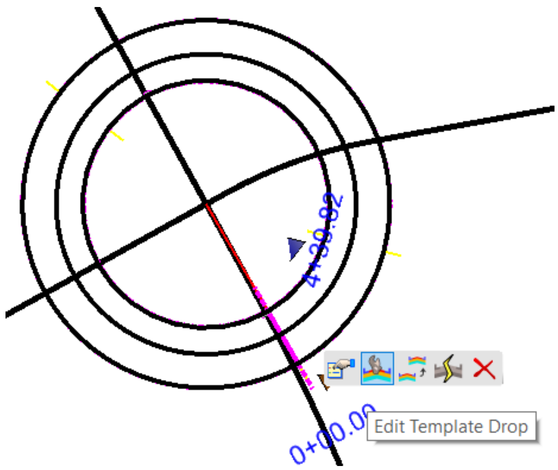


4. Tag **Cancel** *(OK if you actually change the template.)*

11.9.3.3 EDIT TEMPLATE

To edit the template:

1. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.

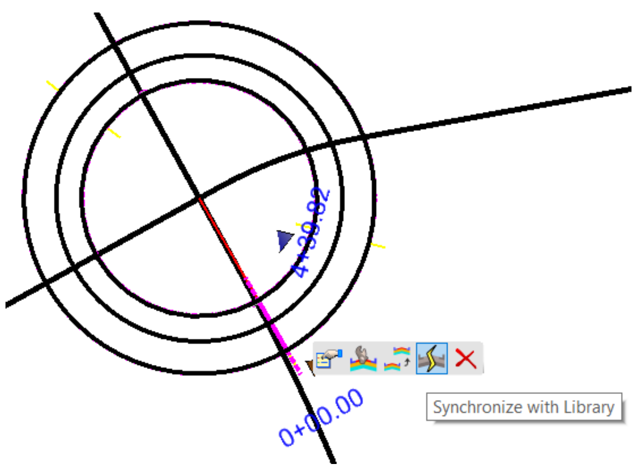


2. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.
3. For this exercise, choose **Cancel.**

11.9.3.4 SYNCHRONIZE

To synchronize a template if modified:

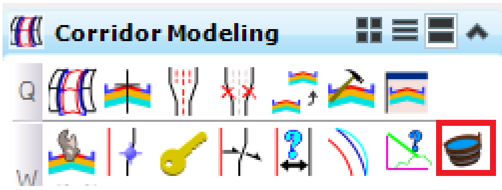
1. Select *Synchronize with Library* as shown below which applies any changes in the template to the linear template.



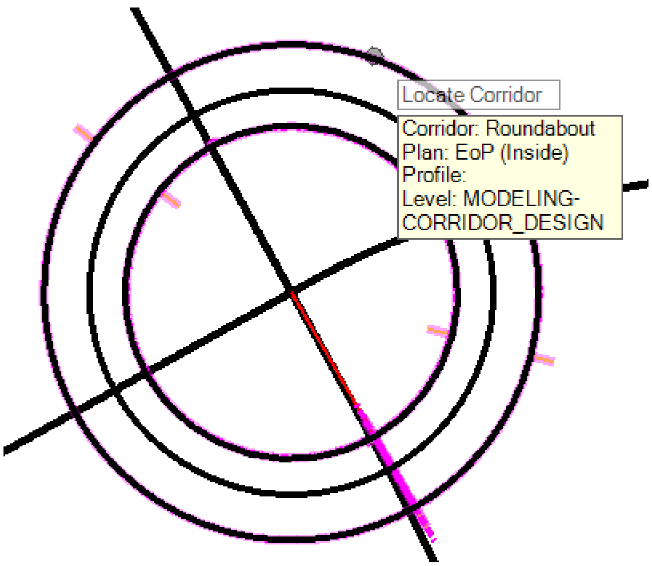
11.9.3.5 POINT CONTROLS

The corridor within the template is preset with two point controls which follow both vertically the EoP (Outside) & EoP (Truck Apron). We will review these in the steps below.

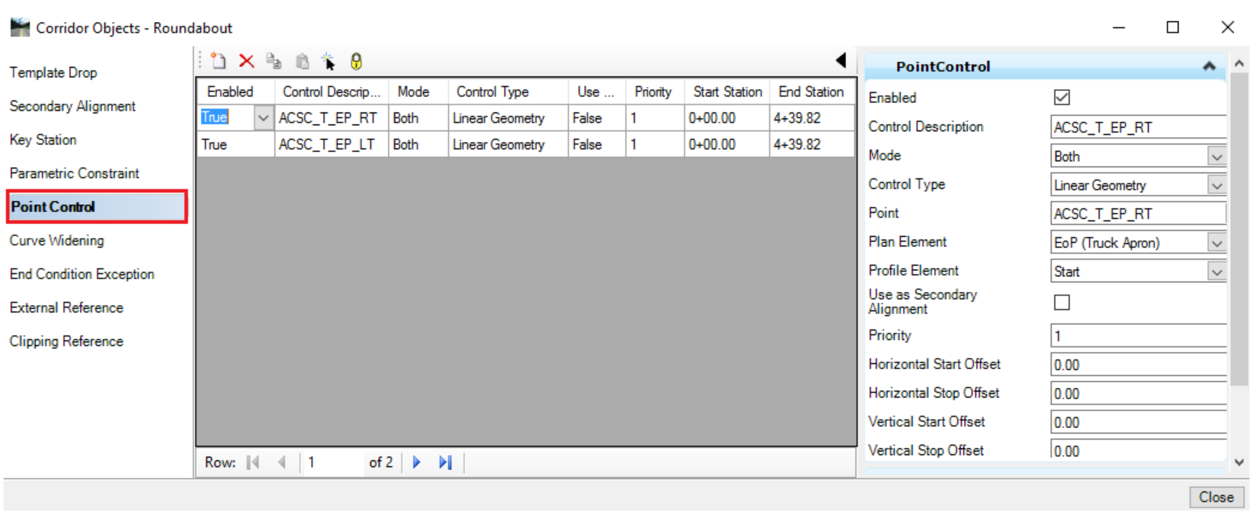
1. Select **Corridor Objects** from the *Corridor Modeling* task menu.



2. Select the **Roundabout corridor** when prompted to *Locate Corridor*.



3. Select **Point Control** to review the point controls and then choose **Close** without making any changes for thjs exercise.

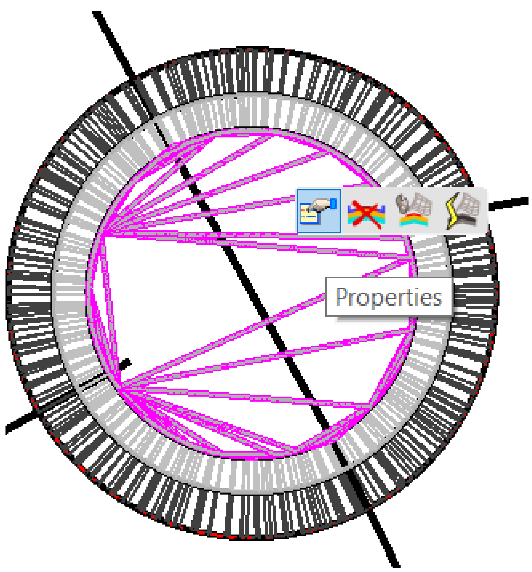


11.9.3.6 SURFACE TEMPLATE

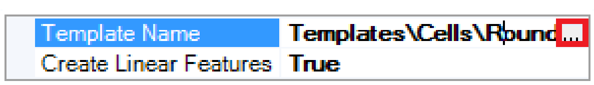
The only Surface Template in the Roundabout Civil Cells is in the island area. Commands available for Surface Template edits from the context menu are shown below and match the Linear Template commands described in the sections directly above with the exception of Delete Template.

NOTE: We'll just go through Properties here to show what Surface template is used by default in the Roundabout Civil Cells. Refer to section 11.3.10 for actual template edit steps.

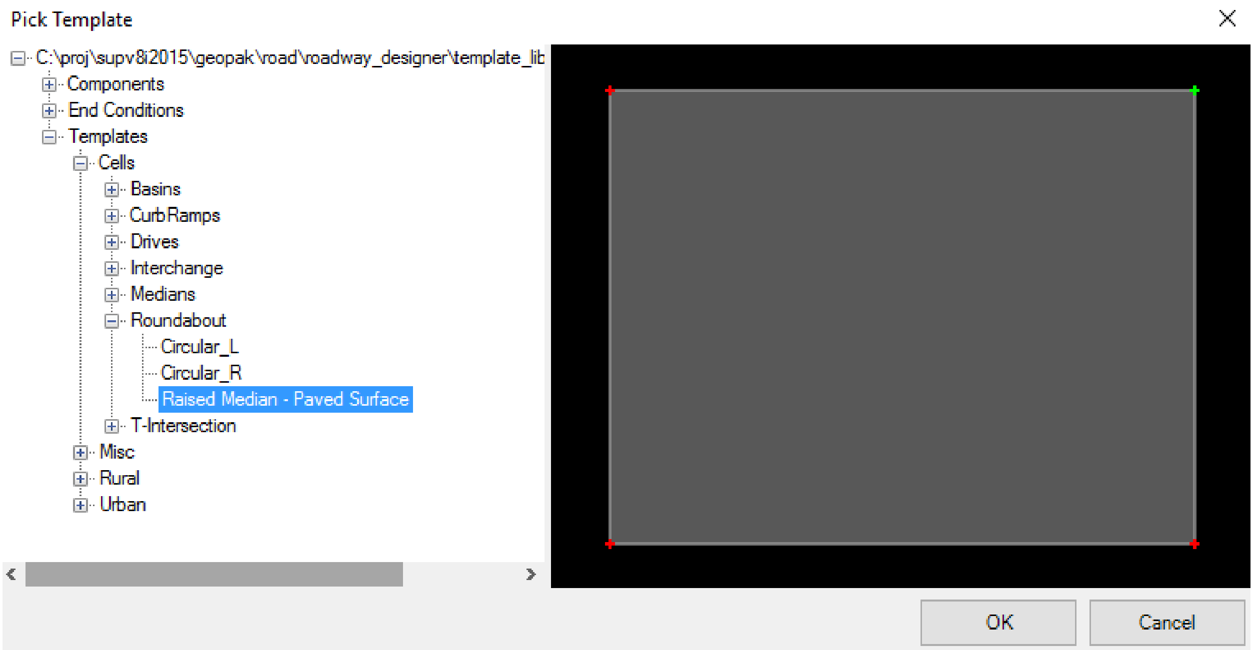
1. Select the Surface Template in the 3d view.
2. From the Context menu, choose **Properties.**



4. From the Properties menu, select the button below.



5. The **Pick Template** dialog is invoked and shown below. The Surface template used in the Urban Drive Civil Cell is shown below. Although we will not replace this template in this exercise, you would choose the template from the **Pick Template** dialog if you wanted to replace the given template.



6. Tag **Cancel** *(OK if you were to actually change the template.)*

11.9.4 Other Cells – Roundabout (Placed on Shape)

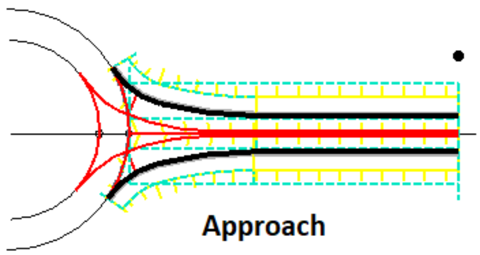
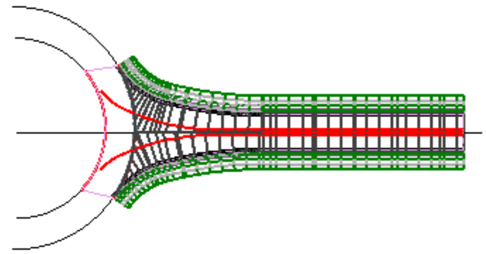
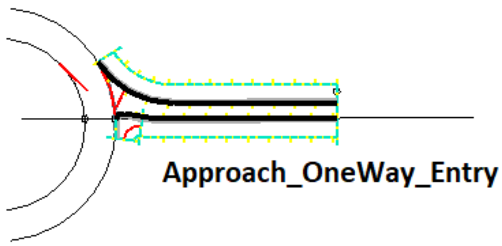
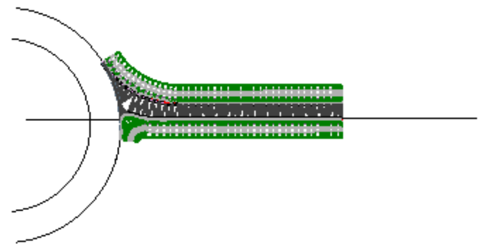
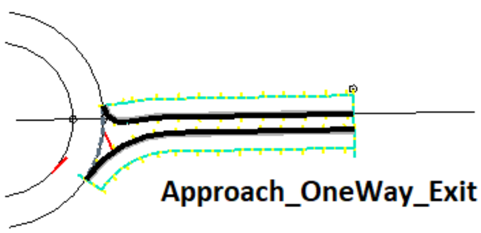
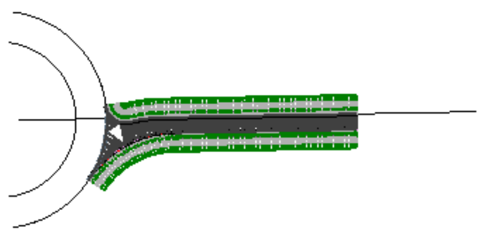
11.9.4.1 OVERVIEW

The other roundabout Civil Cell available is the **Roundabout (Placed on Shape)** Civil Cell. This Civil Cell is basically the same as Roundabout (Placed on Alignments) with the exception it has only one reference and that is a profiled. closed element created with Horizontal Geometry commands. The element can be circular or non-circular. The sections above can be utilized for edits, templates, etc. of this cell.

11.10 ROUNDABOUT APPROACHES

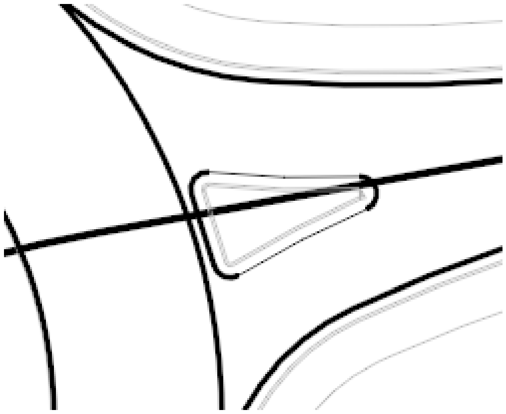
11.10.1 Available Cells

- Approaches

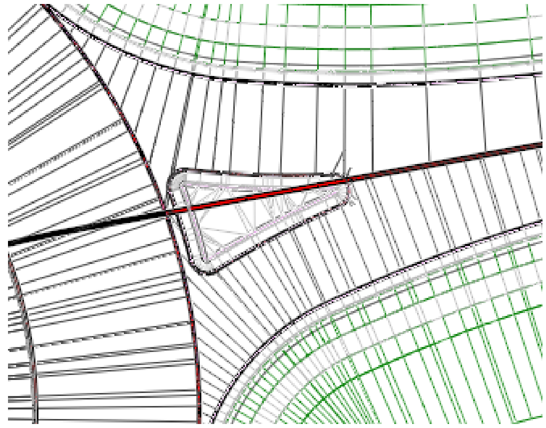
2D View	3D View
	
	
	

- Splitter Island

2D View

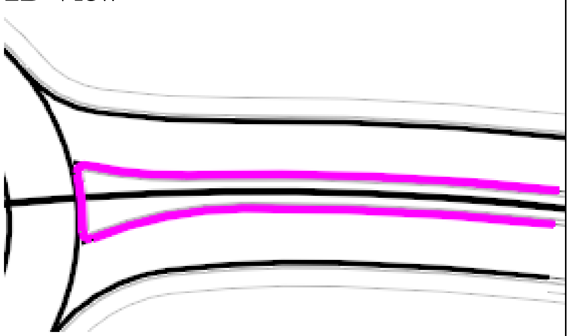


3D View

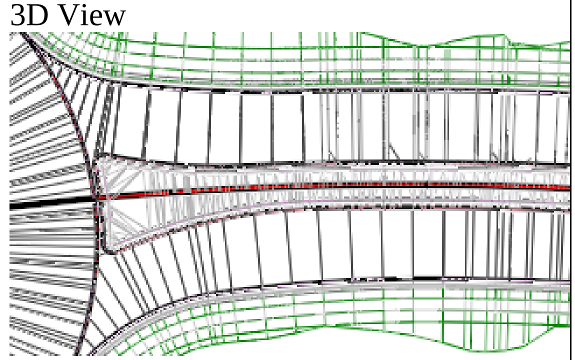


- Splitter Median

2D View

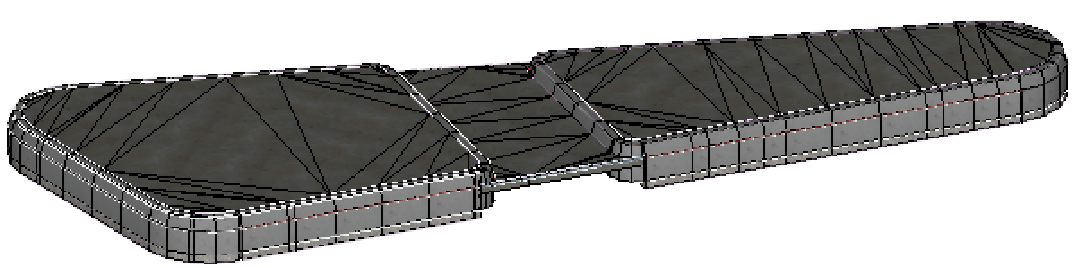


3D View



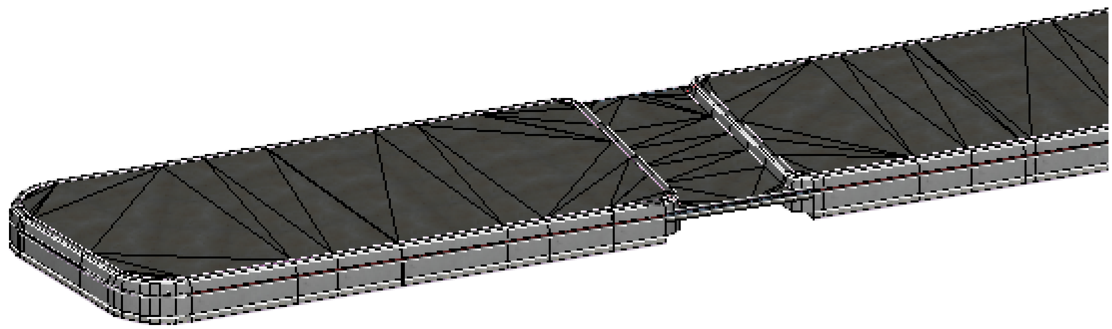
- Splitter Island w/Curb Cut Ramp

3D View

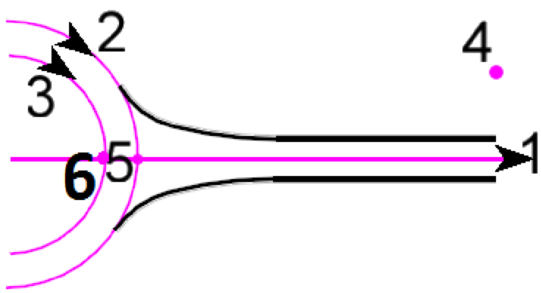


- Splitter Median w/Curb Cut Ramp

3D View

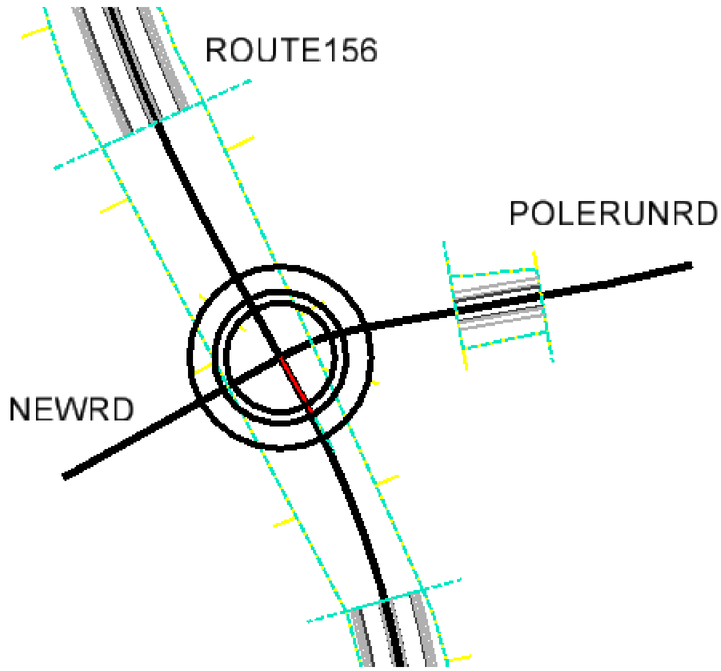


11.10.2 References & Direction of References

Approaches	**Splitter Median & Island**
	See Section 11.10.11
References 1) Approach Alignment (Profiled Min. 125') 2) Roundabout EoP Outside (Profiled) 3) Roundabout EoP Inside (Profiled) 4) Length Control - Data Point along Approach Alignment (within Profile Limits, Min. 125' from Roundabout EoP) 5) Data Point @ Roundabout EoP Outside/Approach Alignment Intersection 6) Data Point @ Roundabout EoP Inside/Approach Alignment Intersection	
NOTES: *(1) Approach Alignment can go through Roundabout or stop at either Inside or Outside EoP.* *(2) Order of Reference prompts may be different than shown here.* *(3) Median or splitter island is added as a separate process.*	

11.10.3 Placement (Approach)

1. Open the file **Roundabout-Approach.dgn.** This file contains the alignments shown in the image below, corridors created for ROUTE156 & POLERUNRD, and a roundabout civil cell placed at the intersection.



NOTE: Alignment NEWRD is not profiled.

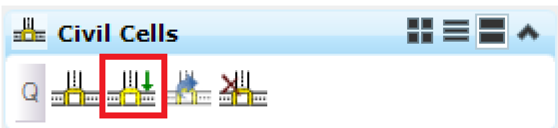
   a. Verify the Default model is open in View 1 and the Default-3D model is open in View 2

   b. Open your references dialog and ensure the Default-3d reference is **Off** in View 1. Also, turn off any reference files that contain 2d elements that lay beneath or on top of the template graphics that will be selected as Civil Cell reference elements. (There are none for this exercise.)

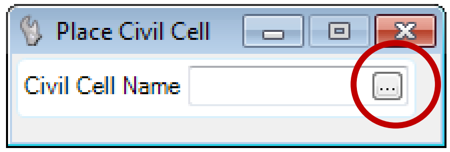
   c. Close the reference dialog.

   d. Zoom to the intersection area.

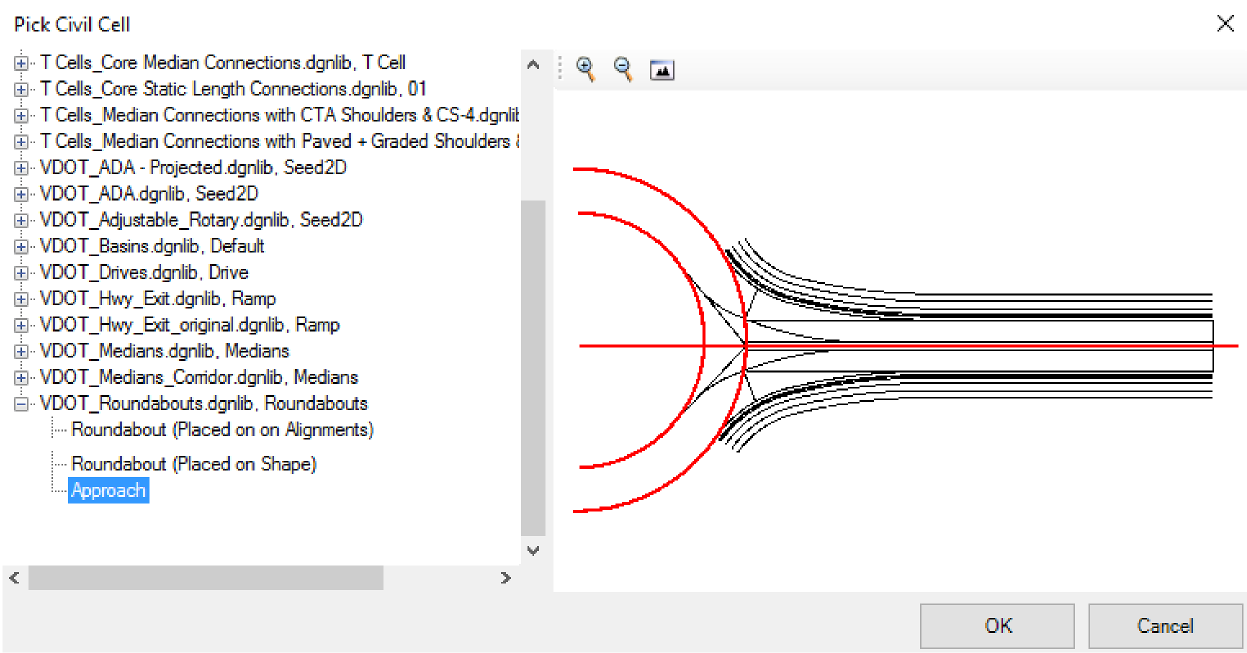
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

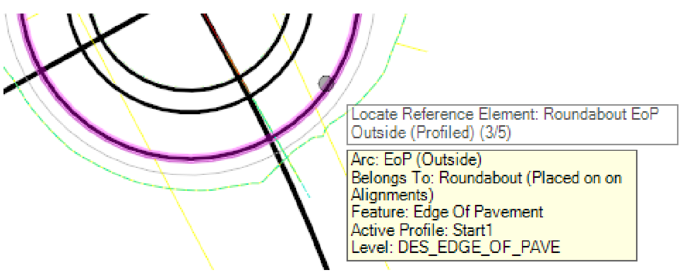


4. Select the **Approach** civil cell from the **VDOT_Roundabouts.dgnlib** folder and click **OK.**

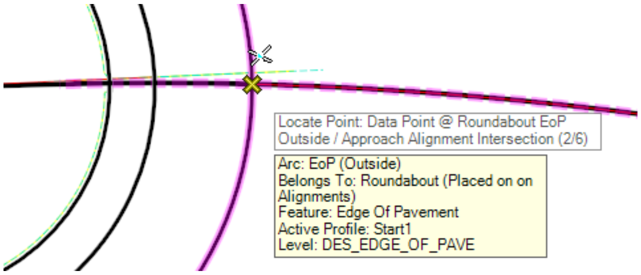


NOTE: The next five prompts may be in different order than listed in this manual.

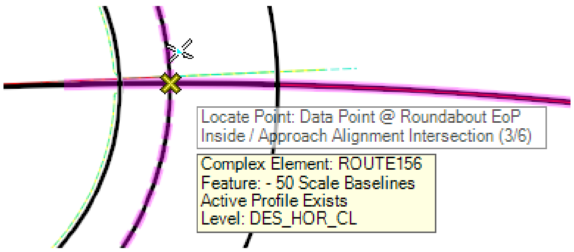
5. When prompted to *Locate Reference Element 'Roundabout EoP Outside (Profiled)*, select the **Roundabout Outside EoP** in View 1 as shown below.



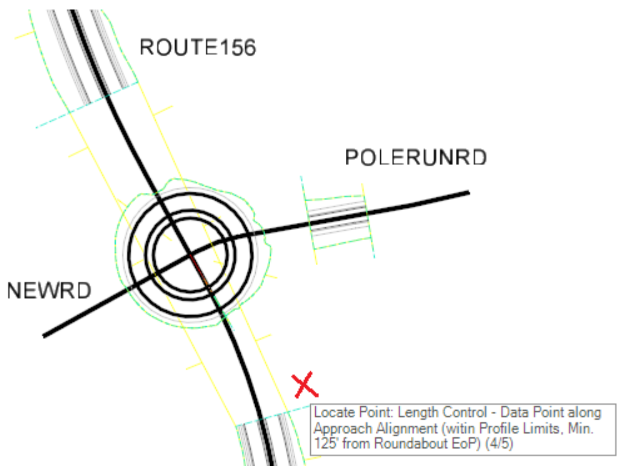
6. When prompted to *Locate Point 'Data Point @ Roundabout EoP Outside/Approach Alignment Intersection'*, **Snap & then Left Click** at the intersection of the ROUTE156 alignment and the Roundabout Outside EoP.



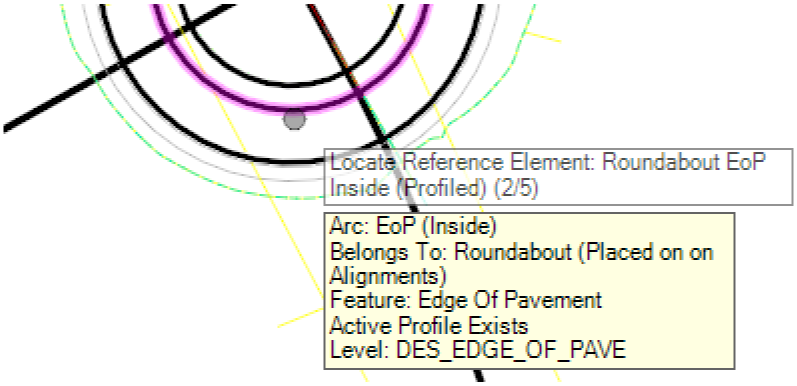
7. When prompted to *Locate Point 'Data Point @ Roundabout EoP Inside/Approach Alignment Intersection'*, **Snap & then Left Click** at the intersection of the ROUTE156 alignment and the Roundabout Inside EoP.



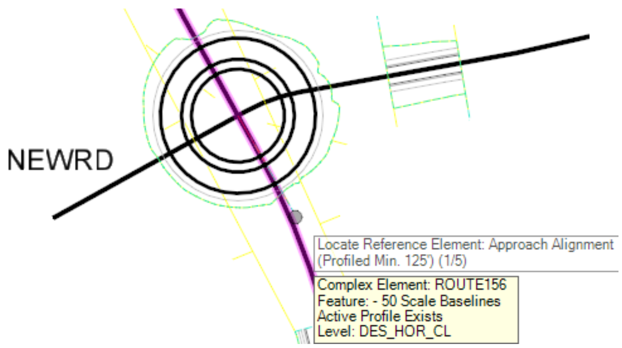
8. When prompted to *Locate Point 'Length Control - Data Point along Approach Alignment (within Profile Limits, Min. 125' from Roundabout EoP)'*, Left click in the area below (approximate).



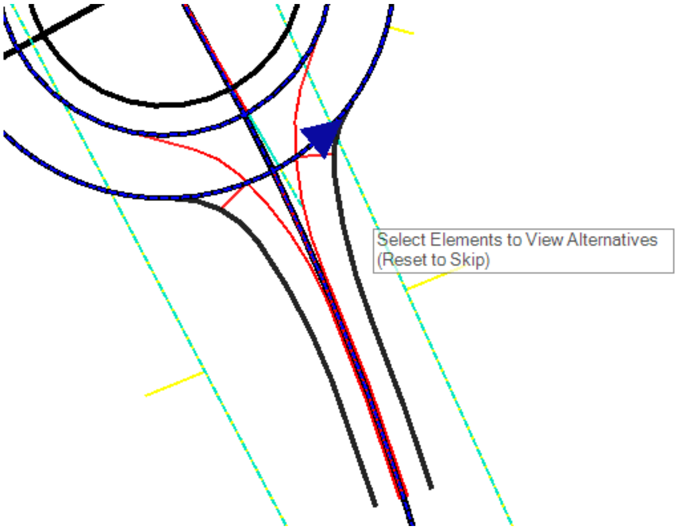
9. When prompted to *Locate Reference Element* '*Roundabout EoP Inside (Profiled)*, select the **Roundabout Inside EoP** in View 1 as shown below.



10. When prompted to *Locate Reference Element* '*Approach Alignment (Profiled Min. 125')*', select the **ROUTE156** alignment in View 1 as shown below.



11. Review the geometry being displayed.



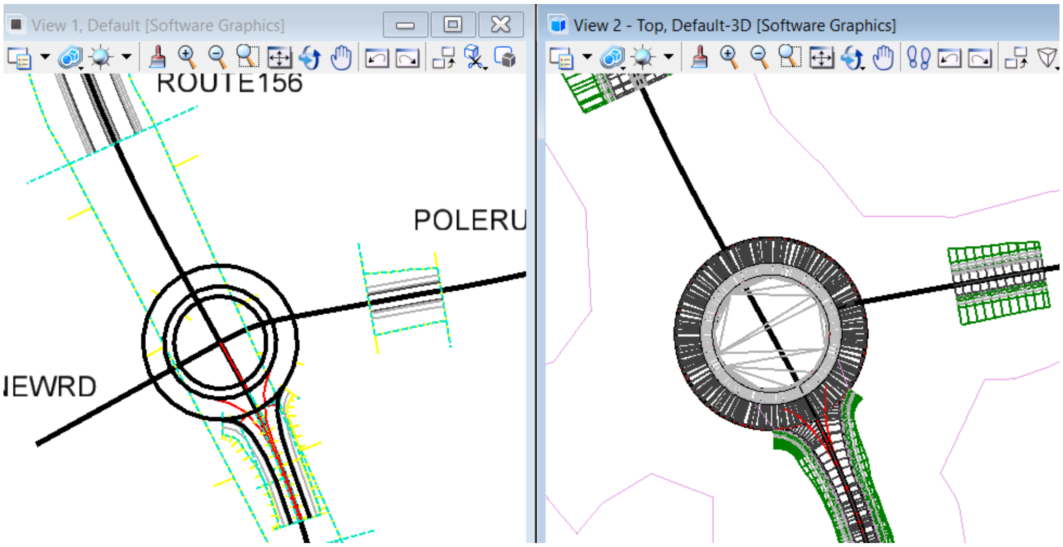
a. If the geometry appears correct and similar to the image above, right click to reset and move on to the next step.

b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.10.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

12. **Left Click** on the View when prompted to *'Accept Civil Cell Placement'*. The cell is placed.

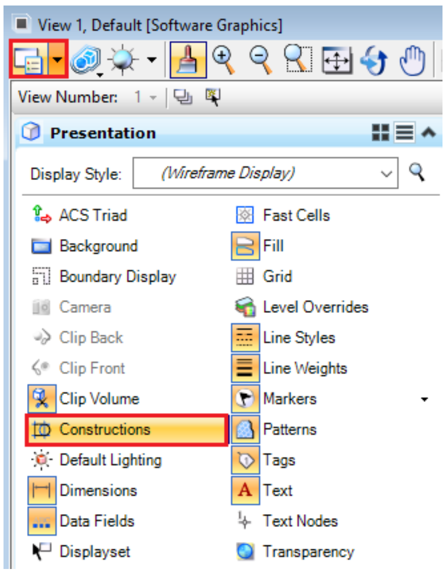
    The image below shows the cell in 2d & 3d views.

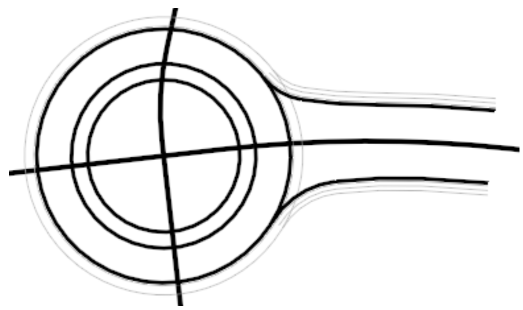


NOTE: The outside EoP's are the normal Edge of Pavement feature and used for edits. The inside (or median) EoP's (profiled) have underlying DNC features (not profiled) which are used for Horizontal edits. We will discuss the type of horizontal edits which can be made in the next section.

11.10.1 Construction Element Display

Construction class element display, which includes template/corridor graphics, construction class elements in civil cells, etc. can be turned off to make the working area less cluttered. This is ideal at times especially when performing horizontal geometry edits which will be discussed in the next section. To turn off Construction class elements, you will go to View Attributes as shown below.

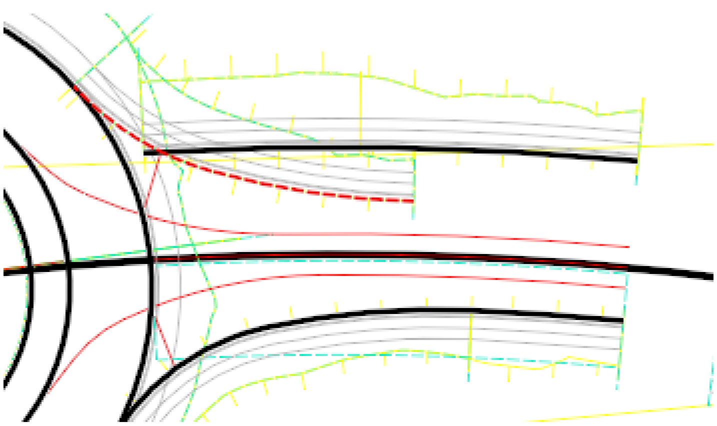




1. Turn off for Horizontal & Vertical Geometry Edits.

11.10.2 Horizontal Edits

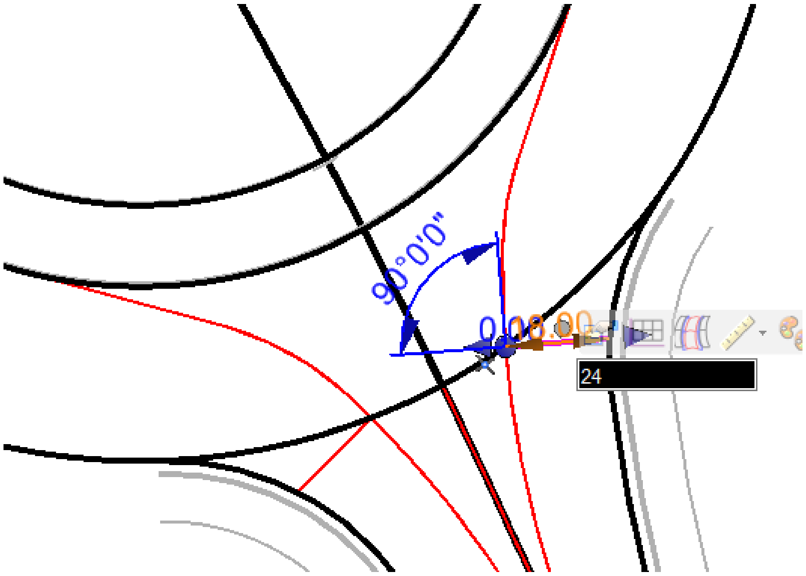
The following steps will take you through the horizontal edits of the approach. Edits made will affect other elements and it is highly possible you will run into situations that are not geometrically feasible with the pre-set values of arcs, angles, etc. In situations where edits cause unsolvable conditions with other edits, the geometry will display as dashed red as shown below.

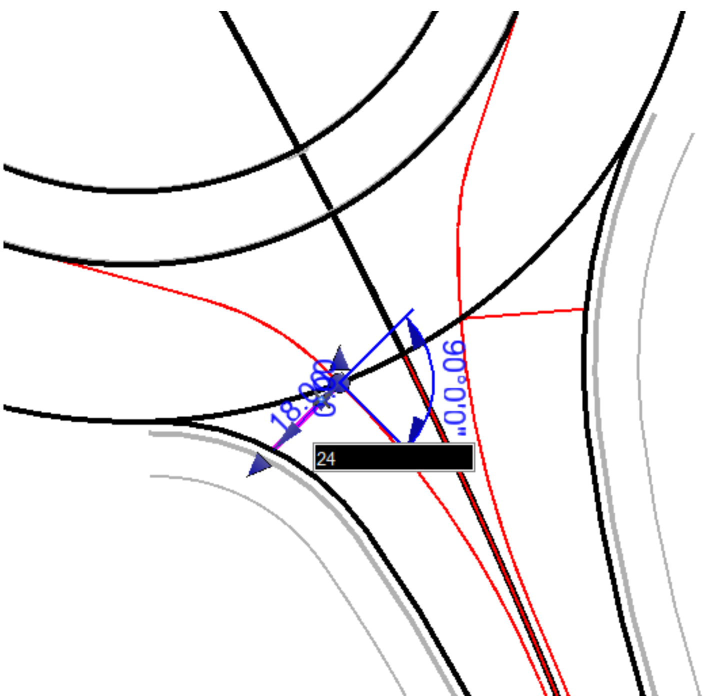


The solution is to UNDO the edit and make changes to the geometry so the edits are geometrically feasible.

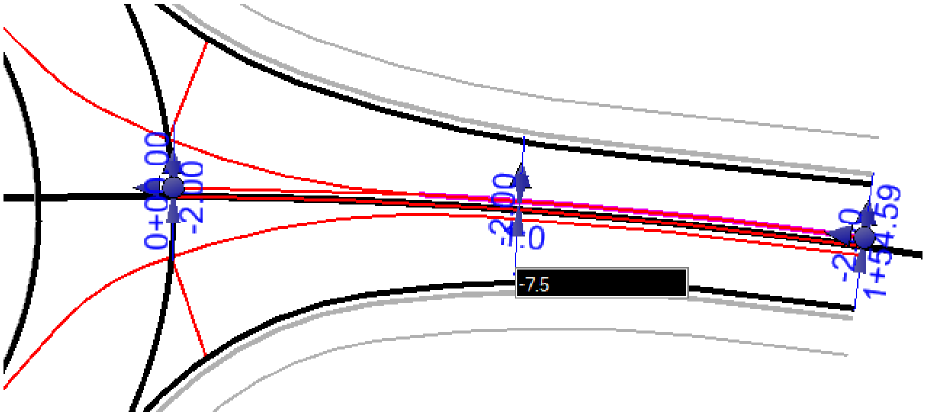
11.10.2.1 LANE WIDTH & EOP'S

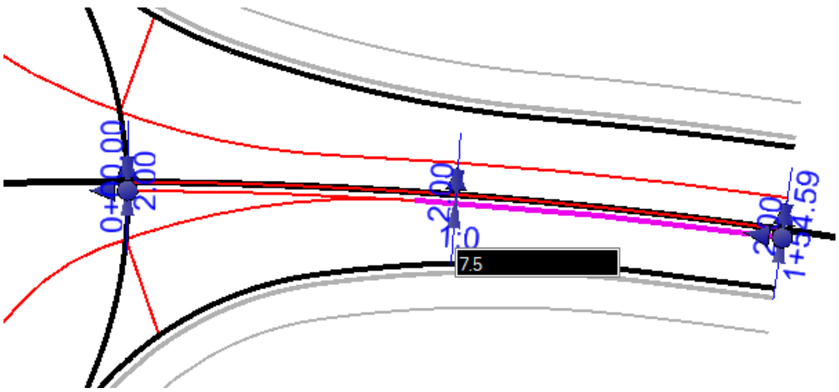
1. Change the *lane width* at the entrance/exit areas from 18 to **24'** by selecting the perpendicular lines shown below and making the graphical edits.



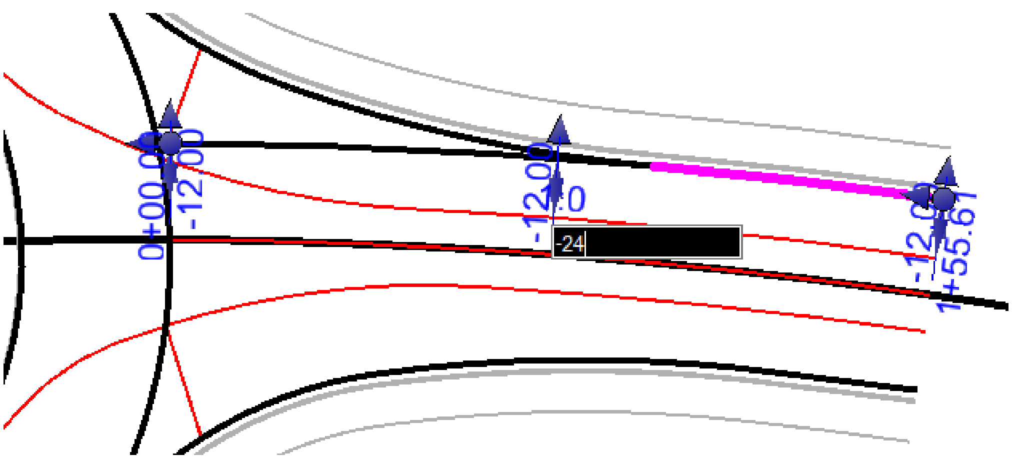


2. Change the *median EoP offset (DNC_Horizontal_Edit_*)* each side of the ROUTE156 alignment of the approach cell from 2’ to **7.5’**. You may have to reset to select the DNC_Horizontlal_Edit elements because there are two DNC elements on top of each other.

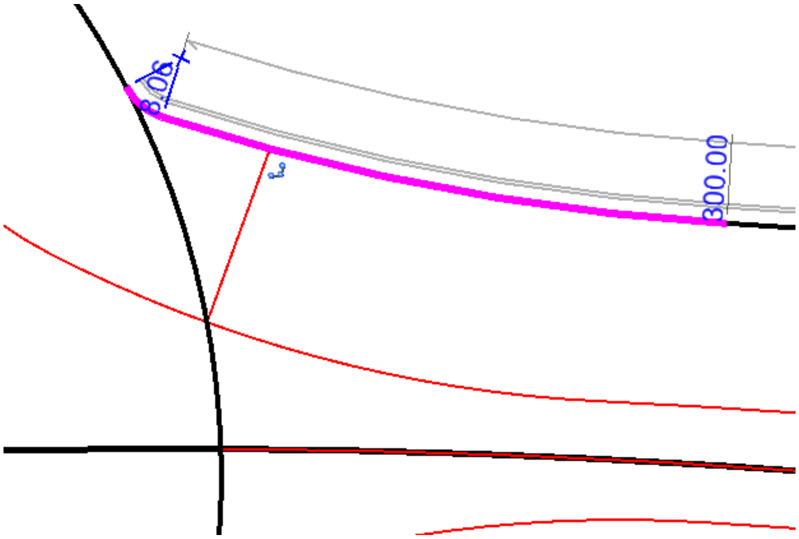




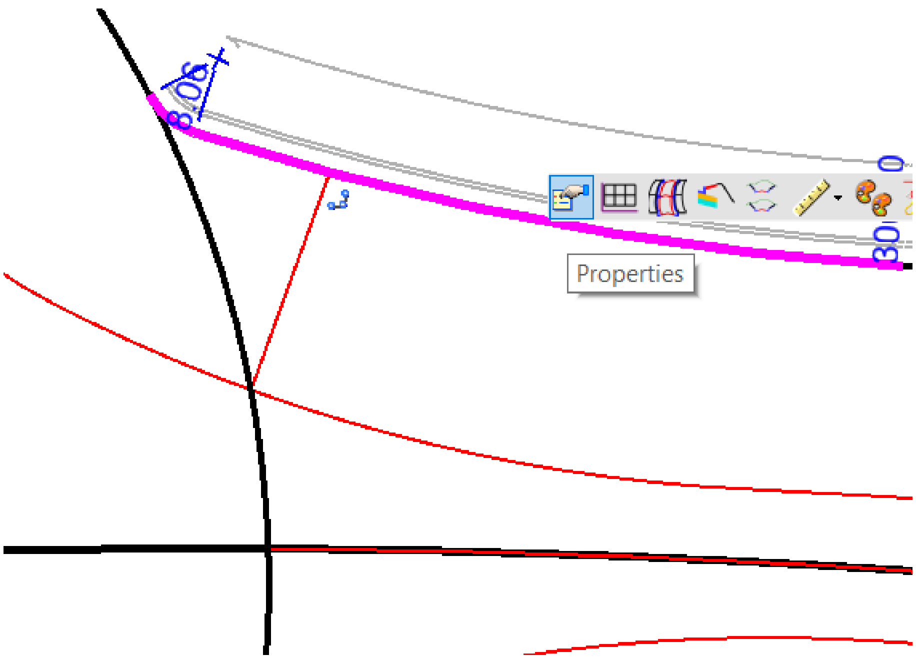
3. Select the *Outside EoP* in the Civil Cell and change this from 12’ to **-24’.**



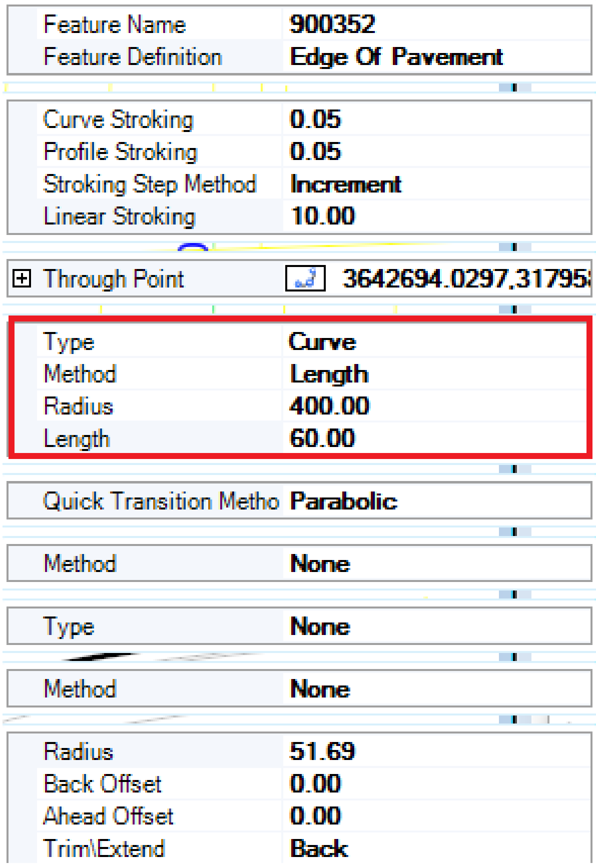
4. Select the *outside EoP* at the roundabout entrance and review. The change in lane width geometry has really reduced the radius at the entry.



Let’s increase the *back transition arc of this 2-center curve* from a 300’ radius to **400’** and shorten the length of the back transition element. To perform this, choose **Properties** from the context menu.

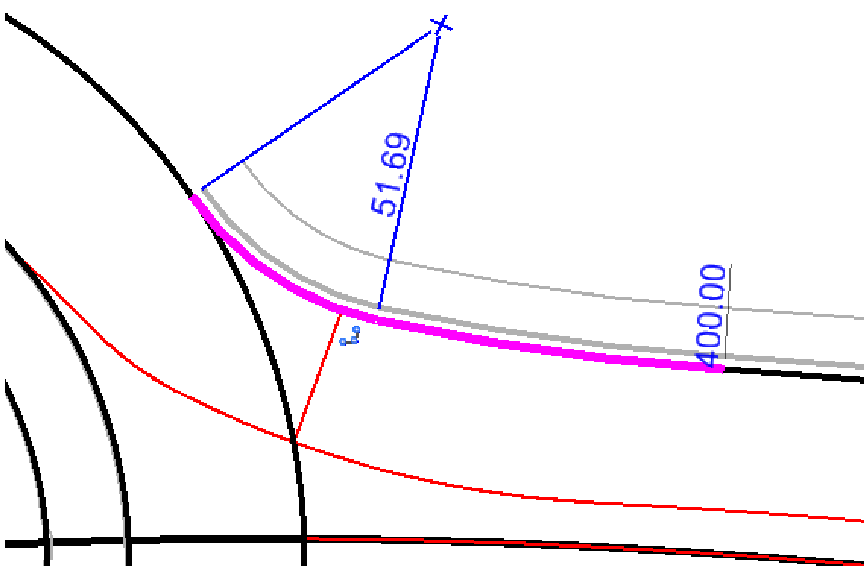


5. Change the *radius* from 300’ to **400’** and change the length from 75’ to **60’.**

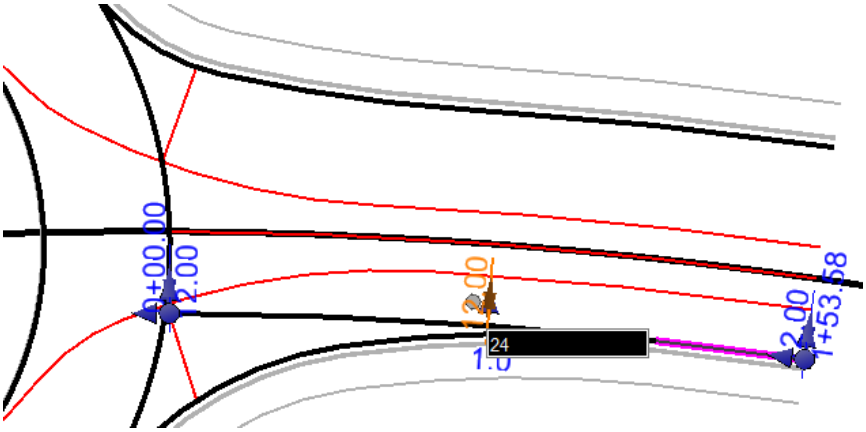


Feature Name	900352
Feature Definition	Edge Of Pavement
Curve Stroking	0.05
Profile Stroking	0.05
Stroking Step Method	Increment
Linear Stroking	10.00
⊞ Through Point	3642694.0297,31795
Type	Curve
Method	Length
Radius	400.00
Length	60.00
Quick Transition Metho	Parabolic
Method	None
Type	None
Method	None
Radius	51.69
Back Offset	0.00
Ahead Offset	0.00
Trim\Extend	Back

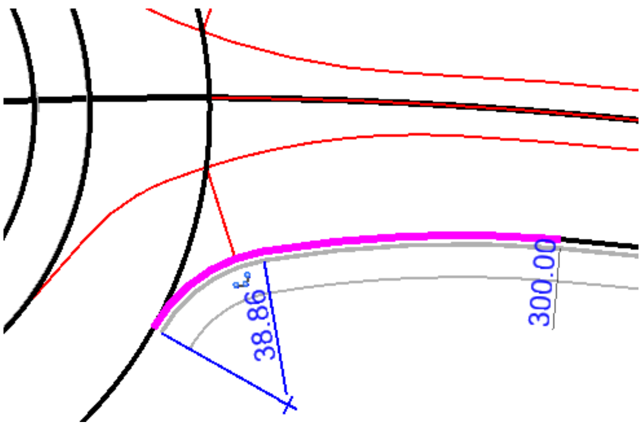
Review the improvement.



6. Change the *width of the opposite Outside EoP* from 12 to **24’.**

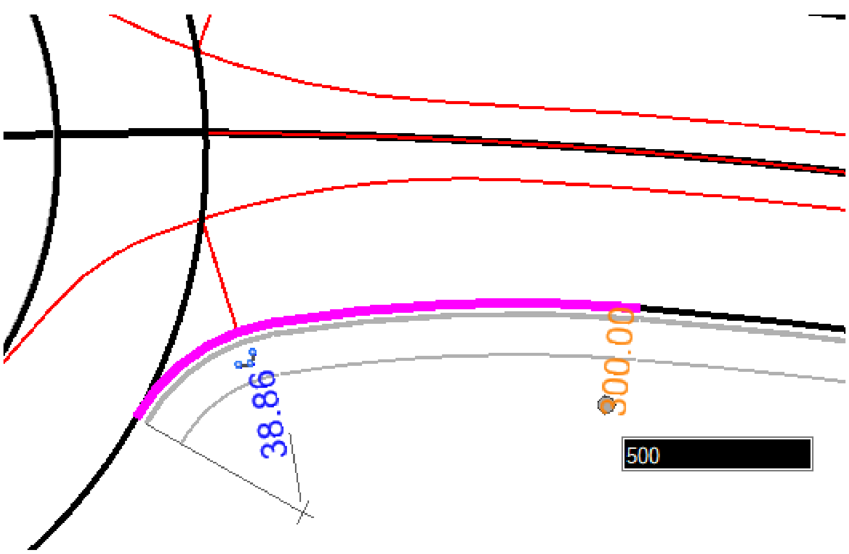


7. Select the *2-center curve* at the roundabout exit and review the geometry.

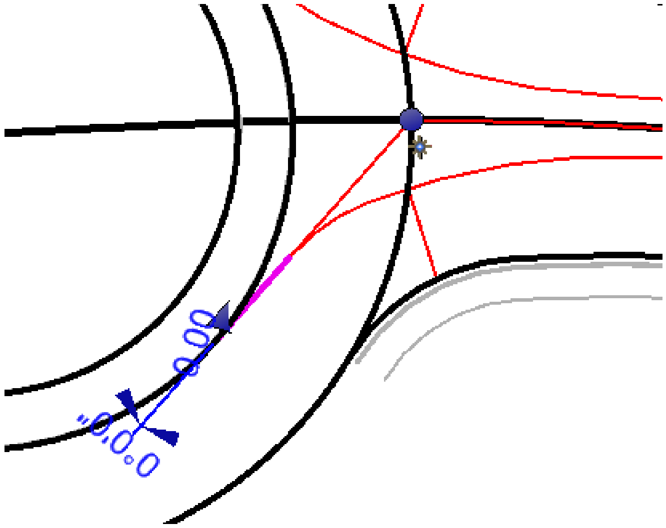


Let’s improve this exit area.

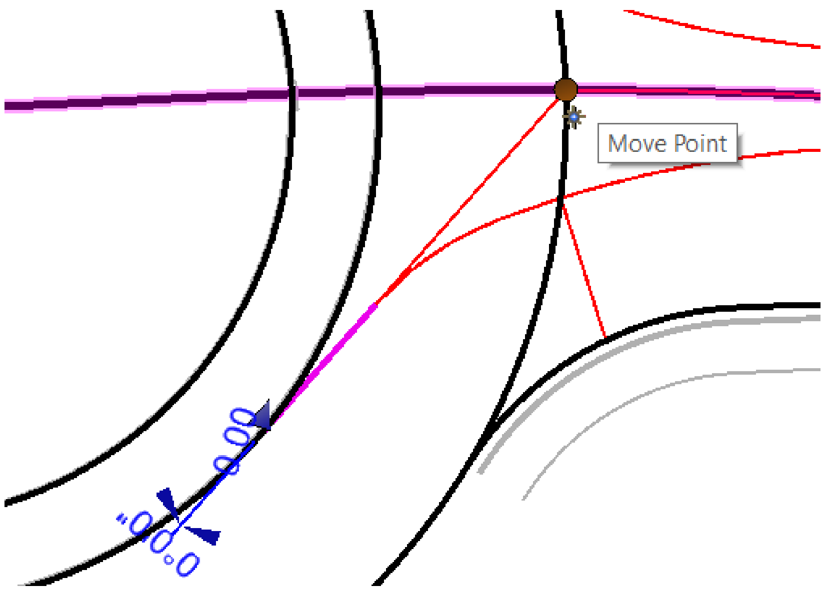
8. Change the *radius* from 300’ to **500’.**



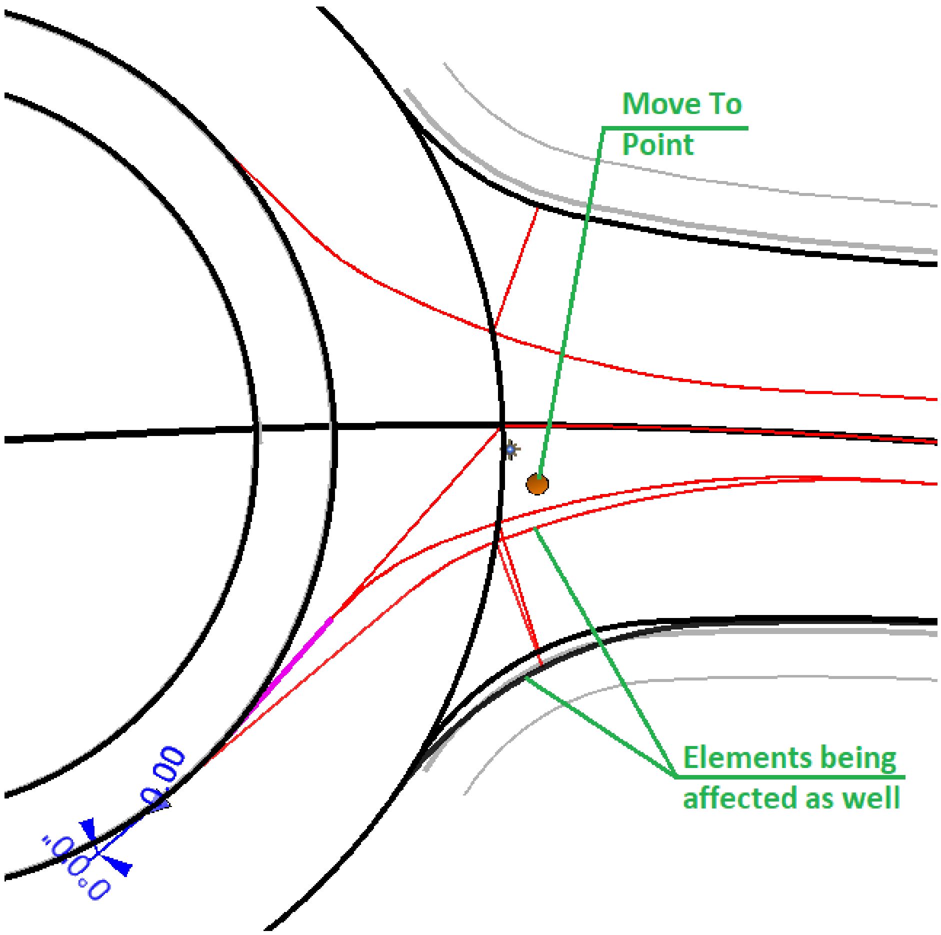
9. To improve this exit area even more, we can adjust the tangent that ties to the roundabout inside EoP. Select this *tangent* as shown below.



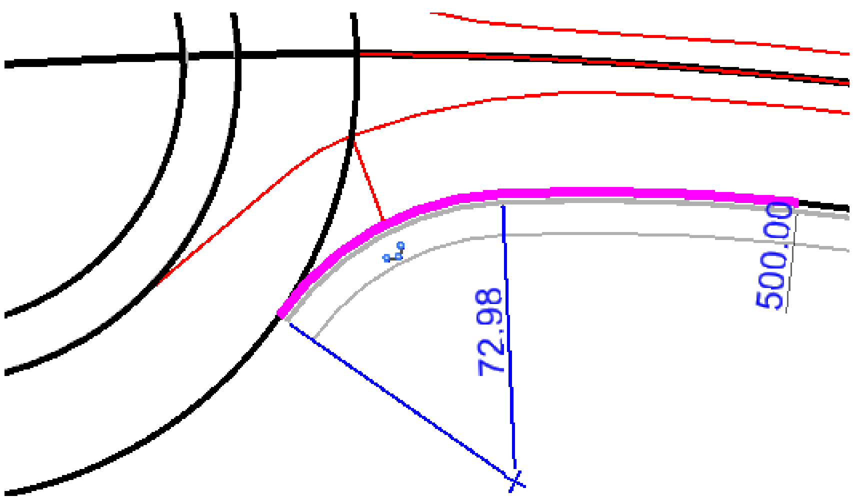
10. Hover over the handler located at the ROUTE156 alignment/roundabout outside EoP intersection and you will notice it says **Move Point.**



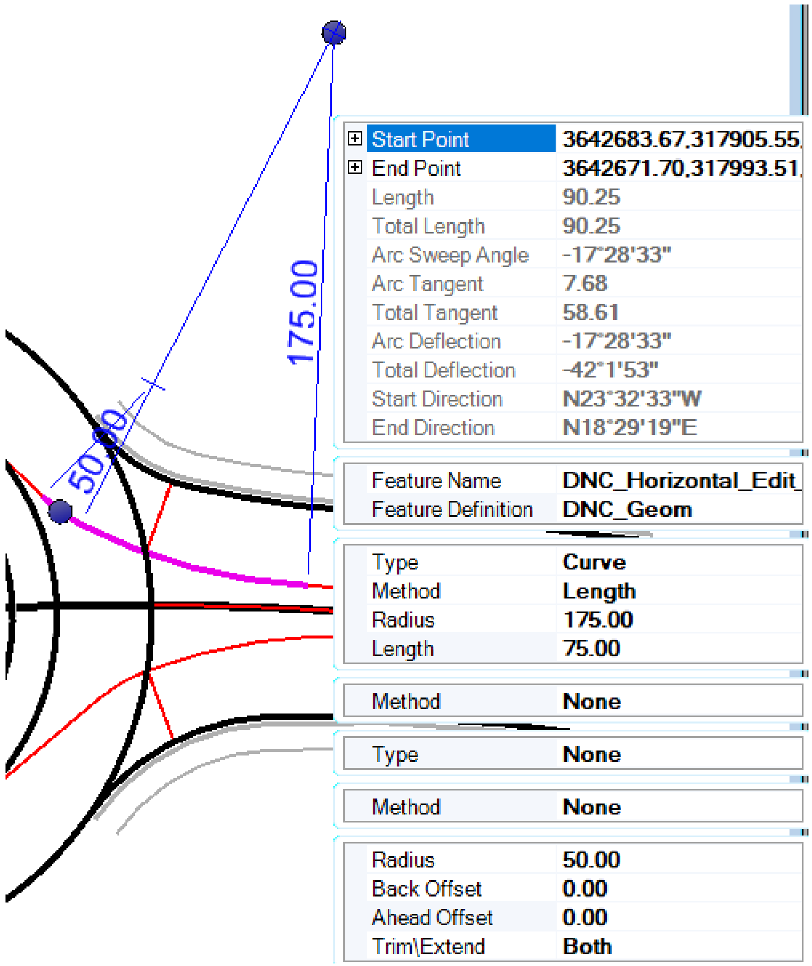
11. Left click and the element begins moving and then left click at the approximate location below to complete the move.



12. Review the geometry again. Your values may be slightly different than the ones shown below because the move-to point differed slightly.



13. Select the *inside EoP (DNC_Horizontal_Edit_* element) of the roundabout entrance* and choose **Properties** from the context menu. Do not make changes for this exercise but edits can be made to this and the opposite inside EoP as shown below. These elements control the location to the Outside EoP. There is an underlying element so you may have to reset to select the correct element.



11.10.2.2 LENGTH

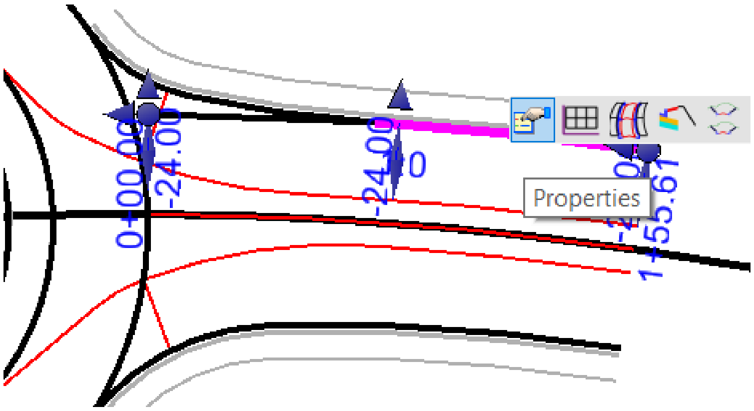
Length of the approach is controlled with the DNC_CL. This edit is discussed in section 11.10.6.

11.10.3 Vertical Edits

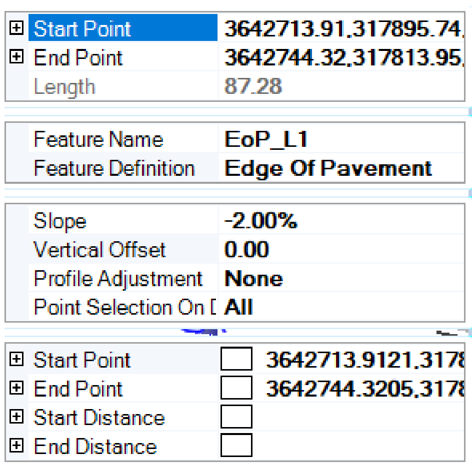
The EoP (Outside) elements are profiled at a -2% slope initially off the CL profile. The 2-center arcs on the outside are initially profiled with the Quick Profile Transition command. The Median EoP's are profiled from the pavement surface.

11.10.3.1 EOP (OUTSIDE)

1. Select the *EoP (Outside)* element and choose **Properties.**

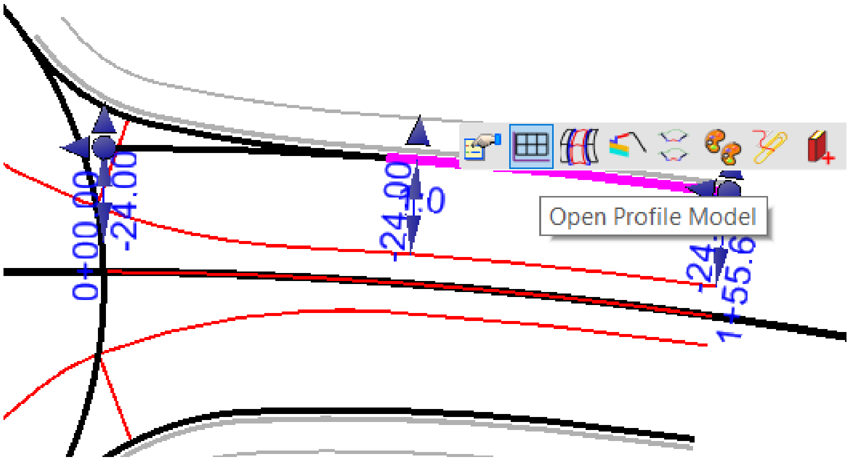


2. View the editable slope is shown below.

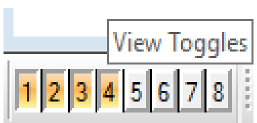


⊞ Start Point	3642713.91,317895.74,
⊞ End Point	3642744.32,317813.95,
Length	87.28
Feature Name	EoP_L1
Feature Definition	Edge Of Pavement
Slope	-2.00%
Vertical Offset	0.00
Profile Adjustment	None
Point Selection On [	All
⊞ Start Point	3642713.9121,317ε
⊞ End Point	3642744.3205,317ε
⊞ Start Distance	
⊞ End Distance	

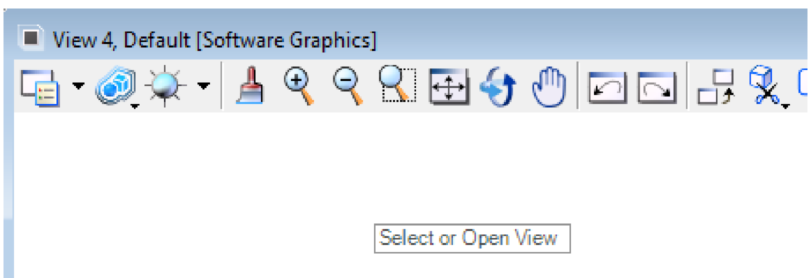
3. Select the *EoP (Outside)* element again and from the context menu, choose **Open Profile Model.**



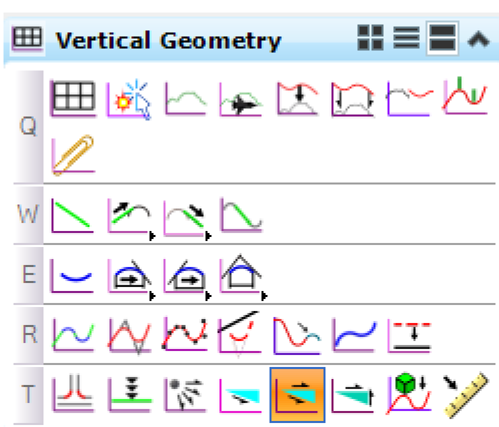
a. Open View 4.



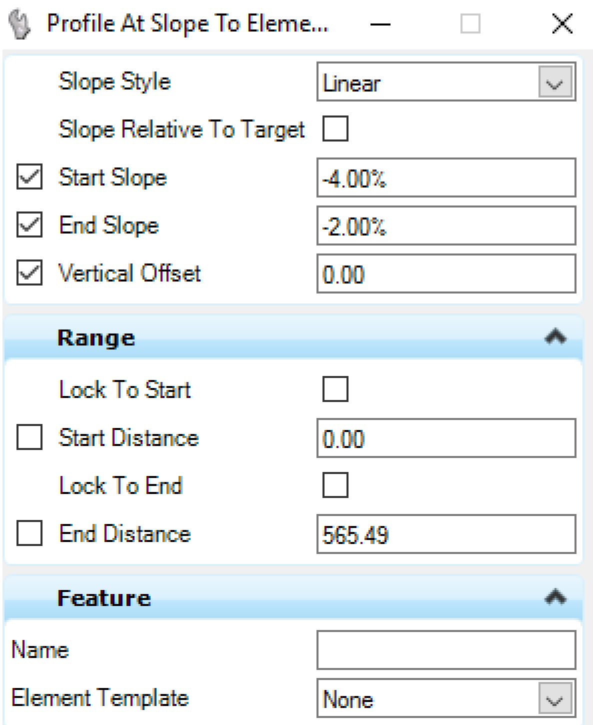
b. Left click in View 4 to open the profile model.



c. Select the Vertical Geometry command **Project By Variable Slope From Element.**

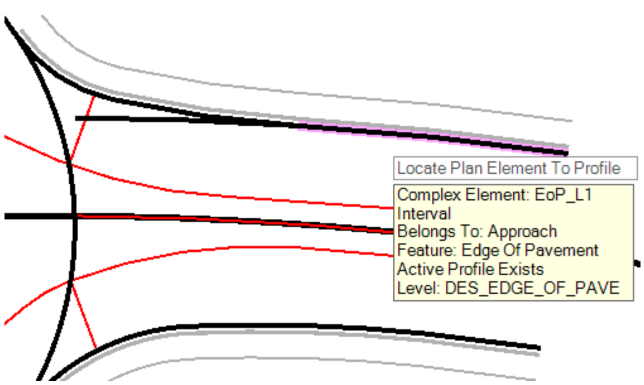


d. Set the dialog as shown below.

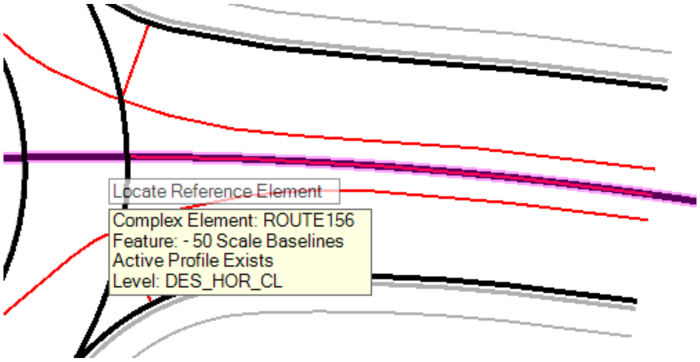


e. Left Click to confirm the *Slope Style* of **Linear.**

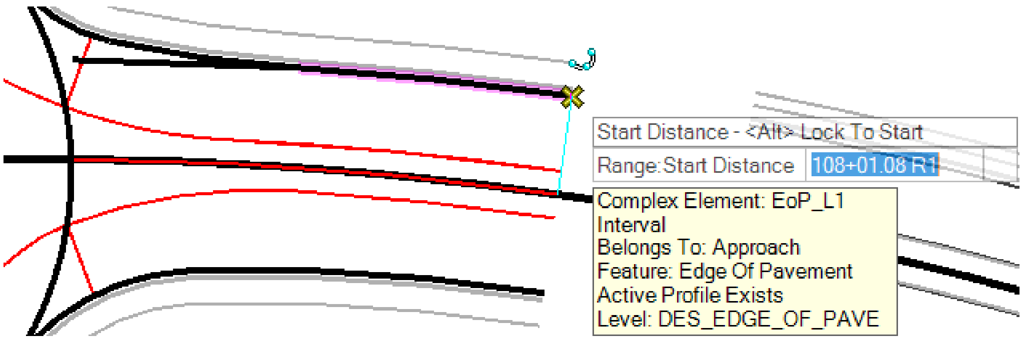
f. Select the **Outside EoP** when prompted to *Locate Element To Profile.*



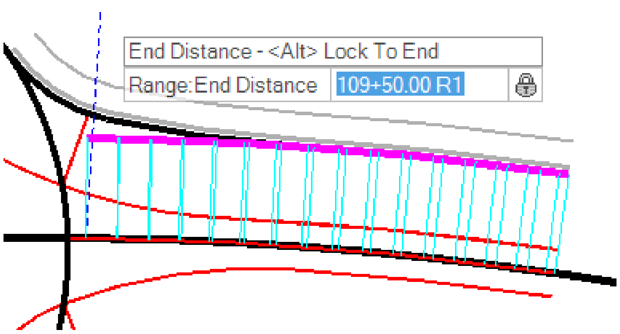
g. Select **ROUTE156** when prompted to *Locate Reference Element.*



h. Snap & left click to the start of the Outside EoP when prompted for the *Start Distance.*

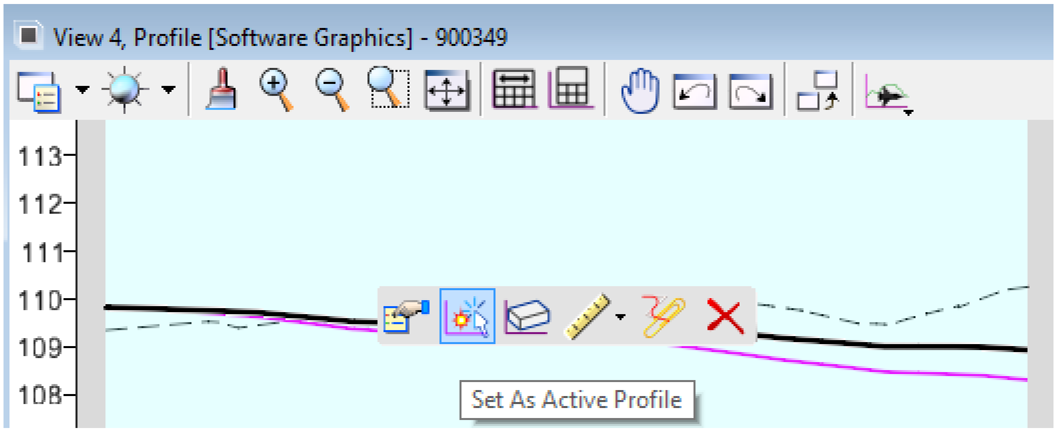


i. Key in **109+50**, hit enter on your keyboard to lock the value, and left click to confirm when prompted for the *End Distance.*

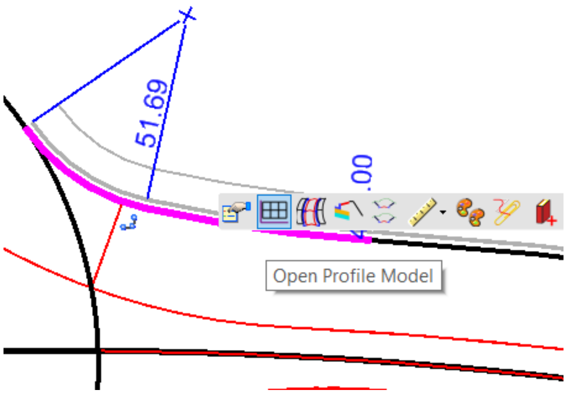


j. Confirm the remaining prompts to create the profile.

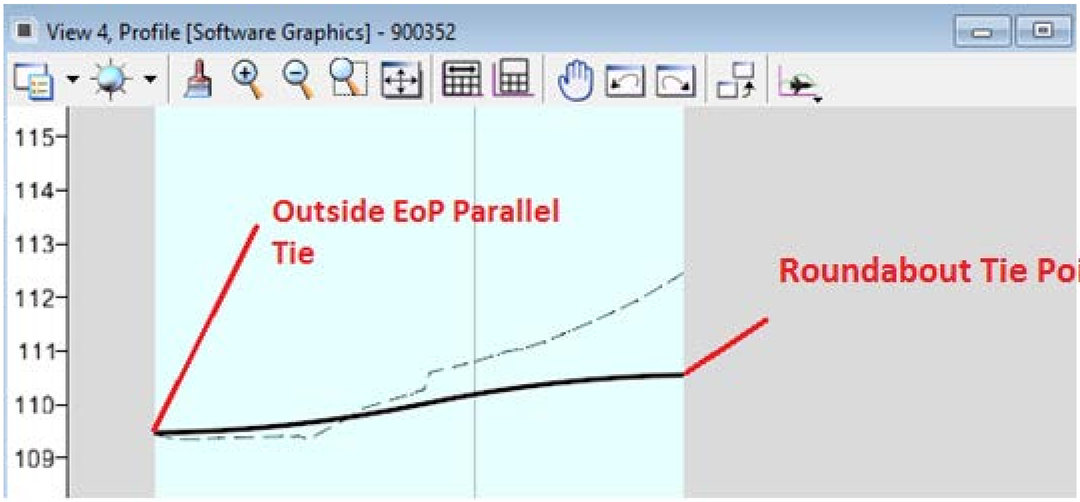
k. Review the profile. We will not make this new profile the active profile for this exercise but this shows the process of re-profiling this element. The 2-center arc part of the outside EoP would be automatically updated to adjust to this new profile if it was made active. The median EoP would also be automatically adjusted.



4. Select the *2-center arc part of the Outside EoP* and from the context menu, choose **Open Profile Model.**

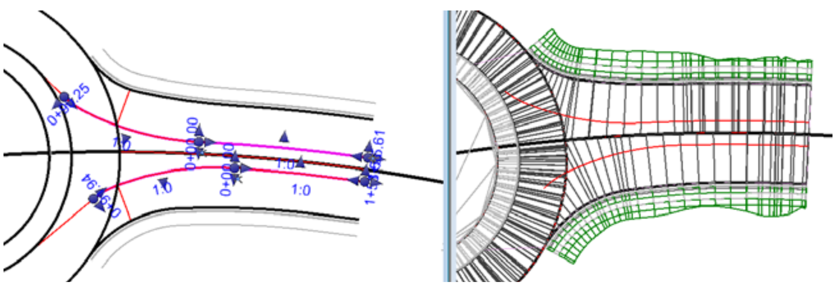


5. Left click in View 4 when prompted to Select or Open View. This profile is shown below. You can re-draw or project slopes as needed but the two Tie points shown below should be a part of any new profile.



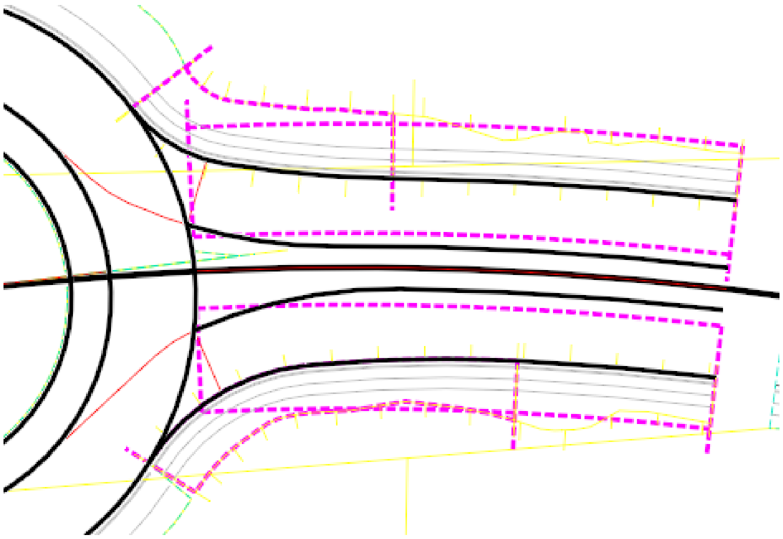
11.10.3.2 EOP (INSIDE)

As mentioned earlier, the inside EoP's *(DNC_Island_Control_*)* are profiled from the pavement surface terrain of the Civil Cell. This profile is automatically updated with any changes to the Outside EoP or alignment profiles. You do have the option to project slopes or re-draw these profiles in the profile view as needed.



11.10.4 Template Edits

The linear templates (four) used in the Roundabout Approach Civil Cell are highlighted below. These are all placed on the outside EoP elements. We will show the various tools in this section available for use and related to Linear Templates but no changes will be made in this exercise and you would need to refer to section 11.3.10 for examples of actually making edits.

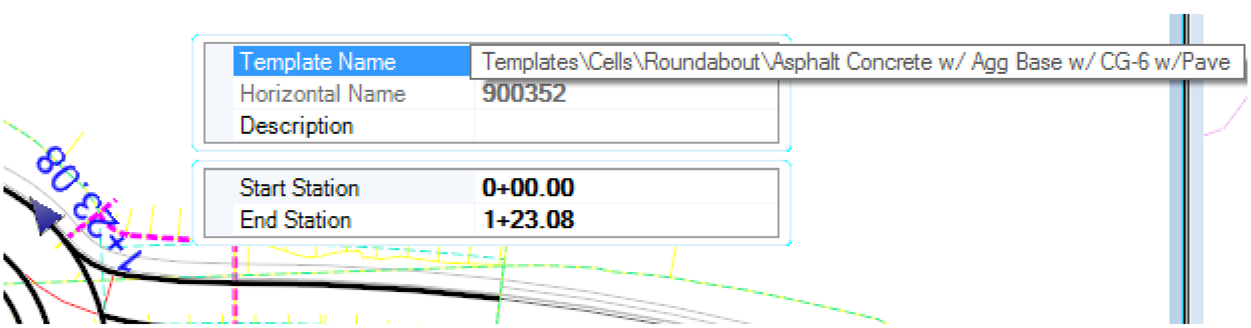


NOTE: Unlike many Civil Cells, there are no Surface Templates in the Approach Civil Cell and there are a couple of reasons for this:

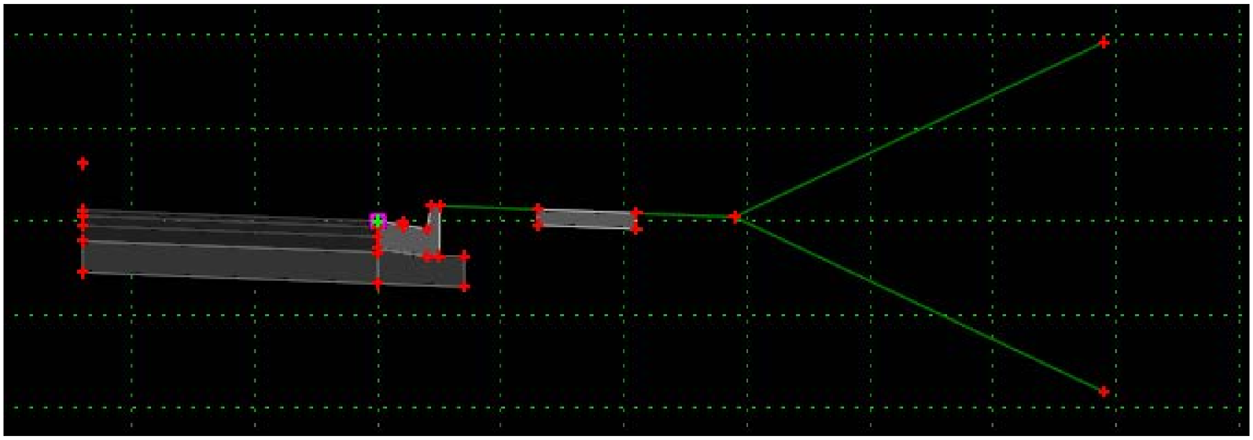
1. To easily switch to overlay templates.
2. To allow clipping for the addition of splitter islands.

11.10.4.2 LINEAR TEMPLATE

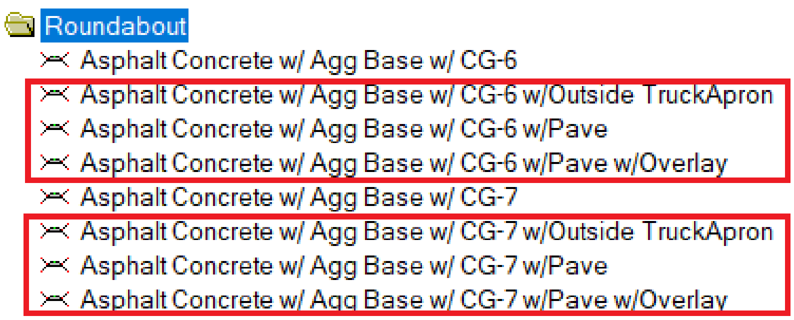
1. Selected in Plan View.



2. Template used.



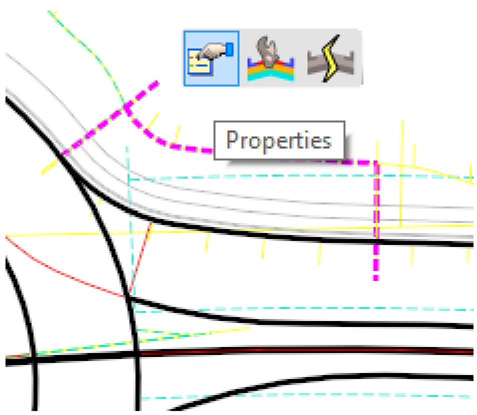
3. Templates Available:



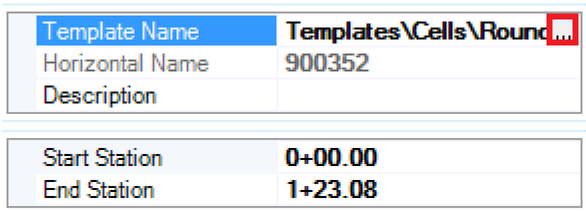
11.10.4.3 PROPERTIES

To re-direct this linear template to a different one in the ITL.

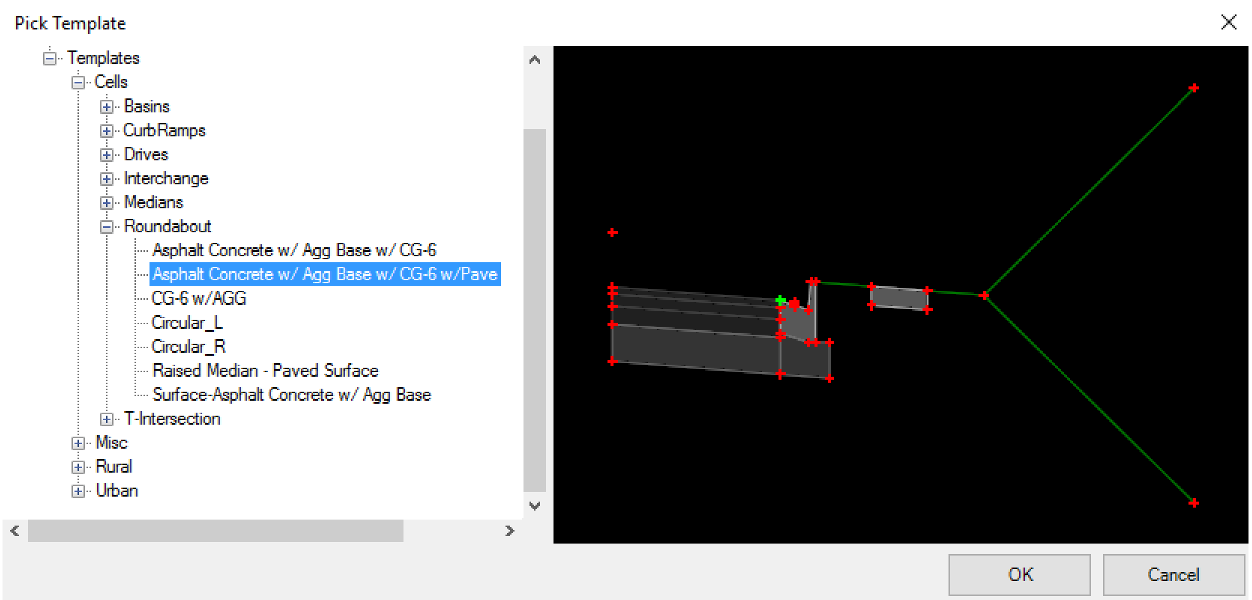
1. Select the *Linear Template handler* and from the context menu choose **Properties** as shown below.



2. Select the button below.



3. The Pick Template dialog is invoked and shown below. The Linear template used in the Roundabout Approach cell is shown below. Although we will not replace this template in this exercise, you would choose a different template from the **Pick Template** dialog if you wanted to replace the given template.

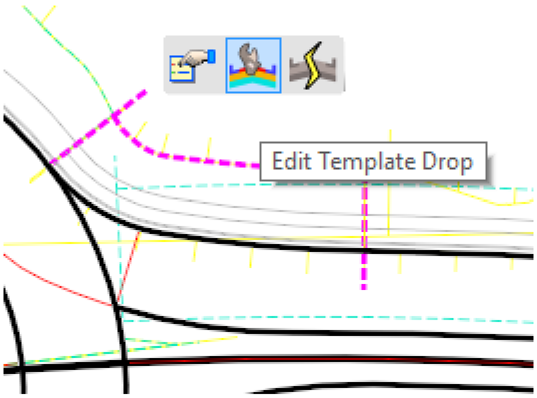


4. Tag **Cancel** *(OK if you actually change the template.)*

11.10.4.4 EDIT TEMPLATE

To edit the template:

1. Select the *Linear Template handler* and from the context menu choose **Edit Template** as shown below.



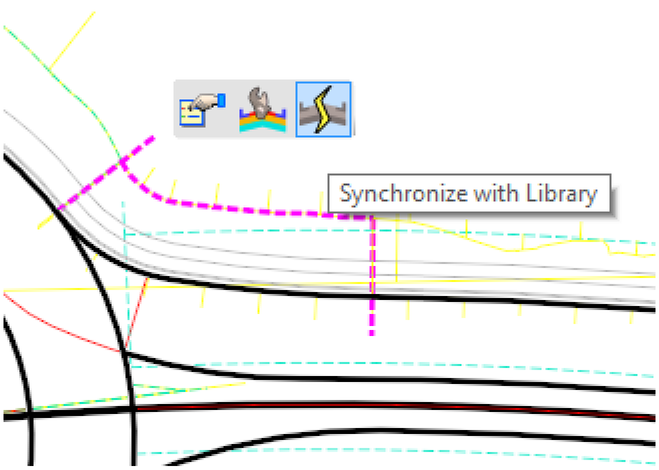
2. The Edit Template Drop dialog is invoked where you can make edits. Refer to section 11.3.10 for this process.

3. For this exercise, choose **Cancel.**

11.10.4.5 SYNCHRONIZE

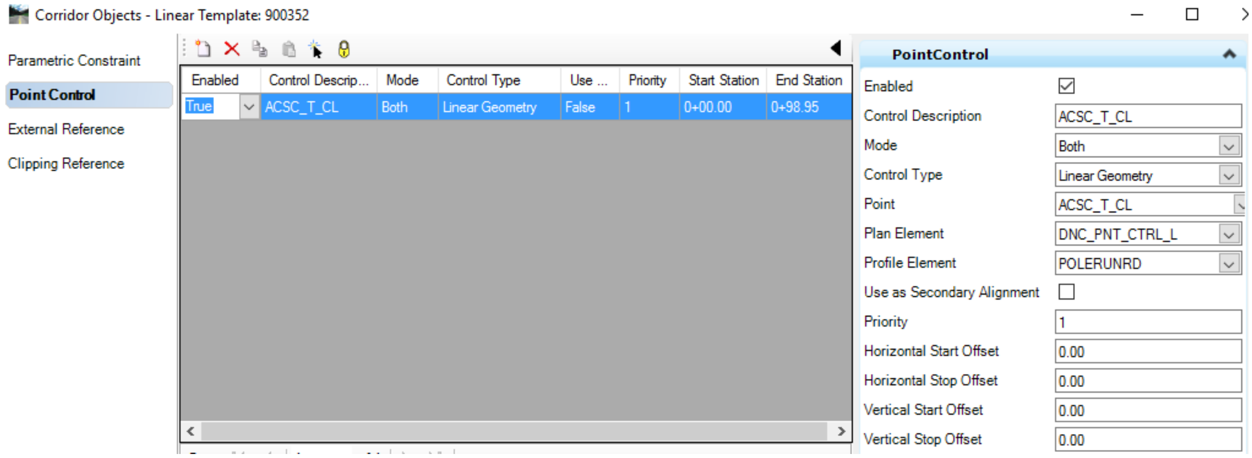
To synchronize a template if modified:

1. Select *Synchronize with Library* as shown below which applies any changes in the template to the linear template.

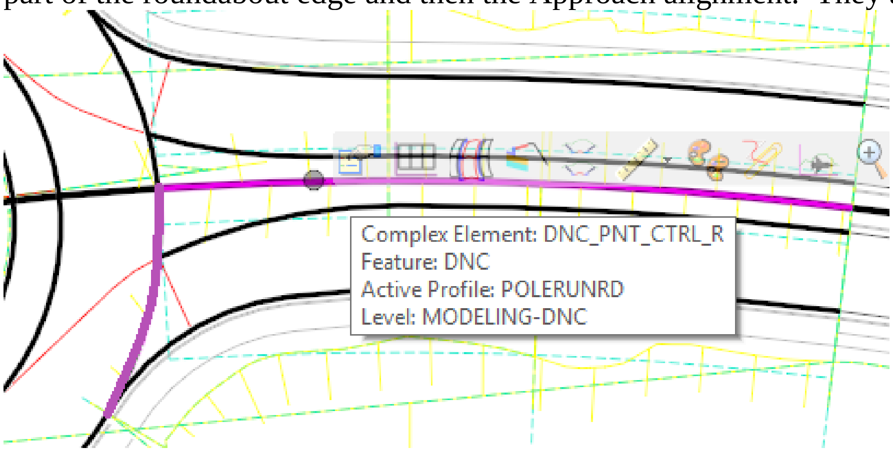


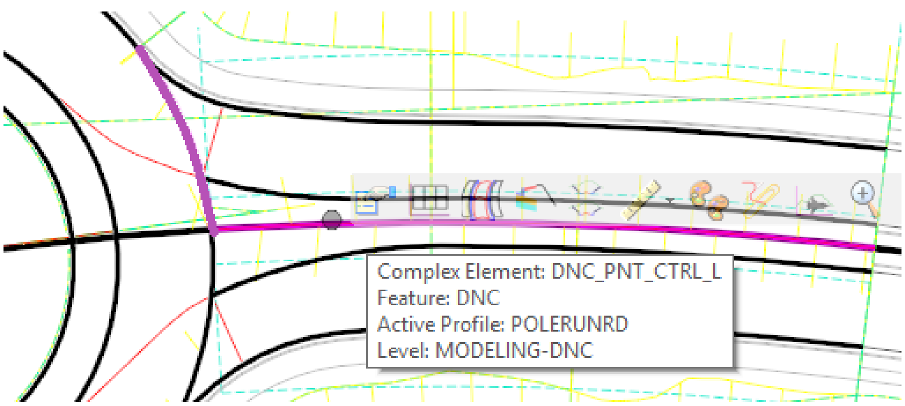
11.10.4.6 POINT CONTROLS

Each linear template has a point control as shown below:



These target either DNC_PNT_CTRL_L or DNC_PNT_CTRL_R. These are elements that trace part of the roundabout edge and then the Approach alignment. They are highlighted below:

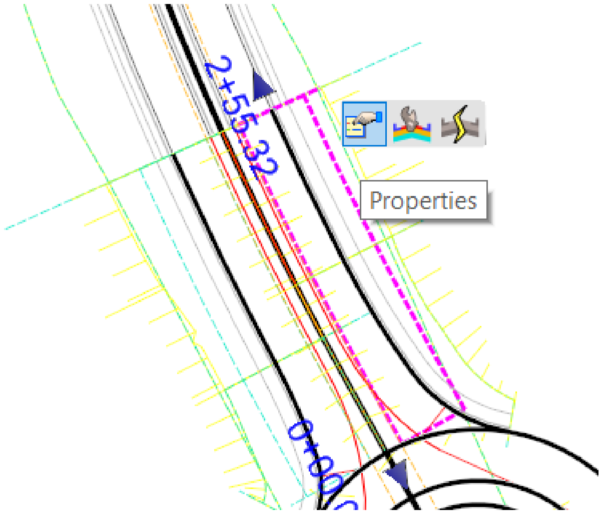




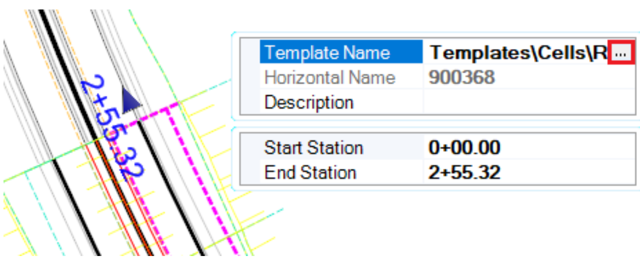
11.10.4.7 OVERLAY TEMPLATES

We will not go through steps of replacing the new construction template with an overlay template but the steps for this process are described below.

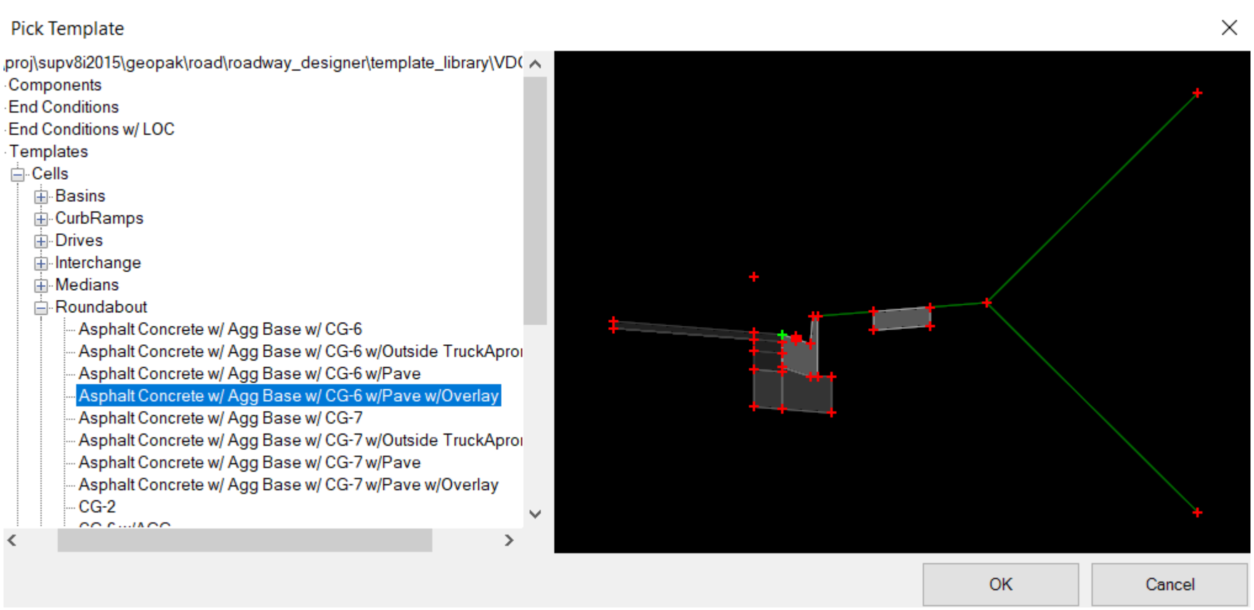
1. Go to **Properties** of one of the linear templates.



2. Choose the **Selection** button.

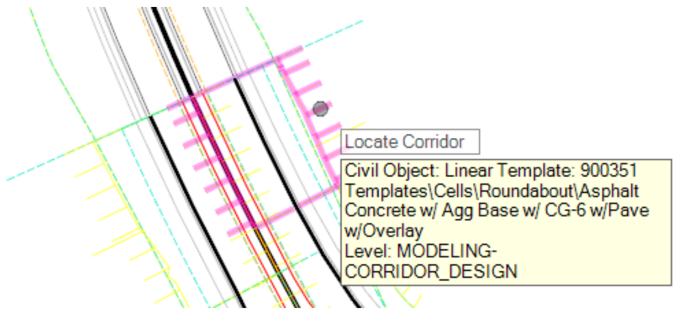


3. Select an overlay template.

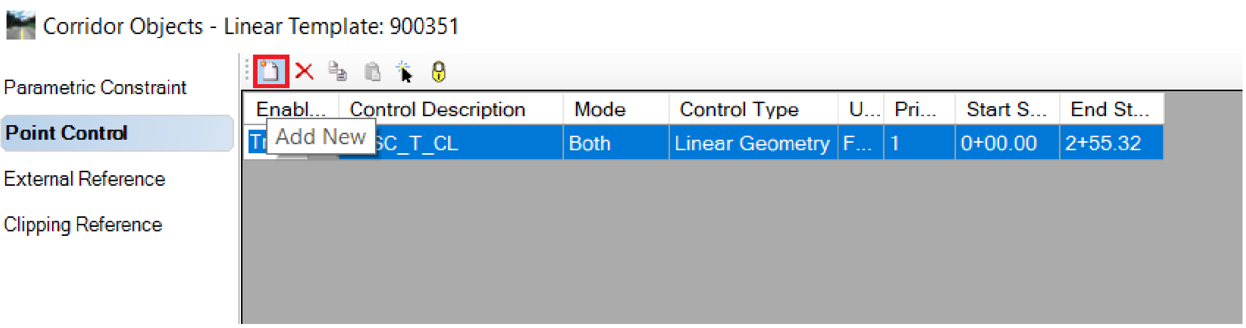


4. Select the **Corridor Objects** command.

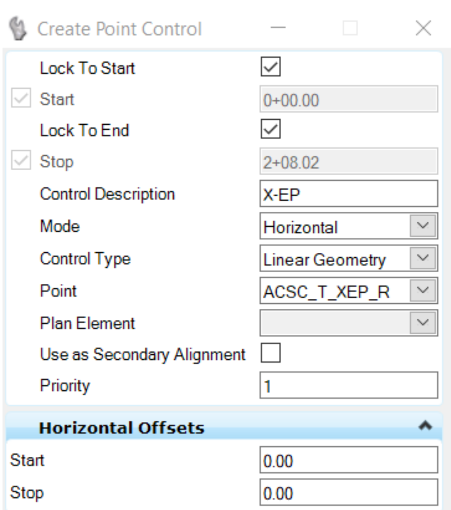
5. Select the linear template when prompted to *Locate Corridor.*



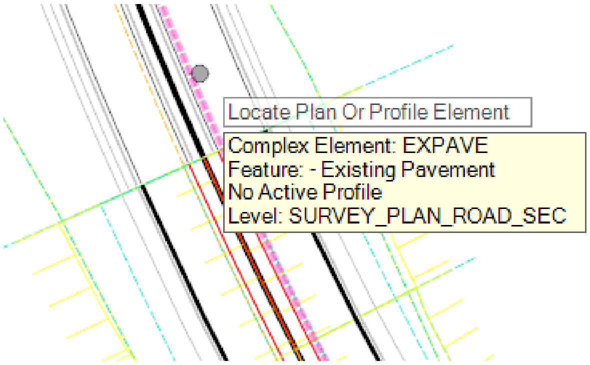
6. Choose the **Point Control tab** and then choose **Add New.**



7. Set the Create Point Control dialog as shown below.

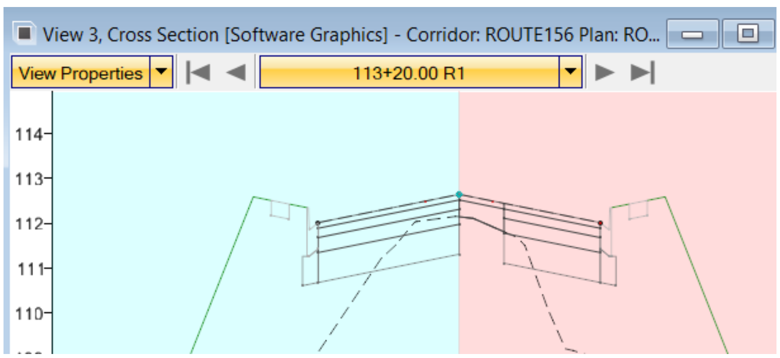


8. Confirm the prompts with Data Points until you are prompted to *Locate Plan Or Profile Element* at which point you select the **Existing EoP** in the plan view**.**



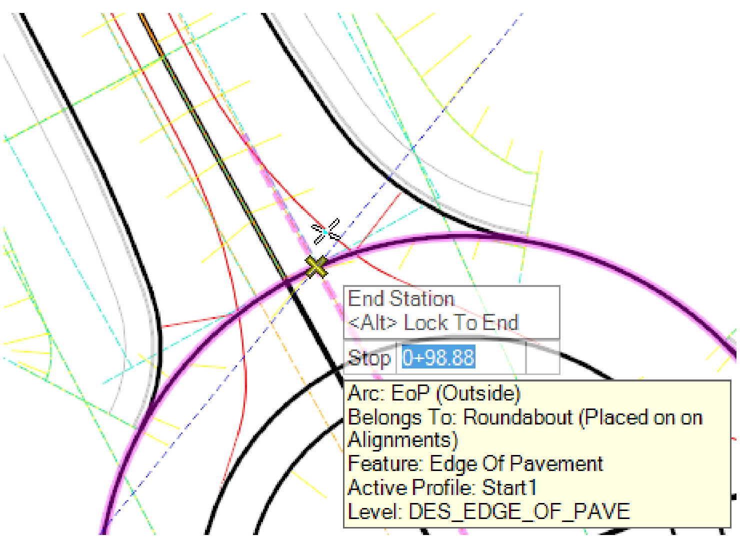
9. Continue confirming prompts and the point control is added.

10. Reviewing in the Cross-Section view, you can see the overlay template has been applied correctly on the right side of the roadway.

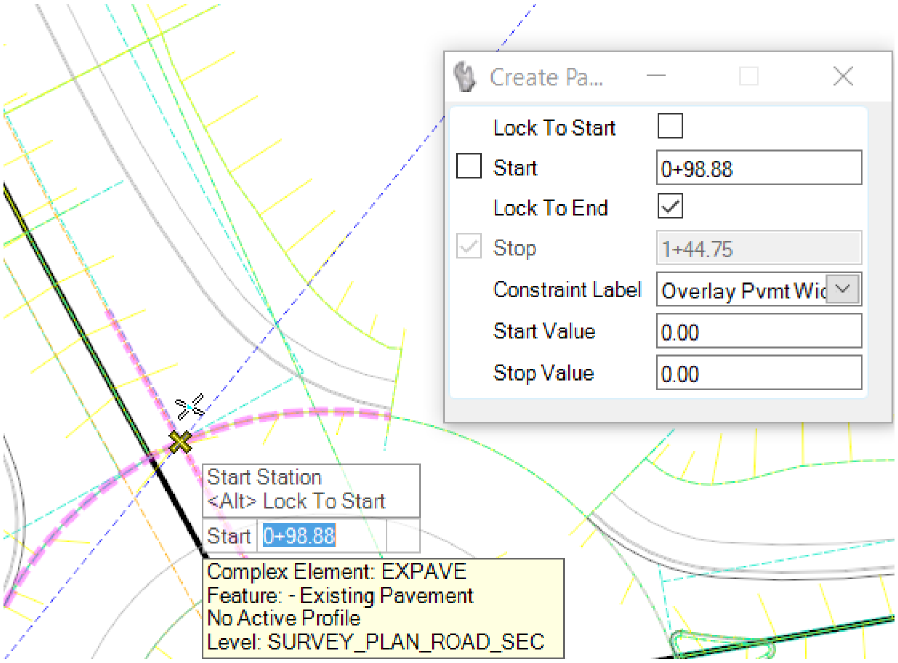


11. Go through the same process for the other three linear templates in the Civil Cell.

NOTE: On the linear templates that adjoin the circular portion of the roundabout, the End Station of the Point Control will end at the point below which is the intersection of the existing EoP & Rotary Outside EoP.

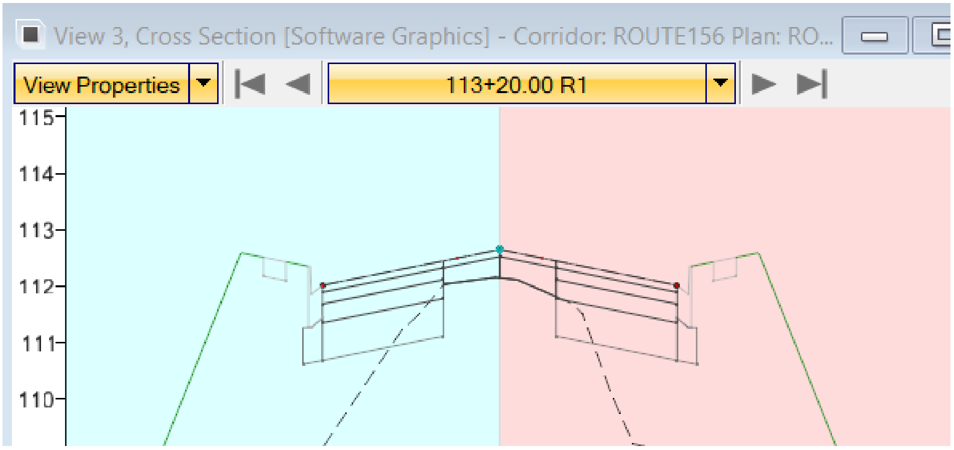


In the area past this point, add a Parametric Constraint as shown below which removes the Overlay width entirely.



Another option is to reduce the length of template to stop at the Existing EoP/Rotary Outside EoP point and to place another new construction template from that point forward.

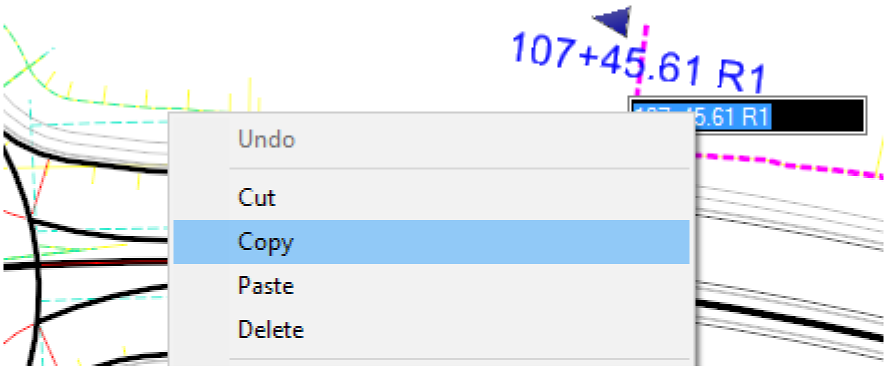
A Cross-Section view is shown below after all templates have been replaced with overlay templates and Point Controls have been applied.



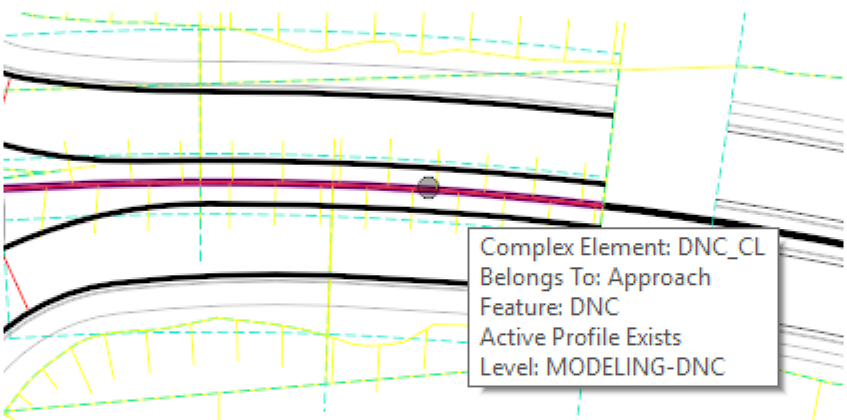
11.10.5 Connecting with the Adjoining Corridor

You can modify the adjoining corridor template drop or modify the Civil Cell Approach to join these two components. We will extend the civil cell in this exercise.

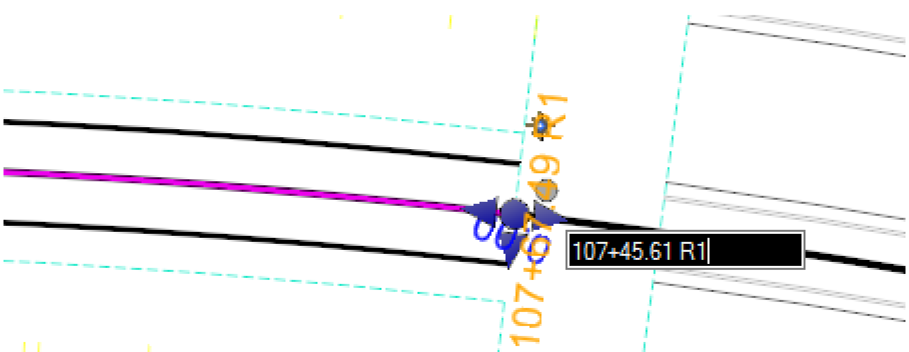
1. Select the **ROUTE156 template** at the end of the approach, select the station, right click and copy the value.



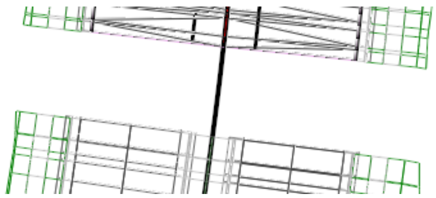
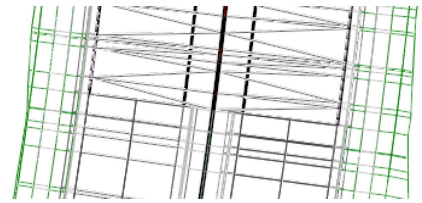
2. Hover over the *ROUTE156 alignment*, reset (if needed because there are a few elements in the Civil Cell), and then select the **DNC_CL** element.



3. Select the station and paste the copied value in the station field.



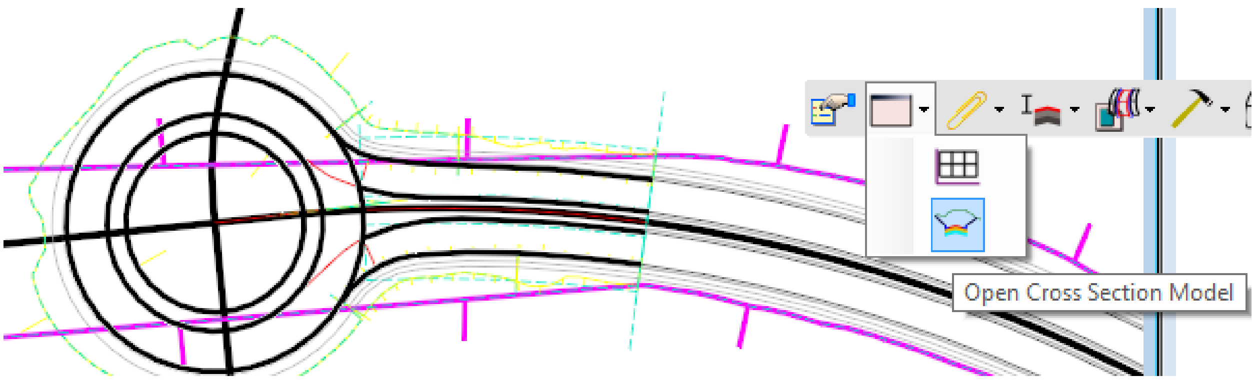
4. View the 3d view. The gap between the cell and the ROUTE156 template in this area should be closed.

Before Edit	After Edit
	

11.10.6 Cross-Section View

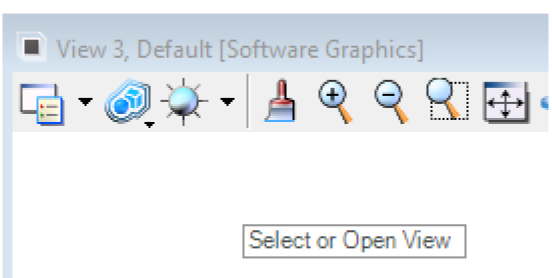
1. Open the cross-section model of the **ROUTE156** as shown below.

   a. From the context menu, select **Open Cross Section Model**.

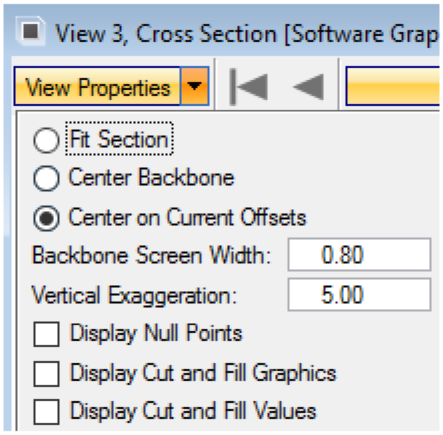


   b. Open **View 3** from *MicroStation's View Toggles* menu.

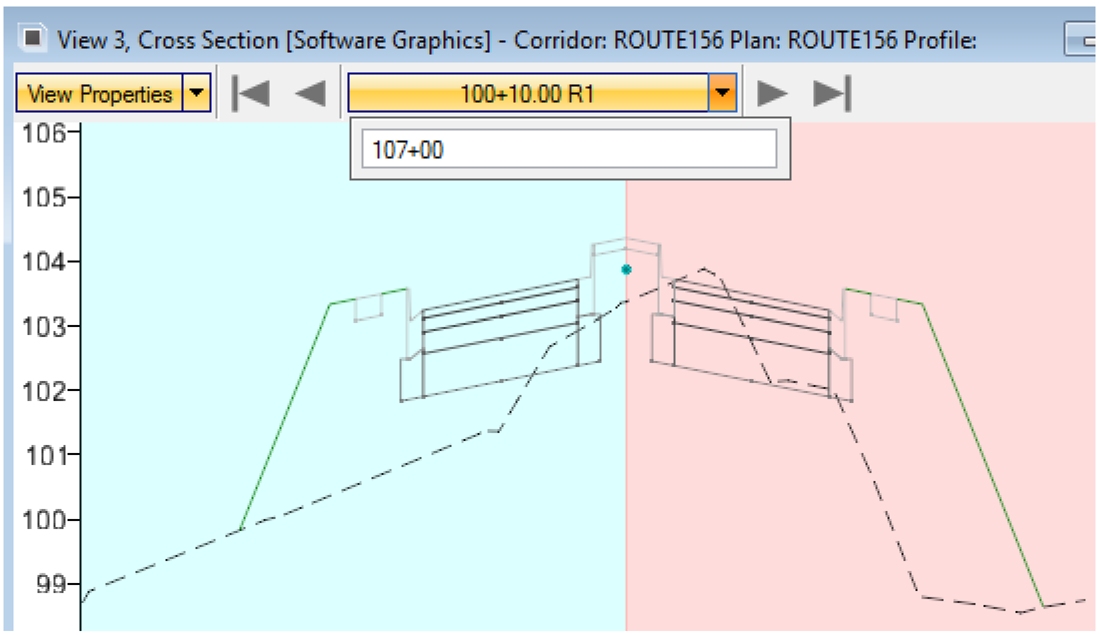
   c. **Left Click** in the drawing area of *View 4*.



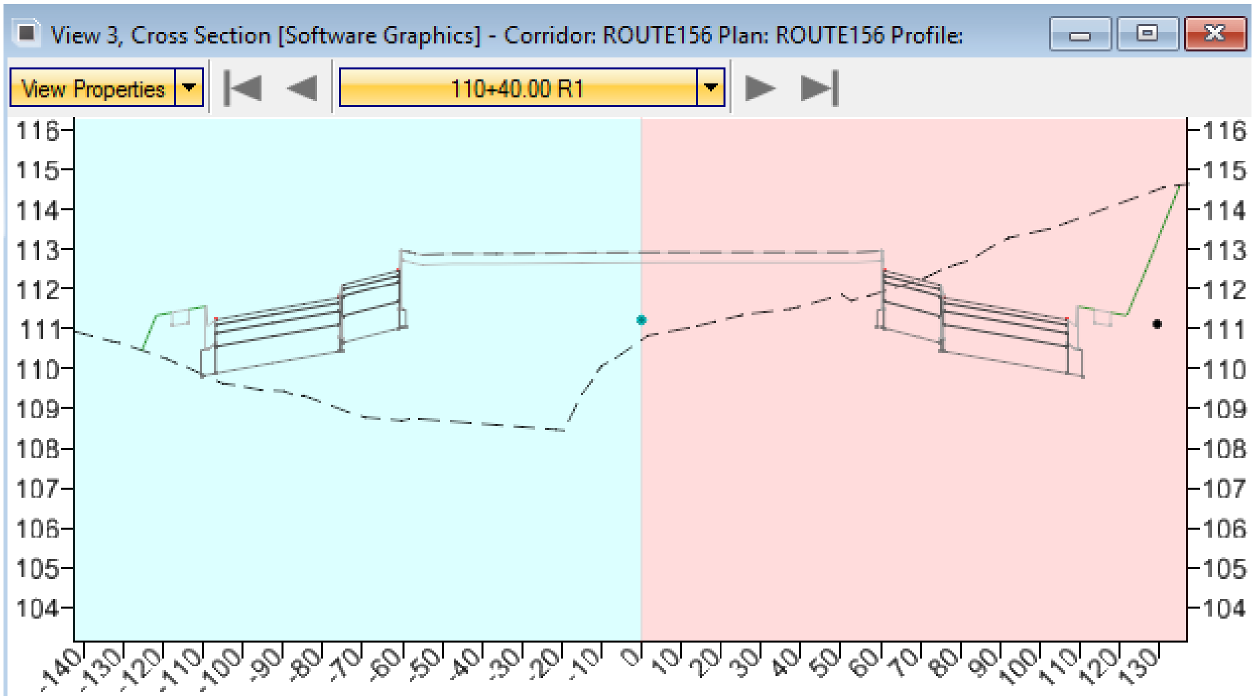
2. Select **View Properties** and set to **Center on Current Offsets.** Also change the *Vertical Exaggeration* to **5.**



3. Key In station **107+00.**



4. Use the **Next** button in the *Cross Section* view to review the Approach & Roundabout.



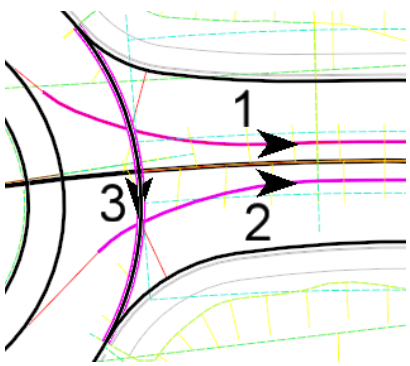
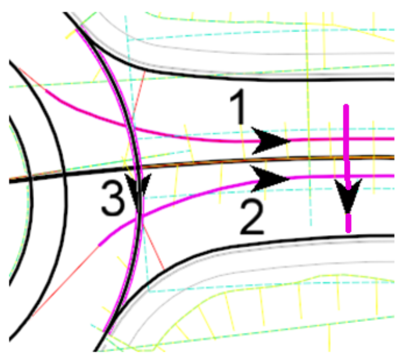
11.10.7 CELL – Splitter Median & Splitter Island

11.10.7.1 OVERVIEW

Splitter Island & **Splitter Median** Civil Cells create the island or open-ended median in the roundabout approach area and utilize elements in the Roundabout & Approach Civil Cells as their references. Available cells are shown below.

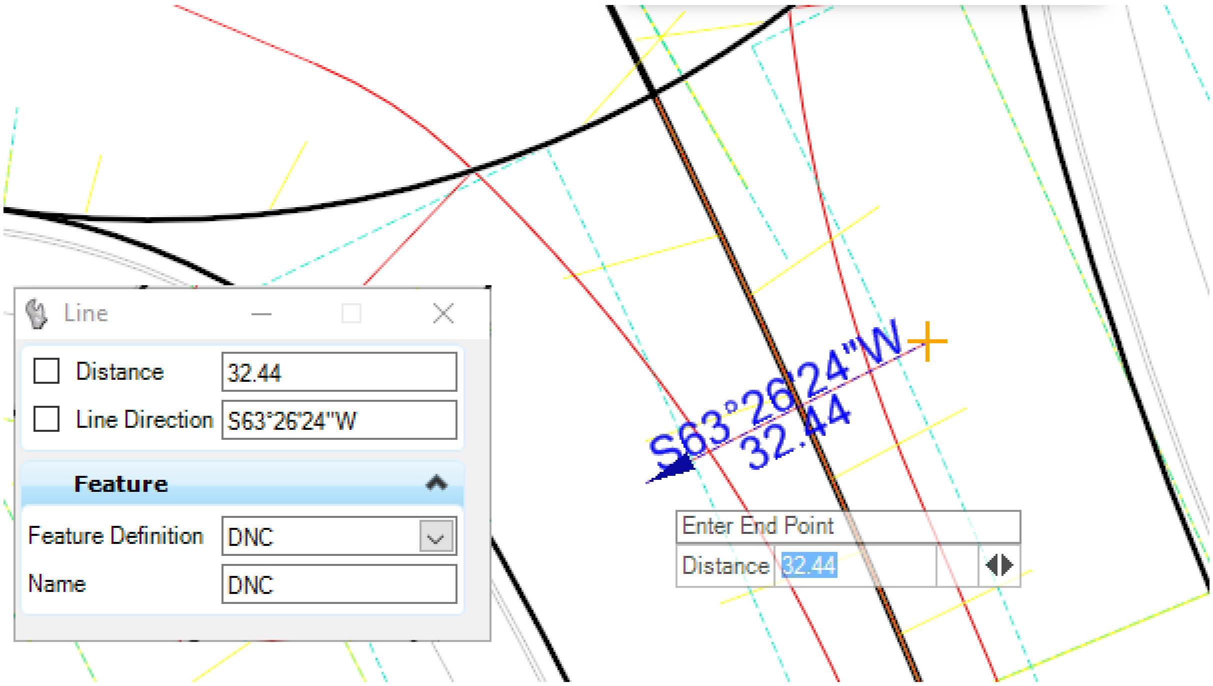
- Civil Cells
  - Civil Cell: Approach
  - Civil Cell: Approach_OneWay_Entry
  - Civil Cell: Approach_OneWay_Exit
  - Civil Cell: Bypass Lane
  - Civil Cell: Roundabout Placed on Alignments
  - Civil Cell: Roundabout Placed on Shape
  - Civil Cell: Splitter Island
  - Civil Cell: Splitter Island w/Curb Cut Ramp
  - Civil Cell: Splitter Median
  - Civil Cell: Splitter Median w/Curb Cut Ramp

11.10.7.2 REFERENCES

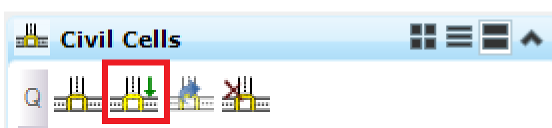
Splitter Cells	Splitter Cells w/Curb Cut Ramps	
		
<u>**References**</u> 1) LT median EoP (Profiled, LT looking at Approach from Roundabout) 2) RT median EoP (Profiled, RT looking at Approach from Roundabout) 3) Seam Line @ Roundabout Outside EoP (Profiled)	<u>**References**</u> 1) LT median EoP (Profiled, LT looking at Approach from Roundabout) 2) RT median EoP (Profiled, RT looking at Approach from Roundabout) 3) Seam Line @ Roundabout Outside EoP (Profiled) 4) Curb Cut Ramp CL	
NOTES: *(1) These references (Other than the Curb Cut Ramp CL) are available in the Approach Civil Cells but they can also be created by the designer for unique geometry (Primarily Islands)* *(2) Order of Reference prompts may be different than shown here.*		

11.10.7.3 PLACEMENT

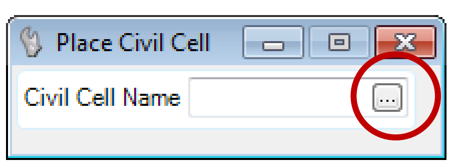
1. Remaining in **Roundabout-Approach.dgn.**
2. From the Horizontal Geometry task menu, choose the **Line Between Points** command, set the feature to Modeling->Linear-> DNC-> DNC, and place a line in the approximate location shown below. This line represents the CL of a Curb Cut Ramp.



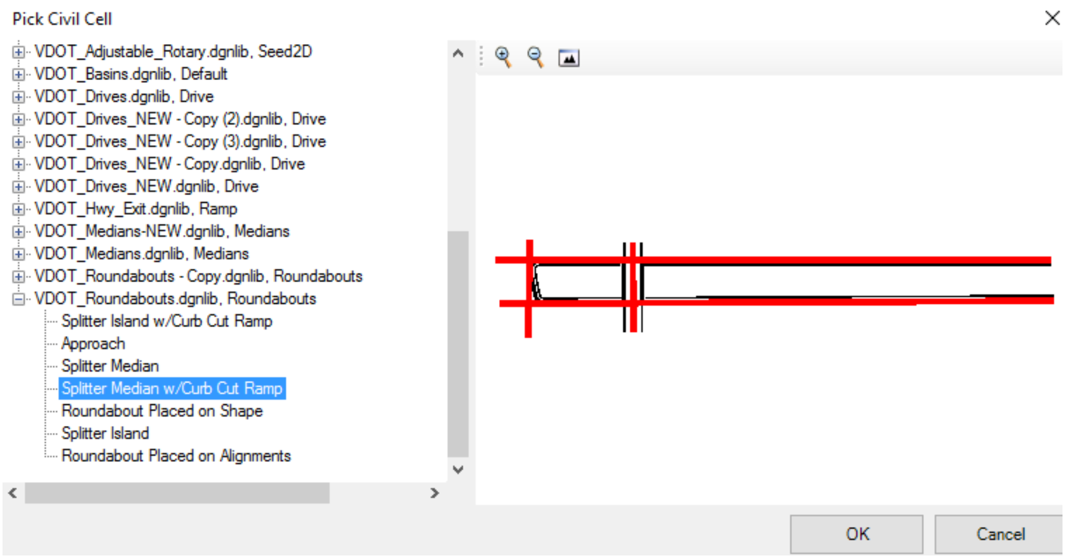
3. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



4. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

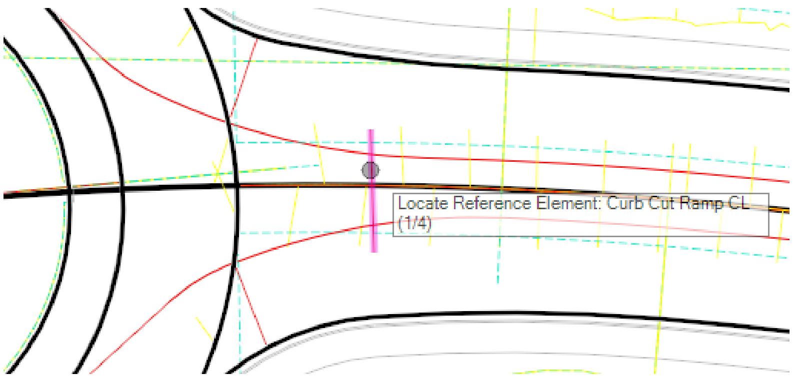


5. Select the **Splitter Median w/Curb Cut Ramp** civil cell from the **VDOT_Roundabouts.dgnlib** folder and click **OK.**

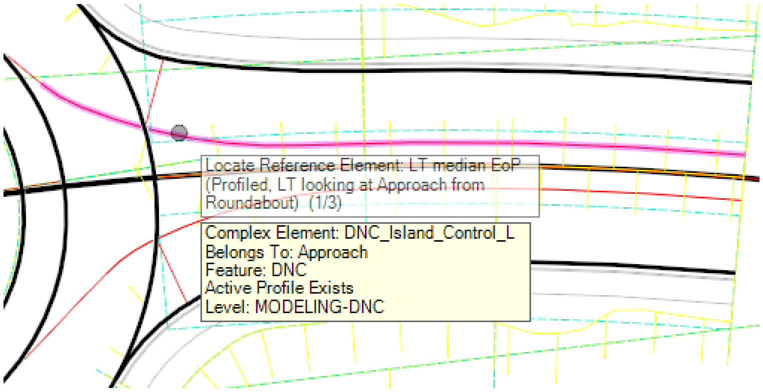


NOTE: The next three prompts may be in different order than listed in this manual.

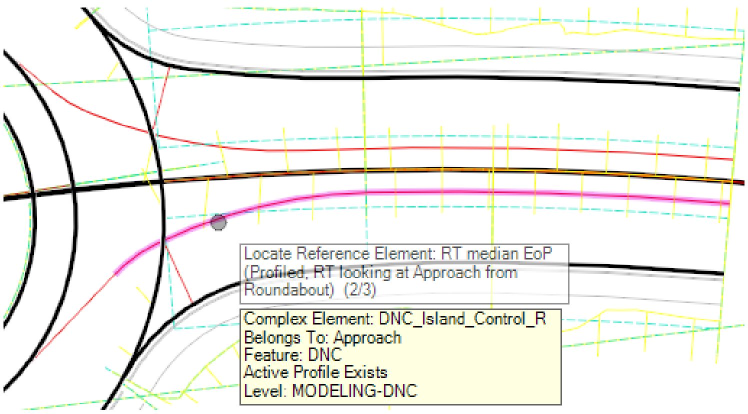
6. When prompted to *Locate Reference Element 'Curb Cut Ramp CL'*, select the **DNC element** just drawn in View 1 as shown below.



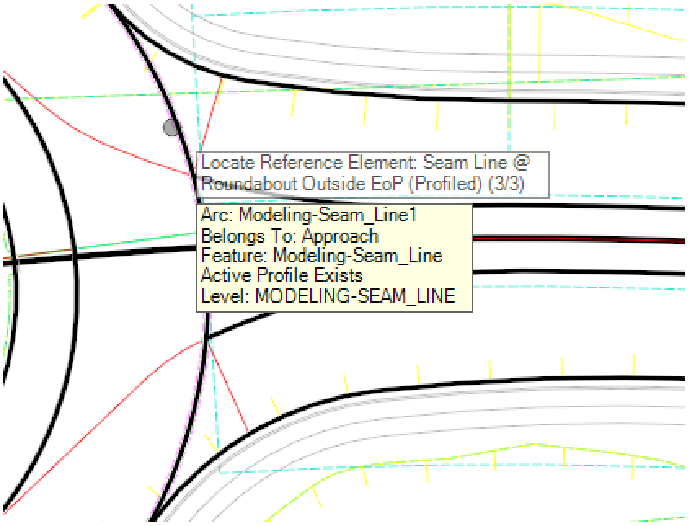
7. When prompted to *Locate Reference Element 'LT median EoP (Profiled, LT looking at Approach from Roundabout)'*, select the **DNC_Island_Control_L** in View 1 as shown below.



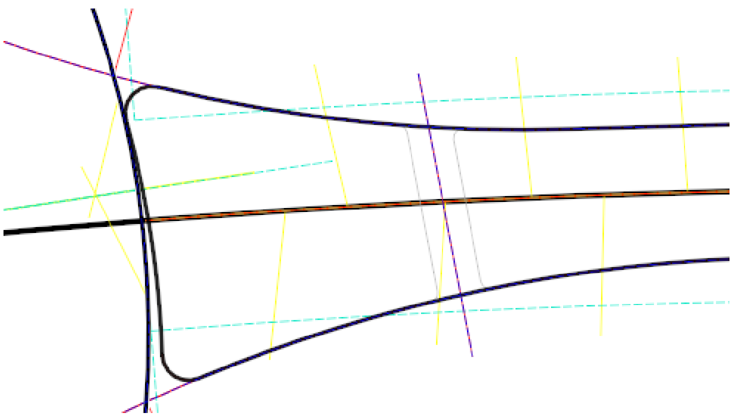
8. When prompted to *Locate Reference Element 'RT median EoP (Profiled, RT looking at Approach from Roundabout)'*, select the **DNC_Island_Control_R** in View 1 as shown below.



9. When prompted to *Locate Reference Element 'Seam Line @ Roundabout Outside EoP (Profiled)'*, select the **Modeling-Seam_Line** in View 1 as shown below.



10. Review the geometry being displayed.

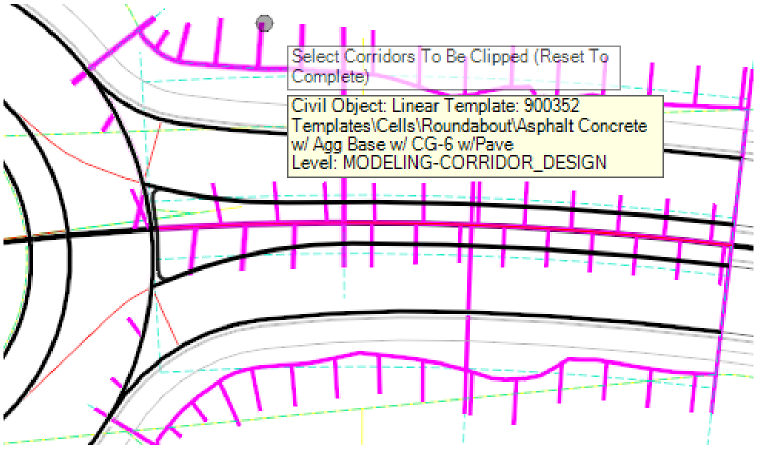


   a. If the geometry appears correct and similar to the image above, right click to reset and move on to the next step.

   b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.10.11.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

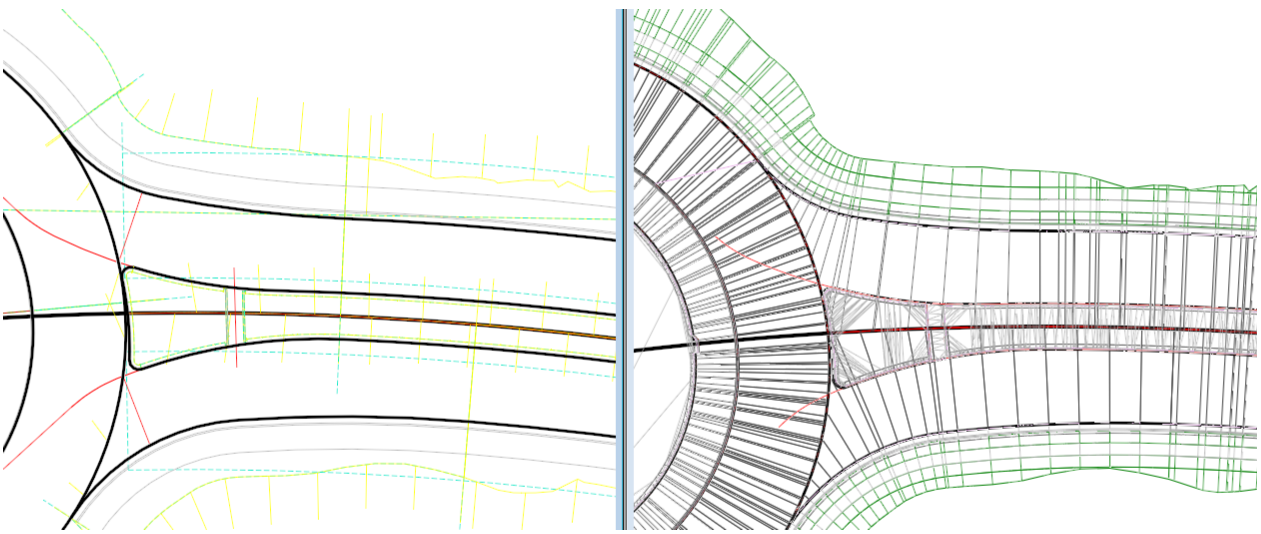
   c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

11. **Select the Linear Templates** shown below when prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.



12. **Left Click** on the View when prompted to *'Accept Civil Cell Placement'*. The cell is placed.

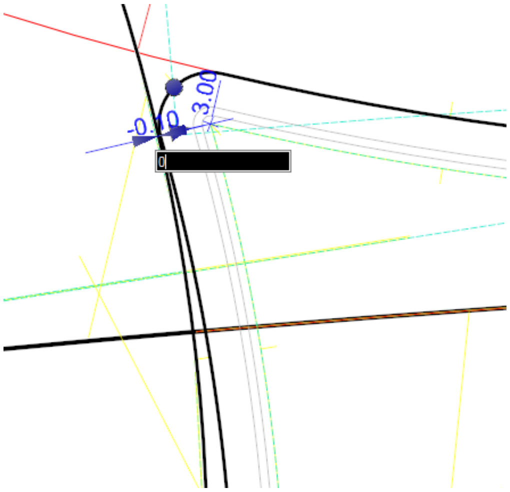
    The image below shows the cell in 2d & 3d views.



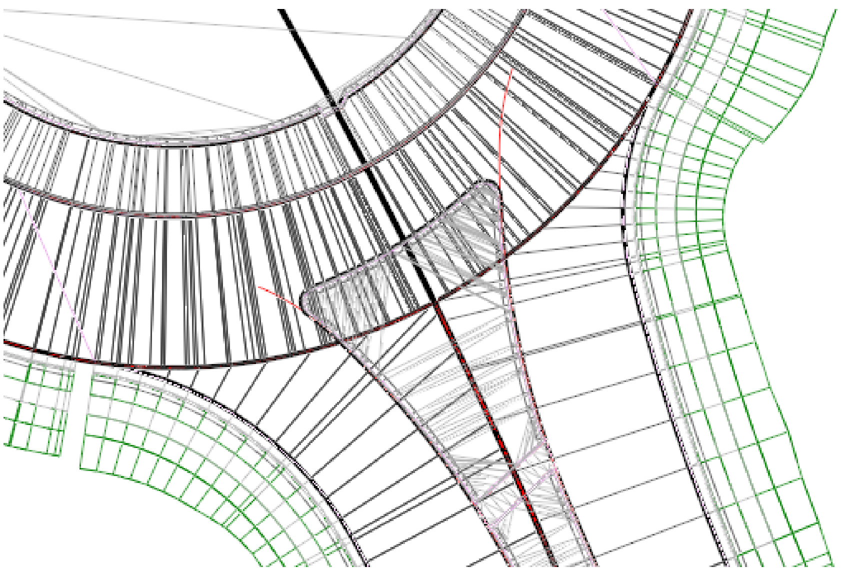
11.10.7.4 HORIZONTAL EDITS

The following steps will take you through the horizontal edits of the splitter median.

1. The initial radius values for the Civil Cell are 3'. These can be edited by selecting the **DNC_Nose** elements which lie under the EoP_Median element. If the radius value of the DNC_Nose element is changed, the radius value of the EoP_Median will also need to be changed.



2. The offset values of the DNC_Nose can be edited as needed and can be edited to push the median into the roundabout circular area if there are 2-lane to 1-lane reductions within the roundabout as shown below.

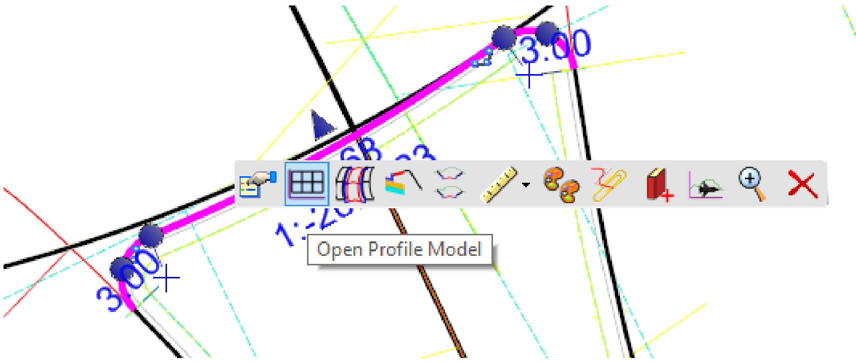


You can also select the EoP_Median elements traversing down the approach, open Project Explorer, drive down the element tree, and make edits such as changing the offset of 0 but this should be tracking the reference elements so these changes shouldn't be needed.

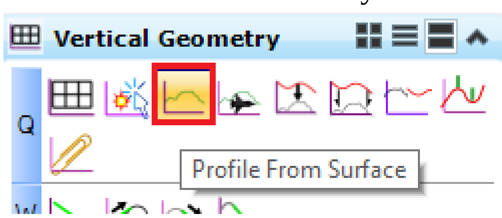
11.10.7.5 VERTICAL EDITS

The initial profile of the median elements is created from projected slopes which can be edited either through Properties or through Project Explorer but the most applicable method is to create new profiles from the approach surface terrain after horizontal edits as described in the steps below.

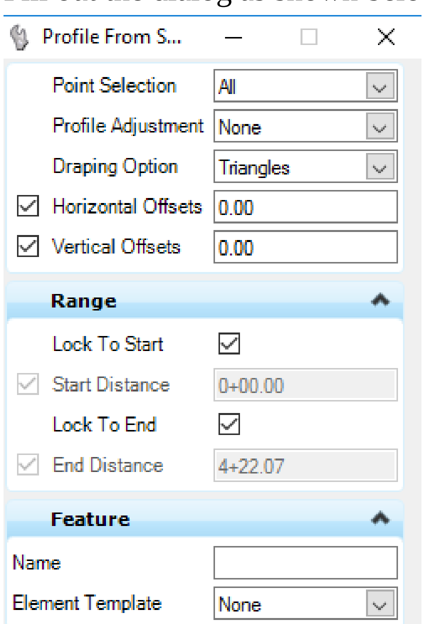
1. Open the profile model of the *EoP_Median* element shown below in View 3.



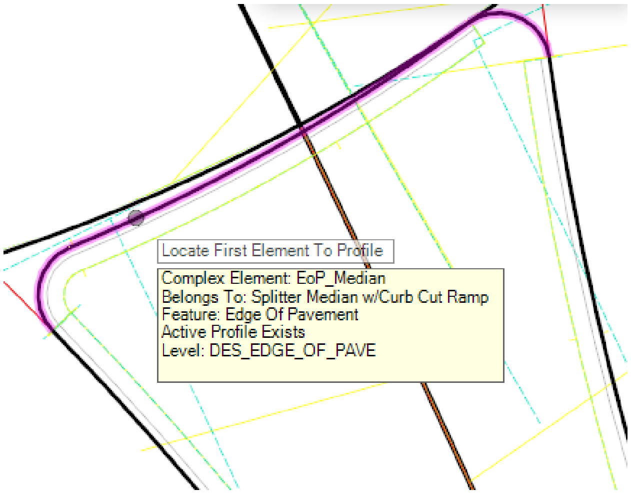
3. Select the Vertical Geometry command **Profile by Surface.**



4. Fill out the dialog as shown below.

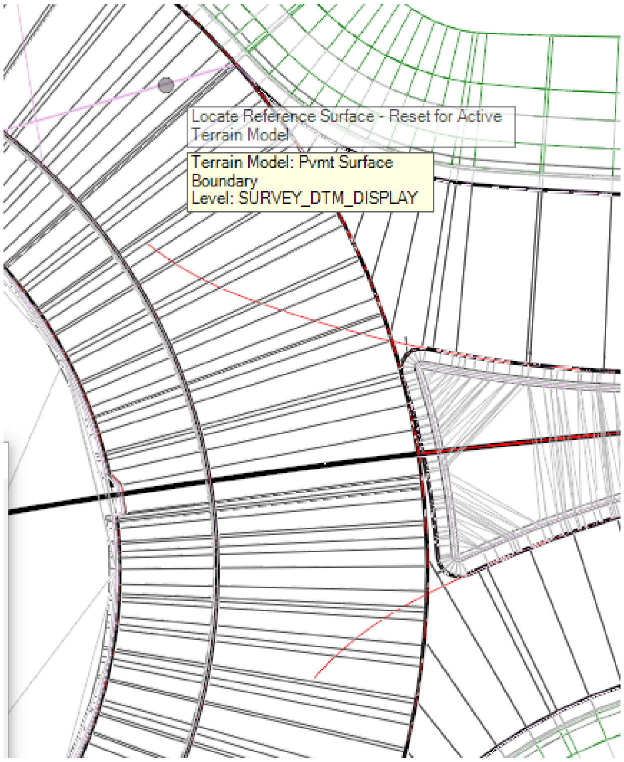


5. Select the **EoP_Median** element when prompted to *Locate First Element To Profile.*



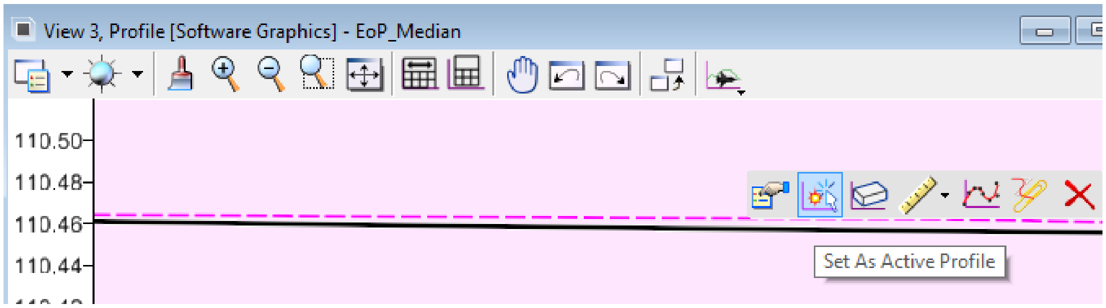
6. Right click to *Reset.*

7. Locate the **Approach Pvmt Surface terrain** when prompted to *Locate Reference Surface ….*



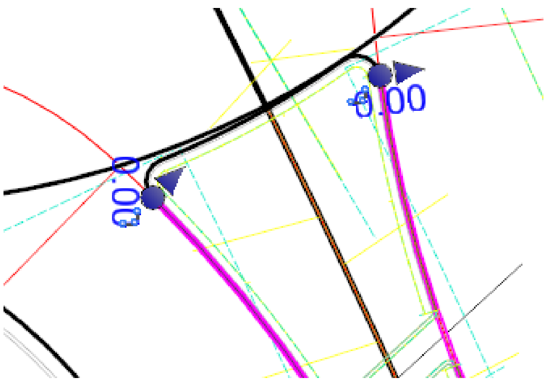
8. Right click to *Reset.*
9. Left click to confirm the remaining prompts.

10. Make this new profile active in the profile view.

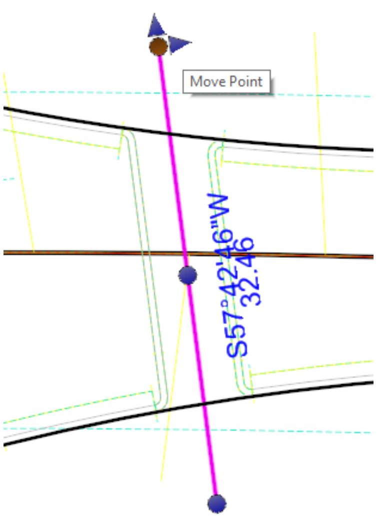


NOTE: This profile may lie beneath the initial active profile.

11. Perform the same process on the other EoP_Median elements which traverse down the approach.

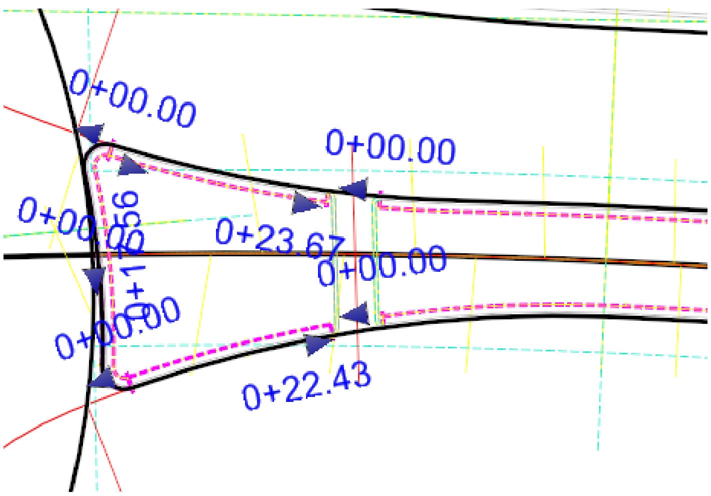


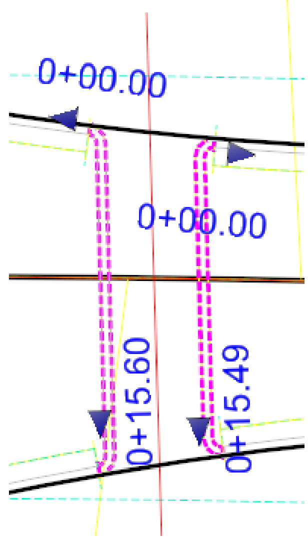
12. Select the DNC element which represents the Curb Cut Ramp CL. Select the handler on one side of the line and move one end of this line to adjust the Curb Cut Ramp location.



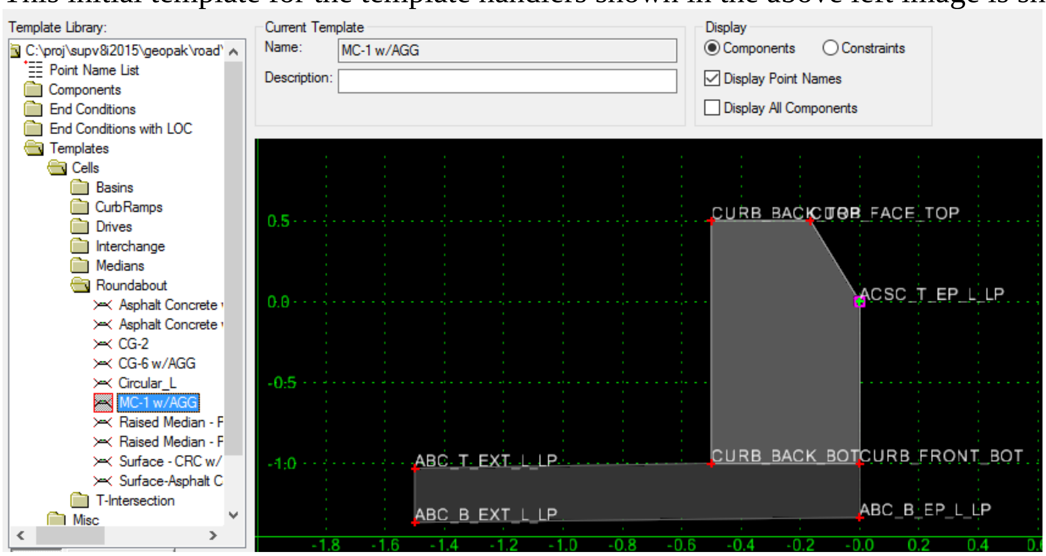
11.10.7.6 LINEAR TEMPLATES

The linear templates initially in the Civil Cell are shown highlighted below.

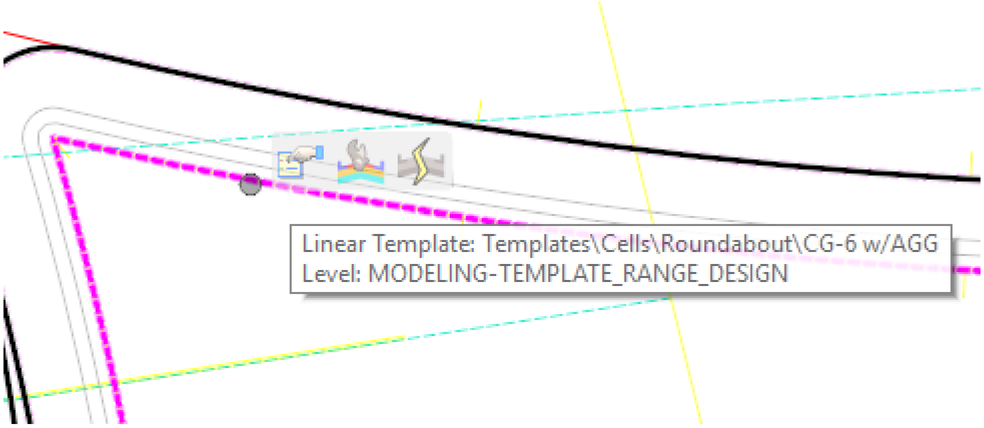




This initial template for the template handlers shown in the above left image is shown below:

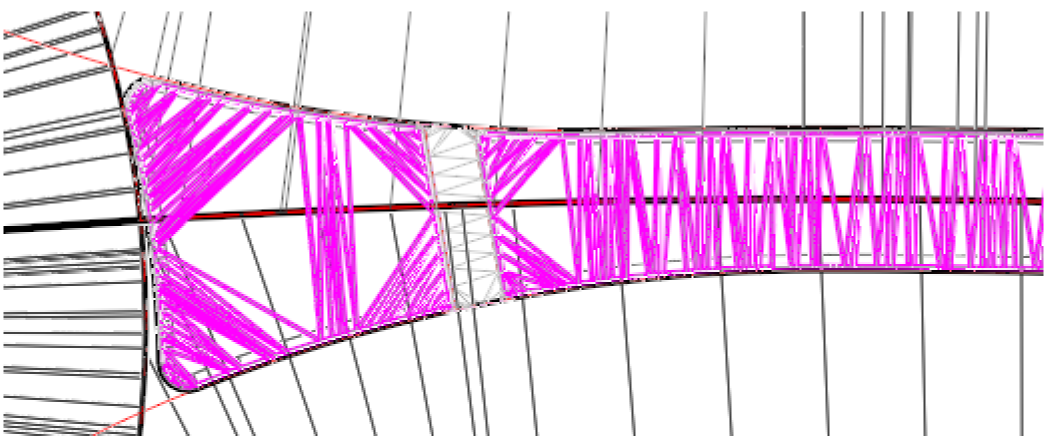


The template related tools, shown below, can be used to replace the templates (Properties), edit the template (Edit Template), or Synchronize the template as discussed in section 11.10.8 & in detail in 11.3.10

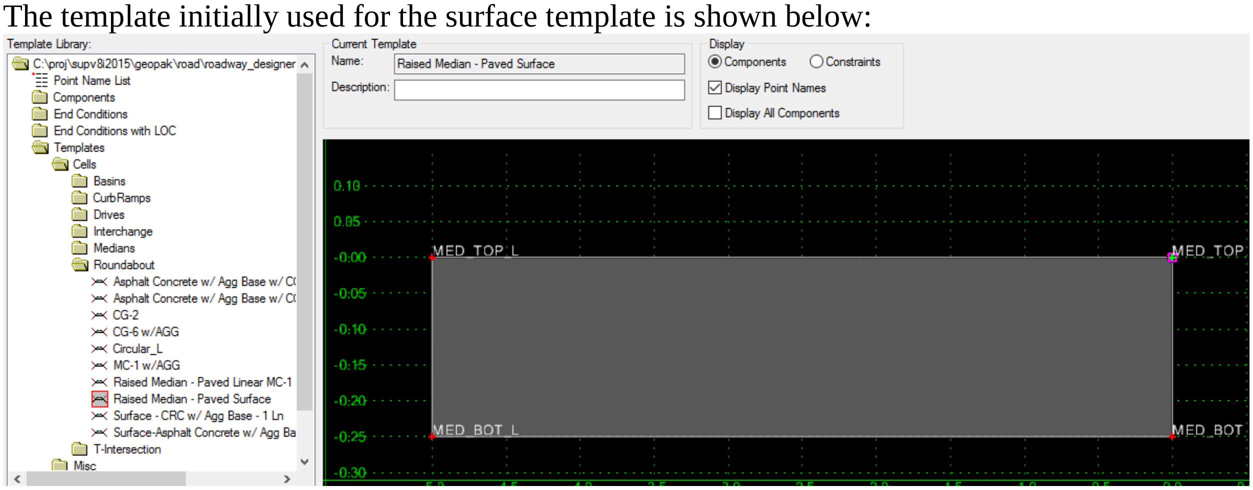


11.10.7.7 SURFACE TEMPLATE

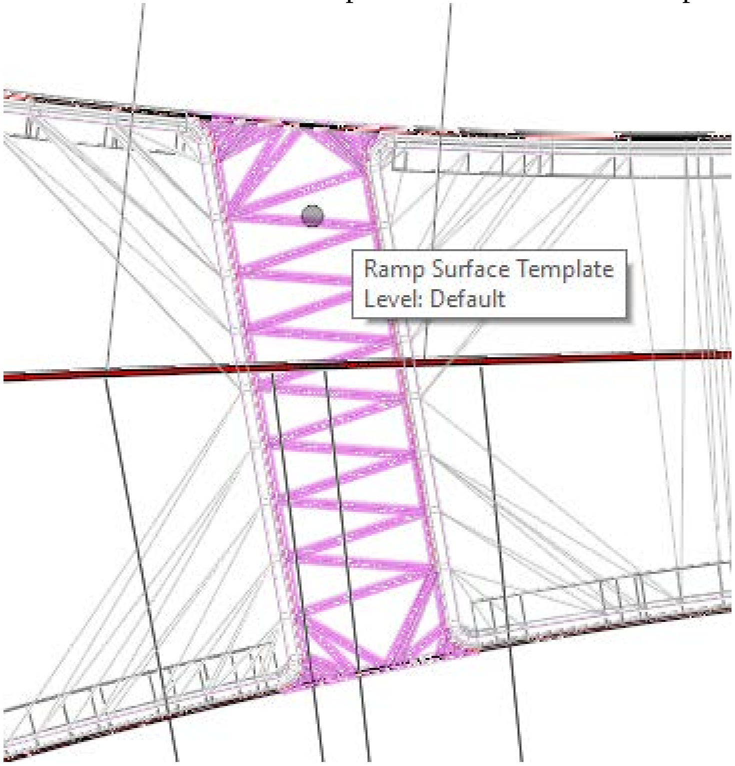
The median is created with a surface template built from the underlying Median terrain. These surface templates are shown below:



The template initially used for the surface template is shown below:



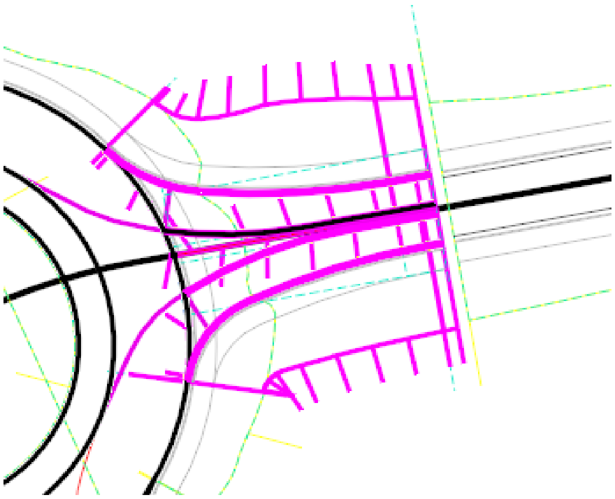
There is also a surface template in the Curb Cut Ramp area as shown below.



11.10.8 CELL – Splitter Island

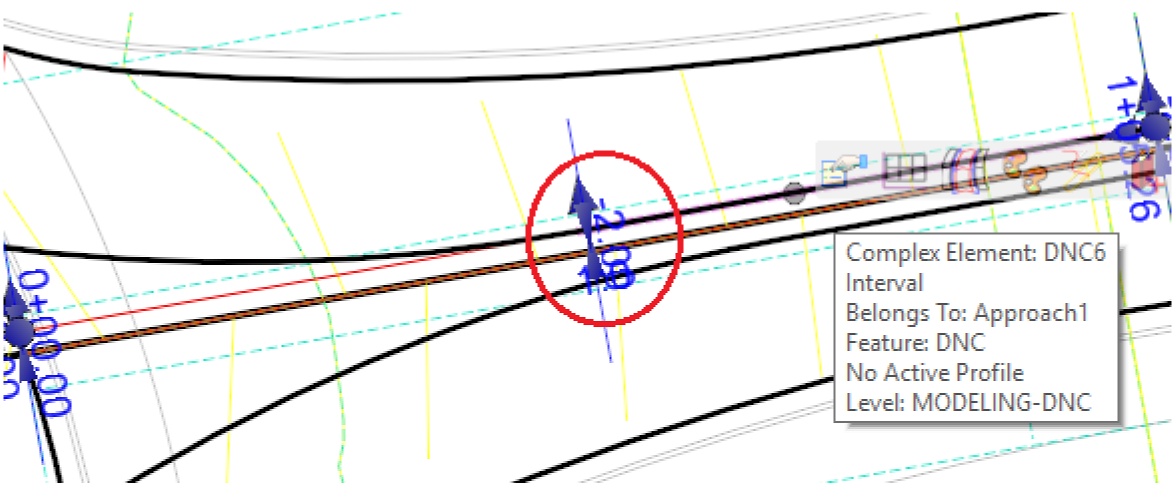
The only primary difference in the Splitter Island Civil Cell and the Splitter Median is the closed shape for the island where the median is open ended. The only additional edit is the radius for the end nose. We will go through one last exercise and show this island nose edit at the end of the exercise. We will not go into detail with most of the commands of this exercise since they are repetitive to what we have already covered.

1. Continuing in the **Roundabout-Approach.DGN** file, place the **Approach Civil Cell** on the *POLERUNRD alignment/roundabout intersection area.*

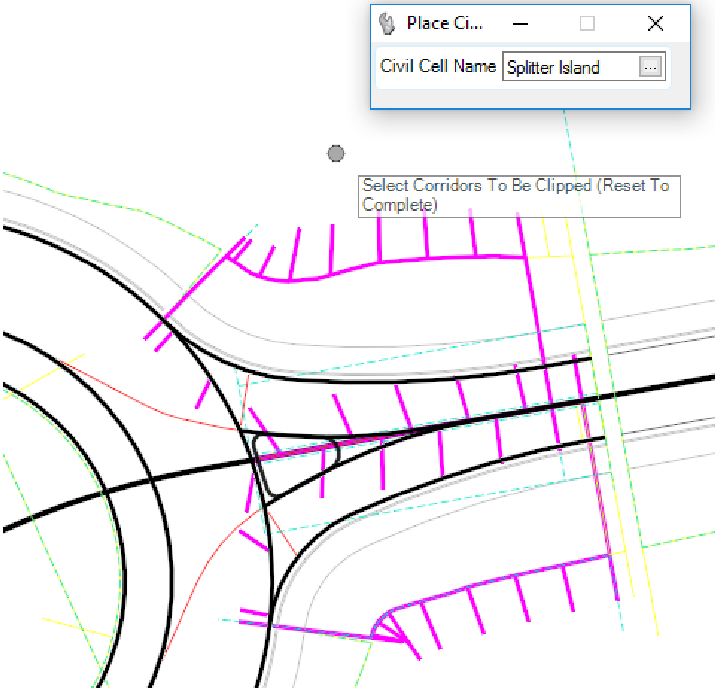


   NOTE: When prompted for the Length Control Data Point reference when going through the steps of placement, left click just shy of the template already placed on POLERUNRD.

2. Change the *offsets of the median EoP's* from 2' to **0'**. The Left Median EoP edit is shown below, perform the same for the right side.

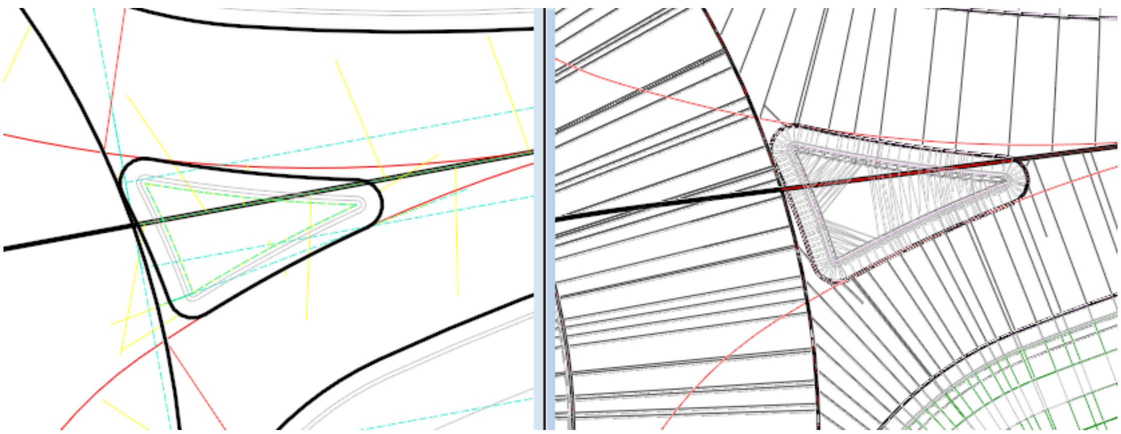


3. Place the **Splitter-Island Civil Cell** on the *POLERUNRD approach* selecting the following *linear templates to be clipped* when prompted.



4. The edits are similar to described in the Splitter Median section (Select the DNC_Nose from Horizontal edits and re-profile if needed from the Approach Pvmt Surface terrains.

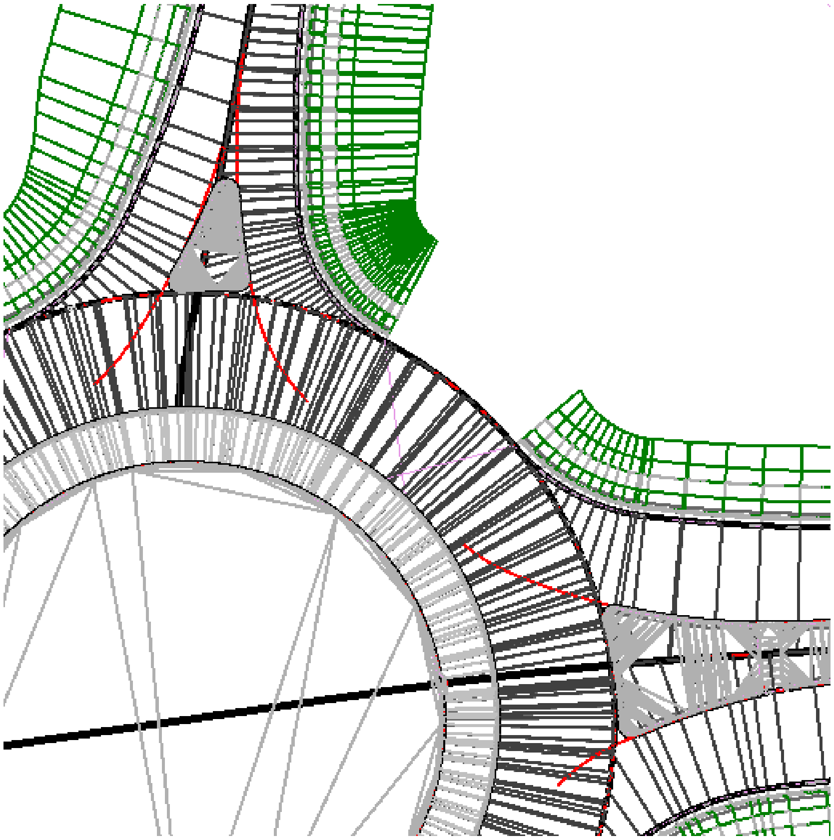
   The Splitter Island is shown below.



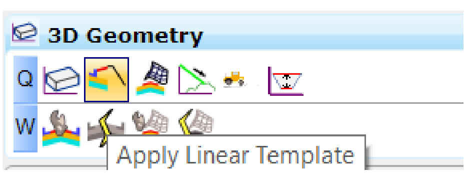
5. Extend the Approach so that it aligns with the beginning of the 2-lane corridor on PoleRunRd.

11.10.9 Final Cleanup

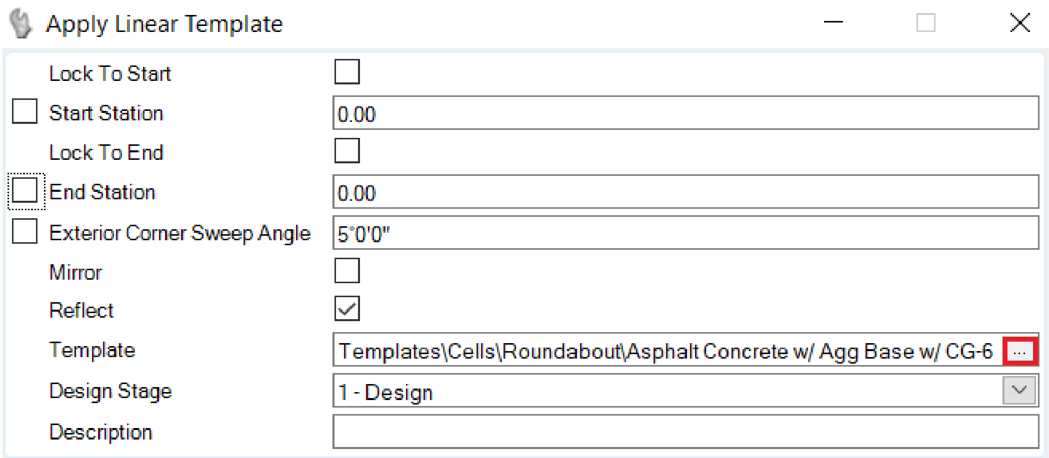
The image below shows the Roundabout at this stage. We will add a linear template in the next few steps to close the gap between the PoleRunRd & ROUTE156 approaches.



1. Select the command **Apply Linear Template** from the *3D Geometry* tools.

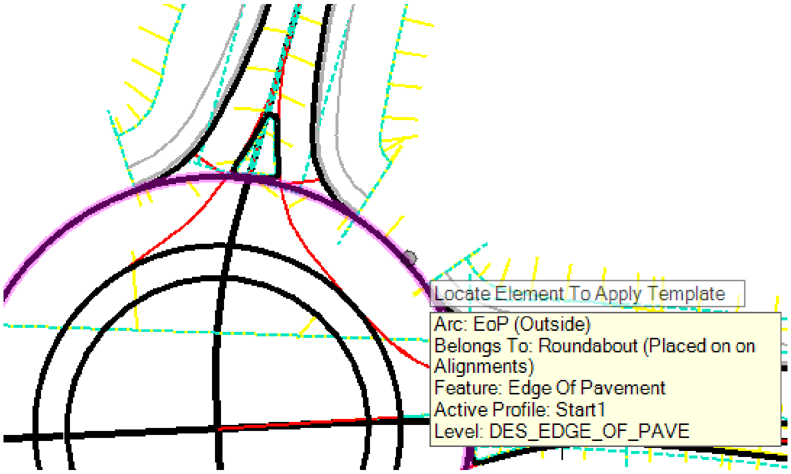


2. Set the dialog as shown below and choose the Template selection button to select a template.

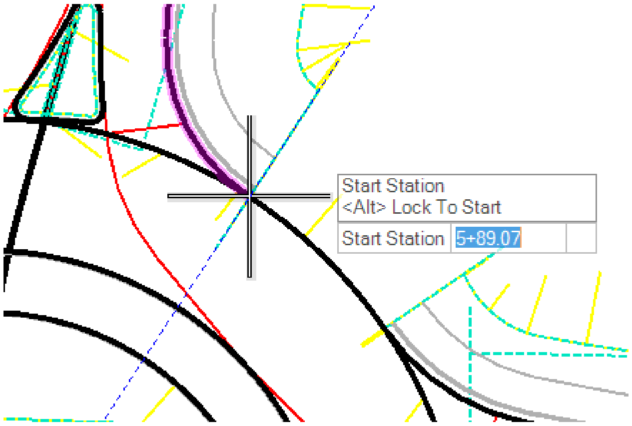


3. Choose the following template.

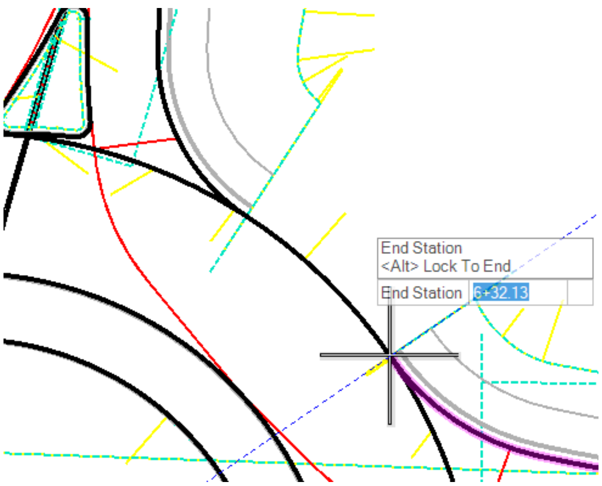
4. Select the **Roundabout EoP (Outside).**



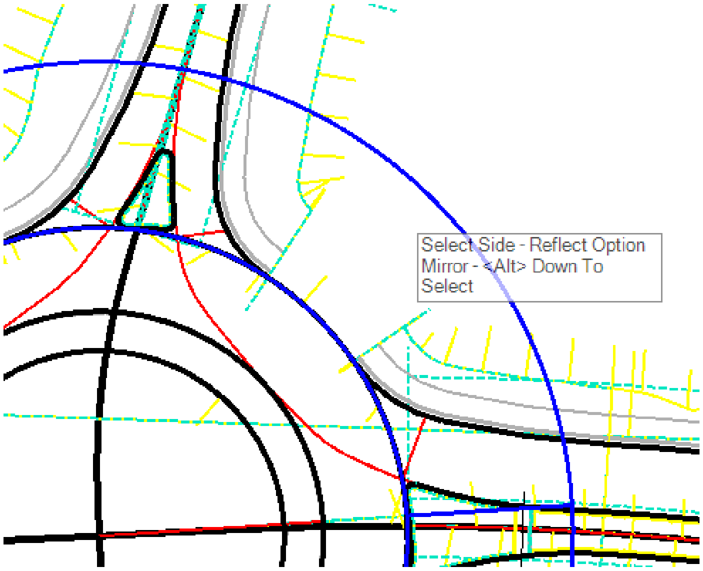
5. Confirm the template and then Snap & Data Point the following location for the **Start Station.**



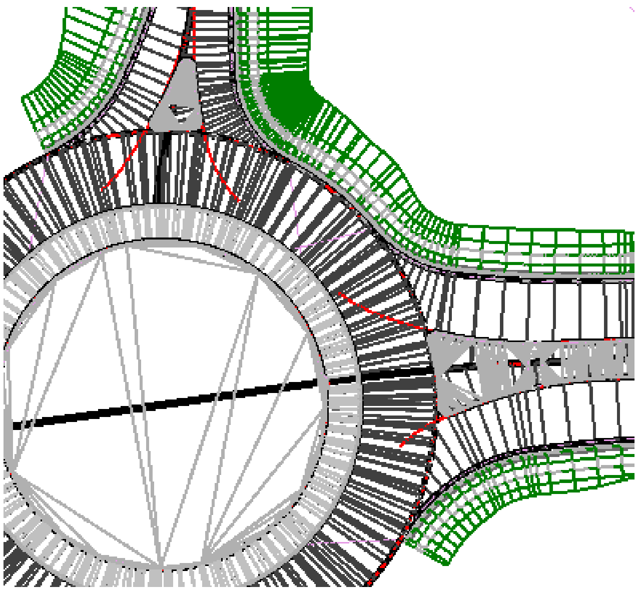
6. Snap and Data Point the following location for the **End Station.**



7. Move your cursor to orientate the template correctly and then Data Point to confirm the **Select Side** prompt.



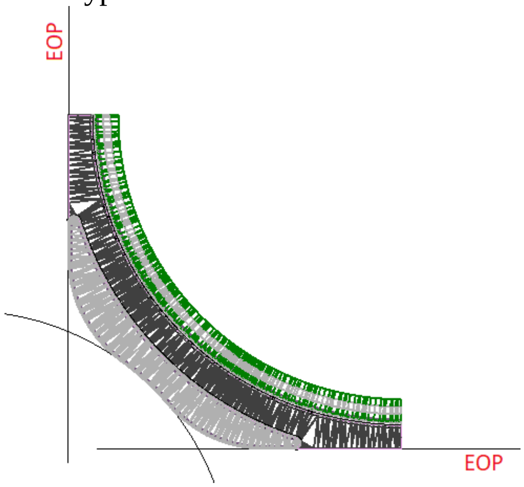
8. The Roundabout & two approaches are complete as shown in the image below.



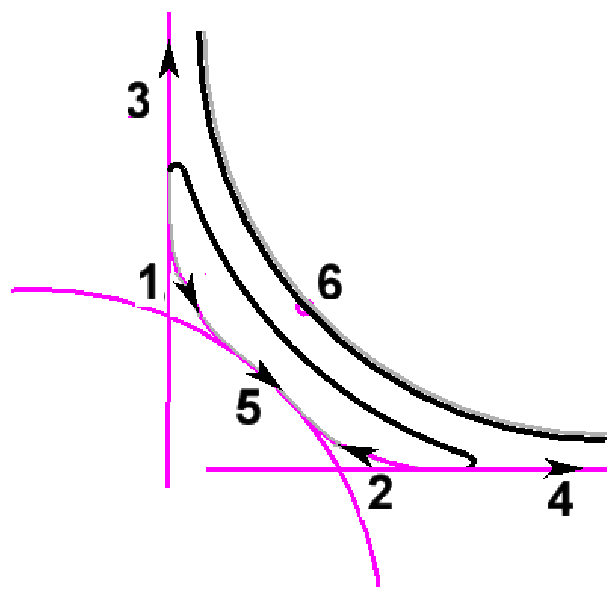
11.10.10 CELL - Bypass Lane

11.10.10.1 OVERVIEW

The Bypass Lane Civil Cell is shown below.



11.10.10.2 REFERENCES

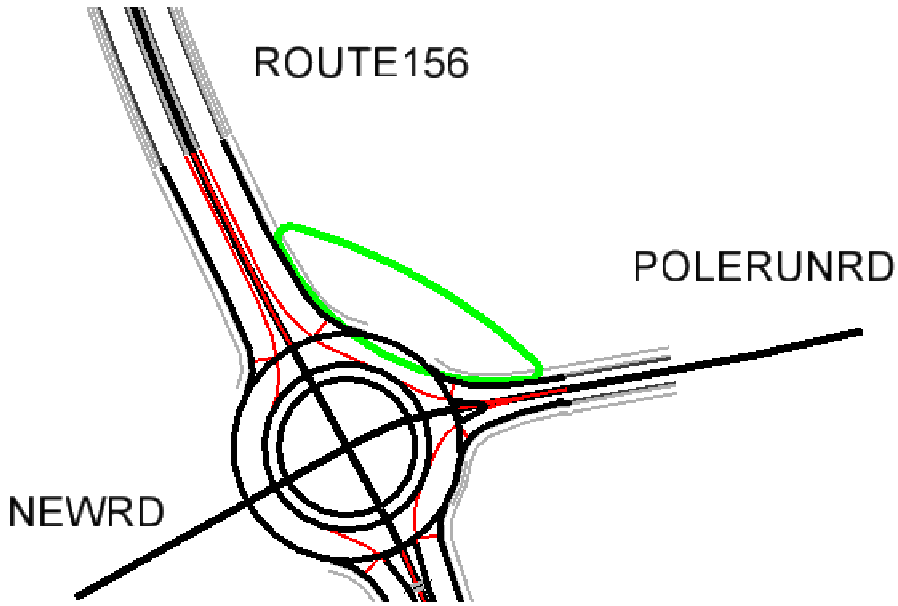
<table>
<tr>
<td>
<u>References</u>
1) LT Approach CURVE Outside EOP (Profiled, LT looking away from Rotary)
2) RT Approach CURVE Outside EOP (Profiled, RT looking away from Rotary)
3) LT Approach PARALLEL Outside EOP (Profiled, LT looking away from Rotary)
4) RT Approach PARALLEL Outside EOP (Profiled, RT looking away from Rotary)
5) Roundabout Outside EP (or element between LT & RT Approaches, Profiled)
6) DP Through Point of Bypass Outside EP (Minimum 20-30' Outside Roundabout Outside EP)
</td>
<td>


</td>
</tr>
<tr>
<td colspan="2">
NOTES:
(1) The Approach EP references are available in the Approach Civil Cells.
(2) Use the trimmed parallel EoP’s in the Approch cell for items # 3 & # 4.
(3) The Roundabout Outside EoP must be continuous between the Approach Curves Ties.
(4) Order of Reference prompts may be different than shown here.
</td>
</tr>
</table>

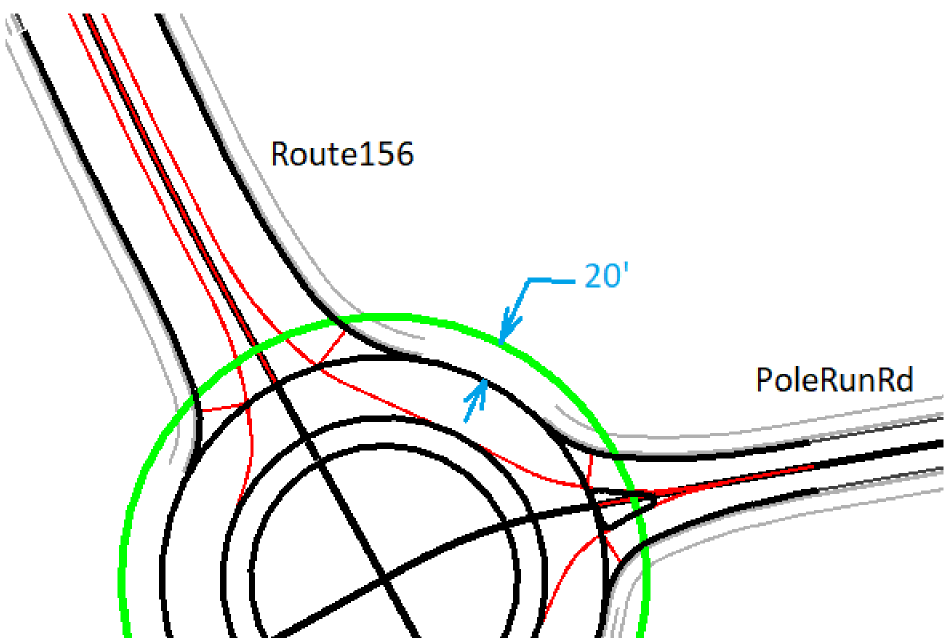
11.10.10.3 REFERENCE ASSESMENT

As mentioned in the notes above, the Approach EoP's (both the interval and complex) can be used as references but the Bypass Lane must fit within their limits. Testing to see where the Bypass Lane Outside EoP needs to be and whether it falls within the Approach limits can be done with the **Arc Between Elements** command.

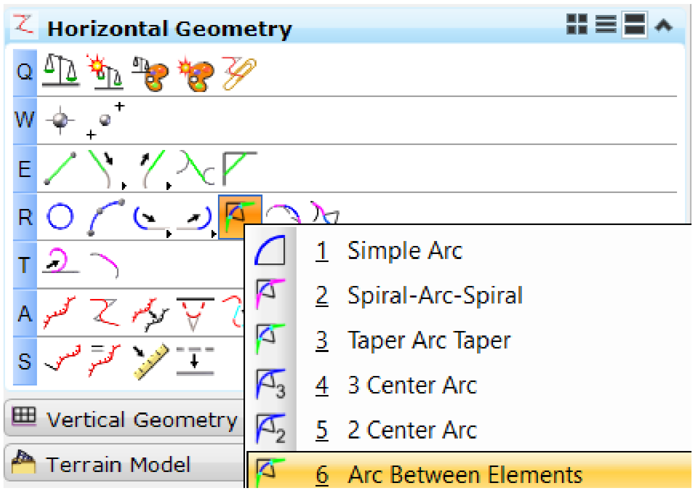
1. Open the file **Roundabout-BypassLane.dgn.**
2. We will place a Bypass Lane Civil Cell in the area shown in green below. We will go through the following steps to access the reference elements.



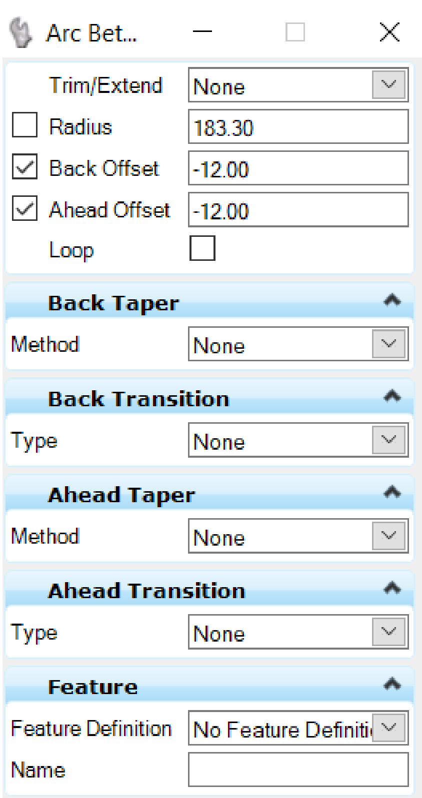
3. Use the *Horizontal Geometry* command **Single Offset Entire Element** to create an element 20' outside the Roundabout Outside EoP.



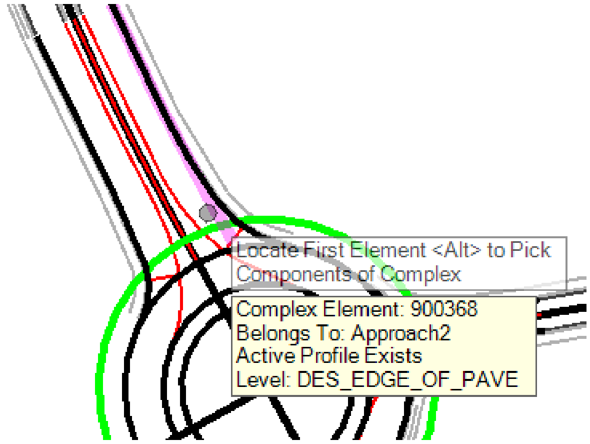
4. Choose the *Horizontal Geometry* command **Arc Between Elements.**



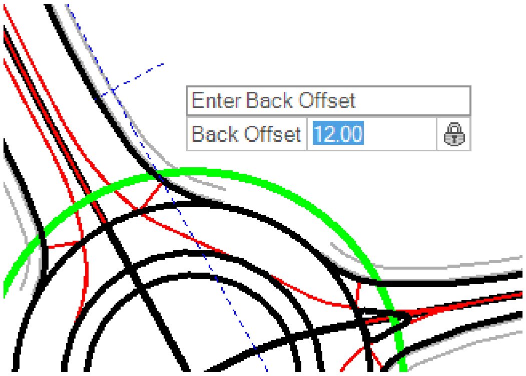
5. Fill out the resulting dialog as shown below.



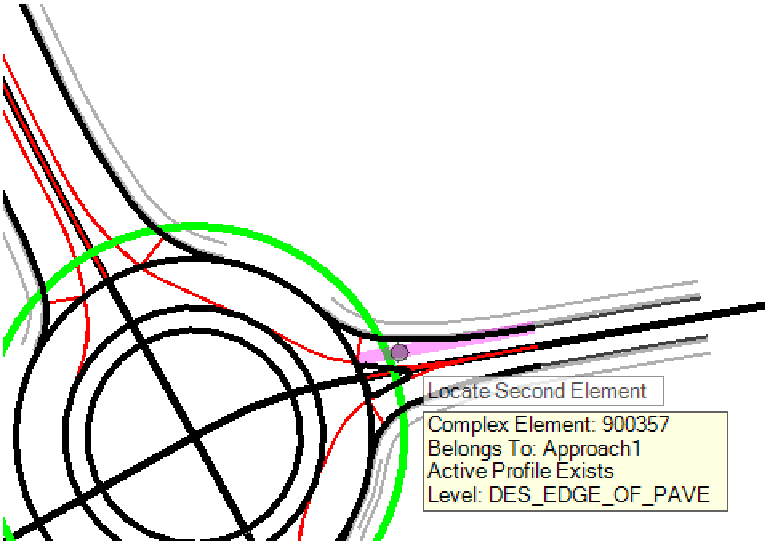
6. Select the interval shown below when prompted to *Locate First Element to Pick Components of Complex.*



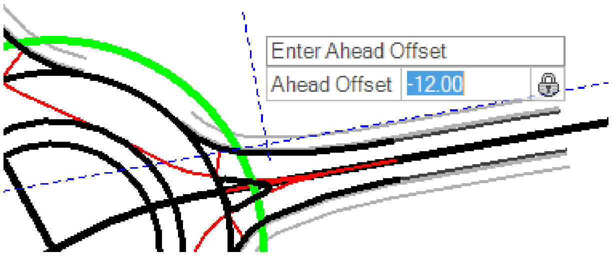
7. Data Point outside the Approach Outside EoP when prompted to *Enter Back Offset.*



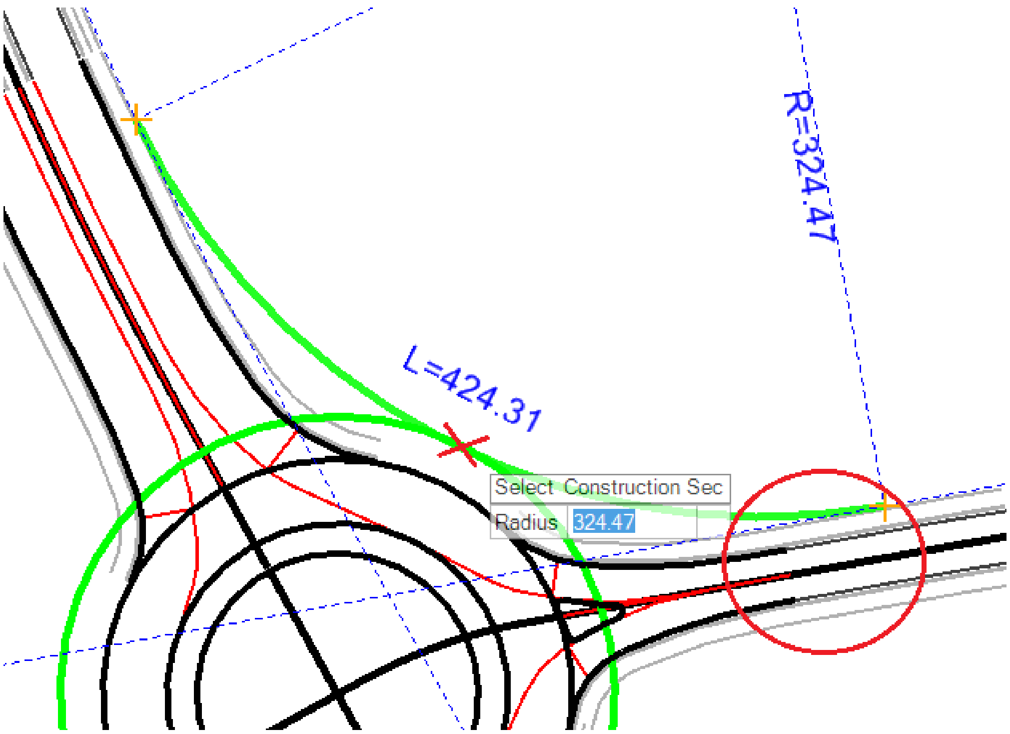
8. Select the interval shown below when prompted to *Locate Second Element.*



9. Data Point outside the Approach Outside EoP when prompted to *Enter Ahead Offset.*



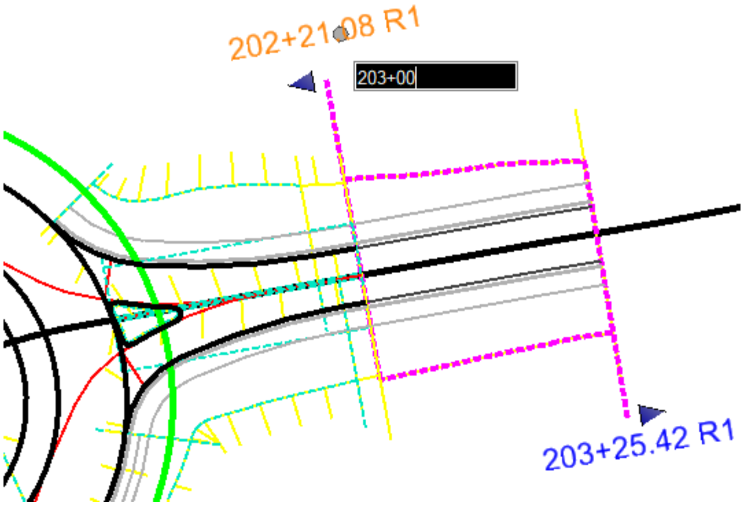
10. Move your cursor to the 20’ Offset from the Roundabout Offset EoP and review where the end points of the arc are falling.

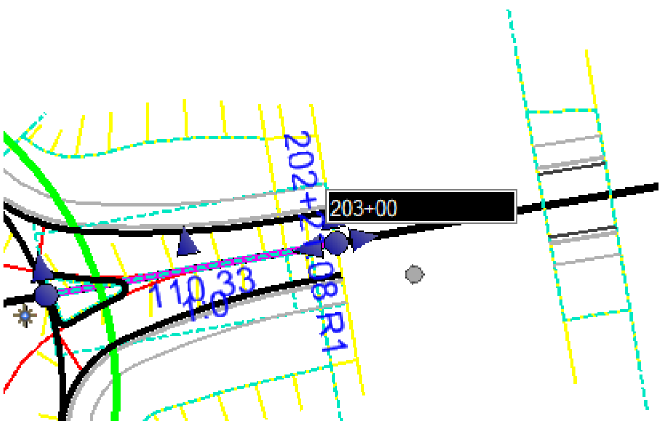


11. The end point along PoleRunRd is falling outside the limits of the Civil Cell. You have two options:
    a. Extend the limits of the cell
    b. Create a new reference for the RT Parallel EoP.
        - Use Offset Partial to create a copy of the Outside EOP in the PoleRunRd area.
        - Use Single Offset to copy the Outside EOP in the Civil Cell.
        - Apply vertical to these elements.
        - Complex these two elements, complex their vertical, and Make Active the complexed profile.
        - Use this created Complex as the RT Parallel EoP reference.

12. In this example, we will just extend the limits of the Civil Cell so **Reset** to exit this command (Don't place the element).

13. Change the Template Begin and Civil Cell end to station 203+00 by choosing the POLERUNRD template handler and by choosing the DNC_CL element respectively to edit their stations.

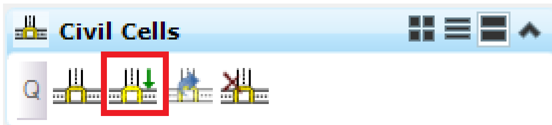




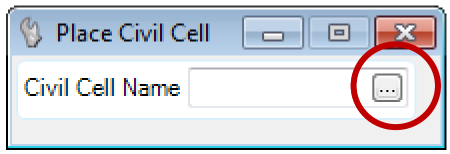
Now we will place the Bypass Lane Civil Cell.

11.10.10.4 PLACEMENT

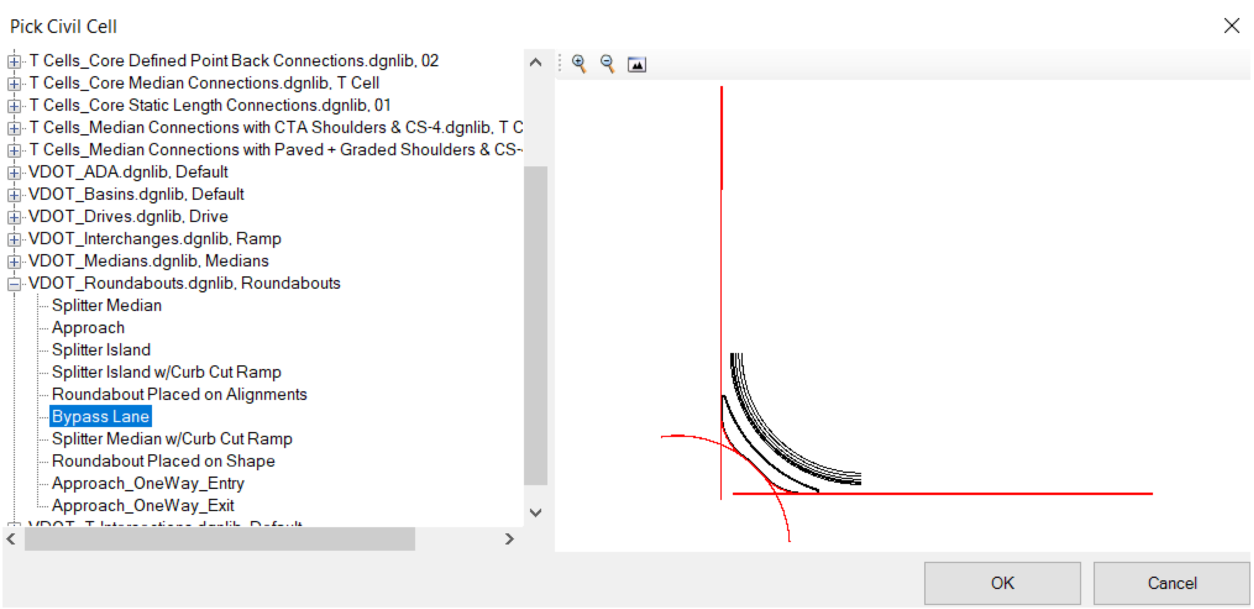
1. Turn **OFF** *Construction class elements* as previously described in this manual.
2. From the *Civil Cells* task group, select the **Place Civil Cell** icon.



3. Click the **ellipsis** button on the Tool Settings dialog next to the Civil Cell Name.

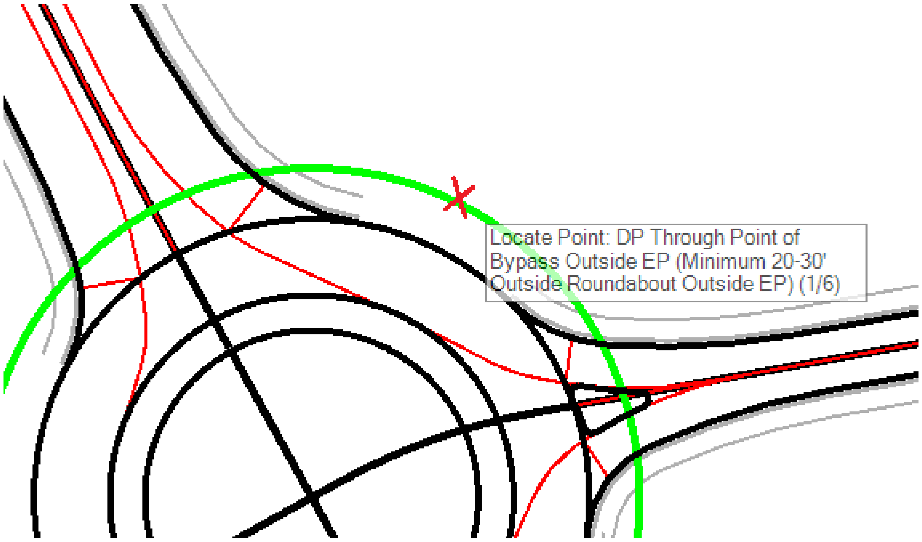


4. Select the **Bypass Lane** civil cell from the **VDOT_Roundabouts.dgnlib** folder and click **OK.**

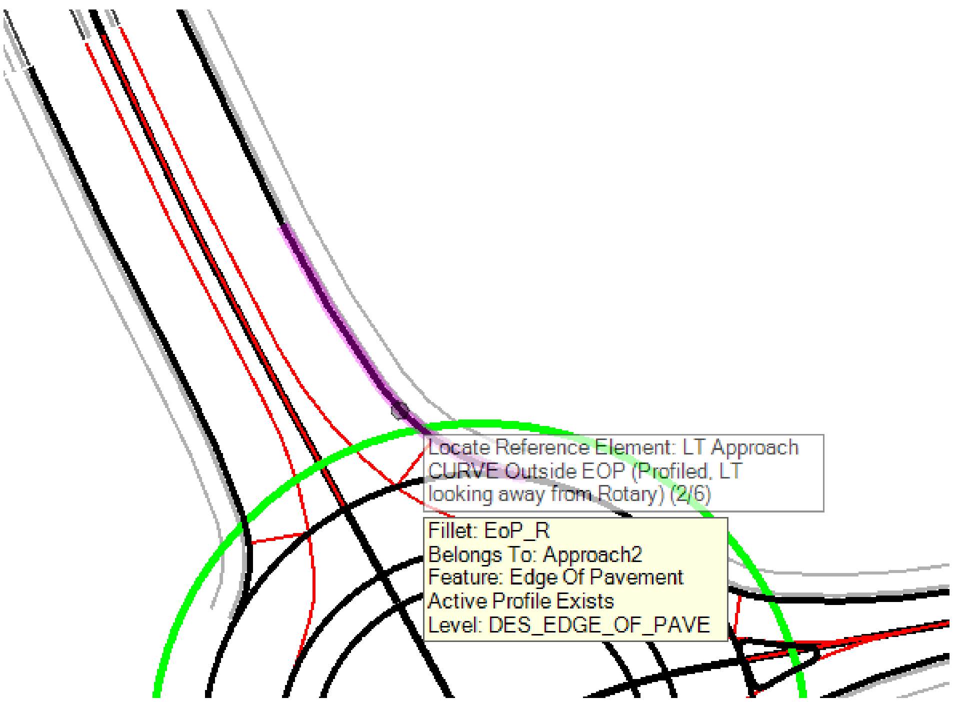


NOTE: The next six prompts may be in different order than listed in this manual.

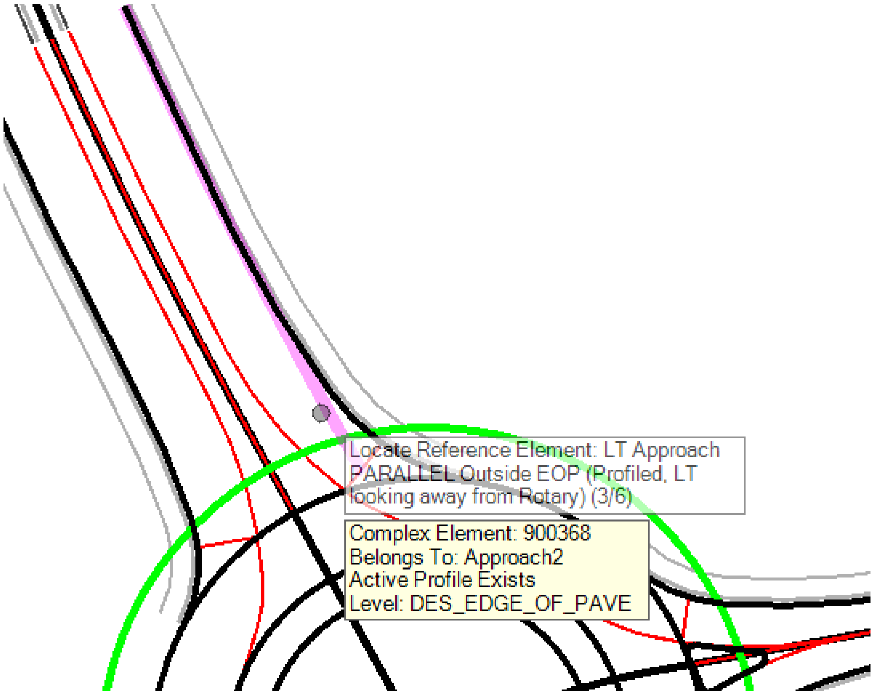
5. When prompted to *Locate Point 'DP Through Point of Bypass Outside EP (Minimum 20-30' Outside Roundabout Outside EP)'*, Data Point at the location shown below (No Snap, just approximate). Note the green element below was placed in the previous section, is for reference only, and can be deleted after the Civil Cell is placed.



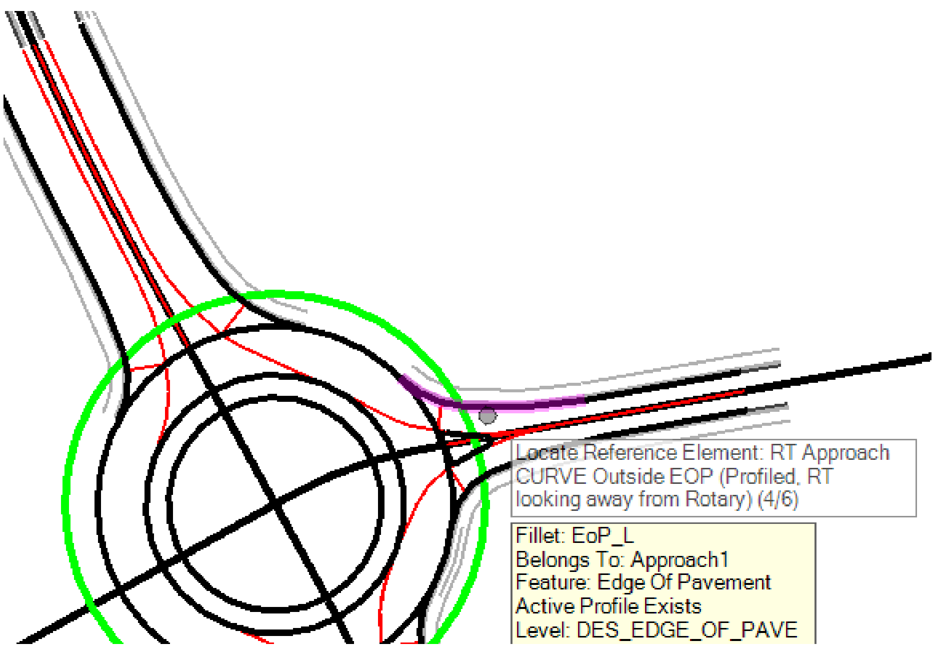
6. When prompted to *Locate Reference Element 'LT Approach CURVE Outside EOP (Profiled, LT looking away from Rotary)'*, select the **Approach Curve Outside EoP along ROUTE156** as shown below.



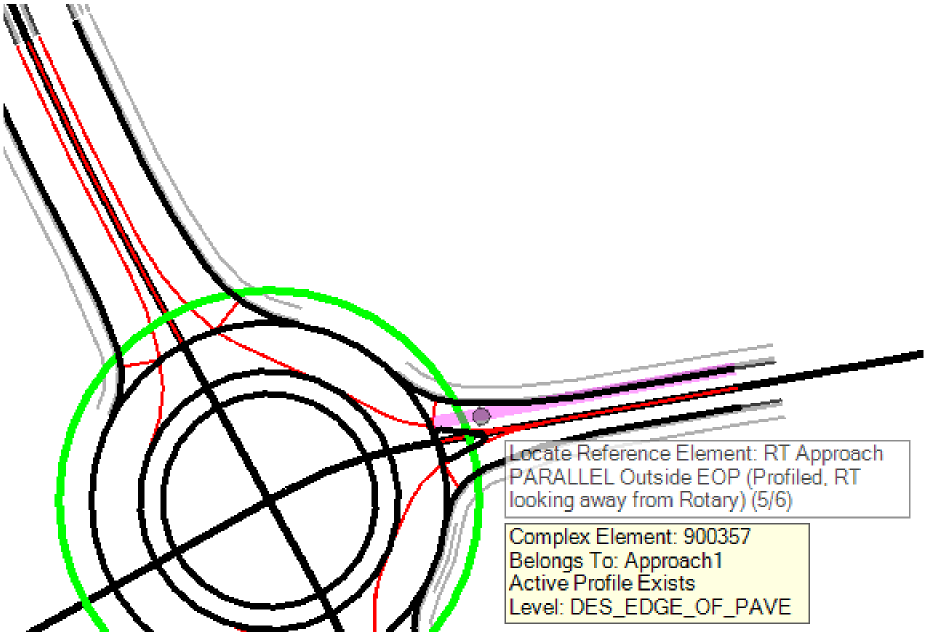
7. When prompted to *Locate Reference Element 'LT Approach PARALLEL Outside EOP (Profiled, LT looking away from Rotary)'*, select the **Approach Interval Outside EoP along ROUTE156** as shown below.



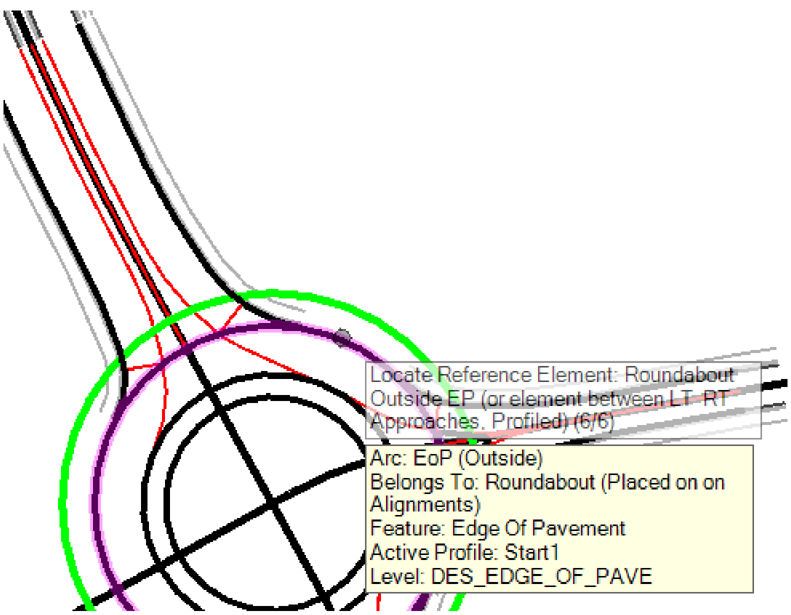
8. When prompted to *Locate Reference Element 'RT Approach CURVE Outside EOP (Profiled, RT looking away from Rotary)'*, select the **Approach Curve Outside EoP along POLERUNRD** as shown below.



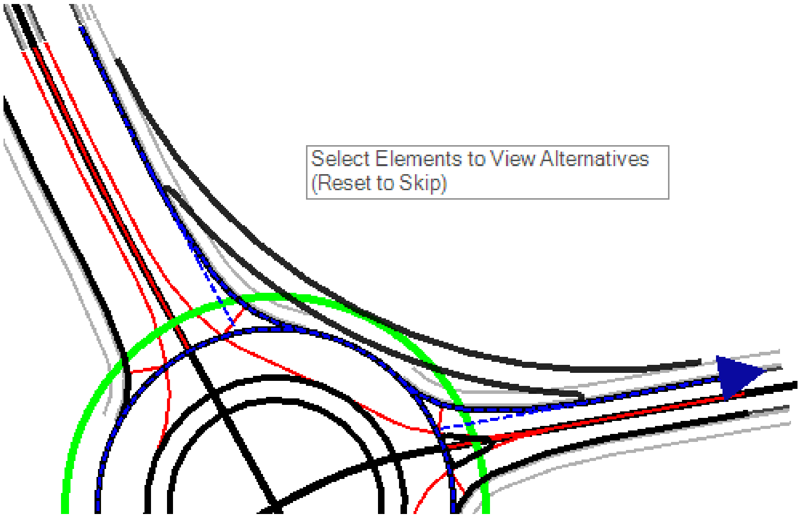
9. When prompted to *Locate Reference Element 'RT Approach CURVE Outside EOP (Profiled, RT looking away from Rotary)'*, select the **Approach Parallel Outside EoP along POLERUNRD** as shown below.



10. When prompted to *Locate Reference Element 'Roundabout Outside EP (or element between LT & RT Approaches, Profiled)'*, select the **Roundabout Outside EoP** in View 1 as shown below.



11. Review the geometry being displayed.



   a. If the geometry appears correct and similar to the image above, right click to reset and move on to the next step.

   b. If the geometry does not look correct, ensure the direction of arrows as shown in section 11.10.9.2. Although the cells will normally adapt to references that are different in direction than the actual cell references, you can change the direction of arrows by hovering over the reference elements to view the directional arrows and left clicking to change the direction.

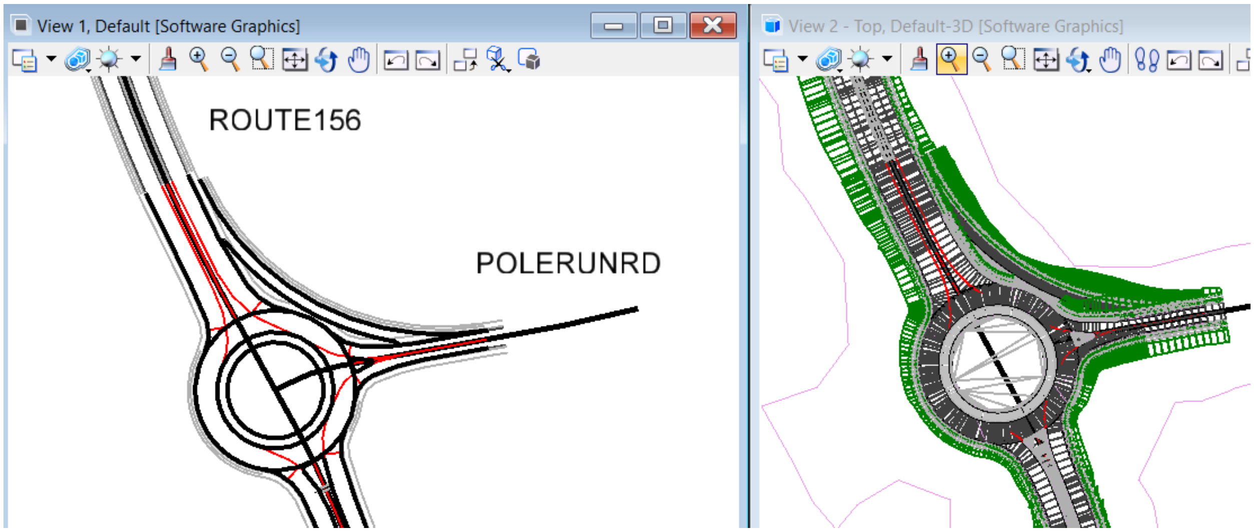
   c. If the geometry still does not appear correct, it's highly likely that the reference elements are not long enough or profiled long enough to accommodate the cell as it is built. You can Right-Click through the remainder of prompts to not place the cell and review the reference elements.

12. **Reset** when prompted to *'Select Corridors To Be Clipped (Reset To Complete)'*.

13. **Left Click** on the View when prompted to *'Accept Civil Cell Placement'*. The cell is placed.

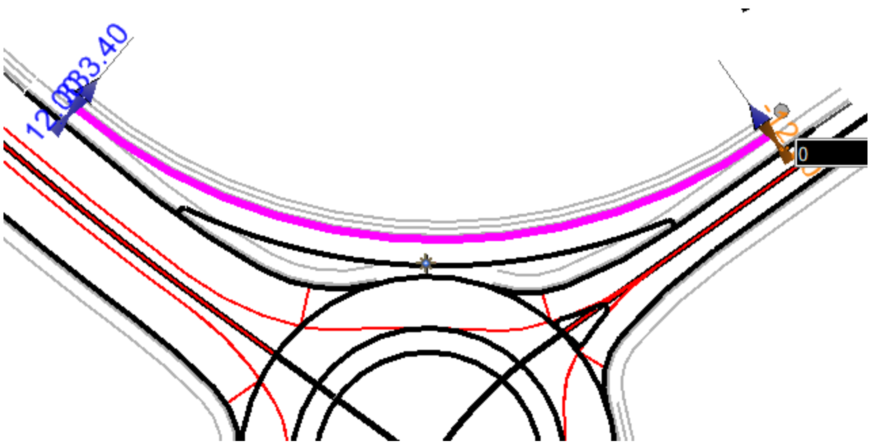
14. Delete the green element copied 20’ outside the Roundabout Outside EOP in section 11.10.9.3

    The image below shows the cell in 2d & 3d views.

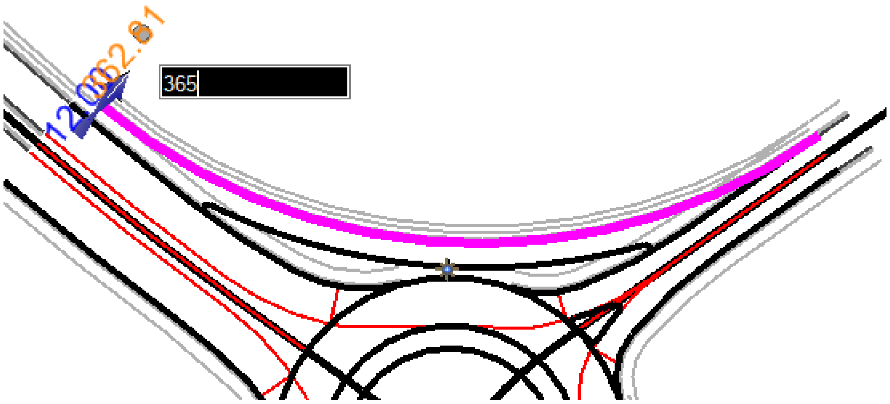


11.10.10.5 HORIZONTAL EDITS

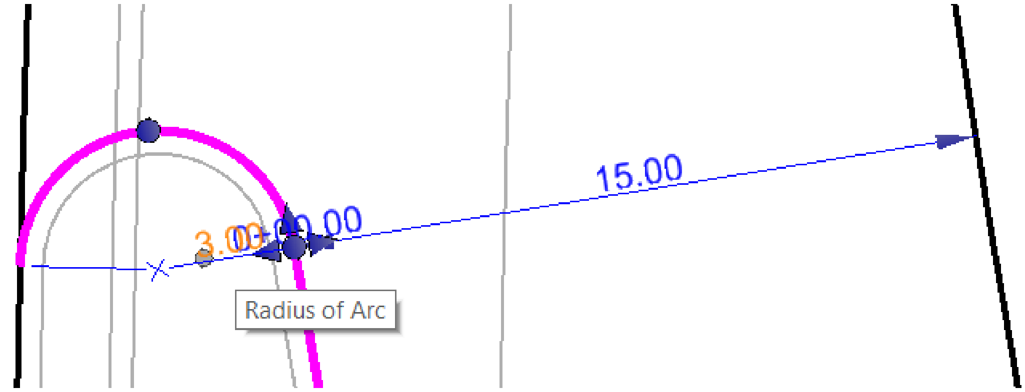
1. Select the **Bypass Lane outside EOP** and change the 12’ offset along POLERUNRD to **0.**



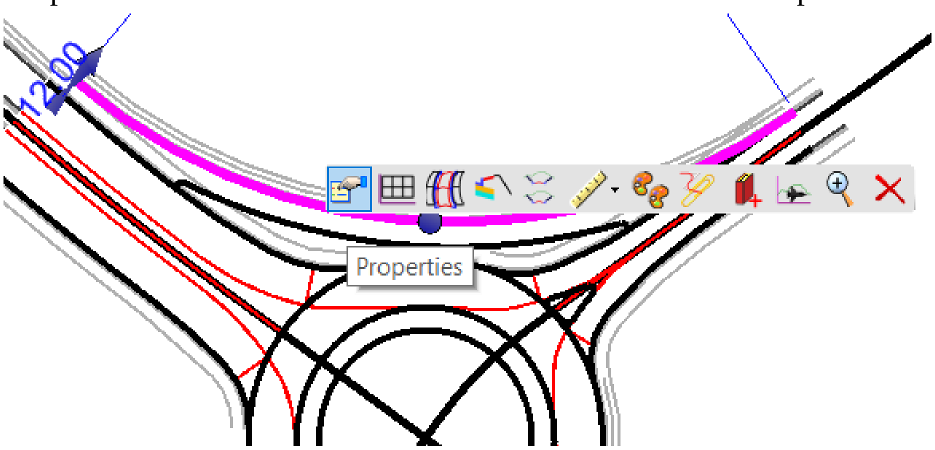
2. With the Bypass Lane Outside EoP still selected, round the Radius to the nearest 5' increment (approximately **365')**.



3. Make no changes in this exercise but select the Bypass Lane Inside EOP and notice the Nose Radius (3' initially) and Lane Width (15' initially) can be changed.



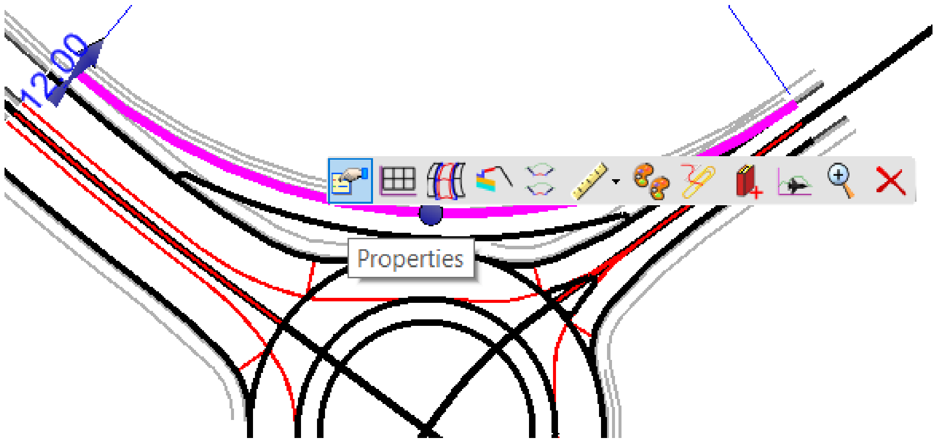
4. Selecting Properties of the Bypass Lane Outside EoP will allow you to change the simple curve to a 2-center or 3-center curve and/or also add tapers.



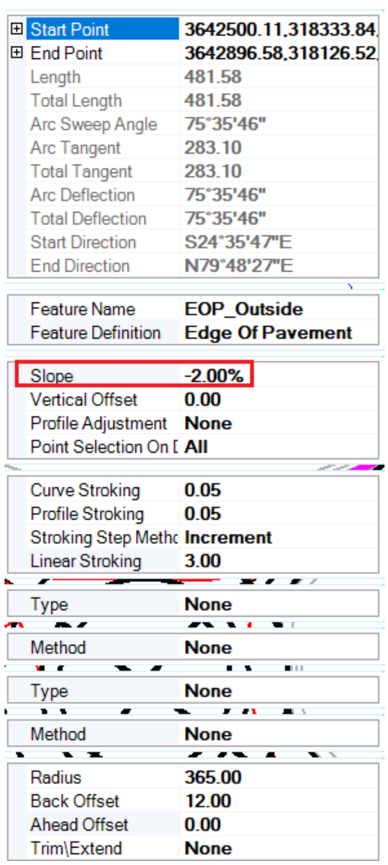
11.10.10.6 VERTICAL EDITS

The Bypass Lane Inside & Outside EOP's are initially profiled at -2% slope from the Approach/Roundabout EOP's. This value can be changed by selecting either one of these elements as shown below or by opening a profile view and re-profiling as needed.

1. Select the Bypass Lane Outside EOP and choose Properties from the context menu.



2. Make no changes but review the Slope Properties.



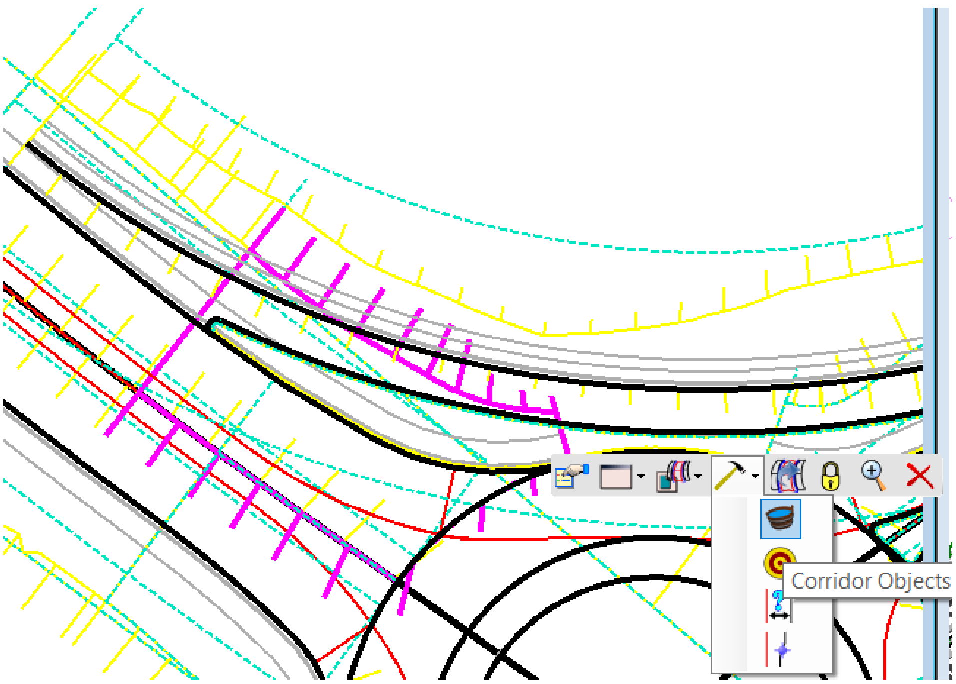
11.10.10.7 TEMPLATES

Templates are fairly straightforward and not documented here. The same CG-6 linear template is used on the outside as is used in the Approach cell and MC1 w/AGG linear template is placed twice in the island.

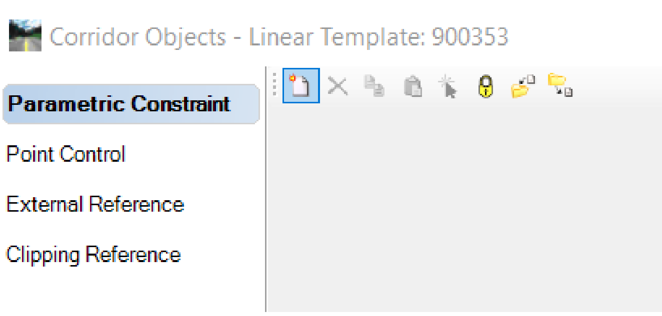
11.10.10.8 DISPLAY RULE/CLIP

The Bypass Lane cell does have a terrain named CLIP which can be used to clip adjoining corridors but we will use the INT_R template display rule to turn off the overlapping CG, SW, and end conditions.

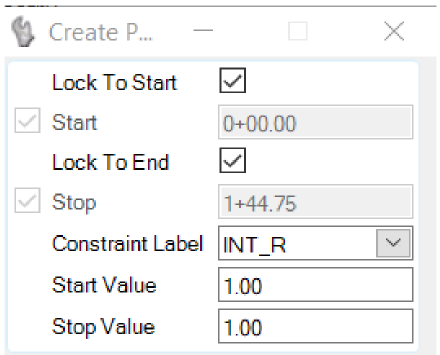
1. Turn ON Construction class elements as demonstrated several times in this manual.
2. Select the *ROUTE156 Approach Curve EOP Template* and choose **Corridor Objects** from the menu.



3. Choose the **Add New** tool under *Parametric Constraints.*

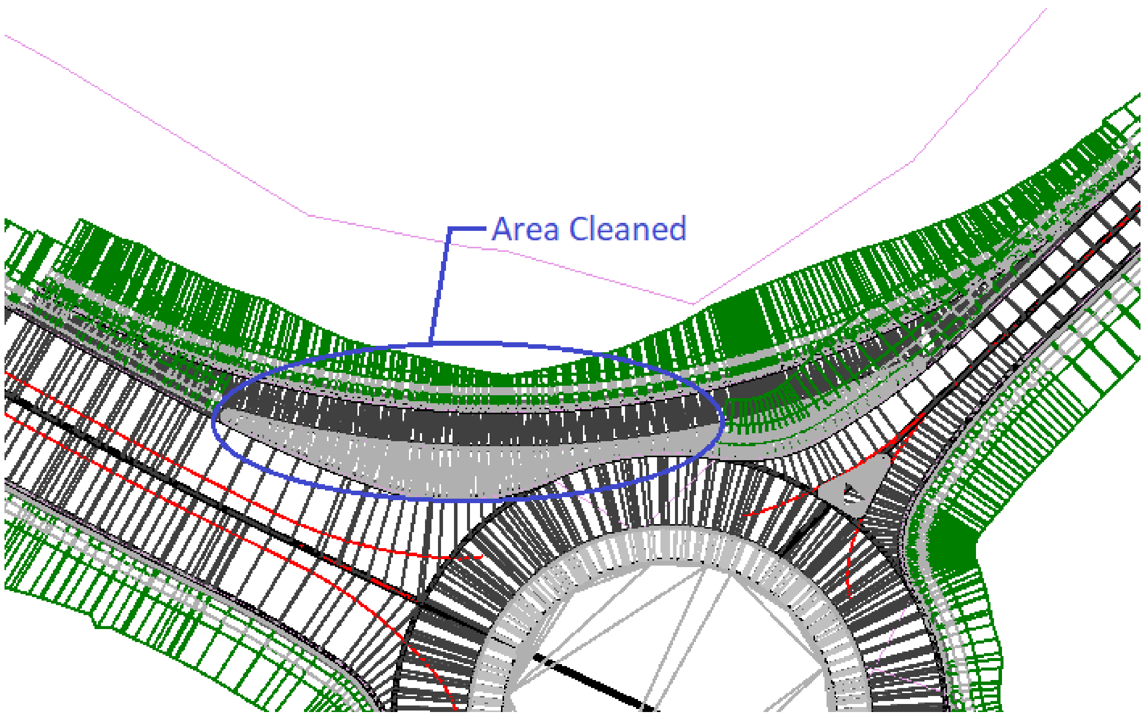


4. Set the dialog as shown below and data point to confirm the prompts and add the Parametric Constraint.

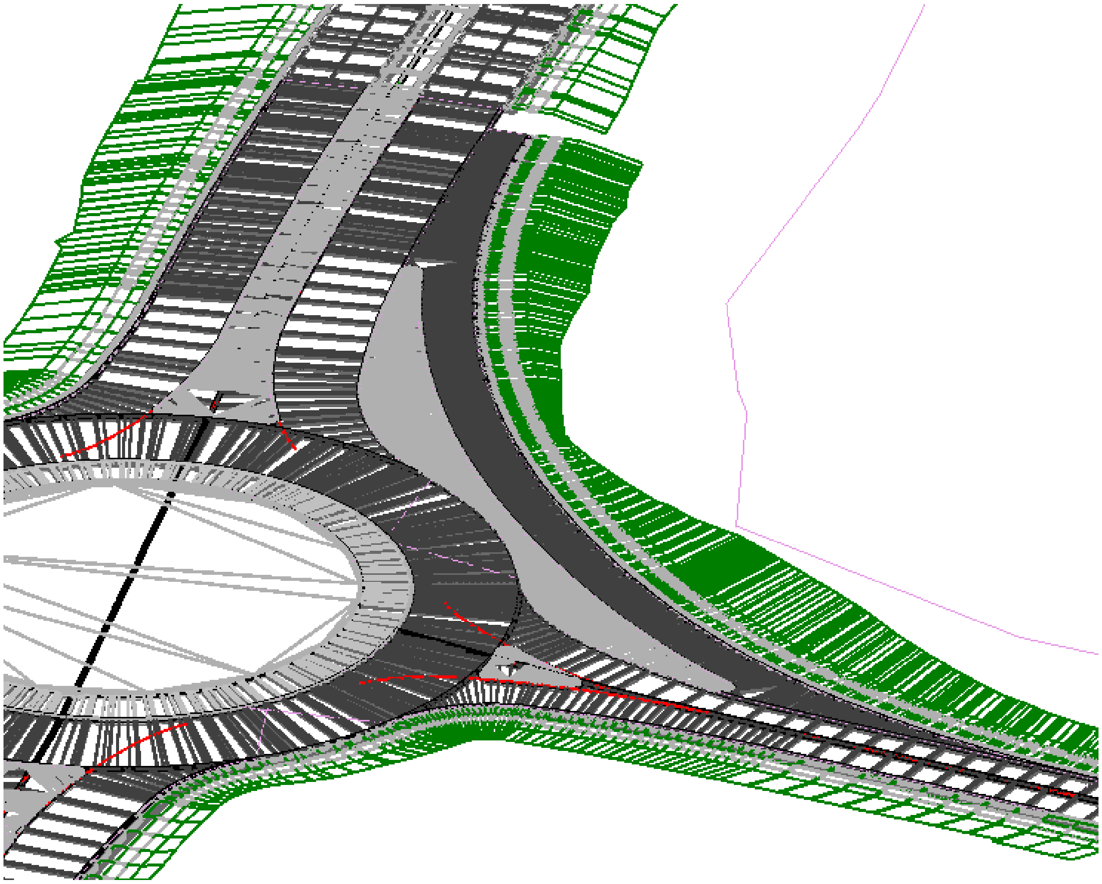


NOTE: Since we want to turn off everything outside the EOP for the entirety of the curve, it is also an option to edit the template and delete everything outside the EOP.

5. The area cleaned up by adding the Parametric Constraint is shown below.



6. Add the Parametric Constraint for the remaining linear templates within the limits of the Bypass Lane. The Bypass Lane should now appear as below.



NOTE: We could now add a Turn Lane Entry Civil Cell which is available in the T-Intersections.DGNLIB to the ROUTE156 leg to finish out this modeling.