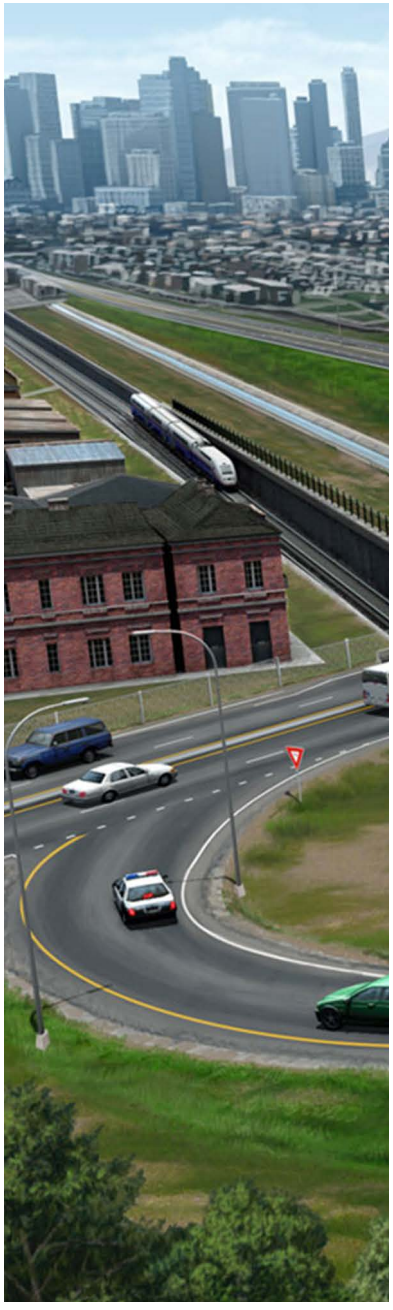


Roundabout Design - Horizontal Geometry

This course is for the **2024 Release 2** *version of:*

OpenRoads Designer

OpenRail Designer

About this Practice Workbook...

- This workbook is designed for use in Live instructor-led training and for OnDemand self study. OnDemand videos for this course are available on **learning.bentley.com.**
- This PDF file includes bookmarks providing an overview of the document. Click on a bookmark to quickly jump to any section in the file.
- Both Imperial and Metric files are included in the dataset. Throughout this practice workbook Imperial values are specified first and the metric values second with the metric values enclosed in square brackets.
  For example: **12.0'** *[3.4m]*.
- This course workbook uses the *Training and Examples* WorkSpace and the *Training-Imperial* or *Training-Metric* WorkSet delivered with the software.
- The terms "Left-click", "Click", "Select" and "Data" are used interchangeably to represent pressing the left mouse button. The terms "Right-click" and "Reset" are also used interchangeably to represent pressing the right mouse button. If your mouse buttons are assigned differently, such as for left-handed use, you will need to adjust accordingly.

Have a Question? Need Help?

If you have questions while taking this course, you can submit questions to the *Civil Design Forum* on Bentley Communities where peers and Bentley subject matter experts are available to help.

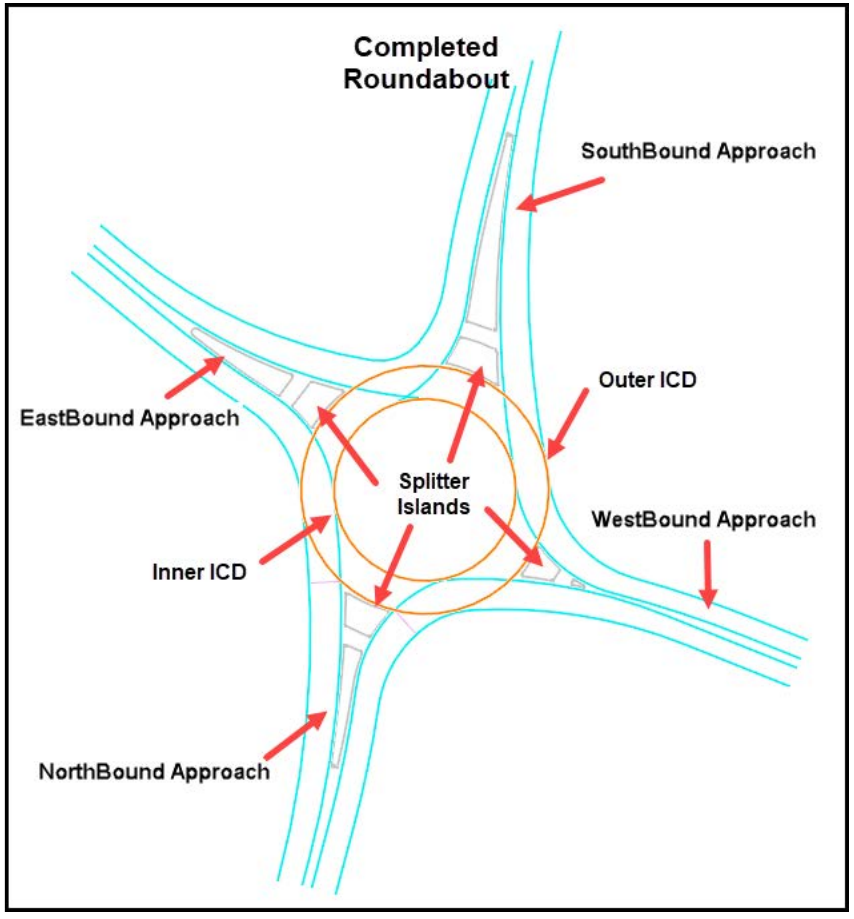
Bentley Institute

Edition: **02-02**

Course Level: **Advanced**

Course Overview

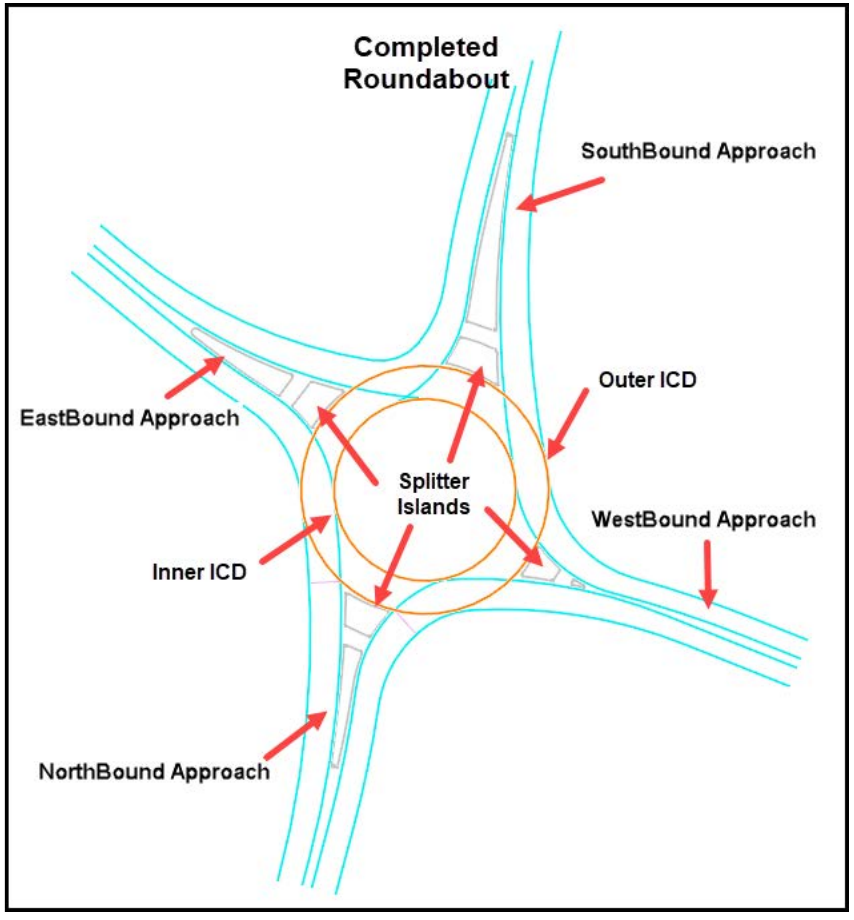
In this course you will learn how to create horizontal geometry for a 4-leg roundabout.



The Inner ICD is designed, in this case, as representing a Horizontal Alignment with a Feature Definition as *Geom_Baseline*. The Outer ICD is designed as an Edge of Pavement.

Roundabout Horizontal Geometry Workflow

1. Create roundabout proposed inner and outer inscribed circle diameter (ICD) features.
2. Create horizontal alignments for each approach leg.
3. Create geometry for splitter islands.



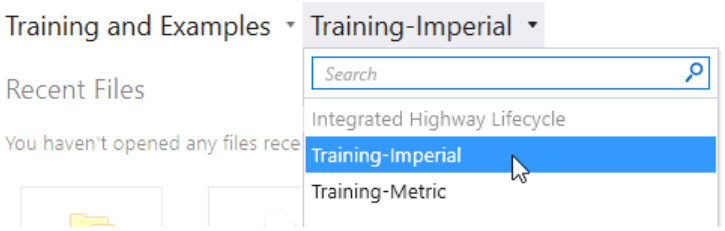
1. Start the software.
2. Set the WorkSpace and WorkSet.

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

   Typically, the WorkSpace contains organizational standards and the WorkSet contains project standards.

   a. Select **Training and Examples** from the *WorkSpace* drop-down menu.

   b. Select **Training-Imperial** from the *WorkSet* drop-down menu.



3. Open an existing file.

   a. Select **Browse**.

   b. Browse to *C:\Bentley Training\Roundabout Design - Horizontal Geometry* or other folder where you unzipped the dataset files.

   c. Select the file **RAB Geometry.dgn** *[Metric-RAB Geometry]* and click **Open**.

Exercise 1: Create Roundabout Circulatory Geometry

Description

In this exercise you will create the geometry for the inner and outer circulatory pavement edges, using the Arc Between Points Tool.

Skills Taught

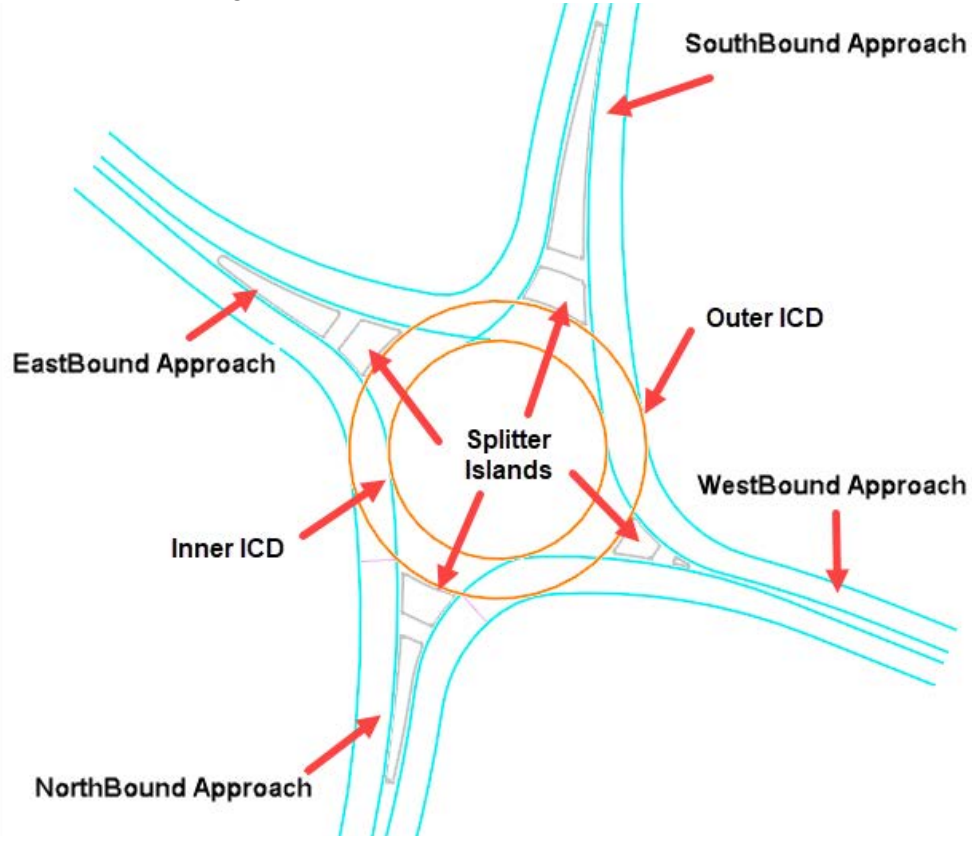
- Arc Between Points

Design Requirements for Inscribed Circle Diameter (ICD)

The inscribed circle diameter (ICD) is the overall outside diameter of a roundabout, which is the distance across the circle inscribed by the outer curb (or edge) of the circulatory roadway. The inscribed circle diameter is determined by a number of design objectives, including accommodation of the design vehicle and providing speed control.

The inscribed circle diameter (ICD) typically needs to be at least 105 feet. Smaller roundabouts can be used for some constrained urban intersections, where the design vehicle may be a bus or single-unit truck. For locations that must accommodate larger vehicles, a larger inscribed circle diameter will be required, typically in the range of 130 to 150 feet. In situations with more than four legs, larger inscribed circle diameters may be appropriate. Generally, the inscribed circle diameter of a multi-lane roundabout ranges from 150 to 250 feet.

The Inner and Outer ICD are shown in the image below.



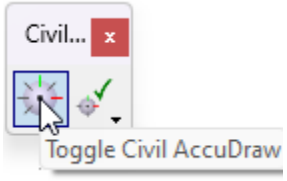
Note: The Roundabout Geometry and layout used in this workbook is specific to this course. Users should refer to the Country/Local standards when designing a Roundabout.

Create Inner and Outer ICD

In this section you will create the geometry for the inner and outer rotary pavement edges.

---

1. The first step is to create a line to be used as a control element for the Inner ICD.



   a. From the ribbon structure, Select, *Geometry* > *General Tools* > *Civil Toggles* > **Civil Accudraw**

   b. On the *Civil Accudraw toolbar*, Select > **Toggle Civil Accudraw**

   c. On the *Civil Accudraw toolbar*, Select > **XY**

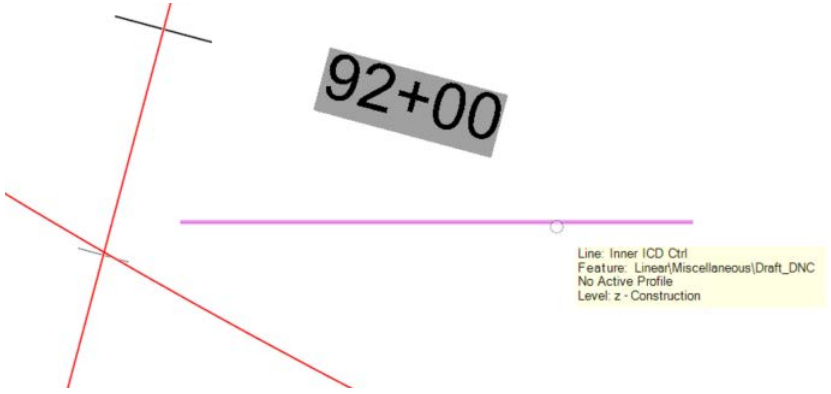
   d. Select *Geometry > Horizontal > Lines >* **Line Between Points**

   e. Set the Feature Definition and Name:

      - *Feature Definition:* **Draft_DNC**
      - *Name:* **Inner ICD Ctrl**

   f. Follow the Heads Up prompts:

      - *Enter Start Point:* Use Tab key to move input to *X value,* type > **2321750.000** *[707669.400]*
      - Use Tab key to move input to *Y value*, type > **762140.000** *[232300.272]*
      - **Data point** to accept *Start Point*
      - *Distance:* **55'** *[16.764m]*
      - *Direction:* **N90E**
      - **Data point** to accept *End Point*



   g. De-activate *Civil AccuDraw*

2. The second step is to create the Inner ICD rotary pavement edge. We will use an Arc to define the Inner ICD. It is a best practice to use an Arc to create the Inner ICD because that will allow more control over the start location and stationing.

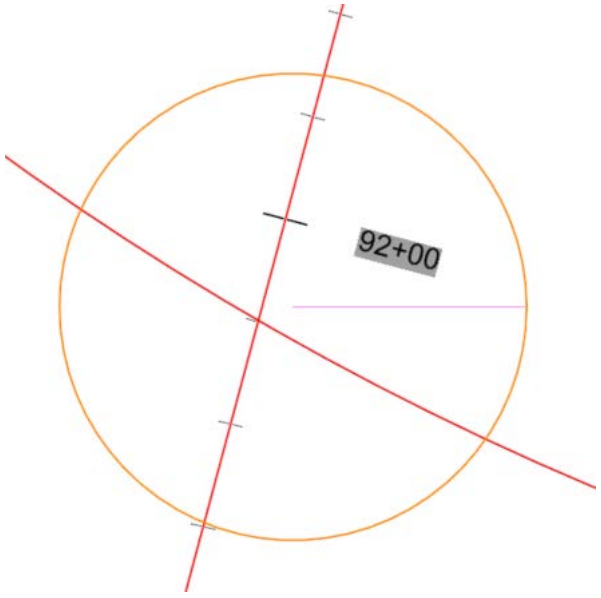
a. From the ribbon, Select, *Geometry* > *Horizontal* > *Arcs* > **Arc Between Points**

b. On the *Arc Between Points* dialog, set the input fields as follows:

- *Placement Method* > **Start\Radius**
- *Feature Definition* > **Geom_Baseline**
- *Name* > **Inner ICD**

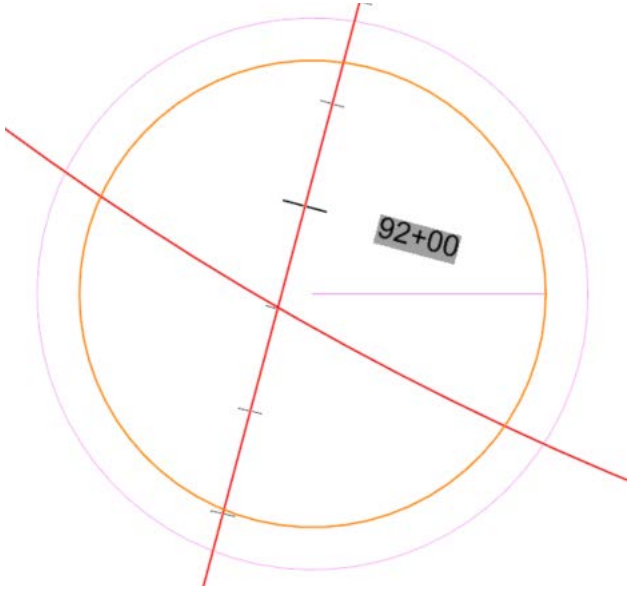
c. Follow the heads-up prompts:

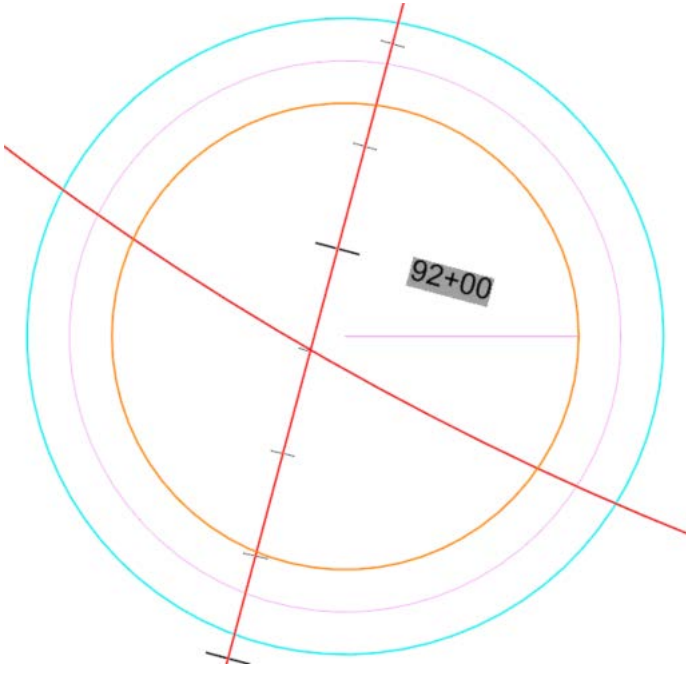
- **Data Point** to accept *Placement Method* > **Start\Radius**
- *Enter Arc Start Point* > Snap to the end point of the **Inner ICD Ctrl** element
- *Enter Center Point* > **Origin Point** snap to the start point of the **Inner ICD Ctrl** element
- *Enter Arc Length* > Moving in a counter clockwise direction, snap to the end point of the **Inner ICD Ctrl** element



Note: By defining the start and end point of the arc to the Inner ICD control element provides us an easy way to manipulate the Inner ICD start location. Simply adjust the start and end points of the control element to manipulate the Inner ICD.

3. Create offset geometry to be used later as elevation reference lines.
   a. Select *Geometry* > *Horizontal* > *Offsets and Tapers* > **Single Offset Entire Element**
   b. *Feature Definition:* **Draft_DNC**
   c. *Name:* **Z_RAB_ElevRef**
   d. *Locate Element <ALT> to Pick element in complex:* Select the **Inner ICD**
   e. *Offset:* **10'** *[3.038m]*
4. Next we are going to create the Outer ICD for the roundabout.
   a. Select *Geometry* > *Horizontal* > *Offsets and Tapers* > **Single Offset Entire Element**
   b. *Feature Definition:* **Road_EdgeOfPavement_Outside**
   c. *Name:* **Outer ICD**
   d. *Locate Element <ALT> to Pick element in complex:* Select the **Z_Rab_ElevRef**
   e. *Offset:* **10'** *[3.048m]*





Exercise 2: Create Northbound Approach Entry and Exit Geometry

Description

In this exercise you will create the Geometry for the northbound approach entry and exit geometry using the horizontal geometry tools.

Skills Taught

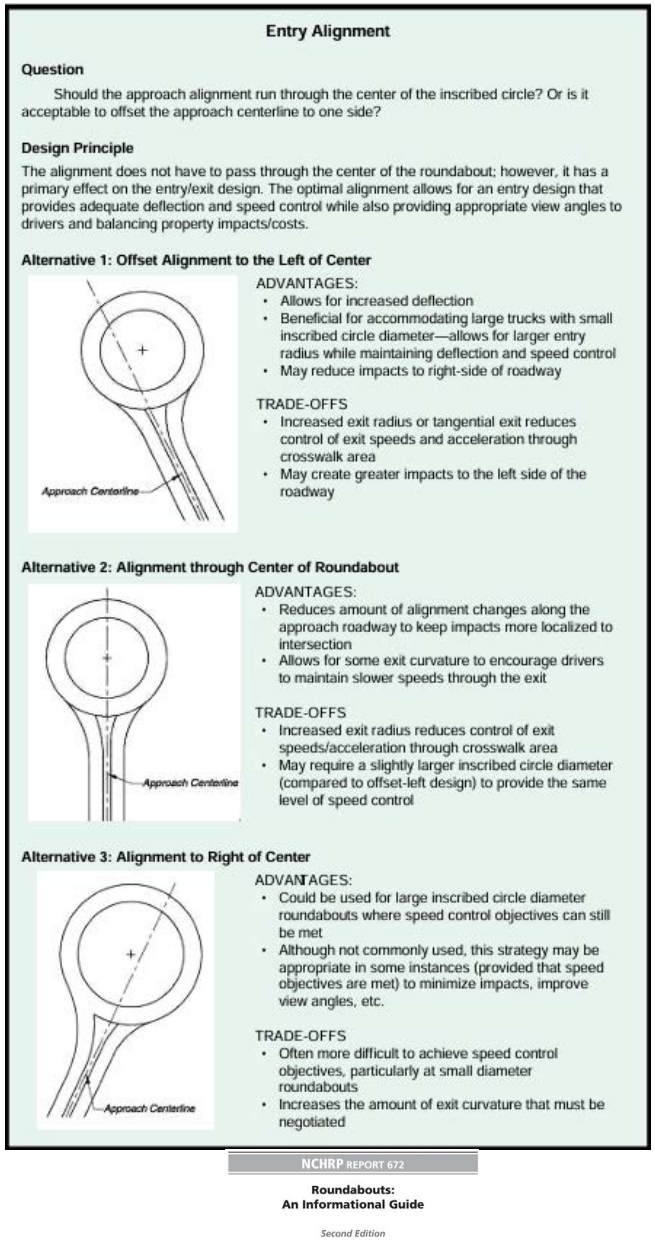
- Create Offset Features
- Arc From Element
- Line between Points
- Arc between Elements
- Complex Geometry

Design Requirements for Entry and Exits

The alignment of the approach legs plays an important role in the design of a roundabout. The alignment affects the amount of deflection that is achieved and the visibility angles to adjacent legs. The optimal alignment is generally governed by the size and position of the roundabout relative to its approaches.

A common starting point in design is to center the roundabout so that the centerline of each leg passes through the center of the inscribed circle. This location typically allows the geometry of a single-lane roundabout to be adequately designed such that vehicles will maintain slow speeds through both the entries and the exits. The radial alignment also makes the central island more conspicuous to approaching drivers and minimizes roadway modification required upstream of the intersection.

Another frequently acceptable alternative is to offset the centerline of the approach to the left (i.e. the centerline passes to the left of the roundabout's center point). This alignment will typically increase the deflection achieved at the entry to improve speed control. However, there is a trade off of a larger radius (or tangential) exit that may provide less speed control for the downstream pedestrian crossing. Especially in urban environments, it is important to have drivers maintain sufficiently low vehicular speeds at the pedestrian crossing to reduce the risk for pedestrians.



Create the Northbound Entry Approach to the Roundabout

In this section you will create the geometry for the entry lane for the northbound approach. First, we are going to create the geometry for the inner approach lanes and then we will offset from them for the outer pavement edges.

---

1. The first step is to create the offset geometry from the incoming centerline. The approach geometry should start at about 175' from the ICD.

   a. Select, *Geometry* > *Horizontal* > *Offsets and Tapers* > **Single Offset Partial**

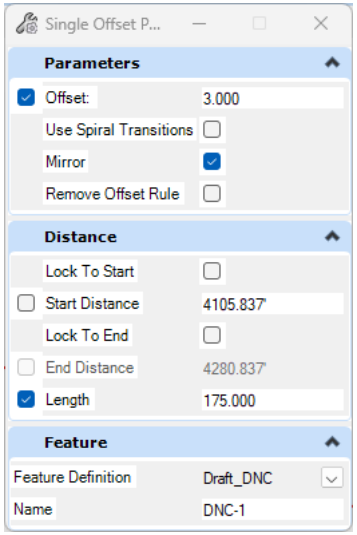
   b. on the *Single Offset Partial* dialog set the following:

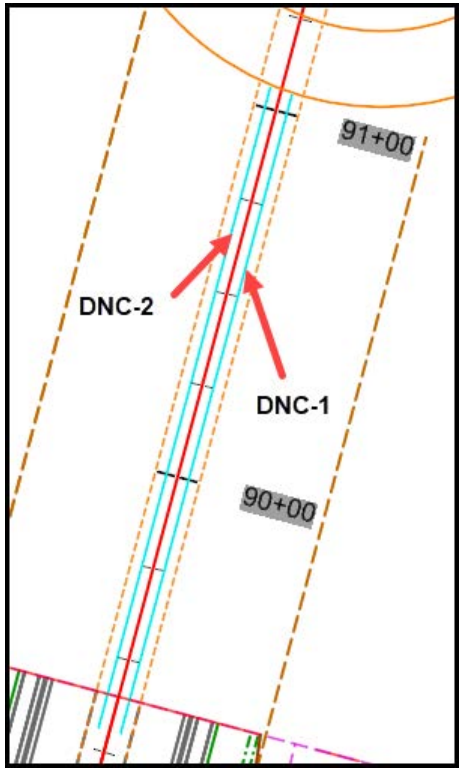
   - *Offset* > **3.000'** *[0.9144m]*
   - *Mirror* > **Yes**
   - *Length* > **175.000'** *[53.34m]*
   - *Feature Definition* > *Linear* > *Miscellaneous* > **Draft_DNC**
   - *Name* > **DNC-1**

   c. Follow the heads-up prompts:

   - *Locate Element* > Select > **LondonRD Centerline**
   - Select *right arrow key*, Select *Start* > (Using Intersect Snap) *Select Intersection of Outer ICD* and *Complex Element LondonRd*

   - Move cursor down towards road corridor and accept length > **175'** *[53.34m]*
   - *Mirror* > **Yes** (This will create **DNC-2**)
   - **<Esc>** to exit command





2. Place an Arc from the Inner ICD to the left offset feature.

   a. Select, *Geometry* > *Horizontal* > *Arcs* > *Arc Between Elements* > **Simple Arc**

   b. *Feature Definition* > **Road_EdgeofPavement_Inside**

   c. *Name* > **ND-1**

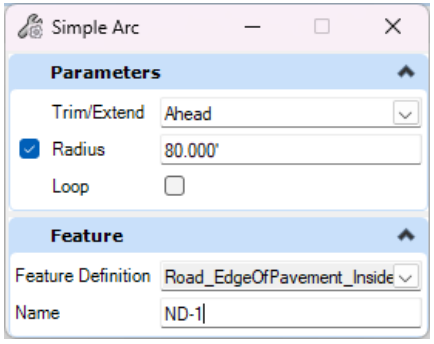
   d. *Radius* > **80.000'** *[24.384m]*

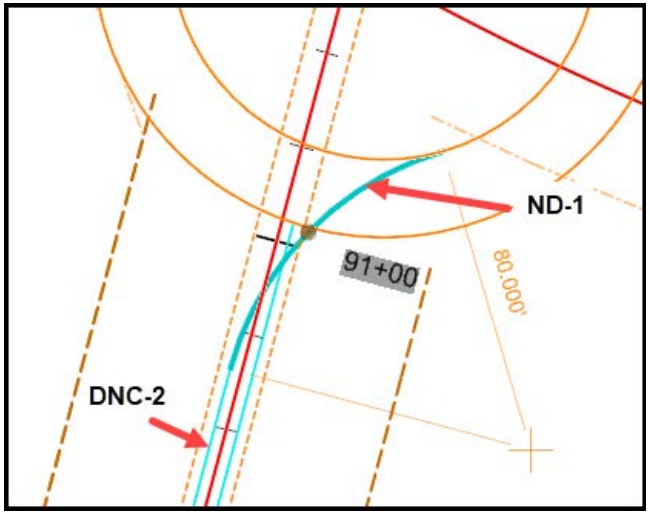
   e. *Locate First Element* > **Inner ICD** (Roundabout)

   f. *Locate Second Element* > **Left Offset** feature **DNC-2**

   g. Select *Construct Sector* > **Data Point** inside elements

   h. *Trim/Extend* > **Ahead**





3. Place an Arc connecting the linear feature and the arc to the Inner ICD

a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**

b. *Feature Definition* > **Road_EdgeofPavement_Inside**

c. *Name* > **ND-2**

d. *Radius* > **660.000'** *[201.168m]*

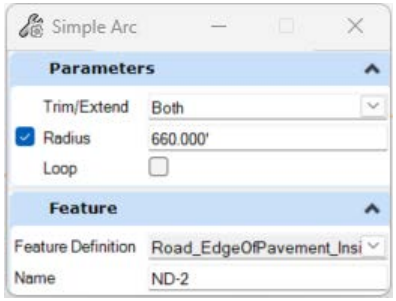
e. *Locate First Element* > *Select Line* > **DNC-1**

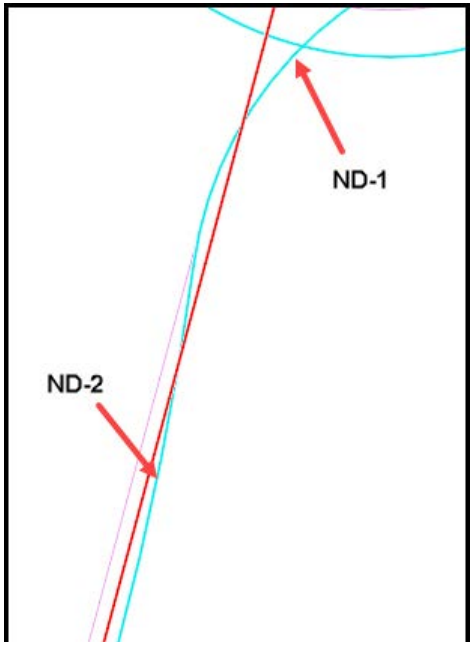
f. *Locate Second Element* > *Select Arc* > **ND-1**

g. The curve is **Left Hand**

h. *Trim/Extend* > **Both**

i. **<Esc>** to exit command





4. Create the **NB Entry EOP-1** alignment from the 3 elements

a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**

b. *Set Method* > **Automatic**

c. *Maximum Gap* > **0.033'** *[0.01m]*

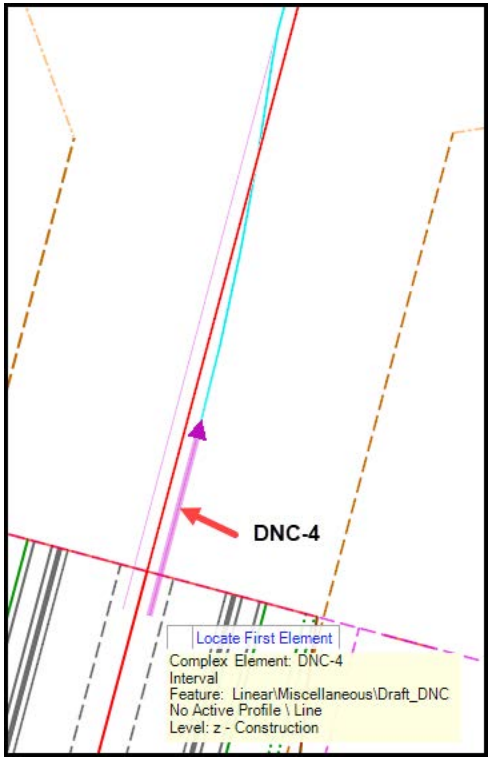
d. *Feature Definition* > **Road_EdgeofPavement_Inside**

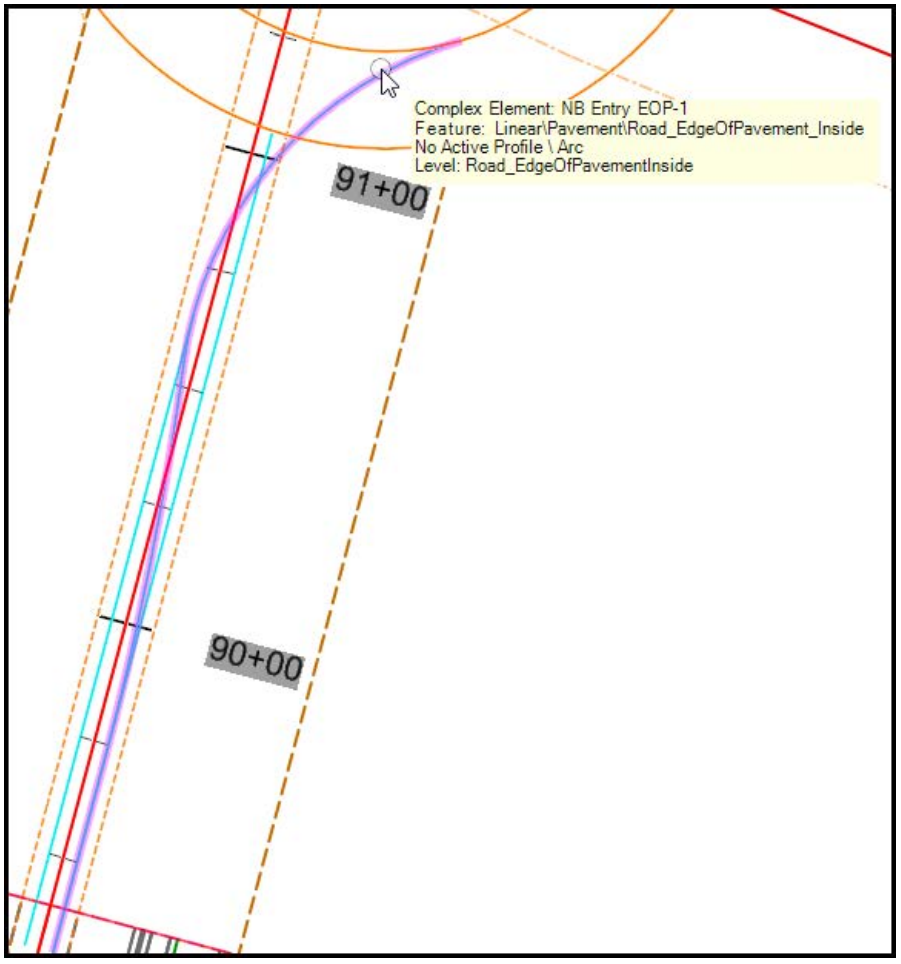
e. *Name* > **NB Entry EOP-1**

f. *Locate First Element* > *Select* > **DNC-4**

g. **Data Point** to *Accept Complex chain*

h. **<Esc>** to exit command





Create the Offset Geometry for the Outer Entry Edge of Pavement

Typical entry widths for single-lane roundabout entrances range from 14 to 18 feet. These entries are often flared from upstream approach widths. However, values higher or lower than this range may be appropriate for speed requirements. A 15-foot entry width is a common starting value for a single-lane roundabout. Care should be taken with entry widths greater than 18 feet or for those that exceed the width of the circulatory roadway, as drivers may mistakenly interpret the wide entry to be two lanes when there is only one receiving circulatory lane.

1. Create the outside entry edge of pavement using Single offset Partial, Simple Arc and Complex Geometry

   a. Select *Offsets and Tapers* > **Single Offset Entire Element**

   b. On the dialog box, Select, *Offset* > **15.000’** *[4.572m]*

   c. *Feature Definition* > **Road_EdgeofPavement_Outside**

   d. *Name* > **ND-4**

   Follow the heads-up prompts

   a. *Locate Element* > **NB Entry EOP-1**

   b. *Mirror* > **No**

   c. *Start Distance:* Press <ALT> to lock to the start.

   d. *End Distance:* Press <ALT> to lock to the end.

   e. **<Esc>** to exit command

2. Create Arc from Outer ICD to ND-8

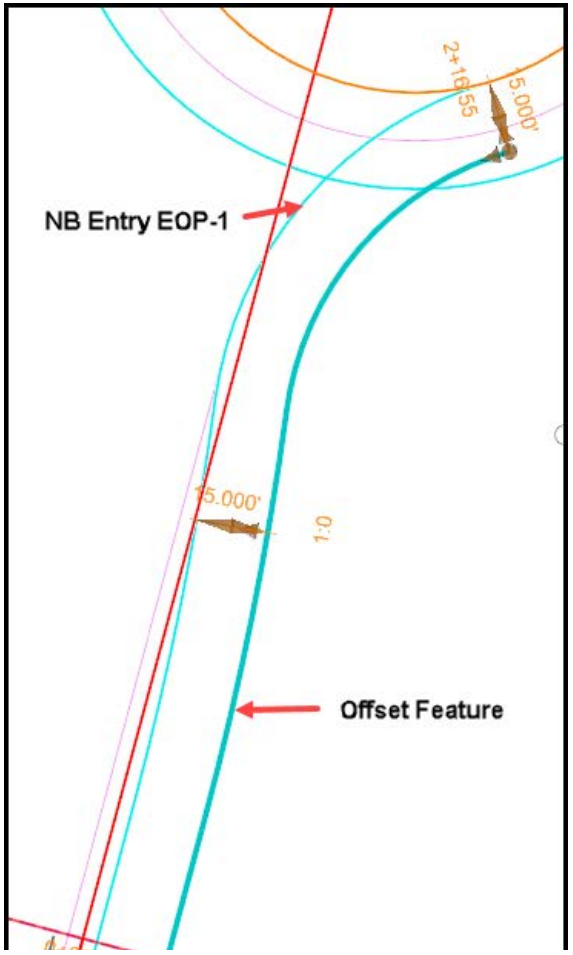
   a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**

   b. *Feature Definition* > **Road_EdgeofPavement_Outside**

   c. *Name* > **ND-5**

   d. *Radius* > **72.500’** *[22.098m]*

   e. *Locate First Element* > **ND-4**



f. *Locate Second Element* > **Outer ICD**

g. *Trim/Extend* > **Back**

3. Create the NB Entry EOP-2 alignment

a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**

b. *Set Method* > **Automatic**

c. *Maximum Gap* > **0.033'** *[0.01m]*

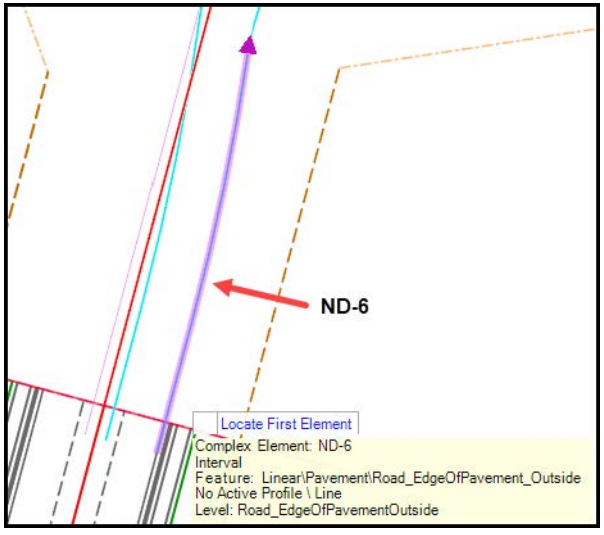
d. *Feature Definition* > **Road_EdgeofPavement_Outside**

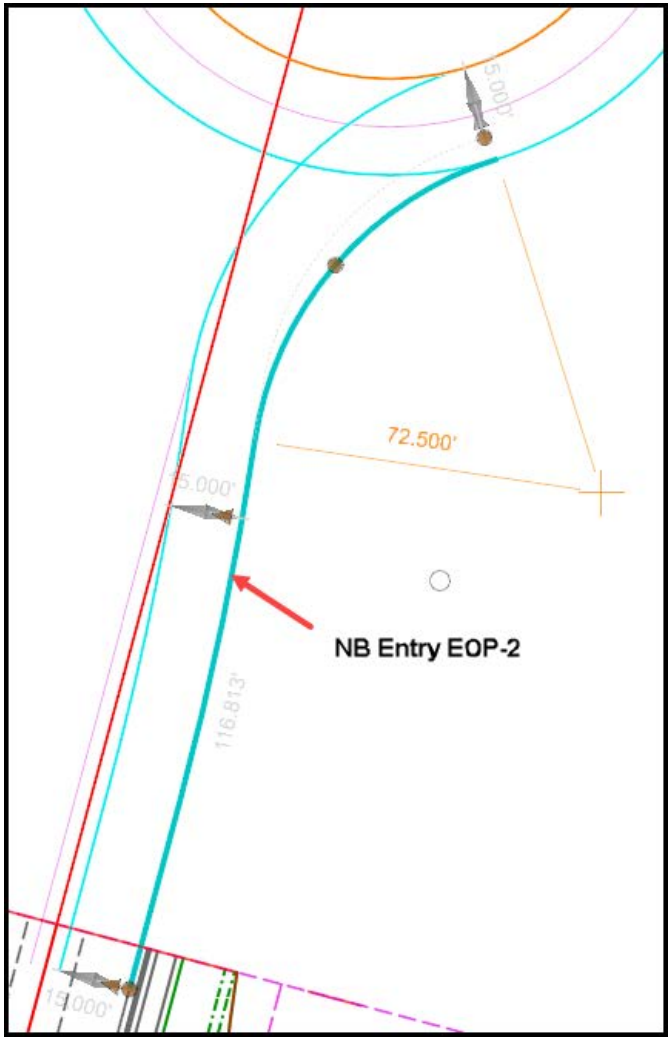
e. *Name* > **NB Entry EOP-2**

f. *Locate First Element* > *Select* > **ND-6**

g. **Data Point** to *Accept Complex chain*

h. **<Esc>** to exit command



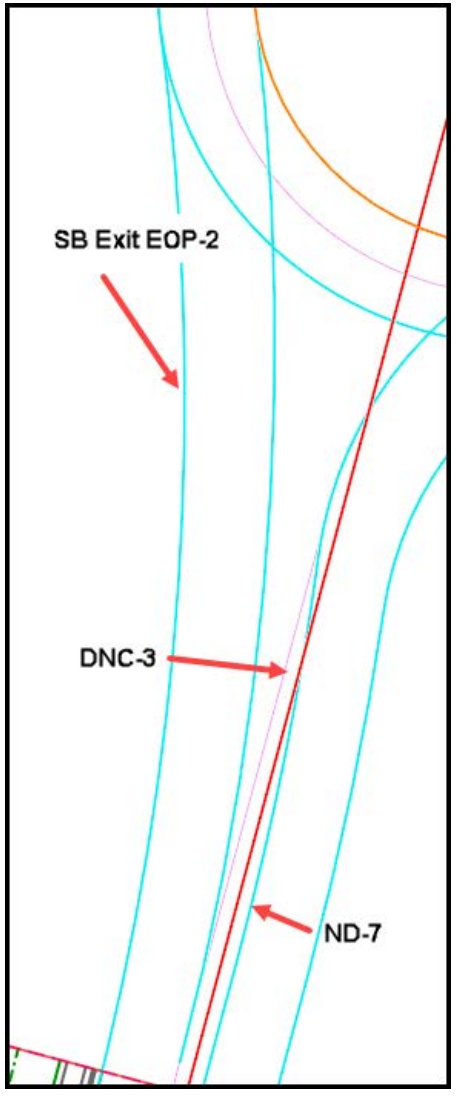


Create the Northbound Exit to the Roundabout

In this section you will create the geometry for the exit lane for the northbound approach. First, we are going to create the geometry for the outer pavement edge exit lane and then we will create the inner pavement edge.

1. Create inner pavement edge arc ND-7
   a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**
   b. *Feature Definition* > **Road_EdgeofPavement_Inside**
   c. *Name* > **ND-7**
   d. *Radius* > **580.000'** *[176.784m]*
   e. *Locate First Element* > **Inner ICD**
   f. *Locate Second Element* > *Offset Element* **DNC-3**
   g. *Trim/Extend* > **Ahead**
   h. **<Esc>** to exit command

2. Create outer edge of pavement SB Exit EOP-2
   a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**
   b. *Feature Definition* > **Road_EdgeofPavement_Outside**
   c. *Name* > **SB Exit EOP-2**
   d. *Radius* > **580.000'** *[176.784m]*
   e. *Locate First Element* > **Outer ICD**
   f. *Locate Second Element* > Select the London Rd **EOL_L** template geometry (left edge of pavement from the corridor)
   g. *Trim/Extend* > **Ahead**
   h. **<Esc>** to exit command



3. Create the SB Exit EOP-1 alignment from the 2 elements (ND-7 and DNC-5)

a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**

b. *Set Method* > **Automatic**

c. *Maximum Gap* > **0.033'** *[0.01m]*

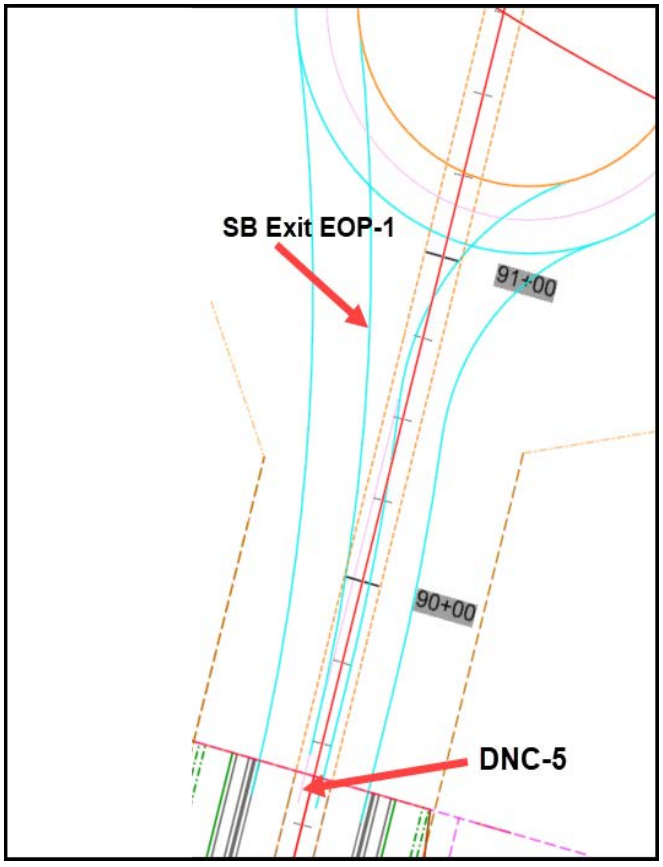
d. *Feature Definition* > **Road_EdgeofPavement_Inside**

e. *Name* > **SB Exit EOP-1**

f. *Locate First Element* > Select **DNC-5**

g. **Data Point** to *Accept Complex chain*

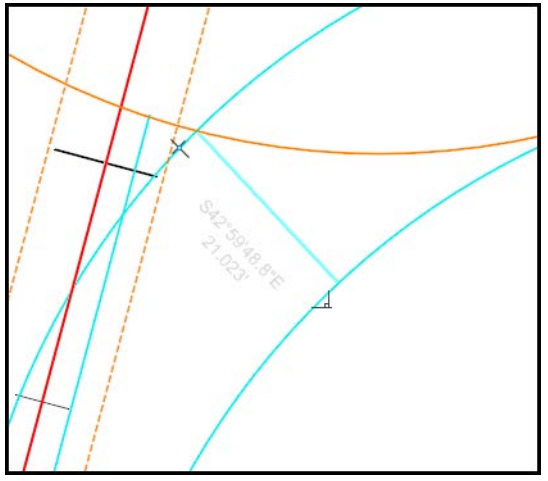
h. **<Esc>** to exit command



Now we are going to create a feature across each of the entry and exit widths where they intersect with the ICD. This is not a design requirement but having these features will tell us what the design widths are. You may wish to adjust these based on your design criteria.

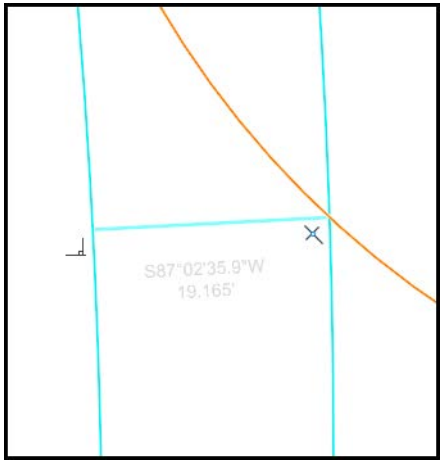
4. Place a Line across the Entry width

   a. Select, *Geometry* > *Horizontal* > *Line* > **Line Between Points**
   b. *Feature Definition* > *Linear* > *Miscellaneous* > **Draft_DNC**
   c. *Name* > **DNC-6**
   d. Set *Intersect snap* on the snap toolbar
   e. *Enter Start Point* > Snap to the intersection of **Outer ICD** and **NB Entry EOP-1**
   f. Set *Perpendicular snap* on the snap toolbar
   g. *Enter End Point* > Snap to the perpendicular on the **NB Entry EOP-2** feature
   h. **<Esc>** to exit command



5. Place a Line across the Exit width

   a. Select, *Geometry* > *Horizontal* > *Line* > **Line Between Points**
   b. *Feature Definition* > *Linear* > *Miscellaneous* > **Draft_DNC**
   c. *Name* > **DNC-7**
   d. Set *Intersect snap* on the snap toolbar
   e. *Enter Start Point* > Snap to the intersection of **ICD** and **SB Exit EOP-1**
   f. Set *Perpendicular snap* on the snap toolbar
   g. *Enter End Point* > Snap to the perpendicular on the **SB Exit EOP-2** feature
   h. **<Esc>** to exit command



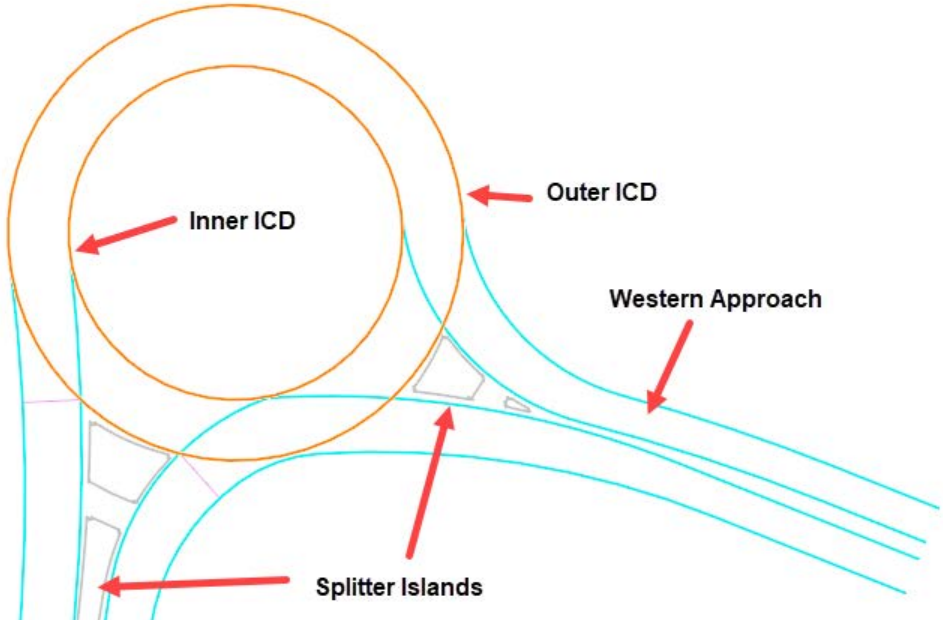
Exercise 3: Create Westbound Approach Entry and Exit Geometry

Description

In this exercise you will create the geometry for the westbound approach entry and exit geometry using the horizontal geometry tools.

Skills Taught

- Create Offset Features
- Arc From Element
- Line between Points
- Arc between Elements
- Complex Geometry



Create the Westbound Entry Approach to the Roundabout

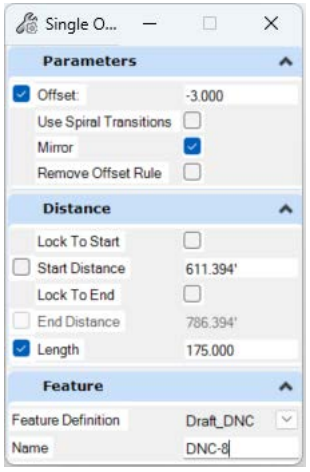
In this section, you will create the geometry for the entry lane for the westbound approach. First, we are going to create the geometry for the inner approach lanes and then we will offset from them for the outer pavement edges.

1. The first step is to create the offset geometry from the incoming centerline. The approach geometry should start at about 175’ from the ICD.

   a. Select *Geometry* > *Horizontal* > *Offsets and Tapers* > **Single Offset Partial**

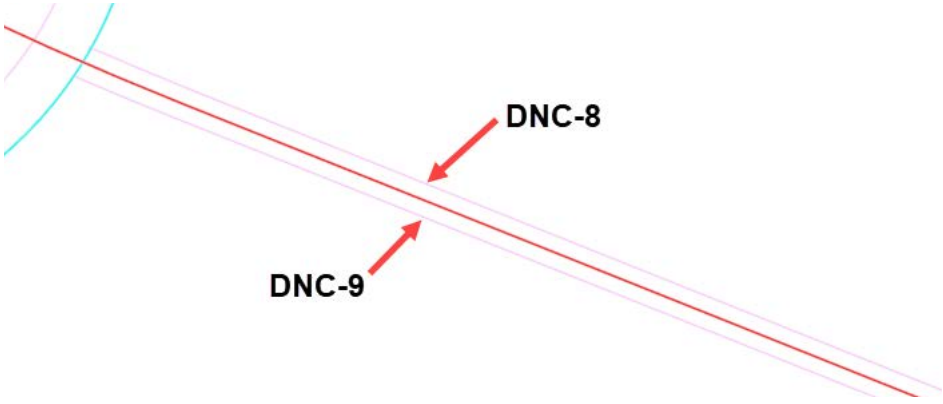
   b. On the *Single Offset Partial* dialog set the following:

   - *Offset* > **-3.000’** *[0.9144m]*
   - *Mirror* > **Yes**
   - *Length* > **175.000’** *[53.34m]*
   - *Feature Definition* > **Draft_DNC**
   - *Name* > **DNC-8**



   c. Follow the heads-up prompts:

   - *Locate Element* > Select > **NewRD Centerline**
   - *Start Parameters* > Using **Intersect Snap** select the intersection of the Outer ICD and the NewRD centerline.
   - Data point through the remaining prompts to complete.
   - **<Esc>** to exit command



2. Place an Arc from the Inner Island to the left offset feature

a. Select, *Geometry* > *Horizontal* > *Arcs* > *Arc Between Elements* > **Simple Arc**

b. *Feature Definition* > **Road_EdgeofPavement_Inside**

c. *Name* > **WD-1**

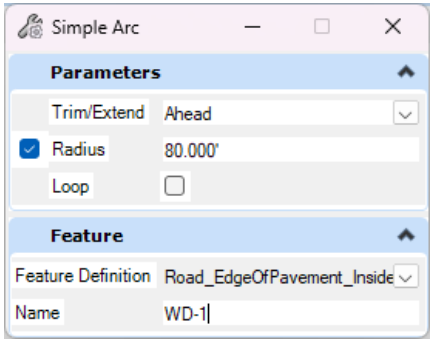
d. *Radius* > **80.000'** *[24.384m]*

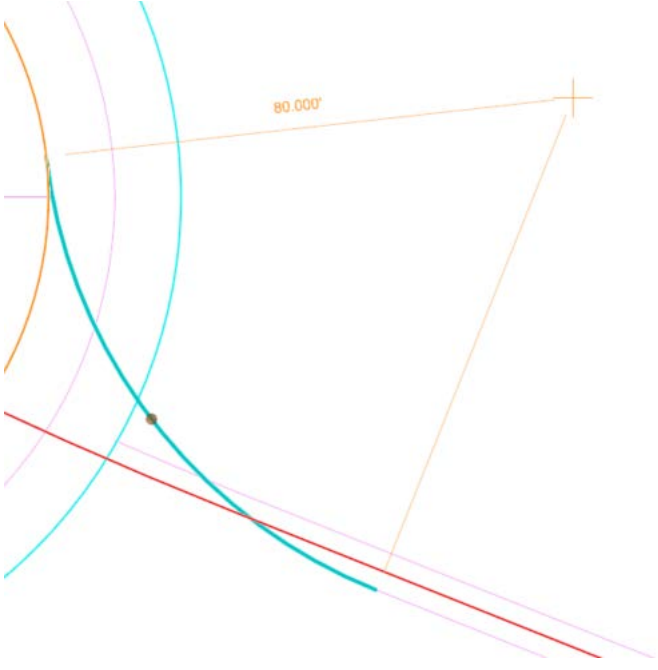
e. *Locate First Element* > **Inner ICD** (Roundabout)

f. *Locate Second Element* > **Left Offset** feature **DNC-9**

g. Select *Construct Sector* > **Data Point** inside elements

h. *Trim/Extend* > **Ahead**





3. Place an Arc connecting the linear feature DNC-8 and the arc WD-1 from the Inner ICD

a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**

b. *Feature Definition* > **Road_EdgeofPavement_Inside**

c. *Name* > **WD-2**

d. *Radius* > **660.000'** *[201.168m]*

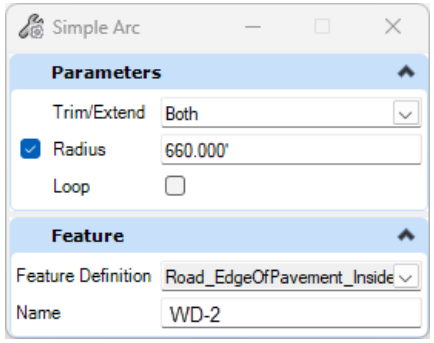
e. *Locate First Element* > *Select Line* > **DNC-8**

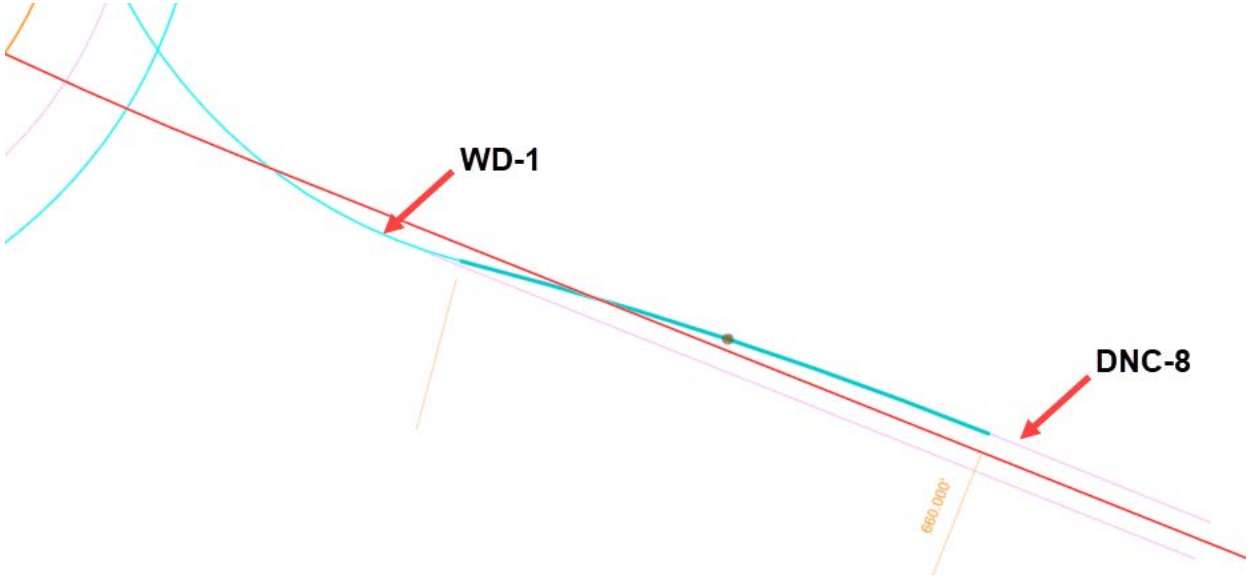
f. *Locate Second Element* > *Select Arc* > **WD-1**

g. The curve is **Left Hand**, so move your cursor to the south to define the direction.

h. *Trim/Extend* > **Both**

i. **<Esc>** to exit command





4. Create WB Entry EOP-1 alignment from the previous 3 elements

a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**

b. *Set Method* > **Automatic**

c. *Maximum Gap* > **0.033'** *[0.01m]*

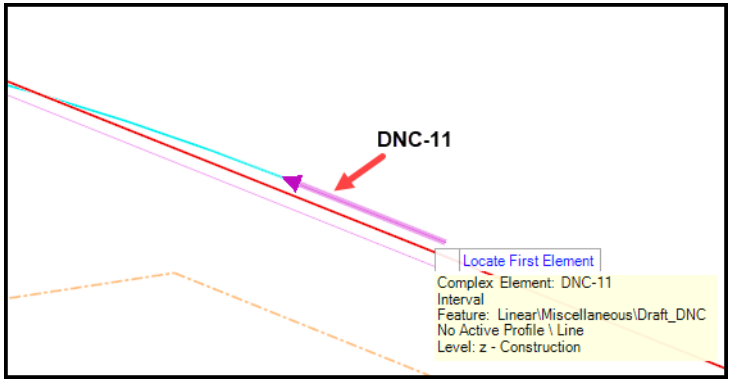
d. *Feature Definition* > **Road_EdgeofPavement_Inside**

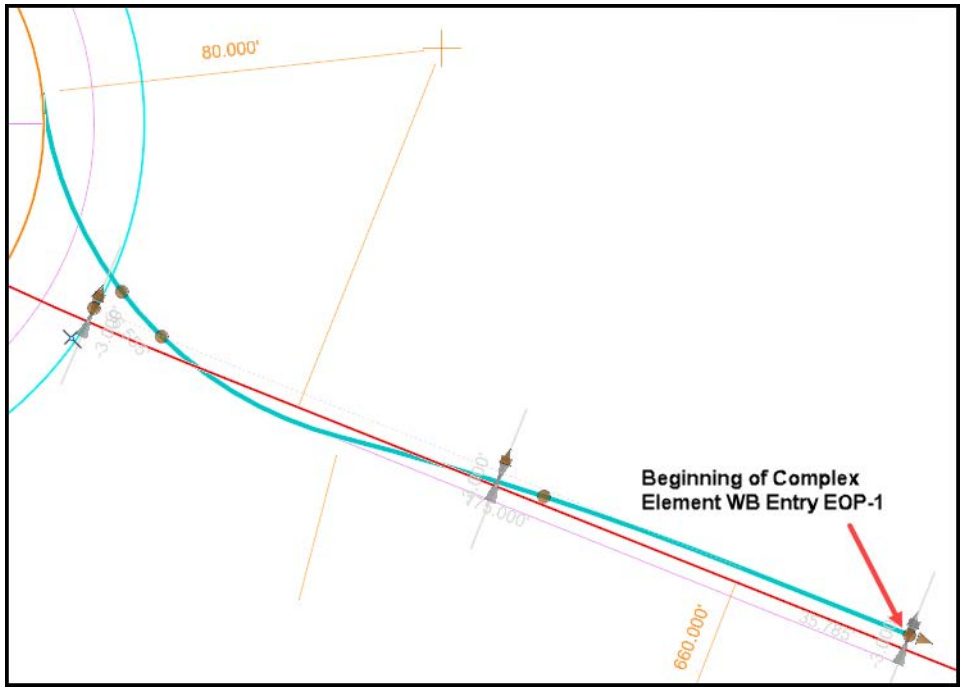
e. *Name* > **WB Entry EOP-1**

f. *Locate First Element* > Select the beginning of **DNC-11**

g. **Data Point** to *Accept Complex chain*

h. **<Esc>** to exit command



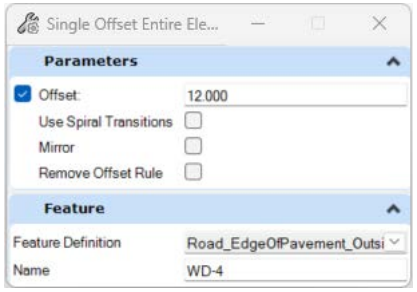


Create the Offset Geometry for the Outer Entry Edge of Pavement

1. Create the outside entry edge of pavement using Single offset Partial, Simple Arc and Complex Geometry

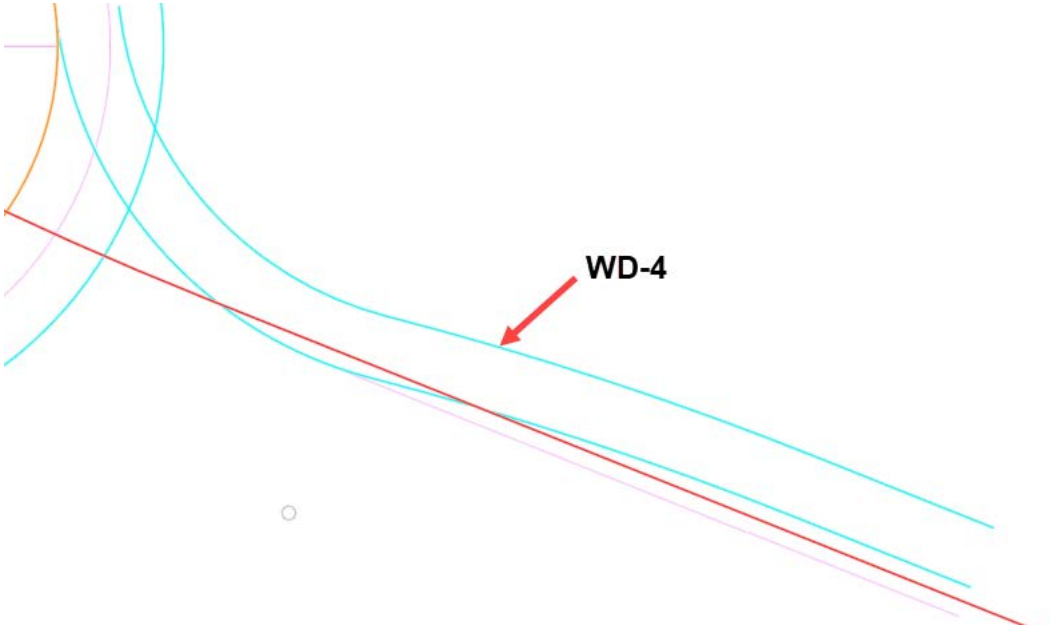
   a. Select *Offsets and Tapers* > **Single Offset Entire Element**

      - On the dialog box, Select, *Offset* > **12.000'** *[3.6576m]*
      - *Feature Definition* > **Road_EdgeofPavement_Outside**
      - *Name* > **WD-4**



   b. Follow the heads-up prompts:

      - *Locate Element* > **WB Entry EOP-1**
      - *Mirror* > **No**
      - **<Esc>** to exit command



2. Create Arc from ICD to WB Entry

a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**

b. *Feature Definition* > **Road_EdgeofPavement_Outside**

c. *Name* > **WD-5**

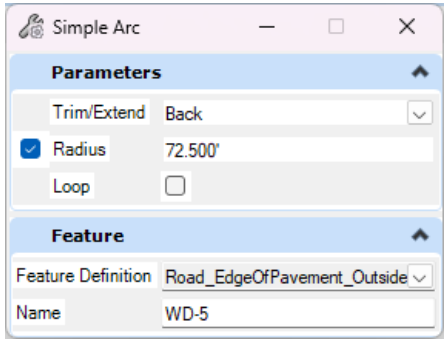
d. *Radius* > **72.500**' *[22.098m]*

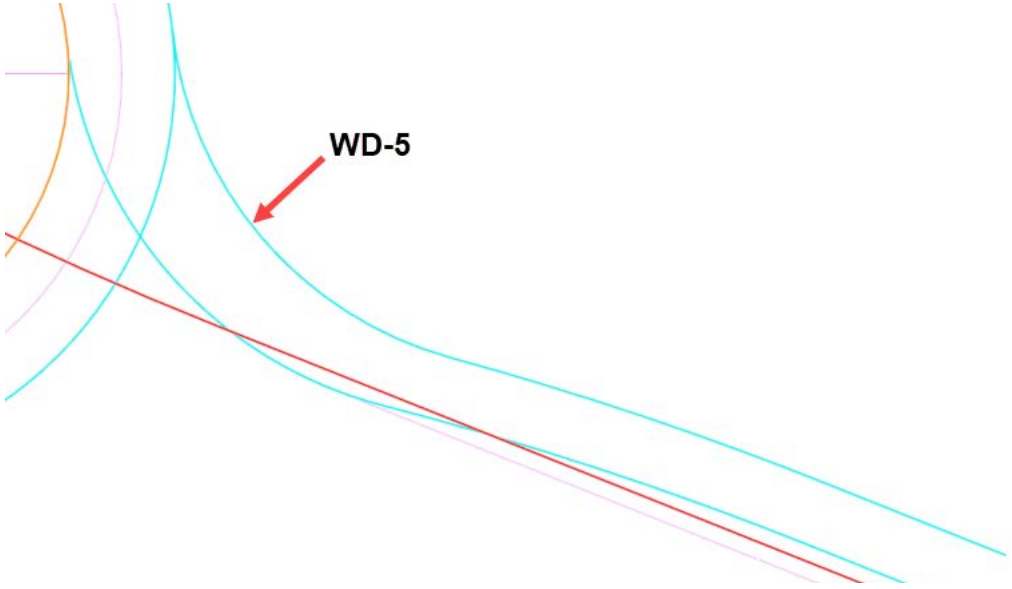
e. *Locate First Element* > **WD-4**

f. *Locate Second Element* > **Outer ICD**

g. *Trim/Extend* > **Back**

h. **<Esc>** to exit command





3. Create the WB Entry EOP-2 alignment

   a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**

   b. *Set Method* > **Automatic**

   c. *Maximum Gap* > **0.033'** *[0.01m]*

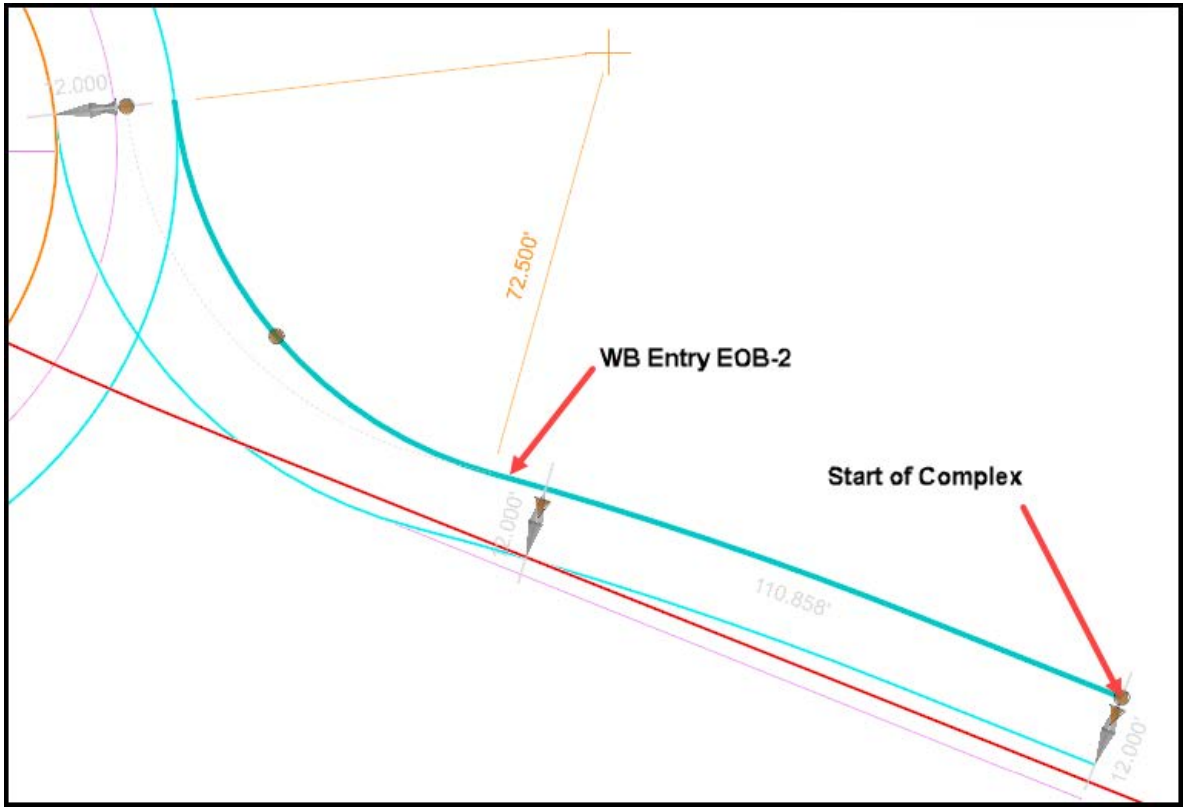
   d. *Feature Definition* > **Road_EdgeofPavement_Outside**

   e. *Name* > **WB Entry EOP-2**

   f. *Locate First Element* > Select **WD-6**

   g. **Data Point** to *Accept Complex chain*

   h. **<Esc>** to exit command



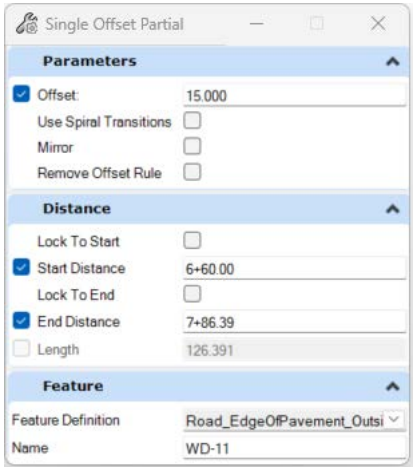
Create the Westbound Exit to the Roundabout

In this section you will create the Geometry for the exit lane for the westbound approach. First we are going to create the geometry for the outer carriage way edge exit lane and then we will create the inner carriageway edge.

Create the outside entry edge of pavement using Single Offset Partial, Simple Arc and Complex Geometry.

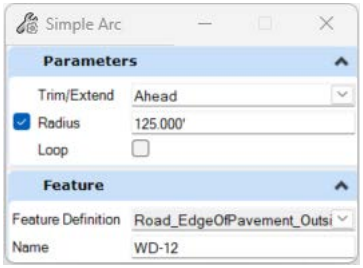
---

1. Create the outside edge of pavement offset element.
   a. Select *Offsets and Tapers* > **Single Offset Partial**
   b. On the dialog box, Select, *Offset* > **15.000'** *[4.572m]*
      - *Feature Definition* > **Road_EdgeofPavement_Outside**
      - *Name* > **WD-11**
   c. On the Heads Up prompts:
      - *Locate Element* > **NewRd Centerline**
      - *Start Station* > **6+60.00'** *[201.168m]*
      - *End Station* > **7+86.39'** *[239.692m]*
      - *Mirror* > **No**
   d. **<Esc>** to exit command



2. Create Arc from Outer ICD to WD-11 (offset feature created above)

a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**



b. *Feature Definition* > **Road_EdgeofPavement_Outside**

c. *Name* > **WD-8**

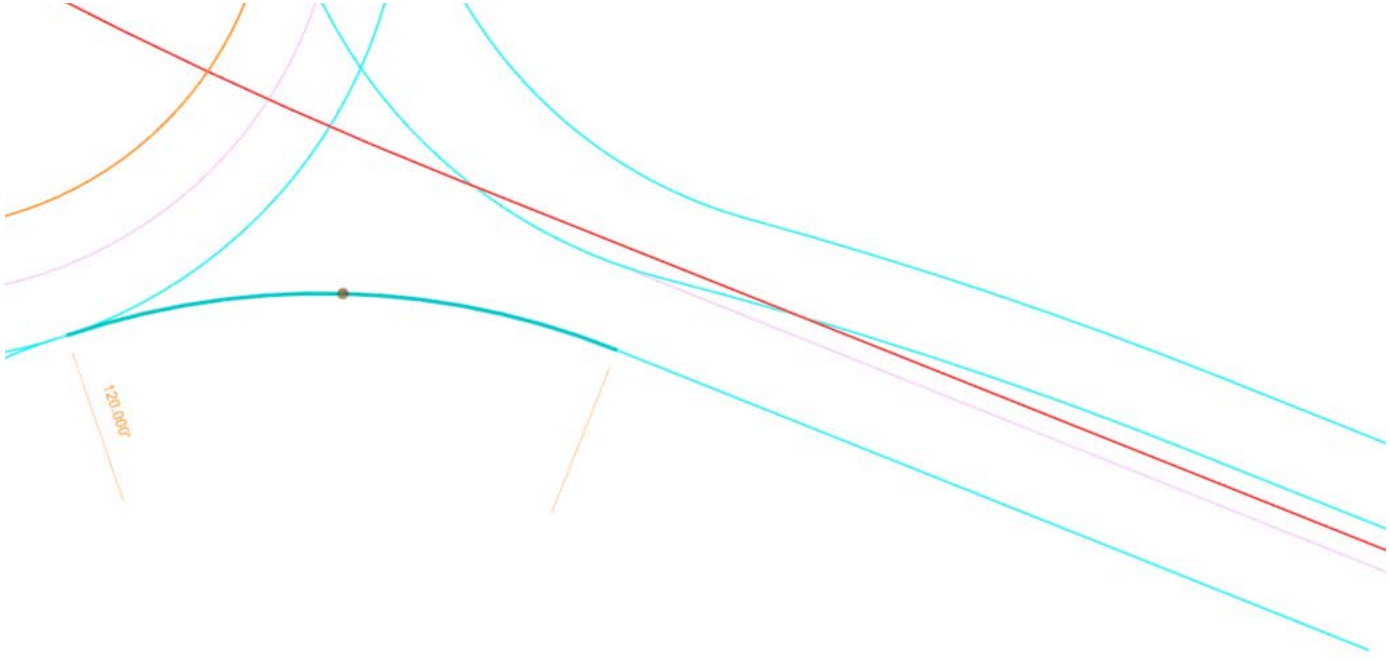
d. *Radius* > **120.000'** *[36.576m]*

e. *Locate First Element* > **Outer ICD**

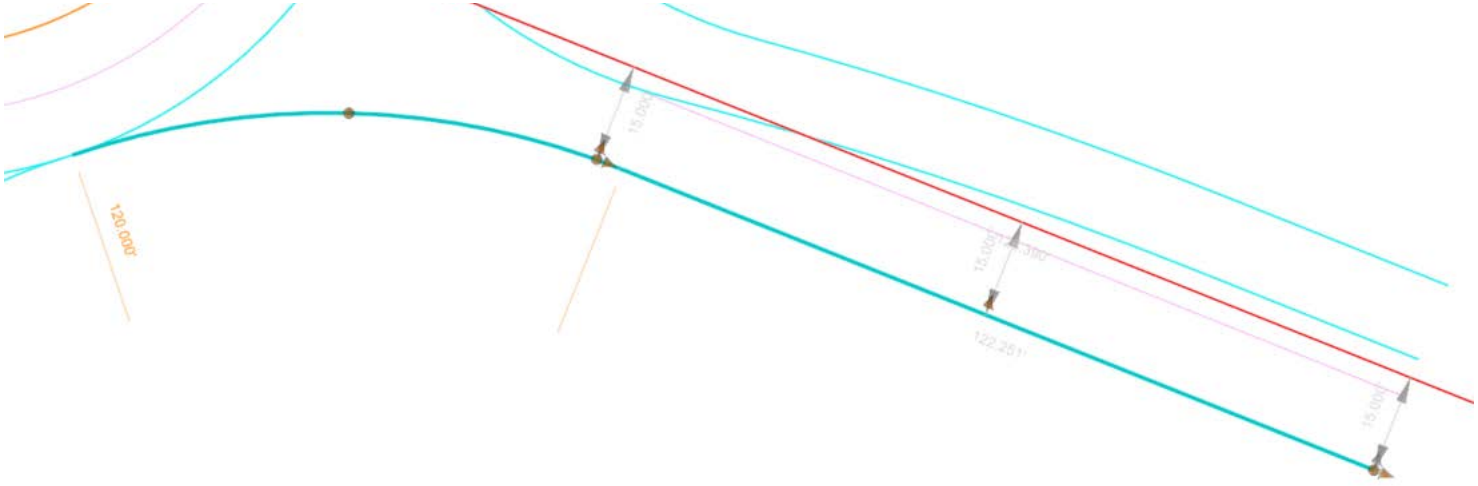
f. *Locate Second Element* > **WD-11**

g. *Trim/Extend* > **Ahead**

h. **<Esc>** to exit command



3. Create EB Exit EOP-1 alignment from the 2 previous elements
   a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**
   b. *Set Method* > **Automatic**
   c. *Maximum Gap* > **0.033'** *[0.01m]*
   d. *Feature Definition* > **Road_EdgeofPavement_Outside**
   e. *Name* > **EB Exit EOP-2**
   f. *Locate First Element* > Select **WD-11**
   g. **Data Point** to *Accept Complex chain*
   h. **<Esc>** to exit command



4. Create the inside entry edge of pavement using Simple Arc and Complex Geometry

a. Select, *Geometry* > *Horizontal* > *Arc* > *Arc Between Elements* > **Simple Arc**

b. *Feature Definition* > **Road_EdgeofPavement_Inside**

c. *Name* > **WD-12**

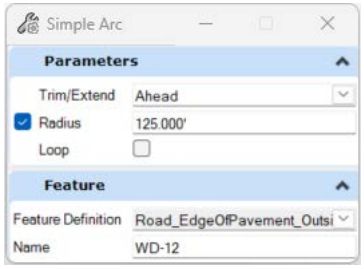
d. *Radius* > **125.000'** *[38.1m]*

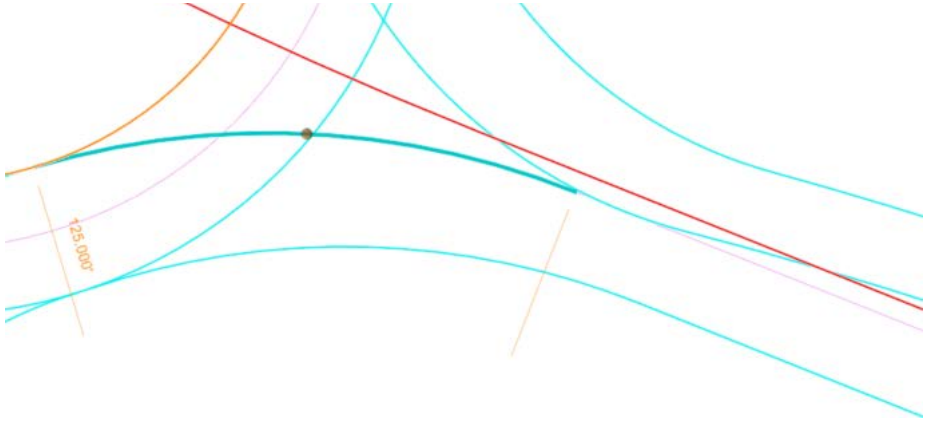
e. *Locate First Element* > **Inner ICD**

f. *Locate Second Element* > **DNC-10**

g. *Trim/Extend* > **Ahead**

h. **<Esc>** to exit command





5. Create EB Exit EOP-1

   a. Select, *Geometry* > *Horizontal* > *Complex Geometry* > **Complex By Element**

   b. *Set Method* > **Automatic**

   c. *Maximum Gap* > **0.033'** *[0.01m]*

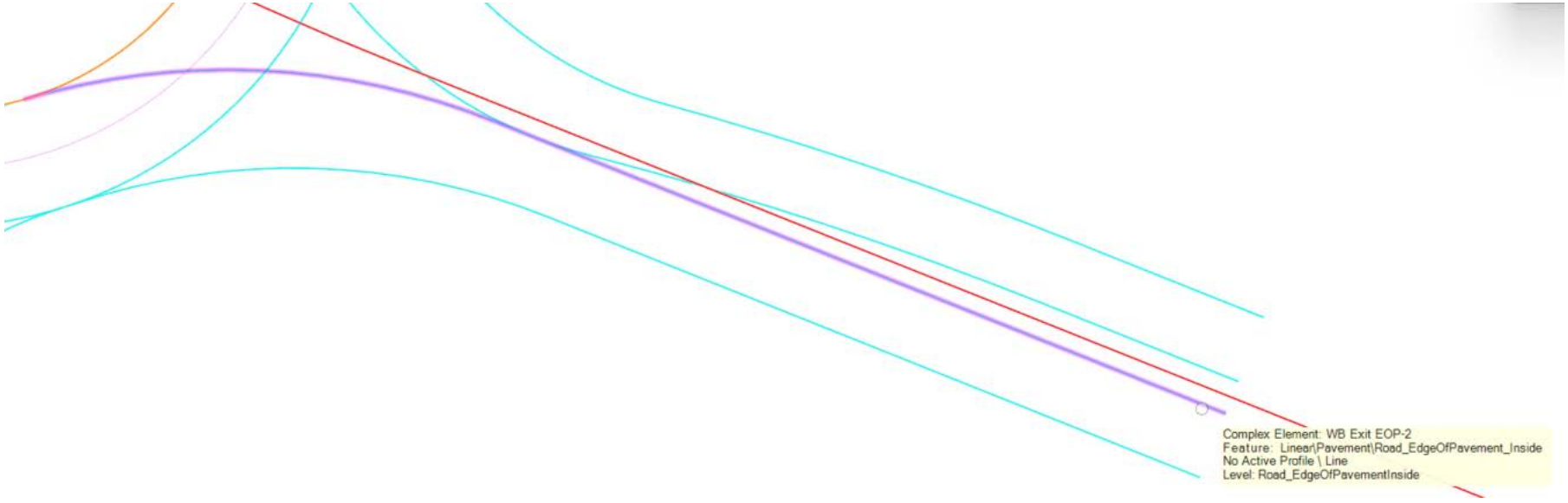
   d. *Feature Definition* > **Road_EdgeofPavement_Inside**

   e. *Name* > **EB Exit EOP-1**

   f. *Locate First Element* > Select beginning of offset element **DNC-10**

   g. **Data Point** to *Accept Complex chain*

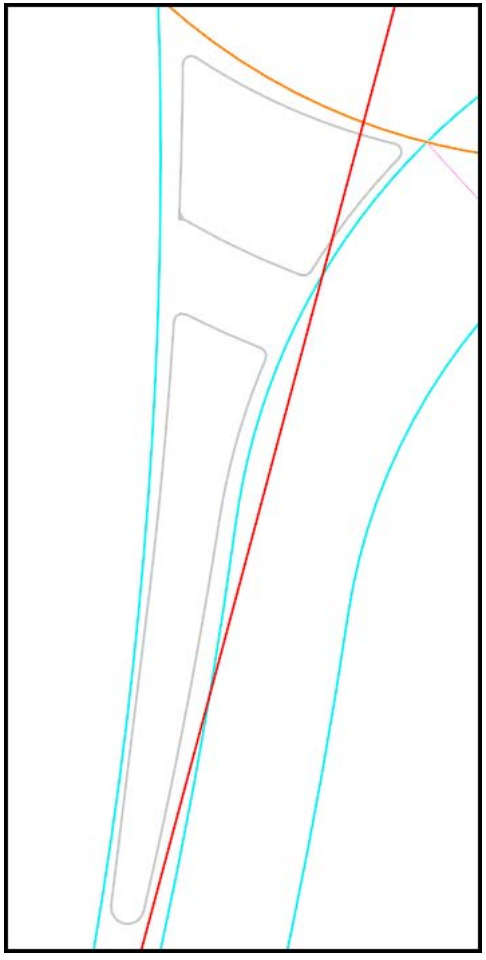
   h. **<Esc>** to exit command



Exercise 4: Create Splitter Island Geometry

Description

In this exercise you will create the geometry for the splitter islands.

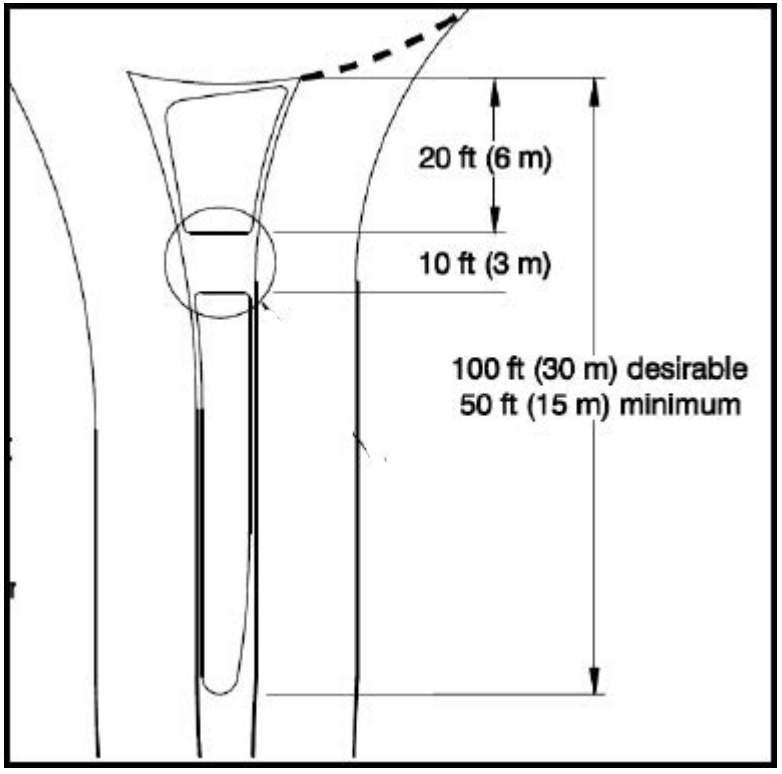


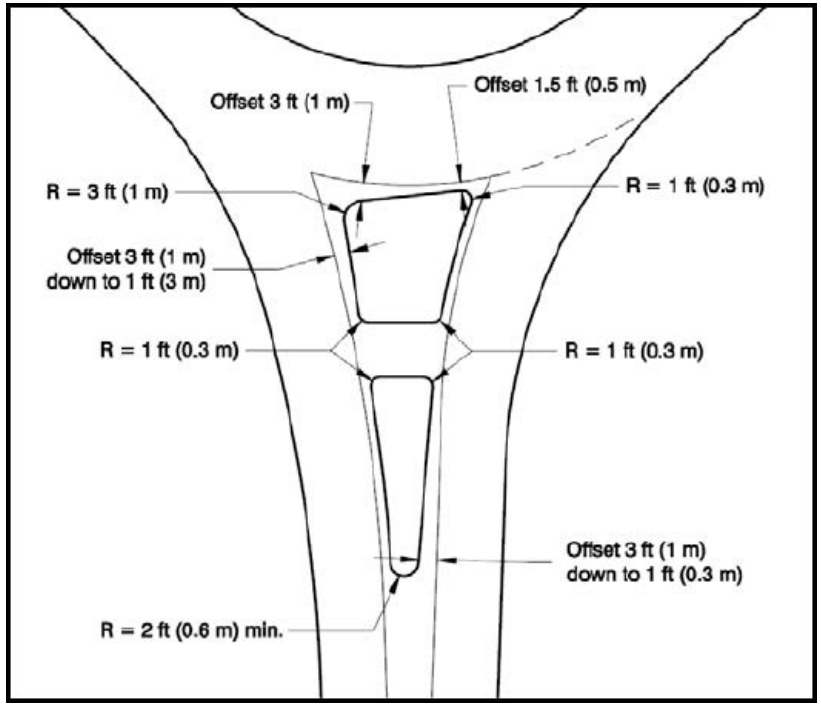
Skills Taught

- Variable offset Taper
- Single Offset Partial
- Simple Arc between Elements

Splitter Island Design Requirements

Splitter islands provide refuge for pedestrians, assist in controlling speeds, guide traffic into the roundabout. The total length of the splitter island will vary but should be at least 50 feet in length (100 feet is desirable) to provide sufficient protection for pedestrians and to alert approaching drivers to the geometry of the roundabout.





Note: The Splitter Island layout used in this workbook is specific to this course. Users should refer to the Country/Local standards when designing a Roundabout.

Create the Northbound Approach Splitter Island for the Roundabout

In this section you will create the geometry for the splitter island for the Northbound Approach.

---

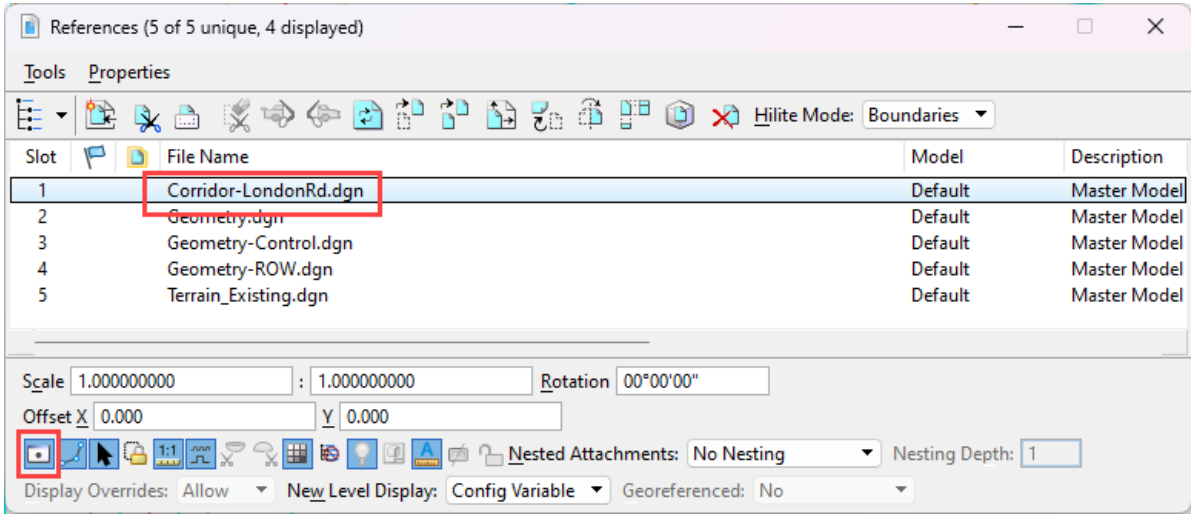
1. For the purpose of this exercise we are going to turn off the reference for the London Rd Corridor.

   a. From the ribbon menu, select, *Home* > *Primary* > *Attach Tools* > **References**

   b. On the References dialog, highlight the file name > **Corridor-LondonRD.dgn**

   c. At the bottom of the dialog de-select > **Display**

   d. **Close** the References dialog

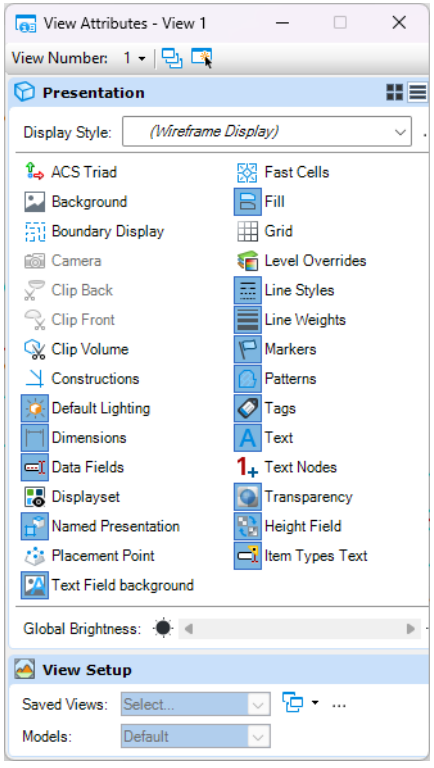


2. The offset features created for the entry and exit lanes are no longer required so we are going to switch them off.

   a. Select > **View Attributes**

   b. From the *View Attributes* dialog, de-select > **Constructions**

      As the offset elements had a feature definition of *Draft_DNC*, they can be switched off from the display by de-selecting construction.



3. Remove annotation from display

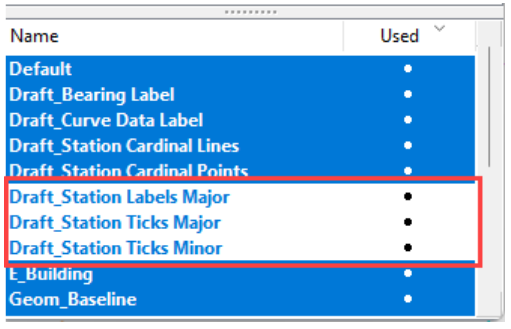
   a. Select, *Home* > *Primary* > **Level Display**

   b. From the list of files, Select > **Geometry.dgn**

   c. In the list of Levels *unhighlight* the following Levels:

      - **Draft_Station Labels Major**
      - **Draft_Station Ticks Major**
      - **Draft_Station Ticks Minor**

   d. **Close** > *Level Display*



4. Now we are going to create the offset features required for the roundabout splitter island. The length of the finished island we are going to create will be about 100.000'.

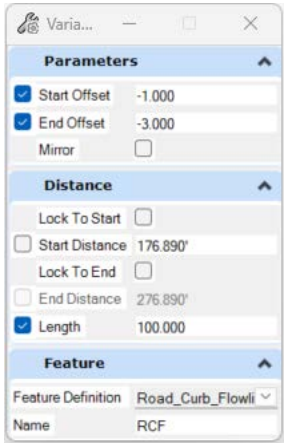
a. Select, *Geometry* > *Offsets and Tapers* > **Variable Offset Taper**

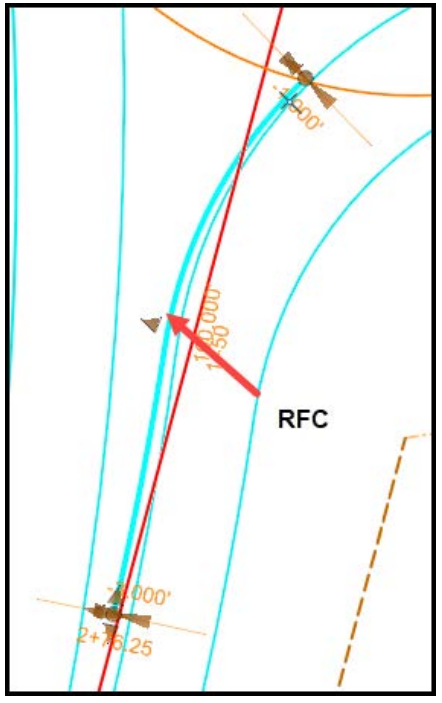
b. On the dialog box, set the following:

- *Start Offset* > **-1.000'** *[0.3m]*
- *End Offset* > **-3.000'** *[0.9m]*
- *Length* > **100.000'** *[30.48m]*
- Select, *Feature Definition* > *Curb* > **Road_Curb_Flowline**
- *Name* > **RCF** (The number will increment)

c. Follow the heads-up prompts:

- *Locate Element* > **NB Entry EOP-1**
- *Start Distance* > Snap to Intersection of *Outer ICD* and *NB Entry EOP-1* **(Data Point)**
- **Data point** through the remaining prompts to complete.



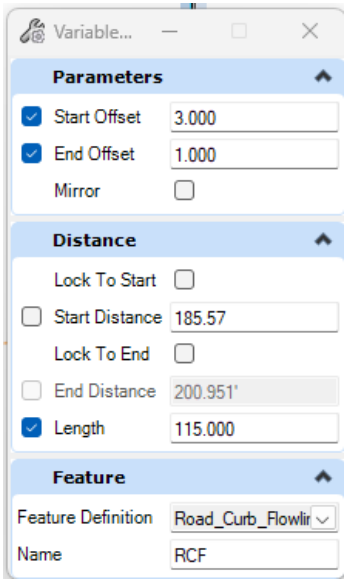


5. Create the taper offset from the SB Exit EOP-1 element.

a. Select, *Geometry* > *Offsets and Tapers* > **Variable Offset Taper**

b. On the dialog box, set the following:

- Set the *Start Offset* > **3.000'** *[0.9m]*
- *End Offset* > **1.000'** *[0.3m]*
- *Length* > **115.000'** *[35.052m]*
- Select, *Feature Definition* > *Curb* > **Road_Curb_Flowline**
- *Name* > **RCF**



a. Follow the heads-up prompts:

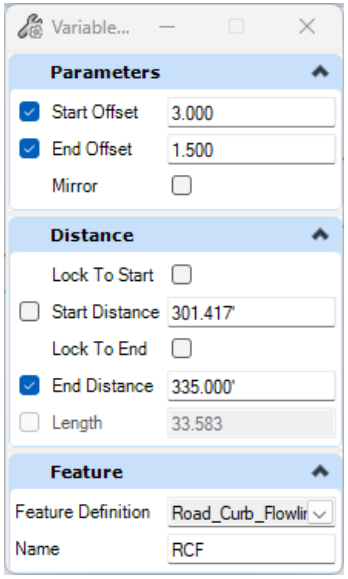
- *Locate Element* > **SB Exit EOP-1**
- *Start Distance >* Snap to Intersection of *Outer ICD* and *SB Exit EOP-1*
- **Data point** through the remaining prompts to complete.

6. Create the island northern taper.

a. Select, *Geometry* > *Offsets and Tapers* > **Variable Offset Taper**

b. On the dialog box, set the following:

- Set the *Start Offset* > **3.000'** *[0.9m]*
- *End Offset* > **1.500'** *[1.542m]*
- Select, *Feature Definition* > *Curb* > **Road_Curb_Flowline**
- *Name* > **RCF**

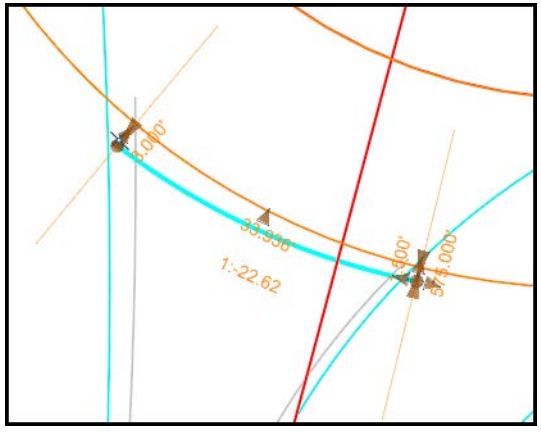


c. Follow the heads-up prompts:

- *Locate Element* > **Outer ICD**
- *Set the snap* > **Intersect Snap**
- *Start Distance* > **Snap** to Intersection of *Outer ICD* and *RCF1* **(Data Point)**
- *End Distance* > **335.000'** *[102.108m]*
- **Data Point** through the remaining prompts to complete.

Tip: If offset values are negative, just adjust values to make them positive so the element is created on the correct side.

d. **<Esc>** to exit command.



7. Now we are going to create 2 more offset features required for the footpath across splitter island.

a. Select, *Geometry* > *Offsets and Tapers* > **Single Offset Partial**

b. On the dialog box, set the following:

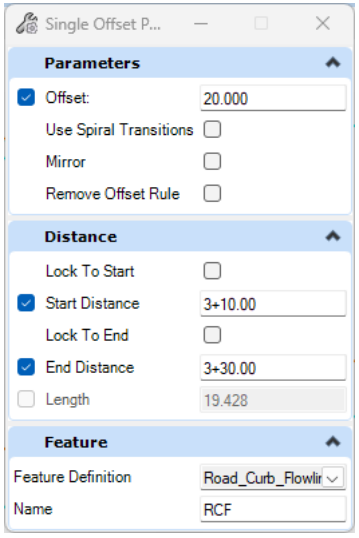
- Set the *Start Offset* > **20.000'** *[6.096m]*
- Set *Start Distance* > **310.000'** *[94.488m]*
- Set *End Distance* > **330.000'** *[100.584mm]*
- Select, *Feature Definition* > *Curb* > **Road_Curb_Flowline**
- *Name* > **RCF**

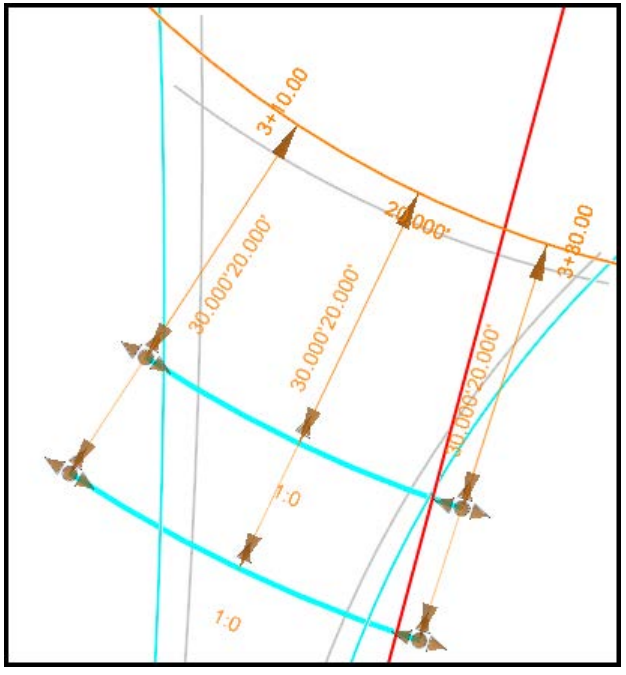
c. Follow the heads-up prompts:

- *Locate Element* > **Outer ICD**
- **Data Point** through the prompts to complete the command.

d. Repeat the above process for a **30.000'***[9.144mm]* offset (Name > **RCF***)

e. **<Esc>** to exit command.

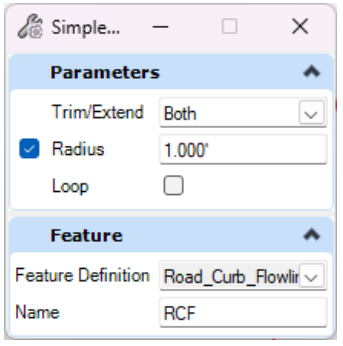


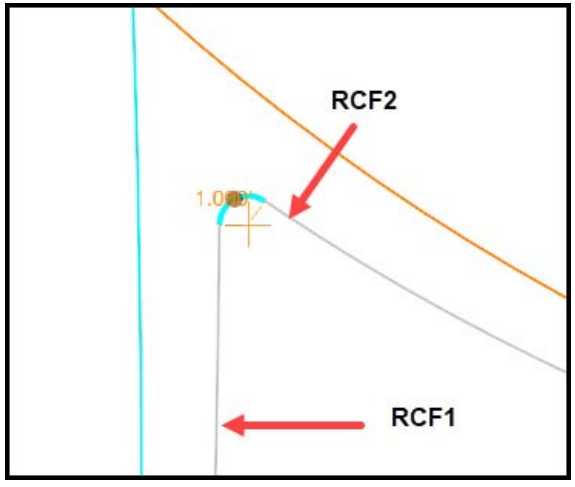


Create the Curb Returns to the Northbound Splitter Island

In this section you will create the curb returns for the splitter island for the Northbound Approach. Generally the Curb returns will be 1.000’ radius.

1. Starting at the northwest corner of the splitter island.
   a. From the ribbon menu Select, *Geometry* > *Horizontal* > *Arcs* > *Arc Between Elements* > **Simple Arc**
   b. *Feature Definition* > **Road_Curb_Flowline**
   c. *Name* > **RCF**
   d. *Locate First Element* > **RCF2**
   e. *Locate Second Element* > **RCF1**
   f. *Radius* > **1.000’** *[0.3m]*
   g. *Extend/Trim* > **Both**





2. Moving South and keeping on the Exit Approach

   a. From the ribbon menu Select, *Geometry* > *Horizontal* > *Arcs* > *Arc Between Elements* > **Simple Arc**

   b. *Feature Definition* > **Road_Curb_Flowline**

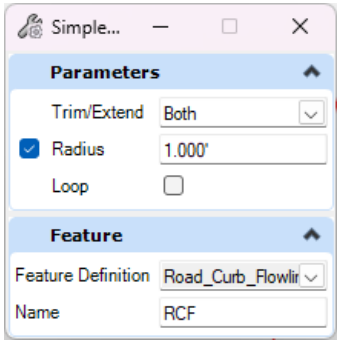
   c. *Name* > **RCF**

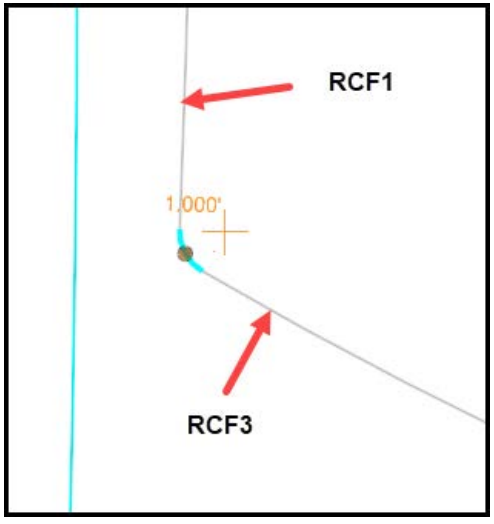
   d. *Locate First Element* > **RCF1** (Do not pick the trimmed element)

   e. *Locate Second Element* > **RCF3**

   f. *Radius* > **1.000’** *[0.3m]*

   g. *Extend/Trim* > **Both**





3. Moving south, create next arc.

   a. From the ribbon menu Select, *Geometry* > *Horizontal* > *Arcs* > *Arc Between Elements* > **Simple Arc**

   b. *Feature Definition* > **Road_Curb_Flowline**

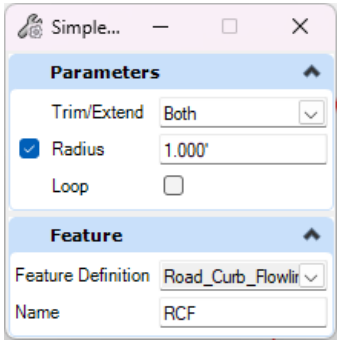
   c. *Name* > **RCF**

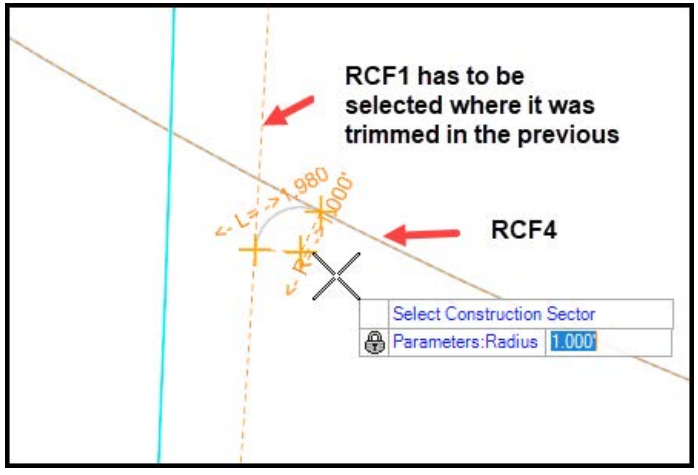
   d. *Locate First Element* > **RCF1** (this feature has to be selected where it was trimmed)

   e. *Locate Second Element* > **RCF4**

   f. *Radius* > **1.000'** *[0.3m]*

   g. *Extend/Trim* > **Both**





4. The next curb return to create will be at the end of the splitter island. The radius for this curb return will be 2.000'

   a. From the ribbon menu Select, *Geometry* > *Horizontal* > *Arcs* > *Arc Between Elements* > **Simple Arc**

   b. *Feature Definition* > **Road_Curb_Flowline**

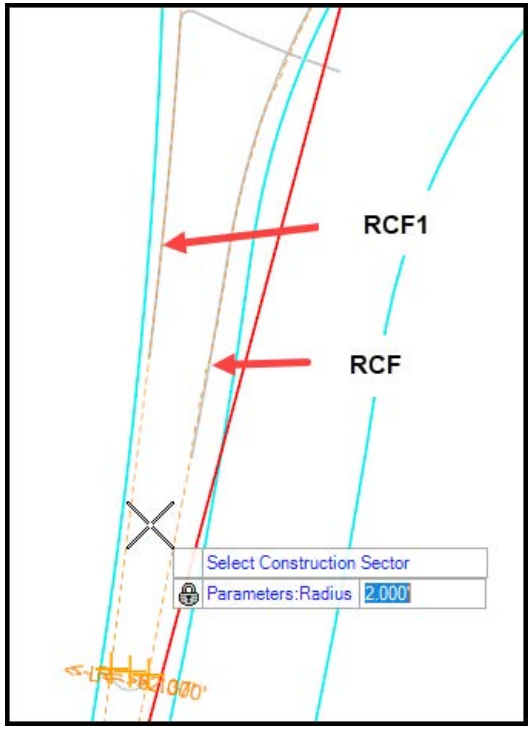
   c. *Name* > **RCF**

   d. *Locate First Element* > **RCF1** (this feature has to be selected where it was trimmed)

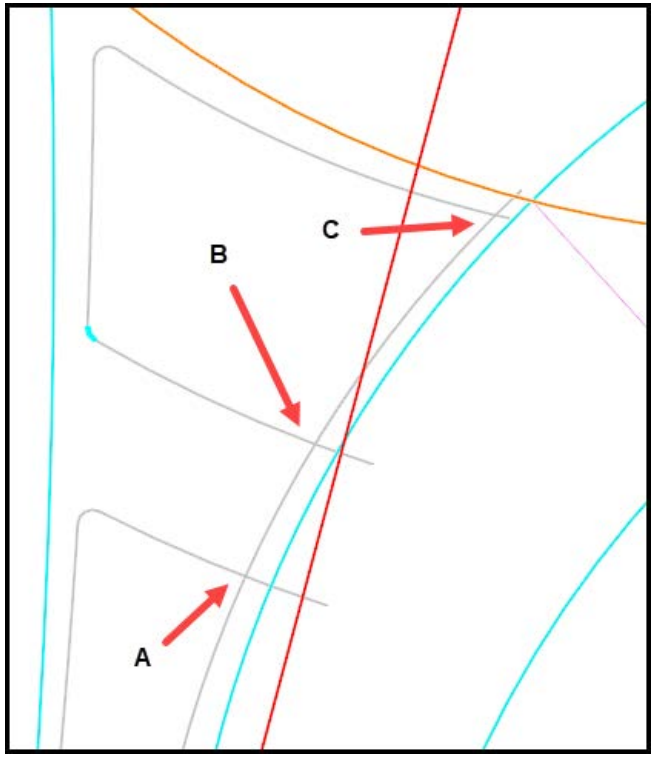
   e. *Locate Second Element* > **RCF**

   f. *Radius* > **2.000'** *[0.6m]*

   g. *Extend/Trim* > **Both**



5. Follow the same process to create the remaining curb returns, with a **1.000'** *[0.3m]* radius, at locations **A**, **B** and **C**, shown in the image below.



Task - Complete the Roundabout Horizontal Geometry

In this task we are going to use what we have learned to complete the horizontal design of the roundabout.

In the previous exercises in this course we have detailed how to create entry and exit approaches to a roundabout. In this task we would like you to create the Southbound and Eastbound approaches using the detailed steps from Exercise 1 to 4.

You will create the entry and exit lanes for each approach as well as the splitter island that divides them. Assume a standard lane width at the entrances and exits of **12'** *[3.65m].*The detailed configuration is shown the following diagrams.

Figure 1 is the layout of the completed Roundabout.

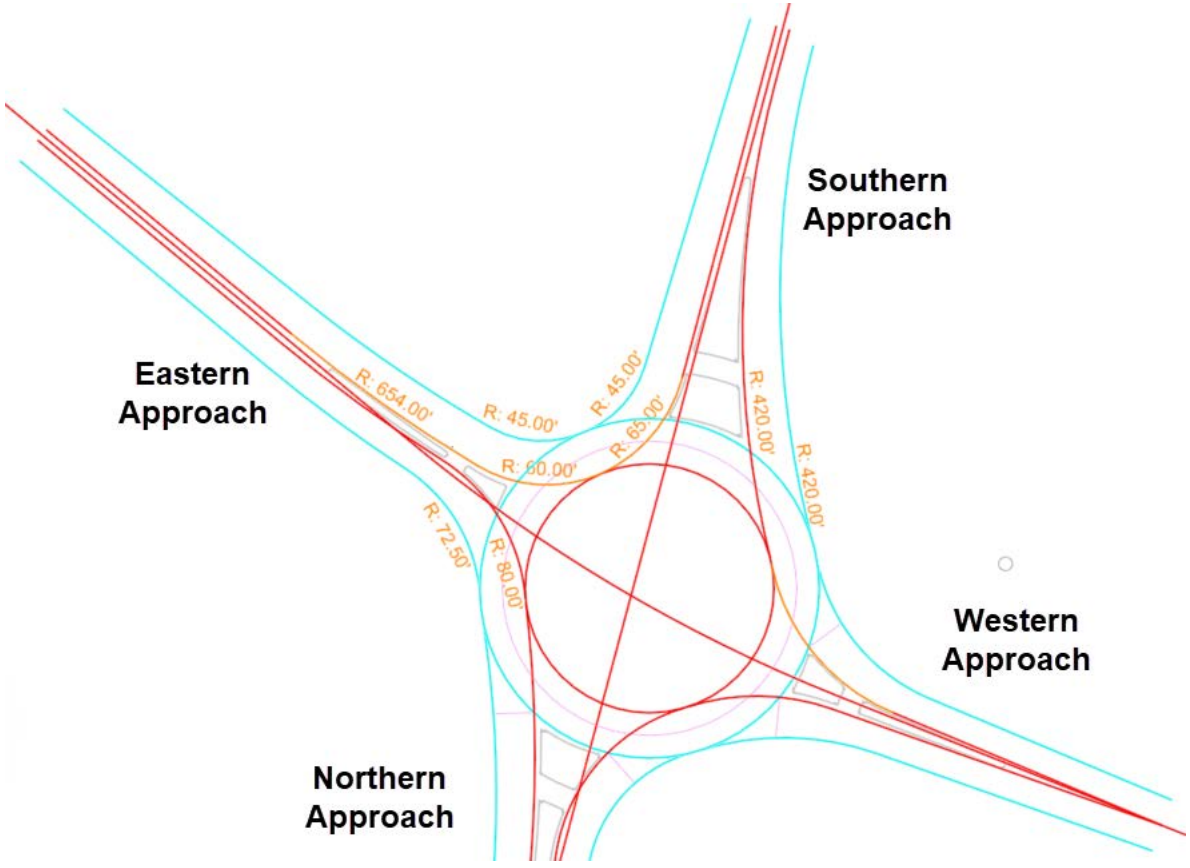


FIGURE 1

Use the images below to define the layout of the splitter islands.