Drawing Production - Creating Cross Section Sheets

This course is for the **2021 Release 1** *version of:*

OpenSite Designer CONNECT Edition

OpenRoads Designer CONNECT Edition

OpenRail Designer CONNECT Edition

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 the *LEARNserver* and through *CONNECT Advisor*.

- 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, search in *CONNECT Advisor* for related courses and topics. You can also submit questions to the Civil Design Forum on Bentley Communities where peers and Bentley subject matter experts are available to help.

Bentley Institute

Edition: 03-01

Course Level: **Fundamental**

Course Overview

In this course, you will learn how to create and annotate cross section sheets. You will learn how to create Named Boundaries that will be used to generate various cross section sheets. You will also learn about drawing models and sheet models that are used during the sheet creation process. And lastly, you will learn how to add individual annotations to label specific location coordinates, station-offset values, elevations, and more.
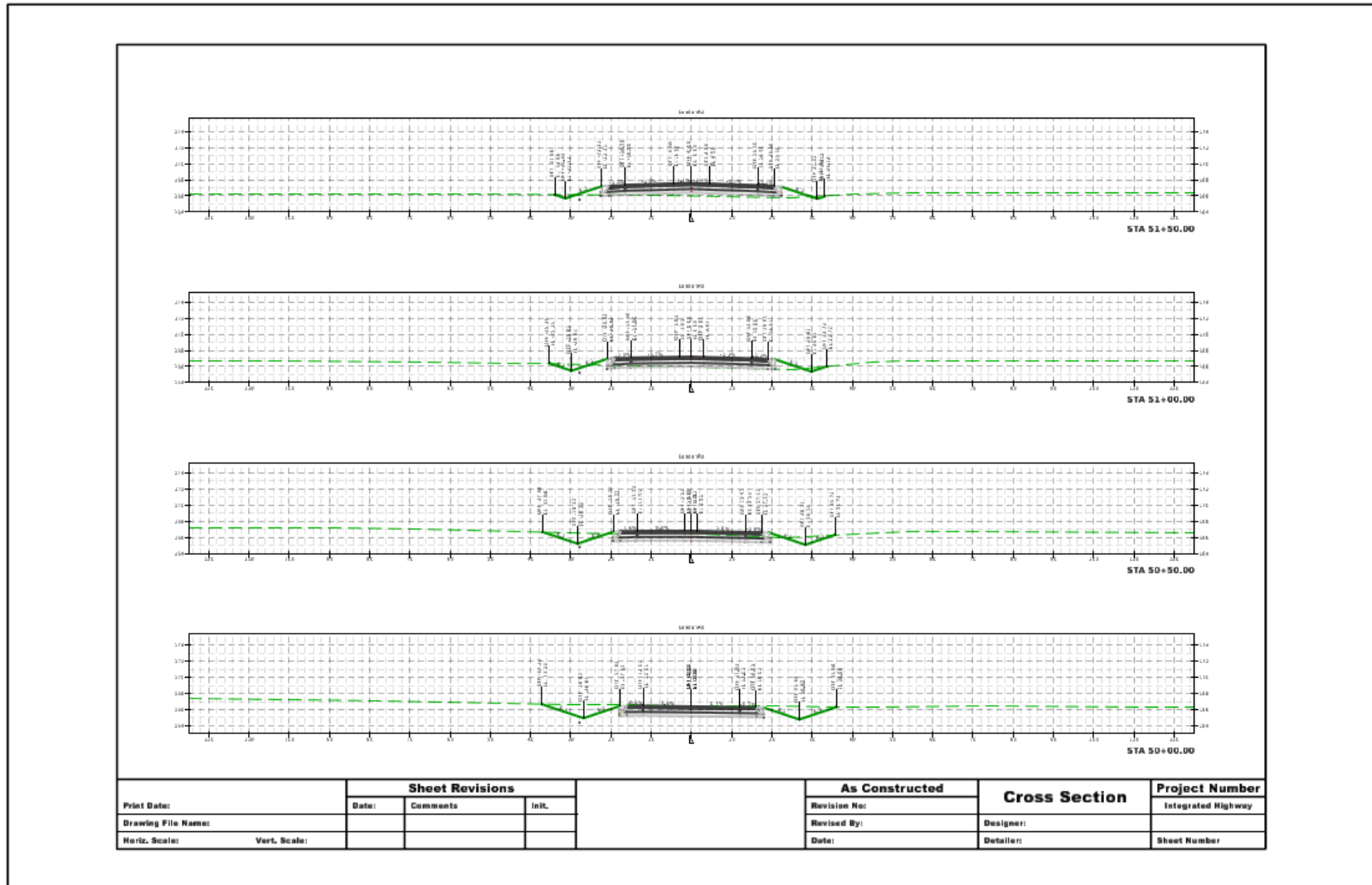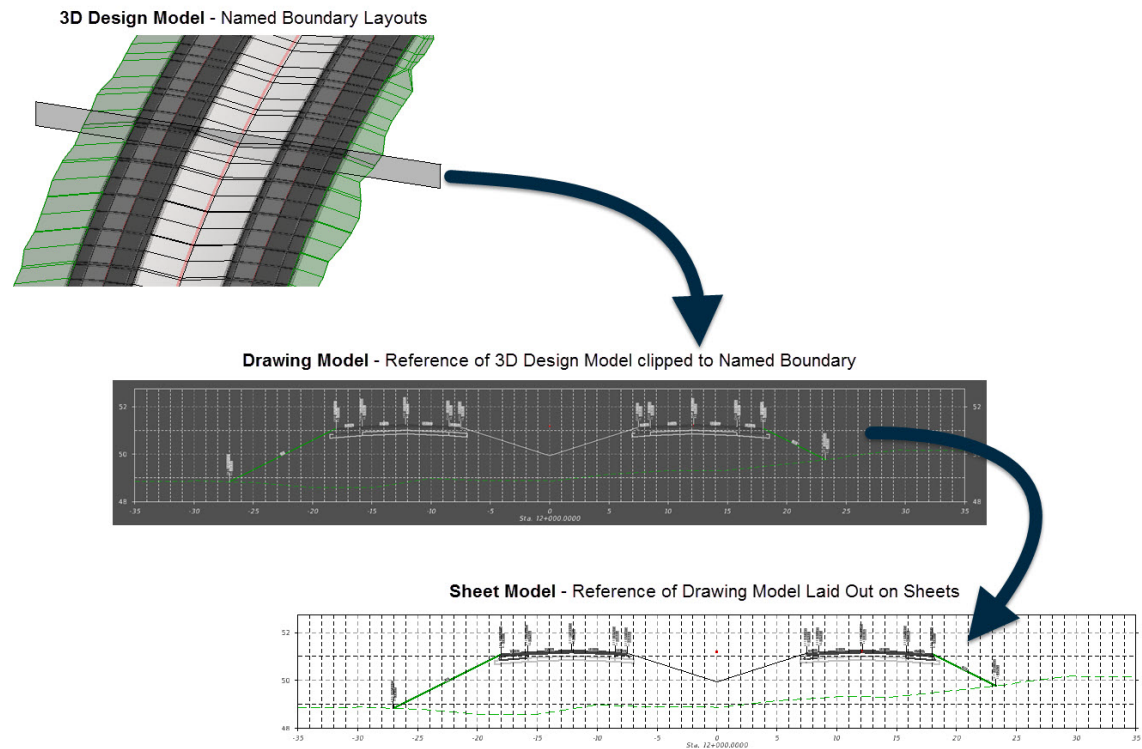
Cross Section Sheets Process

The process to create cross section sheets is very similar to the process that is used to create Plan and Profile Sheets. Named Boundaries are created, Drawing Models and Sheet Models are then generated. The cross sections are a "live" slice or cut through the 3D Model, if the model changes the cross sections automatically update.

General Process:

- Start with 3D model which is typically referenced from the source files.

- Create Named Boundaries (think of these as cross section windows) at user defined intervals that define where cross sections will be "cut" along an alignment.

- Cross Section Drawing Models are generated using the Named Boundaries as a reference.

- Annotation is added to Cross Section Drawing Models.

- Sheet Models are then generated with a reference to each Cross Section Drawing Model.

3D Design Model - Named Boundary Layouts

Drawing Model - Reference of 3D Design Model clipped to Named Boundary

Sheet Model - Reference of Drawing Model Laid Out on Sheets

Exercise 1: Create Cross Section Sheets

Description

In this exercise you will learn how to create cross section sheets.

Skills Taught

- Create uniform cross section sheets
- Create non-uniform cross section sheets

Create Cross Sections

In this exercise you will learn to create cross sections along the length of a project. These cross sections are uniform throughout the design corridor or in other words they will all be the same width, scale, interval, etc. In the following exercises you will learn how to include non-uniform cross sections.

1. Start the software.

2. Set the WorkSpace and WorkSet

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

   a. Select **Training and Examples** from the *WorkSpace* menu.

   b. Select **Training-Imperial** *[Training-Metric]* from the *WorkSet* menu.

3. Open the file **_Cross Section Sheets.dgn** *[_Metric-Cross Section Sheets.dgn]*. This is essentially an empty file that has already been setup with the terrain, geometry, and corridor files referenced. The 2D and 3D model views are already setup.

4. Once the file is open, briefly review the design files that have been attached using the *References* tool. Remember, whatever is displayed in the 3D model view is what will be displayed on the cross section sheets.
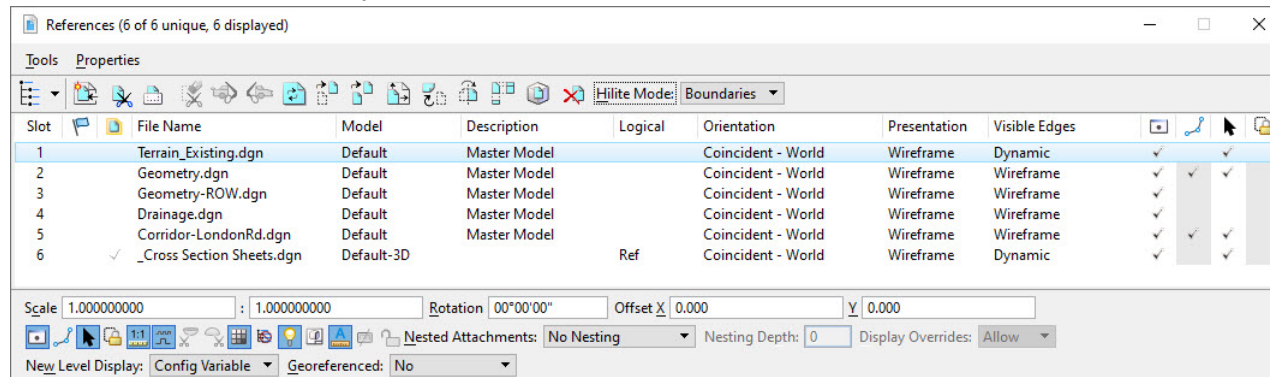
5. Create Named Boundaries which define the location and extent of each cross section.

   IMPORTANT: Both the 2D and the 3D models must be open in a view to create cross sections.

   a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

   The Named Boundary tool which is part of MicroStation is extended when running in OpenRoads Designer to add additional modes that understand civil geometry for creating plan, profile, and cross section boundaries.

   b. Select the **Civil Cross Section** mode.

   c. Set *Drawing Seed* to **ANSI D_XS** *[A1_XS - Frame Annotation]*.

   The Drawing Seed defines default values and other critical parameters required to create sheets. The Drawing Seed definitions are stored inside a dgnlib that is part of the workspace. You should always select a Drawing Seed as the first step when creating named boundaries. This drawing seed is setup for ANSI D size paper. The Drawing Seed includes:

   - Default values for options on the Named Boundary dialog such as offsets, intervals, and clearances. These default values can be changed at run time if desired.

   - Default options on the Create Drawing dialog such as seed files and default annotation groups. These default values can be changed at run time if desired.

   - Other parameters such as where the named boundary is positioned on the sheet. These parameters cannot be changed at run time.

d. In the 2D view, **select the north-south** (LondonRd) alignment along which the cross section named boundaries will be created.

The *Name*, *Start Location*, and *Stop Location* are populated in the dialog. The *Start Location* will change dynamically (unless it is locked) as the cursor is moved.

e. Set the *Detail Scale* to **1"=10'** *[1:100]*.

f. Set the *Group* to **(New)** and the *Name* to **LondonRd**.

The Name defines a group that will hold together each of the individual cross section named boundaries. When the Group option is set to (New) a new group is created using the specified name which by default is set equal to the name of the feature (geometry) selected. The Name is automatically set to the name of the selected geometry but can be changed if desired.

Additional cross sections can also be added to an existing group. For example, adding a cross section at a driveway. We will learn to do this in a following exercise.

g. Set the *Start Location* to **50+00** *[5+000]*. This can be done three ways.

- Graphically move the cursor to the beginning of the alignment and left click.

- Type *50+00 [5+000]* in the dialog.

- Click the Lock to Start icon ◀ on the dialog.

h. Set the *Stop Location* to **70+50** *[5+620]*.

The locations of the cross sections are shown in the 2D view but the Named Boundaries **do not** exist yet! They are not shown in the 3D view.

TIP: The *Interval* option defines the regular distance between cross sections. When enabled, the *Include Control Points* dialog causes a cross section to also be created at horizontal geometry control points such as the PC and PT of a curve.

2D View   3D View

Proposed Named Boundaries

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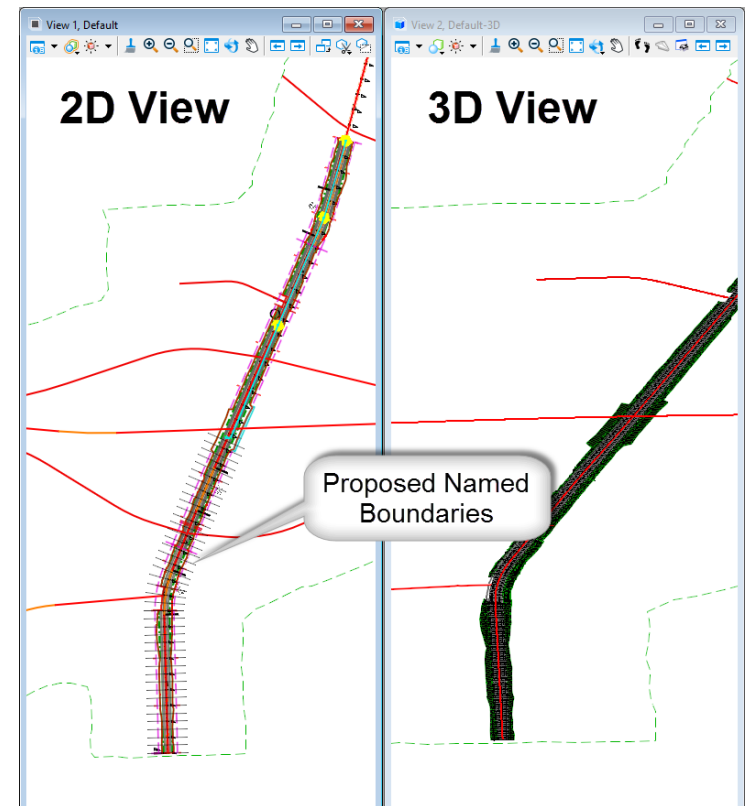
i. Enable the **Create Drawing** option.

When enabled the drawing and sheets creation process is automatically started once the named boundaries are created. When disabled, the named boundaries are created but no drawings and sheets are created. This allows additional cross section locations to be defined before creating the drawing/sheets as you will learn in a following exercise.

j. Enable the **Show Dialog** option.

This option is only valid when the Create Drawing option is enabled. When Show Dialog is also enabled a dialog is shown where some drawing and sheet creation options can be adjusted. When disabled the default values from the active Drawing Seed are automatically used.

k. *Follow the prompts* in the lower left corner **left click** to define the named boundaries. *Multiple left clicks are required*.

TIP: Two to three clicks are required to (1) accept the Start Location, (2) accept the Stop Location, and (3) create the Named Boundaries. However, if the Start or Stop Location were selected graphically one or more of these clicks has already been completed when the elements were selected.

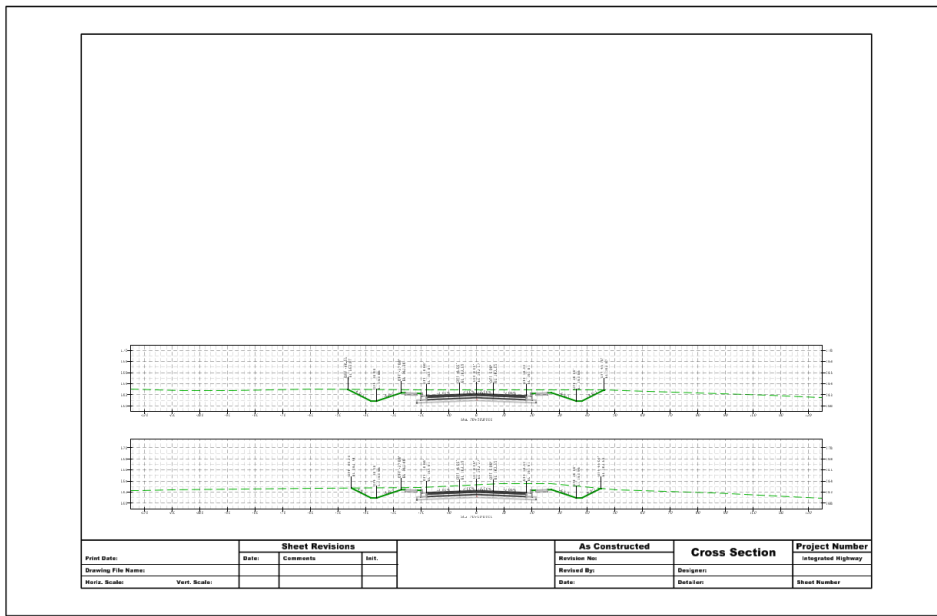Once the named boundaries are created they appear in the 3D view.
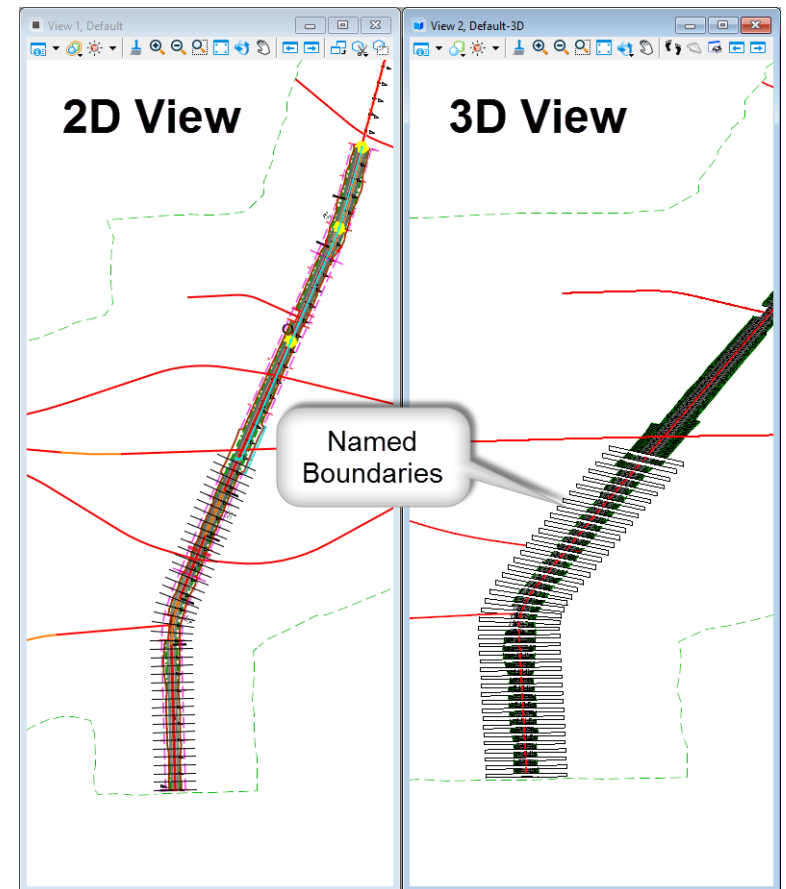
I. After reviewing and making any necessary adjustments on the *Create Drawing* dialog click **OK** to generate the cross section sheets.

Generally it is not necessary to adjust the settings on the Create Drawing dialog. They are defined by the Drawing Seed selected near the top of the dialog. For now we will accept these settings. Some adjustments will be discussed in later exercises.

A progress bar appears in the lower right of the screen and a counter in the message center (lower center) while cross section sheets are created and annotated. It will take a minute or so to generate and annotate all of the cross sections.

The last cross section sheet model is opened automatically when the *Open Model* check box is enabled on the Create Drawing dialog. This is the default setting.

TIP: The View Names, Drawing Model Names and Sheet Model Names can be customized based on your organizations preferences. For example, some users like to name the Sheet Models with names such as Sheet_001, Sheet_002, Sheet_003, etc.

6. Review the cross sections.

Each cross section is clipped and annotated in a separate *Drawing* model which in turn are grouped and placed on *Sheet* models. In other words, the 3D Design model is clipped and referenced into *Drawing* models, annotated, and then referenced into the *Sheet* models. The whole system is a live reference so if the 3D Design model changes, the cross section sheets are automatically updated.

a. Select the *drawing model* named **LondonRd - 50+00.0000** *[5+000.000]* from the *View Group* list in the lower left corner of the screen.

   = Drawing Models

   = Sheet Models

Name	Model
LondonRd - 50+00.0000 Views	LondonRd - 50+00.0000
LondonRd - 50+50.0000 Views	LondonRd - 50+50.0000
LondonRd - 51+00.0000 Views	LondonRd - 51+00.0000
LondonRd - 51+50.0000 Views	LondonRd - 51+50.0000
LondonRd - 52+00.0000 [Sheet] Views	LondonRd - 52+00.0000 [Sheet]
LondonRd - 52+00.0000 Views	LondonRd - 52+00.0000
LondonRd - 52+50.0000 Views	LondonRd - 52+50.0000
LondonRd - 53+00.0000 Views	LondonRd - 53+00.0000
LondonRd - 53+50.0000 Views	LondonRd - 53+50.0000
LondonRd - 54+00.0000 [Sheet] Views	LondonRd - 54+00.0000 [Sheet]
LondonRd - 54+00.0000 Views	LondonRd - 54+00.0000

b. **Fit** the view.

Observe that this is a single cross section at station *50+00 [5+000]*. The annotations, including the grid lines, are located in this model but the cross section graphics are a *live reference* of the 3D Design model.

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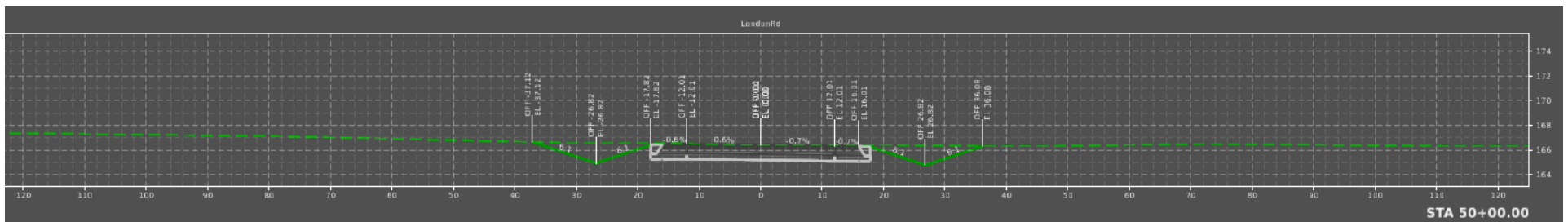
c. Select the *sheet model* named **LondonRd - 50+00.0000 [Sheet]** *5+000.0000 [Sheet]* from the *View Group* list in the lower left corner of the screen to make it the active model.

Observe that this sheet contains multiple cross sections. Each is a *live reference* of a separate Drawing model.
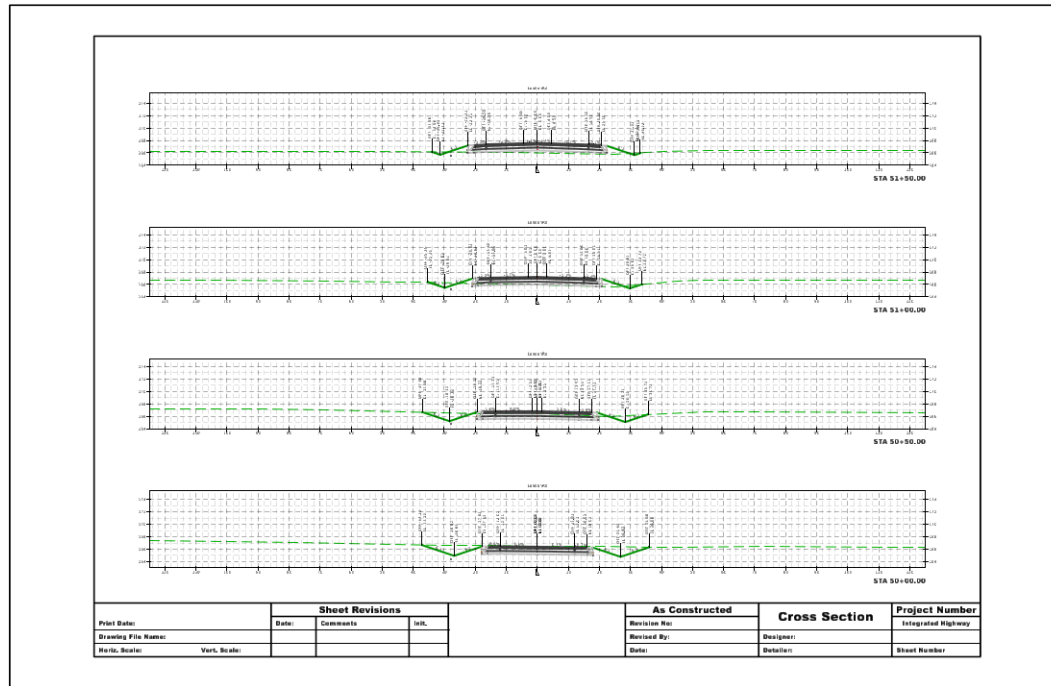
d. Return to the *Design* model by scrolling down the list and selecting **Multi-Model Views** from the *View Group* list to return directly to the multiple model view.

If the *Default* or *Default-3D* model is selected only the selected *Default* or *Default-3D* model will be shown, not the multiple model view of both the 2D and 3D models.
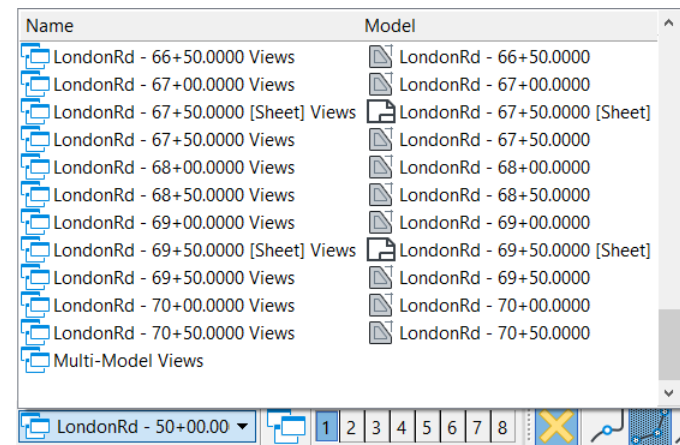
Create Non-Uniform Cross Sections

Sometimes a different width or margin around cross sections are needed in a project. For example, to show drainage structures, utilities, walls, bridges, etc. it may be necessary to include extra height in some parts of a project.

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1. Select **Open** and browse to the folder where you unzipped the dataset files and open the file **_Cross Section Sheets with Drainage.dgn** *[_Metric-Cross Section Sheets with Drainage.dgn]*.

   This otherwise blank file has already been setup with the same references and views as the previous exercise. Multiple sets of cross sections can be created in a single file if desired. However we are using a new file in this exercise for clarity.

2. Create Named Boundaries for the beginning of the project. This is the same as the previous exercise, just more practice.

   a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

   b. Select the **Civil Cross Section** mode.

   c. Set *Drawing Seed* to **ANSI D_XS** *[A1_XS]*.

   d. In the 2D view, select the north-south (LondonRd) alignment along which the cross section named boundaries will be created.

   e. Set the *Detail Scale* to **1"=10'** *[1:100]*.

   f. Set the *Group* to **(New)**.

   g. Set *Name* to **LondonRd**. (This name gets automatically populated with the name of the alignment selected)

   h. Set the *Start Location* to **50+00** *[5+000]*.

   i. Set the *Stop Location* to **70+50** *[5+620]*.

   j. **Disable** the *Create Drawing* option.

   Only the named boundaries will be created, not the drawing and sheets. These will be created after all of the boundaries are defined.

   k. *Follow the prompts* in the lower left corner **left click** to define the named boundaries. *Multiple left clicks are required*.

   TIP: The named boundaries are not created until you can see them in the 3D model!

3. Review the Named Boundaries in the **3D view**.

Named boundaries are closed shapes in the 3D view that define the extents of the cross sections. Reviewing the shape you can see exactly the parts of the model the cross section cuts through.

The illustration shows the first two named boundaries as semi-transparent to better illustrate how they cut through the model.
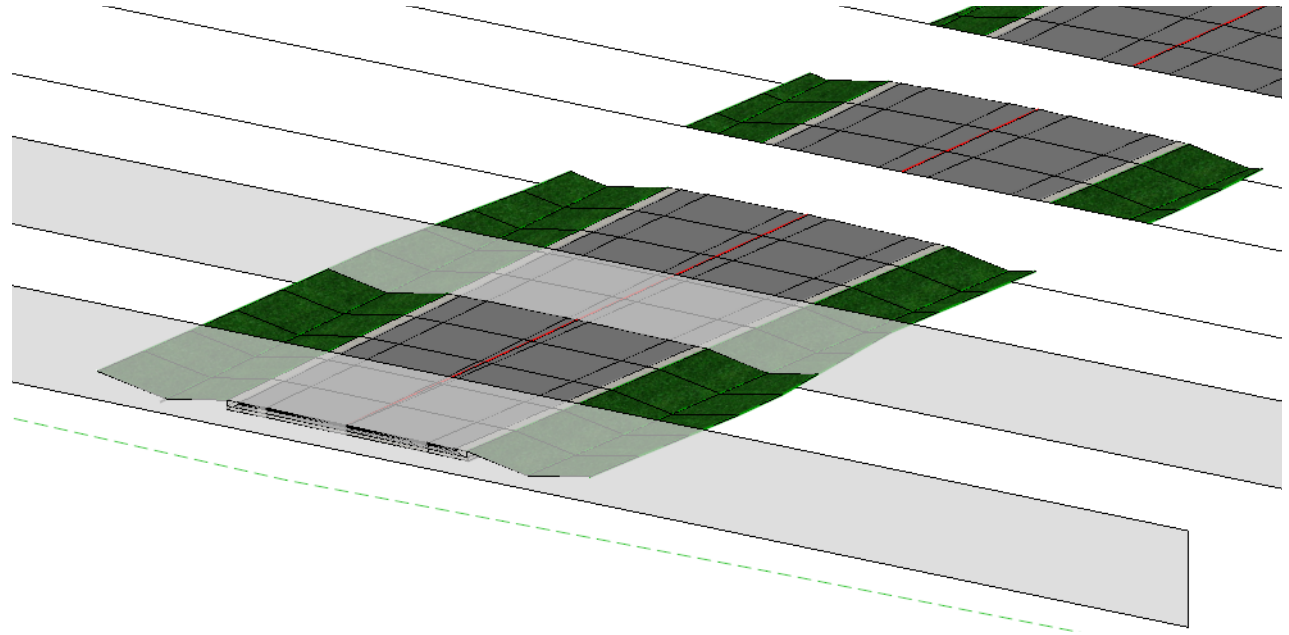
4. Review the Named Boundary Cross Section Group.

a. Open the *Drawing Production* > **Named Boundaries** dialog.

b. Resize the dialog to make it easier to view all the data.

c. Expand the **Cross Section Groups**.
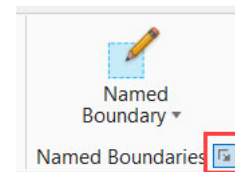
There is currently one group named *LondonRd* in the list. This new group was created because you specified a new group with this name when defining the named boundaries in the previous steps.

d. Expand the **LondonRd** group.

Each of the named boundaries that belong to this group are listed.

e. Close the *Named Boundaries* dialog.
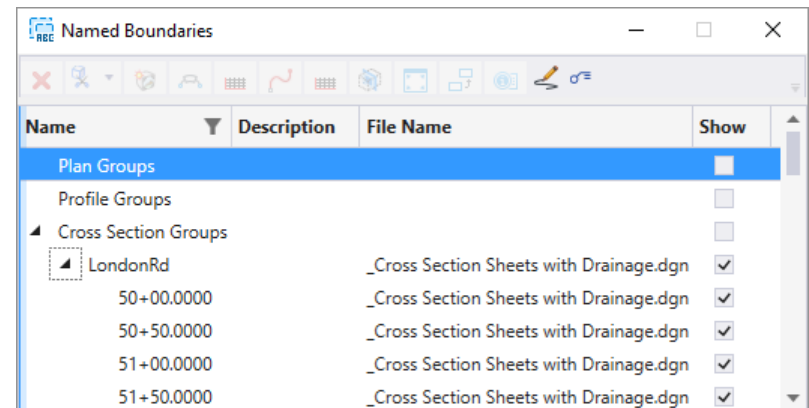
5. Create Named Boundaries for the second segment of the project. The difference is that these boundaries will include extra margin below the cross sections allowing underground utilities to be displayed on the cross sections.

a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

b. Select the **Civil Cross Section** mode.

- *Drawing Seed* = **ANSI D_XS** *[A1_XS]*

- In the 2D view, select the north-south (LondonRd) alignment along which the cross section named boundaries will be created.

- *Detail Scale* = **1"=10'** *[1:100]*

- *Group* = **(New)**

- *Name* = **LondonRd with Drainage** (This is a new name)

- *Start Location* = **71+00** *[5+640]*

- *Stop Location* = **90+00** *[6+200]*

- *Bottom Clearance* = **10** *[3]* (This is a new setting to add space for the underground utilities!)

- **Disable** the *Create Drawing* option.

c. *Follow the prompts* in the lower left corner **left click** to define the named boundaries. *Multiple left clicks are required*.

TIP: Remember, the named boundaries are not created until you can see them in the 3D model!

6. Review the new named boundaries in the 3D view.

   a. Zoom in the 3D model to view near stations **71+00** *[5+640]* where the new named boundaries with the additional bottom clearance begin.

      Observe the additional depth of these boundaries.

      In the image, the boundaries with the additional bottom clearance are shown in blue with the original boundaries shown in green.

      The colors are for illustration purposes and will not appear that way in your file.
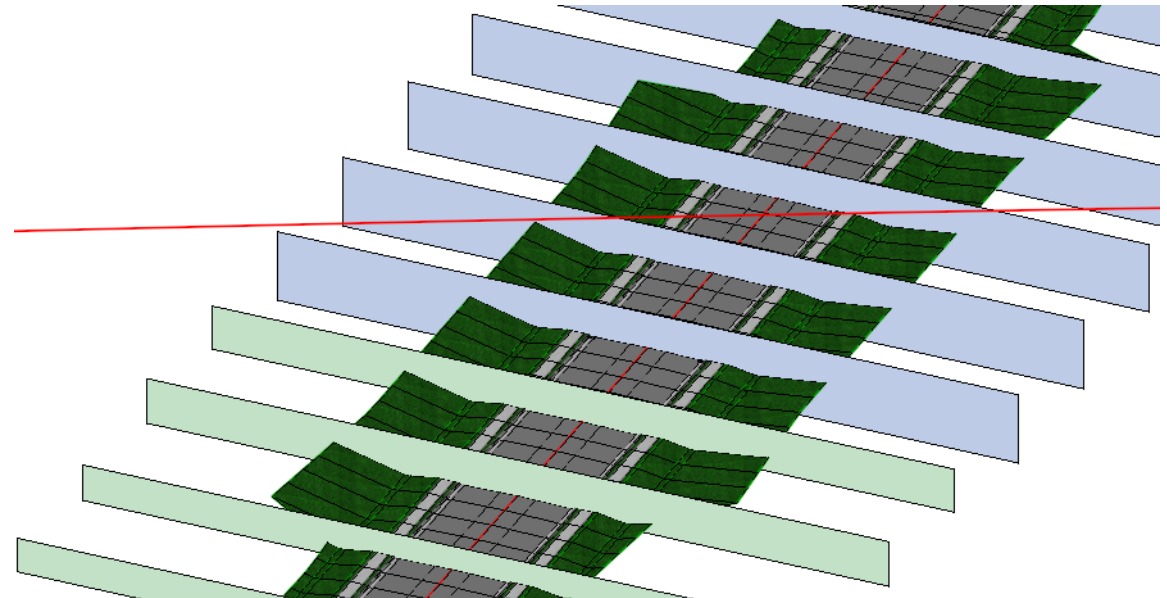
   b. Open the *Drawing Production* > **Named Boundaries** dialog.

   c. Expand **Cross Section Groups**.

      There are now two groups. *LondonRd* (green in the image) is the first set of named boundaries and *LondonRd with Drainage* (blue in the image) is the second set.

   d. Clear the check box in the *Show* column for the **LondonRd with Drainage** group.

      The second set of named boundaries disappear.
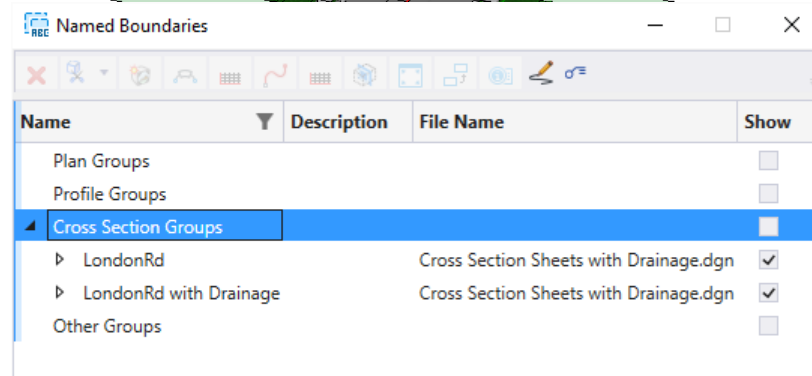
   e. Enable the check box in the *Show* column for **LondonRd with Drainage** group.

IMPORTANT: You have created TWO Named Boundary groups. Cross section sheets can be created from either of these but each will create a *separate* set of cross section sheets. A single set of cross section sheets cannot be created from two different named groups.

Sometimes you will want to create multiple cross section groups. For example for different roadways or ramps or pipe cross sections. But cross sections along a single geometry typically should all be included in a single group.

7. Delete the incorrect named boundaries in the drainage area so that they can be recreated in the proper cross section group.

   a. Select the **LondonRd with Drainage** group.

   b. Select **Delete** at the top of the *Named Boundaries* dialog.

   The group and all of the named boundaries in the group are deleted from the dialog and from the 2D and 3D views.

   c. Close the *Named Boundaries* dialog.

8. Recreate Named Boundaries for the second segment of the project in the proper group.
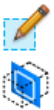
   a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

   b. Select the **Civil Cross Section** mode.

      ▪ *Drawing Seed* = **ANSI D_XS** *[A1_XS]*

      ▪ In the 2D view, select the north-south (LondonRd) alignment along which the cross section named boundaries will be created.

      ▪ *Detail Scale* = **1"=10'** *[1:100]*

      ▪ *Group* = **LondonRd**

      ▪ *Start Location* = **71+00** *[5+640]*

      ▪ *Stop Location* = **90+00** *[6+200]*

      ▪ *Bottom Clearance* = **10** *[3]* (This is a new setting to add space for the underground utilities!)

      ▪ **Disable** the *Create Drawing* option.

   c. *Follow the prompts* in the lower left corner **left click** to define the named boundaries. *Multiple left clicks are required*.

   TIP: Remember, the named boundaries are not created until you can see them in the 3D model!

9. Review the Cross Section Group.

a. Open the *Drawing Production > **Named Boundaries*** dialog.

b. Expand **Cross Section Groups**.

There is now only one group named *LondonRd* that contains all of the named boundaries.

WARNING: Cross sections are placed on the sheets in the same order the named boundaries are defined. If you need to add multiple cross section sets such as we did in this exercise they need to be in the correct station order.

10. Create Sheets from Named Boundaries dialog.

a. Select the **LondonRd** cross section group.

b. Disable the **Show Dialog** icon at the top of the *Named Boundaries* dialog.

TIP: When enabled, the background of the icon is slightly darker. Recall that when Show Dialog is enabled a dialog is shown where some drawing and sheet creation options can be adjusted. When disabled the default values from the active Drawing Seed are automatically used. The *Open Model* option defines if the last cross section sheet is automatically opened once all the sheets are created. This option is enabled by default.
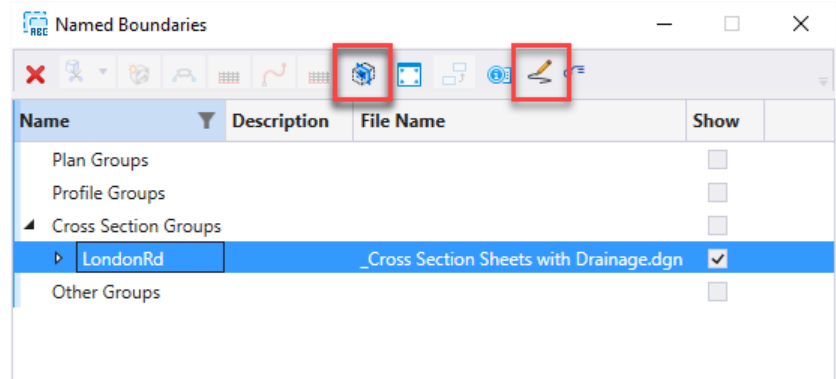
c. Select the **Create Cross Section Drawing** icon at the top of the dialog (or right click and select Create Cross Section Drawing).

The cross section *drawing* models and *sheet* models are created for all cross sections in the group.

The last cross section sheet appears.

TIP: A cross section at a single station such as a driveway or pipe location can be defined by setting the Start and Stop Location values to the same station. Skewed cross sections can be defined using the **Civil Cross Section 2 Point** mode.

d. Close the *Place Named Boundary Civil Cross Section* dialog.
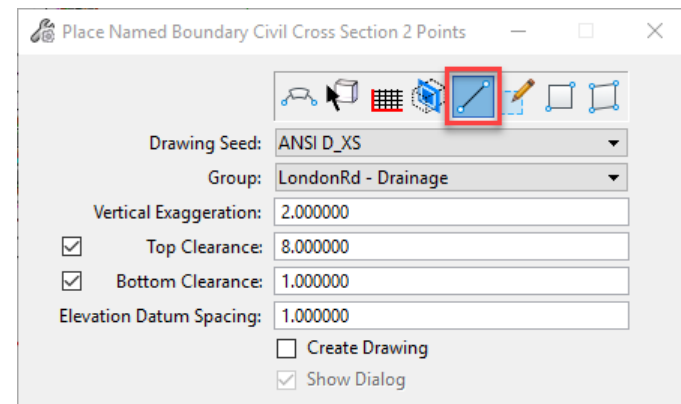
Review Cross Section including Underground Utilities

1. Use the *View Group* tool to select the *sheet* model **71+00.0000 [Sheet]** *[5+640.000 [Sheet]]*.

   Beginning at station *71+00 [5+640]*, observe the additional margin below the cross sections and the pipe utilities that existed in this area.

   Observe the drainage structures displayed in the cross sections at station *71+00 [5+640]*.

   The cross section at station *71+50 [5+660]* shows the cross section of the mainline pipe.
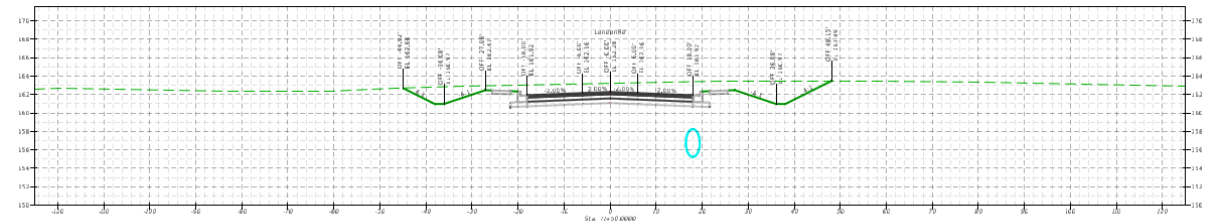
2. Use the *View Group* tool to select the *sheet* model **77+50.0000 [Sheet]** *[6+100.000 [Sheet]]*.

   Observe the cross section at station *78+50 [6+100]* which shows a manhole structure. However, also notice that the pipe is not visible because it is at a greater depth than the cross section shows. In this exercise the bottom clearance was set to *10 [3]*. Setting this to a larger value would allow the entire manhole structure and pipe to be visible.
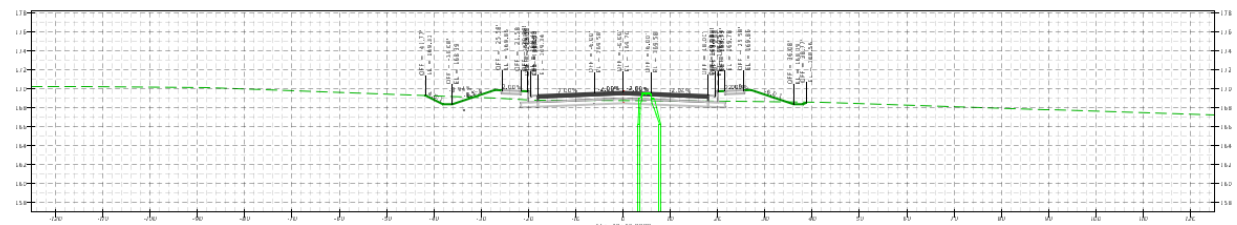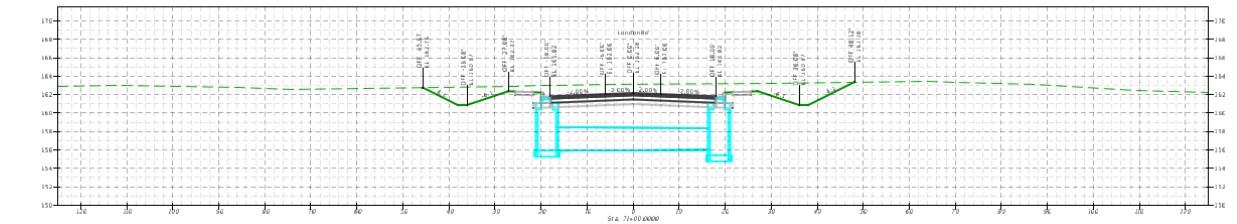
TIP: Remember that the cross sections are live references of the 3D model so if the model changes the cross section drawing and subsequently sheet models are automatically updated. This has many advantages including cross sections that are always up to date but also introduces some things we need to keep in mind when working with these live cross sections. One of those is how a dgn is saved. As a best practice, do not run *Save Settings* with a dgn showing a cross section sheet. When a dgn opens directly to a cross section sheet, the civil model(s) must be reprocessed to ensure the current model is shown on the cross sections. While this is not a problem, it can be slow and distracting.

Adding Additional Cross Sections

Sometimes you may want to add an additional cross section to existing cross sections you have already created. In this section, you will learn how to add an additional cross section to the cross section drawing models.

1. Delete existing cross section sheets (not the cross section drawing models just the sheets).

   a. Select *Home > Primary >* **Models** (this will open the Models dialog).

   b. Scroll down the list and select **ALL** Sheet Models.
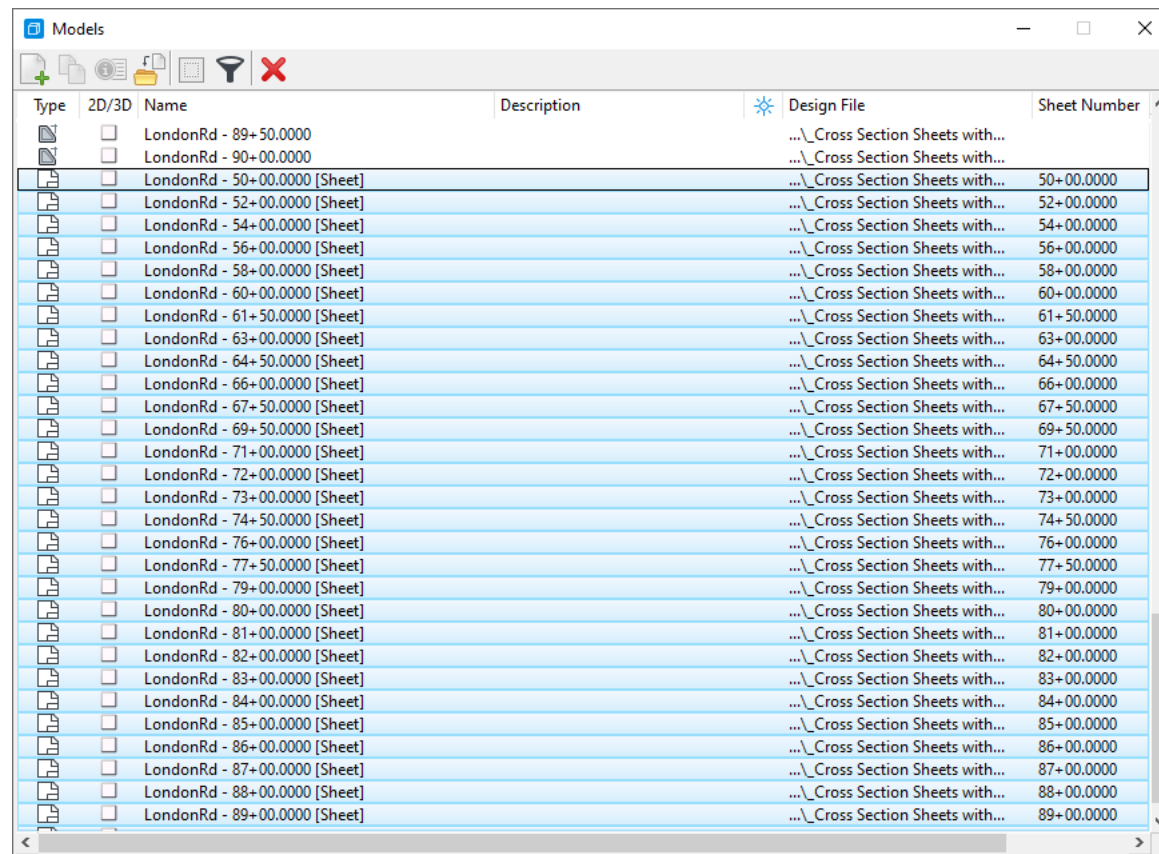
   c. Select the delete button. The sheets will be deleted. Close the **Models** dialog.

2. Create a new named boundary at the location you would like to add to the cross sections. In this example, we will create a new named boundary at the intersection of **Church Rd.** and **London Rd.** (The new named boundary needs to be added to the existing cross section named boundary group).
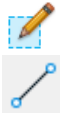
a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

b. Select the **Civil Cross Section 2 Points** mode. This will bring up the *Place Named Boundary Civil Cross Section 2 Points* dialog.
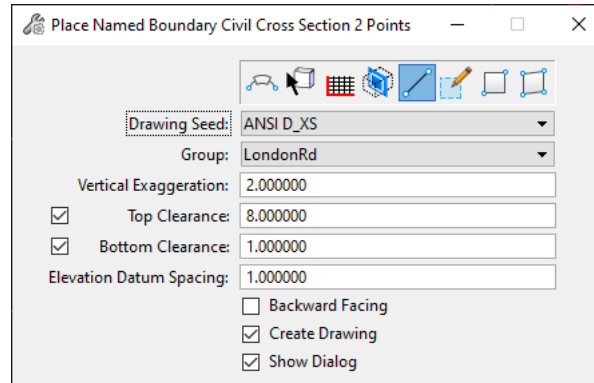
c. Follow the prompts at the bottom lower left of the screen:

- *Identify Path Element:* Select the **London Rd.** centerline alignment.

- *Enter First Point:* Select a point on the **Church Rd.** centerline alignment.

- *Enter Second Point:* Snap to the end point of the **Church Rd.** alignment where it intersects **London Rd.**

- *Accept/Reject. Data point in Plan View to place boundary:* **Left click.**

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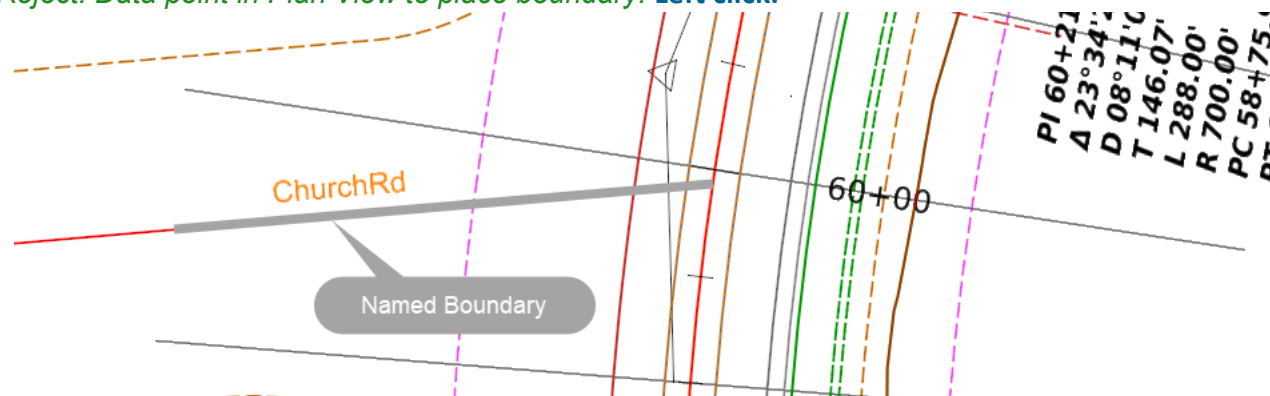
d. The **Create Drawing** dialog will now appear. Note the *View Name*, *Drawing Model Name* and *Sheet Model Name*. These list the **London Rd.** alignment name and the station.

e. In the Sheet Model portion of the dialog, toggle **OFF** *Create Sheet Model* (You don't want to create the sheets yet).

f. Click **OK** to create the new cross section drawing model for this location. The drawing will be created and opened for you to review.

3. Review the Drawing Models.

a. Use the *View Group* tool to review the *Drawing Models* and note the new Cross Section *Drawing Model* was added to the list.
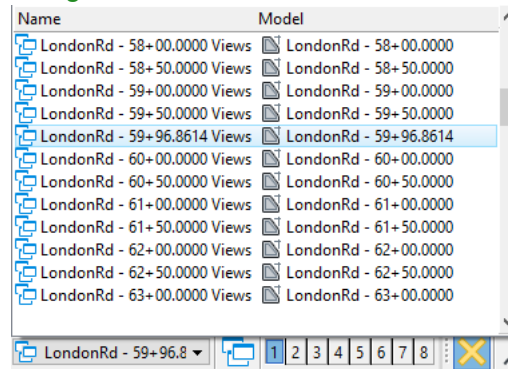
- When new drawing models are created they will be added and inserted into the existing drawing model list.

4. The next step is to re-create the cross section sheets.

a. Open the *Drawing Production > **Named Boundaries*** dialog.

b. Expand **Cross Section Groups**

c. **Right click** on the London Rd. cross section group and select **Create Cross Section Sheets from Drawings**
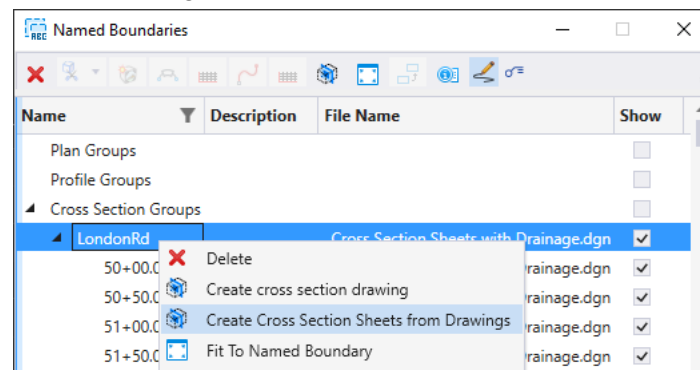
d. The *Create Sheets from Drawings* dialog will appear.

Create Sheets from Drawings	✕
Drawing Seed:	ANSI D_XS ▼
	Sheet Model
Model Name:	LondonRd - 50+00.0000-1
Seed Model:	Cross Section Sheet Definitions.dgnlib, A
☐ Filename:	(Active File)
Sheets:	(New) ▼
A	Full Size 1 = 1 ▼
Drawing Boundary:	ANSI D_XS ▼
Detail Scale :	1"=10' ▼
	☐ Add To Sheet Index
	☐ Make Sheet Coincident
	☑ Open Model
	OK Cancel
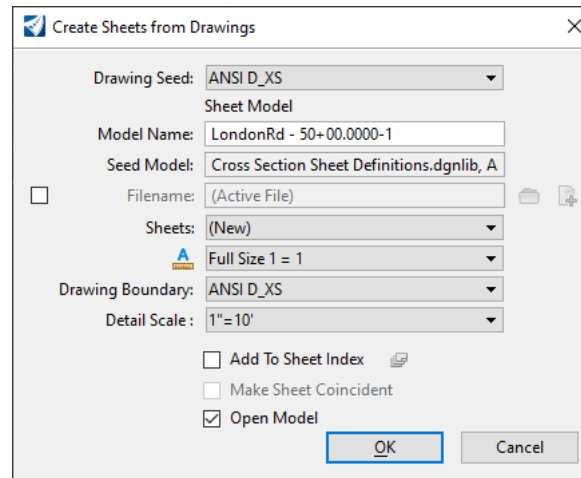
e. Click **OK** to create the sheets.

Cross Section Navigator

A new tool called *Cross Section Navigator* was added in **2021 Release 1** of the software. This tool allows you to easily navigate the cross section drawing models. It is a simple tool that only requires previously created cross section drawing models, an alignment and an open view. The open view is used to display the cross section drawing models as you navigate from station to station. In this section, you will learn how to navigate between cross section drawing models using the *Cross Section Navigator* tool.
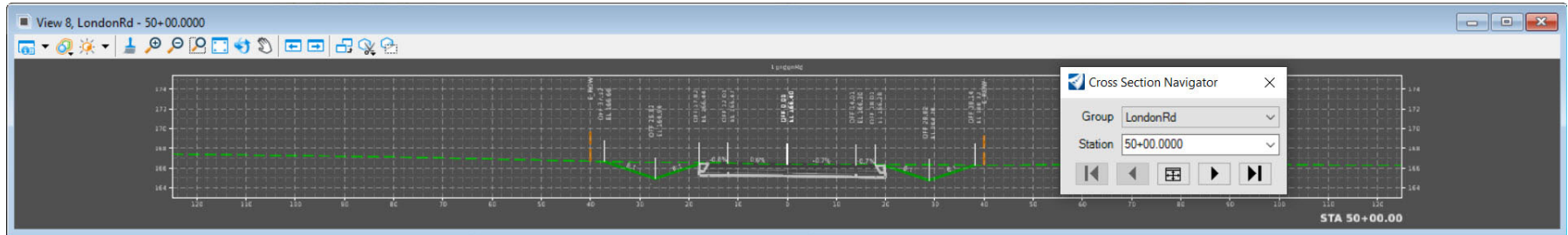
1. Navigate between cross section drawing models using the *Cross Section Navigator*.

    a. Return to the *Design* model by scrolling down the list and selecting **Multi-Model Views** from the *View Group* list to return directly to the multiple model view.

    b. Select *Drawing Production > Review >* **Cross Section Navigator**

    c. Follow the prompts:

    - *Locate Alignment:* In **View 1**, select the **London Rd.** alignment.

    - *Select or Open View:* Open **View 8** and left click in the view. **View 8** will open and display the cross section drawing model.
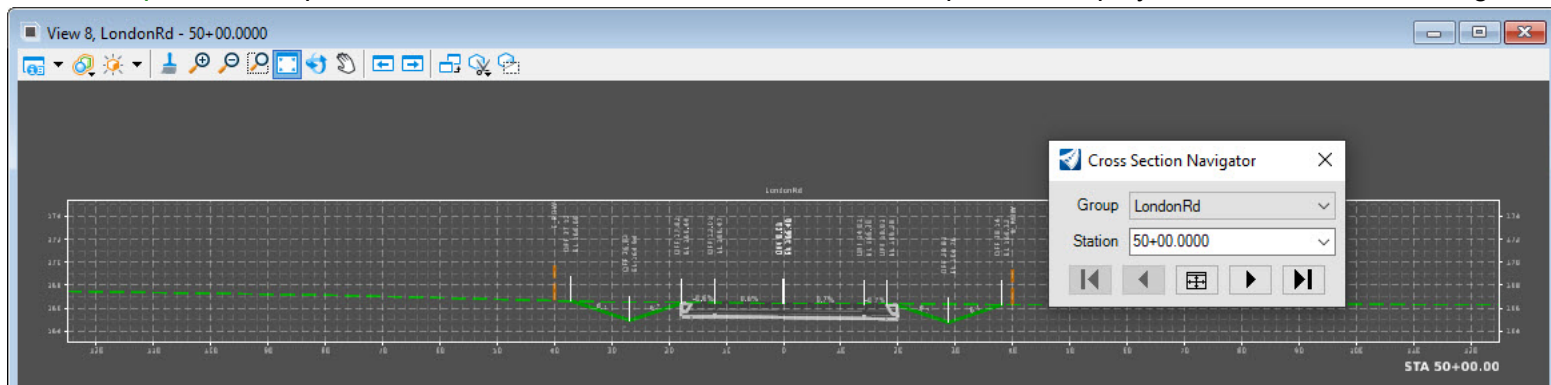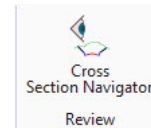
Note the *Cross Section Navigator* toolbox will appear. The toolbox features forward and backward buttons to navigate between cross section stations. The navigation button options include: *Next Cross Section*, *Previous Cross Section*, *First Cross Section* and *Last Cross Section*. There is also an option to fit the view. The *Station* portion of the dialog allows you to pick a cross section station directly from the list of available cross section drawing models. The *Group* portion of the toolbox displays the cross section group name.
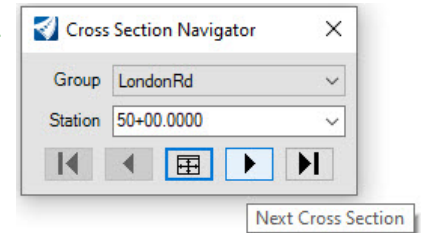
d. Use the navigation buttons to move forward to the next few stations.

e. Experiment with moving forwards and backwards to view the various cross section drawing models.

f. Use the *Station* portion of the *Cross Section Navigator* to view a specific station such as the additional cross section you added in the previous section.

g. Close the **Cross Section Navigator** tool and close **View 8** after reviewing the cross sections.

As you can see the tool is very simple and easy to use. It can be very useful for reviewing cross section drawing models and also can be useful as part of the cross section labeling process (which will be discussed later in the course).
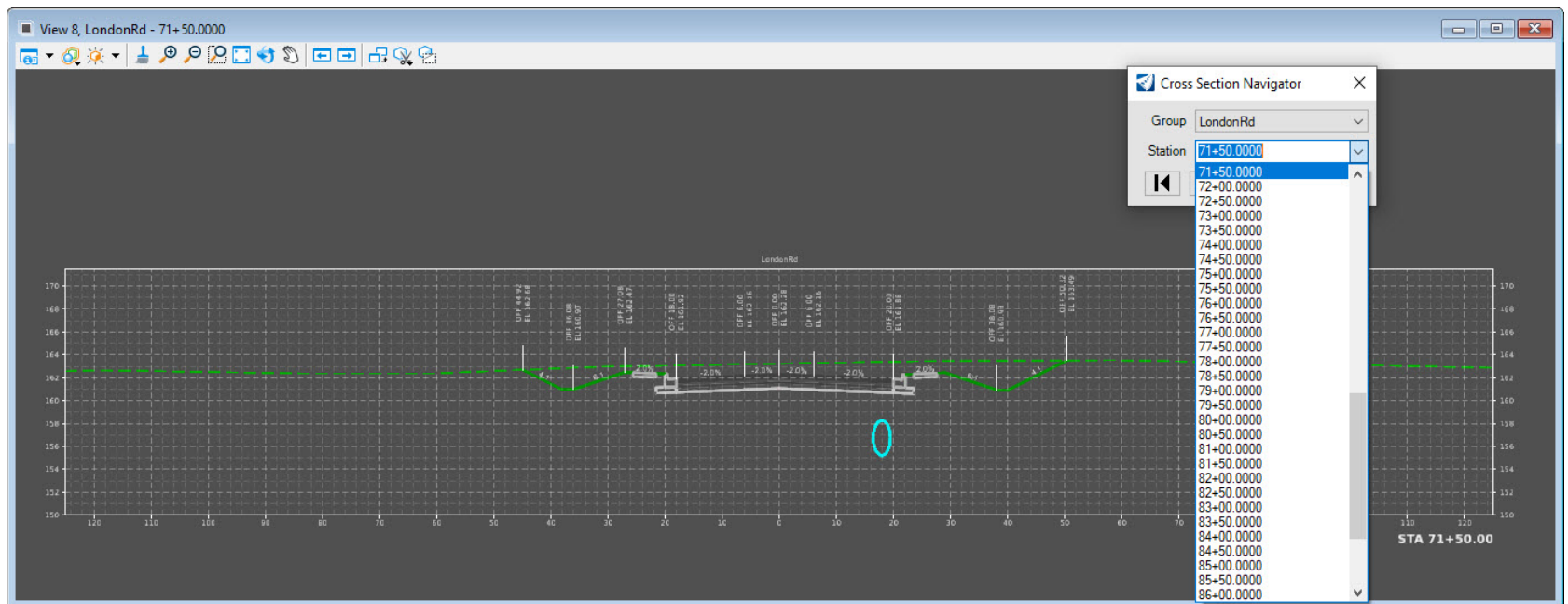
Exercise 2: Advanced Cross Section Sheets

Description

In this exercise you will learn about additional options for creating cross section sheets.

Skills Taught

- Create separate cross section sheets (one sheet per dgn).
- Create stacked cross section sheets (all cross sections in one sheet model).

Create Separate Cross Section Sheets

Some agencies like to have one cross section sheet per dgn. In this section you will learn how to create cross section sheets in separate dgn files.

1. Select **Open** and browse to the folder where you unzipped the dataset files and open the file **_Cross Section Sheets Separate.dgn** *[_Metric-Cross Section Sheets Separate.dgn]*.

2. Create Named Boundaries for the entire project. This is the same process as the previous exercise, with one minor change.

   a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

   b. Select the **Civil Cross Section** mode.

   c. Set *Drawing Seed* to **ANSI D_XS** *[A1_XS]*

   d. In the 2D view, select the north-south (LondonRd) alignment along which the cross section named boundaries will be created.

   e. Set the *Detail Scale* to **1"=10'** *[1:100]*

   f. Set the *Group* to **(New)**

   g. Set *Name* to **LondonRd**. (This name gets automatically populated with the name of the alignment selected)

   h. Set the *Start Location* to **50+00** *[5+000]*

   i. Set the *Stop Location* to **90+00** *[6+200]*

   j. **Enable** the *Create Drawing* option.

   k. **Enable** the *Show Dialog* option.

   l. *Follow the prompts* in the lower left corner **left click** to define the named boundaries. *Multiple left clicks are required.*

The *Create Drawing* will now appear.

m. **Enable** the **One Sheet Per DGN** option.

n. Select the **Browse Sheet Files Folder** option.

o. Browse to the **XS** folder. Each cross section sheet will be created in this folder.

p. Select the **XS** folder and click the **Select Folder** button.

q. Click **OK** to create the sheets.
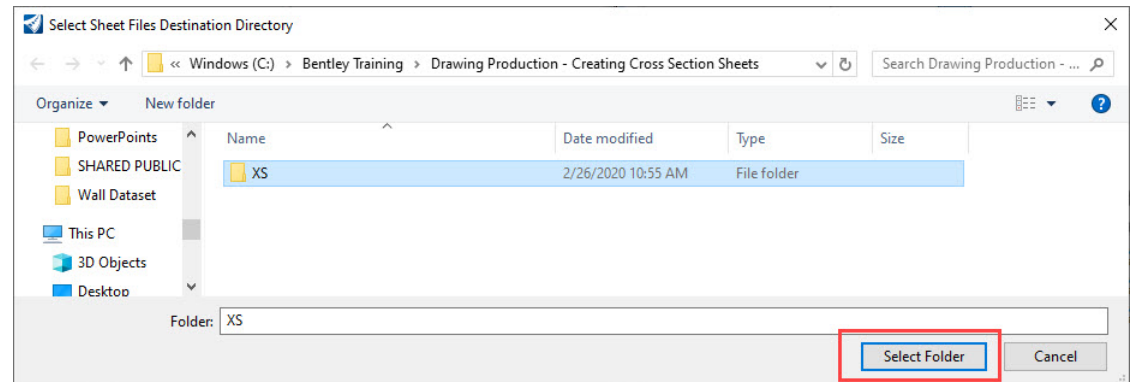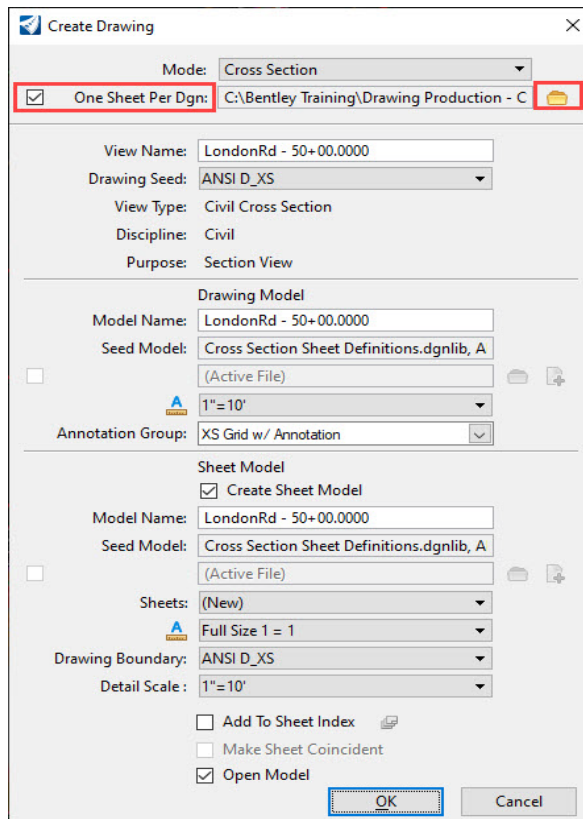
Each cross section sheet will now be created as a separate dgn file in the XS folder.

3. When the sheet creation process is complete, the last sheet created **LondonRd - 90+00.0000.dgn** *[6+200.dgn]* will open. Notice there is only one sheet model and one drawing model in the dgn file.

Name	Model
LondonRd - 90+00.0000 [Drawing] Views	LondonRd - 90+00.0000 [Drawing]
LondonRd - 90+00.0000 Views	LondonRd - 90+00.0000

4. Review the sheets in the **XS** folder. Notice the name of the sheets is based on the first station created on the sheet.
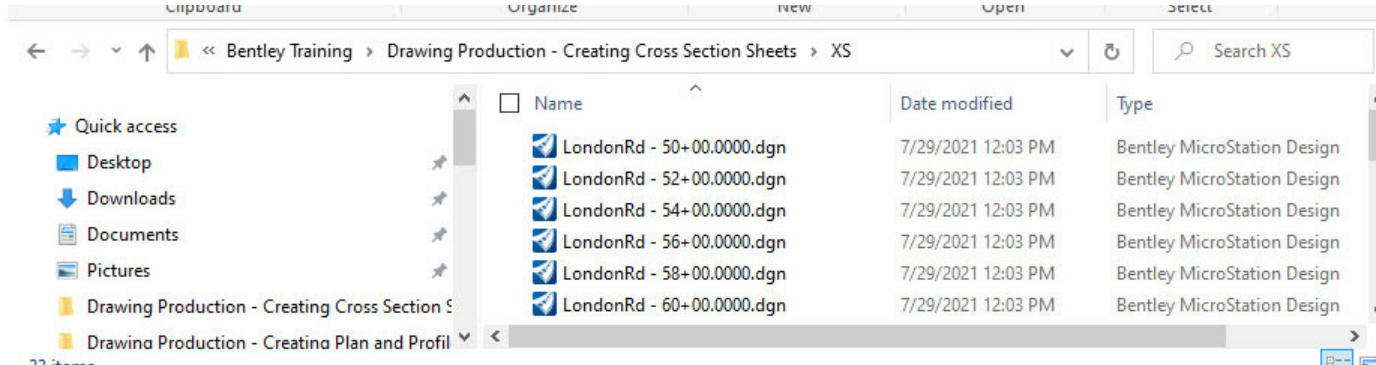
5. Open the Drawing Model for **LondonRd - 90+00** *[6+200].*

6. Review the reference files, notice that the **_Cross Section Sheets Separate.dgn** *[_Metric-Cross Section Sheets Separate.dgn]* 3D Model is attached as a reference. What you see in the drawing model and sheet model is being reference from the 3D Model.
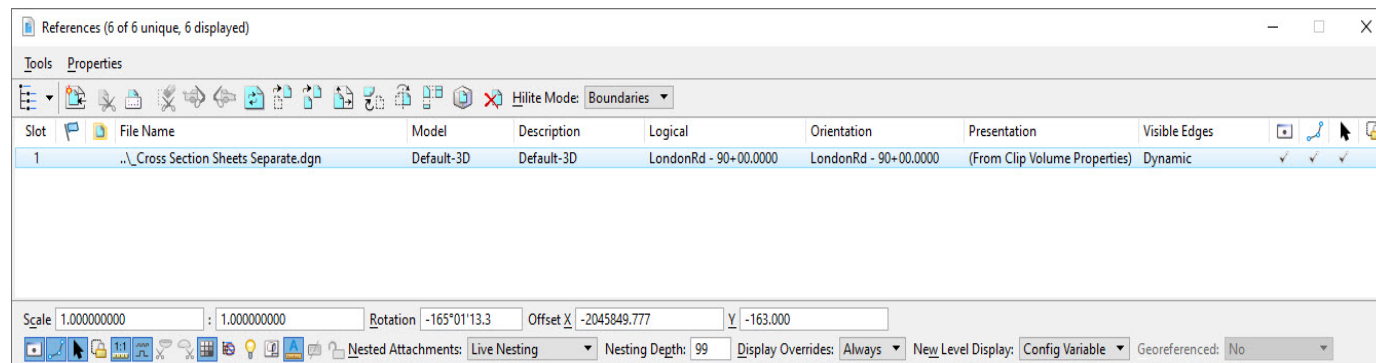
Important Note: Since the Named Boundaries were created in the **_Cross Section Sheets Separate.dgn** *[_Metric-Cross Section Sheets Separate.dgn]*, if you delete the Named Boundaries from that file the cross section sheet models and drawing models will lose their saved views and you will have to re-create the sheets.

Create Stacked Cross Sections

Sometimes it's necessary to create all cross sections stacked into one single sheet model. In this section, you will learn how to create stacked cross sections in one sheet model.

1. Select **Open** and browse to the folder where you unzipped the dataset files and open the file **_Cross Section Sheets Stacked.dgn** *[_Metric-Cross Section Sheets Stacked.dgn]*.

2. Create Named Boundaries for the entire project. This is the same process as the previous exercise, with one minor change.

   a. Select *Drawing Production > Named Boundaries > Named Boundary >* **Place Named Boundary**.

   b. Select the **Civil Cross Section** mode.

   c. Set *Drawing Seed* to **XS Stacked** *[XS Stacked]*

   d. In the 2D view, select the north-south (LondonRd) alignment along which the cross section named boundaries will be created.

   e. Set the *Detail Scale* to **1"=10'** *[1:100]*

   f. Set the *Group* to **(New)**

   g. Set *Name* to **LondonRd** (This name gets automatically populated with the name of the alignment selected)

   h. Set the *Start Location* to **50+00** *[5+000]*

   i. Set the *Stop Location* to **90+00** *[6+200]*

   j. **Enable** the *Create Drawing* option.

   k. **Enable** the *Show Dialog* option.

   l. *Follow the prompts* in the lower left corner **left click** to define the named boundaries and create the sheets. *Multiple left clicks are required*.

   m. The *Named Boundaries* will be created and *Create Drawing* dialog will appear.

   n. Change the *Sheet Model Name* to **LondonRd - Stacked XS**

   o. Click **OK**. The sheet creation process will begin. Once complete, all of the cross sections will be placed into one sheet model.

3. Zoom into the area where the cross sections are displayed and review the Sheet Model and Drawing Models. Notice that each drawing model is referenced into this one sheet model **LondonRd - Stacked XS Views**.

DO NOT DISTRIBUTE - Printing for student use is permitted
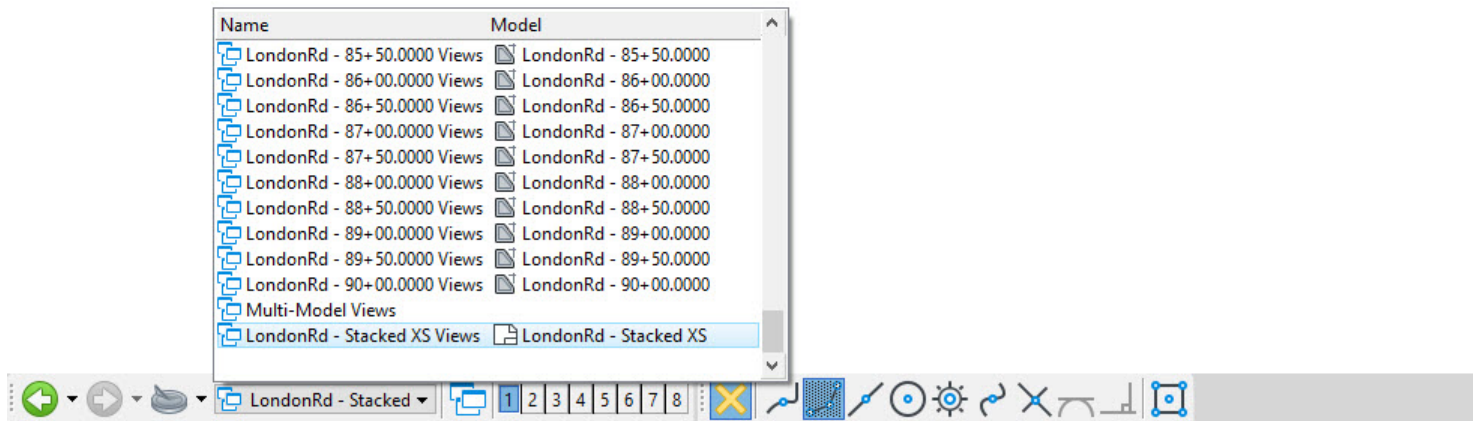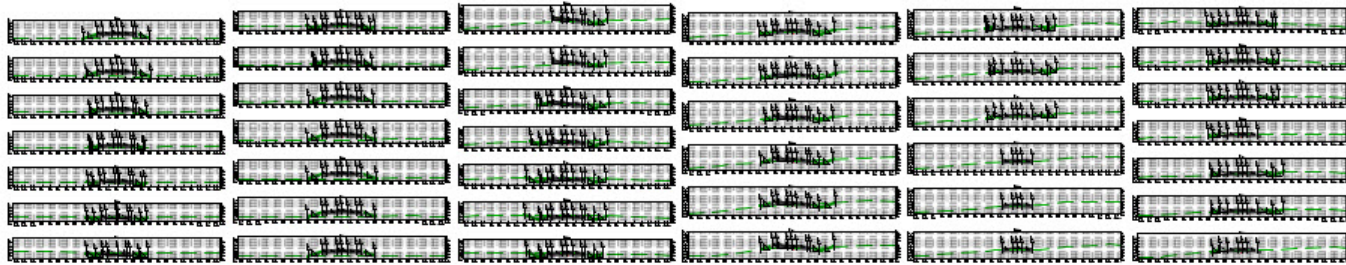
Exercise 3: Cross Section Annotation

Description

In this exercise you will learn how to update and add additional cross section annotation labels.

Skills Taught

- Update cross section sheets and annotation when the model changes

- Add additional bulk annotation that labels right of way locations and adds guardrail to cross section sheets

- Add individual annotation to a cross section using the Place Label tool and Civil Labeler tool

Updating Cross Section Annotation

Cross sections are a live slice of the 3D model and thus are updated automatically when the model changes.However, annotations are not a reference, they are lines and text stored in the drawing model that need to be redrawn when the cross sections change. Redrawing all of the annotations automatically every time the 3D model changes would cause unnecessarily processing. Therefore, the redraw or update cross section annotation process is left up to the designer to decide when to invoke.

---

1. Select **Open** and browse to the folder where you unzipped the dataset files and open the file **_Cross Section Sheets with Drainage.dgn** *[_Metric-Cross Section Sheets with Drainage.dgn]*.

2. Use the *View Group* tool to select the *sheet* model **LondonRd - 52+00.0000 [Sheet]** *[5+080.000 [Sheet]]*.

Observe that the right edge of pavement is currently at an *18' [5.4m]* offset which comes from a *6' [1.8m]* center lane plus a *12' [3.6m]* driving lane.
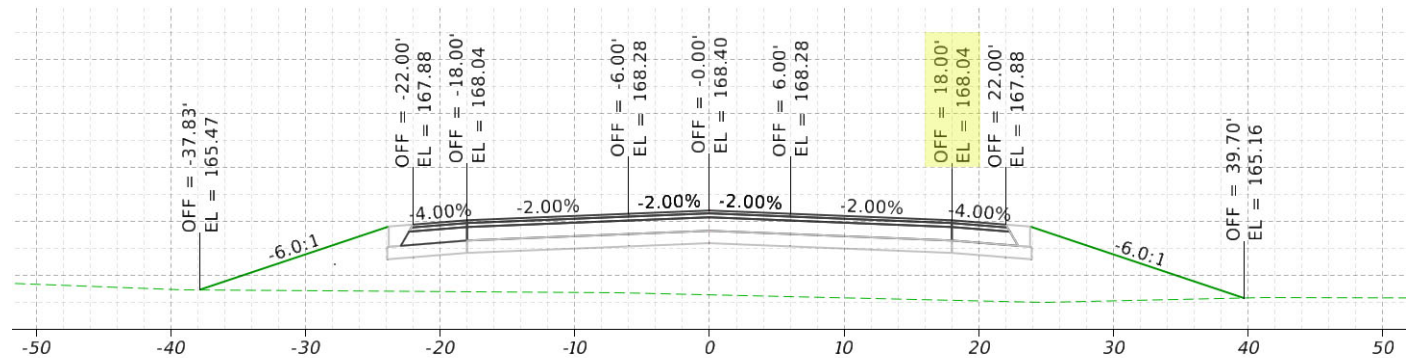
3. Change the driving lane to a *14' [4.2m]* width in the 3D model.

   a. Select **Open**.

   b. Browse and open the file **Corridor-LondonRd.dgn** *[Metric-Corridor-LondonRd.dgn]*.

   c. Select *Corridors > Edit >* **Corridor Objects**.

   d. Following the prompts, left click to select the corridor along London Rd in View 1 (2D view).

   e. Select **Parametric Constraint** in the *Corridor Objects* dialog.

   A parametric constraint for the right pavement width has already been defined but is currently disabled.

f. Select the **Pavt Width_R** Constraint Label in the grid.

g. Enable the parametric constraint by selecting the *Enabled* box in the parameters or changing the value in the grid from *False* to **True**.

The model is reprocessed with the new pavement width.

h. Close the *Corridor Objects* dialog.

Corridor Objects - LondonRd

	Constraint Label	Enabled	Start Value	Stop Value	Start Sta
Template Drop	Lane A Width_R	True	0.0100	6.0000	50+00.00
Secondary Alignment	Shld Slope_L	True			50+00.00
Key Station	Shld Slope_R	True			50+00.00
Parametric Constraint	Shld Width_L	True	-4.0000	-4.0000	50+00.00
Point Control	Shld Width_R	True	4.0000	4.0000	50+00.00
Curve Widening	Ditch Bottom Wid...	True	0.0000	0.0000	50+00.00
End Condition Exception	Ditch Bottom Wid...	True	0.0000	0.0000	50+00.00
External Reference	Pavt Width_R	True	14.0000	14.0000	50+00.00
Clipping Reference					

Row: |◄ ◄ | 15 | of 15 | ► ►|

Parametric Constraint

Enabled	☑
Constraint Label	Pavt Width_R
Start Value	14.0000
Stop Value	14.0000

Station Range

Start Station	50+00.0000
End Station	98+55.1889

Close

4. Select **Go to Previous View Group** the lower left corner to quickly return to the cross section sheet. In this situation the view group was in a different file but that does not matter, the software will automatically open the necessary dgn.

The cross section is automatically updated with the new model with the *14' [4.2m]* lane width. The arrow points at this location. However, the annotation still shows an offset of *18' [5.4m]* reflecting the *12' [3.6m]* lane width.
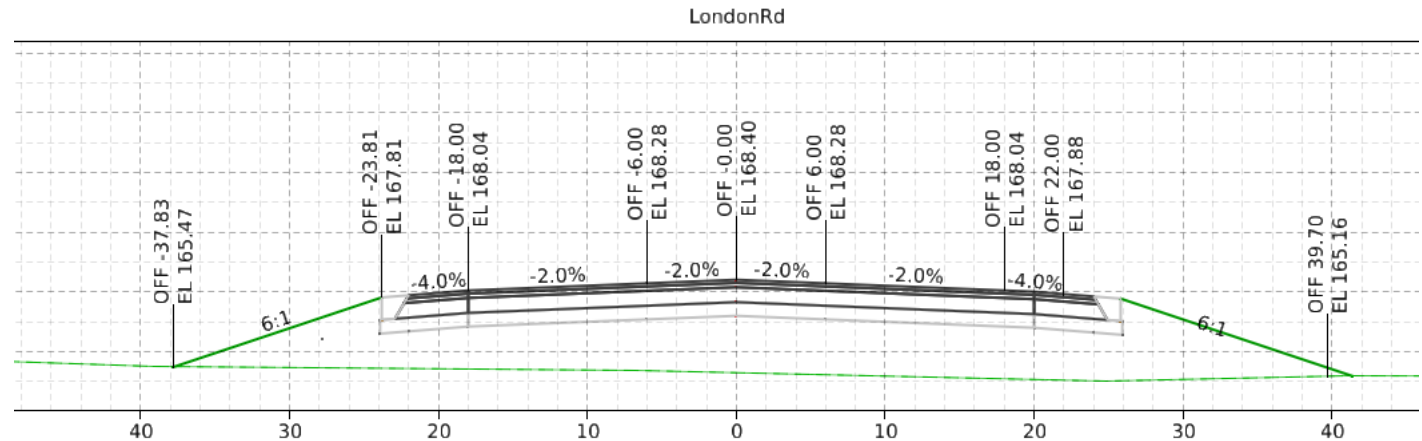
LondonRd

5. Update the cross section annotation.

a. Use the *View Group* tool or the *Cross Section Navigator* tool to view the *drawing* model **LondonRd - 52+50.0000** *[5+100.000]*.

b. **Fit** the view or zoom in to the better see the annotations.

c. Select *Drawing Production > Annotations > Model Annotation >* **Remove Model Annotations** to delete the existing annotations.

d. Following the heads up prompting, set *All Drawing Models* to **Yes** and left click to accept.

   When set to Yes annotations in all of the cross section drawing models are deleted, not just the active cross section at *52+50 [5+100]*. Set the value to No so that only the active cross section model will be updated.

e. Select *Drawing Production > Annotations > Model Annotation >* **Annotate Model**.

f. Following the heads up prompting, set *All Drawing Models* to **Yes** and left click to accept.

g. Following the heads up prompting, set *Annotation Group* to **XS Grid w/ Annotation** and left click to accept.

   This process will take a minute or so because all cross section models are being annotated based on the selected Annotation Group. These are the same annotation settings that are used when creating cross sections with the *ANSI D_XS* Drawing Seed.

6. Select **Go to Previous View Group** the lower left corner to return to the cross section sheet.

The annotation is updated to correctly label the *14' [4.2m]* lane width.
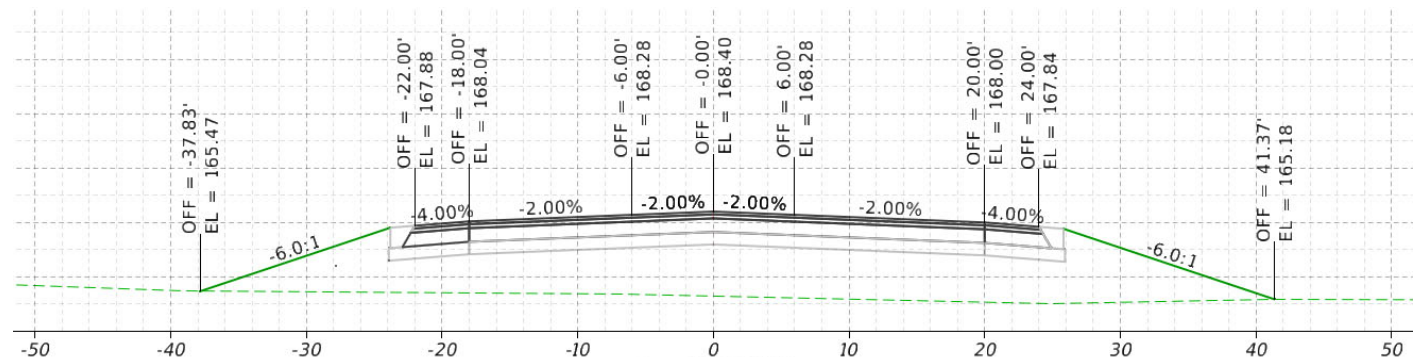
Add Right of Way Annotation to Cross Sections

The annotation group defines what is annotated on a cross section. Annotation can be setup for points, linear elements, and grids. Annotation groups allow multiple annotation definitions in a single annotated group so different points, slopes, and grids can be annotated all at once. In this exercise a new annotation labeling right of way and guardrail locations will be added to the cross sections. The right of way and guardrail annotations are defined in a different annotation group.

Annotation Groups are defined in a dgnlib. Setting up annotations groups is not part of this course but is available in other Bentley courses.

---

1. Use the *View Group* tool or the *Cross Section Navigator* tool to view the *drawing* model **LondonRd - 71+00** *[5+640]*.

   It does not matter which drawing model is active to annotate cross sections as long as you are annotating the entire cross section set. You must be in a drawing model to run the annotation, but it can be ANY drawing model. We selected the **LondonRd - 71+00** *[5+640]* model here but it could have been any model. Remember the previous exercise? We used the **LondonRd - 52+50.0000** *[5+080.000]* model then.

2. **Fit** the view.

3. Update the cross section annotation.

   a. Select *Drawing Production > Annotations > Model Annotation >* **Annotate Model**.

   b. Following the heads up prompting, set *All Drawing Models* to **Yes** and left click to accept.

   c. Following the heads up prompting, set *Annotation Group* to **XS R/W GRail and Cbl Bar Annotation** and left click to accept.

   Note: The annotation processing window will appear showing the progress of the annotation. Once complete, you will see additional annotation. This does take a minute or so as the design model is searching for right of way, guardrail, and fences and the cross sections are annotated.

   This annotation group labels right of way, guardrail, and fence on cross sections. Different types of right of way, guardrail, and fences can automatically be annotated differently simply by assigning the geometry objects proper feature definitions.

   Notice that this time we did not delete the existing annotation. Instead we just added more annotation.
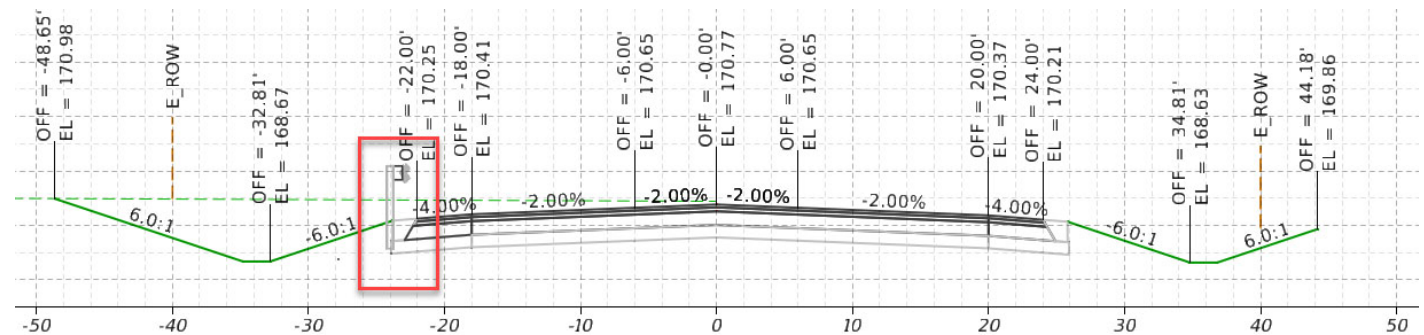
4. Use the *View Group* tool to select the sheet model **LondonRd - 71+00 [Sheet]** *5+640 [Sheet].*

Observe the Existing ROW annotations that have been added to the cross sections.
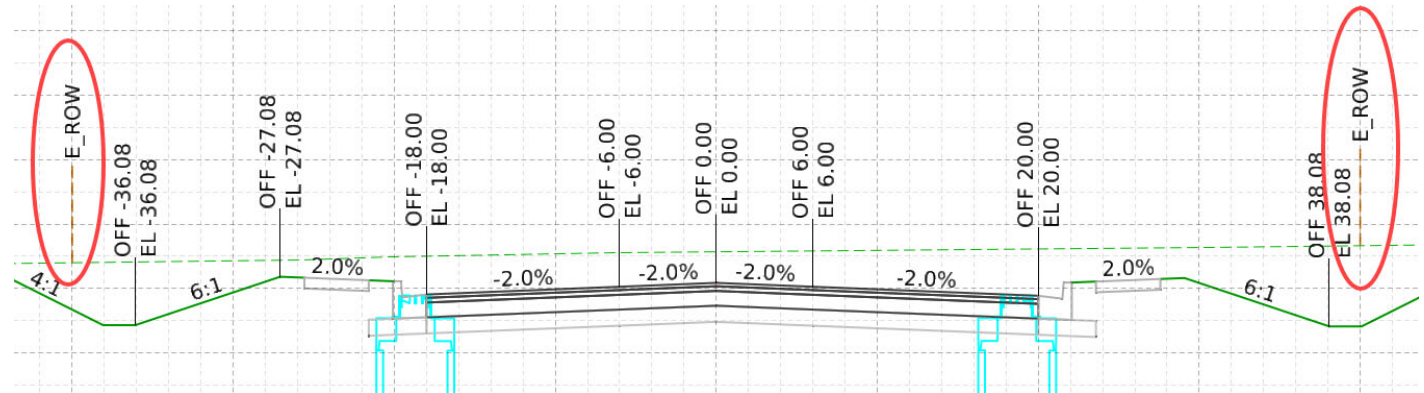
5. Use the *View Group* tool to select the sheet model **LondonRd - 58+00.0000 [Sheet]** *5+160.000 [Sheet]*.

Observe a guardrail cell has been added along the left side of the roadway.

Adding Individual Annotation

The annotation in the previous exercises is great for bulk annotation but what about those individual items that need to be annotated.

1. Use the *View Group* tool or the *Cross Section Navigator* tool to view the *drawing* model **LondonRd - 50+50** *[5+020]*.

   IMPORTANT: Annotation must be placed in the drawing model.

2. **Zoom** the view so that the bottom of the pavement layers is visible.

3. Select *Drawing Production > Notes >* **Place Label**.

4. Select the mode at the top of the dialog to place a label with or without a leader.

5. Set *Type* to **Cell**.

   TIP: It is recommended not to use the Text Favorites option in an OpenRoads environment. The Text Favorite is an intelligent reusable label that can report on MicroStation and OpenRoads objects. The Cell option still uses Text Favorites, but they are part of a cell that can contain additional graphics and text to place more complex labels such as a label containing both an offset and elevation.

6. Set *Cell Name* to **_Lbl_XS_Off-Elev**.

   TIP: All of the cross section annotation cells delivered in the workspace begin with _Lbl_XS.

   The Dimension Style is automatically set to the same value as the cell name if a dimension style with that name exists in the workspace, otherwise a Dimension Style can be manually selected. This workflow make placing labels very efficient and is a recommended way to setup a workspace.

7. Optionally set the *Label Rotation* and *Start At* as needed for the label.

8. Snap to the bottom left corner of the base surface component.
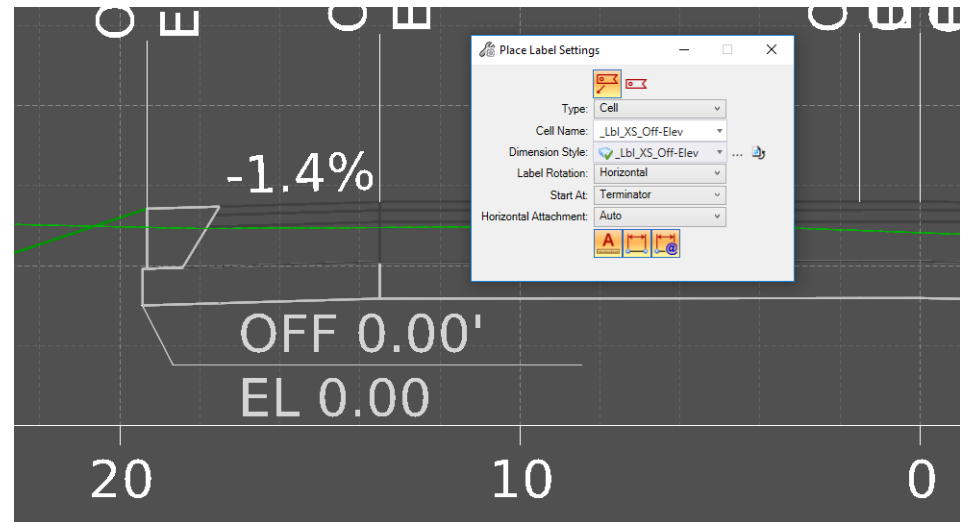
9. Left click to place the label.

The cell displays placeholder text for the offset and elevation until the label is placed as shown in the image to the right. Once placed, the text updates to the appropriate values for the point or object being labeled as shown in the image below.
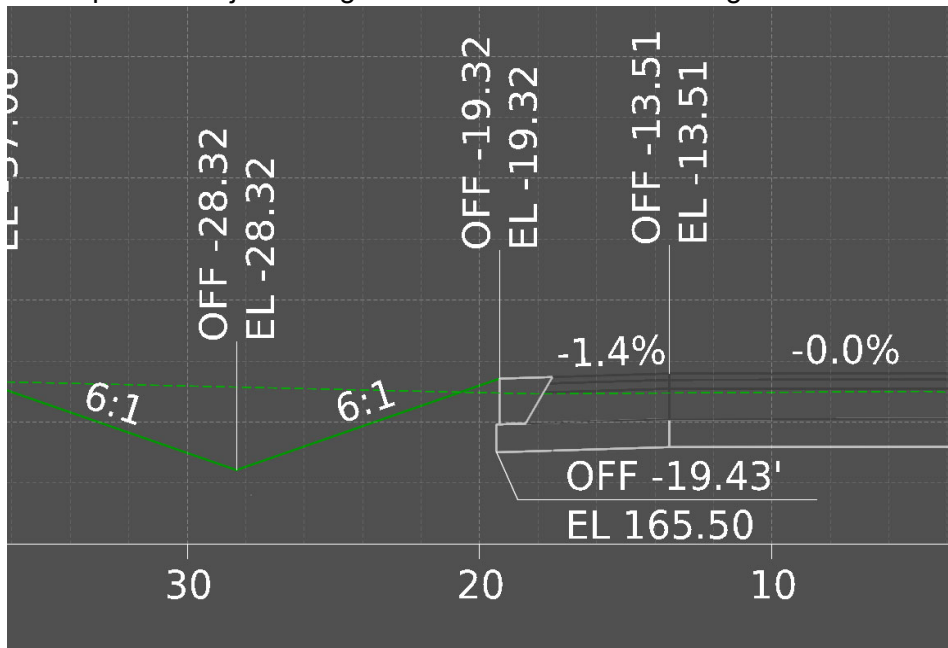
Note that the active level symbology is used when placing the label and its dimension leader.

Civil Labeler Tool (Technology Preview)

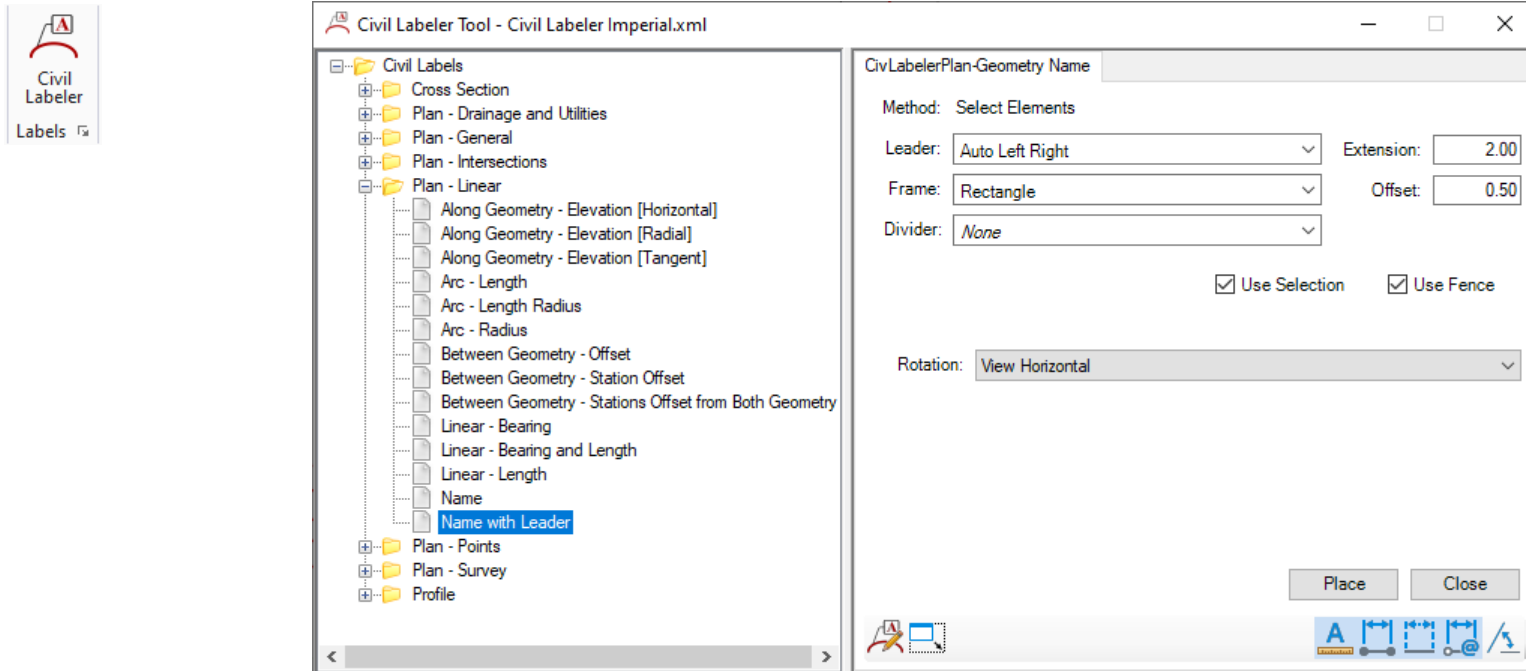The Civil Labeler tool provides extensive labeling capabilities made specifically for labeling civil data. The tool creates dynamic and intelligent labels that are easy to customize and can handle almost any label you would need. Label types are stored and managed in a user customizable **.xml** file.


The panel on the left side of dialog contains folders with various types of Plan, Profile and Cross Section labels. The panel on the right side of the dialog contains the settings for each label.

Place Labels with the Civil Labeler Tool

In this section, you will learn how to place labels using the civil labeler tool. It is a best practice to place labels in the Cross Section Drawing Models.

---

1. Use the Civil Labeler tool to annotate the offset and elevation of the right curb.

   a. Use the *Cross Section Navigator* to navigate to the cross section drawing model at station **71+50**.

   b. Select *Drawing Production > Labels > **Civil Labeler***

   c. Expand the *Civil Labels* folder to *Civil Labels > Cross Section*

   d. Select the label called **Offset Elevation [Horizontal]**.

   e. Set the *Rotation* option to **Horizontal**
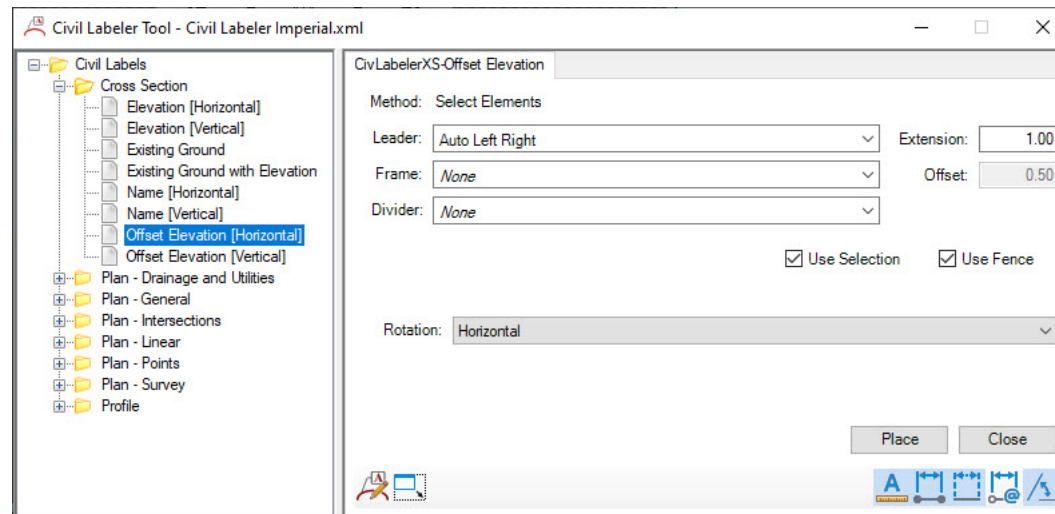
   f. Select **Place** and follow the prompts at the lower left corner of the screen.

   - *Identify point to label*: Select the point that represents the back top of the right curb.

   - *Place Label*: Place the label above and to the right of the top of curb.

g. Continuing in the command and follow the prompts. Place another label at the bottom front face of right curb (i.e gutter flowline).

- *Identify point to label*: Select the point that represents the bottom front face of the right curb.

- *Place Label*: Place the label below and to the right of the curb.
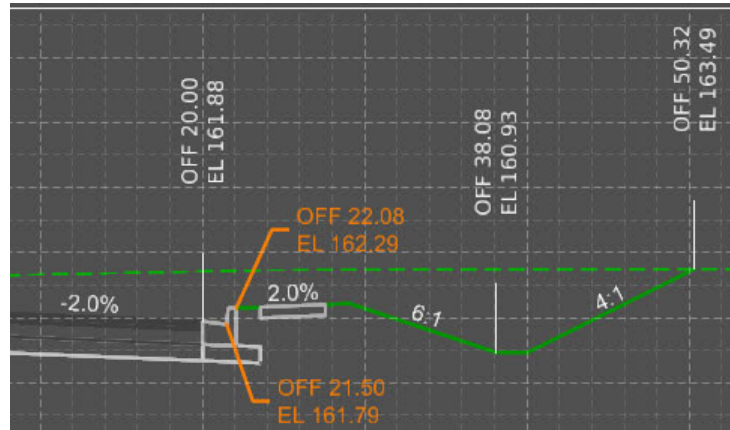
2. Label the offset and elevation of the drainage pipe.

a. Continuing in the command and follow the prompts. Place another label at the bottom of the drainage pipe.

- *Identify point to label*: Select a point at the bottom of the pipe.

- *Place Label*: Place the label below the pipe.
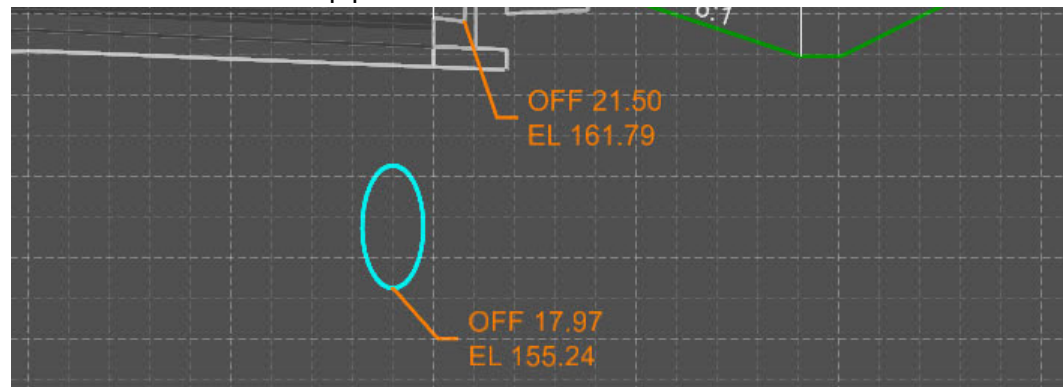
3. Experiment placing other types of labels such as **Existing Ground with Elevation** and **Elevation [Horizontal].**

Additional Information about the Civil Labeler Tool

A label is made up of 5 parts:

- *Anchor Point* - Origin point of the label used for computing text.

- *Leader* (optional) - Optional line and arrow connecting between the Text and the Anchor Point.

- *Text* - The label content which is made up of text, text fields, and graphics.

- *Frame* (optional) - Shape that can be placed around the civil label.

- *Divider* (optional) - Divider that can be used to split text within a civil label.

59+96.86 (LondonRd)
R1 46+89.30 (ChurchRd)

Frame   Text   Divider

Leader

Anchor Point
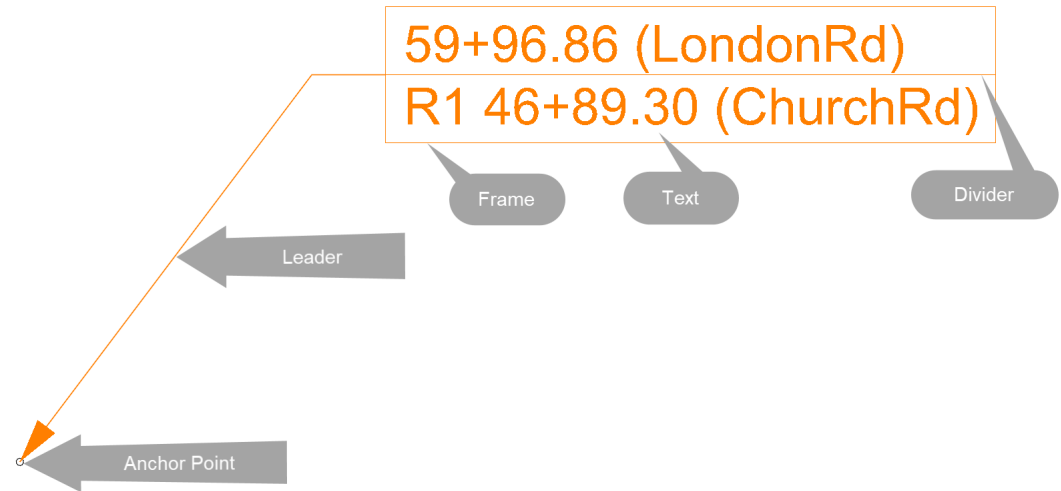
The five icons at the bottom right of the dialog define how the label behaves when the drawing scale is changed or when the referenced element changes.

- *Annotation Scale* - Labels created with this option enabled will scale when the *Annotation Scale* is adjusted.

- *Element Association* - Labels created with this option enabled AND the *Relative Association* option disabled will remain at their placement location when the reference element changes, only the leader line moves.

- *Annotation Association* - Labels created with this option enabled AND Element Association enabled will make the annotation associated to the element when the reference element changes. For example, if the reference element moves the label text will update.

- *Relative Association* - Labels created with this option enabled will remain at their relative location to the reference element when that reference element changes.

- *Rotational Association* - Labels created with this option enabled will ensure that if a reference element changes the label will maintain its relative rotation.

- The icon on the far lower left activates the **Civil Label Manager** which allows you to create new labels.

- The icon on the inner lower left activates *Collapse Mode*. When enabled the *Civil Labeler Tool* will collapse automatically after selecting the **Place** button.

Skills Assessment

The questions below will test your retention of the skills covered in this course.

---

1. Which of the following types of models are used when cross section sheets are created.

   a. Design Models

   b. Details Models

   c. Drawing Models

   d. Sheet Models

   e. Layout Models

2. The Named Boundary...

   a. Defines the extent of what is displayed on the cross section sheet.

   b. Defines the location where a cross section will be extracted from the 3D model.

   c. Is a live "slice" through the 3D model.

   d. All of the above.

3. The drawing seed defines default values and other parameters required to create sheets. Three drawing seeds for cross section drawings are included in the default training and examples workspace.

   a. True

   b. False

4. Labels should be placed in Drawing Models.

   a. True

   b. False

Skills Assessment - Answers

The answers to the skills assessment questions are highlighted below.

1. Which of the following types of models are used when cross section sheets are created.

    a. **Design Models**

    b. Details Models

    c. **Drawing Models**

    d. **Sheet Models**

    a. Layout Models

2. The Named Boundary...

    a. Defines the extent of what is displayed on the cross section sheet.

    b. Defines the location where a cross section will be extracted from the 3D model.

    c. Is a live "slice" through the 3D model.

    d. **All of the above.**

3. The drawing seed defines default values and other parameters required to create sheets. Three drawing seeds for cross section drawings are included in the default training and examples workspace.

    a. **True**

    b. False

4. Labels should be placed in Drawing Models.

    a. **True**

    b. False

Summary

In this course, you learned how to create and annotate cross section sheets. You learned how to create and edit Named Boundaries that were used to generate various cross section sheets. You also learned about drawing models and sheet models that are used during the sheet creation process. And lastly, you learned how to add individual annotations to label specific location coordinates, station-offset values, elevations, and more.