

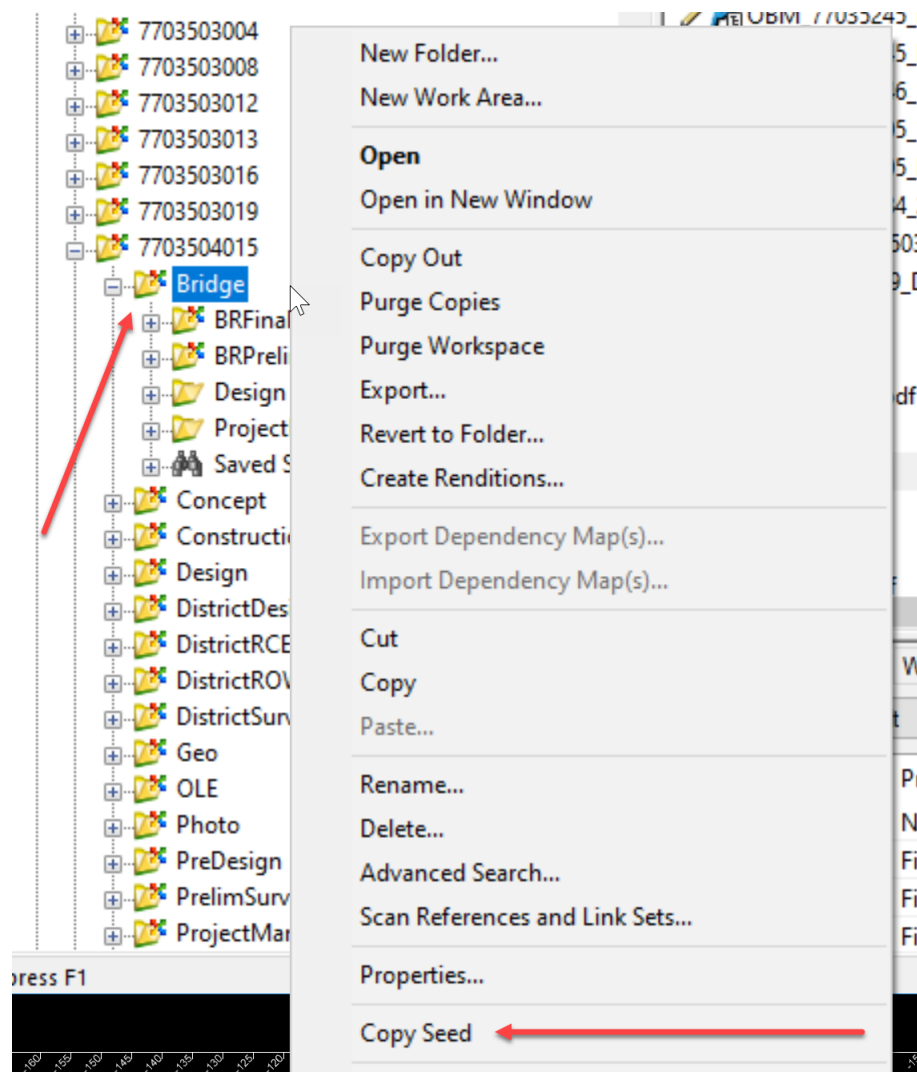
Setting up the MicroStation File to do Drainage Design.

These instructions were created on 4/28/2021. These instructions were created with:



OpenRoads Designer CONNECT Edition - 2020 Release 3 Update 9 - Version 10.09.00.91

The first step to doing a drainage design in CONNECT is to create the files needed to do our work in. In ProjectWise, use the Copy Seed tool. Navigate to the correct project directory for the project, right click on the project folder and select the Copy Seed command.



This will open this tool:

Copy Seed v.08

File Suffix:

Name of file to create (CCRRRPPP):
C=County, R=Route, P=Parenthesis

Location of file to create: Projects\7703504015\Bridge

Choose file type: ORD PIPE CULVERTS Seed

Extension of file to create: dgn Scale of file to create: Z08

Create File Exit

Next, name the file. For pipes, the naming convention for this file is
 ORD_CCRRRPPP_DOT_PIPE_CULVERTS_SPN. **ORD**=the version of MicroStation that the work is done in
CC=County **RRR**=Route **PPP**=Parenthesis **DOT**=company and or source of the file **PIPE_CULVERTS**=type
 of work **SPN**=coordinate projection of this project. For this example, the file will be
 ORD_77035309_DOT_PIPE_CULVERTS_Z08.dgn.

Copy Seed v.08

File Suffix:

Name of file to create (CCRRRPPP): ORD_77035309_DOT_PIPE_CULVERTS
C=County, R=Route, P=Parenthesis

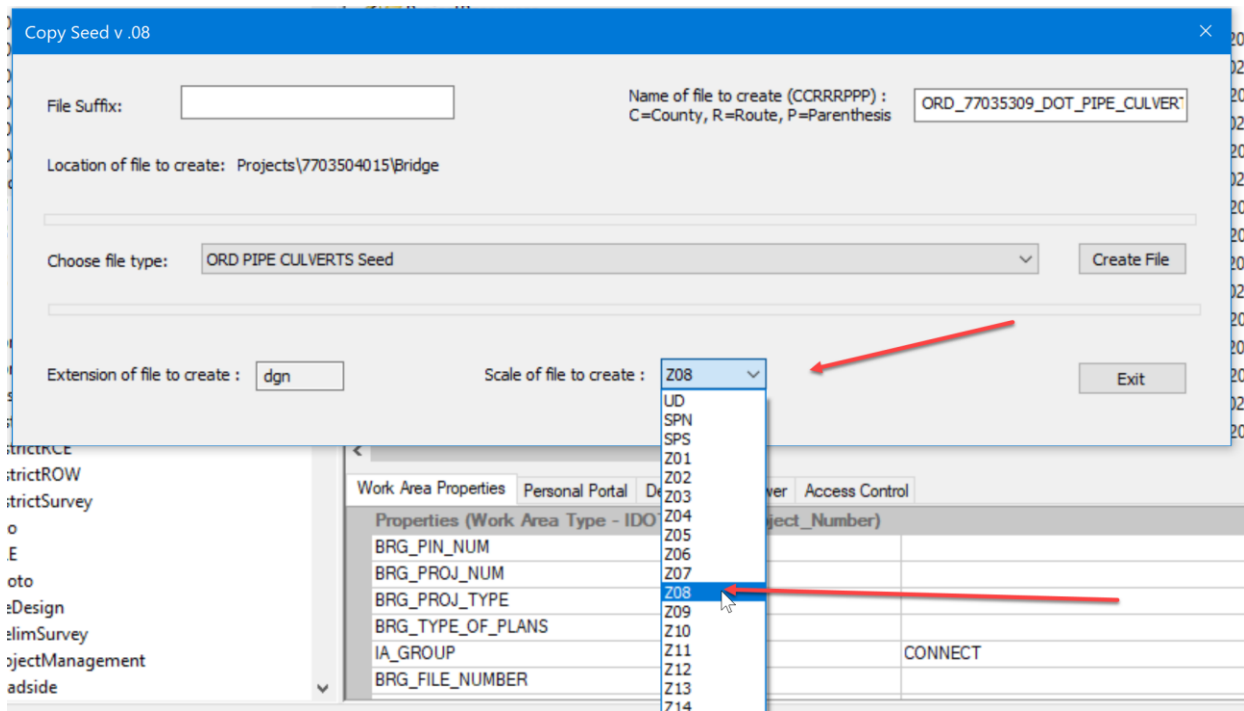
Location of file to create: Projects\7703504015\Bridge

Choose file type: ORD PIPE CULVERTS Seed

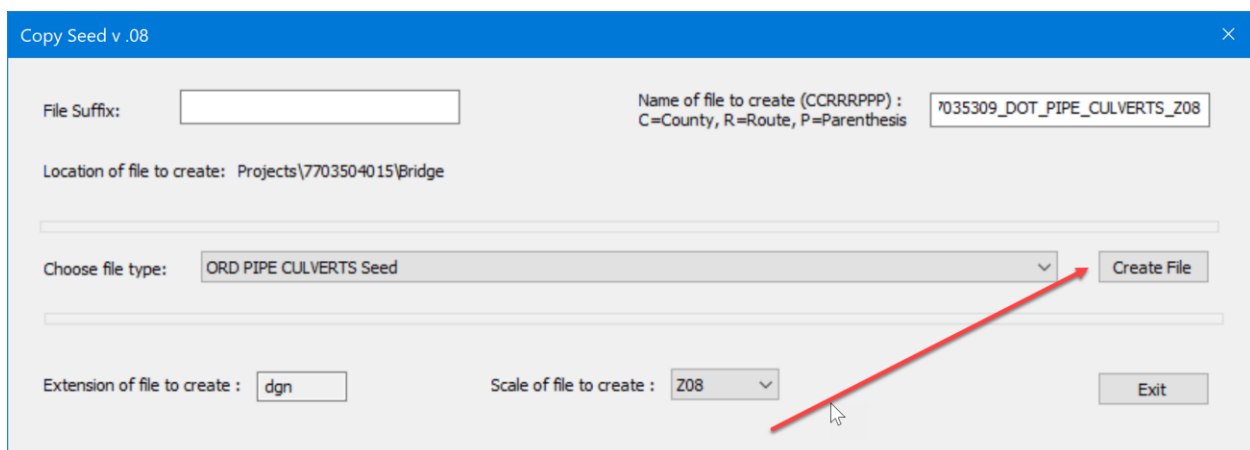
Extension of file to create: dgn Scale of file to create: Z08

Create File Exit

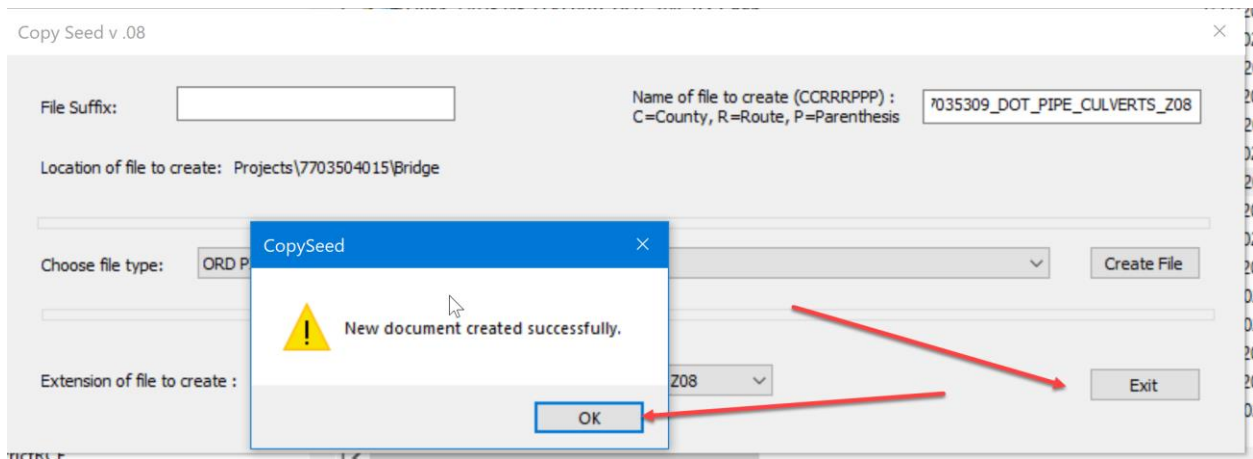
Next, select the correct file type. For this work, choose the ORD PIPE CULVERTS Seed.



Next, select the correct coordinate projection for this file. For this example, select Z08 for IaRCS Zone 08. Then click on the Create File button.



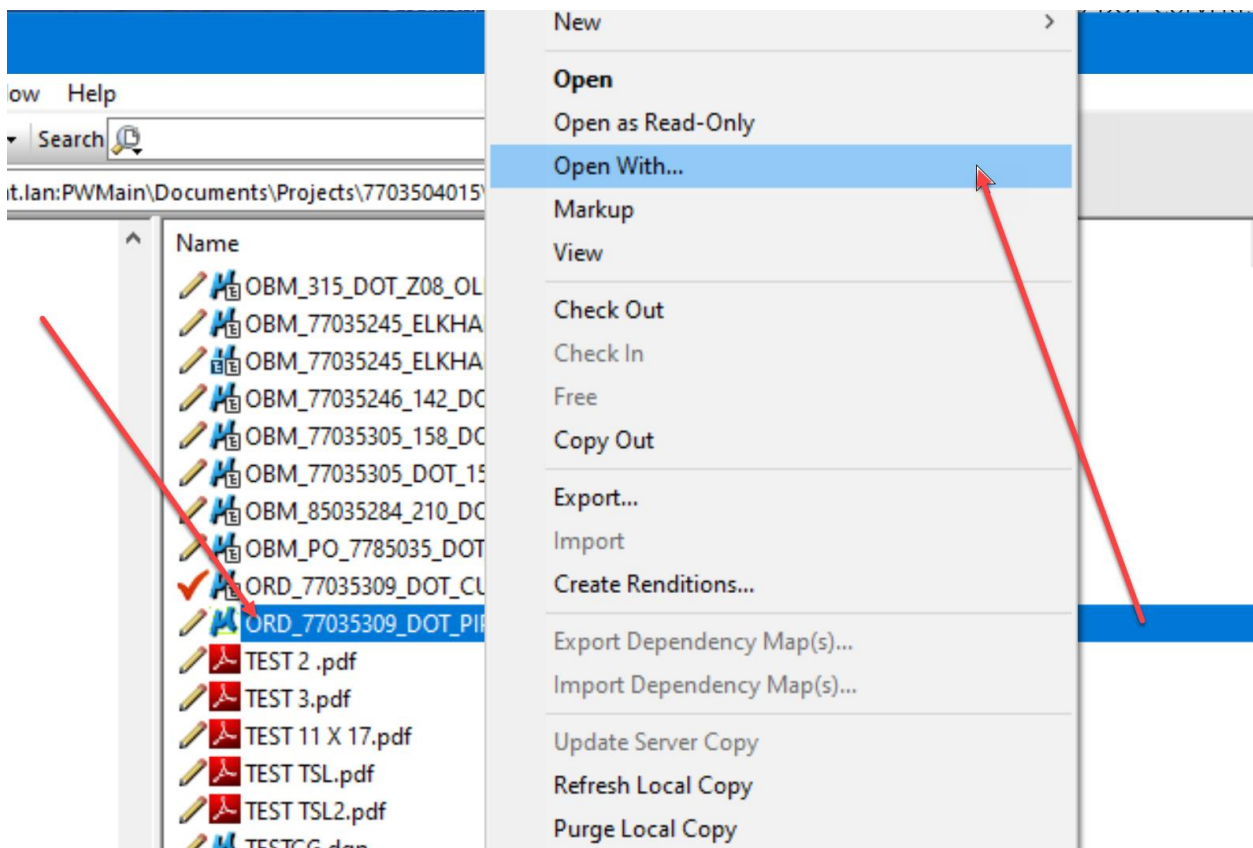
This will create the correct MicroStation file in the project directory. A message displays saying New document created successfully. Click ok on the message.



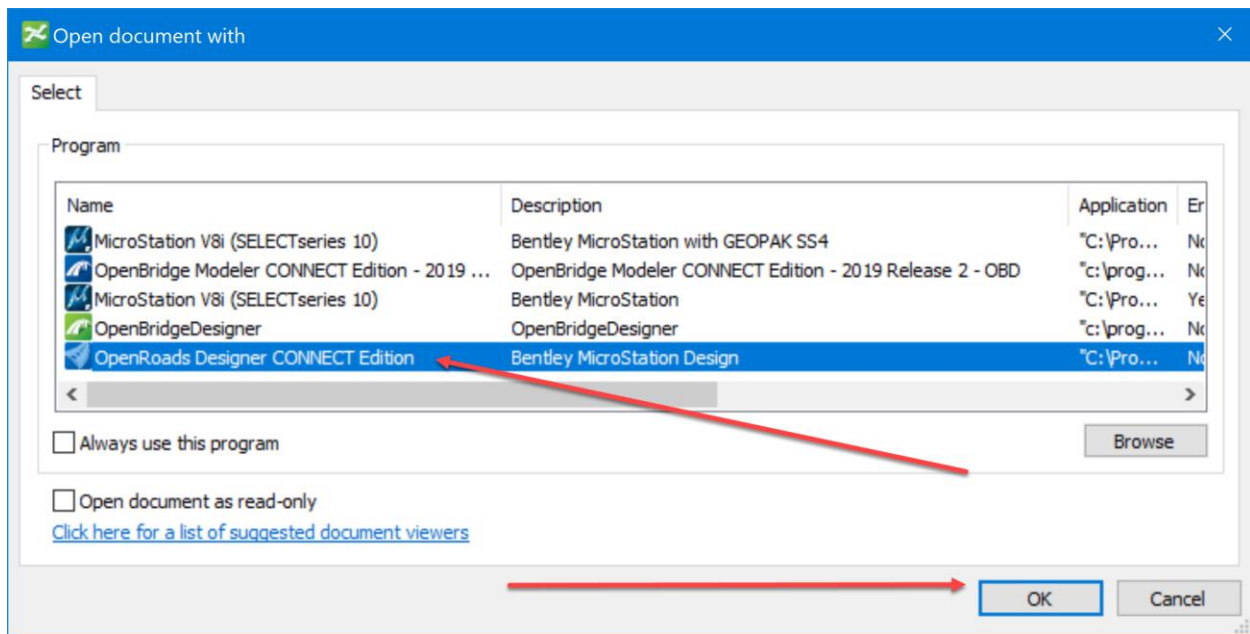
Then click on the Exit button to close the Copy Seed tool.

If your design includes RCB, Flume or drop basins, then repeat this process in order to create an ORD_CCRRRPPP_DOT_STRUCTURES_Z##.dgn file for these types of designs.

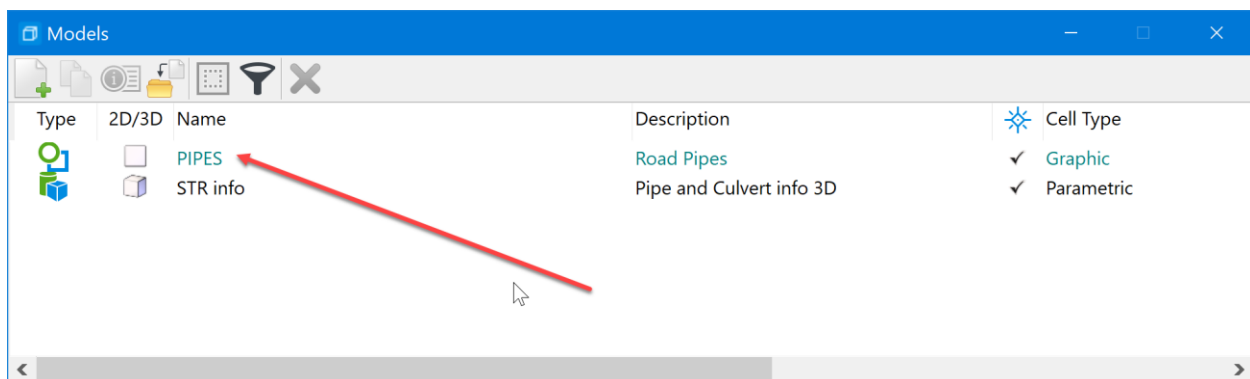
Once the MicroStation file is created, open it in the project directory. Select the file then right click and select the Open With option.



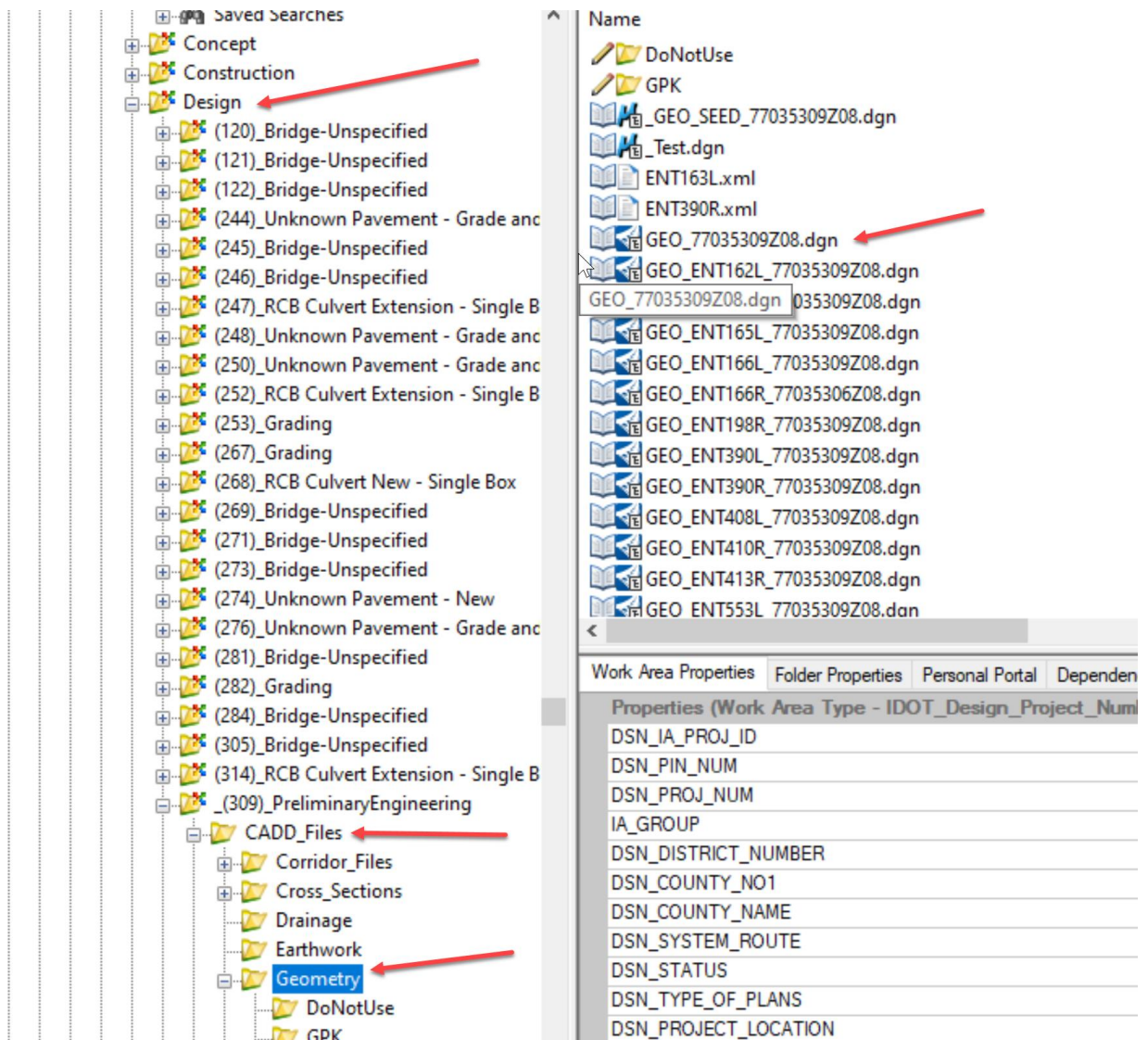
Next, select the OpenRoads Designer CONNECT Edition program. Then click on OK.



Now that the file is open, first set the file up to make a 3D cut of the proposed corridor and/or a dynamic section of the proposed corridor.



To perform either function: In the PIPES model, reference in the Road Design alignment that has an active profile, this file should be located in the Design folder under the CADD_Files\Geometry\ folder. Select the GEO Alignment file that is named GEO_CRRRPPZZZ.dgn. For this example, it will be GEO_77035309Z08.dgn



This is the container GEO file that will contain all the Alignments for this project.

Reference Attachment Properties for ...\\GEO_77035309Z08.dgn

File Name: PW_WORKDIR:d1035644\\GEO_77035309Z08.dgn

Full Path: c:\\pw_work\\pwmain\\ediedri\\d1035644\\GEO_77035309Z08.dgn

Model: Default

Logical Name:

Description: Master Model

Orientation:

View	Description
Coincident	Aligned with Master File
Coincident - World	Global Origin aligned with Master File
Geographic - AEC Transform	Calculated Transform, max error 2.355e+05 sf
Geographic - Reprojected	Reproject reference data to Master GCS
+ Standard Views	
Saved Views (none)	
Named Boundaries (none)	

Detail Scale: Full Size 1 = 1

Scale (Master:Ref): 1.000000000 : 1.000000000

Named Group:

Revision:

Level:

Nested Attachments: Live Nesting

Display Overrides: Allow

New Level Display: Use MS_REF_NEWLEVELDISPLAY Config

Global LineStyle Scale: Master

Synchronize View: Volume Only

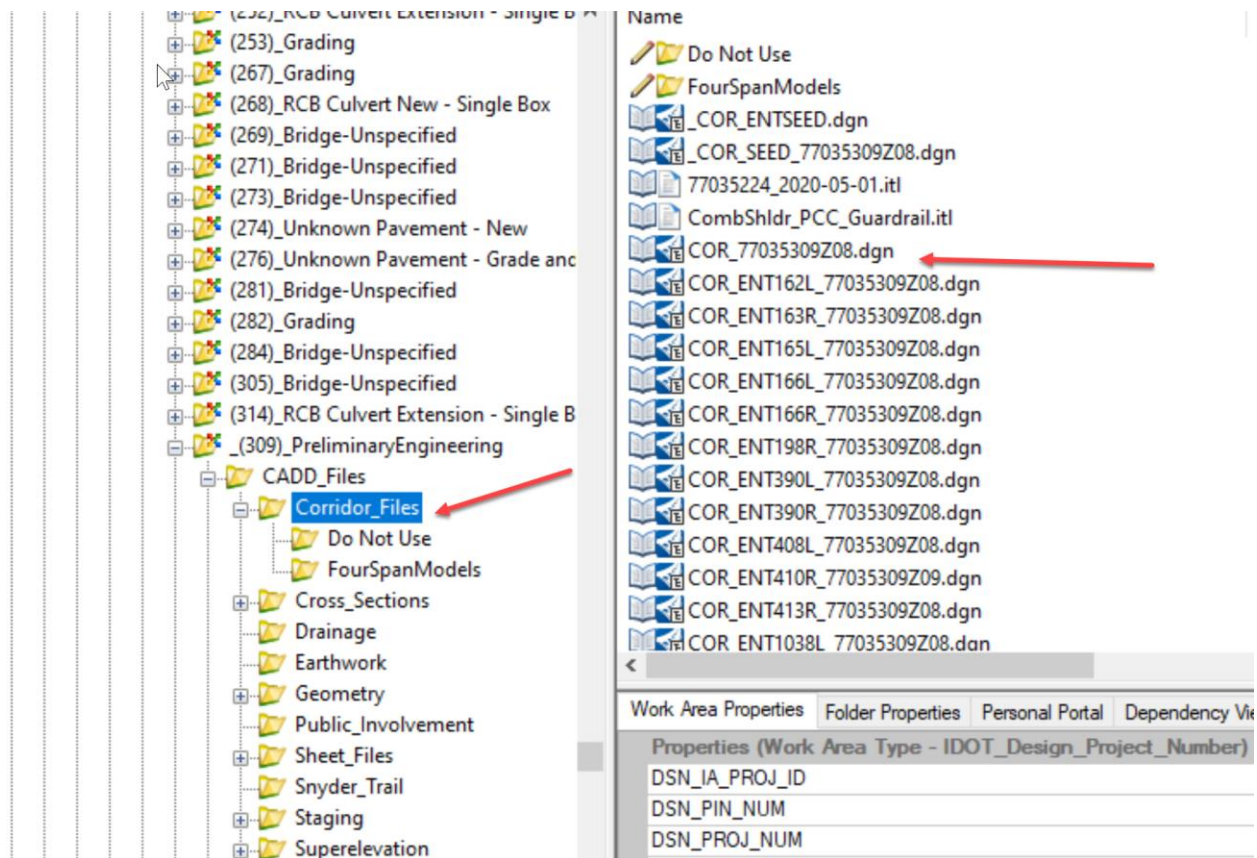
Nesting Depth: 1

Toggles

OK Cancel

Attach the GEO file using the orientation of Coincident World. Then turn on the live nesting and set its depth to 1.

Next, reference the proposed corridor container file. This file should be located in the Design folder under CADD_Files\Corridor_Files\ folder. Select the COR Corridor file that is named COR_CRRRPPZZZ.dgn. For this example, it will be COR_77035309Z08.dgn



This is the container COR file that will contain all the Corridor for this project.

Reference Attachment Properties for ...\\COR_77035309Z08.dgn

File Name: PW_WORKDIR:d1035641\\COR_77035309Z08.dgn

Full Path: c:\\pw_work\\pwmain\\ediedri\\d1035641\\COR_77035309Z08.dgn

Model: Default

Logical Name:

Description: Master Model

Orientation:

View	Description
Coincident	Aligned with Master File
Coincident - World	Global Origin aligned with Master File
Geographic - AEC Transform	Calculated Transform, max error 2.355e+05 sf
Geographic - Reprojected	Reproject reference data to Master GCS
+ Standard Views	
Saved Views (none)	
Named Boundaries (none)	

Detail Scale: Full Size 1 = 1

Scale (Master:Ref): 1.000000000 : 1.000000000

Named Group:

Revision:

Level:

Nested Attachments: Live Nesting

Display Overrides: Allow

New Level Display: Use MS_REF_NEWLEVELDISPLAY Config

Global LineStyle Scale: Master

Synchronize View: Volume Only

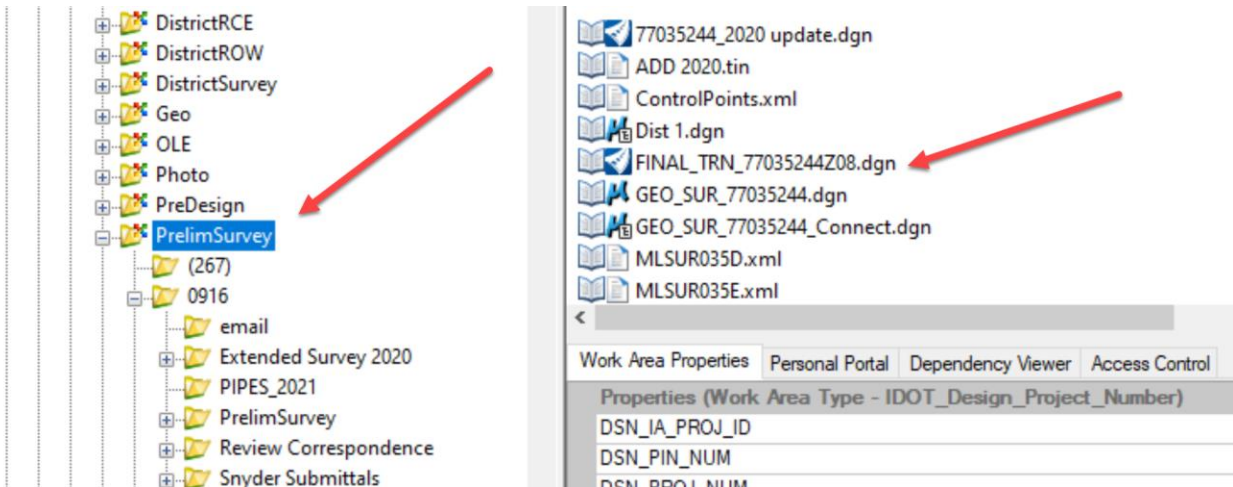
Nesting Depth: 1

Toggles

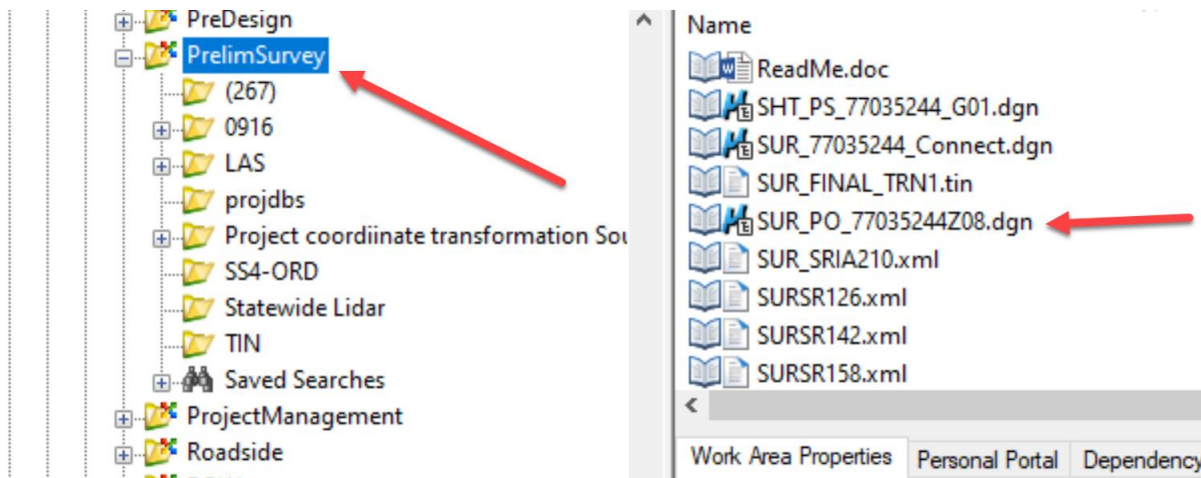
OK Cancel

Attach the COR file using the orientation of Coincident World. Then turn on the live nesting and set its depth to 1.

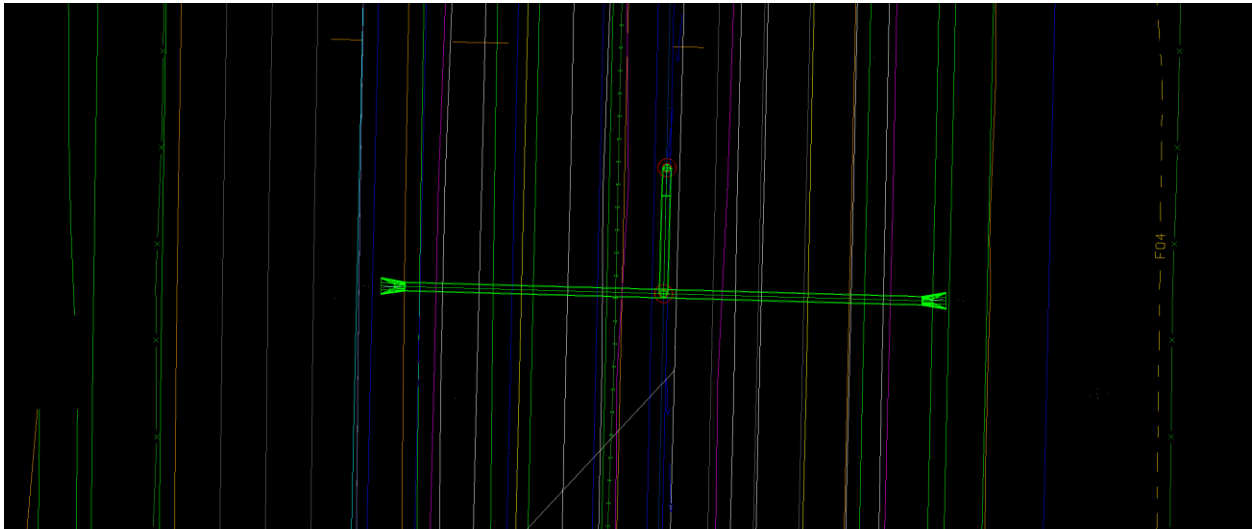
Next, reference in the existing ground. To do this, reference in the TRN file from the survey or Photo location. For this example, it is in the Prelim Survey folder and is called FINAL_TRN_77035244Z08.dgn



Next, attach the survey file that contains the existing 3D pipes and surrounding topo features that will be needed to do an effective design.



This should appear similar to below.

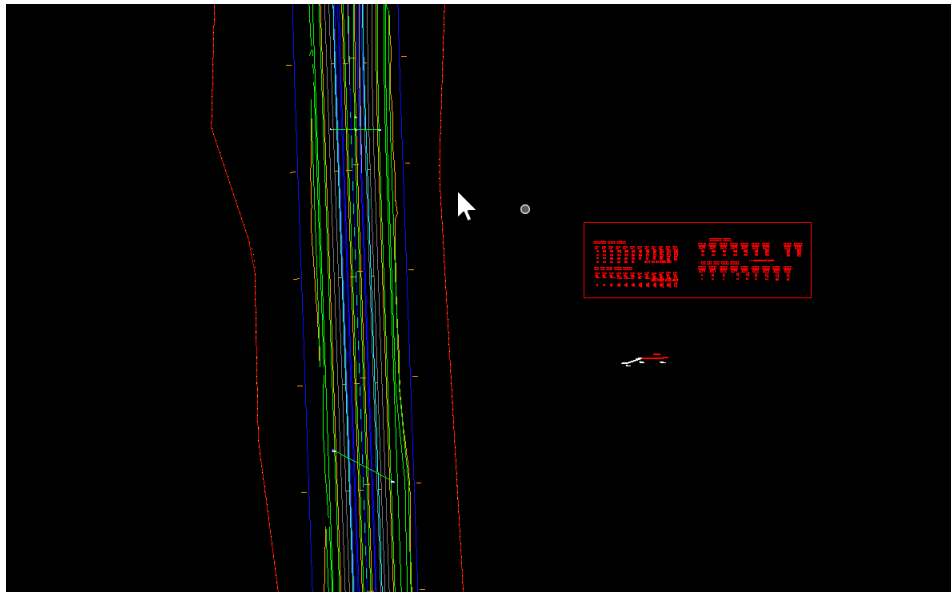


Make sure the files are referenced to the 2D model (that is the PIPES model in this MicroStation file).
ORD will make a managed model automatically once any 3D information is referenced to this 2D model.
ORD names the managed model PIPES-3D. This is a crucial step in setting up this workflow.


Next, reference in a file that contains a selection of our pipe aprons. This file is located in
pw:\\ntPwInt1.dot.int.lan:PWMain\\Documents\\IowaDOTStandardsConnect\\Configuration\\Organization
-Civil\\IowaDOT_Standards\\Cell\\BridgeDesignDetails\\[ApronsConnect.dgn](#). Then, find this referenced
content in the file. It should look like this:

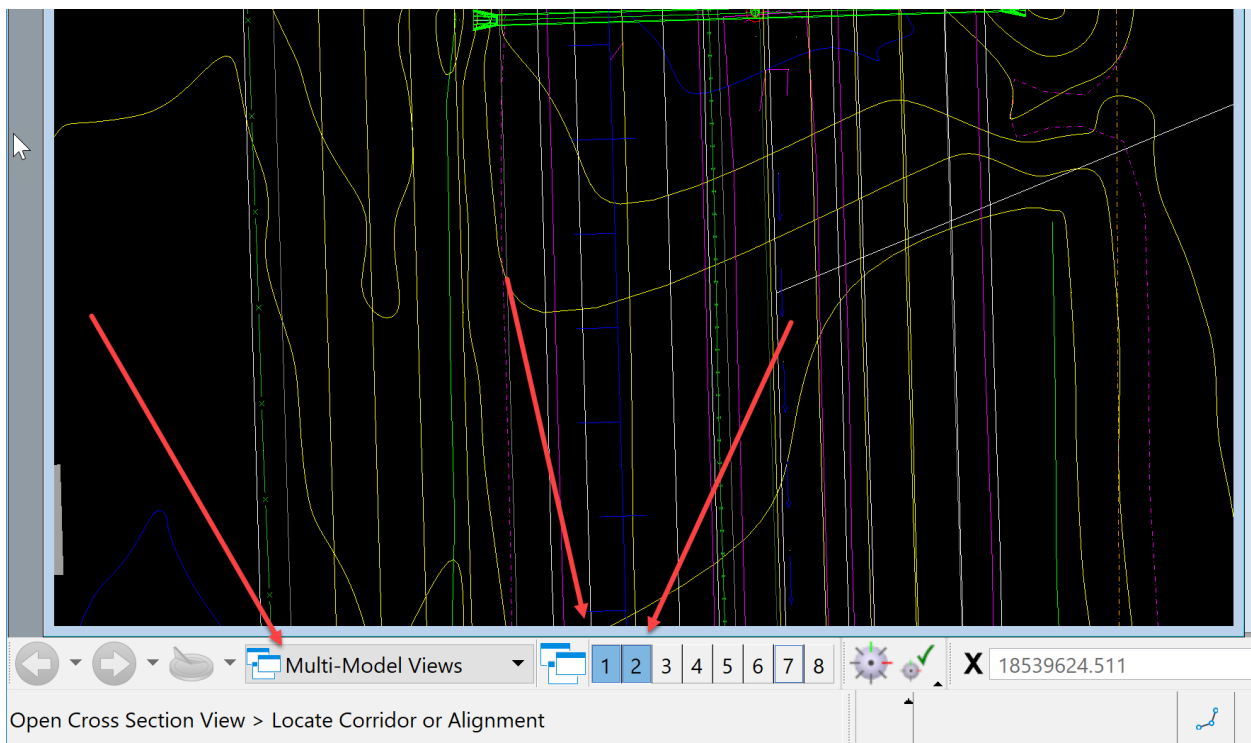


Next, select it with the Element Selection tool and with the copy tool make a copy of it and place it close to our design corridor.

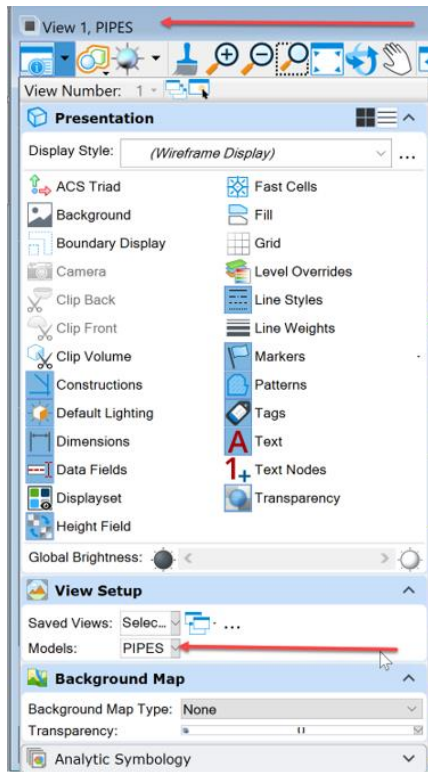


Then, detach the reference file.

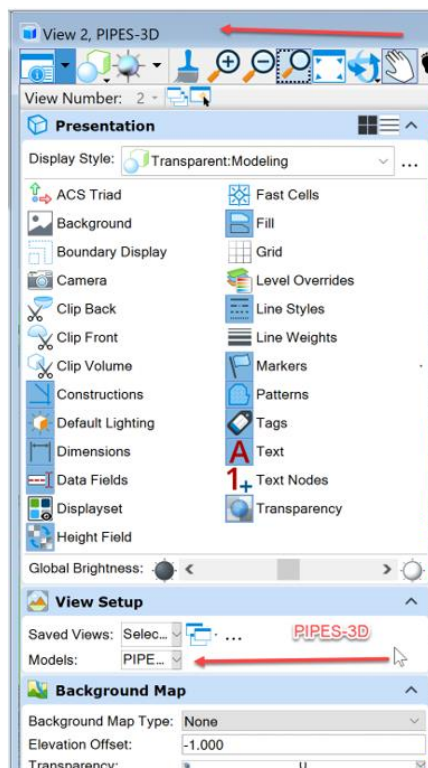
Next, set a few things in the file to make it a little easier to use. The first step is to set up the Multi-Model Views in this file.  Multi-Model Views This will allow viewing the 2D and 3D model at the same time. To set this up, open two views and then select the Multi-Model Views option.



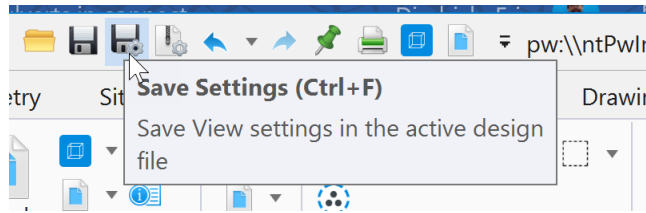
To verify that it is set correctly, open the View Attributes in each window and see what model it is set to. For our needs, set View 1 to the PIPES model which is the pipes 2D model.



For our needs, set View 2 to the PIPES-3D model which is the pipes 3D model.



This allows viewing and manipulating the information in the two models without having to change the model thru the model pallet. Once you have this set, save the settings so that the next time you get into the file there will be no need to set it up again.



Now that the file is set up, start designing and calculating our pipe inverts from the project information.

Laying out Culverts and Drainage Design in CONNECT

These instructions were created on 5/04/2021. These instructions were created with:



OpenRoads Designer CONNECT Edition - 2020 Release 3 Update 9 - Version 10.09.00.91

The first step is to review the profile information and determine where a pipe is needed. Once a location is determined for a pipe, then calculate the correct size. Following calculating the correct type, size and location, design the new pipe and/or structure. There are two methods available to analyze the corridor to design the new pipe and/or structure.

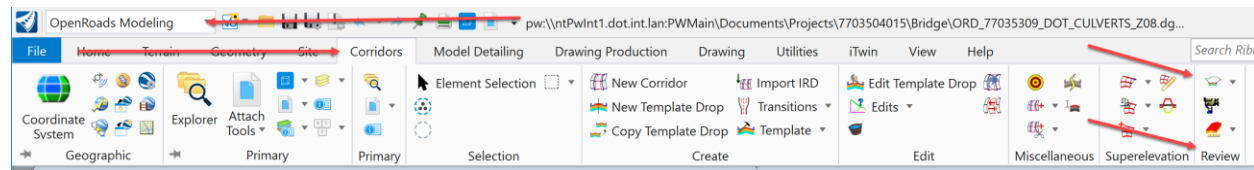
If the design is for a structure and/or pipe that is perpendicular to the alignment, use the first method of cutting a Dynamic Section.

First Method

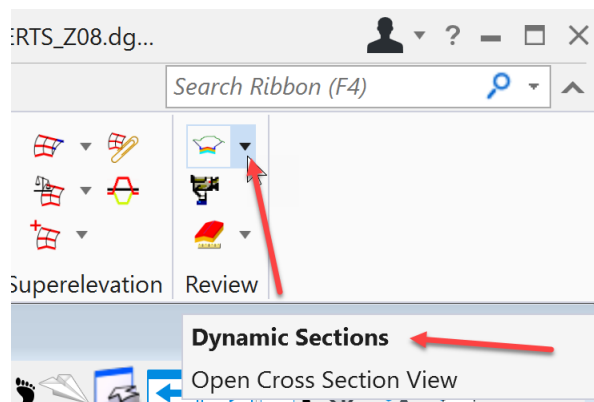
Cutting a Dynamic Section - The tool is in the OpenRoads Modeling workflow on the Corridors tab in the Review group. When using this tool, the recommendation is to turn the corridor reference display off in the 2D model View 1 (This was done previously when setting up the cadd file). The reason is this tool will ask to select a corridor or alignment. With the corridor turned off, selection of the alignment is easier. To do this, make sure the View 1 is set to be the active view and open the reference pallet and turn off the corridor.

Next, open a view to display the section in. For this example, use View 7.

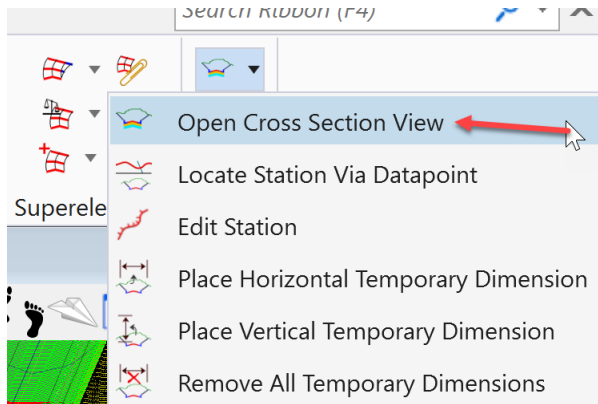
In the OpenRoads Modeling workflow; on the Corridors tab in the Review group,



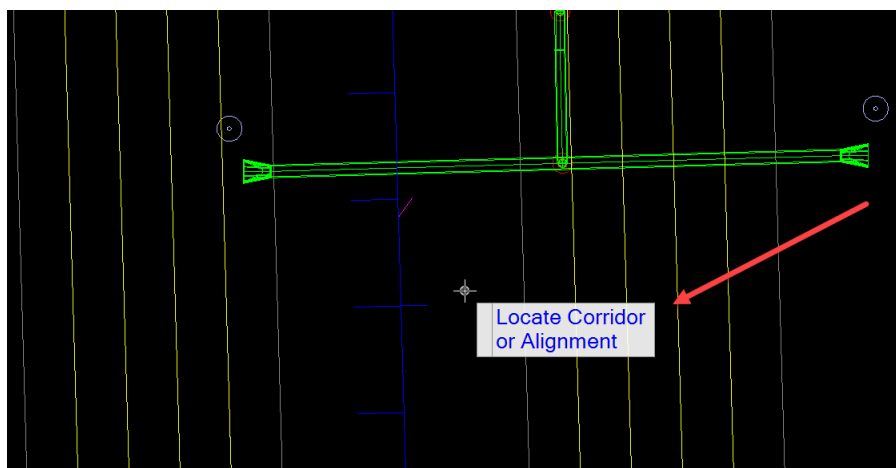
select the Dynamic Sections tools.



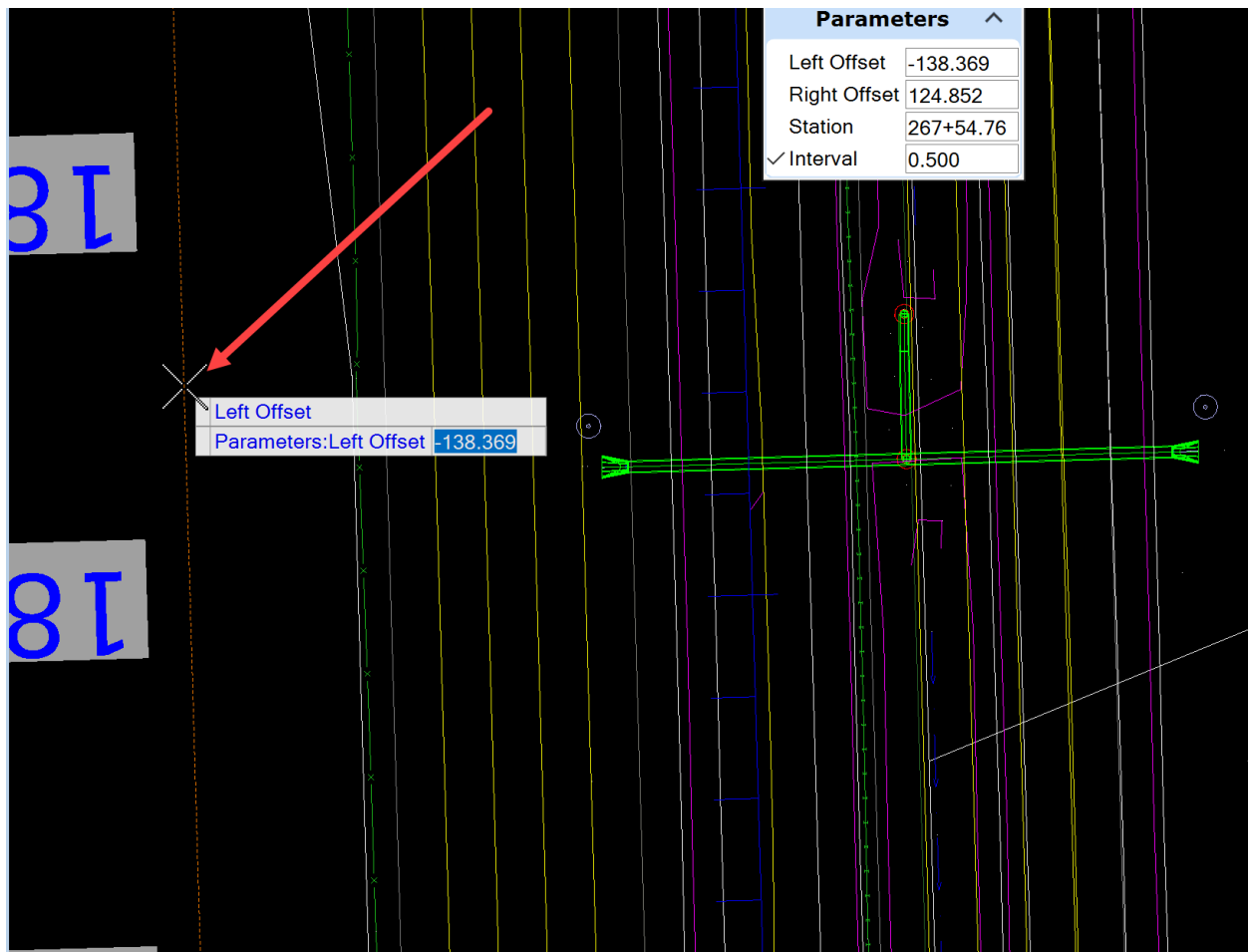
Then select the Open Cross Section View tool.



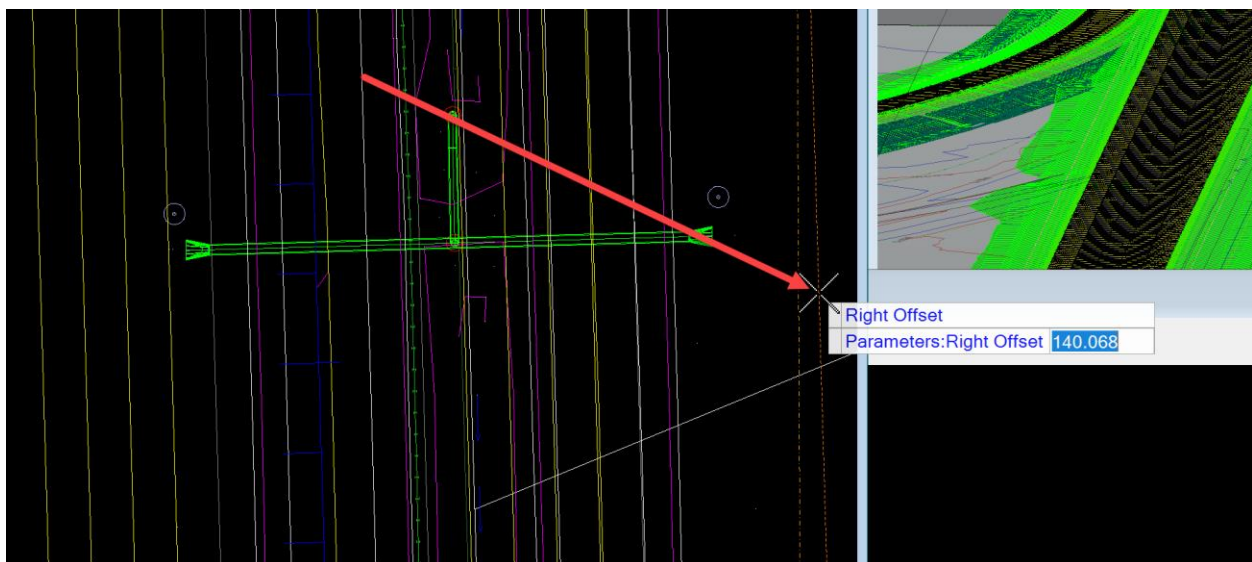
It prompts to locate the alignment.



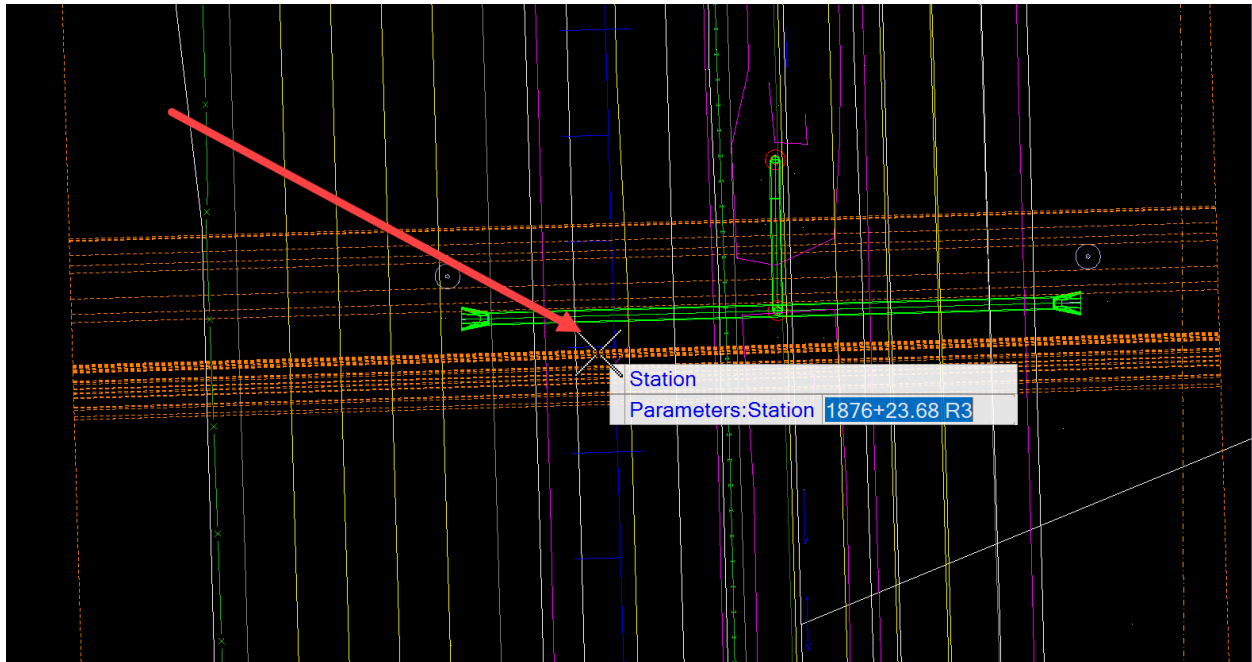
Data point on the alignment in the 2D view, in this example View 1.



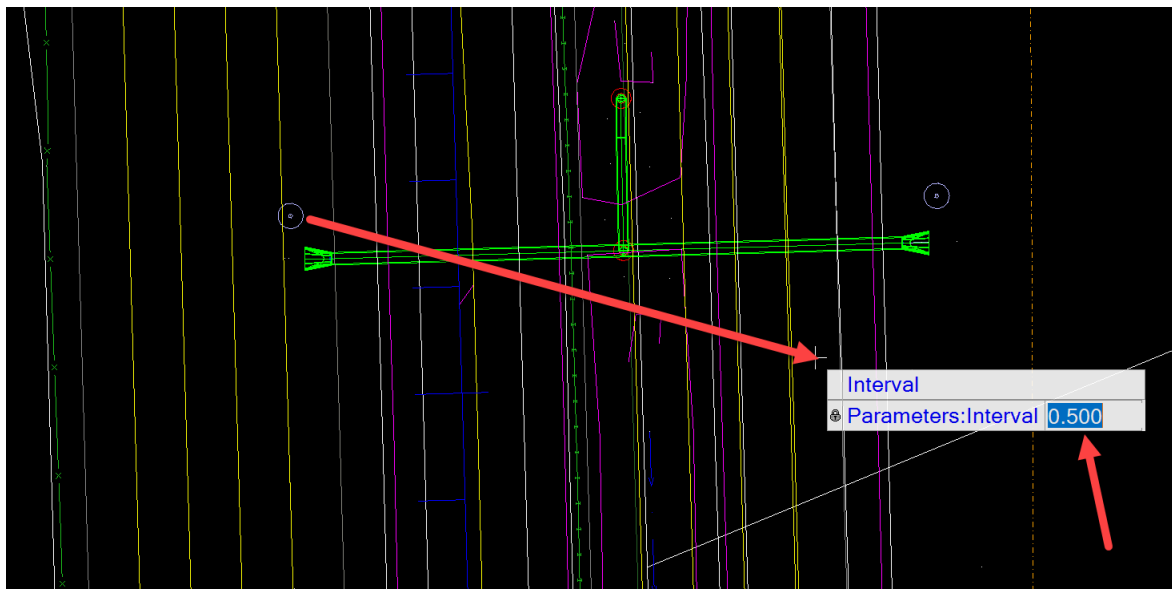
Then select the Offset Left. This will determine how far left the section will cover.



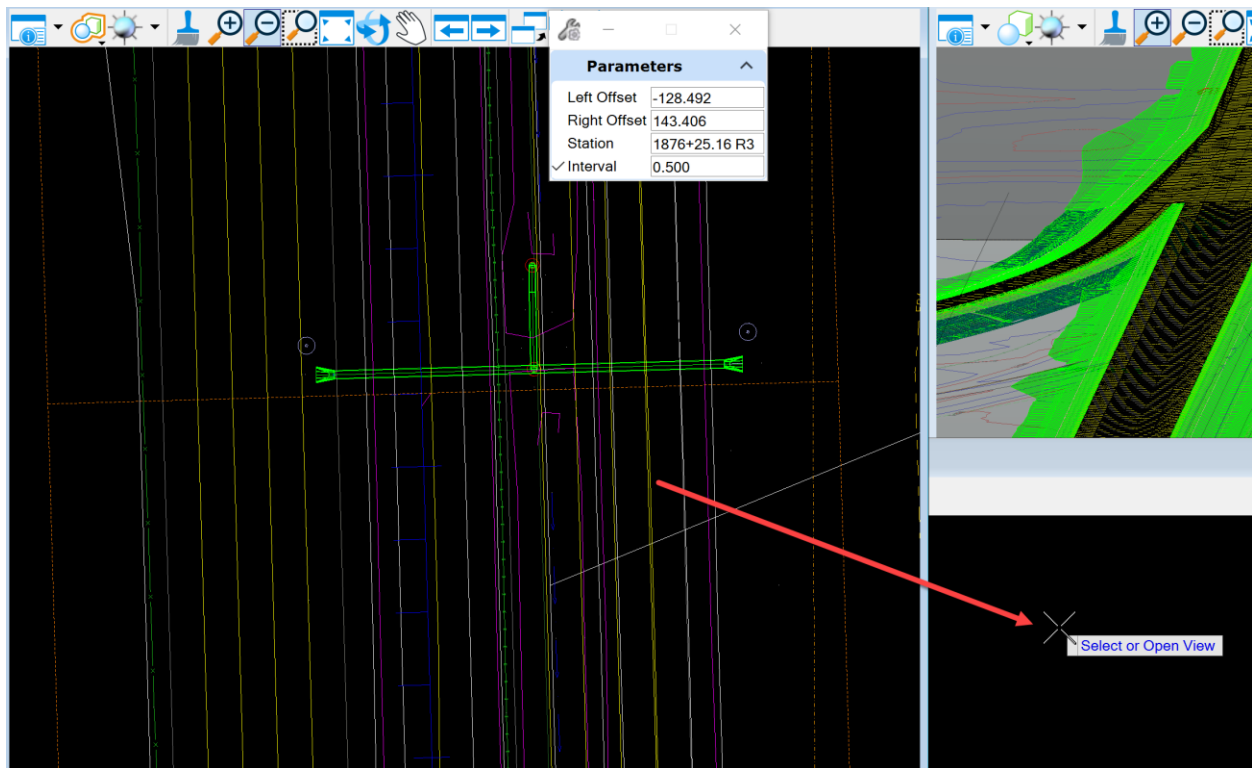
Then select the Offset Right. This will determine how far right the section will cover.



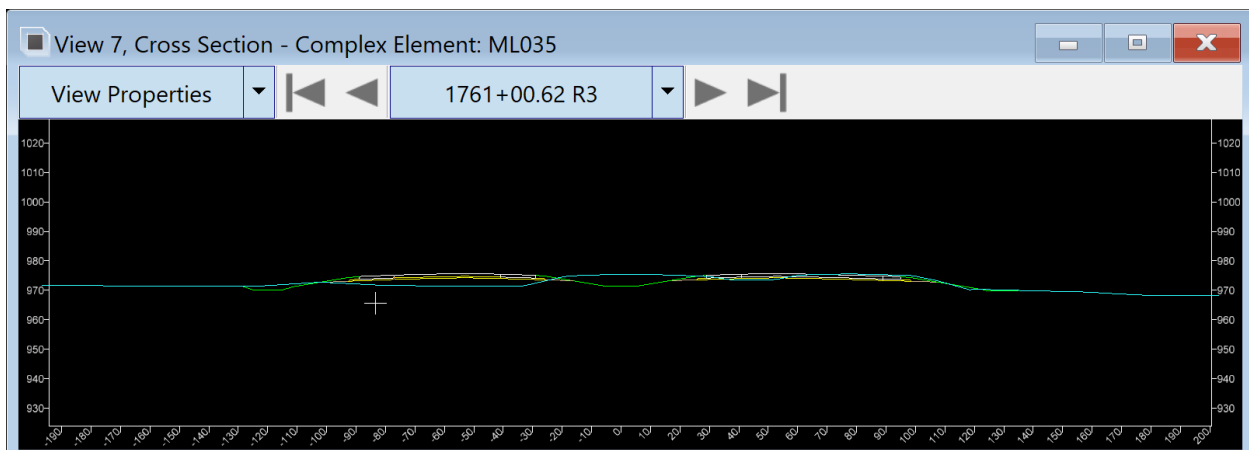
Then select the Station. Note: This does not need to be perfect when selecting it here, it can be adjusted later to a specific station.



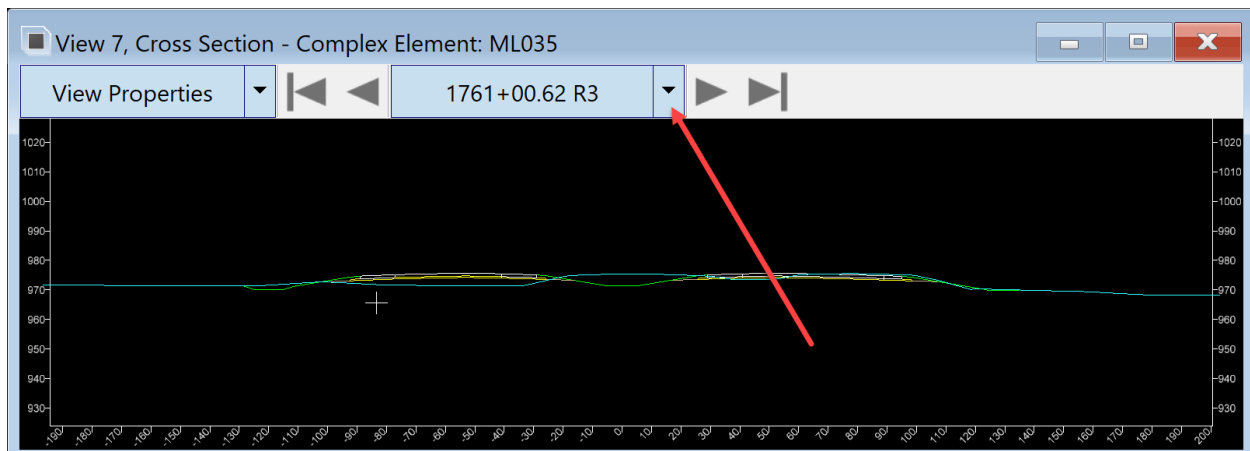
Then Select the Interval. Note: Recommend an interval of 0.5 = 6" for culvert design.



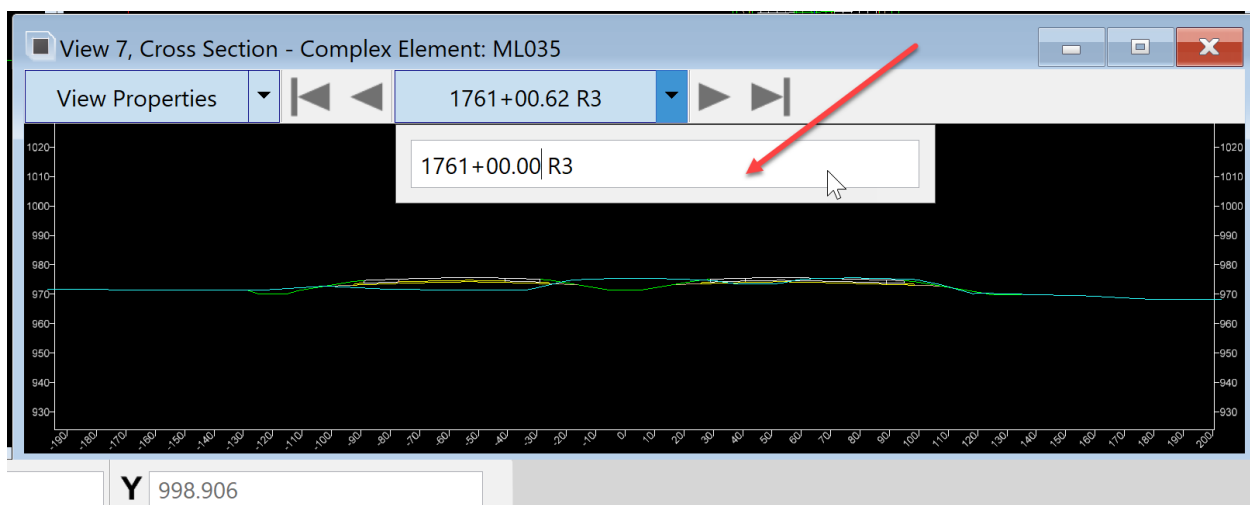
Then Select the View. Data point in View 7 and the section will appear.



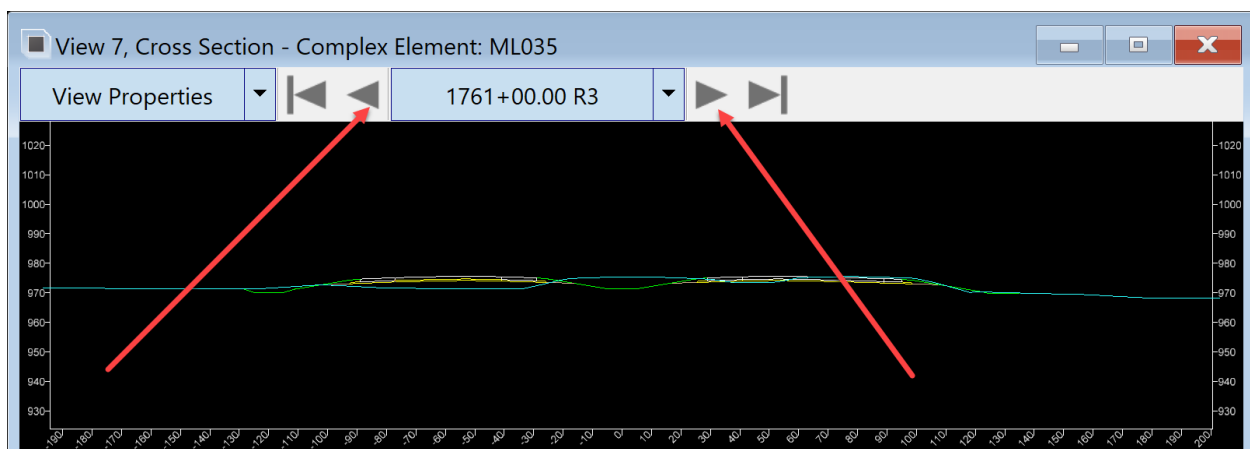
Adjust the Station with the pull down by clicking here:



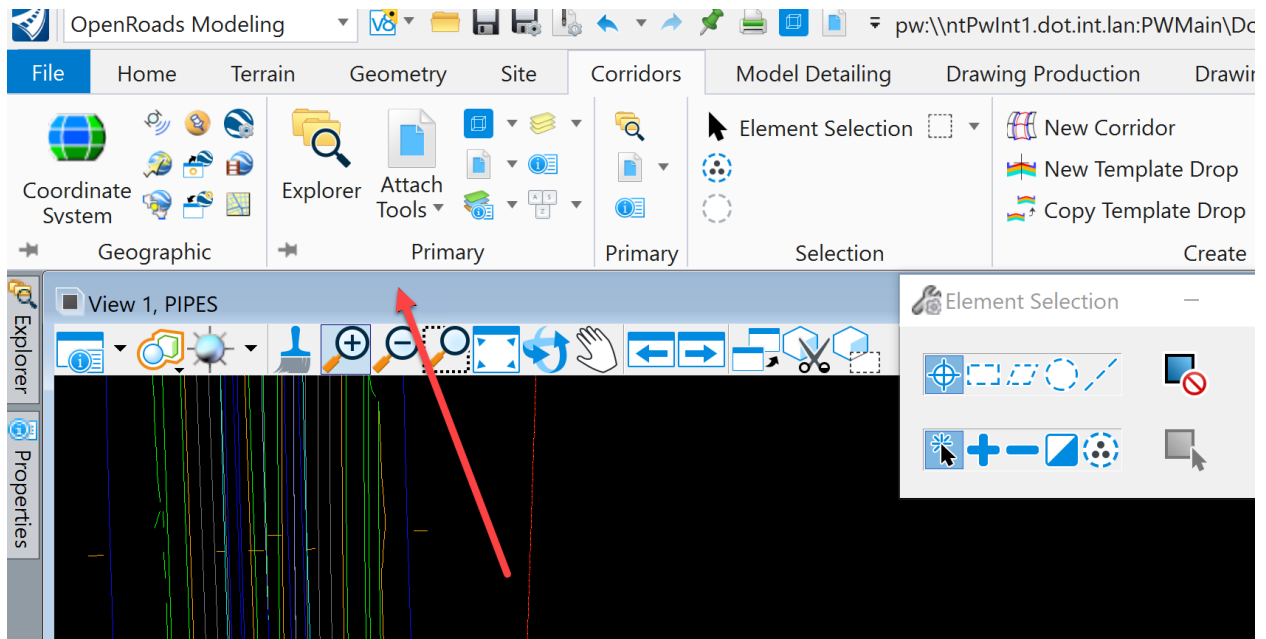
Then type the Station value needed and hit enter.



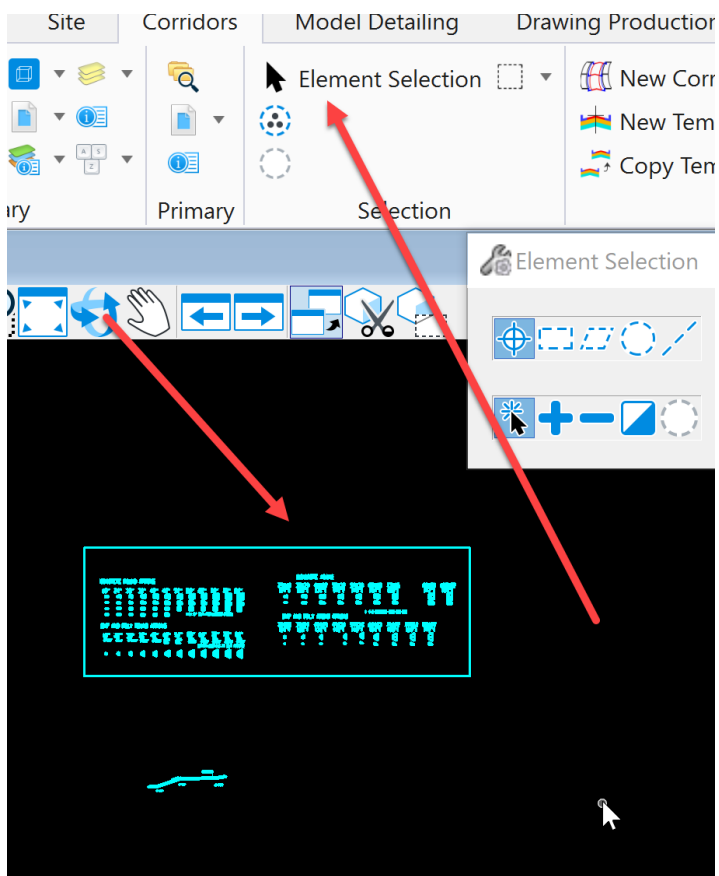
Or use the radio buttons on each side of the Station value, to change the station at the Interval that was selected when the section was created. The value 0.5 = 6" was used so it will advance or move back every 6" by clicking on the buttons.



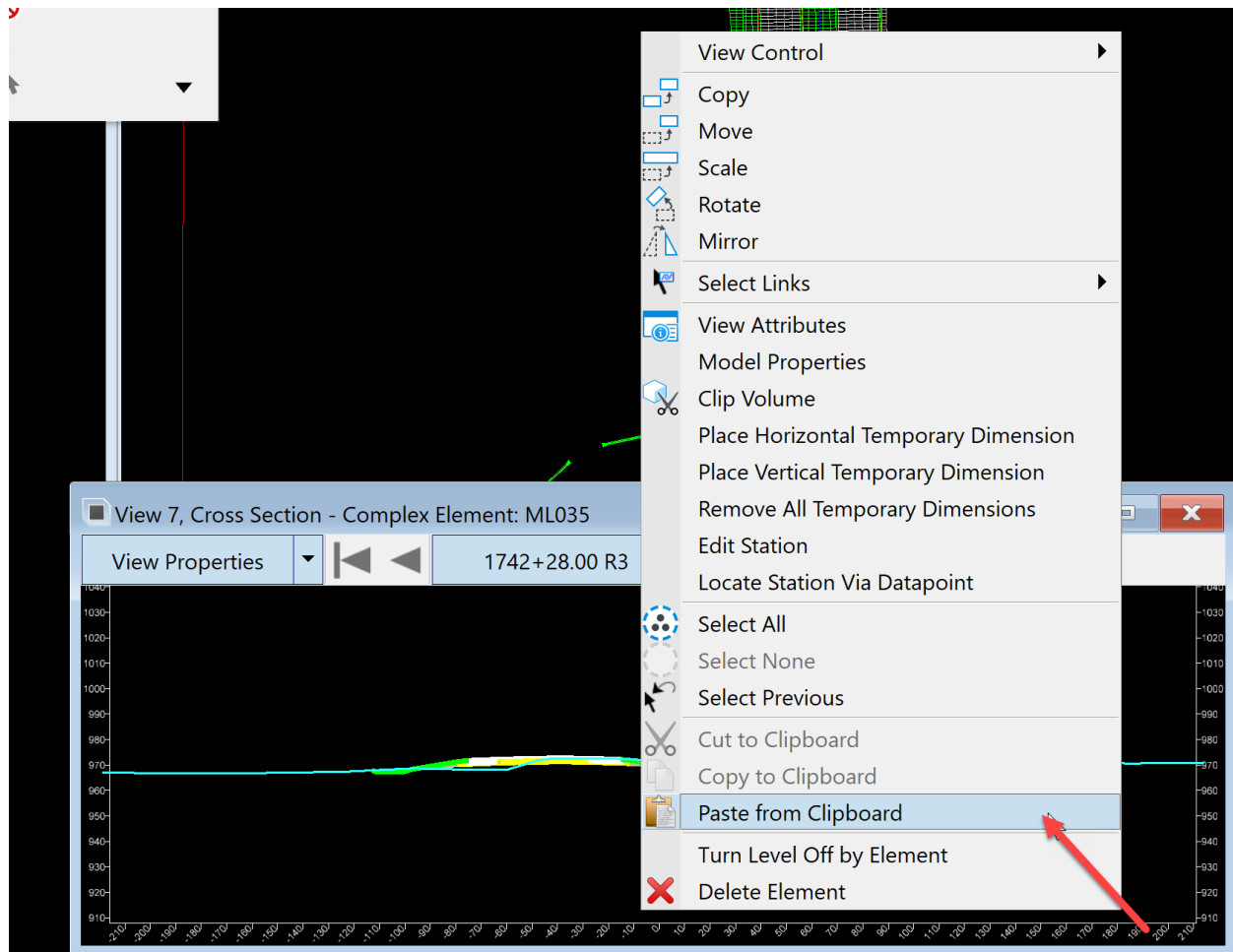
Now that there is a section cut in the area for placing a pipe, one more thing needs added to do the design. Copy the pipe aprons into the cross-section model in View 7. To do this, make the View 1 active by clicking on top of the view.



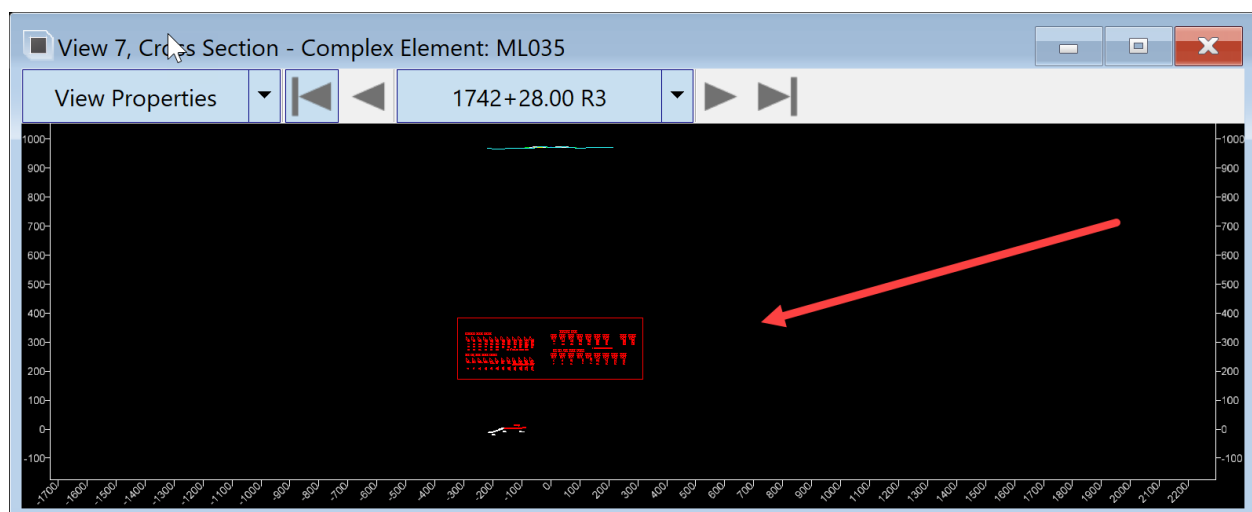
Then with the element selection tool, select the pipe aprons that were placed near the design corridor.



Then press the ctrl + C key on the keyboard to do a copy. Then make the View 7 active by clicking on top of the view. Then in the View 7, right click and hold for a second to access the right click menu.



Select Paste from Clipboard. The aprons should appear on the end of the cursor in that window. Datapoint to place them in this window.

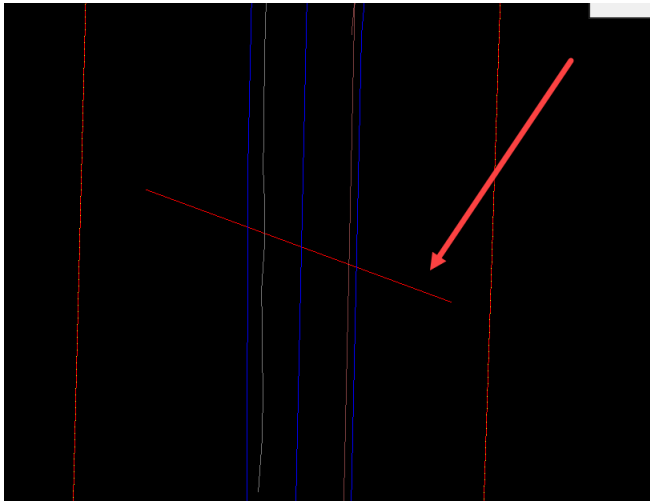


What was done provided a copy of the apron cells into the cross section model that will be used to determine the invert locations of the pipes in the cross section. Keep in mind, that these will be in this model no matter what section is cut until deleted.

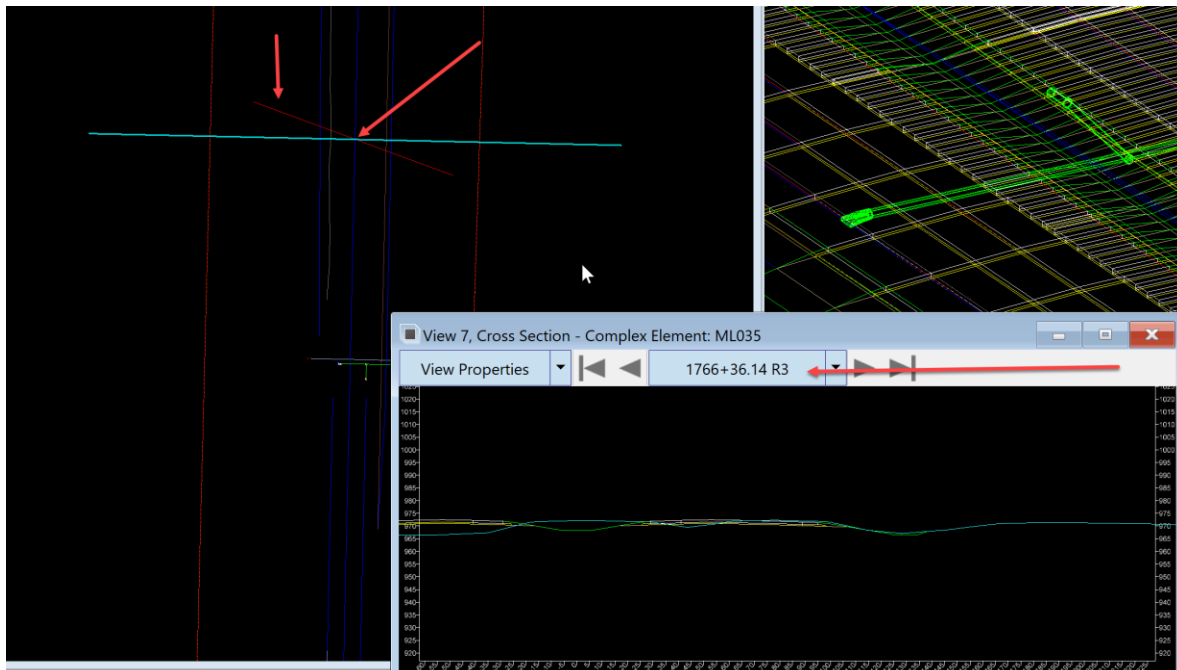
If the design is for a structure and/or pipe that is not perpendicular to the alignment, use the second method that will be designing in the profile window.

Second Method

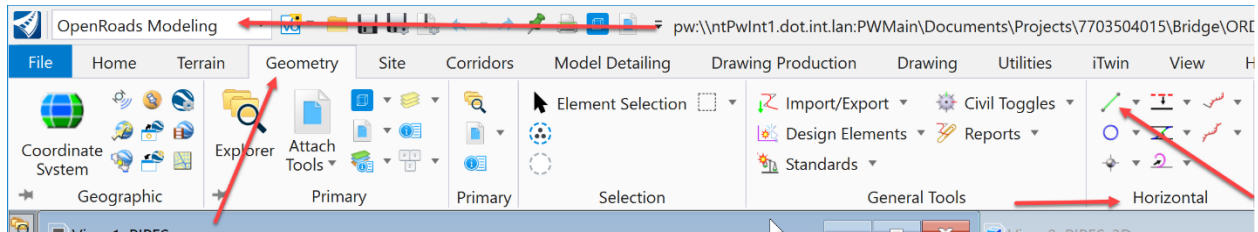
Designing in the profile window - To do this, place a line where the structure should be placed.



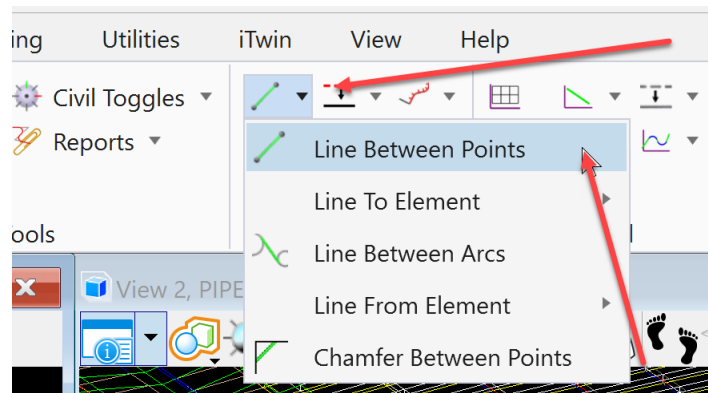
Then, cut a section on that line where it intersects the alignment. This will give us a station value for the new structure. For this example, it will be STA 1766+36.14



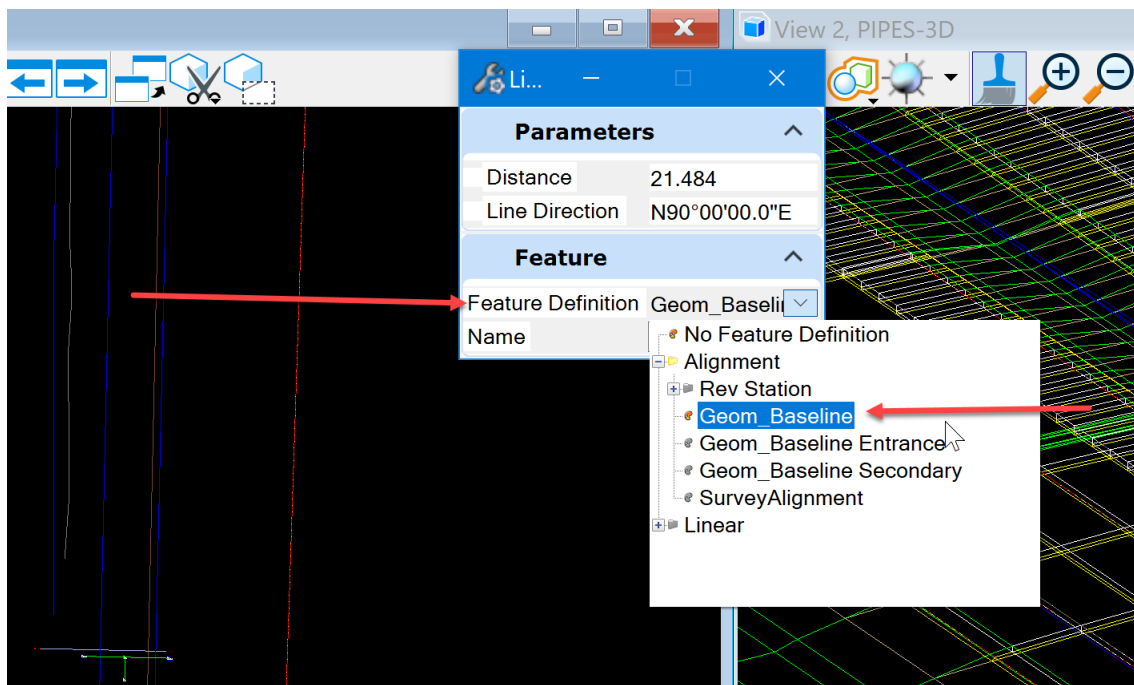
Next, place a geometry base line on the line placed as the structure alignment (the red line in the image above). To do this, change the workflow to OpenRoads Modeling workflow. On the Geometry tab select the Line tools in the Horizontal group.



Select the Line Between Points tool.

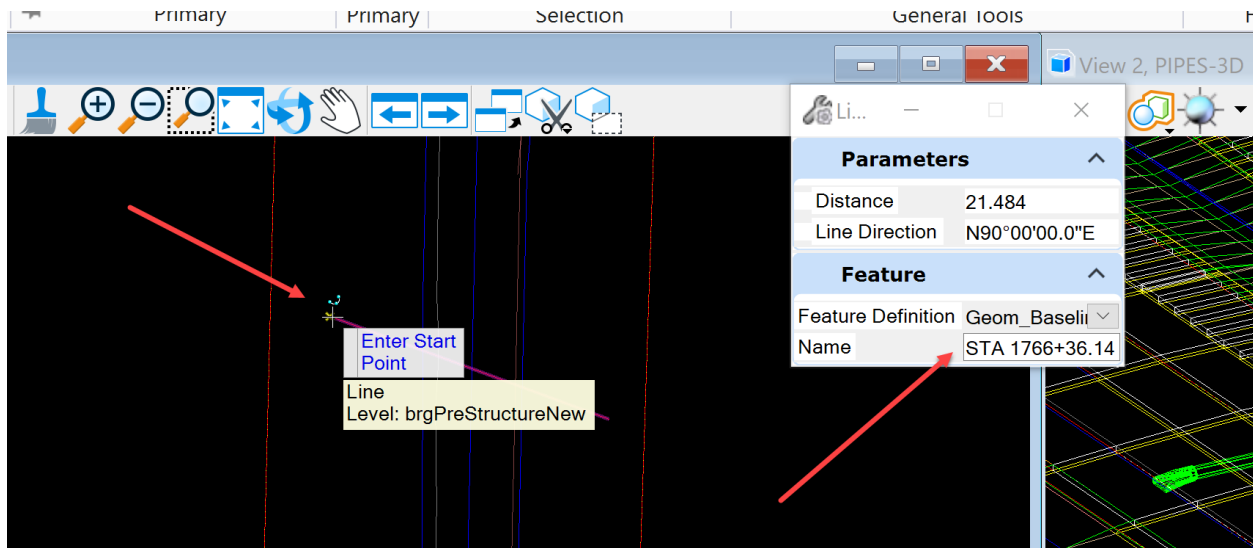


Then set the Feature to Geom_Baseline

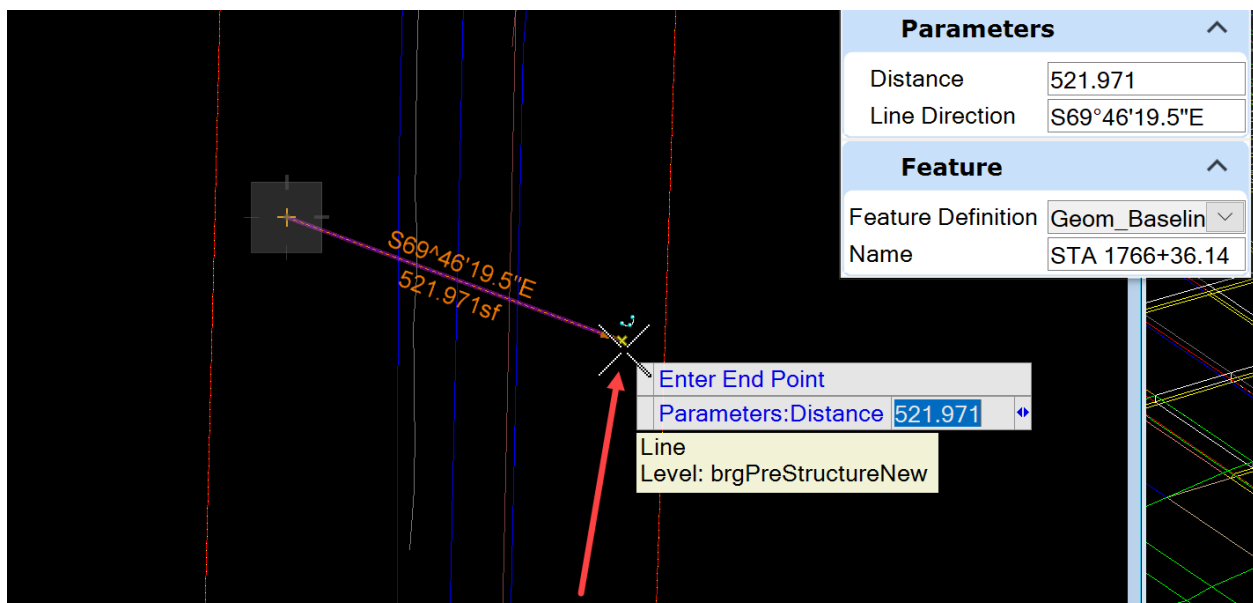


Next, name the feature the station location of the proposed structure.

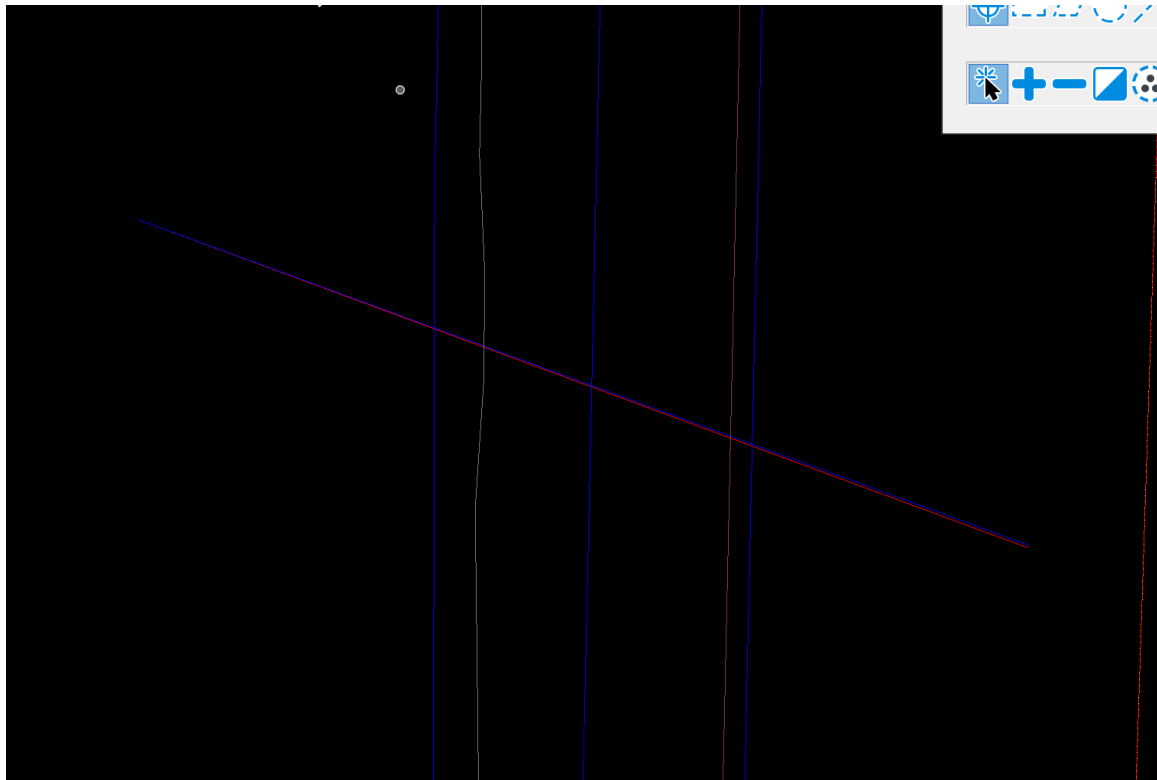
For this example it will be STA 1766+36.14.



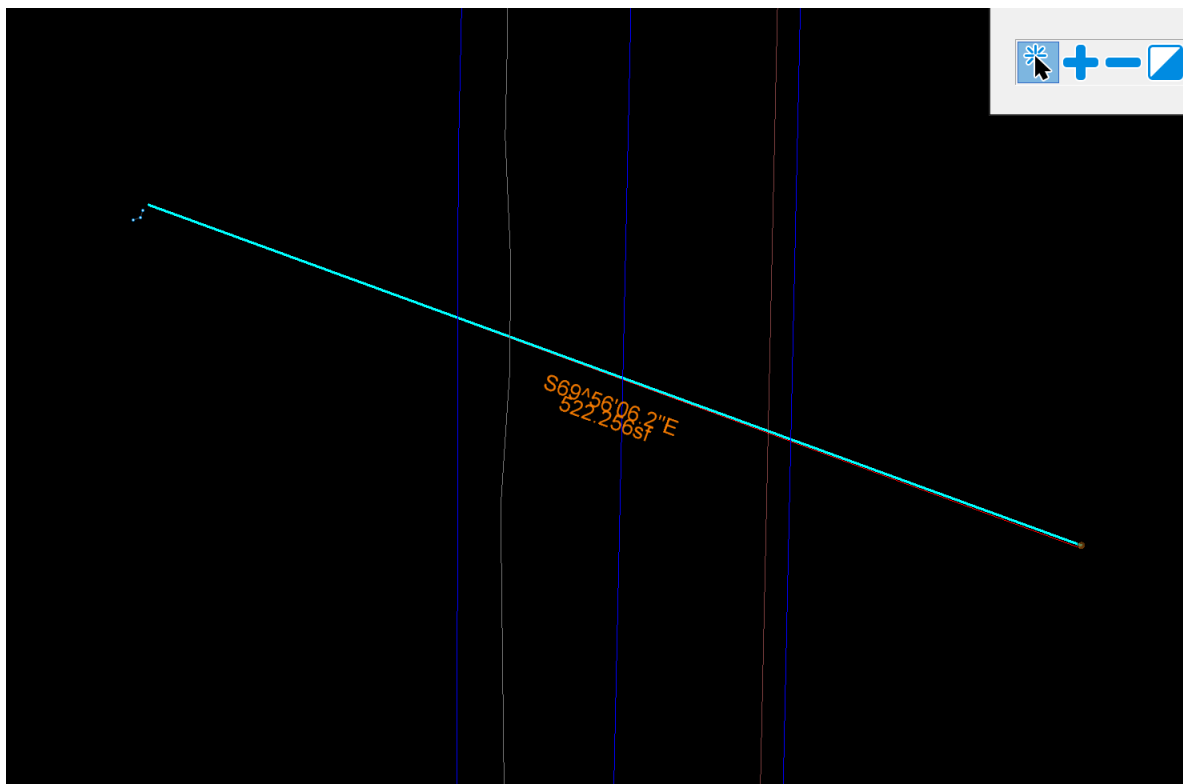
Then select a start point by snapping on the end of the line placed as the structure alignment (the red line in the image above).



Then enter the end point. It should appear similar to below.

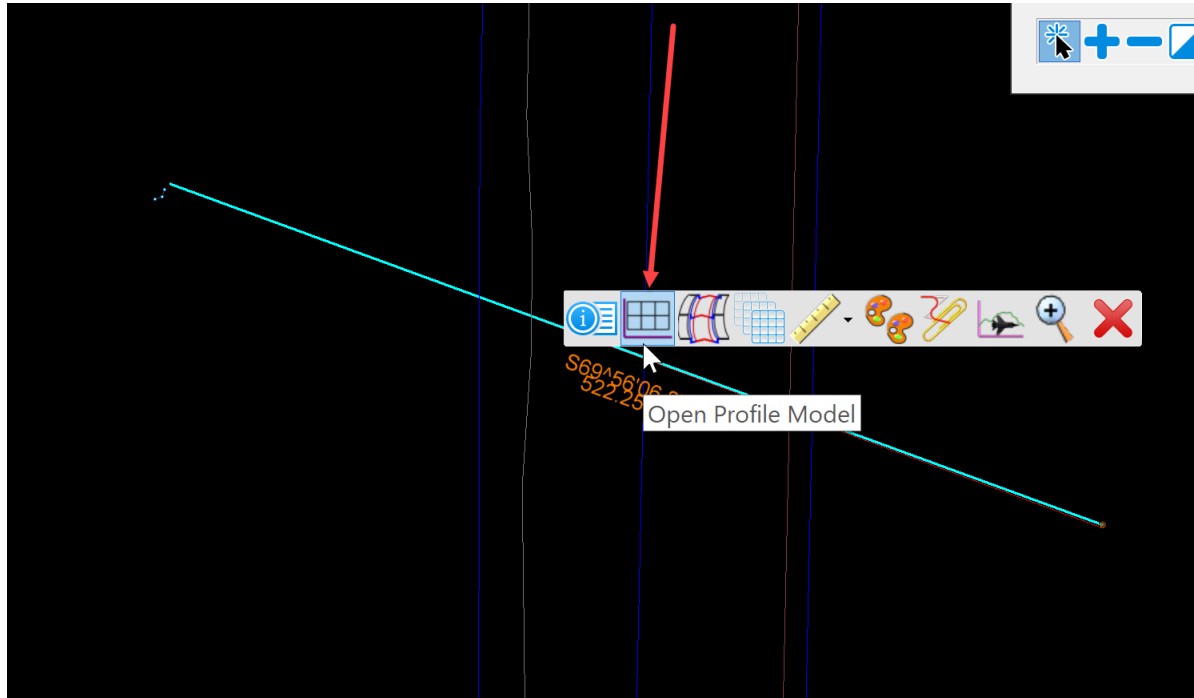


Next with the element selection tool, select the geometry just created.

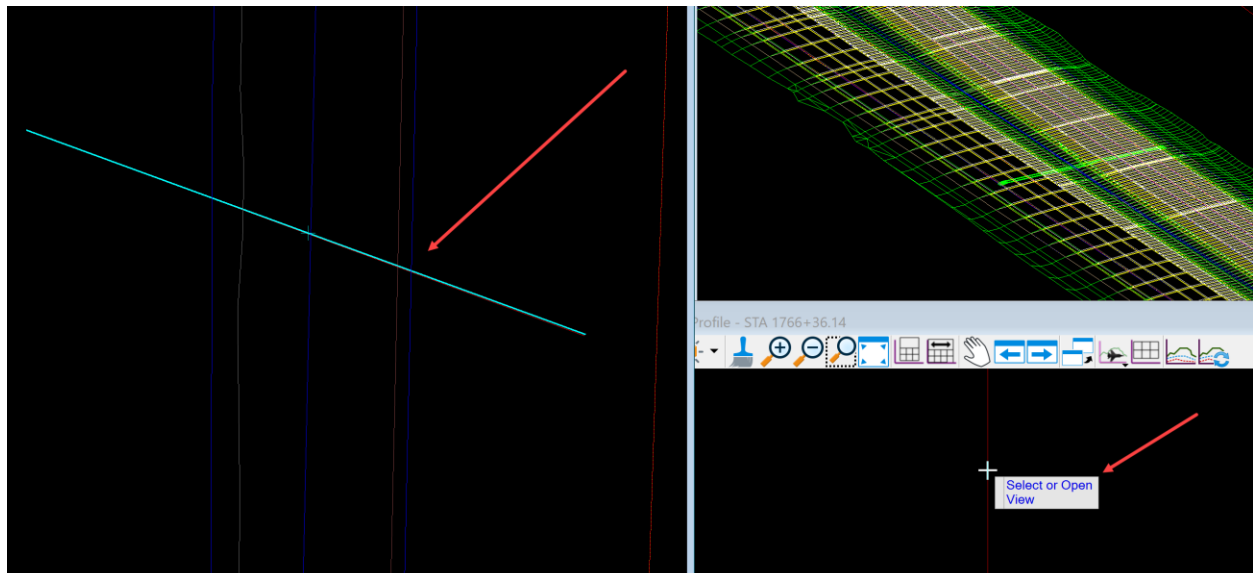


Next, open a window to view the profile in. Recommendation is to use View 8 for the profile window and View 7 for the cross-section window. Do not try to use the same window for both.

For this example, use View 8. Once the view is open, return to View 1 that has the geometry just created already selected. Hover over it to open the heads-up tools.

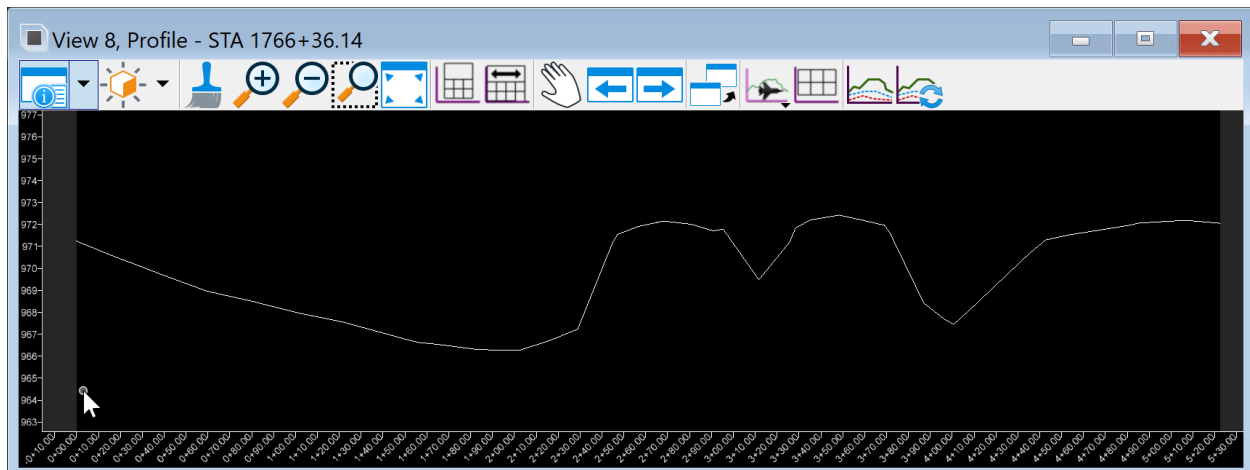


Then select the Open Profile Model tool.

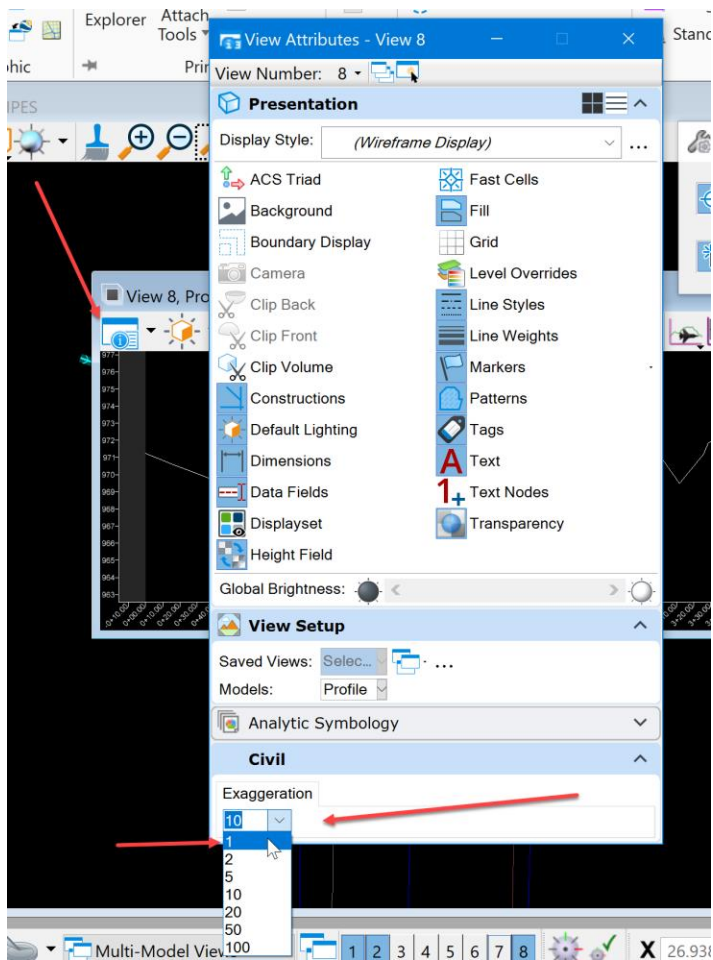


It will prompt to select or open view. Data point in the open profile window that is View 8 for this example.

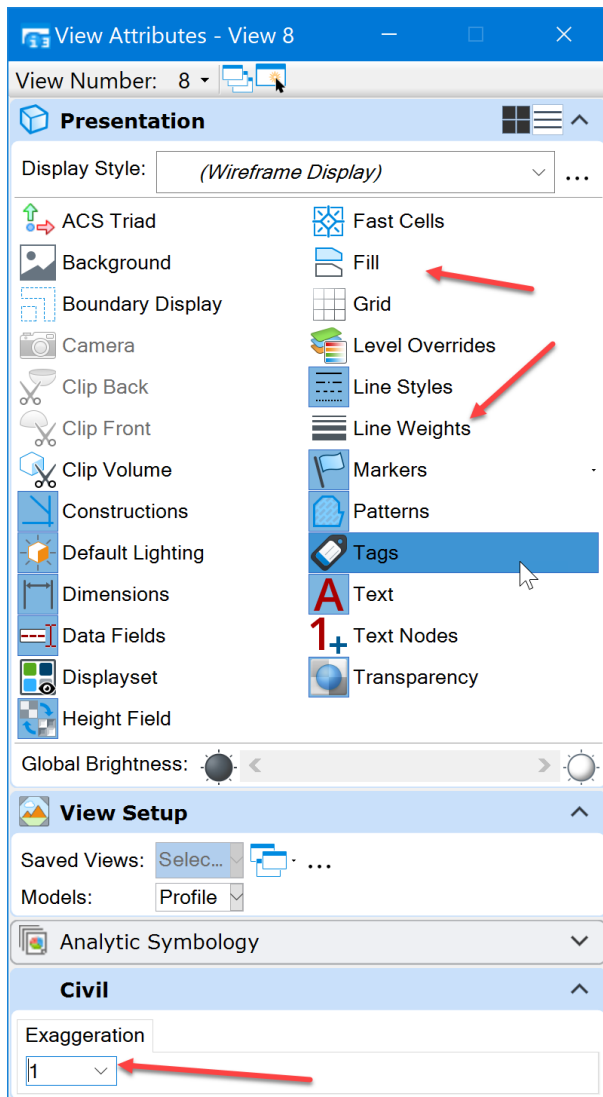
It should appear similar to below.



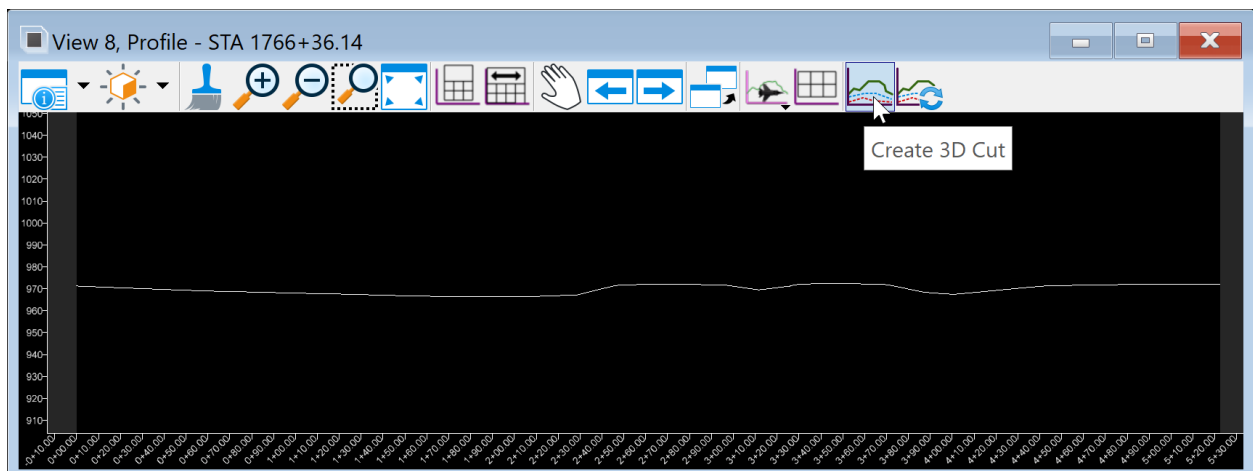
Next, set the exaggeration to 1 in the View Attributes dialog box.



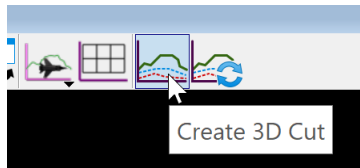
Also recommend having the fill and line weights turned off.



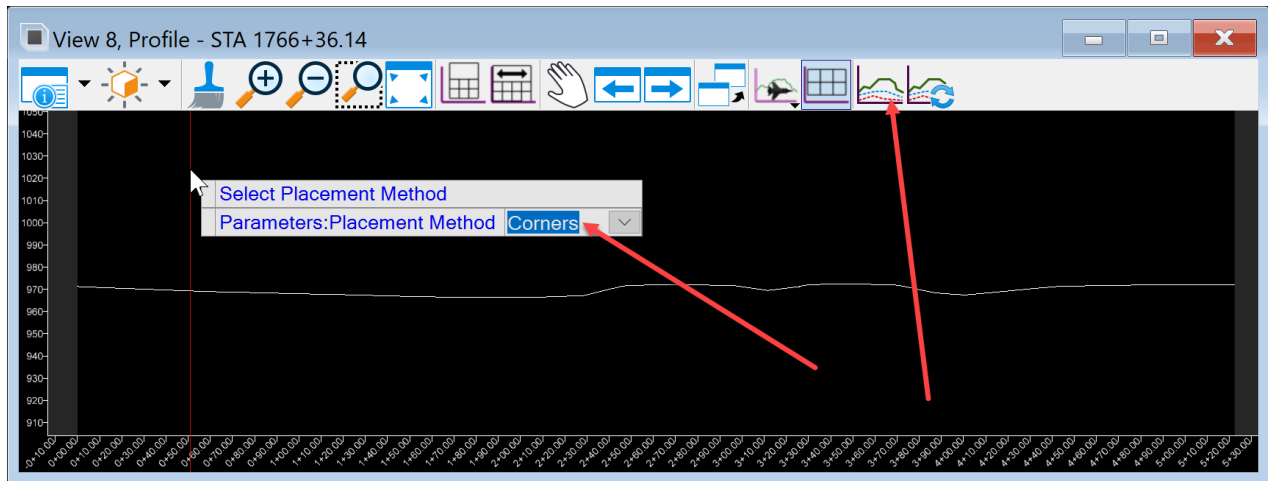
Next, create a 3D cut along this geometry



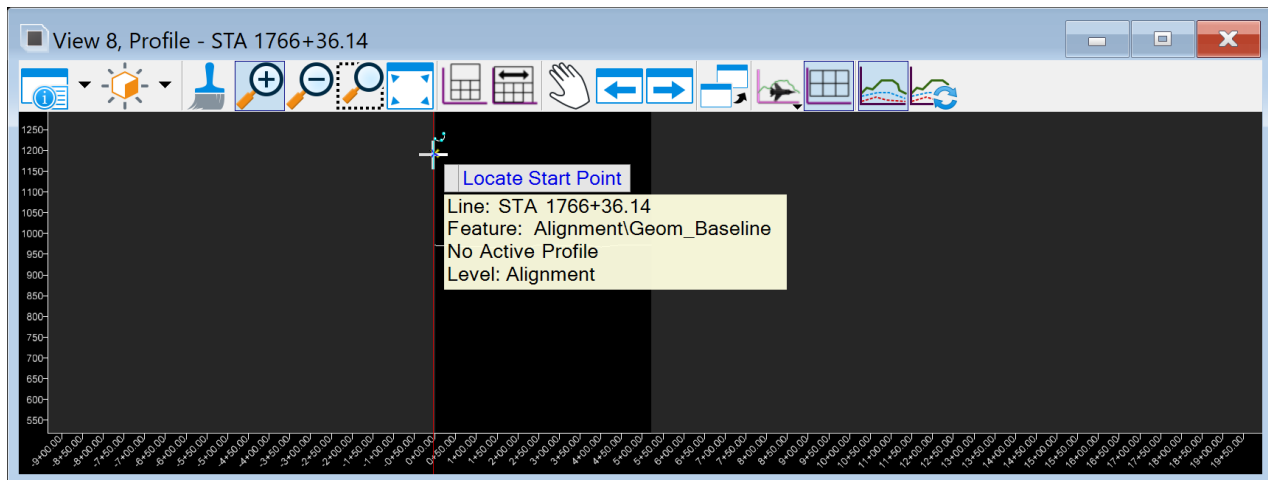
To do this, select the Create 3D Cut tool



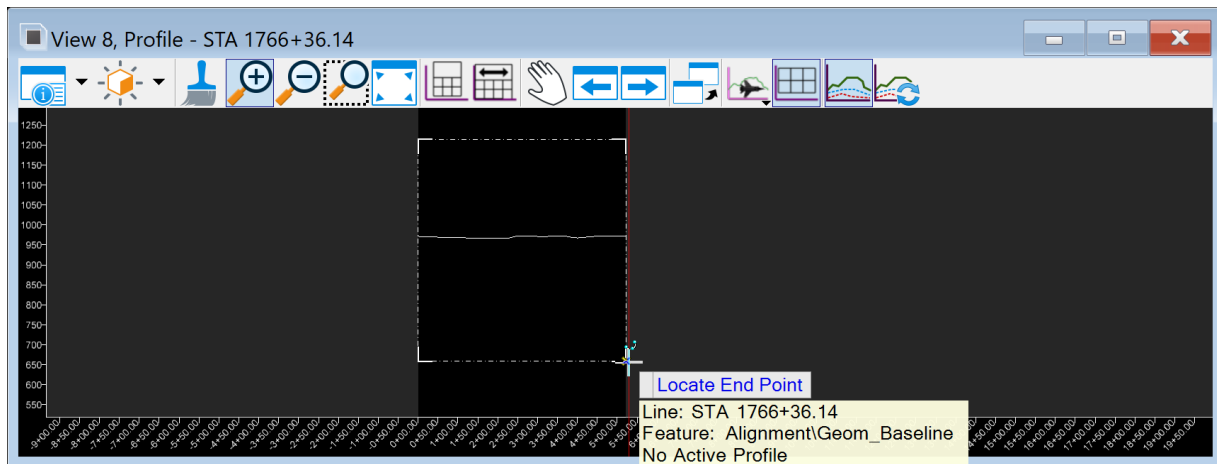
Use the Corners method. Data point to accept the method.



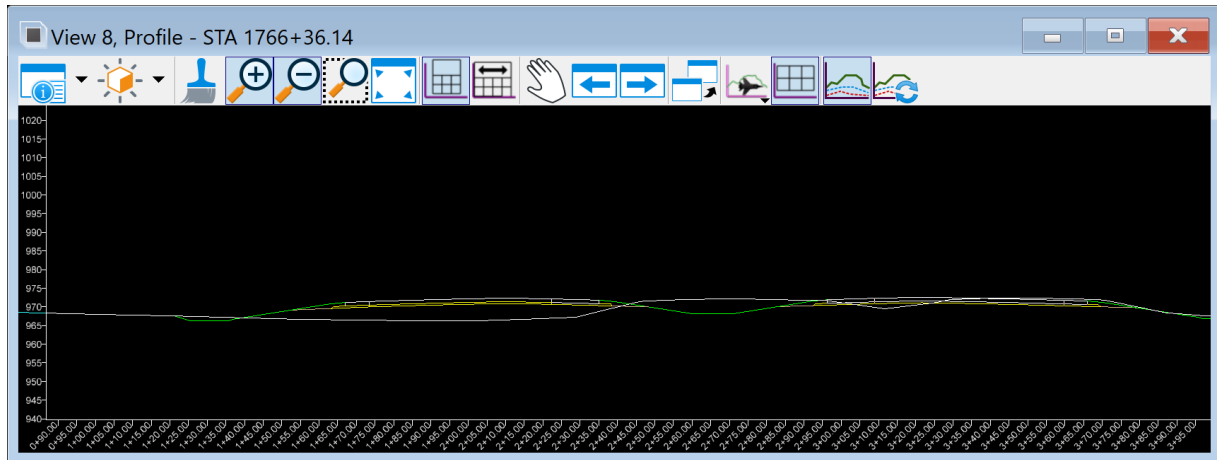
It will prompt to locate the start point. Make sure the start is all the way to one side or the other. Recommend to start at the top right and end at the lower left.



After the data point, it will start drawing a box in the view that the 3D cut is in.

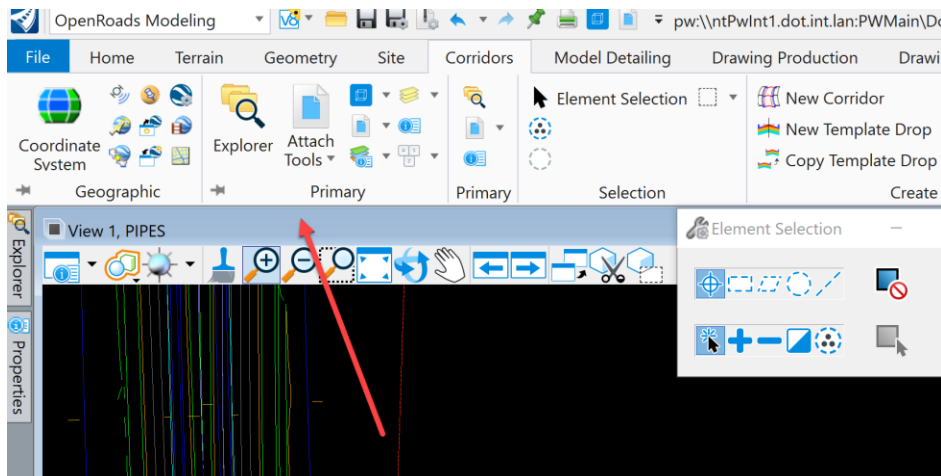


Data point the end point to complete the 3D cut. It should appear similar to below.

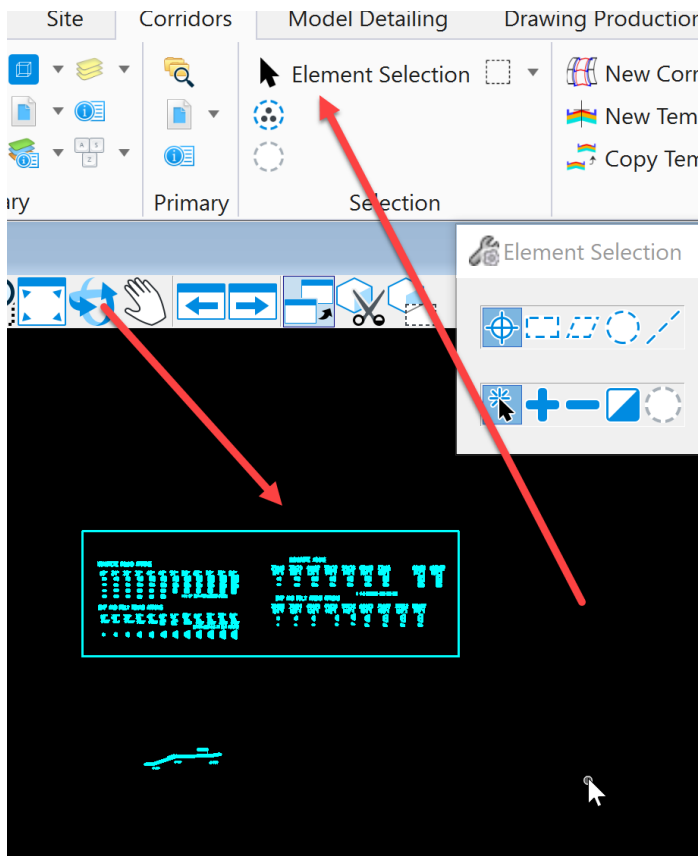


Now that there is a 3D cut created in the area for placing a pipe, one more thing needs added to the view to do the design, copying the pipe aprons into the profile model in View 8.

To do this, make View 1 active by clicking on top of the view.

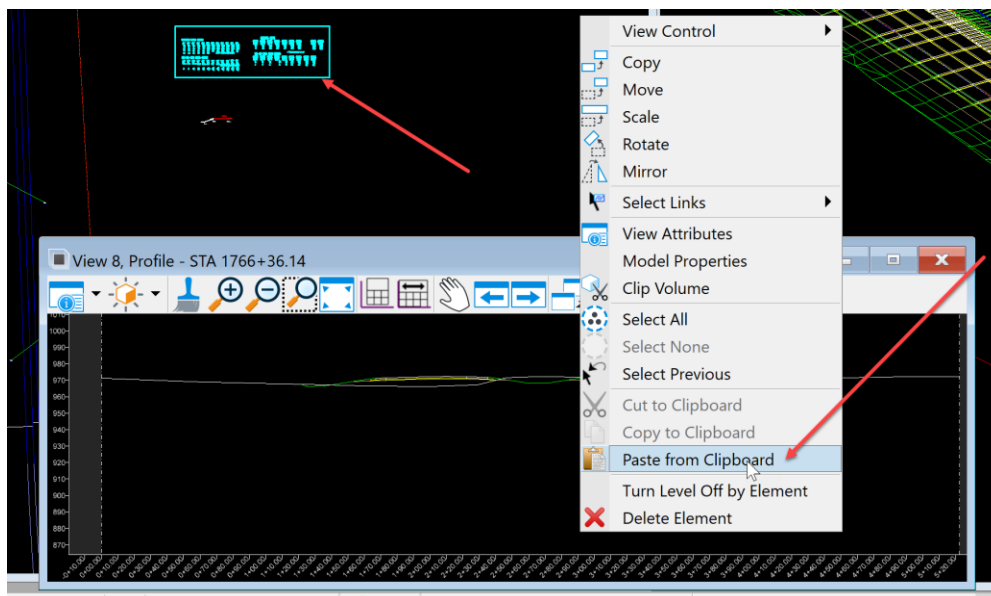


Then with the Element Selection tool, select the pipe aprons that were placed near the design corridor.



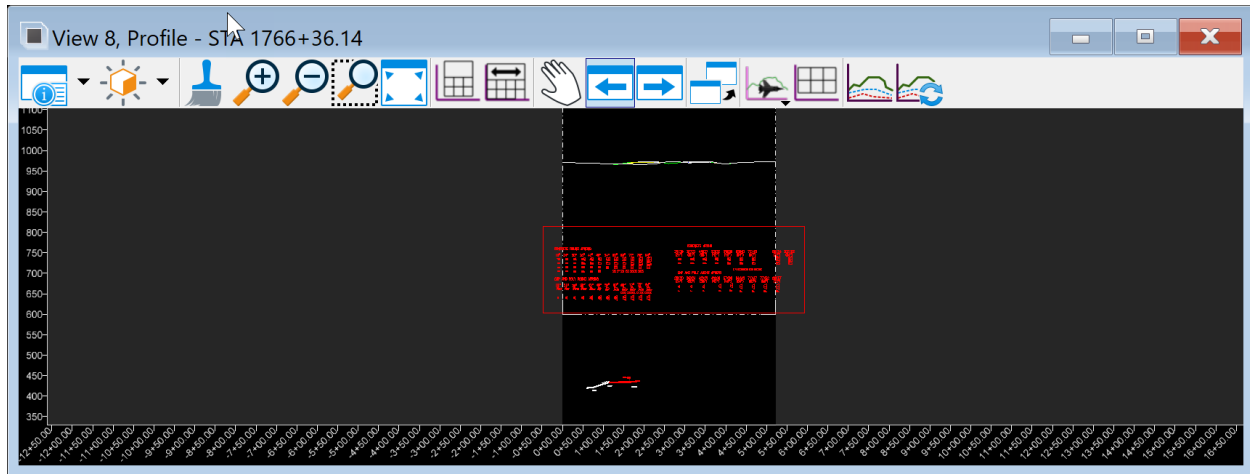
Press the ctrl + C keys on the keyboard to do a copy.

Then, make View 8 active by clicking on top of the view. Right click and hold for a second to access the right click menu.



Select Paste from Clipboard.

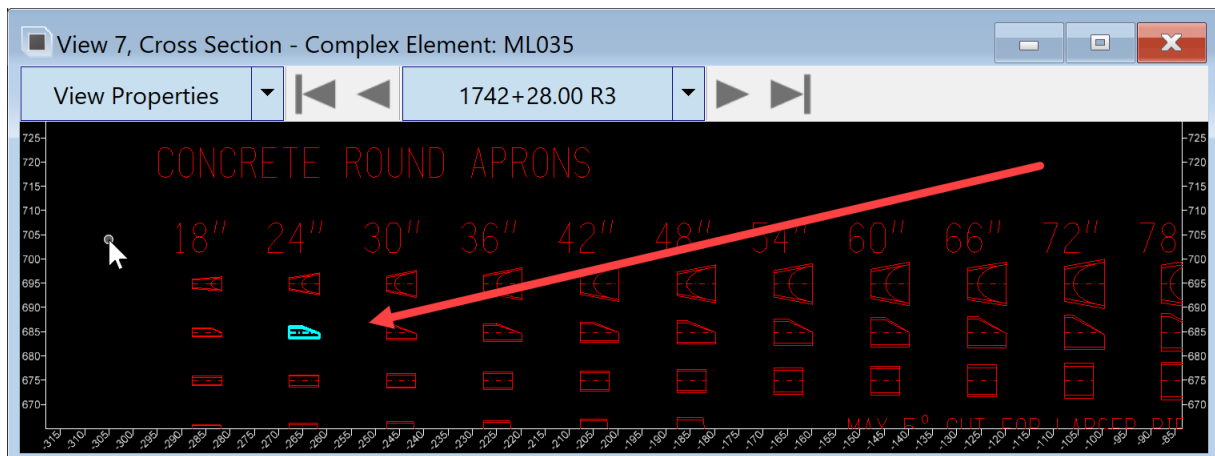
The aprons should appear on the end of the cursor in that window. Datapoint to place them in this window.



Keep in mind, that these will be in this model no matter what section is cut until deleted.

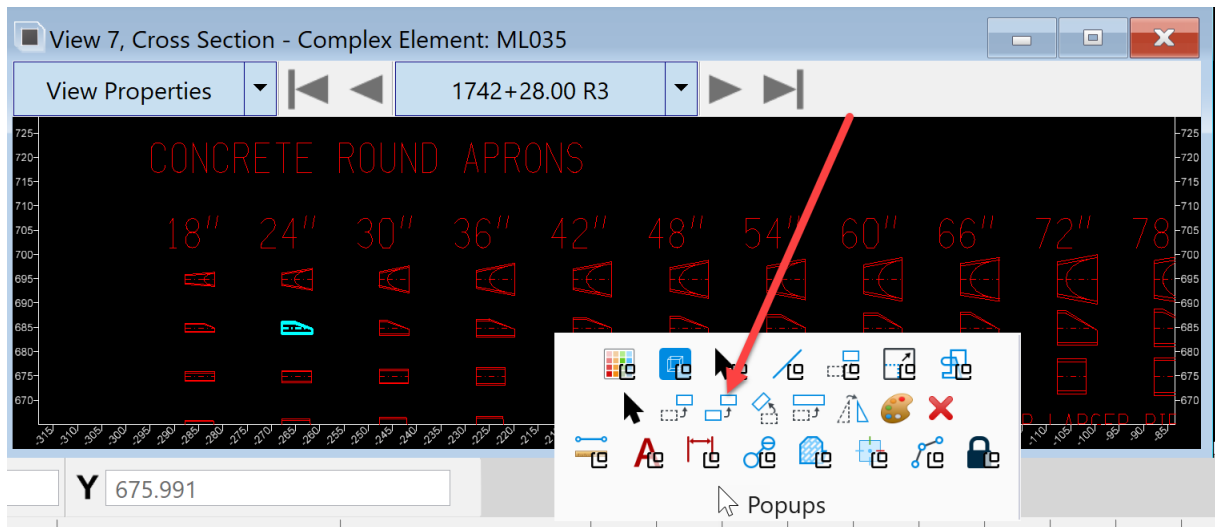
What was done provided a copy of the apron cells into the profile model that will be used to determine the invert locations of the pipes in the profile 3D cut. These will be in this model no matter what profile and profile 3D is cut until deleted.

Now the file is ready for design. For this example, the design is a 24" RCP crossroad pipe. In the section view, View 7 in this example, zoom in on the 24" RCP pipe apron and select it with the element selection tool.

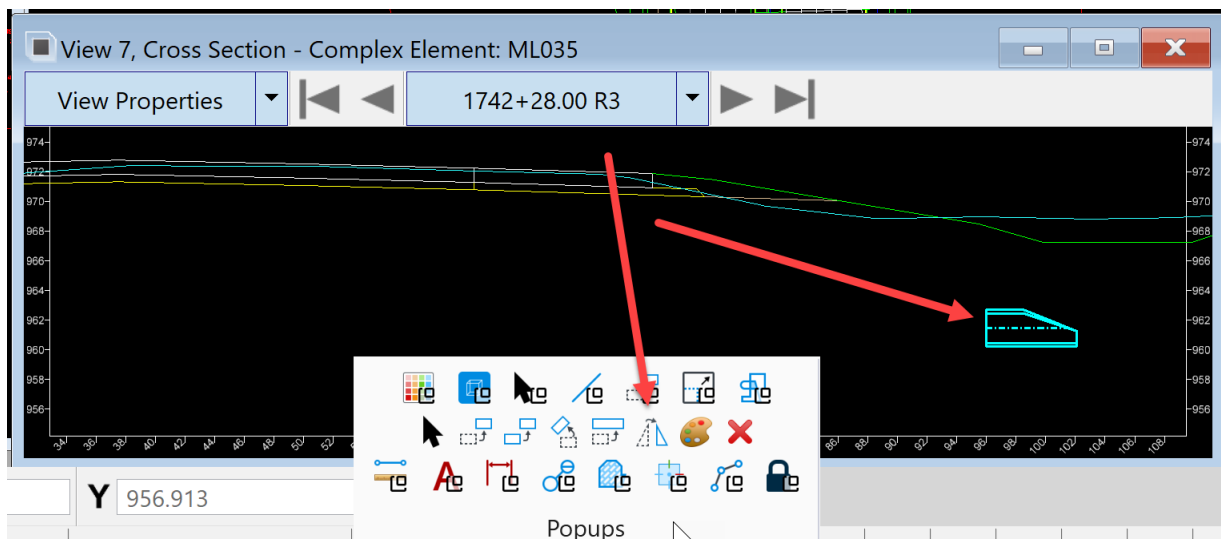


Then with the copy command, copy the apron and place it close to the cross section. Note: to quickly access the copy command press the spacebar on the keyboard.

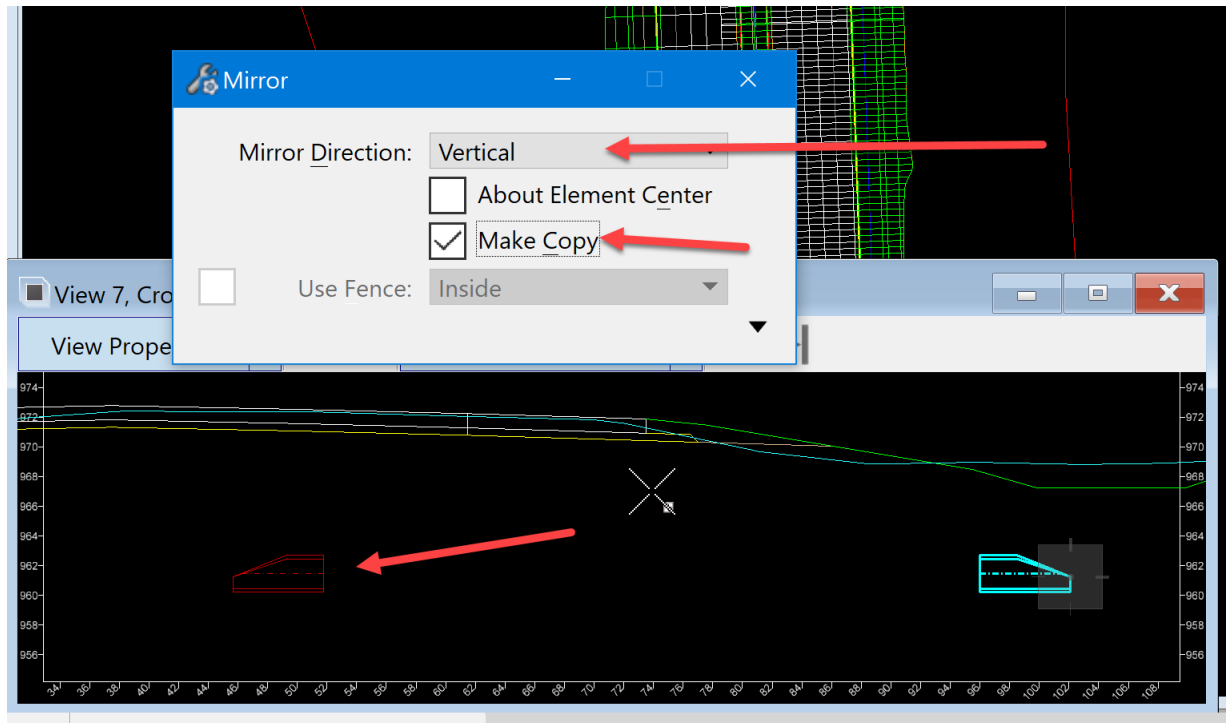
The Poupas will appear. Select the copy command.



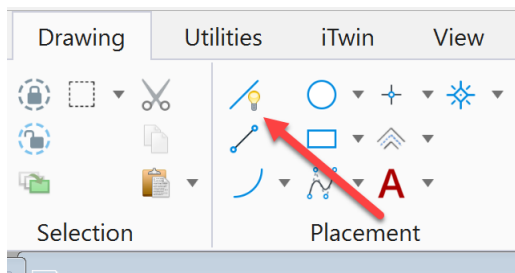
While the copied apron is still selected, press the spacebar on the keyboard and select the Mirror command.



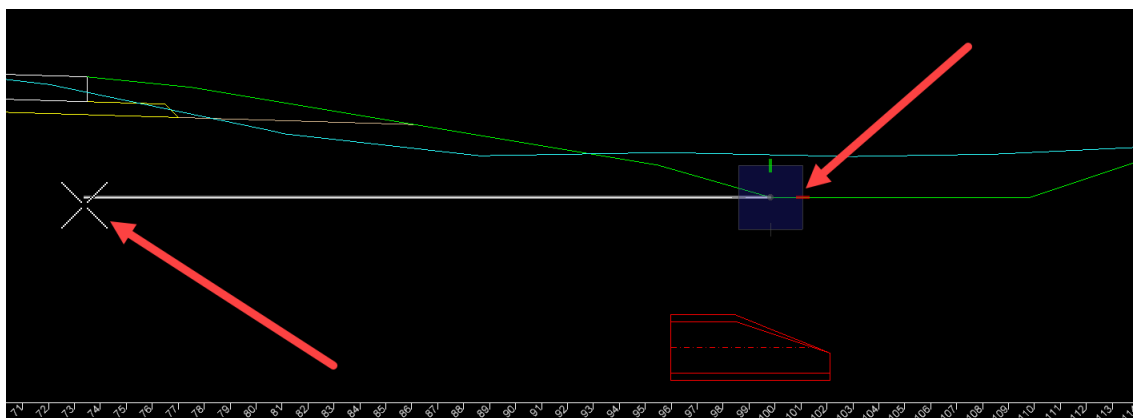
Set the Mirror Direction to Vertical and turn on the Make Copy option. Then place the mirrored copy on the other side of the section.



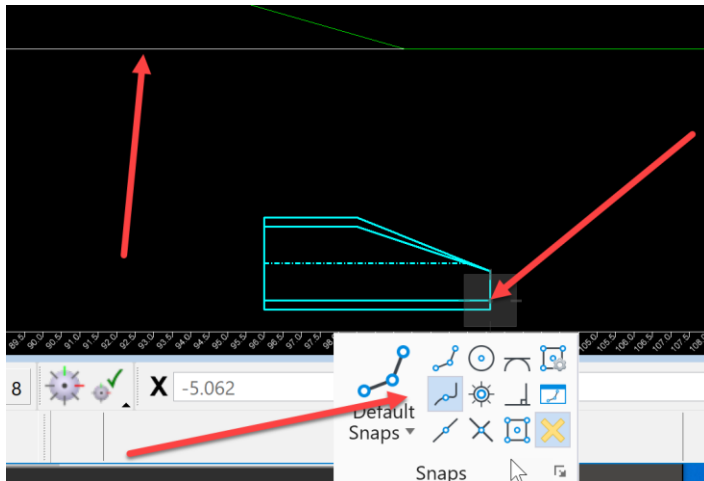
Next, select the smart line command.



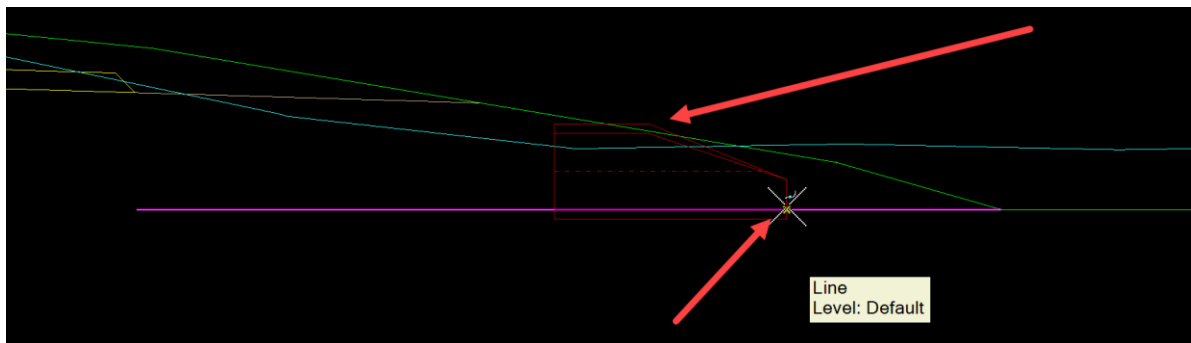
With AccuDraw turned on, snap to the lowest point in the ditch and draw a line using the compass locked on that axis from that point.



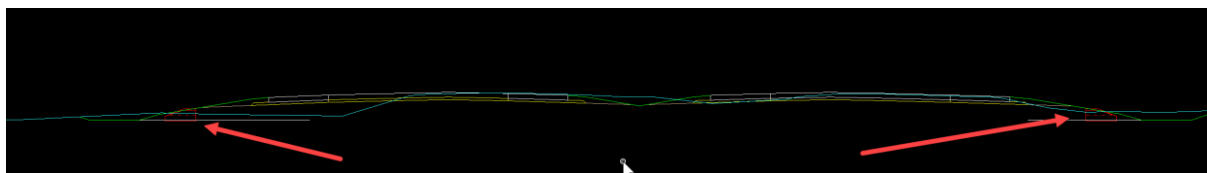
Then use the Element Selection tool to select the apron copied to that side of the section



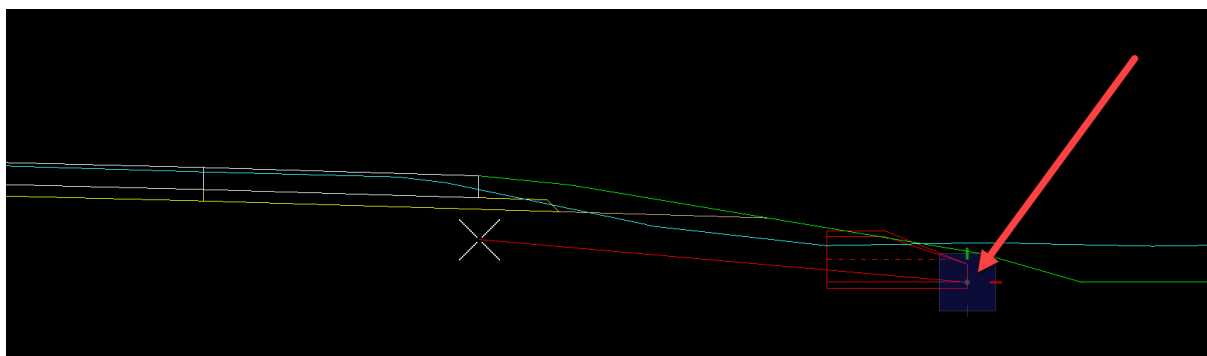
Once it is selected, use the move command to place it at the end of the apron on the flowline. Then set the AccuSnap mode to nearest snap.



Place the apron along the line that represents low point elevation of the ditch until the apron is just peeking out of the foreslope in the section.

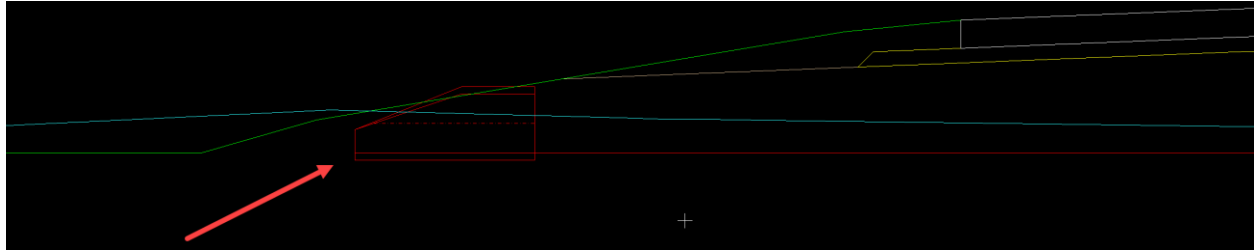


Next, repeat this on the other side of the section.

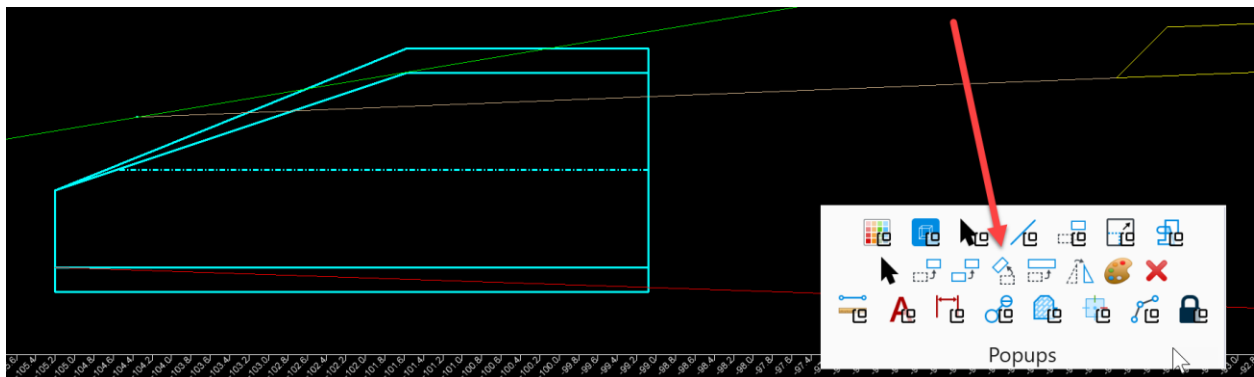


Once the aprons are placed on each end, the lines that were used to establish the ditch elevations can be deleted.

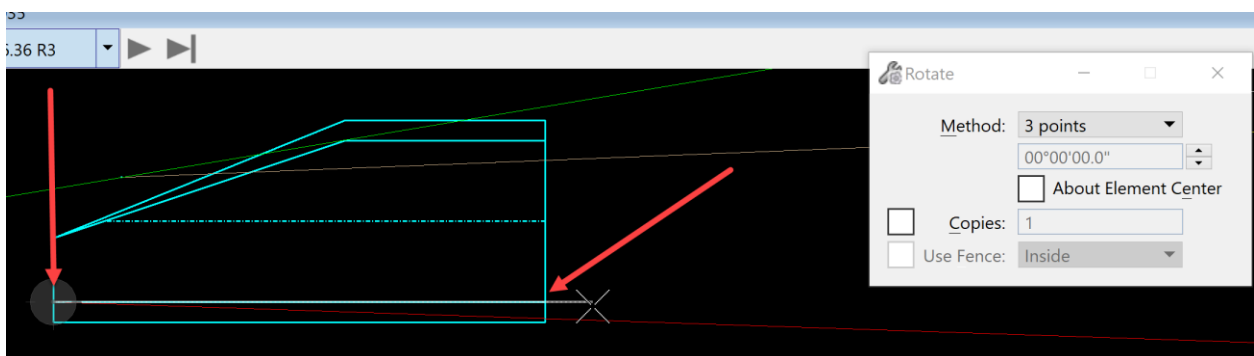
Next, place a smart line from the flowline end of the apron at one end to the flowline end of the apron at the other end. This is also a great place to check the % of fall the structure has.



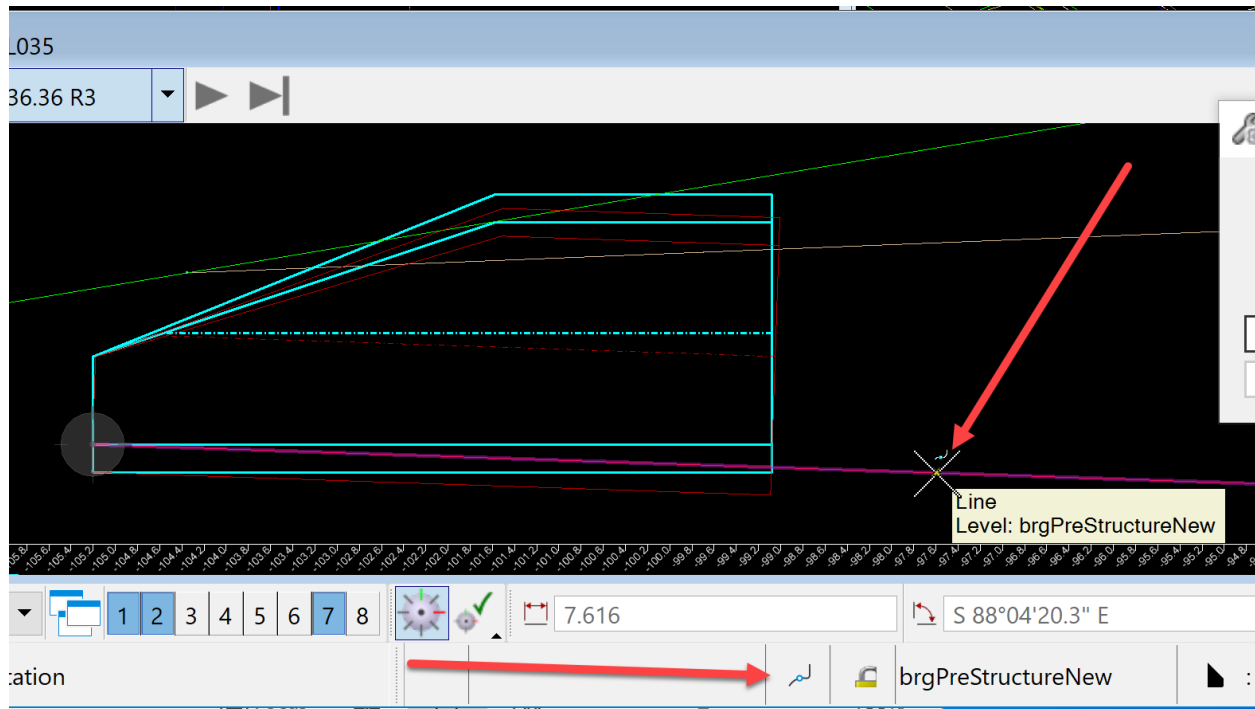
Next, rotate the aprons at each end of the structure to match the % of fall the structure has. To do this use the element selection tool and select the apron.



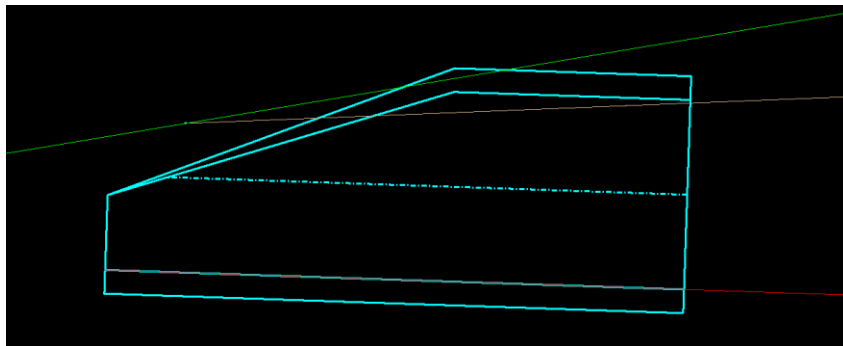
Press the spacebar on the keyboard and select the rotate command. Set the Method to 3 points and select the point at the flowline at the end of the apron for the first point. For the second point select the flowline at the pipe joint.



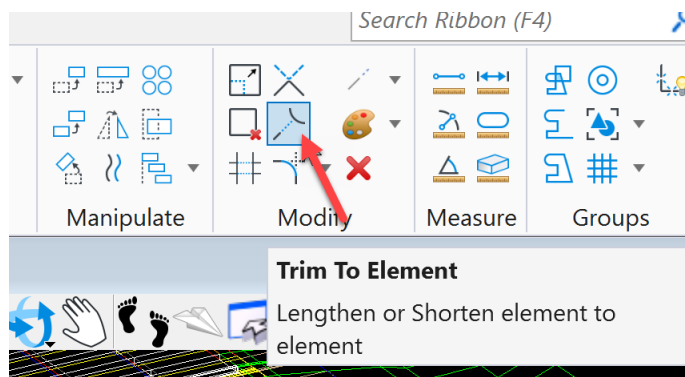
Then for third and last point, change the AccuSnap to a nearest snap and snap the line that was placed from end of apron to end of apron.



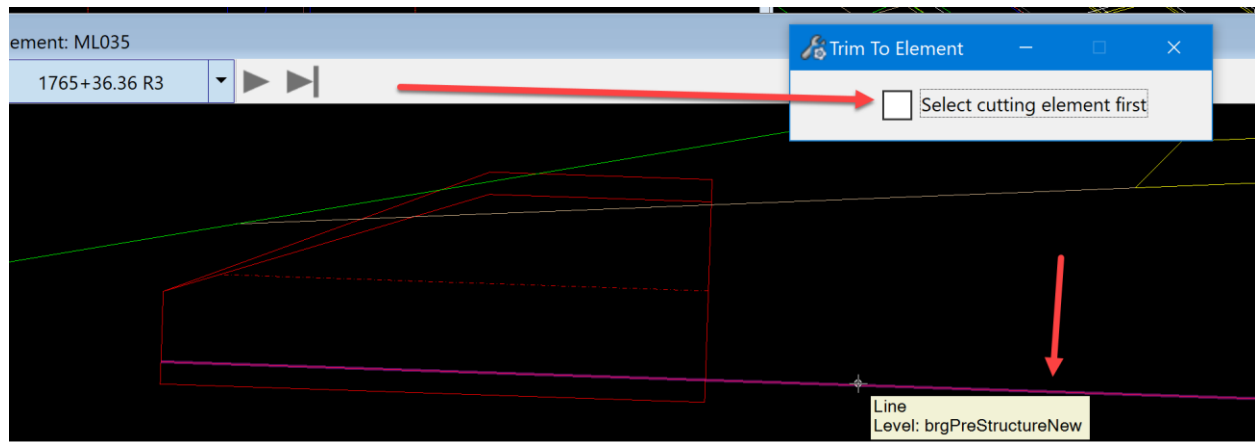
It should appear similar to below.



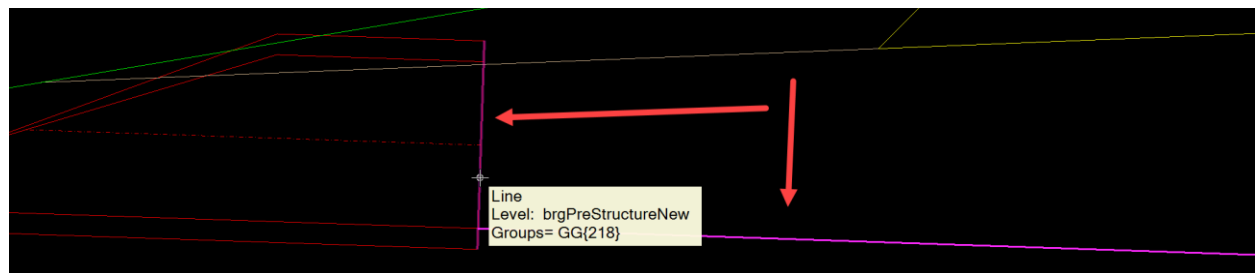
Then use the Element Selection tool to unselect the apron. Then repeat the same process on the other apron. Once the aprons are rotated select the Trim to Element tool.



Select the line that was placed from flowline to flowline as the first element to cut.



Then select the edge of the apron to trim the line to.

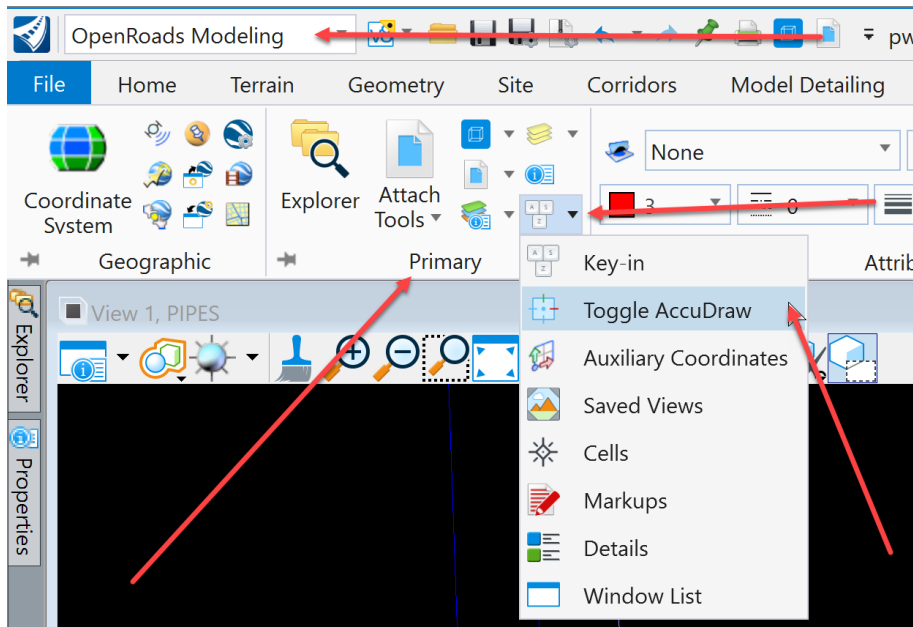


Then repeat this on the other apron. This will make the line between the aprons the exact distance the aprons are apart.

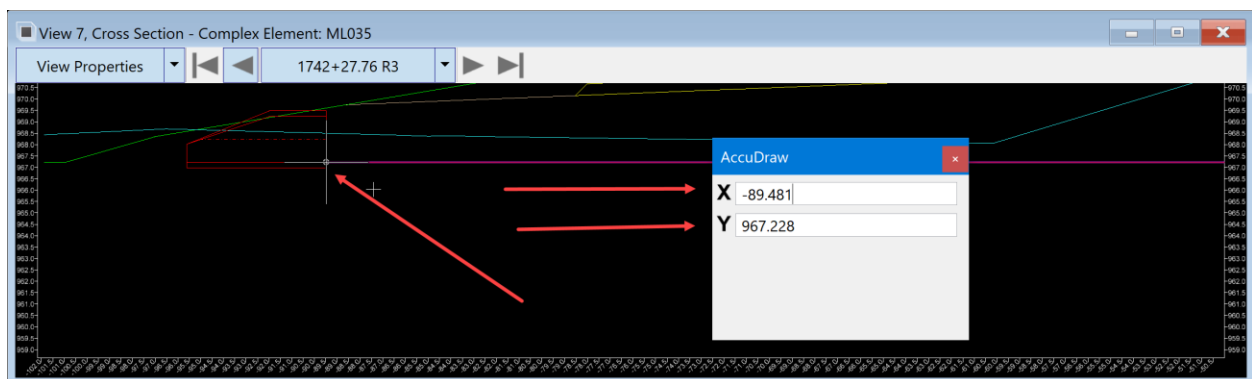
Next, measure that distance and adjust this line to make it match the intervals needed. For example, if it is RCP it needs to be an even 2' interval. If it is an RCB or CMP it needs to be even 1' intervals. Note: if the line is lengthened or shortened too much, check the apron rotation again using the process above. Keep in mind that the point that the apron is rotated from is the end of the apron that is set to the ditch low point elevation.

Once the structure design is as desired, then record the invert elevations and offsets of each key point. If using the ASCII graphics input file method demonstrated in these instructions, that is the location to record that information. For more information about the ASCII graphics input file, please refer to [CW03 ASCII Graphics Import Input File](#).

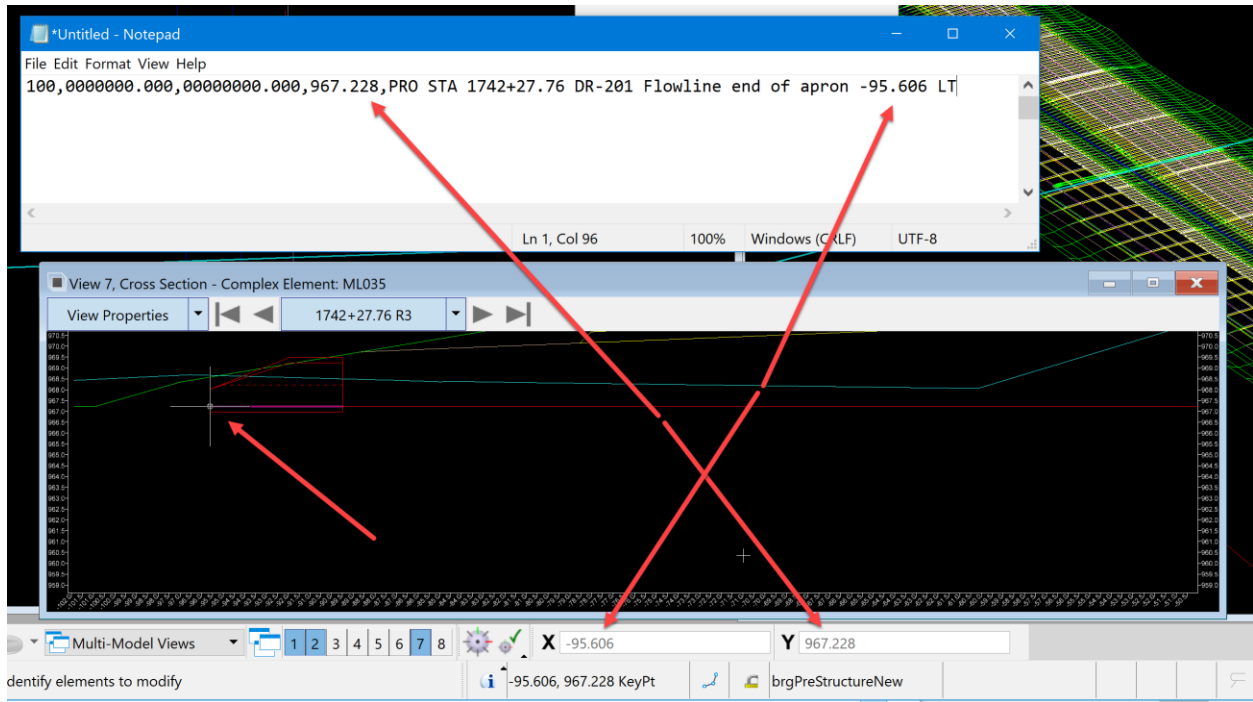
To record the invert elevations and offsets of each key point, make sure the AccuDraw is toggled on.
Note: AccuDraw toggle is located in the Primary group on the More tool pulldown.



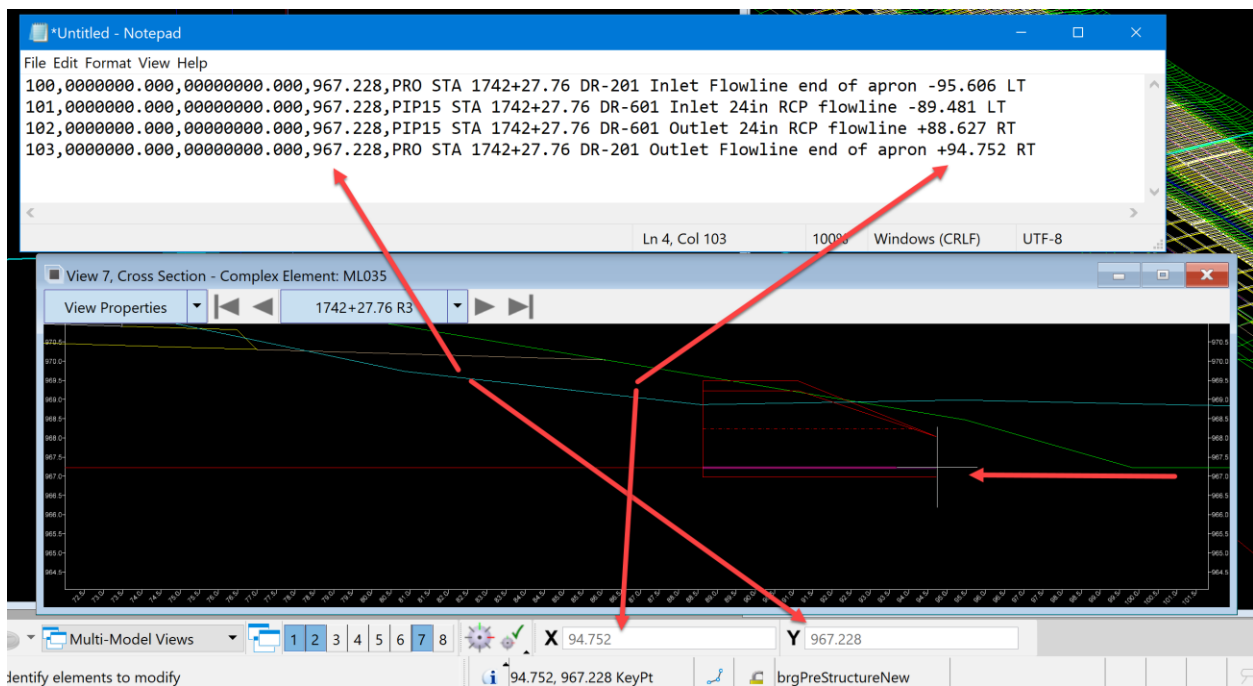
Then snap to each key point. The AccuDraw coordinate readout box will display that points coordinates. The X = offset and the Y = elevation.



Record each of these values for each point in the ASCII graphics input file.

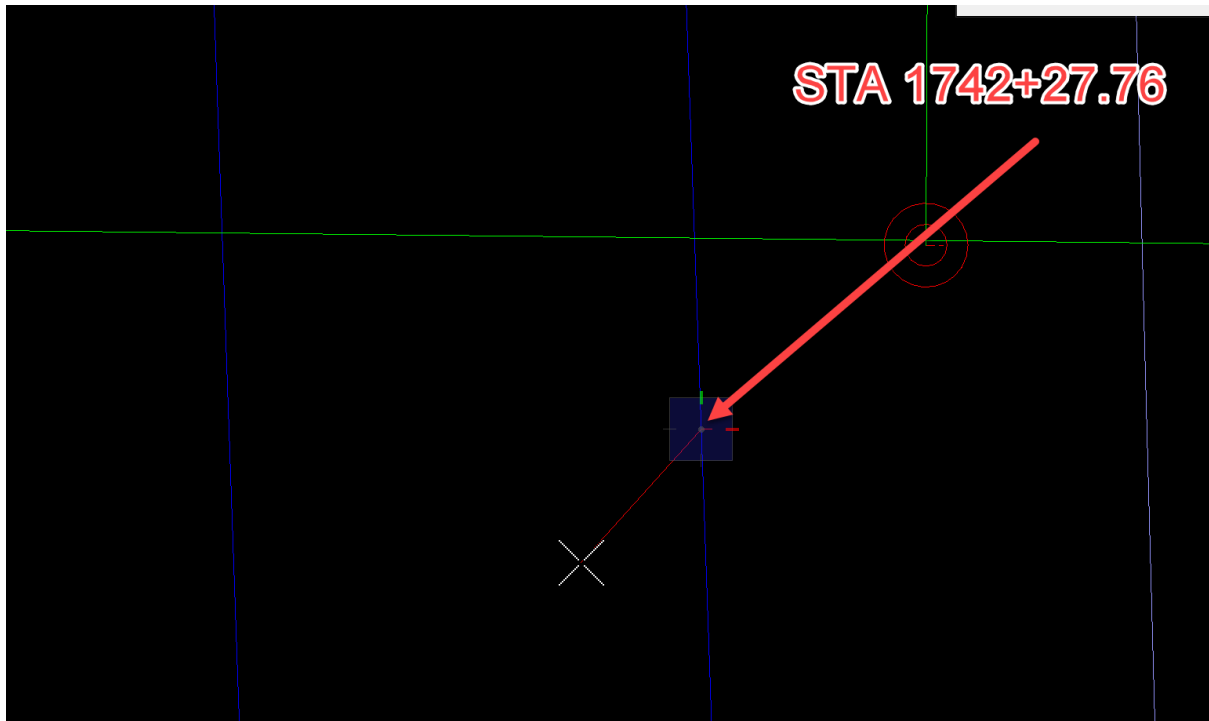


Next, repeat this for each key point that is needed to model the pipe or culvert.

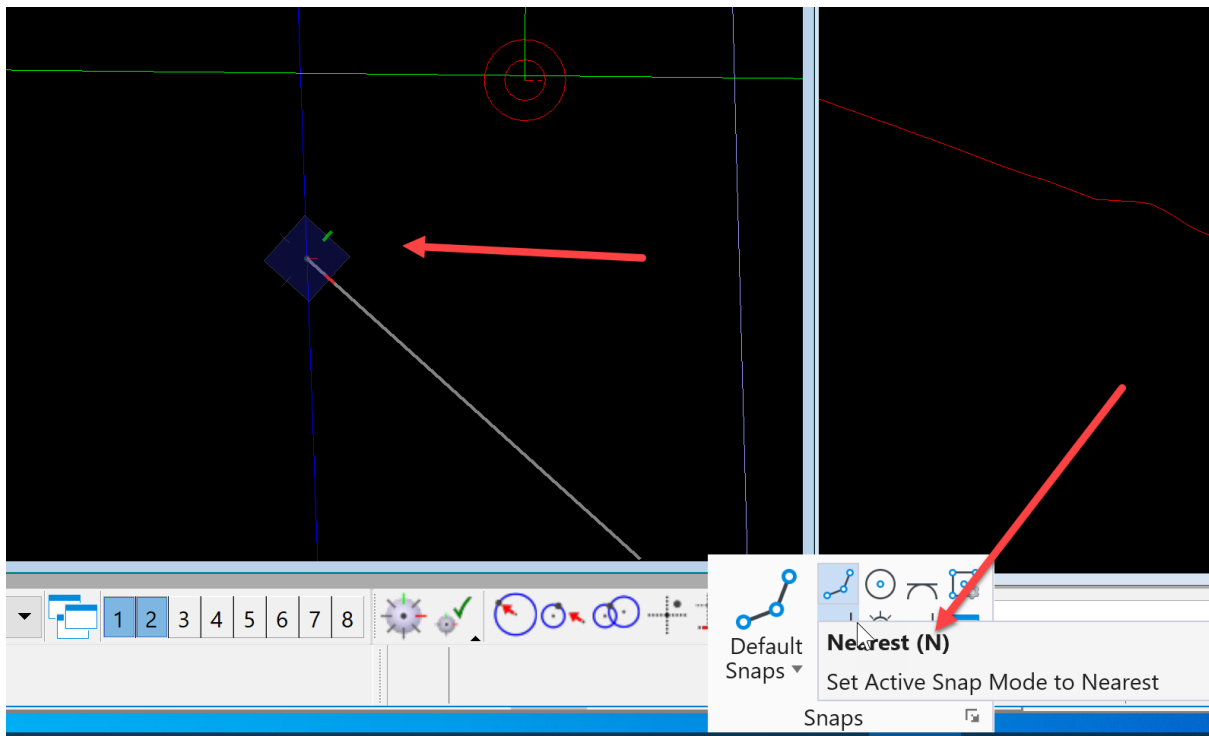


Once all the values are recorded, calculate the X and Y coordinates. To do this, use Civil AccuDraw or standard AccuDraw. Note: When using Civil AccuDraw make sure standard AccuDraw is turned off before toggling on Civil AccuDraw. (MicroStation does not like having both toggled on at the same time.)

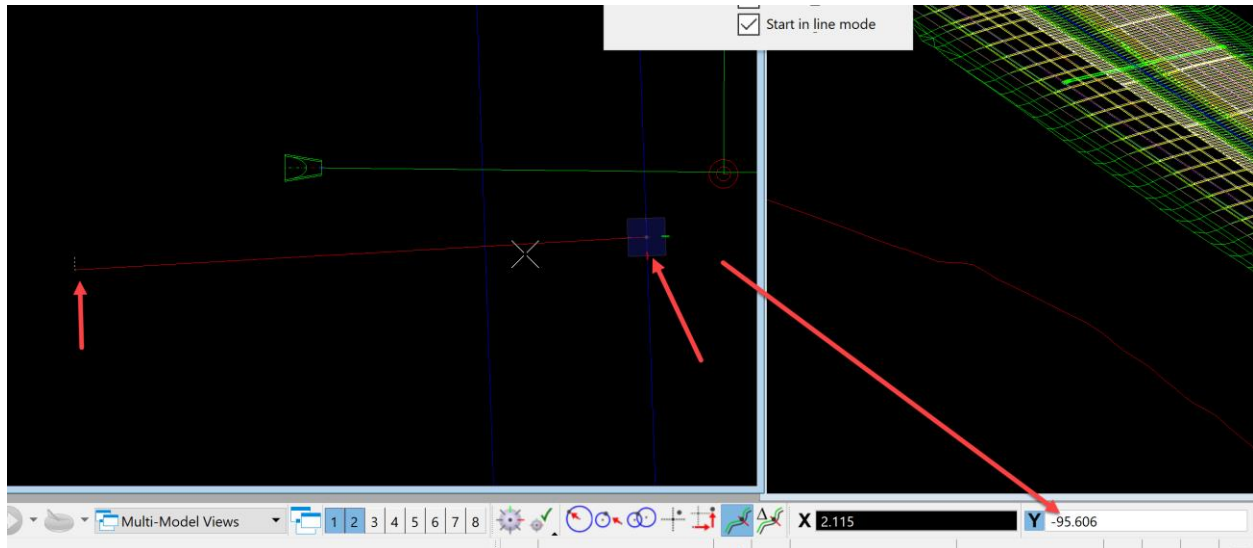
Using standard AccuDraw is covered in this set of instructions. To do this, locate the correct station for the structure along the alignment. For this example, it will be 1742+27.76. Once this location is known select the smart line tool and snap to that point or station along the alignment to start the line at.



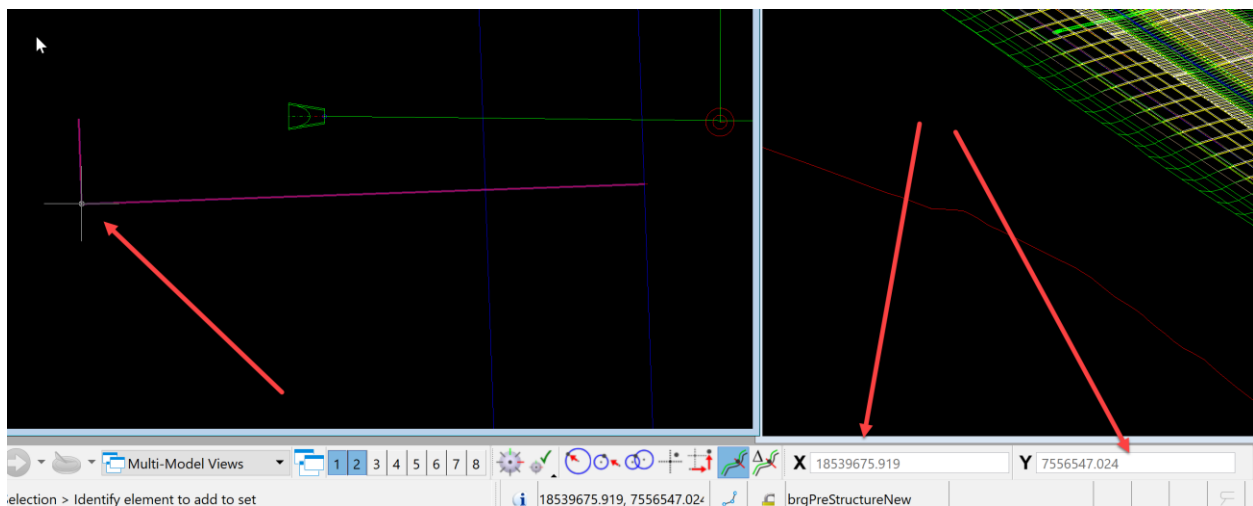
With the line started type R Q on the keyboard to rotate quick the AccuDraw compass. Then with a nearest snap, snap to the alignment.



This will rotate the AccuDraw compass so that it is set to the alignment's axis. Then pull the line in the direction needed to calculate the coordinate and type in the distance of the offset of that point. For this example, it will be -95.606. Pull the line to the left of the alignment and type in 95.606. Note: negative numbered offsets are to the left and positive numbered offsets are to the right.



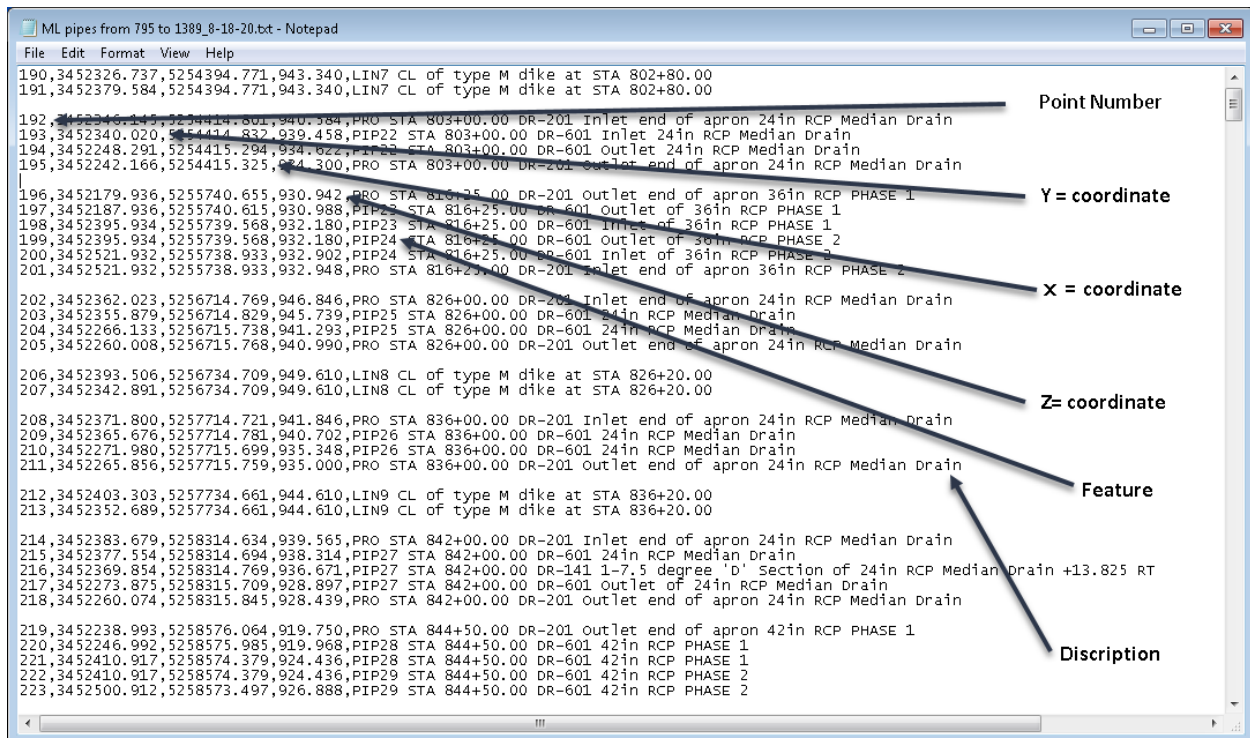
Then data point to accept it. This way, a perfect 90-degree line from the CL is drawn that is the correct distance for the offset. Then snap to the end of this line.



AccuDraw will display the X and Y Coordinates of that point. Then place these coordinates in the ASCII graphics input file. Repeat this process for each input point.

ASCI Graphics Import Input File

Once the invert coordinates of the pipe and/or culverts to be modeled are determined, there are two options to place it. 1st is with Civil AccuDraw; 2nd is with the ASCII graphics. The format of the ASCII graphics input file will be covered first. In a note pad file, make a comma delimited format file. This consists of the point number, Y coordinate, X coordinate, Z coordinate, feature and description. It should look something like this:



The first number is the point number. This number can start as any number but cannot be repeated in the ASCII file and it is a good idea not to repeat it per project. This number needs to increase as the file grows.

The Second number is the Y coordinate of the invert.

The third number is the X coordinate of the invert.

The fourth number is the Z coordinate of the invert.

The fifth value is the feature. The feature can map or draw many different lines and/or cells. For this process, the feature will be PIP (which is the feature for pipes). To make each feature unique, add a number to the feature so that MicroStation knows what features points to connect with the correct line style. So, the first feature will be PIP1, the next one will be PIP2 and so on.

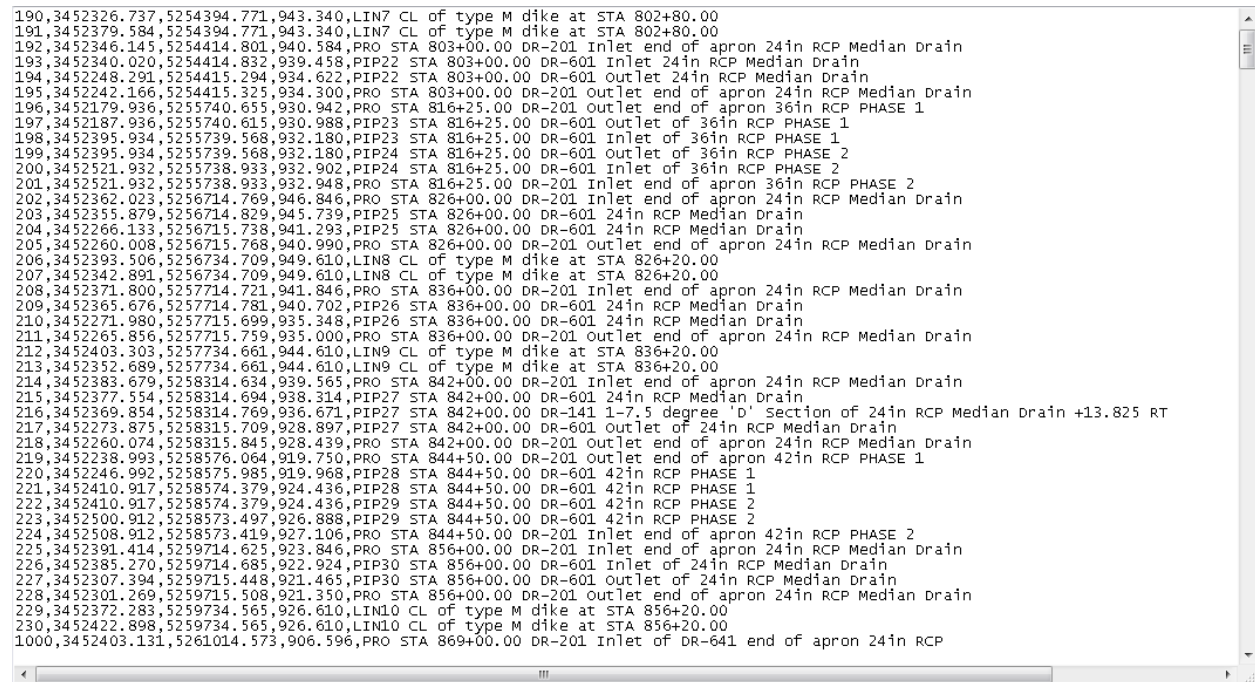
The sixth value is the point description of each point. This value is a little different than the previous values because it is not separated from the other values by a comma but separated with a space between it and the feature. Up to 256 characters can be used to describe the point that will be mapped.

For this process describe the point by design station, design standard, indicate inlet or outlet, include size and last the type of structure.

This is an example for a 24 inch RCP median drain at station 803+00.00

193,3452340.020,5254414.832,939.458,PIP22 STA 803+00.00 DR-601 Inlet 24in RCP Median Drain

Once all the invert coordinates are recorded in the ASCII graphics import input file it should look something like this:



The screenshot displays a text file with a list of stationing and structure data. The data is organized into columns: stationing (e.g., 190,3452326.737), invert coordinates (e.g., 5254394.771), design standard (e.g., LIN7), and structure description (e.g., CL of type M dike at STA 802+80.00). The list continues with various structures including inlets, outlets, and phases of a 24-inch RCP median drain, with stationing increasing from 802+80.00 to 869+00.00. The file is displayed in a window with a scroll bar on the right and a status bar at the bottom.

```
190,3452326.737,5254394.771,943.340,LIN7 CL of type M dike at STA 802+80.00
191,3452379.584,5254394.771,943.340,LIN7 CL of type M dike at STA 802+80.00
192,3452346.145,5254414.801,940.584,PRO STA 803+00.00 DR-201 Inlet end of apron 24in RCP Median Drain
193,3452340.020,5254414.832,939.458,PIP22 STA 803+00.00 DR-601 Inlet 24in RCP Median Drain
194,3452248.291,5254415.294,934.622,PIP22 STA 803+00.00 DR-601 Outlet 24in RCP Median Drain
195,3452242.166,5254415.325,934.300,PRO STA 803+00.00 DR-201 Outlet end of apron 24in RCP Median Drain
196,3452179.936,5255740.655,930.942,PRO STA 816+25.00 DR-201 Outlet end of apron 36in RCP PHASE 1
197,3452187.936,5255740.615,930.988,PIP23 STA 816+25.00 DR-601 Outlet of 36in RCP PHASE 1
198,3452395.934,5255739.568,932.180,PIP23 STA 816+25.00 DR-601 Inlet of 36in RCP PHASE 1
199,3452395.934,5255739.568,932.180,PIP24 STA 816+25.00 DR-601 Outlet of 36in RCP PHASE 2
200,3452521.932,5255738.933,932.902,PIP24 STA 816+25.00 DR-601 Inlet of 36in RCP PHASE 2
201,3452521.932,5255738.933,932.948,PRO STA 816+25.00 DR-201 Inlet end of apron 36in RCP PHASE 2
202,3452362.023,5256714.769,946.846,PRO STA 826+00.00 DR-201 Inlet end of apron 24in RCP Median Drain
203,3452355.879,5256714.829,945.739,PIP25 STA 826+00.00 DR-601 24in RCP Median Drain
204,3452266.133,5256715.738,941.293,PIP25 STA 826+00.00 DR-601 24in RCP Median Drain
205,3452260.008,5256715.768,940.990,PRO STA 826+00.00 DR-201 Outlet end of apron 24in RCP Median Drain
206,3452393.506,5256734.709,949.610,LIN8 CL of type M dike at STA 826+20.00
207,3452342.891,5256734.709,949.610,LIN8 CL of type M dike at STA 826+20.00
208,3452371.800,5257714.721,941.846,PRO STA 836+00.00 DR-201 Inlet end of apron 24in RCP Median Drain
209,3452365.676,5257714.781,940.702,PIP26 STA 836+00.00 DR-601 24in RCP Median Drain
210,3452271.980,5257715.699,935.348,PIP26 STA 836+00.00 DR-601 24in RCP Median Drain
211,3452265.856,5257715.759,935.000,PRO STA 836+00.00 DR-201 Outlet end of apron 24in RCP Median Drain
212,3452403.303,5257734.661,944.610,LIN9 CL of type M dike at STA 836+20.00
213,3452352.689,5257734.661,944.610,LIN9 CL of type M dike at STA 836+20.00
214,3452383.679,5258314.634,939.565,PRO STA 842+00.00 DR-201 Inlet end of apron 24in RCP Median Drain
215,3452377.554,5258314.694,938.314,PIP27 STA 842+00.00 DR-601 24in RCP Median Drain
216,3452369.854,5258314.769,936.671,PIP27 STA 842+00.00 DR-141 1-7.5 degree 'd' Section of 24in RCP Median Drain +13.825 RT
217,3452273.875,5258315.709,928.897,PIP27 STA 842+00.00 DR-601 Outlet of 24in RCP Median Drain
218,3452260.074,5258315.845,928.439,PRO STA 842+00.00 DR-201 Outlet end of apron 24in RCP Median Drain
219,3452238.993,5258576.064,919.750,PRO STA 844+50.00 DR-201 Outlet end of apron 42in RCP PHASE 1
220,3452246.992,5258575.985,919.968,PIP28 STA 844+50.00 DR-601 42in RCP PHASE 1
221,3452410.917,5258574.379,924.436,PIP28 STA 844+50.00 DR-601 42in RCP PHASE 1
222,3452410.917,5258574.379,924.436,PIP29 STA 844+50.00 DR-601 42in RCP PHASE 2
223,3452500.912,5258573.497,926.888,PIP29 STA 844+50.00 DR-601 42in RCP PHASE 2
224,3452508.912,5258573.419,927.106,PRO STA 844+50.00 DR-201 Inlet end of apron 42in RCP PHASE 2
225,3452391.414,5259714.625,923.846,PRO STA 856+00.00 DR-201 Inlet end of apron 24in RCP Median Drain
226,3452385.270,5259714.685,922.924,PIP30 STA 856+00.00 DR-601 Inlet of 24in RCP Median Drain
227,3452307.394,5259715.448,921.465,PIP30 STA 856+00.00 DR-601 Outlet of 24in RCP Median Drain
228,3452301.269,5259715.508,921.350,PRO STA 856+00.00 DR-201 Outlet end of apron 24in RCP Median Drain
229,3452372.283,5259734.565,926.610,LIN10 CL of type M dike at STA 856+20.00
230,3452422.898,5259734.565,926.610,LIN10 CL of type M dike at STA 856+20.00
1000,3452403.131,5261014.573,906.596,PRO STA 869+00.00 DR-201 Inlet of DR-641 end of apron 24in RCP
```

Once the input file is complete then it can be loaded in the MicroStation file.

To proceed: refer to [CW04 Loading the ASCII graphics input file into MicroStation file.](#)

Loading the ASCII Graphics Input File into MicroStation File

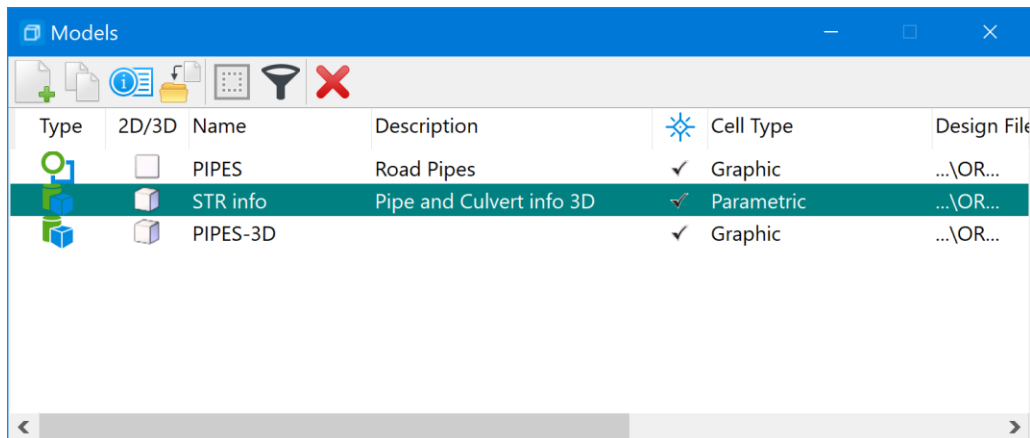
These instructions were created on 3/23/2021. These instructions were created with:



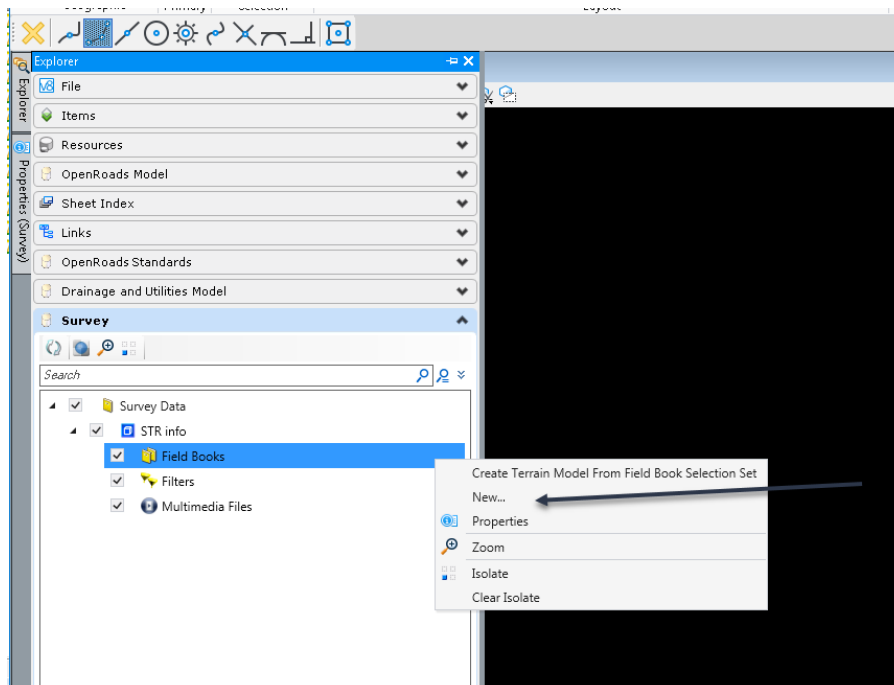
OpenRoads Designer CONNECT Edition - 2020 Release 3 Update 9 - Version 10.09.00.91

Once the ASCII graphics input file is done then the file is ready to load in our MicroStation file.

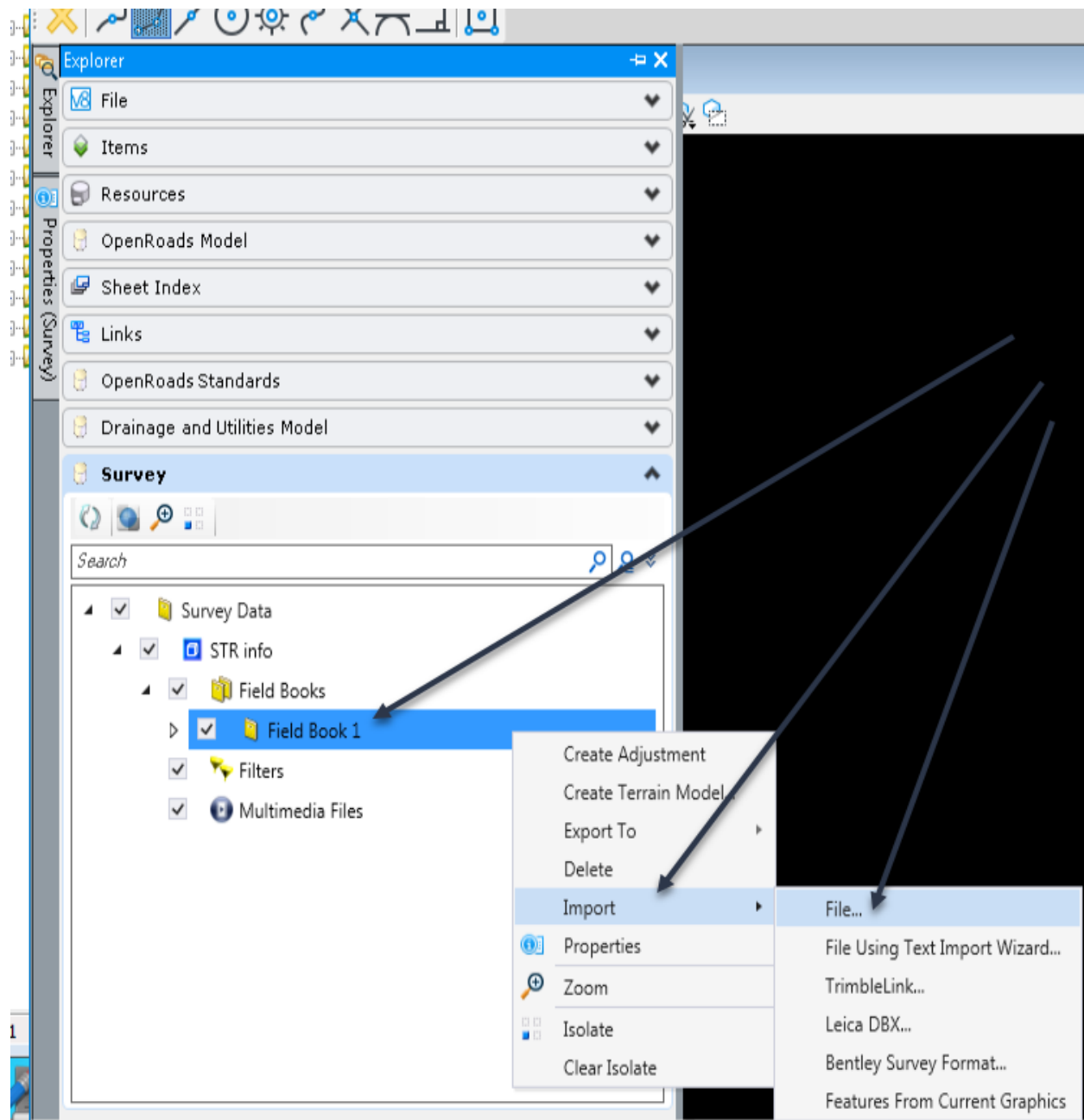
With the MicroStation file open, go to the Models dialog box and select the STR info to make it the active model.



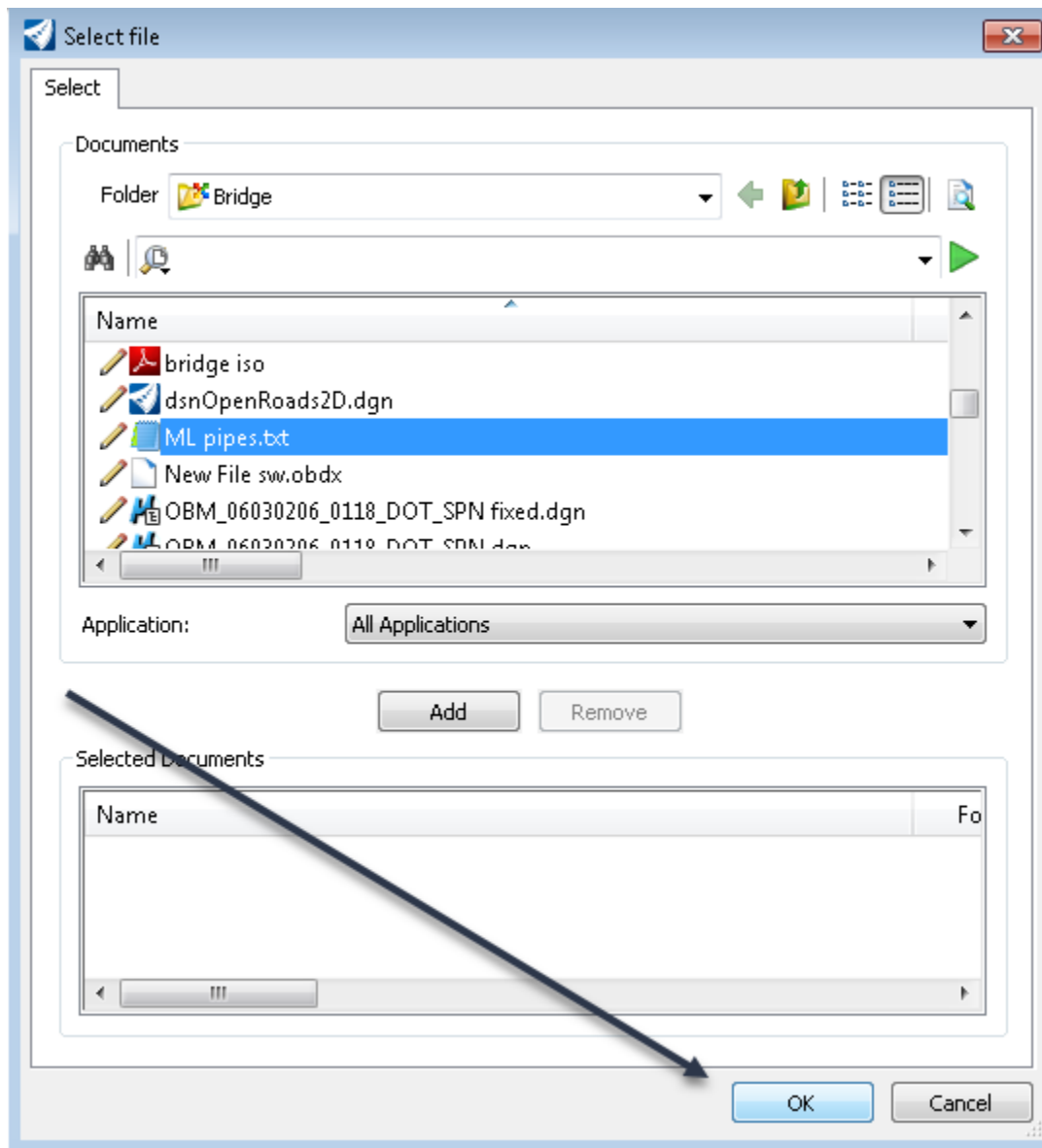
In project Explorer under the Survey tab select Field Books under STR info, then right click and select New. The name of the Field Book is automatic using a sequential number starting with 1. This will make a new field book that will be used to load the ASCII graphics input file that contains the invert coordinates.



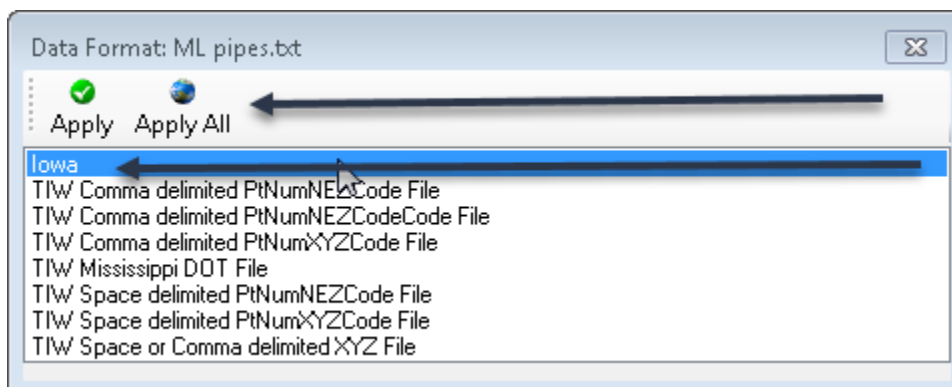
Next select the new field book, then right click and select import. Select the ASCII graphics input file that was created.



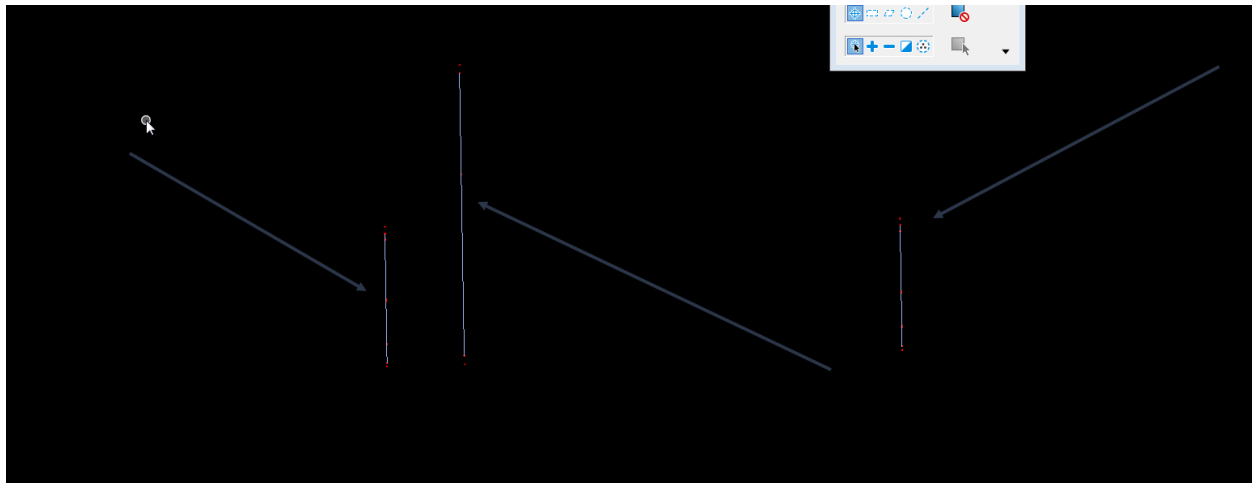
Then browse to where the Survey input file that contains the invert coordinates is stored. Then click OK.



It will prompt for the data format. Select the Iowa format and then click Apply All.



This will map all the points and lines in the survey input file.



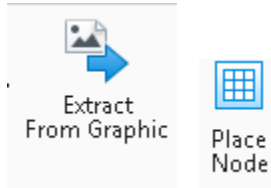
Once the points and lines from the ASCII graphics input file are loaded and the correct location is verified, then start creating the structures.

How to Place Pipes with the Drainage and Utilities Tools

These instructions were created on 1/03/2021 and revised on 5/5/2021 These instructions were created with:

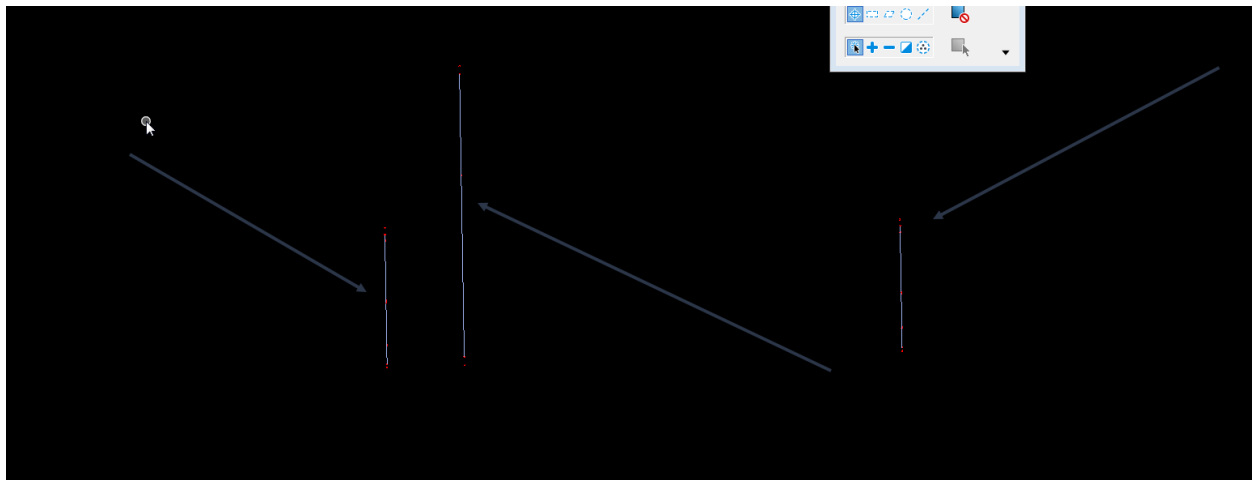


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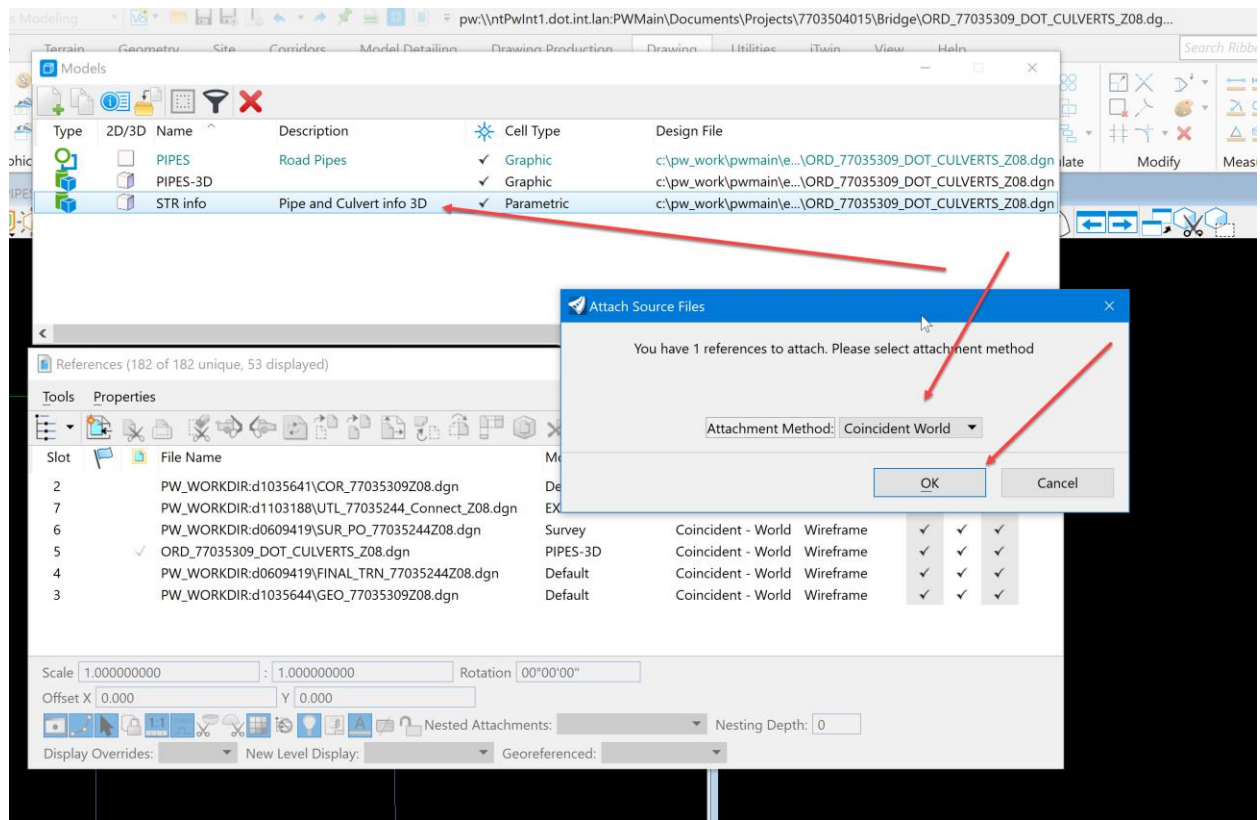


Once the invert coordinates of the pipe and/or culverts to be modeled are determined, then there are two options to place the structure. Place Nodes with Civil AccuDraw or ASCII graphics.

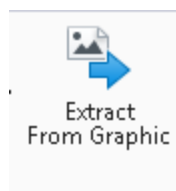
The following instructions cover the Extract by graphics workflow first. To use this tool, generate a 3D line beginning and ending at the determined invert coordinates. Complete this with AccuDraw or with the ASCII file. Note: This method is not the preferred method. It is an old workflow that has some limitations but is quicker and easier to use.



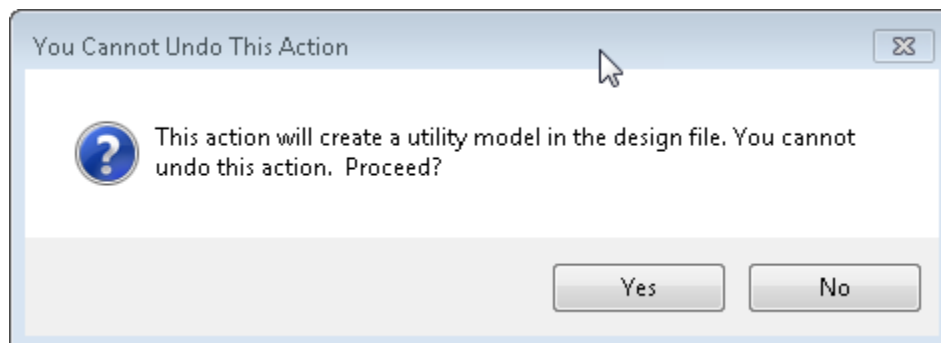
Once the points and lines from the ASCII graphics input file are loaded and the correct location is verified, then start creating the structures. To do this, open the PIPES model and reference in the STR info model. Keep in mind, that the PIPES model is a 2D model and once the STR info model (which is a 3D model) is reference in, MicroStation will automatically create a PIPES-3D model. This is a managed model that cannot and should not be deleted.



The PIPES (2D) model is ready to create the structures. Note: Always make the structures in the 2D model not the 3D model. Next, select the referenced line from the STR info model and activate the utility model by clicking on the Extract From Graphic tool under the Drainage and Utilities workflow on the Lay out tab.

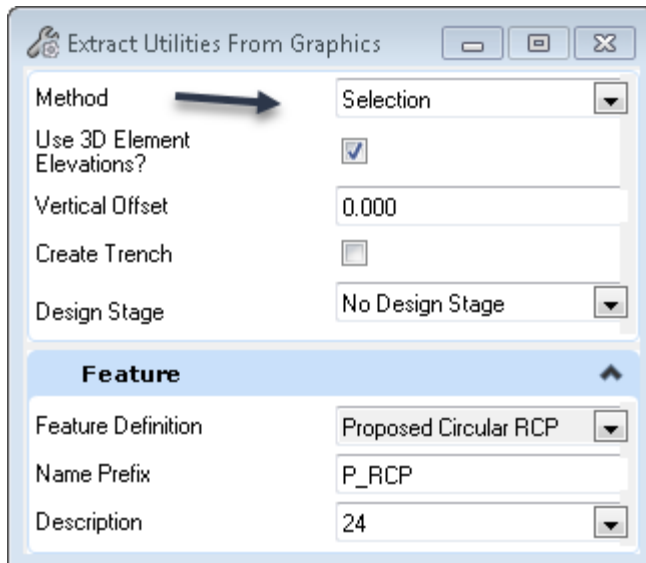


It will display this warning.



Click Yes. Then select the line again and click on the Extract From Graphic tool again.

This will open this Extract Utilities From Graphics dialog box. Select the Selection option from the Method drop down list.



Extract Utilities From Graphics

Method: Selection

Use 3D Element Elevations? ☒

Vertical Offset: 0.000

Create Trench: ☐

Design Stage: No Design Stage

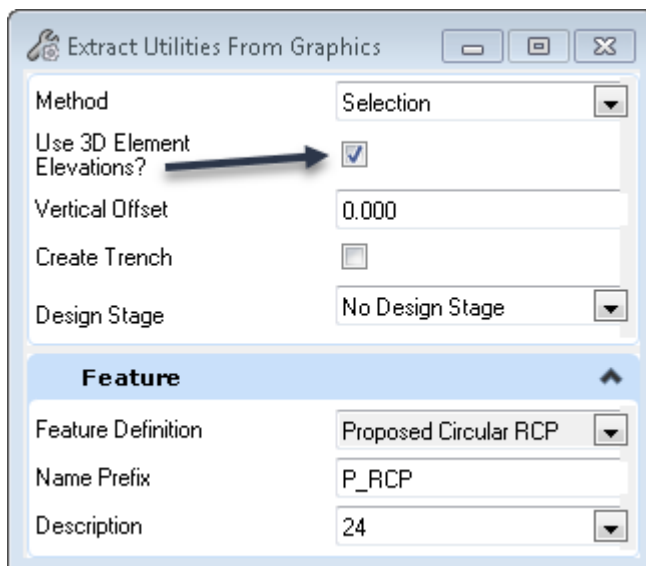
Feature

Feature Definition: Proposed Circular RCP

Name Prefix: P_RCP

Description: 24

Make sure that the Use 3D Element Elevations is toggled on.



Extract Utilities From Graphics

Method: Selection

Use 3D Element Elevations? ☒

Vertical Offset: 0.000

Create Trench: ☐

Design Stage: No Design Stage

Feature

Feature Definition: Proposed Circular RCP

Name Prefix: P_RCP

Description: 24

Then, select the feature definition for the structure being designed. In this example, create a Proposed Circular RCP.

Extract Utilities From Graphics

Method: Selection

Use 3D Element Elevations? ☒

Vertical Offset: 0.000

Create Trench ☐

Design Stage: No Design Stage

Feature

Feature Definition: Proposed Circular RCP

Name Prefix: P_RCP

Description: 24

The Name Prefix is the point description from the survey ASCII import input file.

Extract Utilities From Graphics

Method: Selection

Use 3D Element Elevations? ☒

Vertical Offset: 0.000

Create Trench ☐

Design Stage: No Design Stage

Feature

Feature Definition: Proposed Circular RCP

Name Prefix: STA 803+00.00 DR-601 24in I

Description: 24

Then, select the description that is the size of the pipe.

Extract Utilities From Graphics

Method: Selection

Use 3D Element Elevations?: ☒

Vertical Offset: 0.000

Create Trench: ☐

Design Stage: No Design Stage

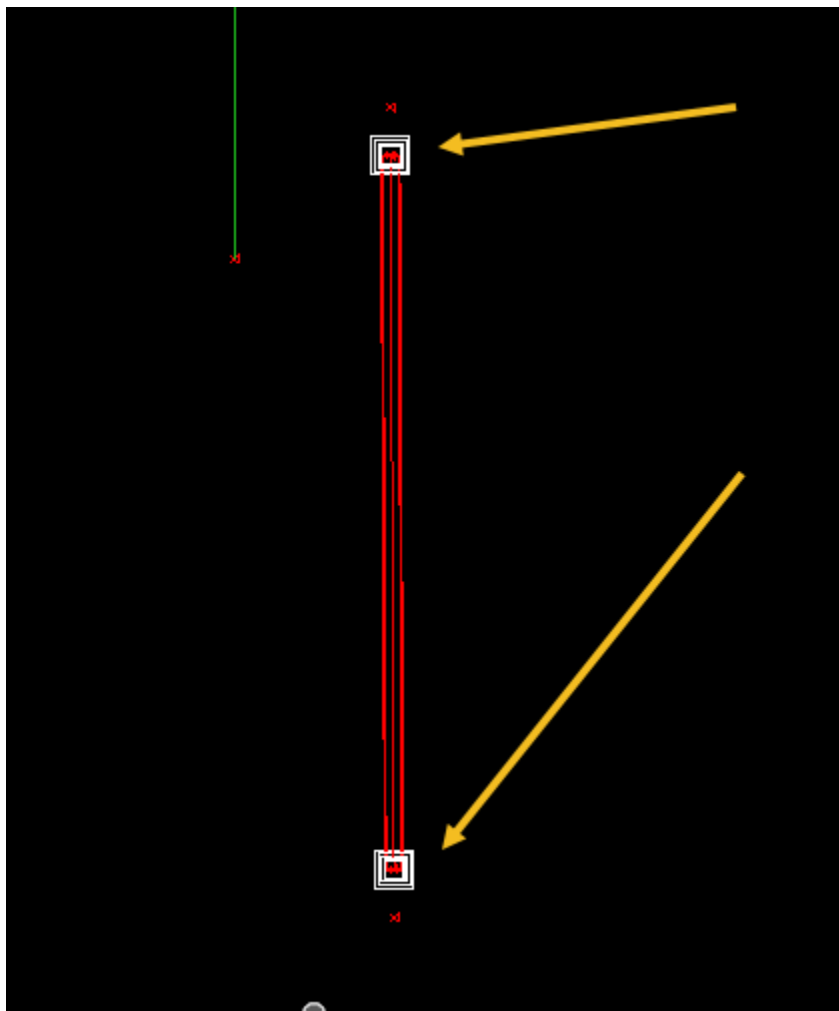
Feature

Feature Definition: Proposed Circular RCP

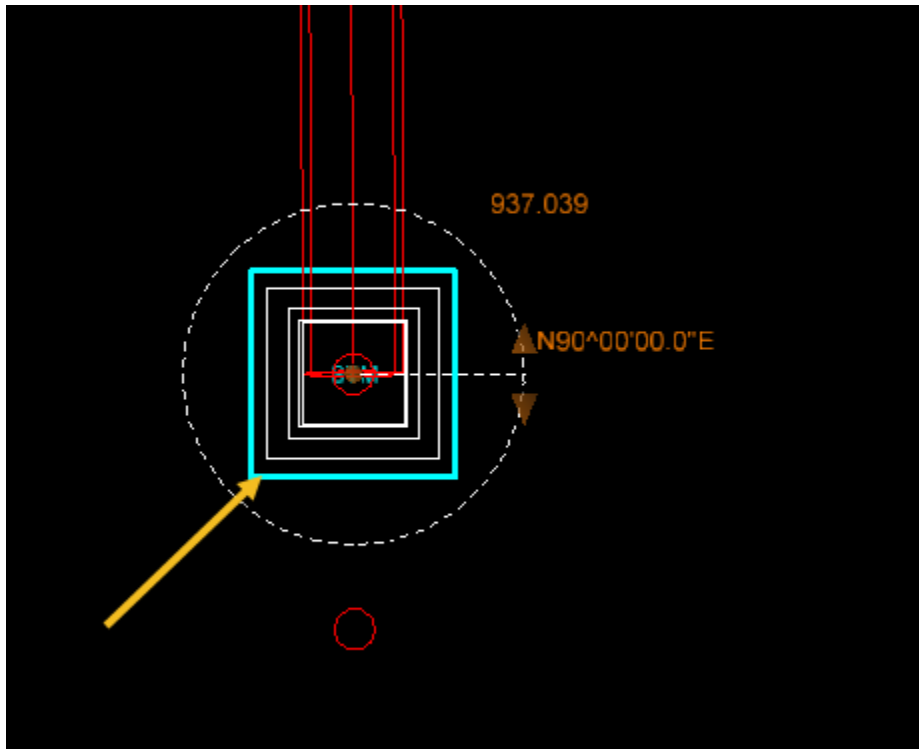
Name Prefix: P_RCP

Description: 24

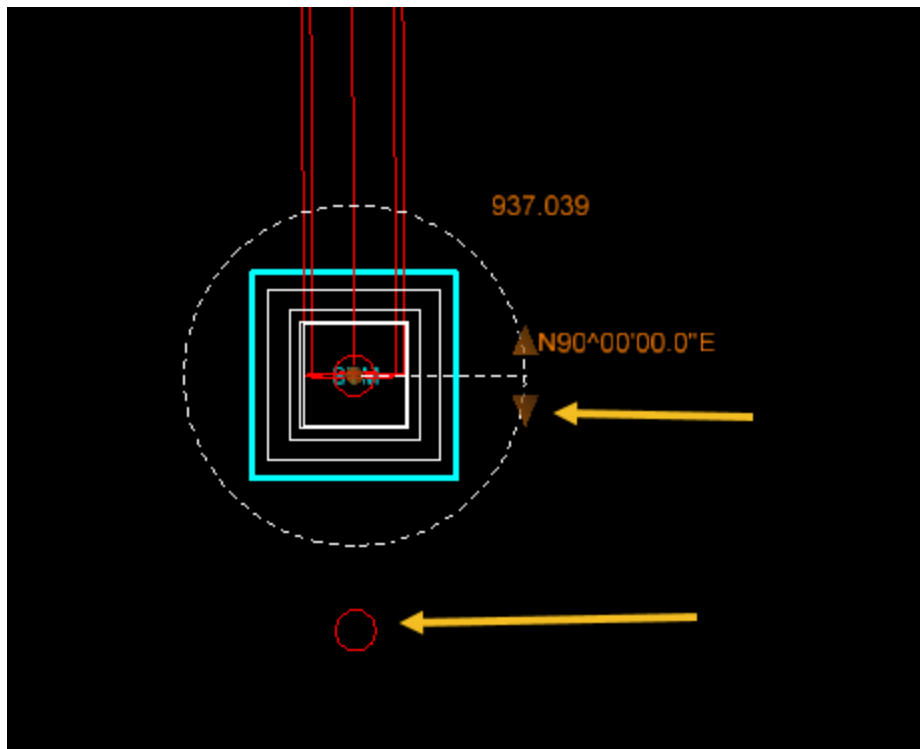
In this feature, it will place the conduit with two of the default nodes attached at each end. It should look something like this.



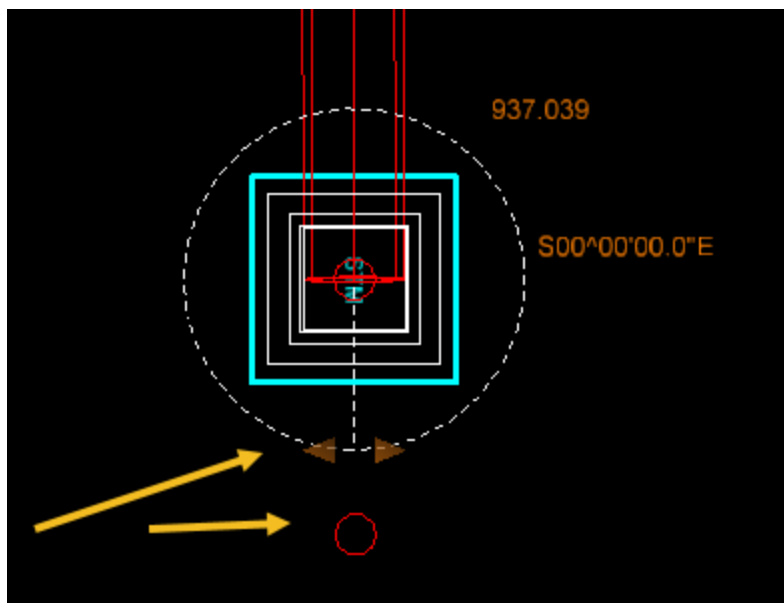
In this example, it is a 24-inch RCP so aprons will be placed on this conduit. To replace these default nodes with aprons, first rotate them then change the feature. To rotate the node, select the outside square and the compass will appear like this.



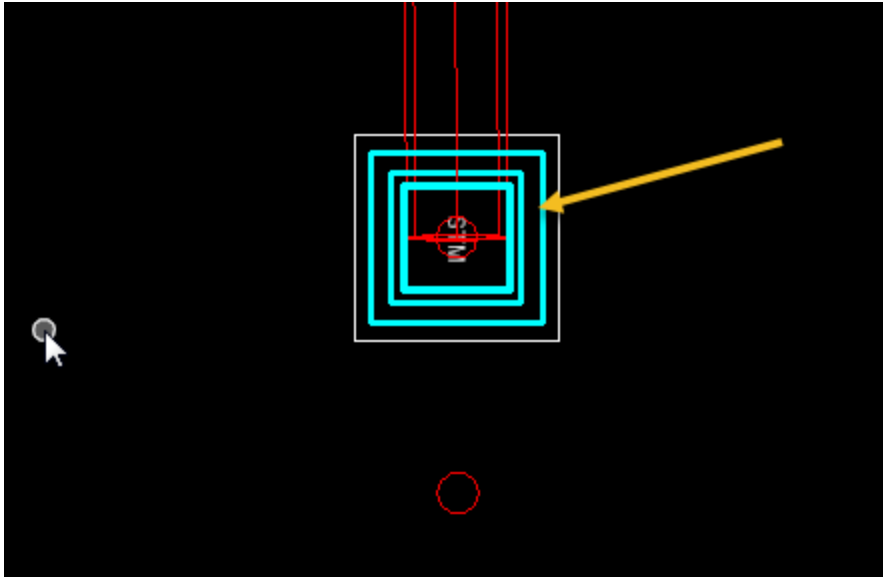
Once the compass shows up, select one of the compass arrows and snap to the PRO point from the input file.



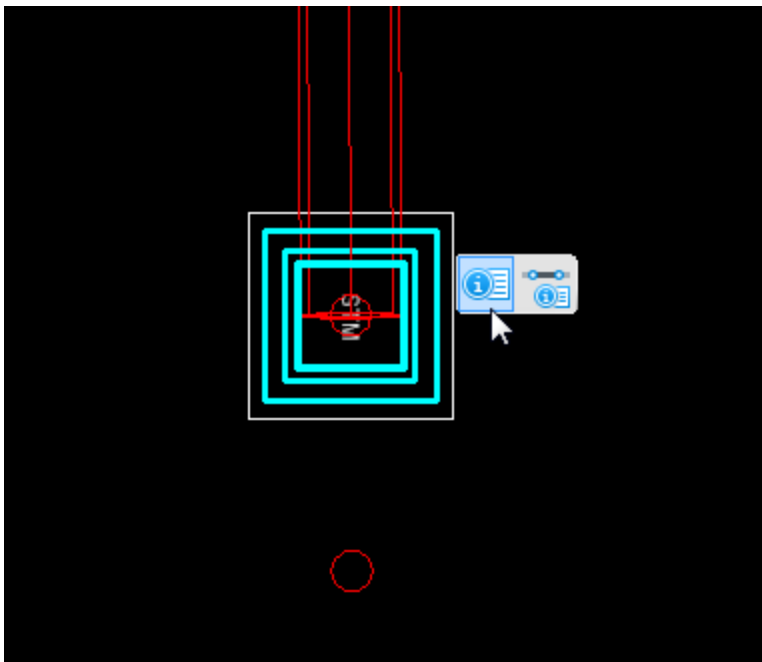
It should look something like this.



Next, change the feature to model the apron required. To do this, select the inner square.



Then hover over it to bring up the heads-up tools. Then select the Properties window.



In the properties window define:

1. The Feature Name that will be the station, standard and either inlet or outlet. For this example, it will be "STA 803+00.00 DR-201 Outlet". This can be copied from the point description of the PRO shot from the input file.
2. The description will be the second half of the point description of the PRO shot. For this example, "Outlet end of apron 24in RCP Median Drain"
3. Then select the Feature Definition.

The image shows a software interface with a feature definition panel. On the left, there is a small map view with a red circle and a cyan square. The panel contains three tables of data. Three yellow arrows, numbered 1, 2, and 3, point to specific fields in the first table.

Feature Name	SN-2
Feature Definition	No Feature Definition
Description	

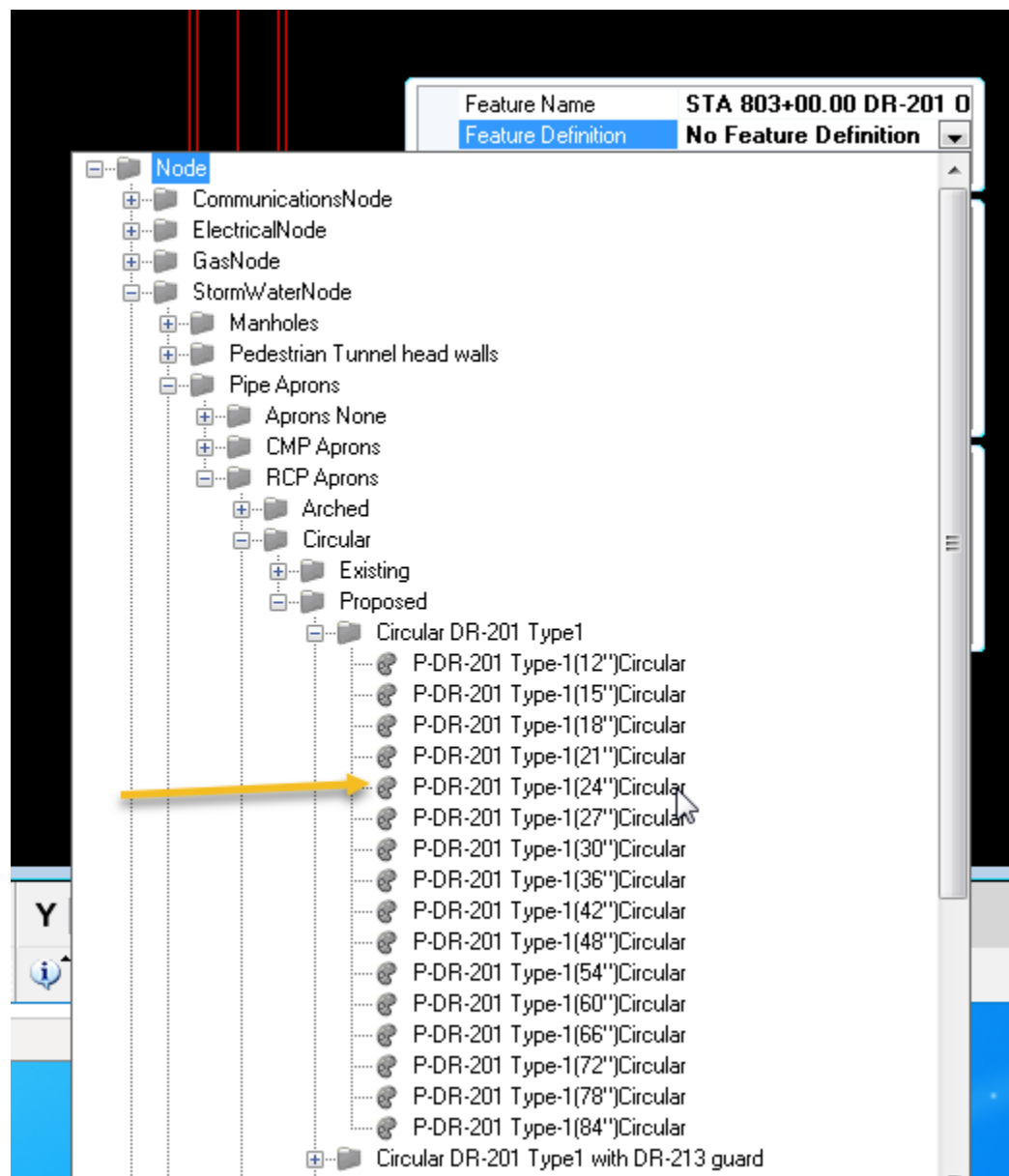
Ground Elevation	937.039
Invert Elevation	934.250
Use Slope of Surface	False
Elevation Reference	
Utility ID	11
Station/Offset Reference	None
Utility Properties	Open Utility Properties

Point	5254415.294sf,3452248.2
X	5254415.294sf
Y	3452248.291sf
Rotation	S00°00'00.0"E
Rotation Reference	None
Absolute Angle	True

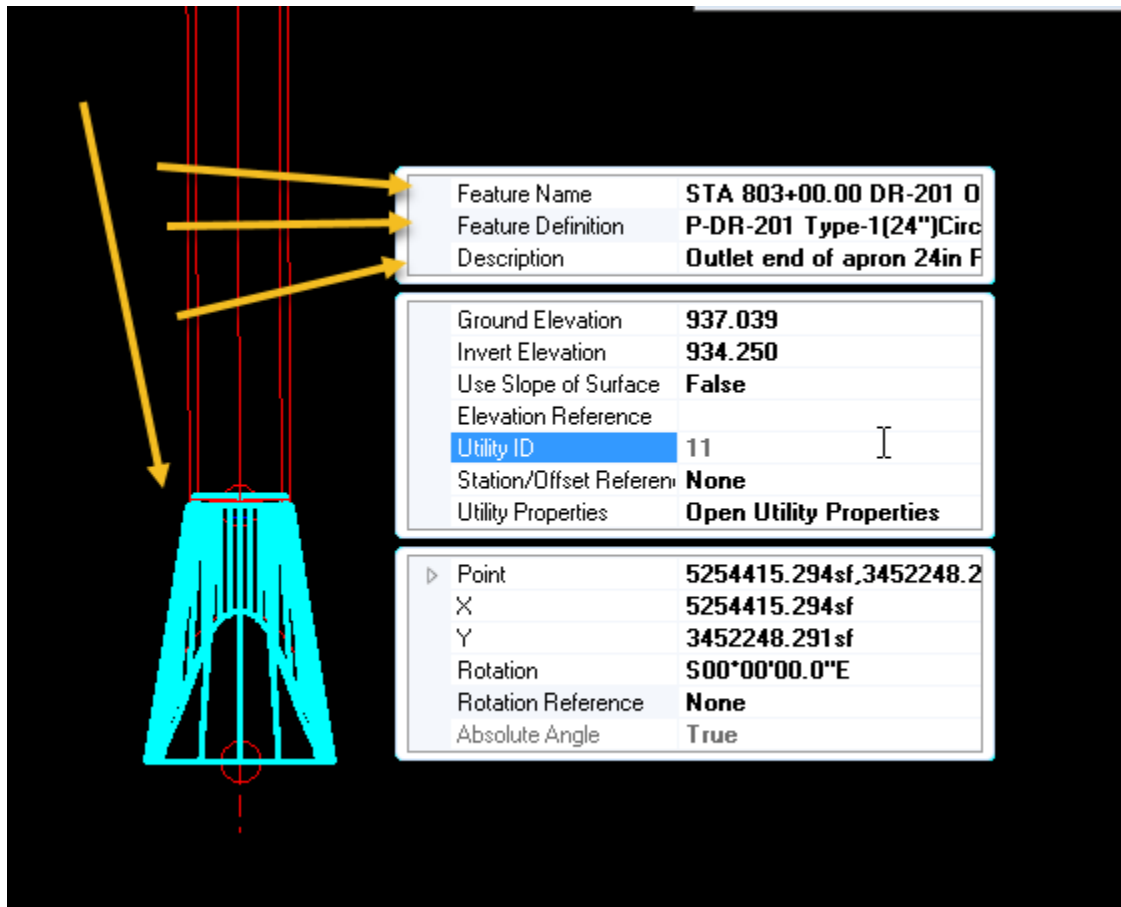
1

2

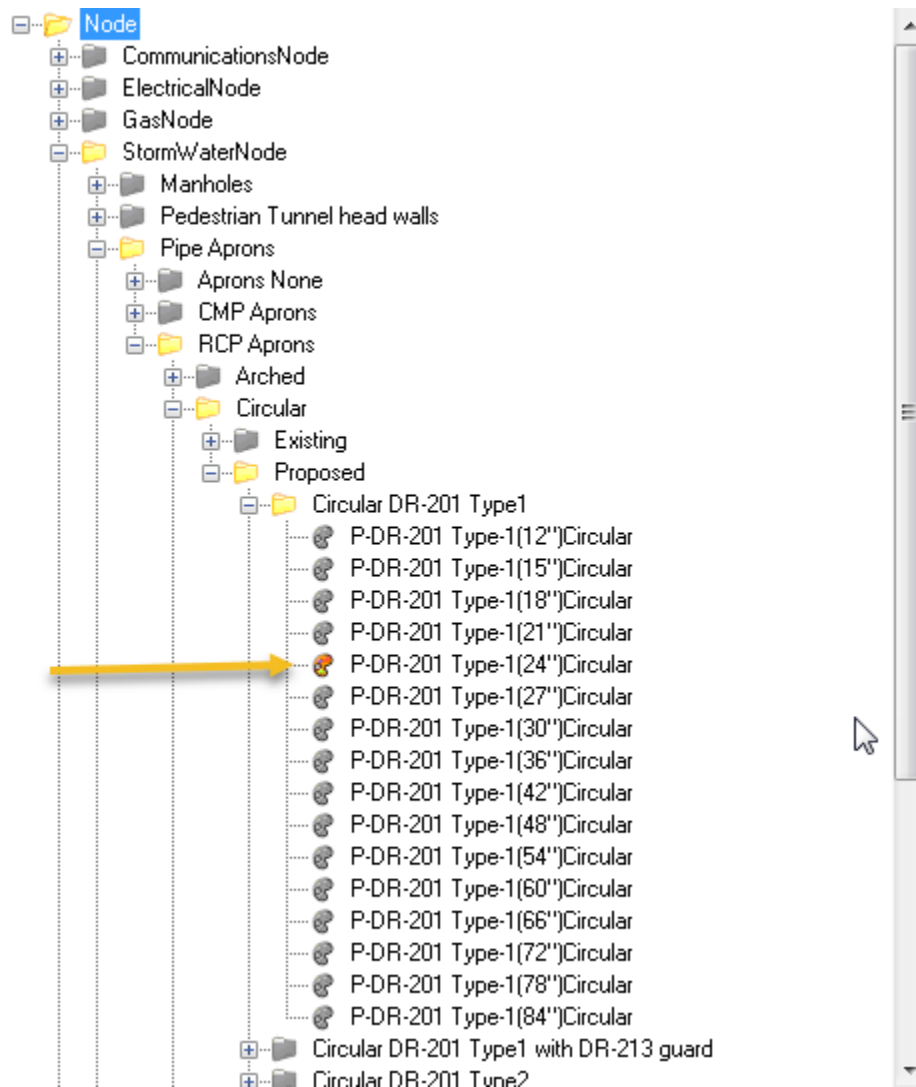
3



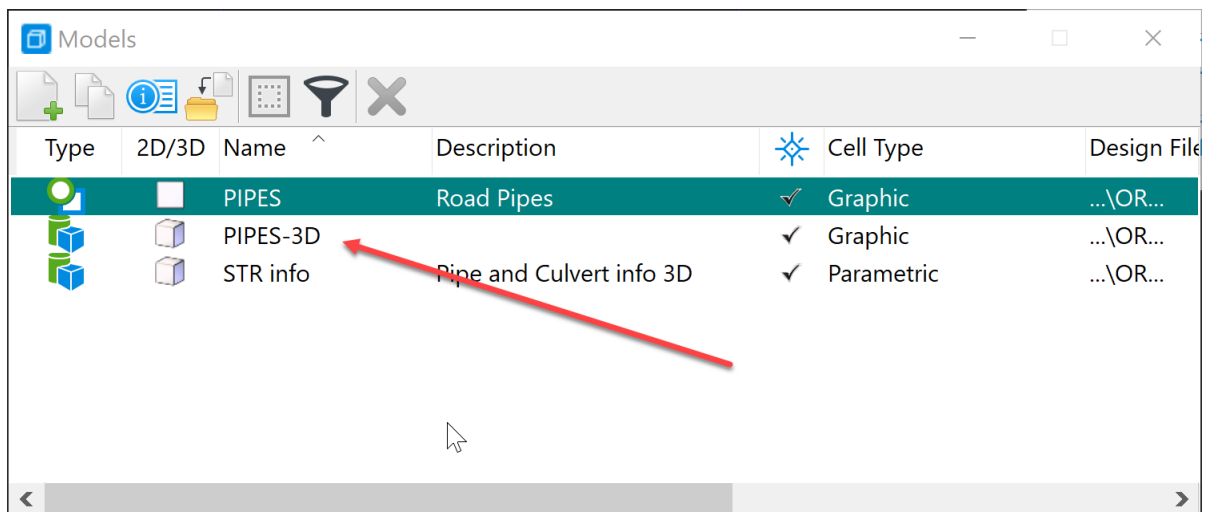
It should look something like this.



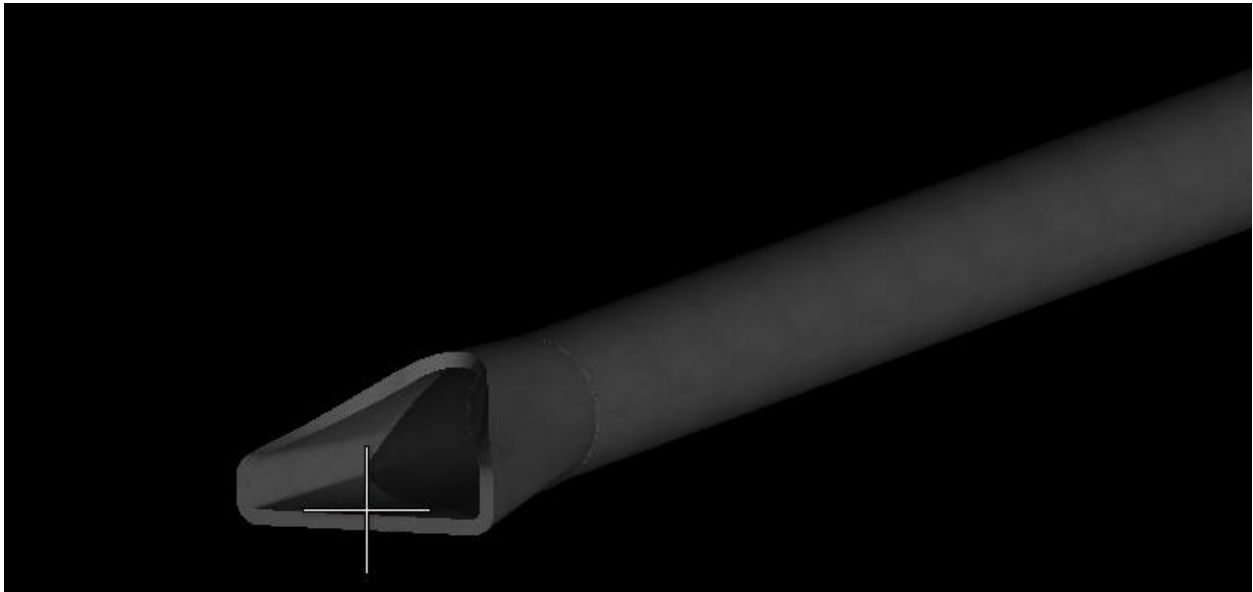
Repeat this process at each end of the structure. Once a feature is used, it will become highlighted and embedded into the file.



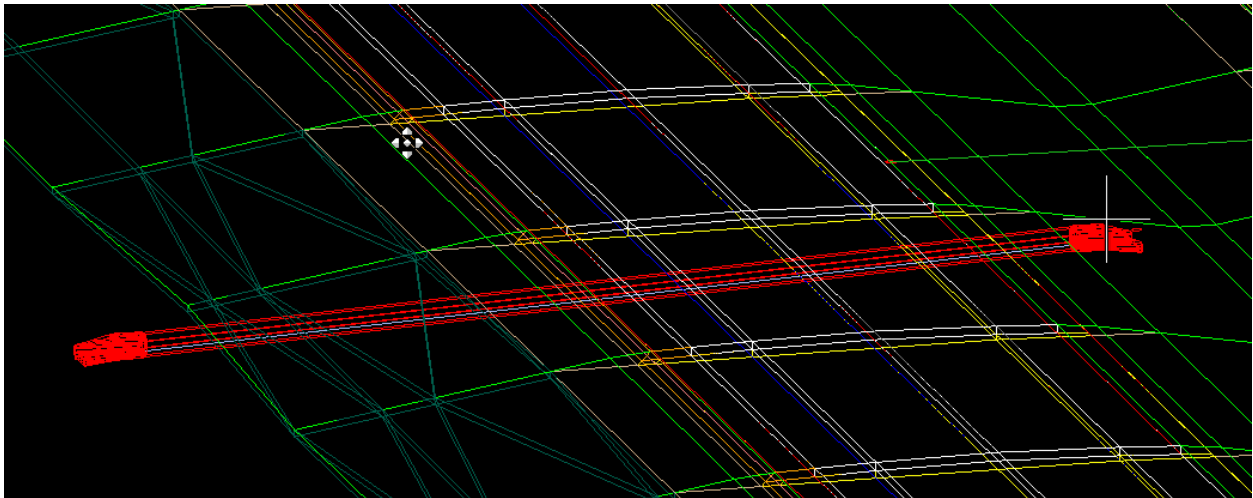
Once that is completed the structure will be modeled in the PIPES-3D model.



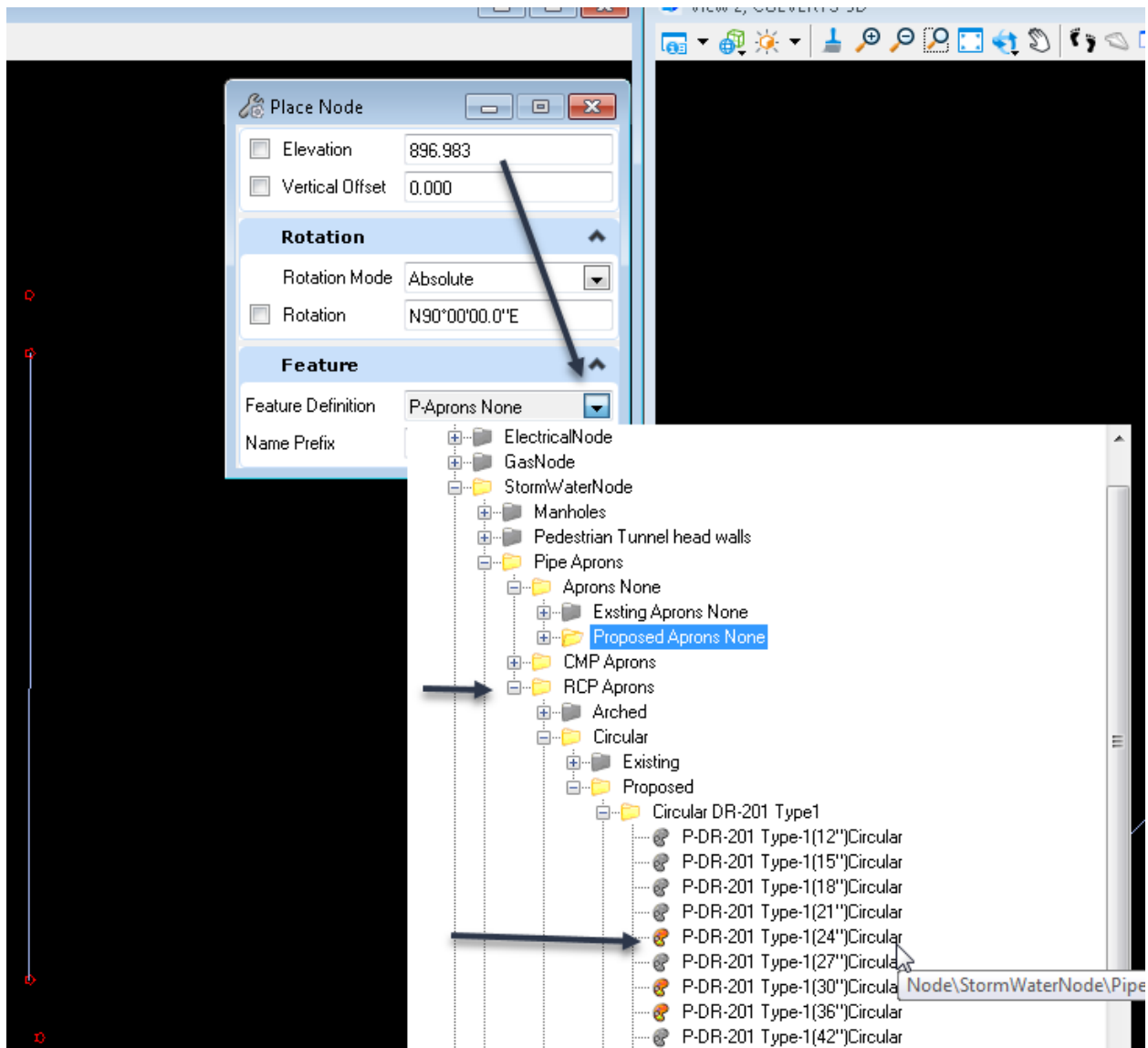
View the structure by opening the PIPES-3D model. It should look something like this.



Then reference in the COR files and see how the drainage design correlates to the Road Design earth work and grading design.



The reason the nodes and conduits are named this way, is that when viewing the information in project Explorer in the Drainage and Utilities Model, it makes it easier to find the correct entry for each structure modeled in the project.



Use the description field from the ASCII file for the Name Prefix.

699,3452954.566,5308286.119,896.149,PRO STA 1341+75.00 DR-201 Inlet end of apron 24in RCP Median Drain +9.00 RT

700,3452948.442,5308286.216,896.068,PIP159 STA 1341+75.00 DR-601 Inlet of 24in RCP Median Drain +15.12 RT

701,3452882.444,5308286.185,895.190,PIP159 STA 1341+75.00 DR-601 Outlet of 24in RCP Median Drain +81.11 RT

702,3452876.334,5308287.275,895.109,PRO STA 1341+75.00 DR-201 Outlet end of apron 24in RCP Median Drain +87.24 RT

It should look something like this.

Place Node

☐ Elevation 896.983

Rotation

Rotation Mode Absolute

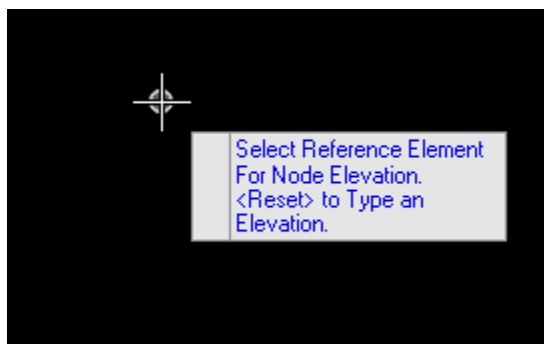
☐ Rotation N90°00'00.0"E

Feature

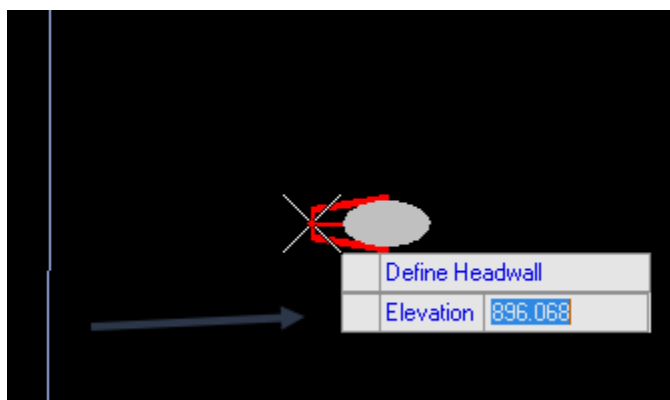
Feature Definition P-DR-201 Type-1(24")Circular

Name Prefix STA 1341+75.00 DR-201 Inlet end of apron 24in RCP Median Drain +9.00 RT

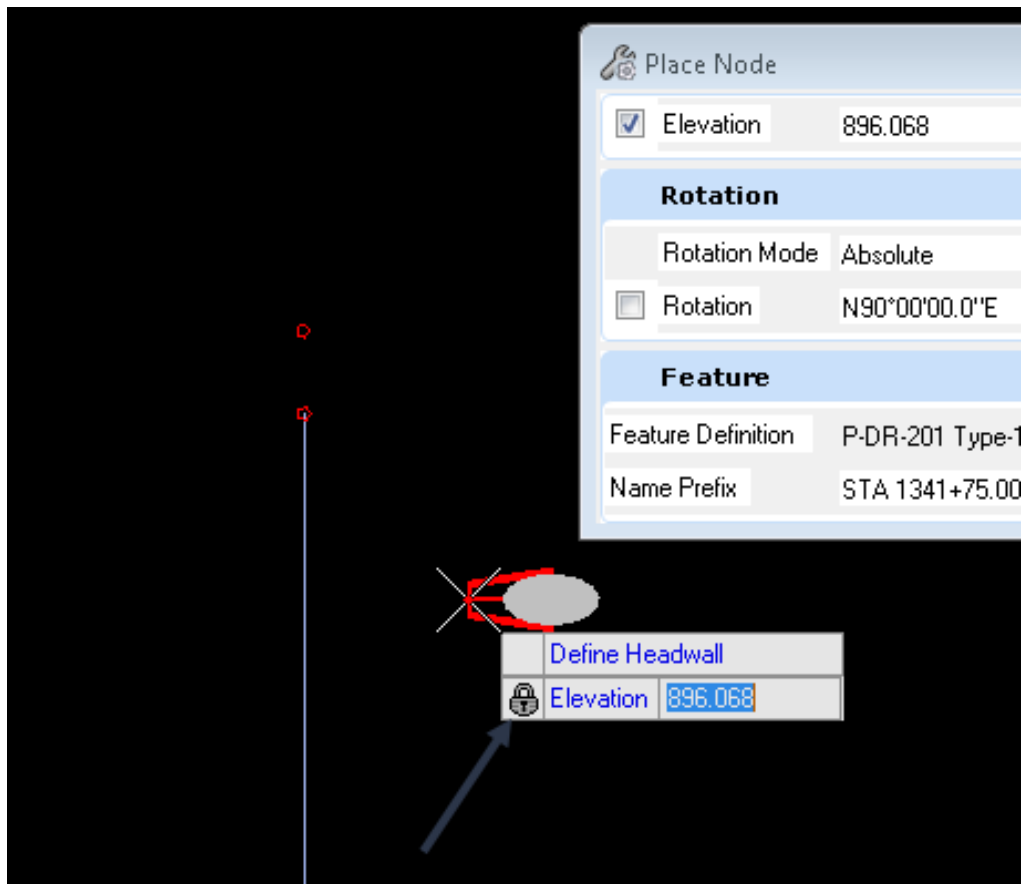
Next, move the cursor to the 2D view and it will prompt to Select Reference Element or to Reset to Type an elevation. Reset and type the elevation.



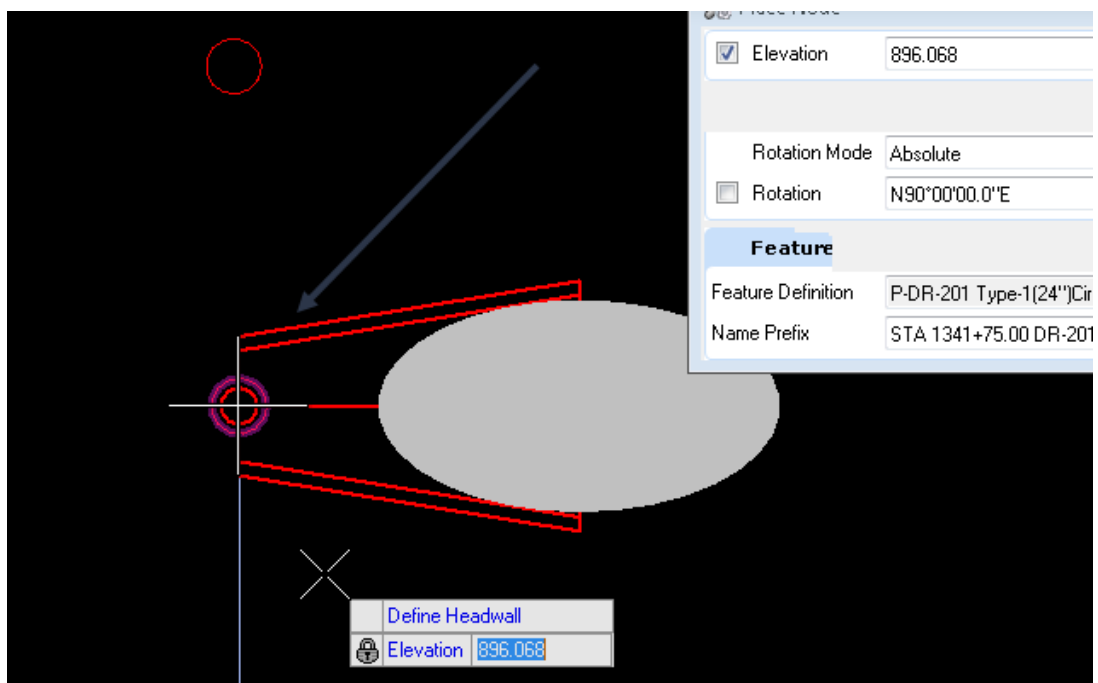
For this example, use 896.068 that is the flowline elevation of the design.



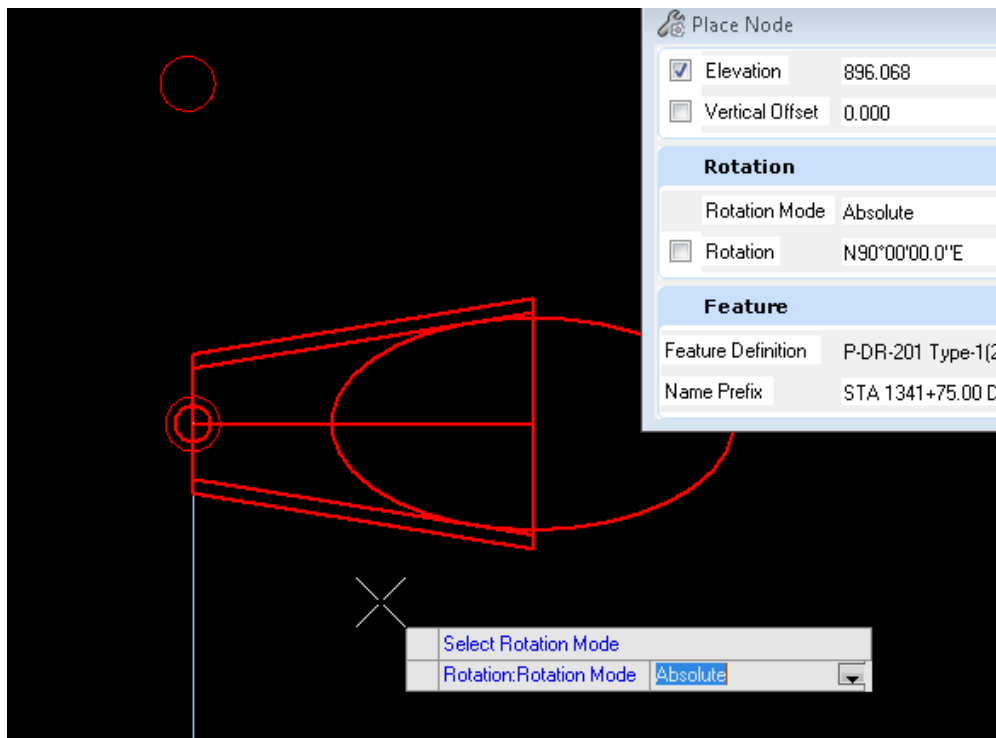
Next hit the enter key and it will lock this elevation and look like this.



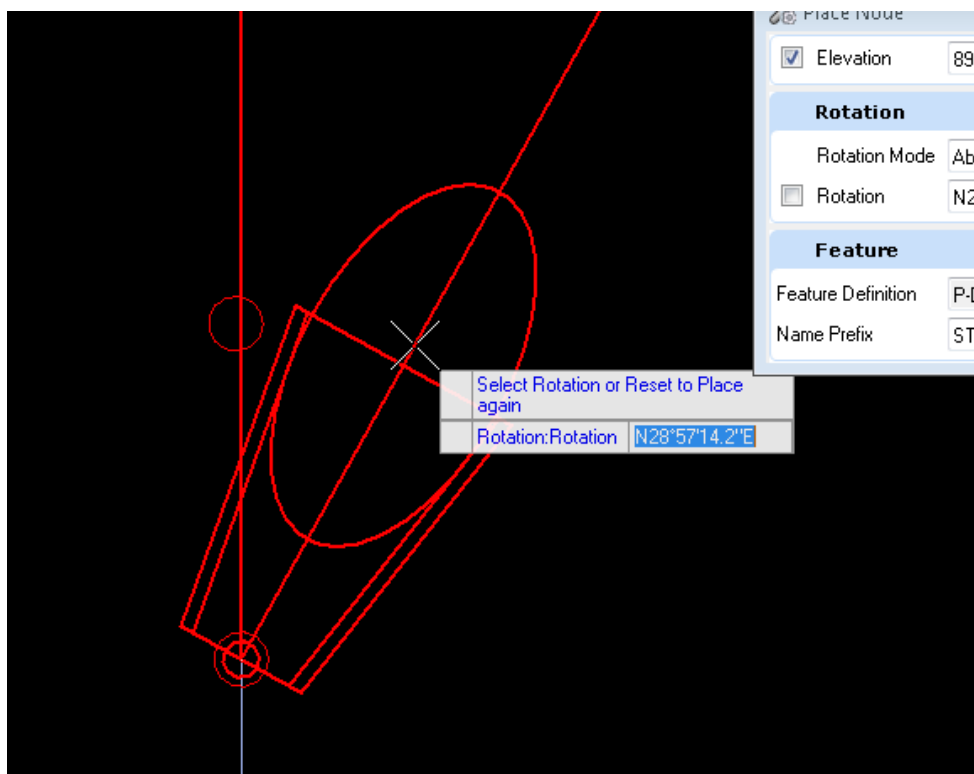
Then, snap to the ASCII graphics to place the apron or node like this.



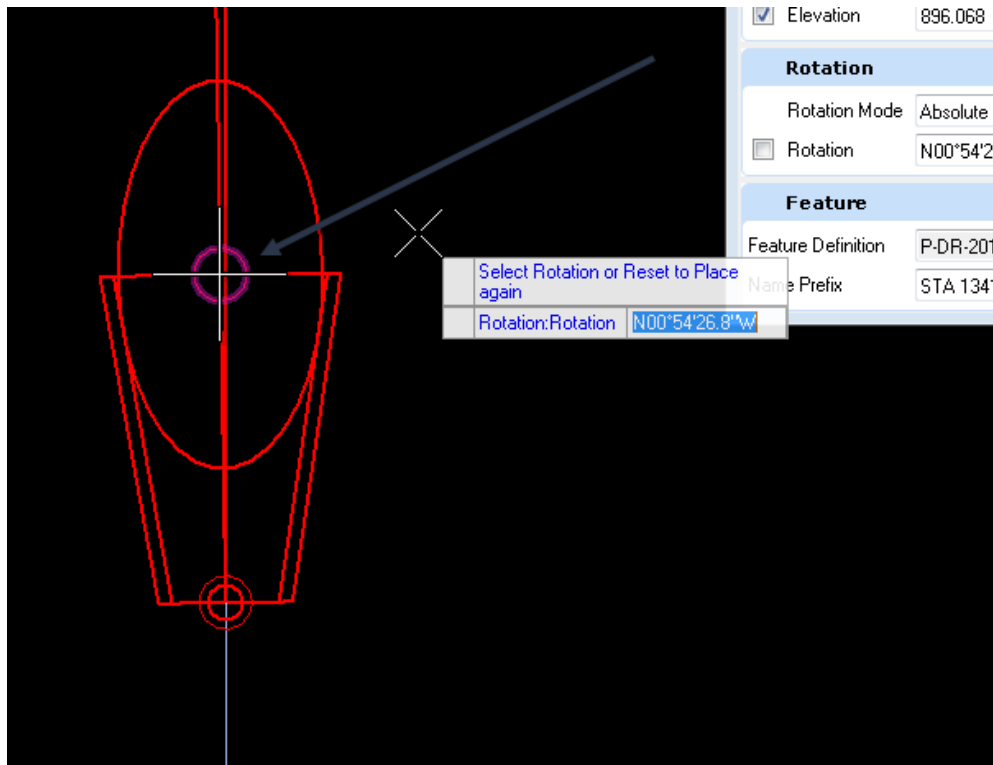
Then, data point to accept it and it will prompt to select rotation mode. For this example, use the absolute mode.



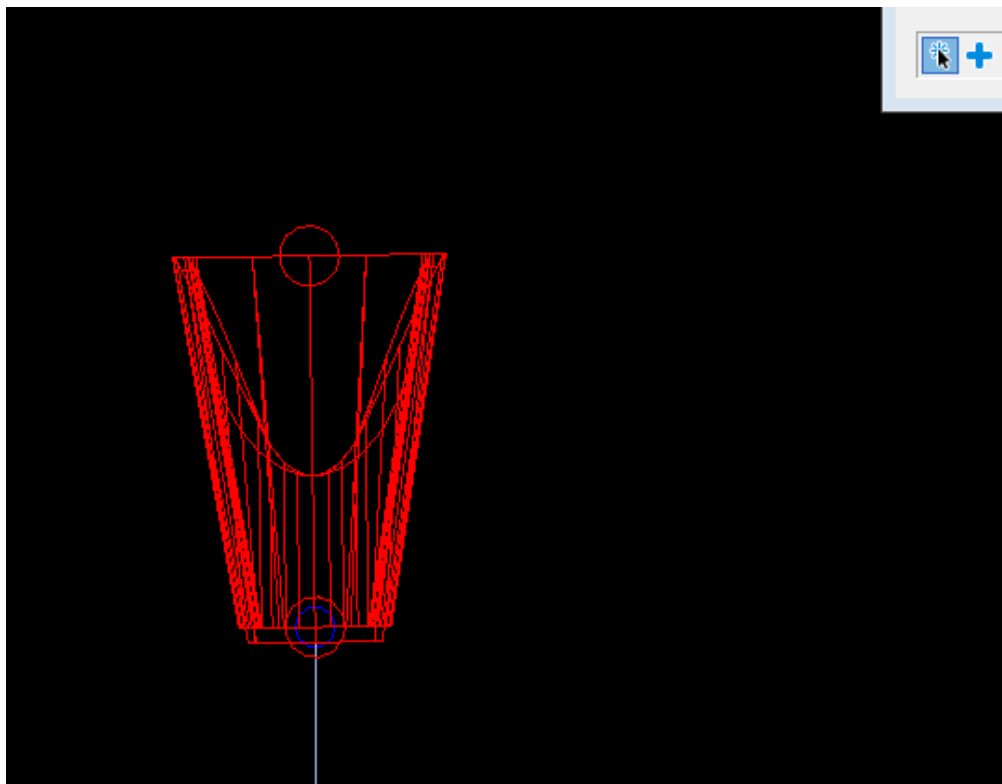
Data point again and the apron will rotate until another data point to accept the rotation.



Snap to the ASCII graphics to set the rotation to the PRO graphic from the ASCII input.

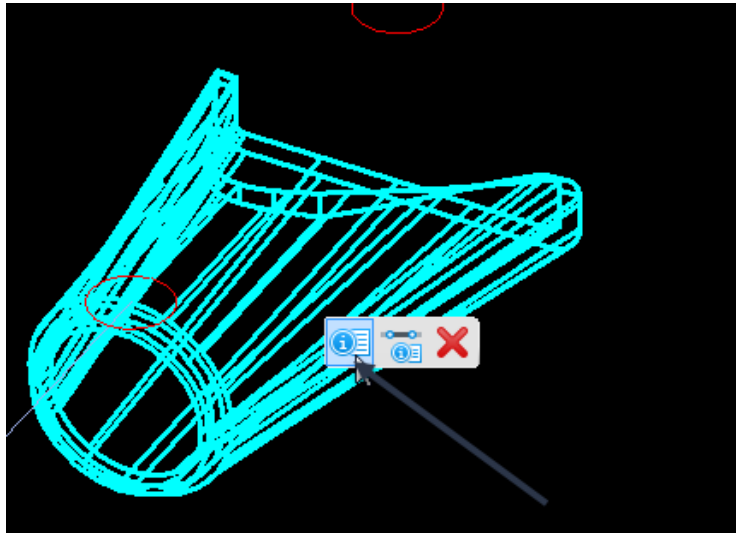


Then, data point to accept. Once it is done placing the node, hit the escape key to exit the tool. It should look like this:



Repeat this on the other end and/or at any vertices along the conduit using the appropriate node in each location.

Keep in mind, that the elevation typed in is the invert elevation not the ground elevation that the software is asking for. To fix this look at the node in the 3D view and select it with the element selection tool.

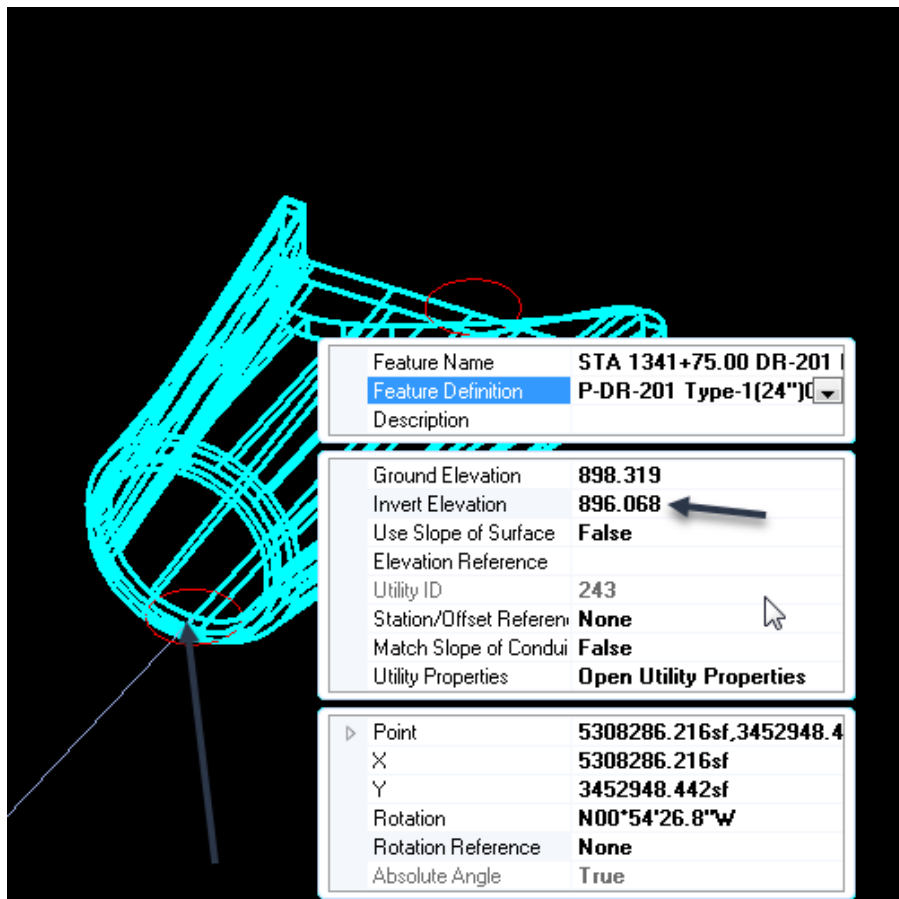


Then bring up the properties of the element and edit the invert elevation to match the design invert elevation.

A 3D wireframe model of a conduit structure, rendered in cyan. A red circle highlights a specific node on the structure. A properties panel is overlaid on the right side of the model, displaying various attributes for the selected element. The panel is divided into three sections: Feature Information, Elevation and Slope, and Point Coordinates. The 'Invert Elevation' field is highlighted in blue, and a black arrow points to it from the right. The 'Ground Elevation' field is also visible. The 'Point' section shows the coordinates and rotation of the selected node.

Feature Name	STA 1341+75.00 DR-201 I
Feature Definition	P-DR-201 Type-1(24")Circ
Description	
Ground Elevation	896.068
Invert Elevation	893.817
Use Slope of Surface	False
Elevation Reference	
Utility ID	243
Station/Offset Referen	None
Match Slope of Condui	False
Utility Properties	Open Utility Properties
Point	5308286.216sf,3452948.4
X	5308286.216sf
Y	3452948.442sf
Rotation	N00°54'26.8"W
Rotation Reference	None
Absolute Angle	True

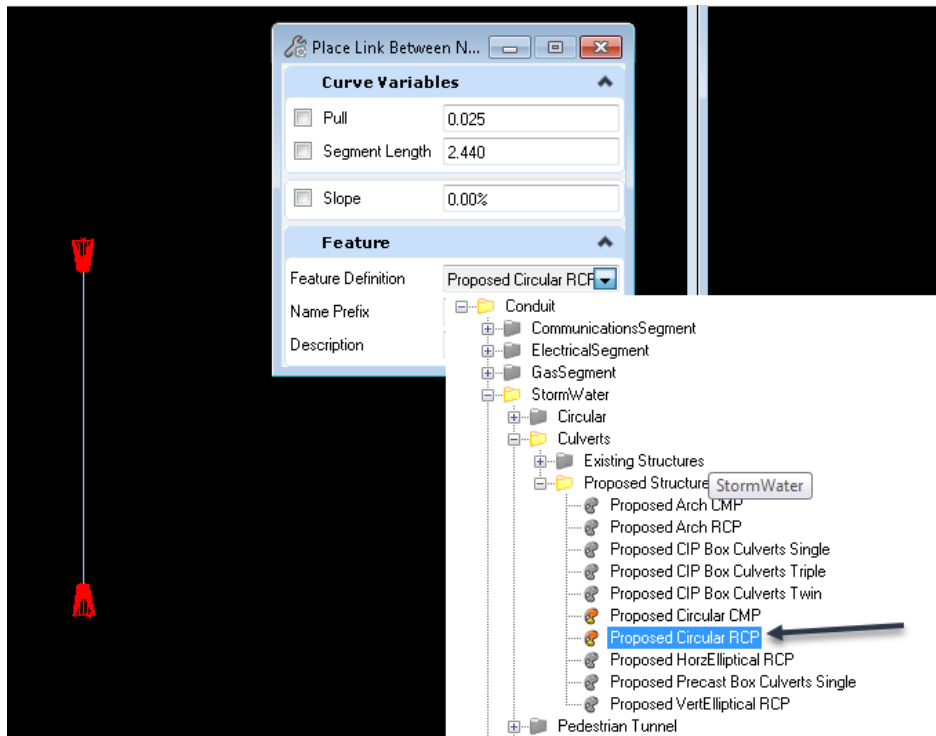
This will correct the elevation placement.



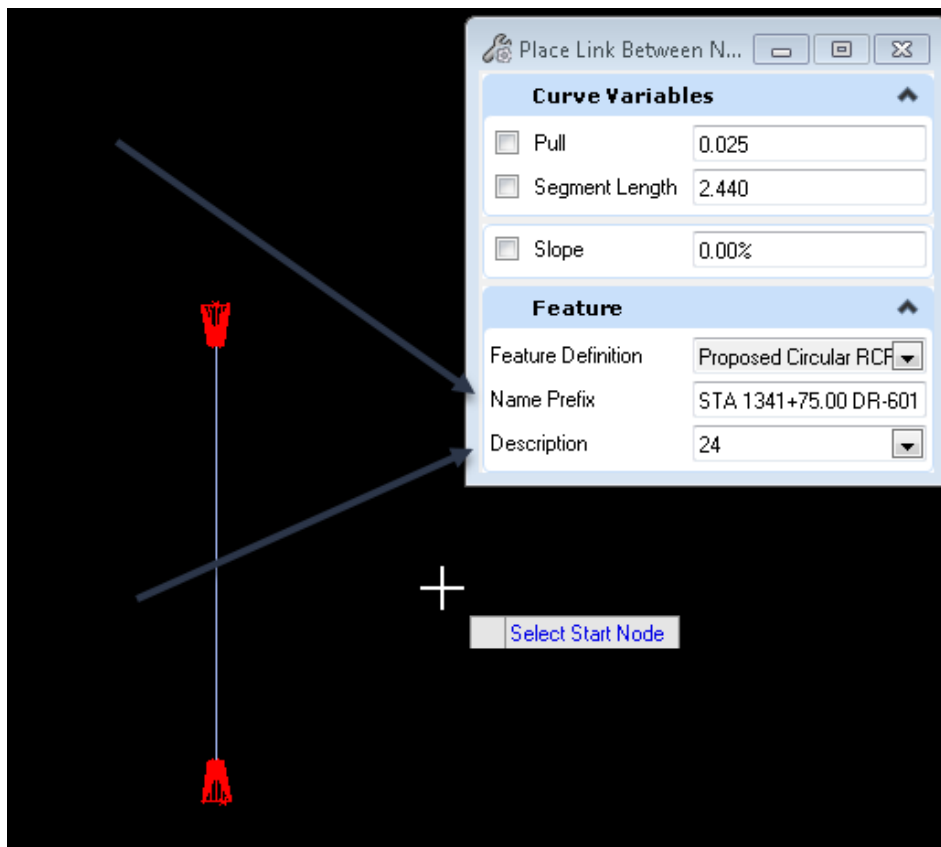
After the nodes are placed that are needed to model the structure, then connect the nodes with the appropriate conduit. To do this, select the Place Conduit tool.



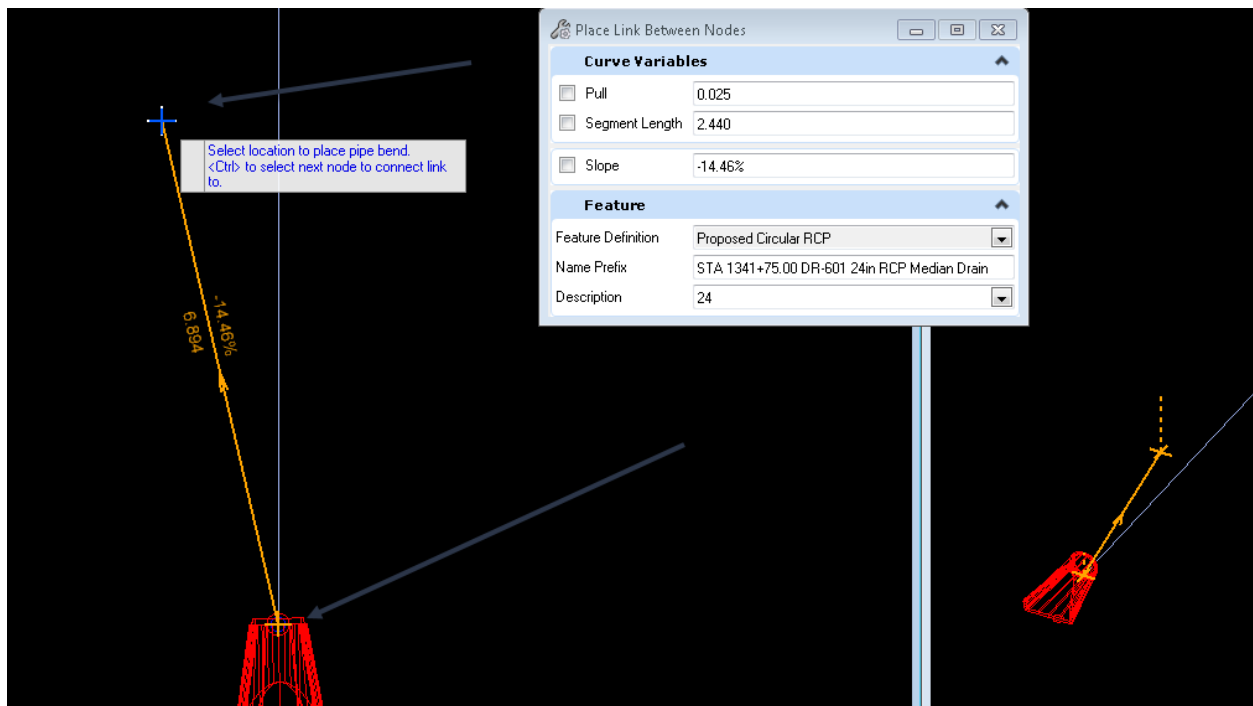
Then, select the feature that is needed to model the structure.



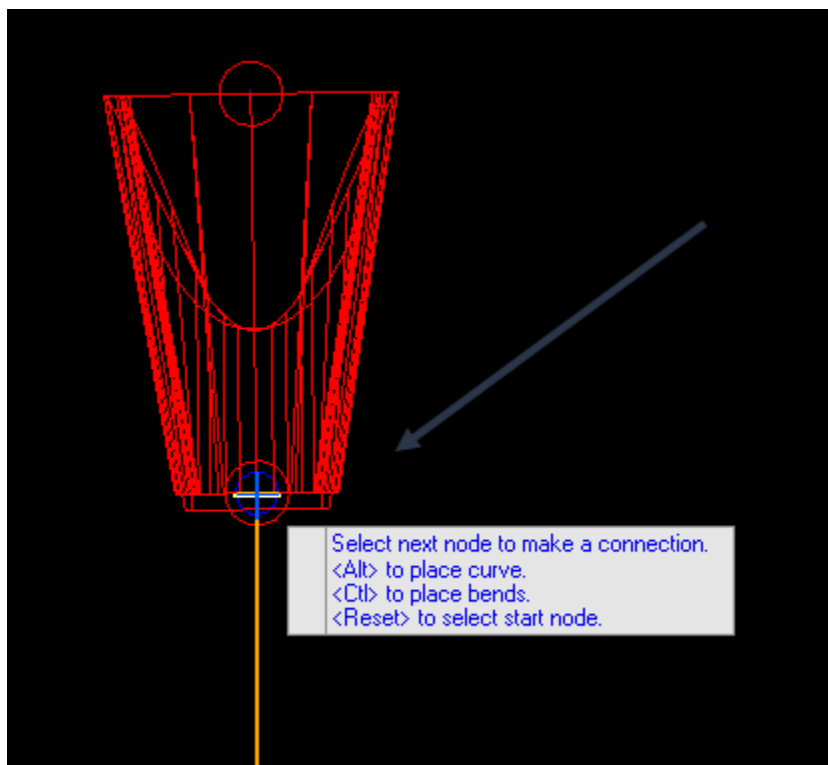
For this example, use the Proposed Circular RCP.



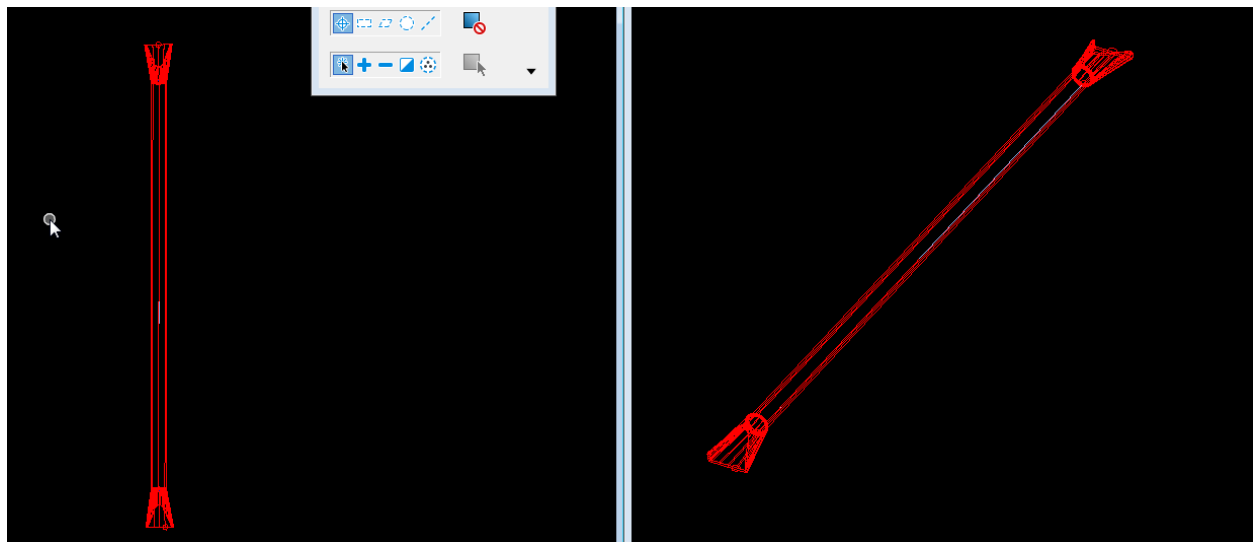
Use the description field from the ASCII file and place it in the Name Prefix field. Then select the size of the structure in the description field. Next, select the node to start from.



Then select the next node along the structure.



It should look something like this.



Now turn on the reference COR files and see how the drainage design correlates to the Road Designs earth work and grading design.

How to make Culvert TSL Sheet and annotate the structures

These instructions were created on 7/13/2021. These instructions were created with:

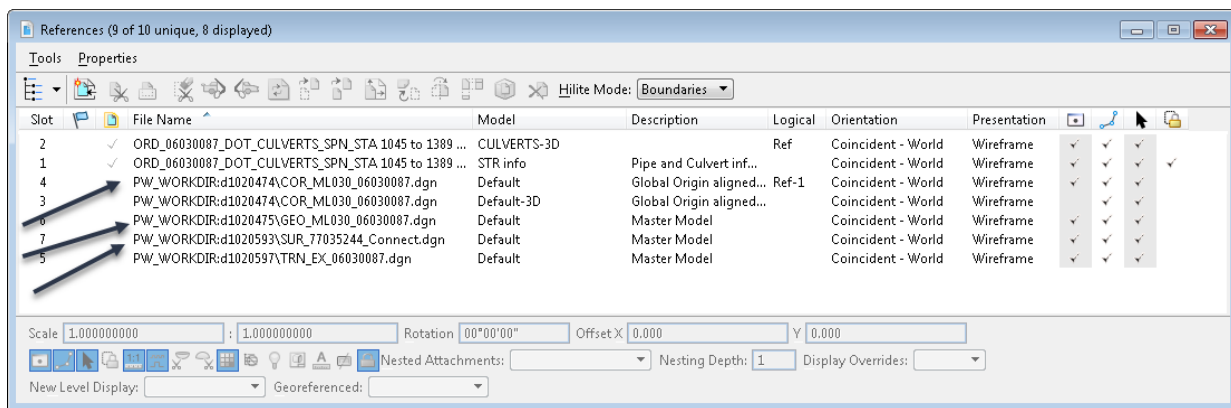


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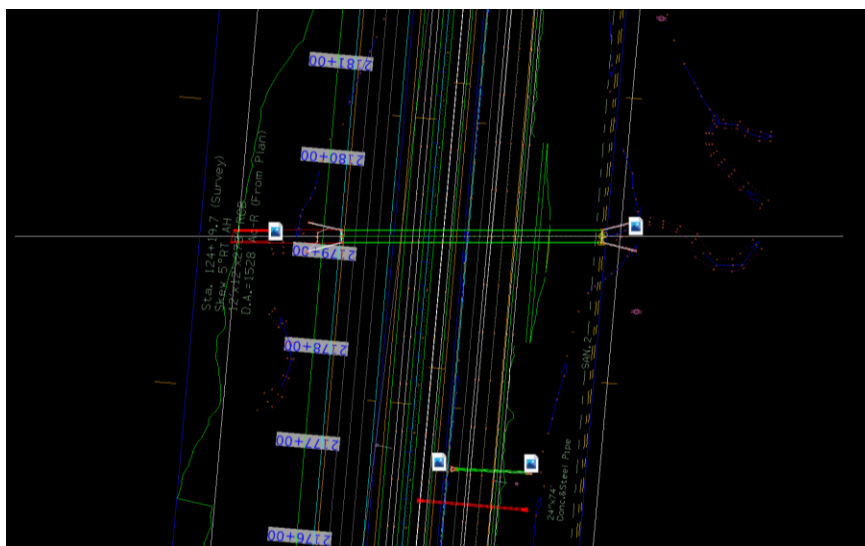
This is the stage to use the Create Drawing dialog to automate the drawing and sheet model creation and place the views in them.

To create a Culvert TSL sheet, open the DGN file. This example will use the ORD_06030087_DOT_CULVERTS_SPN.dgn.

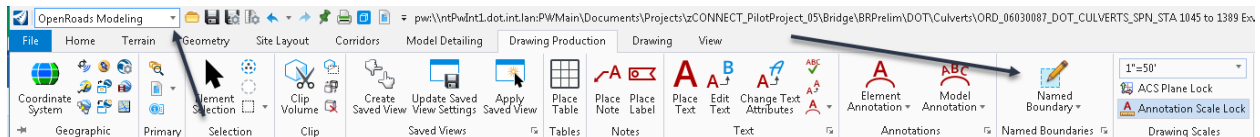
In the 2D PIPES model, reference attach everything that will be used to design the structure, all the source information that will be needed and/or wanted to display on the TSL sheet in the plan view. Also needed will be the TXT_CCRRRPPP.dgn file from the Design folder to get the station and tick marks for the alignment.



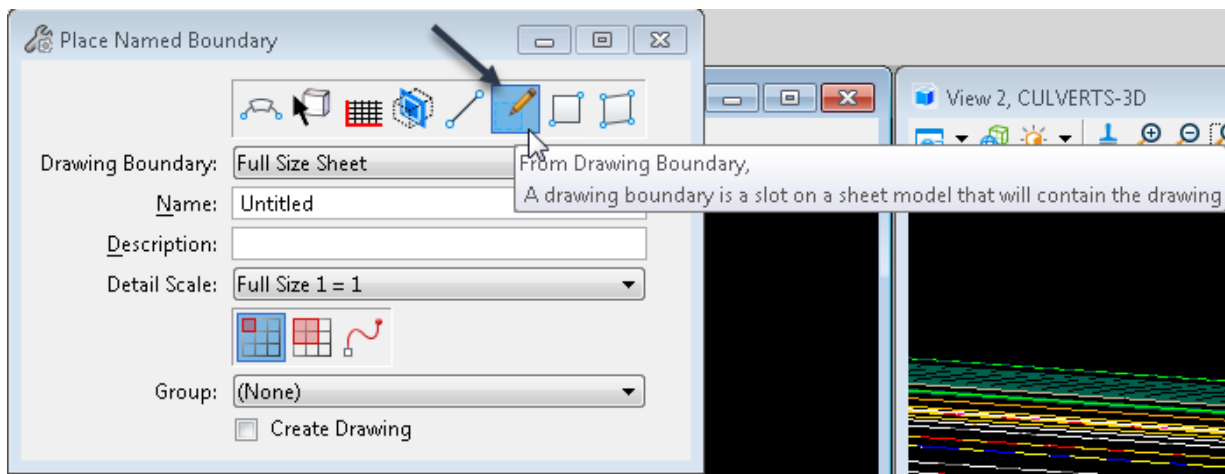
Next rotate the view into the orientation that is needed to be displayed on the TSL sheet. It should look something like this:



Next, under the OpenRoads Modeling workflow, select the **Named Boundary** tool. Note: if working in a Multi Model View, be sure to have the 2D view active when placing the boundary in the 2D view. Also make sure to have all the references turned on in the 3D view for the information to properly display on the plan sheet.



Selecting the Named Boundary tool will open the Place Named Boundary dialog box. Select **From Drawing Boundary** option at the top.

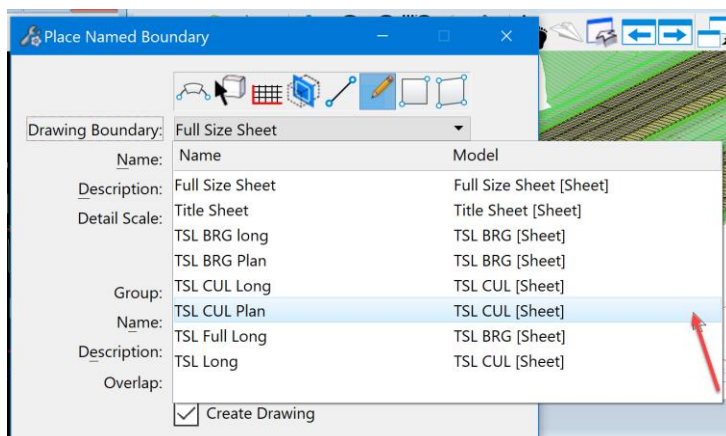


In the From Drawing Boundary pull down, select the sheet seed that will best fit the desired output.

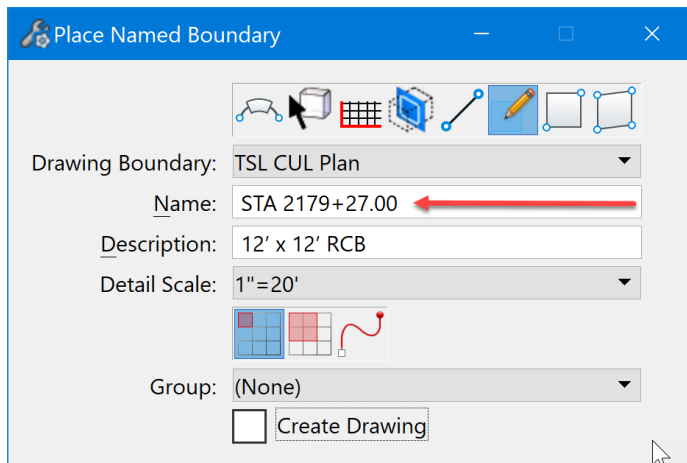
The first Drawing Boundary needed is the **TSL CUL Plan**. This option will place the traditional plan view and will leave space on each side of the plan view for extra notes.

The second Drawing Boundary needed is the **TSL BRG Plan**. This option will place a plan view that will cover the fullwidth of the TSL page and is intended to be used in the bridge TSL creation process.

Decide what plan view is ideal for the design and sheet layout. For this example, the TSL CUL Plan was used.

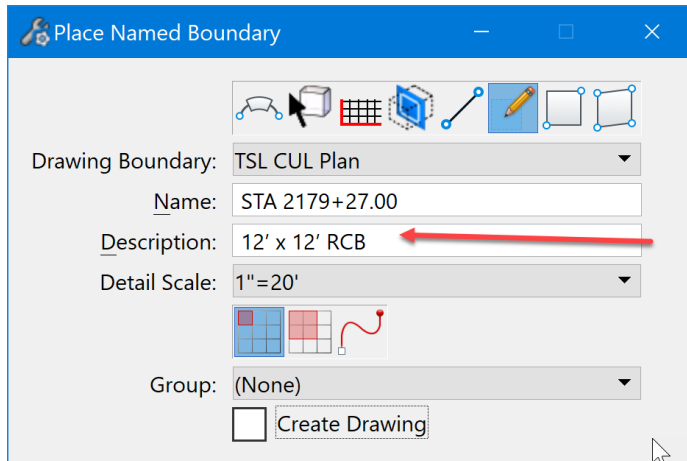


In the **Name** field, enter the station of the structure. For this example, used STA 2179+27.00.



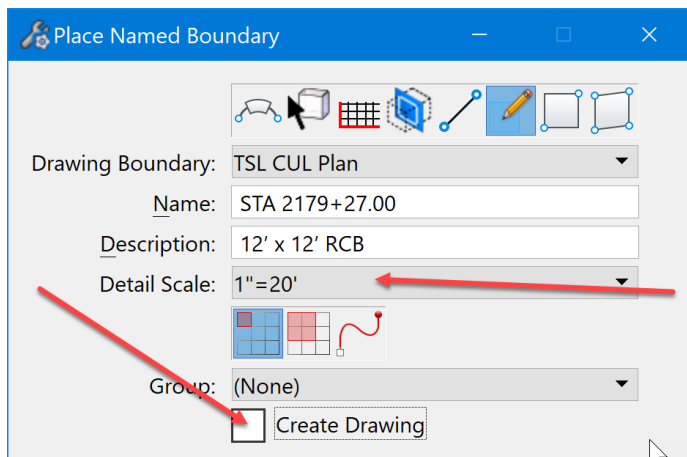
The screenshot shows the 'Place Named Boundary' dialog box. At the top is a toolbar with icons for various drawing tools. Below the toolbar, the 'Drawing Boundary' is set to 'TSL CUL Plan'. The 'Name' field is highlighted with a red arrow and contains the text 'STA 2179+27.00'. The 'Description' field contains '12' x 12' RCB'. The 'Detail Scale' is set to '1"=20''. There is a preview of a grid with a red boundary. The 'Group' is set to '(None)'. At the bottom, there is a checkbox labeled 'Create Drawing' which is currently unchecked.

Next in the **Description** field, describe the structure. For this example, used 12' x 12' RCB.



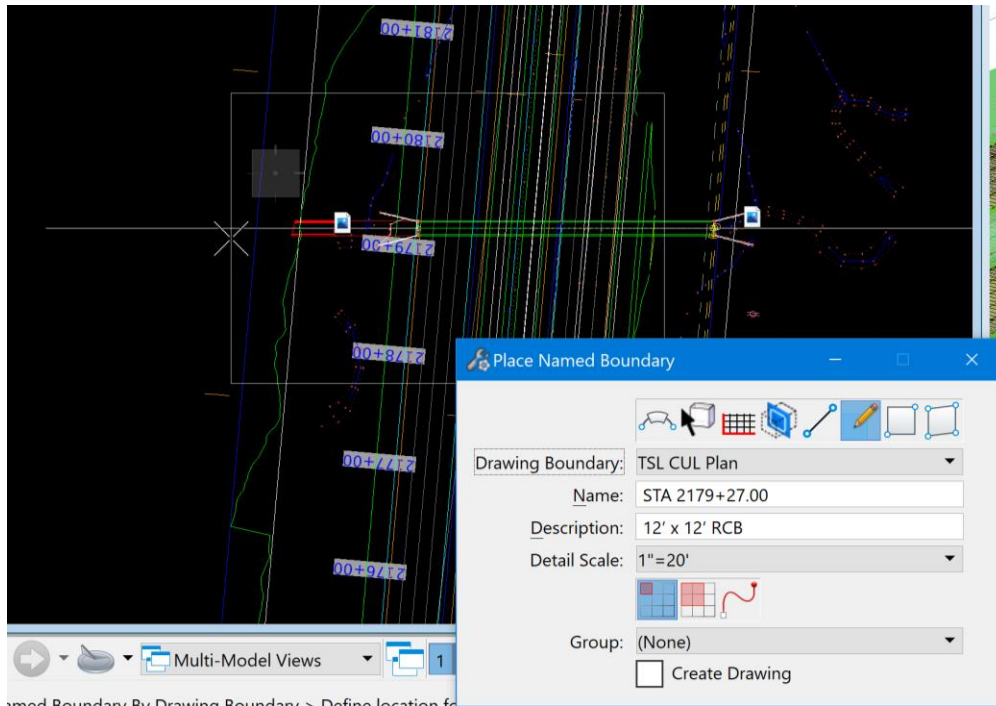
The screenshot shows the 'Place Named Boundary' dialog box. The 'Name' field contains 'STA 2179+27.00'. The 'Description' field is highlighted with a red arrow and contains the text '12' x 12' RCB'. The 'Detail Scale' is set to '1"=20''. The 'Group' is set to '(None)'. The 'Create Drawing' checkbox is unchecked.

Next select the detail scale. The scale for this example is 1" = 20'. Note: make sure to not have "Create Drawing" checked/toggled on. This is done so that the named boundary can be moved after it is placed to enable an ideal position in relationship to the structure, then the drawing and sheet model will be created.

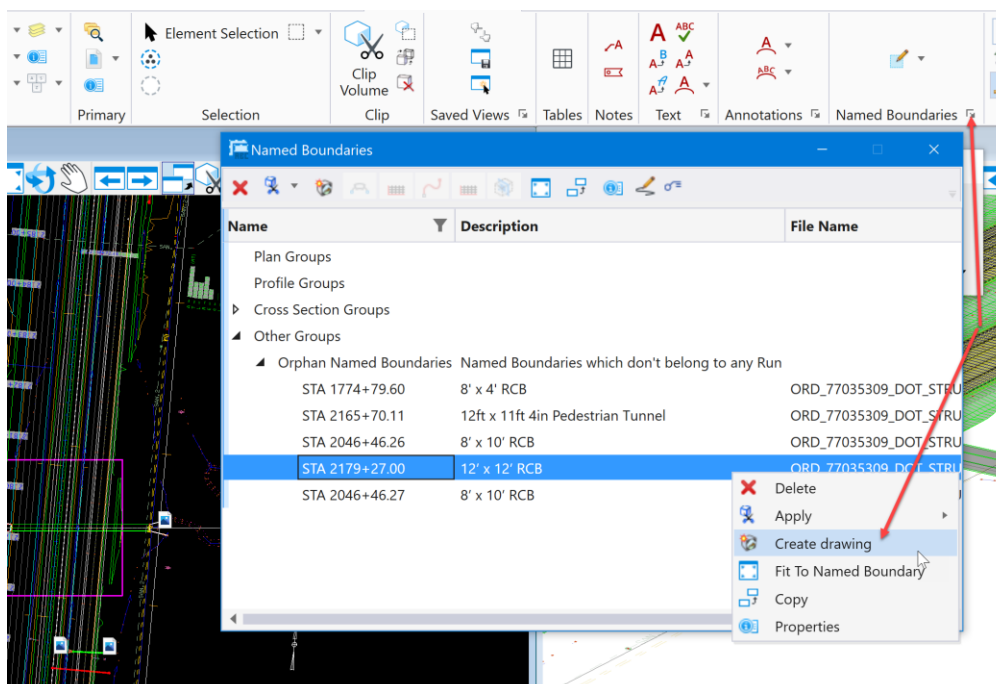


The screenshot shows the 'Place Named Boundary' dialog box. The 'Name' field contains 'STA 2179+27.00'. The 'Description' field contains '12' x 12' RCB'. The 'Detail Scale' is highlighted with a red arrow and set to '1"=20''. The 'Group' is set to '(None)'. The 'Create Drawing' checkbox is highlighted with a red arrow and is unchecked.

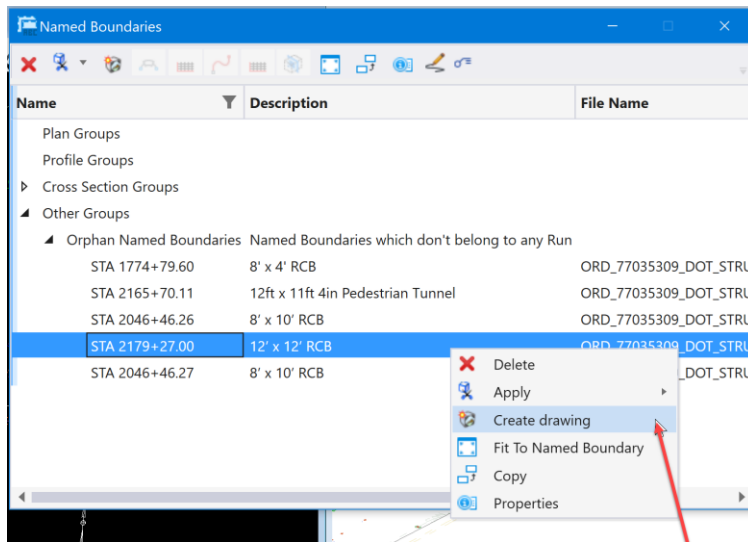
Now place the boundary. It will appear at the end of the cursor. Note: It may be preferred to place it on the outer edge of the structure layout and then move it to the correct location to ensure that the center of the plan view detail on this sheet will be at the centerline of the structure = centerline of the roadway.



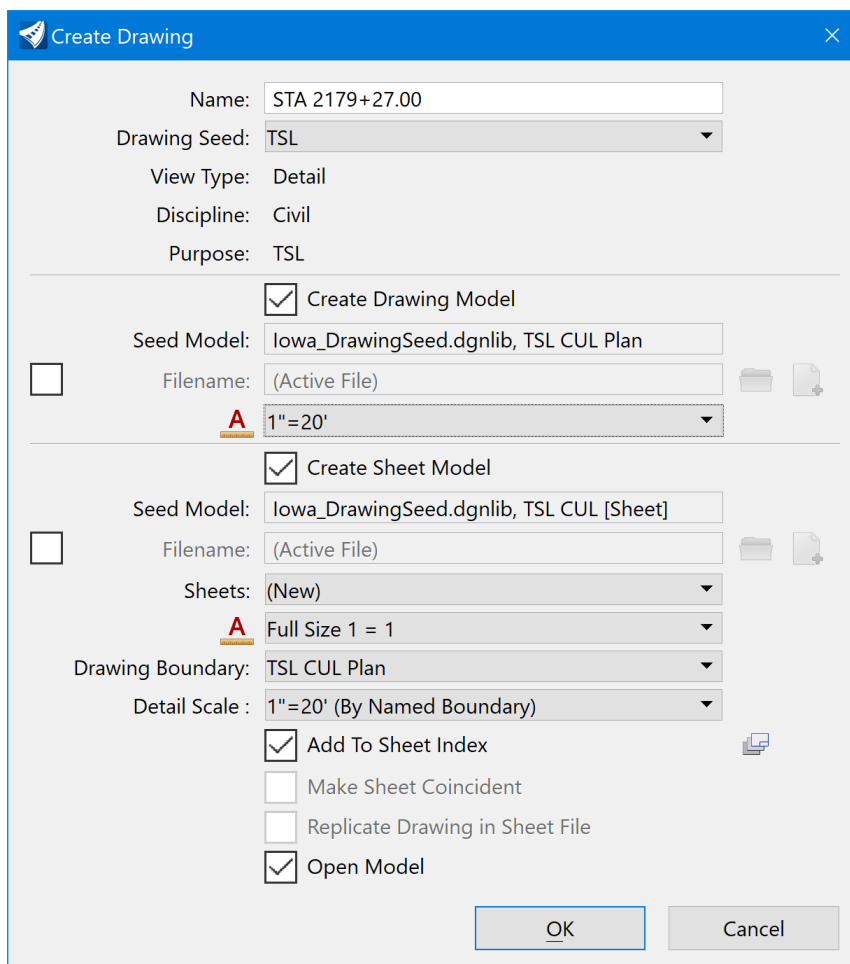
To move the boundary after it is placed, use the Element Selection tool and select the boundary, then use the move command to move the boundary to the position that is needed to place it on the sheet. Once placed, then select the Named Boundaries tool to open the dialog box.



Select the boundary that was created and right click on it. Several options will display to choose from. Select the **Create Drawing** option.



The Create Drawing dialog box will open. The name will already be filled out based on the name of the boundary. The example used STA 2179+27.00.



Next, ensure the scales are set correctly for the sheet.

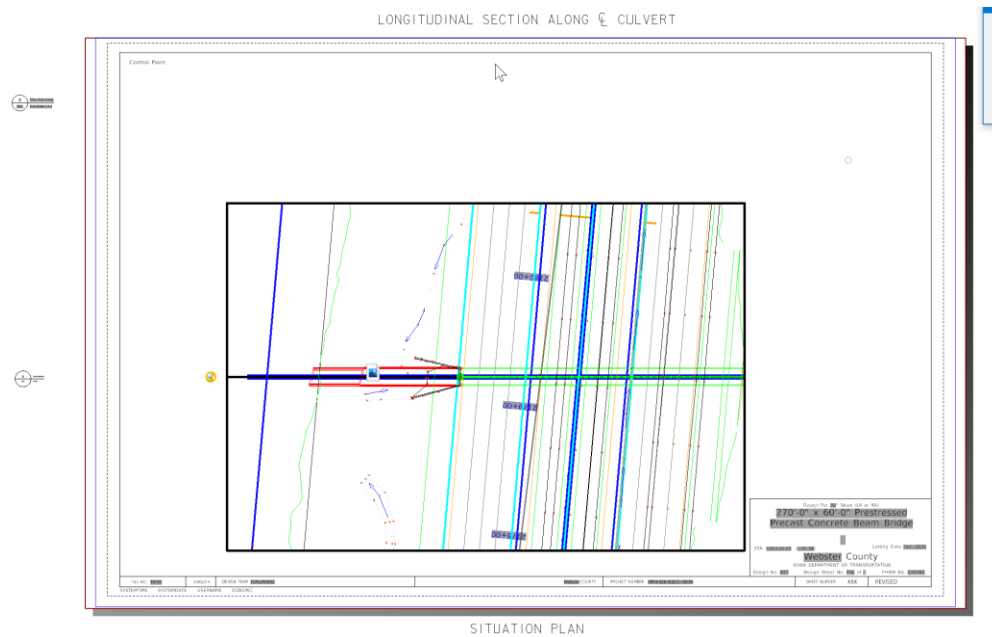
1. Under the Create Drawing Model section set Annotation scale to 1"=20'. The scale is set to match the scale used when referencing the Drawing Model details into the Sheet Model.
2. Under the Create Sheet Model section set Annotation scale to Full Size 1 = 1 and ensure that the Detail Scale is set to 1" = 20' (By Named Boundary). The scale is set to match the scale used when referencing the Drawing Model details into the Sheet Model.

The screenshot shows the 'Create Drawing' dialog box with the following settings and annotations:

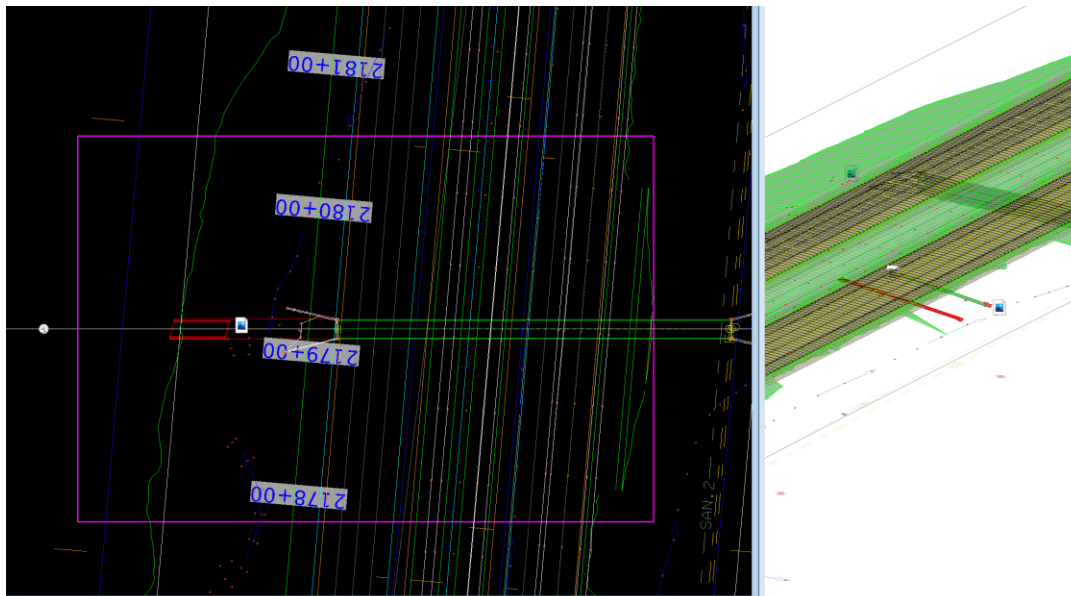
- Name:** STA 2179+27.00 (Red arrow pointing to the text field)
- Drawing Seed:** TSL (Dropdown menu)
- View Type:** Detail
- Discipline:** Civil
- Purpose:** TSL
- Create Drawing Model:** ☒ (Red arrow pointing to the checkbox)
- Seed Model:** Iowa_DrawingSeed.dgnlib, TSL CUL Plan
- Filename:** (Active File) (Folder and file icons to the right)
- Annotation Scale:** 1"=20' (Dropdown menu, with a red arrow pointing to the 'A' icon and another pointing to the scale text)
- Create Sheet Model:** ☒ (Red arrow pointing to the checkbox)
- Seed Model:** Iowa_DrawingSeed.dgnlib, TSL CUL [Sheet]
- Filename:** (Active File) (Folder and file icons to the right)
- Sheets:** (New) (Dropdown menu)
- Annotation Scale:** Full Size 1 = 1 (Dropdown menu, with a red arrow pointing to the 'A' icon)
- Drawing Boundary:** TSL CUL Plan (Dropdown menu)
- Detail Scale:** 1"=20' (By Named Boundary) (Dropdown menu, with a red arrow pointing to the text)
- Add To Sheet Index:** ☒ (Red arrow pointing to the checkbox)
- Make Sheet Coincident:** ☐
- Replicate Drawing in Sheet File:** ☐
- Open Model:** ☒ (Red arrow pointing to the checkbox)
- Buttons:** OK (Red arrow pointing to the button), Cancel

Check/toggle on Open Model, if desired. Add to Sheet Index may be checked if using the Sheet Indexing feature. Another option is to add sheets to the Sheet Index later in the plan sheet development process. When everything is correct, click OK.

This will create the plan sheet. It should look something like this:

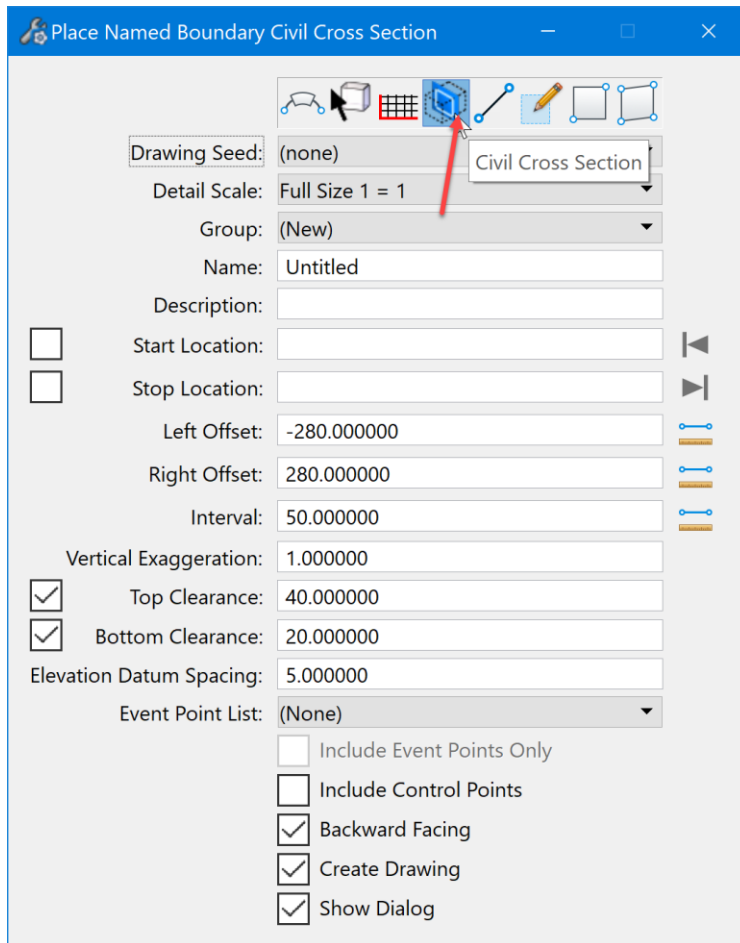


Next, go back to the Multi Model View to make the Longitudinal Cross Section for the sheet.

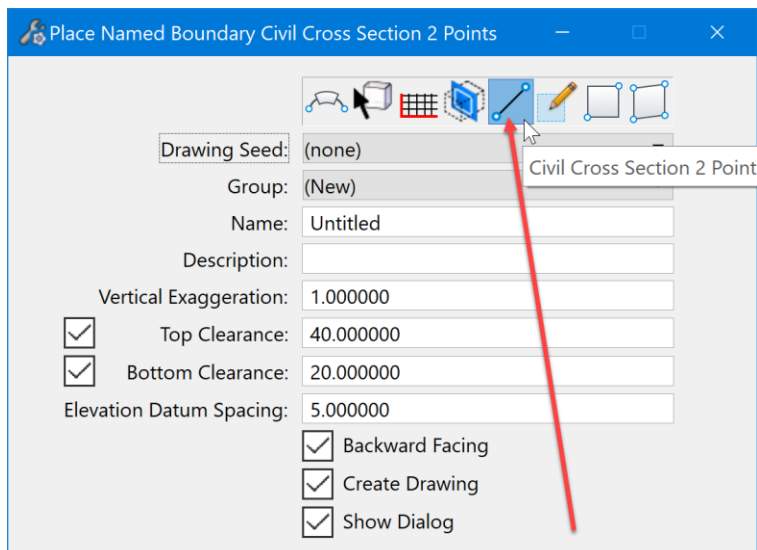


To make the Longitudinal Cross Section for the sheet, there are two tools to choose from. The tool chosen depends on if the structure is perpendicular, at a 90-degree right angle to the alignment, or if it is a skewed Longitudinal section that is needed.

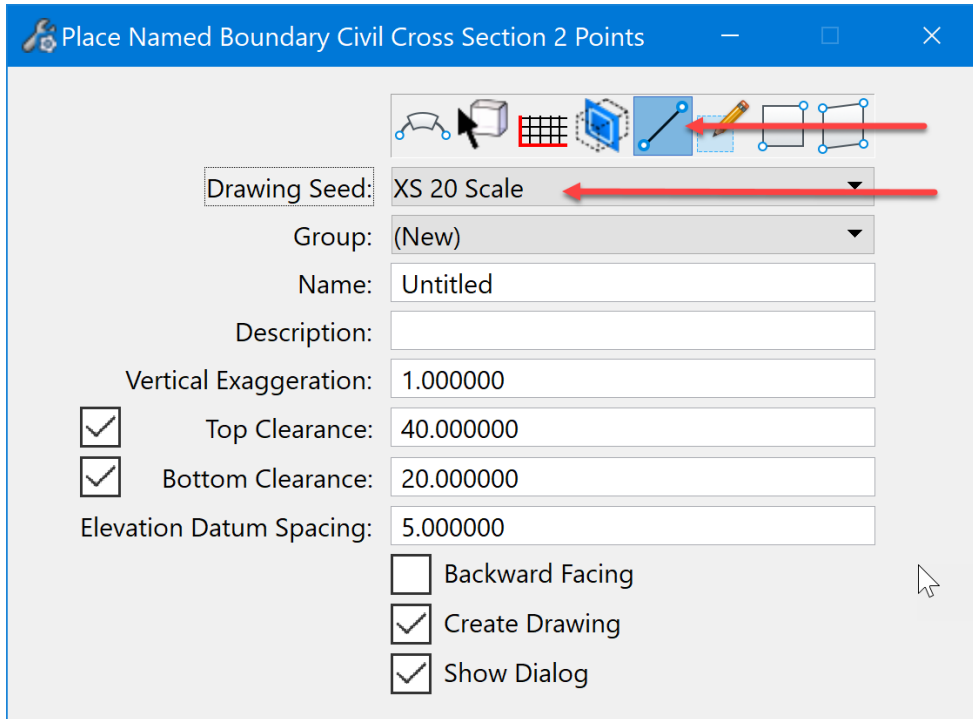
If it is a perpendicular cross section that is needed, then use the **Civil Cross Section** boundary tool. This tool is located on the Place Named Boundary Civil Cross Section dialog box.



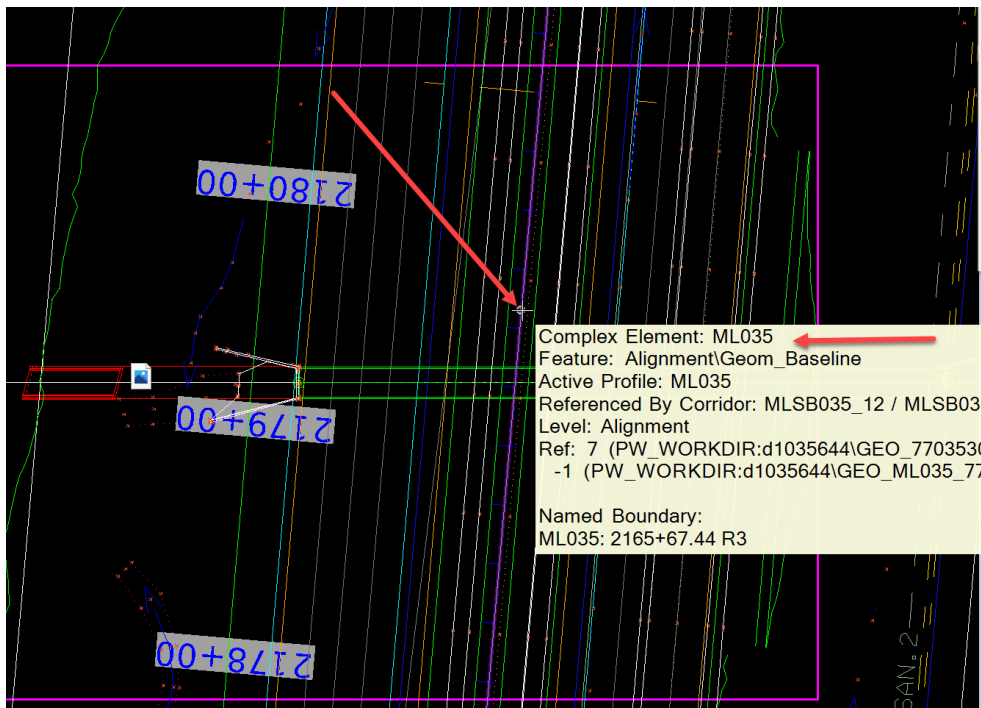
If it is a skewed Longitudinal Cross Section that is needed, then use the **Civil Cross Section by 2 Point** boundary. This tool is also located on the Place Named Boundary Civil Cross Section dialog box.



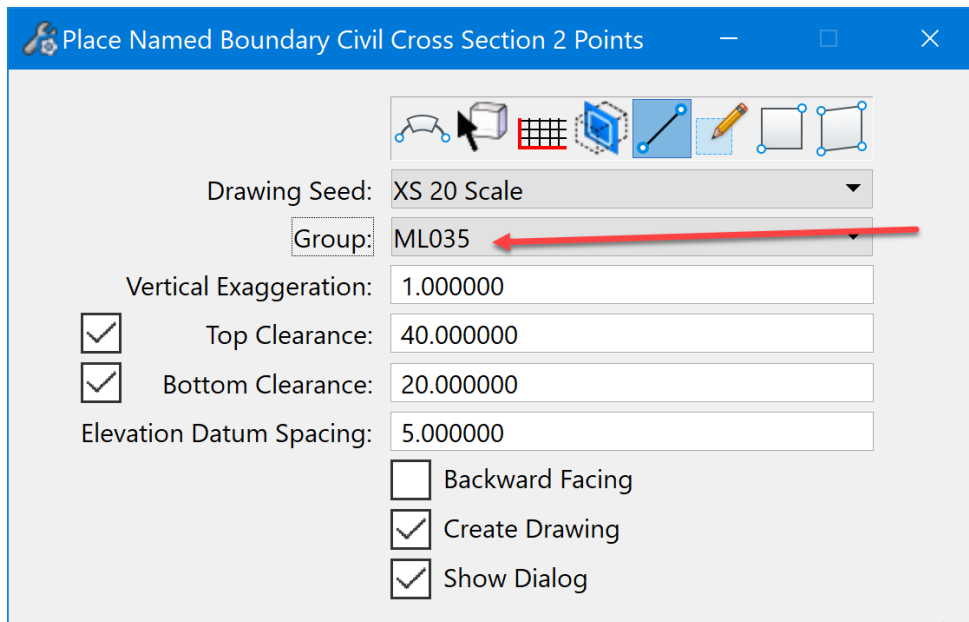
This example used the Civil Cross Section by 2 Point boundary tool. Select a **Drawing Seed**. For this example, used the XS 20 Scale seed to make a 1" = 20' scale cross section.



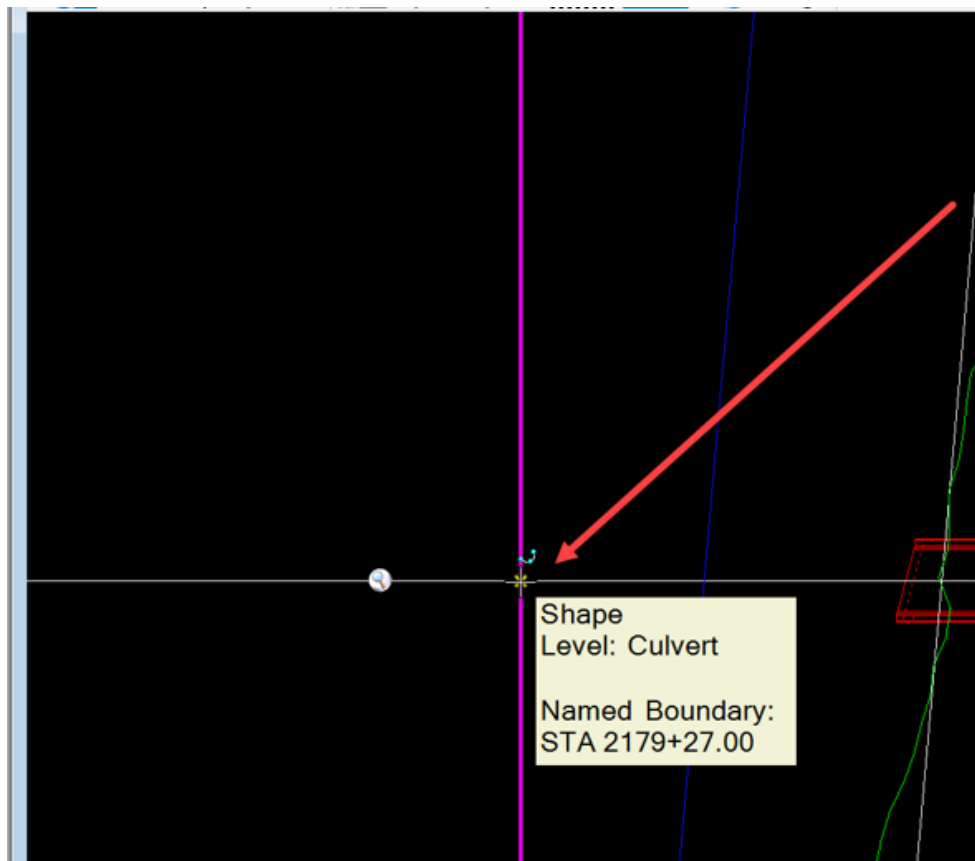
Next identify the path element. For this process, it will be the roadway horizontal alignment that crosses the structure that is shown on the sheet. Note: selecting the alignment will also set the Group. It is very important to set this so that in a large corridor project the cross sections can be placed on their own sheets when the drainage design is complete. To identify the path element, select it in the 2D view.



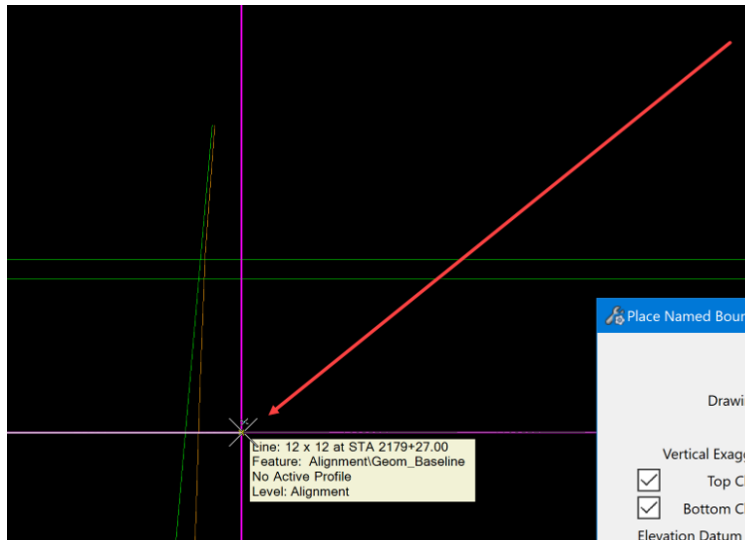
The **Group** should be named the same as the alignment.



Next, identify the start point. To do this, snap to the intersection point of the structure centerline and the edge of the plan view boundary placed earlier.



Next, identify the end point. To do this, snap to the intersection point of the structure centerline and the edge of the plan view boundary placed earlier.



Once everything is set correctly, then Data point in the plan view to accept the settings and this will open the Create Drawing dialog box. It should be filled in similar to this:

Mode: Cross Section

Name: ML035 - 2179+27.00 R3

☐ One Sheet Per Dgn:

Drawing Seed: XS 20 Scale

View Type: Civil Cross Section

Discipline: Civil

Purpose: Section View

Drawing Model

Seed Model: Cross Section Sheet Seed 20 Scale.dgnlib, XS

☐ Filename: (Active File)

Scale: 1"=20'

Annotation Group: XS Grid w/ Annotation 20 Scale

Sheet Model

Seed Model: Cross Section Sheet Seed 20 Scale.dgnlib, XS

☐ Filename: (Active File)

Sheets: (New)

Full Size: 1 = 1

Drawing Boundary: XS 20 Scale

Detail Scale: 1"=20'

☒ Add To Sheet Index

☐ Make Sheet Coincident

☒ Open Model

OK Cancel

Select an **Annotation Group** and select the **Sheet** that the section will be placed on. Check/toggle on Open Model. When adding a detail/cross section to an existing plan sheet, the “Add to Sheet Index” option is grayed out. When creating a new plan sheet, the “Add to Sheet Index” option will appear selectable.

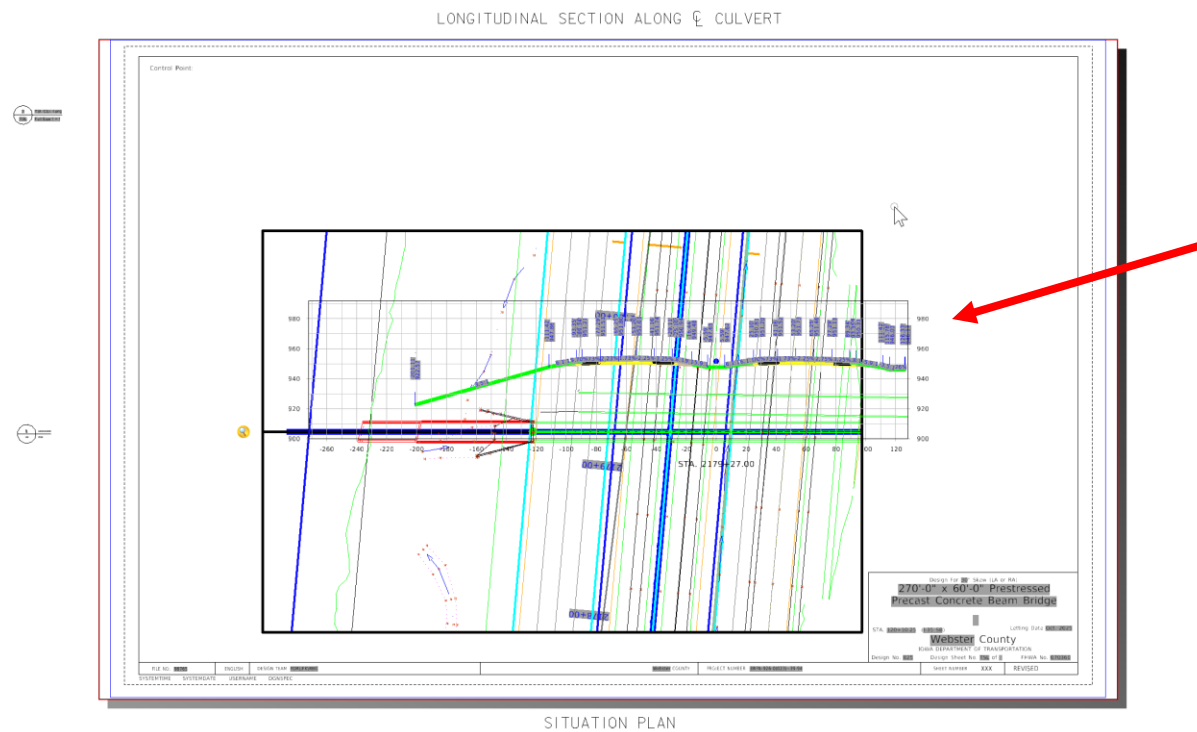
The screenshot shows the 'Create Drawing' dialog box with the following settings:

- Mode: Cross Section
- Name: ML035 - 2179+27.00 R3
- One Sheet Per Dgn: ☐
- Drawing Seed: XS 20 Scale
- View Type: Civil Cross Section
- Discipline: Civil
- Purpose: Section View
- Drawing Model
 - Seed Model: Cross Section Sheet Seed 20 Scale.dgnlib, XS
 - Filename: (Active File)
 - Scale: 1"=20'
 - Annotation Group: XS Culvert Grid w/ Annotation 20 Scale
- Sheet Model
 - Seed Model: Cross Section Sheet Seed 20 Scale.dgnlib, XS
 - Filename: (Active File)
 - Sheets: STA 2179+27.00 [Sheet]
 - Full Size: 1 = 1
 - Drawing Boundary: (New)
 - Detail Scale: 1"=20'
- Options:
 - ☒ Add To Sheet Index
 - ☐ Make Sheet Coincident
 - ☒ Open Model

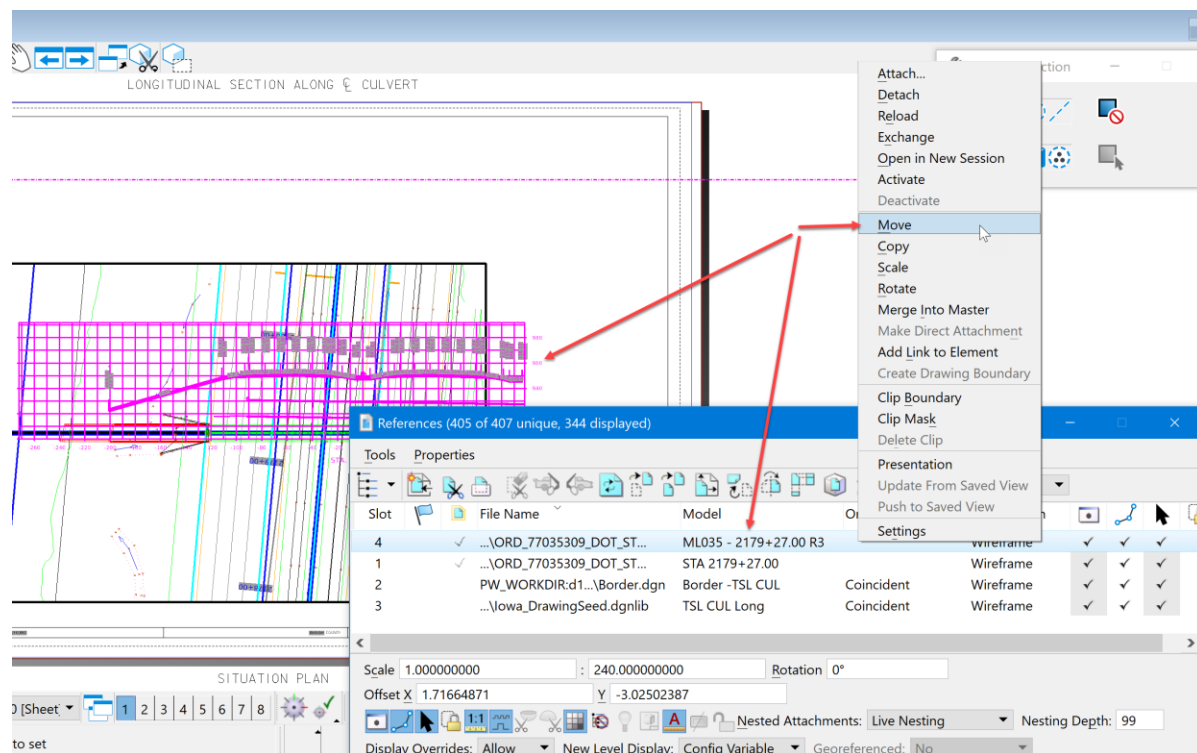
Red arrows point to the Name, Annotation Group, Sheets, and Open Model fields.

Then click OK.

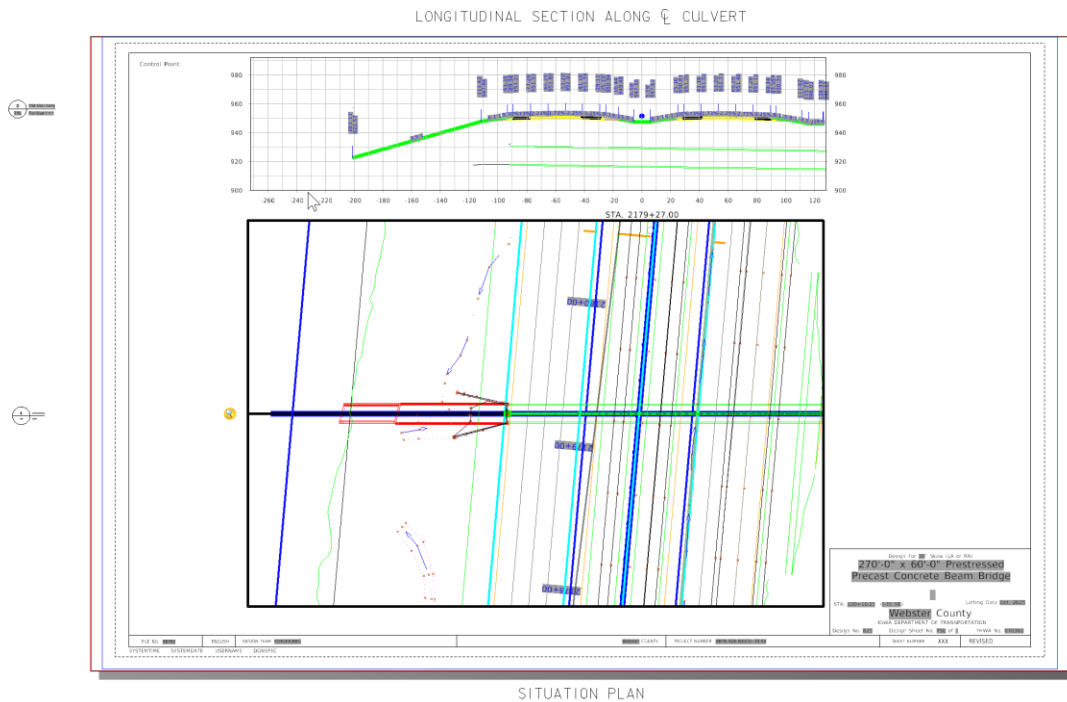
This will place the cross section on the sheet as the Longitudinal Cross Section. It will appear in the center of the sheet.



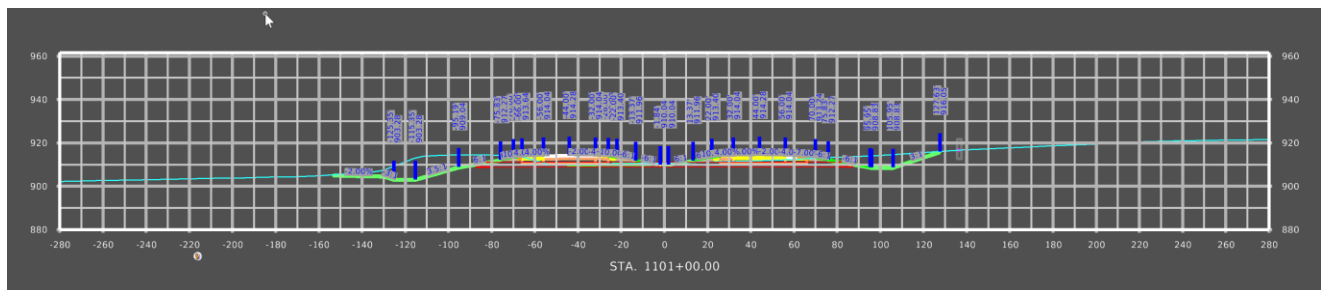
To move it to the proper location, open the References dialog box and select it in the list. Then right click and select the Move option. This is a reference therefore the reference move tool is used.



Then data point somewhere outside of the sheet. With the AccuDraw compass locked vertically, move it up into the correct position. The sheet should look similar to this:

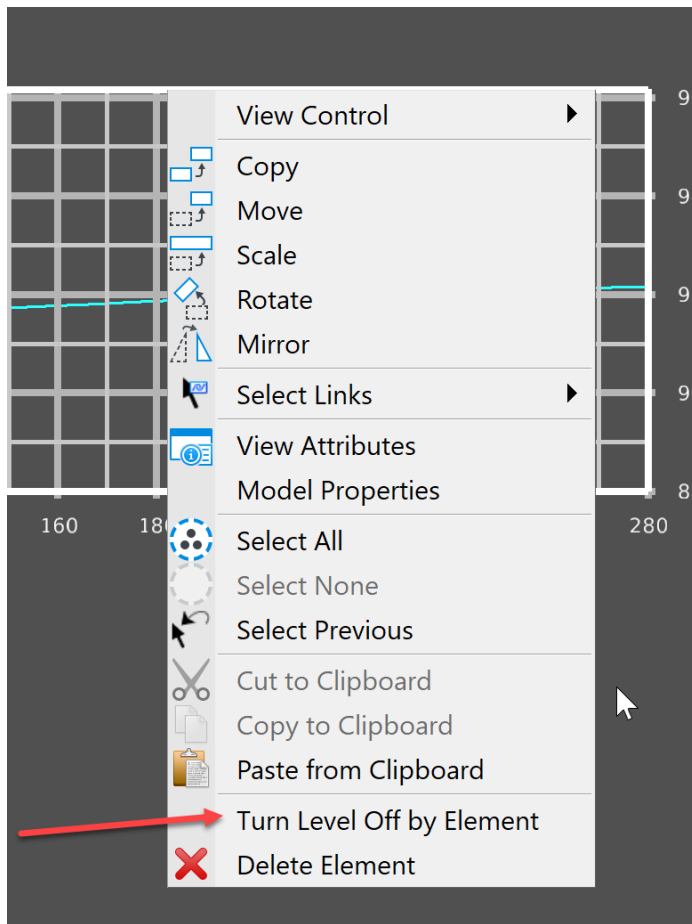


Next, annotate the structure in the Plan View drawing model and in the Longitudinal Cross Section drawing model. For example, start with the Longitudinal Cross Section drawing model and annotate a 24" RCP pipe at STA 1101+00.00. Open the model. Note: This will work the same for any drawing model linked to a sheet model.

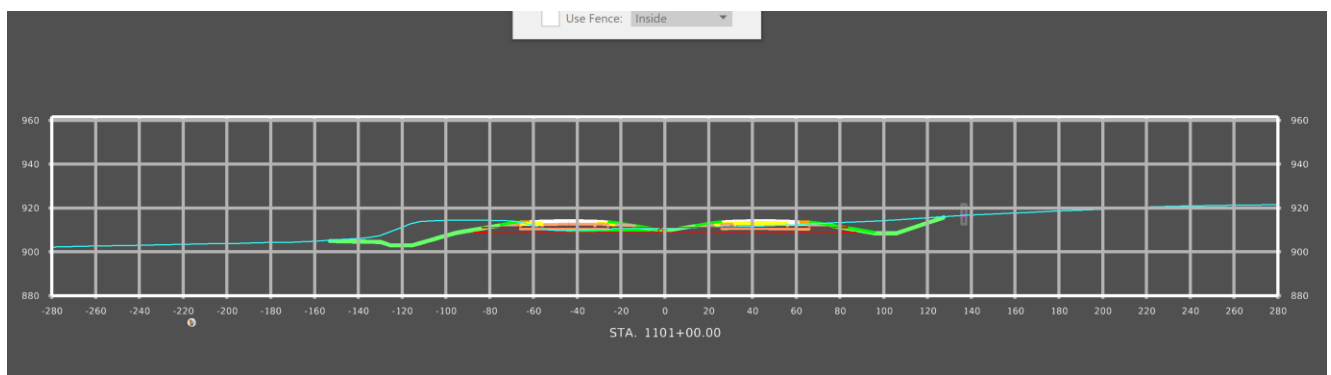


Turn off some of the automatic annotations of this Longitudinal Cross Section to make room for some of the information that will be needed to display.

To turn off some of the automatic annotations, right click and hold to bring up the menu options:



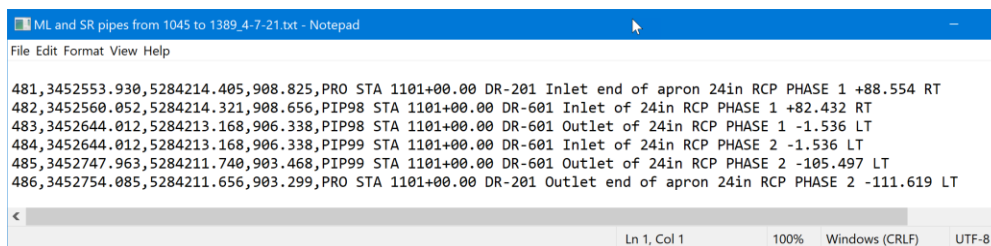
Then select the Turn Level Off by Element option, click on the items not wanted or needed for the sheet. It should look similar to this:



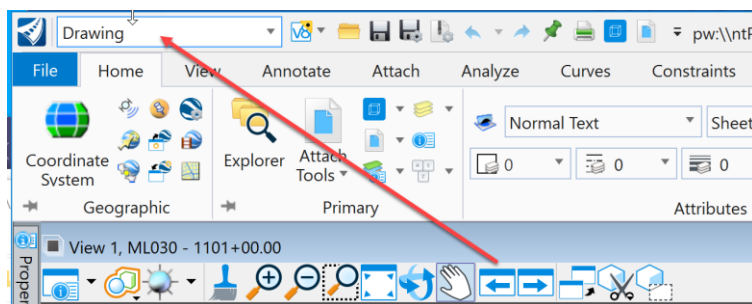
When annotating a structure in the Longitudinal Cross Section, label the items listed below.

1. Design Cover.
2. Profile Grade Elevation.
3. Distance from centerline right.
4. Distance from centerline left.
5. Flowline Elevation at each critical point in the structure.
6. Structure description and any other unique items that need to be called out.

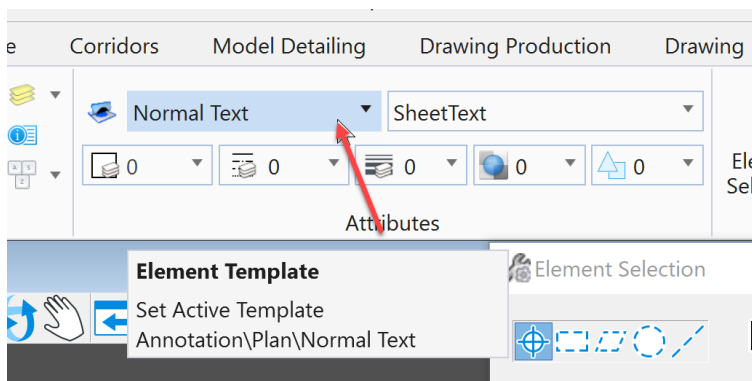
Some of this information is stored in the ASCII graphics input file. It is helpful to have that file open to the structure that is be annotated when doing this process. Copy and paste information from it to the Place Note tool to save on typing.



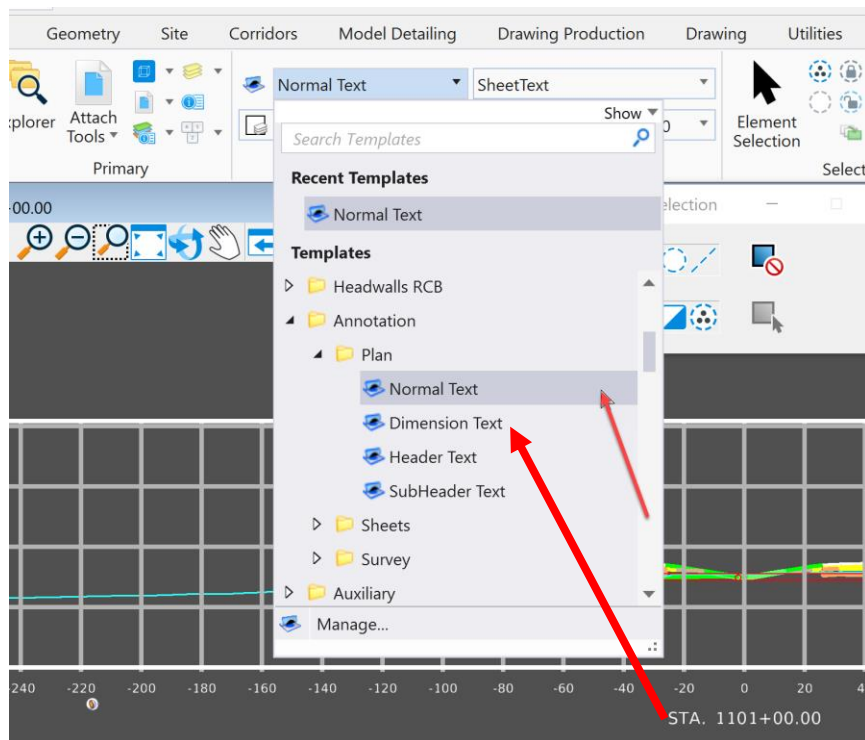
Before starting, a few things need set. The first is to change the workflow to the Drawing workflow. Note this may be a user's preference because some users find it easier to locate the tools to annotate in this workflow. These tools are available on other workflows as well.



The second is to select the correct text Element Template for placing the annotations. Click on the Element Template drop down menu in the Attributes Group on the Home tab.



Navigate to the Annotation folder, Plan subfolder and select the Dimension Text Element Template.



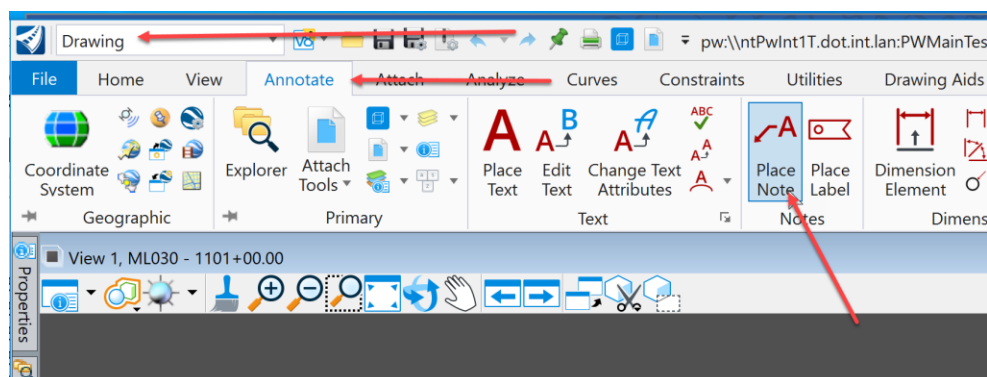
Normal Text: Use for any notes except dimension leader notes.

Dimension Text: Use for all dimensions, leader notes and dimensional/numerical values and text used in tables or fields. See tables used on Iowa DOT Culvert Barrel Details standard sheets as an example.

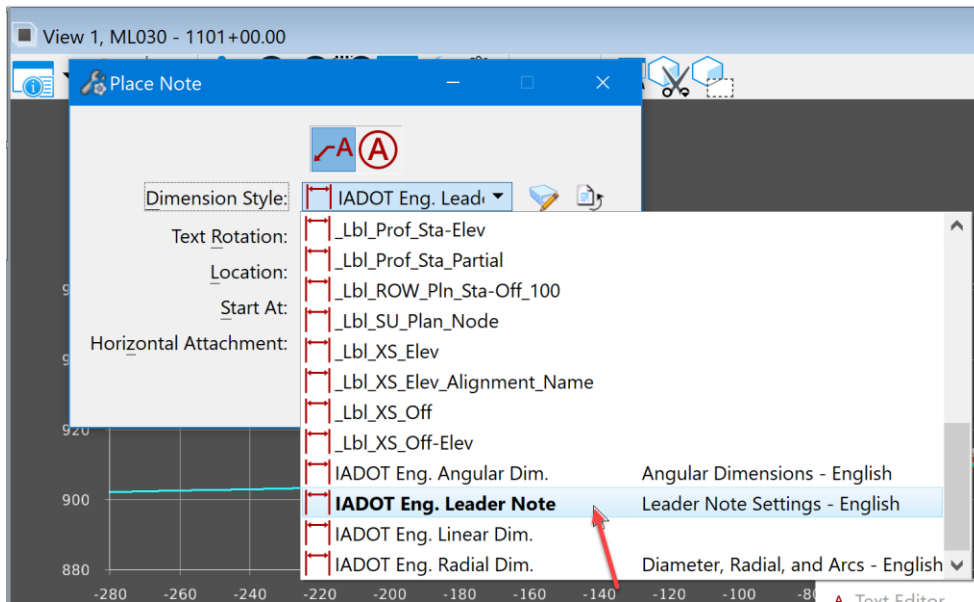
Header Text: Use for all headers and title blocks.

SubHeader Text: Use when Header and Normal text do not seem appropriate. Such as the word “Notes” used when labeling a group of notes or instructions.

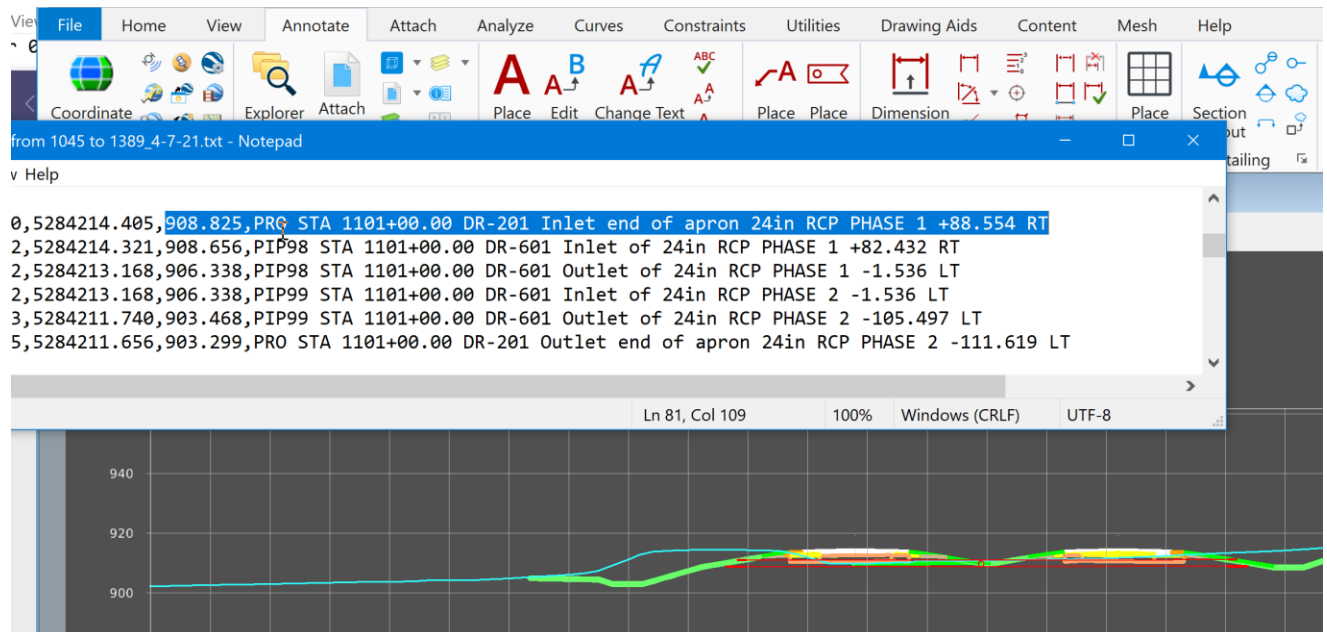
Next, select the correct annotation tool. This example will be placing the Flowline Elevation at the Inlet end of the apron and the offset from centerline. To do this, use the Place Note tool in the Notes Group on the Annotate tab in the Drawing workflow.



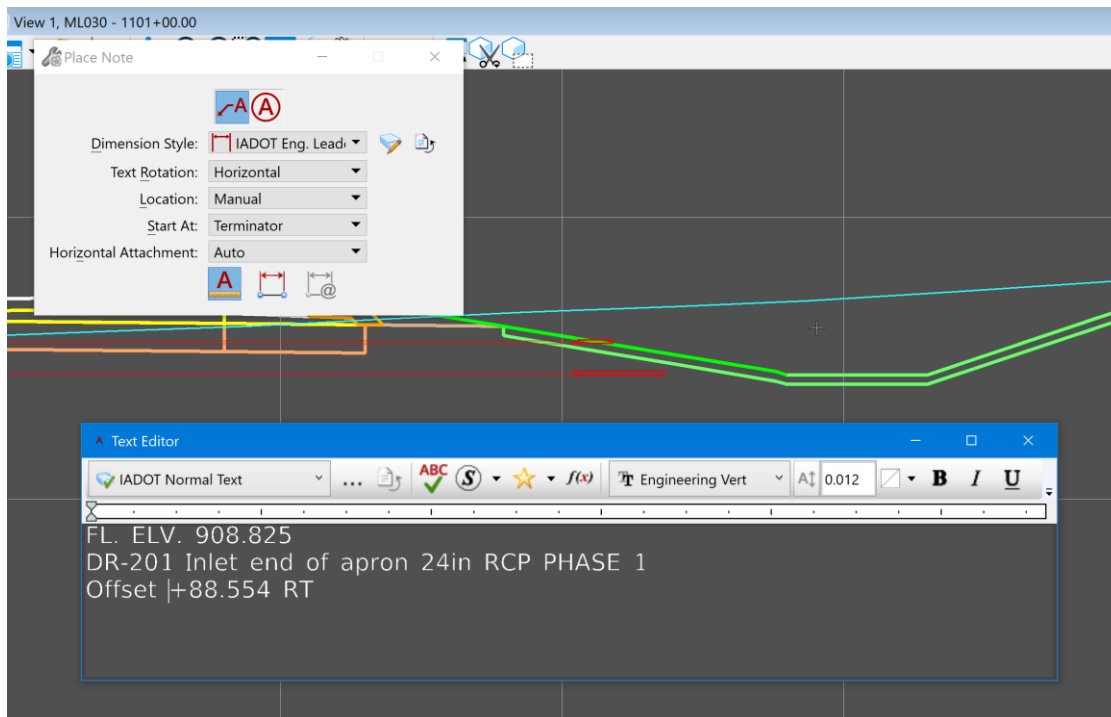
Selecting the Place Note tool will open the Place Note dialog box shown below. Select the correct Dimension Style. This example will use the IADOT Eng. Leader Note style.



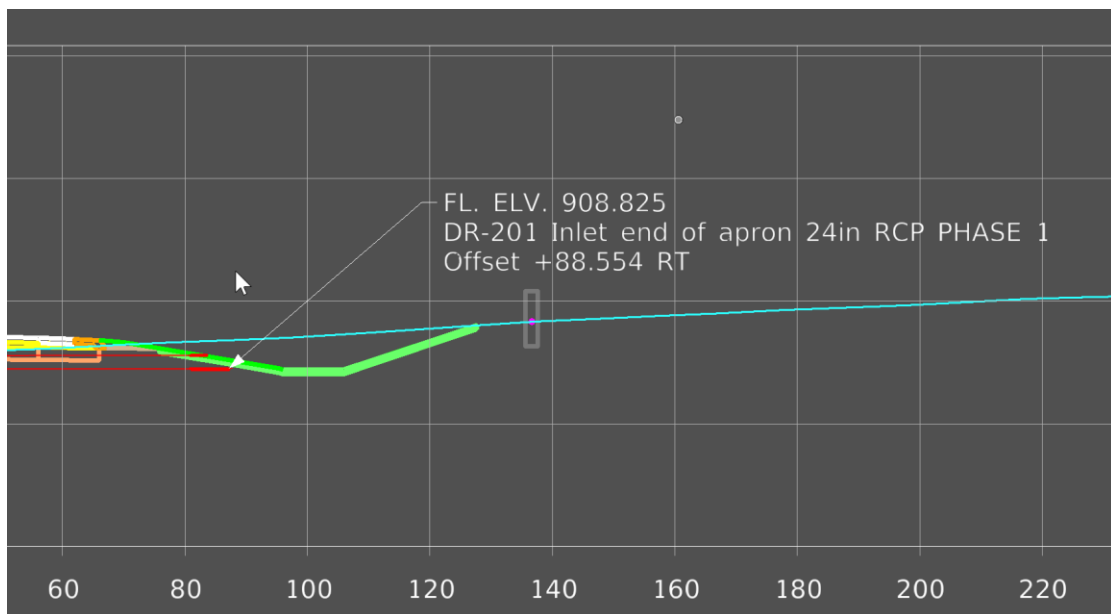
By selecting the correct Dimension Style and Element Template, this will ensure the notes are placed with the correct settings. Once this is set, type in the note needing placed. This is where the ASCII graphics input file may be used. With it opened to the specific structure, highlight the information needed to be placed and copy it from the ASCII graphics input file.



Then paste it into the text window.

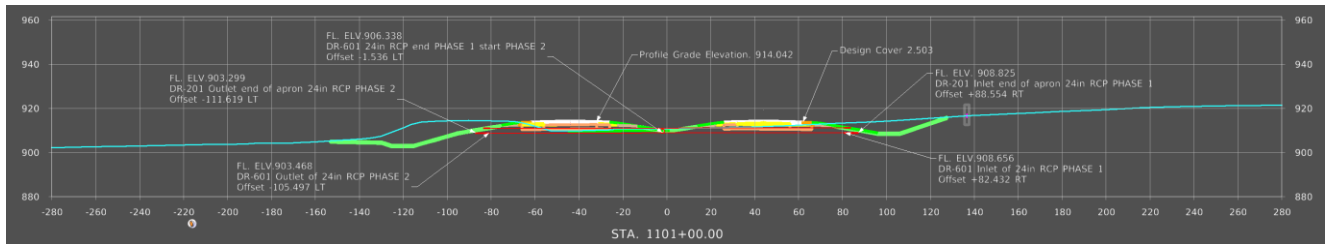


Then snap to the appropriate point to locate the note and place the note.

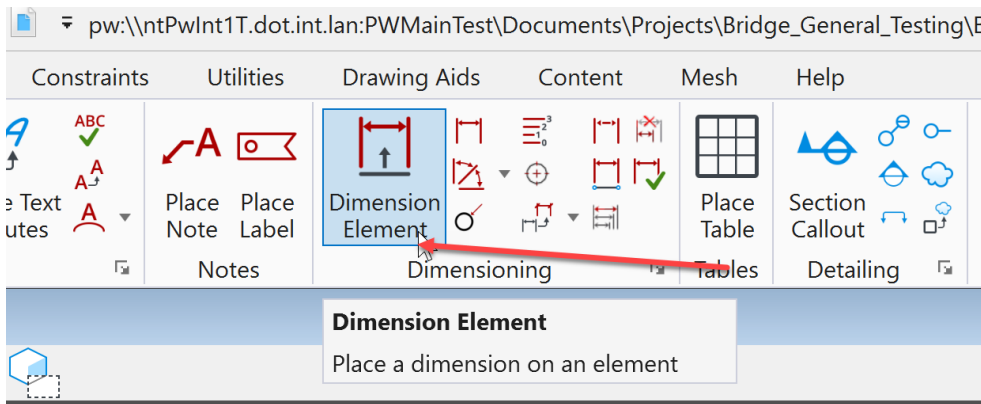


Then repeat the same process to place all the annotation notes needed.

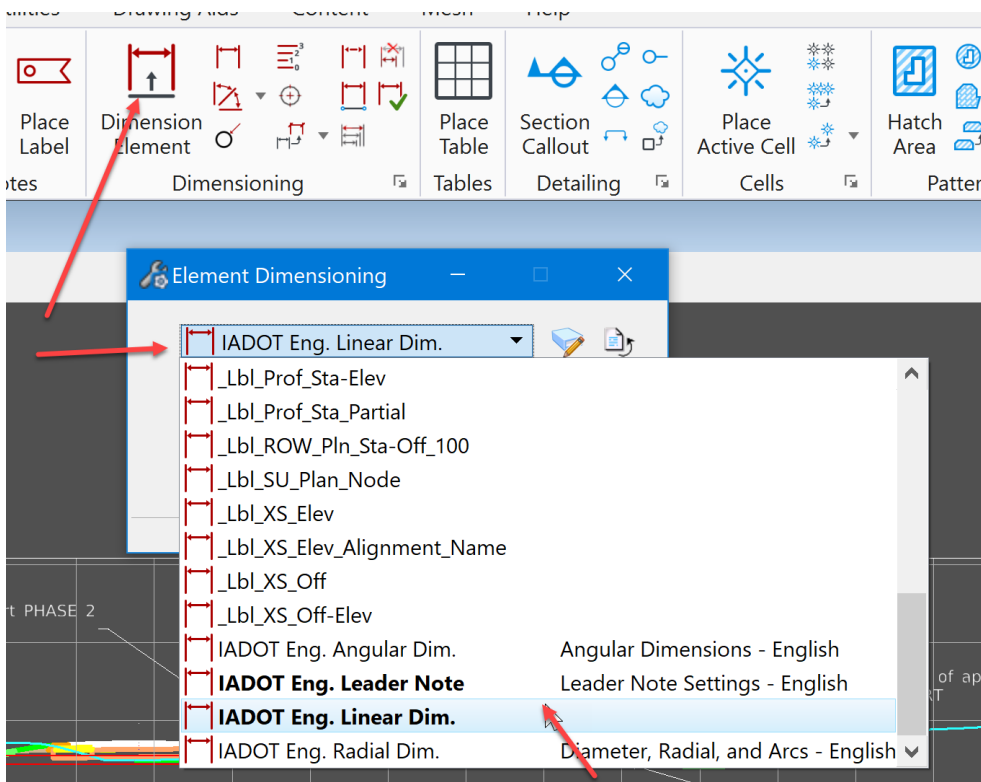
When complete it should look similar to this:



Once done placing the notes, then dimension the pipes. Select the Dimension Element tool in the Dimensioning group on the Annotate tab in the Drawing workflow.



Next, select the correct Dimension Style. This example will use the IADOT Eng. Linear Dim style.



By selecting the correct Dimension Style and Element Template, this will ensure the dimensions are placed with the correct settings. Next, set the **Alignment** to True and the **Location** to Automatic. If Association is checked/toggled on, it will make the dimension capable of auto correcting if the pipe is adjusted.

Element Dimensioning

IADOT Eng. Linear Dim.

Alignment: True

Location: Automatic

☒ Start Extension:

☒ End Extension:

Text Alignment: Standard

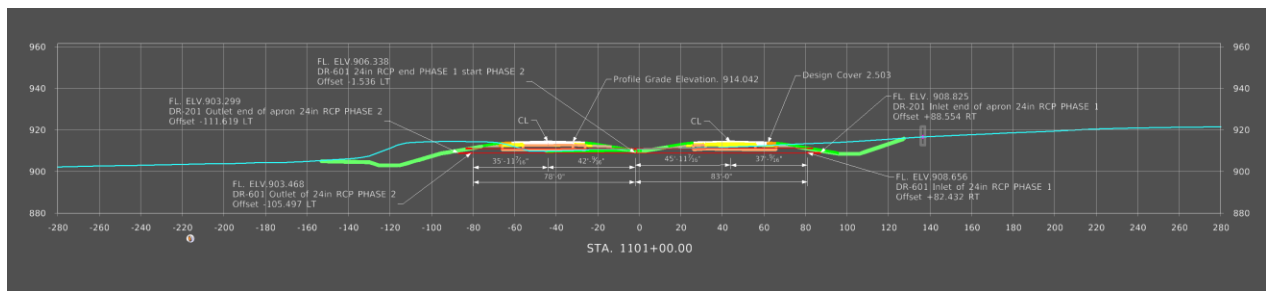
☐ Text Frame: Box

☐ Prefix Text:

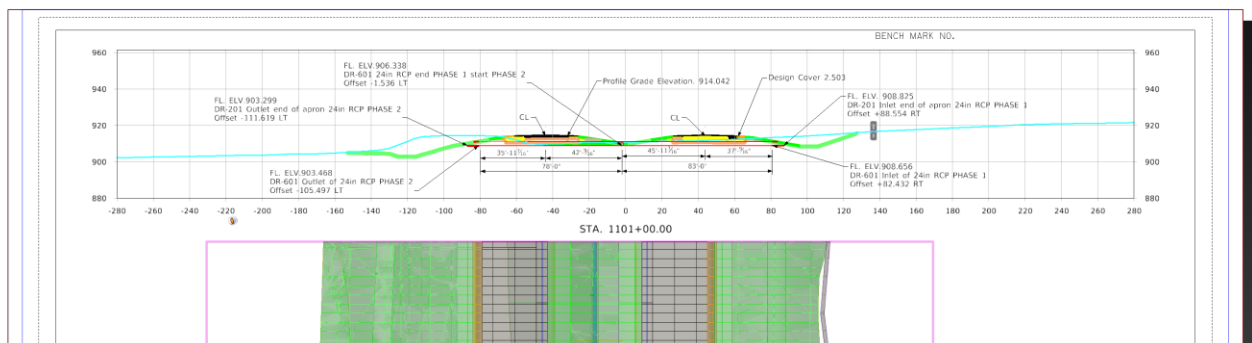
☐ Suffix Text:

☒ Association

When complete it should look similar to this:



LONGITUDINAL SECTION ALONG ϕ APPROACH ROADWAY
LONGITUDINAL SECTION ALONG ϕ CULVERT

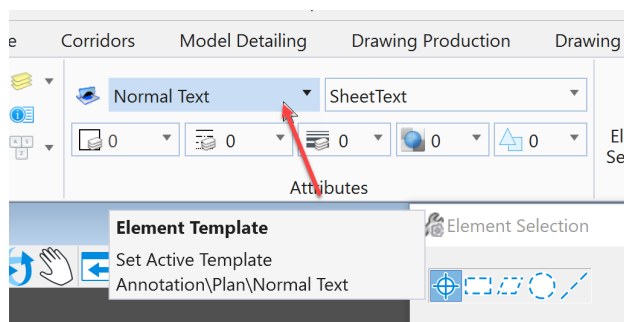


Note: Cut and annotate a cross section for every structure that is designed in the project, even if it is not a B1 Design and will not be placed on a TSL sheet. The cross sections are needed to complete the last part of the Prelim Section Design culvert workflow covered in chapter **CW09_Enterling Pipe and Structure Information into the Access Database**.

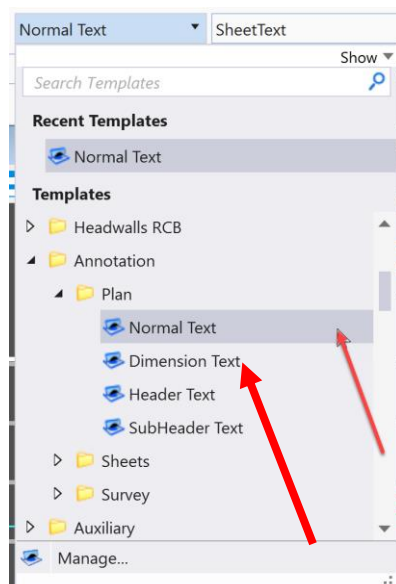
Next, annotate the Plan View portion of the TSL Sheet. When annotating a structure in the Plan View, label these items listed below.

1. Station at centerline of structure = centerline of the alignment.
2. Station at Even Station tic marks before and after the structure.
3. Station of the outside corners of the proposed revetment.
4. Dimension distance from centerline left.
5. Dimension distance from centerline right.
6. Dimension to length of new structure.

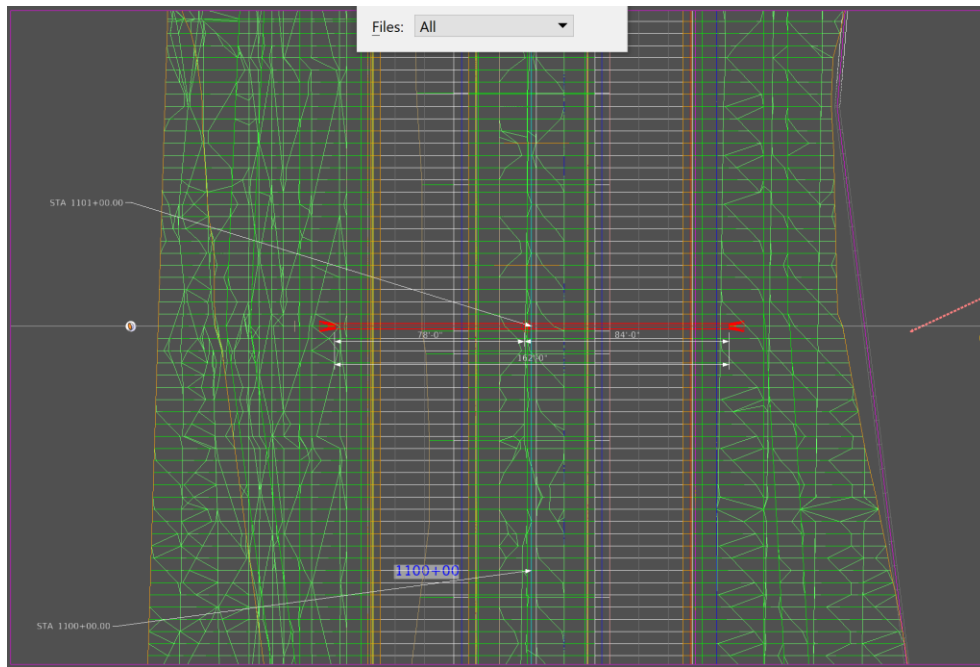
Similar to annotating the Longitudinal Cross Section, make sure to select the correct Element Template for placing the annotations.



Next, navigate to the Annotation folder, Plan subfolder and select the Dimension Text Element Template.

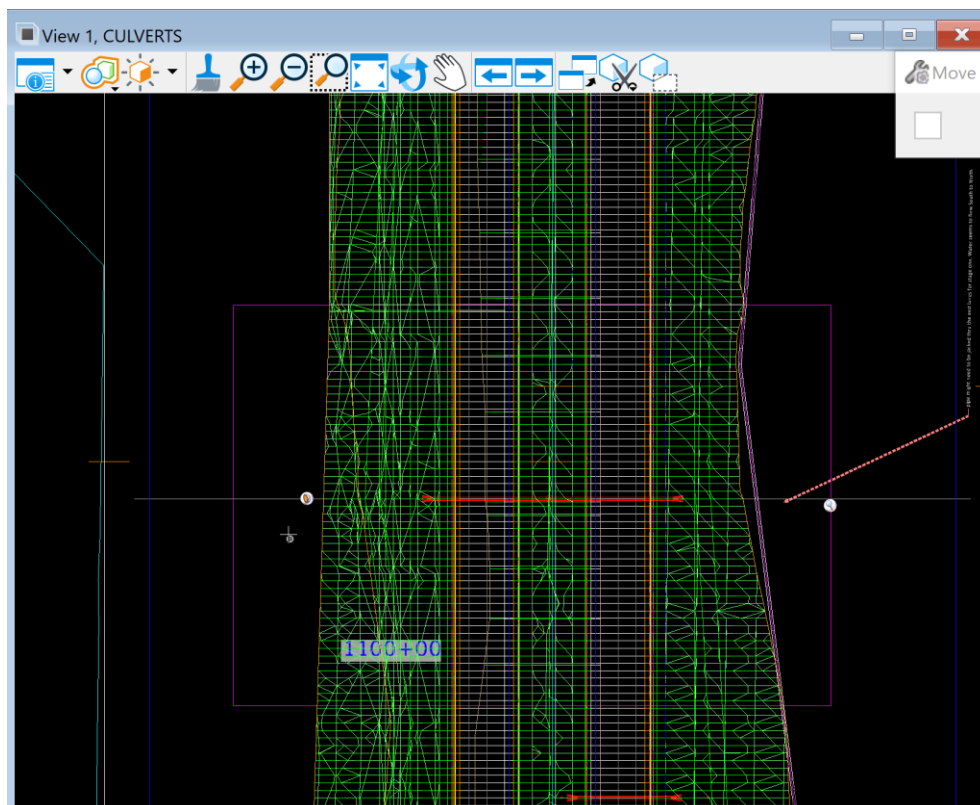


By selecting the correct Dimension Style and Element Template, this will ensure the notes are placed with the correct settings. It should look similar to this:

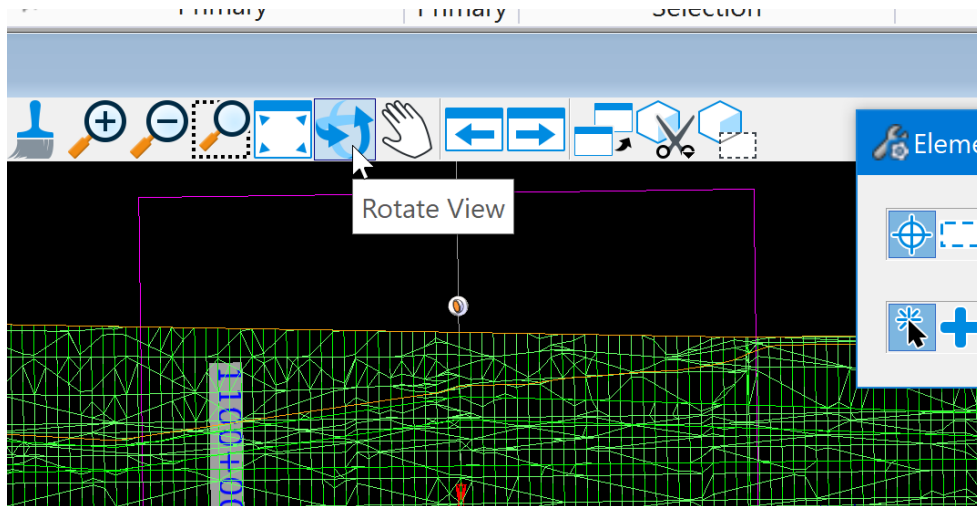


Once all the annotation is complete, then place the North Arrow in the Plan View.

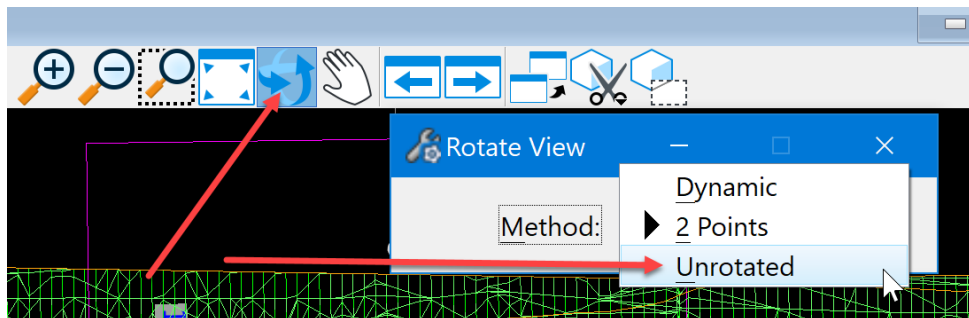
To do this, view the Design model that is the 2D Design model in the file being worked in.



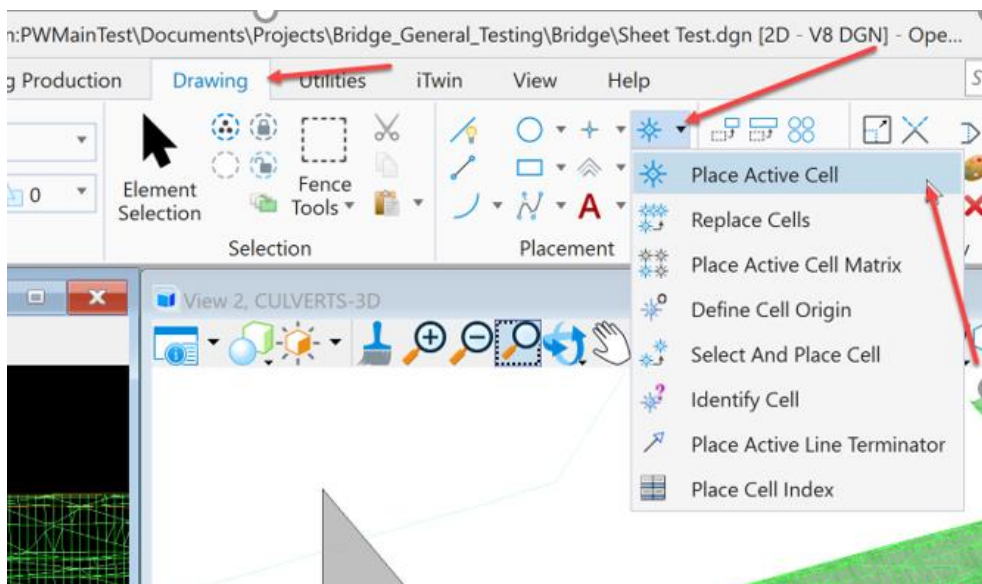
Then reset the rotation of the view to unrotated. Select the Rotate View tool at the top of the view.



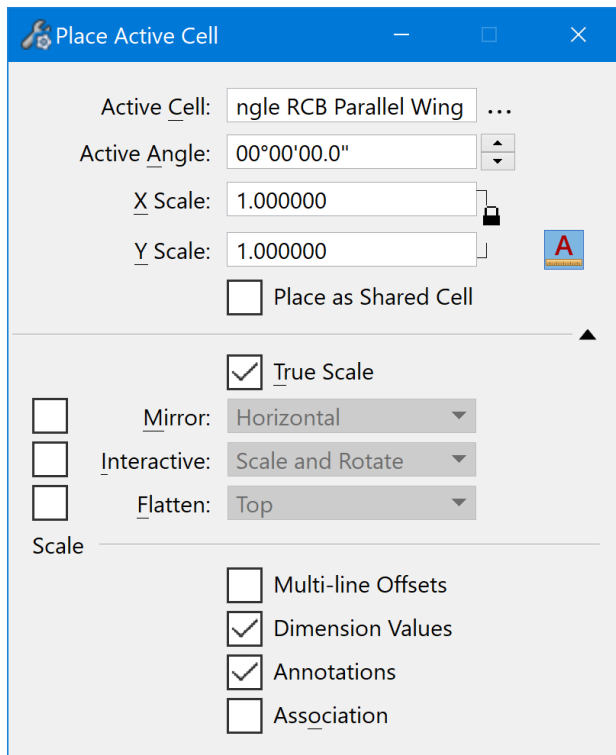
Then select the Unrotated Method.



This will set it so that the Design model will have North to the top of the view. Next, select the Place Active Cell tool in the Placement group on the Drawing tab.



It will open the Place Active Cell dialog box.

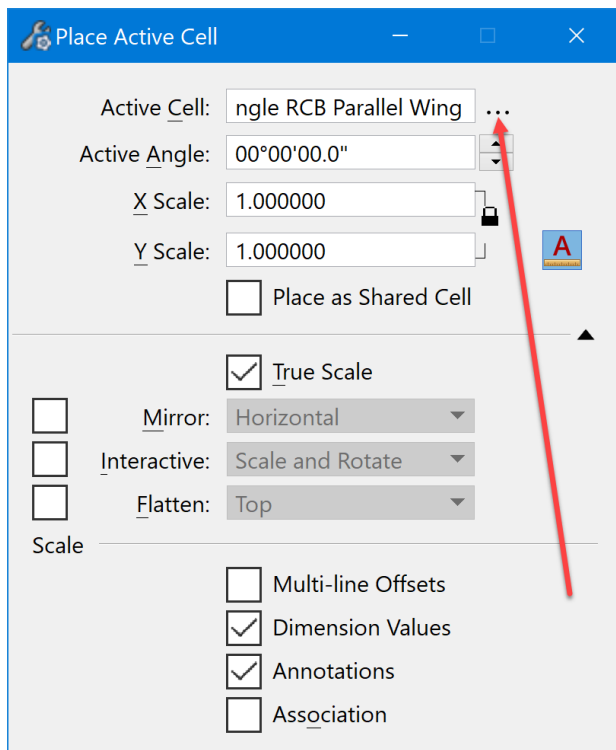


The 'Place Active Cell' dialog box is shown with the following settings:

- Active Cell: ngle RCB Parallel Wing ...
- Active Angle: 00°00'00.0"
- X Scale: 1.000000
- Y Scale: 1.000000
- ☐ Place as Shared Cell
- ☒ True Scale
- ☐ Mirror: Horizontal
- ☐ Interactive: Scale and Rotate
- ☐ Flatten: Top
- Scale
 - ☐ Multi-line Offsets
 - ☒ Dimension Values
 - ☒ Annotations
 - ☐ Association

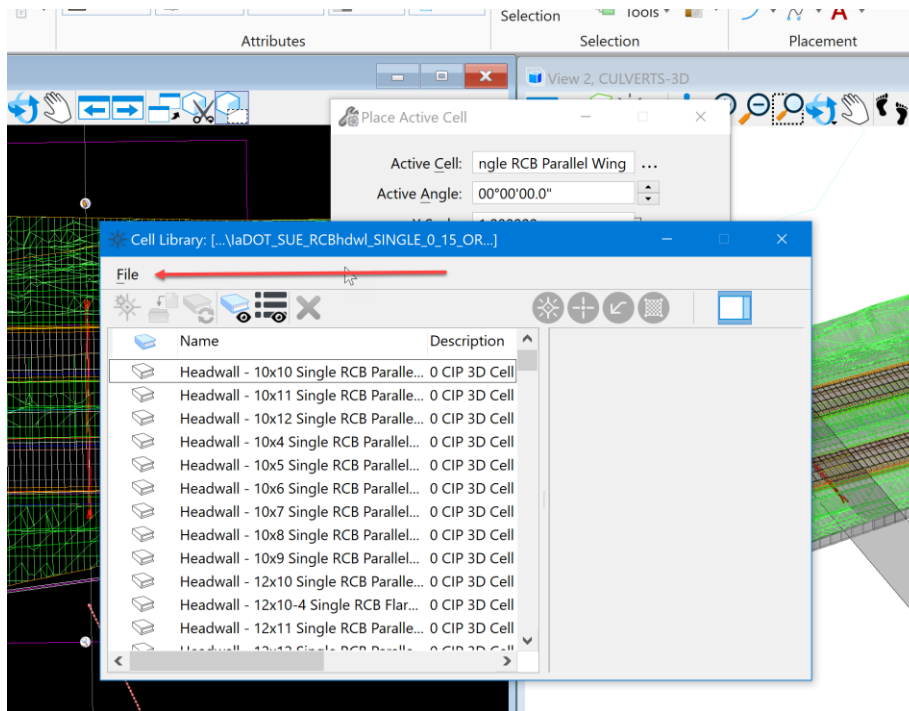
Make the North Arrow cell the active cell.

To do this, click on the three dots next to the Active Cell field.

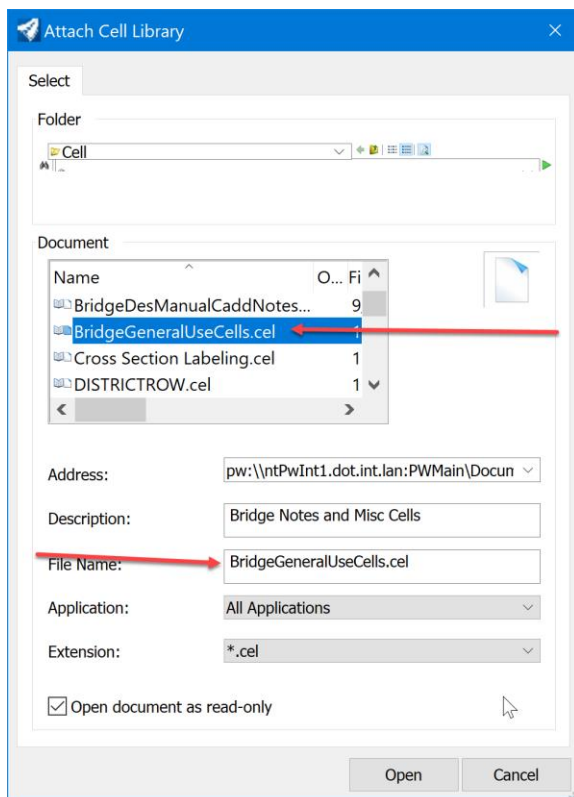


The 'Place Active Cell' dialog box is shown with the same settings as the previous image. A red arrow points to the three dots next to the 'Active Cell' field, indicating where to click to change the active cell.

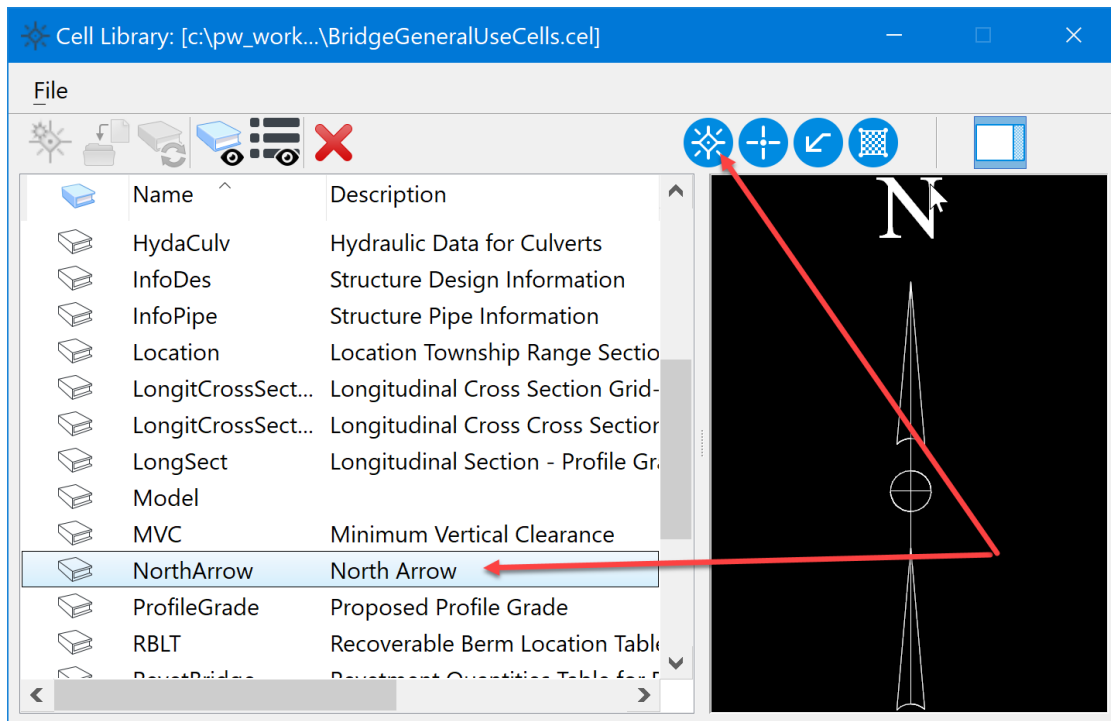
It will open the listing of the cells in the Cell Library.



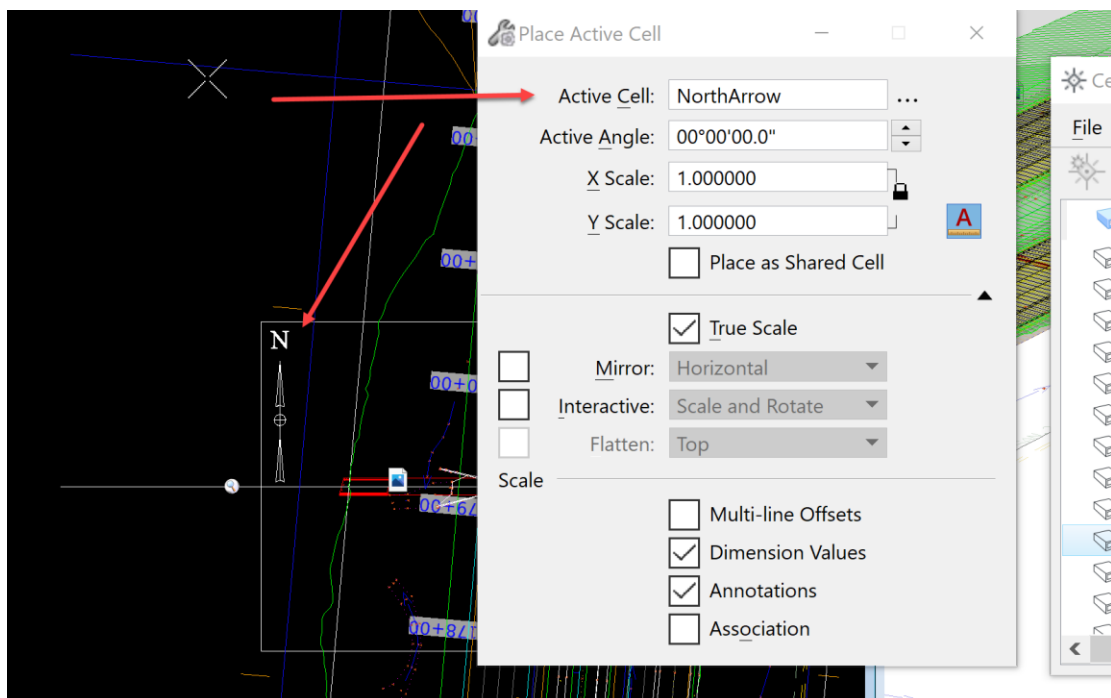
Click on the File menu to navigate to and open the BridgeGeneralUseCell.cel file located at PWMain\Documents\IowaDOTStandardsConnect\Configuration\Organization-Civil\IowaDOT_Standards\Cell\BridgeGeneralUseCells.cel



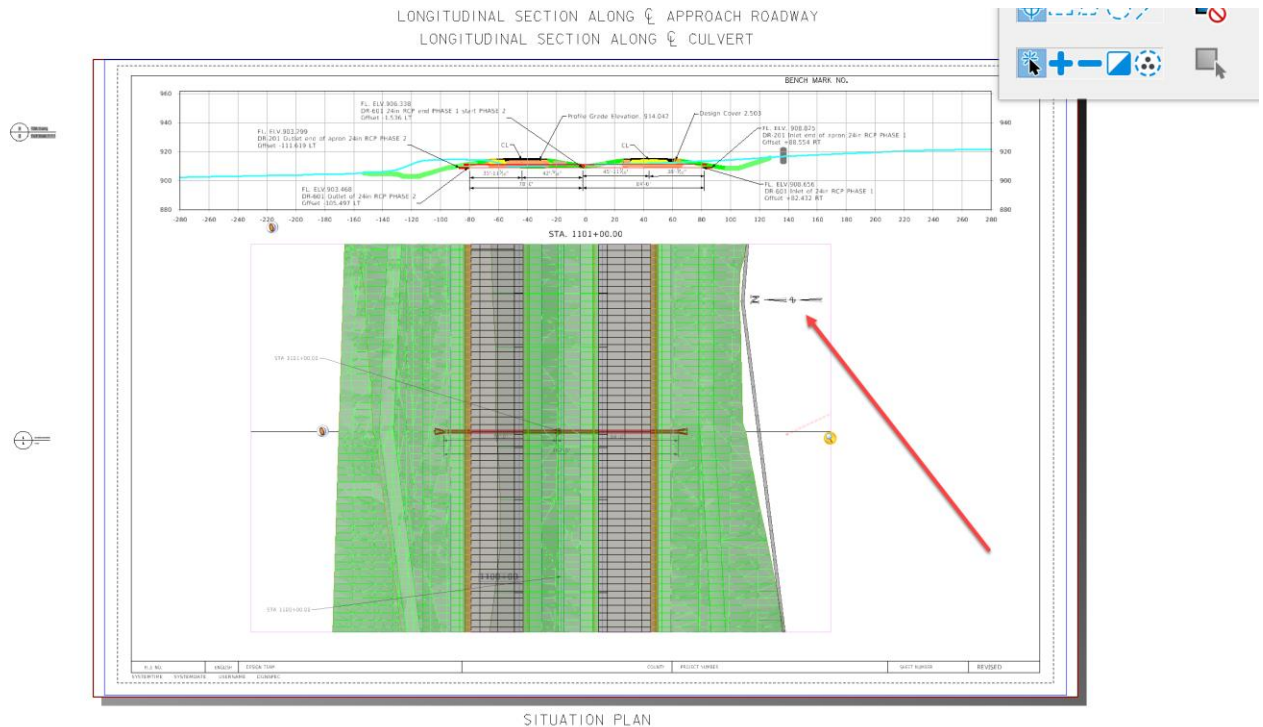
Select the North Arrow cell. Then click on the Place Active Cell tool in the Cell Library dialog box



Place it in the Unrotated 2D design model within the plan view boundary.



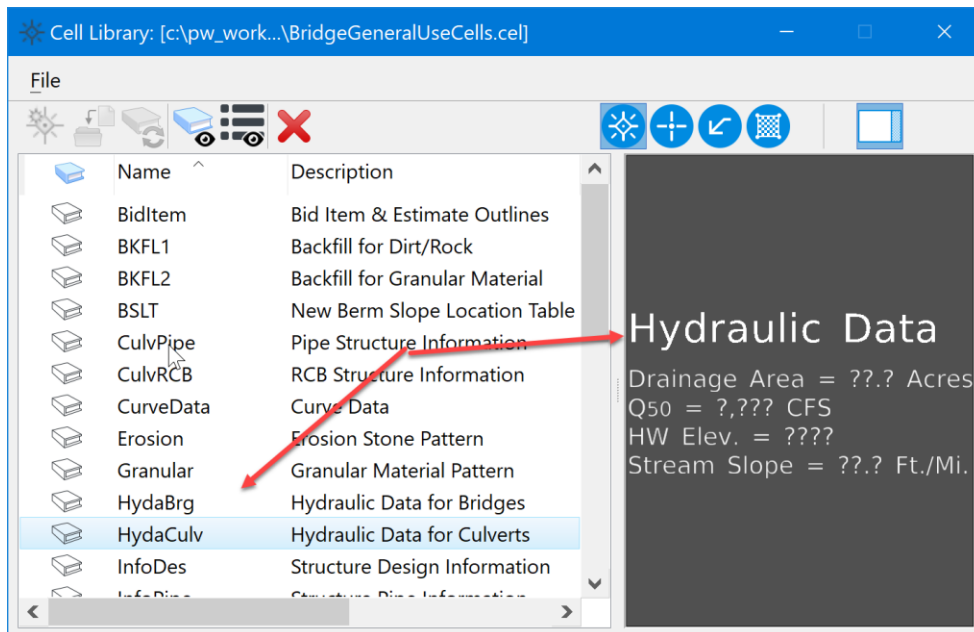
This will make the arrow appear on the sheet at the correct scale and true North Azimuth of the Design file.



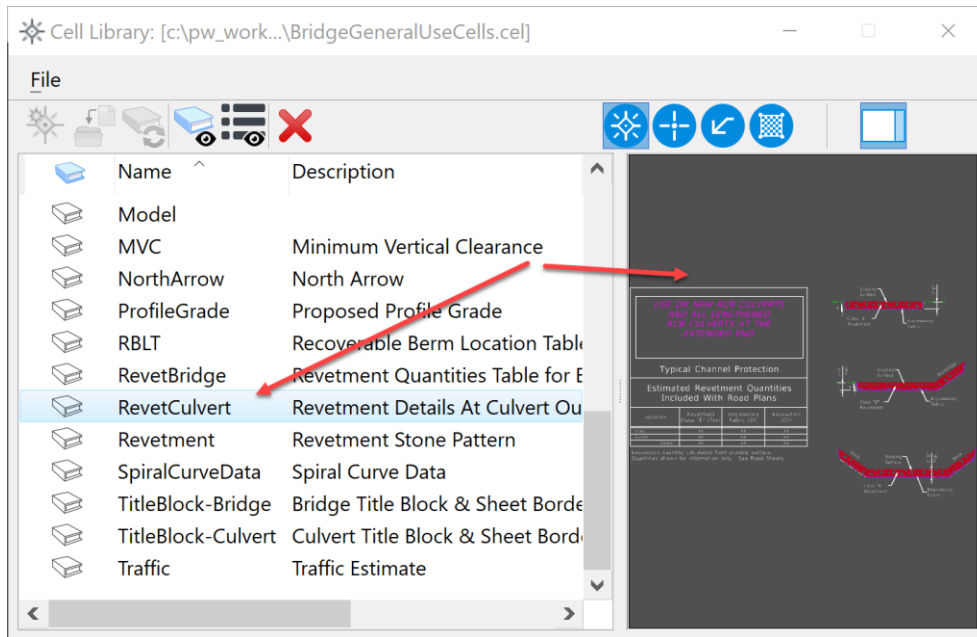
Next, place any of the other notes that need added to this sheet model to properly convey the design intent of the structure.

In the plan view Drawing model, select and place the following cells.

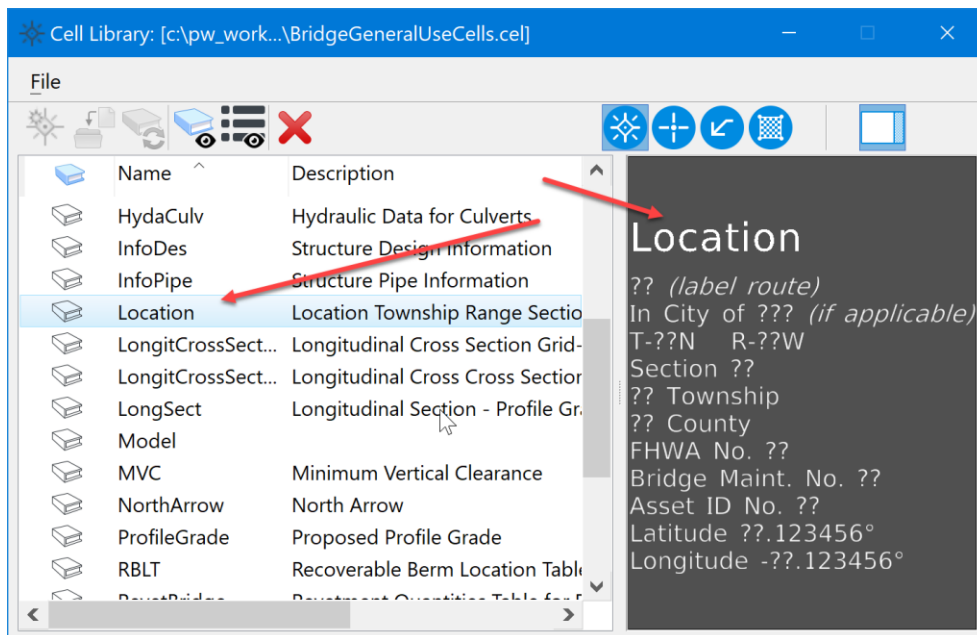
1. Hydraulic Data (HydraCulv)



2. Estimated revetment quantities (RevetCulvert) - This will be included with the road plans along with the channel protection typical.

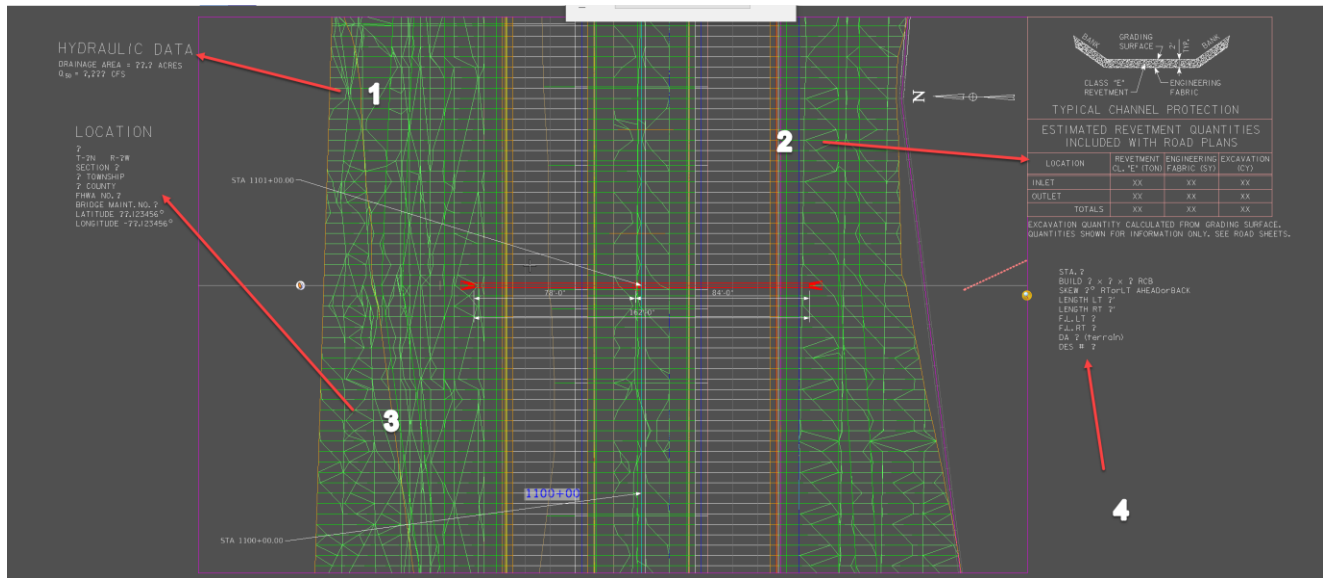


3. Site location (Location)

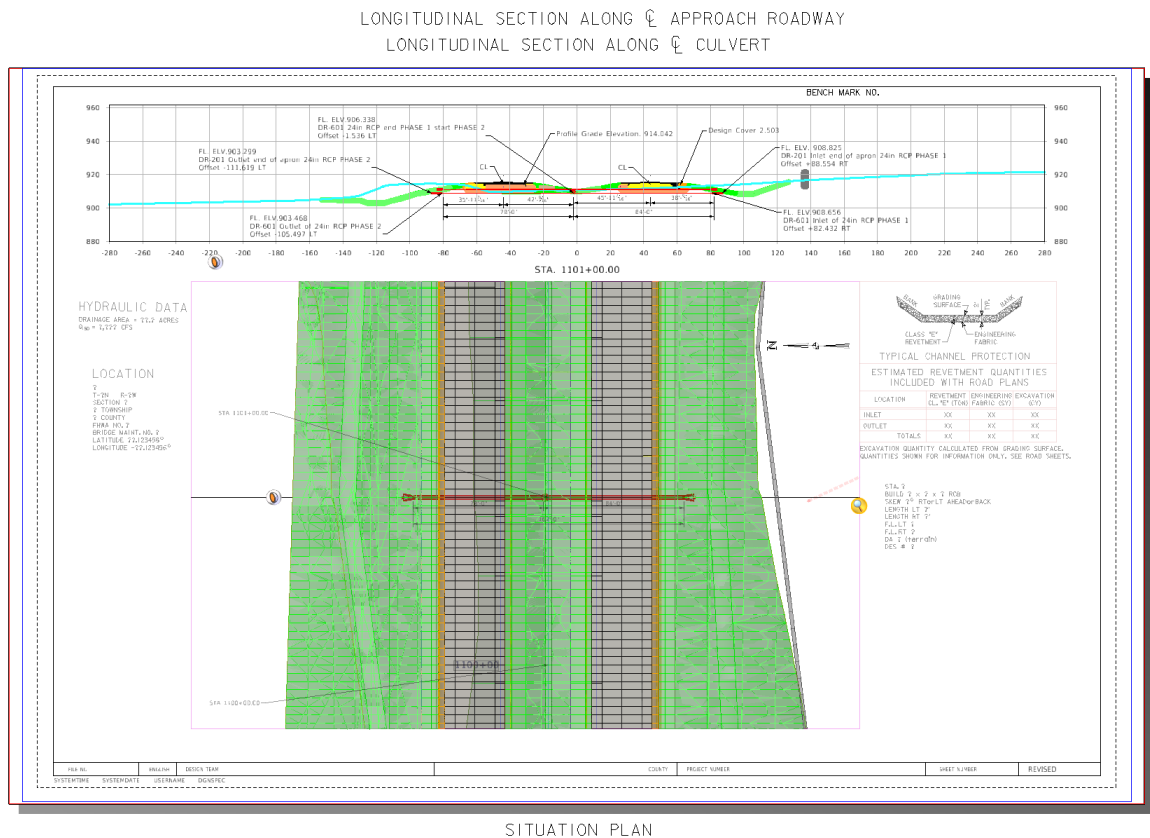


4. Any other notes needed to convey the design intent of the structure.

Once completed, it should look similar to this:



After completing notes, the sheet should appear similar to this:



SITUATION PLAN

Next, enter the Control Point information on the sheet. This information is in the SHT_PS_CCRRRPPZ00.dgn file in the PrelimSurvey directory in ProjectWise. Once the correct control point for the structure is determined, edit the text on the sheet model of the TSL sheet to add this information.

The last step in completing the TSL sheet is the Title Block information and working with the Sheet Index in the IaDOT_WS file that is accessed thru the Project Explorer. This step will be explained in the next chapter. Please refer to **CW07_Enter and Editing Title Block Information on Sheets**.

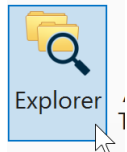
Editing Title Block information on TSL Sheets and Printing Sheets

These instructions were created with:

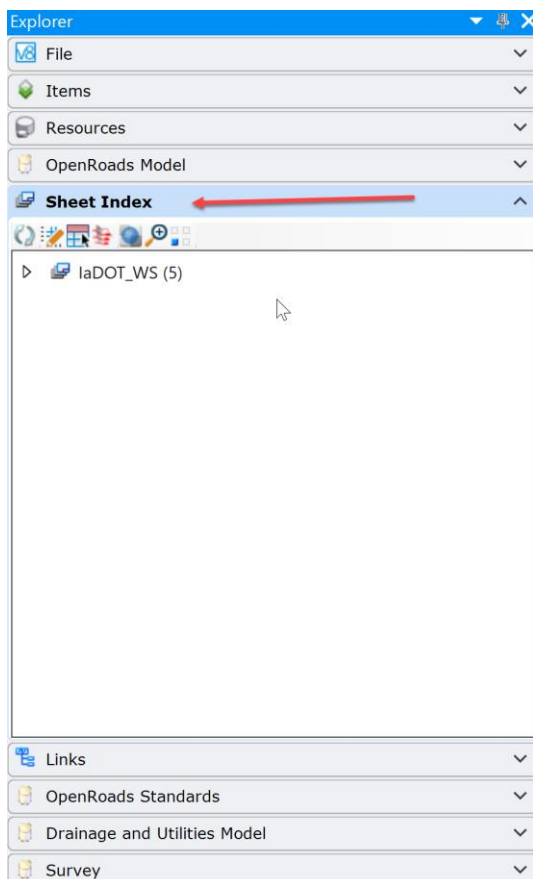



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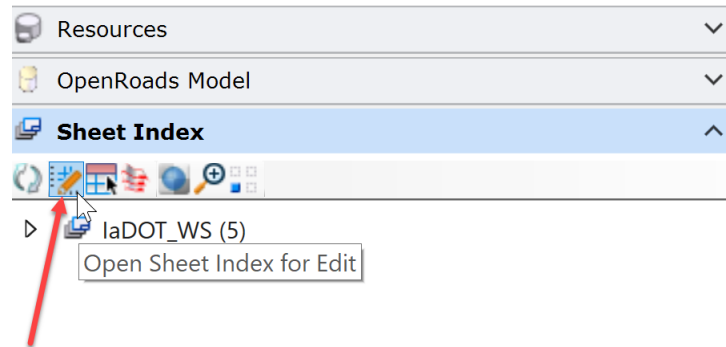
When using the Sheet Models in the Iowa DOT Bridge Bureau seed files, the Title Block and sheet border have text fields that are set up to work with the **laDOT_WS.dgnws** Sheet Index file. This file is in the **ProjectResources\Workset** folder of every Bridge Project Directory. The **laDOT_WS.dgnws** Sheet Index file is specific to each WorkArea that it resides in. The Sheet Models are added to the Sheet Index to autofill the text fields. To do this, access the Sheet Index thru the Project Explorer. The Sheet Index can only be edited by one User at a time.




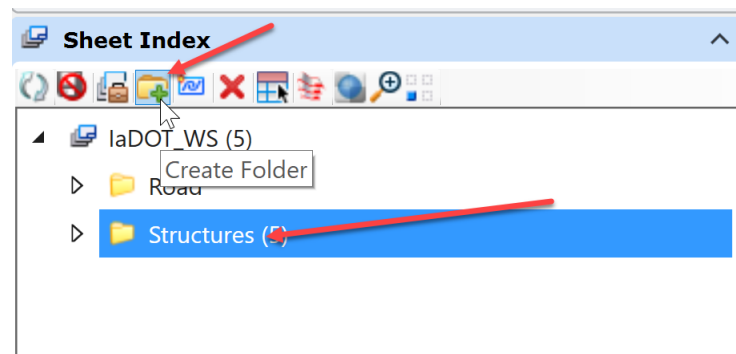
Project Explorer displays the Sheet Index as shown below.



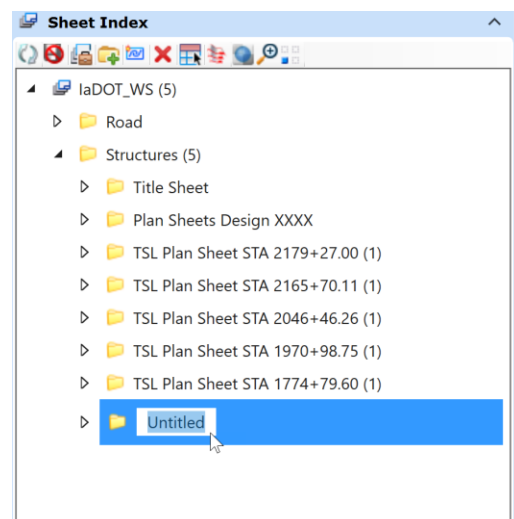
Next, open the Sheet Index for editing, click on the Open Sheet Index for Edit  button.




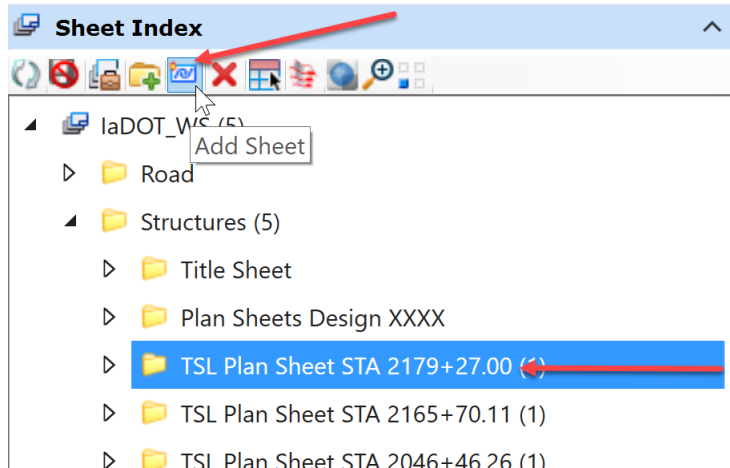
Next, add the folders that the sheets will reside in. Typically, the process is to create a folder for each Structure Design Number. (Note: at this stage the design number may not be known for each structure, so name it something specific to the structure and once the design number has been assigned then rename the folder.) This example will use the Design Station of the structure. To add a folder, click on the structures folder so that it is highlighted then click on the create folder  button.



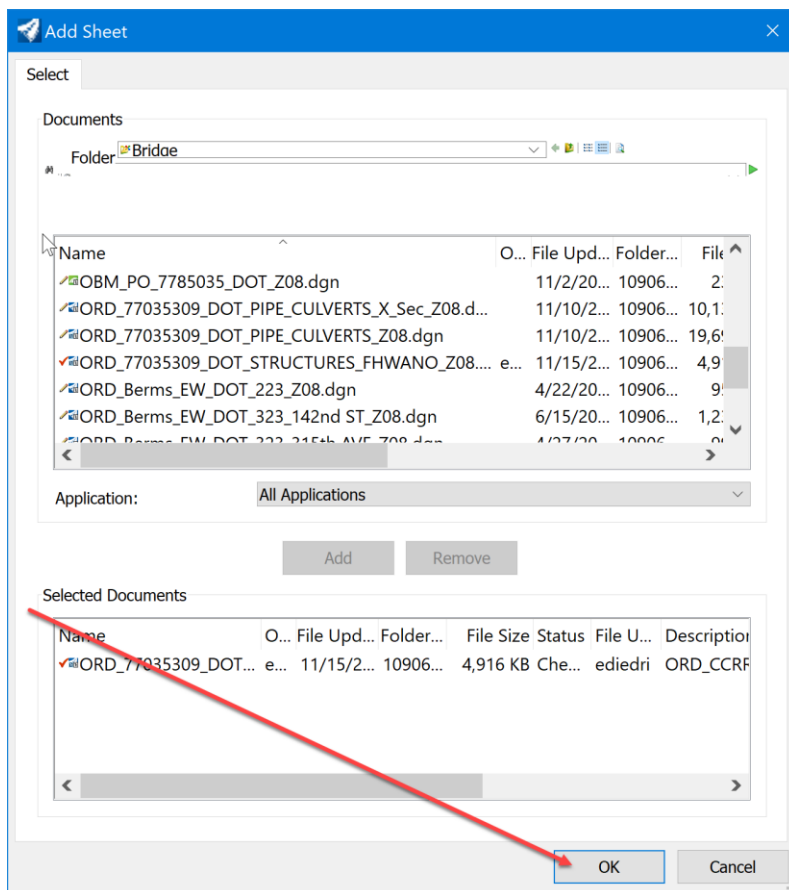
The folder will be added and named "Untitled". To rename the "Untitled" folder, either right click and select Rename or edit it in the folder properties. Rename it the Design Number or the Station of the structure.



Once the folder is created for the design then it will need the sheets added to it. Select the folder that the sheet will reside in and click on the Add Sheet  button.



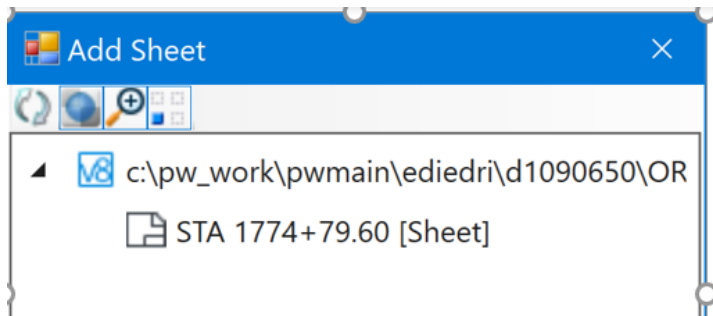
The Add Sheet dialog box will open. Browse to and select the DGN file the sheet is in thru the Select tab.



Click the Add button.

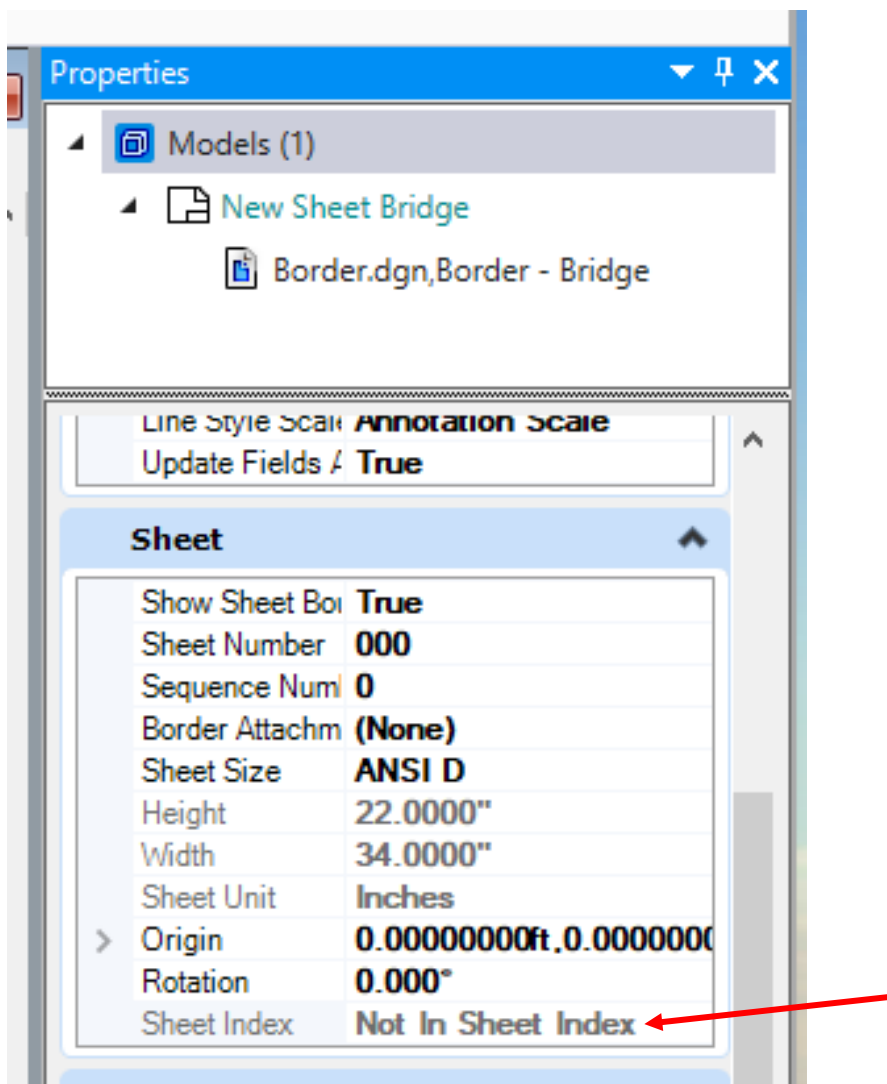
Then click the OK button.

The list of available sheets will display. Select the sheet that will reside in this folder. The “Add Sheet” list will only show Sheet Models that are not part of any Sheet Index. A Sheet Model is only allowed to be assigned to one Sheet Index, not multiple indexes.

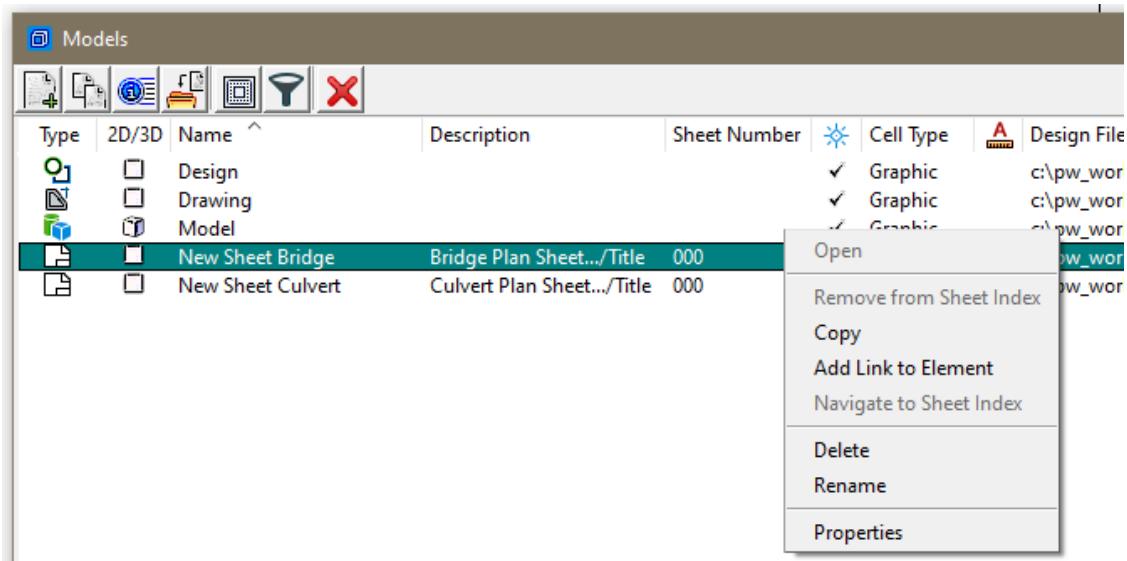


In the Properties of the Sheet Model it will show if the sheet is part of a Sheet Index or not.

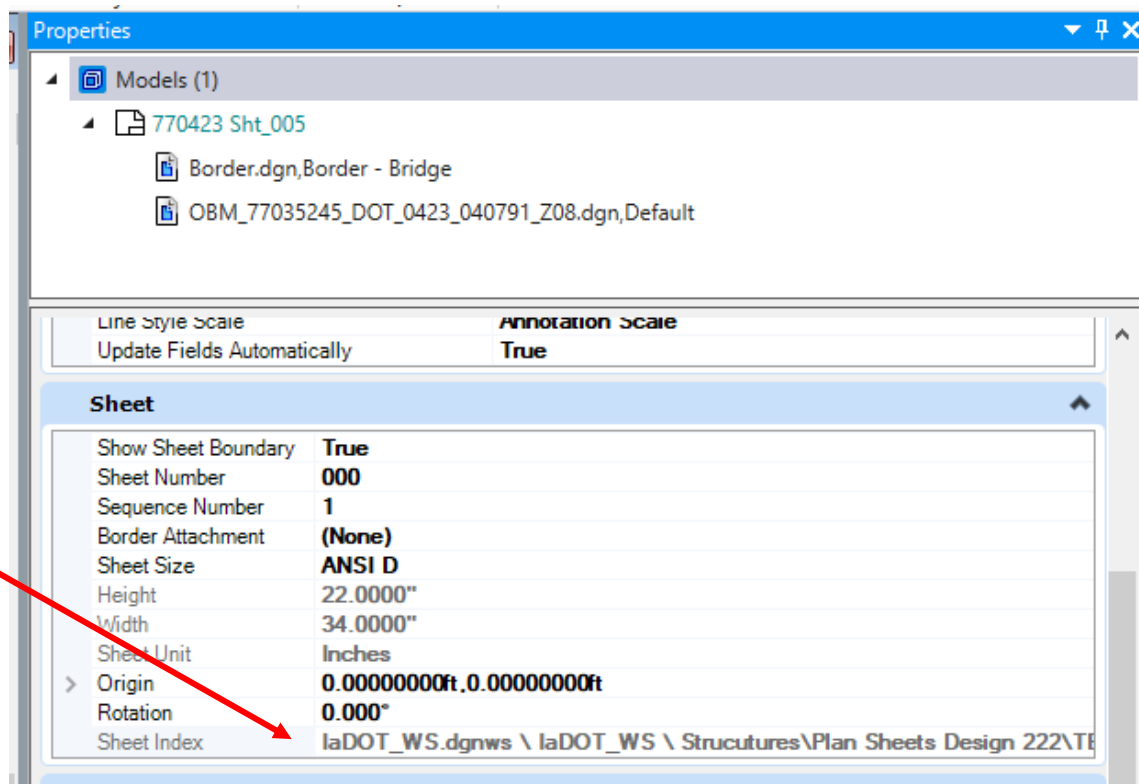
Example below is showing the Sheet Model is “Not in a Sheet Index”.



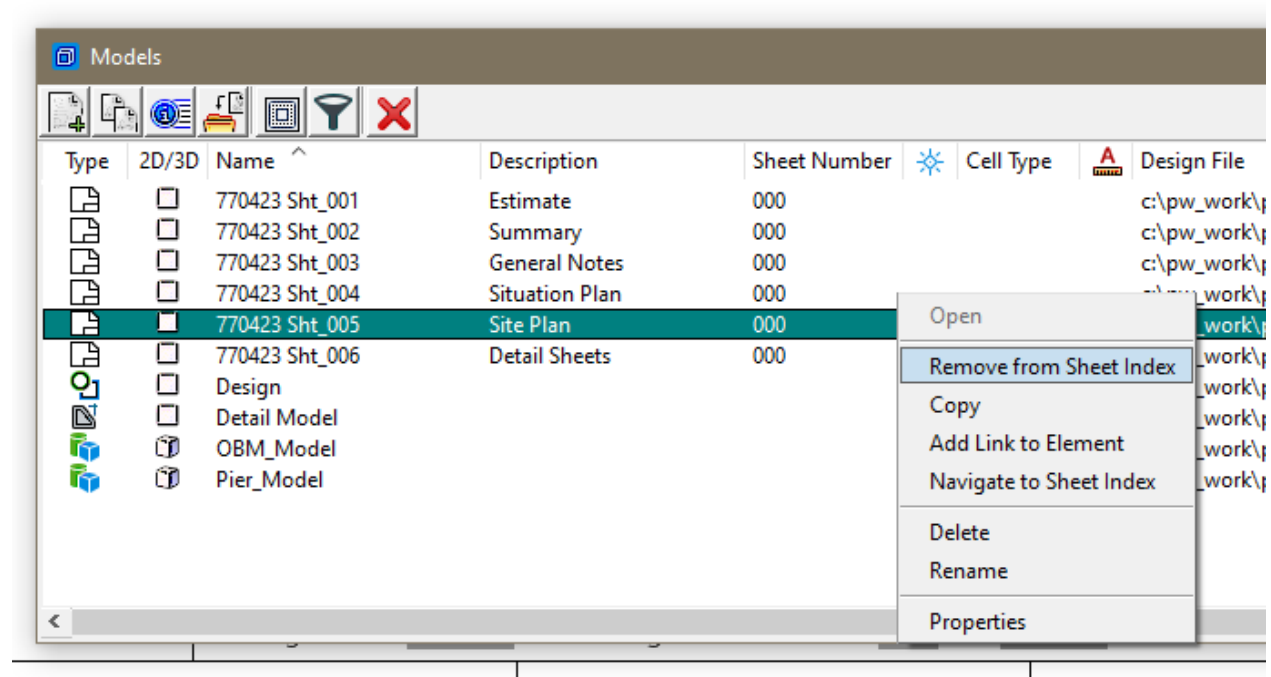
If the Sheet Model was in a Sheet Index then the “Remove from Sheet Index” option would be selectable.



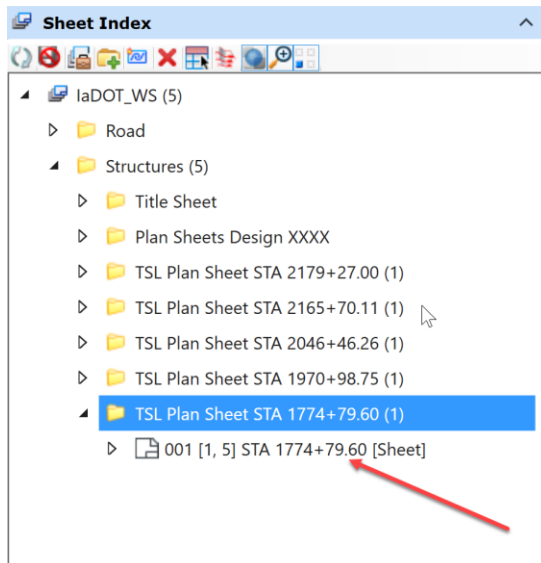
Example below is showing the Sheet Model is in a Sheet Index.



Example below is showing a Sheet Model that is in a Sheet Index. Right clicking on the Sheet Model it can be removed from the Sheet Index, if desired. Sheet Models may also be removed from the Sheet Index through the Sheet Index Explorer.

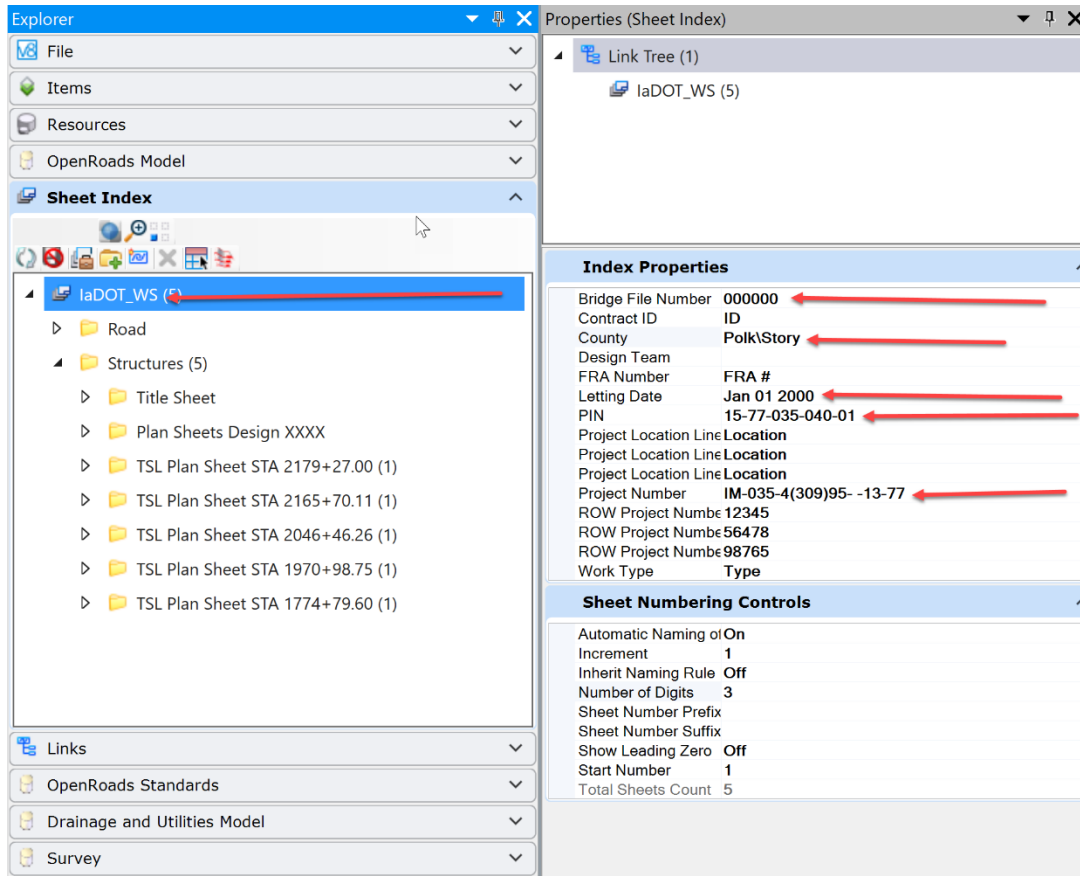


The sheet will appear in the index as shown below.

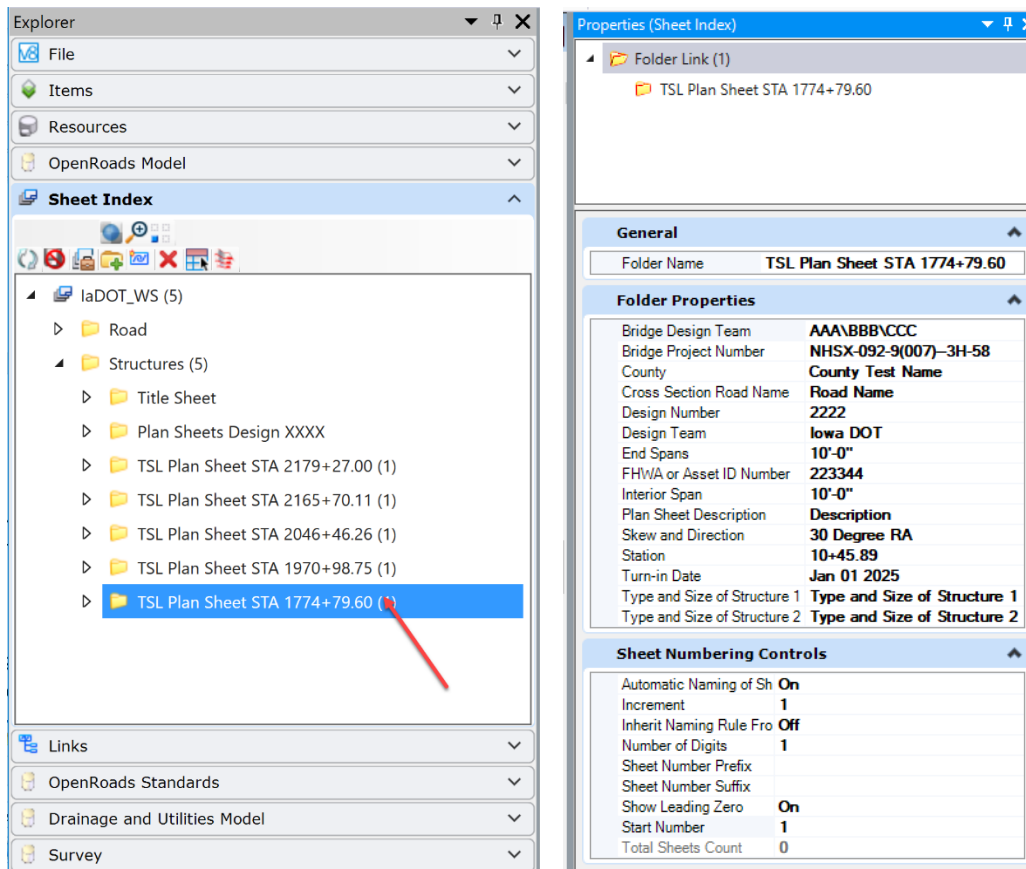


Next, set the Index Properties at the index level. Click on the **laDOT_WS** in the Sheet Index Explorer so that it is highlighted and open the Properties. Set the Bridge File Number, County, Letting Date, PIN Number and Project Number. Completing these values will fill out the corresponding text fields in the Border and Title Block of the plan sheet, as well as the corresponding text fields on the Title Sheet.

The 3 Project Location Lines and 3 ROW Project Number lines are used to populate text fields on the Title Sheet. The Index Properties will set these fields in **all** the sheets in this index.



Next, set the text fields that are design number specific for each design/structure. To do this select the folder created earlier for each design/structure in project explorer so that it is highlighted and open the Folder Properties.



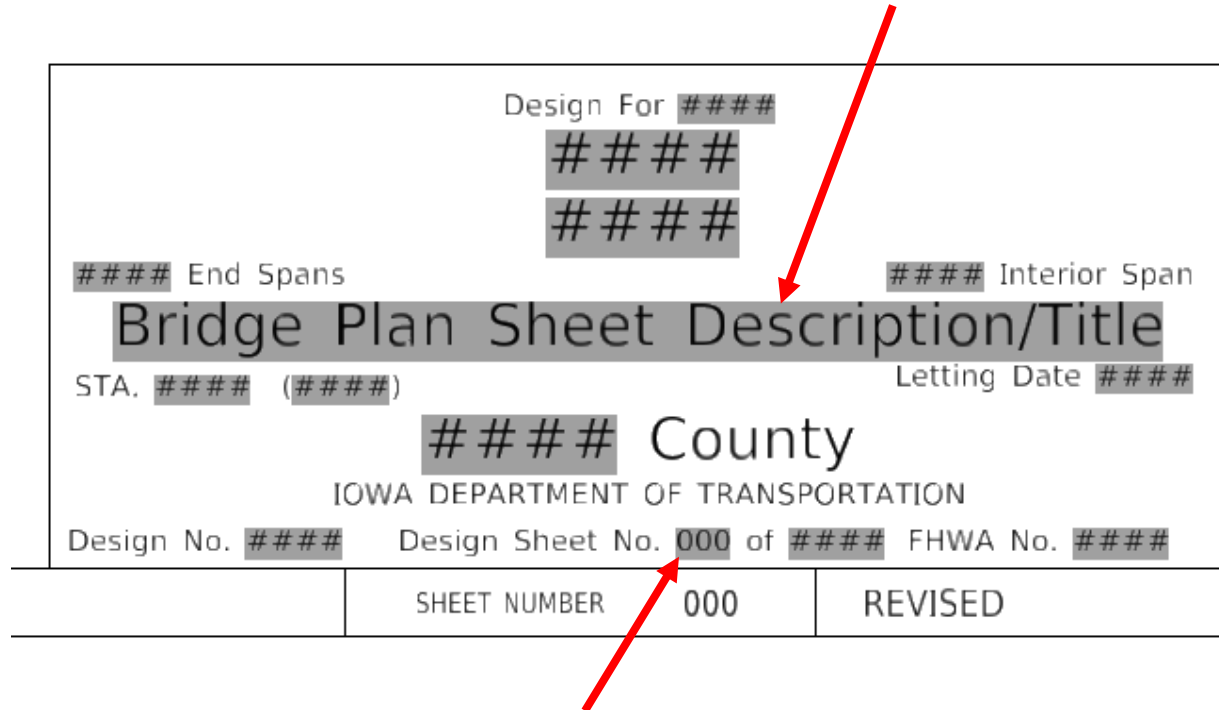
Edit text fields:

- Bridge Design Team
- Bridge Project Number
- County
- Cross Section Road Name
- Design Number
- Design Team (e.g., Iowa DOT or Consultant Name)
- End Spans and Interior Span (Culvert sheets will not use the Span fields)
- FHWA or Asset ID Number
- Skew and Direction (e.g., 30 Degree RA)
- Station of structure
- Turn-in Date
- Type and Size of Structure (There are two fields for Type and Size of Structure.)

Some of the text fields may not be used on every sheet.

This will fill out the corresponding text fields in the Title Block on each sheet that resides in this folder. Each folder must be edited for the specific information that applies to each design/structure.

The Plan Sheet Title Block below shows all text fields. The **Plan Sheet Description** and **Design Sheet No.** text fields are linked to the model properties of the sheet model. All other text fields in the Title Block are linked to the Sheet Index Folder Properties.



Design For #####

#####

End Spans #### Interior Span

Bridge Plan Sheet Description/Title

STA. ##### (#####) Letting Date #####

County

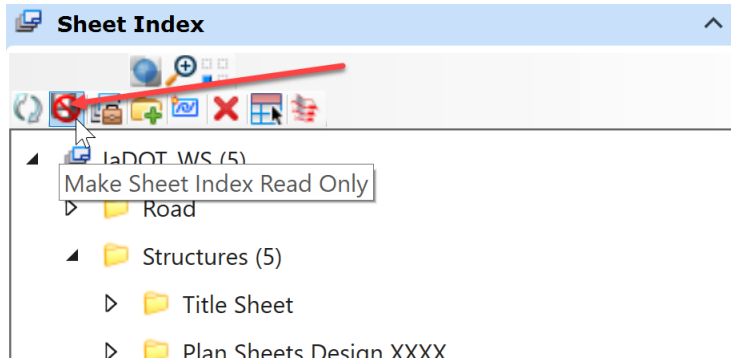
IOWA DEPARTMENT OF TRANSPORTATION

Design No. ##### Design Sheet No. 000 of ##### FHWA No. #####

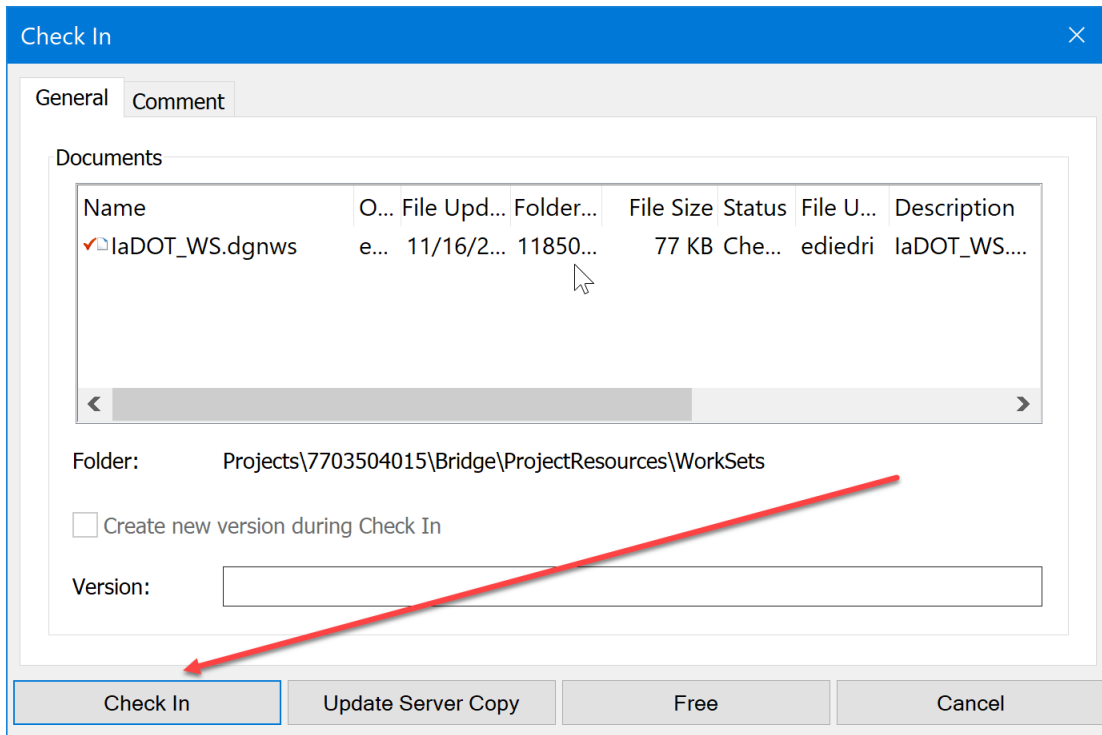
	SHEET NUMBER 000	REVISED
--	------------------	---------

Models							
Type	2D/3D	Name ^	Description	Sheet Number	Cell Type	De	
	<input type="checkbox"/>	Design			✓ Graphic	c:\	
	<input type="checkbox"/>	Drawing			✓ Graphic	c:\	
	<input type="checkbox"/>	Model			✓ Graphic	c:\	
	<input type="checkbox"/>	New Sheet Bridge	Bridge Plan Sheet Description/Title	000		c:\	
	<input type="checkbox"/>	New Sheet Culvert	Culvert Plan Sheet Description/Title	000		c:\	

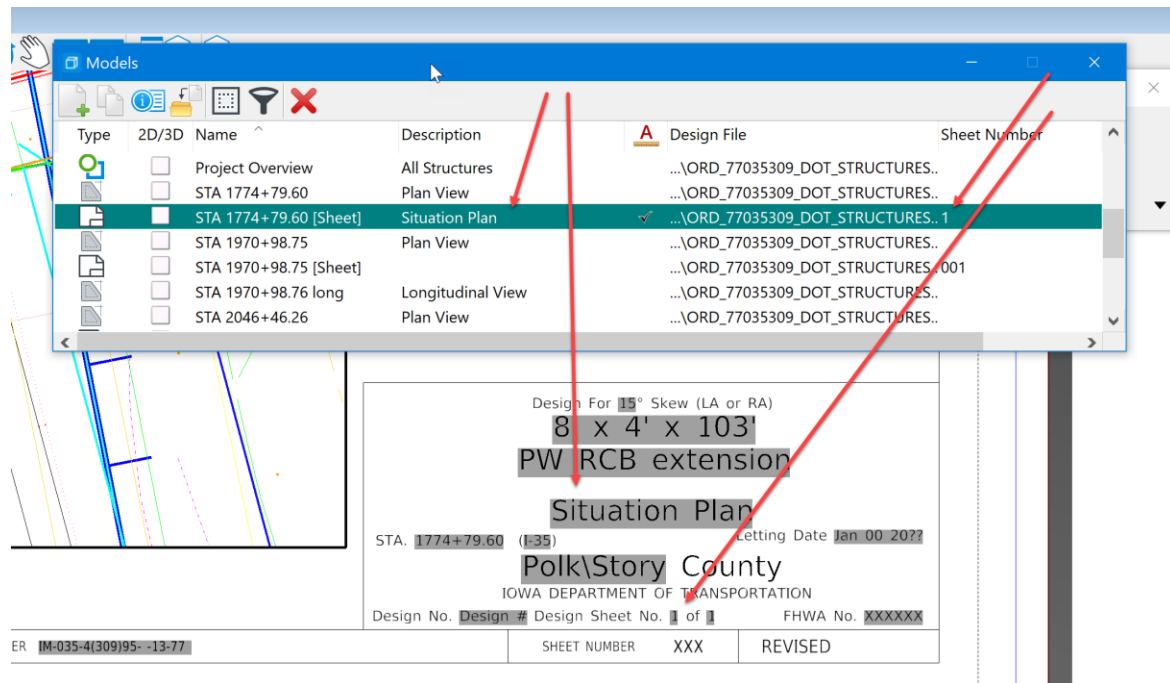
Once this information is set, then stop editing of the Sheet Index. Click on the “Make Sheet Index Read Only” in project explorer. The Sheet Index can only be edited by one User at a time.



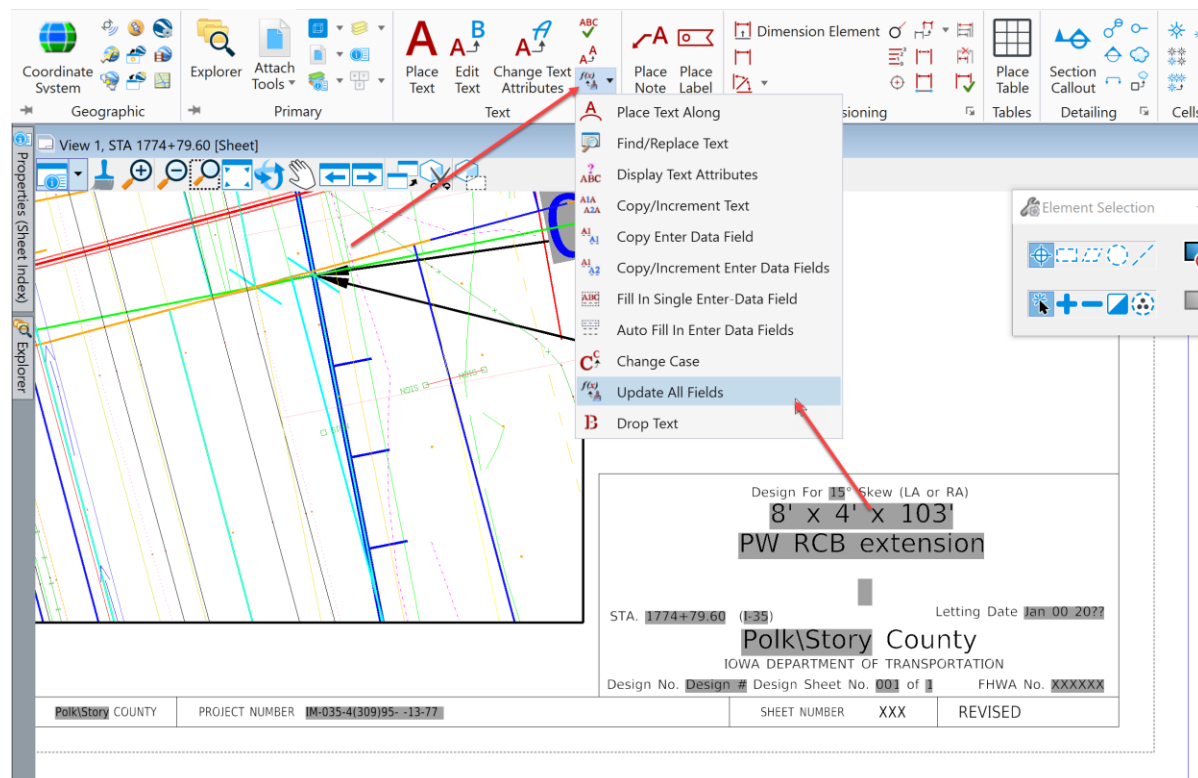
ProjectWise will notify the user to Check In the index, click on the “Check In” button.



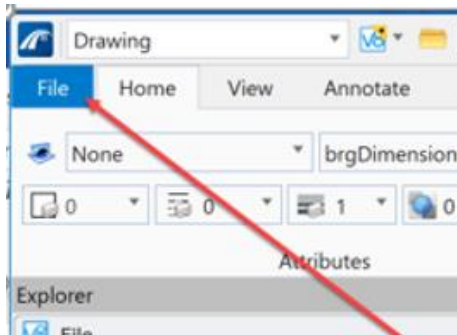
Next, set the Sheet Title and Design Sheet Number by opening the Models dialog box to set these two text fields that are configured to read the model properties. The Sheet Title is reading the sheet model Description. For this example, it is a Situation Plan sheet, and the Design Sheet No. is sheet 1.



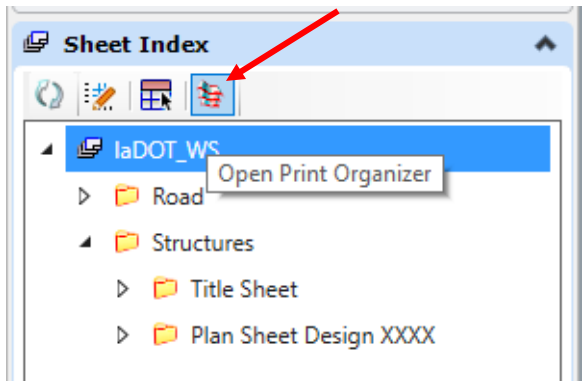
Note, if all the values that are entered are not reflecting the same data on the sheet, use the “Update All Fields” tool. This will apply/reread all the assigned text fields.



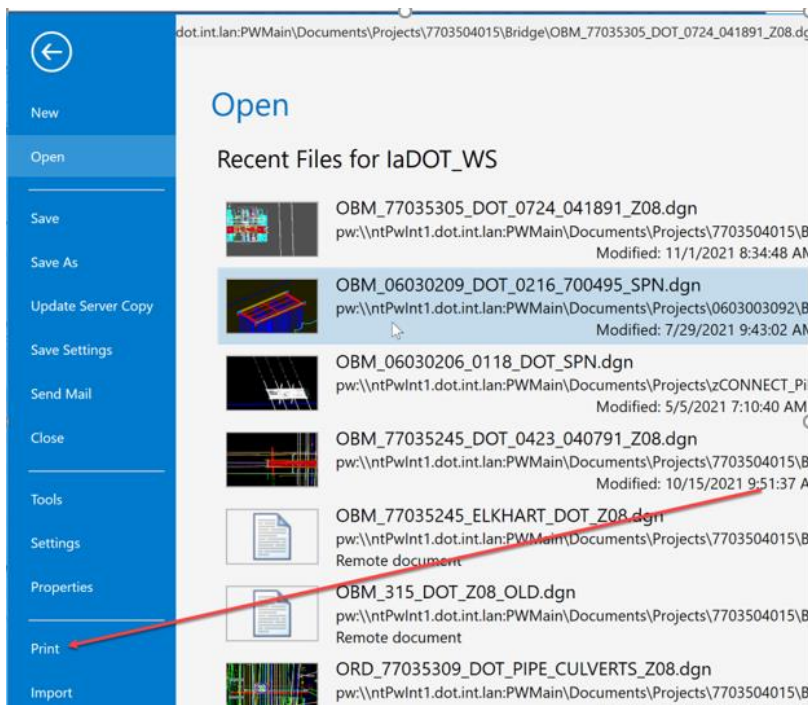
To print the TS&L sheet, use the Print Organizer. To access this tool thru the backstage or back page, click on the **File** menu in the file the sheets are in.



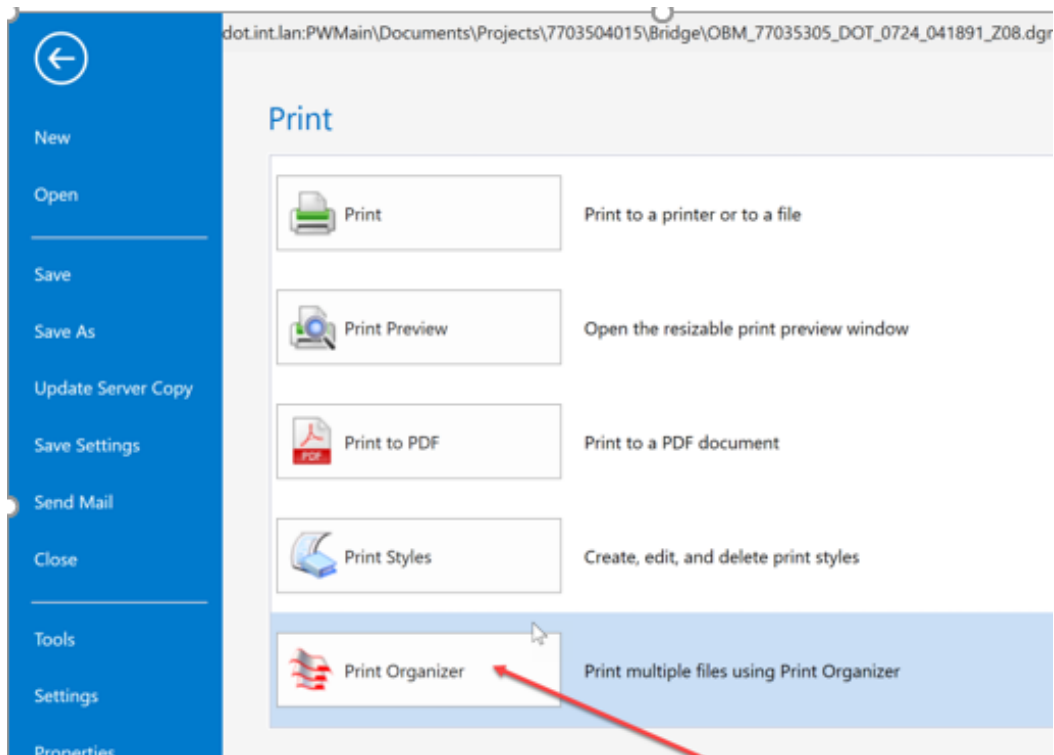
The Print Organizer may also be accessed through the Sheet Index which will be covered in a future document.



The backstage or back page will show the Print option, select **Print**.



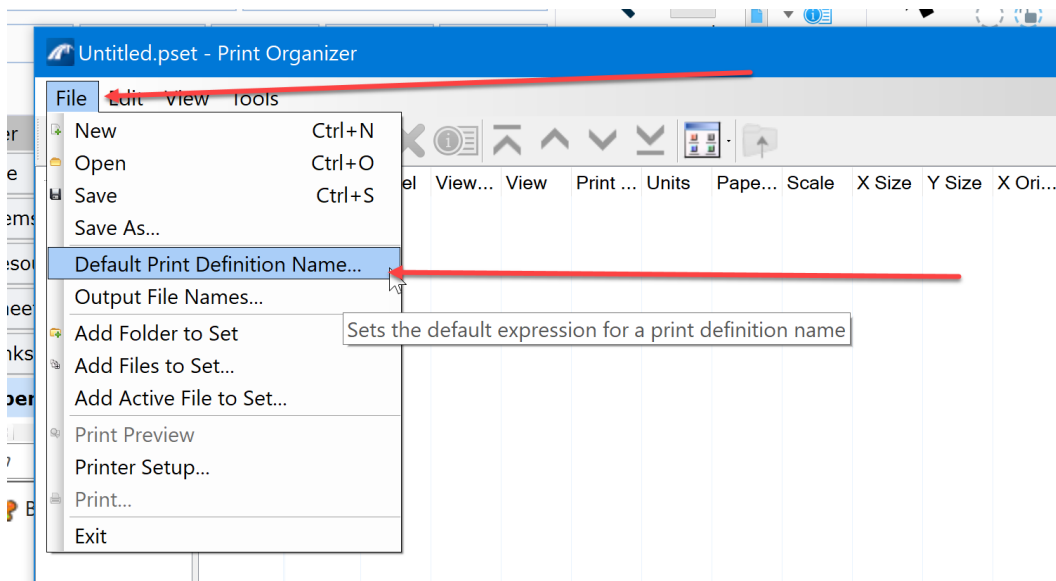
Select Print Organizer.



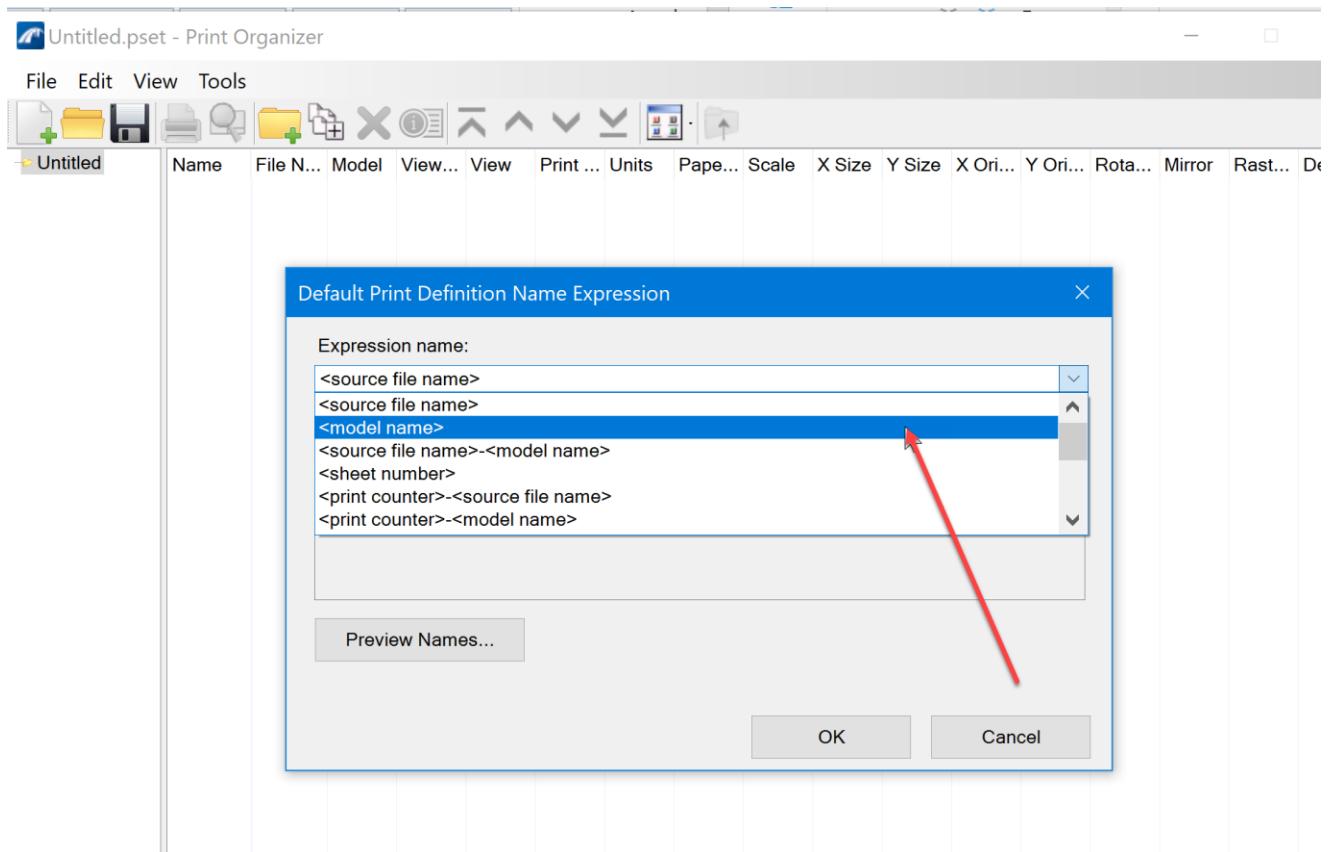
In Print Organizer set the **Default Print Definition Name** and **Output File Names** expressions to use **<model name>** before printing the sheets to the PDF.

Select **File** menu.

Select **Default Print Definition Name...**



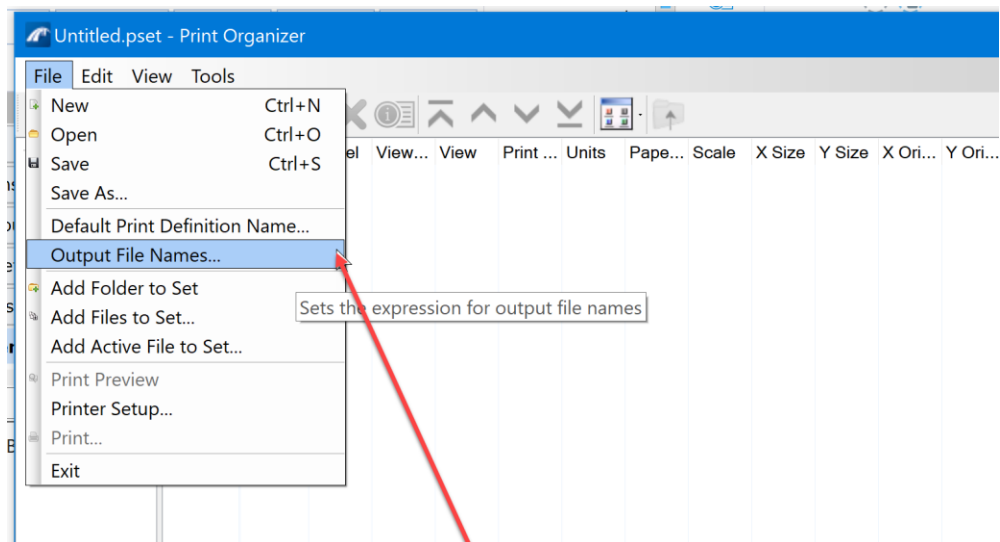
The **Default Print Definition Name Expression** dialog box will display, select **<model name>** option.



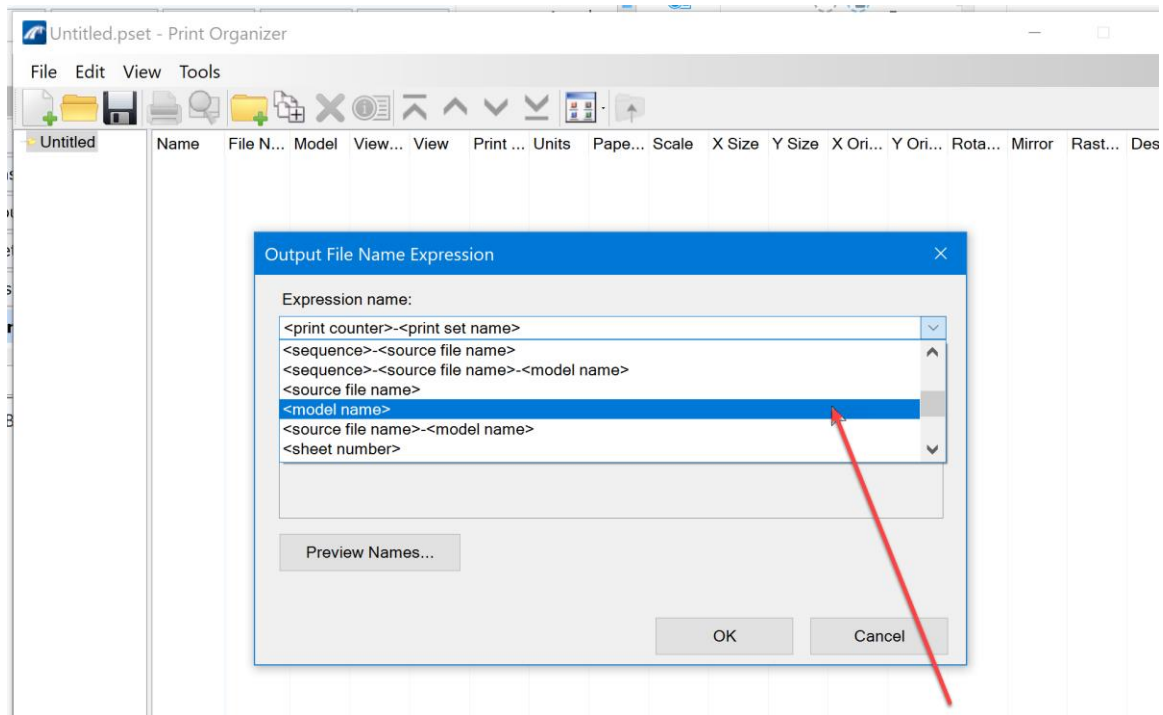
Then click the OK button.

Then select File menu again for the second setting.

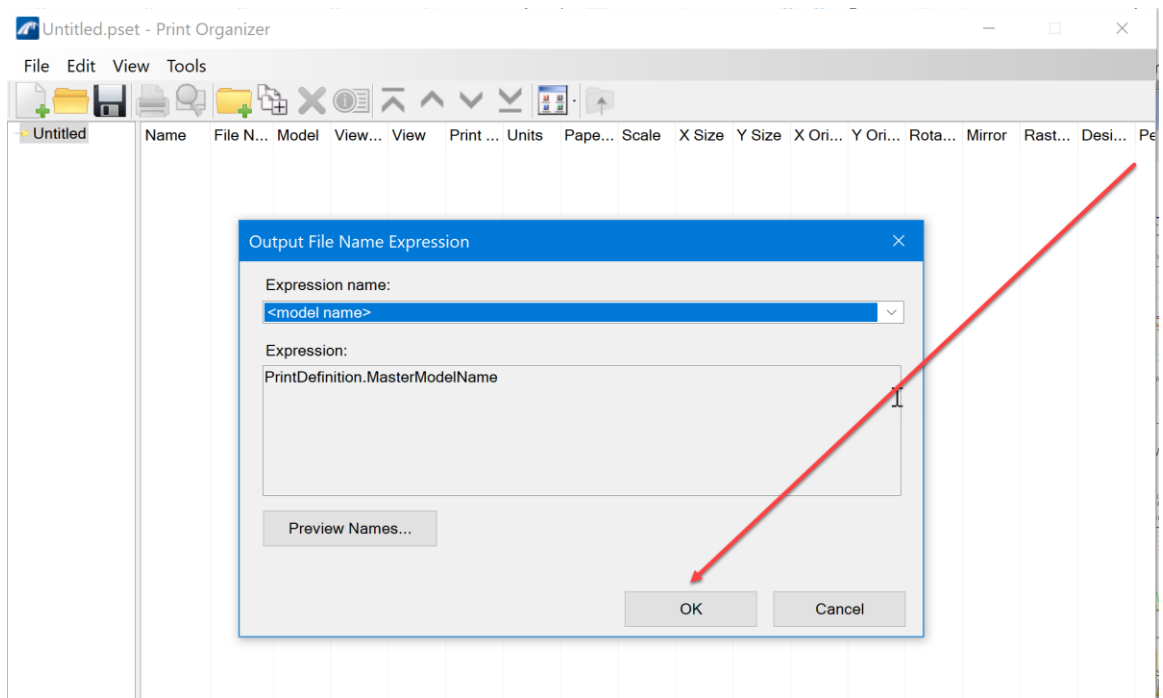
Select **Output File Names...**



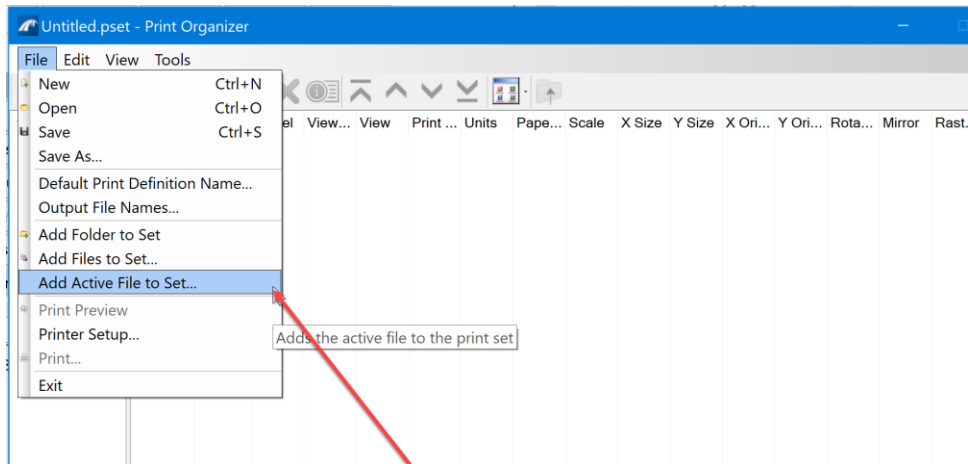
The **Output File Name Expression** dialog box will display, select **<model name>** option.



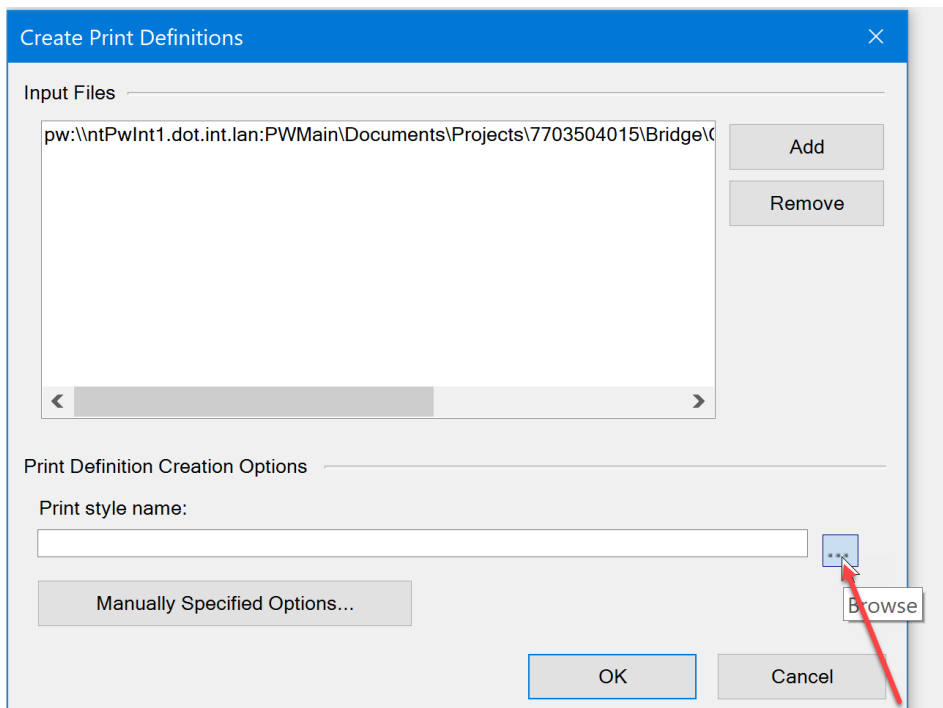
Then click the OK button.



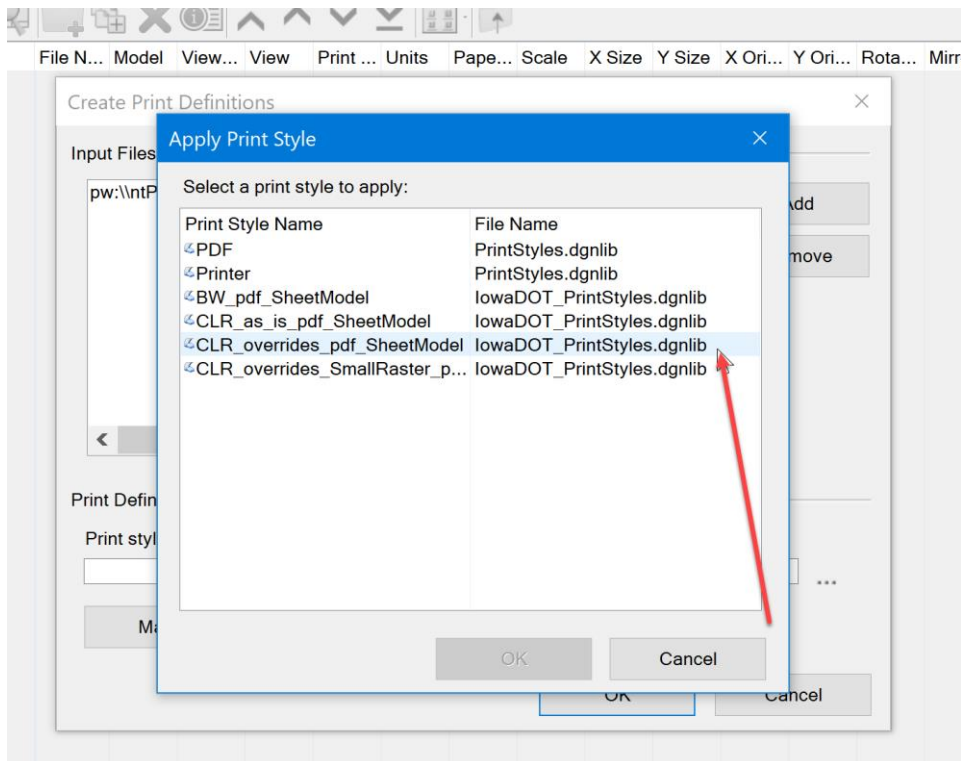
Next, select the **Add Active File to Set...** option thru the File menu.



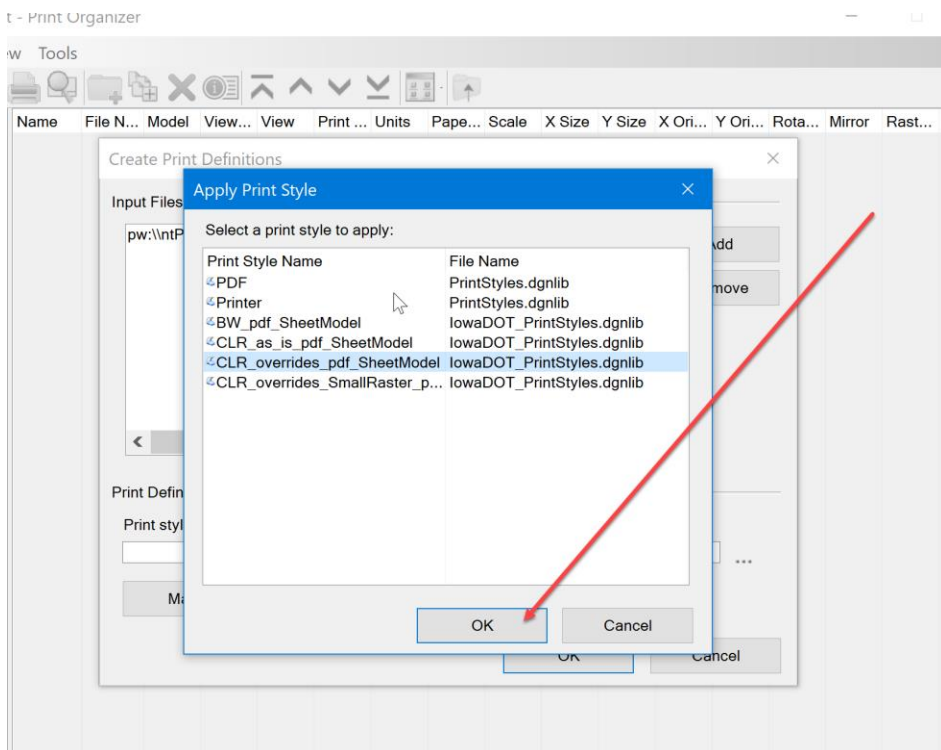
The Create Print Definition dialog box will open to select the print style. Click on the browse button next to the Print style name.



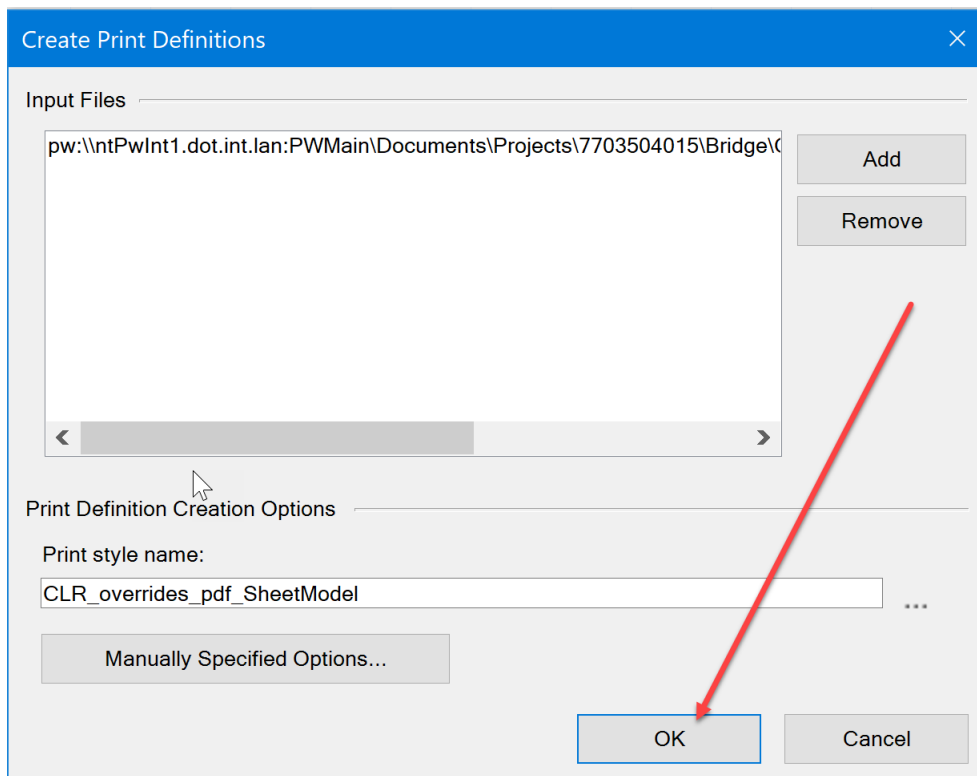
Then select the desired print style option from the Apply Print Style list. This example used CLR_overrides_pdf_SheetModel.



Then click the OK button.

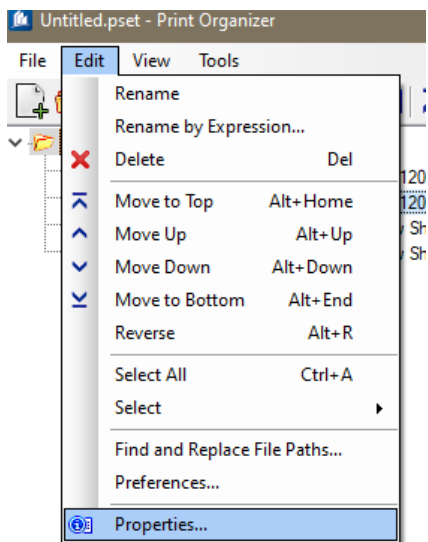


The selected print style should display in the field as shown below. Click the OK button.

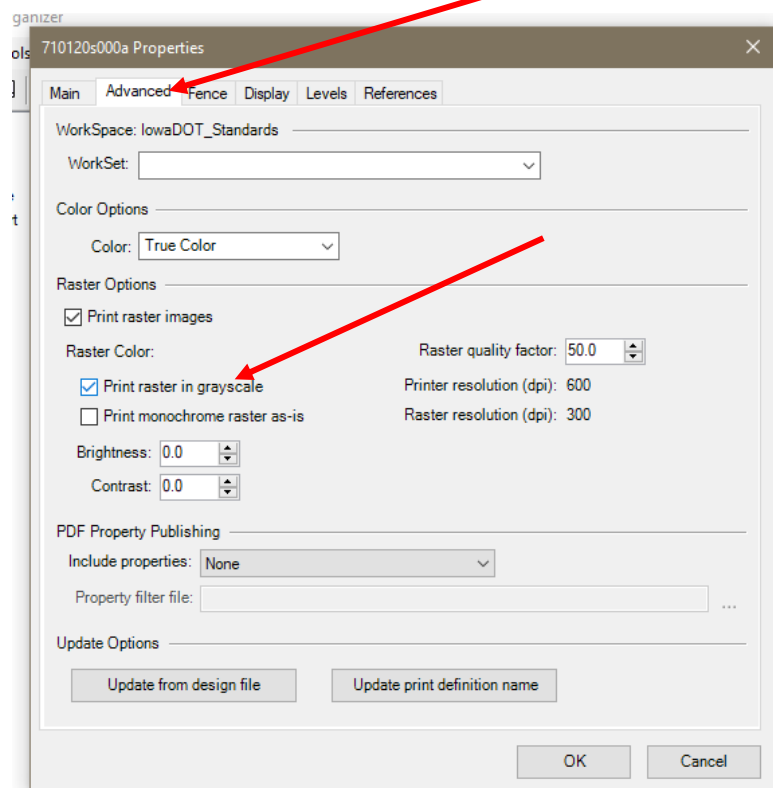


After the Print Organizer compiles the sheets with the model name output, then another print properties setting needs adjusted. Currently the print styles are set to print raster images in grayscale. This will need changed in the Properties of the print styles to have the raster images print in color.

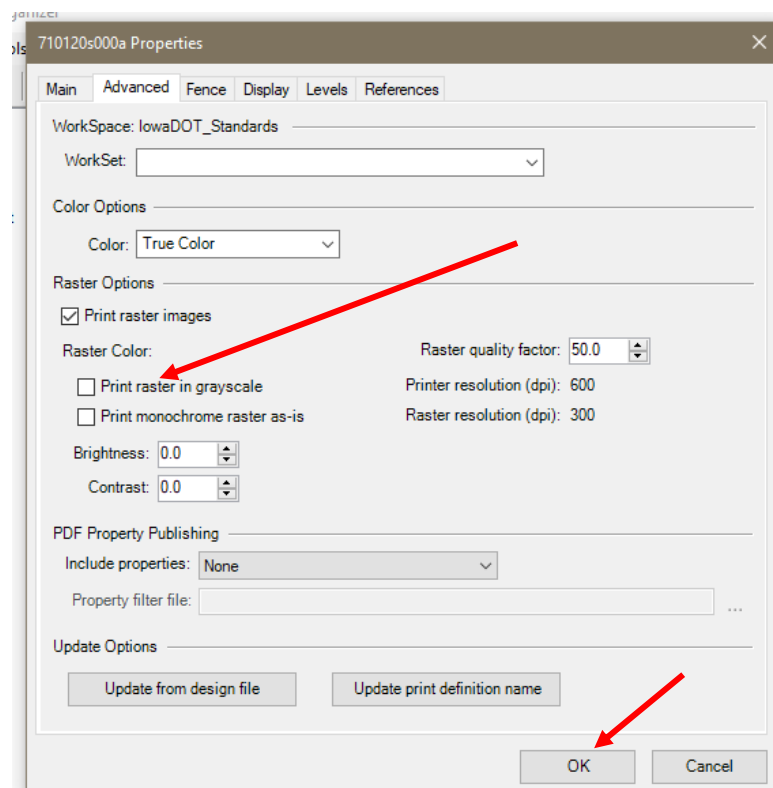
Select/highlight all the sheets to print, select **Edit** menu and select the **Properties** option.



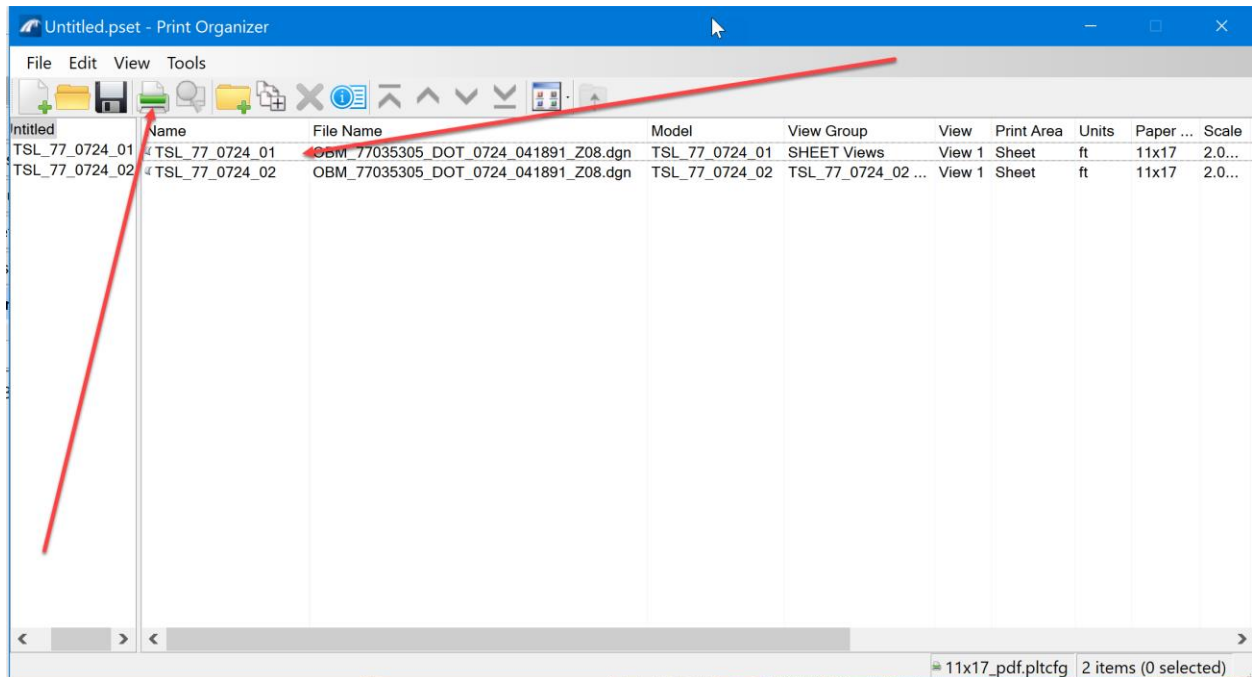
The Properties dialog box will open. Select **Advanced** tab, then uncheck **"Print raster in grayscale"**.



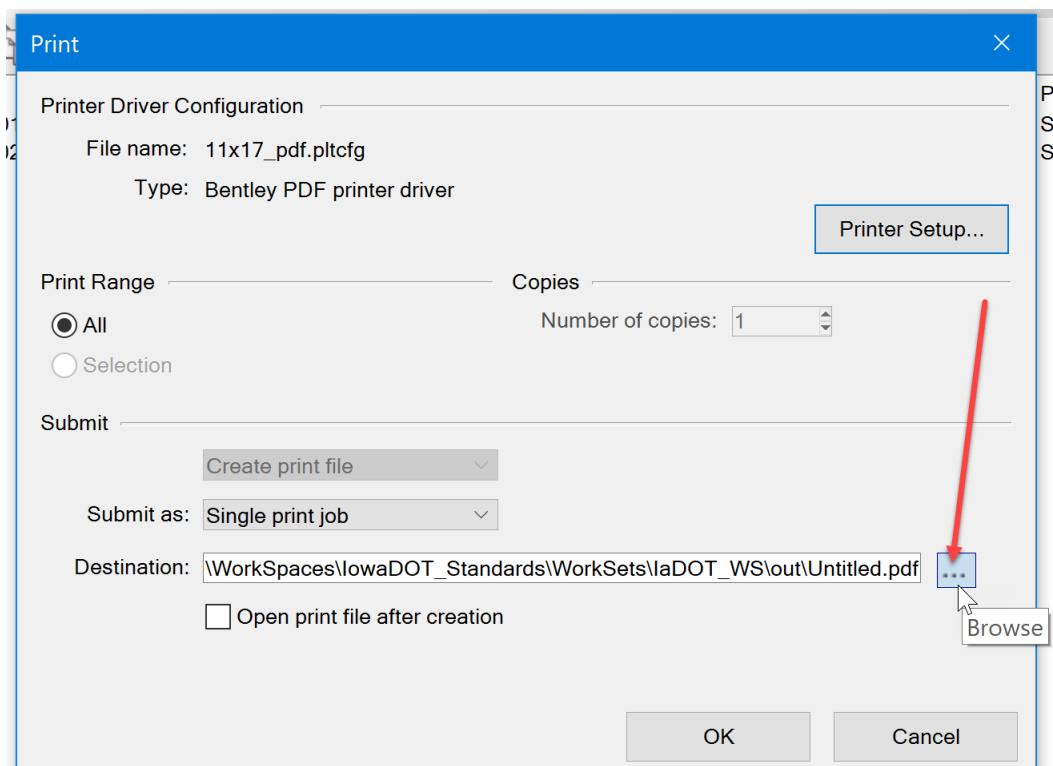
Then click the OK button.



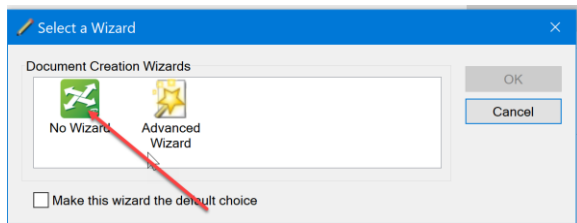
The Print Organizer will display the sheets it will be printing to the PDF. Confirm what you want to print is listed and click on the printer icon at the top of the Print Organizer.



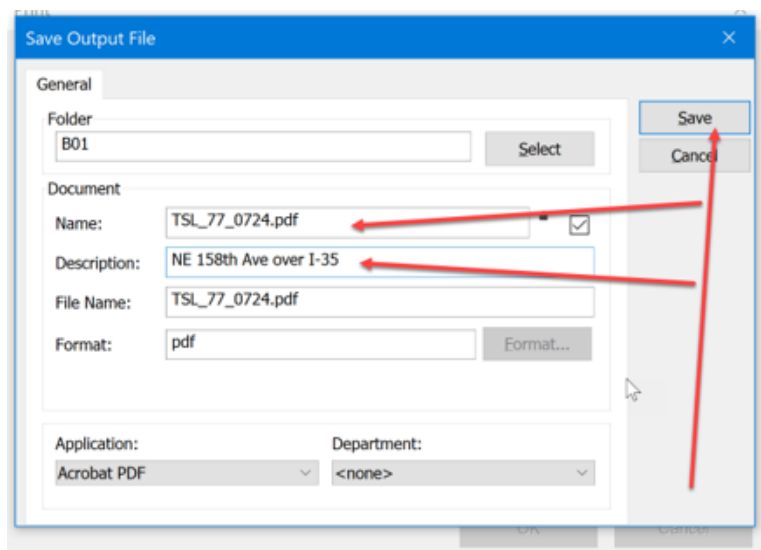
Next set the destination of the PDF file. Click on the Browse button next to the Destination field.



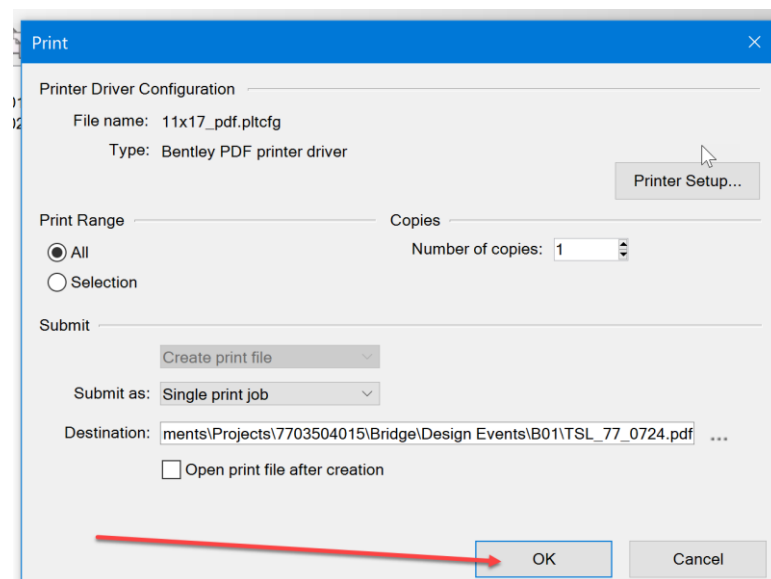
This will open this Select a Wizard dialog box. Select the No Wizard option.



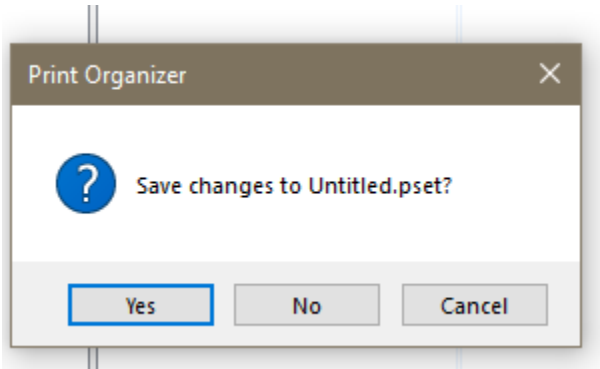
Click the OK button. The Save Output File dialog box will open. Verify the folder is set to the correct location for the PDF. Then Name the PDF. For this example, it is a bridge TS&L sheet so it will be named TSL_County #_Design#.pdf or TSL_77_0724. Next, enter a short description so that users will know that this is for the bridge over I-35 on NE 158th Ave. Then click the Save button.



Then click the OK button.



Then Print Organizer will create the pdf of the plan sheets. When closing, Print Organizer will display a message asking if the pset needs to be saved. This is optional, saving a pset may be helpful when choosing to reprint the set again. However, if sheets have been added or changes to existing sheets, then the existing pset will need to have the added sheets included and “may” need the existing sheets with changes “Updated from design file” to see those changes. For these reasons it is suggested to not save the pset and just recreate a new one as needed. This will ensure all changes to the Sheet Models are seen/read from the CADD file.



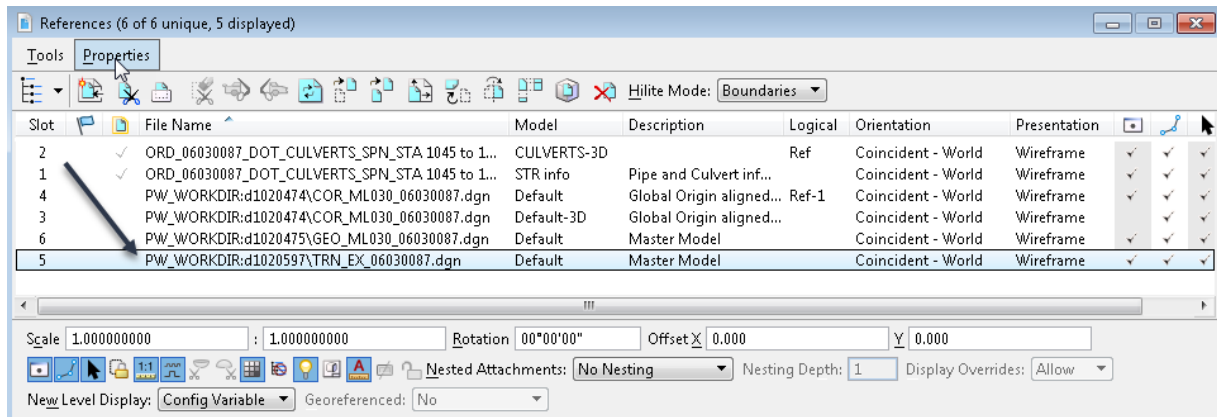
Calculating Excavations

These instructions were created on 4/13/2021. These instructions were created with:

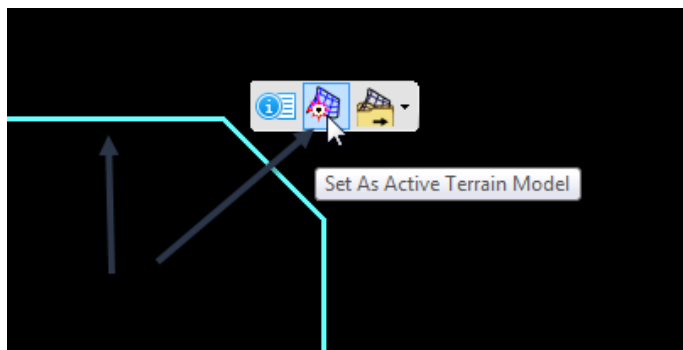


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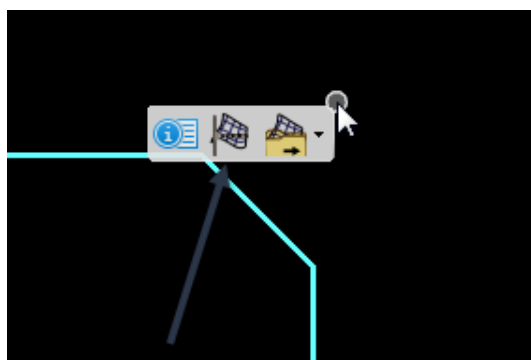
Once the structures are modeled, calculate the excavations. To do this, reference in the TRN to calculate the excavations from. In most situations, it will be from the existing ground TRN.



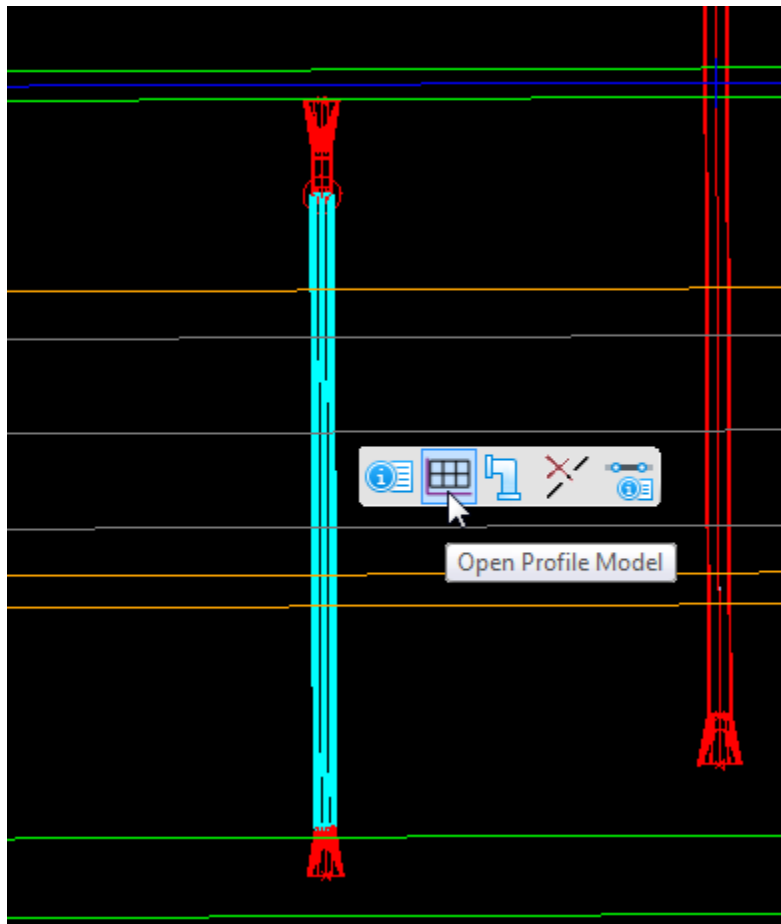
Then, make the TRN active. To do this, select the boundary of the TRN and use the heads-up tools to select the Set As Active Terrain Model tool.



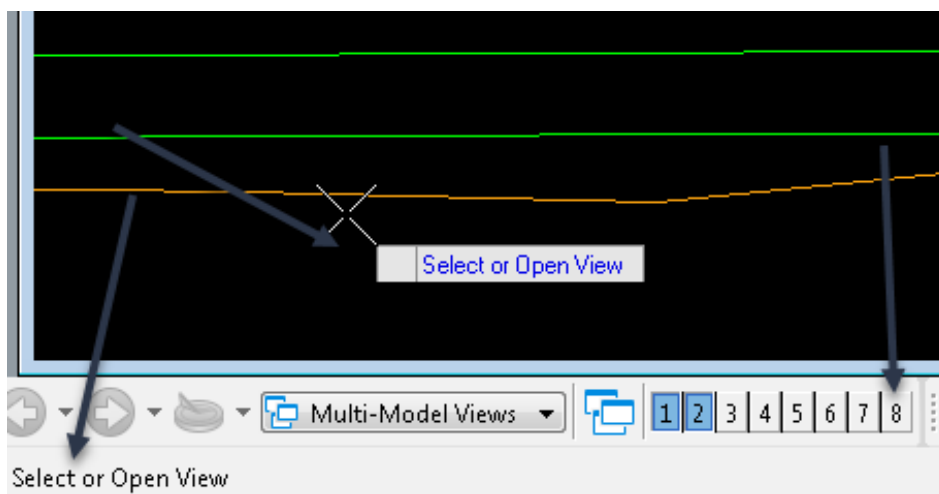
To verify that the TRN is set to active, hover over the boundary and the tools should appear as shown below.



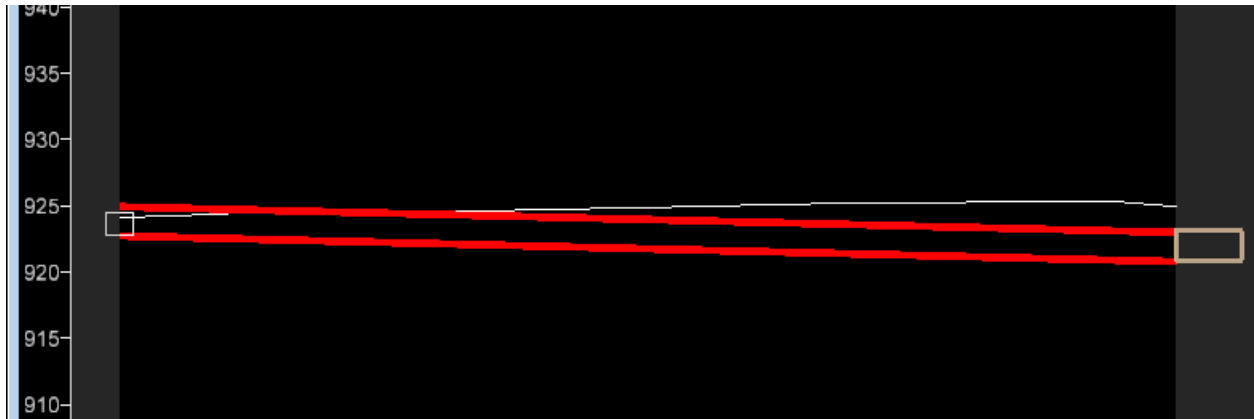
Once the TRN is set to active, then a profile needs to be applied to the conduit before the excavation template can be pushed. To do this, select the structure and select the Open Profile Model tool.



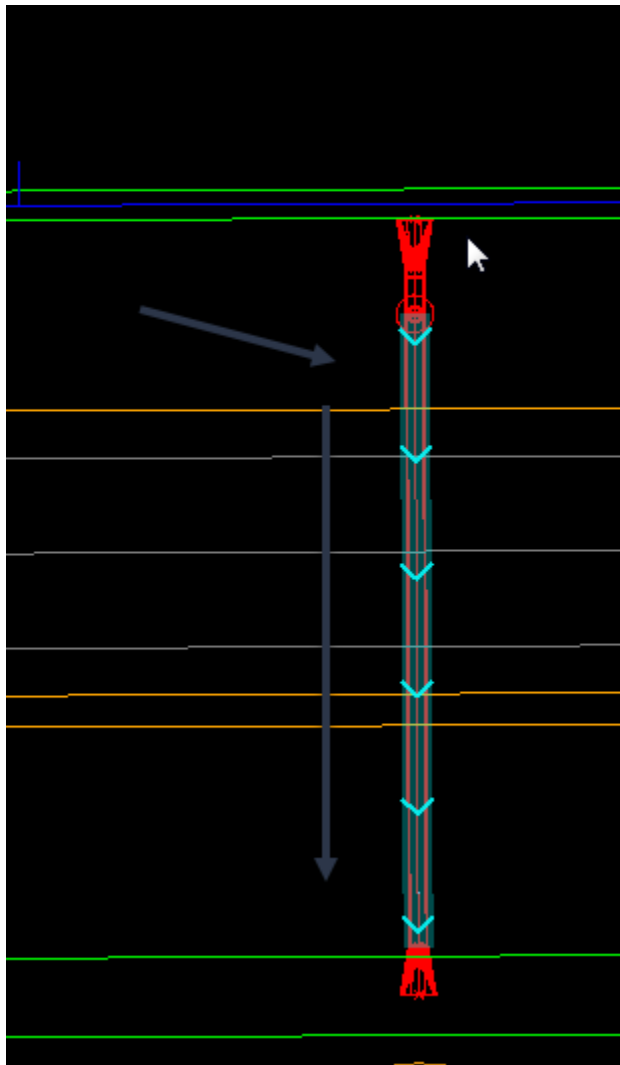
It will prompt to Select or Open View. For this example, use View 8.



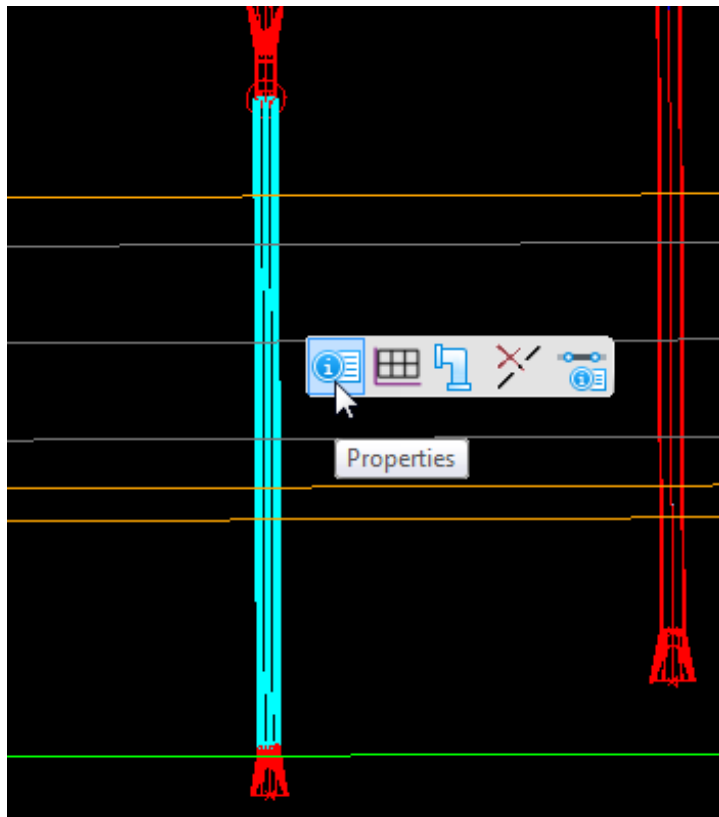
The profile view will display and should appear similar to below.



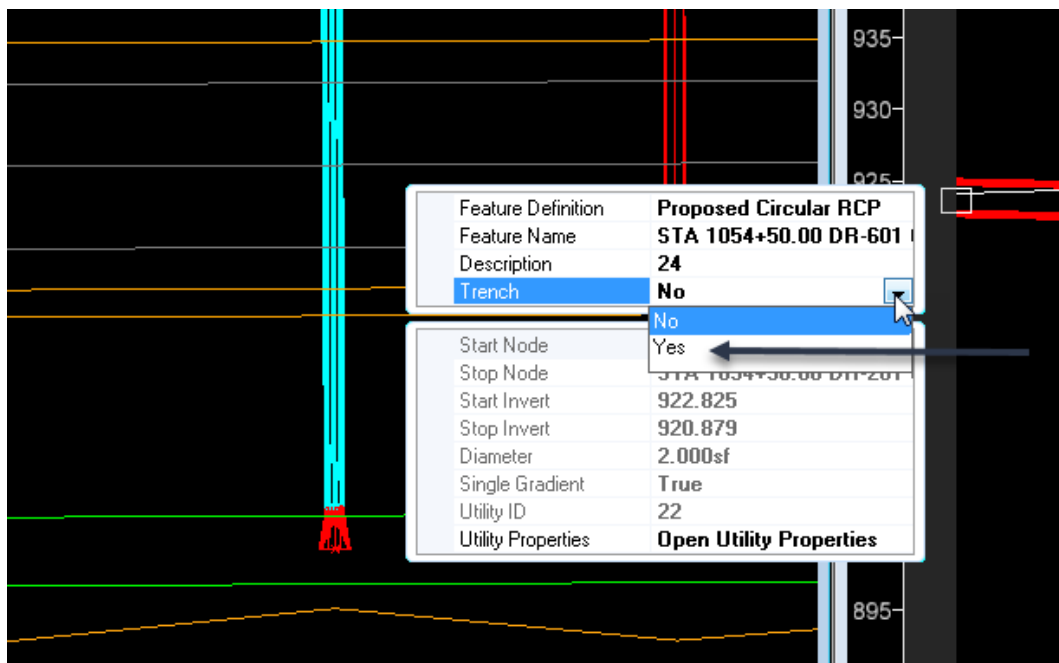
In the plan view or 2D model, it will appear similar to below. Notice that the view shows the direction of the water flow.



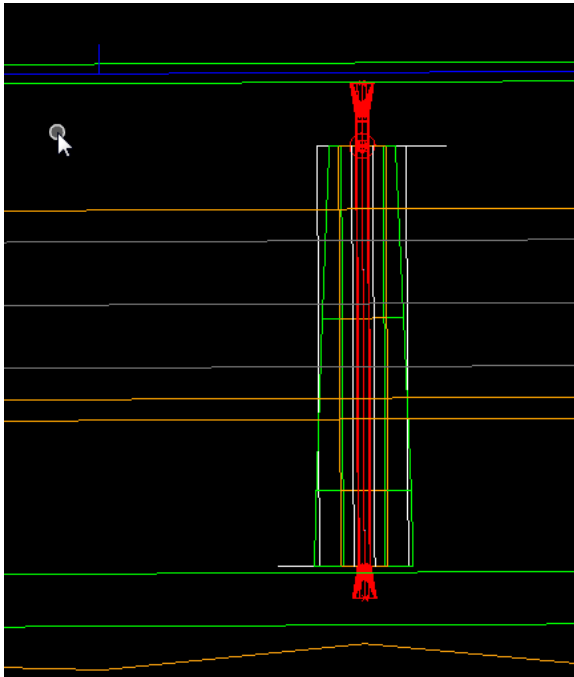
Once the profile has been applied to the conduit, the excavation can be calculated. To do this, unselect the conduit, then select it again to bring up the heads-up tools. But this time, select the Properties tool.



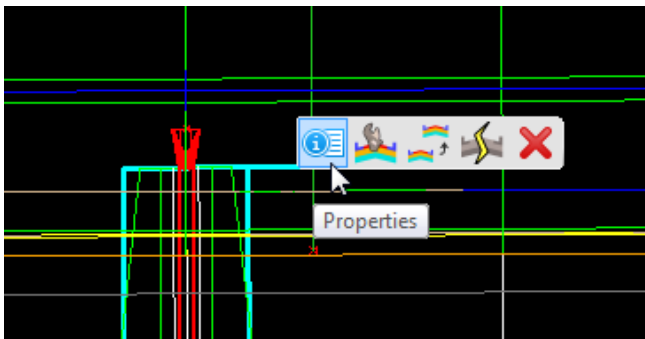
In the Properties, under the Trench field select Yes.



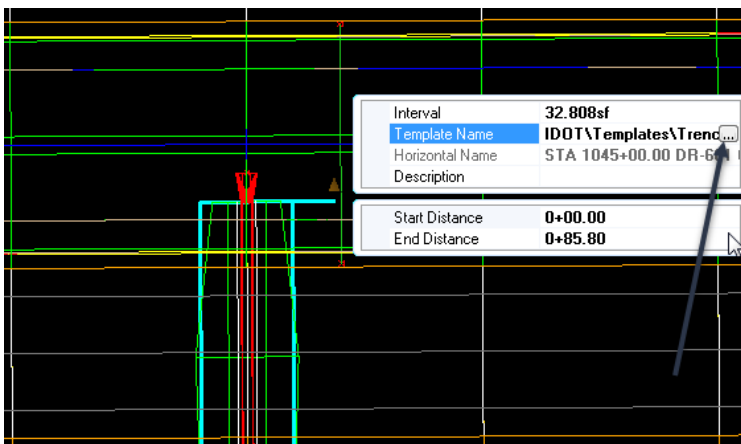
This will create the excavation corridor and should appear as shown below.



The default Trenching template is the Excav. 1 Mat. Bed. If this is not the template required for this project, change it to the template needed. To do this, select the corridor and open the Properties.

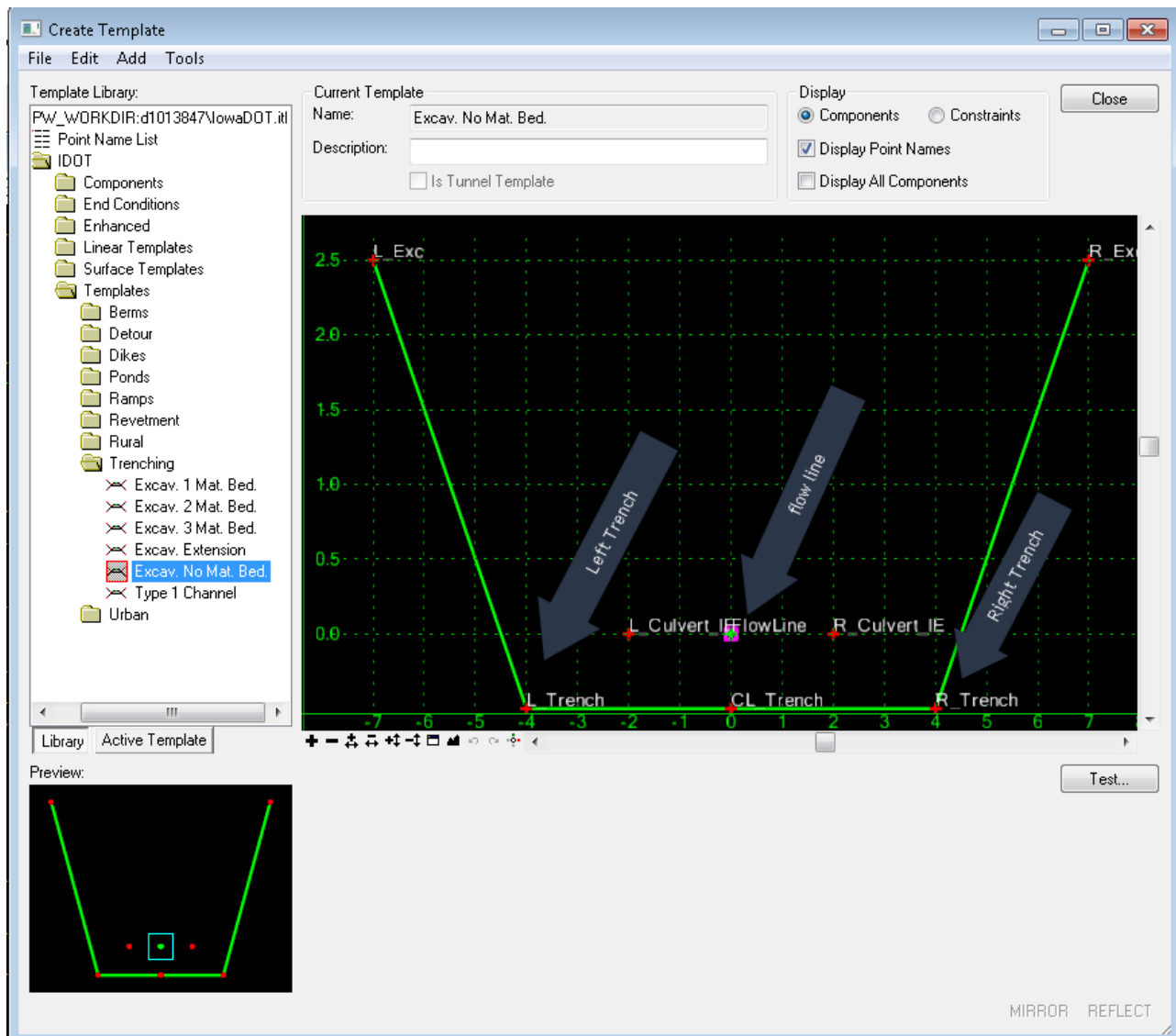


Then select the Template Name needed.



The excavation template is set up as a default for a 48-inch pipe. If the pipe is another size, change the parametric constraints of the template.

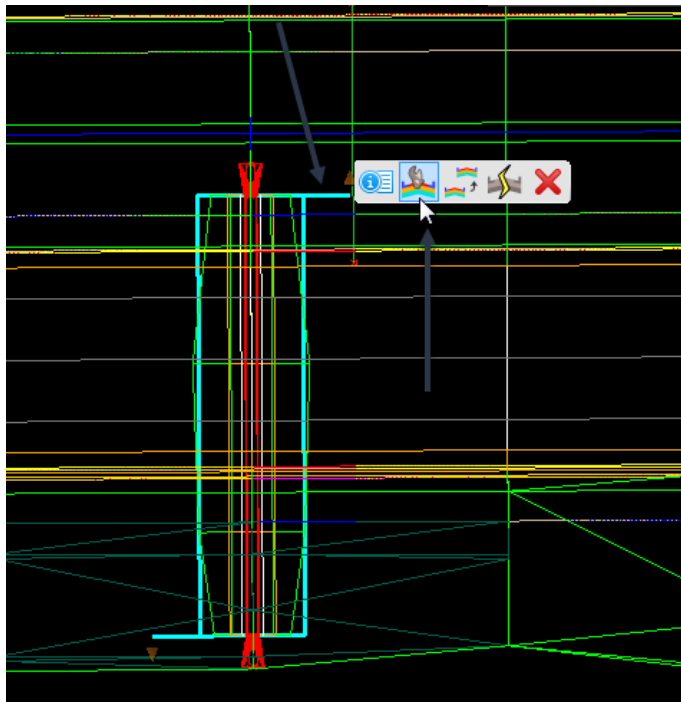
The default Trenching template Excav. 1 Mat. Bed. is pushed along the flowline of the conduit and the left and right edge of the trench are parametrically constrained by the left and right edge of the inside opening of the culvert that is ruled to the flowline.



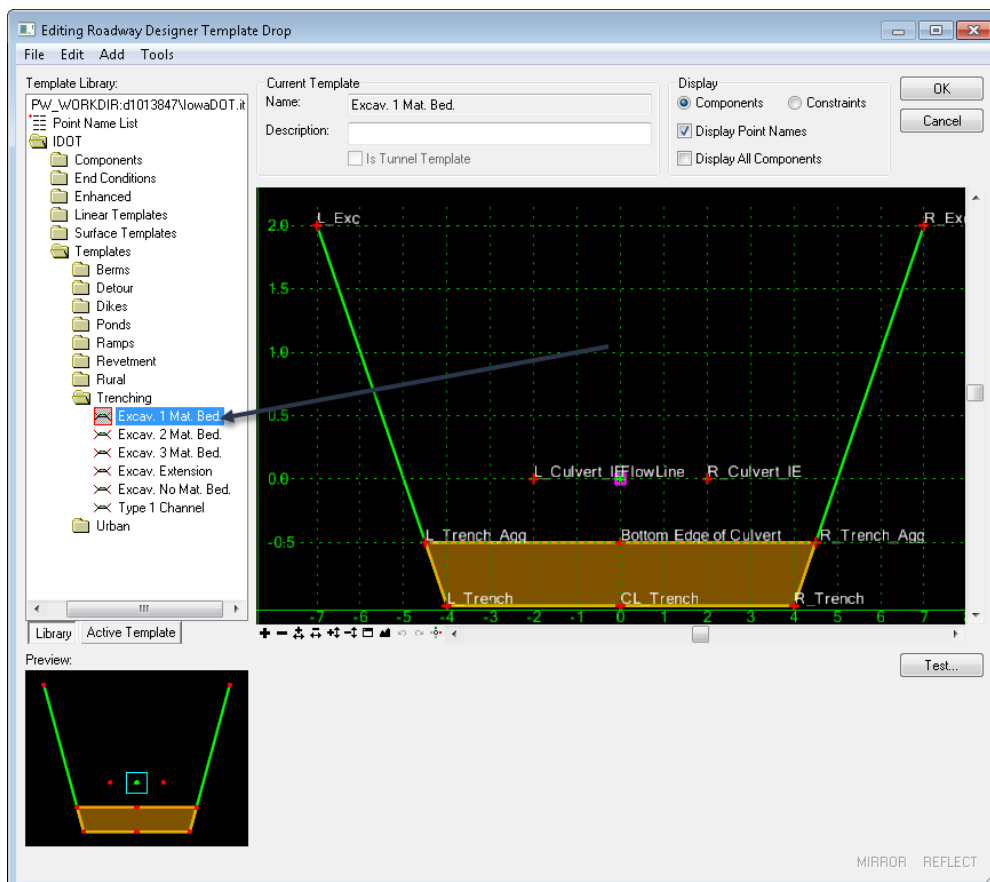
To change the size of the trench, calculate the distance from the flowline to the edge of the inside opening of the pipe being modelled. For example, for a 24-inch pipe, this distance would be 1.00 ft from the flowline left and 1.00 ft from the flowline right which equals $\frac{1}{2}$ distance of the size of the pipe.

Once the correct distance is determined, change the parametric constraints of the template to match the structure. To do this, select the corridor and bring up the heads-up tools.

Then select the Edit Template Drop tool.



This will open the template that was used to model this trench.



To change the parametric constraints on the L_Culvert_IE or R_Culvert_IE points on the template, double click on the point in the template. It will open the constraints on that point. For this example, it will be a 24 inch pipe, so it should appear as shown below.

Point Properties

Name: **L_Culvert_IE** [Apply] [Close] [Previous] [Next >]

☐ Use Feature Name Override: **L_Culvert_IE**

Feature Definition: **Modeler\Template Points\DNC\DNC**

☐ Superelevation Flag

Alternate Surface: []

Member of: []

Constraints

Constraint 1	Constraint 2
Type: Horizontal	Type: Vertical
Parent 1: FlowLine	Parent 1: FlowLine
Value: -1.000 =	Value: 0.000 =
Label: Left Inside Edge of Culve	Label: []
<input checked="" type="checkbox"/> Horizontal Feature Constraint	<input type="checkbox"/> Horizontal Feature Constraint
Range: 0.000	Range: []

Once the constraint value is changed to -1.00 for the left-side, click on Apply then Close buttons. Then repeat the same operation on the other side. Note that the right-side constraint value will +1.00.

Point Properties

Name: **R_Culvert_IE** [Apply] [Close] [Previous] [Next >]

☐ Use Feature Name Override: **R_Culvert_IE**

Feature Definition: **Modeler\Template Points\DNC\DNC**

☐ Superelevation Flag

Alternate Surface: []

Member of: []

Constraints

Constraint 1	Constraint 2
Type: Horizontal	Type: Vertical
Parent 1: FlowLine	Parent 1: FlowLine
Value: 1.000 =	Value: 0.000 =
Label: Right Inside Edge of Culv	Label: []
<input checked="" type="checkbox"/> Horizontal Feature Constraint	<input type="checkbox"/> Horizontal Feature Constraint
Range: 0.000	Range: []

This will resize the trench to fit the structure modeled.

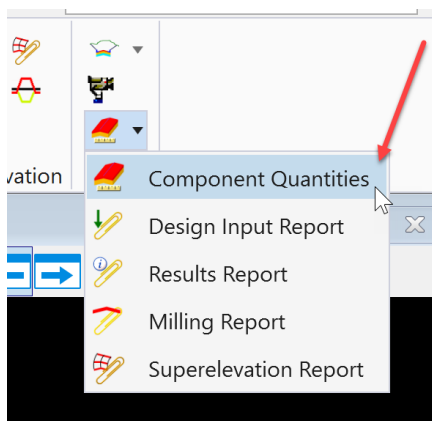
Also change the Template Drop Interval to .5 sf to provide a more accurate excavation quantity.

Template Drop	
Interval	0.500sf
Template Name	IDOT\Templates\Trenching\Excav. 1 Mat. Bed.
Horizontal Name	
Description	

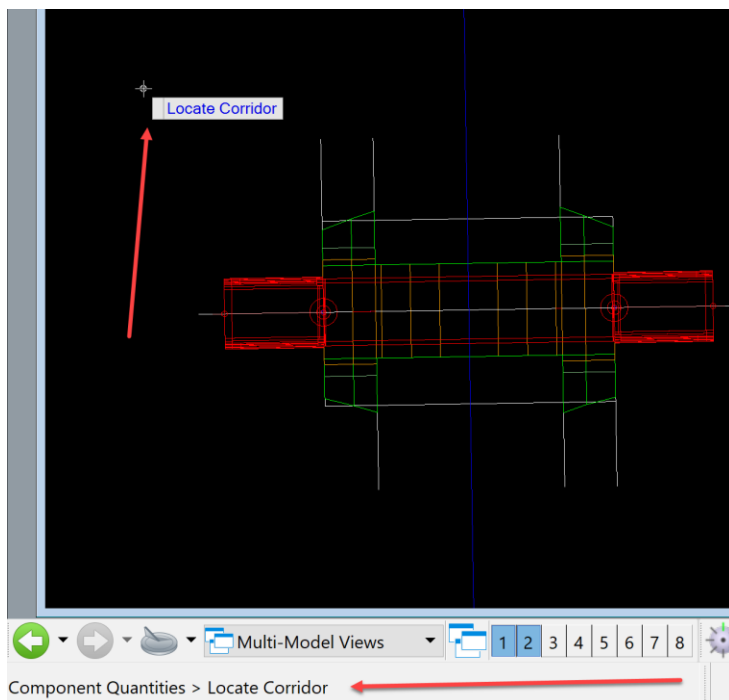
A template will be dropped every 6". Any closer than 6" will not increase the accuracy.

Next compute the excavation quantities from the excavation corridor that was made with the template.

To do this, select Component Quantities in the Corridor Reports tool on the Corridors tab in the Review group.



It will prompt to locate the corridor. Select the excavation corridor.



It will open the window that provides the quantities from the template or templates used to create the excavation corridor.

Component Quantities						
Material	Surface Area	Volume	Units	Unit Cost	Total Cost/Mat	
Cut Volume	0.0000	149.2060	CuY	1.00	149.21	
Fill Volume	0.0000	0.0000		1.00	0.00	
Mesh\Corridor Modeler\Components\Aggregate\Engineering Fabric	1080....	0.0000	SqF	1.00	1080.73	
Mesh\Corridor Modeler\Components\Aggregate\Granular	0.0000	30.2960	CuY	1.00	30.30	
Mesh\Corridor Modeler\Components\Grading\Sideslopes	1566....	0.0000	SqF	1.00	1566.53	

Report

Total Estimated Cost: 2826.77

Corridor Name: Trench: P_CIP_RCB

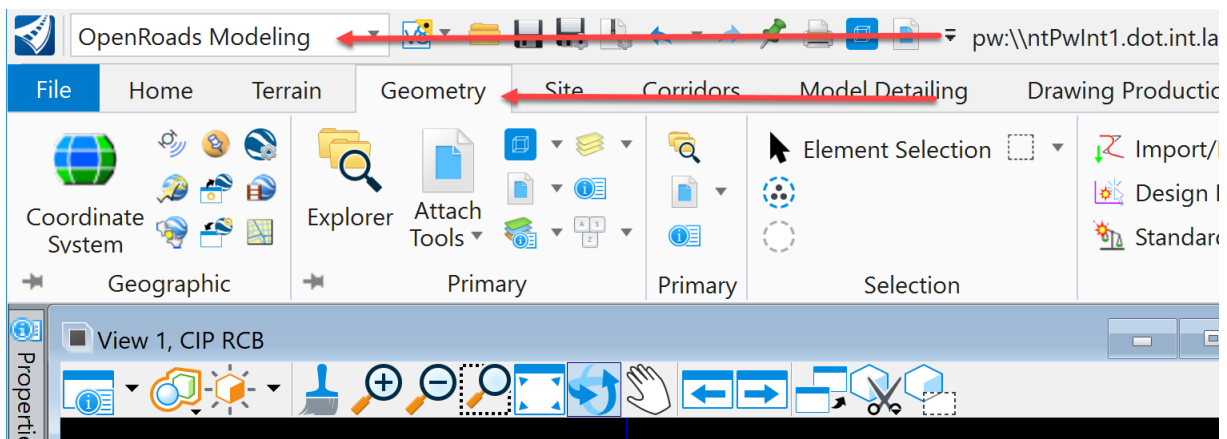
Clipping is not considered in quantities.

The unit cost of each item can be added. Click on the Report button to save the quantities into a report as a deliverable for the project.

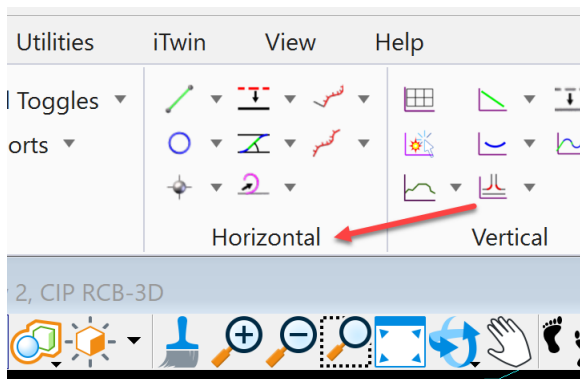
For an RCB to calculate the headwall excavation, there are two options. The first is to follow the instructions above and add geometry to each headwall or the second option is to make geometry for the complete structure and calculate the trench from that.

For this example, add geometry to each headwall. Keep in mind that the process to make the geometry on each headwall is the same as the second option except add more points in the profile process to account for every change of elevation in that structure.

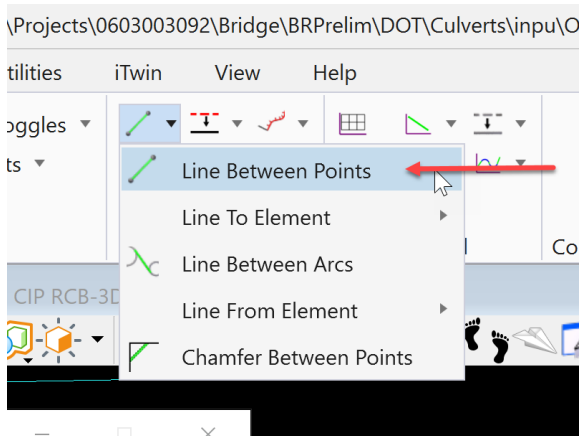
The first step in this process is to work in the 2D model and select the OpenRoads Modeling workflow.



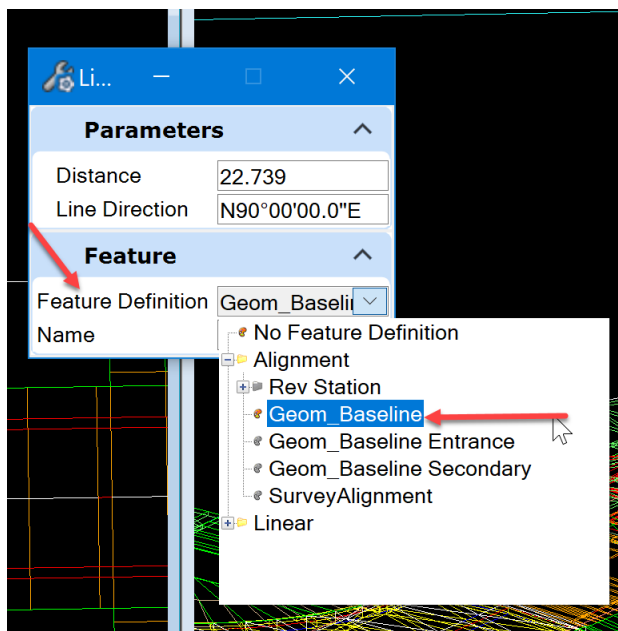
In the Geometry tab in the Horizontal group.



Select the Line Between Points tool.

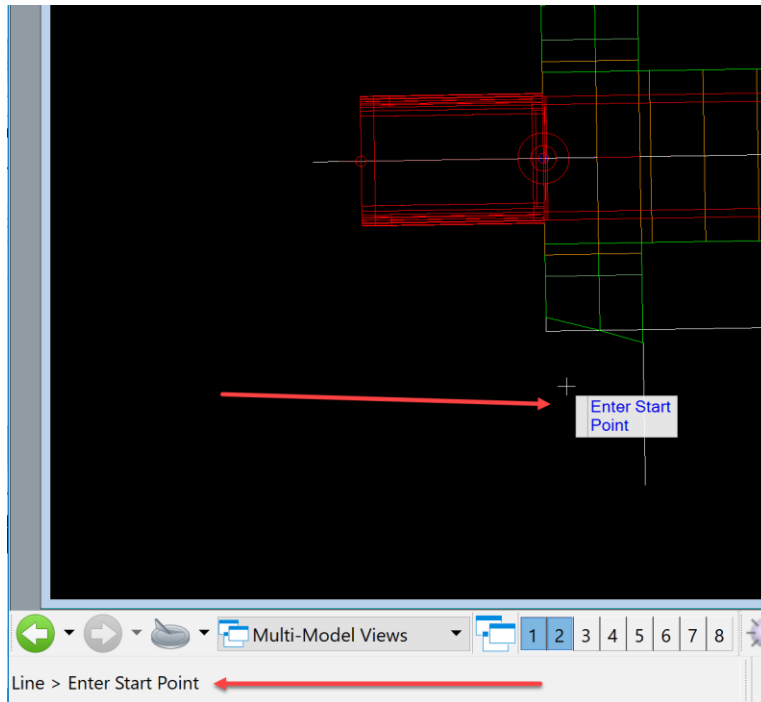


It will open the following dialog box. Select the needed Feature Definition, Geom_Baseline feature.

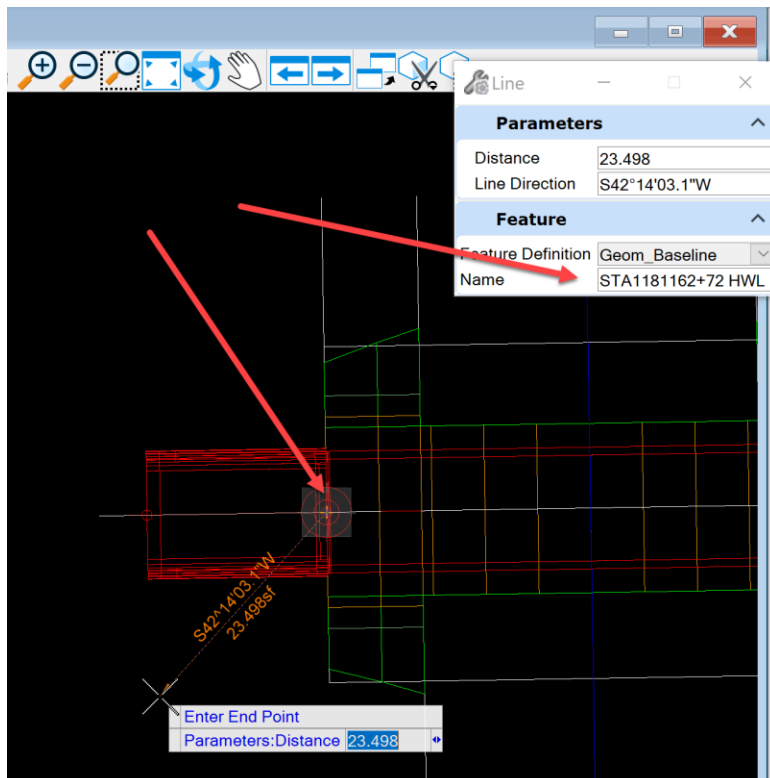


Next, name the Geo baseline being created for this process. The naming convention is STA1181162+72 HWL to indicate the station of the structure, STA1181162+72, and headwall with direction of left.

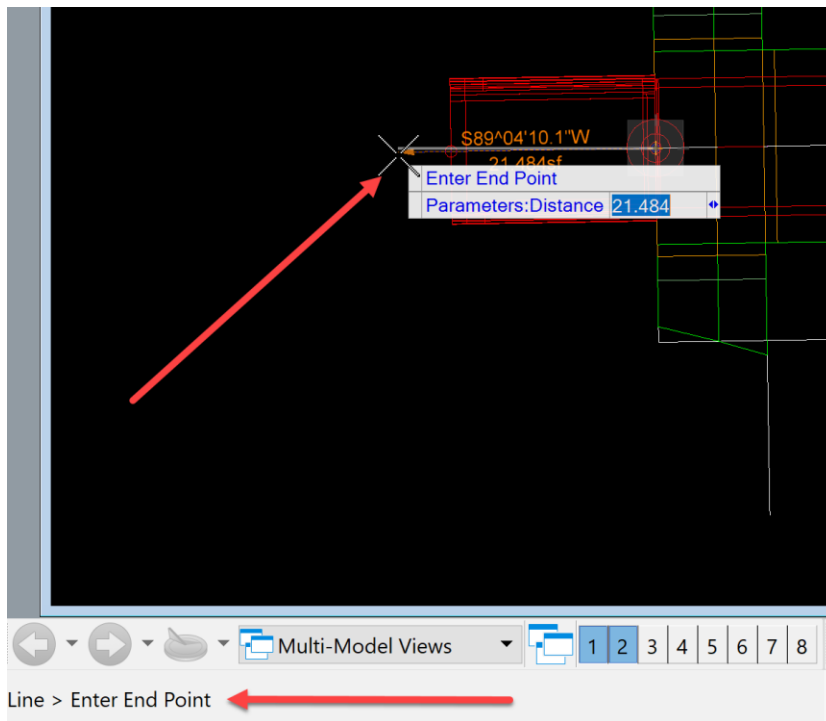
It will prompt to define the start point of the line.



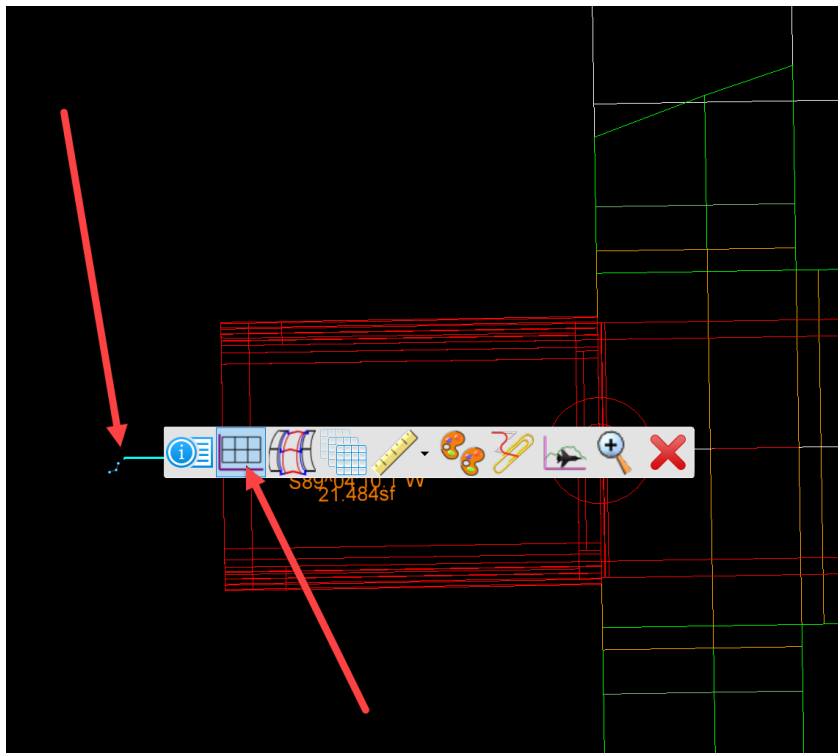
Snap to the end of the original excavation corridor to start this line.



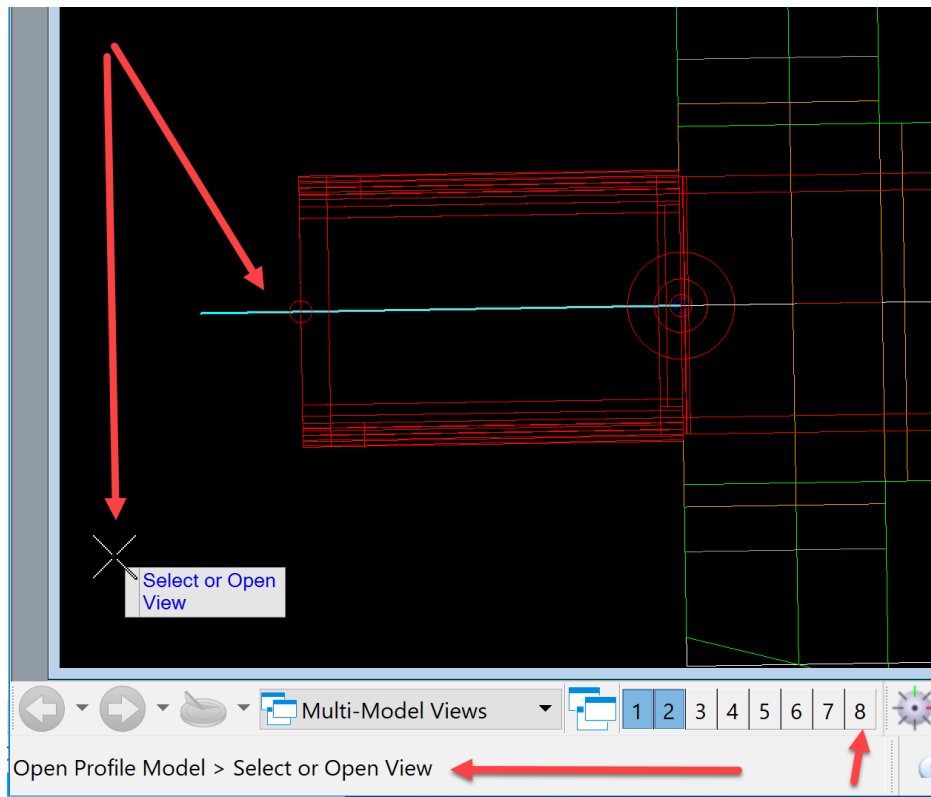
Then select the end point. End the line past the end of the curtain wall.



Next, select the STA1181162+72 HWL baseline just created with the element selection tool. Then hover over it for the heads-up tools access.

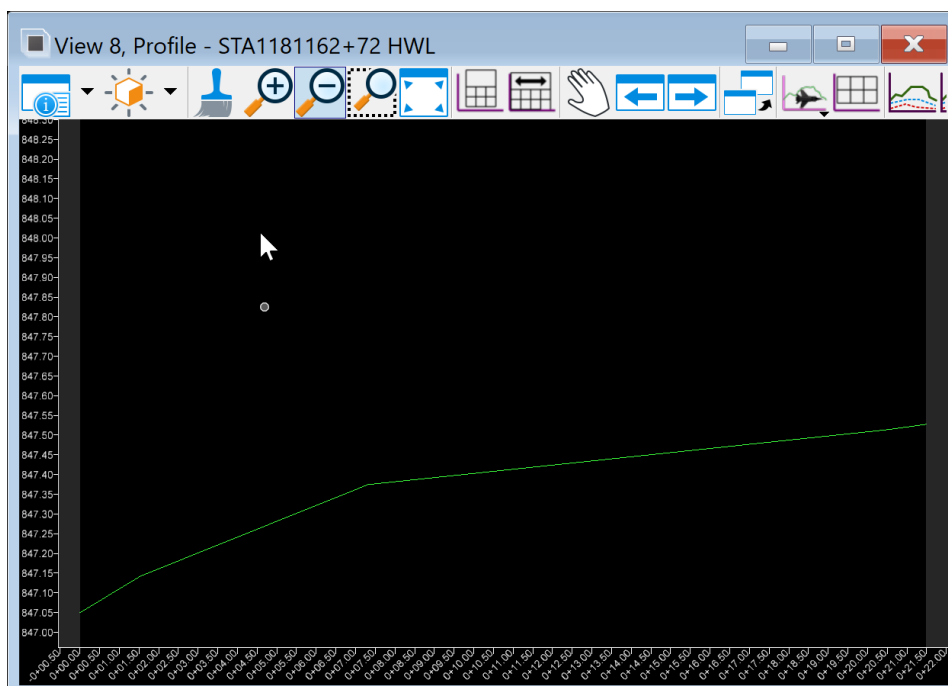


Next, select the Open Profile Model tool and then select a view to open it in.

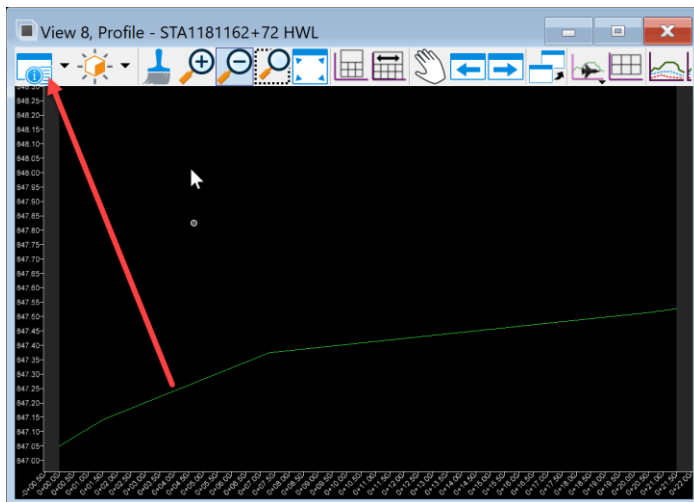


For this example, select View 8.

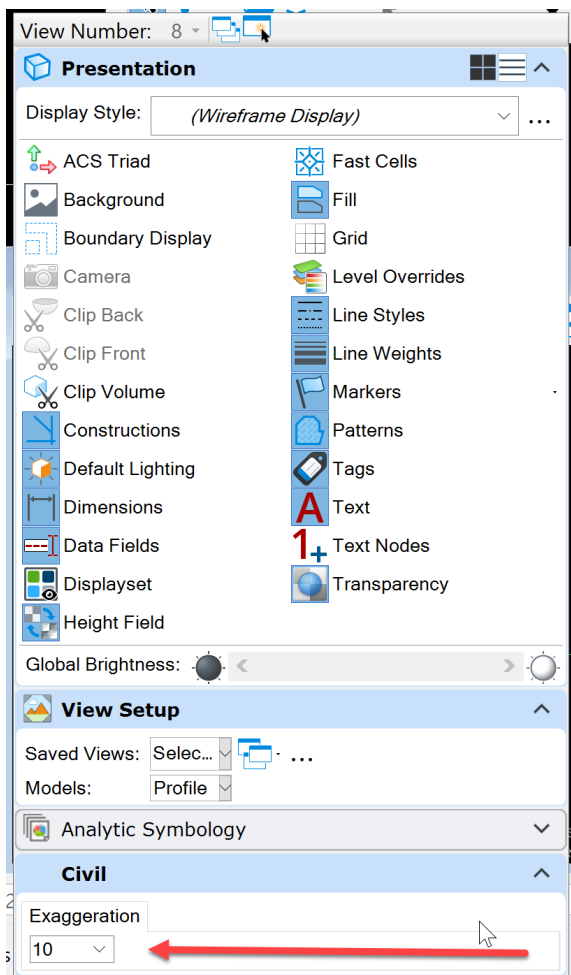
Once the view is opened, data point in the view. The additional profile will display and appear similar to below.



Next, set the exaggeration in the profile view.

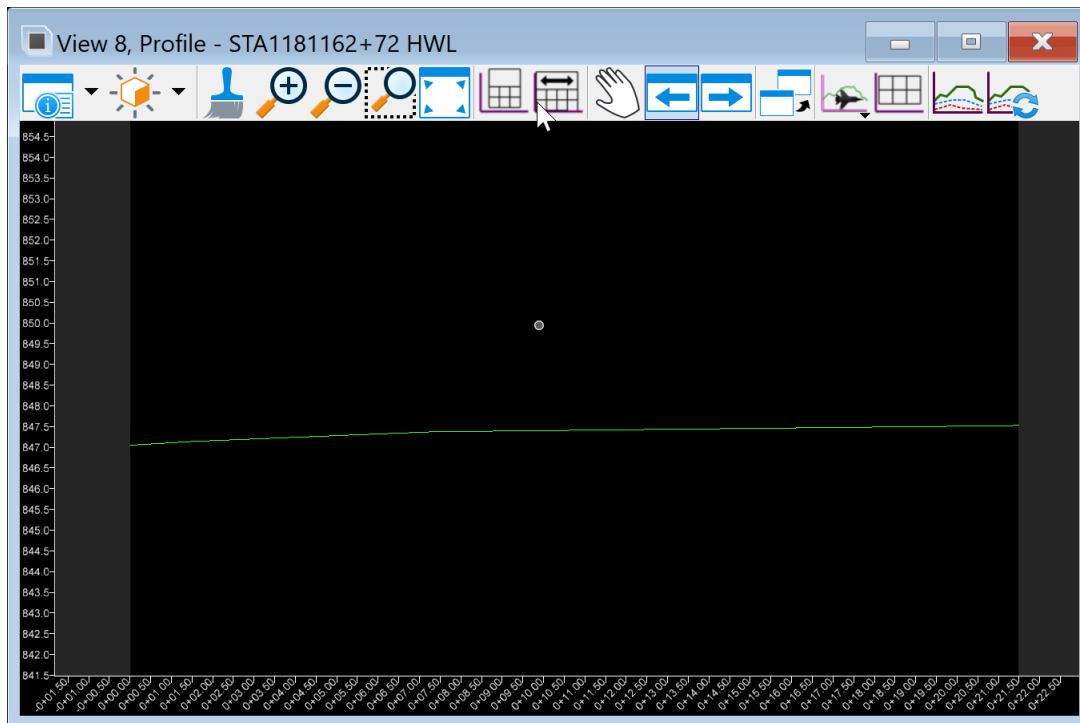


Click the View Attributes button at the top of the view.

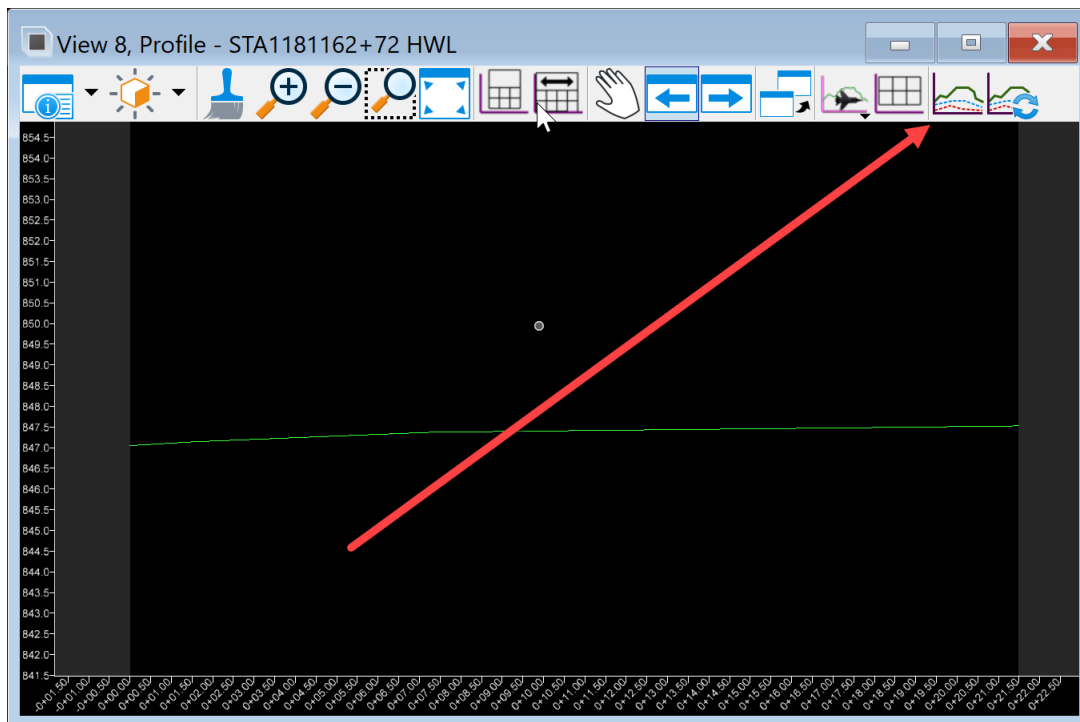


Set the exaggeration to 1.

The view of the profile will now appear as shown below.

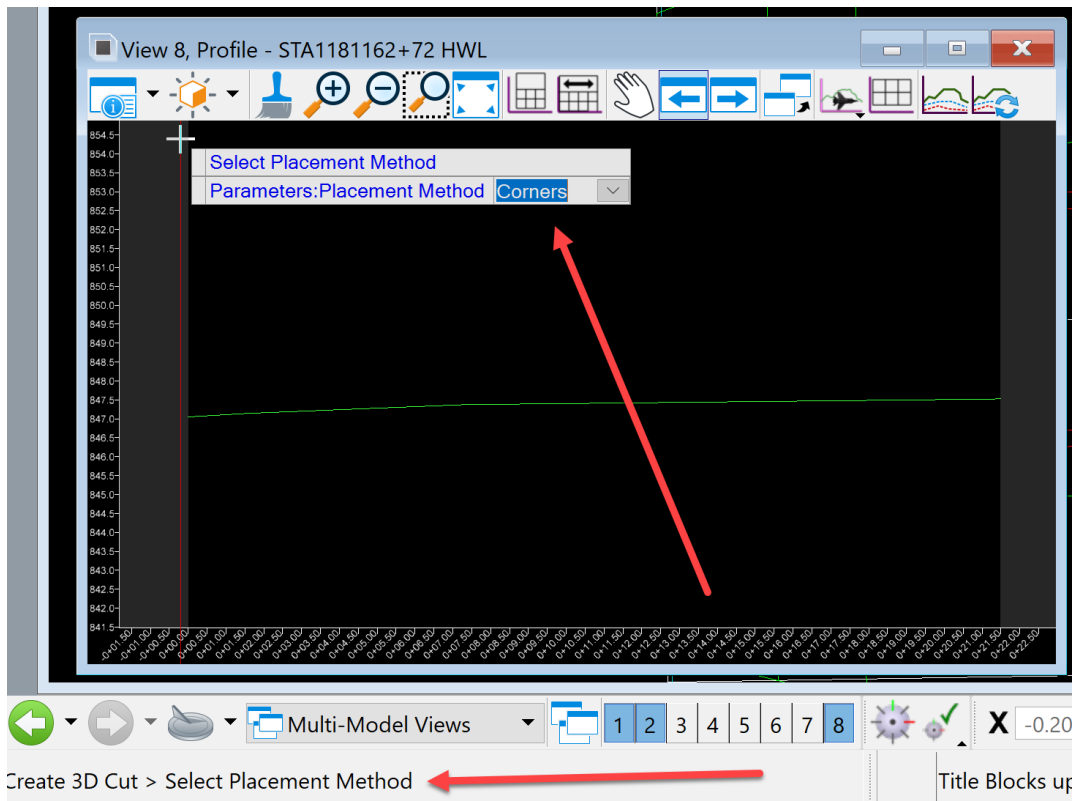


Next, set the 3D cut in the profile window.



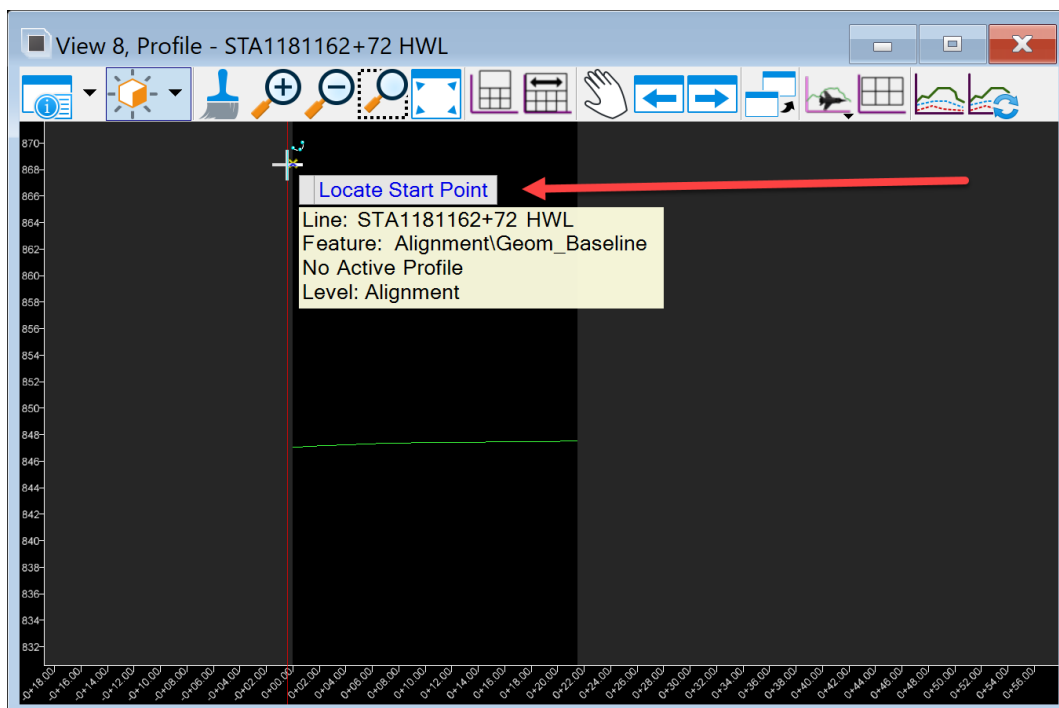
Select the Create 3D Cut tool at the top of the view.

It will prompt to Select Placement Method. Use the Corners method.

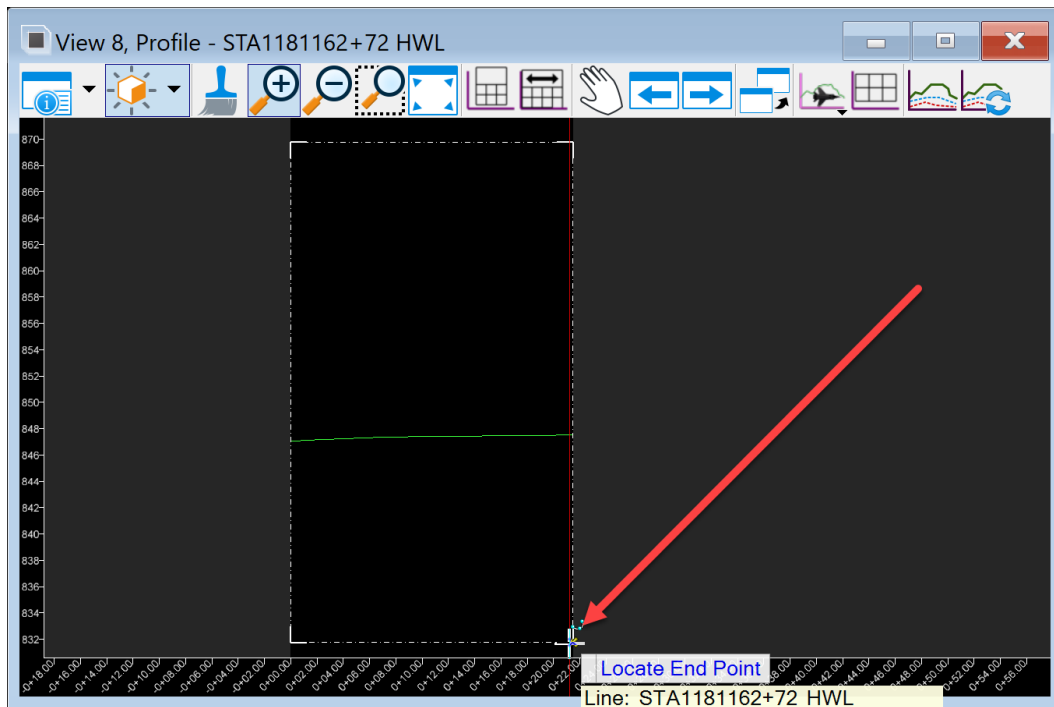


Data point to accept the method and it will prompt to locate the start point.

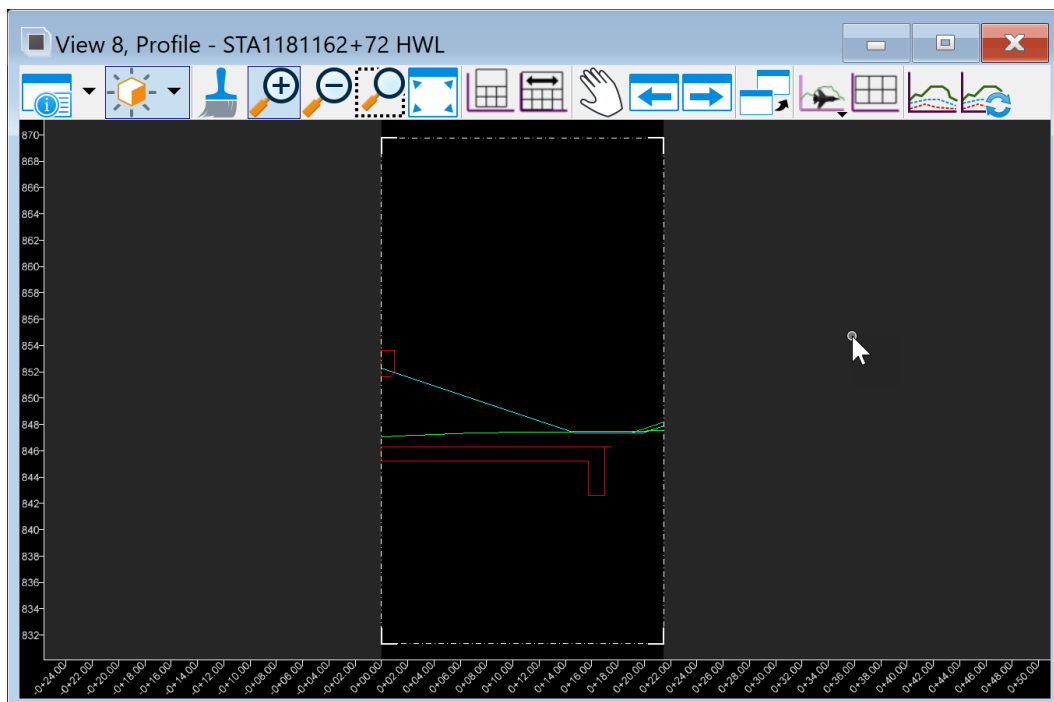
Start it all the way to one side or the other. Recommend to start at top right and end at the lower left.



After the data point, a box will start drawing in the view to make the 3D cut.

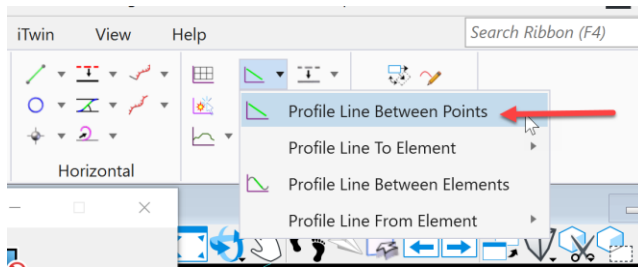


Data point the end point to complete the 3D cut. It will appear as shown below.

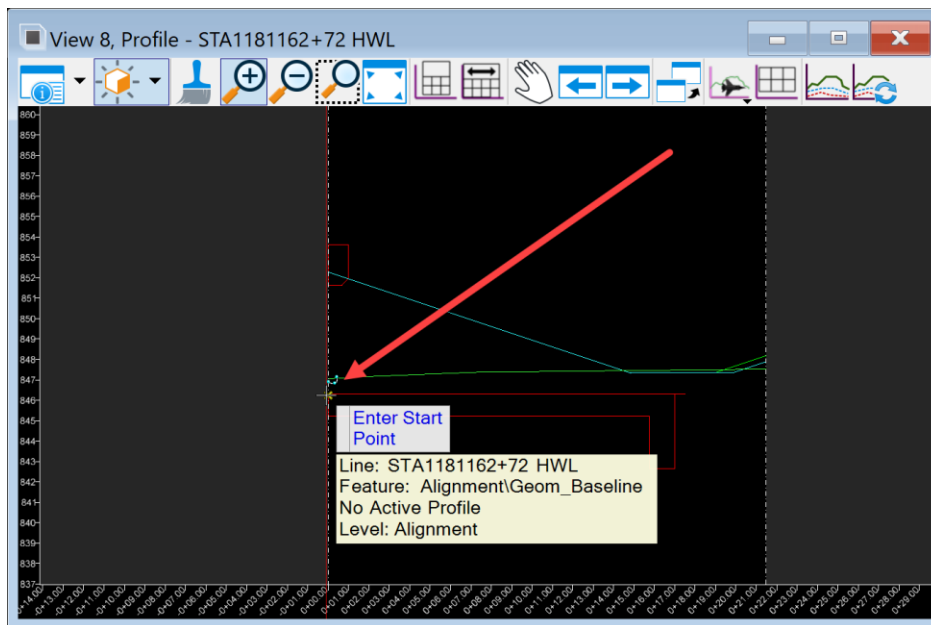


Next, set the profile on the STA1181162+72 HWL baseline that was created.

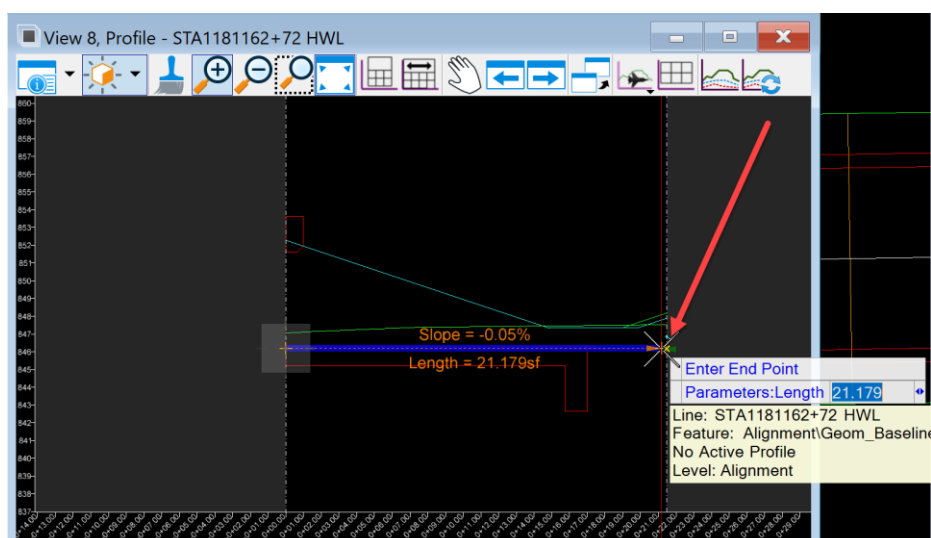
To do this, select Profile Line Between Points in the Lines tools on the Geometry tab in the Vertical group.



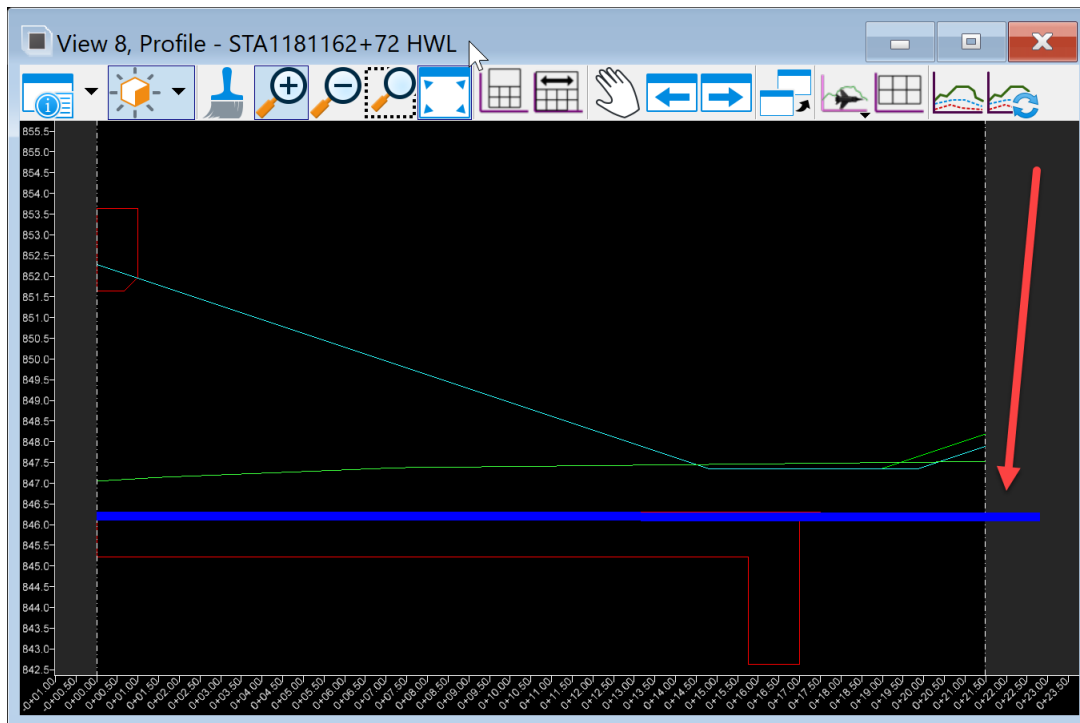
In the profile window, snap to the flowline of the headwall to start the new profile.



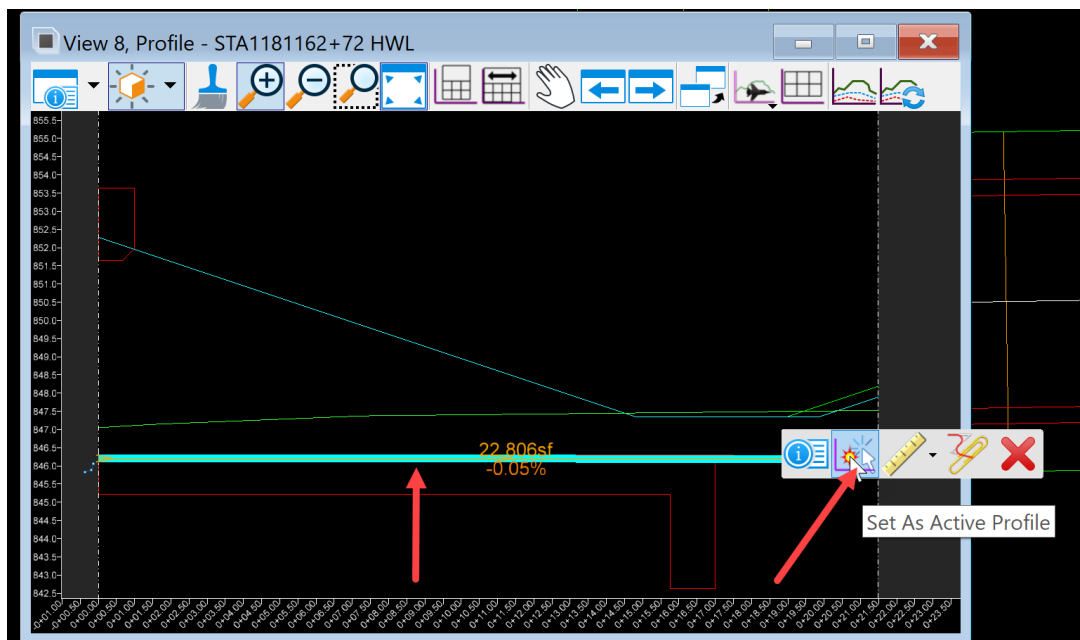
Using the AccuDraw compass, pull the line beyond the headwall in the open profile window and data point to finish the profile.



This will create the profile down the headwall at the same elevation as the flowline of the headwall.



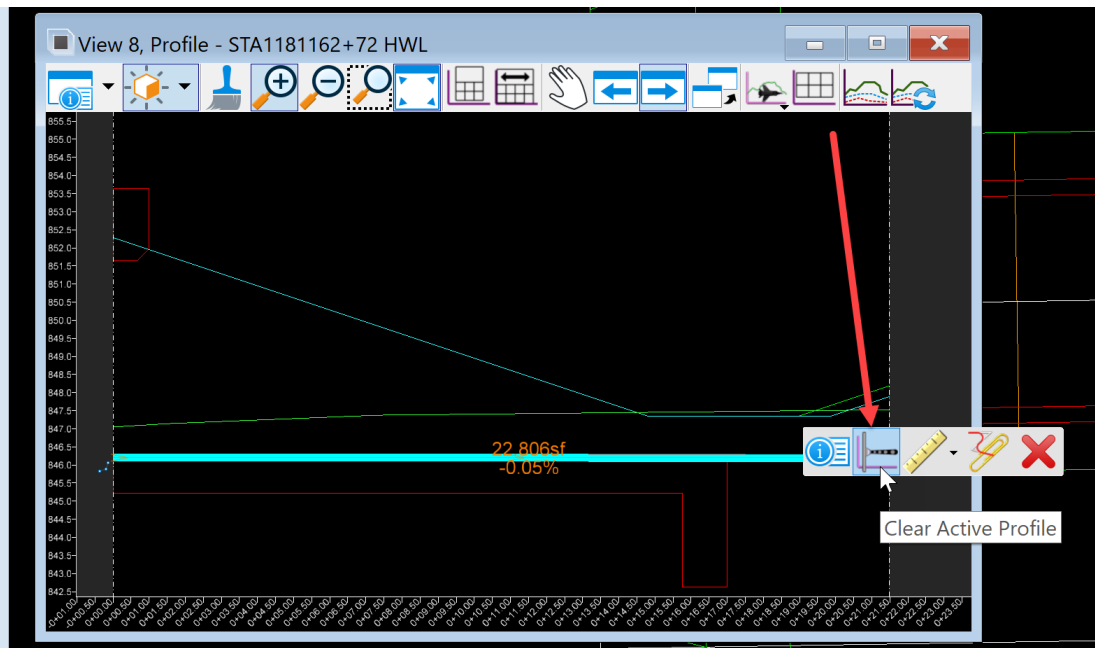
Next, make this profile the active profile. Select the profile just created in profile window with the element section tool, then hover over it until the heads-up tools appear.



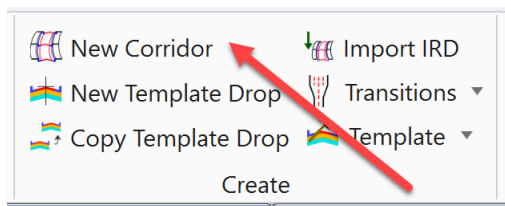
Select the Set As Active Profile tool.

To verify that the new profile is active, hover over profile again and the clear active profile tool will appear.

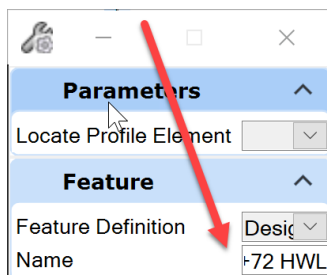
Once this is completed, close the profile view.



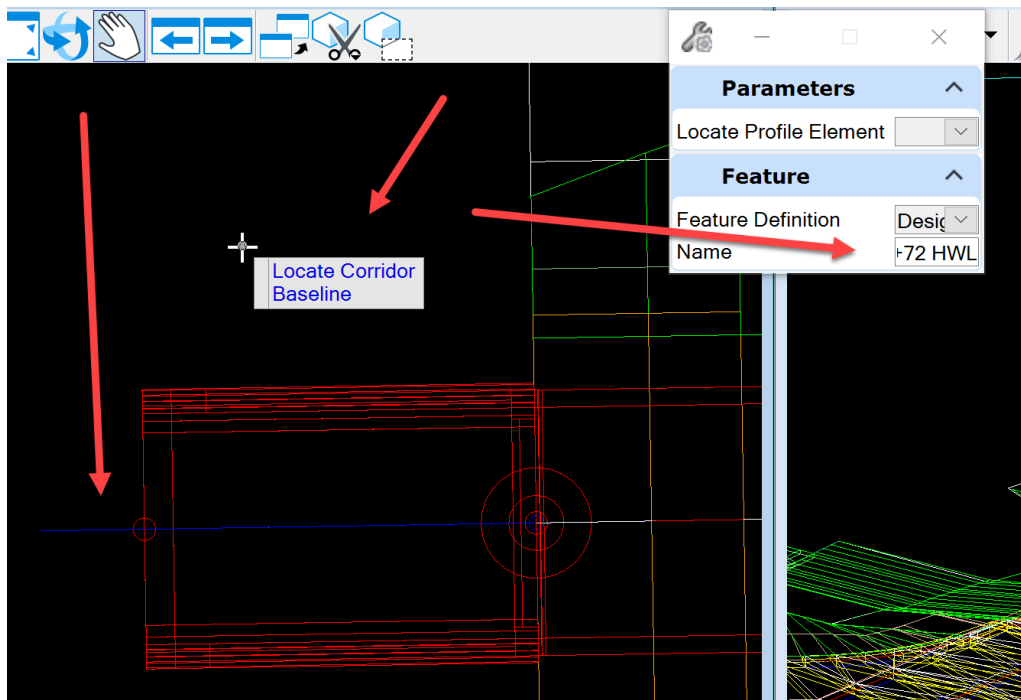
Next, select the New Corridor tool on the Corridors tab in the Create group.



Name it STA1181162+72_HWL to match the baseline.



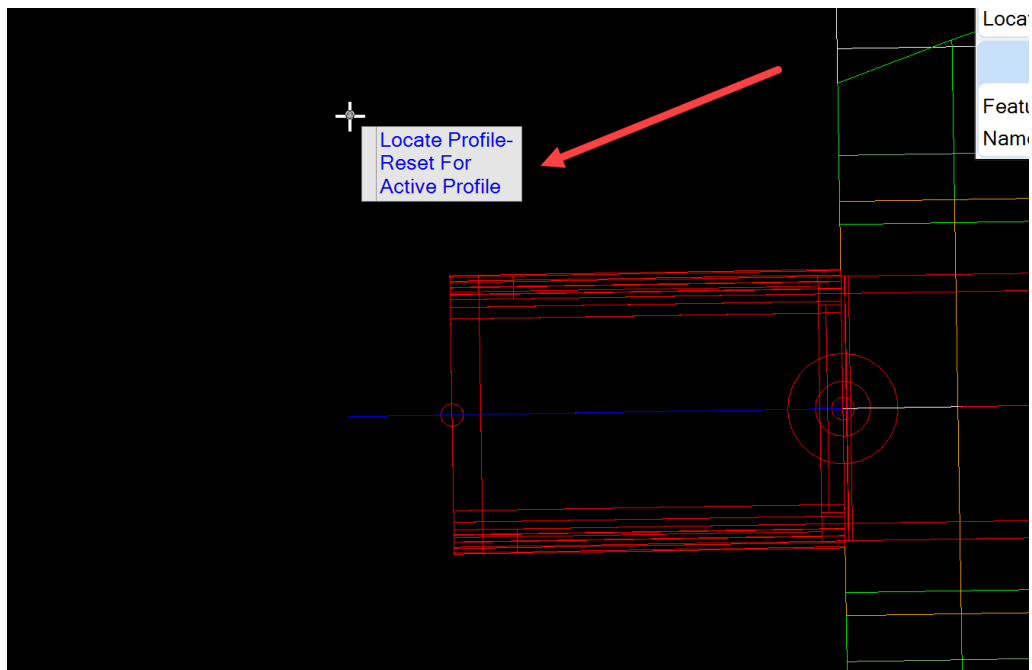
Next, it will prompt to Locate Corridor Baseline.



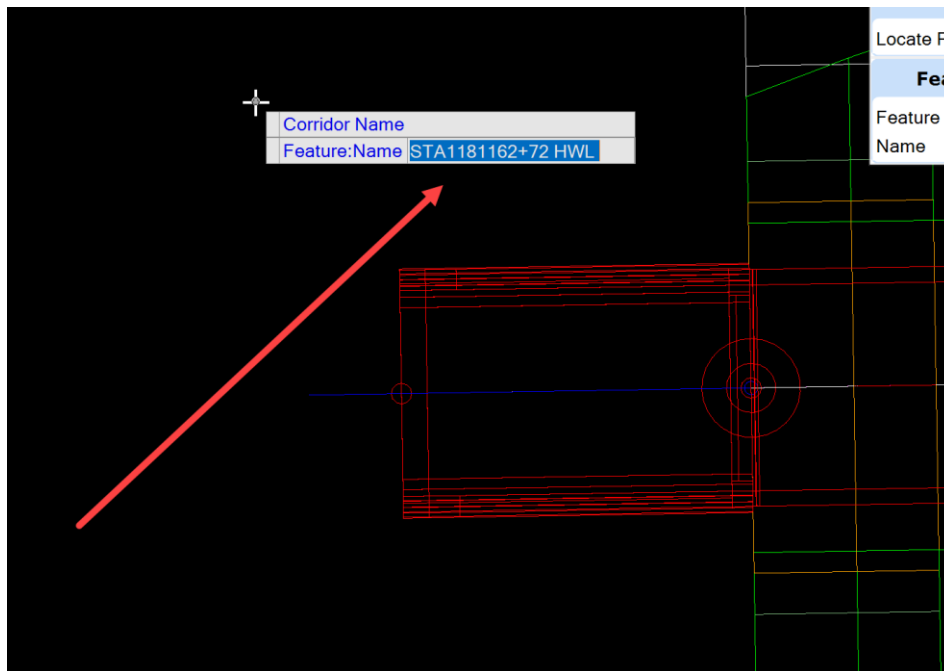
Data point on the STA1181162+72 HWL baseline that was created.

Next, it will prompt to Locate Profile or Reset For Active Profile.

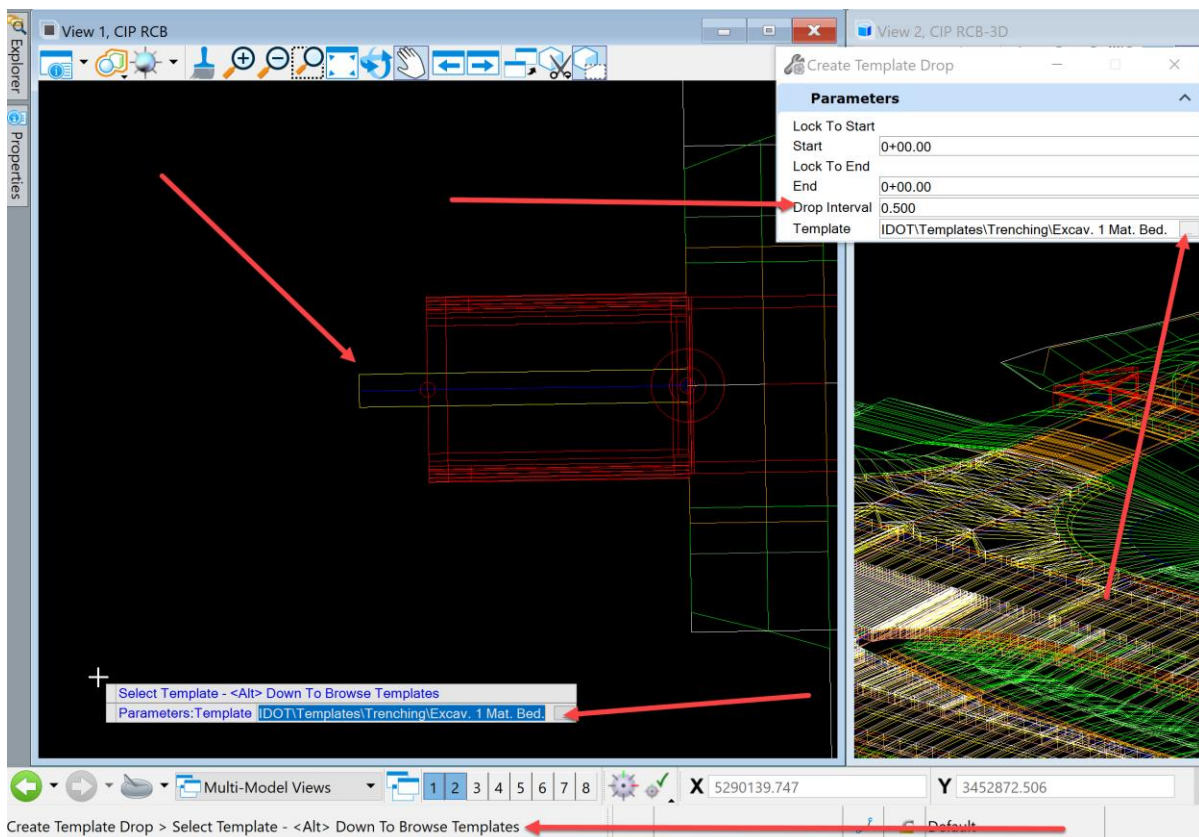
Reset since the STA1181162+72 HWL profile is set as the active profile.



Next, it will prompt to verify the Corridor Name. If it is correct, data point to accept.

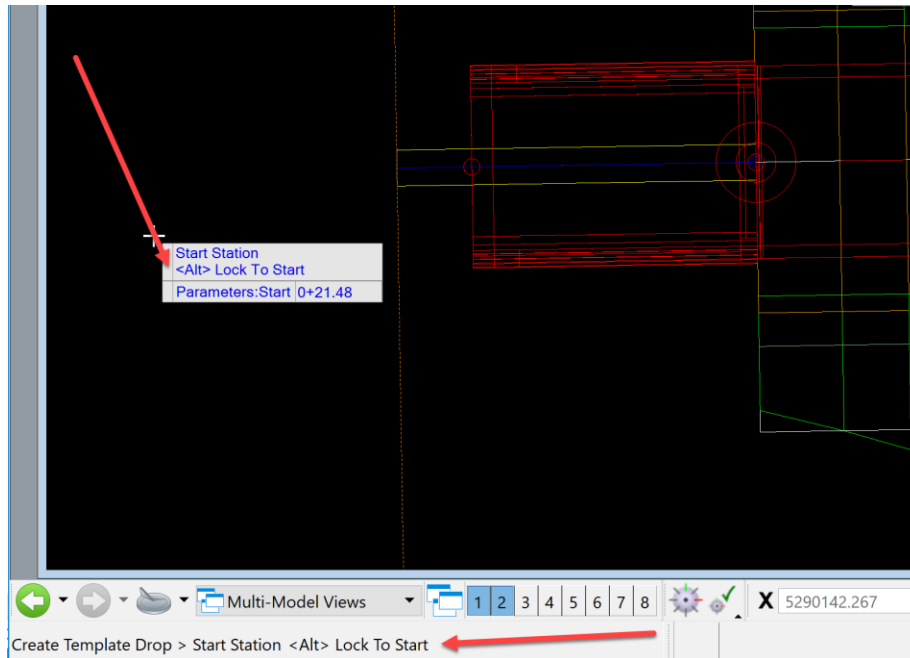


Next, it will prompt to pick the Parameters Template that is needed. This is the excavation template that best fits the trench needs. If the template that is selected is not the template needed, press the alt key and down arrow on the keyboard to open the template library to select a different template.

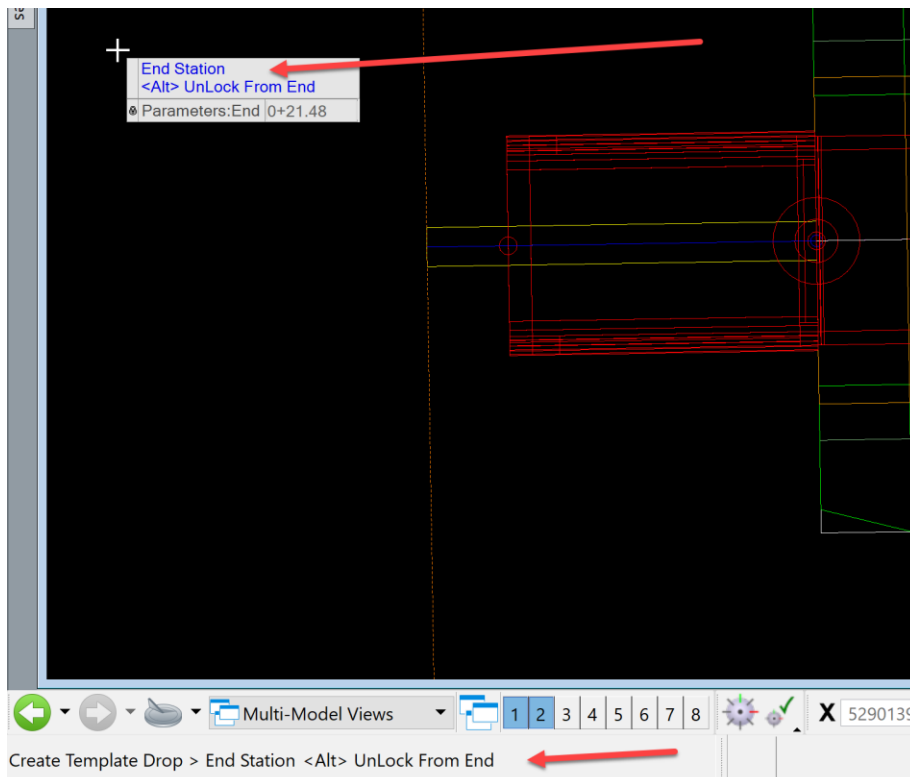


Once the template is selected, then data point to accept.

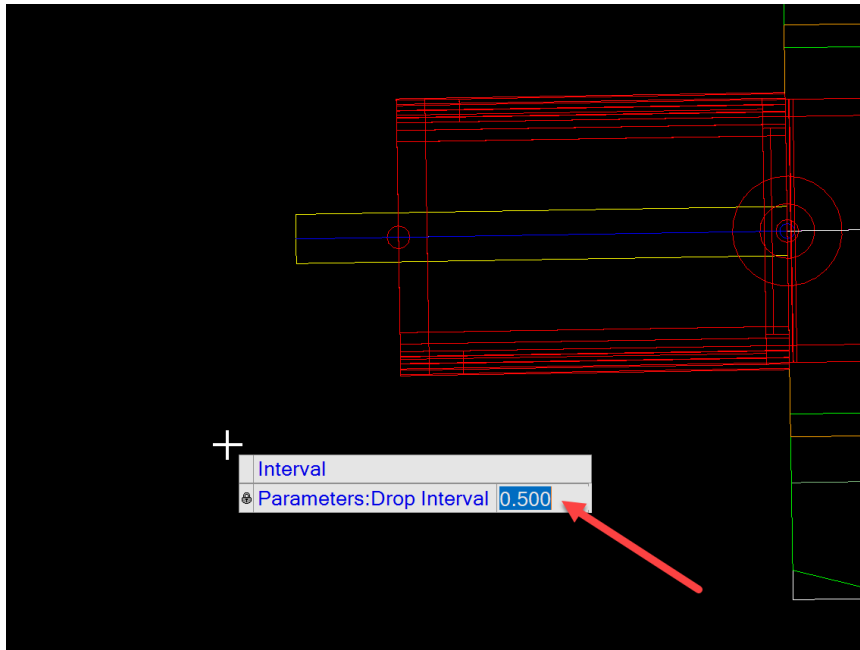
Next, it will prompt for a start station. Push the alt key on the keyboard to lock it to the beginning. Data point to accept.



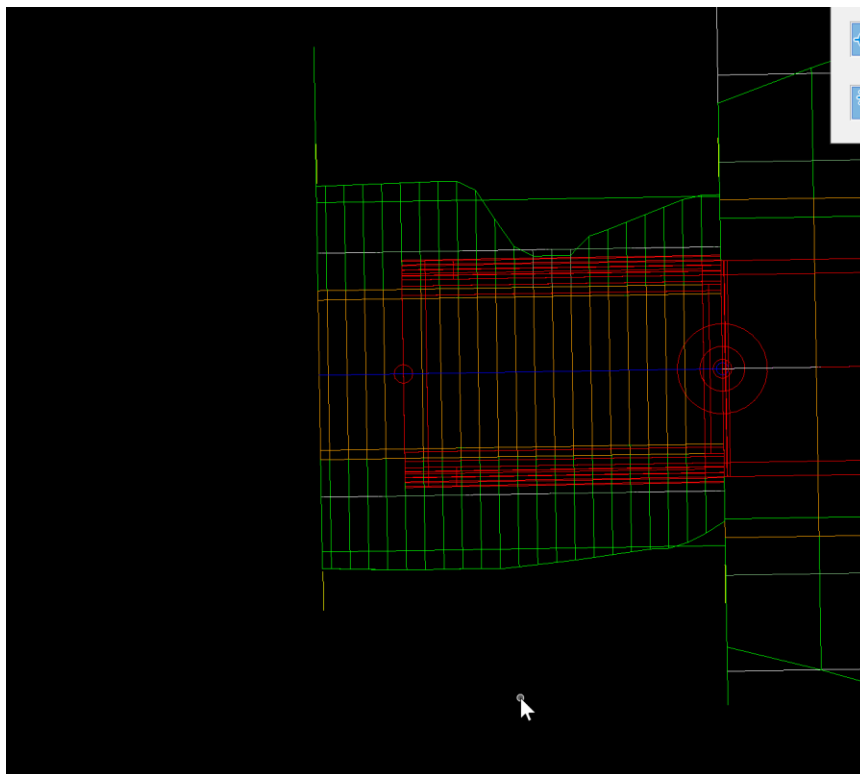
Next, it will prompt for an end station. Push the alt key on the keyboard to lock it to the end station. Data point to accept.



Next, it will prompt for the Parameters Drop Interval. This is the distance between the templates it will drop. Set the interval to .5, which will place a template every 6" or ½ foot. Data point to accept.



Next, it will create the excavation corridor. It will appear as shown below.



Keep in mind that it is placing the default template that is not adjusted to the structure.

Change the parametric constraints of the template to match the structure as described above.

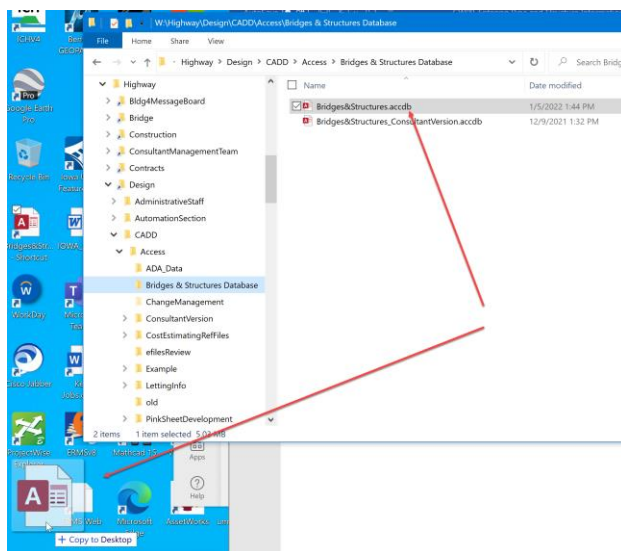
Entering Pipe and Structure Information into Database

Once the cross sections are cut on each pipe and/or culvert and have been annotated as described in [CW06 How to Create Culvert TSL Sheet and Annotate the Structures](#), then input the annotated information in the Bridges&Structures.acddb.

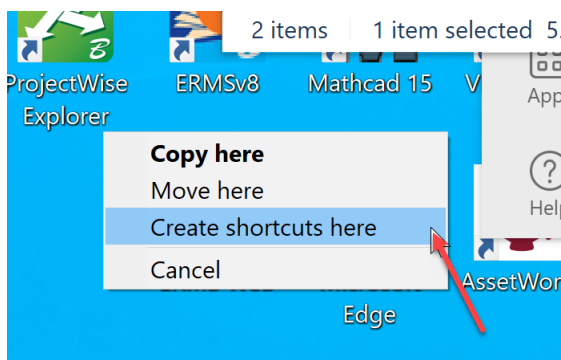
There are two ways this can be done. The first way is intended for internal Iowa DOT employees and the other way is for outside employees or consultant projects.

How to get started for internal Iowa DOT employees is covered first.

First place a short cut of the Bridges&Structures.acddb database on to the desktop. Open a Windows file explorer and browse to W:\Highway\Design\CADD\Access\Bridges & Structures Database. Select the [Bridges&Structures.acddb](#) and right click and drag to the desktop.



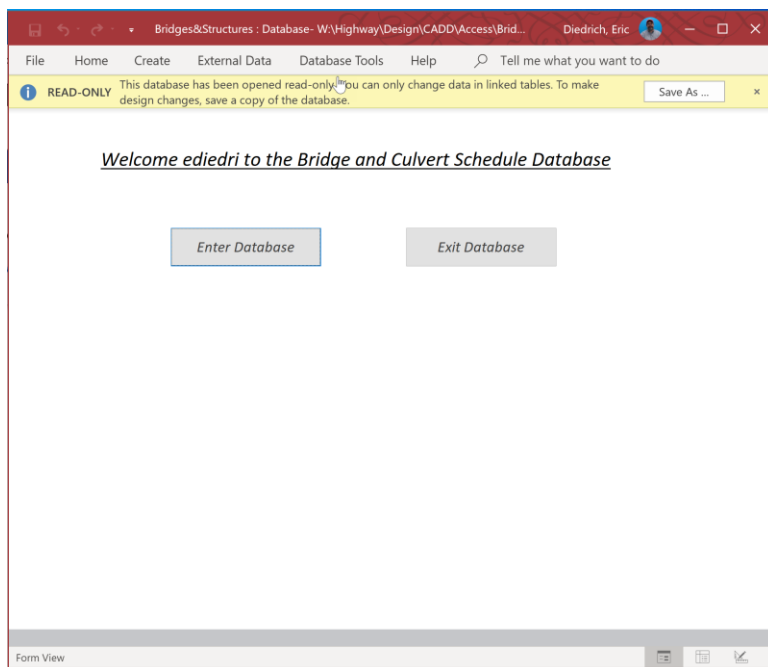
Then select Create shortcuts here.



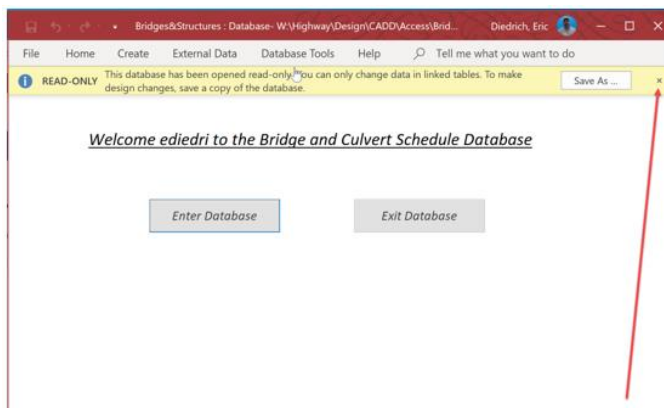
Note: By making a short cut, the system administrators can make changes to the database, and it will always open the latest version.

The second way to use the Bridges&Structures.accdb is intended for outside employees or consultant projects. A different consultant version of the database is located in ProjectWise at: PWMain\Documents\IowaDOTStandardsConnect\Configuration\Organization-Civil\IowaDOT_Standards\Seed\ [Access](#)\Bridges&Structures_ConstantVersion.accdb. This file should be copy to a local work directory then renamed to Bridges&Structures_CCRRRPPP.accdb. This is because Access does not work properly in ProjectWise. Once the data entry is completed in this database, it should be placed in the project directory that it corresponds with.

Now that the correct database for both internal and external users has been explained, lets open it and get started. The welcome screen appears as shown below.

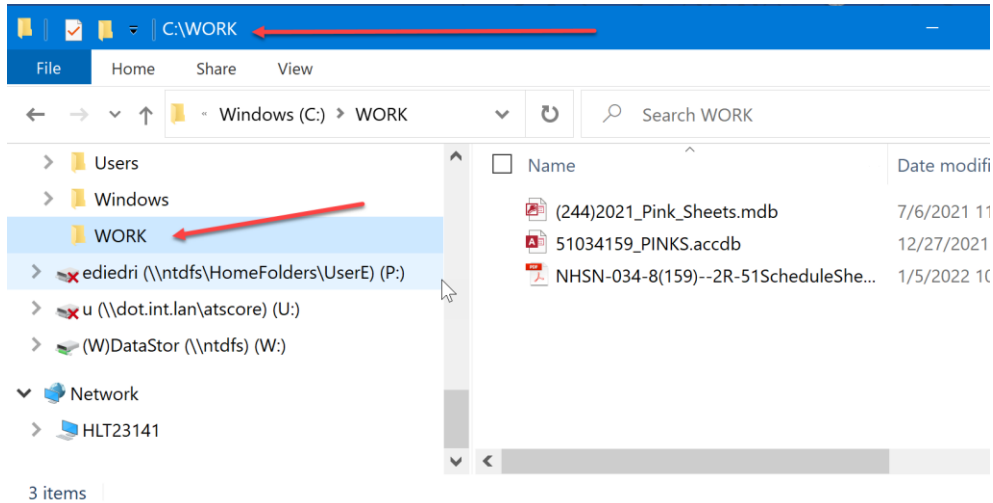


It will display a warning that it is READ-ONLY. Don't be concerned, this is normal. This is indicating that the database design can't be changed, however the data entry will be stored in a table that is read by this database.

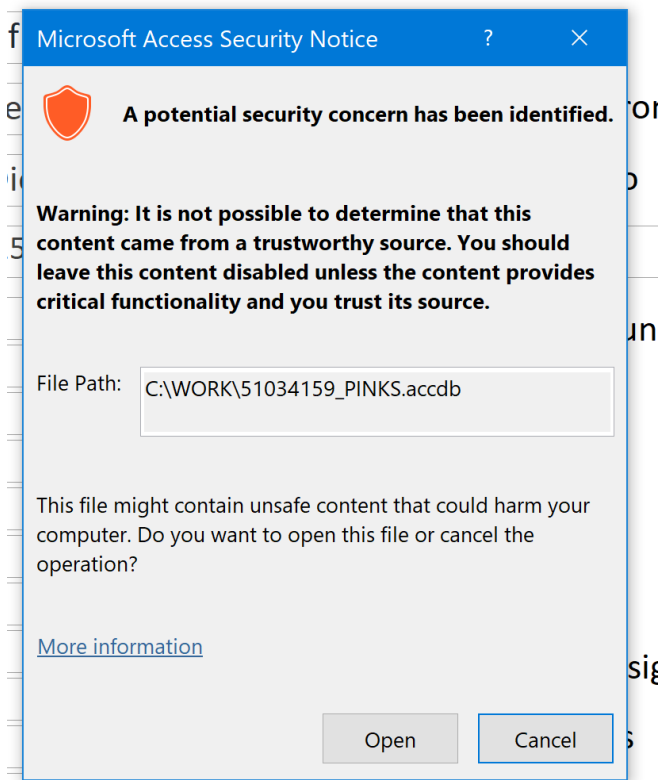


Just click on the X and the warning will close.

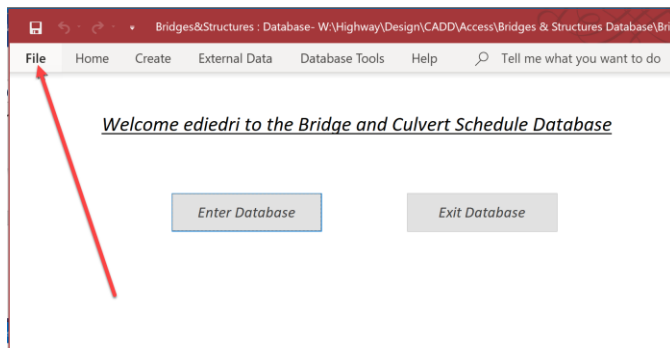
The next step is to make a working directory on the local C:\ drive. For this example, a folder named WORK was created.



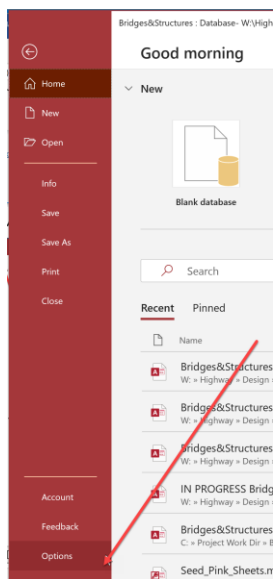
Next, change a few security settings in Access to avoid seeing the warning shown below when the survey information is imported.



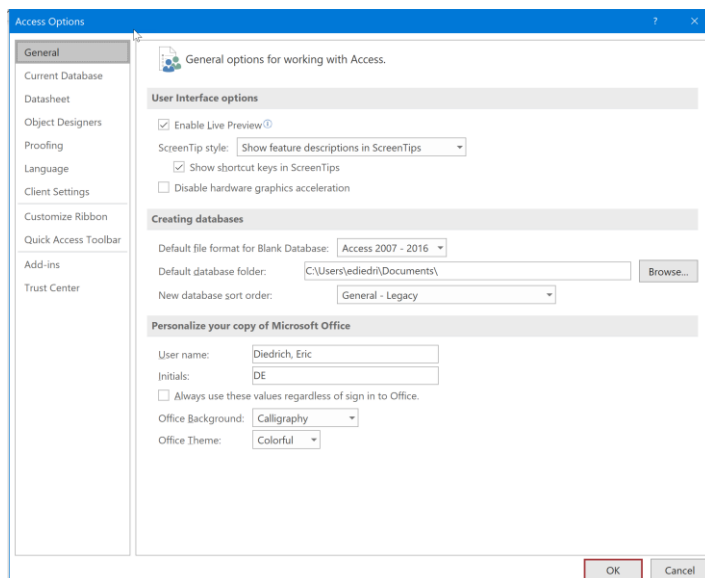
Click on the File tab at the top of the database.



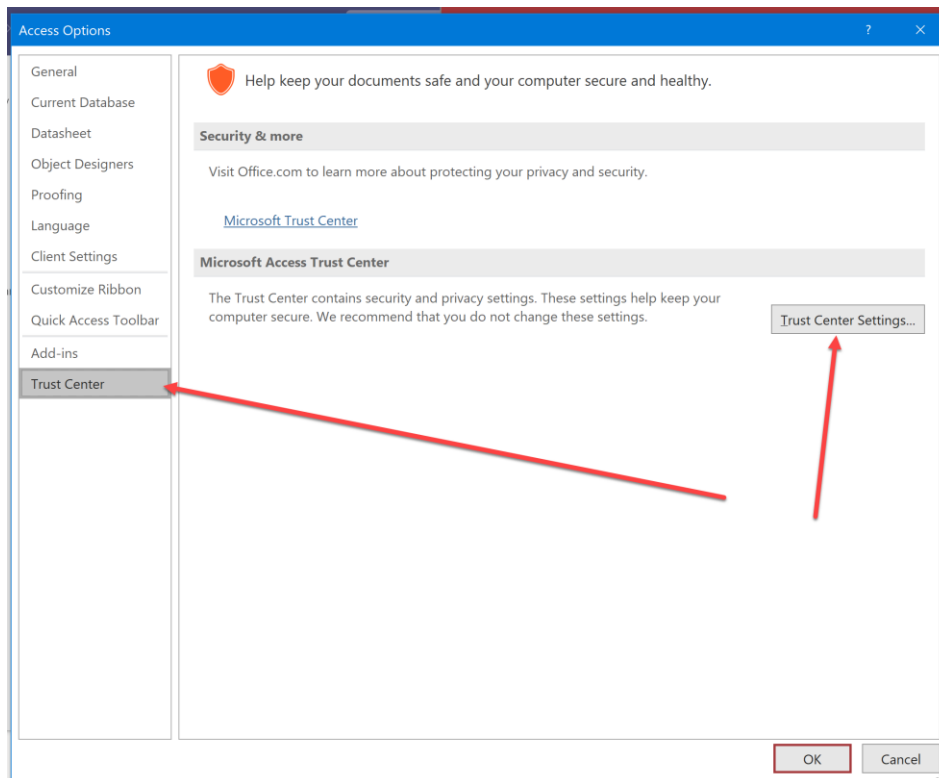
This will open the backstage to access Options.



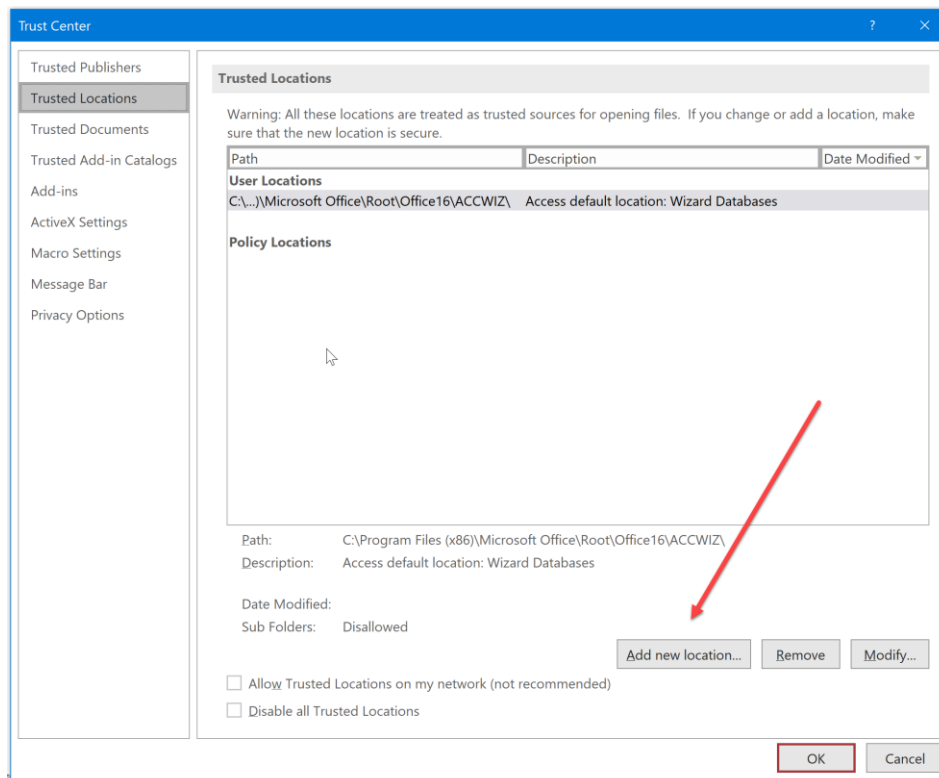
Next, click on Options to open the Access Options dialog box.



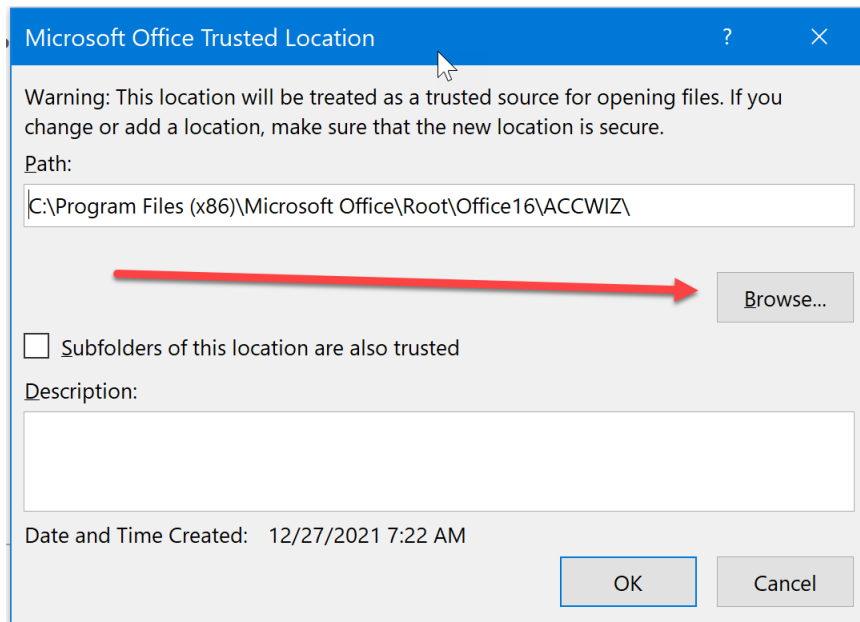
Next, click on the Trust Center option and then click on the Trust Center Settings button.



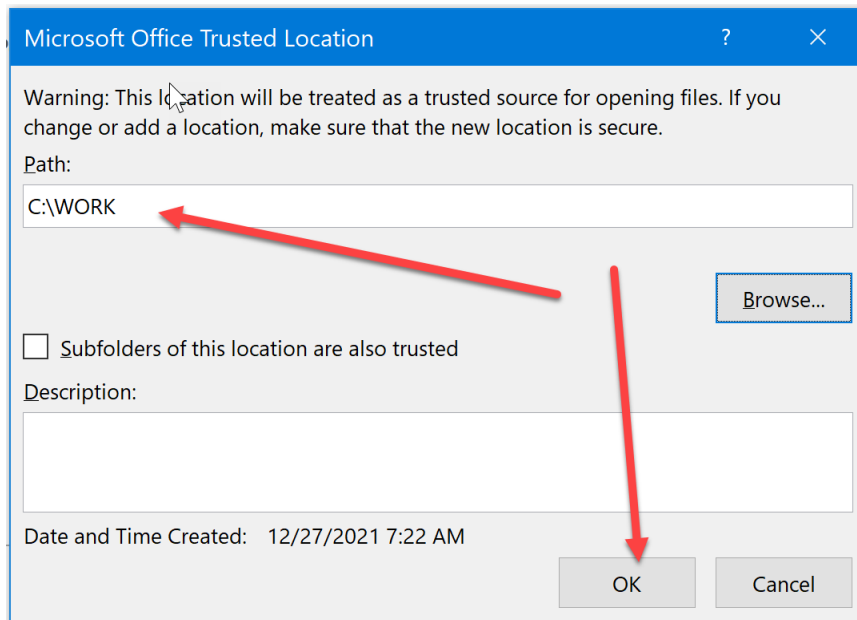
That will open the Trust Center dialog box. Click on the Add new location button.



This will open the Trusted Location dialog box. Click the Browse button to navigate to the temporary work directory created to place the survey information in.



For this example, select the WORK folder that was created.

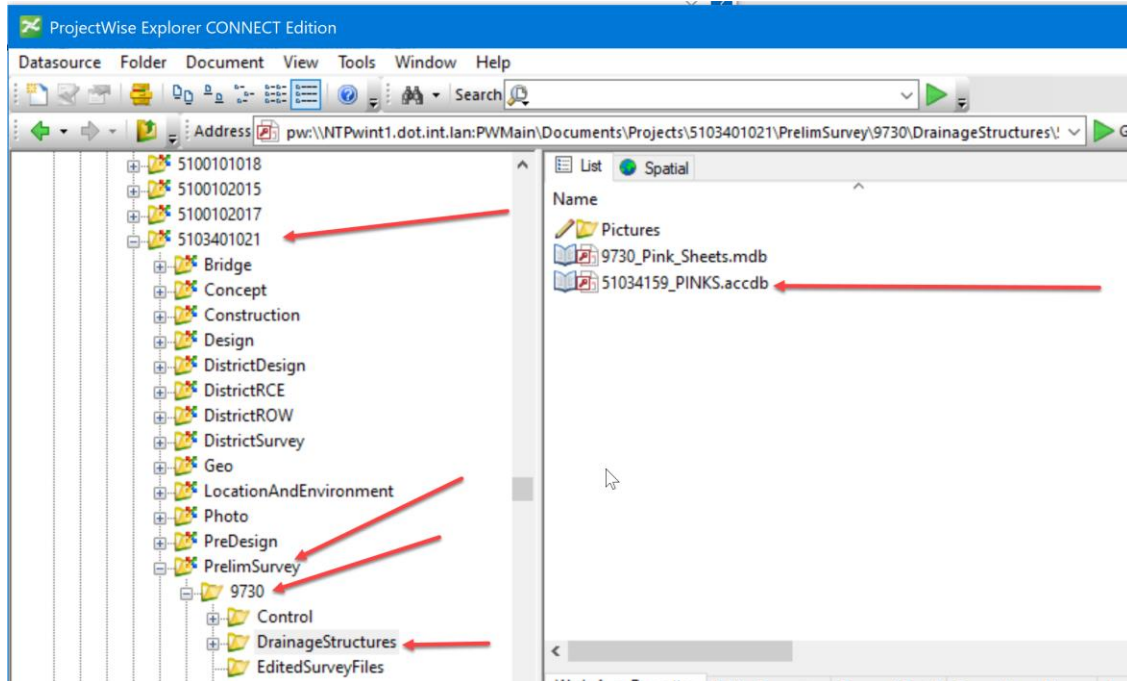


Then click OK.

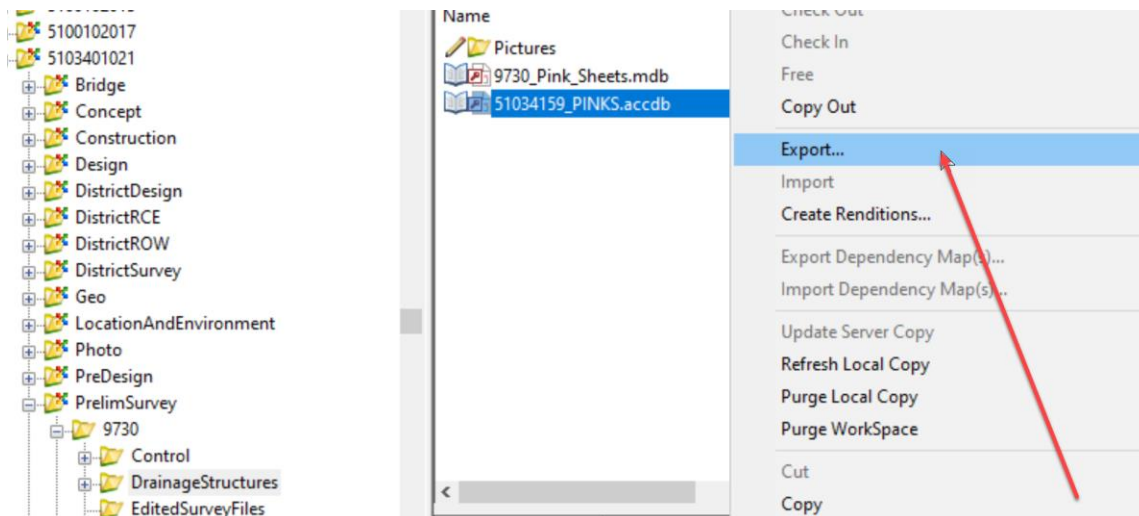
Note: if the same working directory is available and used for all projects, this will only need set once.

The next step is to check for the file to import the survey records for the project. The file is also a database that should be located in the project directory in the PrelimSurvey folder structure under the unique id number SAP folder in the DrainageStructures subfolder.

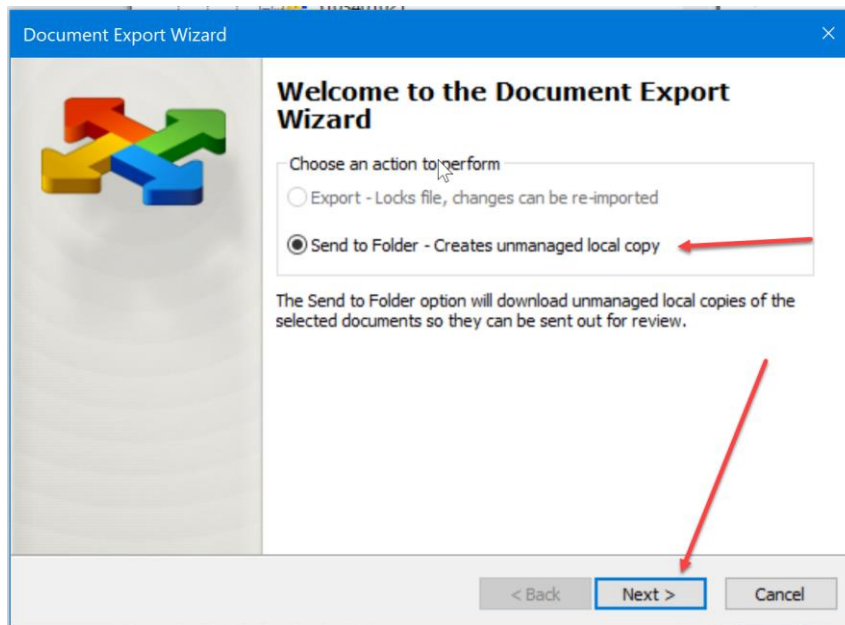
For example: PWMain\Documents\Projects\5103401021\PrelimSurvey\9730\DrainageStructures\ the file will be named CRRRRPPP_PINKS.accdb or for this example it will be 51034159_PINKS.accdb



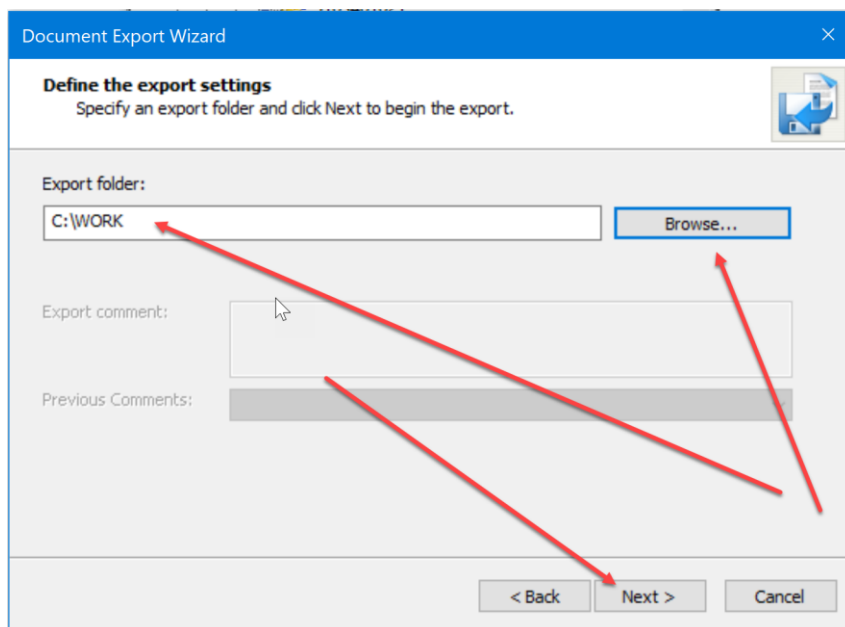
Once the Survey Records are located, export to a local work directory. Select the file, right click and select the Export option.



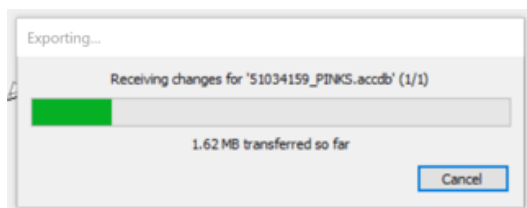
When the Document Export Wizard opens, select the Send to Folder with unmanaged local copy option. Then click the Next button.



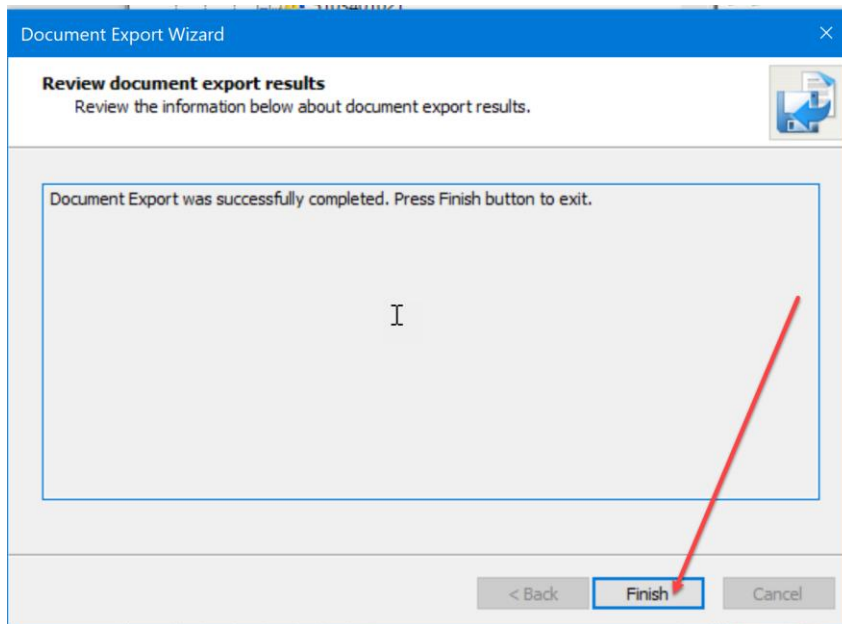
Browse to the local WORK folder created earlier then click the Next button.



A progress bar for exporting will display.

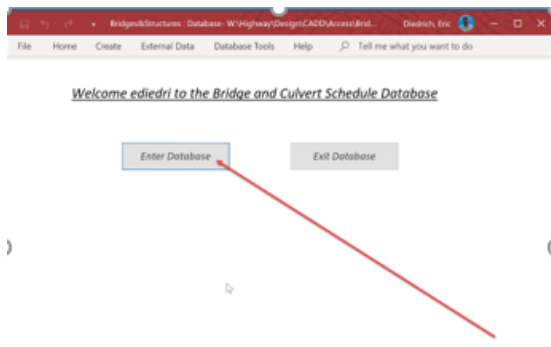


When it is finished, it will display a message indicating a successful export. Click on the Finish button.

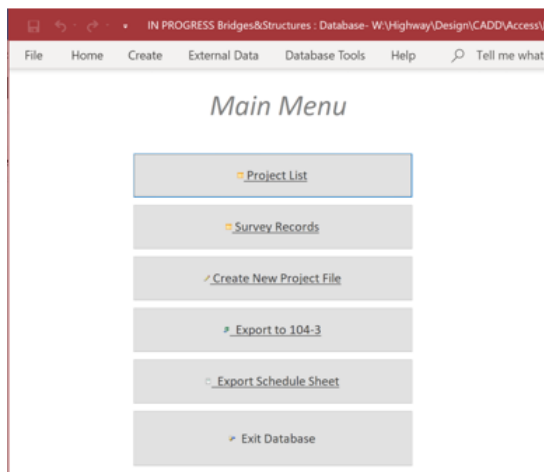


Now return to the Bridges&Structures.accdb database.

The next step is to Create New Project File. To do this, click on the Enter Database button.



The Main Menu will display.



Next, click on the Create New Project File button.

The screenshot shows the 'Main Menu' of the 'IN PROGRESS Bridges&Structures' application. The window title is 'IN PROGRESS Bridges&Structures : Database- W:\Highway\Design\CAD...'. The menu bar includes 'File', 'Home', 'Create', 'External Data', 'Database Tools', and 'Help'. The main area displays a list of buttons: 'Project List', 'Survey Records', 'Create New Project File' (which is highlighted with a red arrow), 'Export to 104-3', 'Export Schedule Sheet', and 'Exit Database'. The status bar at the bottom indicates 'Form View'.

The data entry form will display as shown below.

The screenshot shows the 'Create Project File' form within the same application. The window title is 'IN PROGRESS Bridges&Structures : Database- W:\Highway\Design\CADD\Access\IN PRO...'. The menu bar is the same. The form is titled 'Create Project File' and contains the following fields and controls:

- Project Number: [Text Field]
- File No.: [Text Field]
- Location: [Text Field]
- Pin No.: [Text Field]
- Design Team: [Text Field]
- Station From: [Text Field]
- Bridge Team: [Text Field]
- Station To: [Text Field]
- Import Path: [Text Field]
- A, B, BW, C, Z, E, M, T, X, MW, CLEAR: [List of checkboxes]
- TrafficCount: [Text Field]
- VPD_YR: [Text Field]
- Received: [Text Field]
- ToDesign: [Text Field]
- ToFinalDesign: [Text Field]
- NoDesigns: [Text Field]
- NoPipes: [Text Field]
- Designs: [Text Field]
- Road Typical: [Text Field]
- Typical Date: [Text Field]

At the bottom of the form are two buttons: 'Save' and 'Cancel'.

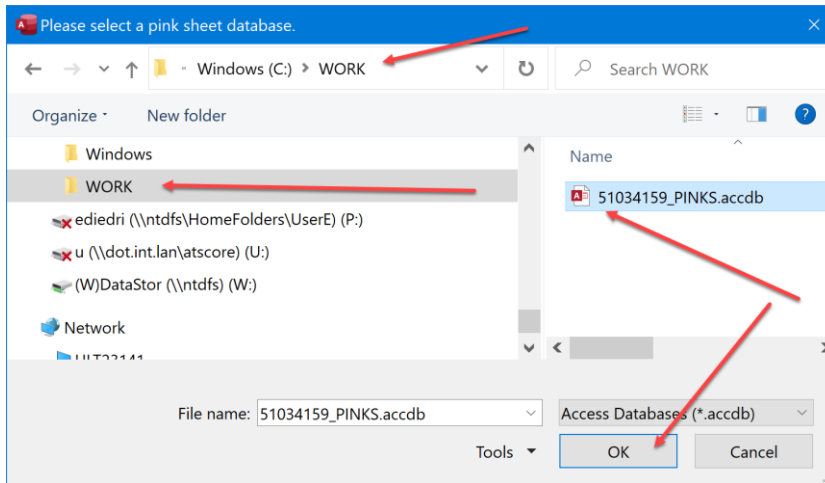
The first step to start a new project is to import the Survey Records into the new project. To do this, click on the magnifying glass next to the Import Path field.

The screenshot shows the 'Create Project File' form in a software application. The form has a title bar with the file path 'Bridges&Structures : Database- W:\Highway\Design\CADD\Access\Bridges&Structures.ac...' and the user 'Diedrich, Eric'. The menu bar includes 'File', 'Home', 'Create', 'External Data', 'Database Tools', and 'Help'. The form fields are organized into two columns. The left column includes 'Project Number' (a dropdown), 'Location', 'Design Team', 'Bridge Team', 'Import Path' (with a magnifying glass icon), a list of categories (A, B, BW, C, Z, E, M, T, X, MW, CLEAR), 'Road Typical', and 'Typical Date'. The right column includes 'File No.', 'Pin No.', 'Station From', 'Station To', 'TrafficCount', 'VPD_YR', 'Received', 'ToDesign', 'ToFinalDesign', 'NoDesigns', 'NoPipes', and 'Designs'. At the bottom are 'Save' and 'Cancel' buttons. A red arrow points to the magnifying glass icon next to the 'Import Path' field.

It will open this dialog box. Click on the OK button.

The screenshot shows the same 'Create Project File' form, but with a 'Microsoft Access' dialog box open. The dialog box has a title bar 'Microsoft Access' and a message: 'Please select the pink sheet database you would like to import all records from.' There is an 'OK' button in the dialog box. A red arrow points to the 'OK' button. The background form is partially obscured by the dialog box.

Next, browse to the location that was used to export the Survey Records to and select the CRRRRPPP_PINKS.sccdb file that corresponds with the project. For this example, it will be 51034159_PINKS.accdb in the C:\WORK folder.

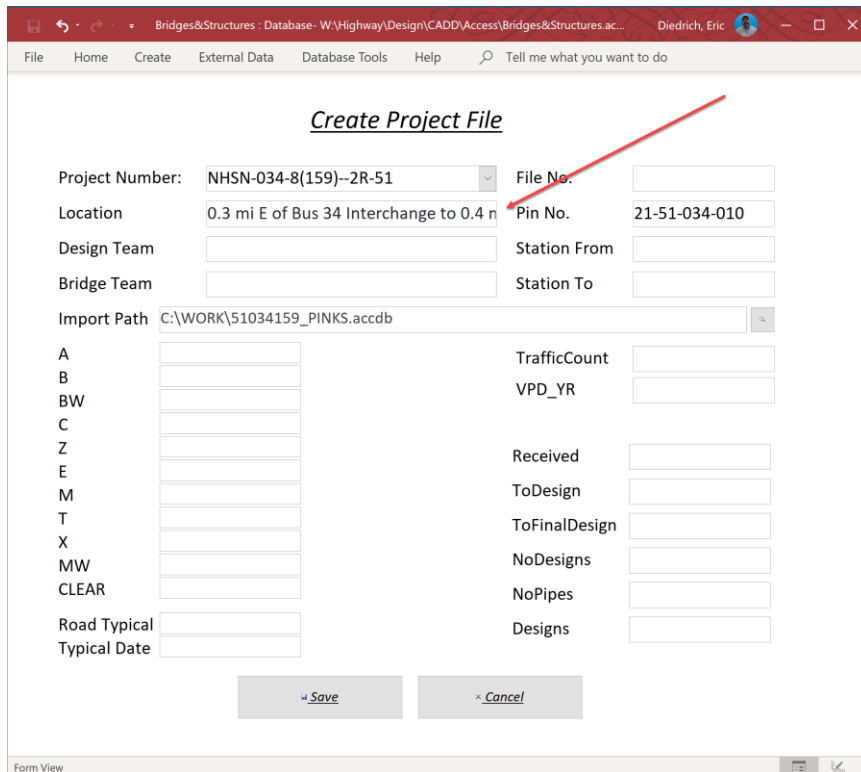


Then click the OK button. Next, set the project number. To do this, click on the pulldown in the Project Number field and find the project number from the list and select it. Otherwise, start typing the project number in the Project Number field and the number should autofill as it is typed. Then select the correct number. For this example, the project number is NHSN-034-8(159)—2R-51. This will also autofill the PIN No. field once selected since these numbers are tied to each other. It should fill in as shown below.

Create Project File

Project Number:	NHSN-034-8(159)—2R-51	File No.	
Location		Pin No.	21-51-034-010
Design Team	I	Station From	
Bridge Team		Station To	
Import Path	C:\WORK\51034159_PINKS.acdb		
A		TrafficCount	
B		VPD_YR	
BW			
C			
Z		Received	
E		ToDesign	
M		ToFinalDesign	
T		NoDesigns	
X		NoPipes	
MW		Designs	
CLEAR			
Road Typical			
Typical Date			

Next, fill out the Location field with the project description. For this example, it will be 0.3 mi E of Bus 34 Interchange to 0.4 mi E of Umber Ave (5 Locations). It should look something like this.



Create Project File

Project Number: NHSN-034-8(159)--2R-51 File No.

Location: 0.3 mi E of Bus 34 Interchange to 0.4 mi E of Umber Ave (5 Locations) Pin No. 21-51-034-010

Design Team Station From

Bridge Team Station To

Import Path C:\WORK\51034159_PINKS.acddb

A TrafficCount

B VPD_YR

BW

C

Z Received

E ToDesign

M ToFinalDesign

T NoDesigns

X NoPipes

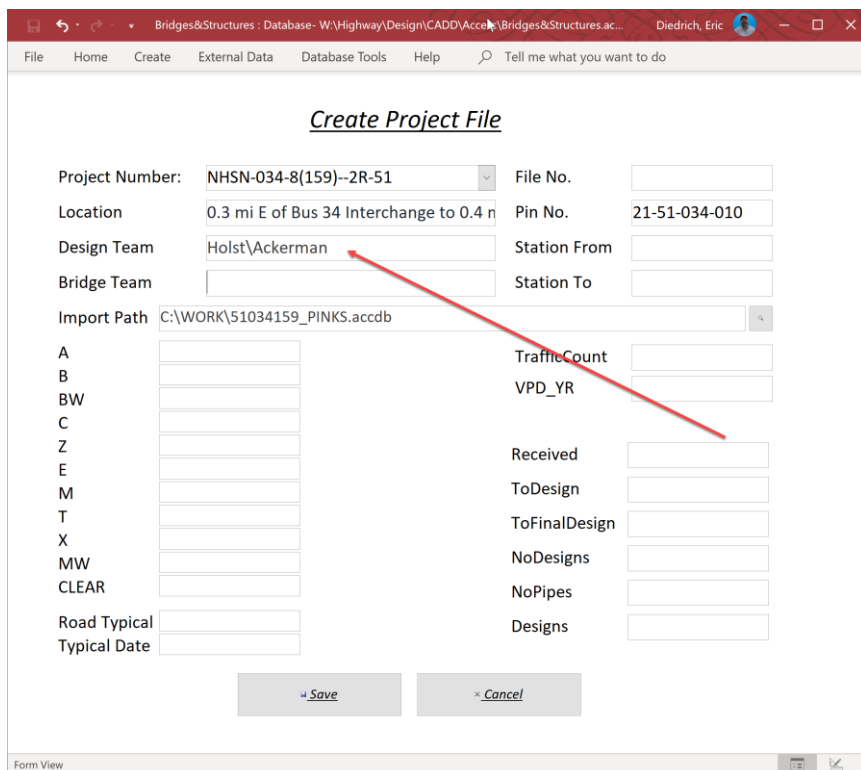
MW Designs

CLEAR

Road Typical

Typical Date

Next, fill out the Design Team. For this example, it will be Holst\Ackerman. It should look like this.



Create Project File

Project Number: NHSN-034-8(159)--2R-51 File No.

Location: 0.3 mi E of Bus 34 Interchange to 0.4 mi E of Umber Ave (5 Locations) Pin No. 21-51-034-010

Design Team: Holst\Ackerman Station From

Bridge Team Station To

Import Path C:\WORK\51034159_PINKS.acddb

A TrafficCount

B VPD_YR

BW

C

Z Received

E ToDesign

M ToFinalDesign

T NoDesigns

X NoPipes

MW Designs

CLEAR

Road Typical

Typical Date

Next, add the Bridge Team. For this example, it will be Claman\Diedrich. It should look something like this.

Next, fill out the File No. and Station from and Station To. Then Click Save.

Note: If the File No. and Station from and Station To are not known at the time of the project creation, leave it blank and fill it in later. Also, creation of the project as a new project is only need once. It will be accessed from the list button from then on.

Click the save button. The New Project will open at the first record. If the Survey Records (CCRRRPPP_PINKS.sccdb) was imported, it will open at the first record that was imported. For this example, the imported Survey Records (CCRRRPPP_PINKS.sccdb) contained two structures so it will show record 1 of 2 as shown at the bottom left.

If survey records were not imported, it will show 1 of 1 records. Since the survey records were imported, the Survey Station, the Drainage Area, Terrain Type and Description of the existing structure are shown.

This is the form that will need to be filled out for each structure in the new drainage design. If the existing structure is being replaced with a new one, fill out the proposed structure information on the record of the existing structure that will be replaced. If the existing structure will be left in place and used as constructed in the new drainage design, leave the proposed structure portion of this record blank. For this example, the existing structure (54" pipe) is being replaced with a new (54" pipe) and the Proposed Structure information needs filled out on this record.

The first thing to fill out is the Design number of the existing structure if it is an RCB. This information can be acquired from the as-builts and entered here.

Present Structure

Design No.	<input type="text"/>	Drainage Area	19.15 acres	TerrainType	<input type="text"/>
Survey Station	414+91.90	Description	54"x289'		
Remove Apron	Both	Remove Headwall To Face Parapet	<input type="text"/>		

PROPOSED STRUCTURE

This example is a pipe, so there is not a design number. Leave it blank.

The next thing to do is decide what will be done with the existing structure.

If the structure is a pipe, click on the pulldown on the Remove Apron field. This will provide 3 options, Left, Right and Both. If the pipe is being extended, select the end that is being extended. However, if the pipe is being replaced select Both.

The screenshot shows the 'Bridges & Structures' software interface. The title bar indicates the database path: 'Bridges&Structures : Database- W:\Highway\Design\CADD\Access\Brid...'. The ribbon includes 'File', 'Home', 'Create', 'External Data', 'Database Tools', and 'Help'. The 'BRIDGE AND CULVERT SCHEDULE' section displays project details: PROJECT NO. NHSN-034-8(159)-2R-51, PIN NO. 21-51-034-010, LOCATION 0.3 mi E of Bus 34 Interchange to 0.4 m, and TO. The 'DESIGNER' section lists ROAD, DRAINAGE, and TRAFFIC COUN. The 'Present Structure' section includes fields for Design No., Drainage Area (19.15 acres), Survey Station (414+91.90), and Description (54"x289'). The 'Remove Apron' dropdown menu is open, showing options: Left, Right, and Both. A red arrow points to the 'Both' option. The 'PROPOSED STRUCTURE' section includes fields for Station, Offset, Kind, Size, Design No., Design Q, Bedding Class, Proposed Camber DR102, Design Cover, Pipe Class, Length New Construction, and Proposed Apron In.

If the structure is an RCB, click on the pulldown on the Remove Headwall field. This will provide 3 options, Left, Right and Both. If the RCB is being extended, select the end that is being extended. However, if the RCB is being replaced select Both.

The screenshot shows the 'Bridges & Structures' software interface. The title bar indicates the database path: 'Bridges&Structures : Database- W:\Highway\Design\CADD\Access\Bridges & Structures Data...'. The ribbon includes 'File', 'Home', 'Create', 'External Data', 'Database Tools', and 'Help'. The 'BRIDGE AND CULVERT SCHEDULE' section displays project details: PROJECT NO. NHSN-034-8(159)-2R-51, PIN NO. 21-51-034-010, LOCATION 0.3 mi E of Bus 34 Interchange to 0.4 m, and TO. The 'DESIGNER IN CHARGE' section lists ROAD (Holst/Ackerman), DRAINAGE (Claman/Diedrich), and TRAFFIC COUNT (VPD YR). The 'Present Structure' section includes fields for Design No., Drainage Area (19.15 acres), TerrainType (Rolling), Survey Station (414+91.90), and Description (54"x289'). The 'Remove Apron' dropdown menu is open, showing options: Left, Right, and Both. A red arrow points to the 'Both' option. The 'PROPOSED STRUCTURE' section includes fields for Station, Offset, Kind, Size, Design No., Bedding Class, Proposed Camber DR102, Design Cover, Pipe Class, Length New Construction, Control, Left/Right, Location Station, and Top Elevation.

For this example, it is a 54-inch pipe and is being replaced with a new structure so select Both.

BRIDGES&STRUCTURES : Database- W:\Highway\Design\CADD\Access\Bridges & Structures

File Home Create External Data Database Tools Help Tell me what you want to do

BRIDGE AND CULVERT SCHEDULE FILE NO. DESIGNER IN CHARGE

PROJECT NO. NHSN-034-8(159)--2R-51 PIN NO. 21-51-034-010 ROAD Holst\Ackerr

LOCATION 0.3 mi E of Bus 34 Interchange to 0.4 m TO DRAINAGE Claman\Diec

TRAFFIC COUNT

Present Structure

Design No. Drainage Area 19.15 acres TerrainType:

Survey Station 414+91.90 Description 54"x289'

Remove Apron Both Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: Bedding Class:

Offset: Proposed Camber DR102:

Kind: Design Cover:

Size: Pipe Class:

Design No: Length New Construction:

Design Q: Proposed Apron In:

Next, fill out the Station of the Proposed Structure. This is the station value that is the intersection point at the centerline of the Proposed Structure and the centerline of the design alignment. For this example, it will be 414+29.00.

Note: when entering this station value, do not place the plus+ just the numeric value and then click in the next field. The database will put in the plus+ as shown below.

Present Structure

Design No. Drainage Area 19.15 acres TerrainType: Rollir

Survey Station 414+91.90 Description 54"x289'

Remove Apron Both Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: 41429.00 Bedding Class:

Offset: Proposed Camber DR102:

Kind: Design Cover:

Size: Pipe Class:

Design No: Length New Construction:

Design Q: Proposed Apron In:

Headwater: Proposed Apron Out:

Standard Connection Type:

DR Flume Description:

A Grade:

R Flowline Left: Apron G

Present Structure

Design No. Drainage Area 19.15 acres TerrainType: Rol

Survey Station 414+91.90 Description 54"x289'

Remove Apron Both Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: 414+29.00 Bedding Class:

Offset: Proposed Camber DR102: Contr

Kind: Design Cover: Left/R

Size: Pipe Class: Locati

Design No: Length New Construction: Top E

Design Q: Proposed Apron In: Type

Headwater: Proposed Apron Out:

Standard Connection Type:

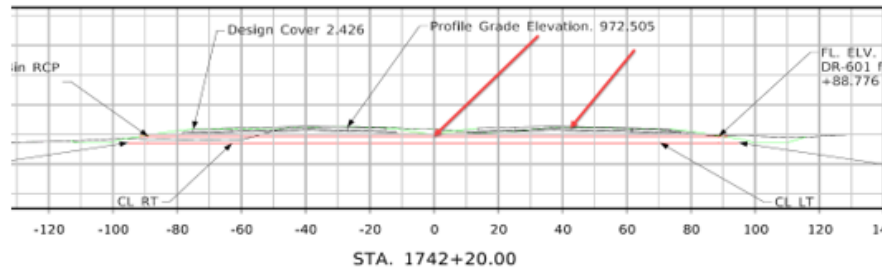
DR Flume Description:

A Grade: Apron

R Flowline Left: Diaphi

Flowline Right:

The next field is Offset field. This is used if the structure is on a divided highway. This will be the distance from the mainline centerline to the Base Line as described in the standards.



If designing a two-lane highway like in this example, leave this blank.

The next field is the Kind of structure. This refers to what kind of structure is the proposed structure.

Present Structure

Design No. Drainage Area acres TerrainType

Survey Station Description

Remove Apron Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: Bedding Class:

Offset: Proposed Camber DR102:

Kind: Design Cover:

Size: Pipe Class:

Design No: Length New Construction:

Design Q: Proposed Apron In:

Headwater: Proposed Apron Out:

Standard Connection Type:

DR Flume Description:

A Grade:

~ Flowline Left:

For this example, select RCP.

Next, select the size.

Present Structure

Design No. Drainage Area acres Terra

Survey Station Description

Remove Apron Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: Bedding Class:

Offset: Proposed Camber DR102:

Kind: Design Cover:

Size: Pipe Class:

Design Q: Length New Construction:

Headwater: Proposed Apron In:

Standard Proposed Apron Out:

DR Connection Type:

A Flume Description:

B Grade:

C Flowline Left:

D Flowline Right:

E Flowline Other:

~ Flowline Other:

Record: 14 1 1 Filter Search

Proposed Size: 84

For this example, it will be 54"

Present Structure

Design No. Drainage Area acres TerrainType: Rollin

Survey Station Description

Remove Apron Both Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: Bedding Class:

Offset: Proposed Camber DR102: Control

Kind: RCP Design Cover: Left/Rig

Size: Pipe Class: Location

Design Q: Length New Construction: Top Elev

Headwater: Proposed Apron In: Type

Standard

DR

Flume Description:

Grade:

Flowline Left: Apron G

Flowline Right: Diaphra

Flowline Other Tee Sect

Flowline Other Reducer



The Next field is the Design Q. Obtain the value from the ICH program that is used to determine the size of the proposed structure. This comes from the Iowa Runoff Chart.

Iowa Runoff Chart

Drainage Area (Acres, 1 to 1280) Compute Q's Print

Land Use and Slope

Select

Land Use LF

Slope 0.6

Specify

Description

LF (0 to 1)

Chart Q (ft³/s)

Return Period (Years)	Frequency Factor (FF)	Q (ft ³ /s)
5	0.5	21
10	0.7	29
25	0.8	34
50	1	42
100	1.2	51

So, for this example it will have a Design Q of 42 because it is designed for the 50-year flood event.

Present Structure

Design No. Drainage Area acres TerrainType: Rolling

Survey Station Description

Remove Apron Both Remove Headwall To Face Parapet

PROPOSED STRUCTURE

Station: Bedding Class:

Offset: Proposed Camber DR102: Control

Kind: RCP Design Cover: Left/Right

Size: Pipe Class: Location S

Design Q: Length New Construction: Top Elevat

Headwater: Proposed Apron In: Type

Standard

DR

Flume Description:

Grade:

Flowline Left: Apron Gua

Flowline Right: Diaphragm

Flowline Other Tee Section

The Next field is the Headwater. This will need to be calculated for the larger structures, however the example is small enough it is left blank.

The next field is the design Standard of the proposed structure. Select the correct Standard from the Proposed Structure field by clicking on the pulldown in the DR field. For the example it will be a [DR-601](#).

SECTION

PLAN

REINFORCED CONCRETE PIPE CULVERT

DR-601

STANDARD ROAD PLAN

REVISION

REMARKS

APPROVED BY

REINFORCED CONCRETE PIPE CULVERT

DR-601

STANDARD ROAD PLAN

REVISION

REMARKS

APPROVED BY

REINFORCED CONCRETE PIPE CULVERT

Note: For more information on the Iowa Department of Transportation drainage standards see the web page at this link. https://iowadot.gov/design/stdplne_dr

Bridges&Structures : Database- W:\Highway\Design\CADD\Access\Bridges & Structures Data...

File Home Create External Data Database Tools Help Tell me what you want to do

Offset: Kind: RCP Size: 54 Design Q: 42 Headwater: Standard DR-601

Proposed Camber DR102: Design Cover: Pipe Class: Length New Construction: Proposed Apron In: Proposed Apron Out: Connection Type: Flume Description: Grade: Flowline Left: Flowline Right: Flowline Other: Flowline Other: DR205 Inlet Apron Top: Total Length Left: Total Length Right: Trenchless Total: Extension Left: Extension Right: Skew Ahead Left: Skew Ahead Right

Control Left/Right Location Station Top Elevation Type

Apron Guard (DR2) Diaphragm (DR501) Tee Section (DR14) Reducer

Remarks:

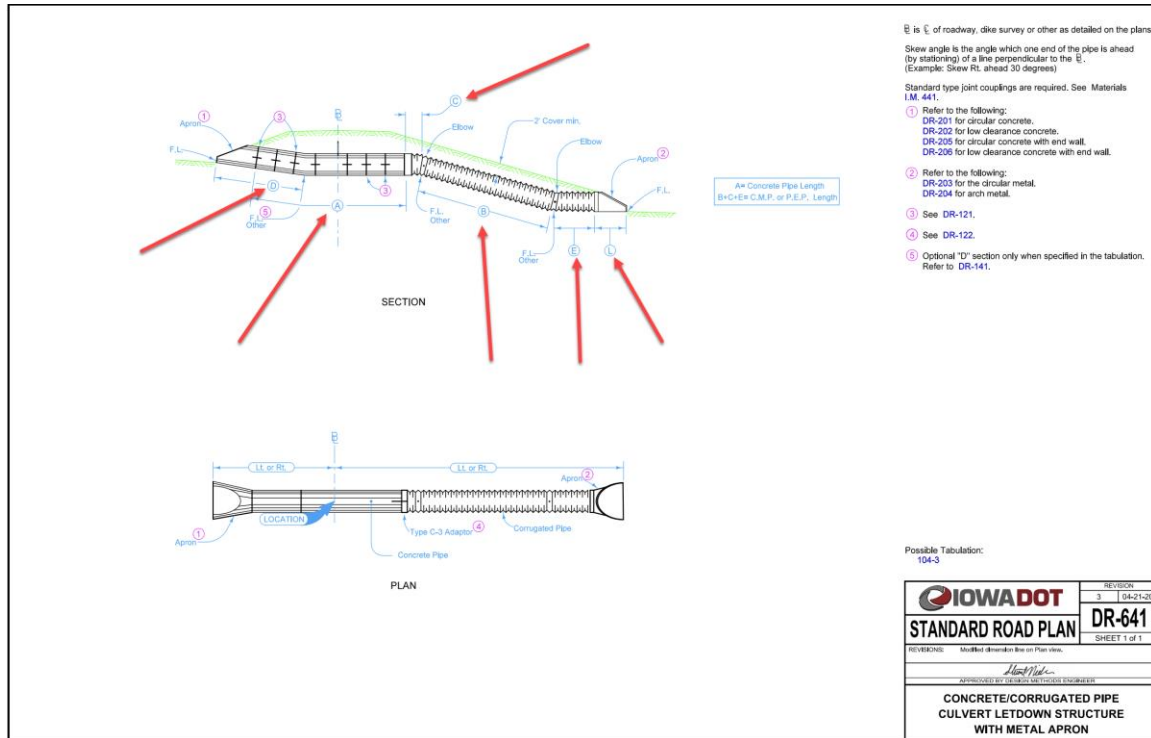
0

First Previous Save/Next Last Delete C

Record: 1 of 2 No Filter Search

Form View

Depending on the DR Standard that is selected the appropriate information fields will become active.
For example, assume the standard used is [DR-641](#)



The information fields A,B,C,D,E and L are now active and the corresponding information will be filled in.

Standard	Connection Type:
DR	Flume Description:
A	Grade:
B	Flowline Left:
C	Flowline Right:
D	Flowline Other
E	Flowline Other
F	DR205 Inlet Apron Top
G1	Total Length Left
G2	Total Length Right
L	Trenchless Total
M	Extension Left
R	Extension Right
X	Skew Ahead Left
Elbow 1	Skew Ahead Right
Elbow 2	
Standard Dr	

First Previous Save/Next

Record: 1 of 2 No Filter Search

Form View

Note: when entering a [DR-641](#) use two records in the database. One for the concrete or RCP portion of the structure and one for the CMP or plastic letdown section of the structure. Enter RCP portion on the first record with all special dimensions. Then just the letdown dimensions on the second record. This will allow the structure to be tabulated correctly.

For this design example, use a [DR-601](#).

Next, select the Bedding Class:

Survey Station	414+91.90	Description	54" x 289'
Remove Apron	Both	Remove Headwall To Face Parapet	

PROPOSED STRUCTURE

Station:	414+29.00	Bedding Class:	B	Control	DI
Offset:		Proposed Camber DR102:	B	Left/Right	
Kind:	RCP	Design Cover:	C	Location Station	
Size:	54	Pipe Class:		Top Elevation	
Design No:		Length New Construction:		Type	
Design Q:	42	Proposed Apron In:			
Headwater:		Proposed Apron Out:			
Standard		Connection Type:			

For pipes it will usually be Class C. However, refer to the [DR-101](#) to verify.

Next, enter the Design Cover for the pipe design. This is the distance from the top of the pipe to the shoulder of the roadway. Refer to the [DR-102](#) to verify. For this example, it will be 2.42

Present Structure			
Design No.		Drainage Area	19.15 acres
Survey Station	414+91.90	TerrainType:	Rolling
Remove Apron	Both	Description	54"x289'
Remove Headwall To Face Parapet			

PROPOSED STRUCTURE

Station:	414+29.00	Bedding Class:	C	Control	
Offset:		Proposed Camber DR102:		Left/Right	
Kind:	RCP	Design Cover:	2.42	Location Station	
Size:	54	Pipe Class:		Top Elevation	
Design No:		Length New Construction:		Type	
Design Q:	42	Proposed Apron In:			
Headwater:		Proposed Apron Out:			
Standard		Connection Type:			
DR	DR-601	Flume Description:			

Next, decide what class of pipe is used for this design. This is determined by the design cover and Bedding Class. Refer to the [DR-104](#) to verify. Use 2000 for this example.

Present Structure			
Design No.		Drainage Area	19.15 acres TerrainType: Rolling
Survey Station	414+91.90	Description	54"x289'
Remove Apron	Both	Remove Headwall To Face Parapet	

PROPOSED STRUCTURE			
Station:	414+29.00	Bedding Class:	C
Offset:		Proposed Camber DR102:	
Kind:	RCP	Design Cover:	2.42
Size:	54	Pipe Class:	2000
Design No:		Length New Construction:	2000
Design Q:	42	Proposed Apron In:	3000
Headwater:		Proposed Apron Out:	4000
Standard		Connection Type:	Unclassified
DR	DR-601	Flume Description:	
A		Grade:	
B		Flowline Left:	
C		Flowline Right:	
D		Flowline Other	

Next, enter the Length New Construction value. This is the total length from connection point of inlet apron to connection point of outlet apron. For the example it will be 290'.

The next two fields are Proposed Apron In and Proposed Apron Out. This is used to determine how many aprons will be needed to construct the new pipe. So, for the example place a (1) in each field so that there are two 54" pipe aprons on the 104-3 tab sheet. If the design was to only extend the pipe, place a (1) in the field of the end of the pipe that was being extended, Inlet or outlet.

PROPOSED STRUCTURE			
Station:	414+29.00	Bedding Class:	C
Offset:		Proposed Camber DR102:	
Kind:	RCP	Design Cover:	2.42
Size:	54	Pipe Class:	2000
Design No:		Length New Construction:	290
Design Q:	42	Proposed Apron In:	1
Headwater:		Proposed Apron Out:	1
Standard		Connection Type:	
DR	DR-601	Flume Description:	
A		Grade:	
B		Flowline Left:	
C		Flowline Right:	
D		Flowline Other	
E		Flowline Other	
F		DR205 Inlet Apron Top	
G1		Total Length Left	
G2		Total Length Right	

The next field, Connection Type, is for indicating if the design requires a connection type, either a [DR-122](#) or [DR-141](#). Select the correct standard and the additional field will appear for the corresponding information for that standard. This will not be used for this design.

The next field is if the design uses a flume. Enter the size and type of flume in this field. This will not be used for this design.

The next field is for the Grade. This is going to be the Profile Grade Elevation that was determined while designing the structure and annotated on the cross section. For this example, it will be 972.50.

Note: The cross section is a great source to use to fill out this data.

Station:	414+29.00	Bedding Class:	C	
Offset:		Proposed Camber DR102:		Control
Kind:	RCP	Design Cover:	2.42	Left/Right
Size:	54	Pipe Class:	2000	Location Station
Design No:		Length New Construction:	290	Top Elevation
Design Q:	42	Proposed Apron In:	1	Type
Headwater:		Proposed Apron Out:	1	
Standard		Connection Type:		
DR	DR-601	Flume Description:		
A		Grade:	972.50	Apron Guard (DR213)
B		Flowline Left:		Diaphragm (DR501)
C		Flowline Right:		Tee Section (DR142)
D		Flowline Other		Reducer
E		Flowline Other		
F		DR205 Inlet Apron Top		Remarks:
G1		Total Length Left		
G2		Total Length Right		
L		Trenchless Total	0	
..		Extension Left		

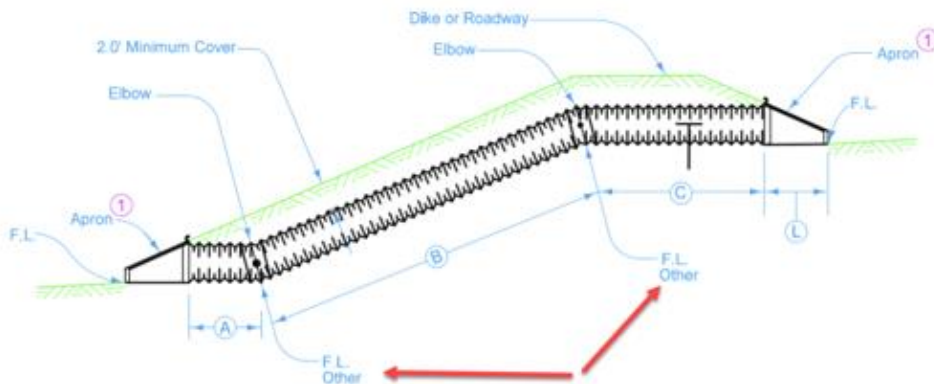
The next 2 fields will be Flowline Left and Flowline Right. This is the elevation of the flowline at the end of the pipe apron.

Note: This information was determined during the design process and annotated on the cross section. The cross section is a great source to use to fill out this data.

PROPOSED STRUCTURE				
Station:	414+29.00	Bedding Class:	C	
Offset:		Proposed Camber DR102:		Control
Kind:	RCP	Design Cover:	2.42	Left/Right
Size:	54	Pipe Class:	2000	Location Station
Design No:		Length New Construction:	290	Top Elevation
Design Q:	42	Proposed Apron In:	1	Type
Headwater:		Proposed Apron Out:	1	
Standard		Connection Type:		
DR	DR-601	Flume Description:		
A		Grade:	972.50	Apron Guard (DR213)
B		Flowline Left:	971.69	Diaphragm (DR501)
C		Flowline Right:	969.95	Tee Section (DR142)
D		Flowline Other		Reducer
E		Flowline Other		
F		DR205 Inlet Apron Top		Remarks:
G1		Total Length Left		

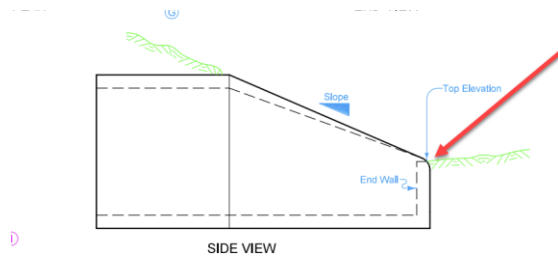
The next fields are used if the standard requires other flowline elevations to be reported, for example a [DR-632](#).

Note: This information was determined during the design process and annotated on the cross section. The cross section is a great source to use to fill out this data.



The next field , DR205 Inlet Apron Top, is for the elevation at the top of the end wall of a [DR-205](#). If this apron is used in the design, enter the elevation here.

Note: This information was determined during the design process and annotate it on the cross section. The cross section is a great source to use to fill out this data.



The next two fields are to report on the Total Length Left and the Total Length Right. This is the distance from center line to end of the apron.

Note: If there is not an offset base line, this will be the offset of the point at the end of the apron. This information was determined during the design process and annotated on the cross section. The cross section is a great source to use to fill out this data.

Size:	54	Pipe Class:	2000	Location Station:	
Design No:		Length New Construction:	290	Top Elevation:	
Design Q:	42	Proposed Apron In:		Type:	
Headwater:		Proposed Apron Out:			
Standard:		Connection Type:			
DR	DR-601	Flume Description:			
A		Grade:	972.50		
B		Flowline Left:	971.69	Apron Guard (DR2	
C		Flowline Right:	969.95	Diaphragm (DR50:	
D		Flowline Other		Tee Section (DR14	
E		Flowline Other		Reducer	
F		DR205 Inlet Apron Top		Remarks:	
G1		Total Length Left	145.00		
G2		Total Length Right	145.00		
H		Trenchless Total			
I		Extension Left			
J		Extension Right			
K					
L					

The next field is for reporting the Trenchless Total. This will refer to a pipe that requires to be jacked in place during installation as opposed to being replaced by cut and cover. This field is to enter the total distance of that pipe that is to be jacked.

Size:	54	Pipe Class:	2000	Location Station:	
Design No:		Length New Construction:	290	Top Elevation:	
Design Q:	42	Proposed Apron In:	1	Type:	
Headwater:		Proposed Apron Out:	1		
Standard		Connection Type:			
DR	DR-601	Flume Description:			
A		Grade:	972.50		
B		Flowline Left:	971.69	Apron Guard (DR2	
C		Flowline Right:	969.95	Diaphragm (DR50:	
D		Flowline Other		Tee Section (DR14	
E		Flowline Other		Reducer	
F		DR205 Inlet Apron Top		Remarks:	
G1		Total Length Left	145.00		
G2		Total Length Right	145.00		
H		Trenchless Total	0		
I		Extension Left			
J		Extension Right			
K		Skew Ahead Left			
L		Skew Ahead Right			

The next two fields are for if the design is to extend the existing structure. Enter the total distance in the direction of the extension that is to be constructed.

Design Q:	42	Proposed Apron In:		Type:	
Headwater:		Proposed Apron Out:	1		
Standard		Connection Type:			
DR	DR-601	Flume Description:			
A		Grade:	972.50		
B		Flowline Left:	971.69	Apron Guard (DR213)	
C		Flowline Right:	969.95	Diaphragm (DR501)	
D		Flowline Other		Tee Section (DR142)	
E		Flowline Other		Reducer	
F		DR205 Inlet Apron Top		Remarks:	
G1		Total Length Left	145.00		
G2		Total Length Right	145.00		
H		Trenchless Total	0		
I		Extension Left			
J		Extension Right			
K		Skew Ahead Left			
L		Skew Ahead Right			
Elbow 1					
Elbow 2					
Standard Dr					

The next two fields are for if the structure is skewed, enter the degree of the angle of the skew in the appropriate field Right or Left.

Station:	414+29.00	Bedding Class:	C	
Offset:		Proposed Camber DR102:		Contr
Kind:	RCP	Design Cover:	2.42	Left/F
Size:	54	Pipe Class:	2000	Locat
Design No:		Length New Construction:	290	Top E
Design Q:	42	Proposed Apron In:	1	Type
Headwater:		Proposed Apron Out:	1	
Standard		Connection Type:		
DR	DR-601	Flume Description:		
\		Grade:	972.50	
3		Flowline Left:	971.69	Apron
0		Flowline Right:	969.95	Diaph
0		Flowline Other		Tee Se
:		Flowline Other		Reduc
:		DR205 Inlet Apron Top		Remar
51		Total Length Left	145.00	
52		Total Length Right	145.00	
-		Trenchless Total	0	
M		Extension Left		
3		Extension Right		
<		Skew Ahead Left		
Elbow 1		Skew Ahead Right		
Elbow 2				
Standard Dr				

The next five fields are for when a dike is included in the drainage design.

C		DIKE	
2:		Control	
	2.42	Left/Right	
2000		Location Station	
1:	290	Top Elevation	
	1	Type	
	1		

The next field is for if the design has an [DR-213](#). Enter the number that is needed for that structure.

1	Type		Nur
1			
972.50			
971.69	Apron Guard (DR213)		
969.95	Diaphragm (DR501)		
	Tee Section (DR142)		
	Reducer		
	Remarks:		
145.00			
145.00			

The next field is for when the design has an [DR-501](#). Enter the number that is needed for that structure.

1	Type		Nur
1			
972.50			
971.69	Apron Guard (DR213)		
969.95	Diaphragm (DR501)		
	Tee Section (DR142)		
	Reducer		
	Remarks:		
145.00			
145.00			

The next field is for when the design has an [DR-142](#). Enter the number that is needed for that structure.

1	Type		Nur
1			
972.50			
971.69	Apron Guard (DR213)		
969.95	Diaphragm (DR501)		
	Tee Section (DR142)		
	Reducer		
	Remarks:		
145.00			
145.00			

The next field is for when the design has a Reducer. Enter the number and size that is needed for that structure.

1	Type		Nur
1			
972.50			
971.69	Apron Guard (DR213)		
969.95	Diaphragm (DR501)		
	Tee Section (DR142)		
	Reducer		
	Remarks:		
145.00			
145.00			

The next field is for Remarks. This is intended for the designer to include the design intent and direction on the staging of the replacement for the proposed structure.

Examples of typical remarks:

Plug and abandon exist median drain at Sta 1451+26. Jack 78' of 24" RCP then lay one 6' DR141 Type "D" double bevel section + apron on inlet end at Sta. 1452+25 – 51' Lt

or

Remove 30 ft of existing 36 in RCP. Replace with 42 ft of 36in RCP with one DR-141 7.5-degree D section beveled end to the RT. Tie new pipe to old pipe with longitude tie bars.

The purpose of the remarks is to eliminate questions during the construction phase of the project.

PROPOSED STRUCTURE				DIKE	
Station:	414+29.00	Bedding Class:	C	Control	
Offset:		Proposed Camber DR102:		Left/Right	
Kind:	RCP	Design Cover:	2.42	Location Station	
Size:	54	Pipe Class:	2000	Top Elevation	
Design No:		Length New Construction:	290	Type	
Design Q:	42	Proposed Apron In:	1		
Headwater:		Proposed Apron Out:	1		
Standard		Connection Type:			
DR	DR-601	Flume Description:			
A		Grade:	972.50	Apron Guard (DR213)	
B		Flowline Left:	971.69	Diaphragm (DR501)	
C		Flowline Right:	969.95	Tee Section (DR142)	
D		Flowline Other		Reducer	
E		Flowline Other			
F		DR205 Inlet Apron Top		Remarks:	Remove or plug and abandon existing 54" RCP at Sta. 141+91.90 Replace with 290' 54" RCP at Sta. 141+29.00 with inlet and outlet aprons. Cut and cover.
G1		Total Length Left	145.00		
G2		Total Length Right	145.00		
L		Trenchless Total	0		
M		Extension Left			
R		Extension Right			
X		Skew Ahead Left			
Elbow 1		Skew Ahead Right			
Elbow 2					
Standard Dr					

Once all the correct fields that corresponds with that structure standard are entered in the record, move to the next record and repeat the process. If the next structure is to be replacing an existing structure, find the records that were imported from the CRRRPPP_PINKS.sccdb that corresponds with that structure. If the next structure does not replace an existing structure, make a new record.

To do this, click the buttons at the bottom of the record or the arrow buttons in the access database task bar to navigate to the desired record.

F		DR205 Inlet Apron Top	
G1		Total Length Left	145.00
G2		Total Length Right	145.00
L		Trenchless Total	0
M		Extension Left	
R		Extension Right	
X		Skew Ahead Left	
Elbow 1		Skew Ahead Right	
Elbow 2			
Standard Dr			

« First
Previous
Save/Next
« Last

Record: 1 of 2 No Filter Search

Form View

Once a record for each structure in the drainage design is finished, create the Schedule Sheet. To do this, click on the Schedule Sheet button at the bottom of the record.

59	Apron Guard (DR213)	
95	Diaphragm (DR501)	
	Tee Section (DR142)	
	Reducer	
00	Remarks:	Remove or plug and abandon existing 54" RCP at Sta. 141+91.90 Replace with 290' 54" RCP at Sta. 141+29.00 with inlet and outlet aprons. Cut and cover.
00		
0		

« Last
Delete Current
Main Menu
Schedule Sheet

All the records in the project are compiled onto a Schedule Sheet.

BRIDGE AND CULVERT SCHEDULE

FILE NO: 21-51-034-030
 PROJECT NO: NH0N-034-8(159)-28-51
 LOCATION: 0.3 mi E of Bus 34 Interchange to 0.4 m

DESIGNER IN CHARGE: Holst/Ackerman
 ROAD DRAINAGE: Claman/Diedrich

TRAFFIC COUNT: VPD YR
 SEE ROAD DESIGN TYPICAL NO.

DESIGN: PRESENT STRUCTURE, PROPOSED STRUCTURE, ELEVATION, DIMENSIONS (ft), SKEW (DEGREES), DIKE

DESIGN	PRESENT STRUCTURE	PROPOSED STRUCTURE	ELEVATION	DIMENSIONS (ft)	SKEW (DEGREES)	DIKE																													
NUMBER	DRAINAGE AREA	SURVEY STATION	DESCRIPTION	STATION	OFFSET	DR	SIZE	KIND	LGTH NEW CONST	DESIGN COVER (in)	IN	OUT	TYPE	NO	FLUME DESCRIPTION	GRADE	LEFT	RIGHT	OTHER	OTHER	DB-205 INLET APPROX TOP ELEV	DB-205 INLET APPROX TOP ELEV	TRENCH LGTH TOTAL	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	CNTR	LT/RT	LOCATION STATION	TOP ELEVATION	TOP ELEV	DISPOSITION OF PRESENT
15-15-Routing	414+91.50	54+289	414+29.00	58-401	54	RCP	290	2-42	1	1					972.50	971.69	969.95				145.00	145.00	0												
11.5-Hilly	228+15.65	54+432																																	

The next step, will be to create a PDF of the Schedule Sheet. To do this, just click on the Create PDF button at the top of the Schedule Sheet.

BRIDGE AND CULVERT SCHEDULE

FILE NO: 21-51-034-030
 PROJECT NO: NH0N-034-8(159)-28-51
 LOCATION: 0.3 mi E of Bus 34 Interchange to 0.4 m

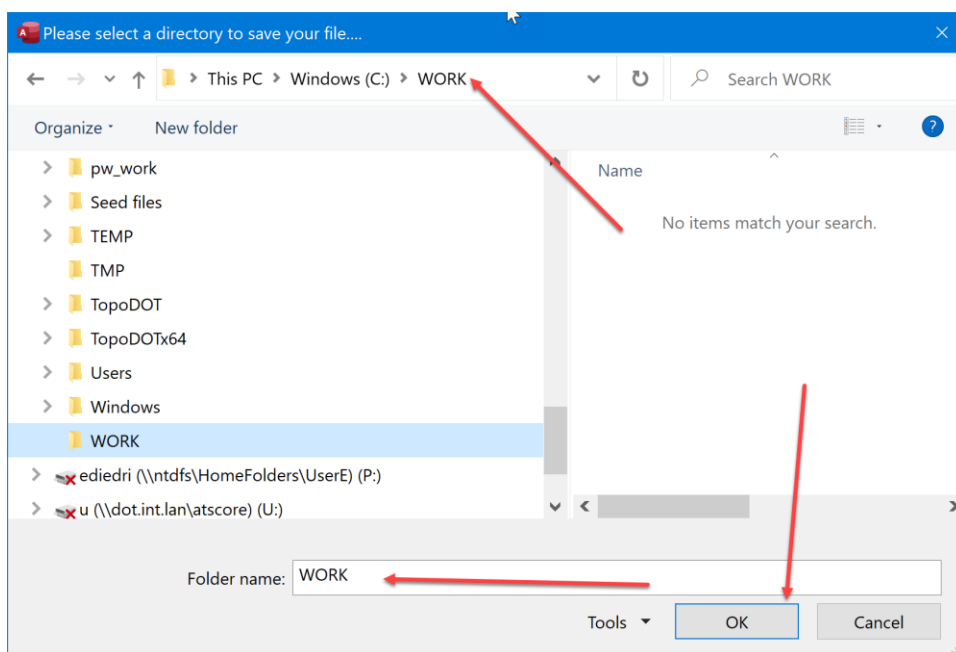
DESIGNER IN CHARGE: Holst/Ackerman
 ROAD DRAINAGE: Claman/Diedrich

TRAFFIC COUNT: VPD YR
 SEE ROAD DESIGN TYPICAL NO.

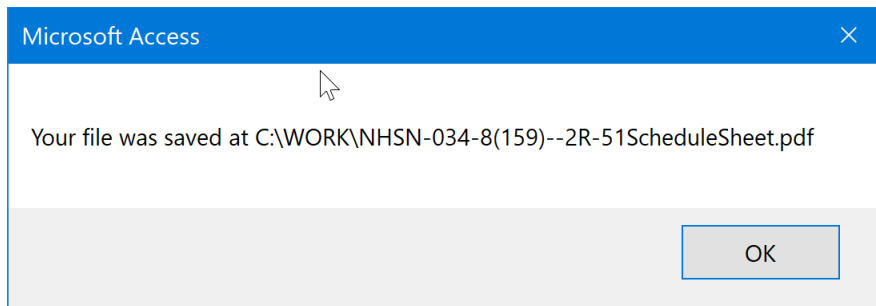
DESIGN: PRESENT STRUCTURE, PROPOSED STRUCTURE, ELEVATION, DIMENSIONS (ft), SKEW (DEGREES), DIKE

DESIGN	PRESENT STRUCTURE	PROPOSED STRUCTURE	ELEVATION	DIMENSIONS (ft)	SKEW (DEGREES)	DIKE																													
NUMBER	DRAINAGE AREA	SURVEY STATION	DESCRIPTION	STATION	OFFSET	DR	SIZE	KIND	LGTH NEW CONST	DESIGN COVER (in)	IN	OUT	TYPE	NO	FLUME DESCRIPTION	GRADE	LEFT	RIGHT	OTHER	OTHER	DB-205 INLET APPROX TOP ELEV	DB-205 INLET APPROX TOP ELEV	TRENCH LGTH TOTAL	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	CNTR	LT/RT	LOCATION STATION	TOP ELEVATION	TOP ELEV	DISPOSITION OF PRESENT
15-15-Routing	414+91.50	54+289	414+29.00	58-401	54	RCP	290	2-42	1	1					972.50	971.69	969.95				145.00	145.00	0												
11.5-Hilly	228+15.65	54+432																																	

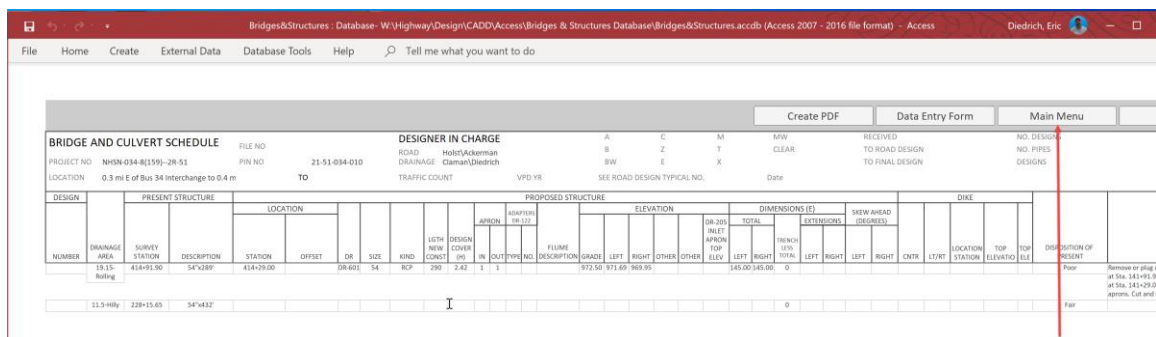
It will open the dialog box asking to select a directory to save the PDF file. For this example, use the C:\WORK directory that was created to download the CRRRRPPP_PINKS.sccdb to. Once the directory is selected, click the OK button.



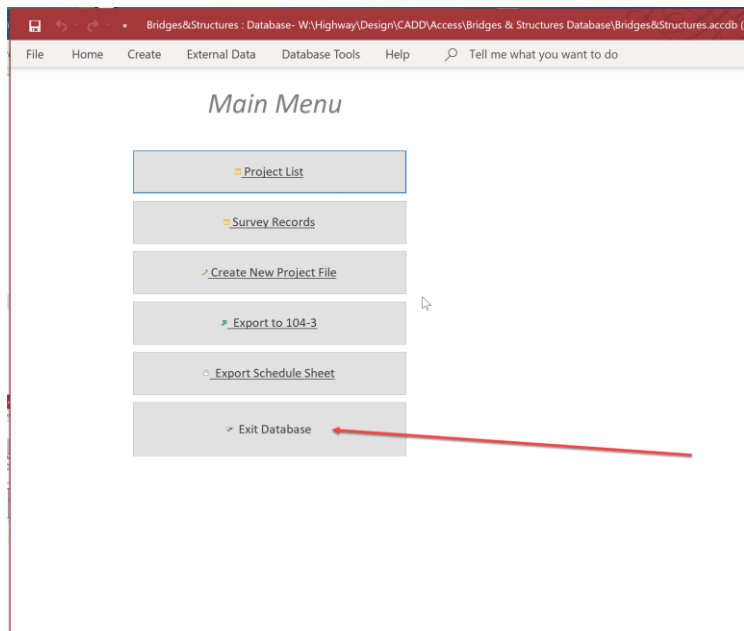
It will create the PDF of the Schedule Sheet in that directory and name the file Project NumberScheduleSheet.PDF. So, for this example it would be named “NHSN-034-8(159)—2R-51ScheduleSheet.pdf”. It will display this message to indicate when it is done. Click the OK button to dismiss.



Next, exit the database. To do this, click on the Main Menu button at the top of the Schedule Sheet.



Once in the Main Menu just click on the Exit Database button.



Place the Project NumberScheduleSheet.pdf file in the Bridge\Design Events\B01\ folder of the project directory in project wise.