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CES321395

The Corridor Trail – Covering More Ground Than Lewis and Clark

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Learning Objectives

- Questions to consider at the beginning of a corridor project
- Review the pros and cons of custom sub-assemblies and out of the box sub-assemblies
- Utilizing different code set styles for visualization of specific elements
- Approaches to unique grading scenarios
- Earthwork analysis and configurations

Description

When it comes to consistent and precise corridor design, it's all about knowing where you're going before you even start, especially when it comes to generating accurate earthwork quantities and surfaces that could potentially be handed over for construction purposes. We will go over many questions to think about before pushing that assembly through your entire project. We'll dive into opinions of out-of-the-box subassemblies vs creating your own custom subassemblies and review some key ones that we have created to help streamline the design process. Setting up code set styles to not only to help visualize surface creation but also materials which we can use for quantities. Next, we will look at different approaches to modeling unique design elements (and when to throw in the towel on others). And finally, we'll also review surface creation of proposed ground and areas for removal to help with more accurate quantities when utilizing tin subtraction and/or average end area.

Speaker(s)

Andy is the Midwest Regional CAD Coordinator with Kimley-Horn and Associates. He has 20 years of civil engineering experience ranging from private development to major transit projects with a current focus on roadway design. His current and past roles included daily production, trouble shooting of issues, and building best practices for end-users. He prides himself in diving deeper into Civil 3D to be able to manipulate the program to produce the best possible product.

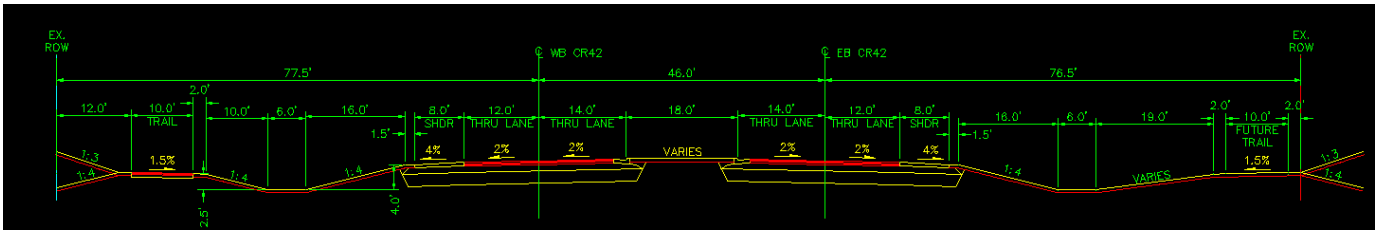
Where is Oregon anyways?

Before you hitch that wagon, you might need to figure out where exactly you're going. Here is an outline of a few things to ask your PM or keep in mind while your setting up your corridor drawing.

Typical Sections

Creating good typical sections that both you and your project manager agree on will give clear direction and context to 2D geometry and will help you consider what subassemblies should be used and how you might need to split up your corridor. Some items to consider:

- Curb types (Infall/Outfall)
- Super elevation needs
- Specific cross slopes / grades
- Depths of ditches
- Independent alignment and profile points
- Daylighting slopes



Corridor Setup

Review your project from a high level, and asses how you might need divide up the project to make the design process easier and more efficient.

- Find natural breaks (bridges/intersections) in your project to divide up your corridor – remember surface created from corridors don't like gaps, so keep this in mind.
- Order of construction is an important process to think about. Pick that main corridor you can have other corridors target (extracted feature lines/surfaces).
- If the project is a divided highway, consider dividing it into two sides. This can help in targeting at intersections and rebuild times.
- Will the project be completed in phases? This might not be apparent at the beginning of the project but ask the potential of this happening, so you can plan for it in the future.

Earthwork

- Knowing expectations when it comes to earthwork is a very important part to understand before you start to put your assemblies together. Each agency/owner might have its own unique way of quantifying earthwork, and this can play into how you setup an assembly or corridor.

Contract

- Ask the following questions so you're not caught off guard:
    - What is the expectation of the contract your company has entered?
    - Do you need to hand over surfaces to the agency for construction or staking purposes? What surfaces are needed?
    - Do you have enough time allocated to get into that level of detail with your surface?

How many oxen do we need?

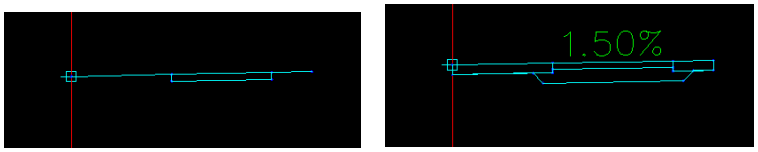
The driving force, or oxen if you will, of any corridor are the subassemblies that you use to create your overall assembly. Assemblies help define surfaces, aid in getting accurate quantities, as well as help visualize the section in plan production.

Out-of-the-box

This is the default option for majority of users, as these are the stock subassemblies you will get with C3D. These can get your corridor created but depending on the ideas outlined in the first section of this document ("Where are we headed?"), you will notice that these will come up short in some scenarios. A few are outlined below.

- Daylight options are complicated and don't allow for a potential positive grade in a fill scenario.
- Curb options lack subbase build out per construction practices or the ability to vary height in a corridor though targets (OOTB on the left, custom on right).

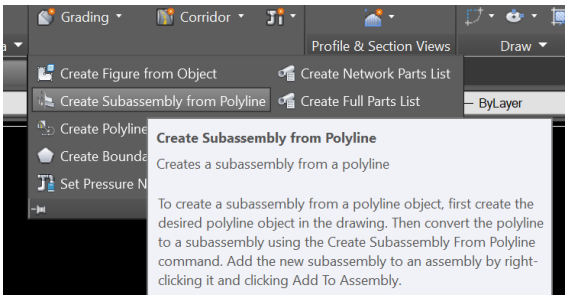
- Some subassemblies don't allow for a given depth to help define a datum surface for quantities.
- Sidewalk and boulevard options are very limited (OOTB on the left, custom on right).



Define from polyline

This is a good option if you're just trying to infill some details that might be lacking with the OOTB subassemblies. By creating a closed polyline, users can create static assemblies and apply code to them for use in assemblies. This is a good option to define nonstandard static objects that might need to be defined for cross section purposes (bridge piers / barriers / etc.). The drawback to these is that they are static and there is no way to manipulate them after they

are created. Note: Users need to have a good understanding of the standard codes to define points, links, and shapes when created to help define surfaces or get quantities.

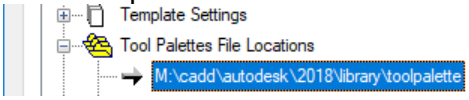


Custom Subassemblies

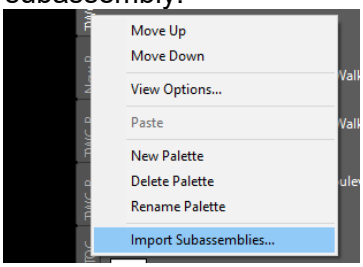
Subassembly composer is an indispensable tool to take your corridors to the next level of detail. The tricky part is this isn't the easiest program to comprehend. Taking time to understand the program and working through different scenarios will pay off big in complicated design tasks. As you work though the program, keep the items below in mind:

- Standard OOTB codes can be found in the standard folder location: C:\ProgramData\Autodesk\C3D 2018\enu in a document called C3DStockSubassemblyScripts_loc.codes. Knowing and matching these codes will help with other task such as creating standard code set styles, extracting and matching feature lines consistently, creating surfaces, and getting areas from shapes for quantity take offs.
- In Civil 3D 2018.2 AutoDesk included .PTK files from some agencies. These subassemblies can be used to supplement the OOTB subassemblies or as a jumping off point to understand subassembly composer a little better. These can be found at: C:\ProgramData\Autodesk\C3D 2018\enu\2018.2 Update Subassemblies.
- Download example .PTK files by going to https://knowledge.autodesk.com/ and searching within the Civil 3D platform for example .PTK files that can be downloaded and reviewed to understand different aspects within subassembly composer.
- Previous AU classes are always a great step when trying to advance to the next level with SSC. I highly recommend classes by Kati Mercier. She has an indispensable list of VB expressions in her handouts that are a great resource and will take your subassemblies to the next level.
- Sharing custom subassemblies is a must and can be a complicated process. Note that if a user rebuilds a corridor that is utilizing custom subassemblies without having these imported onto a tool palette of their own beforehand, that corridor will then become corrupted and will be missing any of the custom subassemblies used when reopened.

  Steps to network are outlined here (this was not reviewed in class):
  - In the options menu on the files tab, set the standard networked location of your tool palettes to the top of the list.



- Create a new tool palette and define an appropriate name for the palette. Then import the subassembly.ptk into the tool palette by right clicking on the palette name and selecting import subassembly.



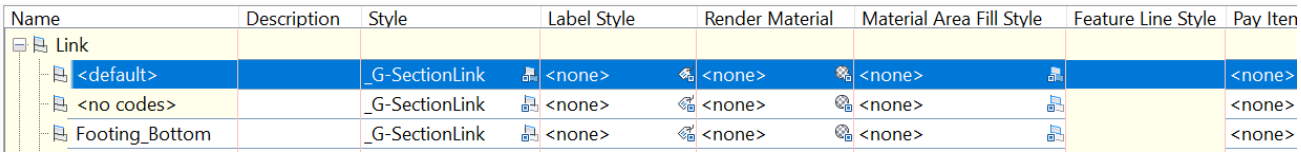
- This will unpack the .ptk file onto your C: drive (C:\ProgramData\Autodesk\C3D 2018\enu\Imported Tools)
- Data that is placed into this location can be copied to a network location and then this data can be copied onto users C drive by way of a batch file or other method.
- When custom subassemblies are used they are always looking locally at the user C drive and not a network location. If you leave them on a networked location processing of a corridor, it will become extremely slow.

Code Set Styles

Code set style control everything from the look of your assemblies as you create them, to what feature lines are displayed during the creation of your corridor, and finally how your cross sections will be displayed and labeled for plan production purposes. Having a good grasp on how to manipulate code set styles can help you recognize errors as you are creating your assemblies and corridors.

Note the options for what can be displayed for each item.

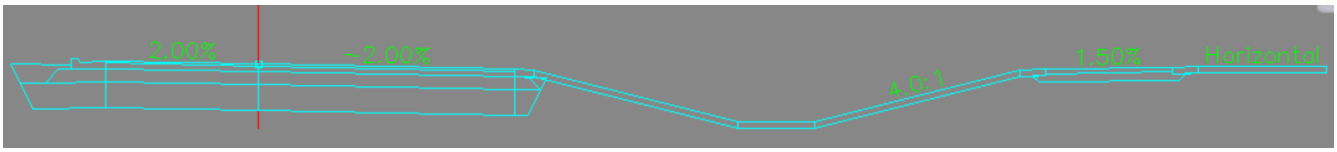
- Points
  - Styles (how the point will display)
  - Label Style (Elevation, Offset, etc.)
  - Feature Line Style (how the feature line will display in a corridor)
- Links
  - Styles (how the link will display)
  - Label Style (Grade, Slope, etc.)
  - Material Area Fill Style (hatching codes in plan view)
- Shapes
  - Style (How hatching and boundary will display in section view)
  - Label Style (Area, Type, etc.)



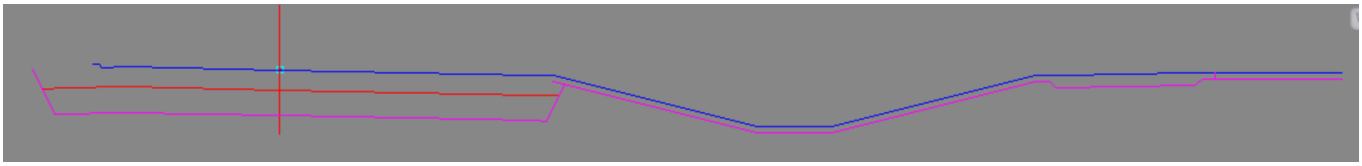
Name	Description	Style	Label Style	Render Material	Material Area Fill Style	Feature Line Style	Pay Iten
Link							
<default>		_G-SectionLink	<none>	<none>	<none>		<none>
<no codes>		_G-SectionLink	<none>	<none>	<none>		<none>
Footing_Bottom		_G-SectionLink	<none>	<none>	<none>		<none>

Code Set Styles for Assembly Display and Cross Section Display

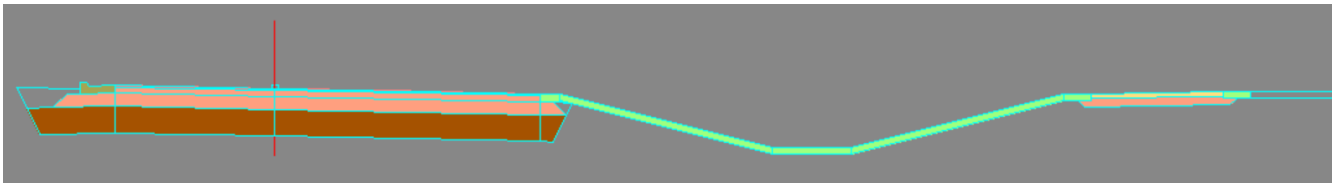
- Cross Section Display: Typical display for plan production with grade and slope labels and styles set for link display.



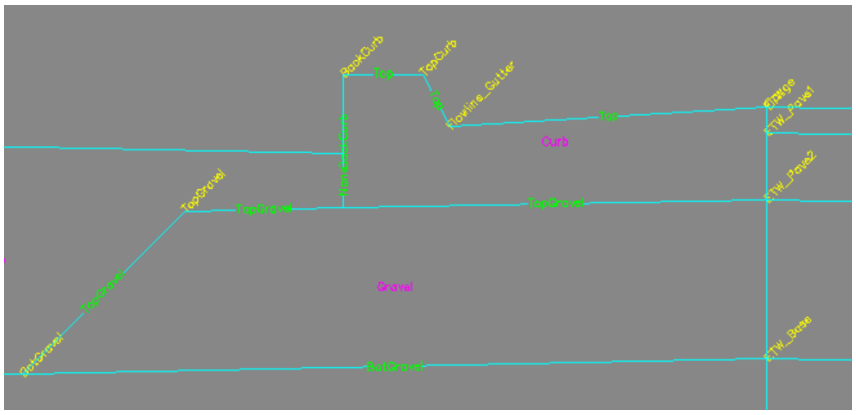
- Surfaces: Useful to determine any gaps before surface creation in assemblies. Link code for “Top”, “Datum”, and “Base” have been set to different colors. All other link, shape, and point codes are set to no display.



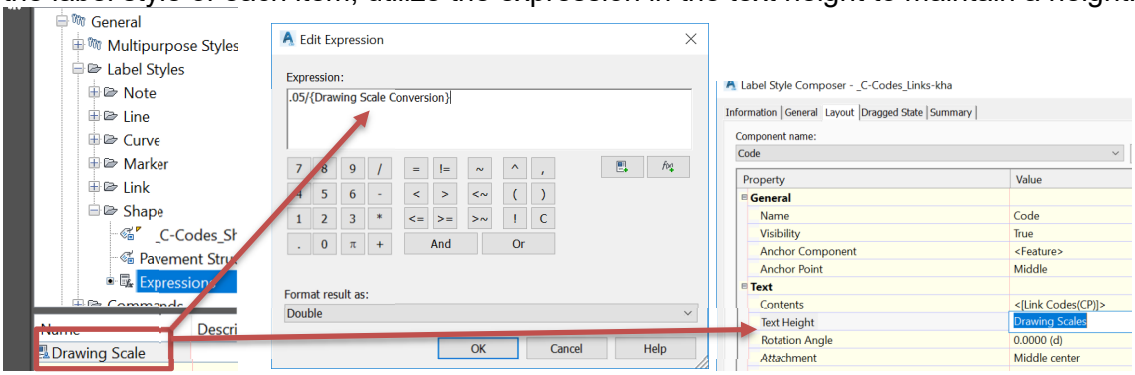
- Shapes: Visualize that all proper shape codes are inputted for use in average end area. By setting up different styles with different colors, they can be assigned to different shape codes.



- Point, Link, Shape Codes: See what codes are being utilized in each subassembly by creating label styles that displays the given code for links, shape, and points.

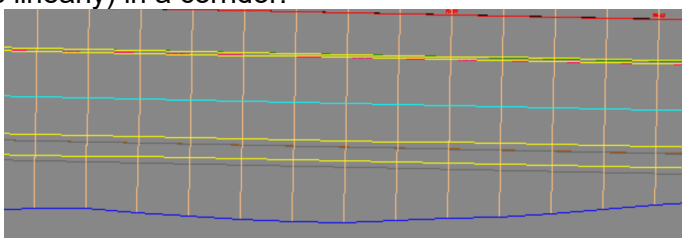


Note: To keep the code label sizes a consistent size no mater your annotation, utilize the expression below in the shape, link, and point expression under the label styles. For the label style of each item, utilize the expression in the text height to maintain a height.

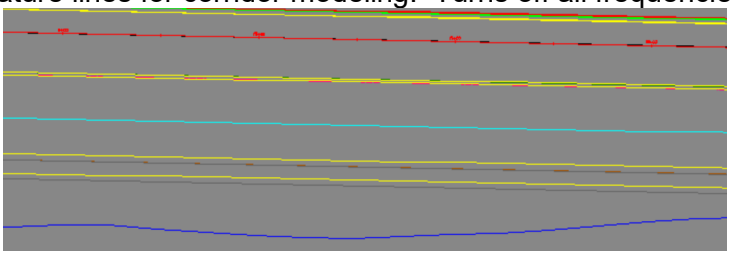


Code Set Styles for Plan Production Display

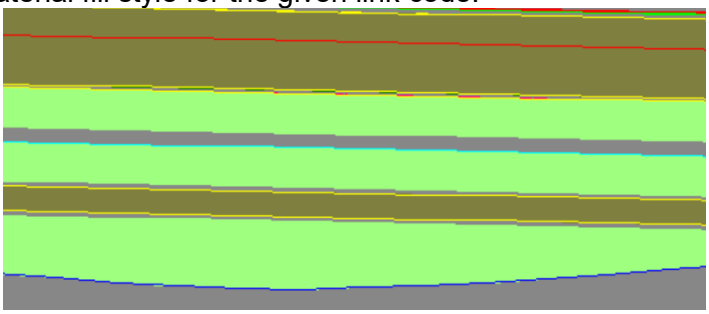
- Working Model: Display all frequencies (links perpendicular) and defined feature lines (connecting points linearly) in a corridor.



- Display Model: Display only top surface feature lines (connecting point parallel along corridor, display option in point section) to ensure proper construction and helps when extracting feature lines for corridor modeling. Turns off all frequencies (links).



- Display given areas with hatching for better visualization. Define hatch by setting style setting the material fill style for the given link code.



How do we portage that river and not lose grandma?

Unfortunately, every road isn't straight as an arrow and perfectly symmetrical just like every river portage is a new adventure. Designers need to get creative when it comes to some design elements to get complete surfaces for quantities or staking purposes. Designers also need to understand where to focus their time and effort based on the project needs and requirements. Thinking back to the first portion of this class (about the questions to be asked) will help guide you through this process and the level of effort you need to take.

Intersections and Ped Ramps

There are already tools inside C3D to create intersection but how can make it more dynamic was well as model ped ramps?

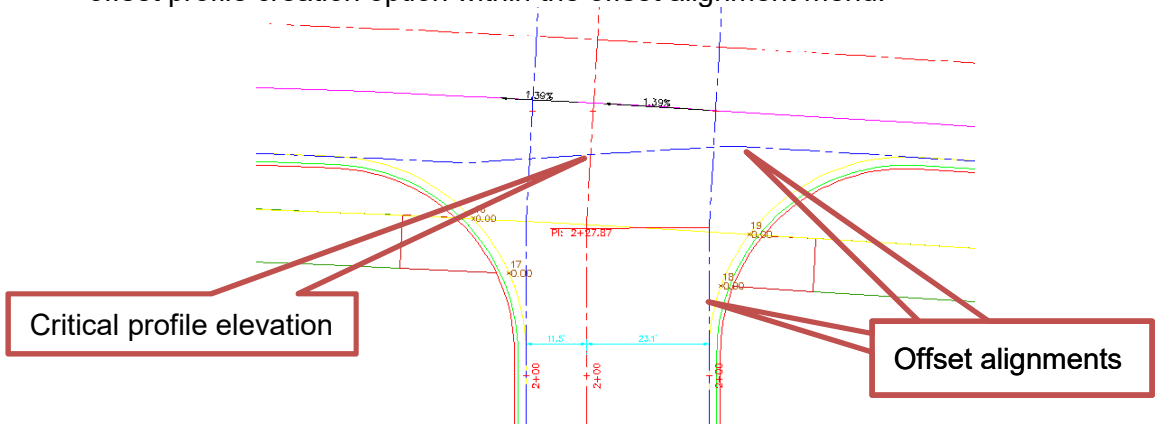
The frist thing to consider is whether or not you need to model them out completely. Are you giving spot elevations or just general guidelines for construction of ped ramps in your plan set? This process gets to be a very precise exercise that might not be required, so understand this before you take time away from other design elements. Also note, this process is utilizing a custom curb assembly that will allow the back of curb to be adjusted.

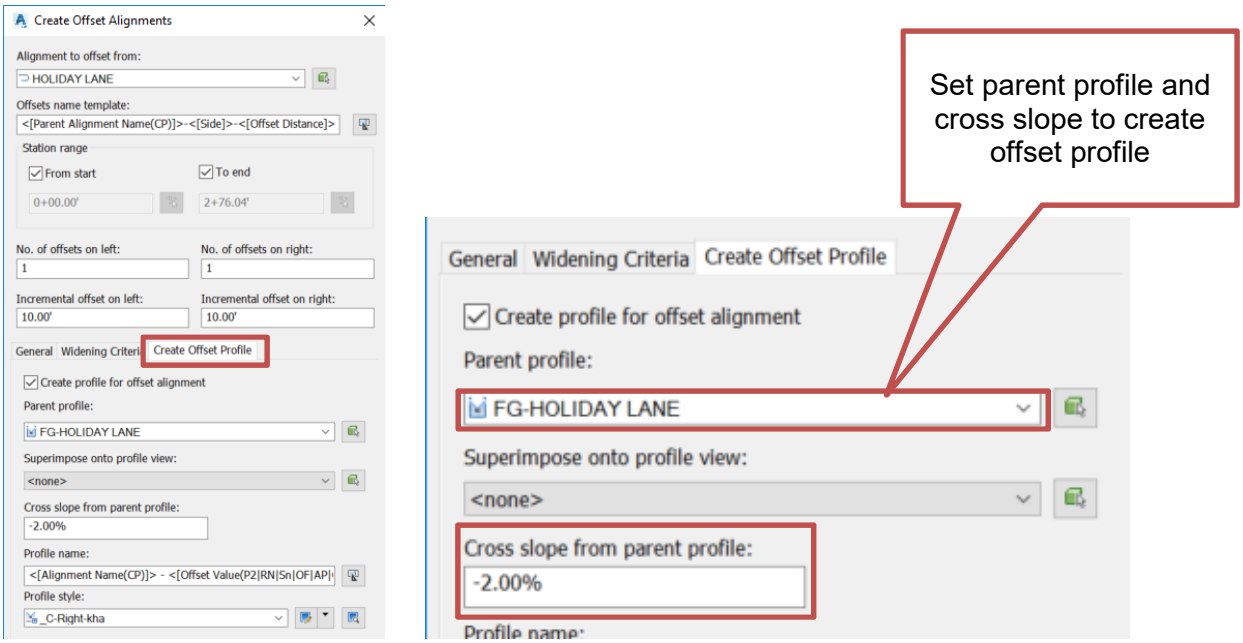
This process will utilize

- Offset Alignments
- Offset Profiles
- Connected Alignment

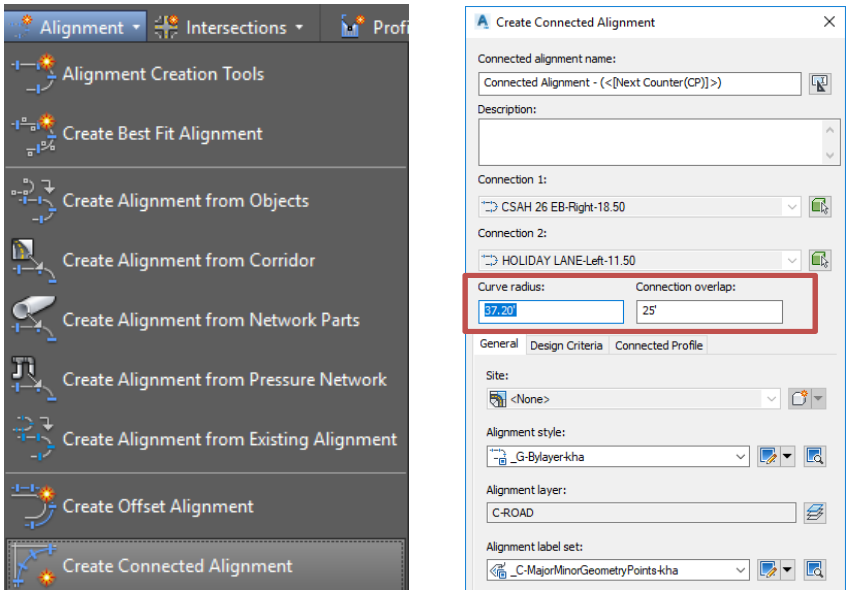
Intersections

- Once centerlines for mainline and the side street are set (ensuring they do meet or cross), utilize offset alignments (with widening if needed) and offset profiles of both the mainline and side street to the edge of pavement or lip of curb. Note the location of the offset profile creation option within the offset alignment menu.

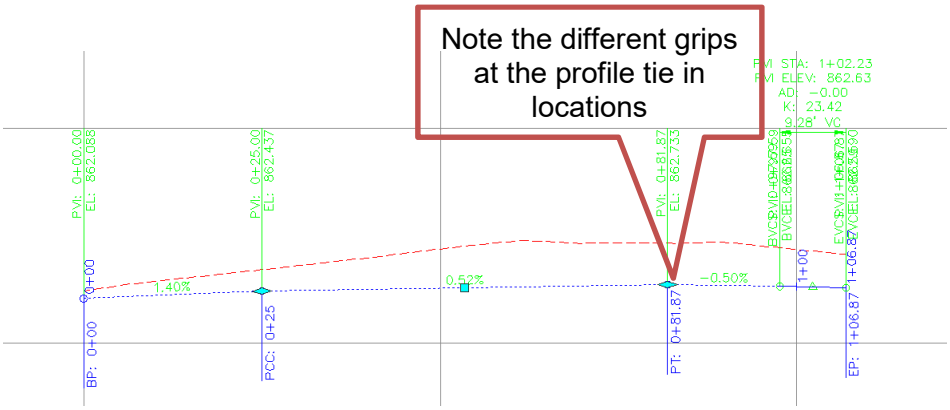




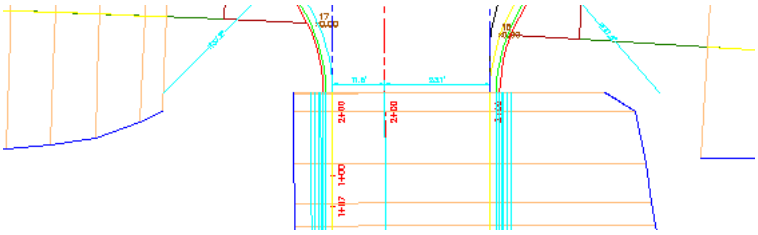
- Once offset alignments are made with linked profiles, users can utilize the connected alignment tool to link the two intersecting alignments and profiles together creating an alignment that will run along the radius of the intersection. Follow the prompts on the command line and input the radius and overlap (tangent length).



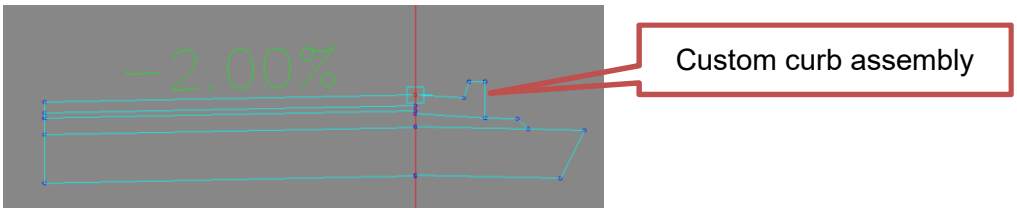
- The connected alignments will create a profile that will connect and lock to the overlapping tangent section in the profile, pulling the elevation from the offset profile created in the first step. The connected profile can be manipulated between the tangent points. For instance, a ped ramp that might need to be a specific grade.



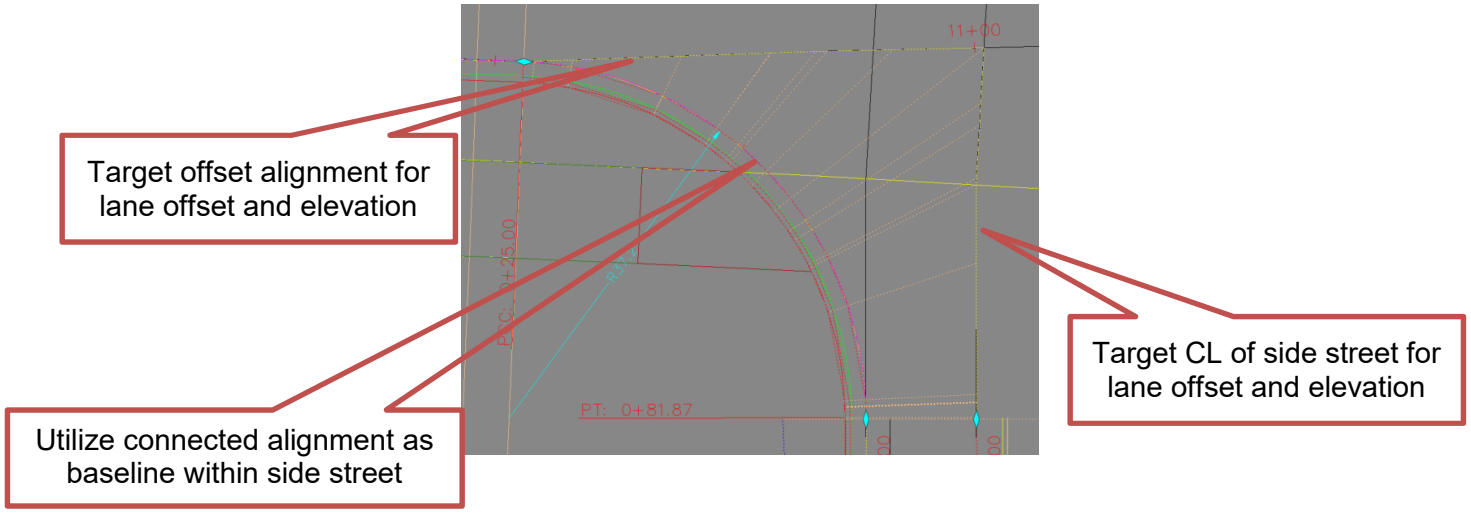
- Create a corridor for the side street created up to the curb returns, and utilize the offset alignment and profiles for targeting for the lanes if needed.



- Create an assembly that has the pavement section to one side and curb on the other (ped ramp adjustment will be covered in the next section).



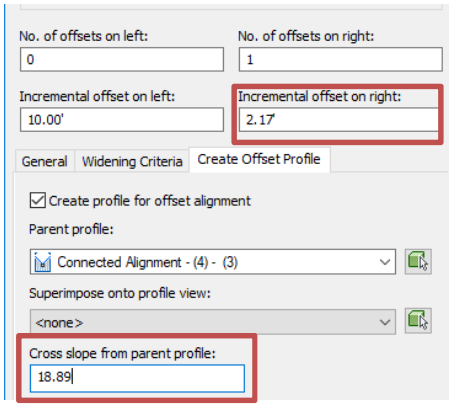
- Add a base line to the side street corridor utilizing connected alignment that runs along the radius and the subassembly created in the last step. Target offset alignment and profile at the ETW and the centerline alignment and profile for the offset and elevation of the lane.



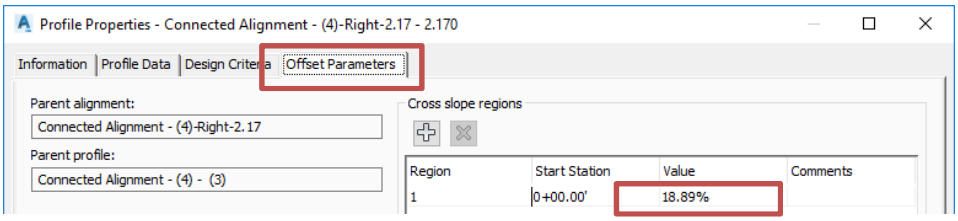
Ped Ramps

With the offset alignment/profiles that were created for the curb returns, we can start to model the ped ramp locations. Leveraging the connected alignment and profile we did in the first section, we can add an offset alignment to represent the back of curb. Note, you will need to have a custom subassembly that will allow the back of curb elevation to be adjusted.

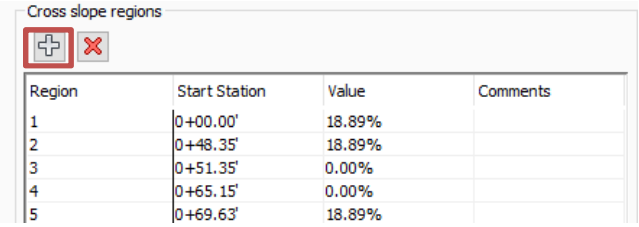
- Calculate out what the slope will be from the lip of curb to the back of curb, we will utilize and offset alignment and profile to set the back of curb elevation. Our overall curb and gutter depth is 2.17', the gutter pan is 1.5' at 6.25% and a curb height of 0.5'. This works out to 18.89% from the lip to the back of curb. That will be the cross slope inputted in for the slope of the offset profile as well as the offset of 2.17'.



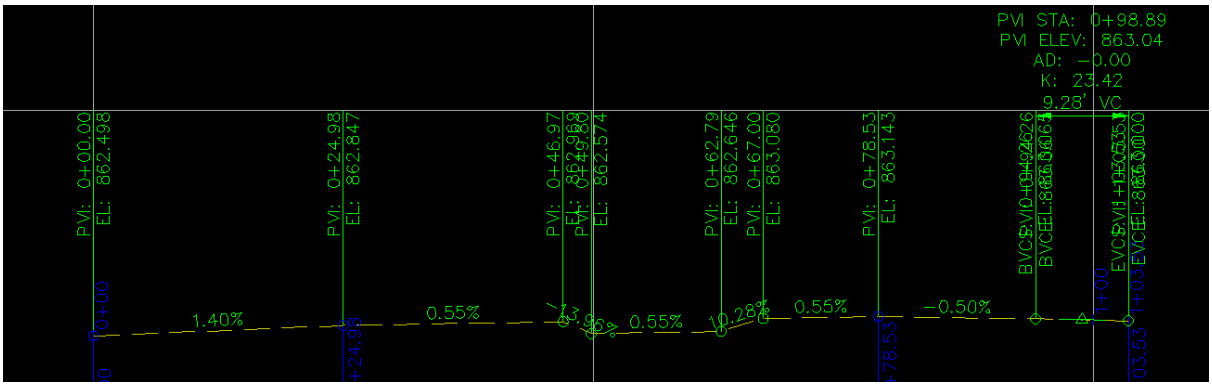
- Create a profile view off the back of curb that was just created. Select this profile and select the profile properties from the ribbon or the right click menu. From there, select the offset parameters tab. Note, currently the entire length of the profile is set to 18.89% from the first step of setting up the offset alignment and profile.



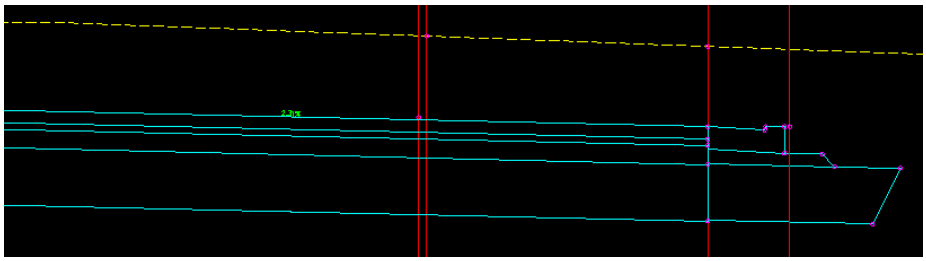
- Add cross slope regions by selecting the + sign at the top of the dialog box and pick the transition points of the ped ramp along the connected alignment for the curb return. They will populate into the dialog box.



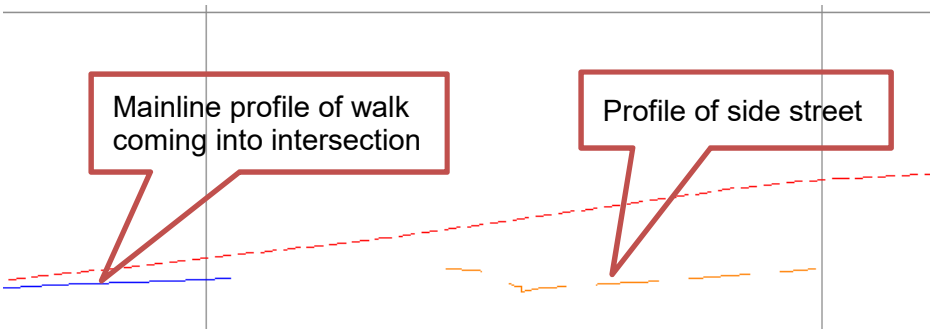
- Now the back of curb profile is linked to the lip of curb profile. The lip of curb profile is linked to the two intersecting offset alignments. The offset alignments are linked to the mainline profile. As changes are potentially made to the mainline or side street profile the lip of curb profile will update since it is a connected by the offset alignments and profiles. Any changes to the lip of curb profile will translate to the back of curb profile.



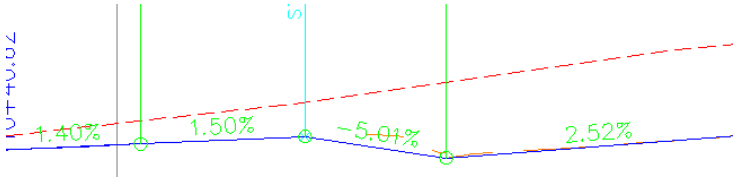
- Go back into the side street corridor and input the back of curb profile as the target for the curb subassembly. The section below shows the back of curb transition through the ped ramp.



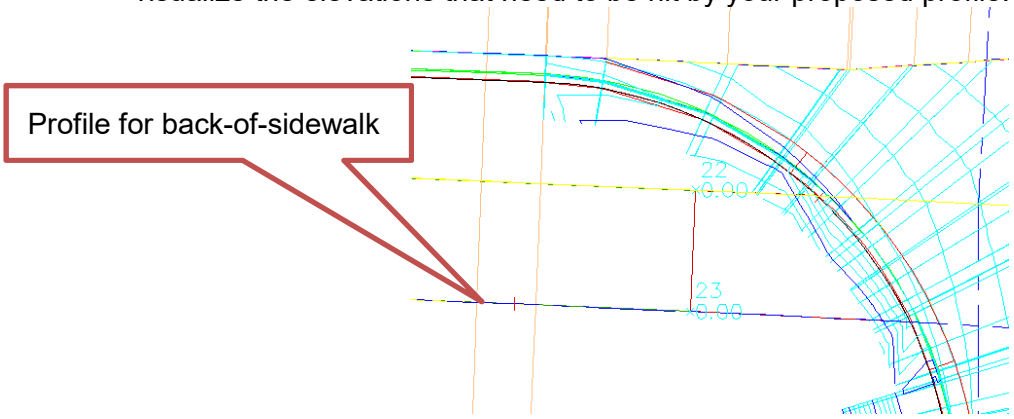
- To fill in the sidewalk section behind the curb, create an offset alignment at the edge of sidewalk. Create a profile of this alignment that samples not only the existing ground, but also the proposed surface of the mainline (to visualize the walk profile coming into the intersection) and also samples the surface of the side street (to visualize the ped ramp location done in earlier steps).



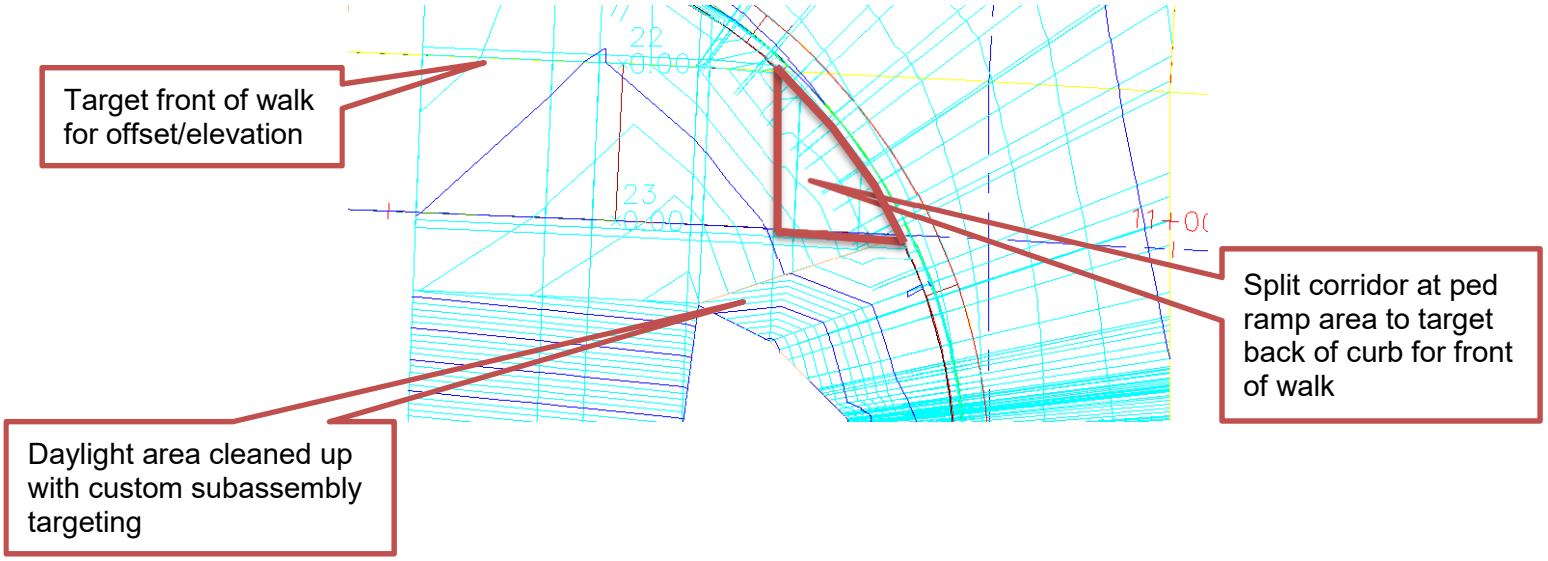
- Connect the 2 proposed corridor surfaces with a proposed profile of how the walk will transition through the ped ramp location.



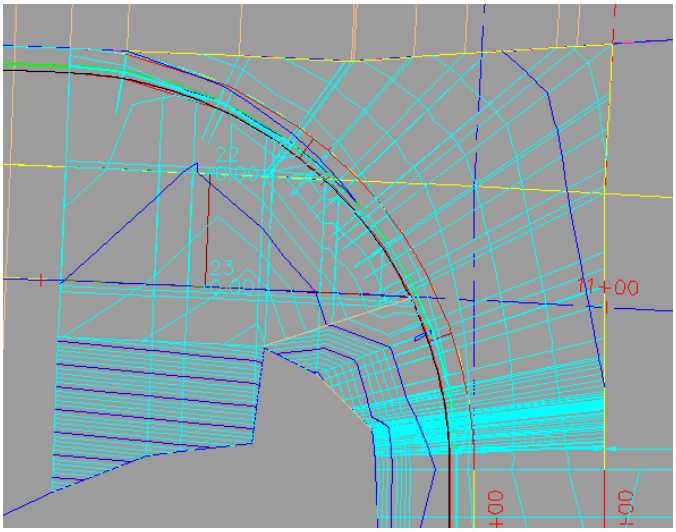
- Run through the same process as was done for the inside profile of the sidewalk for the back-of-sidewalk. Sample existing ground, mainline surface, and side street surface to visualize the elevations that need to be hit by your proposed profile.



- Add another baseline to the side street corridor and select the back-of-sidewalk alignment and profile as the baseline. Utilizing targets for the front of walk for offset and elevation to adjust the sidewalk grades coming in. Target for the boulevard offset and elevation to the back of curb (linked offset alignment from lip). Note that the area where there is no boulevard that you will need to split the corridor and target the elevation of the back of curb.



- This isn't an easy process to get to the end, but if the project requires it, this is the potential effort involved to get to that full model. With the options that are in this process, updates should be easy to follow after everything has been completed.

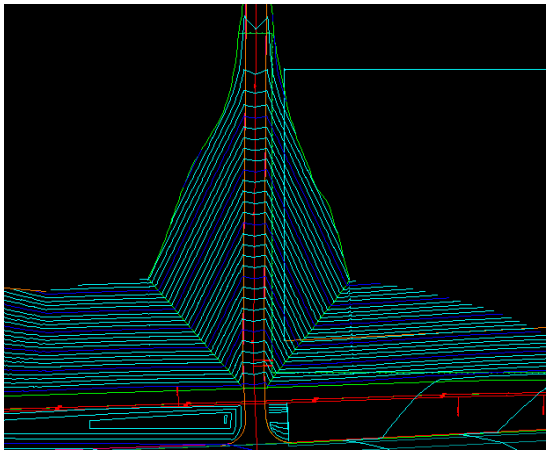


Intersecting Slopes

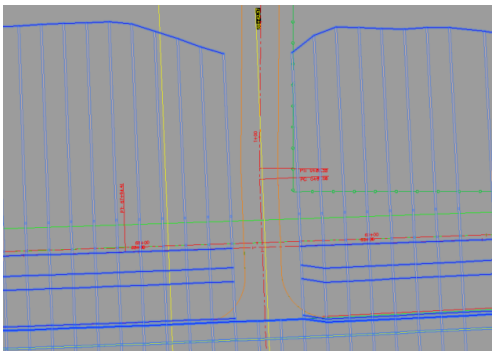
Grading out two intersecting slopes can be a frustrating and a complicated process. Not only to get contours to display properly but to get the cross sections to look correct for plan production. The best way to approach this scenario is to utilize an auxiliary corridor. The idea behind an auxiliary corridor is needing a surface you can utilize for targeting and not get a circular reference error when targeting for corridor creation.

This process will utilize:

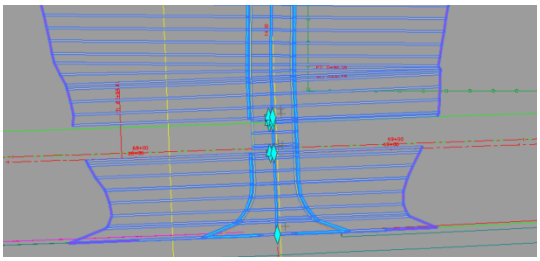
- Auxiliary Corridors and Surfaces
- Extracted and connected feature lines from corridors



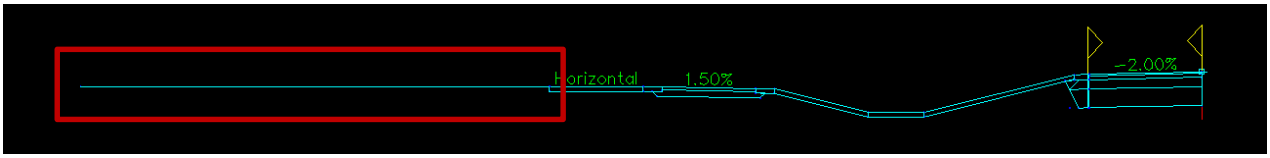
- Create the mainline corridor with a break (can be done with conditional assemblies or multiple regions) at the given driveway location that only builds to the pavement edge.

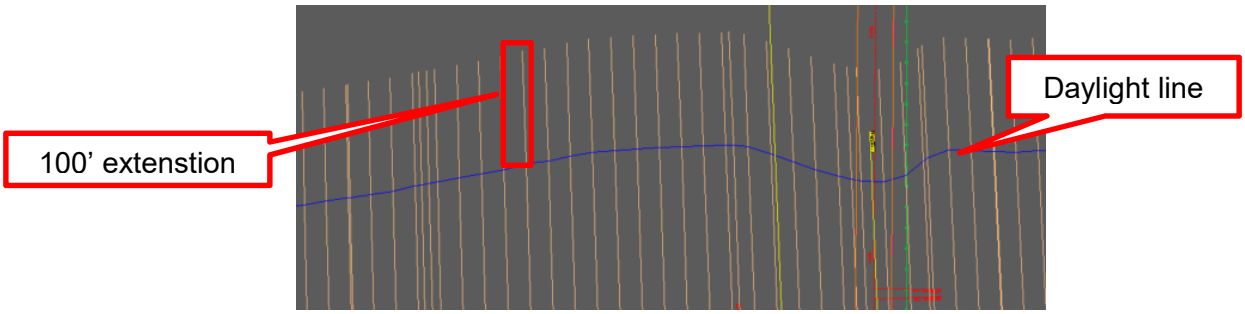


- Build driveway corridor up to the pavement edge of the mainline roadway. For this scenario there is a trail that we have broken up the corridor into two regions on either side of its construction.

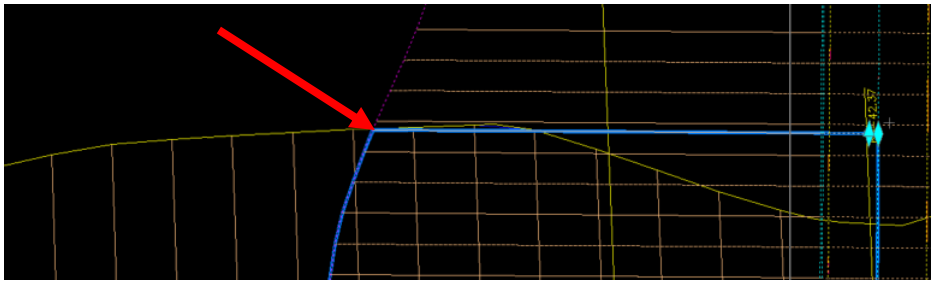


- An assembly and corridor will need to be created that mimics everything that is being created for the mainline corridor. This will be referred to as an auxiliary corridor/surface. You will also want to extend out this auxiliary corridor 100' +/- beyond the daylight point to ensure the auxiliary surface will be created under the driveway, otherwise daylight targeting on the driveway will not perform as expected. Create a surface from this corridor for targeting purposes.

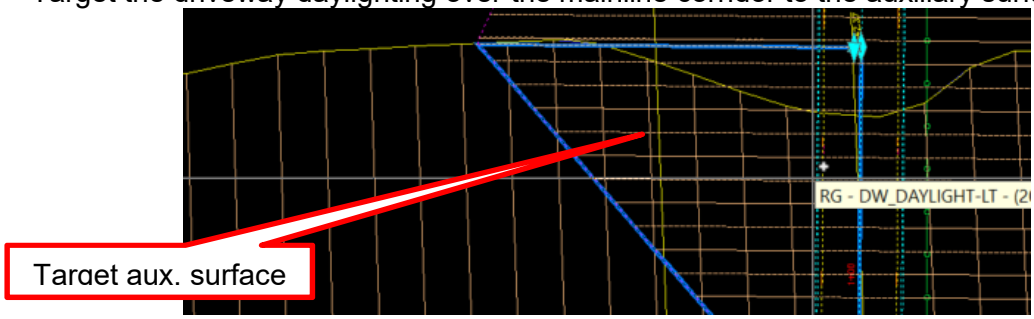




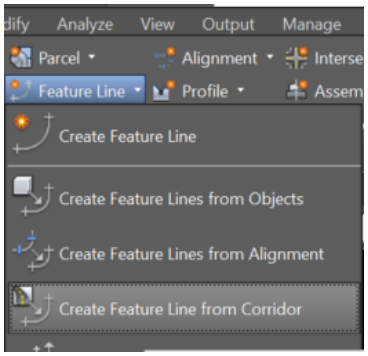
- Split the driveway corridor at the point where both the mainline corridor and driveway corridor cross.

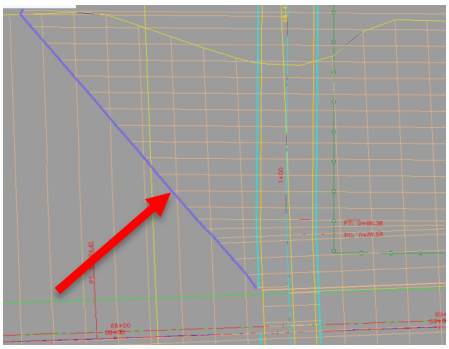


- Target the driveway daylighting over the mainline corridor to the auxiliary surface.

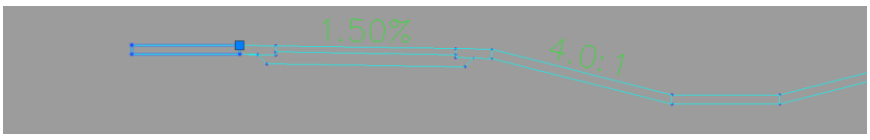


- Extract the daylight feature line from the driveway corridor, this feature line will update with any corridor changes. This will be utilized as an offset and elevation target for the mainline corridor.

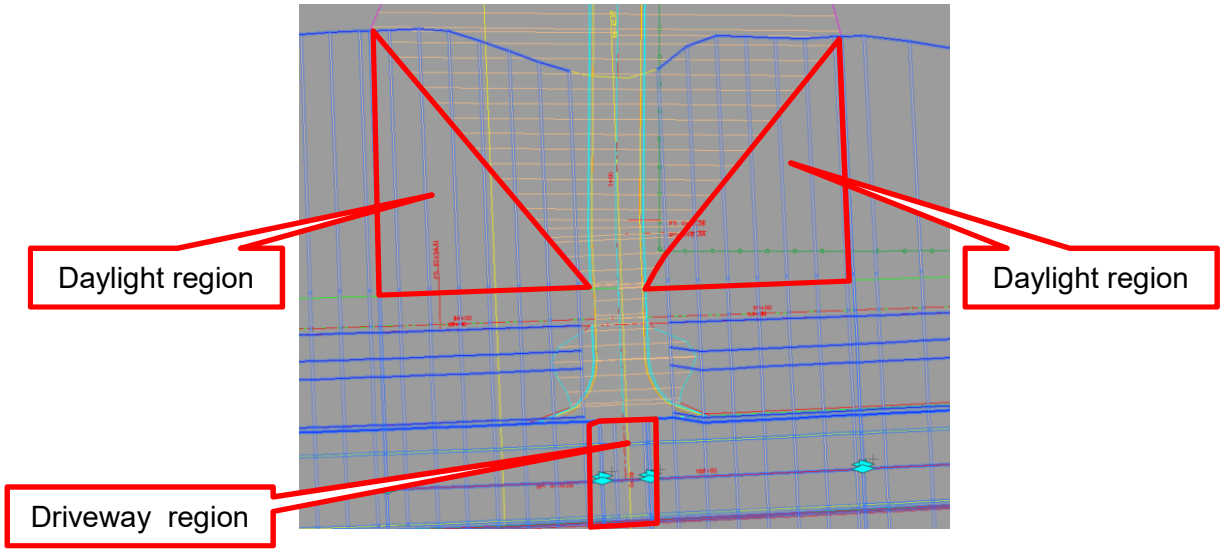




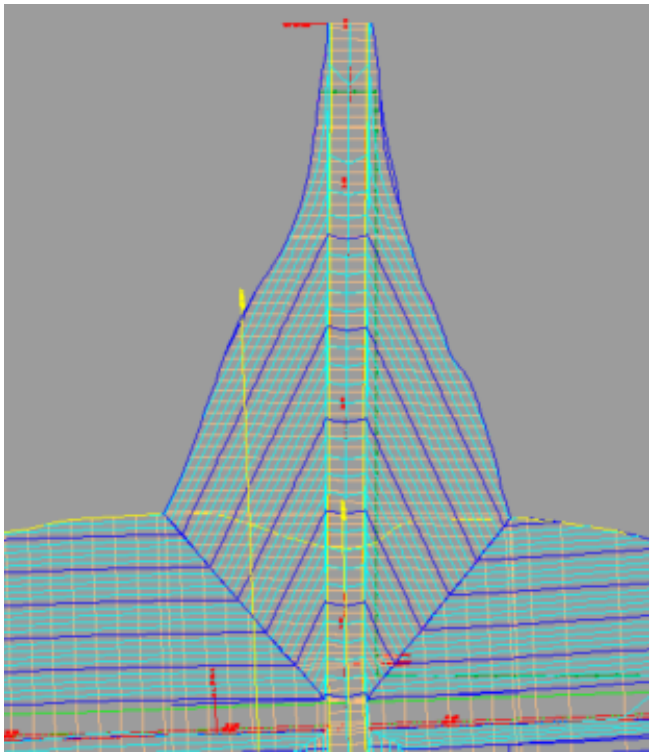
- Create an assembly that mimics the baseline for the mainline corridor, but for the daylight option, utilize an assembly that will allow you to target offset and elevation. For this example, we will utilize the shape trapezoidal.



- Split the corridor up into different regions to allow you to switch assemblies and target the extracted feature lines created on either side of the driveway.



- Once all the targeting is set, the final surface will look like below.



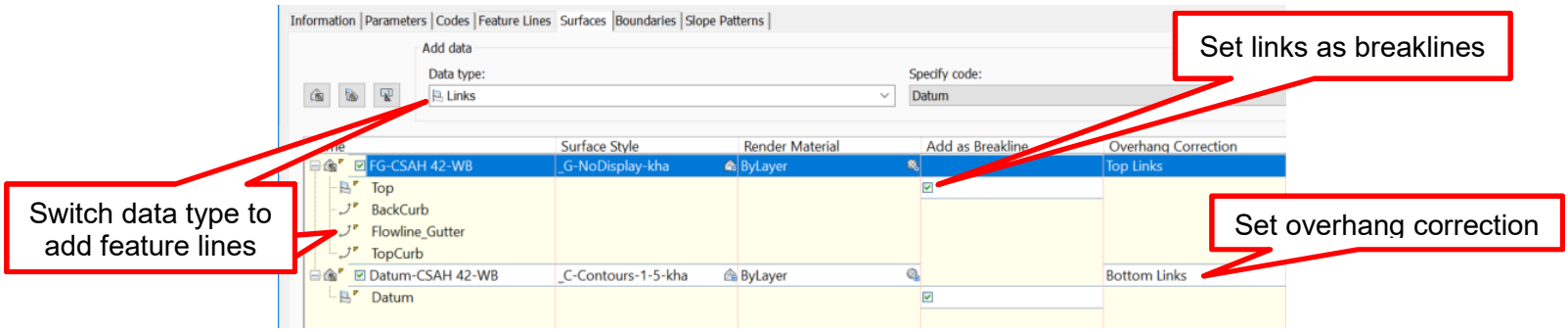
Surface Creation

A good top surface as well as a datum surface will need to be created either for labeling purposes (top) or earthwork analysis (datum)

Proposed Surfaces

Some common things to keep in mind when you're creating a surface from a corridor:

- Set overhang correction to top or bottom option to help with overlapping link codes
- Check option to add links as breaklines
- Add feature lines to help surface definition (curb lines)



Strip Surfaces

An important part of starting the process of earthwork is understand how you want to calculate what will be removed from your existing surface. Topsoil removal, pavement striping, concrete removal, etc. are all items that need to be held down from your existing surface since this will most likely be paid as a separate line item and get aid in true earthwork quantity.

The best option I have found is from a class at AU that was given by Crag Dieziger. His class at AU 2019 called The Handy Man's Guide to Dynamic Differential Tin Surfaces will give you guidance on how to start to utilize this process to create multiple surfaces based on hold down type.

Home stretch

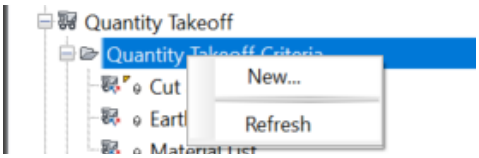
With all corridors created, datum surfaces built, and all the strip surfaces compiled and ready for use these all can be sampled within created cross sections. Note, sample line and cross section creation not covered in this class.

If cross sections have been created for plan production and corridors have been sampled utilizing data shortcuts, it is easy to have a printout document of your earthwork numbers reviewable by those that might not know C3D.

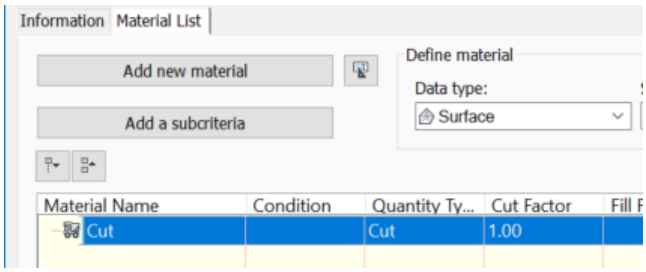
Average End Area

Steps to setup Quantity Takeoff Criteria

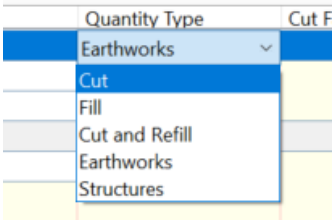
- From the Toolspace and the settings tab, expand the quantity takeoff option. Right click on the quantity takeoff criteria and select New.



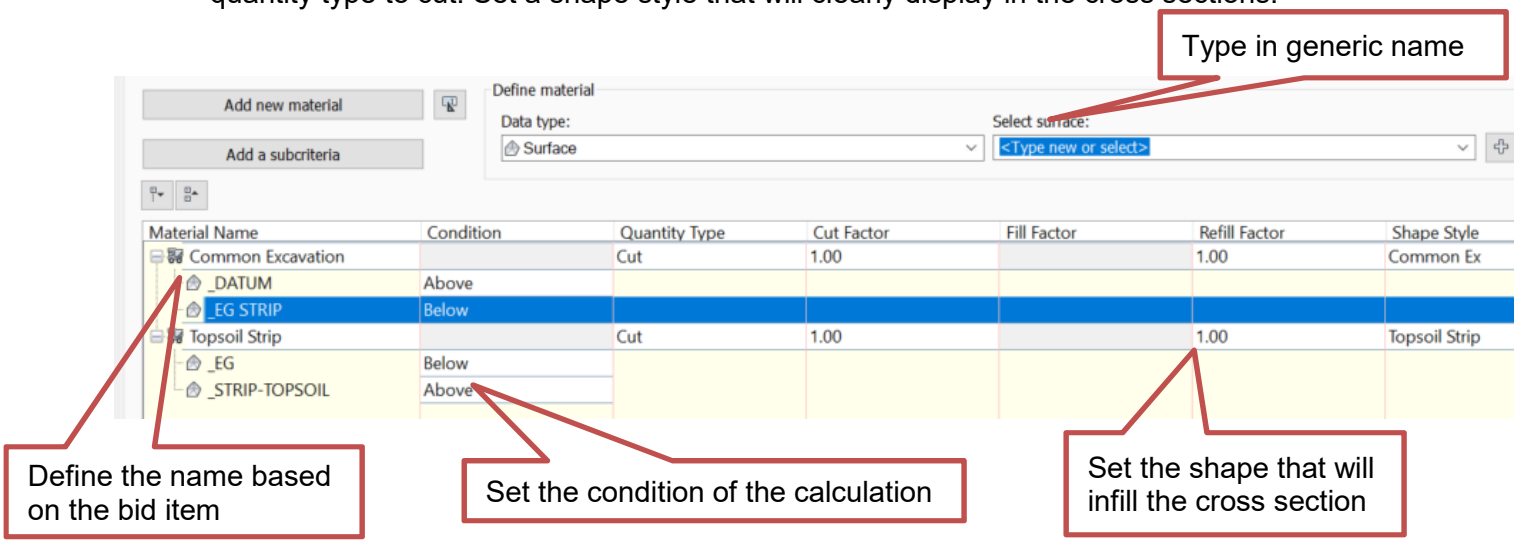
- The first option that will be setup is for cut calculations. Add a new material and rename it to cut.



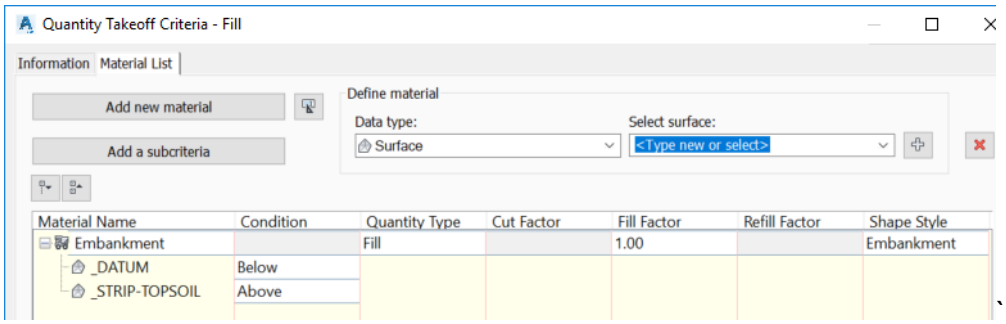
  - The quantity type needs to be set for each material calculated. There are five options and below are the definitions of each:
    - Cut – Allows users to select up to three surfaces to set above or below for comparison for each to define area to be calculated. Also allows for cut and refill factors.
    - Fill - Allows users to select up to three surfaces to set above or below for comparison for each to define area to be calculated. Also allows for refill factors.
    - Cut and Refill – Allows users to select up to three surfaces to set above or below for comparison for each to define area to be calculated. Also allows for cut, fill, and refill factors.
    - Earthworks – Only two surfaces can be compared, and calculations are for cut and refill, cut, fill, and refill factors available for input.
    - Structures – Allows input of corridor shapes to calculate out area. Refill factor available for input.



- For this example, we will only utilize the cut option. Call out the material type based on the name in the bidding document. Type in a generic name (if you chose standard names of all surfaces, utilize that as it will map easier) of the surfaces in the select surface drop down menu, this will display later to help you select the right surfaces. Then set the condition. For this example, we want to calculate out that area that will be cut above the datum surface but below the strip surface. We will also change the quantity type to cut. Set a shape style that will clearly display in the cross sections.



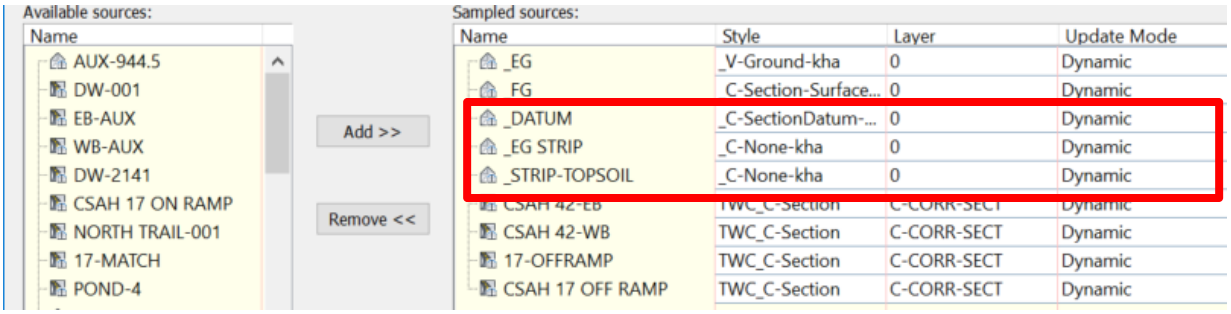
- Setup one more criteria just for Fill. I recommend not inputting any structures and doing it after the materials are calculated. There is an issue with the program as you can't add more than one material from a given corridor to a structure type once calculated, but if you add a structure after you have processed the material, you can add more than just one corridor to the material type.



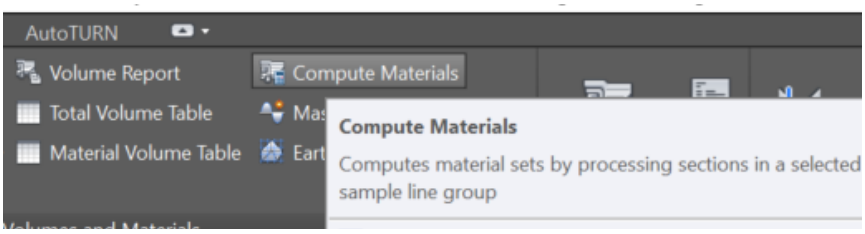
- Another option to consider are Subcritera which can be added to calculate overlapping and independent areas into one, but this option doesn't seem to work well for calculations.

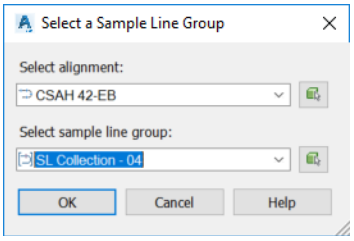
Utilizing the criteria in your cross sections

- You cross sections will need to sample all given corridors as well as the datum and strip surfaces needed for the calculations. For this scenario, we will be calculating the topsoil removal.

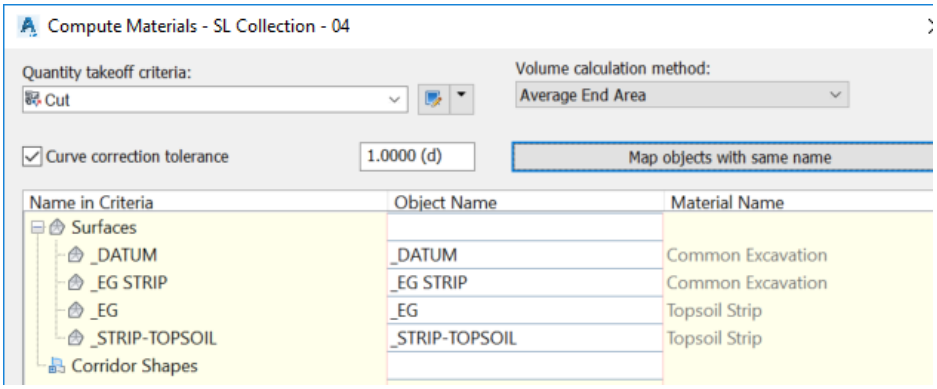


- From the Analyze tab on the ribbon, select Compute Materials and then select the alignment and sample line group that you will be working with to do the calculations from.

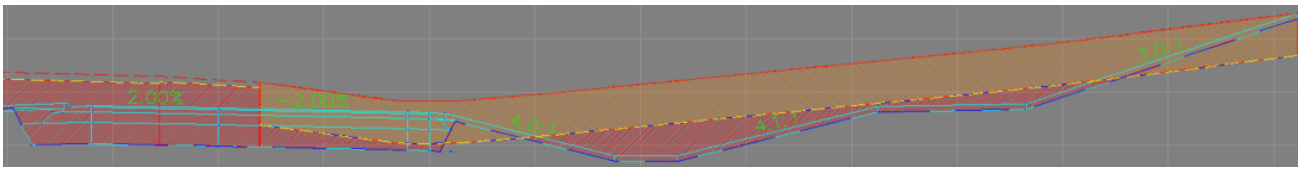




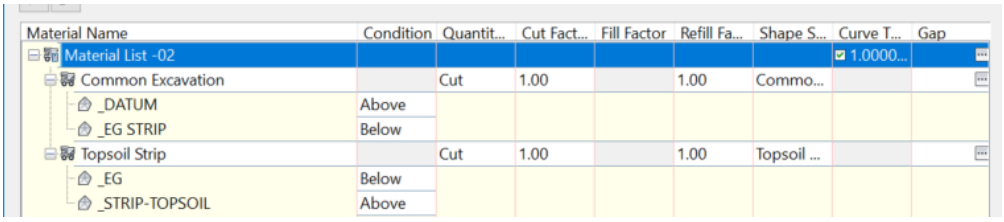
- Select the quantity takeoff criteria “Cut” that was created before. Input the appropriate surface for each item or if you match the names in the criteria to the names of your surfaces, you can select the MAP OBJECT WITH SAME NAME option. There are some other options for calculations, but this topic only utilizes average end area.



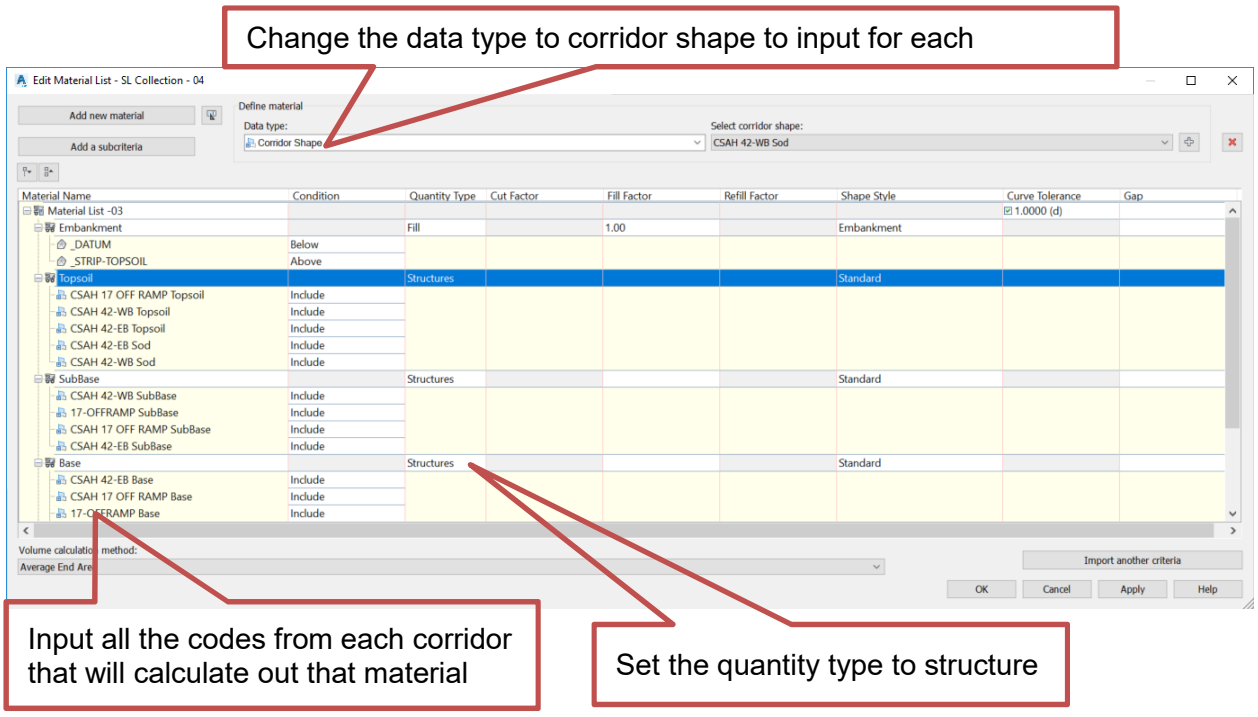
- The design criteria will map the surfaces and apply the materials to the cross sections.



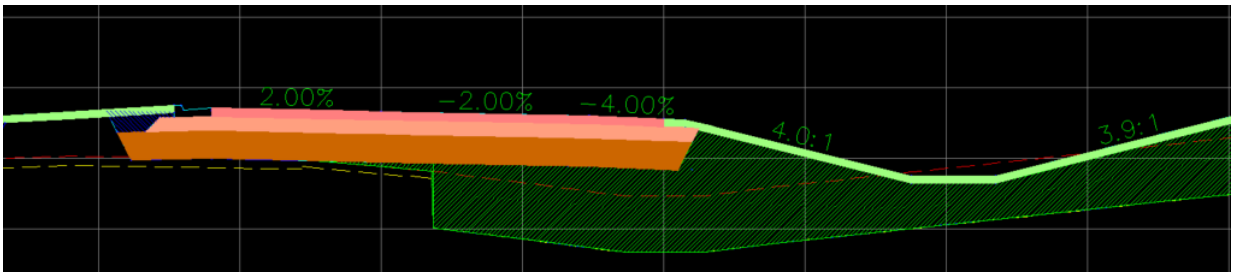
- You can edit the material list after it has been applied to the cross sections by clicking on compute material and select the alignment and sample line group that it was applied to. More materials can be added and/or deleted, and any inputs can be changed to change how it looks in the cross sections or the cut/fill factors. Note, you can enter in gaps into the calculation.



- Let review the fill option that utilizes corridor shapes. In a separate file utilizing a data shortcut corridor with your sections already created, go through the same process outline for the cut scenario to calculate out the fill. Once the fill has been processed, you can go back into the material list and add each structure that might need to be calculated. Note this is where consistent defined codes will help when selecting multiple corridors for input.



- Each defined material will now be defined in the cross section.

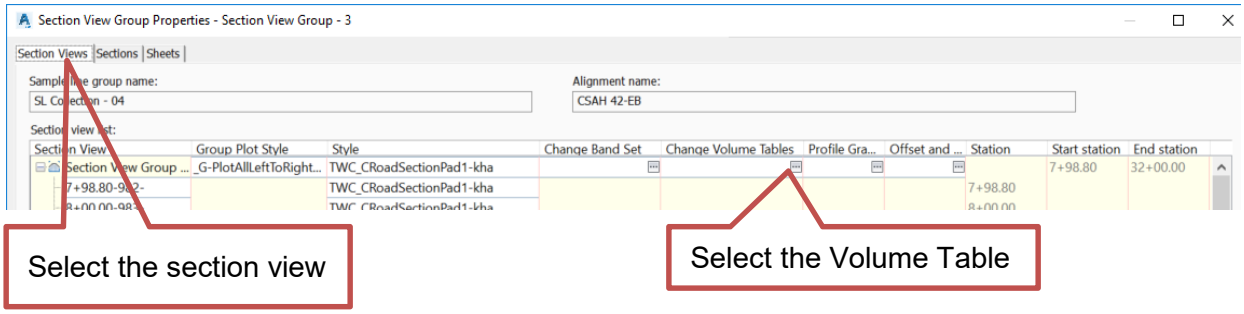


Display of calculations

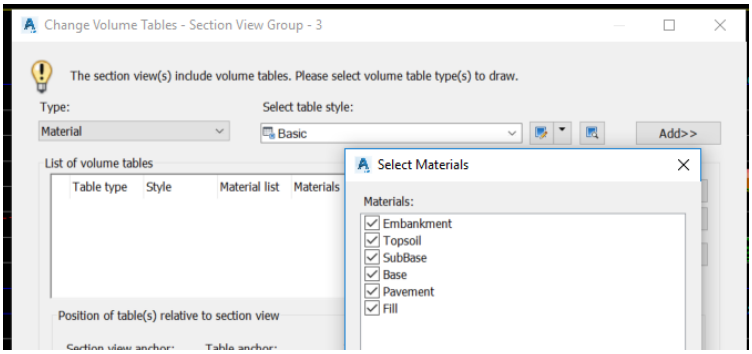
There are a few options to display the calculation of each material type. You can place them on each section showing the area of all materials for that section and a cumulative volume, you can also place a table within the drawing showing the same data, or you can export out a table in HTML format.

Section Display:

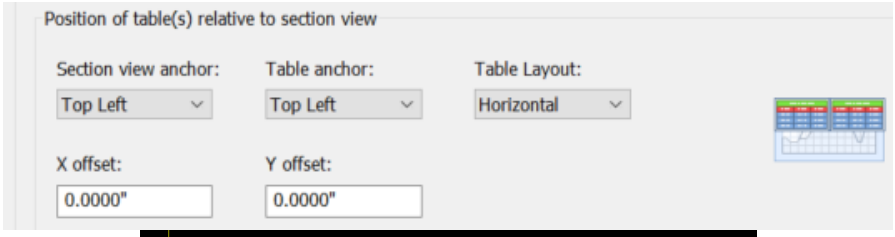
- Go into the View Group Properties and select the section views tab. From there, you can select Change Volume Table.



- Select material for the type and select a table style to display. When you click on the add button, you will be prompted to select what materials will display in the table.



- Select the location of the material table to the section view. Note, that if you utilize the create sections sheets option to automatically create cross section sheets, the location of this table will affect how your sheets are placed inside the given sheet.



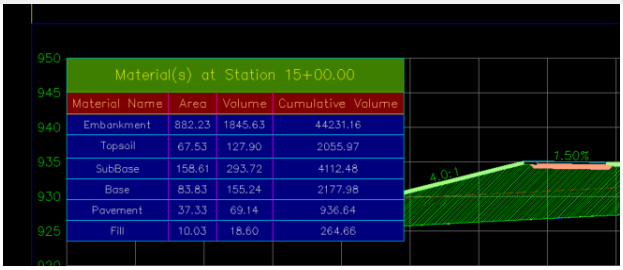
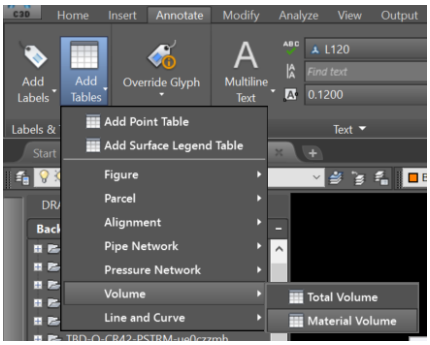
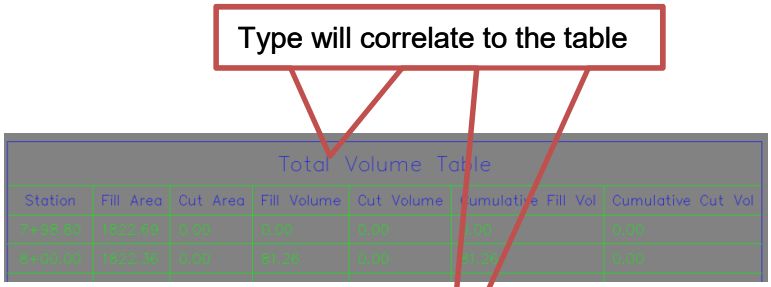


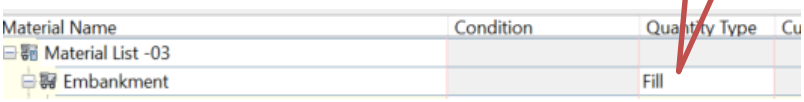
Table Display:

- To display a volume table, go to the annotate tab and select from the drop-down menu the volume table option and select the appropriate type.
  - Total Volume – Will display the cut and fill volumes. Note to utilize this option you will need to calculate cut and fill in the same material list and sample line group, not as we outlined above and will only display surface comparisons. Also note that the Fill and Cut in the table refers to the quantity type set in the material list.
  - Material Volume – Will display the volume of just one given material in the table. This will work for surface comparisons and corridor shapes.

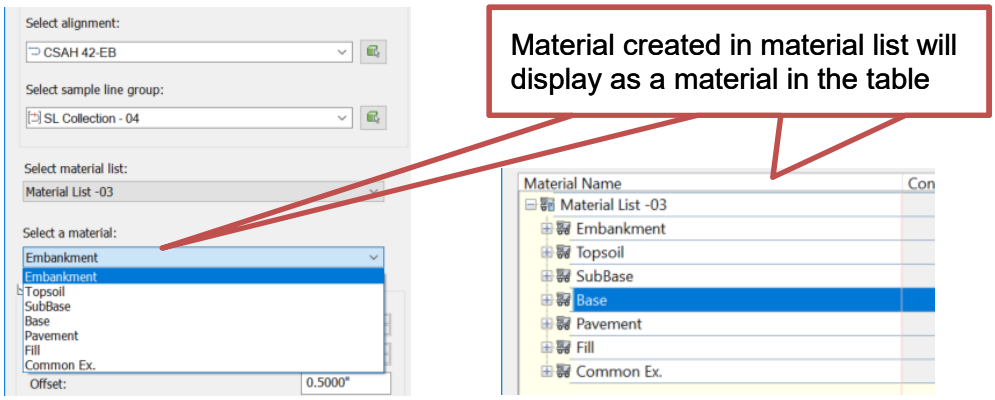
Total Volume

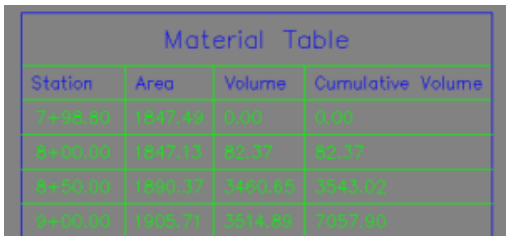






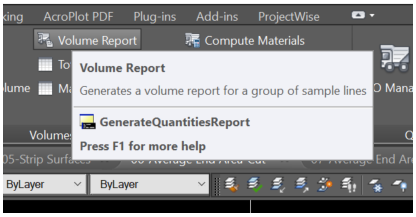
Material Volume



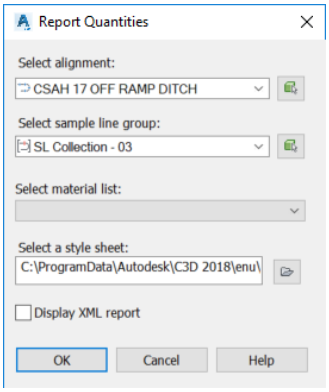


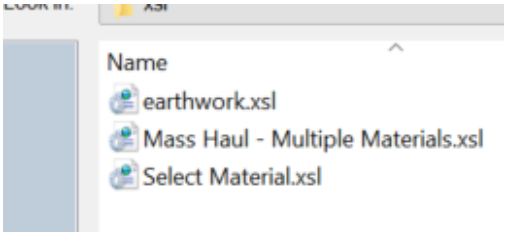
HTML Display:

- To export to HTML go to the analyze tab and select volume report.



- Select the alignment and sample line group and the material list you will utilize. Select a sheet style, much like the other options, you have an option for overall earthwork (cut and fill) and selecting an individual material.





Tin Subtraction Method

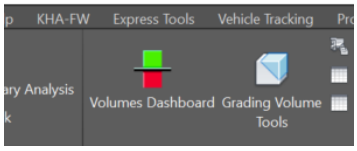
The easiest method to get earthwork volume numbers from your surfaces is to utilize a Comparison Tin Volume. By selecting the base surface of your given strip surface, we can utilize the datum surface from your corridors to get earthwork numbers that do not need to be hand adjusted.

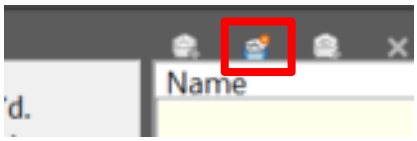
Some things to keep in mind with tin subtraction

- You can only compare two surfaces (unlike average end area)
- No way to give station-by-station cut fill numbers
- No good way to visualize the calculation
- No way to calculate out the give corridor shapes in this method

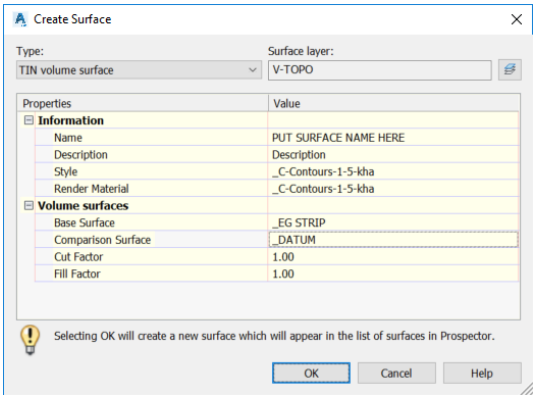
Process to calculate

- From the Analyze tab, select the volumes dashboard and select create new volume surface. (Also, you can select create surface from the home tab and change the type to TIN volume surface.)

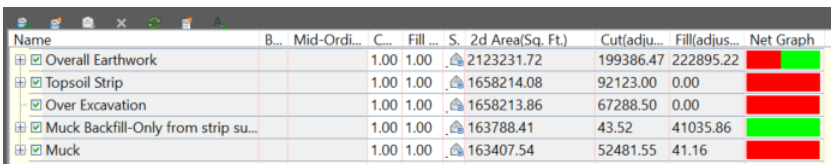




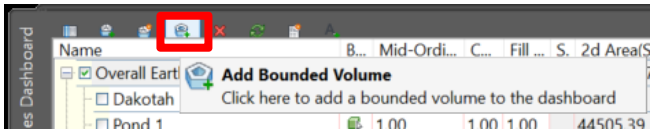
- From the create surface dialog box, you will need to set the base surface (EG_Strip) and the comparison surface (Datum). Set a cut or fill factor if needed.



- Once the calculation is completed, the volumes dashboard will give you all the stats of the surface comparison (2D area, cut, and fill).



- The overall TIN volume surface can be divided up into an individual area by drawing a closed polyline that represents that area that you want calculated.



Name	B...	Mid-Ordi...	C...	Fill ...	S.	2d Area(Sq. Ft.)	Cut(adju...	Fill(adjus...	Net Graph
Overall Earthwork			1.00	1.00		2123231.72	199386.47	222895.22	
Dakotah		1.00	1.00	1.00		12720.31	1322.31	60.35	
Pond 1		1.00	1.00	1.00		44505.39	8585.19	1238.76	
Pond 2		1.00	1.00	1.00		51065.40	2834.65	3449.88	
Pond 3		1.00	1.00	1.00		20596.41	2248.33	777.24	
Proir Lake		1.00	1.00	1.00		644335.19	140039.61	25418.56	
CSAH 42 WB		1.00	1.00	1.00		19258.17	696.33	1300.60	
Shakopee		1.00	1.00	1.00		1171054.44	41598.98	139590.58	
17 Off Ramp		1.00	1.00	1.00		159698.22	2064.11	51043.03	

- Two options for displaying cut/fill reports is to create an HTML file or insert text into the file. Note, the insert cut fill summary is just static text in the drawing and won't update.