



USACE Training: User Reference Guide V2



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USACE Training

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We trust that these manual and downloadable datasets help you to get the most out of Collaboration for Revit and BIM 360 Team software investment. So, enjoy and happy learning!

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Project Set Up

Introduction

A project is a collection in the Prospector tree that represents objects in a database (vault). Each project is essentially a folder that contains drawings, databases of points, and reference objects, such as surfaces, alignments, and pipe networks. A project folder can also contain other documents relevant to an engineering project.

Key Concepts

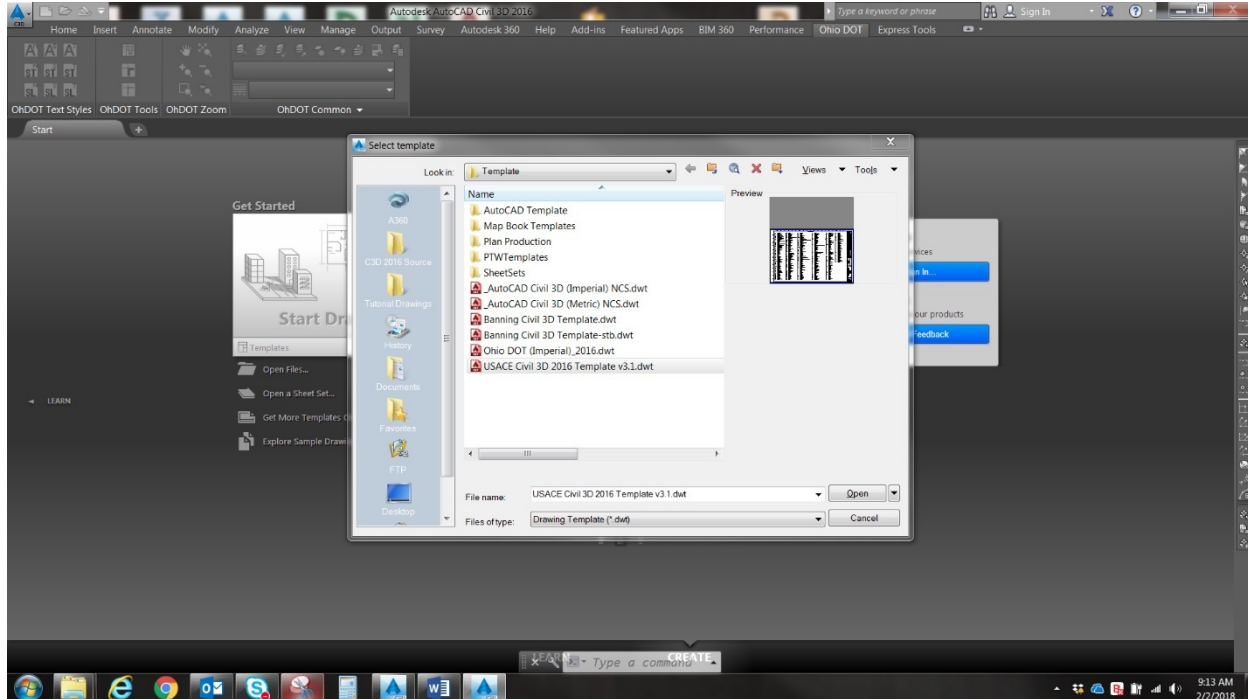
- log in to the project management system
- create a project

Note: you must be in a Civil 3D drawing to set up a project.

Creating a Project

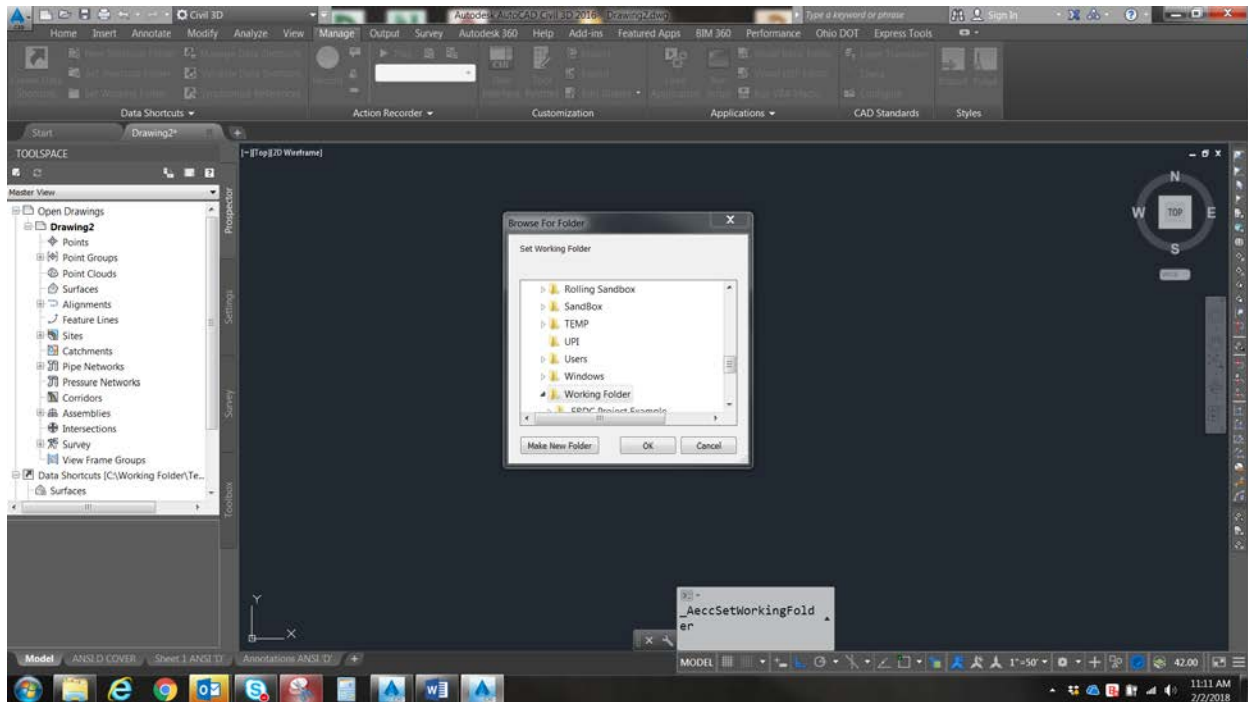
EXERCISE:

1. Open a new drawing using the **USACE** template.

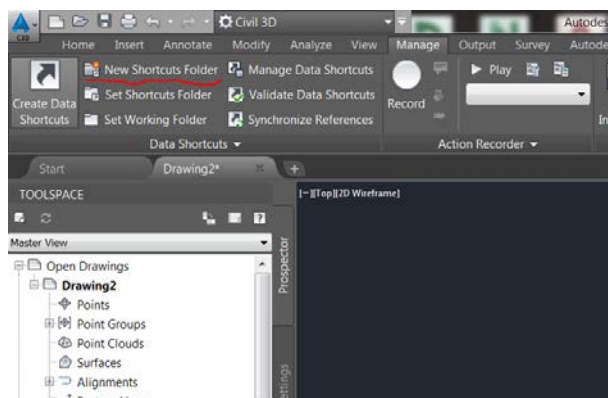


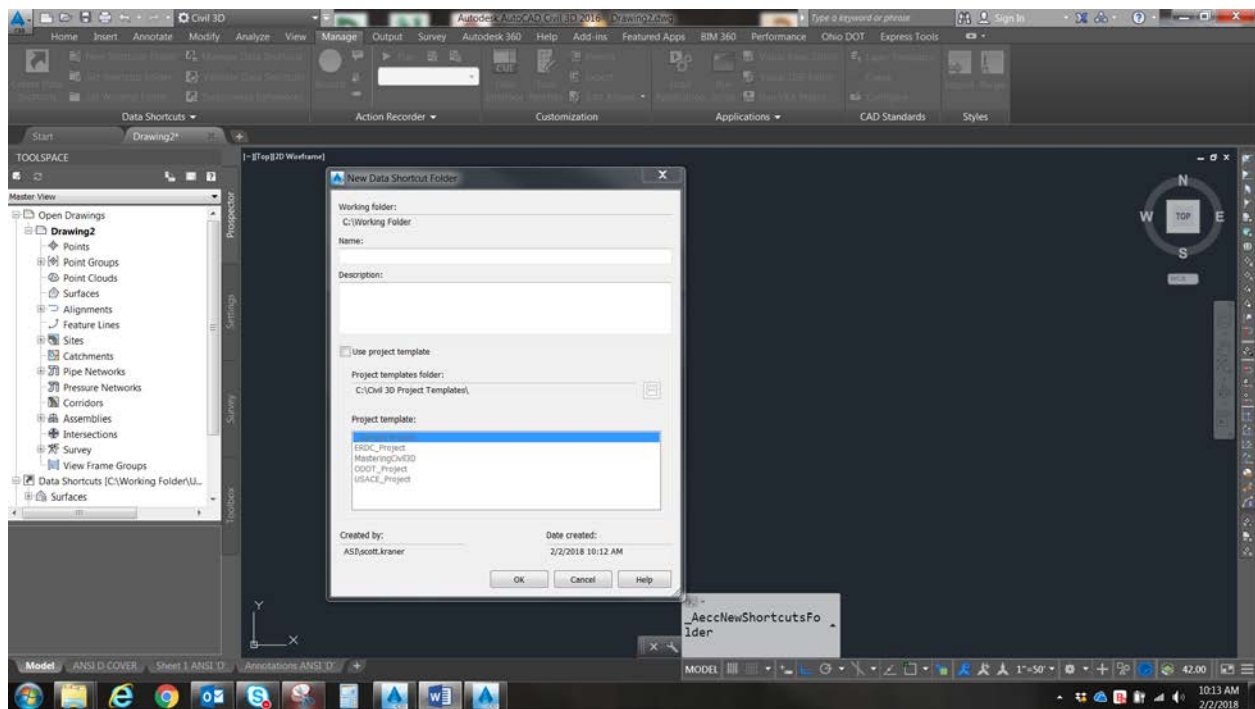
- From the Manage tab>Data Shortcuts pane select "Set Working Folder" and use the "Browse for Folder" dialog to select the Working Folder.

Note: The working Folder is the directory that contains the project folders.

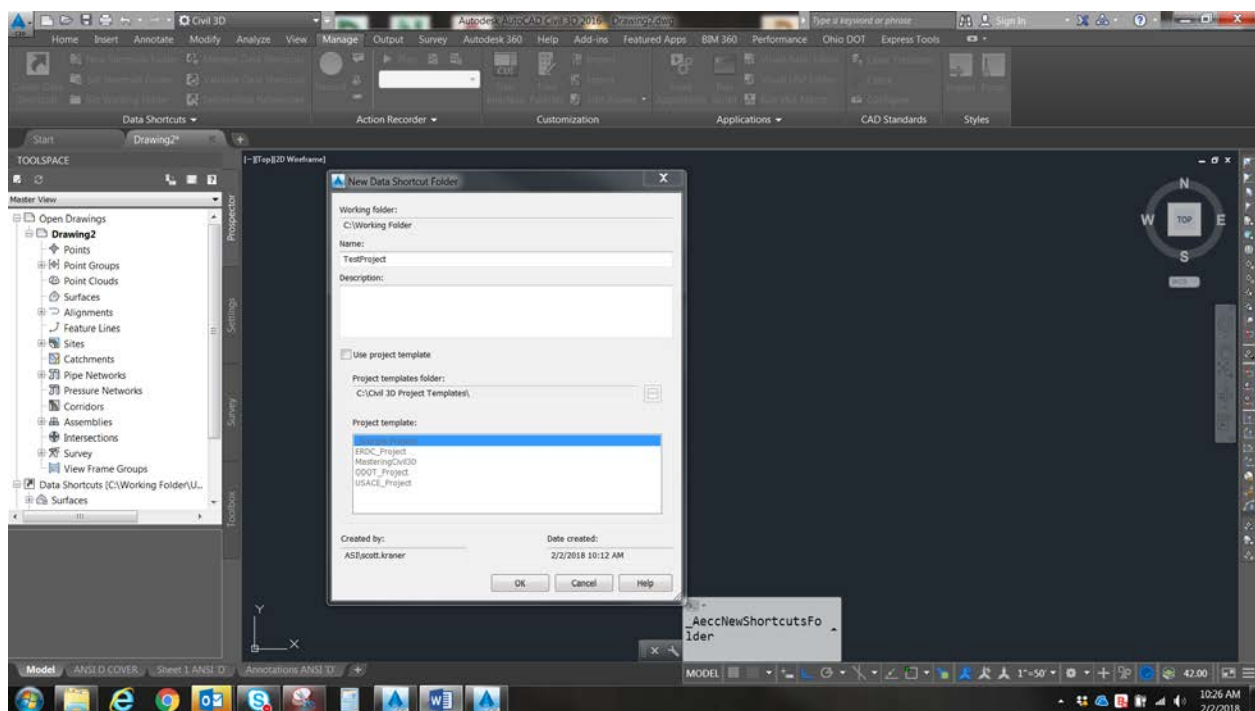


- To create a Civil 3D project using a project directory, which has been previously created using Project Wise, from the Manage tab>Data Shortcuts pane select "New Shortcuts Folder" to open the "New Data Shortcut Folder" dialog.

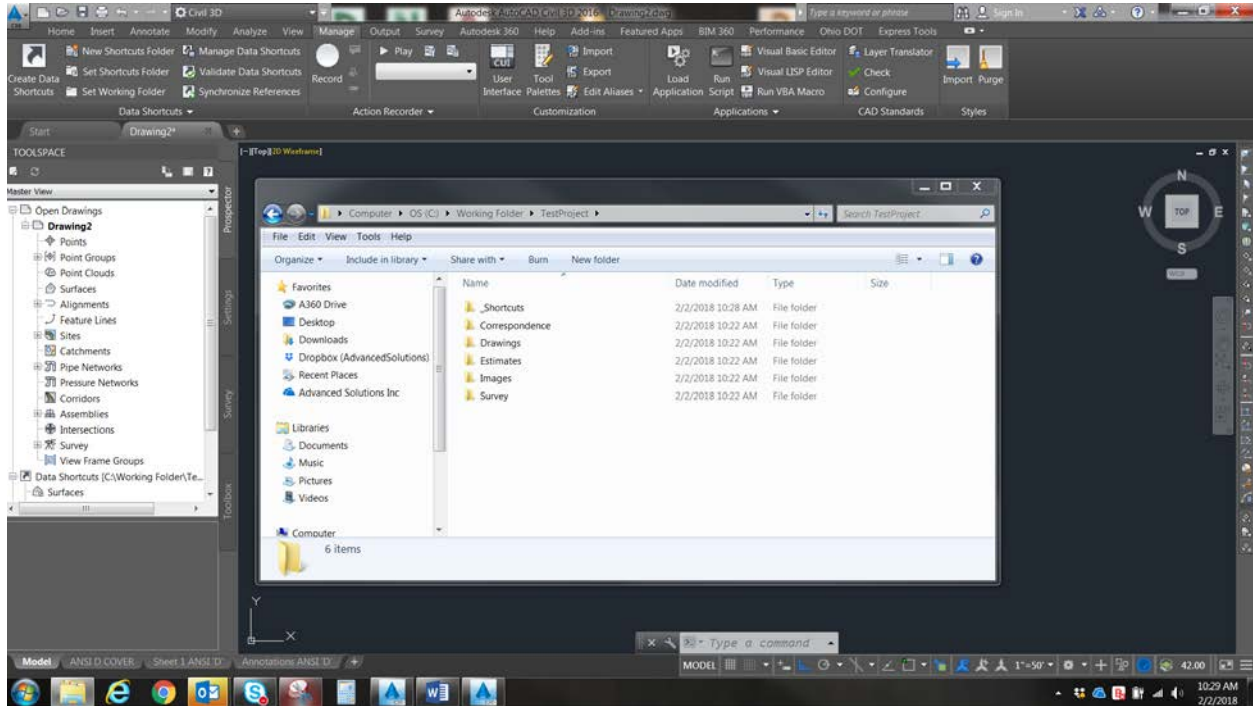




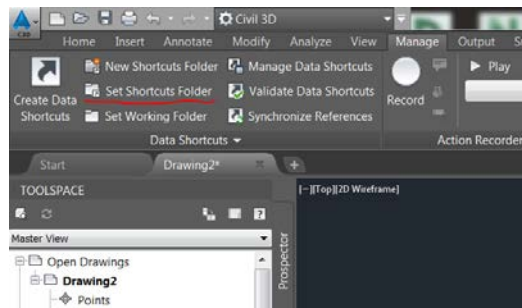
4. Type the name of the project directory in the “Name” portion of the dialog. Note that spelling, capitalization, spacing, etc. must match, exactly. You may add a project description in the “Description” portion of the dialog. Do not select the “Use project template” option, if a directory structure has already been created. Click OK.

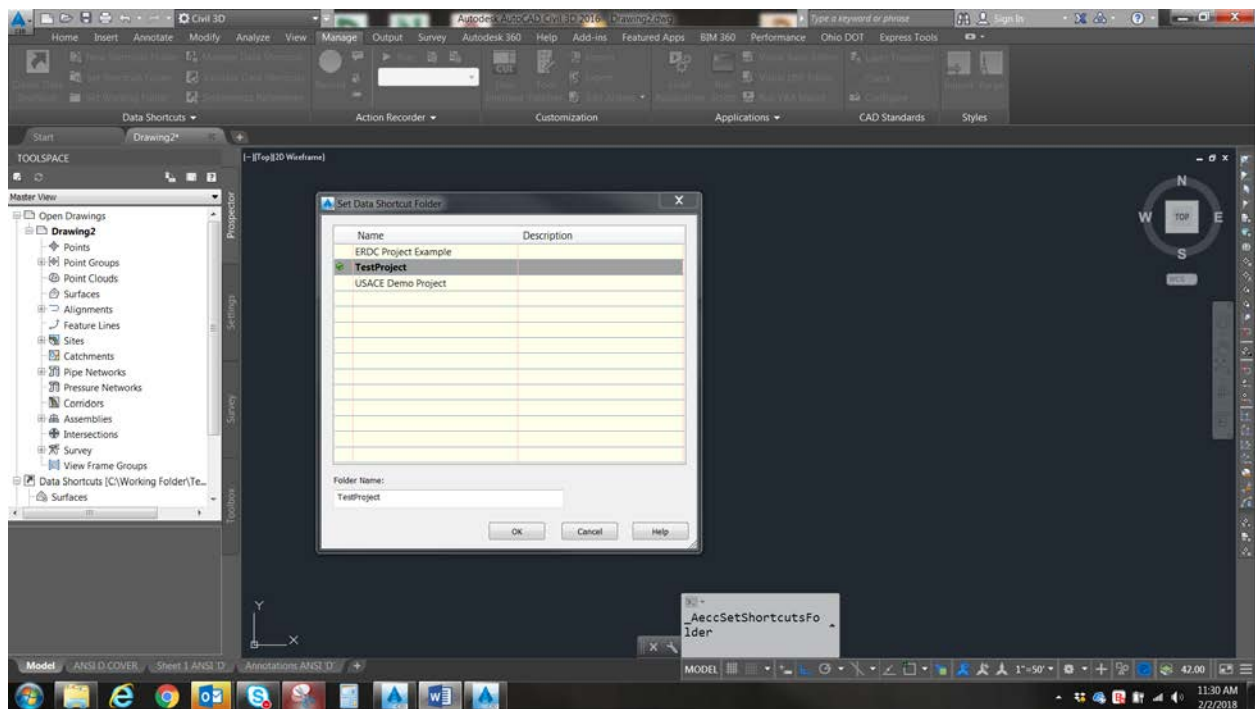


5. A new Civil 3D project is created and associated with the selected project directory. A subdirectory named “_Shortcuts” is added the project directory to manage Data Shortcut XML pointers.

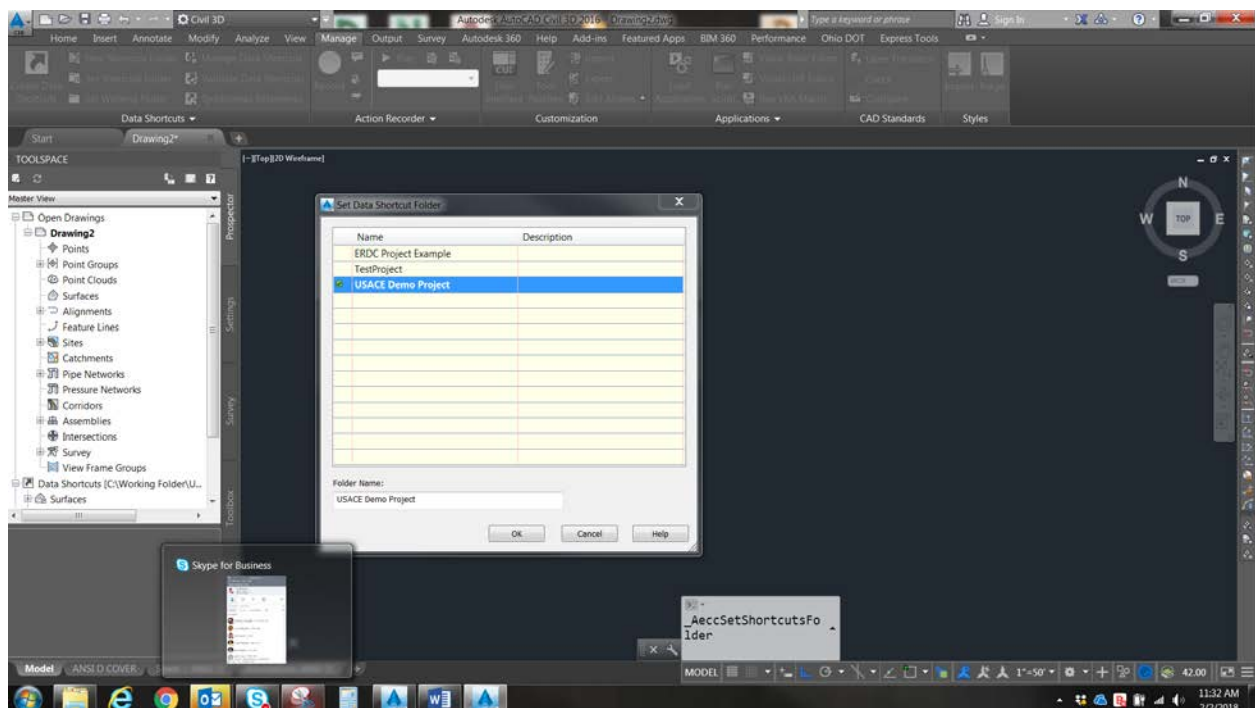


6. From the Manage tab>Data Shortcuts pane select “Set Shortcuts Folder” to open the “Set Data Shortcuts Folder” dialog and set a current project.





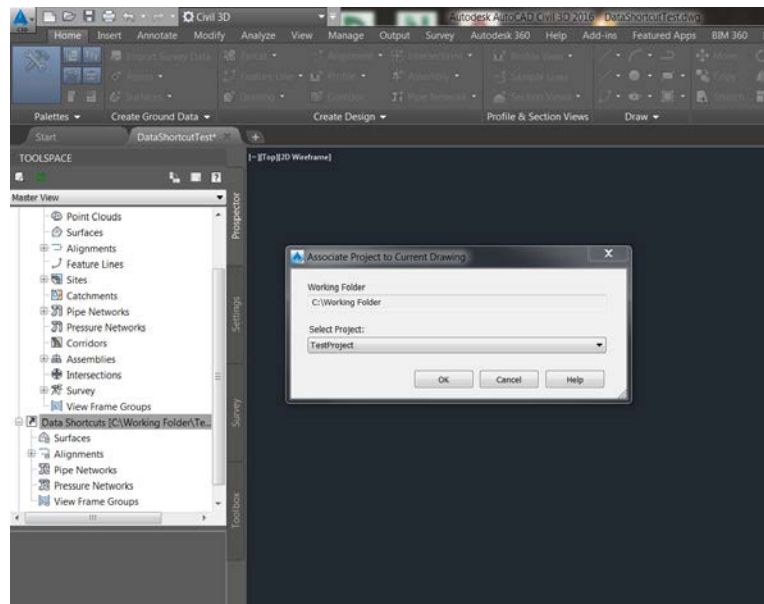
Note: Any project within the Working Folder can be selected.



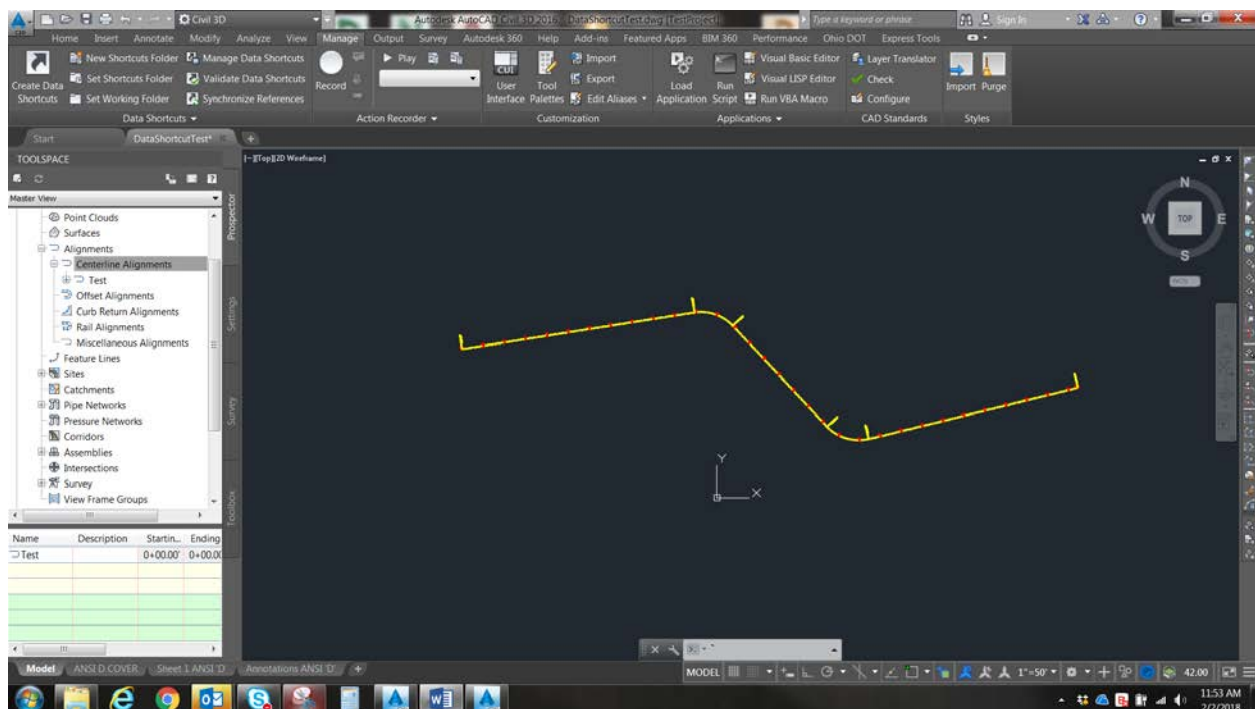
7. New drawings can be created and associated with a project by Right Clicking the "Data Shortcuts" folder in the Prospector tab of Toolspace and selecting "Associate Project to Current Drawing". This



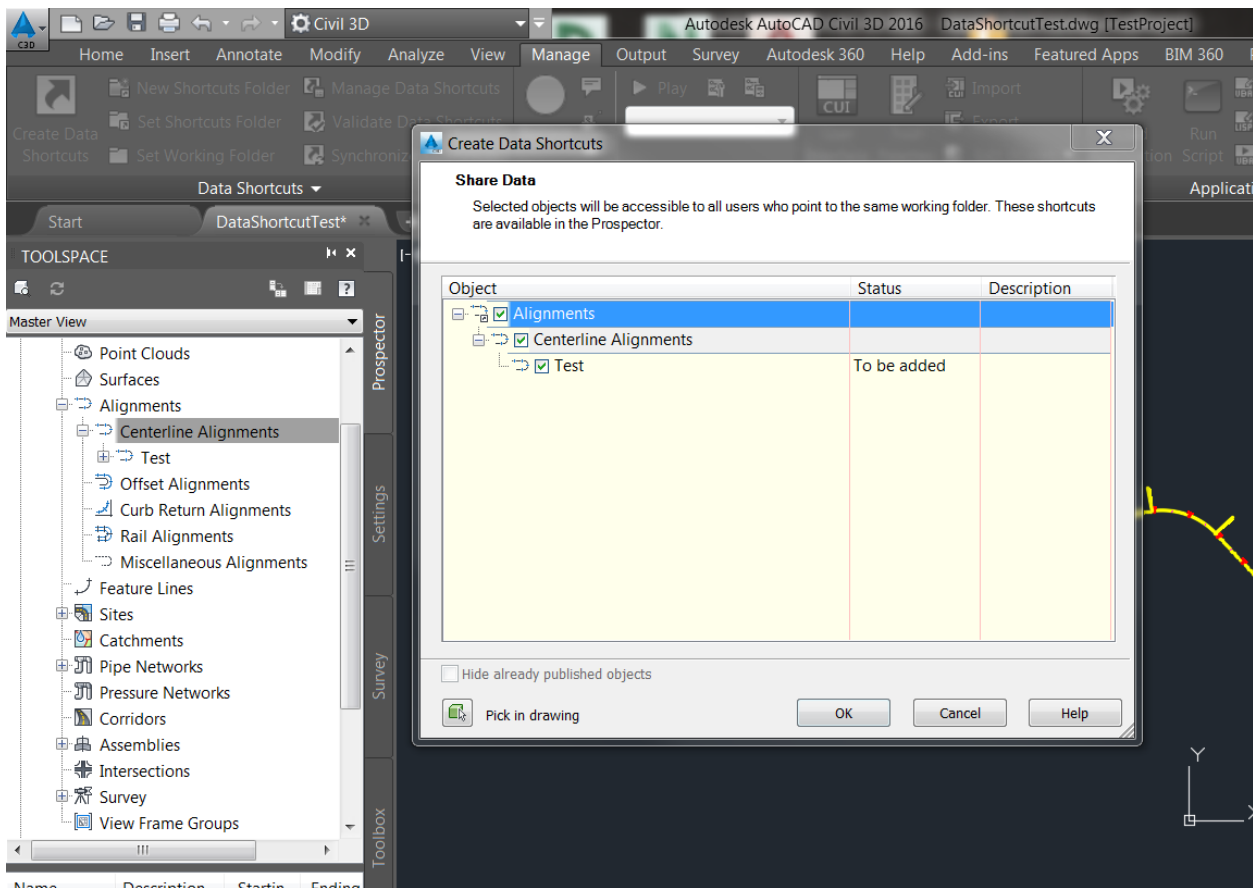
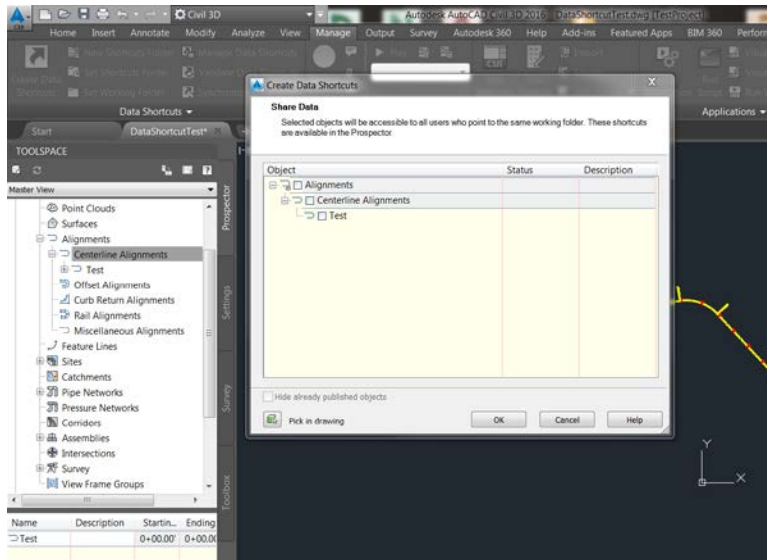
brings up the “Associate Project to Current Drawing” dialog, which allows for the selection of any project within the Working Folder, which is displayed at the top of the dialog.



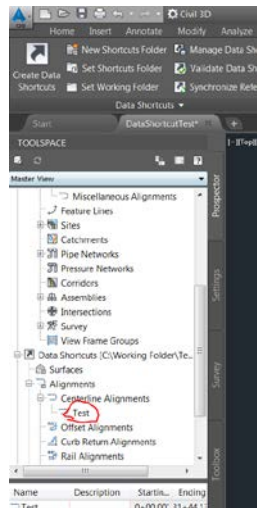
- Data Shortcuts can be created by selecting the “Create Data Shortcuts” icon in the Data Shortcuts pane of the Manage tab.



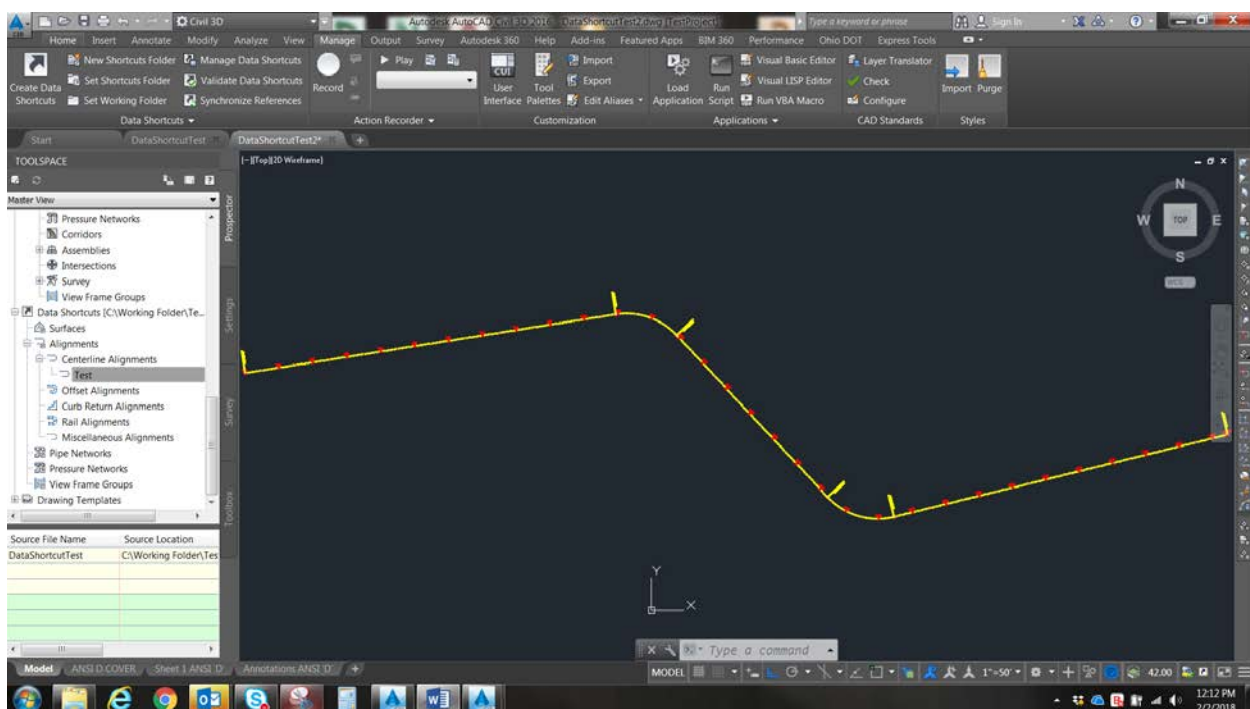
9. This brings up the Create Data Shortcuts dialog, which allows you to select the data you wish to make available.



10. Once selected, data appears under the Data Shortcuts area of Prospector.



11. Data can be shared with another drawing, associated with the same project, by Right Clicking the object under the Data Shortcut area of Prospector and Selecting "Create Reference". The Create <selected object> Reference dialog appears allowing adjustment to some of the data referenced objects settings. Selecting OK creates a data reference of the object within the new drawing. You usually need to zoom to the newly created data reference.



GIS Data

Introduction

Autodesk Civil 3D is built on the Autodesk Map 3D platform technology, which allows for combining of CAD and GIS (geographic information system) data. GIS Data is usually downloaded from County, State or Local agencies or can be a locally stored and maintained.

Key Concepts

- Importing GIS Data.
- Connecting GIS Data.
- Control display of connected GIS Data.

Importing GIS Data: ESRI Shape (.shp) Files

The **MAPIMPORT** command converts GIS data into native AutoCAD geometry, removing the need to maintain them in their original format. The command can be compared to importing and exploding a block in AutoCAD, as the drawing becomes the host of the geometry in model space. ESRI GIS databases store information over several files, our focus will be:


1. Geometry
2. Attributes
3. Coordinates


The dialog box that comes up after using the **MAPIMPORT** command, the selected source file data can be extracted, below are some key items to focus on:

- **Spatial filter:** if no filter is assigned ALL the geometry in file will be imported
- **Drawing Layer:** this will be the AutoCAD layer geometry will be on. New layer can be created by simply typing it, will default to white and continuous.
- **Input Coordinates:** coordinate assigned to source file, important to assign if data does not match drawing coordinates.
- **Data:** MUST be manually set if attribute data is needed.
- **Import polygon as closed polylines:** best if checked, otherwise closed polylines will be imported as shaded polygon objects.



Import - C:\SOW\..\Designated_Highways.shp

Current drawing coordinate system
 MS83-WF
 NAD83 Mississippi State Planes, West Zone, US Foot

Spatial filter
 None
 Current display
 Define window 

Driver options
 Changing these options may affect the layout of the import properties table.

Import properties for each layer imported:

Input Layer	Drawing Layer	Object Class	Input Coordinate	Data	Points
<input checked="" type="checkbox"/> Designated_High	Designated_Highwa	<None>	MS83-TM	<input checked="" type="checkbox"/> Designated_Hi	<ACAD_POINT>

Saved profiles

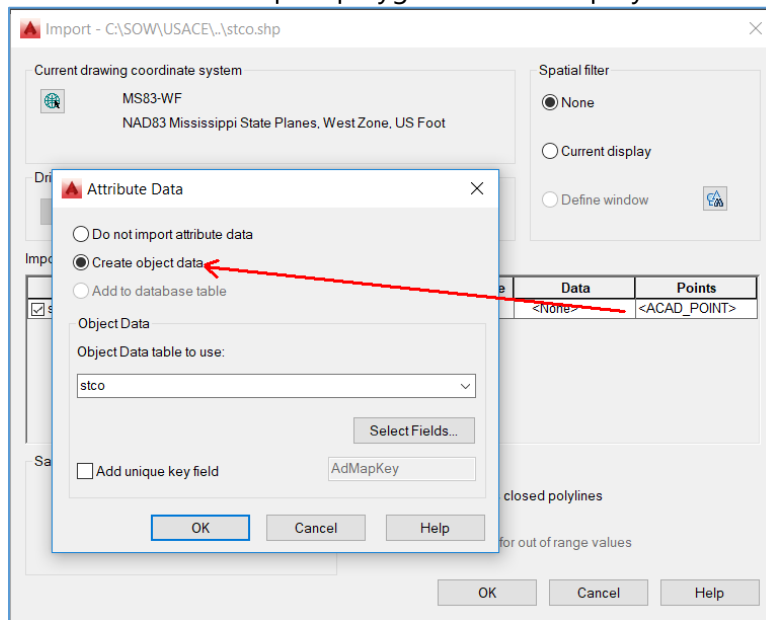
Current profile:

Import polygons as closed polylines
 Use class defaults for out of range values



EXERCISE: Importing County Outlines

1. Start by creating a **NEW** drawing using default template.
2. Switch to Model tab.
3. Set coordinate to **MS83-WF**. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**
4. From the command line type, the command **MAPIMPORT**.
5. Browse to the **County_Boundaries** data folder and select **stco.shp**
6. From the Import Dialog Box:
 - a. Drawing Layer > type in GIS-County
 - b. **Data field** > select Create object data > drop down should read **stco**
 - c. Check box for Import polygons as closed polylines.



(*NOTE: Map and File coordinates are supposed to be different*)

7. Pick the **OK** button. The command line should read that **85 OBJECTS (s) inserted**
8. From model space > Zoom to drawing extents > view all imported entities.
9. Open AutoCAD **PROPERTIES** palette and select any of the county outlines. Notice the objects are recognized as AutoCAD native **polyline** entities. Scroll down to the bottom section of palette and view the "**OD**" (Object Data).



The screenshot shows a GIS application interface. On the left, a map displays a grid of land parcels. A specific parcel is highlighted with a blue square, and a red dot is visible on the map. On the right, the 'PROPERTIES' window is open, showing details for a 'Polyline' object. The 'Extended Data' tab is selected, displaying a table of attributes for the selected object.

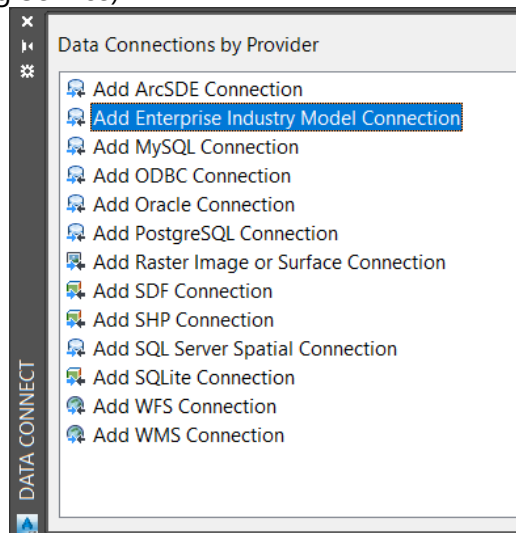
Polyline	
Linetype genera...	Disabled
OD:stco	
FeatId	44
AREA	1480891608.8329
PERIMETER	156137.8345
NEWSTCO_	45
NEWSTCO_ID	44
COUNTY	99
CONAME	Neshoba
CO_SEAT	Philadelphia
TOTAL90	24800
WHITE90	16945
BLACK90	4611
OTHER90	3244
T18_90	17395
W18_90	12709
B18_90	2928
O18_90	1758
TOTAL	28684
WHITE	18788
BLACK	5546
AMERIND	3959



Connecting to GIS Data: ESRI Shape (.shp) Files

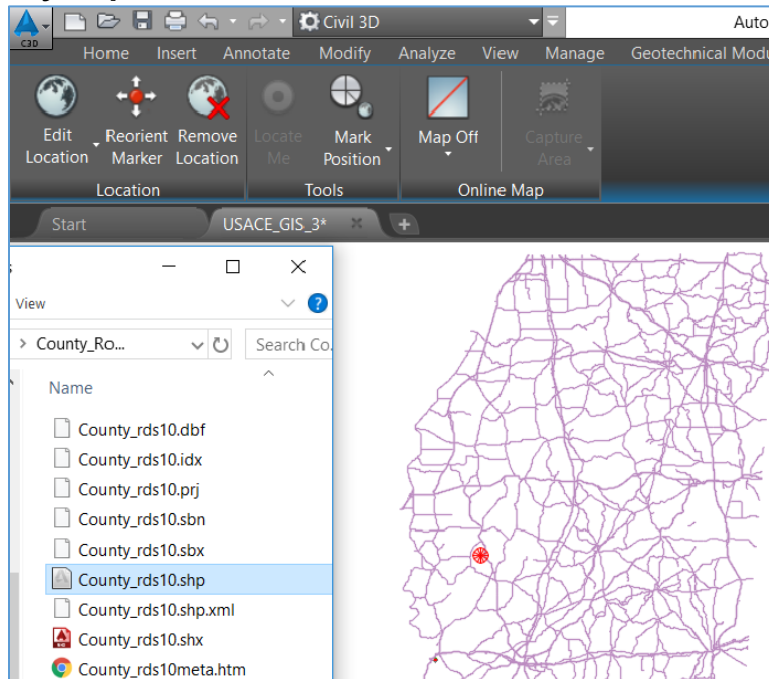
The imbedded Autodesk Map 3D technology allows for connections to Feature Data Objects (FDO) to access GIS data in its native format. It can be compared to the use of AutoCAD X-refs, in the sense that a link is created and if changes occur they can be easily updated. The Data Connect palette contains several data providers to access typical GIS data formats:

1. Relational Database Management Systems (RDBMS):
 - a. ArcSDE
 - b. Enterprise Industry Model Connection (MAPMAION or MAPSYS)
 - c. MySQL
 - d. Oracle
 - e. SQL Serer
 - f. SQL Server Spatial
2. File based formats:
 - a. SDF
 - b. SHP
 - c. ODBC Connections (Open Data Base Connectivity)
3. Web based Service connections
 - a. WFS (Web Feature Service)
 - b. WMS (Web Mapping Service)

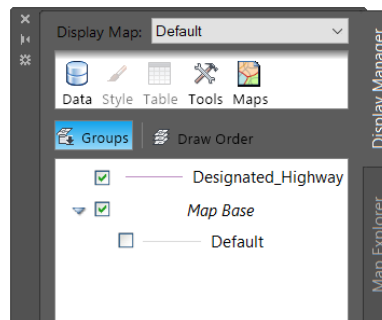


EXERCISE: Connecting to County Boundaries (via drag & drop)

1. Open USACE_GIS_3.dwg
2. Check that Coordinate system is set to **MS83-WF**. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**
3. Open Windows Explorer window > browse to **County_Hwys** folder > drag and drop **Designated_Highways.shp** file



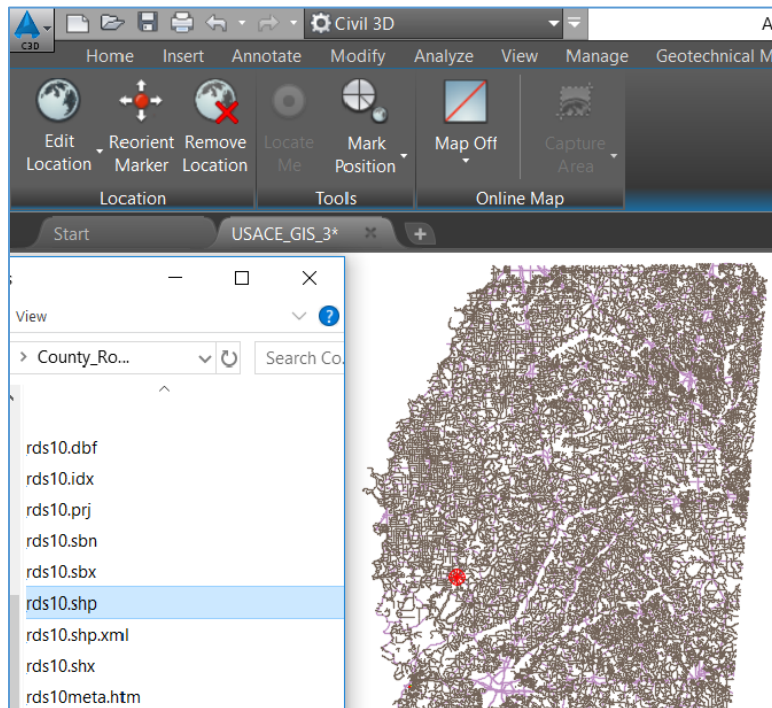
4. Color might vary due to the random color palate that is working in the background.
5. To view connections, open the **TASK PANE** palette > from command line type **MAPWSPACE** > set to **ON** > from **Display Manager** tab



6. The connected **Designated_Highways.shp** file generates Map Feature type objects that DO NOT reside on an AutoCAD layer. Their display is controlled via a style and can be easily turned ON/OFF by Checking or Clearing the box.
7. Continue working on drawing...

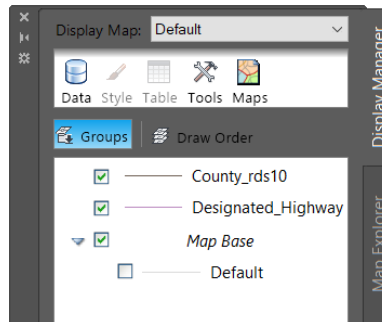


8. Via Windows Explorer window > browse to **County_Roads** folder > drag and drop



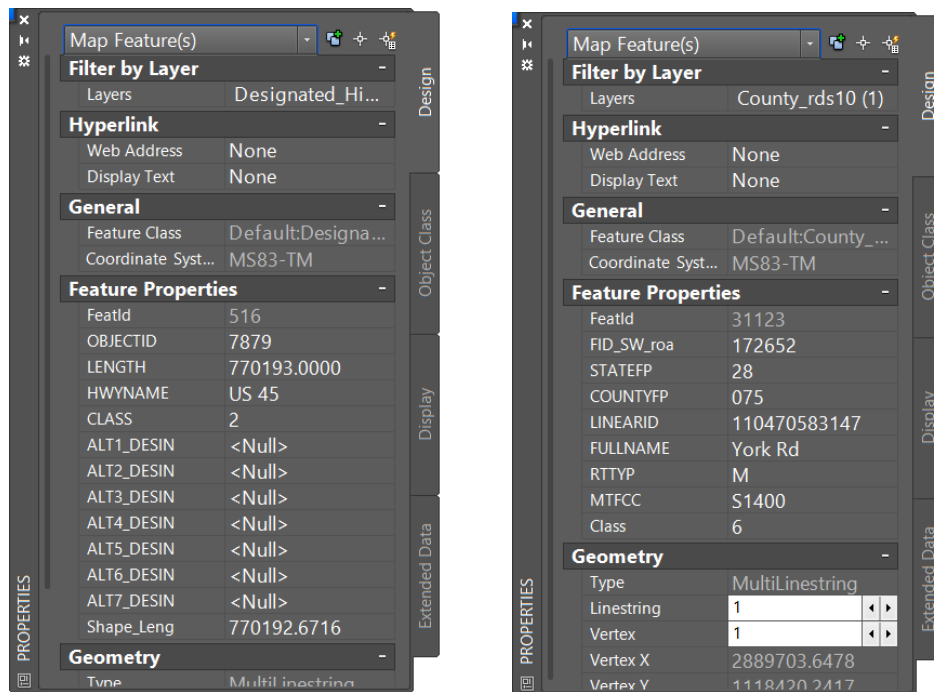
Designated_Highways.shp file

9. To view connections, open the **TASK PANE** palette > from command line type **MAPSPACE** > set to **ON** > look **Display Manager** tab

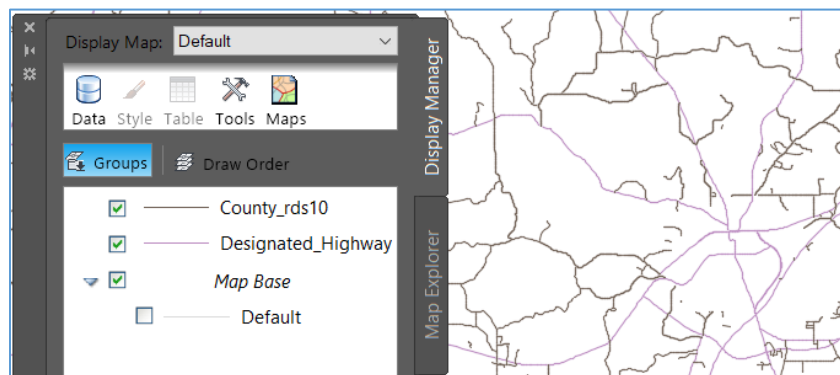


10. The connected **Designated_Highways.shp** file generates Map Feature type objects that DO NOT reside on an AutoCAD layer.
11. Next, Open AutoCAD **PROPERTIES** palette and select a county and/or local roadways centerline. Notice the objects are recognized as Map Feature(s) and NOT AutoCAD entities.



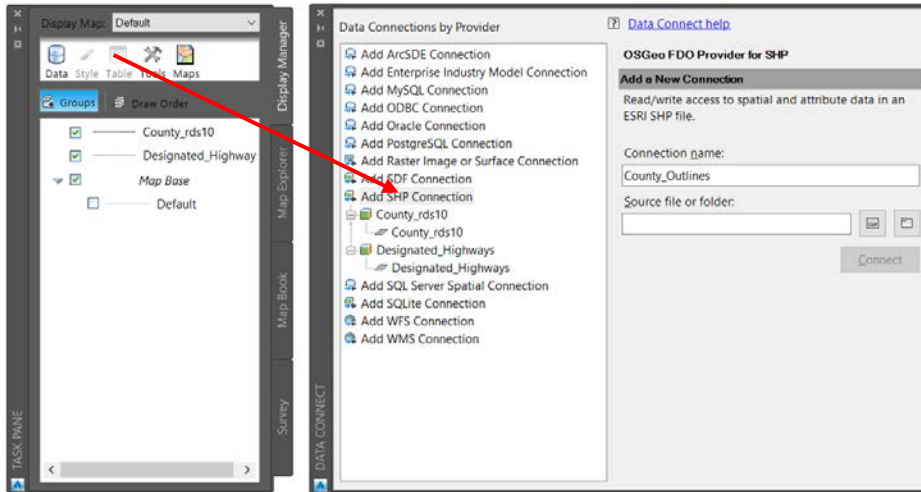




Color of the Feature Data Object (FDO) connections for the Roadway centerlines might vary due to the random color palate that is working in the background. Their display is controlled via styles and can be easily turned ON/OFF by Checking or Clearing the box.

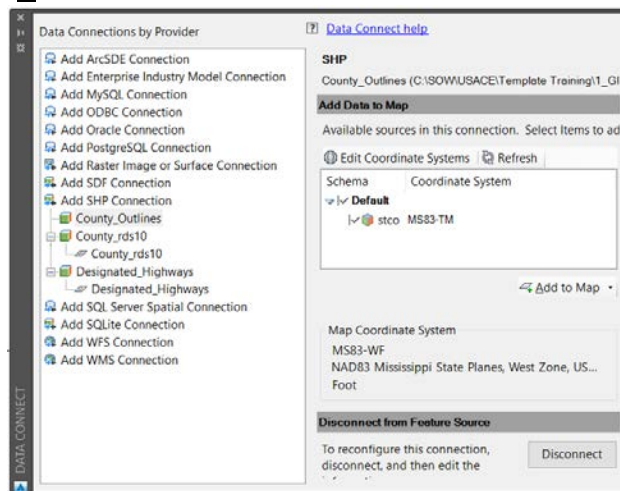



EXERCISE: Connecting to County Boundaries (browse to file)

1. Continue working with previous file or Open **USACE_GIS_4.dwg**
2. Check that Coordinate system is set to **MS83-WF**. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**
3. Open the **TASK PANE** palette > from command line type **MAPSPACE** > set to **ON** > pick on the **Data** button

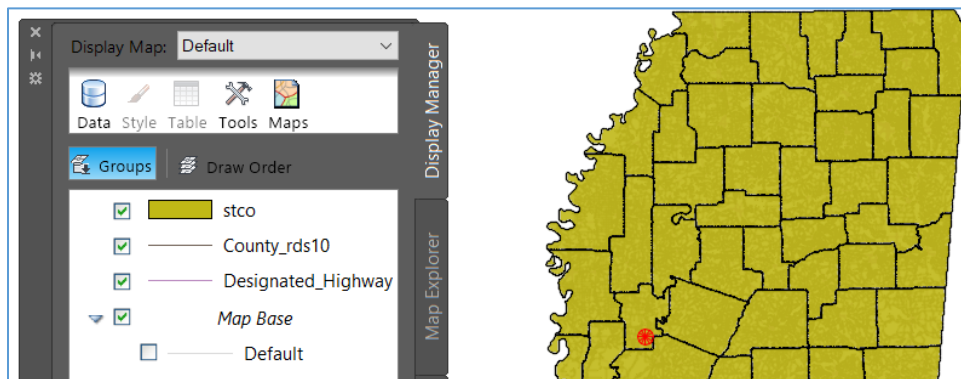


4. From the **DATA CONNECT** palette you can Edit or Add new connections
5. Select the Add SHP Connection >
 - a. From Connection name: set name to **County_Outlines**
 - b. Click on the SHP  button: browse to folder **County_Boundaries** > select **County_rds10.shp**
 - c. Next click on the **Connect**  button

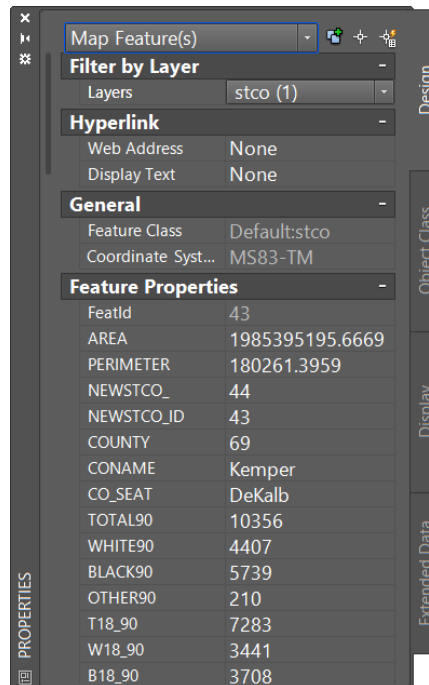


- d. Last click on the **Add to Map**  button.
- e. From model space, you can now see the connected County Boundaries in model space.





- f. The newest connected layer will appear on top of the list on the **Display Manager** tab. Color might vary due to the random color palate that is working in the background.
6. Next, Open AutoCAD **PROPERTIES** palette and select a county outline. Notice the objects are recognized as Map Feature(s) and NOT AutoCAD entities.



The next section will review how to control display and appearance of FDO connections.



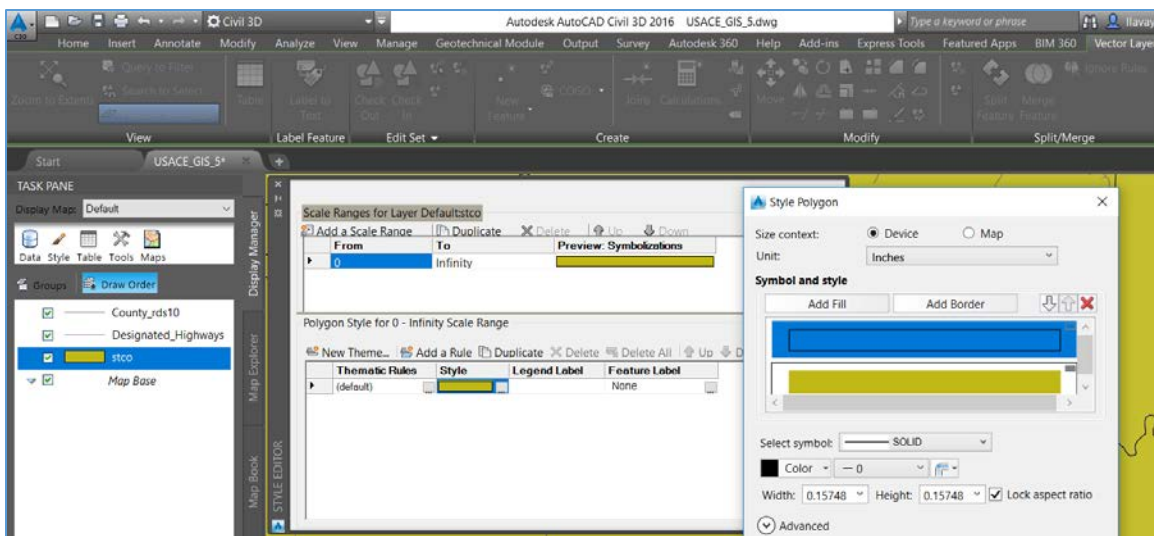
Controlling Display: ESRI Shape (.shp) Files

Autodesk Map 3D will by default assign colors to Feature Data Objects (FDO) connections to make them stand out. Stylizing features will improve created maps look to a user specified display. Feature Styles are NOT stored in the feature source, it is part of the individual drawing. There are three main types of feature elements:

1. Points: control shape, size color.
2. Lines: control weight, line type and color
3. Polygons: control border color and fill pattern and color

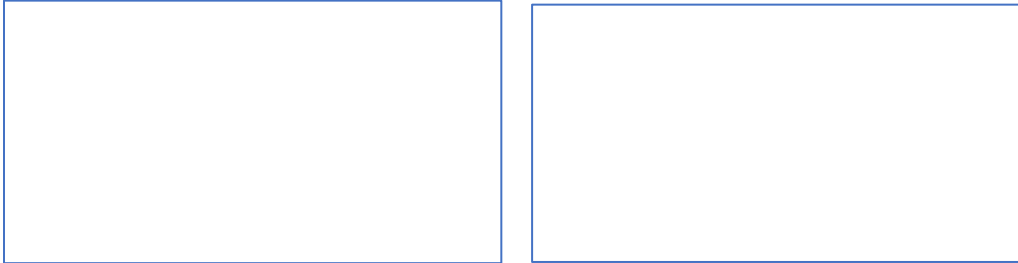
Using the **TASK PANE** palette, the display order (via drag and drop) and visibility of a connection (via check box) can be enabled and disabled.

The **STYLE EDITOR** palette can be used to set the color, weight, transparency and pattern of connected FDO entities. It can be also used to create dynamic labels of attributed data.00

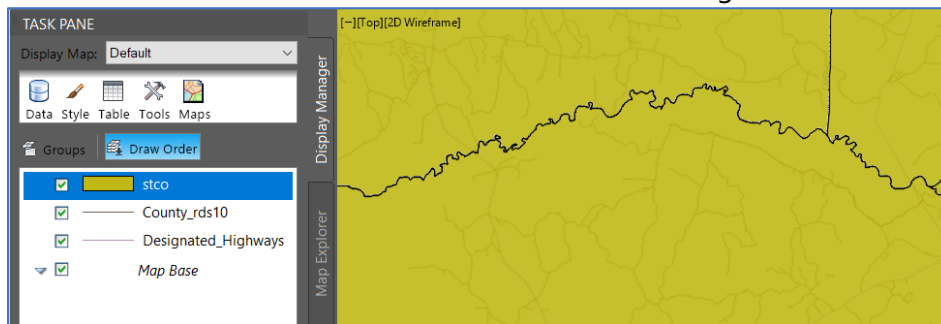


EXERCISE: County Boundaries (polygons)

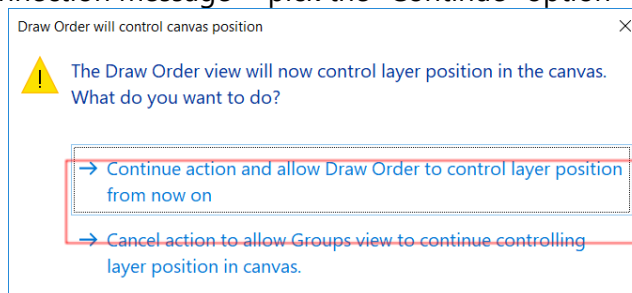
1. Open USACE_GIS_5.dwg
2. Open the **TASK PANE** palette > from command line type **MAPWSPACE** > set to **ON**
3. Use the check box beside the **stco** connection to turn the county outline layer on/off

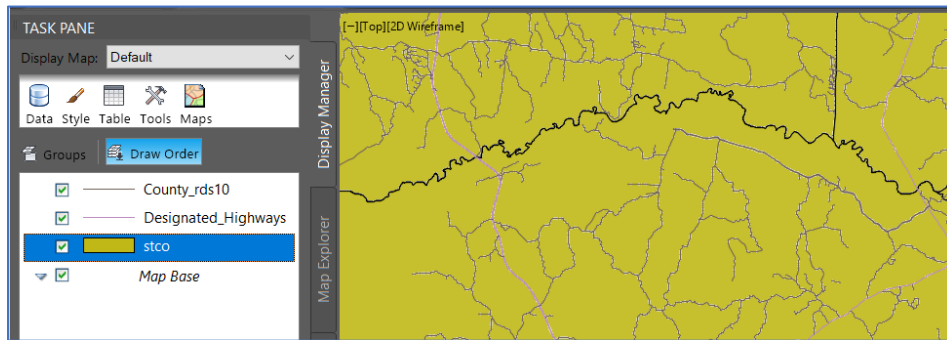


4. Pick on the **Draw Order** button > select the **stco** connection > drag to bottom of connections list



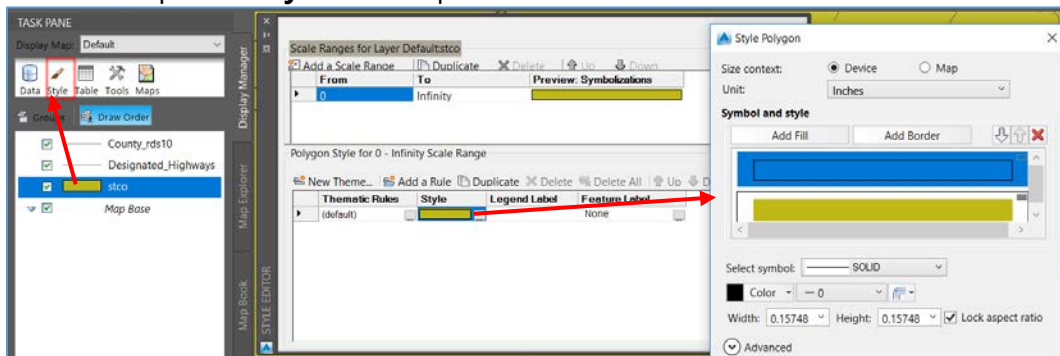
5. You might receive a connection message > pick the "Continue" option



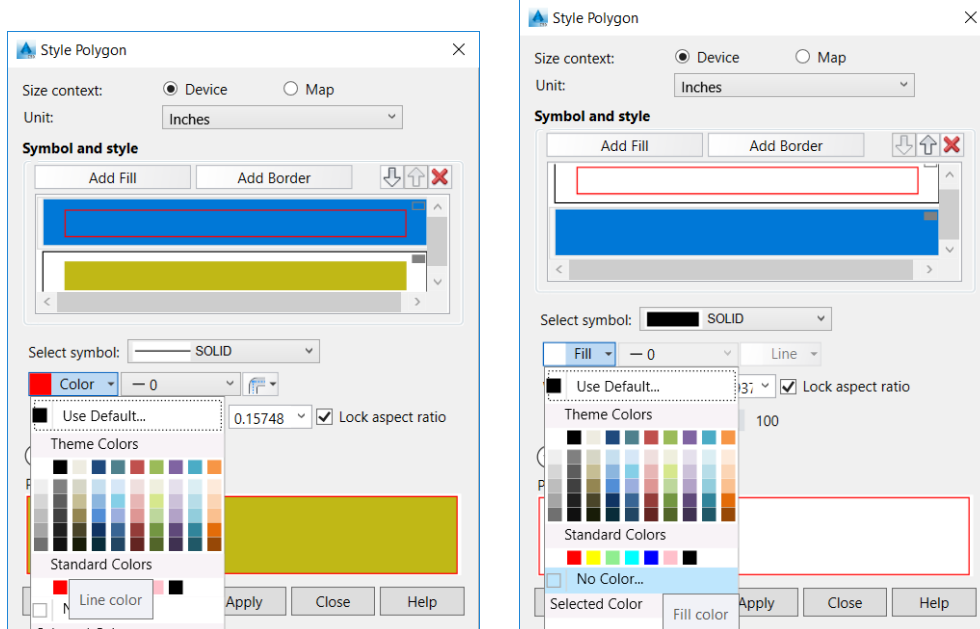


6. The roadway centerlines will now appear above the shaded county filled areas.

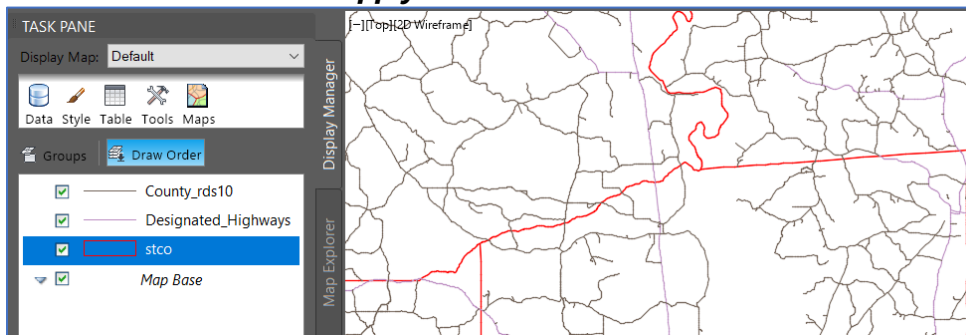
7. Next from the **TASK PANE** palette > select the **stco** layer > then click on the **Style** button > from the **STYLE EDITOR** palette **Style** column pick the browse button



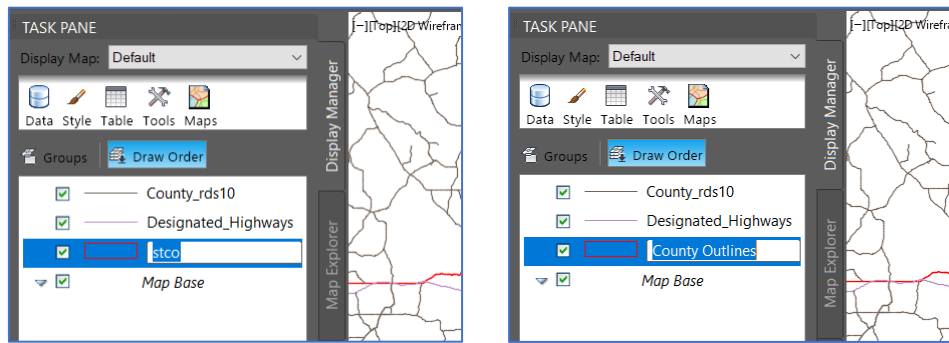
8. From the **Style Polygon** window:
- Select the Border > pick the **Color** drop down color > change color to **RED**
 - Select the Fill > pick the **Fill** drop down > change to **No Color**



9. To view results > click on the **Apply** button and the **Close** button

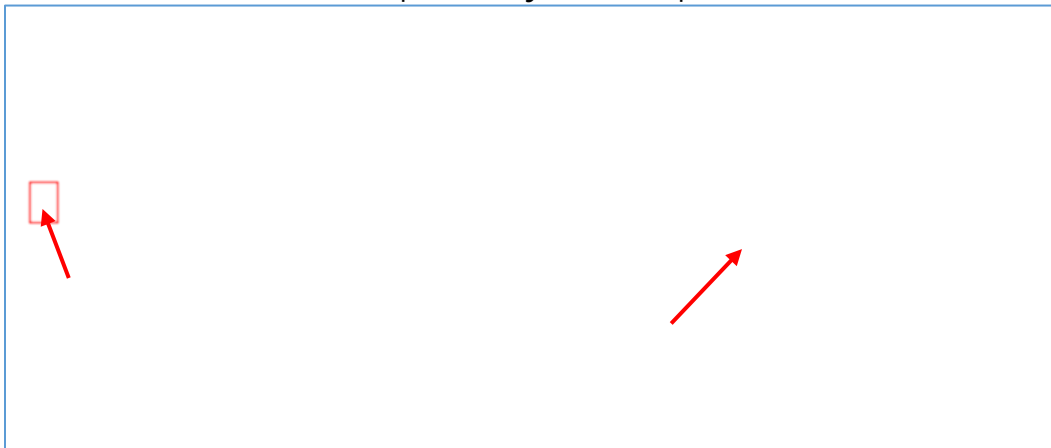


10. Next from the **TASK PANE** palette > slowly double click the **stco** FDO connection > rename to **County Outlines**

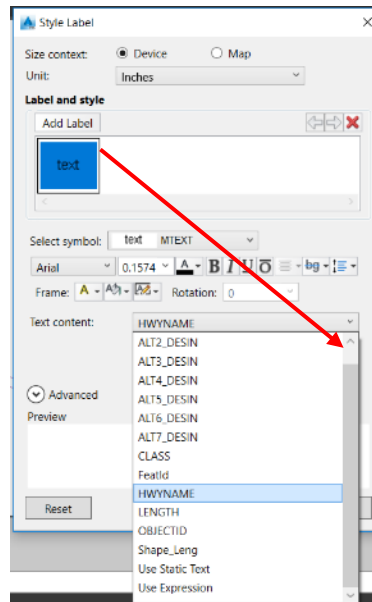


EXERCISE: Stylizing Roadway (lines)

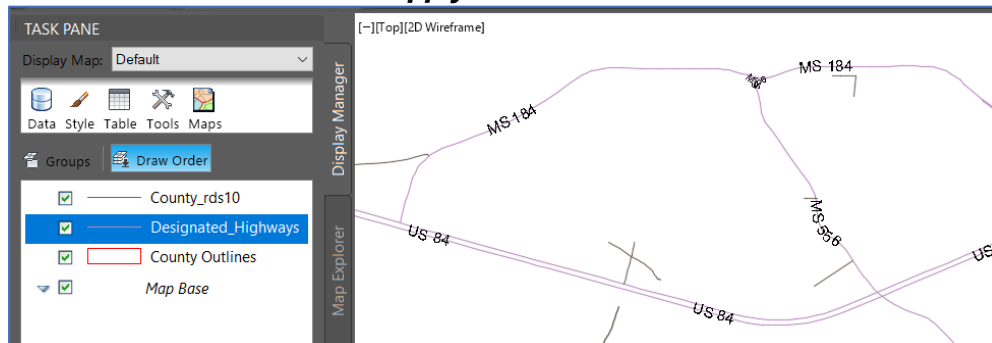
1. Continue working from drawing above or Open **USACE_GIS_6.dwg**
2. Open the MAP 3D Open the **TASK PANE** palette > from command line type **MAPWSPACE** > set to **ON**
3. From the **TASK PANE** palette > select the **Designated_Highways** layer > then click on the **Style** button > from the **STYLE EDITOR** palette **Style** column pick the browse button



4. From the **Style Label** dialog box > pick on the **Add Label** button > from the **Text content** drop down > select **HWYNAME**

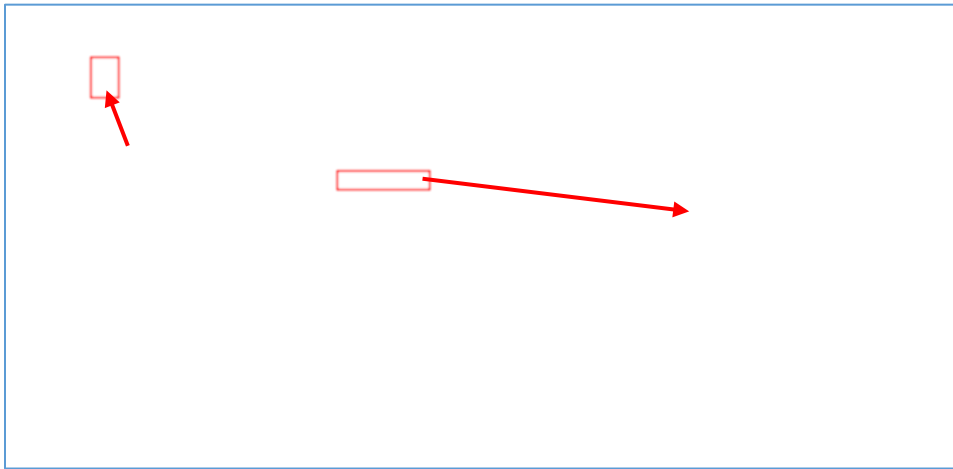


5. To view results > click on the **Apply** button and the **Close** button

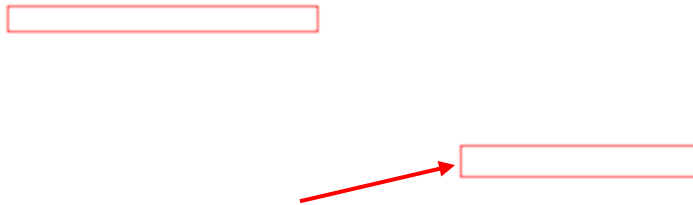


6. Continue working from drawing above or Open **USACE_GIS_7.dwg**
 7. From the **TASK PANE** palette > select the **Conty_rds10** layer > then click on the **Style** button > from the **STYLE EDITOR** palette > pick the **New Theme** button

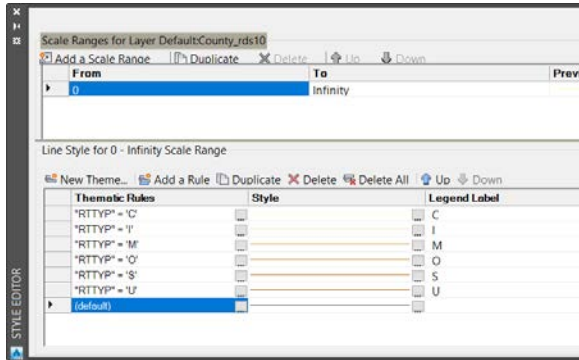




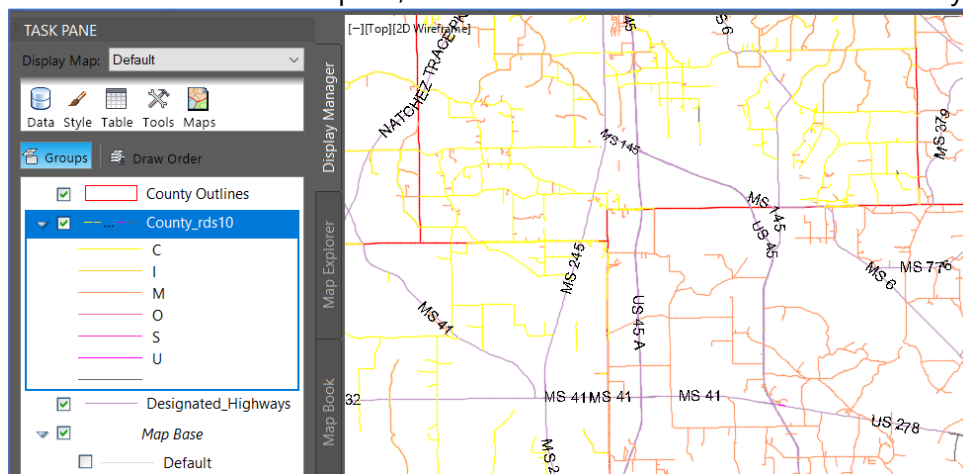
8. From the **Theme Layer** dialog box:
 - a. **Property** field drop down > select **RYTYP**
 - b. **Style range** > click browse button > from **Style and Label Editor** > **Line Color** Yellow > Magenta



9. To view results > click the **OK** button.



10. Results viewed in model space, Local Roads centerlines are color coded by **Type**



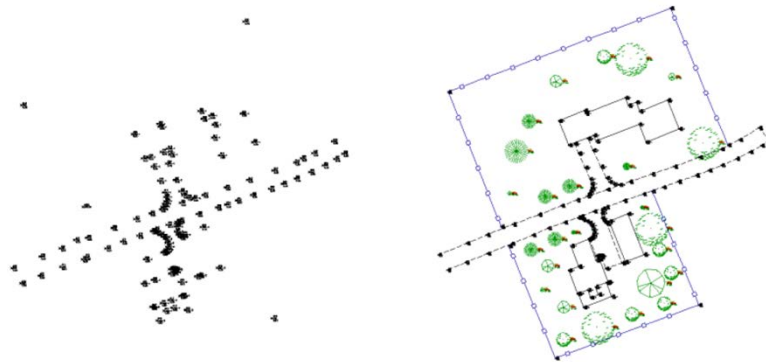
Survey Field to Finish – Processing Survey Data

Introduction

The power of civil 3D comes from its dynamic drawing environment keeping things in sync eliminating the omissions created by blocking information into a series of design bases. Utilizing the interrelated 3D object data from Civil 3D allows the end user to see the impact of design changes throughout the parallel design phases. This synchronization of object data eliminates the omissions and miscommunications of the design team using multiple bases in their project design.

Field to Finish

The goal in field to finish methodology is to create near production drawings utilizing the field data collected for optimum automation using line connectivity commands with standardized field codes. Civil 3D allows for automatic line generation on the proper layers and line types thus eliminating the dot to dot connection in manual drafting practices. Utilizing the survey figure commands, Begin and End, to control “pen down and pen up” actions the field data can be efficiently processed to draft the planimetrics of the base plan. The symbology is linked to the standardized field codes through the Description Key File, thus inserting the CADD standard blocks on their respective layers. All this field data processing is accomplished through the Drawing template, field codes, description key file, figure prefix database, and internal CADD standards.



Learning Objectives

- Configuration Overview
- Importing Points to Drawing
- Importing Points to Survey Data Base



Available Configuration

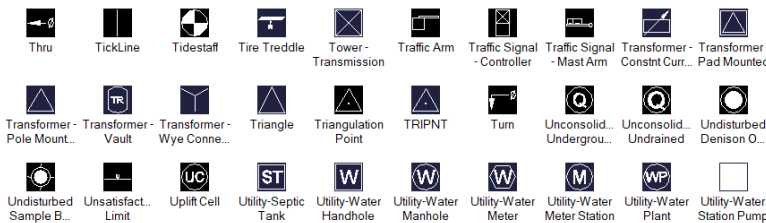
Configuration that will process field survey data can be found in two places:

1. As part of Drawing Template: Prospector or Settings tabs
2. External configuration that is NOT part of Drawing Template: Survey tab

As part of Drawing Template:

From **TOOLSPACE** palette > **Settings** Tab > **Point** collection >

- a. **Point Styles:** There are **318** marker styles available in template, they will be the symbol for collect survey point. Most are built from AutoCAD blocks.



- b. **Label Styles:** There are **23** styles to choose from in template. The annotation will be paired with marker to display attribute as needed.



- c. **Description Key Sets:** this is the 1st level of point management, and can be thought of as a "Filter". Imported points will be matched by RAW Description to the Code column. A single Description Key Set is available, with **237** individual keys to match field collected description to assign point Symbol, Label and Layer.

Code	Style	Point Label	Format	Layer	Scale Parameter	Fi
AC*	<default>	<default>	TOP OF A.C. PAD	V-PADS-OTLN	Parameter 1	<input type="checkbox"/>
ANT*	SITE_Tower V_(USACE)	<default>	\$*	C-SITE-STRC	Parameter 1	<input type="checkbox"/>
AP	<default>	<default>	ABANDONED PIPE	V-SITE-STRS	Parameter 1	<input type="checkbox"/>
APR*	<default>	<default>	APRON	V-APRN-GRND	Parameter 1	<input type="checkbox"/>
ASP*	<default>	<default>	ASPHALT	V-ROAD-ASPH	Parameter 1	<input type="checkbox"/>
ATO*	<default>	<default>	ASPHALT	V-ROAD-ASPH	Parameter 1	<input type="checkbox"/>
ATP	<default>	<default>	ABUTMENT TOE	V-BRDG-DECK	Parameter 1	<input type="checkbox"/>
BAL*	PRKG_Ballast V_(USACE)	<default>	BALLAST	V-PRKG-FIXT	Parameter 1	<input type="checkbox"/>

From > **TOOLSPACE** palette > **Prospector** tab > **Point Groups** collection



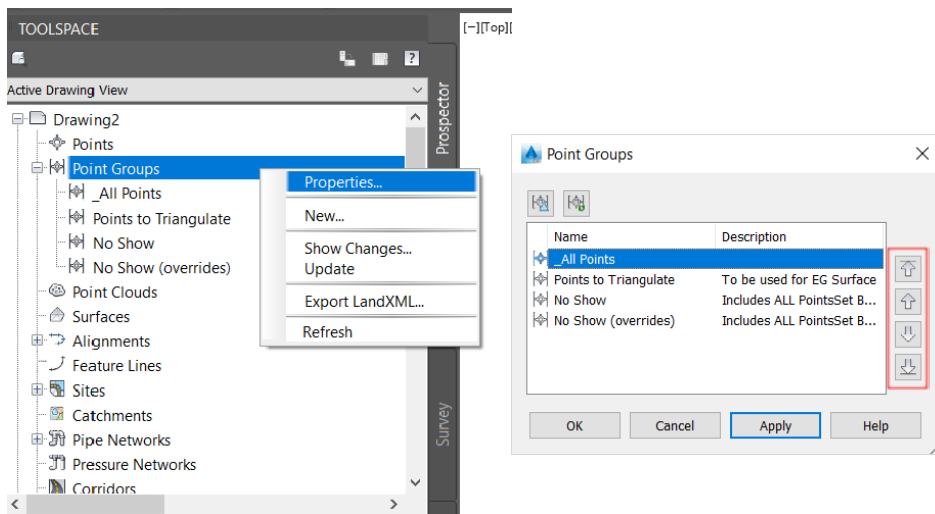
d. **Point Groups**: this is the 2nd level of point management, and can be thought as a “List of Points”. There are only 4 groups available in drawing template:



- _All Points:
- Points to Triangulate:
- No Show:
- No Show (overrides):

As survey data is imported, point groups will need to be updated for data to be re-sorted. New groups can be created and needed to:

- Control Display
- Build Surfaces
- Export
- Create Tables

Display order can be controlled by right click on **Point Groups** collection > select **Properties...**



Both point management options mentioned above will control COGO Points  that are imported directly into drawing or Survey Points  that are imported via Survey Databases.

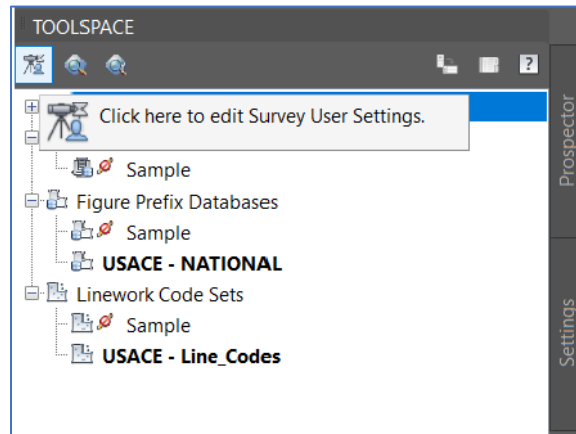


External configuration:

Field to Finish configuration is NOT part of Drawing Template. These external settings can be found from **TOOLSPACE** palette > **Survey** tab

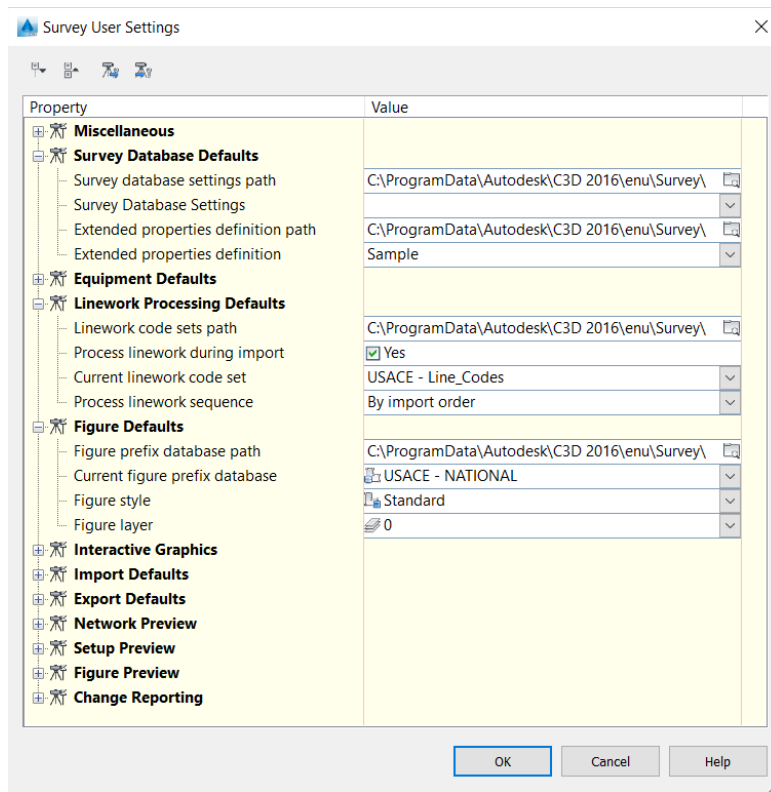
a. Survey User Settings:

Each Civil 3D user can/must set up paths and values here, as these settings are external to the template. From the upper left click on the **Survey User Settings** button.



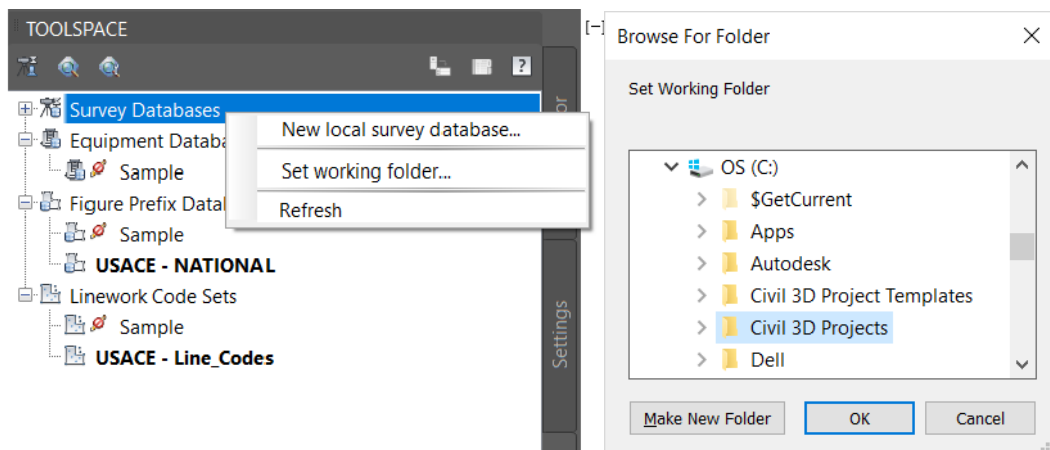
There is NO way of deploying these settings automatically, from the installer or Drawing Template. Typically paths and configurations default locally to **C:\ProgramData\Autodesk\C3D 2016\enu\Survey**. Most users set paths to a centralized shared network location. A noteworthy setting here is under the **Figure Defaults** collection, this will set the default Layer and Style for the automated linework (figure).





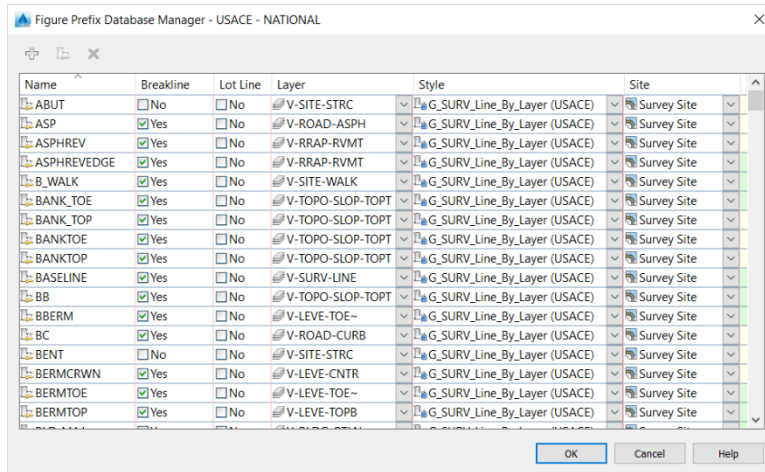
b. Survey Databases - Working Folder:

Process survey data is stored externally in a collection of files. By default, the path is set to **C:\Civil 3D Projects**. It is recommended to set this on a network location, preferably by year. Path can be set by Right clicking on the **Survey Databases** collection > select **Set working folder...**



c. Figure Prefix Database (.fdb_xdef)

Like the Description Key Set, this configuration is meant to process automated linework (figures) based on field collected data based on RAW Descriptions. If match is found the created figure is matched to settings found here.



d. Linework Code Set Database (.f2f_xdef)

This box allows users to tell Civil 3D to read and process almost any field crew utilized field collection methods used to start, stop continue line and curves.



▲ Edit Linework Code Set

Property	Value
Information	
Name	USACE - Line_Codes
Description	Line Code Sets
Coding Methods	
Feature/Code delimiter	<Space>
Field code escape	/
Start in comment mode	<input type="checkbox"/> No
Automatic begin on figure prefix ma...	<input type="checkbox"/> No
Special Codes	
Begin	ST
Continue	C
End	E
Close	CLS
Horizontal offset	H
Vertical offset	V
Stop offsets	SO
Line Segment Codes	
Recall point	JPT
Connect point	JNC
Rectangle	CLSRECT
Right turn	RT
Extend	X
Curve Segment Codes	
Begin curve	PC
End curve	PT
Circle	CIR
Point on curve	OC


OK Cancel Help

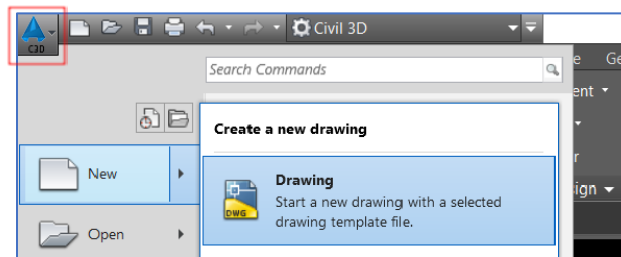


Importing Points: directly into Drawing.

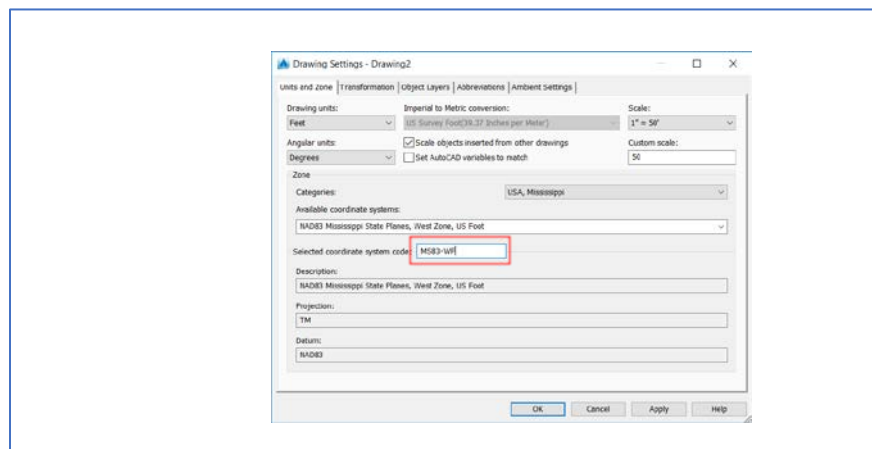
Importing survey data directly into drawings, works like importing blocks, crated COGO points are “live” in drawing allowing for edits in real time. Imported points are processed via Description Key sets, assigning layers, labels and descriptions.

EXERCISE:

1. Start by creating a **NEW** drawing using correct template. From the upper left > click on the **Application**  button > click on **New** flyout > select **Drawing** > select/browse to USACE most current drawing template



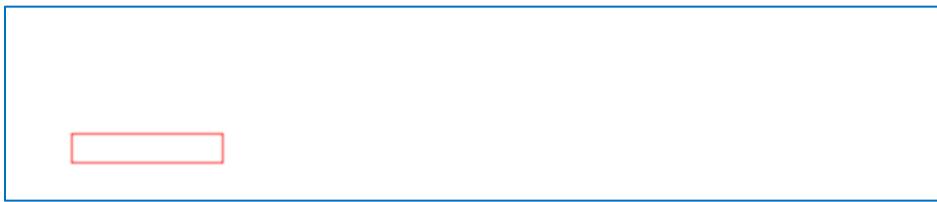
2. Once drawing is created > from the bottom **Status Bar** > switch to the **Model** tab
3. Next, set coordinate system. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...** > From the **Units and Zone** tab > Selected coordinate system code: **MS83-WF**




(Alternatively, you can use the Categories & Available coordinate systems drop downs)

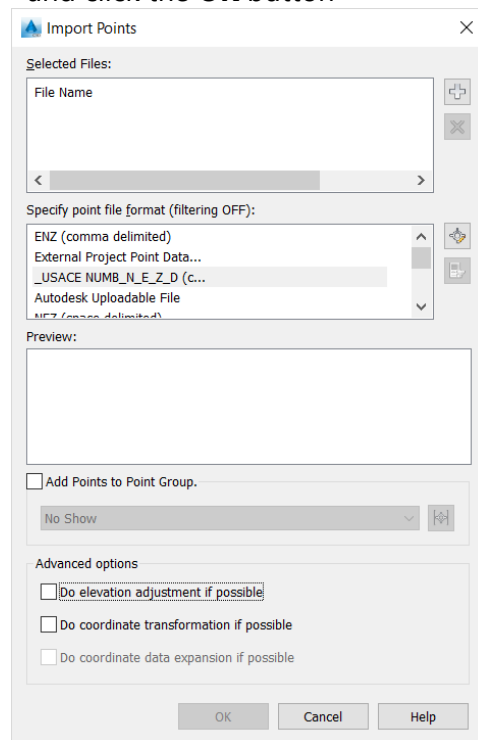
4. From the Ribbon > **Insert** tab > **Import** panel > **Points from File** button





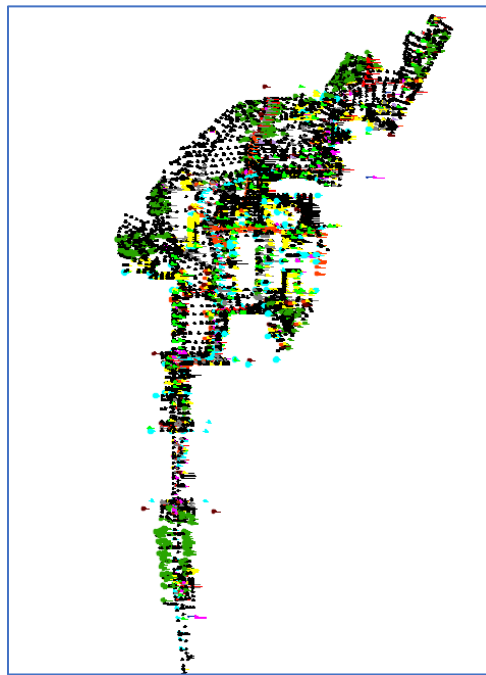
5. From the **Import Points** dialog box:

- a. Selected Files: Use the Add Files button  to browse to > select **ALL POINTS 5-29-13 - REV.txt**
- b. Specify point file format: use `_USACE NUB_N_E_Z` (comma delimited)
- c. Clear all check boxes > and click the **OK** button

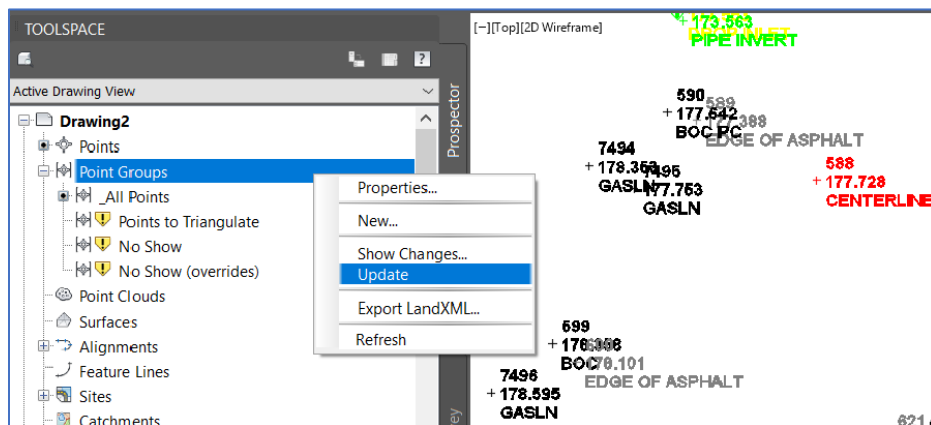


6. Once processes are complete, all points are imported into Model space but might be off screen > Zoom to Extents (double click on wheel mouse). As needed adjust the drawing scale from the Status Bar to make text readable.





7. Next, from **TOOLSPACE** palette > on **Prospector** tab > browse to **Point Groups** collection > notice the yellow ⚠ shield, denotes out of date content. Right click on collection > click on **Update**



This is the most common method of importing reduced survey text files directly into Civil 3D. Points are editable as they resided in drawing and can be managed via Description Key Sets, Point Groups or standard AutoCAD Layer control.




Importing Points: Survey Data Base

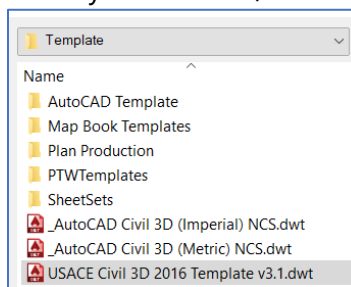
Instead of making the drawing the host of survey data, Civil 3D can process survey data outside of the created drawing in an external Survey Database. Survey Databases allow for consuming survey source data as:

- Field Book File: most familiar format with “RAW” data
- LandXML File: newer options to export data from data collectors or other software
- Point File: reduced text file option, can have linework codes
- Points from Drawing: drawing becomes source of points.

Survey Databases support the automation using line connectivity commands with standardized field codes

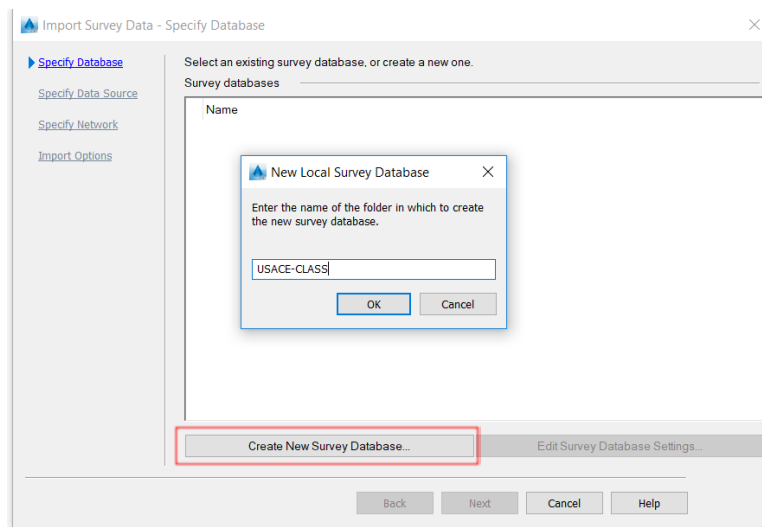
EXERCISE:

1. Start by creating a **NEW** drawing using correct template. From the upper left > click on the **Application**  button > click on **New** flyout > select/browse to USACE most current drawing template

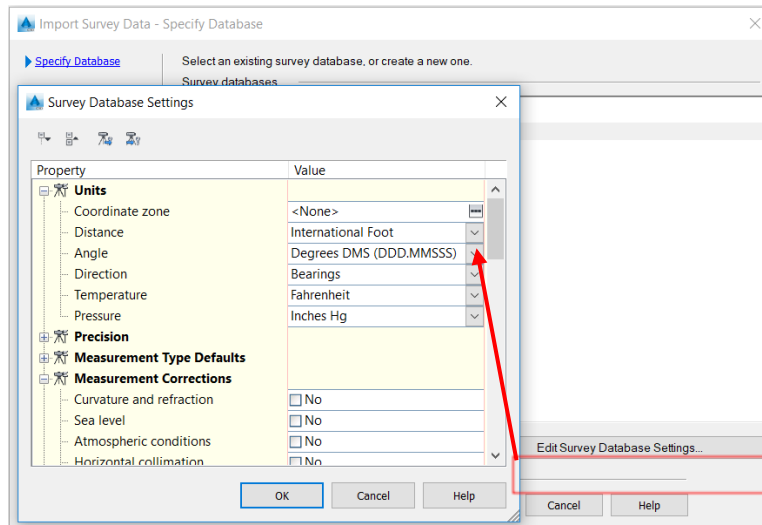


2. Once drawing is created > from the bottom **Status Bar** > switch to the **Model** tab
3. Next set coordinate system. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...** > From the **Units and Zone** tab > Selected coordinate system code: **MS83-WF**
4. Survey Data will be created via an Import Wizard. From Ribbon **TOOLSPACE** > **Insert** tab > **Import** panel > pick on the **Import Survey Data** button
5. Specify Database
 12. First, pick on the **Create New Survey Database** button > name it **USACE-CLASS**





13. Then, pick on the **Edit Survey Database Settings...** button > set Coordinate Zone to match drawings **MS83-WF**



NOTE:


*Default is blank coordinates and **International Foot**. Common mistake is to forget to set Coordinate here causing a shift in drawings.*

*Also, if **Measurement Corrections** are enabled here, a doubling up can happen if done in data collector too*

14. When done click **Next** button

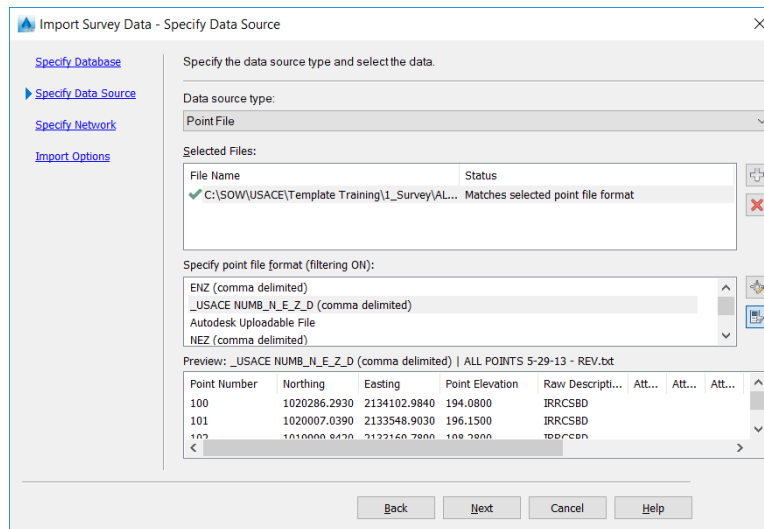
15. Specify Data Source

16. Set Data Source type drop down to Point File

17. Selected Files: Use the Add Files button  to browse to > select **ALL POINTS 5-29-13 - REV.txt**

18. Specify point file format: use **_USACE NUB_N_E_Z** (comma delimited)

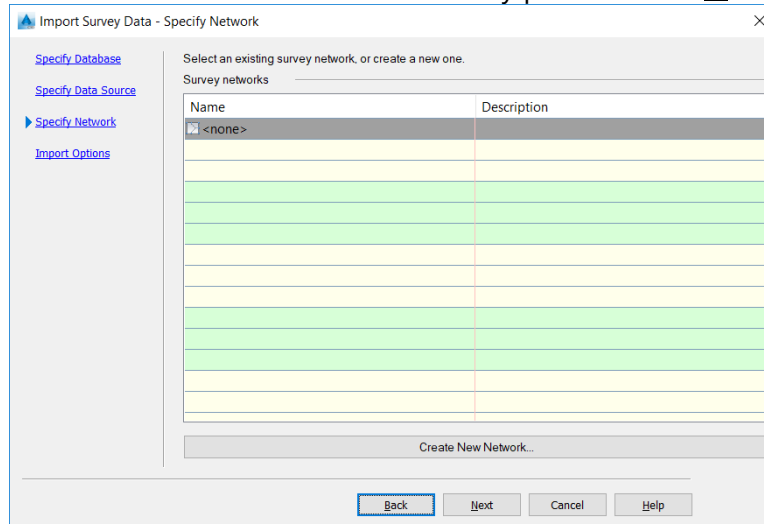




19. When done click **Next** button

20. Specify Network

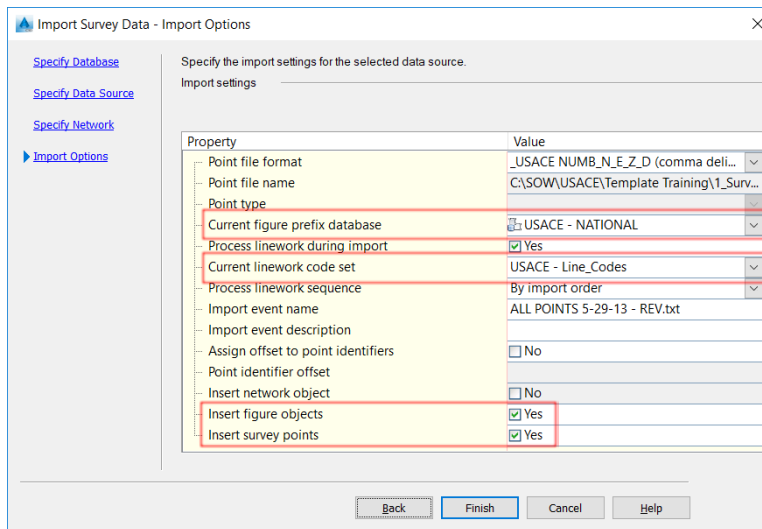
21. Because a reduced text file is being used, no Network will be created. As there is NO observations or raw data All points will be considered Non-Control survey points > click **Next** button



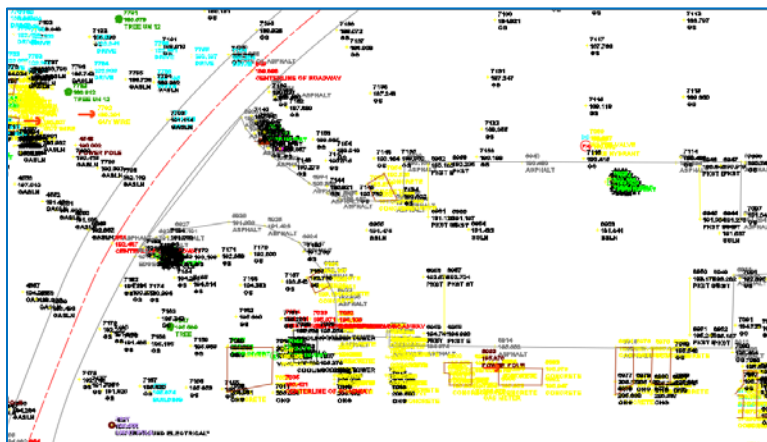
22. Import Options

23. Make sure the **figure prefix database** and **linework code set** are set to use the **USACE** configured files and that **figures** and **points** have been checked to import > then click on the **Finish** button.



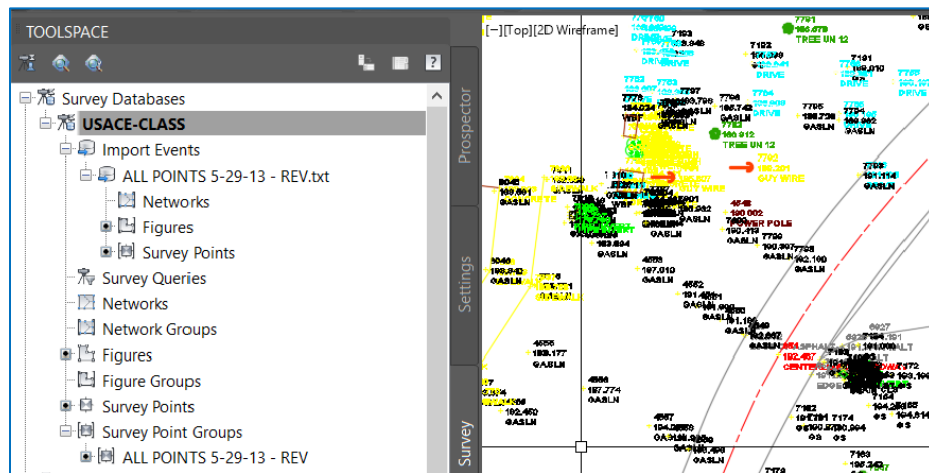



18. Once processes are complete, all points are imported into Model space but might be off screen > Zoom to Extents (double click on wheel mouse). As needed adjust the drawing scale from the Status Bar to make text readable.

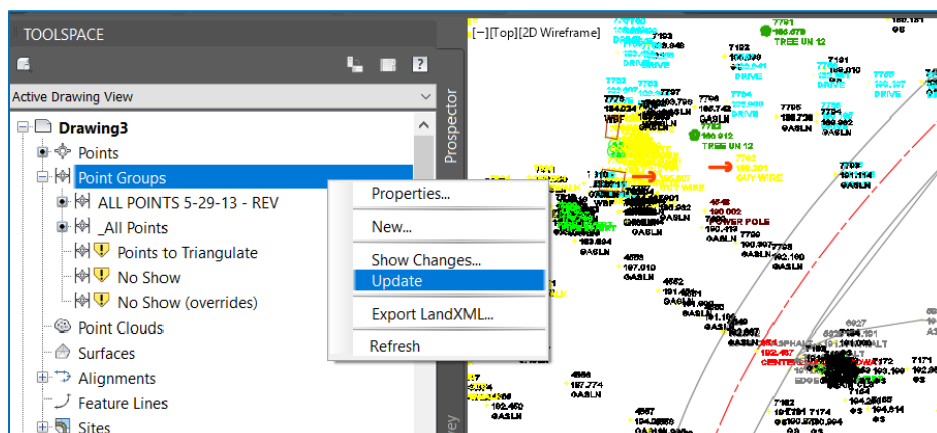


19. Review imported data from **TOOLSPACE** palette > **Settings** tab > **Survey Database**





20. From **TOOLSSPACE** palette > switch to **Prospector** tab > browse to **Point Groups** collection > notice two things here:
- NEW point group is automatically, with the same name as source file
 - Yellow , denotes out of date content. Right click on Point Group collection > click on



Update

Survey Database created Geometry (Survey Networks, Figures and Points) are not all editable as they resided in Survey Database. Typically edits can be done by 3 methods:

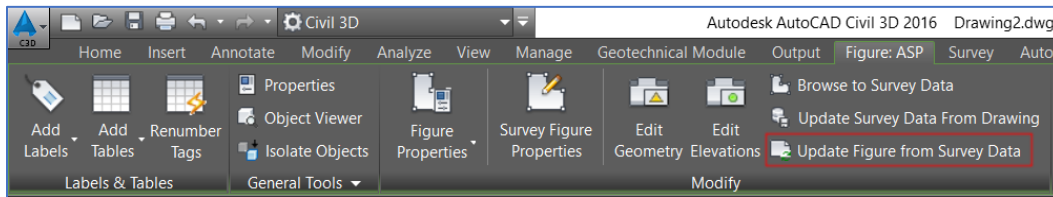
1. Editing graphically on screen:



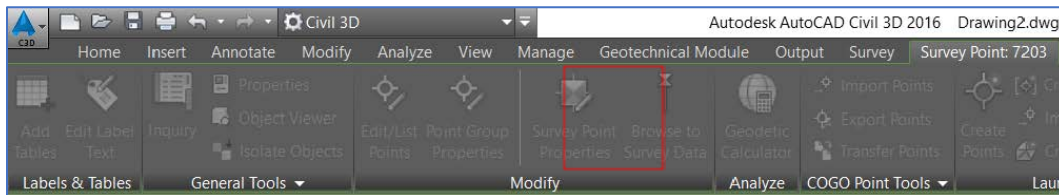
Simple AutoCAD edits such as Grip edits or Erasing geometry is possible. However, changes are NOT applied to Database or original survey file. That if new drawing were to be created edits will not be seen and if data were to ever re-process edits would be lost.

2. Applying Edit to Survey Database:

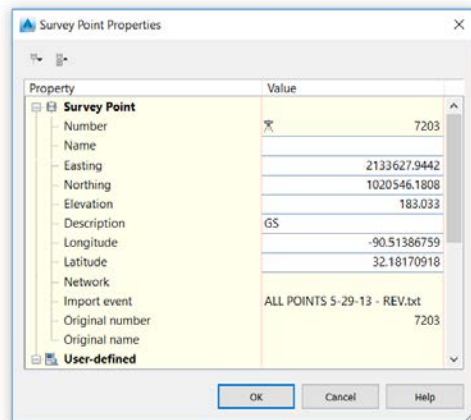
After graphical edits are made to Survey Figures, they can be written back to Survey Database. Select Figure > from contextual ribbon > click on the **Update Figure from Survey Data** button



A similar process can be used to editing Survey Points. Select Point > from the contextual ribbon > click on **Survey Point Properties** button > edit in window



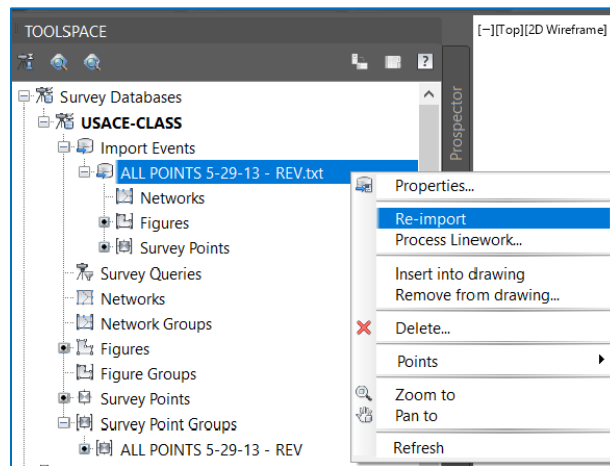
7203
+ 183.033
GS



These edits are only written to Survey Database, if new drawing is created these edits will be seen. However, if original source file were ever to be RE-imported (#3 below) edits will be lost.

3. Editing original source file

Any new Survey Database created from edited file will be corrected any existing survey Databases will need to be updated by using the **Re-import** option on Import Event in Survey Database



Survey points can still be managed via Description Key Sets, Point Groups or standard AutoCAD Layer control.



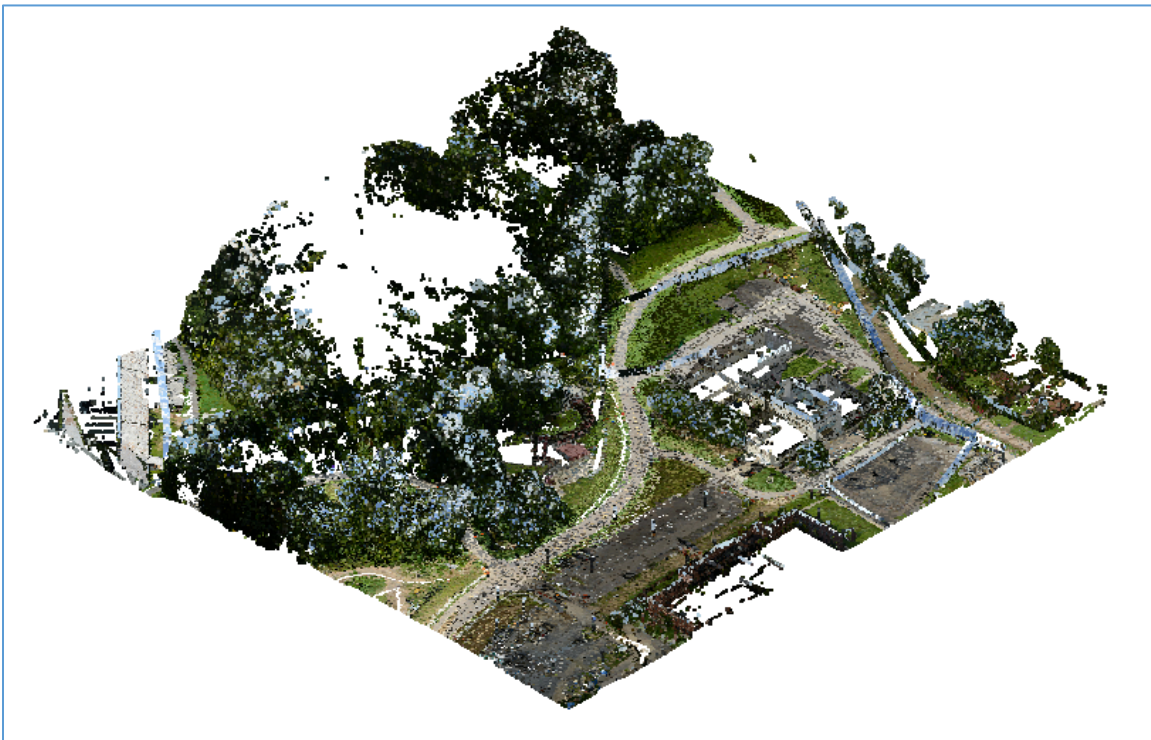
Working with Lidar Data

For this Project we will be using Project Gathered (.LAZ) files. Autodesk Recap supports this point cloud native file format of LAZ as well as the following Point cloud formats:

CL3 (Topcon), CLR (Topcon), E57 FLS (Faro), FWS (Faro), LSPROJ (Faro), LAS PCG PRJ (Leica), PTG (Leica), PTS PTX RCS RDS (3D only; Riegl), TXT XYB XYZ ZFS (Zoller+Fröhlich), ZFPRJ (Zoller+Fröhlich), and E57 PTS PCG RCP/RCS

The Basic Workflow:

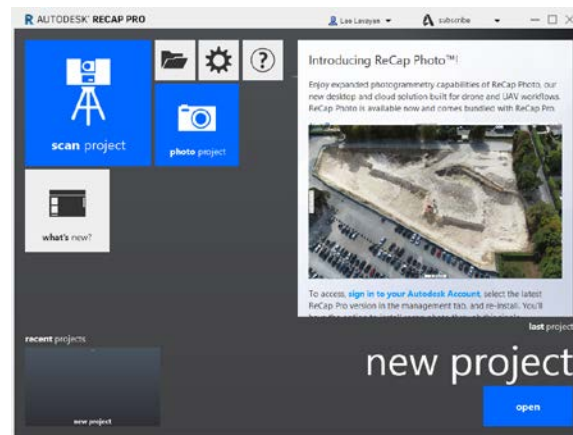
1. Use Autodesk Recap to Create Point Cloud from .LAZ file
2. Use Civil 3D to import Recap Point Cloud
3. Use Civil 3D to create Surface



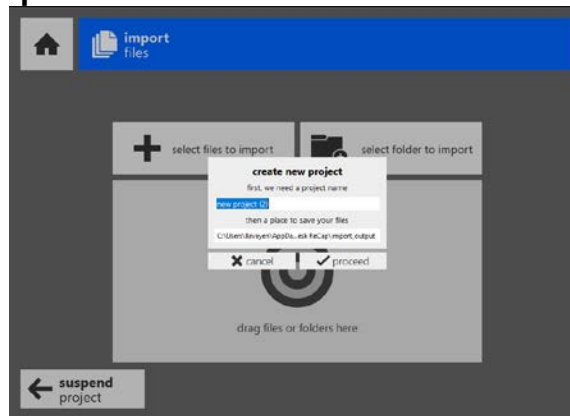
Possessing Lidar Data via Autodesk Recap

1. From Autodesk Recap
2. Start by clicking on the **Scan Project** button

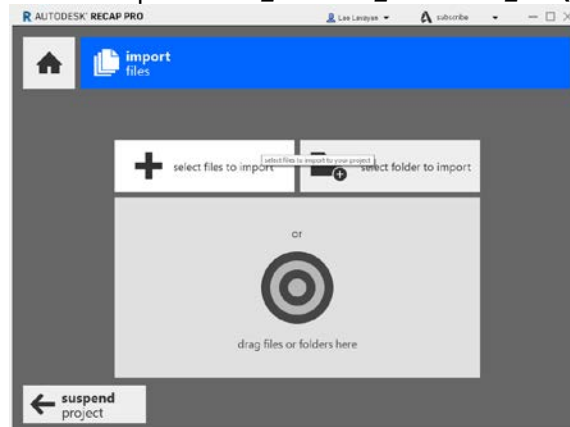




3. Name Project and click on the **proceed** button

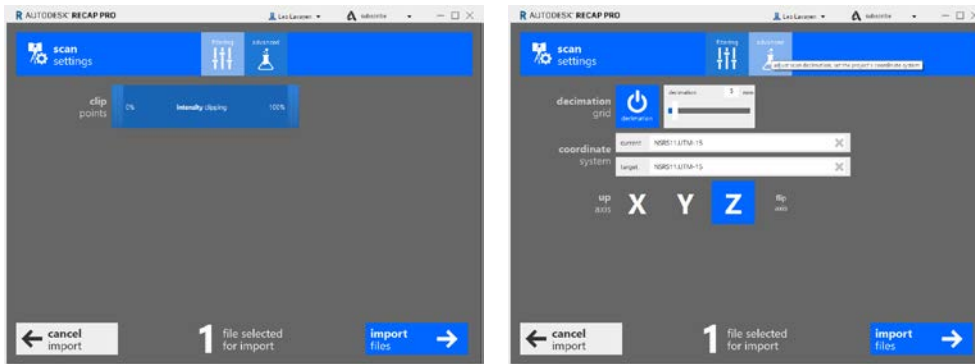


4. Select or Drag and Drop .LAZ files to import: **erdc_701200_3576000_oct(5cm).laz**

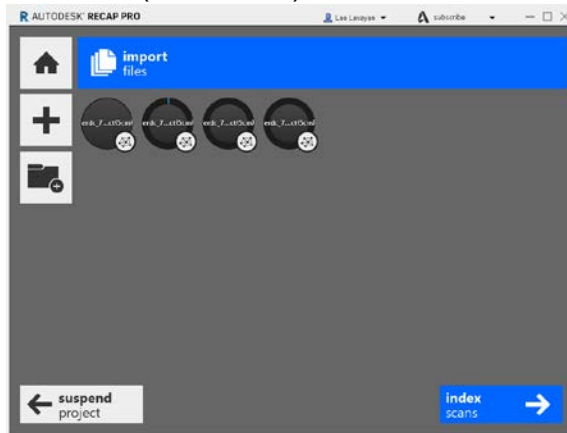


5. Set filtering or advanced options,

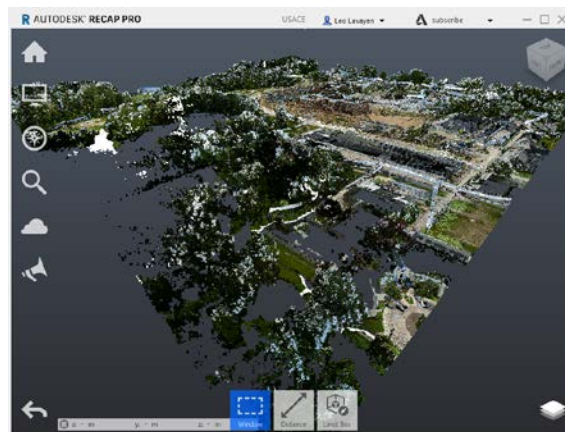




6. Once done click on **import files** button (wait for it...)



7. Once done, click on index scans button



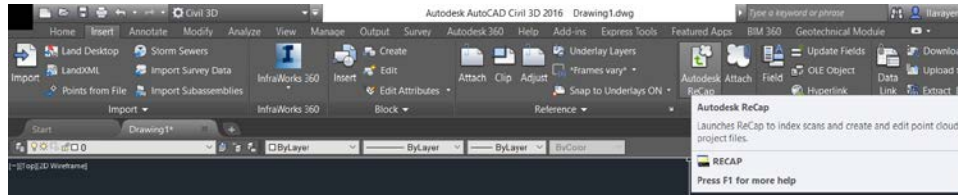
8. Navigate, View and Measure as Desired

9. Save Project

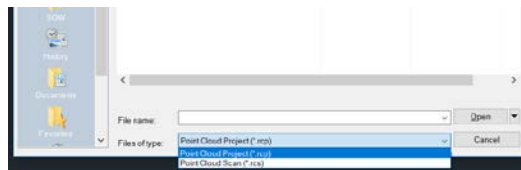


From Civil 3D

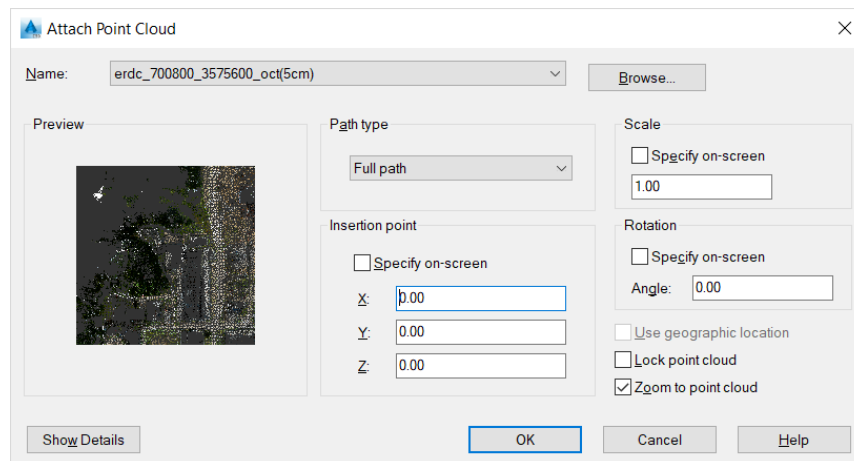
1. Start New Drawing using **USACE Template**
2. From the Ribbon **Insert** tab > **Point Cloud** panel > **Attach** button



3. Navigate to the saved RECAP saved file: **erdc_701200_3576000_oct(5cm)**

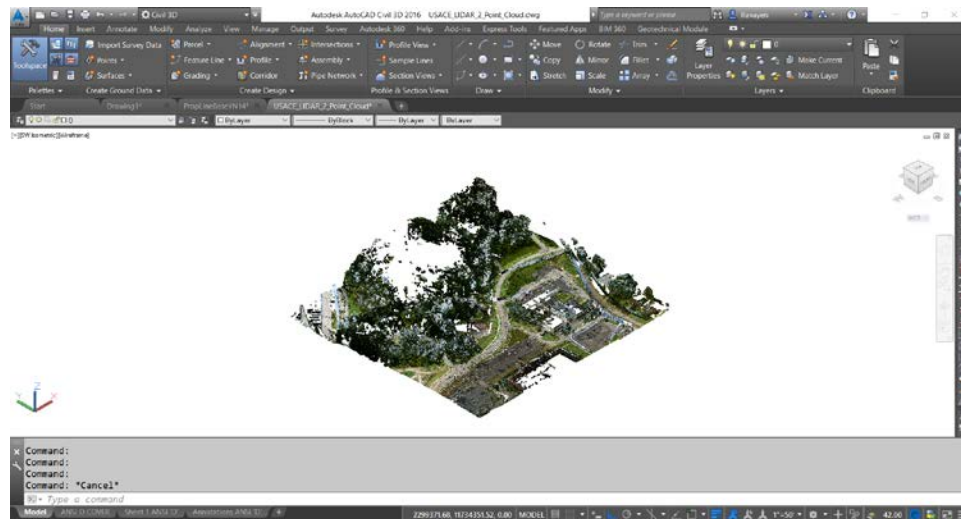


4. From Attach Point Cloud dialog box:
5. Scale: 1
6. Insert: 0,0,0
7. Rotation 0
8. Import to 0.0



9. View and Orbit

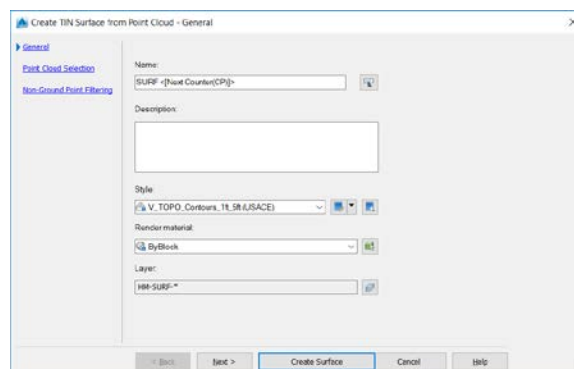




10. Select Point Cloud > from contextual Ribbon > Civil 3D panel > **Create Surface from Point Cloud** button

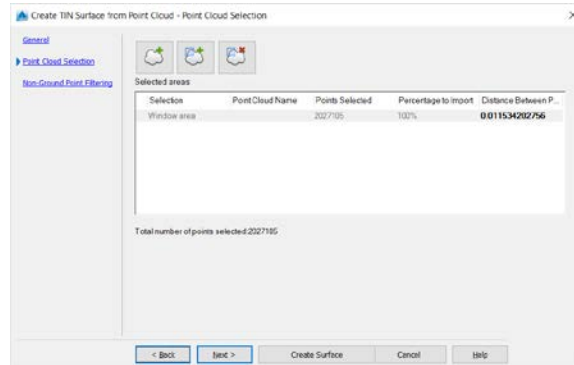


11. Follow wizard
12. General: Set Name and Style

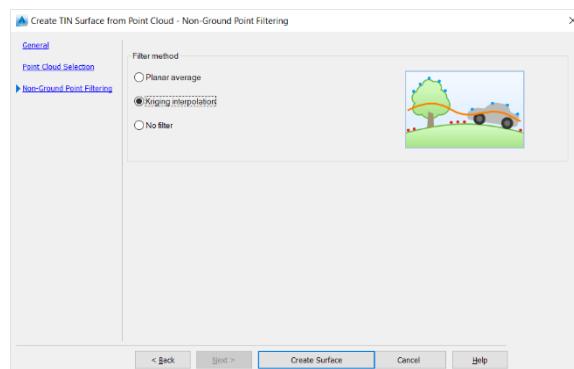


13. Point Cloud Selection (would recommend reducing area for processing speed)



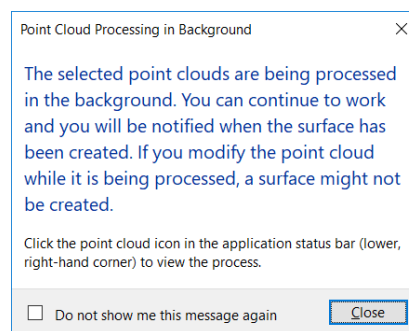


14. Non-Ground Point Filtering: method



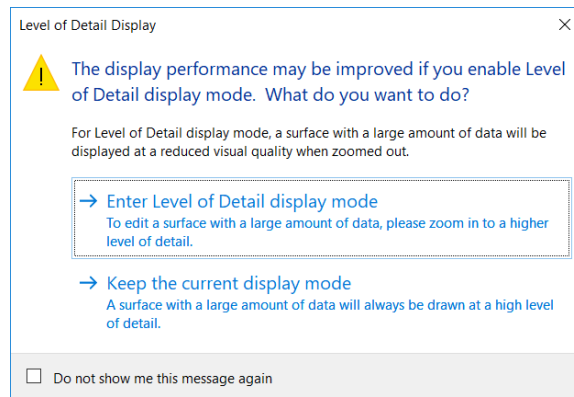
15. Select the Create Surface button

16. Because of Point Density will take a while, and will possess in Background

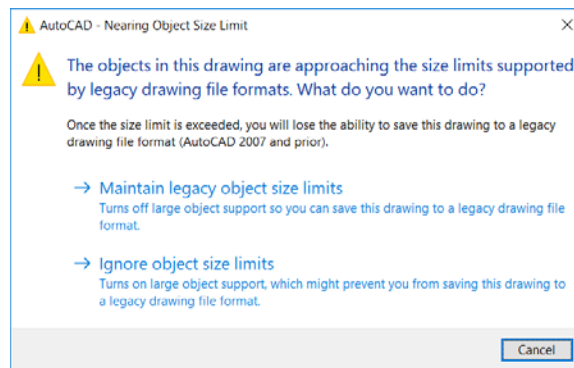


17. You might receive a Level of Detail Display dialog box

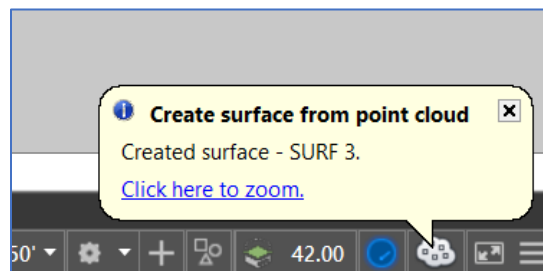




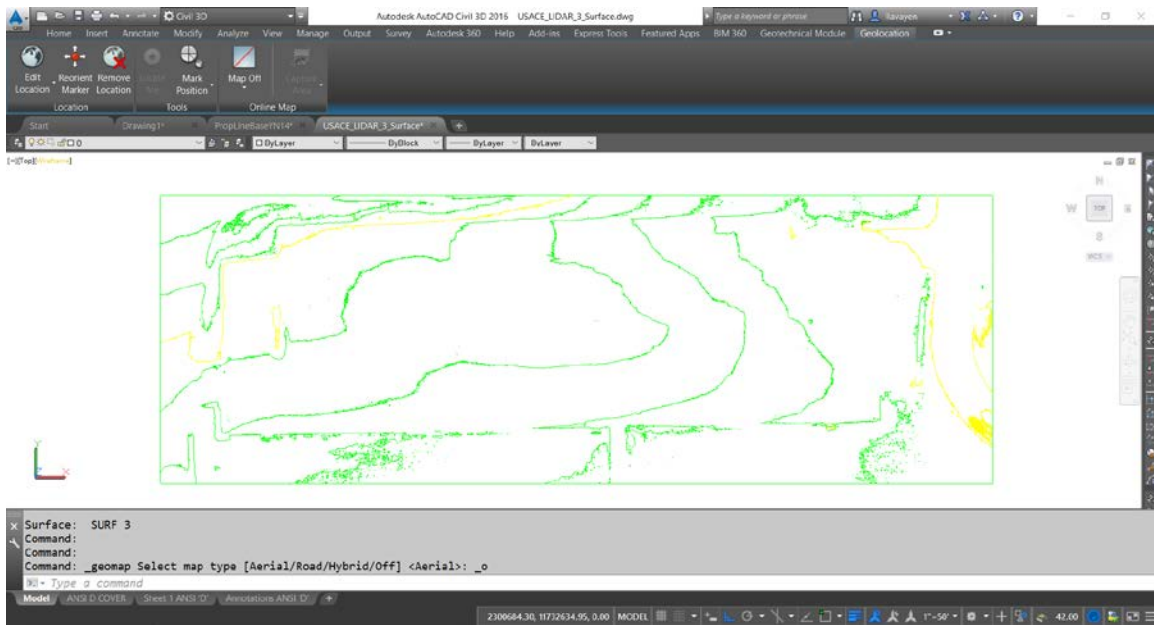
18. You might receive an AutoCAD message
 19. to CAD – Nearing Object Site Limit dialog box



20. Lower Right of AutoCAD tray will notify you once Surface is Complete



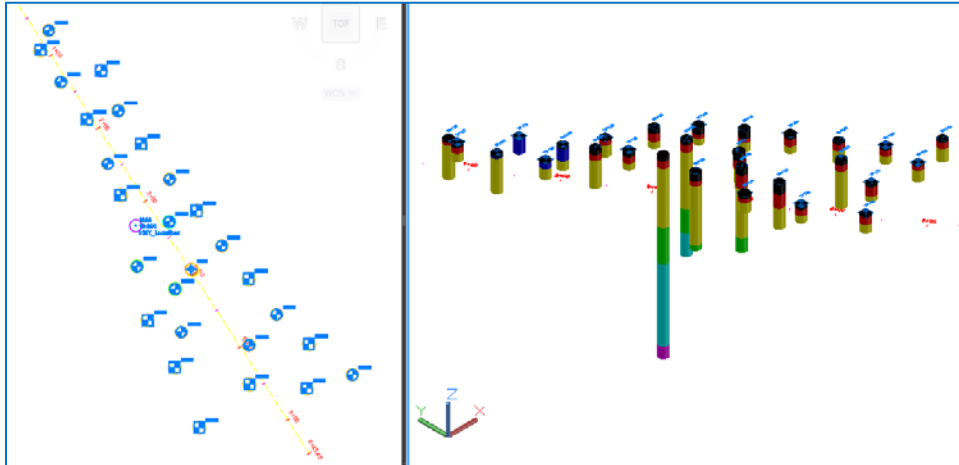
21. Once computing is done, you can disable the Point Cloud to only show the newly created Surface.



Working with Geotechnical Data

The Geotechnical Module provides tool to quickly process Geotechnical Data and create dynamic visual representations of collected as:

- Civil 3D COGO points at Northing and Easting (seen in Plan View)
- Strata data will be hosted in Database (SQL database)
- 3D Solids "Stacks" with matching boring data (seen in 3D)
- Civil 3D surfaces from strata
- Civil 3D profiles from strata



The Basic Workflow:

1. From Civil 3D connect to bore hole data
2. Create Surfaces
3. Create Profiles

NOTE:

For this to work the Geotechnical Module extension needs to be installed.

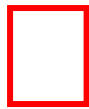


Creating/Connecting to Data Base and Importing Data:

Databases created by the Geotechnical Module are created and stored locally and can be found at:
C:\Users\<USERNAME>\AppData\Local\Microsoft\Microsoft SQL Server Local DB\Instances\Geotechnical Module.

EXERCISE: Importing Geotech Data

1. From Civil 3D > Start **New Drawing** using **USACE Template**
2. Open File: **USACE_Geotech_1.dwg**
3. From the Ribbon Geotechnical Module tab > Data Management panel > Connect button



4. Next, **Login** to local Geotechnical Module Database

Login

Database
Geotechnical Module [Manage Connections](#)

Username
Administrator

Password

Login Cancel



5. From the dialog box pick on the **Create** button.

Geotechnical Module

Project ID	Project title	Status	Category	Location of site
------------	---------------	--------	----------	------------------

Page 1 of 1 (0 of 0)

Create Edit Delete OK Cancel

6. Fill in fields as desired and pick the **Save** button
(You MUST give Project ID, Name Status and Category, the rest are optional)

Geotechnical Module

Project Details

Project ID: _____ Contractor's Name: UNK

For Class: _____ Project Engineer: UNK

Name: Geotech Example Project Engineer: UNK

Status: Desk Study (Manage) Office: Mobile, AI

Category: Default (Manage) General Project Comments: ** Your Notes Here**

Location of site: UNK

Client Name: UNK

Save Cancel

7. Once Connection has been created pick **OK** button

Geotechnical Module

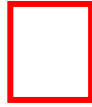
Project ID	Project title	Status	Category	Location of site
For Class	Geotech Example	Desk Study	Default	UNK

Page 1 of 1 (1 of 1)

Create Edit Delete OK Cancel



8. Then from the Geotechnical Module tab > Data Management panel > Connect button >



9. From the dialog box

10. File Selection:

11. Pick on the **Add** button > browse to and select: **GEOL.csv** and **HOLE.csv** files

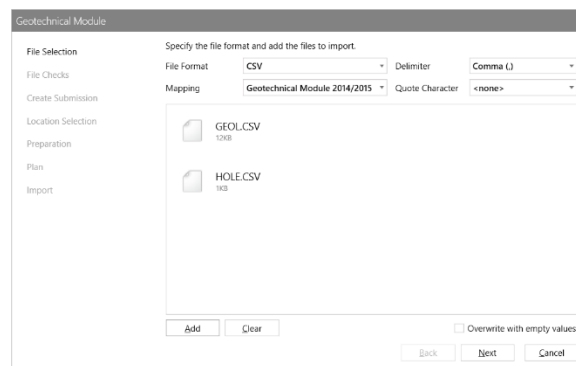
12. File Format: **CSV**

13. Mapping: Geotechnical Module 2014/2015

14. Delimiter: **Command (,)**

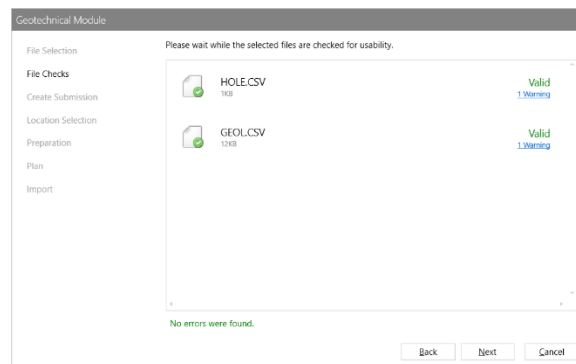
15. Quote Character: **<none>**

16. When done click **Next** button



17. File Checks:

Should read files as "Valid", click the **Next** button



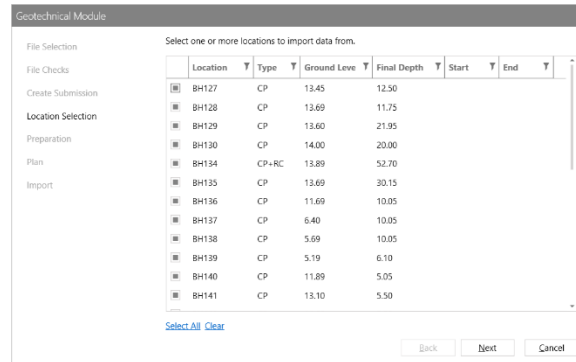
18. Create Submission:

Processes will be a quick flash, and will move on to next automatically



19. Location Selection:

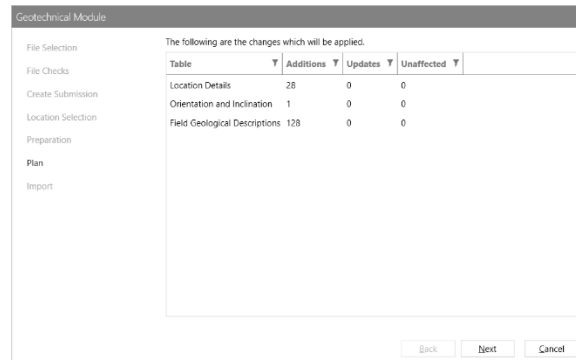
Option is presented here to use or not borings into project via check box [] (all are selected by default). Click **Next** button.

**20. Preparation:**

Processes will be a quick flash, and will move on to next automatically

21. Plan:

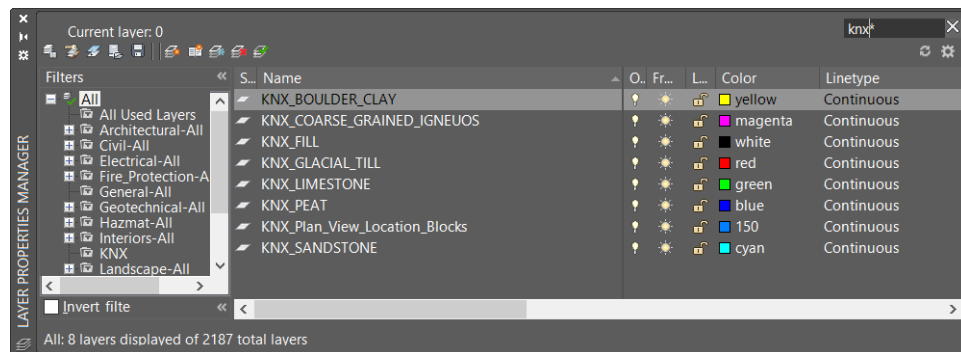
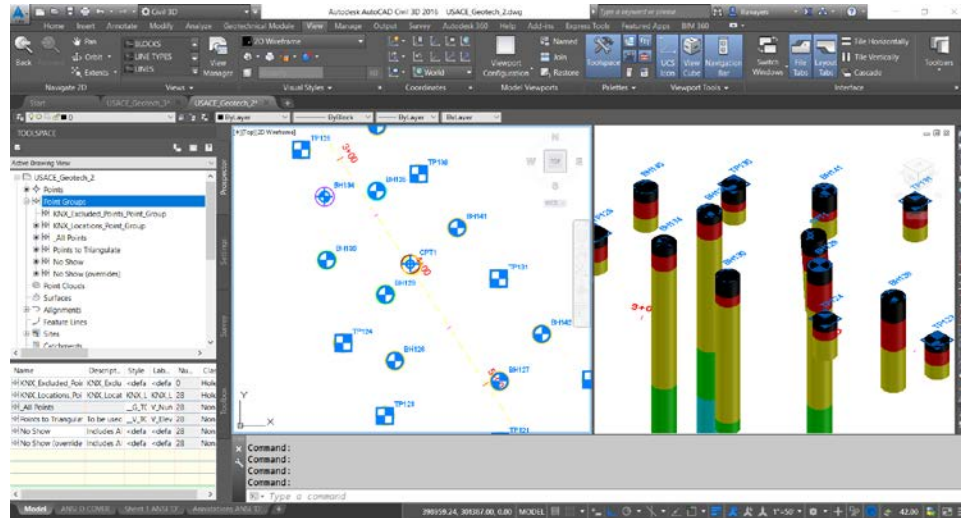
Show report of import. Click on **Next** button

**22. Import:**

If no errors are found bars should show to 100%. When done click **Finish** button.

**23. When process is completed data will appear:****24. Points listed in Prospector, "KNX" point groups are automatically**

- 25. Plan View will show points as borings
- 26. Model 3D view will show points with matching 3D borehole cylinder with strata
- 27. Layers will be created too with "KNX" prefix



Creating Strata Surfaces

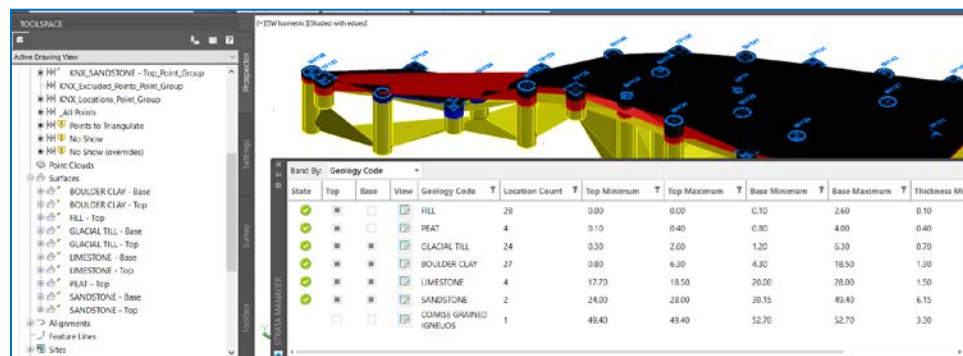
As points only have one elevation associated to them, we will pull for the created Database strata data to create top/bottom subsurfaces. Via the panorama the Geotechnical Module to creates dynamic Civil 3D Surfaces and Point Groups

EXERCISE:

1. Continue working or open **USACE_Geotech_2.dwg**
2. From the Geotechnical Module tab > Asset Management panel > Strata button



3. The Strata Manger Panorama > Check **Top** and **Base** columns [] Surfaces and Point Groups created automatically



Band by: specify the type of geotechnical data to be used to create the surfaces.

State: icon indicates if the data in the project from which the surface was created has altered



Surfaces are using the latest data



Surface needs re-synchronizing with the database.

Top: Toggles to show or hide the top surface of the stratum,

Base: Toggles show or hide the bottom surface of the stratum,

Strata name: The column name will change to reflect the current Band by option, the value displayed is the unique name for the stratum. The value is dependent on the band by option.



Creating Geotechnical Profiles

The Geotechnical Module has the option to Select Alignments from Drawing or Create Alignments on the go for Profiles. Creating Profile Views is based on Civil 3D technology, using Geotechnical Module wizard to project surfaces and borehole log strips.

NOTE:

For profiles to be created drawing must be connect to a project and have strata surfaces created

EXERCISE:

1. Continue working or open **USACE_Geotech_3.dwg**
2. From the **Geotechnical Module** tab > **Profile** panel > **Create** button >



3. The Geotechnical Style Set wizard > **Setup Profile** window:
 - a. **Name:** leave default
 - b. **Style:** leave default
 - c. Alignment: AL (2)
 - d. **Geotechnical Surface:** default ALL selected (if a Top and Base was created for a material a Hatch will automatically be generated)

Geotechnical Module

Setup Profile

Select Locations

Profile View

Name: Geotechnical ProfileView (1)

Style: C.GRID (L-R) Majr_Minr_H100_2_V10_2_FULL_x1 (USACE)

Alignment

Name: ALIGN (2)

Select from Drawing Create Alignment

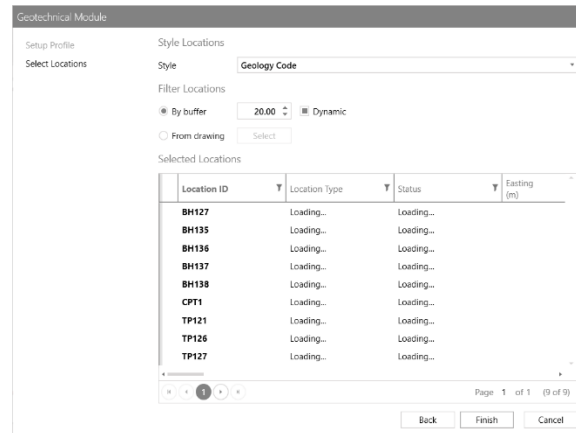
Geotechnical Surfaces

Include	Stratum	Top surface name	Base surface name	Hatch
<input checked="" type="checkbox"/>	SANDSTONE	SANDSTONE - Top	SANDSTONE - Base	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	LIMESTONE	LIMESTONE - Top	LIMESTONE - Base	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	BOULDER CLAY	BOULDER CLAY - Top	BOULDER CLAY - Base	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	GLACIAL TILL	GLACIAL TILL - Top	GLACIAL TILL - Base	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	PEAT	PEAT - Top		
<input checked="" type="checkbox"/>	FILL	FILL - Top		

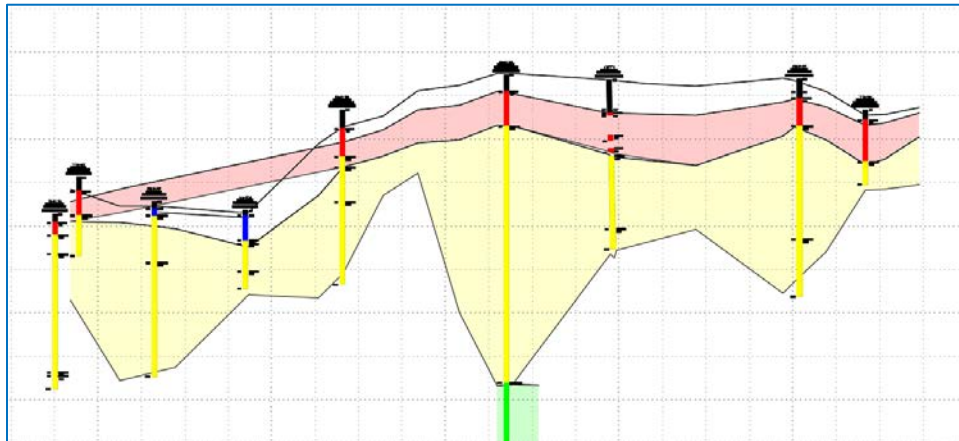
Back Next Cancel



4. Select Locations window:
 - a. **Style:** Select from the predefined list of styles to use when creating the borehole log strips on the profile.
 - b. Filter Location:
 - i. **By Buffer:** Enter a distance to use to find all borehole locations within the specified distance from the alignment. The Dynamic Toggle will search for new borehole locations within the buffer distance to project onto the Profile View when the alignment is modified.
 - ii. **From drawing:** ability to select locations from the drawing



5. After clicking the **Finish** button, it will return to model space to select insertion point for creation of Profile View



The Hatch patterns can be control from:

- From Ribbon > Geotechnical Module tab> Assets Management panel > Hatches button
- Profile View Properties > Hatch tab



For more information, from Ribbon > **Geotechnical Module** tab > click on the **Help** button to PDF help file



The Autodesk® Geotechnical Module

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Surfaces: from other data sources

Introduction

The most accurate source for surface creation is field collected data, however at times the need to move forward with less accurate data available at hand or sometimes surveying task are outsourced and need to recreate existing site conditions. We will look at two methods for creating surfaces:

- Using contour polylines
- Using Land XML file

Surface from Polyline

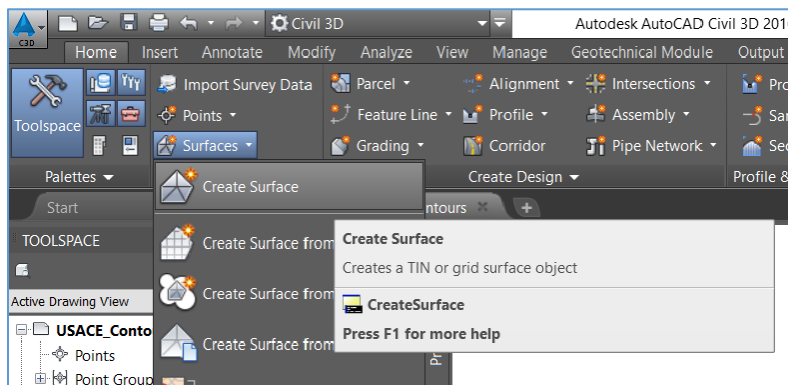
When creating surfaces from contour polyline data accuracy is sacrificed in this method. Elevation are only given at vertices and triangulation is interpolated in-between contours.

The Basic Workflow:

1. Create Surface
2. Add Contour Data
3. Edit Surface as necessary

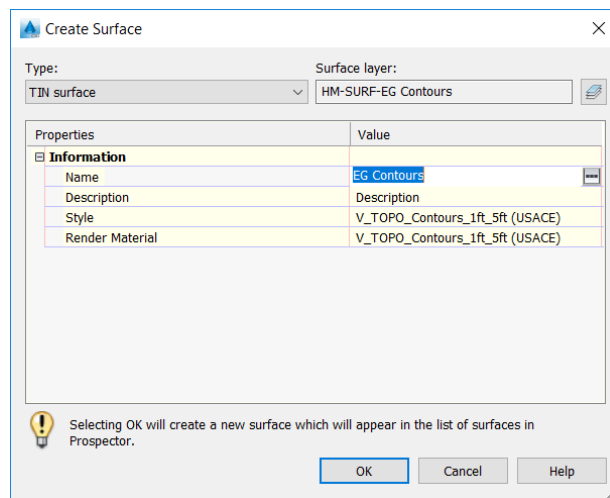
EXERCISE:

1. Open File: **USACE_Contours.dwg**
2. From the Ribbon **Home** tab > **Create Ground Data** panel > expand **Surfaces** button > select **Create Surface** button

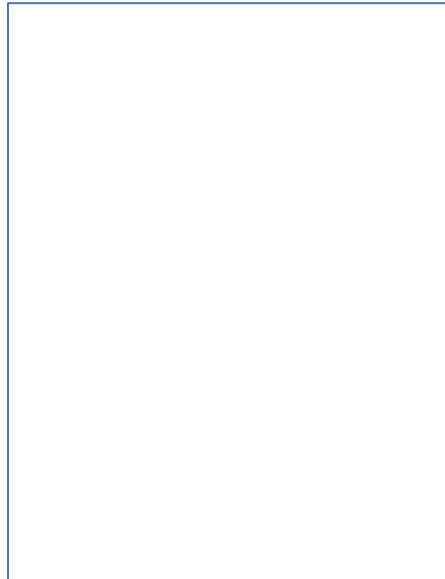


3. From the **Create Surface** dialog box name surface **EG Contours** and click the **Ok** button



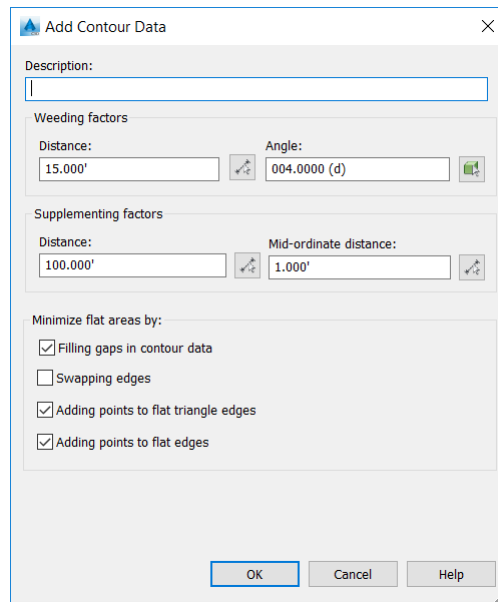


- From the **TOOLSPACE** palette > **Prospector** tab > expand the **Surfaces** category > expand **EG Contours** > expand **Definitions** > right click on **Contours** > select **Add...**

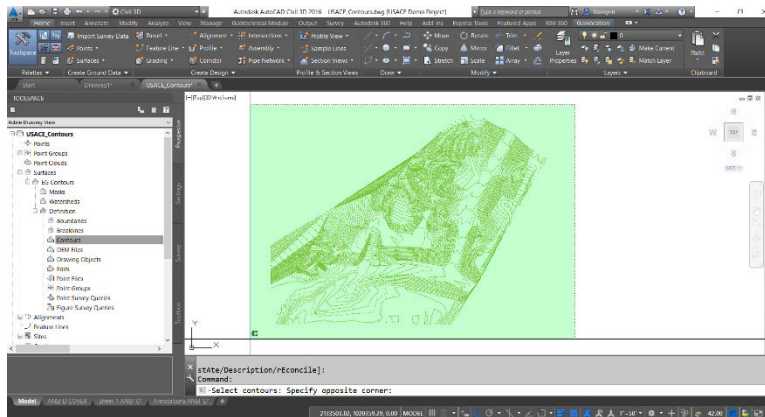


- From the **Add Contours Data** dialog box > pick **Ok** button



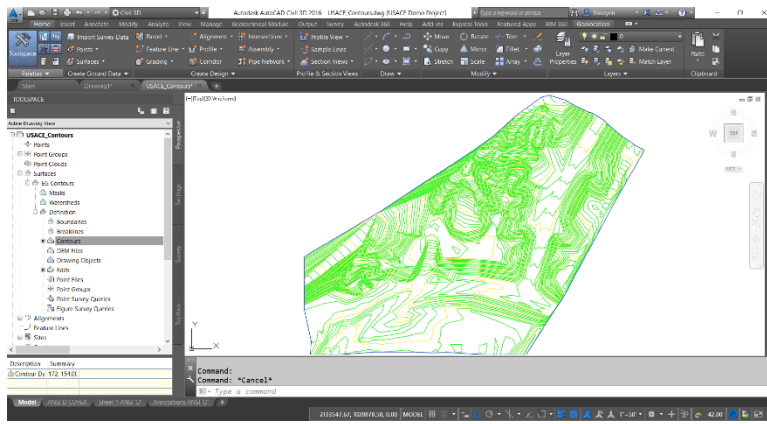


6. From model space > window over ALL contours > hit enter once done.



7. From model space surface will be created



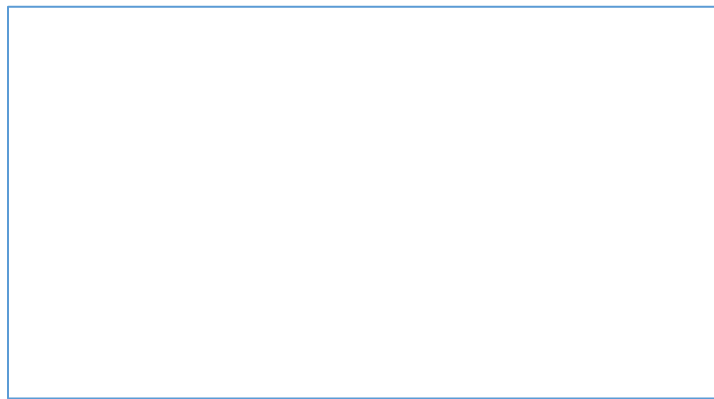


Surface from XML file

When receiving survey data from contracted surveyors, ask for a LandXML export file of the existing ground surface. It is a more accurate method of rebuilding a terrain as not only elevations are shared, but boundaries and break lines come through as well.

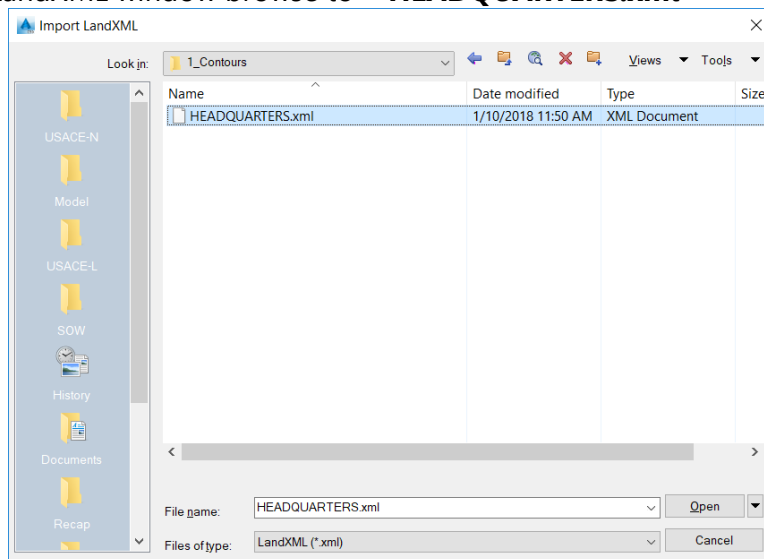
EXERCISE:

1. Start by creating a **NEW** drawing using default template.
2. Switch to Model tab
3. Set coordinate to **MS83-WF**. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**



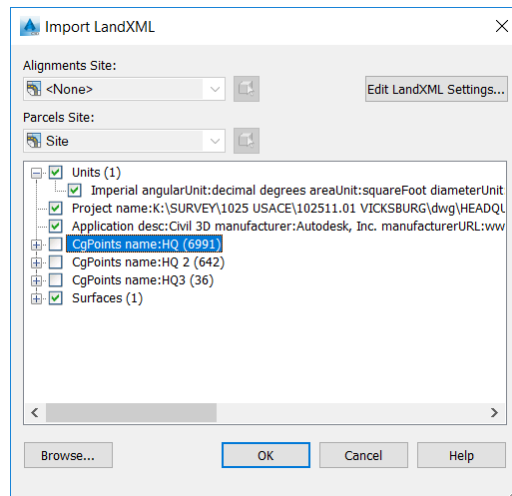
4. From the Ribbon **Insert** tab > **Import** panel > **LandXML** button

5. From the Import LandXML window browse to > **HEADQUARTERS.xml**

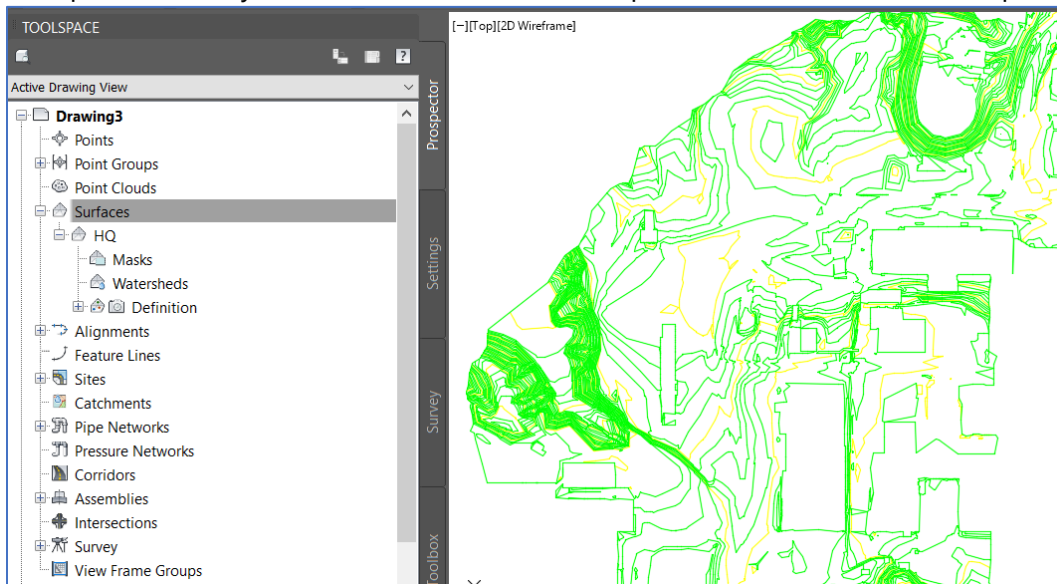


6. From the Import LandXML window > uncheck **CgPoints**





7. Once the import is done, you can see Surface from Prospector tab and from model space



Sites, Feature Lines & Grading Objects

Introduction

Drawing contours by hand has long been the method how sites are graded, Civil 3D presents an easier more efficient way to grade. Typical workflow is to start with as site drafted using 2D polyline defining building foot prints, pavement, curbs, etc. These drafted AutoCAD 2D linear elements will serve as a starting point to create Civil 3D Feature Lines to assign 3D elevations. To then create Grading Objects to create a Finished surface.

Key Concepts

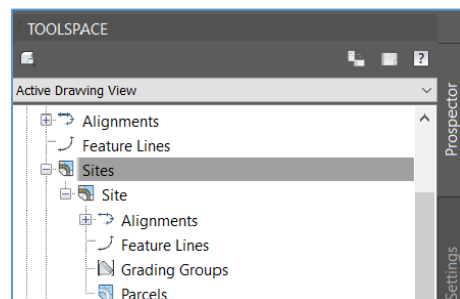
- Understanding Sites, Feature Lines and Grading Objects
- Feature Line and Grading Tools
- Building Pad (split level)
- Retaining Wall
- Detention Pond
- Parking Lot

[SITE: Understanding Feature Lines & Grading](#)

To work with Feature Lines and Grading Objects you will first need to understand awesome power that is unlocked when dealing with Sites inside of Civil 3D. Remember with great power comes great responsibility.

Understanding Sites

First, do not get the term "**Sites**" confused with a physical coordinate location or project extents/limits. The simplest explanation is that **Sites** are repositories of data. Found and managed from on the **TOOLSPACE** > **Prospector** tab > **Sites** collection. Sites can host of four of Civil 3D objects types: Alignments, Feature Lines, Grading Groups and Parcels



Note:

Alignments and Feature Lines are the ONLY 2 Civil 3D objects that can exist outside of Sites.

It was only after the service pack that Civil 3D 2016 first enabled the "Site Less" Future Line option.

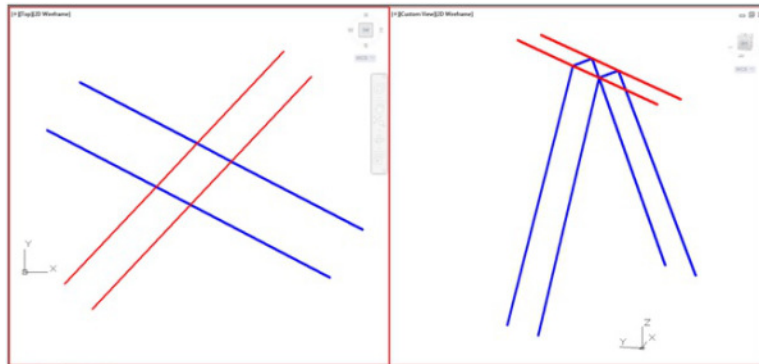


Objects inside of the same Site will interact with each other. To avoid interactions new Sites can be created to silo data and kept apart. Typical behavior of data in same site:

- **Alignments:** will act as parcel lines, as if they close a Parcel will be created. Alignments can cause Parcels to split.
- **Feature Lines:** will interact with each other creating new vertices
- **Grading Groups:** grading will also push/pull and clean up to each other.
- **Parcels:** parcels will resize and subsidizing Easley use of shard lot lines. Linework must close for a parcel to exist and data to appear here.

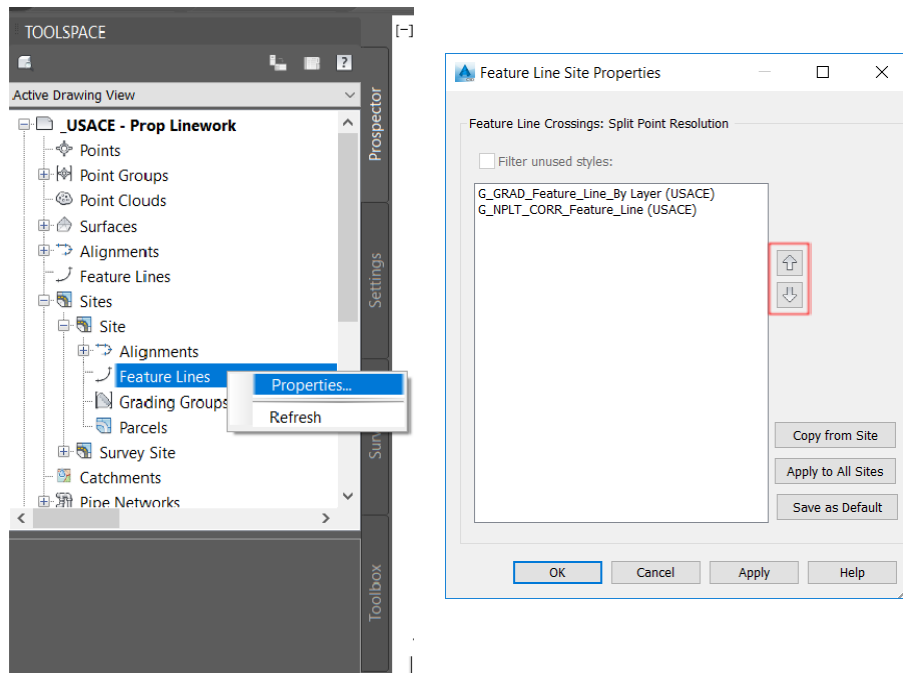
Understanding Feature Lines

Features Lines have incredible intelligence or clumsiness when placed inside of the same Site. A "phantom" Point of Intersection (PI) will be created where lines cross. This newly created vertex will create elevation changes, most of the time causing unwanted results.

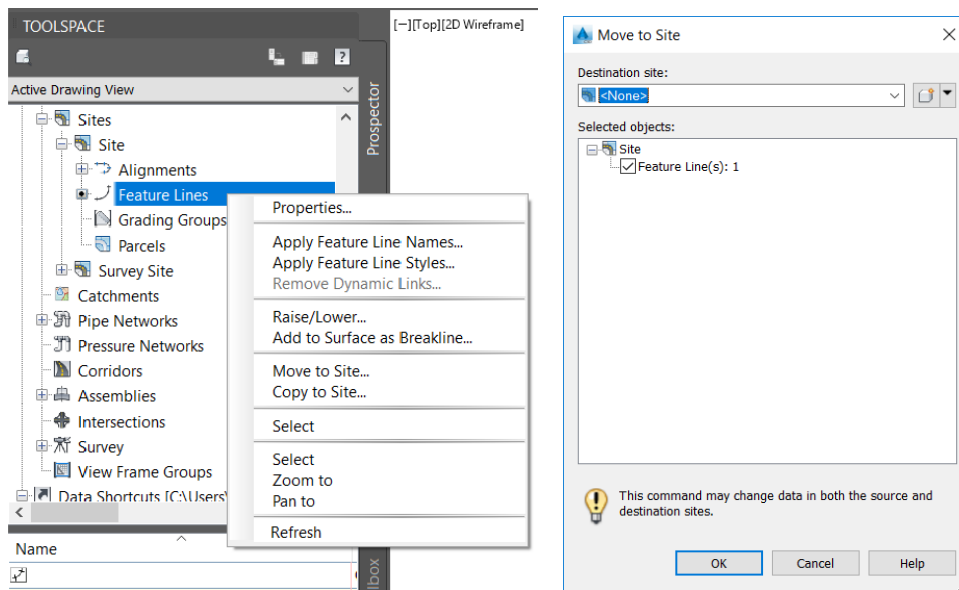


To control this behavior within a Site, from **Prospector** tab > expand **Sites** collection > expand Site used > right click on **Feature Lines** collection > select **Properties...** > from the dialog box > **Feature Lines Crossing: Split Point Resolution** is where available styles in drawing can be organized. Based upon the order a hierarchy will be established to control how lines push and pull each other.

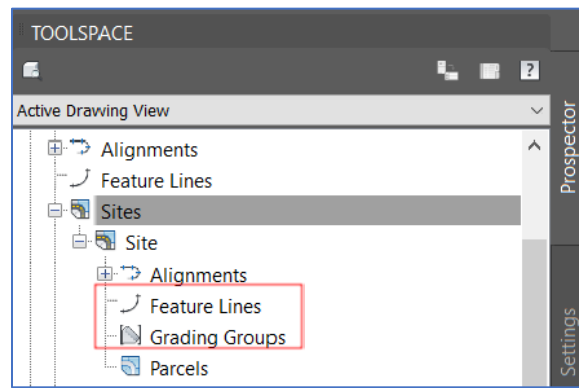




If NO interaction is desired Feature Lines, users will have two options: move them to different **Sites** (create new ones as needed) or moved them to site **<None>**



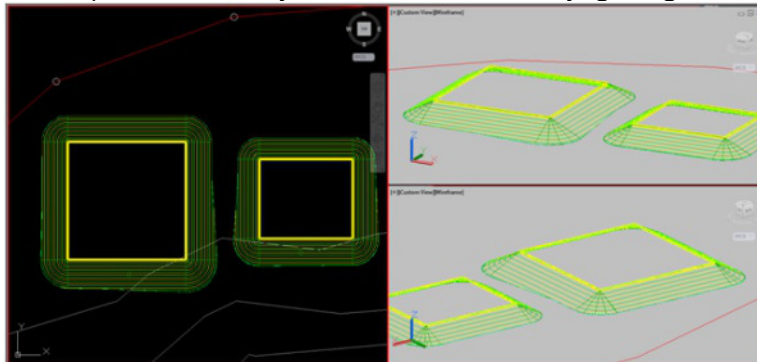
The idea of a "Site-Less" Feature Line is great, it simplifies workflows as a starting point and can cleans up the clutter of keeping track of multiple sites. If **Grading Objects** are to be created from **Feature Lines** they MUST be inside of the **Site**.



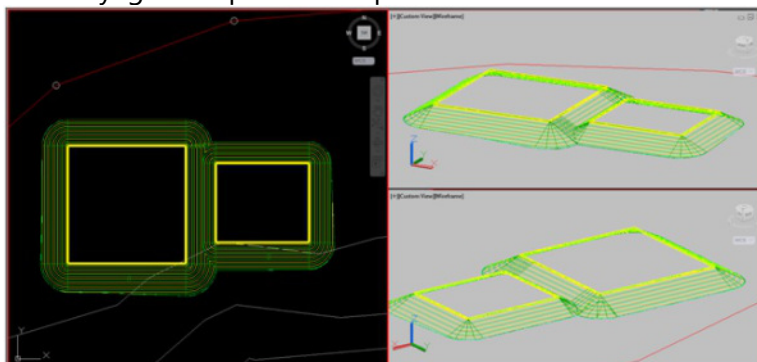
Understanding Grading Objects

Like the behavior of Feature Lines, when Grading Objects are collected in the same site they will interact with each other. In the examples below look at how contours clean up:

1. Grading Objects spread apart where they don't touch while daylighting.



2. Grading Objects where daylighting slopes clean up.

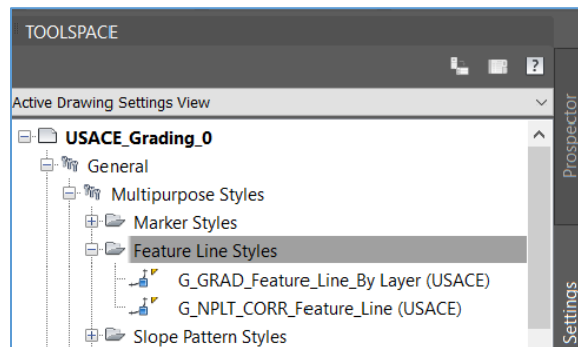


Feature Line Tools

Unlike AutoCAD lines or polylines, Figure Lines provide unique interfaces to Name, Control and Edit this intelligent Civil 3D object.

Feature Line Configuration

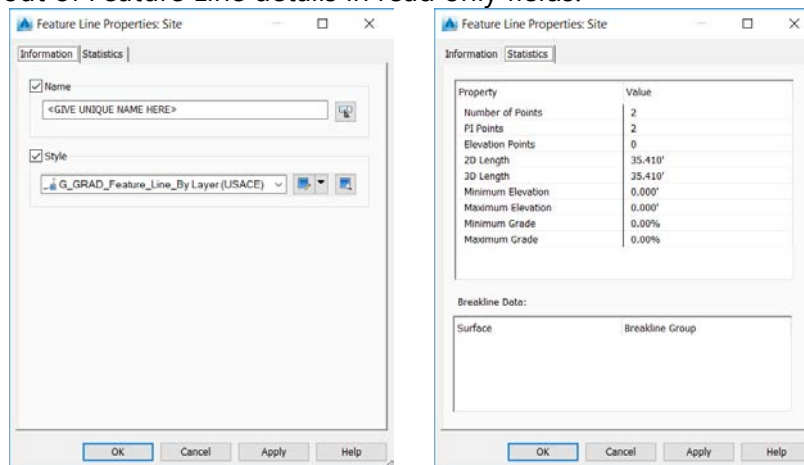
There are **2** configured Feature Line Styles in template. They can be from the **TOOLSAPCE** > **Settings** tab > **General** category > **Multipurpose Styles** collection > **Feature Lines Styles**



Feature Line Properties

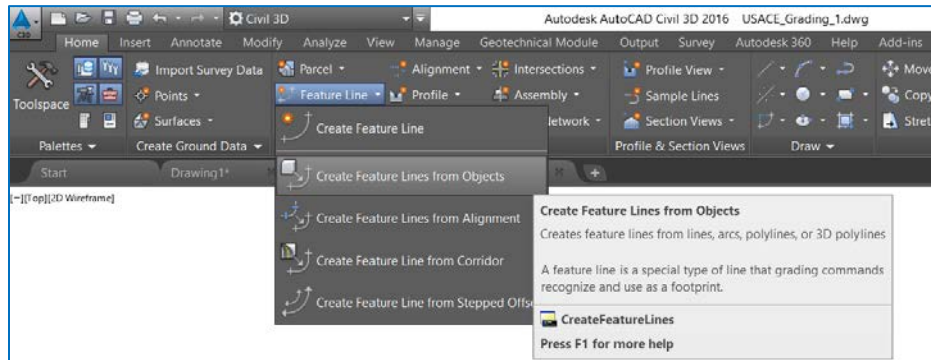
The dialog box has two tabs to edit and obtain information:

- **Information:** tab to assign or change a Feature Line Style or Name (optional)
- **Statistics:** read out of Feature Line details in read only fields.



Creating Feature Lines: from objects

The most common method for creating Feature Line is converting them from 2D AutoCAD linework. From the **Ribbon > Create Design** panel > **Feature Line** flyout > **Create Feature Lines from Objects**.



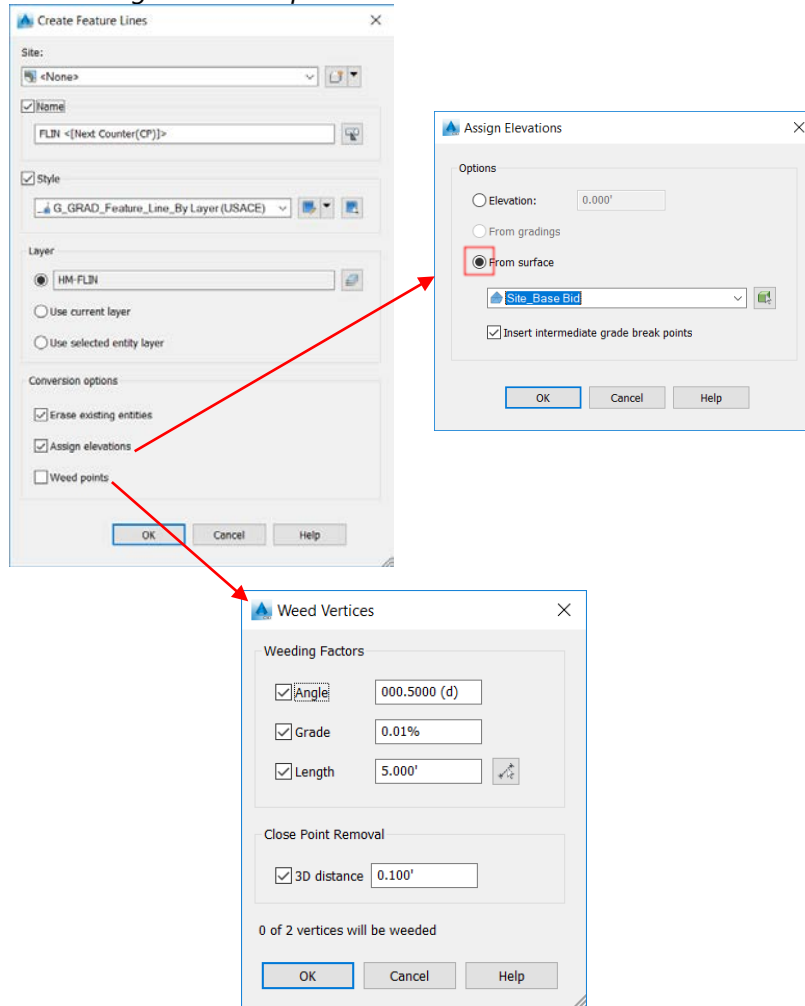
The provided dialog box allows for assignment of:

- **Site:** recommend Site **<None>** as starting point. Set specific site if known.
- **Name:** optional, recommend giving unique names
- **Style:** optional, will control look and split point behavior.
- **Layer:** target layer for feature line
- Conversion options:
 - **Erase existing entities:** option to keep original linework
 - **Assign elevation:** will open new dialog box to set elevations
 - **Weed points:** will remove elevations, at user input

When the Assign elevation is selected a second dialog box will be presented more options:



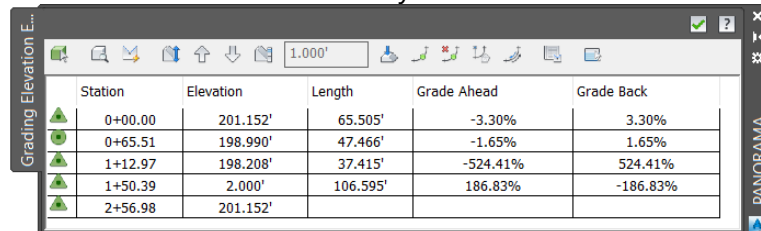
- **Elevations:** set elevation from TIN surface
- **From Gradings:** set elevation from Grading Objects
- **From surface:** will assign vertices elevations form target surface.
 - *Insert intermediate grade break points:* will add new vertex over tin lines.



The Elevation Editor

Using the auxiliary editor window can be used to edit Feature Lines, Parcel Lines or Survey Figures. A few tips on how to use this box.

- When **NOTHING** is Selected = **EVERYTHING** is Selected
- The Value of Cell in **1st Row** is Key
- Use **Shift** or **Ctrl** key for multiple or controlled selections.
- Green triangles ▲ are Geometry Points (PI). The X, Y and Z values are edible.
- Green circles ● are Elevation Points than can only move on the Z axis.



Station	Elevation	Length	Grade Ahead	Grade Back
0+00.00	201.152'	65.505'	-3.30%	3.30%
0+65.51	198.990'	47.466'	-1.65%	1.65%
1+12.97	198.208'	37.415'	-524.41%	524.41%
1+50.39	2.000'	106.595'	186.83%	-186.83%
2+56.98	201.152'			

Station: identifies vertex distance from starting point.

Elevation: point elevation at station.


Length: distance from previous point.


Grade Ahead: grade change here will edit elevation at next point.


Grade Back: grade change here will edit elevation at previous point.


 **Select Line** - Selects a different feature line, lot line, or survey figure for editing.


 **Zoom To** - Zooms the drawing display to the selected PI or elevation point.


 **Quick Profile** - Creates a quick profile of the feature line.


 **Raise/Lower** - Adjusts the elevation of rows either upward or downward. Prompts for a new elevation for the first point, then adjusts all rows by the same relative amount.


 **Raise Incrementally** - Adjusts the elevations of all points upward by the increment value.

 **Lower Incrementally** - Adjusts the elevations of all points downward by the increment value.


 **Set Increment Value** - Specifies the value to be used by the Raise and Lower commands.


 **Flatten Elevations** - Specifies that the elevations of all selected rows are flattened to either the same elevation as the first row in the selection, or a constant grade from the start elevation to the end elevation of the selection.

 **Insert Elevation Point** - Inserts an elevation point between the start and end stations of the footprint, creating an intermediate elevation point.


 **Delete Elevation Point** - Deletes an elevation point between the start and end stations of the footprint. You can delete only a single-row selection of intermediate elevation points.

 **Elevations from Surface** - Set elevations from a surface in the drawing.

 **Reverse** - This command affects the labeling and stationing of feature lines.

 **Show Grade Breaks Only** - Select to display just the feature line start/end points and any grade breaks in between. This option simplifies the editing process by allowing elevation edits to span multiple points.

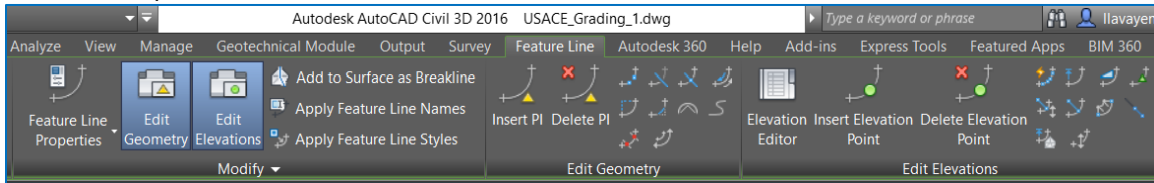


 **Unselect All Rows** - Clears any selected rows. This allows the Raise, Lower, and Flatten commands to affect the entire length of the footprint.












Editing Feature Lines Tools

Civil 3D provides advanced editing tool options that can be used on Civil 3D or AutoCAD entities. There are 2 major panels in the Feature Line contextual tab that collect tools for edits:








- Edit Geometry panel
- Edit Elevations panel








Edit Geometry tools:

-  **Insert / Delete PI:** Inserts/Deletes a vertex on a feature line, survey figure, parcel line, polyline, or 3D polyline
-  **Break:** Breaks a feature line, survey figure, or parcel line.
-  **Trim:** Trims feature lines, survey figures, or parcel lines.
-  **Join:** Joins connecting feature lines, survey figures, polylines, parcel lines, or 3D Polylines.
-  **Reverse:** Reverses the direction of a feature line, survey figure, parcel line, polyline, or 3D polyline.
-  **Edit Curve:** Edits the radius of a feature line arc, parcel line arc, or survey figure arc.
-  **Fillet:** Fits a curve between two segments of a selected feature line, survey figure, parcel line, or 3D polyline.
-  **Fit Curve:** Fits a curve from a selection of vertices with a feature line, survey figure, parcel line, or 3D polyline.
-  **Smooth:** Replaces feature/figure line segments with arcs.
-  **Weed:** Removes unnecessary points from features lines, polylines, or 3D polylines.
-  **Stepped Offset:** Creates a new feature line from an offset and difference in elevation from a selected feature line, survey figure, polyline, or 3D.

Edit Elevations tools

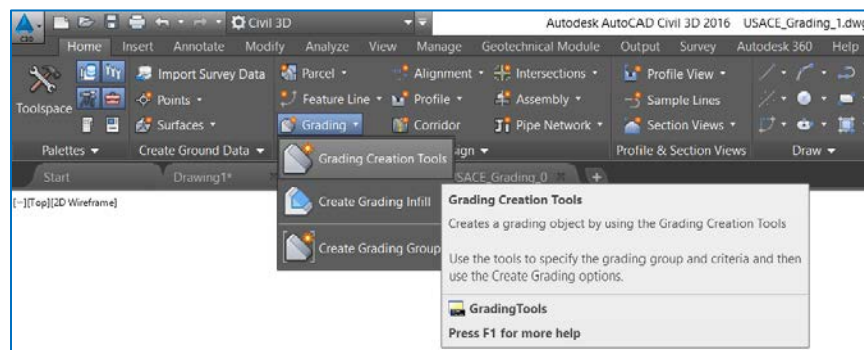
-  **Elevation Editor:** Edits the vertex elevations of feature lines, survey figures, and parcel lines
-  **Insert/Delete Elevation Point:** Inserts/Deletes an elevation point between two vertices on a feature line, survey figure, parcel line, or 3D polyline
-  **Quick Elevation Edit:** Identifies elevations and grades that can be selected and edited as the pointing device moves over feature lines or parcels in the drawing
-  **Edit Elevations:** Edits the vertex elevations of a survey figure, parcel line, or 3D polyline at the Command Line Interface
-  **Set Grade/Slope between Points:** Edits the vertex elevations at the Command Line Interface
-  **Insert High/Low Elevation Point:** Insert Elevation Point from 2 point selection
-  **Raise/Lower by Reference:** Raises or lowers a at a given slope/grade from a specified location



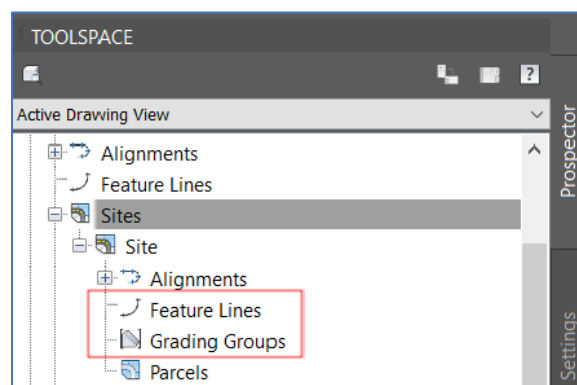
-  **Set Elevation by Reference:** Sets a vertex elevation on a feature line, survey figure, parcel line, or 3D polyline at a given grade/slope from a specified location
-  **Adjacent Elevations by Reference:** Specify elevations based on a grade, slope, or elevation difference from points on another feature
-  **Grade Extension by Reference:** Specify elevations by extending the grade of a segment on another feature
-  **Elevations from Surface:** Assigns elevations to a feature line, survey figure, parcel line, or 3D polyline from a specified surface
-  **Raise/Lower:** Raises or lowers a feature line, survey figure, parcel line, or 3D polyline

Grading Objects Tools

Grading Objects are built off a base Feature Line and a Grading Criteria, after that Grading can be built off other Grading Objects. The 3D grading is driven from **Grading Criteria**, which are scripted methods that dictate how a slope projects from the base starting Feature Line. These grading methods or strategies can be preconfigured and stored in the **Grading Criteria Set**.



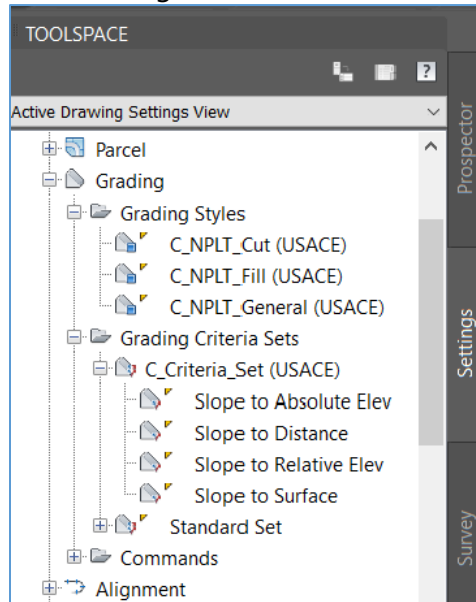
Once a Grading Objects is created it can be found in the **Prospector** tab within the host **Site** in the **Grading Group** collection. The starting base Feature Line must be in the same Site as the Grading Objects are to be created.



Grading Configuration

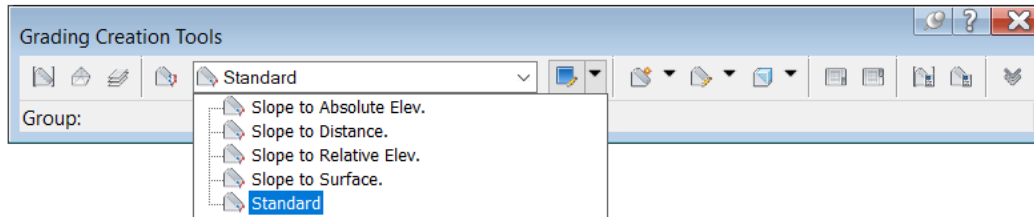
There are two (2) main Grading Categories found in the **TOOLSPACE** > **Settings** tab > **Grading** collection:








1. **Grading Styles:** There are **3** configured Grading Styles in template.
2. **Grading Criteria Sets:** There is **1** Grading Criteria Set with **4** configured criteria.







Grading Objects Dialog Bar

From the **Home** tab > **Create Design** panel > **Grading** fly out > **Grading Creation Tool** button






-  **Set Grading Group** - Select the current grading group, or create a new group.
-  **Set Target Surface** - Select the surface to use as a target.
-  **Set Grading Layer** - Specify on which layer the grading should be created.
-  **Select a Criteria Set** - Sets the current criteria set, from which you can select specific criteria.
-  Standard  **Grading Criteria dropdown** – Sets Grading Strategy.
-  **Style Picker** - Use these options to edit the current criteria or create a new criteria.








GRADING CREATION TOOLS

-  **Create Grading** - Creates grading object using the current style and criteria.
-  **Copy Create Grading** - Copies an existing grading objects criteria and style
-  **Create Transition** - Creates a transitional slope between two grading objects.\
-  **Create Infill** - Creates a grading face to fill in feature lines or holes in gradings.

GRADING EDITING TOOLS

-  **Edit Grading** - Uses command line prompts to change the criteria of a grading object.
-  **Delete Grading** - Deletes a grading and removes it from the grading group.
-  **Change Grading Group** – Moves selected grading objects to specified destination group.

GRADING UTILITIES

-  **Grading Volume Tools** - Opens the Grading Volume Tools dialog bar.
-  **Create Detached Surface** - Creates a new surface that is not associated with the grading group and does not update to reflect changes in the group.
-  **Grading Editor** – opens the Grading Editor dialog box opens for tabular editing.
-  **Grading Elevation Editor** - Prompts you to select an existing feature line or lot line, then displays the Grading Elevation Editor dialog box.
-  **Grading Group Properties** - Opens the Grading Group Properties dialog box.
-  **Grading Properties** - Opens dialog box to view the properties of an individual grading.
-  **Expand** - Shows or hides the current grading criteria values and the style selectors.

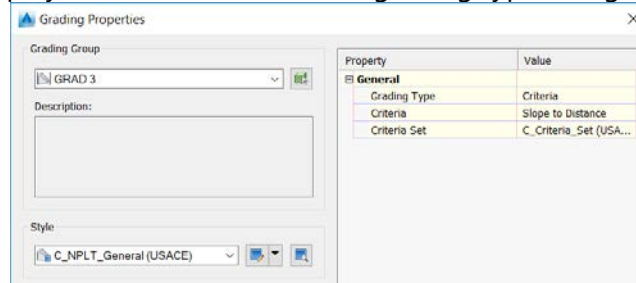
Grading Properties

Use this dialog box to view and change the styles and properties for the selected grading.

- **Grading Group:** Specifies the grading group for the selected grading.



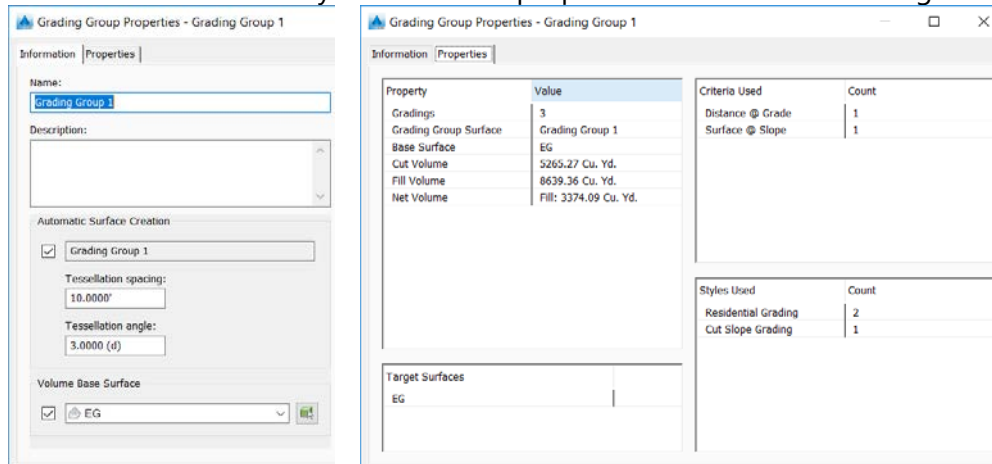
- **Style Name:** Specifies the grading style for the selected grading.
- **Property & Value:** Displays information about the grading type and grading criteria.



Grading Group Properties

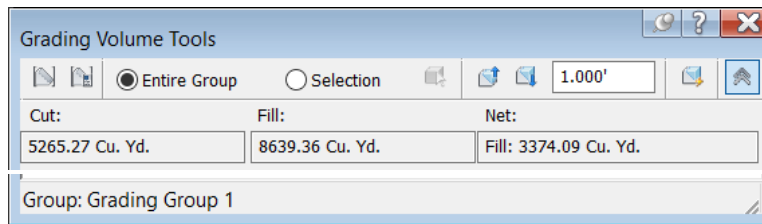
Dialog box has two tabs to view or change general information for the grading group.

- **Information** tab: The options for Automatic Surface Creation and Volume Base Surface are usually set when the grading group is created, but they can be changed here
- **Properties** tab: Use this read-only tab to review properties and statistics of the grading group.



Grading Volumes

Use this toolbar to adjust the cut and fill volumes for a grading group. For Grading Volumes to work make sure the **Automatic Surfaces Creations** and **Volume Base Surfaces** are both checked from the **Grading Group Properties** dialog box. If buttons on this toolbar are not available (dimmed) required data is unavailable.



Set the Grading Group - Click to specify the grading group to adjust. The name of the group is displayed along the bottom of the toolbar.

Grading Group Properties - Opens the Grading Group Properties dialog box.

- **Entire Group** - Click to adjust the elevation of the whole grading group.
- **Selection** - Click to select one or more features. Click to select the features to adjust.

Raise the Grading Group - Raises the elevation of the grading group by user specified value.

Lower the Grading Group - Lowers the elevation of the grading group by specified value.

Auto-Balance Volume - Specify a target value for net volume and automatically balance cut and fill volumes to approach the target. If necessary, re-run the command to get closer to the target.

Expand - Shows/Hides the history of cut and fill adjustments. This history is erased when you close the toolbar.

Volume Display Window: Displays the current cut and fill volumes and the resulting net requirements for the grading group. This display updates whenever you modify either of the two surfaces involved in the comparison.

Creating Building Pads and Sidewalks

This section will focus on building pads and sidewalks for the First and Lower Levels. Various grading ideas will be implemented to set needed design elevations to site.

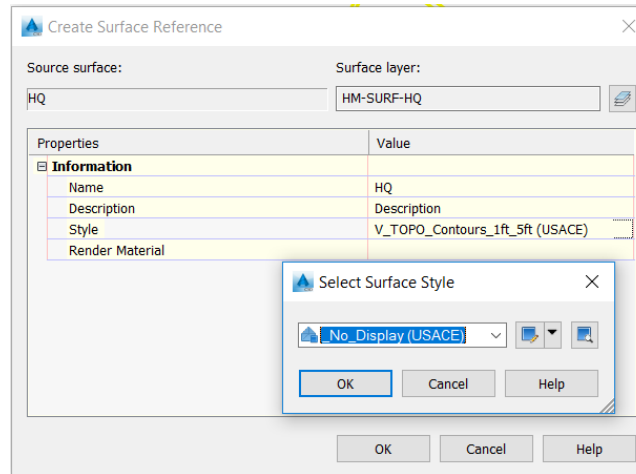
- Building pads at Finish Floor Elevation (FFE)
- Building drop offset with elevation drop
- Temporary grading surface to set elevations along sidewalks
- Sidewalks projected to temporary surface for elevations
- Creation of preliminary grading surface

EXERCISE: Finished Floor Elevations (FFE)

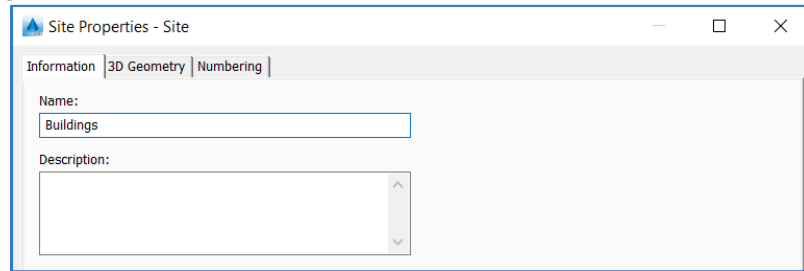
1. Open **USACE_Grading_1.dwg**
2. Xref:
 - a. EX Site.dwg
 - b. Corridor.dwg
3. From **TOOLSPACE** > **Prospector** tab > browse to **Data Shortcut** collection > right click select > **Set Working Folder...**



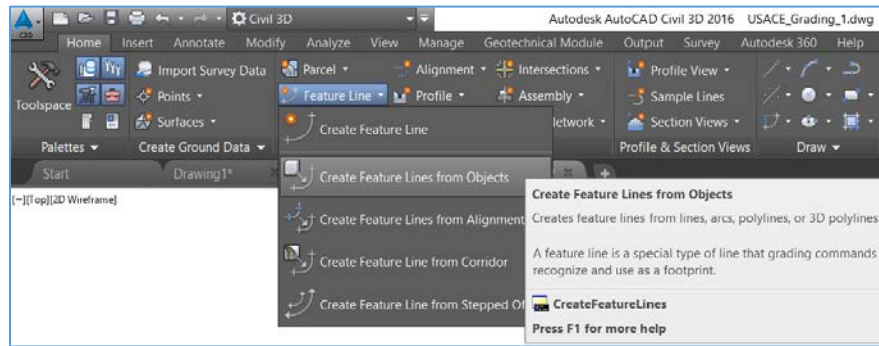
- a. Set path to class path: <Project Path Here>
- b. Expand **Surfaces** collection
- c. Right on HQ > select Create reference...
- d. Set Style to: _NO_Display (USACE)
- e. Click **OK** button



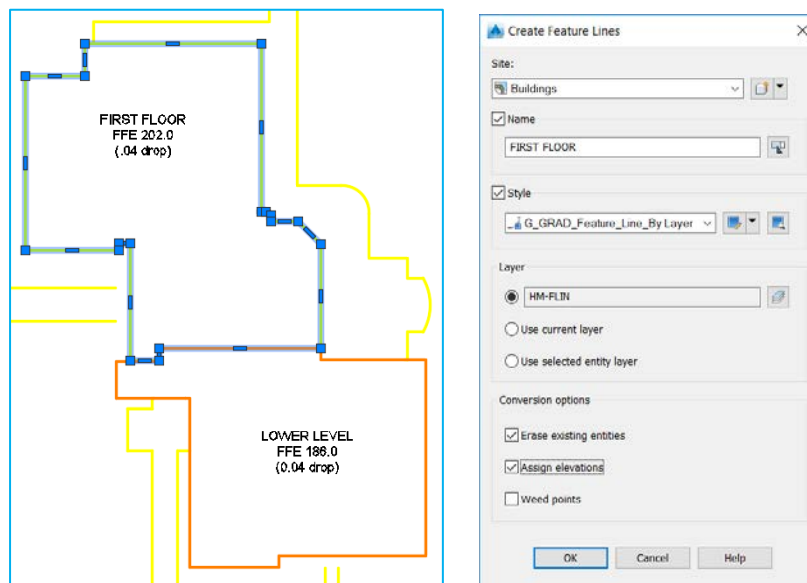
4. From **Prospector** tab > browse to **Sites** collection > right click > Select **New...**
 - a. Name: Buildings



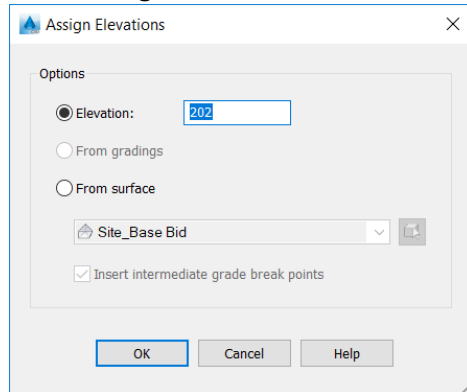
5. Zoom and pan to First Floor building foot print
6. From the Ribbon Home tab > Create Design panel > Feature Line flyout button > Create Feature Line from Objects



7. Select the north **FIRST FLOOR** building outline (**green**)
8. From the **Create Feature Lines** dialog box:
 - a. **Site** > Buildings
 - b. ✓ **Name:** "FIRST FLOOR"
 - c. ✓ **Style:** use default
 - d. ✓ Erase existing entities
 - e. ✓ Assign elevations



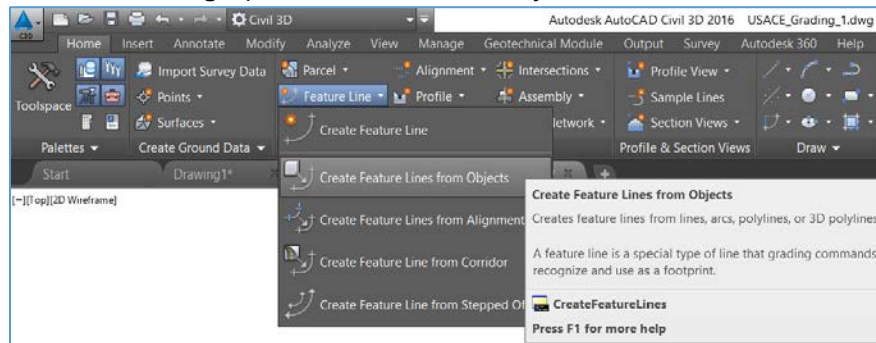
- f. From the **Assign Elevation** dialog box > set **Elevations** > **202**



- g. Click **OK** button

9. Zoom and Pan to the Lower Level building foot print

10. From the Ribbon > Create Design panel > Feature Line flyout > Create Feature Line from Objects button

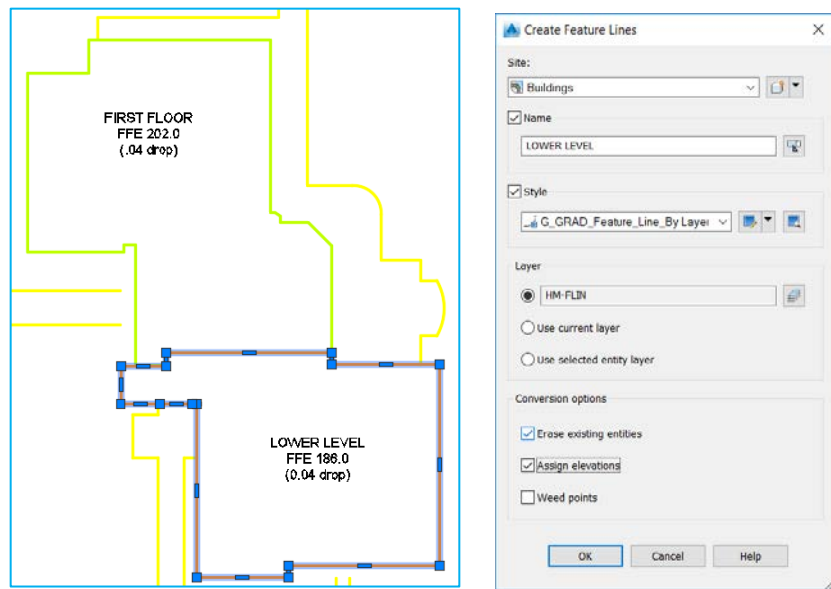


11. Select the south LOWER LEVEL building outline (**orange**)

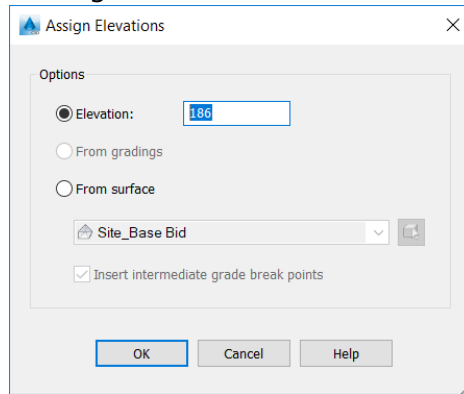
12. From the **Create Feature Lines** dialog box:

- Site:** Buildings
- ✓ **Name:** LOWER LEVEL
- ✓ **Style** - use defaults
- ✓ Erase existing entities
- ✓ Assign elevation





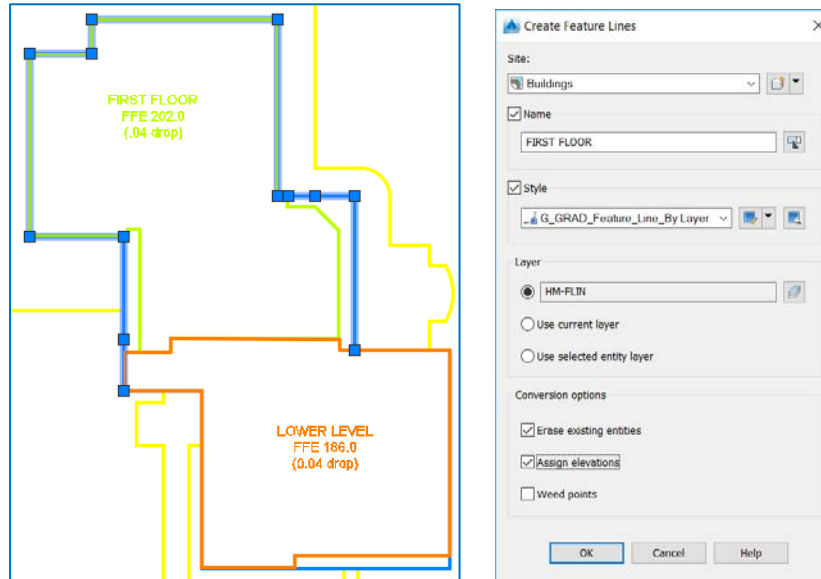
f. From the **Assign Elevation** dialog box > set **Elevation > 186**



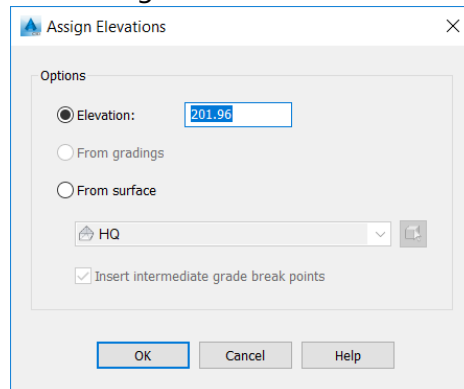
EXERCISE: Building Footprint Offsets

Next create a building footprint offset with a **0.04'** elevation drop from the FFE for the First Floor and Lower Level linework

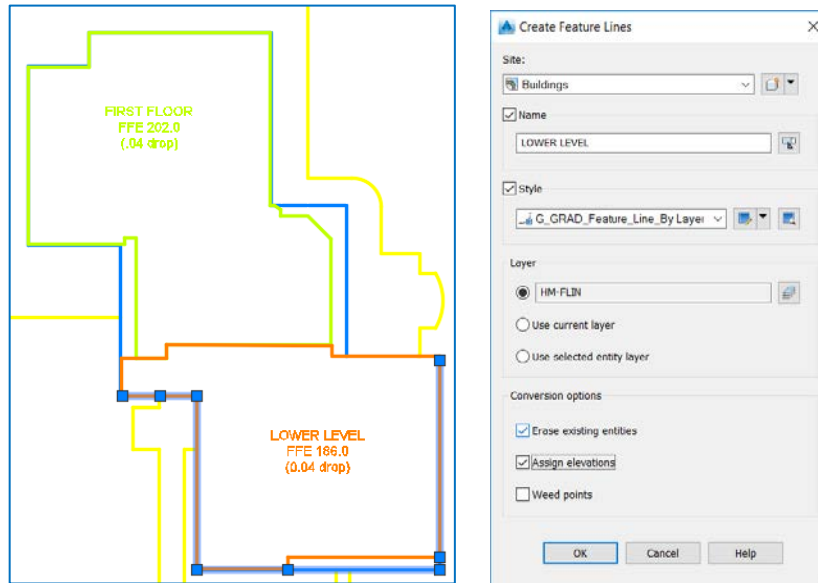
1. Continue working from previous or open **USACE_Grading_2A.dwg**
2. Make sure Layer **C-BLDG-FTPT 3** is visible (**blue** linework)
3. From the Ribbon > **Create Design** panel > **Feature Line** flyout button > **Create Feature Line from Objects** >
4. Select the **northern** outer offset building outline
5. From the **Create Feature Lines** dialog box:
 - a. Site: Buildings
 - b. ✓ Name: FIRST FLOOR OFFSET
 - c. ✓ Style: use default
 - d. ✓ Erase existing entities
 - e. ✓ Assign elevations



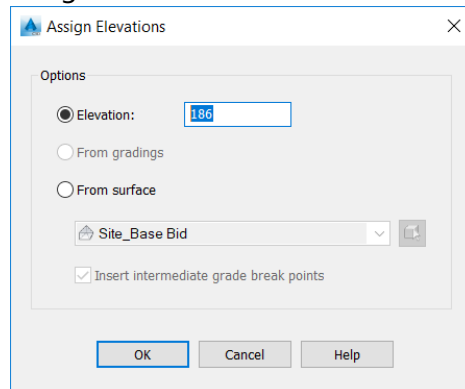
- f. From the **Assign Elevation** dialog box > set **Elevation** > **201.96**



6. From the Ribbon Home tab > Create Design panel > Feature Line flyout > Create Feature Line from Objects button >
7. Select the **southern** outer offset building outline
8. From the **Create Feature Lines** dialog box:
 - a. Site: Buildings
 - b. ✓ Name: LOWER LEVEL OFFSET
 - c. ✓ Style: use default
 - d. ✓ Erase existing entities
 - e. ✓ Assign elevations



- f. From the **Assign Elevation** dialog box > set **Elevation** > **185.96**



EXERCISE: First Floor Sidewalks – setting elevations for temporary linework

Using Civil 3D tools from the contextual ribbon elevations will be set **-2%** slope from building offset outlines using two commands:

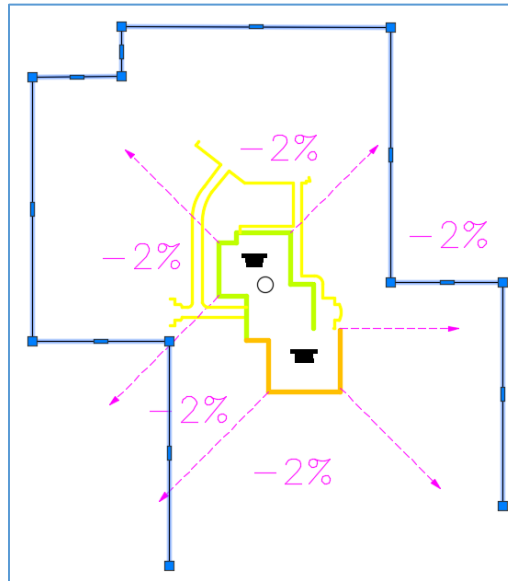
Adjacent Elevations by Reference:

This command allows to edit multipole vertices by projecting proposed elevations from source linework.

Grade Extension by Reference:

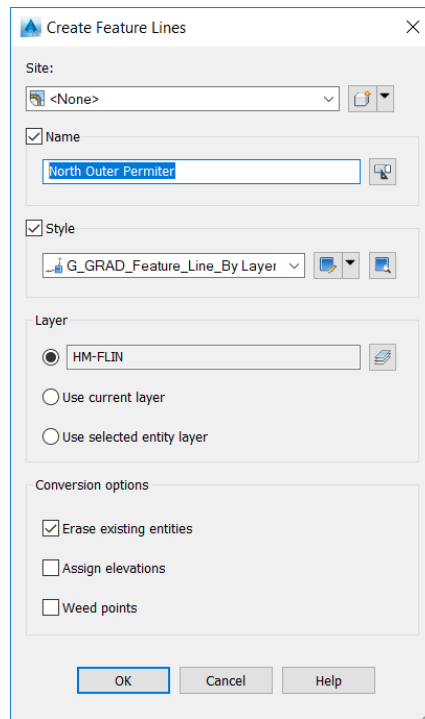
This command steps users through singular vertex edits, by project proposed elevations from source linework.


1. Open **USACE_Grading_3.dwg**
2. First, from the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > First create **Feature Lines from Objects** button 
3. Select the outer most polyline

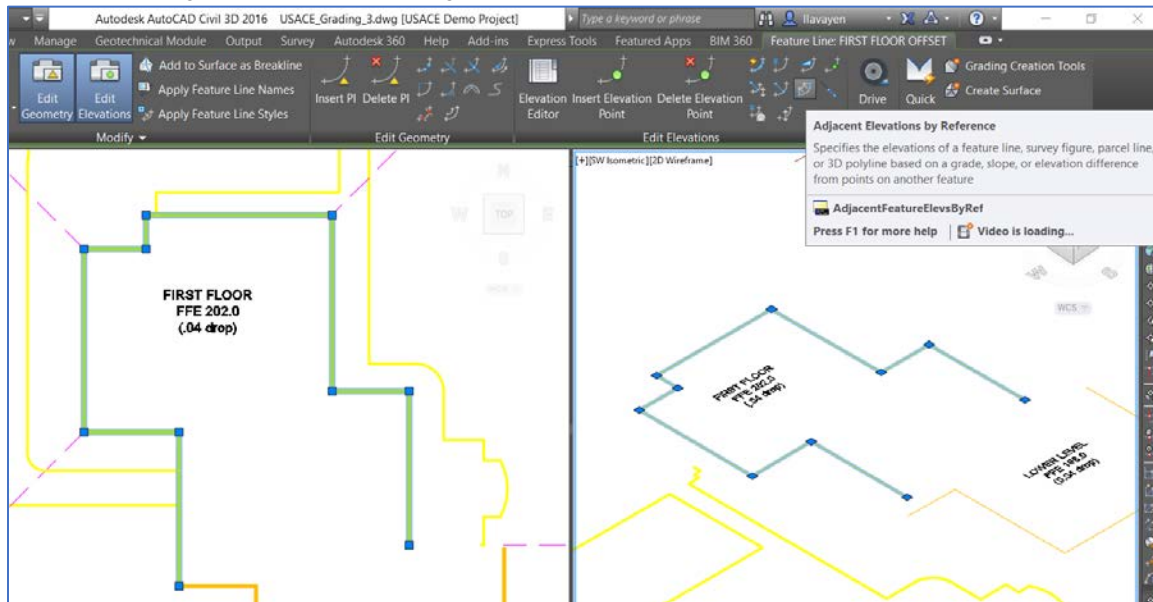


4. From the **Create Feature Lines** dialog box:
 - a. Site: **<None>**
 - b. ✓ Name: North Outer Perimeter
 - c. ✓ Style : default
 - d. Layer: default
 - e. ✓ Erase existing entities

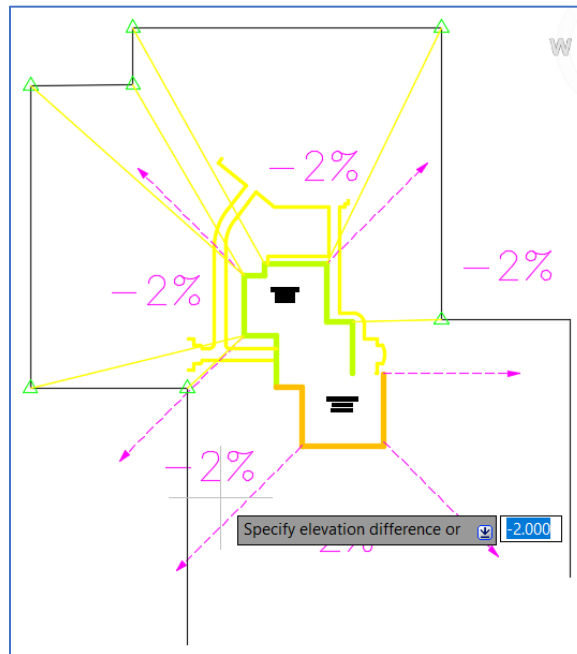




5. Next, select the **GREEN** inner **First Floor Offset** Feature Line > from contextual ribbon > **Edit Elevation** panel > pick the **Adjacent Elevations by Reference** button 



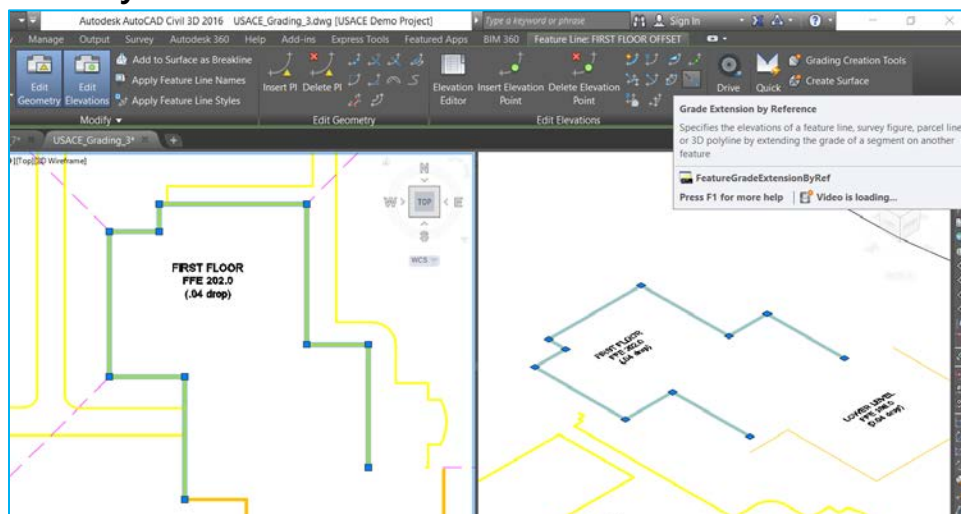
- a. When prompted to **Select object to edit** > pick the previously created outer most line **North Outer Perimeter**
- b. From command line > **Specify by Grade** > **-2**



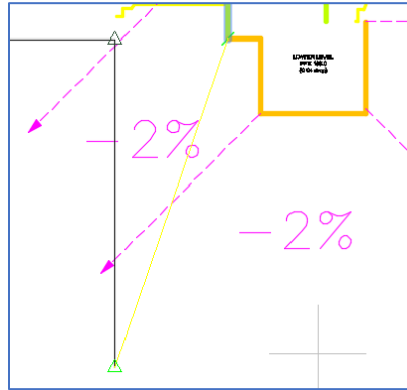
- 6. Notice, when viewed in 3D, the starting and end points of the line were not edited. This is expected as seen from the previous command, not all vertices were selected.



- 7. Each vertex that did NOT get raised will have to be edited one by one.
- 8. Select the **GREEN** inner First Floor Offset Feature Line > from contextual ribbon > **Edit Elevation** panel > **Grade Extension by Reference** button



- a. When prompted to **Select reference segment** > select inner **GREEN** left most segment reference segment,
- b. Next prompt **Specify point** > select the most outer line outer perimeter segment as target, focus on the point to be edited marked with green triangle ▲
- c. On command line > **Specify Grade** > **-2**



9. Repeat as necessary to assign elevations to ALL points



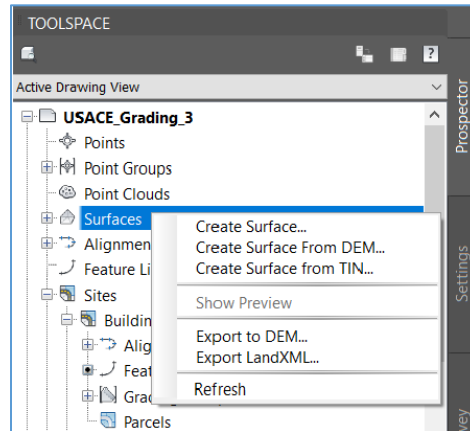
Once linework has been set to correct elevation, a temporary surface can be created to elevate surrounding sidewalk linework.



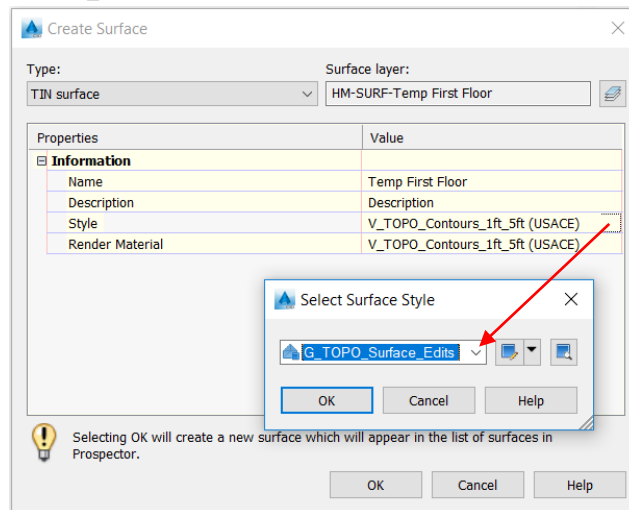
EXERCISE: First Floor Sidewalks – Temporary Surface

With the necessary linework set to the needed elevations a temporary surface will be created using offset and projection linework, which will later be used to set sidewalk elevations.

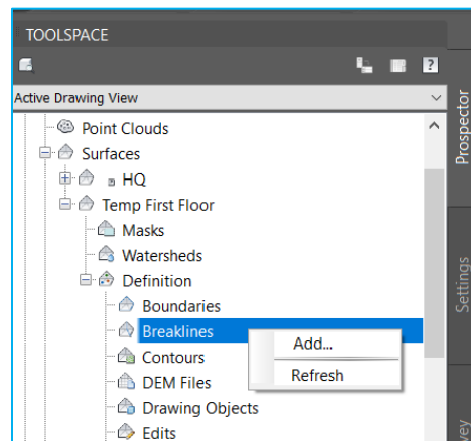
1. Open **USACE_Grading_4.dwg**
2. From **TOOLSPACE** Prospector tab > browse to **Surfaces** category > right click> select **Create Surface...**



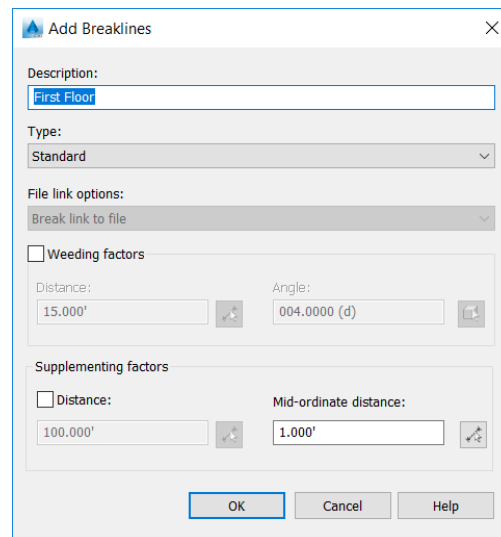
3. From the **Create Surface** dialog box >
 - a. Name > Temp First Floor
 - b. Style > G_TOPO_Surface_Edits



4. From **TOOLSPACE** > Prospector tab > expand **Temp First Floor** surface > expand **Definition** collection > right click on **Boundaries** > select **Add...**

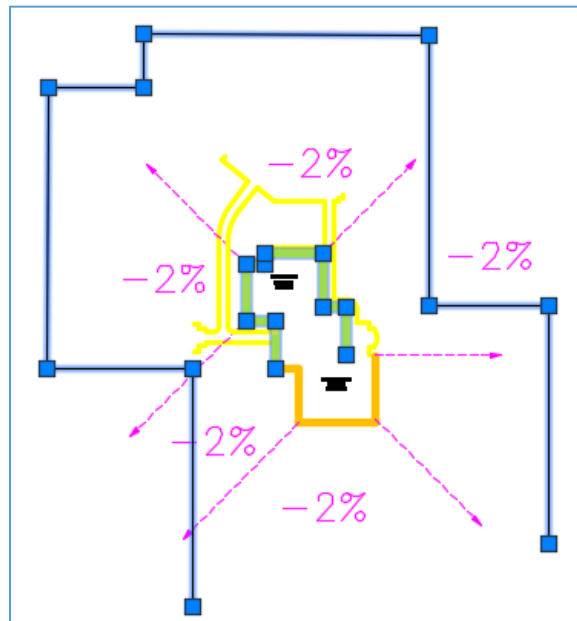


5. From the **Add Breaklines** dialog box >
 - a. Description: **First Floor**
 - b. Type: Standard
 - c. Weeding Factors: unchecked
 - d. Suppelmenting Factors: unchecked

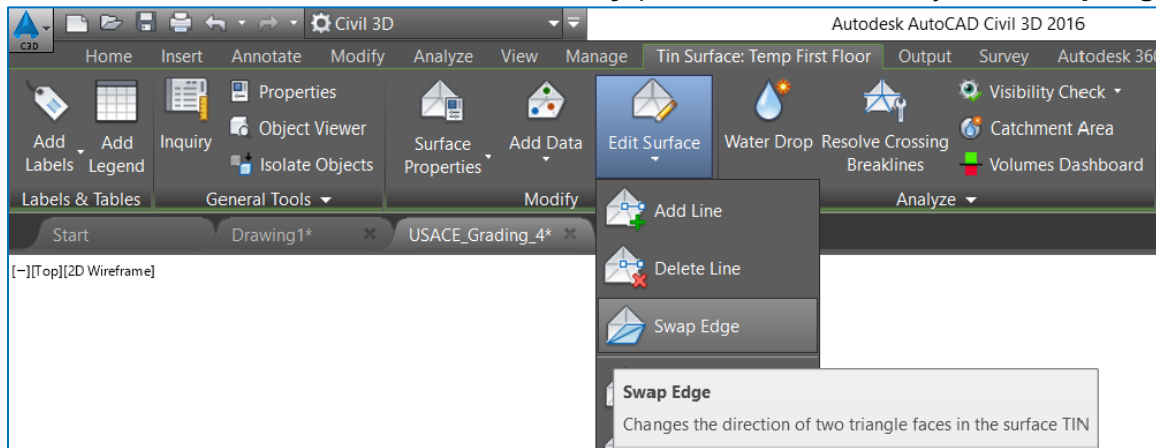


6. From screen select the First Floor offset and the previously created outer line.

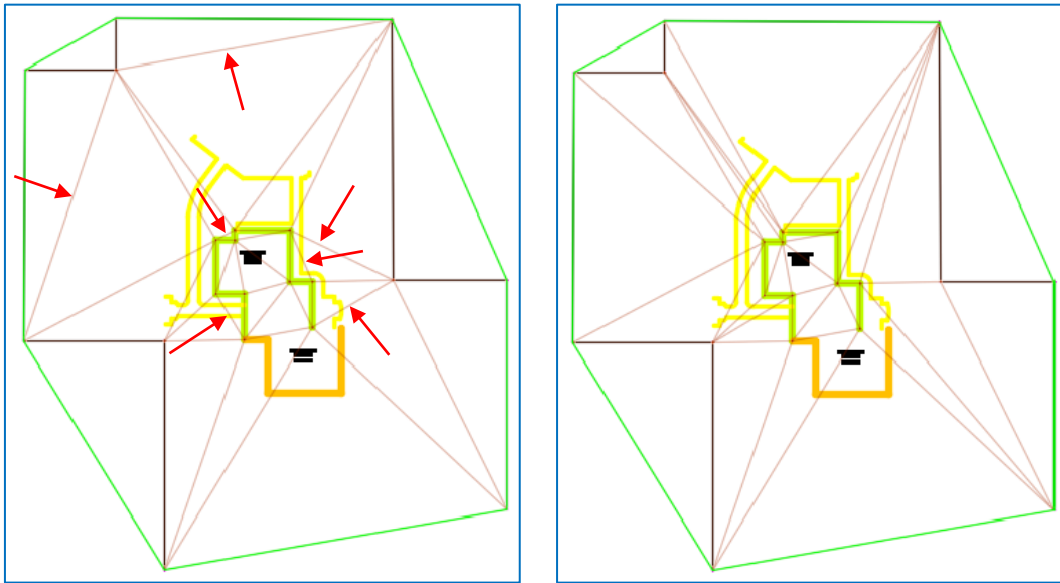




7. The created surface will need to be edited to ensure the -2 % is being followed. Make sure TIN Lines project correctly from inside to outer edges.
8. Select the surface from > contextual ribbon > **Modify** panel > **Edit Surface** flyout > **Swap Edge** button



9. Select the TIN Lines to correct triangulation. This process is very user/site specific.



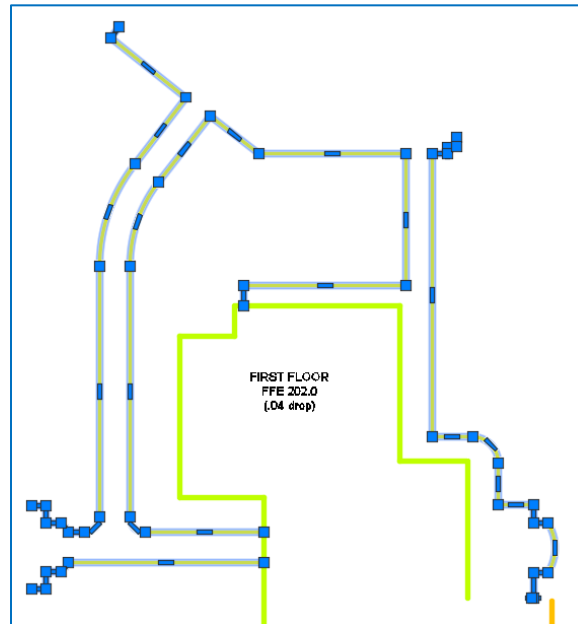
Once surface editing is complete the created surface will be used to elevate surrounding sidewalk linework. After elevations are set the temp surface can be deleted.




EXERCISE: First Floor Sidewalks – projecting linework

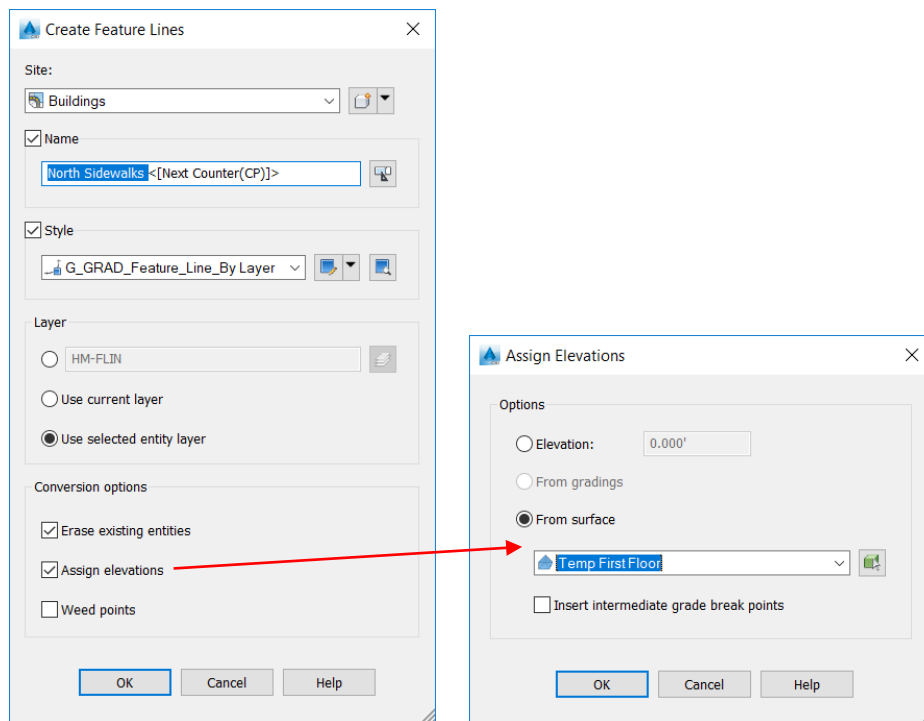
With the temporary surface in place that slopes away from building at -2% in place, the next step is to create sidewalk features that pull those elevations.

1. Open **USACE_Grading_5.dwg**
2. First, select all the **YELLOW** 2D polylines surround the northern First Floor (select similar works great)

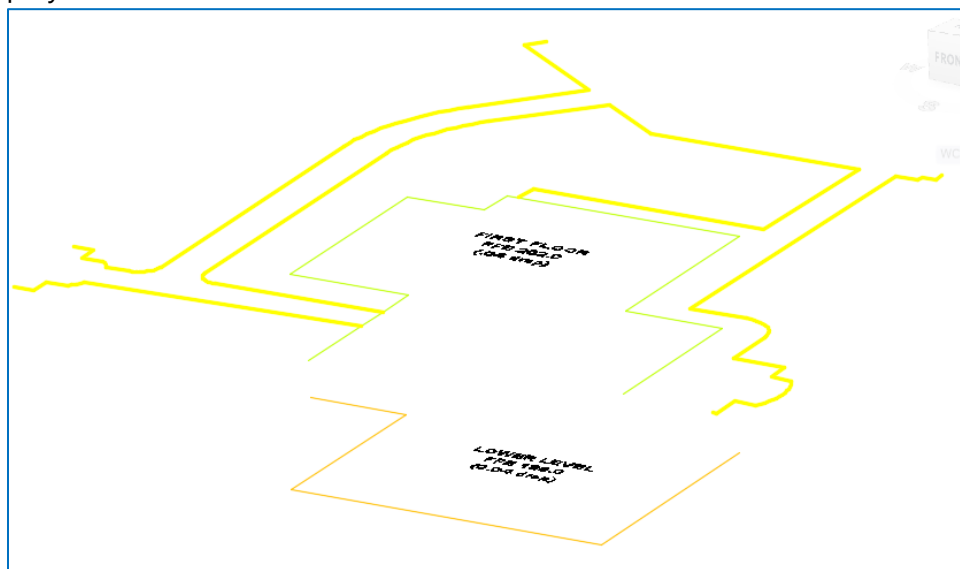


3. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Create Feature Lines from Objects** button 
4. From the **Create Feature Lines** dialog box:
 - a. Site: **<None>**
 - b. ✓ Name : North Sidewalks
 - c. ✓ Style : use default
 - d. Layer: Use selected entity layer
 - e. ✓ Erase existing entities
 - f. ✓ Assign elevation
 - g. From the **Assign Elevations** dialog box >
 - i. From surface > Temp First Floor
 - ii. Uncheck Insert intermediate grade break points





5. 2D Sidewalk polylines have been converted to Feature Lines and have been elevated, as seen in 3D view.



6. After Sidewalk geometry is elevated, all temporary lines and surfaces can be deleted. A similar process will be followed in the next section to set elevation around the southern Lower Level Perimeter Sidewalks.

EXERCISE: Lower Level Sidewalks – setting elevations for temp surface linework

The same Civil 3D tools used in previous exercises will be used for Lower Level linework. Using Civil 3D tools from the contextual ribbon elevations will be set -2% slope from building offset outlines using two commands:

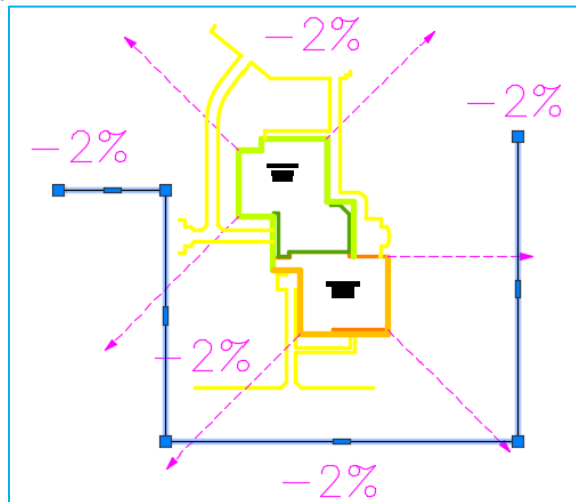
Adjacent Elevations by Reference:

This command allows to edit multipole vertices by projecting proposed elevations from source linework.

Grade Extension by Reference:

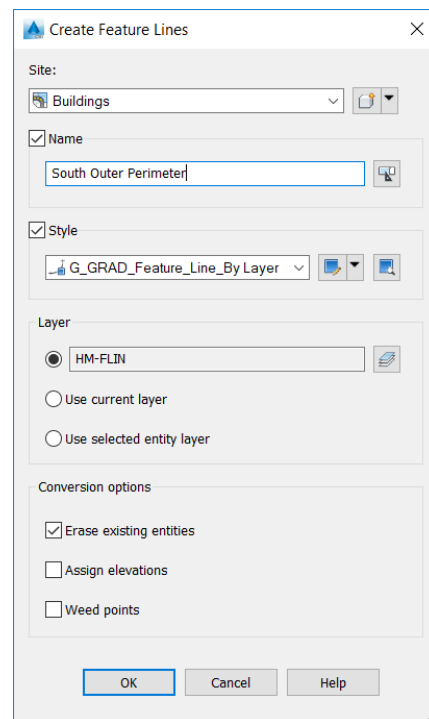
This command steps users through singular vertex edits, by project proposed elevations from source linework.

1. Open **USACE_Grading_6.dwg**
2. First, from the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines from Objects** button 
3. Select the outer most polyline

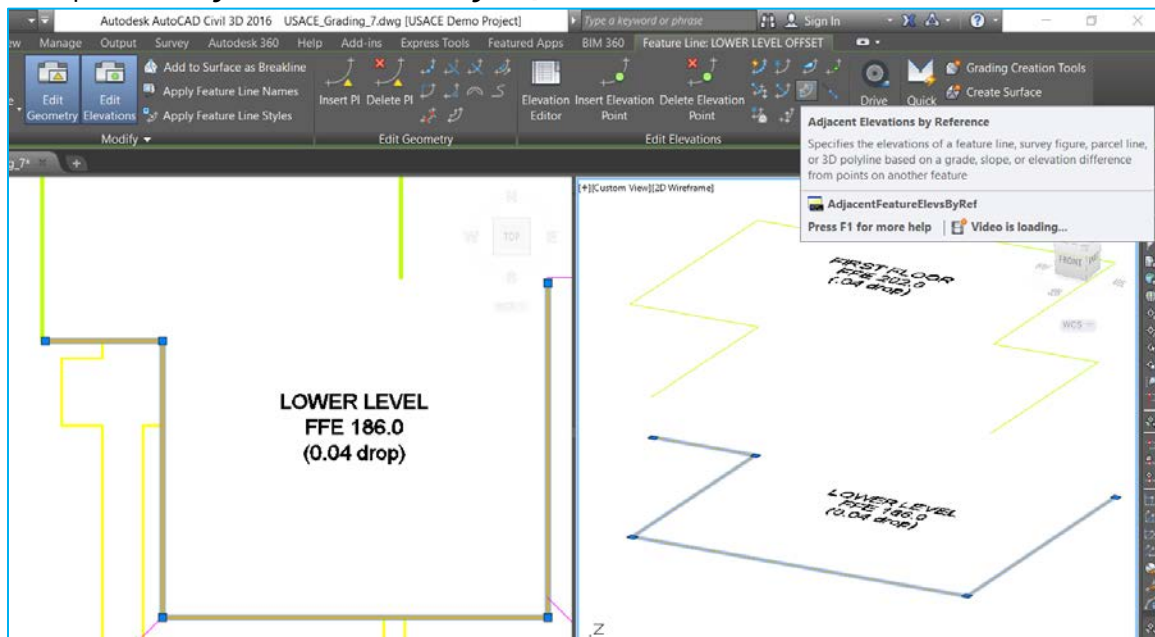


4. From the **Create Feature Lines** dialog box:
 - a. Site: **<None>**
 - b. ✓ Name: South Outer Perimeter
 - c. ✓ Style: use default
 - d. Layer: use default
 - e. ✓ Erase existing entities



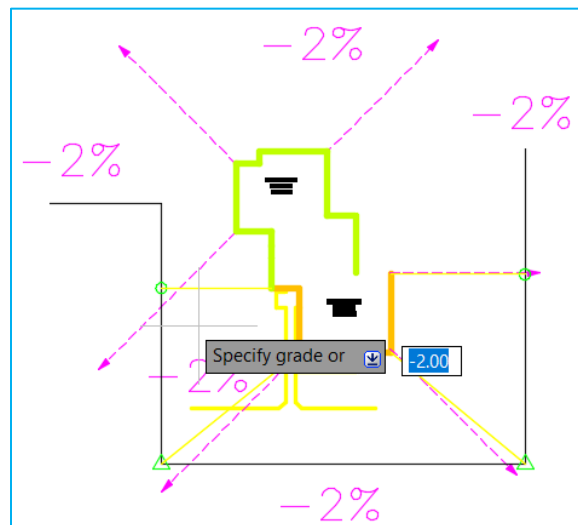


5. Next, select the **ORANGE** inner **Lower Level Offset** Feature Line > from contextual ribbon > **Edit Elevation** panel > **Adjacent Elevations by Reference** button

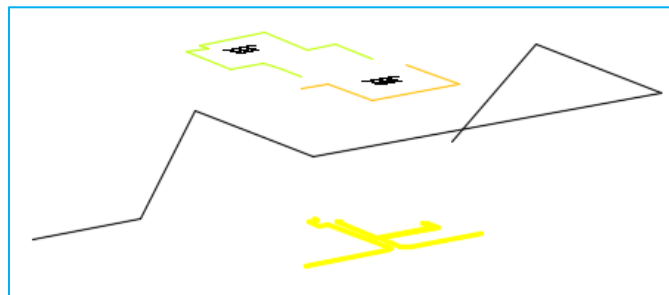


- When prompted to **Select object to edit** > pick the previously created outer most line **South Outer Perimeter**
- From command line > **Specify by Grade** > **-2**

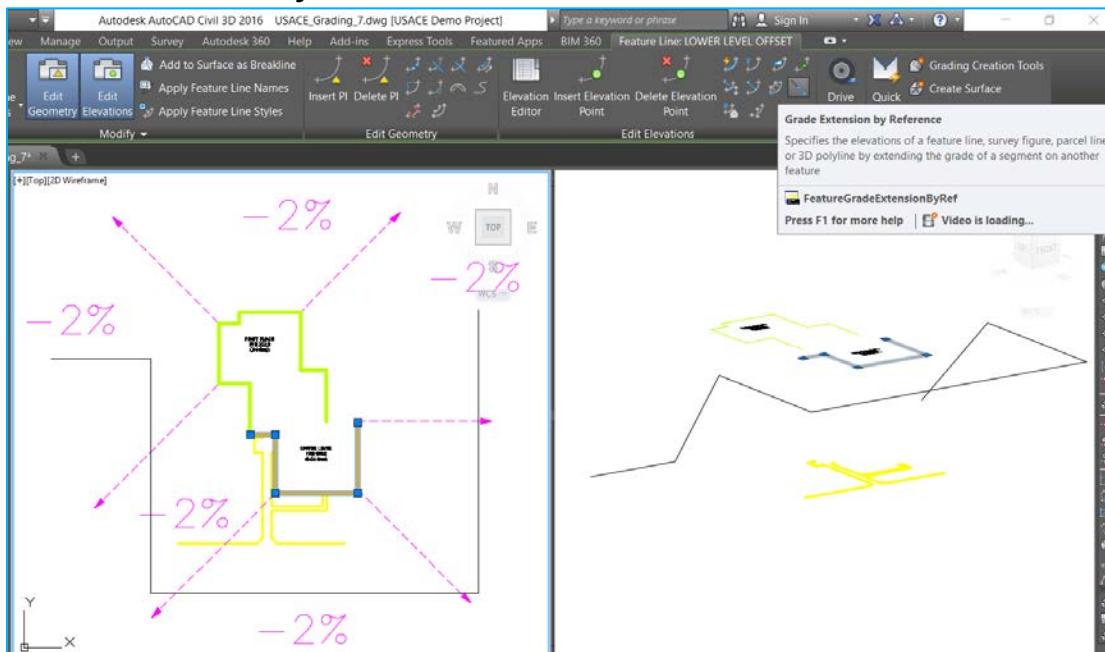




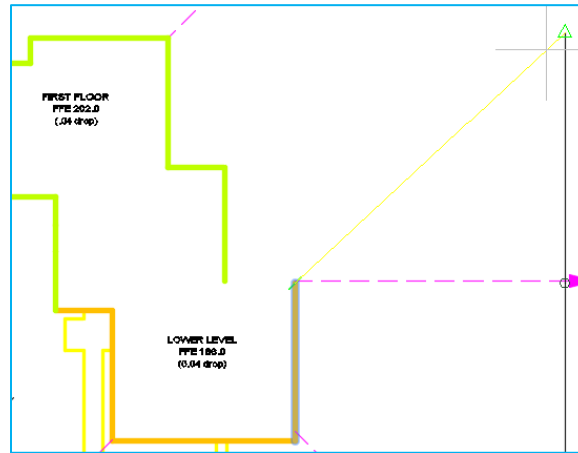
- 6. Notice, when viewed in 3D the starting and end points of the line were not edited. This is expected as seen from the previous command, not all vertices were selected.



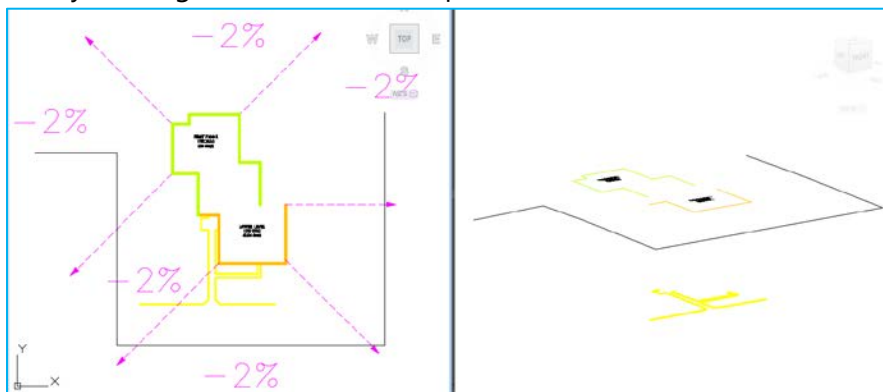
- 7. Each vertex that did NOT get raised will have to be edited one by one.
- 8. Select the **ORANGE** inner Lower Level Offset Feature Line > from contextual ribbon > **Edit Elevation** panel > **Grade Extension by Reference** button



- a. When prompted to **Select reference segment** > select inner **ORANGE** left most segment reference segment,
- b. Next prompt **Specify point** > select the most outer line outer perimeter segment as target, focus on the point to be edited marked with green triangle ▲
- c. On command line > **Specify Grade** > **-2**



9. Repeat as necessary to assign elevations to ALL points



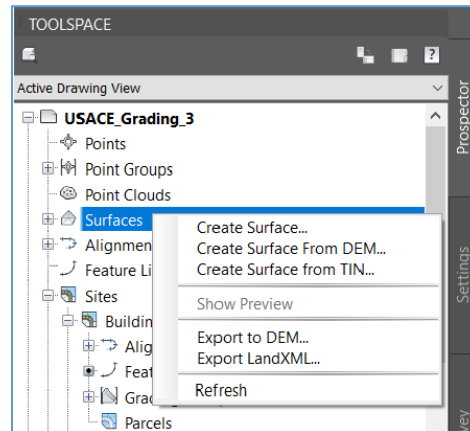
Once linework has been set to correct elevation, a temporary surface can be created to elevate surrounding sidewalk linework.



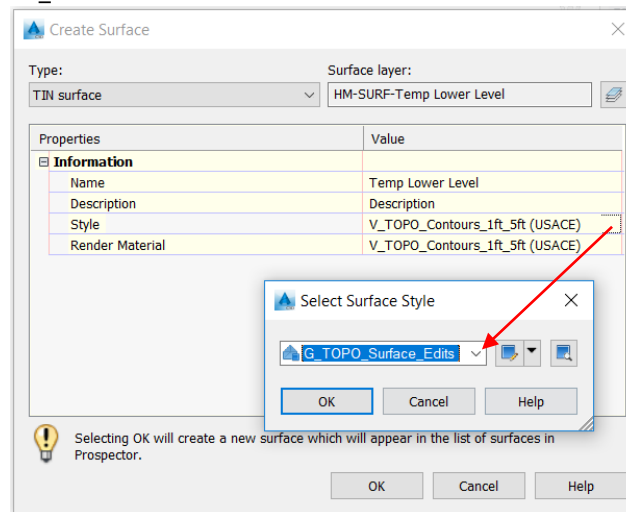
EXERCISE: Lower Level Sidewalks –temporary surface

With the necessary linework set to the needed elevations a temporary surface will be created using offset and projection linework, which will later be used to set sidewalk elevations.

1. Open USACE_Grading_7.dwg
2. From **TOOLSPACE** Prospector tab > browse to **Surfaces** category > right click> select **Create Surface...**

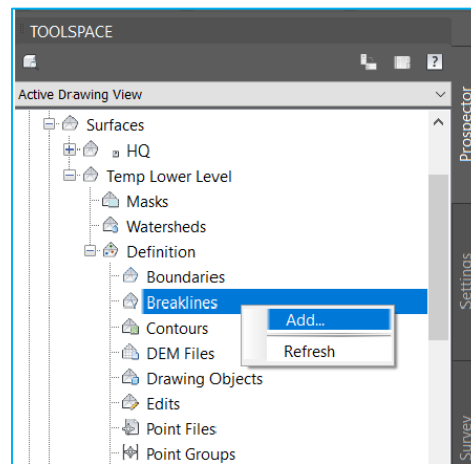


3. From the **Create Surface** dialog box >
4. Name > Temp Lower Level
5. Style > G_TOPO_Surface_Edits

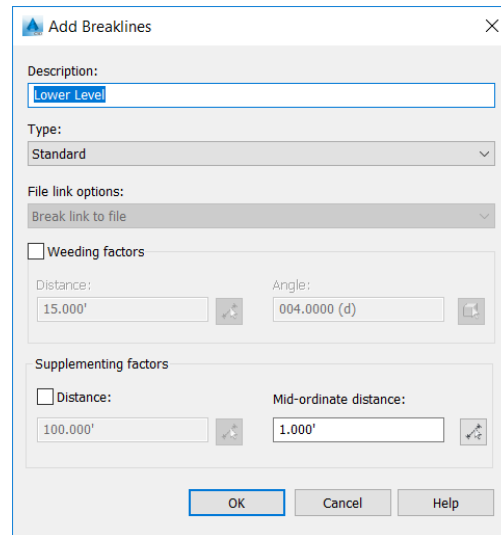


6. From **TOOLSPACE** > Prospector tab > expand **Temp Lower Level** surface > expand **Definition** collection > right click on **Boundaries** > select **Add...**

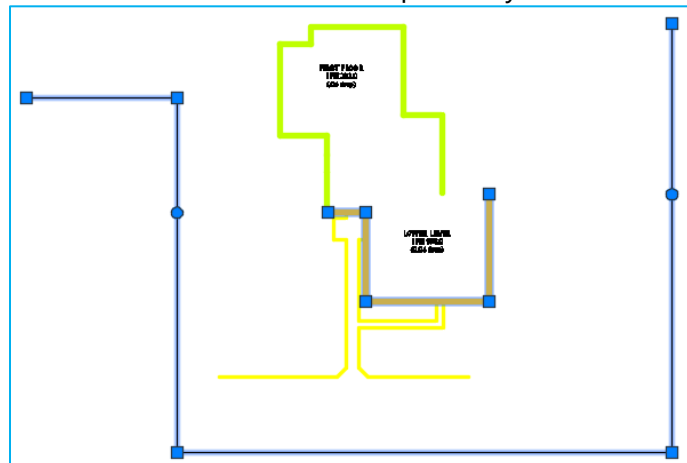




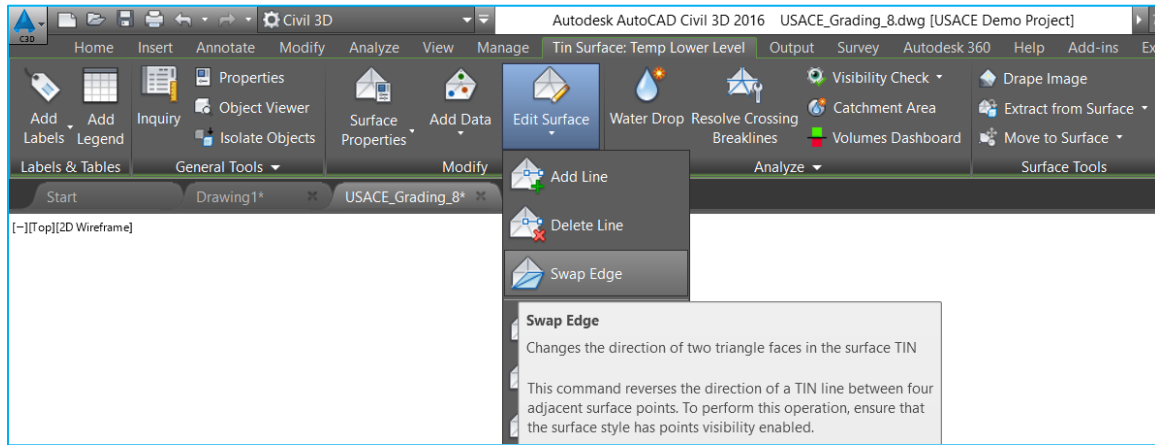
7. From the **Add Breaklines** dialog box >
8. Description: **Lower Level**
9. Type: Standard
10. Weeding Factors: unchecked
11. Suppelmenting Factors: unchecked



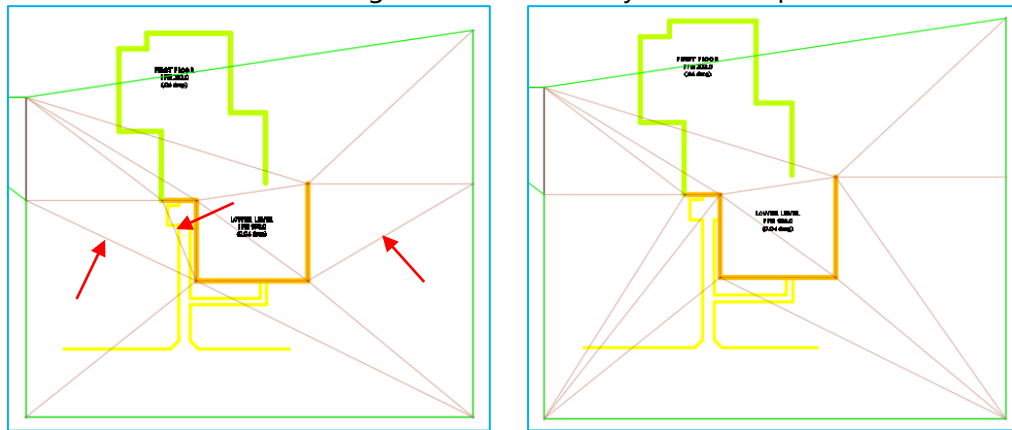
12. From screen select the Lower Level offset and the previously created outer line.



13. The created surface will need to be edited to ensure the -2% is being followed. Make sure TIN Lines project correctly from inside to outer edges.
14. Select the surface from > **contextual** ribbon > **Modify** panel > **Edit Surface** flyout > **Swap Edge** button



15. Select the TIN Lines to correct triangulation. This is very user/site specific.



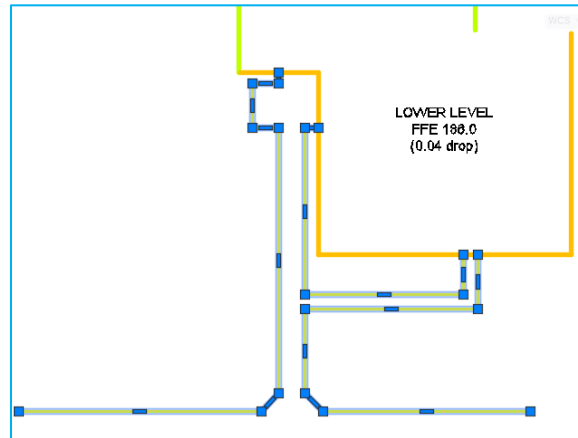
Once surface edited are complete the created surface will be used to elevate surrounding sidewalk linework. After elevations are set the temp surface can be deleted.




EXERCISE: Lower Level Sidewalks – projecting linework

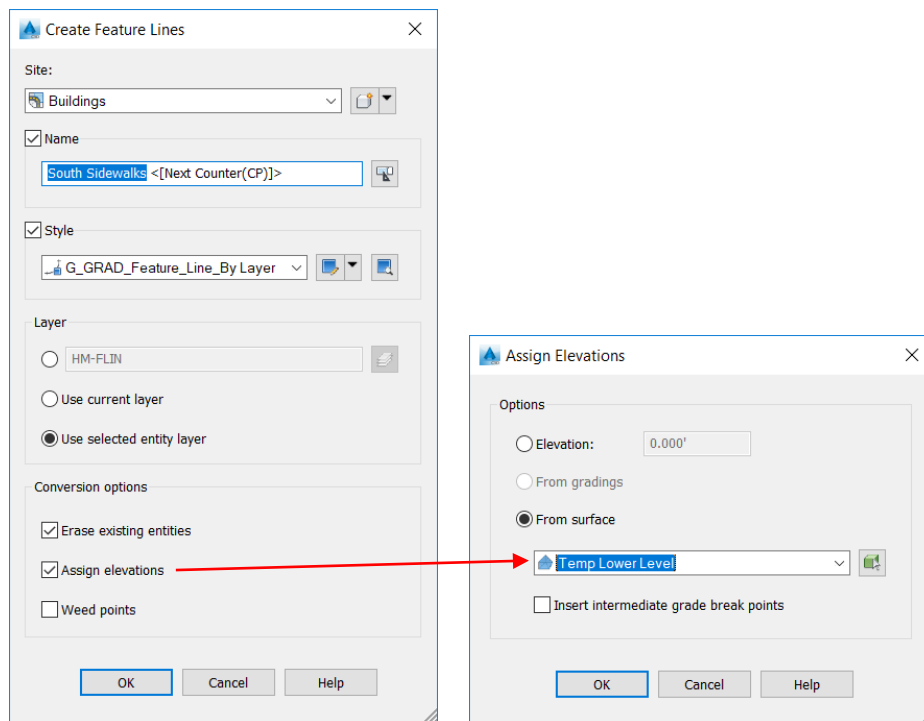
With the temporary surface in place that slopes from building at -2% in place, the next step is to create sidewalk features that pull those elevations.

1. Open **USACE_Grading_8.dwg**
2. First, select all the **YELLOW** 2D polylines surround the northern **Lower Floor** (select similar works great)

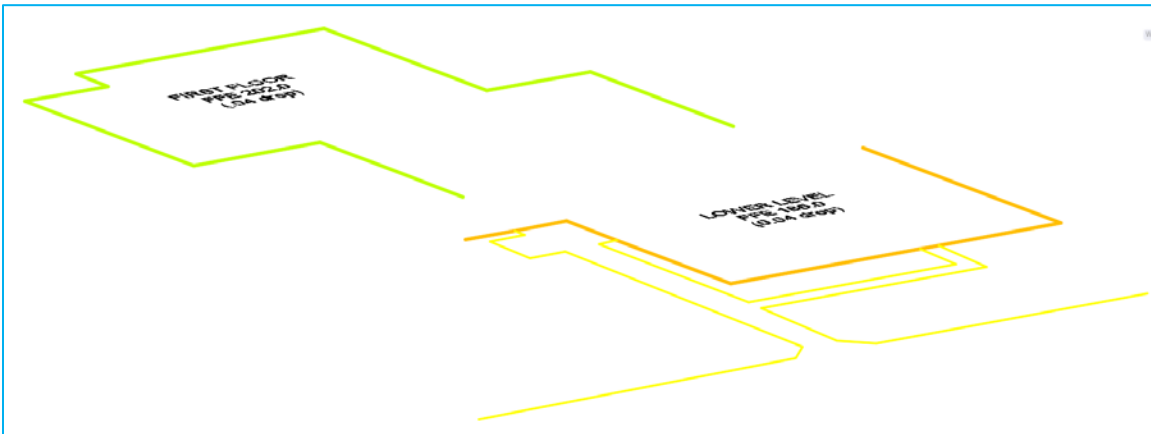


3. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Create Feature Lines from Objects** button 
4. From the **Create Feature Lines** dialog box:
 - a. Site: **<None>**
 - b. ✓ Name : South Sidewalks
 - c. ✓ Style : use default
 - d. Layer: Use selected entity layer
 - e. ✓ Erase existing entities
 - f. ✓ Assign elevation
 - g. From the **Assign Elevations** dialog box >
 - i. From surface > Temp Lower Level
 - ii. Uncheck Insert intermediate grade break points





5. 2D Sidewalk polylines have been converted to Feature Lines and have been elevated, as seen in 3D view.



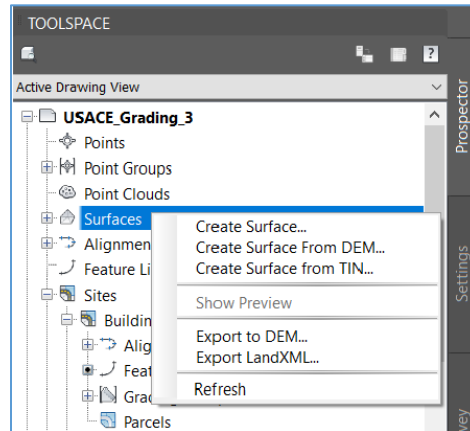
6. After Sidewalk geometry is elevated, all temporary lines and surfaces can be deleted. In the following section ALL the created 3D geometry will be used to create terrain.



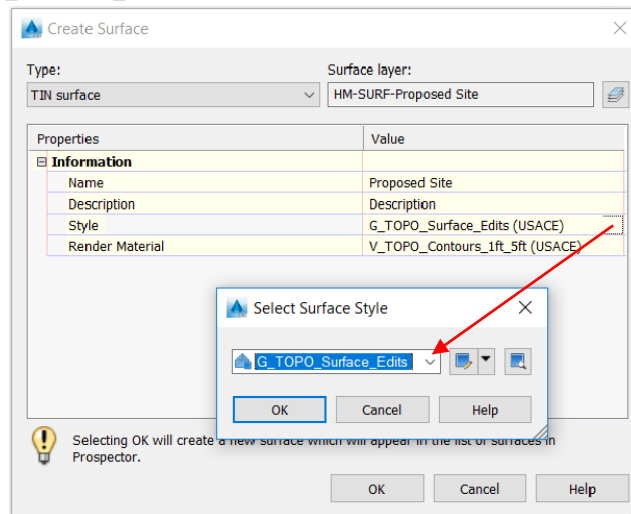
EXERCISE: Buildings and Sidewalks Proposed Surface

Now that the Northern and Southern building foot prints, offsets and surrounding sidewalks Feature Lines have been created and elevated, a proposed surface can be created using all proposed Feature Lines.

1. Open **USACE_Grading_9.dwg**
2. From **TOOLSPACE** Prospector tab > browse to **Surfaces** category > right click> select **Create Surface...**

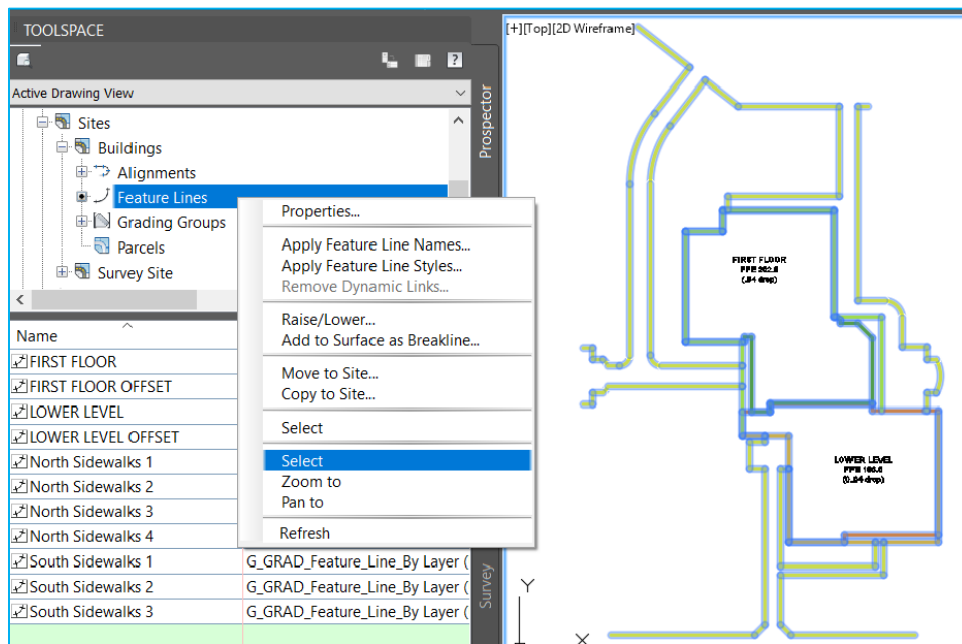


3. From the **Create Surface** dialog box >
 - a. Name > Proposed Site
 - b. Style > G_TOPO_Surface_Edits

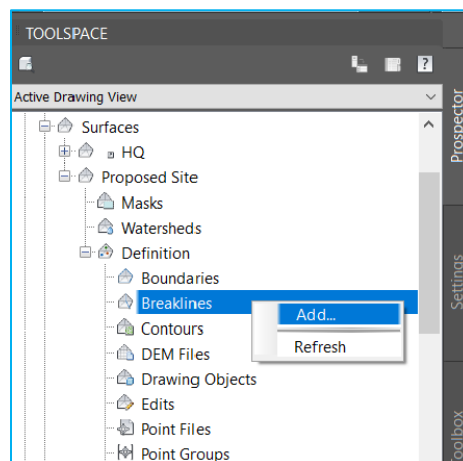


4. From **TOOLSPACE** > **Prospector** tab > expand **Sites** collection > expand **Buildings** collection > right click on **Feature Lines** > **Select**





5. From **TOOLSSPACE** > **Prospector** tab > expand **Proposed Site** surface > expand **Definition** collection > right click on **Boundaries** > **Add...**



6. From the **Add Breaklines** dialog box:
- Descriptor: Building Breaklines
 - Type: Standard



Add Breaklines

Description:
Building Breaklines

Type:
Standard

File link options:
Break link to file

Weeding factors

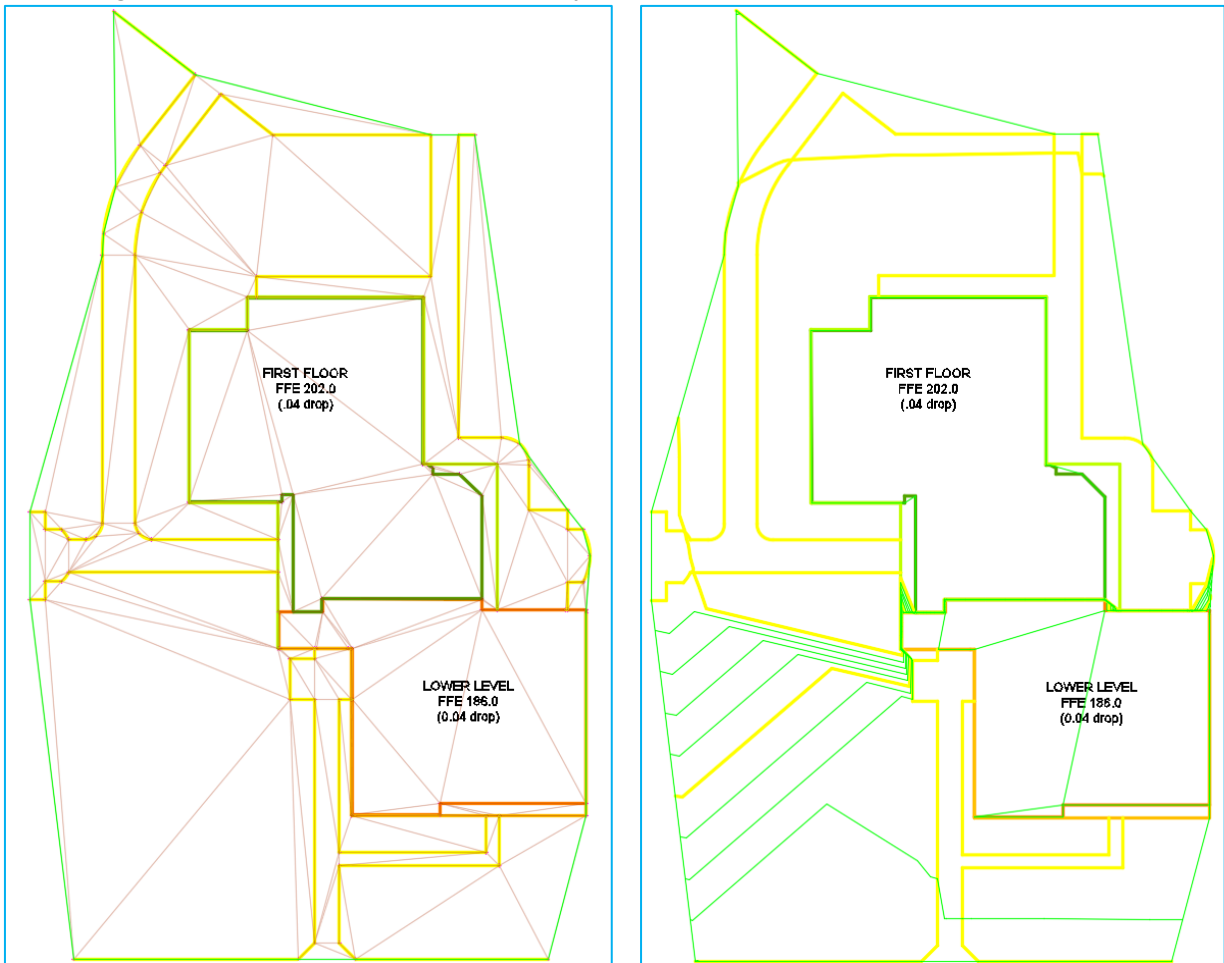
Distance: 15.000' Angle: 004.0000 (d)

Supplementing factors

Distance: 20.000' Mid-ordinate distance: 1.000'

OK Cancel Help

7. After picking **OK** the surface will be immediately built.



This is a step towards grading and creating Finished Ground conditions.

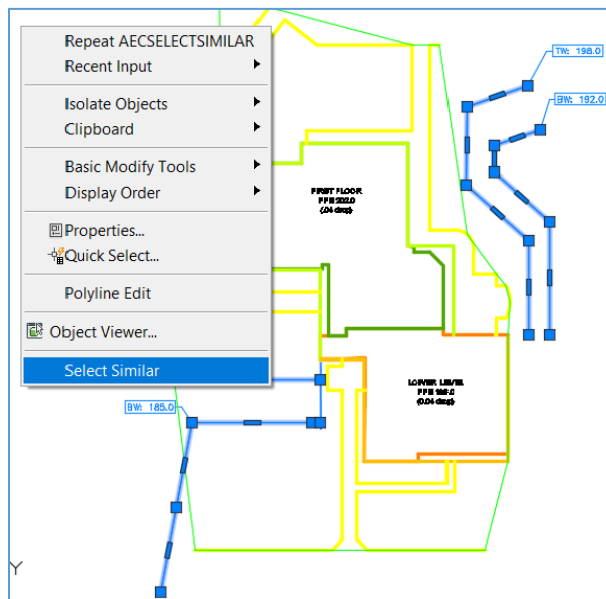


Grading: Site Features - Retaining Walls and Loading Dock

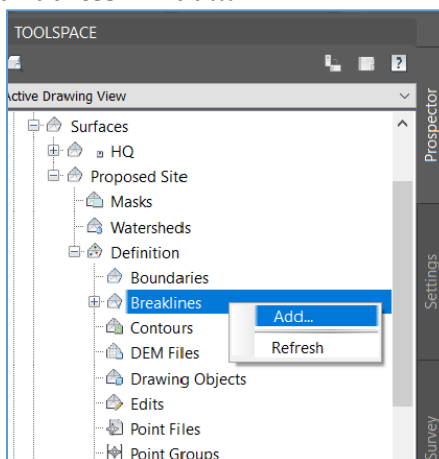
Continuing with site work, next the focus will be on Retaining Wall features and Loading Dock Area. Proposed elevations have already been set to the entities. They will address transitions from First Floor and Lower Level along with adjacent Loading Dock elevations. It is only a matter of adding them to the design surface

EXERCISE: Adding Retaining Walls

1. Open USACE_Grading_Site_1.dwg
2. From Model Space select any of the **BLUE** lines on either side of buildings > right click > **Select Similar**



3. From **TOOLSPACE** > **Prospector** tab > expand **Proposed Site** surface > expand **Definition** collection > right click on **Boundaries** > **Add...**



4. From the **Add Breaklines** dialog box:
5. Descriptor: Site Ret Walls
6. Type: Standard



Add Breaklines

Description:
Site Ret Walls

Type:
Standard

File link options:
Break link to file

Weeding factors

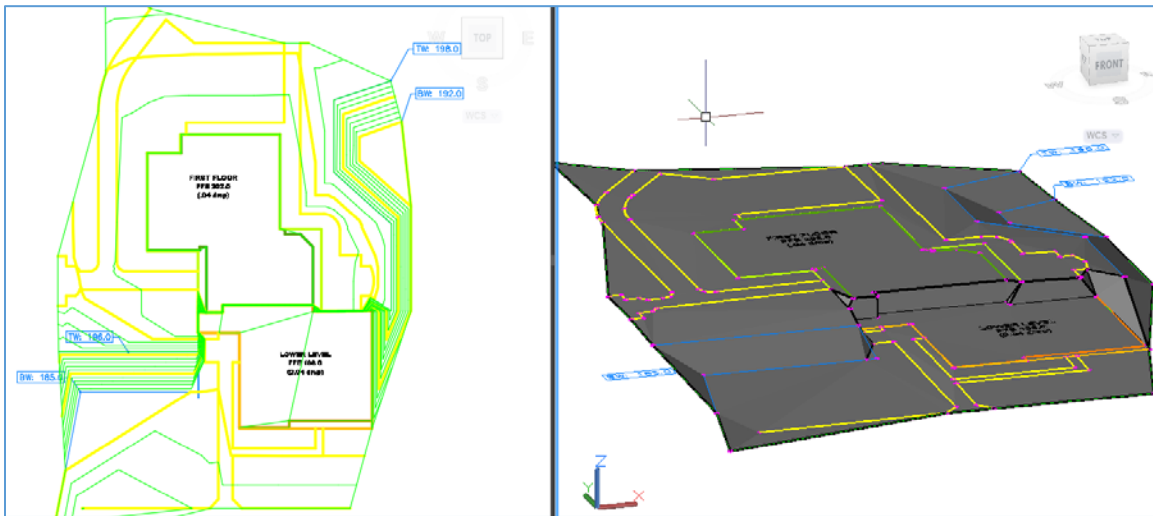
Distance: 15.000' Angle: 004.0000 (d)

Supplementing factors

Distance: 100.000' Mid-ordinate distance: 1.000'

OK Cancel Help

Site should look like below:

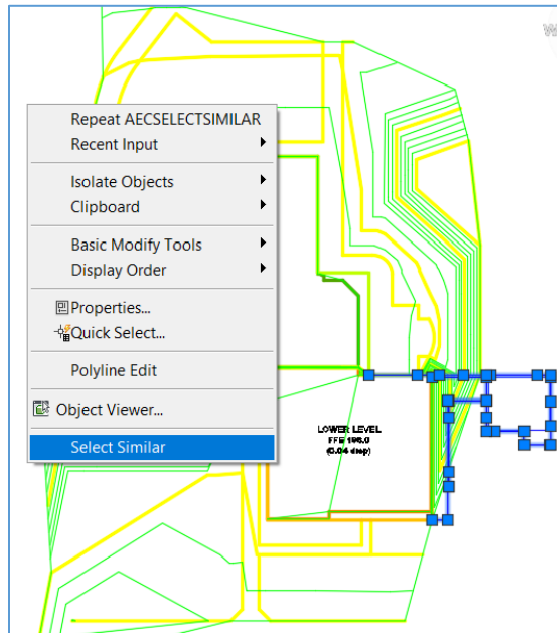


Site is now taking better shape showing proposed conditions. Next, the Dock Area3D linework will be added.

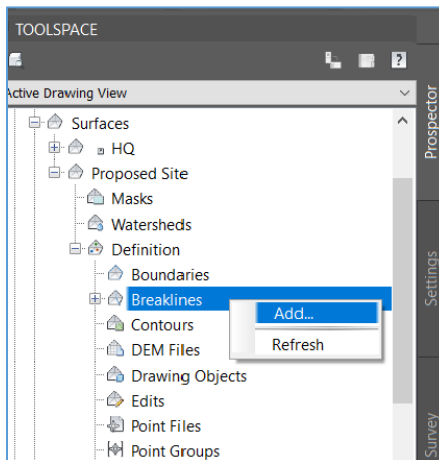


EXERCISE: Adding Loading Dock

1. Open **USACE_Grading_Site_2.dwg**
2. From Model Space select any of the **BLUE** lines on eastern side of site > right click > **Select Similar**

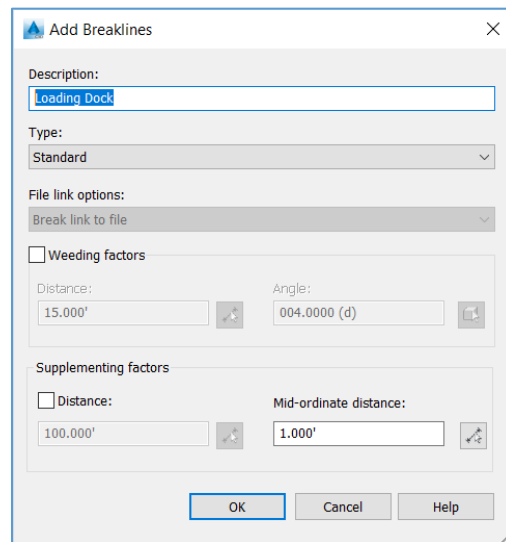


3. From **TOOLSPACE** > **Prospector** tab > expand **Proposed Site** surface > expand **Definition** collection > right click on **Boundaries** > **Add...**

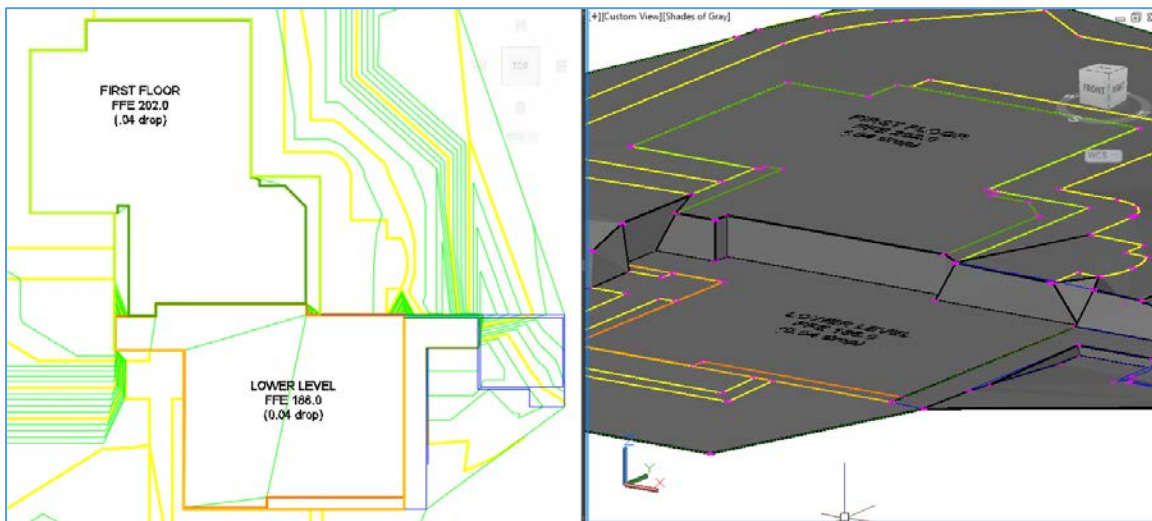


4. From the **Add Breaklines** dialog box:
 - a. Descripton: Loading Dock
 - b. Type: Standard





5. Site should look like below.

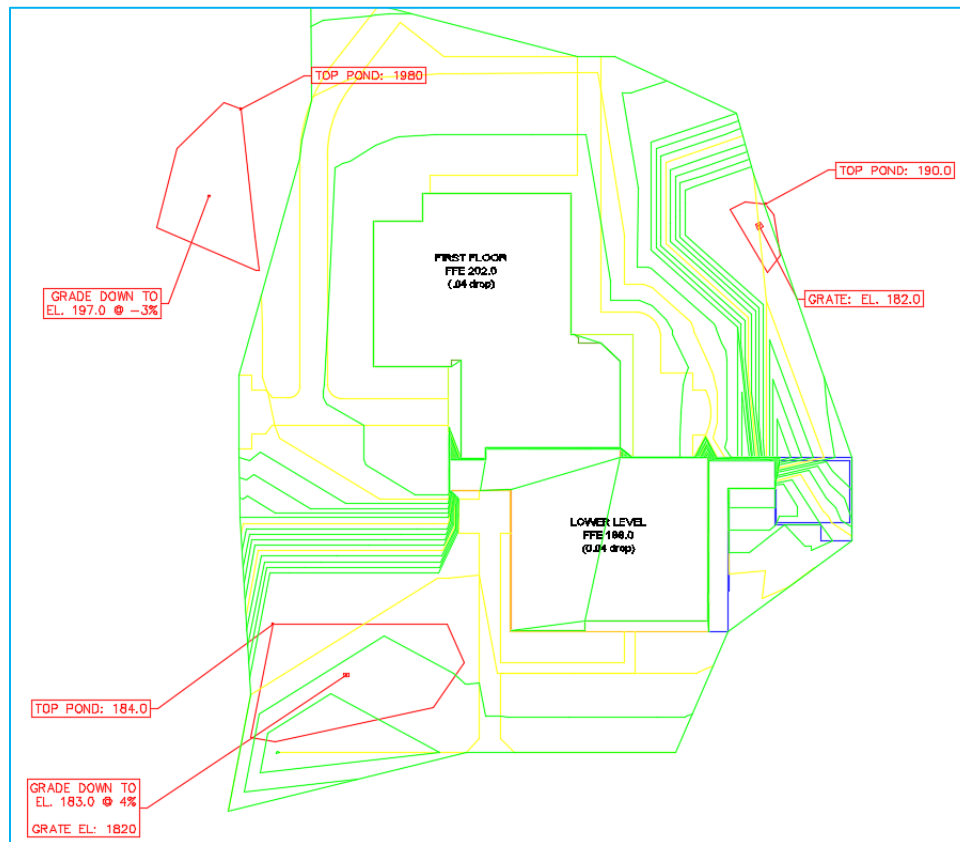


Site Features will be continued to be added to surface. Once the major work has been added, attention can be given to *"tweaking"* triangles to create a cleaner looking surface.



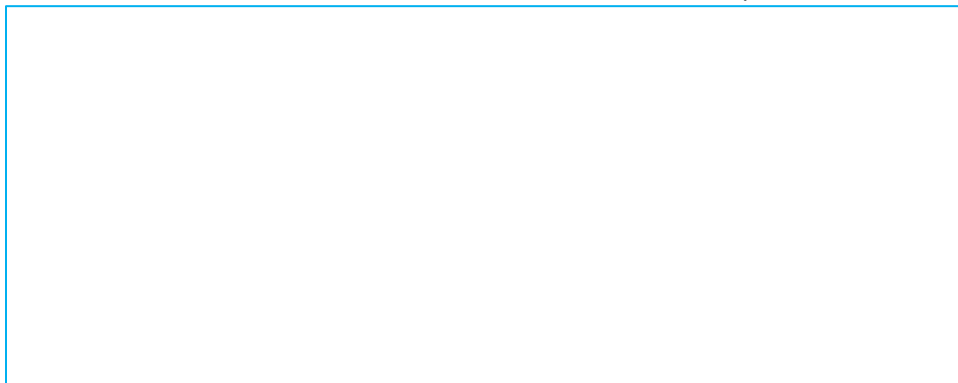
Grading: Ponds

Next attention will be focused on the proposed ponds on site, slightly different techniques will be used on all three.



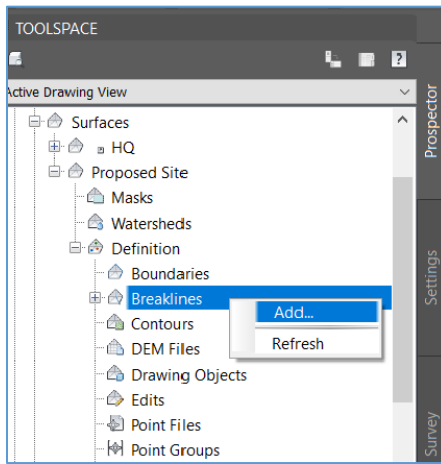
EXERCISE: North East Pond

1. Open USACE_Grading_Site_3.dwg
2. Select both Inner and Outer **RED** linework on North East side of site (EL 190.9 and EL 182.0)

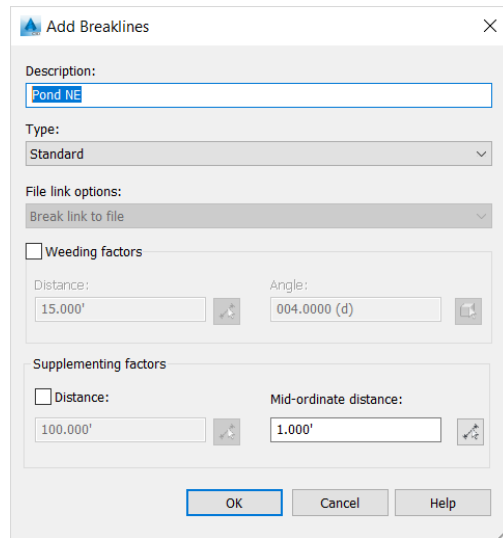


3. From **TOOLSPACE** > **Prospector** tab > expand **Proposed Site** surface > expand **Definition** collection > right click on **Boundaries** > **Add...**

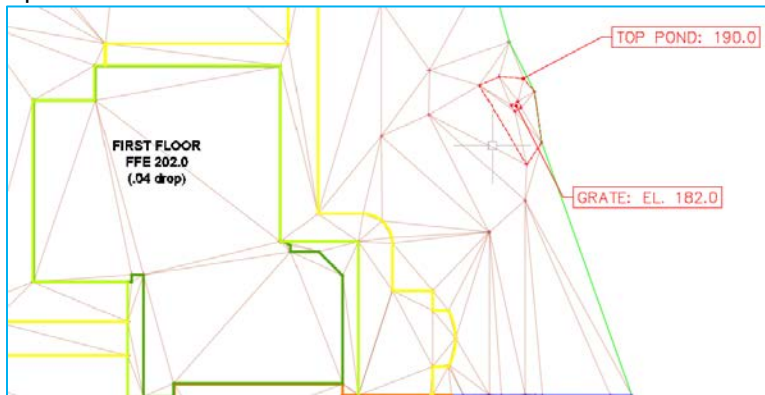




4. From the **Add Breaklines** dialog box:
 - a. Description: Loading Dock
 - b. Type: Standard

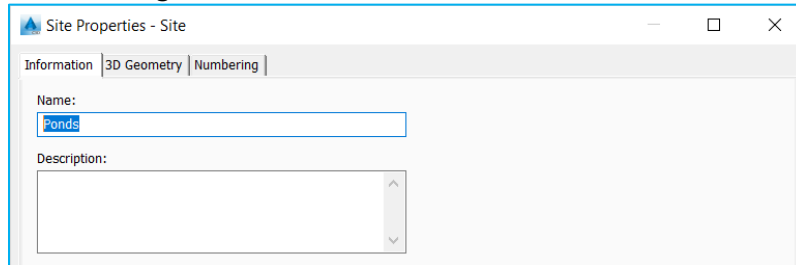


5. Surface should be updated to look like below:

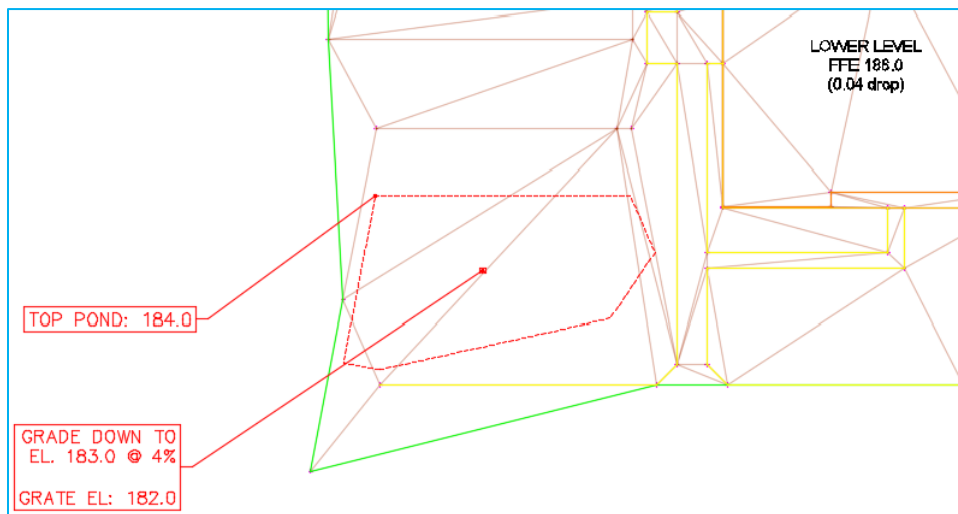



EXERCISE: South West Pond

1. Open USACE_Grading_Site_4.dwg
2. From **Prospector** tab > browse to **Sites** collection > right click > Select **New...**
3. From the **Site Properties** dialog box > Name: **Pond**

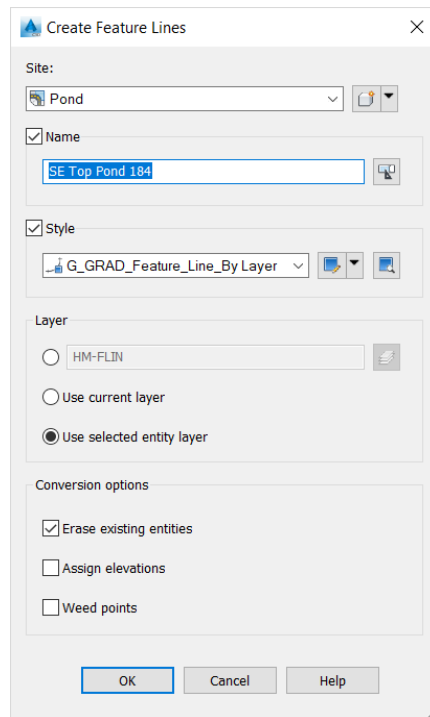





4. Pan and Zoom down to the **South West** linework.



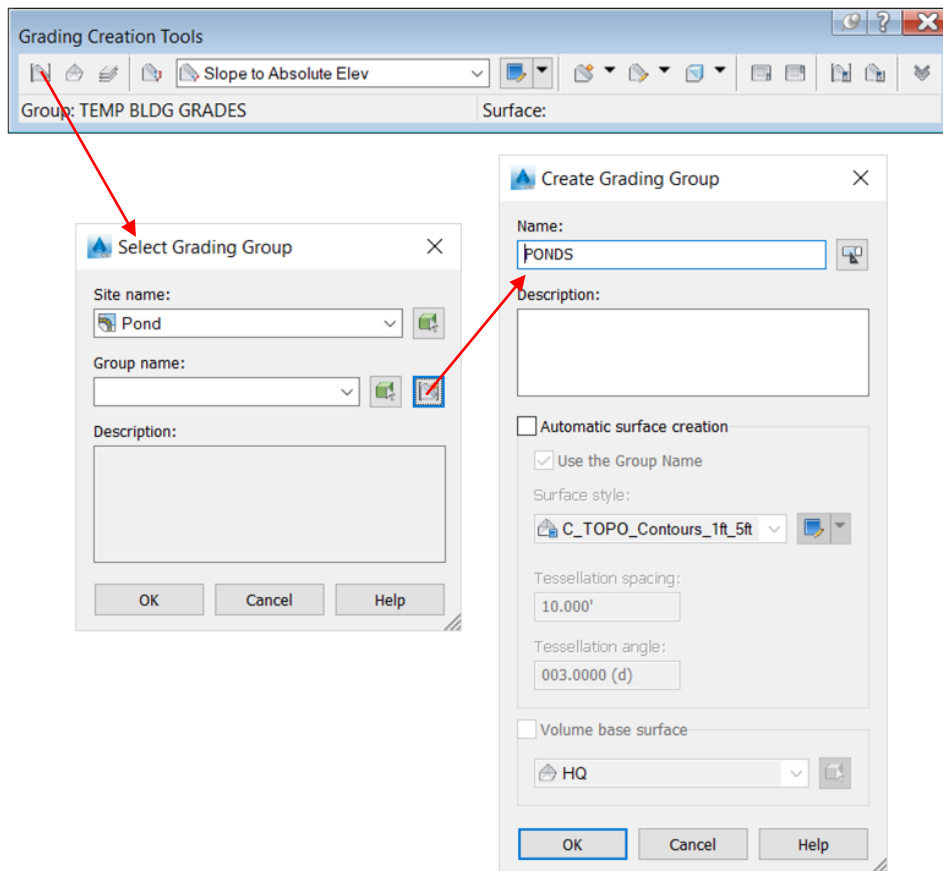
5. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button 
6. Select the **RED** outer most polyline labeled **TOP POND: 184.0**
7. From the **Create Feature Lines** dialog box, set values as seen below (Name: **NE Top Pond 184**)



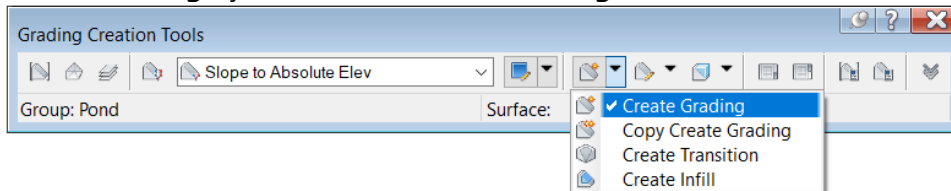


8. Once done click the **OK** button
9. From the Ribbon > **Home** tab > **Create Design** panel > **Grading** dropdown > **Grading Creation Tools** button 
10. From the **Grading Tool** bar > Pick on **Set Grading Group** button 
11. From Select **Grading Group** dialog > Pick on the **Create Grading Group** button 



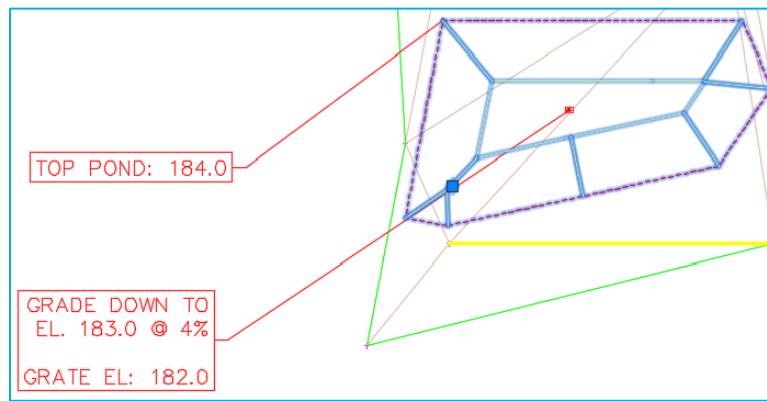


12. When done click on **OK** buttons to close out boxes.
13. From the Grading Tool bar > Set criteria drop down > Slope to Absolute Elve
14. Then from **Create Grading** flyout > select **Create Grading** button

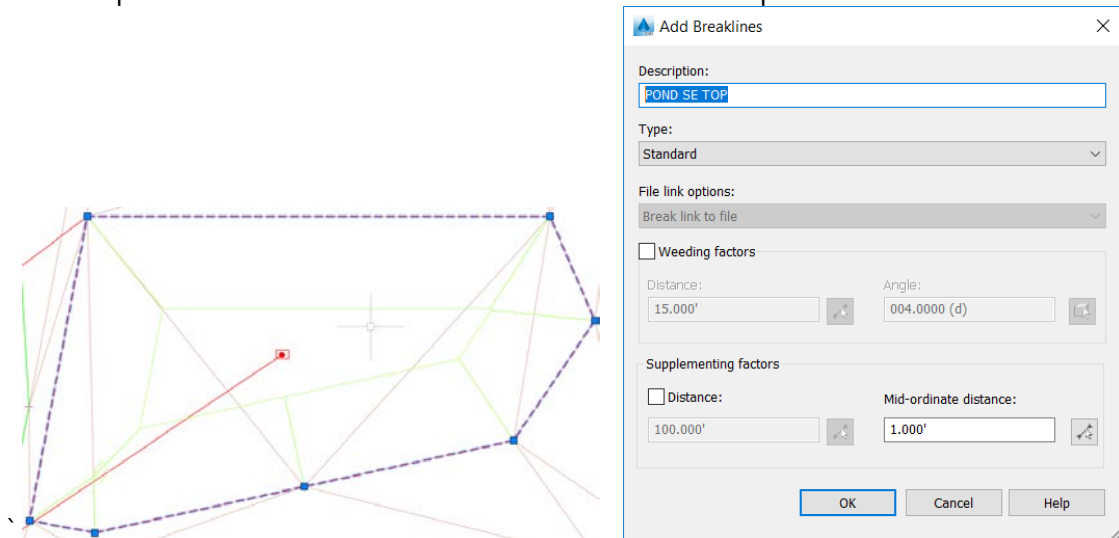


15. From screen select on the previously created Top of Pond Feature Line > from command line:
 - a. Select the grading side: Pick any point on the inside
 - b. Apply to entire length: **YES**
 - c. Relative Elevation: **183**
 - d. Cut Format: **Grade**
 - e. Cut Grade: **4**
 - f. Fill Format: **Grade**
 - g. Fill Grade: **4**
16. Command loops > Hit **Esc** key from keyboard to exit command
17. A 3D Grading Object is created

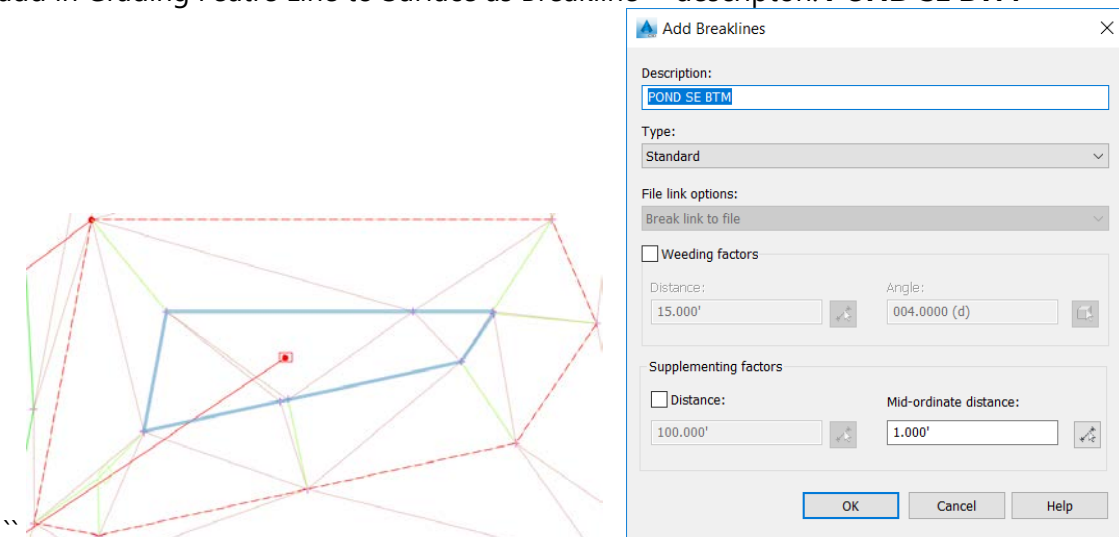




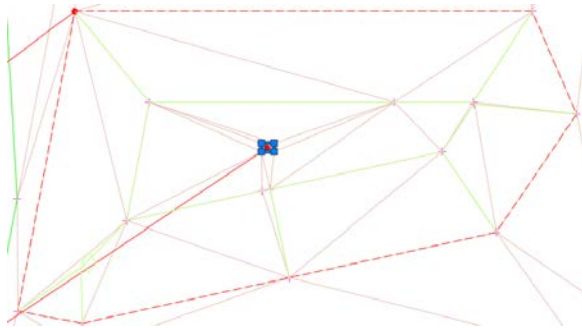
18. Next, add in Top of Pond Feature to Surface as Breakline > description: **POND SE TOP**



19. Then, add in Grading Featre Line to Surface as Breakline > description: **POND SE BTM**



20. Last, add a Grate Box polyline to Surface as Breakline > **POND SE GRATE**



Add Breaklines ✕

Description:

Type:

File link options:

Weeding factors

Distance: Angle:

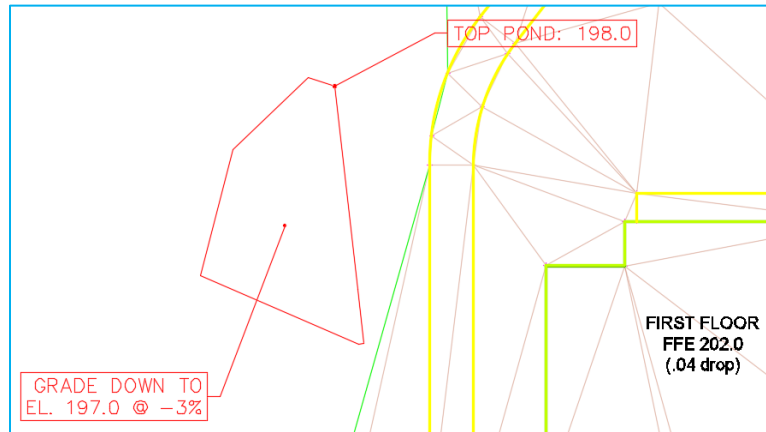
Supplementing factors

Distance: Mid-ordinate distance:

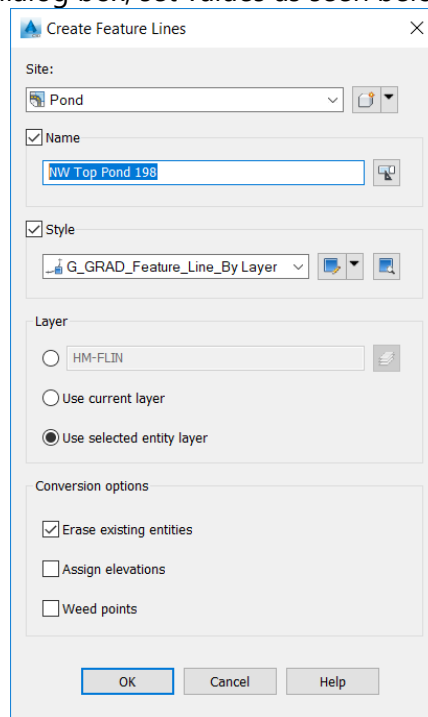


EXERCISE: North West Pond

1. Open USACE_Grading_Site_5.dwg
2. Pan and Zoom to the **North West** linework.

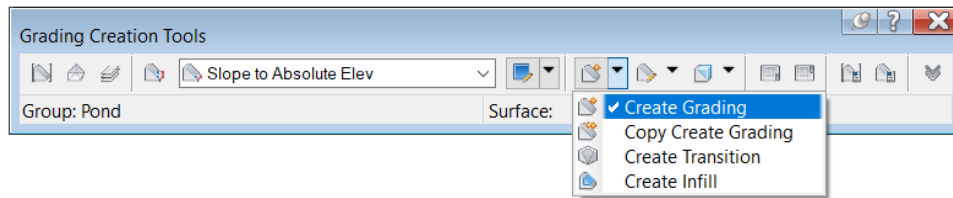


3. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button
4. Select the **RED** outer most polyline labeled **TOP POND: 198.0**
5. From the **Create Feature Lines** dialog box, set values as seen below (Name: **NW Top Pond 198**)

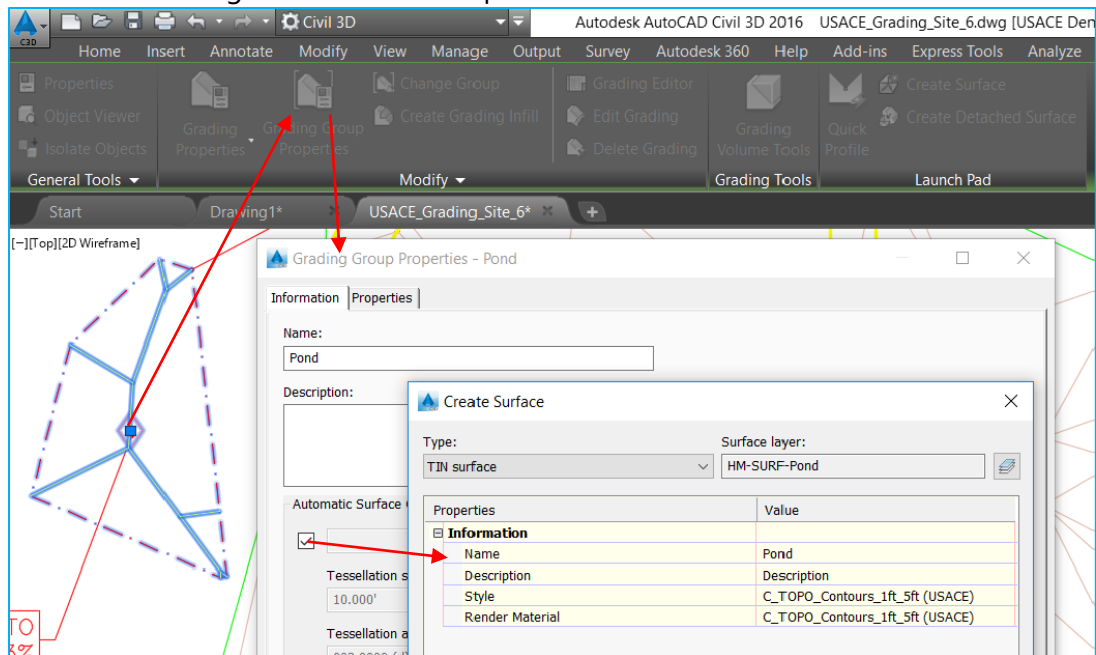


6. Once done click the **OK** button
7. From the Ribbon > **Home** tab > **Create Design** panel > **Grading** dropdown > **Grading Creation Tools** button
8. From the Grading Tool bar > Set criteria dropdown > Slope to Absolute Elevation
9. Then from **Create Grading** flyout > select **Create Grading** button



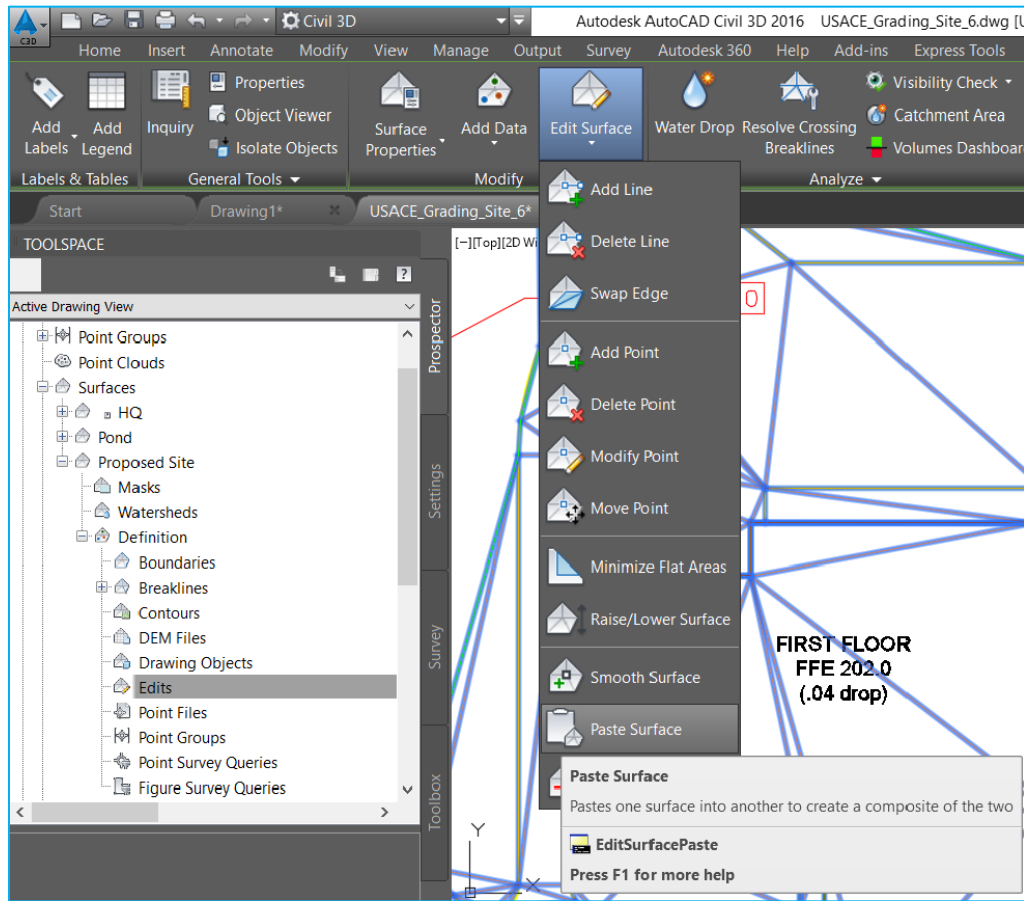


10. From screen select on the previously created Top of Pond Feature Line > from command line:
 - a. Select the grading side: Pick any point on the inside
 - b. Apply to entire length: **YES**
 - c. Relative Elevation: **197**
 - d. Cut Format: **Grade**
 - e. Cut Grade: **3**
 - f. Fill Format: **Grade**
 - g. Fill Grade: **3**
11. Command loops > Hit **Esc** key from keyboard to exit command
12. Select the created 3D Grading Object
13. From contextual ribbon > pick **Grading Group Properties** button
14. From Grading Group Properties dialog box > Information tab > Automatic Surface creation
15. From Create Surface Dialog box > review and pick **OK** button

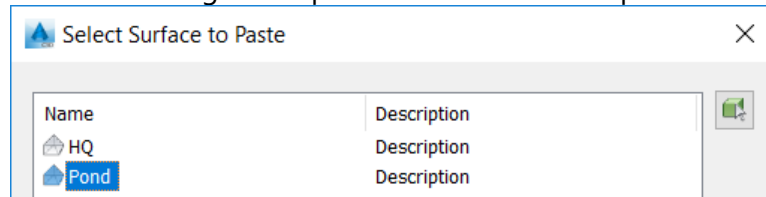


16. Pick on the **OK** buttons to exit out of ALL dialog boxes. Back in the model space a NEW surface is created.
17. Select the **Proposed Site** surface > from contextual ribbon > **Edit Surface** flyout > select **Paste Surface** button

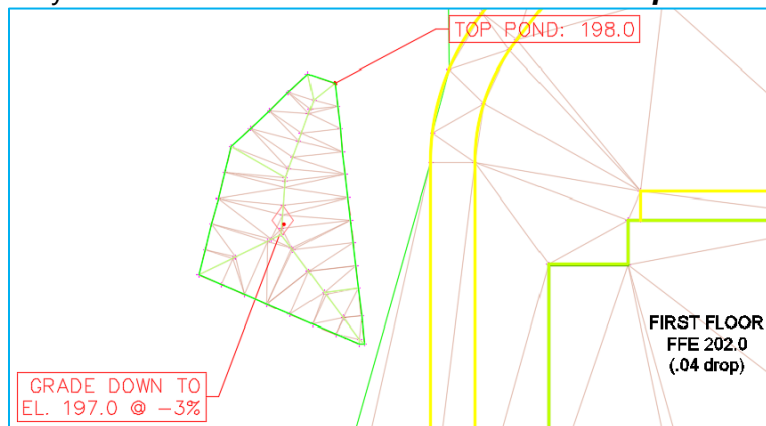




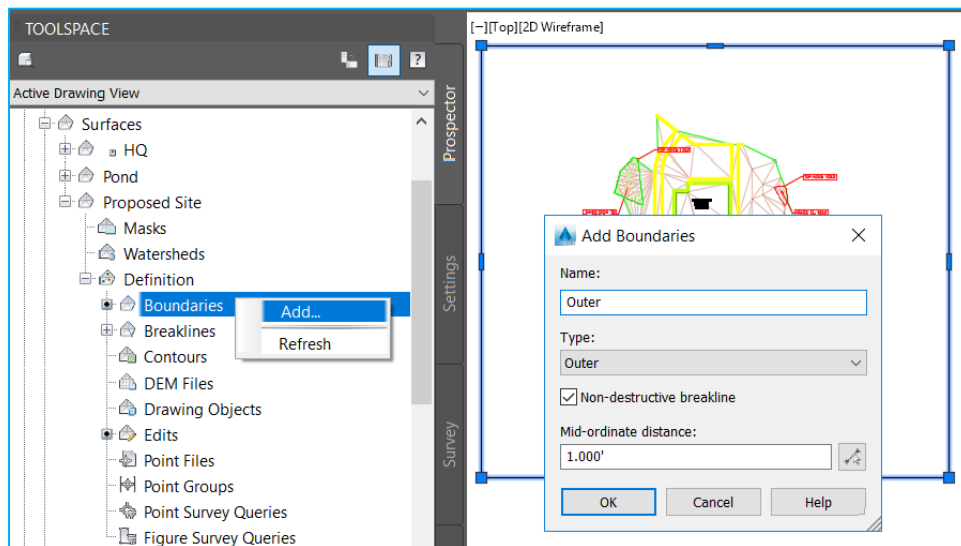
18. From **Select Surface to Paste** dialog box > pick on **Pond** surface > pick **OK** button



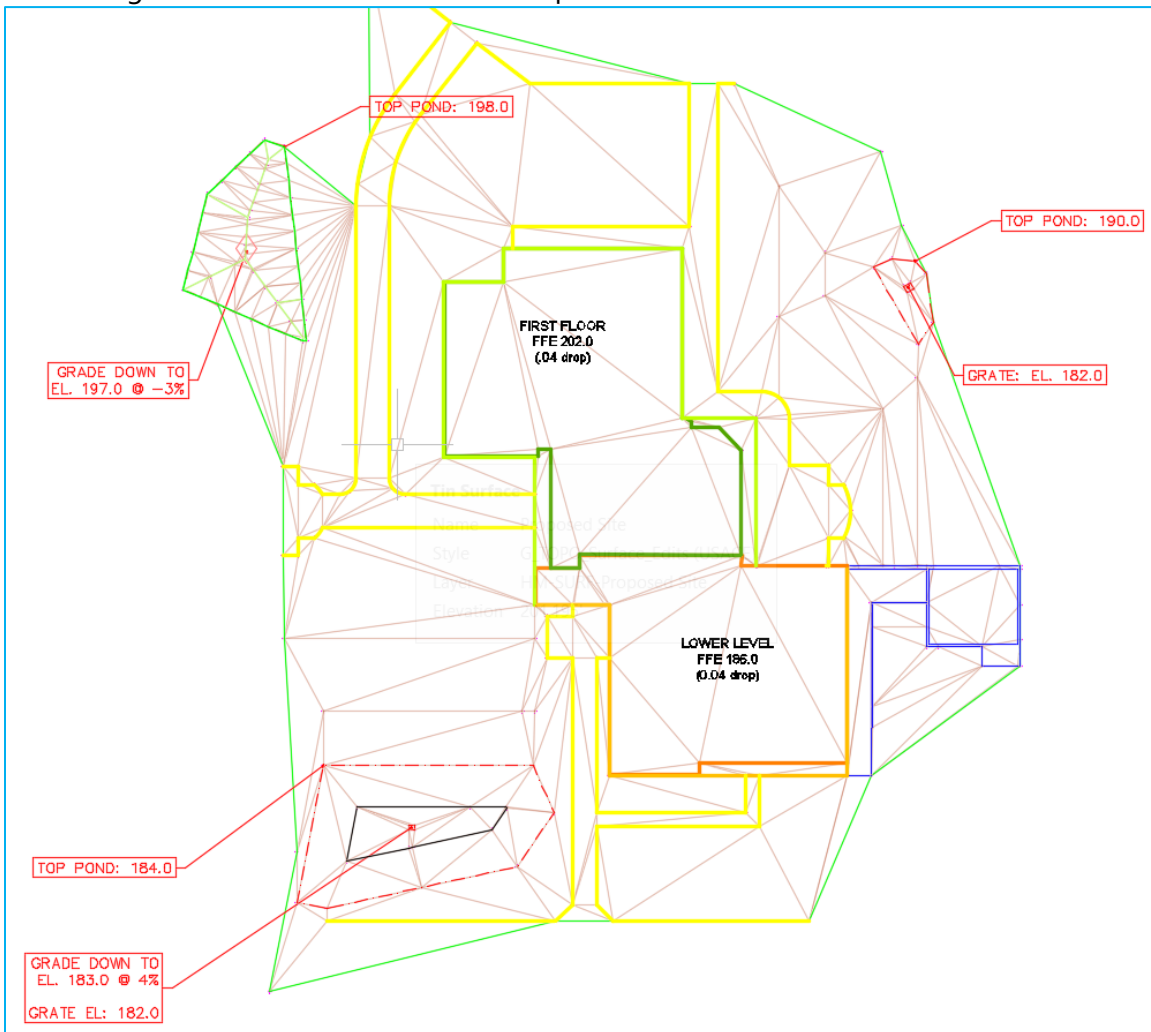
19. On screen the previously created **Pond** surface has been added to **Proposed Site** surface



20. To fill the void add Outer Boundary to Proposed Site surface



21. All Pond designs have now been added to Proposed Site surface



GRADING: South Parking Lot

For grading in the Parking Lot, Feature Lines will be created with key proposed elevations using two commands:



Quick Elevation Edit:

Identifies elevations and grades that can be selected and edited as the pointing device moves over feature lines or parcels in the drawing



Set Grade/Slope between Points:

Edits the grade/slope between vertex elevations at the Command Line Interface



Elevation Editor:

Edits the vertex elevations of feature lines, survey figures, and parcel lines

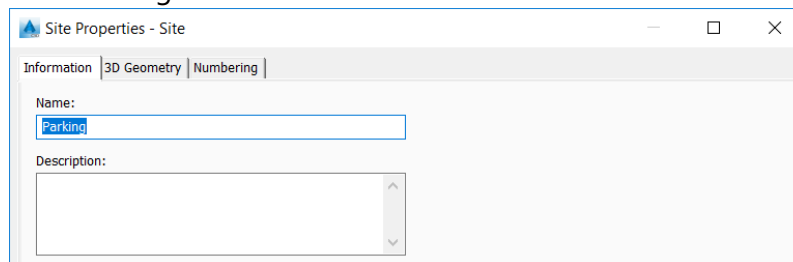


Adjacent Elevations by Reference:

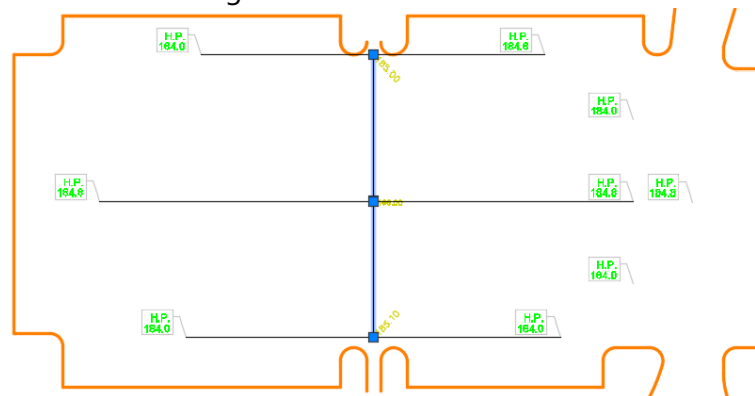
Project elevations based on a grade, slope, or elevation difference from points on another feature

EXERCISE: Creating Feature Lines on Parking Lot

1. Open **USACE_Grading_PK_1.dwg**
2. From **Prospector** tab > browse to **Sites** collection > right click > Select **New...**
3. From the **Site Properties** dialog box > Name: **Pond**

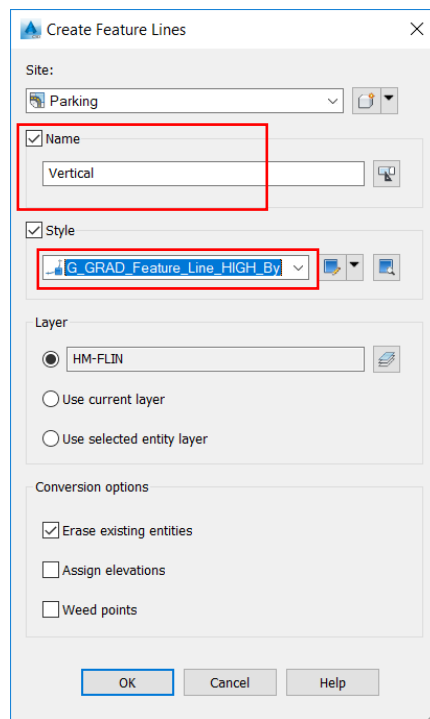



4. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button
5. Select the single vertical line in Parking Lot Area.

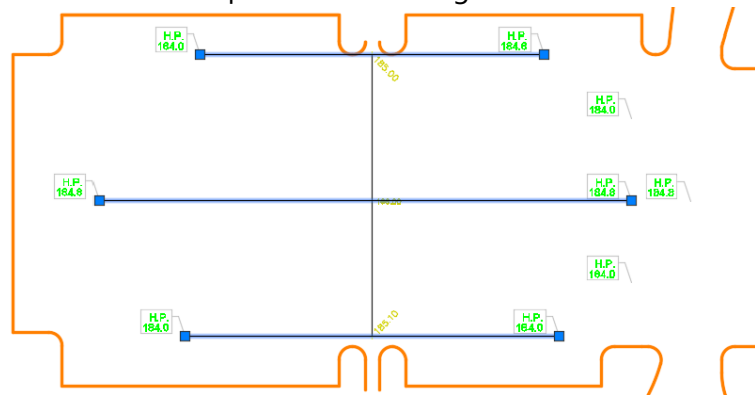


6. From the **Create Feature Lines** dialog box, set values as seen below:



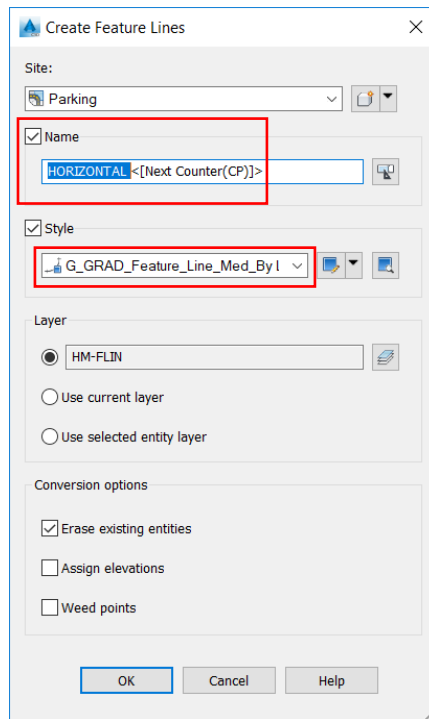



7. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button 
8. Select the three horizontal lines that span across Parking Lot Area.



9. From the **Create Feature Lines** dialog box, set values as seen below:




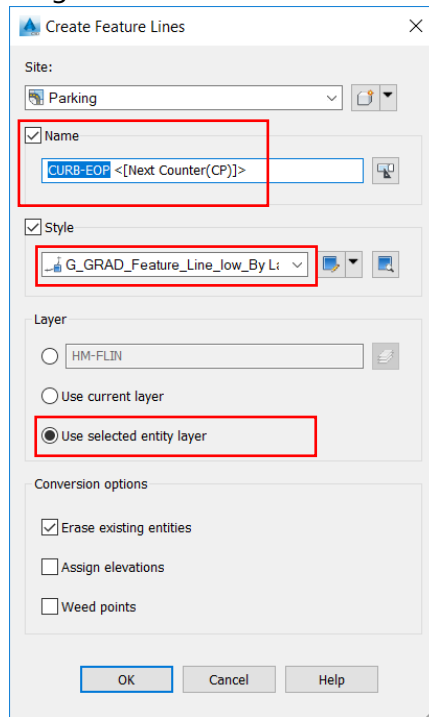


10. Confirm that correct elevations are set on Feature Line. Select created Feature Line > from **Contextual** ribbon > **Edit Elevations** > **Elevations Editor** button 

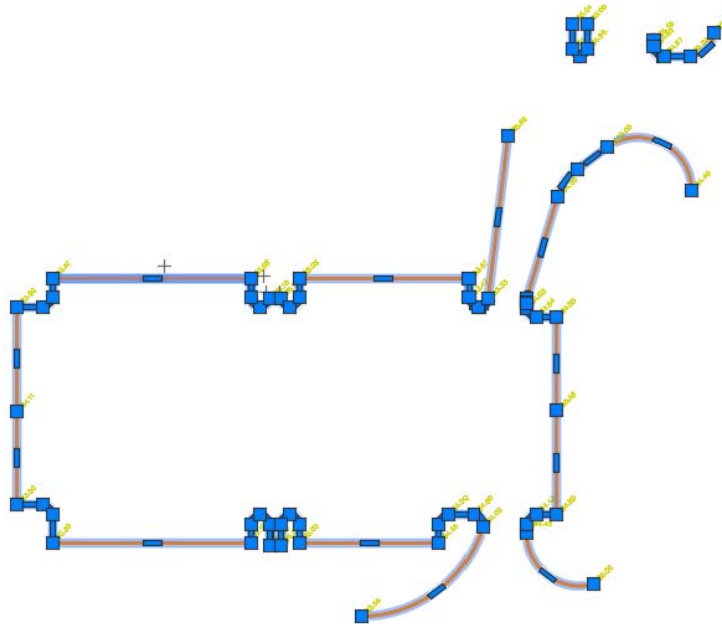
Station	Elevation	Length	Grade Ahead	Grade Back
0+00.00	184.800'	135.142'	0.89%	-0.89%
1+35.14	185.999'	128.525'	-0.93%	0.93%
2+63.67	184.800'			


EXERCISE: Creating Curb Feature Lines

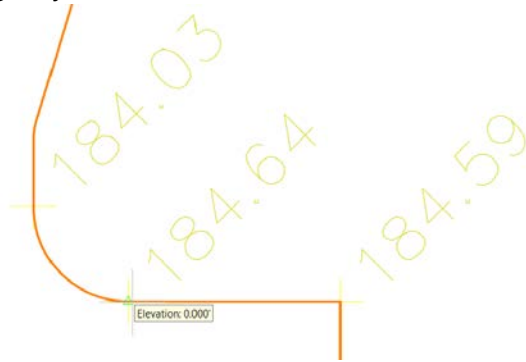
1. Open **USACE_Grading_PK_2.dwg**
2. Select any of the **ORANGE** curb lines > right click > select similar
3. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button 
4. From the **Create Feature Lines** dialog box, set values as seen below:



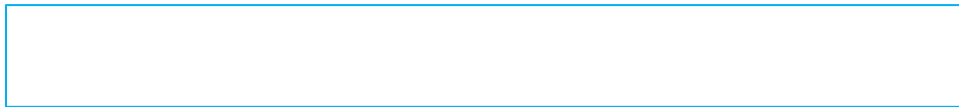
5. Next, elevations will be assigned per on screen notes to each of the six created CURB EOP Feature Lines



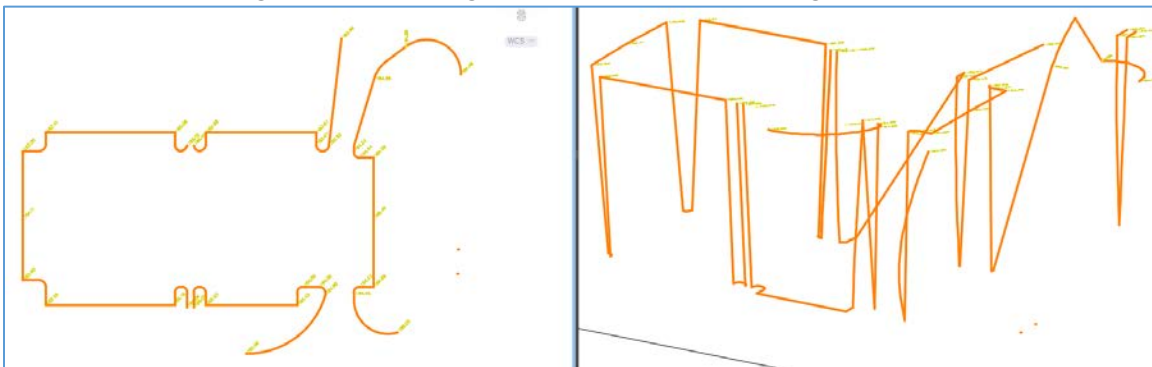
6. Select created Feature Line > from **Contextual** ribbon > **Quick Elevation Edit** button 
7. Hovering over end point will give you feed back on elevation




8. To edit elevation value > left click on vertex > from command line set elevation as needed



9. Once elevation are all assigned, the Parking Curb will still need editing, some elevations are still at 0.00

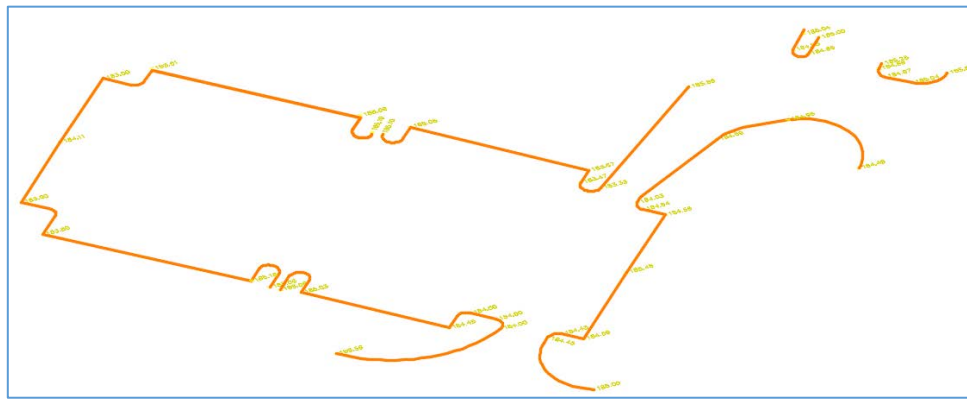


10. Continue working with drawing or OPEN **USACE_Grading_PK_3.dwg**
11. Select created Feature Line > from **Contextual** ribbon > **Set Grade/Slope between Points** button 
 - a. Pick start point vertex > verify elevation is correct
 - b. Trace over line > pick end point vertex
 - c. Hit **Enter** to accept calculated slope




12. Once elevations have been set between points, all lines will be elevated in 3D view

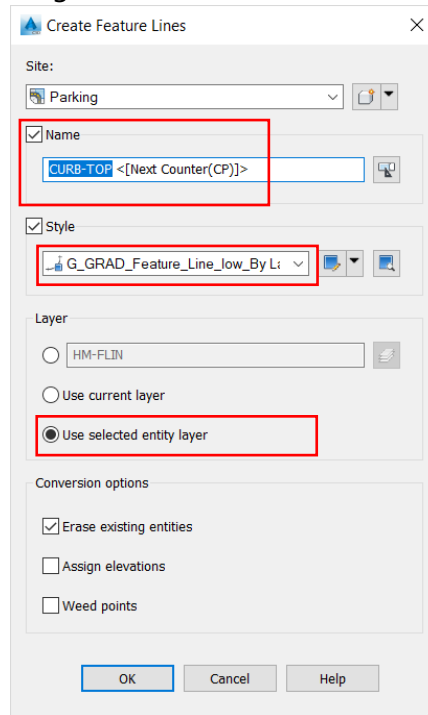





EXERCISE: Creating Curb and Gutter

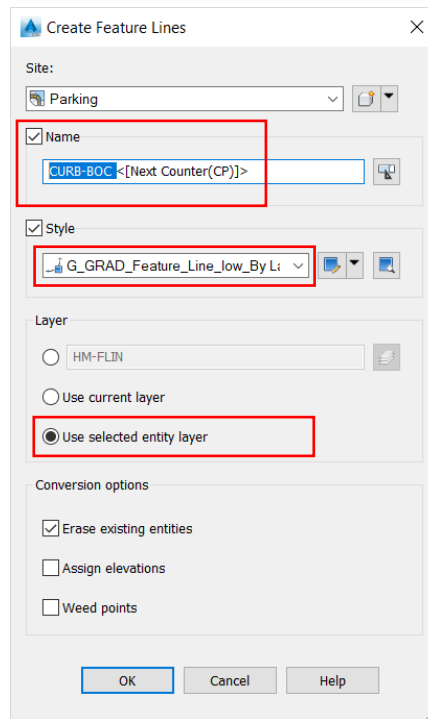
First TOP and BACK of Curb polylines will be converted to feature lines. Then elevations from already set EOP.


1. Open USACE_Grading_PK_4.dwg
2. First, select any of the **GREEN** curb lines > right click > select similar
3. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button 
4. From the **Create Feature Lines** dialog box, set values as seen below:



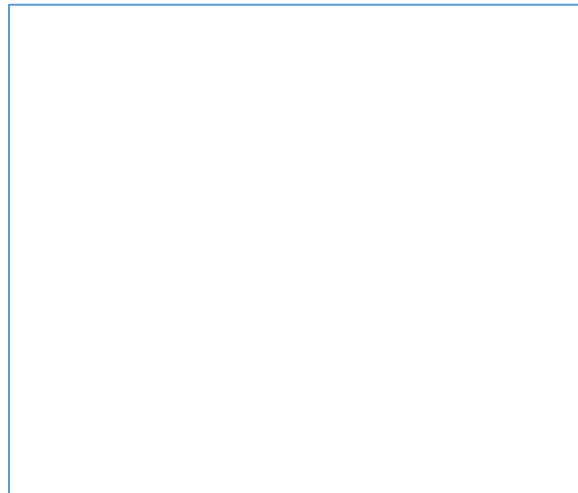
5. Select any of the **CYAN** curb lines > right click > select similar
6. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button 
7. From the **Create Feature Lines** dialog box, set values as seen below:





8. Next, Select any of the **ORANGE** feature line > from Contextual ribbon > **Edit Elevations** panel > select **Adjacent Elevations by Reference** button 

9. Select an adjacent **GREEN** feature line > from command line > **Grade** > **-2**

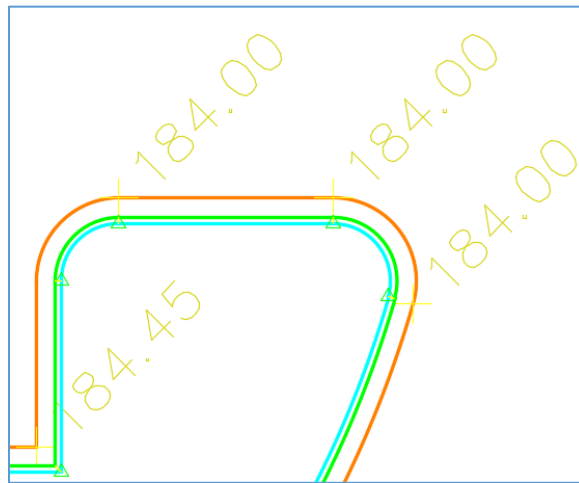


10. Repeat process across entire Parking Lot area

11. Then, Select any of the newly elevated **GREEN** feature lines > from Contextual ribbon > **Edit Elevations** panel > select **Adjacent Elevations by Reference** button 

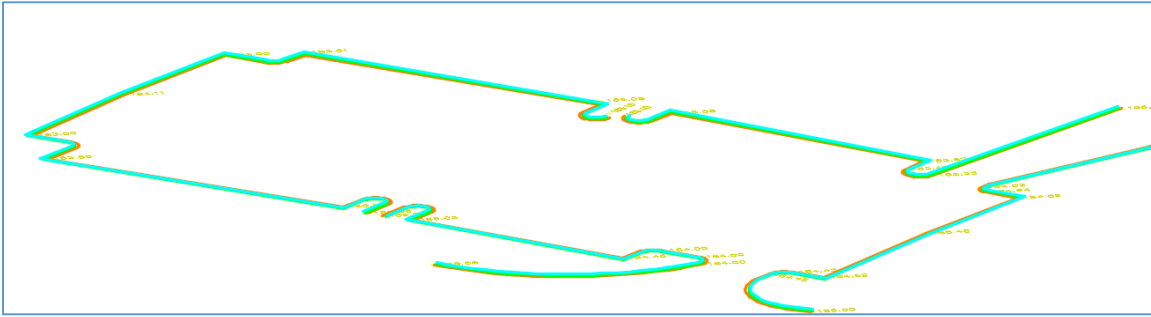
12. Select an adjacent **CYAN** feature line > from command line > **Elevation Difference** > **.5**





13. Repeat process across entire Parking Lot area

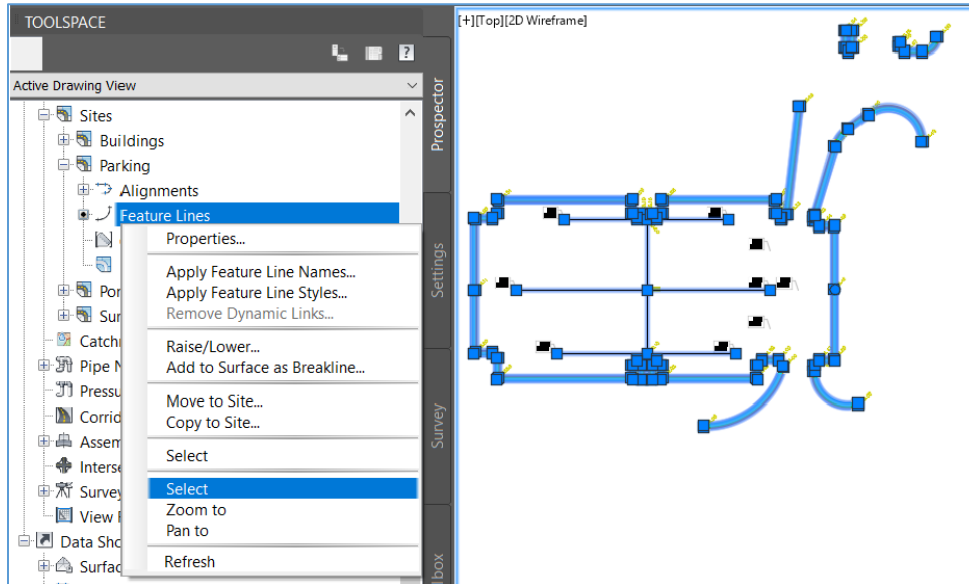
14. Once all lines are elevated site will look like below in 3D:



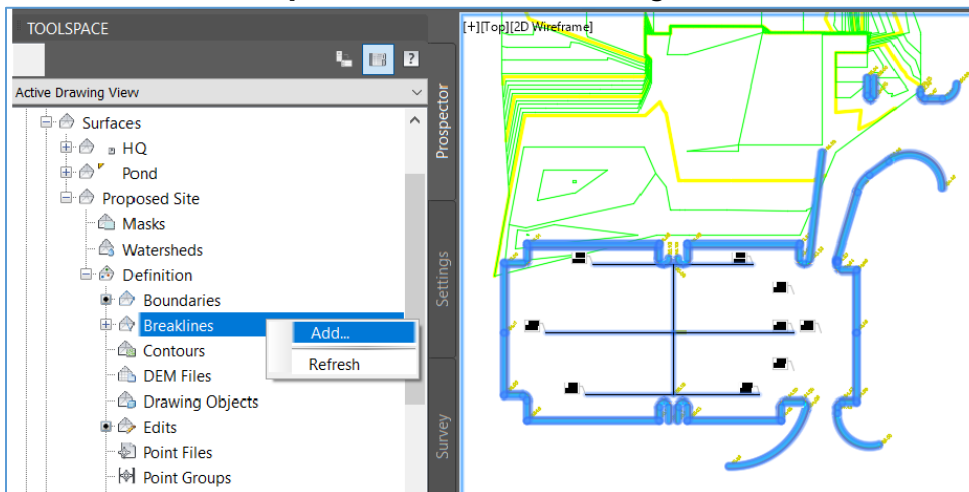
EXERCISE: Adding Parking Lot data to Surface

This section will be adding ALL Parking Lot feature lines to the **Proposed Site** surface. Additional High Point spots will be added to refine surface.

1. Open USACE_Grading_PK_5.dwg
2. From **Prospector** tab > **Sites** > **Parking** > **Feature Lines** > right click > **Select**

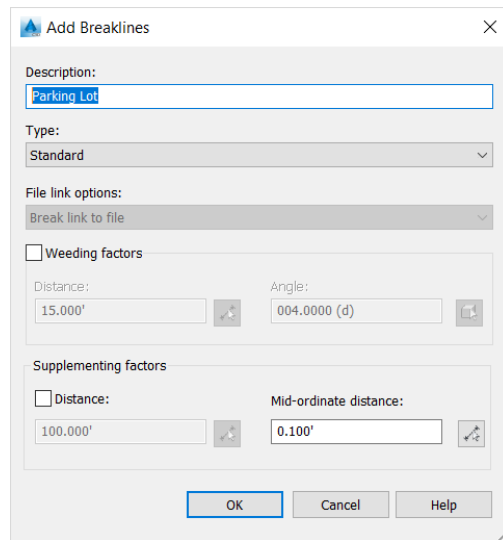


3. From **Prospector** tab > **Surface** > **Proposed Site** > **Definition** > right click on **Breaklines** > Add...

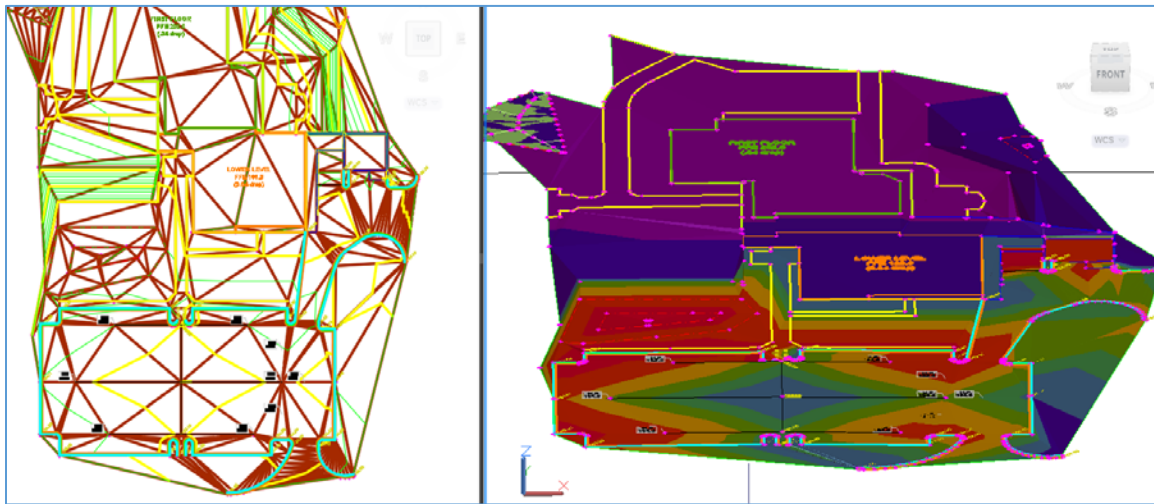


4. From Add Breaklines dialog box

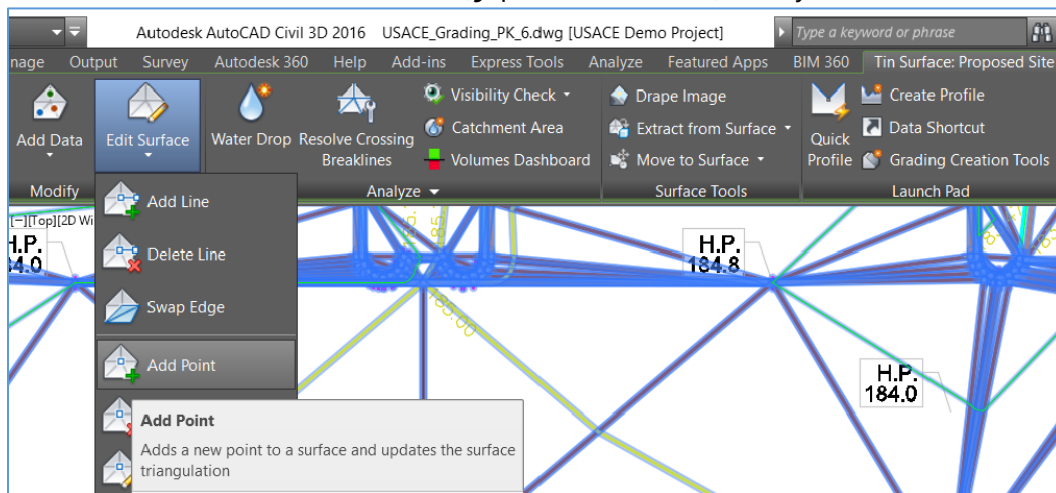




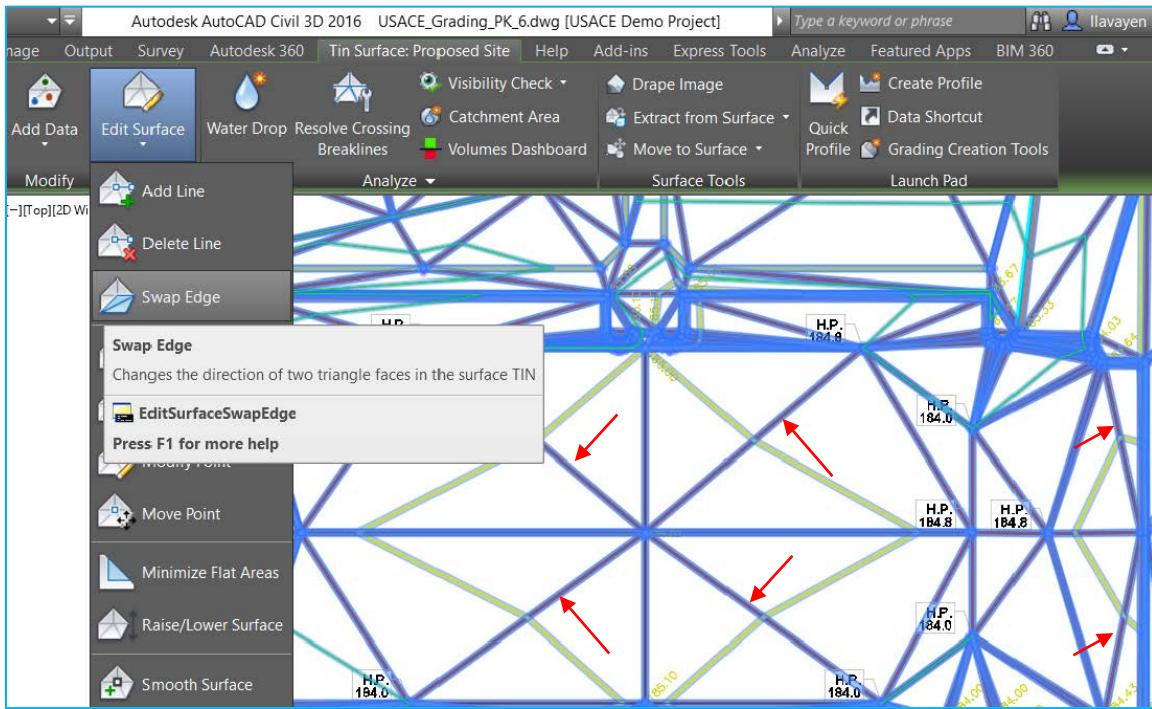
5. Surface will then look like below:



6. Select Surface > from Contextual ribbon > **Modify** panel > **Edit Surface** flyout > **Add Point** button

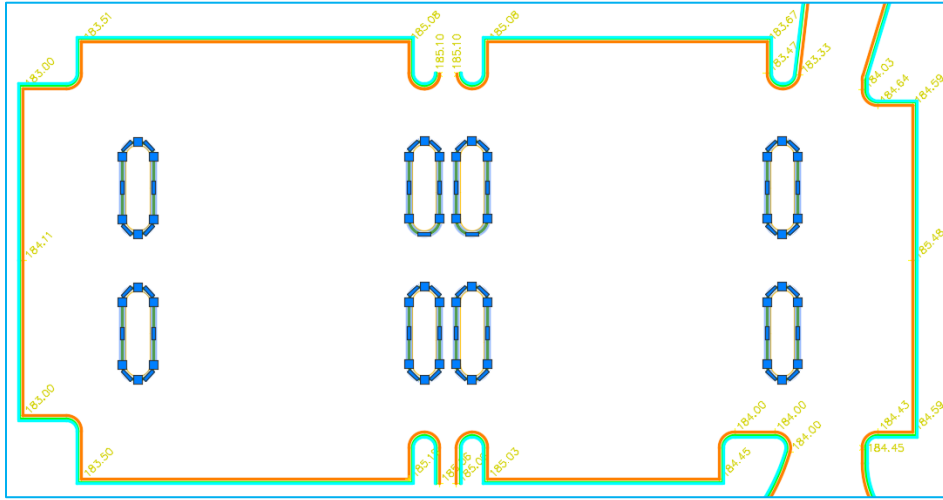


7. Select Surface from Contextual ribbon > **Modify** panel > **Edit Surface** flyout > **Swap Edge** button

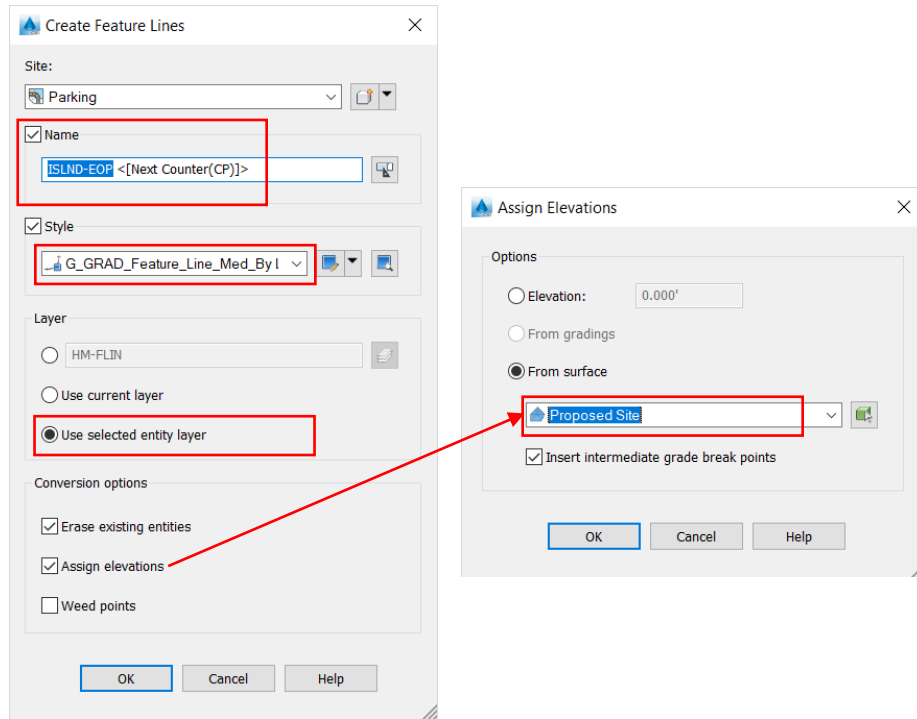


EXERCISE: Creating Islands

- 1. Open USACE_Grading_PK_6.dwg
- 2. Select any of the **GREEN** outside EOP Islands



- 3. From Ribbon **Home** tab > **Createn Design** panel > **Feature Line** flyout > **Create Feature Lines from Objects** button



- 4. Next, select any of the **ORANGE** top curb islands > right click > **select similar**
- 5. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button
- 6. From the **Create Feature Lines** dialog box, set values as seen below:

Create Feature Lines

Site: Parking

Name
ISLND-TOP <[Next Counter(CP)]>

Style
G_GRAD_Feature_Line_HIGH_By

Layer

HM-FLIN

Use current layer

Use selected entity layer


Conversion options

Erase existing entities

Assign elevations

Weed points

OK Cancel Help

7. Select any of the **CYAN** back of curb islands > right click > **select similar**
8. From the Ribbon **Home** tab > **Create Design** panel > **Feature Line** dropdown > **Feature Lines** from **Objects** button 
9. From the **Create Feature Lines** dialog box, set values as seen below:

Create Feature Lines

Site: Parking

Name
ISLND-BOC <[Next Counter(CP)]>

Style
G_GRAD_Feature_Line_Med_By I

Layer

HM-FLIN

Use current layer

Use selected entity layer


Conversion options

Erase existing entities

Assign elevations

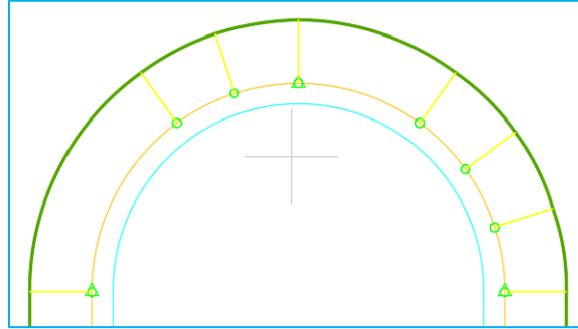
Weed points

OK Cancel Help


10. Next, Select any of the **ORANGE** feature line > from Contextual ribbon > **Edit Elevations** panel > select **Adjacent Elevations by Reference** button 

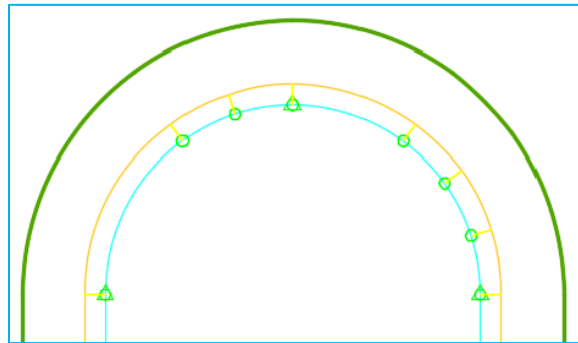


11. Select an adjacent **GREEN** feature line > from command line > **Grade** > **-2**



12. Repeat process across entire Parking Lot area

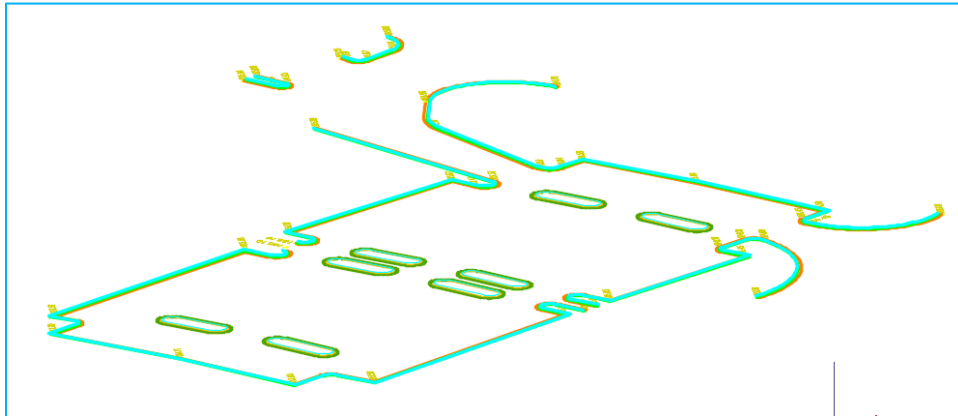
13. Then, Select any of the newly elevated **ORANGE** feature lines > from Contextual ribbon > **Edit Elevations** panel > select **Adjacent Elevations by Reference** button 



14. Select an adjacent **CYAN** feature line > from command line > **Elevation Difference** > **.5**

15. Repeat process across entire Parking Lot area

16. Completed Elevated Islands will look like this in 3D Orbit:



17. Continue working or open **USACE-Grading_PK_7.dwg**.

18. Select all the created and elevated Islands feature lines > add to **Proposed Site** surface as breaklines



Alignments

Introduction

Alignment objects can represent road centerlines, pipe networks, and other construction baselines. Creating and defining a horizontal alignment is one of the first steps in roadway, railroad, or site design. You can draw the alignment geometry as a polyline, and then create the named alignment from that geometry.

Key concepts

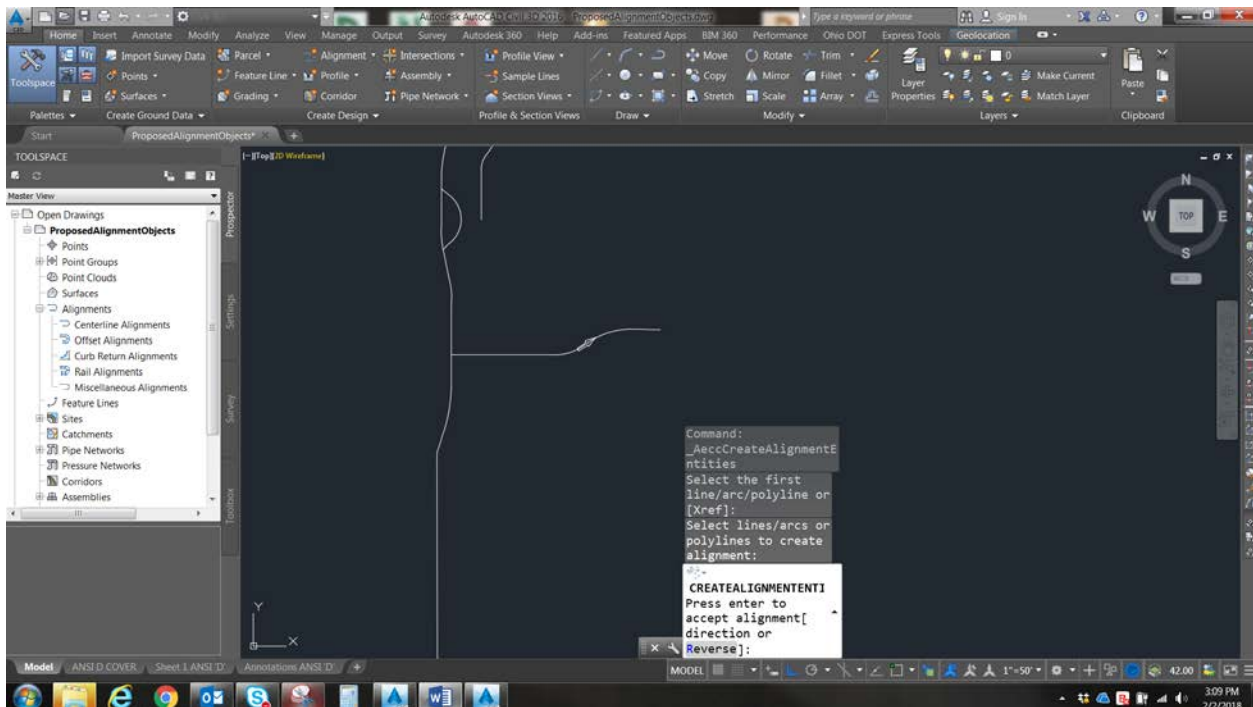
- Creating
 - By Layout
 - From Objects
 - Properties
- Editing:
 - Grip
 - Tabular
 - Edits
- Labels:
 - Label Sets
 - Station / Offset

Creation of Alignments

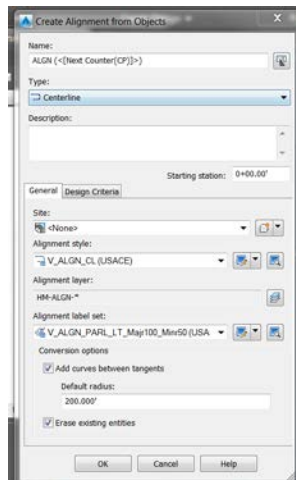
EXERCISE:

1. Alignments can be created from polylines. From the Home tab>Create Design panel, select the Alignment pull down bar and then "Create Alignment from Objects". Select the polyline near the end that you wish stationing to begin and hit enter. An arrow appears showing the direction in which stationing will proceed. You may select "R" to reverse stationing, if you wish. Use **ProposedLignmentObject.dwg**



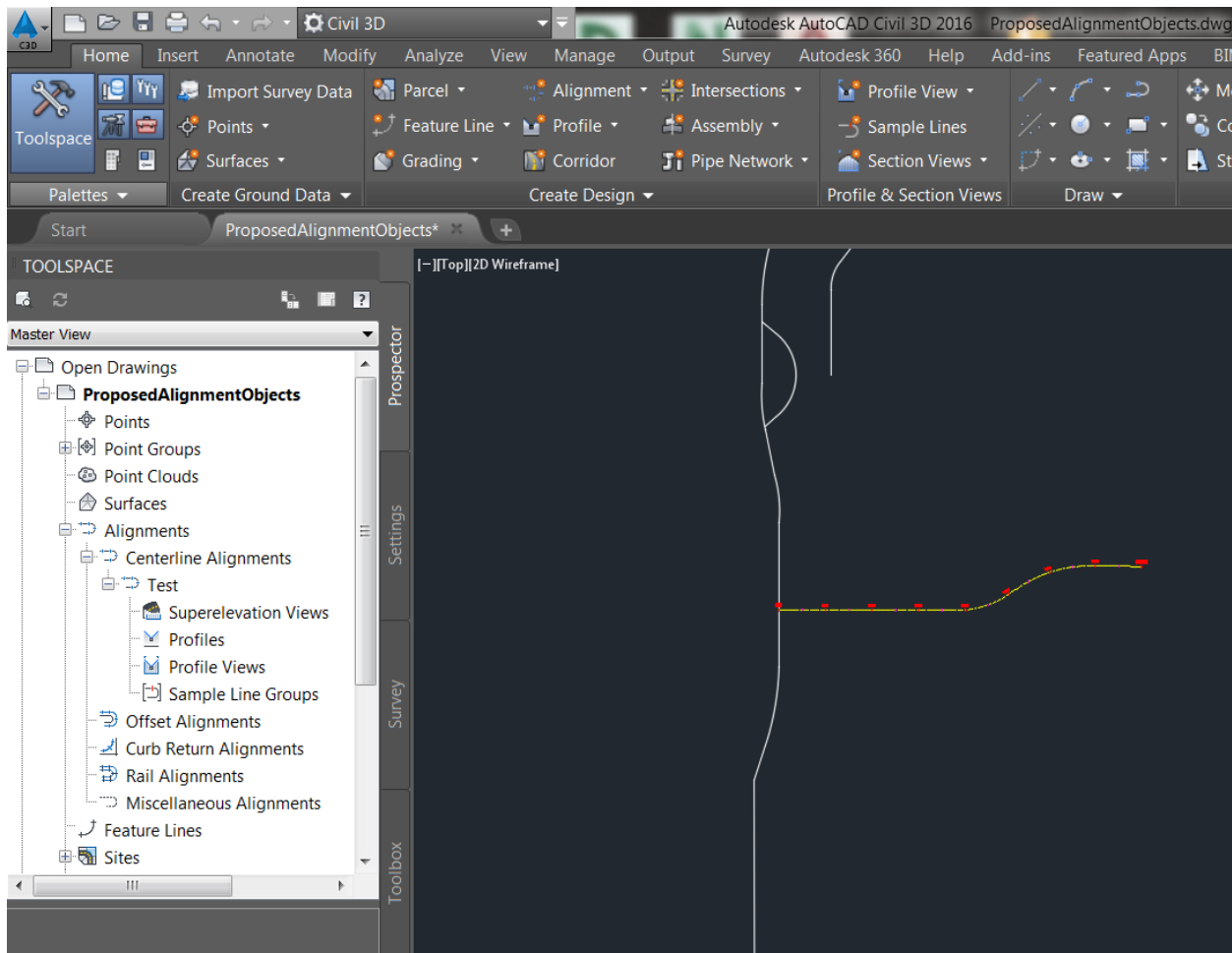


- Hit return to open the "Create Alignment from Objects" dialog.



- The alignment name, type, and other properties can be preselected in this dialog. Select OK, when these options have been completed, and the alignment is created in both the Drawing Window and Prospector.

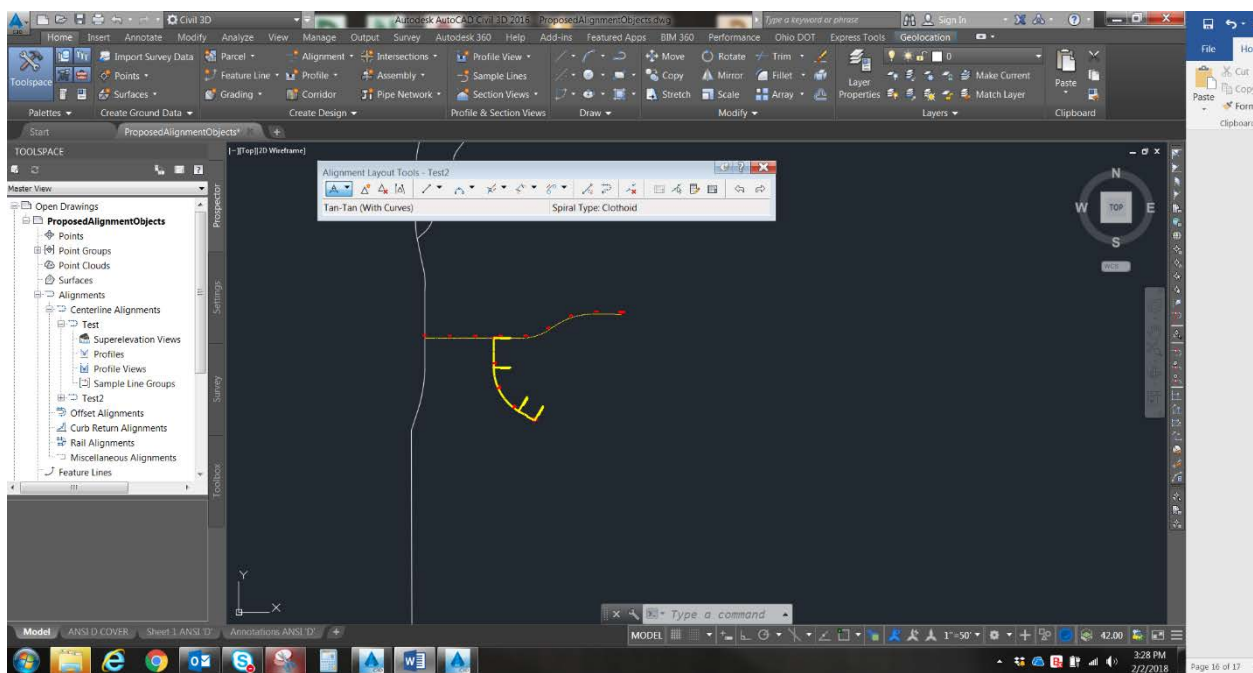




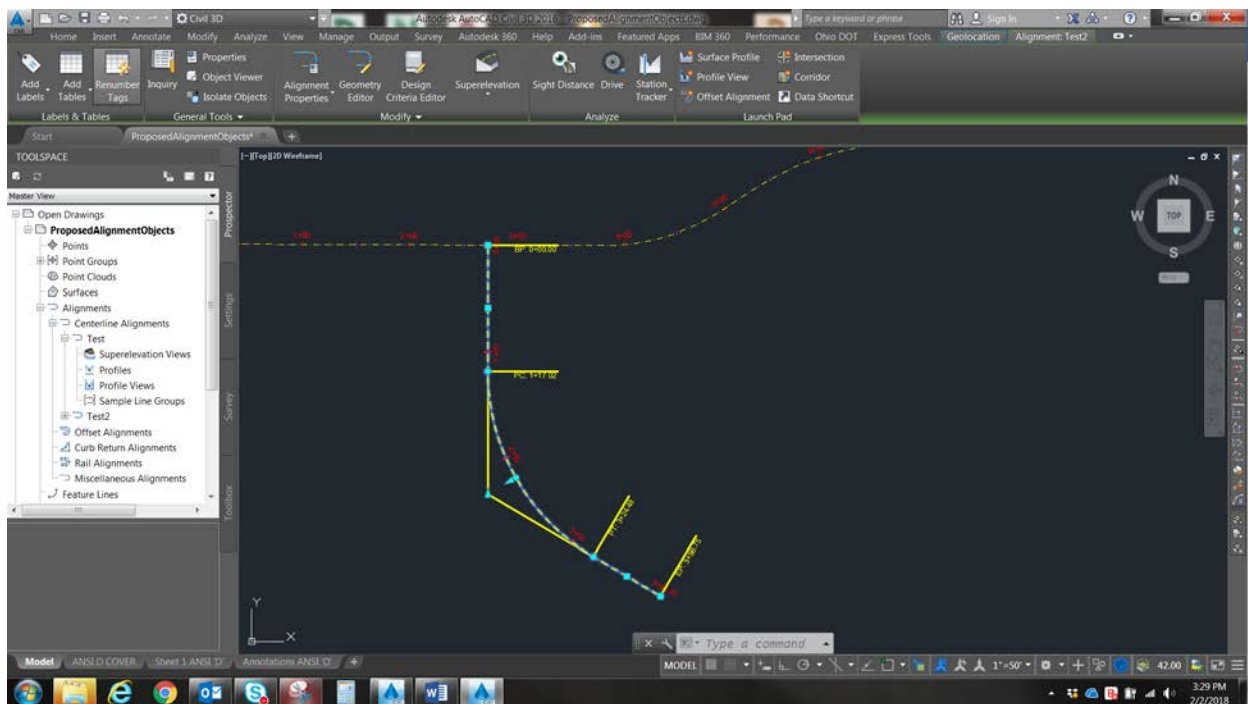
EXERCISE: Alignment Creation Tools

- Alignments can also be created using "Alignment Creation Tools". From the Home tab > Create Design panel, select the Alignment pull down bar and then "Alignment Creation Tools". Complete the "Create Alignment - Layout" dialog that appears. It provides the same property selection options that the "Create Alignment from Objects" dialog does. Select OK, when these selections have been completed. Use the "Alignment Layout Tools" bar that appears to create an alignment by layout. Use **ProposedLignmentObject.dwg**

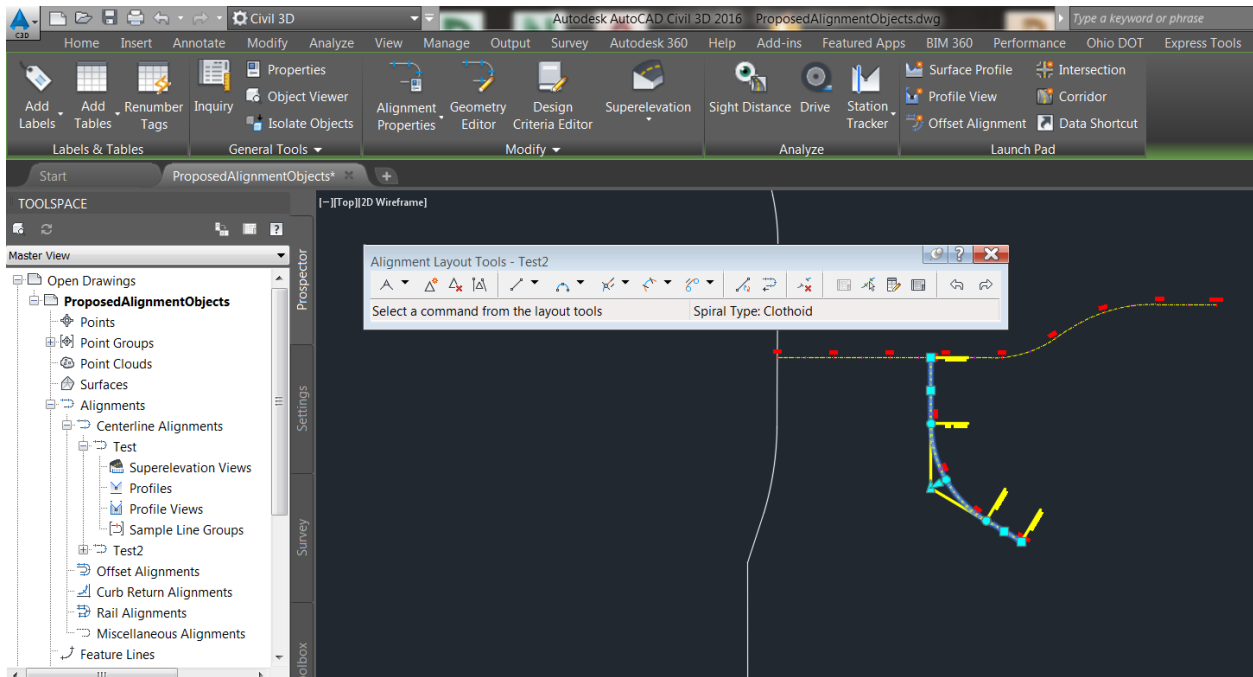




2. Alignments can be edited using grips or options available from the Contextual Ribbon.



3. The “Geometry Editor” provides access to the “Alignment Layout Tools” bar for editing alignments.



Profiles & Profile Views

Introduction

Use the profile view grid to display one or more profiles for a horizontal alignment.

When you create a profile view, you specify which existing profiles to display on the grid. Use these profiles as a reference for drawing new layout profiles on the grid.

A profile view can include one or more related profiles, along with multiple data bands along the X-axis, above or below the grid. Data bands annotate the profiles with stationing, elevation, horizontal geometry, and other data that assists engineering analysis.

Key Points

- A single profile view is typically used to design and edit a profile. It displays the specified station range of the corresponding alignment in a single profile view grid.
- Multiple profile views are useful for plotting shorter segments of a profile in individual profile view grids of a consistent length and vertical scale.
- Stacked profile views are a collection of related profiles drawn in separate, vertically arranged profile views. Typically, a centerline profile is contained in one profile view, and its left and right offsets are drawn in profile views that are placed above and below the centerline profile view.
- A profile can be split within either a single or multiple profile view. This allows a profile view to display a profile elevation range that is greater than the specified height of the profile view.

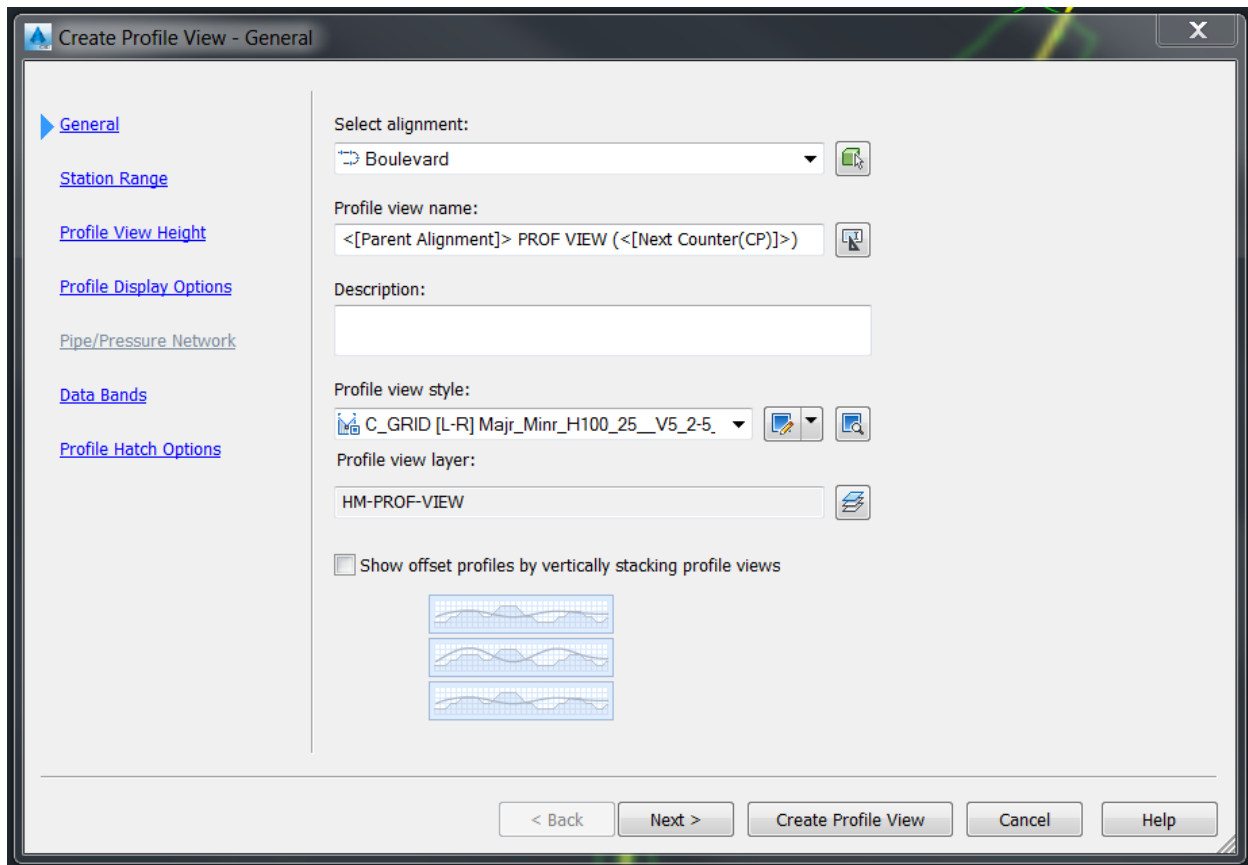
Create a Profile View

EXERCISE:

1. Use **ProposeAlignments.dwg** Necessary prerequisites for creating existing surface profiles are an alignment and an existing surface. From the Home tab>Create Design panel, select the "Profile" pull down bar, then "Create Surface Profile". From the "Create Profile from Surface" dialog, select the alignment and surface. Station limits can also be adjusted within this dialog. The surface can also be sampled at offset distances from the selected alignment. When selections have been completed, select "Add", then "Draw in profile view".

The "Create Profile View" dialog appears.

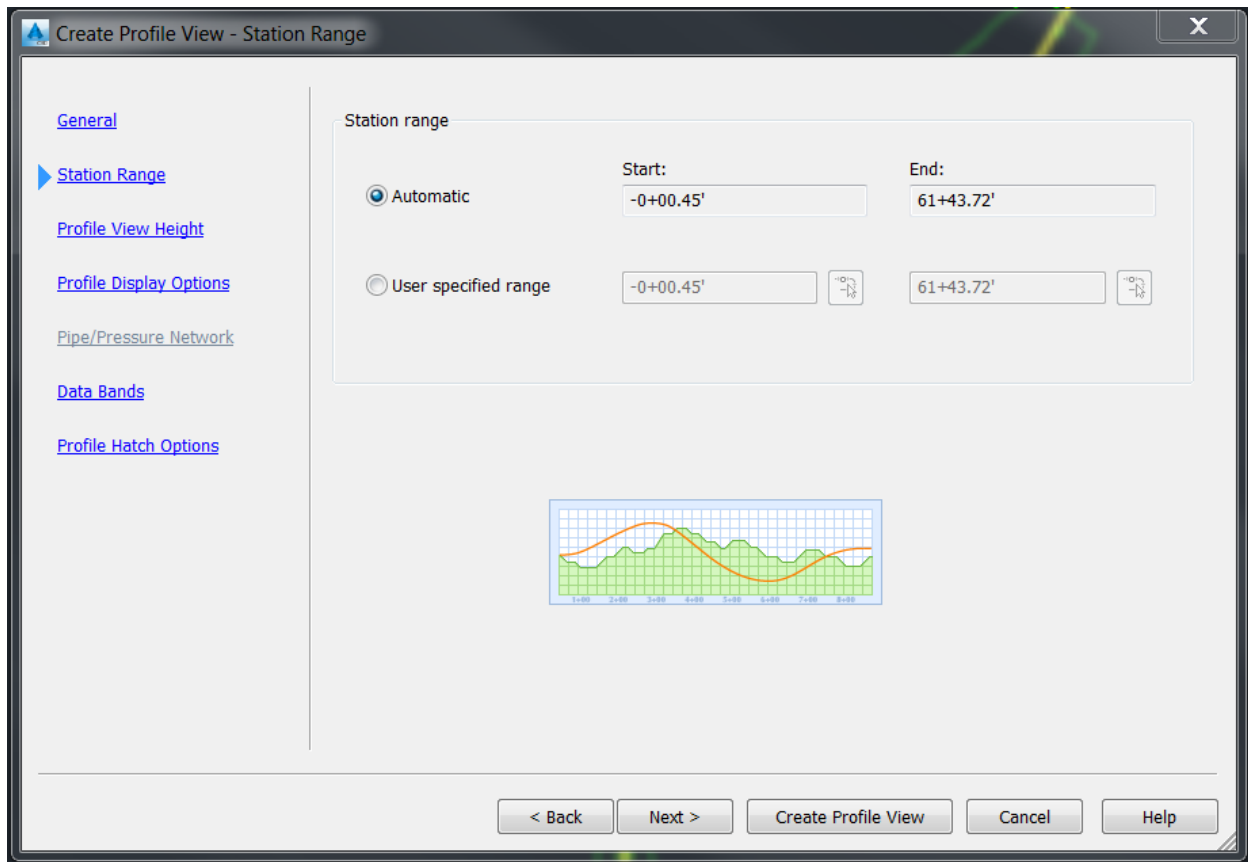




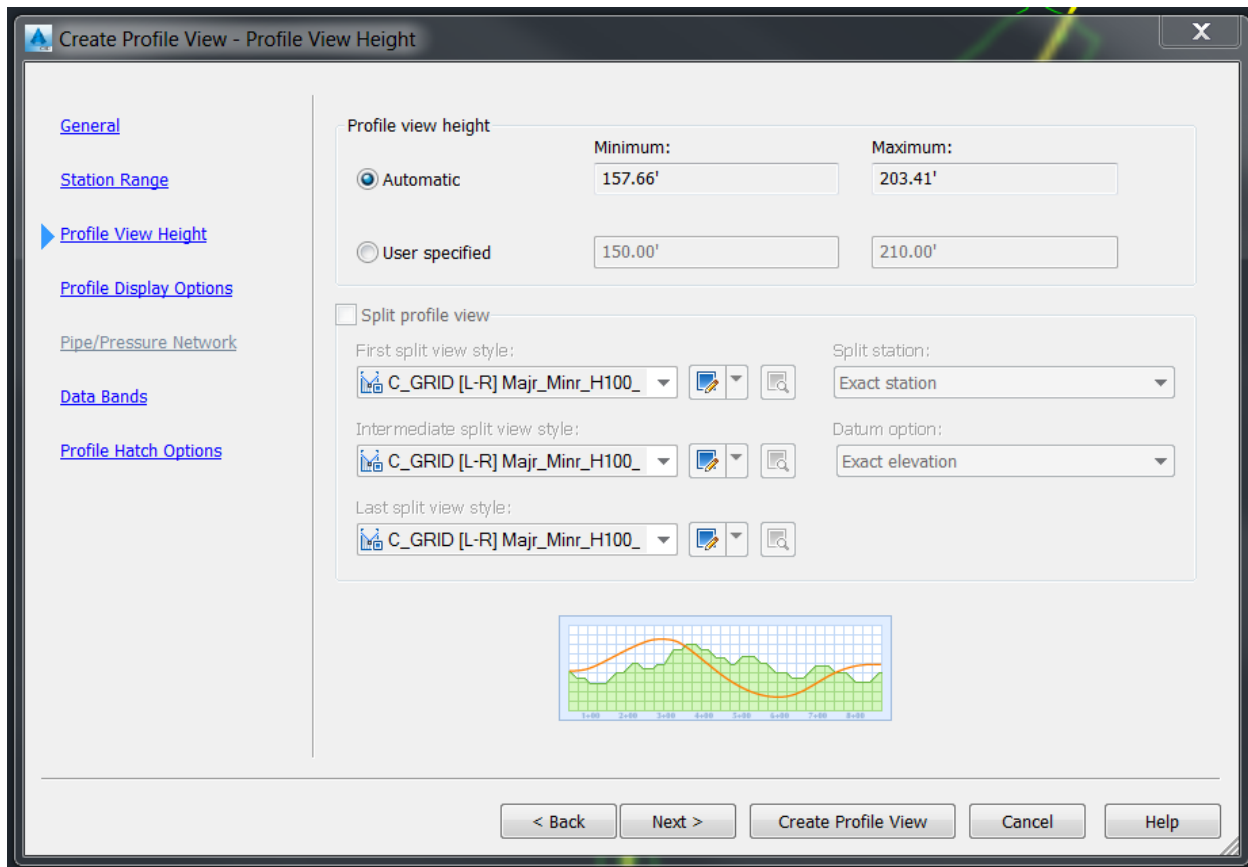
This presents a series of ordered dialogs that allow for the selection of profile view properties. The General dialog appears, above. It provides for the selection of the alignment, profile name, profile view style, and stacking of offset profiles.



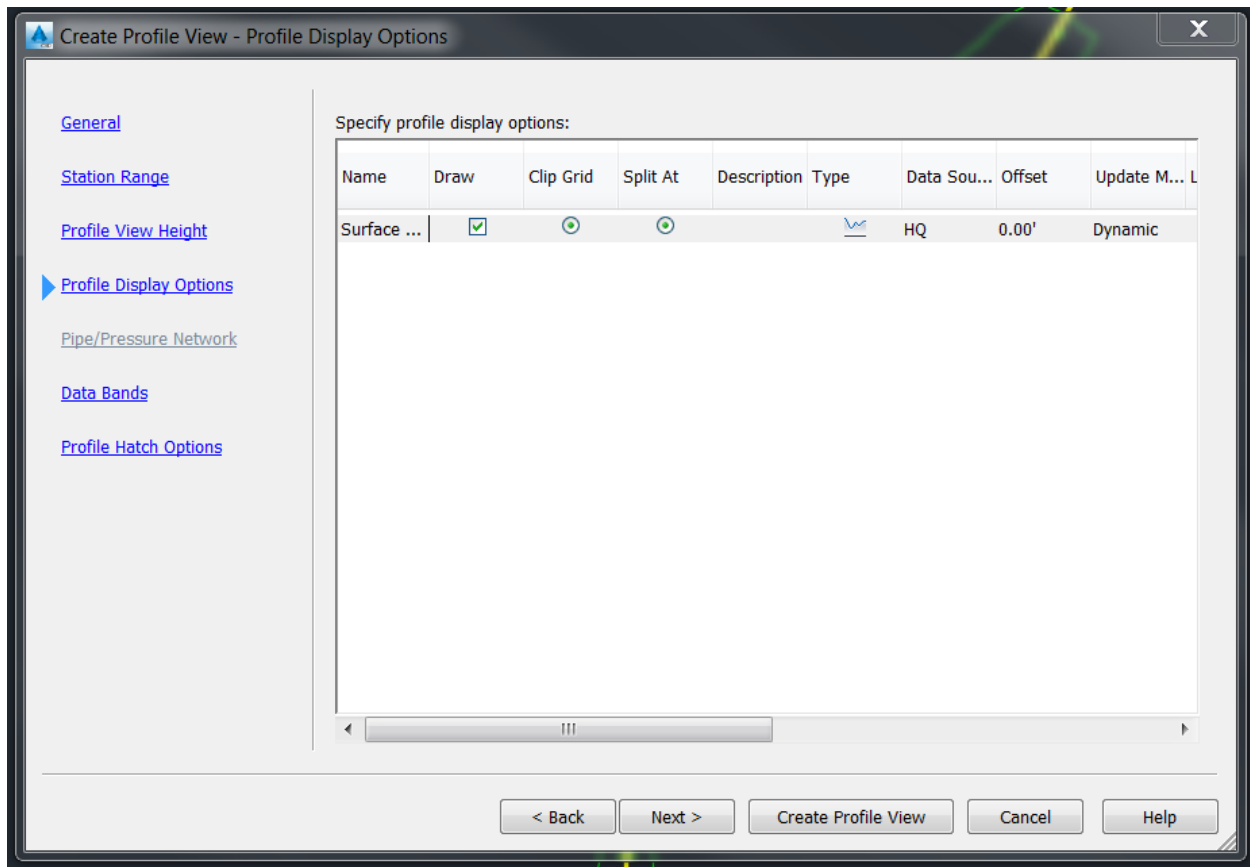
- The Station Range dialog allows for automatic or user specified settings of the profile view station range.



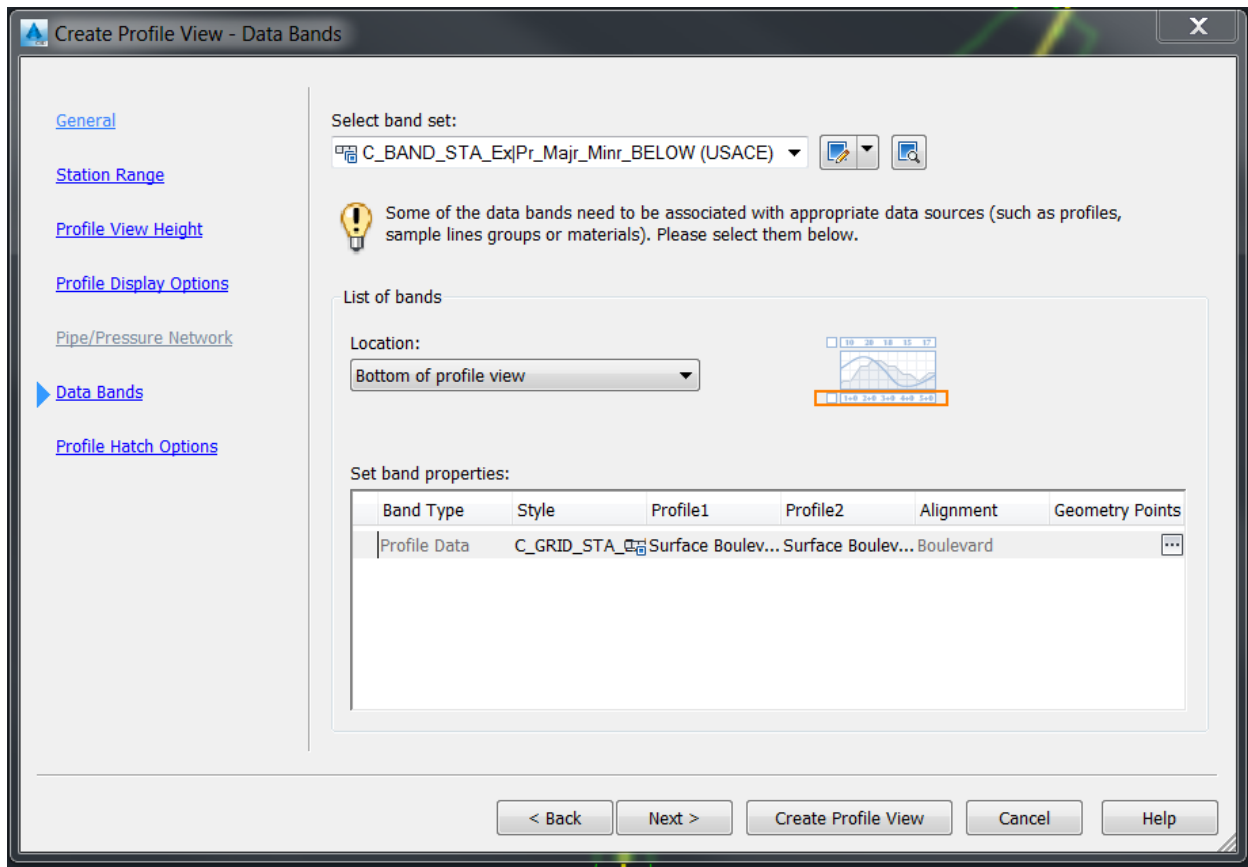
- The Profile View Height dialog offers similar options for the profile height as were available for the station range. It also offers controls for split profile styles and settings.



4. The Profile Display Options dialog provides control over the display of the profiles.

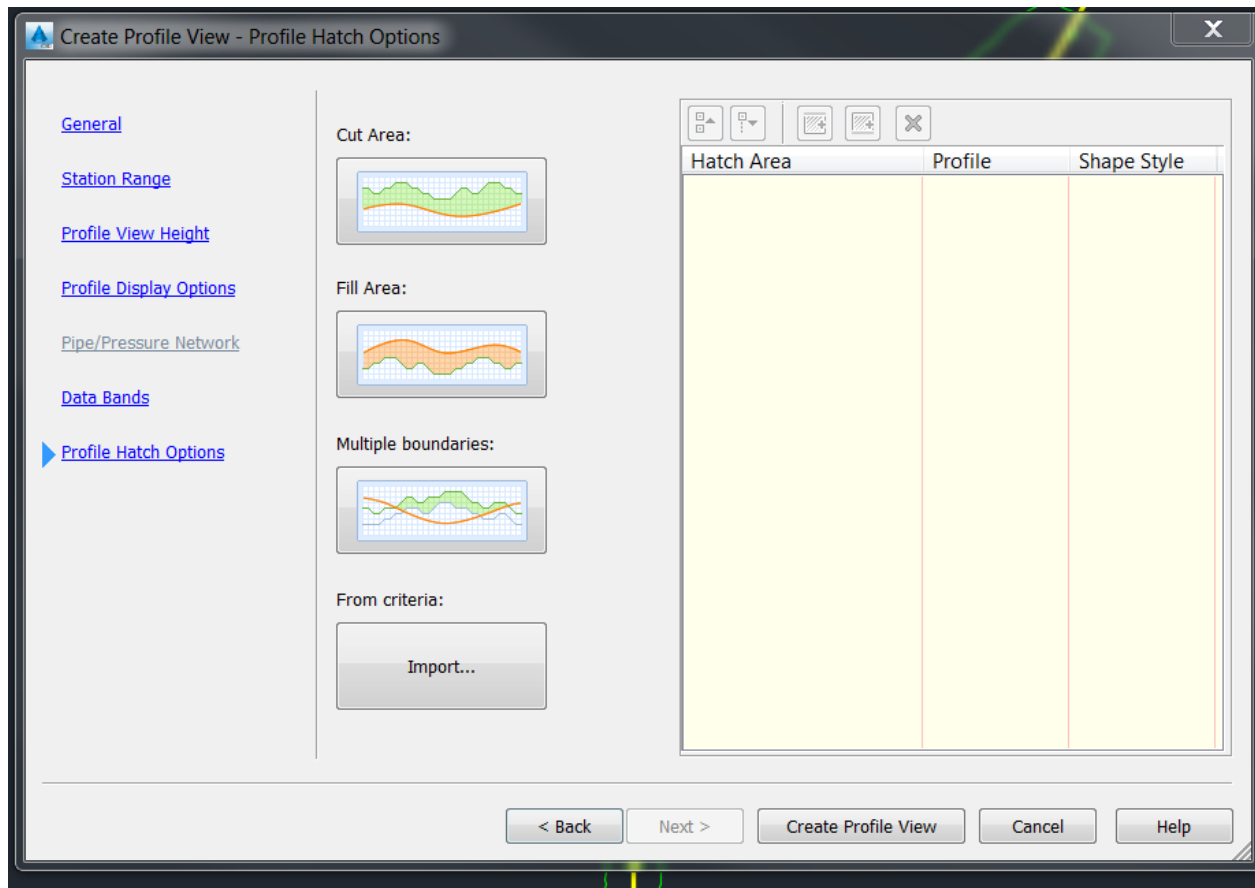


- The Data Bands dialog provides control over the location and style of the data bands displayed.



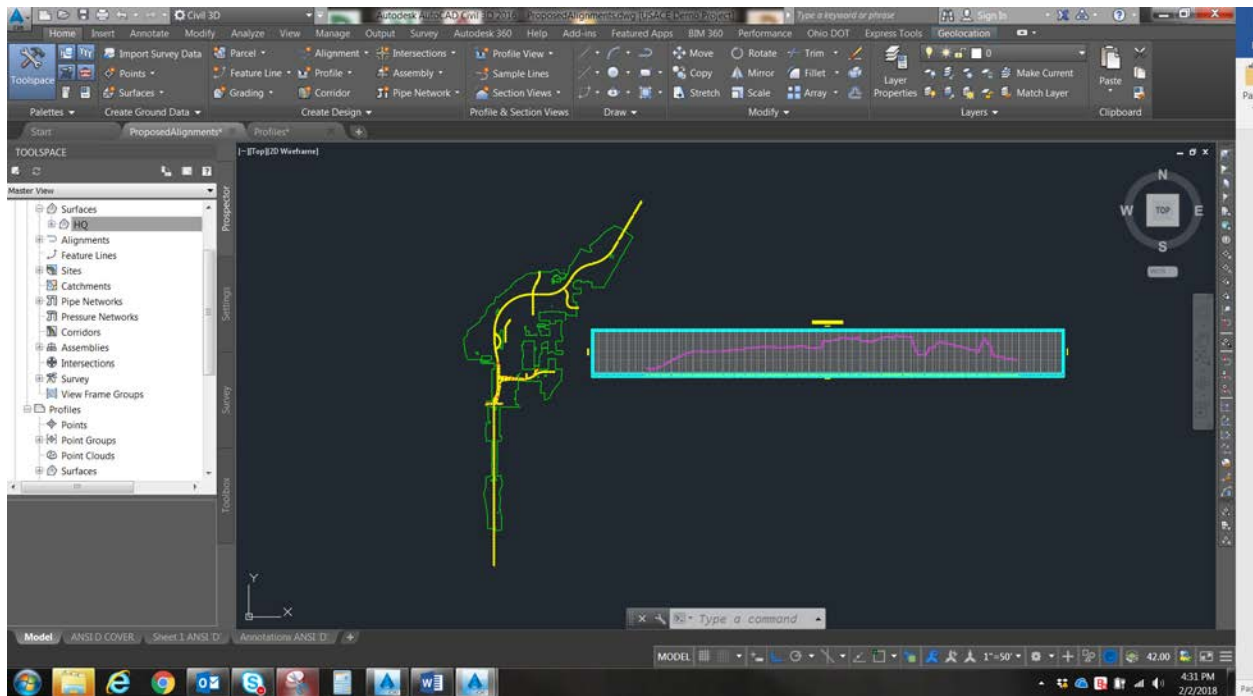
- The Profile Hatch Option provides control over hatching of cut, fill, and volumes between multiple surfaces in the profile view.





7. Once all settings have been made, select "Create Profile View" and pick a point in the Drawing Window that corresponds to the lower left corner of the Profile view. The profile view is created.



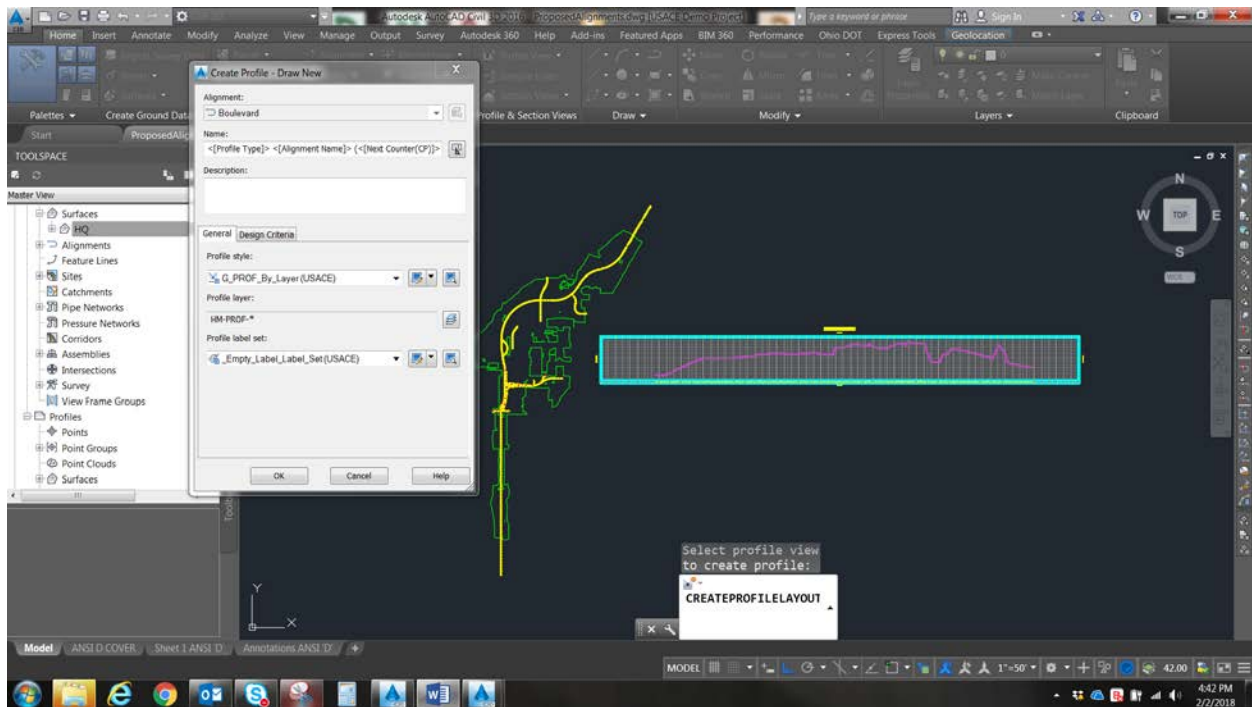


Create a Proposed Profile

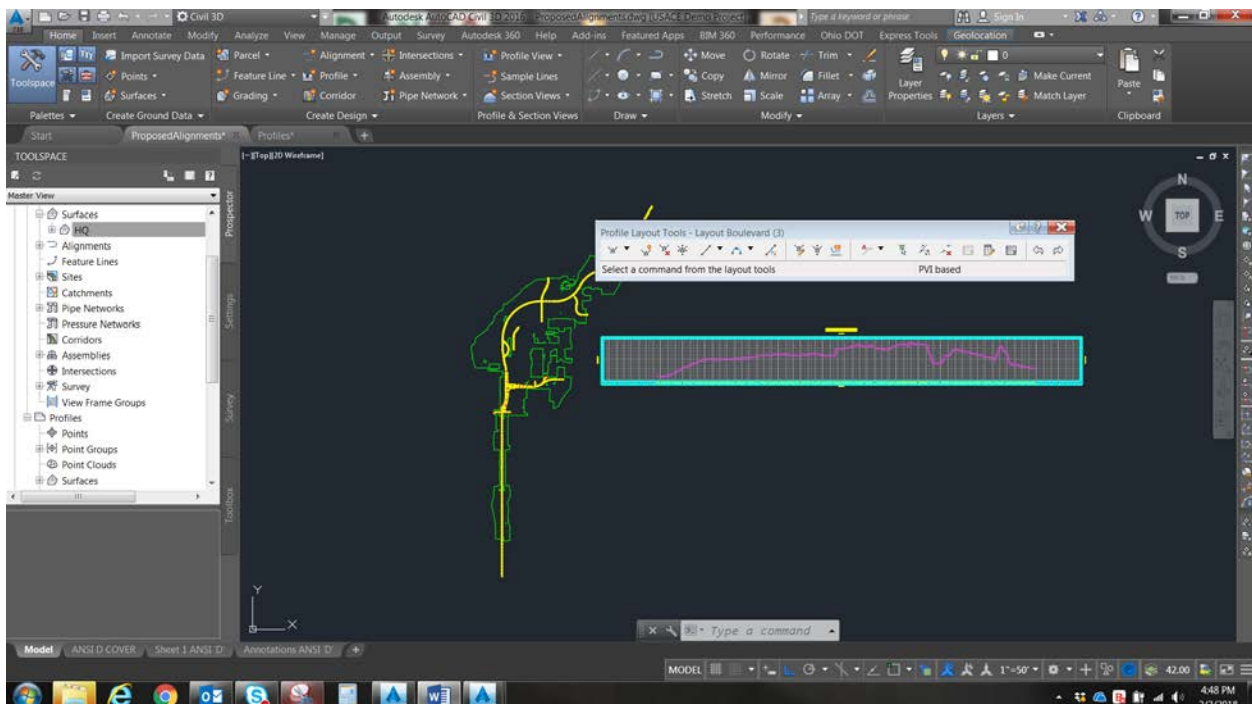
EXERCISE:

1. To create a proposed or layout profile, select the "Profile Creation Tools" pull down bar from the Home tab>Create Design panel>Profile pull down bar. Then, select the profile view in which to design the proposed profile. The "Create Profile – Draw New" dialog appears. This dialog provides options for naming the profile, adding a description, and selecting the profile and label set styles. Use **Profiles.dwg**

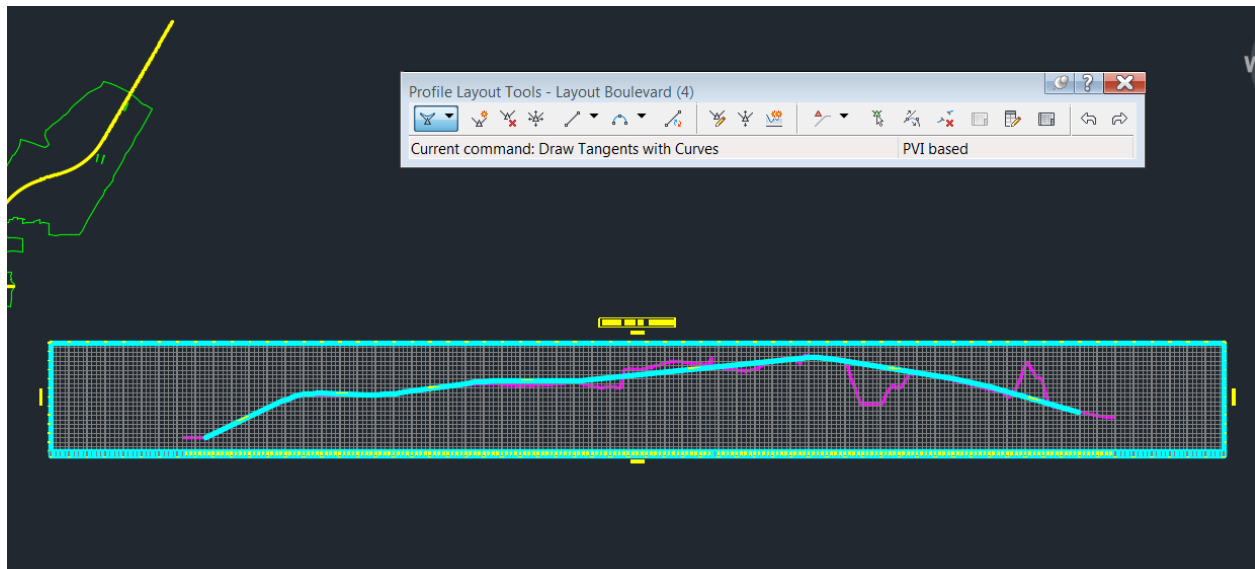




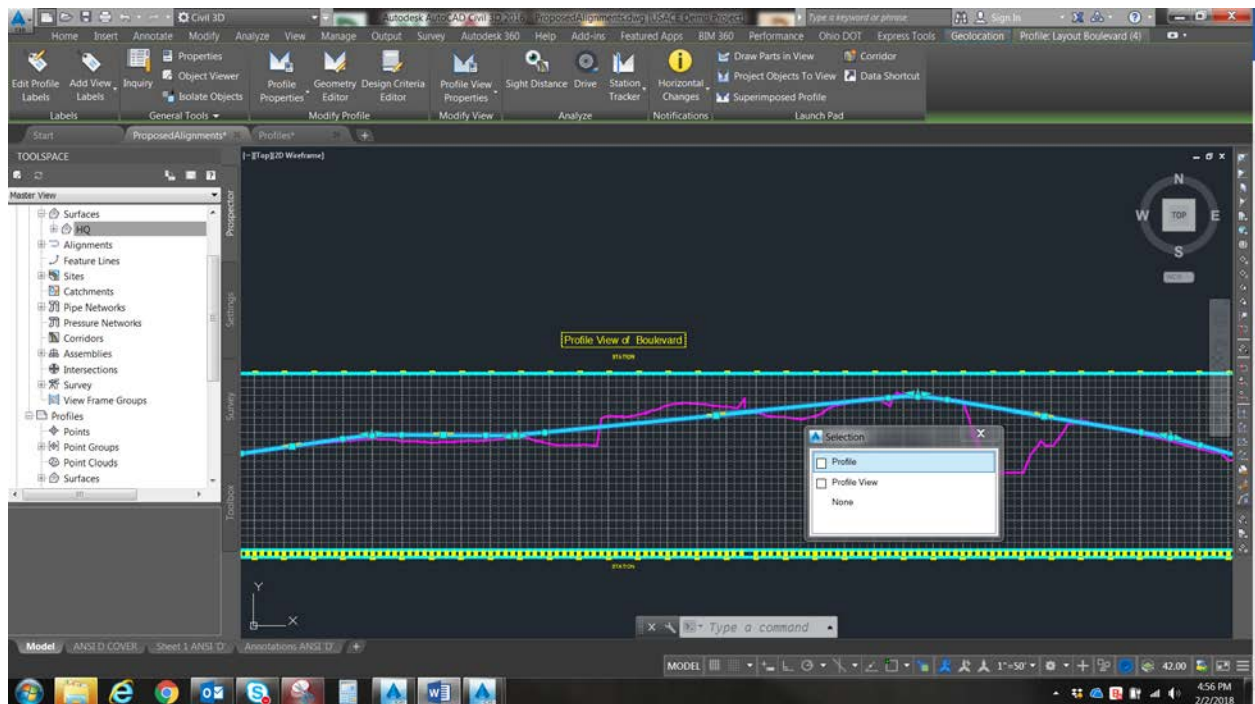
2. Select OK when settings have been completed to display the "Profile Layout Tools" bar. This provides tools for designing a profile, like the "Alignment Layout Tools."



3. Additionally, Osnaps and Transparent Tools can be used in laying out a proposed profile.



4. Proposed profiles can be edited by selecting them and using grips or options available from the contextual Ribbon, like alignments.

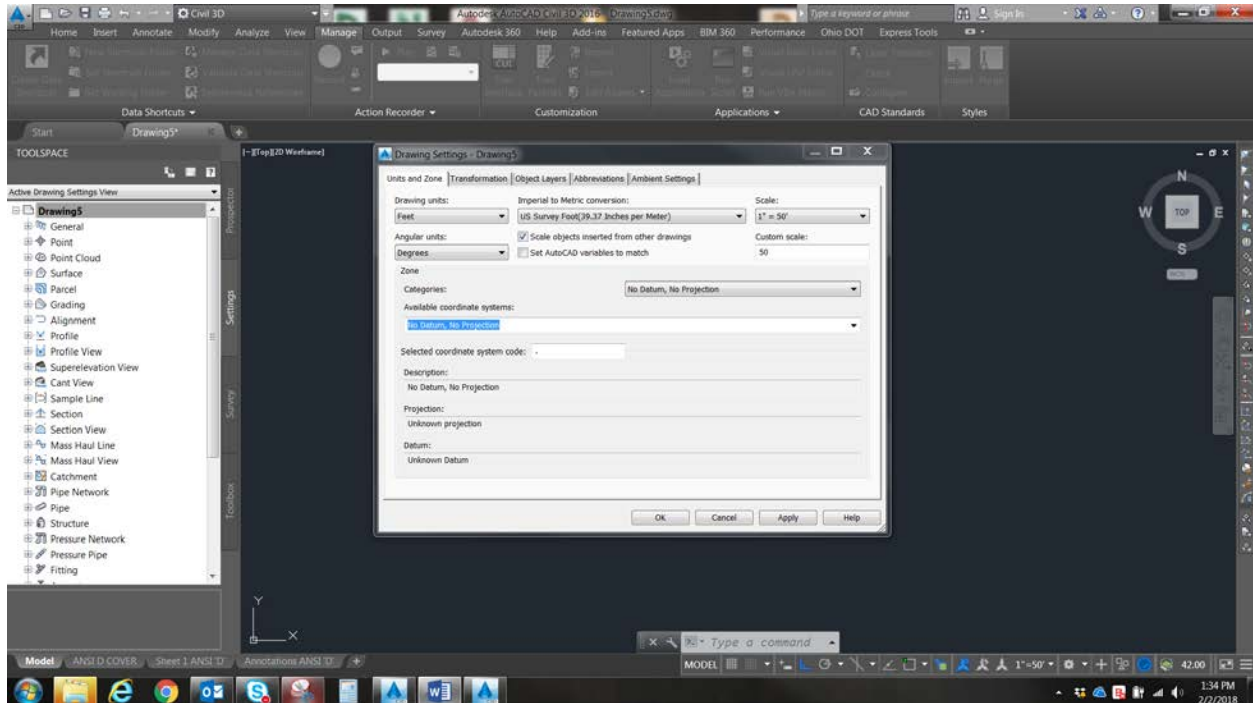


The “Geometry Editor” provides access to the “Profile Layout Tools” bar for editing profiles.

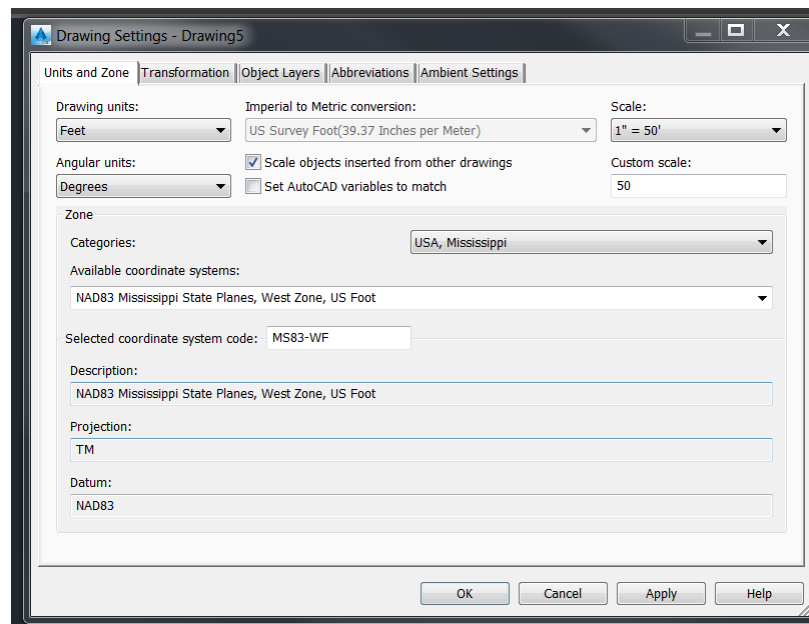


Corridors

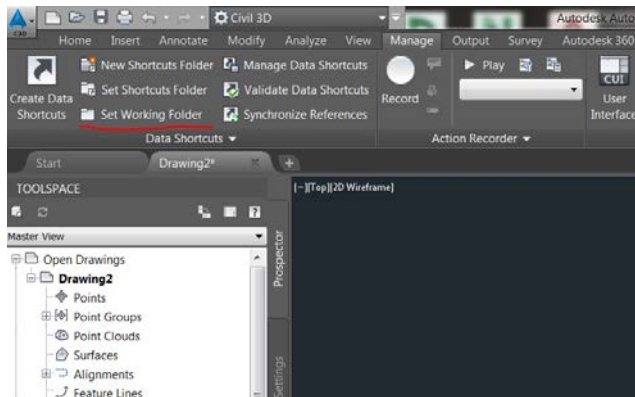
Toolspace, Right Click the drawing name (at the top the view window) and select "Edit Drawing Settings" to open the Drawing Settings dialog



On the Units and Zone tab, set the coordinate system.

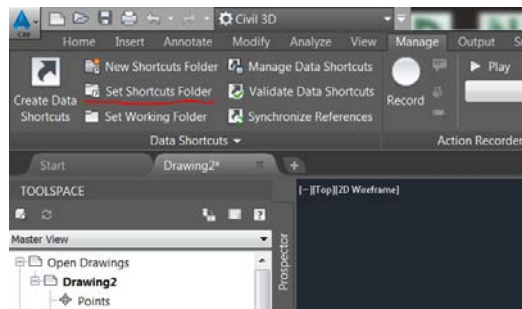


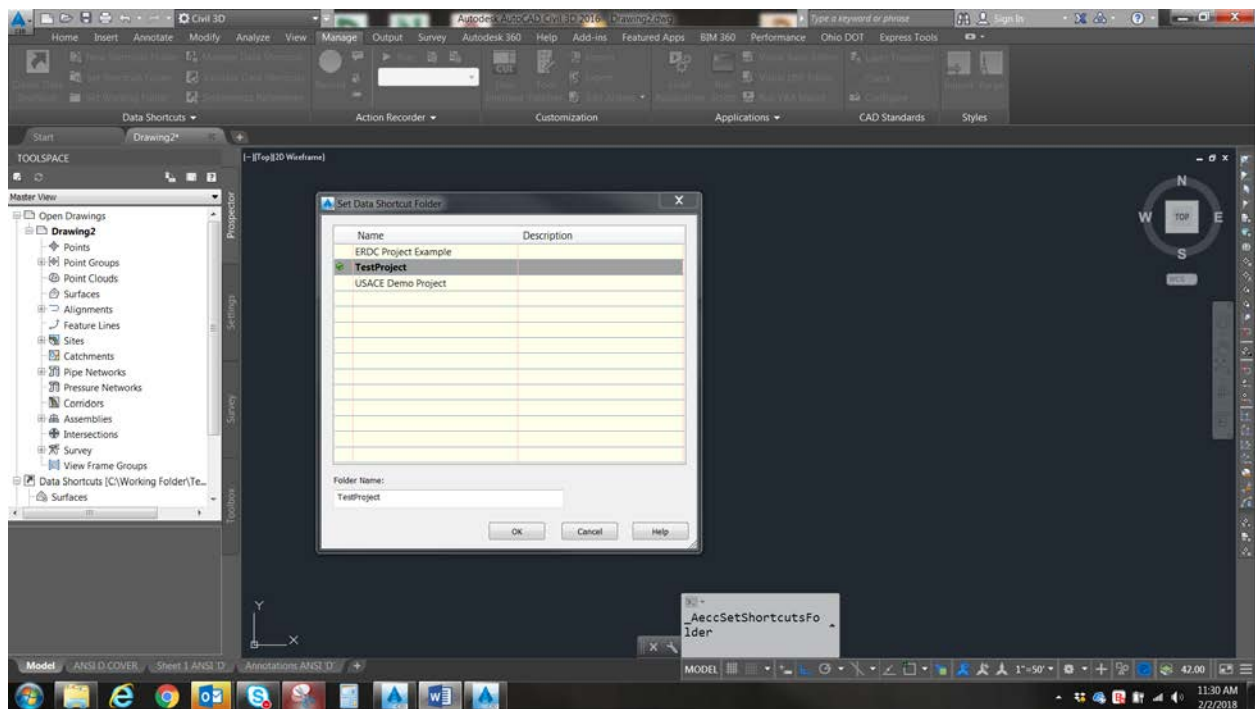
If the Working Folder has not been set, from the Manage tab>Data Shortcuts pane select “Set Working Folder” and use the “Browse for Folder” dialog to select the Working Folder.



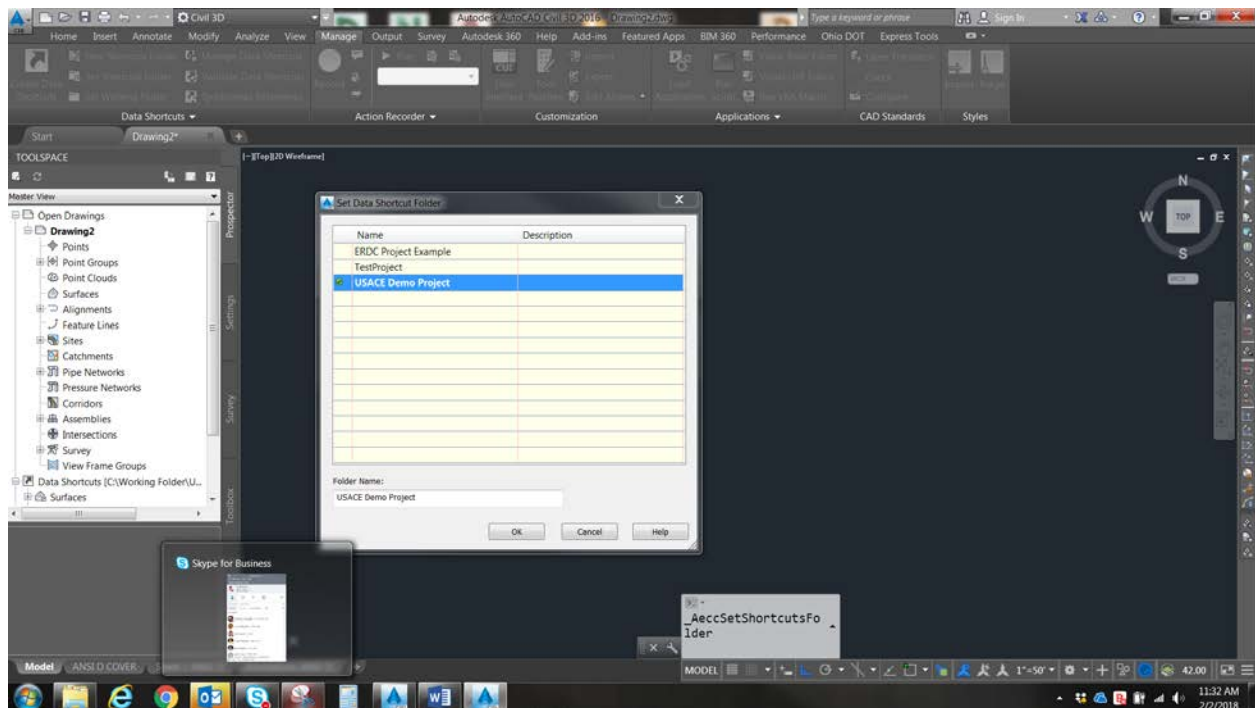
Note: The working Folder is the directory that contains the project folders.

From the Manage tab>Data Shortcuts pane select “Set Shortcuts Folder” to open the “Set Data Shortcuts Folder” dialog and set the current project.





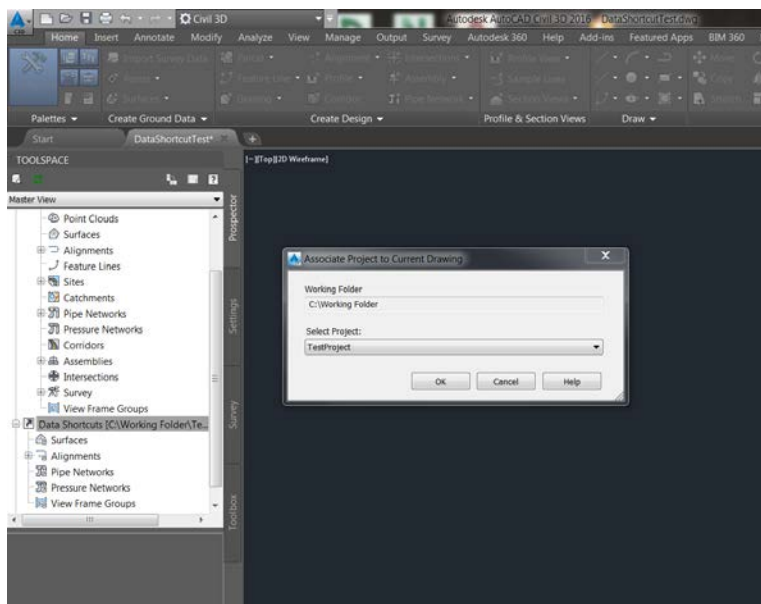
Note: Any project within the Working Folder can be selected.



New drawings can be created and associated with a project by Right Clicking the "Data Shortcuts" folder in the Prospector tab of Toolspace and selecting "Associate Project to Current Drawing". This brings up the "Associate



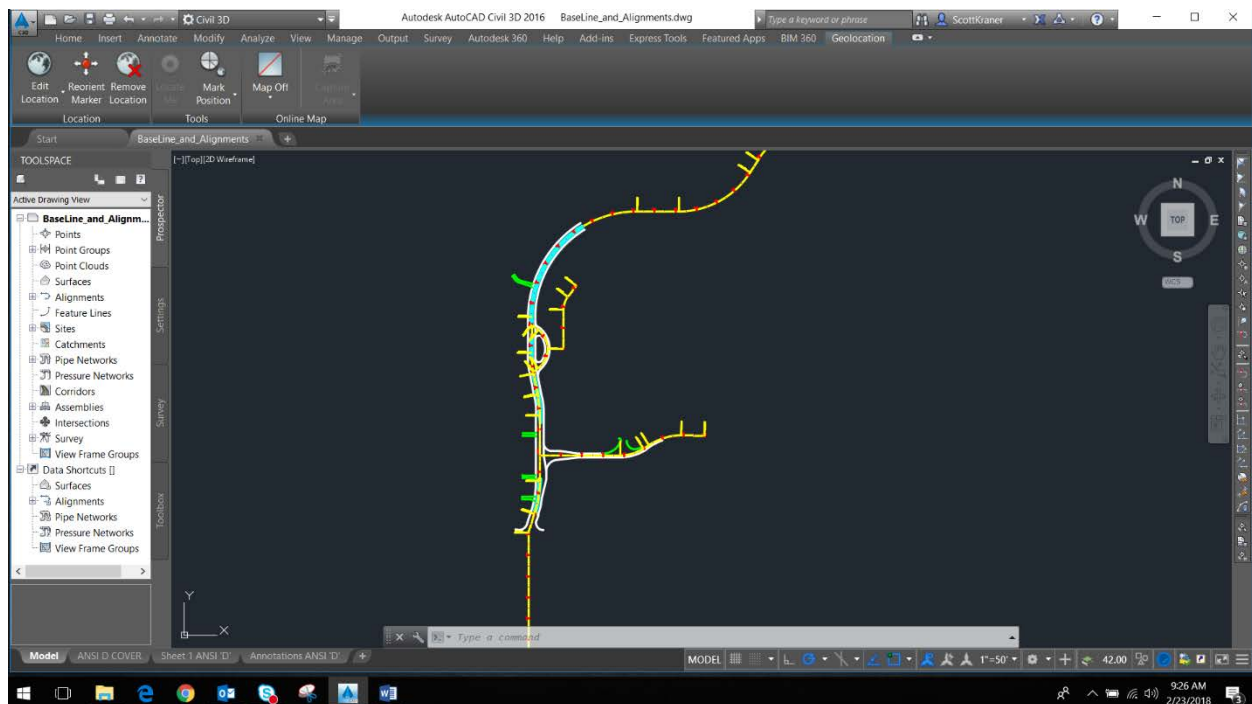
Project to Current Drawing” dialog, which allows for the selection of any project within the Working Folder, which is displayed at the top of the dialog.



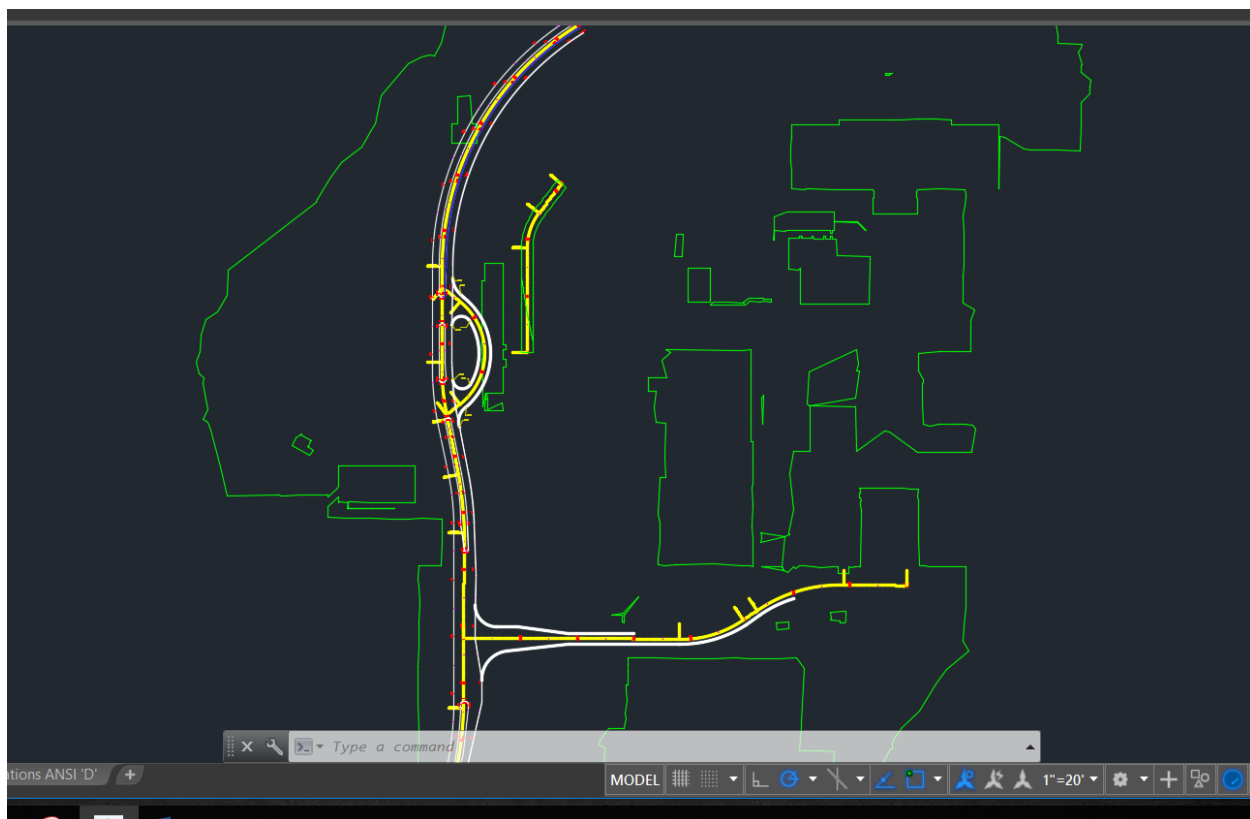
Data Shortcuts were created by selecting the “Create Data Shortcuts” icon in the Data Shortcuts pane of the Manage tab, as indicated in the Project Set Up section. Data References are created by Right Clicking the object under the Data Shortcut area of Prospector and Selecting “Create Reference. The Create <selected object> Reference dialog appears allowing adjustment to some of the data referenced objects settings. Selecting OK creates a data reference of the object within the new drawing. You usually need to zoom to the newly created data reference.

To develop corridors, you will need to create Data References in the new drawing for the existing surface, as well as all required alignments and profiles. Additional geometry information is also usually required. This information is used to control corridor transitions and establish additional baselines. The existing surface can be set to “No Display” to improve visibility.

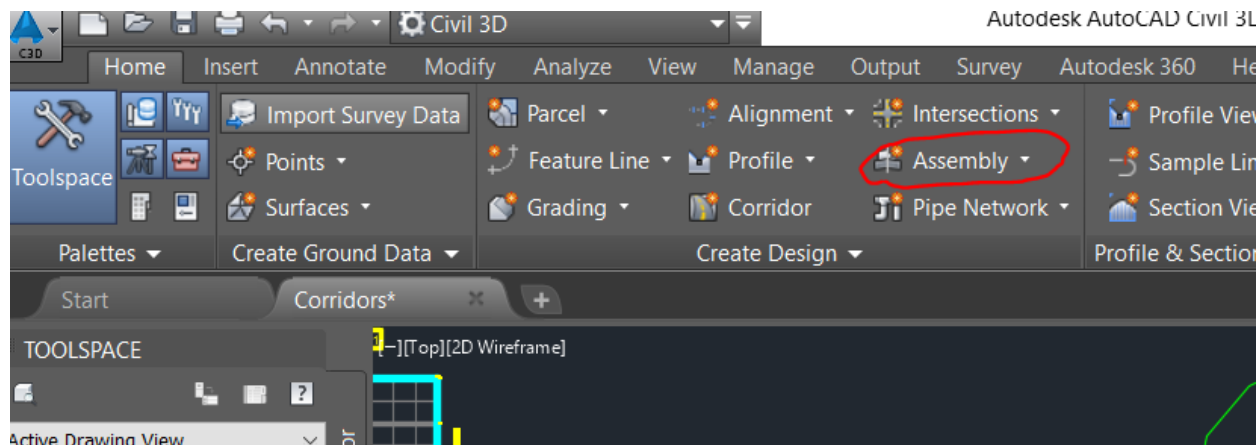


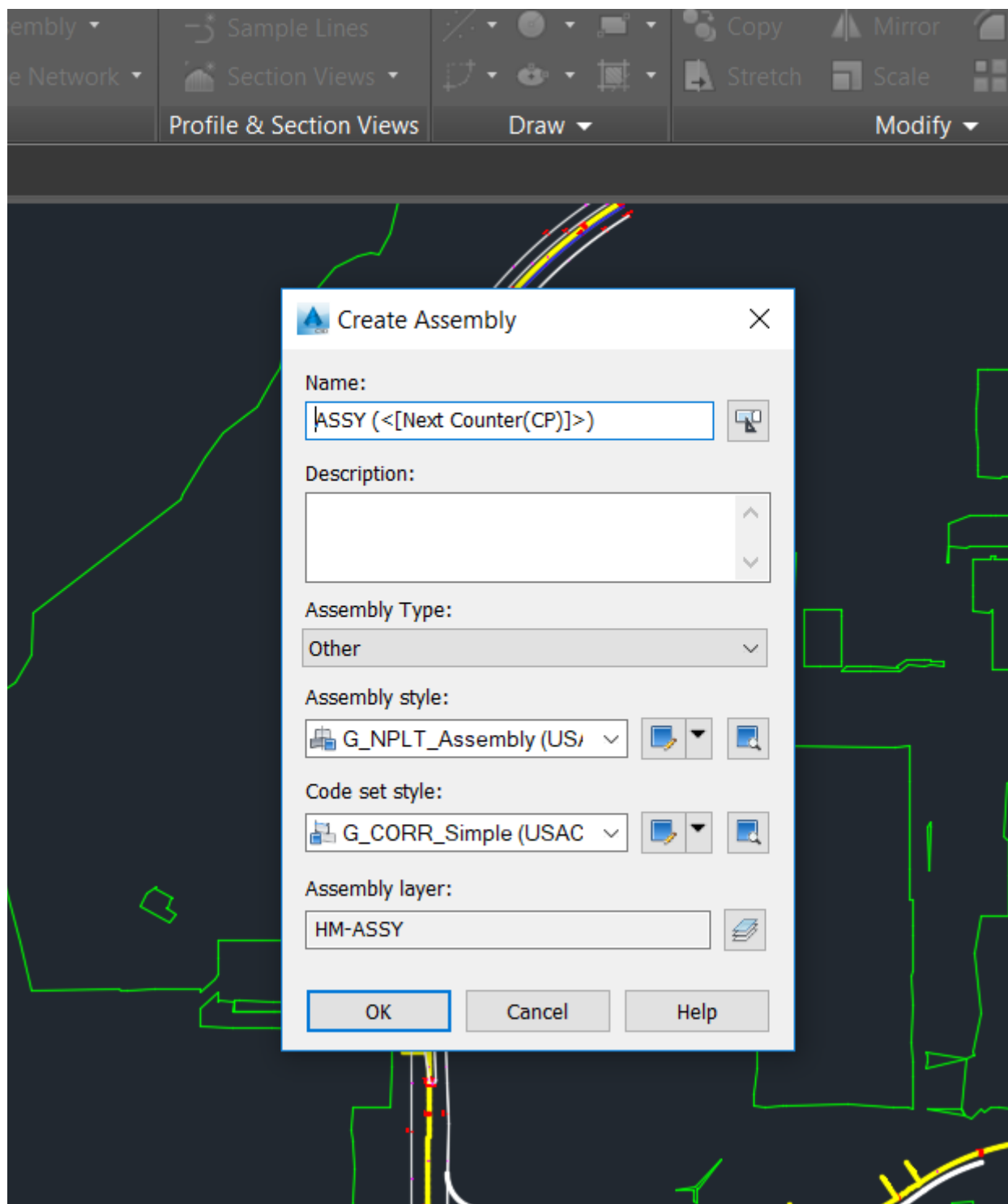


Alternately, the existing surface can be displayed using a “Border Only” style to allow analysis of corridor daylighting issues.



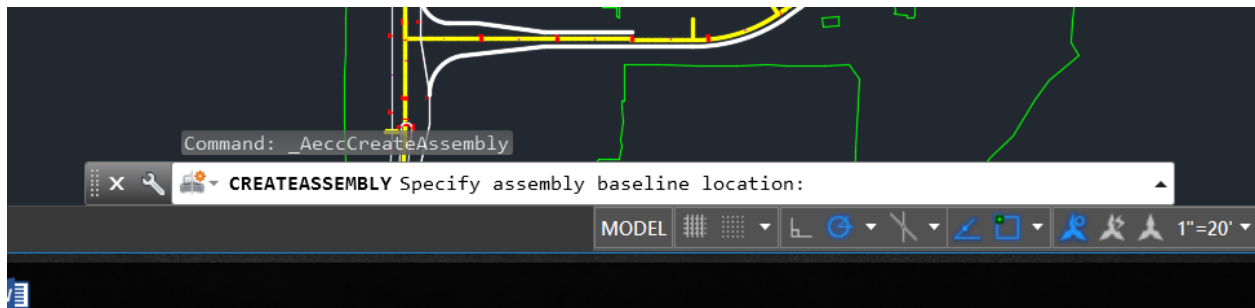
Corridor Assemblies are created by selecting the "Assembly" pull-down and the "Create Assembly" command, which brings up the "Create Assembly" dialog.



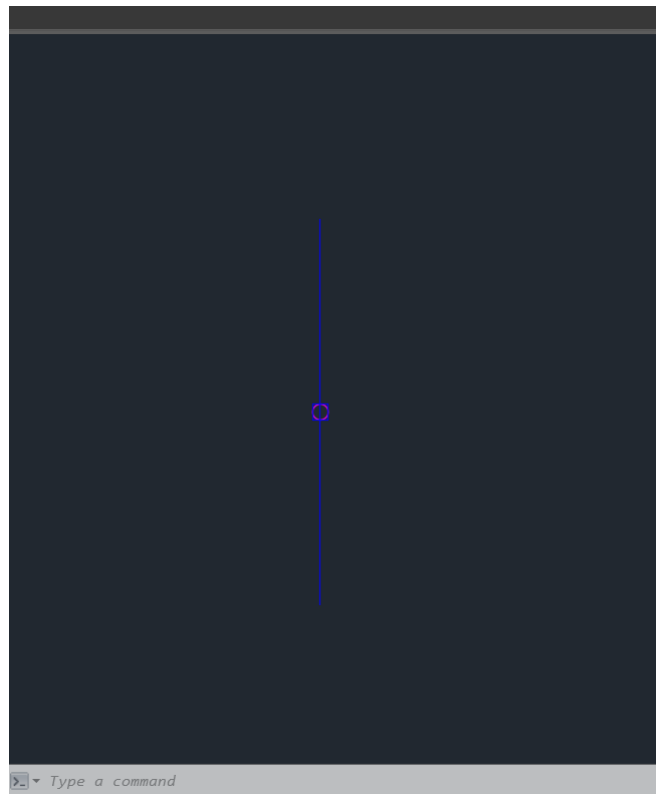


The assembly name, description, and style properties can be preselected in this dialog. Select OK, when these options have been completed, you are directed to place the assembly marker or baseline in the drawing.



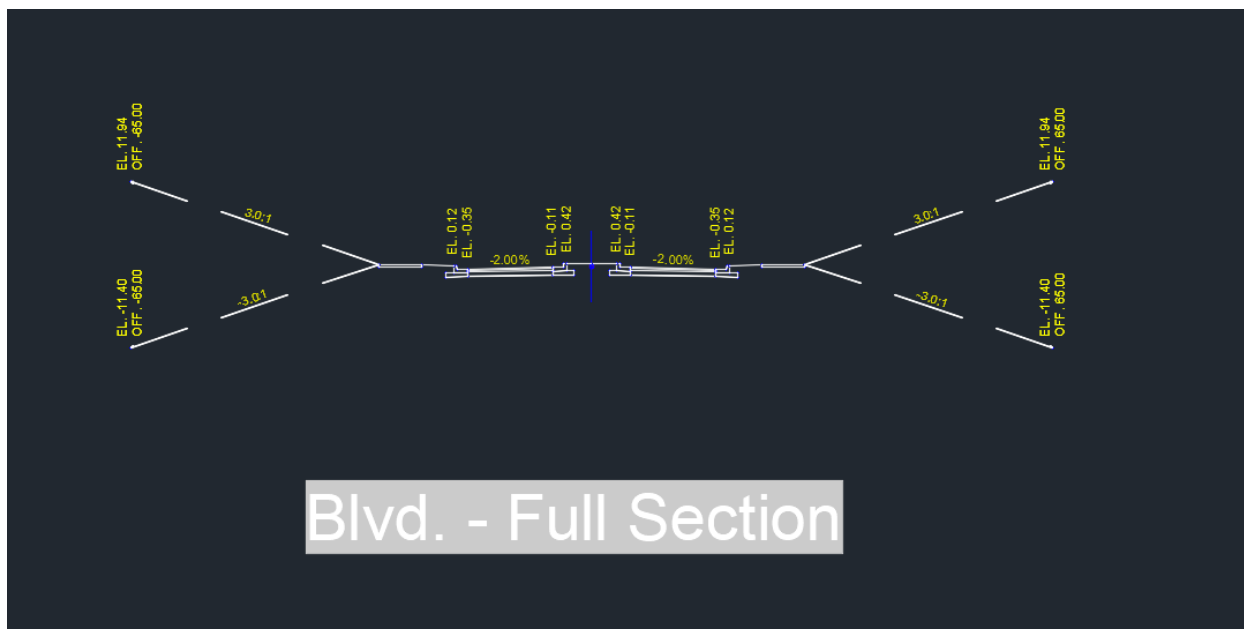


Clicking on a clear location in the drawing places the marker and zooms in so that subassemblies can be placed.



Assemblies are created by adding Subassemblies to this marker, working from the center out, usually beginning on the right side. The marker denotes the point on the Assembly that will attach to the Profile Grade Line (PGL). Corridors are created by connecting appropriate Assemblies along Corridor Regions at specified frequency intervals. Assemblies are very similar to typical sections developed for many roadway project plans.



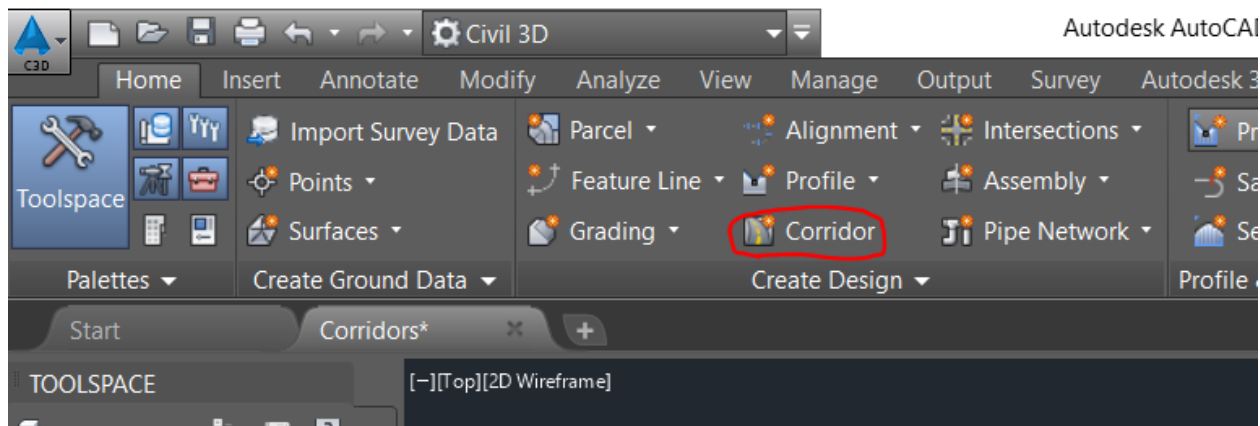


Most projects require numerous Assemblies utilized in multiple regions to achieve the intended design.



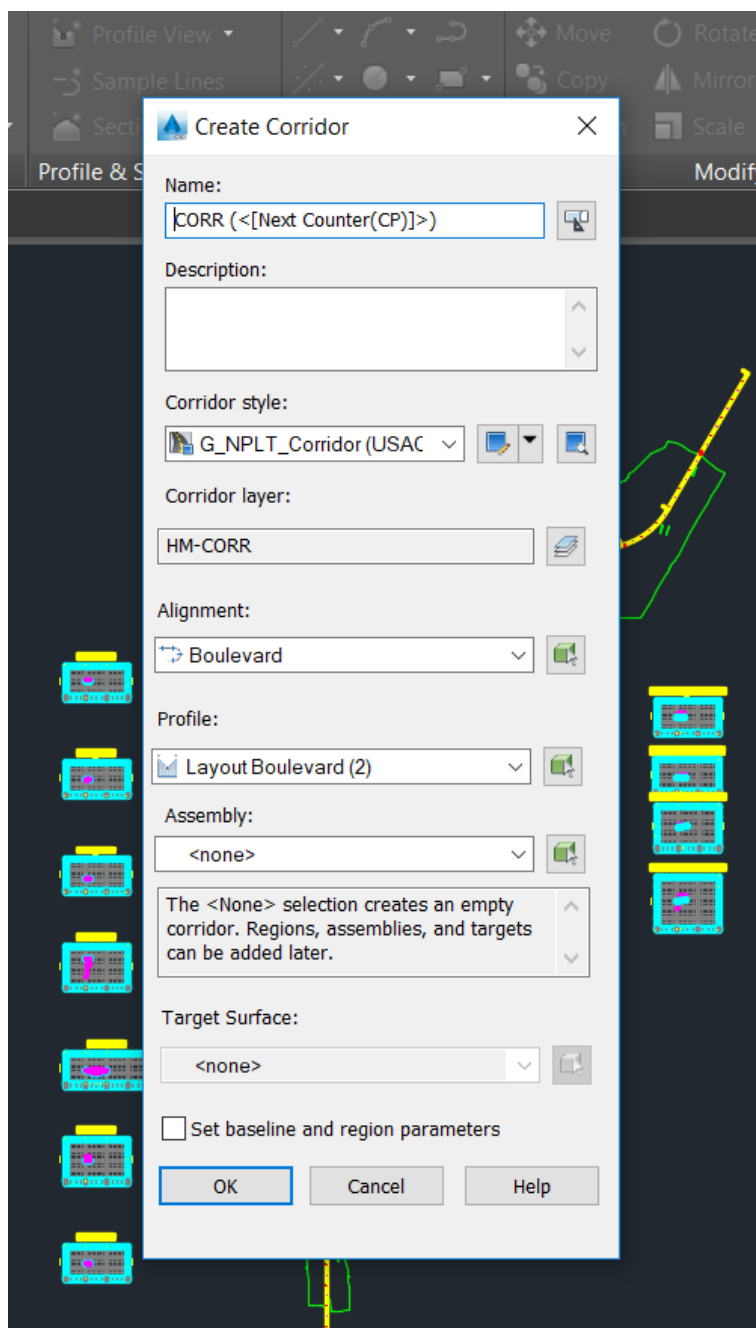
A Corridor is created by selecting the Corridor pull-down on the Create Design pane of the Home tab.





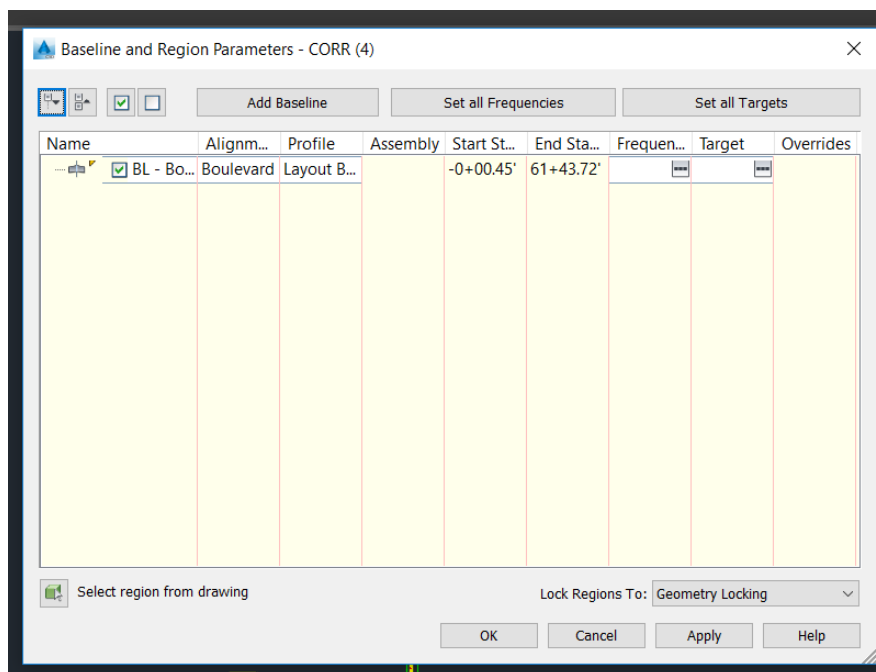
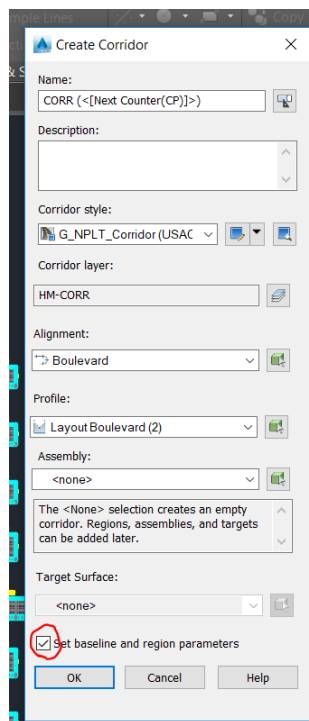
This brings up a dialog very similar to other Civil 3D Object dialogs. This provides for the creation of a Corridor name and description. It also allows the style, alignment, profile, assembly, and surface to be set.





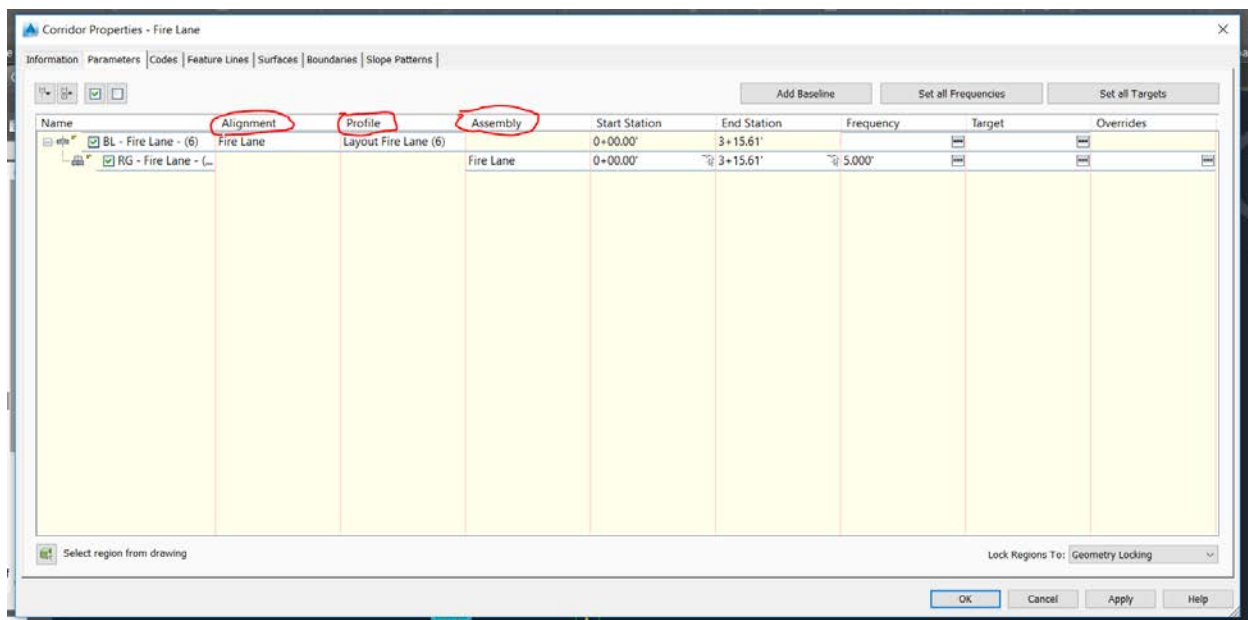
Checking the “Set baseline and region parameters” box opens a dialog for making these settings.



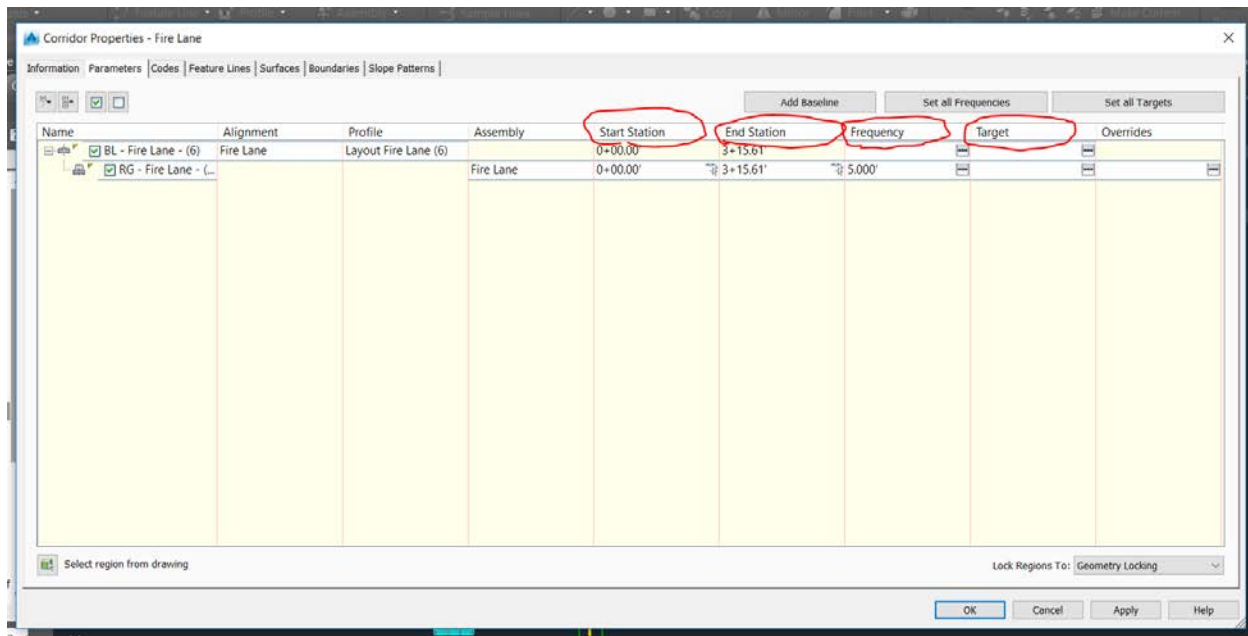


From this dialog, or the Parameters tab of the Corridor Properties dialog, regions can be created and managed. Alignments, profiles, and assemblies can be set.





Stations, frequency, and targets can also be set.

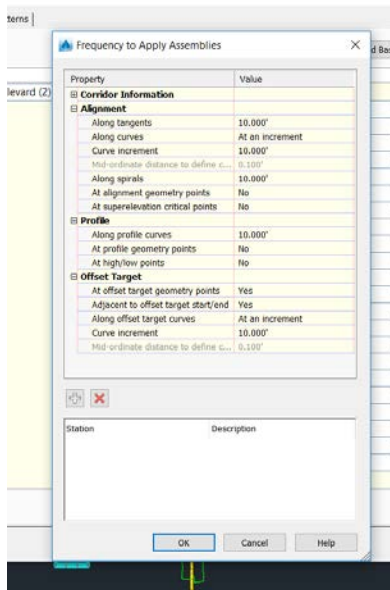


This dialog can get somewhat involved for complex Corridors.



Name	Alignment	Profile	Assembly	Start Station	End Station	Frequency	Target	Overrides
BL - Boulevard - (7)	Boulevard	Layout Boulevard (2)		-0+00.45'	61+43.72'			
RG - Blvd. - Begin...			Blvd. - Begin Tapers	22+73.51'	22+98.97'	10.000'		
RG - Blvd. - Taper...			Blvd. - Taper to Bull N...	22+98.97'	23+00.44'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose Full ...	23+00.47'	23+04.47'	10.000'		
RG - Blvd. - Full S...			Blvd. - Full Section	23+04.47'	24+61.96'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose Full ...	24+61.96'	24+68.69'	10.000'		
RG - Blvd. - No M...			Blvd. - No Median Ful...	24+68.69'	25+04.97'	10.000'		
RG - Blvd. - No M...			Blvd. - No Median No...	25+04.97'	26+36.03'	10.000'		
RG - Blvd. - No M...			Blvd. - No Median Full...	26+36.03'	27+31.76'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose Full ...	27+31.76'	27+80.22'	5.000'		
RG - Blvd. - Full S...			Blvd. - Full Section	27+80.22'	29+49.89'	10.000'		
RG - Blvd. - Full S...			Blvd. - Full Section N...	29+49.89'	29+63.41'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose No ...	29+63.41'	29+68.91'	10.000'		
RG - Blvd. - No M...			Blvd. - No Median No...	29+68.91'	30+32.64'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose No ...	30+32.64'	30+35.52'	10.000'		
RG - Blvd. - Full S...			Blvd. - Full Section N...	30+35.52'	30+38.14'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose No S...	30+38.14'	31+30.11'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose No S...	31+30.11'	31+31.70'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose No ...	31+31.70'	31+35.61'	10.000'		
RG - Blvd. - No M...			Blvd. - No Median No...	31+35.61'	31+82.60'	10.000'		
RG - Blvd. - Bull ...			Blvd. - Bull Nose No ...	31+82.60'	31+88.10'	10.000'		
RG - Blvd. - Full S...			Blvd. - Full Section N...	31+88.10'	32+16.17'	10.000'		
RG - Blvd. - Full S...			Blvd. - Full Section	32+16.20'	37+46.59'	10.000'		

Below is an example of the frequency dialog. It provides several methods of setting frequency parameters.



Target mapping is set in the dialog, below. It allows point targets on select subassemblies to be assigned to target alignments, baselines, and profiles in order to control width, slope, and transitions.



Add Baseline Set all Frequenci

Target Mapping
✕

Corridor name:

Assembly name: Start Station: End Station:

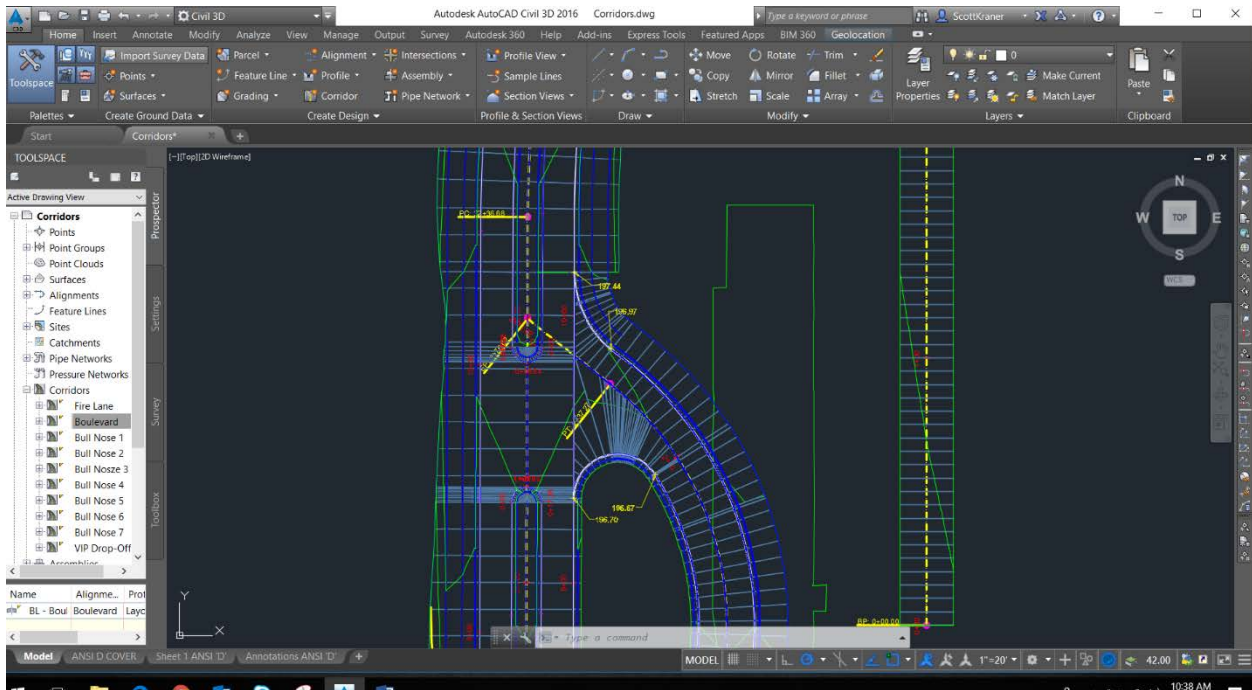
Target	Object Name	Subassembly	Assembly Group
Surfaces			
<Click here to set all >			
Target Surface	HQ	DaylightMaxWidth	Right
Target Surface	HQ	DaylightMaxWidth	Left
Width or Offset Targets			
Width Alignment	<None>	LaneSuperelevationA...	Right
Target Alignment	<None>	DaylightMaxWidth	Right
Width Alignment	<None>	LaneSuperelevationA...	Left
Target Alignment	<None>	DaylightMaxWidth	Left
Slope or Elevation Targets			
Outside Elevation Profile	<None>	LaneSuperelevationA...	Right
Outside Elevation Profile	<None>	LaneSuperelevationA...	Left

OK Cancel Help

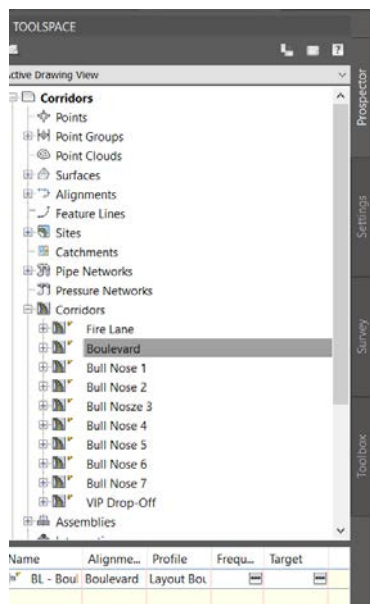
OK

Intersections

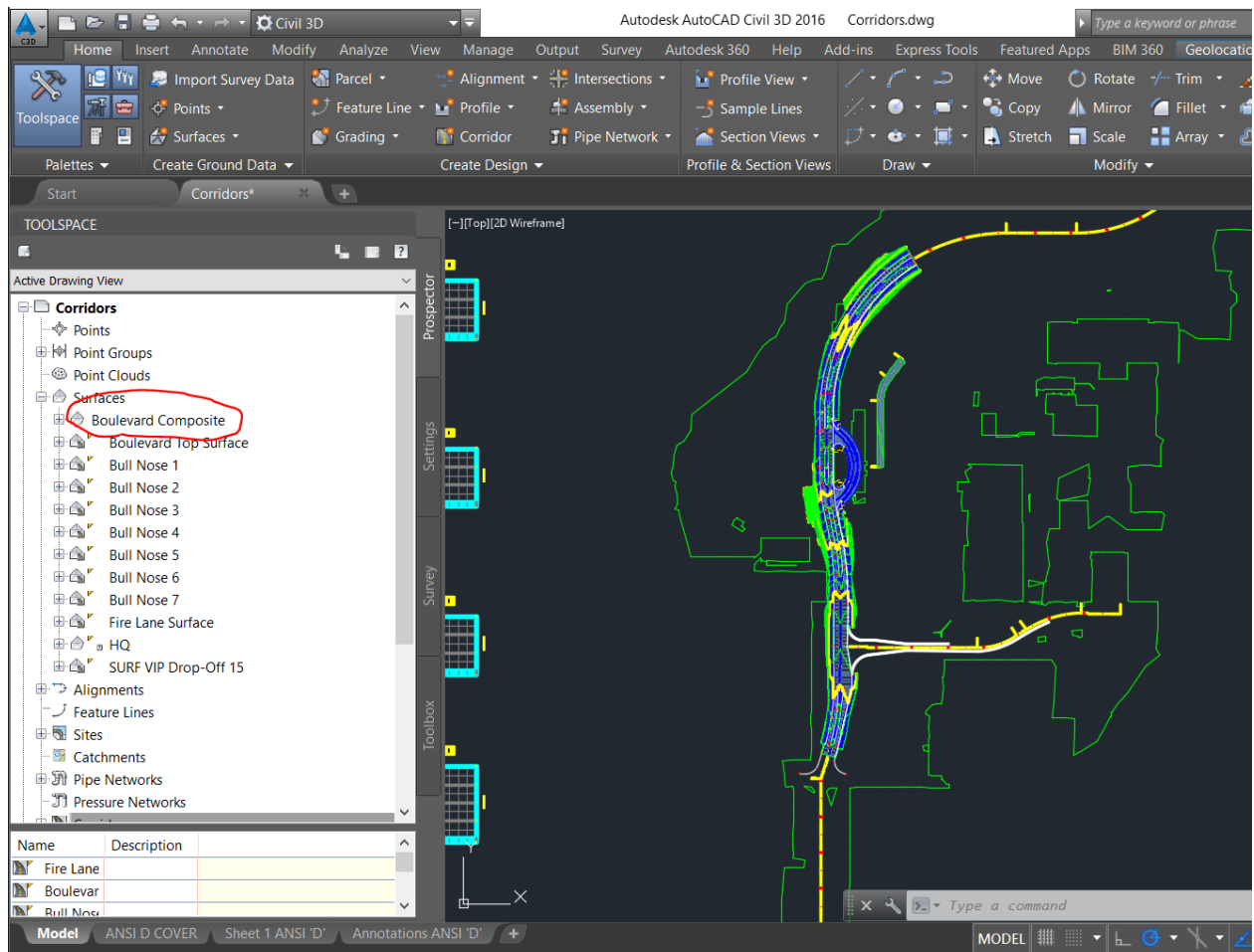
Intersections can be created using an Intersection Creation Wizard, or manually. The complex nature of the median geometry along the Boulevard Corridor made Manual Intersection creation necessary.



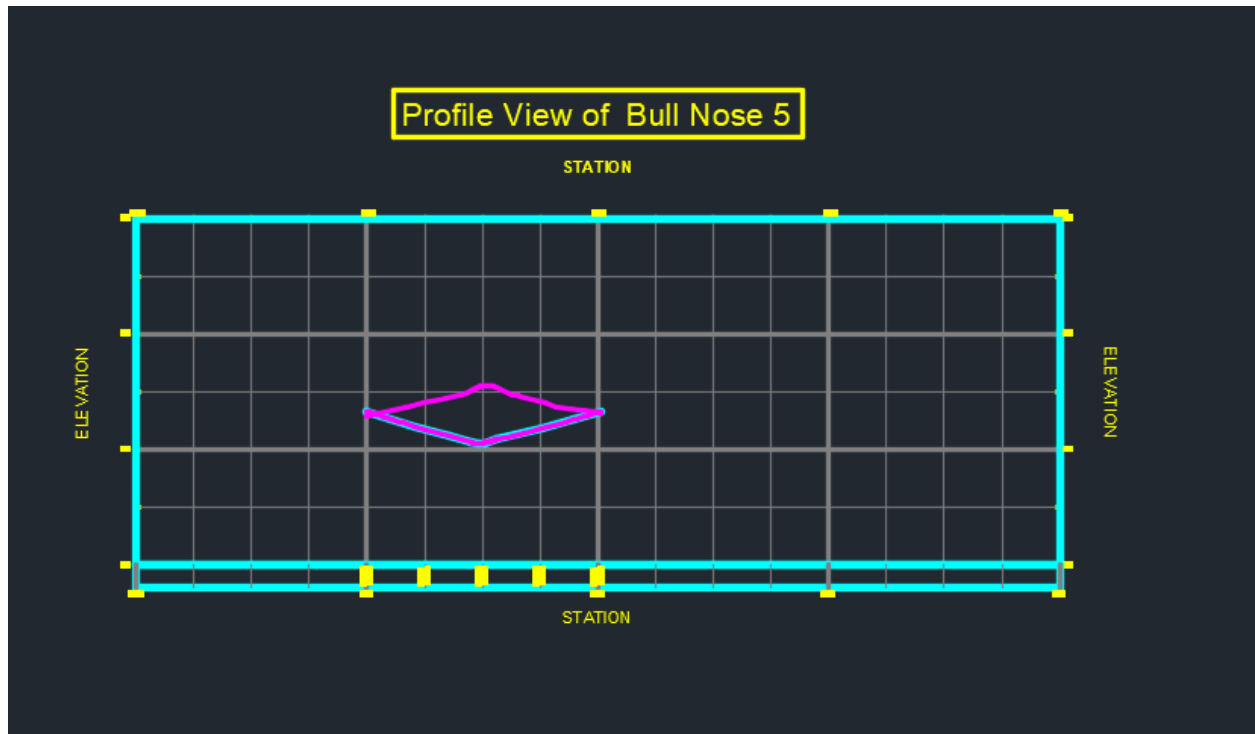
Additionally, the development of median bull noses and a section of median, which is offset from the alignment centerline, made it necessary to create separate corridors for these portions of the design.



Separate top surfaces were created for each corridor and merged into a composite surface. The VIP Corridor was similarly merged into this surface.



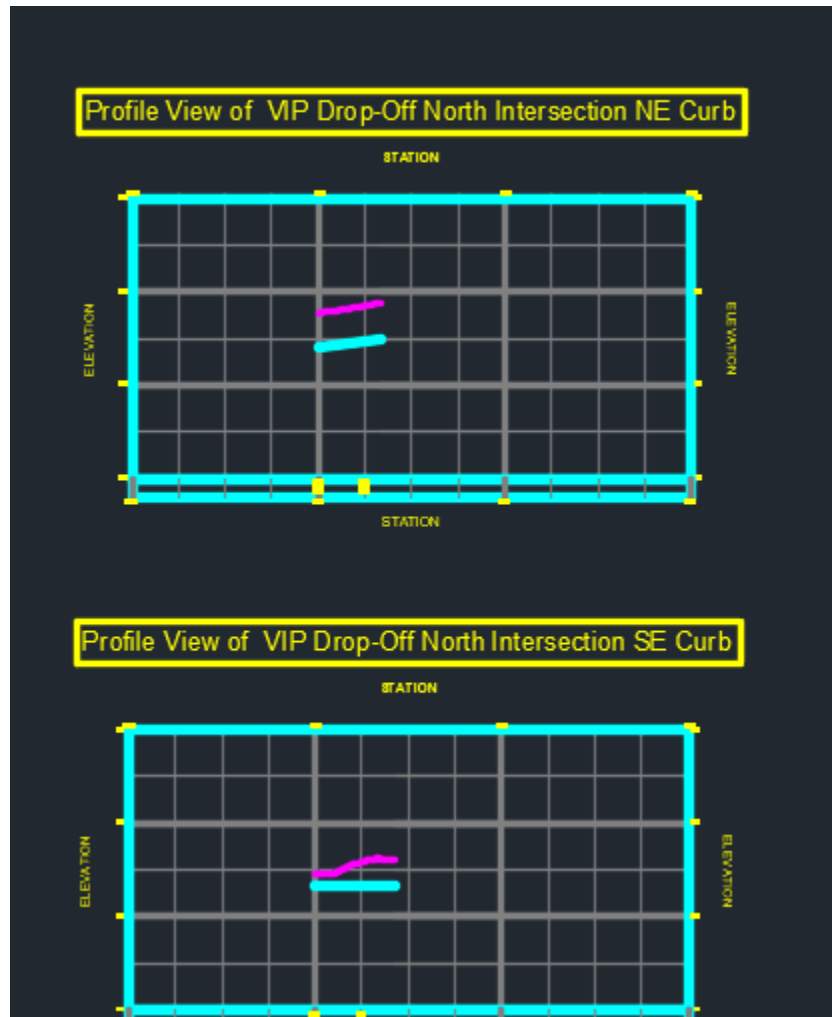
Transitional profiles were developed to facilitate the creation of median bull noses.



This allowed for the use of the roadway corridor top surface to be used in the development of the transitional profiles controlling the bull nose corridors.

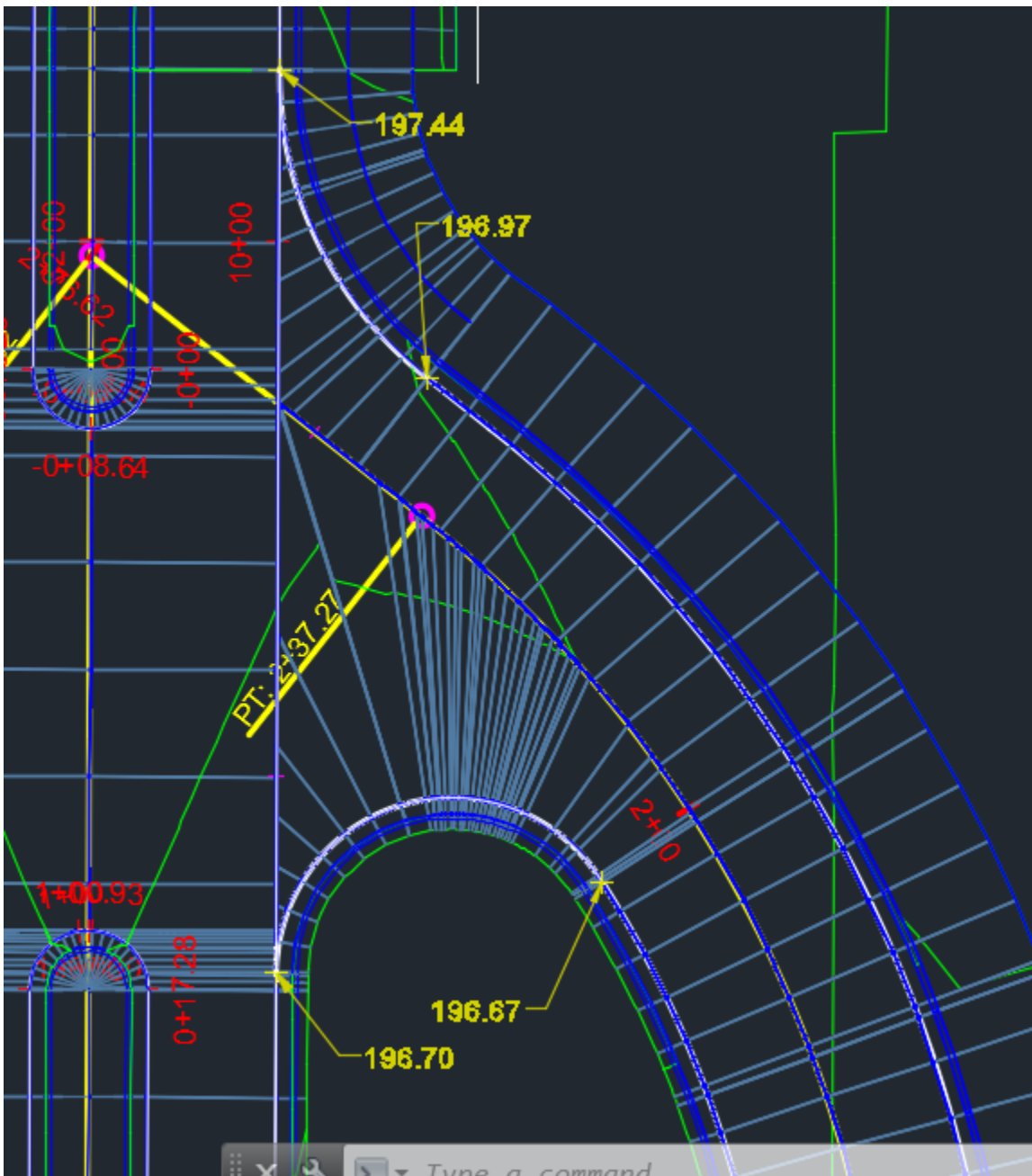


Similar transitional profiles were developed and used to manually create the VIP intersection Corridors.



Here the required top surface elevations were developed using spot elevation annotation at appropriate corridor top surface locations.



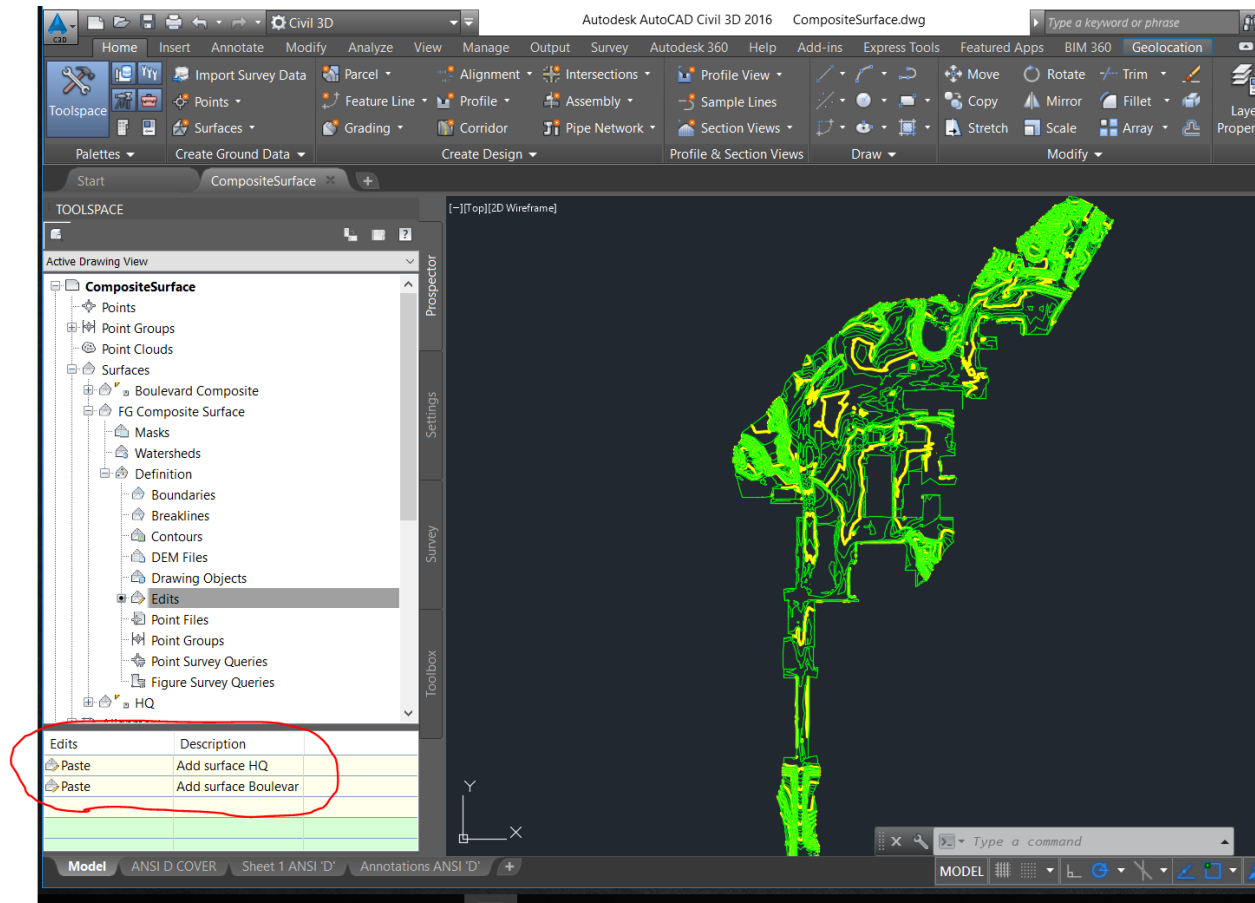


Proposed transitional profiles were then manually adjusted using the Profile Creation Tools.



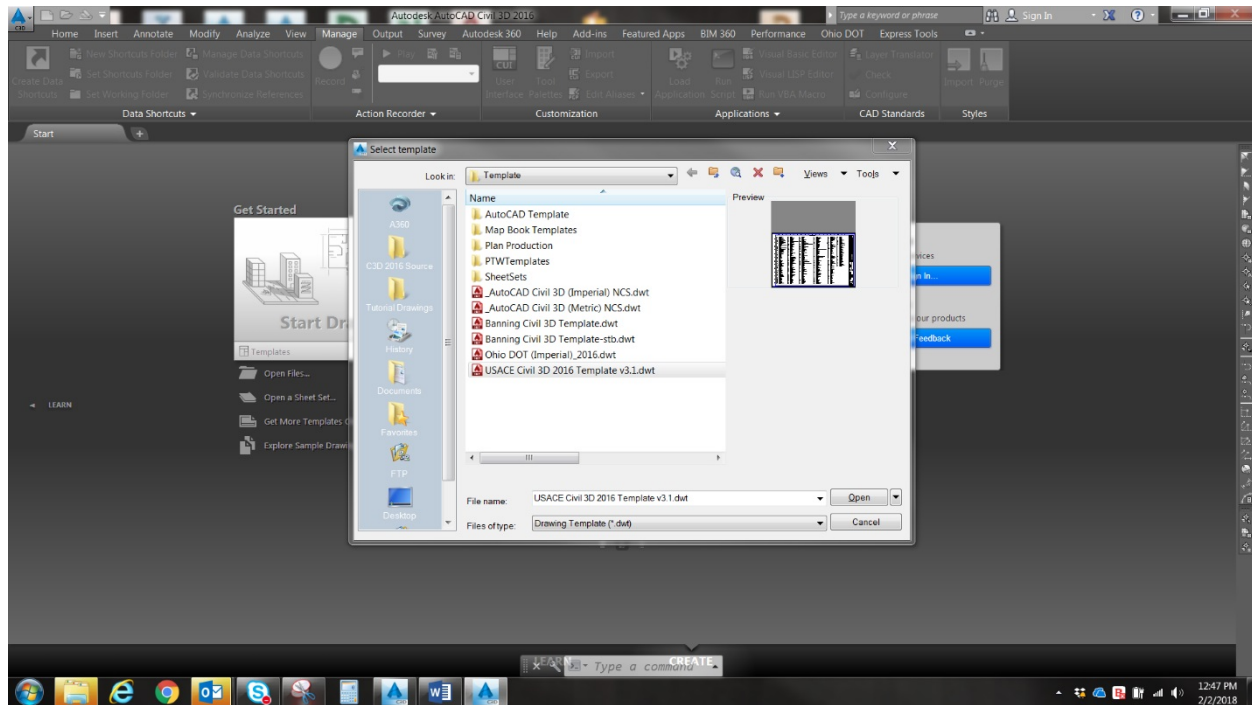
Composite Surface

A total FG composite surface was created in a separate drawing by pasting the composite Boulevard Corridor top surface to the "HQ" existing surface.



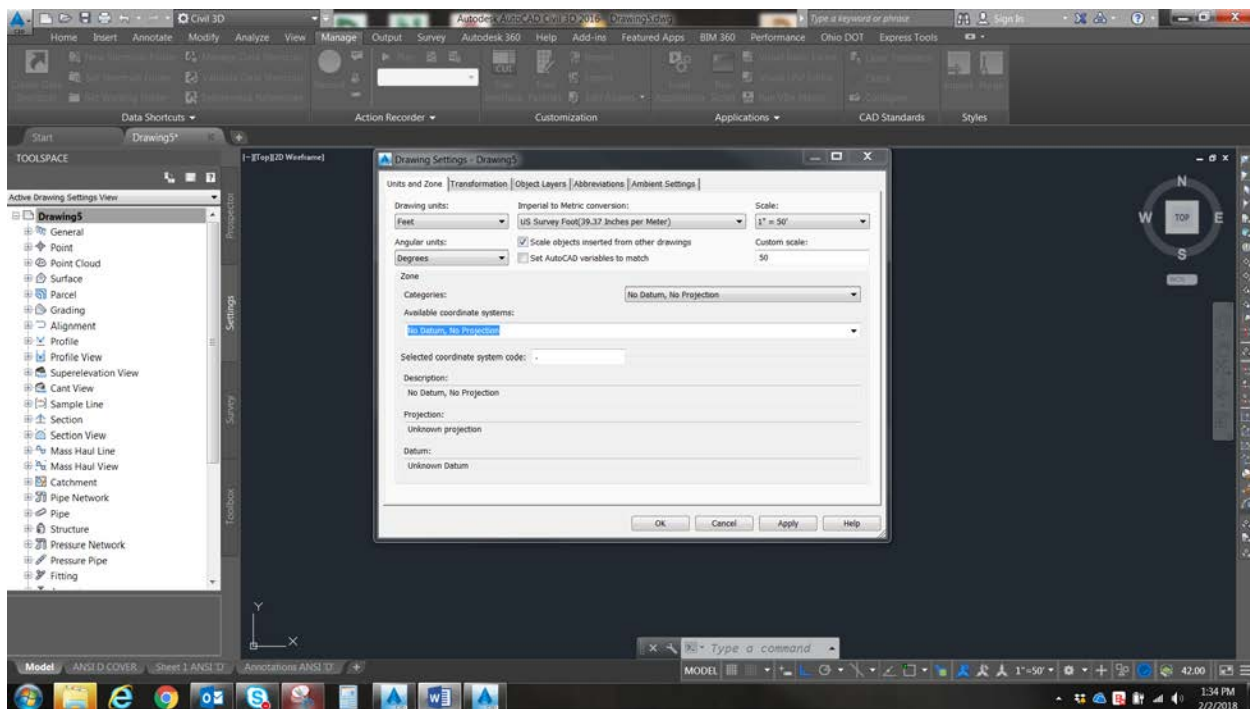
XML Surface Import

Open a new drawing using the **USACE** template.

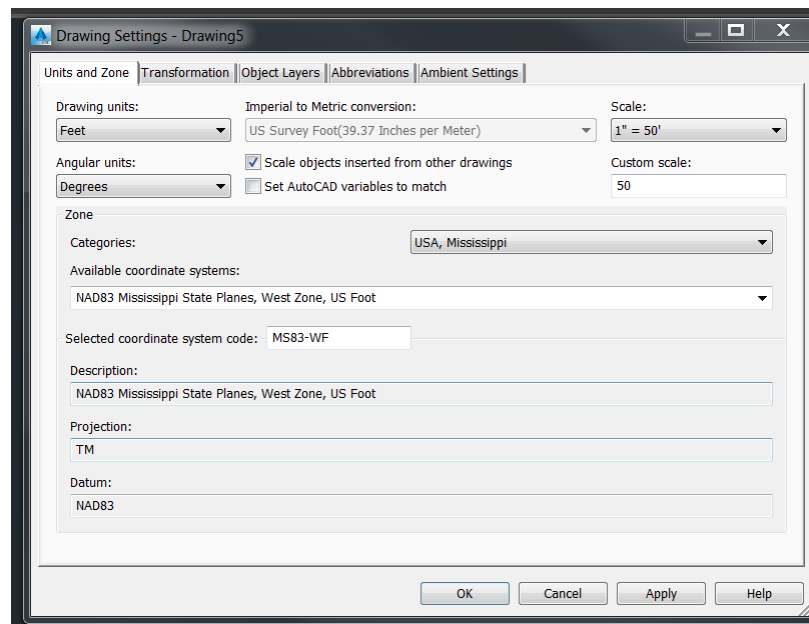


From the Settings tab of Toolspace, Right Click the drawing name (at the top the view window) and select "Edit Drawing Settings" to open the Drawing Settings dialog



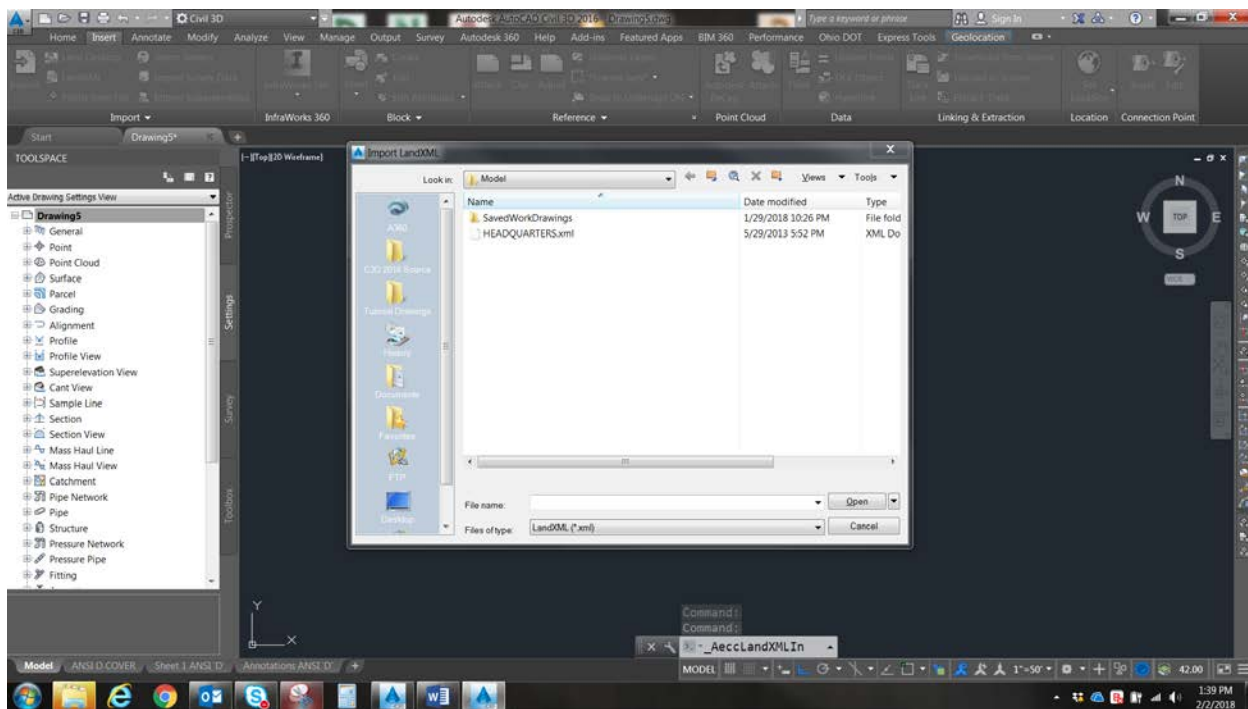


On the Units and Zone tab, set the coordinate system.

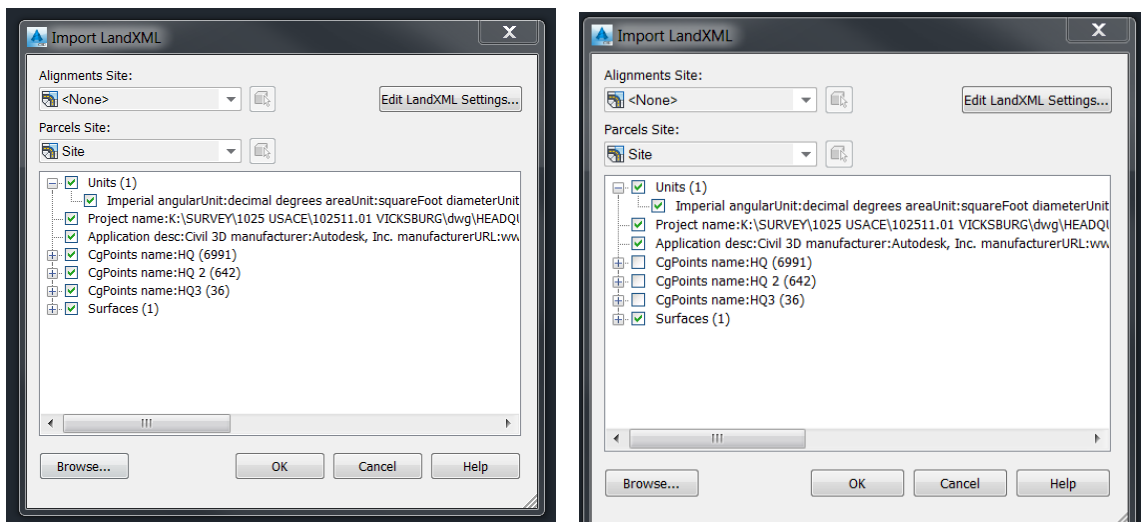


From the Insert tab>Import pane select LandXML to open the "Import LandXML" dialog.



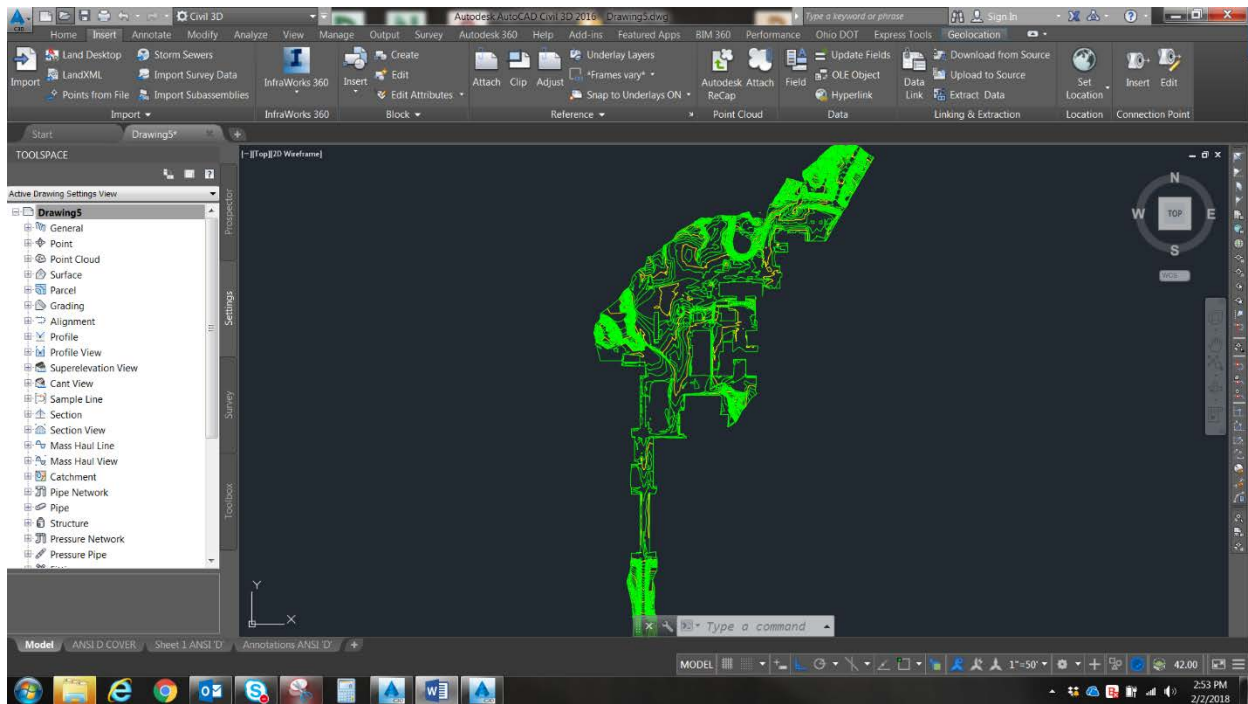


Select the desired XML file and select “Open”.



The “Import LandXML” dialog allows you to select sites, edit settings, and control what data is imported. For example, the points in this XML file can be omitted. Select OK and the XML surface is imported into the Drawing. The drawing can be associated to a Civil 3D project and saved to an appropriate file name, as required.





Cross Sections & Sample Lines

Creating Cross Sections in Civil 3D is accomplished in 2 phases:

1. **Creating Sample Lines:** physical on-screen line on baseline.
2. **Creating Section Views:** plotted grid with linework.

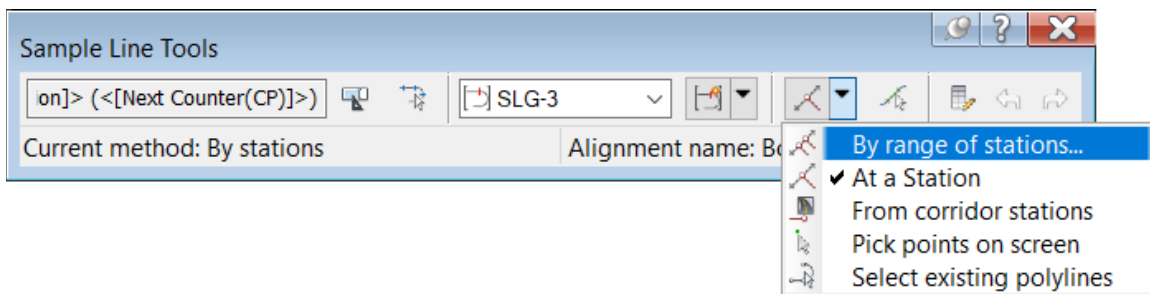
Working with Sample Lines

Like Alignments, Sample Lines are the 2D linework shown in plan view. Sample Lines host the data that will be in the Section Views (grids) and serve as the basis for Sectional Volumes (computing materials). Sample Lines recognize:

- Surfaces (in drawing or via xref)
- Corridors (in drawing or xref)
- Pipe Networks (only in drawing)

Sample Lines only need an Alignment present in drawing to be created (it is possible to create empty grids). Typically, they are perpendicular to baseline station, but can be created skewed or graphically edited. Sample Lines there have five options for creating:

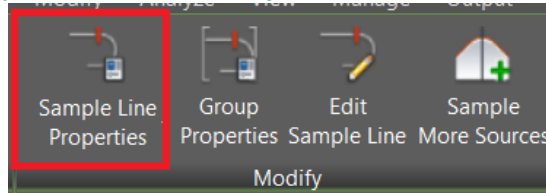
- ✂ *By range of stations: most common option. It's followed by a dialog box to set parameters*
- ✂ *At a Station: default option, users can type in station value or pick location on screen.*
- 📄 *From corridors stations: Opens dialog box to set parameters.*
- 👉 *Pick points on screen: pick single or multiple points on screen.*
- 👉 *Select existing polylines: will create sample lines from existing polylines.*



Sample Line Properties

Each Sample line can be edited individually and has its own set of properties for edits

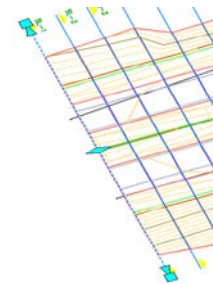
- **Tabular:** Adjust Name, Style, Data included in Sample Line
- **Graphical:** Use Grips to adjust location and length of Sample Line



Sample Line Properties - SL-2

Information | Sample Line Data | Sections | Section Views

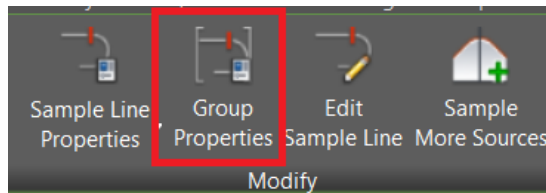
Name	Description	Type	Data Sou...	Update M...	Layer	Style	Offsets		Elevations	
							Left	Right	Minimum	M...
SLG-1 - ...			EG	Dynamic	C-ROAD-...	Standard	-30.0000'	30.0000'	638.261'	640.
SLG-1 - ...			Corridor -...	Dynamic	C-ROAD-...	All Codes	-111.9940'	30.0000'	622.080'	647.
SLG-1 - ...			Corridor -...	Dynamic	C-ROAD-...	Standard	-30.0000'	30.0000'	623.124'	627.
SLG-1 - ...			Corridor -...	Dynamic	C-ROAD-...	Standard	-30.0000'	30.0000'	623.124'	626.
SLG-1 - ...			Corridor -...	Dynamic	C-ROAD-...	Standard	-30.0000'	30.0000'	627.674'	627.
SLG-1 - ...			Corridor -...	Dynamic	C-ROAD-...	Standard	-20.0000'	20.0000'	626.486'	627.



Sample Line Group Properties

Group Properties allow you to adjust settings for all Sample Lines at once

- Modify style
- Left/Right Offsets
- Sampled data included
- Materials List (volumes)



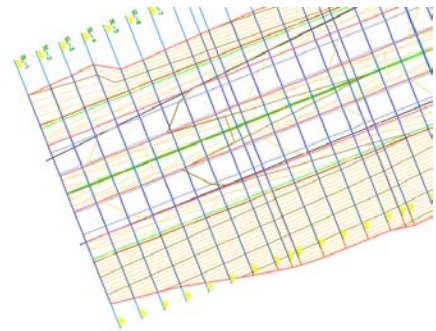
Sample Line Group Properties - SLG-1

Information | Sample Lines | Sections | Section Views | Material List

To edit multiple sample lines, use SHIFT/CTRL keys to select multiple rows and click on a cell within selection to modify.

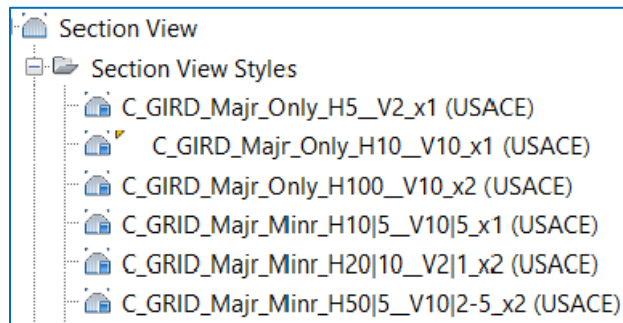
Sample lines:

No.	Name	Station	Layer	Style	Left Offset	Right Offset	Description
1	SL-1	0+00.00	C-ROAD-SAMP	Road Sampl...	30.0000'	30.0000'	
2	SL-2	0+25.00	C-ROAD-SAMP	Road Sampl...	30.0000'	30.0000'	
3	SL-3	0+50.00	C-ROAD-SAMP	Road Sampl...	30.0000'	30.0000'	
4	SL-4	0+75.00	C-ROAD-SAMP	Road Sampl...	30.0000'	30.0000'	
5	SL-5	1+00.00	C-ROAD-SAMP	Road Sampl...	30.0000'	30.0000'	



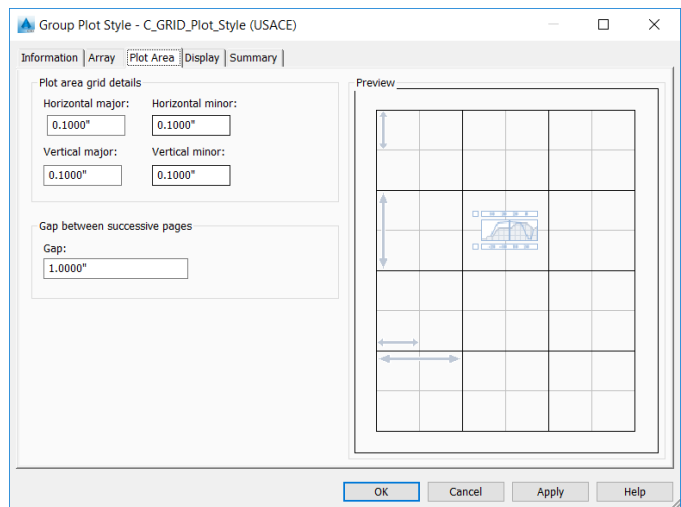
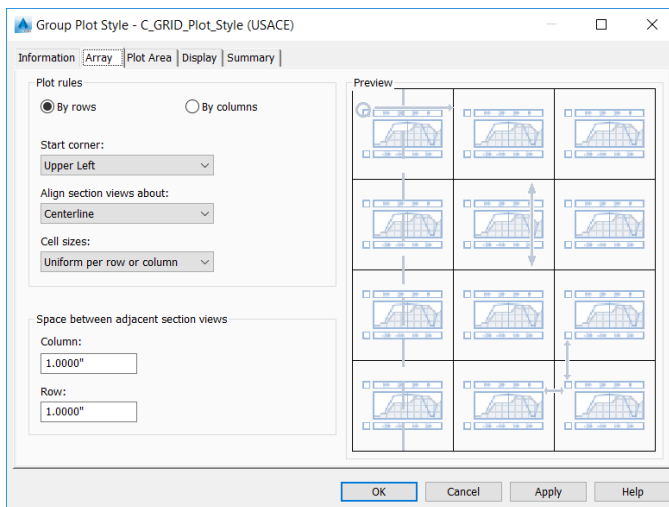
Section View Styles

Section View styles work very much like Profile View styles. Section Views styles control spacing, interval and vertical exaggeration and layers.



Group Plot Styles

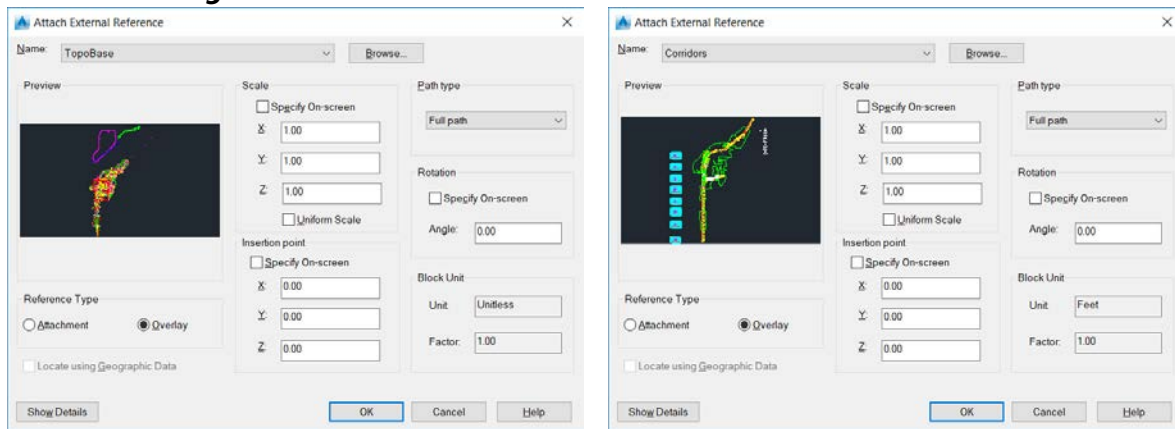
Control how Section Views are spaced out and position when created. There is a single style created: **C_GRID_Plot_Style (USACE)**



EXERCISE: Creating Sample Lines

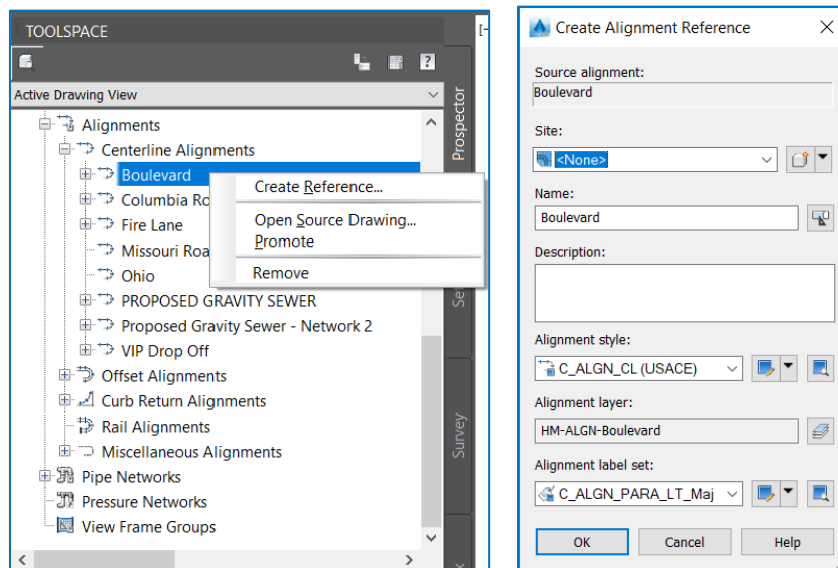
This section will begin by creating a new drawing and base drawings will be inserted as External References (Xrefs). Civil 3D can leverage some design data (Corridors & Surfaces) from base AutoCAD Xrefs to show data in cross sections. The base Alignment that will host cross section data will be brought in via Data References (Drefs) as data shortcuts. Additionally, Storm and Sewer Pipe Networks will be pulled in via Drefs.

1. Start a new drawing > use **USACE Civil 3D 2016 Template v3.1.dwt**
2. Start by setting the coordinate system. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**
3. From the **Units and Zone** tab > Selected coordinate system code: **MS83-WF**
4. Save as > **USACE Sections.dwg**
5. Create two External References (xref) to:
 - **TopoBase.dwg**
 - **Corridor.dwg**



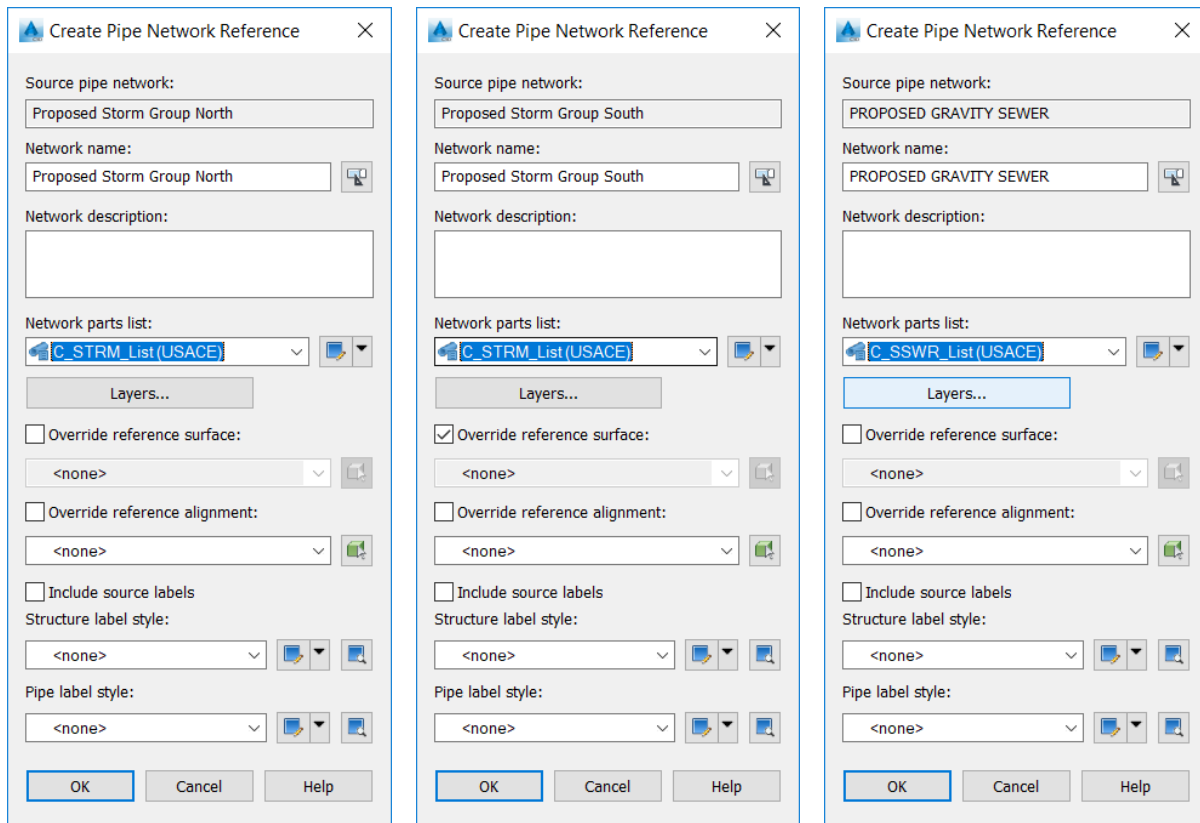
- a. Scale – unchecked
 - b. Insertion point – unchecked
 - c. Specify On screen – unchecked
 - d. Reference Type: Overlay
6. From **TOOLSPACE** > **Prospector** tab > browse to **Data Shortcut** collection > right click select > **Set Working Folder...**
 7. From dialog box > Set path to class path: **<Project Path Here>**
 8. Expand **Alignments** collection > expand **Centerline Alignments** > Right on **Boulevard** > select Create Reference...
 - a. Accept the defaults
 - b. Click **OK** button



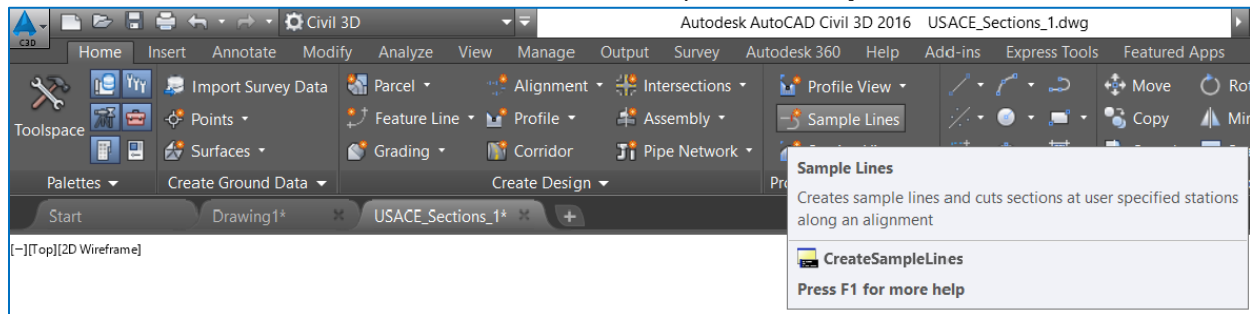


9. Expand **Pipe Networks** collection > Right on **Proposed Storm Group North** > select Create Reference...
 - a. Network parts list: **C_STRM_List (USACE)**
 - b. Leave the other options as default
 - c. Click **OK** button
10. Expand **Pipe Networks** collection > Right on **Proposed Storm Group South** > select Create Reference...
 - a. Network parts list: **C_STRM_List (USACE)**
 - b. Leave the other options as default
 - c. Click **OK** button
11. Expand **Pipe Networks** collection > Right on **PROPOSED GRAVITY SEWER** > select Create Reference...
 - a. Network parts list: **C_SSWR_List (USACE)**
 - b. Leave the other options as default
 - c. Click **OK** button





12. From Ribbon > **Home** tab > **Profile & Section Views** panel > **Sample Lines** button

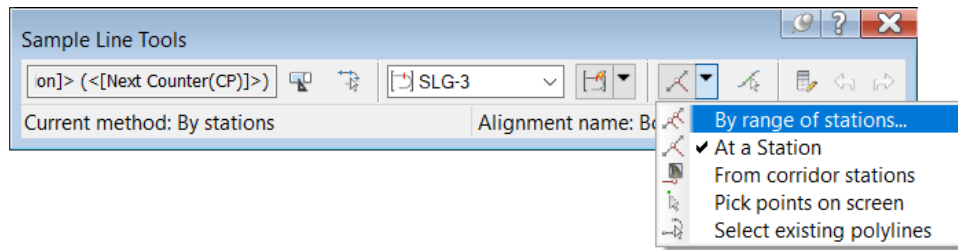


13. Select **Boulevard** Alignment from screen or press enter to select from screen

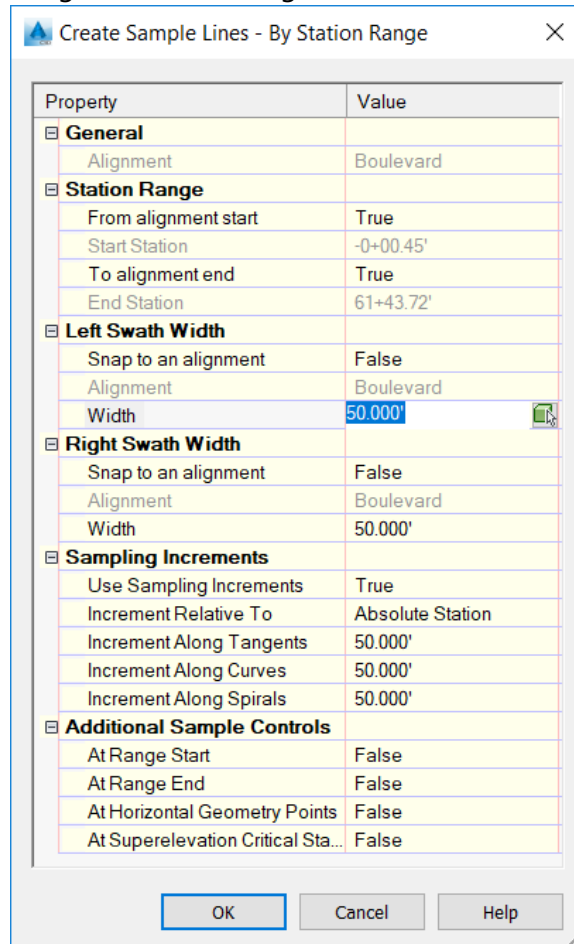
14. From Select data sourced widow > set Styles for Data Sources

Type	Data Source	Sample	Style	Section layer	Update Mode
	PROPOSED GRAVITY SEWER	<input checked="" type="checkbox"/>		HM-PIPE-SEC...	Dynamic
	Proposed Storm Group North	<input checked="" type="checkbox"/>		HM-PIPE-SEC...	Dynamic
	Proposed Storm Group South	<input checked="" type="checkbox"/>		HM-PIPE-SEC...	Dynamic
	HQ	<input checked="" type="checkbox"/>	V_SECT_Existing (USACE)	HM-SECT	Dynamic
	Fire Lane	<input checked="" type="checkbox"/>	C_CORR_Proposed (USACE)	HM-CORR-SE...	Dynamic
	Fire Lane Fire Lane Surface	<input checked="" type="checkbox"/>	C_SECT_Design (USACE)	HM-SECT	Dynamic
	Boulevard	<input checked="" type="checkbox"/>	C_CORR_Proposed (USACE)	HM-CORR-SE...	Dynamic
	Boulevard Boulevard Top Su...	<input checked="" type="checkbox"/>	C_SECT_Design (USACE)	HM-SECT	Dynamic

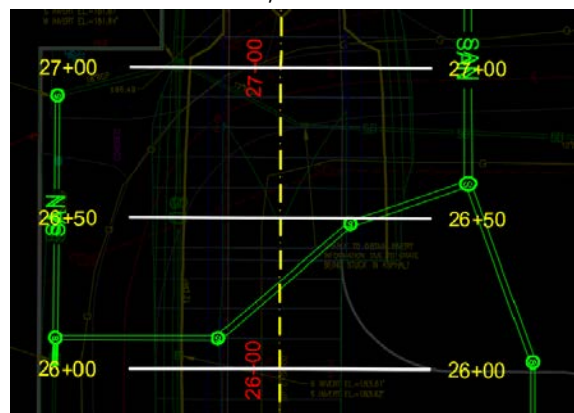
15. From the Sample Line Tools dialog bar > **Sample line creation method** drop down button > select **By range of stations...** button



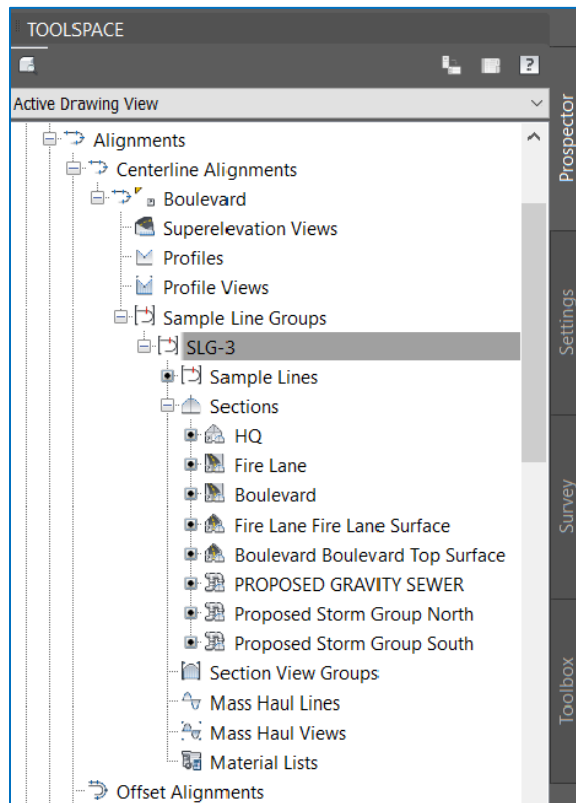
16. From **Crate Sample Lines** dialog box > Set dialog box values to match like below:



17. Sample lines are created along centerline at specified interval. Command is still active to allow to create more sample lines. Hit **ENTER** once to finish command, labels will then automatically appear.



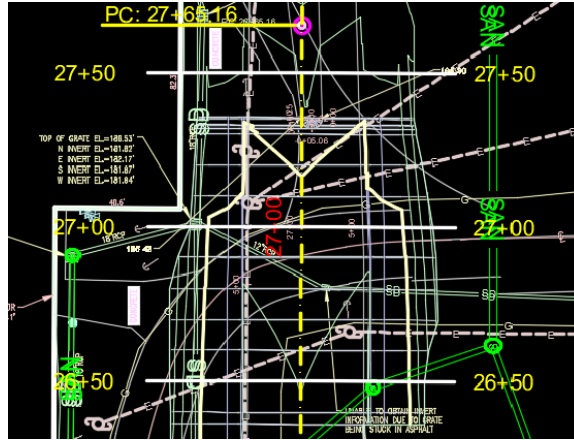
18. From the TOOLSPACE > **Prospector** tab > **Alignments** collection > **Centerline Alignments** collection > **Boulevard** > **Sample Line Groups** collection > **SLG-3** collection > review collections there



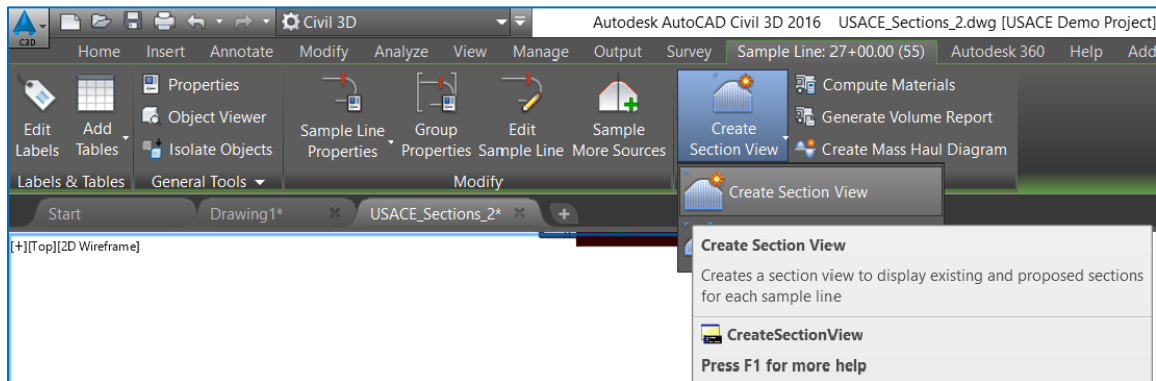
EXERCISE: Creating Single Section View

With Sample Lines created, it is possible to create a single section view at any sampled station.

1. Open **USACE_Sections_2.dwg**
2. Select any Sample Line on screen > in this example line on station **27+00** is selected.

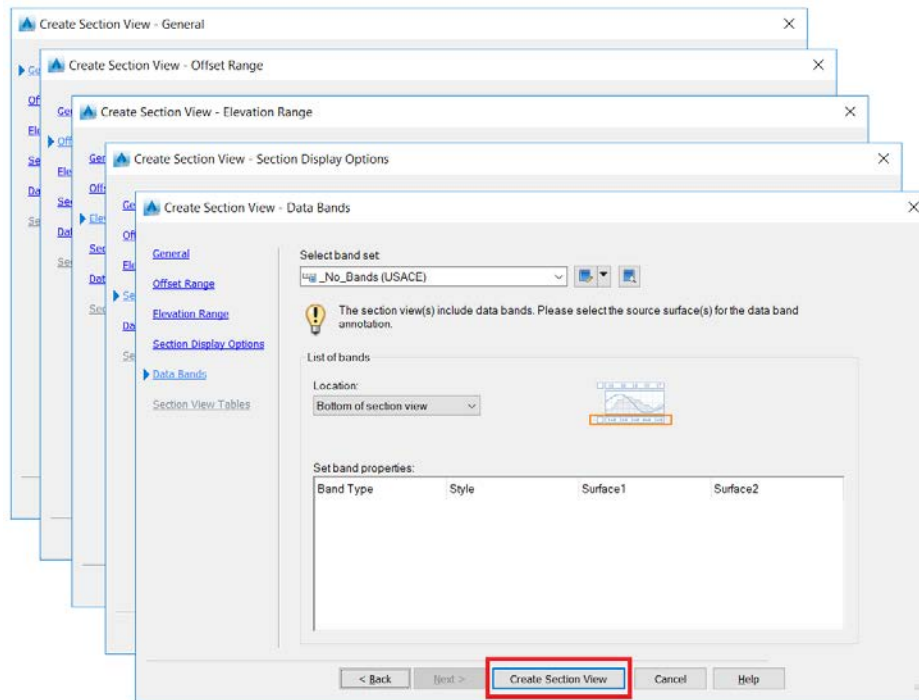


3. From Contextual Ribbon > **Launch Pad** panel > **Create Section View** drop down > **Create Section View** button

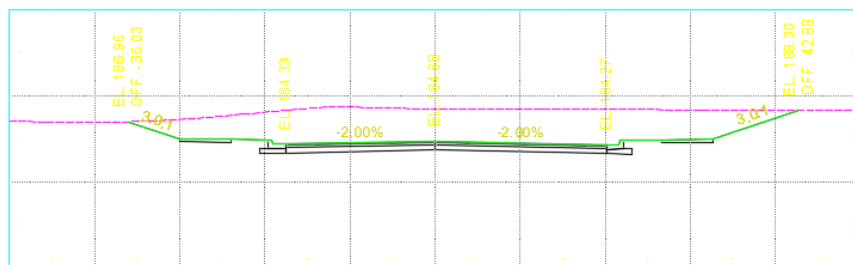


4. Step through the wizard and Accept ALL defaults. From **Create Section View** dialog box > pick the **Create Section View** button



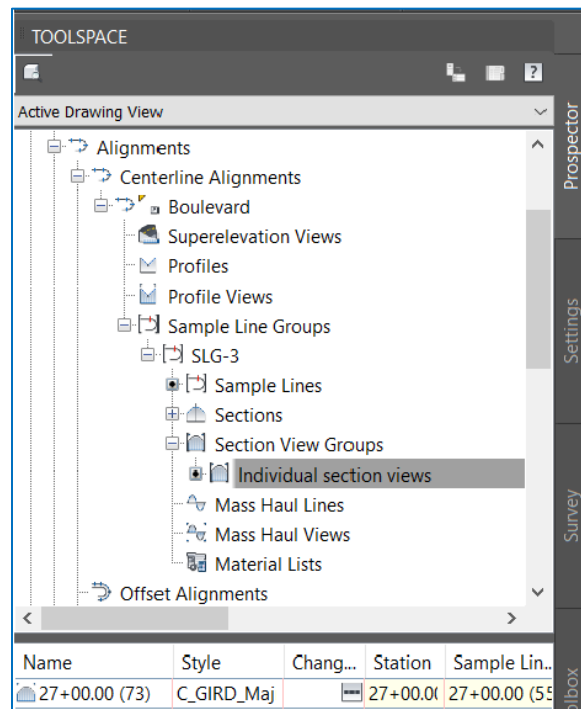


5. Pick point on right view port to insert Section View



6. Crated views can be tracked from within **TOOLSPACE** > **Prospector** tab > **Alignments** collection > **Centerline Alignments** collection > **Sample Line Groups** collection > select **Individual section views**





This process supports the need to create single-sections views when needed.

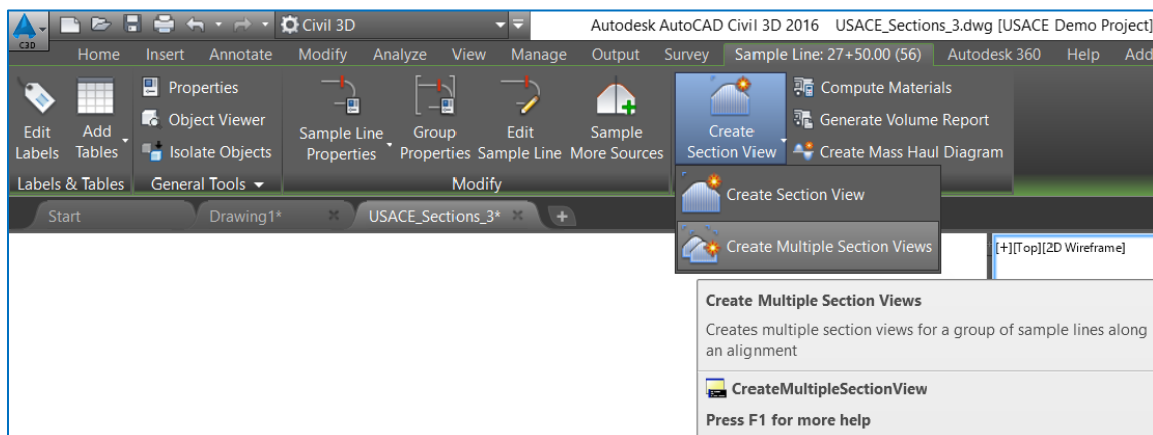


EXERCISE: Creating Multiple Section Views – “Draft Mode”

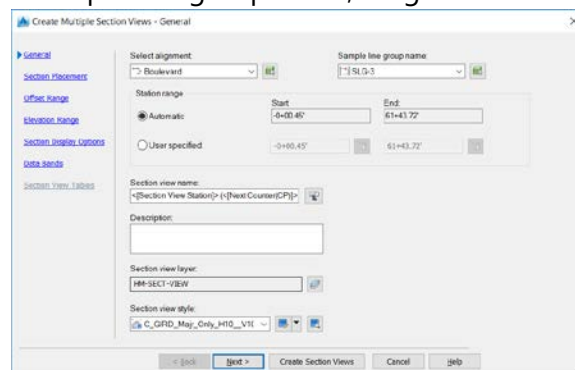
As easy as it is to create single views, when the need to create a range of sections use the Create Multiple Sections Views command. Civil 3D presents two Placement Options for users:

- **Production mode:** *will be shown in a later section.*
Specifies a drawing template to use for creating production-ready section sheets. Use this option if you intend to use the Create Section Sheets command to generate paper space layouts that contain section views.
- **Draft mode:** *method shown below in exercise.*
Specifies that section views will be created in a grid in model space without using a template. Use this option during draft stages. A section view group created with this option cannot be used with the Create Section Sheets command.

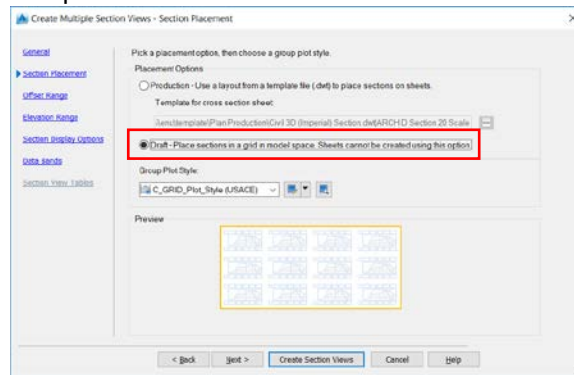
1. Continue working from previous drawing or Open **USACE_Sections_3.dwg**
2. Select any Sample Line on screen
3. From Contextual Ribbon > **Launch Pad** panel > **Create Section View** drop down > **Create Multiple Section Views** button



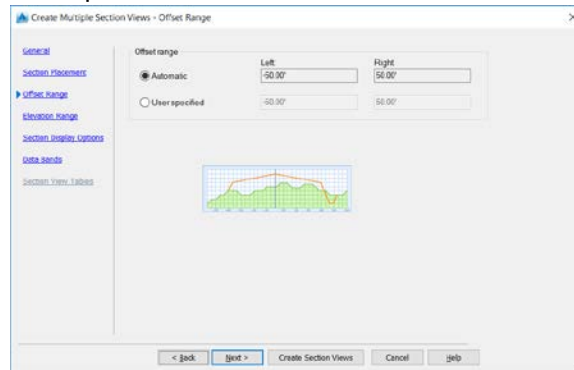
4. Step through the Create Multiple Section Views wizard:
 - a. **General:** Use this page to specify basic information about the section views, including the parent alignment and sample line group name, range of stations, description, style, and layer.



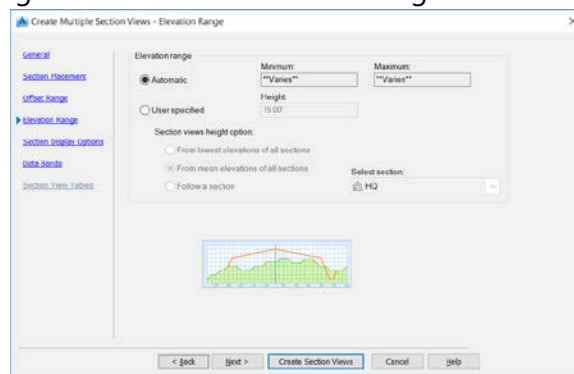
- b. **Section Placement:** Use this page to control the placement of the sections in model space. Select the **Draft** mode option.



- c. **Offset Range:** Use this page to specify the offset range to which the section views are drawn. Should default to left/right swaths width value when creating sample lines. If set to "Automatic" grid will resize itself if sample line is edited.

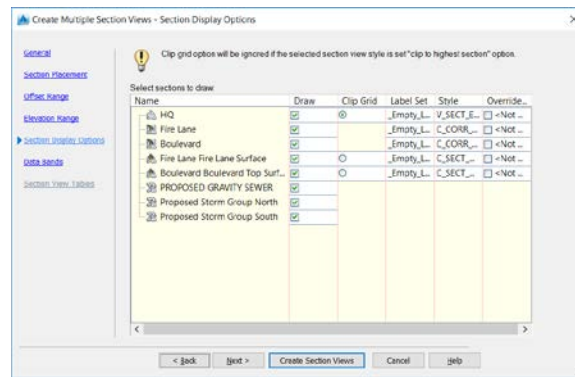


- d. **Elevation Range:** Use this page to specify the elevation properties of the selected section view. If set to "Automatic" grid will resize itself to show highest and lowest sampled data.

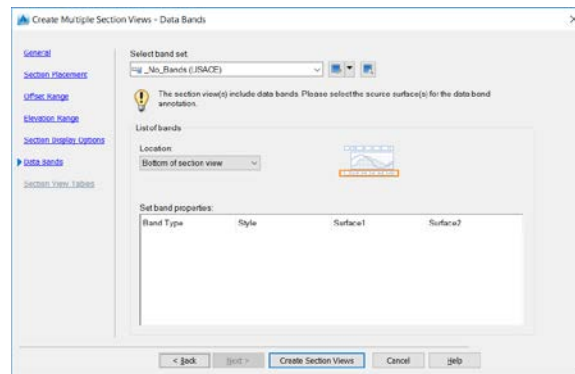


- e. **Section Display Options:** allows users to specify what sampled data to Draw, Style and Labels to use.



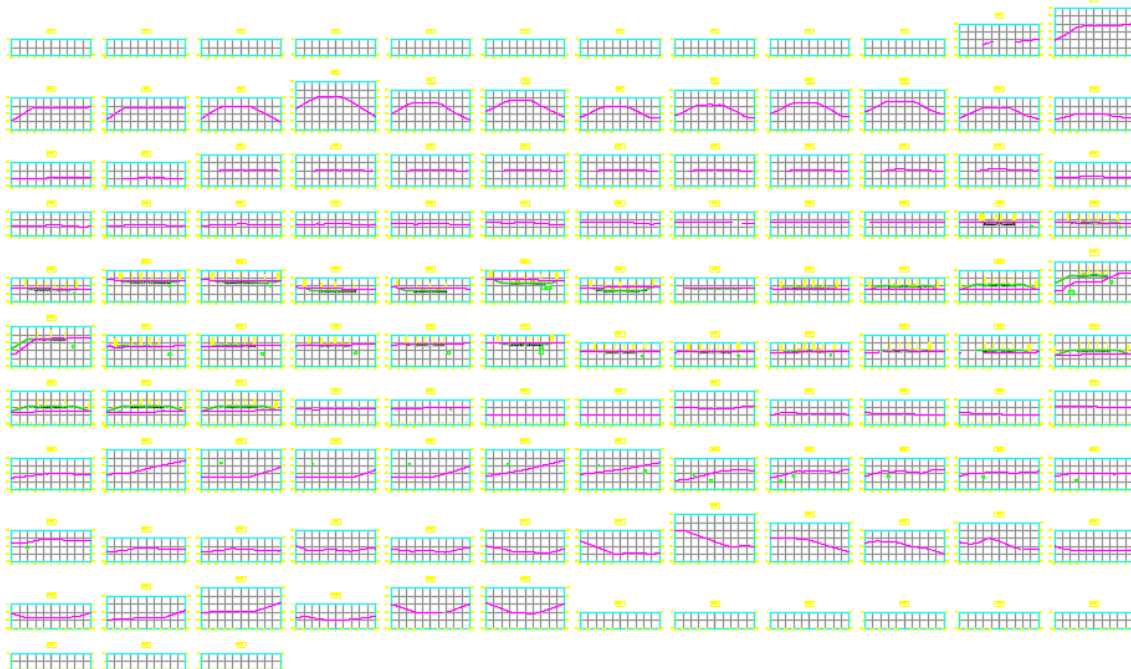


- f. **Data Bands:** Use this page to specify the properties of the data bands associated with the section view.

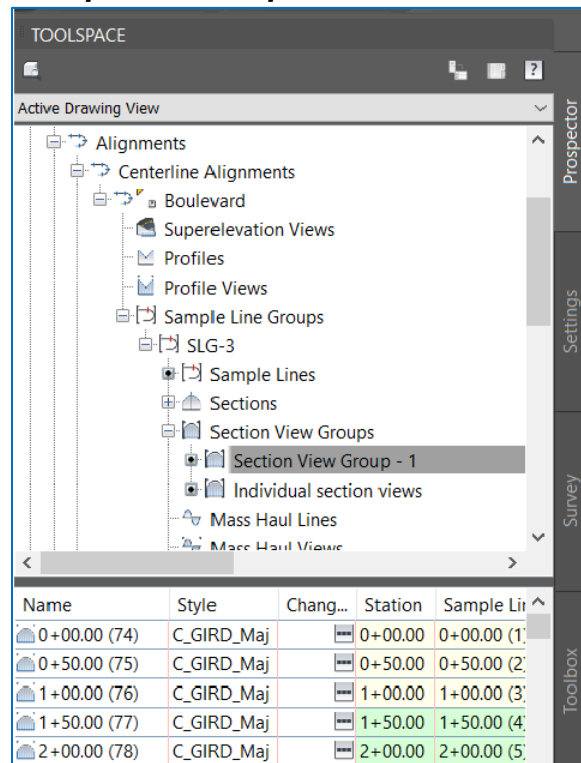


- g. **Section View Tables:** Use this page to set volume table properties for the section view.
<Only active if Materials have been Computed>

5. Once the above options are set > click the **Create Section Views** button to exit and create views.
6. Pick point on right view port to insert all Section Views. Selected point must be somewhere that has enough space for Section Views to stack from lower left to upper right.



7. Created views can be tracked from within **TOOLSPACE** > **Prospector** tab > **Alignments** collection > **Centerline Alignments** collection > **Sample Line Groups** collection > select **Individual section views**



A later exercise will explore the use of the **"Production"** mode to generate sheets

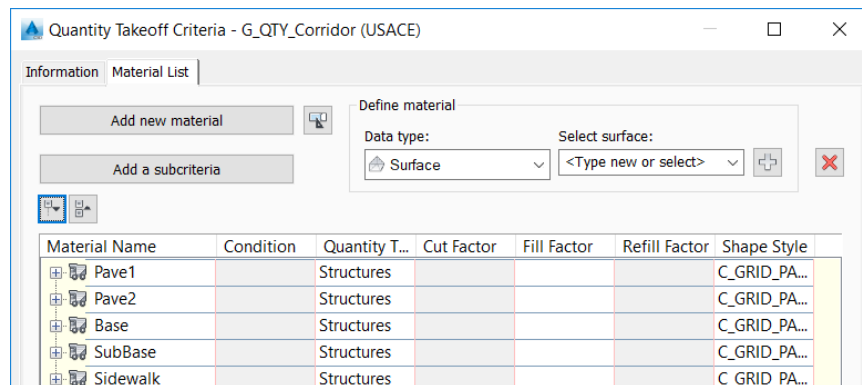
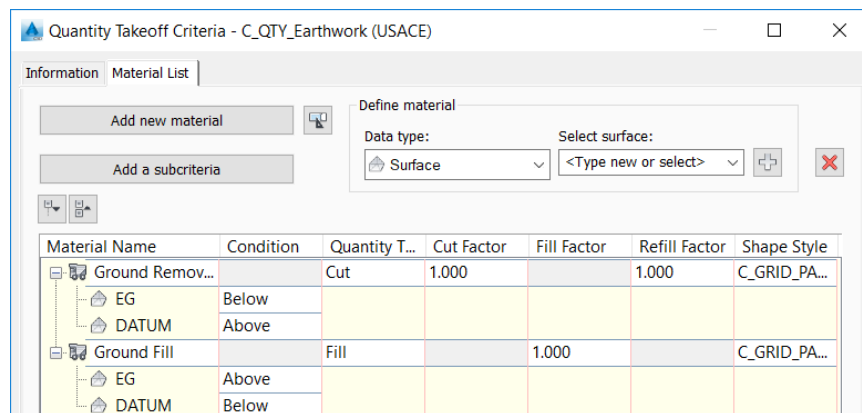
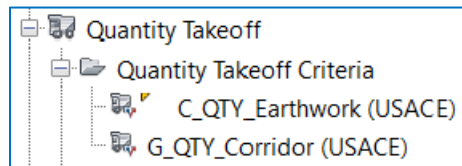


Working with Section Views: Quantity Takeoff Configuration

Once Sample Lines have been created sectional volumes can be computed. There are two main elements are used to calculate sectional volumes:

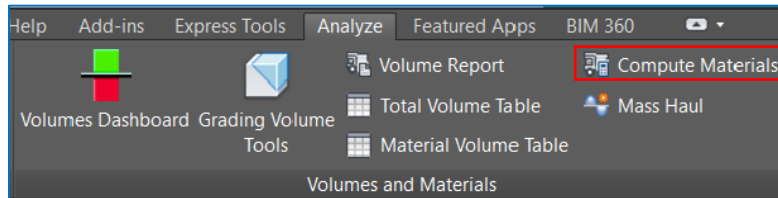
- *TIN Surfaces (earthwork)*
- *Corridor Shapes (select material)*

Configuration for this can be found from TOOLSPACE > **Settings** tab > **Quantity Takeoff** > **Quantity Takeoff Criteria**. There are two main Criteria set up in template:



Working with Section Views: Computing Materials

Sectional Volumes are calculated from Ribbons **Analyze** tab > **Volumes and Materials** panel




After Materials are calculated sectional volumes can be displayed three ways:

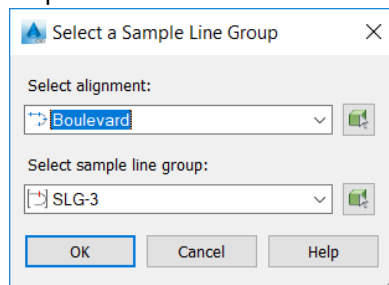
- *Automatically in section views*
- *Imported into screen full table or appended to their matching station in each section view.*
- *Exported to a report as XML or XLS file.*

EXERCISE: Computing Materials - Earthwork

1. Open **USACE_Sections_5.dwg**

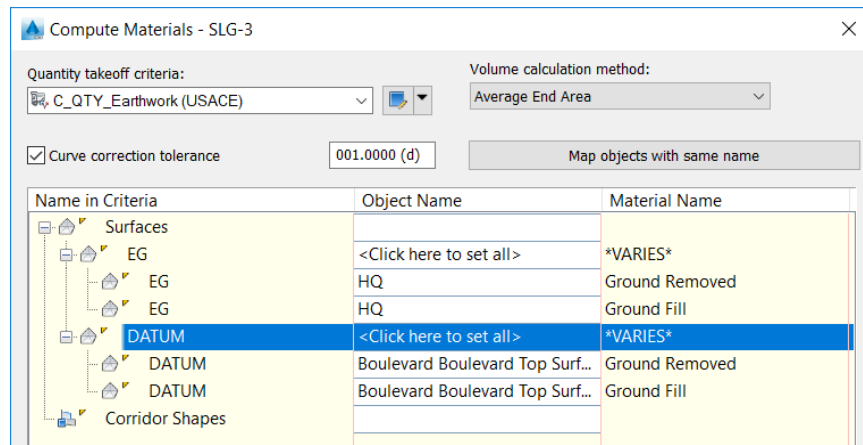
2. From the Ribbon **Analyze** tab > **Compute Materials** button 

3. Dialog box will default to the only Alignment and Sample Line Group in drawing. Only Alignments with created Sample Lines will be available from drop down.

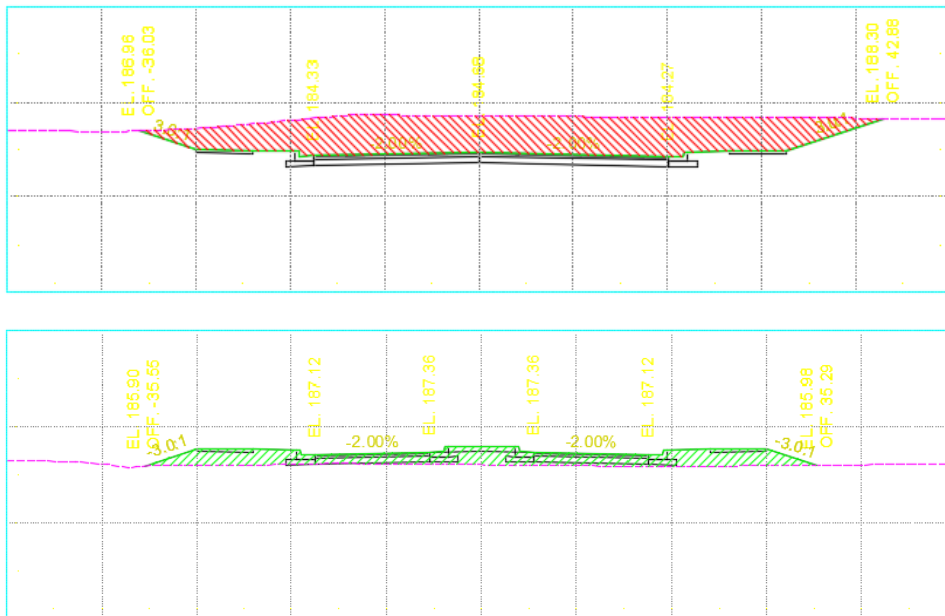


4. From the **Compute Materials** dialog box
- Quantity takeoff criteria > **C_QTY_Earthwork (USACE)**
 - Set Surfaces:
 - EG: **HQ**
 - DATUM: **Boulevard Top Surface**
 - Click **OK** when done.





5. Once the dialog box is closed, pan around model space to view hatch patterns that were automatically created to showing cut and fill.

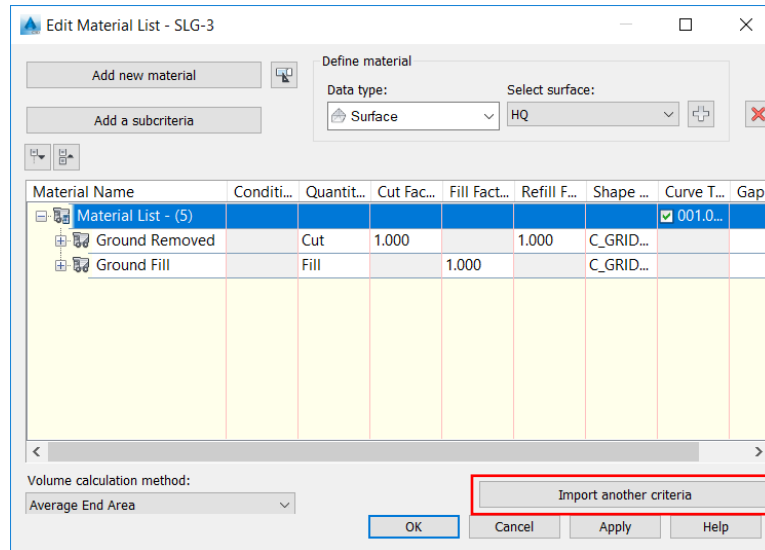


EXERCISE: Computing Materials – Corridor Materials

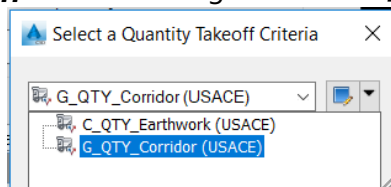
1. Open **USACE_Sections_6.dwg**

2. From the Ribbon **Analyze** tab > **Compute Materials** button 

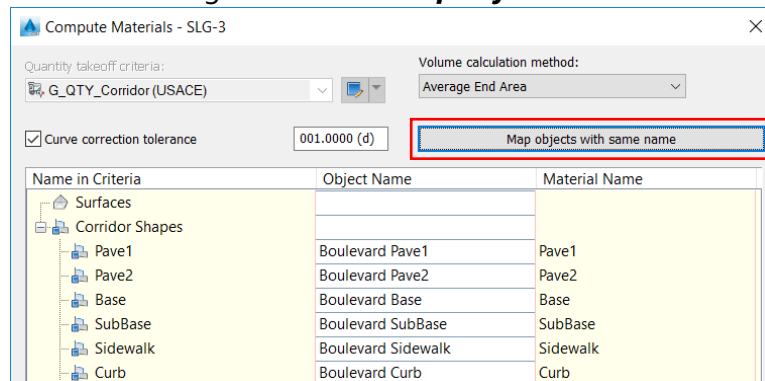
3. Dialog box will be different from the initial box as a Material List already exists > select the **Import another criteria** button



4. From the Select a **Quantity Takeoff Criteria** dialog box > use **G_QTY_Corridor (USACE)**

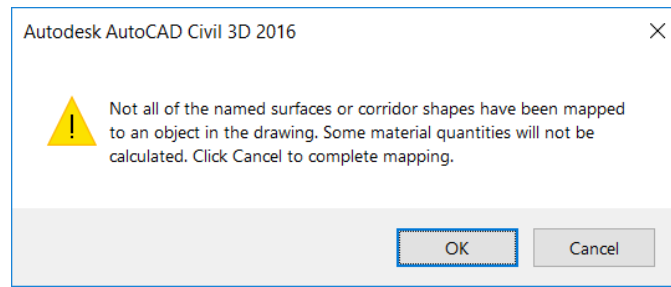


5. From the **Compute Materials** dialog box > select **Map objects with same name** button.

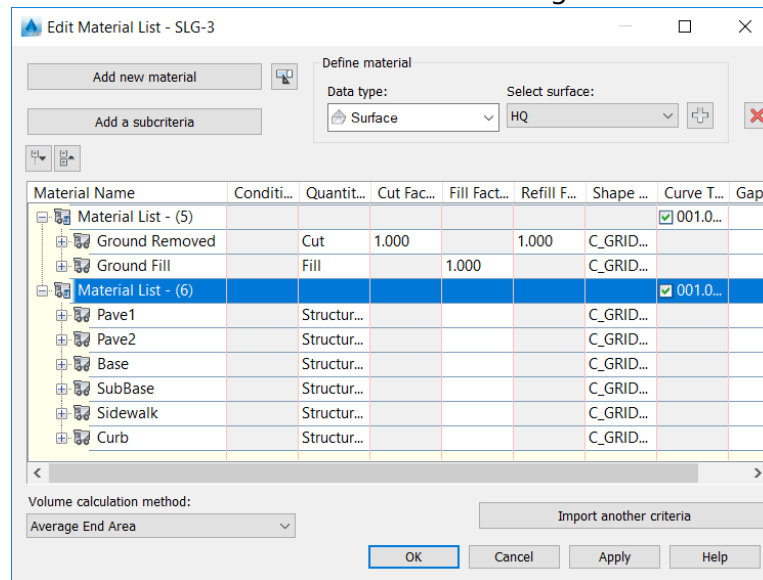


6. A message might pop up, because of the lengthy list not all materials will be assigned.





7. The added material will be seen in the **Edit Material List** dialog box



8. Rename Material List to be more descriptive of materials: **Earthwork** and **Corridor**
9. Once done, exit dialog box by clicking the **OK** button.
10. Like before, hatch patterns will be added to Section Views automatically

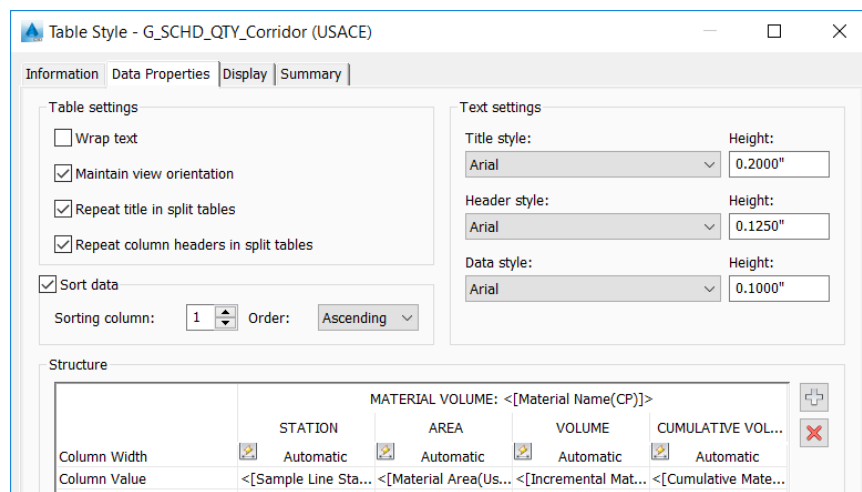
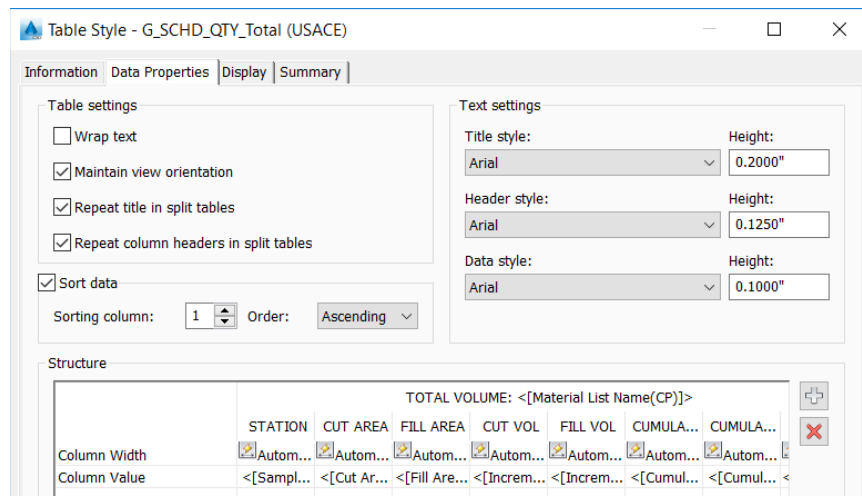
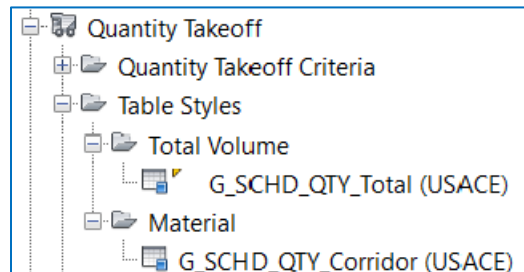


Working with Section Views: Creating Tables & Reports

There are 2 main options for creating tables:

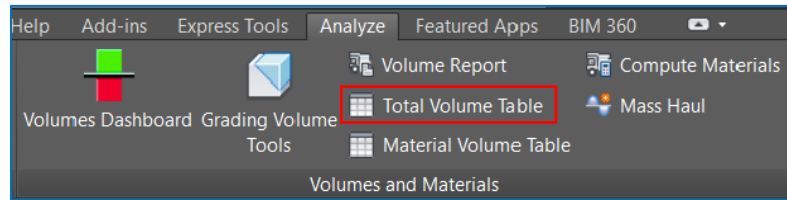
- **Total Volume Table:** best suited for Cut and Fill comparison of Surface Earthwork materials
- **Material Volume Table:** will create single material tables

Configuration for this can be found from TOOLSAPCE > **Settings** tab > **Quantity Takeoff** > **Table Styles**. There are two main Tables Styles set up in template:

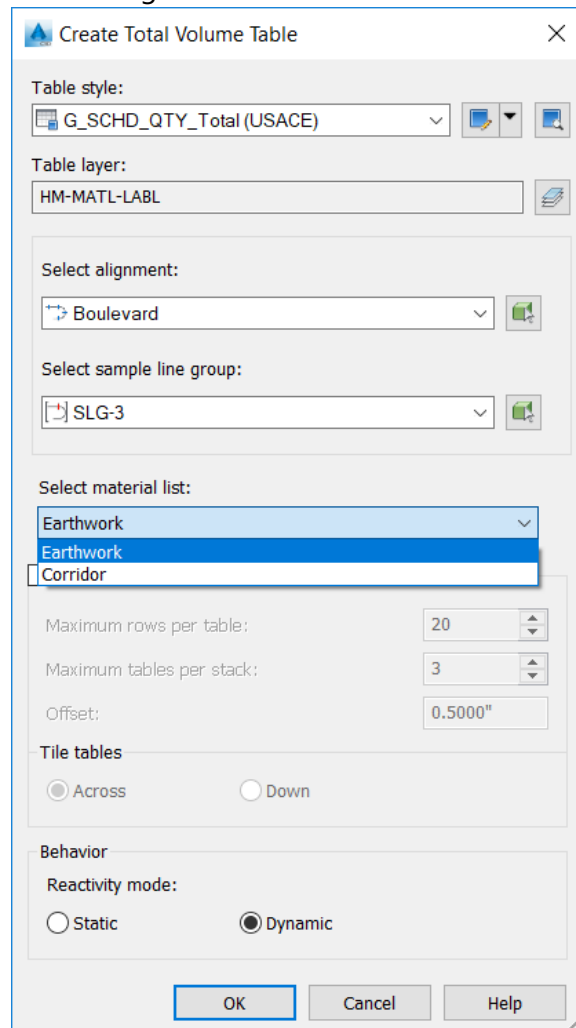


EXERCISE: Create Total Volume Table (earthwork)

1. Open **USACE_Sections_7.dwg**
2. From the Ribbon > **Home** tab > **Analyze** tab > **Volumes and Materials** panel > **Total Volume Table** button



3. From **Create Total Volume Table** dialog box > Select material list > **Earthwork**



4. Pick the **OK** button
5. From model space select point on model space to insert table



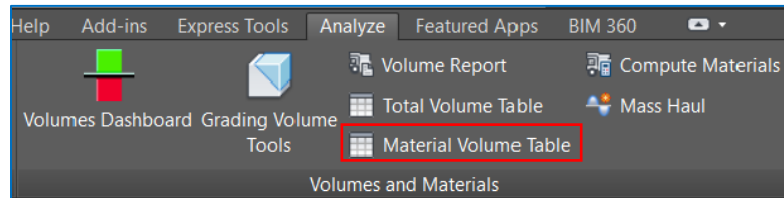
TOTAL VOLUME: Earthwork							
STATION	CUT AREA	FILL AREA	CUT VOL	FILL VOL	CUMULATIVE CUT VOL	CUMULATIVE FILL VOL	NET VOL
0+00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1+50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2+00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2+50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59+00.00	0.00	0.00	0.00	0.00	2883.19	7630.64	-4787.46
59+50.00	0.00	0.00	0.00	0.00	2883.19	7630.64	-4787.46
60+00.00	0.00	0.00	0.00	0.00	2883.19	7630.64	-4787.46
60+50.00	0.00	0.00	0.00	0.00	2883.19	7630.64	-4787.46
61+00.00	0.00	0.00	0.00	0.00	2883.19	7630.64	-4787.46

6. Review table on screen

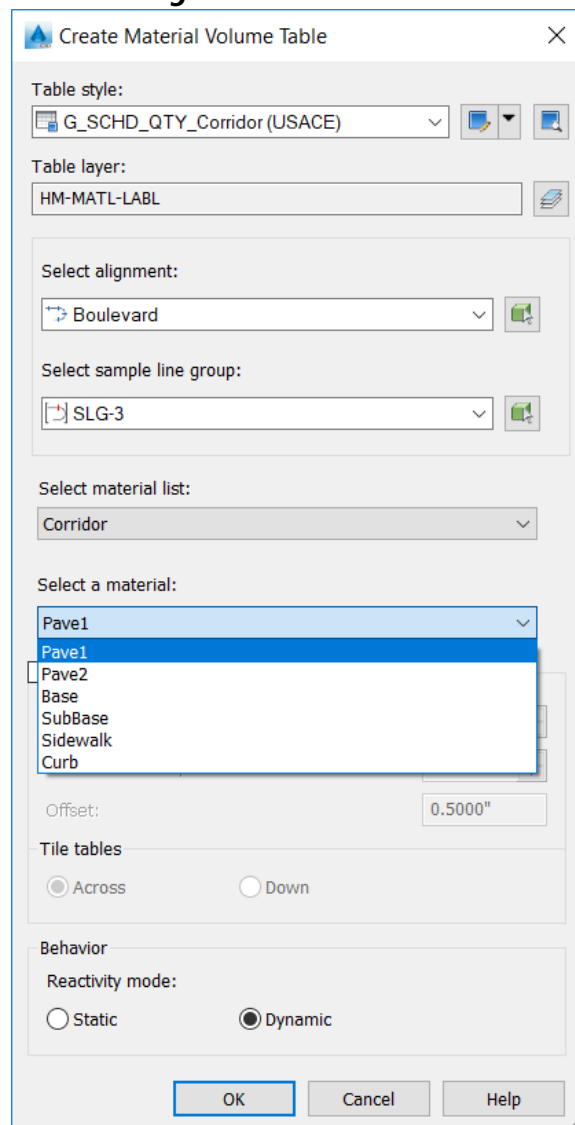


EXERCISE: Create Material Volume Table (corridor)

1. Continue working from previous file or OPEN **USACE_Sections_7.dwg**
2. From the Ribbon > **Home** tab > **Analyze** tab > **Volumes and Materials** panel > **Material Volume Table** button



3. From **Create Total Volume Table dialog** box > Select material list > **Corridor** and a Material



4. Pick the **OK** button
5. From model space select point on model space to insert table



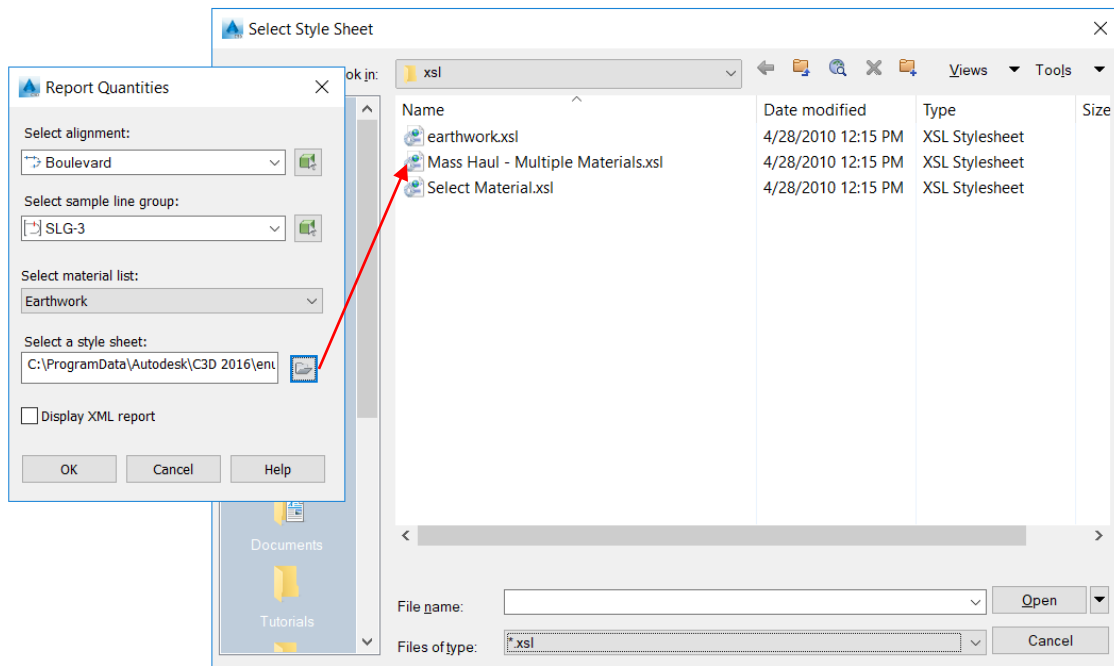
MATERIAL VOLUME: Pave1			
STATION	AREA	VOLUME	CUMULATIVE VOLUME
0+00.00	0.00	0.00	0.00
0+50.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00
1+50.00	0.00	0.00	0.00
60+00.00	0.00	0.00	246.05
60+50.00	0.00	0.00	246.05
61+00.00	0.00	0.00	246.05


6. Review table on screen.



EXERCISE: Creating Reports

Creating reports for Earthwork and Corridor materials requires users to make sure the appropriate sheet styles are selected.











1. Continue working from previous drawing or Open **USACE_Sections_7.dwg**
2. From the Ribbon **Analyze** tab > **Volumes and Materials** panel > **Volume Report** button 
3. From Report Quantities dialog box
 - a. Select material list > **Earthwork**
 - b. Select a style sheet > **earthwork.xsl**
 - c. Pick **OK** button
4. A web browser page will open showing static Report

Volume Report									
Project: C:\Users\llavayen\appdata\local\temp\USACE_Sections_7_1_1_5582.sv\$									
Alignment: Boulevard									
Sample Line Group: SLG-3									
Start Sta: 0+00.000									
End Sta: 61+00.000									
Station	Cut Area (Sq.ft.)	Cut Volume (Cu.yd.)	Reusable Volume (Cu.yd.)	Fill Area (Sq.ft.)	Fill Volume (Cu.yd.)	Cum. Cut Vol. (Cu.yd.)	Cum. Reusable Vol. (Cu.yd.)	Cum. Fill Vol. (Cu.yd.)	Cum. Net Vol. (Cu.yd.)
0+00.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+50.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1+00.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Plan Production

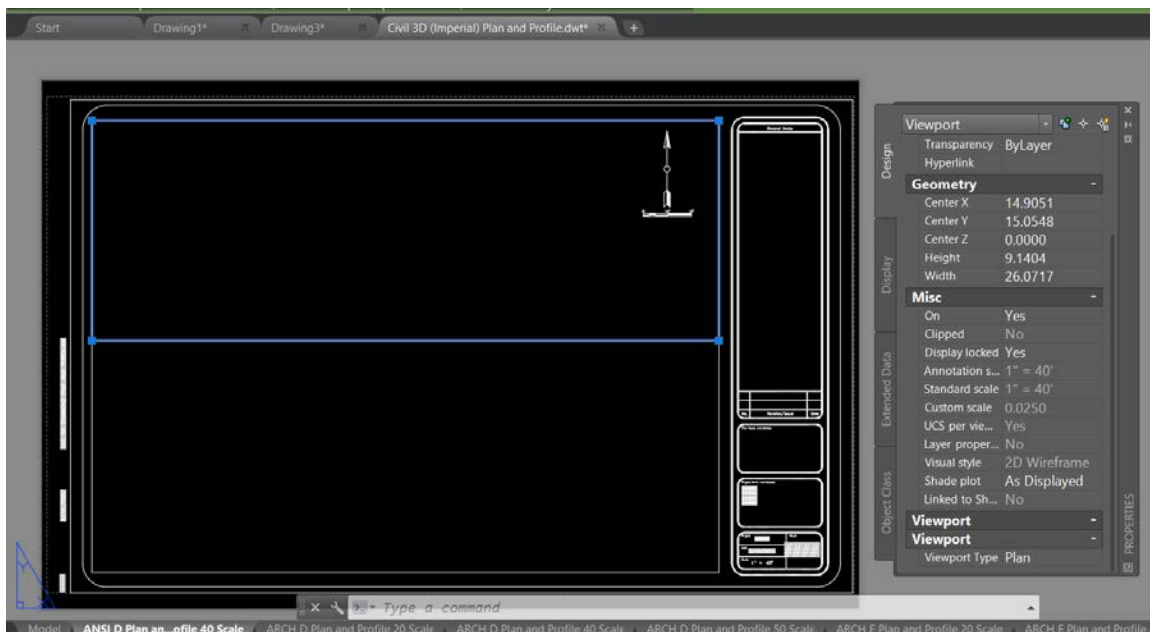
USACE does not have currently developed a Plan Production Template Configured. The out of the box templates will be used found at `C:\Users\llavayen\AppData\Local\Autodesk\C3D 2016\enu\Template\Plan Production`. There are a total of 8 templates (4 Imperial and 4 Metric):

-  Civil 3D (Imperial) Plan and Profile.dwt
-  Civil 3D (Imperial) Plan only.dwt
-  Civil 3D (Imperial) Profile only.dwt
-  Civil 3D (Imperial) Section.dwt
-  Civil 3D (Metric) Plan and Profile.dwt
-  Civil 3D (Metric) Plan only.dwt
-  Civil 3D (Metric) Profile only.dwt
-  Civil 3D (Metric) Section.dwt

Plan and Section Production Templates are typically are and additional configured .dwt file. Templates do not typically store any Civil 3D configurations. Only the most basic AutoCAD items are contained in these templates. Mainly Layers, Text and Dimensions Styles and Blocks that reside on a Paper Space Layout tab.


Plan Production Template

Templates that drive Plan Production are typically configured external and host settings in layout tabs. Basic AutoCAD details can paper space times can be preconfigured here:

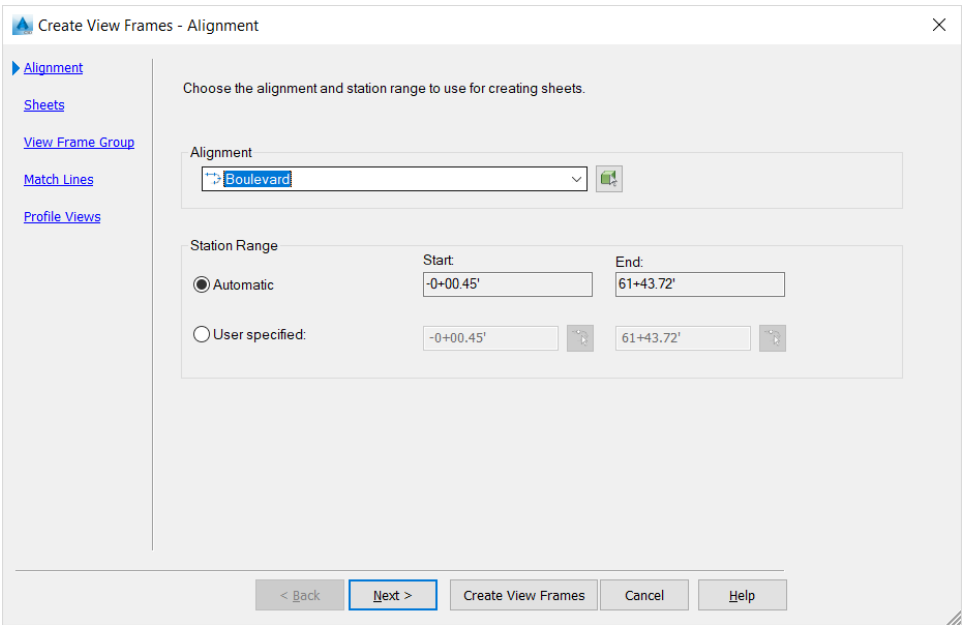


EXERCISE: Creating View Frames

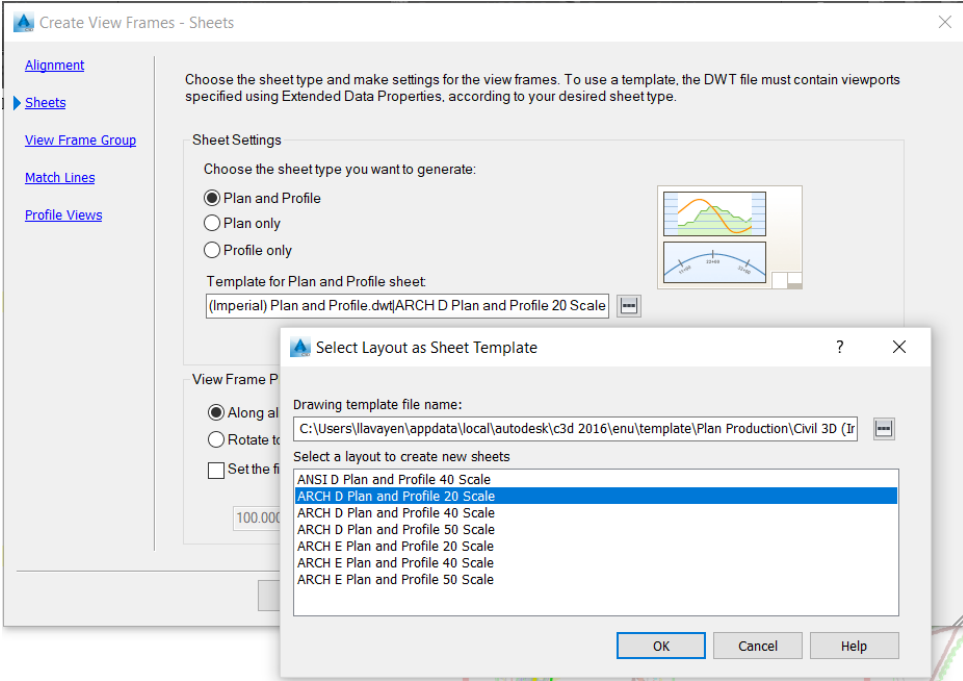
Plan Production has 2 phases:

- **View Frames Creation:** requires an Alignment to be in drawing and using configured template
 - **Sheet Creation:** the automated development of sheets (layouts) from View Frames
1. Start a new drawing > use USACE Civil 3D 2016 Template v3.1.dwt
 2. Set the coordinate system. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**
 3. From the **Units and Zone** tab > Selected coordinate system code: **MS83-WF**
 4. Save as > USACE Plan_Sheets.dwg
 5. Create two External References (xref) to :
 - TopoBase.dwg
 - Corridor.dwg
 6. From **TOOLSPACE** > **Prospector** tab > browse to **Data Shortcut** collection > right click select > **Set Working Folder...**
 7. From dialog box > Set path to class path: **<Project Path Here>**
 8. Expand **Alignments** collection > expand **Centerline Alignments** > Right on **Boulevard** > select Create Reference...
 - c. Accept the defaults
 - d. Click **OK** button
 9. Expand **Pipe Networks** collection > Right on **Proposed Storm Group North** > select Create Reference...
 - d. Network parts list: **C_STRM_List (USACE)**
 - e. Leave the other options as default
 - f. Click **OK** button
 10. Expand **Pipe Networks** collection > Right on **Proposed Storm Group South** > select Create Reference...
 - d. Network parts list: **C_STRM_List (USACE)**
 - e. Leave the other options as default
 - f. Click **OK** button
 11. Expand **Pipe Networks** collection > Right on **PROPOSED GRAVITY SEWER** > select Create Reference...
 - d. Network parts list: **C_SSWR_List (USACE)**
 - e. Leave the other options as default
 - f. Click **OK** button
 12. From the Ribbon > **Output** tab > **Plan Production** panel > pick on the **Create View Frames** button 
 13. Step through the **Create View Frames** Wizard:
 - a. Alignment





b. Sheets



c. View Frame Group

Create View Frames - View Frame Group

Alignment
Sheets
View Frame Group
Match Lines
Profile Views

Specify object creation criteria for the view frame group and view frames.

View Frame Group

Name: VFRM <[View Frame Group Alignment Name(CP)]> <[Next Counter(CP)]>

Description:

View Frame

Layer: HM-VIEW-FRAM

Name: VFRM <[Next Counter(CP)]>

Style: G_ANNO_NPLT_FRAM (USACE)

Label style: G_ANNO_NPLT_FRAM (USACE)

Label location: Top left

< Back Next > Create View Frames Cancel Help

d. Match Lines

Create View Frames - Match Lines

Alignment
Sheets
View Frame Group
Match Lines
Profile Views

You can choose to insert match lines automatically and define how they are placed.

Insert match lines

Positioning

Snap station value down to the nearest

Allow additional distance for repositioning (increases view overlap):

10 10

Match Line

Layer: HM-MLIN

Name: MATL <[Next Counter(CP)]>

Style: G_ANNO_MTCH_Line (US)

Labels

Left label style: G_ANNO_MTCH_Left_PRE

Right label style: G_ANNO_MTCH_Right_Ne

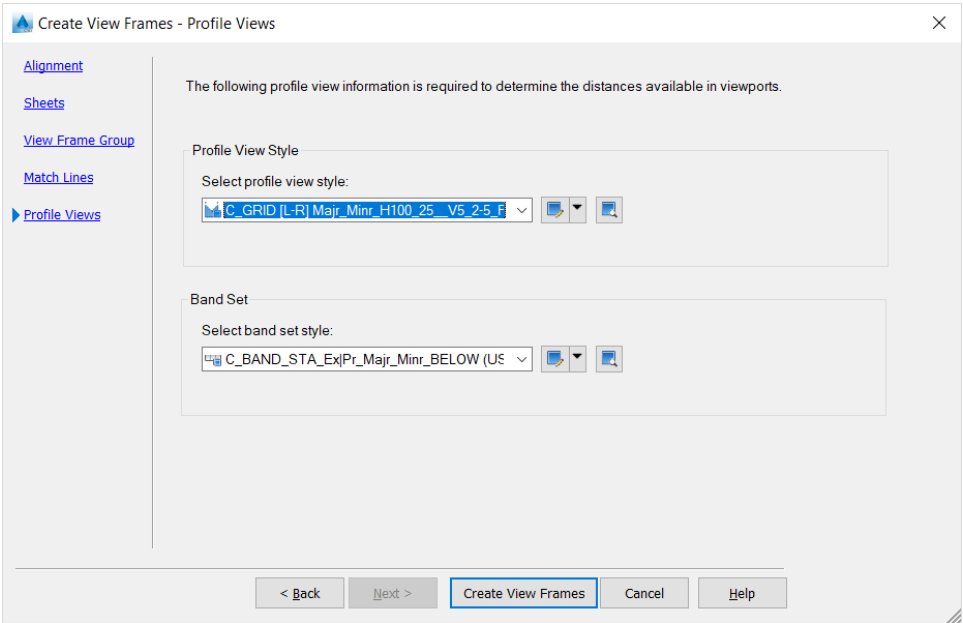
Left label location: End

Right label location: Start

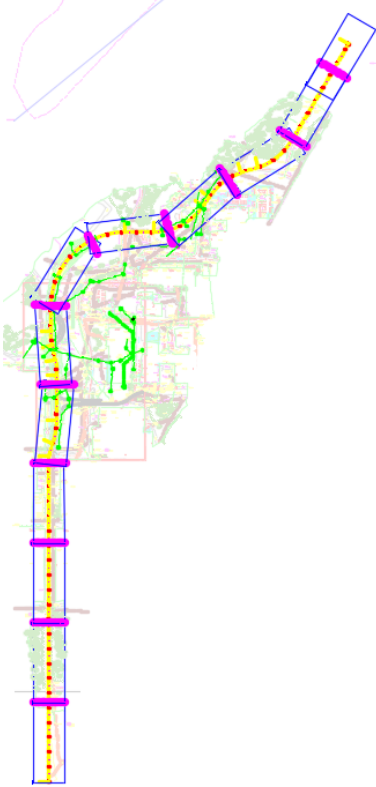
< Back Next > Create View Frames Cancel Help

e. Profile Views



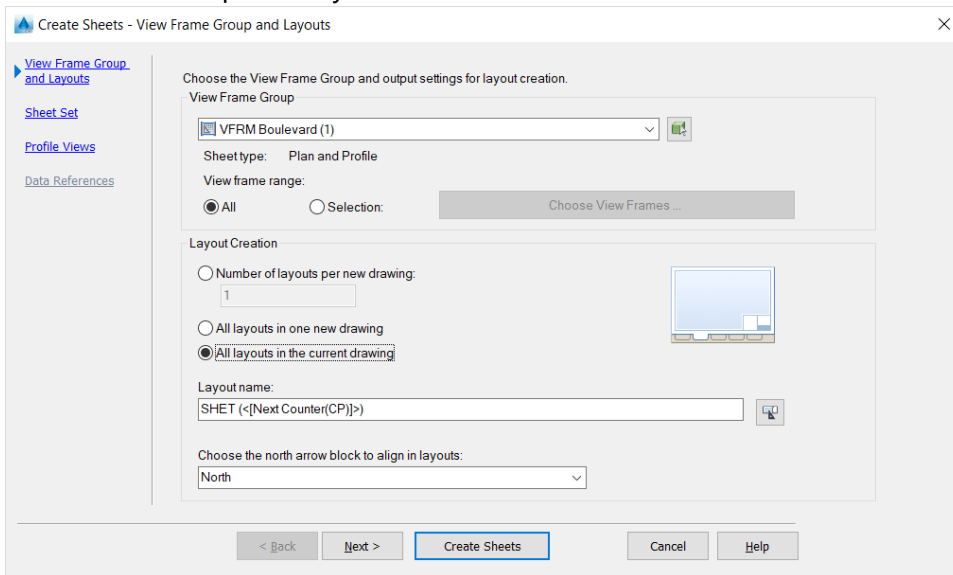


14. When done pick on the **Create View Frames** button




EXERCISE: Creating Sheets

1. Continue working from drawing or OPEN **USACE_Plan_Sheets_1.dwg**
2. From the Ribbon > **Output** tab > **Plan Production** panel > pick on the **Create Sheets** button 
3. Step through the **Create Sheets** Wizard:
 - a. View frame Group and Layouts



Create Sheets - View Frame Group and Layouts

Choose the View Frame Group and output settings for layout creation.

View Frame Group
 


Sheet type: Plan and Profile

View frame range:
 All Selection:

Layout Creation

Number of layouts per new drawing:

All layouts in one new drawing

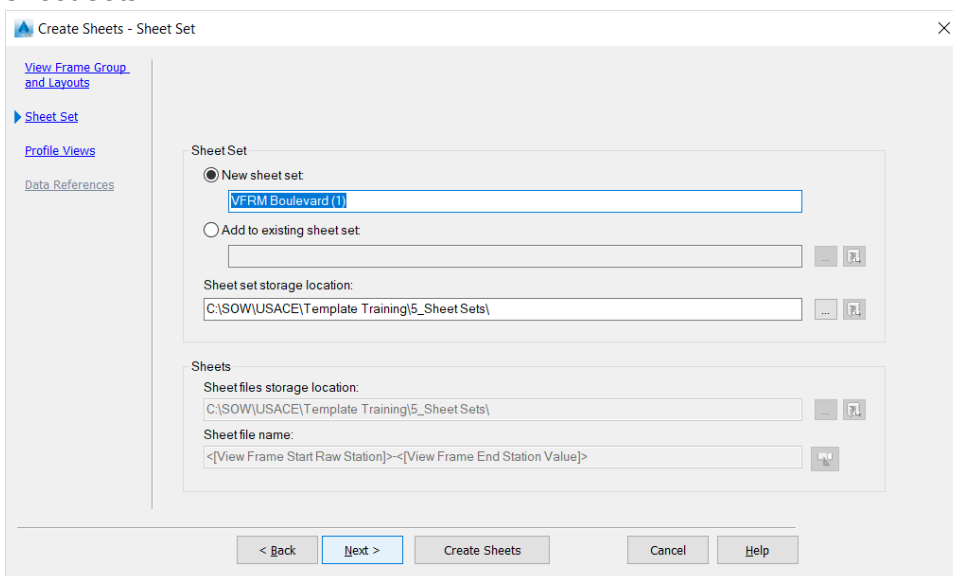
All layouts in the current drawing 

Layout name:

Choose the north arrow block to align in layouts:

< Back Next > **Create Sheets** Cancel Help

b. Sheet Sets




Create Sheets - Sheet Set


Sheet Set

New sheet set:

Add to existing sheet set:

Sheet set storage location:
 

Sheets

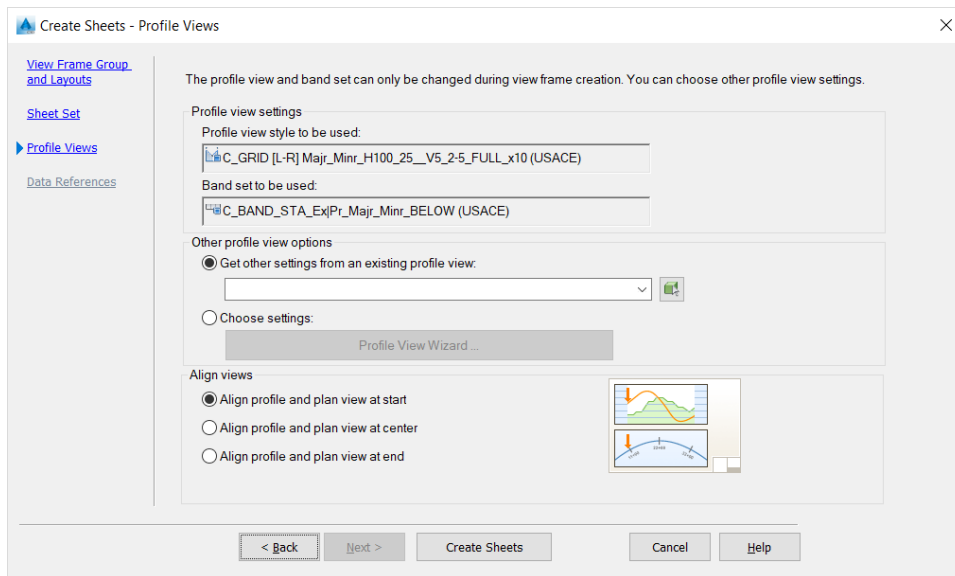
Sheet files storage location:
 

Sheet file name:

< Back Next > **Create Sheets** Cancel Help

c. Profile Views

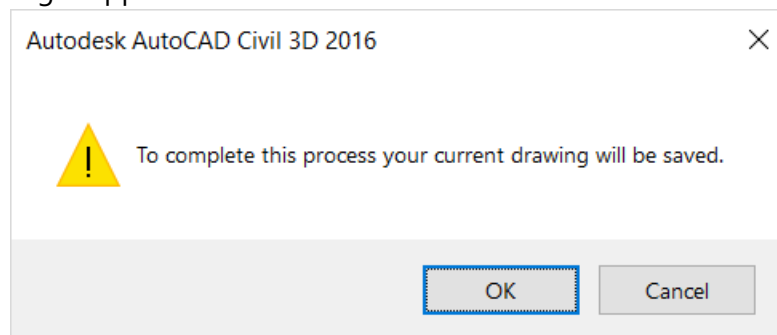




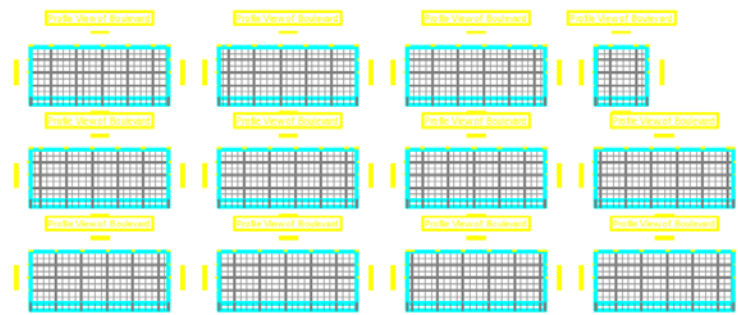
d. Data References

<Only Available if Creating External Sheets>

4. A message to Save might appear



5. Select a point on screen where profiles for sheets will be generated



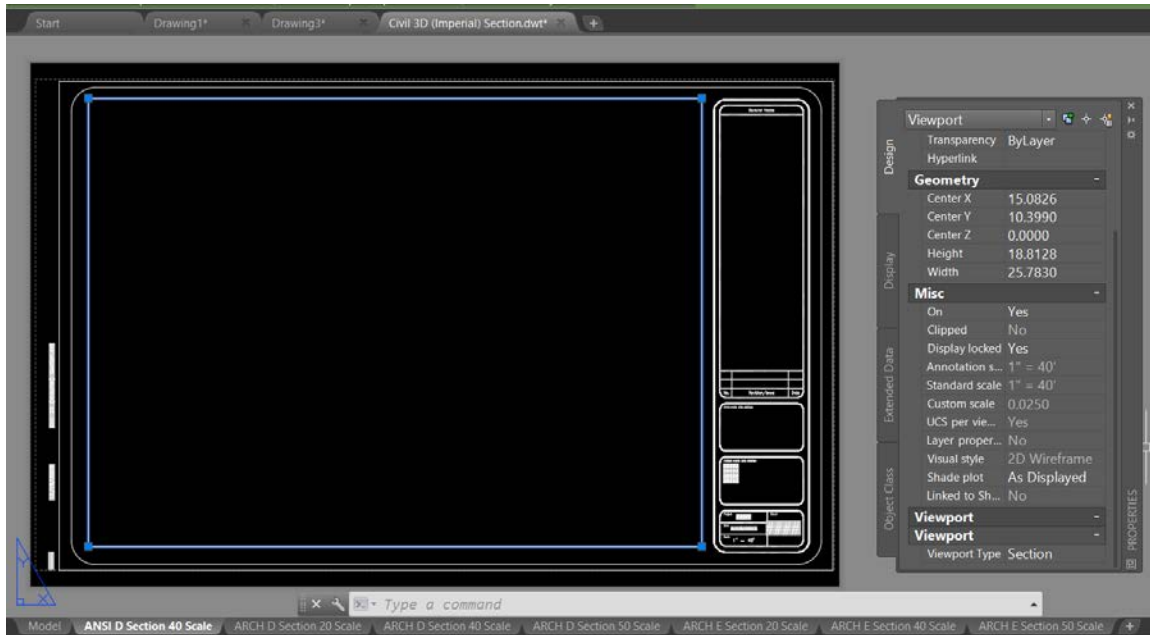
6. View data on newly created layout tabs Layout Tabs.




Section Production

Second Production Template

Templates that drive Section Production are typically configured external and host settings in layout tabs. Basic AutoCAD details can paper space times can be preconfigured here:



EXERCISE: Creating Section View via Production Mode

1. From the Sections folder open the **USACE_Section_7.dwg**
2. From the Ribbon > Home tab > Plan & Section Views panel > Section Views flyout > Create Multiple Views button 
3. Step through the Create Multiple Views Wizard
 - a. General



Create Multiple Section Views - General

General

Section Placement

Offset Range

Elevation Range

Section Display Options

Data Bands

Section View Tables

Select alignment: Boulevard

Sample line group name: SLG-3

Station range:

Automatic Start: -0+00.45' End: 61+43.72'

User specified: -0+00.45' 61+43.72'

Section view name: <[Section View Station]> <[Next Counter(CP)]>

Description:

Section view layer: HM-SECT-VIEW

Section view style: C_GIRD_Majr_Only_H10_V1

< Back Next > Create Section Views Cancel Help

b. Section Placements

Create Multiple Section Views - Section Placement

General

Section Placement

Offset Range

Elevation Range

Section Display Options

Data Bands

Section View Tables

Pick a placement option, then choose a group plot style.

Placement Options

Production - Use a layout from a template file (.dwt) to place sections on sheets.

Template for cross section sheet: \\enu\template\Plan Production\Civil 3D (Imperial) Section.dwt\ARCH D Section 20 Scale

Draft - Place sections in a grid in model space. Sheets cannot be created using this option.

Group Plot Style: C_GRID

Preview:

Select Layout as Sheet Template

Drawing template file name: C:\Users\lavayen\appdata\local\autodesk\c3d 2016\enu\template\Plan Production\Civil 3D (I...

Select a layout to create new sheets

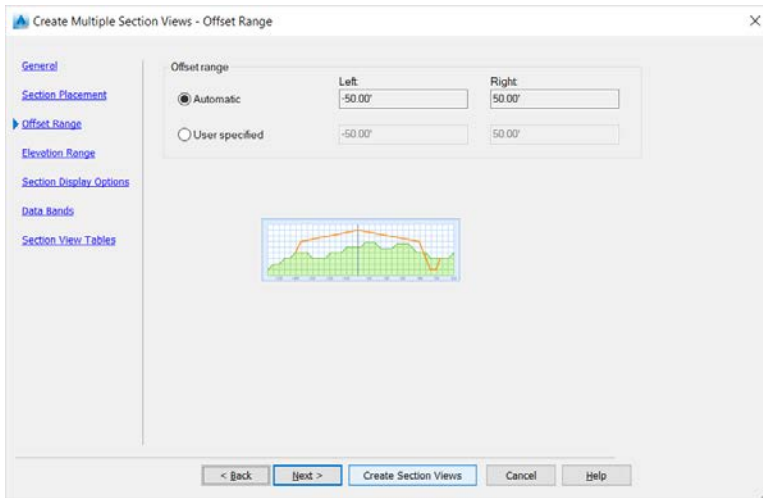
- ANSI D Section 40 Scale
- ARCH D Section 20 Scale**
- ARCH D Section 40 Scale
- ARCH D Section 50 Scale
- ARCH E Section 20 Scale
- ARCH E Section 40 Scale
- ARCH E Section 50 Scale

OK Cancel Help

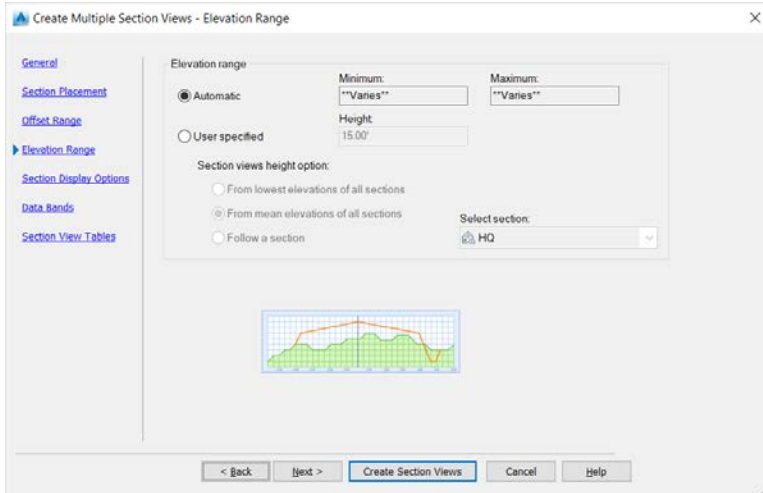
< Back Next > Create Section Views Cancel Help

c. Offset Range

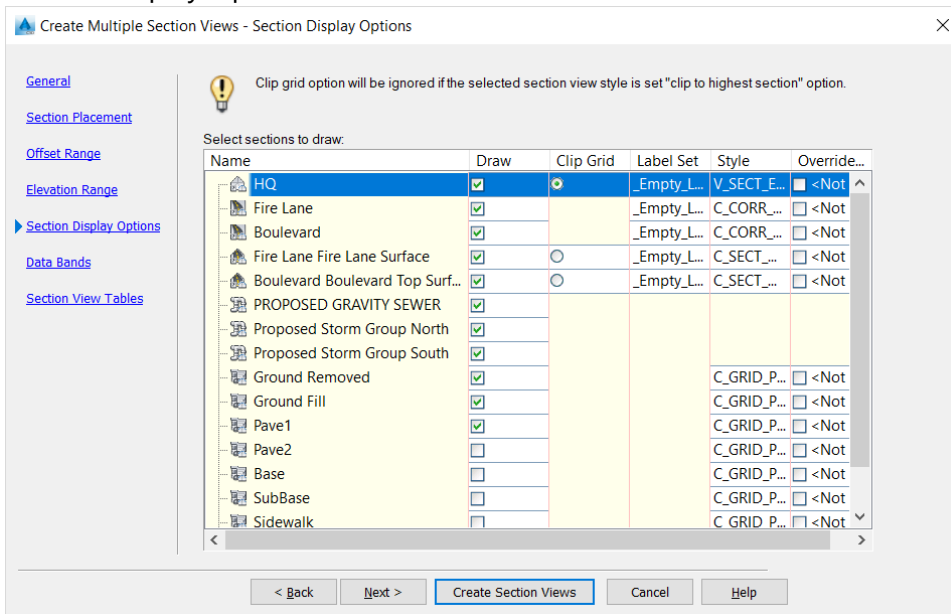




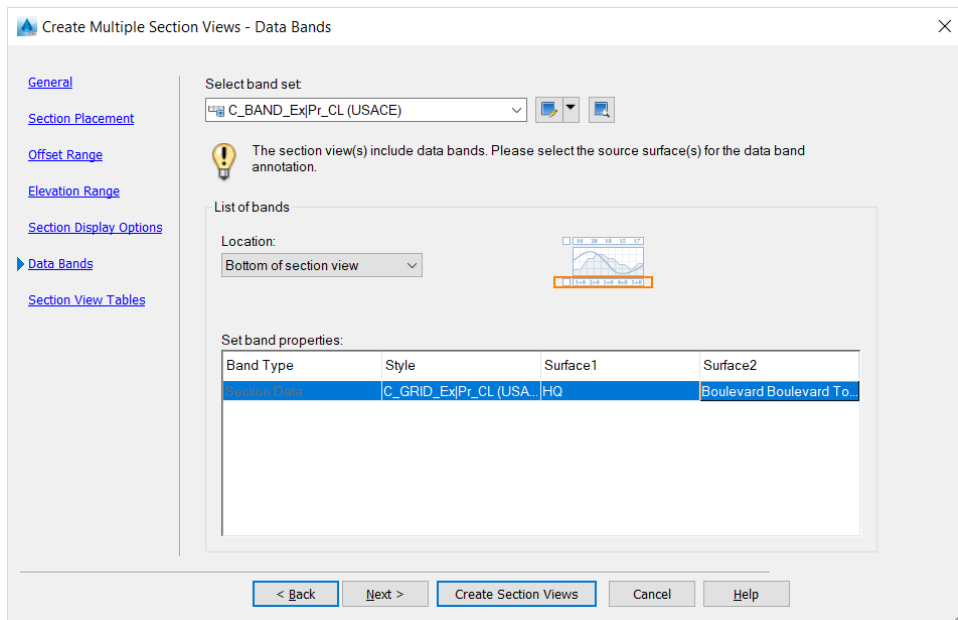
d. Elevation Range



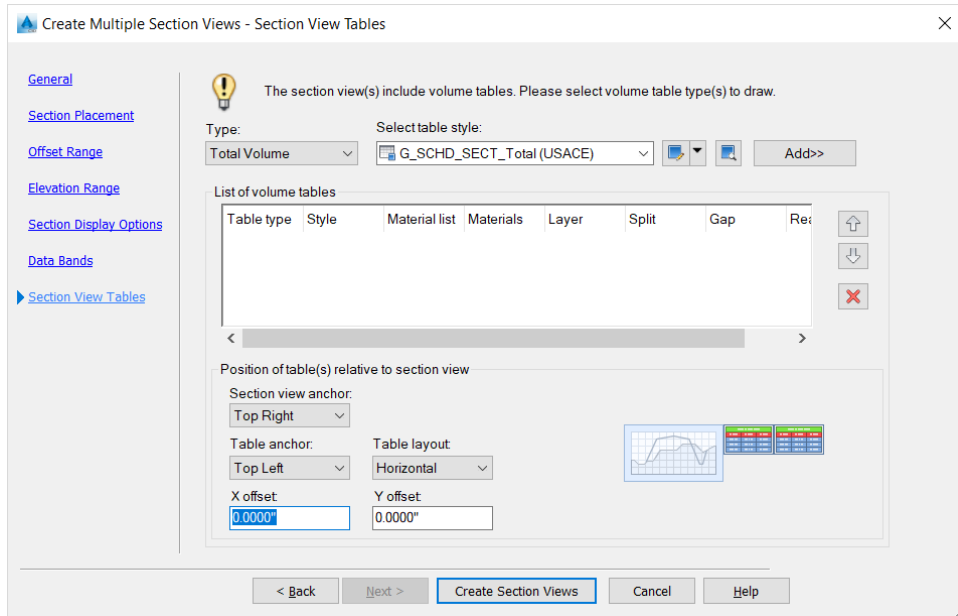
e. Section Display Options



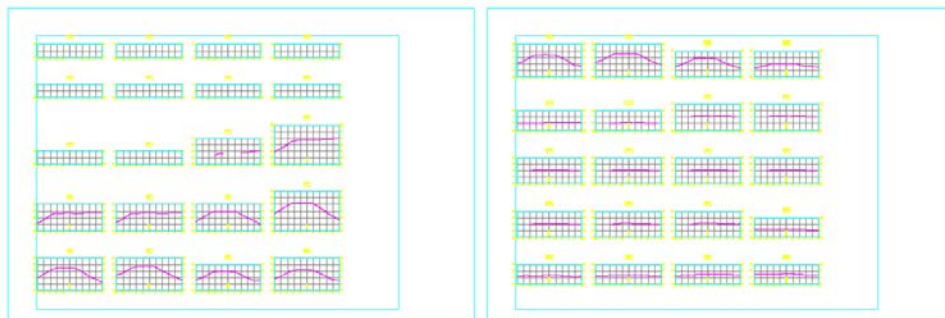
f. Data Bands




g. Section View Tables

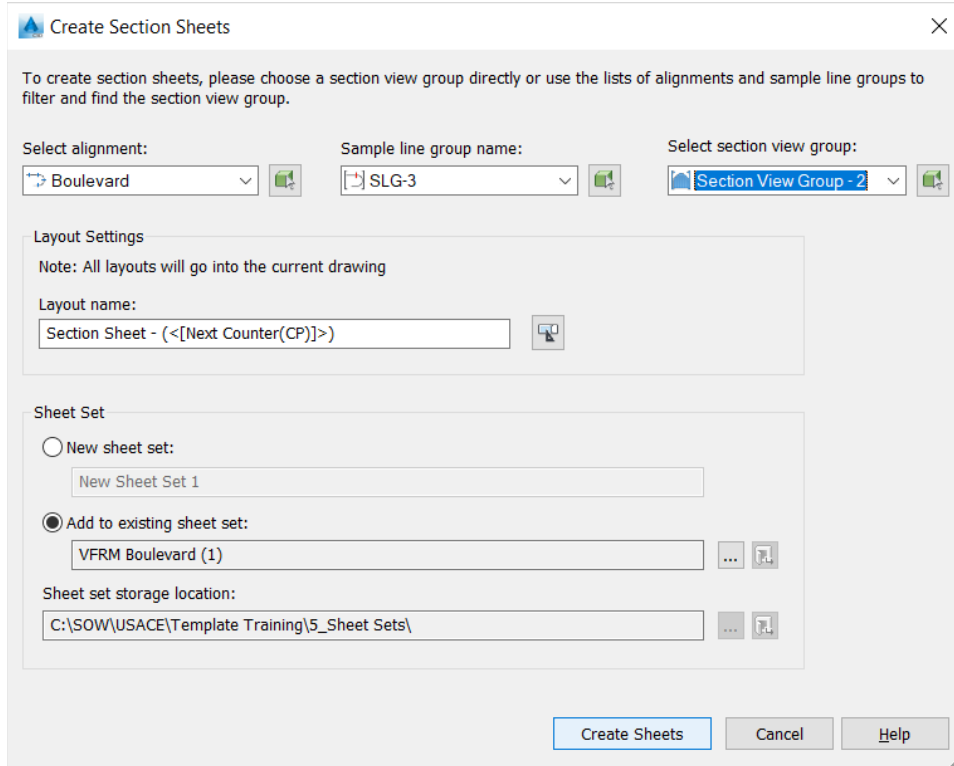


- After picking the Create Section Views button, pick a point on screen to generate Section Views within Sheets.

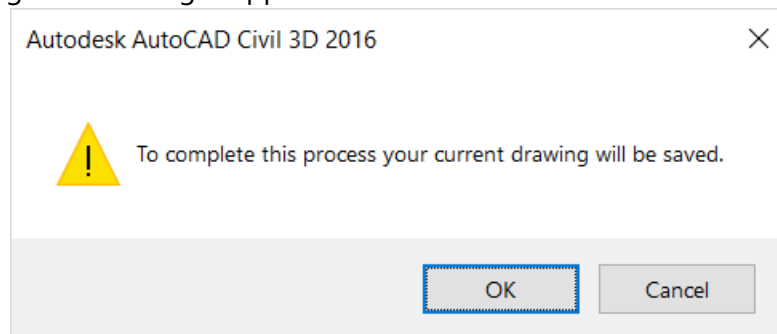


EXERCISE: Creating Section Sheets

5. Continue working or open USACE_Sections_8.dwg
6. From Ribbon > Output tab > Plan Production panel > Create Section Sheets button 
7. From the Create Section Sheets dialog box

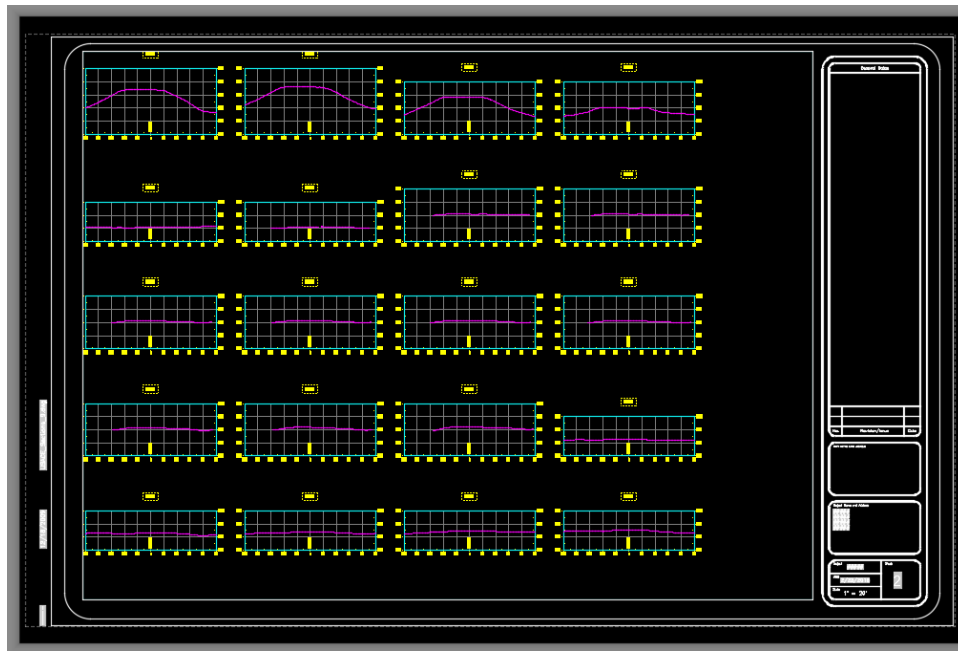


8. An AutoCAD message to save might appear



9. Switch to Layout Tab to see created sheets





Appendix A

Connecting to Aerial using BING Live Maps

The use of the BING Live mapping service is a free function accessed via the AutoCAD interface. For it to work requires a few things:

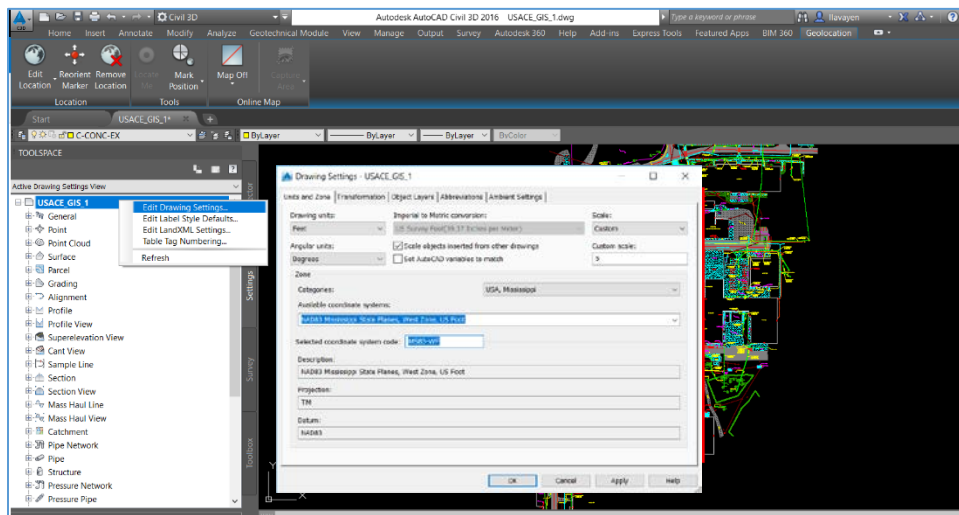
1. Create a FREE Autodesk 360 account. If you need help follow link below:
<https://knowledge.autodesk.com/customer-service/account-management/account-profile/create-autodesk-account>
2. A coordinate system must be assigned to drawing to enable the Geolocation tab
3. Linework must be geographically positioned correctly in model space.
4. Recent updates from BING side cause a permissions connection error. To correct the error follow link below:
<https://knowledge.autodesk.com/support/autocad/downloads/caas/downloads/content/autodesk-C2-AE-autocad-C2-AE-2015-2018-geolocation-online-map-hotfix.html>

Using the Live Mapping Service

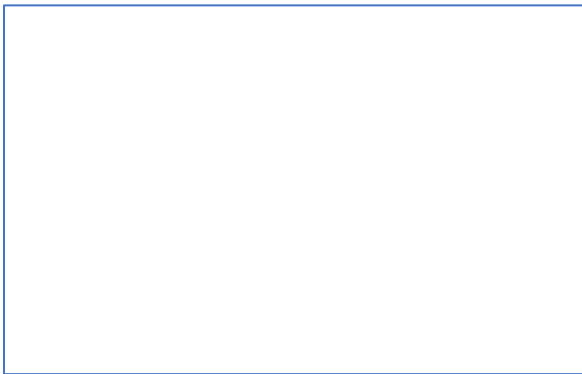
1. Open USACE_GIS_1.dwg
2. Make sure you are signed into your Autodesk account (upper right of AutoCAD session).




- Start by setting the coordinate system. From **TOOLSPACE** palette > **Settings** Tab > right click on drawing name > **Edit Drawing Settings...**

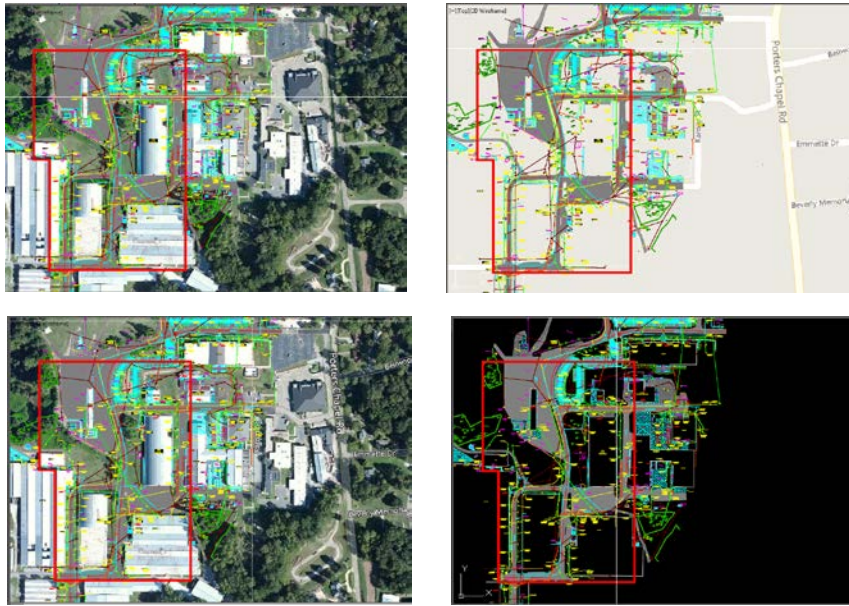


- From the **Units and Zone** tab > Selected coordinate system code: **MS83-WF**
(Alternatively you can use the Categories & Available coordinate systems drop downs)
- Once the coordinate is set and exit out of the dialog box, the blue **Geolocation** tab will become available.

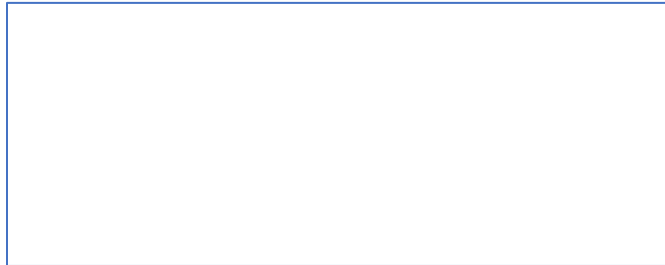


- Another visual queue will be a NON-plotting marker centered on screen that look like Dot/Star/Wheel . This marker can be turned off by changing the system variable **GEOMARKERVISIBILITY** to 0.
- From the Geolocation tab > expand the **Map** button > use the different options:
- Map Aerial
- Map Road
- Map Hybrid
- Map Off





12. To keep a portion of the image after turning the service off, use the Capture Area button. The options are to:
13. **Capture Area:** user is prompted to draw area to trim image
14. **Capture Viewport:** current view shape of screen area is used as cut off image



Appendix B

Associated Files for the Documentation

USACE_GIS_1.dwg
USACE_GIS_2.dwg
USACE_GIS_3.dwg
USACE_GIS_4.dwg
USACE_GIS_5.dwg
USACE_GIS_6.dwg
USACE_GIS_7.dwg
erdc_701200_3576000_oct(5cm).laz
USACE_Geotech_1.dwg
USACE_Geotech_2.dwg
USACE_Geotech_3.dwg
USACE_Contours.dwg
USACE_Grading_1.dwg
USACE_Grading_2A.dwg
USACE_Grading_3.dwg
USACE_Grading_4.dwg
USACE_Grading_5.dwg
USACE_Grading_6.dwg
USACE_Grading_7.dwg
USACE_Grading_8.dwg
USACE_Grading_9.dwg
USACE_Grading_Site_1.dwg
USACE_Grading_Site_2.dwg
USACE_Grading_Site_3.dwg

Found in the Working Folder:

SurfaceFRomXML.dwg
ProposedLignmentObjects.dwg
ProposedAlignments.dwg
TopoBase.dwg
ProposedAlignments.dwg
Profiles.dwg
BaseLine_and_Alignments.dwg
ProposedAlignments.dwg
PropLineWork.dwg
TopoBase.dwg
UtilBase.dwg
Corridors.dwg
CompositeSurface.dwg



