Surveying the World

Importing Survey Data into Civil 3D

FLUG 2019

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Session Objectives:

- Import field book/point files into Civil 3D
- Create and Manage Point Styles and Labels
- Create and Manage Key Descriptions

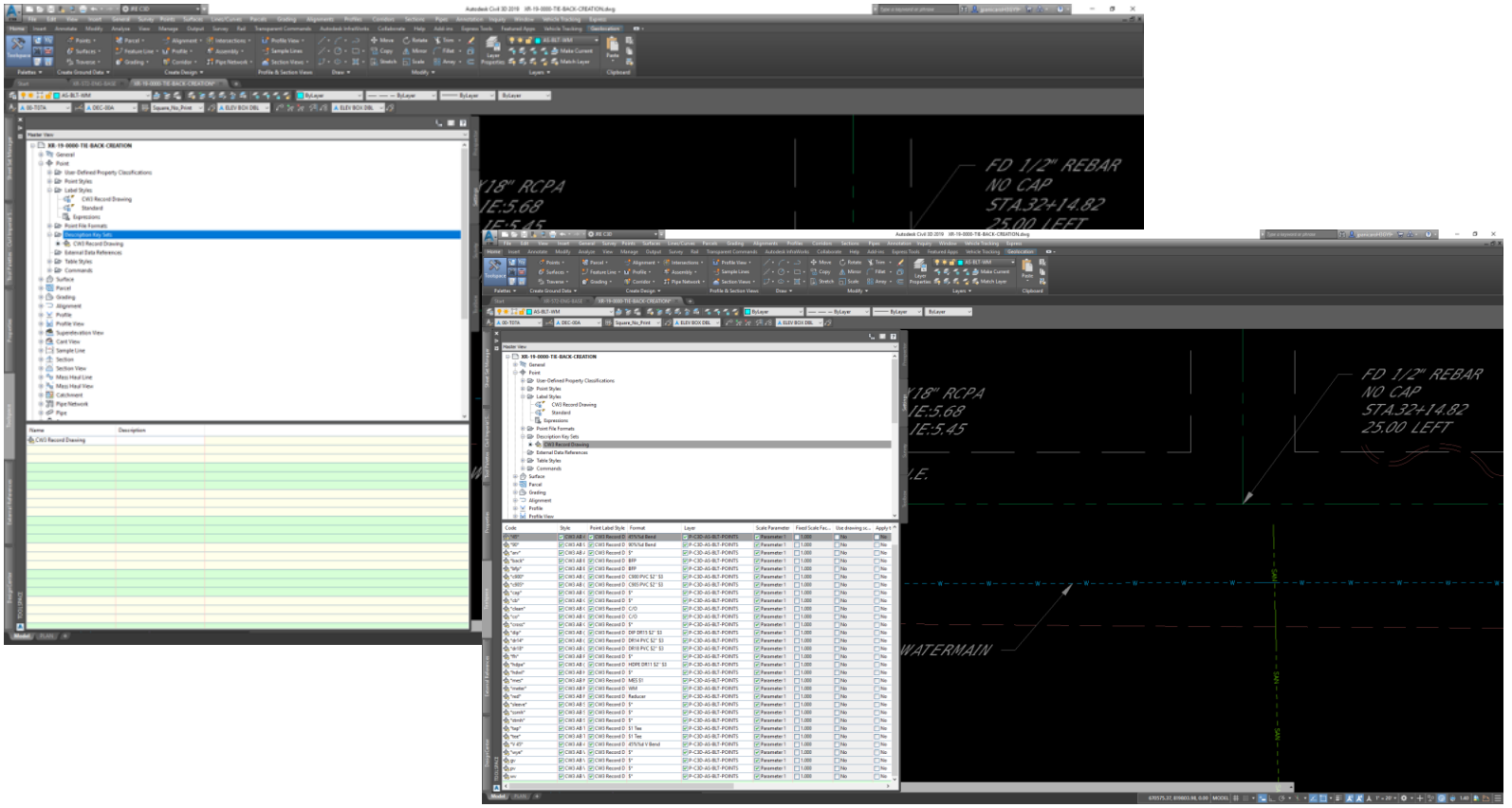
What are .fbk and/or point files:

- Point files can be utilized that are received directly from the surveyor for as-builts/record drawings
- Field Book files are raw data from the field and can be utilized to automatically create survey drawings

Surveying the World – Importing Survey Data into Civil 3D

Managing and Creating Key Descriptions:

- Key Descriptions can be utilized to read the "Raw Description" from the point file to place a readable full description with the correct symbol, label and point style upon import.



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Managing and Creating Key Descriptions:

- Key Descriptions work off of codes, some of these have been outlined below. The full code set is provided at the below link:
  - https://knowledge.autodesk.com/support/civil-3d/learn-explore/caas/CloudHelp/cloudhelp/2019/ENU/Civil3D-UserGuide/files/GUID-3E7422F2-F6D9-4AAD-A997-04678401CE41-htm.html
- In the below examples you can see the code "$" is utilized. If the point has a raw description of "TREE Oak 7" and the key description you have created for oak trees is created to match "TREE" with $0 after it will read "TREE" in the readable description. If $1 it will utilize the 2nd parameter in raw description.

Use this Code...	To do this in a format...	Example
$0	Reference the leading element in the raw description.	**TREE** Oak 7
$1	Reference the first parameter in the raw description.	TREE **Oak** 7
$2	Reference the second parameter in the raw description.	TREE Oak **7**
$3	Reference the third parameter in the raw description.	TREE Oak 7 **24**
$4, $5, through $9	Reference the fourth parameter, the fifth parameter, through the ninth parameter.	

Importing Point Files:

- On the home tab, navigate to points and select Point Creation Tools. This will open the Create Points dialog box.
- Under the "Points Creation" dropdown ensure that Match on Description Parameters is set to false and Disable Description Keys is set to false.
- Select the Import Points button on the far right/top
- This opens the Import Points dialog box, navigate to your point file (.txt, .csv, etc.), specify the file format (PNEZD for this exercise). Add points to the corresponding point group.

Importing Point Files:

- Once the points have been imported you should see the correct symbols, labels & styles that are applicable for each point.
- If fittings/appurtenances need to be rotated this can be done from the properties dialog.
- Once the labels have been cleaned up you can utilize a polyline on the correct layer to draw the as-built utility line.

Exporting to GIS:

- Record Drawing/As-Built Information can be exported to GIS Shape files.
- Directions to complete this are attached to the back of this handout.

Setting Up and Importing Field Book Info:

- Civil 3D has the ability to import field book survey information and automatically draw the linework if the collected field data matches the setup within Civil 3D
- For ease of use we will be utilizing the AutoDesk Civil 3D tutorial files for this exercise.

Step 1: Creating a Survey Database:

- In this exercise, you will open the Survey tab in Toolspace, create a local survey database, and then open a drawing to display the survey data.

- Open **Survey-1.dwg**, which is located in the tutorials drawings folder.
- Click Home tab Palettes panel Survey Toolspace.
- In Toolspace, on the Survey tab, right-click Survey Databases. Click New Local Survey Database.
- In the New Local Survey Database dialog box, enter FLUG Survey 2019 for the database name. Click OK.
- The newly created database is added to the Survey Databases collection on the Survey tab. Empty items that appear in the collection include Import Events, Survey Queries, Networks, Network Groups, Figures, Figure Groups, Survey Points, and Survey Point Groups. These collections are populated when you add or create survey data.

Step 2: Setting the Equipment and Figure Prefix Database (1):

- In this exercise, you will create new survey equipment and figure prefix databases and definitions.
- Equipment definitions specify the values associated with a specific surveying instrument, such as the standard deviations associated with the measuring capabilities of the instrument.
- Figure prefixes specify the layer that a figure is drawn on, how a figure is stylized, and whether figures are created as breaklines and lot lines. When figures are created, they are matched based on their names and the prefix names. All figures that match a specific prefix are assigned the properties of the prefix.
- This exercise continues from Exercise 1: Creating a Survey Database.
- Create an equipment database
- Note: This exercise uses Survey-1.dwg with the modifications you made in the previous exercise.
- In Toolspace, on the Survey tab, right-click the Equipment Databases collection. Click New.
- In the New Equipment Database dialog box, enter FLUG Survey 2019 for the new equipment database and click OK.
- Create an equipment definition
- Right-click the FLUG Survey 2019 equipment database. Click Manage Equipment Database.

Step 2: Setting the Equipment and Figure Prefix Database (2):

- In the Equipment Database Manager – FLUG Survey 2019 dialog box, under the Miscellaneous property, for Name, enter FLUG Survey 2019.
- Note: The Standard Deviations settings determine the accuracy of the survey observations based on the equipment that measured them.
- Click OK.
- In Toolspace, on the Survey tab, right-click the FLUG Survey 2019 equipment definition. Click Make Current.
- In Toolspace, the current equipment database name is displayed in bold text.
- Create a figure prefix database
- In Toolspace, on the Survey tab, right-click the Figure Prefix Databases collection. Click New.
- In the New Figure Prefix Database dialog box, enter FLUG Survey 2019 for the new figure prefix database and click OK.
- Create a figure prefix definition
- In Toolspace, on the Survey tab, expand the Figure Prefix Databases collection. Right-click the figure prefix database FLUG Survey 2019. Click Manage Figure Prefix Database.

Step 2: Setting the Equipment and Figure Prefix Database (3):

- In the Figure Prefix Database Manager dialog box, click .
- Specify the following parameters:
- Name: LOT
- Lot Line: Selected
- Site: Survey Site
- All figures that match the LOT prefix name will have the Lot Line setting set to Yes. When the figure is inserted into the drawing, Autodesk Civil 3D will create lot lines in the drawing in the Survey Site.
- Click OK.
- In Toolspace, on the Survey tab, right-click the FLUG Survey 2019 figure prefix database. Click Make Current.

Step 3: Adjusting and Verifying Settings (1):

- In this exercise, you will view and adjust several types of survey settings.
- Survey user settings are specific to a Windows user login account and affect only the survey features, and not the database or drawing data.
- Survey database settings are specific to the survey features of an Autodesk Civil 3D survey database.
- This exercise continues from Exercise 2: Setting the Equipment and Figure Prefix Databases.
- Specify user settings
- Note: This exercise uses Survey-1.dwg with the modifications you made in the previous exercise.
- In Toolspace, on the Survey tab, click .
- In the Survey User Settings dialog box, specify the following parameters:
- MiscellaneousUse External Editor: Yes
- Network Preview: All Selected
- Setup Preview: All Selected
- Figure Preview: All Selected
- Selecting the check boxes enables the previewing of all survey components in the ToolspaceSurvey tab.
- Click OK.

Step 3: Adjusting and Verifying Settings (2):

- Specify survey database settings
- In Toolspace, on the Survey tab, in the Survey Databases collection, right-click the FLUG Survey 2019 database. Click Edit Survey Database Settings.
- In the Survey Database Settings dialog box, under Precision, specify the following parameters:
- Angle: 4
- Distance: 3
- Elevation: 3
- Coordinate: 4
- Latitude And Longitude: 8
- These precision settings are independent of the Drawing Settings precision settings and affect all aspects of the user interface that displays the survey data.
- Under Least Squares Analysis Defaults, specify the following parameters:
- Network Adjustment Type: 3-Dimensional
- Confidence Level: 99% confidence
- Perform Blunder Detection: Yes
- Note: The Error Tolerance values specify the acceptable error values for the survey measurement. The values in this collection correspond to the units of measure that are specified in the Units collection.
- Click OK.

Step 4: Setting Survey Styles:

- In this exercise, you will review the survey network styles and create a figure style.
- The survey network and figure styles control the way that survey features are displayed in the drawing.
- This exercise continues from Exercise 3: Adjusting and Verifying Settings.
- Review the network style settings
- Note: This exercise uses Survey-1.dwg with the modifications you made in the previous exercise.
- In Toolspace, on the Settings tab, expand the SurveyNetwork Styles collection.
- This collection contains all the existing network styles in the drawing.
- Right-click the Standard network style. Click Edit.
- In the Network Style dialog box, click the Components tab.
- Notice that you can set different marker styles for known control points, unknown control points, tolerance error points, and sideshot points.
- Click OK.
- Create a figure style
- Right-click the Figure Styles collection. Click New.
- In the Figure Style dialog box, on the Information tab, enter Building for the figure style name.
- Click the Display tab.
- In the Component Display table, change the color for the Figure Lines. To do this, click in the Color column. In the Select Color dialog box, in the Color field, enter 11. Click OK.
- Click OK.

Step 5: Setting Up a Linework Code Set (1):

- In this exercise, you will learn how to set up a linework code set to interpret the field codes that the survey field crew enters into a data collector.
- When field-coded data is imported into Autodesk Civil 3D, the linework code set interprets the syntax of simple field codes that are contained within survey point descriptions. The linework is connected between similar points. You will use a linework code set to define linework from imported survey data in the Importing Field-Coded Survey Data exercise.
- This exercise continues from Exercise 4: Setting Survey Styles.
- Examine the default linework code set
- In Windows Explorer, navigate to the tutorial folder. Open Survey-1.fbk using a text editor.
- In Windows Explorer, navigate to the tutorial folder. Open Survey-X.fbk using a text editor.
- In the text editor, for Survey-X.fbk, highlight the 34th and 35th lines, which contain the following code:

BEGIN TC1

FC1 VA 105 19.192302 57.714 88.440647 "TC1"

- In the text editor, for Survey-1.fbk, highlight the 24th line, which contains the following code:

FC1 VA 105 19.192302 57.714 88.440647 "TC1 B H0.5 H-0.1 V-0.5"

- In Toolspace, on the Survey tab, expand the Linework Code Sets collection. Right-click Sample. Click Properties.

Step 5: Setting Up a Linework Code Set (2):

- The field codes for the Sample linework code set are displayed in the Linework Code Set dialog box. Each property has a user-definable code assigned to it. Compare the codes with the line you selected in the text editor.
- The selected lines define the beginning of a top of curb figure:
- In Survey-X.fbk, the selected lines consist of the feature code (BEGIN TC1), FC1 VA 105 horizontal angle, slope distance, zenith angle, and description. The point description contains the raw point description (TC1) and XYZ coordinates.
- In Survey-1.fbk, the selected line contains information that is similar to Survey-X.fbk. Notice that horizontal and vertical offset values are also present. If you examine the remainder of the files, you will see that the format used by Survey-1.fbk is simpler and more flexible than Survey-X.fbk.
- Compare the characters in Survey-1.fbk to the values in the Linework Code Set dialog box. Under Special Codes, notice the codes that are defined for Begin, Horizontal Offset, and Vertical Offset. Each of these codes is displayed in the currently selected line. The current linework code set will interpret this survey point as being the beginning of the survey TC1 figure, with two horizontal offsets and one vertical offset.
- Close the text editors and Linework Code Set dialog box.

Step 5: Setting Up a Linework Code Set (3):

- The field codes for the Sample linework code set are displayed in the Linework Code Set dialog box. Each property has a user-definable code assigned to it. Compare the codes with the line you selected in the text editor.
- The selected lines define the beginning of a top of curb figure:
- In Survey-X.fbk, the selected lines consist of the feature code (BEGIN TC1), FC1 VA 105 horizontal angle, slope distance, zenith angle, and description. The point description contains the raw point description (TC1) and XYZ coordinates.
- In Survey-1.fbk, the selected line contains information that is similar to Survey-X.fbk. Notice that horizontal and vertical offset values are also present. If you examine the remainder of the files, you will see that the format used by Survey-1.fbk is simpler and more flexible than Survey-X.fbk.
- Compare the characters in Survey-1.fbk to the values in the Linework Code Set dialog box. Under Special Codes, notice the codes that are defined for Begin, Horizontal Offset, and Vertical Offset. Each of these codes is displayed in the currently selected line. The current linework code set will interpret this survey point as being the beginning of the survey TC1 figure, with two horizontal offsets and one vertical offset.
- Close the text editors and Linework Code Set dialog box.

Importing Field-Coded Survey Data:

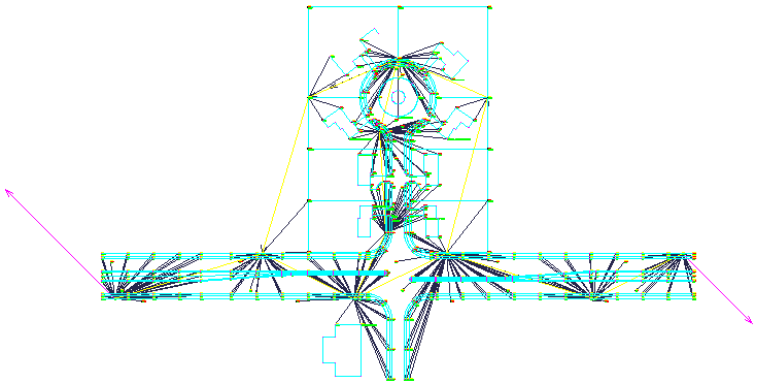
- Once Survey Databases have been setup to reflect company standards, .fbk files can be imported.
- For ease of use the AutoDesk Tutorial will be utilized for this exercise.

Step 1: Importing Field-Coded Survey Data (1):

- In this exercise, you will import survey data from an existing field book file that contains linework codes that can be interpreted by a linework code set.
- The field book file that you will import contains the linework codes that you examined in the Setting Up a Linework Code Set exercise.
- Set up the project
- Open Survey-2A.dwg, which is located in the tutorials drawings folder.
- This drawing is empty, but has point and figure styles that are appropriate for this exercise.
- Click Home tab Create Ground Data panel Import Survey Data Find.
- Create a survey database
- In the Import Survey Data wizard, on the Specify Database page, under Survey Databases, select FLUG Survey 2019.
- If you need to create a survey database, you can click Create New Survey Database.
- Click Edit Survey Database Settings.
- You use the Survey Database Settings dialog box to define the parameters of the survey database. Notice that the settings match those you specified in the Adjusting and Verifying Settings exercise.
- Click OK.
- Click Next.

Step 1: Importing Field-Coded Survey Data (2):

- Specify the file to import
- On the Specify Data Source page, under Data Source Type, select Field Book File.
- Under Source File, click .
- In the Field Book Filename dialog box, navigate to the tutorial folder.
- Select Survey-1.fbk. Click Open.
- Click Next.
- Create a survey network
- On the Specify Network page, click Create New Network.
- In the New Network dialog box, for Name, enter Survey Network 1.
- Click OK.
- Click Next.
- Specify import options
- On the Import Options page, specify the following parameters:
- Current Equipment Database: Sample
- Current Equipment: Sample
- Show Interactive Graphics: Yes (Selected)
- Current Figure Prefix Database: Sample
- Process Linework During Import: Yes (Selected)
- Current Linework Code Set: Sample
- Process Linework Sequence: By Import Order
- Assign Offset To Point Identifiers: Yes (Selected)
- Point Identifier Offset: 10000
- Insert Network Object: Yes (Selected)
- Insert Figure Objects: Yes (Selected)
- Insert Survey Points: Yes (Selected)
- Accept the remaining default values.
- Click Finish.
- The survey data is imported, and the drawing looks like this:
- Navigate to the My Civil 3D Tutorial Data folder. For File Name, enter Survey-2B.dwg. Click Save.



Step 2: Updating Imported Survey Data (1):

- In this exercise, you will modify some of the imported survey data, and then reprocess the linework to apply the changes.
- You will learn about import events, which are a reference to the original survey data file that was imported into the survey database. Import events are useful when you need to determine how the survey data was originally imported and the individual points and figures that were imported during that event. Import events provide a convenient way to remove, re-import, and reprocess the survey data referenced within the event.

Reprocess the survey points

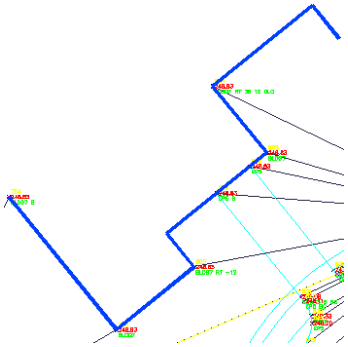
- Note: This exercise uses Survey-2B.dwg, which you saved in the My Civil 3D Tutorial Data folder during the previous exercise. If you did not do this, you can use the copy of Survey-2B.dwg that is in the tutorials drawings folder, but you will get duplicate objects when you update the survey data.
- In Toolspace, on the Survey tab, expand the Survey DatabasesSurvey 1 Import Events collection.
- Note: If you cannot expand the collection, right-click the database name and click Open For Edit.
- Select Import Events.
- The import options that were specified when the survey data was imported are displayed in the Toolspace list view. Notice that Point Identifier Offset is 10000. This indicates that as each survey point was imported, 10000 was added to the original point number. You will remove this offset value in the following steps.
- Under the Survey-1.fbk import event, select Survey Points.
- In the Toolspace list view, compare the values in the Number column with the values in the Original Number column. The Number column reflects the offset of 10000 that was added to the point numbers when they were imported.
- Right-click Survey-1.fbk. Click Re-Import.
- In the Re-Import Field Book dialog box, clear the Assign Offset To Point Identifiers check box.
- Click OK.
- Note: If you are prompted to abort the import process, click No.

Step 2: Updating Imported Survey Data (1):

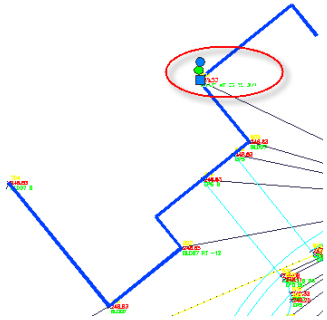
- The points are re-imported, and the linework is reprocessed.

Update and reprocess a survey figure

- In Toolspace, on the Survey tab, select the Survey DatabasesSurvey 1 Figures collection.
- In the list view, select BLDG7. Right-click. Click Zoom To.
- The BLDG7 figure is displayed in the drawing. The ending line segments are incorrect, and the figure is not closed. You will edit the survey point to correct the figure.



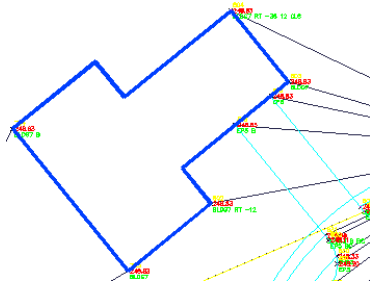
- In the drawing, select survey point 804.



- Click Survey Point tab Modify panel Survey Point Properties Find.

Step 2: Updating Imported Survey Data (1):

- In the Description, two errors are evident. First, a - (hyphen) was omitted from one of the values, which caused the line to extend in the wrong direction. Second, the close code is CLO, while the close code specified in the linework code set is CLS.
- In the Survey Point Properties dialog box, change the Description to the following:
- BLDG7 RT -36 12 CLS
- Click OK.
- You are prompted to select another survey point object. The command persists, so you can continue modifying survey point properties, as necessary.
- Press Enter to end the command.
- You are prompted to update the linework associated with the survey points.
- Note: All survey points must be reprocessed because any point potentially can contribute to the definition of any generated figure.
- Click Yes.
- In the Process Linework dialog box, clear the Insert Survey Points check box.
- In this case, it is only necessary to update the figure linework. The point coordinates did not change.
- Click OK.
- The linework is reprocessed, and the survey figure is corrected.



- Click Save As.
- Navigate to the My Civil 3D Tutorial Data folder. For File Name, enter Survey-3.dwg. Click Save.

Tutorial Links

Key Descriptions: https://knowledge.autodesk.com/support/civil-3d/learn-explore/caas/CloudHelp/cloudhelp/2019/ENU/Civil3D-UserGuide/files/GUID-3E7422F2-F6D9-4AAD-A997-04678401CE41-htm.html

Survey Database Creation: https://knowledge.autodesk.com/support/civil-3d/getting-started/caas/CloudHelp/cloudhelp/2019/ENU/Civil3D-Tutorials/files/GUID-07C021D3-5FBE-496B-9C0F-906AC0779664-htm.html

Importing Field Book Files: https://knowledge.autodesk.com/support/civil-3d/getting-started/caas/CloudHelp/cloudhelp/2019/ENU/Civil3D-Tutorials/files/GUID-344B584B-0E65-4FCF-B85F-A62E2ABCD5DE-htm.html

Tutorial File Locations: https://knowledge.autodesk.com/support/civil-3d/getting-started/caas/CloudHelp/cloudhelp/2019/ENU/Civil3D-Tutorials/files/GUID-DECD2305-4906-4329-A973-CFC9B625B4CD-htm.html

Thank You!

Questions/Comments?

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