

## **CI223971 Civil and Survey Workflows Utilizing the Architecture, Engineering & Construction Collection**

Dino Lustri, P.E., P.S. D.L. Engineering & Surveying

## **Learning Objectives**

- Learn how to incorporate record map electronic data from government agencies into your base-mapping efforts, for example, County **DGN** files
- Learn how to locate, download, and selectively import FEMA flood map information so coordinate systems match and data sets are manageable, **SHP** files
- Learn how to utilize available point cloud data, classify it (isolate ground points from other points), and generate a Civil 3D surface from the points, LAS files
- Learn how to use the GEOMAP command in Civil 3D to aid in preliminary efforts and provide context to smaller sites
- BONUS: Learn how to use AutoCAD MAP 3D, within Civil 3D, to import GIS contours with elevation values, **SHP** files

## Description

Seasoned Autodesk users may have routines and processes that have served them well in the past. This class will provide a modern perspective of legacy workflows that still are crucial parts of day-to-day civil/survey consulting processes, proposals, and workflows. Take advantage of the tools provided with the Architecture, Engineering & Construction Collection, and relearn previous workflows that may have changed in recent releases of Civil 3D software, AutoCAD Map 3D software, ReCap software, and other tools.

## Speaker

Dino Lustri, P.E., P.S. is a consulting water resources engineer and surveyor. He began using Autodesk software in 1987. Dino has extensive experience in information technology. His professional experience includes hydrologic and hydraulic modeling as well as contracts in construction. He has acted in the capacity of city engineer, and provides expert testimony in legal cases. He has provided training for numerous organizations as well as authoring a variety of training materials and best practices for civil engineering and surveying workflows. He is a past president of the Professional Land Surveyors of Ohio, Cleveland Chapter. His present duties as Special Projects Engineer for the City of Cleveland, Department of Port Control is oversight for two airports and a municipal harbor.



## <u>OBJECTIVE 1 -</u> Incorporating record map electronic data from government agencies into your base mapping efforts. (DGN files)

The proper way to start any effort in Civil 3D is by starting a new drawing based on your template. In the absence of a properly customized template, we can start with the default Civil 3D template that is provided with the installation of the software.

This lesson will provide the detailed steps to setup, import and organize data provided in a non-Autodesk format. An added twist is the original data is in a different coordinate system than our working drawing. We will perform a coordinate conversion during the import process.

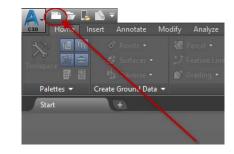
#### Utilizing the MAPIMPORT command

There are a number of file types that aren't native to Autodesk products that we might want to utilize in our drawings. Some of those file types include....

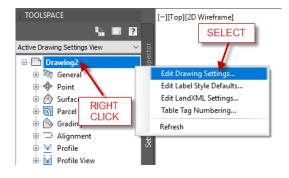
ASCII Point Files (\*.TXT, \*.CSV, \*.ASC, \*.NEZ) Autodesk SDF (\*.SDF) CityGML (\*.GML, \*.XML, \*GZ) ESRI ArcInfo Export (\*.E00) Geography Markup Language (\*.GML, \*.XML, \*.GZ) Google (\*.KML, \*.KMZ) MapInfo (\*.MIF, \*.TAB) MicroStation (\*.DGN) MasterMap (\*.GML, \*.XML, \*.GZ) Spatial Data Transfer Standard (\*.CATD.DDF) SQLite Spatial (\*.SQLITE) Vector Product Format (\*.FT)

- 1) Open a new drawing based on your template or the default Civil 3D template.
  - a. Click on the **QNEW** button.

Or start by opening Cl223971-Lustri-AU2018-01.dwg



b. On the *Settings* tab of the toolspace, right click the drawing name and then select **Edit Drawing Settings...** 





c. Assign the Zone Category as **USA**, **Ohio** and set the Available coordinate systems: as NAD83 Ohio State Planes, North Zone, US Foot (OH-83NF)

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Click <b>OK</b> when finished.	NAD83	3			
		OK Cancel	Apply	He	lp

In lieu of the previous steps, start by opening Cl223971-Lustri-AU2018-02.dwg

- 2) Type **MAPIMPORT** at the command line.
  - a. Set the Files of Type: to **MicroStation File** (\*.dgn)

- b. Browse to the data files folder and select 203p9.dgn.
- c. Click **OK**.

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3) In the resulting Import dialogue box, select **Load...** under saved profiles and browse to the data folder.

OH83NF     NAD83 Chio State Planes, North Zone, US Foot  Driver options  Driver Options  Changing these options may affect the layout of the import properties table.  proof properties for each layer imported:							
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4) Select Cuyahoga County DGN Import Settings USE WITH MAP IMPORT COMMAND.IPF

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One of the benefits of loading this preconfigured file is the second column (Drawing Layer) and another benefit is the fourth column (Input Coordinate System). In the drawing layer column, you can assign whatever layer you want to use and import the sources DGN drawing levels into your layer naming convention. The Input Coordinate System column represents the original coordinate system of the file you are importing (i.e. dgn). You will have to determine what coordinate system the source files are defined. Note the upper left corner of the dialogue, this represents the coordinate system of your drawing and what the imported file will be translated to. In this case Cuyahoga Regional Geodetic Survey (CRGS) is a local proprietary coordinate system developed by the County before State Plane systems were commonplace.

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After reviewing the dialogue and replacing the missing settings, click **OK** to import the data.

5) Zoom extents to see the imported data.

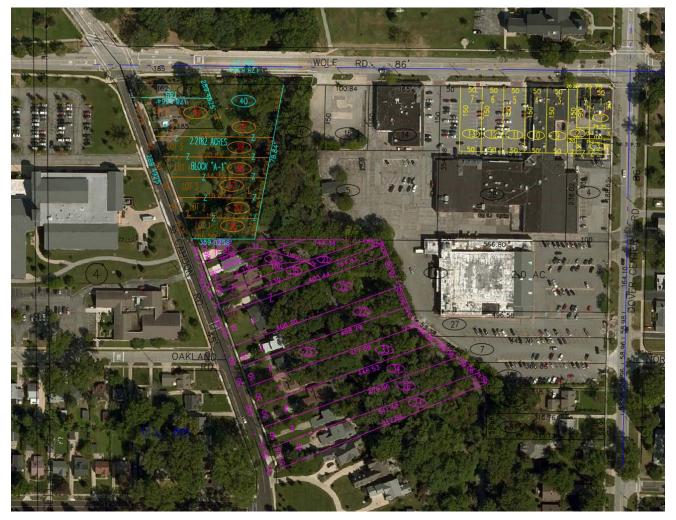
TIP: Try double-clicking the roller button on your mouse for a zoom extents shortcut.





6) The data is now geospatially rectified, so if you use the GEOMAP command and turn on aerial imagery, the imagery will appear in proper context to the data you imported. Note that it is rare that aerial imagery fits perfectly with surveyed data. The complication lies in the many processes and control points used over large areas.

Type **GEOMAP** in the command line and select **A** for Aerial.



Note that the GEOMAP command will only work if you are logged on to Autodesk Cloud Services.

▶ Type a keyword or phrase

### Q.E.D.

The final drawing in this exercise can be viewed by opening Cl223971-Lustri-AU2018-03.dwg



#### **TIPS & TRICKS**

Whenever you import files or insert blocks you inevitably are adding data to your drawing that was performed in a poor manner. Either by lack of standards or other bad CAD etiquette, data in your drawing will be less controllable if left in this state.

I have used the following tools for years in attempts to 'clean up' imports and other people's drawings so I can spend less time manipulating them and more time using them.

#### Start by opening Cl223971-Lustri-AU2018-03.dwg

Start with the last exercise file and turn off **GEOMAP**.

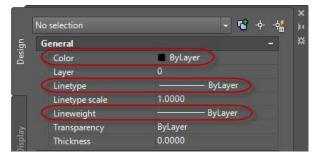
- 1) The first command we will use to clean up the data is **SETNESTEDOBJECTSBYBLOCK** 
  - a. This command changes all the layers inside of a block to layer 0. In this way the block will appear the color and properties of the layer that it is on. Some would call this good CAD practice.
  - b. Type **SetNestedObjectsByBlock** at the command line.
  - c. You will be prompted to Select Block References. Simply window the entire drawing.
  - d. Any blocks that were in the windowed area now have their layers set to 0.





- 2) Another good CAD practice is the properties of your objects being set to BYLAYER, BYLAYER, BYLAYER.
  - The reason this is said three times is due to historic AutoCAD use when Color, Linetype, and Lineweight were always assigned the property BYLAYER.

This was to allow the appearance of your drawing to be easier manipulated by changing layer properties rather than object properties.





- b. The next command we will use to clean up the drawing is **SETBYLAYER**. This command changes property overrides of selected objects to ByLayer.
- c. Type **SetByLayer** at the command line.

Then click S for settings.

Check that all the checkboxes are checked or manipulate as you desire.

- d. Window the entire drawing and press enter.
- e. In the command line you will see a verification request. Click **Yes** to change *ByBlock* to *ByLayer*.
- f. You will then be prompted to verify if you want blocks included, click **Yes**.

You might notice changes to your drawings upon pressing enter.

 The next command we will use requires the download of a script from a user. Credit should be given to Steve Doman for creating this LSP routine. The name is STRIPMTEXT.

This LSP routine will remove the custom properties that may be defined in an MTEXT object.

- a. Type **APPLOAD** at the command line.
- Browse to the location you have it stored, select it and pick Load.

Properties to change to	ByLayer
Color	Material
Linetype	Plot Style
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	Select objects	or [Settings]: Change ByBlock to ByLayer? [Yes No] <yes>:</yes>

Select objects or [Settings]: s Current active settings: Color Linetype Lineweight Transparency Material Select objects or [Settings]: Specify opposite corner: 534 found Select objects or [Settings]: Change ByBlock to ByLayer? [Yes/No] <Yes>: Y SETBYLAYER Include blocks? [Yes No] <Yes>:

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You may be prompted with a Security dialogue box stating that it is an Unsigned Executable File.

You should be very careful about using any executables downloaded from the Internet. USE AT YOUR OWN RISK!

Securit	y - Unsigned E	xecutable File	×				
	The publisher of this executable file could not be verified and the file is no located in a trusted folder. What do you want to do?						
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		Always Load Once Do Not Load					
How d	o I decide wha	t files to load?					

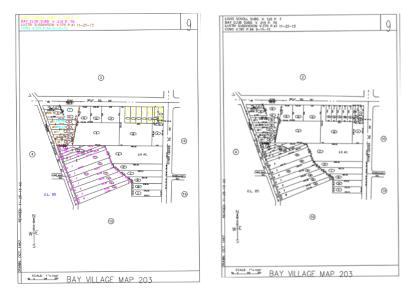
- c. Click Load Once.
- d. Click Close on the Load/Unload Applications dialogue box.
- e. Type **STRIPMTEXT** at the command line.
- f. You will be prompted to select objects, window the entire drawing, then press Enter.
- File to list: \*Cancel\*
  Command: STRIPMTEXT
  StripMtext v5.0b
  Select objects: Specify opposite corner: 285 found
  Select objects:
  E + Type a command

g.	The StripMtext dialogue will display.
	Choose the properties you wish to reset by
	checking the associated boxes.

h. Click OK.

The results of the command are evident as all the colors revert to BYLAYER and therefore are the color of the layers assigned. Left is before the command, Right is after.

StripMtext v5.0b			×						
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Select type of formatting	to remove								
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Color	Paragraph	Fields							
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See the Layer listing.

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_CE_DGN_19_Property_&_Subdivision_Lines	<b>?</b>	÷	E C	÷	white	Continuous	0.00 mm
_CE_DGN_20_Misc_Text_Arrows_Ellipses_Land_Hooks	÷	÷	E C	÷	white	Continuous	0.00 mm
_CE_DGN_21_Centerline_Dimensions	÷	÷	E C	÷	white	Continuous	0.00 mm
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_CE_DGN_23_Parcel_Number	•		E C	÷	white	Continuous	0.00 mm
_CE_DGN_26_Front_Lot_Dimensions	•	÷×	E C	÷	white	Continuous	0.00 mm
_CE_DGN_27_Frontage_Over_50_Feet	•	÷×	E C	÷	white	Continuous	0.00 mm
_CE_DGN_28_Sideline_Dimensions	•	÷×	E.	÷	white	Continuous	0.00 mm
_CE_DGN_29_Rear_Lot_Dimensions	•	÷	E C	÷	white	Continuous	0.00 mm
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_CE_DGN_34_Tax_Page_Cell_&_Map_Circles	•	×	E C	÷	white	Continuous	0.00 mn
_CE_DGN_46_Consolidations_Land_Hooks	•	×	E C	÷	white	Continuous	0.00 mn
_CE_DGN_47_Sublot_Number_Revised	•	×	E C	÷	white	Continuous	0.00 mn
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🖉 Defpoints	<b>?</b>	×	E -		white	Continuous —	— Default 0
∠ Level 20	•	-``	<b>.</b>		white	Continuous —	0.00 mm 0

Scroll down the layer listing to see layers that were not converted in the previous exercise.

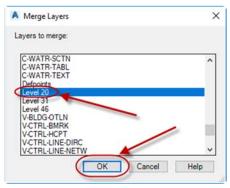
- 4) Often there are blocks within blocks that have the original layer name before they were made into blocks. The following command will help us merge these old layers into the new ones, bringing their data with them.
  - a. On the *Home* tab of the ribbon, *Layers* panel, select the down arrow to the bottom right to expand the panel. Click **Merge**.



 b. You will be prompted to select object on layer to merge or [Name]. Choose Name and the Merge Layers dialogue will appear.

× بر	Command: **** No System Variable Changed **** Command: Command: Command: _laymrg
	▶ TAYMRG Select object on layer to merge or [Name]:

c. Scroll down to pick the redundant layer. This is the <u>FROM</u> layer, you will pick the TO layer next.





- d. You will still be in selection mode, meaning that you can still select items. To end selection mode, click Enter one time.
- e. You will now be prompted to select object on target layer. This is the TO layer. Select Name again to pick from the list.

d.	You will still be in selection mode, meaning that you can still select items. To end selection mode, click <b>Enter</b> one time.	Selected Ia	laymrg ect on layer to merge or [Name]: N ayers: Level 20. Select object on layer to merge or [Name Undo]:
e.	You will now be prompted to <u>select</u> <u>object on target layer</u> . This is the TC layer. Select <b>Name</b> again to pick from the list.	Select Select Select	d: d: _laymrg object on layer to merge or [Name]: N ed layers: Level 20. object on layer to merge or [Name/Undo]: AYMRG Select object on target layer or [Name]:
f.	Choose the proper target layer and o	click <b>OK</b> .	Merge to Layer     X      Target layer:      CE_DGN_20_Misc_Text_Arrows_Elipses_Land_Hooks      CE_DGN_01_Page_Outline     _CE_DGN_01_Page_Outline     _CE_DGN_10_Original_Lot_Lines     _CE_DGN_10_Street_Intes     _CE_DGN_15_Street_Centerlines     _CE_DGN_18_Right_of_Way     CE_DGN_18_Right_of_Way     CE_DGN_18_Right_of_Way     CE_DGN_12_Nropesty_& Subdivision_Lines     TCE_DGN_20_Misc_Text_Arrows_Elipses_Land_Hooks     CE_DGN_20_Misc_Text_Arrows_Elipses_Land_Hooks     CE_DGN_20_Misc_Tex

CE DGN 22 Sublot Number CE\_DGN\_23\_Parcel\_Number DGN 26 Front Lot Dimensions

1

g. You will be prompted with a verification

dialogue. Click Yes.

Merge to Layer	$\times$
You are about to merge layer Level 20 into layer _CE_DGN_20_Misc_Text_Arrows_Ellipses_Land_Hooks.	
Do you wish to continue?	
Yes No	

OK

Cancel

Help

h. Note that the layer named Level 20 no longer exists. It has been merged.

Detpoints	Y I	- <del>1</del> ,21	i di s	white	Continuous	— Default 0
🛥 Level 31	<b>•</b>	- <u>×</u> -	E C	🖶 📃 white	Continuous	—— 0.00 mm 0
🕿 Level 46	<b>•</b>	×	E C	🖶 📃 white	Continuous	—— 0.00 mm 0
	•	- X <b>X</b>		= 170	Continuous	Default 0

i. Repeat the steps for the other two layers. Note in this data file Level 31 does not have a target layer, you will have to create the layer first for this command to work.

The final version of this exercise can be found by opening Cl223971-Lustri-AU2018-04.dwg

#### Q.E.D.

CI223971-Lustri-AU2018



## **OBJECTIVE 2** - Locating, downloading, and selectively importing Federal Emergency Management Agency (FEMA) flood map information to project coordinate systems. (SHP files)

Many consulting engineers and surveyors need to show current flood plain information on their base mapping. The first step is knowing where to go to find that information. Then we need to convert it into our CAD environment, in the project's coordinate system so that we can add project related information to it.

#### FEMA Data Resources

The following links provide access to various website locations within the FEMA website...

- 1) FEMA Flood Map Service Center This site will provide the user with current Federal Insurance Rate Maps (FIRM)
  - a. https://msc.fema.gov/portal/home
- 2) FEMA Flood Map Service Center Search All Products a. https://msc.fema.gov/portal/advanceSearch
- 3) National Flood Hazard Layer (NFHL) Data Home Page
  - a. https://catalog.data.gov/dataset/national-flood-hazard-layer-nfhl
  - b. Under Downloads & Resources, you will see a couple options to select...
    - i. If you select **Download Seamless** Nationwide NFHL GIS data...

HTHE	Download Seamless Nationwide NFHL GIS data 2867 views The most recent nationwide extract of the National Flood Hazard Layer	▲ Download
	is Ø Linkis ok 📌ជាជាជាស់ Openness score	

### Index of /FIMA/Risk MAP/NFHL

ii. You will see a folder listing files to download, some of which are 10-30 GB. Unless you have a computer capable of dealing with these data sets and/or your project requires you to span large areas, do not download from this location.

Name	Last modified	<u>Size</u>	<b>Description</b>
Parent Directory		-	
00_README_NFHL.txt	07-Jun-2016 11:25	1.3K	
FIRM Panel USNG Crosswalk.zip	14-Aug-2015 02:25	8.7M	
<b>NFHL_10.0.1yr</b>	15-Nov-2014 08:53	220K	
<b>NFHL_20150429.1yr</b>	24-Jun-2015 16:24	73K	
NFHL_20171004.gdb.zip	11-Oct-2017 09:55	10G	
NFHL_20180612.gdb.zip	14-Jun-2018 08:42	10G	
NFHL_20181001.gdb.zip	09-Oct-2018 12:02	11G	
NFHL_AS_OF_9-28-2012.zip	30-Aug-2018 09:42	30G	
NFHL_Core_20170313.gdb.zip	15-Mar-2017 11:23	12G	
NFHL_Repaired.gdb.zip	16-Oct-2018 05:59	9.9G	
<u>NFHL_S_POL_AR_20180924/</u>	25-Sep-2018 16:01	-	
Pending_20171015.gdb.zip	16-Oct-2017 15:10	877M	
metadata/	10-Aug-2016 13:27	-	
web.config	15-Nov-2014 09:08	600	

iii. If you select Get Flood Maps and Data from FEMA...

Apache Server at data femadata com Port 443

Get Flood Maps and Data from FEMA Current effective maps and data at the county and state level are available OLink is ok





#### FEMA Flood Map Service Center: Welcome!

Looking for a Flood Map? 🛛

Enter an address, a place, or longitude/latitude coordinates:
Enter an address, a place, or longitude/latitude coordinates:
Looking for more than just a current flood map?
Visit <u>Search All Products</u> to access the full range of flood risk products for your community.



AUTODESK.

About Flood Map Service Center

The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the National Flood Insurance Program (NFIP). Use the MSC to find your official flood map, access a range of other flood hazard products, and take advantage of tools for better understanding flood risk.

FEMA flood maps are continually updated through a variety of processes. Effective information that you download or print from this site may change or become superseded by new maps over time. For additional information, please see the <u>Flood</u> <u>Hazard Mapping Updates Overview Fact Sheet</u>

 After typing in your address, you will be provided the search results of available effective flood maps, revisions, amendments and revalidations. You will also be able to generate a 'FIRMette' from this page.

FEMA Flood Map Service Center: Search By Address

Enter an address, place, or coo	ordinates: 🔞			
475 Cahoon Road, Bay Village, C	он	Search		
live in an area with low or mode	erate flood risk, you are 5 time: ce Program's flood insurance ;	od insurance because most homeowne s more likely to experience flood than a policy could cost less than \$400 per yea i damage.	fire in your home over th	e next 30 years. For
Search Results—Produc	cts for <b>BAY VILLA</b>	AGE, CITY OF		Show ALL Products »
The flood map for the selected ar	ea is number 39035C0	131E, effective on 12/03/2010	0	
DYNAMIC MAP	MAP IMAGE	Changes to this FIRM Revisions (0) Amendments (4) Revalidations (2)	0	
You can choose a new flood map or move i new location in the search field above. It m				Go To NFHL Viewer »
t (	C.			Contraction of the second s
pr.		EXTERNAL CONTRACTOR		English Constant
et in St	n poten la	F	at at a	e Pesiti
Prev Approximate location based and does not represent an a property location Selected FloodMag Bounda Digital Driss Available	SPECIAL FLOOD HAZARD AREAS	Without Base Flood Devalues (BFD) Jour A 9, 80 With BFC or Depth P P Regulatory Floodway Jour AD, MI, MI, MI, MI, 0,2% Annual Charce Flood Hazard, Areas	()	a Sections with 1% Annual Chance or Surface Elevation tal Transet Flood Elevation Line (BFE) of Study diction Boendary
MAP PANELS No Digital Data Available University of Minimal Flood His University Area of Minimal Flood His Other Areas	OTHER AREAS OF	of 1% annual chance flood with average depth less than one boot or with desinage areas of less than one square mile 2me it Future Conditions 1% Annual Chance Flood Histard 2me it Area with Reduced Flood Risk due to Less Eles Notes, Line it	OTHER FEATURES	kai Transect Baseline de Basaline ographic Feature unel, Culvert, or Storer Sever
OTHER AREAS Area of Undetermined Flo	66 Hazard Jone D FLOOD HAZARD	Area with Fixed Risk due to Leves Zona 2		



Download

- 4) National Flood Hazard Layer (NFHL) GIS Viewer
  - a. This site is a modern GIS viewer that allows for both the download of FIRMs as well as the GIS data that we are interested in.
  - b. If you select NFHL Interactive Map (FEMA GeoPlatform)



You will land on the official NFHL page, on which the link to the ArcGIS web app viewer is found.

	Data from digitally available Flood Insurance Rate Maps (FIRMs). On April 1, 2018 this map will no Anger function. Please update your bookmark to https://hazards-	Open in Map Viewer
E East 7	(fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd)	Open in ArcGIS Desktop
	K Web Map by eliza.ledwell_FEMA	
T	Created: Jun 24, 2013 Updated: Mar 11, 2018 View Count: 10,295,659	Details
Description		Size: 48 KB ★ ★ ★ ★ ★
naps. On April 1, 2018 thi	A replaced this map with a new NFHL map with additional functionality which allows users to print official flood a map and NFHL link will no longer function. Please update your bookmark to https://hazards-	f1 ¥ 8
	os/webappviewer/index.html?id=8b0adb51996444d4879338b5529as9cd. For more information on NFHL data NFHL GIS Services page at https://hazards.fema.gov/femaportal/wps/portal/NFHLWMS	Owner
	MA systems will require the use of the "https" protocol, and "http" links will no longer function. This may impact EMA GeoPlatform (including this map) will not be affected by this change. For more information on how NFHL	eliza.ledwell_FEMA
	ed, please visit the NFHL GIS Services page at https://hazards.fema.gov/femaportal/wps/portal/NFHLWMS.	Tags
sis services will be impact		

#### https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

Once you zoom into or type in your project location, click in the map, and download links will appear. Click on the one that refers to county GIS data.

Your download will begin. Once downloaded, extract the file contents to your project folder and review the contents.

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(1 of 3) ► 🗆 🗙
FIRM Panels: 39035C0131E
Map Effective Date: 12/2/2010, 7:00 PM
Map is
Download a praphic of the map (available if
map panel is printed) Download county GIS data
B B B B B B B B B B B B B B B B B B B
Zoom to
a state of a state the The The state and

Note: In the XML file which contains the metadata, you will find the coordinate system used as well as the vertical datum used in these files. The PRJ files are just as important as the SHP or DBF files. Make sure you keep all these together in the same folder.

That link is:



### Using MAPIMPORT to import FEMA Data

#### Start by opening Cl223971-Lustri-AU2018-05.dwg

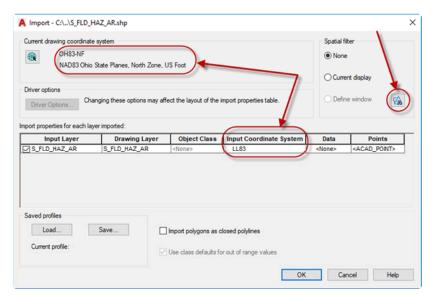
- 1) Using a drawing that has information in a geospatially correct location will help in determining the area in which to bring in the FEMA data that was downloaded.
- 2) The list of SHP files that were part of the download are defined in the MetaData file...
  - a. S\_Base\_Index: Location and attributes for a tiling index for raster data used for the FIRM base map.
  - b. S\_BFE: Location and attributes for base flood elevations lines shown on the FIRM.
  - c. S\_FIRM\_Pan: Location and attributes for FIRM hardcopy map panels.
  - d. S\_FId\_Haz\_Ar: Location and attributes flood insurance risk zones shown on the FIRM.
  - e. S\_FId\_Haz\_Ln: Location and attributes for boundaries of flood insurance risk zones shown on the FIRM.
  - f. S\_Gen\_Struct: Location and attributes for flood control structures shown on the FIRM.
  - g. S\_LOMR: A spatial data set consisting of polygons that depict effective LOMRs that have been incorporated into the NFHL since the last publication of the FIRM panel for the area.
  - h. S\_PLSS\_Ar: Location and attributes of sections, townships and ranges shown on the FIRM.
  - i. S\_Pol\_Ar: Location and attributes for political jurisdictions shown on the FIRM.
  - j. S\_Profil\_BasLn: A spatial data set consisting of lines showing the flow path used for floodplain modeling and mapping.
  - k. S\_Stn\_Start: A spatial data set consisting of points indicating the location of the reference point that was used as the origin for distance measurements along streams and rivers.
  - I. S\_XS: Location and attributes for cross-section lines in the area covered by the FIRM.

#### 3) Type MAPIMPORT at the command prompt.

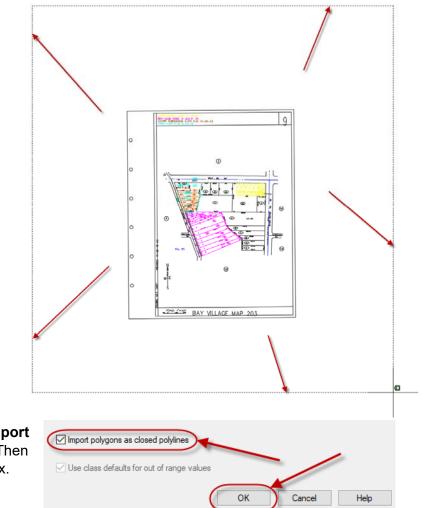
- a. Set the Files of type to ESRI Shapefile (\*.shp)
- b. Select the **S\_FLD\_HAZ\_AR.shp** file.
- A Import Location ? × Look in: 39035C\_20170802 🖕 🛤 🕅 💥 🛤 ye Date modified Name Type Size S\_BASE\_INDEX.shp 8/3/2017 1:08 AM AutoCAD Shape S. 1 KB 8/3/2017 1:08 AM AutoCAD Shape S... S\_BFE.shp 190 KB S FIRM PAN.shr 8/3/2017 1:08 AM AutoCAD Shape S... 32 KB 8 S\_FLD\_HAZ\_AR.shp 8/3/2017 1:08 AM AutoCAD Shape S... 23,314 KB S FLD HAZ LN.she 8/3/2017 1:08 AM AutoCAD Shape S... 12.023 KB AutoCAD Shape S... S\_GEN\_STRUCT.shp 8/3/2017 1:08 AM 37 KB AutoCAD Shape S... S\_LOMR.shp 8/3/2017 1:08 AM 4 KB 8/3/2017 1:08 AM S PLSS AR.shp AutoCAD Shape S... 591 KB S\_POL\_AR.shp 8/3/2017 1:08 AM AutoCAD Shape S. 534 KB S PROFIL BASLN.shp 8/3/2017 1:08 AM AutoCAD Shape S... 170 KB S\_STN\_START.shp 8/3/2017 1:08 AM AutoCAD Shape S... 1 KB S XS.shp 8/3/2017 1:08 AM AutoCAD Shape S 108 KB File name OK Files of type: ESRI Shapefile (\*.shp) Cance
- c. Click OK.



4) In the Import dialogue box, note the *Input Coordinate* System is present and that it is different than the *Current* drawing coordinate system.
LL83 versus OH83-NF.
Under Spatial filter, select the Define Window button.



5) Window an area larger than the data set in the drawing.



 Make sure to check the box for Import polygons as closed polylines. Then click OK in the import dialogue box.



7) You will see the Import Progress dialogue and shortly after the linework will appear in the proper location in your drawing.

A Import Progress	×
Processing objects	0
Cancel	

8) Although the windowed area is smaller, the defined window acts as a crossing window, not as an encapsulating window, so anything it touches or crosses will be included in the import.



### Q.E.D.

The final drawing of this exercise can be viewed by opening Cl223971-Lustri-AU2018-06.dwg



# <u>OBJECTIVE 3 – Utilize available point cloud data, classify it (isolate ground points from other points) and generate a Civil 3D surface. (LAS files)</u>

Many jurisdictions are beginning to make available aerial LiDAR data that has been organized (classified). LiDAR is an acronym for Light Detection And Ranging. There are numerous files types for point cloud data, in this exercise we will be using LAS files.

**Ohio Geographically Referenced Information Program (OGRIP)** 

The following links provide access to state of OHIO LiDAR data.

1) <u>http://gis5.oit.ohio.gov/geodatadownload/</u>





- C OGRIP Data Downloads × + → C ☆ ③ Not secure | gis5.oit.ohio.gov/geodatadownload/ ← \$ 1 🔾 🖉 🗄 **QGR** Ohio Geographically Referenced Information Program OGRIP Data Downloads Zoom to. County/City/Zip Coordinates ZOOM IN CLOSER TO THIS TILE 44140 Zoom 3) Zoom in closer to the tile numbered N2125660. Click on a county, links to data will appear in the tabs below Zoom in to see the tiles, click them to see links to tile data Tools Em 152 Pan Select Clear Click the Select tool to select more than one tile. Drag your mouse to draw a rectangle across tiles on the map. Click the Clear Selection button to clear all selected tiles Basemap OSIP Imagery OSIP II Enhanced OSIP I & II OSIP III LBRS USGS OSIP I Help
- 2) Type 44140 in the **Zoom to...** box then click the **Zoom** button.

4) When you click on that tile, the lower part of the dialogue populates with the data that is available for that tile. For example the OSIP I tab provides TIFF, SID, LIDAR, GRID and ASCII information. While the OSIP II tab only provides TIFF and SID aerial imagery.

OSIP I OSIP II	Enhanced OSIP I & II	OSIP III LBRS	USGS	Help
N2125660	<u>SID LIDA</u>	<u>r grid</u>	ASCII	
OSIP I		SIP III LBRS	USGS	Help
N2125660	<u>SID</u> LIDAR (	NA) GRID (NA)	ASCII (NA)	

- 5) By clicking on the blue links, the data files will begin downloading.
- 6) Extract the contents of the file in your project folder. In this case we receive and LAS file and an XML file which is the metadata for the LAS file. This metadata will tell you the coordinate system, date the data was obtained and various other information about the processing and source of the data.



### Using RECAP to process point cloud data and prepare it for use in Civil 3D

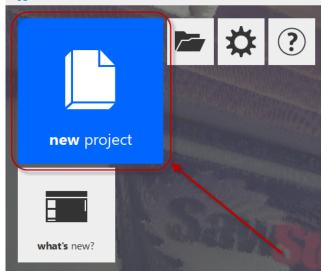
In previous versions of Civil 3D, there was a point cloud object for the purpose of classifying point cloud data and using it to generate a Civil 3D surface. In present releases Autodesk products, namely the AEC Collection, the point cloud processing was removed from Civil 3D and placed within RECAP which is the subject matter application.

1) Launch RECAP.



2) Select new project.

#### R AUTODESK' RECAP PRO





3) Select import point cloud.

3)	Select import point clo	ud.				
		new project				×
		imp point of		<b>transfer</b> from mobile device	photo	to 3D
4)	Provide a project name		ave the		e new projec	
	result and click <b>proceed</b>	l.			need a project na	me
				LAS LIDAR C3D S	urface Creation	<u>)</u>
					ace to save your f	iles
				C:\Cl223971-Lustri-A	AU2018	
		_		🗙 cancel	<b>√</b> p	roceed
5)	Choose <b>select files to i</b>	mport.	select	t files to import	+ select fold	ler to import
				or		
				0		
		l		drag files or fold	lers here	
6)	Choose the file and	> This PC > 0	(C:) > CI223071.	-Lustri-AU2018 > Point Cloud	lInfo	
	select <b>open</b> .	New folder				
		Name	^	Date modified	Туре	Size
		N2125660.las		8/9/2006 6:54 PM	AutoCAD Layer St	11,124 KB
			File name: N21	25660.las	✓ All Supported File	es (*.rcs;*.fls;*.1 ∨
					Open	Cancel



7) Select the **advanced tab**.

R AUTODESK" RECAP PRO	🚨 Dino Lustri 👻 🔥 connect 💽 💌 🖂 🖂
scan settings	filtering
<b>clip</b> points	intensity dipping 100%

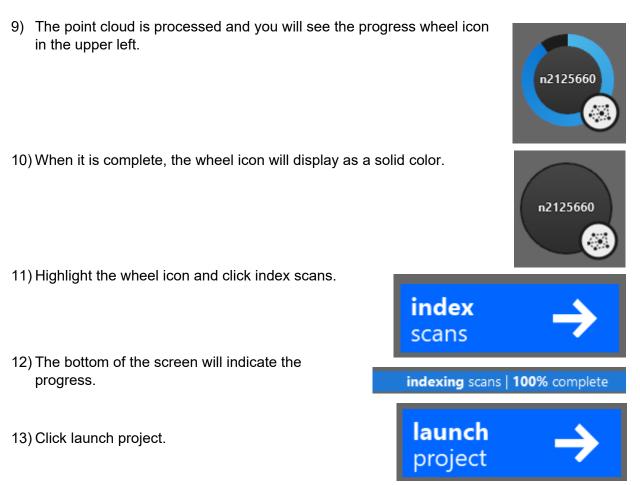
- 8) Enter the coordinate system you determined from the XML file metadata in the current field and enter the coordinate system of your drawing in the target field.
  - a. Begin typing the coordinate system ID if you know it and the right search results will display all that being with what you type. If you know the EPSG then you can enter that as well.

scan settings		filtering	advanced			
<b>decimation</b> grid	decimation 5	mm				
coordinate system	current OH83 target <none></none>		×	ID OH83-N OH83-NF OH83-SF OH83-SF	Description         EI           NAD83 Ohio State Planes         32           NAD83 Ohio State Planes         37           NAD83 Ohio State Planes         37	123
<b>up</b> axis	X Y Z	flip axis				
				change to: OH83-NF	Car	

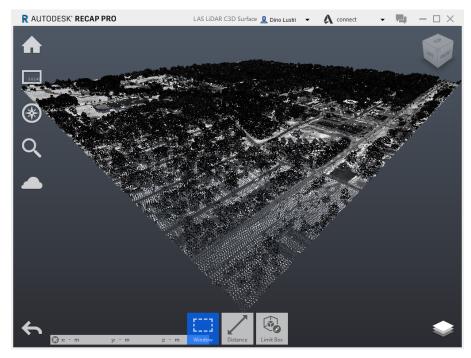
- b. Do the same effort for the target field.
- c. Verify that your dialogue looks like the below before selecting import files.

R AUTODESK' RECAP PR	0	👤 Dino Lustri	- \Lambda connect	• 🖫 – 🗆 ×
scan settings	filterin H			
<b>decimation</b> grid	decimation 5	mm		
<b>coordinate</b> system	current OH83-NF target OH83-NF		×	
up axis	ХҮ	flip axis		- ,
← cancel import		le selected or import	imp files	ort 🔶





14) A visual representation of the LiDAR file will display on your screen.





Page 24

## 15) Hover over the house icon and select the 'floppy disk' icon for saving your processed work.

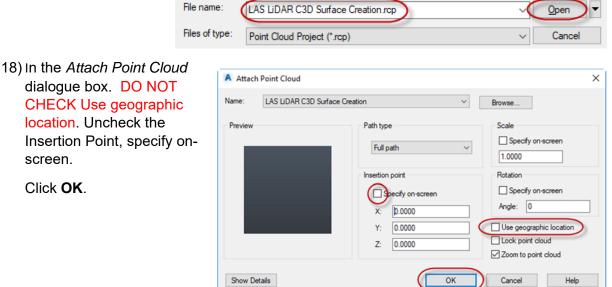
#### 16) Launch Civil 3D.

Start by opening **Cl223971-Lustri-AU2018-07.dwg**. Note this drawing had the coordinate system assigned in the previous steps. If you start from a new drawing, make sure to assign the correct coordinate system.

#### 🛟 Civil 3D 🕞 🖪 💺 🕈 🚔 🐟 Output Autodesk InfraWorks Collaborate 🌺 Land Desktop \_\_\_\_\_ Create 😕 Underlay Lave T 🚅 Edit 🔤 LandXML ort Survey Data Clip Adju InfraW 🐝 Edit Attributes nts fro Snan to L Block -InfraWorks Point Cloud Reference -CI223971-Lustri-AU2018-07

On the Insert tab, Point Cloud panel, select Attach.

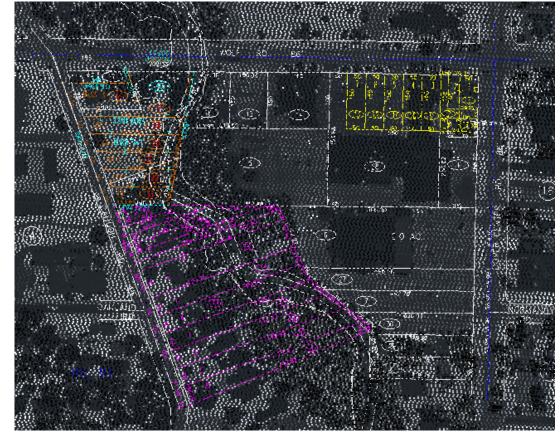
17) Select the RCP file that you created in the steps above and pick open.







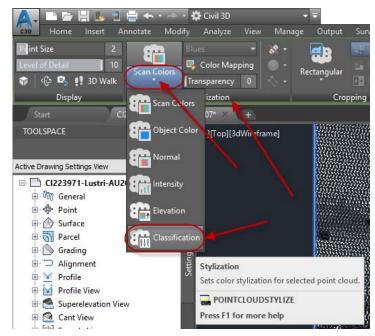




19) The point cloud should have imported to the proper location.

20) Click on the point cloud's edge to launch the contextual ribbon.

 a. On the contextual ribbon, visualization tab, click the lower half of the Scan Colors button to display the other visualization options. Select Classification.





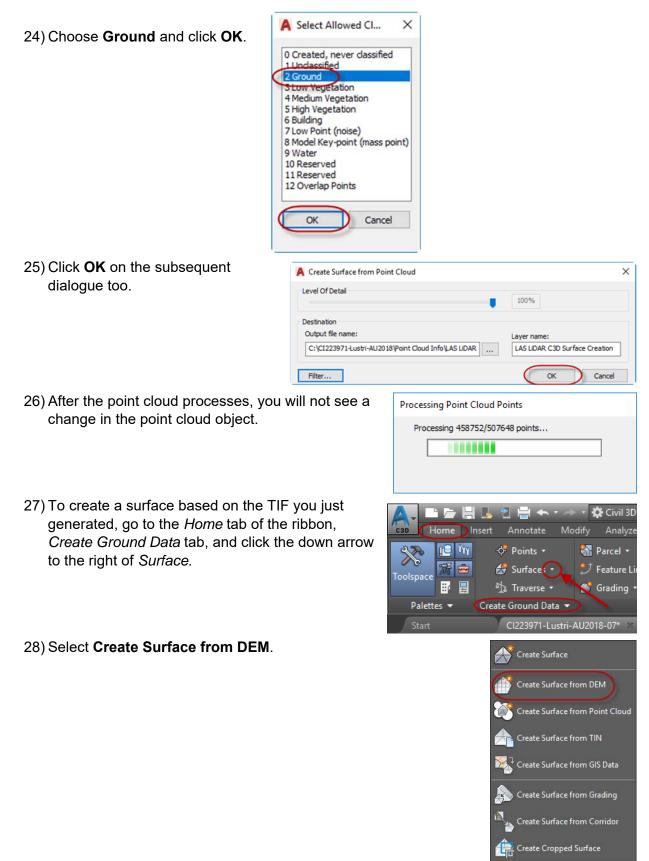
b. This will verify that your LAS file had classes defined. In the below image you see gray representing buildings, green representing vegetation, and brown representing ground.



- 21) At the command line type **MAPCREATEPCSURFACE**. Be sure to type the correct command, there is a similar command called **Mapcreatesurface** that is incorrect for this process.
- 22) You will be prompted to select the object, pick the edge of the point cloud object. Then press enter.
- 23) In the Create Surface from Point Cloud dialogue box, choose the output file name and location, (Note the TIF suffix). Select Filter.

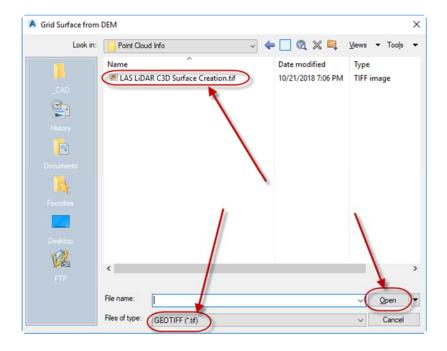
A Create Surface from Point Cloud		
Level Of Detail	100%	
Destination Output file name:	Layer name:	
C: \CI223971-Lustri-AU2018\Point Cloud Info\LAS LiDAR	LAS LIDAR C3D Surf	ace Creation
Filter	ОК	Cancel



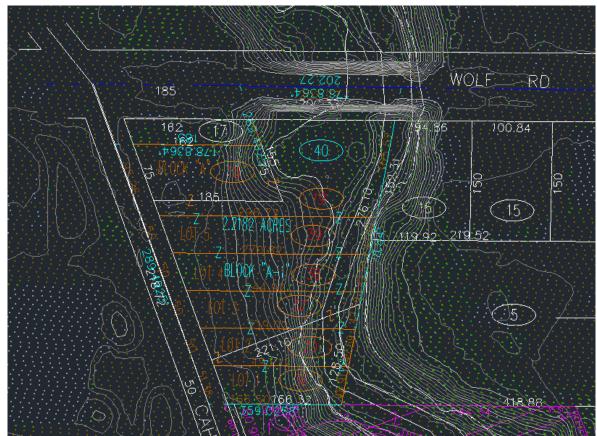




29) Browse to the TIF you generated, make sure the *Files of type* is set to **GEOTIFF (\*.tif)** and select the file, then click **Open**.



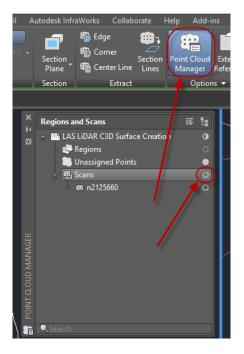
30) Once it is finished processing you will notice a Civil 3D surface appear under the point cloud.





The drawing at this stage can be observed by opening Cl223971-Lustri-AU2018-08.dwg.

31) To manipulate the point cloud, i.e. turn it off, but not detach it, click on the point cloud object to launch the contextual ribbon. On the *Options* tab, click **Point Cloud Manager**. In the Point Cloud Manager, clicking the radio button for the scan will turn off the visibility like turning a layer off.

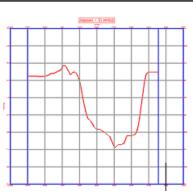


The drawing at this stage of this exercise can be found in **Cl223971-Lustri-AU2018-09.dwg**.

32) Alternatively, you could go to the XREF dialogue box and detach the point cloud permanently.

×	m. • € • m. • N	RIGHT CLICK						
~	File References	1						
	Reference Name		Status		Туре	Date	Saved Path	
EXTERNAL REFERENCES	C2223971-Lustri-AU2018-09	Attach Unload Reload Detach Change Path Type > Select New Path Find and Replace	Opened Loaded	4.15 MB 263 KB	Current RCP	10/21/2018 7:25: 10/21/2018 6:39	C\Cl223971-Lustri-AU2018\LAS LiDAR C3D Surface Creation.rcp	
TERP	Details							
EX D								

33) Even with the RCP detached, the surface can still generate profiles.





The drawing at this stage of this exercise can be found in CI223971-Lustri-AU2018-10.dwg.

34) Using the LEVELOFDETAILOFF command allows you to keep all the contours on if you wish. Using the LEVELOFDETAIL command will all the system to display contours dependent on your zoom level.

Q.E.D.



# <u>OBJECTIVE 4 –</u>Utilize MAP to import SHP file contours with elevation values. (SHP files)

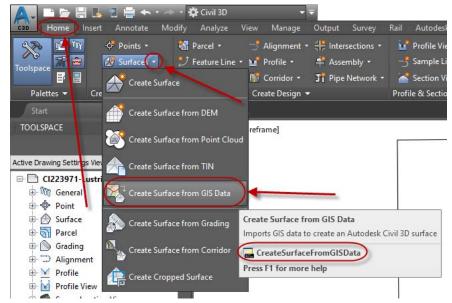
ESRI SHP files come in many variations. Autodesk added a great tool to automate the process of importing SHP contours while adding the elevation data and generating a surface thorugh a wizard interface. Sometimes the SHP file does not work with that command. The below steps will show the 'other' method to assign elevation data to the CAD objects so Civil 3D can utilize it to make a surface.

#### Utilizing the CREATESURFACEFROMGISDATA command

This process demonstrates the wizard added to Civil 3D for the purpose of importing ESRI SHP contour data into Civil 3D while generating a surface.

Begin by opening **Cl223971-Lustri-AU2018-11.dwg**. If you are starting from a new drawing, it is imperative to assign a coordinate system before continuing.

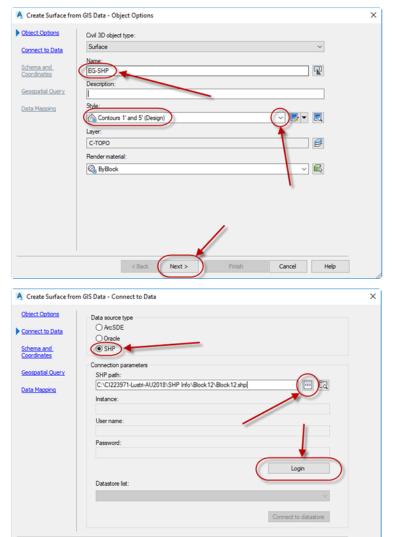
1) On the *Home* tab of the ribbon, *Create Ground Data* panel, click the down arrow next to *Surfaces* and pick **Create Surface from GIS Data**.



Note that you can type CREATESURFACEFROMGISDATA at the command line to launch the same wizard.



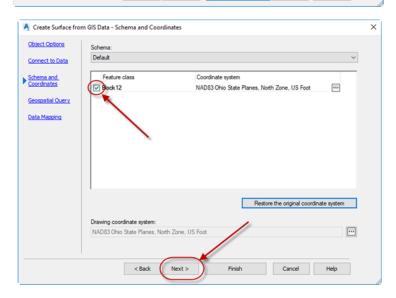
 In the Object Options dialogue box, assign a name, assign a style and click Next >.



 On the Connect to Data dialogue box, click the SHP radio button then click the ellipsis to browse to the SHP file.

Click Login.

 On the Schema and Coordinates dialogue, select the check box next to the Feature Class, then click Next >.



< Back

Next >

Finish

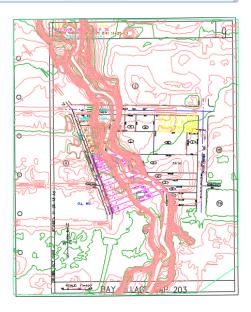
Cancel

Help



On the <i>Geospatial Query</i> dialogue box, select the Window radio button. Make sure the <i>Query Type</i> is set to <b>Crossing</b> and click the query button.	Create Surface fro     Object Options     Connect to Data     Schema and     Coordinates     Sesseatial Overy     Data Magging	m GIS Data - Geos Define area O Polygor @ Window O Fence O Circle	of interest by	(				x
Window the target area you want imported.		Query type				•		
Click <b>Next &gt;</b> to continue.								
On the <i>Data Mapping</i> dialogue, assign the elevation property next to the Elevation GIS Field.	Create Surface fro Object Options	Map GIS data to			Finish	Cancel	Help	×
	Connect to Data Schema and Coordinates Geospatial Query Data Macoino	- igds - igds - igds - igds - igds - igds - igds eleva	class style weigh color graph level lev_1 tion PE_Leng	Civil3D Proper				
Click Finish to complete the wizard.		File name:	< Back	Next >	Finish	Cancel	Нер	

7) A Civil 3D Surface will be generated.



The drawing at this stage of this exercise can be found in **Cl223971-Lustri-AU2018-12.dwg**.

5)

6)

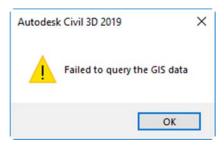


Utilizing MAP to process a SHP file that does not work with the CREATESURFACEFROMGISDATA command

This process demonstrates how to use MAP in order to work around SHP files that do not cooperate with the wizard.

Begin by opening **Cl223971-Lustri-AU2018-13.dwg**. If you are starting from a new drawing, it is imperative to assign a coordinate system before continuing.

 To show that the wizard doesn't work on the second data set, we repeat the above steps to attempt an import into Civil 3D. Use the TOPO\_08 data set this time.



2) Change the workspace to **Planning and Analysis**.

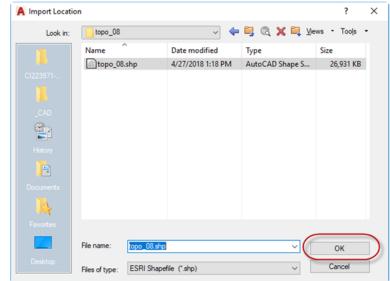
If the Map Task Pane is not showing, type **MAPWSPACE** at the command line and choose **On**.

	📙 🔁 🖶 🖘 🗠	🔹 🙀 Civil 3D	(-)		
C3D Home Ir	nsert Annotate Moo	lify Civil 3D	Output Survey Ri		
Toolspace	◆ Points • ♂ Surfaces • ☆ Traverse •	Drafting & Annotation 3D Modeling Planning and Analysis	· ‡ Intersections • ▲ Assembly • Ji Pipe Network •		
Palettes 🔻	Create Ground Data 👻	Save Current As Workspace Settings	Planning and Analysis		
Start	Cl223971-Lustri-A	U2 Customize	Press F1 for more help		

3) On the Insert tab of the ribbon, Import panel, select Map Import.



4) Browse to the **topo\_08.shp** file and click **OK**.





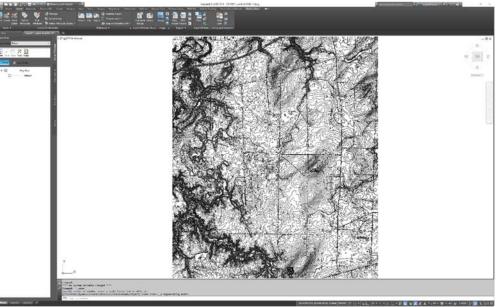
5) On the Import dialogue box, perform the following steps:

A Import - C:\\topo_08.shp	×			
Current drawing coordinate system OH83-NF NAD83 Ohio State Planes, North Zone, US Foot	Spatial filter None		Object Data Mapping	n input field
Driver options Driver Options Changing these options may affect the layout of the import properties table.	Current display	Do not import attribute data	Peatld ✓ OBJECTID ✓ Layer	Target Fields Featld OBJECTID Layer
	Points LAD_PON a	Add to database table Object Data Object Data Object Data table to use: Iopo_08	✓ TDPOYEAR     ✓ SHAPESTLen     ✓ E EVINDEX     ✓ L ASTUPDATE     ✓ L ASTUPDATE	ELEVATION TOPOYEAR SIAPESTLen ELEVINDEX LASTUPDATE LASTEDITOR Name
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- a. Click on the Data field.
- b. Select the Create object data radio button.
- c. Click Select Fields.
- d. Verify the check boxes are selected for the object data mapping.
- e. Click OK.
- f. Click OK.
- g. Click OK.
- 6) The import will begin processing.

A Import Progress	×
Processing objects	21500
Cancel	

7) The imported data will appear.





- 8) By clicking on any of the lines and reviewing the properties, you will note that the elevation data is in the data table but it is not part of the AutoCAD object geometry and therefore will not be able to generate a Civil 3D Surface.
- Geometry Current Vertex Vertex X 599456.2821 Vertex Y Start segment width 0.0000 Global width 0.0000 Elevation Area Length Misc Closed Linetype generation Disabled OD:topo\_08 FeatId 452340 OBJECTID INTERMED\_CONTOURS Layer TOPOYEAR 1999 SHAPESTLen
- 9) Save the drawing and close it.

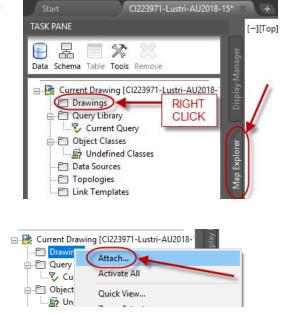
Note that it is important to close the drawing, or the following query steps will not work.

The drawing at this stage of this exercise can be found in CI223971-Lustri-AU2018-14.dwg.

10) Start a new drawing and assign a coordinate system or open the following:

Start by opening Cl223971-Lustri-AU2018-15.dwg.

11) Click on the Map Explorer tab of the Task Pane.



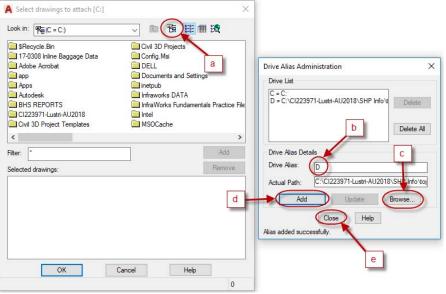
12) Right click Drawings and choose Attach.



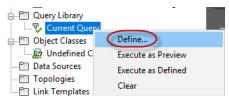
- 13) On the Select Drawings to attach dialogue, perform the following steps:
  - a. Click the Alias button.
  - b. Assign a drive alias letter.
  - c. Browse to the folder with the previously saved drawing completed in step 16.

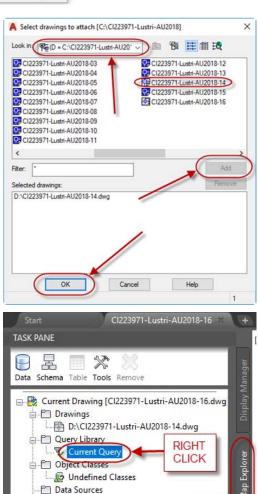
d. Click Add.

e. Click Close.



- 14) Assign the drive alias you just created in the Look in: location.
- 15) Select the file saved from the previous steps, i.e. step 16.
- 16) Click Add.
- 17) Click **OK**.
- 18) On the Task Pane, Map Explorer tab, right click Current Query and choose Define.





Dudefined Classes

Data Sources

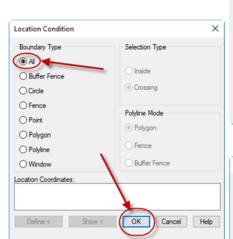
E Link Templates

Topologies



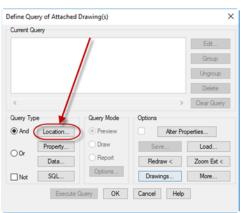


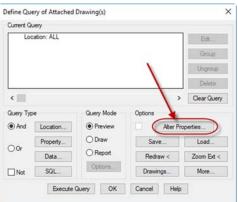
20) Select **All** then click **OK**.

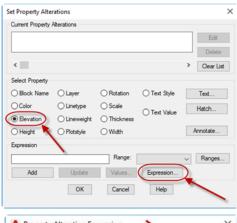


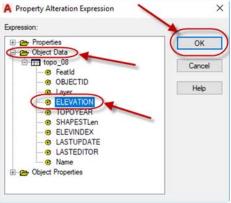
- 21) In the *Define Query of Attached Drawing(s)* dialogue, *Query Type*, click the **Alter Properties** button.
- 22) In the *Set Property Alterations* dialogue box. Click **Elevation** and then click the **Expression** button.

23) In the Property Alteration Expression dialogue box, expand Object Data, select Elevation and then click OK.











24) Click Add. Click OK.

25) In the Define Query of Attached Drawing(s) dialogue, click the radio button for Draw under Query Mode and the click **Execute Query**.

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26) Perform a Zoom Extents to show the imported data. Click on a line in the drawing and note the properties dialogue box compared to the beginning of this exercise. The Elevation field under Geometry is now populated with the actual elevation. You can now perform the standard Civil 3D Surface Creation steps by adding this CAD data to the surface by Contours.

The drawing at this stage of this exercise can be found in Cl223971-Lustri-AU2018-16.dwg.

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Q.E.D.