CES322101

Guardians of the Galaxy: Autodesk Plus Esri - The Beginning

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Applied Software Technology, Inc.

Learning Objectives

- About Autodesk connector for ArcGIS
- The Data Source Panel
- Add data from ArcGIS
- Manage ArcGIS
- Convert GIS Data into Civil 3D Objects
- Publish InfraWorks to ArcGIS
- Export InfraWorks Features to File Geodatabase (FGDB)

Description

The Autodesk Connector for ArcGIS is the first step toward realizing the vision of the partnership between Autodesk and Esri to integrate BIM and GIS workflows. Autodesk Civil 3D, InfraWorks, AutoCAD, and Map 3D allow you to connect GIS data in a more seamless manner to your BIM design model. Learn how to enable designers, engineers and planners everywhere to import and export data into Civil 3D, Map 3D and InfraWorks. Review the traditional process of import-export and data connection methods for both Civil 3D and InfraWorks using tools like FDO. Learn Display and Stylization methodologies in InfraWorks and Civil 3D with connected Esri data sources. Understand what the ArcGIS Data Connector is in Civil 3D and InfraWorks and how to use it for a new model and an existing model in the Civil BIM + GIS Design Model environment. Understand the workflows associated with the accessibility to ArcGIS Online in Civil 3D and InfraWorks workflows associated with that connection in the Civil BIM model in Civil 3D using the Autodesk Connector for ArcGIS.

Speaker(s)

Kenneth L. Driscol

Kenneth is a Senior Technical Specialist in Civil Infrastructure for Applied Software with over 20 years' experience in the Civil Engineering industry. Prior to joining the Autodesk reseller partner channel, he was a Design Engineer for an ENR 500 ranked design firm. Kenneth is an Autodesk Certified Product Support Professional and has reached the level of Civil Engineering Certified Implementation Expert. He regularly conducts seminars on the use of Autodesk Technology in civil engineering and regularly provides implementation services, customization, training, and

support to civil engineering professionals on Autodesk A/E/C BIM Technology Portfolio products. He has become the regional expert on BIM for Civil as it pertains to civil engineering practices and interoperability between other design disciplines in the AEC enterprise. In addition to his civil engineering background, he also has been involved with field surveying and electronic data reduction. During his entire professional career Kenneth has used Autodesk products. During his tenure with a number of leading Civil Engineering firms, he participated in and led a number of projects for road design and improvement, underground utilities, site development, and storm and sanitary drainage design. Kenneth has diligently worked with Transportation clients who have transitioned with Autodesk and Bentley products to bridge the gap with data translation and production work: migrating data between AutoCAD Civil 3D and Bentley InRoads and Bentley GEOPAK software with the Civil Engineering Data Translator cloud service; and uploading design source files and converting them to target project data formats without having to install Bentley software.

For the last 15 years, he has been a Senior Civil Application Specialist concentrating in Civil 3D, InfraWorks, Surveying, Map 3D, Hydrology and GIS services and instruction. Kenneth is Applied Software's Senior Civil instructor and provides software demonstrations, custom and standardized classroom training, mentoring, and technical support.

PROFESSIONAL EDUCATION & CERTIFICATIONS

Autodesk Implementation Expert
Certified Autodesk Instructor
Autodesk ICE Certified (Civil Implementation Expert)
Autodesk Product Support Expert
FDOT (Florida Department of Transportation) Certified Expert
InfraWorks 360 Roads & Bridges Certification
Autodesk AutoCAD Civil 3D Certified Professional
Autodesk Storm & Sanitary Analysis Certified Professional

The Traditional Process

By default, AutoCAD Map 3D considers SHP files a multi-select, file-based format; that is, you select one or more individual .shp files during a single import process. You can change the default in the mapimport.ini file so that AutoCAD Map 3D considers SHP files a folder-based format (all files in the folder are included in the import) or a single-select format (only one file can be selected for import).

When importing SHP files, it is important that you have the complete set of .shp, .shx, and .dbf in the same folder. The import operation will work if you have only the .shp file, but only the geometries will be imported. To import data with its geometry, you need the full set of files.

The link to the data stored in the .dbf file can be maintained during the import operation, or the data can be imported into object data in the AutoCAD Map 3D drawing.

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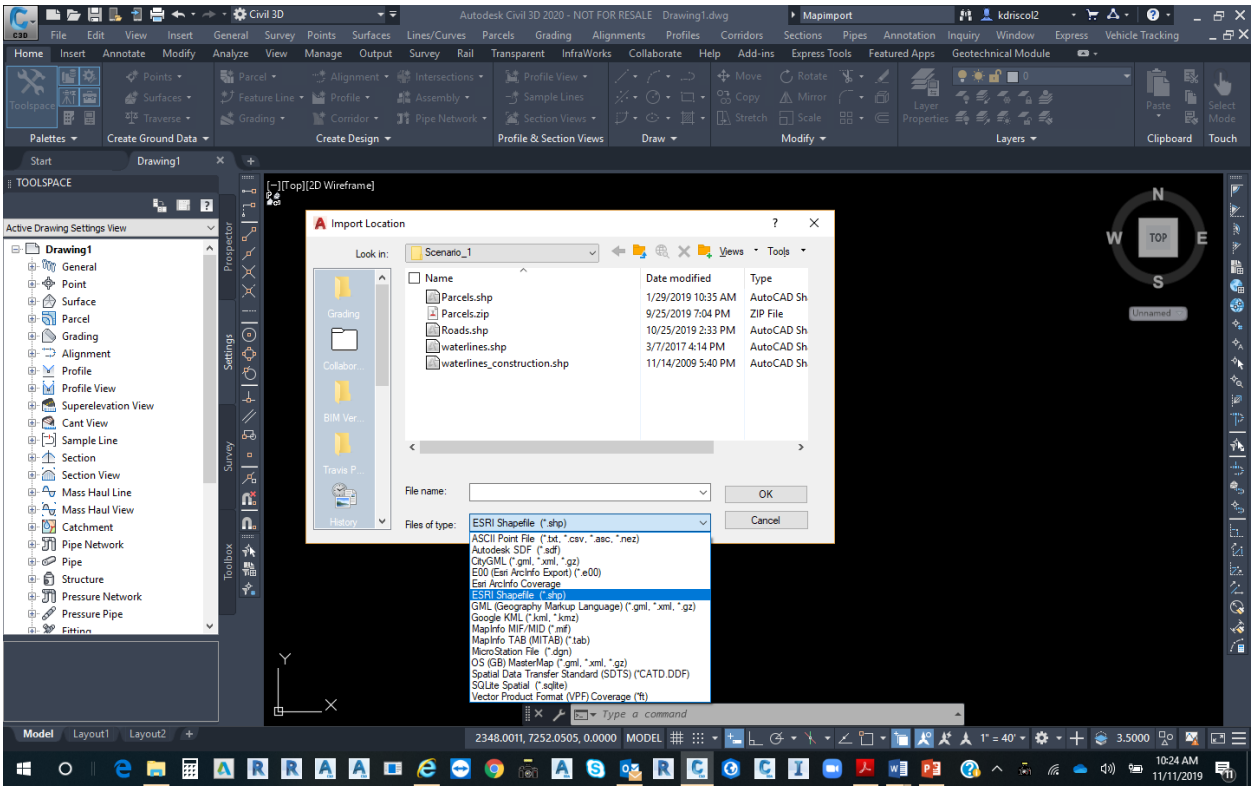
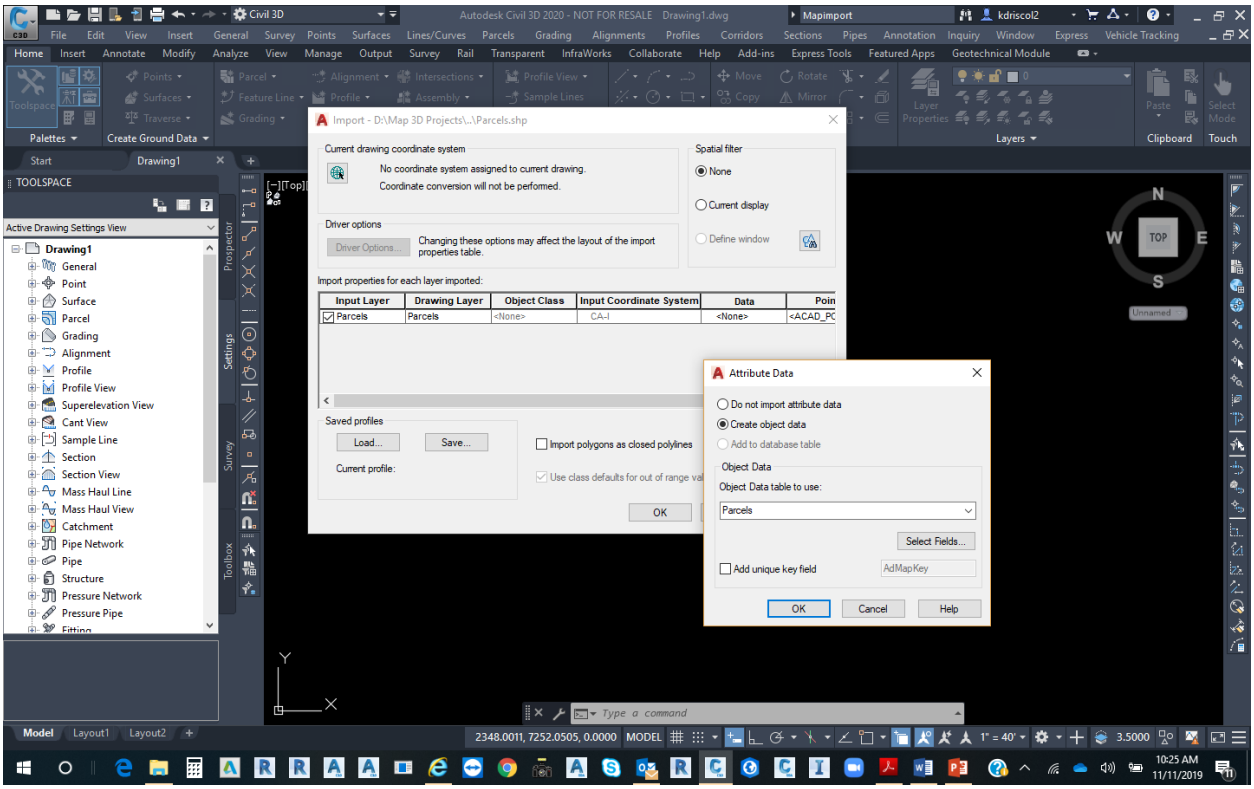




As access to data and information has expanded, so has interest in the whole concept of “Data at the Center,” which holds the promise of driving better infrastructure project workflows.

BIM and GIS data are two important data sources supporting infrastructure project delivery and operations; however, current ways of working between BIM and GIS teams is often disconnected and highly fragmented.

The way project teams work today with GIS and BIM is typically manual and uni-directional. For example, at project handover, the GIS specialist will take CAD or BIM data from the design and engineering teams and manually update it to import it into a GIS system. This process is prone to not just inefficiencies but critical data loss. Plus, as soon as data is manually exported in this one-way fashion, it becomes “outdated.”

The “What Was, What Is, and What Is to Come”

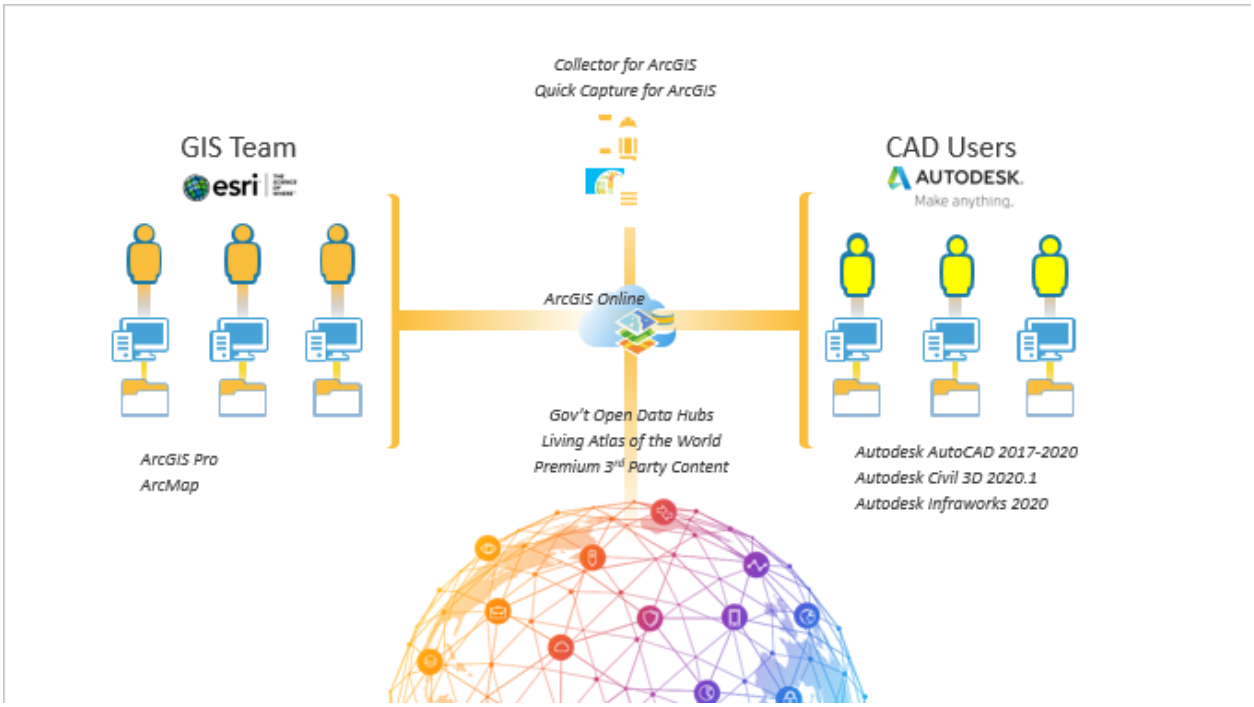
Ok, so this is where many firms are at today. They are using desktop GIS software and sharing data through a files-based workflow. That is to say, you are making data and maps and then either saving locally to your hard drive or maybe you are uploading the data to an internal server, ftp site, dropbox, etc. Some firms have taken this a step further and use our data interoperability tools or other ETL workflows to transfer data between GIS and CAD. Ultimately, the current workflow introduces some issues. It’s often a manual process that requires adjusting coordinates, projections and data schemas. It can be time consuming to the GIS team and can create frustration between teams that need GIS data fast. Since it’s file based, the data is also

static, so as soon as the GIS analyst creates the data and shares it with the CAD user, it is potentially out of date.

The new workflow connects data using ArcGIS Online. The GIS team shares to the ArcGIS online organization, and the Autodesk user can discover that data. They can bring the GIS data into view, they can edit and save back, and they can even publish new datasets built in CAD such as as-builts. Again, this all happens leveraging Esri's cloud and ArcGIS Online. In addition to making it easy to share data between the two systems, there are a couple other benefits worth noting.

So, by connecting Autodesk users to the ArcGIS Online cloud, you are not only exposing them to data created by the GIS team, but you are also now connecting them to data sources from all

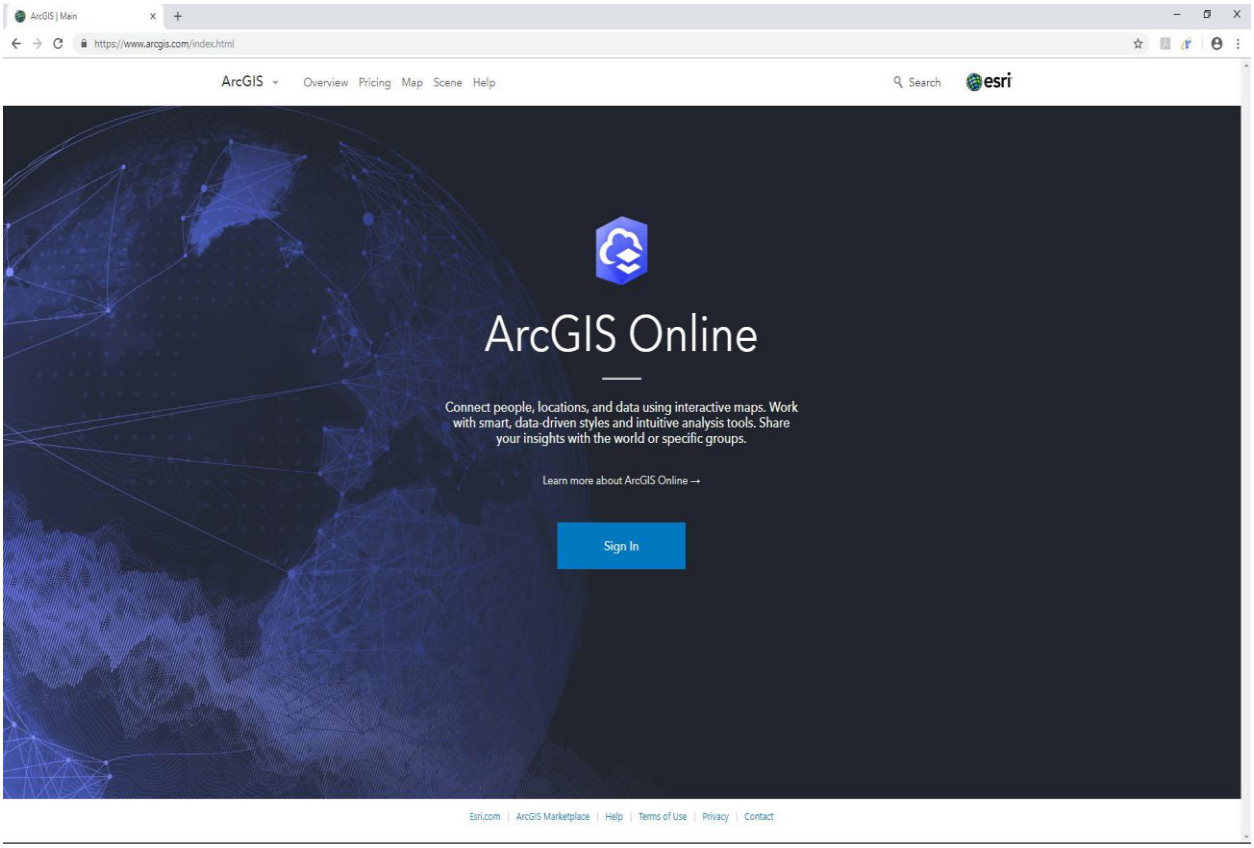
over the world. These include the thousands of layers, maps and apps available in Esri's Living Atlas of the world. That data is curated by Esri but authored by authoritative sources such as the USGS, NOOA, FEMA, EPA, Department of Interior, Bureau of Land Management, and so many others. In addition to the Living Atlas, users can also go out and connect to data services available in the open data hubs of counties and cities. This is a fairly new concept, but ever since the Digital Accountability and Transparency Act (DATA) was passed in 2013, government agencies have been publishing out data to the general public. That's over 20,000 datasets about the earth being pushed out as a streaming hosted feature layer or similar. Users connected to ArcGIS Online will also have the ability to purchase premium data through the ArcGIS Marketplace – including things like high-resolution imagery, 3D city models and more.



The Process and Getting Started.

Logging in to ArcGIS Online:

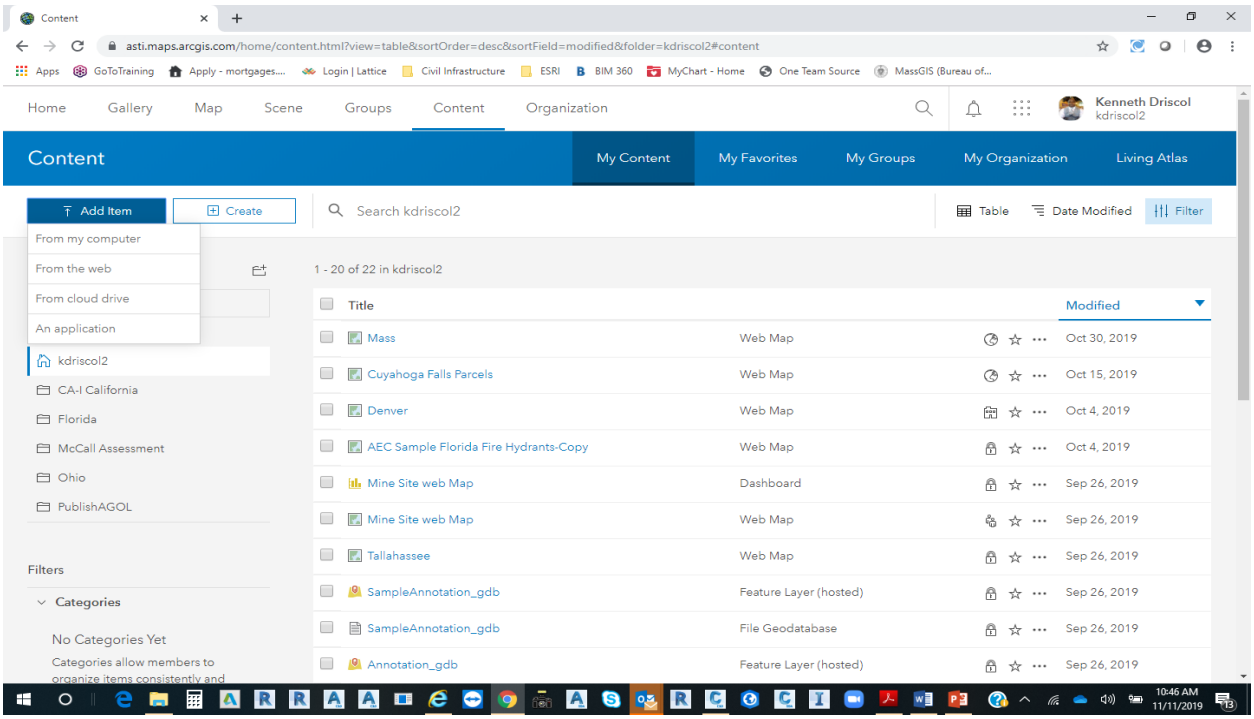
Open an internet browser and go to www.arcgis.com.



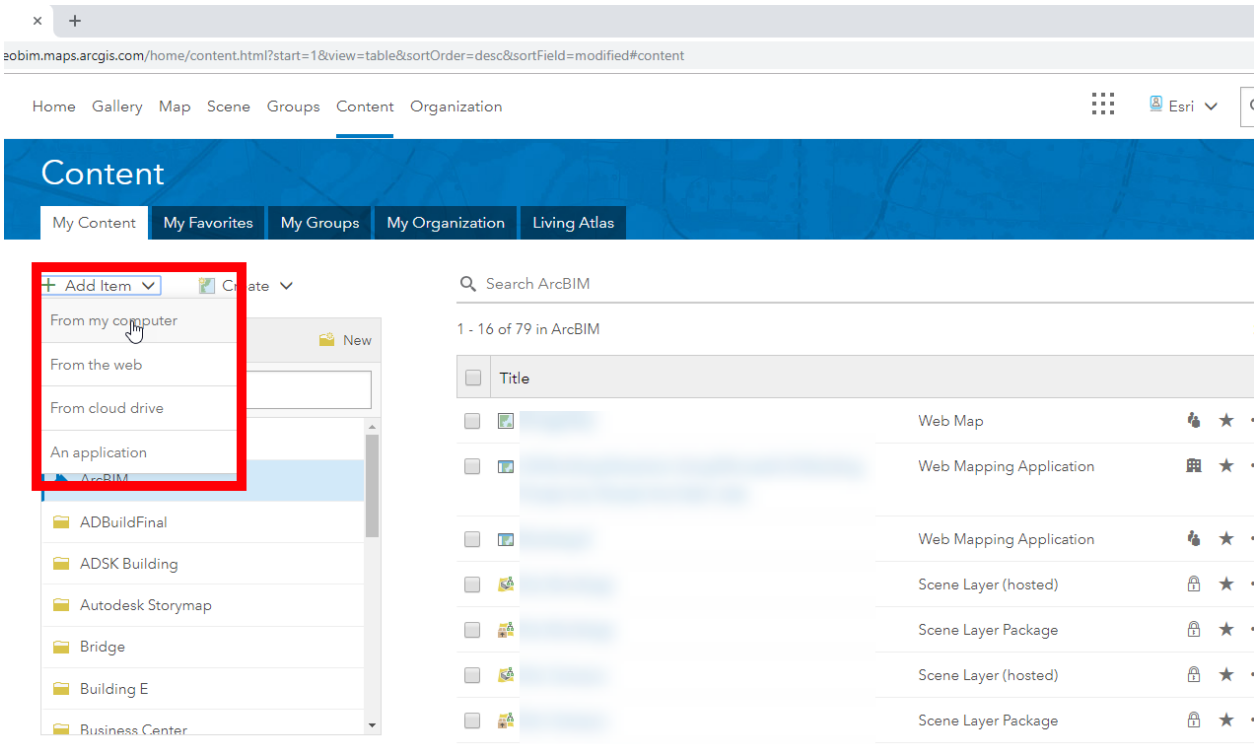
ArcGIS online allows users to connect people, locations and data using interactive maps. Not only is there the ability to work with smart data and style-driven analysis tools, but also to share data around the world with multiple and specific groups.

Next browse to the Content tab.

The **Contents pane** lists the layers contained in a map or scene. You can manage the display of layers, symbology and other layer properties in the Contents pane. You control which layers are drawn in the map or scene at any given time using the check boxes next to the layer names.

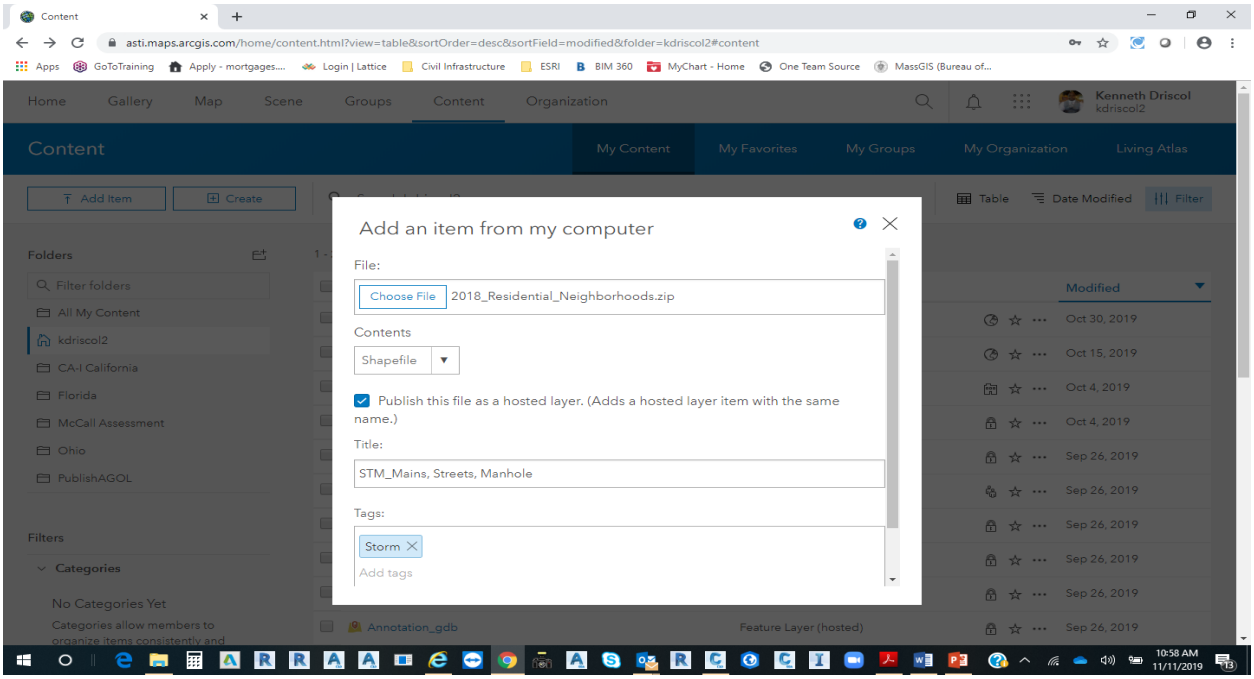


Add GIS content from your computer, the web, a cloud drive, or even an application.

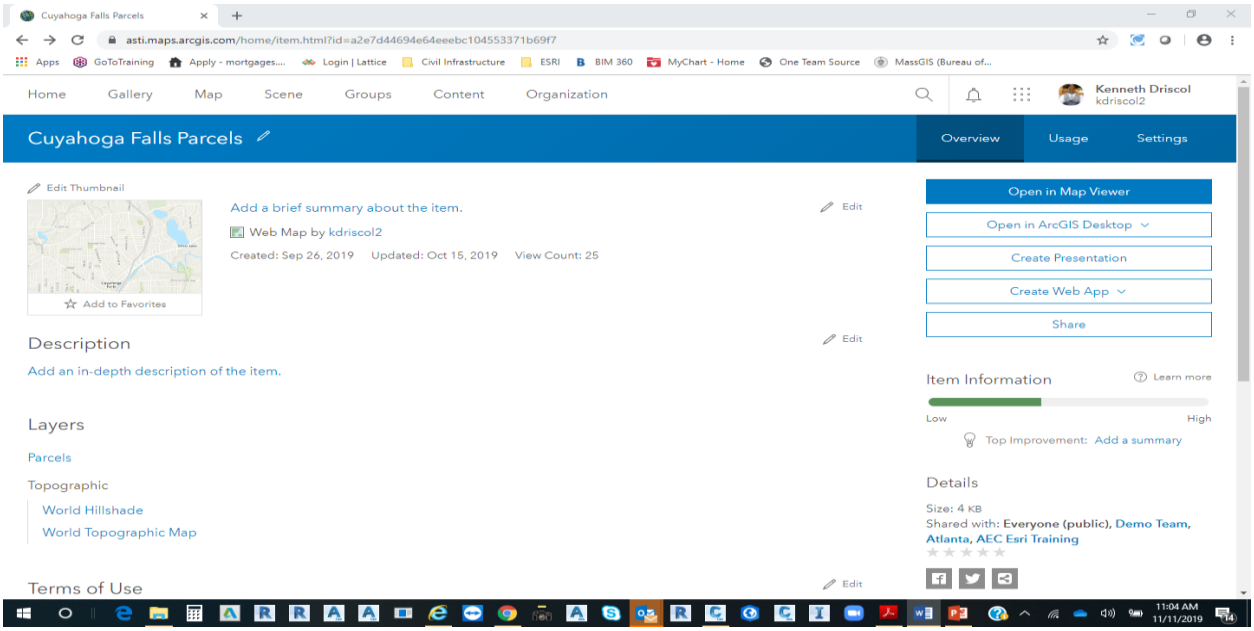


Specify data from your computer. Add Tags, Title and most importantly select “Publish this file as a hosted layer” (**Critical for Data going into Civil 3D).**

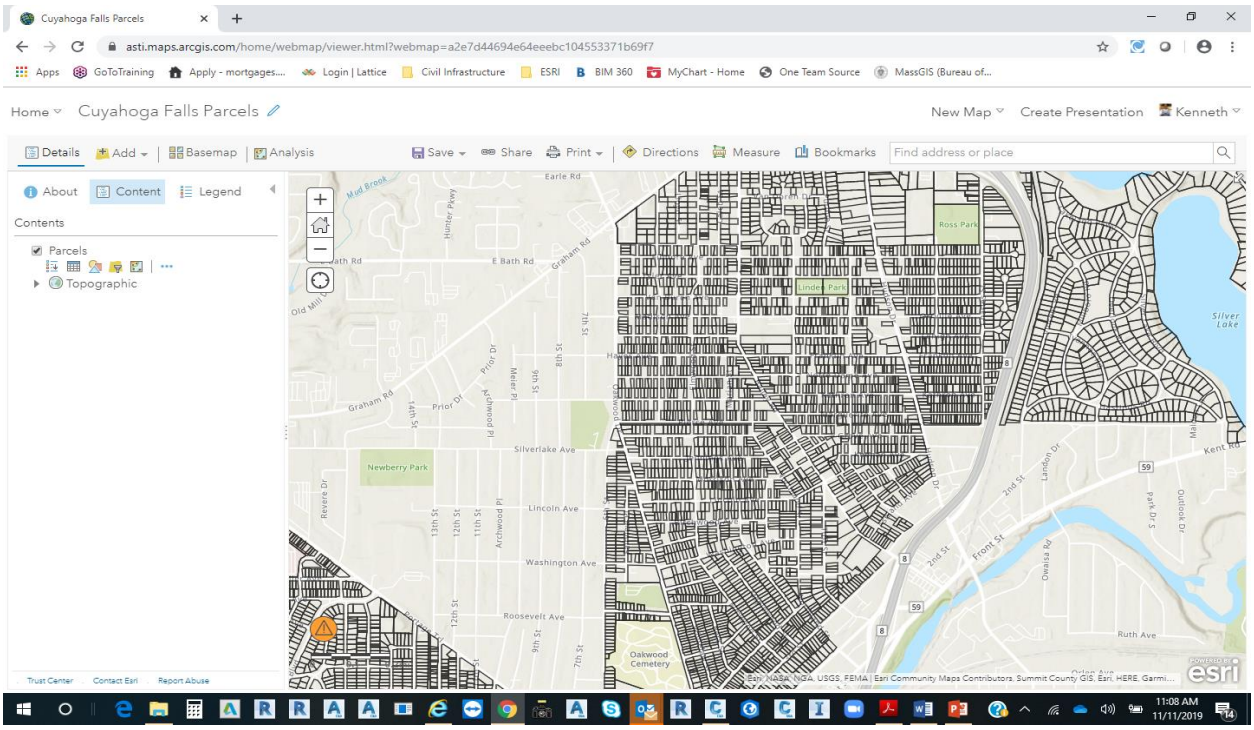
For Example, Parcels, Waterline, Storm Sewers, Centerlines.



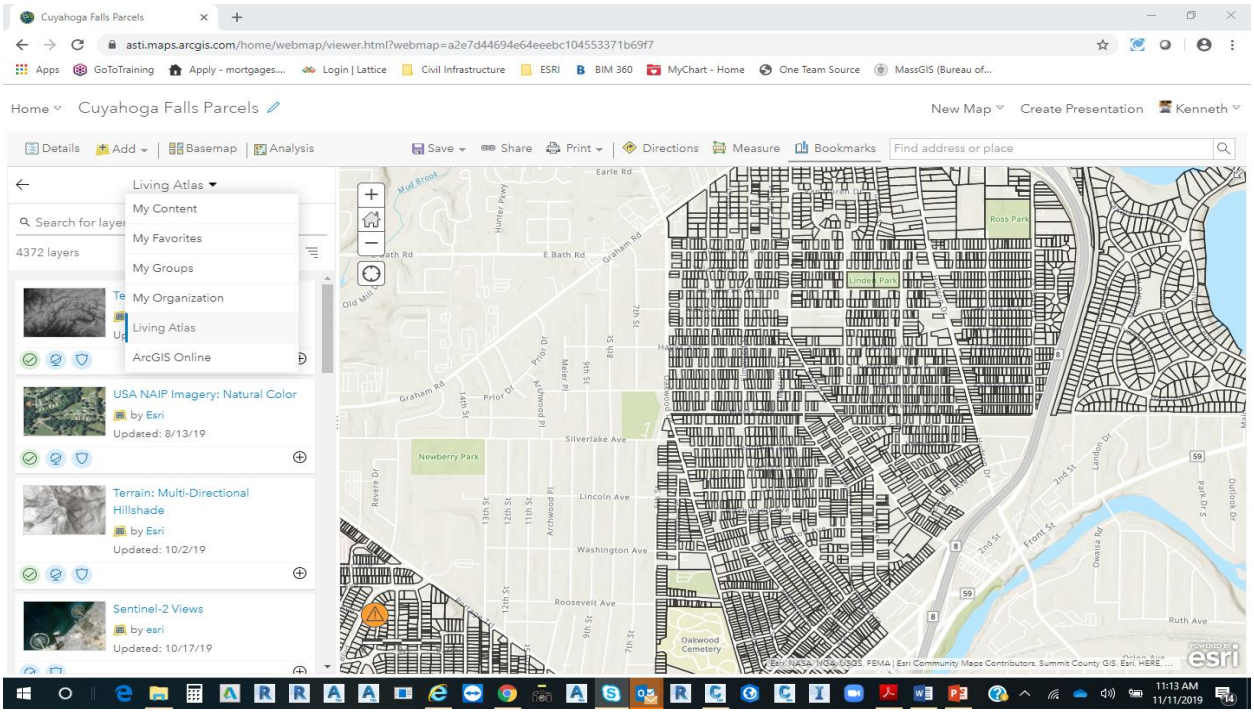
Viewing the uploaded data in the Map Viewer.



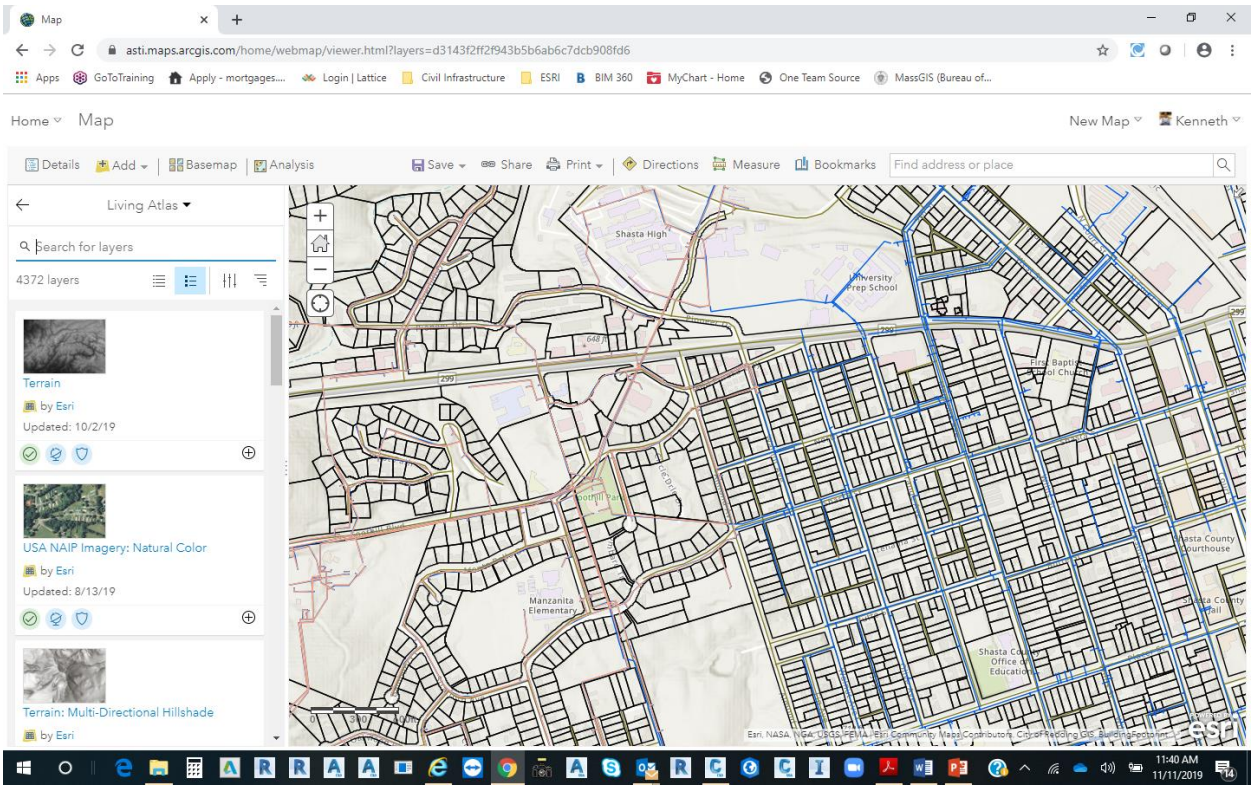
The results: the ability to share data with groups.



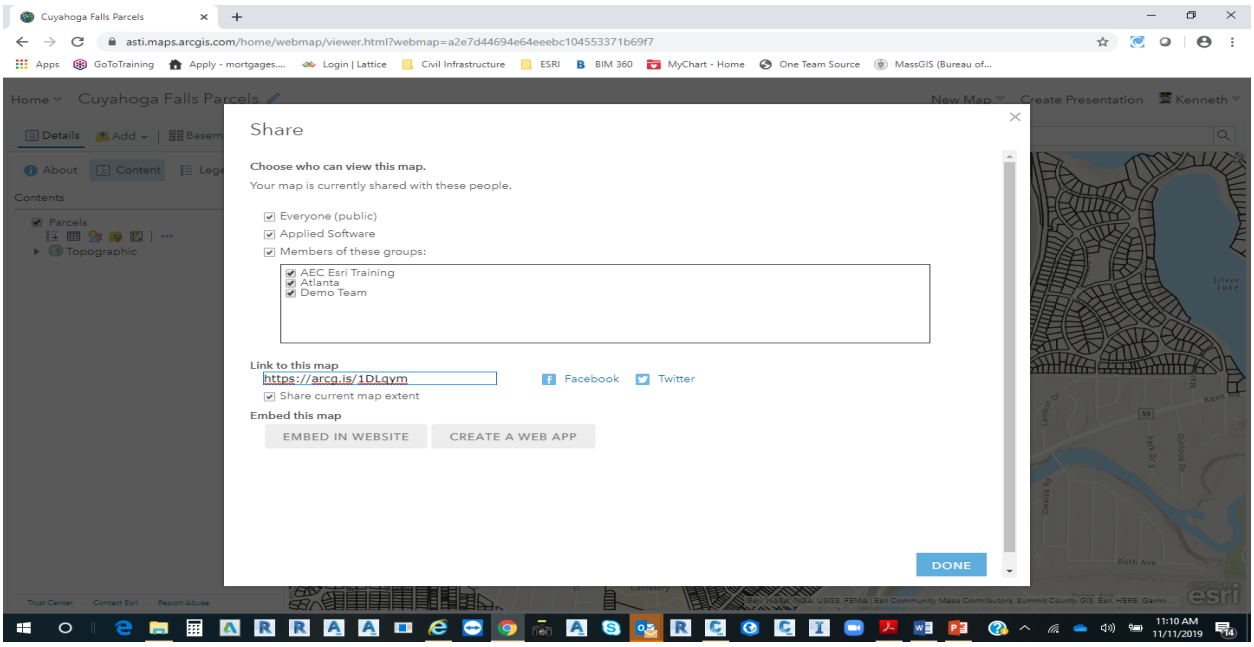
Finding the Data…The Living Atlas.



Building the Data…Gathering the content from multiple sources: water utilities, sewer, storm water, transportation.

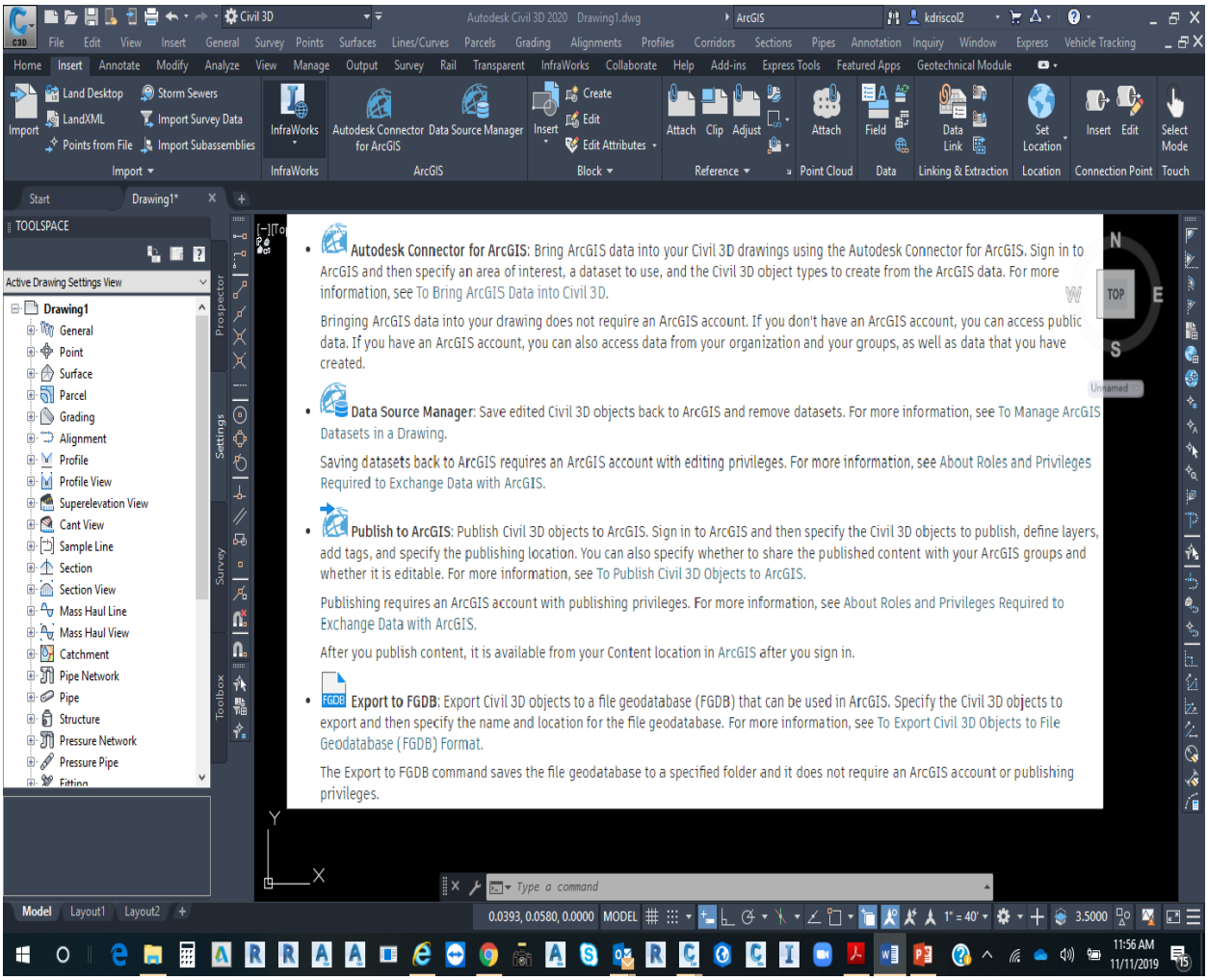


Save and Share the map so others can access it and use it.

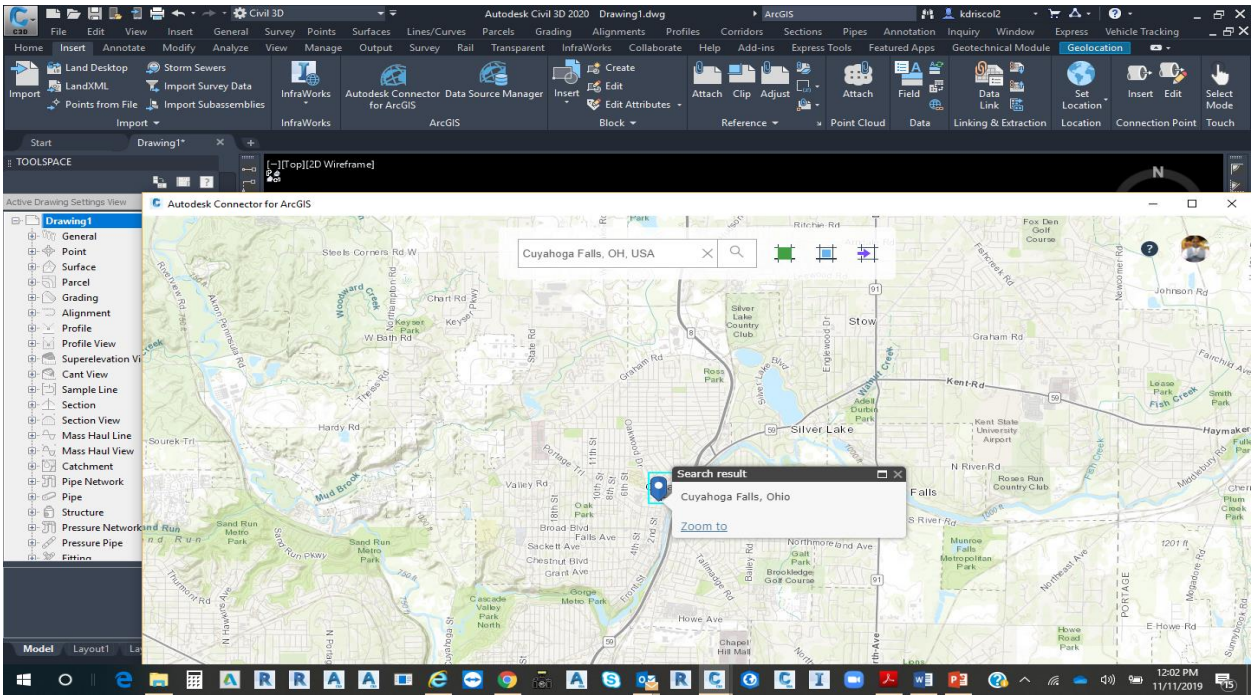


Launch the Civil 3D and select the Insert tab

You can bring ArcGIS datasets into your Civil 3D drawings using the Autodesk Connector for ArcGIS, save back edited content, and publish and export Civil 3D data for use in ArcGIS.

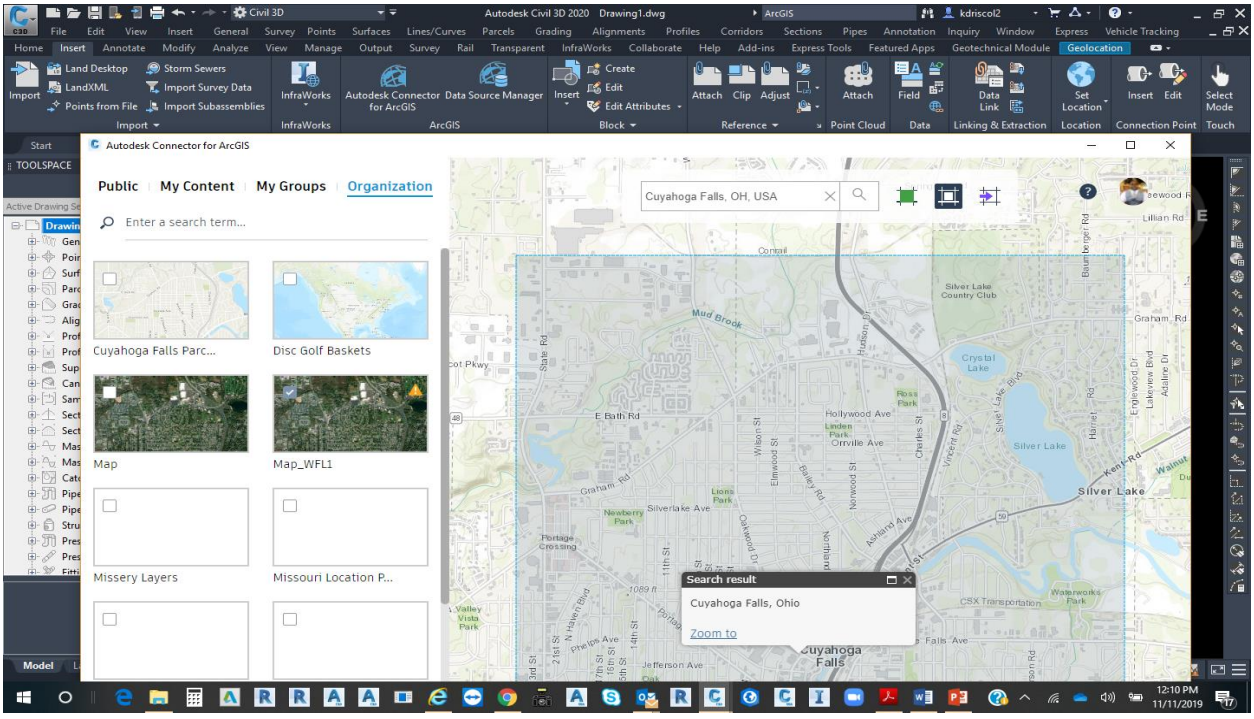


Pick on the Icon for the Autodesk Connector for ArcGIS with Coordinate System in drawing. Search by location after logging into ArcGIS.

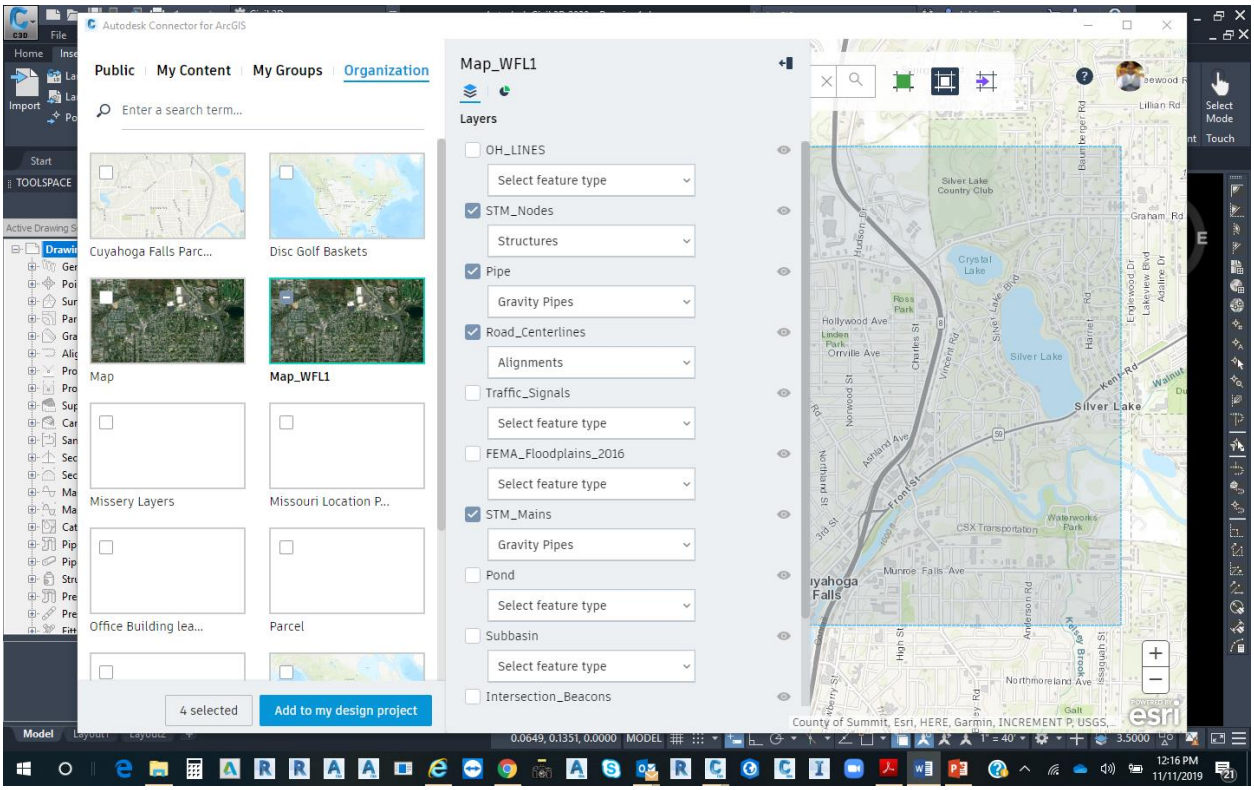


Search Public, My content, My Groups, or My Organization for populated data after selecting the area of interest.

If you have uploaded the content from a shapefile and maybe created a Feature Map of the Storm, Waterlines, Centerlines and/or Structures data then you can access it from the My Content, My groups or My Organization that you shared the data with from the tab in the upper left corner.



Place a checkmark when selected, and a panel will come up that allows you to select the feature type in Civil 3D that will represent the Parcels, Storm, Waterlines, Centerlines and/or Structures data. Select the pull down and pick Points of Interest.



Then select at the bottom in blue “Add to my design project,” and Civil 3D will package up the data, import and display it in your drawing.

The Magic Begins…Guardians of the Galaxy: Autodesk Plus Esri - The Beginning!

The beauty of it all is Schema Mapping. Use this dialog box to map attributes in ArcGIS data to pipe and structure properties in Civil 3D. This dialog box is displayed when you use the Autodesk ArcGIS Connector to bring in ArcGIS data as pipes and structures.

You can also open this dialog box from within the Prospector item view. Select the pipe network in Prospector to display the item view, and then click in the Schema Mapping field of the item view.

This dialog box will have a tab for each pipe or structure layer that you are bringing in to Civil 3D so you can define mapping parameters for each layer.

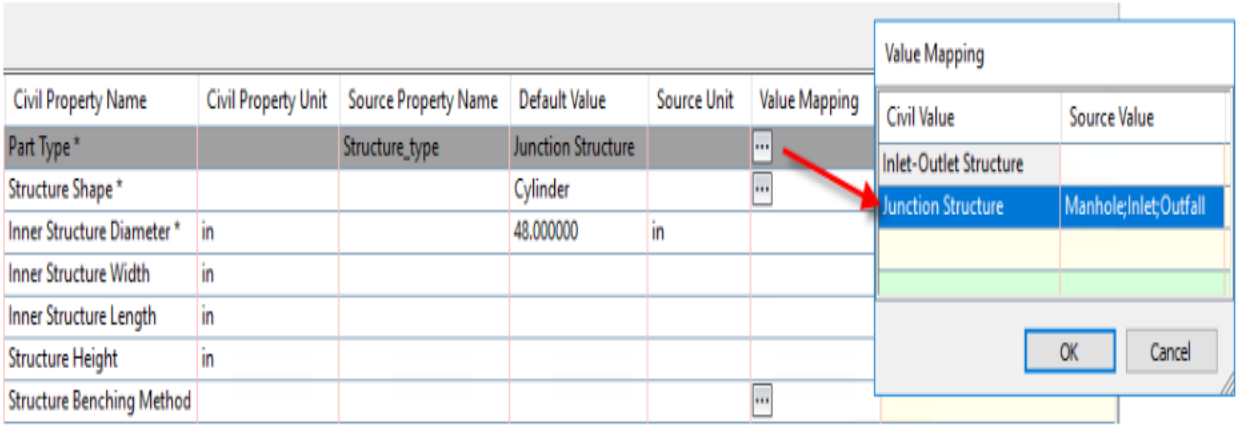
Specifying schema mapping values

You can set up schema mapping to associate attributes that have been defined in ArcGIS data to pipe and structure properties that are used in Civil 3D.

For example, if there is a field named Structure Height in the dataset, you can map that to the Structure Height property in Civil 3D so that the height value assigned to the part is the same height value defined in ArcGIS.

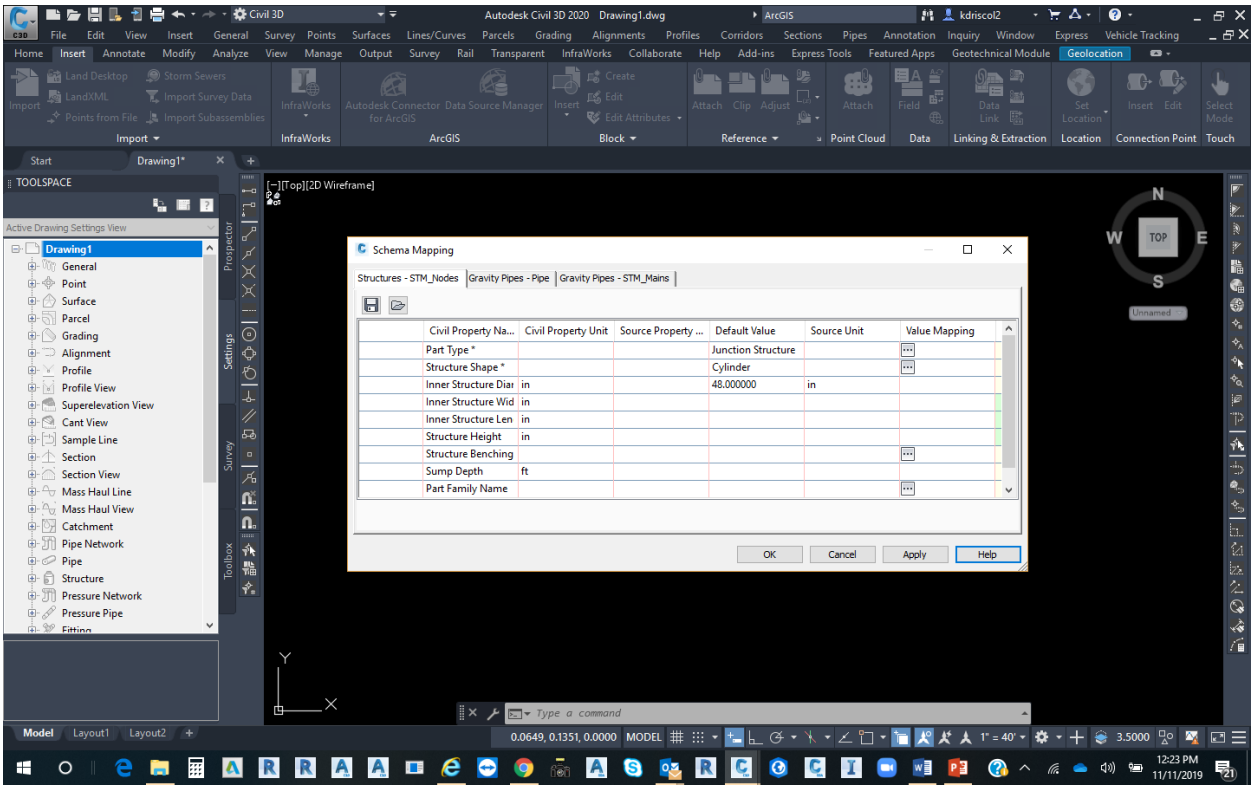
Tip: If you are not familiar with the dataset, you can view the data in ArcGIS to see which attributes and attribute values are defined in it. The URL for the dataset is listed in the Autodesk Connector for ArcGIS window when you are selecting a dataset to bring into Civil 3D, and it is also listed in the Data Source Manager dialog box after the dataset has been brought into Civil 3D.

If you want to bring in manholes, inlets and outfalls as Junction part types, you can set up the Value Mapping for the Part Type. For example, if attribute values Manhole, Inlet and Outfall were specified in the ArcGIS data to indicate the structure type, you can enter those values in the Value Mapping dialog box.

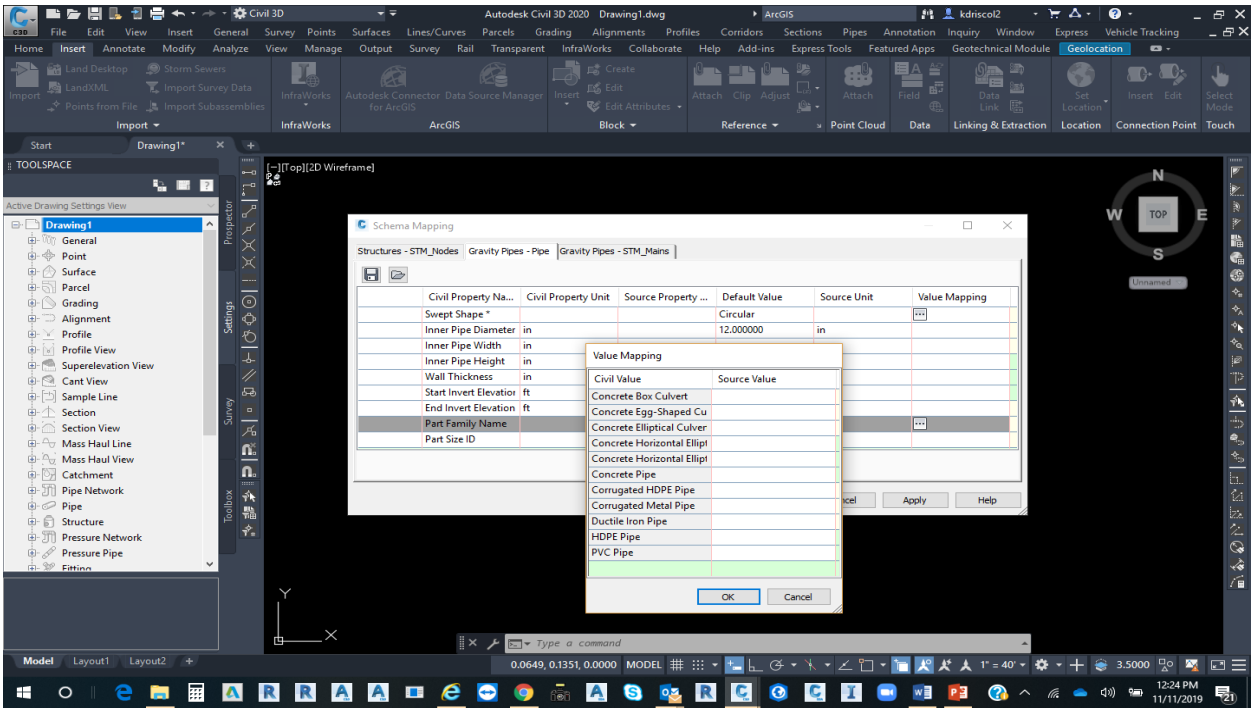


You can include multiple values by separating them with a semicolon. For example, Manhole;Inlet;Outfall. Entries are not case-sensitive.

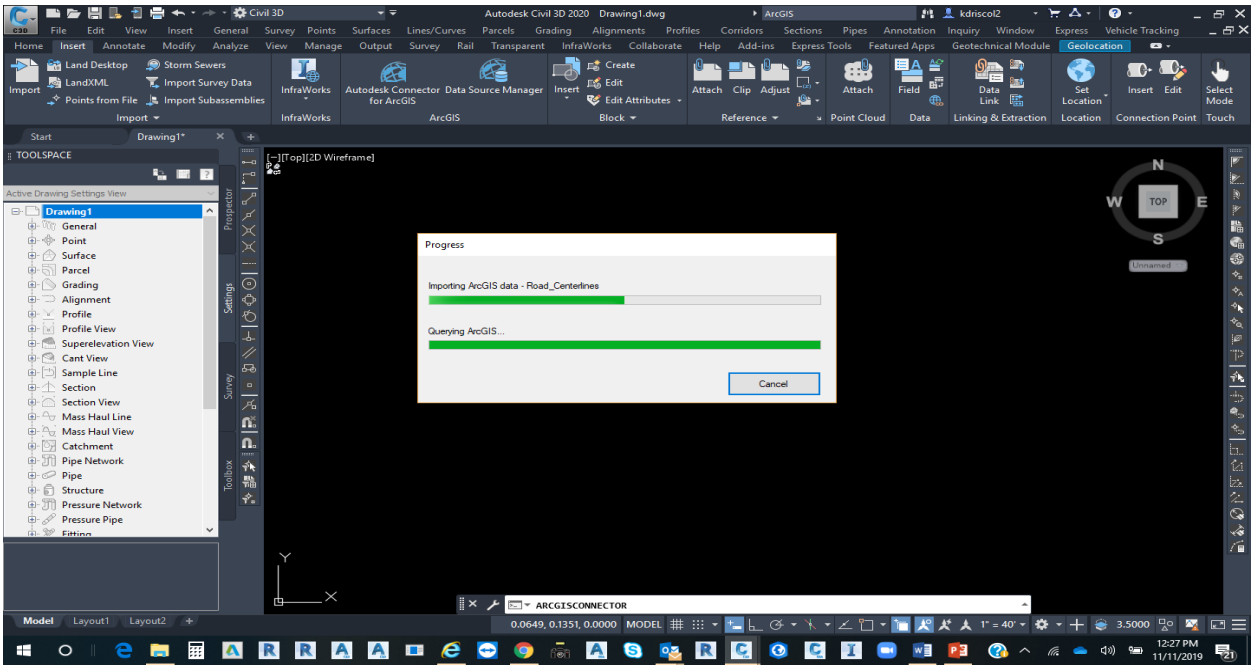
Note: In the example above, all of these structures will be created in the drawing as generic Junction structures (with a Structure Type of <none>). You can manually set the Structure Type using the Structure Properties dialog box or you can use the Map Drainage Structure Parameters command to assign the Structure Type and other properties.



You mean Civil 3D objects created from GIS Data…**WHAT!**



Progress….



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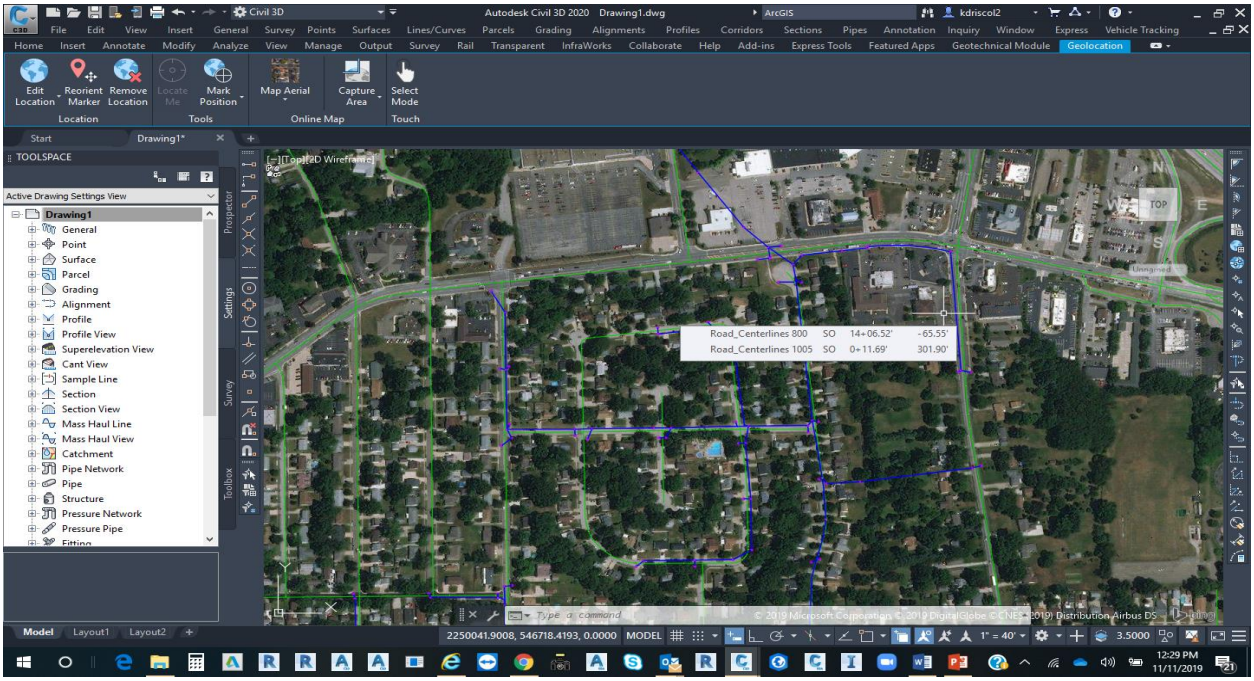

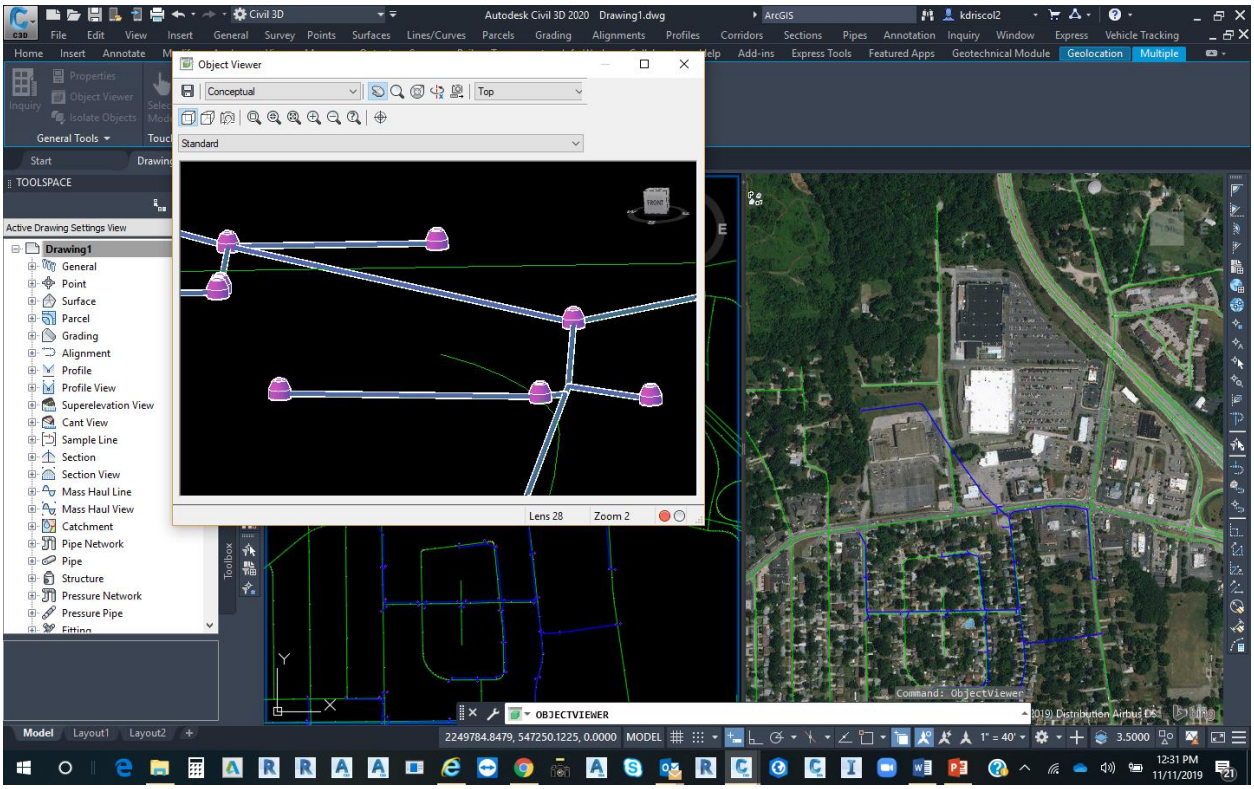
Civil 3D
Autodesk Civil 3D 2020 Drawing1.dwg
ArcGIS
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Object Viewer
Conceptual
Top
Standard
Lens 28
Zoom 2
TOOLSPACE
Active Drawing Settings View
Drawing1
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Parcel
Grading
Alignment
Profile
Profile View
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Sample Line
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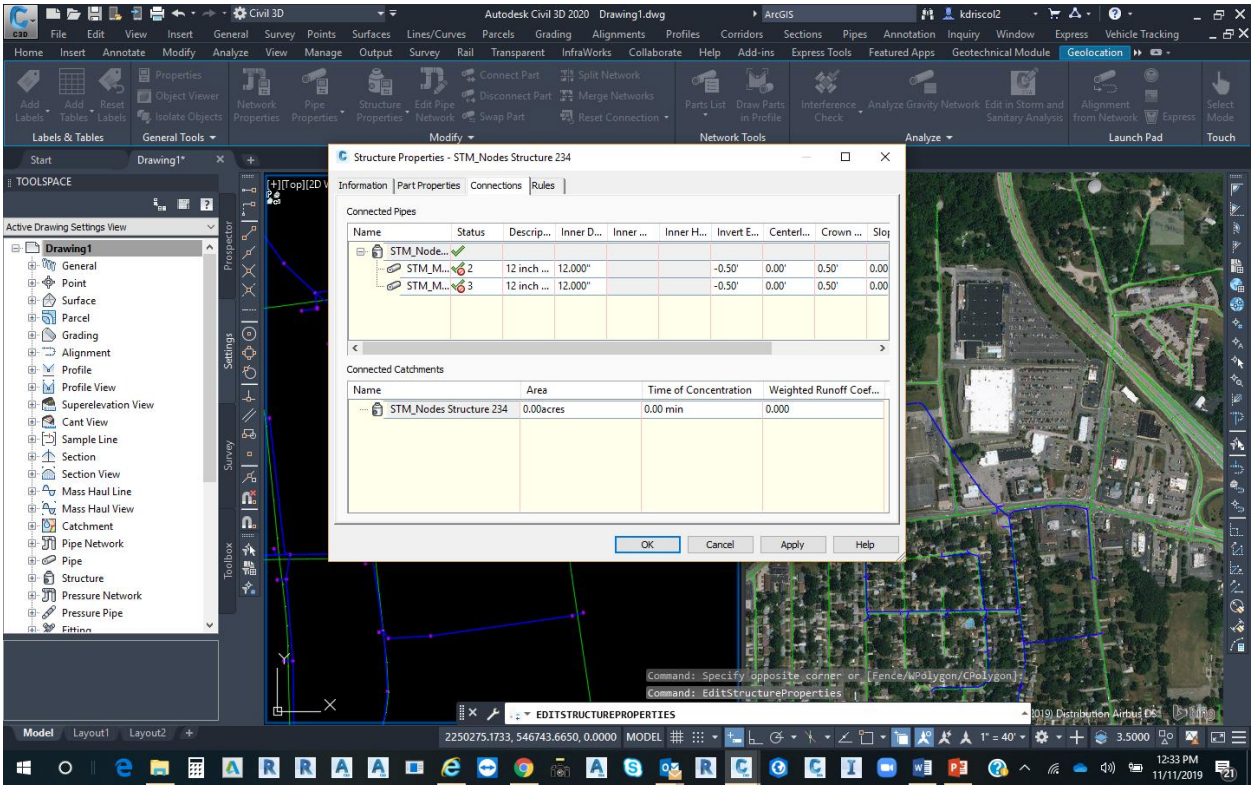
Civil 3D
Autodesk Civil 3D 2020 Drawing1.dwg
ArcGIS
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Structure Properties - STM_Nodes Structure 234
Information
Part Properties
Connections
Rules
Connected Pipes
Name
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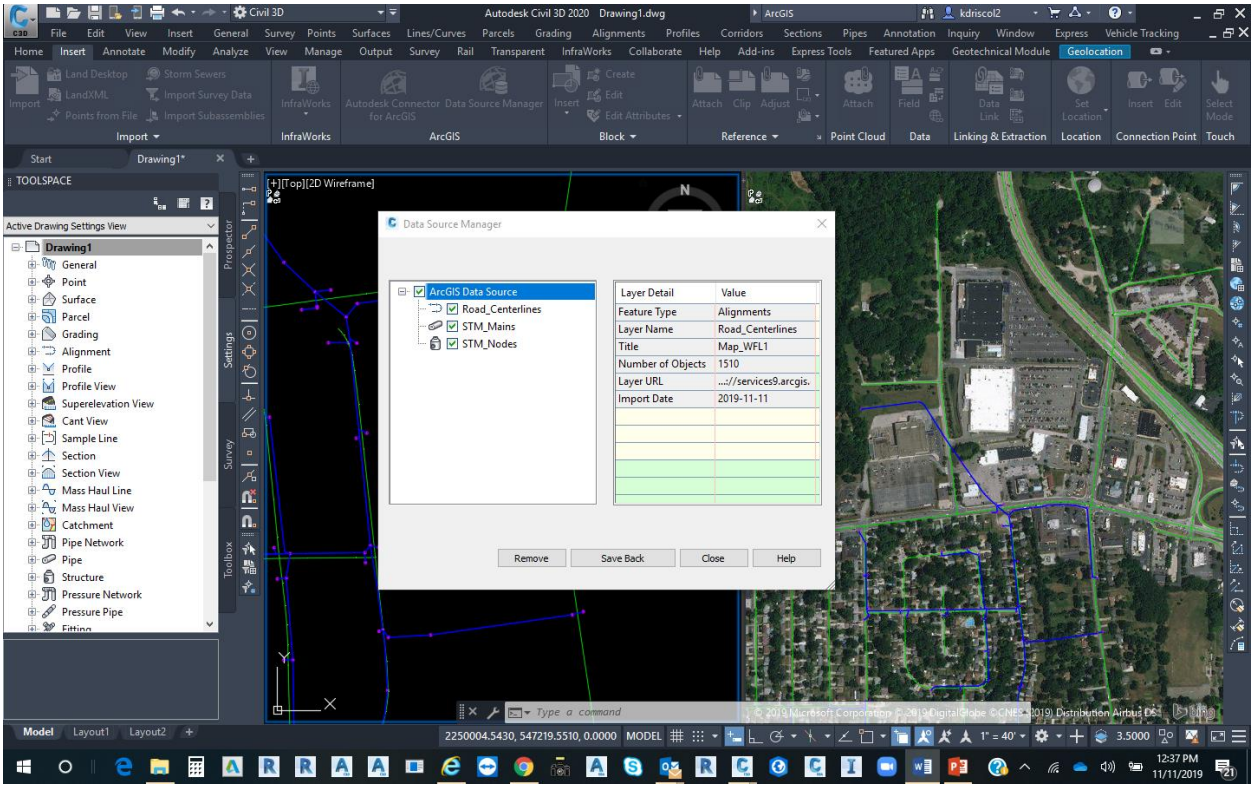
Data Sources Manager and Save Back:

Use this dialog box to remove ArcGIS datasets from a drawing and save back changes to ArcGIS.



Data imported and supported for saving back changes to ArcGIS:

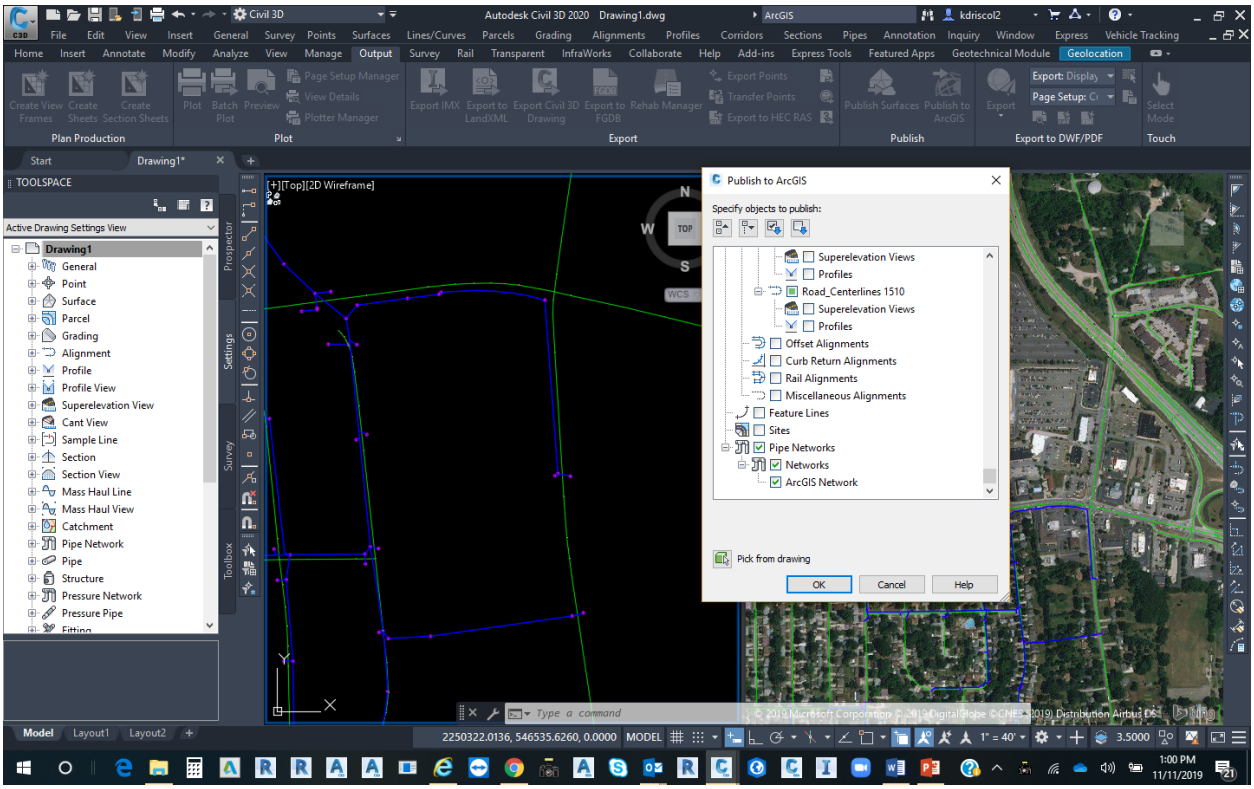
Some object types that are created by importing an ArcGIS dataset cannot be saved back to the original ArcGIS layer.

ArcGIS Feature Type	Imported as Civil 3D Object	Save Back Support
Point	Structure	Yes
Point	COGO Point	Yes
Polygon	Parcel	Yes
Polygon	Feature Line	No
Polygon	COGO Point	No
Line	Alignment	Yes
Line	COGO Point	No
Line	Gravity Pipe	Yes **Note:** Pipes with more than two vertices cannot be saved back to ArcGIS.
Line	Feature Line	Yes

To Publish Civil 3D Objects to ArcGIS:

You can publish the following Civil 3D objects to ArcGIS:

- Alignments
- Feature lines
- Parcels
- Pipe networks
- Points



To publish to ArcGIS:

Ensure that your drawing has a coordinate system assigned to it. If a coordinate system is not specified for the drawing, you will be prompted to assign one after selecting the Publish to ArcGIS command.

Note: Some coordinate systems are not supported when publishing to ArcGIS.

Click Output tab Publish panel Publish to ArcGIS.

Each time you publish to ArcGIS you must specify a unique Service Name. To update previously published content, you can bring it into a Civil 3D drawing using the Autodesk Connector for ArcGIS, and then edit the objects and use the Save Back command to save the changes back to ArcGIS.

Note: You can also delete the dataset on the ArcGIS website and then republish it. However, if the dataset has already been brought into Civil 3D drawings, deleting and republishing the dataset will not restore those links.

After publishing the content to ArcGIS, use the Autodesk Connector for ArcGIS command to bring the dataset into a Civil 3D drawing.

Edit the objects as needed.

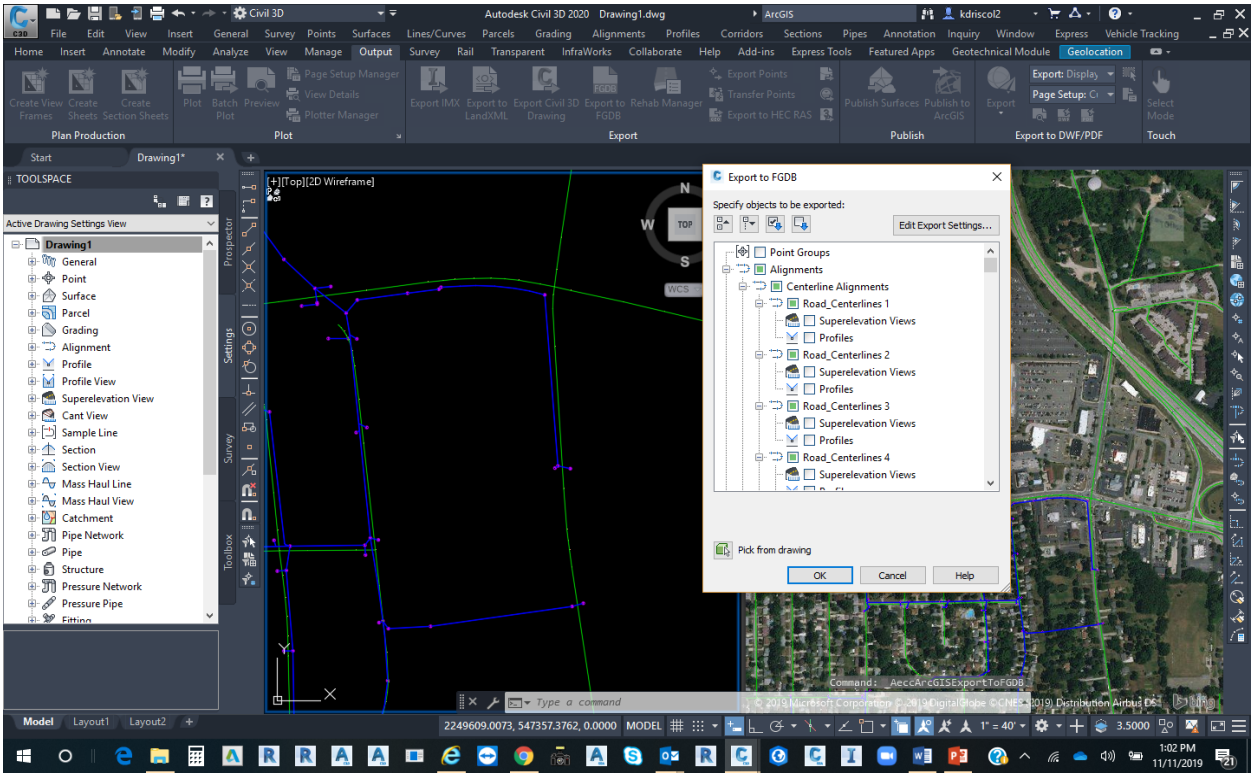
Use the Save Back command to save the dataset back to ArcGIS.

Publishing requires an ArcGIS account with publishing privileges. For more information, see About ArcGIS Roles and Privileges.

After you publish content, it is available from your My Content location in ArcGIS after you sign in.

- **Export to FGDB**: Export InfraWorks features to a file geodatabase (FGDB) that can be used in ArcGIS. Specify the InfraWorks features to export and then specify the name and location for the file geodatabase. For more information, see To export to FDGB.

The Export to FGDB tool saves the file geodatabase to a specified folder and does not require an ArcGIS account or publishing privileges.



What about coordinate systems:

- Before bringing ArcGIS data into a model with the Autodesk Connector for ArcGIS, install the ArcGIS Projection Engine Data. The Projection Engine Data prevents a coordinate offset from occurring when you bring ArcGIS data into a model.
- To prevent a coordinate offset issue from occurring when you save back to ArcGIS, use a coordinate system that has an EPSG code.

- To publish to ArcGIS and to export objects to a file geodatabase (FGDB), the model must use a supported coordinate system.

Note: Some coordinate systems are not supported when publishing to ArcGIS or exporting to FGDB.

If a model is assigned an unsupported coordinate system, publishing to ArcGIS or exporting to FGDB will not proceed.

In addition, there are three categories of coordinate systems which are not supported:

- Obsolete Coordinate Systems
- Arbitrary X-Y Coordinate Systems
- Test Only Coordinate Systems

In Conclusion
Autodesk and Esri have collaborated to provide native and live access to BIM information within a GIS environment, and – conversely – to provide the same native and live access to GIS information within a BIM environment. From the planning, designing, and building, to the operating and maintenance of infrastructure assets, bringing GIS and BIM together allows for a more frictionless, live, and native data flow between platforms in order to reduce risk, inefficiencies, data loss, and cycle times.

Looking at the full lifecycle, planning, designing, building, and managing are best done in context. This requires an integrated and holistic approach where you are able to gain a better understanding by viewing vertical and horizontal infrastructure assets at various scales – understanding impacts at a larger scale, like statewide or county-wide, down to understanding impacts at the city-scale and also at the asset-level itself (building/infrastructure asset).

So, by connecting Autodesk users to the ArcGIS Online cloud, you are not only exposing them to data created by the GIS team, but you are also now connecting them to data sources from all over the world. These include the thousands of layers, maps and apps available in Esri's Living Atlas of the world. That data is curated by Esri but authored by authoritative sources such as the USGS, NOAA, FEMA, EPA, Department of Interior, Bureau of Land Management, and so many others. In addition to the Living Atlas, users can also go out and connect to data services available in the open data hubs of counties and cities.

Autodesk Connector for ArcGIS with Civil 3D
Connect GIS data to digital design models to make better decisions and deliver more resilient infrastructure projects.
"The Autodesk Connector for ArcGIS is the first step toward realizing the vision of the partnership between Autodesk and Esri to integrate BIM and GIS workflows."

GIS Informs BIM; BIM Fuels GIS – by providing a real-world context of an asset's existing environment within which designers and engineers can explore and evaluate design and construction.