GS5322-L: Follow the GIS Brick Road - Data Sharing Workflows between GIS and Civil 3D 2015

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About the Speakers

Mike is the AutoCAD Coordinator for Freese and Nichols Inc. (FNI), an engineering and architectural firm located in Fort Worth, Texas. Certified in AutoCAD and AutoCAD Civil 3D software, he has over 35 years of drafting and CAD experience. Michael draws from over 20 years of teaching experience to provide custom material and training through Freese and Nichols University, the training arm of FNI.

Mark is the GIS coordinator for Freese and Nichols Inc. (FNI), an engineering and architectural firm located in Fort Worth, Texas. An Esri Certified ArcGIS Desktop Professional and Esri Certified Enterprise Associate, he has over 15 years of GIS and Database Experience.

Eddie is an ENI Technical Specialist for Construction Industry Solutions (COINS) in Dallas-Fort Worth. He is an Autodesk Certified Instructor, Certified Autodesk Product Support Specialist and Autodesk Infrastructure Design Suite Certified BIM Specialist focusing on the products in the Infrastructure Design Suite.

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Class summary

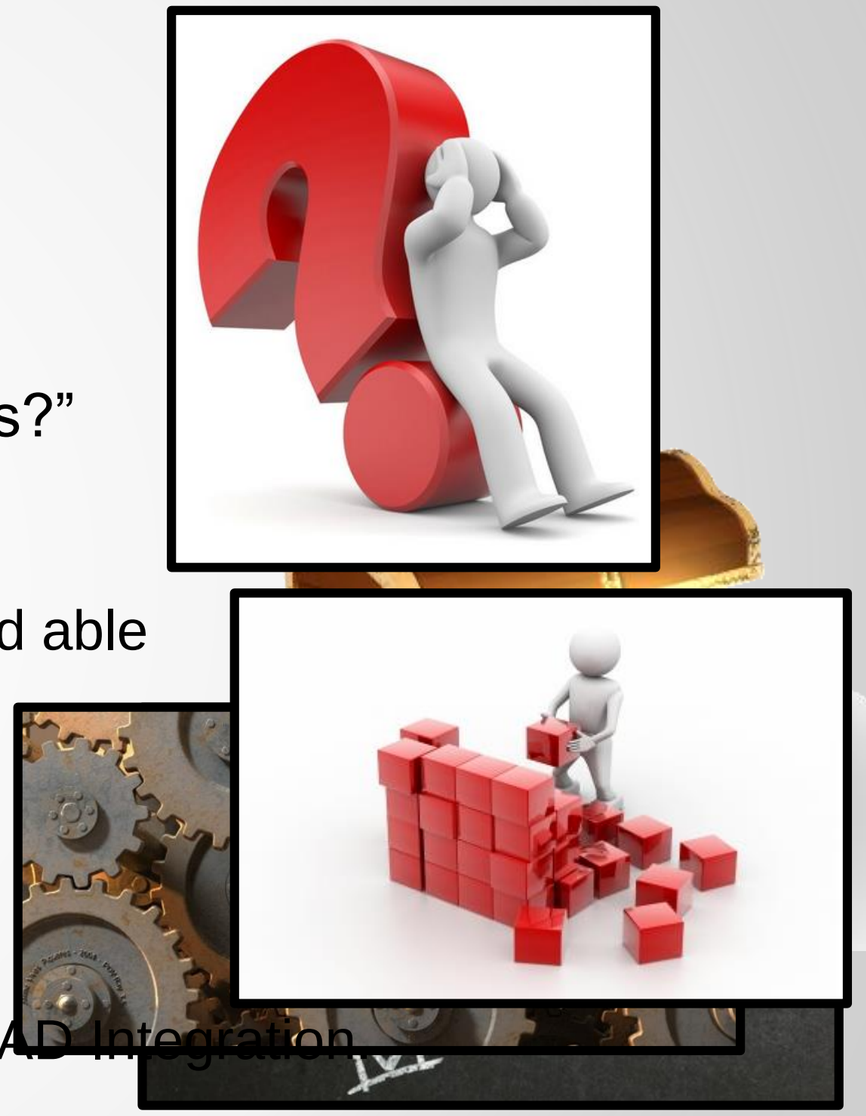
Today's Class will address the age old questions of:

- "How do I add additional existing data to my design?"
- "Can I easily get this data into Civil 3D?"
- "How do I share my final design data for future projects?"

The facts are:

- There is a wealth of **FREE** data out there ready, willing and able to be incorporated into your design workflow.
- We can be **Takers** and **Givers** of data.
- We face the need to utilize data from various formats and providers, GIS data being one of the most important.

Today's class is your Foundational Building Block for GIS-CAD Integration.



Goal: Use GIS Data for Preliminary Design and return final design to GIS

Objectives

- Attach GIS data using Civil 3D
- Manipulate and Transform GIS data using Civil 3D
- Create Civil 3D design data directly from GIS data
- Export Civil 3D design back to a GIS database

Objectives

At the end of this class you will be able to:

- Attach GIS data using Civil 3D
- Manipulate and Transform GIS data using Civil 3D
- Create Civil 3D design data directly from GIS data
- Export Civil 3D design to a GIS database

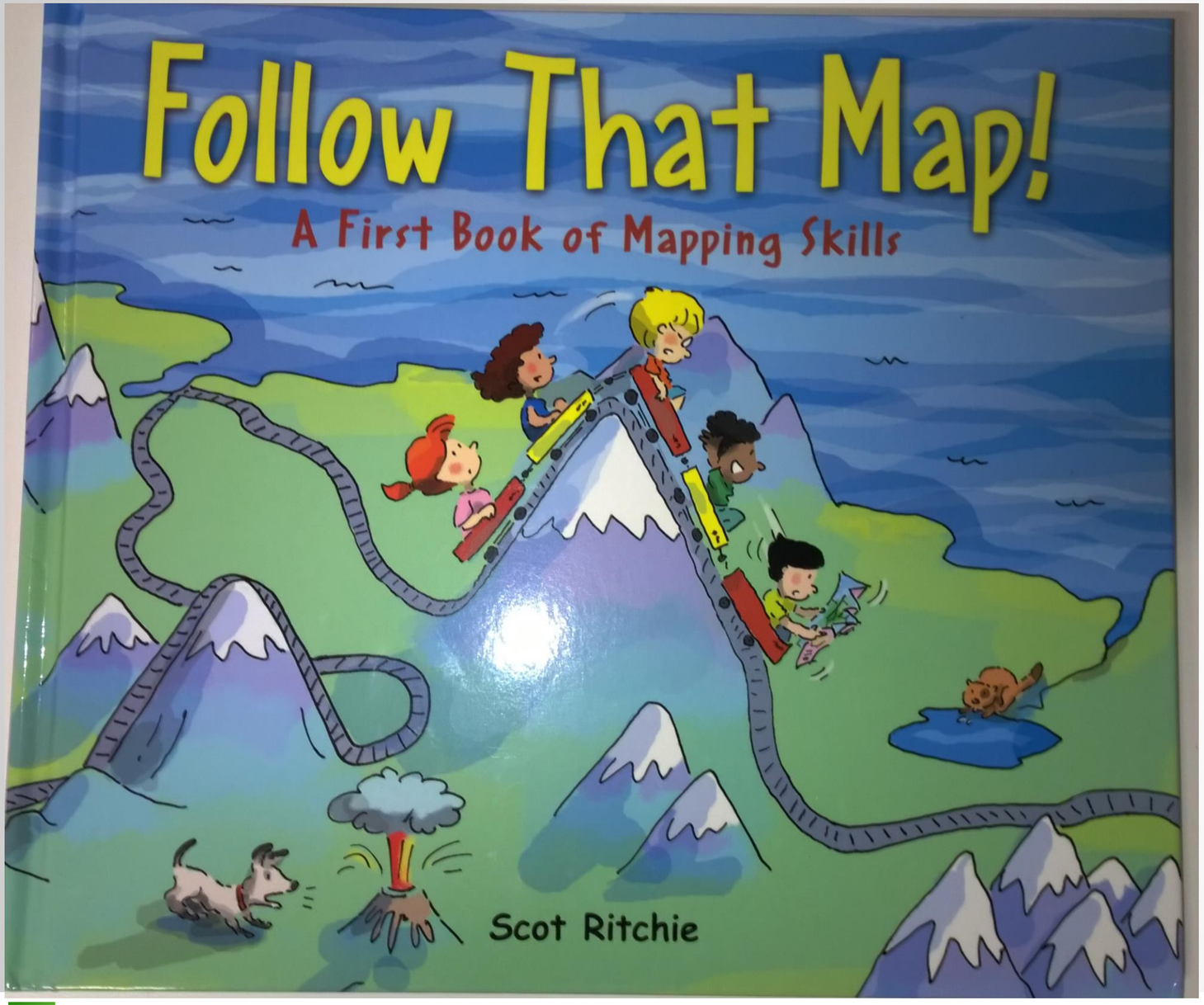
GIS Overview – Attaching GIS Data in Civil 3D 2015

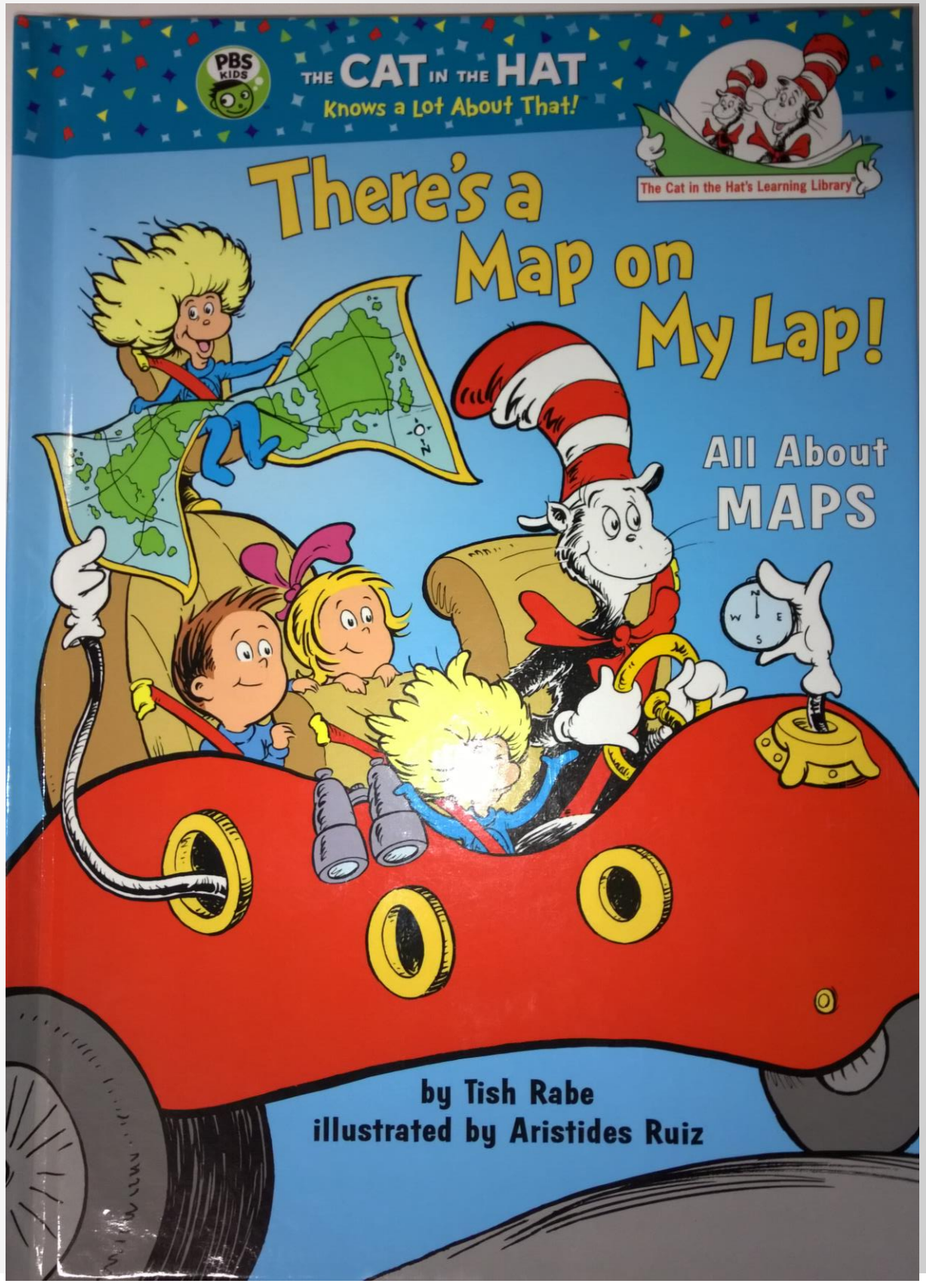
What is GIS?

- A **Geographic Information System**, or **GIS**, is a computerized data management system used to capture, store, manage, retrieve, analyze, and display spatial information.

- **Spatial data**, also known as **geospatial data**, is information about a physical object that can be represented by numerical values in a geographic coordinate system. Generally speaking, **spatial data** represents the location, size and shape of an object on planet Earth such as a building, lake, mountain or township.

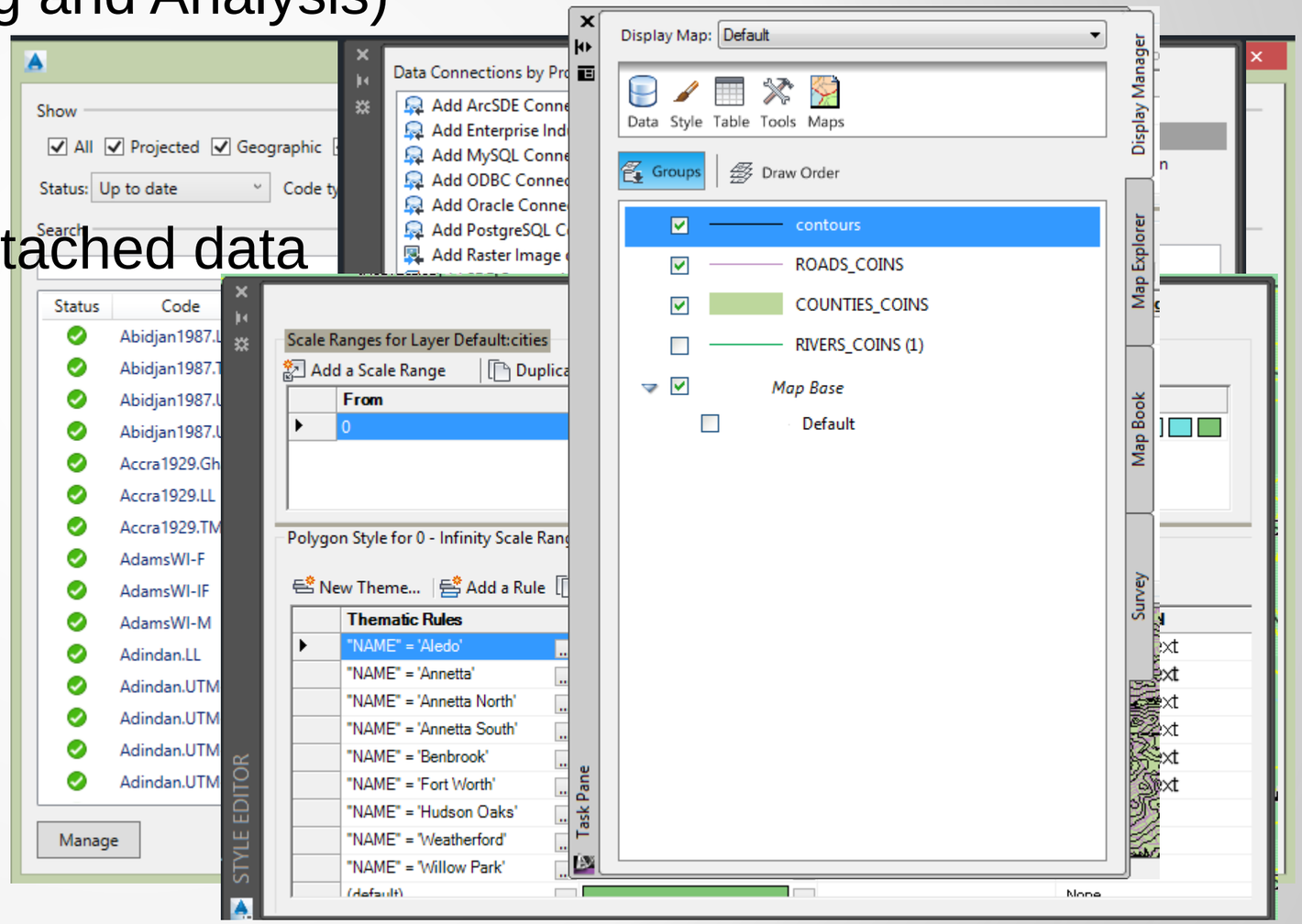
GIS First Steps





GIS to CAD Workflow

- Set the Workspace (Planning and Analysis)
- Assign Coordinate system
- Attach GIS data
- Arrange Drawing Order of attached data
- Apply Styling and Labels



Coordinate Systems

Scale Factor

Meter

International Foot

Geographic

EPSG Code

Datum

UTM

State Plane

Unit

Zone

Northing

Degree

Projected

Grid

Easting

US Survey Foot

Latitude

Ground

Longitude

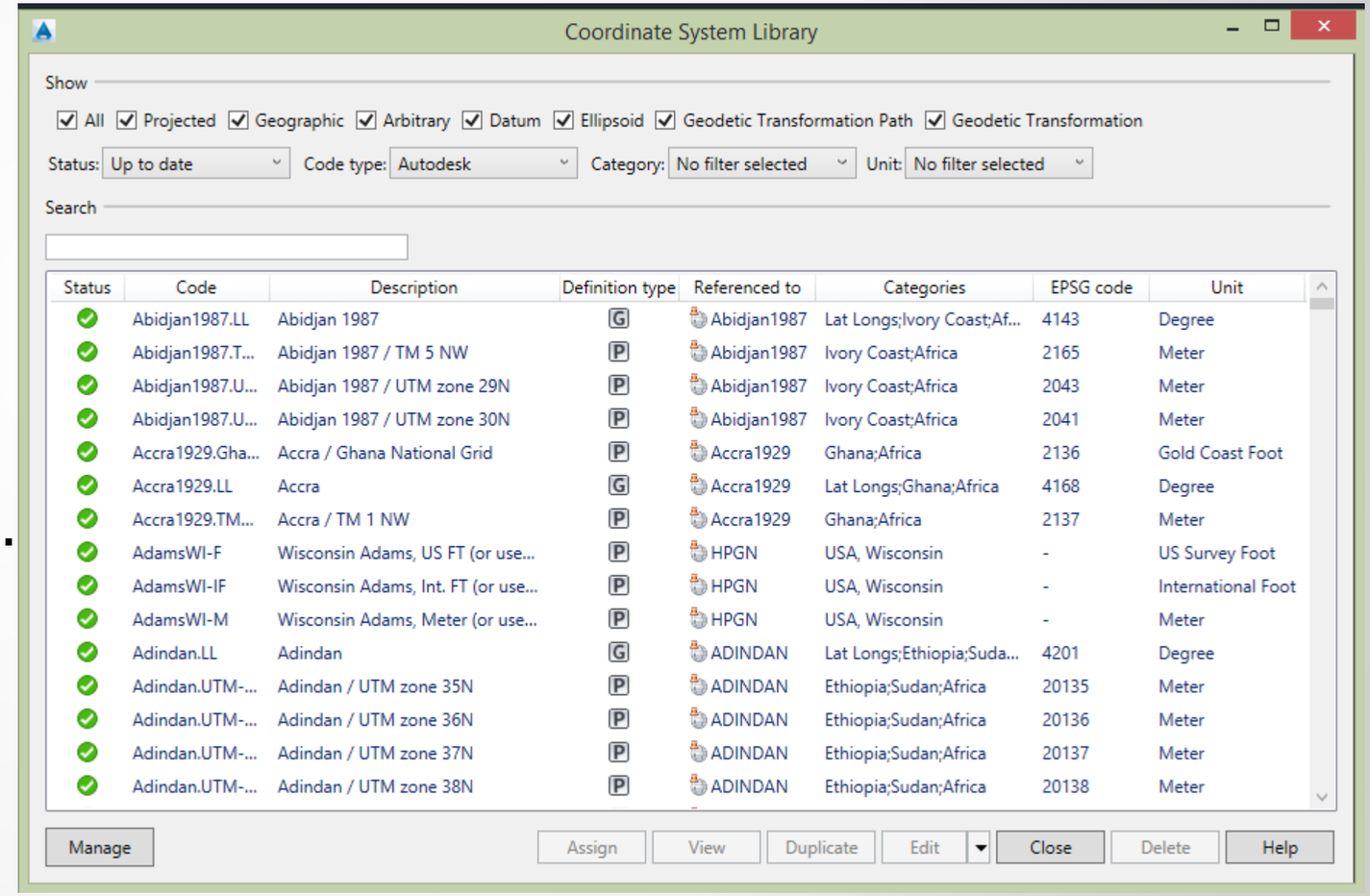
Surface

Horizontal

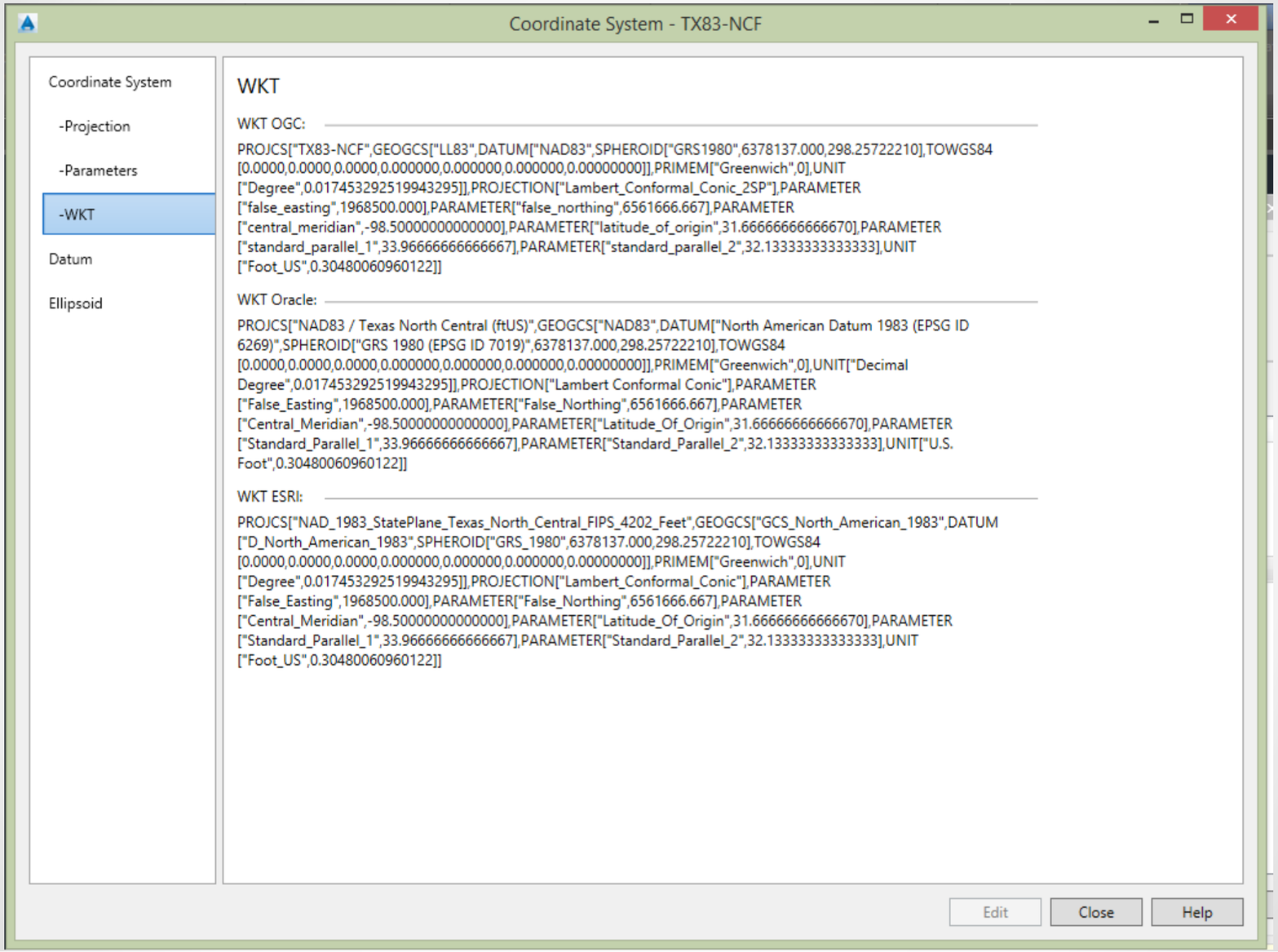
Vertical

Coordinate Systems

- Know what your Coordinate System is!
- If you do not know **ASK Someone**
- There are Thousands of different Coordinate Systems
- Know your area you work in.
- Understand metadata
- What are the Units

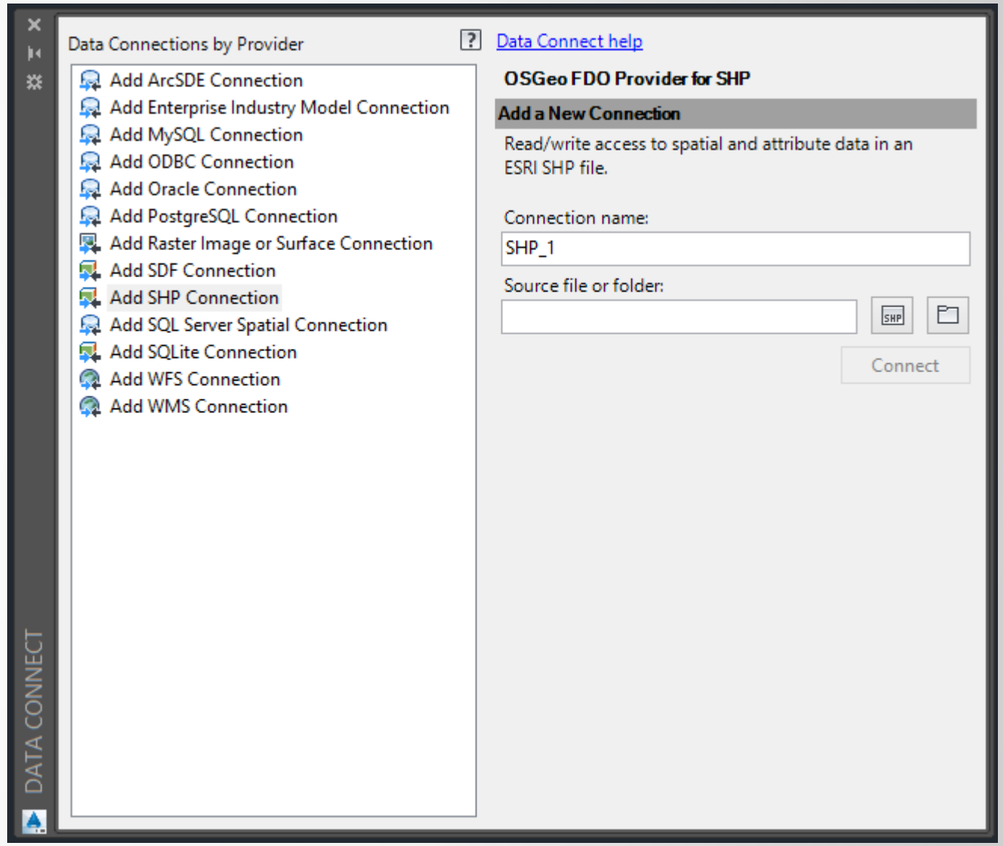


Coordinate Systems - WKT



Data Types

- Databases
  - Requires Additional Configuration
- Rasters
  - JPG, SID, ECW, TIF, JP2 ……
- Web Connections
- GIS Files
  - Shapefiles
  - ArcSDE (at 10.3 Direct Connect Only)
- For complete list and configuration requirements view the ***HELP!***



Styles and Labels

Scale

Style

Thematic Rules

Legend

Labels

Style

Query

Style Editor

Draw Order

Symbol

Size

Font

Layer Files

Line Thickness

Grid

Line Cap

Angle

Color

Symbolizations

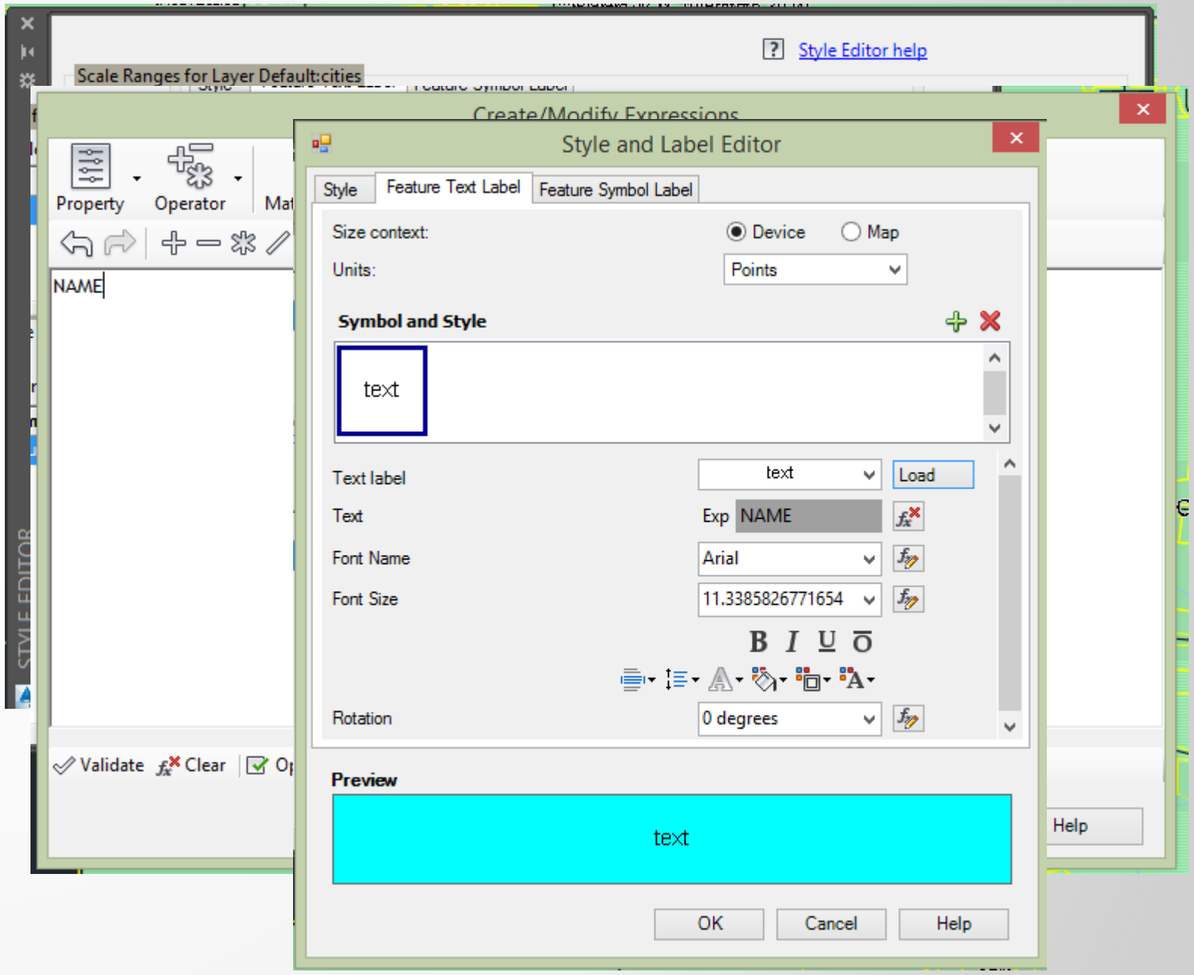
Join Style

Height

Width

GIS to CAD Workflow – Styles and Labels

- Open Style Editor
- Define Theme
- Define Labels
- Create Label Expression



Demo

Hands-On Activity

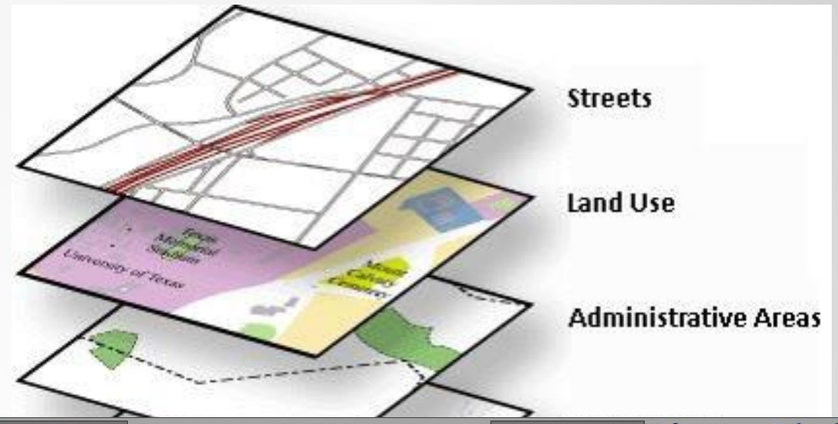
Create Base File from GIS Data

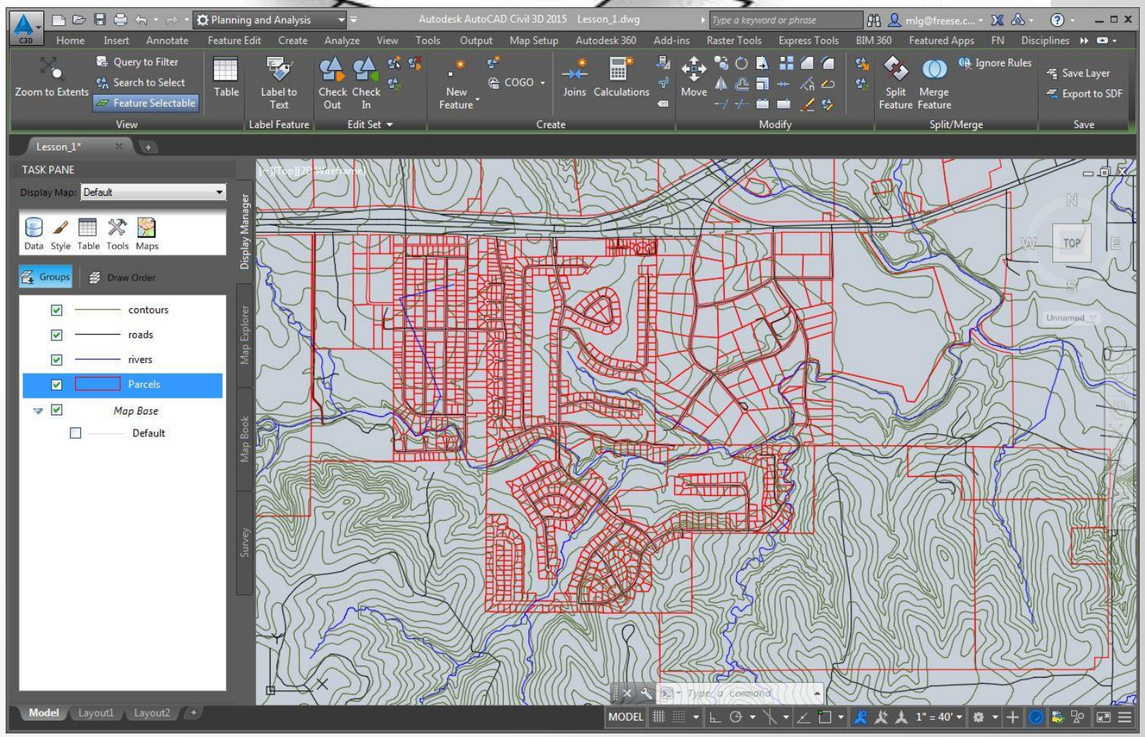
- Switch to Planning and Analysis Workspace
- Verify Coordinate System
  - TX83-NCF State Plane Coordinate system
- Open Map Task Pane
- Attach SHP data from folder
  - **C:\Datasets\Hands-On Labs\GS5322-L Follow the GIS Brick Road\Lesson 1\SHP**
- Arrange Order of attached data
- Style and Label Data

Creating Civil 3D Objects from GIS Data

Benefits of Using GIS Data

- Readily Available Data
- Start Preliminary Design Sooner
- Extract GIS data for Preliminary Design
- Use contour data to create surfaces
- Identify creeks, stream, rivers and lakes
- Locate roads and highways
- Locate Property Lines and ROW





What GIS Resources are Available

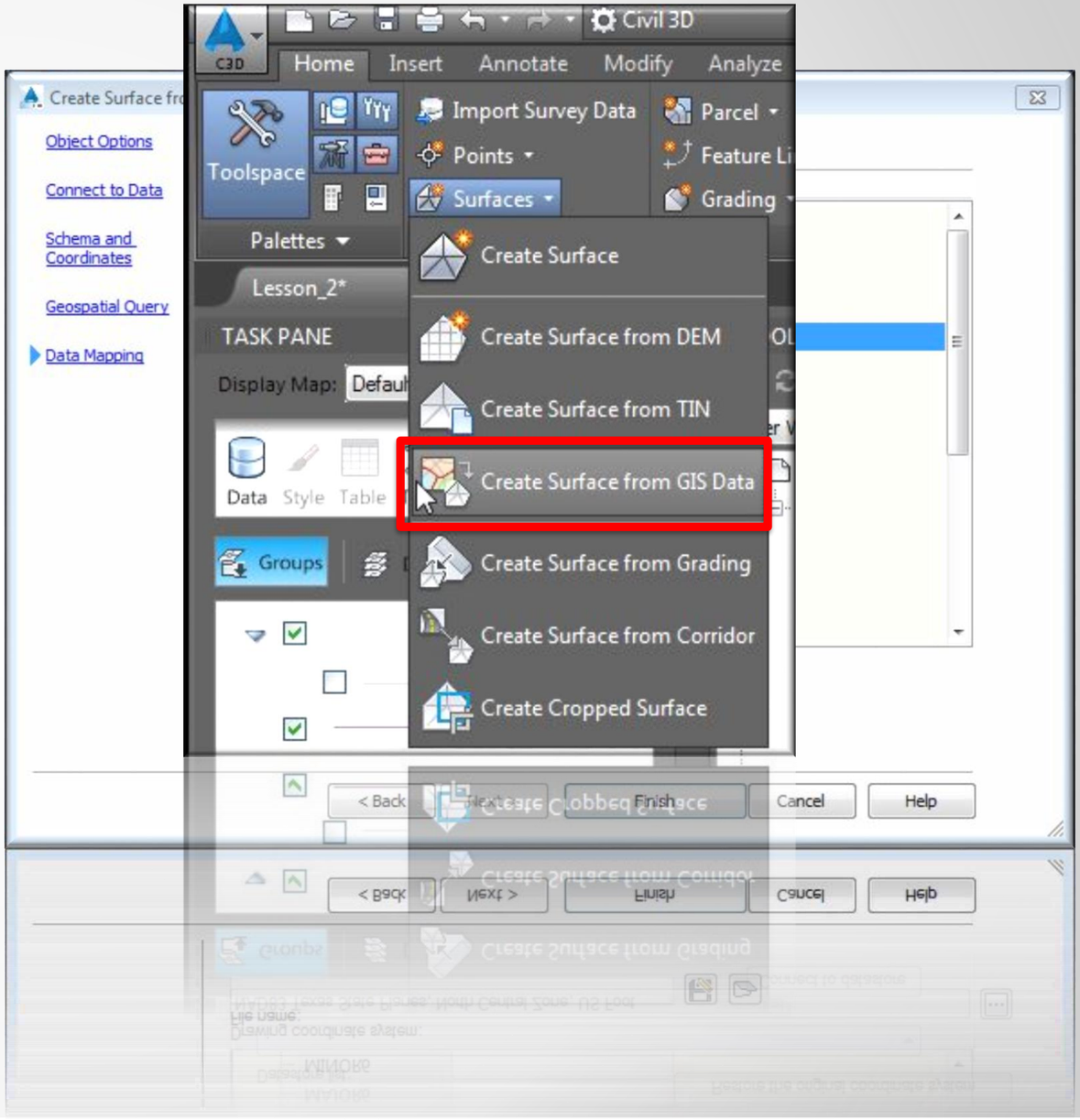
GIS Resources

- http://www.esri.com/
- http://www.usgs.gov/
- http://www.webgis.com/usgsseam.html
- http://data.geocomm.com/
- Local Government Agencies

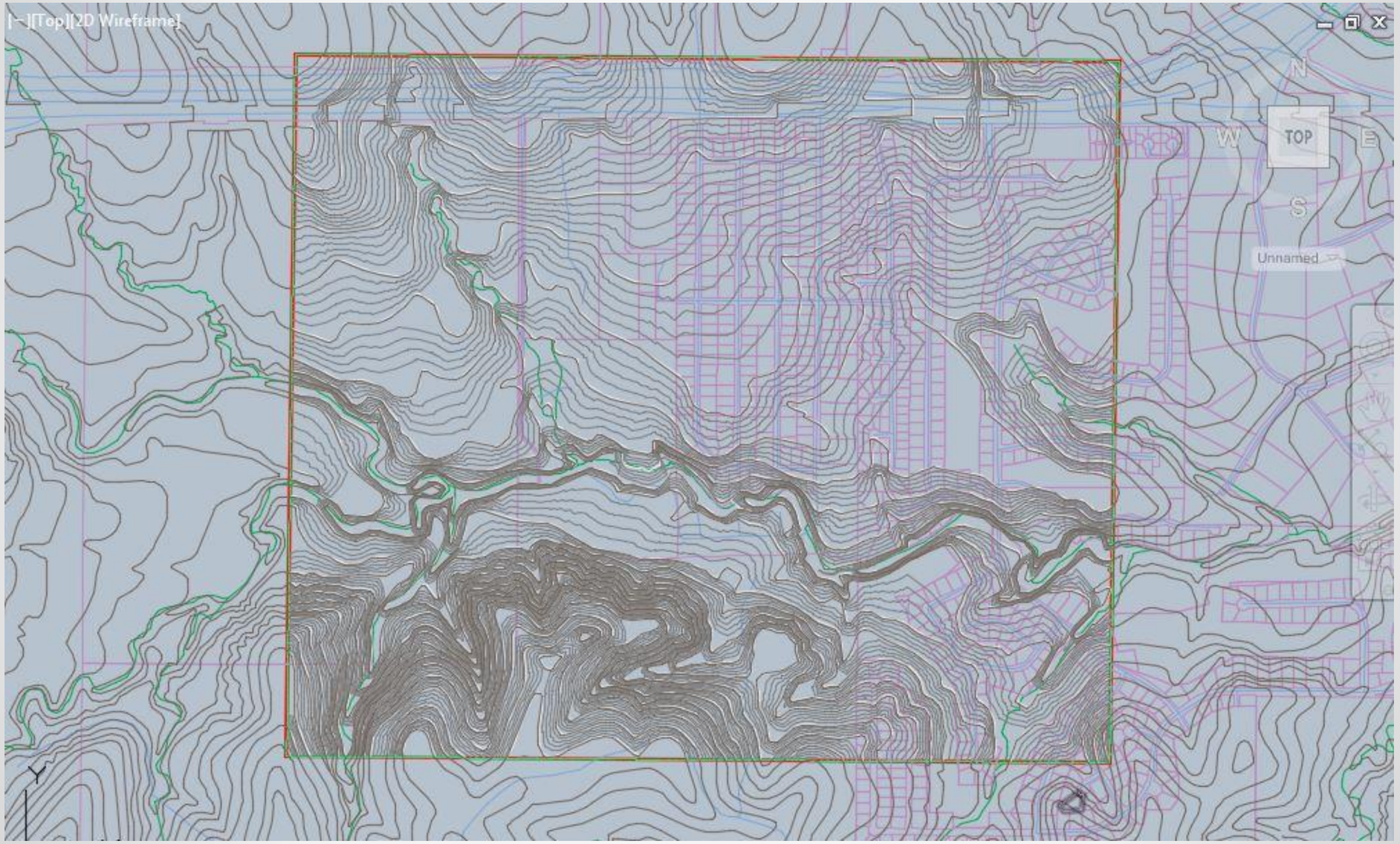
Surface Creation from GIS

Creating Surface from SHP Workflow

- Surface may be Created from Live Data
- Attaching SHP Not Required
- Create Surface from GIS Data
- Name and Style Surface
- Select Source Data Type
- Select Feature
- Define Area for Surface
- Map GIS Data to Civil 3D Properties



Surface Creation from GIS



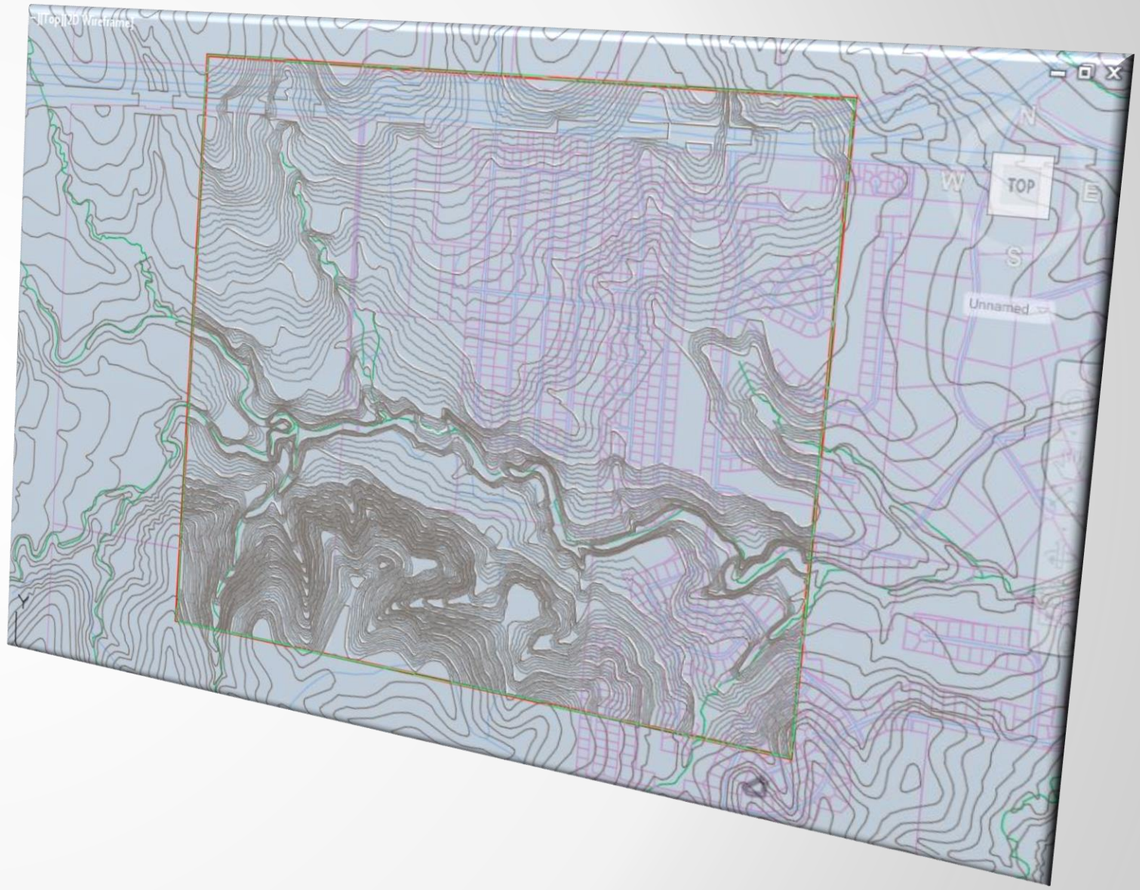
Demo

Hands-On Activity

Create Civil 3D Surface from GIS Data

1. Open Drawing Lesson_2-1.dwg
2. MAPWSPACE>ON
3. Data Connect – Add SHP Connection
4. Attach **Lesson 2/Contour_SHP/Contours**
5. Create Surface from GIS Data
6. Use default settings for name and style
7. Select Area using Red Rectangle
8. MINOR1 – Elevation

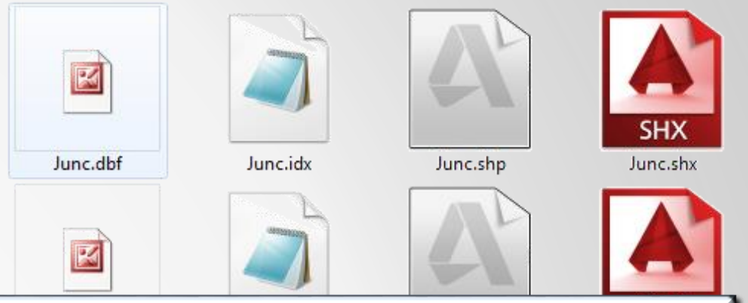
9. Optional – Draw Line and Create Quick Profile

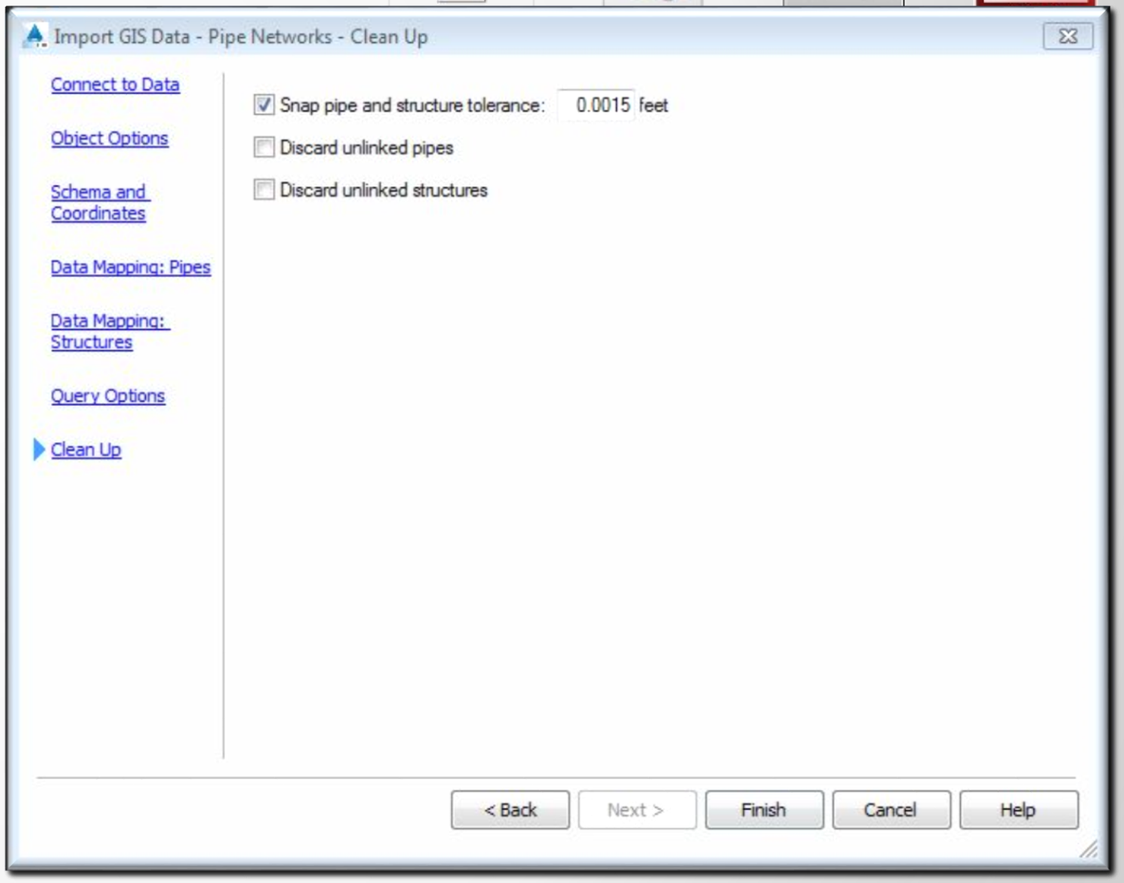


Existing Utilities From GIS

Creating Pipe Network from SHP

- Attaching SHP Not Required
- At Least Two SHP – One for Pipes and One for Structures
- Place SHP's in single Folder
- Import GIS Data
- Connect to Data
- Name and Style Pipe Network
- Map Features from GIS to Civil 3D
- Import All or Some
- Connect the Dots





Demo

Hands-On Activity

Create Civil 3D Pipe Network from GIS Data

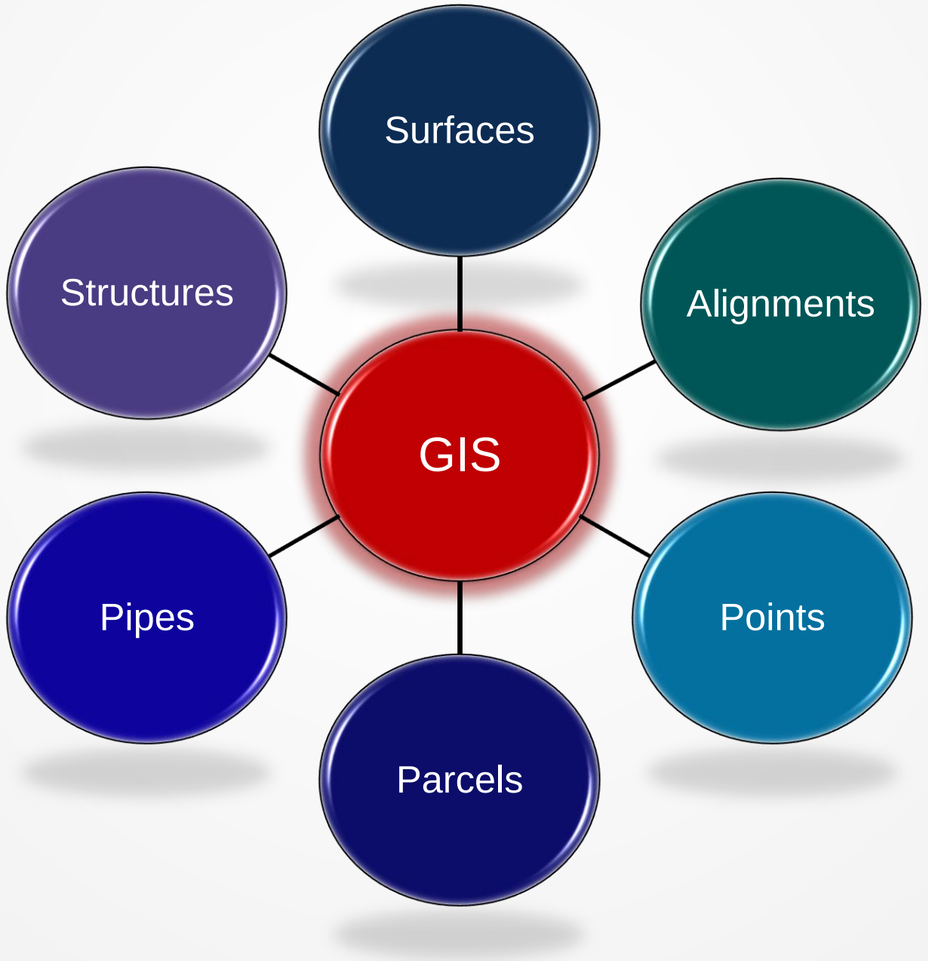
1. Open Drawing Lesson_2-2.dwg
2. Insert>Import>Import GIS Data
3. Connect to Data – Folder>Pipe Net_SHP
4. Name and Style Pipe Network
    1. Parts List – Sanitary Sewer
    2. Surface – FG Group
    3. Structure Label Style – Standard
    4. Pipe Label Style - Standard
5. Add Pipe:Circular
6. Data Mapping:pipe_ssa.xml
7. Add Junc:Cylindrical
8. Data Mappting:struc_ssa.xml
9. Connect the Dots

Exporting Civil 3D Data to GIS

Export Civil 3D Design Data to GIS

Each Completed Civil 3D Project Contains Valuable **Shareable** Information

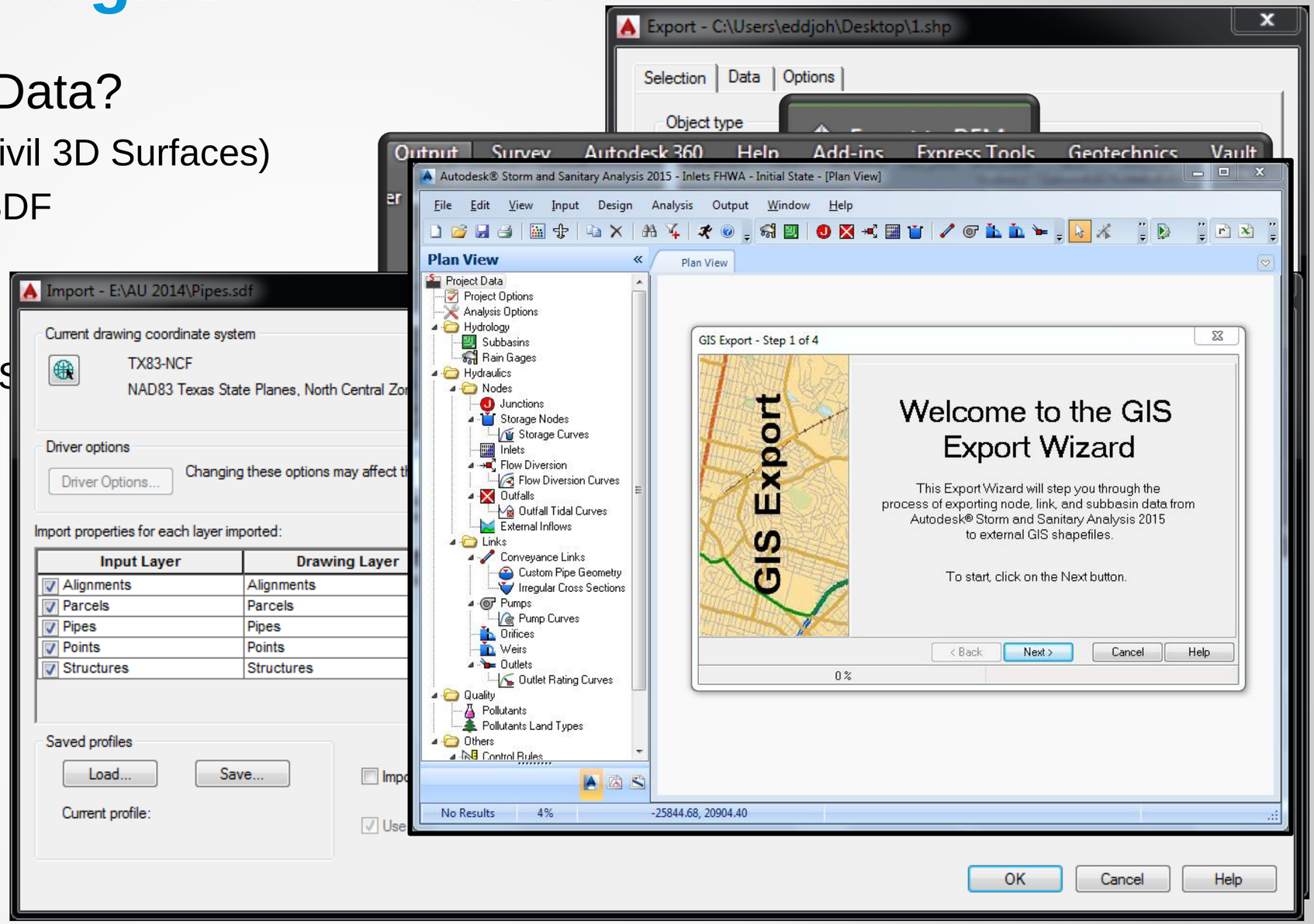
Shareable Civil 3D Data:



Export Civil 3D Design Data to GIS

How Do We Share Civil Data?

- Extract Contour Data (Civil 3D Surfaces)
- Export Civil Objects to SDF
- MapImport / MapExport
- Bulk Copy
- GIS Export - Storm and S



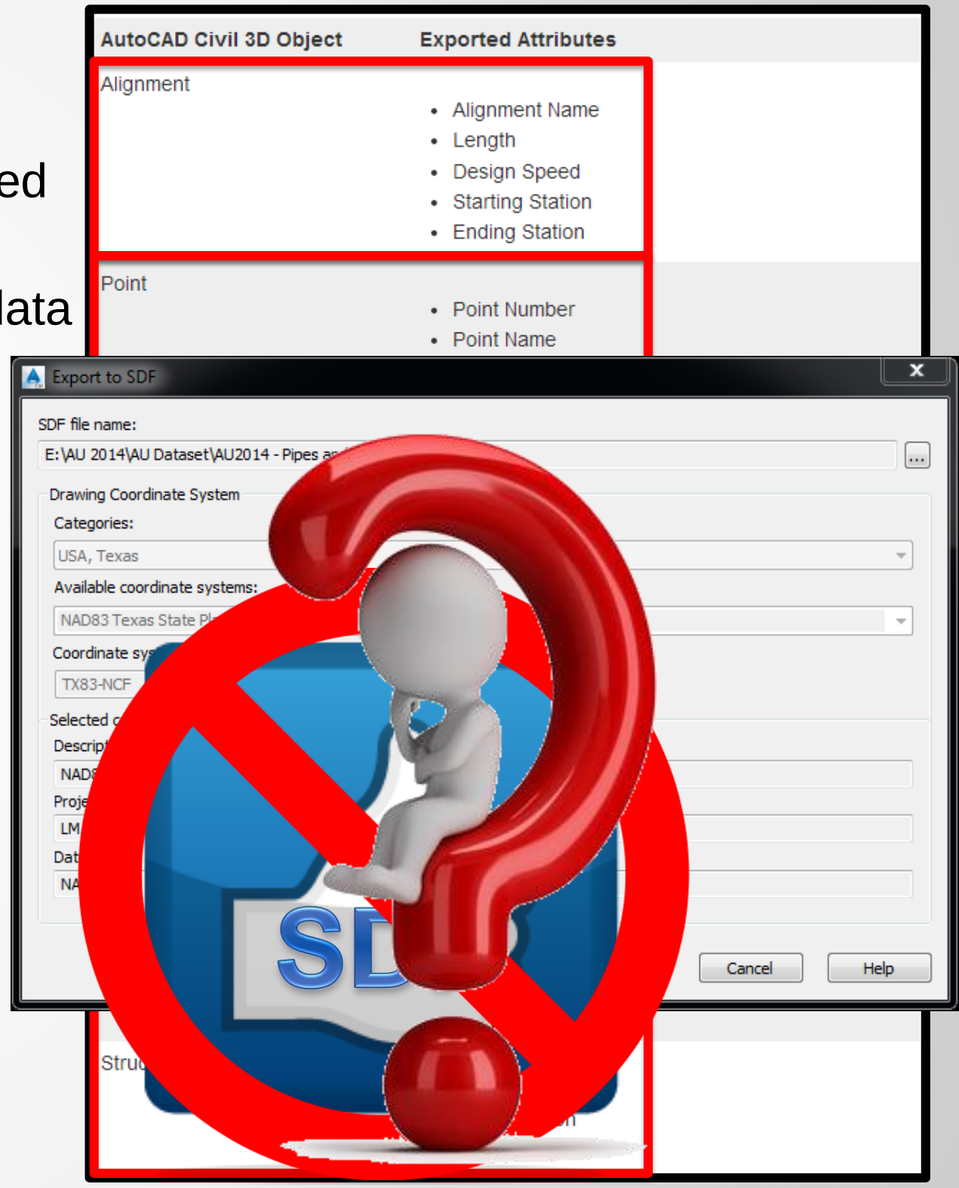
Export Civil 3D Design Data to GIS

Exporting Civil 3D Objects to SDF

- SDF - Autodesk file-based geospatial format that is optimized for storing large, classified data sets
- Unlike a Shape file, SDF stores both Spatial and Attribute data in a single file rather than a set of files
- 4 Types of Civil Data can be Exported to SDF
  - Alignments
  - Points
  - Parcels
  - Pipe Network Data
- Simply specify location of the SDF – Coordinate System in drawing is assigned to SDF
- The GOOD: SDF Export is extremely EASY

  The BAD: ESRI does not support the SDF Format

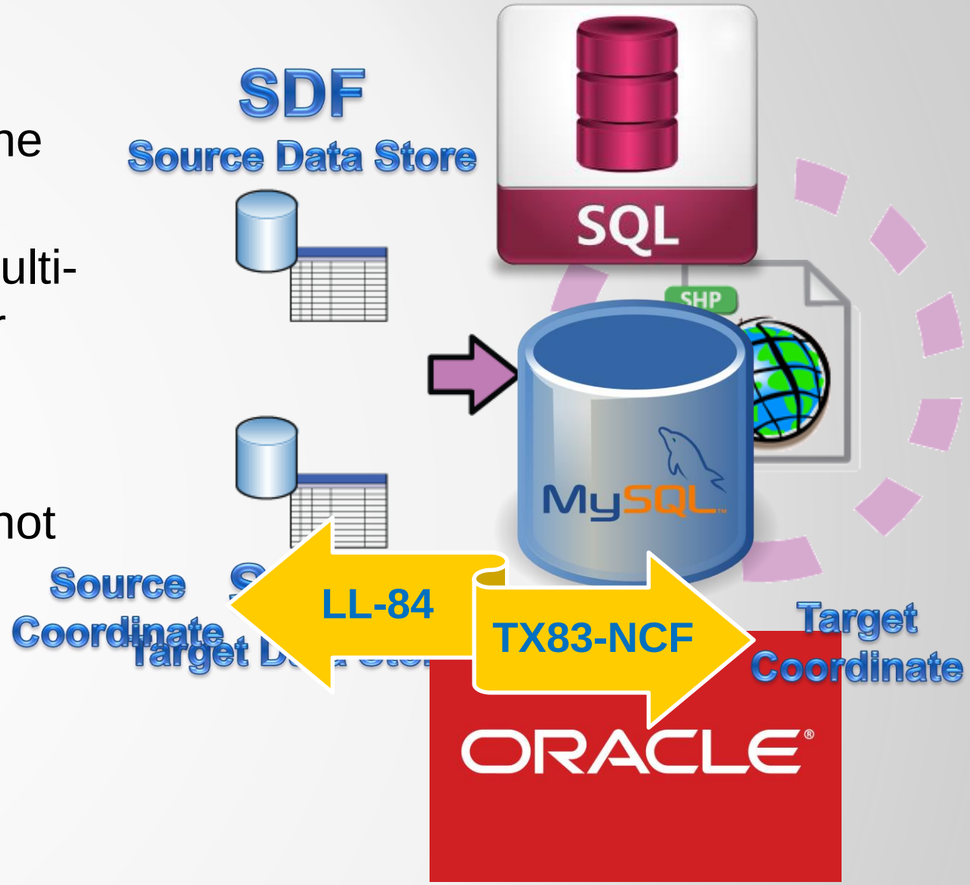
- Where do we go from here?



Export Civil 3D Design Data to GIS

Bulk Copy Using MAP 3D

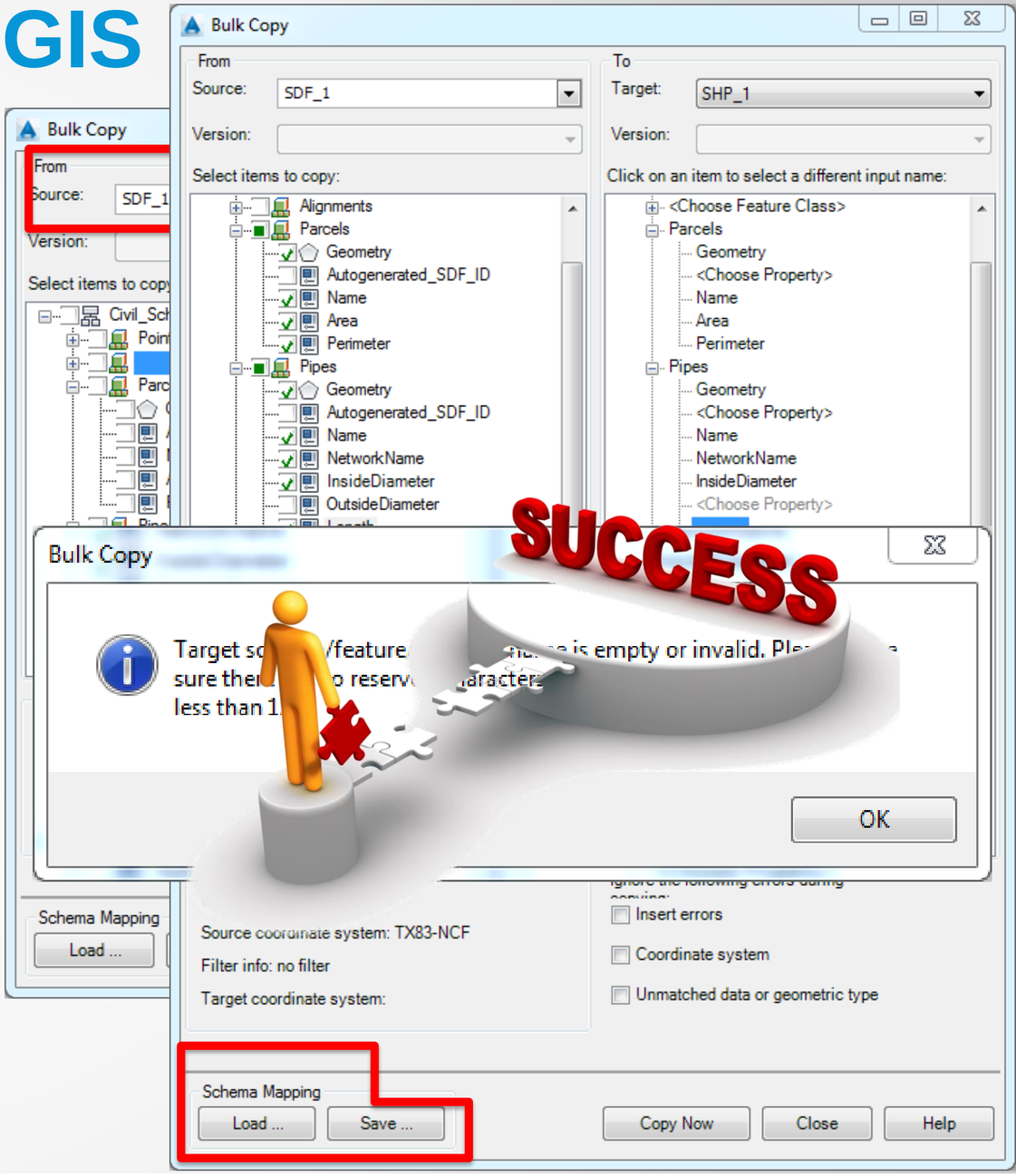
- Copy Data from one feature source to another, either in the same format or in a different one
- Upgrade from file-based (SDF or SHP) data storage to multi-user database storage (Microsoft SQL Server, MySQL, or Oracle)
- Transform coordinate systems easily.
  - Assign a coordinate system to a data store that does not have one.
  - Create a new data store whose coordinate system is different from the source.



Export Civil 3D Design Data to GIS

Bulk Copy SDF to SHP Workflow

- Data Connect to SDF File
- Create Destination Folder in Windows Explorer for Shapefile
- Add Data Connection to this SHP Folder .
- In MAP Task Pane select the Map Explorer Tab
  - Notice the Connections listed
  - Select Tools and Bulk Copy
- Select the Source (SDF) and the Target (SHP)
- Select the Items to Copy from Source SDF
- Save Schema Mapping
  - SHP will not accept Items with Characters in the name (Ex. / , \ , - , _ etc)
  - Name Length must be 12 Characters or less
  - Target Names can be shortened to avoid error
- Click Copy Now – Shape files are created

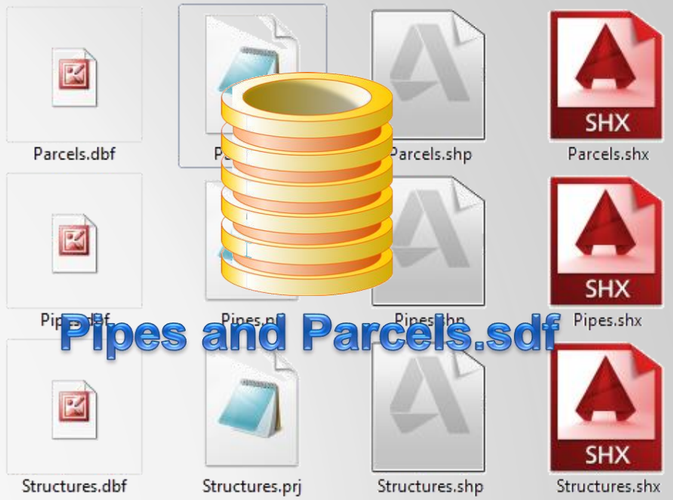


Demo

Hands-On Activity

Bulk Copy SDF to SHP

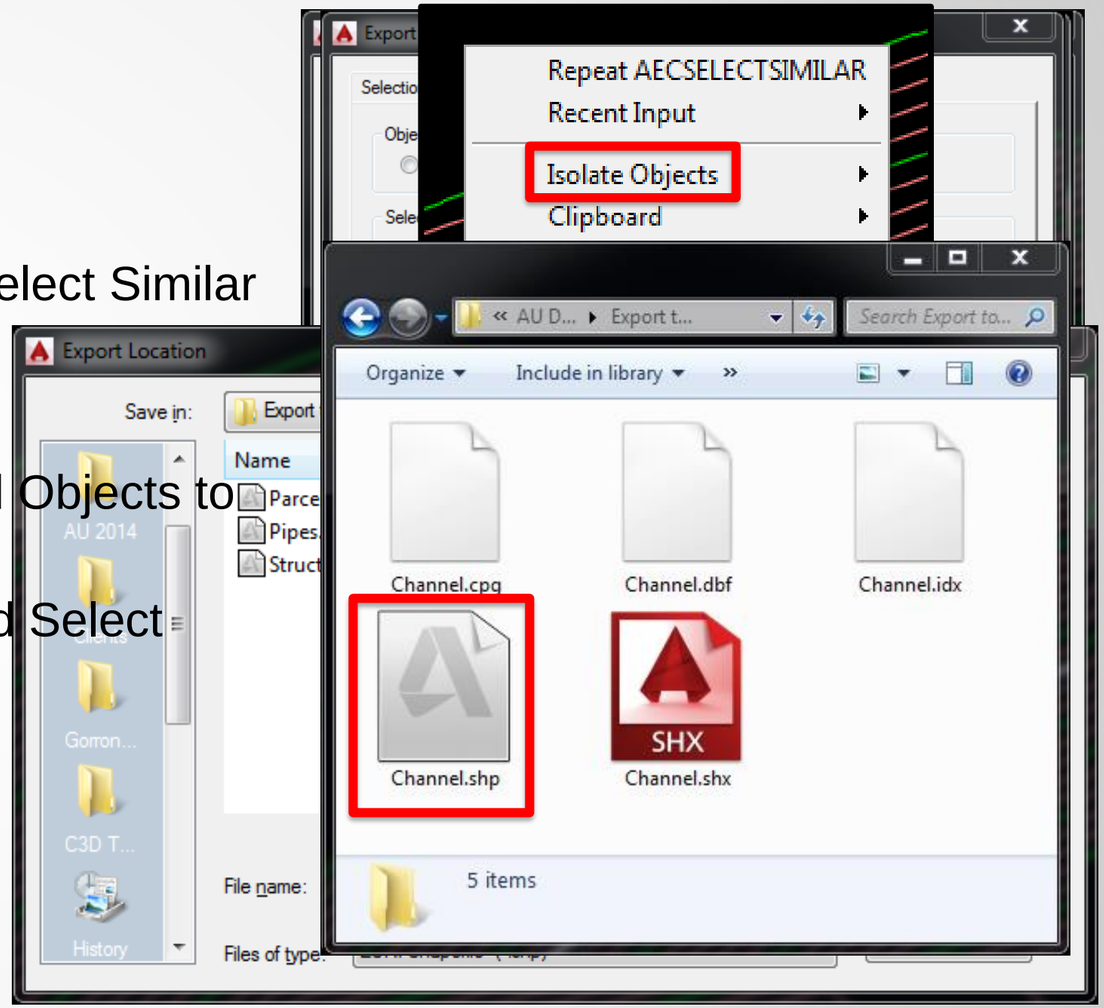
1. Open **Pipes and Parcels.dwg**
2. In the **Output Tab** in the Ribbon select **Export Civil Objects to SDF**. Verify location of SDF filename, Click **OK**.
3. In **Home Tab** in Ribbon, **Palettes** Panel**, Expand** and open **Map Task Pane**. Select **Data** and **Connect to Data**.
4. Add **SDF Connection (Pipes and Parcels.sdf)**
5. Select **Parcels**, **Pipes** and **Structures** and **Add to Map**
6. Add **SHP Connection** to folder **Bulk Copy to ESRI**
7. Switch to **Map Explorer Tab**, Select **Tools** > **Bulk Copy**
8. Select **From Source (SDF_1)** and **To Target (SHP_1)**
9. Select the Items to Copy from Parcels, Pipes and Structures
   - Deselect **Autogenerated_SDF_ID** for all and **OutsideDiameter** on Pipes
   - In the **Target Column** under **Pipes**, rename **InsideDiameter to InsideDia** and **StructureStart to StructureS**
10. Click **Copy Now** and **Continue Bulk Copy**



Export Civil 3D Design Data to GIS

Civil 3D Surface to Shape File Workflow

- Extract Contour Data
- Extracts Polylines at Elevation from Surface
- Select one Major and Minor Contour. Right Click>Select Similar
  Right Click>Isolate Objects
- MAPExport
- Selection Tab – Select Appropriate Object Type and Objects to Export
- Data Tab – Select Attributes, Expand Properties and Select Desired Object Data
- Surface is Exported as ESRI Shape file



Demo

Hands-On Activity

Export Civil 3D Surface to Shape File

1. Open **Prop Channel.dwg**
2. Select Surface. In the **Surface Tools** panel in the Ribbon Select **Extract Objects**
3. Extract **Major and Minor Contours** from Civil 3D Surface
4. Select **One Major and One Minor Contour**, Right Click> **Select Similar** > Right Click >**Isolate Selected Objects**
5. Type **MapExport** in command line. Name the file **Channel** and select Files of Type to be **ESRI Shapefile.**
6. Select **Line** for **Object Type** and accept **Select All** for **Objects to Export**
7. In the **Data Tab**, pick **Select Attributes**, Expand **Properties**, Select **Elevations** and **Layers** as Properties to be Exported.
8. Click **OK** Twice. Open Shape file location and verify Creation of File

C3D Surface

GIS Data

Class Review

Lesson One

1. Where do we assign a Coordinate System for our drawing?
2. What are two Data Types that can be connected to?

Lesson Two

1. What Data Field is critical for creation of a Surface from GIS?
2. When creating a Pipe Network from SHP, can you connect to a single Shapefile or Folder of Shapefiles?

Lesson Three

1. What Civil 3D Objects can be exported to SDF?
2. What is the maximum Character length for SHP Features when using Bulk Copy?

Goal: Use GIS Data for Preliminary Design and return final design to GIS

Objectives

- Attach GIS data using Civil 3D
- Manipulate and Transform GIS data using Civil 3D
- Create Civil 3D design data directly from GIS data
- Export Civil 3D design back to a GIS database

Having Completed Today's Session You:

- Attached GIS data using Civil 3D
- Manipulated and Transformed GIS data using Civil 3D
- Created Civil 3D design data directly from GIS data
- Exported Civil 3D design back to a GIS database

Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2014 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time

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