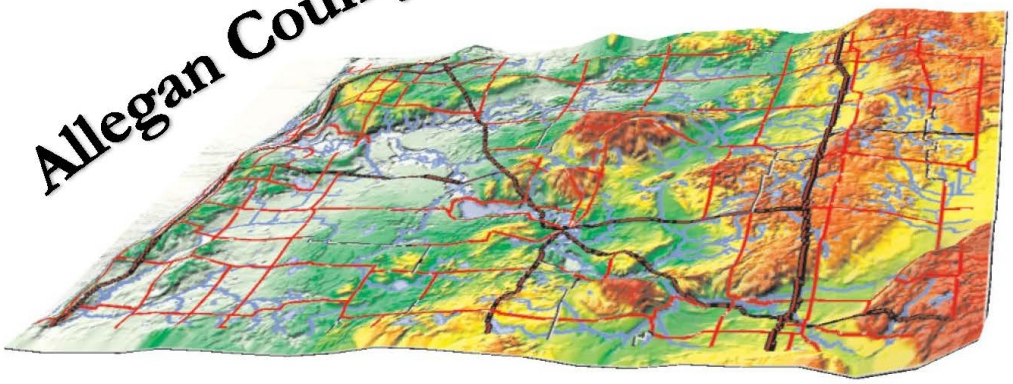
Allegan County GIS Services



Policies and Procedures

WWW.ALLEGANCOUNTY.ORG/GIS

JUNE 25, 2021

Contents

Part I

Brand

1 Awards

1.1 The GIS Champion Award

1.1.1 GIS Champion

An individual whose actions promote the use of GIS

GIS Champion Award

Figure 1.1: Example GIS Champion Award

Background

Though Allegan County has had a formal GIS department for over 20 years, few people have learned to use it.

Statement of Problem

GIS is underutilized in Allegan County government. The county would benefit from more GIS use in its government. Currently there is no formal recognition of individuals that promote GIS.

Analysis

The GIS Champion Awardis a simple method of recognizing those that promote GIS in the county.

Past GIS Award Recipients

- Ian Hanes
- Karen
- Brian Redmon

GIS Champion Award Code

```
\documentclass[landscape]{article}
\usepackage{wallpaper}
\usepackage{niceframe}
\usepackage{xcolor}
\usepackage{ulem}
\usepackage{graphicx}
\usepackage{geometry}
%\geometry{tmargin=.75cm,bmargin=.25cm,
%lmargin=.8cm,rmargin=.2cm}
\geometry{tmargin=.25in,bmargin=.25in,
  lmargin=.25in,rmargin=.25in}
\usepackage{multicol}
\setlength{\columnseprule}{0.4pt}
\columnwidth=0.3\textwidth

\begin{document}
\centering
\scalebox{2.9}{
\color{green!30!black!60}
\begin{minipage}{.33\textwidth}
\font\border=umrandb
\generalframe
{\border \char113} % up left
{\border \char109} % up
{\border \char112} % up right
{\border \char108} % left
{\border \char110} % right
{\border \char114} % lower left
{\border \char111} % bottom
{\border \char115} % lower right
{\centering
\includegraphics[height=1.5cm]{GIS_Logo_better.jpg}
```

```
\vspace{-8mm}

\curlyframe[.9\columnwidth]{

\textcolor{green!10!black!90}
{\small Allegan County GIS Services}
\vspace{.005in}

\textcolor{green!10!black!90}{
\tiny Recognizes}\\
%\smallskip
\vspace{.005in}
\uline{\textcolor{green!30!black!60}
\textcolor{green!30!black!60}{Brian Redmond}}
\\
\smallskip
\tiny Information Services Technician

%\smallskip
\textcolor{green!10!black!90}
{
\\
\tiny for Excellence in
}
\smallskip
\\
\textcolor{black}{\normalsize \textsc{Enabling
 Employee Experiences}}
\\
\vspace{.1in}
\textcolor{green!10!black!90}
{
\tiny on this day
\itshape September 21, 2018
```

```
}

\vspace{.1in}

{\color{green!10!black!90}
\scalebox{.6}{
```

```
\begin{tabular}{ccc}
\cline{1-1}
\cline{3-3}
\\
Neil Besteman  & &  Bryan May \\
GIS Manager & & GIS Analyst \\
\end{tabular}

} % closes scalebox{.6} arg
} % closes blue!40!black
} % closes curlyframe arg
} % closes centering
\end{minipage}
} % closes scalebox{2.8} arg

\end{document}
```

Part II

Methods

2 Documentation

2.1 About Documentation

2.1.1 How Jalapeño Works

Problem and Analysis

Background

GIS Services has complicated and evolving workflows and uses everchanging technologies

Statement of Problem

GIS documentation has traditionally been done in different formats and stored in many different files and folders in the county network. This has resulted in problems with:

- version control
- finding the documentation
- disseminating the documentation

Analysis

The Jalapeño folder along with some open-source software provides a robust documentaion tool for GIS documentation.

Default sizes in Jalapeño

Element	Default Size
Paragraph Heading	Large
Paragraph text	normalsize
Subparagraph Heading	large
Subparagraph Text	normalsize

Table 2.1: Default Sizes

Examples:

Schema Change Procedure large size

large size type

Schema Change Procedure Default size

default size type

Schema Change Procedure Large size

Large size type space neg pouint 3in here

Schema Change Procedure Large size

LARGE size type

Schema Change Procedure Default size

default size type

Schema Change Procedure large size

large size type

Schema Change Procedure Large size

Large size type

Schema Change Procedure LARGE size

LARGE size type

Colors

Blues

HeaderBlueA
HeaderBlueB
HeaderBlueC
HeaderBlueD
HeaderBlueE

Golds

HeaderGoldA
HeaderGoldB
HeaderGoldC
HeaderGoldD
HeaderGoldE

Oranges

HeaderOrangeA
HeaderOrangeB
HeaderOrangeC
HeaderOrangeD
HeaderOrangeE

Greens

HeaderGreenA
HeaderGreenB
HeaderGreenC
HeaderGreenD
HeaderGreenE

Others

HyperlinkBlue1
graphicOrange

PROJECT NOTES:

- jalapeno folder is a git package https://github.com/nbesteman/jalapeno
- Project is coded with relative paths and jalapeno can be located anywhere.

Project File Structure:

...\jalapeno\..

folder	description
.git	versioning repository for Jalapeño
documentation	resources used in Jalapeño
processing	.tex douments and build folders
source	common image files
temp	untracked folder for temp storage

...\jalapeno\documentation\..

folder or file	description
classDocs	LaTeX class documentation
DevNotes	Notes and Mind Maps for Jalapeño
latexamples	LaTeX example code
moduleTemplates	.tex templates
packageDocs	LaTeX package documentation
readingRoom	Resources linked in Jalapeño
unsorted	Unsorted documentation
gitnotes.txt	git commands notes

...\jalapeno\processing\..

folder or file	description
archive	Processing backup folder
...Part	Folders of book *parts*
build	LaTeXfolder for .pdf output and temp files
build\referenceEntries.bib	Entries that appear in references
preamble.tex	preamble code for all documents
titlePages	Assortment of .tex title pages
compileFull.sh	pdflatex, bibtex, makeglossaries, makeindex, pdflatex, pdflatex
compileMainX2.sh	pdflatex, pdflatex
GISDocumentation.tex	Master document code
glossaryEntries.tex	Entries that appear in glossary
indexEntries.tex	Entries that appear in the index

...\jalapeno\processing\preamble..

folder or file	description
chapterStyles.tex	Sets chapter title page attributes with Memoir Class
colorDefs.tex	Defines custom colors
graphicsPath.tex	Defines graphics variable
pageLayoutCommands.tex	Sets spacing and typeface for headings of Sections down to Subparagraphs in mainmatter
pageLayoutCommandsAlt.tex	Sets spacing and typeface for headings of Sections down to Subparagraphs in backmatter
pageStyles.tex	Sets header and footer properties
preamble.tex	Preamble used to compile main document
subSectionPreamble.tex	Preamble used to compile any subsection document

USING THE GLOSSARY

Glossary Requirements

Glossary commands require a Perl interpreter. Activeperl is a free Perl interpreter and can be downloaded from:
https://www.activestate.com/activeperl/downloads (A typical installation adds Perl to your path). Compiling the glossary requires running the makeglossaries command either in a LaTeX IDE or in command line as described here. PDFLatex must be run first to create a .aux file that is used by makeglossaries to create an .gls file. After the .gls file is created, PDFLatex must be run again to insert the glossary at the \printglossaries location.

Creating a new glossary entry

To **create a new glossary entry:** Add an entry to glossaryEntries.tex. Save it there and then use the makeglossaries command to recompile the .gls file.

Rebuilding the glossary

To Recompile the .gls. In the (main document)build folder:

- Launch command prompt
- enter command: **makeglossaries GISDocumentation***

Note that this command reads the .aux file and creates the .gls file. The .aux file is created by compiling with PDFLatex. If there is no .aux file the command will fail

Using glossary terms in a subdocument:

In the subdocument you must add code to input the glossaryEntries file.
ie. After the line:

```
\input{../../../preamble}
```

Add the line:

```
\input{../../../glossaryEntries}
```

To use a glossary term in the subdocument:

In place of the term, use code referencing the key (in the glossaryEntries file):

- \gls{key}

To add the glossary to the subdocument:

- Add the line \makeglossaries to the preamble of the subdocument.
- Add the line \printglossaries to the subdocument.
- Run makeglossaries in command line on the subdocument similar to how is described above.

USING THE BIBLIOGRAPHY (REFERENCES)

Bibliography requirements

Compiling the bibliography requires running bibtex either in a LaTeX IDE or in command line as described here. PDFLatex must be run first to create a .aux file that is used by bibtex to create a .bbl file. After the .bbl file is created, PDFLatex must be run again to insert the bibliography at the \bibliography location.

Inserting the bibliography

In the LaTeX code:

```
\bibliography\{referenceEntries}
```

Inserts a bibliography called referenceEntries.bib from the same folder as the project .aux file

Creating a new bibliography entry

To **create a new bibliography entry:** Add an entry to referenceEntries.bib. Save it there and then use bibtex to recompile the .bbl file.

Rebuilding the bibliography

To Recompile the .bbl. In the (main document)build folder:

- Launch command prompt
- Enter command: **bibtex GISDocumentation**

Note that this command reads the .aux file and creates the .bbl file. The .aux file is created by compiling with PDFLatex. If there is no .aux file the command will fail

To cite a bibliography source in a subdocument

In the place that you want the citation In the LaTeX code:

```
~\cite[pg.#]{key}
```

USING THE INDEX

Index requirements:

Compiling the index requires running the makeindex command either in a LaTeX IDE or in command line as described here. PDFLatex must be run first to create a .aux file that is used by makeindex to create an .idx file. After the .idx file is created, PDFLatex must be run again to insert the index at the \printindex location.

Creating a new index entry

To **create a new index entry:** Add an entry to indexEntries.tex. Save it there and then use the makeindex command to recompile the .idx file.

Rebuilding the index

To Recompile the .idx In the (main document)build folder:

- Launch command prompt
- enter command: **makeindex GISDocumentation***

Note that this command reads the .aux file and creates the .idx file. The .aux file is created by compiling with PDFLatex. If there is no .aux file the command will fail. Run PDFLatex first

Access the index from a subdocument

In the subdocument you must add code to input the indexEntries file. For example: After the line:

```
\input{../../../preamble}
```

Add the line:

```
\input{../../../indexEntries}
```

To use a index term in the subdocument:

In place of the term, use code referencing the key (in the indexEntries file):

- \index {key}

To add the index to the subdocument:

- Add the line \makeindex to the preamble of the subdocument.
- Add the line \printindex to the subdocument.
- Run makeindex in command line on the subdocument similar to how is described above.

USING THE APPENDICES

2.2 Document Storage Concepts

2.2.1 GIS File Standard

Folders inside the project folder

- archive
- build
- delivered
- documentation
- processing
- source

3 Team Concept

3.1 Team Structure

3.1.1 Paired Programming

A paragraph about pp from Joy Inc.

4 Learning Concept

4.1 Learning and Growth

4.1.1 Learning And Growth Plan

Strength to Leverage

Area of Focus: Professional Development

GISP Certification

Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

Development Activities

(assignments, coaching, formal training)

Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

Strength to Leverage

Area of Focus: Documentation

Maintain Metadata

Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

Development Activities

(assignments, coaching, formal training)

Results

What is the Key Performance Indicator (KPI)?
How have I succeeded in adapting my behavior or what new skill did I learn.
Keep track of metadata in a datset table.

Strength to Leverage

Area of Focus:

SMART Goal

Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

Development Activities

(assignments, coaching, formal training)

Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

DEVELOPMENT OPPORTUNITY

Area of Focus: Customer Focus

Customer Focus SMART Goal

Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

Development Activities

(assignments, coaching, formal training)

Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

Development Opportunity

Area of Focus: Teamwork

Teamwork SMART Goal

Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

Development Activities

(assignments, coaching, formal training)

Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

DEVELOPMENT OPPORTUNITY

Area of Focus: Outreach

GIS Promotion to Local Stakeholders

Acheived through improved communication and networking

Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

Development Activities

(assignments, coaching, formal training)

Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

4.1.2 LEARNING LOOP

LEARNING LOOP

Disconnect All Users

Part III

Service

5 Applications

5.1 For Drains Department

5.1.1 Traverse Notices Production

Problem and Analysis

Background

This tool replaces a mapInfo toolset to produce the different notification documents needed for drain maintenance.

Statement of Problem

Drains Department must notify property owners affected by drain maintenance.

Analysis

Traverse Notification Workflow will facilitate: generation of notification documents based on a drain selected in a map. From a selected drain this workflow selects affected parcels and assembles letters and lists with needed information.

People Involved in the Workflow

- GIS Analyst
- Drains Staff

Stages of the Workflow

- Use the Traverse Notices Letter Task
- Create a Map
- Export reports for parcels intersecting selected drains

Traverse Notices Workflow Summary

The Three Stages of the workflow *in ArGIS Pro*:

1. Traverse Notices Letter Task
   - ➢ Search for drain
   - ➢ Select drain
   - ➢ Process data for selected drain
2. Create Maps
   - ➢ Set area and zoom level of map
   - ➢ Markup map as desired
   - ➢ Export map to PDF
3. Export Letters
   - ➢ Export individual reports from the Export Report Pane to PDF

Technologies Used in The Workflow

ArcGIS Pro

- SQL Server Source Data(ACPro.SDE)
- An ArcGIS Pro Task is used to execute geoprocessing
- Map creation in ArcGIS Pro
- Report creation(letters) in ArcGIS Pro

Other Software

- PDF document printer

Hardware

- Printer

TRAVERSE NOTICES LETTERS TASK

Open ArcGISPro

➢ Navigate to:

```
J:\Departments\Drains\Apps\TraverseNotices\Processing
```

➢ Click the Project: **TraverseNoticesTool.aprx**

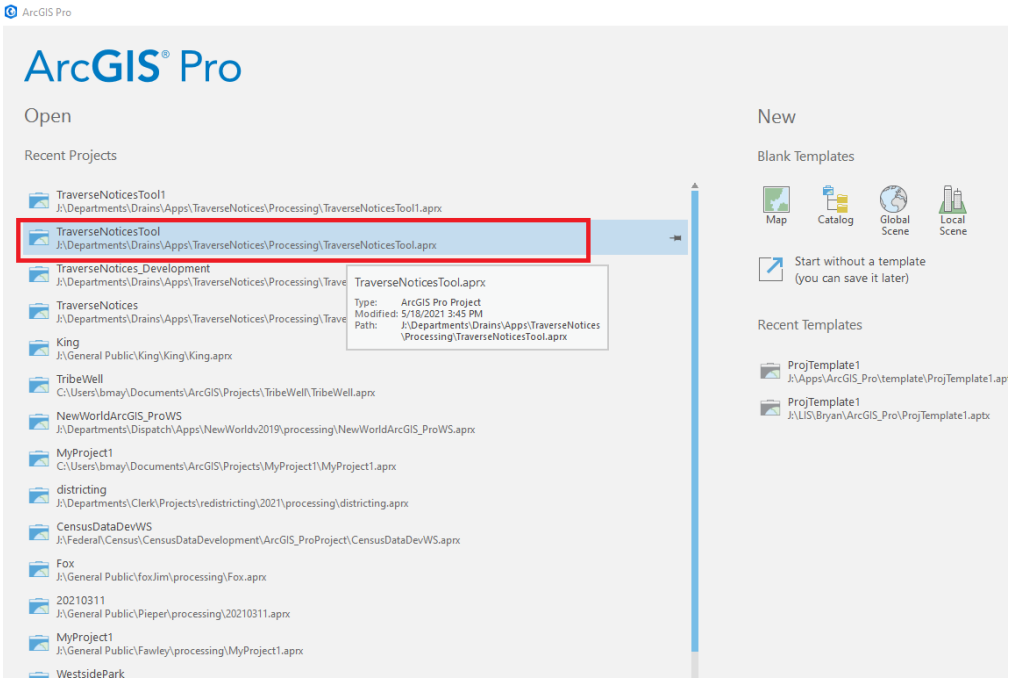


Figure 5.1: Select Project

Workspace Overview

Within ArcGIS Pro: Panes and windows can be placed in any way.

The default layout is depicted below.

The important elements for this workflow are:

- Contents Pane
- Catalog Pane
- Tasks Pane
- Map Pane
- Attribute Tables
- Layout Panes
- Report Panes
- Geoprocessing Tool Boxes

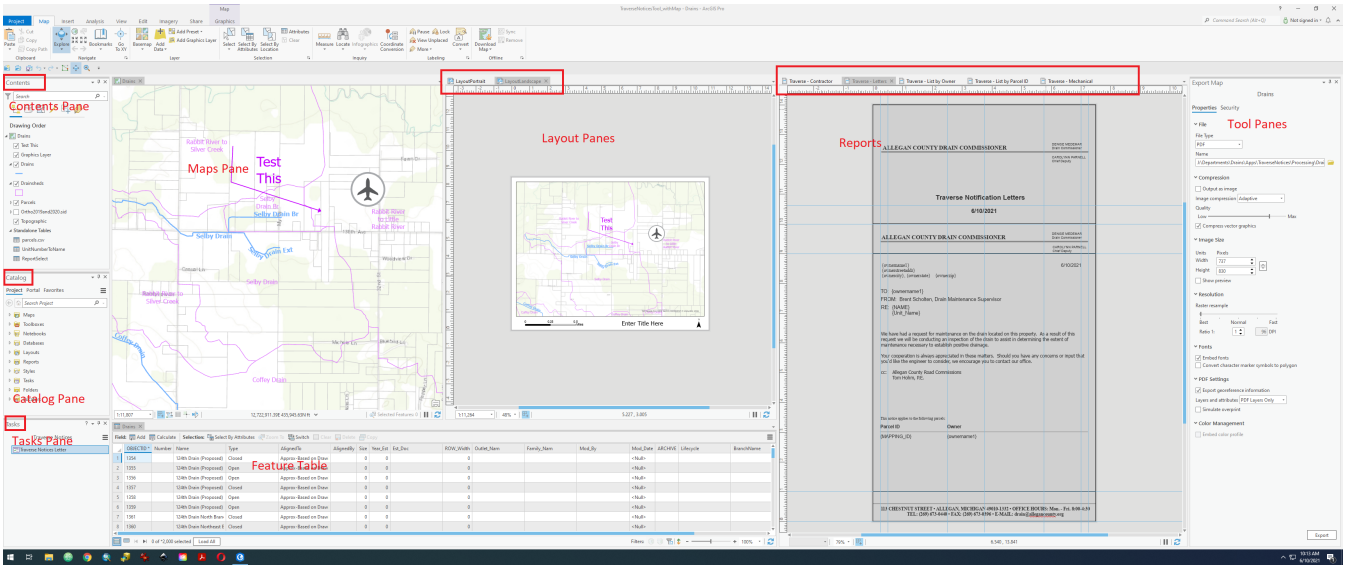


Figure 5.2: Workspace Overview

Begin the Traverse Notices Letter Task

If needed, click on the the task in catalog and choose Open

- Left click on the task name in Tasks Pane
- Push green arrow in tasks for Traverse Notices Letter

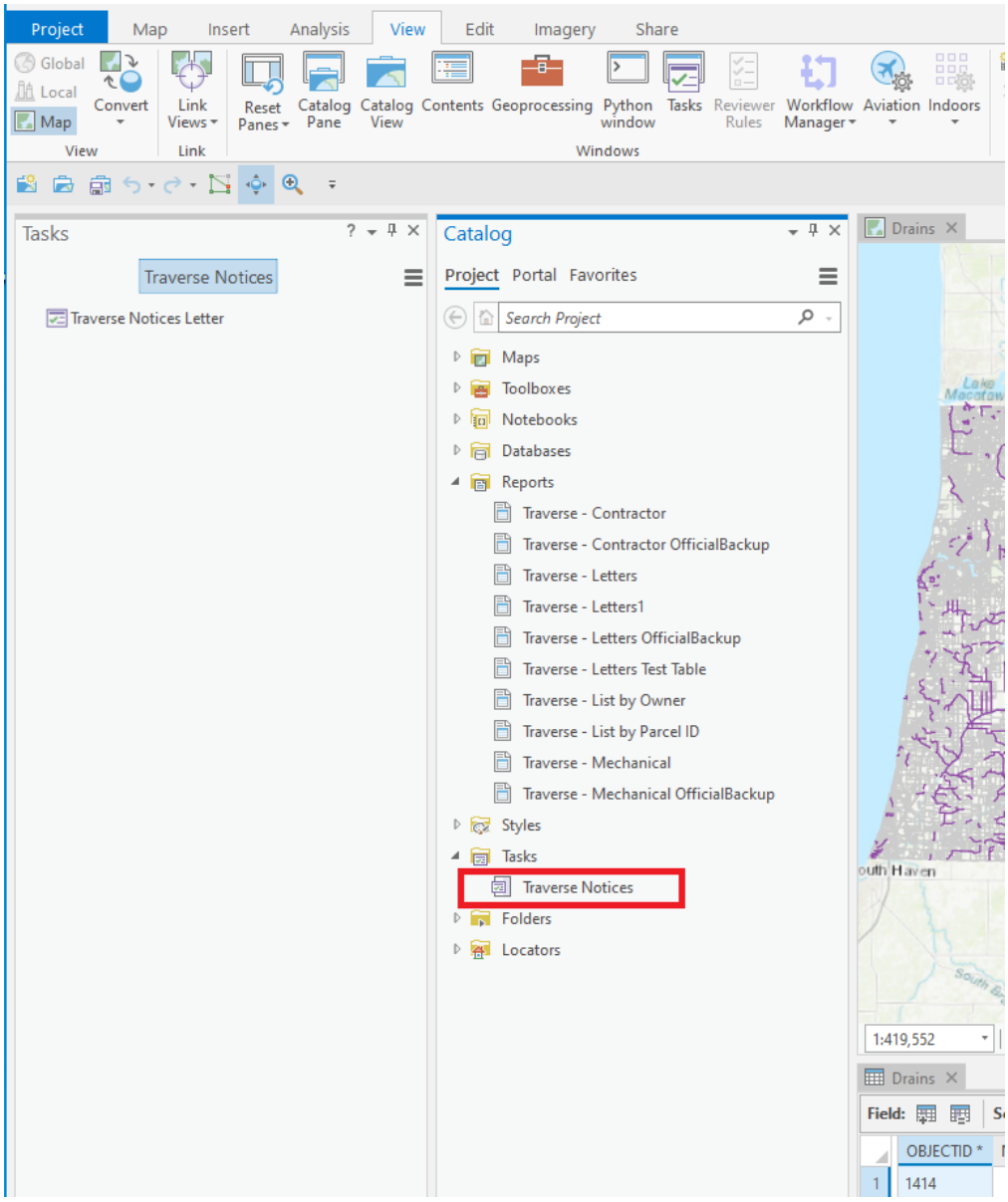


Figure 5.3: Open the Task

Search for a Drain

- In Task Pane, Click Layer Search
- From dropdown select ⇒ match any part
- Enter partial drain name ⇒ Push enter

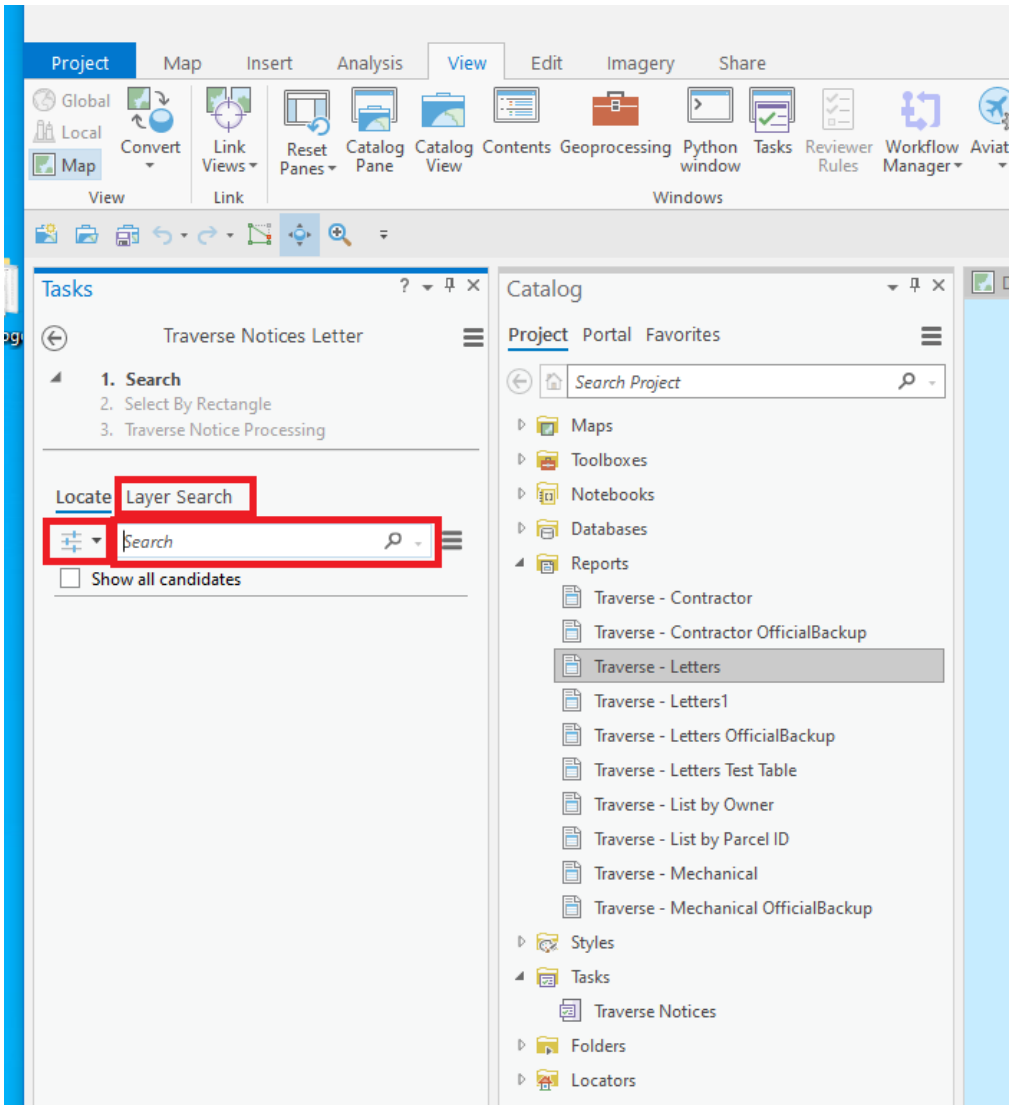


Figure 5.4: Drain Search

.

Right click a drain

zoom to selected

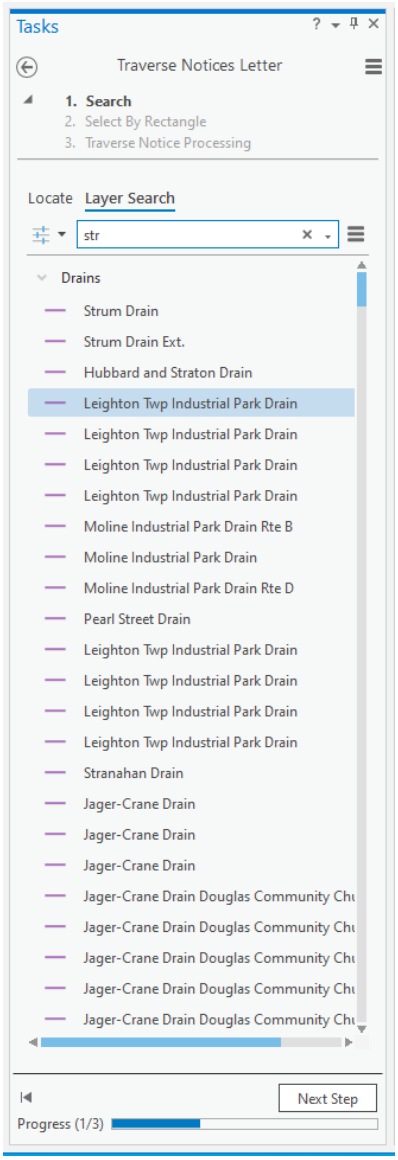


Figure 5.5: Drains List

Map the Drain

- Click and hold to pan
- Use the mouse wheel to zoom in or out
- Push next step in the task

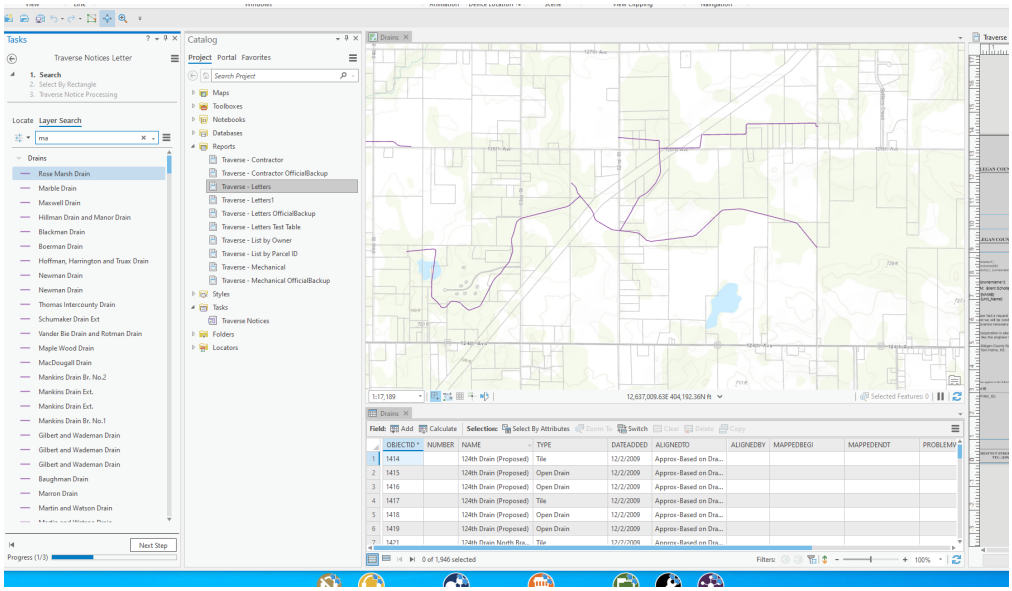


Figure 5.6: Drain Zoomed

If the map is in the correct area:

- Push Next Step

Select Drains of interest

- The select by rectangle tool is enabled
- Left click and hold to draw a box around the drain
- To deselect, click away from the selection in the map
- To add to the selection hold shift and select more drains

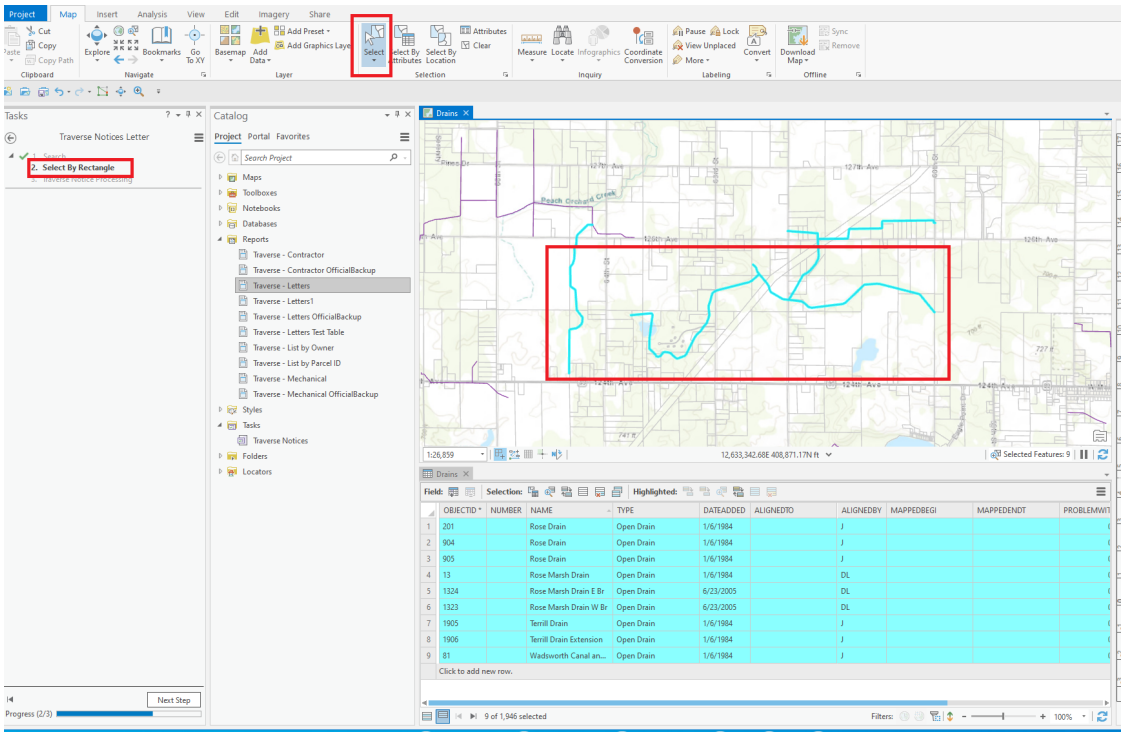


Figure 5.7: Select Drain

Highlight Selected Drains

To see a list of selected drains:

- In the Drains table, Push the button for Show selected records

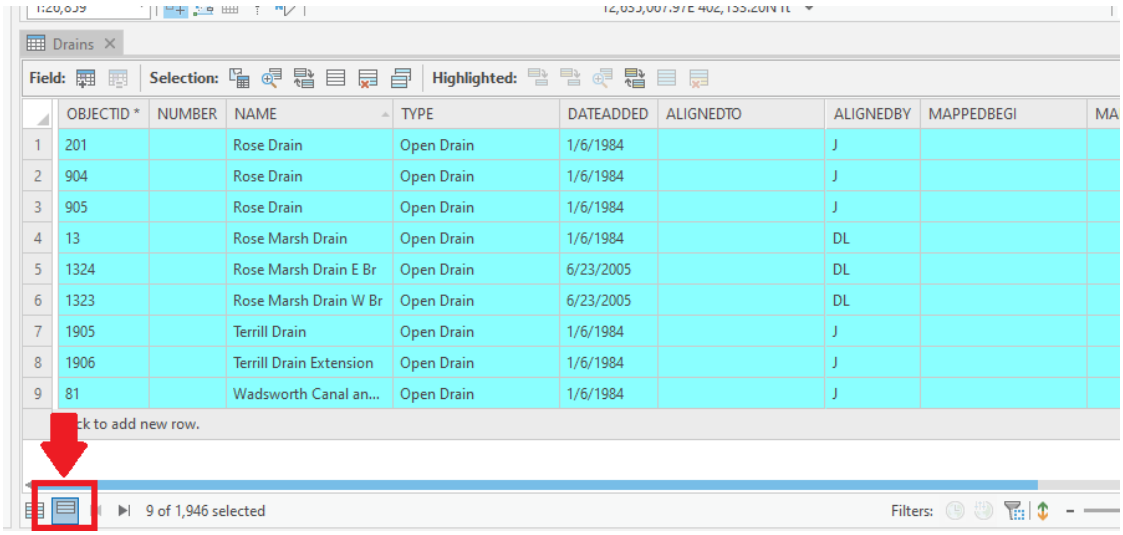


Figure 5.8: Show Selected Drains

Process Selected Drains

.

Push Next Step

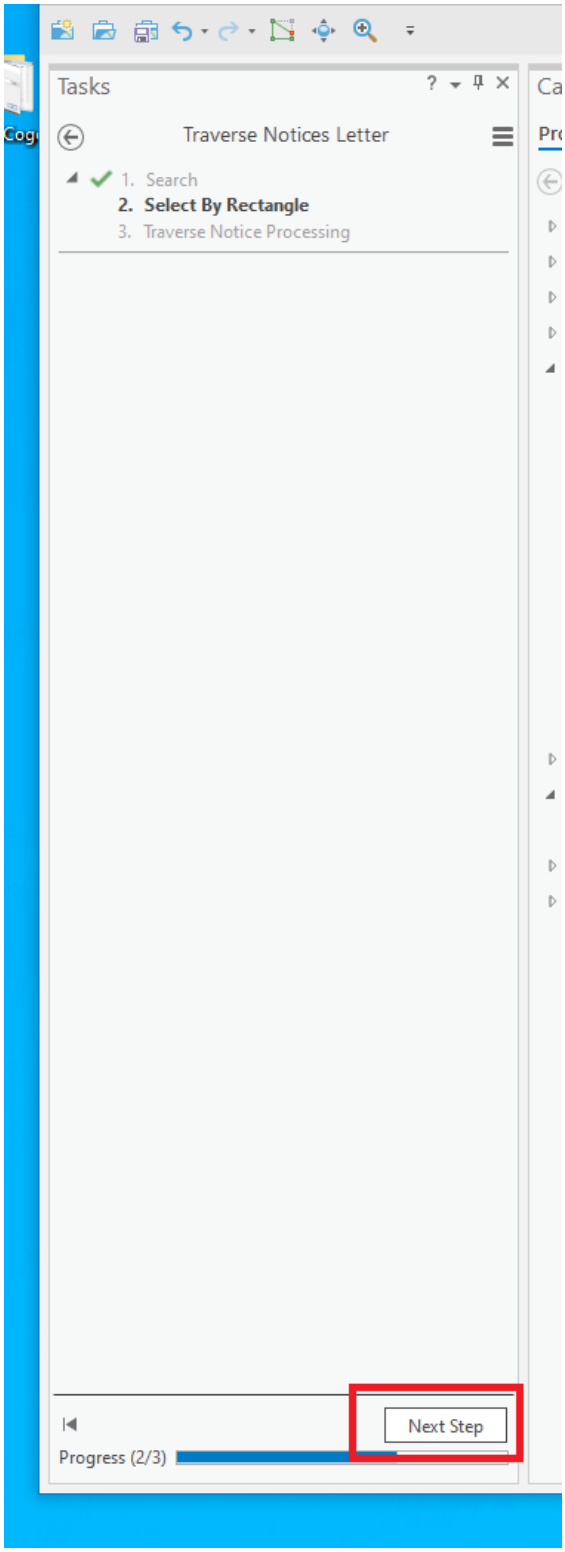


Figure 5.9: Process Selected Drains

Parcel Selection Process Runs

A selection of parcels is created based on intersection with the selected drains.

If the selection of parcels looks correct:
Push Finish

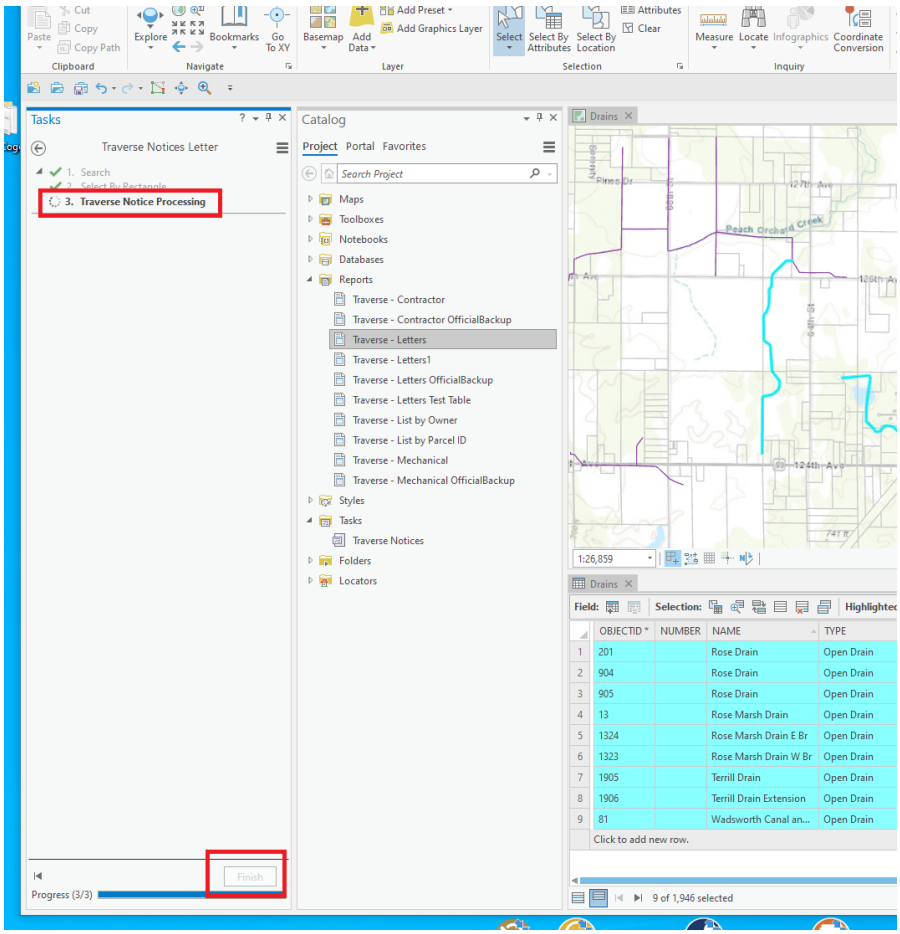


Figure 5.10: Traverse Notice Processing

The data is now ready for exporting reports (letters).

CREATE REPORTS (LETTERS)

Select a Report

Click on tab of desired report

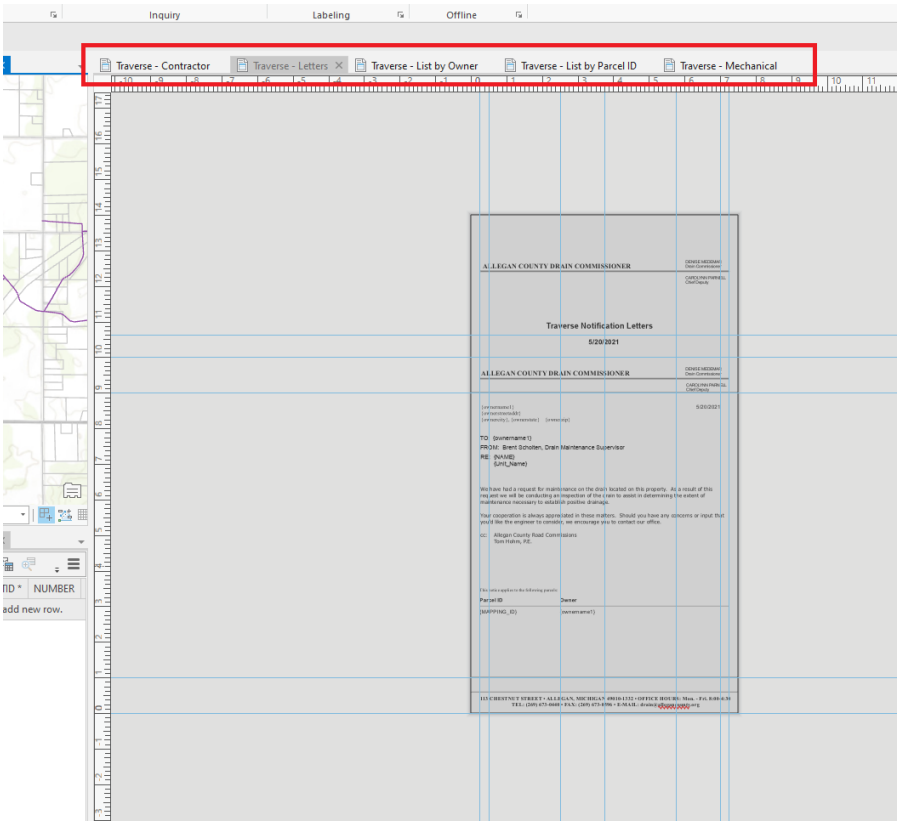


Figure 5.11: Select Report

Export Reports(Letters)

Push Export Report from the Share Tab

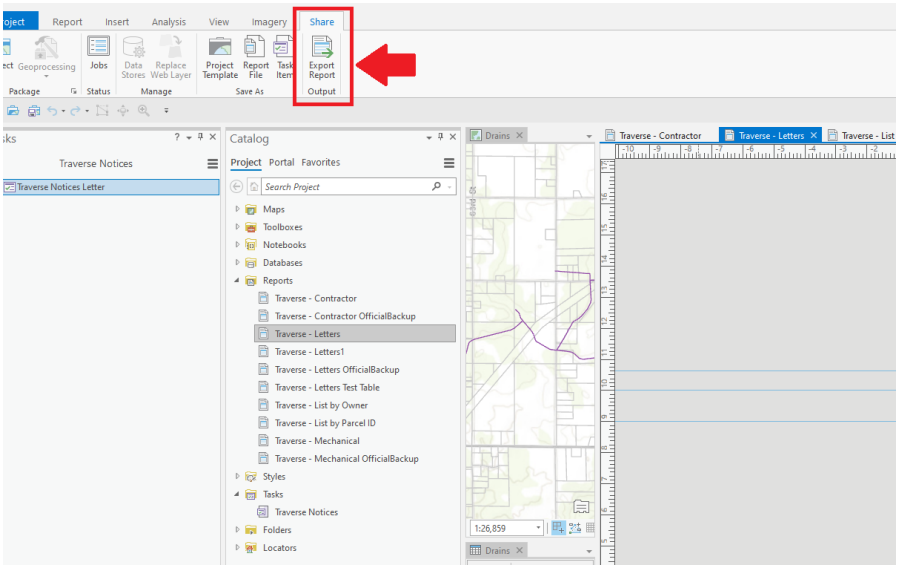


Figure 5.12: Export Report

Export Reports

- Share each report for all the letters
- Enter a name and output location for each report

Push Export

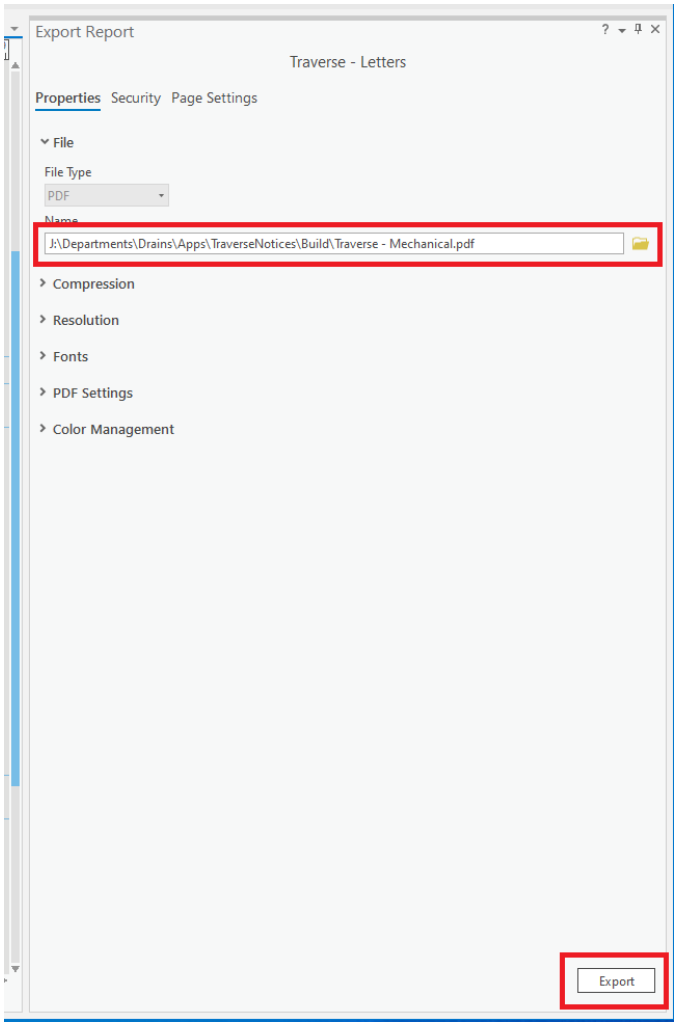


Figure 5.13: Export Report

Layouts

Layouts are used to assemble a map document for printing. To zoom and move around within the layout, it must be activated.

Activate Layout Frame

To activate the Layout Frame:

Right Click in the Layout and select Activate

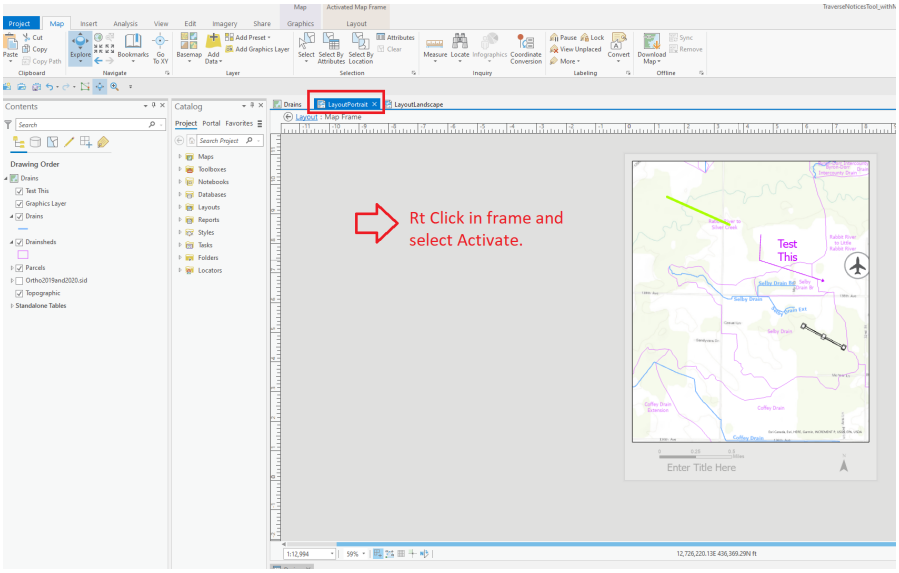


Figure 5.14: Activate Layout

Right click in the layout choose Pan (or zoom) to selected

To pan, hold left click and roll the mouse wheel to zoom

Using Map Graphic Elements

Graphic Elements

- Can be used to add notes, text, arrows, etc to the map.
- Map graphics stay in geographic position.

To create graphic elements:
click Graphics Layer in Contents Pane

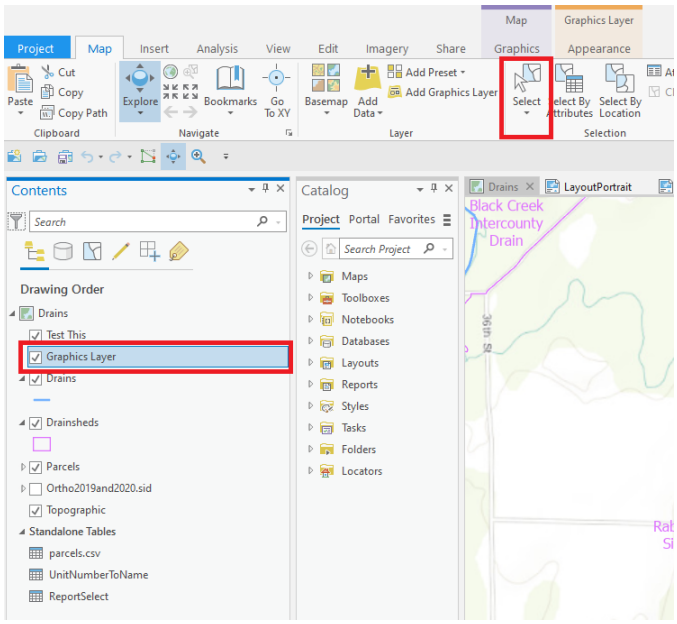


Figure 5.15: Click on Graphics Layer

Set Target Graphics Layer

To get to graphics options:

Map Tab → Graphics

set Target Layer to Graphics Layer

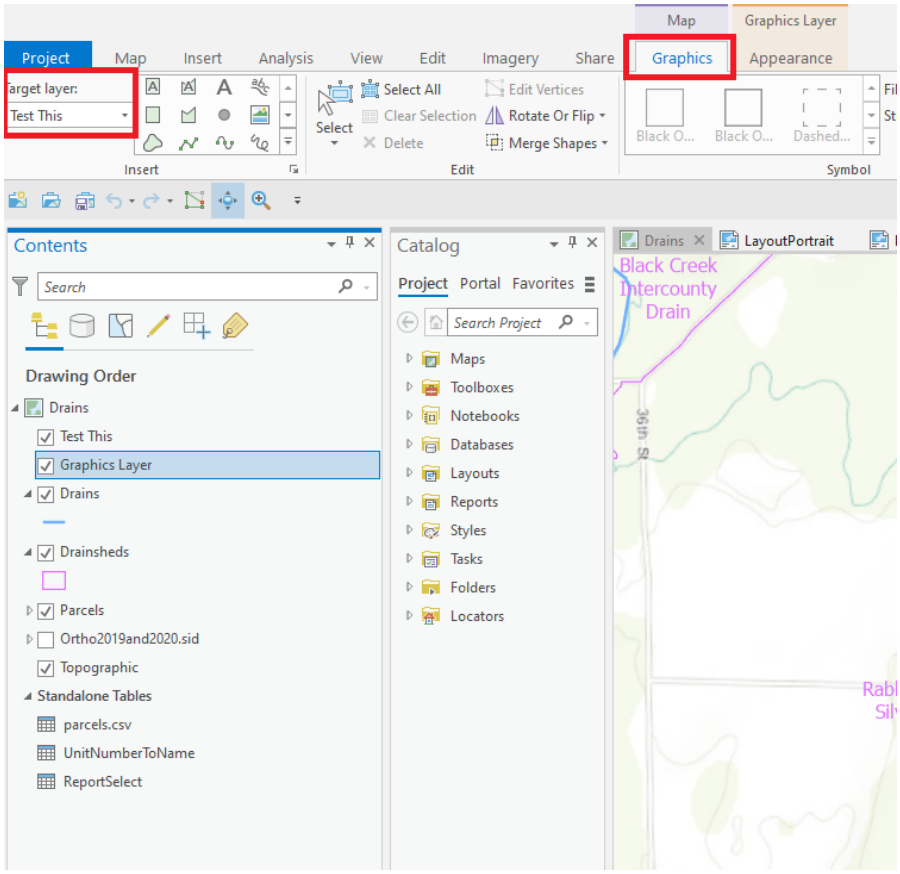


Figure 5.16: Graphics Tab

Create a graphics element

Select a graphics type

Graphic types are chosen from this menu

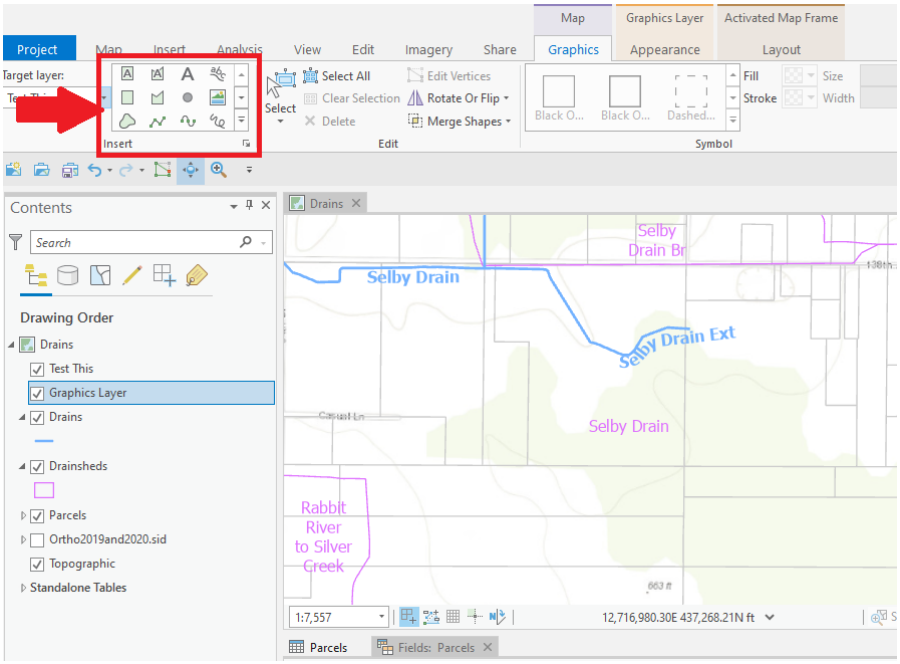


Figure 5.17: Insert Graphic

Using graphics from the Symbol Gallery

Select any graphic element to change its style.

Premade symbols can be accessed in the Symbol Gallery

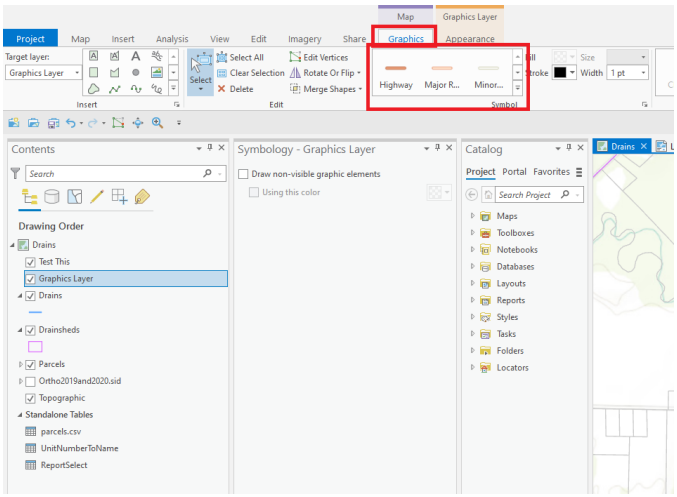


Figure 5.18: Symbol Gallery

Custom Graphics

Format the Selected Graphic as desired

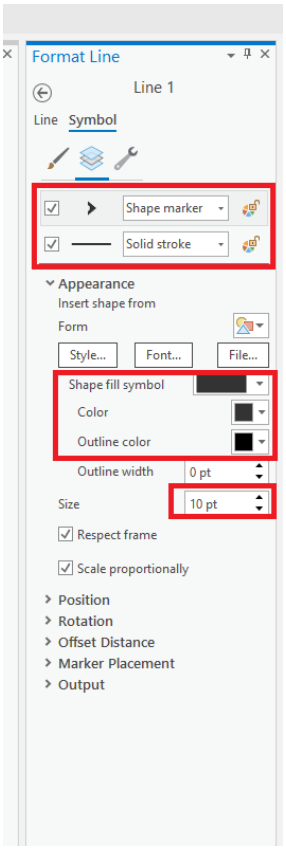


Figure 5.19: Format Symbol

Deactivate Layout Frame

To go back to editing the map frame, deactivate the Layout frame

Click Arrow

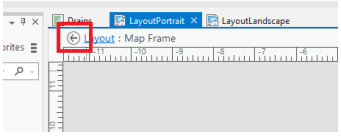


Figure 5.20: Deactivate

Turning labels on and off

In the Contents Pane, Right Click on the layer

- Select Label to turn labels on
- Select Label again to turn labels off
- Labels can be customized in Labeling Properties

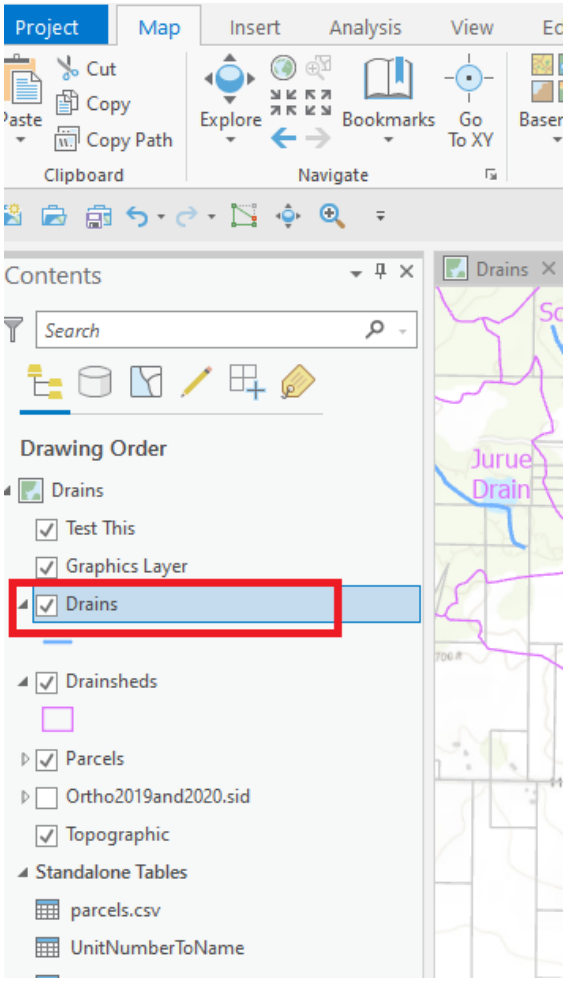


Figure 5.21: Labels On and Off

5.2 For Equalization Department

5.2.1 Tax Map Production

Problem and Analysis

Background

Equalization department (EQ) has an annual responsibility to produce a printed version of maps that show all of the tax parcels in the county for every tax year. The GIS Services Department(GIS) has traditionally provided this as a service to Equalization.

Statement of Problem

Annually, after March Board of Review, a tool is needed to create updated parcel maps for printing by Equalization and the local units.

Analysis

Tax Map Production Workflow will facilitate: Creation of new tax maps for each new tax year.

People Involved in the Workflow

- GIS Analyst
- EQ Mapper

Stages of the Workflow

- Data Updates
- Map Production Testing
- Map Style Refinement
- Map Production

Tax Map Production Summary

The Four Stages of the workflow:

1. Data Updates Tax Roll Rollover:
   - Update ACParcelsPublishing FDS from ACParcelsEditing FDS
   - Prepare ACParcelsEditing FDS for the next year of use
   - Add or delete quarter section index frames
2. Map Production Testing:
   - Execute Tax Map Builder ArcPy Script on test units
   - QA QC to verify updates
3. Map Refinement
   - Symbols
   - Labels
   - Layer Order
4. Map Production:
   - Execute Tax Map Builder ArcPy Script on all units
   - QA QC results

Technologies Used in The Tax Map Workflow

ArcGIS Enterprise

SQL Server Source Data:

- ACPro.SDE

ArcGIS Desktop

ArcPy tools produce map pages using Data Driven Pages (DDP) functionality

Production Data

- ACCadastral.gdb (File GDB Created From ACPro.SDE)

Python

A Python interpreter to tune the TaxMapTool.py script

Adobe Acrobat

Combine pdf pages into books by unit

DATA UDPATE PROCEDURE

Run DB maintenance routine on AC_ Pro.sde first

Updates to AC_ Pro.sde

Datasets involved:

- ParcelEditing
- ParcelPublishing
- TaxMapIndexFrames
- TaxMapLayers
- TaxMapUnitBounds

Update Procedure

Parcel Editing and Parcel Publishing

Annually, the ParcelEditing feature dataset (FDS) is used to update the ParcelPublishing FDS.

For each FC in ParcelPublishing

Append and Clear:load from Editing to Publishing and delete all from Editing
Replace Pub: Delete all in Publishing and load all from Editing and leave all in Editing

Data Update Relation		
FC in ParcelEditing	**FC in ParcelPublishing**	**Update Procedure**
AC_COGO_LnEdits	AC_COGO_Ln	Append and clear
AC_DimensionsEdits	AC_Dimensions	Replace Pub
AC_Gap_OverlapEdits	AC_Gap_Overlap	Replace Pub
AC_PointsEdits	AC_Points	Replace Pub
AC_Splits	AC_Parcels	Replace Pub
AC_SubBlocksEdits	AC_SubBlocks	Replace Pub
AC_SubdivisionsEdits	AC_Subdivisions	Replace Pub
AC_SublotsEdits	AC_Sublots	Replace Pub
AC_TiebarsEdits	AC_Tiebars	Replace Pub

TaxMapIndexFrames

As this is the index layer for the DDP, Quarter Section frames must be added or removed to account for added or removed subdivision features at this time.

TaxMapLayers

Layers that are derived from other fcs for cartography purposes

- AC_M_Rd_Lbl is a subset of AC_Roads used only for less busy labeling
- AC_MapID_RR is a subset of AC_Parcels used only for Railroad Labeling
- AC_Road_ROWs_Tax is an aggregation of AC_Road_ROWs by unit

TaxMapUnitBounds

Layers extracted from AC_Units for bounding polygons in the locator Data Frame

Workspace Folder Setup

Inside of J: ⟹ Apps ⟹ Python ⟹ TaxMaps:
Copy the folder: **TaxMapsWorkspaceTemplate**
Into the years folder and rename to: **YYYY**

Production Data Creation

In the source folder, create a new file GDB named AC_Cadastral. Copy the following FDSs from AC_Pro.sde:

- AdministrativeArea
- CadastralReference
- Hydrology
- ParcelPublishing
- Roads
- TaxMapIndexFrames
- TaxMapLayers
- TaxMapUnitBounds

Map Production Setup

(In the new workspace folder)
Add a field to AC_Parcels InUnit text 1 characters
Add a field to AC_Subdivisions InUnit text 1 character
Add a field UnitText text 2 characters and calculate as 1st two digits of the unit number to:

- AC_Parcels
- AC_Road_ROWs_Tax
- AC_Subdivisions
- AC_Units

Update the tax year in the 2 .mxd s

In ArcGIS Desktop

Use ArcMap Catalog to navigate to:
workspace folder $\Rightarrow$ processing $\Rightarrow$ Toolbox $\Rightarrow$ TaxMapTools.tbx

Right Click on the tool in Catalog and select properties.
Set the path to the script file in the tool for the current year.

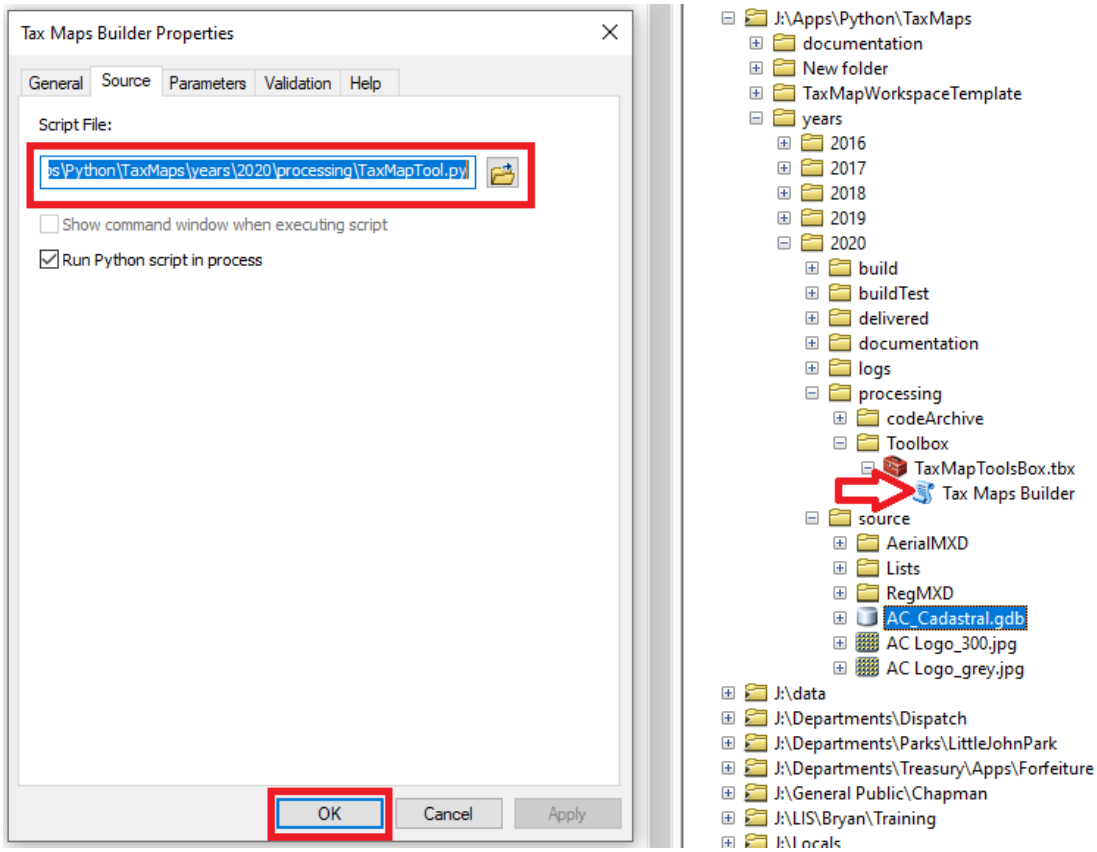


Figure 5.22: Set Path to Script

Launch the Tax Map Builder Tool

Double click on the **TaxMapBuilder** script

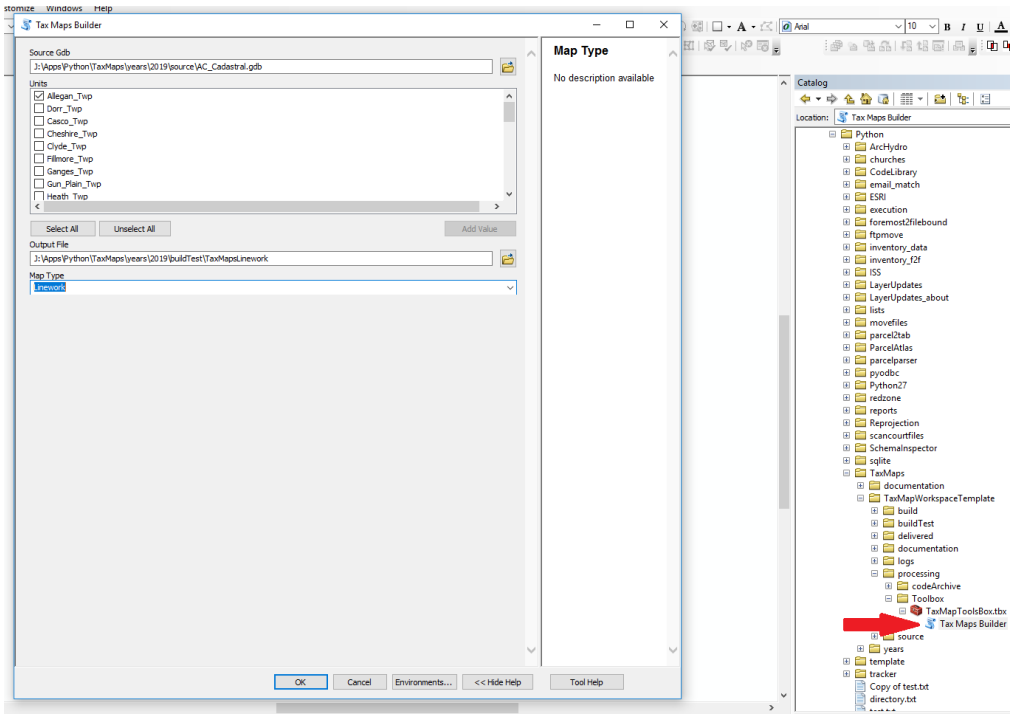


Figure 5.23: Tax Map Builder UI

Execute the tool

Make selections in the tool from the appropriate locations in the workspace folder.

- Choose any combination of units to produce
- Select output location
- Choose aerial or linework type maps

Map Refinement

Test groups of maps should be produced.

Any style improvements that can be made should be done at this time.

Map Production

Use ArcMap Catalog to navigate to:

workspace folder ⟹ processing ⟹ Toolbox ⟹ TaxMapTools.tbx

Double click on the **TaxMapBuilder** script

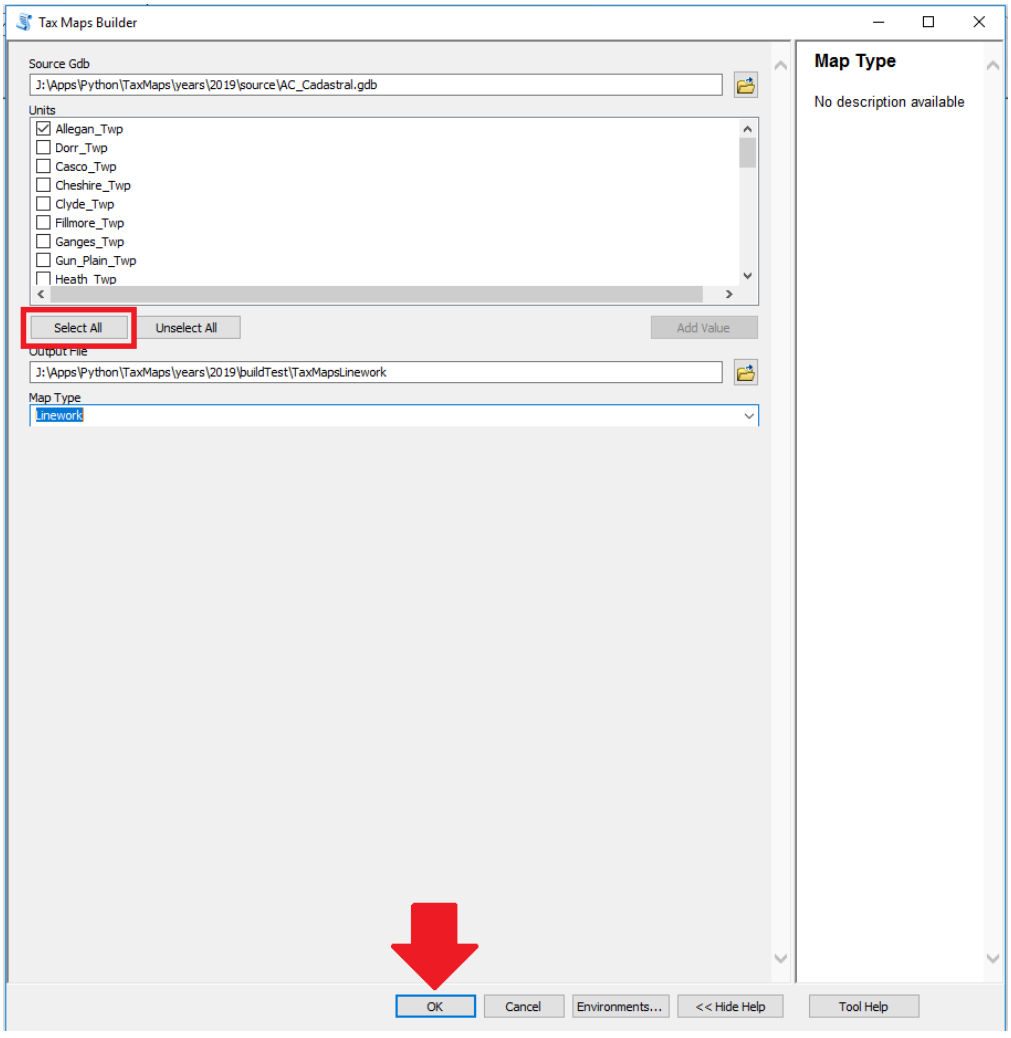


Figure 5.24: Tax Map Builder UI

Select All Units and Press OK

Create Books from Pages

For each unit, organize the pages into the TaxMapUnitFolders.
Move the pages to the appropriate pdf folders inside the delivered folder of the workspace.
Combine all of the individual map pages into books using Adobe Acrobat and save to the PDF_Book folder.

Share the map books with Equalization

Copy the entire TaxMapUnitsFolder to:
J: ⟹ Departments ⟹ Equalization ⟹ TaxMaps ⟹ TaxMap Archive

5.3 For Treasurer Department

5.3.1 Forfeiture Data Collection

Problem and Analysis

Background

Treasurer department has an annual responsibility to properly document the tax forfeiture process. The LIS Department built an application in MS Access and MapInfo that consumed a daily export from BSA and was deployed to the field on a laptop. A digital camera was used for site photos and later imported into the laptop.

Statement of Problem

The current Tax Forfeiture workflow is built on MapInfo software and MS Access amd executed on a laptop pc. Both MapInfo and MS Access are no longer supported in county workflows. ESRI software can be used to rebuild the workflow. *Forfeiture Data Collector Application*, (**Forfeiture App**) must be recreated in the ESRI framework.

Analysis

Forfeiture App will facilitate: *Mobile data collection on a handheld device*,: (**Mobile Interface**) and an *in office workflow to complete data processing*, (**Pre and PostProcessing**)

Mobile Interface

- Synchronize with data in the office (online)
- Collect data and photos of forfeiture sites (offline)
- Synchronize the collected data with data in the office (online)

Pre & Post Processing

- Produce and print a form for each site visited with required data and images

DESIGN OVERVIEW

Forfeiture Parcels is used through the workflow

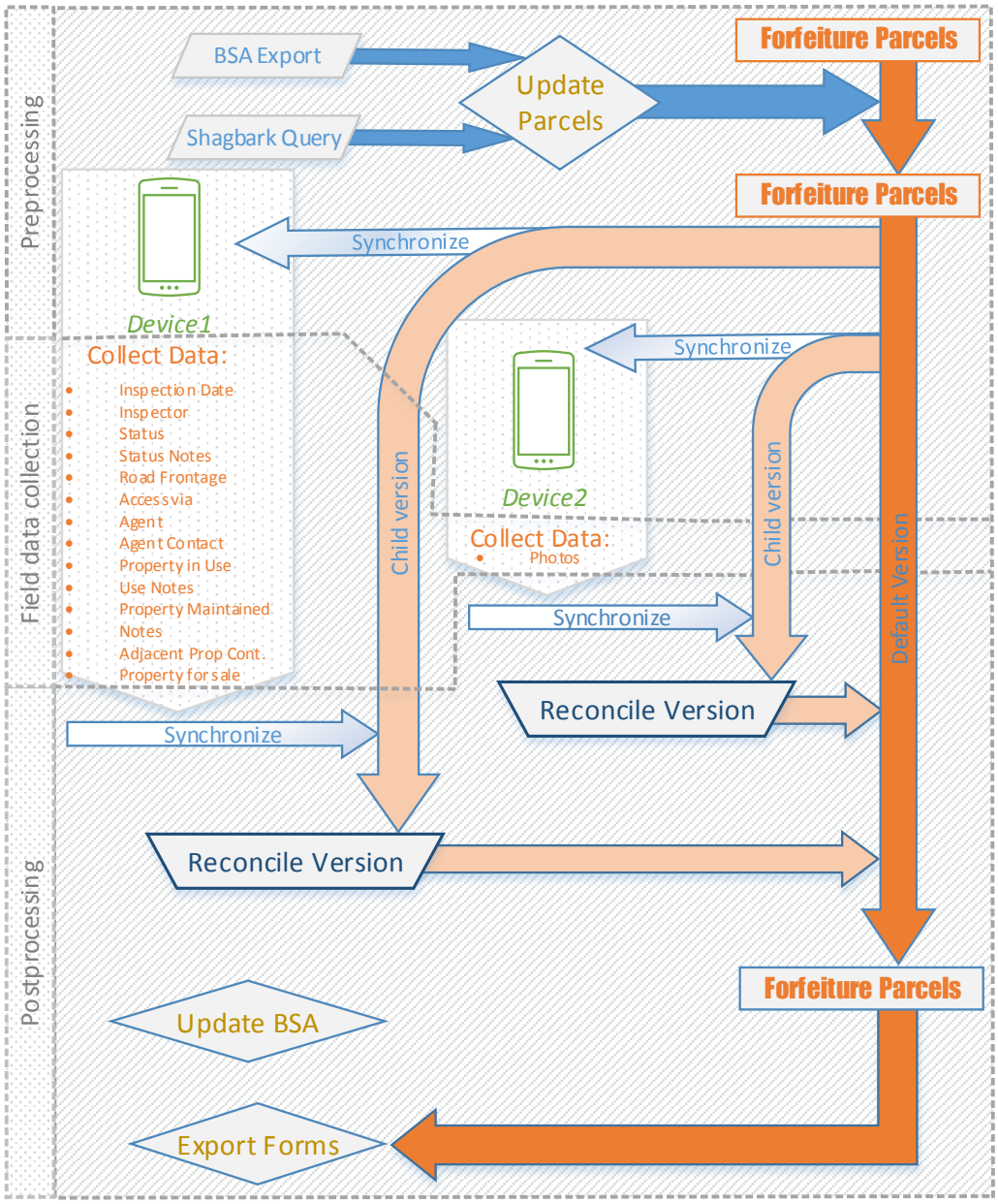


Figure 5.25: Project Design

Forfeiture App Summary

There are three parts to the daily routine:

1. Preprocessing (in the office):
   - Export current forfeiture list from BSA
   - Update Forfeiture Parcels with BSA export
   - Update Forfeiture Parcels with contaminated sites information
   - Synchronize Forfeiture Parcels to Mobile Interface
2. Field data collection with Mobile Interface:
   - Aids in navigation
   - Provides a Checklist of data points for each site
   - Attaches photos for each site
   - Save results for synchronization in post-processing
3. Post-processing (in the office)
   - Synchronize data and images collected in Mobile Interface to Forfeiture Parcels
   - Export form for each site
   - Print form for each site
   - Update BSA data

Technologies Used in The Forfeiture App

BSA Data

Details of parcels in the forfeiture process are managed in BSA Delinquent Tax.net. The Treasurer office does a BSA export of the parcels in need of a site visit in the preprocessing.

ArcGIS Desktop

Tools are designed to preprocess and postprocess forfeiture parcel data for fieldwork. The user will execute a preprocess script tool that prepares the data for field deployment. After fieldwork, a post process script tool synchronizes data from the fieldwork with the live data on the Allegan County network.

ArcGIS Collector

A free mobile application developed and tested on Android is deployed to the field for data collection. The application is configured to work offline(without an internet or cellular connection) by syncronizing before and after fieldwork. The user collects the necessary information on each forfeiture parcel in the field disconnected, and then uploads the changes when reconnected.

Enterprise Geodatabse

Live data from a publishing geodatabase (ACPub), running on SQL Server database server (acintsql01) provides access to Forfeiture Parcels

ArcGIS Portal

Forfeiture Parcels is served as a feature service (REST service) named TaxReversionParcels. A webmap on Portal, called the Forfeiture Field Map consumes the TaxReversionParcels exposing the data to editing. The Forfeiture Field Map is configured to work in the ArcGIS Collector App.

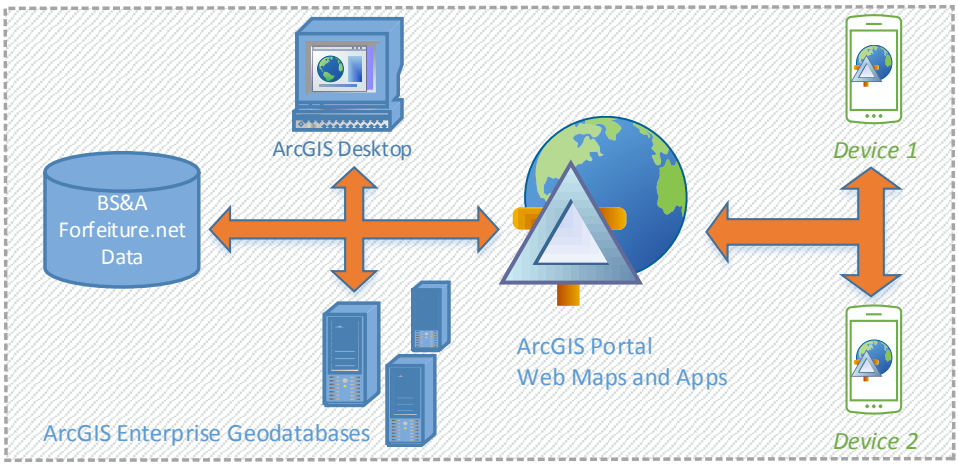


Figure 5.26: Technology Design

DATA DETAILS

The data is located in a geodatabase called ACPUB. ACPUB is on SQL Server AC-INTSQL01.

Forfeiture Parcels Data

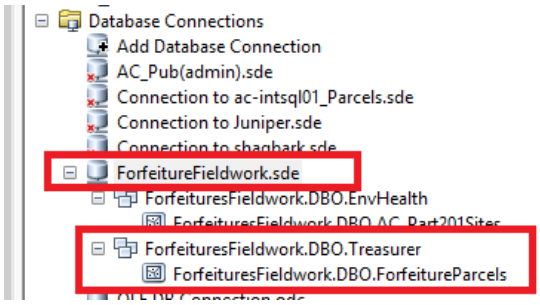


Figure 5.27: Live Data Location

Contamination Data

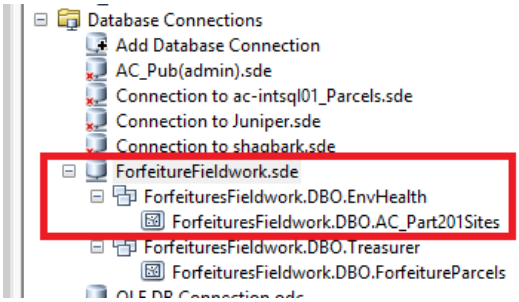


Figure 5.28: Contamination Feature Class

ForfeitureParcels Feature Class Details

Attribute Details			
Field Name	Field Alias	Entry Type	Note
PropertyNumber	Property Number	Prefilled	NA
Need2Print	Print Today	Dropdown	Yes or No
InspectionDate	Inspection Date	Autofill or Dropdown	NA
Inspector	Inspector	Dropdown	NA
Address	Address	Prefilled	NA
Status	Status	Dropdown	NA
StatusNotes	Status Notes	Open Entry	120Char
Roadfrontage	Road Frontage	Dropdown	Yes or No
AccessVia	Access Via	Open Entry	30Char
Agent	Agent	Open Entry	30Char
AgentContact	Agent Contact	Open Entry	30Char
PictureComments	Picture Comments	Open Entry	50Char
PropertyInUse	Property In Use	Dropdown	Yes or No
UseNotes	Use Notes	Open Entry	120Char
PropertyMaintained	Property Maintained	Dropdown	Yes or No
PropMaintNotes	Property Maintained Notes	Open Entry	120Char
PropertyContaminated	Property Contaminated	Prefilled	Preprocessing
PropertyContaminatedNotes	PropertyContaminatedNotes	Prefilled	Preprocessing
AdjacentPropertyContaminated	Adjacent Property Contaminated	Prefilled	Preprocessing
AdjPropertyContaminatedNotes	Adj Property Contaminated Notes	Prefilled	Preprocessing
PropertyForSale	Property For Sale	Dropdown	Yes or No
GlobalID	GlobalID	NA	NA
PostedDate	Posted Date	Dropdown	Date
Posted	Posted	Prefilled	NA
InList	In List	Prefilled	Preprocessing
PostedInList	Posted In List	Prefilled	Preprocessing
Acres	Acres	Prefilled	NA
Class	Class	Prefilled	NA

Table 5.1: Dataset Details

Webmap Details

The Forfeiture Field Map is made up of a feature layer and a basemap.

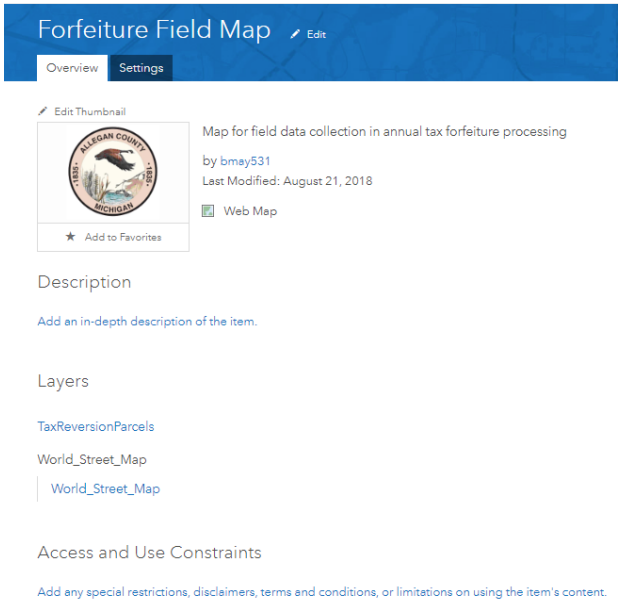


Figure 5.29: Web Map Details

Feature Layer Details

TaxReversionParcels has been configured for offline use.

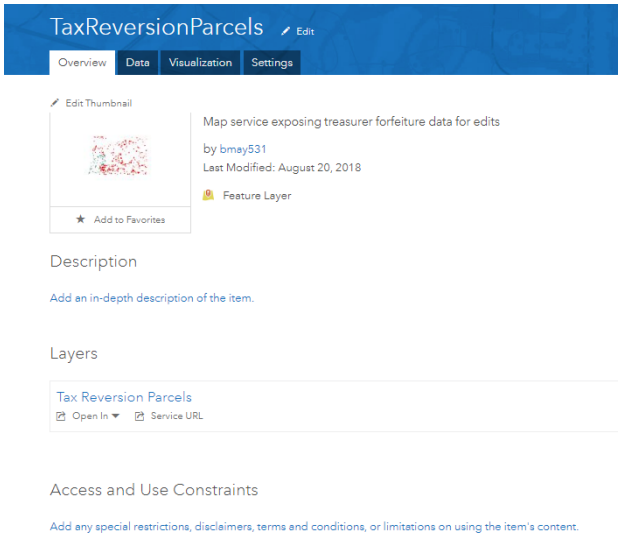


Figure 5.30: Feature Layer Details

Basemap Details

- A tiled basemap service is used
- The infoserv user credentials are used for sharing
- The url for the shared service is:

https://tiledbasemaps.arcgis.com/arcgis/rest/services/World_Street_Map/MapServer

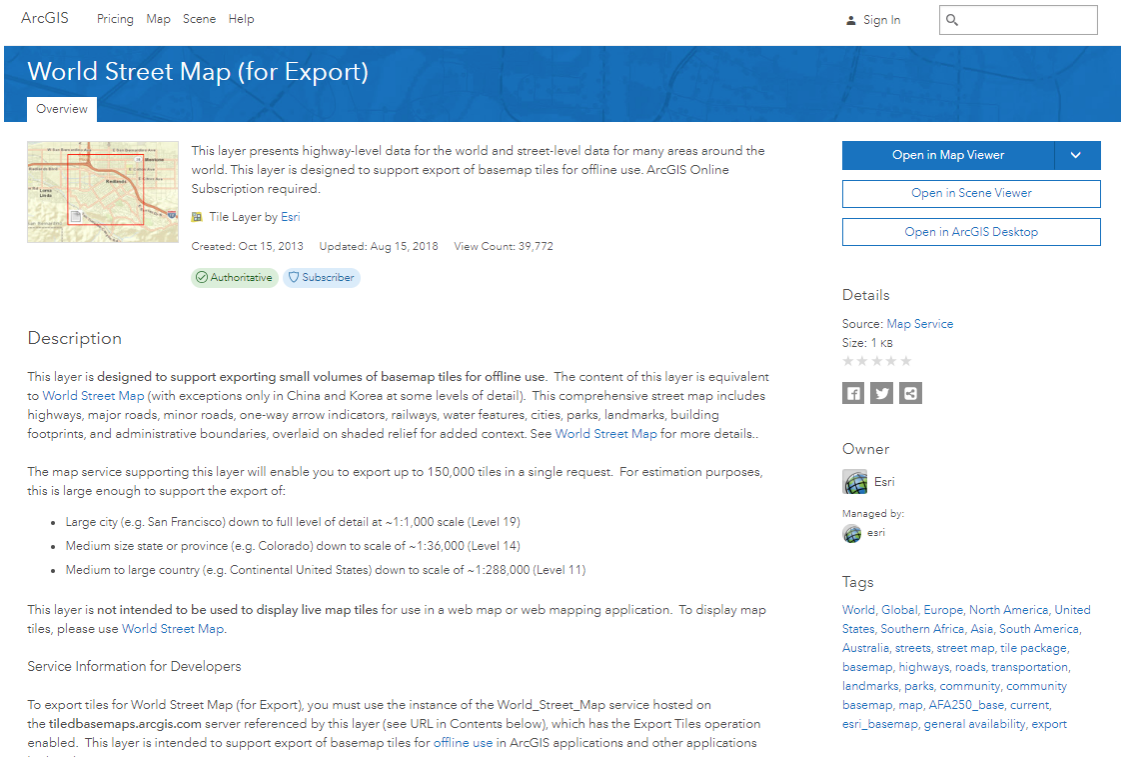


Figure 5.31: Basemap Source Description

Hard Copy Record

screenshots: arcmap map arcmap tools portal screenshots sql server mgt screen shots phone screenshots

ArcGIS Server

ADMINISTRATIVE MANUAL

Annual Setup

A new dataset for forfeiture parcels must be created each year.

The forfeiture information comes from BSA Forfeitures.net.

Parcel geometry and other attributes comes from ACParcelsCombined.

To Connect to the Forfeiture Dataset

To Add a new database connection:

- Right Click on Add Database Connection
  - Enter these values into the tool

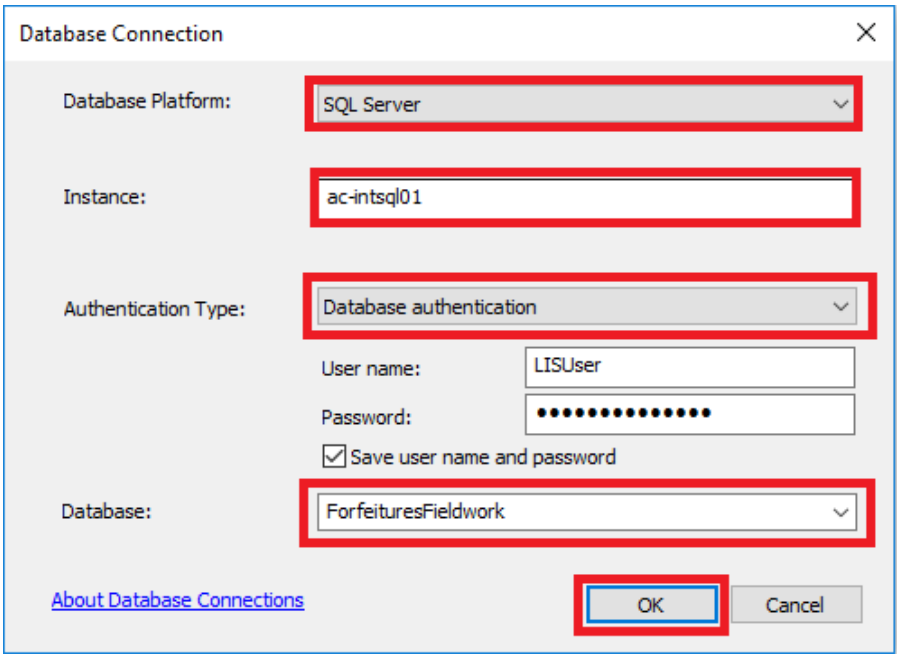


Figure 5.32: Add New Connection

Push OK

Update the Forfeiture Dataset

To clear the features from the existing dataset:

- Use the Delete Feature Tools
- For Input Features:
  - ForfeituresFieldwork.DBO.ForfeitureParcels

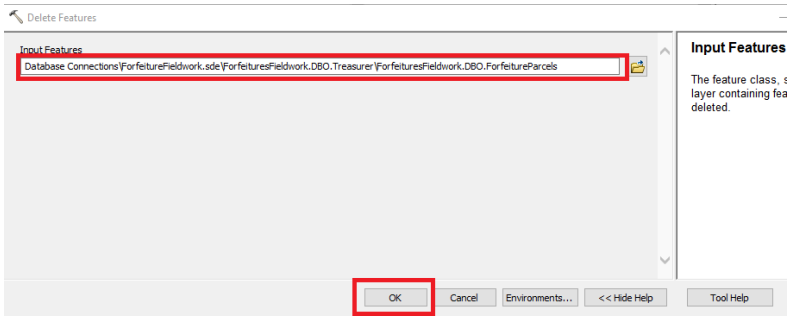


Figure 5.33: Annual Delete Features

Push OK

Delete the attached table

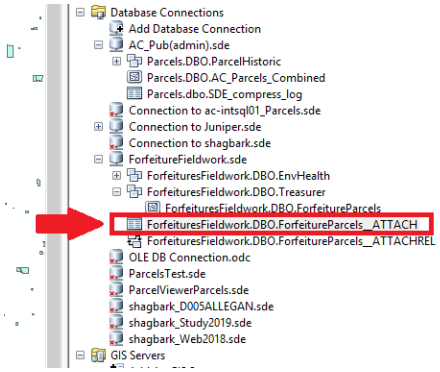


Figure 5.34: Delete Attached Table

Create new connection to BSA server

A connection to BSA is used to get the latest forfeiture information.

To Connect to the BSA Server

To Add a new database connection:

- ➢ Right Click on Add Database Connection
  - – Enter these values into the tool

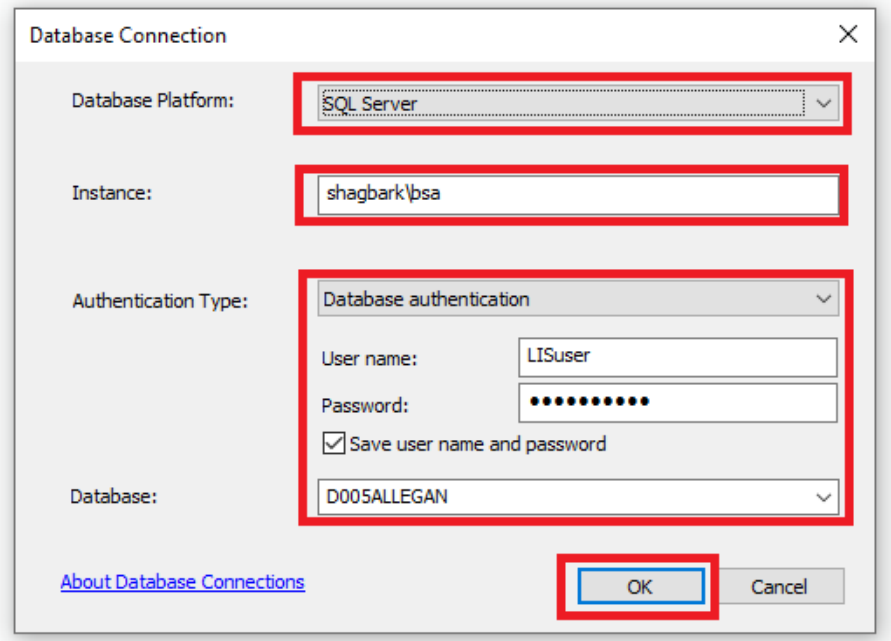


Figure 5.35: Connect to BSA Server

Push OK

Create a Table Query For the New Data

- File ⟹ Add Data ⟹ Add Query Layer
- Select your connection (*shagbark_D005ALLEGAN.sde*)

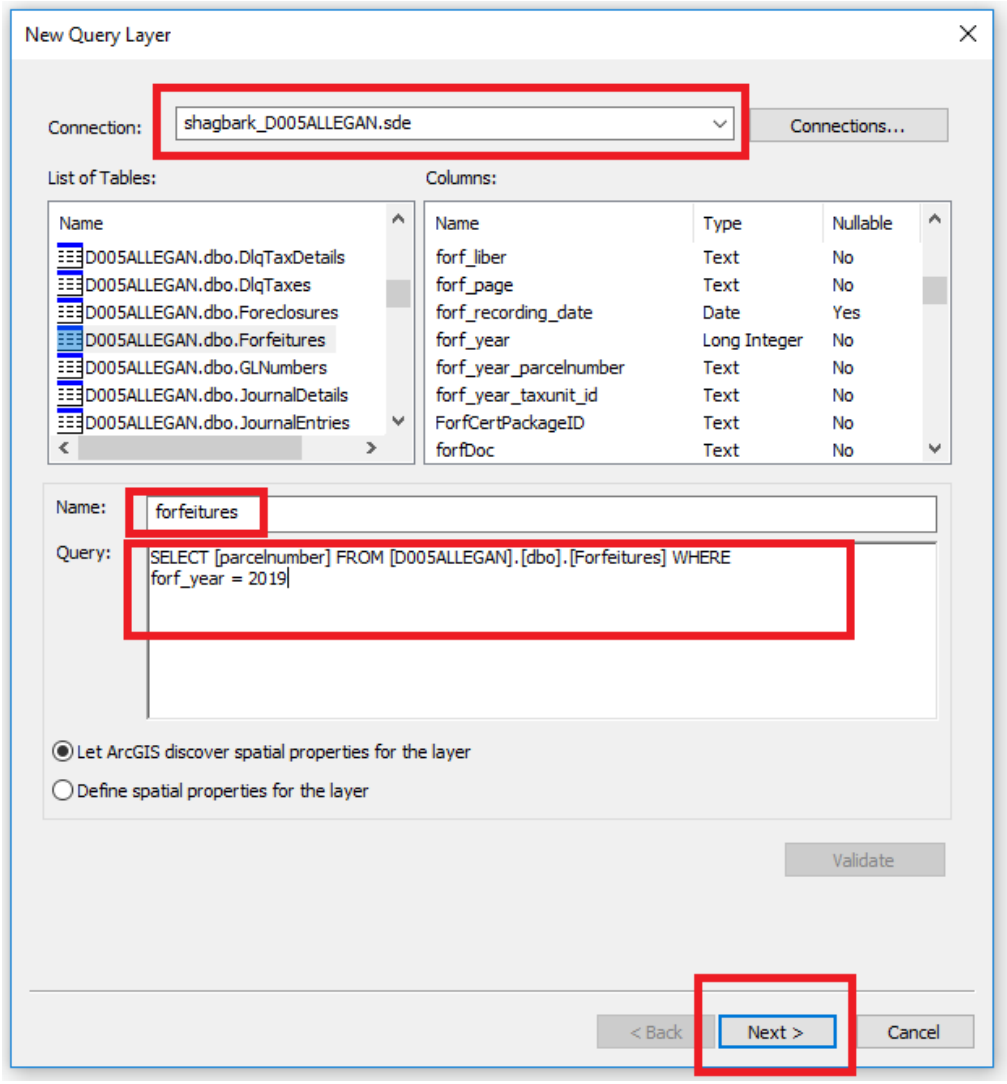


Figure 5.36: New Query Layer Dialog

Edit Query Text for current Year:

```
SELECT [parcelnumber] FROM [D005ALLEGAN].[dbo].[Forfeitures]
WHERE forf_year = 2020
```

Select a Unique Identifier

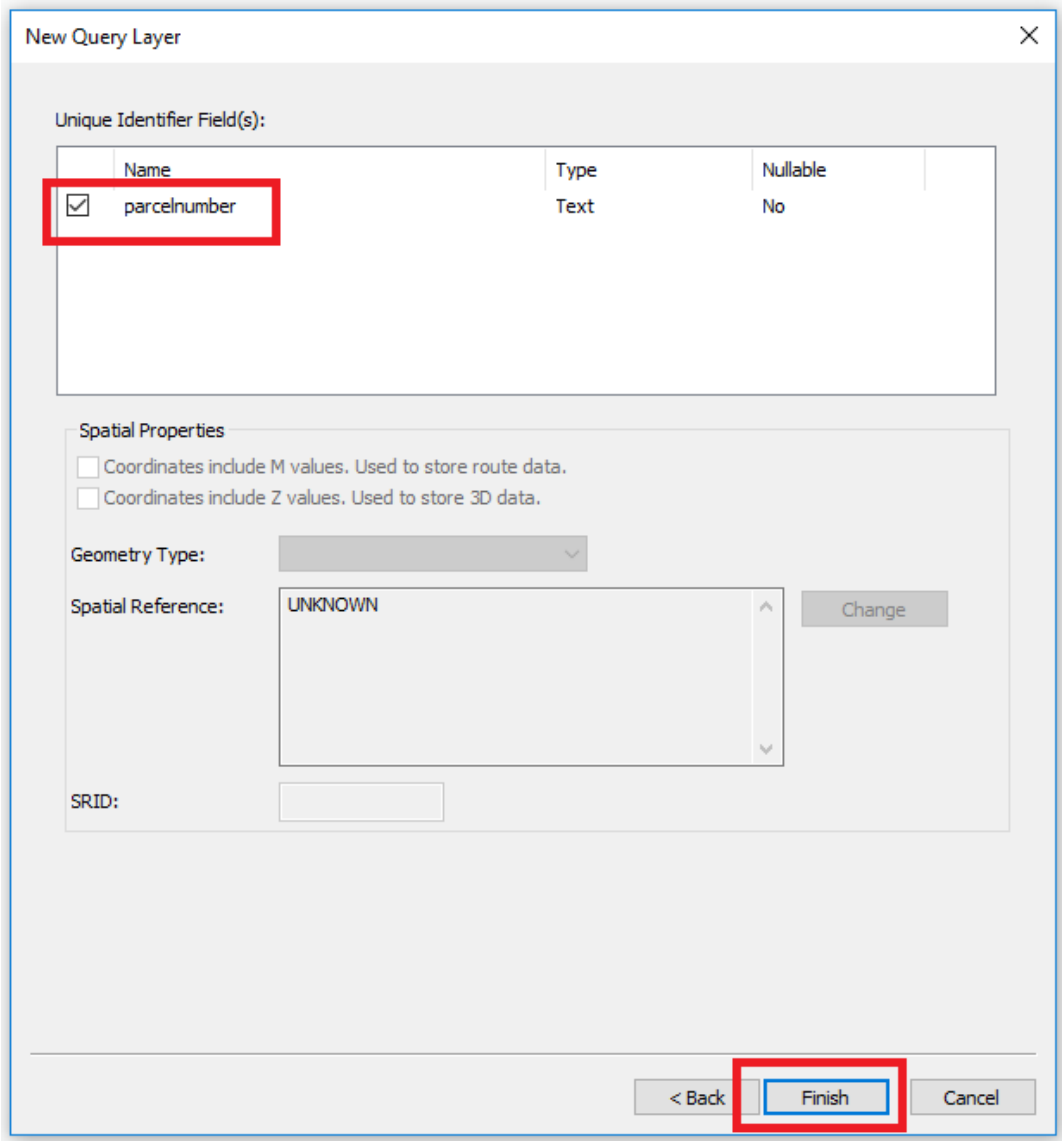


Figure 5.37: Query Layer Unique ID

Push Finish

Table is added to the map

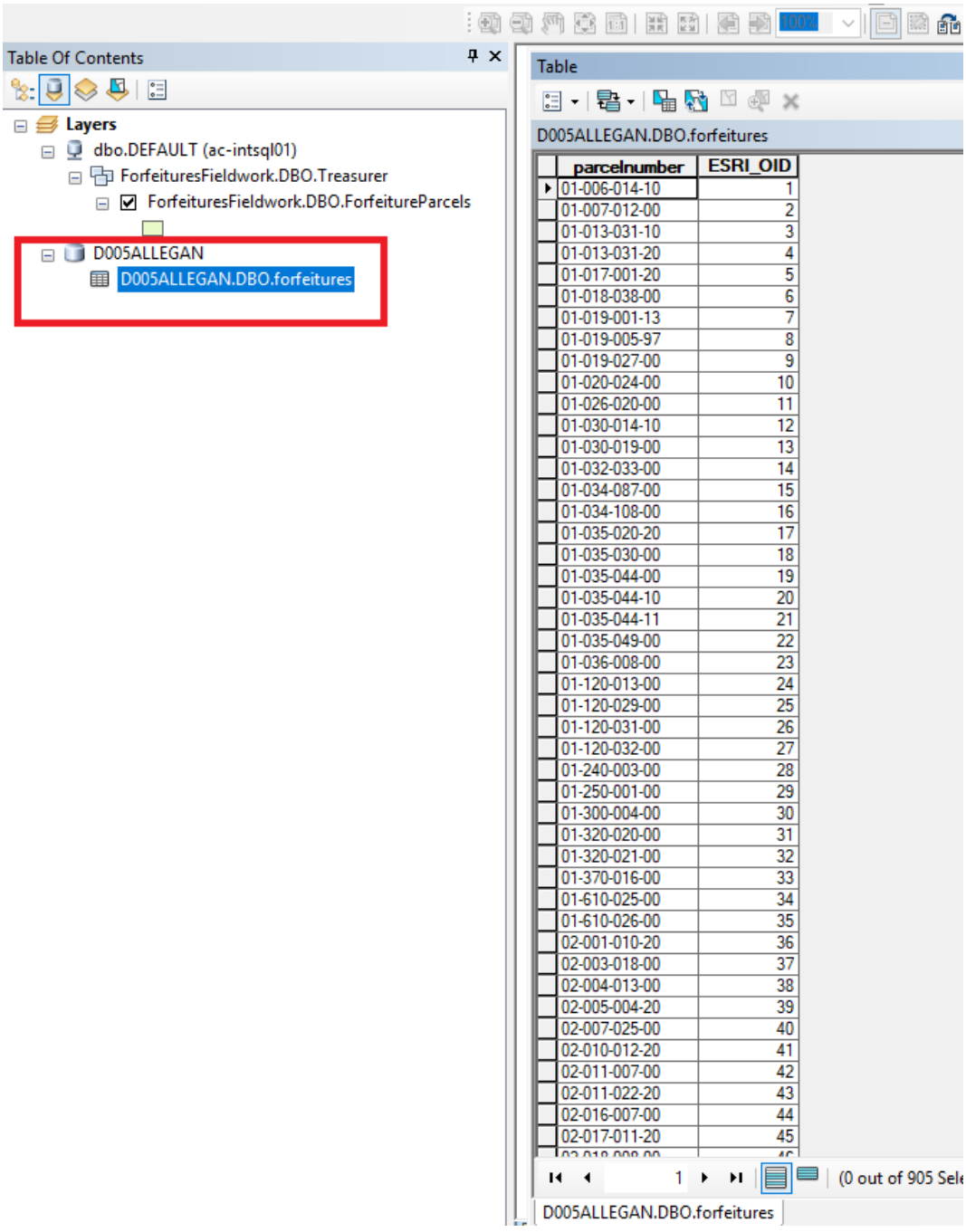


Figure 5.38: Forfeiture Table Added

Add Parcels Layer to the Map

- Parcels are added to the map to provide parcel geometry and attributes
- Parcel year is = current year - 2
- I.E. Use ACParcelsCombHistoric2018 in 2020

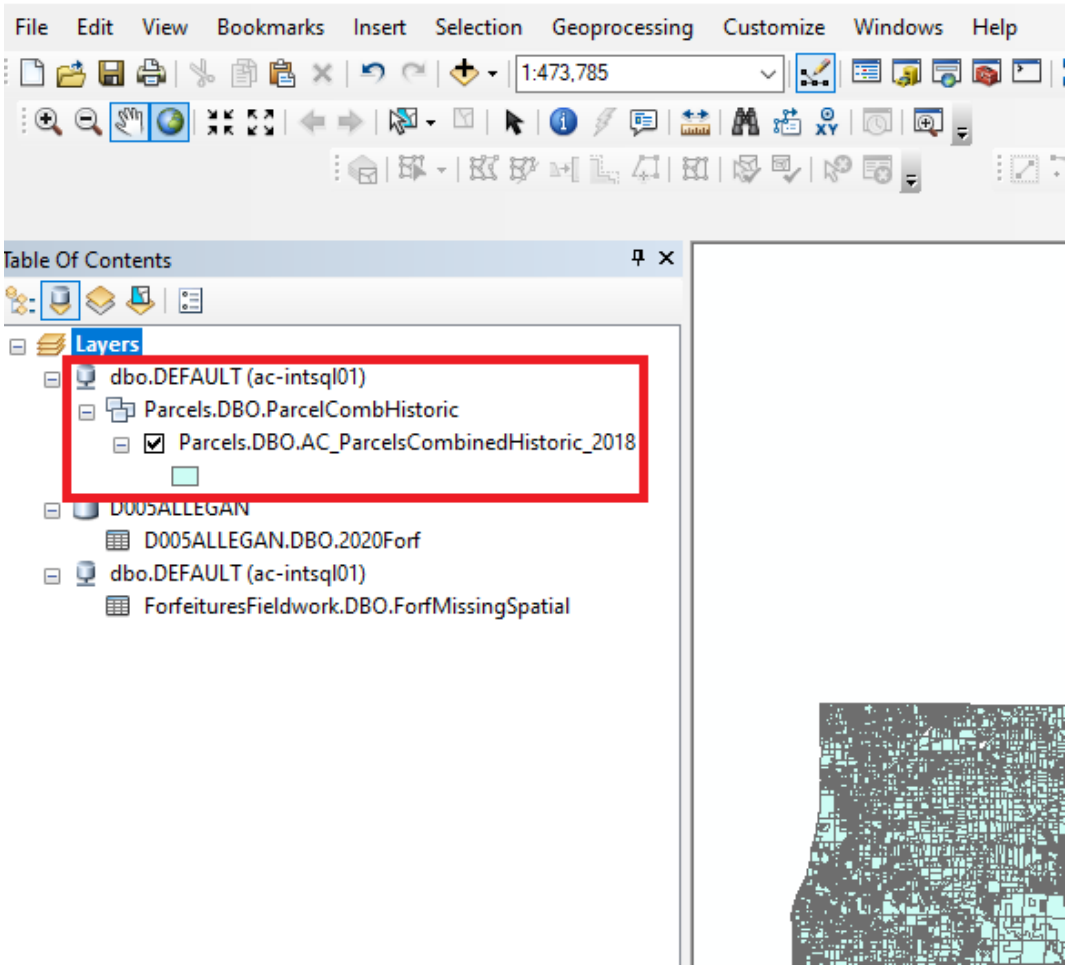


Figure 5.39: Parcels Layer Added

Forfeiture parcel missing spatial data

A temporary join, selection, and export will save these

- Join Parcels to Forfeiture table

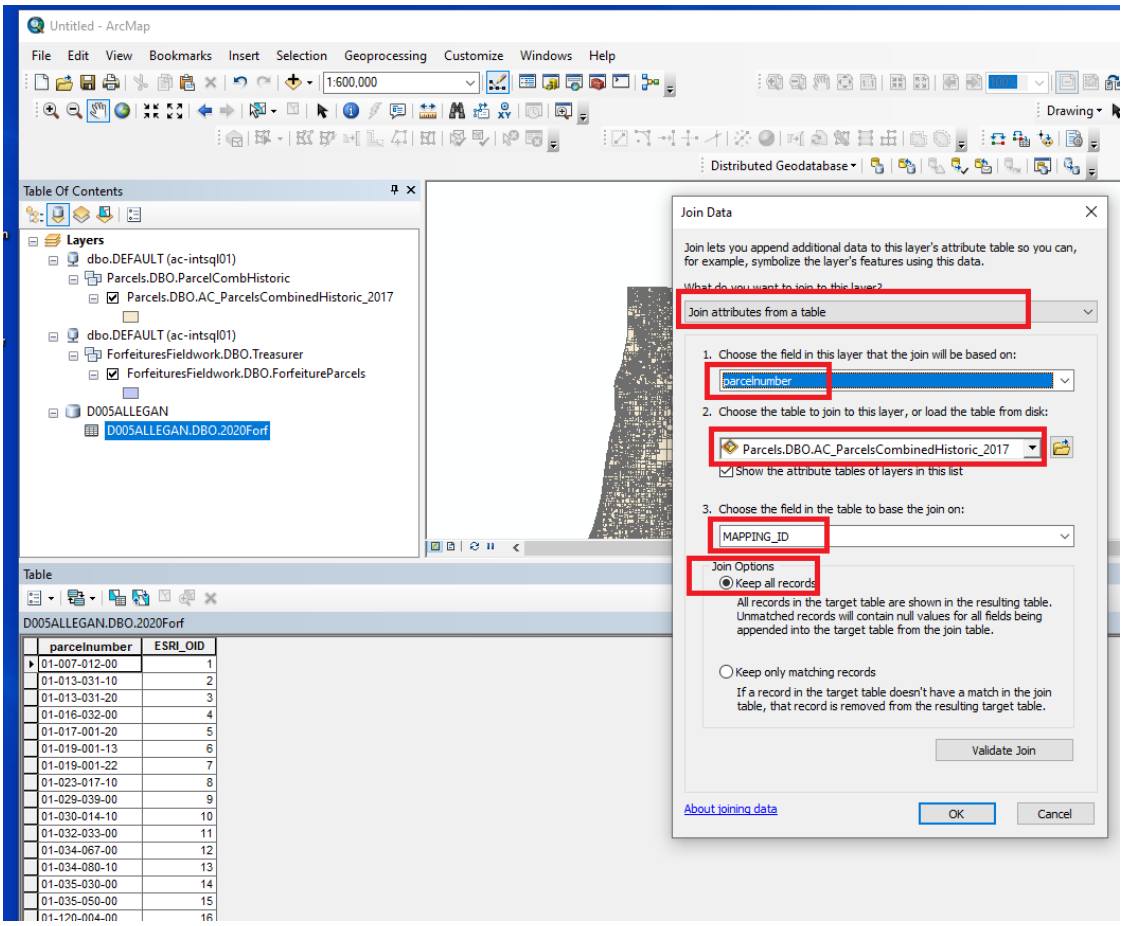


Figure 5.40: Join to Forfeiture Table

➢ Select any parcels missing spatial data

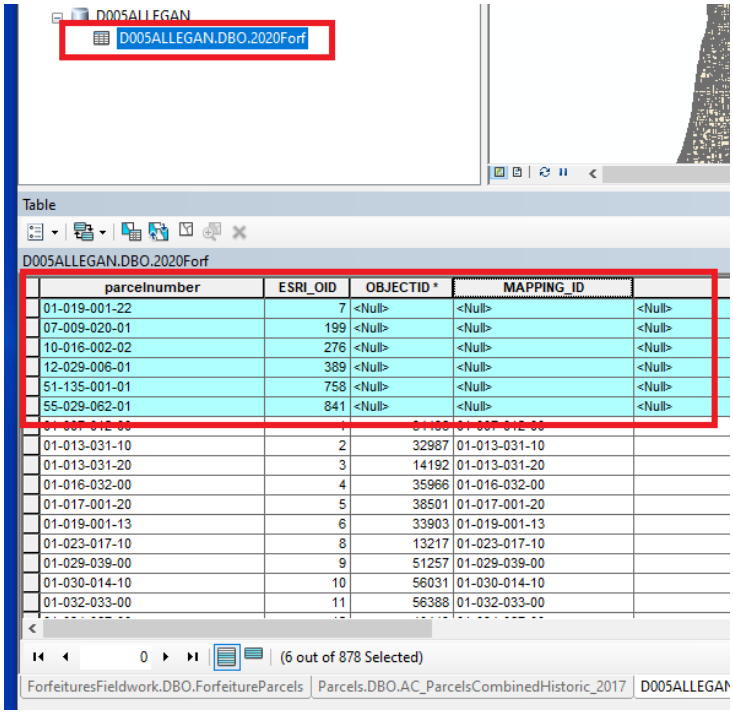


Figure 5.41: Select for Missing Spatial

➢ Export Parcels missing spatial to a table in the GDB

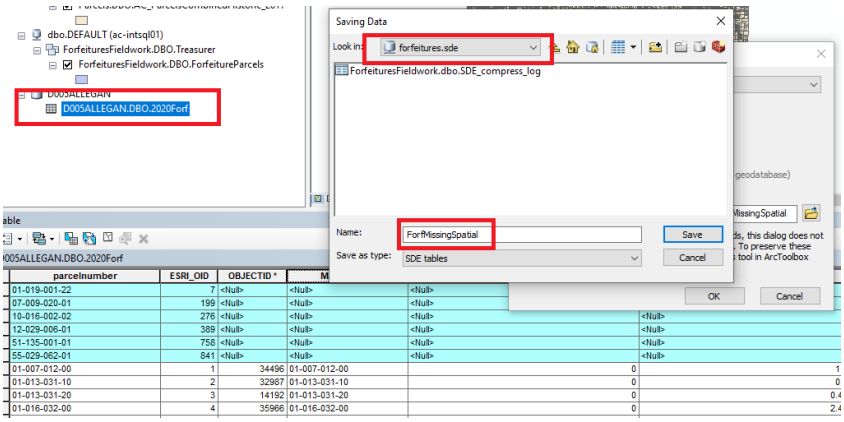


Figure 5.42: Export Missing Spatial

Create current year Forfeiture dataset

Create Join

- Create new join to *ACParcelsCombHistoricXXXX* of forfeitures on parcel numbers

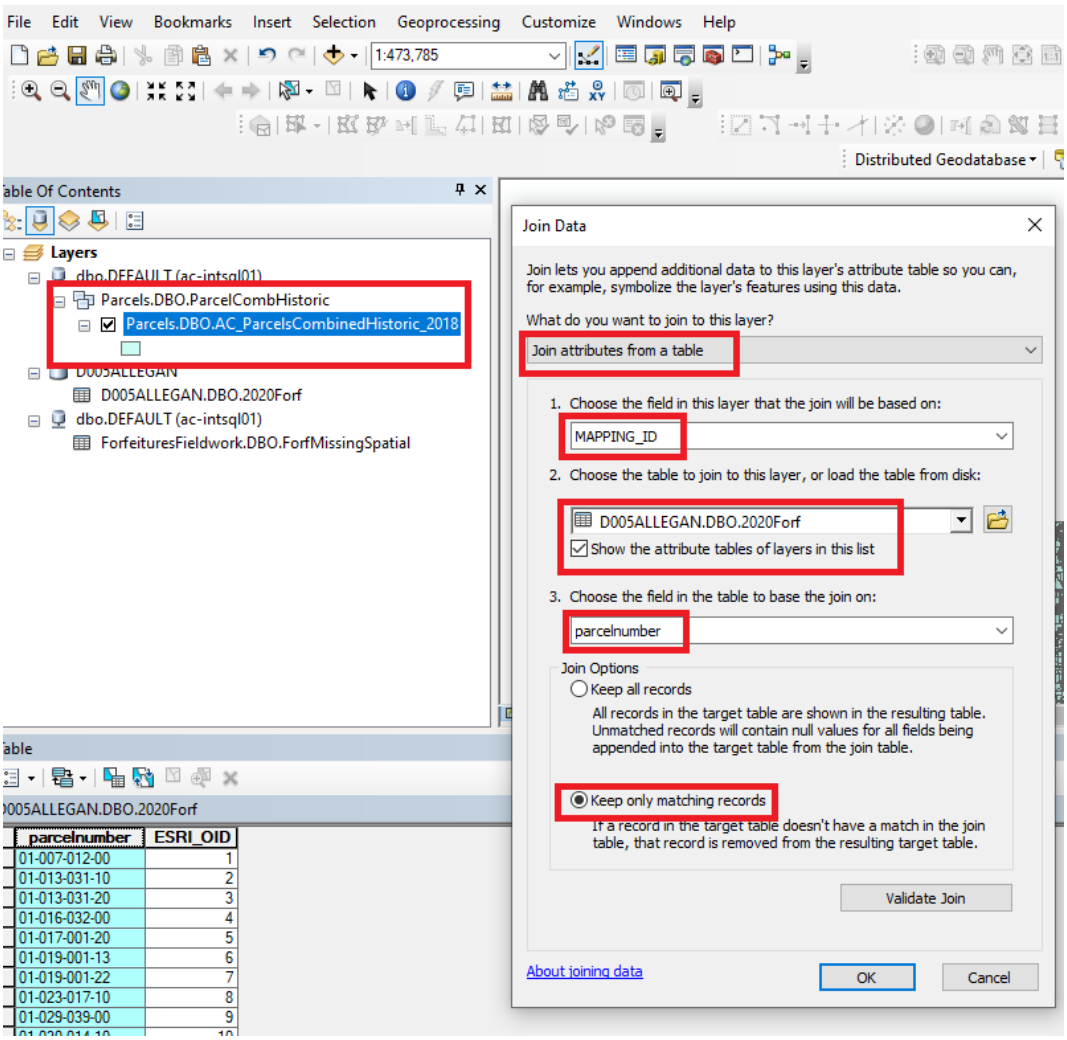


Figure 5.43: Join Parcels

Export Joined Features to a temp location

➢ Right click ⇨ on joined feature class in TOC and choose export

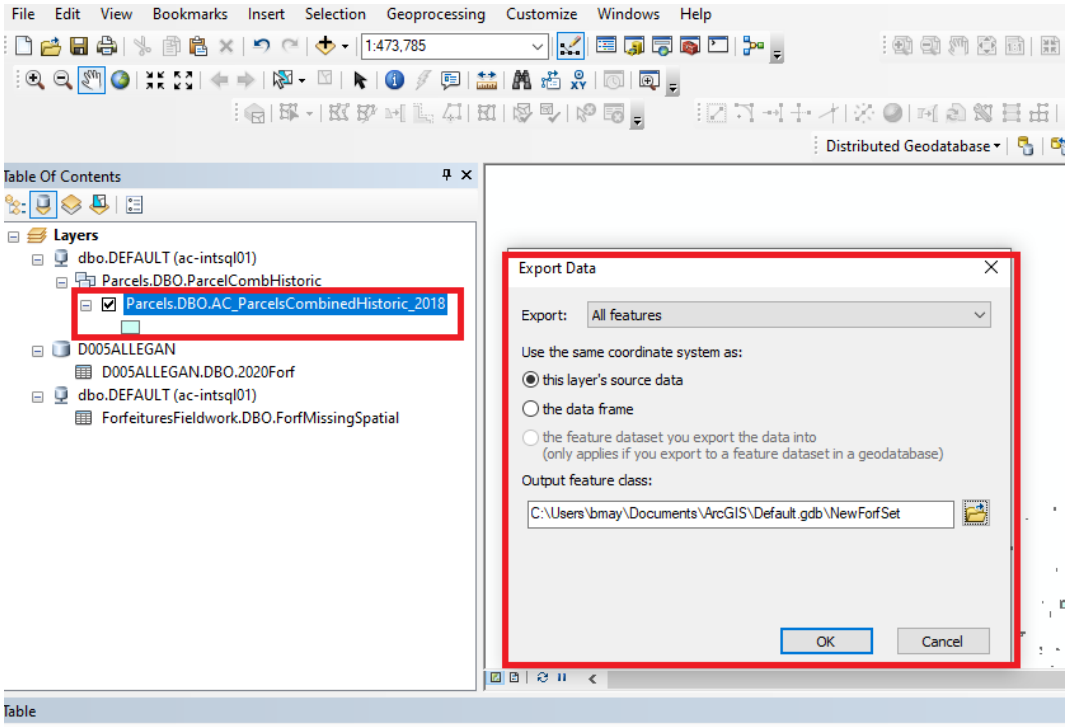


Figure 5.44: Export Joined Features

choose location and Push OK

Load data from temp location to forfeitureParcels

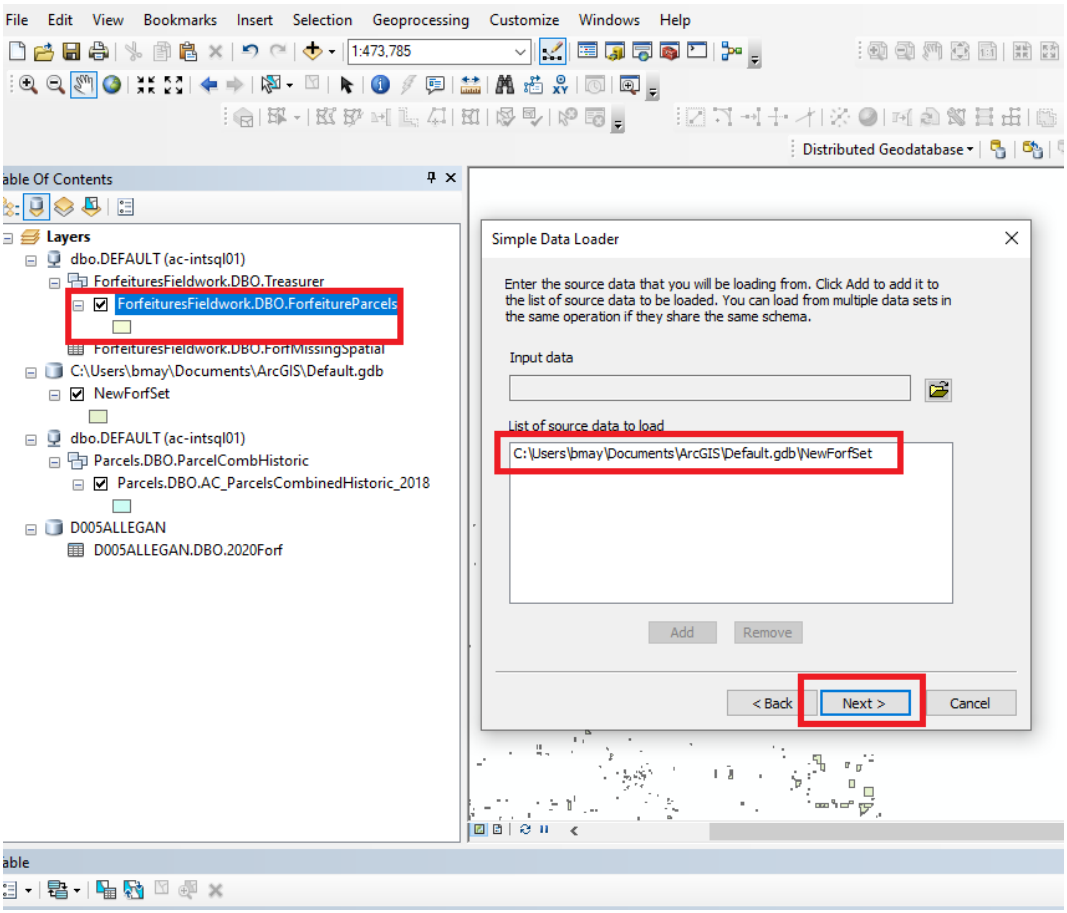


Figure 5.45: Load Data 1

choose features from a temp location

Push Next

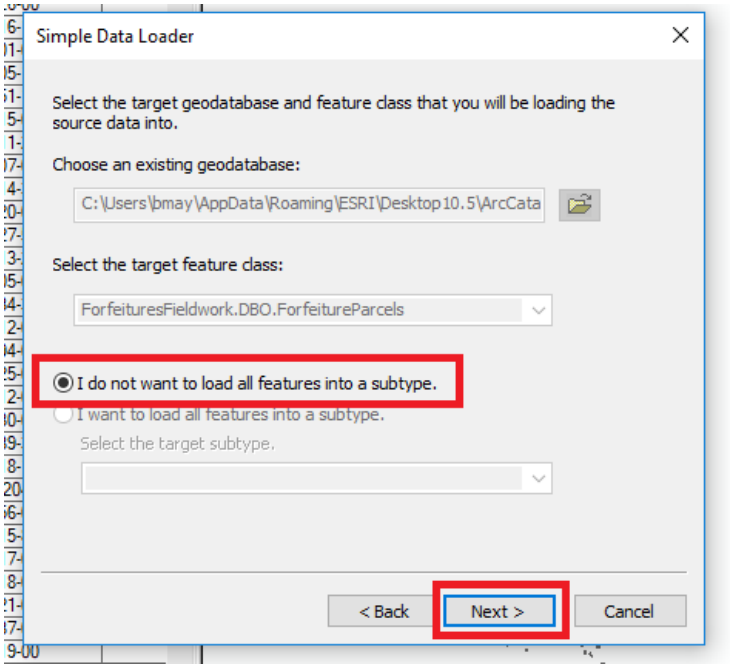


Figure 5.46: Load Data 2

Match these fields

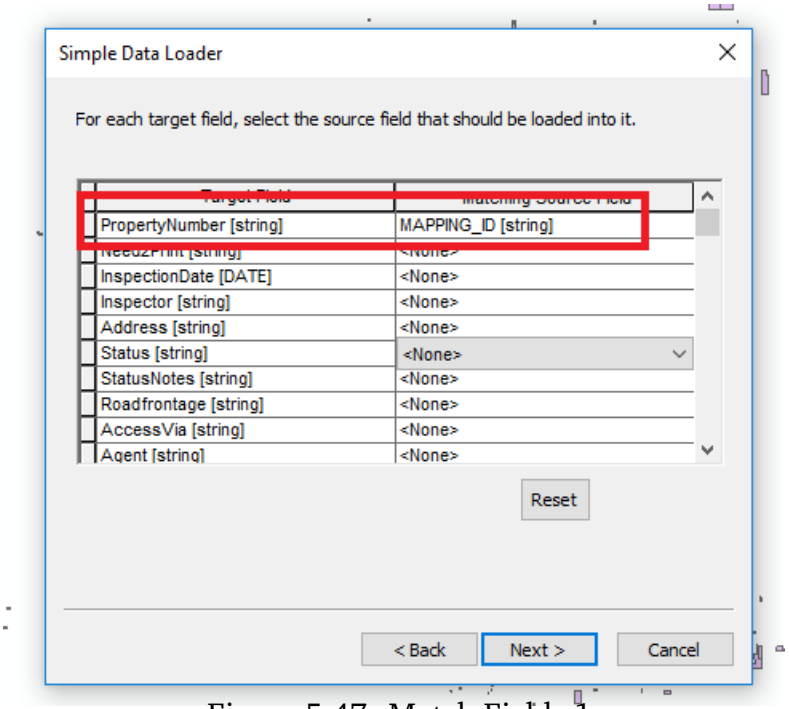


Figure 5.47: Match Fields 1

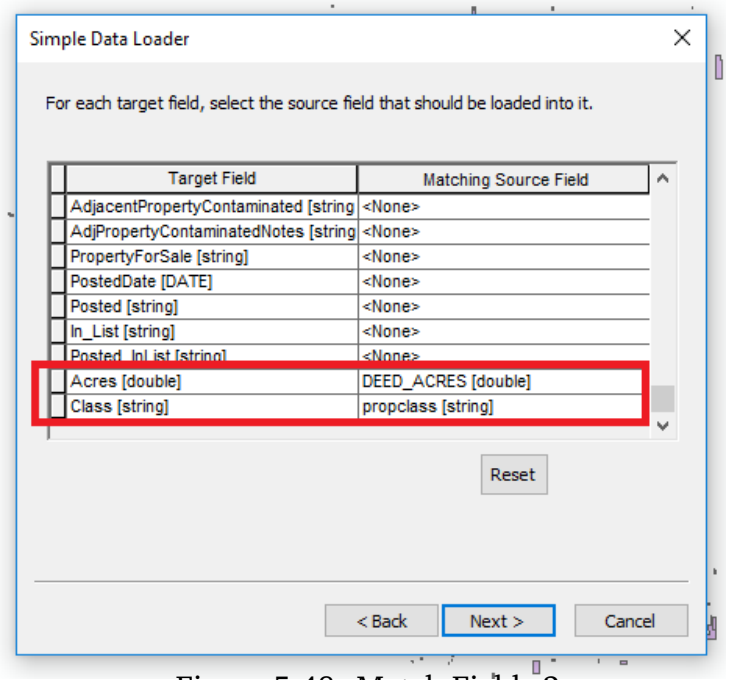


Figure 5.48: Match Fields 2

Push Next

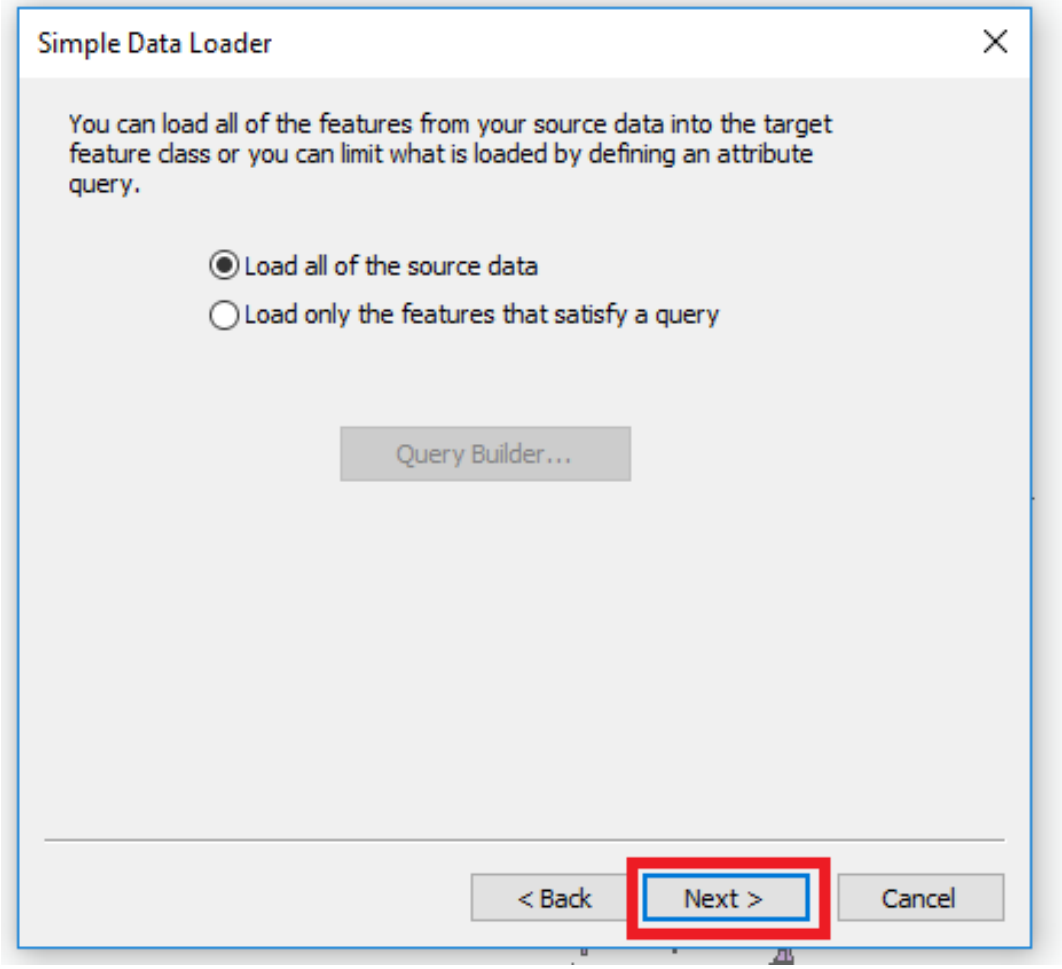


Figure 5.49: Load Data 3

Push Finish

Calculate Initial Values

Calculate In List value

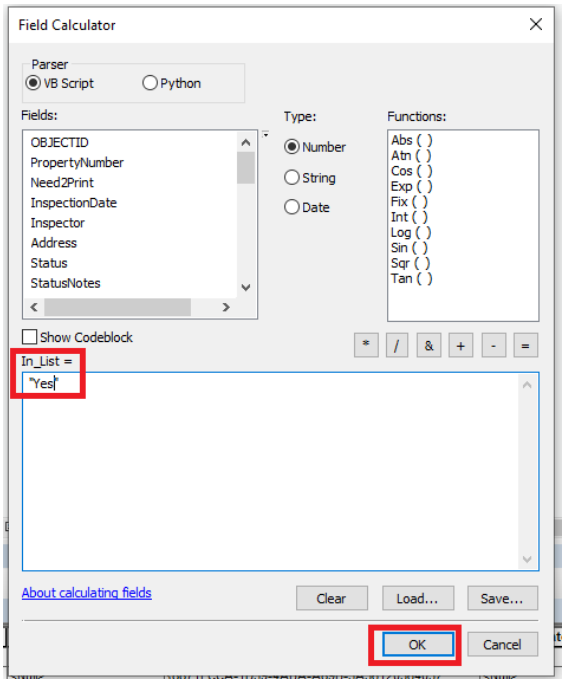


Figure 5.50: Calculate In List

Calculate Posted Value

Calculate Posted InList Value

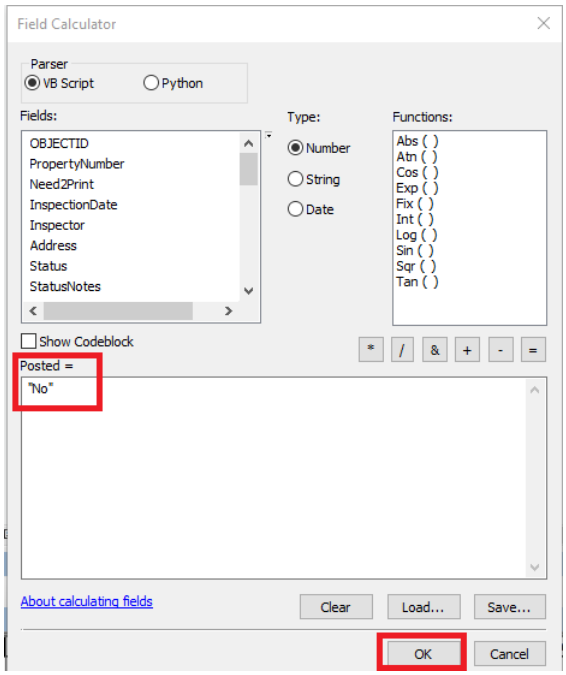


Figure 5.51: Calculated Posted

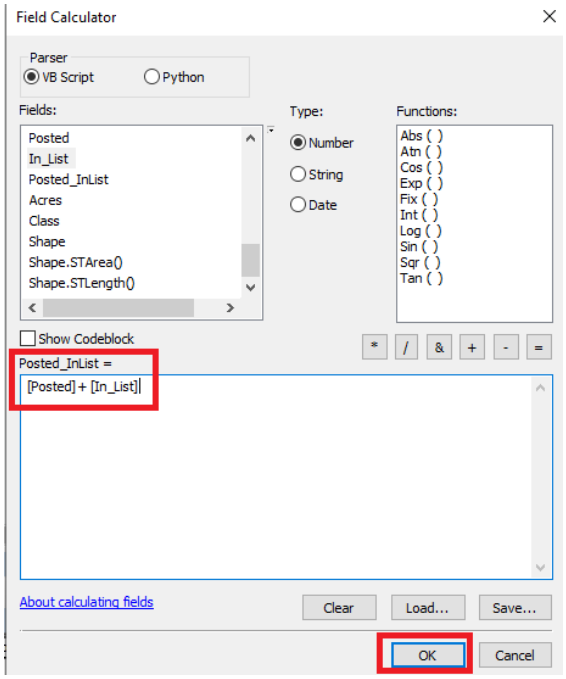


Figure 5.52: Calculate Posted in List

Data Setup

Register as versioned and Add Global IDs

Right Click ⇨ Manage ⇨ Register as Versioned

and

Right Click ⇨ Manage ⇨ Add Global IDs

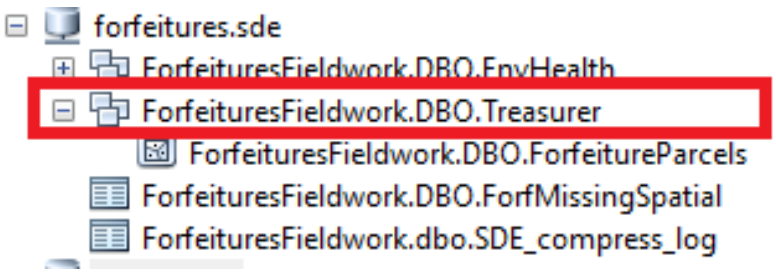


Figure 5.53: Setup Data

Create Attachments

Attachments is for storing the photos for each feature.
Right Click ⇨ Manage ⇨ Add Attachments

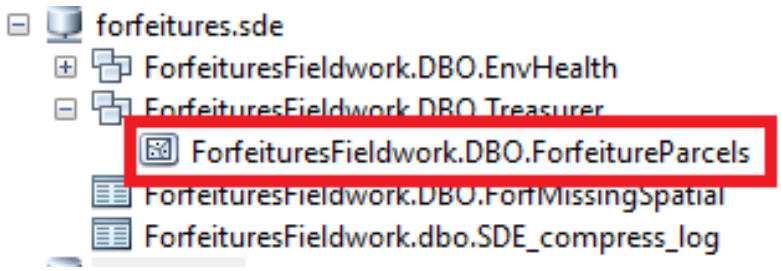


Figure 5.54: Create Attachments

Calculate Acres in ForfeitureParcels

Right Click ⇨ Acres Column ⇨ Calculate geometry (acres)

Setup Users in ArcGIS

Users that will run Pre and Post processing scripts must be created and given priviliges on Treasurer Feature Data Set.

For any new users of the geoprocessing tools:

Use the create Database User tool

or

In Catalog ⇨ Right click on ForfeituresFieldwork ⇨ Administration ⇨ Add User

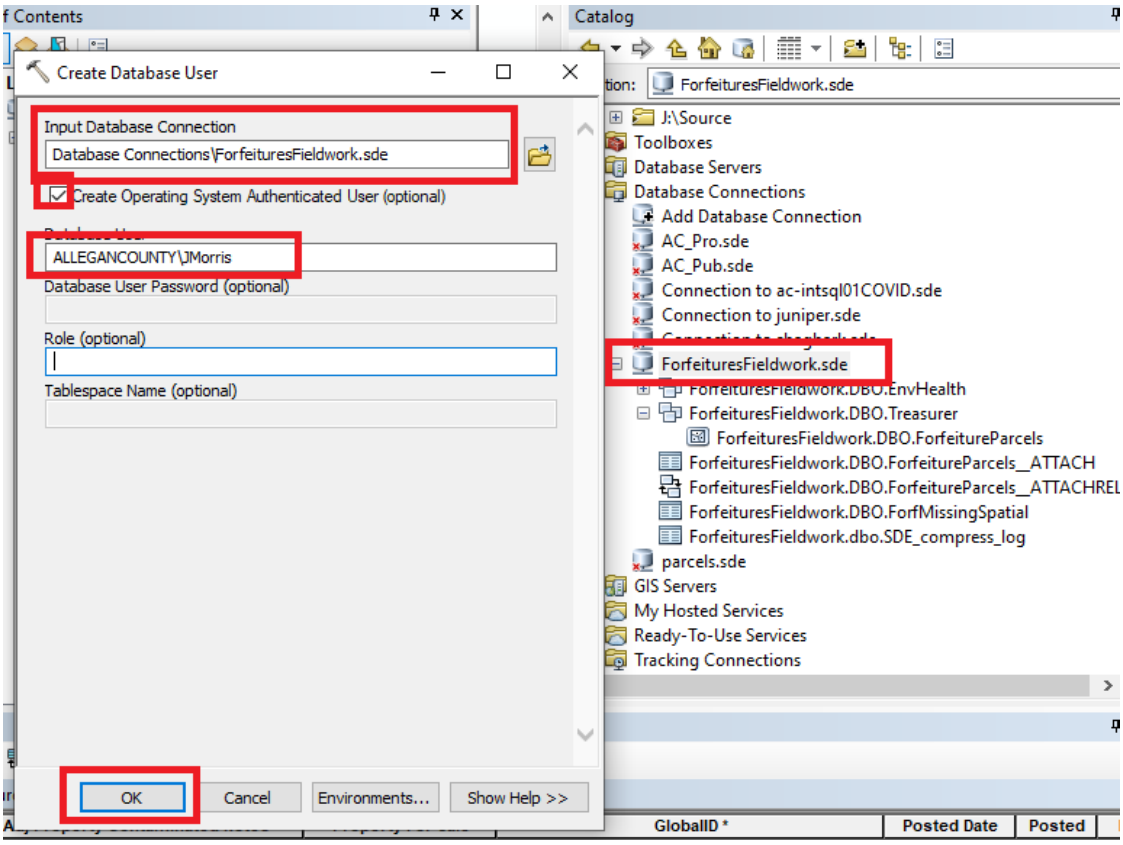


Figure 5.55: Add Db User

Add New User to Feature Dataset

In Catalog, ⇨ right click on Treasurer Feature Data Set

⇨ Manage ⇨ Priviliges ⇨ Add ⇨ Type new user ⇨

Push OK

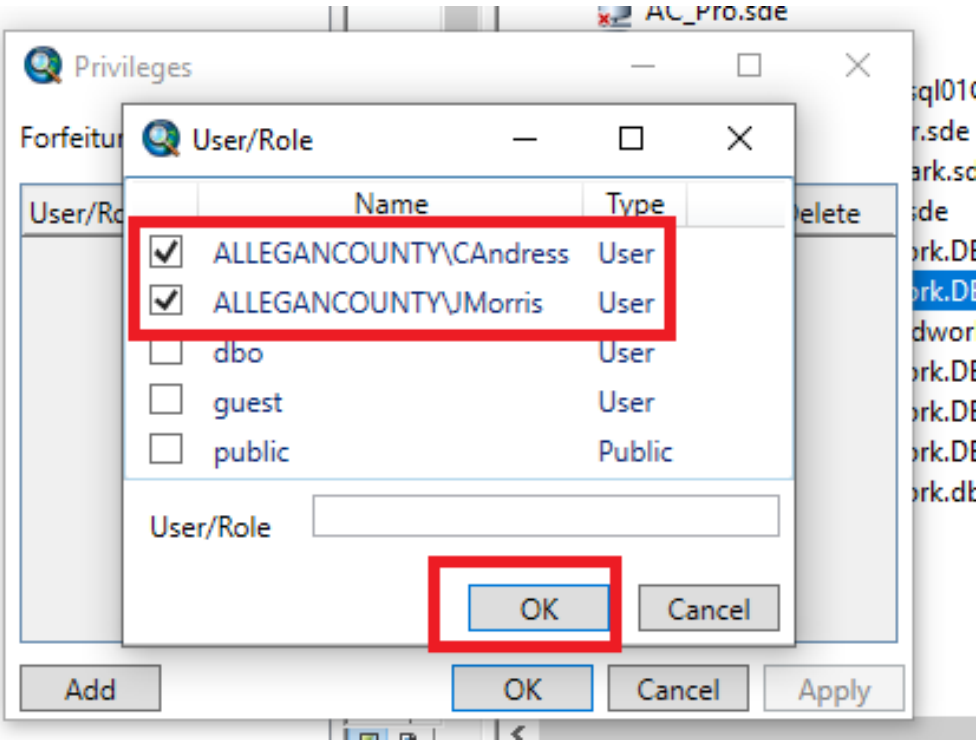


Figure 5.56: Add Feature Dataset User

Extend Priviliges for New User

In Catalog ⇨ right click on Treasurer FDS ⇨ Manage ⇨ Priviliges ⇨ check boxes

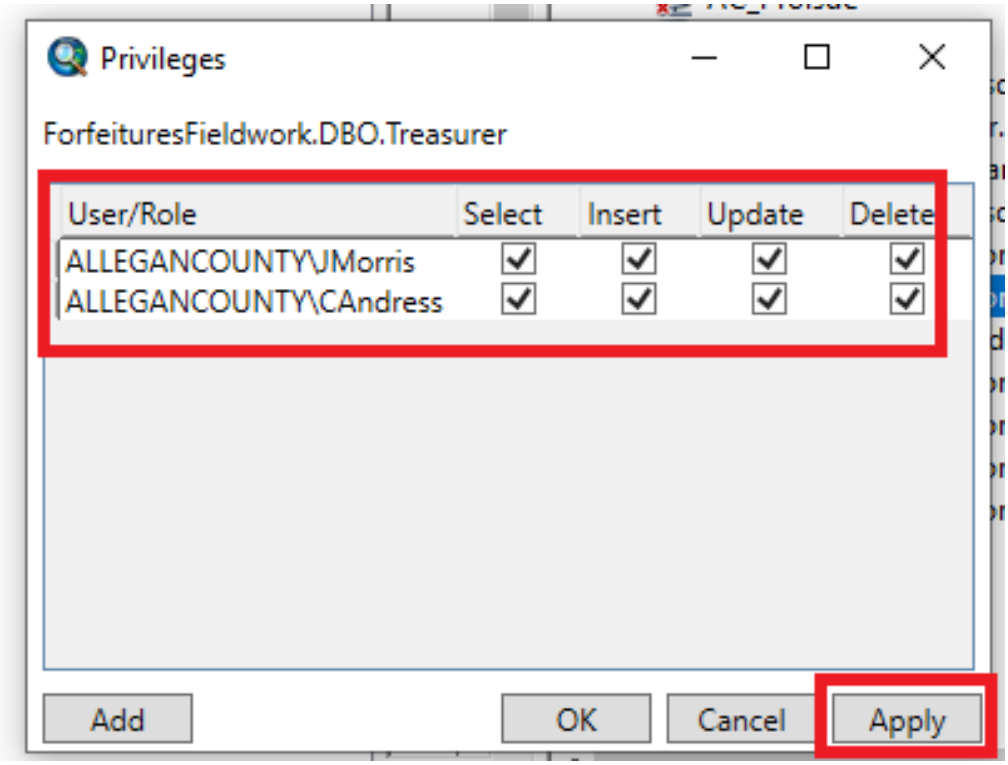


Figure 5.57: Extend Feature Dataset Priviliges

Portal Setup

Setup Users in Portal for ArcGIS

Users that will use the Collector for ArcGIS must have profiles added to and managed in the Allegan County GIS Portal site.

In Portal, ⇨ My Organization

Push Add Members

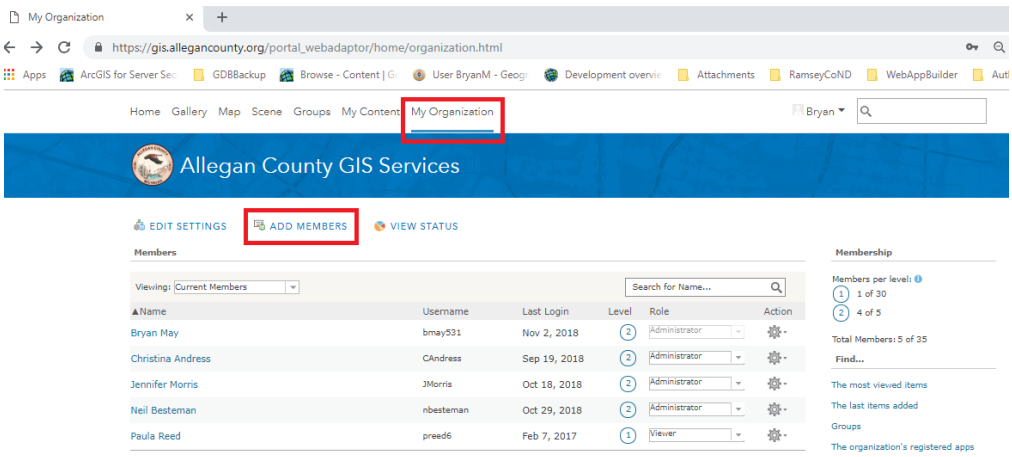


Figure 5.58: Portal Add User 1

Add Members to Portal

Select Built in Member ➪

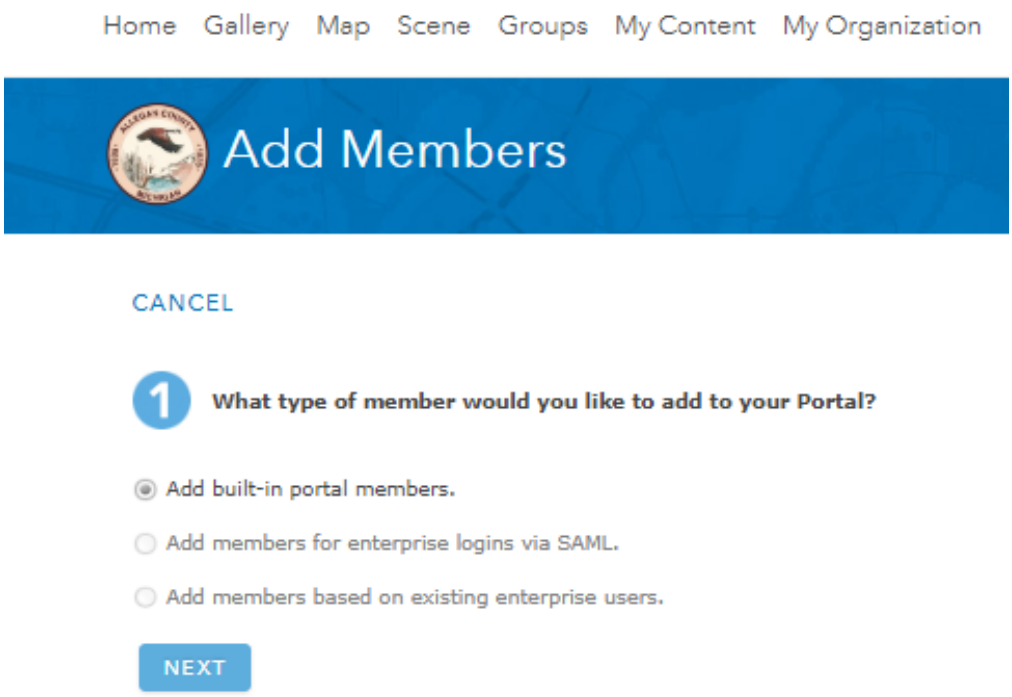


Figure 5.59: Portal Add User 2

Push Next

Enter required info for new member

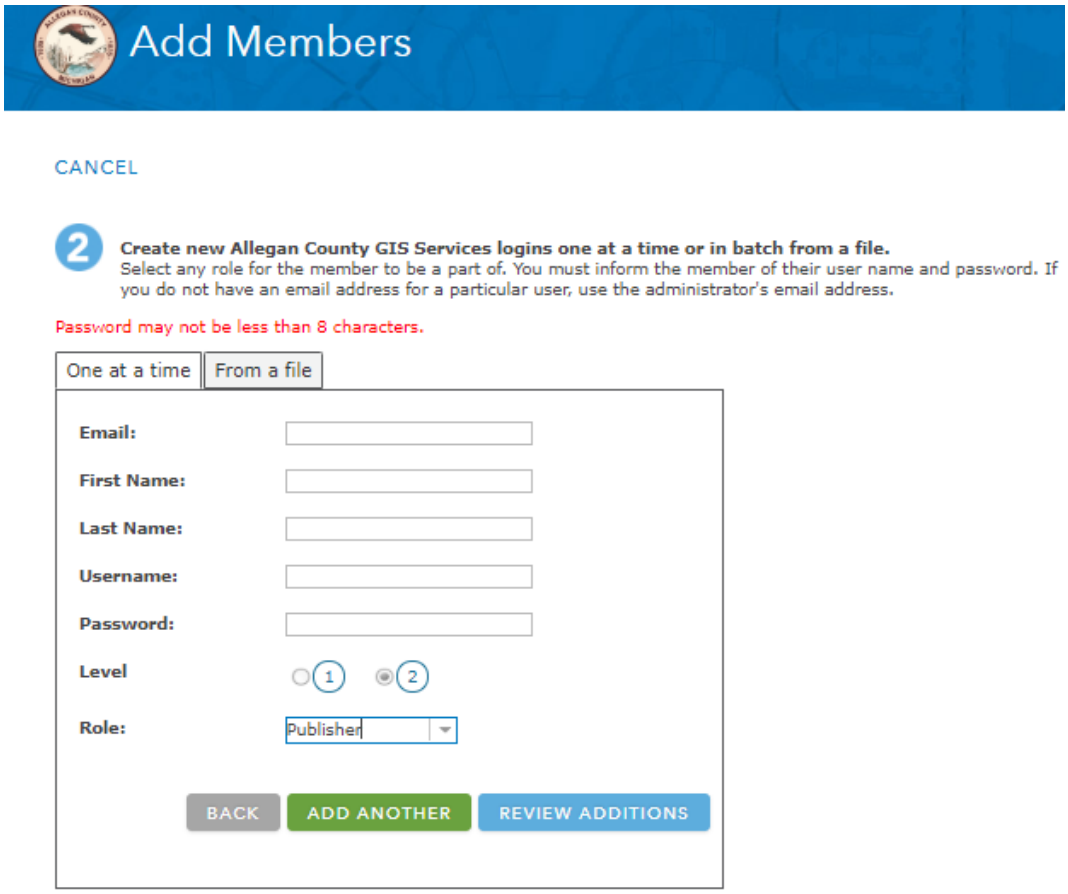


Figure 5.60: Portal Add User 3

Manage Treasurer Group

In Portal ⇨ Go to groups ⇨ Invite new user to the group

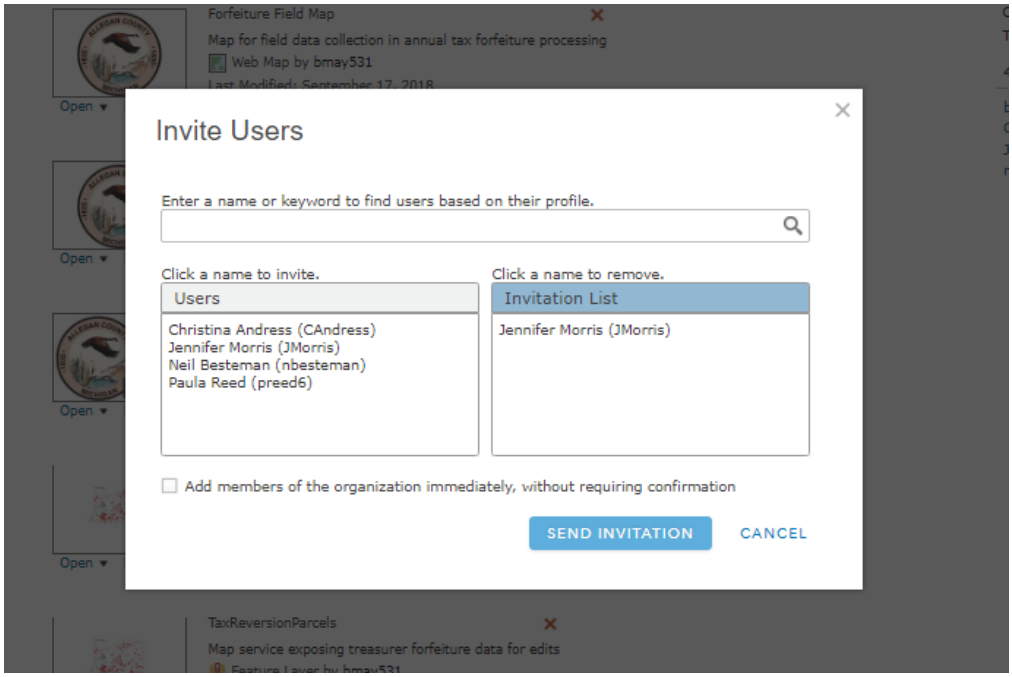


Figure 5.61: Portal Add User 4

Share Portal Content with the group

Any content used by the group needs to be shared to the group

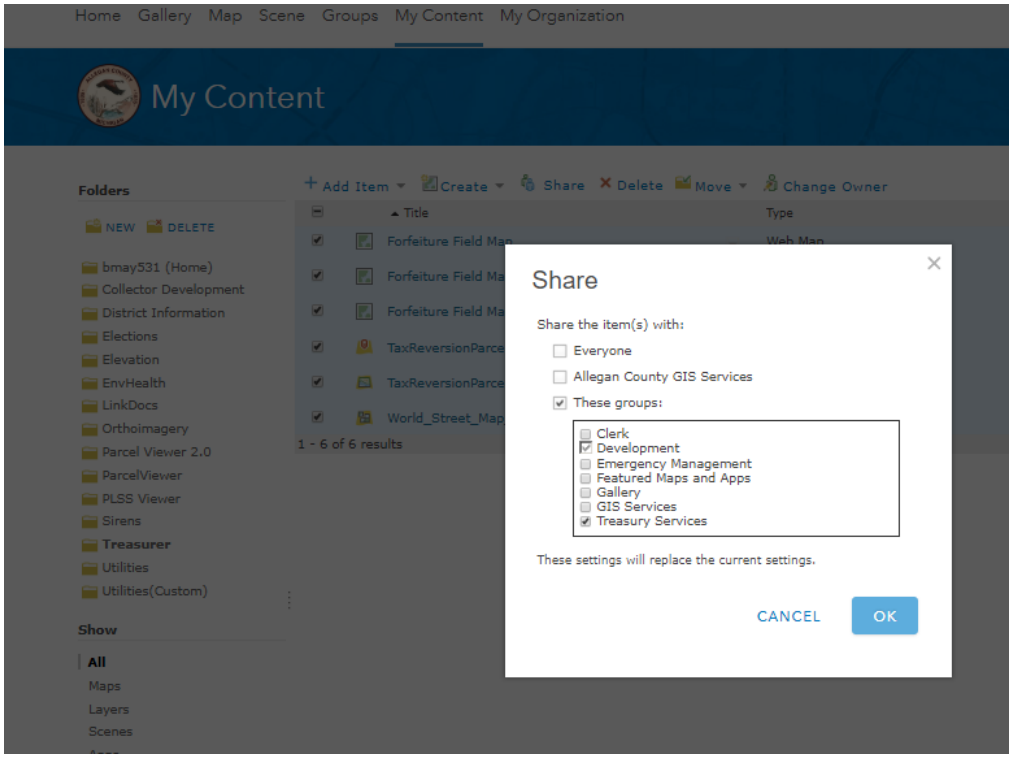


Figure 5.62: Portal AddUser 5

Start services and webmap

Find published MXD

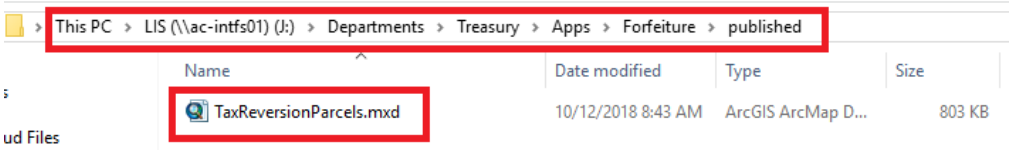


Figure 5.63: Published Mxd

Publish Forfeiture Parcels Map Service

General

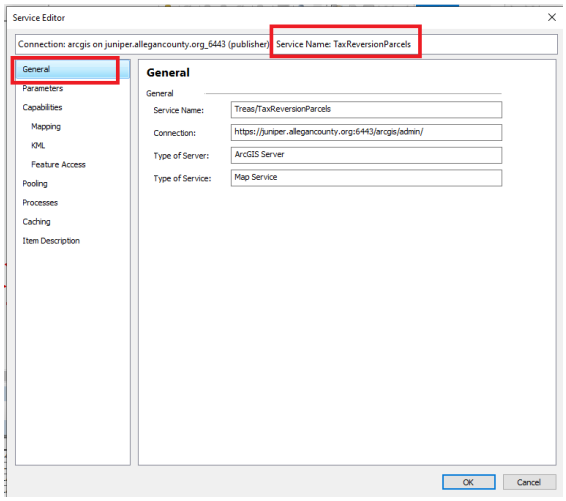


Figure 5.64: General

Capabilities

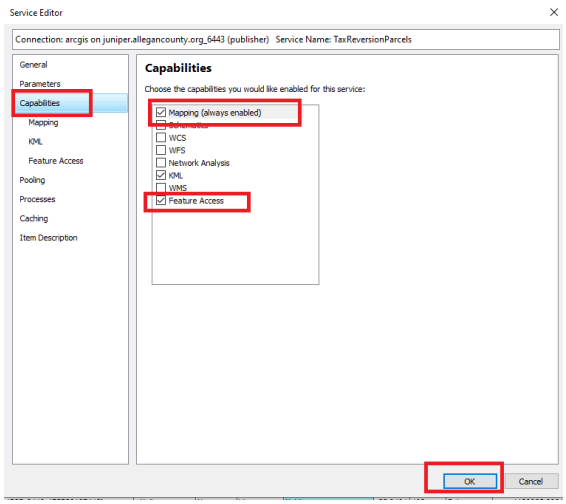


Figure 5.65: Capabilities

Feature Access

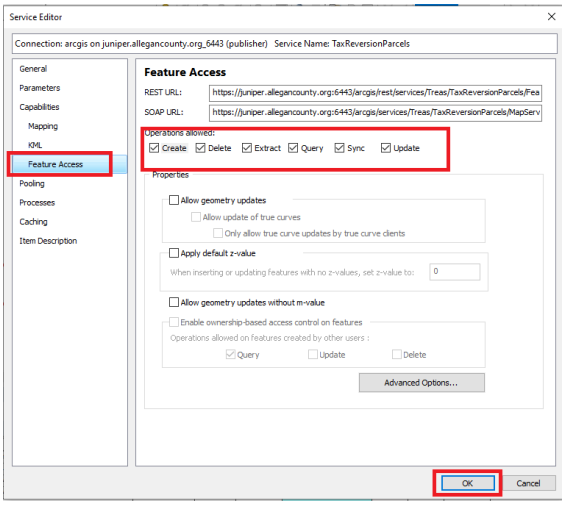


Figure 5.66: Feature Access

Publish Service

Figure 5.67: Publish Service

Schema Change Procedure

Form Edits Procedure

USER MANUAL

Collection Device Setup

Install Collector Classic

Available for IOS, Android, and Windows 10

This workflow supports Collector Classic on IOS

➢ Get Collector Classic from the App Store

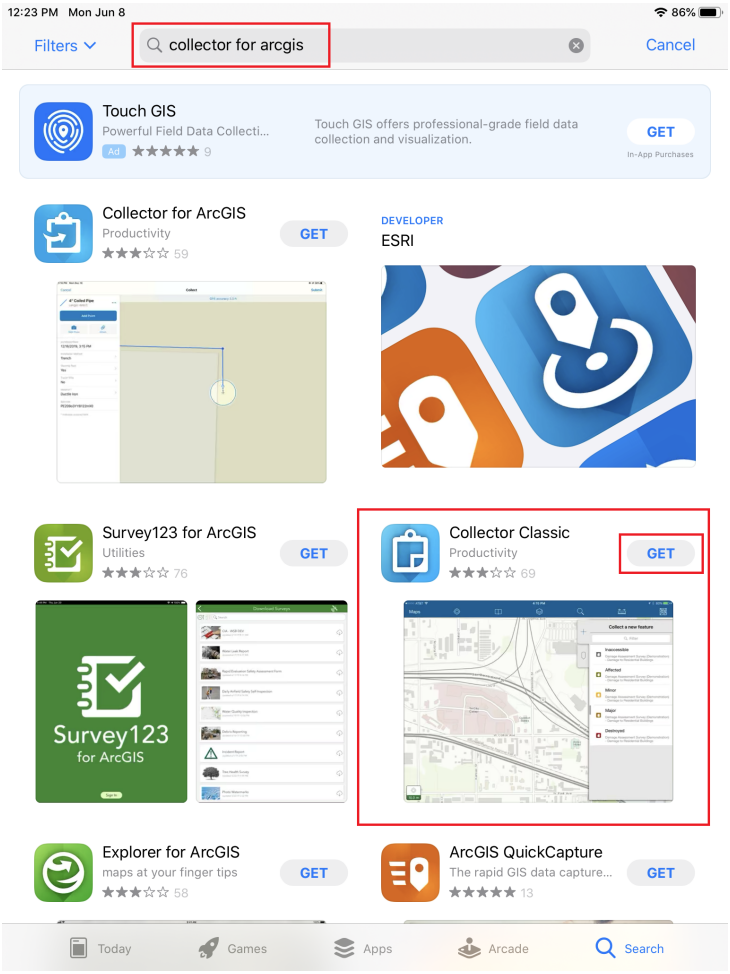


Figure 5.68: Download the App

Configure Collector

Choose

Sign in with ArcGIS Enterprise

for **Organization Website**, Type:

`https://gis.allegancounty.org/portal_webadaptor`

Push OK

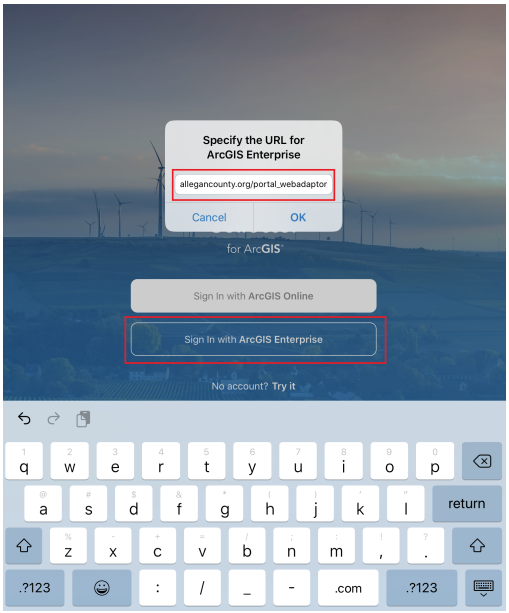


Figure 5.69: Collector Connection

Enter Credentials

Push SIGN IN

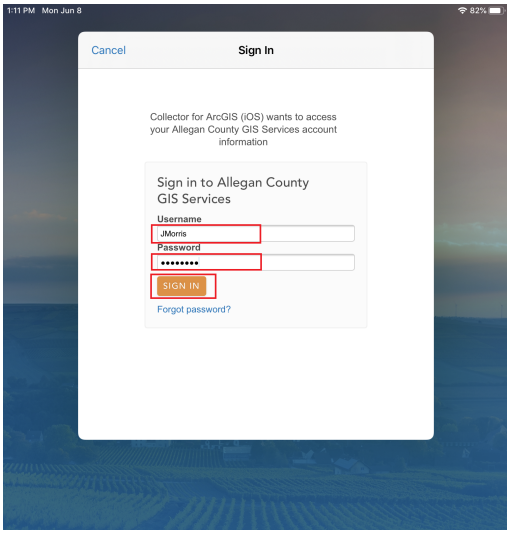


Figure 5.70: Enter Credentials

Download the Forfeiture Field Map

There are 3 different versions of the map

- Forfeiture Field Map
- Forfeiture Field Map For Photos
- Forfeiture Field Map For Attributes

The cloud with one arrow indicates it is not on the device but is available for offline use

.

Choose a Map

Push the cloud button

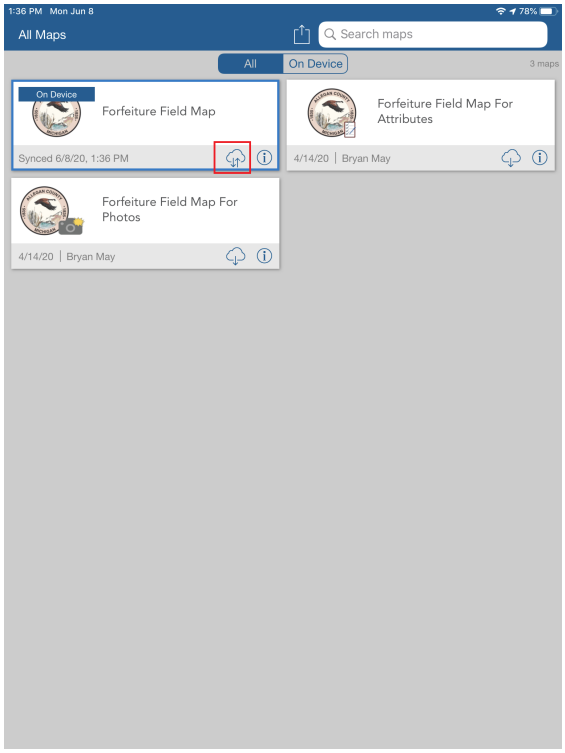


Figure 5.71: Collector Maps Menu

Specify work area

Define Area of Interest

Note that a larger area takes longer to download but the basemap only needs to be downloaded once

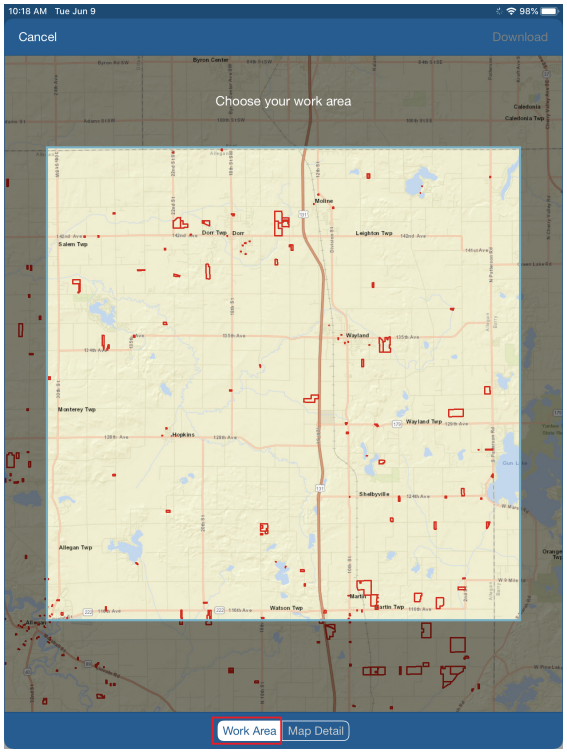


Figure 5.72: Choose Work Area (large)

Push Map Detail

Zoom into the level of detail desired

Figure 5.73: Choose Map Detail

Push Download

Preprocessing Routine

Each day the data must be prepared by executing the tool:

1. **Preprocess**

What the tool does:

- Exports current forfeiture list from BSA
- Updates webmap layers with results from BSA export

To use the preprocess tool:

In the Catalog window, navigate to:

`J:\Departments\Treasury\Apps\Forfeiture\processing\ForfeitureToolbox.tbx`

.

Open the toolbox

1.Preprocess

Double click on the tool

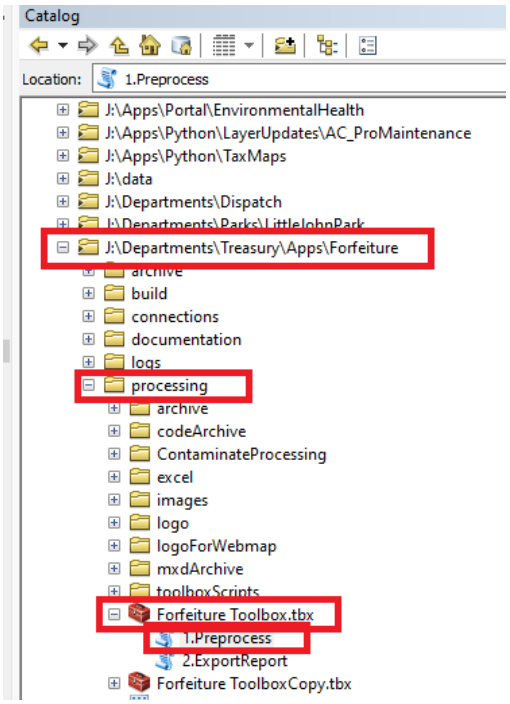


Figure 5.74: Processing Tools

Preprocessing Routine Cont.

Execute the Preprocess Tool

➢ Set parameters of the tool

In the tool, navigate to: `J:\Departments\Treasury\Apps\Forfeiture\source\Forfeitures.csv`

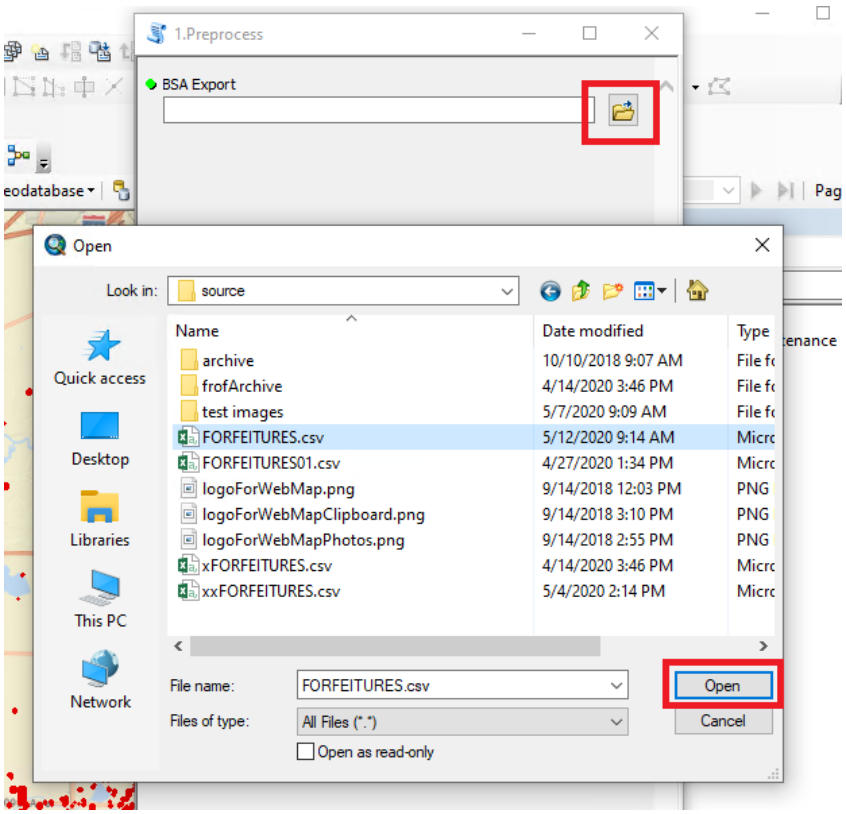


Figure 5.75: Select BSA Export

Push Open

Push OK on the tool to execute

Fieldwork data is updated from BSA

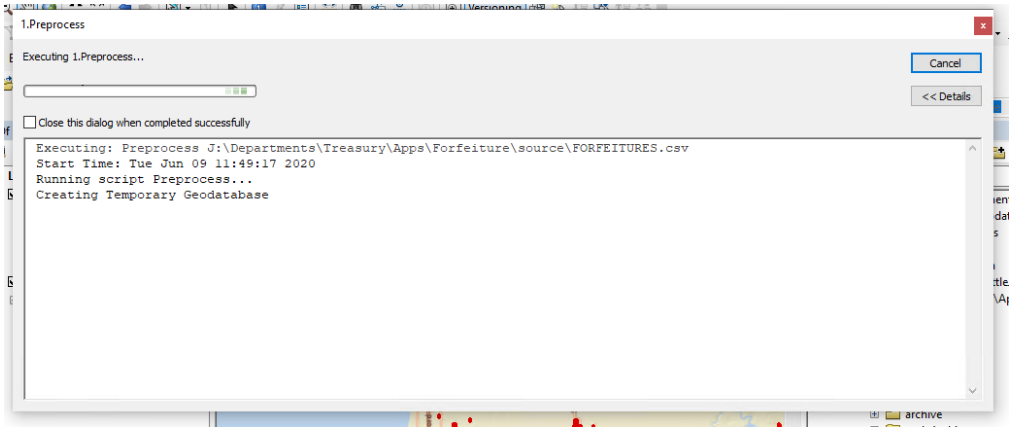


Figure 5.76: Preprocess Running

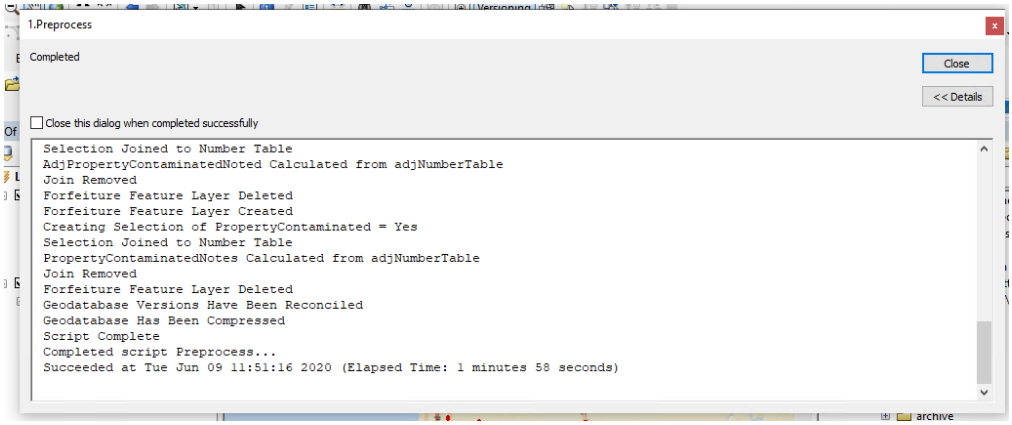


Figure 5.77: Preprocess Completed

Now that the fieldwork data is updated, mobile devices must be updated.

Synchronize the Forfeiture Field Map

On the fieldwork devices:

Note the date and time

Push Sync

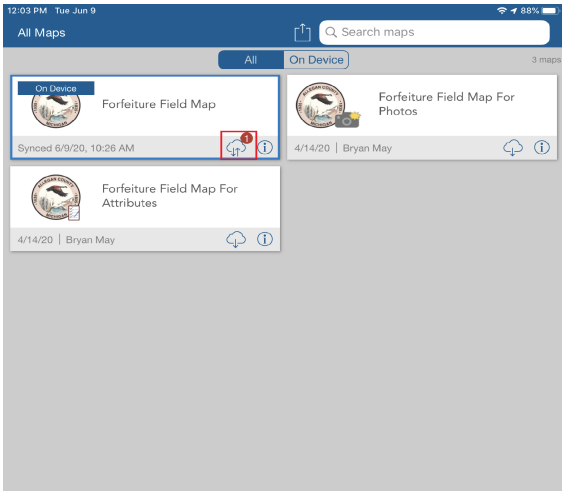
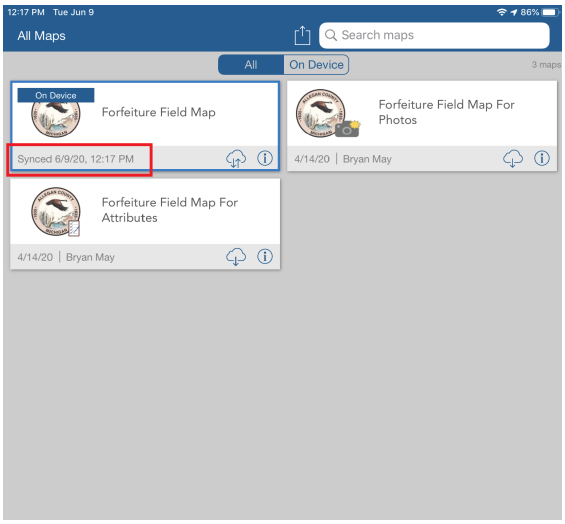


Figure 5.78: Map Downloaded

Note the date and time



If date has been updated then map is now synchronized

Figure 5.79: Map Synchronized

Field Data Collection

Data Entry Details

Attributes are of three entry types:

- Prefilled (in preprocessing)
- Dropdown
- Text box

Mobile Device Summary

For each site visited,

- Select the desired parcel
- Push Edit
- Collect attributes or photos
- Update parcel on device

Device 1 Field Operation

.

Select a Parcel

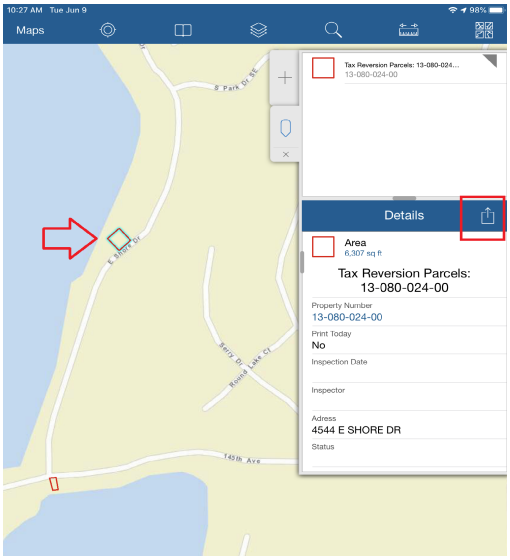


Figure 5.80: Select a Parcel

Edit

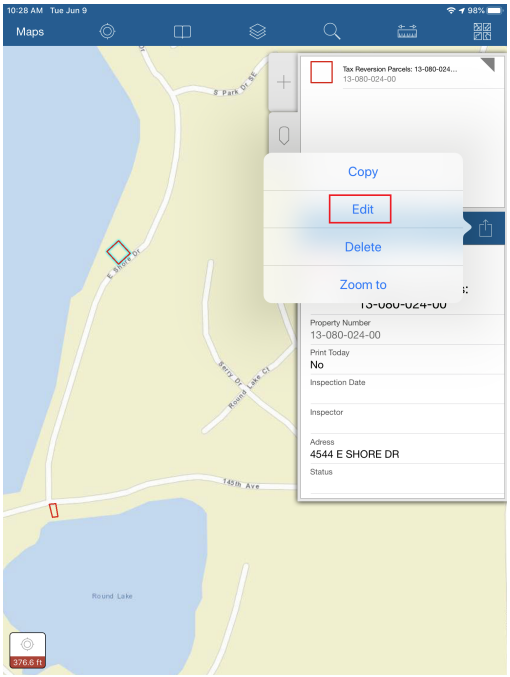


Figure 5.81: Edit Parcel

Device 1 Field Operation

(cont.)

Print Today

This will tag parcel for report production in postprocessing

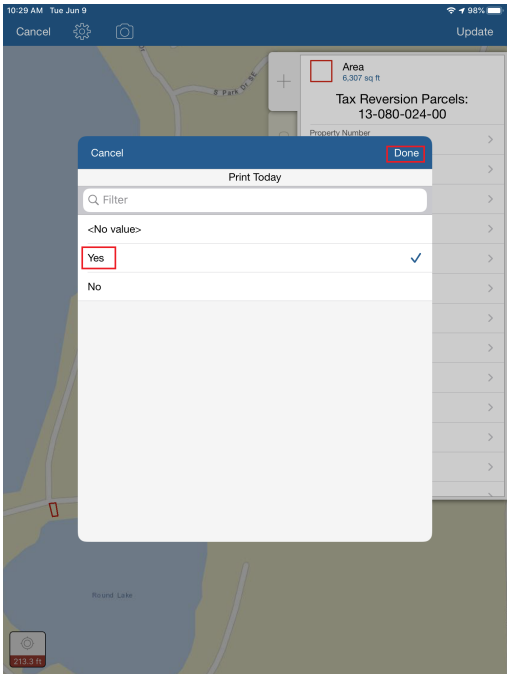


Figure 5.82: Print Today

Inspection Date

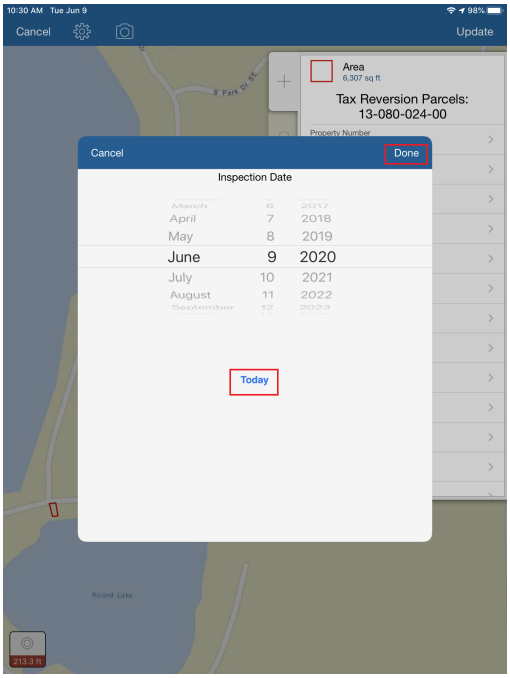


Figure 5.83: Enter Date

Device 1 Field Operation

(cont.)

Inspector

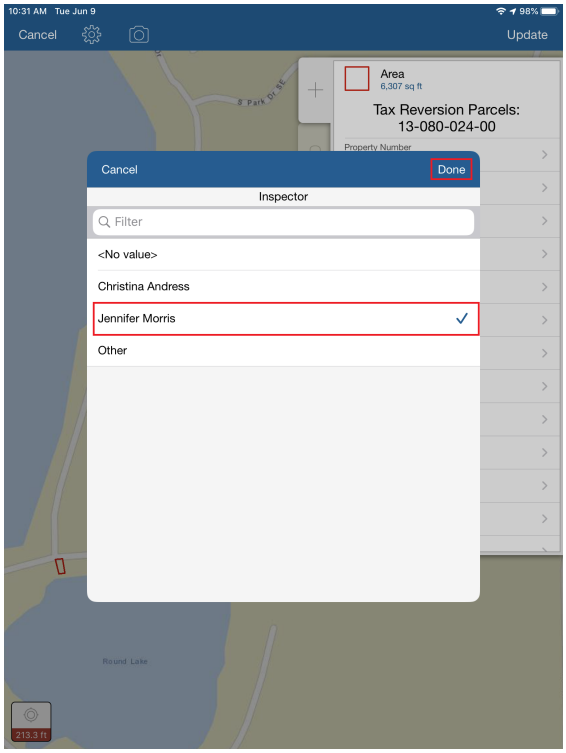


Figure 5.84: Select Inspector

Device 1 Field Operation

(cont.)

Status

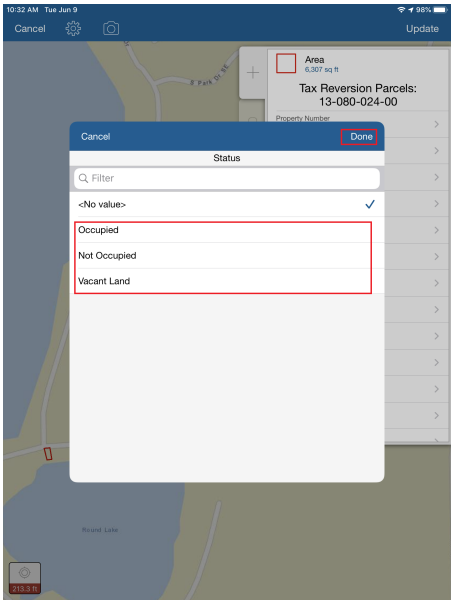


Figure 5.85: Occupied or Not

Status Notes

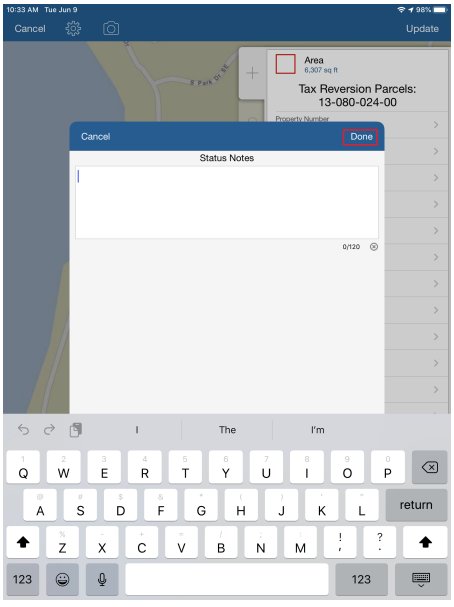


Figure 5.86: Enter Text

Device 1 Field Operation

(cont.)

Road Frontage

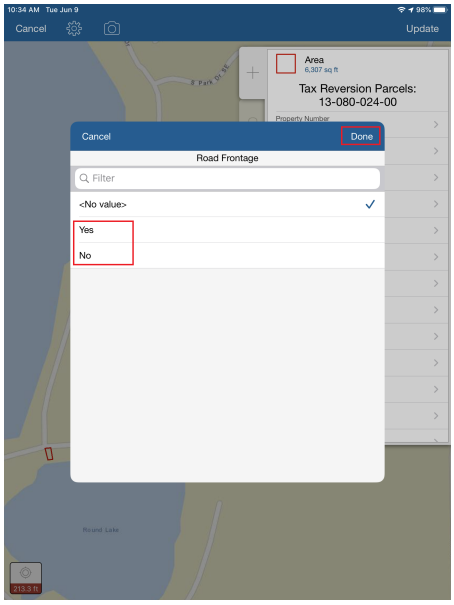


Figure 5.87: Road Frontage

Access Via

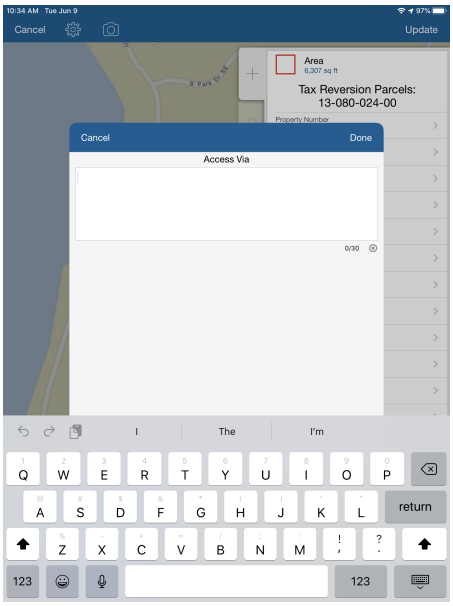


Figure 5.88: Enter Text

Device 1 Field Operation

(cont.)

Agent

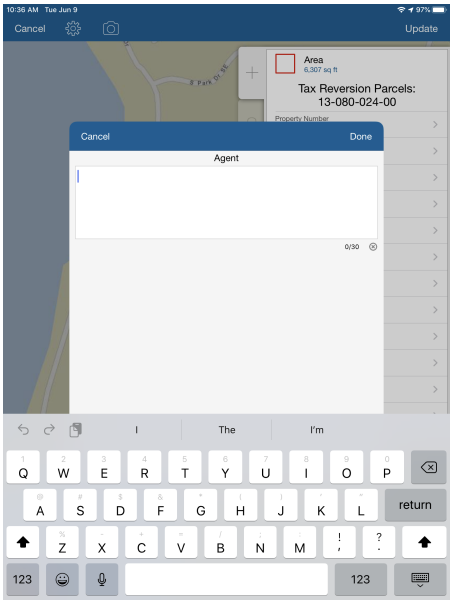


Figure 5.89: Enter Text

Agent Contact Info

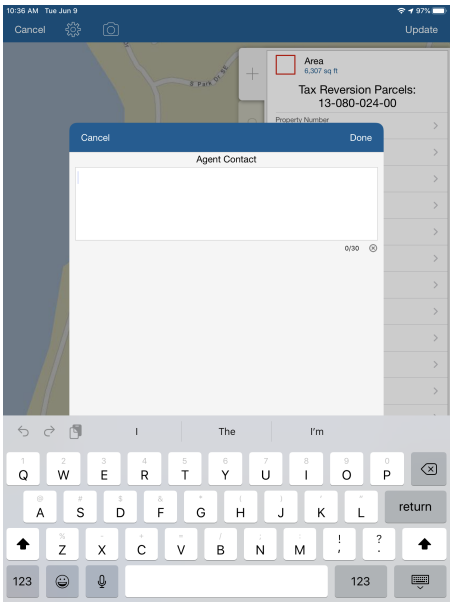


Figure 5.90: Enter Text

Device 1 Field Operation

(cont.)

Property in Use

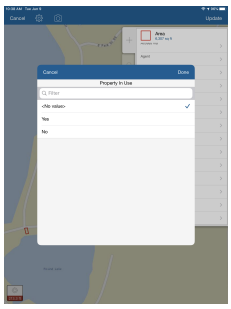


Figure 5.91: Yes or No

Use Notes

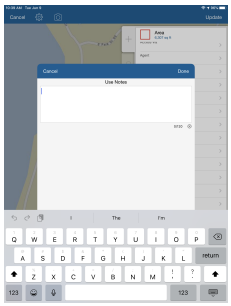


Figure 5.92: Enter Text

Property Maintained

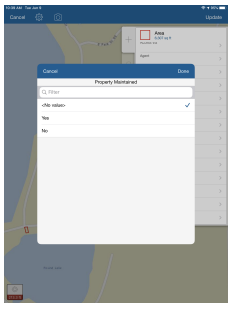


Figure 5.93: Yes or No

Device 1 Field Operation

(cont.)

Maintenance Notes

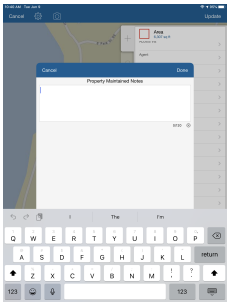


Figure 5.94: Enter Text

Property Contaminated

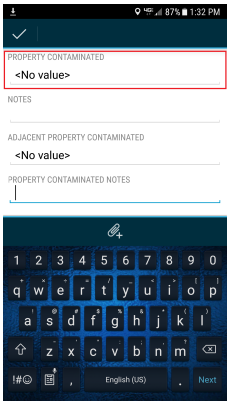


Figure 5.95: Prefilled

Property Contaminated Notes

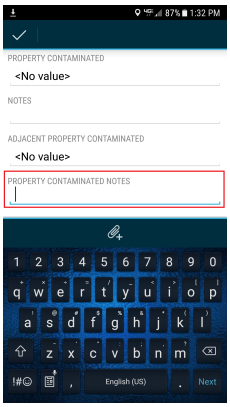


Figure 5.96: Prefilled

Device 1 Field Operation

(cont.)

Adjacent Property Contaminated

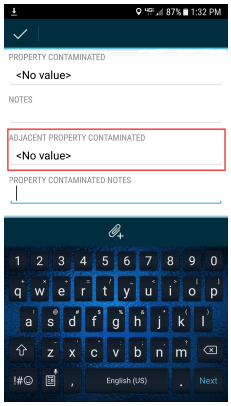


Figure 5.97: Prefilled

Adjacent Property Contaminated Notes

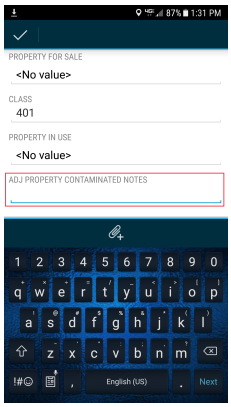


Figure 5.98: Prefilled

Device 1 Field Operation

(cont.)

Property For Sale

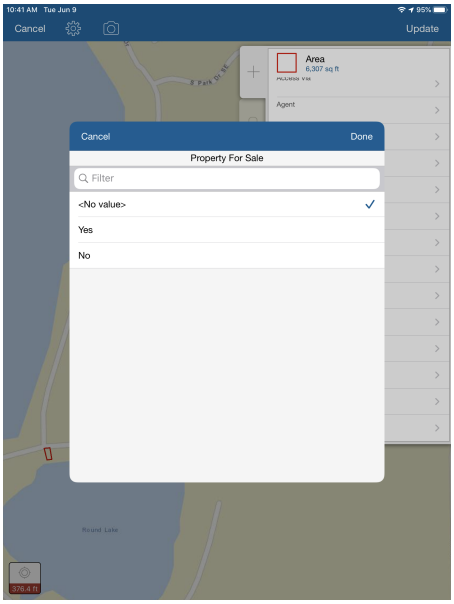


Figure 5.99: Yes or No

Forfeiture Posted

This will turn this parcel from red to green in the map

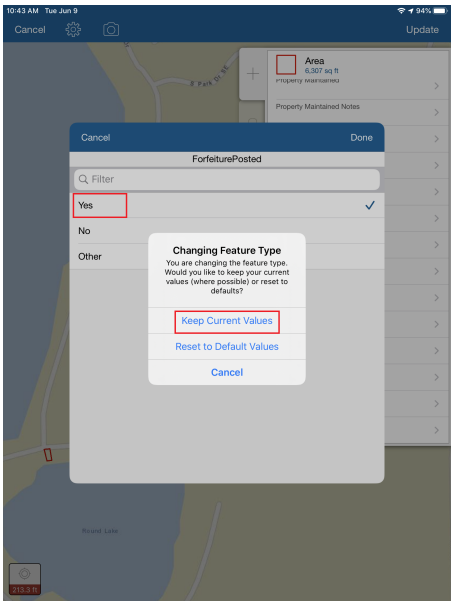


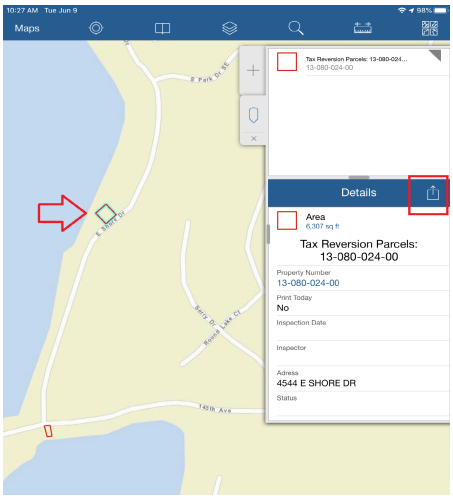
Figure 5.100: Forfeiture Posted

Photos and comments

Can be added from the same device or another device

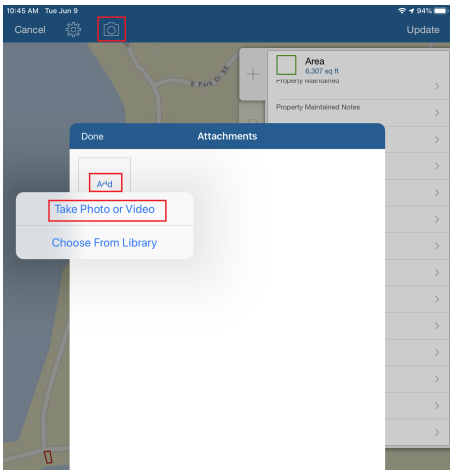
.

Select a Parcel



Push Detail Button

Figure 5.101: Select Parcel



Attachment

Add

Take Photo

Figure 5.102: Add Attachment

Take Picture

Push Done

Push Update

DAILY POSTPROCESSING ROUTINE

Synchronize Data

Any devices that were used for field data collection must be synchronized with the network production data.

Synchronize the Field Collection Devices

So, if two devices were used:

On Device 1:

Sync Attributes

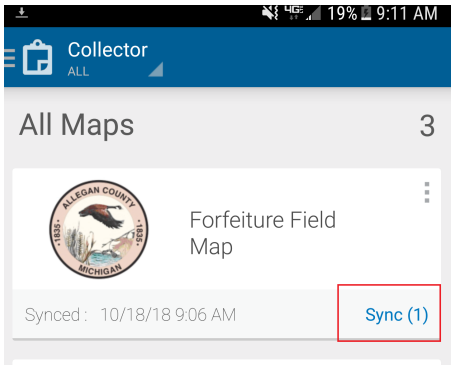


Figure 5.103: Sync

On Device 2:

Sync Photos

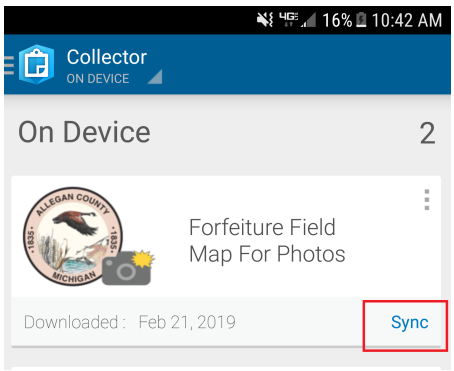


Figure 5.104: Sync Photos

Reconcile Versions and Print Report

Each device that is synchronized corresponds to a version within the geodatabase.

The versions must be reconciled with the Reconcile Versions tool:

Find and open the Reconcile Versions Tool
To find the tool in ArcMap:

Windows ➡ Search ➡

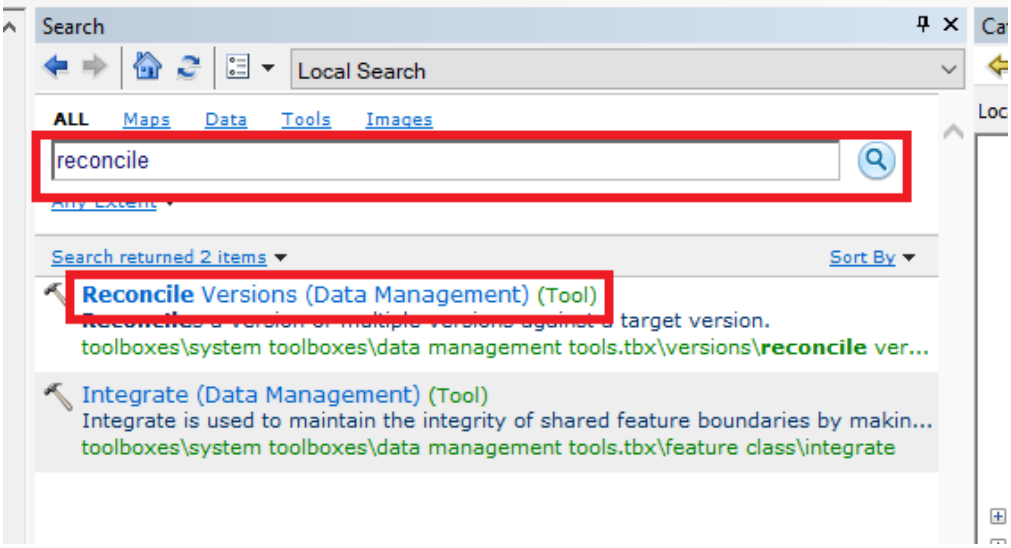


Figure 5.105: Search for Reconcile tool

Reconcile Tool Setup

The tool uses these settings:

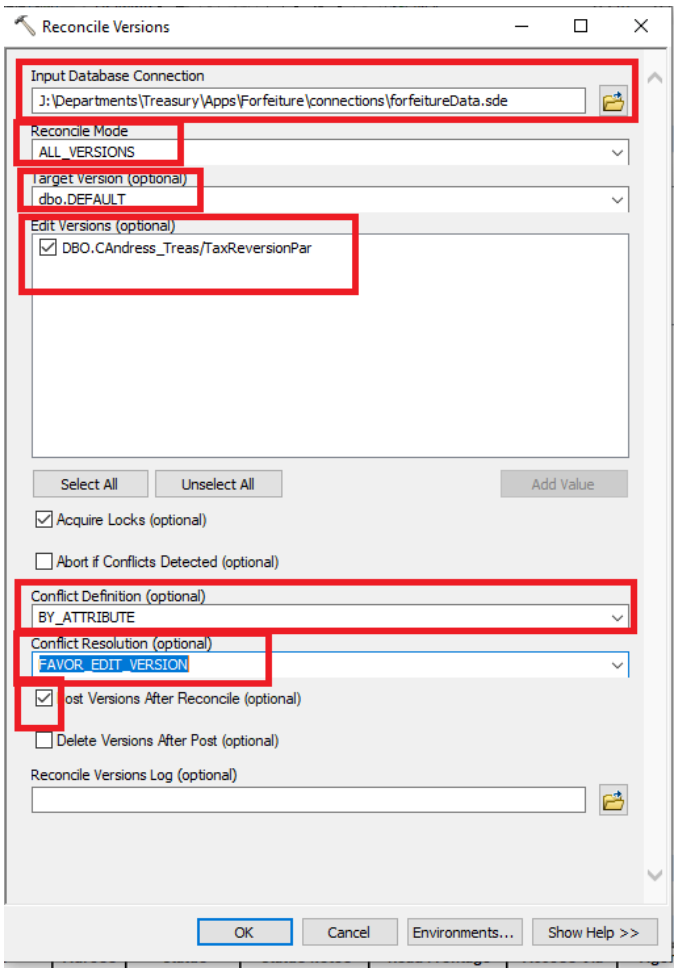


Figure 5.106: Reconcile Settings

Push OK to Run the tool

Next is exporting reports for the sites visited

Reconcile Versions and Print Report (cont.)

Print Reports

Any parcel that is marked Print Today as Yes will generate a report.

Inspection reports are generated by running the tool:

.

Double click on the tool
2. Export Report
and press OK

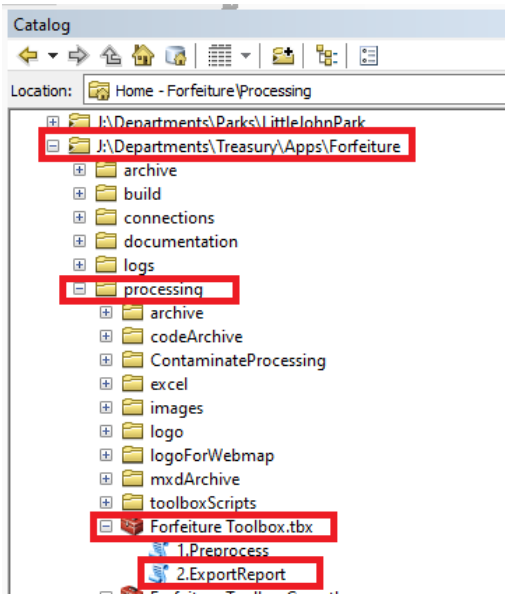


Figure 5.107: Double Click

Report is generated to:

```
J:\Departments\Treasury\Apps\Forfeiture\build\reports
```

6 Tools

6.1 BSA Support

6.1.1 Adding a Layer to the BSA GIS

Tool Summary

Background

B S And A features a GIS toolset that requires data layers to be added to map documents for visualization.

B S AND A is used within Equalization and by local assessors throughout the county.

Why the Tool is Needed

B S And A Users often ask ACGIS for data and assistance in using the data.

Who the Tool is For

User knowledge of B S And A.

B S And A installed.

GIS data source files on the local machine.

Takeaway

With the necessary data files, any B S And A user can add layers to a map within B S And A GIS

ADD AN IMAGERY LAYER

Step 1: Edit GIS Settings

In **Program Setup** ⇒ Select **GIS Settings...**

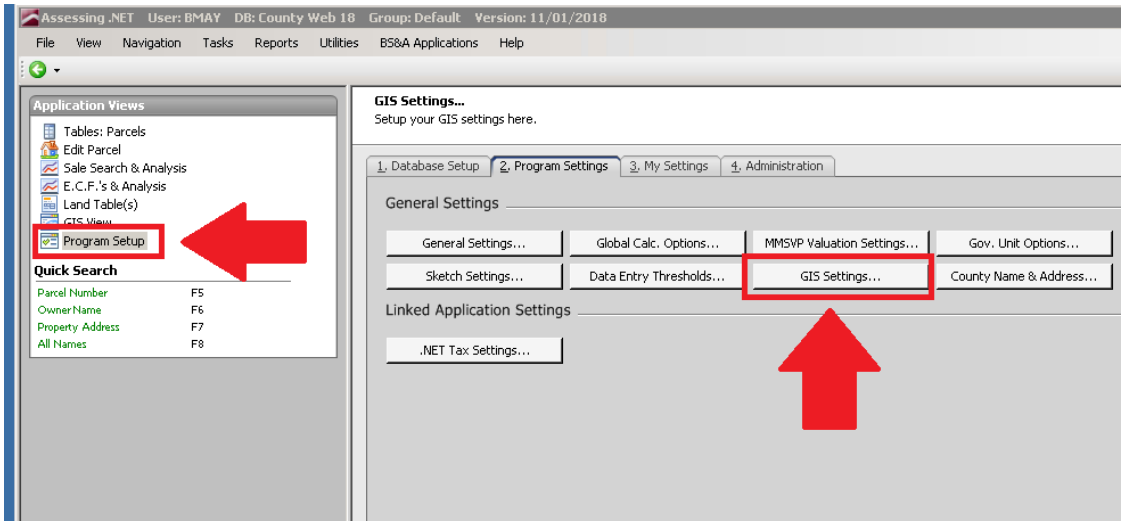


Figure 6.1: BSA Program Setup

Step 2: Select Map To Edit

In **GIS Settings** ⇒ **Map Collections** ⇒

Double click on the map that you want to add a layer to

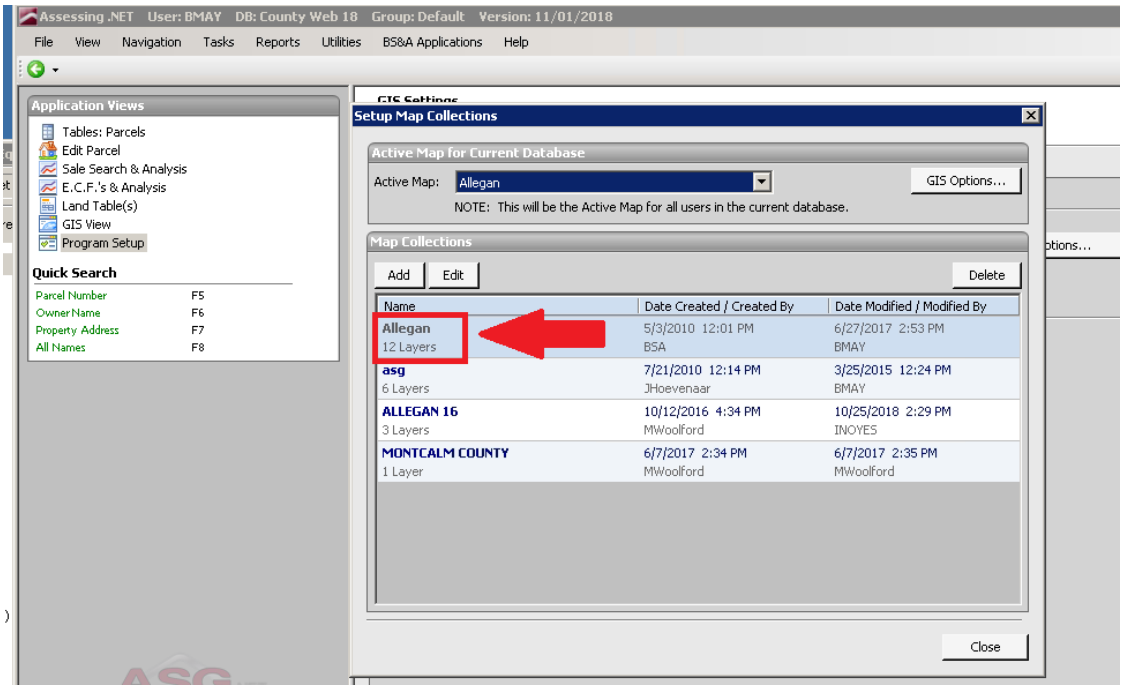


Figure 6.2: GIS Setup

Step 3: Add Layer

Setup Layers ⇒ Add

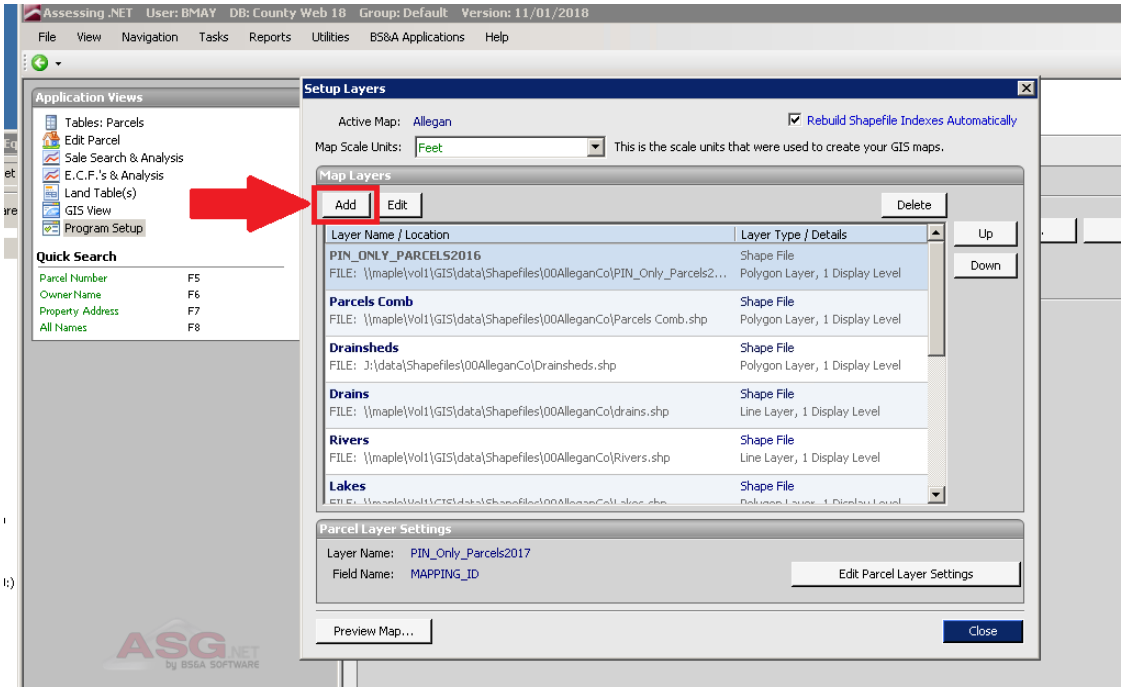


Figure 6.3: Layers Setup

Step 4: Select Layer Type

Setup Layers ⇒ Image ⇒ OK

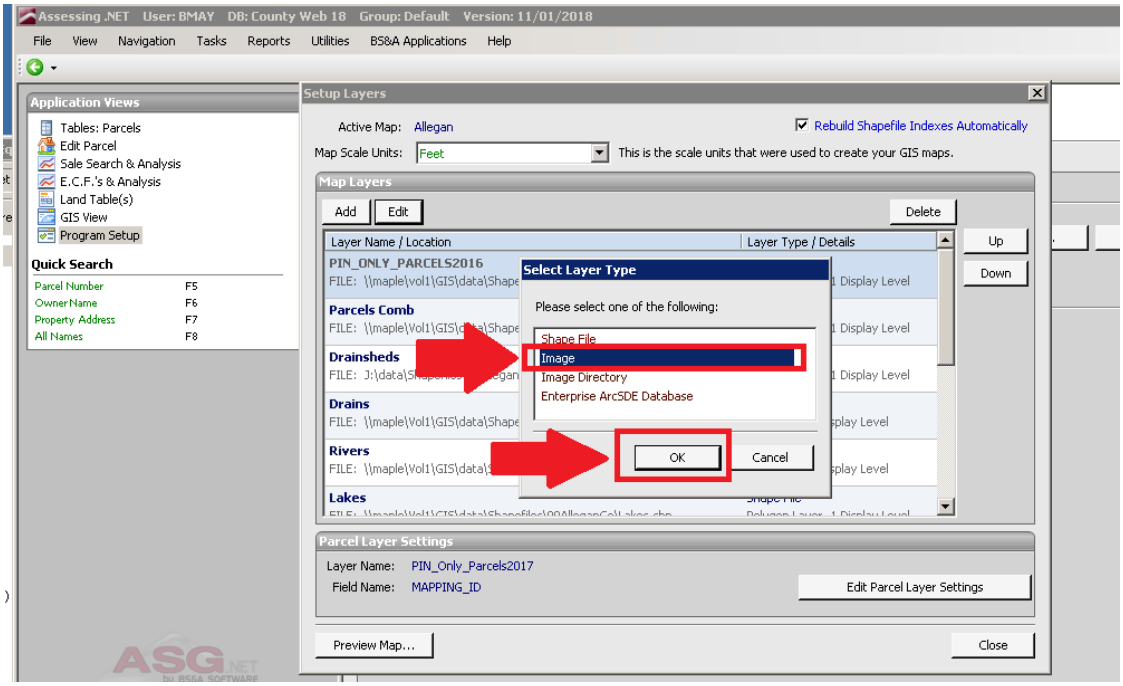


Figure 6.4: Select Layer Type

Step 5: Add Layer From Local Drive

Navigate to Image File ⇒ **Open**

∗image files are often file type .sid

∗layer files are often file type .shp

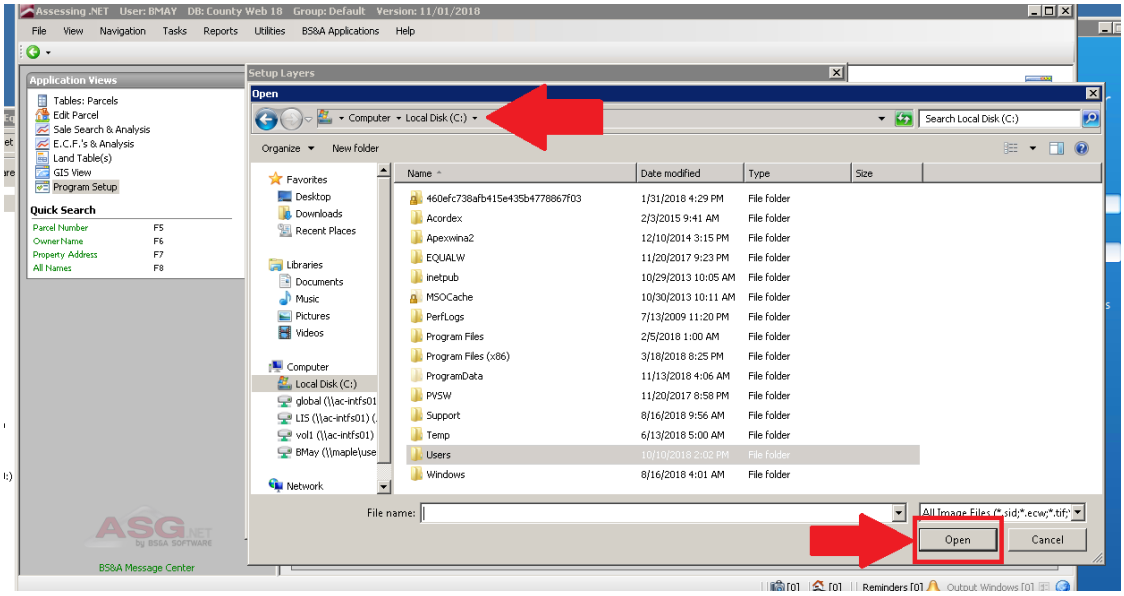


Figure 6.5: Add Layer From Drive

The new image should now be in the map

6.2 Core Data

6.2.1 GIS Data Maintenance

Tool Summary

Background

Allegan County GIS Services works with various stakeholders to maintain authoritative data. Often mapping requests involve data maintenance and sometime require data schema alterations.

Why is the Tool Needed

Though the variety of GIS data input and maps output required of the different stakeholders varies and is extensive, general workflow details can be synchronized. It is important that this workflow be platform independent and therefore may be described in somewhat general terms.

Who is the Tool For

Allegan County GIS Services staff.

Takeaways

This general workflow can be used to maintain authoritative data and fulfill mapping requests efficiently. This documentation will assist in evaluating and executing mapping requests that involve any core data edits.

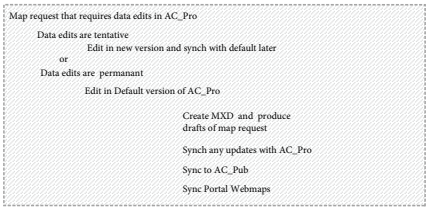


Figure 6.6: Workflow Summary

OVERVIEW

Inputs

- Map request requiring edits in ACPro

Outputs

- Maps
- Updates to ACPro
- Updates to ACPub
- Updates to Portal Maps

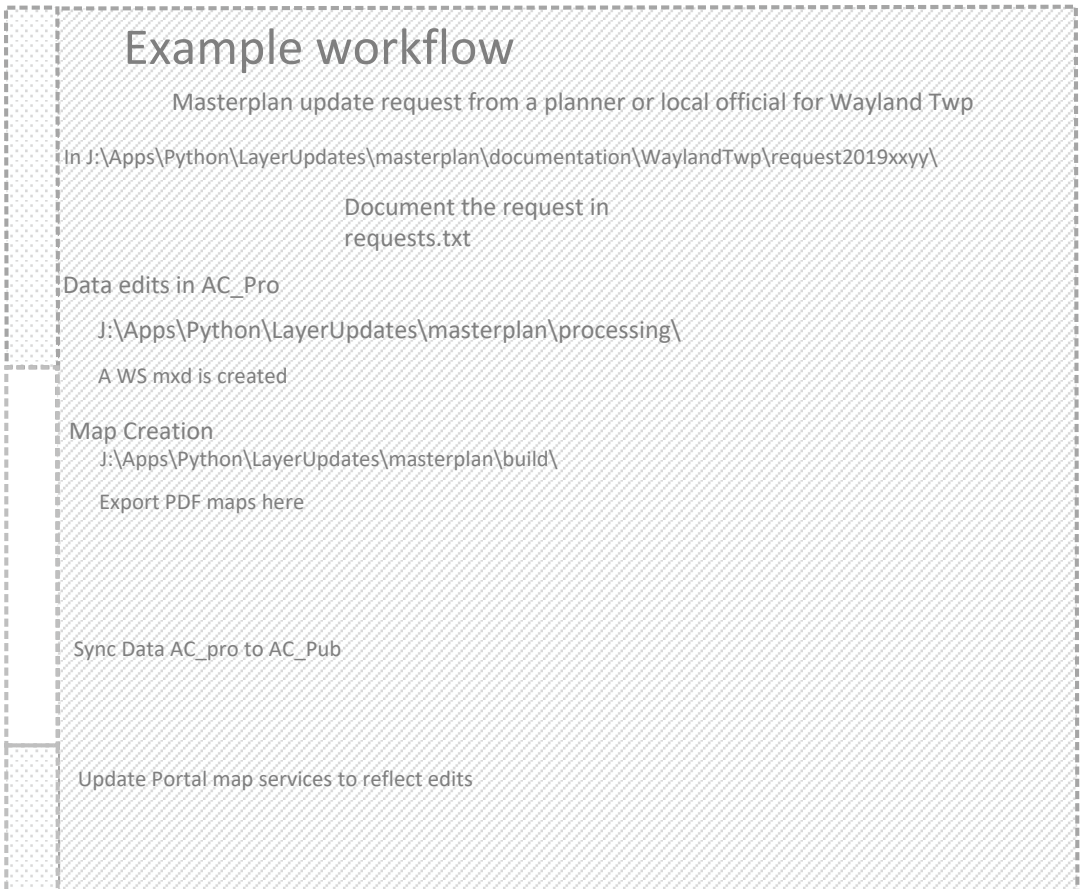


Figure 6.7: Workflow Overview

⇒ Push the Configure Button

6.2.2 Control Points

Maintaining Cadastral Control Points

Install the Fabric Point Move to Feature Addin

⇒ Push the Configure Button

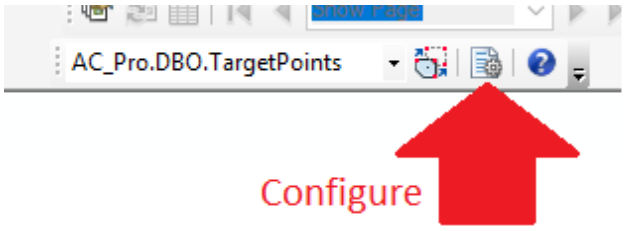


Figure 6.8: Fabric Point Move to Feature Addin

Configure Addin

- Set Reference Feature Layer to TargetPoints
- Use point to point matching
- Use point layer field: PointID

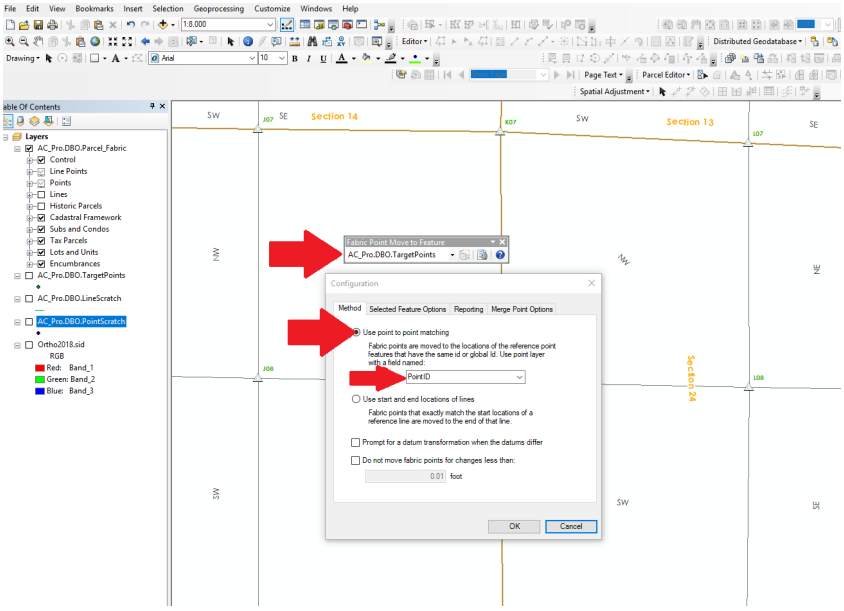


Figure 6.9: Addin Configuration Method

2
Configure Fabric Point Move to Feature addin Selected Feature Options
Move Fabric Points of the Selected Parcels
Push OK
FabricPointMoveToFeatureConfigSelectedFeatures.png

3
Identify position of new control point
Select TargetPoints in Create Features Templates
Create Target Point at location for new Control Point
createTargetPoint.png

4
Use Identify tool to find ObjectID of Control Point that is to be moved
Select the Target point PointID of the point its moving to
Edit Target Point pointID attribute to match associated fabric control point OID
updateTargetPointPointID.png

4.5
Push move point button
moveControlPoint.png

5
Open maintain control point tool
Select control Point
push edit button
maintainControlPointTool.png

6
Use Identify Tool to View X and Y vals for the point
copy x and y value from point(attribute window) to Control (maintain control tool)
push update
Save Edits
transferCoordinates.png

Identify position of new control point

Place Taarget Point

Update Target Point attributes to associated fabric point OID

Push move point button

Zoom to Control point

Open maintain control point tool

Select control Point

edit button

copy x and y value from

identify tool x and y of points

update button

6.3 Core Data Schema

Problem and Analysis

Background

Allegan County GIS Services builds and maintains the geographic dataset used in workflows in and out of county government.

Statement of Problem

Geographic data must be be both maintained and shared. Data is maintained by Equalization and GIS Services. Data is shared with EH, EQ, Dispatch and the public.

Analysis

Here is where analysis of this problem goes

DESIGN

Overview

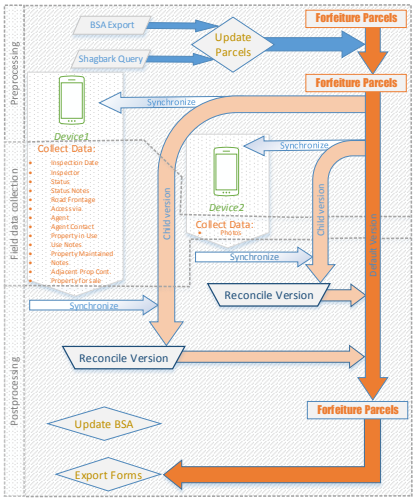


Figure 6.10: Project Design

6.3.1 Production Data AC PRO

Domains

Directory Location

Managed at this location:

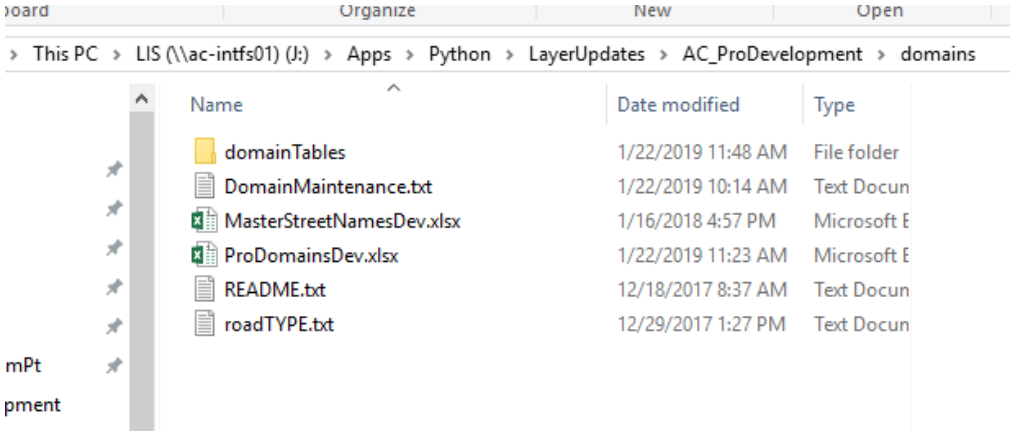


Figure 6.11: Directory Location of Workspace

Domain Documentation

This is where...

⇒ Push the Configure Button

6.4 ESRI Tools

COGO Tools in ArcGIS

COGO Workspace Setup

Navigate to the COGO Mapping document (MXD)

`J:\Departments\Treasury\gis\COGO`

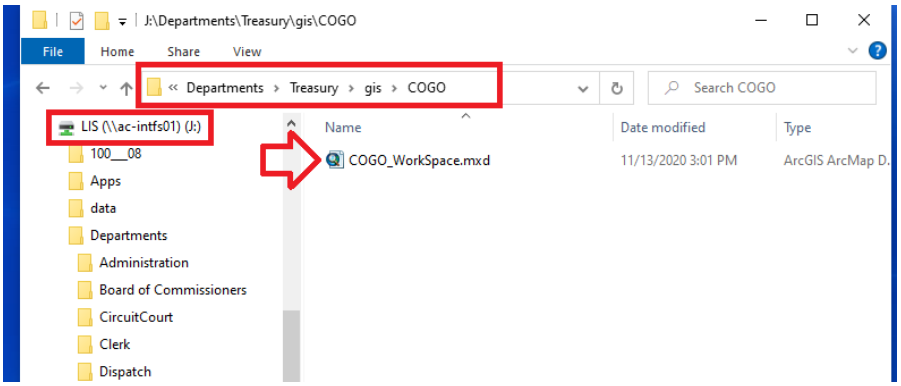


Figure 6.12: COGO Map File

Copy the file to your personal workspace

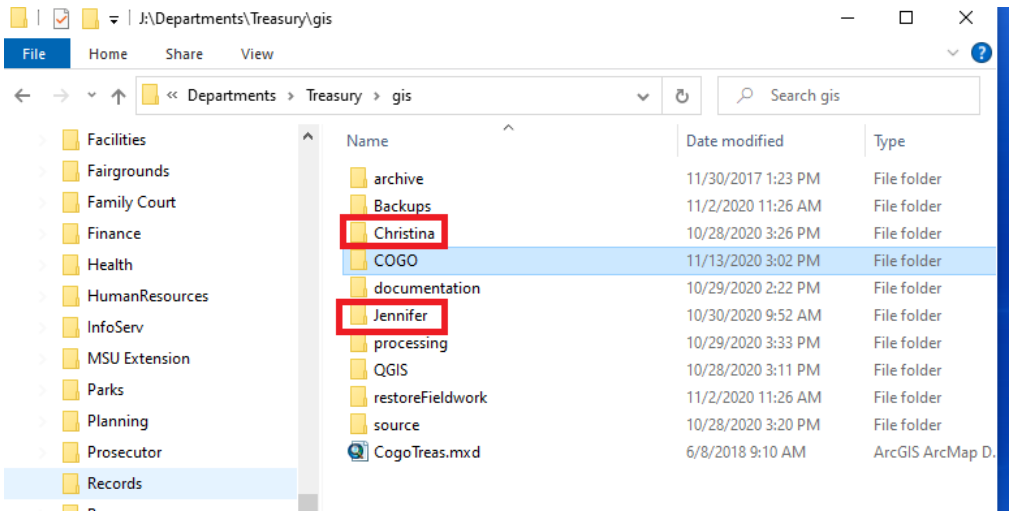


Figure 6.13: User Folder

Double click on COGOWorkSpace.mxd to open it

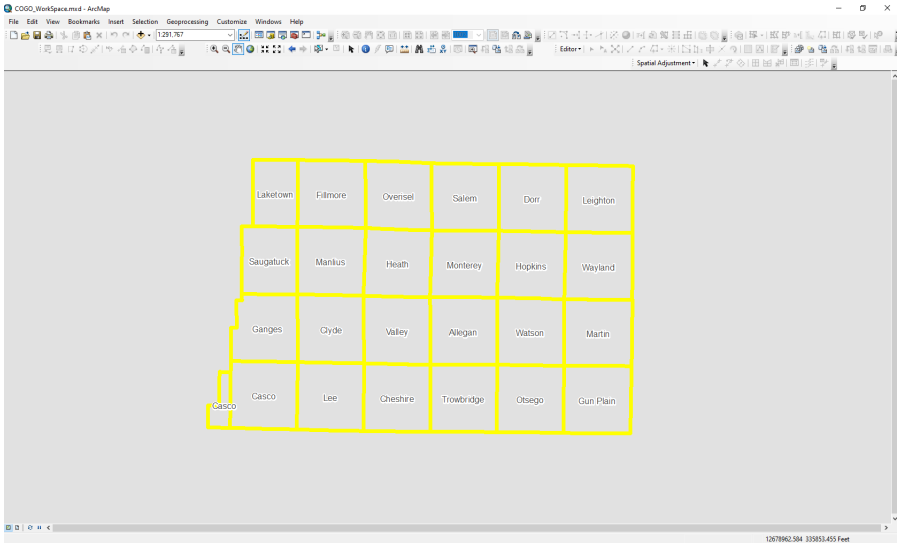


Figure 6.14: First Screen

Zooms out to show all features in the broadest layer

Push Full Extent Tool

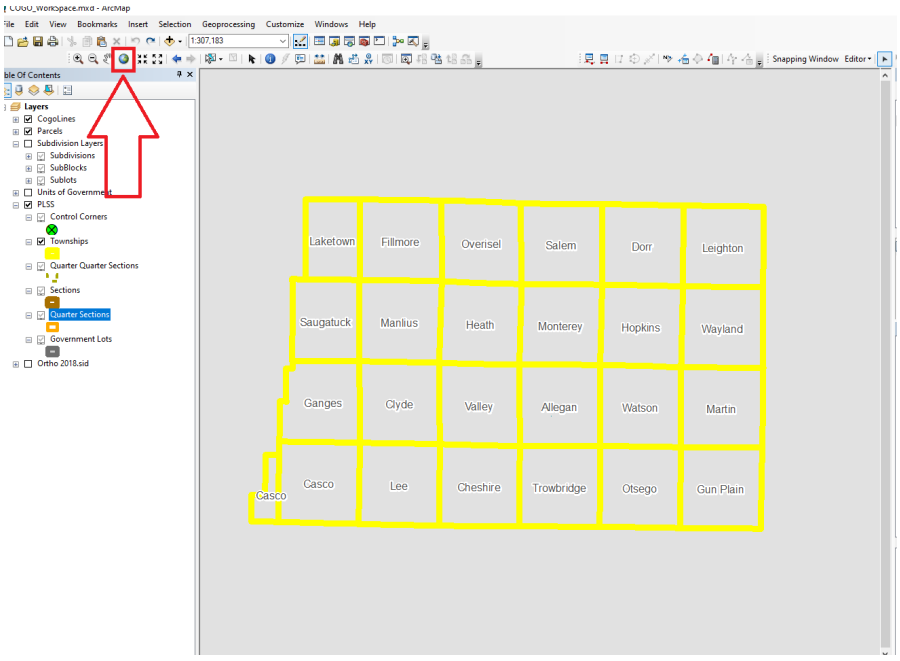


Figure 6.15: Full Extent Tool Result

Set up editor options for COGO:

Push Editor Toolbar Button to get the dropdown

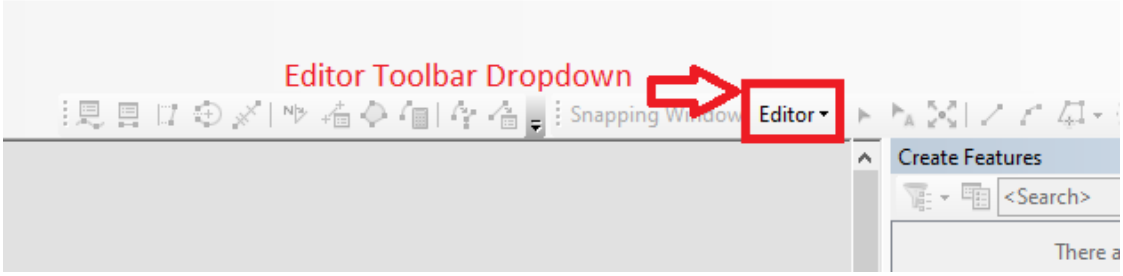


Figure 6.16: Editor Toolbar Button

Set units for COGO:

Editor ⇒ Options ⇒ Units

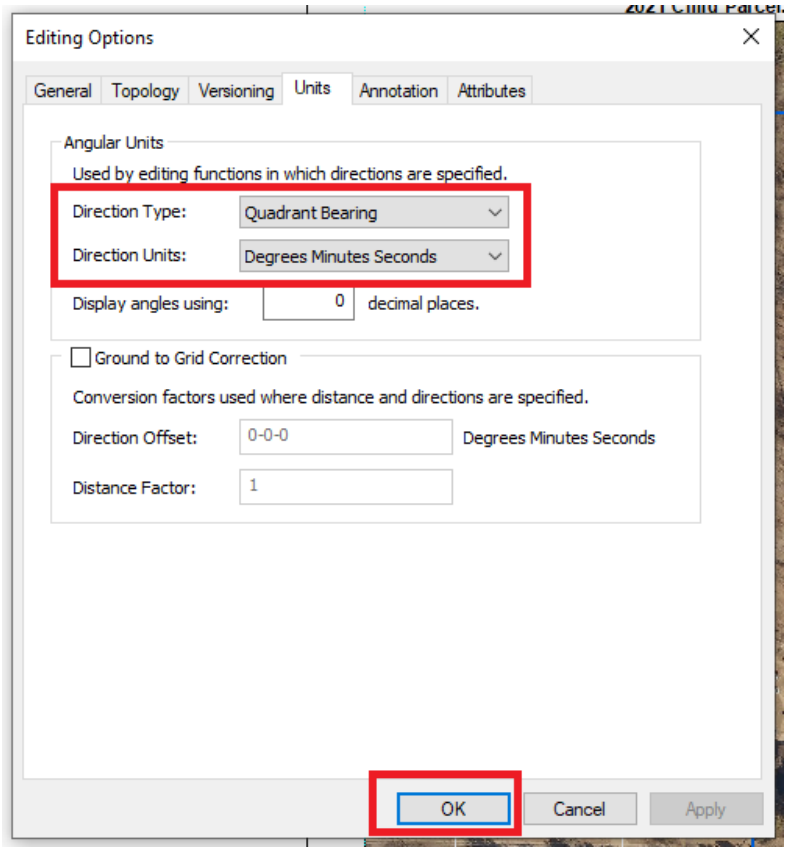


Figure 6.17: Editor Options

Snapping Setup

Snapping settings are important for accuracy and precision in editing GIS data

Enable Classic Snapping

Editor ⇒ Options ⇒ General ⇒ Use Classic Snapping

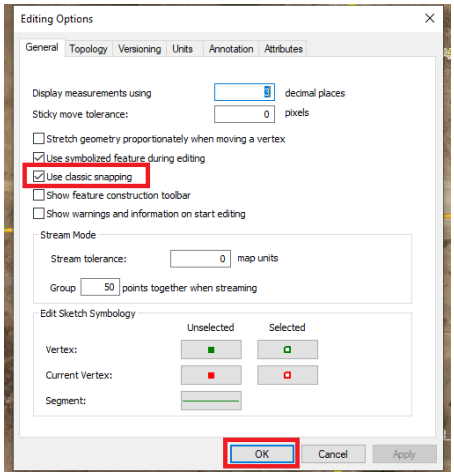


Figure 6.18: Enable Classic Snapping

Enable Snap Tips

Snap Tips are text that show what you are snapping to

Editor Dropdown ⇒ Snapping ⇒ Options

➢ Check the box for Show Snap Tips

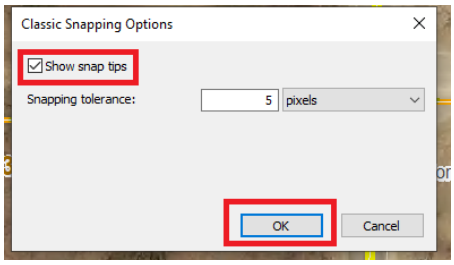


Figure 6.19: Enable Snap Tips

Configure Snapping Window

For each feature layer in the map there are 3 options for snapping:
Vertex, Edge,and End Snapping

Open the Snapping Window
Editor ⇒ Snapping ⇒ Snapping Window
These settings are a good start:

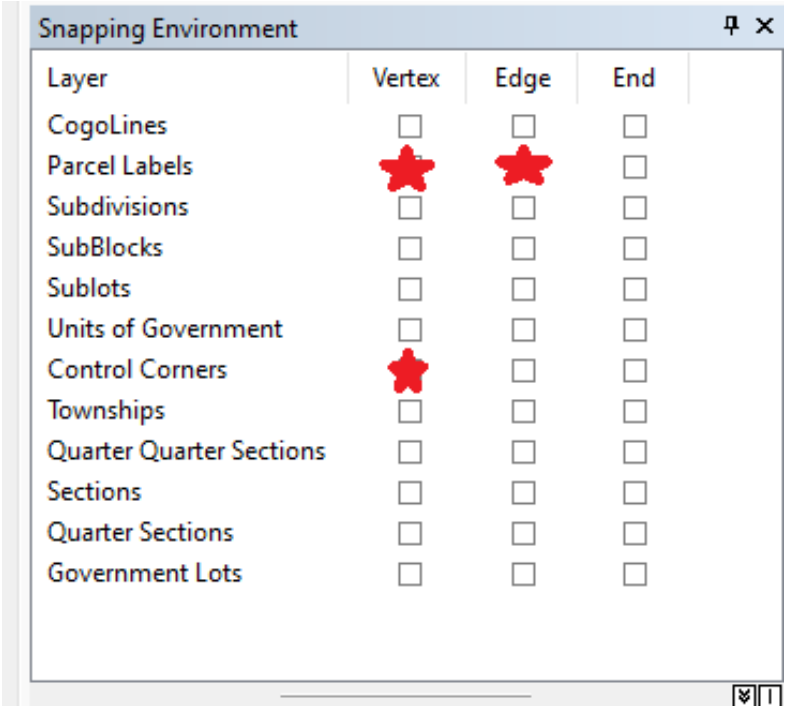


Figure 6.20: Snapping Window

For more information on Snapping:

Link to Documentation on Classic Snapping

Find starting point for COGO sketch

Using the Find Tool

If you have a parcel number near your area of interest, you can use the find tool to get there.

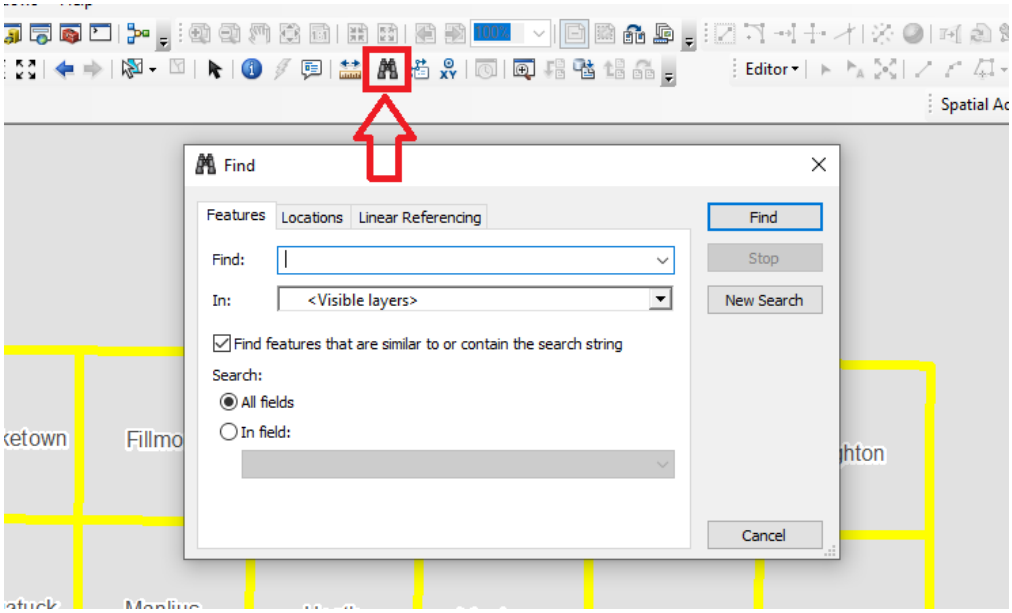


Figure 6.21: Find Tool

Enter a parcel number into the Find Tool

Input the:

- Parcel Number
- Layer to search
- Field to search

Push Find

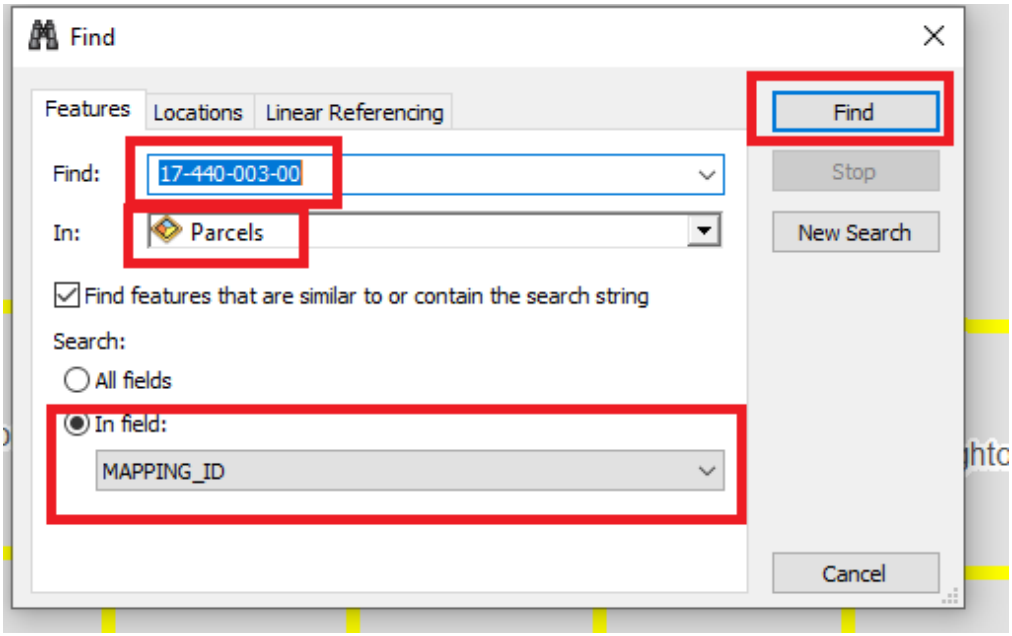


Figure 6.22: Tool Data

If find tool finds a match:
right click on it and select zoom to

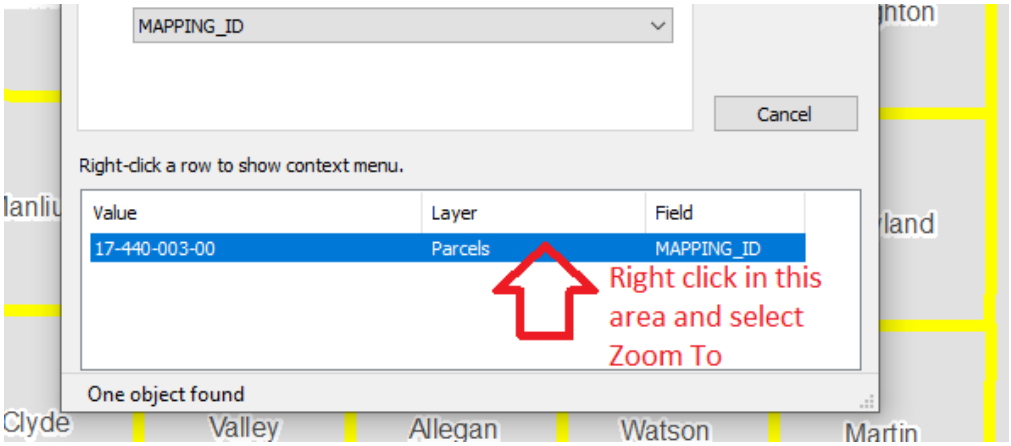


Figure 6.23: Match

Find a starting point for mapping by:

- Using the mouse wheel to zoom in or out
- Toggle layers on or off in the table of contents

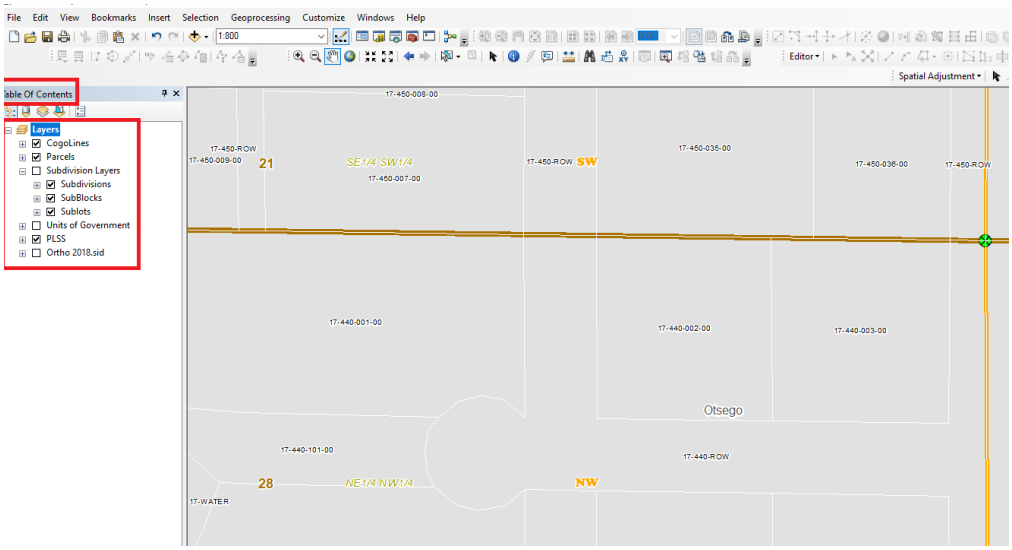


Figure 6.24: Reference Point

Begin COGO Sketch

Start Editing

Editor ⇒ Start Editing

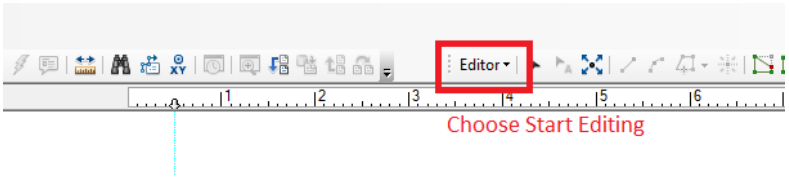


Figure 6.25: Editor Toolbar

In the start editing box, under source, select the Shareddata connection

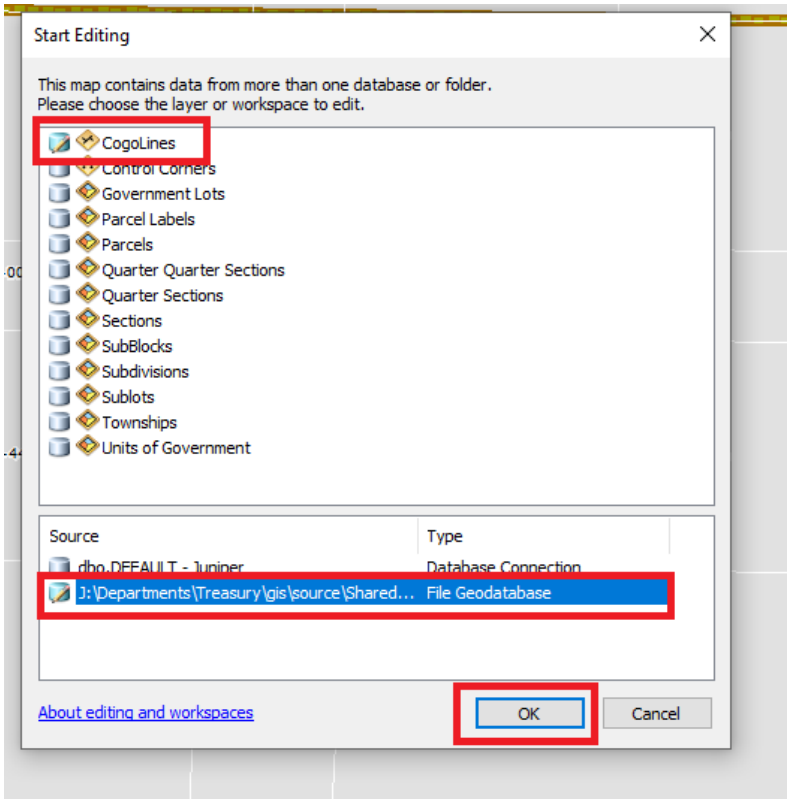


Figure 6.26: Start Editing

Use the Traverse Tool on the COGO Toolbar

Once you have your starting point:

Push Traverse on the COGO toolbar

Push Template and select CogoLines

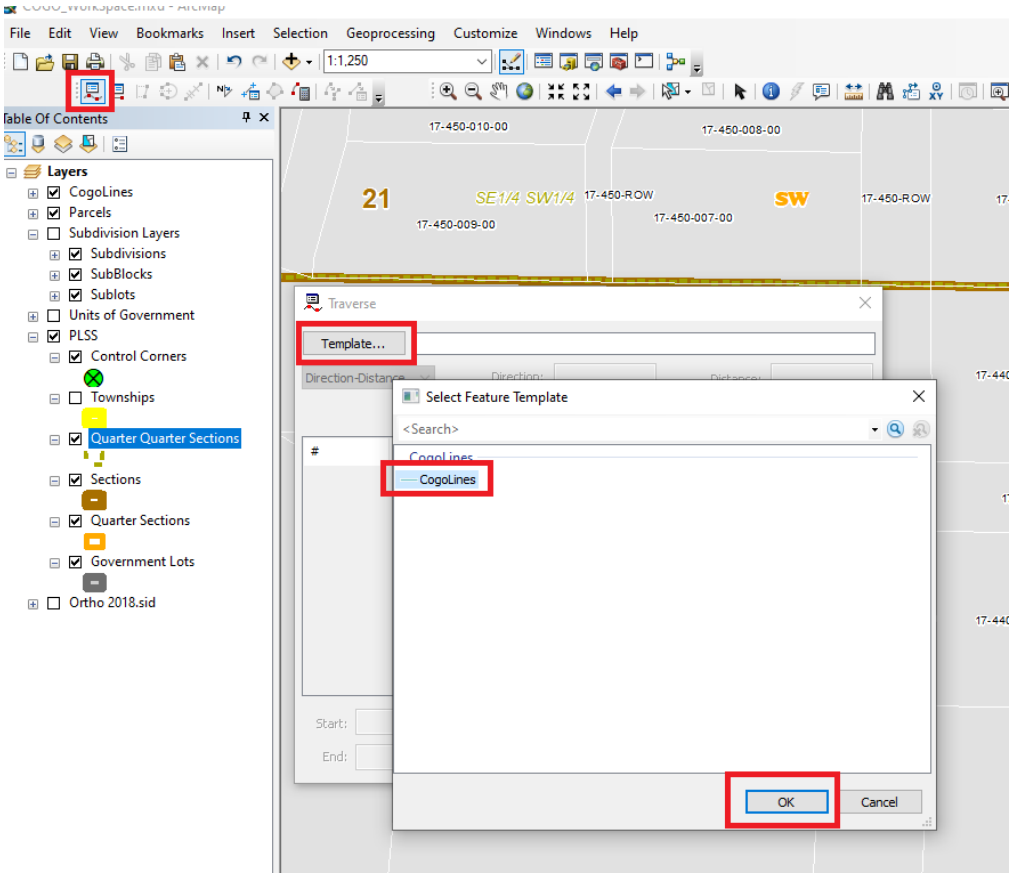


Figure 6.27: Launch COGO Toolbar

Example Legal Description

Commencing at the South Quarter post of Section 17, Town 1 North, Range 15 West; thence South 88° 28' 49" East on the South section line, 654.51 feet to the West line of the East Half of the Southwest Quarter of the Southeast Quarter and the place of beginning of this description; thence North 00° 44' 38" East on said West line, 295.00 feet; thence South 88° 28' 47" East 295.36 feet; thence South 00° 42' 30" West parallel to the East line of the Southwest Quarter of the Southeast Quarter, 295.00 feet to the South section line; thence North 88° 28' 49" West on same, 295.54 feet to the place of beginning.
Subject to any and all easements and restrictions of record, or otherwise. Subject to the rights of the public and of any governmental unit in any part thereof taken, used, or deeded for street, road, or highway purposes.

Figure 6.28: Sample Description

For this parcel, you can use the find tool to get to a nearby parcel or navigate to Lee Twp Section 17.

Once there, locate the South Quarter Post for the starting point for sketching.

Select Starting Point for the Sketch

To the right of the Start box: Push arrow+

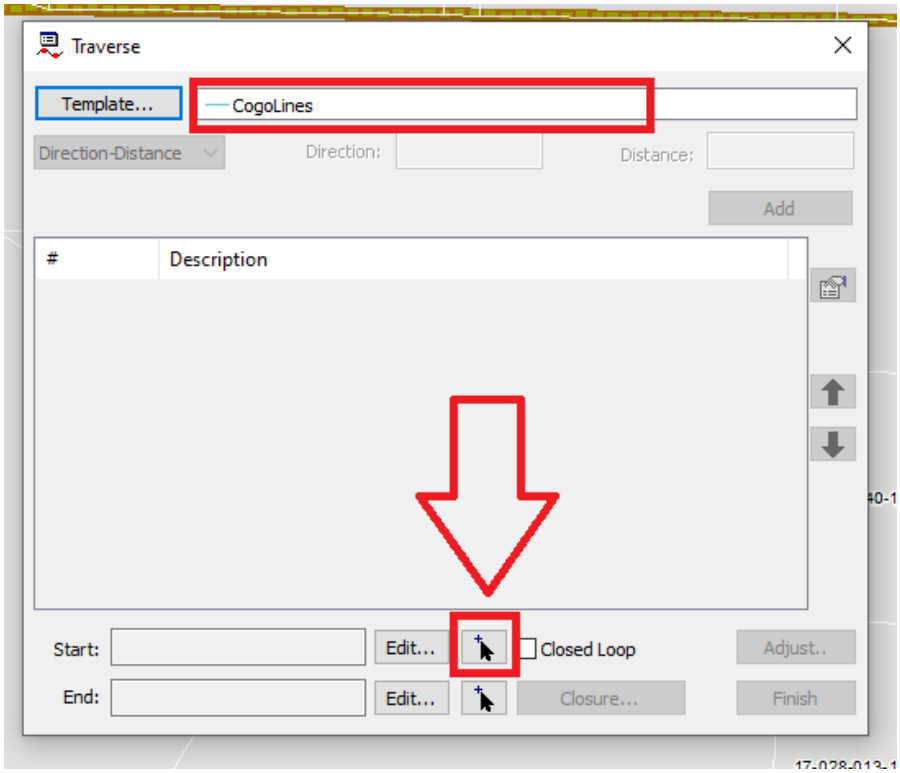


Figure 6.29: Start COGO

Click a starting point in the map

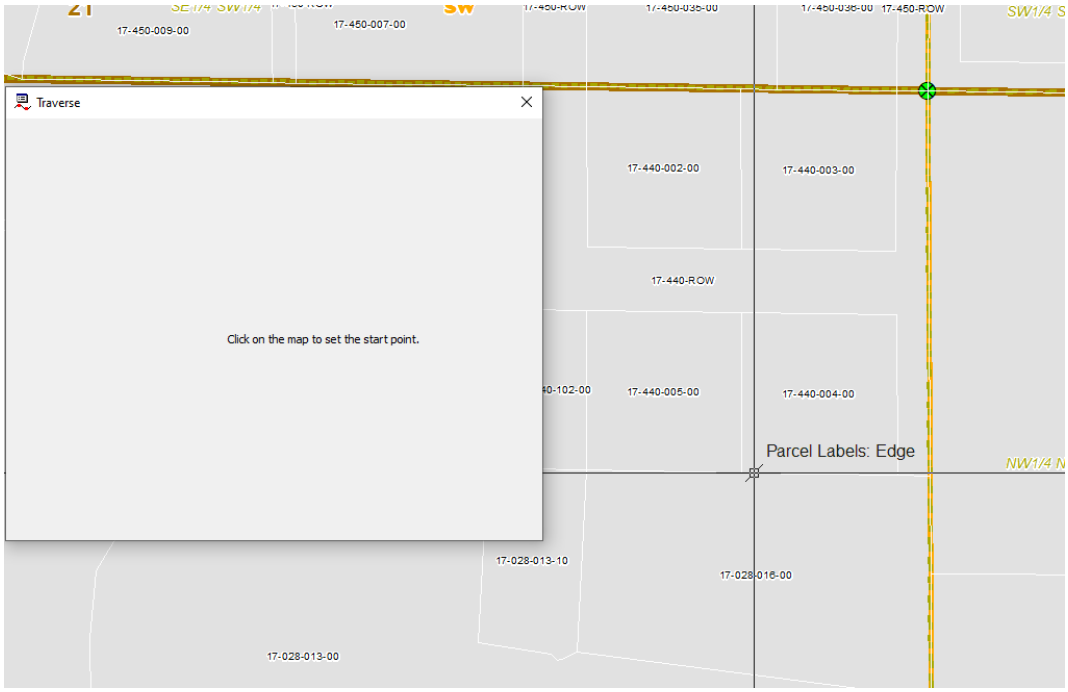


Figure 6.30: Click Starting Point

Note: The cursor should snap to points specified in the Snapping Window.

Enter COGO Inputs

Enter Direction and Distance

i.e.

From the South Quarter post of Section 17

One Direction Distance can be entered or the **entire traverse** can be entered at one time.

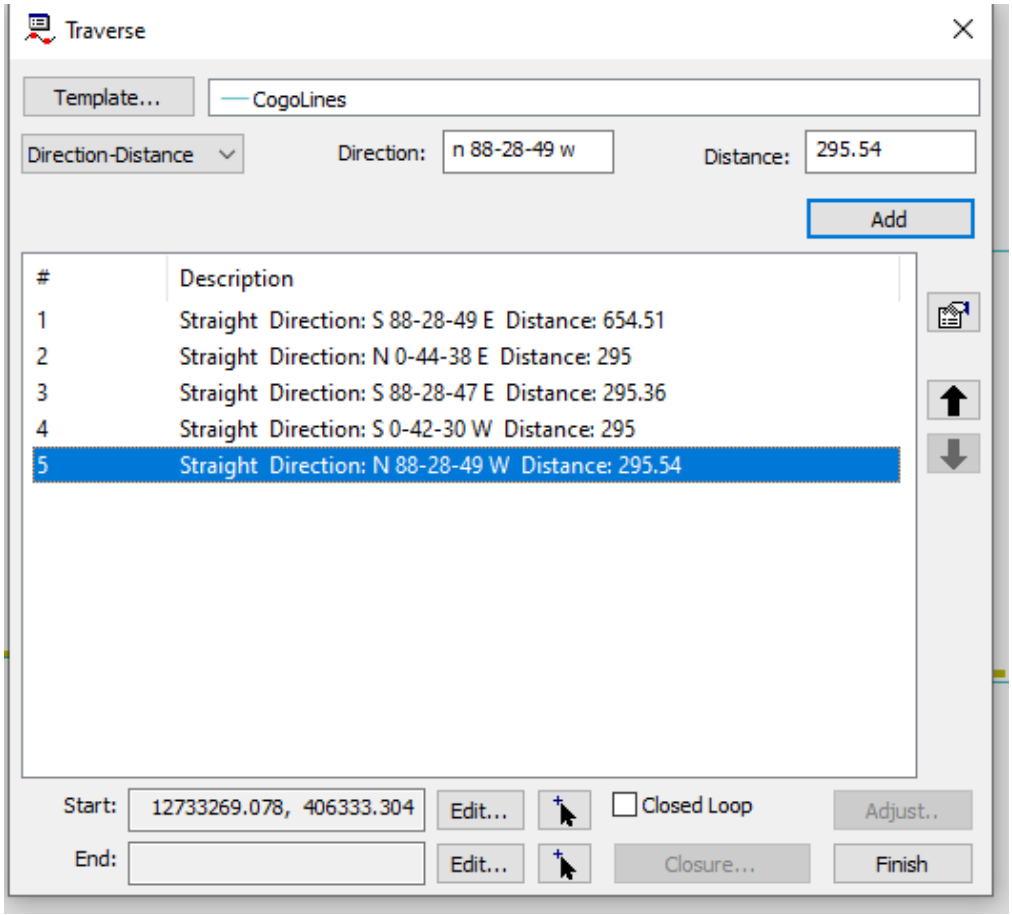


Figure 6.31: Sample Traverse

Push Finish and the lines are added to the data

More Examples of Direction Distance Inputs

To go straight North:

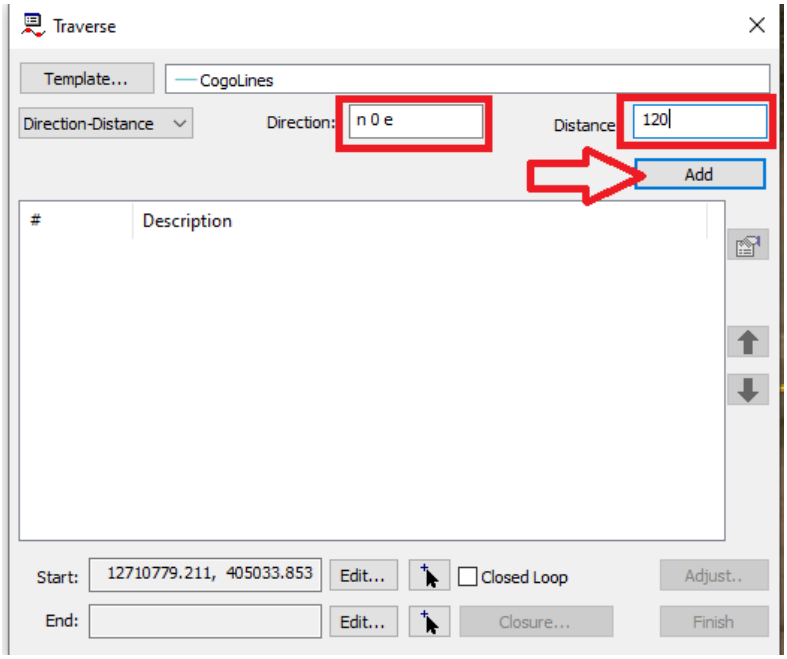


Figure 6.32: North Direction Distance

Push Add and the line is added to the sketch

Note: the sketch is only temporary at this point, lines can be reordered added and removed.

To go straight West:

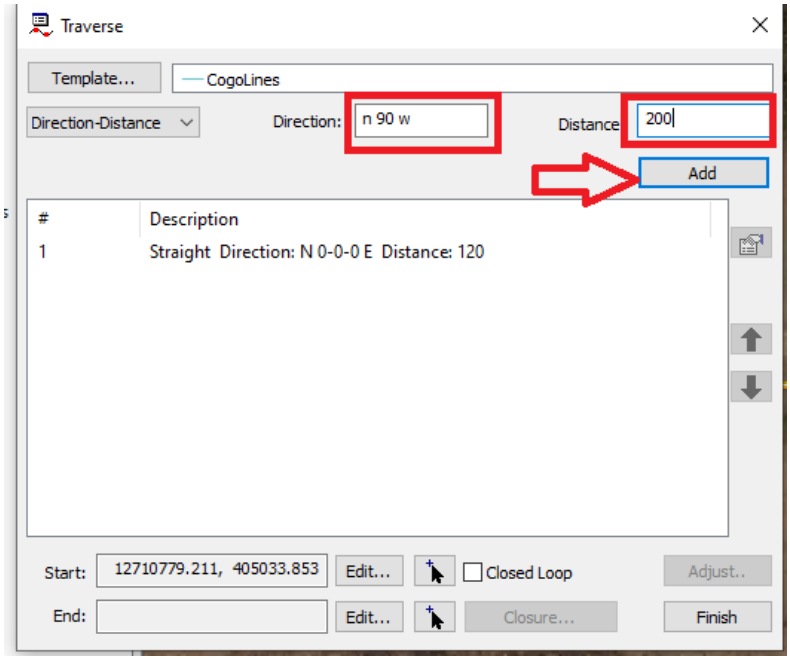


Figure 6.33: West Direction Distance

To go straight South:

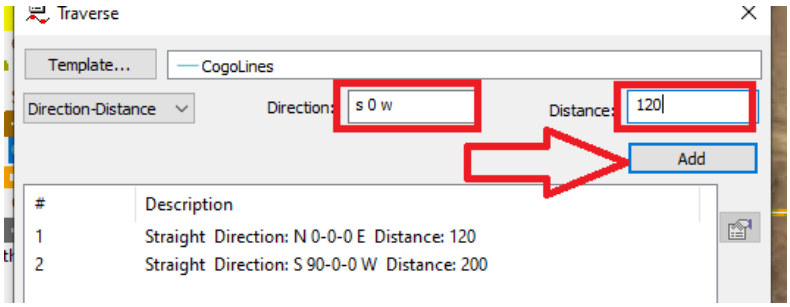


Figure 6.34: South Direction Distance

To go straight East:

Figure 6.35: East Direction Distance

Note: anytime before you push finish you can add or remove lines and reorder lines.

Push Finish and the lines are added to the data

6.5 GIS ADMINISTRATION

Register a server with ArcGIS Server

Site Settings in Server Manager

Figure 6.36: Site Settings

Add Fieldwork to Registered Databases

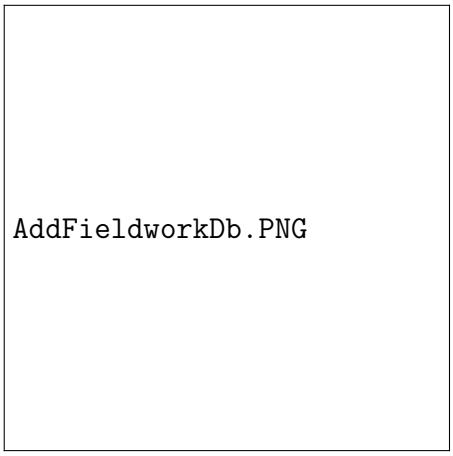


Figure 6.37: Add Fieldwork Database

Register Database

Figure 6.38: Details of Registered Database

6.5.1 Connecting to ArcGIS Server Admin Directory

Generate a Portal Token

Run the Python Script

```
import urllib, urllib2, json, ssl

username ="bmayxxx"
password = "gisRxxxxxxxx"

tokenURL = 'https://gis.allegancounty.org/portal_webadaptor/sharing/#
            rest/generateToken/'
params = {'f': 'pjson', 'username': username, 'password': password, 'referer':#
         'https://portal.allegancounty.org'}
req = urllib2.Request(tokenURL, urllib.urlencode(params))
try:
    response = urllib2.urlopen(req)
except:
    gcontext = ssl.SSLContext(ssl.PROTOCOL_TLSv1)
    response = urllib2.urlopen(req, context=gcontext)
data = json.load(response)
token = data['token']
print(token)
```

Copy the Portal Token

ARCGIS SERVER ADMIN LOGIN

Login to Juniper

Windows R ⇨ mstsc ⇨ Juniper

Connect to ArcGIS Server localhost

In a browser go to:

`https://localhost:6443/arcgis/admin/services/System`

UN: bmaxxxx

PW: gisRxxxxxxxx

Paste in the Portal Token

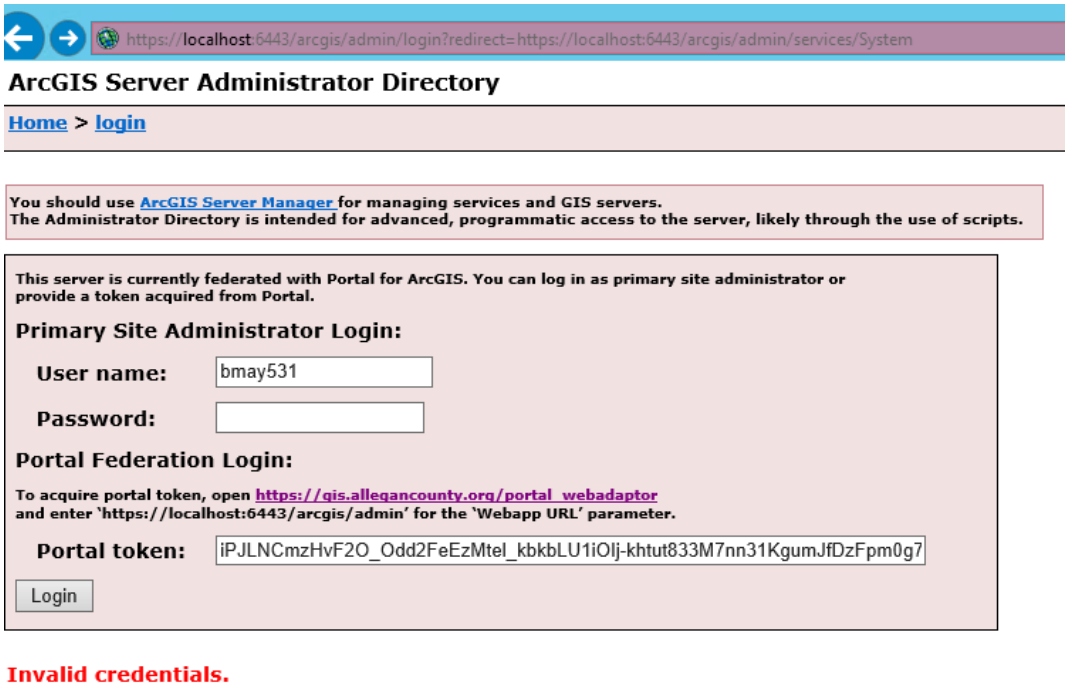


Figure 6.39: Login to Server Admin Directory

Push Login

6.5.2 New Connections in ArcCatalog

Install SQL Server on client machine

On client machine:

For any machine to connect to the Enterprise Geodatabase, SQL Server Native Client must be installed locally.

Search for sql server native client download on the internet

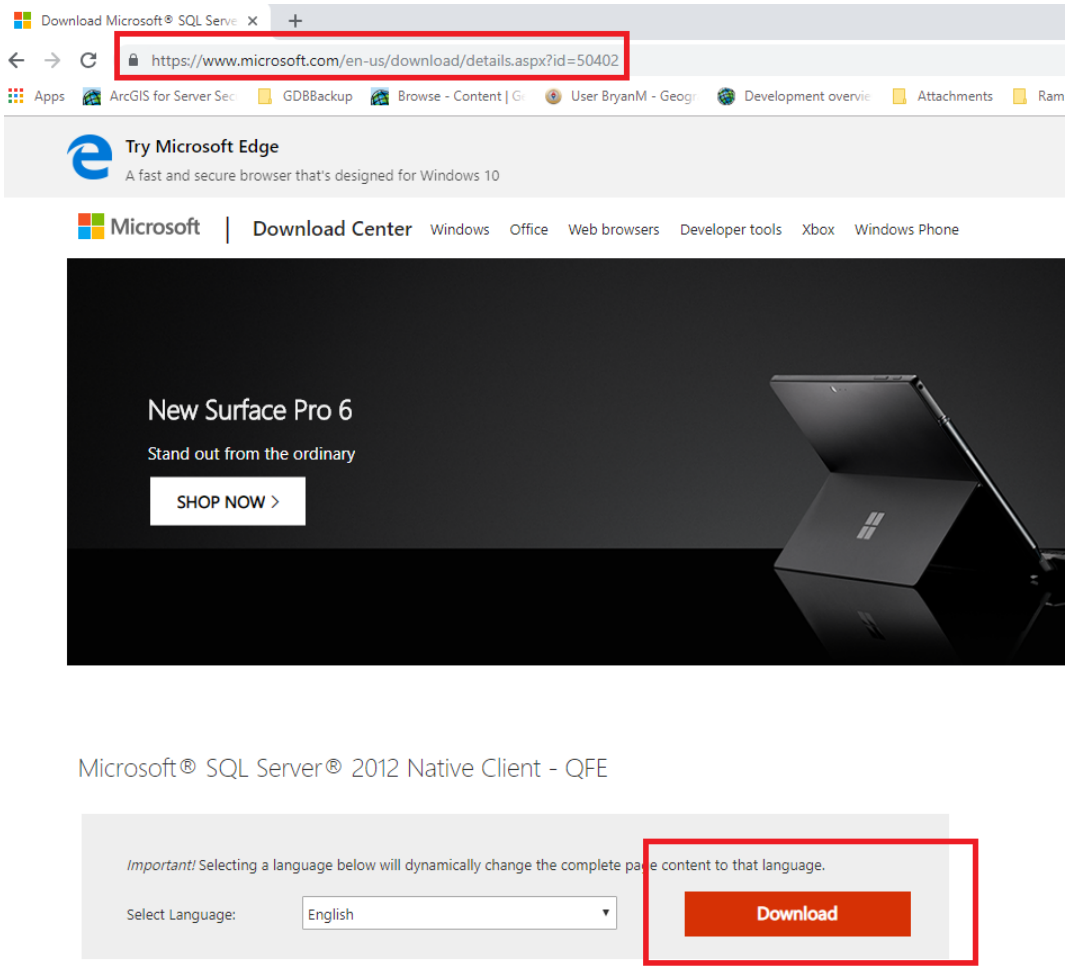


Figure 6.40: SQL Server Client Search

Select appropriate Version

Decide whether to get the 32bit or 64bit version

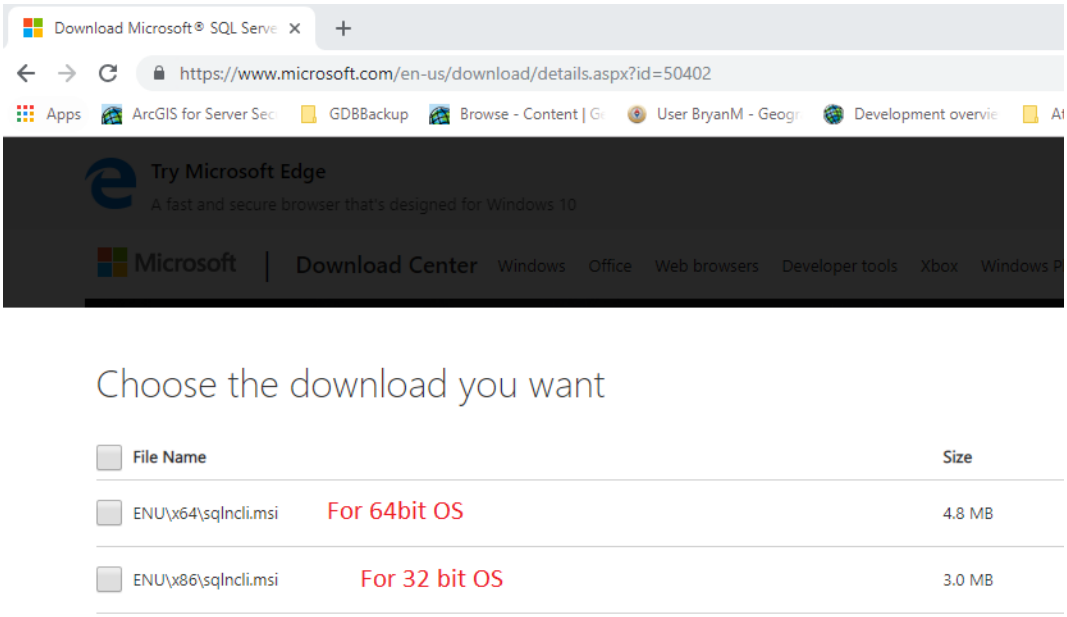


Figure 6.41: SQL Server Client Search Choose

Download and Install

CONNECT ARCGIS TO A SQL SERVER DATABASE

In Catalog:

Double click on add database connection

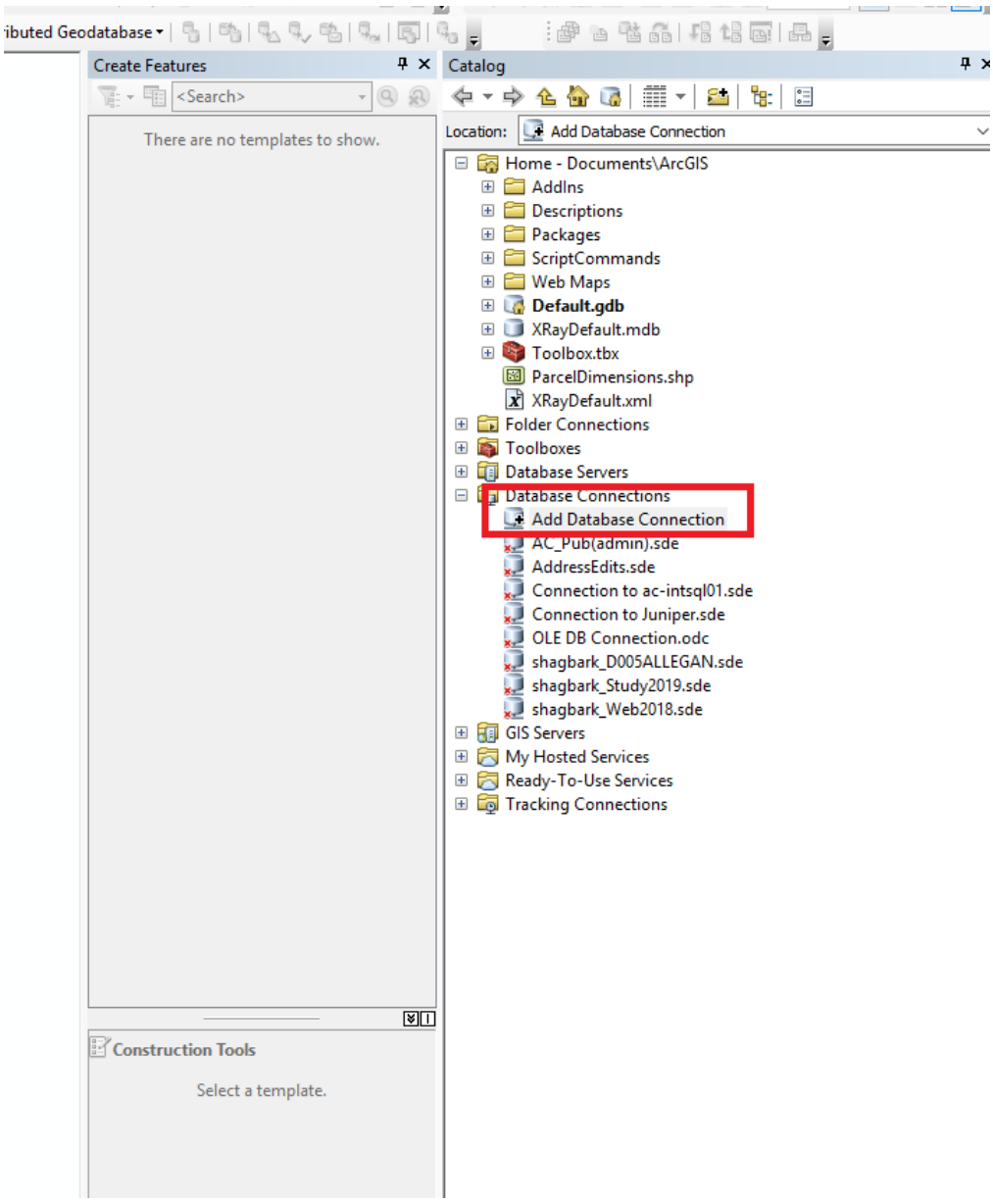


Figure 6.42: Catalog Add Db Connection

New Connection Dialog

Enter into the tool

- Select Database Platform
- Enter Instance Name
- Enter user name and password
- Check Save user name and password
- Select Database in dropdown

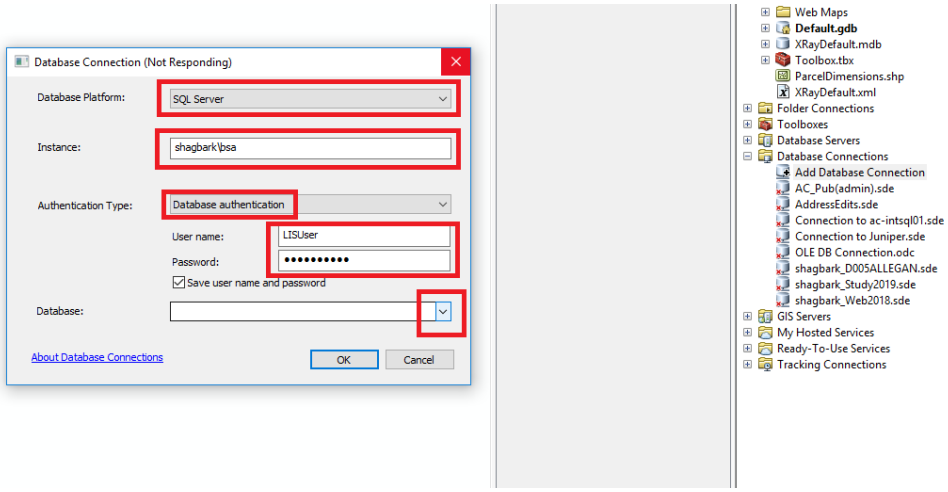


Figure 6.43: Catalog Add Database Connection

6.5.3 CREATE QUERY TO SQL DATABASE IN ARCGIS

ADD QUERY LAYER

In ArcMap:

Open the New Query Layer Dialog
Go to ⇒ File ⇒ Add Data ⇒ Add Query Layer In the connection dropdown select your connection

NOTE

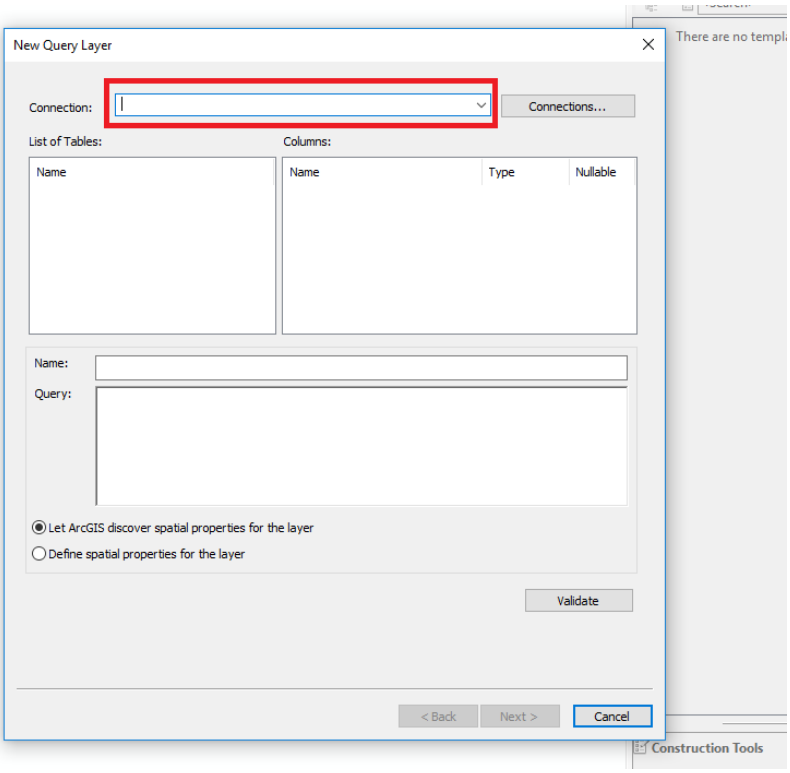


Figure 6.44: New Query Layer Dialog

DETAILS OF THE QUERY LAYER

Enter into the tool

- Choose connection
- Name the query
- Enter SQl query
- Press Next

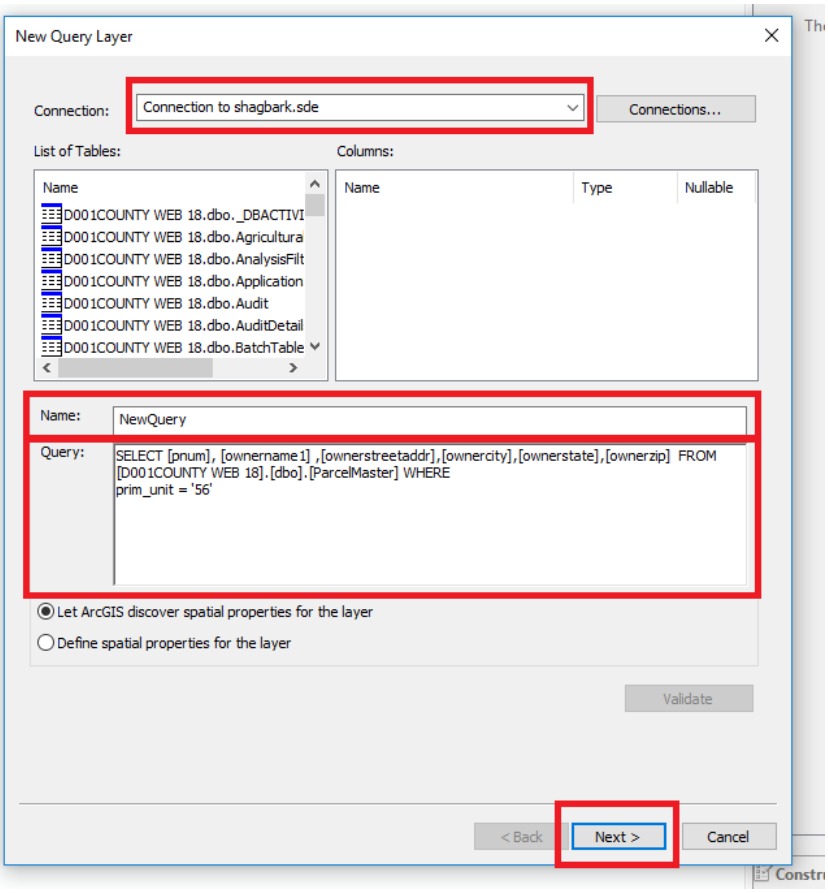


Figure 6.45: Query Layer Dialog Filled

More Details of the Query Layer

Enter into the tool

- Select unique identifier field
- Click Finish

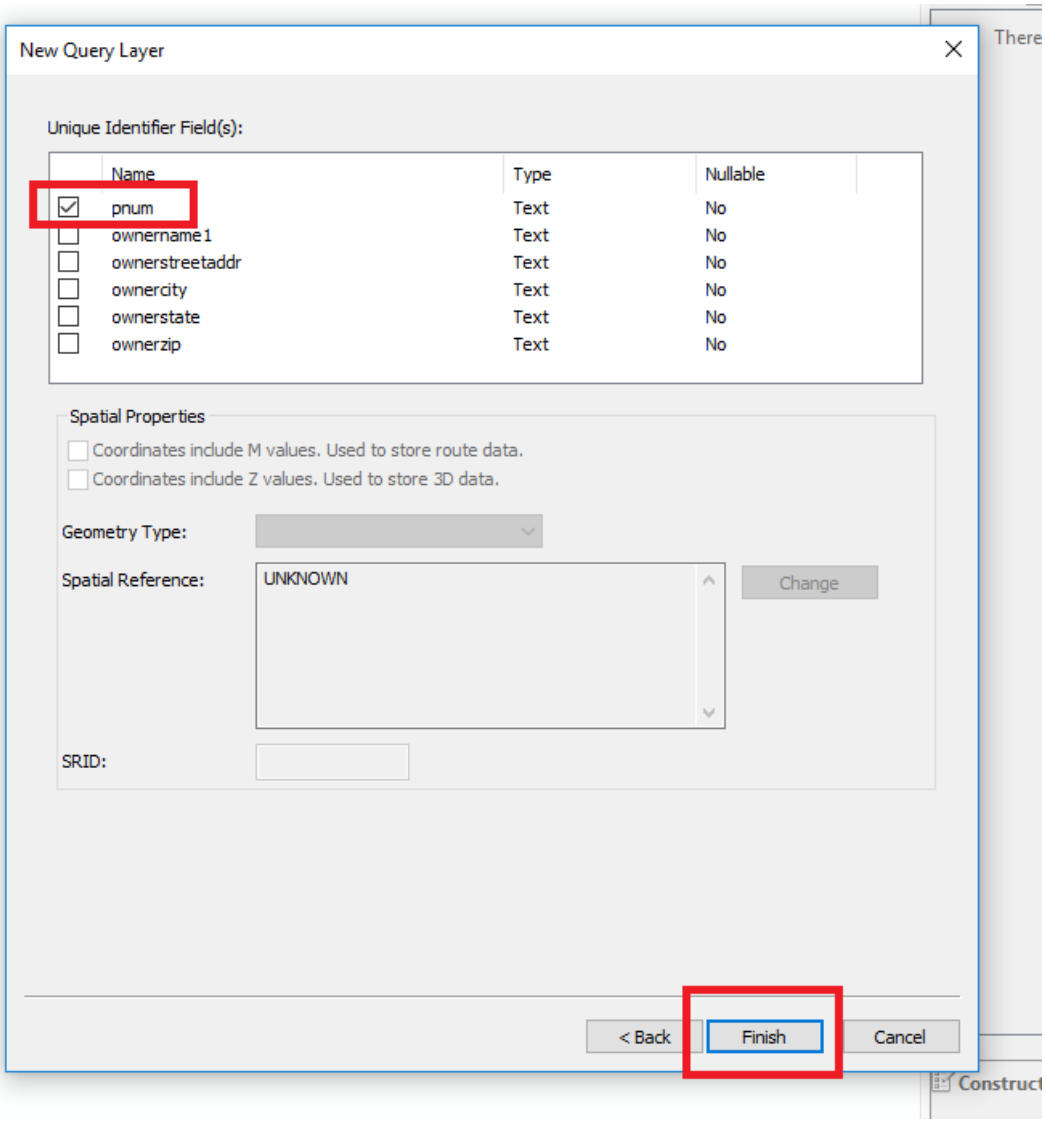
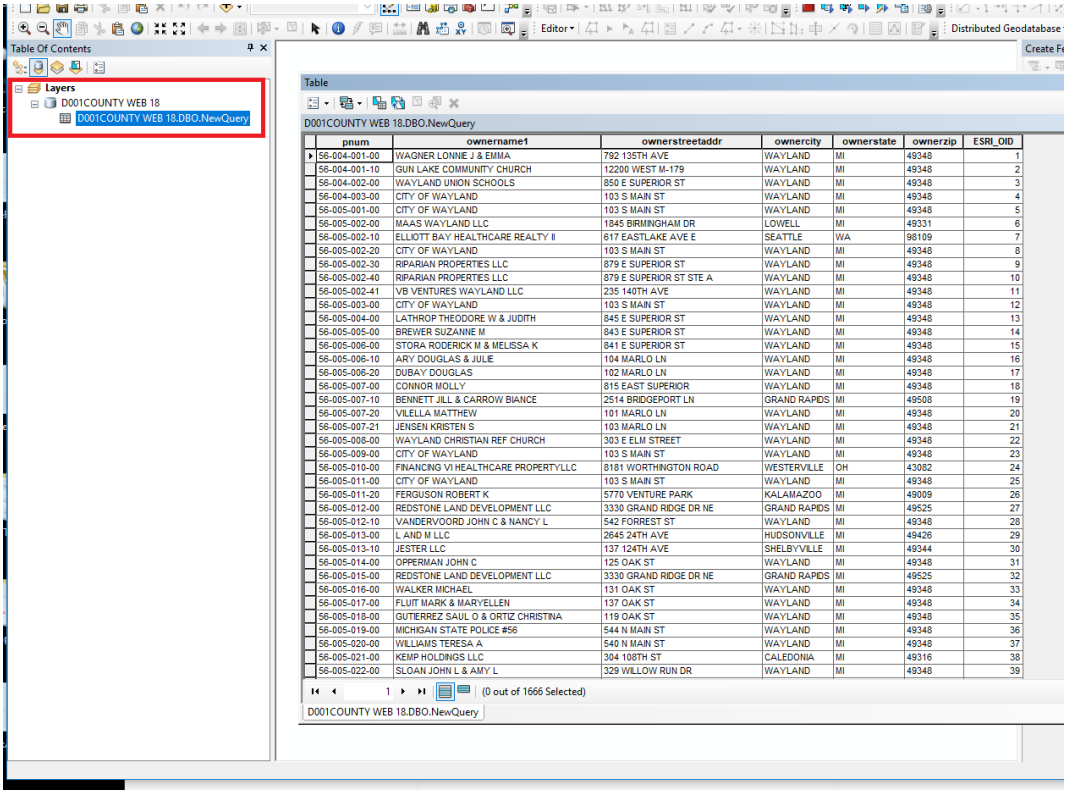


Figure 6.46: Select Unique Identifier

OPEN RESULTS TABLE

Verify the Query by Looking at the Table



pnum	ownername1	ownerstreetaddr	ownercity	ownerstate	ownerzip	ESRI_OID
56-004-001-00	WAGNER LONNIE J & EMMA	792 135TH AVE	WAYLAND	MI	49348	1
56-004-001-10	GUN LAKE COMMUNITY CHURCH	12200 WEST M-179	WAYLAND	MI	49348	2
56-004-002-00	WAYLAND UNION SCHOOLS	850 E SUPERIOR ST	WAYLAND	MI	49348	3
56-004-003-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	4
56-005-001-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	5
56-005-002-00	MAAS WAYLAND LLC	1845 BIRMINGHAM DR	LOWELL	MI	49331	6
56-005-002-10	ELLIOTT BAY HEALTHCARE REALTY II	617 EASTLAKE AVE E	SEATTLE	WA	98109	7
56-005-002-20	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	8
56-005-002-30	RIPARIAN PROPERTIES LLC	879 E SUPERIOR ST	WAYLAND	MI	49348	9
56-005-002-40	RIPARIAN PROPERTIES LLC	879 E SUPERIOR ST STE A	WAYLAND	MI	49348	10
56-005-002-41	VB VENTURES WAYLAND LLC	235 140TH AVE	WAYLAND	MI	49348	11
56-005-003-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	12
56-005-004-00	LATHROP THEODORE W & JUDITH	845 E SUPERIOR ST	WAYLAND	MI	49348	13
56-005-005-00	BREWER SUZANNE M	843 E SUPERIOR ST	WAYLAND	MI	49348	14
56-005-006-00	STORA RODERICK M & MELISSA K	841 E SUPERIOR ST	WAYLAND	MI	49348	15
56-005-006-10	ARY DOUGLAS & JULIE	104 MARLO LN	WAYLAND	MI	49348	16
56-005-006-20	DUBAY DOUGLAS	102 MARLO LN	WAYLAND	MI	49348	17
56-005-007-00	CONNOR MOLLY	815 EAST SUPERIOR	WAYLAND	MI	49348	18
56-005-007-10	BENNETT JILL & CARROW BIANCE	2514 BRIDGEPORT LN	GRAND RAPIDS	MI	49508	19
56-005-007-20	VILELLA MATTHEW	101 MARLO LN	WAYLAND	MI	49348	20
56-005-007-21	JENSEN KRISTEN S	103 MARLO LN	WAYLAND	MI	49348	21
56-005-008-00	WAYLAND CHRISTIAN REF CHURCH	303 E ELM STREET	WAYLAND	MI	49348	22
56-005-009-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	23
56-005-010-00	FINANCING VI HEALTHCARE PROPERTYLLC	8181 WORTHINGTON ROAD	WESTERVILLE	OH	43082	24
56-005-011-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	25
56-005-011-20	FERGUSON ROBERT K	5770 VENTURE PARK	KALAMAZOO	MI	49009	26
56-005-012-00	REDSTONE LAND DEVELOPMENT LLC	3330 GRAND RIDGE DR NE	GRAND RAPIDS	MI	49525	27
56-005-012-10	VANDERVOORD JOHN C & NANCY L	542 FORREST ST	WAYLAND	MI	49348	28
56-005-013-00	L AND H LLC	2645 24TH AVE	HUDSONVILLE	MI	49426	29
56-005-013-10	JESTER LLC	137 124TH AVE	SHELBYVILLE	MI	49344	30
56-005-014-00	OPPERMAN JOHN C	125 OAK ST	WAYLAND	MI	49348	31
56-005-015-00	REDSTONE LAND DEVELOPMENT LLC	3330 GRAND RIDGE DR NE	GRAND RAPIDS	MI	49525	32
56-005-016-00	WALKER MICHAEL	131 OAK ST	WAYLAND	MI	49348	33
56-005-017-00	FLUIT MARK & MARYELLEN	137 OAK ST	WAYLAND	MI	49348	34
56-005-018-00	GUTIERREZ SAUL O & ORTIZ CHRISTINA	119 OAK ST	WAYLAND	MI	49348	35
56-005-019-00	MICHIGAN STATE POLICE #56	544 N MAIN ST	WAYLAND	MI	49348	36
56-005-020-00	WILLIAMS TERESA A	540 N MAIN ST	WAYLAND	MI	49348	37
56-005-021-00	KEMP HOLDINGS LLC	304 108TH ST	CALEDONIA	MI	49316	38
56-005-022-00	SLOAN JOHN L & AMY L	329 WILLOW RUN DR	WAYLAND	MI	49348	39

Figure 6.47: Query Results Table

6.5.4 Enterprise Geodatabase Maintenance

Enterprise Geodatabase Compression Routine

Disconnect All Users

To disconnect the GIS Server, stop all services

➢ In ArcGIS Server Manager ⇒ Site ⇒ GIS Server ⇒ Machines ⇒ Stop all Services

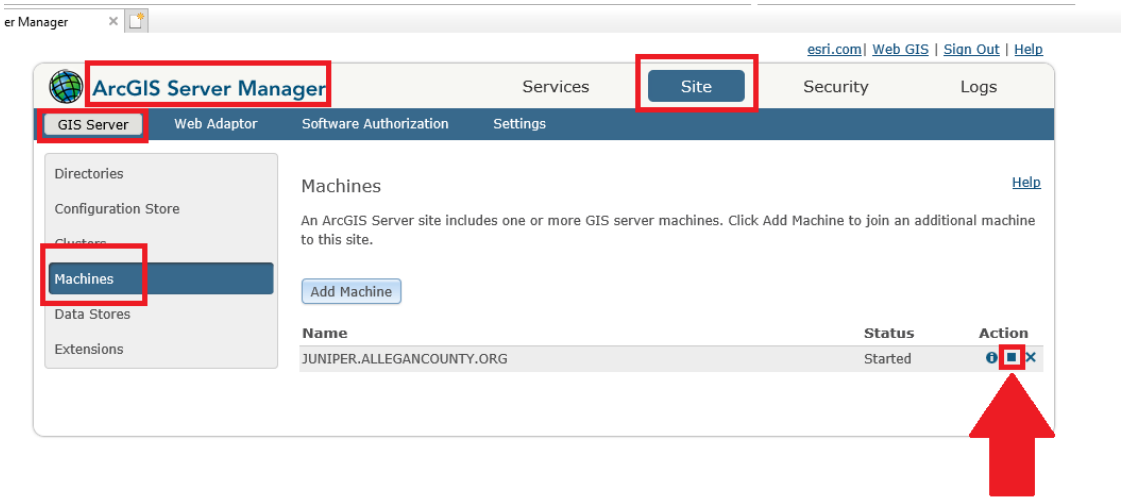


Figure 6.48: Stop ArcGIS Server

Use the Search tool to find the Rebuild Indexes Tool

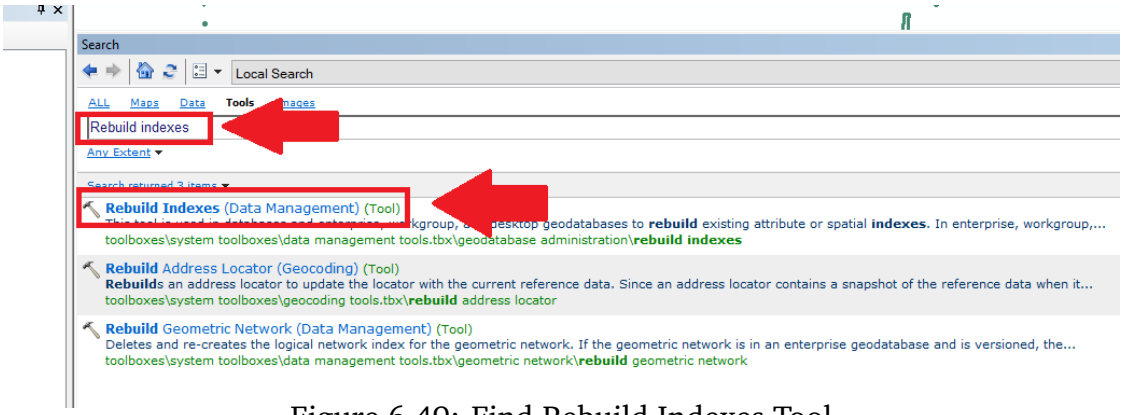


Figure 6.49: Find Rebuild Indexes Tool

Rebuild Indexes

Select Connection ⇒ Include System Tables ⇒ Select All ⇒ Press OK

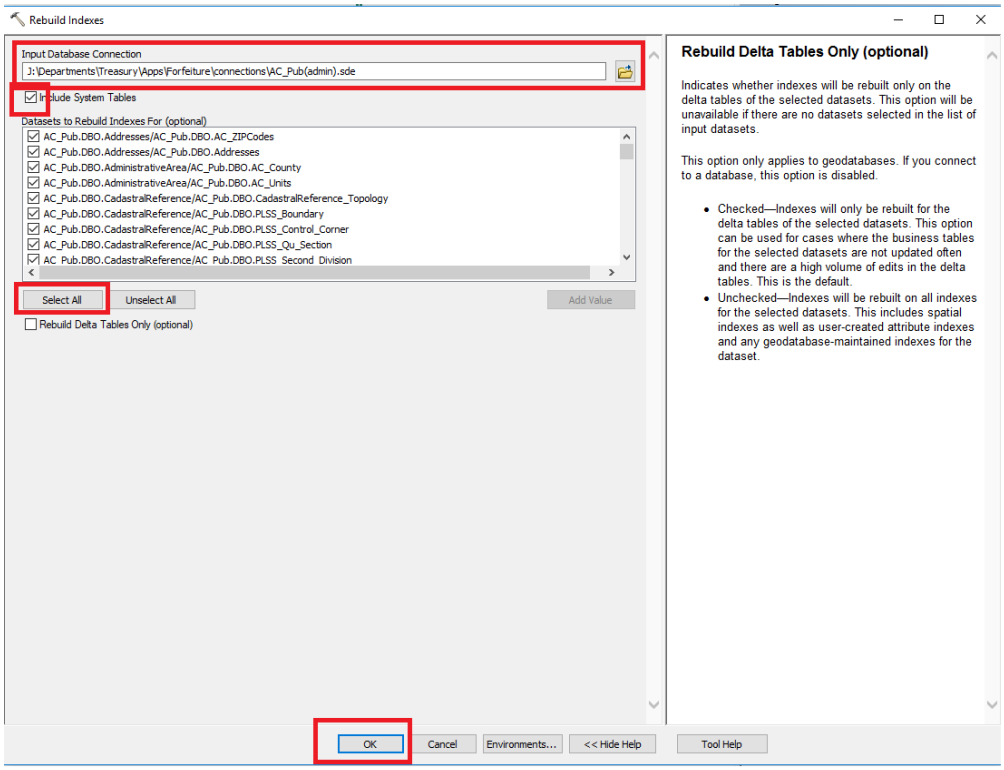


Figure 6.50: Rebuild Indexes Tool Operation

Recalculate Statistics

In the Analyze Datasets Tool:

Select Connection ⇒ Include System Tables ⇒ Select All ⇒ Press OK

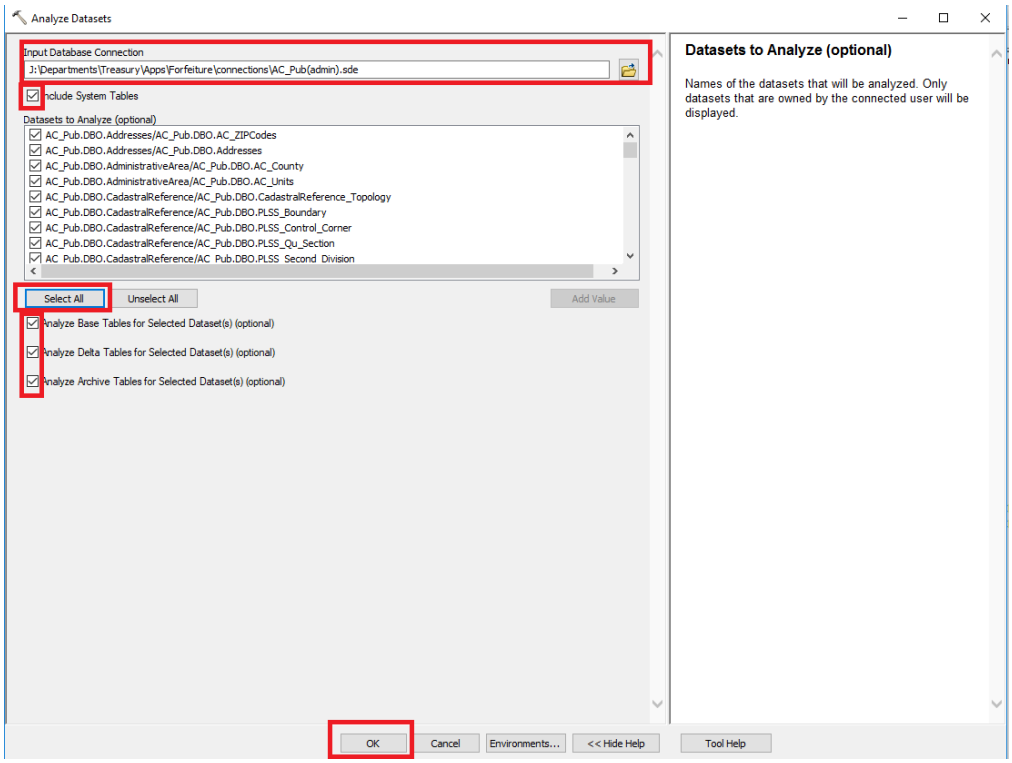


Figure 6.51: Recalculate Statistics

Compress

Select Connection ⇒ Press OK

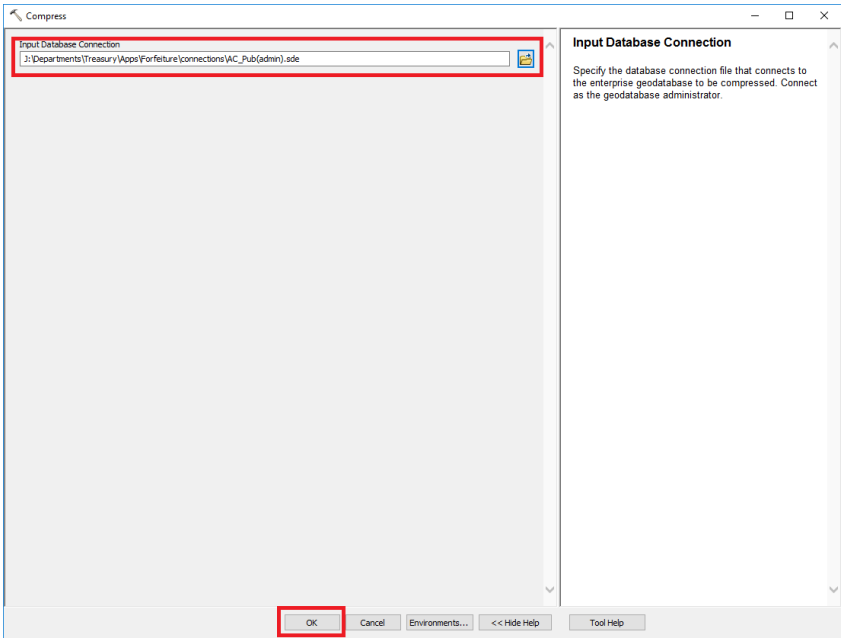


Figure 6.52: Compress

Rebuild Indexes Again

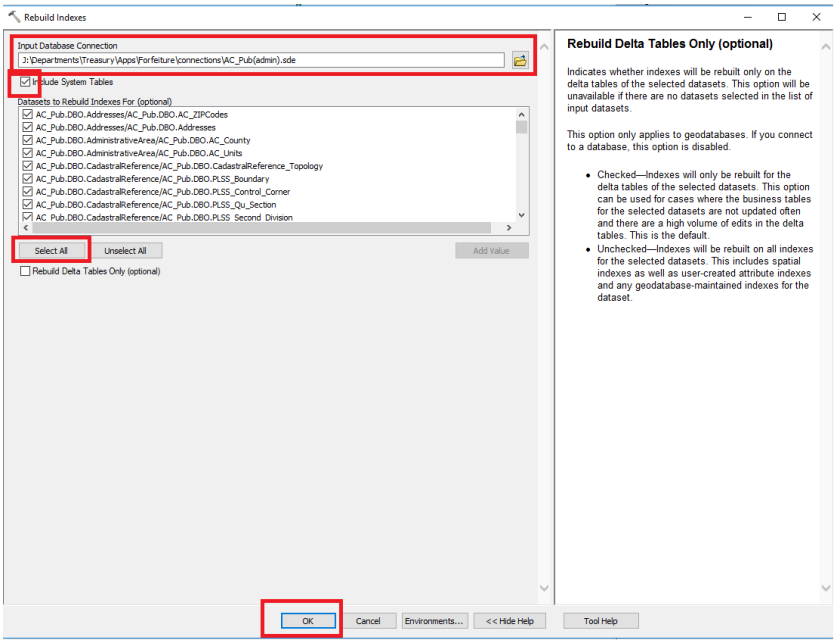


Figure 6.53: Rebuild Indexes Tool Operation

Recalculate Statistics Again

In the Analyze Datasets Tool:

Select Connection ⇒ Include System Tables ⇒ Select All ⇒ Press OK

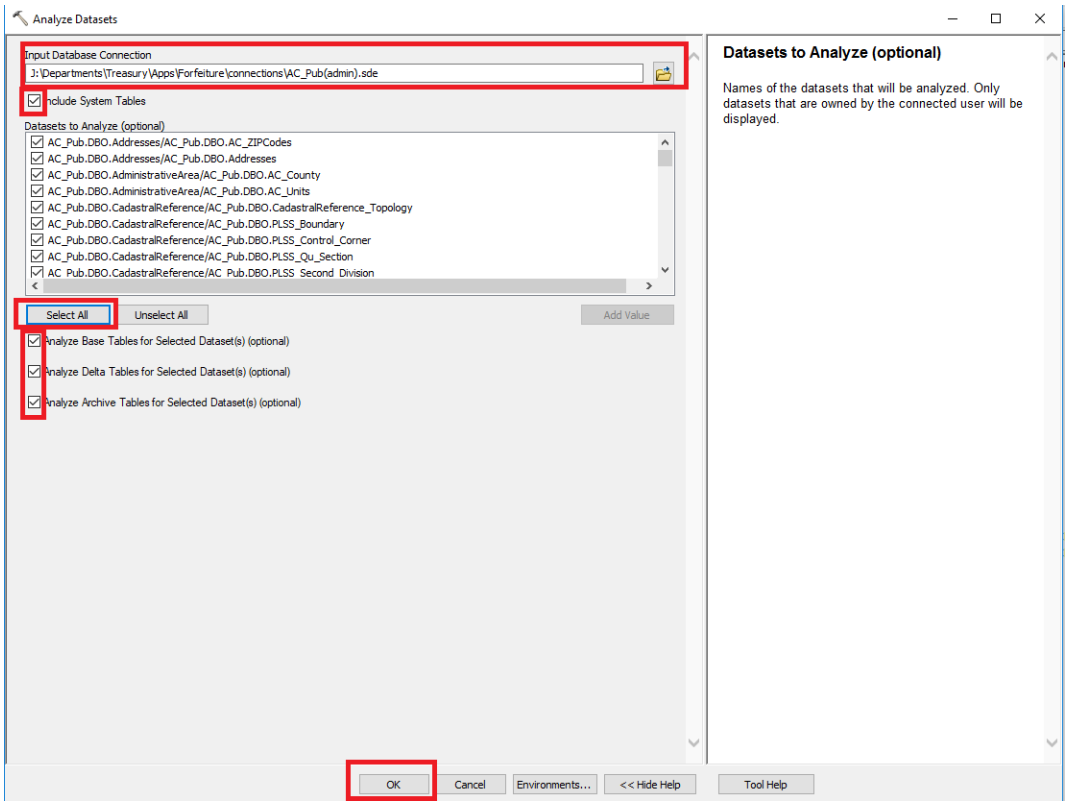


Figure 6.54: Recalculate Statistics

Enterprise Geodatabase Performance Troubleshooting

Editing Is Slow In a Specific Feature Dataset

This list of steps worked to improve performance in the ParcelEditing Feature Dataset. Note the highlighted steps are suspected to be important and discussed further here.

- Compress GDB
- Analyze Dataset
- Unregister Replicas
- Compress GDB
- Unversion Dataset
- Restart the SQL Server
- Delete Topology
- Recreate Topology
- Register dataset as versioned

Unregister As Versioned

With all users disconnected

➢ In Catalog ⇒ ACPro ⇒ Problem Dataset Manage ⇒ Unregister As Versioned

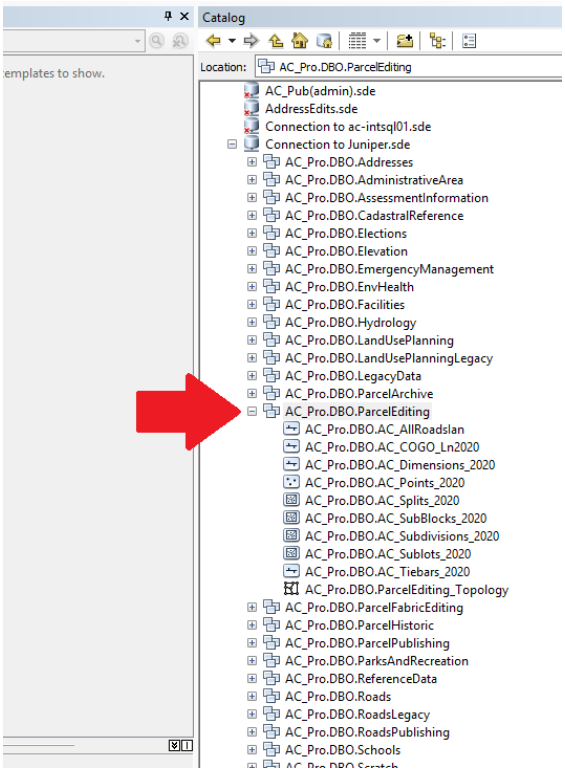


Figure 6.55: Unregister FDS as Versioned

Restart the SQL Server

➢ In SQL Server Management Studio ⇨ Juniper ⇒ restart

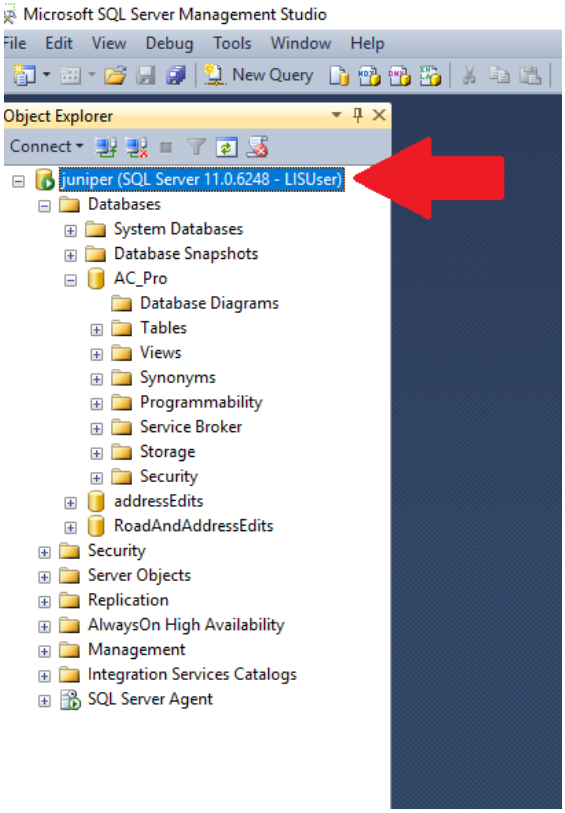


Figure 6.56: Restart SQL Server

Register the FDS as Versioned

➢ In Catalog ⇒ ACPro ⇒ Problem Dataset  Manage ⇒ Register As Versioned

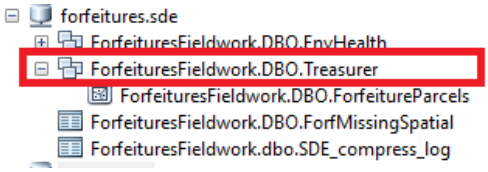


Figure 6.57: Register FDS as Versioned

6.5.5 Managing Map Services

To stop ArcGIS Server

Launch ArcGIS Server Manager

Site ⇒ GIS Server ⇒ Machines ⇒ Stop the Server

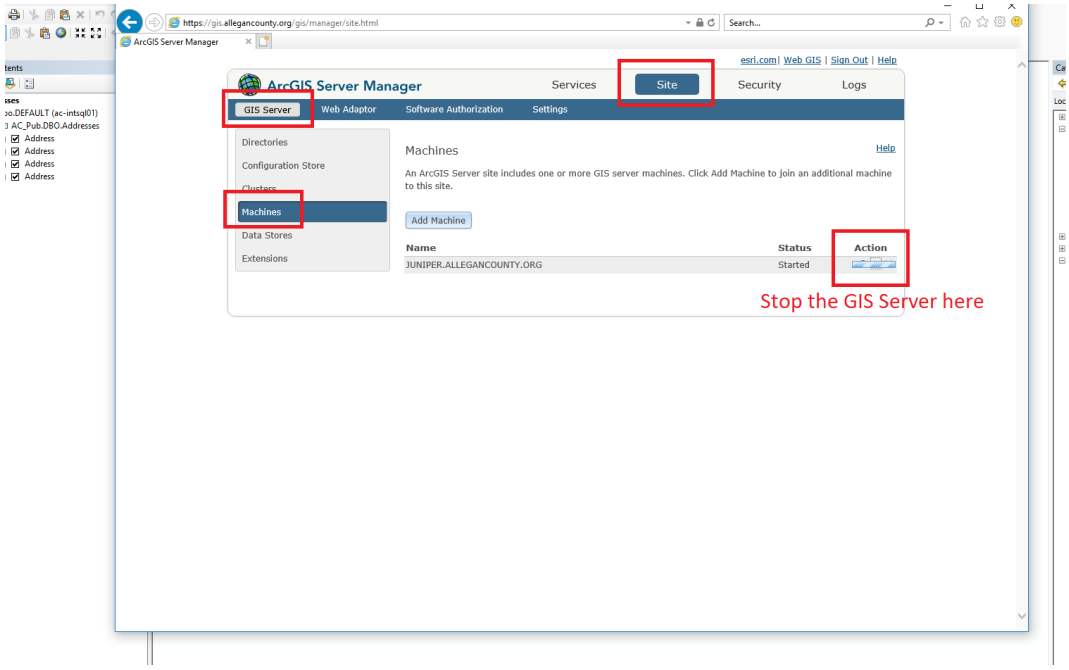


Figure 6.58: Stop the GIS Server

FIXING DAMAGED SERVICES

Error:

Service is currently being configured by another administrative operation

Remedy:

This tech support article applies:
https://support.esri.com/en/technical-article/000015549

There are at least 2 ways to fix:

- Use the ArcGIS Server Account Utility
- Remove Lock Files

Use the ArcGIS Server Account Utility

Access the GIS Server

To Log in to Juniper

windows R ⇒ mstsc

⇒ juniper

Use personal network credentials

On the GIS Server (Juniper)

In Windows Search, find:

Configure ArcGIS Server Account Utility

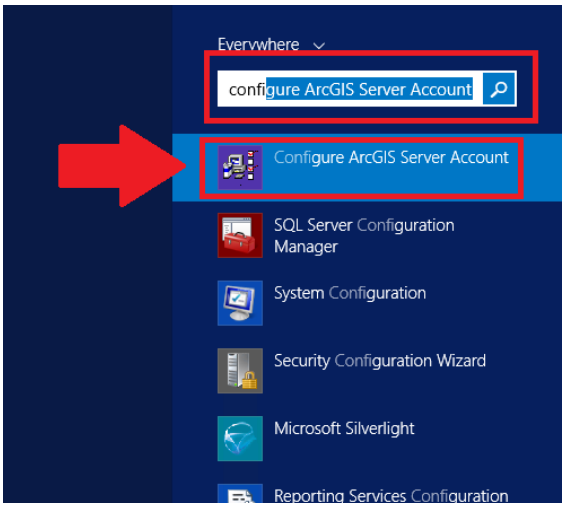


Figure 6.59: ArcGIS Server Accounty Utility

Use credentials:

`PW: @lleganGxxxxxx`

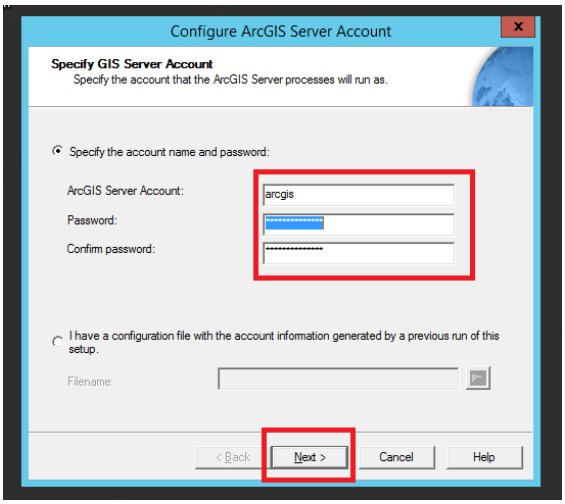


Figure 6.60: Accounty Utility Login

In the utility, paste these paths:

```
C:\arcgisserver\directories
C:\arcgisserver\config-store
C:\arcgisserver\logs
```

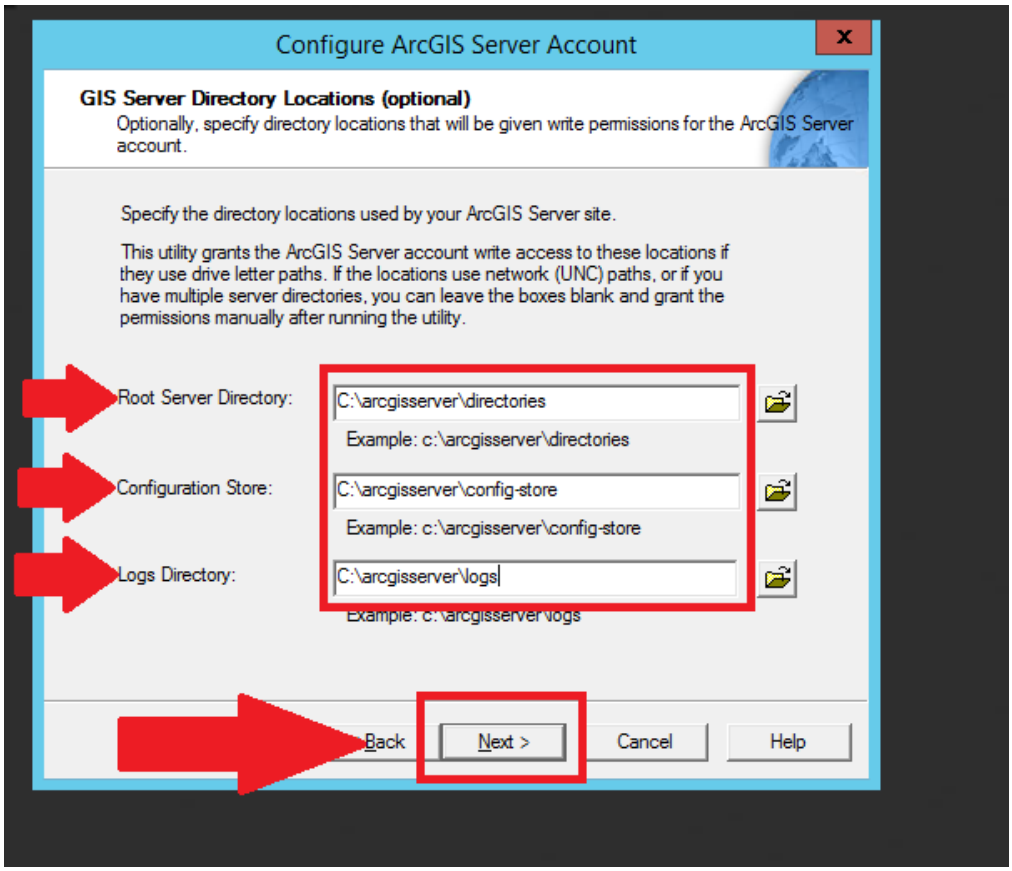


Figure 6.61: GIS Directory Locations Filled

Push Next

Select option **Do not export Configuration File**

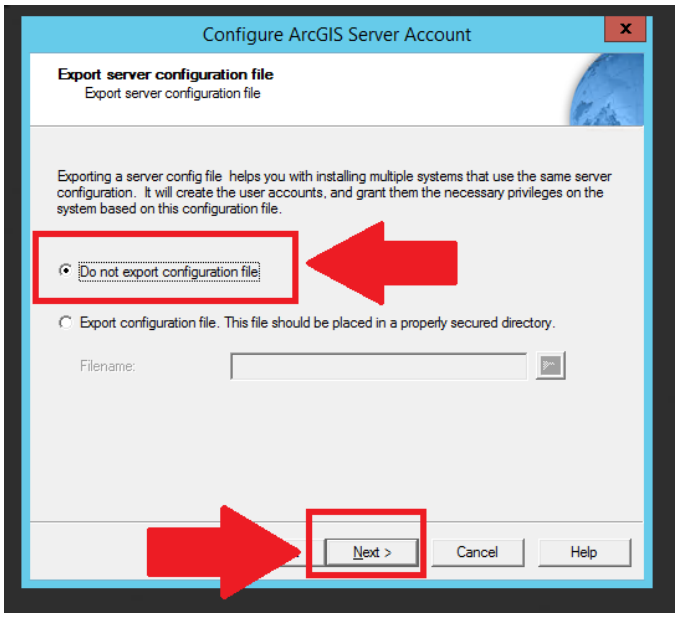


Figure 6.62: Do not Export Config File

Push Next

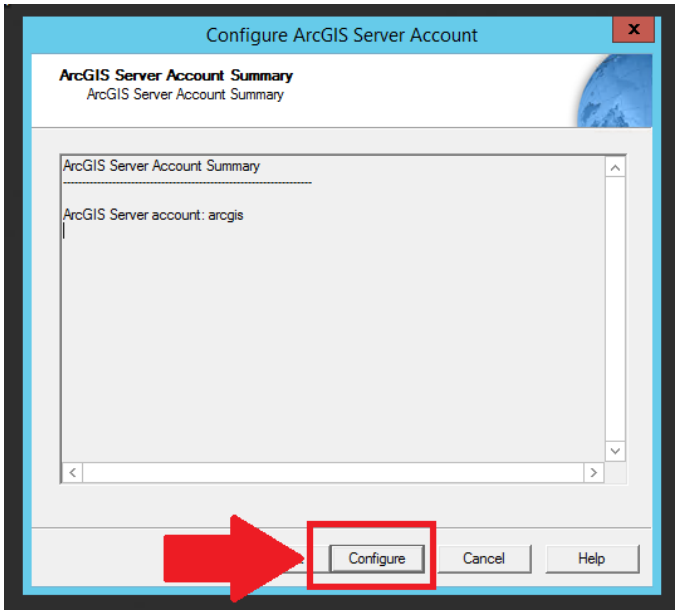


Figure 6.63: Configure Account

Push Configure

While the tool runs, open the service manager

In Windows Search, find: **Service Manger**

Launch **Service Manger** When the tool completes,

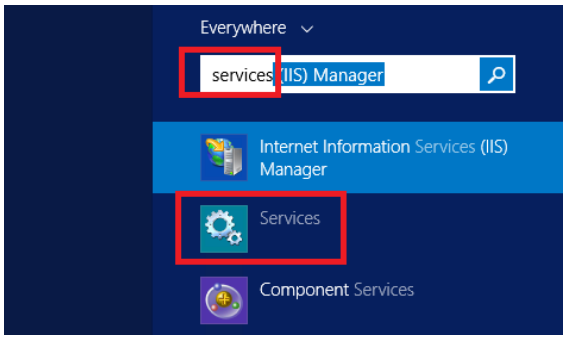


Figure 6.64: Search For Service Manager

Push Finish

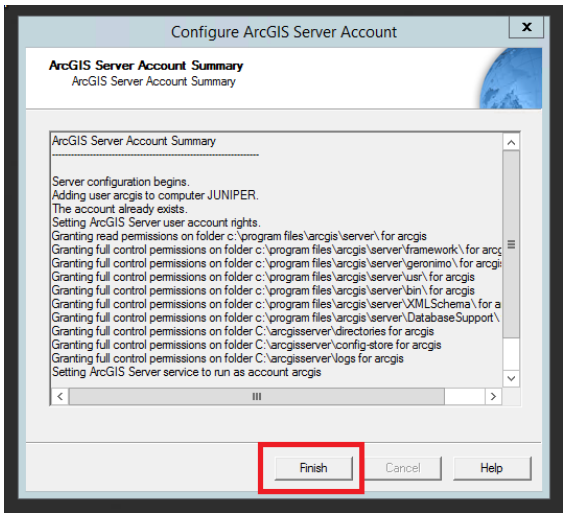


Figure 6.65: Finish On Configure

Services Manager

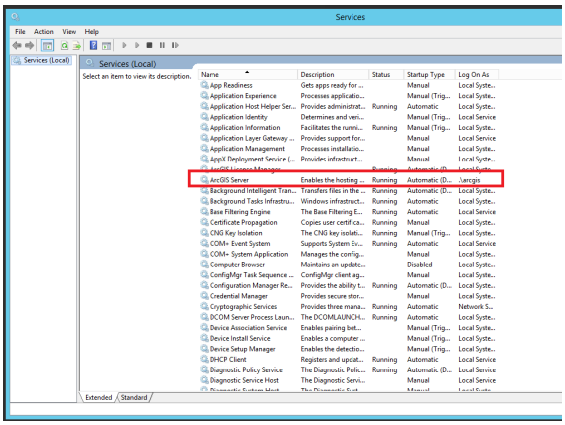


Figure 6.66: Open Services Manager

In services, select the ArcGIS Server service and restart the service. (Randy had to do this)

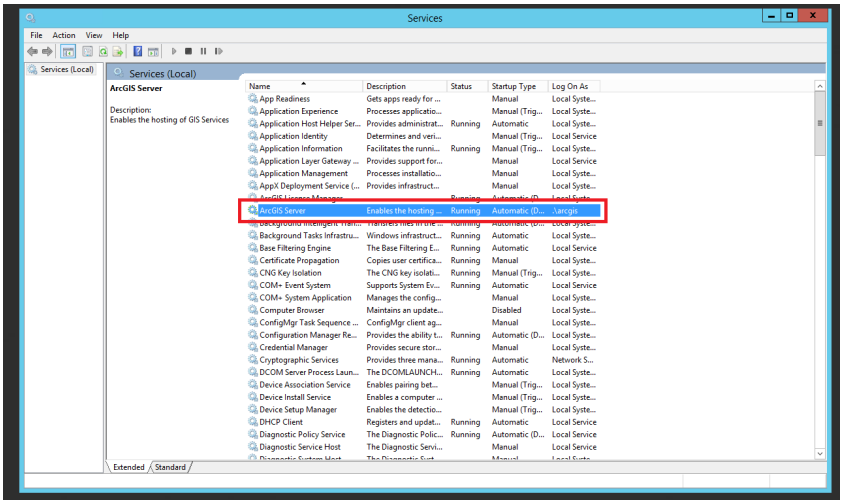


Figure 6.67: arcGis Service In Services Manager

Quick and dirty fix

When a service get hung up in som admin process, you may get an error like:

Error:

Service is currently being configured by another administrative operation

Removing Lock Files

This may work, here is a blog about it
https://community.esri.com/thread/103710 Network location for an example service

```
on juniper
C:\arcgisserver\config-store\services\ParcelViewer2\
PV2Adresses.MapServer\startup\JUNIPER.ALLEGANCOUNTY.ORG

Suggested Steps:

1)stop arcgis server services.

2)delete the lock files(*.glock and *.rlock )
    (in arcgisserver\config-store).

3) restart arcgis server service.

4)stop the pending stopping service and then start it.
```

mapservices would not stop so I try this:
https://support.esri.com/en/technical-article/000012685
Check permission levels for the arcGIS account ArcGisServerPermissions.PNG

If necessary, add the arcgis user to the permissions on the folders ArcGisServer-PermissionsAddUser.PNG

6.5.6 Managing Geodatabase Replicas

Adding A New Feature Class To A Replica

Source: https://support.esri.com/en/technical-article/000010345

Summary

Currently, there is no out-of-the-box tool to add a feature class to an existing replica. With ArcGIS Desktop, one must either recreate the replica or if the workflow allows, replicate the new feature class as a separate replica.

Steps:

The steps below outline how the recreate the replica using the Register Existing Data option in Desktop. These steps can be applied to both one-way and two-way replicas.

- Synchronize the changes between parent and child replica geodatabases using the existing replica so that the data is identical in each database, then Unregister the replica in both geodatabases. For two-way replicas, ensure that changes are synchronized in both directions and there are no outstanding edits before unregistering the replica.
- Create or import the new feature class into the parent geodatabase, and add the GlobalID.
- Register the newly added data as versioned.
- Copy and paste the new feature class to the child geodatabase using ArcCatalog.
- Note: that the GlobalIDs must have already been added to the feature class.
- For two-way replica or one-way full model, register the newly added data in child geodatabase as versioned.
- Using the parent geodatabase, add all the data that is to be replicated to a map in ArcMap.
- Click the 'Create Replica' tool on the Distributed Geodatabase toolbar.
- Select 'One way replica' or 'Two way replica' and click Next.
- Select 'Register existing data only'.
- Select the child geodatabase and specify a replica name.

➢ Click Next and click Finish.

➢ A new replica is created that includes the new data.

6.5.7 Managing Geodatabase Versions

Version Queries

SQL Queries

Four queries of SDEversions, SDEstates, sdestatelineages, and SDEcompresslog

```
use AC_Pub
select name, owner, version_id, state_id, parent_name
, parent_owner from
 [AC_Pub].[dbo].[SDE_versions]
select * from [AC_Pub].[dbo].[SDE_states] order by state_id
select * from [AC_Pub].[dbo].[sde_state_lineages] order
 by lineage_name,
 lineage_id
select TOP(5) * from [AC_Pub].[dbo].[SDE_compress_log] order by
 compress_end DESC
```

Query of SDEversions and SDEstates

```
 use AC_Pub
SELECT v.version_id,v.creation_time,v.creation_time,
 s.state_id, s.creation_time
FROM SDE_versions v
INNER JOIN SDE_states s ON v.state_id = s.state_id
```

FINDING ORPHANED VERSIONS

Remove orphaned versions

Follow the procedure: Link to source
Use SQL Server Management Studio to execute two queries and compare the results.

Step 1:

Execute the query:

```
use AC_Pub
SELECT ObjectID, name from dbo.GDB_ITEMS where
 TYPE='4ED4A58E-621F-4043-95ED-850FBA45FCBC';
```

Step 2:

Execute the query:

```
use AC_Pub
SELECT name from [dbo].[SDE_versions]
order by name
```

Compare the tables

This graphic summarizes elements of the queries. Note the items from step two

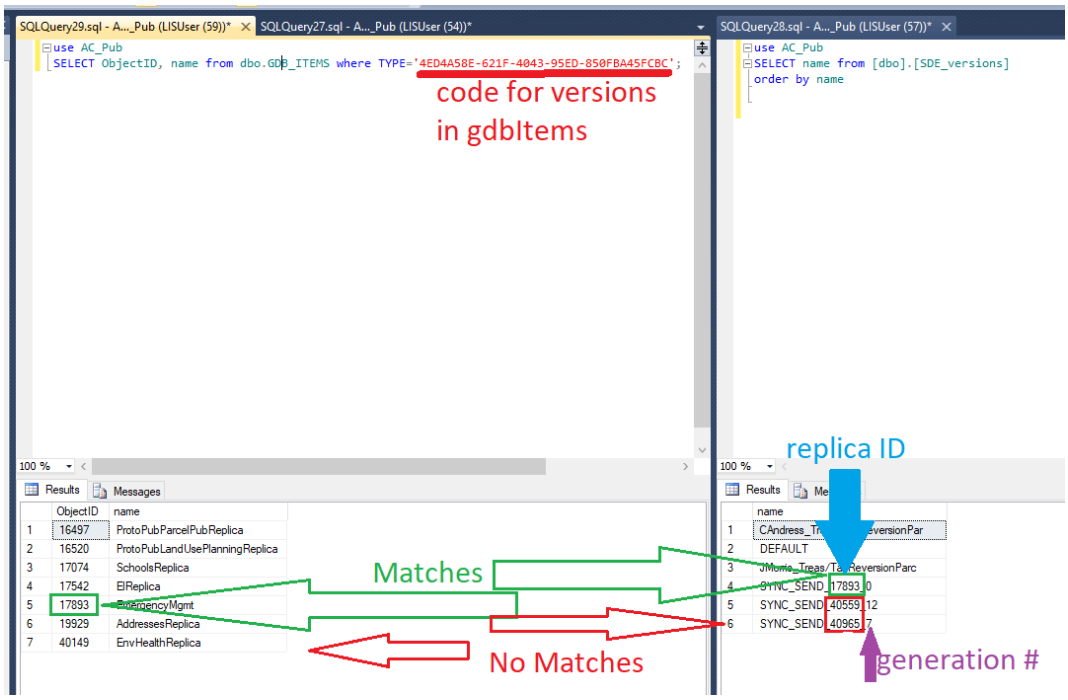


Figure 6.68: Find Orphan Versions

that have no match in step one.

Orphaned versions can be removed by name in ArcGIS

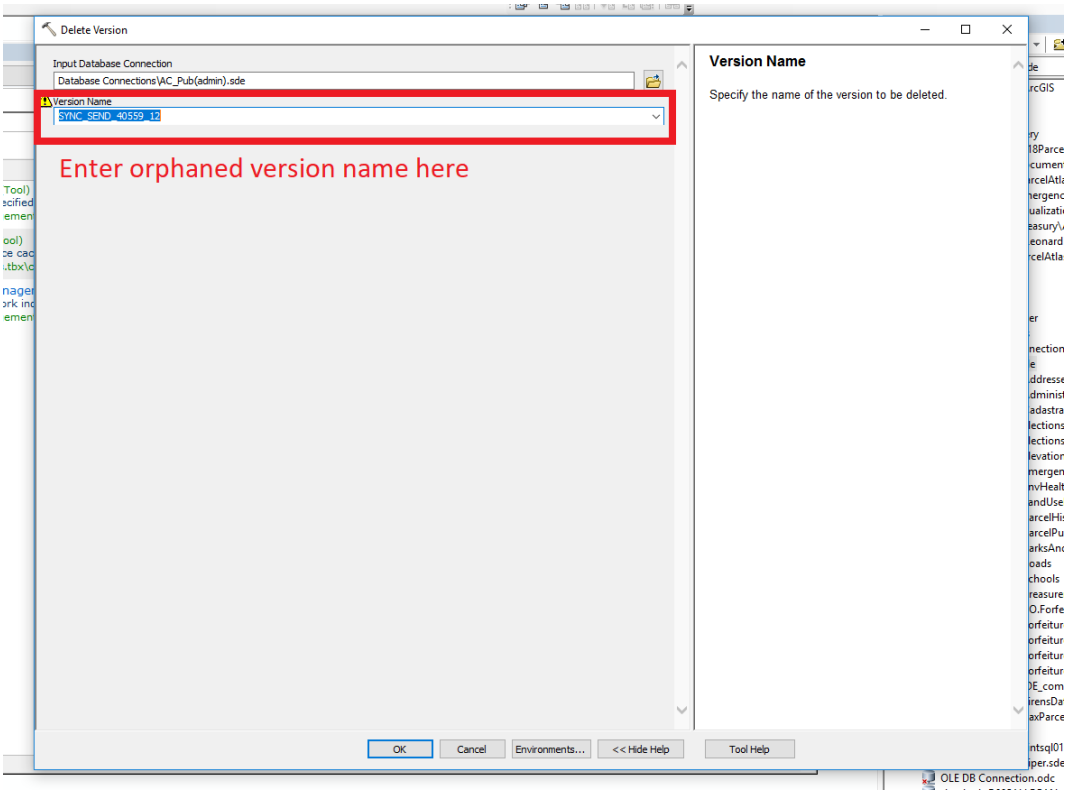


Figure 6.69: Delete Orphan Versions

6.5.8 MXD MANAGEMENT

FIND/REPLACE TEXT OBJECT

Python Code

Python Code for finding and replacing a text object in a ArcGIS .mxd file. A snippet of this code may be found in the LayerUpdates/Zoning/processing folder. It is used to edit the .mxd files located there.

```
import arcpy
from arcpy import env

env.workspace = r"J:\Apps\Python\LayerUpdates\zoning\processing"
for mxdname in arcpy.ListFiles("*.mxd"):
    print mxdname
    mxd = arcpy.mapping.MapDocument(r"J:\Apps\Python\
        LayerUpdates\zoning\processing\\" + mxdname)
    for elm in arcpy.mapping.ListLayoutElements
        (mxd, "TEXT_ELEMENT"):
        if elm.text.startswith('As ammended'):
            elm.text = elm.text.replace('As ammended',
                'As amended')
            print elm.text
    mxd.save()
del mxd
```

6.6 LaTeX Packages used by AC GIS

6.6.1 Common Errors

Source:
https://www.ocf.berkeley.edu/~latex/files/commonerrors.tex

If you have every compiled a LaTeX document, chances are high you have received a few error messages. Sometimes they come from something as stupid and as easy to fix as forgetting a parenthesis or forgetting to end an environment. There are also a lot more cases where you have no idea what you have done wrong and it takes you a long time to find or even understand your error.

The purpose of this is to explain some of the common errors that may happen when compiling a LaTeX document and suggestions for what is probably going on and how to debug your document.

The Form of an Error

There are two forms of errors: LaTeX errors and TeX errors. In both types of errors, the part after the error message will tell you where the error occurred. An example:

```
l.15 <offending text>
```

The `l.15` tells you what line the error occurred on and the text will tell you the text that caused the error.

LaTeX Errors

The general form of an error in LaTeX is shown below:

```
! LaTeX error: <error message>

See the LaTeX manual or LaTeX Companion for
explanation.
Type H <return>   for immediate help.
...
```

The `!` lets you know that the error has occurred. The error message will tell you what type of error you have committed. After the ellipses, you will find the line at which the error occurred and the text that caused the error (or at least the text where LaTeX found the error).

TeX Errors

Errors may also have the following form:

```
! <error message>
```

These errors are formatted differently because they are error messages that came from TeX instead of LaTeX. After the error, you will still find the line that the error occurred in and the text of the error.

Warnings

There are some error messages that are just warnings and will not stop or change the compilation of the document. Chances are you have seen them many times.

Underfull

The following error results when a line does not extend the width of the page, something LaTeX always tries to accomplish:

```
Underfull \hbox (badness 10000) in paragraph at lines
104--107
```

This error message is just a warning and is not something to worry about. For the most part, when a line does not span the width of the page, it is because you have written something that you want to only cover part of the page.

Overfull

The following error results when a line extends beyond the width of the page:

```
Overfull \hbox (16.04988pt too wide) in paragraph at
lines 30--31 [] [] \OT1/cmtt/m/n/12 I'm trying to put
way too much text into a line in my document.
```

Usually this error comes form when you are using the `verbatim` package because it will not move to the next line if your text does not go to the next line. The easiest way to fix this is to find the place in your document where this is occurring and change the text so that it fits to the page.

This error will still show up if the text is still on the page but outside of the width of text that LaTeX has set. In this case, you are welcome to fix things so that the error does not show up or you can leave the text as it is.

References

The following warnings occur when references are changed when LaTeX was compiled:

```
LaTeX Warning: Label(s) may have changed. Rerun to get
cross-references right.

LaTeX Warning: There were undefined references.

LaTeX Warning: Reference ‘name’ on page 1 undefined on
input line 15.
```

The way to fix these errors is to recompile the document again to correct the page numbers. Sometimes it is necessary to recompile the document twice to fix this error. You also may have defined a reference wrong, so you should check to make sure your label is correct.

Beginning and Ending

Begin Ended by End

This type of error occurs when each environment is not correctly started and ended. When you are missing an `\end` command, the following error will show up:

```
! LaTeX Error: \begin{enumerate} on input line 23
ended by \end{document}.
```

To fix this, you need to end the environment mentioned in the error with the appropriate command.

When you are missing a `\begin` command, the following will appear:

```
! LaTeX Error: \begin{document} ended by
\end{itemize}.
```

To fix this, you basically do the same thing as before, correctly beginning the environment mentioned in the error with the appropriate command.

End Occurred Inside a Group

The following error message will show up at the end of compiling a file if an environment is begun that is not ended:

```
(\end occurred inside a group at level <n>)
```

To fix this error, make sure you end the environment that was begun. The previous error is more helpful in finding the `\begin` statement.

Ended by End of Line

The following error will occur when you try to place a command inside a section heading:

```
! LaTeX Error: \verb ended by end of line.

See the LaTeX manual or LaTeX Companion for
explanation.
Type H <return>   for immediate help.
...
```

There will be many errors of the same type for this mistake. In order to find where you put the command, look in the output file and find the last heading that shows up.

Missing Begin Document

This error is self-explanatory:

```
! LaTeX Error: Missing \begin{document}
```

Errors Usually Caused by Bad Spelling

Unknown Control Sequence

This error results when you use a command (something that starts with a \) that is not recognized by LaTeX:

```
! Undefined control sequence.
```

Usually this error results from spelling a command incorrectly. Go to the line that is indicated by the error and fix the command.

Environment Undefined

This error results when you begin an environment with a `\begin` command that is not recognized:

```
! LaTeX Error: Environment verbatin undefined.
```

Usually you have just spelled your environment incorrectly, so you just need to fix it.

Bad File Name

This error results when you have mistyped the command `latex` or do not have LaTeX installed on your computer:

```
Bad command or file name
```

To fix this, correctly spell the command to compile your file or make sure that LaTeX is correctly installed on your computer.

CANNOT FIND FILE NAME

This error occurs when you try to compile a file that the computer cannot find:

```
! I can't find file 'sample'.
<*> sample

Please type another input file name:
```

To fix this error, make sure you have spelled the file name correctly. You also may be in the wrong directory to compile the file, so check to make sure you are in the same directory as your file.

FATAL ERRORS

RUNAWAY ARGUMENT

This error happens when a paragraph ends before a command's argument is done (i.e., LaTeX thinks that there is a missing }):

```
Runaway argument?
```

To fix this, you should use a different command to accomplish what you are trying to do. An example of this is to use `\bfseries` instead of `\bftext` to make bold text in more than one paragraph.

This error can also be caused by a missing mandatory argument to a command.

JUST AN *

This error normally occurs when you do not end your document with `\end{document}`:

```
*
```

If you are prompted to enter something in, it is best to enter

```
\end{document}
```

and hope it works. Be sure to end your document with the appropriate command.

Emergency Stop

This error happens when LaTeX will stop trying to compile your document due to a serious error:

```
! Emergency stop.
```

To fix this error, you will need to figure out what caused it to stop compiling. Chance are you forgot to end your document with `\end{document}`, but there might also be another reason for the emergency stop.

Please Type a Command or Say End

This error happens when your file has ended prematurely:

```
(Please type a command or say `\end')
```

The best way to deal with this type of error is to type

```
\end
```

or

```
\end{document}
```

in the case that the absence of that command caused the error. Usually if you have ended your document correctly, the error will result from a missing } or forgetting to end a verbatim environment.

Graphics Errors

Too Many Unprocessed Floats

This error occurs when figures or tables (i.e., floats) have not been typeset:

```
! LaTeX Error: Too many unprocessed floats.
```

LaTeX can only have so many floats waiting to be typeset. In order to fix this error, make sure that you are placing your floats where you want them (with a `[h]` option) and not wanting too many on one page in sequence. Using the command `\clearpage` can be very useful in distributing floats correctly.

Unknown Graphics Extension

The following error occurs when you try to use a type of graphic that is not supported by the type of file that you are producing:

```
! LaTeX Error: Unknown graphics extension: .gif
```

In order to fix this error, you should change your graphics to the types that are supported by the type of file you are outputting or you will need to include the correct package to deal with that type of graphic. Sometimes you may have named the graphic poorly so that LaTeX will not recognize it as a graphic file.

Division by Zero

The following error occurs when the height of a graphic object is zero:

```
! Package graphics Error: Division by 0.
```

This is usually caused when you rotate an object with zero depth so that its height becomes zero. The best way to fix this is to use the keyword `totalheight` instead of `height`.

Math Errors

Display Math Should End With $$

This error occurs when the displaymath or equation mode is ended incorrectly:

```
! Display math should end with $$
```

To fix this error, make sure that you end the displaymath or equation mode correctly (ending them with a $ is not acceptable).

Bad Math Environment Delimiter

This error occurs when you do not have your delimiters correct in math mode:

```
! LaTeX Error: Bad math environment delimiter.
```

Usually this occurs when you forget to match a right delimiter with every left delimiter. This error may also happen when you forget to end an array.

Missing Right

This error occurs when you have a missing right parenthesis:

```
! Extra \right.
```

To fix this, you either need to add a `\right` command or you need to end an array.

Missing Delimiter

This error message occurs when a delimiter is missing:

```
! Missing delimiter (. inserted).
```

To fix this error, you need to make sure that you have a right delimiter for every left delimiter. If you do not want a right delimiter matching a left delimiter, you need to use "." to not have an error message show up.

Missing $ Inserted

The following error occurs when you try to use a character that can only be used in math mode, like _ or ^:

```
! Missing $ inserted
```

To fix this error, make sure you change the character to what it should be in text mode.

Tabular Environment Errors

Misplaced Alignment Tab Character &

This error occurs when you use & and when you are not in a tabular environment:

```
Misplaced alignment tab character &
```

To fix this error, you need to use \& to make a &.

Extra Alignment Tab

This error occurs when you use too many tabs for the number of columns in a table:

```
! Extra alignment tab has been changed to \cr
```

The result of this error is that a new row is formed where the extra tab was. You should go back and fix your table so that the correct number of items in each row would show up.

Argument Has an Extra }

These errors happen when an incorrect number of arguments to a tabular environment have been specified:

```
! Argument of \cline has an extra }.
```

```
! Argument of \multicolumn has an extra }.
```

To fix this error, make sure your arguments to the tabular environment are correct.

Errors With Lists

Missing Item

This error occurs when there is plain text in an environment that takes items:

```
! LaTeX Error: Something's wrong--perhaps a missing
\item.
```

To fix this error, make sure the plain text is changed into an item.

Too Deeply Nested

This error occurs when there are too many lists for LaTeX to handle:

```
! LaTeX Error: Too deeply nested
```

LaTeX can only handle four levels of one type of list and six levels of different types of lists. To fix this, you need to use less levels of lists or define your own list environment.

Miscellaneous Errors

Only Used in the Preamble

This error occurs when you place a command in the body of a LaTeX document that should be placed in the preamble:

```
! LaTeX Error: Can be used only in the preamble.
```

To fix this error, just move the command to the preamble.

There Is No Line/Page Here to End

This error occurs when you incorrectly use the commands that make a new line or a new page:

```
! LaTeX Error: There's a no line here to end.
```

You may just leave the command that is making a new line in place or you can take it out. Here, LaTeX is just trying to make sure that everything looks nice.

Command Already Defined

This error occurs when you try to define a command that already exists:

```
! LaTeX Error: Command ... already defined.
```

To fix this, you need to define your command differently.

MISSING NUMBER

This error is made when a number is expected as an argument and one is not provided:

```
! Missing number, treated as zero.
```

To fix this error, you need to find where a number is expected so that you can provide the correct one.

6.6.2 FLOAT PACKAGE

USEPACKAGE

```
text
```

SIMPLE USE

```
text
```

OPTIONS

```
text
```

Add optional arguments to the usepackage line:
Useful options:

- **OPTION NAME**
  OPTION NOTE
- **OPTION NAME**
  OPTION NOTE

USE WITH OPTIONS

```
text
```

Commands

6.6.3 Graphics Examples and Notes

CurlyFrame Example

```
\documentclass[landscape]{article}
\usepackage{wallpaper}
\usepackage{niceframe}
\usepackage{xcolor}
\usepackage{ulem}
\usepackage{graphicx}
\usepackage{geometry}
\geometry{tmargin=.75cm,bmargin=.25cm,lmargin=.8cm,rmargin=.2cm}
\usepackage{multicol}

\begin{document}

\curlyframe[.9\columnwidth]{

TEXTTTTTTTTTTTTTTTT

}
\end{document}
```

RectFrame Example

```
\documentclass[landscape]{article}
\usepackage{wallpaper}
\usepackage{niceframe}
\usepackage{xcolor}
\usepackage{ulem}
\usepackage{graphicx}
\usepackage{geometry}
\geometry{tmargin=.75cm,bmargin=.25cm,lmargin=.8cm,rmargin=.2cm}
```

```
\usepackage{multicol}

\begin{document}
\begin{minipage}{.33\textwidth}
\centering
\scalebox{3}{\color{green!30!black!60}
\font\border=umrandb
\generalframe
{\border \char113} % up left
{\border \char109} % up
{\border \char112} % up right
{\border \char108} % left
{\border \char110} % right
{\border \char114} % lower left
{\border \char111} % bottom
{\border \char115} % lower right
{\centering
\includegraphics[height=1.25cm]{GIS_Logo_better.jpg}}}
\end{minipage}
%\vspace{-8mm}

\end{document}
```

6.6.4 GRAPHICX PACKAGE

USEPACKAGE

text

SIMPLE USE

text

OPTIONS

```
text
```

Add optional arguments to the usepackage line:
Useful options:

- **OPTION NAME**
  OPTION NOTE

- **OPTION NAME**
  OPTION NOTE

USE WITH OPTIONS

```
text
```

COMMANDS

6.6.5 HYPERREF PACKAGE

INTRODUCTION

Official hyperref package documentation

Notes:

- Add the *hyperref package* to the preamble **last** [2]

- To use Tex in a pdf bookmark: use

  ```
  \texorpdfstring{\\}{}
  ```

  ```
  ie. \paragraph{Sample Text\texorpdfstring{\\}{}}
  ```

  Creates a new line without an error.

```
\usepackage[options]{hyperref}
```

Simple Use

Use \href{URL}{DESCRIPTION} to add a link with description

\href{https://www.latex-tutorial.com}{Website with tutorials}
produces:

Website with tutorials

Options

Add optional arguments to the usepackage line:
Useful options:

- **pdftex**
  enables other options like breaklines
- **breaklinks**
  allow links to be broken across several lines
  eg. https://lists.gnu.org/archive/html/emacs-orgmode/2013-06/msg00776.html
- **colorlinks**
  Colors the text of links and anchors.(default is false)
- **linkcolor**
  Color for normal internal links(default is red).
- **anchorcolor**
  Color for anchor text.
- **citecolor**
  Color for bibliographic citations in text.
- **urlcolor**
  Color for linked URLs

Use with options

\usepackage[breaklinks,colorlinks,citecolor=blue,
urlcolor=green]{hyperref}

COMMANDS

`\href{URL}{text}` Makes text a link to URL.

To put a file path in text:

eg:

Official hyperref package documentation

(documentation Pt.4 pg.15)

`\href[options]{URL}{text}`

Options:

- absolute

```
\href{C:/AC/jalapeno/documentation/packageDocs/hyperref2017.pdf}
    {Official hyperref doc}
```

- relative **Note: relative path must be from final pdf location**

```
\href{../../../../../documentation/packageDocs/hyperref2017.pdf}
    {Official hyperref package doc}
```

This path works from main document

```
\href{../../documentation/packageDocs/hyperref2017.pdf}
    {Official hyperref package documentation}
```

This path works from subsection document

`\hyperref[label]{text}`

Makes text a link to where \ref{label} would point.

`\hypertarget{name}{text}`

Sets an anchor on text with the label name.

`\hyperlink{name}{text}`

Makes text a link that takes you to the anchor labeled name.
Pair with \hypertarget.

`\phantomsection`

Used in conjunction with

```
\addcontentsline
    to make the correct link in the Table of Contents.
```

6.6.6 IMPORT PACKAGE

USEPACKAGE

```
text
```

SIMPLE USE

```
text
```

OPTIONS

```
text
```

Add optional arguments to the usepackage line:
Useful options:

- **OPTION NAME**
  OPTION NOTE
- **OPTION NAME**
  OPTION NOTE

USE WITH OPTIONS

```
text
```

COMMANDS

6.6.7 WRAPFIG PACKAGE

USEPACKAGE

text

SIMPLE USE

text

OPTIONS

text

Add optional arguments to the usepackage line:
Useful options:

- **OPTION NAME**
  OPTION NOTE
- **OPTION NAME**
  OPTION NOTE

USE WITH OPTIONS

text

COMMANDS

6.7 LaTeX Templates

6.7.1 LaTeX Section Template

```
\begin{document}
  %
\section{SECTION NAME}
  %
\subimport{THIS SECTION/}{SOMESubsection.tex}
\subimport{THIS SECTION/}{SOMESubsection.tex}
% etc...
  %
\end{document}
```

6.7.2 LaTeX Subsection Template

```
  %
  %
  %
%+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
%    To Do:
%
%
%
%-------------------------------------------------------------------------
  %
  % OPTIONAL PREAMBLE FOR LOCAL COMPILE  %
    %
  \def\titlename{SubsectionTemplate}
  \def\authorName{Allegan County GIS Services}
  \def\pdfTitle{SubsectionTemplate}
  \def\pdfSubject{GIS Tools} %
  \def\pdfKeywords{latex,documentation}
   %
```

```
  \input{../../../preamble/subSectionPreamble.tex}

  %-----------------------------------------------------------------------
      %
%\begin{document}% document begins
      %
      %
  %-----------------------------------------------------------------------
      %
\subsection{SUBSECTION TITLE}
  %
\subsubsection{Problem and Analysis}
  %
\begin{adjmulticols}{2}{\innerMar}{\outerMar}
  %
\paragraph{Background}
  %
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\paragraph{Statement of Problem}
  %
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\paragraph{Analysis}
  %
```

```
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\subparagraph*{SUBPAR HEADING}
  %
\begin{itemize} %
  %
\item ITEM 1
  %
\item ITEM 2
  %
\end{itemize} %
  %
\subparagraph*{SUBPAR HEADING}
  %
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\end{adjmulticols}
  %
\clearpage
  %
  %
\subsubsection{SUBSUBSECTION HEADING}
  %
  % Single Figure
  %
%\begin{figure}[h!]
%\centering
%    \includegraphics[width=1\textwidth]{ProjectDesign}
%\vspace{-.2in}
```

```
%
%\caption{Design}
%\end{figure}
  %
\clearpage
  %
  %
\paragraph{Summary}
  %
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text




\clearpage
  %
  %
\paragraph{PAR HEADING}
  %
\begin{adjmulticols}{2}{\innerMar}{\outerMar}
  %
\subparagraph{SUBPAR HEADING}
  %
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
```

```
\paragraph{PAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\subparagraph{SUBPAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\subparagraph{SUBPAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\subparagraph{SUBPAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
  %
\end{adjmulticols}
  %
  % Single Figure
  %
%\begin{figure}[H]
%\centering
%    \includegraphics[width=1\textwidth]{IMAGE}
%\vspace{-.2in}
%
%\caption{IMAGE NAME}
%\end{figure}
\clearpage
```

6.8 Python Scripts used by AC GIS

6.8.1 File Rename with Python

Purpose and Summary

Purpose

Changing the file names within a directory

Summary

This script creates a list of all files in a source folder and then iterates through the list editing the file names, in this case, replacing spaces with no spaces.

Requirements

Software

- python 2.7 and a Python IDE
- A text editor

Python(2.7)

This script was developed in python 2.7

The Python Script

```
#-------------------------------------------------------------------------------
# Name:         RenameFiles.py
#
# Purpose:      Renames any number of files within a directory
#
# Notes:         This script creates a list of all files in a source folder and
#                    then iterates through the list editing the file names,
#                    in this case, replacing spaces with no spaces.
# Author:       BMay
#
# Created:      20190620
```

```
# Updated:    20190621
#-------------------------------------------------------------------------------
################################################################################
#   Imports and Relative path folder setup
################################################################################
import os, sys
project = os.path.dirname(os.path.dirname(__file__))
processing = os.path.join(project, 'processing')
build = os.path.join(project,'build')

################################################################################
#   vars
################################################################################
renameSrc = os.path.join(processing, 'RenameSource')

################################################################################
#   Main
################################################################################
if __name__ == "__main__":

    os.chdir(renameSrc)
    for i in os.listdir(renameSrc):
        print i
        newName = i.replace(' ','')
        print newName
        os.rename(i, newName)
```

6.8.2 PDF OPTIMIZER

PURPOSE AND SUMMARY

Purpose

Optimization of any number of pdf documents

Summary

A Python script creates a list of .pdf docs in a folder. The list is used to write a .txt document in which every line is a DOS command to optimize each of the .pdf documents and save them to another location. The .txt must be saved as a .bat. When executed the batch process calls ghost script for the optimization.

REQUIREMENTS

Software

- ghostscript
- python 2.7 and a Python IDE
- A text editor

About ghostscript

ghostscript is used for the optimization. ghostscript is an interpreter for the PostScript language and for PDF [1].

Licensing

ghostscript is available opensource under AGPL conditions. more information can be found here.

Download

ghostscript can be downloladed here.

Add Ghostscript to the system path Variable

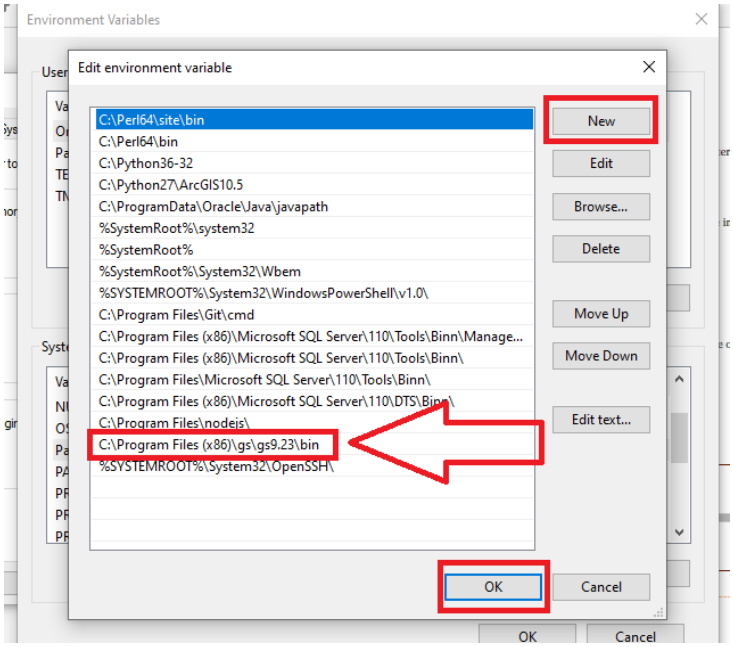


Figure 6.70: Add GS to Path

note:

The output of this script is bdoc.txt, Save as a .bat to execute the optimize.

Python(2.7)

This script was developed in python 2.7

The Python Script

The output is a batch file

```
#-------------------------------------------------------------------------------
# Name:         OptimizePDF.py
#
# Purpose:      Batch optimize pdfs
#
# Notes:        This script creates a list of pdf files in a source folder and
#                   then creates a .txt that can be used as a .bat file to optimize
#                   all of the pdfs in the source folder to a new location.
# Author:       BMay
#
# Created:      06/20/2019
#-------------------------------------------------------------------------------
################################################################################
#   Imports and Relative path folder setup
################################################################################
import os, sys
project = os.path.dirname(os.path.dirname(__file__))
processing = os.path.join(project, 'processing')
build = os.path.join(project,'build')

################################################################################
#   String vars for each line of the .bat file
################################################################################
inString1 = "gswin32 -sDEVICE=pdfwrite -dCompatibilityLevel=1.4 -dPDFSETTINGS=/ebook#
 -dNOPAUSE -dQUIET -dBATCH -sOutputFile=H:\\2019ParcelAtlas\\optimized\\"
inString2 = " H:\\2019ParcelAtlas\\20190619\\"
usString = '_' # Underscore string to add to file names

################################################################################
#   Source pdfs path
################################################################################
sourcepdf = os.path.join(project, '20190619x') # folder with pdfs to be optimized
```

```
#############################################################################
#   new .txt
#############################################################################
batchdoc = os.path.join(processing,"bDoc.txt") # new .txt that can be used as a .bat

#############################################################################
# Main
#############################################################################
if __name__ == "__main__":
    list1 = os.listdir(sourcepdf) # assemble list of all files in sourcepdf
    l = open(batchdoc,'w') # open .txt doc to write lines
    for i in list1: # iterate list of files
        #newi = i[0:] # allows slicing on file name if chars need to be removed
        #print newi
        #t = inString1 + usString + newi + inString2 + i + "\n"
        t = inString1 + usString + i + inString2 + i + "\n" # assemble each string
        print t
        l.write(t) # write each string
    l.close()
```

WINDOWS BATCH FILE

A line from the batch file looks like:

```
gswin32 -sDEVICE=pdfwrite -dCompatibilityLevel=1.4 -dPDFSETTINGS=/ebook -dNOPAUSE
        -dQUIET -dBATCH -sOutputFile=J:\Project\2018ParcelAtlas\build\optimized 02-
        001-001-00.pdf J:\Projects\2018ParcelAtlas\build\2018071 \_02-001-001-00.pdf
```

To execute the batch file: change the extension of the scripts output from .txt to .bat. Double click the .bat to execute.

6.9 QGIS Tools

6.9.1 QGIS Azimuth and Distance Plugin

Tool Summary

The Azimuth and Distance Plugin can be added to QGIS to provide COGO functionality.

Background

QGIS is an opensource GIS that provides additional tools through Plugin architecture.

Why the Tool is Needed

QGIS does not have a COGO toolset built in.

Who the Tool is For

A user with QGIS installed locally and the ability to make a basic map.

Takeaways

The Azimuth and Distance Plugin provides the COGO functionality in QGIS.

The Plugin can be installed following these steps.

AZIMUTH AND DISTANCE PLUGIN INSTALLATION

Install the Plugin

Plugins *(1)* ⇒ Topography Group

Select the Azimuth and Distance Plugin *(2)*

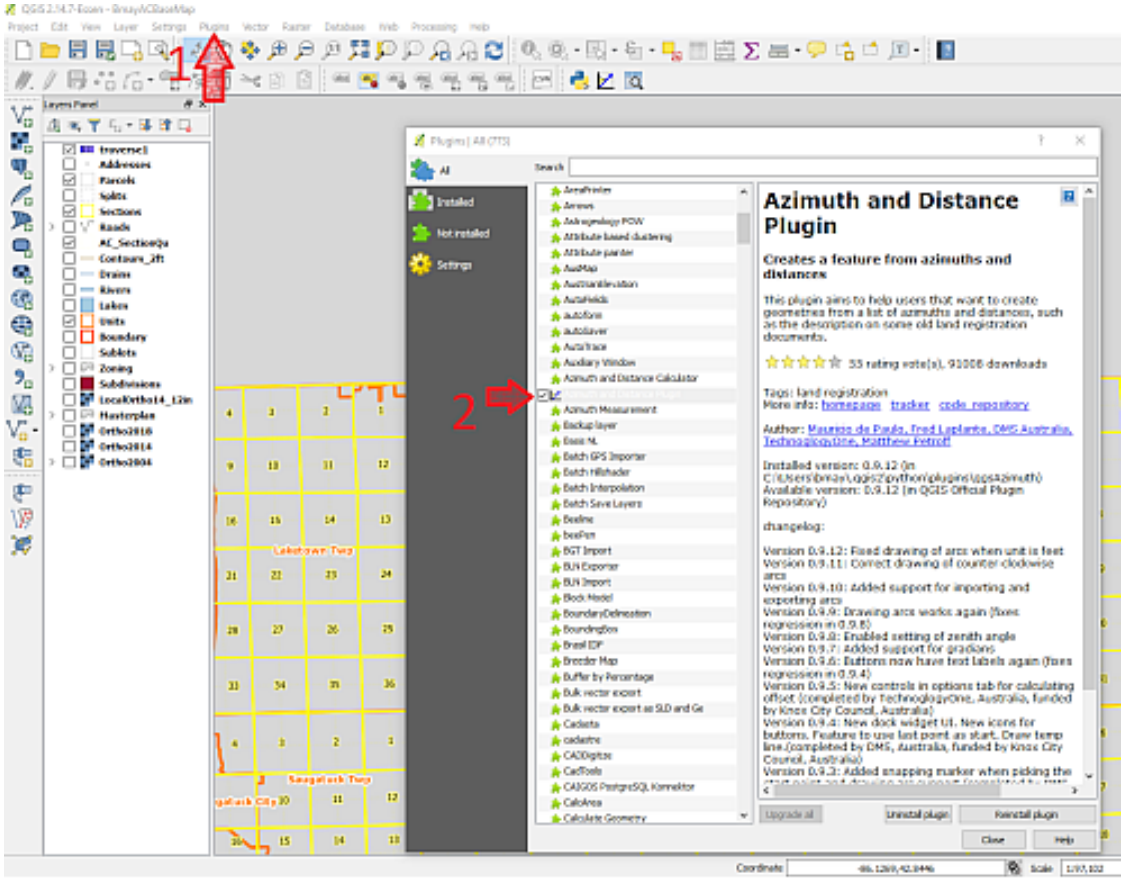


Figure 6.71: Launch Plugin

Azimuth and Distance Plugin Tool is Added to Toolbar

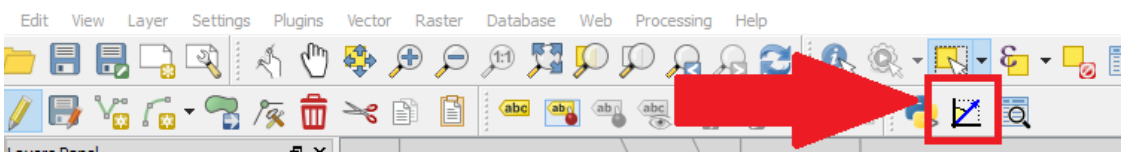


Figure 6.72: COGO Icon

6.9.2 COGO Tools in QGIS

Tool Summary

Transfers of real property typically involve a Metes and Bounds description:

Commencing at Southeast corner of Section 1, Town 2 North, Range 11 West, Martin Township, Allegan County, Michigan; thence North 88 degrees 32 minutes 05 seconds West 1338.44 feet along the south line of said section to the point of beginning; thence North 01 degrees 27 minutes 55 seconds East 388 feet; thence South 88 degrees 32 minutes 05 seconds East 584 feet, more or less, to the centerline of the Gun River: thence southerly along said centerline to the south section line; thence West along said section line to the point of beginning.

Figure 6.73: Description From Deed

Background

In GIS, *Coordinate Geometry* or **COGO** tools convert written descriptions of real property into digital map features.

Users in several county departments use COGO tools in their regular workflow.

Why the Tool is Needed

A tool is needed to convert between written descriptions of real property and digital map data.

The COGO tools in ArcGIS require an advanced license.

Who the Tool is For

A user with QGIS installed locally and the ability to make a basic map.

Takeaways

QGIS is an open source GIS without a built in COGO toolset.

The Azimuth and Distance Plugin provides the COGO functionality in QGIS.

Following are instructions for using QGIS for COGO

To use COGO tools in QGIS, follow these steps

Step 1:

Launch and Configure the Azimuth and Distance Plugin

∗Plugin installation is covered in a separate document.

Figure 6.74: COGO Icon

∗This tool draws in a temporary layer or in an active map layer.

Select **traverse1** as active layer in the tool.

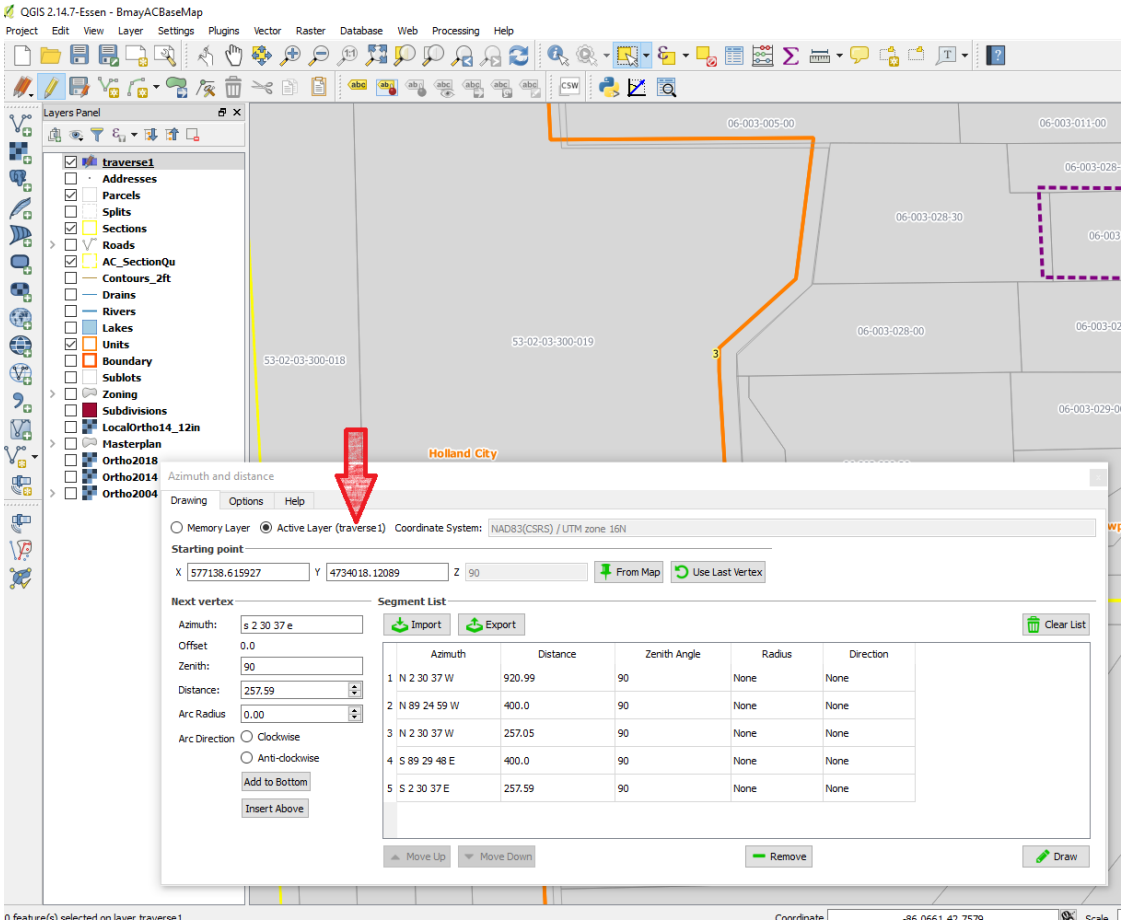


Figure 6.75: Check Active Layer

Configure Options in Plugin

On the **Options** **Tab:** Select these radio buttons;

- Boundary
- Bearing
- Feet
- Degree

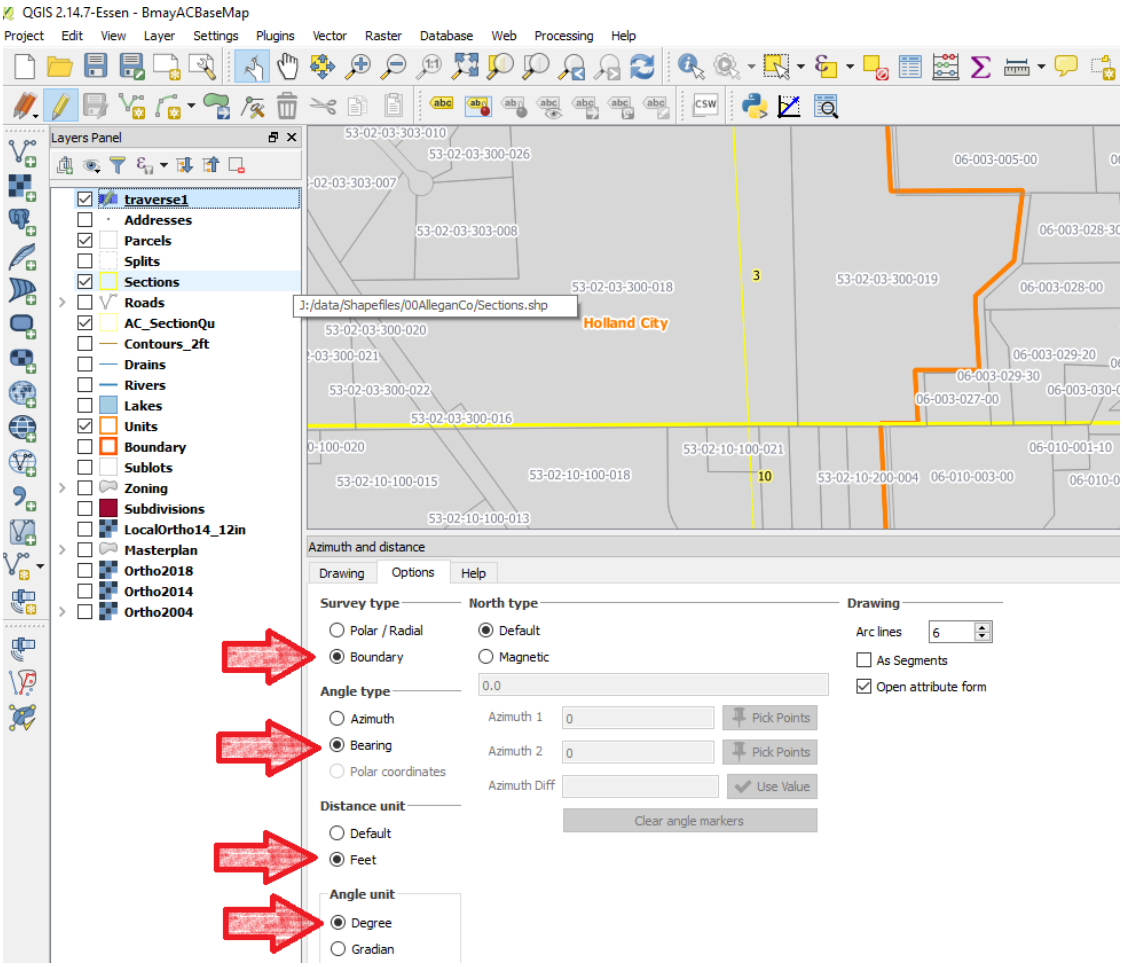


Figure 6.76: Plugin Options

Step 2: Activate traverse layer in map

*For a map layer to be editable, it must be activated in the Layers Panel.

(If necessary) left click the layer **traverse1** in Layer Panel to activate it.

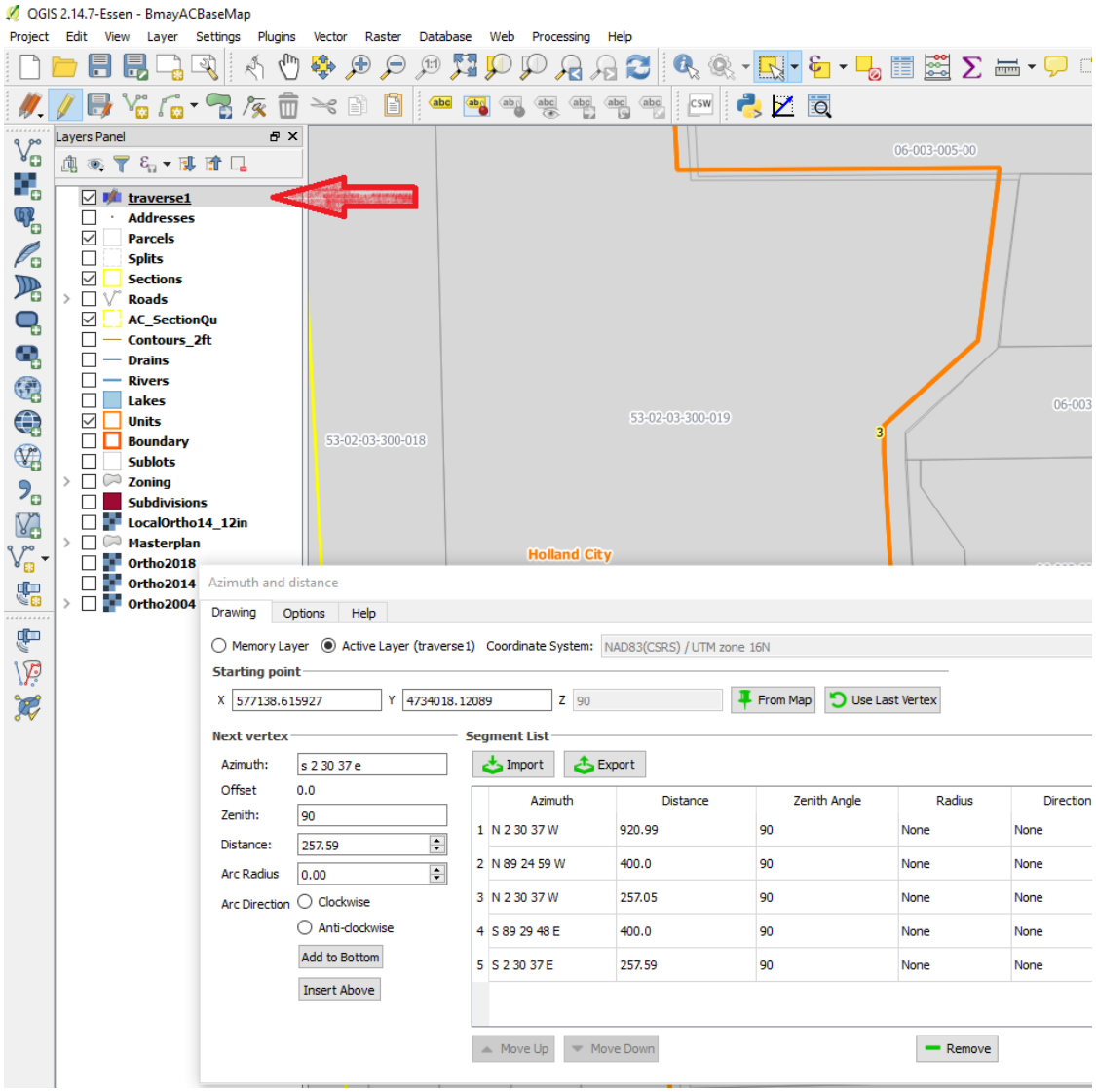


Figure 6.77: activate layer

Step 3: Locate the Point of Commencement

To get to the Point of Commencement,

Use **any combination** of the following methods:

- Use Reference Layers such as Units, Sections, Quarter Sections, and Parcels.

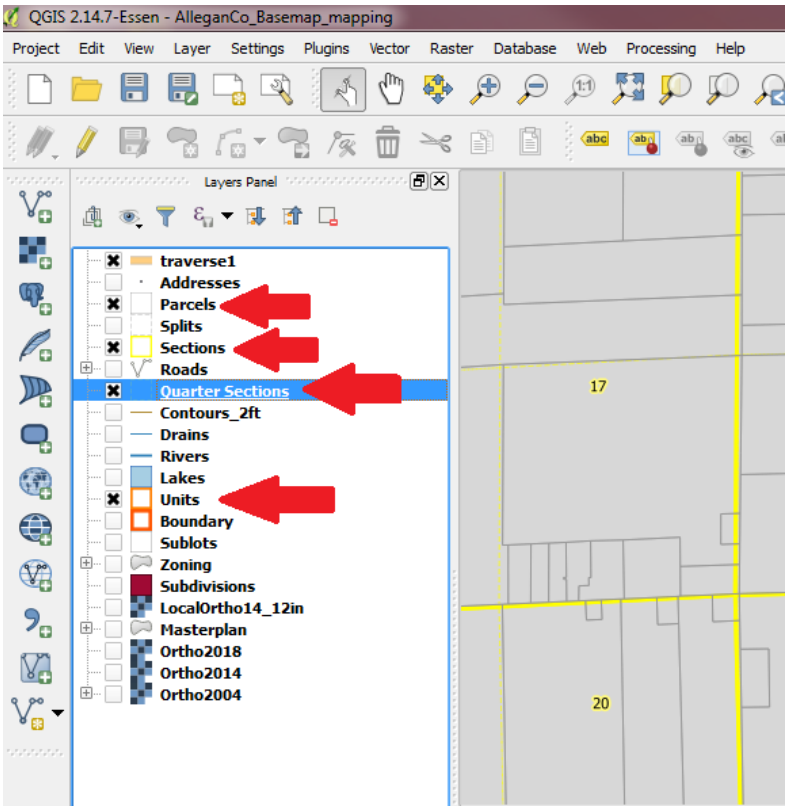


Figure 6.78: Select Reference Layers

➢ Use the Measuring Tool

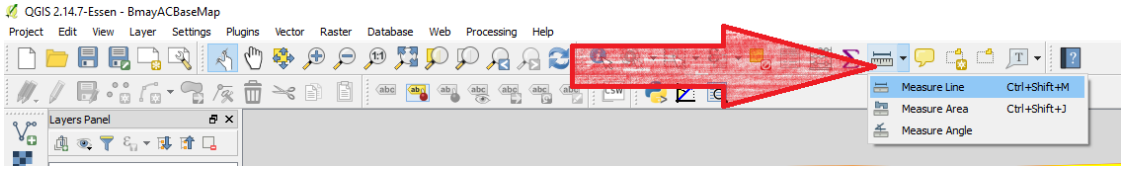


Figure 6.79: Measuring Tool

➢ Search by Parcel Number (Search Layers Plugin)

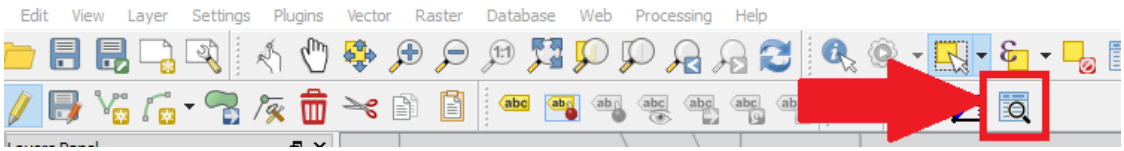


Figure 6.80: Search Layer Icon

➢ Draw COGO lines (Step 4)

Step 4: Draw a Line With Azimuth and Distance

Commencing at Southeast corner of Section 1, Town 2 North, Range 11 West, Martin Township, Allegan County, Michigan; thence North 88 degrees 32 minutes 05 seconds West 1338.44 feet along the south line of said section to the point of beginning; thence North 01 degrees 27 minutes 55 seconds East 388 feet; thence South 88 degrees 32 minutes 05 seconds East 584 feet, more or less, to the centerline of the Gun River: thence southerly along said centerline to the south section line; thence West along said section line to the point of beginning.

Figure 6.81: Description From Deed

On the **Drawing Tab:**

- Azimuth (bearing): Enter Bearing in format: *N 88 32 05 W*
- Offset: Set to *0*
- Zenith: Set to *90*
- Distance: Enter Feet Distance in numbers only *1338.44*

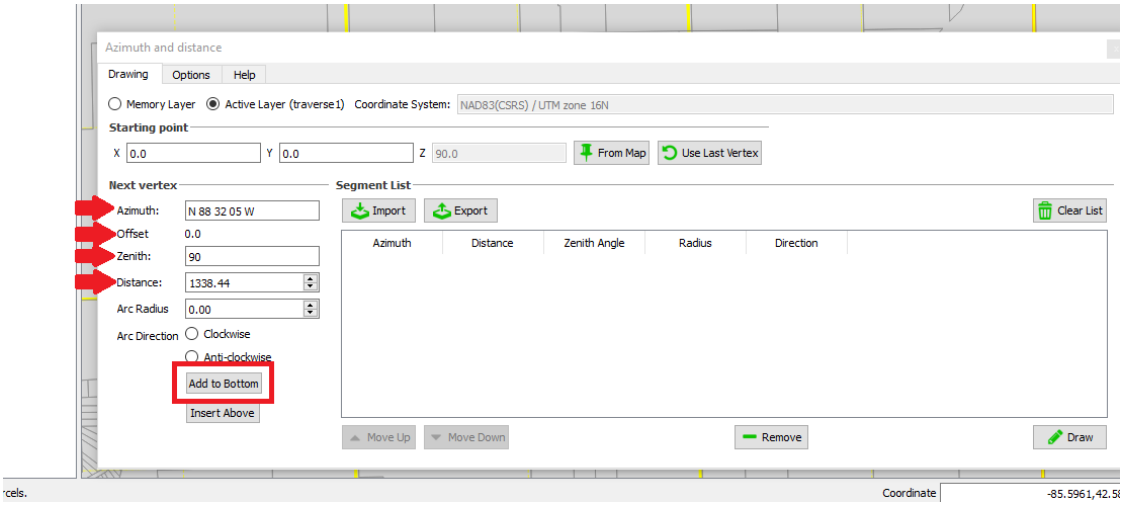


Figure 6.82: Entering Bounds

Push Add to Bottom

Line is added to the list

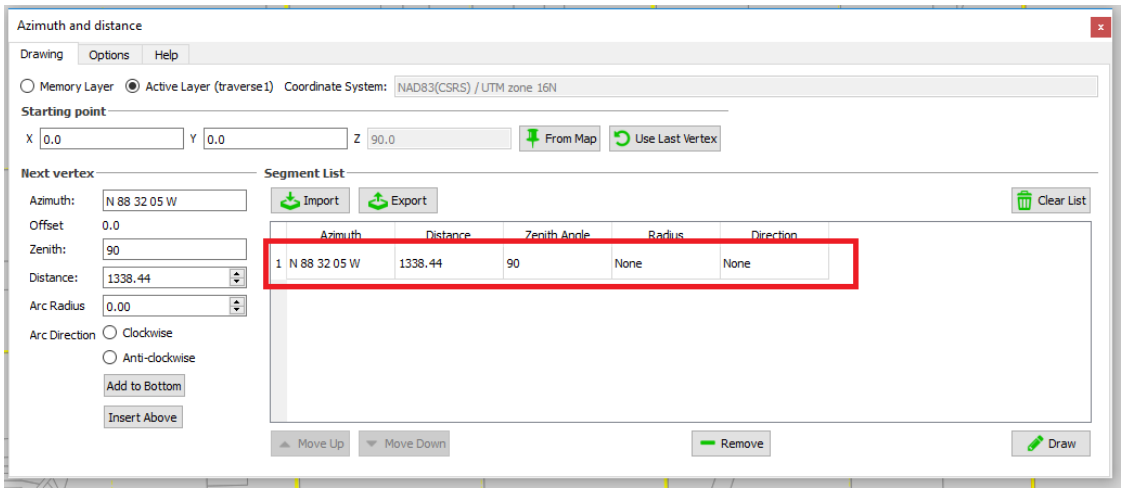


Figure 6.83: Line Added

Add as many bounds as you can from the description

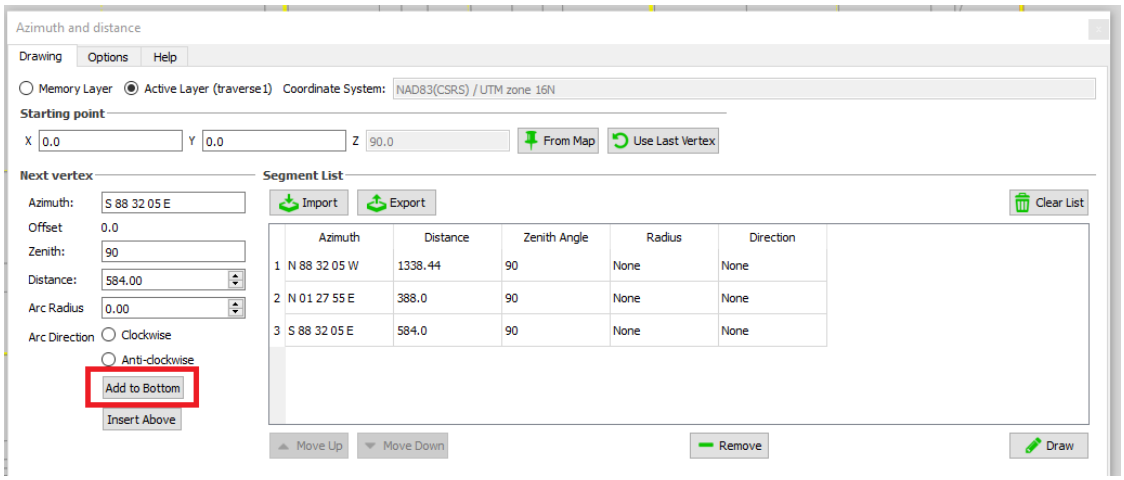


Figure 6.84: Three Lines Added

Choose A Point to Start Drawing From

Push the **From Map** button.

*Decide which layer to reference for a starting point.

Align cursor with desired starting point and click.

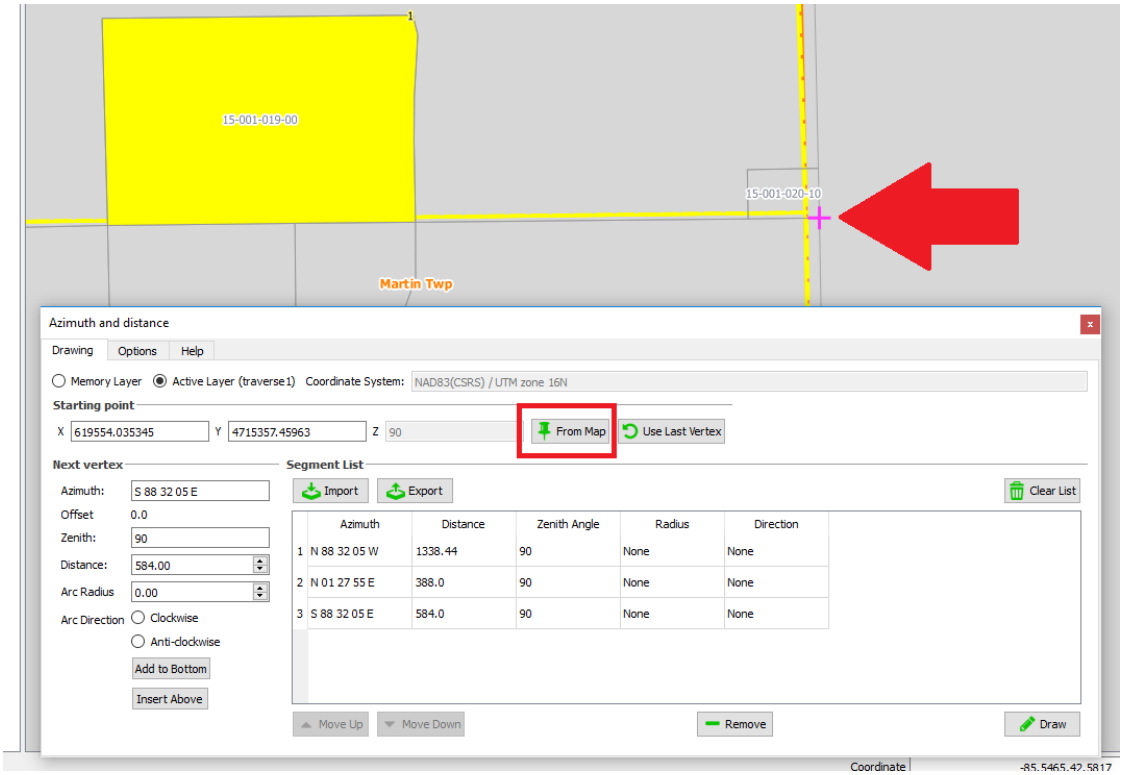


Figure 6.85: From Map

Draw the Segments So Far

- Push **Draw**
- Enter Attributes for the polyline to be created
- Press **OK**

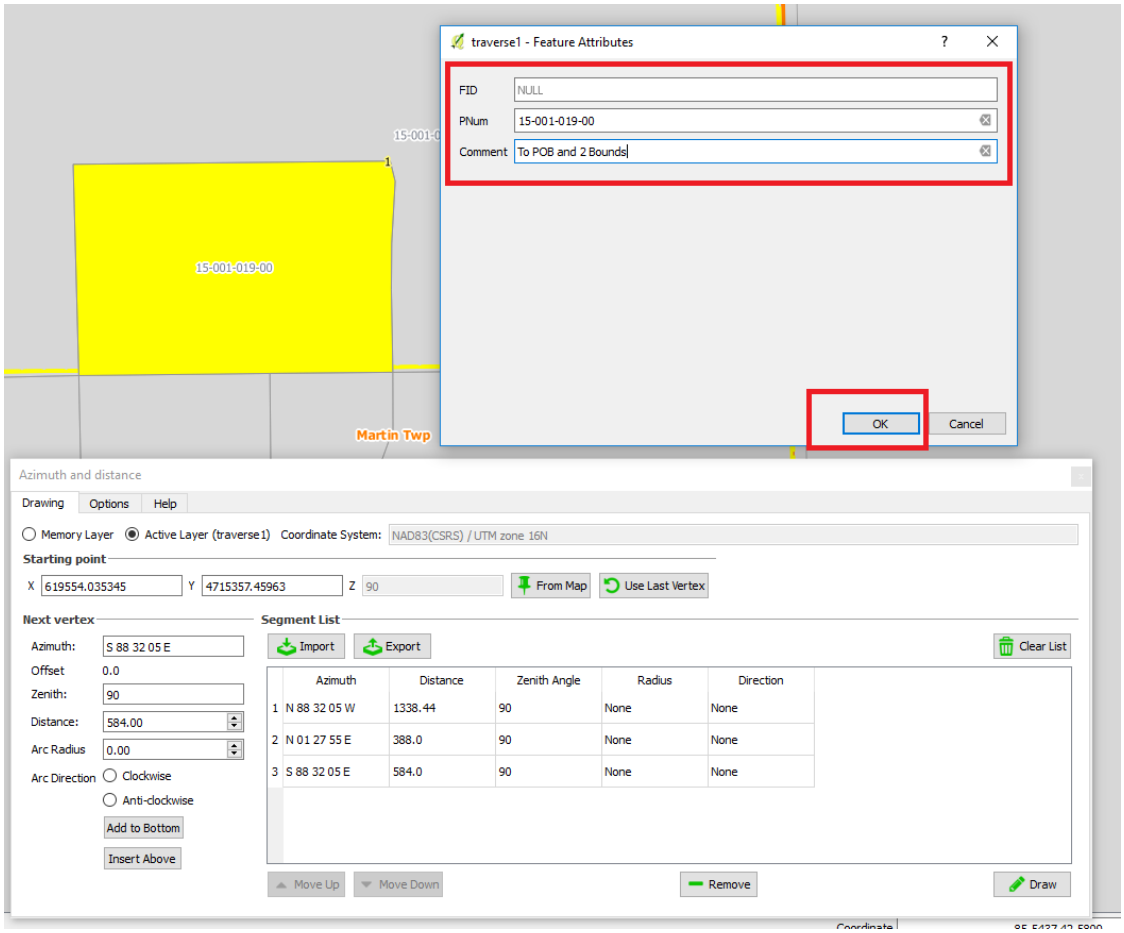


Figure 6.86: Enter Attributes

Use the sketch to identify the parcel

In this case, turn on ortho photo to verify the remaining bounds.

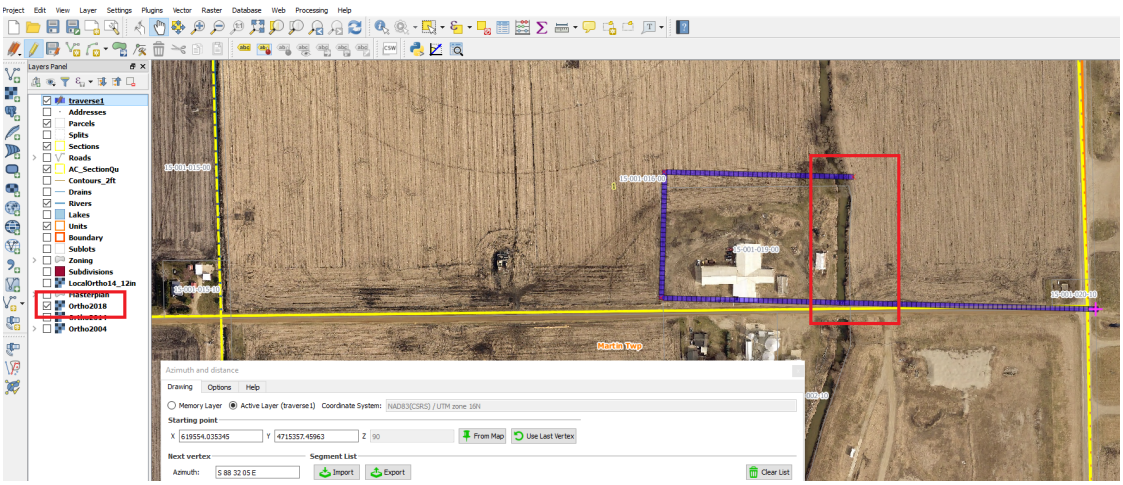


Figure 6.87: Verify Remaining Bounds

(optionally) Save Input for Later Use

If you want to save the segments for later use, press **Export**.

Name it and select a **save** location.

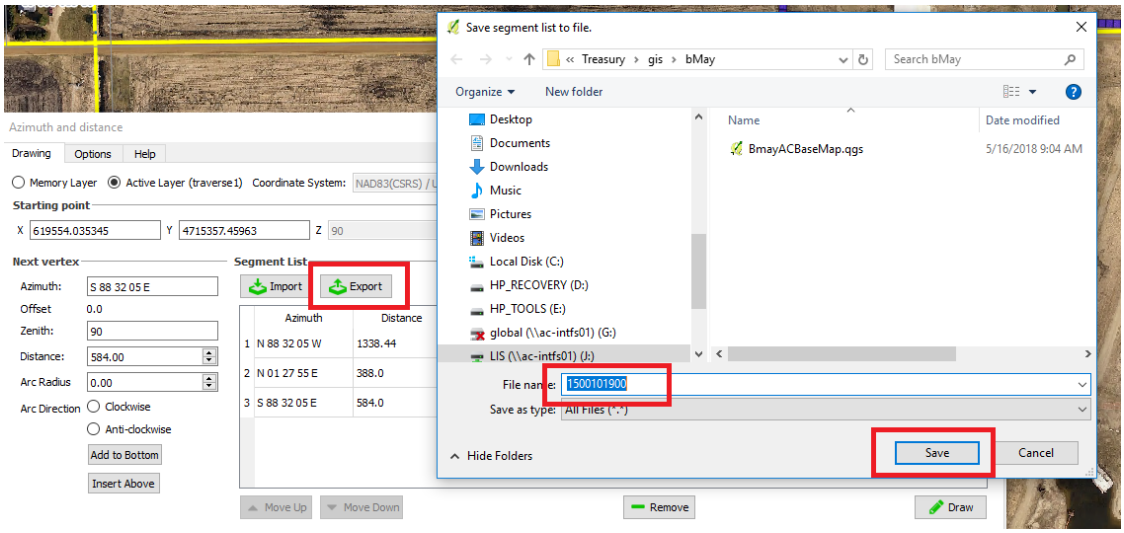


Figure 6.88: Save Segment List

Verify Attributes

Right click on *Traverse1* in the Layers Panel

and select **open attribute table**.

The attributes you entered should be in the table.

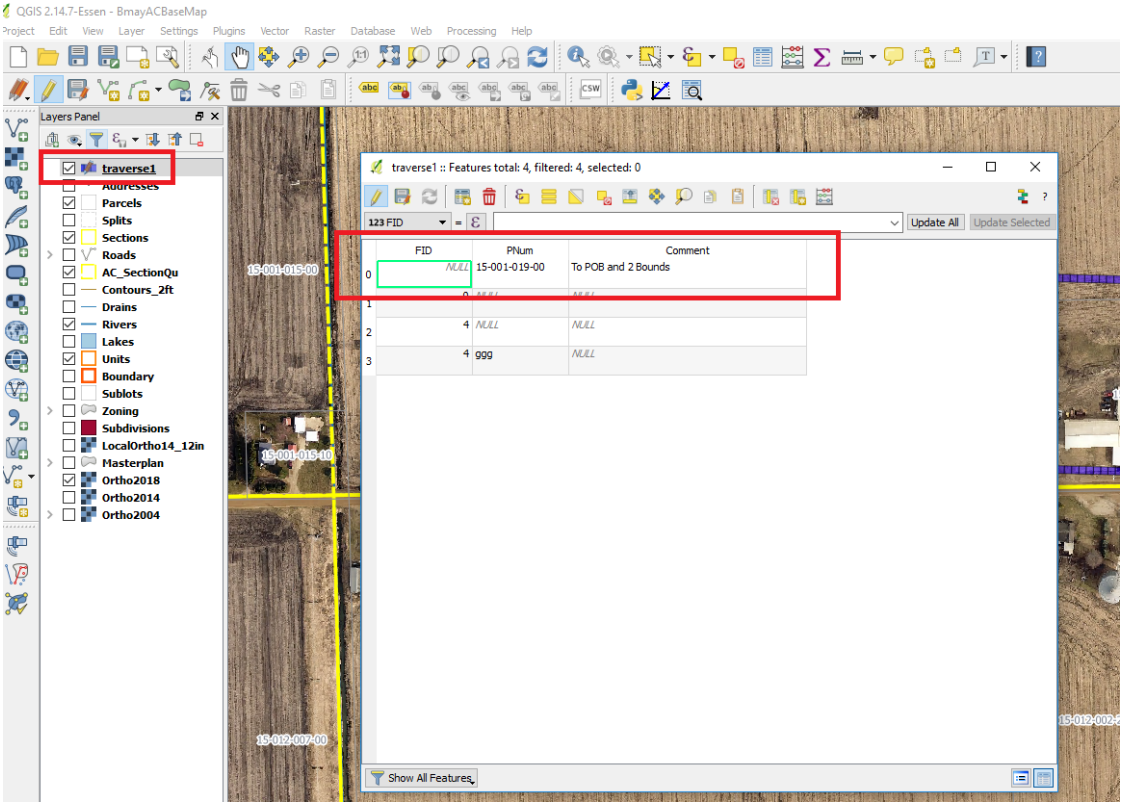


Figure 6.89: Segments In Table

6.9.3 Search Layers Plugin

Tool Summary

QGIS has some tools built in and others can be added via the Plugin architecture.

Background

QGIS is an open source GIS and search by feature attributes is needed.

Why the Tool is Needed

QGIS users need a tool to search for features by attribute.

Who the Tool is For

QGIS users that require a search by attributes tool.

Takeaway

The Search Layers Plugin can be added to any installation of QGIS.

PLUGIN SETUP

Install Search Layers Plugin

➢ To install: Plugins ⇒ **Search Layers** Plugin ⇒ Install

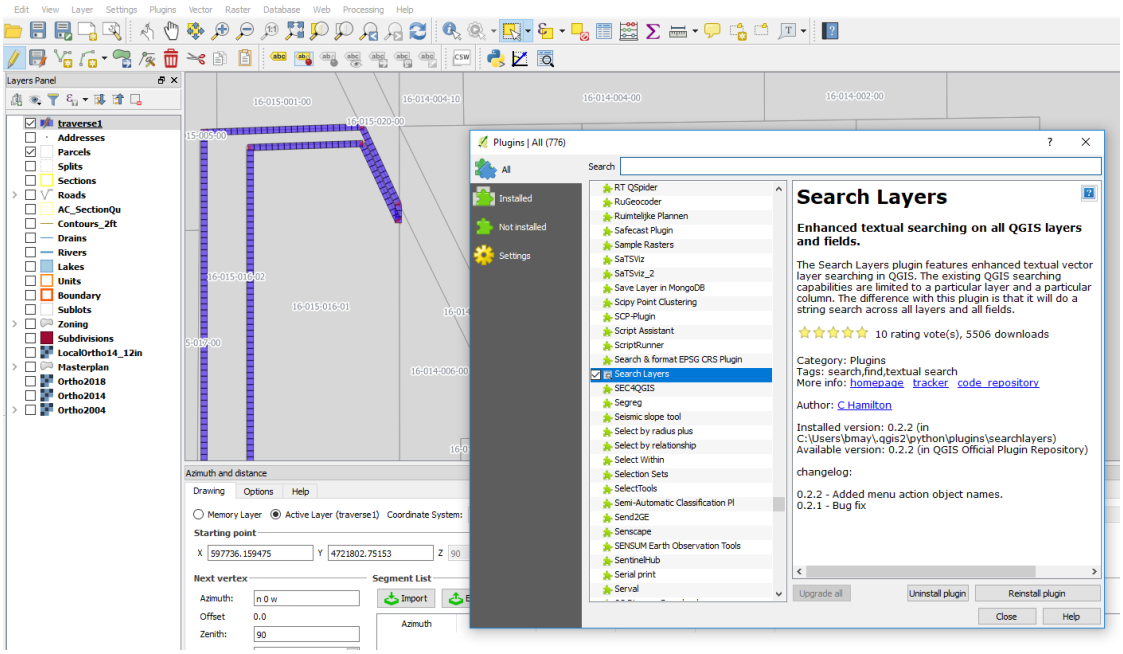


Figure 6.90: Search Layers Plugin

Search Layers Plugin Tool is Added to the Toolbar

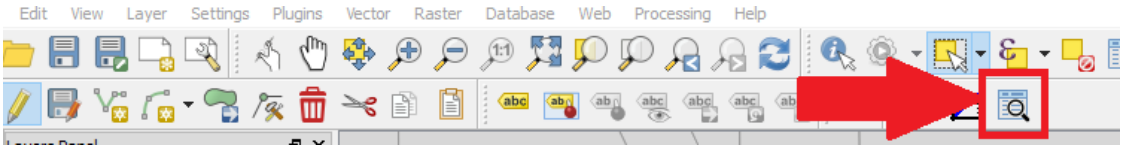


Figure 6.91: Search Layer Icon

USING THE PLUGIN

Enter Parcel Search Data

In The **Search Layers Plugin:**

- Enter **parcel number** (with dashes) into *Search String*
- Select **Parcels** in *Search Layers*
- Select **PARCELID** in *Search Fields*
- Select = in *Comparison*

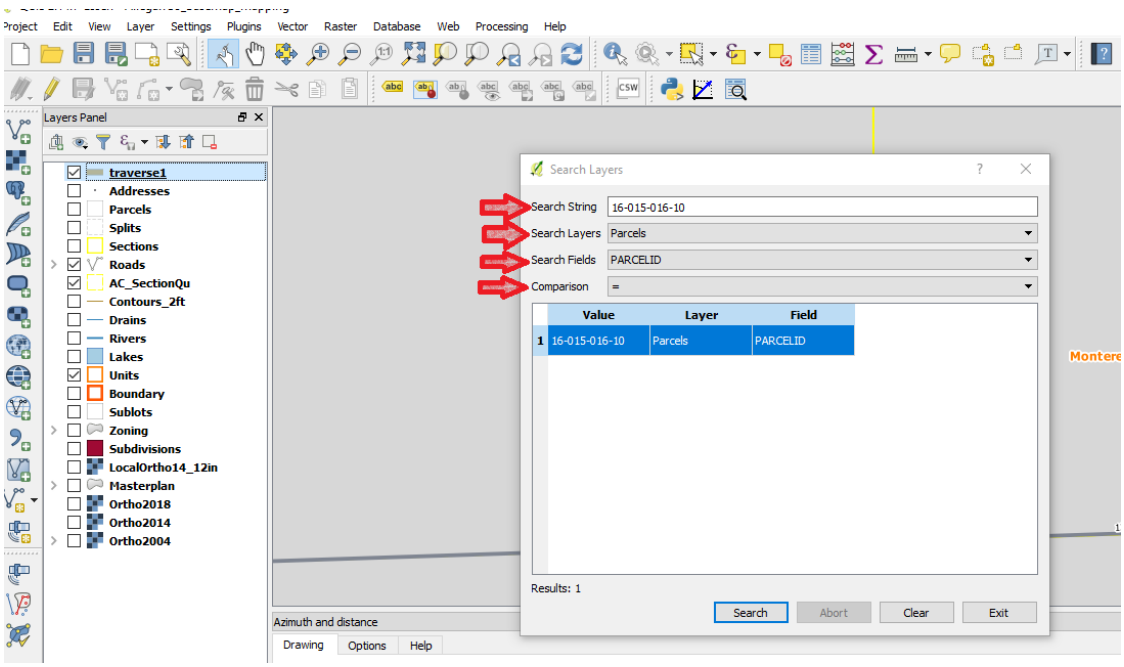


Figure 6.92: Search Layers Setup

- click on result in table

Screen zooms into the selection

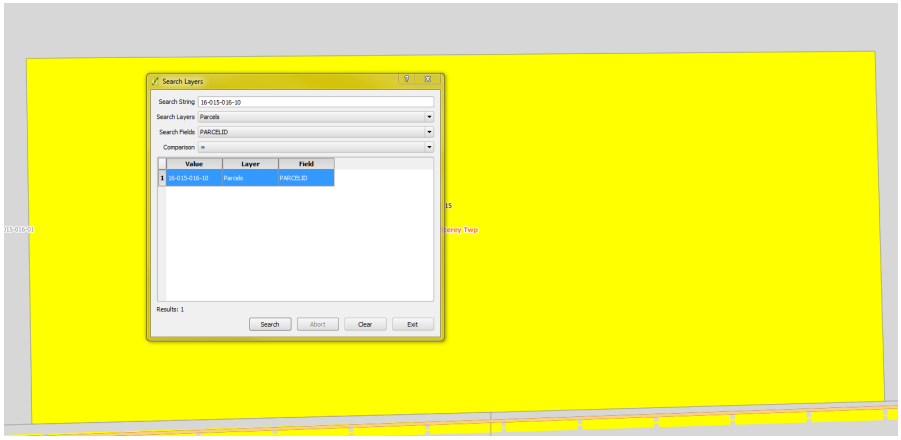


Figure 6.93: Search Results

Zoom out far enough to find a reference point

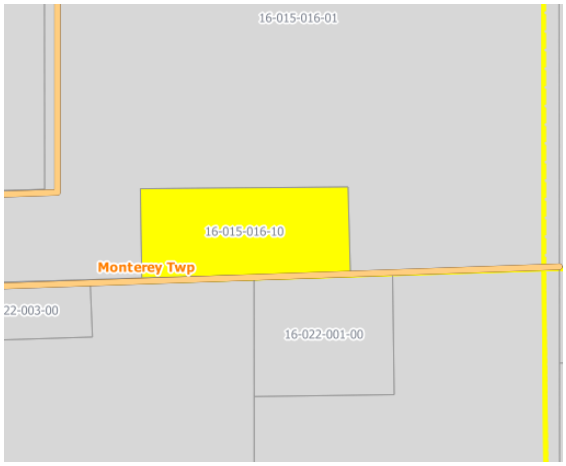


Figure 6.94: Search Results Zoomed Out

Part IV

Resources

Reading Room

Drains Resources

Drain Engineer

How to be a Drain Engineer

Document Link

ESRI PRODUCT DOCUMENTATION

ARCGIS ENTERPRISE

arcgis 10.5 Enterprise Functionality Matrix

Document Link

Geography 101

Terms and Abbreviations

BLM Glossary of Terms

Document Link

Coordinate Systems

A Primer on Coordinate Systems Commonly Used in Michigan

Document Link

PLSS Resources

PLSS Development Notes

Document Link

Theoretical Township Map

Document Link

US Public Land Survey System

Document Link

Printing Resources

Page Sizes

ANSI Size Illustration

Document Link

Standard Paper Size Guide

Document Link

State Resources

State ROW Documents

County Road Association ROW Definition

Document Link

State Tax Commission

State Tax Commission Course on Legal Description

Document Link

Version Control Resources

git Resources

git Branching Model

Document Link

Task Summaries

Survey Plans

Using Coordinates From Survey Plans

How to use Northing and Easting Coordinates Table

Using a spreadsheet to convert the dimensions To use Northing and Easting from survey plans: In a spreadsheet, adjust the data to be relative to the 1st point

So if a survey gives you:

Pt	Northing	Easting
1	995.9952	9766.6
2	994.3049	9112
3	989.234	7150
4	1194.3099	9114
5	1193.266	8710.2059
6	1193.0954	8644.2016
...	...	...
32	1617.7856	8827.4296

Table 1: Survey Plan Northing and Easting

Calculate Relative North and Relative Easting of the points to Point 1 by subtracting the point 1 values from each of the other points.

Use formulas:

	A	B	C	D	E
1	Pt	Northing	Easting	Relative NS	Relative EW
2	1	995.9952	9766.6	0	0
3	2	994.3049	9112	=B3-B$2	=C3-C$2
4	3	989.234	7150	=B4-B$2	=C4-C$2
...	...	...	...	...	...
6	32	1617.7856	8827.4296	=B9-B$2	=C9-C$2

Table 2: Survey Plan Northing and Easting

Giving you:

	A	B	C	D	E
1	Pt	Northing	Easting	Relative NS	Relative EW
2	1	995.9952	9766.6	0	0
3	2	994.3049	9112	-1.6903	-654.6
4	3	989.234	7150	-6.7612	-2616.6
...	...	...	...	...	...
6	32	1617.7856	8827.4296	621.7904	-939.1704

Table 3: Relative Northing and Easting

So to place pt 32:

From pt 1:

Use distances 621.7904' N and 939.1704'W

References

[1] Artiflex, *ghostscript.com*, 2018. 233

[2] na, *The hyperref package*, CTAN, na ed., na na. 221

Glossary

git An open source version control system. 15

Index