

What We Do

Allegan County GIS
www.allegancounty.org/gis

November 9, 2018

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Part I

Brand

Chapter 1

Awards

1.1 The GIS Champion Award

1.1.1 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}
\underline{\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

Chapter 2

Documentation

2.1 About Documentation

2.1.1 How Jalapeño Works

General 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 |
| documentation | resources used in Jalapeño |
| processing | .tex documents and build folders |
| source | common image files |

| ...\\jalapeno\\documentation\\.. | |
|----------------------------------|---|
| folder or file | description |
| moduleTemplates | .tex templates |
| packageDocs | L <small>A</small> T <small>E</small> X documentation |
| references | reference and appendix resources |
| unsorted | catch all for unsorted documentation |
| BookStructureMM.mm | A mindmap of jalapeno |

...\\jalapeno\\processing\\..

| folder or file | description |
|----------------------------|---|
| ...Part | folders of book <i>parts</i> |
| build | L ^A T _E X folder for .pdf output and temp files |
| build\referenceEntries.bib | entries that appear in references |
| commonTitle.tex | code for all title pages |
| fullCompile.sh | shell script to compile GISDocumentation.tex |
| GISDocumentation.tex | master document code |
| glossaryEntries.tex | entries that appear in glossary |
| indexEntries.tex | entries that appear in the index |
| preamble.tex | preamble code for all documents |

***Note about referenceEntries.bib** Any reference entries built here can be cited in any .tex document in the project.

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 L^AT_EX 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 .glx file. After the .glx 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 .glx file.

Rebuilding the glossary To Recompile the .glx. In the (main document)build folder:

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

***Note:** This command reads the .aux file and creates the .glx 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. For example:

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 L^AT_EX 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 `.bb1` file. After the `.bb1` file is created, PDFLatex must be run again to insert the bibliography at the `\bibliography` location.

For example, the command:
`...\\bibliography{referenceEntries}`
...places the bibliography called `referenceEntries.bib` which must be in 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 `.bb1` file.

Rebuilding the bibliography To **Recompile the .bb1**. In the (main document)build folder:

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

***Note:** This command reads the `.aux` file and creates the `.bb1` 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:

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

To add the bibliography to the subdocument:

- Similar to adding to the master document but not documented here.

Using the Index

Index requirements: Compiling the index requires running the makeindex command either in a L^AT_EX 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:** 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

Using index terms in 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

Lets talk about map projection

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

Chapter 3

Team Concept

3.1 Team Structure

3.1.1 Paired Programming

A paragraph about pp from Joy Inc.

Part III

Service

Chapter 4

Applications

4.1 Applications for Treasurer Dept.

4.1.1 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 Current Tax Forfeiture workflow is built on MapInfo software which has been replaced by ESRI software. The Forfeiture data collection application must be recreated in the ESRI framework.

Analysis Tax Forfeiture Application, referred to here as: **Forfeiture App** will facilitate:

- Mobile data collection on handheld device, referred to here as: **Mobile Interface**
 - Mobile Interface will:
 - * Synchronize with data in the office (online)
 - * Navigate to forfeiture sites (offline)
 - * Collect data and photos of forfeiture sites (offline)
 - * Synchronize the collected data with data in the office (online)
 - Daily form production and printing for each site visited with required data and images

Design

Overview The Forfeiture App documents the Tax Forfeiture process

The key data set, is referred to here as: **Forfeiture Parcels**

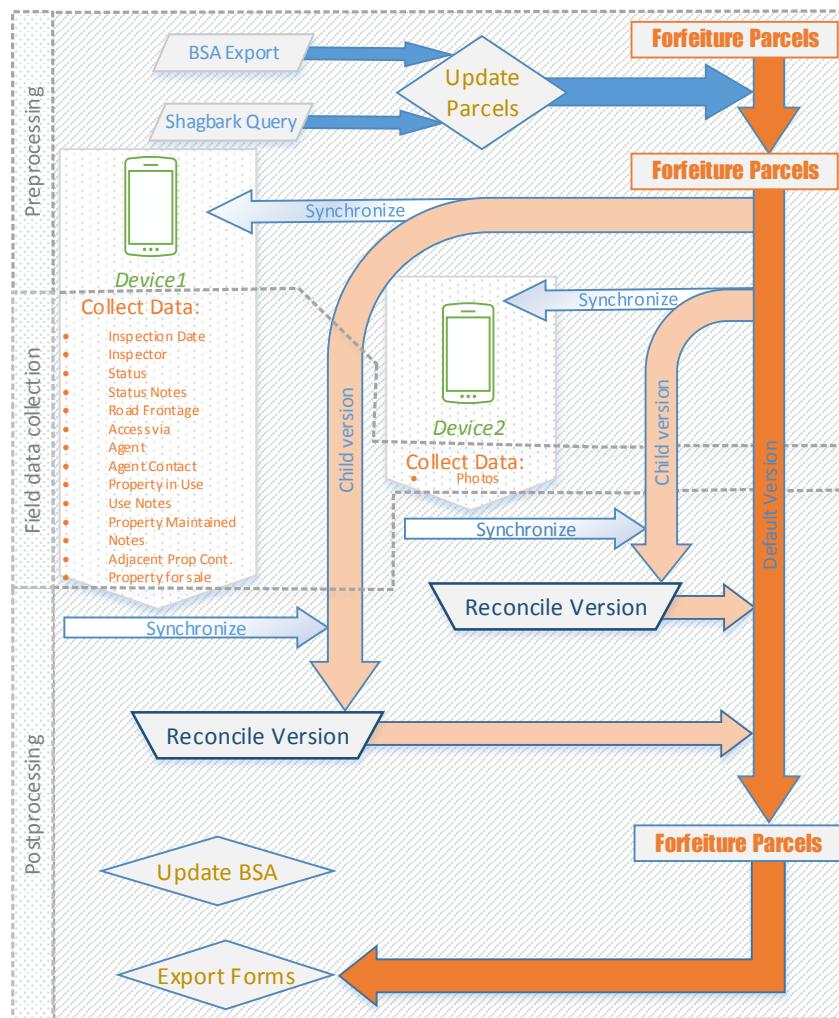


Figure 4.1: Project Design

Forfeiture App Summary Three parts of 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 synchronizing 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.

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

ArcGIS Portal Webmaps and Apps 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.

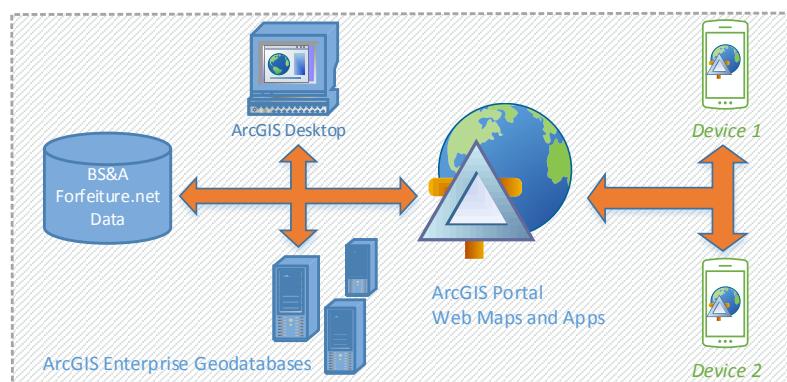


Figure 4.2: Technology Design

Data Details

Data Location The data is located in ACPUB. ACPUB is a geodatabase on ACINTSQL01.

Forfeiture Parcels Data

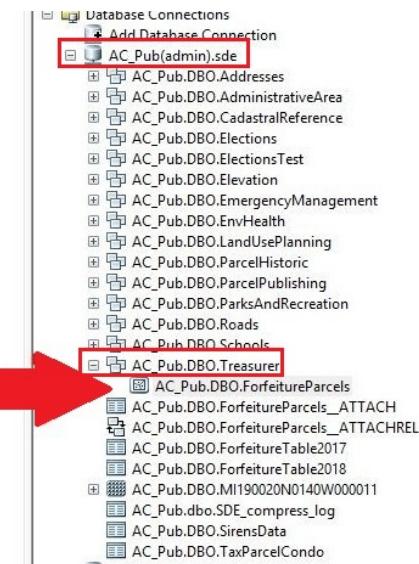


Figure 4.3: Live Data Location

Contamination Data

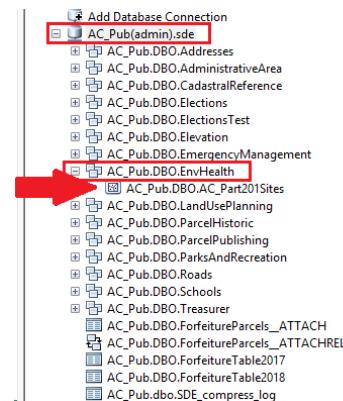


Figure 4.4: Contamination Feature Class

ForfeitureParcels Feature Class Data 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 4.1: Dataset Details

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

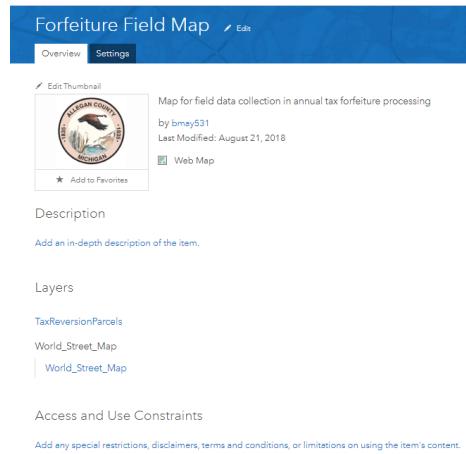


Figure 4.5: Web Map Details

Feature Layer Details TaxReversionParcels has been configured for offline use.

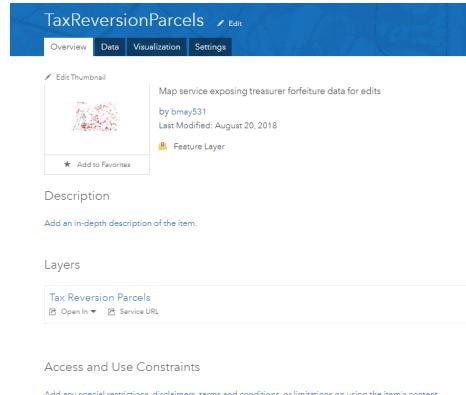


Figure 4.6: Feature Layer Details

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](https://tiledbasemaps.arcgis.com/arcgis/rest/services/World_Street_Map/MapServer)

The screenshot displays the ArcGIS Online interface for the 'World Street Map (for Export)' service. At the top, there's a navigation bar with links for ArcGIS, Pricing, Map, Scene, and Help, along with a sign-in button and a search bar. Below the header, the title 'World Street Map (for Export)' is prominently displayed. The main content area features a map preview showing a portion of the world map with red and orange lines representing highways and streets. To the right of the map, there's a detailed description of the layer, stating it presents highway-level data for the world and street-level data for many areas around the world. It mentions that the layer is designed to support export of basemap tiles for offline use and requires ArcGIS Online Subscription. Below the description, there are buttons for 'Tile Layer by Esri' and 'Overview'. Further down, there are buttons for 'Authoritative' and 'Subscriber'. On the right side of the page, there are three buttons: 'Open in Map Viewer', 'Open in Scene Viewer', and 'Open in ArcGIS Desktop'. Below these buttons, there's a 'Details' section with information about the source being a Map Service, its size (1 kB), and a rating of 4 stars. There are also social sharing icons for Facebook, Twitter, and LinkedIn. The 'Owner' section shows 'Esri' as the managed entity. The 'Tags' section lists numerous keywords related to the map, such as World, Global, Europe, North America, United States, Southern Africa, Asia, South America, Australia, streets, street map, tile package, basemap, highways, roads, transportation, landmarks, parks, community, community basemap, map, AFA250_base, current, esri_basemap, general availability, export.

Figure 4.7: 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 To Create the new ForfeitureParcels dataset

Use the Delete Feature Tools

The tool will delete features in the feature class and attachments table

In the tool: Select ACPub.DBO.ForfeitureParcels

Press OK

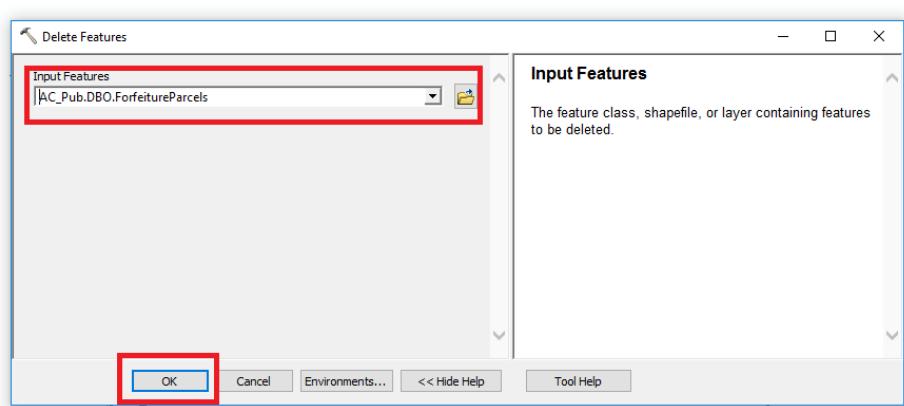


Figure 4.8: Delete Features

Add Query Layer

In ArcMap:

Open the New Query Layer Dialog

Go to \Rightarrow File \Rightarrow Add Data \Rightarrow Add Query Layer

In the connection dropdown, select your connection

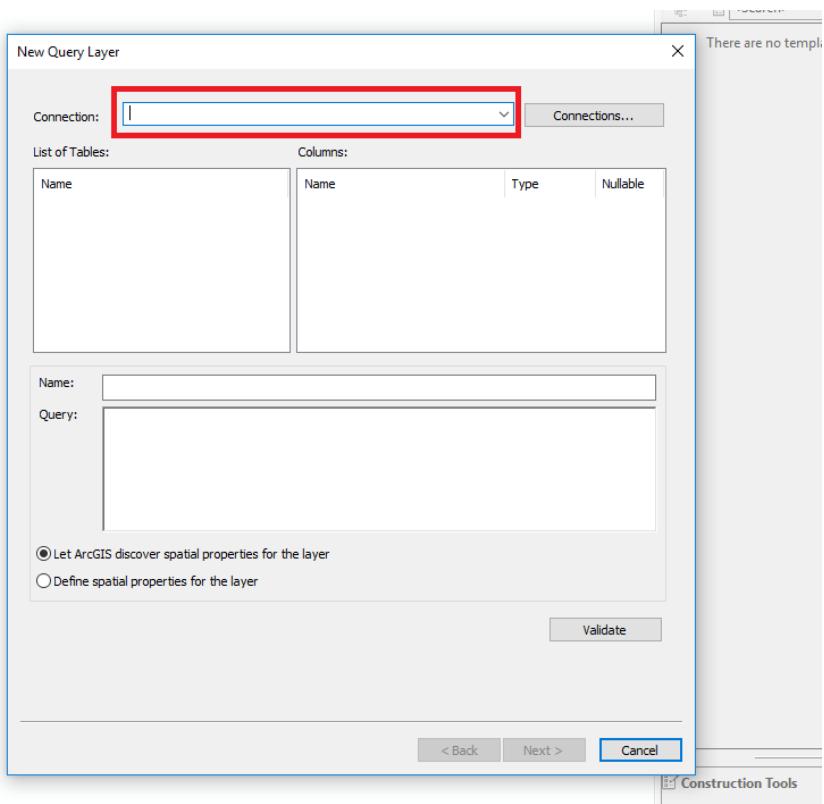


Figure 4.9: New Query Layer Dialog

Create Query in ArcGIS to SQL Database

Details of the Query Layer

Enter into the tool

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

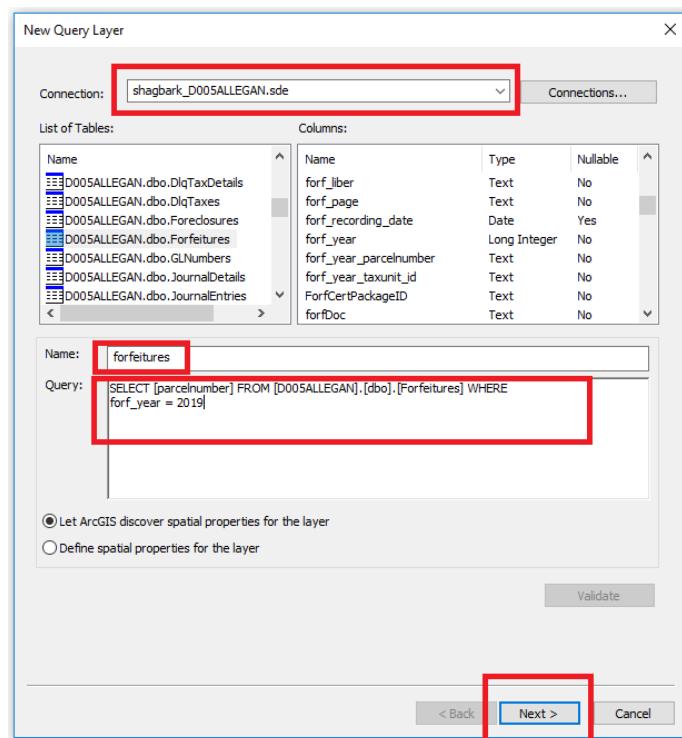


Figure 4.10: Forfeiture Query Layer Details

Select a Unique Identifier

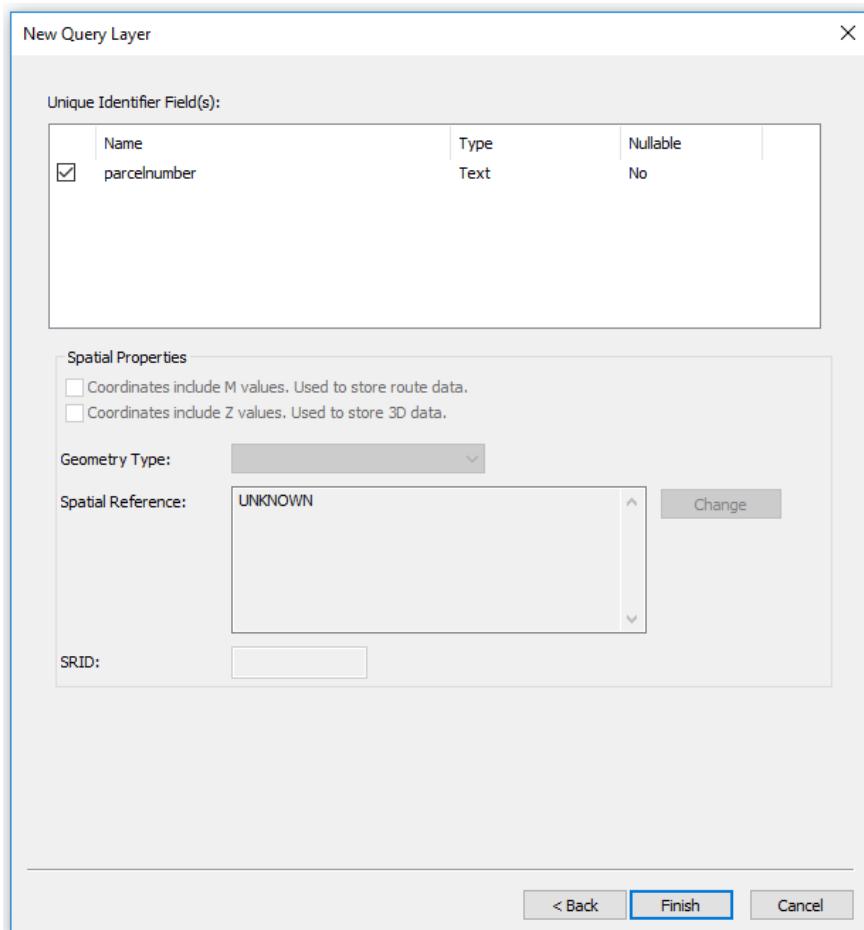


Figure 4.11: Query Layer Unique ID

Setup Users in ArcGIS

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

For any new users of the geoprocessing tools, use the create Database User tool
or

Go to ⇒ Right click on ACpub ⇒ Administration ⇒ Add User

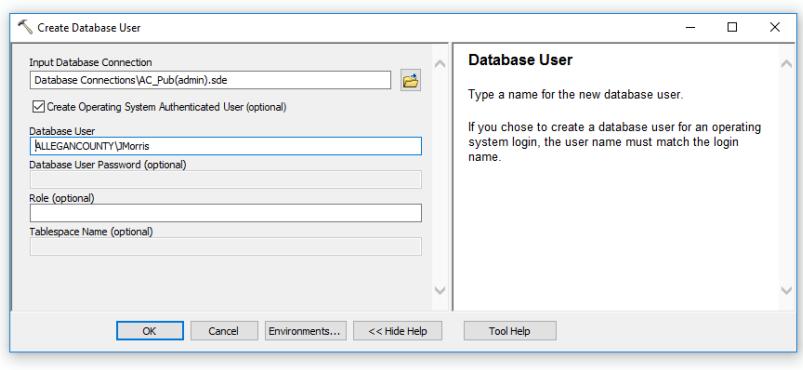


Figure 4.12: Add Db User

Add New User to Feature Dataset

In Catalog, ⇒ right click on Treasurer Feature Data Set ⇒ Manage ⇒ Privileges ⇒ Add ⇒ Type new user ⇒ ok

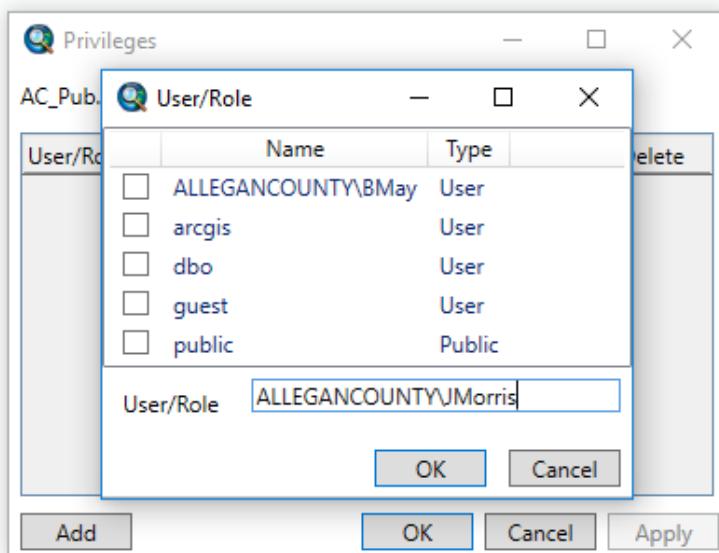


Figure 4.13: Add Feature Dataset User

Extend Privileges for New User

In Catalog⇒right click on Treasurer FDS ⇒ Manage⇒ Privileges⇒ check boxes

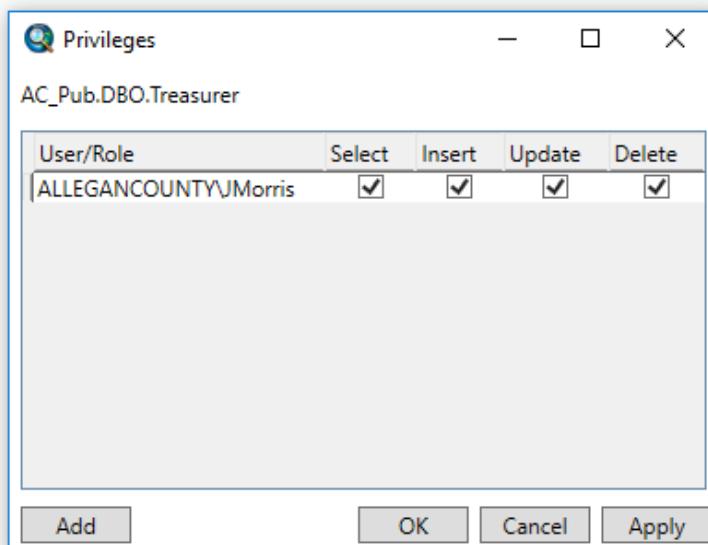


Figure 4.14: Extend Feature Dataset Privileges

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 go to My Organization

The screenshot shows the 'My Organization' page of the Allegan County GIS Services portal. At the top, there's a navigation bar with links like 'Home', 'Gallery', 'Map', 'Scene', 'Groups', 'My Content', and 'My Organization'. Below the navigation is a search bar with the name 'Bryan' entered. The main content area is titled 'Allegan County GIS Services' and contains a table of member information:

| Name | Username | Last Login | Level | Role | Action |
|-------------------|-----------|--------------|-------|---------------|--------|
| Bryan May | bmay531 | Nov 2, 2018 | ③ | Administrator | [Edit] |
| Christina Andress | CAndress | Sep 19, 2018 | ② | Administrator | [Edit] |
| Jennifer Morris | JMorris | Oct 18, 2018 | ③ | Administrator | [Edit] |
| Neil Besteman | nbesteman | Oct 29, 2018 | ② | Administrator | [Edit] |
| Paula Reed | preed6 | Feb 7, 2017 | ① | Viewer | [Edit] |

On the right side, there's a sidebar titled 'Membership' with statistics: 'Members per level: 1 of 30' (with a note '4 of 5'), 'Total Members: 5 of 35', and links for 'Find...', 'The most viewed items', 'The last items added', 'Groups', and 'The organization's registered apps'.

Figure 4.15: Portal Add User 1

Add Members to Portal

Push add members ⇒ built in member

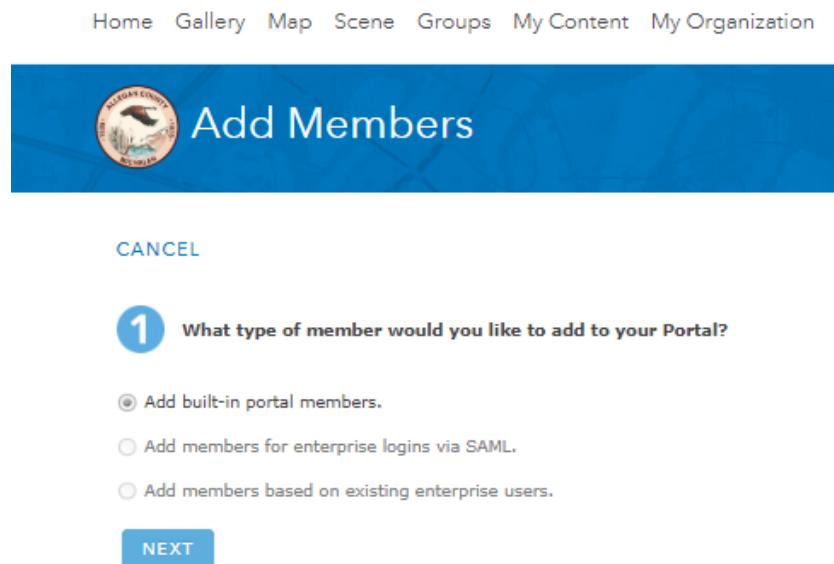


Figure 4.16: Portal Add User 2

Add Members

2 Create new Allegan County GIS Services logins one at a time or in batch from a file.
Select any role for the member to be a part of. You must inform the member of their user name and password. If you do not have an email address for a particular user, use the administrator's email address.

Password may not be less than 8 characters.

One at a time From a file

Email:

First Name:

Last Name:

Username:

Password:

Level 1 2

Role: Publisher

Figure 4.17: Portal Add User 3

Enter required info

Manage Treasurer Group

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

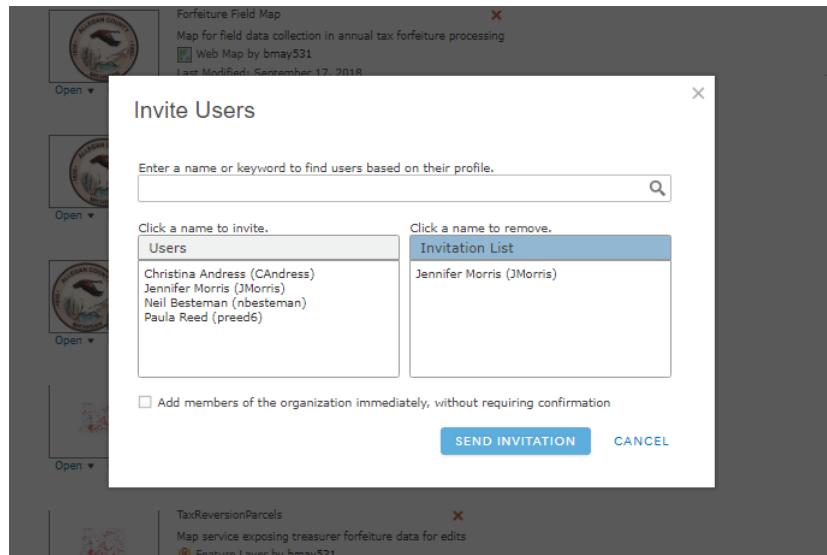


Figure 4.18: Portal Add User 4

Share Content To The Group

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

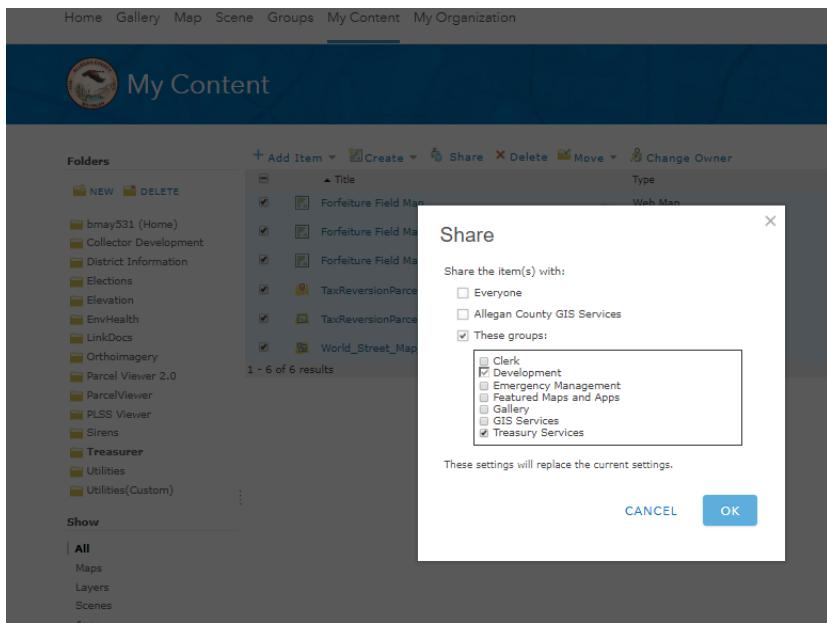


Figure 4.19: Portal AddUser 5

Schema Change Procedure

Form Edits Procedure

User Manual

Collection Device Setup

Collector Application Setup Details

Install Collector for ArcGIS

- Available from the Google Play Store

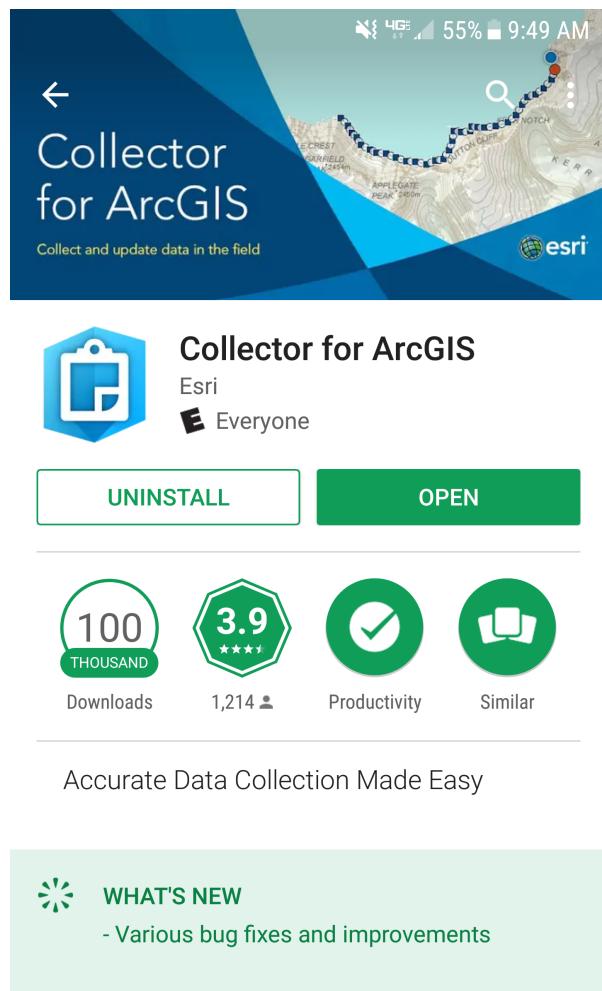


Figure 4.20: Download the App

Configure Collector

for Organization Website, Type:

[https://gis.allegancounty.org/
portal_webadaptor](https://gis.allegancounty.org/portal_webadaptor)

then:

Press Continue

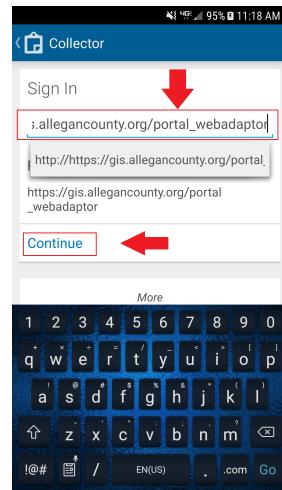


Figure 4.21: Collector Connection

Enter Credentials

then:

Press SIGN IN

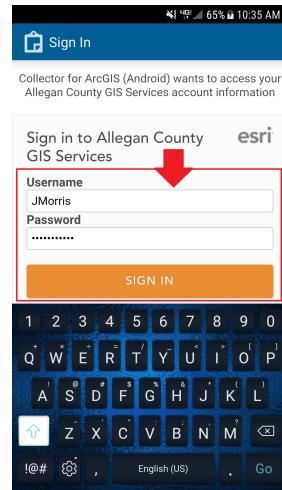


Figure 4.22: Enter Credentials

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 Download option indicates it is not on the device but is available for offline use

Choose a Map

Press Download

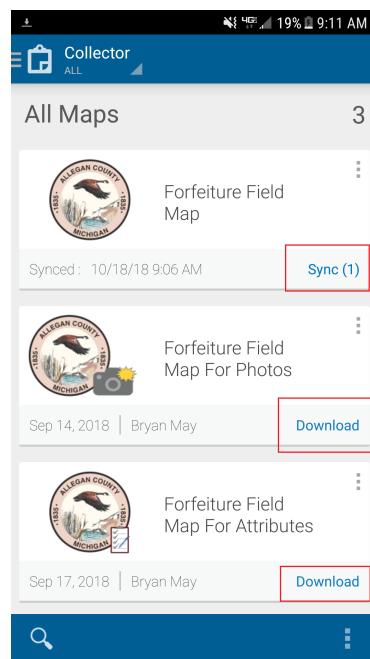


Figure 4.23: Collector Maps Menu

Specify work area

and press

map detail

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

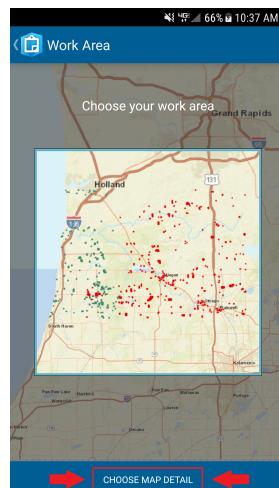


Figure 4.24: Choose Work Area (large)

Choose Map Detail

Zoom into the level of detail desired.

Press Download

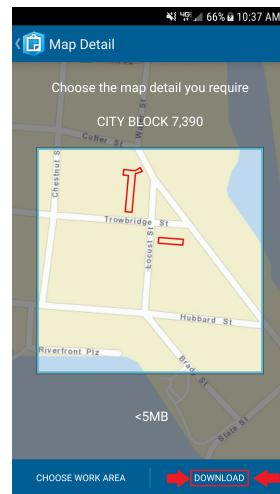


Figure 4.25: Choose Map Detail

This area is ready for field data collection.

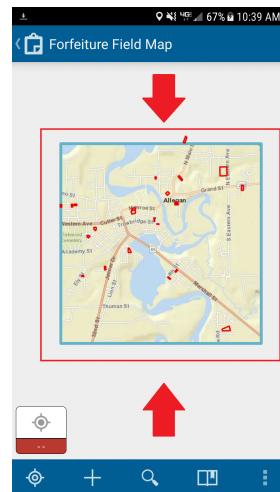


Figure 4.26: Map on Device

Open Camera Application Setup Details

Install Open Camera

- Available from the Google Play Store

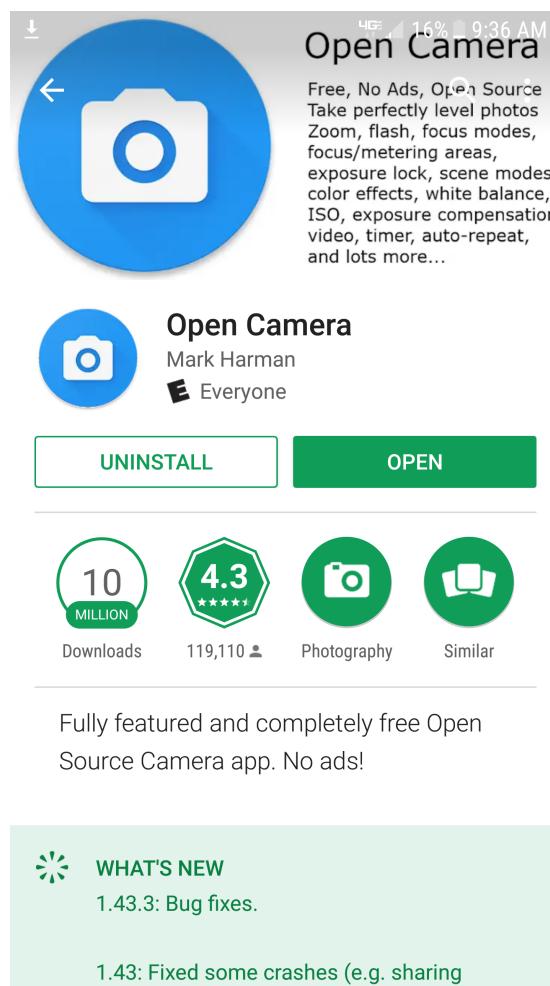


Figure 4.27: Open Camera from Google Play Store

Configure Open Camera

In the Open Camera Application:

Press the gear shaped Settings button to go into the settings menu

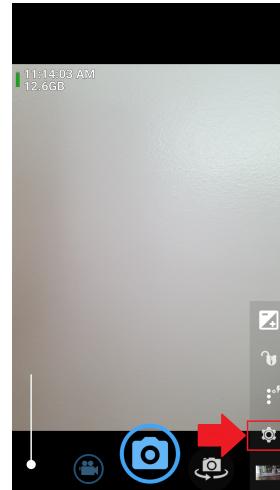


Figure 4.28: Find Settings Menu

Press the Photo Settings button

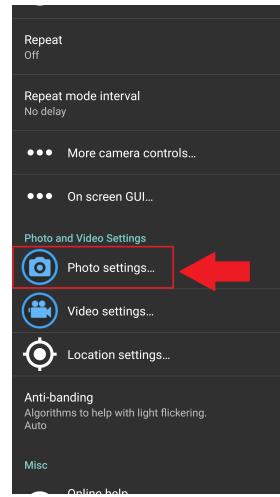


Figure 4.29: Setting Screen

Set Photo Resolution

In photo settings:

Press the Camera resolution button

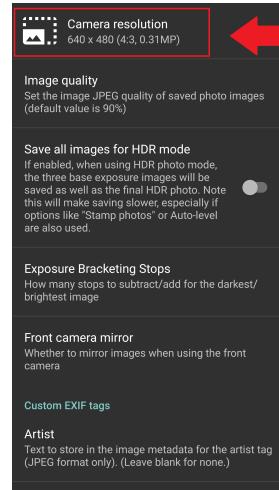


Figure 4.30: Photo Settings Menu

Select **640 x 480**

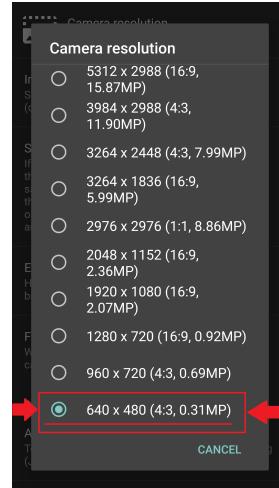


Figure 4.31: Camera Resolution Setting

Daily Preprocessing Routine

Execute Preprocessing Script A tool in ArcGIS that:

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

In Catalog:

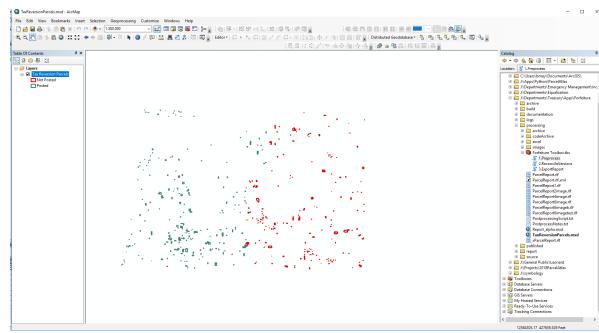
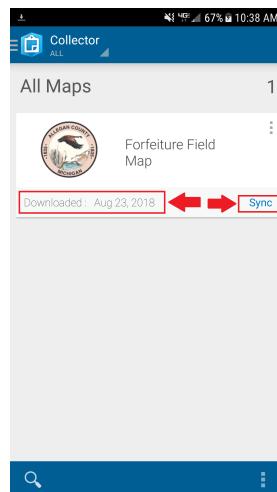


Figure 4.32: Processing Tools

Open tool 1

Synchronize the Forfeiture Field Map

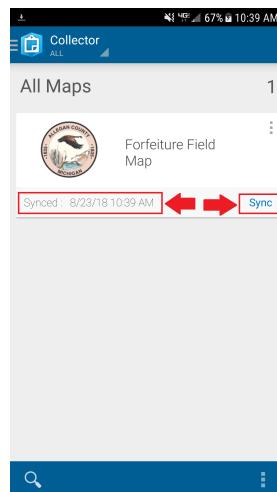
Note the date and time:



Press Sync

Figure 4.33: Map Downloaded

Note the date and time:



Map is synchronized

Figure 4.34: Map Synchronized

Forfeiture Data Collection

Forfeiture Parcels Data Details Attributes are of four entry types:

- prefilled
- autofill
- dropdown
- text box

For each site visited, select the desired parcel, push the edit button and collect attributes.

Device 1 Field Operation

Select a parcel



Figure 4.35: Select Parcel

Push the edit button

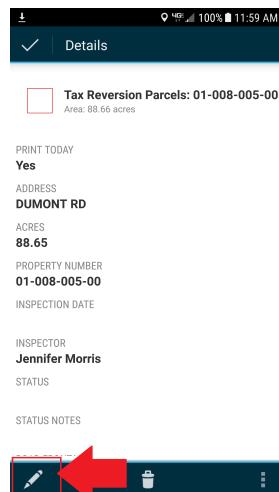


Figure 4.36: Parcel Details

Device 1 Field Operation Cont. Select Yes for Print Today

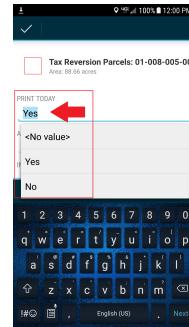


Figure 4.37: Print Today Yes or No

Select Use Current or enter any date

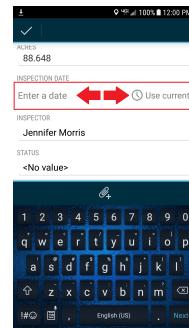


Figure 4.38: Enter Date

Select Inspector From Drop-down

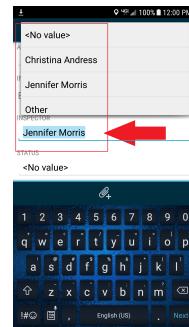


Figure 4.39: Select Inspector

Device 1 Field Operation Cont.

Select Occupied or Not Occupied

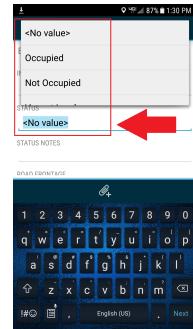


Figure 4.40: Status

Enter status notes up to 120 characters

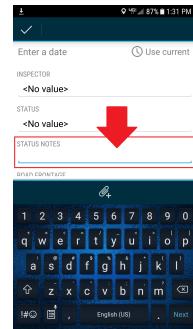


Figure 4.41: Status Notes

Select Yes or No for Road Frontage



Figure 4.42: Road Frontage

Device 1 Field Operation Cont.
Enter road used for access

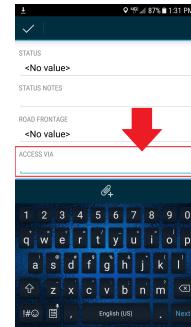


Figure 4.43: Access Via

Enter Agent Name

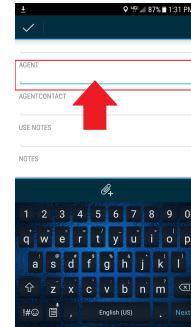


Figure 4.44: Agent

Enter Agent Contact Info

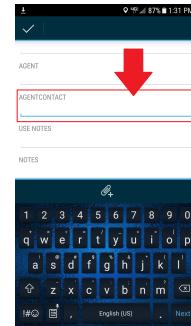


Figure 4.45: Agent Contact

Device 1 Field Operation Cont.

Enter Use Notes up to 120 characters

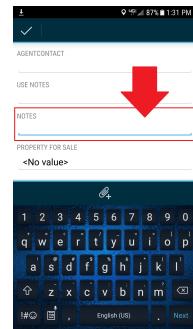


Figure 4.46: Use Notes

Enter Notes up to 120 characters

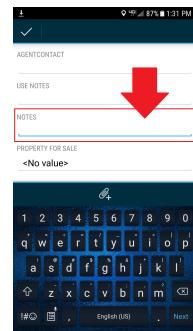


Figure 4.47: Notes

Enter property for sale yes or no

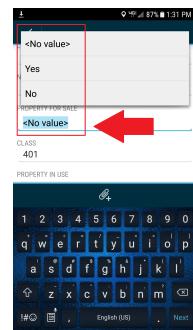


Figure 4.48: Property for Sale

Device 1 Field Operation Cont.
Property in Use Yes or No

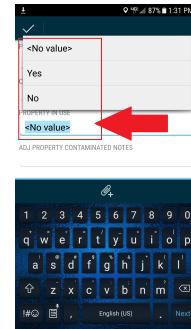


Figure 4.49: Property in Use

Placeholder

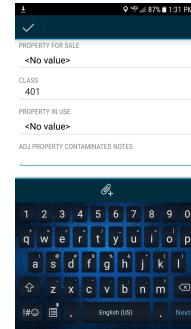


Figure 4.50: Placeholder

prefilled

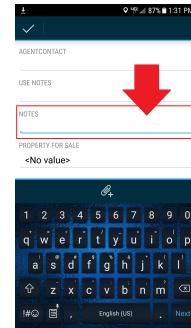


Figure 4.51: Property Contaminated

Device 1 Field Operation Cont.

Enter notes up to 120 characters

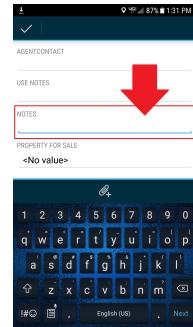


Figure 4.52: Notes up to 120 characters

Adjacent Property Contaminated prefilled

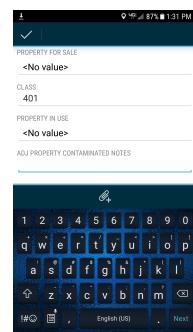


Figure 4.53: Adjacent Property Contaminated

Property Contaminated notes prefilled

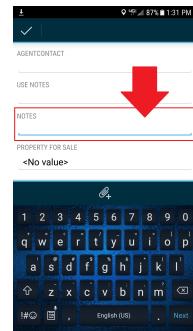


Figure 4.54: Property Contaminated

Device 1 Field Operation Cont. Property Maintained Yes or No

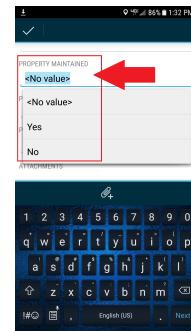


Figure 4.55: Property Maintained

Picture Comments up to 120 characters

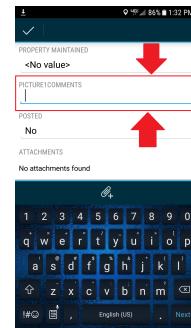


Figure 4.56: Picture Comments

Placeholder

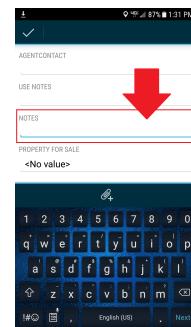


Figure 4.57: Placeholder

Device 2 Field Operation

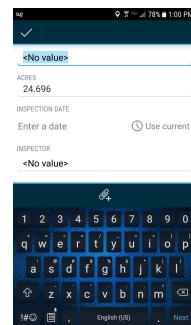
A photo or photos can be added from the Open Camera Application.

Select a parcel from the map



Figure 4.58: Select Parcel

Push Attachment Button



Select Gallery

Figure 4.59: Push Attachment Button

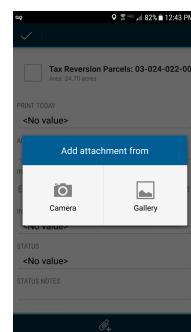


Figure 4.60: Add Attachment From Gallery

Device 2 Field Operation Cont. Navigate to the Open Camera Folder

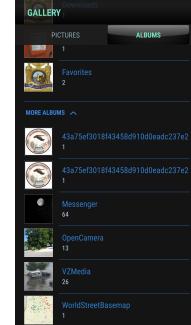


Figure 4.61: Open Camera Folder

From within the Open Camera Folder, Select the appropriate image



Figure 4.62: In the Open Camera Folder

Press the check button to save the image to the parcel

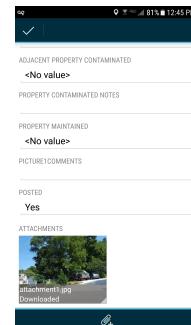


Figure 4.63: Image in the App

Daily Postprocessing Routine Back at the office

Synchronize Webmap In Collector for ArcGIS, push the sync button on the Forfeiture Field Map

Execute Postprocessing Script A tool in ArcGIS that:

- Reconciles geodatabase versions
- Generates forms for each site visited

Software

ESRI Licensed Products

ArcDesktop Users of this application need a license to ArcGIS Standard level.

Enterprise ArcGIS Deployment This app uses ArcGIS Server and ArcGIS Portal.

Collector for ArcGIS Developed and tested on Android(7.0). Collector is available at the Google Play Store.

Other Software



Figure 4.64: Open Camera from Google Play Store

Chapter 5

Tools

5.1 Core Data

5.1.1 Control Points

Maintaining Cadastral Control Points

Steps

```
Identify position of new control point
Place Target 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
```

5.2 ESRI Tools

5.2.1 COGO Tools in ArcGIS

TEXT

5.3 GIS Administration

5.3.1 New Connections in ArcCatalog

Connect ArcGIS to a SQL Server Database

In Catalog:

Double click on add database connection

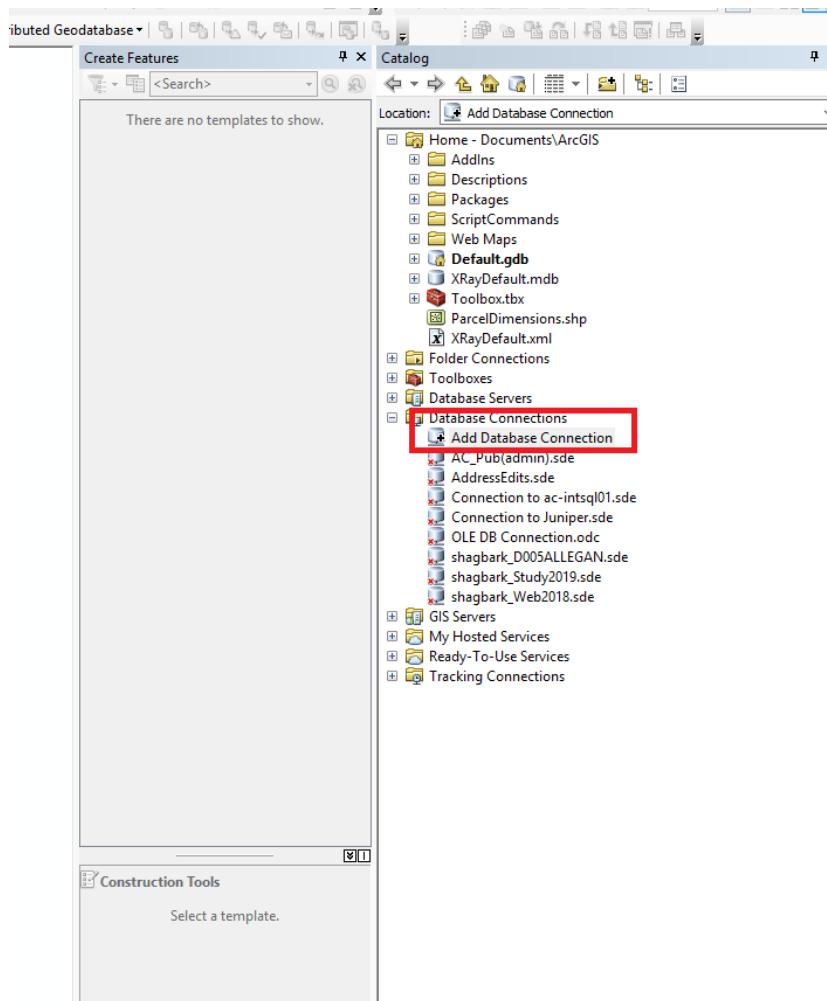


Figure 5.1: Catalog Add Db Connection

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

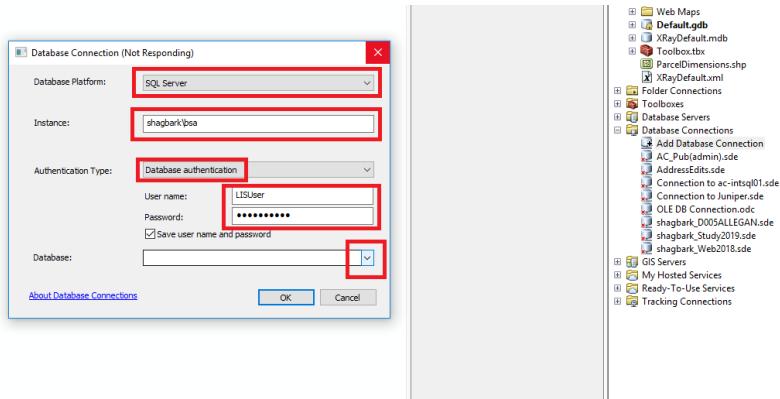


Figure 5.2: Catalog Add Database Connection

5.3.2 Create Query in ArcGIS to SQL Database

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

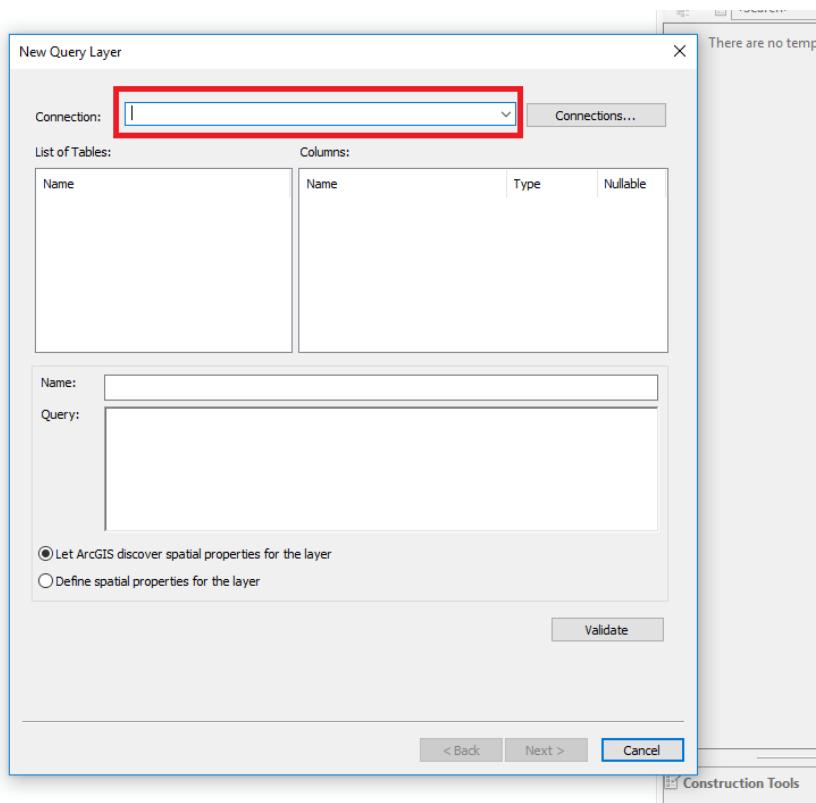


Figure 5.3: New Query Layer Dialog

Details of the Query Layer

Enter into the tool

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

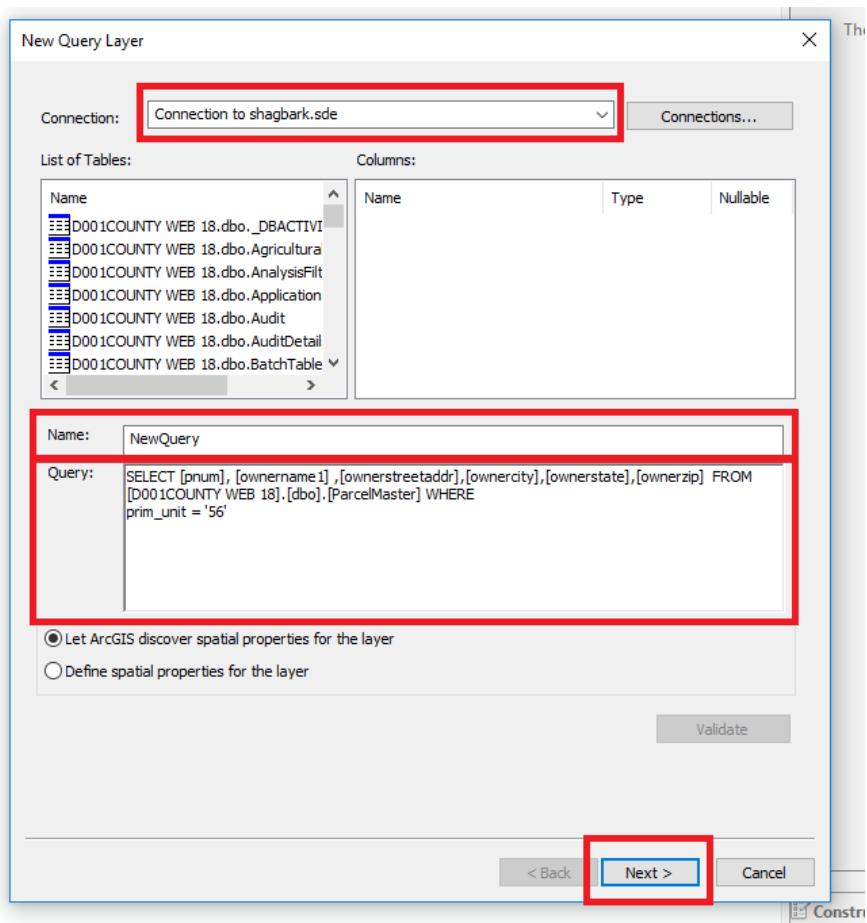


Figure 5.4: Query Layer Dialog Filled

More Details of the Query Layer

Enter into the tool

- Select unique identifier field
- Click Finish

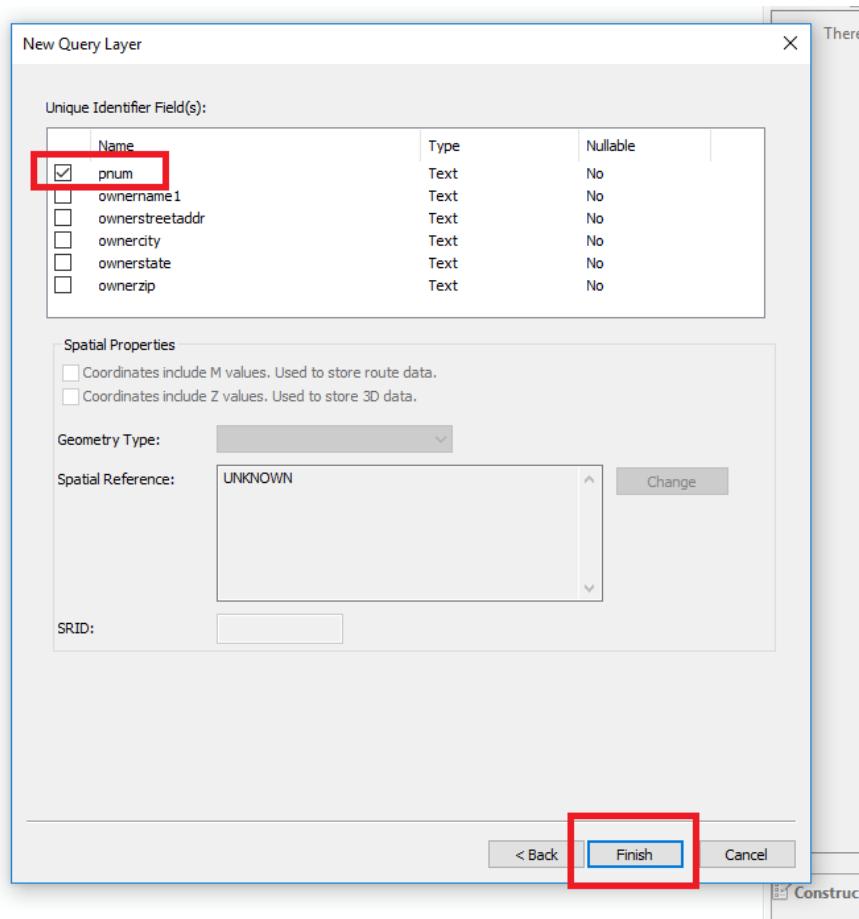


Figure 5.5: Select Unique Identifier

Open Results Table

The screenshot shows the ArcGIS Pro interface with the 'Table Of Contents' tab selected. In the 'Layers' section, there is a single entry: 'D001COUNTY WEB 18.DBO.NewQuery'. This entry is highlighted with a red box. To the right of the layers, there is a large table window displaying a list of records. The table has columns: 'idnumber', 'ownername1', 'ownerstreetaddr', 'ownercity', 'ownerstate', 'ownerzip', and 'ESRI_OID'. The data in the table spans multiple pages, indicated by the scroll bar on the right.

| idnumber | ownername1 | ownerstreetaddr | ownercity | ownerstate | ownerzip | ESRI_OID |
|---------------|-------------------------------------|-------------------------|----------------|------------|----------|----------|
| 56-004-001-00 | WAGNER LOREN & ERICA | 7521 13TH AVE | WAYLAND | MI | 49348 | 1 |
| 56-004-001-10 | GUN LAKE COMMUNITY CHURCH | 1220 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 | REDFORCE LAND LLC | 104 S MICHIGAN DR | LUDINGTON | MI | 49441 | 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 | RPAIRIAN PROPERTIES LLC | 879 E SUPERIOR ST | WAYLAND | MI | 49348 | 9 |
| 56-005-002-40 | RPAIRIAN PROPERTIES LLC | 879 E SUPERIOR ST STE A | WAYLAND | MI | 49348 | 10 |
| 56-005-002-50 | CITY OF WAYLAND | 235 S MICHIGAN DR | WAYLAND | MI | 49348 | 11 |
| 56-005-003-00 | CITY OF WAYLAND | 103 S MAIN ST | WAYLAND | MI | 49348 | 12 |
| 56-005-004-00 | LATHROD 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 | BRONKHORST HELEN & MELISSA K | 841 E SUPERIOR ST | WAYLAND | MI | 49348 | 15 |
| 56-005-006-10 | ADY 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 & CARRON BIANCA | 2514 BRIDGEPORT LN | GRAND RAPIDS | MI | 49508 | 19 |
| 56-005-007-20 | VELVET LINDA | 101 MARLO LN | WAYLAND | MI | 49348 | 20 |
| 56-005-007-30 | THOMSEN 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 |
| 56-005-008-00 | CITY OF WAYLAND | 103 S MAIN ST | WAYLAND | MI | 49348 | 23 |
| 56-005-010-00 | FINANCIAL & HEALTHCARE PROPERTY LTD | 8181 WORTHINGTON ROAD | WEIRTON, W. VA | OH | 43062 | 24 |
| 56-005-010-10 | CITY OF WAYLAND | 103 S MAIN ST | WAYLAND | MI | 49348 | 25 |
| 56-005-011-00 | 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 | VANDEVERCORD JOHN C & NANCY L | 542 FOREST ST | WAYLAND | MI | 49348 | 28 |
| 56-005-012-20 | LAND II LLC | 2645 24TH AVE | HUDSONVILLE | MI | 49428 | 29 |
| 56-005-013-00 | COLE D | 137 12TH AVE | SHELBURNE | 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 | WILSON JEFFREY & MELISSA EN | 1770 12TH AVE | WAYLAND | MI | 49348 | 34 |
| 56-005-018-00 | GUTTERFEEZ KAREN D & CHRISTINA | 118 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 | KEME 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 5.6: Query Results Table

Verify the Query by Looking at the Table

5.3.3 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 5.7: Stop ArcGIS Server

Use the Search tool to find the Rebuild Indexes Tool

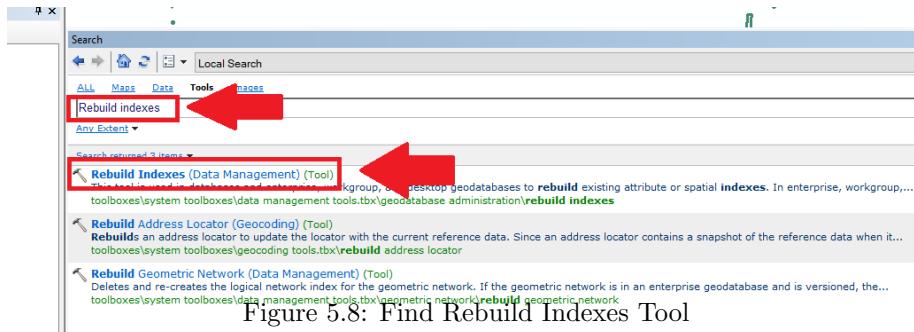


Figure 5.8: Find Rebuild Indexes Tool

Rebuild Indexes

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

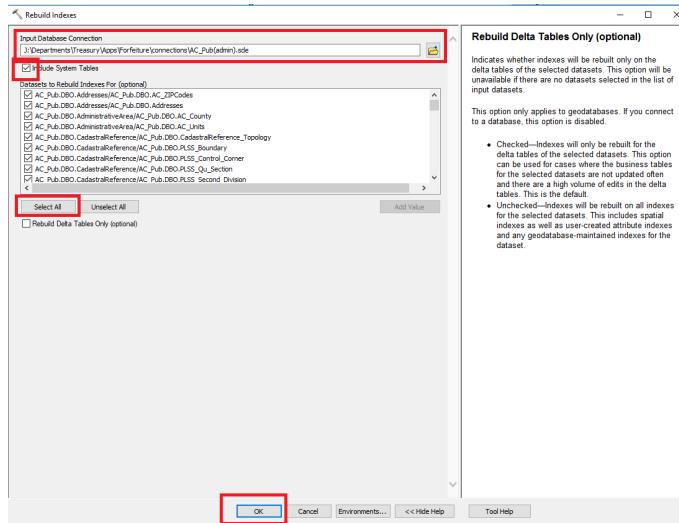


Figure 5.9: Rebuild Indexes Tool Operation

Recalculate Statistics

In the Analyze Datasets Tool:

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

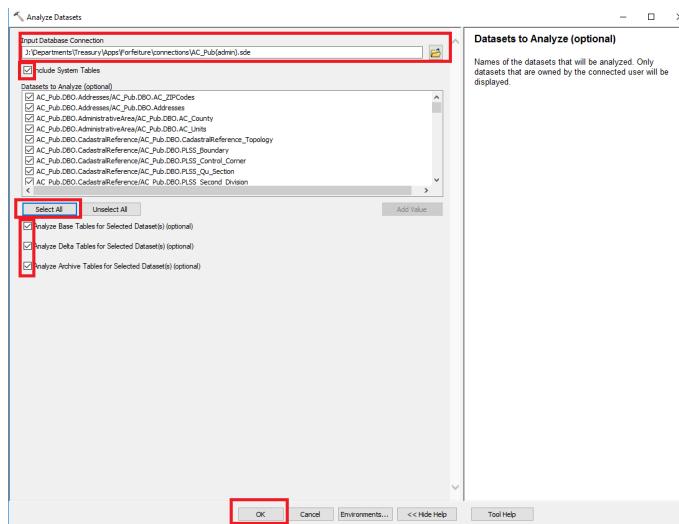


Figure 5.10: Recalculate Statistics

Compress

Select Connection ⇒ Press OK

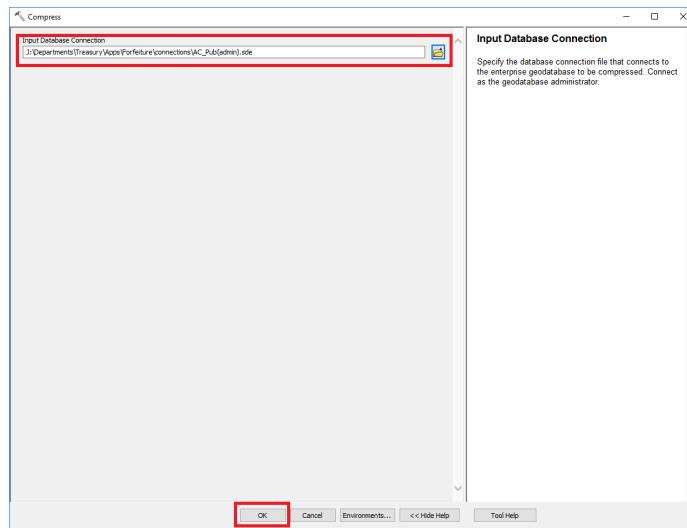


Figure 5.11: Compress

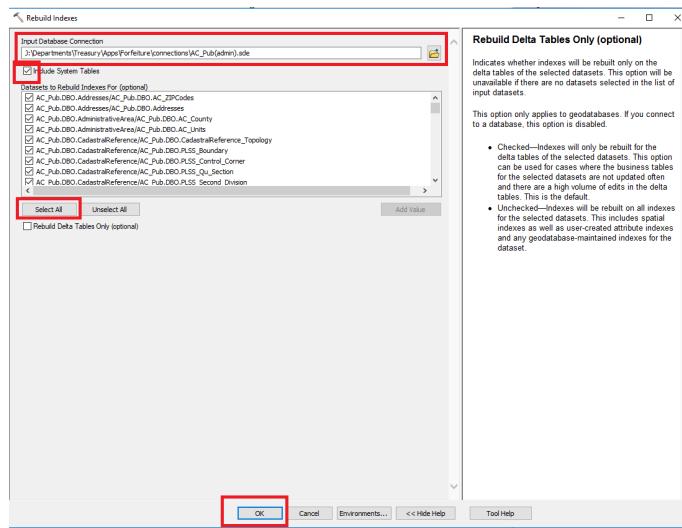


Figure 5.12: Rebuild Indexes Tool Operation

Rebuild Indexes Again

Recalculate Statistics Again

In the Analyze Datasets Tool:

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

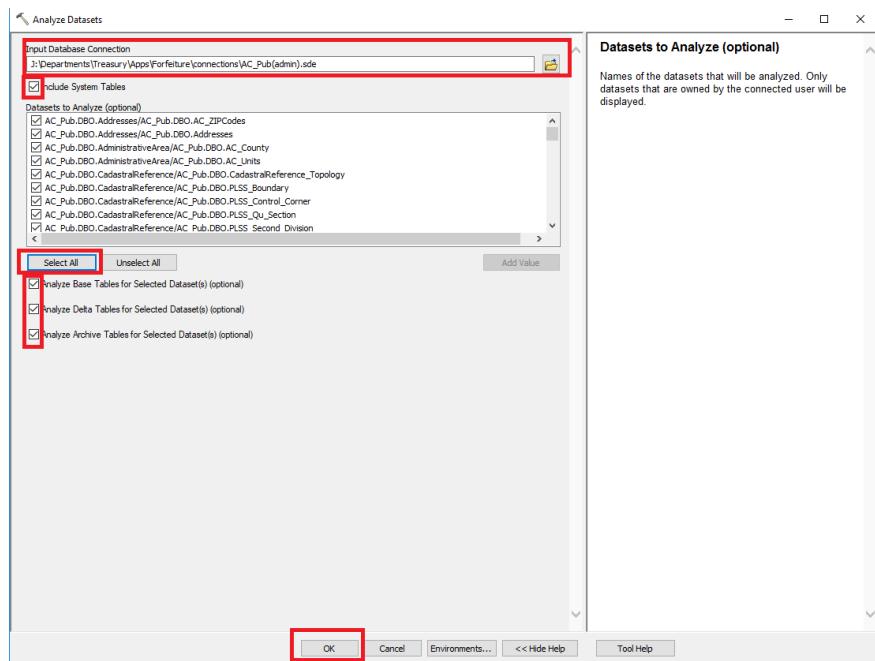


Figure 5.13: Recalculate Statistics

5.3.4 Managing Map Services

To stop ArcGIS Server

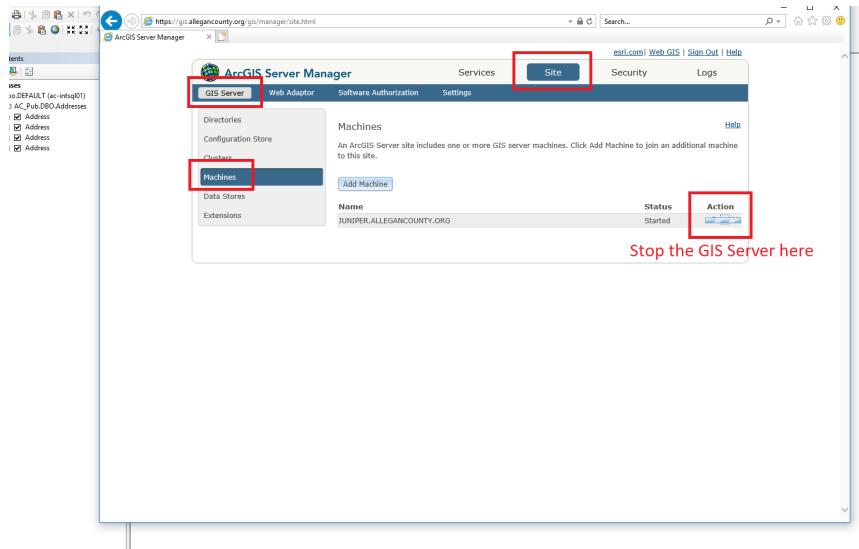


Figure 5.14: Stop the GIS Server

Launch ArcGIS Server Manager

Fixing Damaged Services

Removing Lock Files

A blog about it <https://community.esri.com/thread/103710>

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

This method works.

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.

5.3.5 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.

A feature class or table can only be added to an existing replica (without recreating the replica) using ArcObjects code.

Steps:

The steps below outline how to 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/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.

5.3.6 Managing Geodatabase Versions

Version Queries

SQL Queries

Four queries of SDEversions, SDEstates, sdestatelineages, and SDEcompress-log

```
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

ID and delete orphaned geodatabase 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

The screenshot shows two SQL Server Management Studio windows side-by-side. The left window (Query 29) contains the following code and output:

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

The output shows a list of objects with their IDs and names:

| ObjectID | name |
|----------|---------------------------------|
| 16497 | ProtoPub.ParcelPubReplica |
| 16520 | ProtoPub.LandUsePlanningReplica |
| 17074 | SchoolsReplica |
| 17542 | ElReplica |
| 17893 | EmergencyMgmt |
| 19929 | AddressesReplica |
| 40149 | EnvHealthReplica |

The right window (Query 28) contains the following code and output:

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

The output shows a list of version names:

| name |
|-----------------------------|
| C:\address\temp\versionPar |
| DEFAULT |
| MobileTreasTaxReversionParc |
| SYNC_SEND17893.0 |
| SYNC_SEND40959.12 |
| SYNC_SEND40965.7 |

Annotations in red and green highlight specific rows:

- A red arrow points from the 'EmergencyMgmt' row in the GDB_ITEMS results to the 'MobileTreasTaxReversionParc' row in the SDE_versions results, labeled 'No Matches'.
- Green arrows point from the 'ElReplica' and 'AddressesReplica' rows in the GDB_ITEMS results to the 'SYNC_SEND...' rows in the SDE_versions results, labeled 'Matches'.
- A blue arrow points from the 'Sync_Send' row in the SDE_versions results to the 'replica ID' column header, labeled 'replica ID'.
- A purple arrow points from the 'Sync_Send' row in the SDE_versions results to the 'generation #' column header, labeled 'generation #'.

Figure 5.15: Find Orphan Versions

two that have no match in step one.

Orphaned versions can be removed by name in ArcGIS

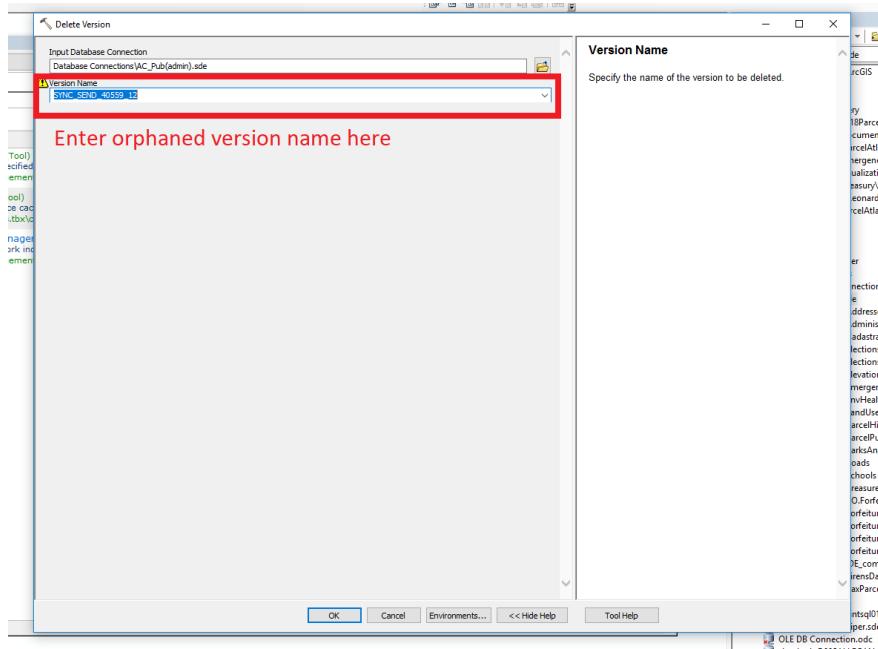


Figure 5.16: Delete Orphan Versions

5.3.7 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
```

5.4 L^AT_EX Packages used by AC GIS

5.4.1 Common Errors

Source:

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

If you have every compiled a L^AT_EX 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 L^AT_EX 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: L^AT_EX errors and T_EX errors. In both types of errors, the part after the error message will tell you where the error occurred. An example:

1.15 <offending text>

The 1.15 tells you what line the error occurred on and the text will tell you the text that caused the error.

L^AT_EX Errors

The general form of an error in L^AT_EX 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 L^AT_EX found the error).

T_EX Errors

Errors may also have the following form:

! <error message>

These errors are formatted differently because they are error messages that came from T_EX instead of L^AT_EX. 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 from 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 verbatim 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 `\bfseries` 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 L^AT_EX 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. Chances 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.

5.4.2 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

5.4.3 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}
```

5.4.4 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

5.4.5 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](https://www.latex-tutorial.com)

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.

5.4.6 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

5.4.7 standalone Package

Introduction

[Link to official standalone documentation](#)
standalone provides a **package** and a **class**

- The *standalone package* is used for:

- Main documents that will input or import sub documents.
- For example:

```
\usepackage[subpreambles=false]{standalone}
```

* Ignores preambles of imported sub documents [3, pg.4]

- the *standalone class*:

- Is a document class
- Provides standalone / subdocument switches and options
- For example:

```
\documentclass[class=article]{standalone}
```

* behaves as an article when standalone
* makes document available for import into a master document

Simple Use

- The *standalone package*

- In the main document:

```
\documentclass[openany]{book}
```

```
\preamble...
```

```
\usepackage{standalone}
```

- the *standalone class*:

- In any subdocument:

```
\documentclass[class=article]{standalone}
```

```
\preamble...
```

Options

- The *standalone* package
 - **subpreamble**
 - * default value of subpreambles is *false*
- the *standalone* class:
 - **crop**
 - **titlepage**
 - **twoside**
 - * Makes pagination style match book
 - * default value is *false*
 - **multi**
 - * `multi=true|false`
 - * `multi={<environment name>, ...}`
 - **float**

Use with options

- the *standalone* package:
 - `\usepackage[subpreambles=false]{standalone}`
- the *standalone* class:
 - `\documentclass[class=article , crop=false, titlepage, twoside, multi={itemize, figure, verbatim}, float=false]{standalone}`

Commands

5.4.8 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

5.5 L^AT_EX Templates

5.5.1 L^AT_EX Section Template

```
\documentclass[class=report , crop=false, multi={itemize, figure}, float=false]{standalone}%Exp
\documentclass[class=book , crop=false]{standalone}

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

\def\titlename{Section Template}

\title{\input{../../../../commonTitle}} % closing brace for title

\begin{document}% Document Begins

\input{../../../../commonFront} % provides standalone options

\section{SECTION NAME HERE}

\subimport{RELATIVE PATH TO NEW Section/}{NEW SUBSECTION Subsection.tex}

%eg.
%\subimport{latexTemplatesSection/}{subsectionTemplateSubsection.tex}
% etc...

\end{document}
```

5.5.2 L^AT_EX Subsection Template

```
\documentclass[class=book , crop=false]{standalone}

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

\def\titlename{Subsection Template}

\title{\input{../../../../commonTitle}} % closing brace for title

\begin{document}% Document Begins

\input{../../../../commonFront} % provides standalone options

% NEW INFO GOs HERE.
\subsection{Subsection Template}
```

\medskip

5.6 PDF Tools used by AC GIS

5.6.1 PDF Optimizer

Purpose and Summary

Workflow Purpose: Optimization of a large number of pdf docs.

Workflow Summary: Uses Python to create a list of .pdf docs in a folder and creates a batch file to optimize the pdfs in the list to another location. The batch process calls ghost script for the optimization.

requirements

Opensource software:

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

paragraphPython(2.7)

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

Script that creates a batch file

```
import os, sys

project = os.path.dirname(os.path.dirname(__file__))
processing = os.path.join(project, 'processing')
#source = os.path.join(project, 'source')
build = os.path.join(project, 'build')
sourcepdf = os.path.join(build, '20180716')

inString1 = "gswin32 -sDEVICE=pdfwrite -dCompatibilityLevel=1.4
-dPDFSETTINGS=/ebook -dNOPAUSE -dQUIET -dBATCH
-sOutputFile=J:\\Projects\\2018ParcelAtlas\\build\\optimized\\"

inString2 = " J:\\Projects\\2018ParcelAtlas\\build\\20180716\\"

batchdoc = os.path.join(processing, "bDoc.txt")

# Main
#####
if __name__ == "__main__":
    list1 = os.listdir(sourcepdf)
```

```
l = open(batchdoc,'w')
for i in list1:
    newi = i[1:]
    print newi
    t = inString1 + newi + inString2 + i + "\n"
    print t
    l.write(t)

l.close()
```

ghostscript

About 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](#).

Windows batch files

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\20180716
\_02-001-001-00.pdf
```

5.7 QGIS Tools

5.7.1 Using COGO Tools in QGIS

Set up the Azimuth and Distance Plugin (Azd Plugin).

In the Plugins drop down(1), under the topography group select the **Azd Plugin(2)**(see fig.).

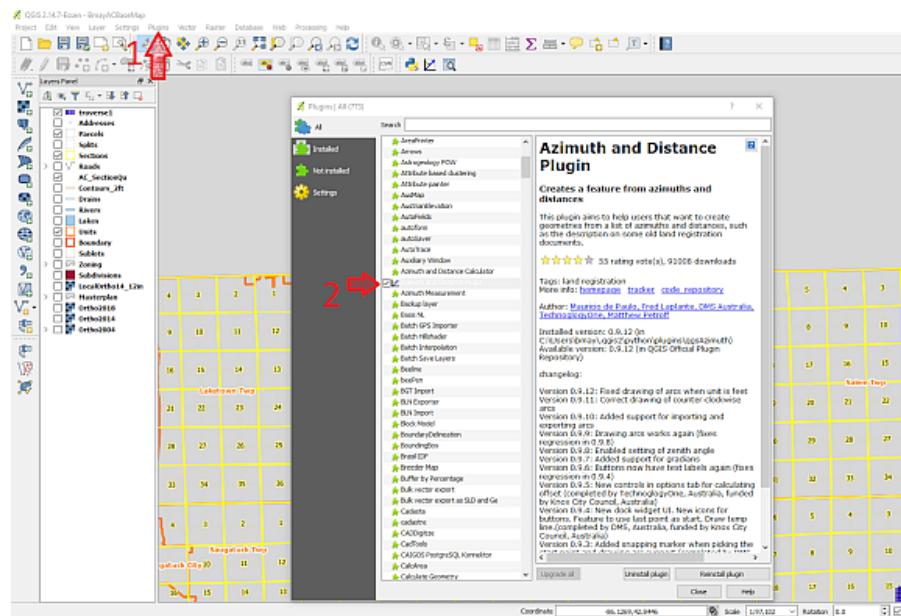


Figure 5.17: launch plugin

Note here which layer is active (see fig.).

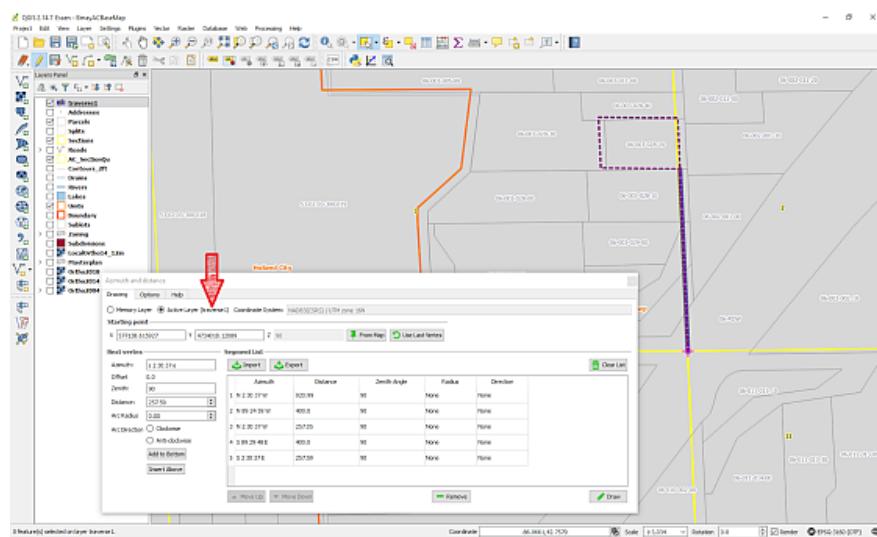


Figure 5.18: check active layer

If necessary, left click the layer ***traverse 1*** in Layer Panel to activate it(see fig.).

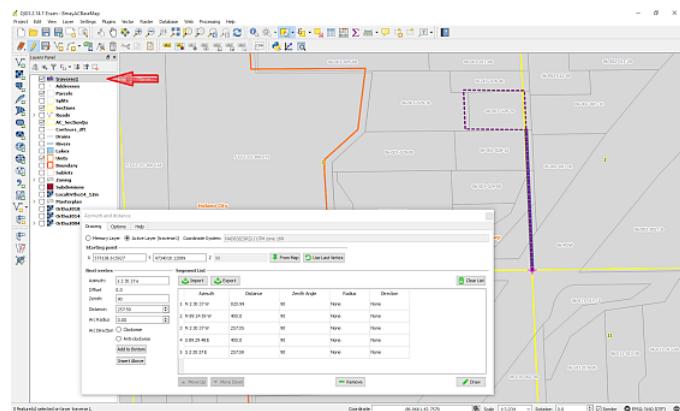


Figure 5.19: activate layer

Configure Options On Options Tab: Select Boundary, Bearing, Feet, and Degree radio buttons.

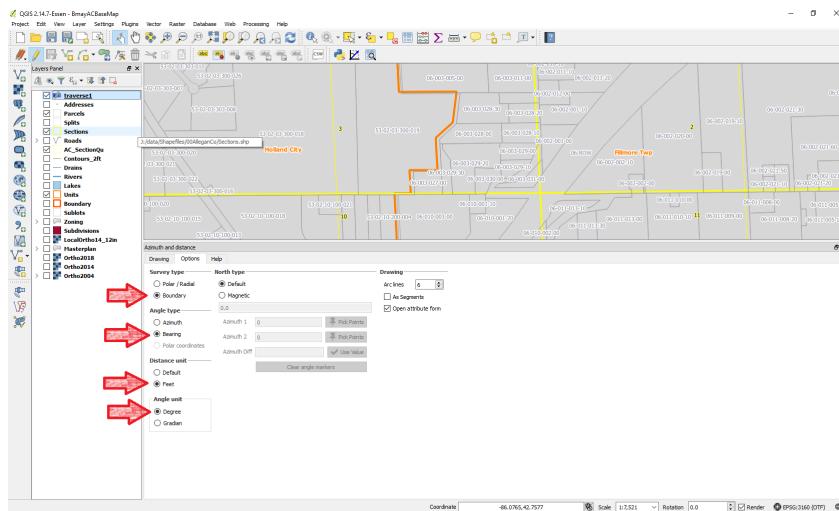


Figure 5.20: Plugin Options

Using the tool Boundary descriptions are entered into the Drawing Tab. Azimuth (bearing) and Distance are the important boxes (Set Offset = 0 and Zenith = 90 and ignore)(see below).

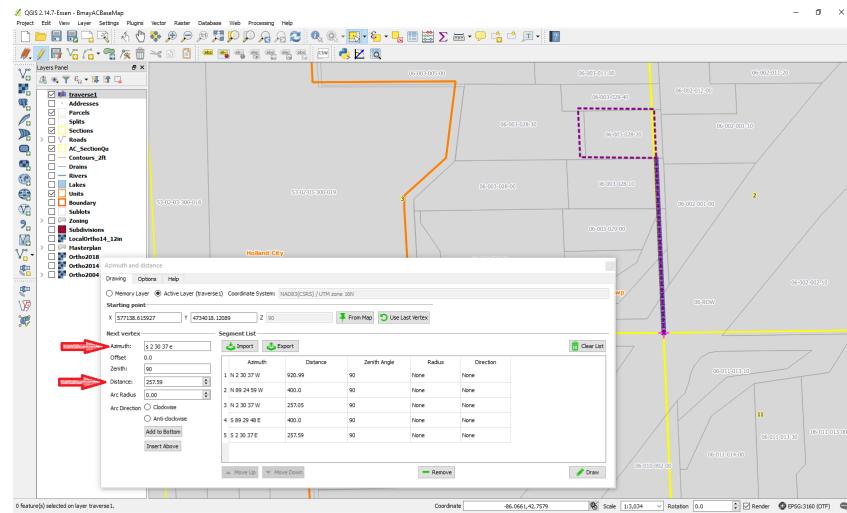


Figure 5.21: Entering Bounds

Configure editing environment

Use Settings Dropdown and Snapping Options to enable snapping to Sections, Quarter Sections, and or Parcels if desired (see fig.).

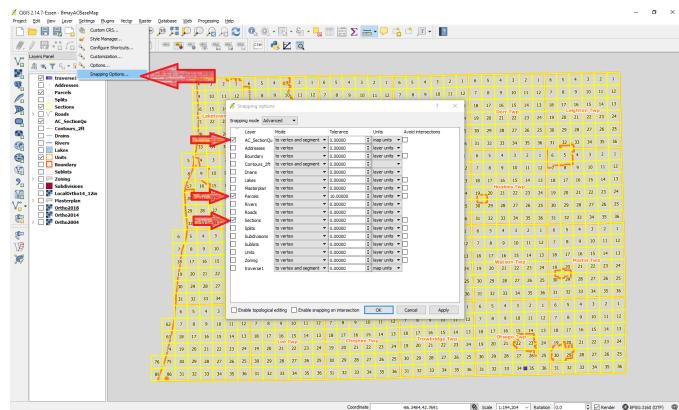


Figure 5.22: Configure editing environment

Locate Point of Commencement

To get to the Point of Commencement,

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

- Using Reference Layer
- Using Measuring Tool
- Search by Parcel Number (Search Layers Plugin)
- Draw COGO lines (Azd Plugin)(as described earlier)

Using Reference Layer Use reference layers; Units, AC_SectionsQu, Sections, and Parcels. Toggle layers on and off in Layers Panel and zoom in and out with mouse wheel.

Using Measuring Tool Use the measuring tool, make sure to set units to feet. To exit current measurement right click (see fig.).

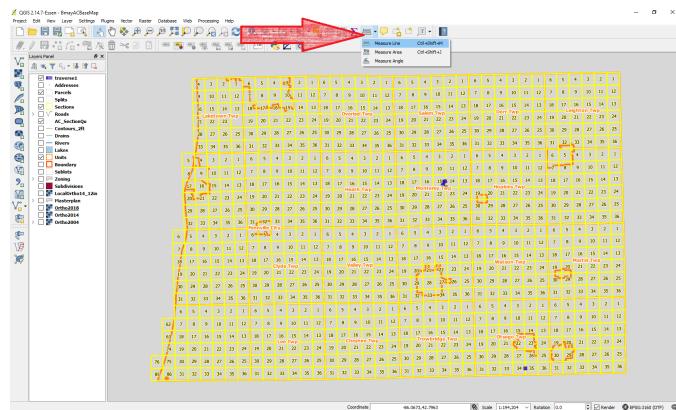


Figure 5.23: Measuring Tool

Search by Parcel Number (Search Layers Plugin.)

To Launch Search Layers Plugin:
 In Plugins dropdown:
 Enable the **Search Layers** Plugin. (see fig.)

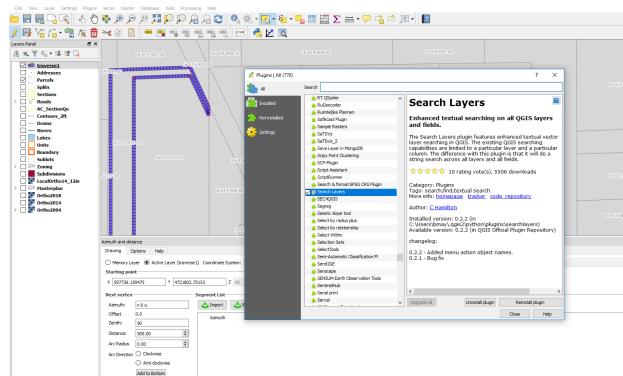


Figure 5.24: Search Layers Plugin

Enter parcel number (with dashes), Set layers, and set search field.(see fig.)

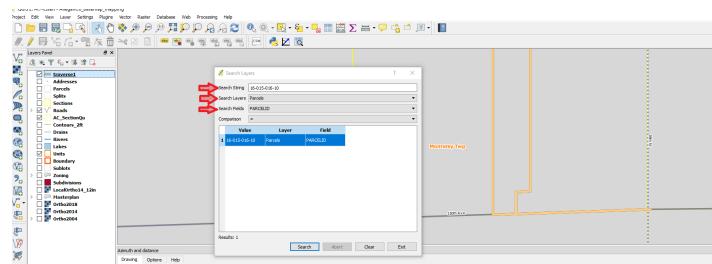


Figure 5.25: Search Layers Setup

Part IV

Resources

Appendices

A.1 Geography 101

Foundations of geography

A.1.1 A Primer on Coordinate Systems Commonly Used in Michigan

[A Primer on Coordinate Systems Commonly Used in Michigan](#)

B.2 ESRI Resources

Product Documentation

B.2.1 Functionality Matrices

arcgis 10.5 Enterprise Functionality Matrix [Document](#) [Link](#)
arcmap 10.5 Functionality Matrix [Document](#) [Link](#)

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