

## What We Do

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Allegan County GIS  
[www.allegancounty.org/gis](http://www.allegancounty.org/gis)

August 23, 2018

# Contents

<b>I</b>	<b>Brand</b>	<b>1</b>
<b>1</b>	<b>Awards</b>	<b>2</b>
1.1	The GIS Champion Award . . . . .	2
1.1.1	GIS Champion Award Code . . . . .	2
<b>II</b>	<b>Methods</b>	<b>5</b>
<b>2</b>	<b>Documentation</b>	<b>6</b>
2.1	About Documentation . . . . .	6
2.1.1	How Jalapeño Works . . . . .	6
General Notes:	. . . . .	6
Project file structure:	. . . . .	6
Using the glossary . . . . .	. . . . .	7
Glossary requirements:	. . . . .	7
Creating a new glossary entry . . . . .	. . . . .	7
Rebuilding the glossary . . . . .	. . . . .	7
*Note: . . . . .	. . . . .	7
Using glossary terms in a subdocument: . . . . .	. . . . .	7
To use a glossary term in the subdocument: . . . . .	. . . . .	8
To add the glossary to the subdocument: . . . . .	. . . . .	8
Using the bibliography(References) . . . . .	. . . . .	8
Bibliography requirements: . . . . .	. . . . .	8
. . . . .	. . . . .	8
Creating a new bibliography entry . . . . .	. . . . .	8
Rebuilding the bibliography . . . . .	. . . . .	8
*Note: . . . . .	. . . . .	8
To cite a bibliography source in a subdocument: . . . . .	. . . . .	8
. . . . .	. . . . .	8
To add the bibliography to the subdocument: . . . . .	. . . . .	9
Using the Index . . . . .	. . . . .	9
Index requirements: . . . . .	. . . . .	9
Creating a new index entry . . . . .	. . . . .	9

Rebuilding the index . . . . .	9
. . . . .	9
*Note: . . . . .	9
Using index terms in a subdocument: . . . . .	9
To use a index term in the subdocument:	
. . . . .	9
To add the index to the subdocument: . . . . .	9
Using the Appendices . . . . .	10
2.2 Document Storage Concepts . . . . .	11
2.2.1 GIS File Standard . . . . .	11
Folders inside the project folder . . . . .	11
<b>3 Team Concept</b>	<b>12</b>
3.1 Team Structure . . . . .	12
3.1.1 Paired Programming . . . . .	12
<b>III Service</b>	<b>13</b>
<b>4 Applications</b>	<b>14</b>
4.1 Applications for Treasurer Dept. . . . .	14
4.1.1 Forfeiture Data Collection . . . . .	14
Problem and Analysis . . . . .	14
Background . . . . .	14
Statement of Problem . . . . .	14
Analysis . . . . .	14
Design . . . . .	15
Overview . . . . .	15
Workflow Summary . . . . .	16
Technologies Used . . . . .	16
BSA Data . . . . .	16
ArcGIS Desktop . . . . .	16
ArcGIS Collector . . . . .	16
ArcGIS Portal Webmaps and Apps . . . . .	16
Field Data Collection . . . . .	16
Data Details . . . . .	17
Location of Production Data . . . . .	17
ForfeitureParcels Feature Class . . . . .	18
Collector for ArcGIS . . . . .	18
Webmap Details . . . . .	19
Hard Copy Record . . . . .	20
User Manual . . . . .	21
Admin Tasks . . . . .	21
Setup Users in ArcGIS . . . . .	21
Setup Users in Portal for ArcGIS . . . . .	21
Schema Change Procedure . . . . .	21

Form Edits Procedure . . . . .	21
Collection Device Setup . . . . .	21
Camera Settings . . . . .	21
Internet Settings . . . . .	21
Collector Setup Details . . . . .	22
Install Collector for ArcGIS . . . . .	22
Configure Collector . . . . .	23
Daily Preprocessing Routine . . . . .	24
Execute Preprocessing Script . . . . .	24
Synchronize Webmap . . . . .	24
Forfeiture Data Collection . . . . .	25
Forfeiture Parcels Data Details . . . . .	25
Device 1 Field Operation . . . . .	26
Device 2 Field Operation . . . . .	27
Daily Postprocessing Routine . . . . .	28
Synchronize Webmap . . . . .	28
Execute Postprocessing Script . . . . .	28
Software . . . . .	29
ESRI Licensed Products . . . . .	29
ArcDesktop . . . . .	29
Enterprise ArcGIS Deployment . . . . .	29
Collector for ArcGIS . . . . .	29
<b>5 Tools</b>	<b>30</b>
5.1 ESRI Tools . . . . .	30
5.1.1 COGO Tools in ArcGIS . . . . .	30
5.2 L <sup>A</sup> T <sub>E</sub> X Packages . . . . .	31
5.2.1 float Package . . . . .	32
usepackage . . . . .	32
Simple Use . . . . .	32
Options . . . . .	32
Use with Options . . . . .	32
Commands . . . . .	32
5.2.2 graphicx Package . . . . .	33
usepackage . . . . .	33
Simple Use . . . . .	33
Options . . . . .	33
Use with Options . . . . .	33
Commands . . . . .	33
5.2.3 hyperref Package . . . . .	33
Introduction . . . . .	33
Simple Use . . . . .	33
Options . . . . .	34
Use with Options . . . . .	34
Commands . . . . .	34
5.2.4 import Package . . . . .	36

usepackage . . . . .	36
Simple Use . . . . .	36
Options . . . . .	36
Use with Options . . . . .	36
Commands . . . . .	36
5.2.5 standalone Package . . . . .	37
Introduction . . . . .	37
Simple Use . . . . .	37
Options . . . . .	38
Use with Options . . . . .	38
Commands . . . . .	38
5.2.6 wrapfig Package . . . . .	39
usepackage . . . . .	39
Simple Use . . . . .	39
Options . . . . .	39
Use with Options . . . . .	39
Commands . . . . .	39
5.3 L <sup>A</sup> T <sub>E</sub> X Templates . . . . .	40
5.3.1 L <sup>A</sup> T <sub>E</sub> X Section Template . . . . .	40
5.3.2 L <sup>A</sup> T <sub>E</sub> X Subsection Template . . . . .	40
5.4 PDF Tools . . . . .	42
5.4.1 Introduction . . . . .	43
Pupose and Summary . . . . .	43
requirements . . . . .	43
5.4.2 Python(2.7) . . . . .	43
Note: . . . . .	43
Script that creates a batch file . . . . .	43
5.4.3 ghostscript . . . . .	44
About . . . . .	44
Licensing . . . . .	44
Download . . . . .	44
5.4.4 Windows batch files . . . . .	44
5.5 QGIS Tools . . . . .	45
5.5.1 Using COGO Tools in QGIS . . . . .	45
Set up the Azimuth and Distance Plugin . . . . .	45
Configure Options . . . . .	48
Using the tool . . . . .	49
Configure editing environment . . . . .	50
Locate Point of Commencement . . . . .	51
Using Reference Layer . . . . .	51
Using Measuring Tool . . . . .	52
Search by Parcel Number . . . . .	53
. . . . .	53

<b>IV Resources</b>	<b>54</b>
<b>Appendices</b>	<b>55</b>
A.1 Geography 101 . . . . .	56
A.1.1 Coordinate Systems for Michigan . . . . .	56
B.2 ESRI Resources . . . . .	56
B.2.1 Funcionality Matrices . . . . .	56
References . . . . .	57
<b>Glossary</b>	<b>57</b>
<b>Index</b>	<b>58</b>

# **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}
\usepackage{multicol}
\setlength{\columnseprule}{0.4pt}
\columnwidth=0.3\textwidth

\begin{document}

% \TileWallPaper{4cm}{2cm}{CoLogo133x200.png}

\centering
\scalebox{3}{\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
\end{minipage}}
```

```
{\border \char114} % lower left
{\border \char111} % bottom
{\border \char115} % lower right
{\centering

\includegraphics[height=1.25cm]{GIS_Logo_better.jpg}
%\end{minipage}
\vspace{-8mm}

\curlyframe[.9\columnwidth]{

\textcolor{red!10!black!90}{%
{\small Allegan County GIS Services}\%
\textcolor{green!10!black!90}{%
\tiny recognizes}

\\
\uline{\textcolor{black}{%
{Ian Hanes}}}
\\
\smallskip
\tiny Chief Equalization Technician
\smallskip

\textcolor{green!10!black!90}{%
{
\tiny as a
}
\smallskip
\tiny
\\
\textcolor{black}{\large \textsc{GIS Champion}}}
\\
\vspace{1mm}
\textcolor{green!10!black!90}{%
{
\tiny for outstanding dedication and service to the community
\\while using GIS technology on this day
\itshape June 29, 2018
}
\vspace{3mm}

\color{blue!40!black}
\scalebox{.6}{%
\begin{tabular}{ccc}
```

```
\cline{1-1}
%\cline{2-2}
\cline{3-3}
%\cline{4-4}
%\cline{5-5}
\\
Neil Besteman & & Bryan May \\
GIS Manager & & GIS Analyst \\
\end{tabular}
}}}}
\end{minipage}

}
\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 <sup>A</sup> T <sub>E</sub> 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<sup>A</sup>T<sub>E</sub>X 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<sup>A</sup>T<sub>E</sub>X 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.

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 `.bbl` file.

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

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

**\*Note:** 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:

- `\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<sup>A</sup>T<sub>E</sub>X 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 will facilitate:

- Mobile data collection on handheld device via Collector for ArcGIS configured with Allegan County GIS Portal (**device app**)
  - Device app 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** This Application utilizes Treasurer Department data to document the forfeiture process. An enterprise GIS deployment enables offline data collection by up to two users.

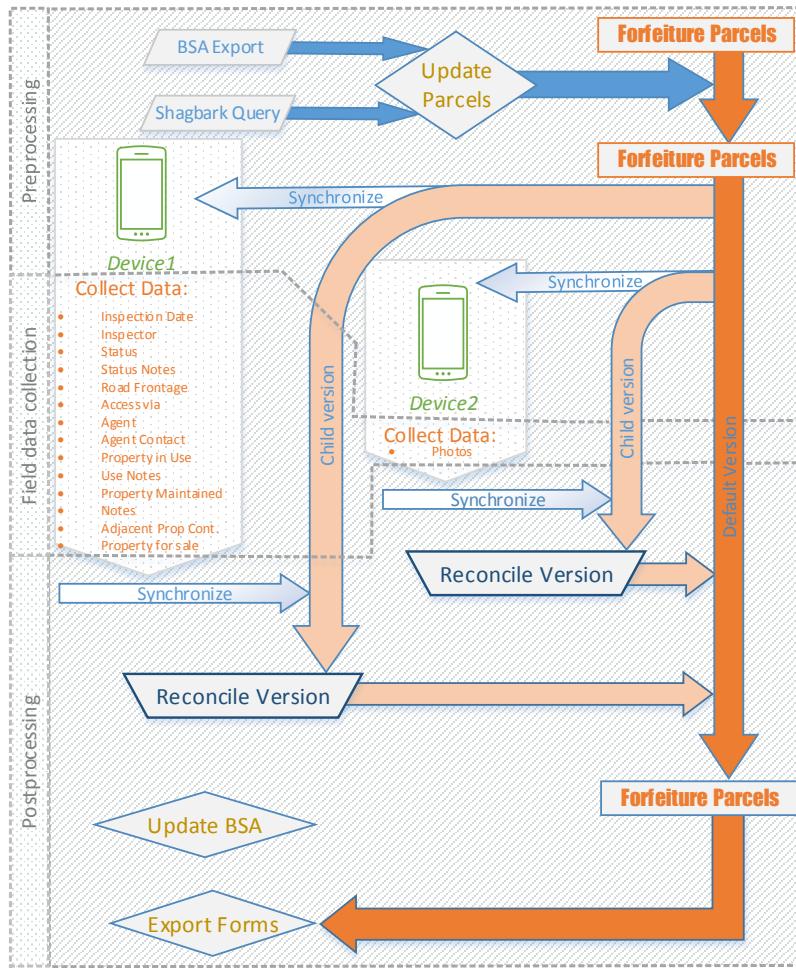


Figure 4.1: Project Design

There are three stages to daily workflow: Preprocessing, Field Collection, and Postprocessing. Forfeiture Parcels, is a map feature class that is processed in the office via the network and remotely via the internet.

### Workflow Summary

**Preprocessing** The data is updated to match the Treasures data in BSAforfeiture.net and synchronized to two android mobile devices.

**Field data collection** The two mobile devices are used to collect info required, one for all the attributes, the other for photos.

**Postprocessing** The mobile devices are synchronized back to the network data and a form is exported for each site visited that day.

### Technologies Used

**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.

**ArcGIS Portal Webmaps and Apps** Live data from a publishing enterprise geodatabase (ACPub), running on SQL Server database server (acintsql01) is provided through a feature service (REST service) named TaxReversionParcels. A webmap called the Forfeiture Field Map consumes the TaxReversionParcels feature service, exposing the data to editing. The Forfeiture Field Map is configured to work in the ArcGIS Collector App. The app downloads the webmap, allowing the user to collect the necessary information on each forfeiture parcel in the field disconnected and uploads the changes when reconnected.

**Field Data Collection** Three parts of the daily routine:

1. Pre-processing (in the office):

- Export current forfeiture list from BSA
- Update webmap layers with results from BSA export
- Synchronize from webmap layers to field collection devices (**device app**)

2. Field data collection with device app:

- Navigation to forfeiture sites is aided by users location shown in map
- A Checklist of data points about the site
- Attach photos to the site
- Save results for synchronization in post-processing

3. Post-processing (in the office)

- Synchronize data and images collected in device app to webmap layers

### Data Details

#### Location of Production Data

The data is located in AC PUB.

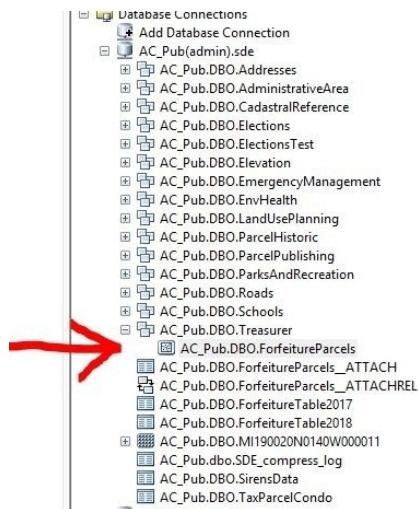


Figure 4.2: Live Data Location Screen-shot

**ForfeitureParcels Feature Class**

**Collector for ArcGIS**

**Webmap Details**

**Hard Copy Record**

**User Manual****Admin Tasks**

**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.

**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.

**Schema Change Procedure****Form Edits Procedure****Collection Device Setup****Camera Settings****Internet Settings**

### Collector Setup Details

#### Install Collector for ArcGIS

- Available from the Google Play Store



Figure 4.3: Download the App

### Configure Collector

Organization website is:

[https://gis.allegancoounty.org/portal\\_webadaptor](https://gis.allegancoounty.org/portal_webadaptor)

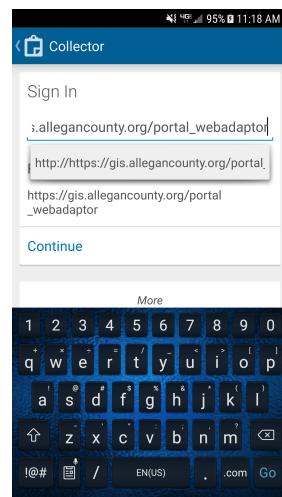


Figure 4.4: Collector Connection

Enter Credentials3

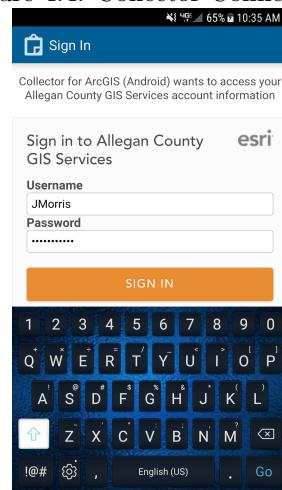


Figure 4.5: Enter Credentials

### 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

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

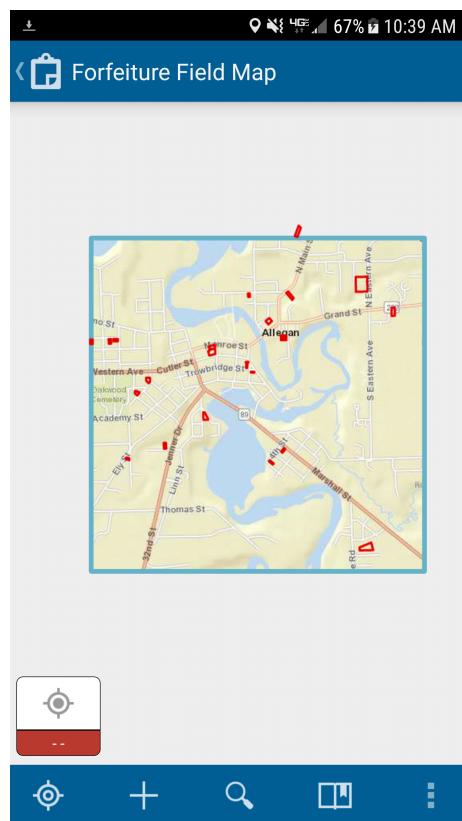


Figure 4.6: Map on Device

Attribute List		
Field Name	Entry Type	Note
Property Number	Prefilled	NA
Inspection Date	Autofill or Dropdown	NA
Inspector	Dropdown	NA
Class	Prefilled	NA
Acres	Prefilled	NA
Address	Prefilled	NA
Status	Dropdown	NA
Status Notes	Open entry	254 Char limit
Road Frontage	Dropdown	Yes or No
Access via	Open entry	30 Char Limit
Agent	Open entry	30 Char Limit
Agent Contact	Open entry	30 Char Limit
Property in use	Dropdown	Yes or
Use Notes	Open entry	254 Char limit
Property Maintained	Dropdown	Yes or No
Notes	Dropdown	254 Char limit
Prop Contam	Dropdown	Yes or No
Notes	Open entry	254 Char limit
Adj Prop Contam	Dropdown	NA
Notes	Open entry	254 Char limit
Property for sale	Dropdown	Yes or No
Posted	Prefilled	in Pre and Postproc
InList	Prefilled	in Preproc
PostedInList	Prefilled	in Preproc
Print Today	Dropdown	Yes or No

Table 4.1: Dataset Details

### Forfeiture Data Collection

**Forfeiture Parcels Data Details** Attributes are of four entry types:

- prefilled
- autofill
- dropdown
- text box

In the Forfeiture Field Map, for each site visited, select the desired parcel, push the edit button and collect attributes. If the boxes are autofill, select from dropdown or typed.

### Device 1 Field Operation

In the Forfeiture Field Map, for each site visited, select the desired parcel, push the edit button and then edit attributes.

This figure shows the data collection interface. Device one will be used to add data to all of the boxes. Touch the boxes to enter text or select a dropdown.

The screenshot displays the Collector for ArcGIS mobile application interface. At the top, it shows the title "Collector for ArcGIS". Below the title, there is a header section with a red square icon and the text "Tax Reversion Parcels: 01-008-005-00" followed by "Area: 88.66 Acres". The main area contains several data entry fields:

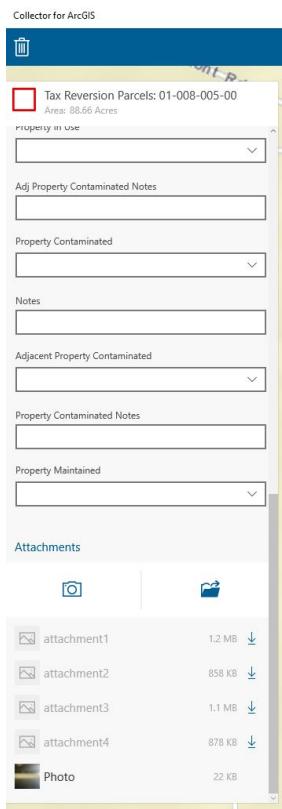
- Inspection Date: August 14, 2018
- Inspector: Christina Andress
- Status: Occupied
- Status Notes: notes.....notes
- Road Frontage: Yes
- Access Via: Dumont Rd
- Agent: (empty)
- Agent Contact: (empty)
- Use Notes: (empty)
- Notes: (empty)
- Property For Sale: No

At the bottom of the screen, there is a "Print Today" button.

Figure 4.7: Device 1 Data Entry

## Device 2 Field Operation

In the Forfeiture Field Map, for each site visited, select the desired parcel, push the edit button and then the add attachment button. Select photo and take a photo.



This figure shows the data collection interface. Device two will be used to add photos to a parcel.

Figure 4.8: Device 2 Data Entry

**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.

# **Chapter 5**

## **Tools**

### **5.1 ESRI Tools**

#### **5.1.1 COGO Tools in ArcGIS**

TEXT

## 5.2 L<sup>A</sup>T<sub>E</sub>X Packages used by AC GIS

### 5.2.1 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

### 5.2.2 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

### 5.2.3 hyperref Package

#### Introduction

Official hyperref package documentation

Note: Add the *hyperref package* to the preamble **last** [2].

\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.
```

### 5.2.4 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

### 5.2.5 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

### 5.2.6 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

## 5.3 L<sup>A</sup>T<sub>E</sub>X Templates

### 5.3.1 L<sup>A</sup>T<sub>E</sub>X Section Template

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

### 5.3.2 L<sup>A</sup>T<sub>E</sub>X 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

## 5.4 PDF Tools used by AC GIS

### 5.4.1 Introduction

**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

### 5.4.2 Python(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()

```

### 5.4.3 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](#).

### 5.4.4 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

```

## 5.5 QGIS Tools

### 5.5.1 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.).

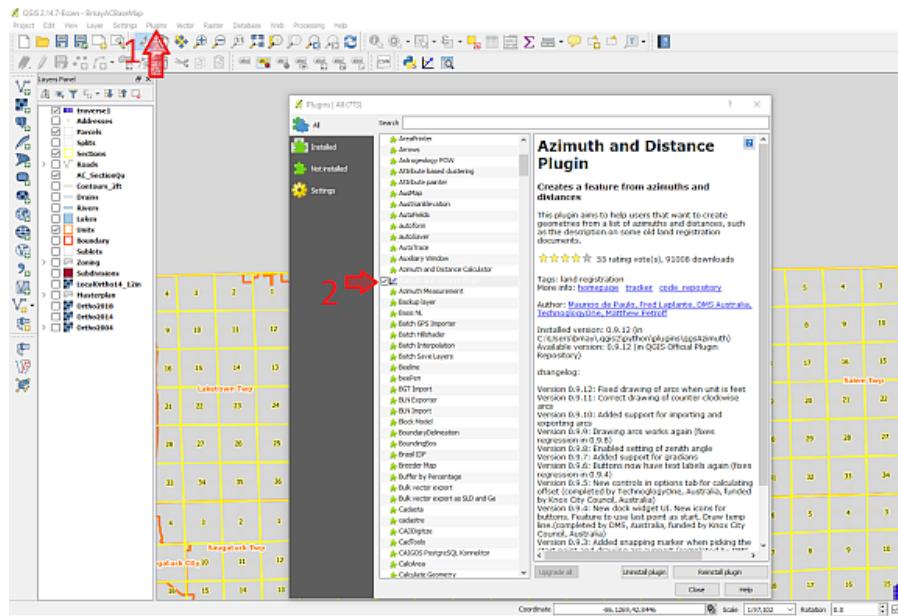


Figure 5.1: launch plugin

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

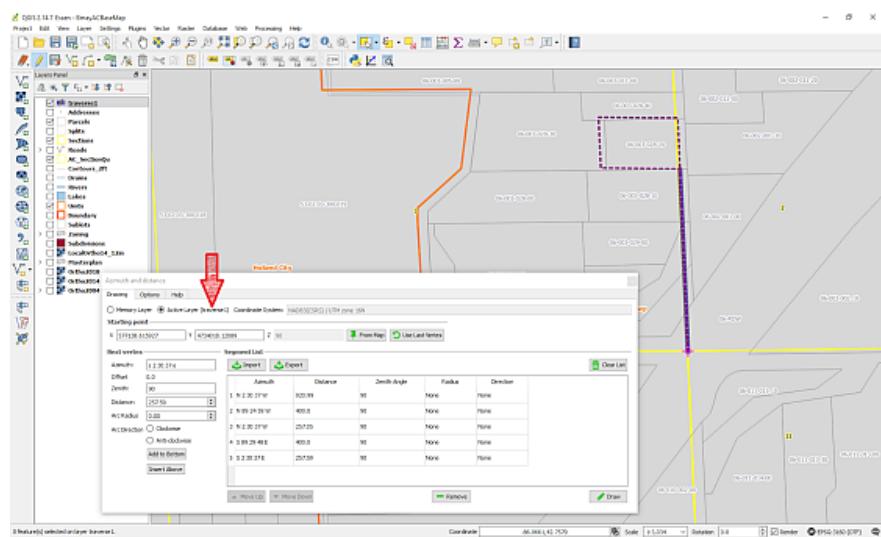


Figure 5.2: check active layer

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

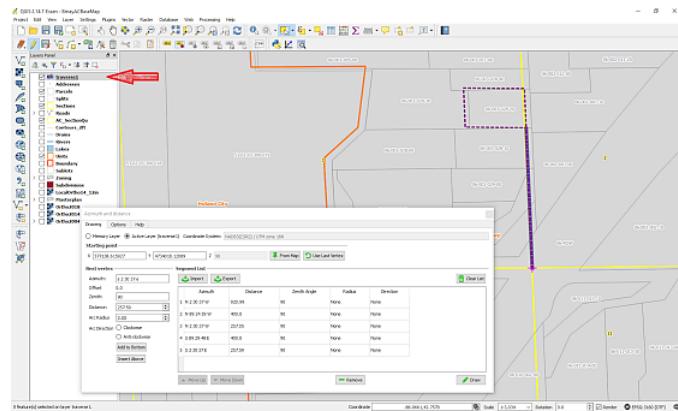


Figure 5.3: activate layer

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

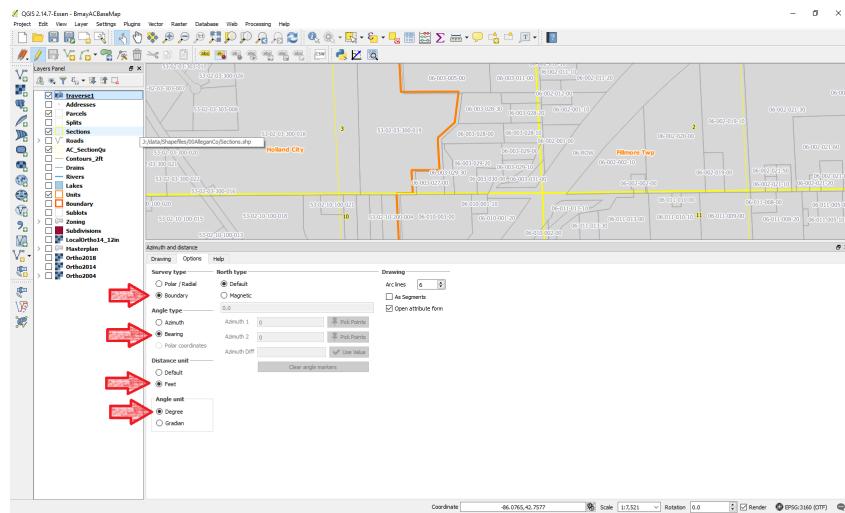


Figure 5.4: Plugin Options

**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).

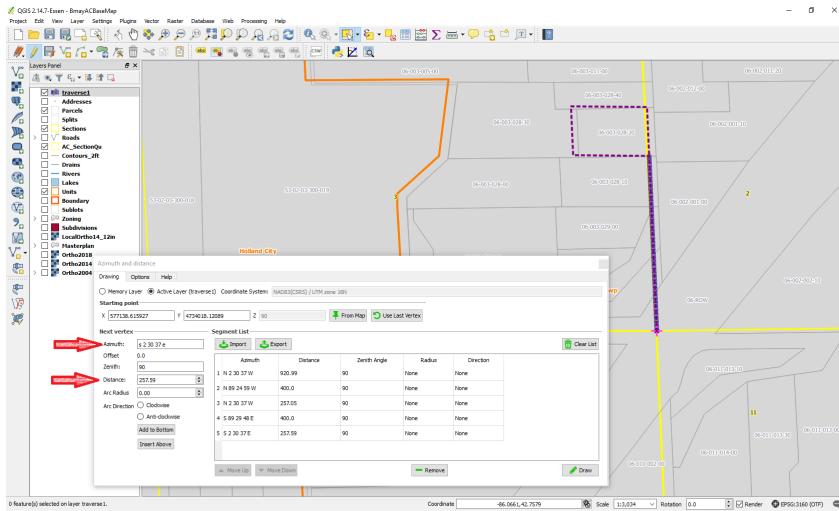


Figure 5.5: Entering Bounds

### Configure editing environment

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

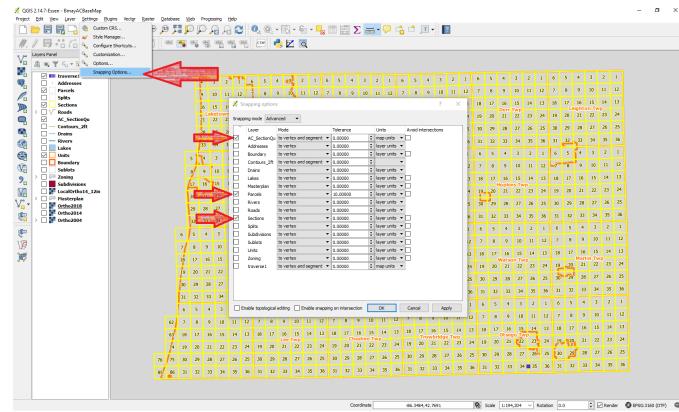


Figure 5.6: Configure editing environment

## 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.).

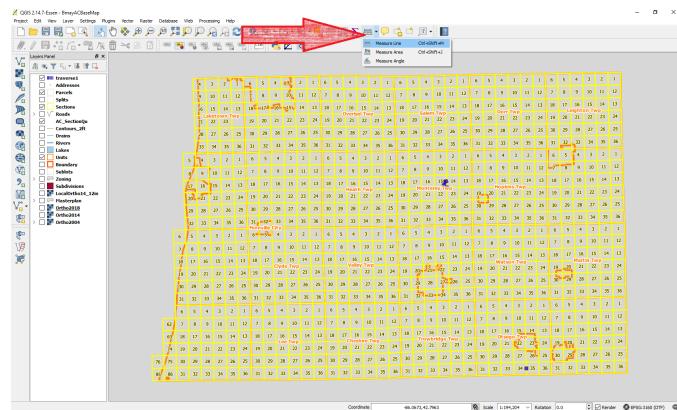


Figure 5.7: Measuring Tool

### Search by Parcel Number (Search Layers Plugin.)

To Launch Search Layers Plugin:

In Plugins dropdown:

Enable the **Search Layers** Plugin. (see fig.)

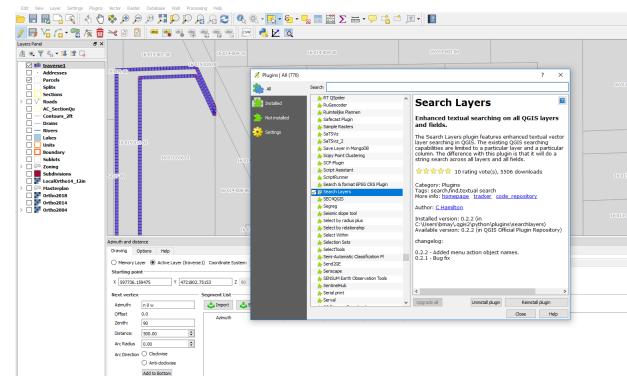


Figure 5.8: Search Layers Plugin

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

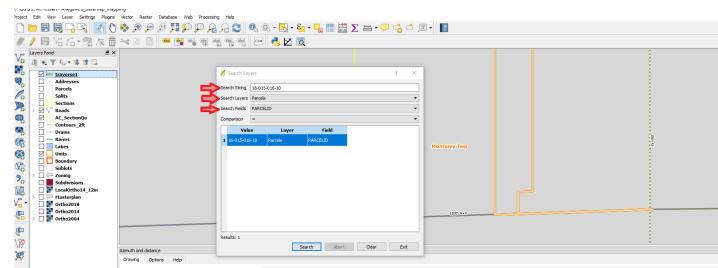


Figure 5.9: Search Layers Setup

## **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 Funcionality Matrices

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

# Bibliography

- [1] Artiflex, *ghostscript.com*, 2018. 44
- [2] na, *The hyperref package*, CTAN, na ed., na na. 33
- [3] Martin Scharrer, *The standalone package*, CTAN, 1.3a ed., 03 2018. 37

# Glossary

**IDE** Integrated Development Environment. 55

**map projection** Representing a sphere on a flat surface. 11, 55

**sample** an example. 55

# Index

ArcGIS Enterprise 10.5 functionality matrix, 54

ArcMap 10.5 functionality matrix, 54

coordinate systems, 54

ESRI Product documentation, 54

functionality matrix, 54

georef, 54

map projections, 11

Michigan, 54

State Plane, 54