Developing a GIS Database for the City of Cottonwood, Arizona

By Scott Ellis

An Applied Practicum Submitted for Fulfillment of a

Master of Science in

Applied Geospatial Sciences

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May 2019

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Abstract

The use of GIS in municipal activities is on the rise. With its availability and diverse functionality, GIS is becoming a necessary tool for everyday use in many cities. Some smaller cities and towns are lacking current GIS functionality and availability. The City of Cottonwood currently has very limited GIS capabilities, functionality, and use, other than with the Police Department. An organized data structure is lacking.

Most departments and employees are uneducated about GIS and its ability to effectively be used for various projects. Currently, the city's GIS data is poorly organized, is not current, and is mostly stored as shapefiles. The purpose of this practicum is to develop a geodatabase to compile and store the city's GIS data, and provide a platform to collect new and updated data for ease of use, specifically within the Planning and Zoning Department.

The project intends to design the most suitable geodatabase and GIS platform for the Planning Department to manage, collect, maintain, update, use, and manipulate data as needed to ensure we have the ability to assist customers in a sufficient manner. Geodatabases are repositories for spatial data and are used by ESRI (Environmental Systems Research Institute) ArcGIS applications. ArcGIS allows the collection, storage, management, use, and sharing of spatial data. ArcGIS is the platform currently used by the City of Cottonwood.

An appropriate design of a geodatabase, that supports the effective and efficient data storage, collection, maintenance, and needs of the Planning Department will allow the city to move forward with existing technology to provide better customer service, improve internal knowledge, provide more efficient workflow, and update an archaic data management system that confuses even knowledgeable users.

March 28, 2019

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Dr. Ray Huang
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Dear Dr. Huang,

This letter is in regards to the GIS work Scott Ellis has done for the City of Cottonwood prior to and since being employed as a Planner for the city. In 2013 Scott came in as a volunteer to manage the existing GIS data the city had, and create updated map products for the city's General Plan. This included updating and creating official zoning and land use maps used on a daily basis by Planning staff.

Scott has worked extensively on trying to bring the city's GIS data into a more manageable geodatabase and eliminate the excessive personal geodatabases that have been created over the years. This has also resulted in ensuring that ever changing data is maintained in a single geodatabase that can be accessed by him, or other GIS users in the city as needed.

Scott's work as a Planner, combined with his GIS abilities, has helped improve the Planning Department's ability to incorporate GIS into project presentations, customer service, and decision making by the Planning & Zoning Commission and City Council. His work has also brought to light property boundary and municipal boundary issues that were solved by working with Yavapai County GIS.

Scott's contributions to the City of Cottonwood Planning Department with GIS has been needed for a long time. His extensive work and desire to improve what is existing has made a major impact on how the department operates. Without this work, our GIS would still be significantly lacking and mostly unusable. This has provided a platform for the city to move forward with larger GIS capabilities across all departments.

I look forward to Scott's continued GIS work as a Planner moving forward with the City of Cottonwood.

Sincerely,

Berrin Nejad
Community Development Director, City of Cottonwood

Keywords: Geographic Information System (GIS), geodatabase, Database Management System (DBMS), Environmental Systems Research Institute (ESRI), attribute table, feature dataset, coordinate system.

Acknowledgements

I would first like to thank the City of Cottonwood for giving me the opportunity to work as a Planner and continue my education along with improving internal processes using GIS. In addition, I would like to thank Berrin Nejad, Community Development Director for the City of Cottonwood for allowing the time necessary to complete this project and improve the Planning Department's GIS functions; Dr. Ruihong Huang for invaluable guidance throughout this practicum and patience as this has been a long process; and Dr. R. Dawn Hawley for providing beneficial information and guidance as a committee member for the practicum. The city's GIS Technician was also helpful in confirming the design and elements of the geodatabase. Without all of these great individuals, this project would not have been possible.

1. Introduction

The City of Cottonwood is about 100 miles north of Phoenix and sits in the Verde Valley in Yavapai County (Figures 1 & 2). It was incorporated in 1960 and is home to approximately 11,265 people (htts://factfinder.census.gov, 2017). As of 2015, the surrounding Verde Valley communities of Jerome, Sedona, Clarkdale, Camp Verde, Verde Village, Lake Montezuma, and Cornville have a combined population of approximately 66,175 people (www.cottonwoodchamber.org, 2018). With the vast areas of land between communities, it is natural that city boundaries will change due to annexations and land purchases. Cottonwood has grown significantly over the past several decades. The city limits keep growing as the town acquires new land through annexation and purchases. This creates a constant need for updating land ownership records, parcel information, zoning designations, land-use designations, and boundary information. The infrastructure is also constantly being upgraded and new infrastructure is needed as the city grows.

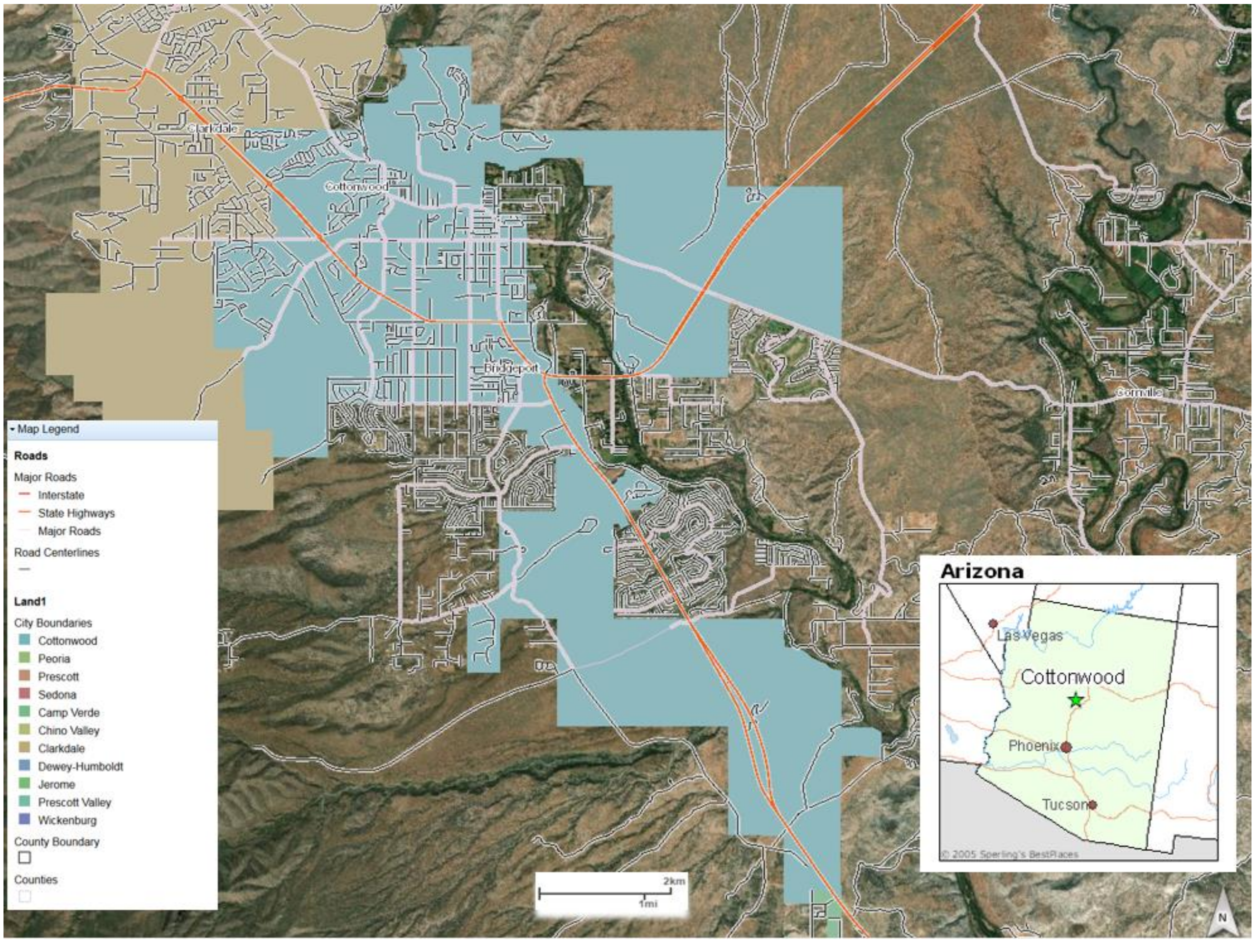

Figure 1: Location of Cottonwood, AZ.

Figure 2: Ground and aerial photos of Cottonwood, AZ.

Cottonwood continues to rely on other sources for GIS use, with limited, in-house, reliable data and a data management system. The inability to organize and maintain the existing data in a central geodatabase has created the issue of multiple people in multiple departments having to store, maintain, and edit their own data as they use it. This creates discrepancies in accuracy across numerous data layers and fields. As the main department of contact for multitude of projects in the city, the Planning Department should take the lead on developing a GIS for the entire city, maintaining it, and managing it until the city grows enough to warrant GIS staff. Having the ability to use GIS across a broad range of planning duties could have a significant impact on the quality and quantity of work produced for customers. Unfortunately, many employees of the city and members of Council, commissions, and boards are unfamiliar with what GIS is and the benefits it can provide.

Current data and GIS functions of the city are problematic at best and is not organized. By starting fresh and designing a new geodatabase for the Planning Department is the first step to organizing much of the data the city currently has, and providing more efficient GIS products for staff and customers.

The city has a certain amount of GIS data that has been collected and stored in multiple personal geodatabases in various departments, and in the same department (Planning). Some of the data has been supplied by third party collections. Some of Cottonwood's data is provided by Yavapai County, however, the information provided is limited. Parcel boundaries, streets, and property ownership information are examples of only a few of the data the city is responsible for maintaining. Until recently, the City of Sedona provided street centerline information to the Cottonwood Fire Department for use with Fire Department maps. There is a definite need for Cottonwood to be able to collect, maintain, and store its own GIS information. Rather than rely on outside agencies for GIS information, Cottonwood should be able to acquire, store, and maintain its own data.

The City of Cottonwood IT Department is attempting to build master GIS data sets for E9-1-1 and general planning purposes to be used by the city and others in the Verde Valley. One of the main benefits of GIS is to help improve management and organization of the resources. Using GIS to create a single shared geodatabase will help departments benefit from each other. As long as the data is available, a map can be created at any time, for any location, at any scale, for anyone.

A constant challenge with establishing a GIS for the city as a whole is cost, and incorporating those costs into the budget cycle. When there are needs, the ability to fulfill those needs comes down to time and money. Once the reasons for the needs become greater than the cost of the project, a solution for time and money is found. Although GIS is an important technology, it quickly becomes buried by other needs and projects. GIS is poorly understood by many so it is very important to educate on the benefits of GIS in everyday work to the City Council to show that one need in one department can be solved with GIS while bettering an unknown problem in another department. Although this is not a goal or the scope of this practicum, it is certainly something that needs to be considered when moving forward with any change to the current data structure that could potentially benefit every city department. This will be further discussed in the conclusion.

The entire city can benefit by a GIS that can be used across all departments, however, this practicum will focus specifically on how GIS can be used and implemented in the Planning Department. The goals of the Planning Department are to be able to efficiently use GIS every day to help streamline workflow. Staff currently uses an online GIS platform provided by Yavapai County to look up properties in order to identify their location within the city limits and determine the parcel size, shape, zoning, and ownership. Since this service is provided by an outside agency, it limits the ability to include our own internal data related to a property.

With technology changing every day, it is important for cities and towns to keep current with these changes. Implementing a GIS will allow digital storage of important data such as street centerlines, sewer lines, water lines, addresses, parcels, buildings, fire hydrants, etc. Existing paper maps depicting these features can be digitized and translated into the GIS. Classifying some of this data (if a building is a school, hospital, etc.) can significantly help future planning needs of the local government. However, GIS is not an automated decision making system, but a tool to store, query, analyze, and map data in support of the decision making process.

Objectives

1. Identify the current GIS needs of the City of Cottonwood Planning Department.
2. Identify the current limitations of the existing GIS setup of the Planning Department.

3. Identify the changes necessary to make GIS more user friendly for Planning staff.
4. Inventory current data layers and develop new layers that may be needed or can be useful on a daily basis in the department.
5. Survey current staff who use GIS for daily job duties to identify what information would be helpful.
6. Research the most effective file geodatabase system for future implementation in the department using existing GIS capabilities. Since a file geodatabase does not support multiusers, the geodatabase will be managed and edited by one person to avoid data corruption issues.
7. Have the ability to create useful end-user products based on the new geodatabase design.

2. Background

A Geographic Information System is a system that allows you to store, combine, analyze, manage, manipulate, and visualize spatial and geographic data (ESRI, 2018). From this, maps can be produced, queries can be made, and a variety of spatial questions can be answered to give users the information and tools needed to make decisions. Simply, it links information about where things are with information about what things are like. A GIS map combines many layers of information to better understand what is being shown. The city currently uses ESRI software, specifically ArcGIS for desktop.

2.1 Introduction to GIS

With a GIS, the information is stored in a geodatabase, a shapefile, and other data formats (i.e. ArcSDE raster, Digital Terrain Elevation Data (DTED), Tagged Image File Format (TIFF), among others). A geodatabase is a particular technology that usually uses an enterprise database to store and manage geospatial data. However, the City of Cottonwood currently has not adopted a centralized geodatabase, therefore, this practicum aims to design a geodatabase for the Planning Department that can be a model for a larger, city-wide system. Data are scattered with different users and stored in different formats. A geodatabase organizes all of this information and can range from a small single-user database to a large enterprise database used by many. Geodatabases can be simple and hold basic information about a place, or very large and complex with varying information, layers, feature classes and datasets, rasters, and attributes. It is the primary data format to edit and manage geospatial information used in a GIS.

A huge benefit of using an enterprise geodatabase is to improve management of resources within an organization. Datasets can be linked by common locational data, such as company projects which helps staff share data. Used within the Planning Department, GIS can assist with decisions on locating new developments with minimal environmental impacts, which are close to city centers, or tie into current infrastructure.

2.2 The City of Cottonwood

The City of Cottonwood has minimal GIS capabilities, with the exception of the Police Department. Until 2015, the Police Department consulted with outside professionals to manage GIS related needs. In 2015, the city hired a GIS Technician to take over these responsibilities. This is a huge benefit and a step in the right direction for the city to have an in-house GIS professional, however, the focus is largely on Police Department needs, leaving very little time to dedicate resources to city-wide GIS needs. The Fire Department has one employee who is self-taught in GIS to maintain all of the city’s address points, street centerlines, and response maps. The Planning Department has one of four ArcGIS licenses in the city and only one employee formally educated in GIS. This leaves multiple departments across the city with an extreme lack of GIS capabilities, but with a great need for them.

Since the city currently has three basic and one standard ESRI licenses for ArcGIS software, features such as Versioning, Spatial Analyst, and other tools and features are not available to use. This has created a substantial problem with storing and using geodatabases and the associated data. Most of the geodatabases for the Planning Department have been created as personal geodatabases, instead of file geodatabases. Since a personal geodatabase is limited to a size of 2 GB, performance can be significantly affected as the amount of data and size increases. Also, since versioning is not an option, numerous geodatabases have been created for each particular need (i.e. geodatabases have been created for only one map document for zoning, land use, historic areas, public lands, and countless other map products produced). This has created a headache of an unorganized system which requires filtering through different geodatabases that have all had their own relevant feature classes imported and edited. The data may also not be updated, as we currently have several features that are frequently changing (parcels, addresses). This creates the need (and problem) of having one geodatabase show a parcel layer edited to a particular map, while another geodatabase has the same parcel layer edited differently for its corresponding map. Parcel layers are updated every few weeks/months by Yavapai County and provided to the city for use. Having to import the updated information into each geodatabase using this layer becomes highly problematic and time consuming.

Another challenge that has been noted with the data currently used by the city is the lack of metadata showing the history of the information, when it was collected, how it was collected, etc. A recent issue that has been brought to light is the accuracy of the city's boundary and where the original data came from. There are significant discrepancies between the boundary the city has on file and that of the U.S. Census Bureau and Yavapai County. This creates problems with property owners who may be on the boundary between the city and county, not knowing whose jurisdiction they reside in. This requires going back through annexation and incorporation legal descriptions to ensure an accurate depiction of the city's legal boundary.

2.3 Successful Examples of GIS Applications

The following will highlight the benefits of using GIS in Planning, and other aspects of city government. It will provide examples of using GIS to enhance the enjoyment of public places, increase productivity, and provide exceptional service to customers and coworkers. There will also be general benefits of GIS use across cities as a whole, not just focusing on one department.

Being able to use GIS to help determine access to public facilities in a municipality is a great benefit to the community. If Planners can view the amenities used by citizens, we can develop a guide to ensure the availability of services and amenities and the best location for new ones as Cottonwood grows. The City of Alexandria, Virginia successfully used GIS to conduct a study to improve access to public and semipublic play areas within the city (Layton, 2012/2013). GIS was a key tool for locating playgrounds, facilities, or locations where elements specific for children's play were located. Aerial photos, existing lists, and general knowledge and expertise from the Alexandria Planning Department and Recreation Department were utilized to identify 86 play spaces in the city. A set of attributes were identified such as ease of access, perceived safety, protection from the elements, and water availability. The scores were based on a system that would allow evaluators to assess the value of each play space using five aspects; physical domain, intellectual domain, social domain, natural domain, and free play. Once the scores were calculated, they were entered into a geodatabase to calculate a numerical value for each play space. This allowed city officials to rank and compare play spaces and determine the value they provide. ArcGIS was used to map the locations of play spaces and analyze play in the city, along with the data management of the play areas. The results showed a level of service value for access to play areas for any location in the city within 1/3 of a mile.

Another benefit to using GIS in Planning is to determine growth areas, and the impact on infrastructure and services. Cottonwood has a unique layout, with areas of the City overlapping areas of Yavapai County. To get to outlying areas, emergency responders must pass through areas covered by Yavapai County emergency services. An accurate depiction of past, current, and potential future growth is imperative to provide necessary information on the impact of infrastructure. By incorporating our growth areas in a geodatabase, we can keep this information updated frequently. In Charleston, South Carolina, there has been an increase of urban expansion, thanks to I-95 and its increased coastal access. A grant from the National Aeronautics and Space Administration (NASA) was awarded to several agencies and universities to study the rate of development in the metropolitan area. Imagery was used with three classes of land cover consisting of water, urban, and nonurban areas, to identify the type of growth that was occurring in the area. This resulted in the local Council of Governments to develop a program to link infrastructure development with land use planning (ESRI, 2006). In the Cottonwood and Verde Valley area, there has been long term discussion about providing new infrastructure to outlying areas, especially to a proposed new, large housing development on the eastern boundary of the city. Also, with recent (in the last 20 years) development of subdivisions and increased traffic, Planners have been involved with conceptual road extensions to alleviate traffic congestion on the arterial state highways running through town. Showing these growth areas and projected demand on infrastructure using GIS can help decision makers apply the best options to provide needed services.

Planners use GIS on a daily basis to help with decision making processes in their communities. GIS helps them plan and map their neighborhoods. As a primary duty, planners help develop communities and must have the ability to foresee how these developments impact their locality at present and into the future. By using GIS, they are able to map these areas, and provide visual interpretations of future land use.

> "No matter how large or small your community (is), as a planner you deal with spatial information such as parcels, zoning, land use, addresses, transportation networks, and housing stock. You also monitor multiple urban and regional indicators, forecast future community needs, and plan accordingly to help improve the quality of life in your community." (Milton Ospina, ESRI, 2006).

Giving the public the ability to locate properties and identify zoning, land use, addresses, etc. can provide them with information needed when trying to find a suitable location for a prospective residence or business, or for general information on how to navigate the city and avoid potential delays. Yavapai County currently has an online interactive mapping application with the above information readily available. Cottonwood would benefit from creating its own system with specific information related to properties, such as permitted and conditional uses within a zoning district, sewer and water availability, road construction, business locations, etc. Johns Creek, Georgia is a fairly young city, incorporated in 2006, but has already embraced GIS technology and provides its citizens a valuable tool to use for everyday life. They have an open data set with useful information for everyday life. Also, by teaming up with Waze, a navigation app, the city has been able to provide road closure, accident, and event information that affects traffic. By adding names and locations of local businesses, the app also allows citizens to determine the best route home and the proximity to a certain business location. All aspects of land use data is also available on the open data site, including zoning, topology, parcels, street centerlines, address points, and parcels. All of this data is available for free to anyone who may need it. Johns Creek has also included demographic information, real estate information, and countless other useful tools to assist with providing an exception GIS experience for its community. According to Nick O'Day, the city's GIS Manager, "the hard part is letting people know the data is there" (Wyland, 2016). Providing this type of information to citizens could help them feel better connected with what happens in their city, especially when trying to find important property information and business locations.

Many places in Arizona, particularly in the Verde Valley, are experiencing substantial growth. The City of Cottonwood currently has 5 large, active subdivisions under construction, with another in the planning stages. This growth is great for the overall economy, however, cities and counties need to be able to accommodate this growth with increased infrastructure and services. Being able to use GIS to plan these developments and view their potential impact on the city, we can give council and commission members a view of this growth. Placer County, California has seen a large increase in population growth (ESRI, ArcUser, 2017). The county has developed a financial analysis of future development to determine the financial impacts these developments will have on the county, including services and infrastructure. Instead of continuing to rely on outside consultants, the county decided to find an efficient and cost-effective way to manage and analyze the changes that occur with the planning process. By choosing to use ESRI's GeoPlanner for ArcGIS, they have been able to do away with consultants and move the process in-house to better keep up with projects. GeoPlanner allows others within the organization to view and manipulate the resulting analysis by inputting different scenarios. This allows for a complete and comprehensive review of potential projects that come through the department (ArcUser, 2017).

Currently, all staff in Cottonwood's Planning Department use GIS for everyday work. Though they may not realize it, the functions of looking at zoning maps, address points, parcel information and other relevant property information is provided by GIS (in this case, they all use Yavapai County's online mapping application for this information). I am the only one in the department with a GIS background in which to bring this information in-house to use with our existing data and tailor our needs to create the type of products we need. In Falls Church, Virginia, the city hired a GIS manager in 2016 to improve the efficiency of the existing GIS (ArcNews, 2018). Prior to hiring their GIS manager, the city only had one staff member who used GIS, a planner, to make development maps for City Council meetings. Instead of spending a lot of additional money on expanded GIS capabilities, the new GIS manager, Andrew Peters, was able to use the city's existing system and data, and services from ESRI such as ArcGIS Pro, ArcGIS Online, WebAppBuilder for ArcGIS, and the ArcGIS Solutions website to increase efficiency and expand the GIS users to those in the field, across all departments (ArcNews, 2018). Peters was able to convert from a file geodatabase to an enterprise geodatabase to accomplish this. He also began creating apps to allow mobile users in the field the ability to inventory everything from trees to bridges. This has allowed the city to expand their GIS capabilities, functionality, users, and data, without big spending.

"Creating a smarter world starts with smart planning (ArcNews, 2017)." An article from ArcNews in Spring 2017 describes the benefits and need for cities to consider geodesign when it comes to planning the future of their city. Geodesign combines the art of design with the science of geography (ArcNews, 2017). All municipalities, no matter how large or small, face constant planning issues of how and where to grow, without disrupting the character of the community. Some cities, including San Francisco, California and Boulder, Colorado are beginning to use 3D geodesign. This helps provide a platform for decision makers to view potential growth and how it might impact their community. By using this technology, planners can show citizens and staff how development will look from a 3D perspective. Boulder, Colorado is using it to update their Comprehensive Plan to show wetland areas, bike lanes, pedestrian trails, sidewalks, parks and open space, zoning districts, and other city projects (ArcNews, 2017). This has led residents to become interested in the planning process.

According to Environmental Systems Research Institute (ESRI), there are eleven steps to a geodatabase design:

1. Identify the information products that you will create and manage with your GIS: Determine what your organization needs in a GIS. The type of map products, models, applications, data, etc. What data sources will be needed and what type of map product (2D, 3D) would you like to produce?
2. Identify the key data themes based on your information requirements: Determine how each dataset will be used. Determine where the data will come from, how accurate it is and/or must be for your use. Develop the map the theme for the map to be displayed, including the scale, text, annotation, symbology, etc.
3. Specify the scale ranges and the spatial representations of each data theme at each scale: Determine what features and data you want displayed between a range of scales.
4. Decompose each representation into one or more geographic datasets: Determine the data types needed to manage the data. Will you need more than just feature classes, such as topologies, networks, and terrains? Mosaics and catalogs should also be considered for large raster collections.
5. Define the tabular database structure and behavior for descriptive attributes: This is where you will identify the attribute fields and column types, along with domains, relationships, and subtypes.
6. Define the spatial behavior, spatial relationships, and integrity rules for your datasets: Add spatial behavior and capabilities in related features using topologies, address locators, networks, terrains, etc.
7. Propose a geodatabase design: Define the geodatabase elements for the design of each data theme. Use ArcGIS data models for patterns and best practices.

8. Design editing workflows and map display properties: Define editing procedures and integrity rules. Design workflows to help meet integrity rules. Define display properties for maps.
9. Assign responsibilities for building and maintaining each data layer: Who within the organization will maintain the data?
10. Build a working prototype. Review and refine the design: Test the design. Build sample geodatabases using file, personal, or enterprise geodatabases to determine the best fit. Build maps and run applications, perform editing. Based on the results, you can revise the design as needed.
11. Document your geodatabase design: Use drawings, map layer examples, diagrams, reports, and metadata documents to describe the database design (ESRI, ArcGIS Help, 2017).

3. GIS Tasks and Needs for the Planning Department

Time was spent surveying the tasks of the Planning Department, what GIS functions are currently used from Yavapai County, and how our own GIS can help and improve processes. Throughout this process, the following phases used:

- Needs/Requirements (user data, training, orientation, soft/hard specifications).

    - At a very minimum each staff member of the Planning Department would need to use parcel data, address labels, zoning, and land-use data on a daily basis. This data is used to answer questions from customers on what they can and can't do on their property, the types of setbacks they are required to meet, and whether or not they are even within the Cottonwood city limits.

    - Additional data that could be used in addition to the above would be code enforcement violations (a new point feature class is required to be created, and could possibly be hyperlinked to the corresponding violation letter; or the violations could be hyperlinked to the existing address point, eliminating the need to create a new feature class), trails, subdivisions, historic properties, entertainment district boundaries, water lines, sewer lines, public lands, etc. These are not data that are used every day, however, they could be used as needed.
    - The ability to hyperlink permit information to an address point would be a very valuable benefit with GIS. Staff currently has to look up the address on the Yavapai County interactive map, then search through electronic or physical address folders to find the appropriate permits. Unfortunately, ArcGIS does not provide a function to hyperlink to folders with numerous documents (discussed in more detail later in this report), so an extreme amount of time would be required to hyperlink each document to an address label, unless all documents were combined into one.

- Design/Planning (user applications, database design, data migration/conversion)

- Construction (staffing, policies, standards, backup)

- Implementation (testing, release in phases or all at once, review of system, updates)

- This practicum will use test data to ensure the concept of how the database is setup will work for the needs of the Planning Department, however, implementation of the geodatabase will not occur within the scope of this practicum.

A functional GIS within the Planning Department would allow for staff to provide more efficient services, both to internal and external customers. Various projects would benefit from better GIS functionality such as:

A. Development Review Project Tracking:

1. Currently, the Planning Department uses hard-copy files and folders, and electronic folders to store and maintain project files.

Inputting project approval information into parcel information can help staff identify development requirements. Knowing as much information as possible for a parcel would save time and improve efficiency if staff could know what project was associated with a parcel. This could be done by hyperlinking the parcel or address to the approval document associated with that property. Doing this would save time and improve efficiency.

This same process can be done with building permits and code violations that may be associated with a property, again saving time and improving efficiency.

B. Zoning Information:

1. The ability to turn on and off layers as needed to determine the zoning and land-use of a property, surrounding zoning districts, setbacks, and most importantly, whether the property is within the city limits.

Staff currently uses the Yavapai County Interactive Map, a publicly available online GIS site that allows you to look at a variety of information for any parcel in Yavapai County, including ownership, APN, acreage, lot numbers, lot dimensions, subdivision, zoning (if provided by city/town), flood plain, contours, buildings, roads, city boundaries, and many other features.

This has been a great tool and is used extensively by Planning staff on a daily basis, however, it only shows the relevant information for the county as a whole, and specific information related to individual cities and towns is limited, except for zoning districts (but only if provided by the city/town), address, and parcel information. A constant issue for Cottonwood is the continuing discovery of zoning errors, boundary errors, and address issues. Except for the boundary, zoning and address information is provided by the city to Yavapai County for inclusion into this map. However, the county sometimes makes errors when inputting the information.

Cottonwood needs the ability to maintain this information within its own boundaries, and be able to incorporate our own data as needed (see list above, i.e. building permits, violations, etc.). This will allow staff to access this information quickly.

C. Department yearly reports for Community Development Department/Development Patterns:

1. Create map documents to show the prior year's developments throughout the city.

This will allow management and Council to have visual representation of the city's growth, where businesses are focusing, where violations tend to occur, and the overall development of the city.

There is not enough existing GIS data (feature classes specifically) that allow this type of map to be easily and quickly created. By creating new features, such as violation points and new development points, maps can be generated that allows us to visually show what is happening in Cottonwood.

D. City Facility Location:

1. Informational maps for the public.

Staff could use the data layers within the geodatabase to create user friendly directional maps for the public. Cottonwood does not operate from a centrally located city hall building housing all departments. The city's departments are scattered across no less than ten different buildings throughout town. This creates problems for customers, especially those who are not from the area and are unfamiliar with the roads.

4. Geodatabase Design

A geodatabase is the collection of different geographic datasets within a common file system that can be used to store, query, and manipulate spatial data (ESRI, 2018). The geodatabase stores a spatial reference system, attributes, geometry, and behavioral rules for data (ESRI, 2018). ESRI identifies three types of geodatabases; File geodatabases – stored as folders in a file system, Personal geodatabases – datasets are stored within a Microsoft Access data file, and Enterprise geodatabases – known as multiuser geodatabases. This practicum will focus on the use of ESRI's ArcGIS platforms using a file geodatabase system. ArcGIS is the software developed by ESRI that is used to create, manage, share, and analyze spatial data (ESRI, 2018).

The design of a geodatabase is crucial to its success (Zeiler, 1999). According to Zeiler, you should identify goals, propose, analyze, evaluate alternatives, and create a plan to implement them. Zeiler has identified a five step process to design a geodatabase:

1. Model the user's view:

    In order to model the user's view of the geodatabase, it is necessary to identify the Planning Department's functions. Determining the data to be used, where it comes from, and then categorizing it is also necessary.

    In this case, the functions of the Planning Department are identified as the need to provide accurate zoning, ownership, address, and land use information. Other useful data would be permits and code violations associated with a particular address. This information is critical in order to provide accurate information to customers inquiring about their rights to use their land for development.

The Community Development Department consists of three divisions; the Building Department, Planning & Zoning, and Code Enforcement (Figure 3). Within each of these divisions are several employees with varying job duties, almost all of which require the use of GIS in some capacity. This usually comes from obtaining property information using the Yavapai County interactive GIS services.

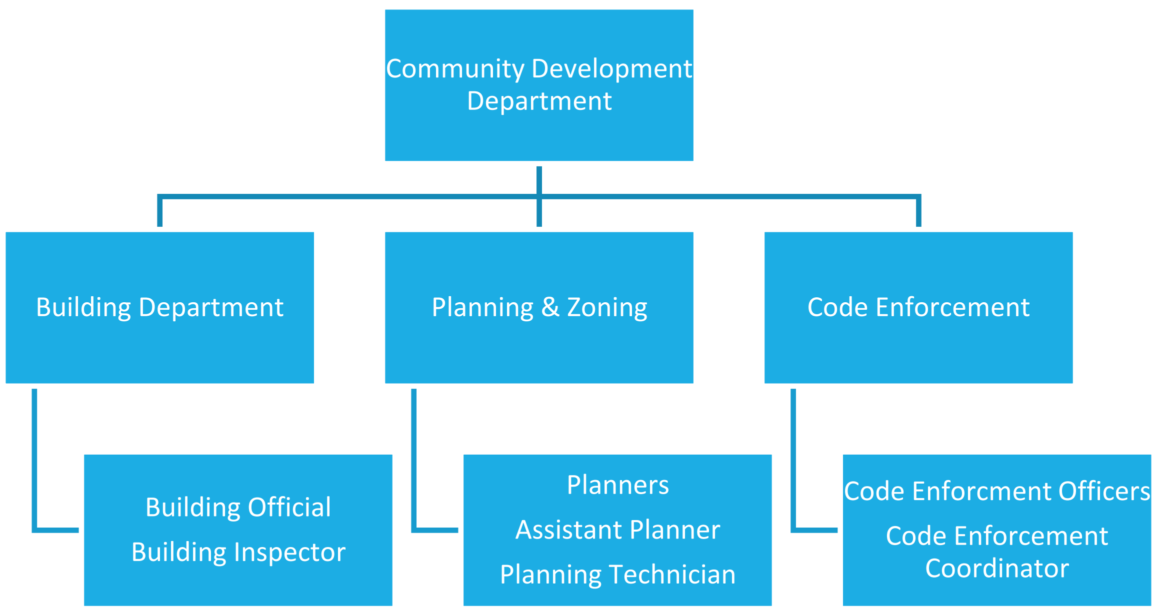

Figure 3. Organizational Chart for the City of Cottonwood Community Development Department.

2. Define entities and their relationships:

This is where feature classes and tables are defined, including relationship classes, domains, subtypes, and possible topologies. All feature classes will be placed into one of three feature datasets (Table 1) that were created for this project. At this time, based on discussions with the city's GIS Technician, currently available data, and the needs of the

Planning Department, only three feature datasets were determined to be relevant/needed. As this concept expands to a city wide GIS, additional feature datasets will be created to accommodate other department data.

Table 1. A table identifying the three feature datasets and features within them.

Base_Features	Planning	Infrastructure
city_boundary	Address_Points	Bldgs2017_wgs84
Cottonwood_2ft_Contours	Annexation	streets
river_1	Historic_District	
	Landuse	
	Lot_Dimensions	
	Lot_Numbers	
	Parcels	
	Subdivisions	
	zoningUpdate	

The current structure of existing geodatabases used by the Planning Department house numerous features that have no associated metadata to tell the user anything about the feature. This leaves a mess of features that were likely created for a specific project or created to house data that was never collected. Many of the features are not needed or are duplicated. Failure to maintain and manage this data has led to unusable features that are mixed in with usable features (Figure 4).

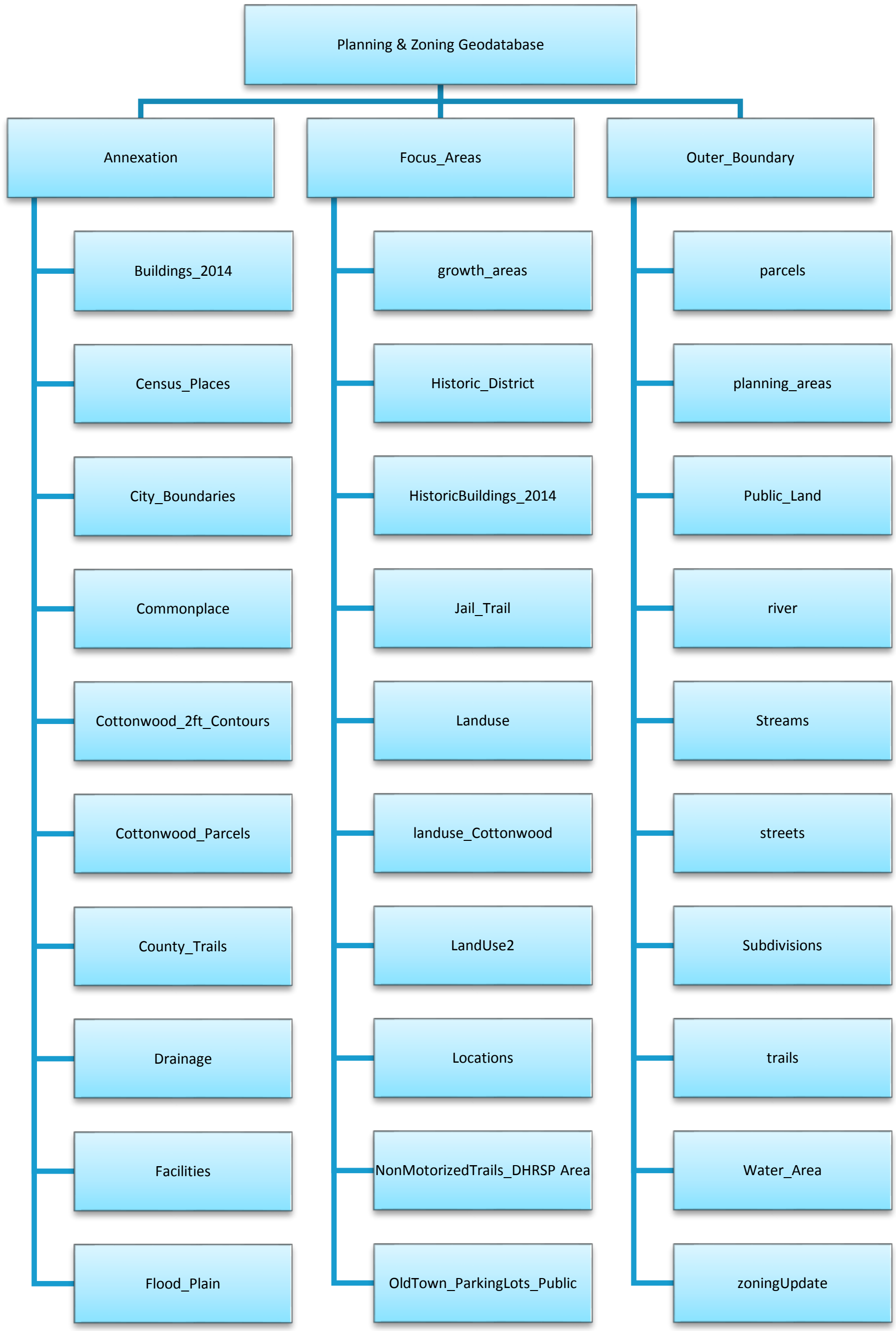

Figure 4. Current structure of existing geodatabases used in the Planning Department.

3. Identify representation of entities:

This step requires what data representations should be used; points, polygons, lines, raster data, etc.

Points, polygons, and lines are all readily available for use and inclusion in the geodatabase to be created, as well as potential future data that would be beneficial city wide (Table 2). Two annotation layers are also used and provided to the city by Yavapai County (*Lot Numbers* and *Lot Dimensions*). It is still questionable on the availability, quality, and usefulness of potential raster data that could be used. The city would benefit from an Intergovernmental Agreement with Yavapai County to use existing raster data they have covering the county, including the City of Cottonwood.

Table 2: Breakdown of various data types and the features associated with them.

Points	Polygons	Lines	Annotation
Address labels	Zoning districts	Street centerlines	Lot Numbers
Violations	Land use classification	Verde River	Lot Dimensions
Historic properties	Public lands	Contours	
Fire hydrants	Buildings	Sewer lines	
	Annexations	Water lines	
	Historic district	Trails	
	Parcels		
	Subdivisions		
	City boundary		

4. <u>Match to the geodatabase model:</u>

This requires a determination of the complexity of data to be used. In this case there will be both simple and complex data used.

Existing parcel data is obtained every few weeks from Yavapai County as they are the agency responsible for maintaining APN information regarding all property within Yavapai County. This information is shared with the City of Cottonwood in the form of shapefiles and while it contains attributes associated with county records it also contains relevant information used by the Planning Department such as: subdivision name, APN, acreage, and owner (see appendices A, B, and C). It does contain the owner's address, however, this is the mailing address listed by the owner for the property, not necessarily the property's physical address. Though both addresses are important, the local physical address is necessary for planning purposes. The local physical address data is maintained in-house in an address feature class maintained by the city's Fire Department and shared with other departments as needed. Our address points include the parcel number associated with it to ensure accuracy. As the county shares their data with us, we in turn share our data with them (i.e. physical address points, zoning).

Even though the parcel layer contains a lot of useful information that is mentioned in this report, some of the information would be better off as part of its own feature class. This is the case with the subdivision information. Planning staff would benefit from a subdivision feature class in order to create products that identify boundaries of various subdivisions in the city. As mentioned, the address information within the parcel feature class only pertains to the owner's mailing address, not the physical address of the parcel.

Some vacant, undeveloped parcels exist with no physical address. As these parcels are presented to Planning staff for development, they will be issued an address point.

Another issue with the parcel feature class when obtaining it from Yavapai County is that they provide parcel information to us for the county as a whole. This requires clipping parcels to a manageable number (which is still in the thousands). The current setup of multiple geodatabases for different projects has resulted in clipped parcel layers that are not the same in each geodatabase. When the county provides us with updated parcel information, some of the geodatabases do not have the new parcels imported to replace what is existing. This has resulted in old information being used in some geodatabases and updated/current information being used in others. The City of Cottonwood also has to consider its service area when clipping parcels. Though Cottonwood is only approximately 16 square miles with a population around 11,000, the service area of the city is almost twice those numbers, therefore parcels for these areas must remain as part of the feature class. To maintain consistency when updating parcel data, and to avoid having to continuously clip parcel data frequently after updates, a *service_area_boundary* feature class polygon will be created within the infrastructure feature dataset. This will allow for the map to be displayed within this feature class avoiding unnecessary clipping and inconsistent parcel features.

Until recently, the city obtained street centerline information from the Sedona Fire District GIS Technician. This caused concern due to having an outside agency maintain our street data. If updated street information was not sent to the GIS Tech, updates would be missed, and data would become inaccurate. The street centerlines for the city are now maintained by one of our firefighters as well as the city's GIS Technician. This helps with accuracy and ensuring the streets are updated as needed. However, as mentioned previously, the information is stored in a local geodatabase on the city's network, but only accessible by the fire department.

Other data in other departments have the same problem. The Utility Department has some water and sewer line information, but it is not stored in a geodatabase, rather it is in shapefiles. The data is minimal and inaccurate. The Utility Foreman has a paper map taped to the wall with thumbtacks used to indicate locations of water mains (the author would love to show a picture of this as an appendix, however, due to security concerns of it being viewable to the public, it cannot be shown). The Public Works Department has miscellaneous data in a shapefiles in their department, with no staff members who truly understand how to use GIS, maintain and edit the data, and manage it in a geodatabase. This adds to the problems mentioned above about the city not having a main GIS storage system, or a centralized city hall.

Ensuring that the data has appropriate metadata is another important aspect that is lacking within current geodatabases. Nobody seems to know when, where, how, or by whom most of the existing data were derived. Logic would tell you that a feature class such as the city boundary would be created from legal descriptions created during incorporation and subsequent annexations. This information does not exist for the current city boundary, no current staff have knowledge of it, and reaching out to Yavapai County did not result in any information on how, when, and who created this particular feature. There are also redundant and unnecessary attributes associated with some features that will be deleted (Table 3). The information we receive from Yavapai County (i.e. parcels & buildings) contains their attributes and metadata. The city would like to create its own *buildings* feature class to maintain attributes and metadata not currently available with the data provided from the county, shown in Table 3.

Table 3. Representation of current data and attributes of a geodatabase frequently used by the Planning Department. Attributes shown in red italics represent new attributes to be added to the feature class.

	Feature Classes							
	city_boundary	**parcels**	**river**	**zoning**	**land_use**	**buildings**	**trails**	**growth_area**
Attribute Fields	OBJECTID_1	OBJECTID_1	OBJECTID	OBJECTID_1	OBJECTID_1	OBJECTID	~~OBJECTID_12~~	OBJECTID
	Shape	Shape	Shape	Shape	Shape	Shape	Shape	SHAPE
	OBJECTID	OBJECTID	FNODE_	OBJECTID	OBJECTID	AREA	~~OBJECTID_1~~	GROWTH_
	CITYDIST	COUNTY	TNODE_	ZONING	ZONING	PERIMETER	~~OBJECTID_2~~	GROWTH
	Shape_Length	BOOK	LPOLY	Shape_Length	Shape_Length	BUILD00_	~~OBJECTID_3~~	ACRES
	Shape_Area	MAP	RPOLY	Shape_Area	Shape_Area	BUILD00_ID	OBJECTID	SHAPE_Length
	Date	PARCEL	LENGTH	*DESCRIPTION*	AREA	BLDGTYPE	TRAILS_ID	SHAPE_Area
	Updated	SPLIT	STREAMS_	*Updated*	PERIMETER	Shape_Length	NAME	*Date*
	Staff	CHECK_	STREAMS_ID	*Staff*	LANDUSE	Shape_Area	~~Shape_Leng~~	*Updated*
		SUBNAME	CU		LANDUSE_	*Type*	~~Shape_Le_1~~	*Staff*
		SUBUNIT	SEG		LANDUSE_ID	*Staff*	~~Shape_Le_2~~	
		SUBCOMMON	MILE		*Staff*	*Date*	~~Shape_Le_3~~	
		SUBDIVISIO	PER		*Date*	*Updated*	TRAIL_TYPE	
		SUBPHASEE	DAF		*Updated*		Shape_Length	
		RECTYPE	DAT				*Date*	
		RECNUMBER	DATNAME				*Updated*	
		SUBBOOK	CO				*Staff*	
		SUBPAGE	NAME					
		TAX_AREA_C	Shape_Length					
		PARCEL_ID	*Staff*					
		PARLABEL						
		PARNUMASR						
		GVP_ID						
		ACRE_CALC						
		ACRE_DEED						
		LASTUPDATE						

5. <u>Organize into geographic datasets:</u>

This is the step to create datasets using feature classes and subtypes.

Given the small amount of data to be used, and since this is not a city-wide endeavor, the pros and cons of using feature datasets were weighed. Even though the data are not numerous, the potential for future data inclusion and the long term goal to have a functional GIS throughout the entire city, feature datasets will be used in this geodatabase design.

Subtypes currently exist within the *streets* feature class that identify the type of street it is, from dirt roads and private streets, to major highways and local streets (Table 4). This is a useful function for the Fire Department to know what kind of road conditions they can expect when responding to calls. It has been determined that additional subtypes are not necessary at this time, therefore none will be created in this geodatabase design.

Table 4. A table showing the *streets* subtypes used by the Fire Department.

Street Subtype Number	Street Type
1	Freeways
2	State Routes
3	Main Streets
4	Streets
10	Private Roads
20	Future Roads
30	Dirt Roads

Additional property information to be available with address points would be permits and violations. These would be available via a hyperlink to the document through ArcMap to show relevant property history information; building permits, planning permits, violation notices and warnings. This information will provide staff with all relevant history of the property, including building permits, sewer permits, zoning permits, code violations, etc. Details of this process are provided in Figures 8-11 under Future Development.

Three feature datasets (Figure 5) were designed at this point to contain the data to be used in the Planning Department. The three feature datasets were created using the coordinate system, projection, datum, spatial resolution and tolerances shown in Figures 6 & 7. These spatial references were maintained at these levels to maintain consistency of existing data in the Planning Department, the data used by the Police Department (when managed by an outside consulting firm, and now a staffed GIS Technician), and the data shared with the city by Yavapai County.

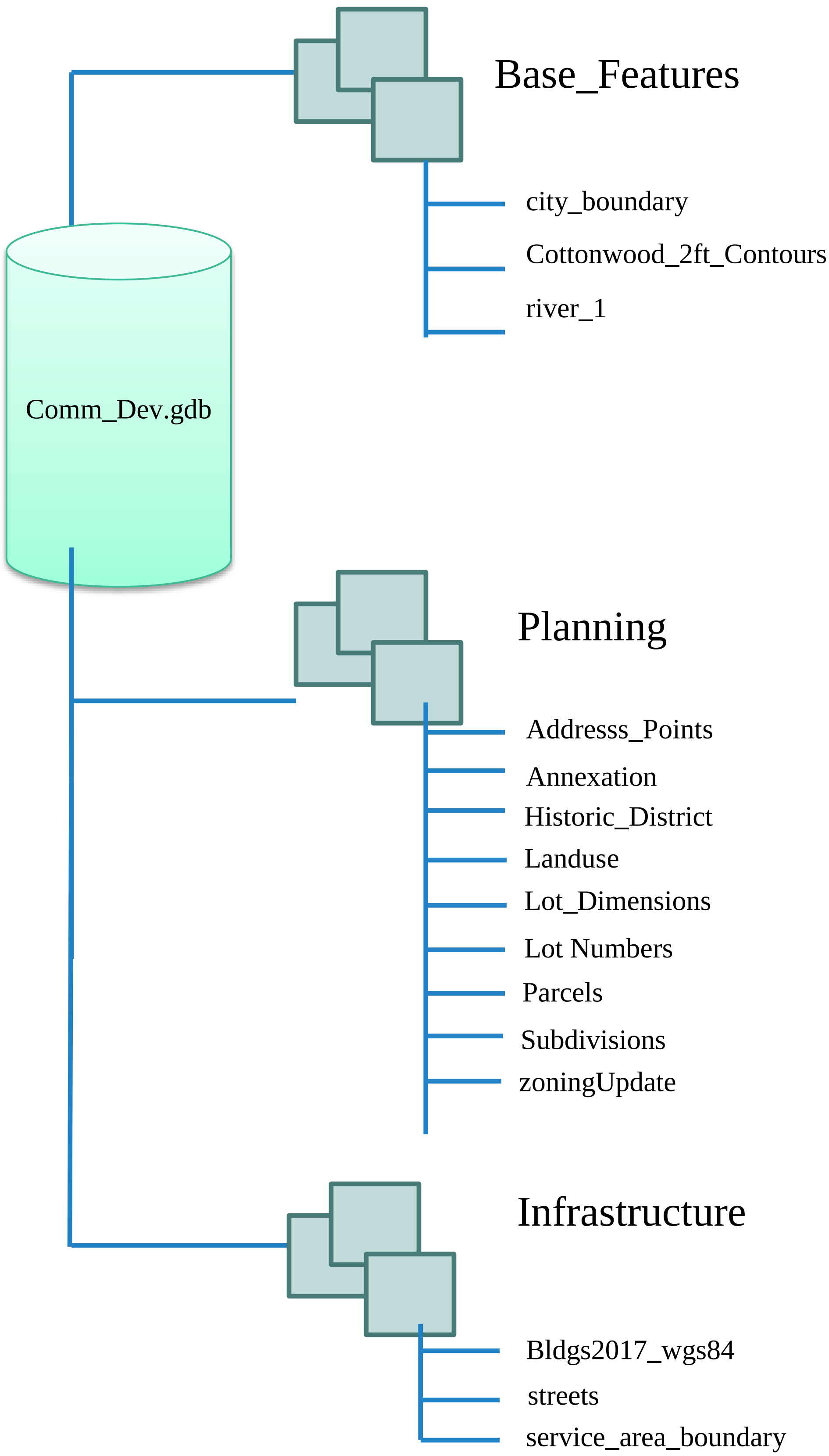

Figure 5. Geodatabase Design.

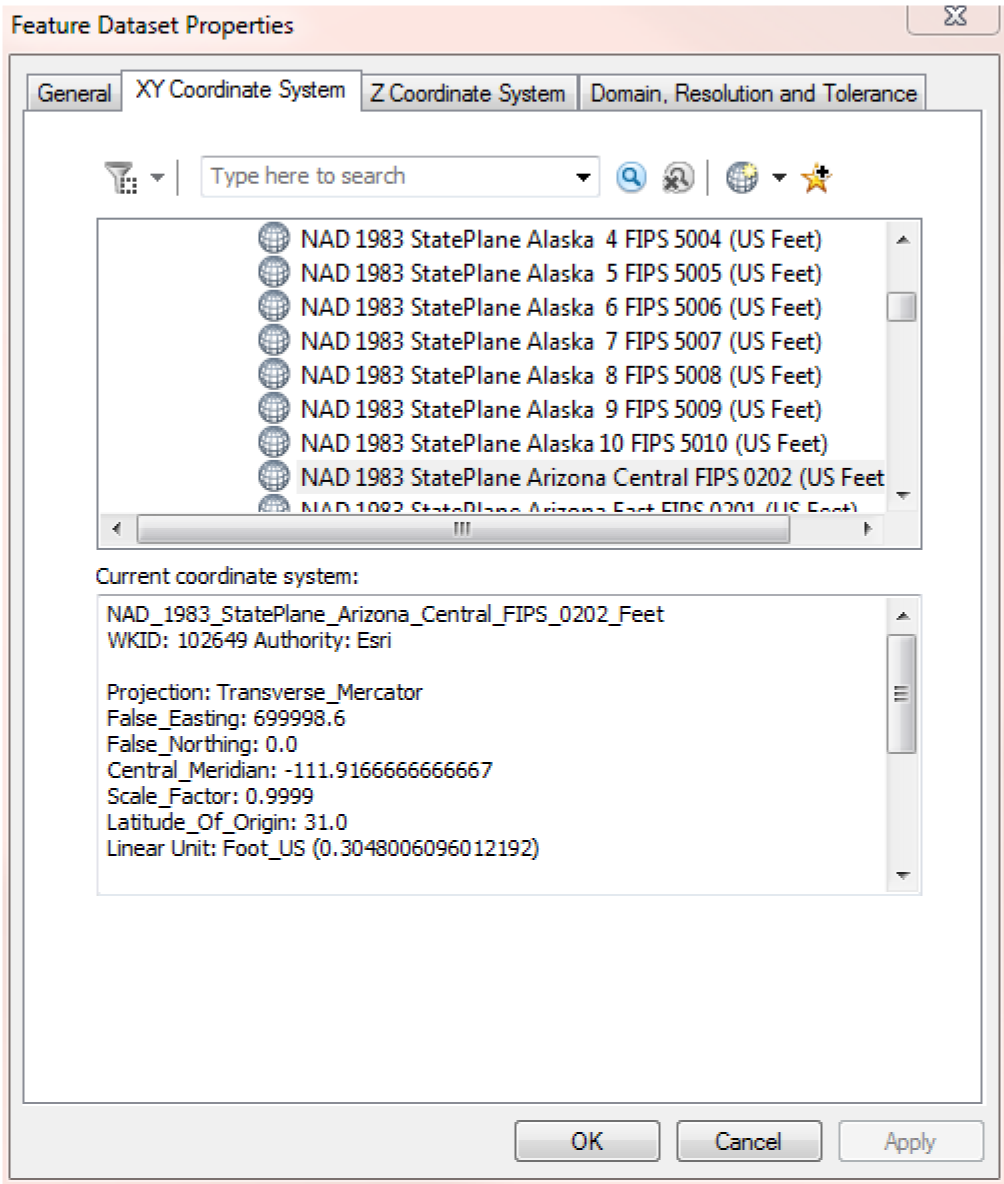

Figure 6. Showing feature dataset spatial references.

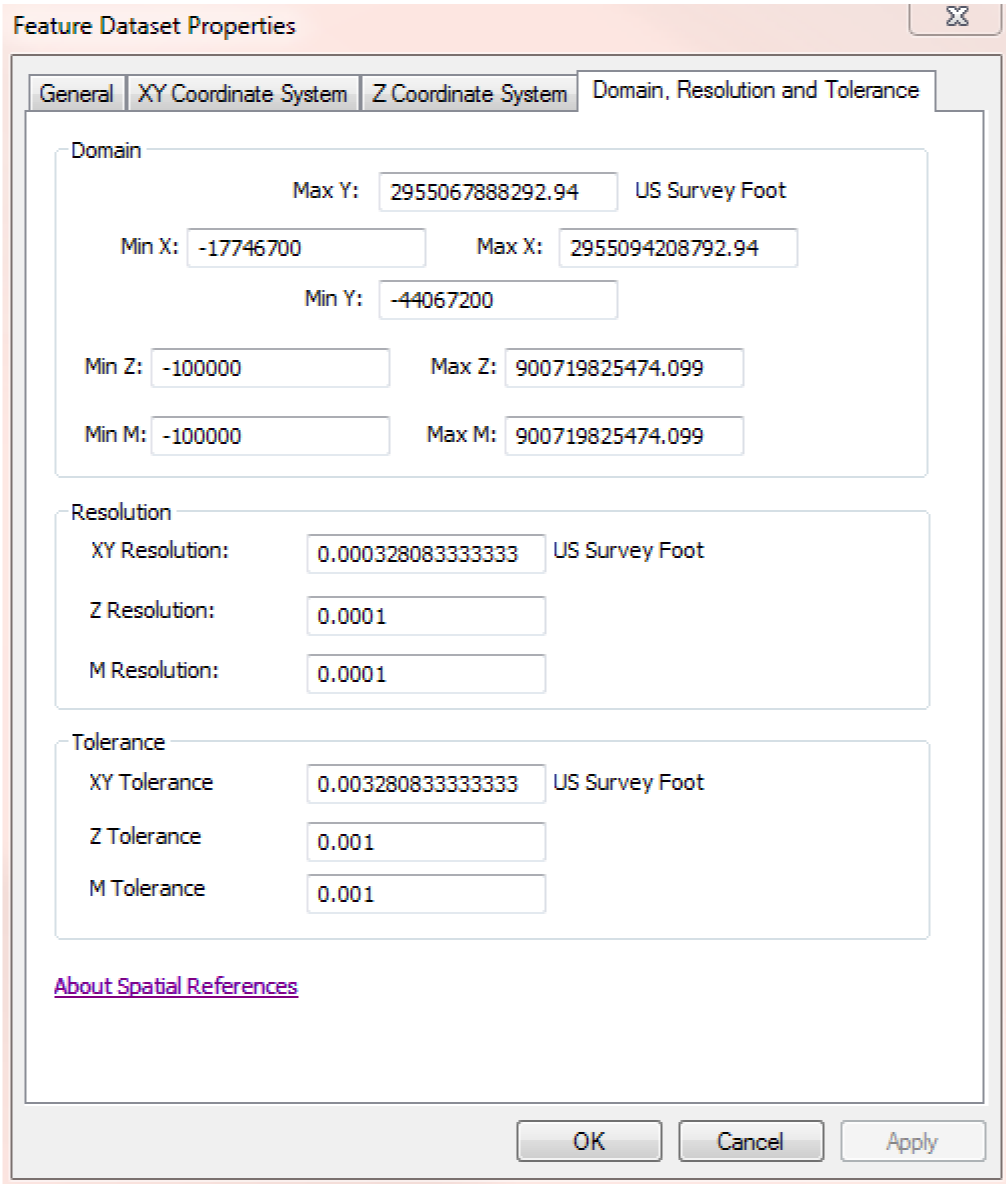

Figure 7. Showing feature dataset spatial references.

Thematic layers should also be determined in the design. According to ESRI, thematic layers should be characterized based on visual representations, uses, data sources, and resolution (Table 5). This gives the user a general idea of what each feature will represent and how it will be shown on a map. The same thematic layer would be done with the features within the Base Features and Infrastructure feature datasets.

Table 5. A table showing the thematic layers for the features within the Planning feature dataset.

Layer	Parcels
Map Use	Land Ownership
Data Source	Yavapai County GIS
Representation	Polygons
Spatial Relationships	Cannot overlap
Map Scale	TBD
Symbology/Annotation	User defined symbols, parcel number annotation

Layer	Address_Points
Map Use	Physical Address Point
Data Source	Internally created as needed
Representation	Points applied to a parcel to identify address
Spatial Relationships	More than one address may be on a single parcel. No duplicate addresses
Map Scale	TBD
Symbology/Annotation	User defined symbol, address label annotation

Layer	Annexation
Map Use	Display each area of annexation in the city
Data Source	Internally created using legal descriptions from surveys
Representation	Polygons
Spatial Relationships	Polygons cannot overlap
Map Scale	TBD
Symbology/Annotation	User defined symbol, text annotation added to map

Layer	Historic_District
Map Use	Identify Cottonwood Historic District Boundary
Data Source	Internally created based on Council/Commission determination of boundary
Representation	Polygons drawn as requested
Spatial Relationships	Must only include Historic District as determined by Council
Map Scale	TBD
Symbology/Annotation	User defined line symbol, text annotation

Layer	Landuse
Map Use	Parcels define land use classification based on the city's General Plan designations
Data Source	Previously existing data, updated as needed
Representation	Polygons
Spatial Relationships	Can overlap parcels and zoning layers, cannot overlap other land use polygons
Map Scale	TBD
Symbology/Annotation	User defined symbol, text annotation

Layer	Lot_Dimensions
Map Use	Identify parcel dimensions to determine parcel size and frontages
Data Source	Yavapai County GIS
Representation	Annotation Layer
Spatial Relationships	Can have same lot dimensions along two parcel boundaries as needed. Otherwise, one dimension per parcel boundary edge
Map Scale	TBD
Symbology/Annotation	Annotation layer

Layer	Lot_Numbers
Map Use	Further identify lot numbers within a parcel
Data Source	Yavapai County GIS
Representation	Point features placed in a parcel polygon
Spatial Relationships	Only one lot number point per parcel
Map Scale	TBD
Symbology/Annotation	Annotation associated with point feature

Layer	Subdivisions
Map Use	Identify subdivision boundaries in the city
Data Source	Internally created based on legal descriptions for subdivisions
Representation	Polygons
Spatial Relationships	Cannot overlap other subdivision polygons
Map Scale	TBD
Symbology/Annotation	Annotation associated with subdivision name attribute

Layer	zoningUpdate
Map Use	Identify zoning districts
Data Source	Existing data maintained and edited based on zone changes. New zoning districts created based on annexation legal descriptions and parcel boundaries as determined
Representation	Polygons
Spatial Relationships	Can overlap parcels within same zoning district. Cannot overlap other zoning districts
Map Scale	TBD
Symbology/Annotation	Annotation associated with zoning type attribute

5. Geodatabase Implementation

The above steps were followed to get the basis of the geodatabase and the information that would be included within it. The needs and data requirements listed above are sufficient to at least move the GIS capabilities of the Planning Department in the right direction. The database is designed to incorporate the above requirements and relationships to better serve staff. Attributes and domains need to be updated and modified to provide accurate and usable information for the users.

The City has existing hardware to support the development and use of geodatabases, and the appropriate software (ArcGIS), however, the software is limited to the extent of the licensing the City is willing to pay for at this time (basic licensing). Although it would be nice to have expanded capabilities of ArcGIS including additional add-ons, the existing capabilities will be sufficient to complete this practicum.

A File Geodatabase was chosen and created using ArcGIS 10.6.1 from ESRI. Test data has been included to confirm the functionality of the geodatabase. The geodatabases that currently exist are numerous, were created as Personal Geodatabases, created to be used for a multitude of requested products (i.e. zoning map, land-use map, historic map, streets map, etc.). So many geodatabases have been created that they are difficult to keep track of and manage. According to ESRI, a file geodatabase can be edited by multiple users at the same time. This is possible if separate, stand-alone feature classes at the root level are being edited, separate feature datasets are being edited, or the same feature dataset but different feature classes are being edited. Though not ideal, given the current situation in the Planning Department, only the author will have access to edit data within the file geodatabase. A computer currently placed at the front counter will have a basic ArcGIS license to allow viewing of features in an *.mxd* created by the author. This will allow staff to view the data and provide information to customers as needed.

Only one new feature was created at this time for this project, to allow a "service area" extent to be shown rather than randomly clipping parcels. Existing data was used, and future needs of the Planning Department will dictate what additional data may be useful to create. All data in the feature datasets were imported using the import feature class (multiple) option within ArcCatalog to be included in this project. The numerous personal geodatabases stored on the system have varying amounts of feature classes used specifically for the project the geodatabase was created for. Most of the feature classes within these geodatabases are outdated and no longer accurate (i.e. parcels, streets, addresses). Other project specific feature classes were also created but determined to not be of use for this project or as an everyday need of the Planning Department and were therefore left out of this geodatabase design. They may be added at a future date after research determines their functionality and usefulness.

Topologies were created for the *parcels*, *zoningUpdate*, and *Landuse* feature classes within the *Planning* feature dataset (Figure 8). These topologies indicate that *parcels* must be covered by the *zoningUpdate* feature class (each parcel must have a zoning classification), and the *parcels* may not overlap. The *zoningUpdate* feature must be covered by the *Landuse* feature. This allows determination that a potential rezone falls within the landuse designation of the city's General Plan. The *zoningUpdate* and *Landuse* features must not overlap and must not have gaps. Additional topologies were created for *Subdivisions*, with a rule that they cannot overlap.

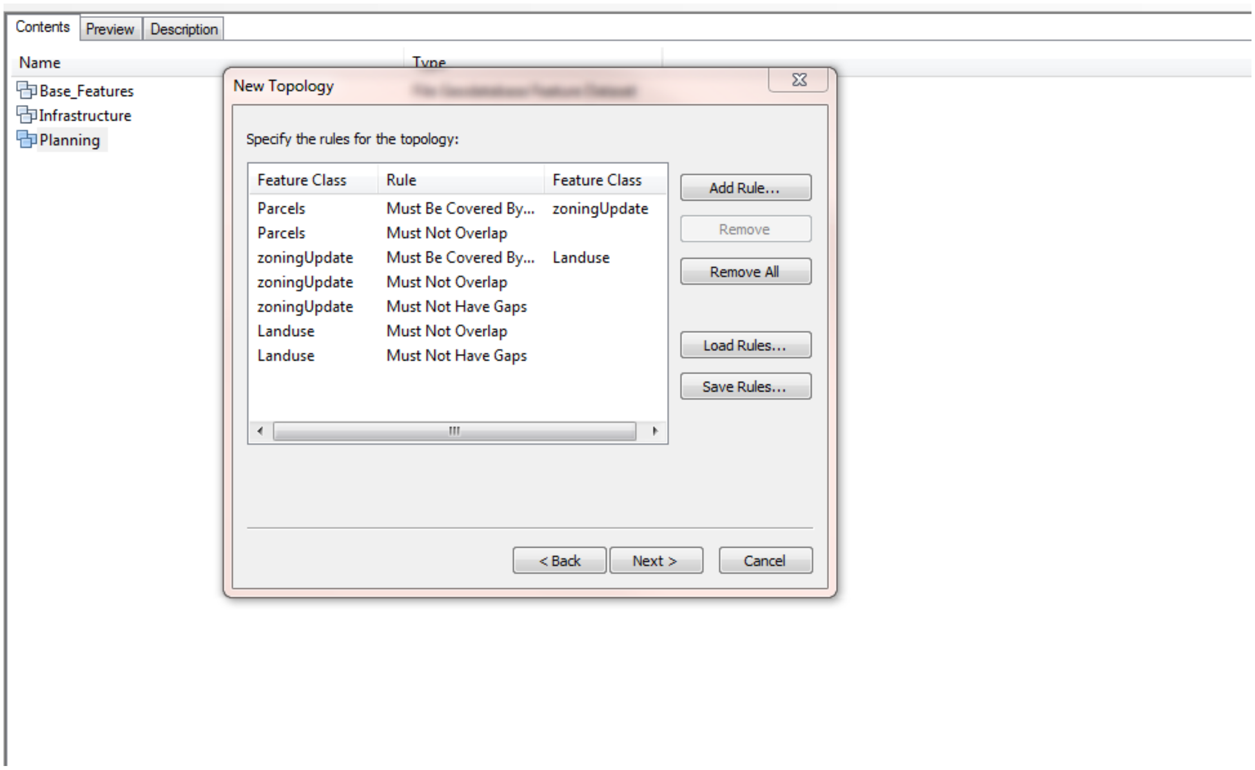

Figure 8. Showing creation of topology rules.

After creation of the test geodatabase, the feature datasets were added to include the features listed in Table 1. Once this was done, Geodatabase Diagrammer for 10X along with Microsoft Visio was used to create a geodatabase schema diagram of the newly created file geodatabase (Figure 9). The schema diagram shows details of each feature class within the geodatabase, including the data types.

Geodatabase schema diagram

Geodatabase C:\Users\sellis\Desktop\Practicum 2018\Comm_Dev.gdb

Date generated Monday, March 04, 2019

Geodatabase summary graphics

- Point feature class **Address_Points**
- Polygon feature class **Annexation**
- Polygon feature class **Historic_District**
- Polygon feature class **Parcels**
- Polygon feature class **Landuse**
- Polygon feature class **zoningUpdate**
- Polygon feature class **Subdivisions**
- Annotation feature class **Lot_Dimensions**
- Annotation feature class **Lot_Numbers**
- Line feature class **streets**
- Polygon feature class **bldgs2017_wgs84**
- Line feature class **Cottonwood_2ft_Contours**
- Polygon feature class **city_boundary**
- Line feature class **river_1**

Geodatabase detail graphics

Simple feature class
Address_Points

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID_12	Object ID						
Shape	Geometry	Yes					
OBJECTID_1	Long integer	Yes			0		
OBJECTID	Double	Yes			0	0	
PARCEL_ID	String	Yes					14
PARLABEL	String	Yes					12
CIVIC	Double	Yes			0	0	
PRE_DIR	String	Yes					2
STREET	String	Yes					50
SUFFIX	String	Yes					5
FORMATED_A	String	Yes					70
POSTDIR	String	Yes					2
UNIT	String	Yes					6
X	Double	Yes			0	0	
Y	Double	Yes			0	0	
COMMUNITY	String	Yes					50
CITY_UPDTE	Date	Yes			0	0	8
FILE_UPDTE	Date	Yes			0	0	8
Comments	String	Yes					99

Address Points placed on each parcel. Some parcels may have more than one address point if more than one building (i.e. shopping center).

Simple feature class
Annexation

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Annex	String	Yes					50
Percent_toAnnex	Short integer	Yes			0		
Value_ofAnnex	Short integer	Yes			0		
Value_ofProperty	Short integer	Yes			0		
County	String	Yes					50
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Annexation polygons, identifying various annexations in the city's history.

Simple feature class
Historic_District

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
Type	Short integer	Yes			0		
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Polygon of Cottonwood's designated Historic District.

Simple feature class
Parcels

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
COUNTY	String	No					2
BOOK	String	No					3
MAP	String	No					2
PARCEL	String	No					3
SPLIT	String	No					2
CHECK_	String	No					1
SUBNAME	String	Yes					140
SUBUNIT	String	Yes					42
SUBCOMMON	String	Yes					42
SUBDIVISION	String	Yes					72
SUBPHASE	String	Yes					72
RECTYPE	String	Yes					15
RECNUMBER	String	No					12
SUBBOOK	Short integer	Yes			0		
SUBPAGE	Short integer	Yes			0		
MAPPLAT	String	Yes					12
LANDSURVEY	String	Yes					12
LASTTRANSFER	String	Yes					24
LAMER	String	Yes					12
TAX_AREA_C	Short integer	No			0		
PARCEL_ID	String	No					14
PARLABEL	String	No					12
PARNUMASR	String	Yes					9
GVP_ID	Double	Yes			0	0	
ACRE_CALC	Double	Yes			0	0	
ACRE_DEED	Double	Yes			0	0	
LASTUPDATED	Date	Yes			0	0	8
RECONFIG_DATE	Date	Yes			0	0	8
ACCOUNTNO	String	Yes					30
NAME	String	Yes					60
SECONDARY	String	Yes					60
ADDRESS	String	Yes					50
CITY	String	Yes					50
STATE	String	Yes					2
ZIP	String	Yes					10
CO_ADDRESS	String	Yes					50
MARKET_AREA	Short integer	Yes			0		
MARKET_SUBAREA	Short integer	Yes			0		
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Polygons of parcel features provided by Yavapai County.

Simple feature class
Landuse

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID_1	Object ID						
Shape	Geometry	Yes					
OBJECTID	Double	Yes			0	0	
ZONING	String	Yes					6
AREA	Double	Yes			0	0	
PERIMETER	Double	Yes			0	0	
LANDUSE	String	Yes					50
LANDUSE_	Double	Yes			0	0	
LANDUSE_ID	Double	Yes			0	0	
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Landuse polygon depicting characteristics of underlying zoning in accordance with the city's General Plan.

Simple feature class
zoningUpdate

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID_1	Object ID						
Shape	Geometry	Yes					
OBJECTID	Double	Yes			0	0	
ZONING	String	Yes					6
Updated	String	Yes					50
Staff	String	Yes					50
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

City's official zoning layer polygon identifying each zoning district within the city. Overlaps numerous parcels.

Simple feature class
Subdivisions

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID_1	Object ID						
Shape	Geometry	Yes					
OBJECTID	Double	Yes			0	0	
SUBNAME	String	Yes					140
Zoning	String	Yes					50
Land_Use	String	Yes					50
Date	String	Yes					50
Updated	String	Yes					50
Staff	String	Yes					50
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Subdivision polygon identifying the city's subdivision boundaries.

A **Annotation feature class**
Lot_Dimensions

Geometry
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
FeatureID	Long integer	Yes			0		
ZOrder	Long integer	Yes			0		
AnnotationClassID	Long integer	Yes			0		
Element	Blob	Yes			0	0	0
SymbolID	Long integer	Yes			0		
Status	Short integer	Yes	0	AnnotationStatus	0		
TextString	String	Yes					255
FontName	String	Yes					255
FontSize	Double	Yes			0	0	
Bold	Short integer	Yes		BooleanSymbolValue	0		
Italic	Short integer	Yes		BooleanSymbolValue	0		
Underline	Short integer	Yes		BooleanSymbolValue	0		
VerticalAlignment	Short integer	Yes		VerticalAlignment	0		
HorizontalAlignment	Short integer	Yes		HorizontalAlignment	0		
XOffset	Double	Yes			0	0	
YOffset	Double	Yes			0	0	
Angle	Double	Yes			0	0	
FontLeading	Double	Yes			0	0	
WordSpacing	Double	Yes			0	0	
CharacterWidth	Double	Yes			0	0	
CharacterSpacing	Double	Yes			0	0	
FlipAngle	Double	Yes			0	0	
Override	Long integer	Yes			0		
ID_1	Long integer	Yes			0		
Shape_STArea_1	Double	No			0	0	
Shape_STLength_1	Double	No			0	0	
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Lot Dimension Annotation Layer provided by Yavapai County.

A **Annotation feature class**
Lot_Numbers

Geometry
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
FeatureID	Long integer	Yes			0		
ZOrder	Long integer	Yes			0		
AnnotationClassID	Long integer	Yes			0		
Element	Blob	Yes			0	0	0
SymbolID	Long integer	Yes			0		
Status	Short integer	Yes	0	AnnotationStatus	0		
TextString	String	Yes					255
FontName	String	Yes					255
FontSize	Double	Yes			0	0	
Bold	Short integer	Yes		BooleanSymbolValue	0		
Italic	Short integer	Yes		BooleanSymbolValue	0		
Underline	Short integer	Yes		BooleanSymbolValue	0		
VerticalAlignment	Short integer	Yes		VerticalAlignment	0		
HorizontalAlignment	Short integer	Yes		HorizontalAlignment	0		
XOffset	Double	Yes			0	0	
YOffset	Double	Yes			0	0	
Angle	Double	Yes			0	0	
FontLeading	Double	Yes			0	0	
WordSpacing	Double	Yes			0	0	
CharacterWidth	Double	Yes			0	0	
CharacterSpacing	Double	Yes			0	0	
FlipAngle	Double	Yes			0	0	
Override	Long integer	Yes			0		
X	Double	Yes			0	0	
Y	Double	Yes			0	0	
LOT	String	Yes					12
TEXT	String	Yes					255
Shape_STArea_1	Double	No			0	0	
Shape_STLength_1	Double	No			0	0	
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Lot Number Annotation layer provided by Yavapai County.

Simple feature class
streets

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
PREDIR	String	Yes					2
ST_NAME	String	Yes					60
ST_TYPE	String	Yes					4
SUFFDIR	String	Yes					2
FULLNAME	String	Yes					84
A_FULLNAME	String	Yes					84
A_PREDIR	String	Yes					2
A_ST_NAME	String	Yes					60
A_ST_TYPE	String	Yes					6
A_SUFDIR	String	Yes					2
FROMLEFT	Long integer	Yes			0		
TOLEFT	Long integer	Yes			0		
FROMRIGHT	Long integer	Yes			0		
TORIGHT	Long integer	Yes			0		
LEFTCROSS	String	Yes					50
RIGHTCROSS	String	Yes					50
ST_CODE	Short integer	Yes			0		
LZIPCODE	String	Yes					10
RZIPCODE	String	Yes					10
LCOMMUNITY	String	Yes					35
RCOMMUNITY	String	Yes					35
LESN	String	Yes					5
RESN	String	Yes					5
CREATEDATE	String	Yes					9
LASTUPDATE	String	Yes					9
LCOUNTY	String	Yes					10
RCOUNTY	String	Yes					10
PSAP	String	Yes					16
Shape_Leng	Double	Yes			0	0	
CITY	String	Yes					6
Shape_Le_1	Double	Yes			0	0	
Shape_Le_2	Double	Yes			0	0	
Shape_Le_3	Double	Yes			0	0	
Shape_Length	Double	Yes			0	0	

Street centerline feature class of all streets in Cottonwood and surrounding area.

Simple feature class
bldgs2017_wgs84

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID_1	Object ID						
Shape	Geometry	Yes					
OBJECTID	Long integer	Yes			0		
CREATEBY	String	Yes					15
CREATEDATE	Date	Yes			0	0	8
LASTUPDTBY	String	Yes					15
LASTUPDATE	Date	Yes			0	0	8
SUBNAME	String	Yes					140
PARLABEL	String	Yes					12
PARNUMASR	String	Yes					9
ACCOUNTNO	String	Yes					30
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

Building polygon layer provided by Yavapai County.

Simple feature class
Cottonwood_2ft_Contours

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
Entity	String	No					16
Layer	String	No					254
Elevation	Double	No			0	0	
Shape_Length	Double	Yes			0	0	

Two foot contour lines across the city.

Simple feature class
city_boundary

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID_1	Object ID						
Shape	Geometry	Yes					
OBJECTID	Double	Yes			0	0	
CITYDIST	String	Yes					35
Date	String	Yes					50
Updated	String	Yes					50
Staff	String	Yes					50
Shape_Length	Double	Yes			0	0	
Shape_Area	Double	Yes			0	0	

City boundary polygon.

Simple feature class
river_1

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
Shape	Geometry	Yes					
FNODE_	Double	Yes			0	0	
TNODE_	Double	Yes			0	0	
LPOLY_	Double	Yes			0	0	
RPOLY_	Double	Yes			0	0	
LENGTH	Double	Yes			0	0	
STREAMS_	Double	Yes			0	0	
STREAMS_ID	Double	Yes			0	0	
CU	Long integer	Yes			0		
SEG	Short integer	Yes			0		
MILE	Float	Yes			0	0	
PER	Short integer	Yes			0		
DAF	Short integer	Yes			0		
DAT	Short integer	Yes			0		
DATNAME	String	Yes					8
CO	Short integer	Yes			0		
NAME	String	Yes					30
Shape_Length	Double	Yes			0	0	

Verde River running through the Cottonwood area.

Coded value domain
AnnotationStatus

Description	*Valid annotation state*
Field type	*values.*
Split policy	*Short integer*
Merge policy	*Duplicate*

Code	Description
0	Placed
1	Unplaced

Coded value domain
VerticalAlignment

Description	*Valid symbol vertical*
Field type	*alignment values.*
Split policy	*Short integer*
Merge policy	*Duplicate*

Code	Description
0	Top
1	Center
2	Baseline
3	Bottom

Coded value domain
HorizontalAlignment

Description	*Valid horizontal symbol*
Field type	*alignment values.*
Split policy	*Short integer*
Merge policy	*Duplicate*

Code	Description
0	Left
1	Center
2	Right
3	Full

Coded value domain
BooleanSymbolValue

Description	*Valid values are Yes*
Field type	*and No.*
Split policy	*Short integer*
Merge policy	*Duplicate*

Code	Description
1	Yes
0	No

Figure 9. Geodatabase Schema Diagram of newly created geodatabase and feature datasets.

6. Future Development

Looking to future GIS development in the City of Cottonwood, ESRI provides ArcGIS Data Models that can be used as a starting point for creation and maintenance of geographic data. Though not used as a part of this project, the benefits of these models could be something Cottonwood incorporates into future design and development of a city-wide GIS. The programs focus on many industry specific models to help different aspects of local government (and other industries), with even more specific department level models within the local government. For example, ESRI provides data models under the local government option focuses on land records, water utilities, public works, fire service, emergency management, law enforcement, planning and development, elections, health and human services, or the organization as a whole. Within these model headings are even more specific data models available. Moving forward beyond the scope of this project, the Planning Department will look into utilizing the planning and development and land records models.

Another beneficial use of GIS for planning staff would be to have the ability to click an address label associated with a parcel to determine permits and violations associated with the property. A folder filing system currently exists within the local network of the city for all addresses. The folders are set up by street name, then within this folder is each address on that street. Each address folder then contains any document associated with that property that the city has on file. Everything from permits, pictures, violations, notifications, etc. are save in the address file for easy access when needed. Unfortunately, this electronic file system is not 100% complete, as there are some address folders that do not have any documents associated with them at this time. This is due to the ongoing efforts by volunteers to scan documents from the physical address folders and save them into the appropriate electronic folder. The process is very time consuming and tedious.

After consulting with the city's GIS Technician (working with the Police Department), it was decided that the best way to associate these documents with address labels is to provide hyperlinks to each document associated with the address. Unfortunately, using hyperlinks within ArcMap only allows you to link to documents (there are other options, but for this practicum, they are not relevant, i.e. URL hyperlinks) and not a folder. This creates the problem of tasking someone to hyperlink each document in an address folder to each address point. Some addresses may only have a couple documents, while others can have over twenty, including .jpg images. This would be a very useful function, however, at this time, it is both cost and time prohibitive to realistically incorporate this vast information into this practicum, or the city's GIS as a whole. Perhaps in the future, additional staffing or the ability to hyperlink to folders could make it a reality.

By using the *Identify* tool within an ArcMap session, you can right-click the feature and select the *Add Hyperlink* option. This then brings up a screen allowing you to link to a document by selecting the path to the document. Once the document is selected, it will be added to the feature, available to view when the address point is selected (Figures 10-12).

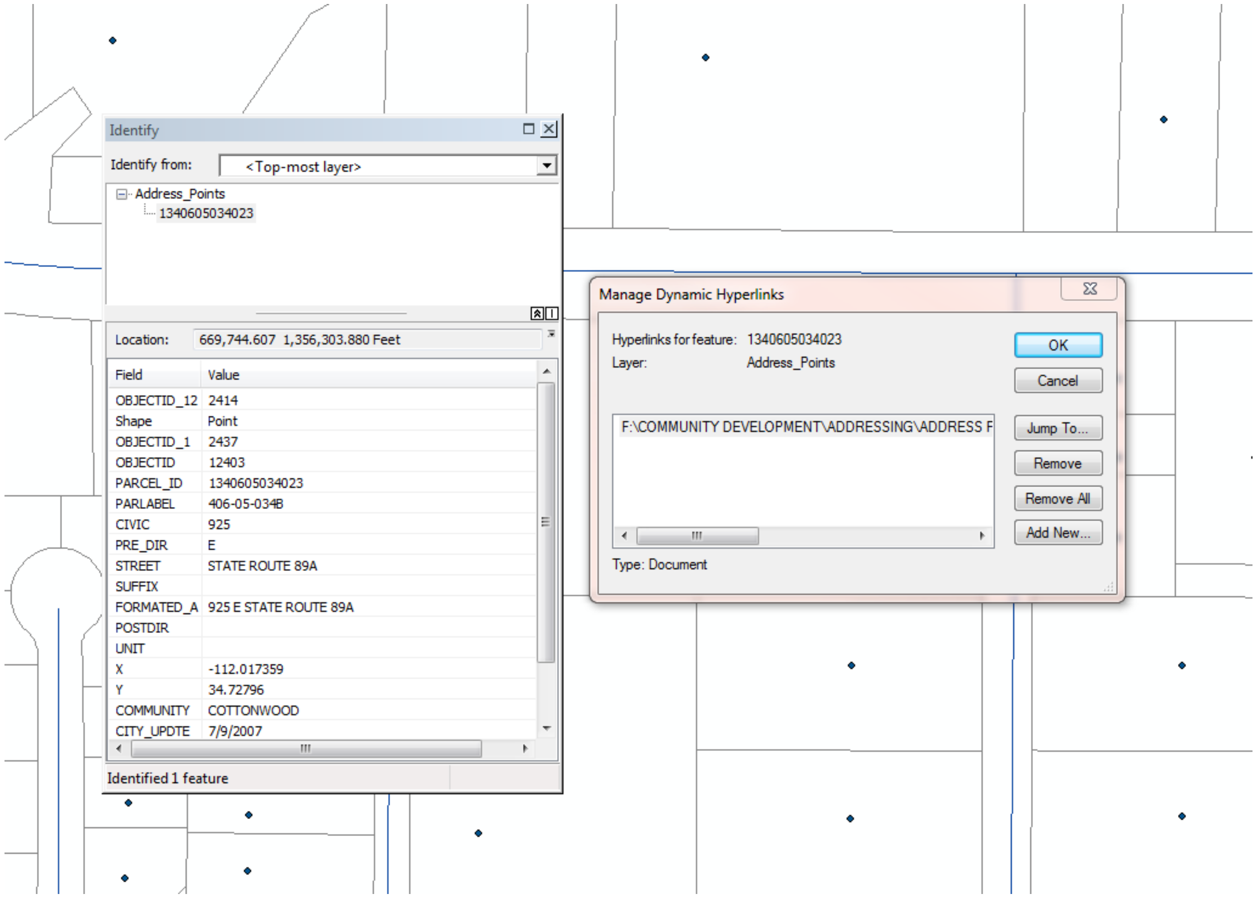

Figure 10. Selecting feature with *Identify* tool in ArcMap.

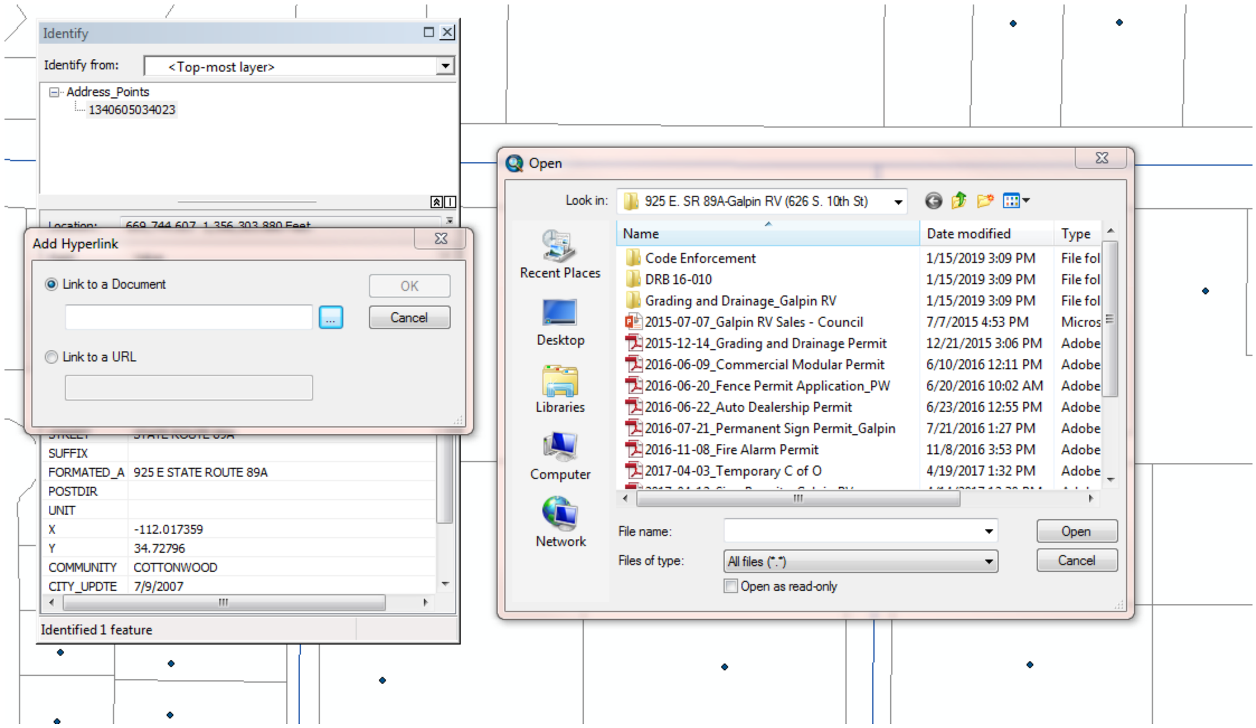

Figure 11. Navigating to document location for hyperlink.

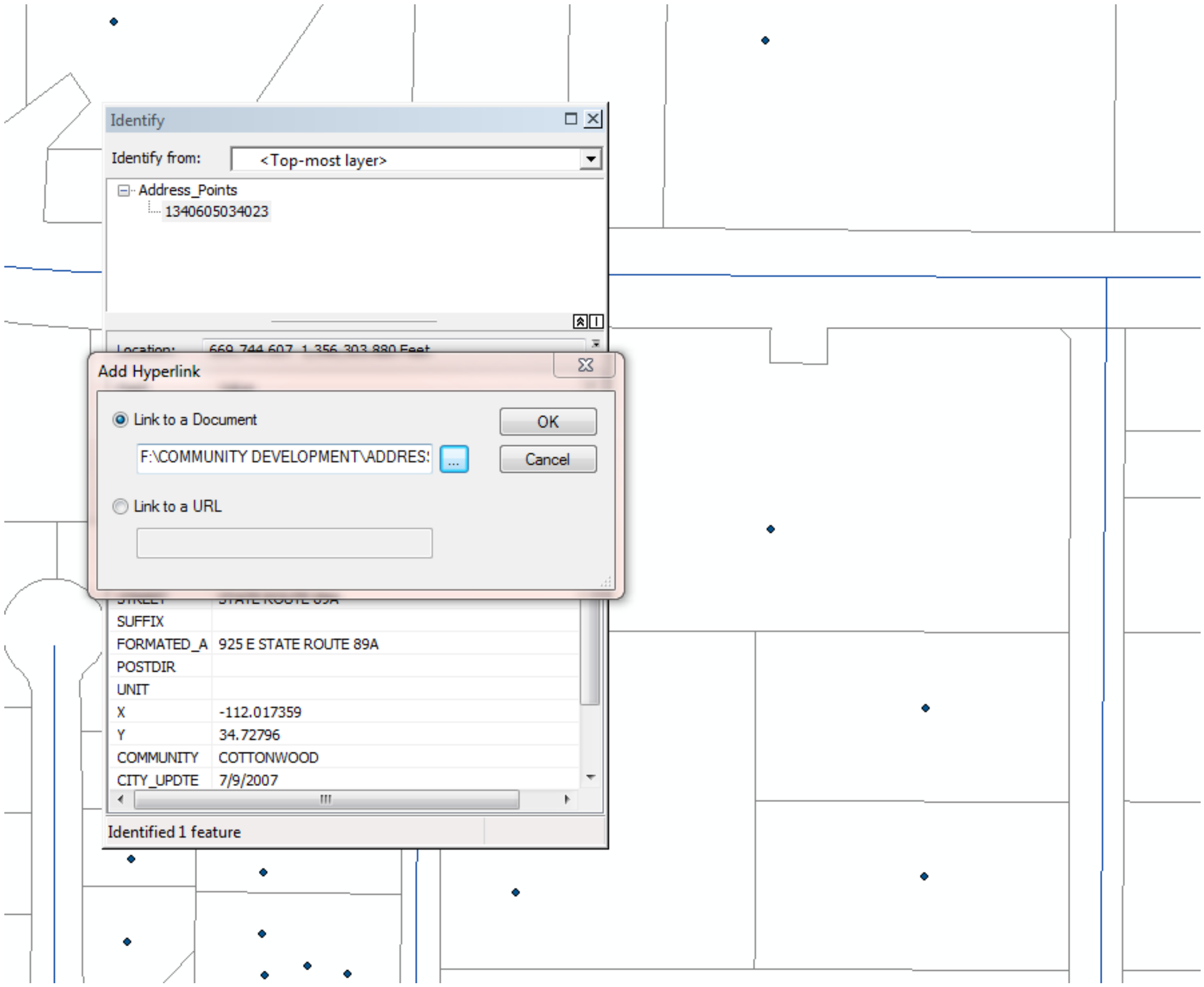

Figure 12. Add hyperlink after navigating to document location.

Using the hyperlink tool (lightning bolt on the *Tools* toolbar within ArcMap), you can then select the address point to view the associated hyperlinked documents (Figure 13). This will provide the opportunity for staff to see what documents are associated with a particular address/property.

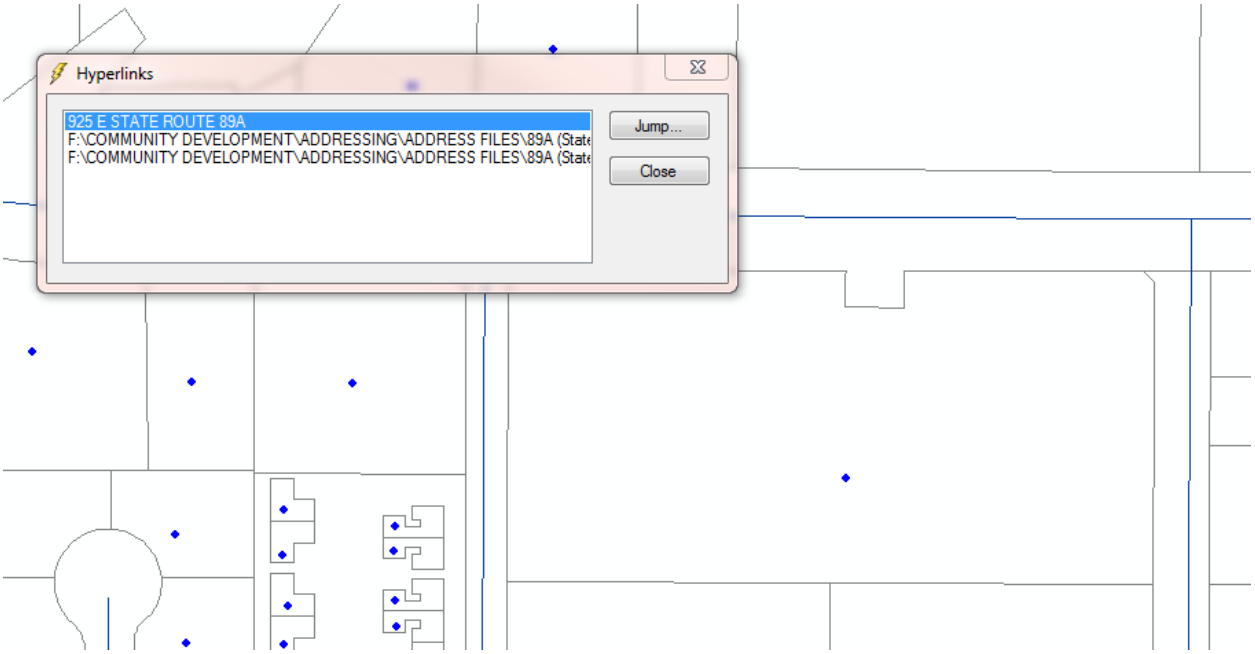

Figure 13. Hyperlinked documents.

7. Conclusion

As indicated throughout this practicum, the current use of GIS within the City of Cottonwood Planning Department (and within the city as a whole) is sporadic and leaves a lot to be desired. Since being hired as a full time Planner for the city, the author has been able to maintain the existing planning data for use as needed. However, there is much more work that could and should be done to make the system even better so all employees can use it. The basic data exists and with a little time, effort, and support from management, GIS can take off and be used for things that are only read about in other communities. Although both time and money are factors within the Planning Department, we currently have the basic hardware and software to accomplish the goals and objectives of this practicum.

This practicum allowed the author to detail the existing problems with the current GIS setup, determine the functions of the Planning Department's use of GIS, and design and provide guidance on implementing a file geodatabase to be maintained by one person, allowing manageable data to be used by staff. The consolidation of existing data into feature datasets, and removal of unwanted and unusable data will begin the process of cleaning up the numerous geodatabases that currently exist.

Standardizing the metadata for the city is also a crucial step that will need to be taken. Creation of data dictionaries or glossaries, field definitions, description of values, etc. are important items to keep in mind when creating accurate, usable metadata. There are numerous ways metadata can be managed and stored, some are considered more cumbersome, FGDC (Federal Geographic Data Committee Standards) and others not quite as cumbersome but still time consuming, ISO (International Organization for Standardization). ESRI also has standards within ArcCatalog to allow the maintaining of metadata, based on ISO standards. The City of Cottonwood has identified at the very least needing to know who/what organization created the data, sources of data, how it was created, and the date it was created. Moving forward, at least for now, the metadata containing this information will be kept within a feature class by using the fields available under the description tab of layer properties within ArcCatalog. This allows edits to be made and the metadata to be maintained. As the city looks at an organization wide GIS, metadata standards will be fine-tuned to be followed by all users/editors as required.

It is hopeful that implementation of this practicum will kick start the process for the city to further look into investing time and money to incorporate GIS city-wide, to benefit all departments and not just leave it up to individual staff in select departments to create maps on the fly with incomplete data. Unfortunately some departments may be a little apprehensive on giving up or sharing data they may have, as the thought of losing control of the information may not sit well with them. This will require cooperation between departments and possibly a top-down approach from city management to ensure each department understands the benefits a city-wide GIS can provide, and help their productivity and workflow. The Utility Department could benefit from having all of their water and sewer lines, manhole covers, well sites, meters, water mains, etc. incorporated into GIS data for easy access and management. With the right tools, field workers would be able to update information from the field. The Public Works Department has a desire to map all sidewalks and street lights in the city. This could be done with GPS units given to field inspectors to build the data and include it within a geodatabase. These are all good ideas, but it takes an understanding of the benefits GIS can provide the community, and a financial commitment from City Council to move forward. The city's IT Department is requesting $30,800 to obtain server licenses and collectors to initiate a city-wide SDE Enterprise GIS. Meetings are scheduled for April 2019 with the city's current GIS users to provide ideas for the system requirements. Even if the funding is approved, it will take significant time to develop and implement the system. Until then, the Planning Department will move forward with implementing its own system.

Project Timeline

Spring 2013	Began volunteer work with City of Cottonwood to update General Plan maps and familiarize self with available data.
Summer 2013	Hired as a Planner for the City of Cottonwood Community Development Department.
Fall 2013	Began documenting problems with existing GIS functions and data within the city. Practicum project ideas began to design a geodatabase.
January 2014-August 2018	Continued slowly documenting, updating, editing, and creating new data for use in the Planning Department. Serious needs and lack of GIS coordination documented.
September 2018	Committee meeting held and practicum proposal was approved.
September 2018-January 2019	Designed and developed geodatabase requirements for the Planning Department.
January 2019	First draft of practicum report submitted for review.
March 2019	First draft revisions to practicum report submitted for second review. Continued revising draft report.
April 2019	Successful oral defense of practicum.

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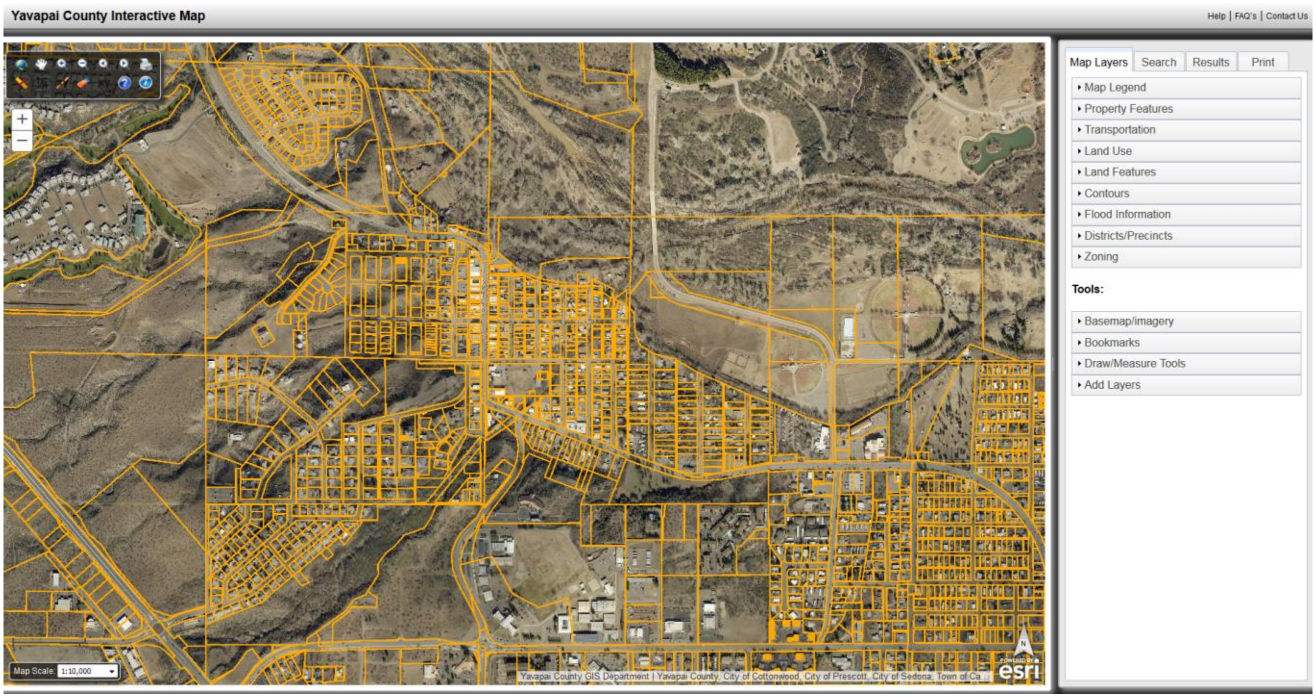
APPENDIX

Appendix A: Yavapai County GIS Interactive Map. Used daily by Planning staff to provide information to the public and research properties.



Appendix B: Example of attribute table for parcels provided by Yavapai County.

PARLABEL	PARNUMASR	GVP_ID	ACRE_CALC	ACRE_DEED	LAST UPDATED	RECONFIG_DATE	ACCOUNTNO	NAME
408-33-003D	40833003D	167715	25.02	24.83	<Null>	<Null>	R000154338	UNITED STATES OF AMERICA
408-33-004	40833004	167720	50.54	50	<Null>	<Null>	R000154342	CVF SEDONA HOLDINGS LLC
408-33-003F	40833003F	167717	15.05	15.11	2/25/1995 12:11:00 PM	<Null>	R000154339	WARFLE MICHELLE A
408-05-128	40805128	161471	0.28	0.29	3/11/2010	<Null>	R000148798	WILCOXSON FAMILY REVOCABLE TRUST
408-05-122	40805122	161461	0.27	0.25	3/11/2010	<Null>	R000148792	CURRY MARTIN J JR
408-33-003H	40833003H	167719	5.05	5.02	8/27/1997 10:59:54 AM	<Null>	R000154341	STRAUSS FAMILY TRUST
408-24-062	40824062	164575	0.51	0.5	<Null>	<Null>	R000151409	KONTZER EDWARD B & JOANN L RS (BD)
408-24-070A	40824070A	164588	0.35	0.38	<Null>	<Null>	R000151421	GLOBAL COMMUNITY COMMUNICATIONS ALLIANCE
408-24-027	40824027	164488	0.24	0.26	<Null>	<Null>	R000151344	RICHMAN TRUST
408-45-018	40845018	169181	0.02	0.02	3/11/2010	<Null>	R000154831	ALL SEASONS DEVELOPMENT INCORPORATED
408-24-338	40824338	164965	0.22	0.19	3/11/2010	<Null>	R000151735	YOUNG LINDA E
800-02-001M	80002001M	180327	10788.32	0	6/21/2000 12:00:00 PM	<Null>	<Null>	<Null>
800-02-001L	80002001L	180326	11568.4	0	6/21/2000 12:00:00 PM	<Null>	<Null>	<Null>
408-25-258	40825258	165478	0.03	0.03	3/11/2010	<Null>	R000152203	GREC ANDREW & BERNICE JT
408-25-038	40825038	165241	1.32	1.43	<Null>	<Null>	R000151992	ROBINSON JOHN M & VIVIAN A FAMILY TRUST
408-25-196	40825196	165414	0.24	0.24	3/11/2010	<Null>	R000152142	SANTADONA LLC
408-24-092	40824092	164636	0.22	0.21	<Null>	<Null>	R000151452	RMB SEDONA LLC
408-45-009	40845009	169172	0.02	0.02	3/11/2010	<Null>	R000154822	ALL SEASONS DEVELOPMENT INCORPORATED
408-24-351A	40824351A	164981	0.56	0.64	3/11/2010	<Null>	R000151749	SEDONA RED ROCK FIRE DISTRICT
800-02-012Q	80002012Q	248243	525.24	0	10/21/2005 3:09:21 PM	<Null>	<Null>	<Null>
408-24-336	40824336	164963	0.24	0.23	11/7/2013	<Null>	R000151733	SEDONA-RED ROCK FIRE DISTRICT
800-02-012T	80002012T	248246	592.99	0	10/21/2005 3:09:21 PM	<Null>	<Null>	<Null>
408-33-002F	40833002F	248250	2.11	2.1	6/9/2016	<Null>	R000154336	HANCOCK RANCH LLP
800-02-006	80002006	236061	479.19	0	9/1/2004 4:16:08 PM	<Null>	<Null>	<Null>
800-02-012S	80002012S	248245	595.41	0	10/21/2005 3:09:21 PM	<Null>	<Null>	<Null>
408-35-349	40835349	287667	0.06	0.06	7/21/2017	1/1/1899 1:02:03 AM	R010050685	SPECIALTY/SEDONA LOAN HOLDINGS LLC ET AL
408-33-002C	40833002C	243097	88.07	88.12	5/31/2005 2:53:44 PM	<Null>	R000154333	UNITED STATES OF AMERICA
800-02-001S	80002001S	180332	627.41	0	12/16/2006	<Null>	<Null>	<Null>
408-22-445	40822445	164350	0.95	0.96	<Null>	<Null>	R000151186	CARTER DANNY R & SUSAN H JT
800-02-012V	80002012V	248248	1199.32	0	10/21/2005 3:09:22 PM	<Null>	<Null>	<Null>
408-33-002A	40833002A	234137	7.57	7.5	6/23/2004 4:10:10 PM	<Null>	R000154332	UNITED STATES OF AMERICA
408-33-003B	40833003B	167713	110.31	110	<Null>	<Null>	R000154337	UNITED STATES OF AMERICA
800-02-012R	80002012R	248244	1922.62	0	10/21/2005 3:09:21 PM	<Null>	<Null>	<Null>
408-24-467	40824467	165115	0.25	0.25	3/11/2010	<Null>	R000151869	BRUNNER MILLY LIVING TRUST
408-22-342	40822342	164244	0.43	0.42	8/17/2010	<Null>	R000151122	KOMMER CURTIS &
408-22-148	40822148	164046	0.28	0.28	3/11/2010	<Null>	R000150934	POWELL JANET A
408-22-171	40822171	164069	0.27	0.26	3/11/2010	<Null>	R000150957	LEDBETTER FAMILY TRUST
800-02-002F	80002002F	180345	103.95	0	6/21/2000 12:00:00 PM	<Null>	<Null>	<Null>
408-22-165	40822165	164063	0.27	0.26	3/11/2010	<Null>	R000150951	ANC REVOCABLE LIVING TRUST
408-22-170	40822170	164068	0.27	0.27	3/11/2010	<Null>	R000150956	CROCKETT LELAH EASTWOOD LIVING TR
408-11-361	40811361	162633	0.02	0.02	3/11/2010	<Null>	R000149807	PAGNETTI ROSEANN (BD)
408-22-144	40822144	164042	0.27	0.26	3/11/2010	<Null>	R000150930	TURNER FAMILY TRUST
408-22-174	40822174	164072	0.3	0.29	3/11/2010	<Null>	R000150960	DOWNEY ROBERT A &
408-24-131	40824131	164742	0.08	0.08	<Null>	<Null>	R000151527	REMMELE PAUL M
408-11-362	40811362	162634	0.02	0.02	3/11/2010	<Null>	R000149808	PIOTROWSKI 2008 TRUST
408-24-133	40824133	164746	0.96	0.88	<Null>	<Null>	R000151532	ZAUN FAMILY REVOCABLE TRUST
408-22-141	40822141	164039	0.28	0.27	3/11/2010	<Null>	R000150927	PENVENNE JUDITH
408-22-150	40822150	164048	0.34	0.33	3/11/2010	<Null>	R000150936	DIMINO GEORGINE M
408-06-069B	40806069B	241984	0.26	0.28	3/11/2010	<Null>	R000148971	IVISON FAMILY TRUST
408-05-225	40805225	161582	0.36	0.35	3/11/2010	<Null>	R000148895	BELL DAVID L & LISA A (RS)
408-06-020	40806020	161608	0.26	0.25	3/11/2010	<Null>	R000148918	WULFERT ROBERT ALSTON
408-22-399	40822399	164304	0.25	0.25	3/11/2010	<Null>	R000151181	FURMAN-VOSS TRUST
408-22-401	40822401	164306	0.27	0.27	3/11/2010	<Null>	R000151183	CHANG SAI Y
408-22-398	40822398	164303	0.25	0.25	3/11/2010	<Null>	R000151180	ADAMS WILLIAM ROYSTON
408-22-287	40822287	164190	0.94	0.93	3/11/2010	<Null>	R000151070	ADAMS WILLIAM P & CAROL L REVOCABLE LIVING TRUST
408-22-341	40822341	164243	0.43	0.42	8/17/2010	<Null>	R000151121	MBC PROPERTIES NO 4 LLC

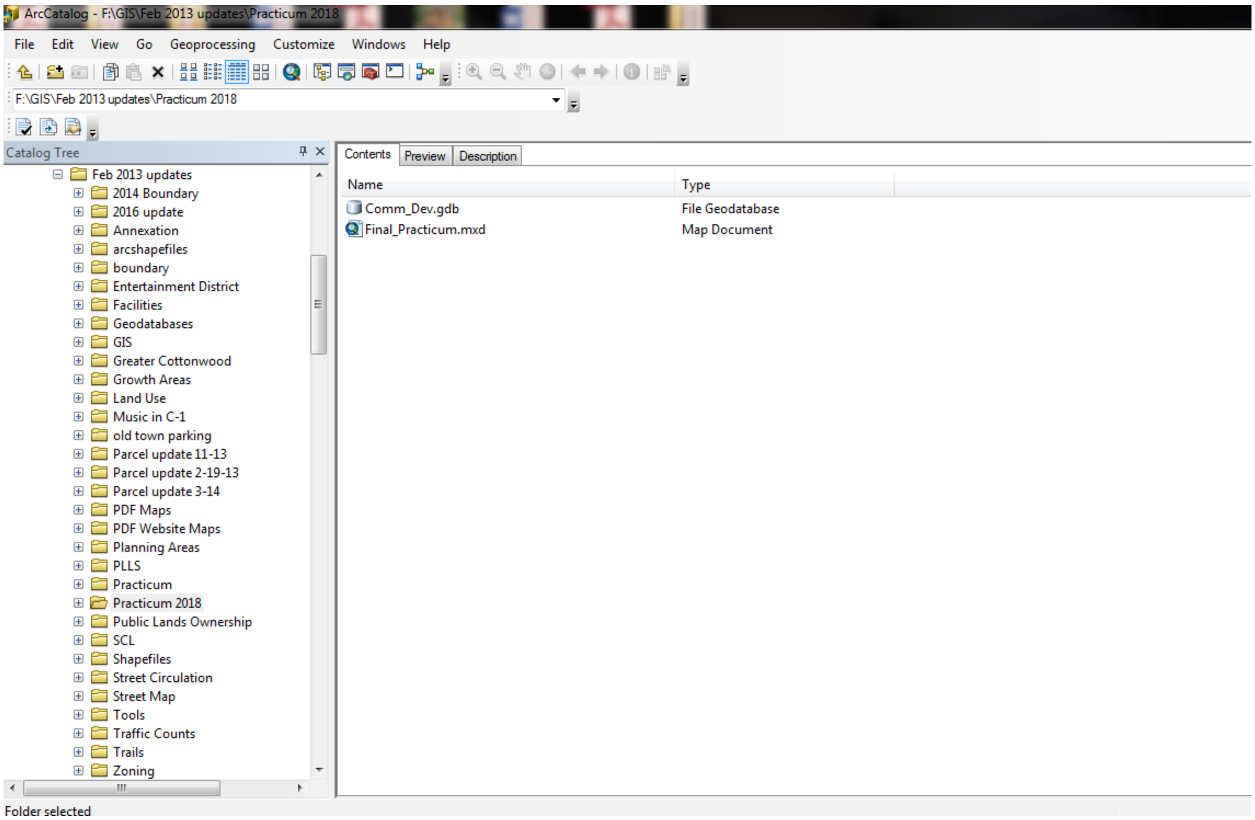
Appendix C: Example of attribute table for parcels provided by Yavapai County.

ADDRESS	CITY	STATE	ZIP	CO_ADDRESS
517 GOLD AVE SW	ALBUQUERQUE	NM	871023117	C/O USDA FOREST SERVICE/SUSI NESS
2398 E CAMELBACK RD STE 200	PHOENIX	AZ	850169025	WESLEY CLELLAND
300 E 300 N # E-7	KANAB	UT	847413360	<Null>
PO BOX FF	SEDONA	AZ	863392660	<Null>
55 JOHNNY GUITAR CIR	SEDONA	AZ	863364616	<Null>
2370 W STATE ROUTE 89A SUITE 11 PMB 239	SEDONA	AZ	863365350	<Null>
235 GOODROW LN	SEDONA	AZ	863364509	<Null>
PO BOX 4910	TUBAC	AZ	856464910	<Null>
111 W MONROE ST	CHICAGO	IL	606034096	ATTN: LORI ANN WOODS
25510 COMMERCENTRE DR # 100	LAKE FOREST	CA	926308855	C/O SEDONA SPGS RESORT MSTR OWNERS ASSOC
38 POMONA AVE	FAIR LAWN	NJ	074101331	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
82 CIRCULAR ST APT 2A	SARATOGA SPRINGS	NY	128664250	<Null>
PO BOX 38594	MORMON LAKE	AZ	860380594	<Null>
3361 VISTA DR	BOULDER	CO	803042324	<Null>
139 S LOS ROBLES AVE UNIT 107	PASADENA	CA	911012488	<Null>
25510 COMMERCENTRE DR # 100	LAKE FOREST	CA	926308855	C/O SEDONA SPGS RESORT MSTR OWNERS ASSOC
2860 SOUTHWEST DR	SEDONA	AZ	86336	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
2860 SOUTHWEST DR	SEDONA	AZ	86336	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
615 MALABAR DR	CORONA DEL MAR	CA	926251838	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
64 WALL ST STE 212	NORWALK	CT	068503403	C/O HARLAN W ROBINS ESQ
333 BROADWAY BLVD SE	ALBUQUERQUE	NM	871023407	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
PO BOX 2517	SEDONA	AZ	863392517	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
333 BROADWAY BLVD SE	ALBUQUERQUE	NM	871023407	C/O USDA FOREST SERVICE
517 GOLD AVE SW	ALBUQUERQUE	NM	871023117	C/O USDA FOREST SERVICE
<Null>	<Null>	<Null>	<Null>	<Null>
770 SUNSHINE LN	SEDONA	AZ	863363106	<Null>
325 RIM SHADOWS DR	SEDONA	AZ	86336	<Null>
2330 CORRAL RD	SEDONA	AZ	86336	<Null>
7037 SEVILLE WAY	RIVERSIDE	CA	925044832	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>
2220 LARIAT RD	SEDONA	AZ	863363269	<Null>
PO BOX 4138	SEDONA	AZ	863404138	<Null>
3340 W STATE ROUTE 89A APT 16	SEDONA	AZ	863364923	<Null>
2311 WINROCK AVE	ALTADENA	CA	910013258	<Null>
PO BOX 594	SEDONA	AZ	863390594	<Null>
4031 MCLAUGHLIN AVE APT 8	LOS ANGELES	CA	900665464	<Null>

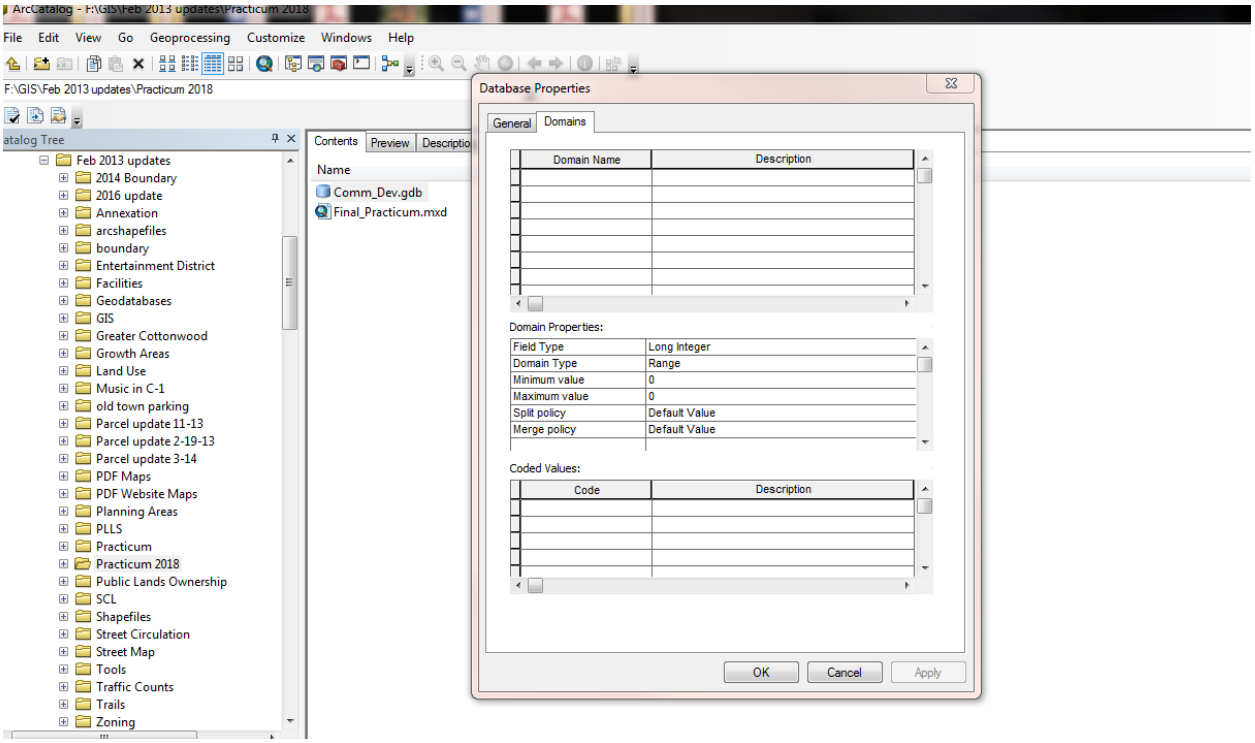
Appendix D: Example of attribute table for parcels provided by Yavapai County.

SUBNAME	SUBUNIT	SUBCOMMON
SEDONA WEST		SEDONA WEST
SEDONA WEST		SEDONA WEST
SEDONA SPRINGS RESORT		SEDONA SPRINGS RESORT
SOUTHWEST CENTER		SOUTHWEST CENTER
VISTA MONTANA AMENDED		VISTA MONTANA
MISSION HILLS		MISSION HILLS
SEDONA SPRINGS RESORT		SEDONA SPRINGS RESORT
SOUTHWEST CENTER		SOUTHWEST CENTER
SOUTHWEST CENTER		SOUTHWEST CENTER
ENCLAVE AT SEVEN CANYONS REPLAT OF PARCEL B	1	ENCLAVE AT SEVEN CANYONS
WESTWARD SUBDIVISION		WESTWARD SUBDIVISION
RIM SHADOWS		RIM SHADOWS
WESTERN HILLS		WESTERN HILLS
WESTERN HILLS		WESTERN HILLS

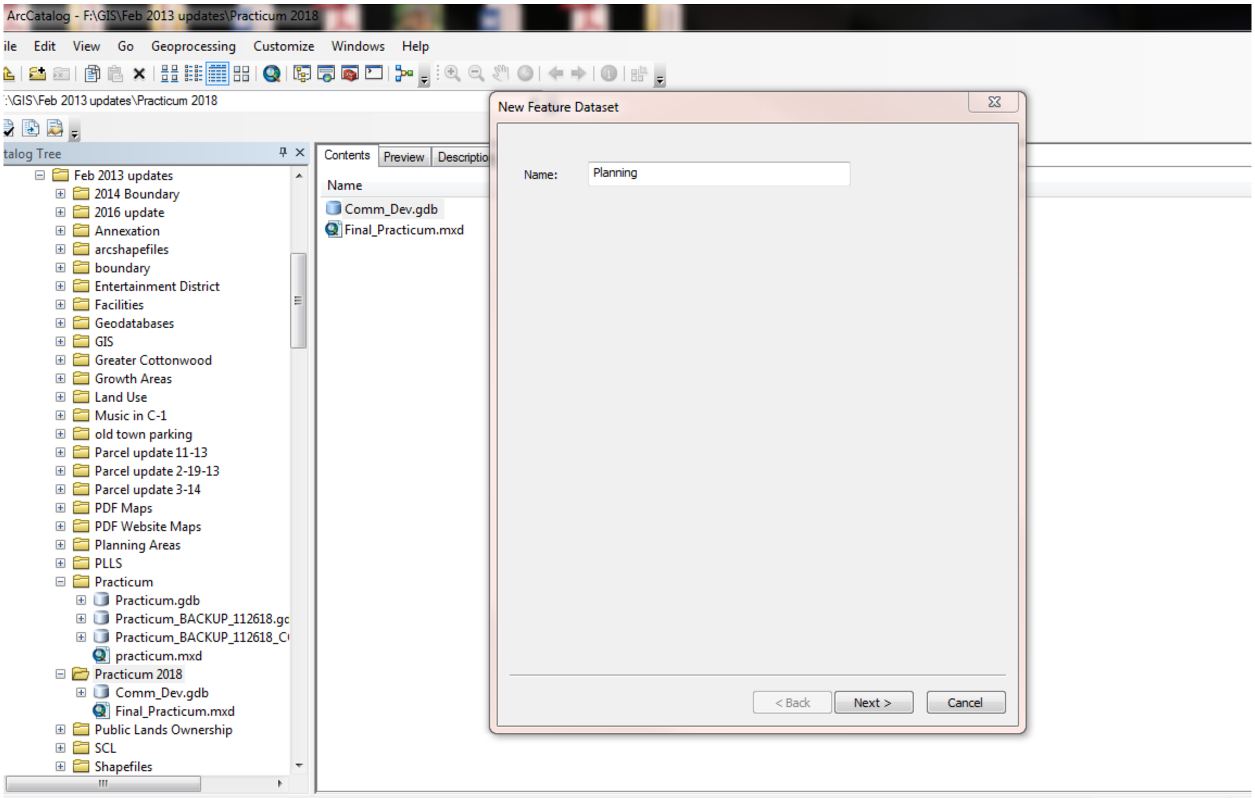
Appendix E: Creation of new file geodatabase named *Comm_Dev.gdb.*



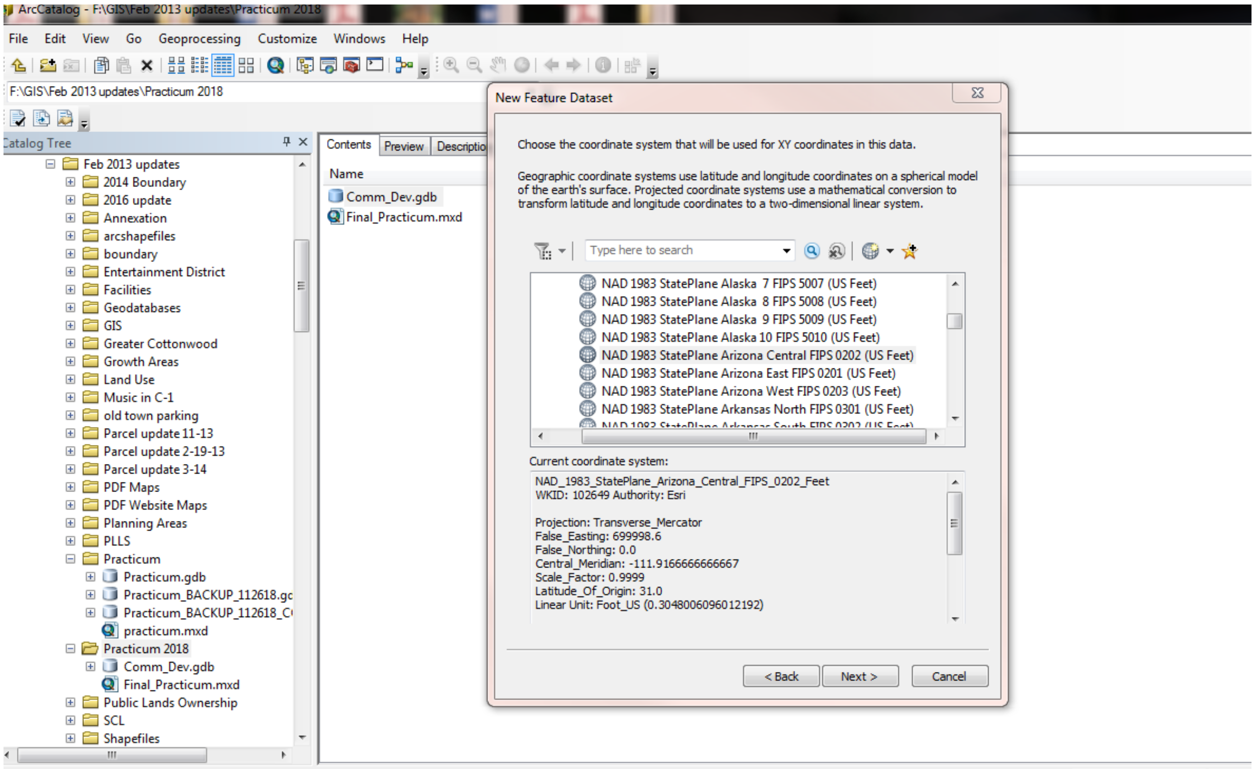
Appendix F: Determined to leave all properties and domains as is. There is not sufficient need to modify.



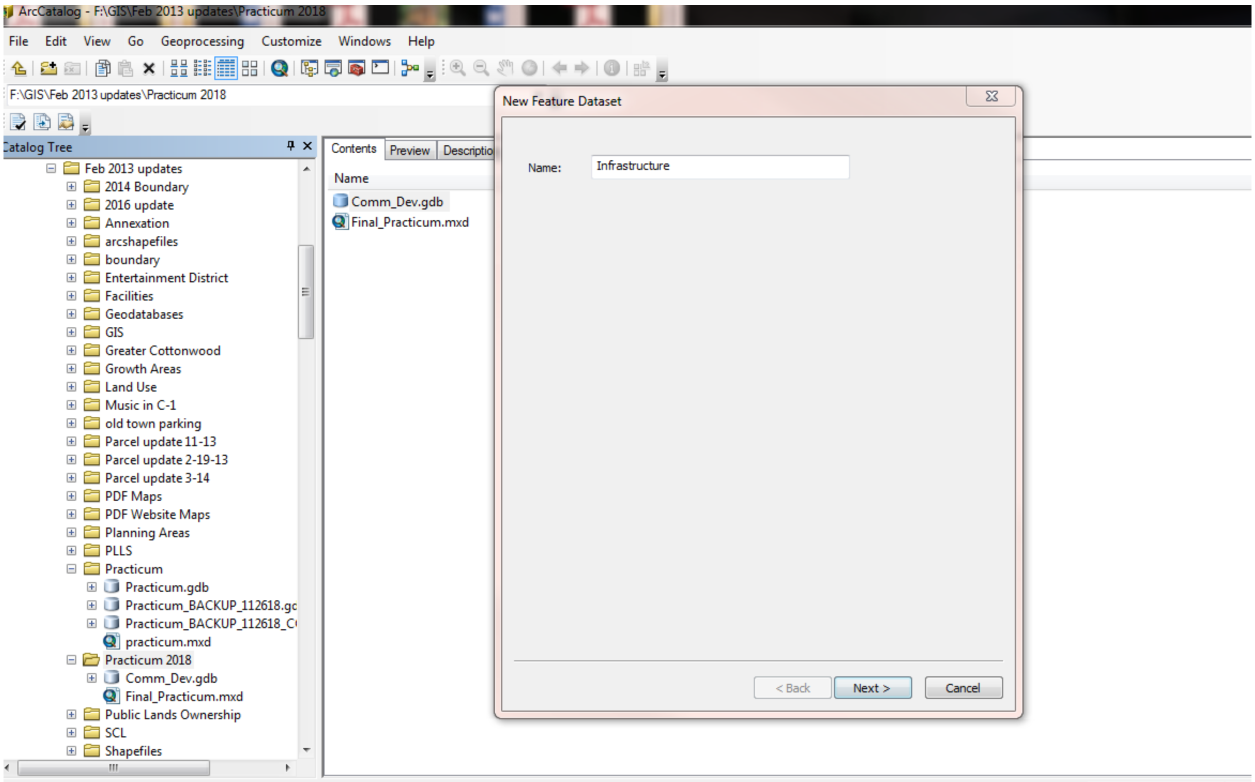
Appendix G: Creation of new feature dataset, *Planning*.



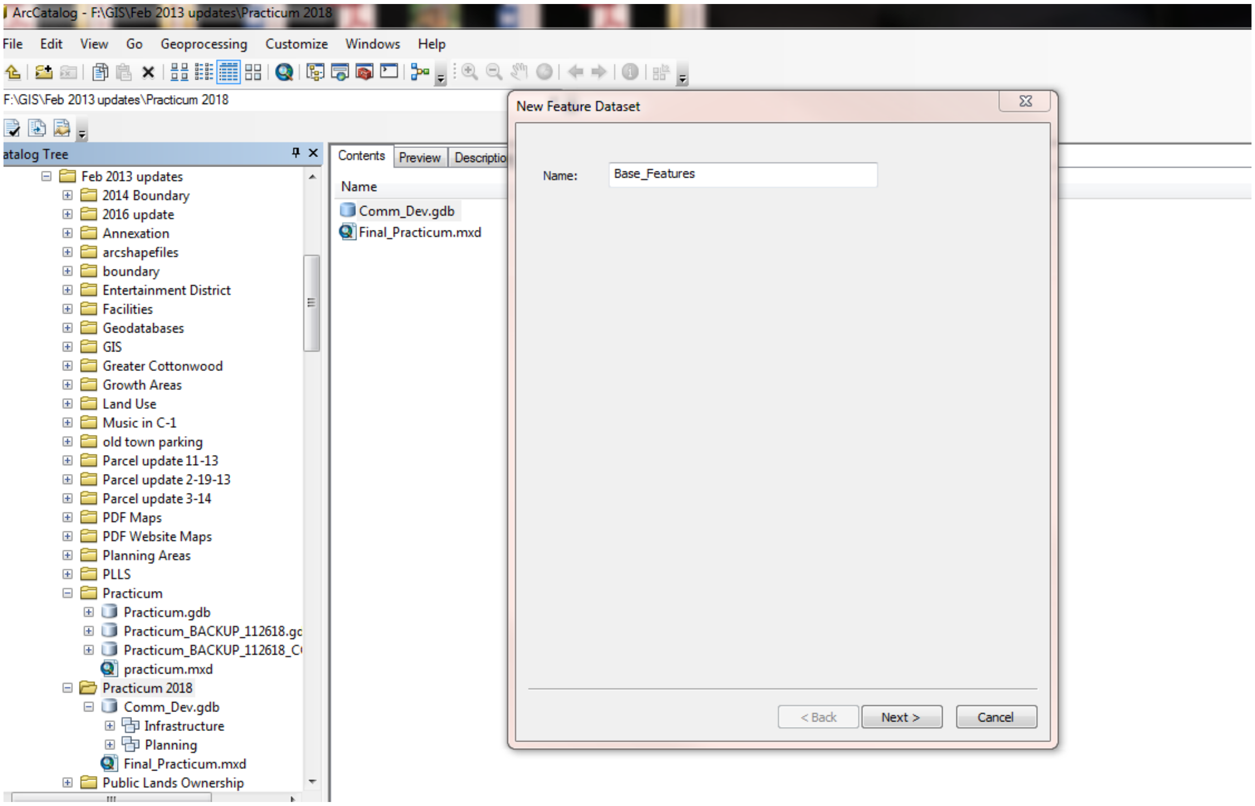
Appendix H: Setting the Projected Coordinate System for the feature dataset to NAD 1983 StatePlane Arizona Central FIPS 0202 (US Feet). This was repeated for the other two feature datasets created.



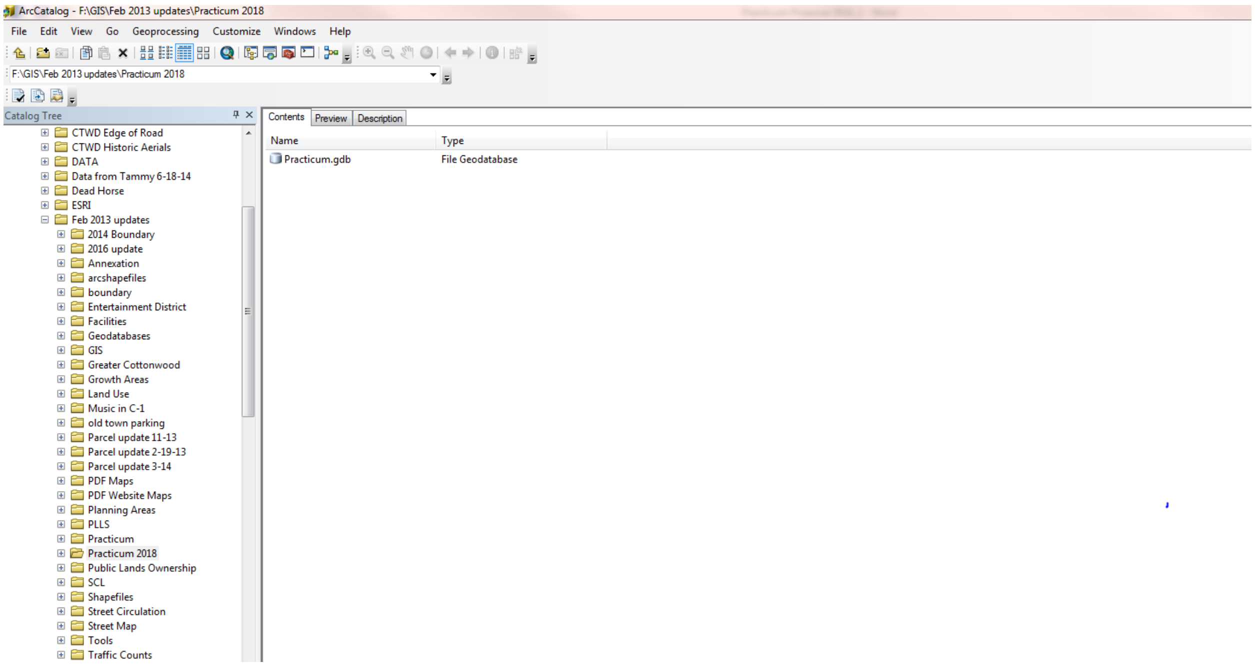
Appendix I: Creation of the *Infrastructure* feature dataset.



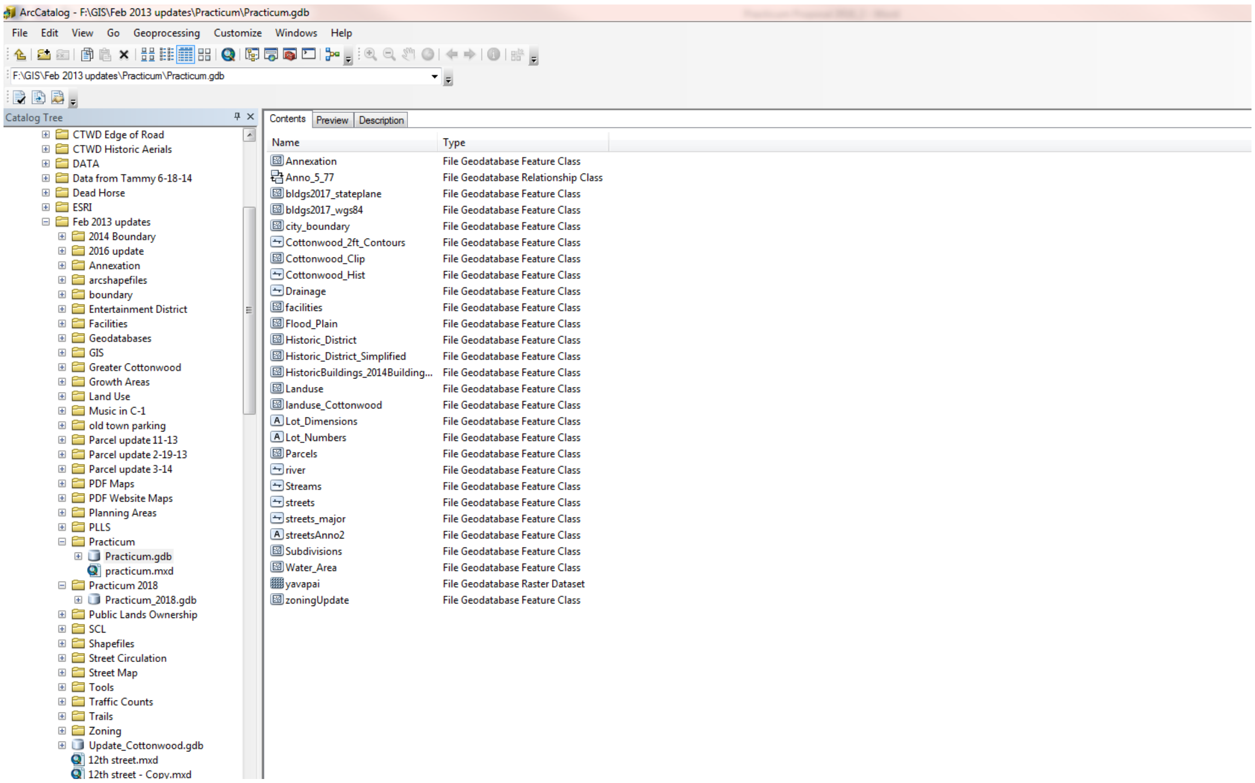
Appendix J: Creation of the *Base_Features* feature dataset.



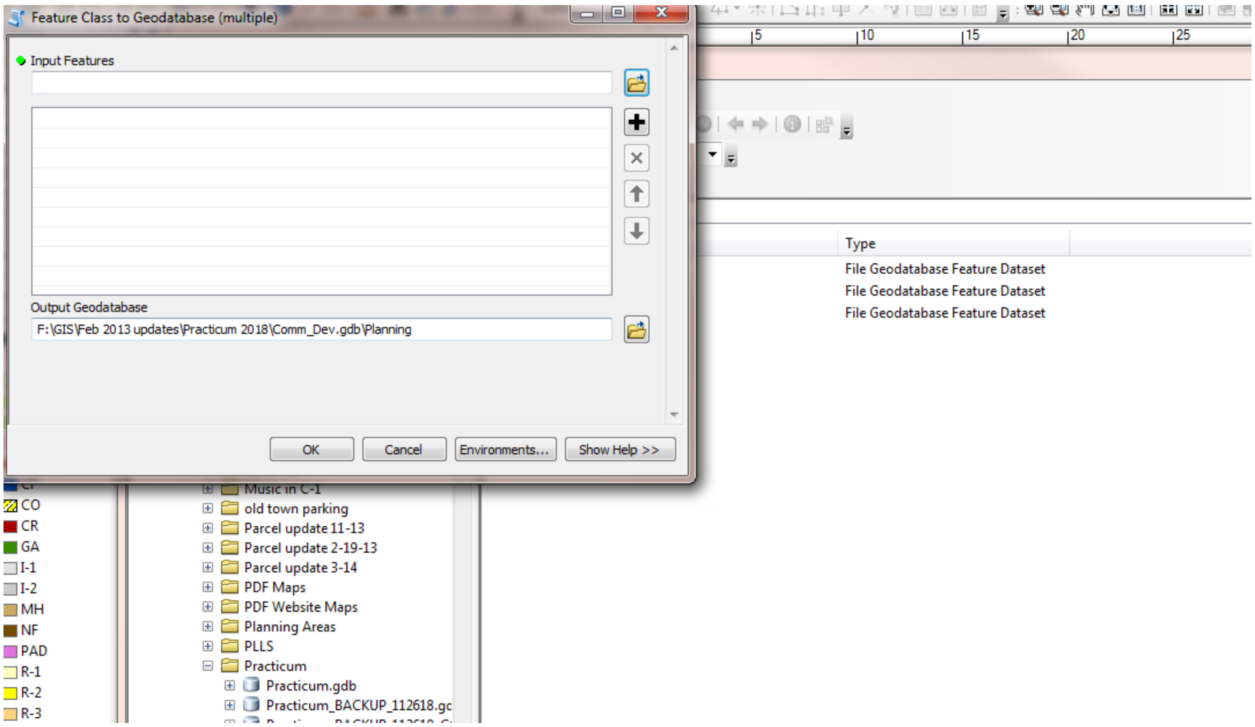
Appendix K: Location of existing features to be imported into feature datasets.



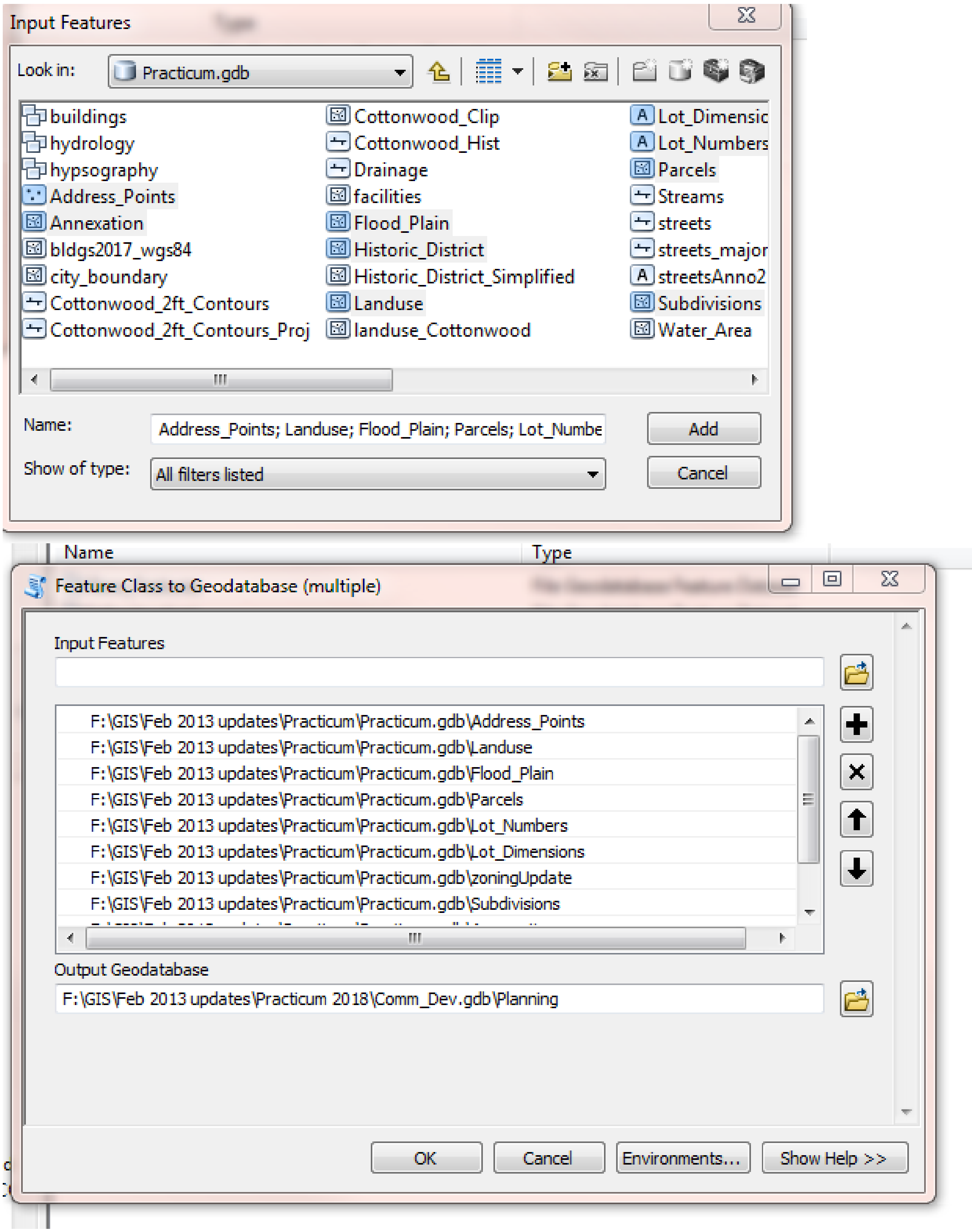
Appendix L: Contents of existing geodatabase showing some of the useable and unusable feature classes.



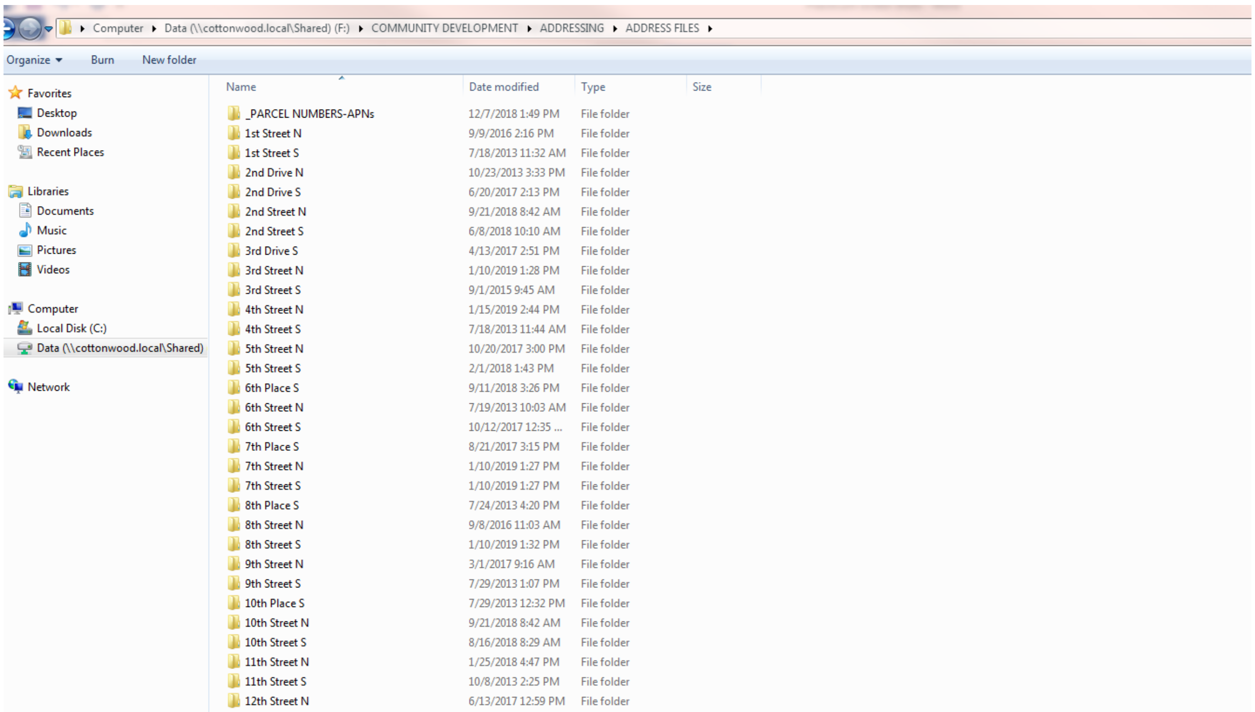
Appendix M: Importing option of feature class to feature dataset (multiple).



Appendix N: Feature classes selected to be imported into feature dataset.



Appendix O: Address file structure on local Community Development network.



Appendix P: Hyperlinked document from address feature.

C - 6/22

CITY OF COTTONWOOD

BUILDING PERMIT

PERMIT#
0571

ISSUE DATE: 6/22/2016
EXPIRATION DATE: 4/25/2016

SITE INFORMATION	PERMIT TYPE
Property Address 925 E State Route 89A	AUTODEALERSHIPS

PROPERTY OWNER NAME	PHONE NUMBER	ASSESSOR PARCEL NUMBER:
Greg Galpin		406-05-034B
920 S. State Route 69	PROJECT COST (LABOR & MATERIAL)	PERMIT FEES:
Dewey, AZ 86327	$ 338078.4	$ 3848.05

DESCRIPTION OF PROJECT AND USE OF BUILDING(S)

Building a new Galpin RV dealership building. Building will also have service area. All City and Fire comments must be addressed before a final C of O will be issued. Fire sprinklers and Fire alarm are on deferred submittal. All landscaping must be done in conjunction with the temporary building, along with the CMU Block fence.

CONTRACTOR INFORMATION

NAME & MAILING ADDRESS		CONTRACTOR PHONE #	
Kenson Construction		9284455192	
6135 Corsair Ave		STATE CONTRACTOR LICENSE #	BUSINESS LIC. #
Prescott, AZ 86301		069883	1266
		8/31/2016	12/31/2016

ADDRESS SHALL BE POSTED ON BUILDING FRONTAGE AND BE VISIBLE AND LEGIBLE FROM THE STREET FRONTING THE PROPERTY. UFC 901.4.4

This permit is granted on the express condition that the said construction shall, in all respects, conform to any ordinances, building, and fire codes of this jurisdiction, and may be revoked at any time upon violation of said ordinances, building, and fire codes.

PERMIT CARD MUST BE OPENLY DISPLAYED ON CONSTRUCTION SITE.

It is agreed to construct in conformity with the plans submitted and with the laws of the City of Cottonwood and the State of Arizona.

SIGNATURE: [signature] DATE: 6.23.16

CIRCLE ONE: Owner or Agent

ISSUED: Berrin Nejad Community Development Director DATE: 6/22/2016

Appendix Q: Standard liability statement to be included with all hardcopy GIS products created by the Planning Department, and provided with data requests by outside organizations.

NOTICE:

This map is designed to provide information about Cottonwood, and has been prepared for general planning and informational purposes only. It is not necessarily accurate to engineering or surveying standards. Every effort has been made to make this map as complete and as accurate as possible; however, no warranty or fitness is implied.

The information is provided on an "as-is" basis. The City of Cottonwood shall have neither liability nor responsibility to any person or entity with respect to any loss or damages in connection with or rising from the information contained on this map.