

# GIS FUNDAMENTALS

Presented by Tomas Arguello





# AGENDA

Introduction

What is GIS

How is GIS Used

GIS with Water Utilities

Mapping Basics

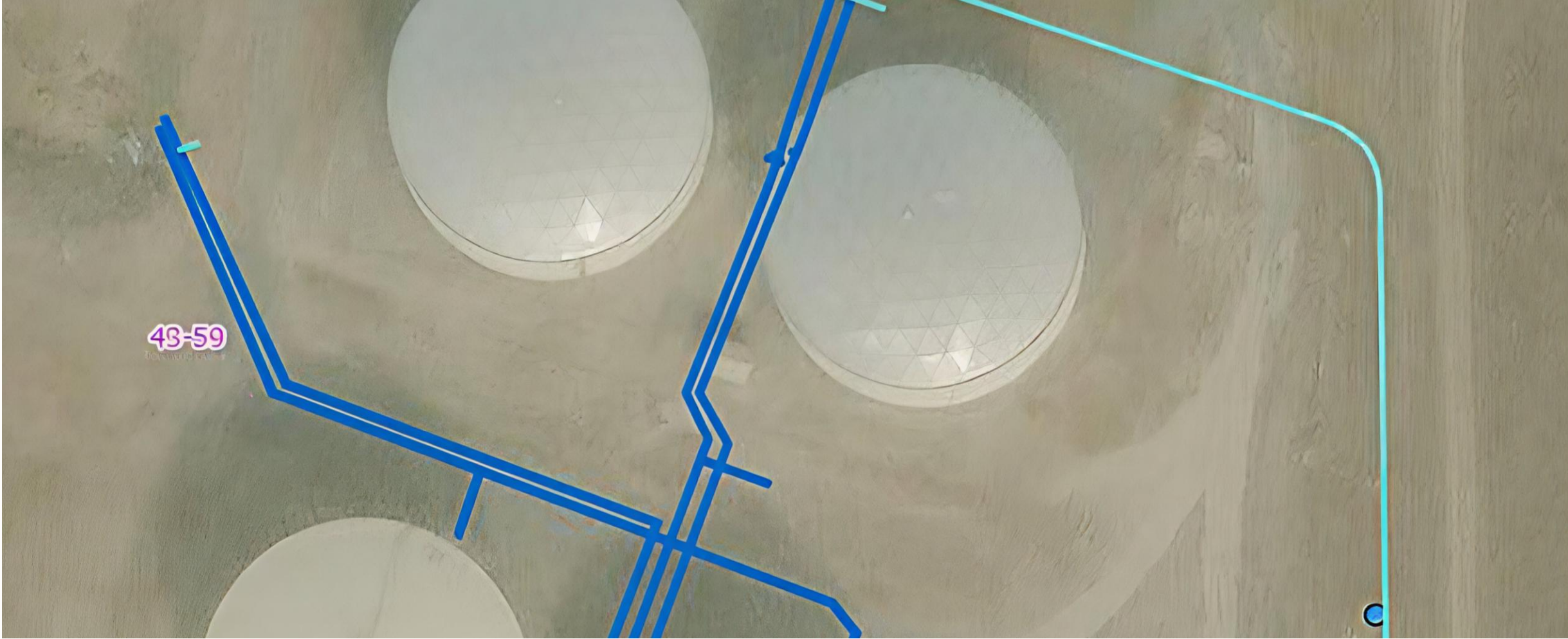
Attribute Tables

Mobile and Web Applications

Demo

# OVERVIEW

This presentation is focused the fundamentals of how GIS functions and is used with respect to Water Utility personnel and situations.



# MY GOAL

I aim to help you all understand how GIS functions and help answer any questions about what GIS does and how it can help in the field.

# WHAT ARE EXAMPLES OF GIS BASED PRODUCTS?

# WHAT IS GIS?

# WHAT IS GIS?

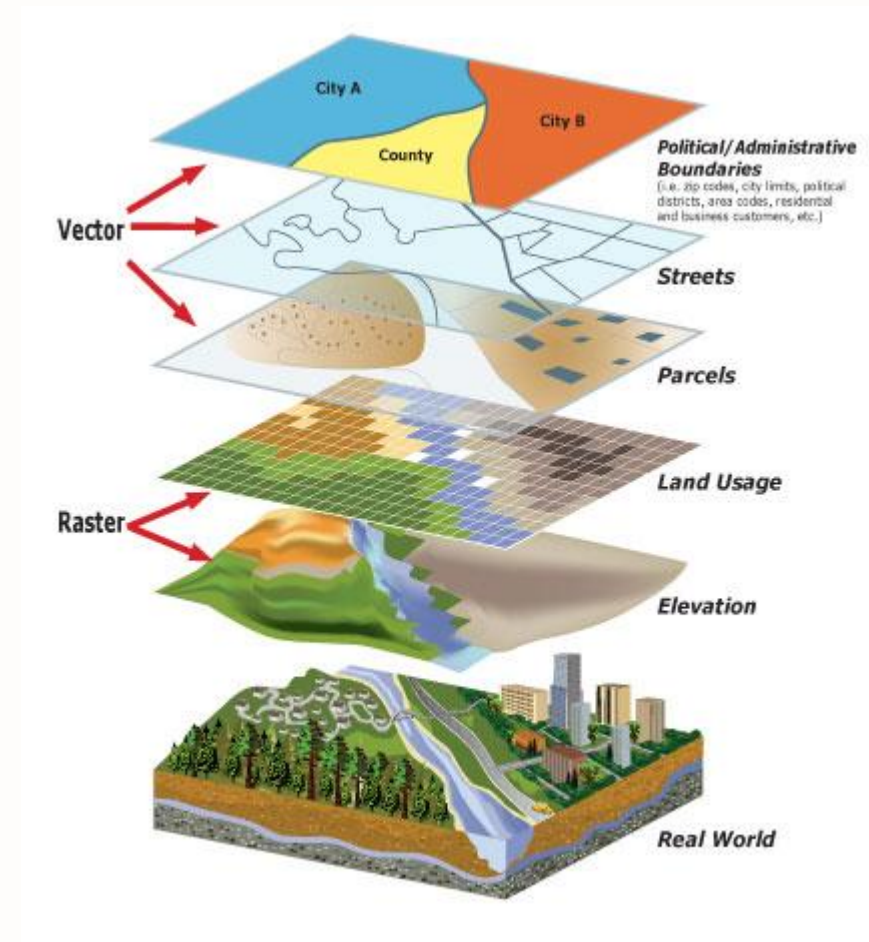
**GIS = Geographic Information System**

**Considered a spatial database**

- WHERE is the asset or item
- Then WHAT is the asset or
- Saas (Software as a service), ESRI
- Open source (Free) QGIS

**Key Point:** GIS is a system designed to geographically associate different types of data sets to form a clear picture of the situation. System of record for location and information on an asset.

-Remember the WHERE is first, then the WHAT.



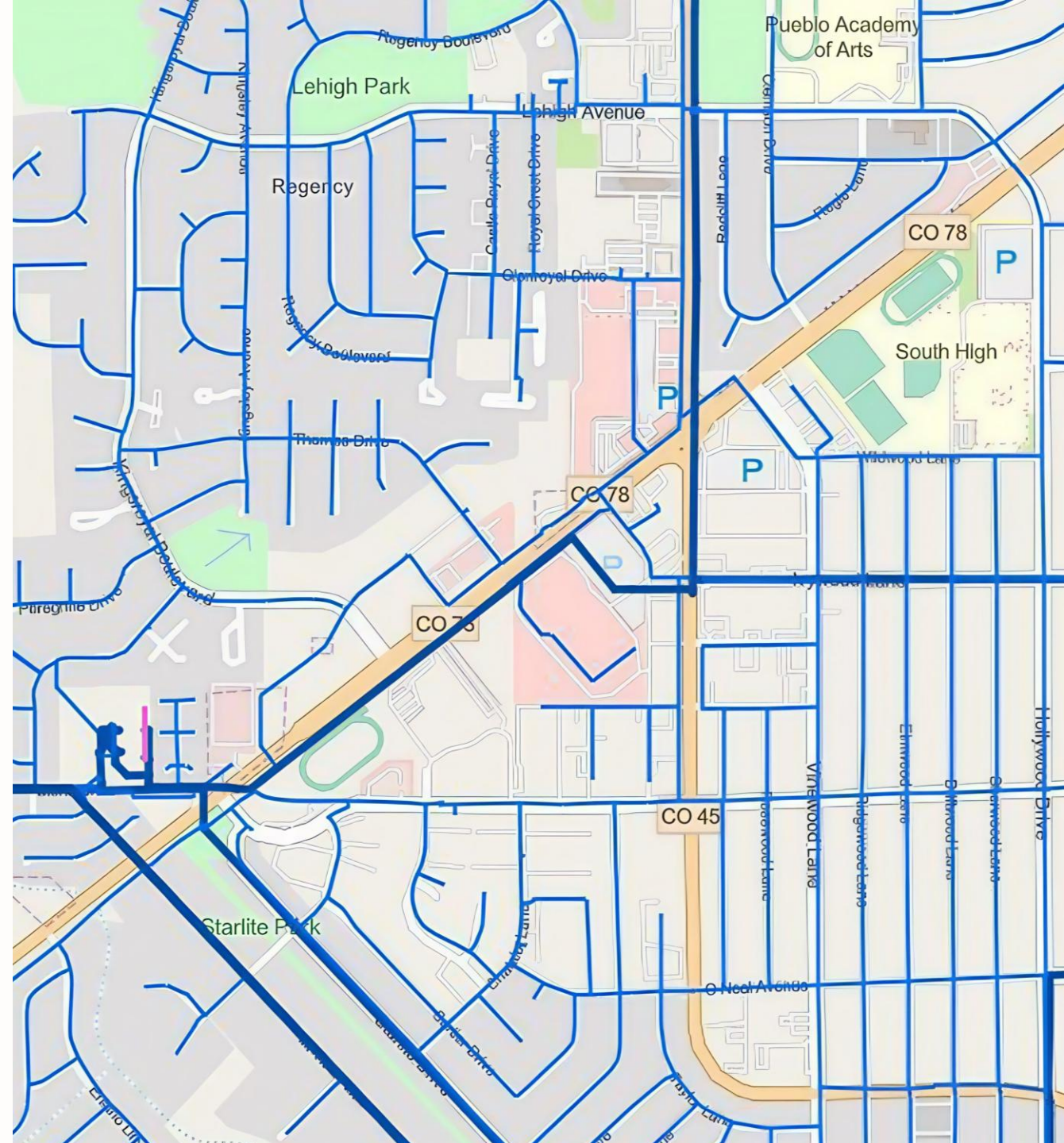
Source: NOAA

HOW IS GIS USED

# GIS USE

## GIS Use Cases:

- Very broad application in several industries
- Water, Electric, City Planning, Wildfire, Traffic information, and many more
- GIS is used to map the physical location of assets along with information about the asset called attribute information



# GIS USE

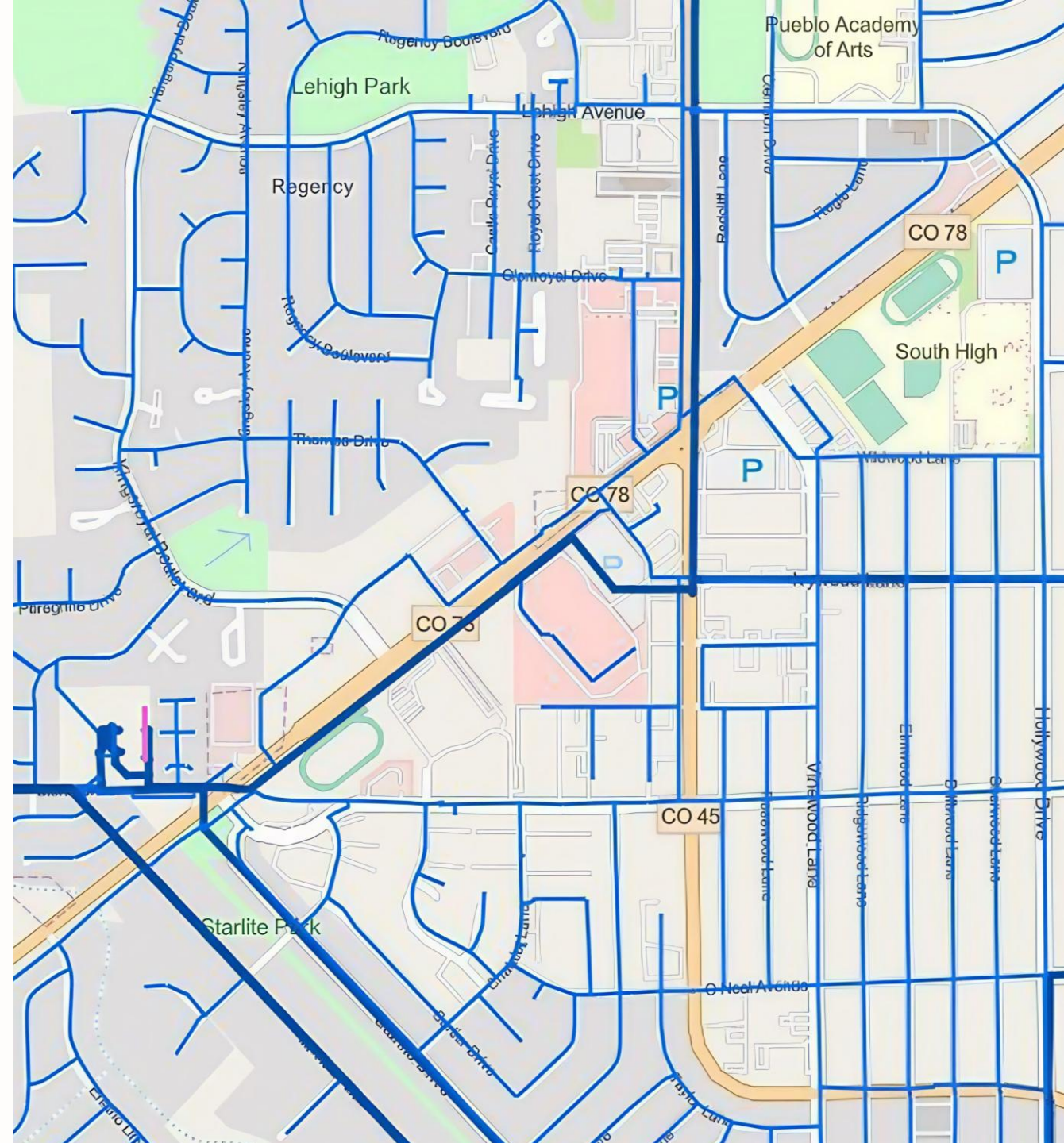
## Asset:

An asset is a piece of equipment used the entity owns for use in a system or machine.

- Hydrant
- Water Main
- Valve
- Pump

## Asset Life Cycle

Plan → Install → Repair → Retire → Replace



# GIS IN WATER UTILITIES

# GIS IN WATER UTILITIES

## Spatial Reference

Refers to the type of coordinate system used to map all assets

- Projected or Coordinate Projected System
  - Projected = State Plane Coordinate System (What we use, small scale)
  - Coordinate = WGS (Large Scale, usually basemaps)

## Asset Types:

- Points = Hydrant, Valves, Pumps
- Polygon = Service Area
- Line = Water Mains, Water Laterals, Fire Lines

## Legend

### Water Device

#### Fire Hydrant

##### Asset type,Hydrant Color

-  Fire Hydrant,
-  Fire Hydrant,Blue
-  Fire Hydrant,Green
-  Fire Hydrant,Not Flowed
-  Fire Hydrant,Orange
-  Fire Hydrant,Red

 others

### Water Line

#### Water Main

##### Asset type

-  Unknown
-  Transmission Main
-  Distribution Main
-  Production
-  Overflow
-  Drain
-  Other

### Service Territory



# GIS in Water Utilities Cont.

## Networks and Modeling

### Two Types

- Utility Network
- Geometric Network

## Hydraulic modeling

- Used for flood analysis and urban development

## Integrations

Used to feed information to other software systems, also able to receive information via something called an API

- Feeding- Asset Management, Public Service Website, apps
- Receiving- CIS information, Backflow information

# MAPPING BASICS

# MAPPING BASICS



## Mapping:

- Through CAD, Asbuilts
- Survey GNSS or Professional Survey



Goal: Produce digitized data with the smallest offset possible.



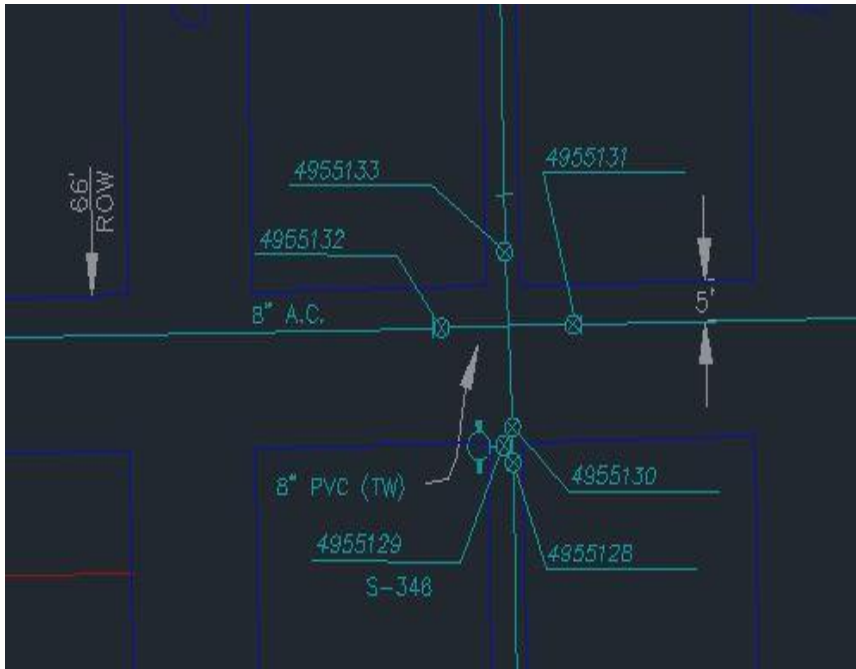
## Why?

- SOP driven system
- Minimum mapping tolerances exist, called accuracy
- Minimize ground truth work (Is the map right?)

# MAPPING BASICS: CAD TO GIS

Mapping: DIGITIZING ERRORS HAPPEN

CAD Drawing



Nerd Magic  
& Caffeine



GIS Map



# MAPPING BASICS: SURVEY TO GIS



# MAPPING UPDATES



Identify

Document  
asset and  
correct  
location



Report

Contact GIS/  
Engineering  
for change



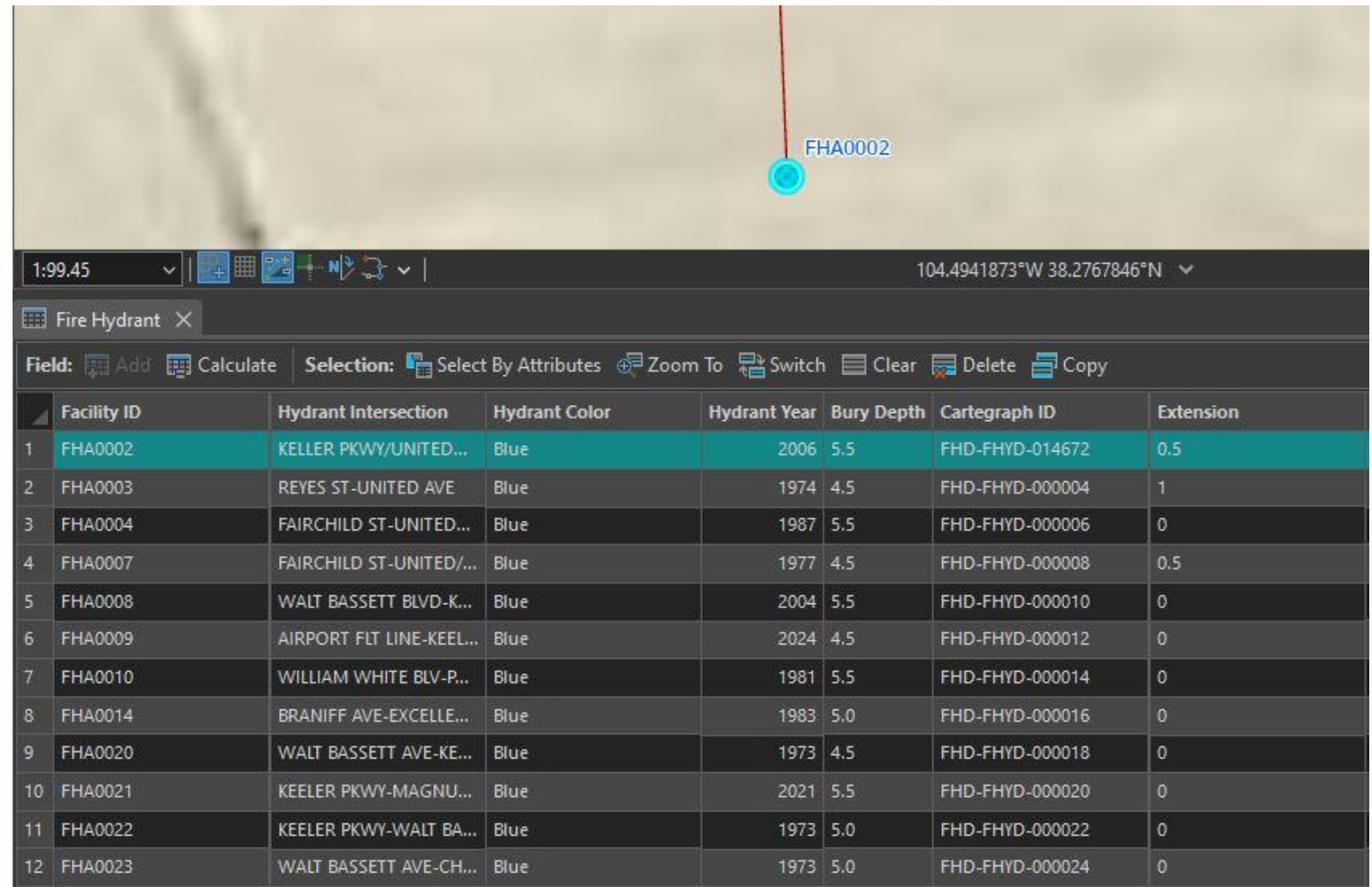
Goal: Produce digitized data with  
the smallest offset possible.

# ATTRIBUTE TABLES

# ATTRIBUTE TABLES

Attribute table:

- Collection of details associated to mapped asset
- Examples:
  - Pipe Diameter
  - Hydrant Color
  - Turns to Close
  - Meter Type



The screenshot displays a GIS application interface. At the top, a map shows a fire hydrant labeled 'FHA0002' with a blue circular icon. Below the map is a toolbar with various icons. The attribute table is titled 'Fire Hydrant' and contains 12 rows of data. The first row is highlighted in teal.

|    | Facility ID | Hydrant Intersection     | Hydrant Color | Hydrant Year | Bury Depth | Cartegraph ID   | Extension |
|----|-------------|--------------------------|---------------|--------------|------------|-----------------|-----------|
| 1  | FHA0002     | KELLER PKWY/UNITED...    | Blue          | 2006         | 5.5        | FHD-FHYD-014672 | 0.5       |
| 2  | FHA0003     | REYES ST-UNITED AVE      | Blue          | 1974         | 4.5        | FHD-FHYD-000004 | 1         |
| 3  | FHA0004     | FAIRCHILD ST-UNITED...   | Blue          | 1987         | 5.5        | FHD-FHYD-000006 | 0         |
| 4  | FHA0007     | FAIRCHILD ST-UNITED/...  | Blue          | 1977         | 4.5        | FHD-FHYD-000008 | 0.5       |
| 5  | FHA0008     | WALT BASSETT BLVD-K...   | Blue          | 2004         | 5.5        | FHD-FHYD-000010 | 0         |
| 6  | FHA0009     | AIRPORT FLT LINE-KEEL... | Blue          | 2024         | 4.5        | FHD-FHYD-000012 | 0         |
| 7  | FHA0010     | WILLIAM WHITE BLV-P...   | Blue          | 1981         | 5.5        | FHD-FHYD-000014 | 0         |
| 8  | FHA0014     | BRANIFF AVE-EXCELLE...   | Blue          | 1983         | 5.0        | FHD-FHYD-000016 | 0         |
| 9  | FHA0020     | WALT BASSETT AVE-KE...   | Blue          | 1973         | 4.5        | FHD-FHYD-000018 | 0         |
| 10 | FHA0021     | KEELER PKWY-MAGNU...     | Blue          | 2021         | 5.5        | FHD-FHYD-000020 | 0         |
| 11 | FHA0022     | KEELER PKWY-WALT BA...   | Blue          | 1973         | 5.0        | FHD-FHYD-000022 | 0         |
| 12 | FHA0023     | WALT BASSETT AVE-CH...   | Blue          | 1973         | 5.0        | FHD-FHYD-000024 | 0         |

# MOBILE AND WEB APPLICATIONS

# MOBILE AND WEB APPLICATIONS

GIS Maps can be exported out to mobile applications for use out in the field.

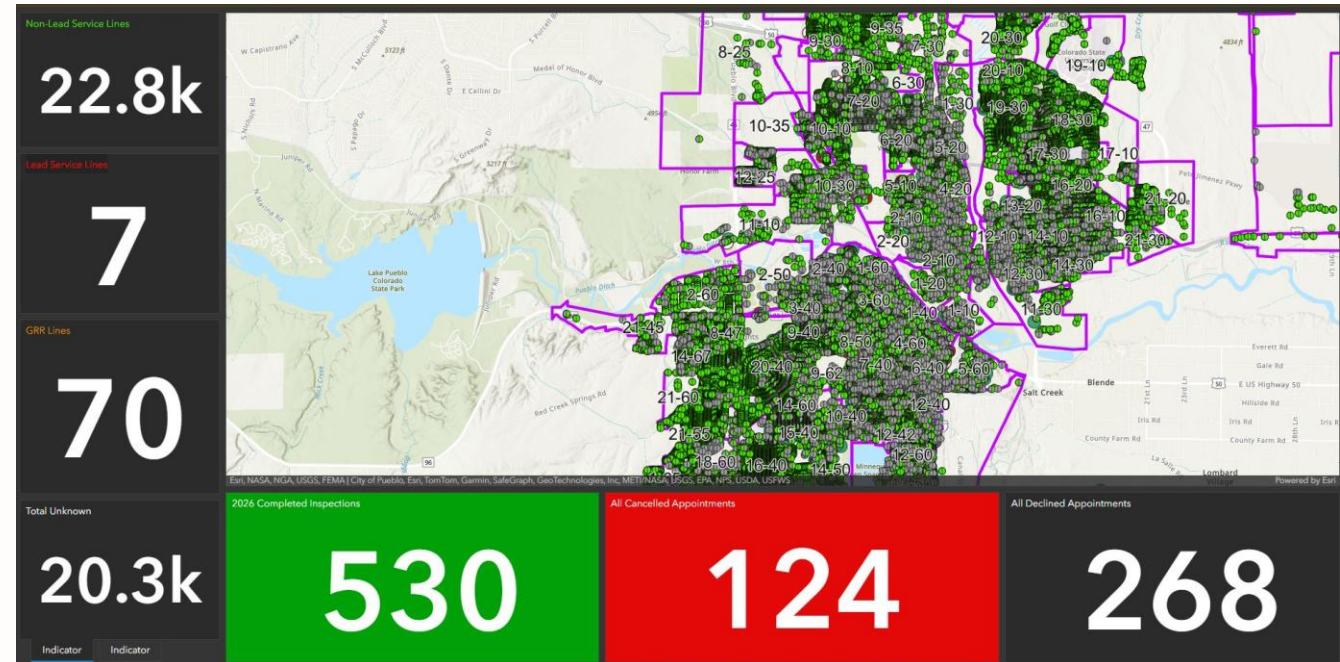
-Field Maps, Avenza, Google Earth

Benefit: Offline use with sync when back in service

Web Applications

-ArcGIS Enterprise and ArcGIS Online

Benefit: Can share data company wide and no dedicated application is needed to view, just login credentials



# DEMO:

<https://gis.pueblowater.org/portal/apps/mapviewer/index.html?webmap=af094a7b6fa24feab8f508e157f96284>

<https://pueblowaterworksco.eam.opengov.com/sign-in?navId=7d8152a5-2925-45ef-b7f3-de41281a9a7e>

# Q & A

## GIS



What my friends think I do



What my mom thinks I do



What society thinks I do



What my clients think I do



What I think I do



What I really do