



Smart Management for
Small Water Systems

Mapping: There's More Than One Way to Show Your Data Electronically

8/21/18 | Webinar

www.efcnetwork.org



This program is made possible under a cooperative agreement with the U.S. EPA.



SOUTHWEST ENVIRONMENTAL FINANCE CENTER



Heather
Himmelberger



Dawn Nall



Francine Stefan



Matt Ziegler



Sandi Blanton



Rose Afandi



Luke Andrews



Mark Ogrentz



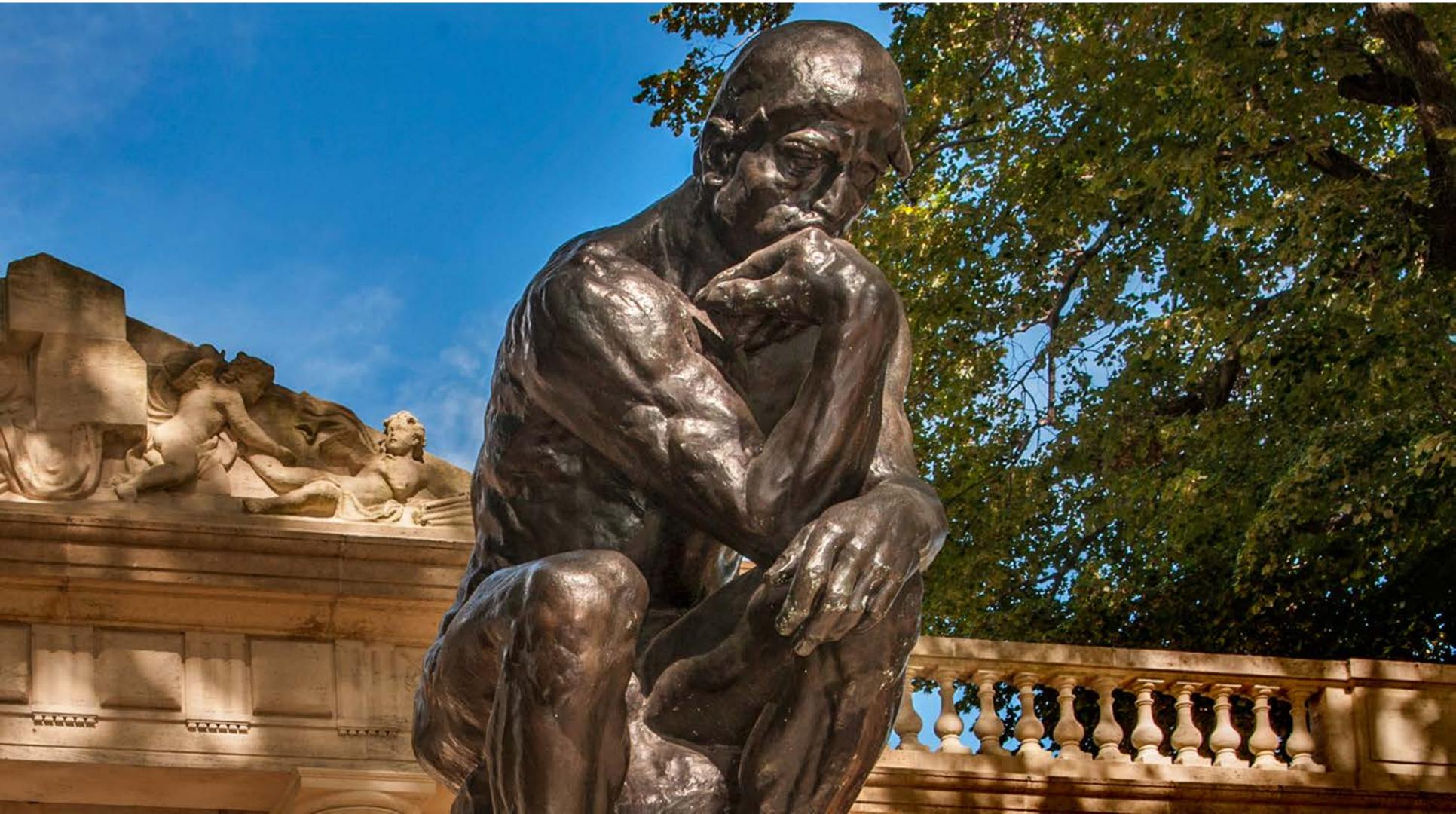
James Markham



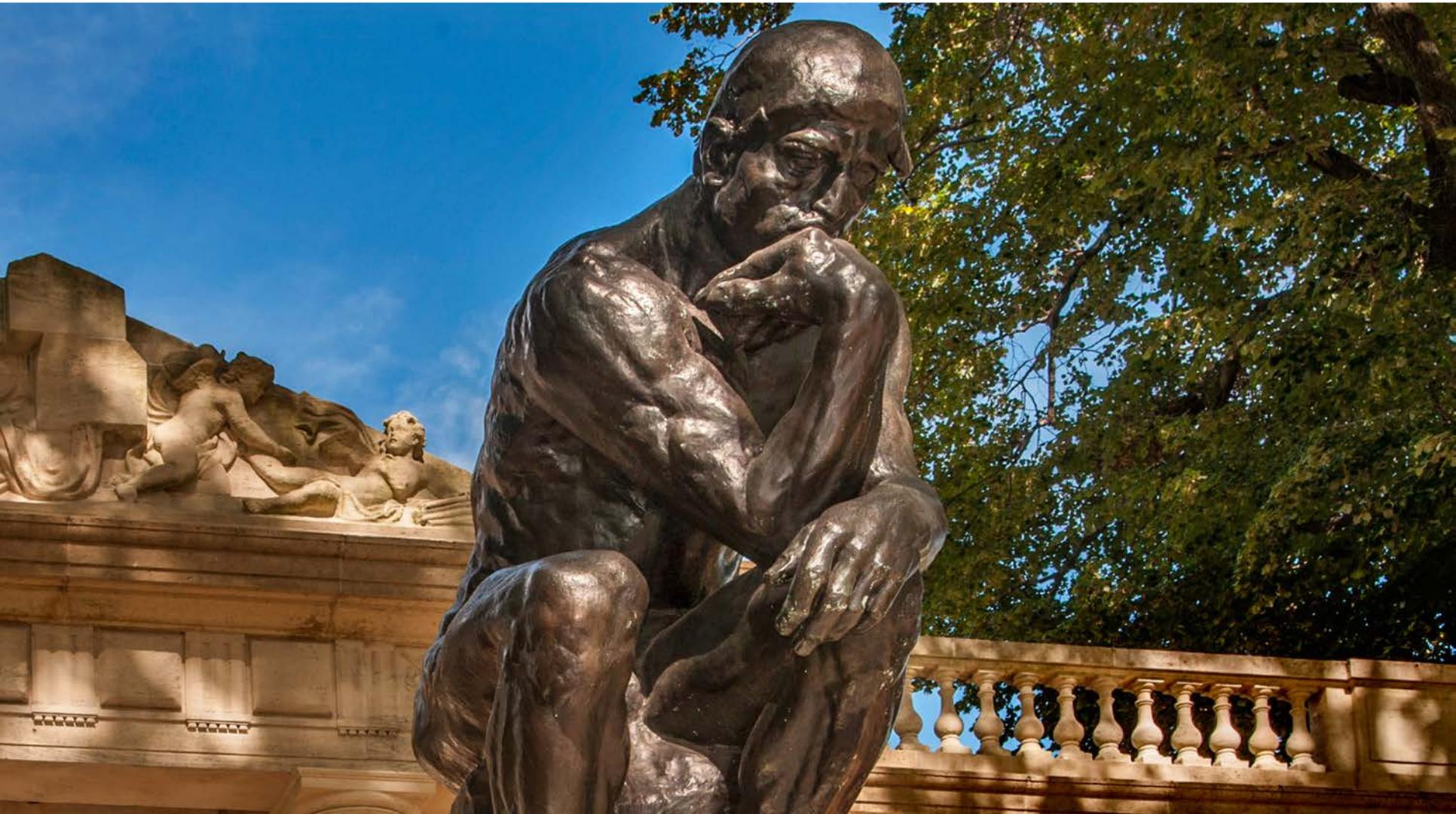
Hayley Hajic



Verify your decisions with data



Don't believe everything you think





Knowledge Management

I HAVE INFORMATION

I know something, I have information in my possession (in my head, my notebook, my truck, etc.)



DATA IS DIGITIZED

My data and data from other sources is digitized and combined.



WE KNOW MORE

The collective data and knowledge is now available to all.



I DOCUMENT IT

My information gets written down, or otherwise formally documented for use by others

DATA IS VISUALIZED & ANALYZED

Use appropriate tools (pushpins, GIS, etc.) to analyze and visualize the combined data.

Mapping is about process

PLAN

Decide what you want to collect, what tools and software you need, and what time frame you're working in.

1

COLLECT

Go out and get your data: location info, office info, other info

2



MAKE MAPS, USE & IMPROVE THEM

Use your maps, improve them and keep them current. A tool that isn't used is worthless.

5

PROOF DATA

Review your data. Does it make sense? Are there conflicts?

4

COMBINE SOURCES

Pull together useful data from other available sources.

3

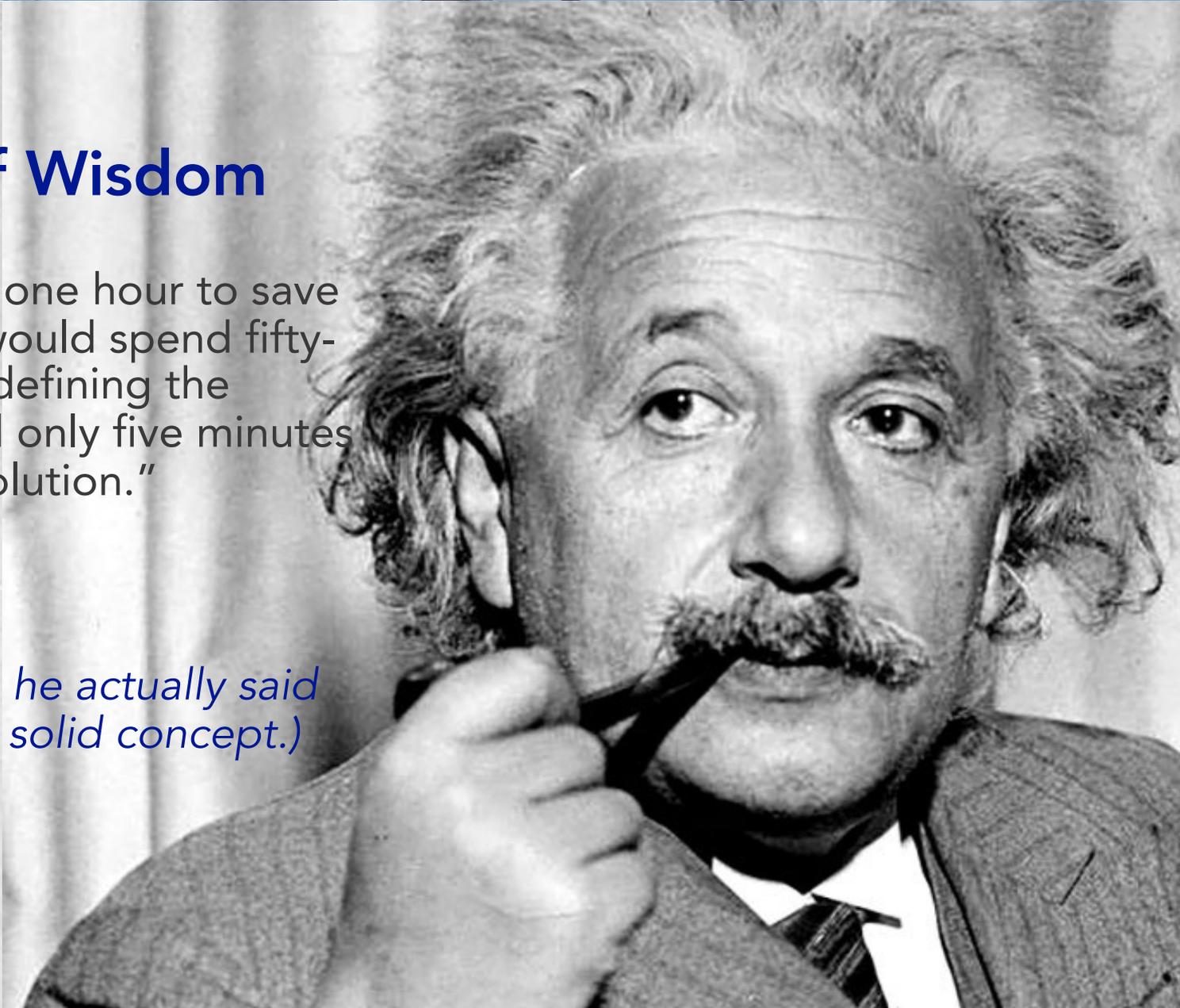


Words of Wisdom

"If I had only one hour to save the world, I would spend fifty-five minutes defining the problem, and only five minutes finding the solution."

Albert Einstein

(No evidence he actually said this, but it's a solid concept.)





Mapping Poll Questions





Why should you map electronically?

And what should you be mapping?



1000 words



Pattern Recognition: It's What We Do

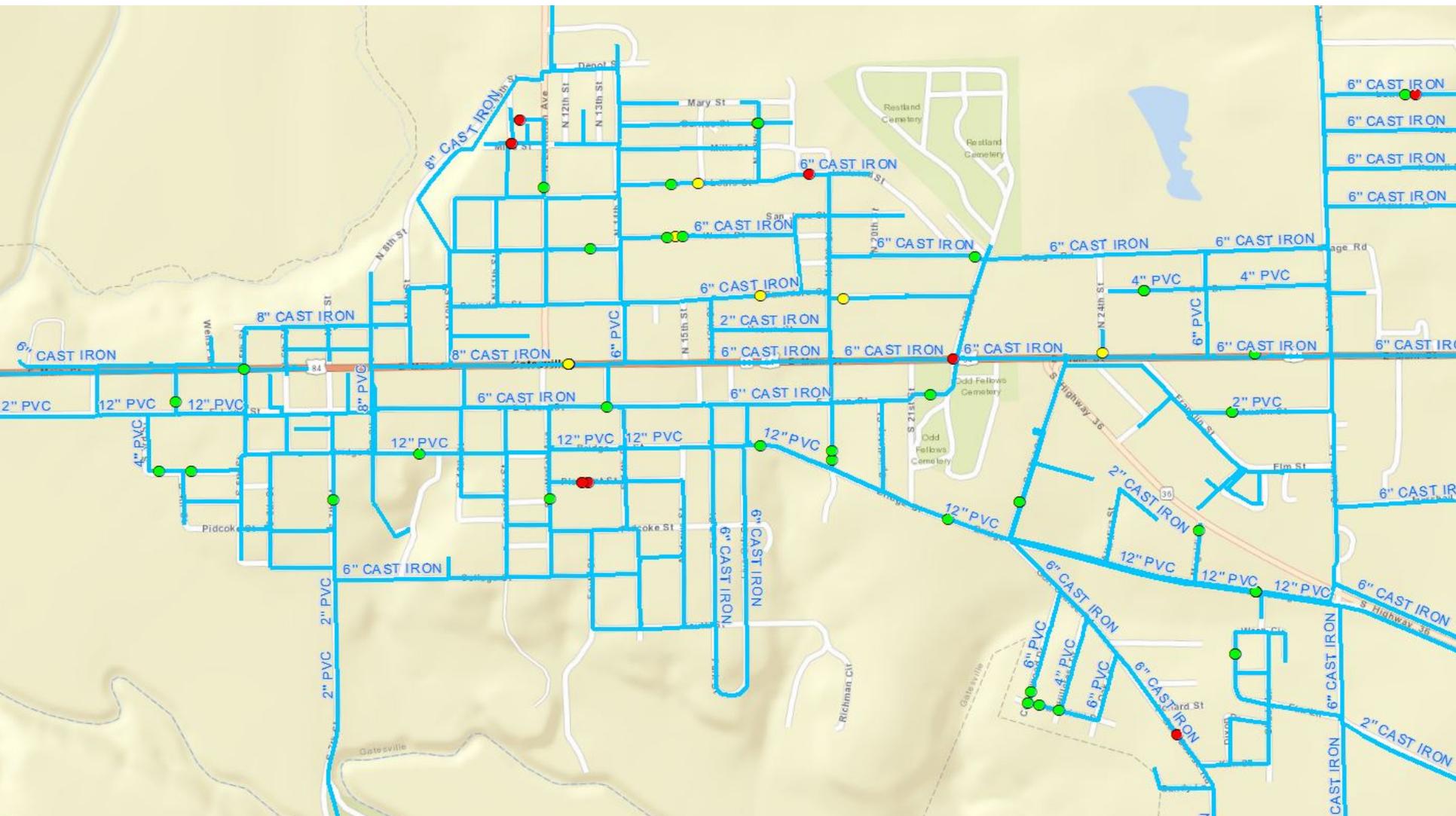


My own field, pattern recognition... is the fundamental capability of the human brain. We can't think fast enough to logically analyze situations quickly, so we rely on our powers of pattern recognition.

~ Ray Kurzweil



Visualization





**What should you
map?**



Assets



Start with things that will help you the most.



What else would be helpful on a map?



Information about those assets....



Valve Data that could be included

- GPS coordinates
- Valve Type
- Size
- Manufacturer
- Functional status
- Purchase date
- Install date
- Life expectancy
- Warranty information
- Replacement cost
- Pictures of valve can
- Pictures for orientation
- Video/Audio detailing crucial information
- How often exercised
- When last exercised
- Closing direction
- Condition assessment

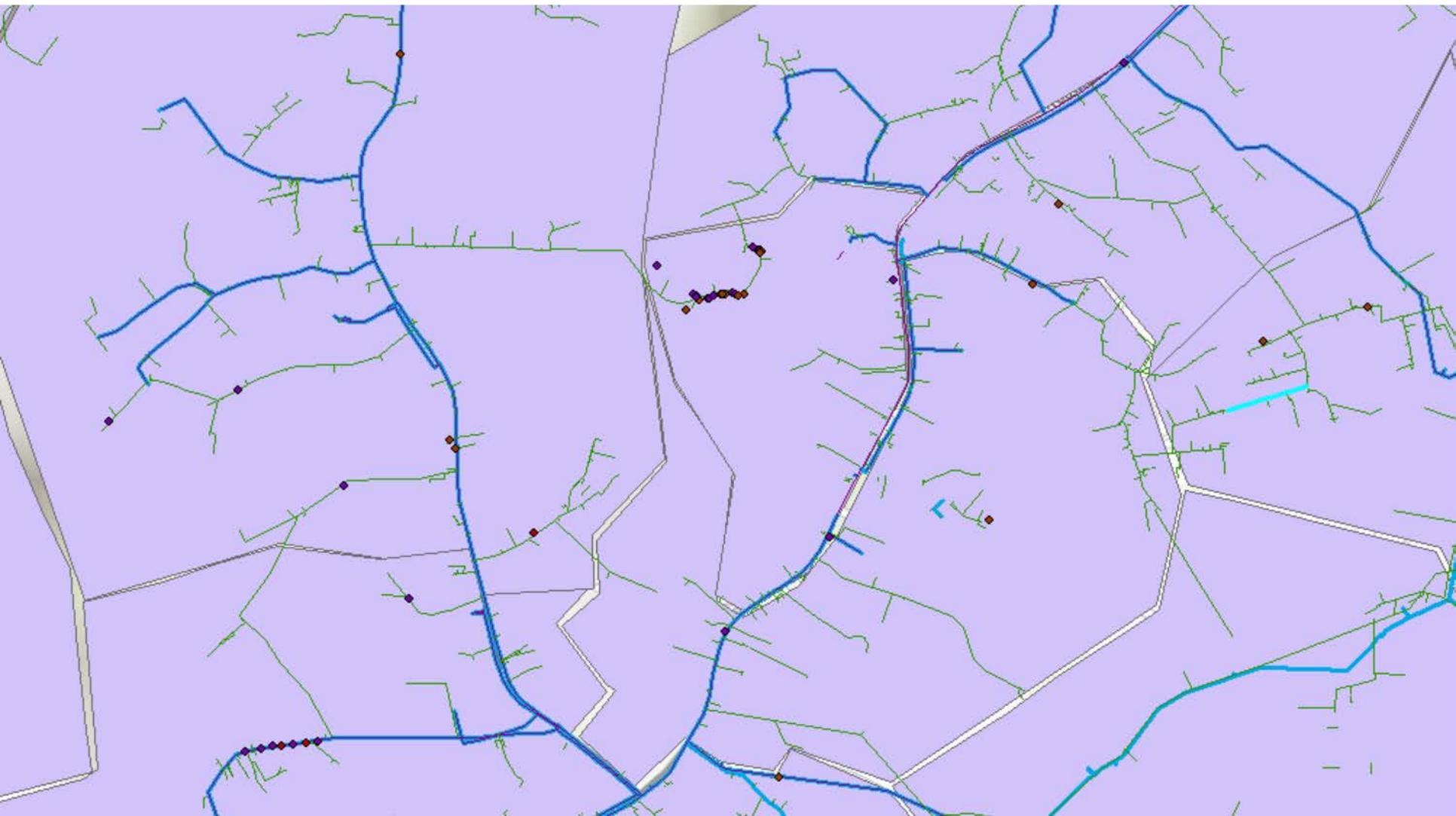


Events





Events – Like Line Breaks





More Than Just Where & When

Where breaks occur is a good start. But ..

- What was the cause?
- When was it reported?
- When was it repaired?
- How much water was lost?
- How much did it cost?
- How many customers were impacted?
- Did we meet our LOS repair standard?

More Than Just Where & When

Google Earth Pro

Search

ex: Restaurants

Get Directions History

Places

- My Places
 - Sightseeing Tour
 - Make sure 3D Buildings layer is checked
 - Water Mains
 - Water Mains
 - Line Breaks
 - WWTP Site.kmz
 - WWTP Site
 - Water Service Connections
 - Water Network Structures
 - Water Network Structures
 - Water Fittings
 - Water Fittings
 - DAILY_WORK
 - Temporary Places

Layers

- Primary Database
 - Borders and Labels
 - Places
 - Photos
 - Roads
 - 3D Buildings
 - Ocean
 - Weather
 - Gallery
 - Global Awareness
 - More
 - Terrain

5/10/16

5/10/2016	
WA	
OID	20
WA/SE	WA
DATE	5/6/2016
TIME	1:35PM
ADDRESS	2515 LOWREY
USER	DD
CALLED	RM
NOTES	LEAK IN STREET IN FRONT OF HER HOUSE, SAME ONE THAT ALWAYS LEAKS
UPDATES	FIXED CN DA MF 5-10-16
WORK TICKET #	48775
BREAK TYPE	deterioration
REPAIR DATE	5/10/2016
L	4
M	1
latitude	31.44047
longitude	-97.723088
NEAR_FID	858
NEAR_DIST	0.000223
NEAR_X	-97.723091
NEAR_Y	31.440247
DDLat	31.44024681N
DDLon	097.72309089W
ORIG_OID	20
Rep_time	4

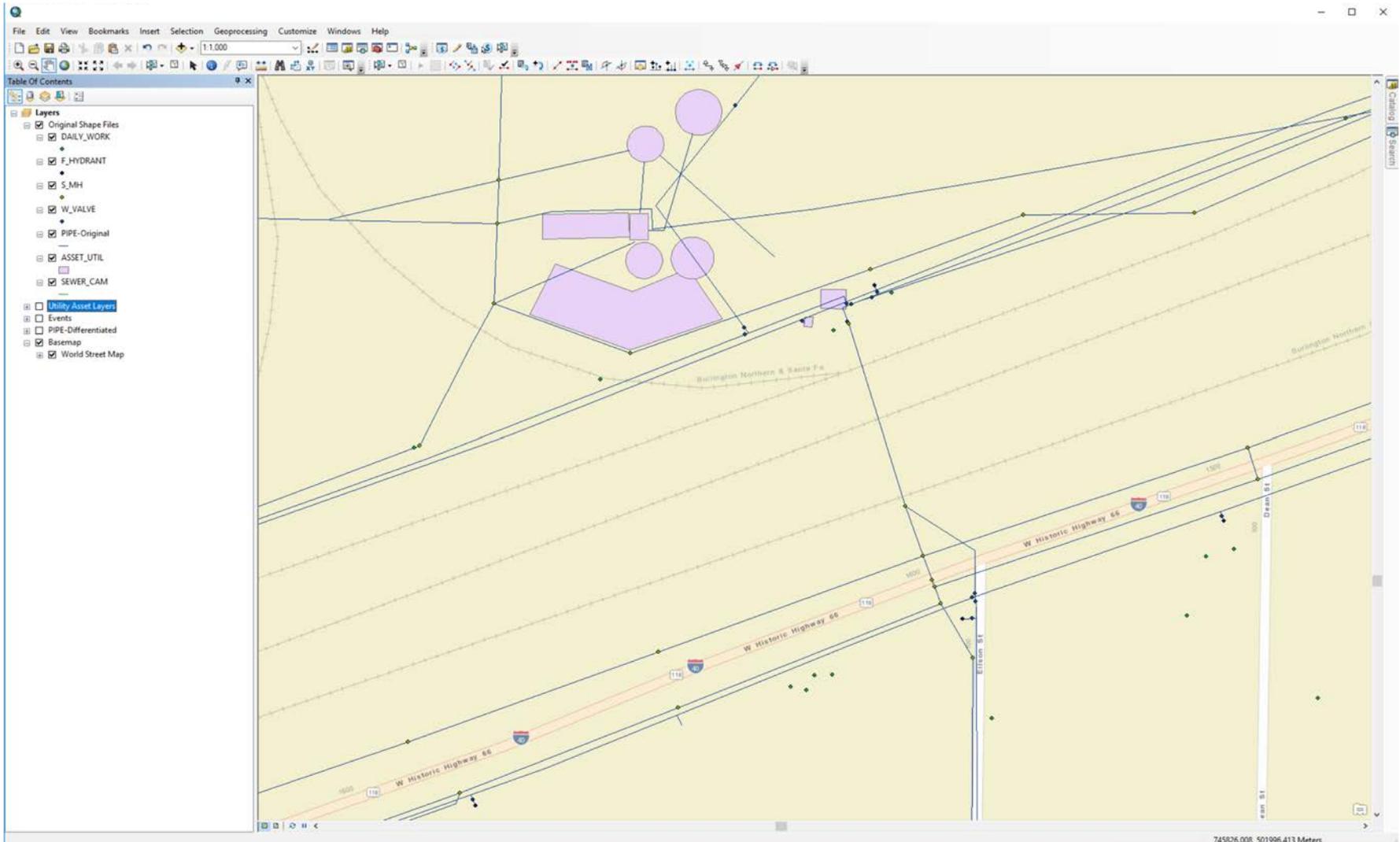
Directions: [To here](#) - [From here](#)



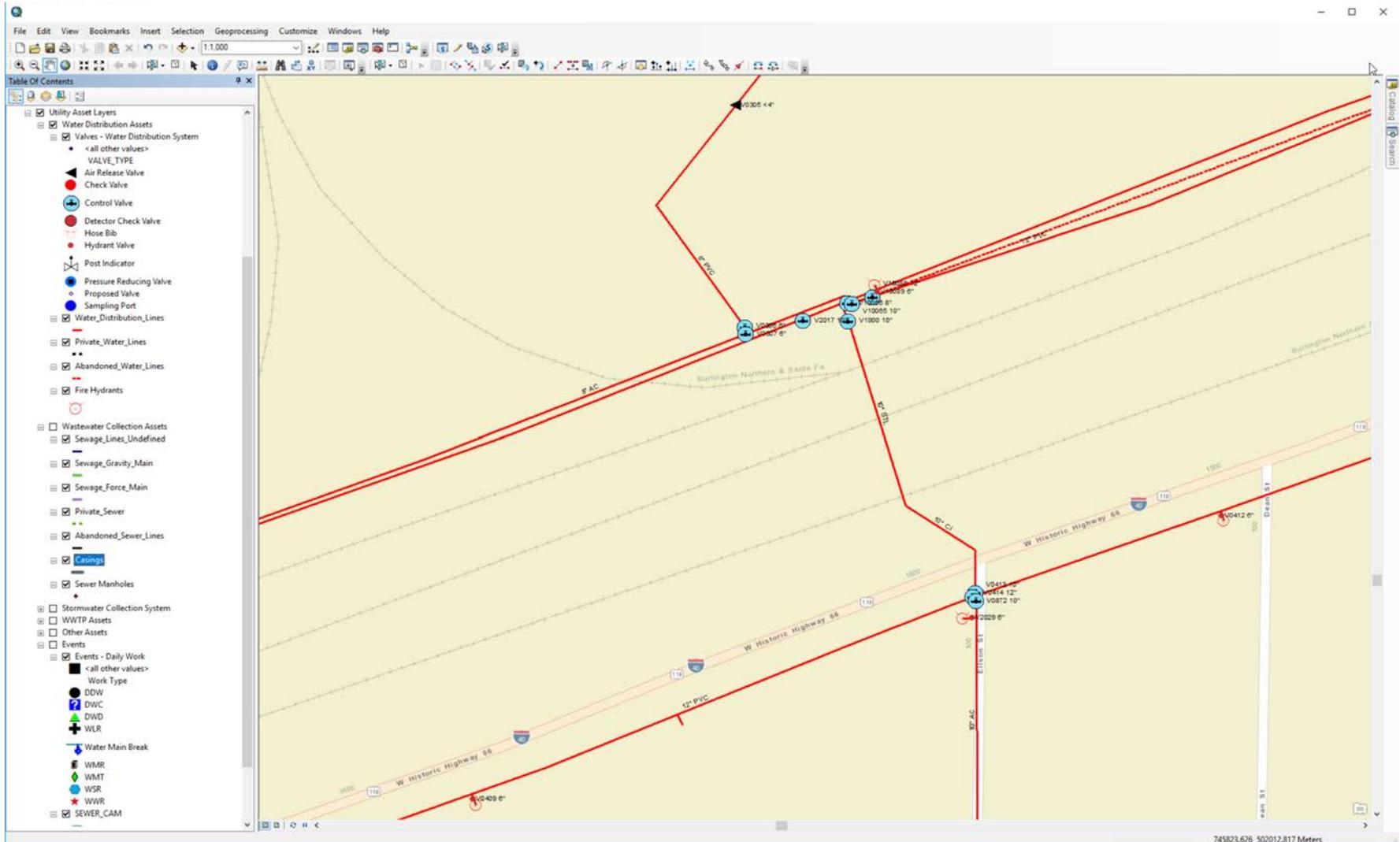
How should you map?

Basic considerations for whatever mapping platform you use

Organize Your Data



Organize Assets: Drinking Water



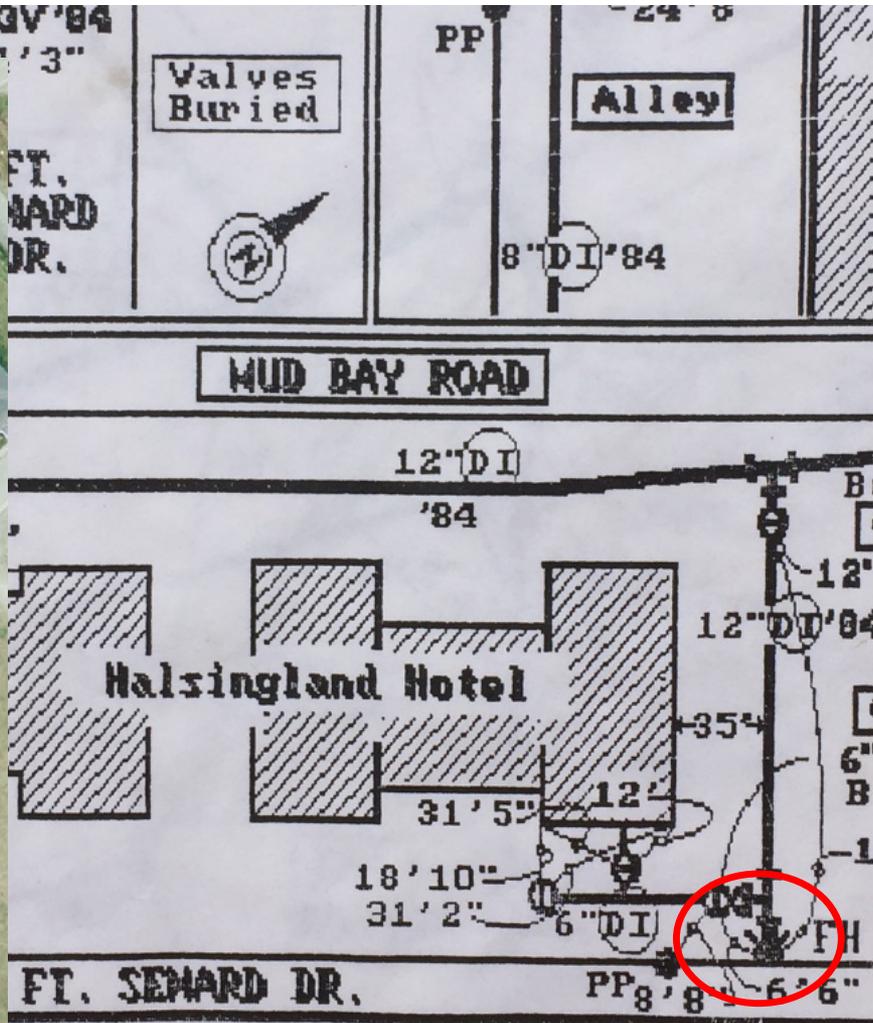


Organize Assets: Wastewater

The screenshot displays a GIS application window with a map of wastewater assets. The map shows a network of pipes, manholes, and valves overlaid on a street map. A legend on the left side of the window lists various asset types and their corresponding symbols and colors. The map includes labels for 'W Historic Highway 66' and 'Burlington Northern & Santa Fe'. The interface includes a menu bar (File, Edit, View, Bookmarks, Insert, Selection, Geoprocessing, Customize, Windows, Help) and a toolbar with various GIS tools. The bottom right corner of the window shows the coordinates '745639.741 501891.109 Meters'.

- Check Valve
- Control Valve
- Detector Check Valve
- Hose Bib
- Hydrant Valve
- Post Indicator
- Pressure Reducing Valve
- Proposed Valve
- Sampling Port
- Water_Distribution_Lines
- Private_Water_Lines
- Abandoned_Water_Lines
- Fire Hydrants
- Wastewater Collection Assets
 - Sewage_Lines_Undefined
 - Sewage_Gravity_Main
 - Sewage_Force_Main
 - Private_Sewer
 - Abandoned_Sewer_Lines
 - Catchings
 - Sewer Manholes
- Stormwater Collection System
 - WWTP Assets
 - Other Assets
- Events
 - Events - Daily Work
 - <all other values>
 - Work Type
 - DDW
 - DWC
 - DWD
 - WLR
 - Water Main Break
 - WMR
 - WMT
 - WSR
 - WWR
- SEWER_CAM
- Events
- PIPE-Differentiated
- Basemap
- World Street Map

Consolidate Data Sources





Maps can tell you much more than what & where...

Who?

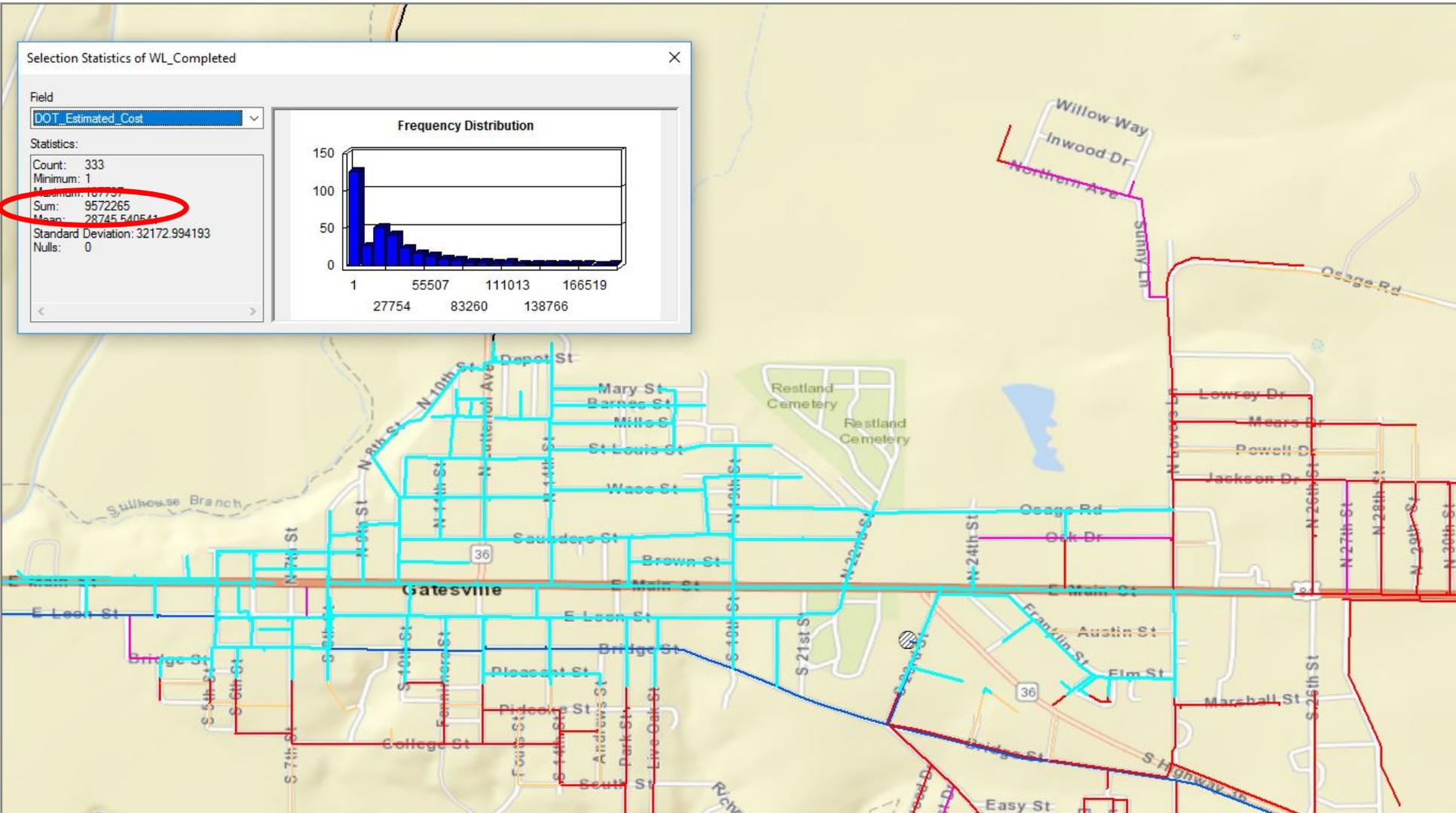
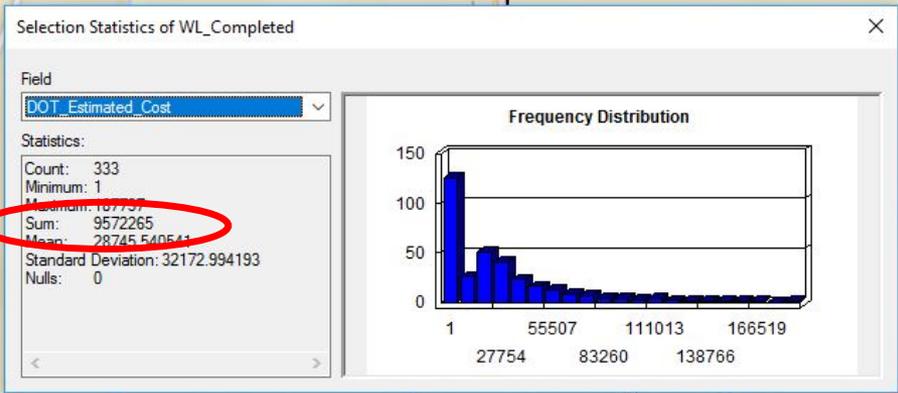
When?

Why?

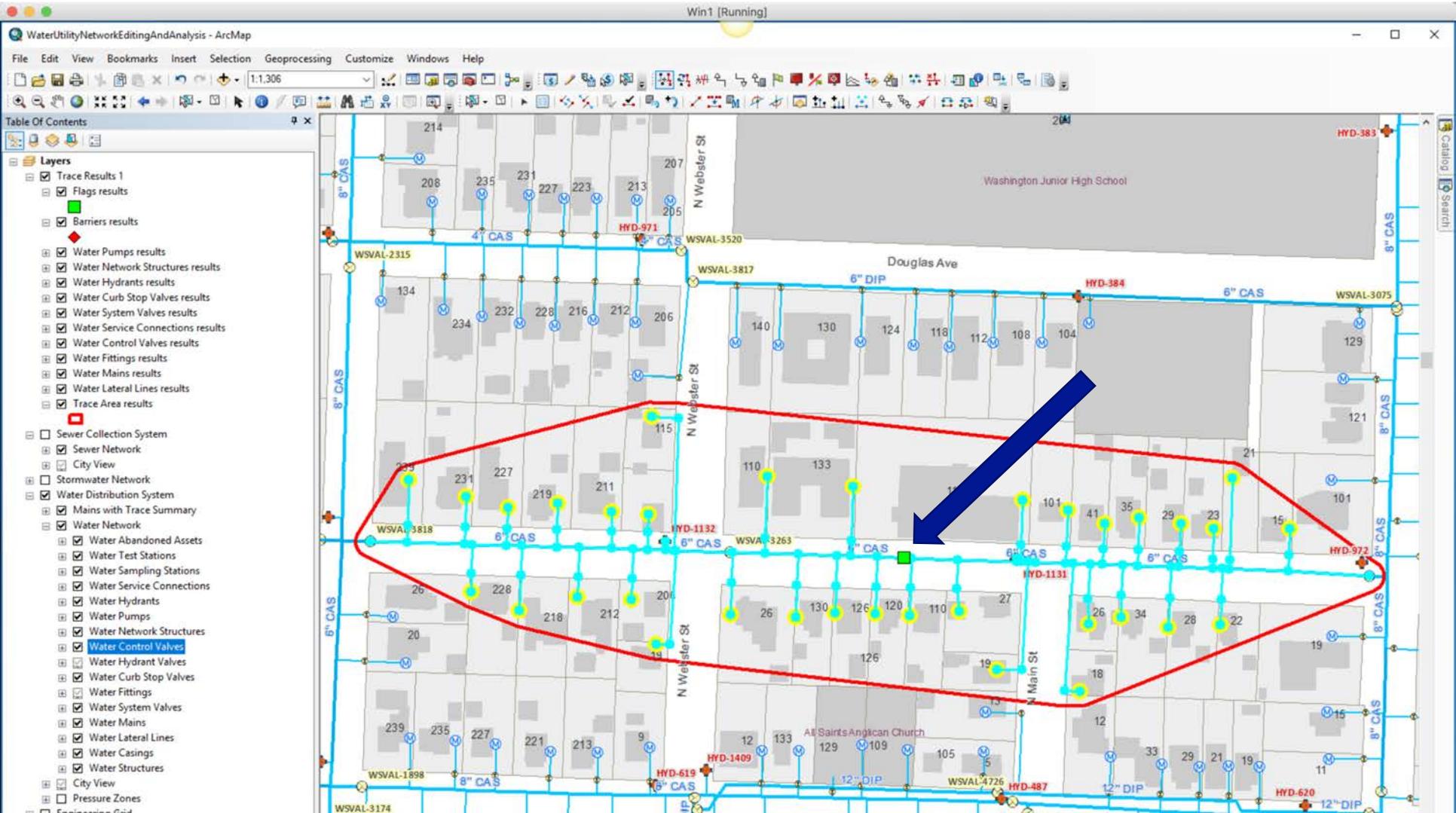
How much?

How?

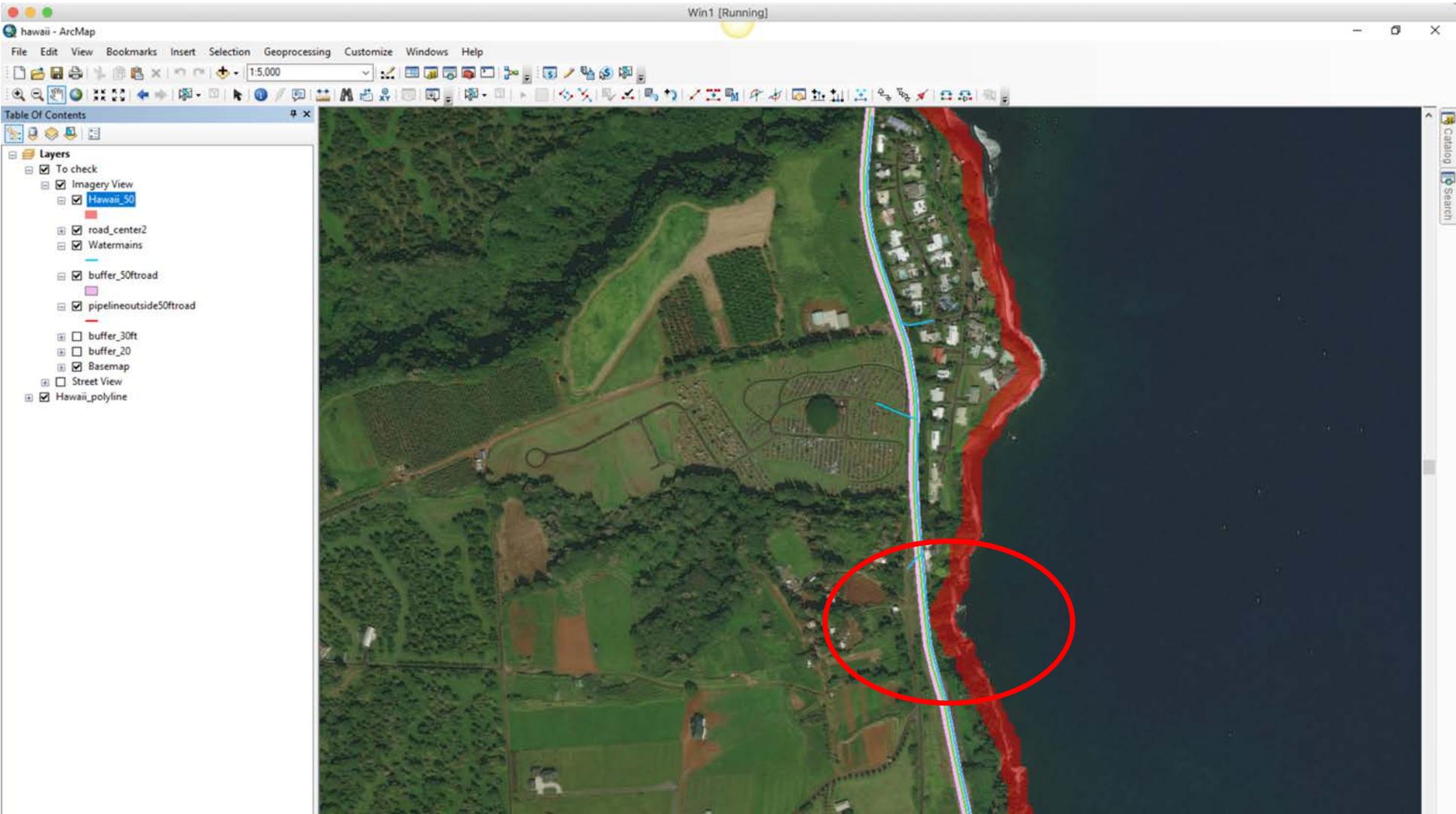
Example: Replacement Costing



Level of Service: Planned outages

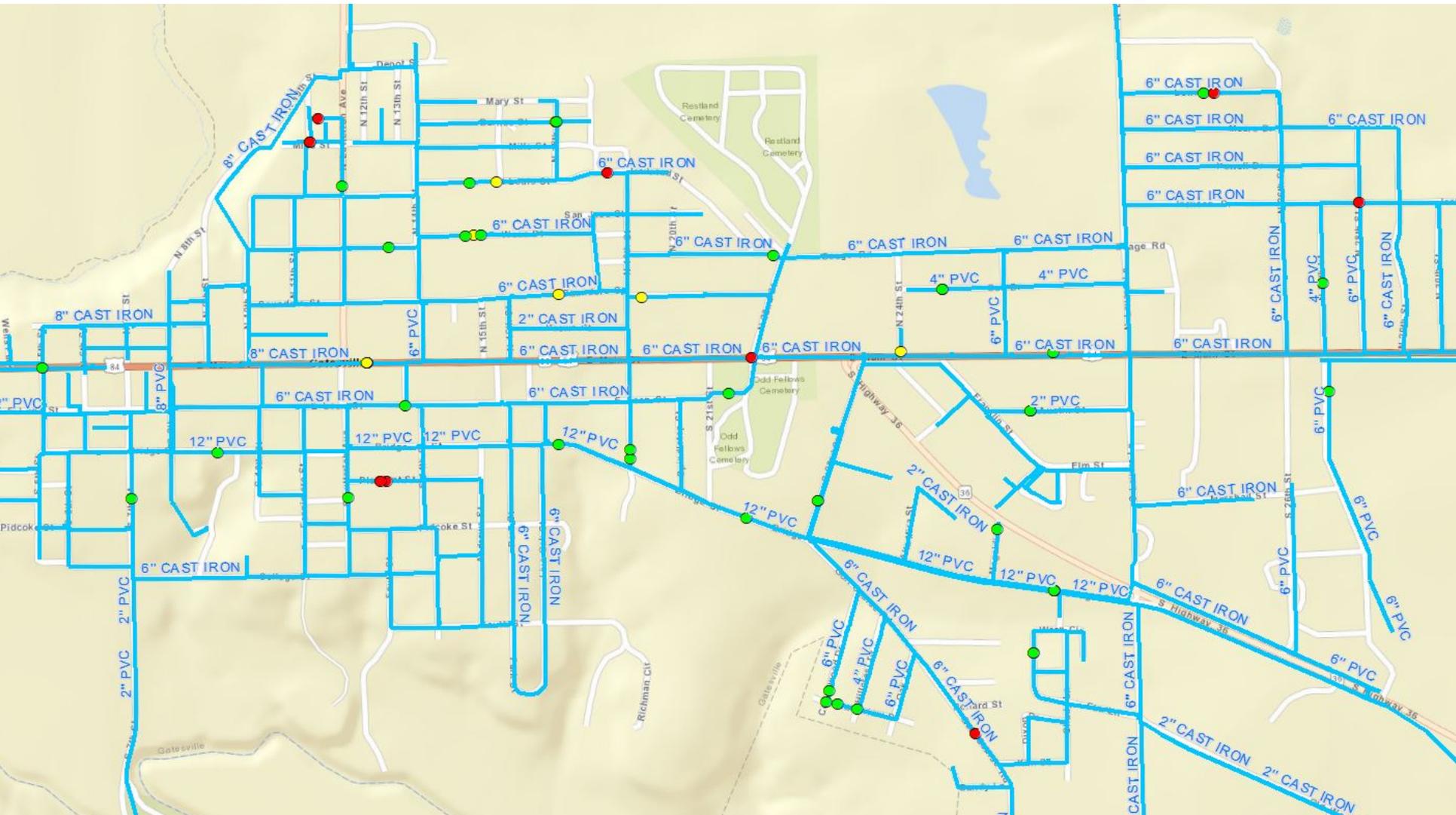


Example: Risk Analysis in Hawaii

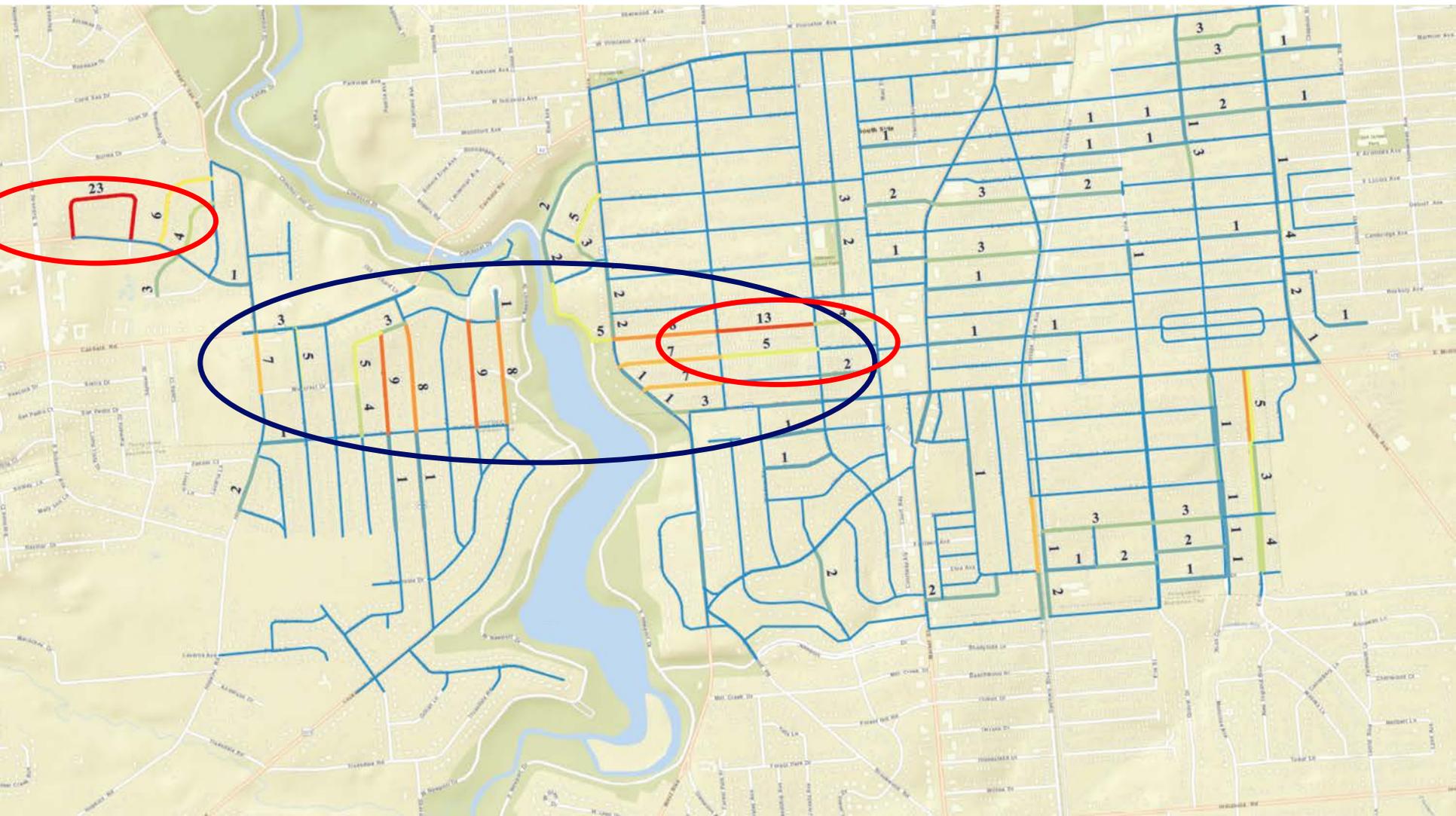




Adding Time: Level of Service



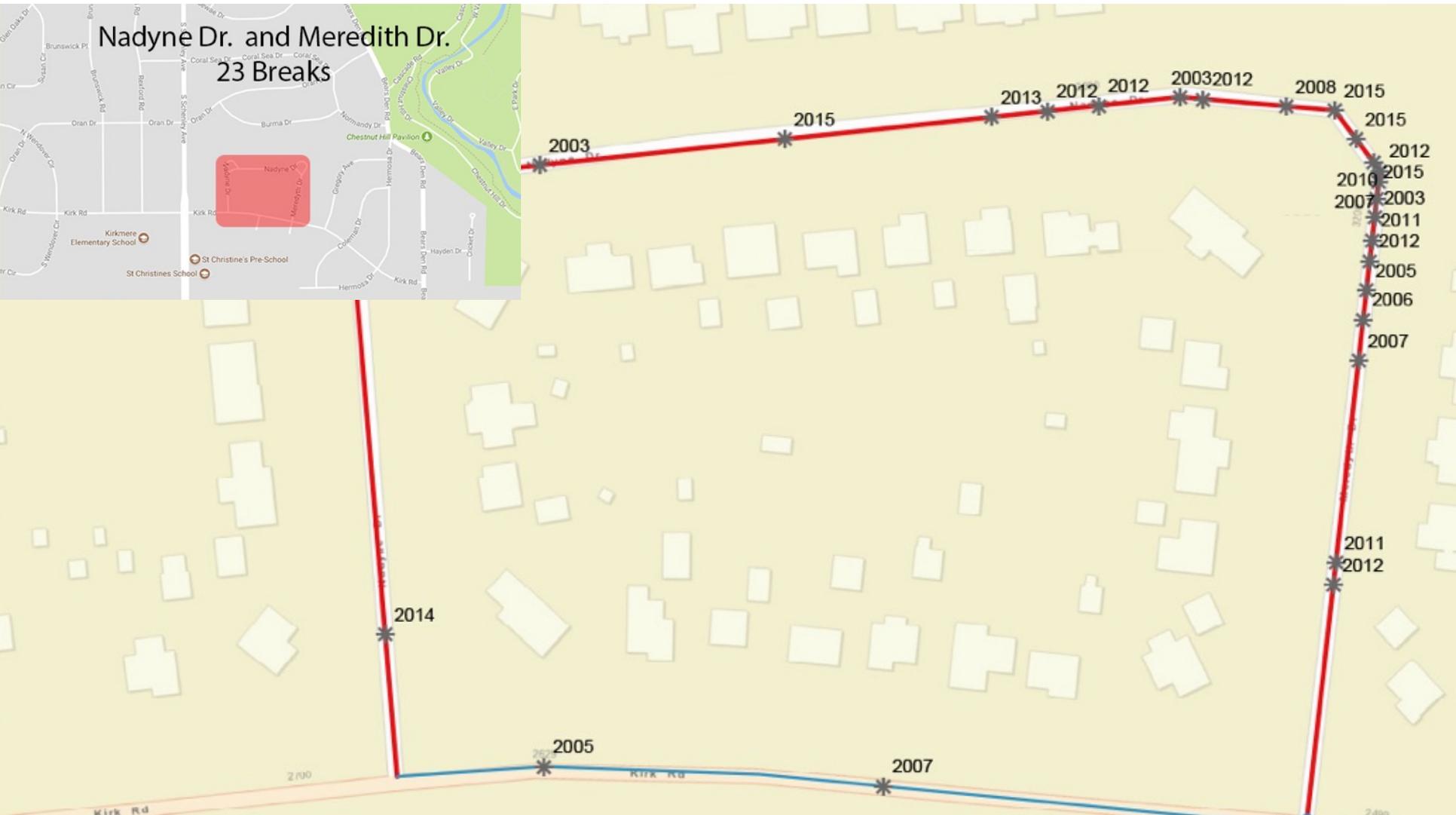
Adding Time: Break Frequency



Adding Time: Break Frequency

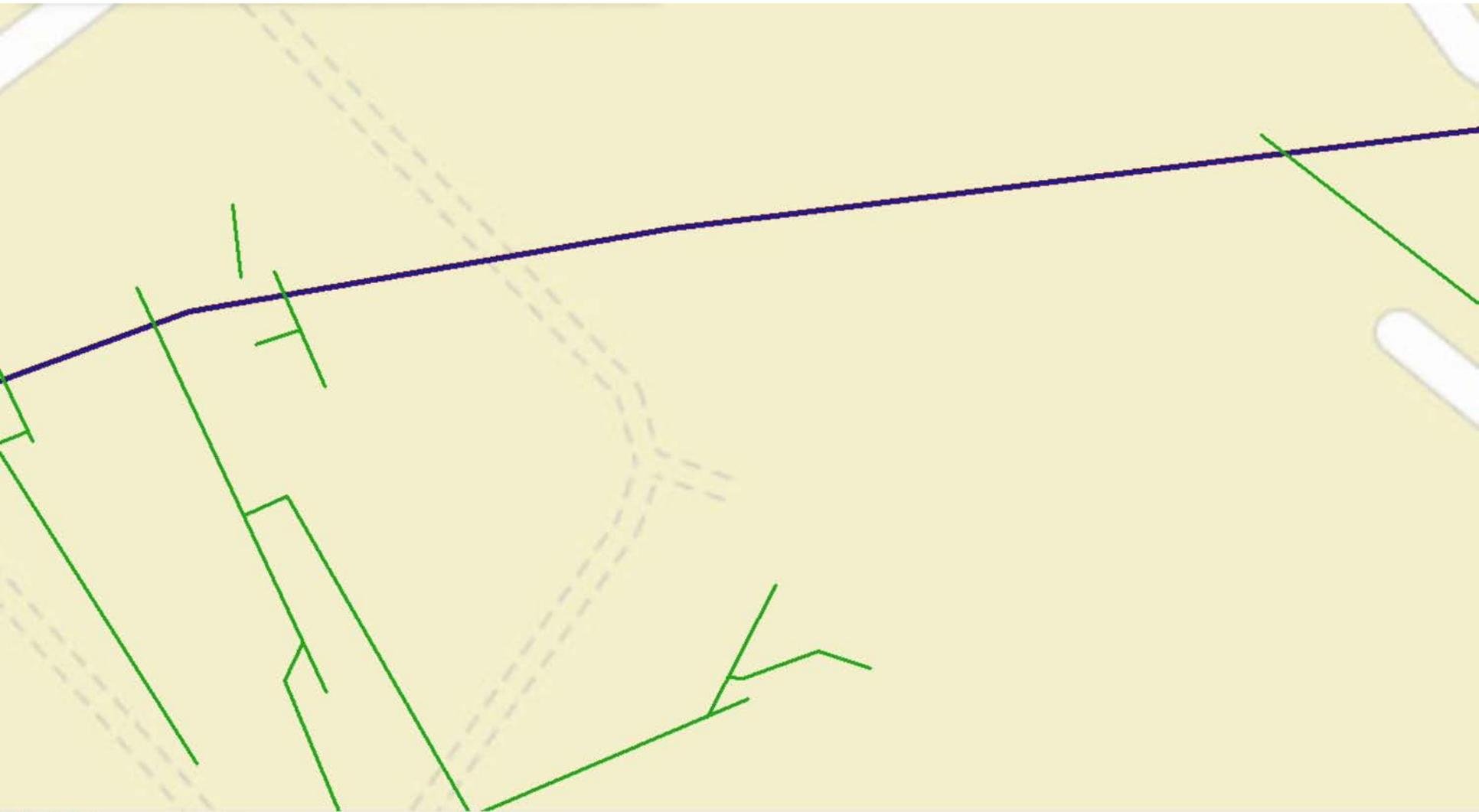


Adding Time: Break Frequency





Visualizing Time – Chasing Breaks



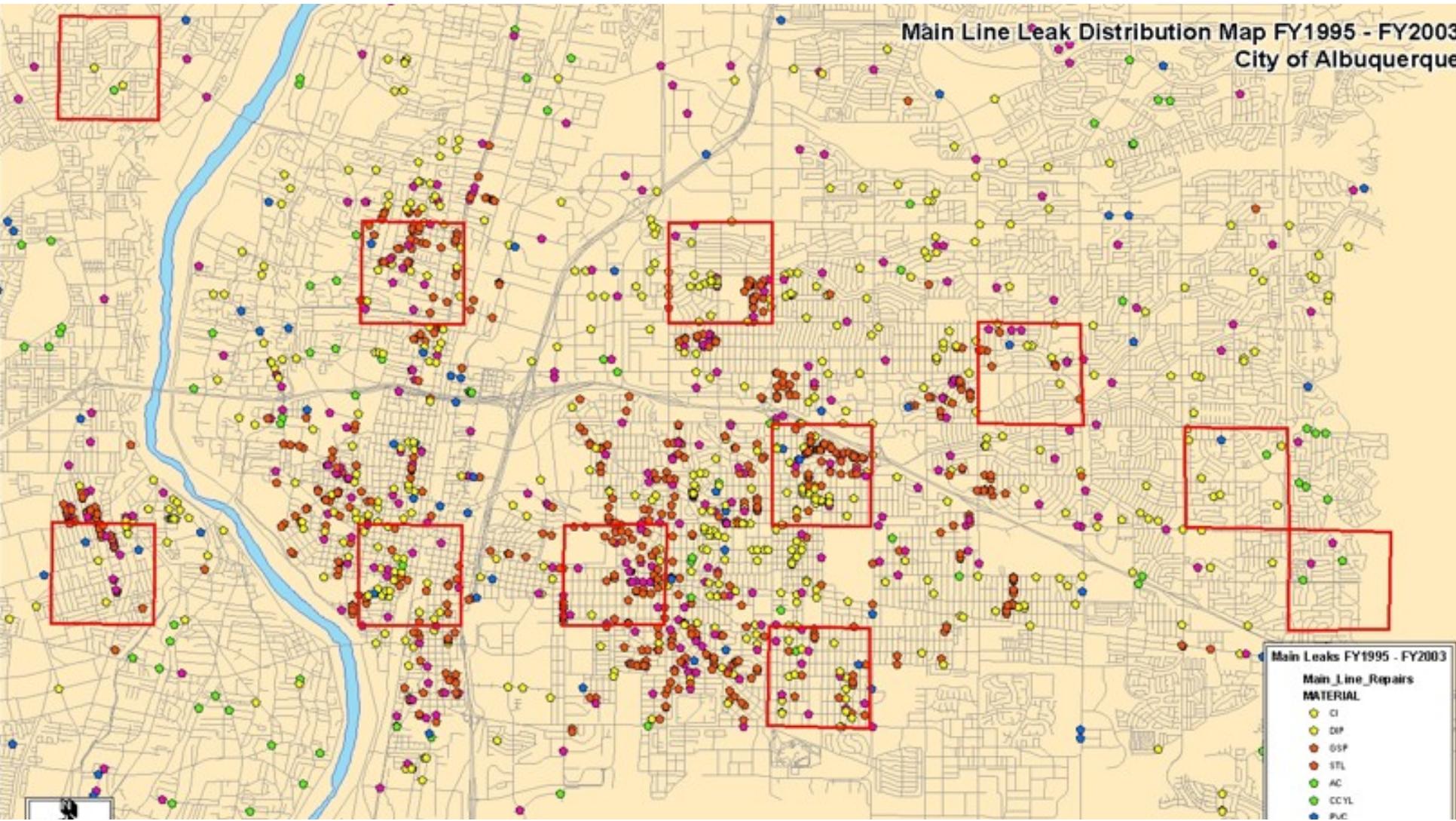


ABCWUA Steel Water Lines Study



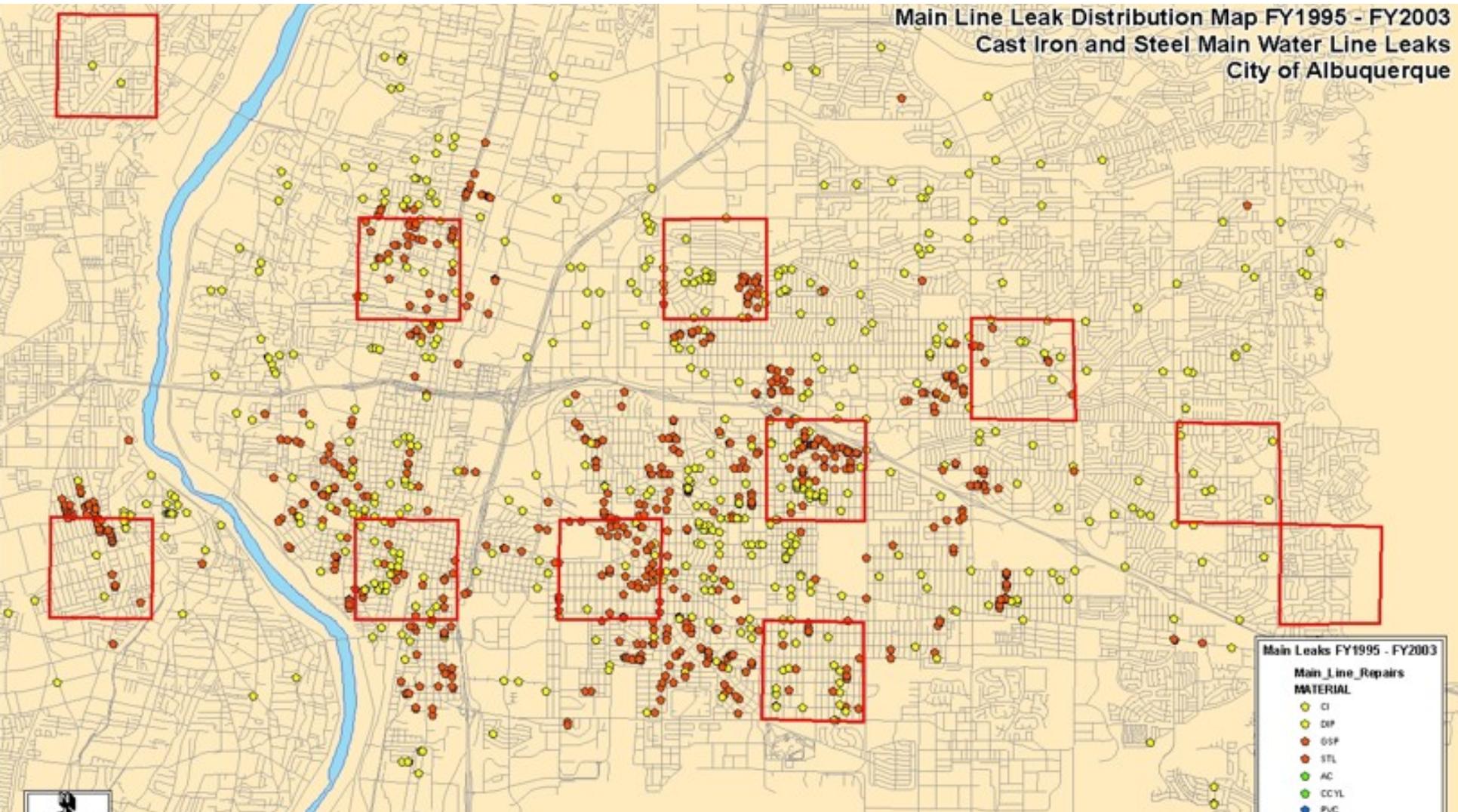


Plot breaks from work order system

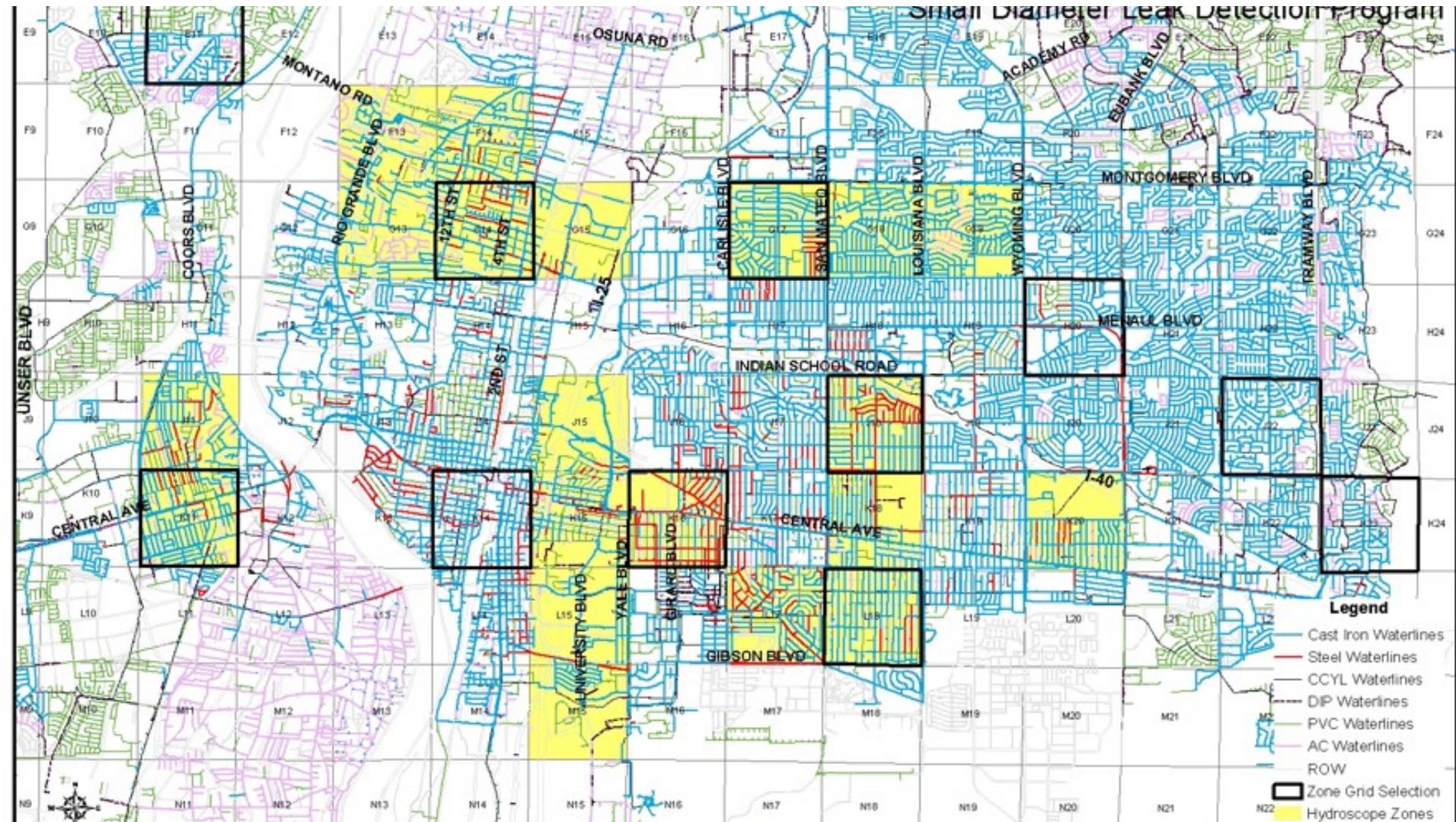




Isolate Breaks on Steel and Ductile Iron

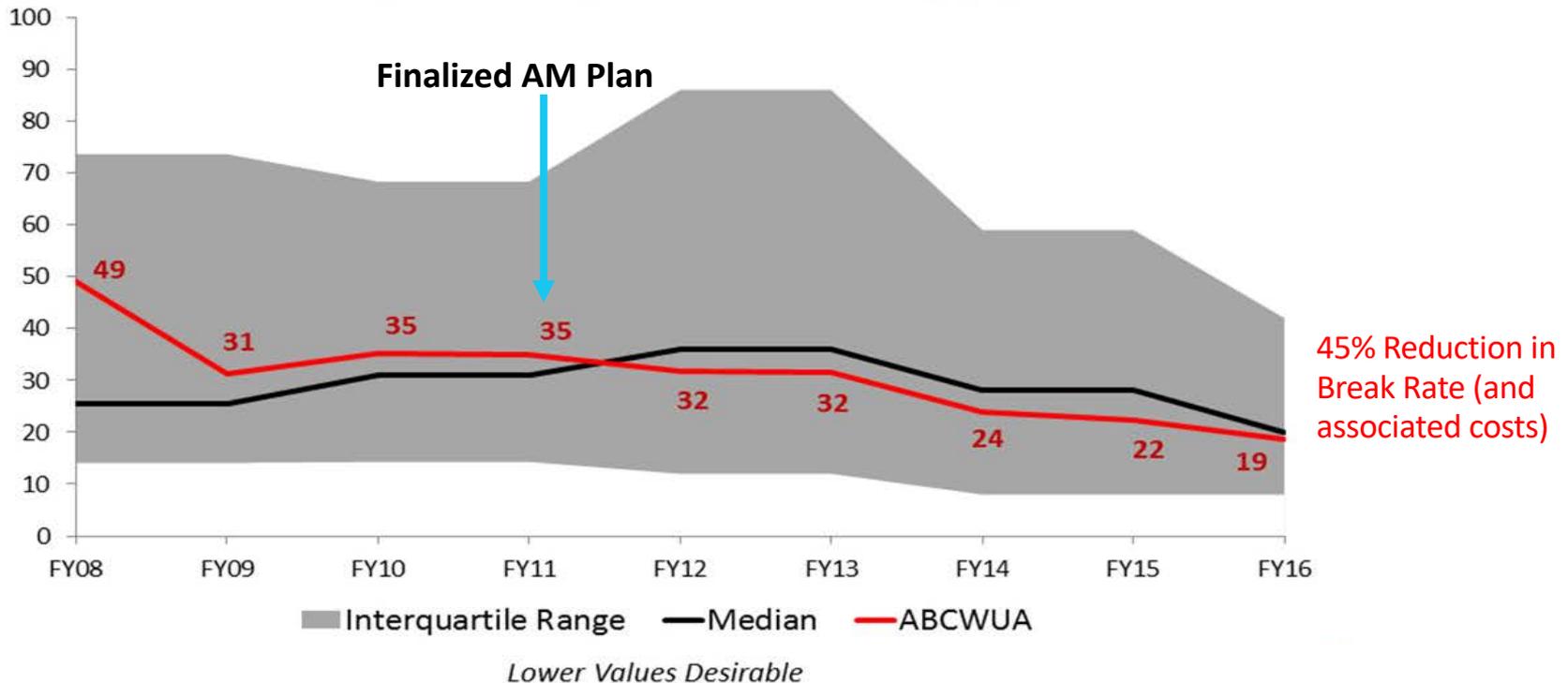


Compare to quantities of pipe



Change the replacement strategy

Water Line Integrity *Leaks/breaks per 100 miles of pipe*





Data Collection

Data sources, collection options and other considerations



Leverage your data... for your maps



An Excel Call Log

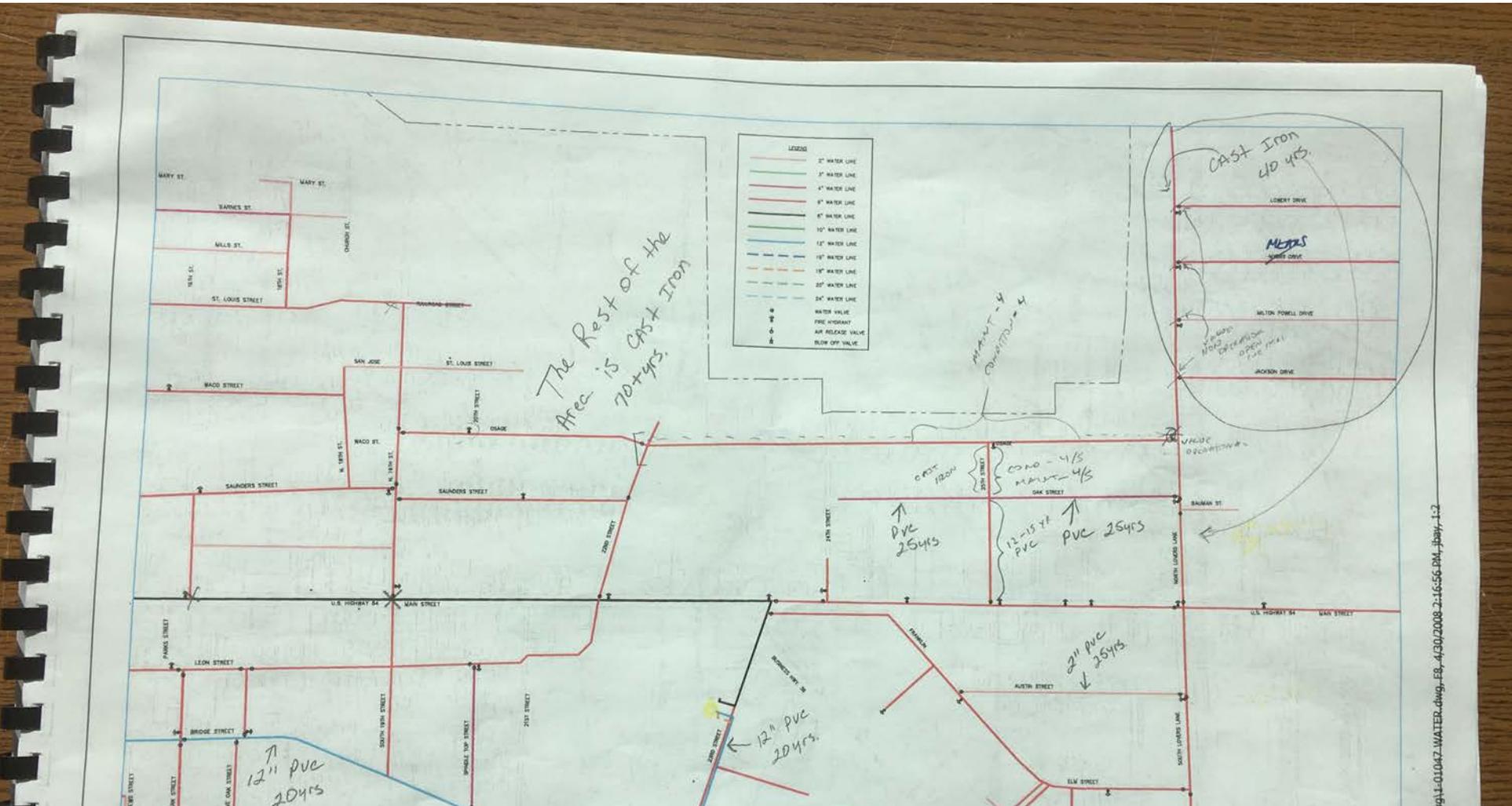
	A	B	C	D	E	F	G	H	I
1	WATER & SEWER LEAK CALL LOG								
2	WA/SE	DATE	TIME	ADDRESS	USER	CALLED	NOTES	UPDATES	WORK TICKET #
3	WA	2/9/2016	10:38AM	OLD HILLSIDE NURSING HOME	BH	RM	FIRE HYDRANT RUNNING	CREW WORKING ON LINE PER RM @ 10:50AM	48674
4	STREET	2/9/2016	11:24AM	1008 PLEASANT	DD	RM	LEAK IN THE STREET	FIXED	48642
5	SE	2/10/2016	10:00AM	400 FINNIMORE	BH	RM	SEWER BACKED UP AT STREET	UNCLOGGED	48683
6	WA	2/10/2016	10:00AM	3502 RIVER ROAD	BH	RM	A CAR HIT THE FIRE HYDRANT	FIXED DA/CN 2-22-16	48644
7	WA	2/10/2016	10:00AM	CORNER OR 22ND AND WACO	BH	RM	LEAK FILLING UP CULVERT		
8	SE	2/10/2016	10:36AM	2015 WACO STREET	DD	RM	RAW SEWER SHOOTING UP IN AIR FROM CLEAN OUT	UNCLOGGED	48684
9	WA	2/10/2016	3:15PM	1105 S LOVERS LANE	BH	RM	METER LEAK	FIXED	48647
10	WA	2/10/2016	3:30PM	206 FIELDSTONE	DD	RM	LEAK-METER WAS RUN OVER BROKE CUTOFF	FIXED	48648
11	WA	2/10/2016	3:32PM	119 N 28 ST	BH	RM	LEAK @ METER	FIXD	48649
12	WA	2/10/2016	3:57PM	119 N 28 ST	BH	RM	CUSTOMER CALLED AGAIN AND SAID METER LEAK WAS VERY LARGE. CALLED RODNEY TO LET HIM KNOW	FIXED	48649
13	WA	2/11/2016	9:00AM	28TH AND MEARS	BH	RM	WATER SHOOTING OUT OF MANHOLE	FIXED	48687
14	WA	2/11/2016	9:00AM	BLESSINGS BUILDING	BH	RM	WATER LEAK BEHIND BUILDING	FIXED	48671
							CALLED LAST NIGHT AT 8 AND THEY		



Leverage your maps... for your data

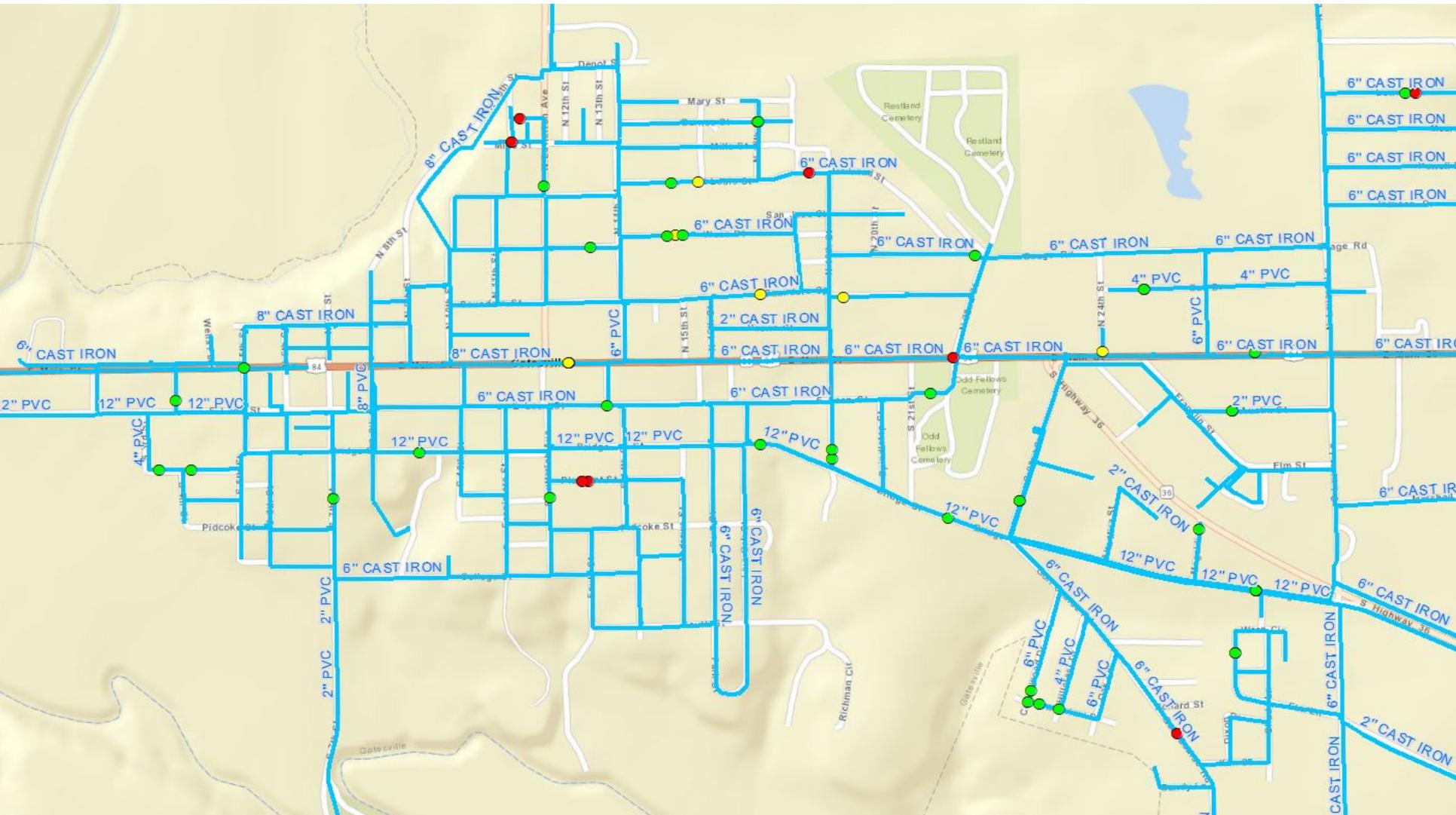


A physical map book





An digital map in another format





Data Sources (it's not all in the field)

- Existing as-builts (or “as-we-wish-it-was-builts”)
- Billing software
- Work order system
- Field data collection for visible assets
- Field data collection for underground assets
- Many other sources...



Some considerations

Some data you'll use wasn't generated for mapping.

It may be great for its intended purpose but...

there will be issues/anomalies/inaccuracy/concerns.

Over time you can change how you collect data.



“Field” vs “Office” Example: Valves

Office Data:

From as-builts and associated docs:

- Type
- Size
- Manufacturer
- Closing direction
- Purchase Date
- Install date
- Warranty information
- Approximate location

Field Data:

- GPS coordinates
- Pictures of valve can
- Pictures for orientation
- Video/Audio detailing crucial information

Work Order System:

- How often exercised
- When last exercised
- Condition assessment



“Field” vs “Office” Example: Meters

Office Data:

From as-builts and associated docs:

- Type
- Size
- Manufacturer
- Purchase Date
- Install date
- Warranty information
- Approximate location

Field Data:

- GPS coordinates
- Pictures of valve can
- Pictures for orientation
- Video/Audio detailing crucial information

Billing System:

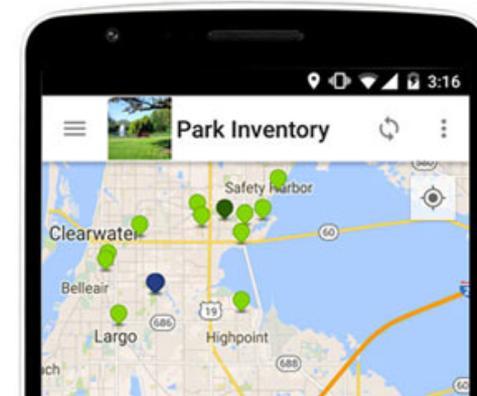
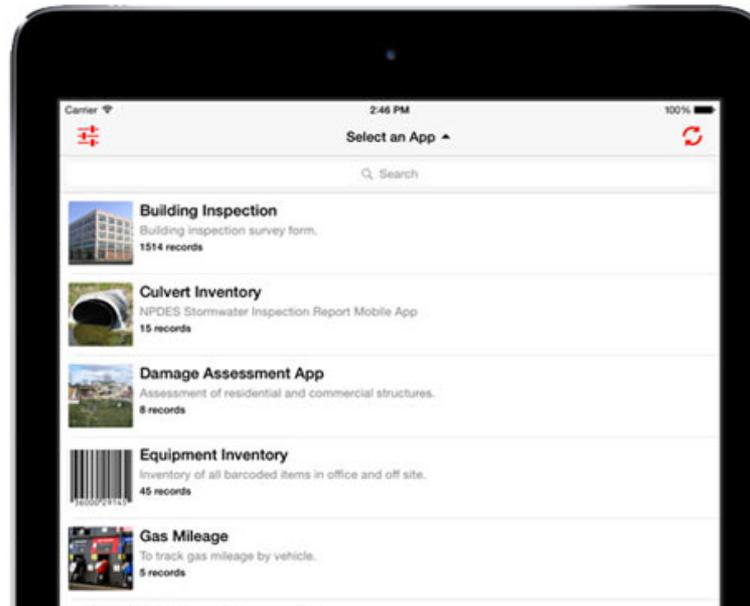
- Serial Number
- Radio Read ID
- Customer number
- Install date



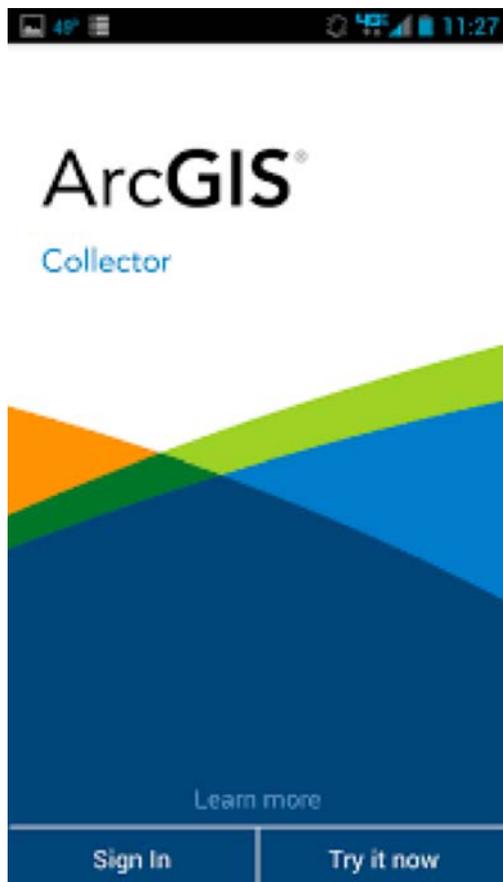
Data Collection Tools



Equipment &
Software:
How to
choose?



Data Collection Applications



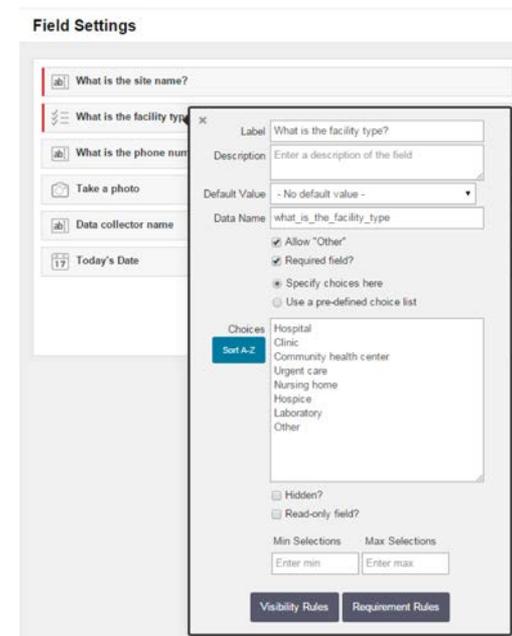
ArcGIS®
Collector

Learn more

Sign In Try it now



- QField Installation Guide
- Concepts
- Android: Special File Access Notes
- Supported data formats
- Raster data
- QField Project Management
- Configure Map Themes
- Portable Project
- Vector Layer Settings
- QField User Guide
- Change the active Map Theme
- Global variables
- Development and support
- QFieldSync plugin
- River State Survey Using QField



Field Settings

What is the site name?

What is the facility type?

What is the phone number?

Take a photo

Data collector name

Today's Date

Label: What is the facility type?

Description: Enter a description of the field

Default Value: - No default value -

Data Name: what_is_the_facility_type

Allow "Other"

Required field?

Specify choices here

Use a pre-defined choice list

Choices: Hospital, Clinic, Community health center, Urgent care, Nursing home, Hospice, Laboratory, Other

Hidden?

Read-only field?

Min Selections: Enter min Max Selections: Enter max

Visibility Rules Requirement Rules

Data Collection Applications



Fields

- Basic
 - Text
 - Numeric
 - Yes / No
 - Date
 - Time
- Choice
 - Single Choice
 - Multiple Choice
 - Classification Field
- Design
 - Section
 - Repeatable
 - Label
- Media
 - Signature
 - Photos
 - Videos
 - Audio
- Advanced
 - Address
 - Hyperlink
 - Calculation
 - Barcode
 - Record Link

Fields

- ID Number
- Asset Class or Category
- Photos
- Videos
- Audio
- Sub Asset Class or Category - TBD
- Asset Name - TBD
- Type - TBD
- Size
- Length
- Manufacturer
- Model Number
- Serial Number
- Location Description
- Condition Rating
- Operational Status
- Maintenance Rating
- POF
- COF

Settings

Label: Asset Class or Category
Description: Type of Asset
Default Value: - No default value -
Data Name: asset_class_or_category

Allow 'Other'
 Required field?
 Specify choices here
 Use a pre-defined choice list

Choices: Customer Meter, Master Meter, Hydrant, Hydrant Valve, Isolation Valve, Water Line, Sewer Line, Water Line Man Hole, Sewer Line Man Hole

Hidden?
 Read-only field?
 Default to previous value?

Min Selections: Enter min | Max Selections: Enter max

Visibility Rules | Requirement Rules

Settings

- Title (ID Number)
- Table Status Field
- Status Field (Disabled)
- Location Settings (Enabled)
- Data Events

Save and Exit | Save and Continue

This app has existing data. You can make changes to this form, but removing fields will cause existing data in those fields to become unavailable. If you need to make more than a few changes, consider duplicating the app before making your changes.

See the reference manual to learn more about how to use the app designer.



Fulcrum - Mobile Location Lev x JAMES

Secure https://web.fulcrumapp.com/apps/1d1ac142-d6dd-483e-89ba-7b08db74a875/edit

fulcrum Pipe Breaks

Preview App UNM

Fields: 27 Settings

Fields

- Basic
 - Text
 - Numeric
 - Yes / No
 - Date
 - Time
- Choice
 - Single Choice
 - Multiple Choice
 - Classification Field
- Design
 - Section
 - Repeatable
 - Label
- Media
 - Signature
 - Photos
 - Videos
 - Audio
- Advanced
 - Address
 - Hyperlink
 - Calculation
 - Barcode
 - Record Link

Layout

- Work Order Number
- Pipe Asset ID
- Pipe Material
- Pipe Diameter
- Photos
- Videos
- Audio
- Break Type
- Break Cause
- Repair Type
- Longitudinal Crack Length
- Corrosion Hole Size
- Circumference Crack Percentage
- Circumference Crack Length
- Break Size
- Condition of Pipe Near Break
- Date Reported
- Time Reported
- Date Leak Isolated
- Time Leak Isolated
- Date Repair Completed
- Time Repair Completed
- test calc
- Water Pressure
- Direction of Flow
- Estimated Water Loss
- Calculated Water Loss Estimate

Settings

App Name: Pipe Breaks

Description: A data collection app for pipe breaks

App Status: Active

Record Title: Title (Pipe Material)

Enable Status Field: Status Field (Disabled)

Location Settings: Location Settings (Enabled)

Data Events: Data Events

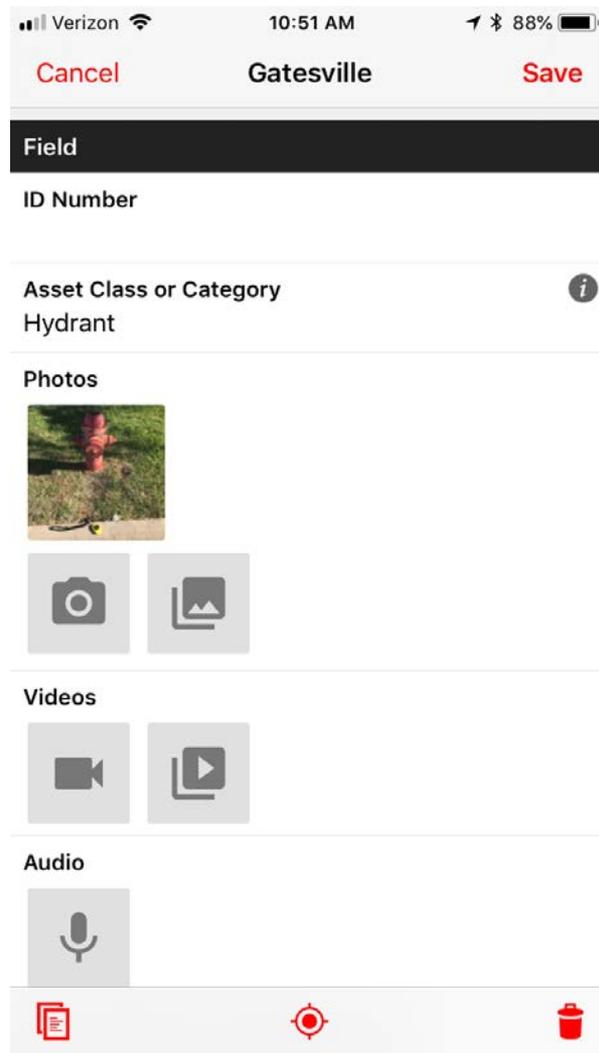
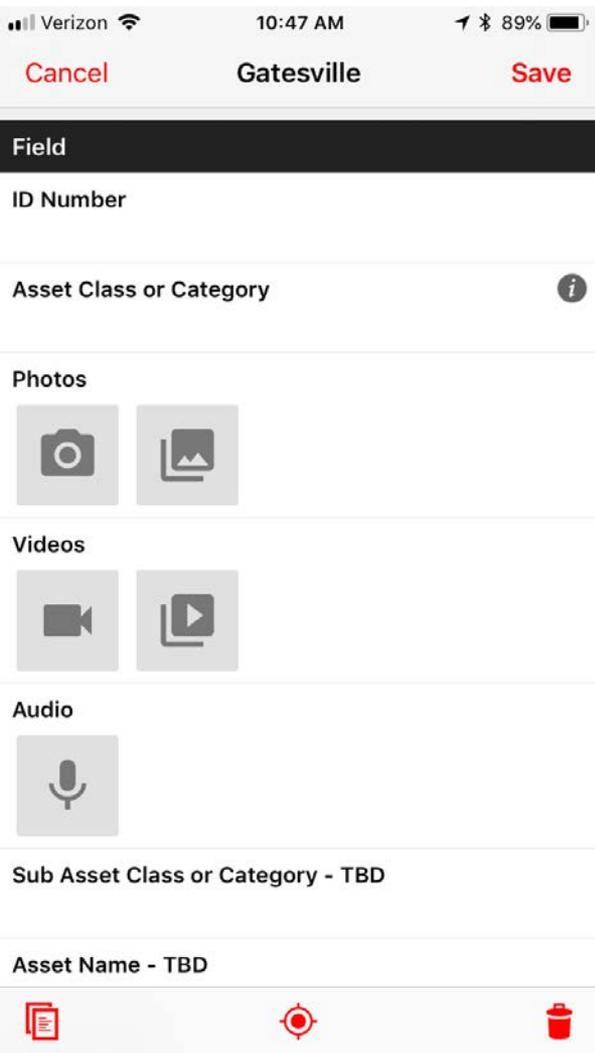
Save and Exit Save and Continue

This app has existing data.
You can make changes to this form, but removing fields will cause existing data in those fields to become unavailable. If you need to make more than a few changes, consider duplicating the app before making your changes.

See the [reference manual](#) to learn more about how to use the app designer.



fulcrum In the Field



Basic Collected Data

The screenshot displays the Fulcrum web interface for mobile location data. The browser address bar shows the URL: <https://web.fulcrumapp.com/dash/20a04b23-7f22-4b24-ae1c-7ff7fe3a7473?mode=map&z=17&lat=31.436761&lon=-97.721008>. The page title is "Fulcrum - Mobile Location Lev" and the user is identified as "JAMES".

The interface includes a search bar with the text "Search your data..." and a notification that there are "504 records". A "Filter Data" sidebar on the left provides options for filtering records by update date:

- Record Updated
- All
- Today 08/16/2018
- Yesterday 08/15/2018
- Last 7 days 08/09/2018 - 08/16/2018
- Last 30 days 07/17/2018 - 08/16/2018
- This Month 08/01/2018 - 08/31/2018
- Last Month 07/01/2018 - 07/31/2018
- Specific Range

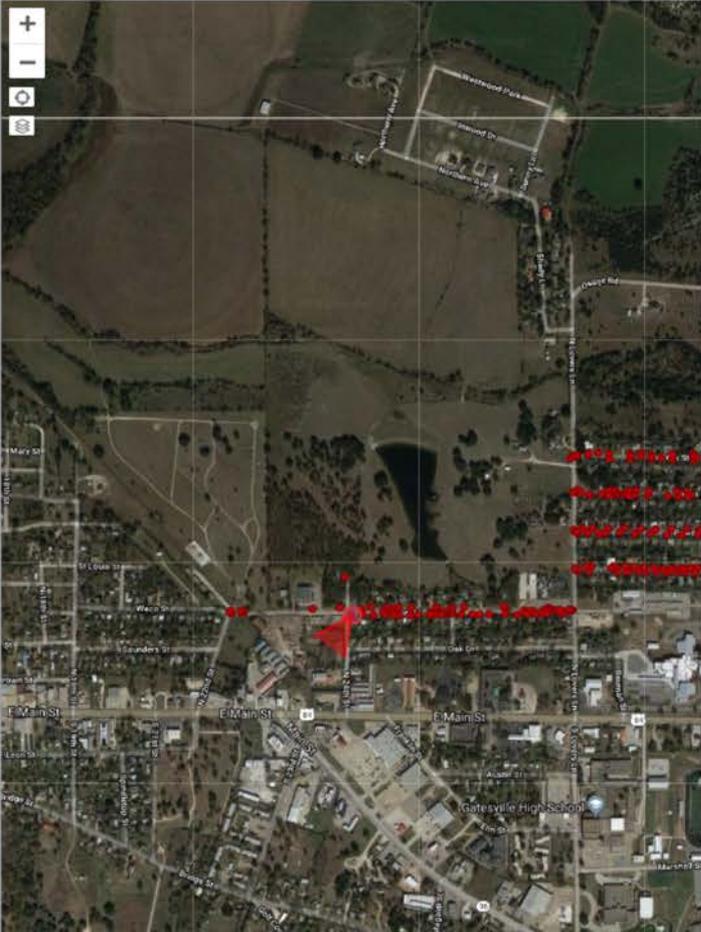
Below the filter options are input fields for "Start date" and "End date". The main map area shows an aerial view of a residential neighborhood in Gatesville, Texas, with numerous red circular markers representing collected location data points. The markers are densely packed along several streets, including Main St, Jackson Dr, and various residential streets. A "No Title" tooltip is visible over one of the markers. The map also shows landmarks such as "Gatesville Elementary School" and "Gateville Fitness Center".

Viewing an Individual Record

Fulcrum - Mobile Location Lev X JAMES

Secure | <https://web.fulcrumapp.com/dash/20a04b23-7f22-4b24-ae1c-7ff7fe3a7473?mode=split&z=17&lat=31.436761&lon=-97.721008>

Captured by James Markham near Osage Road, Gatesville a year ago



Download

- [Original](#)
- [Large](#)
- [Thumbnail](#)

Metadata

Date:	2017-04-06 10:36:46
Make/Model:	Apple iPhone 6s
Software:	Fulcrum iOS 2.13.0 (2980), iOS 10.2.1, Apple, iPhone 6s
Dimensions:	610 x 1080 (0.9MP)
Size:	409 KB
Latitude:	31.436925
Longitude:	-97.730539
Accuracy:	5.0m
Altitude:	247.4m
Direction:	215°
Distance:	1.1m



Bells and Whistles ...



Exporting Data

fulcrum UNM

Gatesville

Last activity over 1 year ago

887 records

4 contributors

Records
View/Edit Data

Designer
Edit App Structure

Importer
Import Data

Exporter
Export Data

Duplicate App

Activity Settings Members Data Share

	Mark Ogrentz submitted 19 records 1 year ago	19 created 0 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	0 created 1 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	0 created 1 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	0 created 1 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	1 created 0 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	0 created 1 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	0 created 1 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	1 created 0 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	1 created 0 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	1 created 0 updated 0 deleted
	Mark Ogrentz submitted 1 record 1 year ago	0 created 1 updated 0 deleted

1 2 3 4 ... Next Last

Export Formats

The screenshot shows the Fulcrum web application interface. At the top, there is a navigation bar with the Fulcrum logo and a user profile icon labeled 'JAMES'. Below the navigation bar, the main content area is titled 'Exporter'. A red box highlights the export configuration section, which includes a status message: 'With your current filters, the export will contain 887 record(s)'. The 'File Format' dropdown menu is open, showing a list of export options: CSV (.csv) (selected), Excel XLSX (.xlsx), ESRI File Geodatabase (.gdb), ESRI Shapefile (.shp), Spatialite (.sqlite), SQLite (.sqlite), PostGIS (.sql), KML (.kml), and GeoJSON (.geojson). To the right of the dropdown, there is a list of supported export formats: CSV (.csv), Excel XLSX (.xlsx), ESRI File Geodatabase (.gdb), ESRI Shapefile (.shp), Spatialite (.sqlite), SQLite (.sqlite), PostGIS (.sql), KML (.kml), and GeoJSON (.geojson). Below this list, there is a note: 'Optionally, you may also export your photos. The photos will be included in a folder, and the photo names will be referenced in the export.' and a link to 'the documentation'. At the bottom of the page, there is a section titled 'Apps' with a 'Toggle all' button and a list of application names, including 'Alcalde MDWCA Water System', 'AlcaldeTEST', 'Blank Test', 'COH', 'COH Backup App', 'COH Data Collection Demo', 'COH Data Collection - Demo', 'CoH Data Collection - WW', 'CoH Data Collection WWD', 'CoH Data Collection - WWD OLD', 'CoH Data Collection - WWD V1', 'COH DC Demo', 'CoH - Technology Infrastructure', 'COH Test App', 'COH Test App 2', 'CoH WW', 'CRRUA actual backup', 'CRRUA Fix Address', 'CRRUA Hydrants', 'CRRUA Hydrants Incomplete', 'CRRUA Main Wastewater Treatment Plant', 'CRRUA Map', 'Crrua Map duplicate app', 'Culvert Inventory', 'Data Collection Template', 'El Prado - All Assets', 'example crrua app', and 'equipment'.



Exporter

Please confirm the following settings for exporting your data. Your data export will take some time to process and will be available for download once it is completed.

- Apps: Gatesville
- Export format: KML (.kml)
- Timezone for exported dates: (GMT+00:00) UTC
- Exporting photos: Yes
- Number of records to be exported: 887

Back Finish



Understand and Document Accuracy

Be clear about and document:

- Data Sources
- Collection Methods
- Accuracy Variances



Mapping Platforms

Basic Visualization vs GIS, and an overview of pay vs open source options



Basic Visualization

fulcrum

Can be used for
both data
collection and
visualization of
point data



Basic Visualization



Google Earth

Google Earth

Fulcrum - Mobile Location Lev x Resources for Google Earth - x JAMES

Secure | https://www.google.com/earth/resources/

Google Earth EARTH FOR CHROME EARTH PRO ON DESKTOP RESOURCES

Earth for Chrome

Explore the world, right in your browser.

[LAUNCH GOOGLE EARTH](#)

[HELP CENTER](#)

[KML SUPPORT](#)

Earth Pro on Desktop

Advanced tools for pros.

[DOWNLOAD](#)

[TUTORIALS](#)

[HELP CENTER](#)

Frequently Asked Questions



Visualization

Google Earth

[EARTH FOR CHROME](#)

[EARTH PRO ON DESKTOP](#)

[RESOURCES](#)

Earth Pro on desktop

Create maps with advanced tools on PC, Mac, or Linux.

- Compute distances and areas using measurement tools
- Visualize, manipulate and export GIS data
- Use Movie Maker to produce media collateral
- Manipulate and export GIS data
- Go back in time with historical imagery

[DOWNLOAD](#)





Chrome Browser Option

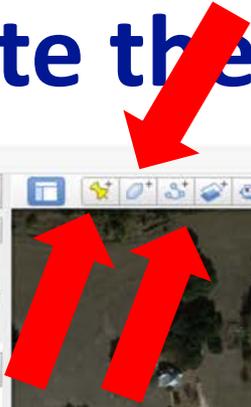


Google Earth

Loading in progress. 4.26 billion of 4.54 billion years processed.



Create the Map in Google Earth Pro



The screenshot displays the Google Earth Pro interface with a water network map overlaid on a satellite view. The map features a grid of blue lines representing water mains and numerous blue circular markers with white centers, each labeled with a unique identifier such as WSRV-72, WSRV-102, WSRV-111, WSRV-112, WSRV-113, WSRV-114, WSRV-115, WSRV-116, WSRV-117, WSRV-118, WSRV-119, WSRV-120, WSRV-121, WSRV-122, WSRV-123, WSRV-124, WSRV-125, WSRV-126, WSRV-127, WSRV-128, WSRV-129, WSRV-130, WSRV-131, WSRV-132, WSRV-133, WSRV-134, WSRV-135, WSRV-136, WSRV-137, WSRV-138, WSRV-139, WSRV-140, WSRV-141, WSRV-142, WSRV-143, WSRV-144, WSRV-145, WSRV-146, WSRV-147, WSRV-148, WSRV-149, WSRV-150, WSRV-151, WSRV-152, WSRV-153, WSRV-154, WSRV-155, WSRV-156, WSRV-157, WSRV-158, WSRV-159, WSRV-160, WSRV-161, WSRV-162, WSRV-163, WSRV-164, WSRV-165, WSRV-166, WSRV-167, WSRV-168, WSRV-169, WSRV-170, WSRV-171, WSRV-172, WSRV-173, WSRV-174, WSRV-175, WSRV-176, WSRV-177, WSRV-178, WSRV-179, WSRV-180, WSRV-181, WSRV-182, WSRV-183, WSRV-184, WSRV-185, WSRV-186, WSRV-187, WSRV-188, WSRV-189, WSRV-190, WSRV-191, WSRV-192, WSRV-193, WSRV-194, WSRV-195, WSRV-196, WSRV-197, WSRV-198, WSRV-199, WSRV-200, WSRV-201, WSRV-202, WSRV-203, WSRV-204, WSRV-205, WSRV-206, WSRV-207, WSRV-208, WSRV-209, WSRV-210, WSRV-211, WSRV-212, WSRV-213, WSRV-214, WSRV-215, WSRV-216, WSRV-217, WSRV-218, WSRV-219, WSRV-220, WSRV-221, WSRV-222, WSRV-223, WSRV-224, WSRV-225, WSRV-226, WSRV-227, WSRV-228, WSRV-229, WSRV-230, WSRV-231, WSRV-232, WSRV-233, WSRV-234, WSRV-235, WSRV-236, WSRV-237, WSRV-238, WSRV-239, WSRV-240, WSRV-241, WSRV-242, WSRV-243, WSRV-244, WSRV-245, WSRV-246, WSRV-247, WSRV-248, WSRV-249, WSRV-250, WSRV-251, WSRV-252, WSRV-253, WSRV-254, WSRV-255, WSRV-256, WSRV-257, WSRV-258, WSRV-259, WSRV-260, WSRV-261, WSRV-262, WSRV-263, WSRV-264, WSRV-265, WSRV-266, WSRV-267, WSRV-268, WSRV-269, WSRV-270, WSRV-271, WSRV-272, WSRV-273, WSRV-274, WSRV-275, WSRV-276, WSRV-277, WSRV-278, WSRV-279, WSRV-280, WSRV-281, WSRV-282, WSRV-283, WSRV-284, WSRV-285, WSRV-286, WSRV-287, WSRV-288, WSRV-289, WSRV-290, WSRV-291, WSRV-292, WSRV-293, WSRV-294, WSRV-295, WSRV-296, WSRV-297, WSRV-298, WSRV-299, WSRV-300.

The interface includes a search bar on the left with the text "ex: Restaurants" and "Get Directions History". Below the search bar is the "Places" panel, which lists "My Places" and includes a "Sightseeing Tour" and a "Water Network Structures" folder containing "Water Fittings" and "DAILY_WORK". The "Layers" panel at the bottom left shows a "Primary Database" folder with "Borders and Labels", "Places", "Photos", "Roads", "3D Buildings", "Ocean", "Weather", "Gallery", "Global Awareness", and "More" sub-items, and a checked "Terrain" layer. The main map area shows a satellite view of a residential area with a blue grid overlay. A tooltip in the top right corner reads "Click and drag to rotate, or click 'N' to reset to north". The Google Earth logo is visible in the bottom right corner.



Then Export to Chrome

Fulcrum - Mobile Location Lev x Google Earth x Fulcrum - Mobile Location Lev x JAMES

Secure | <https://earth.google.com/web/@31.43204213,-97.74551945,243.17504394a,35920.11985945d,35y,0h,0t,0r>

My Places <

IMPORT KML FILE ▾

- ▶ L Line Breaks EDIT
- ▶ W WWTP Site.kmz EDIT
- ▶ W Water Service Connections EDIT
- ▶ W Water Network Structures EDIT
- ▶ W Water Fittings.kmz EDIT
- ▶ W Water Mains EDIT
- ▶ D EDIT
- ▶ D EDIT

Aerial satellite view of a water network. A blue line traces a path through the landscape, with numerous blue circular markers indicating specific locations. Each marker is accompanied by a date label, such as 5/26/2016, 3/23/2016, 7/19/2016, 8/5/2016, 7/25/2016, 5/10/2016, 2/17/2016, 12/29/2016, 9/21/2016, 5/4/2016, 5/10/2016, 7/17/2016, 5/2/2016, 4/29/2016, 5/10/2016, 9/14/2016, 5/10/2016, 3/1/2016, 5/10/2016, 3/14/2016, 3/7/2017, 1/12/2017, 6/21/2016, 2/1/2017, and 8/1/2016. Labels for 'Ater', 'Leon River', 'Alfred D. Hughes Unit', 'Christina Melton Crain Unit', and 'Fort Gates' are also visible on the map.



Styled Map Detail in Chrome

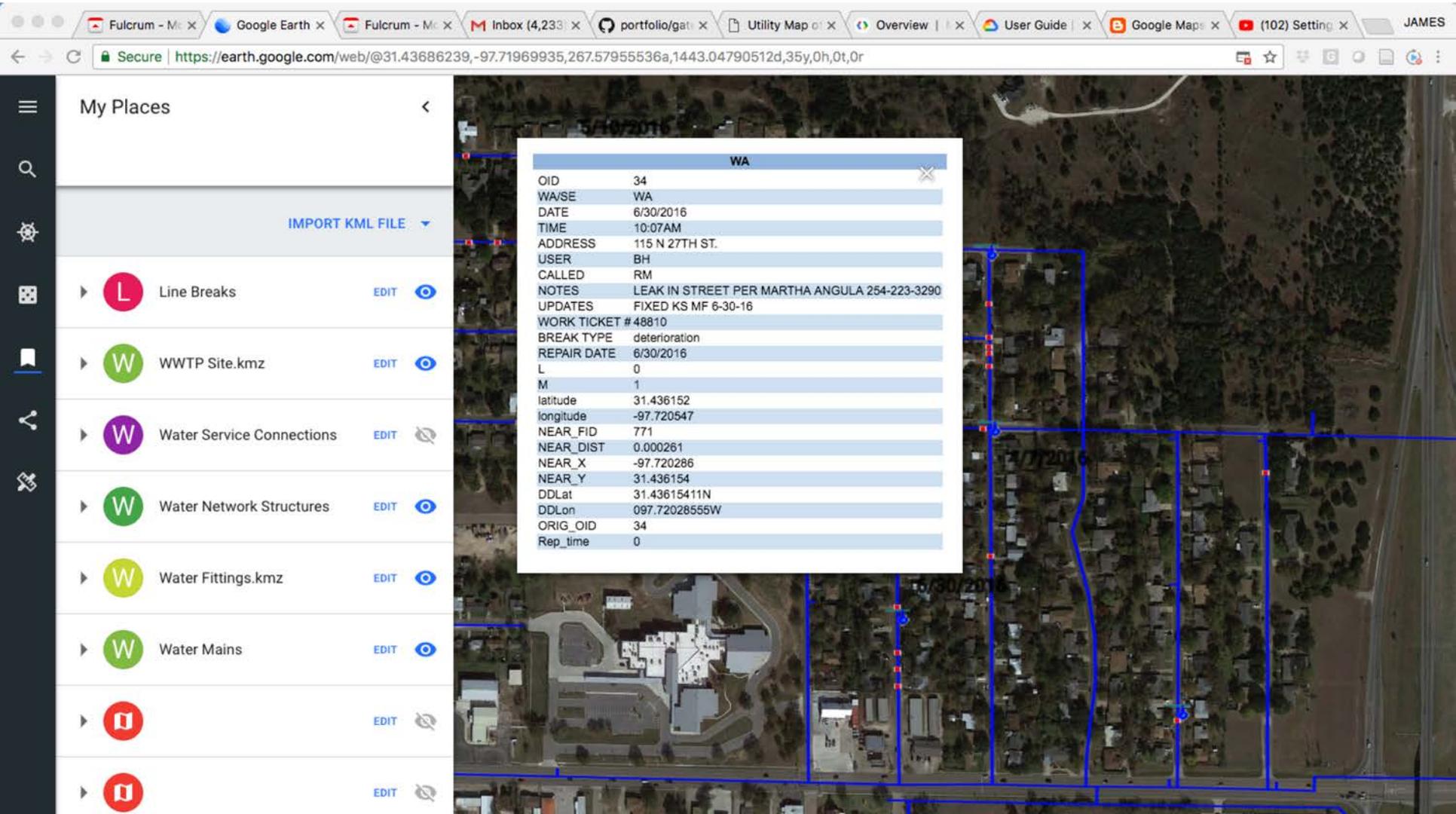
The screenshot displays the Google Earth web interface in a Chrome browser. The browser's address bar shows the URL: <https://earth.google.com/web/@31.43726171,-97.7208327,266.87670011a,1333.76589498d,35y,-0h,0t,0r>. The page title is "Fulcrum - Mobile Location Lev".

On the left side, there is a sidebar titled "My Places" with a search icon and a gear icon. Below the title is an "IMPORT KML FILE" button. A list of saved places is shown, each with a colored circular icon, a name, and an "EDIT" button:

- Line Breaks (Red icon)
- WWTP Site.kmz (Green icon)
- Water Service Connections (Purple icon)
- Water Network Structures (Green icon)
- Water Fittings.kmz (Yellow-green icon)
- Water Mains (Green icon)
- (Red icon)
- (Red icon)

The main map area shows an aerial view of a residential and commercial area. A network of blue lines is overlaid on the map, representing water infrastructure. Numerous blue circular markers are placed along these lines, indicating specific locations or features. The map is viewed from a high angle, showing the layout of the network across the terrain.

Metadata is available



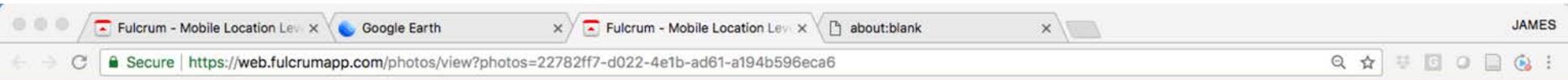
The screenshot shows a web browser window with multiple tabs. The active tab is Google Earth, displaying a map of a residential area with a blue water network overlay. A metadata popup window is open over a specific asset, showing the following information:

WA	
OID	34
WA/SE	WA
DATE	6/30/2016
TIME	10:07AM
ADDRESS	115 N 27TH ST.
USER	BH
CALLED	RM
NOTES	LEAK IN STREET PER MARTHA ANGULA 254-223-3290
UPDATES	FIXED KS MF 6-30-16
WORK TICKET #	48810
BREAK TYPE	deterioration
REPAIR DATE	6/30/2016
L	0
M	1
latitude	31.436152
longitude	-97.720547
NEAR_FID	771
NEAR_DIST	0.000261
NEAR_X	-97.720286
NEAR_Y	31.436154
DDLat	31.43615411N
DDLon	097.72028555W
ORIG_OID	34
Rep_time	0

The left sidebar of the Google Earth interface shows a 'My Places' list with the following items:

- Line Breaks
- WWTP Site.kmz
- Water Service Connections
- Water Network Structures
- Water Fittings.kmz
- Water Mains

Fulcrum Imagery is Linked



fulcrum

UNM



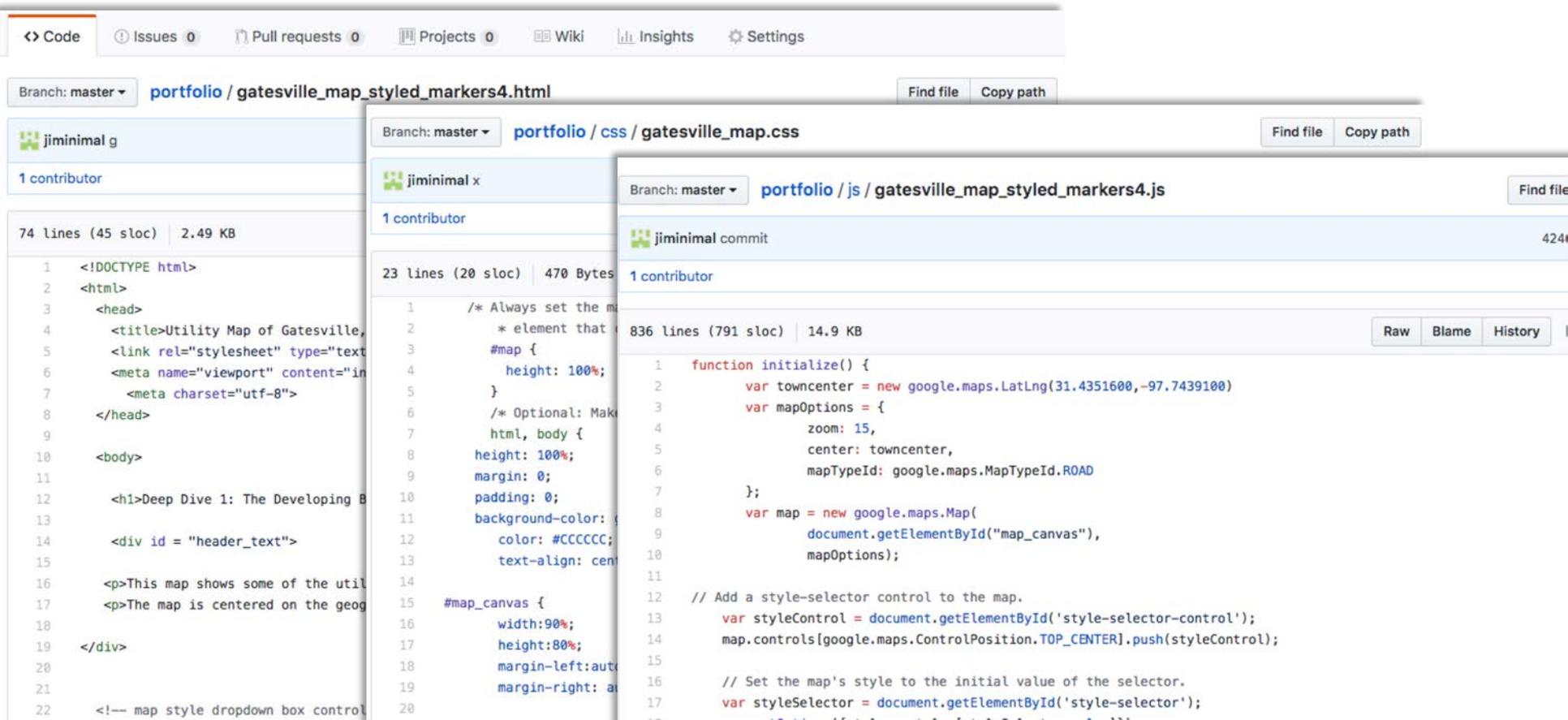


A More Code Heavy Google Option

Do you know, or want to learn html, javascript, and css?

Using Google Maps API/Google Cloud

You need a free Google API Key, and you also need to know how to code (a bit)



The image shows a GitHub repository interface for a project named 'portfolio'. The repository is on the 'master' branch and contains three files related to a Google Maps application:

- gatesville_map_styled_markers4.html**: A 74-line HTML file (45 sloc, 2.49 KB) containing the map's structure, including a title 'Utility Map of Gatesville', a header, and a main content area with a paragraph about the map's location.
- css/gatesville_map.css**: A 23-line CSS file (20 sloc, 470 Bytes) defining styles for the map container and a style-selector control.
- js/gatesville_map_styled_markers4.js**: An 836-line JavaScript file (791 sloc, 14.9 KB) containing the logic to initialize the Google Maps API, set the map's center and zoom, and add a style-selector control.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Utility Map of Gatesville,
    <link rel="stylesheet" type="text
    <meta name="viewport" content="in
    <meta charset="utf-8">
  </head>
  <body>
    <h1>Deep Dive 1: The Developing B
    <div id = "header_text">
    <p>This map shows some of the util
    <p>The map is centered on the geo
  </div>
  <!-- map style dropdown box control
```

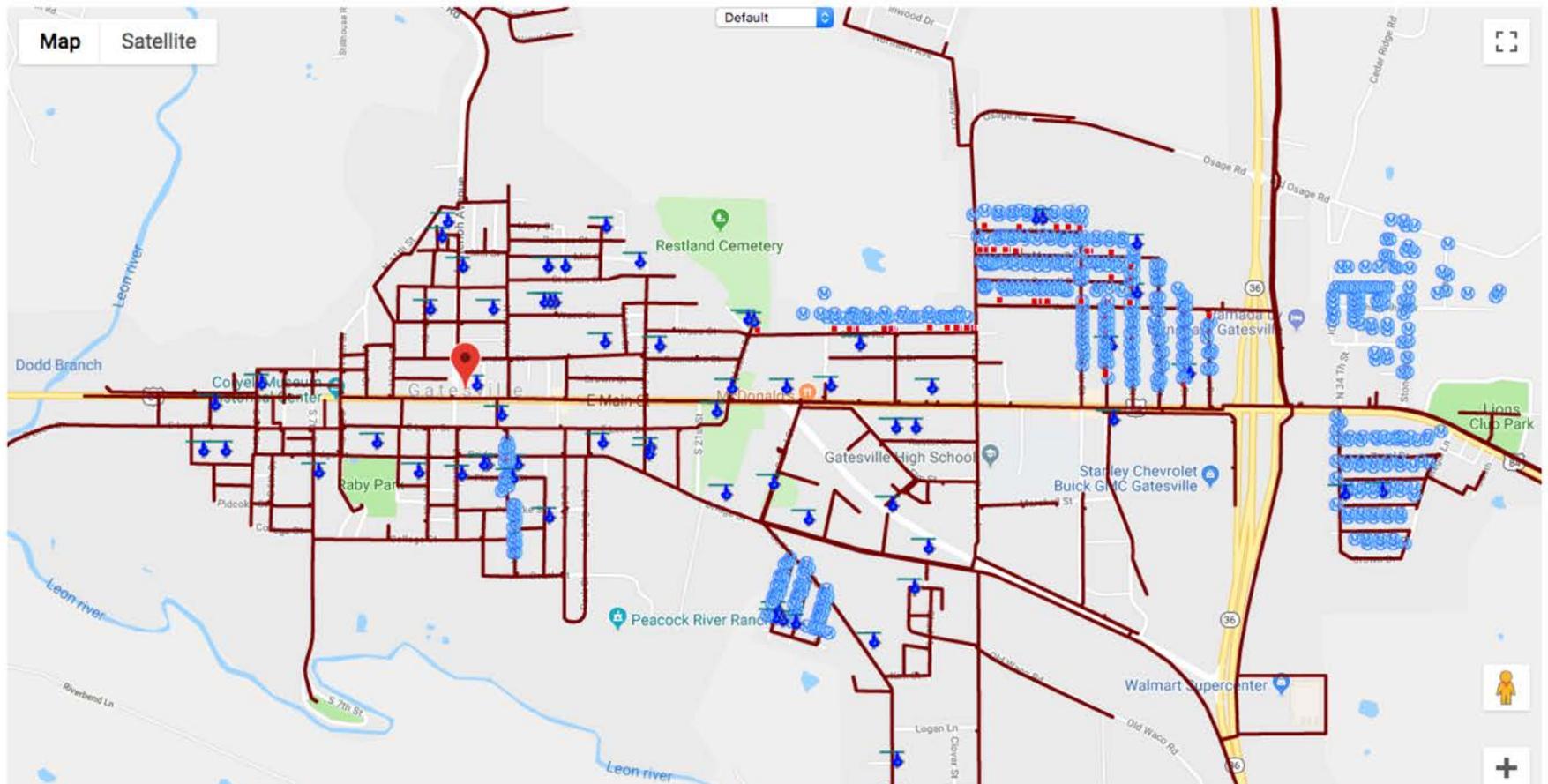
```
/* Always set the m
 * element that
#map {
  height: 100%;
}
/* Optional: Mak
html, body {
height: 100%;
margin: 0;
padding: 0;
background-color:
color: #CCCCCC;
text-align: cent
#map_canvas {
width:90%;
height:80%;
margin-left:auto
margin-right: a
```

```
function initialize() {
  var towncenter = new google.maps.LatLng(31.4351600,-97.7439100)
  var mapOptions = {
    zoom: 15,
    center: towncenter,
    mapTypeId: google.maps.MapTypeId.ROAD
  };
  var map = new google.maps.Map(
    document.getElementById("map_canvas"),
    mapOptions);

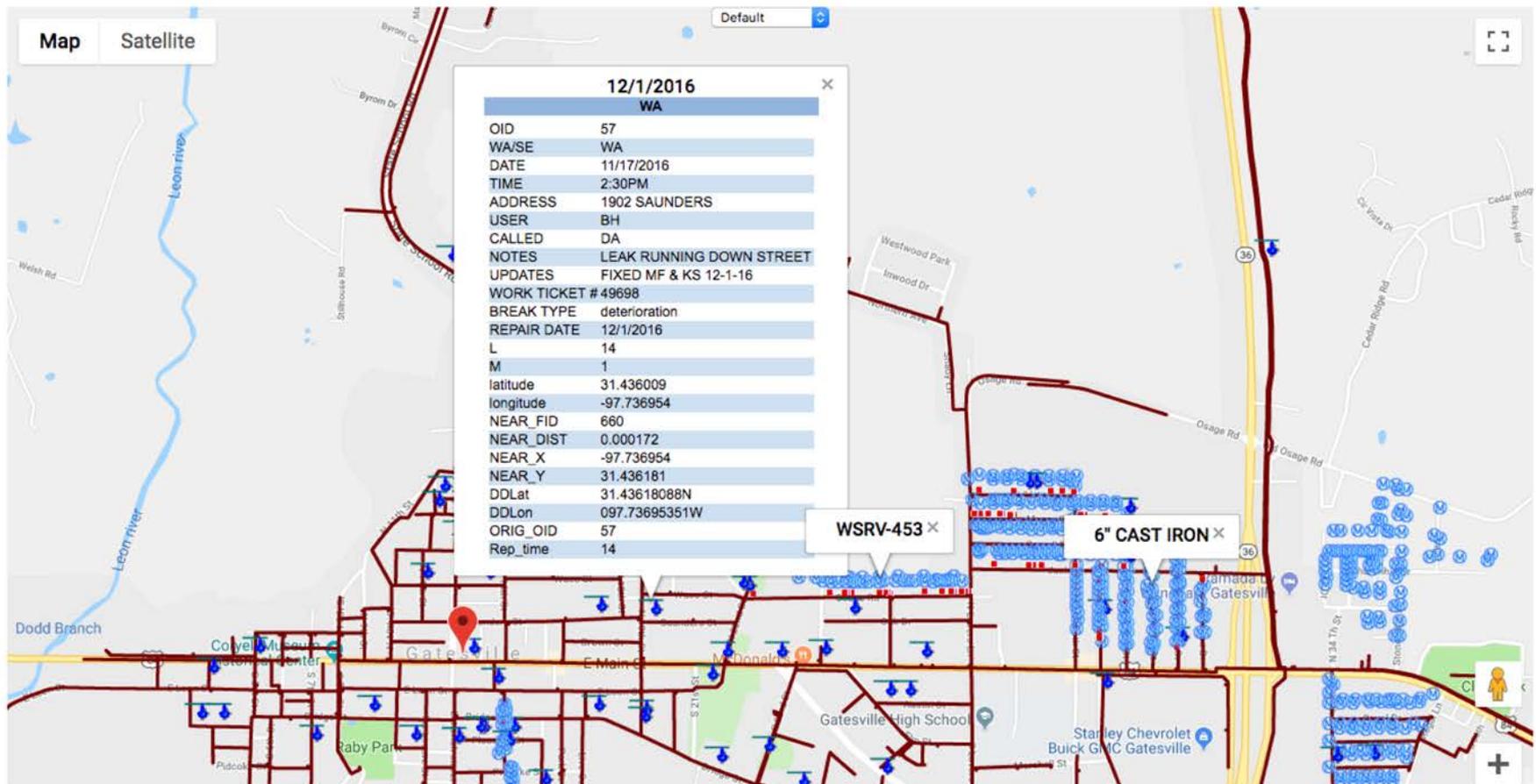
  // Add a style-selector control to the map.
  var styleControl = document.getElementById('style-selector-control');
  map.controls[google.maps.ControlPosition.TOP_CENTER].push(styleControl);

  // Set the map's style to the initial value of the selector.
  var styleSelector = document.getElementById('style-selector');
```

Self and Cloud Hosted Maps



Meta data can be included ...



As can different basemaps ...

The screenshot displays a GIS application interface. At the top left, there are two buttons: "Map" and "Satellite", both highlighted with a red border. The main area is a satellite map of a town, with a red outline indicating a specific area of interest. A large white popup window with a red border is centered on the map, displaying the following data:

12/1/2016	
WA	
OID	57
WA/SE	WA
DATE	11/17/2016
TIME	2:30PM
ADDRESS	1902 SAUNDERS
USER	BH
CALLED	DA
NOTES	LEAK RUNNING DOWN STREET
UPDATES	FIXED MF & KS 12-1-16
WORK TICKET #	49698
BREAK TYPE	deterioration
REPAIR DATE	12/1/2016
L	14
M	1
latitude	31.436009
longitude	-97.736954
NEAR_FID	660
NEAR_DIST	0.000172
NEAR_X	-97.736954
NEAR_Y	31.436181
DDLat	31.43618088N
DDLon	097.73695351W
ORIG_OID	57
Rep_time	14

Below the popup window, there are two more red-bordered boxes containing the text "SRV-453 x" and "6" CAST IRON x". The map shows various features like roads, buildings, and trees. Labels on the map include "Leon river", "Dodd Branch", "Coyote Museum", "Gatesville", "Gatesville High School", and "Starley Chevrolet Buick GMC Gatesville". The bottom right corner has a person icon and a plus sign for zooming in.



Functionality will be familiar...

The screenshot shows a Google Maps interface in satellite view. A popup window is open over a residential street, displaying the following information:

12/1/2016
WA

OID	57
WA/SE	WA
DATE	11/17/2016
TIME	2:30PM
ADDRESS	1902 SAUNDERS
USER	BH
CALLED	DA
NOTES	LEAK RUNNING DOWN STREET
UPDATES	FIXED MF & KS 12-1-16
WORK TICKET #	49698
BREAK TYPE	deterioration
REPAIR DATE	12/1/2016
L	14
M	1
latitude	31.436009
longitude	-97.736954
NEAR_FID	660
NEAR_DIST	0.000172
NEAR_X	-97.736954
NEAR_Y	31.436181
DDLat	31.43618088N
DDLon	097.73695351W
ORIG_OID	57
Rep_time	14

The map shows a residential street with houses and trees. The popup is titled "12/1/2016" and "WA". The popup contains a list of fields and values. The map interface includes a "Map" and "Satellite" toggle, a "Default" dropdown, a "Map data ©2018 Google Imagery ©2018" footer, and a "Report a map error" link.



It's no longer free but has a free tier

\$200/month tier is free

Does require a credit card account, but you can budget access to maintain low costs

There have been some recent changes to the API that consolidate functions into three major areas: mapping, routes and places.



Some GIS Options (there are others)



ArcGIS

The logo for QGIS, featuring the letters 'QGIS' in a bold, green, sans-serif font. The letter 'Q' is stylized with a small 3D cube icon inside it, colored in orange, yellow, and green.



ArcGIS

Pros

Industry Standard with lots of training available (quite a bit is free)

Very powerful GIS package, robust symbology, tools and extensions

Accepts many data source types (including Fulcrum exports)

Many utility-specific tools, and online integrations available

Lots of free information available on YouTube (don't knock free stuff)



ArcGIS

Cons

Fairly steep learning curve for beginners

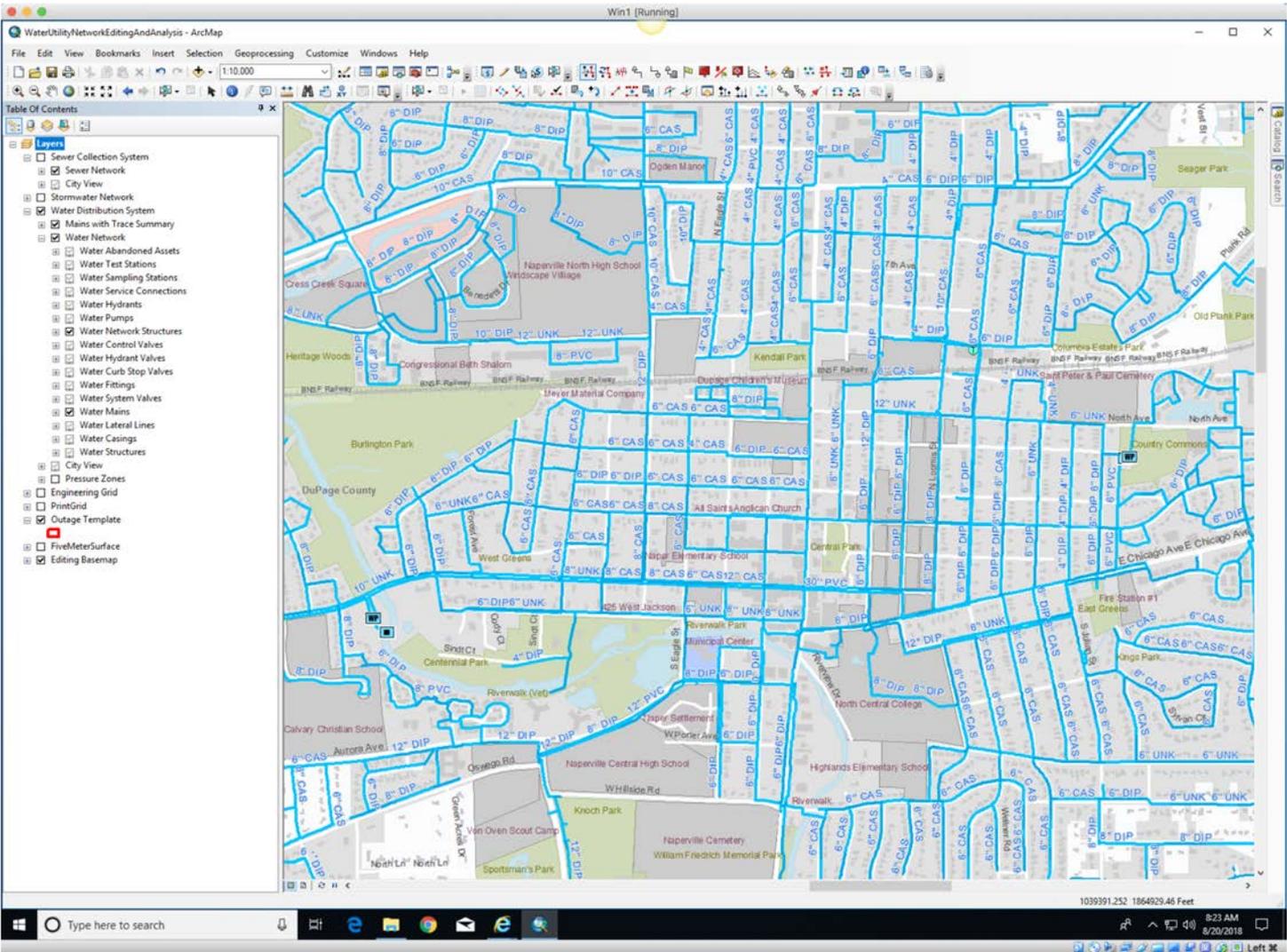
Finicky and it's a memory hog

It's expensive: \$800 - \$6000+ per year/user depending on setup

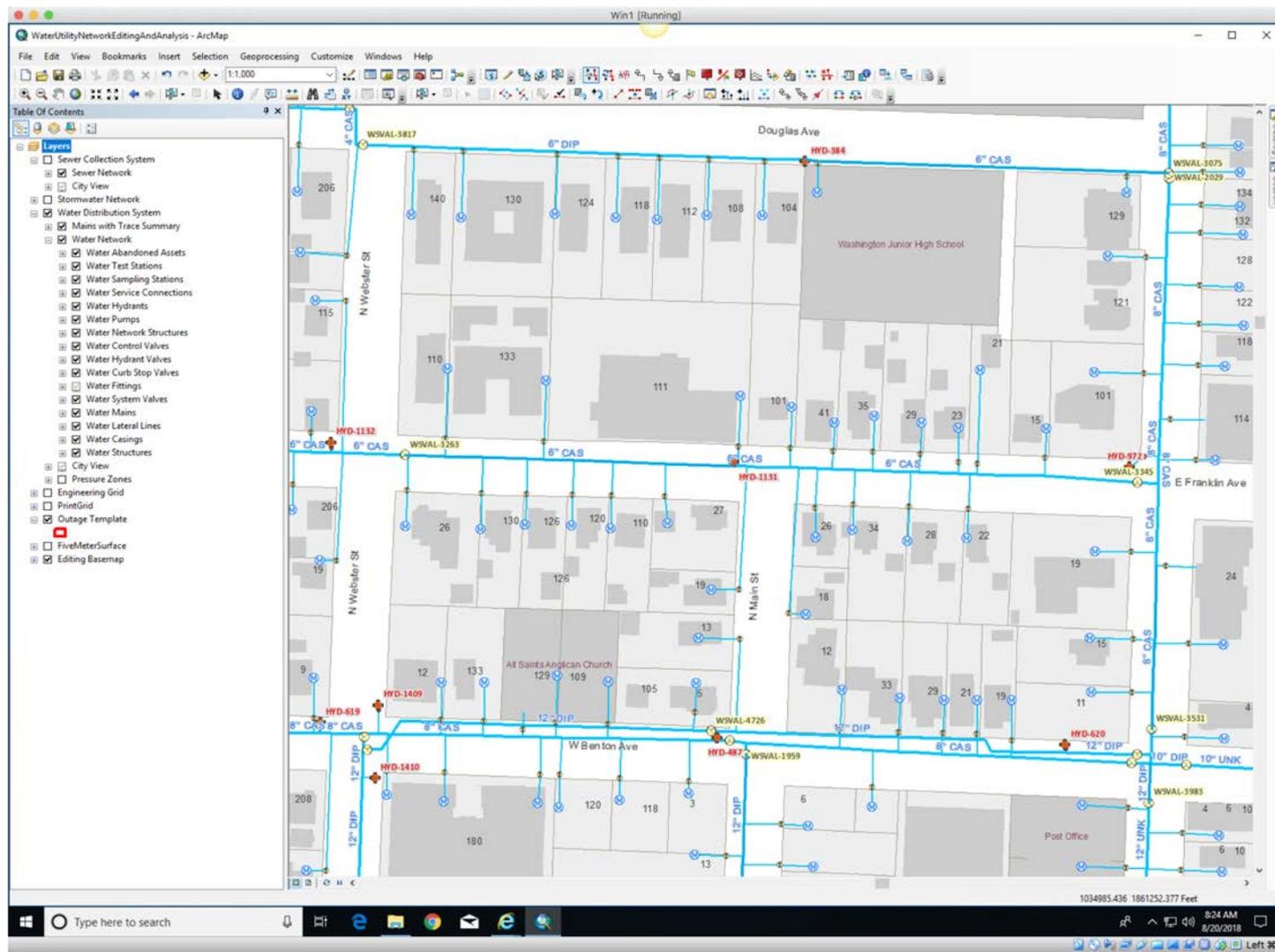
PC Only – no MAC or Linux options

(But is really is pretty awesome)

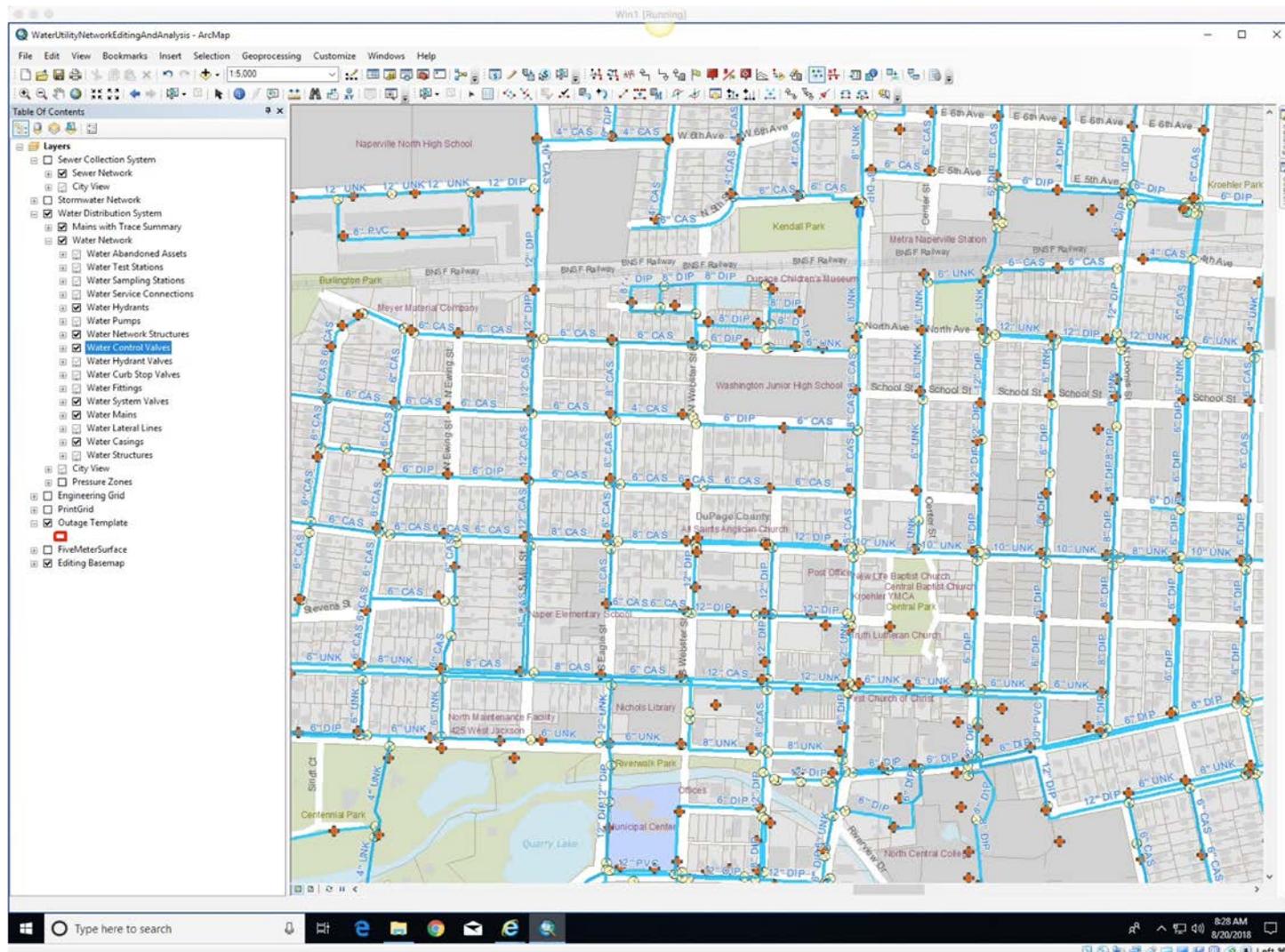
Utility Specific Tools (no extra charge)



There are editing templates available

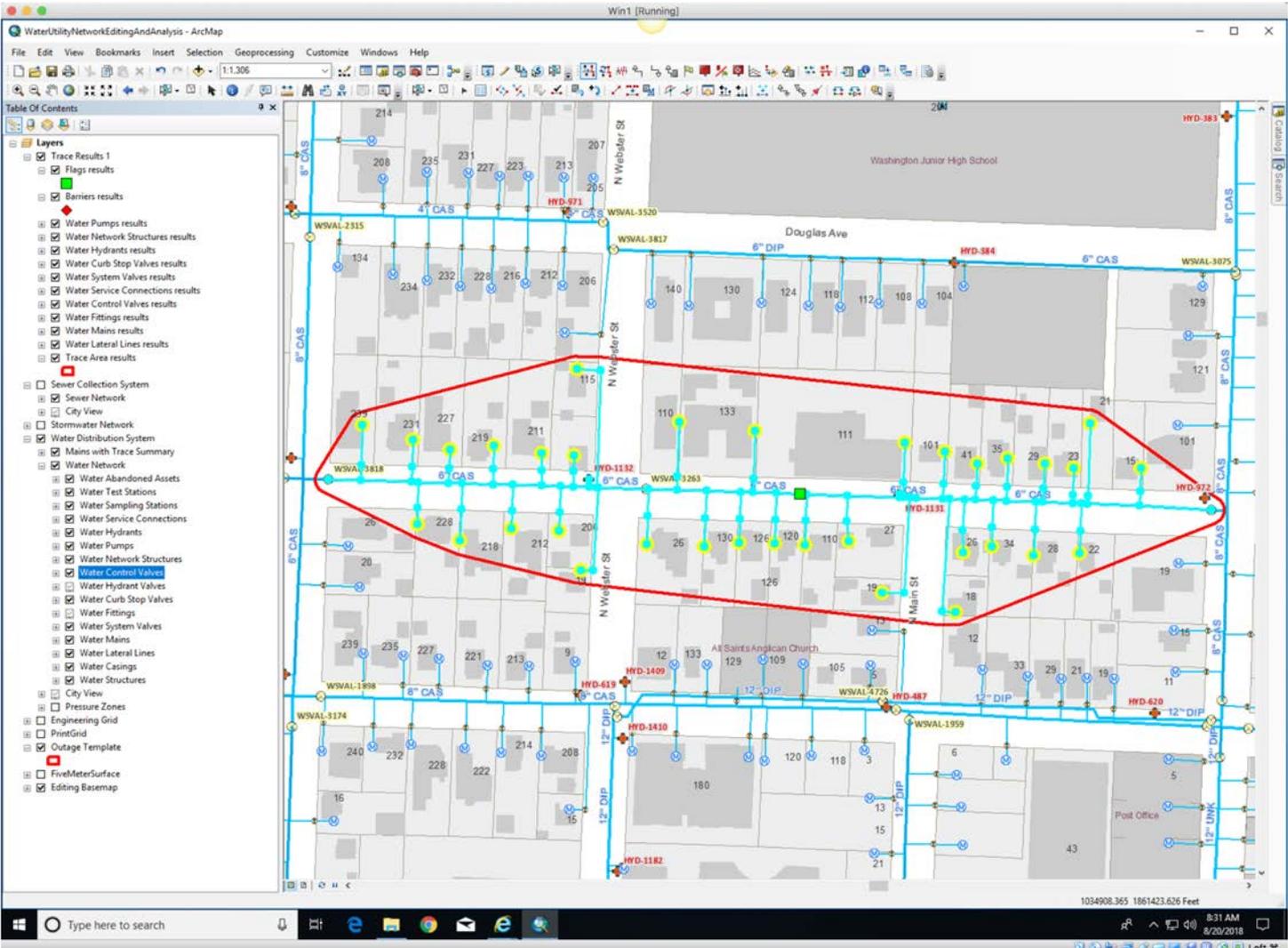


Utility Specific Tools: Valve Trace



Utility Specific Tools: Valve Status

The screenshot displays the ArcMap interface for a water utility network. The map shows a grid of streets including Washington Junior High School, W Franklin Ave, N Main St, W Benton Ave, and a Post Office. The network consists of blue lines representing water mains and valves, with various labels such as 8" CAS, 12" DIP, and WSWAL-4726. A red arrow points to a valve symbol on W Benton Ave, and another red arrow points to a valve symbol on W Franklin Ave. A dialog box is open in the center of the map, displaying the message: "Value Water System Valves: WSWAL-3263 Operable is now False". The dialog box has an "OK" button. The Table of Contents on the left lists various layers, with "Water Control Valves" highlighted. The status bar at the bottom shows "AA Complete" and coordinates "103405.347 1061065.308 Feet". The system tray at the bottom right shows the time "8:30 AM" and date "8/20/2018".



Utility Specific Tools: Capital Projects

The screenshot displays the ArcMap interface for 'WaterUtilityCapitalPlanning'. The main map area shows a complex network of water mains and project locations overlaid on a street grid. The 'Table of Contents' on the left lists several layers, including 'Sewer Collection System', 'Stormwater System', 'CIP Projects', and 'Water Distribution System'. The 'Project Cost Estimating Window' at the bottom provides details for a selected 'Water Main' asset, showing a cost of \$409,277.85 and a length of 3,410.65 feet.

Project Cost Estimating Window

Water Main | Proposed | Open Cut | Cost: \$409,277.85 | Length: 3,410.65 | Points: 0 | Area: .00

Assets	Source	Asset ID	Strategy	Action	Existing: 1	Existing: 2	Proposed: 1	Proposed: 2	Cost	Multiplier	Add. Cost	Length/Area	Total Cost	Notes
Details														
Active														

1040256.629 1863731.683 Feet | 10:14 AM 8/20/2018

Utility Specific Tools: Capital Projects

The screenshot displays the ArcMap interface for a utility network. The 'Table of Contents' on the left shows various layers including 'Sewer Collection System', 'Stormwater System', and 'CIP Projects'. The main map area shows a network of pipes and valves. An 'Identify' window is open, and a data table for 'piCIPCost' is displayed below the map. The table contains 31 rows of data, each representing a specific utility asset and its associated project details.

OBJECTID*	Asset Name	Strategy	Action	1st Filter Value	2nd Filter Value	Costper measure unit for lines)	Additional Cost	Notes	Cost Per Intersecting Asset
1	wHydrant	Replacement	Open Cut	<Null>	<Null>	4500	0	<Null>	0
2	wServiceConnection	Replacement	Open Cut	<Null>	<Null>	1200	0	<Null>	0
3	wMain	Replacement	Open Cut	1		60	0	<Null>	0
4	wMain	Replacement	Open Cut	2	PVC	70	0	<Null>	0
5	wMain	Replacement	Open Cut	4	PVC	80	0	<Null>	0
6	wMain	Replacement	Open Cut	6	PVC	90	0	<Null>	0
7	wMain	Replacement	Open Cut	8	PVC	100	0	<Null>	0
8	wMain	Replacement	Open Cut	10	PVC	110	0	<Null>	0
9	wMain	Replacement	Open Cut	12	PVC	120	0	<Null>	0
10	wMain	Replacement	Open Cut	14	PVC	130	0	<Null>	0
11	wMain	Replacement	Open Cut	16	PVC	140	0	<Null>	0
12	wMain	Replacement	Open Cut	18	PVC	150	0	<Null>	0
13	wMain	Replacement	Open Cut	20	PVC	160	0	<Null>	0
14	wMain	Replacement	Open Cut	24	PVC	170	0	<Null>	0
15	wMain	Replacement	Open Cut	30	PVC	180	0	<Null>	0
16	wMain	Replacement	Open Cut	36	PVC	190	0	<Null>	0
17	wMain	Replacement	Open Cut	40	PVC	200	0	<Null>	0
18	wMain	Replacement	Open Cut	42	PVC	210	0	<Null>	0
19	wMain	Replacement	Open Cut	48	PVC	220	0	<Null>	0
20	wMain	Replacement	Open Cut	54	PVC	230	0	<Null>	0
21	wMain	Replacement	Open Cut	60	PVC	240	0	<Null>	0
22	wMain	Replacement	Open Cut	66	PVC	250	0	<Null>	0
23	wMain	Replacement	Open Cut	72	PVC	260	0	<Null>	0
24	wMain	Replacement	Open Cut	75	PVC	270	0	<Null>	0
25	wMain	Replacement	Open Cut	15	ABS	135	0	<Null>	0
26	wMain	Replacement	Open Cut	11	ABS	60	0	<Null>	0
27	wMain	Replacement	Open Cut	2	ABS	70	0	<Null>	0
28	wMain	Replacement	Open Cut	4	ABS	80	0	<Null>	0
29	wMain	Replacement	Open Cut	6	ABS	90	0	<Null>	0
30	wMain	Replacement	Open Cut	8	ABS	100	0	<Null>	0
31	wMain	Replacement	Open Cut	10	ABS	110	0	<Null>	0

Utility Specific Tools: Capital Projects

The screenshot shows the ArcMap interface with a utility network map. The 'Project Cost Estimating Window' is open, displaying the following table:

Assets	Source	Asset ID	Strategy	Action	Existing: 1	Existing: 2	Proposed: 1	Proposed: 2	Cost	Multiplier	Add. Cost	Length/Area	Total Cost	Notes
Details	Water Mains	Sketch-1	Proposed	Open Cut			12"	Polyvinyl Chl.	\$120.00	1	\$0.00	3410.65	\$409,277.85	
Active														

Project Cost Estimating Window Summary:
 Water Main: Proposed, Open Cut
 Cost: \$409,277.85 | Length: 3,410.65 | Points: 0 | Area: .00

Utility Specific Tools: Capital Projects

The screenshot displays the ArcMap interface for 'WaterUtilityCapitalPlanning'. The main map area shows a network of blue lines representing utility assets overlaid on a street map. A 'Table of Contents' on the left lists various layers, with 'CIP Project Lines' selected. Below the map is a 'Project Cost Estimating Window' for a 'New Main' project. The window shows a cost of \$409,277.85 and a length of 3,410.65 feet. The 'CIP Project Details' section includes fields for Project Name, CIP Status (Proposed), Project Manager (Other), Link to Report, Funding Source (Unknown), Expected Start Date (8-20-2018), Date Completed (8-20-2018), Notes, Created By, Date Created (8-20-2018), Project Type (Water Distribution), Contact Phone, and Contact Email.

WaterUtilityCapitalPlanning - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Table of Contents

- Layers
- Sewer Collection System
- Stormwater System
- CIP Projects
- CIP Project Locations
- CIP Asset
- CIP Project Points
- CIP Project Lines
- CIP Project Polygons
- CIP Projects
- CIP Project Overviews
- Water Distribution System
- Editing Basemap

Project Cost Estimating Window

Water Main Proposed Open Cut Cost: \$409,277.85 Length: 3,410.65 Points: 0 Area: 0.0

CIP Project Details

Assets	Project Name New Main	CIP Status Proposed	Project Manager Other	Link to Report	Funding Source Unknown
Details	Expected Start Date 8-20-2018	Notes	Created By	Project Type Water Distribution	Contact Phone
Active	Date Completed 8-20-2018		Date Created 8-20-2018	Contact Email	

Page 1

1039798.607 1862327.744 Feet 10:10 AM 8/20/2018



Pros

Open Source (it's free)

Very powerful GIS package

Accepts many data source types (including Fulcrum exports)

Large user community developing tools and plugins

Lots of free information available on YouTube (don't knock free stuff)



Cons

Requires a higher level of “computer comfort”

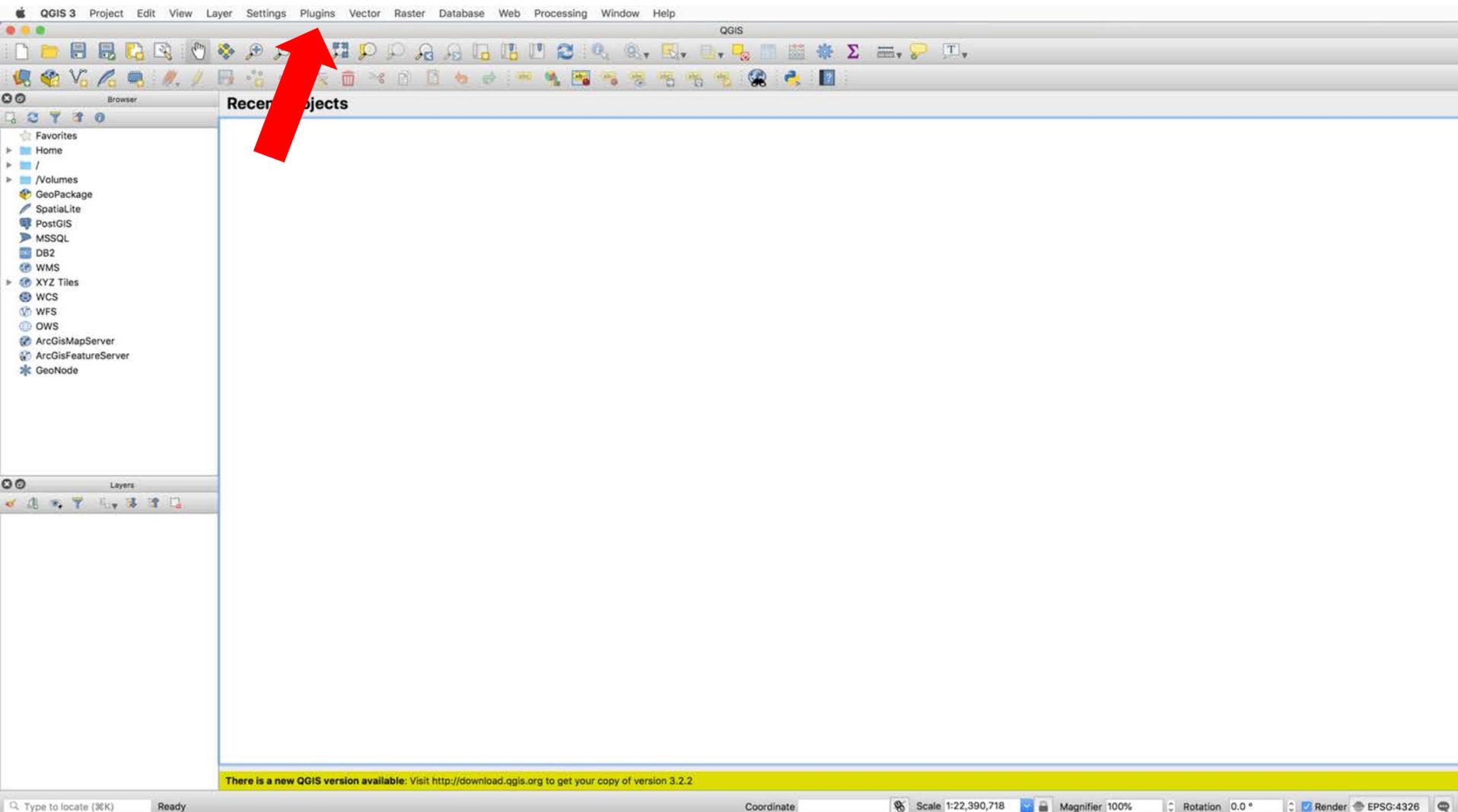
Set up is more complicated than a simple software package install

You have to install plugins for a lot of functionality, like basemaps

Has simpler initial symbology than some proprietary programs

(But, it’s very customizable and you can import your own symbology)

Adding satellite basemap work flow



Search for the

The screenshot shows the QGIS 3.2.2 interface. The main window is the 'Plugins | All (183)' dialog box. A search bar at the top of the dialog contains the text 'TaMa'. A red arrow points to the search bar. The list of plugins is filtered to show only those containing 'TaMa'. The first item in the list is 'TaMa', which is highlighted. Other items in the list include 'Advanced Line Editor', 'ArcCloud', 'Another DXF Importer / DXF2Shape Converter', 'Append Features to Layer', 'arrayPlus', 'Attribute painter', 'AttributeAssignment', 'AustrianElevation', 'autoSaver', 'Azimuth and Distance Calculator', 'Batch Hillshader', 'Beeline', 'beePen', 'Bivariate legend', 'Buffer by Percentage', 'CAIGOS PostgreSQL Konnektor', 'Calculate Geometry', 'cartogram3', 'CDAU Downloader', 'Clipper', 'Cloud Masking', 'ClusterPoints', 'Contour plugin', 'CoordGuesser', 'Coordinate Capture', 'Coordtransform', 'D3 Data Visualization', 'Data Analysis and Visualization', 'Data Plotly', 'DB Manager', and 'Digitizing Tools'. At the bottom of the dialog, there are buttons for 'Upgrade all', 'Uninstall plugin', 'Reinstall plugin', and 'Close'. A yellow banner at the bottom of the screen reads: 'There is a new QGIS version available: Visit <http://download.qgis.org> to get your copy of version 3.2.2'. The status bar at the bottom shows 'Type to locate (36K) Ready', 'Coordinate', 'Scale 1:22,390,718', 'Magnifier 100%', 'Rotation 0.0 °', 'Render', and 'EPSG:4326'.

Search for my satellite basemap plugin

The screenshot shows the QGIS 3.2.2 interface with the Plugins dialog open. The search bar contains the text 'quick'. A red arrow points to the 'EasyCustomLabeling' plugin in the search results list. The plugin details panel on the right displays the following information:

EasyCustomLabeling

Allows to quickly duplicate layer into memory layer ready for data defined labeling. Requires Memory layer Saver >= 3.2 to restore all labels correctly BUT it is currently not yet available to QGIS 3

EasyCustomLabeling is a plugin for QGIS, designed to simplify the work for manual and data defined labeling. The tool duplicates a data vector layer into a new memory layer made of lines, adds all necessary fields for advanced custom labeling like label location, rotation, color, font, callout, alignments. The resulting layer is activated ready to use labeling tools. Data is saved in Memory Layer provider, which means it is NOT saved to a file or a database. To make those layers persistent, please install Memory Layer Saver v3.2 or higher plugin, that saves all memory layers to a qdatastream file along the project named myqgisprojectname.qgs.mldata.

★★★★★ 64 rating vote(s), 70517 downloads

Tags labeling

More info [homepage](#) [bug tracker](#) [code repository](#)

Author Regis Haubourg

Available version 2.1

Buttons: Upgrade all, Install plugin, Close

At the bottom of the screen, a yellow banner reads: "There is a new QGIS version available: Visit <http://download.qgis.org> to get your copy of version 3.2.2"

Install my plugin

The screenshot shows the QGIS 3.2.2 interface with the Plugins dialog open. The dialog is titled "Plugins | All (183)" and has a search bar containing "quick". A list of plugins is shown, with "EasyCustomLabeling" selected and checked. A red arrow points to the "Settings" category in the left sidebar. The details for "EasyCustomLabeling" are displayed on the right, including a description, tags, and version information. A red arrow points to the "Install plugin" button at the bottom right of the dialog. Another red arrow points to the "Close" button. A yellow banner at the bottom of the QGIS window reads: "There is a new QGIS version available: Visit <http://download.qgis.org> to get your copy of version 3.2.2".

Recent Projects

Plugins | All (183)

Search quick

- ✓ EasyCustomLabeling
- FS3
- Indicatrix mapper
- Quick Attribution
- QuickMapServices
- QuickOSM
- QuickPrint
- QuickWKT

EasyCustomLabeling

Allows to quickly duplicate layer into memory layer ready for data defined labeling. Requires Memory layer Saver >= 3.2 to restore all labels correctly BUT it is currently not yet available to QGIS 3

EasyCustomLabeling is a plugin for QGIS, designed to simplify the work for manual and data defined labeling. The tool duplicates a data vector layer into a new memory layer made of lines, adds all necessary fields for advanced custom labeling like label location, rotation, color, font, callout, alignments. The resulting layer is activated ready to use labeling tools. Data is saved in Memory Layer provider, which means it is NOT saved to a file or a database. To make those layers persistent, please install Memory Layer Saver v3.2 or higher plugin, that saves all memory layers to a qdatastream file along the project named myqgisprojectname.qgs.midata.

★★★★☆ 64 rating vote(s), 70517 downloads

Tags labeling

More info [homepage](#) [bug tracker](#) [code repository](#)

Author Regis Haubourg

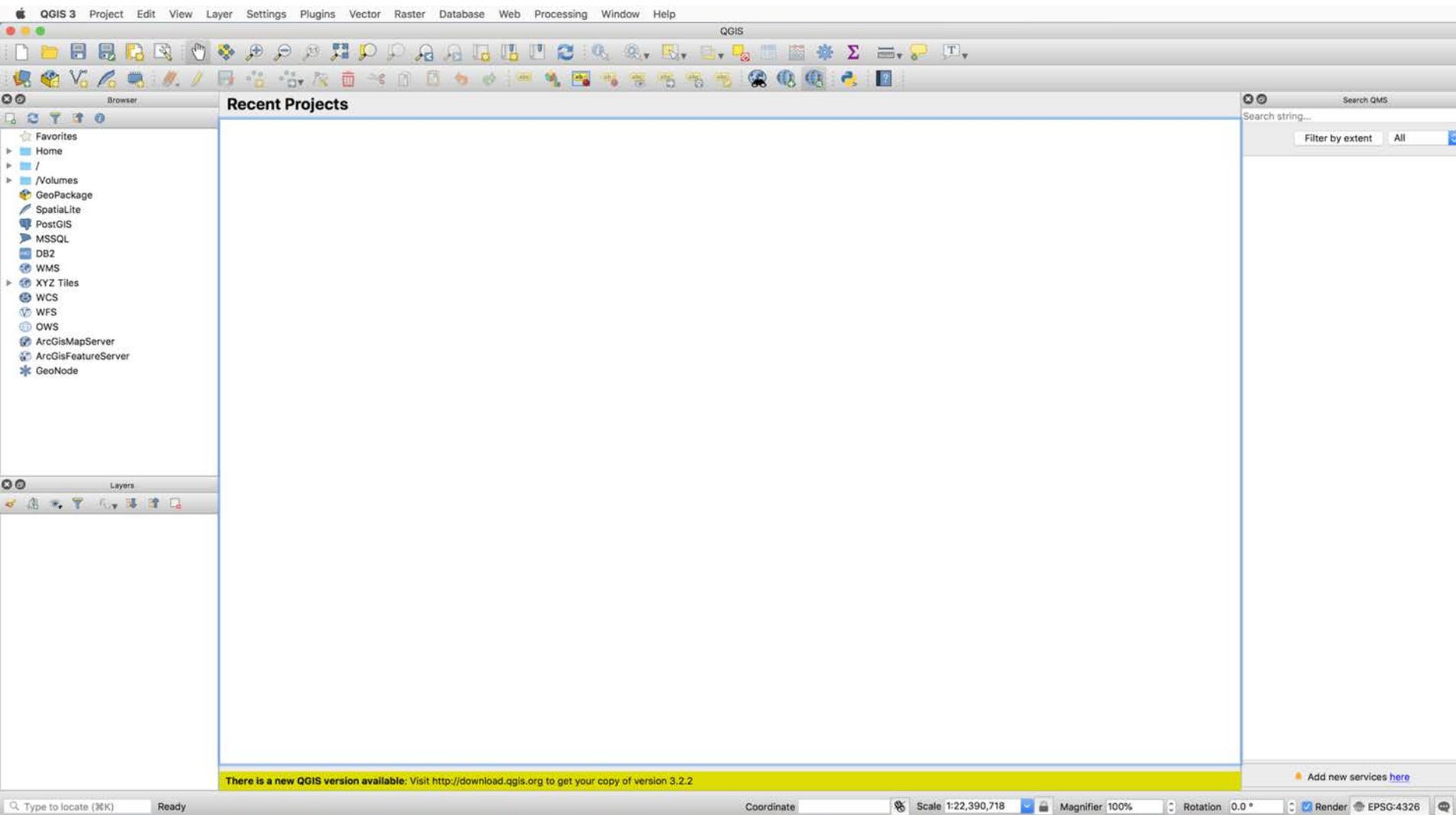
Available version 2.1

Upgrade all Install plugin Close

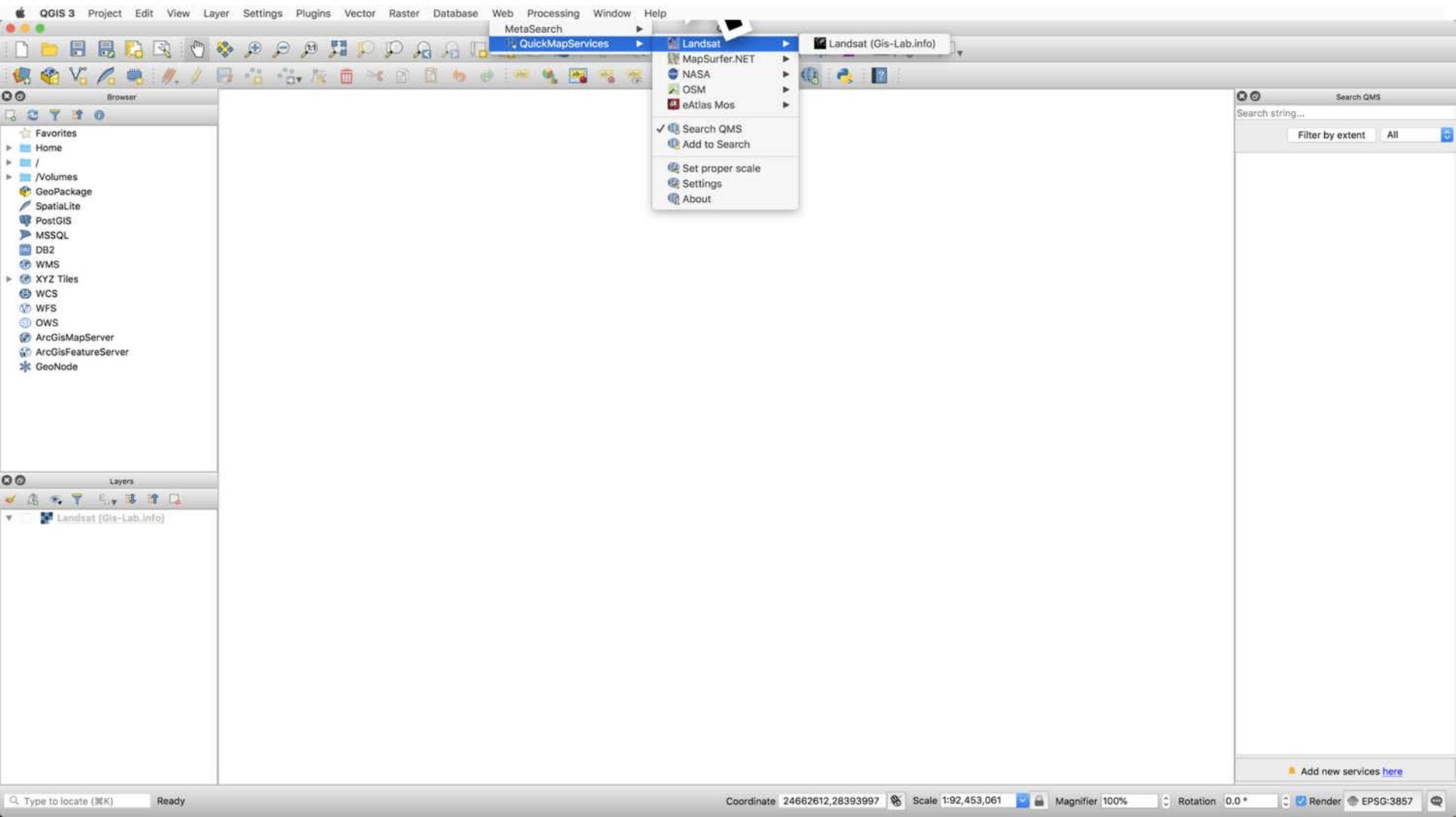
There is a new QGIS version available: Visit <http://download.qgis.org> to get your copy of version 3.2.2

Coordinate Scale 1:22,390,718 Magnifier 100% Rotation 0 Render EPSG:4326

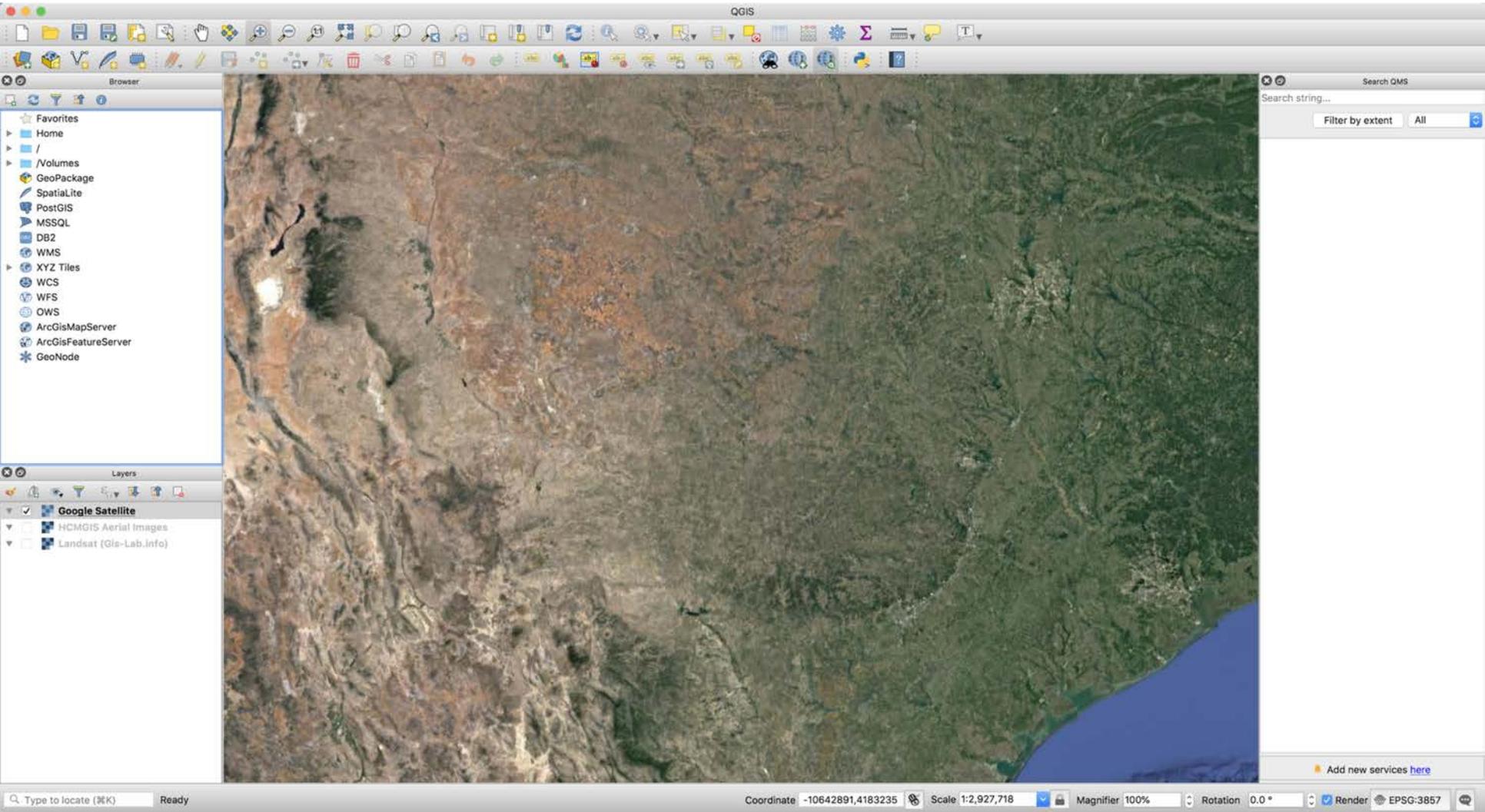
Back to the main screen



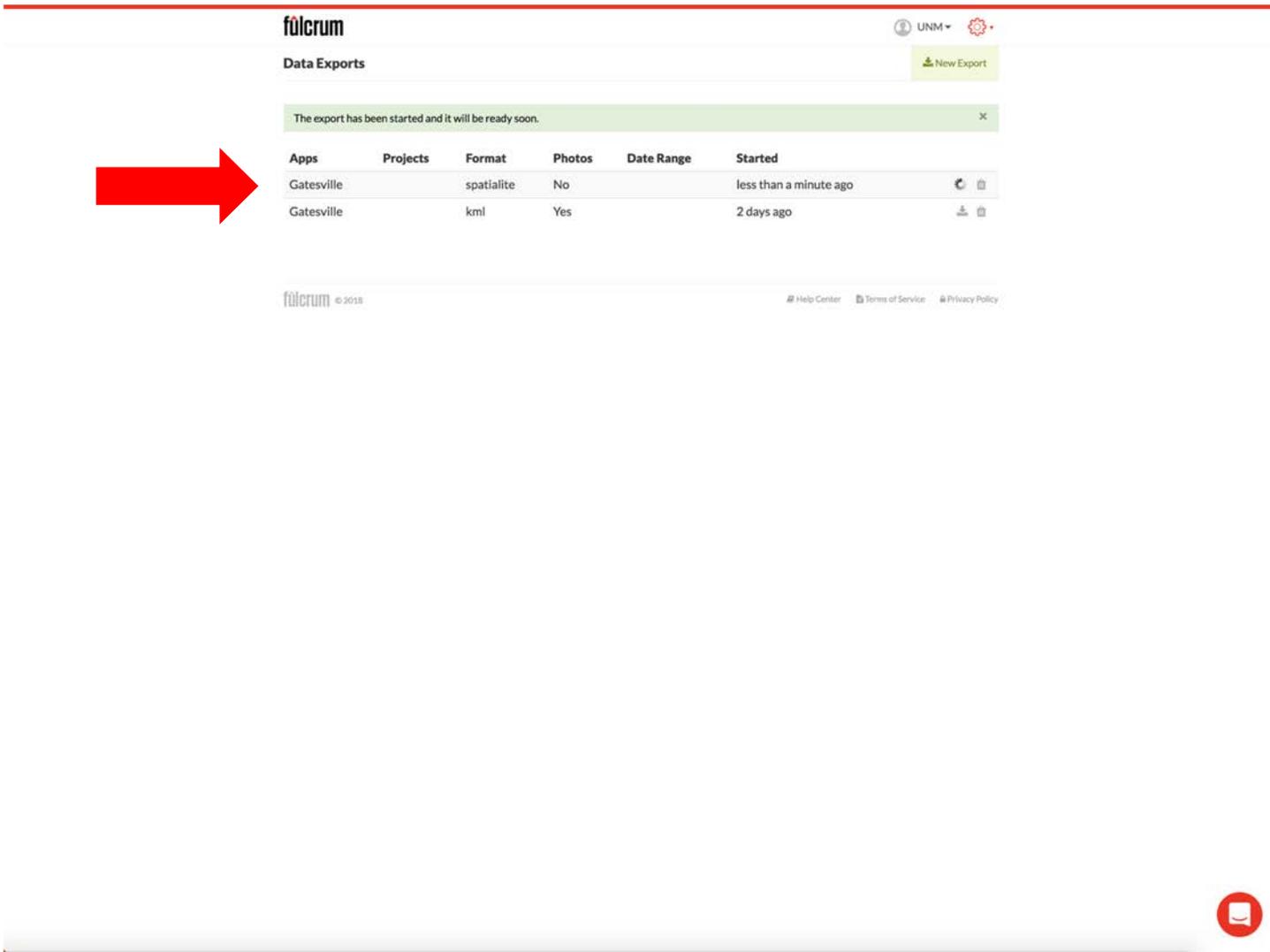
Load my basemap



Get to the right place on the globe



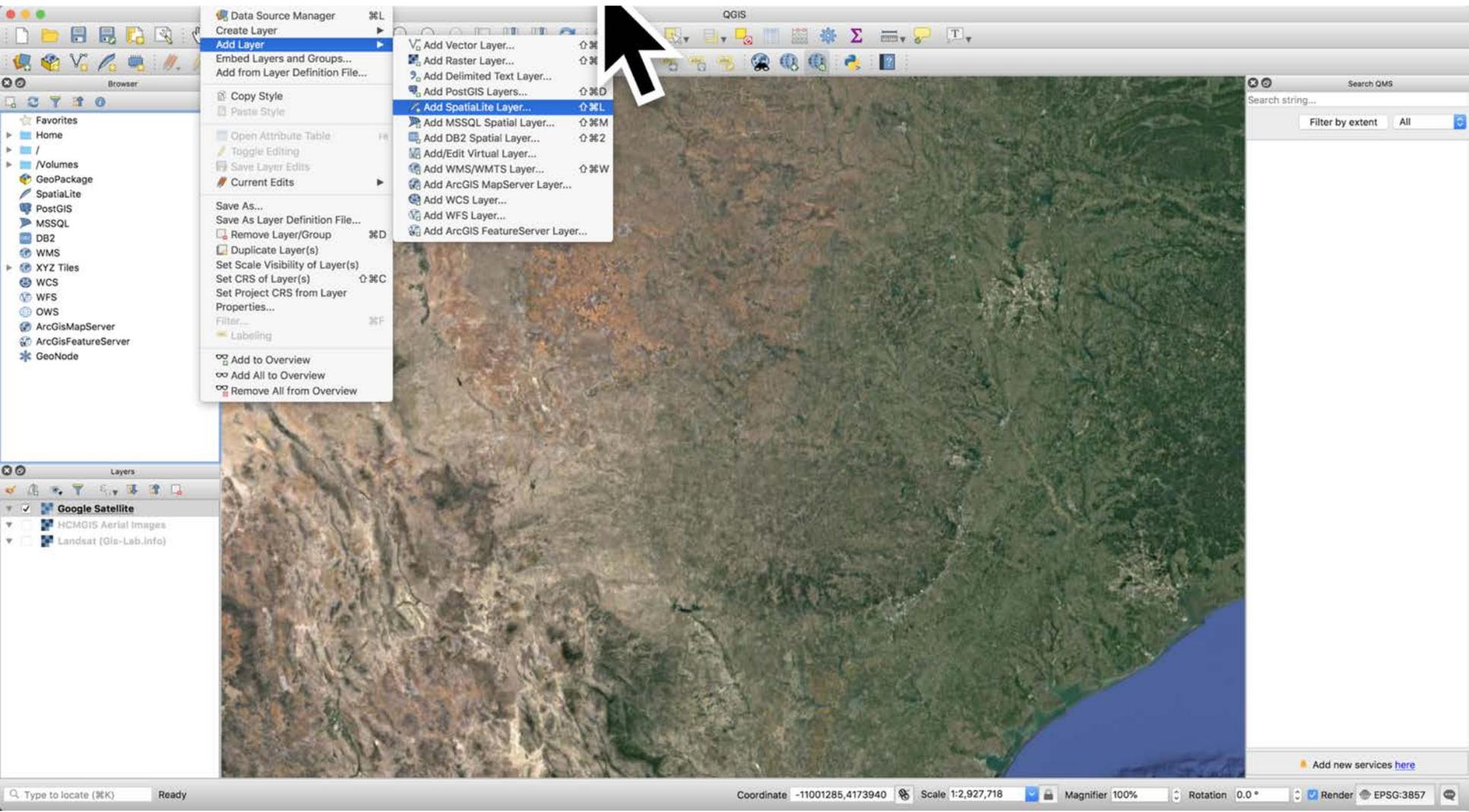
Download fulcrum data



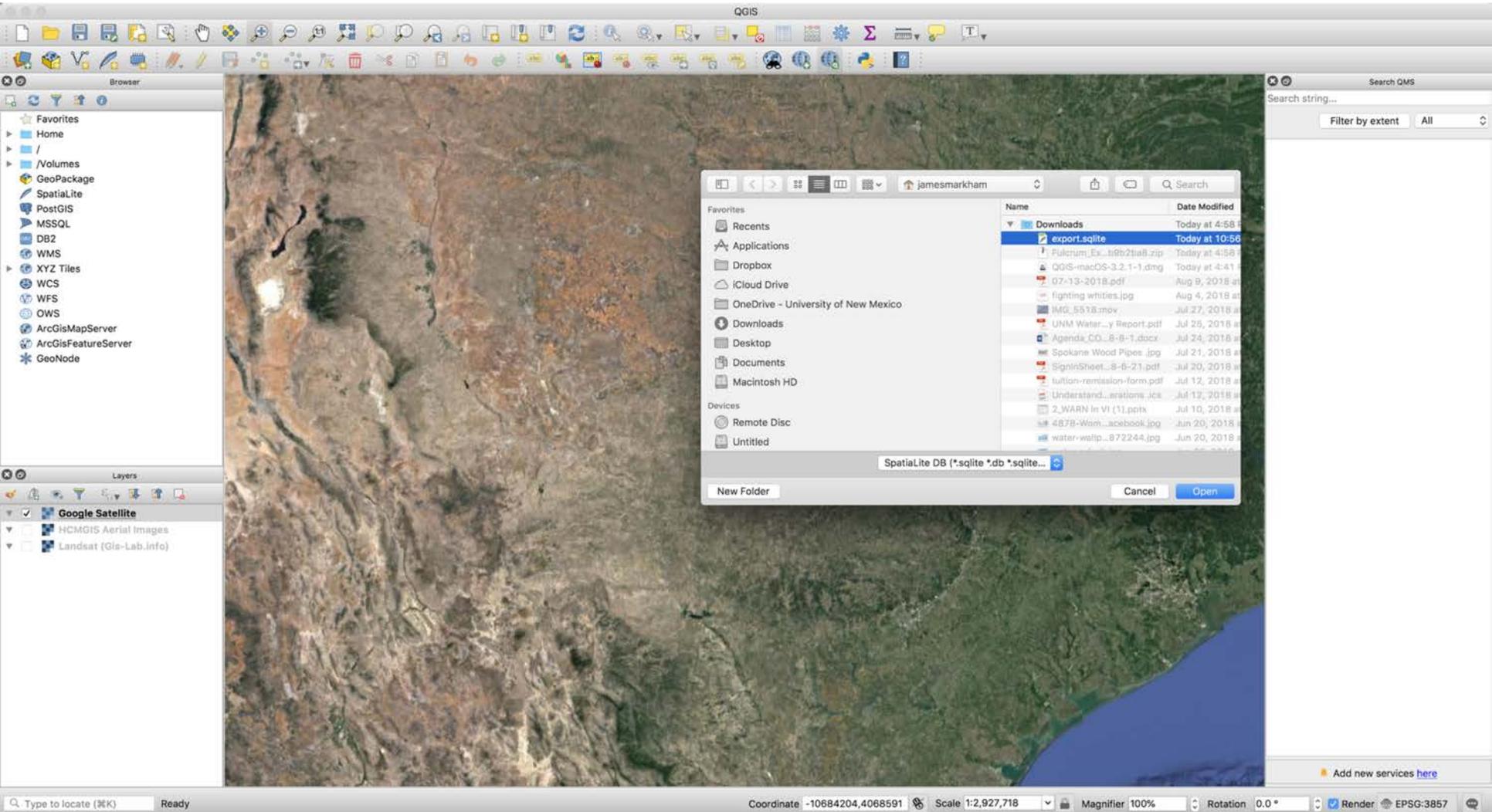
The screenshot shows the Fulcrum web interface. At the top left is the Fulcrum logo. To the right of the logo is a user profile icon labeled 'UNM' and a settings gear icon. Below the logo is the heading 'Data Exports' and a 'New Export' button. A green notification bar states: 'The export has been started and it will be ready soon.' Below this is a table with the following columns: Apps, Projects, Format, Photos, Date Range, and Started. A red arrow points to the 'Apps' column. The table contains two rows of data. At the bottom of the page, there is a footer with the Fulcrum logo, copyright information '© 2018', and links for 'Help Center', 'Terms of Service', and 'Privacy Policy'. A red circular icon is visible in the bottom right corner of the page.

Apps	Projects	Format	Photos	Date Range	Started
Gatesville		spatialite	No		less than a minute ago
Gatesville		kml	Yes		2 days ago

Add the data layer



Select the file



Add the data

The screenshot shows the QGIS Data Source Manager dialog box for a SpatialLite connection. The connection path is set to `export.sqlite@/Users/jamesmarkham/Downloads/export.sqlite`. The dialog displays a table list with the following columns: Table, Type, Geometry, and Srid. Two tables are listed: `gatesville` and `gatesville_photos`, both of type POINT and with geometry.

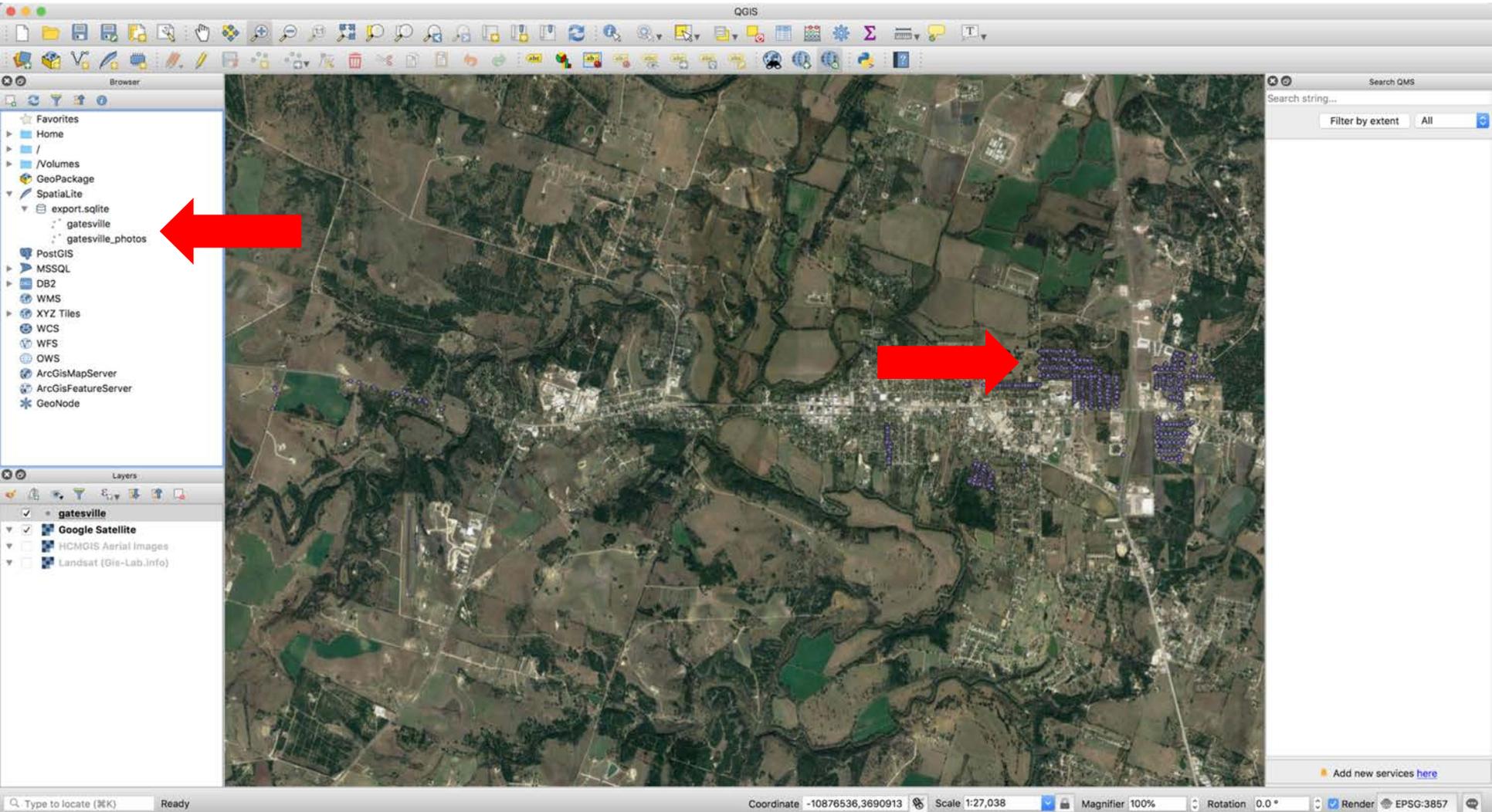
Table	Type	Geometry	Srid
gatesville	POINT	geometry	
gatesville_photos	POINT	geometry	

Additional options in the dialog include:

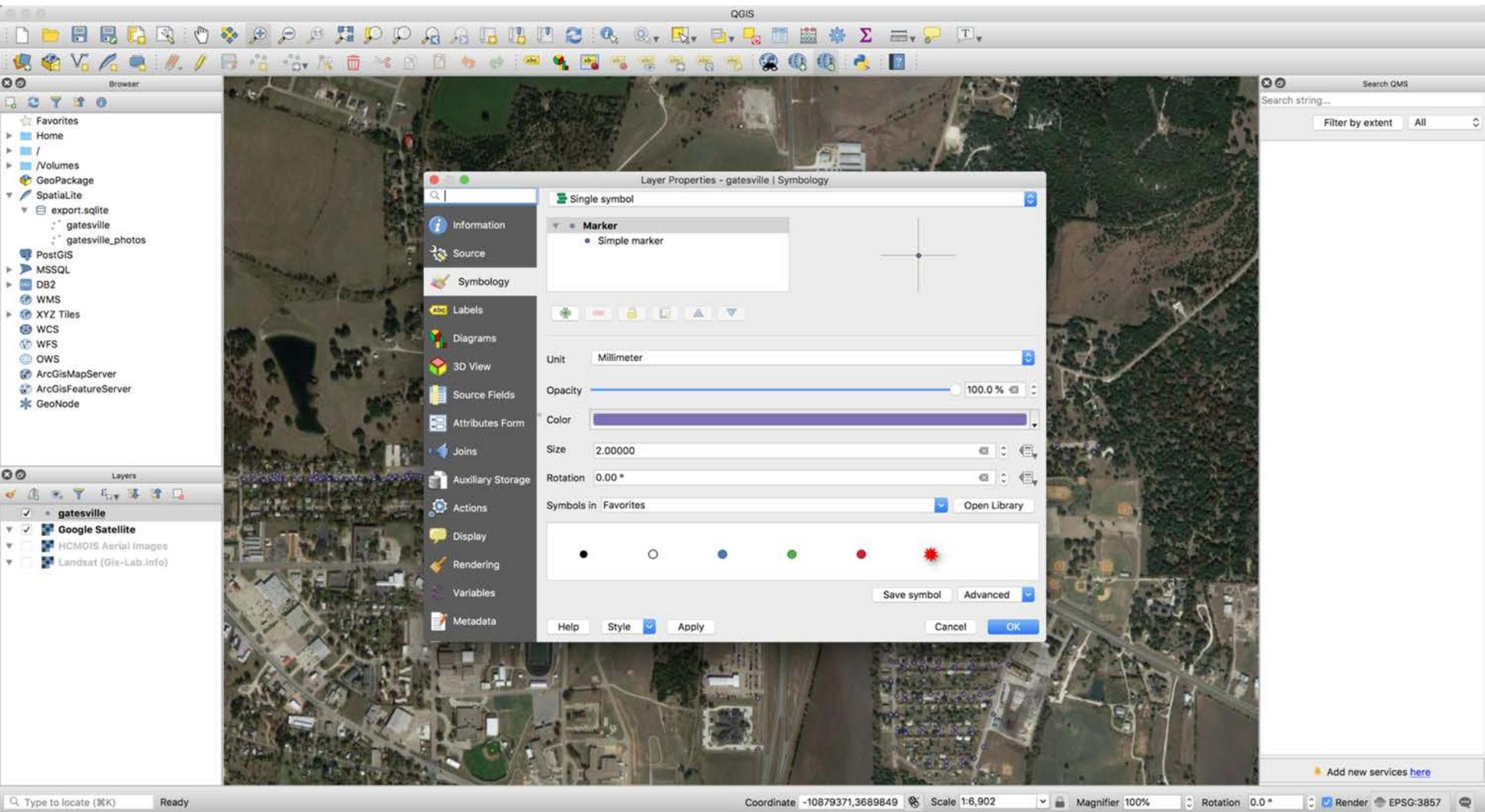
- Also list tables with no geometry
- Search options

Buttons at the bottom of the dialog include: Help, Add, Set Filter, Update Statistics, and Close.

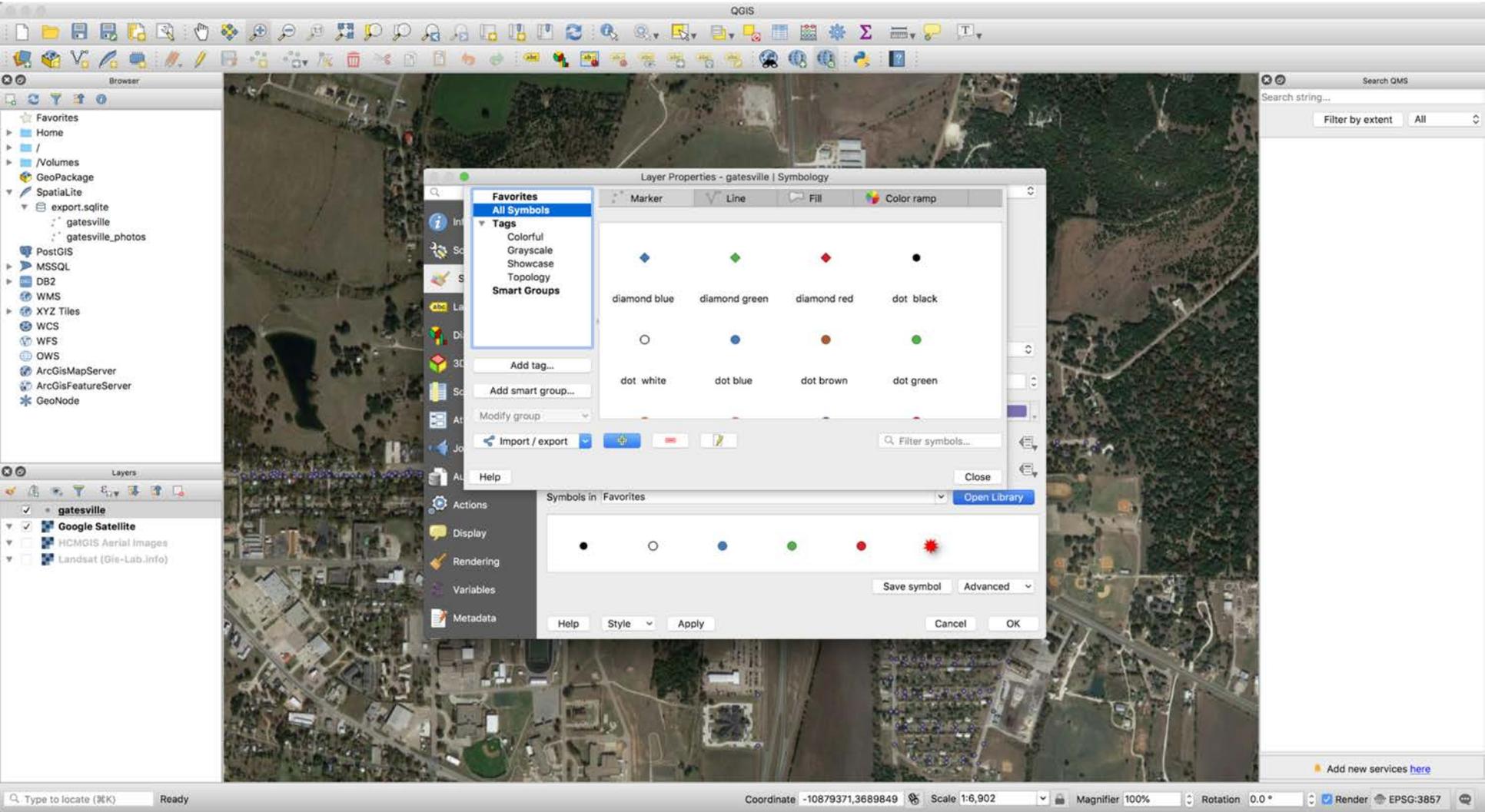
And there it is, but it's hard to see



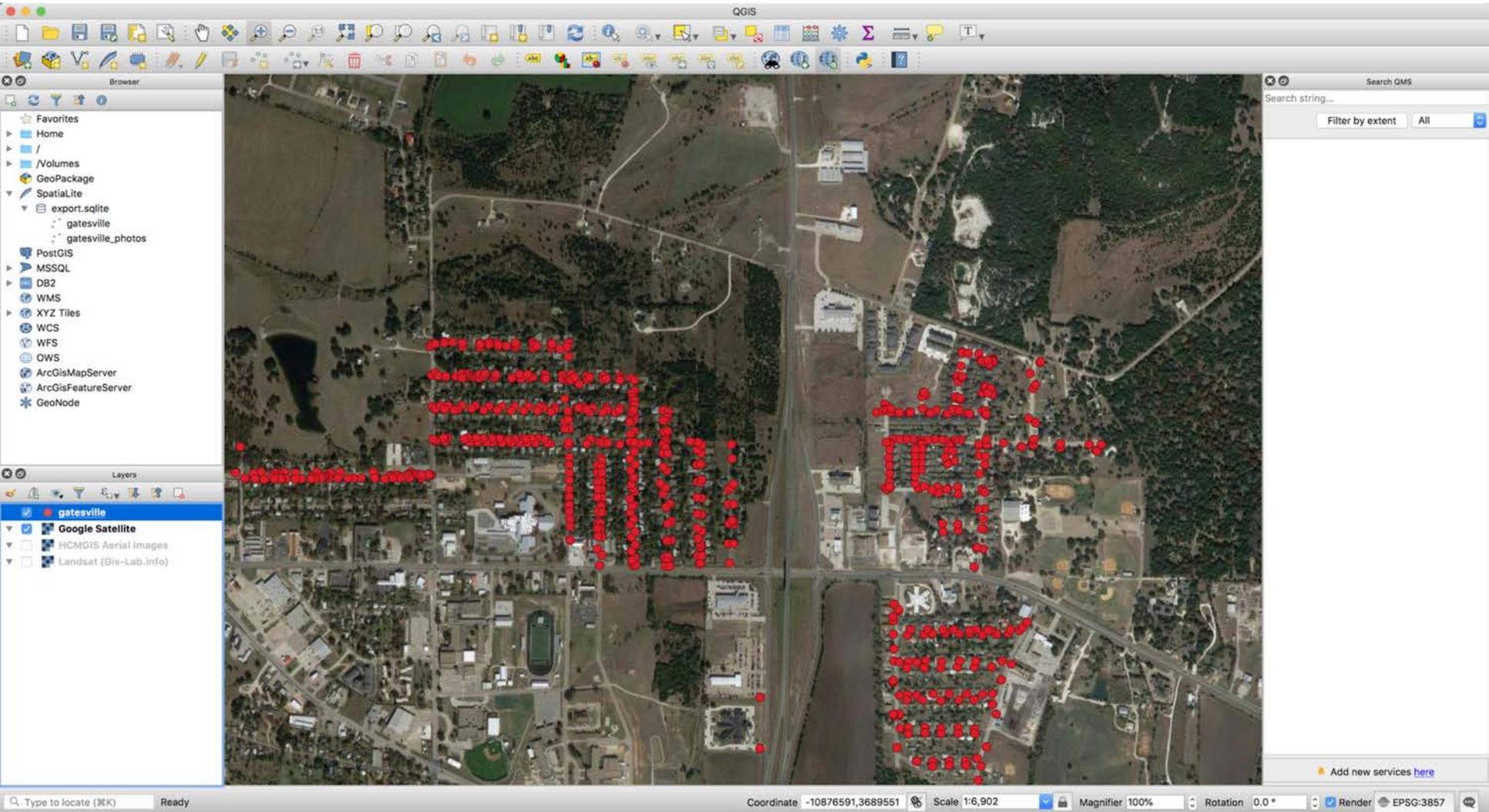
So alter the symbology



Change layer properties



To red ...





Data is still there; images hyperlinked

The screenshot displays the QGIS desktop environment. The main map area shows a satellite view of a residential area with a pond. Numerous red circular markers are overlaid on the map, indicating specific data points. A green arrow points to one of these markers, and a large red arrow points from the map to the 'Identify Results' panel on the right.

The 'Identify Results' panel shows the following feature information:

Feature	Value
updated_by	jmarkham@gmail.com
system_created_at	2017-04-04 15:49:08 UTC
system_updated_at	2017-04-04 15:49:08 UTC
version	1
status	
project	
assigned_to	
latitude	31.4379410571922
longitude	-97.7241044864058
id_number	
asset_class_or_categ...	Customer Meter
asset_class_or_categ...	
photos	22763559-4b3c-4572-b87d-e70a04...
photos_caption	
photos_url	https://web.fulcrumapp.com/photos/view/
videos	
videos_caption	
videos_url	
audio	
audio_caption	
audio_url	

The interface also shows a 'Browser' panel on the left with a project tree, a 'Layers' panel at the bottom left, and a 'Search QMS' panel at the top right. The status bar at the bottom indicates the coordinate is -10878400,3689786, the scale is 1:3,936, and the rotation is 0.0 degrees.

Added pipe layers

Gatesville_QGIS_TEST - QGIS

Browser

- Favorites
- Project Home
- Home
- /
- /Volumes
- GeoPackage
- SpatialLite
 - export.sqlite
 - gatesville
 - gatesville_photos
- PostGIS
- MSSQL
- DB2
- WMS
- XYZ Tiles
- WCS
- WFS
- OWS
- ArcGisMapServer
- ArcGisFeatureServer
- GeoNode

Layers

- Mains
- Meter_leaks
- gatesville
- Google Satellite
- HCMGIS Aerial Images
- Landsat (Gis-Lab.Info)

Search QMS

Search string...

Filter by extent All

Add new services here

Identify Results

Feature	Value
WA_SE	WA
(Derived)	
(Actions)	
WA_SE	WA
DATE	2016-07-18
TIME	2:20PM
ADDRESS	116 AUSTIN
USER	BH
CALLED	RM
NOTES	LEAK IN WATER METER BOX. ...
UPDATES	FIXED 8-8-16 DA CN KS
WORK_TICKE	48825
BREAK_TYPE	meter
REPAIR_DAT	2016-08-08
Field12	21
Field13	1
Field14	21
Field15	0
latitude	31.43338130000
longitude	-97.72697210000
WA_SE	WA

Mode Current layer Auto open form

View Tree Help

Type to locate (英K) 1 legend entries removed.

Coordinate -10878307,3691609 Scale 1:8,998 Magnifier 100% Rotation 0.0° Render EPSG:3857

Added some pavement cut data

The screenshot displays the QGIS desktop environment. The main map area shows an aerial view of a residential area with a network of water mains overlaid in various colors (purple, green, orange, blue). Yellow diamond symbols are placed along the mains lines, representing pavement cut locations. The interface includes a toolbar at the top, a Browser panel on the left, and an Identify Results panel on the right.

Browser Panel:

- Project Home
- Home
- /
- /Volumes
- GeoPackage
- SpatialLite
 - export.sqlite
 - gatesville
 - gatesville_photos
- PostGIS
- MSSQL
- DB2
- WMS
- XYZ Tiles
- WCS
- WFS
- OWS
- ArcGisMapServer
- ArcGisFeatureServer
- GeoNode

Layers Panel:

- Water_leaks
- Patches
- Meters
- Mains
- Google Satellite
- HCMGIS Aerial Images
- Landsat (Gis-Lab.info)

Identify Results Panel:

Feature	Value
WA_SE	WA
(Derived)	
(Actions)	
WA_SE	WA
DATE	2016-07-18
TIME	2:20PM
ADDRESS	116 AUSTIN
USER	BH
CALLED	RM
NOTES	LEAK IN WATER METER BOX. ...
UPDATES	FIXED 8-8-16 DA CN KS
WORK_TICKE	48825
BREAK_TYPE	meter
REPAIR_DAT	2016-08-08
Field12	21
Field13	1
Field14	21
Field15	0
latitude	31.43338130000
longitude	-97.72697210000
WA_SE	WA

Status Bar: Coordinate: -10877559,3689577 | Scale: 1:4,301 | Magnifier: 100% | Rotation: 0.0° | Render: EPSG:3857

Which is also linked to images

The image displays a GIS application interface with several key components:

- Browser:** Shows a project structure including 'Project Home', 'Home', and 'SpatialLite' with sub-items like 'export.sqlite', 'gatesville', and 'gatesville_photos'.
- Layers:** Lists various data layers such as 'Water_leaks', 'Patches', 'Meters', 'Mains', 'Google Satellite', 'HCMGIS Aerial Images', and 'Landsat (Gis-Lab.info)'. The 'Patches' layer is currently selected.
- Map:** Displays an aerial view of a residential area with colored overlays (purple, yellow, green, blue) representing different features or boundaries. Small colored dots are scattered along these lines.
- Search QMS:** A search interface with a 'Search string...' field and a 'Filter by extent' dropdown.
- Identify Results:** A table showing metadata for a selected feature. The table has two columns: 'Feature' and 'Value'.

Feature	Value
Patches	
ObjectID	39
(Derived)	
(Actions)	
ObjectID	39
latitude	31.44024350000
longitude	-97.72210467000
asset_clas	Patch
photos	608b108f-9716-4e74-b068-75f492d...
photos_cap	
photos_url	https://web.fulcrumapp.com/photos/view/608b108f-9716-4e74-b068-75f492d...
videos	
videos_cap	
videos_url	
audio	
audio_capt	
audio_url	
sub_asset	
sub_asset1	
asset_name	
type_tbd	
- Browser Window:** A Fulcrum browser window is open, displaying a photo of a residential street with a white SUV and a silver SUV parked on the side. The URL is <https://web.fulcrumapp.com/photos/view?photos=608b108f-9716>.

Add and format labels

Layer Properties - Mains | Labels

Show labels for this layer

Label with: `concat("Size", " INCH ", "Material")`

Text Sample

abc Text

Formatting

abc Buffer

Background

Shadow

Placement

Rendering

Buffer

Draw text buffer

Size: 0.4000

Millimeter

Color: [Color Picker]

Color buffer's fill

Opacity: 100.0 %

Pen join style: Round

Blend mode: Normal

Draw effects

Help Style Apply Cancel OK

Coordinate: -10879165,3689581 Scale: 1:4,301 Magnifier: 100% Rotation: 0.0° Render: EPSG:3857

Feature	Value
ObjectID	39
(Derived)	
(Actions)	
ObjectID	39
latitude	31.44024350000
longitude	-97.72210467000
asset_clas	Patch
photos	608b108f-9716-4e74-b068-75f492d...
photos_cap	
photos_url	https://web.fulcrumapp.com/photos/view/...
videos	
videos_cap	
videos_url	
audio	
audio_capt	
audio_url	
sub_asset	
sub_asset1	
asset_name	
type_tbd	

Ready for a query: 50+ year old pipe

The screenshot displays the QGIS interface with a 'Select Features by Value' dialog box open. The dialog is configured with the following settings:

- Field: Age
- Value: 50
- Operator: Greater than or equal to (>=)

The map shows a network of pipes with labels such as '8 INCH CAST IRON', '4 INCH PVC', '12 INCH PVC', '18 INCH STEEL CYLINDER', and '12 INCH STEEL CYLINDER'. The status bar at the bottom indicates '606 feature(s) selected on layer Mains'.

Yellow lines are my result

Gatesville_QGIS_TEST - QGIS

Browser

- Project Home
- Home
- /Volumes
- GeoPackage
- SpatialLite
- export.sqlite
- gatesville
- gatesville_photos
- PostGIS
- MSSQL
- DB2
- WMS
- XYZ Tiles
- WCS
- WFS
- OWS
- ArcGISMapServer
- ArcGISFeatureServer
- GeoNode

Layers

- Water_leaks
- Patches
- Meters
- Mains
- Google Satellite
- HCMGIS Aerial Images
- Landsat (Gis-Lab-Info)

Search QMS

Search string...

Filter by extent All

Add new services here

Identify Results

Feature	Value
Patches	
ObjectID	39
(Derived)	
(Actions)	
ObjectID	39
latitude	31.44024350000
longitude	-97.72210467000
asset_clas	Patch
photos	608b108f-9716-4e74-b068-75f492d...
photos_cap	
photos_url	https://web.fulcrumapp.com/photos/view/
videos	
videos_cap	
videos_url	
audio	
audio_capt	
audio_url	
sub_asset	
sub_asset1	
asset_name	
type_tbd	

606 feature(s) selected on layer Mains.

Coordinate: -10879195,3689726 Scale: 1:4,301 Magnifier: 100% Rotation: 0.0° Render: EPSG:3857



Big picture view

The screenshot displays the QGIS desktop environment with the following components:

- Browser Panel:** Shows a project structure with folders for 'Project Home', 'Home', and 'SpatialLite'. Under 'SpatialLite', there is a folder named 'gatesville' containing 'gatesville_photos'.
- Statistics Panel:** Displays statistics for the 'Mains' layer. The 'Length_Fee' field is selected, showing a count of 606, a sum of 175304, and a mean of 289.281.
- Layers Panel:** Lists several layers: 'Water_leaks' (blue dots), 'Patches' (yellow diamonds), 'Meters' (red dots), and 'Mains' (colored lines). The 'Mains' layer is currently selected and active.
- Map Canvas:** Shows an aerial photograph of a rural area with a network of water mains overlaid in various colors (yellow, green, purple, blue). Blue dots representing water leaks are scattered across the network.
- Search GMS Panel:** A search interface with a search string field and a 'Filter by extent' button.
- Identify Results Panel:** Shows details for a selected feature from the 'Patches' layer. The 'ObjectID' is 39. The 'photos' field contains a URL: <https://web.fulcrumapp.com/photos/view/>.
- Status Bar:** At the bottom, it indicates '606 feature(s) selected on layer Mains', the coordinate '-10873651,3692151', a scale of 1:30,579, and other settings like 'Magnifier 100%' and 'Render EPSG:3857'.



Take Away



Q & A



Smart Management for
Small Water Systems

**Thank you for participating today.
We hope to see you at a future workshop!**

www.efcnetwork.org

