



Up to Speed on LCRR/LCRI Inventory?

Texas Water 2024, April 2024

Fort Worth, Texas

Patrick Forrest, GISP

City of Irving, Texas – Water Utilities Department

Lead and Copper Inventory

Background

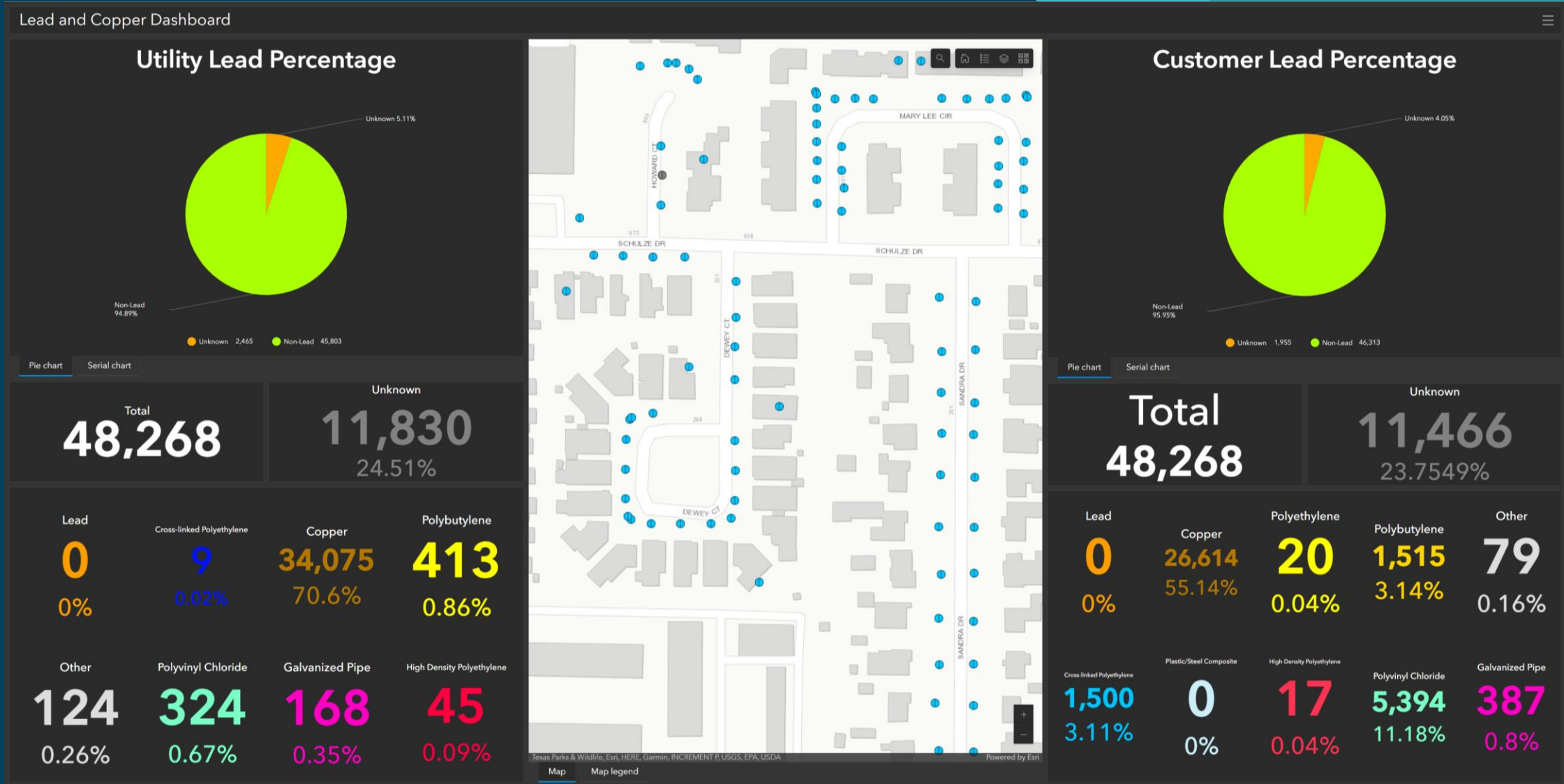
Background

- EPA's Lead & Copper Rule - Identify and reduce the number of lead lines in a system
- Collect, organize, and maintain your inventory
- Follow guidance from EPA and TCEQ
 - Lead and Copper Rule Revisions
 - Lead and Copper Rule Improvements
- Share findings with community stakeholders and public

Project Scope

- How to collect and maintain your data?
- Utilize existing solutions?
- Third-party vendors/applications
- Tracking progress
- Data at a glance

Lead and Copper Dashboard



The GIS Viewpoint

- Where is your data...
 - In the real world?
 - Within your organization?
- What data sets are we maintaining?
- Connecting to outside systems
- Centralized data location

ESRI's ArcGIS Solutions

Lead Service Line Inventory

ArcGIS Solution - Lead Service Line Inventory

The screenshot displays the ArcGIS Solutions web interface. At the top, the header reads "ArcGIS Solutions" with the subtitle "Industry-specific configurations for ArcGIS". A search bar contains "Search Solutions". On the left, a "Filters" sidebar is open, showing a tree view of industries. The "Utilities" category is expanded, and "Water Distribution" is selected. The main content area shows a grid of 8 solution cards. The card for "Lead Service Line Inventory" is highlighted. The interface also shows filter criteria: "Industry: Utilities" and "Domain: Water Distribution".

ArcGIS Solutions

Industry-specific configurations for ArcGIS

Search Solutions

Relevance Filter

Solutions: 16 | Filters | Industry: Utilities X | Domain: Water Distribution X | Clear filters

New Release

Industries

- Architecture, Engineering, and Construction (AEC)
- Business
- Conservation
- Defense
- Facilities
- Health and Human Services
- Pipeline
- Public Safety
- State and Local Government
- Telecommunications
- Utilities**
 - District Energy
 - Electric
 - Gas
 - Sewer
 - Stormwater
 - Water Distribution**

Citizen Problem Reporter

Citizen Problem Reporter can be used to solicit non-emergency requests (for example, blight, graffiti, trash, potholes, clogged drains, and flooding) from the general public.

Water Distribution Data Management

Water Distribution Data Management can be used to map water distribution assets, edit data, view system maps in the field and office, view asset reports, and collaborate with map notes.

Plans and Drawings

Plans and Drawings can be used to index the geographic extent of record plans and drawings and provide access to a catalog of source documents in the office or the field.

Capital Project Tracking

Capital Project Tracking can be used to manage an active project portfolio, communicate project status, and share project updates with internal and external stakeholders.

Lead Service Line Inventory

Lead Service Line Inventory can be used to develop a lead service line inventory and monitor the replacement of service lines required to comply with the Environmental Protection Agency's (EPA) Lead and Copper Rule Revisions.

Participatory Budgeting

Participatory Budgeting can be used to solicit community feedback to identify, discuss, and prioritize public spending projects.

Capital Project Planning

Capital Project Planning can be used to define a project portfolio, organize the portfolio into an official capital improvement plan, and share the plan with internal and external stakeholders.

Social Equity Analysis

Social Equity Analysis can be used to understand community conditions, analyze demographic data, and communicate racial equity initiatives.

ArcGIS Solution - Lead Service Line Inventory

A configurable, out-of-the-box application





































- Deployed in minutes
 - ArcGIS Online
 - ArcGIS Enterprise
- Built-in maps, layers, tools, and applications
 - Dashboard
 - Story Maps
 - Survey123 forms
- Free to use (with your ESRI Maintenance Agreement)

Allows organizations to:

- Streamline service line inventories
- Comply with regulations
- Optimize replacement programs
- Inform the public

Post-solution Deployment

- Understanding your new workload
- Select maps/apps that you'll use
- Conform your data to the solution
 - Append existing data to new schema
 - Change GIS data types
 - Add/remove fields

<input type="checkbox"/> Title				Modified
<input type="checkbox"/> Field Verification	 Feature Layer		 ...	Apr 26, 2021
<input type="checkbox"/> Field Verification	 Web Map		 ...	Apr 26, 2021
<input type="checkbox"/> Lead and Copper Dashboard	 Dashboard		 ...	Mar 2, 2023
<input type="checkbox"/> Lead Report	 Web Mapping Application		 ...	Apr 26, 2021
<input type="checkbox"/> Lead Report	 Web Map	 	 ...	Aug 23, 2023
<input type="checkbox"/> Lead Service Management	 Web Mapping Application		 ...	Apr 26, 2021
<input type="checkbox"/> Lead Viewer	 Web Map		 ...	Apr 26, 2021
<input type="checkbox"/> Lead Viewer	 Web Mapping Application		 ...	Mar 10, 2022
<input type="checkbox"/> Lead_Services_Merge	 Service Definition		 ...	Jun 6, 2022
<input type="checkbox"/> Lead_Services_Merge	 Web Map		 ...	Jun 6, 2022
<input type="checkbox"/> Lead_Services_Merge	 Feature Layer	  	 ...	Aug 22, 2023

Solution Configuration

- How do you make your data fit?
- Comes with points, we need lines
- Fill in gaps by connecting to other systems, i.e., appraisal district data, work order management systems, and customer information systems
 - Common Fields
 - Geoprocessing
 - Python Scripting

```
# Purpose: Queries 'Lead and Copper' workorders from Cityworks and
# pushes data into the hosted feature layer for Lead and Copper
# inspection.
#-----

import cwLogon
import accountHelper
import requests
import json, time, datetime
import datetime as dt
import string, smtplib, os, sys
import pandas as pd
from getpass import getpass

# Search Cityworks for Lead and Copper WorkOrders Between Init Dates
#-----

def cwSearchWorkOrder(myToken):
    print("Starting Search")
    myDomainId = '3'
    myApplyToEntity = 'WTRSERVICELINE'
    myAssetGroup = 'Water Distribution'
    myDescription = 'SERVICE MATERIAL INVENTORY'
    myCanceled = 'False'
    myInitDate = '2022-05-31T00:00:00'
    myEndInitDate = '2022-06-30T00:00:00'

    myURL = r'https://irving.newedgeservices.com/Cityworks/services/Ams/WorkOrder/Search?data=' \
           '{"Description": ["' + myDescription + '"], "AssetGroup": ["' + myAssetGroup + '"], ' \
           '"ApplyToEntity": ["' + myApplyToEntity + '"], "InitiateDateBegin": "' + myInitDate + '", "InitiateDateEnd": "' + myEndInitDate + '", ' \
           '"Canceled": "' + myCanceled + '", "DomainId": ["' + myDomainId + '"]}&token=' + myToken + ''

    jres = requests.post(myURL).json()
    ## print(jres)
    ## print(jres['Value'])
    myWorkOrderIDs = []
    for wo_key in jres['Value']:
        data = str(wo_key)
        myWorkOrderIDs.append(data)
    ## print(myWorkOrderIDs)

    if jres['Status'] == 0:
        myStatus = 'OK'
    else:
        myStatus = jres['Message']

    ## myWorkOrderIDs = ['1279540','1266826','1273256']
    ## myWorkOrderIDs = ['1266826']
    ## myWorkOrderIDs = ['1279703']
    return myWorkOrderIDs
```

GIS at the Center

Field Data
Collection



DCAD
Data



Work Order
Management System



GIS
Centralized Data
Repository



Customer Information
System

GIS at the Center

- Application Programming Interfaces (API's) and Python
- Access to work orders for field verification
 - Performing inspections
 - Identifying pipe materials
- Access to CIS for water service accounts
 - Active meters
 - Contact information

GIS at the Center

Field Data
Collection



DCAD
Data



Work Order
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Customer Information
System

GIS at the Center

- Query meters from CIS
- Geocode meters by service address
- Import meter data to GIS hosted feature layer
- Draw in service lines
- Service type, location, account ID, meter number

<input type="checkbox"/> Display Name	Field Name	Type
<input type="checkbox"/> OBJECTID	OBJECTID	ObjectID
<input type="checkbox"/> Utility Install Date	UTILINSDAT	Date
<input type="checkbox"/> Utility Lead	UTILLEAD	String
<input type="checkbox"/> Site Address	SITEADDRES	String
<input type="checkbox"/> Customer Install Date	CUSTINSDAT	Date
<input type="checkbox"/> Customer Lead	CUSTLEAD	String
<input type="checkbox"/> Account ID	ACCOUNTID	String
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<input type="checkbox"/> Utility Material Source	UTILSOURCE	String
<input type="checkbox"/> Utility Material	UTILMAT	String
<input type="checkbox"/> Customer Material	CUSTMAT	String
<input type="checkbox"/> Residential Year Built	RESYRBLT	Double
<input type="checkbox"/> GlobalID	GlobalID	GlobalID
<input type="checkbox"/> Facility ID	FACILITYID	String
<input type="checkbox"/> Work Order ID	WorkOrderID	String
<input type="checkbox"/> Facility ID	FACILITYID_1	String
<input type="checkbox"/> METER_NUMBER	METER_NUMBER	String
<input type="checkbox"/> ZIPCODE	ZIPCODE	Double
<input type="checkbox"/> LAT	LAT	Double
<input type="checkbox"/> LONG	LONG	Double
<input type="checkbox"/> SERVTYPE	SERVTYPE	String
<input type="checkbox"/> Photos And Files	Photos And Files	Attachment

GIS at the Center

Field Data
Collection



DCAD
Data



Work Order
Management System



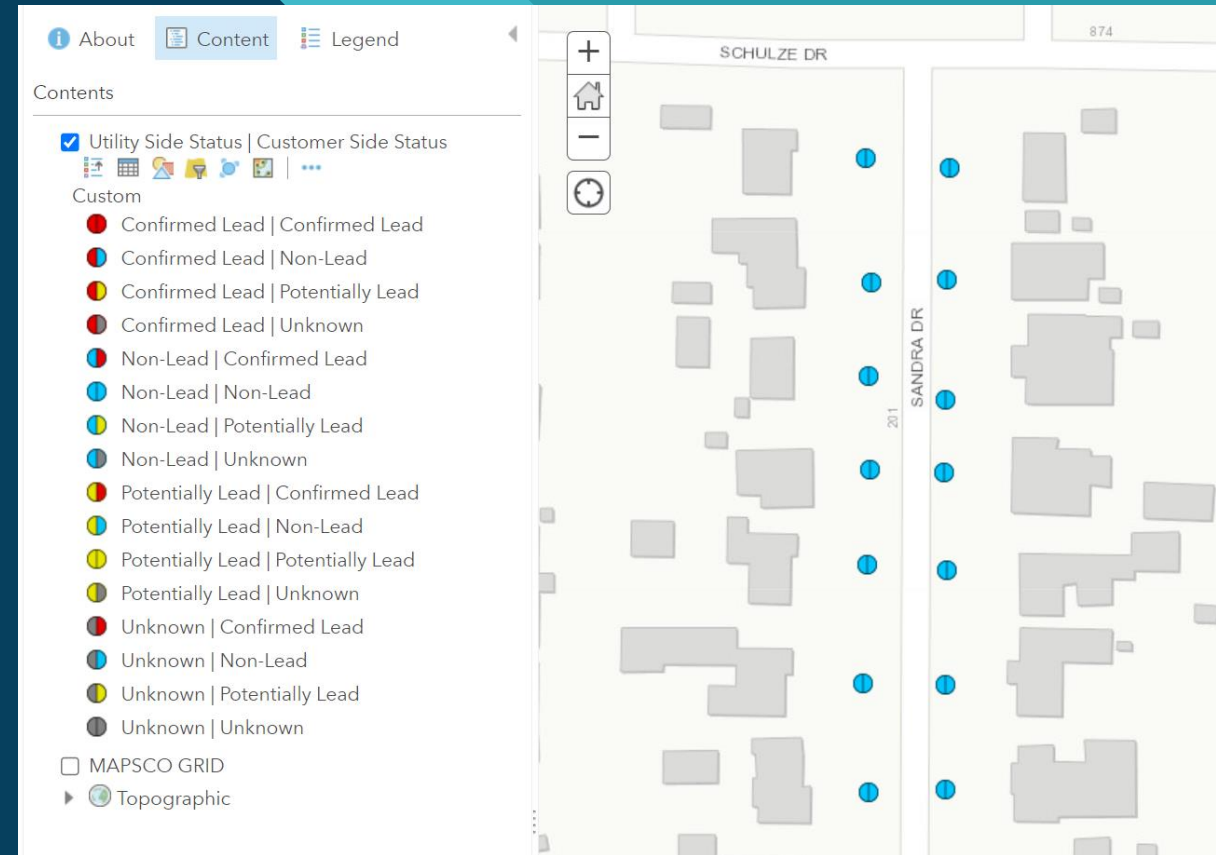
GIS
Centralized Data
Repository



Customer Information
System

GIS at the Center

- Dallas Central Appraisal District
 - Provides 'year built' data
- Start your inspections



GIS at the Center

Field Data
Collection



DCAD
Data



Work Order
Management System



GIS
Centralized Data
Repository



Customer Information
System

GIS at the Center

- Create service line inspections in WO system
 - Captures customer and city sides of service line
- Query WO's related to service line inspections
- Python transmits important details and attachments from WO to GIS hosted feature layer

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GIS at the Center

Field Data
Collection



DCAD
Data



Work Order
Management System



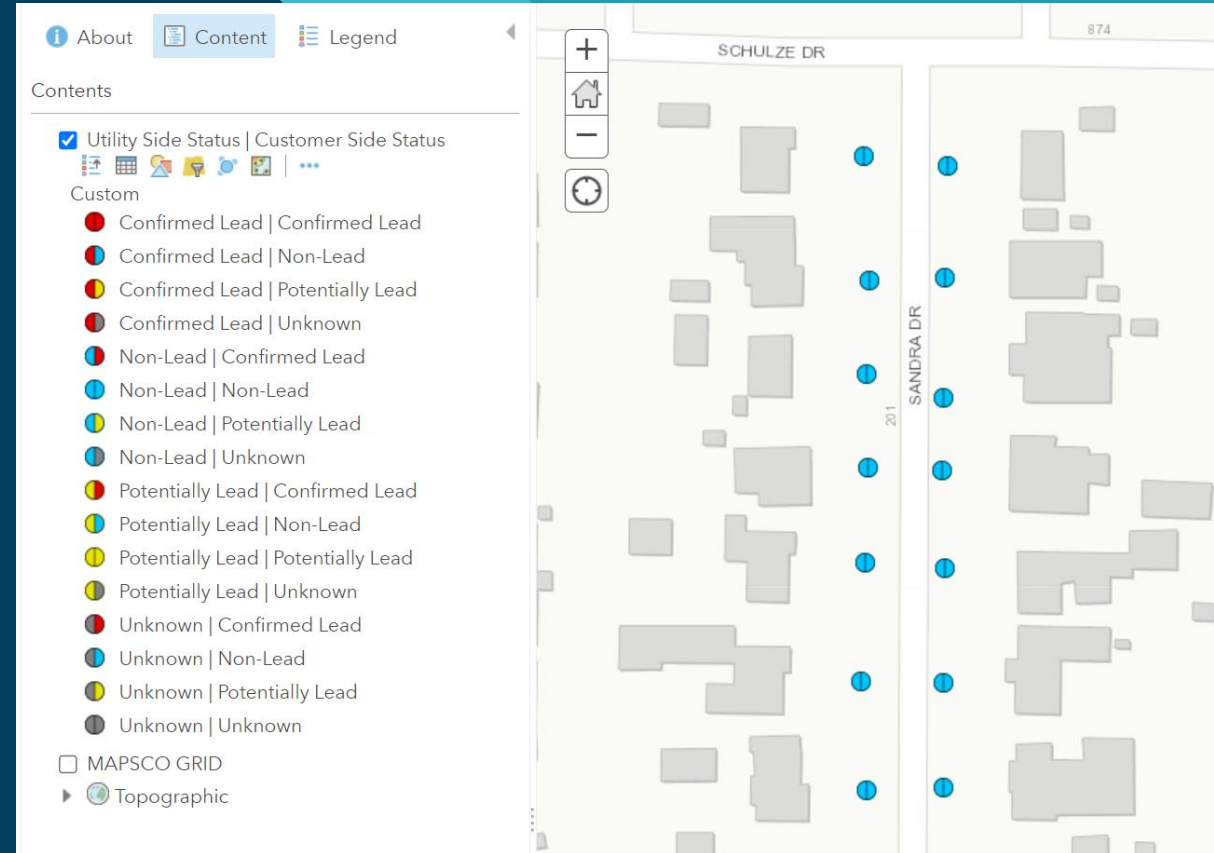
GIS
Centralized Data
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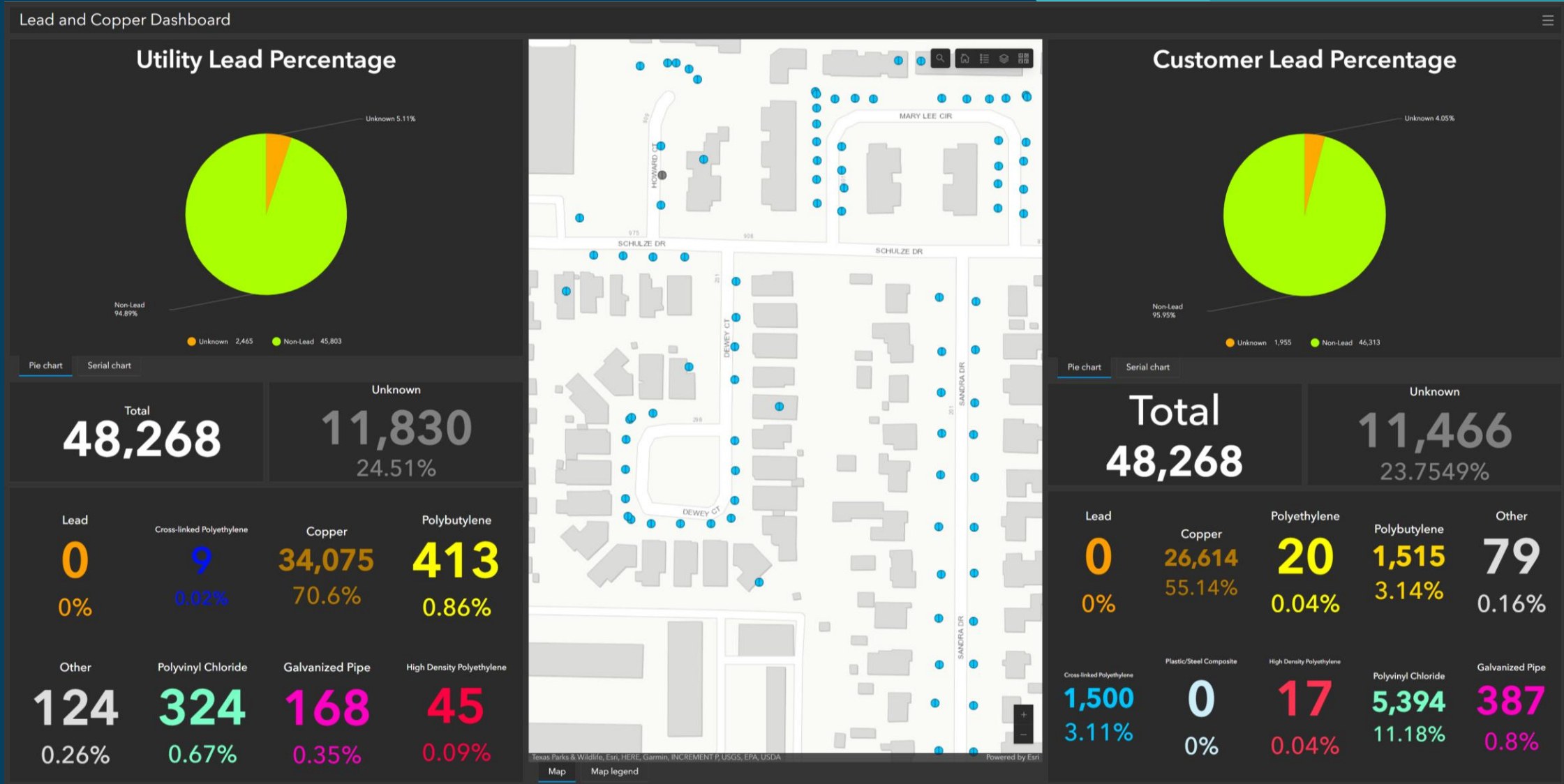
Customer Information
System

GIS at the Center

- Third-party data collection
- Import data into the hosted feature layer
- Methods may vary



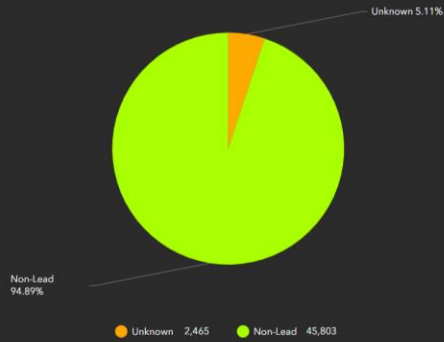
Lead and Copper Dashboard



Lead and Copper Dashboard

Lead and Copper Dashboard

Utility Lead Percentage

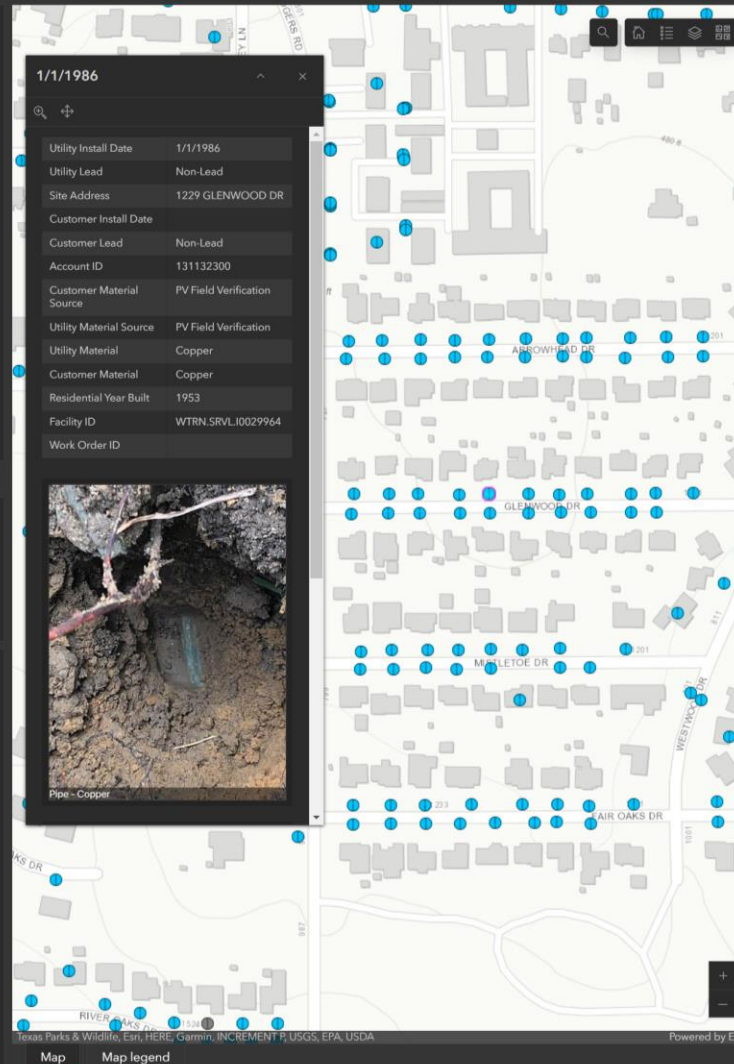


Pie chart Serial chart

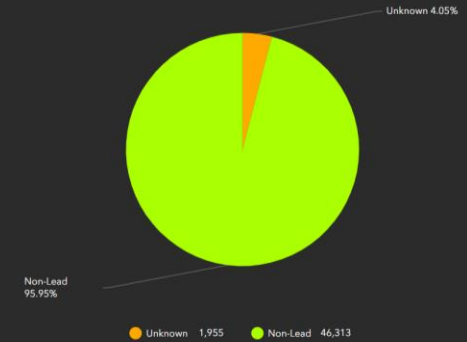
Total
48,268

Unknown
11,830
24.51%

Lead 0 0%	Cross-linked Polyethylene 9 0.02%	Copper 34,075 70.6%	Polybutylene 413 0.86%
Other 124 0.26%	Polyvinyl Chloride 324 0.67%	Galvanized Pipe 168 0.35%	High Density Polyethylene 45 0.09%



Customer Lead Percentage



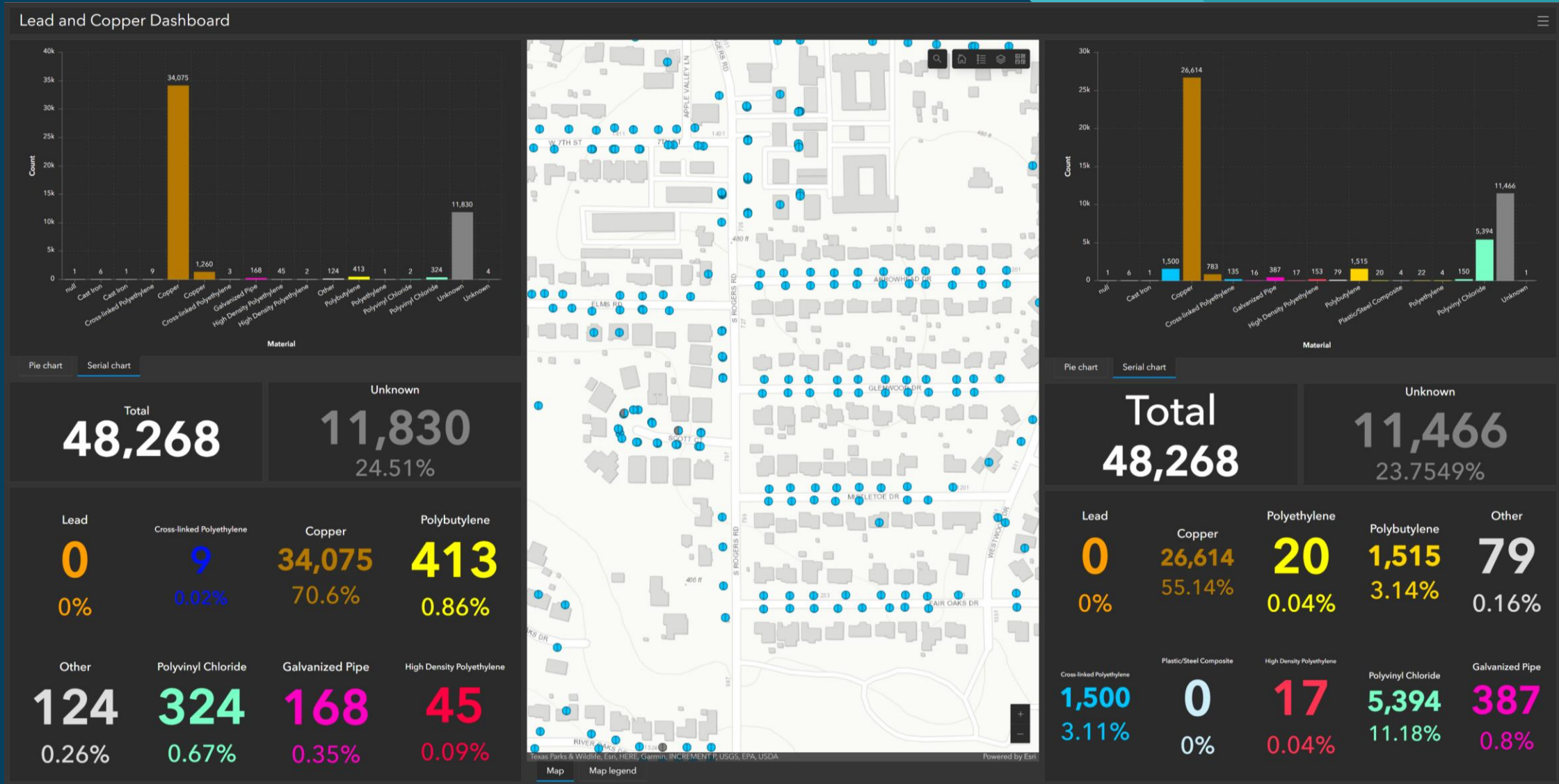
Pie chart Serial chart

Total
48,268

Unknown
11,466
23.7549%

Lead 0 0%	Copper 26,614 55.14%	Polyethylene 20 0.04%	Polybutylene 1,515 3.14%	Other 79 0.16%
Cross linked Polyethylene 1,500 3.11%	Plastic/Steel Composite 0 0%	High Density Polyethylene 17 0.04%	Polyvinyl Chloride 5,394 11.18%	Galvanized Pipe 387 0.8%

Lead and Copper Dashboard



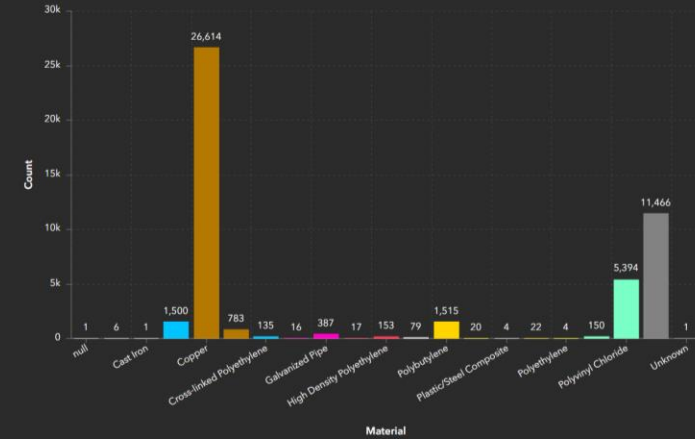
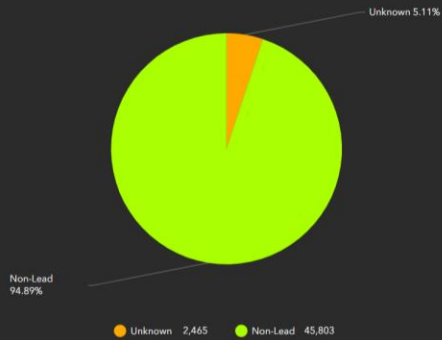
Lead and Copper Dashboard

- Solution deployed to ArcGIS Online
 - Cloud hosted
 - Web based
 - Data storage consumes credits
- Accessible to staff and contractors
- See your progress
- Easily configurable for public use

Lead and Copper Dashboard

Lead and Copper Dashboard

Utility Lead Percentage



Pie chart Serial chart

Pie chart Serial chart

Total
48,268

Unknown
11,830
24.51%

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Lead	Cross-linked Polyethylene	Copper	Polybutylene
0 0%	9 0.02%	34,075 70.6%	413 0.86%
Other	Polyvinyl Chloride	Galvanized Pipe	High Density Polyethylene
124 0.26%	324 0.67%	168 0.35%	45 0.09%

Lead	Copper	Polyethylene	Polybutylene	Other
0 0%	26,614 55.14%	20 0.04%	1,515 3.14%	79 0.16%
Cross-linked Polyethylene	Plastic/Steel Composite	High Density Polyethylene	Polyvinyl Chloride	Galvanized Pipe
1,500 3.11%	0 0%	17 0.04%	5,394 11.18%	387 0.8%

Map Map legend

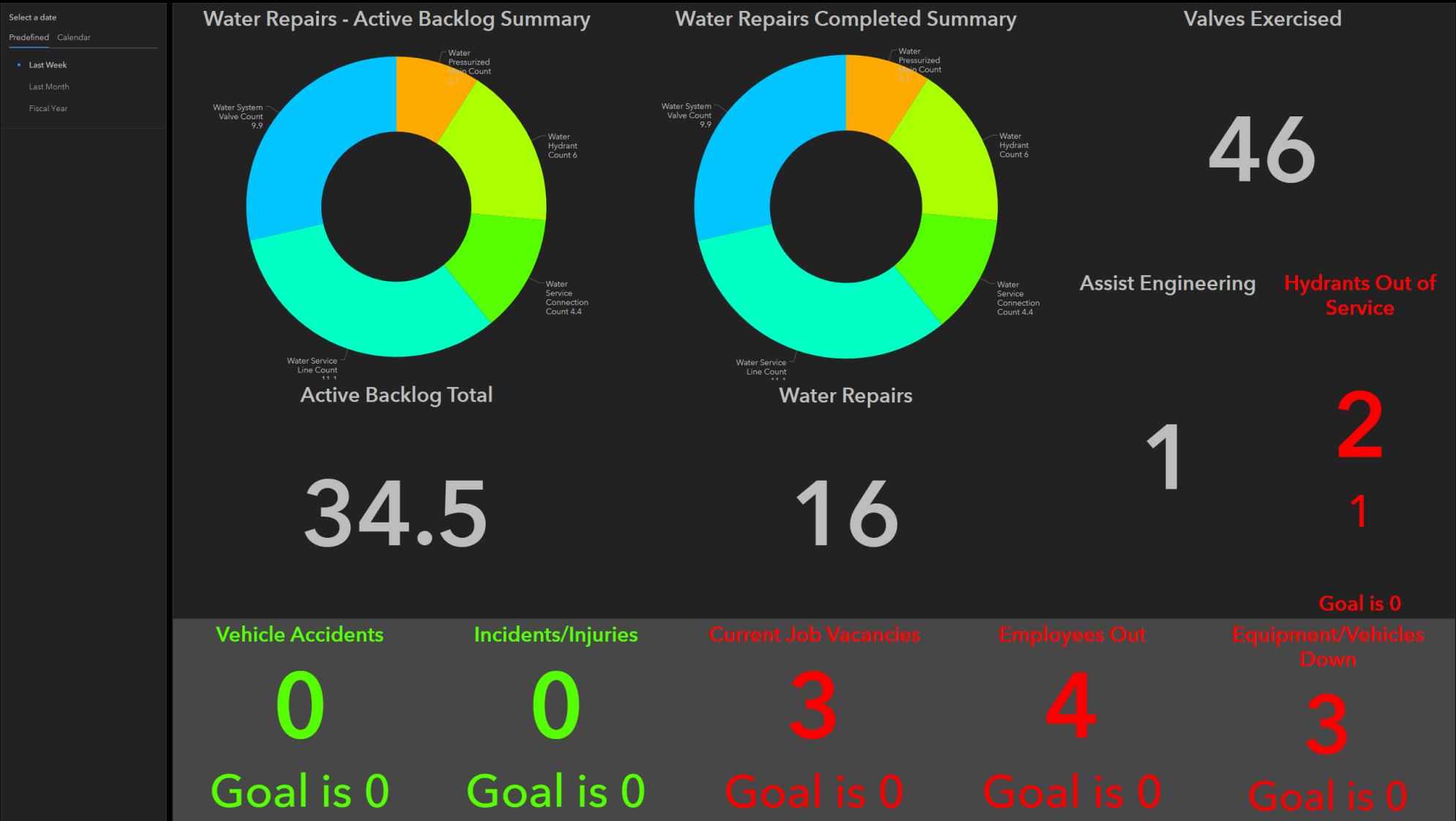
Lead and Copper Dashboard

- Further analyze your data
 - Targeted internal field inspections
 - 65 field inspections/week > 25 field inspections/day
- Dynamic application
 - Layers can be added/removed
 - Application can change with project needs
 - Compatible with other ESRI products
- Feeds future public facing application

Other GIS Applications for Water Utilities

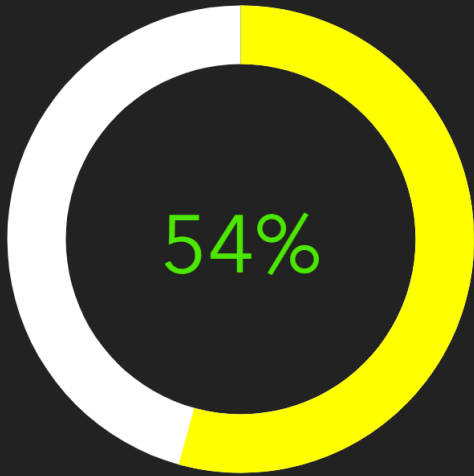
- Water/Wastewater Repairs
- Discharge Point Inventory and Inspections
- Sanitary Sewer Overflows
- Water Flush Points
- Fire Hydrant Inspections
- *Any asset that has location information*

Water Repairs Dashboard



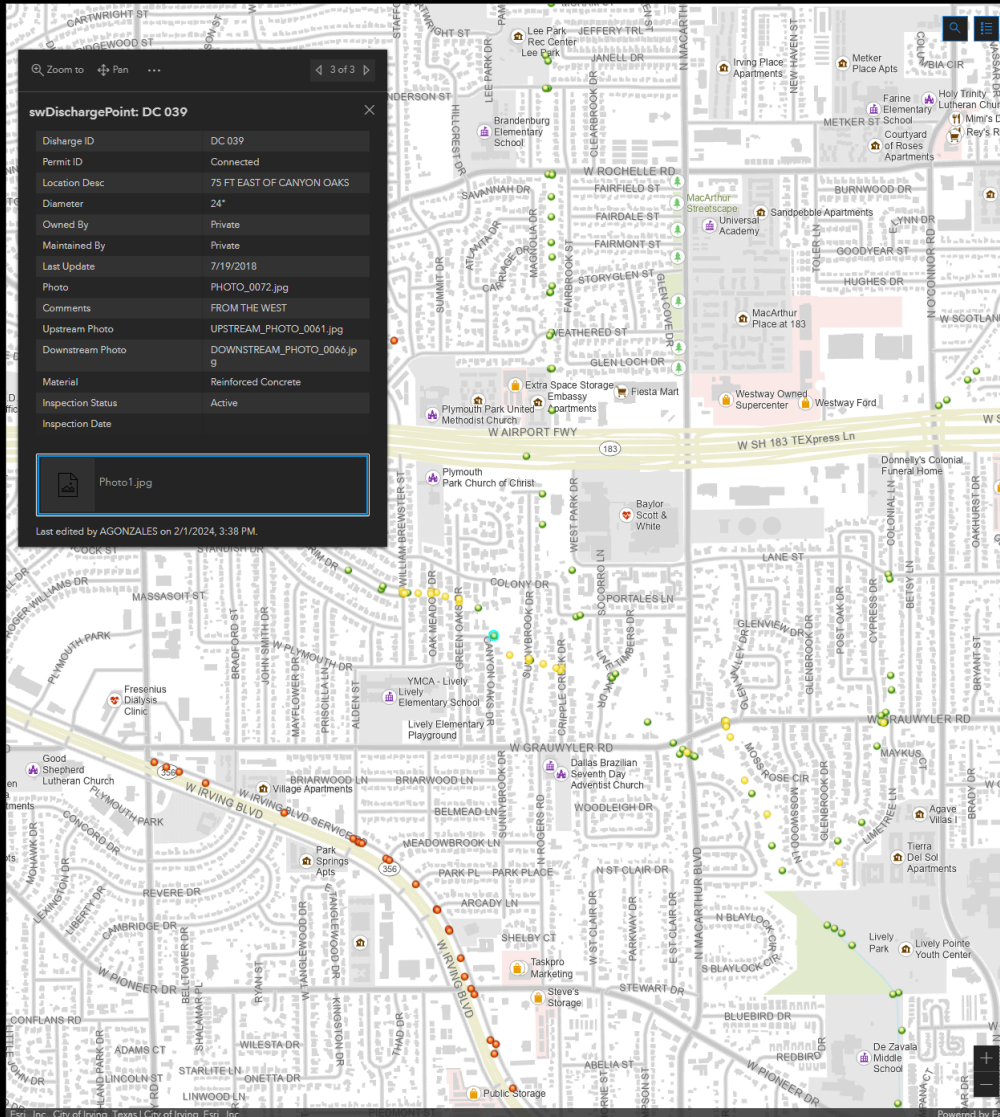
Discharge Point Inventory and Inspections

DW Screens Completed of Original Total



DW Screens Left to Inspect

362



DW Screens Completed in FY 2023-2024

64

DWFS This Week

0

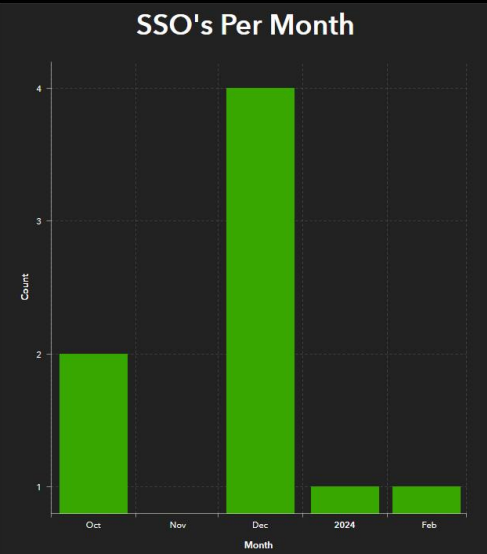
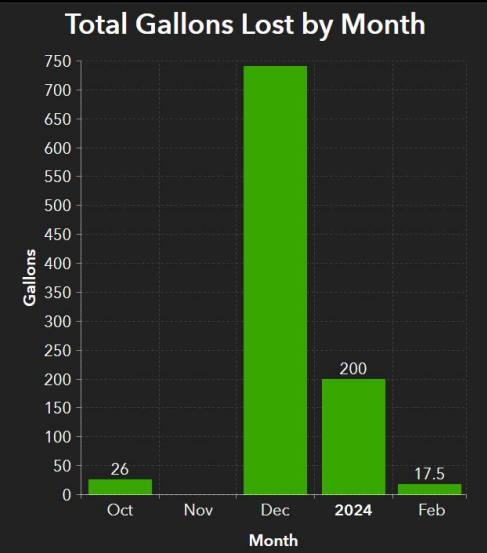
DWFS Last Week

0

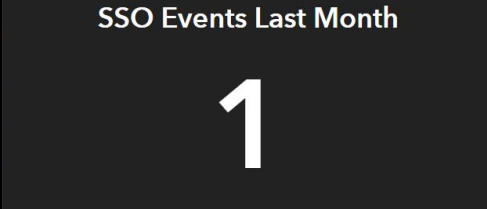
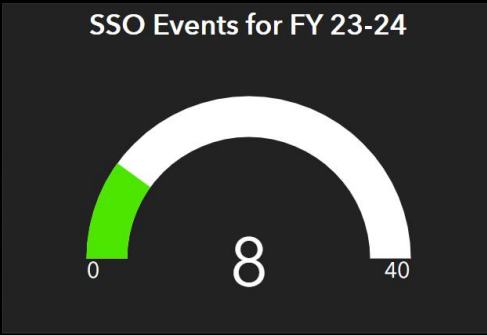
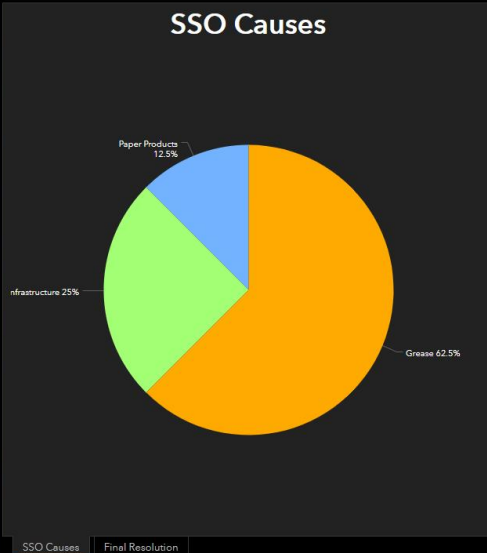
DWFS This Month

0

Sanitary Sewer Overflows



Overflow Start: 2/22/2024
 Total Gallons Lost: 18
 Notes: Grease
 Workorder ID: 1372383
 Cityworks: View
 Repair Status: Repair Completed
 Work Order Resolution: 1372895
 Final Resolution: Add to PM List



Water Flush Points

Total Flush Points

688

2-inch Flush Points

188

Automatic Flush Points

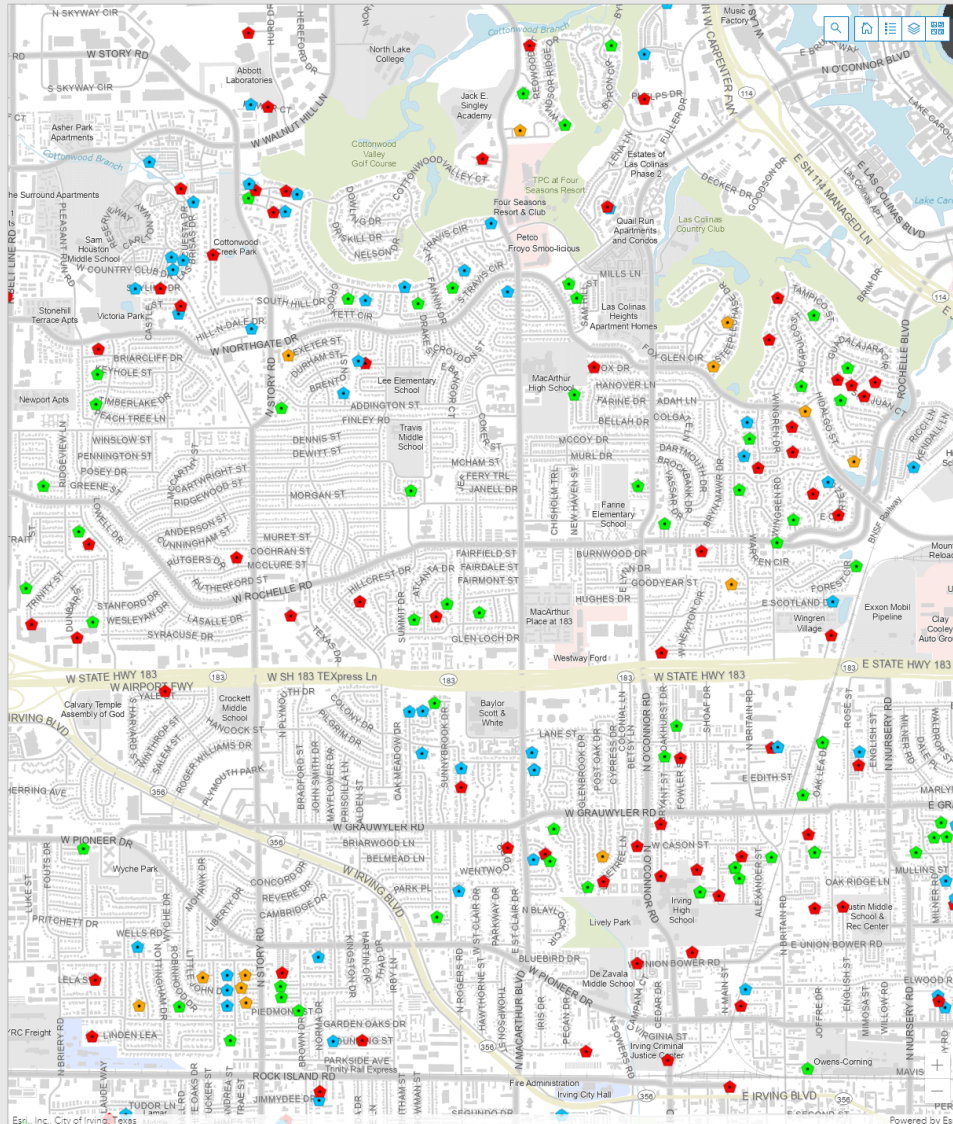
48

Fire Hydrant Flush Points

230

Install Flush Points

222

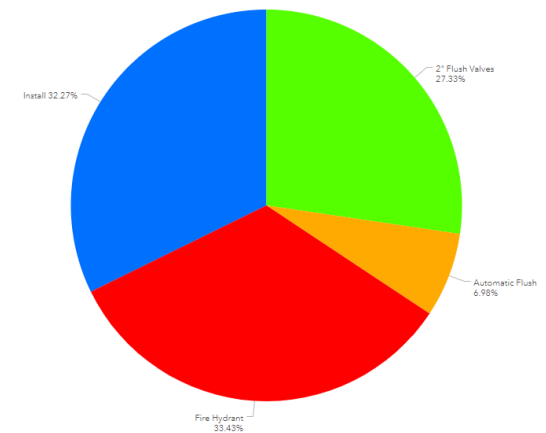


Water Flush Points

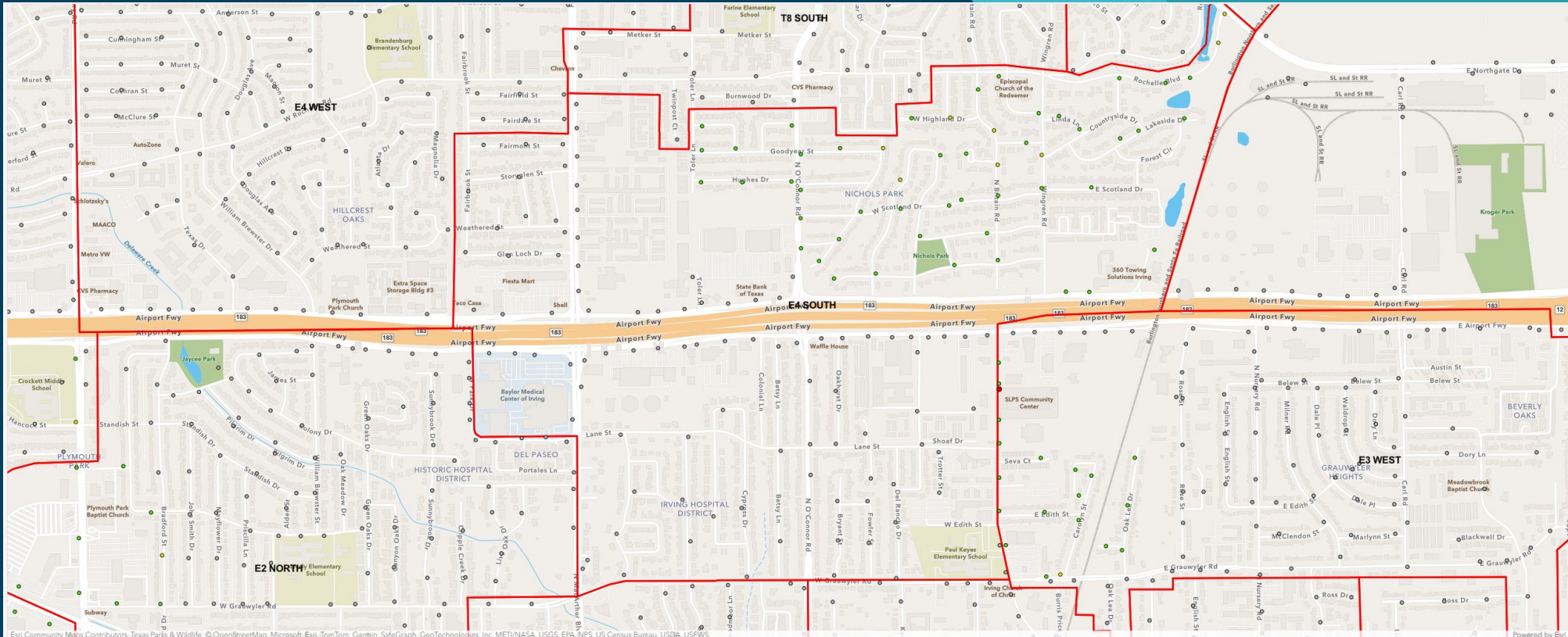
Flush Point Type

- 2" Flush Valves
- Automatic Flush
- Fire Hydrant
- Install

Flush Point Types



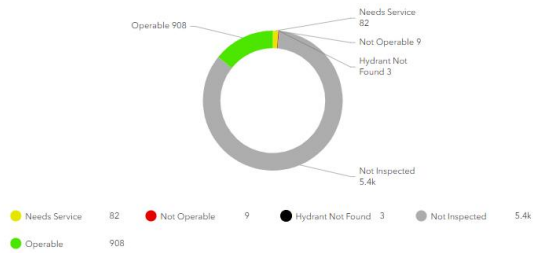
Fire Hydrant Inspections



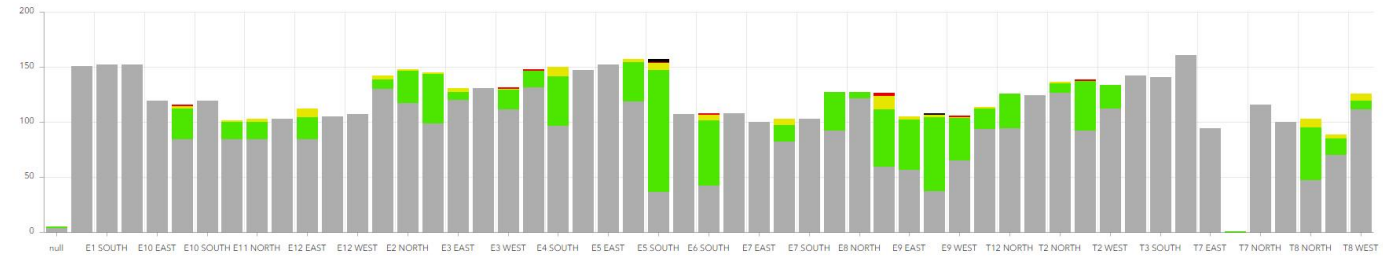
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Powered by Esri

City-Wide Fire Hydrant Operational Status:



Hydrant Status by Station



Things to Consider

- Access to GIS professionals
- Organization goals
- Timelines
- Access to ESRI solutions/tools
- Other applications/software used by organization
- Consistent access to dashboard
- Good data in > good data out



Questions



Thank You