ADAPTIVE ASSET MANAGEMENT BASED ON DATA AVAILABILITY

NCTCOG Public Works Roundup – September 17th, 2020

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AGENDA

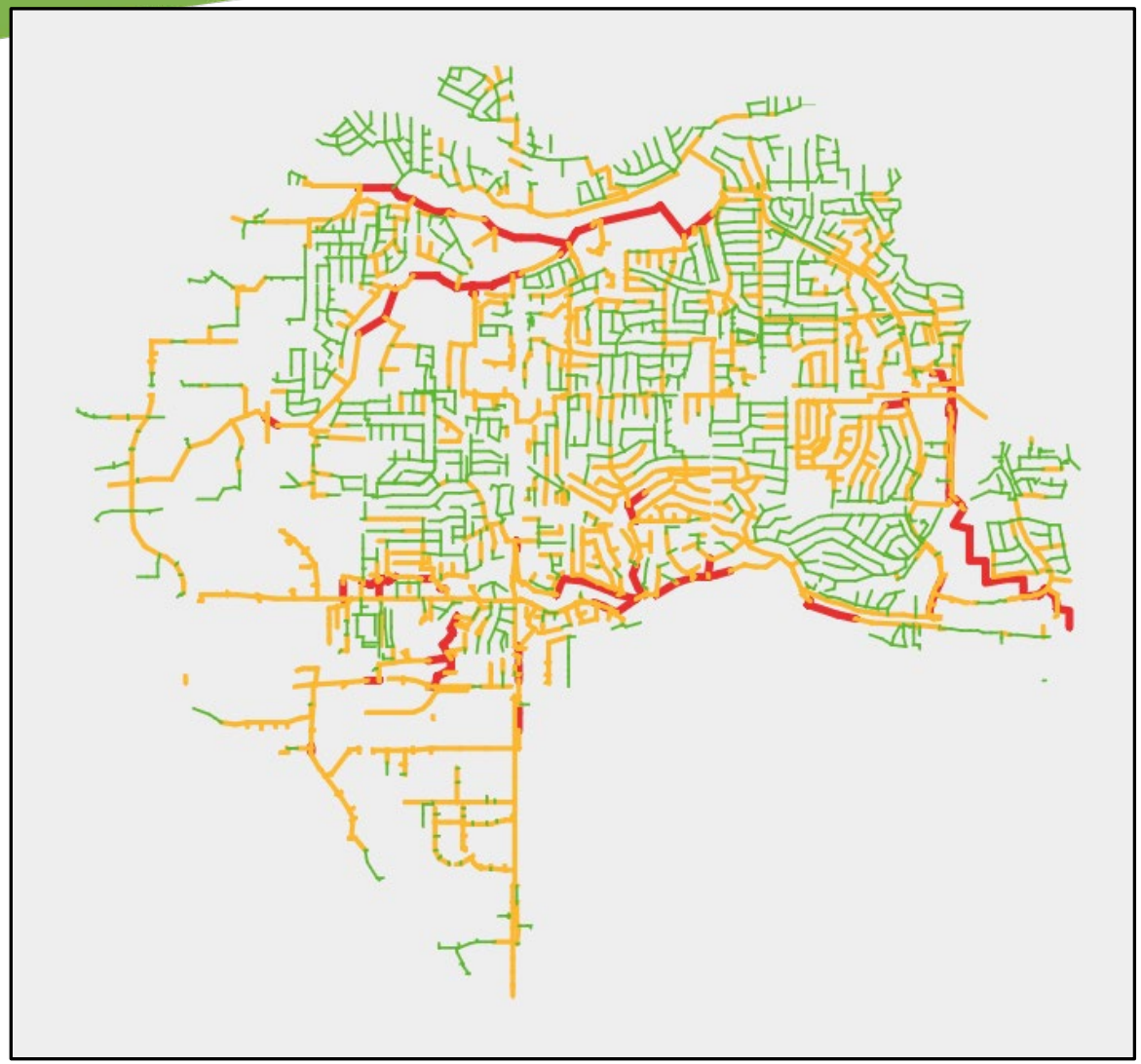
- Asset Management Basics
- The Spectrum of Electronic Data Availability
- Three Case Studies
- Coppell’s Current Database and Inspection Plan

ASSET MANAGEMENT BASICS

"Asset management is the practice of managing infrastructure **capital assets** to **minimize the total cost** of owning and operating them, while **delivering the service level** customers desire." - USEPA

Likelihood of Failure (LOF) **x** Consequence of Failure (COF) **=** Risk

RISK PRIORITIZATION = FINANCIAL PRIORITIZATION



Inspection Plan

Year	Inspect Segment Numbers	Total Distance (Linear Feet)
2020	1 to 134	45,553
2021	135 to 303	45,308
2022	304 to 447	45,591
2023	448 to 614	45,541
2024	615 to 791	45,530
2025	792 to 1,000	45,352
2026	1,001 to 1,193	45,518
2027	1,194 to 1,383	45,526
2028	1,384 to 1,593	45,521
2029	1,594 to 1,782	45,563

ASSET MANAGEMENT BASICS – COLLECTION SYSTEM

Likelihood of Failure (LOF) **x** **Consequence of Failure (COF)** **=** **Risk**

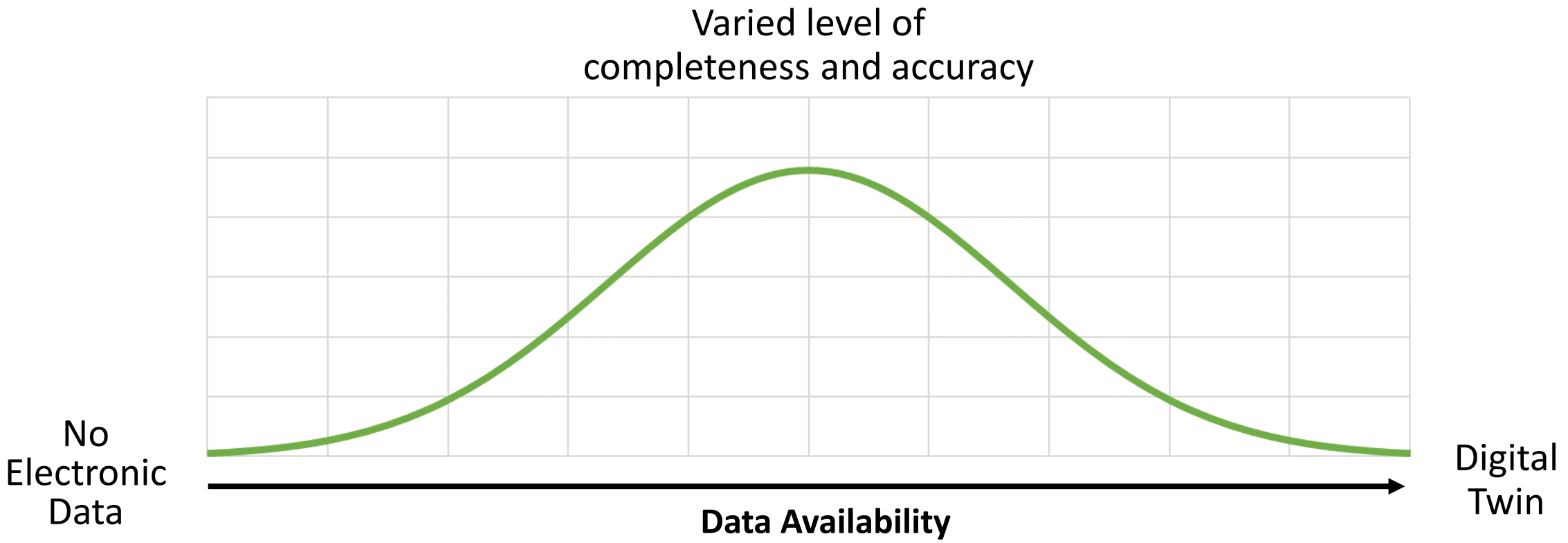
- Age
- Material
- Condition

- Proximity to:
  - Major roads
  - Water bodies
- Size/Flow Capacity

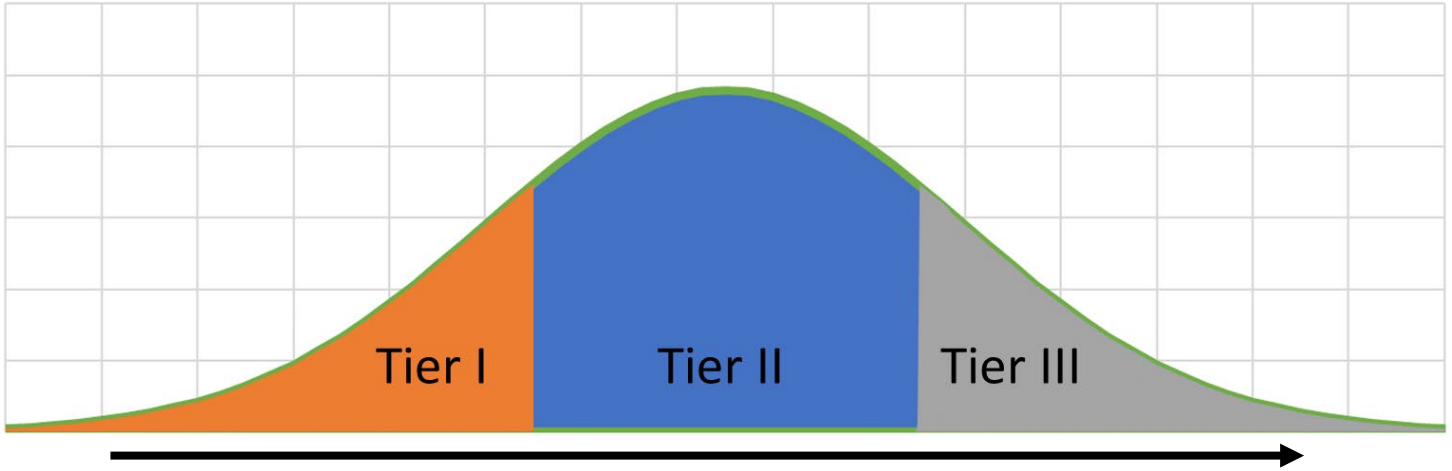
Dependent upon Electronic Data

ELECTRONIC DATA

- Electronic representation of a collection system can vary significantly



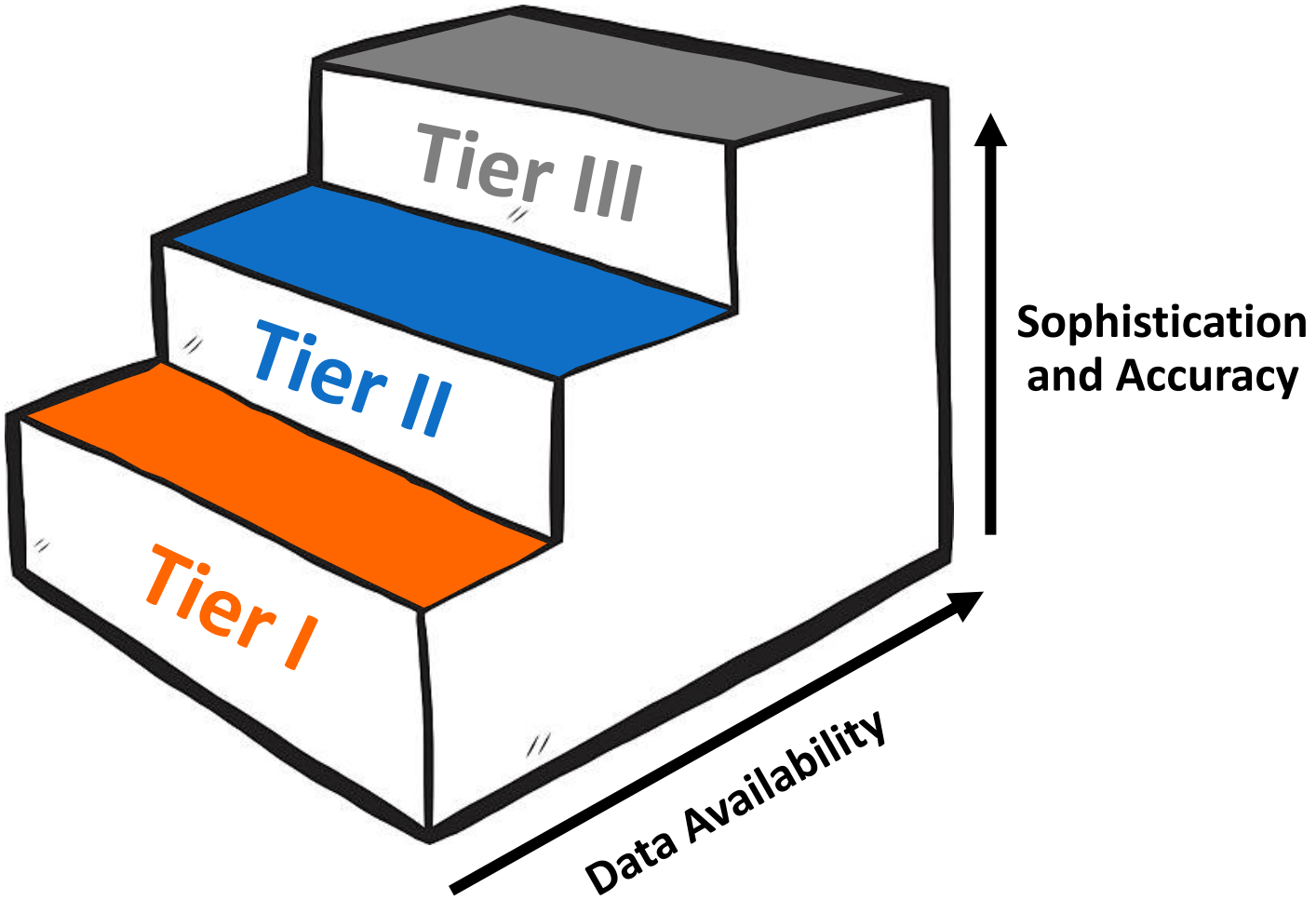
RANGE OF DATA AVAILABILITY



Tier	Georeferenced Location	Attributes[1]	Condition Scores
I	Maybe	<50%	No
II	Yes	>50%	No
III	Yes	>90%	Yes

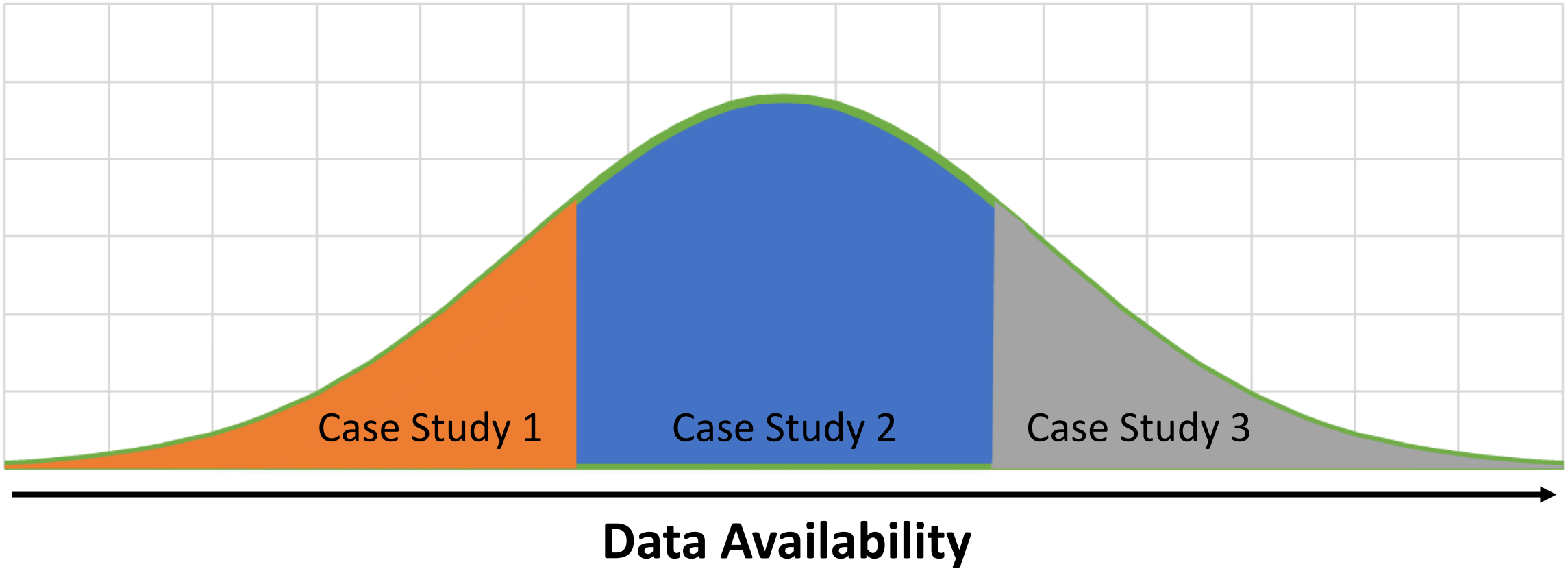
[1] Includes diameter, age, and material

RANGE OF DATA AVAILABILITY



However, even a risk prioritization for a City in Tier I provides value.

TEXAS CASE STUDIES



CASE STUDY #1

Location: West Texas

Population: >100,000

Collection System: 700 miles

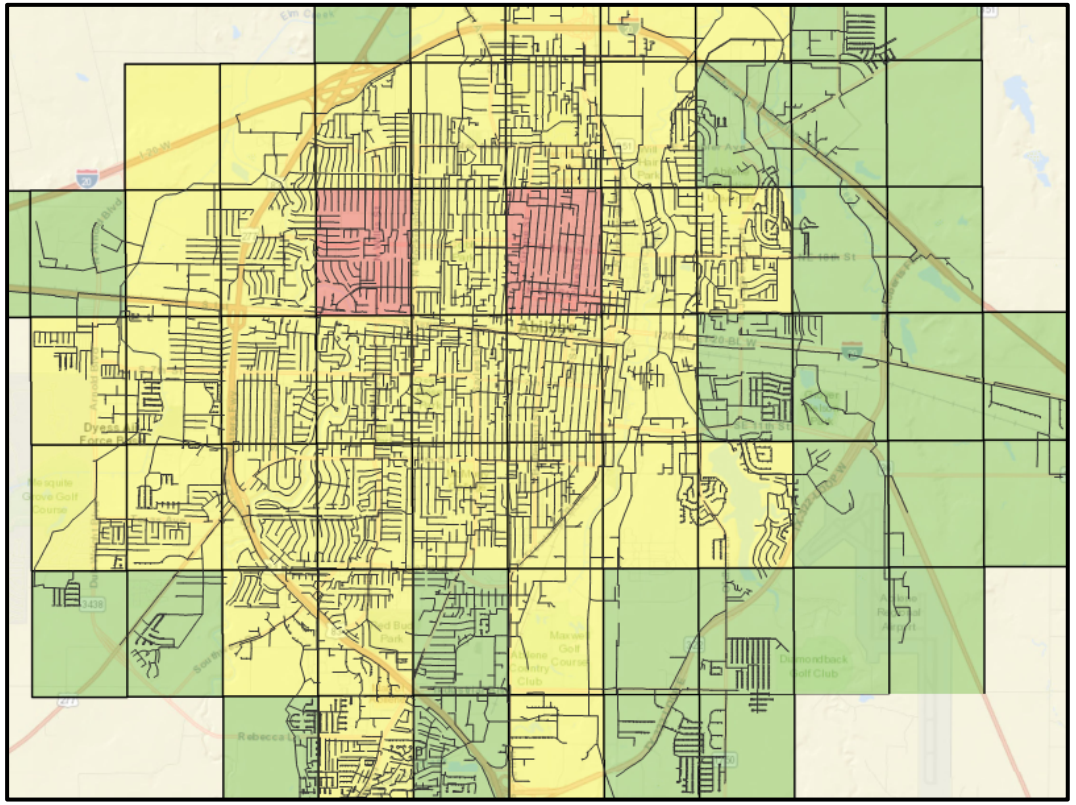
Data Availability: Tier I

Data	Available?
Georeferenced Location	Some
Pipeline Diameter	90%
Pipeline Material	90%
Pipeline Age	0%
Condition Scores	No

CASE STUDY #1 – SURROGATE DATA

- **Age** – Initially assigned based on development date of closest land parcel. Refined to match timeframe in which pipe material was typically installed.
  - Example: Asbestos Concrete Pipe installed between 1940 and 1970.

- **Condition** – Staff knowledge capture workshop scoring by grid



CASE STUDY #2 – COPPELL

Location: Coppell

Population: <50,000

Collection System: 220 miles

Data Availability: Tier II

Data	Available?
Georeferenced Location	Yes
Pipeline Diameter	100%
Pipeline Material	100%
Pipeline Age	100%
Condition Scores	No

Like Case Study #1, the **condition** of pipes in Coppell was estimated from a staff knowledge workshop.

CASE STUDY #3

Location: DFW Metroplex

Population: >100,000

Collection System: 500 miles

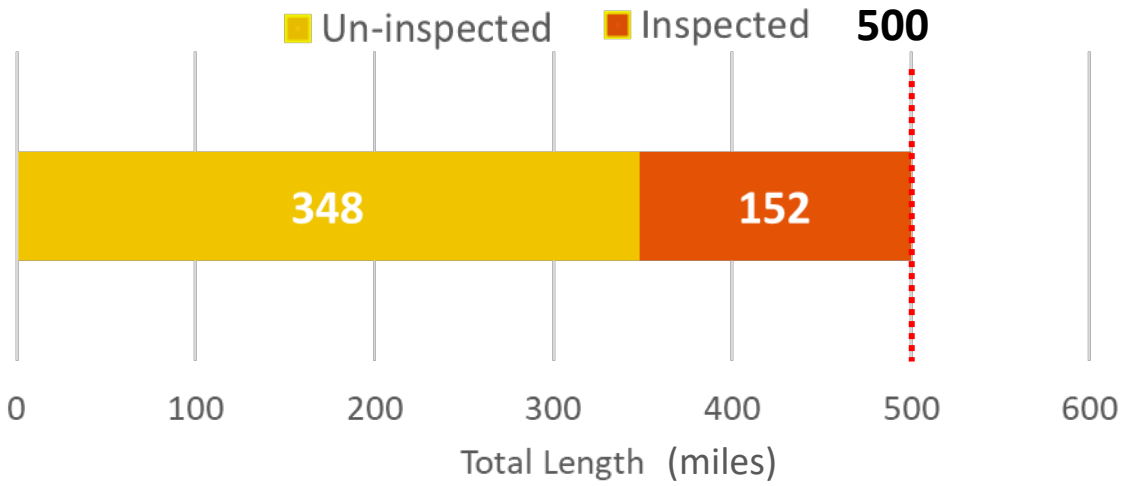
Data Availability: Tier III

Data	Available?
Georeferenced Location	Yes
Pipeline Diameter	100%
Pipeline Material	100%
Pipeline Age	100%
Condition Scores	30%

For cities in Tier III, more sophisticated models (machine learning) can be used to predict the condition of pipes that have not been inspected.

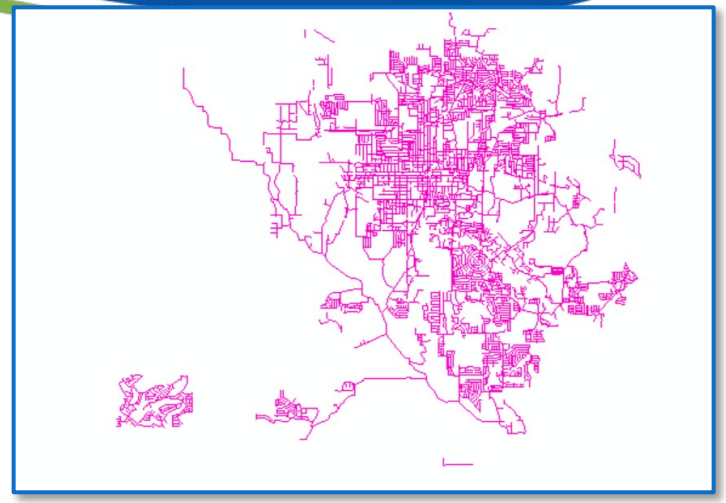
NOT ALL CITIES IN TIER III ARE EQUAL

Case Study #3

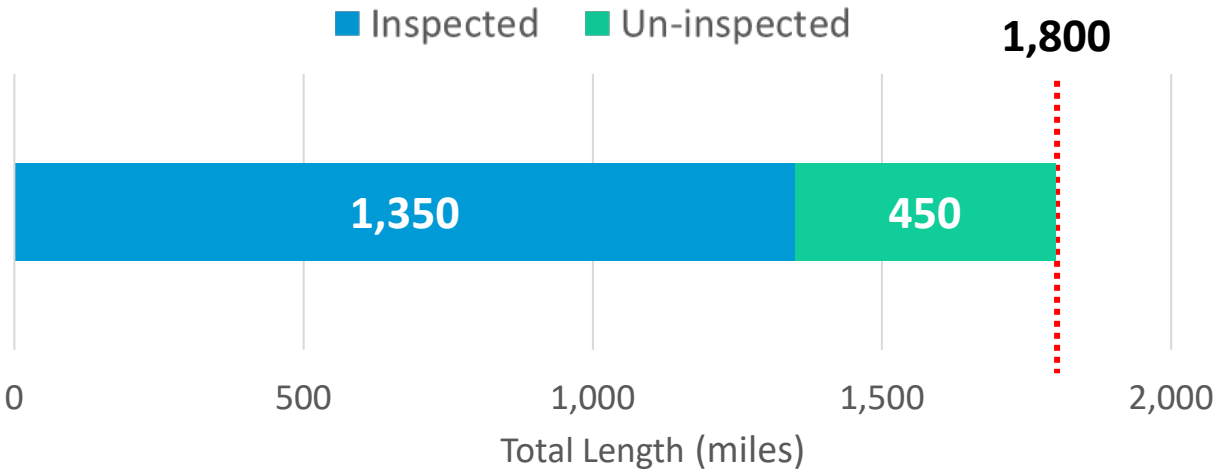


Model Accuracy

64%

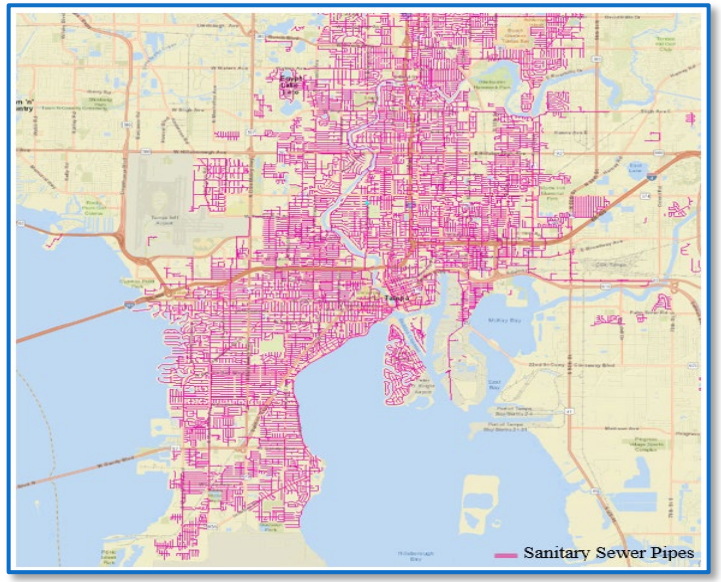


City of Tampa

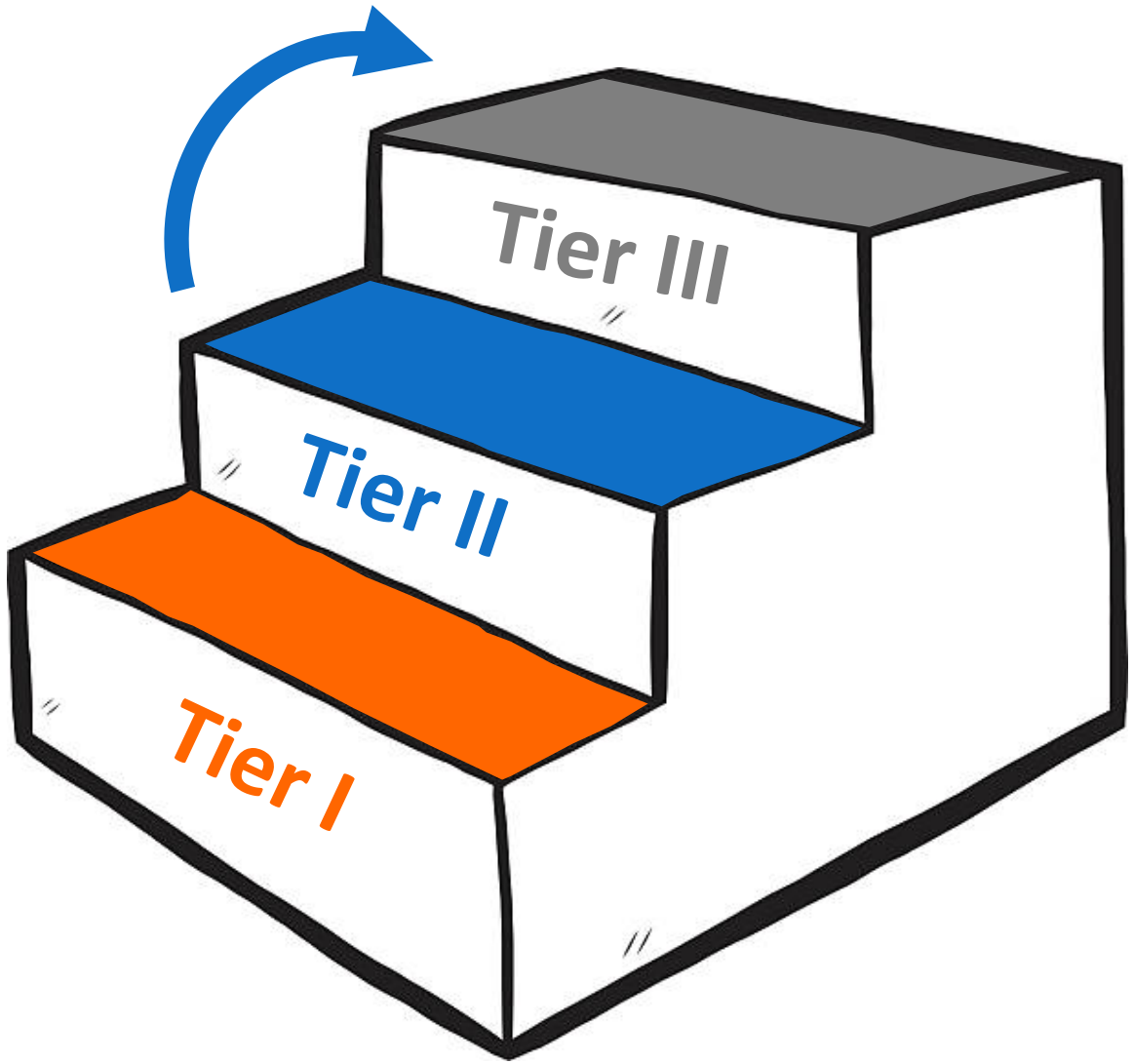


Model Accuracy

84%



COPPELL'S JOURNEY FROM TIER II TO TIER III



COPPELL'S GIS DASHBOARD

- Using the asset management data developed by Plummer, Coppell created a GIS dashboard to view water lines, wastewater lines, and roads in real time.
- The Dashboard is used to view and prioritize pipeline and road replacement.
- As field repairs and replacements are made, the GIS data is updated.

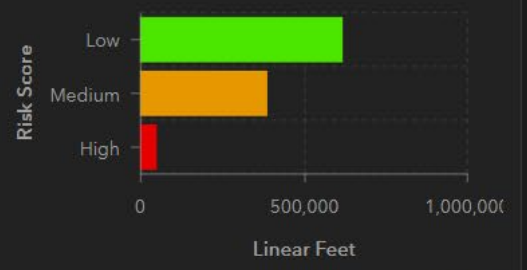
Public Works Assets Dashboards

A City of Coppell Story Map

Water System | Sanitary Sewer System | Transportation System | Combined Systems

Sewer Asset Management Dashboard City of Coppell GIS Team

Sewer System Risk Results



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High Risk Pipes - Sewer

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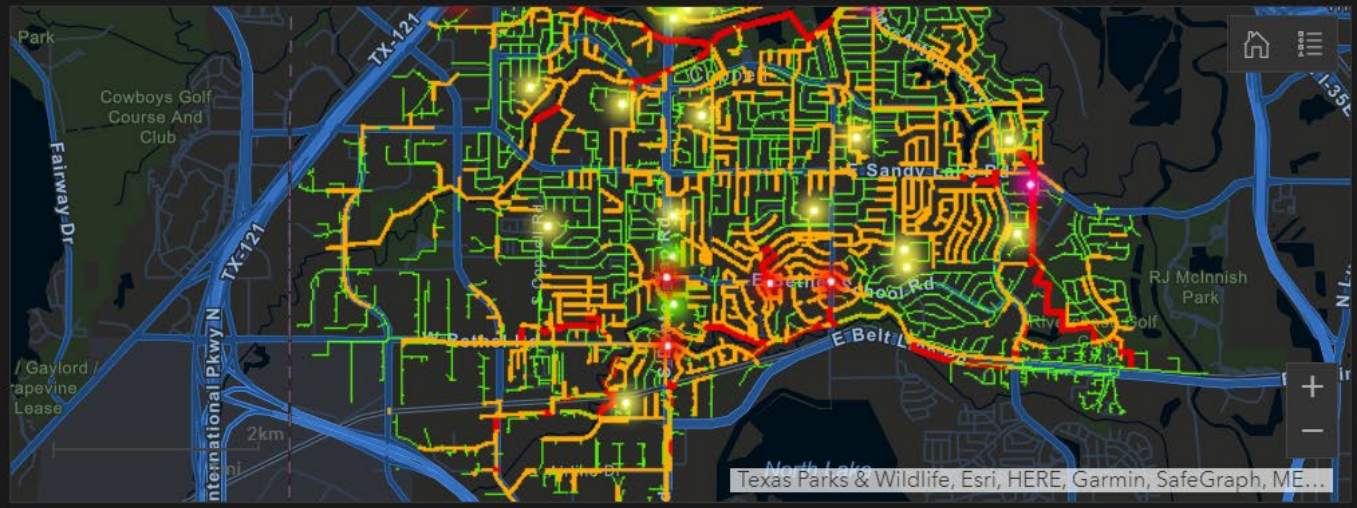
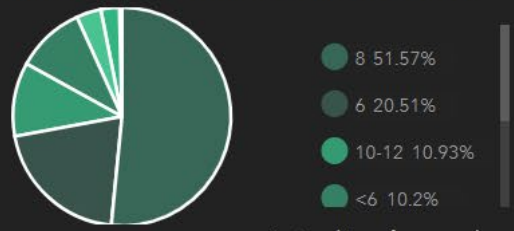


All data, specifically including the geographic and tabular data herein are provided "as is" without warranty of any kind, either expressed, implied, or statutory, including, but not limited to, the implied warranties or merchantability and fitness for a particular purpose.

Sewer System Pipe Size In Inches (By Pipe Length)



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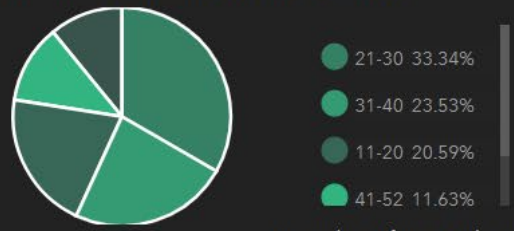
Sewer System Age In Years (By Pipe Length)



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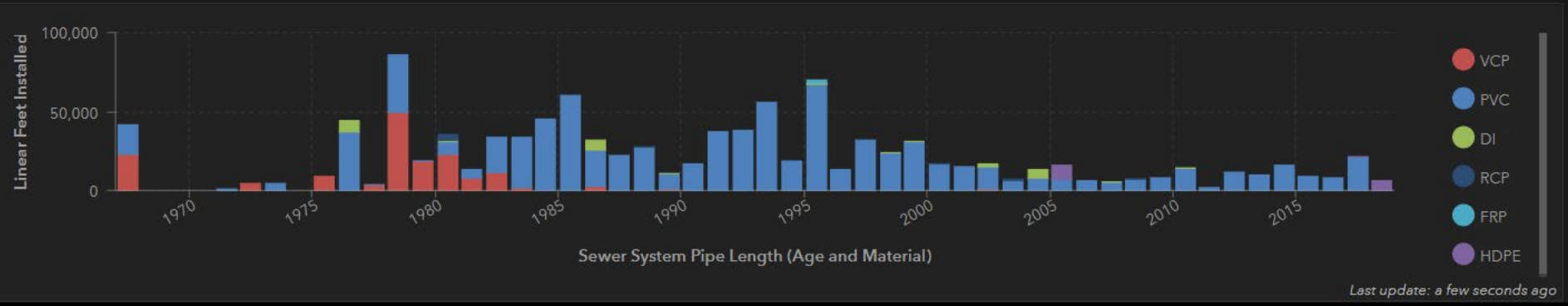

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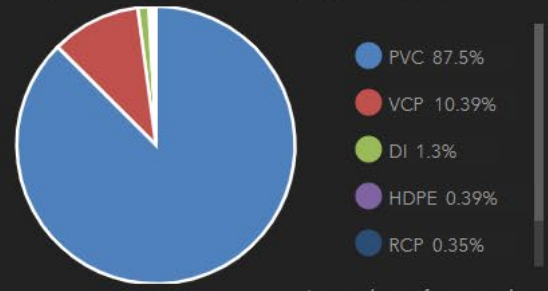
Sewer System Pipe Material (By Pipe Length)



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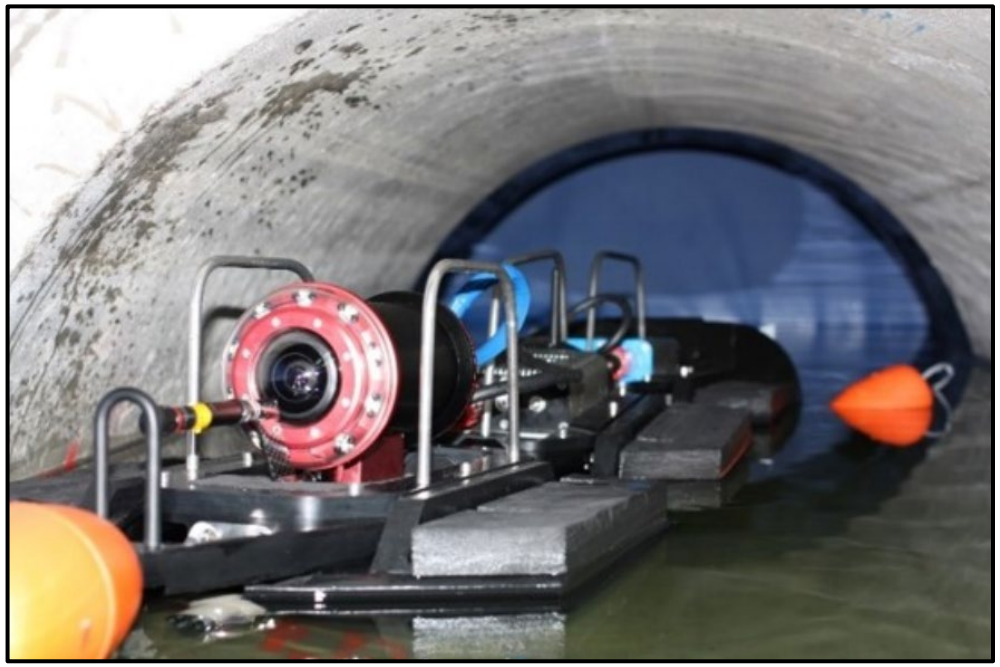
COPPELL'S INSPECTION PLAN

- The City teamed up with UT Arlington and RedZone Robotics

- Inspected a total of 300,000 linear feet of sanitary sewer pipe (26% of system)
  - 150,000 linear feet of 8 to 12-inch PVC
  - All non-PVC pipes greater than or equal to 15-inches



CONDITION PREDICTION MODELING

- Information collected from the inspections will be used in artificial intelligence models to predict the remaining life of the City's pipelines that are 21" or larger.

- Inspections started in late April 2020. Report is expected in October 2020.

- Results will be used to develop CIP projects.

CONCLUSION

- Each City is at a different place along the spectrum of available electronic data.
- Surrogate data can be used for missing information.
- The sophistication and accuracy of an asset management plan increases in direct proportion to the amount of available electronic data.
- The accuracy of statistical models is dependent on a large, balanced dataset.
- Proactive planning leads to informed decision making and efficient resource allocation

THANK YOU

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