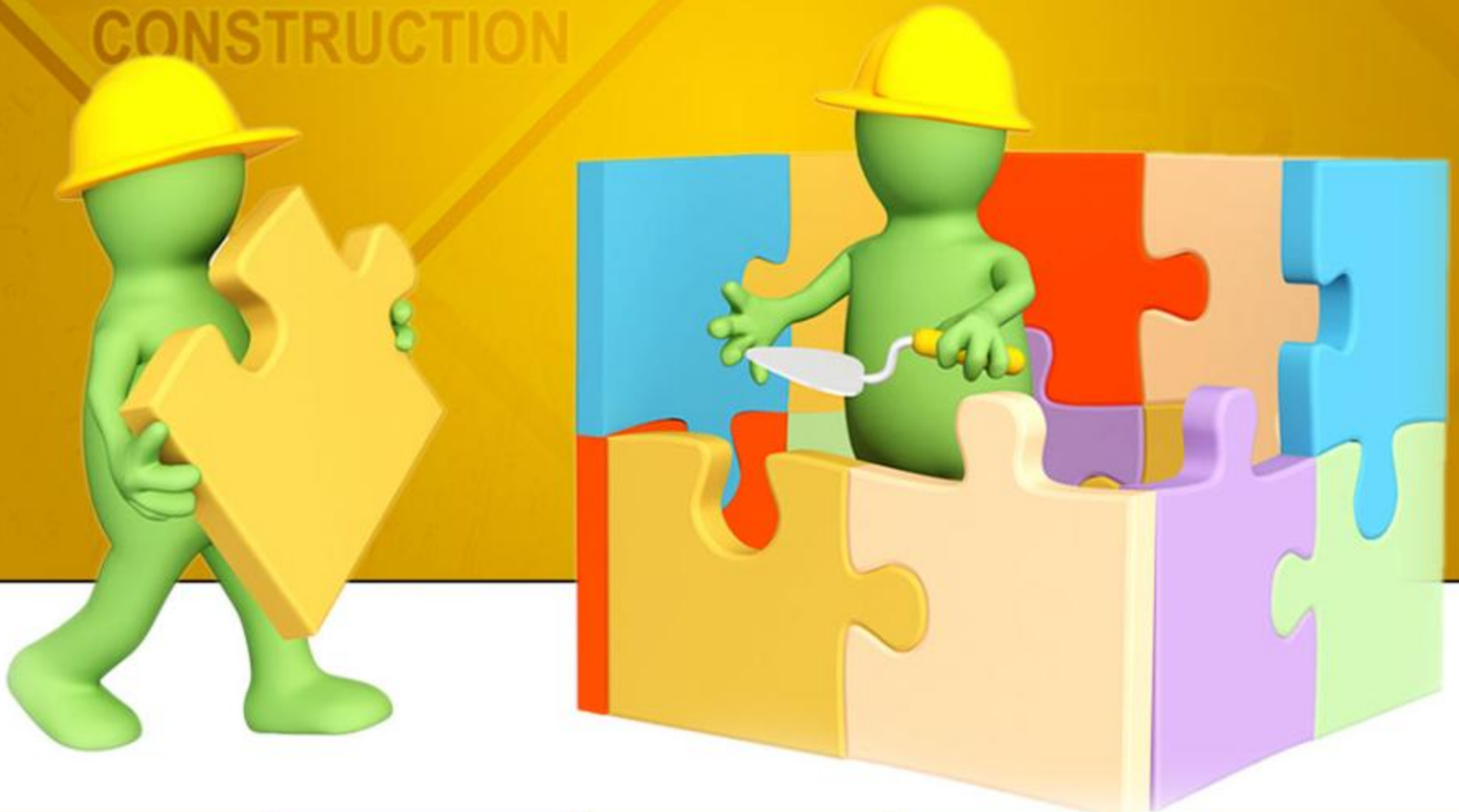


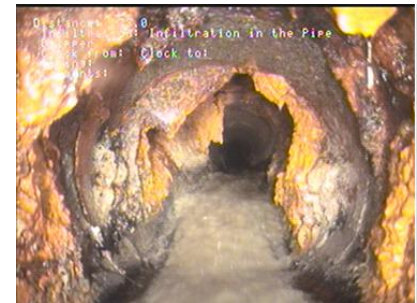
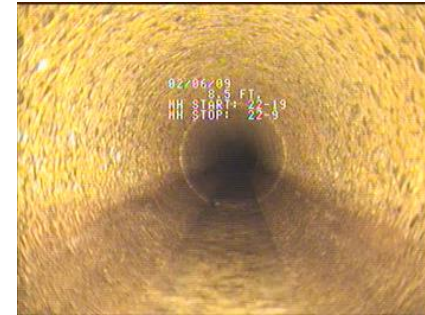
# Restoration & Replacement Program



# Today's Topics



- Vision
- Program Development
- Existing Data
- Critical Sewer Analysis
- Condition Assessment
- Asset Risk
- Project Scoring
- Next Steps



UNDER  
CONSTRUCTION

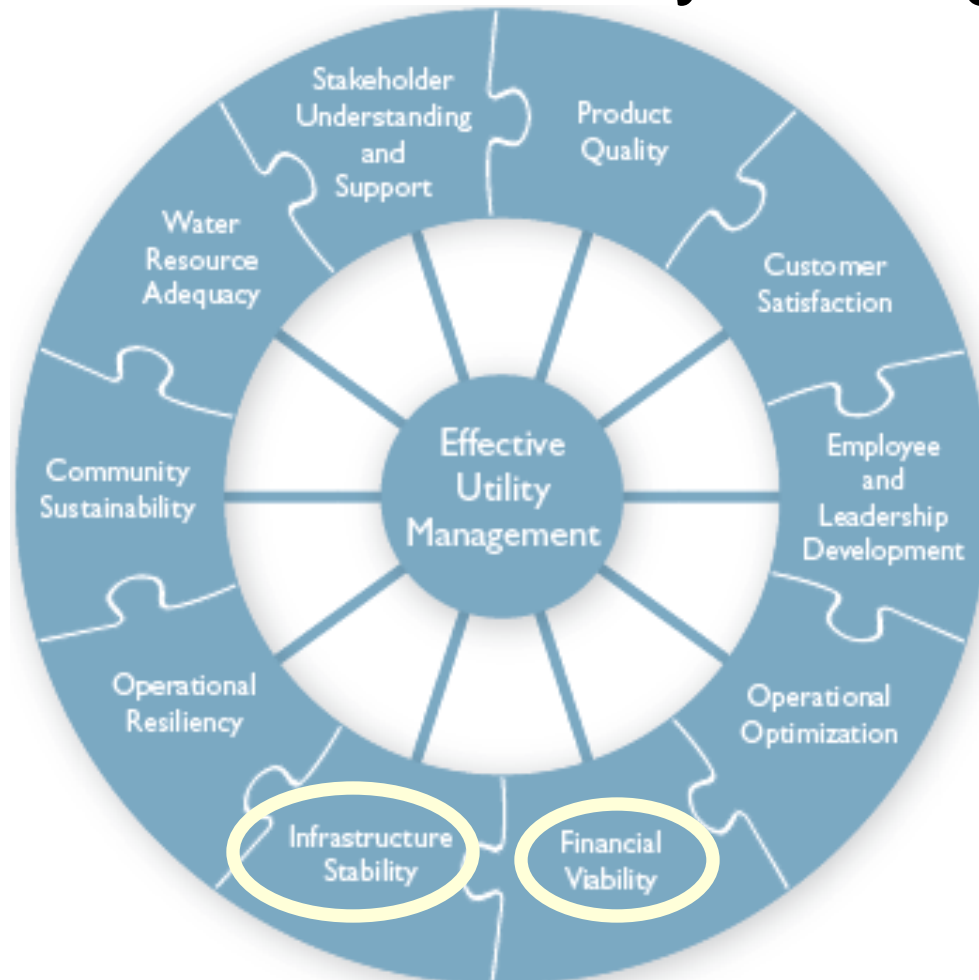


# Vision

# Vision



## •10 Attributes of Effectively Managed Utilities



# Vision



- **Financial Viability**

- Understand full life-cycle cost of utility
- Establish & maintain effective balance between:
  - Long-term debt
  - Asset values
  - Operations / maintenance expenditures
  - Operating revenues
- Establish predictable rates (consistent with community expectations / acceptability) adequate to recover costs
- Provide for reserves
- Maintain support from bond rating agencies
- Plan / invest for future needs

# Vision



- Infrastructure Stability

- Understand condition of & costs associated with critical infrastructure assets
- Maintain / enhance condition of all assets
  - Over long-term at lowest possible life-cycle cost
  - Acceptable risk consistent with customer, community & regulator-supported service levels
  - Consistent with anticipated growth & system reliability goals
- Assure asset repair, rehabilitation & replacements are coordinated to minimize disruptions & other negative consequences

# Vision



- Customer Focused
  - Meet customer expectations - public values survey
- Environmental Stewardship / Protecting Water Resources
  - Proactive management of the system minimizes backups, I&I and unexpected pipe failures
- Financial Responsibility
  - Stable rates
  - Staffing and workload planning
  - Minimize the high cost of emergency repairs and overflows
  - Prioritizing limited resources - Fix the Worst First!
- Responsible Management
  - Practicality of managing 9,500 main line pipes segments
- Supporting Economic Development
  - Reliable sewer system
  - Targeted investments

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CONSTRUCTION



# Program Development



# Program Development



- Develop a Comprehensive Restoration and Replacement Program Including:
  - Critical Sewers Analysis
  - Condition Assessment
  - Asset Risk
  - Project Prioritization Process
  - Program Level Project Scoping
  - Documentation



# Program Development



- Timeline

- 2010

- Critical Sewer Analysis
    - Condition Assessment

- 2011

- Asset Risk (by pipe segment only)
    - Define and Prioritize Projects

- 2012 - Project Priority Array

- 2013 - Pump Stations

- 2014 - Force Mains / Air Valves

- 2015 - Manholes

- 2016 - STEP Systems



# Program Development



- Program Outline
  - ☑ Identify Existing Data
    - GIS and CCTV Investments
  - ☑ Critical Sewer Analysis
    - Consequence of Failure (GIS Analysis)
  - ☑ Asset Condition
    - Probability of Failure (CCTV Data)

# Program Development



- Program Outline
  - Asset Risk
    - Combining Condition and Criticality (GIS Analysis)
  - Develop Prioritization Concept
  - Define R&R Projects
  - Prioritize R&R Projects
  - Project Priority Array

UNDER  
CONSTRUCTION



# Existing Data

# Existing Data



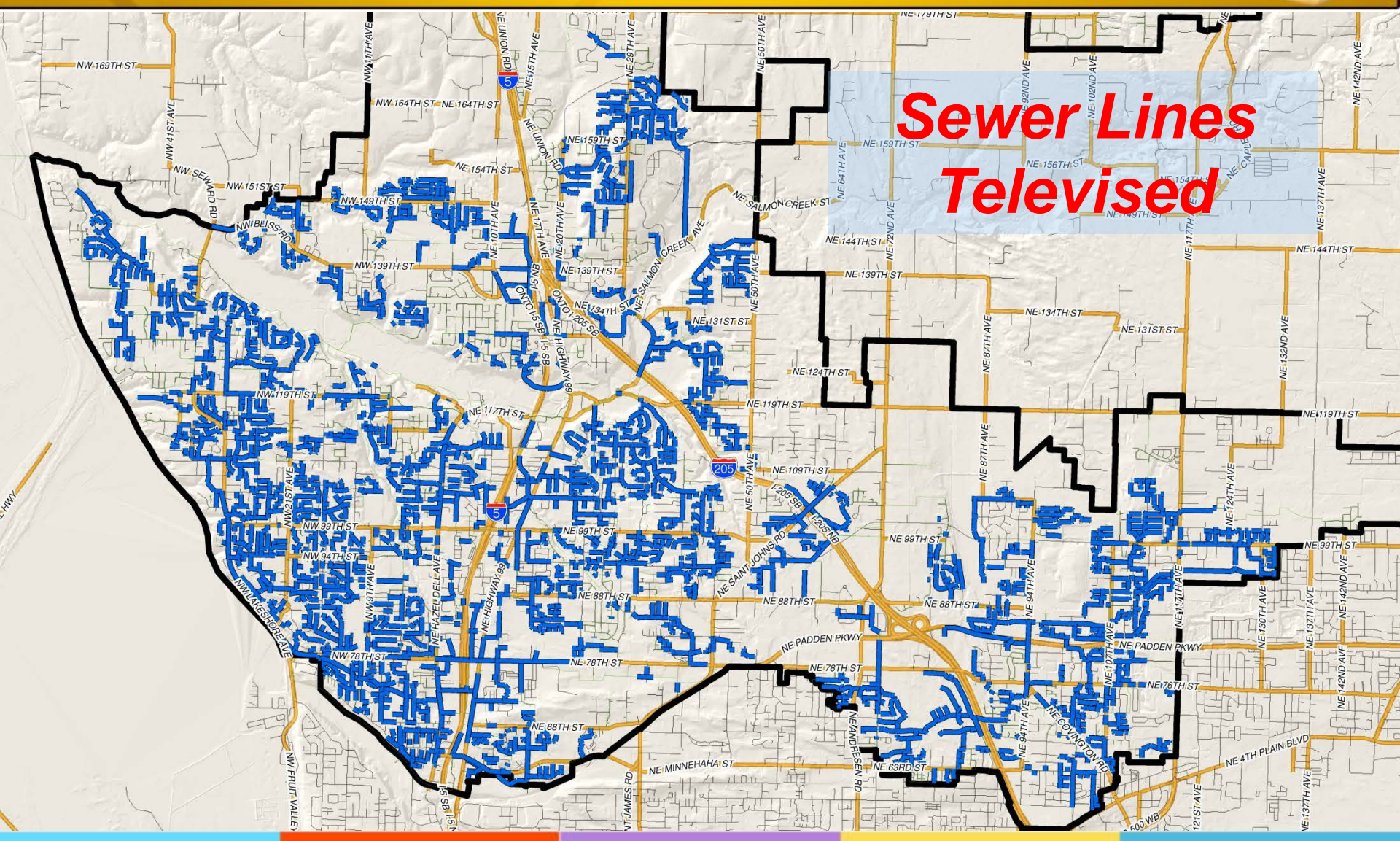
- Identify Existing Data
  - Assets
    - GIS
  - Asset Condition
    - CCTV Data
      - 315 miles of CCTV in Maintenance Management System (Granite & Lucity)
      - Data collected since 2005, 75% of main lines
      - All lines televised at some point
    - Tribal Knowledge of known defects



# Existing Data



**Sewer Lines  
Televised**



UNDER  
CONSTRUCTION



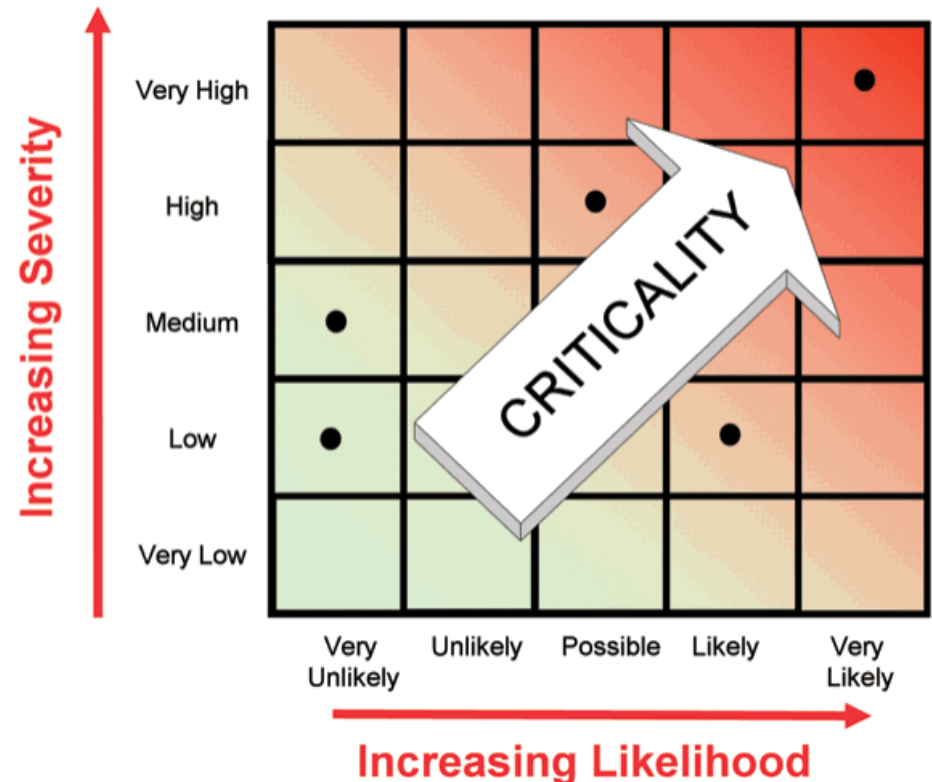
# Critical Sewer Analysis



# Critical Sewer Analysis



- Defining Criticality
  - 1 to 3 scoring scale based on potential impact of asset failures or “consequence of failure”

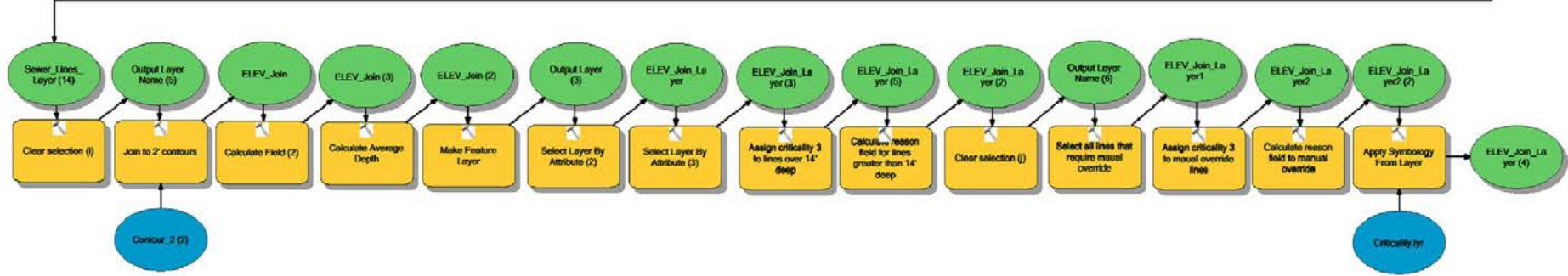
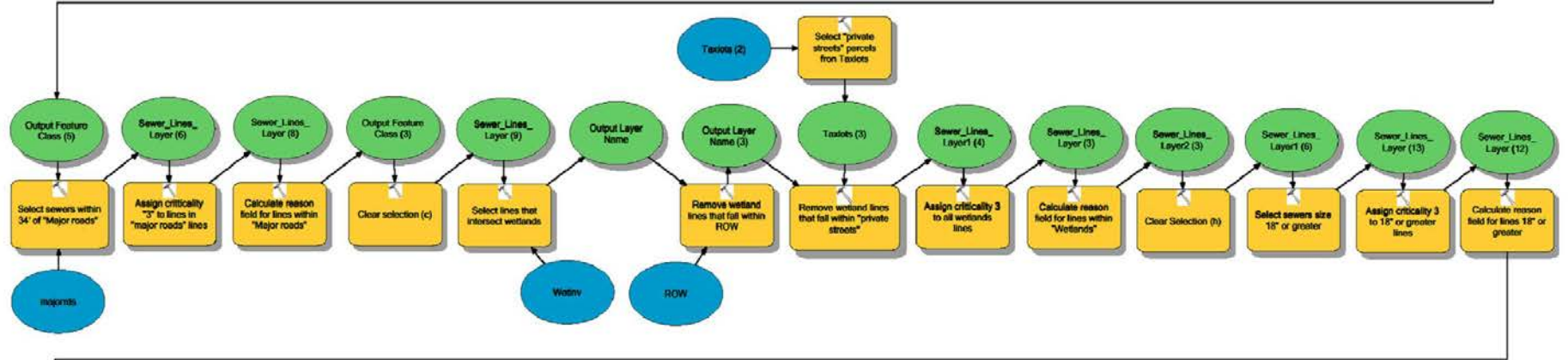
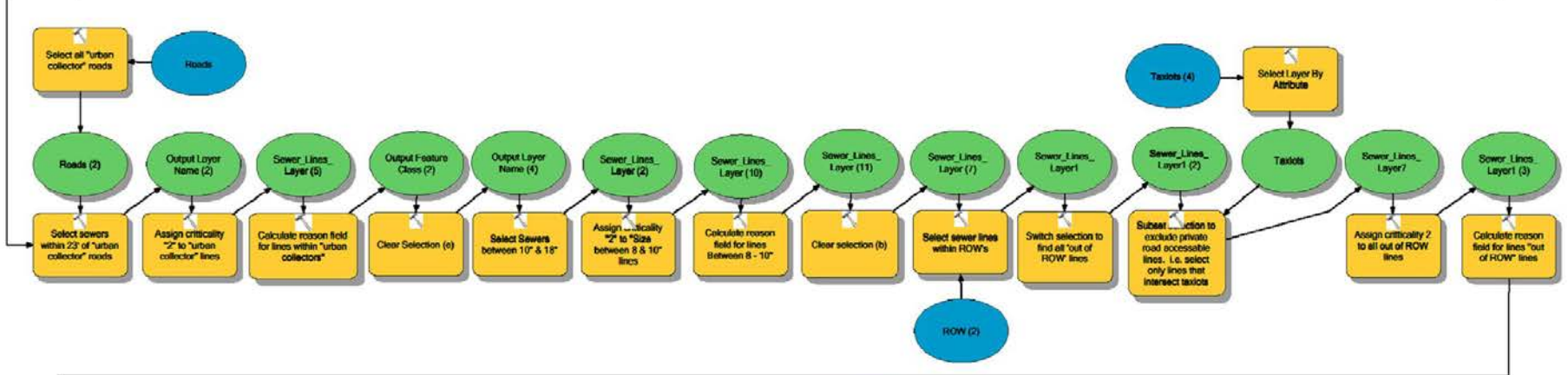
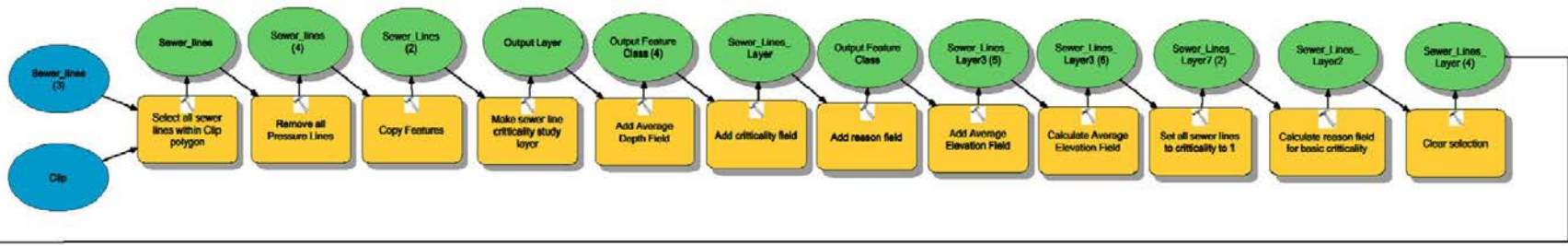


# Critical Sewer Analysis

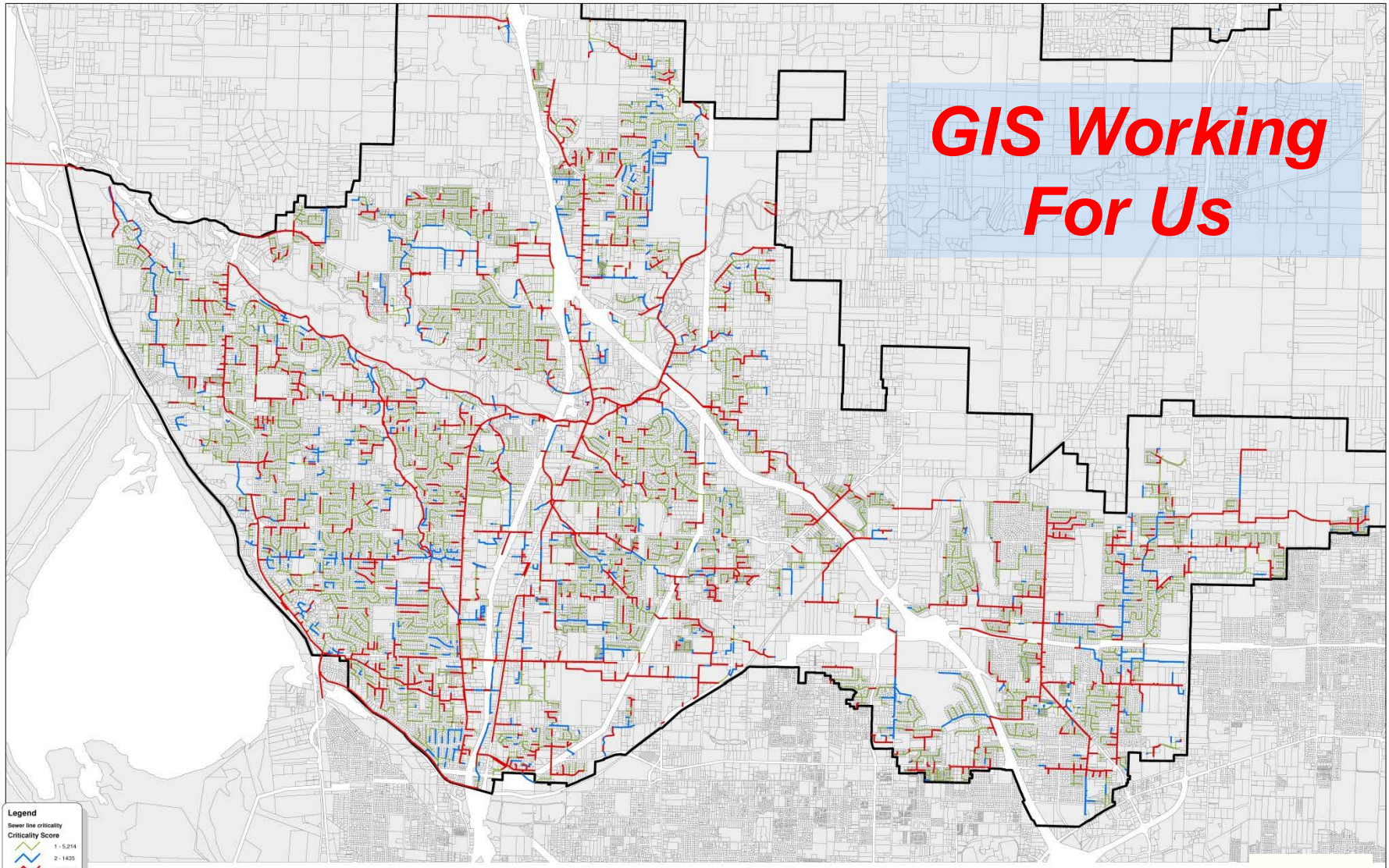


- Score of 3 includes pipes:
  - in major roads (parkways, arterials)
  - in environmentally sensitive areas
    - Includes all difficult to access canyon lines
  - Greater than 18" diameter
  - More than 14' deep
- Score of 2 includes pipes:
  - In urban collectors
  - Inaccessible lines
  - 10" to 18 " diameter
- Score of 1 includes all other pipes





# Critical Sewer Analysis





UNDER  
CONSTRUCTION

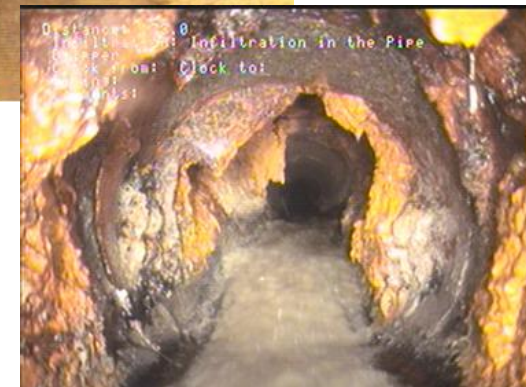


# Condition Assessment

# Condition Assessment



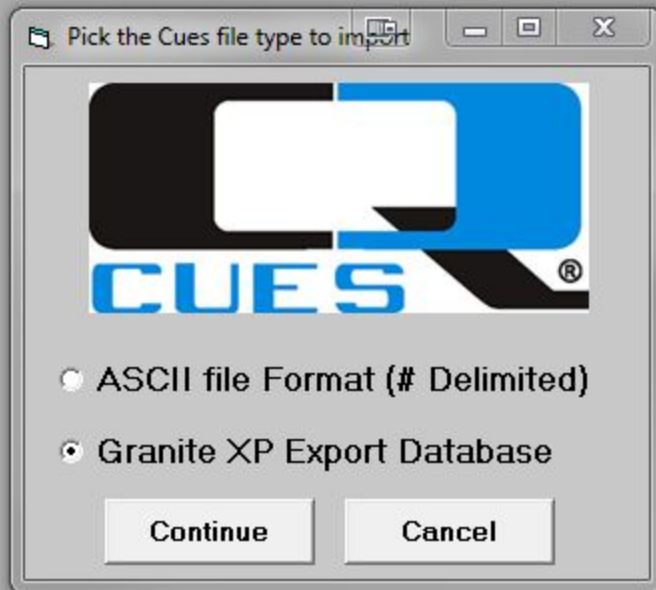
- CCTV Data
  - Infiltration / Inflow
  - Structural – Cracks / Shears
  - Sags
  - Roots
  - Fats, Oils, Grease (FOG)



# Condition Assessment



- CCTV Data Collected from Cues CCTV trucks.





# Condition Assessment



- CCTV Data Scoring “Weight”

Lucity Inspection Setup - No Filter

Flow Basin: DEFAULT ALL FLOWS IN GPM

TV/Lamp Infil TV/Lamp Struc TV/Lamp Clean Struct Flow Struct Cover Struct Structural Smk/Dye/Bldg Bldg Sumps

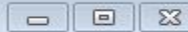
Field Code /	Defect Type	Structure Rating 1	Structure Rating 2	Structure Rating 3	Structure Rating 4	Structure Rating 5
01	Crack-Radial	1	2	5	10	20
02	Crack-Horizontal	1	2	5	10	20
03	Broken Pipe	30	50	70	100	130
04	Collapsed Pipe	0	0	0	200	400
05	Wye Service	0	0	0	0	0
06	Break-in Conn	100	125	150	175	200
07	Extended Tap	1	5	10	25	100
08	Offset	0	0	25	70	120
09	Gapped Joint	0	0	25	70	120
10	Roots	1	5	10	75	100
11	Debris	0	0	0	0	0
12	Grease	0	0	0	0	0
13	Corrosion	3	6	10	25	75
14	Scaling	3	6	10	25	75
15	Sag	1	2	5	10	25
16	Infiltration	0	0	0	0	0
17	New Manhole	0	0	0	0	0
18	Other	0	0	0	0	0
31	Pipe Seal	5	10	20	30	50
35	Belly in Pipe	15	25	50	60	75
36	Cavity	30	50	70	100	130
37	Clean Out					
38	CONTINUE DS					
39	CONTINUE US					
40	Crack	1	2	5	10	20
41	Deposits					
42	End Inspection					
44	H2S Erosion	25	30	50	60	75
46	Joint - Infiltration	5	6	25	30	50

Record 1 of 1 View Mode Ready...

# Condition Assessment



Sewer TV Inspection - Unnamed Filter Set



US Structure	43-180		0.00	Pipe ID	3444
DS Structure	43-167	Lakeshore Trunk	11.00	TV Rec #	2333
Alt Pipe ID	3474	Flow Basin		Most Recent Inspect	<input type="checkbox"/>

[Set-up](#) | 
 [Pipes](#) | 
 [Data](#) | 
 [TV Observation](#) | 
 [Summary](#) | 
 [Rehab](#) | 
 [Custom](#) | 
 [Comment](#)

# of TV Connections

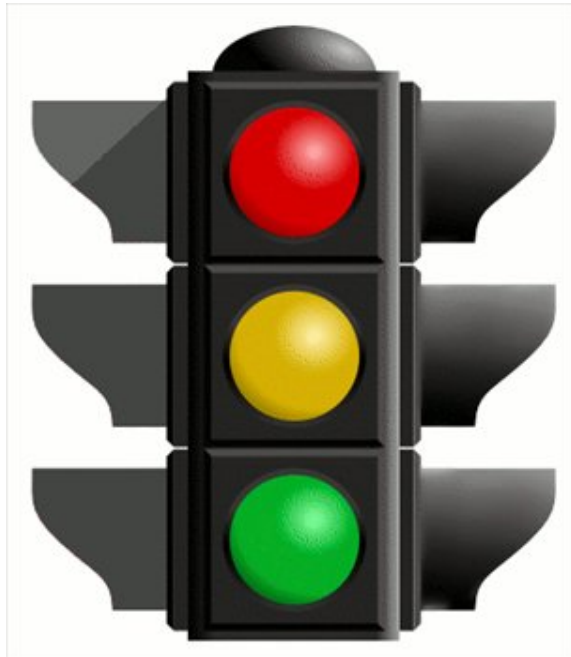
Distance (ft)/	VCR Counter	Location Text	Description Text	Rating (1-5)	Start Clock	Document Available	La
8.00			START US	0		No	
8.70			Grease	3		No	
39.20			Root-in-Joint	1		Yes	
41.80			Root-in-Joint	1		Yes	
44.40			LAT	0	2	No	
51.00			Root-in-Joint	1		Yes	
62.70			LAT	0	10	No	
94.00			Root-in-Joint	3		Yes	
102.30			Root-in-Joint	3		Yes	
105.40			Root-in-Lateral	1	10	Yes	
105.40			LAT	0	2	No	
105.40			LAT	0	10	Yes	
108.60			Root-in-Joint	3		Yes	
117.90			Root-in-Joint	5		Yes	
120.80			Root-in-Joint	5		Yes	
127.00			Root-in-Joint	5		Yes	
130.00			Root-in-Joint	5		Yes	
133.50			Root-in-Joint	5		Yes	
136.50			Root-in-Joint	1		Yes	
148.30			LAT	0	10	No	
153.80			Root-in-Joint	1		No	



# Condition Assessment



– CCTV Data Simplified Based on Score

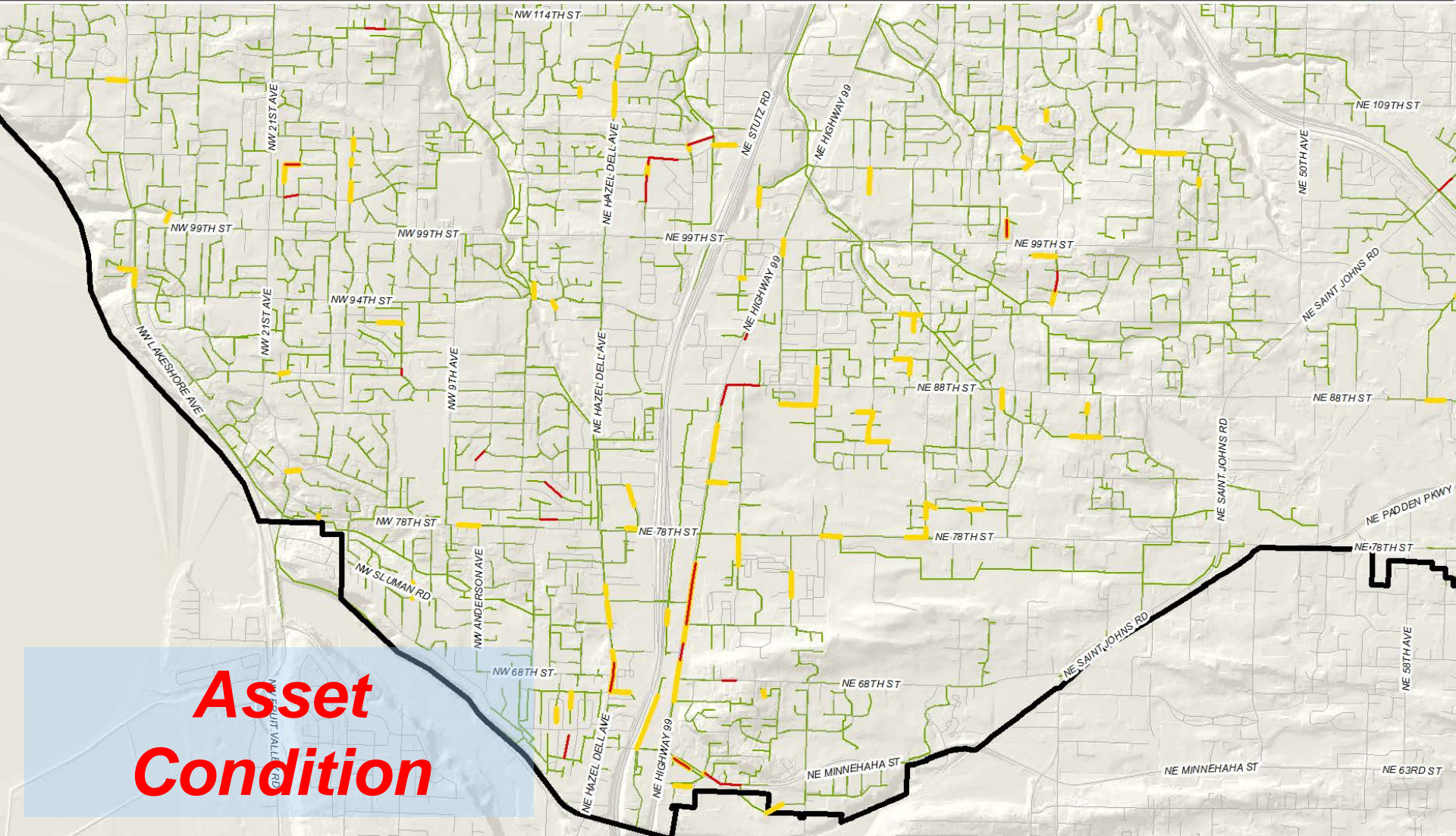


= Failing: Imminent failure

= Poor: Monitor, proactive repairs

= Good: No concerns

# Asset Assessment



**Asset  
Condition**

UNDER  
CONSTRUCTION



# Asset Risk

# Asset Risk

UNDEVELOPED  
CONSTRUCTION



- Integrating Criticality & Condition
  - Criticality – Consequence of Failure
    - Score 1, 2, or 3
  - Condition – Risk of Failure
    - Score Red, Yellow, Green
  - Extra point, or fraction of a point added for hot spots.

**Asset Risk = Criticality + Condition**

# Asset Risk



Condition (Risk of Failure)

Red	Watch/Fix Medium Priority 7,584 ft	Fix High Priority 1,651 ft	Fix Now 4,820 ft
Yellow	Watch Low Priority 10,329 ft	Watch Medium Priority 4,494 ft	Watch High Priority 6,357 ft
Green	Standard Maintenance	Watch Low Priority	Watch Medium Priority

1

2

3

12

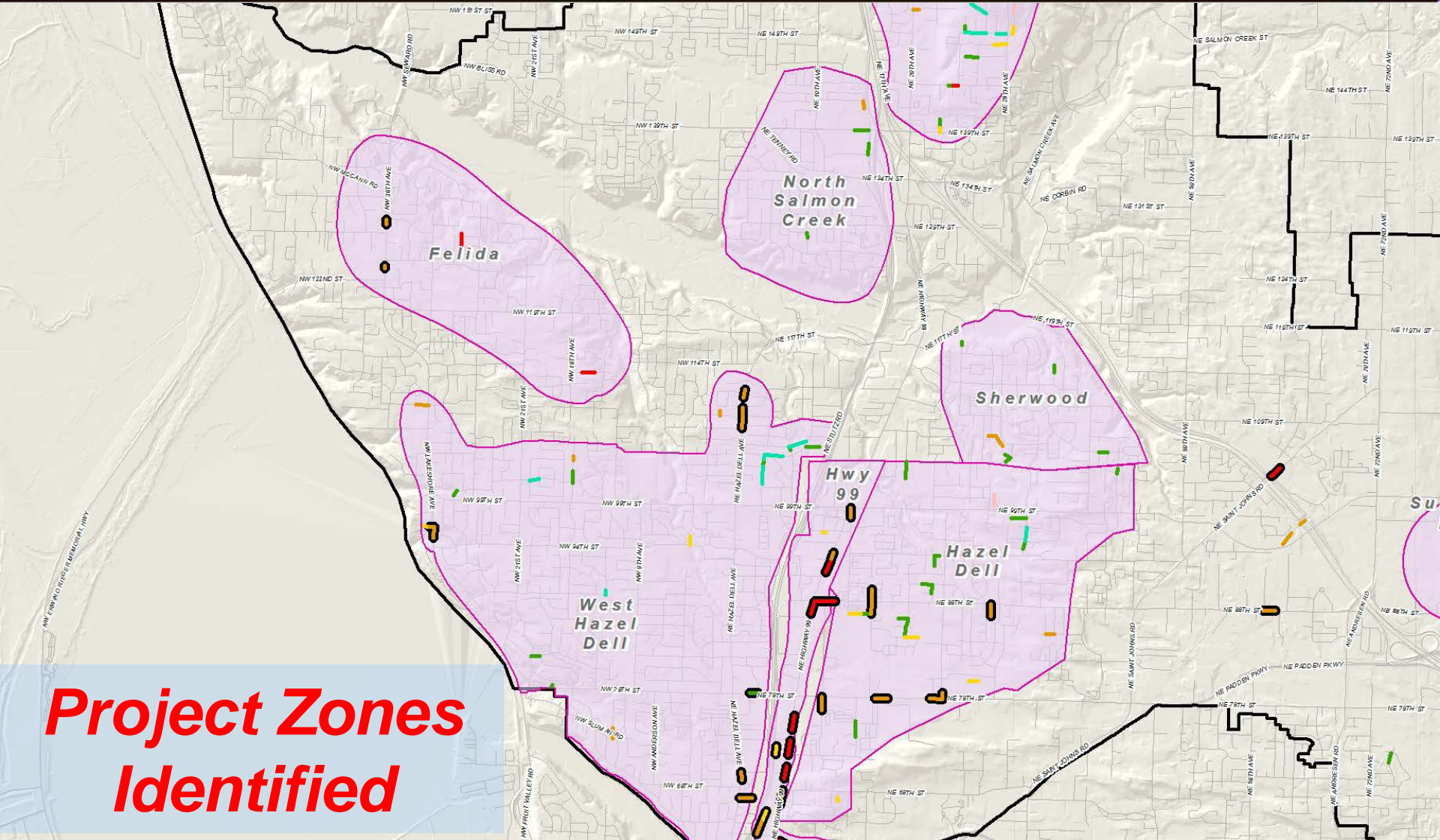
Criticality (Consequence of Failure)





# Asset Risk

CONSTRUCTION



**Project Zones  
Identified**

UNDER  
CONSTRUCTION

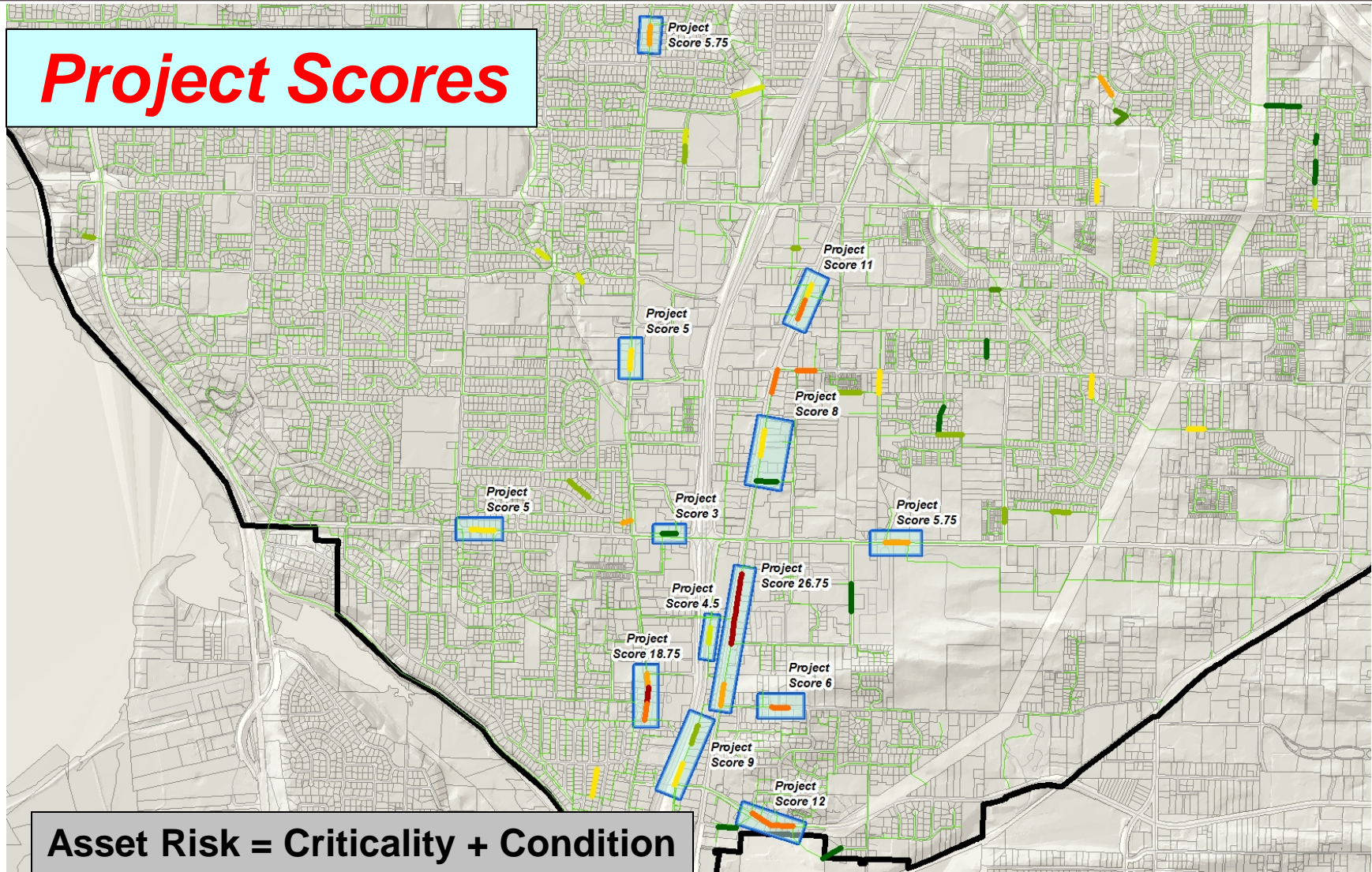


# Project Scoring

# Project Scoring



## Project Scores



Asset Risk = Criticality + Condition

UNDER  
CONSTRUCTION



# Next Steps

# Lucy Rehab module



- Expand on our use of the rehab module.

Pipe Rehab Work Tasks - No Filter

Task: 1115 point repairs main dig up

WD Task Code: 1115

Rehab Units: 3 Each

Rehab Class: [ ]

% I/I Removed: [ ]

Min Rehab Length: 3

Pt Repair Min Dist: 1

Default Task Cost - Up to 10 feet Deep

	Easy	Difficult
Unpaved	10000.00	15000.00
Paved	15000.00	20000.00
Heavy Traffic	20000.00	20000.00

Cost per each VF > 10 ft: 10.00

Cost per Pipe Diameter

Dia /	Unpaved-Easy	Paved-Easy	Heavy-Easy	Unpaved-Diff	Paved-Diff	Heavy-Diff	Cost>10Ft

Record 2 of 8 View Mode Ready...

# Next Steps



- Project Priority Array
- Capital Project component
- Pump Stations
- Force Mains
- Rework codes/weights to work with PACP



# Questions?



# ?