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Main Lift Station Force Main Assessment and Repair
City of Ashland, WI

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2015 WWOA Conference

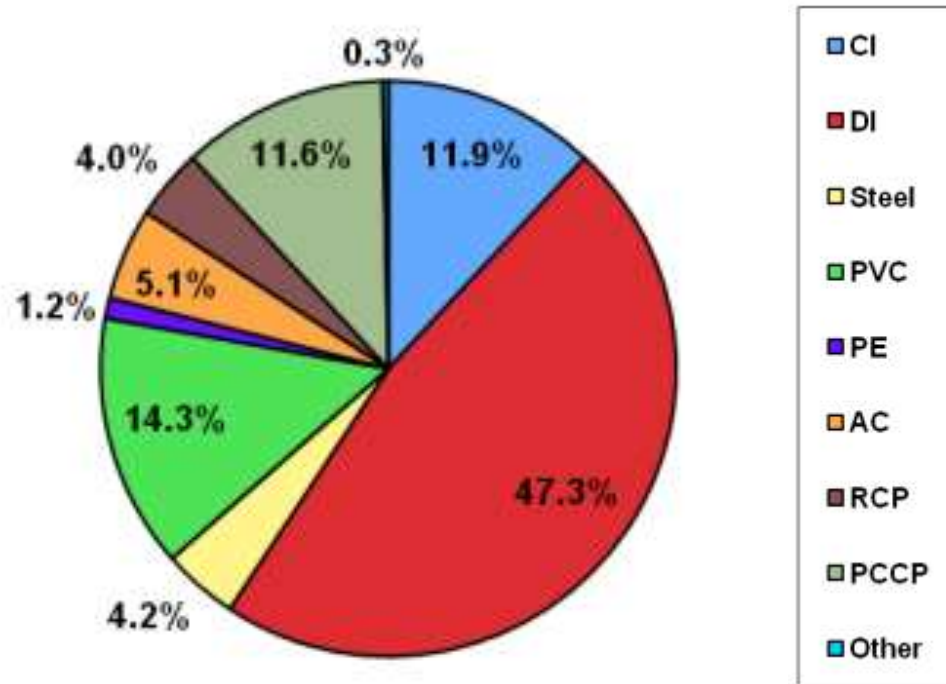
October 8, 2015

Presentation Outline

- Background
- General Force Main Statistics
- Failure Mechanisms
- Assessment
- Rehabilitation

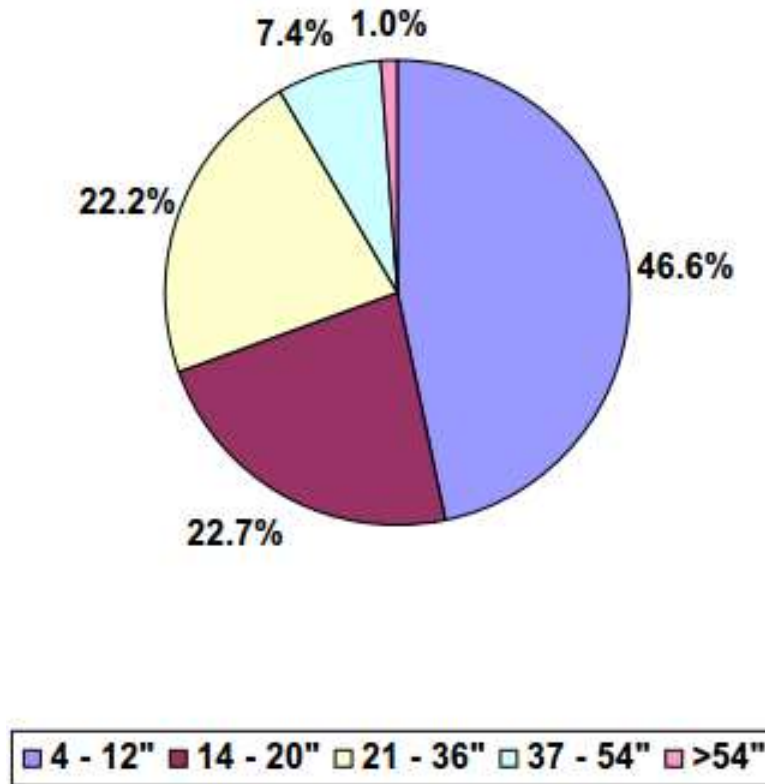


Force Main Data - Materials



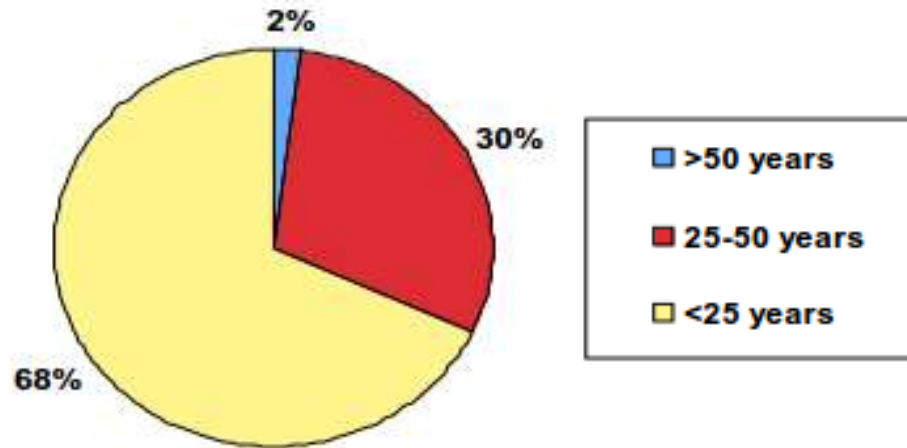
Inspection Guidelines for Wastewater Force Mains, Water Environment Research Foundation

Force Main Data – Size



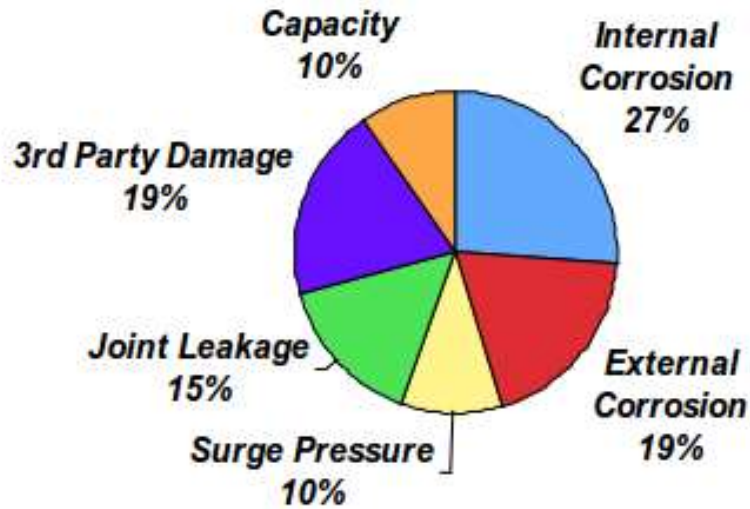
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Force Main Data – Age

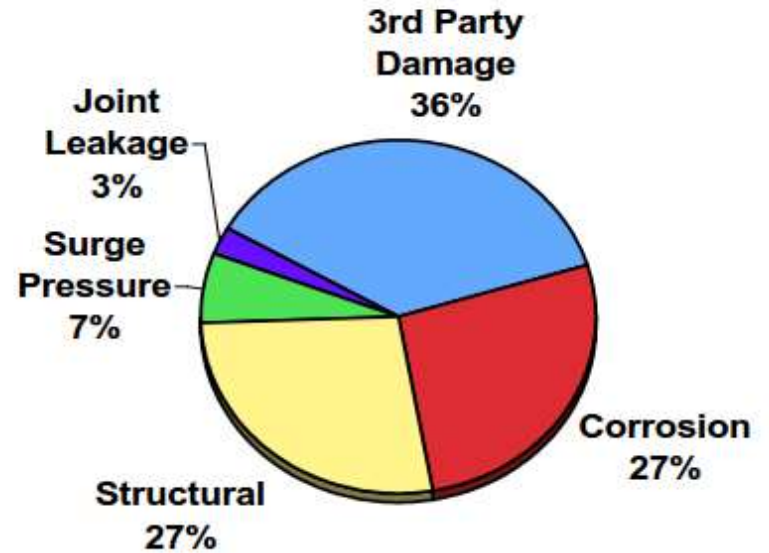


Inspection Guidelines for Wastewater Force Mains, Water Environment Research Foundation

Failure Types



Ferrous

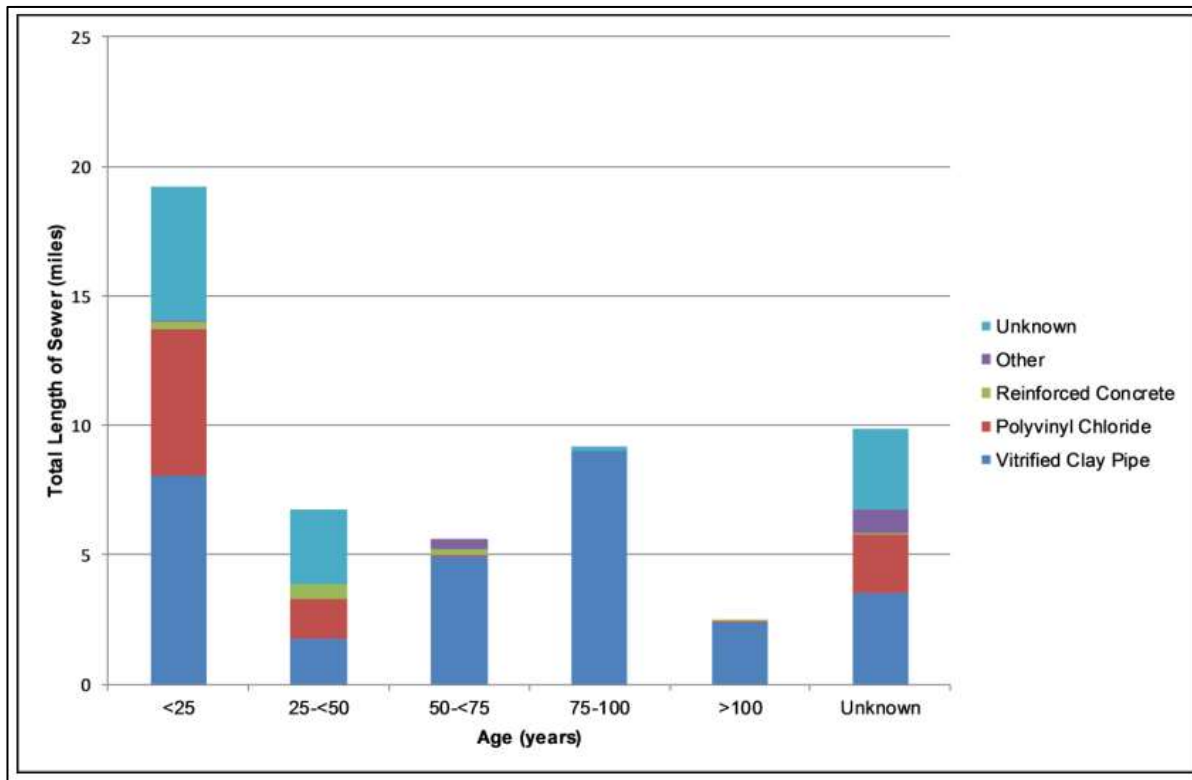


Nonferrous

Inspection Guidelines for Wastewater Force Mains, Water Environment Research Foundation

City of Ashland Collection System Overview

- Provides service to approximately 8,200 residents
- 53 Miles of gravity sewer, 989 manholes
- 11 pumping stations and 11,540 feet of force main

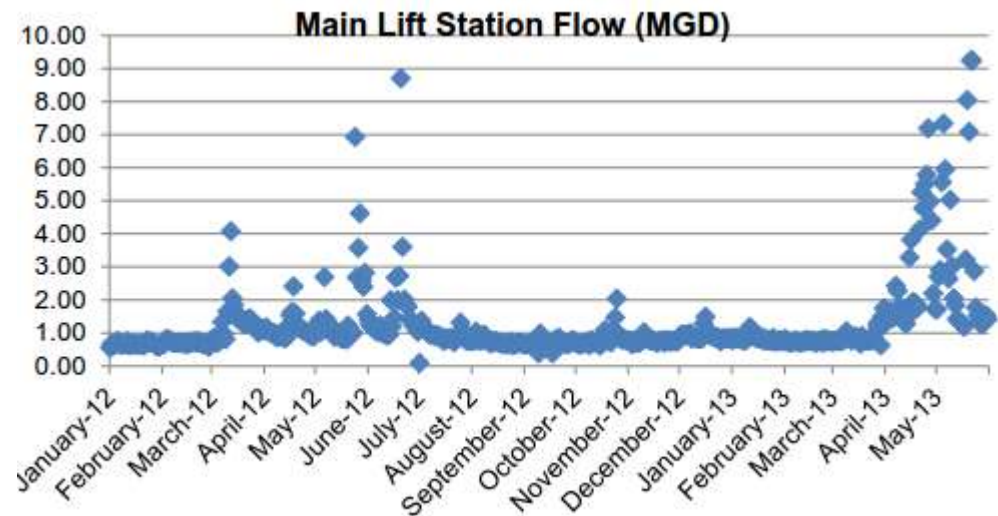


More History



Main Lift Station Force Main

- Constructed in 1991
- Ductile iron
- 24 inch diameter
- 5,252 feet long
- Six 150 hp pumps
- Serves more than 80% of City
- Flows in excess of 10 mgd during wet weather events



Main Lift Station Force Main Failure History

- First Leak – Fall 2012
- Second Leak – May 2013
- Two additional leaks suspected in 2013
- All leaks emerged during periods of high flow
- Mode of failure appeared to be external corrosion

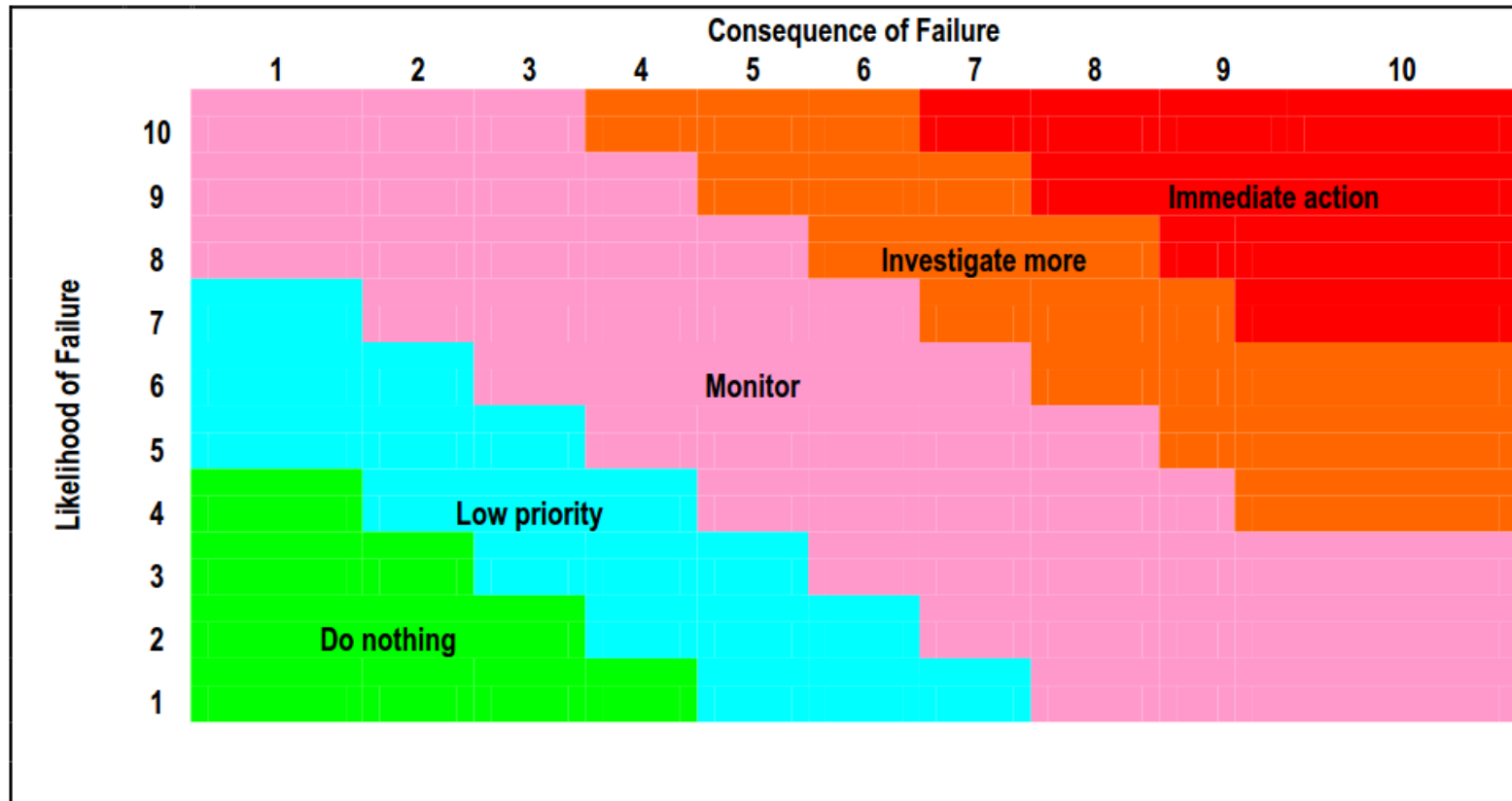


Main Lift Station Force Main Failure History



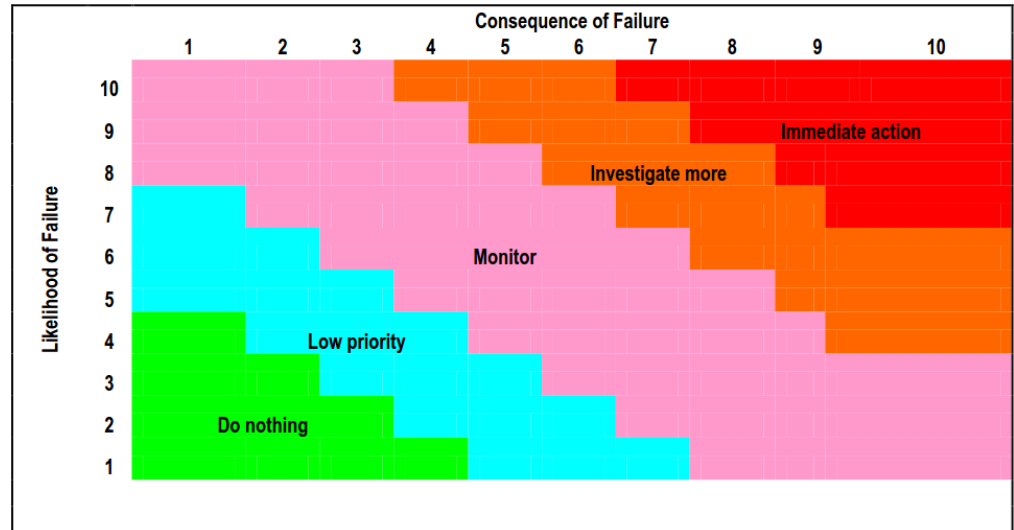
Risk Based Assessment and Rehabilitation

- Analyze in segments



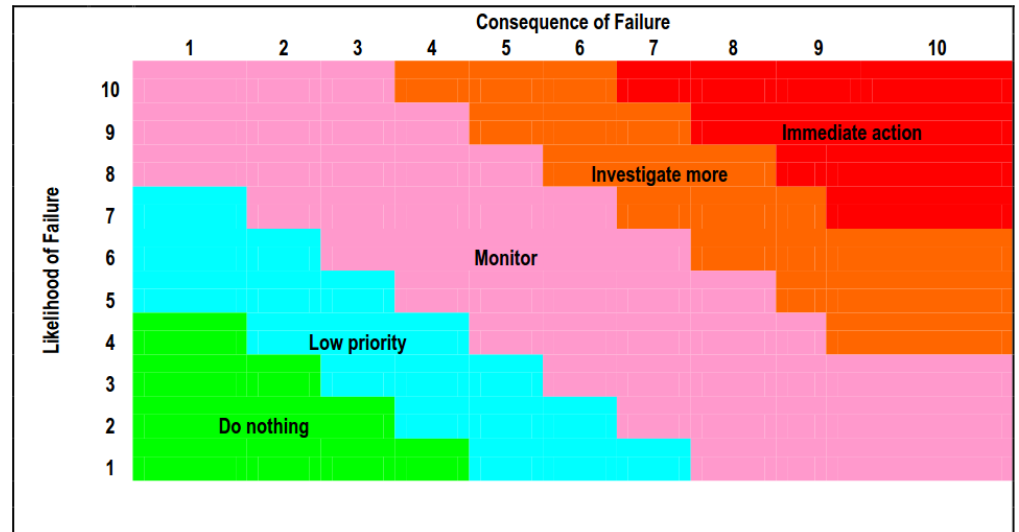
Likelihood of Failure

- Age
- Pipe Material
- Operating Pressure
- **Soils**
- **Failure History**
- **Physical Assessment**



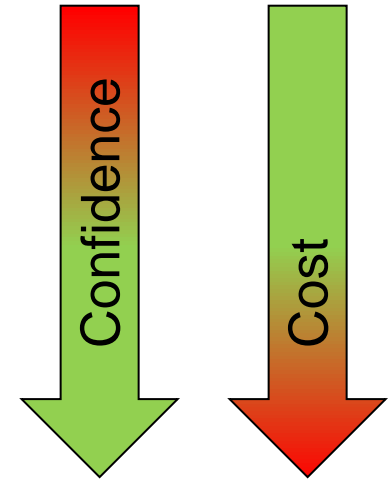
Consequence of Failure

- Critical Roads
- Environmental Effects
- Health Effects
- Cost to Replace/Repair
- Operational Considerations



Assessment Methods

Assessment Level	Assessment Methods
Desktop Assessment	<ul style="list-style-type: none">• Soils Loadings• Failure history
Field Assessment – Random Excavation	<ul style="list-style-type: none">• Expose Pipe
Field Assessment – Targeted Excavations	<ul style="list-style-type: none">• Intelligent Excavations• Soil Chemistry
Advanced Assessment Tools	<ul style="list-style-type: none">• Continuous Assessment Tools



Other Considerations:

- Can assessment be completed while force main is in service?
- Status of technology
- Likely failure mechanism
- Access

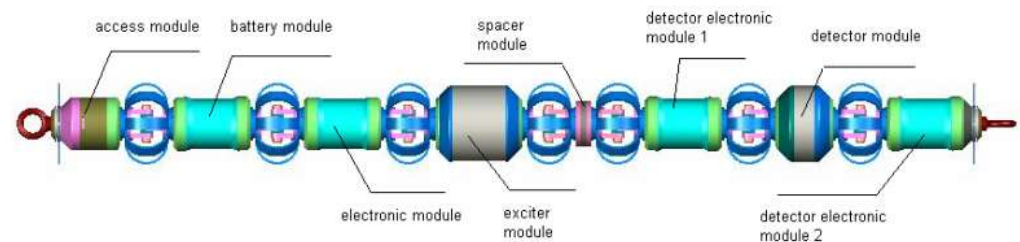
Advanced Assessment Technologies

Types (not an all inclusive list!)

- Acoustic leak detection (locates leaks and air pockets)
- Ultrasonic thickness (continuous or point wall thickness measurement)
- Broadband electromagnetic (wall thickness)
- Magnetic flux leakage (measures wall thickness loss)
- Remote field eddy current (continuous wall thickness, wire breaks [PCCP])

Considerations

- Can it be completed while in service?
- Status of technology/ confidence in results
- Likely failure mechanism
- Access
- Pipe material, coatings
- Tethered vs. free swimming
- Retrieval
- Cost!

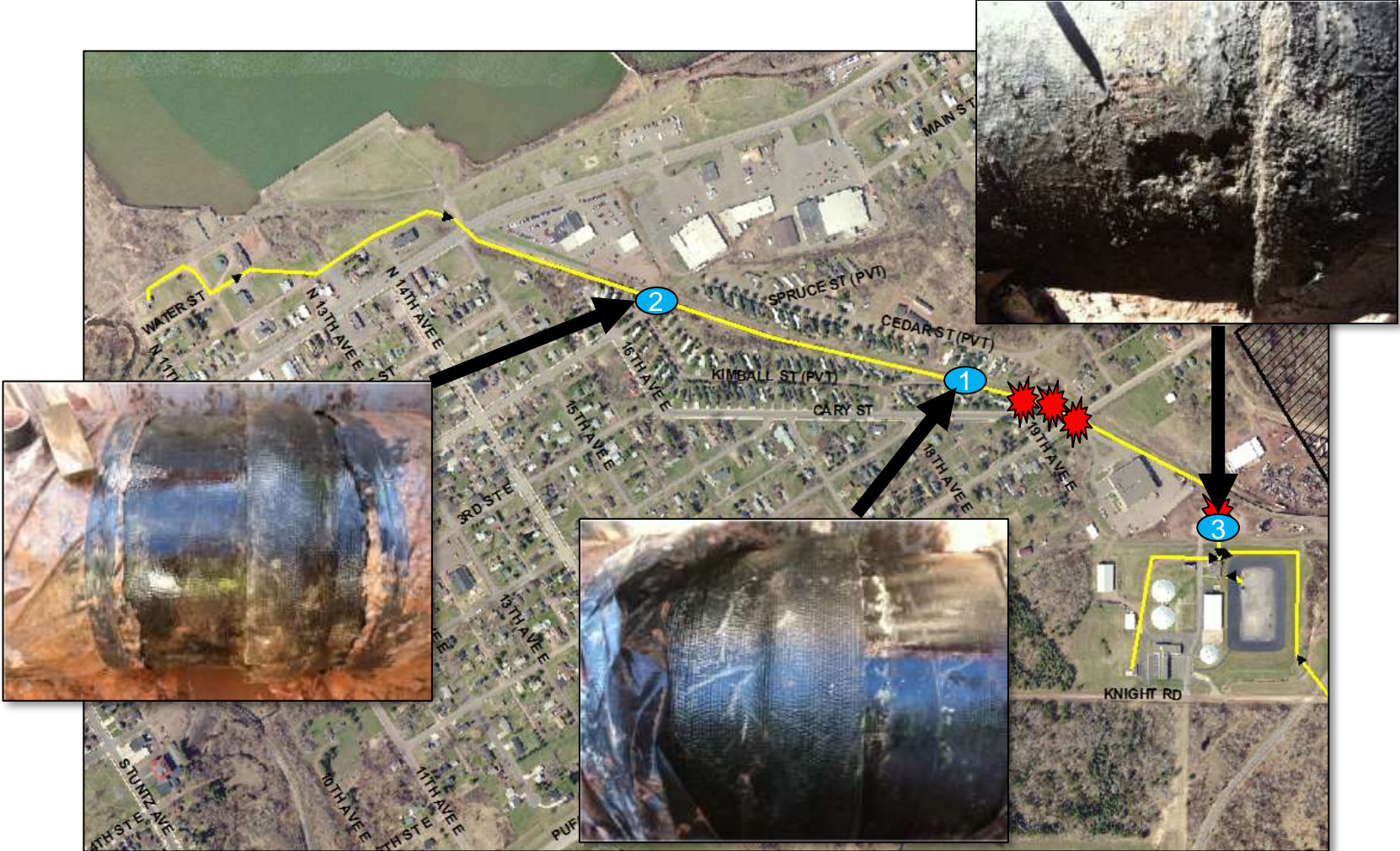


Ashland Force Main Assessment Methods

Targeted Excavations with Additional Soils Testing

- (Relatively) inexpensive
- Failure likely a result of external corrosion
- Internal corrosion unlikely (no high spots)
- DIPRA
- Soils investigation

Ashland Force Main Assessment - Findings

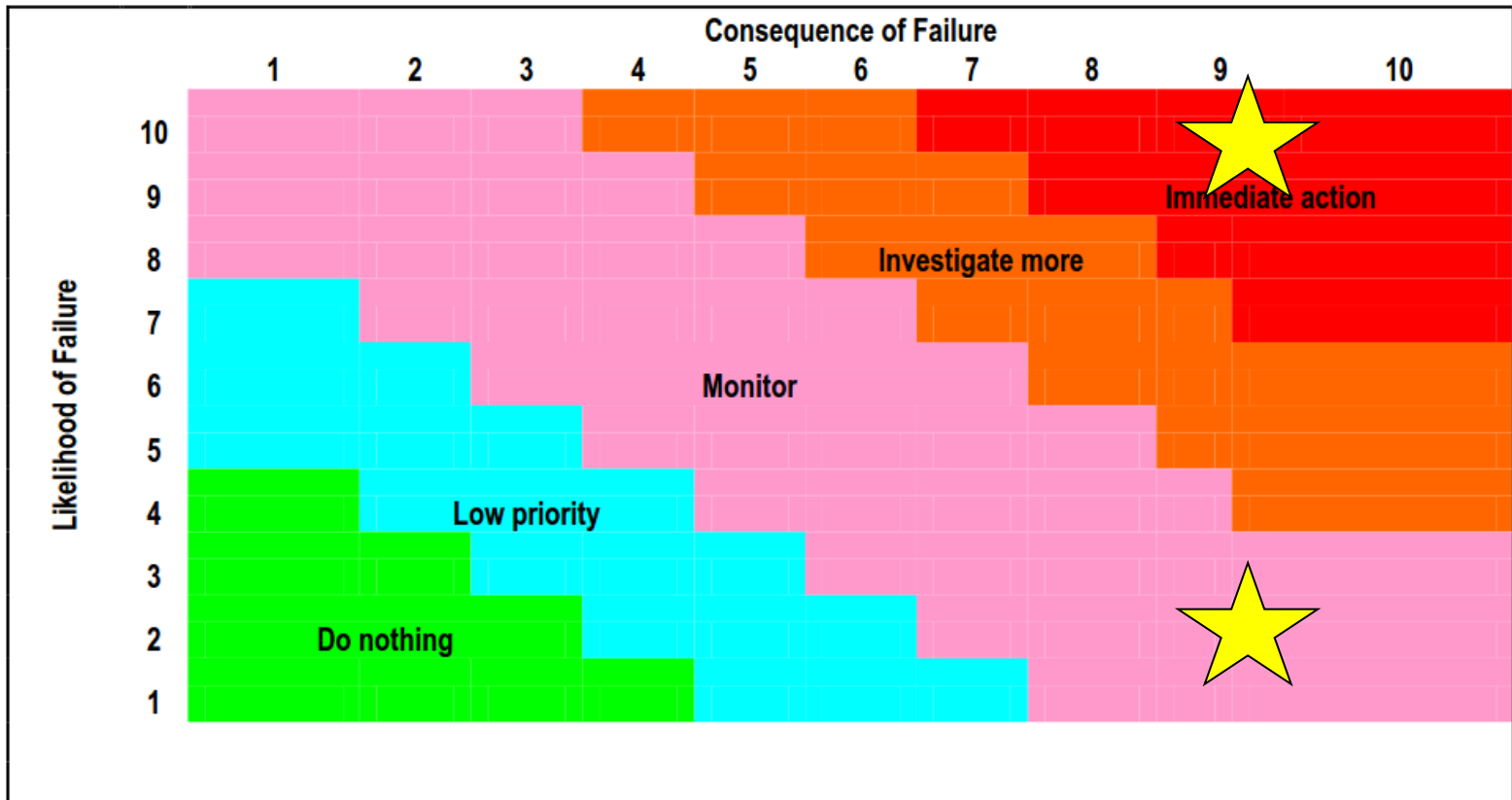


Ashland Force Main Assessment - Findings

Excavation 3



Ashland Force Main Assessment - Findings



Force Main Renewal Methods (Not an all-inclusive list!)

Repair

- Point repairs

Rehabilitation

- Spray on linings (corrosion protection – typically non structural)
- Close-fit linings (“modified slip lining”)
- CIPP

Replacement

- Open cut
- Slip lining
- Pipe bursting

Considerations

- Operating conditions
- Site specific parameters
- Life cycle cost
- Accessibility
- Status of technology
- Higher consequences of failure – More conservative renewal method!



Ashland Force Main Renewal

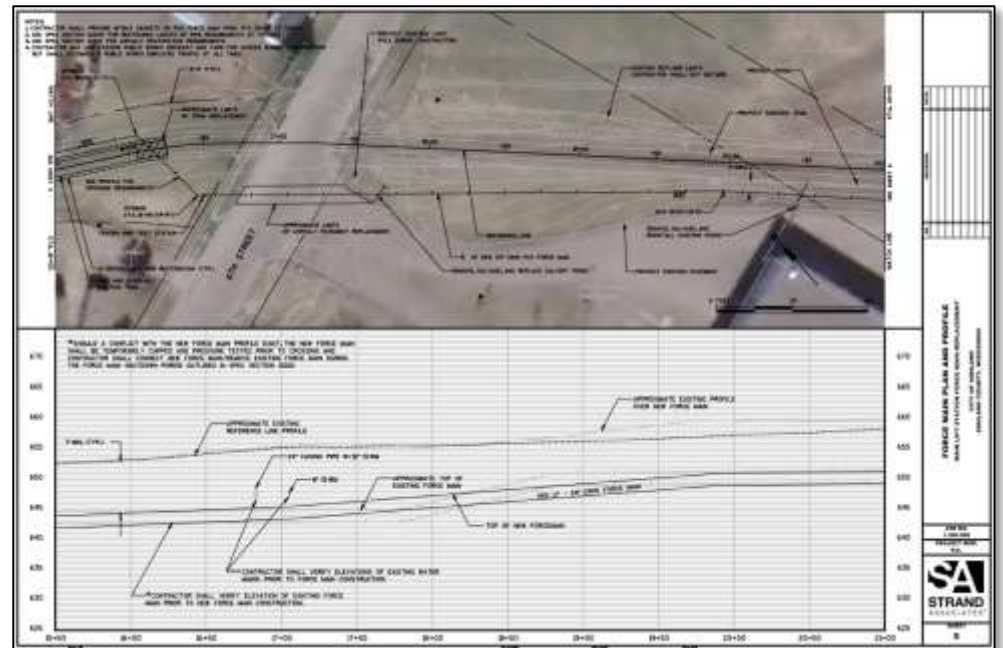
Partial Replacement

- Conservative approach (remember – high consequences of failure!)
- Location
- Cost
- Negligible impact to hydraulics



New Force Main Construction

- Fall 2014, restoration in spring, 2015
- Approximately 1,500 feet
- 24 inch C905 PVC
- Petroleum contaminated soils – nitrile gaskets
- Wrap ductile fittings, add sacrificial anodes
- Existing force main location



Final Tie-Ins and Bypassing

- November 12th-13th
- Three tie-in locations
- Cold and snow! – Not good for pumps!
- Low flow – overnight
- Three 8-inch pumps, 5 tankers, 3 septic haulers
- Multiple loading and discharge locations



Final Thoughts

- Force mains are a critical part of your collection system but are often ignored!
- Document data related to your force mains:
 - Age, size, material, history of failures, etc.
- Do you have an emergency plan in place in the event of force main failure?
- Consider performance (capacity)
- Polyethylene Wrap
- Understand risk! Consider risk of failure and consequences of failure – then determine next steps.



Resources

- Ductile Iron Pipe Research Association (DIPRA)
- Inspection Guidelines for Wastewater Force Mains, Water Environment Research Foundation
- Condition Assessment of Wastewater Collection Systems, United States Environmental Protection Agency
- Rehabilitation of Wastewater Collection and Water Distribution Systems-State of Technology Review Report, United States Environmental Protection Agency
- Condition Assessment of Wastewater Collection Systems, United States Environmental Protection Agency





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