

# CSO Mitigation, Wet Weather Flows, and Regulatory Compliance

A Look into Fitchburg's  
Collection System Rehabilitation Plan  
NEWEA Annual Conference  
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Nick Erickson, PE – City of Fitchburg  
Director of Public Works

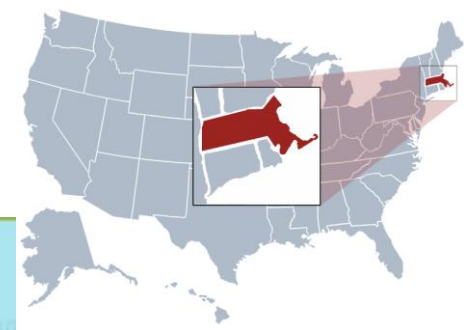
Frank Occhipinti, PE – Weston & Sampson  
Vice President



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WORKING FOR WATER QUALITY



# Where is Fitchburg?









# Fitchburg's Sewer System



## System Age

1890-1900 - 27.4%

1910-1925 - 26.0%

1930-1950 - 25.0%

1951-1975 - 8.5%

1984-Present - 12.8%

Unknown - 0.3%



# Fitchburg's Sewer System

## Sanitary Sewer System

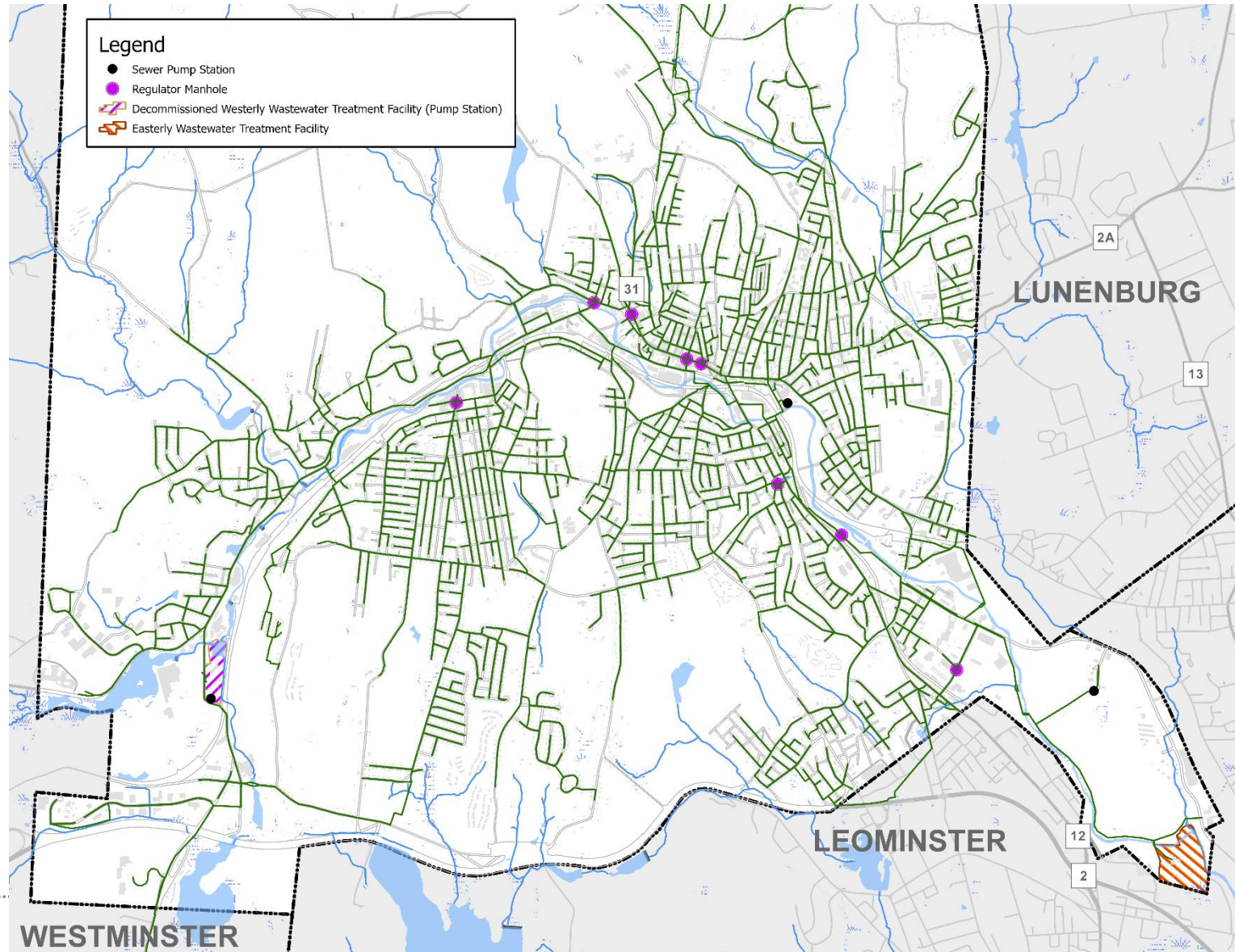
### ❑ 148 miles of pipe

- Mostly VCP gravity pipe
- Pipe diameters range between 6" and 54" RCP
- 30"+ either brick or cast-in-place concrete

### ❑ 5 Siphons

- ❑ Range - 6" to 36" diameter

### ❑ 3 City-maintained pump stations





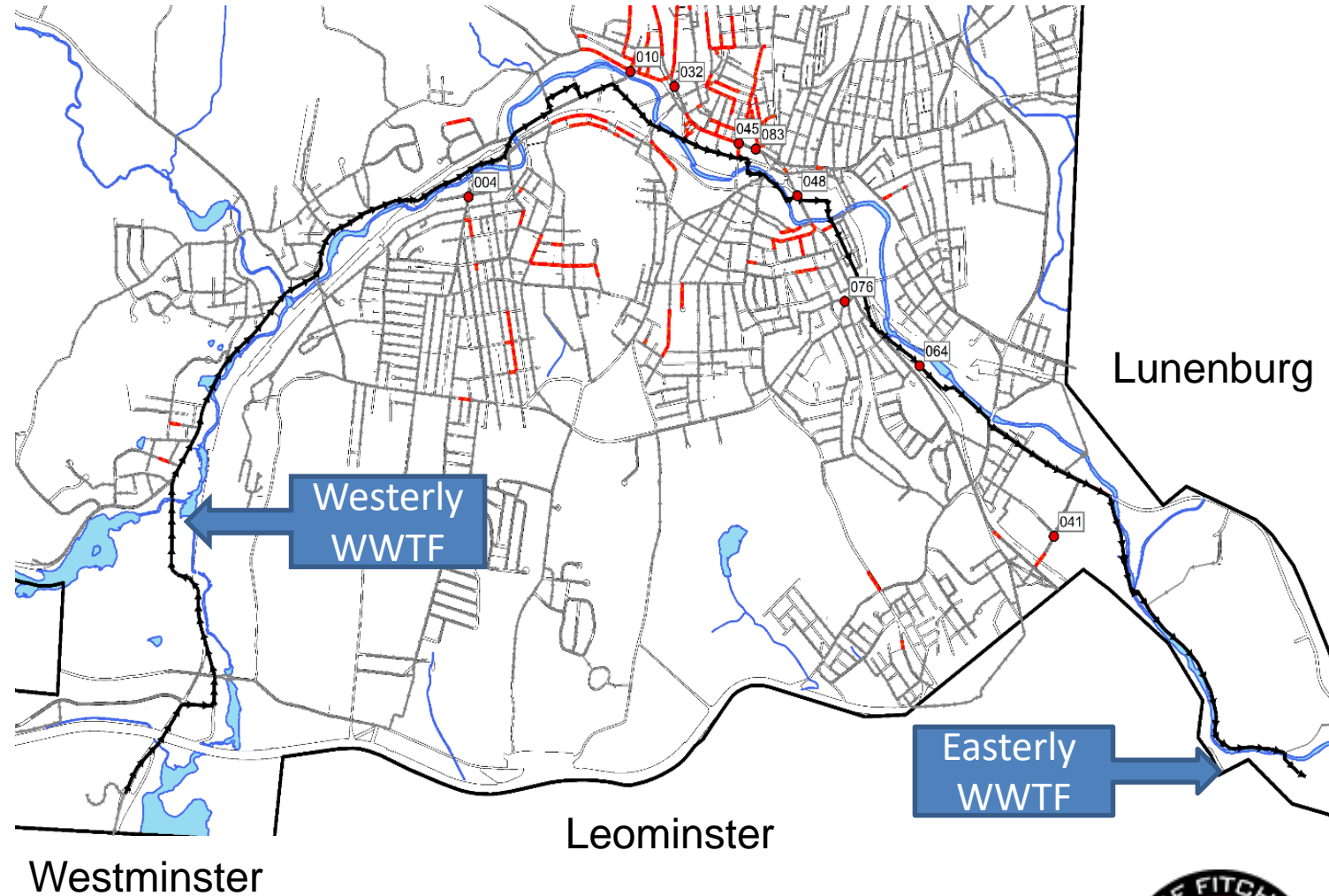
# Fitchburg's Sewer System

## Combined Sewer System

- ❑ Approximately 20 miles in 2005, **currently 8.4 miles**
- ❑ Down to **8 CSO Regulators**, from 64 CSOs 15 years ago
- ❑ **102 combination manholes**, down from 235 CMHs 10 years ago

## Wastewater Treatment

- ❑ Easterly Wastewater Treatment Facility
  - 20-40 MGD
  - Lunenburg/ Westminster flows
- ❑ Westerly Wastewater Treatment Facility
  - Decommissioned
  - Acts as pump station
  - Anaerobic Digestion - Proposed







# Fitchburg's System

- Average Daily Flow (2015-2022) – 8 MGD
  - Approximately 4 MGD of base flow infiltration
  - Combined Sewers – Up to 50 MGD in rain events
  - Bypasses of secondary treatment during rain events



# What is a CSO Community?

- ❑ Combined stormwater and wastewater collection system
- ❑ Various relief points in collection system
  - Combined Sewer Overflow (CSO) Regulators
- ❑ Over 700 cities in US

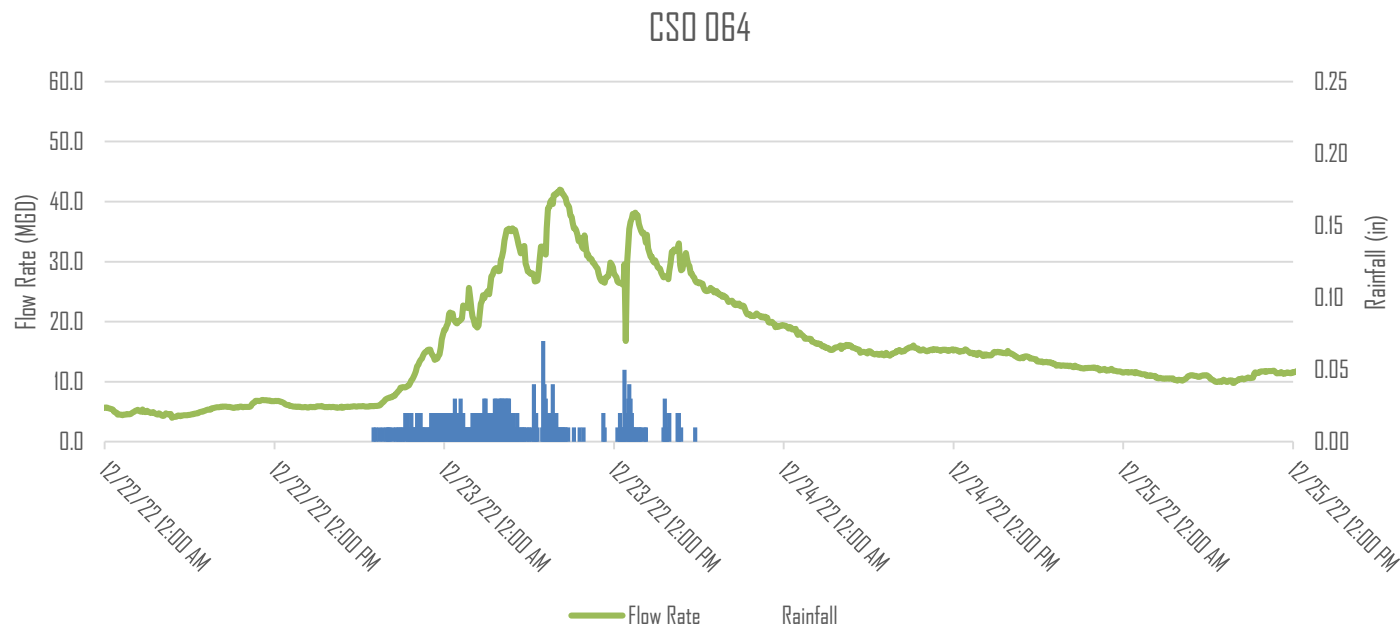


CSO-007 Regulator/Outfall



# Problems within CSO Communities

- ☐ Highly variable flow rates
- ☐ Significant inflow
- ☐ Debris buildup in collection system
- ☐ Untreated combined sewage discharges





# 2012 Consent Decree

- ☐ Meet CSO discharge requirements by 2030
- ☐ Mandated Sewer Separation Projects 2B, 3C, 4D, and Beech/Hazel Streets
- ☐ Mandated Sewer System Evaluation Survey (SSES)
- ☐ Hydraulic Model and Capacity Assessment
- ☐ Wastewater Management Plan





# Wastewater Management Plan

- ❑ Schedule to meet a seasonal Phosphorus discharge limit of 0.5 (conditional); 0.2 mg/L
- ❑ Schedule to meet CSO discharge requirements in 2010 NPDES Permit by December 31, 2030
  - CSO Long-Term Control Plan

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REPORT

May 2019

CITY OF  
Fitchburg  
MASSACHUSETTS

Combined Sewer Overflow  
Long-Term Control Plan





# MassDEP Options for CSO Controls

- ❑ EPA's Nine Minimum Controls
- ❑ Storage Technologies
- ❑ Treatment Technologies
- ❑ Elimination/Relocation (Sewer Separation)





# Consent Decree Remedial Measures

## Easterly Wastewater Treatment Facility

- ☐ Chemically Enhanced Primary Treatment – March 2019
- ☐ Secondary System Upgrades – August 2020
- ☐ Tertiary Treatment - TBD

## Collection System

- ☐ Sewer Separation/ Rehabilitation:
  - Approx. \$100 million to date (construction only),
  - \$76.5 million left
  - \$64 million for SSES after completion of sewer separation

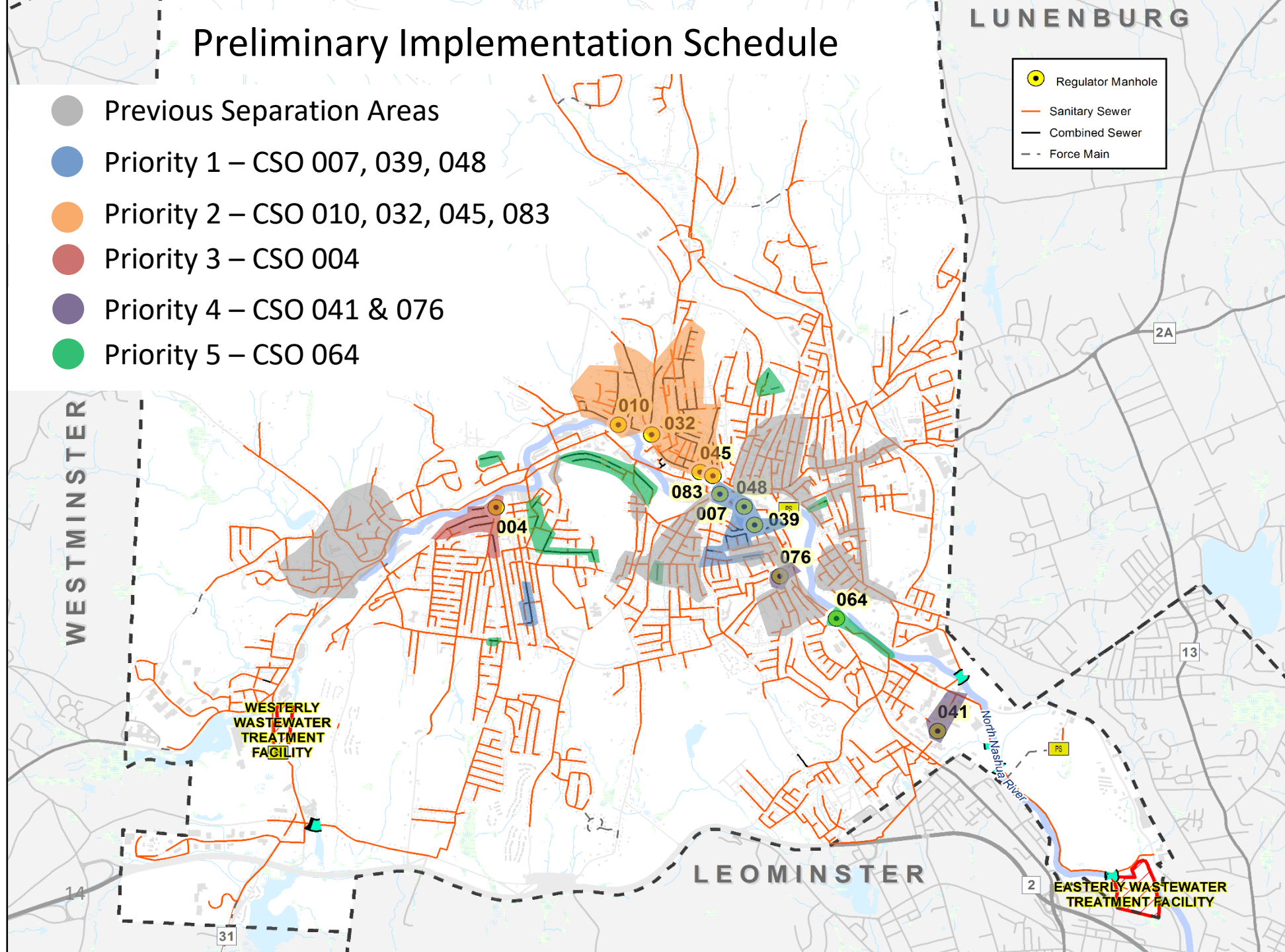




# Preliminary Implementation Schedule

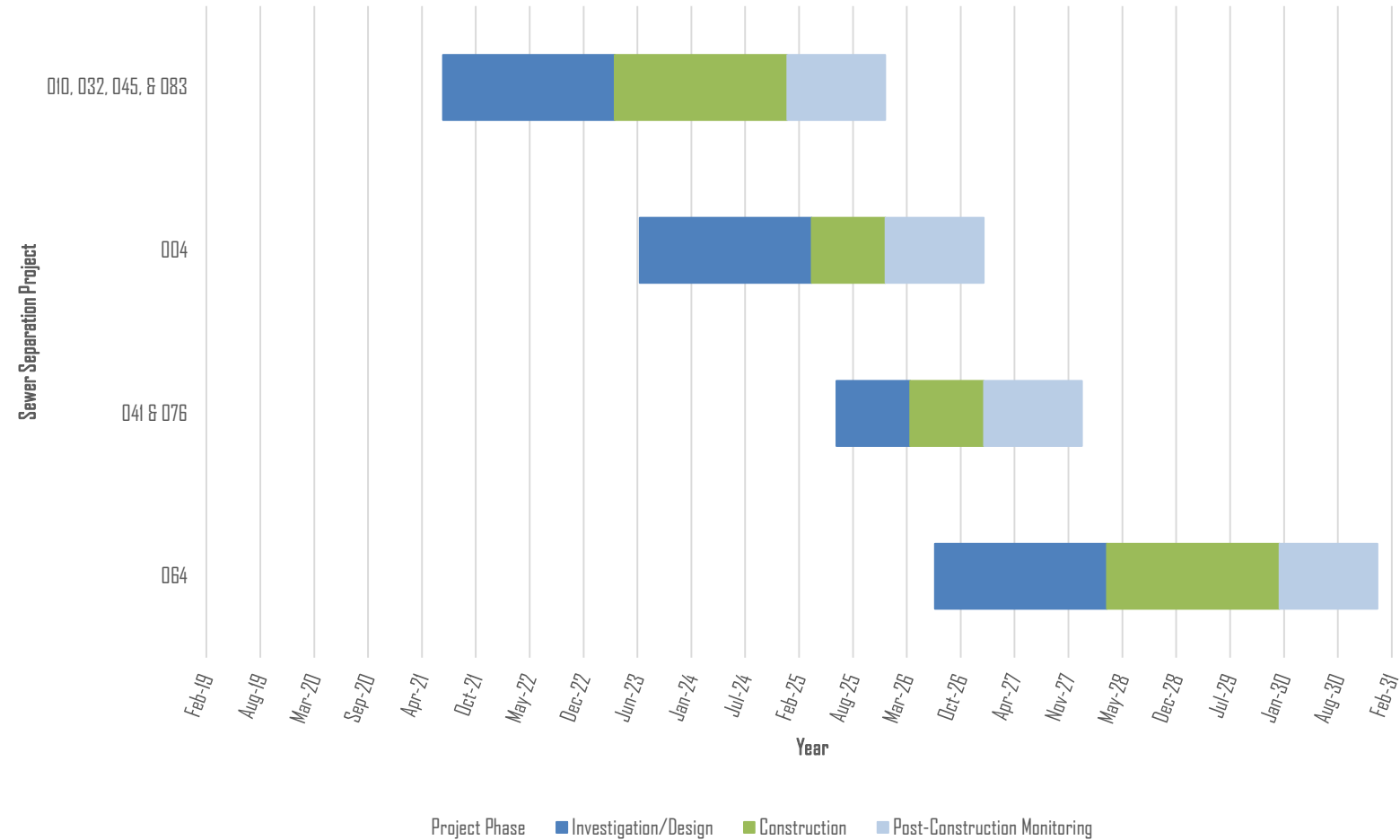
- Previous Separation Areas
- Priority 1 – CSO 007, 039, 048
- Priority 2 – CSO 010, 032, 045, 083
- Priority 3 – CSO 004
- Priority 4 – CSO 041 & 076
- Priority 5 – CSO 064

- Regulator Manhole
- Sanitary Sewer
- Combined Sewer
- - Force Main





# Preliminary Implementation Schedule





# CSO Discharges

- Down to 8 active regulators (1 closed in 2022)
- 2022 – 90 CSO events

CSO Events vs. Total Yearly Rainfall



# Sewer Interceptors





# Sewer Interceptors







# Sewer Interceptors





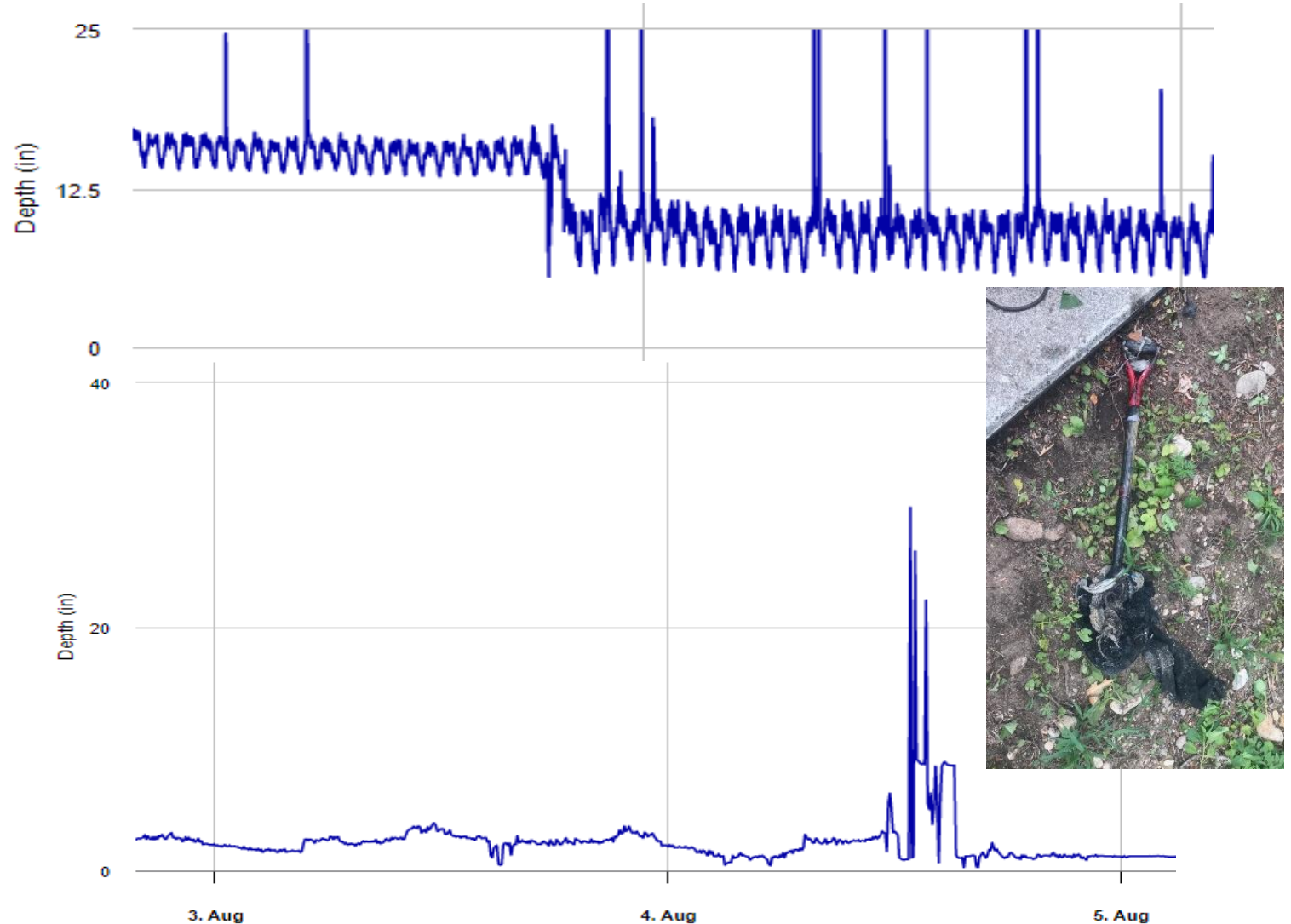
# Sewer Interceptors





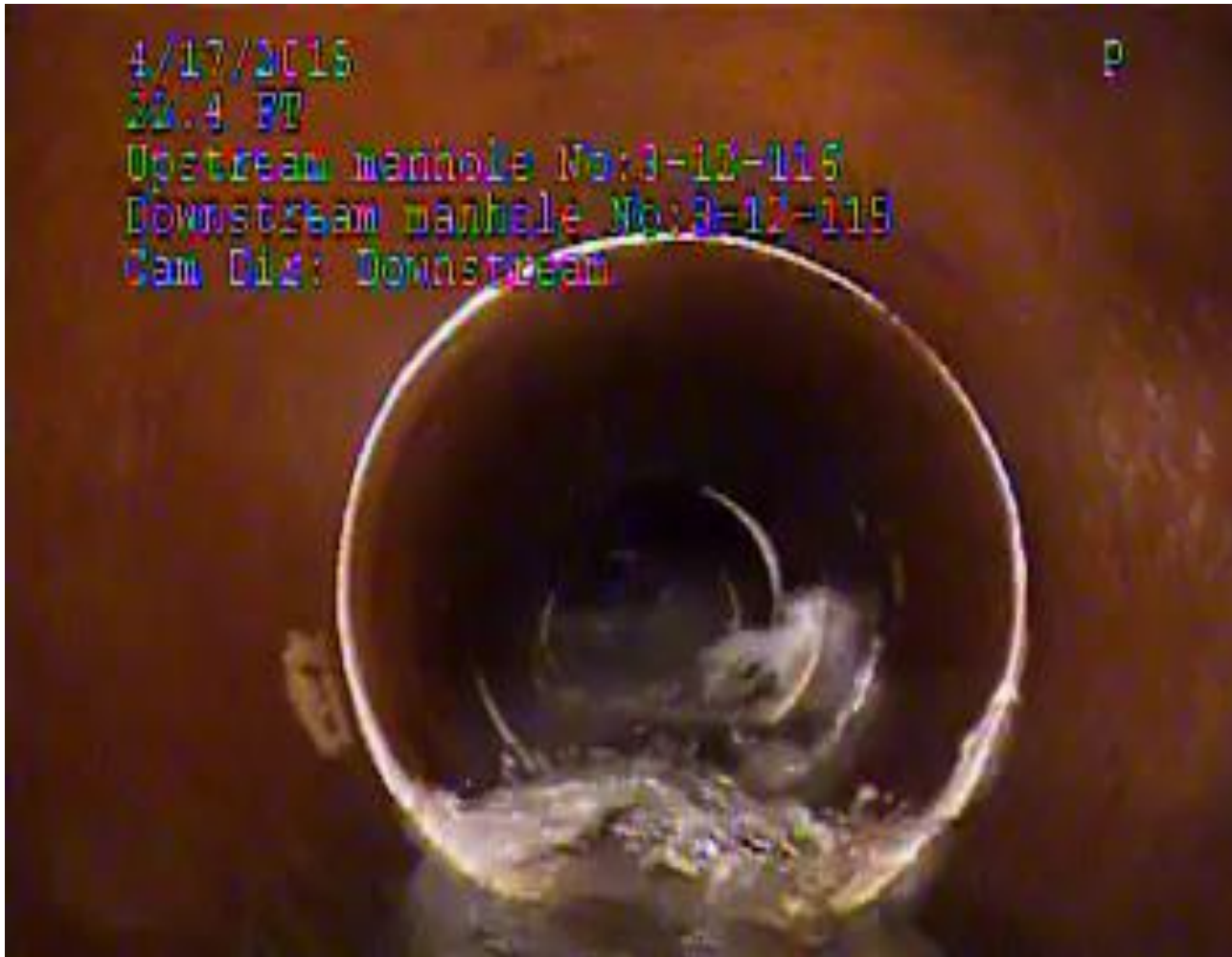
# Siphon Cleaning

- ❑ Completed in Summer 2020
- ❑ 284 cubic yards of debris removed from siphons and interceptor sewers
- ❑ 30-inch and 36-inch double barrel siphon outside treatment facility (top picture)
- ❑ 10-inch and 18-inch double barrel siphon (second picture and shovel picture – shovel removed from 10-inch barrel)





# CSO 007, 011, 039, 048 Separation/Rehabilitation



## ☐ SSES Investigation – September 2018

- CCTV video review
- Manhole inspections
- Smoke testing
- Building inspections
- Site survey
- Subsurface geotechnical and environmental investigations
- Database development

# CSO 010, 032, 045, 083 Separation/Rehabilitation

- Private I/I - Smoke Testing
  - Drone inspections for roof leaders

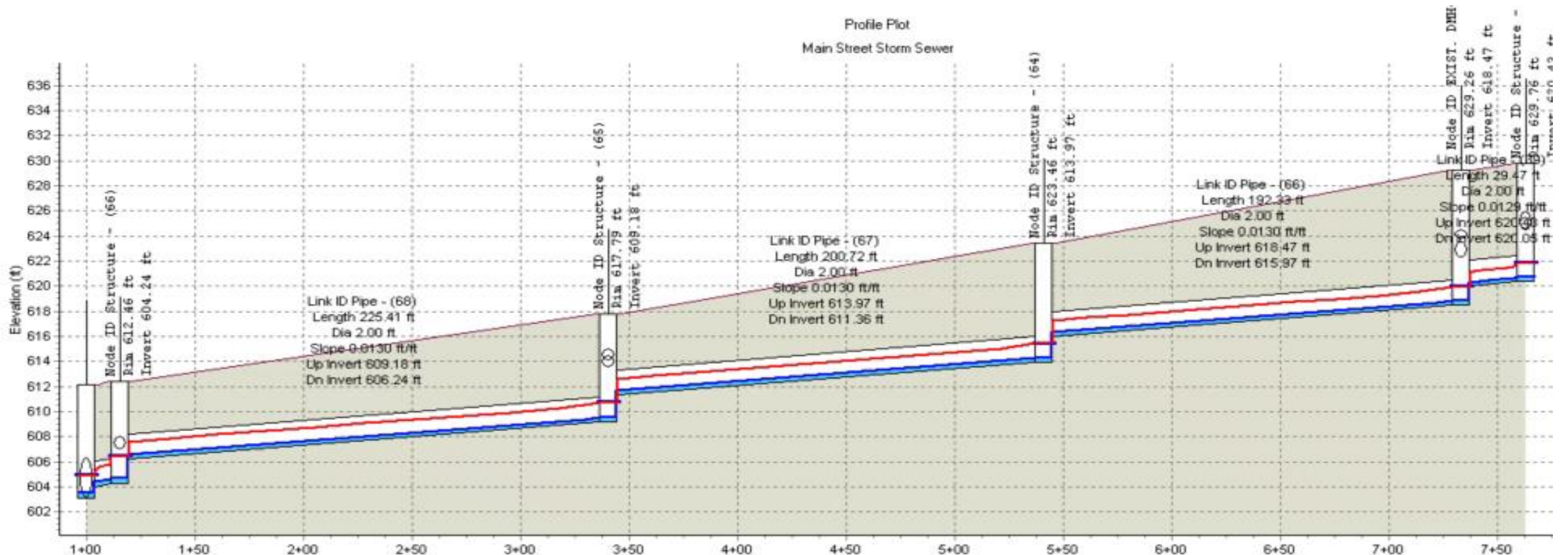




# Modeling in SSA

## Design – Summer 2019 through Present

- Existing conditions model – InfoSWMM
  - Flooding was predicted during 5-year, 24-hour storm event
- Proposed conditions – AutoDesk SSA
  - NOAA Atlas 14 – Year 2070 10-year, 24-hour storm event for resiliency







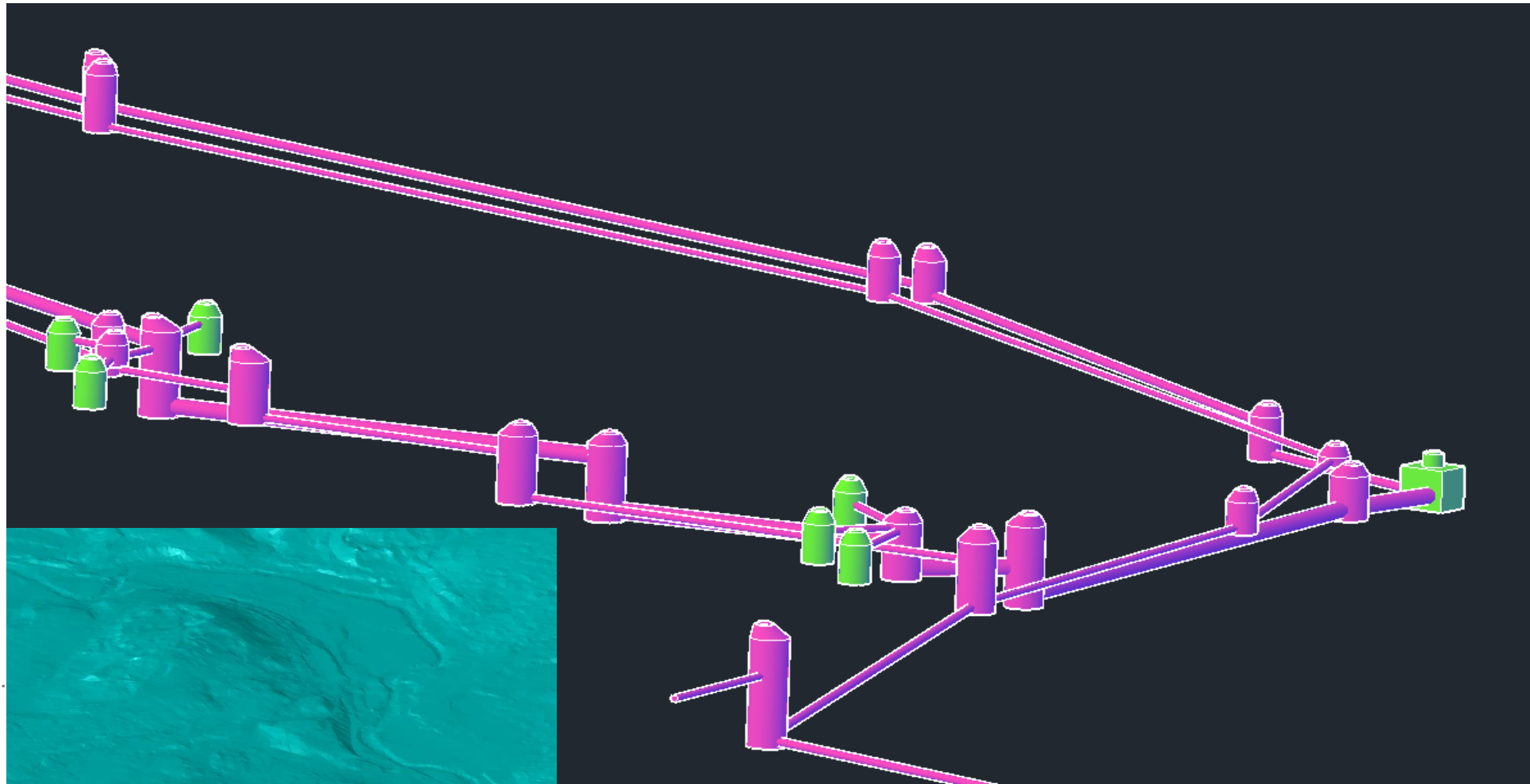






# Ongoing Sewer Separation Efforts

□ Design – Summer 2019 through Present





# CSO 007, 011, 039, 048 Separation/Rehabilitation

## ❑ Construction Start – Fall 2020

- 7,100 LF of sewer separation and 3,400 LF of sewer replacement
- 20,000 LF of sewer rehabilitation
- 18 combination manhole separations
- Duration – 901 days



# Combination Manhole Separation Program

- 102 known combination manholes in City
  - Approx. 91 with known transferences
  - Violation of NPDES Permit
  - Spring 2019 – design of 150 combination manhole separations (179 total in Spring 2019)



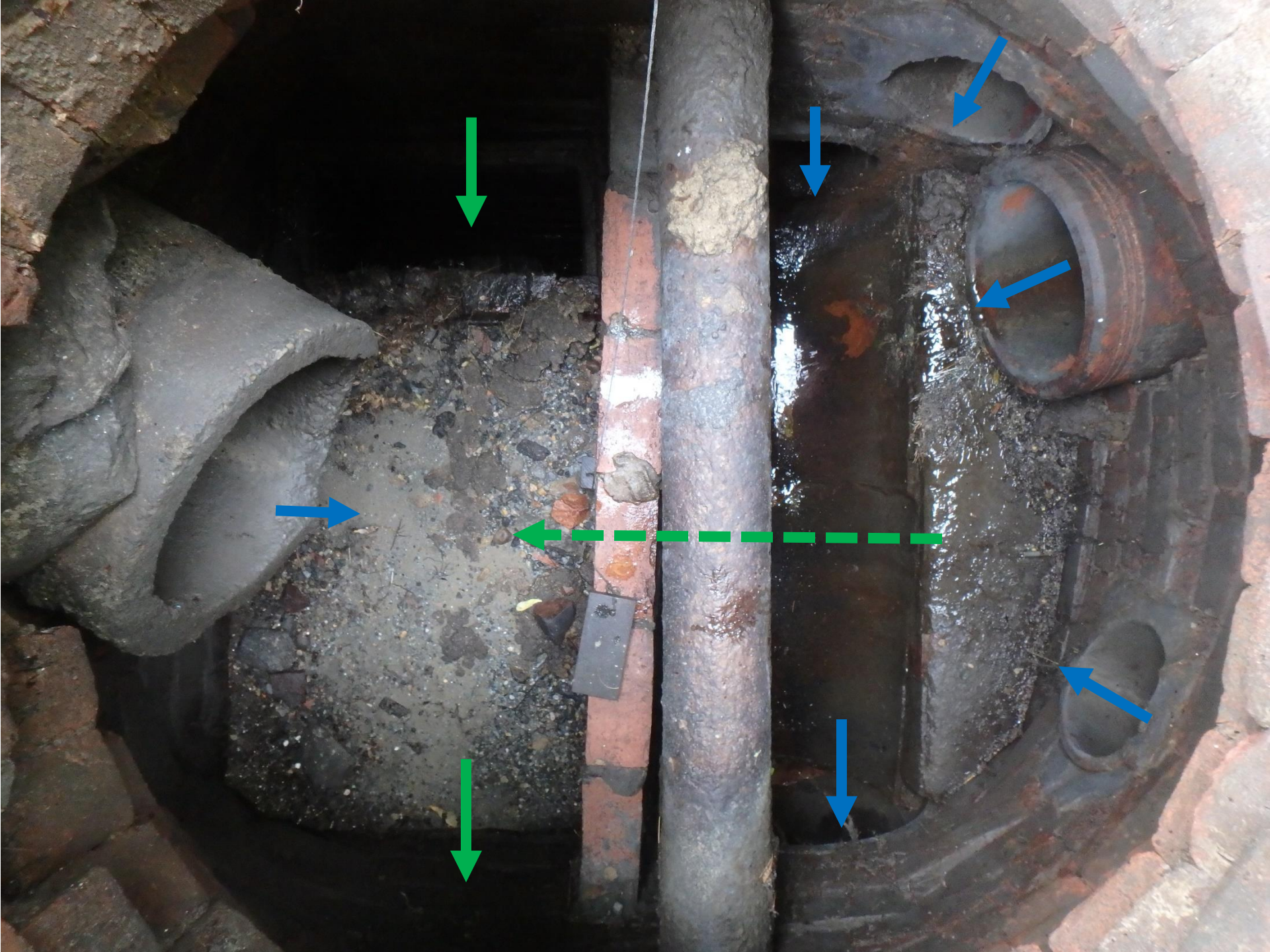














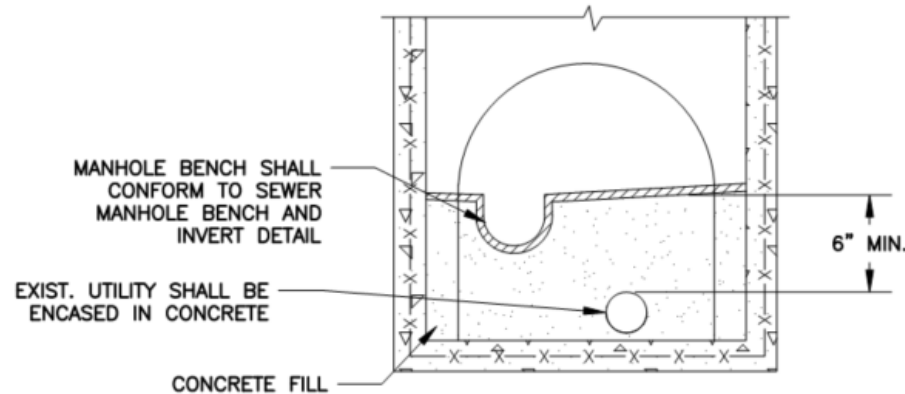




# Combination Manhole Separation Program

## ❑ Separation Methods

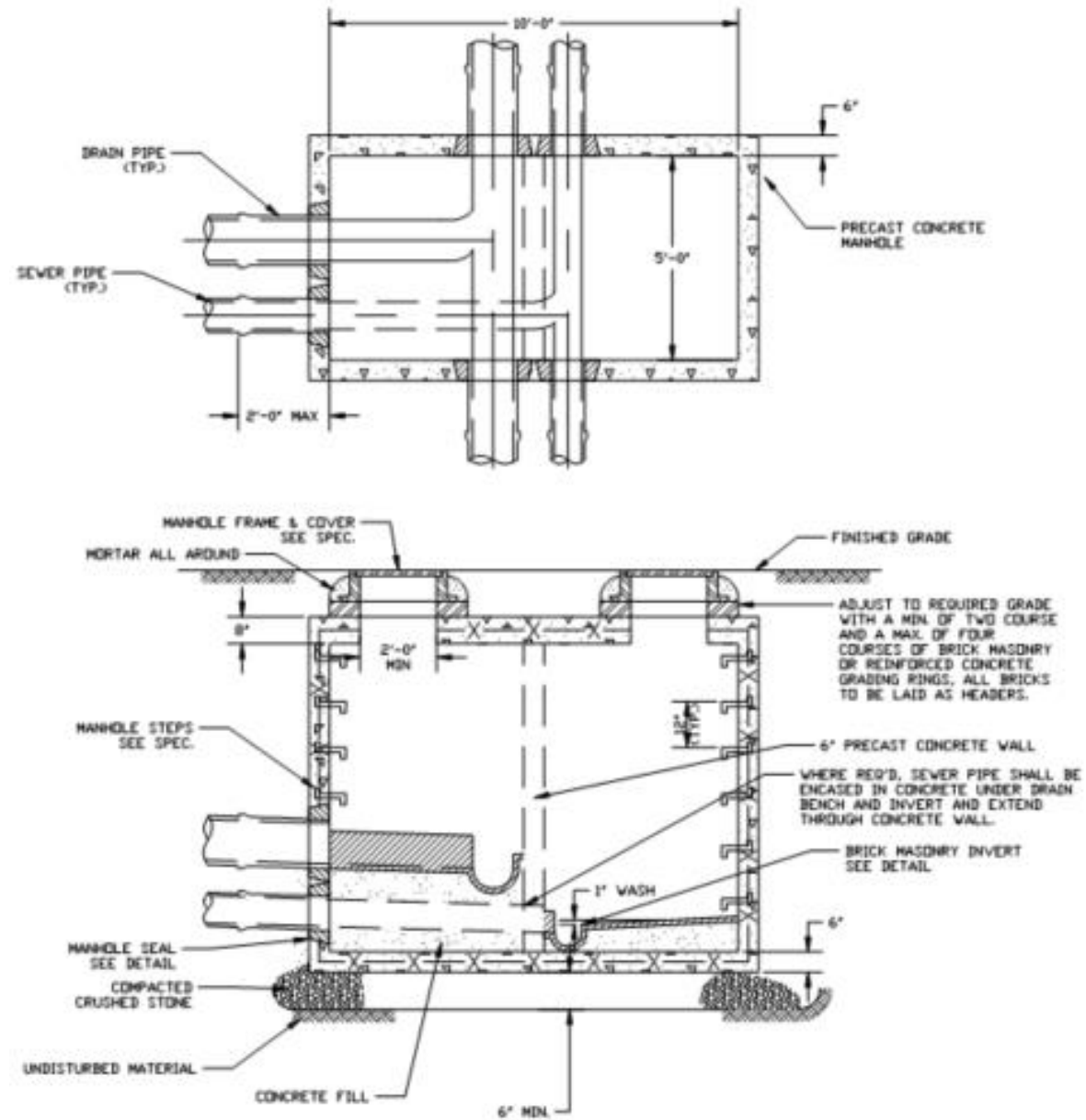
- Short Liners
- Doghouse Manholes
- Custom Structures



BENCH AND INVERT OVER  
EXISTING UTILITY DETAIL  
N.T.S.















Dual Access Manhole



Doghouse manhole over existing sewer



# Summary of Work to Date (2002-Present)

Work Completed	Quantity
Sewer separation (miles)	14.3
CCTV investigation (miles)	152.9
Manhole inspections (each)	2,903
Smoke testing (miles)	60.4
Building inspections (each)	1144
Trenchless rehabilitation/CIPP (linear feet)	40,834
Identified I/I (mgd)	63.2
Combination manholes separated (each)	133





# Next Steps

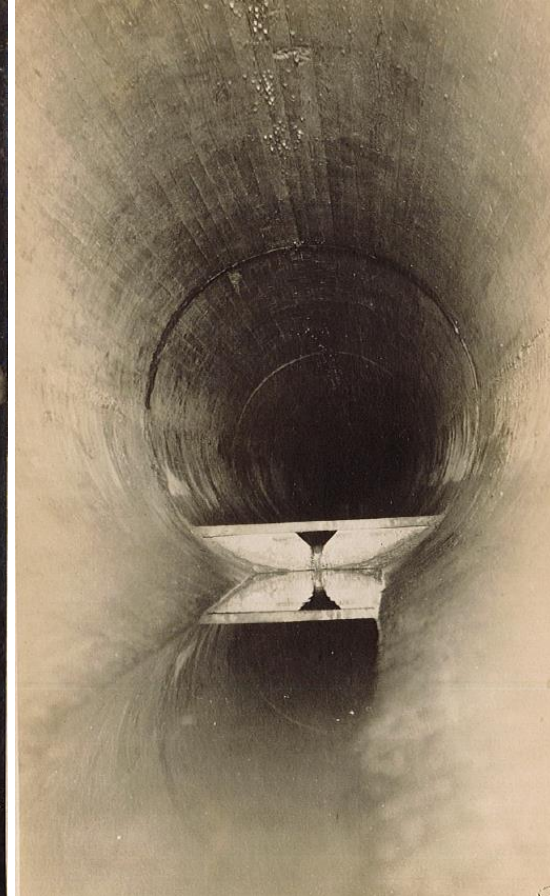
- ✓ CSO 010, 032, 045, 083 Separation/Rehabilitation
  - Downtown Area
  - Design Phase began Summer 2021 - Ongoing
  - Total cost: \$30 million
- ✓ Additional 3 Separation Projects Completed by 2030
  - Total cost: \$41.2 million
- ✓ Combination Manhole Separations
  - Total cost: \$6 million
- ✓ SSES – Ongoing
  - Total cost: \$64 million
- ✓ CSO Notification





# Summary

- ✓ Develop a plan
- ✓ Assess vulnerable conditions
- ✓ Develop Annual Investigate and O&M program
- ✓ Consider Improving your system's resiliency as part of proposed improvements
- ✓ Take it one step at a time







transform your environment

**thank you**

**Nick Erickson, PE – City of Fitchburg**

**Director of Public Works**

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