SANITARY SEWER LATERAL LINING

Project Overview & Lessons Learned

INTRODUCTIONS

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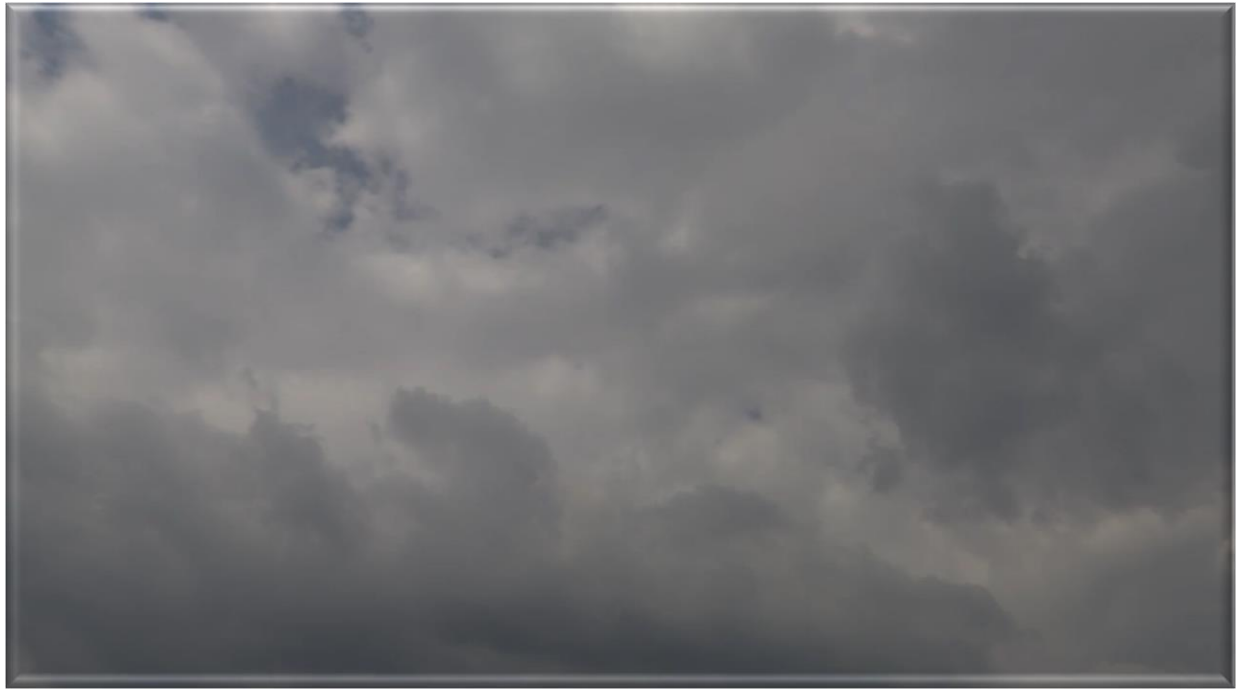
AGENDA

- Today's Agenda
  - Introductions
  - Background & History of I/I in Newport
  - Project Planning
  - Beyond Mainline Lining
  - Project Overview/Lessons Learned
  - Impacts to Newport
  - Q&A

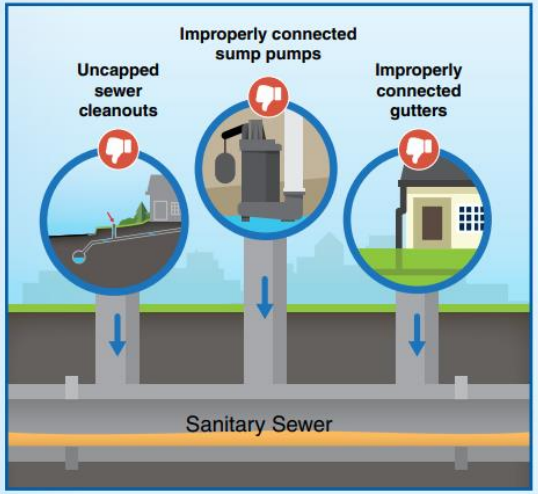
BACKGROUND – WHAT IS I/I



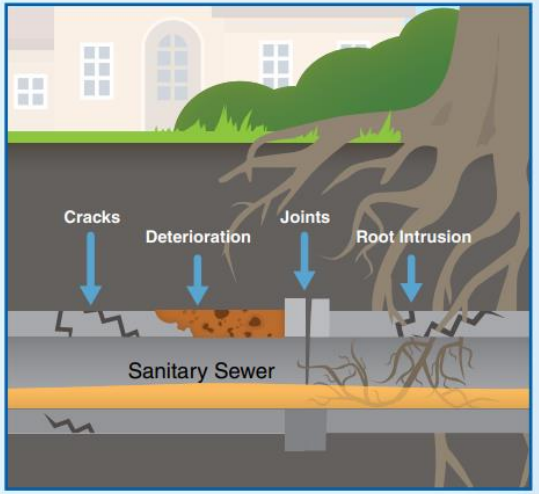
Sources of Infiltration and Inflow

BACKGROUND – WHAT IS I/I

Inflow and infiltration (I/I) is clear water that enters the wastewater system. It overloads the system and can cause costly sewer backups into homes and buildings.



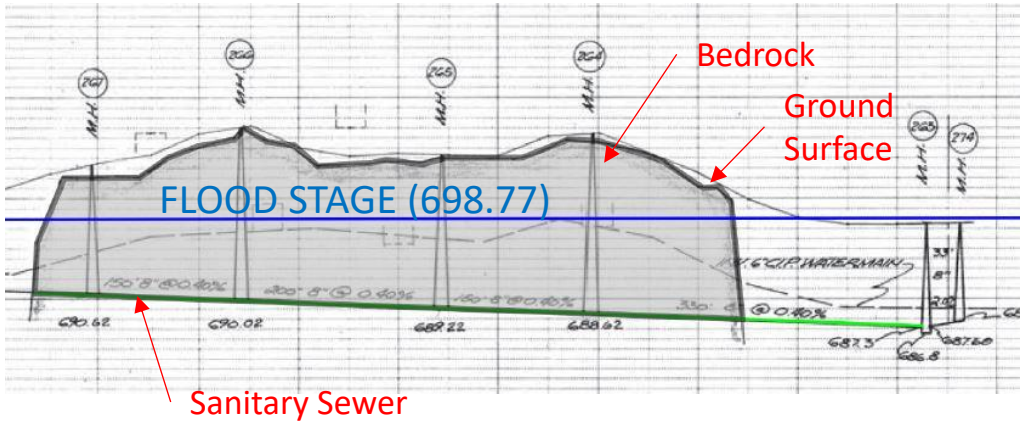
Inflow is clear water that quickly enters the wastewater system after rainfall events from sources such as sewer cleanouts, sump pumps, gutters, building foundation drains, and broken maintenance hole covers.



Infiltration is clear water that gradually enters the wastewater system below ground through cracks and openings in sewer service lines and joints, and public sewer mains and deteriorated maintenance holes.

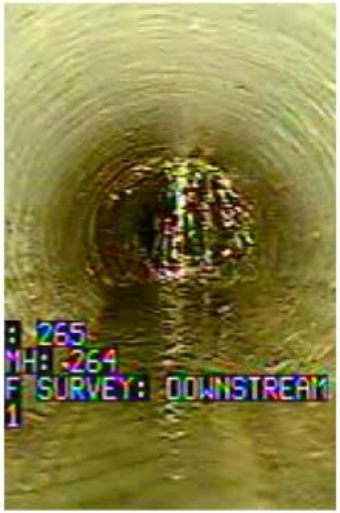
More information about I&I: https://metrocouncil.org/Wastewater-Water/Planning/Wastewater/Inflow-and-Infiltration/Property-Owners.aspx

BACKGROUND – NEWPORT LOCATION/GEOGRAPHY



BACKGROUND – SOURCES OF I/I

Upstream Manhole - I/I Entry at Structure Joints



I/I Entry at Reinstated Service Connection

Downstream Manhole - I/I Discharging between Liner and Host Pipe

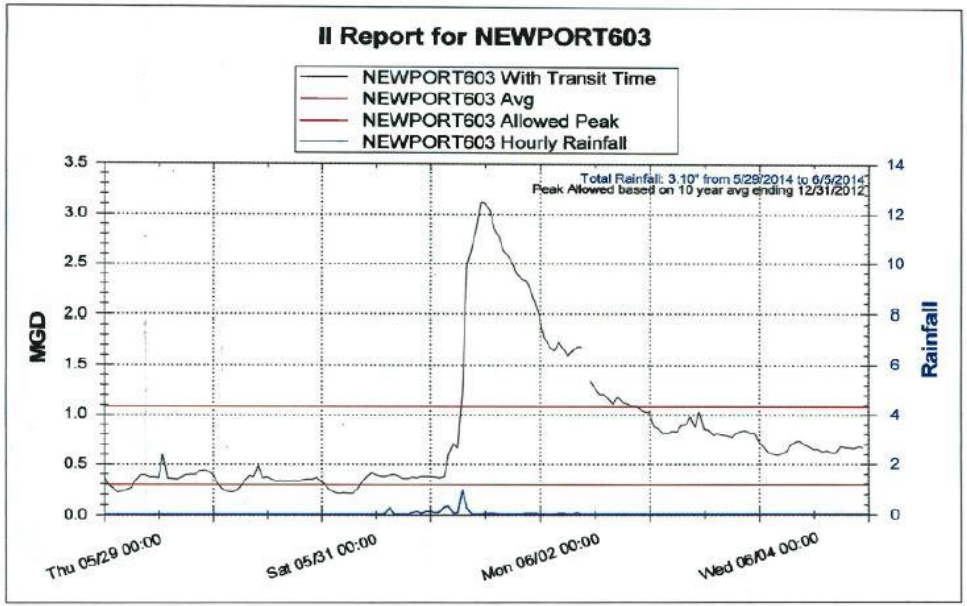
BACKGROUND – SOURCES OF I/I

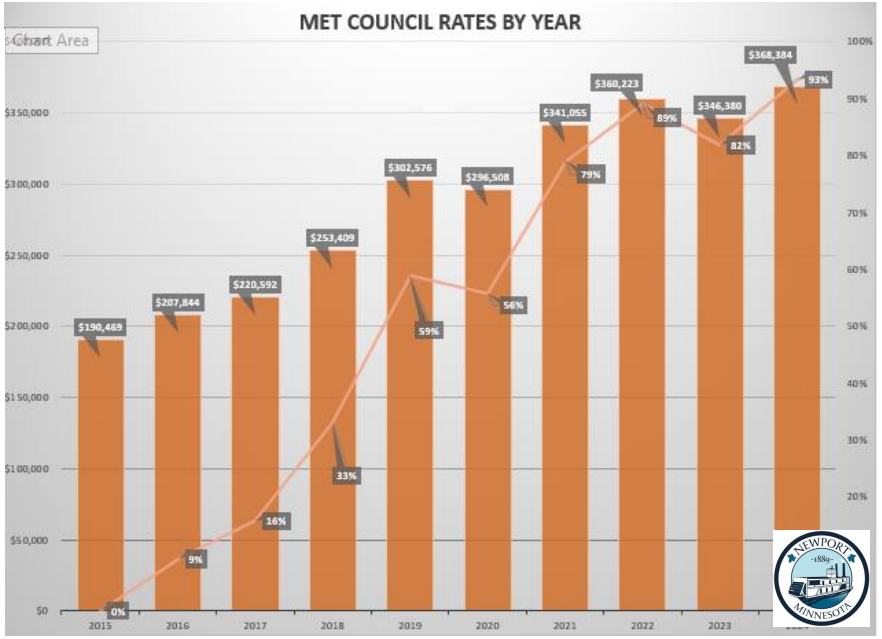
Infiltration at WYE Connection

BACKGROUND – SOURCES OF I/I

Roots at Transition

BACKGROUND – FINANCIAL IMPACT

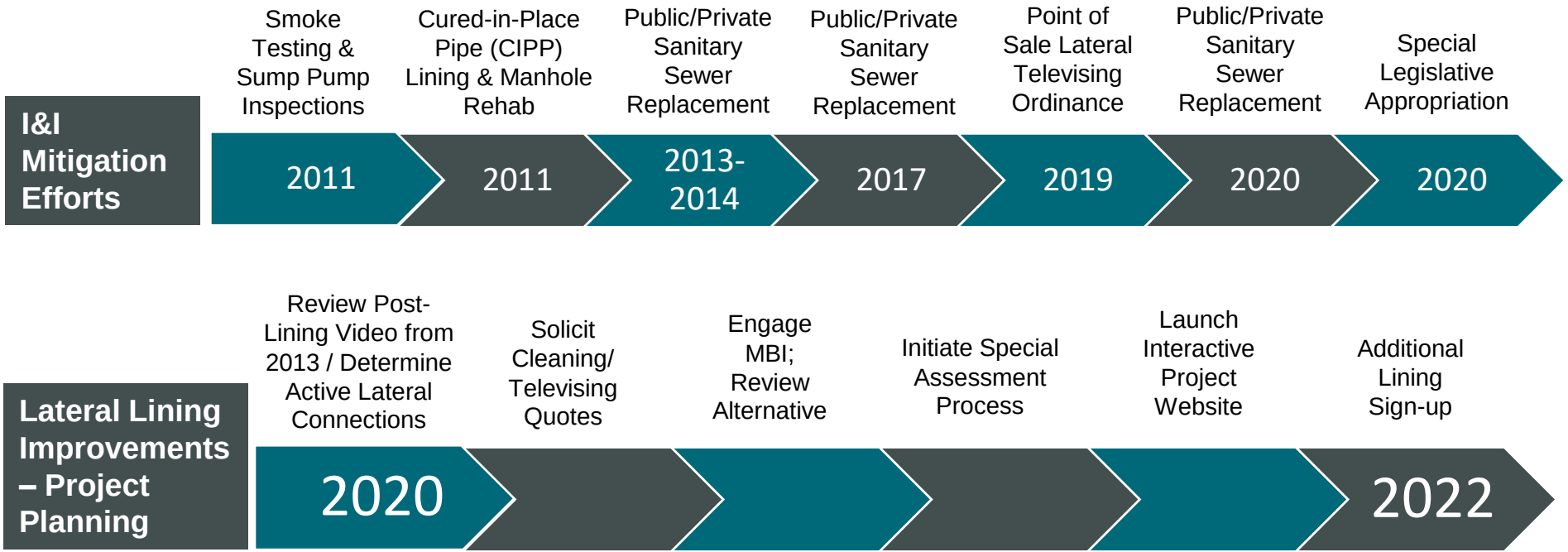




Musson Brothers, Inc. Since 1945

MSA

PROJECT PLANNING



BEYOND MAINLINE LINING

Mainline CIPP Only

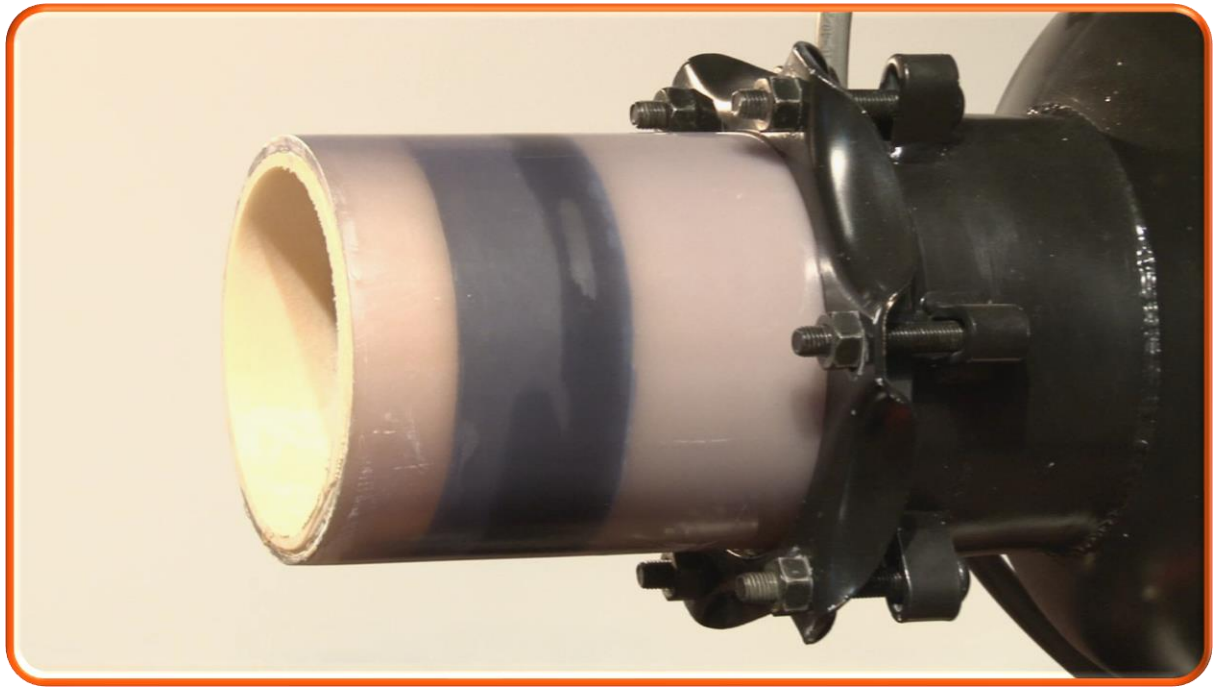
BEYOND MAINLINE LINING

- Why isn’t CIPP Water-Tight?
  - We can not adequately prepare the mainline pipe for bonding
  - Resins do not bond to the mainline pipe
  - All resins shrink
  - There is always an annular space between the host pipe and CIPP lining

BEYOND MAINLINE LINING

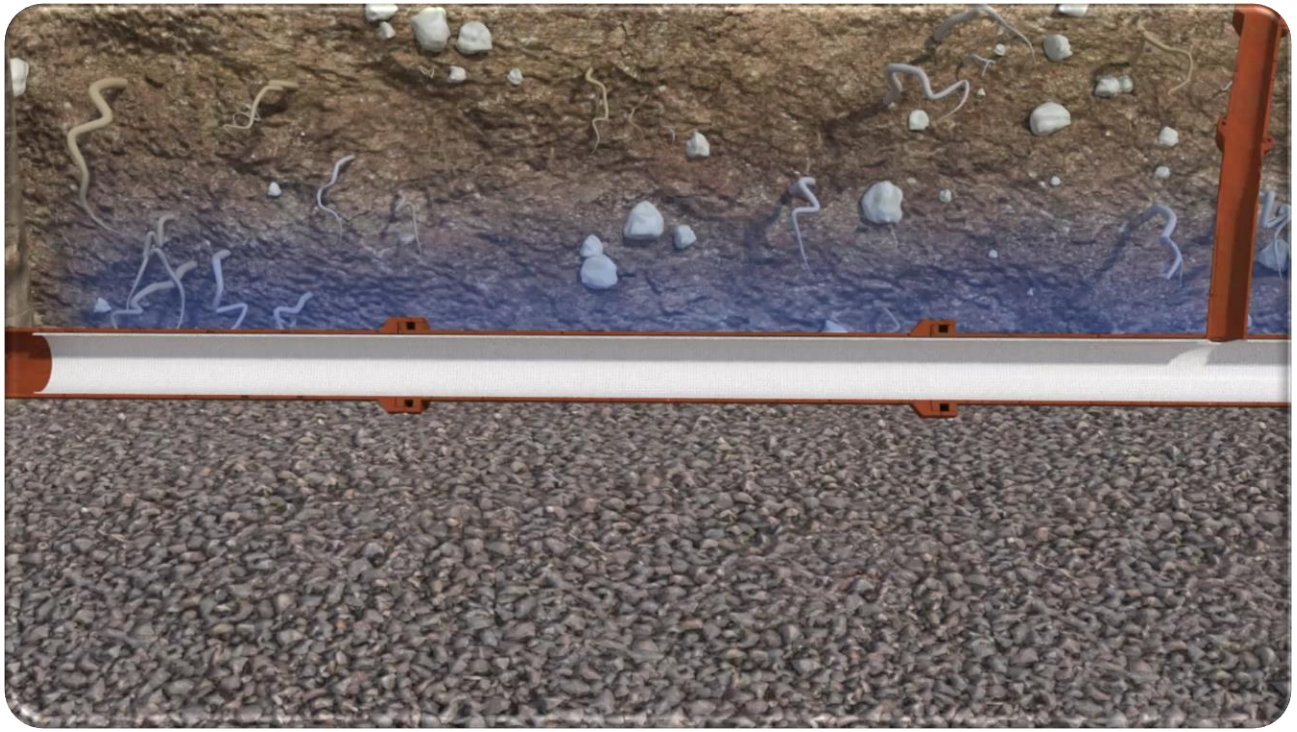
- Molded Hydrophilic Gasket (ASTM F3240)
  - Ability to Swell 800%
  - Paste does not comply
  - Installed in strategic locations at the same time of the liner
    - (Subsequently in Newport's case)
  - Withstand hydration and dehydration cycles
- Where are the Gaskets Placed
  - Manhole Protrusions
  - Connections to the Main
  - Terminating Ends of the Lateral

BEYOND MAINLINE LINING



Hydrostatic Pressure Testing

BEYOND MAINLINE LINING

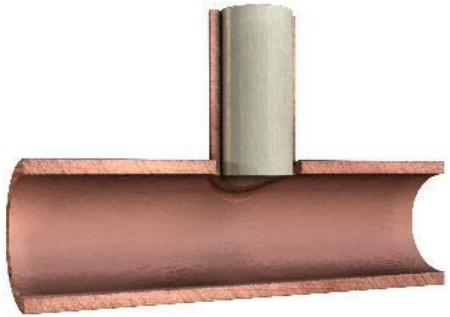


Hydrophilic End Seals

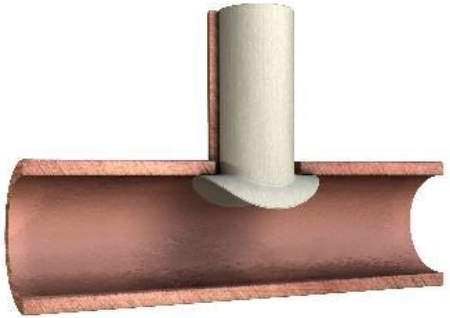
BEYOND MAINLINE LINING

Hydrophilic End Seals

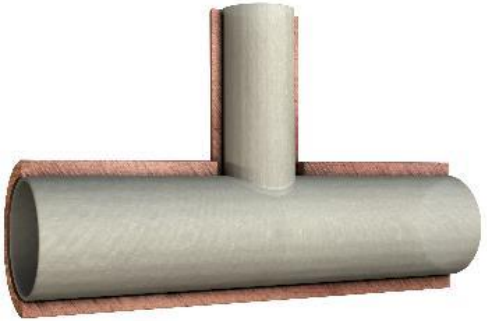
BEYOND MAINLINE LINING



1st Generation
No connection seal



2nd Generation
"Brim Style or Top Hat"

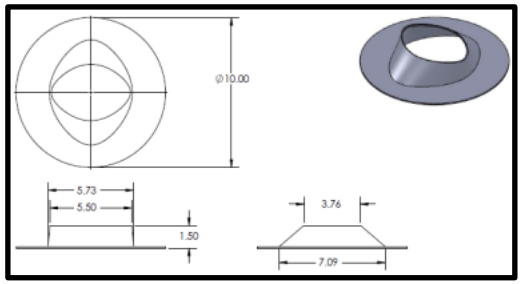


3rd Generation
Full wrap, Hydrophilic Caulk

Evolution of Lateral Lining

BEYOND MAINLINE LINING

- ASTM F2561
  - Standard practice for the rehabilitation of a sewer service lateral and its connection to the main using a one-piece main and lateral cured in place liner
- Essential Components
  - End Seals
  - Hydrohats
  - O-Rings



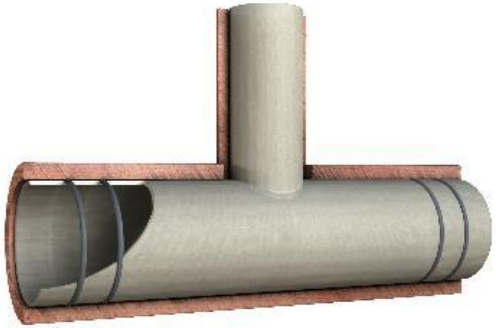
Hydrohat

O-Rings

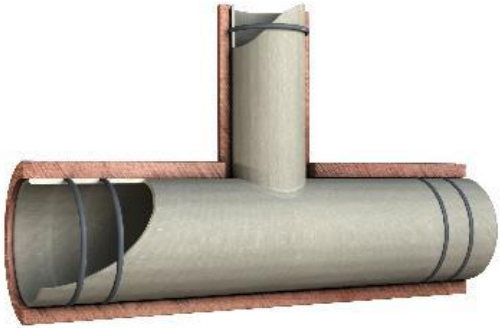
Hydrohat

End Seal

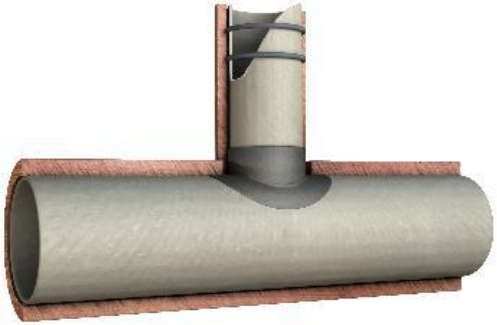
BEYOND MAINLINE LINING



4th Generation
Full wrap,
sealed in main



5th Generation
Full wrap, sealed
in main and lateral



6th Generation
enhanced seal
using “Hydro Hat”

Evolution of Lateral Lining

BEYOND MAINLINE LINING

Lateral Lining Install (Lab)

BEYOND MAINLINE LINING

Lateral Lining Install (Field)

BEYOND MAINLINE LINING

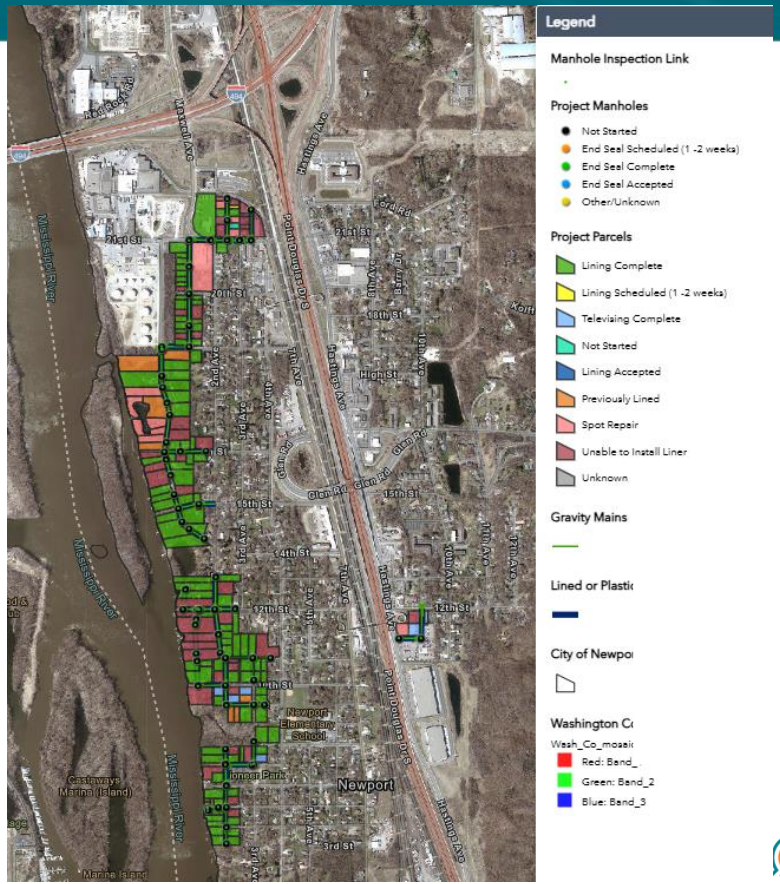
- Limitations
  - 10-foot max length for ‘blind’ install
    - Longer installations possible with ideal conditions (case-by-case)
  - Cleanout needed for longer installations
  - Lateral connection orientation at mainline
  - **Pipe transitions/bends within lateral**
  - Excessive Infiltration
- Other Options
  - UV Liners
  - Flex Liners
  - Two-step overlap process

BEYOND MAIN LINE LINING

Vac-A-Tee Install

PROJECT OVERVIEW & LESSONS LEARNED

- Original Project Scope
  - 146 Lateral Liners ($4,550/each)
  - 21 Spot Repairs ($4,000/each)
  - 135 End Seals ($3,800/each)
  - 2,190 feet of Additional Lining ($40/foot)
  - 73 Cleanouts ($1,500/each)
- Final Project Scope
  - 97 Lateral Liners
  - 31 Spot Repairs
  - 60 End Seals
  - 624 feet of Additional Lining
  - 10 Cleanouts
- Scope Changes
  - Unable to install 49 lateral liners
  - Less interest in additional lining than anticipated
  - Full replacement of manholes



PROJECT OVERVIEW & LESSONS LEARNED

- What Went Well
  - Project communication
  - Property owner interaction (MBI Crews/MSA Representation)
  - Multiple Crews. Progressed quickly after mobilization
  - Sharing videos on FTP site
  - Regular project meetings to review surprises
  - Low impact to residents
  - I/I Reduction!
- What are some challenges
  - **Protruding Pipe Connections/Transitions**
  - Difficulty installing Vac-A-Tee (Bed Rock)
  - **Interior venting in home**
    - Water splashing out of fixtures
    - Odor getting into home

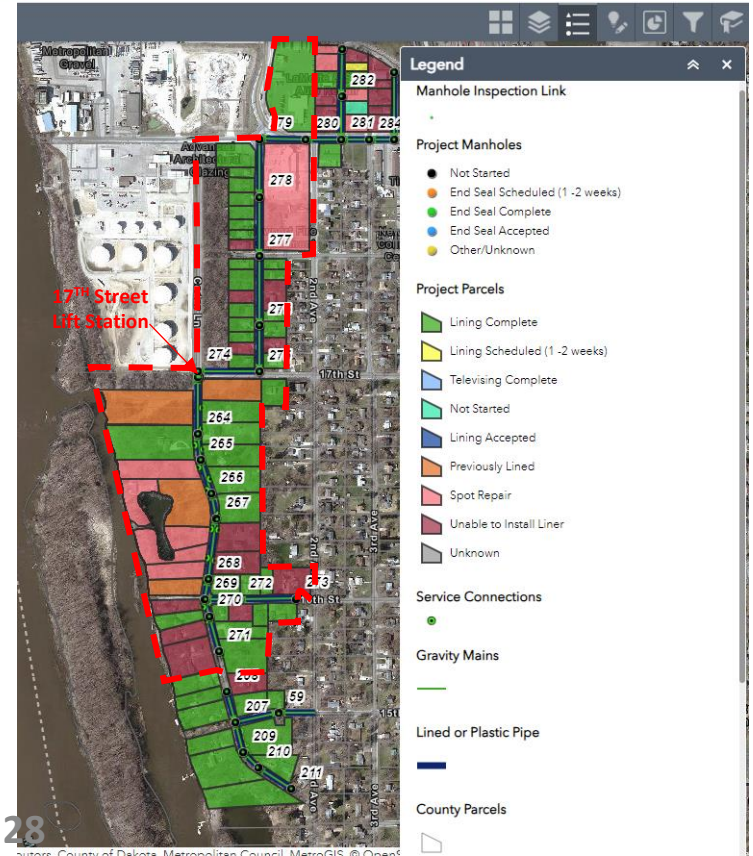
BEFORE

AFTER

LATERAL LINING IMPROVEMENTS

Protruding Pipe Connections/Transitions

PROJECT OVERVIEW & LESSONS LEARNED



17th Street Lift Station	
Pre-Lining Pumping Duration (May-2022)	84.9 HR
Post-Lining Pumping Duration (May - 2023)	26.3 HR
Average Pumping Rate	258 GPM
Pre-Lining Volume	1,314,914 GAL
Post-Lining Volume	407,329 GAL
Volume Reduction	907,585 GAL
MCES Total Annual Cost (2024)	$368,384.05
Total Volume (2023)	106.44 MG
Unit Cost	$3,460.95/MG
Monthly Cost Reduction	$3,141.11
Annual Cost Reduction	$37,693.33
Total Connections	54*
Mainline Repairs	6
Lined Connections	36
End Seals	15
Improvement Cost	$244,800
Payoff Term	6.5 Years

*Remaining 12 Laterals will be replaced in 2024

THANK YOU

Follow-up Questions

Let's continue the conversation.