Background Information

- The Washington Suburban Sanitary Commission (WSSC) was established in 1918.
- The commission housed approximately 60 miles of sanitary sewer.
- Today WSSC serves a 1,000-square-mile area in Montgomery and Prince George's Counties in the Washington metropolitan area with approximately 5,500 miles of sewer mains.
- Population of 1.8 million through approximately 460,000 customer accounts.

History of Service Laterals

WSSC maintains sewer service laterals from the mainline to the property line.

WSSC Consent Decree

- WSSC entered into a Consent Decree on December 7, 2005.
- The Sewer Repair, Replacement, & Rehabilitation (SR3) program was developed as a multi-year effort to improve the condition of the wastewater collection system assets in conjunction with our consent decree.
Outline

- Why WSSC considered tackling laterals
- Lateral defects encountered
- Lateral contract development
- Lateral inspection & design
- Pre-construction inspection process & lessons learned along the way
- Lateral review process before construction
- Lateral rehabilitation methods
- Construction inspection & issues encountered

Why Laterals Were Considered

- The Consent order intends to minimize I&I, Basement Backups and Sanitary Sewer Overflows (SSO’s)
- Lateral connections with a high priority at the mainline were identified in the SR3 plan
- Lateral observations were typically noted at the mainline connection during our mainline CCTV inspection.

Additional Lateral Problems

- Grease at Mainline connection
- Deposits attached at Mainline Connection
Lateral Contract Development

• Candidates for Lateral contracts based on clustered rehabilitation work
• Indefinite Delivery Indefinite Quantity (IDIQ) contracts were developed to expedite the rehabilitation process

Lateral Inspection/Rehabilitation Design

• Identify Sewer Asset candidates and retrieve the customer data
• Perform a redundancy check
• Project Management team of consultants that manage the Lateral construction program
  o Review inspection data for both internal & above ground features
  o Recommendations are made
  o Rehabilitation task orders that are issued to a WSSC contractor based on recommendations

Lateral Inspection/Rehabilitation Design

<table>
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<tr>
<th>Category</th>
<th>Street</th>
<th>US</th>
<th>MH</th>
<th>DS</th>
<th>MH</th>
<th>DATE</th>
<th>CLEANING</th>
<th>METHOD</th>
<th>TRAFFIC</th>
<th>CONTROL</th>
<th>TAP</th>
<th>STA</th>
<th>(FROM DS MH)</th>
<th>EXISTING</th>
<th>CO?</th>
<th>LATERAL SIZE</th>
<th>(INCHES)</th>
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<th>MAIN or CLEANOUT</th>
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<td>109.2</td>
<td>N</td>
<td>4</td>
<td>3.6</td>
<td>MAIN</td>
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Inspection Process

Contractors are given maps with all necessary header information
Lessons Learned During Inspection

A consultant developed an Above ground database with a form interface that would allow the contractor to enter above ground features that may effect an excavation.

Above Grade Survey

Data is accompanied by a sketch as well as photographs.

Above Grade Survey - cont’d
Additional Lessons Learned

- CCTV is not always possible
- Our system contains taps at the 12 o'clock position

Review Process

- Once the field work is complete, we review the data & make recommendations based on pipe and above ground conditions
- Our goal is to use trenchless technologies wherever possible in order to limit disturbance
- Above ground features were a large deciding factor in the use of excavation methods

Lateral Rehabilitation Methods Used

Multiple options available
Open-cut Excavation

Excavating a cleanout at the property line

Lateral Rehabilitation Methods Used - cont’d

Open cut replacement for entire lateral when no other option can be used

Mainline Connection Sealing

Chemical Grout Sealing  Full Wrap Profile Liner
Construction Inspection

• WSSC has a large staff of full time employees as well as consultant inspectors
• Proper documentation and accurate record keeping of as-builts

Issues encountered

• Residential Interaction
  ▪ Before & after photographs are very useful for restoration
  ▪ Access to areas located behind private property
  ▪ WSSC has created a customer advocate position which allows for a direct contact that residents can reach out to

• Permitting

Overall Picture
Laterals play an important role in solving I&I issues as well as preventing basement back-ups and eventual SSOs
For More Information

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Jonathan Kunay
CDM Smith

How to Navigate the Service Lateral Connection Liner Market
Service Lateral Connection Liners

• Overview of Product
• Usefulness in Trenchless Applications

Our Focus Today

• Factors to Consider for Various Applications
• Different Styles of Connections

Service Lateral Connection Liners

• Resin Types
• Materials
• Installation Methods/Requirements
• Length of Installed Product
Service Lateral Connection Liners

- Gain Valuable Working Knowledge
- Know the Important Questions to Ask

Service Laterals and Their Connections to the Mainline

Can Contribute up to ½ of System Infiltration

Service Lateral Connection Liners

- New Technologies and Methods of Installation
- Documented Successes
- Important Tool in Your Rehabilitation Product Arsenal
- Critical for Comprehensive Rehabilitation Programs
Service Lateral Connection Liners
Purpose
• Seal Annular Space and Connection between Service Lateral and CIPP Lined Mainline Sewer
• Rehabilitate Service Lateral Pipe to Various Lengths
• Increases Life of Critical Component of the Collection System

Types of Service Lateral Connection Sealing
• Chemical Grout
  o Acrylamide or Urethane
  o Seals Annular Space and Connection
  o Hardened Gel/Resin
  o Life Expectancy of 5-20 Years
• Necessary in all Service Lateral Connection Rehabilitation Programs

Types of Service Lateral Connection Sealing
Brim Seal Service Lateral Connection Liner
• CIPP Method
• Utilizes Circular Brim
• Design Life of 50+ Years
Brim Seal Service Lateral Connection Liner

One or Two-Part Lining System

Types of Service Lateral Connection Sealing

Full Wrap Service Lateral Connection Liner
- CIPP Method
- Covers Full Circumference of Mainline Pipe
- Design Life of 50+ Years

Full Wrap Service Lateral Connection Liner

One or Two-Part Lining System
Types of Service Lateral Connection Sealing

<table>
<thead>
<tr>
<th>Technology</th>
<th>Service Lateral Diameter (inches)</th>
<th>Distance Up Into Lateral (Feet)</th>
<th>Design Life (Years)</th>
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*Cost ranges from various Bid Tabs on projects from 2010-2012
**Does not include cost to install a cleanout, if needed

Factors to Consider During Design
Part 1
- Design Life/Service Life
- Goals of Rehabilitation Program
- Liner Type/Style
- Distance up Lateral Required for Rehab
- Mainline Pipe Size/Shape

Factors to Consider During Design
- Design Life
  - Based on Calculations Related to Strength Characteristics of Design
- Service Life
  - Actual Amount of Time Until Weakest Component of a Particular Product Fails
Design Life/Service Life of Chemical Grout

Design Life of 5 - 20 Years Based on Site Specific Characteristics
- Connection Fully Submerged at all Times
- Varying Groundwater Table

Recommending Chemical Grout Only
- Connection is Fully Submerged at all Times
- Evaluate Goals of Rehabilitation Program
  - Aggressive Approach for Removing Infiltration from Lateral Connections Not Needed

Recommending Service Lateral Connection Liners
- Varying Groundwater Conditions
- Integrity of Service Laterals is Severely Degraded
- Long-Term Comprehensive Rehabilitation Program
  - High Percentages of Infiltration Must be Removed
Service Lateral Connection Liner
Type: Brim Style vs. Full Wrap

When to Recommend Full Wrap
Service Lateral Connection Liner

Mainline Pipe Has Not Been Lined with CIPP Liner

When to Recommend Full Wrap
Service Lateral Connection Liner

Reinstated Service Connections Have Been Overcut or Have Shifted
When to Recommend Brim Style Service Lateral Connection Liner

Mainline Pipe Has Been Lined with CIPP Liner

Distance Up Lateral Required for Rehabilitation

- Based on Condition of Collection System and Desired Removal Goals
- Liners Can Extend from 6” up to the House

Factors Affecting Distance Up Lateral Required for Rehabilitation

- Groundwater Levels
- Age/Condition of Service Lateral Pipes
- Available Funding
- Installation Method: With or Without a Cleanout
  - Work on Private Property
  - Newly Installed Cleanout - $2,000 - $5,000
Factors to Consider During Design Part 2

- Pre-CCTV Inspection of Service Laterals
- Bends
- Orientation
- Pipe Size Changes
- Design and Installation Methods

CCTV & Cleaning Prior to Installation

- CCTV Inspection from Mainline Sewer
  - Pan and Tilt Camera
  - For SLCL’s Extending up to 2 ft
- CCTV Inspection with Lateral Launching Camera
  Required for Long SLCL

Bends within the Service Lateral Pipe

- Common Bends: 22.5°, 45°, 90°
- Not All Liners Can Navigate Bends
  Can Cause Wrinkles/Blockages in Service
- May Need to Cut Liner Short, Prior to Bend
Orientation of Service Lateral Connection to the Mainline

- Factory Wye/Tee or Break-In Service
- Clock Position of Break-In

Pipe Size Changes within the Service Lateral Pipe

- Exit Property as a 4-inch and Expand to 5-inch or 6-inch at the Mainline
- Not All Liners Can Navigate Pipe Size Changes
  Can Cause Wrinkles/Blockages in Service

Design & Installation: Hydrophilic Seals vs. Resin Migration

- Often a Contentious Issue
- Opinions Vary Widely
- Installation
  - Inversion Method - Resin Migration
  - Inflation/Packer Method - Mechanical Bond
Resin Migration

• Excess Resin Squeezes Out at the Terminus
• Binds Liner to Service Pipe

Hydrophilic Seal

Hydrophilic Material Increase in Size in Presence of Water and seals annular space between host pipe and liner in case of bond failure

Conclusions

• Rehabilitating Only Mainline Pipe Addresses Only a Fraction of Infiltration
• Service Lateral Connection Liner Recommendations Include Many Variables
• A Detailed Evaluation of the Collection System is Required
MDC Introduction

- The MDC is a nonprofit municipal corporation chartered by the Connecticut General Assembly in 1929.
- The MDC provides water, sewer and household hazardous waste collection to its member towns and treated water to portions of non-member towns.
- Service population of approximately 400,000 people.
About the MDC’s Sanitary Sewers

MDC owns & maintains 1,216 miles of sanitary sewers and 4 water pollution control facilities
- Hartford - 80 million gallons a day (MGD) secondary & 30 MGD wet weather
- Largest wastewater treatment plant in CT
- East Hartford - 12.5 MGD
- Poquonock - 5.0 MGD
- Rocky Hill - 7.5 MGD

MDC Clean Water Project

Main goals
- Eliminate Sanitary Sewer Overflows (SSO) - Consent Decree
- Reduce the amount of sewage that enters the CT River - Consent Order
- Reduce the amount of Nitrogen released into the CT River - Consent Order

Sanitary Sewer Overflows
MDC Clean Water Project

- MDC SSO Program
  - Compliance with 2006 Consent Decree (SSO Closure)
- Initial phases included
  - Data Collection via SSES (2005 - 2007)
  - Sewer Modeling (SWMM Model) & Development of SSO Elimination Plans (2007-2010)
  - Initial Sanitary Sewer Repair/Rehabilitation (2008-2011)
  - SSO Pilot Program (2011-2014)

SWMM Output

Intent of Lateral Rehab

MDC Historical Approach
- Cured In Place Pipe
  - Grout Sealing of Laterals
- Excavated repairs where required
- Lateral repairs for structural needs only
Intent of Lateral Rehab

- Why was project considered?
  - Included as part of large-scale I/I Removal Pilot Program
  - Lining to property line vs house connection

- What types of lateral rehab were considered?
  - Ambient Cure
  - Steam Cure
  - Lining from main vs. from house cleanout

Intent of Lateral Rehab

Background information

SSO Pilot Program included
  - Lateral Lining (property line & house connection)
  - Lateral replacement via open-cut (property line)
  - Private property inflow removal (foundation drain disconnection)
  - Mainline sewer/manhole rehabilitation (SSES Recommendations)
  - Mainline Lining + Lateral Connection Seals

Design of Lateral Rehab

- Design Team
  CDM Smith

- Evaluation criteria (cost, schedule...etc.)
  Pilot Study Target Area Considerations
  - Level of work completed to date
  - Quantity of Infiltration/inflow
  - Costs

- Process used to determine rehab system(s)
  - Workshop held with multiple vendors during planning
  - CCTV inspection of laterals during design phase
Design of Lateral Rehab

• Specifications
  o Tabular list of properties to be lined
  o CCTV reports of laterals

• Plans
  Locations of cleanouts shown - selected during design

• Bid Items
  o 0-5 feet (Lump Sum)
  o 5 feet to property line/house (per foot)

• Impact on residents
  o Cleanouts
  o Failures

Project Implementation

• Ownership of Laterals
  o Property Owner vs MDC

• Unforeseen circumstances and solutions
  o Lateral lining failures
  o “Un-lineable” laterals
  o Bypass pumping Lessons Learned

• Project inspections and/or oversight
  Full time inspection & resident engineer required

Project Implementation

• Residential interaction and/or issues
  o Public Meeting before construction
  o Numerous notifications in advance of work

• Political interaction and/or issues
  o Benefits of increased outreach
  o Difficulty obtaining private property agreements (required for private property cleanouts)
Project Results

• Lessons learned
  o No “one size fits all solution” - need a “tool box”
  o Comprehensive rehabilitation best choice
• Results of rehab project
  o Mainline Sewers & Manholes = 5-30% reduction
  o Lateral Connections & mainline = 25% reduction
  o Lateral rehab, lateral connections, & mainline = 15-50% reduction
  o Private inflow & mainline = 15-75% reduction
• Future plans
  SSO Master Plan Update of Prior Reports

Project Costs

• Replacing lateral to property line @ 30 LF each = $6,000 to $7,000 per lateral
• Lateral Connection Seals = $1,600 to $1,800 each
• Lining Lateral to property line @ 35 LF each = $5,000 to $5,200 each
• Lining lateral to house @ 60 LF (with cleanout) = $7,000 to $7,300 each

Project Photos
Project Photos

For More Information
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Questions?
Thanks to our Speakers!

Shawn Peters
WSSC

Jonathan Kunay
CDM

Jason Waterbury
MDC

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