A CASE STUDY FOR THE EFFECTIVENESS OF SEWER REHABILITATION ON REDUCING I/I

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SULLIVANT AVENUE
I/I REMEDIATION PROJECT

- Separate sanitary system constructed in early 1900’s
- One Designed Sewer Relief (DSR)
- Mixed land use
- Deteriorated and vacant homes
- High impervious area
2005 - Wet Weather Management Plan
(includes Sullivant Avenue Priority Area Study)

2007 – Flow Meters Installed

2010 – CIPP Lining Project
(Approx. 7,000 LF of 8”-10” pipe)

2012 – Sullivant I/I Remediation Study
FLOW MONITORING

- **FM0380 (Rehab)**
  - 10” pipe
  - 1.10 cfs capacity
  - 54 tributary acres

- **FM0707 (Control)**
  - 15” pipe
  - 2.89 cfs capacity
  - FM 0380 tributary area plus 35 additional acres
WET WEATHER FLOW

• % Capture = 1% to 5%
• Max I/I Rate = 0.03 cfs/ac
• Sharp peaks and quick recession limbs
• Peak flow events occurred in summer months
• System susceptible to inflow more than infiltration

What was the impact of the rehabilitation on the wet weather flow?
FLOW METER DATA CONSIDERATIONS

• Only quality flow meter data was used.
• Data was NOT considered if:
  • Surcharging occurred
  • DSR activation occurred
  • DWF could not be determined (unreliable patterns due to industrial use)
• I/I volumes calculated by subtracting dry weather flow.
• No data collected during the rehabilitation was used.
TWO METHODS OF REGRESSION ANALYSIS

**Rainfall Method**
Analyze the relationship of I/I to rainfall volume

**Control Method**
Analyze the relationship of I/I to the I/I from a control area, independent of rainfall
REGRESSION ANALYSIS SHOWS INCREASE IN VOLUME

Rainfall Method

FM 0380 (Rehab) vs. Rain Gage

Increase in Volume = 0.2% Capture
REGRESSION ANALYSIS SHOWS INCREASE IN VOLUME

Control Method

Post-Rehab:
FM 0380 (Rehab) is 54% of FM 0707 (Control)

Pre-Rehab:
FM 0380 (Rehab) is 44% of FM 0707 (Control)

Change in Proportion shows Increase of l/l at FM 0380 (Rehab)
REGRESSION ANALYSIS SHOWS INCREASE IN VOLUME

Rainfall Method

Control Method
WHAT’S HAPPENING?

• I/I Sources?
• Sewer System Improvements?
• Private Property Improvements?
• Operation & Maintenance?
• Groundwater?
• Soil type?
Eldean-Urban Land Complex (EmB)

Typical Soil Cross-Section (EmB)
EXFILTRATION IS REAL

OUR STUDY AREA

- Old VCP sewers
- Roots & deposits
- Low velocity
- Large sags
- Low observed infiltration
- Soil w/rapid permeability
- Low groundwater
Evidence from our study area characteristics and field investigations indicates that our mainline sewers are more conducive to exfiltration than infiltration.

As a result, sewer and manhole lining caused an **INCREASE** in wet weather volume of approximately 0.2% capture by preventing exfiltration.
LESSONS LEARNED

• It can be a hard and confusing process with lots of data and many influential factors to consider.

• Must have a sufficient amount of quality data.

• A control area is a good tool to verify results independent of rainfall. More than 1 control area is recommended.

• Soil and groundwater conditions are important considerations.

• Every study area is different.
QUESTIONS?