Mandatory Weeping Tile Disconnection to Reduce the Impact of Basement Flooding

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Outline

- Terminology
- Background:
  - Inflow/Infiltration; Basement flooding
- Case Study: Sherwood Forest Subdivision
  - Causes of Basement Flooding
  - Public and Private Side Solutions
  - Next Steps
Terminology
Inflow and Infiltration (I/I)

What is I/I?

- Storm water and/or ground water entering sanitary sewers

Why is it a problem?

- Higher conveyance costs at pumping stations
- Higher treatment costs at pollution control plants
- Combined sewer overflows, bypasses at plants
- Basement flooding
Where does I/I come from?

- Cracks in pipe
- Combined sewers (catchbasins, cross connections)
- Downspout connections to sanitary
- Weeping tile connections to sanitary
London’s Weeping Tile History

Prior to 1985:
• weeping tile connected to sanitary sewer

1985-1995:
• weeping tile connected to sump pit; sump pump discharge to surface

1995-present:
• weeping tile connected to sump pit; sump pump discharge to storm sewer PDC
Basement Flooding

- Problem within the City of London for many years
- Can be caused by:
  1) Isolated issues leading to localized basement flooding
  2) Systemic issues leading to regional basement flooding
Basement Flooding

**Isolated issues** can include:

- Private Drain Connection (PDC) collapse/blockage
- Weeping tile blockage
- Poor / altered lot grading (sloping towards house)
- Basement wall deterioration (cracks, etc)
- Downspout discharge location (adjacent to building)
Regional issues can include:
- Blocked Sanitary Main
- Surcharged/Overloaded Sanitary Main

Major source of Surcharged Sanitary Main:
- Weeping tile connected to the sanitary sewer, **plus**:
- Lot grading sloped towards house; **and/or,**
- Downspout discharge location (at or near foundation wall).

*Leading to*: sanitary surcharging from excess stormwater (I/I)

*Resulting in*: Basement Flooding
Case Study: Sherwood Forest

- Subdivision developed late 1970s to early 1980s
- Historical basement flooding prone area
- Hit particularly hard May 28, 2009:
  - 83mm of rain in 5 hours
Flooding Areas – May 28/09
Flow Monitors

Blanchard Rd & Cr - 200mm diameter sanitary

Rainfall
I/I Flow in Sanitary Sewer

Flow Rate (L/s)
Rainfall (mm/hr)

Monday  Tuesday  Wednesday  Thursday  Friday  Saturday  Sunday  Monday

Flow Rate May 18-May 24
Flow Rate May 25-May 31
Rainfall May 25-May 31
Flow Monitors
What’s Happening?

• Clay soil – does not absorb water
• Lot grading has settled over the years
• Zero lot line homes →
  • Closely spaced together = high % of roof and hard surface
• Poorly placed downspout discharge location
Downspouts
Aerial Photos
Area Study

- City engaged consultant to:
  - Analyze flow monitoring data
  - Build and calibrate computer model
  - Prepare basement flooding mitigation solutions:
    - Public alternative (City infrastructure)
    - Private alternative (Homeowner property)

- Two surveys administered to all 2,000 residences
  - one survey conducted by City of London
  - one survey conducted by ICLR
Public Side Alternative

City Infrastructure Improvement:

- Pipe upsizing and storage
- Protects basements up to the 25-year design storm event
- Estimated cost: $10 million (100% funded by City)
- Risk of larger storm, or back to back storms:
  - overwhelming storage and conveyance
  - more basement flooding

This option only accommodates the I/I
Pipe Upsizing and Storage

2,300m of Pipe Upsizing

1400m$^3$ of Inline Storage
Private Side Alternative

Private Homeowner Improvements:
• Disconnect weeping tile from private sanitary lateral to remove I/I
• Modeling analysis indicates 160 homes required to disconnect
• Protects basements beyond 25-year design storm event
• Estimated cost: $2 million (100% funded by City)
  • Includes: weeping tile disconnection, sump pump, backwater valve, dedicated storm PDC for sump pump discharge, and road resurfacing

This option removes the I/I at the source
Private Side Alternative

Current State (25-year Storm):

70% Home Disconnection (25-year Storm):
Private Side Alternative: Advantages

Disconnecting the weeping tile from sanitary:

• Removes I/I at the source
• Saves treatment costs
• Reduces risk of overwhelming system with ‘next big storm’
• Significantly more cost effective:
  → only 20% of public side alternative
How?

Voluntary (Current Practice):
• 75% Grant Program for Basement Flooding Protection (includes sump pump, backwater valve, weeping tile disconnection, storm PDC)
• Very low uptake; ‘dry basement’ homeowners have no interest, even though they are contributing.

Mandatory (Proposed):
• 100% funded by City
• Focus on problem areas only
Obstacles

Public Perception:
• City approved original subdivision therefore City responsible to fix
• City sewer pipes are too small
• Nearby development is causing our flooding

Homeowner reluctance to retrofit sump pump:
• Noise, nuisance
• Electricity and maintenance costs
Next Steps

- Currently preparing Council report which recommends:
  - Focused, mandatory weeping tile disconnections
  - All sump pumps to discharge directly to storm PDCs to prevent icing problems experienced in other areas

- Council acceptance will be key factor
Thank You

Thanks for flushing our business down the drain!