


EITP-12-003 Basement Flooding




EITP-12-003 Report

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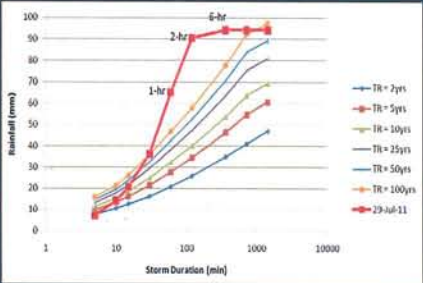
Overview of Report

1. July 29, 2011 Rain Event & Outcomes
2. Underlying Causes
3. Background on Sewers & Servicing
4. Mechanisms of Basement Flooding
5. Building Code & Practice
6. Addressing Extraneous Flows
7. How to Protect a Home from Flooding
8. Challenges
9. Recommendations




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July 29th, 2011 Event & Outcomes



Event Overview


- Very intense, short duration event.
- 94.3mm total.
- Very low probability of occurrence.
- 1-, 2- and 6-hr amounts exceeded '100-yr' event.
- Climate change uncertainty




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Outcomes

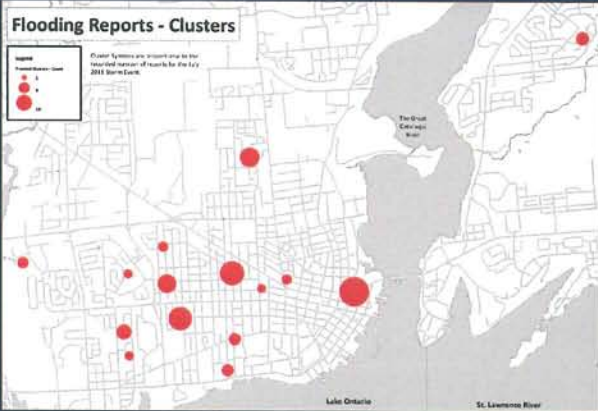
- Surface flooding
- Inundation & surcharge of utilities and services
- Combined Sewer Overflows (CSO)
- Facility overload
- Basement flooding





ETIP-12-004 Report
1 2 3 4 5 6 7 8 9


Flooding Reports - Clusters



Cluster Systems are important due to the increased number of reports for the 2011 Storm Event.

- 323 reports of basement flooding (Nov 16, 2011 figure)
- Outreach to insurance industry


Lake Ontario
St. Lawrence River




ETIP-12-004 Report
1 2 3 4 5 6 7 8 9

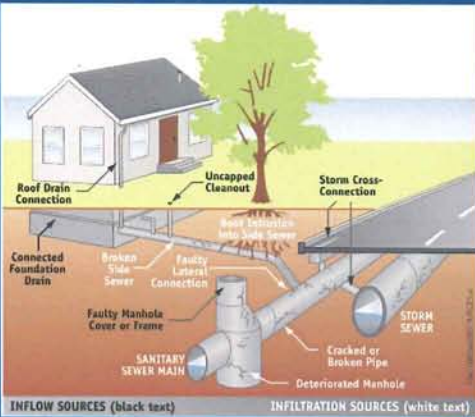
Underlying Causes

- **Extraneous Flows:**
 - Storm or groundwater entering the sanitary sewer system





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1 2 3 4 5 6 7 8 9




Sources:

- Leaks in manholes, pipes and laterals
- Cross-connections between storm/sanitary
- Illegal connections on the Private-Side

INFLOW SOURCES (black text) INFILTRATION SOURCES (white text)

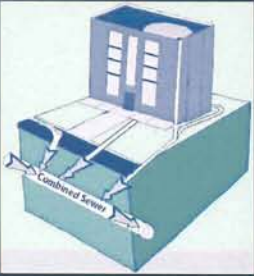
Source: King County, WA



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1 2 3 4 5 6 7 8 9

Background on Servicing

Overall Servicing Types – ‘Combined’

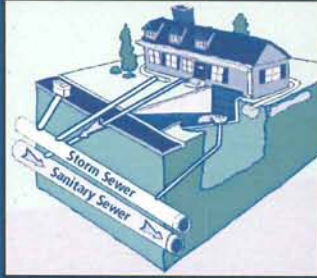


- Single pipe collecting both storm and sanitary flows
- Not built anymore
- Risk level: Highest, except risk is highly reduced by presence of built-in overflows.

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Overall Servicing Types – ‘Fully-Separated’



- Two pipes – sanitary sewer and storm sewer.
- Sanitary sewer conveys only sanitary sewage.
- Risk level: Lowest, due to highly reduced wet-weather response in sanitary sewer.

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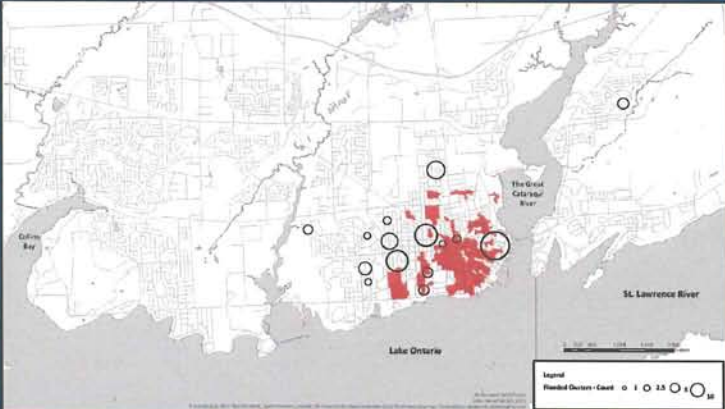
Overall Servicing Types – ‘Partially-Separated’



- Two pipes – sanitary sewer and storm sewer.
- Private-side storm & groundwater sources connected to sanitary sewer.
- Risk level: Moderate, due to unknown quantity of extraneous flows.

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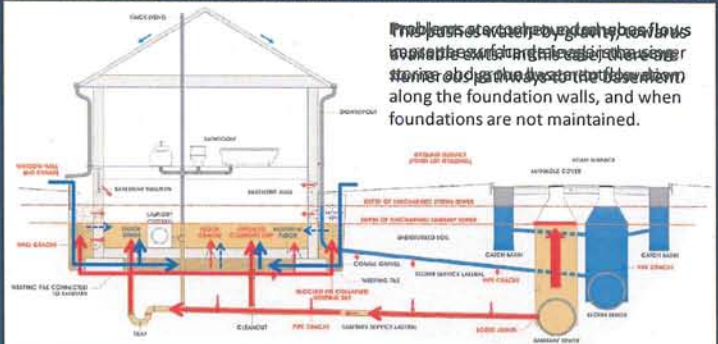


Legend
Flooded Districts - Count: 0 0.25 0.5 1 2+

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Basement Flooding Mechanisms



Problems are caused by high water tables in the wet weather season, when the water table rises above the basement floor level, and when foundations are not maintained.

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Building Code & Practice

Building Ages vs Flooding Clusters
July 29th 2011 Storm Event

Legend
Flooded Clusters - Count

- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-30
- 31-35
- 36-40
- 41-45
- 46-50

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Addressing Extraneous Flows

What are we doing?

- Flow Monitoring
- Sanitary Sewer Rehabilitation
- Sewer Cleaning & CCTV
- Combined Sewer Replacement
- Flood Report Tracking

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What else can we do?


- Coordinate City/UK policies
- Engage Private-Side Issues
 - Enforcement of By-Law 2008-192
 - Financial Assistance
- Review design standards and how sewer separation is done.
- Consider sewer laterals

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Home Flooding Protection

Backflow can occur if a pipe is not properly installed or if a pipe is not properly sealed.




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1 2 3 4 5 6 7 8 9

Challenges

Approach


Source Control	Conveyance Control	End-of-Pipe Control
<ul style="list-style-type: none"> Address extraneous flow problem at the source Private & public sources to address 	<ul style="list-style-type: none"> Acceptance of problem Accommodate increase flow conveyance in public sewer system. Requires replacement of existing pipes with over-sized infrastructure 	<ul style="list-style-type: none"> Acceptance of problem. Accommodate increased flows with treatment and/or storage at end-of-pipe. Requires major modifications to wastewater treatment plants



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1 2 3 4 5 6 7 8 9

Uptake & Buy-in


- Perception of need
- Finances
- Disturbance



Source: Tripster.com

Cause & Effect

- Extraneous flow → storm & groundwater






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1 2 3 4 5 6 7 8 9

Recommendations

1) Private-Side Extraneous Flow Reduction Programs

- i. Preventative Plumbing Program
(financial assistance to help affected homeowners undertake projects to reduce future flood risk)
- ii. Downspout Disconnection Program
(program to enforce By-Law 2008-192, mandatory compliance)
- iii. Sump Pump Disconnection Program
(program to enforce By-Law 2008-192, mandatory compliance)










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1 2 3 4 5 6 7 8 9

2) Public-Side Extraneous Flow Reduction Programs (modify & improve existing programs)

- i. Direct-Inflow Elimination Program
(extraneous flow reduction program focused on elimination of rapid inflow sources)
- ii. General Extraneous Flow Reduction Program
(refocusing of existing program utilizing flow monitoring as primary tool)
- iii. Future consideration for addressing leaky private- and public side laterals.











3) Considerations during Construction

- i. Early communication with property owners regarding elimination of extraneous flow sources.
- ii. By-Law 2008-192 enforcement
- iii. Consideration for mandating use of backflow prevention devices.





Princess St, 2010






- 4) Development of a comprehensive Public Education & Outreach Program
- 5) General use of By-Law enforcement 2008-192 (to maximize the effectiveness of private-side extraneous flow reduction programs)
- 6) Co-ordination of City & Utilities Kingston policies and practice for reduction of flooding (to reduce sewage backups AND storm- & groundwater issues)





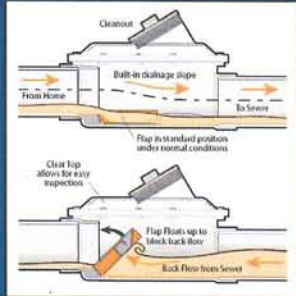
Discussion & Questions

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Backflow Prevention

- Backflow prevention can add increased protection against flooding, but they cannot guarantee it.
- Issues:
 - Connectivity of foundation drainage
 - Proper installation
 - Maintenance and water-use during events



Source: Mainline Backflow Products (website)

