Recovering from the Flood

Halton’s Basement Flooding Mitigation Program

November 25, 2016
Presentation Outline

• Background on Halton Region
• August 2014 Flood
• Halton’s Response and Actions
• Direction from Regional Council
  ▪ Find causes
  ▪ Phased approach
• Basement Flooding Mitigation Program
  ▪ 10 year program
  ▪ Public and Private side
• Lessons Learned
Regional Municipality of Halton

Comprised of Four Area Municipalities

- The City of Burlington
- Town of Halton Hills (Georgetown & Acton)
- Town of Oakville
- Town of Milton

2016 Population – 530,000
2031 Projected Population – 780,000
Halton’s Sanitary Assets

- 7 WWTP’s
- 85+ Pumping Stations
- 1900 km’s of sanitary sewers
- 150 – 2400 mm sewers
- Over 35,000 manholes
- Separate Sewer System
Halton’s Inflow and Infiltration Reduction History

- **1980’s** – Region experienced basement flooding, collection system overflows and WWTP bypasses
- **1990’s** - I/I Team created; driver => basement flooding reduction focusing on public side
- **2006** – Driver shifting to increase operational efficiency of the plants and reduce operating costs
- **2007/2008** – Another set of storm events caused basement flooding, resulting in:
  - Basement Flooding Prevention Subsidy program (2008)
  - 50% Subsidy: Backwater Valve, downspout disconnection and weeping tile disconnection (max. $2725)
  - Interest and uptake tapered off – “out of sight out of mind:
- **2014** – Massive flooding City of Burlington
- “**Perfect Storm**” of events to drive significant changes
  - Repeat Basement Flooding / New Commissioner of PW / Municipal Elections
  - Spot light on basement flooding issue and Launched the Basement Flooding Mitigation Program at Halton
August 4, 2014
Storm Event
The Heart of the Matter
August 4, 2014

- ~200 mm
- 8 hours
- 60% in 2 hours
- Twice unlucky!
The Aftermath!
# August 4, 2014 vs. Historical Extremes

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Duration (hours)</th>
<th>Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region of Halton *</td>
<td>August 4, 2014</td>
<td>8</td>
<td>200</td>
</tr>
<tr>
<td>Hurricane Hazel</td>
<td>1954</td>
<td>48</td>
<td>280</td>
</tr>
<tr>
<td>Harrow</td>
<td>1989</td>
<td>27</td>
<td>450</td>
</tr>
<tr>
<td>Northwestern Ontario</td>
<td>2002</td>
<td>48</td>
<td>400</td>
</tr>
<tr>
<td>May-14</td>
<td>13-May-14</td>
<td>5</td>
<td>23</td>
</tr>
</tbody>
</table>

![Extreme Rainfall Events Total Volume](chart.png)
## August 4, 2014 vs Historical Intensity

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Duration (hours)</th>
<th>Rainfall(mm)</th>
<th>Intensity (mm/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region of Halton *</td>
<td>August 4, 2014</td>
<td>8</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Hurricane Hazel</td>
<td>1954</td>
<td>48</td>
<td>280</td>
<td>6</td>
</tr>
<tr>
<td>Harrow</td>
<td>1989</td>
<td>27</td>
<td>450</td>
<td>17</td>
</tr>
<tr>
<td>Northwestern Ontario</td>
<td>2002</td>
<td>48</td>
<td>400</td>
<td>8</td>
</tr>
<tr>
<td>May-14</td>
<td>13-May-14</td>
<td>5</td>
<td>23</td>
<td>5</td>
</tr>
</tbody>
</table>

### Extreme Rainfall Event Intensities

![Extreme Rainfall Event Intensities Graph](image-url)
### Extreme Rainfall Event Intensities

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Duration (hours)</th>
<th>Rainfall(mm)</th>
<th>Intensity (mm/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region of Halton *</td>
<td>August 4, 2014</td>
<td>8</td>
<td>200</td>
<td>25</td>
</tr>
<tr>
<td>Hurricane Hazel</td>
<td>1954</td>
<td>48</td>
<td>280</td>
<td>6</td>
</tr>
<tr>
<td>Harrow</td>
<td>1989</td>
<td>27</td>
<td>450</td>
<td>17</td>
</tr>
<tr>
<td>Northwestern Ontario</td>
<td>2002</td>
<td>48</td>
<td>400</td>
<td>8</td>
</tr>
<tr>
<td>May-14</td>
<td>13-May-14</td>
<td>5</td>
<td>23</td>
<td>5</td>
</tr>
</tbody>
</table>

Intensity in the 3 worst hours was closer to 50mm/hr to 60mm/hr.
All Hands on Deck

- Attended to all those who reported flooding
- Over 6000 phones calls into Region reporting flooding
- Over 3500 logged calls relating to their own homes being flooded
- Approximately 2200 Ex-gratia grants given out (over $2M in total)
- Over 3000 houses visited by Halton Staff or representative of Halton
- Assisted over 100 homeowners who have had repeat flooding and at higher risk
- Completed basement flooding mitigation work for homeowners outside and inside of the homes
- Streamlined Subsidy Program Processing
- Enhanced and increase frequency of waste pickup
- Increase education for basement flooding
Direction from Regional Council

• Identify causes and remedies
• RFP - Retained GM BluePlan Engineering Ltd.
  ▪ Clean Slate approach to diagnosing causes and contributors to basement flooding
  ▪ Not a validation or summary review of past studies, rather an in depth evidence based review with up to date information
  ▪ Comprehensive review of Halton’s existing wastewater collection system
  ▪ Assess private side contributory factors
  ▪ Review of existing Policies and By-Laws
Two Phase Approach

- “No stone unturned” approach
- Identified 7 priority areas in the City of Burlington most impacted by historical flooding and one in Milton
- Phase 1 - assess priority areas
  - Implement any actions necessary as expeditiously as possible.
- Phase 2 - extend review region wide
  - Similar approach to reduce the risk of future basement flooding region wide.
Phase 1: High Priority Areas
Findings

Existing sanitary sewer system

- Generally in good condition
- No pipe defects significant enough to have caused basement flooding.
- Opportunities to enhance and optimize wastewater collection system to “better than industry standards”.
- Can conclude that sewer surcharging is caused by too much extraneous storm water getting into the wastewater collection system, mainly from inflow and infiltration

Eliminate sources of inflow and infiltration

- I&I from rain and groundwater reduces available capacity of sewers and can contribute to basement flooding.
- Public – leaking sewers, manholes
- Private – downspouts, weeping tiles, sump pumps connected to the sanitary sewer
## Phase 1 – Sewer Optimization Projects

**Phase 1 Wastewater System Enhancement Projects - Region Wide Basement Flooding Mitigation Study**

<table>
<thead>
<tr>
<th>Project</th>
<th>Diameter</th>
<th>Length (l) (m)</th>
<th>Estimated Cost</th>
<th>10% Engineering</th>
<th>20% Contingencies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conveyance Capacity Projects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Full Length Open Cut Projects</td>
<td>200 - 600</td>
<td>2214</td>
<td>$1,612,980</td>
<td>$161,298</td>
<td>$322,596</td>
<td>$2,096,874</td>
</tr>
<tr>
<td><strong>Inflow and Infiltration Projects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Full Length Trenchless Lining Projects</td>
<td>200-300</td>
<td>1917</td>
<td>$380,000</td>
<td>$38,000</td>
<td>$76,000</td>
<td>$494,000</td>
</tr>
<tr>
<td>100 Trenchless Spot Repair Projects</td>
<td>200-675</td>
<td>6995</td>
<td>$456,000</td>
<td>$45,600</td>
<td>$91,200</td>
<td>$592,800</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td></td>
<td></td>
<td>$836,000</td>
<td>$83,600</td>
<td>$167,200</td>
<td>$1,086,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>$2,448,980</td>
<td>$244,898</td>
<td>$489,796</td>
<td>$3,183,674</td>
</tr>
</tbody>
</table>

**Halton Region**

Halton.ca  | 311
Phase 2: Region Wide Study Recommendations

- Sewer System Optimization Capital Program
- Enhanced Basement Flooding Prevention Subsidies
  - Increase most subsidies to 100% reimbursement (up to maximum)
  - Targeted Downspout Disconnection
  - Authorized Contractors for weeping tile disconnection
  - New lateral lining / repair subsidy
- Permanent Flow Monitoring
- Inter-Jurisdictional Working Group
- Education and Outreach
Sewer System Optimization

Undertake $6 million in system improvement projects on a priority basis annually over a period of 10 years.

- The remediation works represent a multi-year program that will be prioritized based on reasonable criteria including:
  - severity of the issue being addressed
  - coordination with other Regional and Local construction projects
  - historical record of previous basement flooding occurrences;
  - actual benefit to be realized.

- Projects validated every year based on new information
Enhanced Basement Flooding Prevention Subsidy Program

Enhanced Basement Flooding Prevention Subsidies - 50 percent Programs

- **Backwater Valve** (up to $675 per house)
  - Building code approved
  - Must show that weeping tiles are disconnected

- **NEW Lateral Lining / Repair** (up to $2000 per house)
  - Sub-standard laterals
  - Require pre and post videos
Enhanced Basement Flooding Prevention Subsidy Program

Enhanced Basement Flooding Prevention Subsidies – 100 percent Programs

- **Downspout Disconnection** (up to $500 per house)
  - Available Region Wide (Homeowner to complete and submit application)
  - Targeted areas (Region to coordinate and disconnect through consultant/contractor)
    - 2016/2017: Oakville
    - 2018/2019: Burlington, Oakville

- **Weeping Tile Disconnection** (up to $5000 per house)
  - Costs will be paid upfront by homeowner and reimbursed for eligible works
  - Submit Subsidy Application along with waiver and all documentation
  - Homeowners must use contractor on Pre-Qualification List
Basement Flooding Mitigation Program

Authorized List of Weeping Tile Contractors

- Halton will screen contractors to generate “Authorized Contractors List” for weeping tile disconnection
- Criteria used for evaluation
  - Years of experience in weeping tile disconnection by the company
  - Years of experience by the key staff
  - Licenses of staff
  - History of exceptional Customer Service
  - Warranty of parts and labour
  - Bonding and insurance
- Process to suspend and remove contractor from list
- Customer Service Survey
Flow Monitoring

- Existing Stations
  - Flow Monitors
  - Rain Gauges
  - Level Sensors

- New Flow Monitors for Basement Flooding Mitigation Work
  - Targeted Downspout Disconnection area
  - Region Wide

- New Flow Monitors to calibrate model
Basement Flooding Mitigation Program

Inter-Jurisdictional Basement Flooding Working Group

- Halton Region responsible for wastewater collection system
- Local Municipalities and Conservation Authorities responsible for stormwater system
- Value for inter-jurisdictional working group to coordinate, share information and ideas on any initiatives intended to mitigate risk of future basement flooding
- Partnership with Town of Oakville for their Master Plan review
- Rain gauge network enhancement and optimization (CH lead)
Basement Flooding Mitigation Program

Develop an Extraneous Flow Reduction Public Education Program

- Communicate benefits of reducing private side stormwater contributions
- Non-technical, clear and consistent messaging
- Maximize voluntary program
- Develop “shared responsibility” message
- Builds on work already initiated with Region Wide project
Lessons Learned

• Basement Flooding cannot be 100% avoided
• Difficult to differentiate between clean water and sewer water
• Sanitary Sewers are designed to allow some rainwater in but not direct connections
• Sanitary sewer systems have been designed properly and convey wastewater as intended
• Most effective way to mitigate Basement Flooding from sanitary sewer backup is to avoid overloading the sewer system
• Direct Connections represent the greatest volume of instantaneous water entering the sewer system
• Backwater valves installed without fully disconnecting direct connections are NOT the solution
• Controlling at the source is the most economical and effective
• Incentivizing encourages but does not see wholesale changes
• Education is key
John Duong, M.Eng., P.Eng.
Manager of Systems Planning and Customer Service
Public Works
Regional Municipality of Halton
john.duong@halton.ca
905-825-6000 ext 7961