Recovering from the Flood

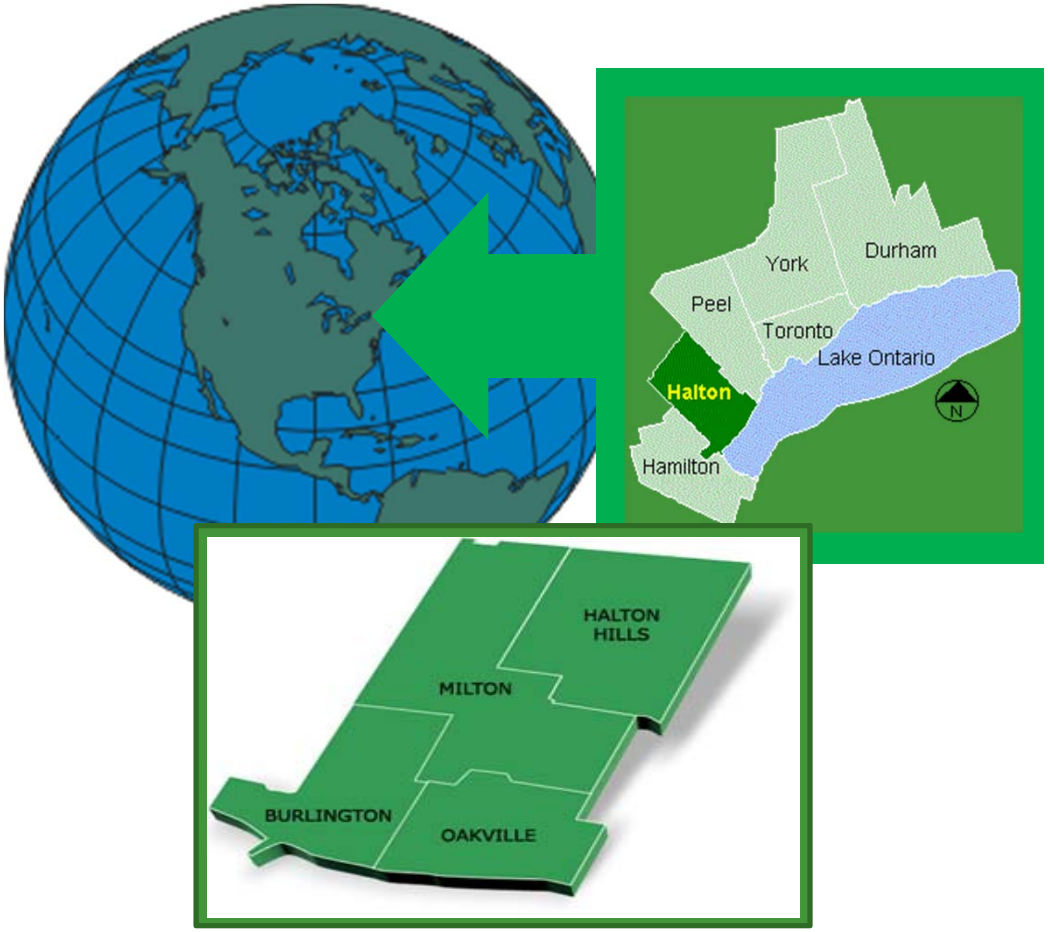
Halton's Basement Flooding Mitigation Program

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

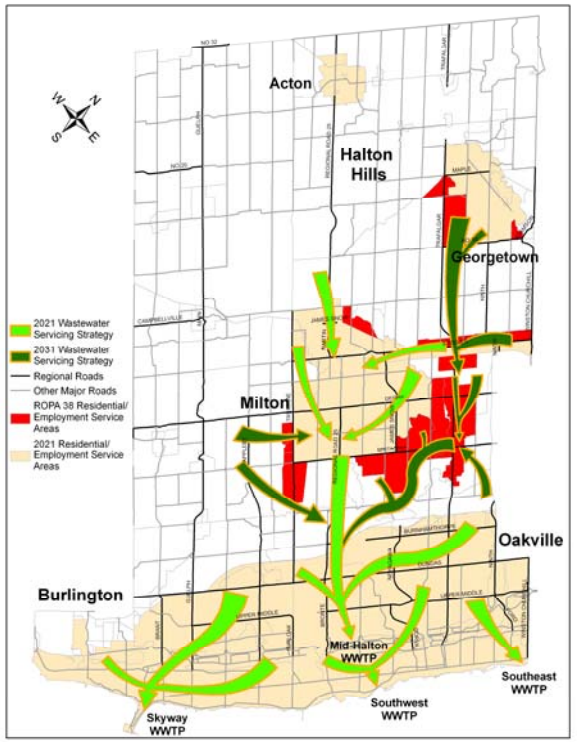
- The City of Burlington
- Town of Halton Hills (Georgetown & Acton)
- Town of Oakville
- Town of Milton

2016 Population – 530,000

2031 Projected Population – 780,000

Halton REGION

Halton's Sanitary Assets

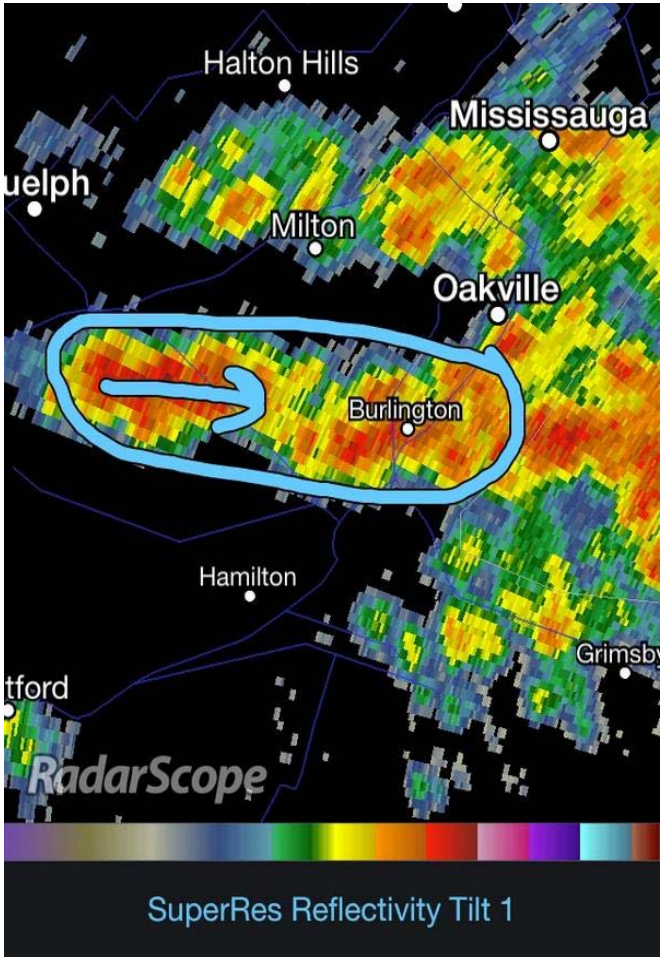


- 7 WWTP's
- 85+ Pumping Stations
- 1900 km's of sanitary sewers
- 150 – 2400 mm sewers
- Over 35,000 manholes
- Separate Sewer System

Halton's Inflow and Infiltration Reduction History

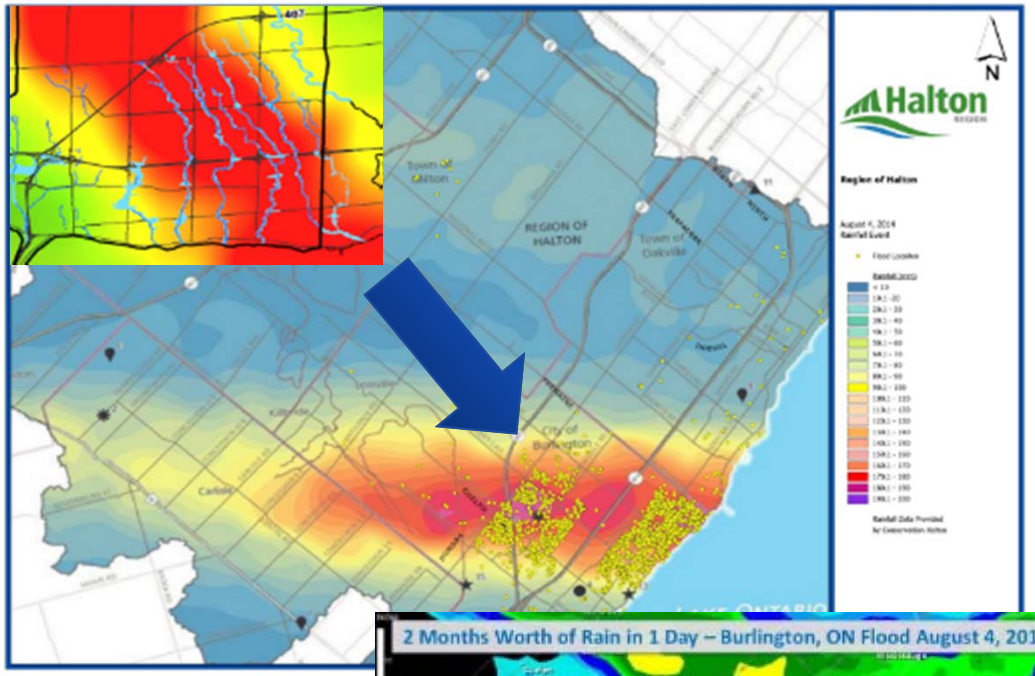
- **1980's** – Region experienced basement flooding, collection system overflows and WWTP bypasses
- **1990's** - I/I Team created; driver => basement flooding reduction focusing on public side
- **2006** – Driver shifting to increase operational efficiency of the plants and reduce operating costs
- **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 !

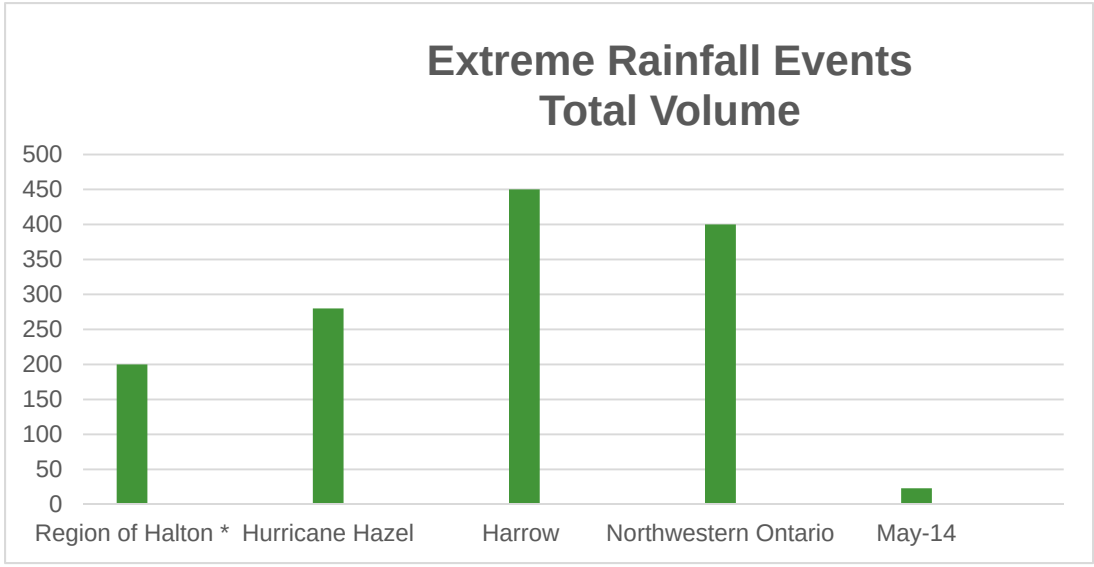


The Aftermath !

Halton REGION

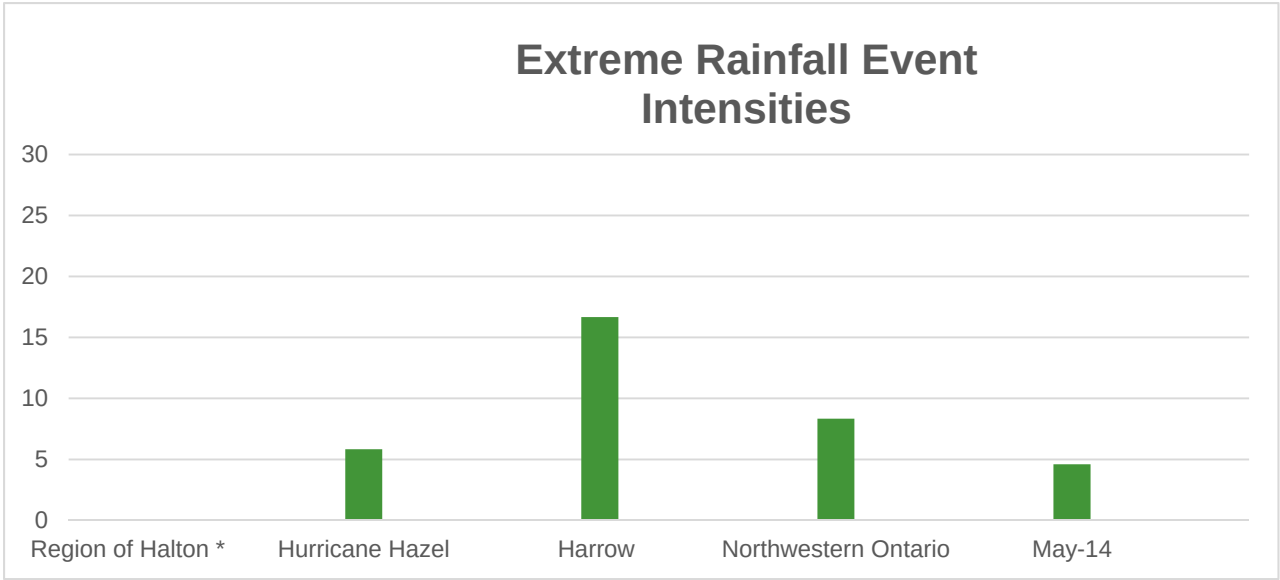
August 4, 2014 vs. Historical Extremes

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



August 4, 2014 vs Historical Intensity

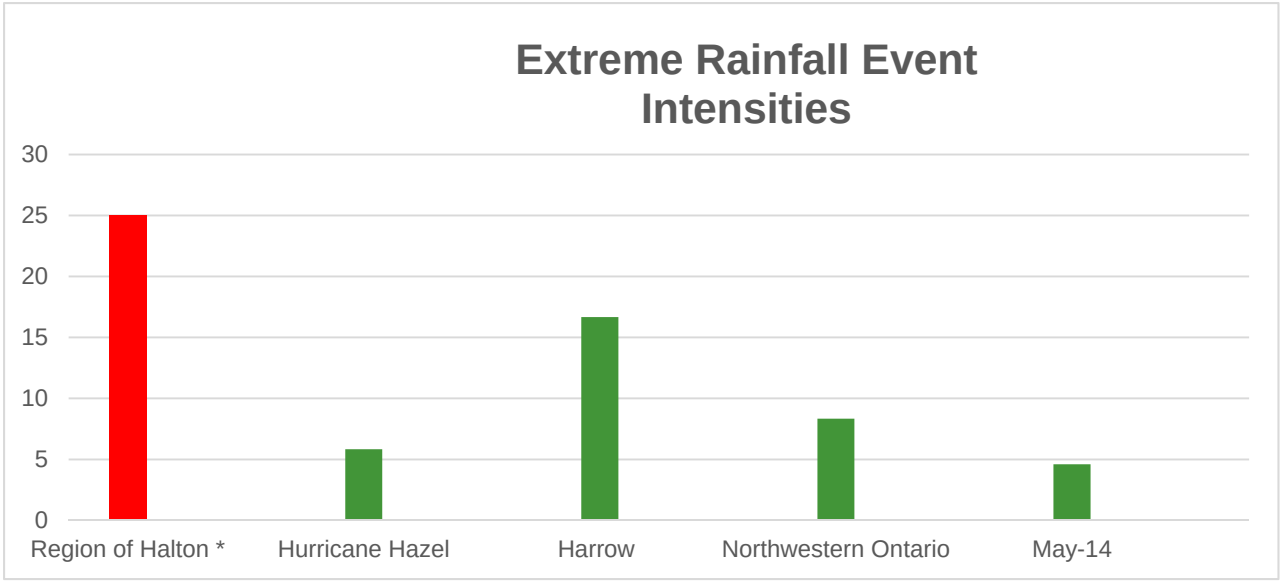
Event	Date	Duration (hours)	Rainfall(mm)	Event Intensity (mm/hr)
Region of Halton *	August 4, 2014	8	200	
Hurricane Hazel	1954	48	280	6
Harrow	1989	27	450	17
Northwestern Ontario	2002	48	400	8
May-14	13-May-14	5	23	5



August 4, 2014 vs Historical Intensity

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

Intensity in the 3 worst hours was closer to 50mm/hr to 60mm/hr



All Hands on Deck

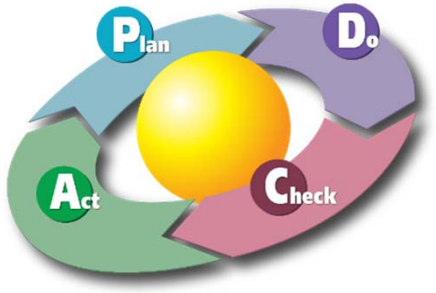
- Attended to all those who reported flooding
- Over 6000 phones calls into Region reporting flooding
- Over 3500 logged calls relating to their own homes being flooded
- Approximately 2200 Ex-gratia grants given out (over $2M in total)
- Over 3000 houses visited by Halton Staff or representative of 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

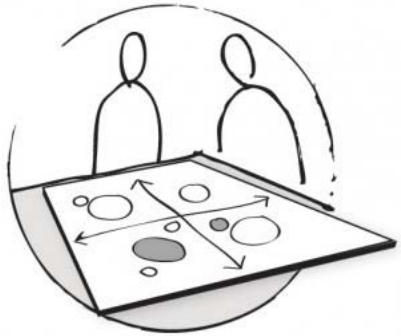
Direction from Regional Council

- 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

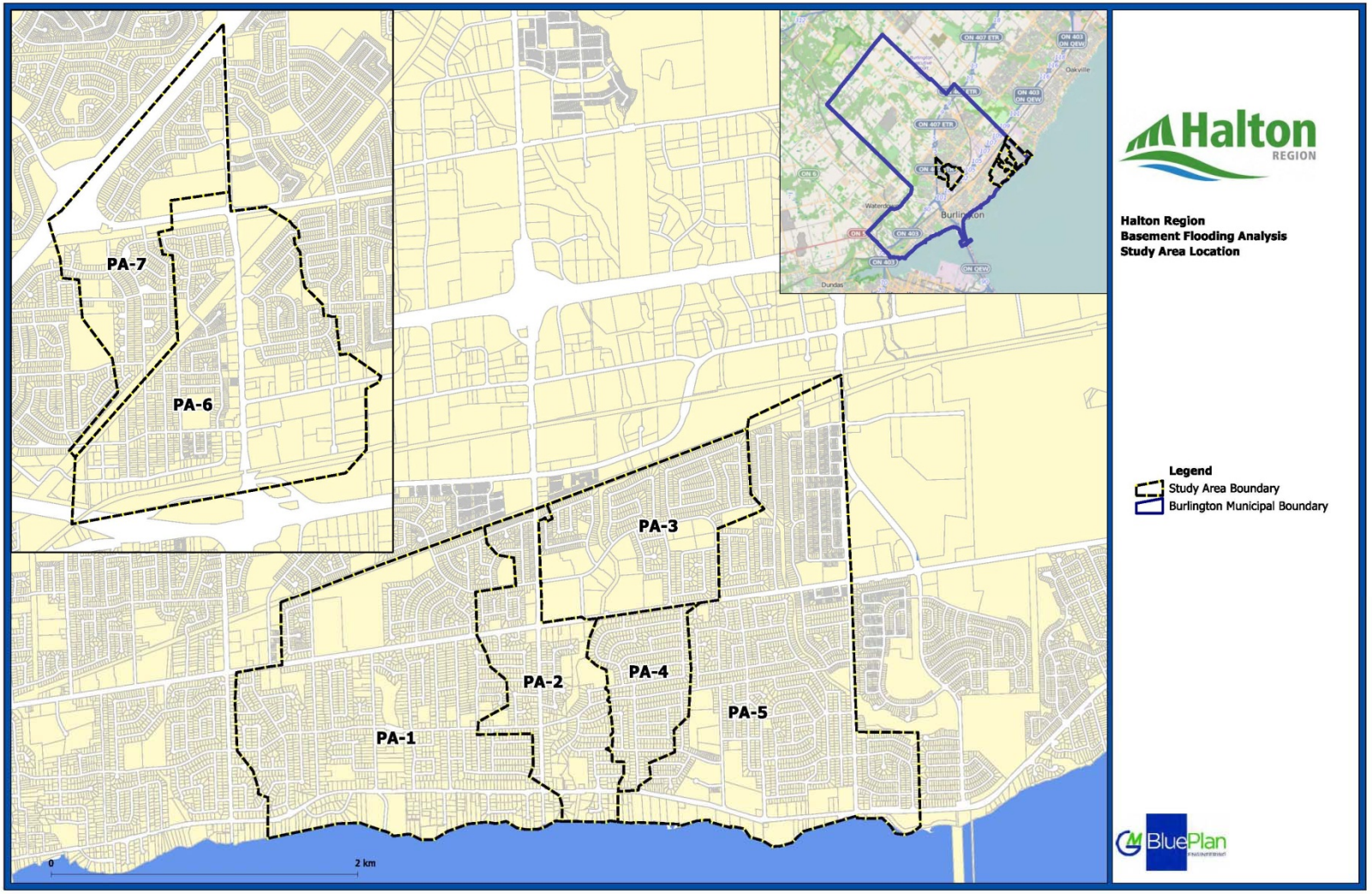
Two Phase Approach

- "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

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

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

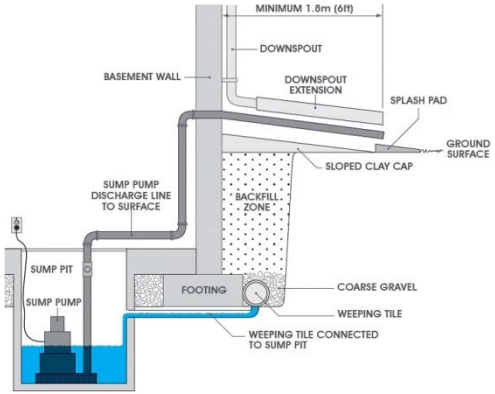
- NEW Lateral Lining / Repair (up to $2000 per house)
  - Sub-standard laterals
  - Require pre and post videos

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
    - 2017/2018: Milton, Acton, Georgetown, Burlington
    - 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



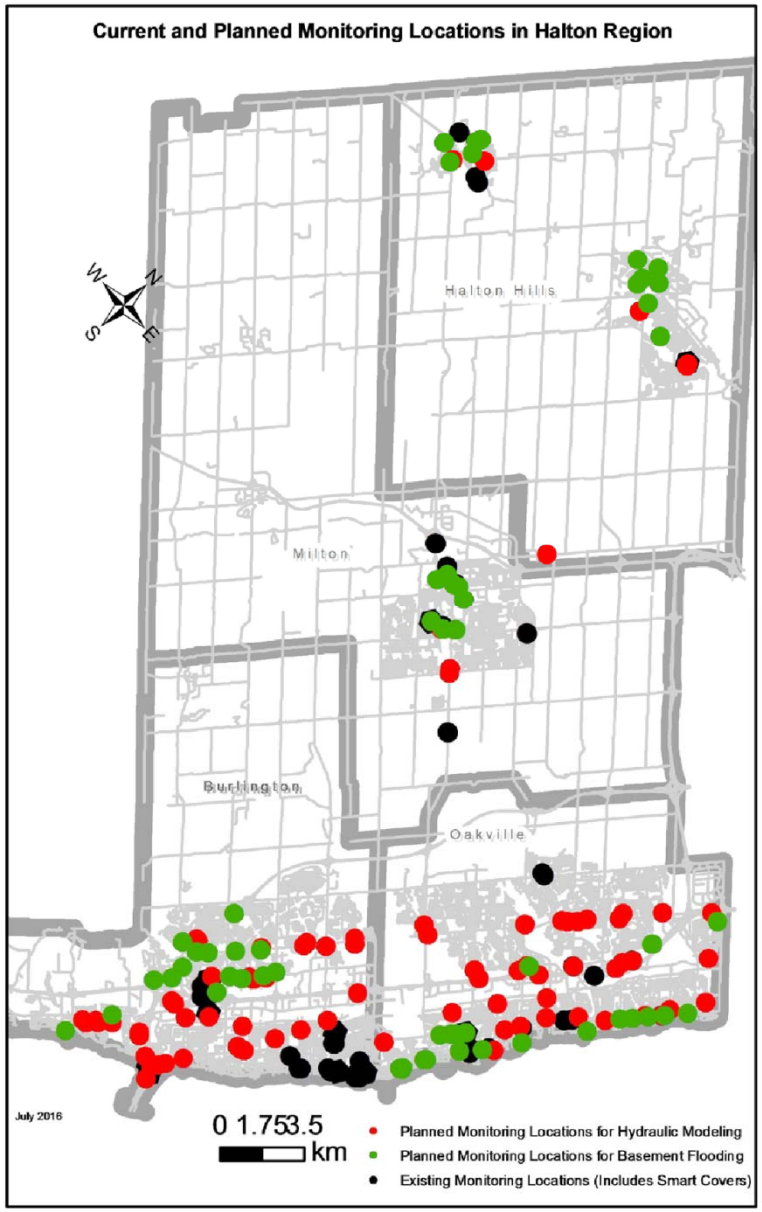
Basement Flooding Mitigation Program

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

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