VIA EMAIL

Monday, July 14, 2025

Corporate Services Department
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Meaghen Reid, Director, Legislative & Legal Services/Town Clerk, Town of Milton
William Short, Town Clerk, Town of Oakville

Please be advised that at its meeting held on Wednesday, July 9, 2025, the Council of The Regional Municipality of Halton adopted the following resolution:

RESOLUTION: PW- 21-25 – July 2024 Flood Response Action Update and Recommended Enhancements to the Region-Wide Basement Flooding Mitigation Program

1. THAT Regional Council approve the recommended changes to the Basement Flooding Prevention Subsidy Program as outlined in Report No. PW-21-25 re: "July 2024 Flood Response Action Update and Recommended Enhancements to the Region-Wide Basement Flooding Mitigation Program", with the exception of the subsidy increases as identified in Attachment #5 to the report.

2. THAT staff be directed to report back in September 2025 on potential enhancements to the subsidy program as discussed by Council at the meeting of July 9, 2025.

3. THAT the Regional Clerk forward a copy of Report No. PW-21-25 to the City of Burlington, the Town of Halton Hills, the Town of Milton, the Town of Oakville, Conservation Halton, Credit Valley Conservation and the Grand River Conservation Authority for information.

Please find attached a copy of the above-noted report for your information. Please note that the resolution adopted by Council differs from the staff recommendation in the report. If you have any questions, please contact me at the email address below.

Sincerely,

Graham Milne
Regional Clerk
Graham.Milne@halton.ca

The Regional Municipality of Halton

Report To:	Regional Chair and Members of Regional Council
From:	Lee Anne Jones, Commissioner, Public Works
Date:	July 9, 2025
Report No.:	PW-21-25
Re:	July 2024 Flood Response Action Update and Recommended Enhancements to the Region-Wide Basement Flooding Mitigation Program

Recommendation

1. THAT Regional Council approve the recommended changes to the Basement Flooding Prevention Subsidy Program as outlined in Report No. PW-21-25 re: "July 2024 Flood Response Action Update and Recommended Enhancements to the Region-Wide Basement Flooding Mitigation Program".

2. THAT the Regional Clerk forward a copy of Report No. PW-21-25 to the City of Burlington, the Town of Halton Hills, the Town of Milton, the Town of Oakville, Conservation Halton, Credit Valley Conservation and the Grand River Conservation Authority for information.

Report

Executive Summary

- Like many municipalities across Ontario and Canada, Halton Region is experiencing more frequent, intense, and localized storms that are increasingly difficult to predict. These severe weather events can overwhelm public stormwater and wastewater systems, as well as private drainage infrastructure, leading to widespread impacts on residents and communities.
- This report outlines actions taken since the July 2024 flooding event to enhance Halton Region's wastewater system resiliency and emergency response processes.
- The Region-Wide Basement Flooding Mitigation Program focuses on building long-term resiliency in the wastewater system to handle more frequent and intense storms by reducing excessive inflow and infiltration to the wastewater system from both public and private sources.

- This report presents key findings from an in-depth analysis of the wastewater system, to inform several recommendations to strengthen Halton Region's Basement Flooding Mitigation Program ("The Program").
- The primary recommendations focus on reducing basement flooding through private side disconnections, which have been identified as a leading cause.
- Key recommendations include:
    - Expanding the flow monitoring program.
    - Enhancing subsidy eligibility.
    - Raising public awareness about stormwater connections to the wastewater system and their impacts.
    - Implementing a household drainage survey program.
    - Strengthening inter-agency coordination to align public infrastructure improvements with private-side Inflow and Infiltration reduction measures will also be important, particularly in high flood-risk areas.
- On-going, dedicated staff resources are required to ensure successful delivery of the Basement Flooding Mitigation Program (the "Program").
- Pending Council approval, the Region will implement the Program changes identified in this report, including $300,000 in retroactive payments dating back to July 15, 2024, and will update Council on the status of these initiatives as required.

Background

Like many communities across Ontario and Canada, Halton Region is experiencing more frequent and intense storms due to climate change. These extreme storms put increased pressure on public stormwater and wastewater systems as well as private drainage infrastructure, pushing the infrastructure far beyond what it was originally designed to handle and overwhelming even well-maintained systems.

Council has been updated about the severe storm events of July 2024 in two reports over the past year:

- PW-25-24: July 15 and 16, 2024 Flood Response Update
- PW-10-25/CS-13-25: Ex-Gratia Grant Program Enhancements and Status Update on Flooding Initiatives Outlined in Report No. PW-25-24

This report continues the updates to Council and recommends ways to strengthen Halton Region's approach to mitigating the impacts of basement flooding. It covers three main areas:

A. **Emergency Response and Recovery After Action Review and Recommendations:** After the July 2024 storm, the Region conducted a review to identify what worked well and what could be improved in the Region's emergency response. The report outlines actions already taken, those underway, and planned improvements.

B. **In-Depth Wastewater System Analysis, Key Findings and Recommendations:** A detailed analysis of the stormwater and wastewater system performance was completed to better understand the causes of the July 2024 flooding. The findings will help guide future improvements to reduce flood risk and build resilience.

C. **Basement Flooding Mitigation Program ("The Program") Review and Recommendations for Enhancements:** This report recommends enhancements to further reduce inflow and infiltration contributions to the wastewater system to mitigate basement flooding risk and its impacts. These enhancements include both financial support to residents, improvements to both public and private infrastructure, and increased public outreach.

The report emphasizes that while basement flooding risk cannot be fully eliminated, a coordinated and sustained effort across all levels of government, the Region, the Local Municipalities, the Conservation Authorities and residents, can significantly reduce that risk.

Discussion

A. *Emergency Response and Recovery – After-Action Review and Recommendations*

As described in Report No. PW-25-24, the response to the July 2024 flooding included managing reports of flooding through Access Halton/311, operations staff response in the field, inter-agency coordination, and communications to residents. Following the initial response, flood recovery supports included administering grants, enhancing curbside waste collection, coordinating with the Canadian Red Cross, and advancing an educational campaign focused on flood mitigation.

Following the conclusion of the July 2024 flood response and recovery activities, the Region initiated a post-incident after-action review. This structured review evaluated what happened, why it happened, and identified opportunities to improve future emergency response and recovery efforts. The review involved collecting input from all involved

Regional program areas, analyzing the effectiveness of the response, identifying strengths and weaknesses, and documenting lessons learned.

The review assessed response roles and responsibilities, inter-agency coordination, communication protocols, call centre operations, and resident support services. It also evaluated data sharing practices, public messaging, and emergency response tools, with the goal of identifying gaps and opportunities for improvement.

The following is a summary of key actions being taken in these areas:

- **Online Grant Access –** A new online portal was launched May 31, 2025, for residents to report a flood and apply for a grant, providing faster financial support. For residents who prefer not to use online tools, alternative access channels remain available to ensure inclusive service delivery.
- **Flood Response Planning** – A Regional Flood Emergency Response Plan has been developed to clarify roles and improve communication. It was tested in a joint exercise on June 19, 2025, with Conservation Halton and the Local Municipalities. The exercise showed improvements in coordination between call centres and communication between Regional and Municipal responders. The new online flood reporting tool made it easier for residents to report issues and increased Access Halton's capacity to respond. Preparedness efforts such as early notifications to Access Halton and Public Works and joint coordination meetings enhanced situational awareness and flood readiness. Future efforts will focus on refining flood notification distribution and coordination meeting attendance to ensure an even more effective response.
- **Data Sharing** – Work is underway to improve access to critical information during emergencies, streamline data integration and establish standard agreements to facilitate data sharing between the Region, Local Municipalities and Conservation Authorities.
- **Call Center Response –** Strengthen Access Halton/311 ability to respond during emergencies by enhancing scripts, standardizing data collection, and improving dashboards to better support residents during floods.
- **Resident Supports –** Ongoing efforts are underway to enhance flood-related support services, improve access to resources, and strengthen recovery initiatives for affected residents.
- **Education and Outreach –** Public education and outreach are being enhanced through proactive communication, quicker notification and sharing of flood warnings, and expanded homeowner engagement programs focused on flood risk mitigation. The Region currently provides outreach, but this program needs to be scaled up significantly to more effectively reach affected residents.

A detailed description of the gaps and issues identified and the recommended actions to be taken in response is provided in Attachment #1, re: “Emergency Response and Recovery – After-Action Review”.

Halton remains committed to continuously enhancing its emergency preparedness, response, and recovery efforts. Significant improvements have already been made, and Halton’s approach will continue to be refined and strengthened. Ongoing training will ensure Halton, and its partners, are well-prepared to support residents and respond effectively to future flooding emergencies.

B. In-Depth Wastewater System Review and Key Findings

Basement flooding can occur by overland flooding, storm sewer surcharges, private drainage system overload, and wastewater sewer surcharges caused by infiltration and inflow. While some stormwater inflow is expected and designed for, the wastewater system is not designed to accommodate excessive amounts of stormwater inflow from direct stormwater connections. Many of these connections in older areas of Halton are from private property weeping tile foundation drains and downspouts, reverse grade driveways and other private rear-lot or walkout drains. These connections provide a route for stormwater to enter and overwhelm the wastewater system during extreme storm events and can result in basement flooding locally and in connected areas downstream.

In order to understand the root cause of basement flooding in July 2024, Halton Region hired GEI Consultants Canada Ltd. (“GEI”) to conduct a detailed study of how the wastewater and stormwater systems performed during that time. The goal was to identify the causes of basement flooding in 11 priority geographic areas, which accounted for 90 per cent of the reported flooding from system surcharges.

Based on the results of the in-depth analysis, the Region developed the recommended actions presented in Section C of this report. A map of the priority areas is included in Attachment #2.

GEI’s mandate was the following:

- Assess the wastewater and stormwater system performance using hydraulic modelling to identify capacity constraints or performance issues in both systems.
- Conduct hydrologic flow modelling (surface flow modelling) to simulate how stormwater moves across the land and identify flood-prone areas relative to wastewater infrastructure.
- Prepare a stormwater system impact analysis using a hydraulic model to identify factors contributing to basement flooding in the affected areas.

The following outlines key findings from the GEI’s review and subsequent analysis performed by the Region. For more detailed information refer to Attachment #3, re:

"System Performance and Flood Risk" and Attachment #4, re: "Wastewater System Response to Storm". The Region agrees with the findings made by GEI.

1. Direct inflow from private storm drain connections is a major cause of wastewater system overload during heavy rainfall.

Wastewater systems are designed to handle a nominal amount of rainwater, about two to four times normal dry weather flow, that comes from minor leaks and cracks in infrastructure as it deteriorates over time. During the July 2024 storms, flow monitoring showed stormwater entering the system at rates up to 19 times the provincial design guideline.

Flow data showed an immediate spike after the rain started, indicating that direct inflow was the main cause of wastewater-system overload, likely from improper stormwater drainage connections from homes. Halton subsequently carried out detailed investigations in two areas of Oakville and Burlington that included smoke testing, drone testing, and video inspections during light rain events, which supported this conclusion.

In total, the Region has completed 297 Household Drainage Surveys, which is a detailed inspection of a property's stormwater and wastewater drainage systems to help identify potential basement flooding risks and recommend appropriate remediation measures.

Completed Household Drainage Surveys confirmed that there are many homes with improper drainage connections. Homes built between 1958 and 1978 were often constructed with storm drain connections to the wastewater system through downspouts and weeping tiles. Around 15,000 homes in the 11 priority areas studied were built during this time period.

2. The Stormwater system was overwhelmed, increasing surface flooding and contributing to basement flooding.

Stormwater modelling of the July 2024 storms confirmed the stormwater systems were overwhelmed in many areas. This led to increased surface flooding as roads and creeks overtopped, increasing flooding on private property. In Burlington, a blocked culvert at Highway 407 contributed significantly to surface flooding in the Cavendish Road area as well as wastewater system surcharging downstream.

When weeping tiles, foundation drains or reverse driveway drains are connected to the wastewater system, the flooding on private property enters the wastewater system rapidly, particularly when the ground is already saturated with water. These connections allow much more flow into the wastewater system than it is designed for, at rates much higher than the system can handle.

Addressing the stormwater system issues that contribute to basement flooding will require ongoing coordination and planning between the Region and Local Municipalities to improve stormwater management and related infrastructure.

Stormwater system performance to the July 2024 storm was modelled by GEI and supports the conclusion in this section. Attachment # 3 provides more detailed information on the system response and flood risk based on modelling results.

3. Ground saturation and soil conditions were factors that contributed to flooding.

In the days leading up to the July 2024 storm, heavy rainfall left the ground saturated, limiting its ability to absorb water, resulting in increased runoff and overland flow. Overflowing rivers and streams further caused surface water to enter homes and overwhelm private drainage systems.

The type of soil in an area also contributes to the amount of overland flooding. Highly porous soils allow water to drain into the ground quickly, while low drainage soils and hard surfaces resulting from urbanization increase the amount of surface water that can eventually make its way onto private property and then into the wastewater system as noted above.

Details on flood risks based on soil drainage classification is included in Attachment #3, Table 1.

4. Halton's Wastewater Infrastructure is generally in very good condition and is not a significant source of Inflow and Infiltration.

A recent review of closed-circuit camera inspections (CCTV) across the 11 priority areas found that the Region's wastewater system is generally in good to very good condition, with only a small number of minor defects noted for improvement.

GEI conducted a "rolling ball" topographic analysis to identify natural low spots and drainage paths that may contribute to surface flooding. The Region identified maintenance holes located in these high-risk areas, such as ditches and floodplains. This analysis found that approximately 0.5 per cent of maintenance holes were situated in these low-lying areas where pooled surface water could enter the system through unsealed covers or vent holes.

Overall, the findings confirm that wastewater pipes and maintenance holes are not significant contributors to inflow and infiltration within the system.

5. Halton's wastewater treatment plants and pumping stations were not the cause of basement flooding during the July 2024 storm.

GEI's review found no direct link between the operation of the wastewater treatment plants and pumping stations and the reported basement flooding incidents. GEI also concluded that the facilities did not cause basement flooding.

The wastewater pumping stations operated as intended, diverting the extra flow through permitted emergency overflow systems. These overflows helped prevent more serious

flooding in homes and were reported to the Ministry of the Environment, Conservation and Parks as required.

The measured wet well levels did not exceed the top of the wastewater sewers. This confirms that the surcharging occurred outside of the pumping stations. The upsizing of wastewater pumping stations will not materially resolve basement flooding issues, as the limiting factor lies in the sewer system's inability to convey the amount of stormwater that it experienced in the July storm event.

6. Most areas will not benefit from larger sewers.

Wastewater pipes are designed based on how much wastewater they need to carry during both dry and wet weather. Engineers consider the number of users, typical water use, and how much inflow and infiltration might enter the system during typical storms, using Provincial design guidelines. For areas of the Region that are known to have high inflow and infiltration, pipes are designed using allowances that are above the Provincial design guideline.

GEI's analysis did not identify any areas where increasing sewer size is necessary to support existing wastewater flows. Halton's Integrated Master Plan has identified some areas where accommodating forecasted growth will require upsizing sewers. The Integrated Master Plan is ongoing, and details have been presented to Council most recently in a presentation to Council on January 22, 2025.

GEI also conducted a review of the intersection hydraulics at locations where two flows converge at a 180-degree angle and exit at 90 degrees. The assessment confirmed that flow convergence at these intersections is not a contributing factor to the primary issue inflow and infiltration. Moreover, it was noted that enhancements to intersection hydraulics could create downstream surcharge conditions by pushing the problem downstream.

Increasing the size of wastewater pipes to handle extreme stormwater volumes from these intense storms is neither practical nor environmentally responsible and increases the operational complexity of the wastewater system. In many urban areas, there is not sufficient space under roads to install larger pipes. Limited right-of-way widths, pipe depth requirements and the presence of other underground utilities often make it physically impossible to fit larger pipes within the roadway. Oversized pipes also do not function well during normal dry-weather conditions. Excessively low flow can lead to blockages, odours, generation of noxious gases and higher maintenance needs.

Additionally, investing in infrastructure that remains underutilized for much of its lifespan carries significant capital and operational costs and is less efficient than strategies removing excess stormwater from entering the wastewater system in the first place.

C. Basement Flooding Mitigation Program Review and Recommendations

The Region-Wide Basement Flooding Mitigation Program focuses on building long-term resiliency in the wastewater system to handle more frequent and intense storms by reducing excessive inflow and infiltration to the wastewater system from both public and private sources.

Based on GEI's analysis, staff recommend that this program be enhanced in several areas. The analysis shows that more attention is needed on the private side, particularly in older neighbourhoods with aging private-side infrastructure and improper private storm drainage connections to the wastewater system.

The enhancements to the Program will focus on both Region-led initiatives, as well as significantly increasing the number of voluntary measures taken by the public:

- Updating private-side inflow and infiltration reduction programs, including enhancing subsidies for disconnecting downspouts and weeping tiles to encourage more homeowners to disconnect, and enhancing subsidies for repair of private wastewater laterals that connect home plumbing to the public wastewater system.
- Improving public education and outreach to raise awareness about the importance of keeping stormwater from private properties out of the wastewater system.
- Increasing wastewater system monitoring and field investigations to better understand system behaviour during storms and sources of inflow and infiltration to identify where further system improvements are required.
- Reviewing the potential to include the repair of private-side laterals in conjunction with Regional capital and maintenance programs.
- Increasing inter-agency collaboration to support implementation of flood mitigation measures.
- Dedicating additional staff resources to support the community and to undertake further actions to reduce the risk of basement flooding.

Progressive Storm Drain Disconnection Approach

Programs addressing private side inflow and infiltration reduction measures can be progressive, where each step provides a higher number of disconnections, but at higher costs and a higher degree of disruption to residents:

- **Funding and incentive-based approaches** – Programs that offer financial support, such as grants, rebates, or subsidies, to encourage voluntary adoption of lot-level solutions. This has been the approach the Region has taken to date,

with limited success in advancing only a relatively small number of disconnections.

- **Education and outreach-based approaches** – Initiatives that more proactively and directly build public awareness and promote behavioral change through workshops, campaigns, and technical guidance.
- **Mandatory disconnection requirements with targeted enforcement in high-risk areas** – By-laws requiring property owners to implement specific measures, often supported by enforcement measures such as compliance inspections or penalties, focussed on the highest risk areas.
- **Mandatory disconnection requirements with enforcement across the Region** – Expanding enforcement measures broadly throughout the Region.

Halton is currently in a funding and incentive-based approach. Despite financial incentives, participation rates in Halton remain low. Since 2016, the Program has invested over $5 million to assist residents in disconnecting 193 downspouts and 531 weeping tiles, repairing 956 laterals, and installing 888 backwater valves.

A review of similar programs in 17 municipalities confirms that low uptake is typical for voluntary subsidy initiatives. This is due to several factors: homeowners often lack awareness of available programs, are unsure about necessary repairs, struggle to find qualified contractors, or view the repair process as inconvenient or disruptive. High upfront costs, even with subsidies, also present barriers. Additionally, many homeowners who have not experienced flooding may not feel an urgent need to act.

Most municipalities have enacted by-laws that prohibit discharging stormwater to the wastewater system, and some have enacted by-laws requiring downspout disconnection. Only a few municipalities appear to actively enforce these types of by-laws and enforcement programs vary across the province. These trends highlight the importance of designing programs that balance public engagement, financial support, and regulatory tools to achieve meaningful reductions in stormwater inflow.

While Halton's Sewer Use By-Law 2-03 prohibits the discharge of stormwater into the sanitary sewer system, Halton has relied on voluntary disconnection rather than enforcement of mandatory disconnection to date.

Staff recommend moving to an enhanced education and outreach approach at this time. This is the best balance of support for residents while ensuring more stormwater drainage connections are disconnected from the wastewater system.

If these enhanced voluntary measures do not sufficiently reduce basement flooding and private stormwater inflow, the Region may wish to consider mandatory disconnection programs, with targeted enforcement in high-risk areas.

Staff will report back to Council with details about and options for a mandatory disconnection program should the initiatives described in this report prove insufficient.

The sections that follow describe in more detail how the proposed Enhanced Basement Flooding Prevention Program will be designed and implemented.

Basement Flooding Prevention Subsidy Program Review Findings

The focus of the proposed Program is to ultimately have more homeowners reduce flood risk on their property and the entire wastewater system by providing financial support to voluntarily disconnect downspouts and weeping tiles, repair wastewater laterals, and install backwater valves. The Program will focus on the 11 priority areas as residents in these areas are at the highest risk of basement flooding.

The Region will focus on increasing homeowner participation in disconnecting private side storm drains, weeping tile foundation drains and repairing laterals in all 11 priority areas. To achieve this, a dedicated private side disconnection program will be implemented to increase voluntary participation through targeted public education, increased subsidy financial support and supporting homeowners through the permitting and construction required to properly undertake and complete disconnections.

As the Program matures and higher-risk areas are addressed, the Program can be expanded to other areas of the Region.

Halton remains committed to expanding and improving voluntary programs to support homeowners:

- **Expand Subsidy Program Eligibility**

Smoke testing and Household Drainage Surveys revealed there are other types of private storm drain connections, such as outdoor patio drains, reverse driveway drains, and exterior stairwell drains, that contribute inflow and infiltration to the wastewater system that are not currently covered by the Subsidy Program. Expanding this program to include these connections would help address overlooked sources of inflow and infiltration.

- **Increase Subsidy Program Amounts**

Financial incentives are a key driver of homeowner participation in the Subsidy Program. For property owners to take part, the available support must be sufficient to offset the cost and effort involved. Since the subsidy amounts were last updated in 2016, the cost of completing eligible work has increased significantly.

Residents that have experienced flooding have shared their experiences with staff at public meetings and one of the requests staff hear regularly is that subsidy amounts are not enough to cover the costs. Staff reviewed the last three years of invoices received from residents through the Subsidy Program and agree that the current subsidies do not cover the average disconnection invoice cost.

To ensure the Subsidy Program continues to provide value and encourage greater participation, this report recommends increasing the subsidies available to eligible property owners, as outlined in Table 1. These costs were determined by evaluating the invoice costs received by residents over the last three years and ensuring the subsidy covers the average cost of disconnection for each type of connections noted in Table 1.

Attachment #5, re: "Basement Flooding Subsidy Jurisdictional Scan and Recommended Subsidy Increases" provides more information on the recommended subsidy amounts, as well as a comparison of subsidies offered by other municipalities in Ontario. Halton currently has some the highest subsidies in Ontario and will have the highest subsidies in Ontario should Council approve the recommended amounts in Table 1.

Many residents who experienced basement flooding in July 2024 have already made disconnections and received reimbursements through the Subsidy Program. Staff recommends the subsidy amounts be made retroactive to July 2024. This will allow those residents that have experienced flooding in July and have already disconnected to receive a higher total payment where eligible.

The Region will contact those eligible residents that have received subsidy payments since July 2024 to ensure they receive the incremental difference between the current and the proposed subsidy where their payments have exceeded the current subsidy amounts. An estimated cost of up to $300,000 will be required to make these subsidies retroactive to July 15, 2024.

Table 1: Recommended Subsidy Increases

Program	2008 Subsidy	2016 Subsidy	Proposed Subsidy
Downspout Disconnection	50% up to $250	100% up to $500	100% up to $900
Weeping Tile Disconnection /Sump Pump Installation	50% up to $1,800	100% up to $5,000	100% up to $6,500
Exterior Storm Drain Disconnections			100% up to $6,500
Backwater Valve Installation	50% up to $675	50% up to $675	50% up to $1,600
Wastewater Lateral Lining & Repair	-	50% up to $2,000	50% up to $4,000

- **Improve Contractor Quality and Oversight for Subsidy Program Work**

Many homeowners need support finding qualified contractors that can complete the work. The Region will enhance the supports that are currently offered to residents to ensure that contracting the work is not a barrier to residents disconnecting their storm drainage connections from the wastewater system. This can include providing a list of potential contractors that are pre-approved for this type of work, a guide for homeowners to

navigate the program and making staff available to support the residents through the disconnection process in an advisory role.

- **Expand Targeted Public Education and Outreach**

Increasing participation in the Subsidy Program requires raising public awareness and ensuring a clear understanding of its benefits to residents. To support this goal, the Region is advancing a series of targeted outreach initiatives, including public meetings across the Region to help residents understand local flood risks and the crucial role of disconnecting private stormwater systems.

Communications will be further strengthened through educational videos, regular updates to halton.ca/flood, enhanced online reporting and grant application tools, and collaboration with Local Municipalities, Conservation Authorities and emergency management partners to better share with our residents the role of each of these parties in flood risk mitigation. Outreach will continue to prioritize high-risk neighborhoods, supporting homeowners in disconnecting improperly connected systems and maximizing uptake of the Subsidy Program.

- **Strengthen Inflow and Infiltration Detection Through Expanded Flow Monitoring, Field Investigations, and Household Surveys**

The Region's wastewater flow monitoring program will be expanded to incorporate advanced software tools and additional strategically placed sensors to help pinpoint areas with elevated inflow and infiltration across the Region.

To further refine source identification, the Region will employ targeted field investigations, including smoke testing, drone surveys and closed-circuit television (CCTV) during dry and wet weather to detect potential sources of public and private inflow and infiltration. The Region will also continue to expand its rain gauge network, operating the Gauge-Adjusted Radar Rainfall program year-round. There are sufficient funds in the 2025 operating budget to immediately move to year-round operation of this program.

While the Region already provides Household Drainage Surveys to residents, the number of surveys completed will be scaled up to provide coverage across the 11 priority areas. Approximately 300 household drainage surveys have been completed to date, but around 15,000 homes in the 11 priority areas have high potential for storm drainage connections to the wastewater system. Connecting with residents across the 11 priority areas will be a multi-year program that will require significant on-the-ground resources to fully realize.

These household drainage surveys will provide customized homeowner guidance for corrective actions that can be supported through the Subsidy Program, including a report showing stormwater drainage connections to the wastewater system, poorly graded areas that increase flooding risk, information on how to disconnect and subsides that are available to residents. These surveys are the best tool for residents to understand and manage the infrastructure on their private properties.

Incorporating Private-Side Lateral Repairs into Regional Wastewater Capital Replacement Projects

Homeowners are responsible for the portion of the wastewater lateral on their property, while the Region manages the portion on public property. The Region regularly invests in replacing and maintaining public wastewater infrastructure to ensure reliable and efficient service. However, many homeowners may not be aware of the condition of their lateral or know their responsibilities to maintain their lateral. When these private wastewater laterals are cracked or damaged, stormwater can seep into the ground and infiltrate the wastewater system adding pressure during heavy rainfall and increasing the risk of system surcharges and basement flooding.

Although the Region already offers a subsidy to help cover the cost of private lateral repairs, participation rates remain low (less than 2 percent). To address this, the Region is adopting a more proactive approach by incorporating private-side lateral upgrades into existing Wastewater Capital Replacement Projects.

Through this coordinated approach, homeowners will be offered the opportunity to assess and repair their private laterals while public infrastructure work is taking place in their area. Coordinating repairs with the Region's capital projects is likely the lowest cost residents will have to repair damaged laterals.

By combining these efforts, the Region aims to enhance awareness of maintenance responsibilities and available financial support and makes the repair process more convenient and accessible for residents to encourage timely homeowner action. This integrated strategy supports long-term infrastructure sustainability and helps strengthen the overall performance and resilience of the wastewater system.

Wastewater System Remediation to Reduce Inflow and Infiltration

As part of the Region's ongoing wastewater system optimization efforts, any identified defects will be assessed for the appropriate remediation and will be prioritized and executed through existing infrastructure initiatives, such as the Basement Flooding Mitigation Lining and Spot Repair Program and the State-of-Good Repair Program. These efforts align with the strategic direction outlined in the Region's Asset Management Program, ensuring that resources are allocated effectively and critical issues are addressed proactively.

While investigations have determined that submerged maintenance holes are not a major source of inflow and infiltration into the wastewater system, the Region has nonetheless initiated proactive remediation measures (lining and low-flow lids). This work is already underway and is expected to be completed by the end of 2025.

Strengthening Inter-Jurisdictional Partnerships

Reducing the risk of basement flooding requires strong collaboration between Halton Region, Local Municipalities, and Conservation Authorities. Coordinated action is essential.

Since 2016, Halton Region, the Local Municipalities, and Conservation Authorities have collaborated through an Inter-Jurisdictional Working Group to share flooding data and information and to support private-side disconnection efforts under the Region's Subsidy Program. Halton Region recommends expanding the current partnership to better integrate stormwater infrastructure upgrades with wastewater system improvements and private-side inflow and infiltration reduction efforts. This coordinated, cross-jurisdictional approach is especially critical in flood-prone areas.

To strengthen this collaboration, there is an opportunity to establish a formal policy and governance framework that would:

- Clarify roles and responsibilities for stormwater planning, project delivery, design standards, and source control;
- Promote integrated risk management and coordinated monitoring;
- Work with Chief Building Officials and inspectors to ensure awareness of Halton's Sewage Use By-Law 3-02 and Subsidy Program.
- Align capital investments and emergency response planning, focusing on high-risk areas; and
- Track and report progress on flood risk reduction and response outcomes.

The Region will continue to keep Council informed on the Working Group's progress.

Dedicated Staff Resources

The enhancements to the Basement Flooding Mitigation Program noted in this report will require additional dedicated staff, supported by external consulting firms where appropriate. While some re-prioritizing of staff has already been completed to better respond to flooding, these improvements are not sustainable in the long-term without additional staff. These additional staff will provide:

- Strategic oversight and technical expertise for the Program, including system monitoring, private-side disconnections and the Subsidy Program.
- Guidance for residents through the building permit process, supporting contractor selection and quality assurance.

- Development of standardized installation practices, inspection protocols, homeowner resources for independently sourced contractors, and supporting our residents to ensure the work is completed within standards.
- Oversight of household drainage surveys performed by contractors.
- Public engagement, including the delivery of targeted education campaigns, facilitation of community meetings, delivery of information centres, and maintenance of accessible communication channels.
- Promotion of participation in Household Drainage Surveys, the Subsidy program and raising awareness of other available municipal flood recovery supports.

A dedicated staff team will be required to build and deliver this program. Resources may be scaled to meet increasing needs, as the Region is expected to contact up to 15,000 homes in the 11 priority areas to promote participation and complete private side disconnections, beginning with the highest-risk areas on a priority basis. This is a multi-year program requiring significant resources.

One person can complete two to three household drainage surveys per day. Currently there is one dedicated resource that can be increased to three by the end of the year, as more residents request this service. Further ramping up may be required in 2026 to ensure the program to keep up with demand.

Initial staff resource needs have been identified beginning with the 2026 budget as noted in Report No. FN-17-25 re: “2026 Budget Directions”.

Summary and Next Steps

This report outlines improvements to the Region’s flood emergency response and recovery plans and presents findings from a detailed assessment of how stormwater and wastewater system response during the severe storms experienced in July 2024. The assessment identified excessive inflow and infiltration, mostly from private-side infrastructure, as the primary cause of wastewater system surcharges during heavy rainfall.

As outlined in this report, staff recommend several enhancements to the Basement Flooding Mitigation Program, broadly falling into four themes:

1. Enhance the Basement Flooding Prevention Subsidy Program.
2. Expand education, outreach, and disconnection support to the public.
3. Conduct wastewater system investigations, including private side household drainage surveys, and proceed with repairs where noted.
4. Increase coordination with Local Municipalities and Conservation Authorities.

With Council's approval, the Region will implement a number of program changes this year:

- Enhance the Basement Flooding Prevention Subsidy Program
    - Roll out the increased subsidy amounts recommended in this report.
    - Contact residents that have received subsidy payments since July 2024 to provide the incremental amount between the current and proposed subsidy amounts.
- Expand education, outreach, and disconnection support to the public
    - Develop standards and inspection protocols for foundation/storm drain disconnections, lateral repairs, and backwater valve installations.
    - Publish a new Homeowner's Guide to Hiring Qualified Contractors and enhance the Region's Authorized Contractors List processes and procedures.
    - Prepare communication materials for targeted public meetings, including updated website content, new educational videos, and FAQs.
    - Launch targeted public engagement sessions, focusing on the high-risk areas.
    - Create a framework for the Private Side Lateral Repair Program in coordination with Wastewater Capital Projects for implementation in 2026
- Conduct wastewater system investigations, including private side household drainage surveys, and proceed with repairs where noted
    - Install five new flow monitoring devices to support system data collection and analysis.
    - Conduct field investigations in high-priority areas, including 10 km of wet weather CCTV inspections and 39 km of smoke testing/drone surveys.
    - Carry out up to 150 household drainage surveys.
    - Increase the number of staff assigned to support field investigations, household drainage surveys, and program development and implementation.
    - Complete 155 maintenance-hole lid sealings and 10 rehabilitations in low-lying areas.
- Increase coordination with Local Municipalities and Conservation Authorities
    - Collaborate with Chief Building Officials to raise awareness of Halton's Sewer Use By-Law and the Subsidy Program.

- Convene coordination meetings with Local Municipalities and Conservation Authorities to advance joint efforts and coordinate stormwater upgrades, wastewater improvements, and private-side inflow and infiltration reduction efforts in flood-prone areas.

Beginning in 2026, staff will update Council bi-annually in March and September on the ongoing progress of the Basement Flooding Mitigation Program.

Financial/Program Implications

As reported through Report No. FN-17-25 re: “2026 Budget Directions”, the 2026 Rate Budget Target includes an additional 0.5% rate increase required to support the recommended changes to the Region-Wide Basement Flooding Mitigation Program outlined in this report, including additional staff resources and enhancements to the subsidy program. The recommended resourcing plan, as well as any other operating and capital budget requirements to support this program, will be brought forward for Council’s consideration in the 2026 Budget and Business Plan.

There is an estimated impact of $300,000 to provide retroactive payments related to the enhanced subsidy back to July 15, 2024. Upon approval of this report, The Region will monitor the uptake of the enhanced subsidy program in 2025, and the actual impact of the retroactive payments, and provide an update on the projected variance in the August variance report.

Respectfully submitted by,

Kiyoshi Oka, P. Eng.,
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Lee Anne Jones, P.Eng.,
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Approved by,

Andrew Farr
Chief Administrative Officer

If you have any questions about the content of this report, please contact:
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Attachments:
Attachment #1 – Emergency Response and Recovery – After-Action Review
Attachment #2 – Map of Priority Areas
Attachment #3 – System Performance and Flood Risk
Attachment #4 – Wastewater System Response to Storm
Attachment #5 – Basement Flooding Subsidy Jurisdictional Scan and Recommended Subsidy Increases

Additional Information:

The sources listed below are for supplemental information and reference only. Halton Region is not responsible for the currency, accuracy, or legality of the content from any external links.

None.

Emergency Response and Recovery – After-Action Review

The table below identifies the findings and outcomes of the post-incident after-action review undertaken to assess the Region's response to the July 2024 flooding event. It identifies the gaps/issues identified related to flood response planning, data sharing, call centre response, supports for impacted residents, and public education and outreach efforts. For each of these areas, associated actions to improve the Region's future emergency response and recovery efforts are identified.

Area	Gaps/Issues Identified	Actions
1. Flood Response Planning	• Following the July 2024 flooding Council identified the need for a Regional flood response plan to better assist in coordinating response and recovery activities for flooding within Halton.	**Outline Flood Response Roles and Responsibilities** Halton Emergency Management is finalizing a new Flood Emergency Response Plan which will set up clear roles and responsibilities for the Region and individual program areas as it relates to flooding.
		Clarify Communication and Notification Procedures This work is being undertaken as part of the development of the Regional Flood Emergency Response Plan identified above.
2. Data Sharing	• Following the July 2024 flooding, data sharing between Region and City of Burlington was slow due to the absence of agreements regarding sharing resident data. An agreement had to be developed during the response/recovery, which took time and slowed down the response.	**Accelerate Data Sharing Through Standardized Agreements** Discussions are underway to establish agreements around service levels and data sharing between the Region and Local Municipalities so information can be shared more quickly during an emergency. These efforts will also address standardizing data and improving integration of data between agency partners.
3. Call Centre Response	• During the July 2024 flooding the Region was made aware of situations where residents contacted	**Streamline Processes for Reporting Flooding** The Region has launched an online flood reporting service on **halton.ca**, enabling residents to quickly report basement flooding. This tool also allows residents to initiate grant applications. This online tool allows residents to report flooding without having to

Area	Gaps/Issues Identified	Actions
	either Burlington or the Region and were wrongly transferred to the other organization due to gaps in the call centre scripts.	contact Access Halton/311, standardizes data collection, and speeds up access to flooding information to inform response and recovery efforts.
		Update Flood Response Scripts The scripts and processes used by Access Halton/311 have been updated to align with the new online flood reporting tool. Access Halton also connected with municipalities regarding expectations around call transfers. During a flood event, Access Halton will attempt a warm transfer for calls that belong to Local Municipalities directly to their contact center. If Access Halton is inundated with calls and there is a long wait time in the Local Municipality's queue, Access Halton staff will not be expected to wait in the queue for a warm transfer. Instead, they will inform the resident that their issue is the responsibility of the Local Municipality, provide them with the phone number and then transfer the resident directly to the Local Municipality. For example, the Town of Oakville expressed that, if preferred, callers can be provided with their email address as an alternative communication option during a flood event. Similarly, if there is no wait time in Access Halton's queue and the Local Municipality is not experiencing a high call volume, they will attempt a warm transfer. If this is not possible, they will transfer the call to Access Halton for regional matters.
		Improve Dashboard Capabilities Work is underway to implement a real time Access Halton/311 call volume dashboard (using Power BI or another visualization tool) that can be reviewed, by appropriate Access Halton staff, when trigger occurs or for ad hoc review at any time. This broader improvement will support Access Halton's call response.
4. Resident Supports	• Following the July flooding a number of residents were unsure of supports potentially available to	**Enhance Awareness and Delivery of Supports for Residents** Promote awareness of existing core programs in Social and Community Services, leveraging community partnerships to share information about existing programs, targeted to vulnerable residents. Develop decision making and cost sharing approach

Area	Gaps/Issues Identified	Actions
	them following a flood. These residents were identified during Red Cross Wellness Checks.	for Wellness Checks with Local Municipalities, to be activated in large-scale events such as flooding.
		Improve the Ex-Gratia Grant Program Enhancements to the Ex-Gratia Grant Program, now known as the "Residential Basement Flooding Grant Program" were approved by Council in April 2025 through Report No. PW-10-25/CS-13-25. These changes improve service and access by expanding eligibility and launching an online flood reporting and grant application customer portal.
5. Public Education and Outreach	• Experience during and following the July flooding indicated there are opportunities to strengthen targeted outreach and education, and broader public marketing efforts to increase understanding of flood causes, risk and mitigation efforts.	**Improve Public Notification Process & Timing** Processes have been refined to enable quicker public notification and sharing of flood warnings, as well as steps to take if experiencing basement or overland flooding when areas of the region experience a significant rainfall event. Messaging has been updated to reflect the new online reporting form and the new Residential Flood Grant form.
		Enhance Public Messaging on Flood Risk Reduction The Region is continuing to produce regular messaging, visuals, videos and other resources to increase engagement and understanding of flood causes, risks and mitigation efforts. A greater focus will be placed on educating homeowners on stormwater and wastewater systems, inflow and infiltration through direct private connections and ways for property owners to make home improvements that can reduce the risk of property and basement flooding.
		Develop a New Flooding Public Meeting Program A new public meeting program has been developed to provide direct communication, information, and support to homeowners in identified neighbourhoods recently impacted by flooding events and with high inflow and infiltration. This first targeted meeting took place in early June and staff will continue with targeted neighbourhood meetings throughout the Summer and into Fall 2025. Additional public meetings are being planned to invite any homeowner who would like to learn more about flood causes, risk mitigation and private-side/property remediation.

Attachment #2
to Report No. PW-21-25

System Performance and Flood Risk

The following outlines the wastewater and stormwater (major and minor) system performance and basement flood risk for the July 2024 Extreme Rainfall Event for each of the specified 11 priority areas.

Basement flooding can occur by overland flooding, storm sewer surcharges and wastewater sewer surcharges caused by inflow and infiltration of stormwater. Addressing all these flooding sources is critical to reducing the risk of basement flooding during severe rainstorms.

In the July 2024 Storm Analysis study, GEI analyzed the flood risk to residential properties in the 11 priority areas using the following parameters:

1. **Rainfall Characteristics –** Analysis based on rainfall volumes and intensities observed during the July 2024 storm. The intensity and volume of rainfall during severe weather events like the July 2024 storm pushes infrastructure far beyond what it was originally designed to handle. GEI's analysis utilized rainfall volumes and intensities in their modelling like those experienced in the July 2024 storm.

2. **Soil Drainage Class –** This parameter indicates the soil's capacity to absorb overland flow. High drainage soils allow better infiltration, while low drainage soils lead to increased surface runoff and flooding. In the days leading up to July 2024 storm event, there were several days of heavy rainfall that left the ground saturated, limiting its ability to absorb water and increasing runoff and overland flow. Details on flood risks based on soil conditions during the July 2024 storms are provided in Table 1: Wastewater System Performance and Flood Risk below.

3. **Wastewater Pipe Condition Rating** – This metric reflects the structural integrity of wastewater sewer pipes and whether their condition significantly contributed to the system response in the July 2024 storms. A recent review of camera inspections across the 11 priority areas found that the Region's wastewater system is generally in good to very good condition based on Pipeline Assessment Certification Program (PACP) condition scores, with only a small number having defects that can be improved. Details on the sewer condition rating in the 11 priority areas is provided in the attached table.

   GEI's *rolling ball* analysis identified natural low spots and drainage paths where flooding is more likely to occur. Regional analysis identified about 0.5% of maintenance holes fell within these low-lying areas where surface water pooled and could enter the system through unsealed covers or vent holes. This was not found to be a major contributing factor to the system response to the July 2024 storms.

4. **Age of Homes –** GEI's analysis focused on homes built in the 1960s and 1970s, which are more susceptible to flooding due to outdated infrastructure and improper connections to the wastewater system.

The stormwater and wastewater models were used to assess flood risk across the 11 identified priority areas. This analysis focused on three types of flooding:

- **Overland Flooding –** Defined by surface water accumulation. High risk is assigned to properties with ≥10 cm of flooding. These thresholds were established by GEI.

- **Storm Sewer Surcharge –** Evaluates basement flooding risk due to storm sewer overflow. High risk corresponds to surcharge levels exceeding 1.8 m (typical basement elevation).

- **Wastewater Sewer Surcharge –** Assesses risk from storm-induced inflow into wastewater systems. High risk is defined by surcharge levels above 1.8 m (typical basement elevation).

Flood Risk Assessment

The following summarizes the flood risk for each area based on the criteria used in GEI's analysis:

1. **Burlington:** In the eight priority areas within the City of Burlington, flooding appears to occur by surface flooding and wastewater system surcharge based on the modelling. Across the eight priority areas in the City of Burlington, 58% of homes are identified as having high risk of a private-side storm connection to the wastewater sewer and a high likelihood of having direct storm drainage connections to the wastewater system based on the age of the home. Across all eight priorities areas, the modelling shows that 41% of properties are at high risk of surface flooding and 43% of storm sewers are at risk of surcharge greater than 1.8m. Given the high percentage of aged homes in the priority areas, many of which are likely to have improper private-side connections, this creates a higher likelihood of inflow and infiltration entering the wastewater system and overwhelming it beyond its design capacity.

2. **Halton Hills:** Based on the modelling, flooding in this priority area appears to occur primarily by storm system surcharge. Based on modelling, 40% of the storm sewer system is identified as high risk (exceeds 1.8m surcharge in the storm). Given the high percentage of aged homes in the priority area (72%), likely many of which have improper private-side connections, there is a higher likelihood of

inflow and infiltration into the wastewater system, overwhelming it beyond its design capacity. Evidence of this has recently been detected by undertaking CCTV surveys during periods of rainfall, which shows inflow and infiltration.

3. **Milton:** This priority area is newer than the other 10 areas. It has less aged homes (approximately 11%) and seemingly less risk of surface flooding based on the modelling and analysis (14% of properties are at high risk). Storm sewer surcharge appears to present the main cause of basement flooding during the storm. Modelling shows that 72% of the storm sewer system is identified as high risk, meaning that it will exceed 1.8m surcharge in the storm. This suggests that the basement flooding in this priority area is primarily caused by storm sewer surcharge, partly due to the shallow depth of the sewers in the area.

4. **Oakville:** In this priority area, based on the modelling, flooding appears to occur primarily by sewer surcharge. The modelling shows that 56% of the storm system is identified as high risk (exceeds 1.8m surcharge in the storm). Given the high percentage of aged homes in the priority area (76%), likely many of which have improper private-side connections, there is a higher likelihood of inflow and infiltration to the wastewater system and overwhelming it beyond its design capacity.

The GEI modelling and analysis is important in understanding the causes and risks of basement flooding across the 11 priority areas. It demonstrates that intense rainfall events are causing three main flooding types. When a large amount of rainfall occurs in a short period of time, the flows then overwhelm the storm sewers, which are designed for smaller storms. The problem is exacerbated by conditions present in July 2024, where rain events in the days leading up the storms resulted in the ground being saturated, limiting its ability to absorb additional rainfall. When the storm sewers are overwhelmed, this can worsen surface flooding, leading to roads and creeks overtopping. In areas with older homes with more private storm connections, the surface flooding and excess stormwater makes its way into the wastewater system that is not designed to handle that much excess storm flow.

Increasing the size of wastewater pipes to handle extreme stormwater volumes from these intense storms is neither practical nor environmentally responsible and increases the operational complexity of the wastewater system. In many urban areas, there isn't enough space under roads to install larger pipes. Limited right-of-way widths, pipe depth requirements and the presence of other underground utilities often make it physically impossible to fit larger pipes within the roadway. Oversized pipes also do not function well during normal dry-weather conditions. Excessively low flow can lead to blockages, odours, generation of noxious gases and higher maintenance needs. Additionally, investing in infrastructure that remains underutilized for much of its lifespan carries significant capital and operational costs and is less efficient than strategies removing excess stormwater from entering the wastewater system in the first place.

Attachment 3 Table 1: System Performance and Flood Risk

Halton Region July Storm Analysis Study (GEI, 2025)

Municipality	Priority Area	Name	Rainfall Depth (mm)	Rainfall Intensity (mm/hr)	Soil drainage class	Sewer PACP Condition Rating 4&5 (% of pipes)	Total # of Residential Properties in the Study Area	Total # Homes Built in 1958-78	% of House Built Between 1958-78 at Risk of Flooding Due to Inflow and Infiltration	% of Properties at High Risk of Overland Flooding (Major System ≥10 cm of flooding)	% of Storm Sewer System at High Risk of Surcharge (> 1.8 m typical basement elevation)	% of Wastewater Sewer System at High Risk of Surcharge (> 1.8 m typical basement elevation)
Burlington	Area 1	Bonnie Court/Leighland/Glendor	54.4	41.2	Average drainage	0%	435	65	15%	29%	1%	83%
	Area 2	Cavendish/Tyandaga	63.6	45	Good drainage	1%	6,701	3,572	53%	44%	17%	7%
	Area 3	Fisher/Mountainside	63.6	45	Poor drainage	1%	1,800	1,350	75%	42%	55%	11%
	Area 4	Homewood Dr/Mainway/Guelph	63.6	45	Good drainage	0%	3,913	2,334	60%	37%	39%	12%
	Area 7	Elizabeth Gardens WWPS	39.1	34.3	Average drainage	6%	4,839	2,405	50%	43%	64%	1%
	Area 8	Pinedale WWPS	39.1	34.3	Average drainage	1%	2,040	1,422	70%	57%	49%	3%
	Area 9	Paletta Gardens WWPS	48.8	39.8	Good drainage	1%	1,790	1,097	61%	26%	63%	9%
	Area 10	Bromley WWPS	48.8	39.8	Average drainage	0%	1,005	817	81%	35%	59%	9%
Burlington Totals		Areas 1-4 and 7-10	---	---	---	10%	22,523	13,062	58%	41%	43%	9%
Milton	Area 5	Oak St	47.2	23.8	Average drainage	<3%	542	59	11%	14%	72%	5%
Oakville	Area 6	Belvedere WWPS	60.4	51.6	Poor drainage	<12%	233	176	76%	12%	56%	0%
Halton Hills	Area 11	Delrex/Duncan	36.6	25.8	Average drainage	<4%	2,877	2,074	72%	1%	40%	11%

Wastewater System Response to July Storms

The following outlines the stormwater (major and minor) and wastewater system response for the July 2024 Storm Event for each of the 11 priority areas, as studied and modelled by GEI.

The 11 priority areas were established based on flooding call volumes and drainage / catchment area. Burlington has eight of 11 priority areas, whereas Halton Hills, Milton and Oakville each have one priority area. The focus of analysis to date has been on residential homes across all priority areas.

A total of 1,966 properties across the Region reported basement flooding during the July 2024 storms, 1,547 of those are located within the 11 priority areas, including 1,403 in Burlington, 114 in Halton Hills, 17 in Milton, and 13 in Oakville.

There are three types of flood sources that were recorded: wastewater system backup, stormwater, and combination. Stormwater can be a result of surface flooding, storm sewer surcharge or private stormwater drainage failures. Combination means that the source of flooding was suspected to be from both the sewer system and stormwater.

The classification is critical for understanding infrastructure vulnerabilities and tailoring mitigation strategies. Wastewater system backups generally occur when the system becomes overloaded, whereas stormwater flooding happens when surface runoff surpasses the capacity of the public and private stormwater drainage infrastructure and enters buildings through openings such as windows, doors, foundation cracks or overflowing private storm drainage systems.

Combination events highlight the complexity of stormwater interactions, especially during intense weather events. The combination category refers to cases where both wastewater system surcharging and overland flow were both suspected cause of basement flooding. In addition, some reports were classified as ‘Unknown’, where the flooding source could not be confidently identified based on available information. Table 1 outlines the characterization of the flood type.

Table 1: 2024 Flood Basement Flooding Type

Total properties in the priority areas	Total # homes Reporting flooding July 2024	Stormwater (Overland)	Wastewater System Backup (Sanitary)	Combo	Unknown
26,175	1,547	592	759	142	54

- In Burlington, 580 of the 1,403 flooding reports were a result of overland flooding and 732 were storm-induced wastewater surcharge.

- In Oakville and Milton, the impacts were less given the number of basement flooding reports.
- In Halton Hills, most flooding reports were due to a combination of flooding from the sewer system and overland flow.

This indicates that the problem is not the Halton wastewater system alone. This problem is complex and requires Local Municipalities and Conservation Authorities to coordinate with stormwater management planning and solutions. During the July 2024 storms, basements were flooded directly by stormwater, specifically surface water, directly entering homes through doors and windows, seeping in through cracks in foundation or from private-side drainage system failures. Once inside, this water flowed into the wastewater system via floor drains and other plumbing fixtures, significantly increasing wastewater system overload and contributing to wastewater sewer backups in downstream homes. Homes with direct private-side stormwater connections to the wastewater system contributed to the excessive amounts of inflow and infiltration that significantly contributed to the system backup.

Instantaneous peaking factor is an indication of how much stormwater enters the system. It is determined by flow monitors and is a measure of peak flows versus dry weather flows in a sewer. The Region's wastewater system was designed to handle a small amount of rainwater, typically two to four times normal dry weather flow, from minor leaks and cracks that happen as wastewater sewers and laterals age over time, which permits small amounts of inflow and infiltration. During the July 2024 storm, the following peaking factors were observed by Municipality as shown in Table 2.

Table 2: Instantaneous Peaking Factor by Municipality and Area

Municipality	**Burlington**		**Milton**	**Oakville**	**Halton Hills**
Area	Area 1-4	Area 7-10	Area 5	Area 6	Area 11
Instantaneous Peaking Factor	13 to 16	9 to 11	7	24	15

These instantaneous peaking factors demonstrate a significant amount of stormwater ("peak flows") entering the systems well beyond the design capacity.

A small amount of inflow and infiltration is permitted within wastewater systems. Inflow is stormwater that enters the wastewater system through improper private storm drain connections such as downspouts, weeping tiles/sump pumps and outdoor patio drains, as well as vent holes in maintenance-hole covers when streets or ditches are flooded.

The risk of high inflow increases when the minor storm system (sewers) and the major storm system (roads, creeks, ditches) become flooded. The overland flooding makes its way into the various entry points. Infiltration is groundwater that gradually seeps slowly

into the system through cracks and joints in public or private wastewater sewers. When groundwater and surface water surround a home, private drainage systems can be overwhelmed, flooding the home with water. This water can enter the wastewater system through basement floor drains, quickly overwhelming the wastewater system.

The Province of Ontario guideline allows for a limited amount of stormwater and groundwater inflow and infiltration (0.28 litres per second, per hectare, or L/s/ha) to enter the sanitary system through inflow and infiltration, typical through cracks in wastewater pipes, maintenance holes and laterals as this infrastructure ages over time. During the July 2024 storm, the following peak inflow and infiltration levels were observed:

Table 3: Peak Inflow and Infiltration levels by Municipality and Area

Municipality	**Burlington**		**Milton**	**Oakville**	**Halton Hills**
Priority Area	Area 1-4	Area 7-10	Area 5	Area 6	Area 11
How many factors above the Provincial Limit (L/s/ha) was The Flow in the Area	7 to 19	7 to 17	5	14	9

These results show that inflow and infiltration levels during the storm were far beyond what the system is designed to handle, overwhelming the wastewater sewer capacity and contributing to basement flooding in affected areas.

A recent review of camera inspections across the 11 priority areas found that the Region's wastewater system is generally in good to very good condition, with only a small number having defects that allow inflow and infiltration to enter the wastewater system. Flow monitoring data during rain events indicate that a large percentage of the wet weather flow entering the system is quick response, which suggests direct, private connections from homes are the biggest contributing factor of inflow and infiltration.

Homes built between 1958 and 1978 were often constructed with storm drain connections to the wastewater system, such as downspouts and weeping tiles. Over the 11 priority areas, it is estimated that 15,371 of the 26,175 homes were built in this period – a breakdown by Local Municipality is below:

- Burlington estimate: 13,062 of 22,523 properties (58%)
- Halton Hills estimate: 2,074 of 2,877 properties (72%)
- Milton estimate: 59 of 542 properties (11%)
- Oakville estimate: 176 of 233 properties (76%)

While Milton is lower than the others, there is a high likelihood of direct storm connections from homes to the wastewater system.

The Region has continued to build upon the existing Basement Flooding Mitigation Program by conducting household drainage surveys and offering financial subsidies to homeowners to financially support disconnection efforts. To date, the uptake in the existing program has been low. There have been 297 voluntary household drainage surveys completed, which is less than 2% of the homes across the 11 priority areas. In summary, reduction efforts are as follows:

Table 4: Private Side Inflow and Infiltration Reduction Efforts and BWV installations

Weeping Tiles Disconnected	Downspouts Disconnected (Subsidy & Targeted)	Private Side Lateral Repaired	Back Water Valve Installations
523	**1,822**	**277**	**698**

Subsidy program enhancements and expanded outreach and education are expected to help increase public participation and program uptake.

It should be noted that these efforts cannot be completed by the Region in isolation. Modeling and analysis show that surface flooding during severe storm events plays a significant factor in basement flooding. This requires broader interagency collaboration with the Local Municipalities and Conservation Authorities for stormwater management and flood resiliency.

Attachment 4 Table 5- Wastewater System Response to Storm
Halton Region July Storm Analysis Study (GEI, 2025)

Municipality	Priority Area	Name	Incident Date	Total Properties in Study Area	Total # Homes Reporting flooding within 11 Priority Areas July 2024	Repeat Flooding (2014 & 2024)	July 2024 Basement Flooding Type				WW System Response to Storm				
							Storm-water	Wastewater Sewer Backup	Combo	Un-known	Rainfall Depth (mm)	Rainfall Intensity (mm/hr)	Max Peaking Factor 3-7 = Expected (green) 8-15 = Significant (yellow) >15 = Extreme (red)	Max Peak Unit RDII (L/s/ha) <0.28 = Low (green) 0.28-0.80 = Significant (yellow) >0.8 = Extreme (red)	Times the Provincial Limit (0.28 L/s/ha)
Burlington	Area 1	BonnieCourt/Leighland/Glendor	15-Jul	435	137	4	11	120	3	3	54.4	41.2	16	2.68	10
	Area 2	Cavendish/Tyandaga	15-Jul	6701	327	22	204	101	10	12	63.6	45	13	1.83	7
	Area 3	Fisher/Mountainside	15-Jul	1800	252	41	90	152	7	3	63.6	45	13	5.31	19
	Area 4	Homewood Dr/Mainway/Guelph	15-Jul	3913	389	131	157	210	11	11	63.6	45	N/A	N/A	N/A
	Area 7	Elizabeth Gardens WWPS	15-Jul	4839	113	68	49	54	6	4	39.1	34.3	10	4.65	17
	Area 8	Pinedale WWPS	15-Jul	2040	93	64	30	54	5	4	39.1	34.3	9	3.59	13
	Area 9	Paletta Gardens WWPS	15-Jul	1790	54	33	27	19	3	5	48.8	39.8	11	2.03	7
	Area 10	Bromley WWPS	15-Jul	1005	38	24	12	22	0	4	48.8	39.8	10	4.03	14
Burlington	Areas 1- 4 and 7 - 10 Totals		15-Jul	22,523	1403	387	580	732	45	46	---	---	---	---	---
Milton	Area 5	Oak St	16-Jul	542	17	0	0	15	1	1	47.2	23.8	7	1.28	5
Oakville	Area 6	Belvedere WWPS	15-Jul	233	13	0	1	12	0	0	60.4	51.6	24	3.87	14
Halton Hills	Area 11	Delrex/Duncan	16-Jul	2877	114	0	11	0	96	7	36.6	25.8	15	2.38	9
Total				**26175**	**1547**	**387**	**592**	**759**	**142**	**54**					

Attachment 4 – Table 6: Private Side Inflow and Infiltration Sources and Reduction Progress
Halton Region July Storm Analysis Study (GEI, 2025)

Municipality	Priority Area	Name	Total Properties in Study Area	Private Side Inflow and Infiltration Sources								Private Side Inflow and Infiltration Reduction						2024 Flooded homes with BWV
				Total # Homes between 1958 - 78	% of Homes between 1958 - 78	Total HHDS Completed	Uptake in HHDS Aged Homes between 1958 - 78	# of Homes Confirmed WT Connections	Known Leaky Private Laterals (based on HHDS)	Known Exterior Stormwater Drains (based on HHDS / drone survey)	Known outside drains - Reverse driveways (based on HHDS / drone Survey)	WT Disconnects	Downspouts Disconnects (Subsidy only)	Downspouts Disconnected (TDDP only)	Downspouts Disconnected (Subsidy & TDDP)	Private Side Lateral Repair	BWV	
Burlington	Area 1	Bonnie Crt/Leighland/Glendor	435	65	16%	15	23%	6	2	25	2	9	0	0	0	8	16	5
	Area 2	Cavendish/Tyandaga	6701	3,572	56%	20	1%	8	8	1	None	29	11	178	189	41	60	3
	Area 3	Fisher/Mountainside	1800	1,350	77%	28	2%	21	5	None	1	70	24	121	145	39	75	18
	Area 4	Homewood Dr/Mainway/Guelph	3913	2,334	63%	36	2%	21	11	None	1	51	30	328	358	40	88	15
	Area 7	Elizabeth Gardens WWPS	4839	2,405	51%	72	3%	54	18	6	1	149	50	207	257	76	176	26
	Area 8	Pinedale WWPS	2040	1,422	71%	41	3%	38	2	None	1	76	39	257	296	17	89	18
	Area 9	Paletta Gardens WWPS	1790	1,097	63%	24	2%	18	3	1	None	65	39	229	268	12	97	8
	Area 10	Bromley WWPS	1005	817	84%	43	5%	35	9	None	None	55	35	117	152	25	69	7
Burlington	Areas 1- 4 and 7 - 10 Totals		22523	13062	60%	279	2%	201	58	33	6	504	228	1437	1665	258	670	100
Milton	Area 5	Oak St	542	59	14%	2	3%	0	None	None	None	2	0	0	0	5	4	0
Oakville	Area 6	Belvedere WWPS	233	176	78%	3	2%	1	None	19	11	1	0	10	10	2	4	1
Halton Hills	Area 11	Delrex/Duncan	2877	2,074	74%	13	1%	8	5	None	None	16	4	143	147	12	20	2
Total			**26175**	**15371**		**297**	**0.2%**	**210**	**63**	**52**	**17**	**523**	**232**	**1590**	**1822**	**277**	**698**	**103**

Basement Flooding Subsidy Jurisdictional Scan and Recommended Subsidy Increases

Jurisdictional Scan Review

The Region's consultant, GEI, undertook a jurisdictional scan for flooding-related subsidies (see attached Table-1: Sample of Municipal Subsidy Programs) and found the subsidy amounts and eligibility varied considerably between municipalities. Halton's existing subsidy amount offered is at the higher end of the maximum subsidies offered among other municipalities in Ontario.

This jurisdictional scan helped inform the Region's recommendations for increased subsidy, aimed at encouraging subsidy uptake.

Rationale for Recommended Subsidy Program Expansion and Increases

Financial incentives are a key driver of homeowner participation in the Subsidy Program. For property owners to take part, the available support must be sufficient to offset the cost and effort involved. Since the subsidy amounts were last updated in 2016, the cost of completing eligible work has increased significantly. The recommended subsidy increases shown in Table-2 are based on the jurisdictional scan and recent invoices from existing homeowners.

Table-2: Recommended Subsidy Increases

Program	2008 Subsidy	2016 Subsidy	Proposed Subsidy
Downspout Disconnection	50% up to $250	100% up to $500	100% up to $900
Weeping Tile Disconnection /Sump Pump Installation	50% up to $1,800	100% up to $5,000	100% up to $6,500
Exterior Storm Drain Disconnections			100% up to $6,500
Backwater Valve Installation	50% up to $675	50% up to $675	50% up to $1,600
Wastewater Lateral Lining & Repair	-	50% up to $2,000	50% up to $4,000

Weeping tiles, sump pumps and downspout disconnection subsidies are recommended to be paid in full, up to a maximum amount. These disconnections have a broader community benefit in reducing inflow and infiltration and contribute significantly to the risk of basement flooding. Private side lateral repairs and backwater valve installations are recommended to be paid at 50%, up to a maximum amount, as there is an individual benefit to the property owner but also a benefit to the public system.

- **Downspout Disconnection:** The recommended proposed subsidy is 100% of the invoice cost to a maximum of $900. Reviewing the last 3 years of invoices received through the subsidy program, 75% of all invoices received are below approximately $850. $850 is also in line with the average invoice cost. Providing 100% of up to $900 will cover the full costs for most residents to disconnect.

- **Weeping Tile Disconnection /Sump Pump Installation:** The recommended proposed subsidy is 100% of the invoice costs to a maximum of $6500. Reviewing the last three years of invoices received through the subsidy program, 80% of all invoices are below approximately $6500. Weeping tiles and sump pumps have a major impact on basement flooding, so this high level of support is essential to encourage disconnection.
- **Exterior Storm Drain Connections:** Exterior stormwater connections such as reverse driveway drains or basement walkout drains that are connected to the wastewater system are not currently covered by the subsidy program but are significant contributors to inflow and infiltration. The proposed subsidy amount for these connections is 100% up to a maximum of $6,500, in line with the weeping tile disconnection subsidy as the work is very similar in scope.

- **Backwater Valve Installation:** The recommended proposed subsidy is 50% of the invoice costs to a maximum of $1,600. Reviewing the last three years of invoices received through the subsidy program, the average cost to install a back water valve was $3,200. As backwater valves are a benefit to the homeowner and does not reduce inflow and infiltration, covering 50% of the average invoice cost is proposed. Since the average invoice cost is $3,200, the Region is proposing to cover half the invoice up to a maximum of $1,600.

- **Wastewater Lateral Lining & Repair:** The recommended proposed subsidy is 50% of the invoice costs to a maximum of $4,000. Reviewing the last three years of invoices received through the subsidy program, the average cost of repair was $8,000. Although the lateral is the sole responsibility of the homeowner, its repair benefits the municipal wastewater system by reducing inflow and infiltration. Therefore, it is proposed that 50% of the average invoice cost be covered. Since the average invoice cost is $8,000, the Region is proposing to cover half the invoice up to a maximum of $400.

Attachment 5 Table-1: Sample of Municipal Subsidy Programs

Municipality	Tier	Max. Subsidy	Eligibility	Backwater Valves	Weeping Tile	Lateral	Downspouts
Halton Region (Current)	**Upper**	**$8,175**		**50% up to $675**	**100% up to $5000**	**50% up to $2,000**	**100% up to $500**
City of Markham	Lower	$9,500	Pre Application Post Inspection for approval Property must be in known flood location	100% up to $1,750 indoor 100% up to $2,000 outdoor	100% up to $5,000	100% up to $2,500	80% up to $500 if eligible; must be disconnected from sanitary for other subsidy eligibility
City of Mississauga	Lower	$7,500	Detached home, semi-detached home, duplex or townhouse, no outstanding taxes	-	100% up to $6,000	None	$125 each up to $500
City of London	Single	$7,200*	Residential homes, basement has flooded or live in flood-prone area	90% up to $1,800	90% up to $4,000		None
City of Welland	Lower	$6,000	Pre and Post inspection	100% up to $6,000		None	None
City of Niagara Falls	Lower	$5,200	Single detached home, appointment with City to determine if eligible	100% up to $1,200	100% up to $4,000	None	None
City of St Catharines	Lower	90% to $5,000	Single-detached residential homes (including duplexes, triplexes, etc.), built before 2012	90% up to $5,000	90% up to $5,000	None	None

Municipality	Tier	Max. Subsidy	Eligibility	Backwater Valves	Weeping Tile	Lateral	Downspouts
City of Brantford	Lower	$5,000	Not new construction, done by licensed contractor	80% to $3,000 indoor 80% to $5,000 outdoor	100% up to $4,000	50% up to $2,000	100% up to $500
Town of Fort Erie	Lower	$4,500	Appointment required to verify eligibility. Post inspection by Town staff	100% up to $4,500			
City of Greater Sudbury	Single	$4,475	Residential home Pre and Post City Inspection	75% up to $1,500	75% up to $1,875	50% up to $1,100	Eavestrough extenders $10 each up to $40 2 x rain barrels 50% up to $60
City of Toronto	Single	$3,400	Single-family, duplex, triplex or fourplex, existing residential home, disconnected downspouts, paved areas in compliance with zoning by-law, no outstanding taxes	80% up to $1,250	80% to $2,150	None	Up to $500 for low-income seniors or low-income with disability
City of Kingston	Single	$3,000	Single family detached home, semi-detached home, row-house, duplex or triplex; compliant with Ontario Building Code, Sewer Use Bylaw	75% up to $1,200	75% up to $1,400 50% up to $1,000 to cap foundation drain	None	None

Municipality	Tier	Max. Subsidy	Eligibility	Backwater Valves	Weeping Tile	Lateral	Downspouts
City of Windsor	Single	$3,500	Single family or duplex home	100% up to $1,450	100% up to $2,400	50% up to $4,000 (separate rebate)	Free disconnection by City for Residential, mandatory by by-law,
City of Hamilton	Single	$2,000	Residential homes built before 2012	$500 or up to $2,000 with other works	100% up to $2,000	None	$75 per downspout if done with other subsidy works
City of Ottawa	Single	$1,950	Residential homes built before 2012 (BWV mandatory on new homes in 2011)	100% up to $700	$1,250	None	75% up to $1,000; all rainwater management rebates up $5,000
Region of Peel	Upper	$1,500	BWV if proof of flooding	60% up to $1,500	None	None	Free by Region if connected to sanitary (Region program by target neighbourhood)
City of Vaughan	Lower	$750	For existing homes only	100% up to $750	None	None	None
Region of Durham	Upper	$3,000 interest free loan (3 yrs)	Residents with basement flooding due to sewer backup	$3,000 interest free loan (3 yrs) for properties with basement flooding due to sewer backup	$3,000 interest free loan (3 yrs) for properties with basement flooding due to sewer backup	No	No
*Sewage ejector pump & tank $6,000 instead of BWV; Battery back-up for new sump pump $1,400							