SUBJECT: Storm event of July 15, 2024 and response update

TO: Committee of the Whole

FROM: Engineering Services Department

Report Number: ES-25-24

Wards Affected: All

Date to Committee: November 4, 2024

Date to Council: November 19, 2024

Recommendation:

Receive engineering services department report ES-25-24 providing an update on the July 15, 2024 storm event and response update for information.

PURPOSE:

Vision to Focus Alignment:

☐ Designing and delivering complete communities

☑ Providing the best services and experiences

☑ Protecting and improving the natural environment and taking action on climate change

☐ Driving organizational performance

Executive Summary:

On July 15, 2024, the City received a total of 74mm of rainfall, with 50mm falling within a single hour, equating to a 1:100-year storm event. This intense rainfall caused widespread flash flooding, overwhelming stormwater and sewer systems, leading to flooded roads, private properties, and significant debris accumulation in creeks and culverts. The City's emergency response plan was escalated, involving multiple departments to clear blocked storm infrastructure, repair damaged roads, and communicate with residents about ongoing recovery efforts. Key impacts included 25 road closures, damage to recreation facilities, and numerous locations of debris removal within creek segments and at culvert inlets.

At the time of this report, Service Burlington had received 1069 storm related customer requests with the majority by phone where an estimated 1620 homes in Burlington had flooding occur within their basements due to sanitary sewer backing up or overland flow of water entering through building openings (Basement Walkouts, Windows, Doors etc.).

The report identifies the following options for areas of improvement that can be implemented immediately to assist in reducing any future risk of flooding during these extreme events:

- *Expanded Infrastructure Assessments and More Frequent Maintenance*
- *Encroachments and Site Alterations Enforcement*
- *Increased Third Party Infrastructure Coordination (407 ETR, MTO, CN, Metrolinx)*
- *Enhanced City Response Through Expanded On-Call Resources*
- *Storm Water Drainage Area Assessments*
- *Initiate a Storm Infrastructure Renewal and Resiliency Program*
- *Create a City wide Storm Water Masterplan*
- *Storm Sewer Inlet Grates Review*
- *Increased Frequency of Storm Network Inspection*
- *Increased and Direct Proactive Mainline CCTV Storm Sewer Inspection and flushing/cleaning activities from a 15-year cycle to a 10-year cycle to determine infrastructure conditions.*
- *Increased Proactive Stormwater Infrastructure Maintenance*
- *Building Resilience Through Expanded Emergency and Continuity Management Staffing*
- *Building Resilience Through Expanded Public Education*

The total immediate cost of the storm response is estimated at $2.27 million, with funding provided through the Severe Weather Reserve Fund. The options presented in this report to enhance flood resilience have been included in the proposed 2025 Capital and Operating Budgets. To remain within Budget guidelines, the Annual Roadway Resurfacing program of $2 Million has been removed for 2025 from the capital program.

Background and Discussion:

Incident Overview

For the 5 days prior to July 15, Burlington experienced approximately 95mm of rain, saturating soils and increasing the volume of runoff managed by creek and stormwater systems.

On July 15, 2024, the City received an additional 74mm of rain with the majority of the rainfall, approximately 50mm, falling between 11:30am-12:30pm. This peak 1-hour rainfall intensity equated to a 1:100 storm event. On July 16, another smaller rain event of 14mm occurred further compounding the flooding issues.

Flash flooding resulted in creeks overtopping their banks, along with roadways, ditches, swales, and private flooding. Storm and sanitary sewer systems also surcharged causing significant flooding to homes. Flooding on urban roads and private properties was also reported and significant volumes of debris and sediment accumulated in watercourses and culvert inlets.

At 12:30 pm, Environment and Climate Change Canada issued a rainfall warning, prompting the Community Emergency Management Coordinator (CEMC) to escalate the City's Emergency Response Plan to Level 2 Enhanced Monitoring. At 1:35 pm, Conservation Halton upgraded a Watershed Conditions Statement Flood Outlook to a Flood Watch that noted localized flooding in urban areas was likely.

An estimated 1,620 homes in Burlington experienced flooding within their basements due to sanitary sewer backups or overland flow entering through building openings such as basement walkouts, windows, and doors. During the extreme rainfall, large volumes of stormwater infiltrated the wastewater system, causing the sewers to surcharge. Halton Region identified approximately 875 homes that faced some degree of wastewater backup into basements.

Throughout the event, the CEMC maintained situational awareness by sharing operational updates with multiple relevant departments as needed to aid in the coordinated action to provide an immediate incident response to mitigate the storm impacts. Staff were reallocated to respond to resident calls and emails, as well as undertake flood impact inspections and repairs with an initial focus on addressing storm surcharge flooding on main roads and clearing of storm infrastructure blockages to ensure conveyance as well as addressing flooding and service restoration of facilities. Public notifications on the City's website and social media channels occurred

throughout the afternoon and evening of July 15 through July 17, when City messaging evolved to provide recovery supports for residents.

A detailed summary of the City's storm response and public communications is provided in Appendix A.

City staff coordinated with Regional emergency control, communications, 311, stormwater management, and other staff throughout.

The initial impact of the storm within the first 48hrs on public infrastructure resulted in:

- 24 emergency response calls to the Fire Department (most on Day 1 of Storm)
- 25 short term road closures
- 5 traffic signal outages
- 3 road construction projects were impacted with major road repairs required
- 70 tree related responses
- 10 temporary amenity closures of Park Facilities
- 11 recreation facilities were impacted including Tyandaga Golf Course
- Over 100 locations of creek system and major culvert inlet/outlet debris removals
- Multiple locations of road shoulder washouts requiring short and long term repairs

The storm sewer system in Burlington is comprised of major creeks and watersheds that flow from the Niagara Escarpment through the urban center and outlet at Lake Ontario. Feeding into this system is a minor (underground) and major (above ground) storm network that is designed to provincial and city standards.

The City's storm network is designed with a capacity to convey the runoff from 1:5-year rain event. Given that the July 15 storm was greater than a 1:5-year storm, significant overland flow and flooding occurred.

In addition, creeks transport stones, soil, and woody debris downstream during high flows. Debris accumulation can occur at bends in creeks and where trees have fallen,

as well as at storm inlet grates. Many creeks across the city were impacted by the July 15 storm, with the following locations experiencing the most severe riverine flooding:

- Falcon Creek @ Willowbrook Drive - storm sewer inlet lack of capacity caused overtopping of ditch and flooding of road and private properties.
- Rambo Creek @ Cavendish Drive - 407 storm inlet structure was blocked with debris, causing the creek to back up and overtop it's banks, flooding the road and private properties. 407 is designing permanent repairs at this location.
- Shoreacres Creek @ Headon Road - storm inlet structure was blocked with debris, causing the creek to back up and overtop it's banks, flooding the road and private properties.
- Sheldon Creek @ Mainway - storm inlet structure on north side of Mainway was blocked with debris, causing the creek to overtop the road, flooding the road and private properties.

Areas of the city developed prior to 1977, when Stormwater Design Standards were adopted to incorporate overland flow routes into urban design, are at risk of urban area flooding where roads or properties have isolated low points that have no drainage (overland flow) route to convey the accumulated stormwater away.

Strengths

Community Support and Customer Response

Service Burlington responded to 1,069 customer requests between July 15 and August 1, related to the storm. These requests spanned 13 different categories and involved four City departments. The majority (74%) of these requests were made by phone, a notable increase from the typical 66%. During this period, the CoBY AI virtual assistant answered 63 flood-related questions on Burlington.ca. Collaborative efforts among City departments, including Halton Region, helped address over 300 customer requests related to the flood relief grant program.

Top 5 Request types:

1. Regional Services
2. Catch Basin and Maintenance Hole repair
3. Public Tree Ownership, Inspections & Maintenance
4. Storm Water Management; Private Property
5. Grading, Drainage Permits, Site Alteration

Coordination with Halton Region

Communication between contact centre leads at the City and Halton Region improved the ability to verify information swiftly, which reduced frustration for customers contacting Burlington's main phone line or Halton 311. Future streamlining of these communication channels is recommended to further reduce misinformation and improve the efficiency of customer response.

City staff continue to coordinate with Halton Region staff on the Enhanced Basement Flooding Prevention Subsidy Program which includes subsidies for weeping tile disconnection and sump pump installation, downspout disconnection, backwater valve installation and sewer lateral repairs.

The website link is:

https://www.halton.ca/For-Residents/Water-and-Environment/Enhanced-Basement-Flooding-Prevention-Subsidy-Prog

Supports for Residents

1. Burlington Plumbing Permit Fee Reimbursement Program

When plumbing permits have been issued for back water valves, disconnections of foundation drains from sanitary sewer and installation of sump pumps, residents are able to claim a refund from the City for the cost of their Plumbing Permit. These measures reduce the risk of basement flooding due to sanitary sewer backup into the basement. This program has been active since 2014.

The website link is:

https://www.burlington.ca/en/building-and-renovating/home-flood-prevention.aspx?_mid_=10083#Plumbing-Permit-Fee-Grant-Program

2. Burlington Home Flood Protection Program

The Home Flood Protection Program is in place to help homeowners reduce their risk of basement flooding and minimize damage if flooding occurs. The program offers homeowners up to 50 per cent of the cost of Home Flood Protection Assessments which aim to find potential ways that water/sewage can enter your home. These assessments are done by a trained third-party assessor and can be completed in-person or virtually based on homeowner preference.

The website link is:

https://www.burlington.ca/en/building-and-renovating/home-flood-prevention.aspx?_mid_=10083#Home-Flood-Protection-Program

3. Burlington Flood Relief Grant Program

The City of Burlington Flood Relief Grant Program ($1,000) which can help residents with confirmed in-home flooding that occurred as a result of overland stormwater flow to offset the cost of an insurance deductible or help with in-house flooding-related costs that are not otherwise covered under their home insurance policy. Residents are eligible for the City's grant if Halton Region has deemed them not eligible for the Halton Region Ex-Gratia Grant.

The website link is:

https://www.burlington.ca/en/fire-and-emergency-services/flood-emergency-response-and-safety-information.aspx#

Areas of Improvement

While Staff continue to review the damage and impact of the flooding within the City, some areas of improvement have been identified.

Expanded Infrastructure Assessments and More Frequent Maintenance

One potential improvement in the current stormwater management strategy is exploring opportunities for expanded infrastructure assessments and increasing the frequency of maintenance. While there are ongoing efforts such as storm sewer capacity assessments and the development of a Stormwater Master Plan, the varying designs and conditions of storm sewer inlet grates pose challenges. The city could also benefit from standardizing inlet designs for future installations and increasing inspection and maintenance cycles. Additionally, expanding proactive debris removal efforts upstream could reduce the amount of debris being transported down our creeks during high flow events and could help prevent system blockages and mitigate flood risks more effectively.

Encroachments and Site Alterations

Recent inspections of creek blocks highlighted a significant issue: resident encroachments on creek block areas with private amenities. These unregulated additions, such as landscaping structures, contribute to debris accumulation, which can obstruct stormwater conveyance and lead to flooding upstream. Additionally, unpermitted site alterations, such as lot grading changes, blocking storm sewer easements, and filling in ditches or swales, further reduce stormwater drainage

capacity. These activities not only affect the immediate property but also disrupt the flow of stormwater, increasing flood risks for downstream areas.

To prevent future issues, a more proactive approach is proposed to enforce regulations related to lot alterations and creek block encroachments. Currently, these problems are addressed reactively, following complaints from impacted neighbors. Through updated bylaws, implementing regular inspections and stricter enforcement, the City can work to mitigate these risks before they lead to significant infrastructure damage or increased flooding. Proactive public education campaigns will also be essential in raising awareness among residents about the impact their property alterations may have on the broader stormwater system. Working with the community to emphasize the importance of adhering to city guidelines and seeking proper permits will be an important component in maintaining a resilient stormwater network.

Increased Third Party Infrastructure Coordination (407 ETR, MTO, CN, Metrolinx)

The stormwater conveyance network within Burlington consists of both public and private infrastructure, including natural creeks and constructed storm sewer systems. However, much of this infrastructure, such as those under the jurisdiction of 407 ETR, the Ontario Ministry of Transportation (MTO), and railway authorities like CN, CP, and Metrolinx, lies beyond the City's direct control. While these systems are typically built to industry standards, their maintenance and monitoring fall to private property owners, who are responsible for ensuring functionality and addressing storm damage. For instance, the stormwater culvert at Cavendish Drive, managed by 407 ETR, experienced significant damage during the July storm, requiring extensive coordination between City staff and 407 ETR to monitor and repair.

Going forward, increased coordination with 3rd party infrastructure owners is recommended to ensure the resilience of Burlington's stormwater network.

Although infrastructure owned and maintained by third parties are independent of the City's control, they can have a significant impact on our residents during extreme weather events.

Enhanced City Response Through Expanded On-Call Resources

To further strengthen our ability to respond to storm events, particularly during non-winter months, we could explore ways to enhance our on-call resources. Currently, the city provides on-call coverage for forestry services from April to November, and winter response from December to March. However, for non-winter storm events outside

regular working hours, staff are canvassed for emergency call-in, which can extend response times.

To improve efficiency, it is proposed that the City expand on-call coverage for non-winter storms by assigning two additional staff to be on-call from April to November. This would be achieved by reallocating existing staff resources, with no additional full-time positions required. This enhancement aims to ensure a more timely and coordinated response to unpredictable weather events while maintaining our current staffing levels

Improvement Plan

The following initiatives are planned to enhance flood management and resilience during extreme weather events:

Storm Water Drainage Area Assessments

Studies are being conducted to evaluate the capacity of storm sewers and overland flow systems in designated urban areas. Additional areas may be included as these assessments continue.

Initiate a Storm Infrastructure Renewal and Resiliency Program

In 2025 staff are proposing a reallocation of capital funding ($2M) from the Local Road Resurfacing program to the Storm Infrastructure Renewal and Resiliency program. Taking a risk-based approach, the program will target storm sewers and culverts that require rehabilitation activities, with the goal of extending the life of the storm network and improving resiliency within the system. Utilizing the City's CCTV inspection information, over 200 pipe segments and culverts have been identified as requiring rehabilitation and/or replacement. The rehabilitation work will be prioritized over multiple years based on the severity of the defect and the proximity to areas prone to flooding. The program could also include potential stormwater capacity upgrades that could be recommendations in future studies and assessments.

Create a City wide Storm Water Masterplan

As the city experiences growth, including intensification and infill development, and with increasingly intense weather patterns, stormwater management has become a key focus. The Storm Water Master Plan (SWMP) provides a comprehensive strategy for stormwater conveyance and management. This plan outlines a long-term approach to safeguarding residents, infrastructure, and the environment, and it offers

recommendations for ensuring a robust stormwater infrastructure system capable of addressing the impacts of high-intensity weather events

Storm Sewer Inlet Grates review

We maintain a list of key storm sewer inlet grates that are regularly inspected for debris. Given the varying designs from different installation periods, we are conducting a review of these grates to assess their condition and design, and to provide recommendations for their replacement, removal, or standardization in future installations.

Increase the Frequency of Storm Network Inspection

Increase inspection frequency of natural watercourses within the urban areas for signs of erosion, debris accumulation and infrastructure conditions from a 3-year cycle to a 2-year cycle. This can be accomplished by way of scheduling and scope of work modifications to the Creek Inventory and Erosion Assessment capital program.

Increase And Direct Proactive Mainline CCTV Storm Sewer Inspection And Flushing/Cleaning Activities From a 15-Year Cycle to a 10-Year Cycle To Determine Infrastructure Conditions

Focus will be given to network clusters and sections that present higher risk (creek enclosures, locations prone to silt and/or debris accumulation, locations with inlet and/or outlet grates)

Increased Proactive Stormwater Infrastructure Maintenance

Proactive debris and sediment removal is currently focused within close proximity of inlets and outlets of major culverts. Additional funding is proposed to extend the amount of proactive maintenance into upstream segments of the natural/overland stormwater systems in order to proactively address debris accumulation and mitigate potential system blockages.

Increased Communication with Partner Organizations (407, MTO, CN, Metrolinx, Halton Region)

We will continue to work to strengthen coordination with third-party organizations on the design, maintenance, and upgrades of their infrastructure to mitigate impacts on City residents during extreme weather events.

Building Resilience Through Expanded Emergency and Continuity Management Staffing

With the increasing frequency and intensity of extreme weather events, including heavy precipitation, there is a need to expand our emergency and continuity management capacity. The addition of a second full-time staff member will support emergency planning, business continuity efforts, and improve our ability to coordinate internal and external responses during emergencies, enhancing the City's overall resilience.

Building Resilience Through Expanded Public Education

The recent flood event highlighted the need for more proactive public education on emergency preparedness. Expanding public education efforts will help residents better prepare for emergencies, understand available support programs, and know where to seek assistance during recovery efforts. The additional full-time position will also support these expanded outreach efforts, helping to empower residents to protect their properties and reduce future risks.

In addition to these options listed above, Flood Mitigation Works (2014-Present) and Planned (2025-2035) are summarized in Appendix B.

Financial Matters:

Staff have included the costs for the items identified under the options considered in the 2025 Operating and Capital Budget Forecast submission. At this time, no additional funding is required outside of the costs incurred in the immediate response to the July event.

Total Financial Impact

The cost impact of the immediate response to the storms of July 15 and 16, 2024 is summarized as follows:

	Severe Weather Reserve
Internal Resources	$ 34,400
External Services	$ 71,000
Materials and Supplies	$ 24,900
Flood Grants	$ 662,000
Flatt Road Sinkhole Permanent Repair	$ 450,000
Waterdown Road flood repair	$ 50,000
Tyandaga Park Drive Flood Repair	$ 40,000

Interim Repair Upper Middle Road Culvert Collapse @ Rambo Creek	$ 50,000
Upper Middle Road @ Rambo Creek Culvert Replacement	$ 500,000
Rambo Creek Debris removal between Upper Middle Road and Hwy 407	$ 65,000
Roseland Creek Debris Removal between Glencrest Road and New Street	$ 50,000
Shoreacres Creek Debris Removal (between Dundas St and Headon Rd)	$ 50,000
Misc Inlet Repairs and Debris Removal	$ 75,000
Ongoing Damage Assessment	$ 150,000
Total	**$2,272,300**

Additional stormwater infrastructure capital projects, listed below have been included in the 2025 Capital Budget with funds being reallocated from the 2025 Annual Resurfacing Program.

	Capital Budget
Stormwater Drainage Assessments for 12 urban vulnerable areas of flooding.	$100,000
Storm Sewer Inlet Grate Review	$ 30,000
Enhanced CCTV Storm Sewer Inspections	$ 250,000
Additional Funding for Storm Water Infrastructure – Renewal and Resiliency	$ 1,800,000
Total	**$2,180,000**

The unfunded proposed initiatives below, have been identified as a key priority ask in the 2025 Budget submission with an associated business case number 2025-026.

	One-Time Funding	**On-Going Funding**
Stormwater Master Plan	$ 750,000	
Improving Storm Response (Expanded On-Call Coverage)		$ 50,000
Increased Proactive Ditching and Creek Maintenance		$ 200,000
Additional 1 FTE to the Emergency Continuity Management program		$ 150,000
Total	**$ 750,000**	**$ 400,000**

Source of Funding

The immediate source of funding for storm response has been charged to a combination of various operating and capital accounts. The Severe Weather Reserve will be relied upon in accounts where expenditures significantly exceed allocated budgets. The current uncommitted balance of the reserve fund is $5,362,000.

The remaining options and initiatives to reduce the risk of flooding have been included in the 2025 Capital and Operating budgets as outlined above. In order to meet capital budget guidelines, staff have eliminated the annual road resurfacing program for 2025 and will reintroduce it in 2026.

Other Resource Impacts

Considerable staff resources throughout the organization including Engineering, Roads Parks Forestry, Legal, Fire and Finance have been directed to addressing the needs that arose from the July 15th storm event, and it's anticipated that this will continue as we work through the actions identified in this report.

Climate Implications:

Storm response is impacted by a changing climate such as an increase in the frequency of severe weather events, extreme cold cycles and fluctuating freeze and thaw events. Response to these situations will vary and will be dependent on the severity of each weather event. Response resources are currently dependent on gas and diesel powered equipment, which contribute to the City's corporate greenhouse gas emissions. Through its green fleet replacement strategy, the city will endeavor to reduce its reliance on vehicles and equipment which are powered by internal combustion engines.

The City's Stormwater Management Design Guidelines are currently being re-evaluated every 5 years which includes assessment and consideration of design criteria modifications because of ongoing climate change impacts. The undertaking of a Stormwater Master Plan would provide further climate change evaluation as it relates to our current and future infrastructure.

Engagement Matters:

The City continues to assess community feedback received through Service Burlington, Access Halton, and City social media channels. It also continues to engage with partner organizations on third party infrastructure repairs.

Public involvement and consultation will be an important component of the City's work program. Public Information Centers will be schedule as we proceed through the Stormwater Masterplan and as our Stormwater Drainage Assessments are completed. Updates will also be provided on the City's website.

The City will also create a communication initiative for areas more at risk of flooding that can better educate property owners to assist in reducing the risk of flooding as a result of our changing weather conditions.

Conclusion:

Today, most facilities and services have been restored. City staff continue to inspect storm infrastructure and remove debris, flush sewers, review creeks and channels. Staff also continue to respond to drainage enquires including meeting with residents to review their concerns and explaining how the storm sewer system functions. Assessment of our storm system and our response related to this significant storm event is also ongoing including identifying areas of improvement.

Weather is unpredictable as depicted by the forecasts for week of July 15 which indicated minimal rainfall amounts with only a chance of thunderstorms. This weather forecast was updated on the day of the event with a minor increase in rainfall amounts but with a higher risk of thunderstorms over July 15 and 16. Regardless, forecasted rainfall amounts were considerably lower than actual rainfall amounts. This highlights the importance of emergency preparedness and highlights the value of real-time rainwater and high-water monitoring systems along with automated alerts.

Spikes in service requests can strain customer service systems and potentially impact response effectiveness by diverting resources. This underscores the need for improved public awareness and enhanced triage capabilities for customer service staff. Access to multiple sources of real-time data is also crucial for validating response priorities and activities. To address these needs, we aim to take a proactive approach with public awareness programs regarding jurisdictional responsibilities, preventive measures, and

opportunities for collaboration with external agencies such as Conservation Halton, Halton Region, and Halton Regional Police Service.

Capital investments since 2014 have mitigated storm-related impacts, reinforcing the importance of continuing with the Stormwater Master Plan and updating flood mapping to guide a multi-year investment plan. This plan will identify necessary response resources and highlight the value of maintaining a comprehensive preventative maintenance program to ensure stormwater infrastructure remains in good condition.

It is also important to maintain collaboration with private and third-party infrastructure owners, as Burlington's stormwater conveyance network includes both public and private components. Regular collaboration, sharing of infrastructure data, ensuring up-to-date emergency contacts, and conducting appropriate maintenance activities will support the effective functioning of the overall system.

Respectfully submitted,

Scott Hamilton, P.Eng.

Commissioner of Public Works

905-335-7600 ext. 7812

Appendices:

A. Emergency Response and Public Communications Detailed Summary
B. Flood Mitigation Works (2014-Present) and Planned (2025-2035)

Report Approval:

All reports are reviewed and/or approved by Department Director, the Chief Financial Officer and the Executive Director of Legal Services & Corporation Counsel.