OAKVILLE

REPORT

COMMUNITY SERVICES COMMITTEE

MEETING DATE: JUNE 17, 2019

FROM: Development Engineering Department

DATE: May 27, 2019

SUBJECT: **Stormwater Master Plan Update**

LOCATION: Town wide
WARD: Town wide

RECOMMENDATION:

1. That the Stormwater Master Plan update from the Development Engineering Department dated May 27, 2019 be received; and

2. That Council approve the allocation of $1,600,000 from gas tax funding to support the implementation of the minor works projects in 2019/2020 (as outlined within this report), providing flood mitigation benefits to vulnerable areas of the community.

KEY FACTS:

The following are key points for consideration with respect to this report:

- The Stormwater Master Plan (*SWMP*) focuses on community areas that were developed pre 1980. These older areas developed at a time when the practice of storm water management was limited; hence these areas tend to be vulnerable to urban flooding. The *SWMP* was undertaken to understand the extent of this vulnerability and to develop a responsive active plan to minimize these vulnerabilities. The work program was broken down into the following phases of work:
    - o Phase 1: Data collection and structural needs assessment
    - o Phase 2: Detailed modelling and assessment, development of service level criteria/indicators allowing for evidence based project development and prioritization
    - o Phase 3: Development and assessment of funding strategies to support the delivery of recommended storm water service improvement projects
- Phase 1 of the *SWMP* was completed in 2015 and included a review of the structural condition of the existing underground storm sewer pipe

infrastructure within the focus area. Results indicate that the underground pipe network is generally in a good state of repair.

- Phase 2 focuses on assessing the functional performance and capacity of the storm water system (within the target area) including underground storm sewer pipes, roadside ditches and major overland flow corridors (road right-of-way). This assessment provides insight into how these systems perform during a range of runoff/rainfall events, including the impacts of climate and land use changes. Results of this analyses are being used to develop a series of recommendations/projects to address vulnerabilities and minimize risk exposure.
- Guided by the Town's Asset Management Plan principles, the recommendations of the *SWMP* will be guided by factual data (allowing for evidence based decisions) and the establishment of traceable service levels that focus on meaningful changes that (in the case of the *SWMP*) minimizes exposure to flood risk and minimizes service disruption.
- Phase 3 focuses on the development and assessment of financial strategies necessary to deliver the recommendations/projects defined in Phase 2.
- Although Phase 2 of the *SWMP* is not yet complete, the project has identified three (3) different types of relatively low cost minor works projects that are deemed beneficial to advance in select areas of the community to improve drainage function and reduce flood risk exposure. These minor works include:
    - Installation of inlet control devices (*ICDs*) in street storm catch basins to reduce the potential for basement lateral flooding.
    - Increasing the inflow capacity to the storm sewer system to mitigate localize ponding; and
    - Improved inlet grates to reduce the potential for debris blockages that can result in localized flooding.
- These minor works projects have been estimated to cost approximately $1,600,000.
- Minor works projects are not appropriate for all identified risk areas and some areas require more substantive projects; major work projects. Work is currently underway in the refinement, costing and prioritization of major works projects and these will be brought forward with the final *SWMP* report in September.
- Gas tax funding is currently available to support the financial needs of these recommended minor works projects

BACKGROUND:

Oakville's community has grown over the decades and so has its storm sewer infrastructure. Additionally (and fortunately) our knowledge of storm water and storm water management practices has also grown. This has resulted in storm water

services that are variable in age/need as well as varying in service level depending on which part of the community you live in (older vs newer).

While communities have routinely undertaken master plans for infrastructure, like transportation systems, to understand infrastructure needs and priorities, few have completed master plans for their storm water system. With the advancement of Asset Management approaches and policies, Oakville launched its first Storm Water Management Plan (*SWMP*) with the desire to better understand it storm water service operation, the pressures being put upon it through climate and land use change, how to best respond to those changes and what to do to improve upon its service operation, where deemed appropriate and necessary.

The *SWMP* was launched with a work program that would have the work progress in three (3) phase. The phases of work are:

- Phase 1: Data collection and structural needs assessment
- Phase 2: Detailed modelling and assessment, development of service level criteria/indicators allowing for evidence based project development and prioritization
- Phase 3: Development and assessment of funding strategies to support the delivery of recommended storm water service improvement projects

Phase 1 of the *SMP* concluded that the overall physical condition of the storm sewer system (using high level camera technology) was in relatively good condition. Specifically, 84% of storm pipes were deemed in good or better structural condition, while only 4% were noted to be in poor structural condition. A more detailed review of the poorly ranked sewer segments (via closed circuit television) is actively underway so that we may verify the high level review findings and confirm the necessary replacement projects that will form part of the *SWMP* recommendations.

The storm water management drainage network consists of much more than the pipes that reside underground. The network consists of roadside ditches, open space channels and (believe it or not) the roadway right-of-way itself. Together these infrastructure components work to move runoff/rainfall off the land and into receiving systems like creeks/streams and ultimately Lake Ontario.

Aside from the assessing the structural state of the underground storm sewer pipe network, it is equally important to understand the operational function of the community storm water system which is comprised of two (2) main components; a minor system and a major system.

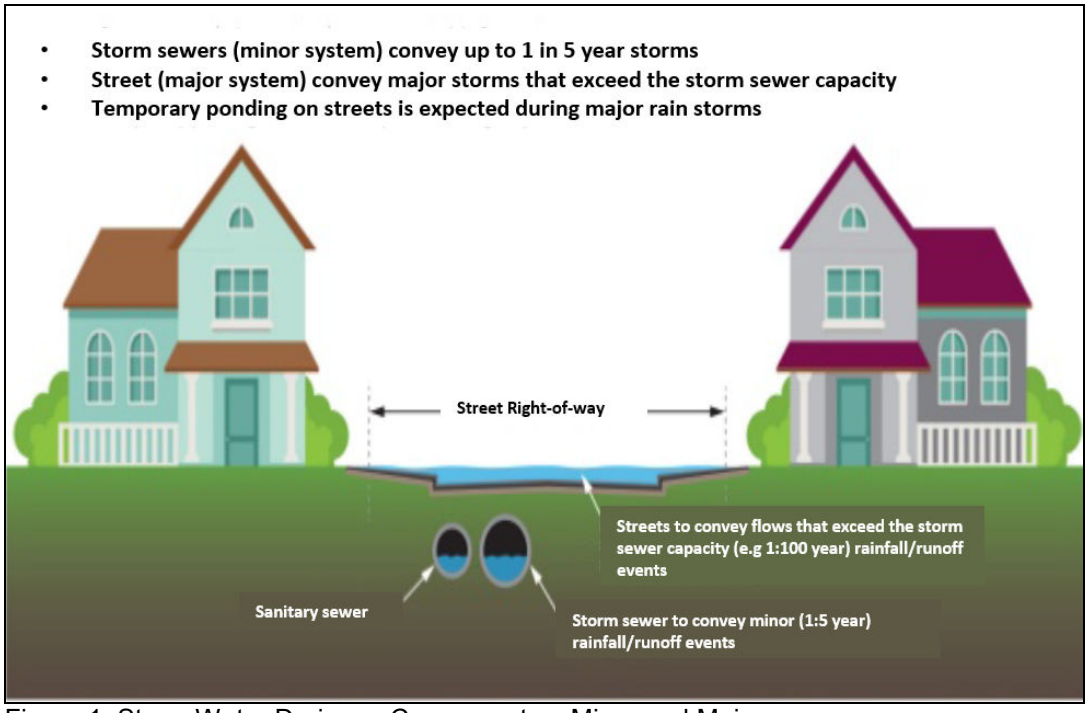

Figure 1: Storm Water Drainage Components – Minor and Major

The minor system includes storm sewer pipes, ditches, swales and driveway culverts. The minor system is typically designed to handle the more frequent rainfalls/runoff event, commonly termed in the engineering practice as the 1:5 or 1:10 year return period event.

The major system includes the overland drainage system comprised of road right-of ways and public lands such as creek blocks. In areas designed from the mid 1980's onward, the major system is generally sized to handle runoff in excess of the minor drainage system up to the 1:100 year return period event. Many areas designed prior to the mid-1980's were not designed/built with regard for a major drainage accommodation. As such, these older areas can be (and typically area) vulnerable to overland flooding.

Current design practice ensures that the minor system (underground pipe network) continues to operate appropriately (no storm water back-up) during larger runoff/rainfall event despite the fact that the major system (overland flow) becomes operational. This operational function tends not to be present in our older community areas as the older areas were not designed with these safeguards. Older areas are also therefore, prone to basement flooding where direct connections to the minor system are present.

In terms of flooding risks associated with residential areas, there are two main mechanisms that can produce risk of flooding to a home (structure). These are:

Basement lateral flood risk: Homes (structures) that are directly connected to the underground storm water pipe system, can present the opportunity for storm water to be pushed up (back along) the storm water lateral and into/around the home. This type of flooding can be produced when the municipal storm sewer system operates under pressure. This type of connection can be found within our older community areas and presents an undesirable opportunity for home flooding.

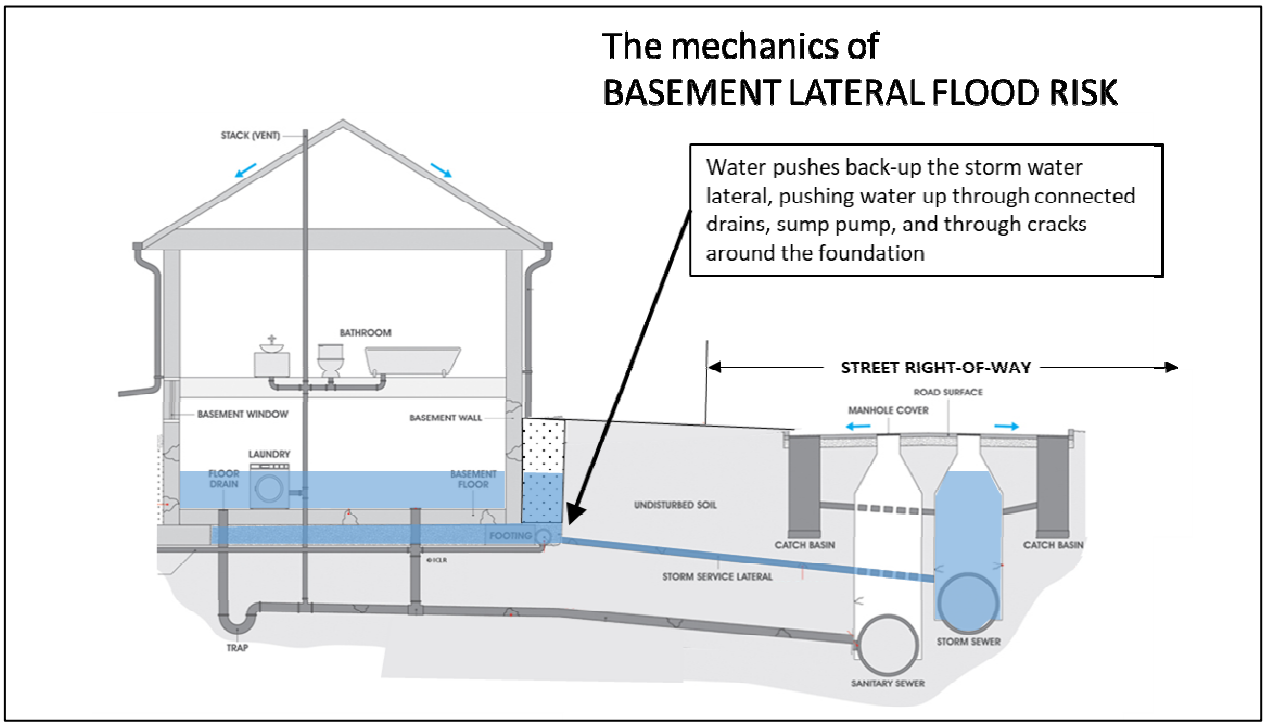

Figure 2: Basement lateral flood risk

Overland flood risk: When the capacity of the underground storm water pipe and/or roadside ditch system is exceeded, water will naturally begin to fill the street right-of-way and flow (ideally) along the route of the roadway. Community areas that were designed with this operation in mind, will see water flowing down the street but contained within the street right-of-way. In some cases, our modelling has identified locations where the overland flow extends beyond the street right-of-way to the point where it approaches and/or surrounds the home/buildings in the area. This is second form or risk of flooding (like basement lateral flood risk) is also undesirable.

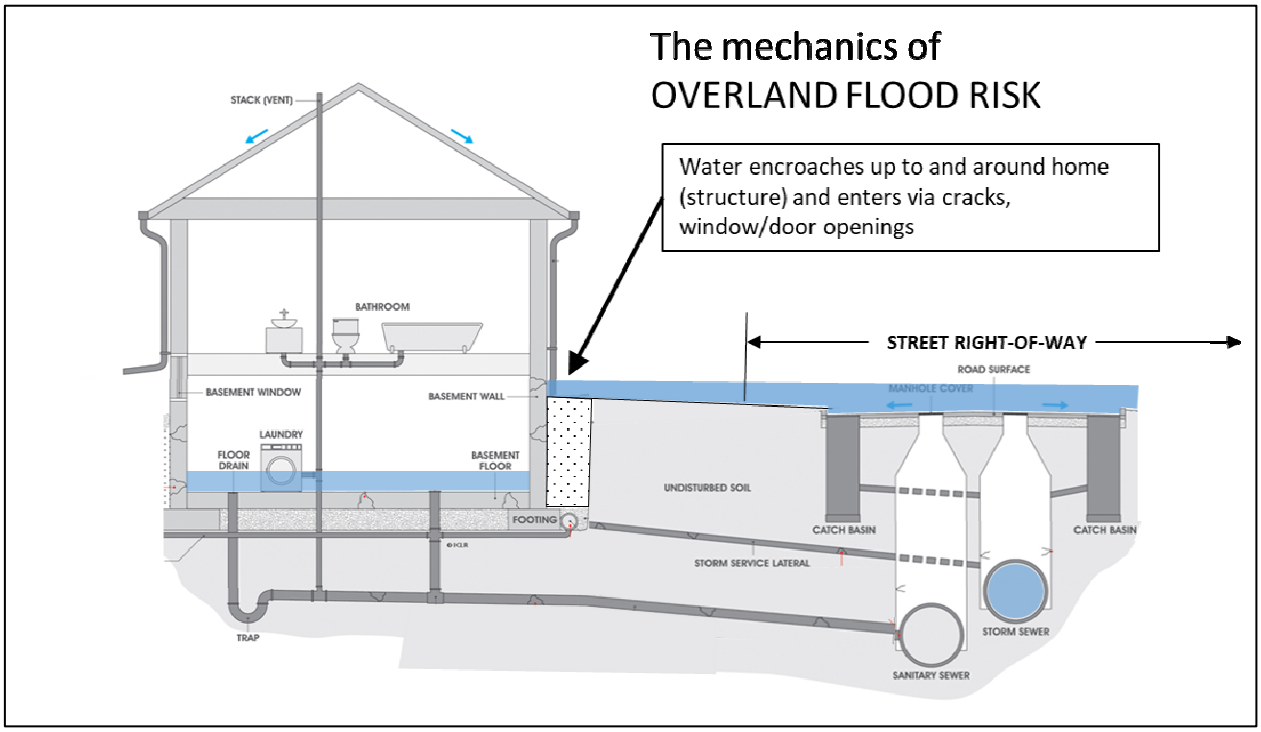

Figure 3: Overland flood risk

Phase 2 of the SWMP was advanced to understand where and to what extent the community was vulnerable to either of both forms of flood risk; these being basement lateral flood risk and overland flood risk. For the purpose of this study, a home would be defined as 'at risk of flooding' if the storm water system (by modelling) indicates that the home may experience storm water within the home by:

a) Storm water being pushed back up through its lateral connection
   OR
b) Storm water encroaching near to or around the foundation of the home

The study goes further to understand the extent to which flood risk is present within an area. We refer to this as an areas exposure index. Appendix A pictorially displays the vulnerability of the study area in terms of flood risk exposure. The exposure levels are defined by the percentage of homes within a defined catchment

that are exposed to one or more forms of flooding (as set out above). The exposure scale is set as follows:

FLOOD RISK	EXPOSURE INDEX	RELATIVE DESCRIPTION
Low	Less than 20%	Approx. 1 home in 10 exposed to flood risk
Low/Moderate	20% to <40%	Approx. 2 to 3 homes in 10 exposed to flood risk
Moderate	>40% to <60%	Approx. 4 to 5 homes in 10 exposed to flood risk
High	60% or more	Approx. 6 homes or more in 10 exposed to flood risk

With this understanding, minor and major work projects could be and have been developed to respond to and mitigate these vulnerabilities. While more work is required to define, prioritize and cost the major works projects, the minor works projects are being presented to Council through this update report with the recommendation to fund these projects. Should these projects be funded, they will be advanced to implementation in 2019/2020, allowing the targeted community areas to receive the benefit of flooding risk exposure reduction at the earliest opportunity.

COMMENT/OPTIONS:

The modeling work associated with Phase 2 of the *SWMP* included a functional and capacity performance assessment of both the minor and the major system. Existing conditions were based on GIS data and mapping as well as historical engineering plans. Current land use was considered for the existing conditions model. Existing conditions were modeled to identify flood vulnerable areas and define the current flood risk exposure levels across the focus area. The level of service is based on service performance and considers the flood risk exposure with respect to that service operation. The focus area was broken up into 56 drainage networks comprised of about 3,000 smaller drainage areas and 262 km of storm sewer pipes. Each drainage network has been assigned a level of service ranking based on flood risk exposure as shown in Appendix A. The majority of the high risk exposure areas (shown in red) are a result of basement lateral flood risk.

Results of this modeling work are currently being evaluated to develop a prioritized mitigation strategy that includes bot minor and major work projects. Major work projects will include the replacement and upsizing of storm sewers, storage tanks, and diversions. Consideration for these larger mitigation projects into the capital forecast will be required.

Minor work projects include items that can be implemented relatively quickly to reduce flood risk exposure. These minor works include the following:

- Installation of inlet control devices (*ICDs*) in street storm catch basins to reduce the potential for basement lateral flooding.
- Increasing the inflow capacity to the storm sewer system to mitigate localize ponding (approximately 21 locations); and
- Improved inlet grates to reduce the potential for debris blockages that can result in localized flooding (approximately 8 locations).

The minor works provide significant community benefit within a number of the community drainage areas and as such are being recommended for implementation within an advanced timeline outside of the typical budget process. Subject to securing funding these minor works projects could move ahead as early as late summer 2019/spring 2020. Appendix B highlights the level of service benefit expectations within several community drainage areas should these projects move into implementation.

Costs associated with the minor works projects are estimated at $1,600,000 which includes the following:

- Consulting assistance to oversee project implementation/inspection;
- Installation work of *ICD's* including associated maintenance work (sewer clean-out prior to installation); and,
- Implementation of higher capacity inlets and inlet improvements.

The minor works projects are unfortunately not applicable to all risk areas. Risk areas that do not benefit from minor works projects unfortunately require more substantive projects; major work projects. These projects will be brought forward as part of the final *SWMP* report. Major works projects include works such as:

- Storm sewer placement
- Storm sewer upsizing
- Major ditching and/or roadway re-profiling
- Holding tanks/temporary detention reservoirs

Additionally the major works projects will include the installation of water quality treatment facilities where appropriate and reasonable.

Status of the Storm Water Master Plan (final document)
The second and final *SWMP* public information meeting has been planned for the end of June 2019. This input, along with agency and other stakeholder will inform the final set of recommendations within the *SWMP.* The complete results and recommendations, including major project works, policy matters, and implementation strategy will be presented to Council in the fall 2019.

CONSIDERATIONS:

(A) PUBLIC

While there has been no public meeting or notification with respect to this update and/or funding request, should the recommended minor works program funding request be approved, staff will notify the benefitting areas of the planned works and timing so that the benefitting property owners are aware of this program.

With respect to Phase 2 of the *SWMP*, the second public meeting is currently scheduled for the end of June 2019 wherein the results of the functional assessment work and proposed improvement options will be shared with the public for their review and comment prior to bring forward the final *SWMP* report to Council in September.

(B) FINANCIAL

The cost associated with minor works projects identified herein have been estimated at $1,600.000. This works is comprised of the following:

Implementation of inlet control devices	$1,000,000
Implementation of higher capacity inlets (21 locations)	$ 260,000
Inlet improvements (8 locations)	$ 140,000
Consulting assignment	$ 120,000
Staff time	$ 80,000
TOTAL	$1,600,000

It is recommended that gas tax funding be allocated to the address the financial needs of the recommended minor works projects, allowing them to move forward in 2019/2020.

The *SWMP* will prioritize proposed major works projects with a focus on minimizing risk in the remaining high exposure areas. This priority approach will be used in the development of future capital budgets which will be presented to Council in September with the overall *SWMP* and further as part of the annual budget process.

(C) IMPACT ON OTHER DEPARTMENTS & USERS

The Finance department was consulted in the development of this update report. The departments of Engineering and Construction and Roads and Works were circulated on this report for information. Development Engineering staff will follow up with colleague departments and agencies (Region of Halton) as appropriate to ensure proper project planning/coordination.

(D) CORPORATE AND/OR DEPARTMENT STRATEGIC GOALS

This report addresses the corporate strategic goal to:

- enhance our natural environment
- continuously improve our programs and services

(E) COMMUNITY SUSTAINABILITY

This report is in support of the pillars of social (health and well-being), economic responsibility, and environmental sustainability.

APPENDICES:

Appendix A: Focus Area Network Performance – Existing Conditions
Appendix B: Focus Area Network Performance – Post Minor Works Project Implementation

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