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Appendix J

Drainage and Stormwater Management
Report

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Drainage and Stormwater Management Report

ReNew Golden Mile: Reconfigured & New Major
Streets Environmental Assessment Study

City of Toronto

September 25, 2026

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- Appendix B: Excerpts from the City of Toronto Basement Flooding Studies
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1 Introduction

The City of Toronto is undertaking a Schedule 'C' Class Environmental Assessment (EA) Study for the proposed new major streets and the reconfiguration and extension of the existing street network as identified in the Golden Mile Transportation Master Plan (TMP) and the Golden Mile Secondary Plan (GMSP). The study is referred to as ReNew Golden Mile: Reconfigured & New Major Streets Environmental Assessment Study. HDR has been retained by the City of Toronto to conduct this EA study, and the EA study limits are illustrated in **Figure 1-1**.

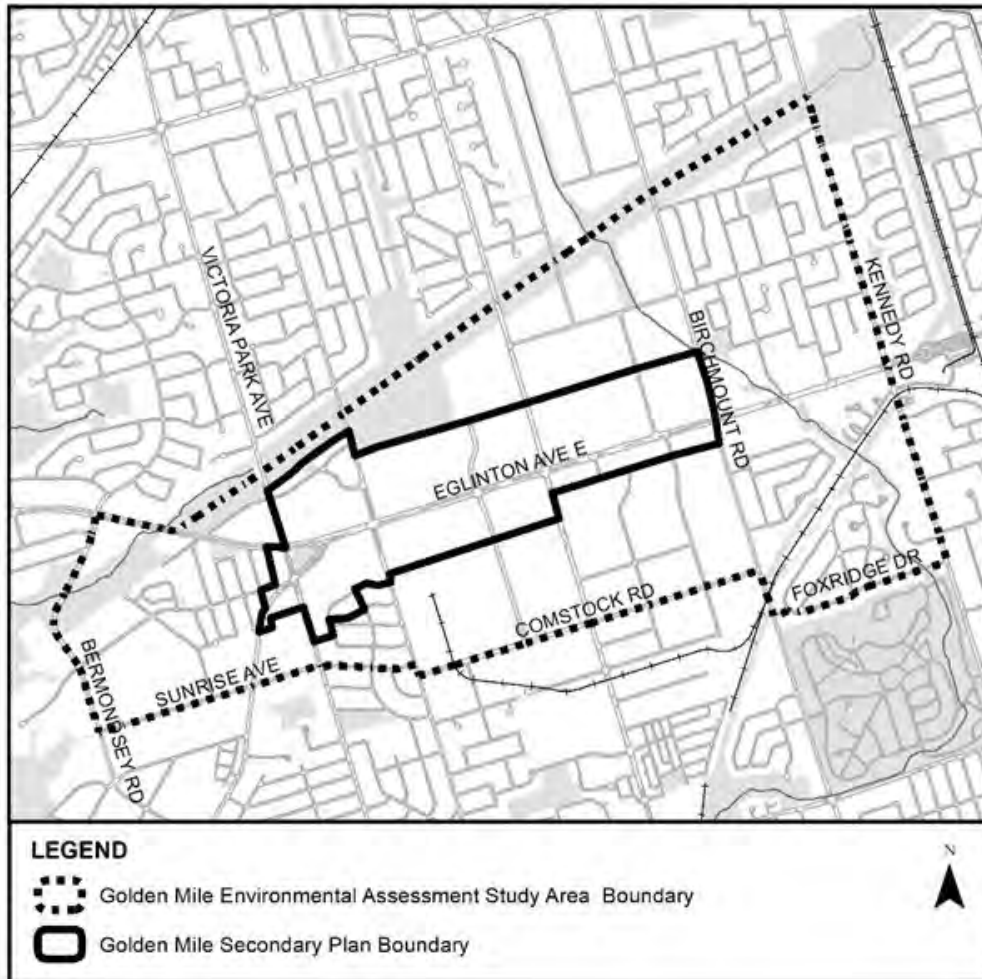


Figure 1-1. Study Area

The specific study area includes five road corridors, including their rights-of-way and immediately adjacent lands. Transportation improvements include:

- O'Connor Drive to Birchmount Road realignment and reconfiguration;
- Golden Mile Boulevard (a new east-west public street) from Victoria Park Avenue to Birchmount Road;
- Craigton Drive preferred alignment, widening, and reconfiguration;
- Thermos Road and Sinnott Road intersection design; and

- Jonesville Crescent/Craigton Drive/Ashtonbee Road from Eglinton Avenue to Birchmount Road streetscape improvements.

The objectives of this Drainage and Stormwater Management Report are to:

- Review available drainage information for existing conditions, including storm drainage area plans, reports and previous studies, plan-and-profile drawings and hydraulic and hydrologic models;
- Identify and characterize existing drainage patterns and transverse culvert locations;
- Identify the existing stormwater and drainage conditions in the study area, including sensitive areas and constraints;
- Establish design criteria for stormwater management to meet the requirements of the various approval agencies;
- Identify anticipated stormwater runoff quality and quantity impacts to the receiving watercourses/storm sewer system resulting from changes to the roadway cross-section (i.e. increased pavement area); and
- Propose an appropriate drainage system, transverse culvert upgrades, and a stormwater management strategy in conjunction with the proposed road widening to mitigate any potential impacts.

This Drainage and Stormwater Management Report has been prepared in support of the Class EA Study and is based upon a desktop review of available information, and detailed analyses are to be completed as part of subsequent stages of planning and design for the respective developments in the study area, complying with the Ministry of the Environment, Conservation and Parks (MECP), Toronto and Region Conservation Authority (TRCA), and the City of Toronto's Policies and Standards.

1.1 Background information

In preparation of this Drainage and Stormwater Management Report, the following documents were provided and reviewed:

1. City of Toronto Design Criteria for Sewers and Watermains, January 2021;
2. City of Toronto Wet Weather Flow Management Guidelines, November 2006;
3. Ministry of the Environment, Conservation and Parks Low Impact Development Stormwater Management Guidance Manual, January 2022 (Draft for Consultation);
4. Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Practices Planning and Design Manual, March 2003;
5. Ministry of Transportation (MTO) Highway Drainage Design Standards, January 2008;
6. Toronto and Region Conservation Authority (TRCA) Stormwater Management Criteria, August 2012;
7. Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) Low Impact Development Stormwater Management Planning and Design Guide, 2010;

8. Sustainable Technologies Evaluation Program (STEP) Low Impact Development Stormwater Management (LID SWM) Planning and Design Guide, 2020;
9. Draft Golden Mile Area Street Network Environmental Assessment Natural Sciences Report, prepared by LGL Limited, October 2022;
10. Golden Mile Secondary Plan Master Servicing Study Revision 11, prepared by The Odan/Detech Group Inc., July 2022;
11. City of Toronto Basement Flooding Remediation and Water Quality Improvement Master Plan Class EA – Study Area 34 Profile File Report, prepared by WSP, November 2018;
12. Toronto Basement Flooding Capacity Studies – Bundle D Area 47: Study Report, prepared by Stantec Consulting Ltd., June 2022; and
13. City of Toronto CUMAP Information, obtained April 2022.
14. City of Toronto Green Streets Technical Guidelines, November 2017

2 Existing Drainage Conditions

The background information listed in the preceding section has been reviewed to characterize the existing drainage and water resources system within the study area. Key findings are summarized below.

2.1 Watershed and Subwatershed

The study area is located within the Lower East Don (Wilson Brook) and Taylor Massey Creek subwatersheds of the Don River watershed. The Toronto and Region Conservation Authority (TRCA) has jurisdiction with respect to the natural hazards of the Don River Watershed. However, the road corridors within the EA Study Area are not directly within TRCA regulated areas, and the proposed transportation improvements for the five (5) roadway corridors do not have any transverse watercourse crossings. Consequently, the study area and drainage works are not anticipated to require permitting from TRCA under Ontario Regulation 41/24.

2.2 Land Use

The study area is highly urbanized and consists of a broad range of urban land use designations, including apartment neighbourhoods, mixed-use areas, natural areas, parks, general employment areas, core employment areas, and utility corridors.

2.3 Hydrogeological Conditions

No information was provided regarding the hydrogeologic conditions within the study area. Further details regarding the hydrogeological conditions will be provided when information from the field investigations is available at subsequent stages of planning and design.

During the detailed design stage, in-situ infiltration rate measurements should be completed at all proposed Low Impact Development (LID) facility locations to confirm the soil infiltration rates and groundwater levels. In general, underdrains are required where native soil infiltration rates are below 15 mm/hr, and a minimum separation of 1.0 m is required between the base of the LID facility and the seasonally high groundwater table.

2.4 Existing Drainage Pattern

The proposed O'Connor Road and Golden Mile Boulevard alignments are new roadway alignments through existing properties. Under existing conditions, the properties generally drain toward the existing storm sewers on Eglinton Avenue or the north-south roadways within the study corridor, including Victoria Park Avenue, Pharmacy Avenue, Hakimi/Lebovic Avenue, Warden Avenue, Thermos Road, Sinnott Road, and Birchmount Road. Based on the information from the Golden Mile Secondary Plan Master Servicing Study (2022), it is understood that the existing storm sewers within the study area convey the runoff to several outlet locations. East of Warden Avenue, the O'Connor Road alignment is situated on the existing Civic Road alignment and continues to Birchmount Road. Craigton Drive has an urban cross-section and is drained by a storm sewer system, which ultimately

outfalls to Storm Outlet 1, as per the Master Servicing Study (2022). Excerpts from the Master Servicing Study are provided in **Appendix A**.

2.5 Aquatic Resources and Wetlands

Based upon the information provided in the Natural Sciences Report prepared by LGL (LGL, 2022), it is understood that no fish were observed in Taylor Massey Creek, and is classified as indirect fish habitat only. No species at risk were identified within or in proximity to the study area.

2.6 City of Toronto Basement Flooding Studies

The project area falls within Areas 34 and 47 of the City of Toronto basement flooding study areas. The Basement Flooding Remediation and Water Quality Improvement Master Plan Class EA – Study Area 34 Project File Report, prepared by WSP (2018), and the Toronto Basement Flooding Capacity Studies – Bundle D Area 47: Study Report, prepared by Stantec Consulting (2022), were reviewed to identify key findings and recommendations to be included within this EA study. Relevant excerpts from both reports are included in **Appendix B** and a summary is provided below.

During detailed design, the recommendations from the abovementioned basement flooding studies shall be considered and/or implemented in consultation with the City of Toronto and Toronto Water.

2.6.1 Study Area 34

Based on the Project File Report (WSP, 2018), the following key findings relevant to this EA Study were identified:

- Under existing conditions, a total of six (6) major cluster areas were defined as flood-prone areas. The EA Study Area falls within Cluster 1, which is roughly bounded by the CN rail to the north, Victoria Park Avenue to the west, and Taylor-Massey Creek to the south and east.
- Preferred Remedial Measures were identified in Figure ES-1 of the Project File Report (ES-1), which include implementation of inlet control devices, high-capacity inlets, new catchbasins, and in-line storage in various locations. These remedial measures are to be considered and/or implemented during subsequent design stages in consultation with the City of Toronto and Toronto Water.

2.6.2 Study Area 47

Based on the Study Report (Stantec, 2022), the following key findings relevant to this EA Study were identified:

- A preferred solution was developed for the storm and combined sewer system, which included a combination of conveyance upgrades/diversions, catchbasin inlet capacity adjustments, outfall modifications and inline storage to meet the City's design criteria and minimize impact to receiving watercourses and sewers. With the preferred solution, there are still some areas within the EA Study Area where the pipes are undersized (i.e., along Pharmacy Ave. north of Eglinton Ave. East) or the hydraulic grade line freeboard is within basement level (i.e., Hakimi Ave. between Eglinton Ave. East and Ashtonbee Rd.) under 100-year storm conditions.

- With the preferred solution, under the 100-year storm conditions, there are several locations within the EA Study Area where the overland depth exceeds maximum allowable conditions (i.e., south-west corner of Pharmacy Ave. and Eglinton Ave. East).
- Proposed solutions are grouped into several Assignment Numbers for future implementation. The EA Study Area falls within Assignment Groups 47-02 and 47-10. Measures include sanitary sewer upgrades, inline storage, bulkhead dual manholes, and increased inlet capacity within and adjacent to the study area. These remedial measures are to be considered and/or implemented during subsequent design stages in consultation with the City of Toronto and Toronto Water.

3 Proposed Conditions

The preferred street designs for Craigton Road, Golden Mile Boulevard, and O'Connor Drive recommends an urbanized two-lane roadway (one lane in each direction). The overall corridors will accommodate cycle tracks, pedestrian clearways, and streetscaping/planting zones on both sides of the roadway. The roadway horizontal alignments of O'Connor Drive and Golden Mile Boulevard are new alignments through existing properties. Layby/parking areas are also proposed on Golden Mile Boulevard and Craigton Road.

Implementation, detail design and construction of the new and reconfigured streets are expected to be completed through the planning application process in parallel with the adjacent developments. As such, the vertical profiles of the new roadway alignments completed as part of this EA are to be confirmed and adjusted/revise as required as part of subsequent stages of planning and design for the adjacent developments. Preliminary vertical alignments have been established based on existing conditions topographic data; however, refinements will be required to set new street grades consistent with adjacent site grades. The preliminary roadway vertical alignments are presented in the Golden Mile Environmental Study Report (September 2026).

During detailed design, the recommendations from the aforementioned basement flooding studies referenced in Section 2.4 shall also be considered and/or implemented in consultation with the City of Toronto and Toronto Water.

3.1 Proposed Drainage Pattern

The proposed discharge locations were determined based on the recommendations provided in the Master Servicing Study (2022). Refer to the Drainage Plans in **Appendix C** for additional details.

Table 3-1 summarizes the approximate locations and size (i.e. area) for each of the contributing drainage areas.

Table 3-1. Summary of Drainage Areas

Drainage Area ID	Description	Drainage Area (ha)	Proposed Discharge Location as per Golden Mile Secondary Plan (GMSP) MSS, 2022
<i>Craigton Boulevard</i>			
C1	Craigton Drive, from Victoria Park Ave. to east of Victoria Park Ave.	0.21	Existing storm sewer on Craigton Drive (ultimate outfall to GMSP Outlet 1)
C2	Craigton Drive, from east of Victoria Park Ave. to Pharmacy Ave.	0.76	Existing storm sewer on Craigton Drive (ultimate outfall to GMSP Outlet 1)
C3	Craigton Drive and Pharmacy Ave. intersection	0.29	Existing storm sewer on Craigton Drive (ultimate outfall to GMSP Outlet 1)
C4	Ashtonbee Road, east of Pharmacy Ave.	0.39	Existing storm sewer on Craigton Drive (ultimate outfall to GMSP Outlet 1)
<i>Golden Mile Boulevard</i>			
G1	New alignment, from Victoria Park Ave. to east of Victoria Park Ave.	0.97	Existing storm sewer on Craigton Drive (ultimate outfall to GMSP Outlet 1)

Drainage Area ID	Description	Drainage Area (ha)	Proposed Discharge Location as per Golden Mile Secondary Plan (GMSP) MSS, 2022
G2	New alignment, from east of Victoria Park Ave. to Hakimi Ave.	2.16	Existing storm sewer on Craigton Drive (ultimate outfall to GMSP Outlet 1)
G3	New alignment, from Hakimi Ave. to Warden Ave.	1.05	Existing storm sewer on Warden Ave. (ultimate outfall to GMSP Outlet 4)
G4	New alignment, from Warden Ave. to east of Warden Ave.	0.46	Existing storm sewer on Warden Ave. (ultimate outfall to GMSP Outlet 4)
G5	New alignment, from east of Warden Ave to west of Thermos Rd.	0.50	Existing storm sewer on Eglinton Ave. (ultimate outfall to GMSP Outlet 3)
G6	New alignment, from west of Thermos Rd. to Thermos Rd.	0.61	Existing storm sewer on Eglinton Ave. (ultimate outfall to GMSP Outlet 3)
G7	New alignment, from Thermos Rd. to east of Thermos Rd.	0.53	Existing storm sewer on Ashtonbee Rd. (ultimate outfall to GMSP Outlet 2)
G8	New alignment, from east of Thermos Rd. to Birchmount Rd.	0.45	Existing storm sewer on Ashtonbee Rd. (ultimate outfall to GMSP Outlet 2)
O'Connor Road			
O1	New alignment, from west study limit to Victoria Park Ave.	0.80	Existing storm sewer on O'Connor Dr.
O2	New alignment, from Victoria Park Ave. to east of Victoria Park Ave.	0.84	Existing storm sewer on Pharmacy Ave. (ultimate outfall to GMSP Outlet 1)
O3	New alignment, from east of Victoria Park Ave. to Lebovic Ave.	1.91	Existing storm sewer on Pharmacy and Eglinton Ave. (ultimate outfall to GMSP Outlet 1)
O4	New alignment, from Lebovic Ave. to Warden Ave.	1.41	Existing storm sewer on Warden Ave. (ultimate outfall to GMSP Outlet 4)
O5	Civic Rd. alignment, from Warden Ave. to east of Warden Ave.	0.42	Existing storm sewer on Warden Ave. (ultimate outfall to GMSP Outlet 4)
O6	Civic Rd. alignment, from east of Warden Ave. to Manville Rd.	0.69	Existing storm sewer on Warden Ave. (ultimate outfall to GMSP Outlet 4)
O7	Civic Rd. alignment, from Manville Rd. to Sinnott Rd.	0.61	Existing storm sewer on Sinnott Rd. (ultimate outfall to GMSP Outlet 3)
O8	Civic Rd. alignment, from Sinnott Rd. to Birchmount Rd.	1.08	Existing storm sewer on Sinnott Rd. (ultimate outfall to GMSP Outlet 3)
Total		15.05	

3.1.1 External Areas

The proposed road corridors for O'Connor Drive, Golden Mile Boulevard, and Craigton Drive currently receive and convey storm runoff from external properties. As such, and as part of detailed design, a continuous flow path should be provided for any external drainage that enters the O'Connor Drive, Golden Mile Boulevard, or Craigton Drive right-of-way to continue to receive and convey external drainage to its respective outlet.

3.1.2 Minor Drainage System

To accommodate the proposed new streets and additional infrastructure within the right-of-way, the proposed roadway runoff will be collected by a series of catchbasins and will be conveyed by curb and gutter and storm sewers. Where feasible, the existing drainage outlet locations will be maintained to minimize changes to the existing overall drainage pattern and system. The storm sewer system for the various road classifications shall be designed in accordance with Table 16 of the City of Toronto Design Criteria for Sewers and Watermains (January 2021).

For the storm sewer discharge locations, refer to the Drainage Plans in **Appendix C**.

3.1.3 Major Drainage System

The roadway design should be designed in accordance with Table 17 of the City of Toronto Design Criteria for Sewers and Watermains (January 2021). Roads may be used for major system overland flow conveyance during the 100-year storm subject to the following criteria:

- Local and collector roads: maximum depth of ponding shall be the lesser of 0 cm above the crown of road or the water level up to the right-of-way limit;
- Arterial Roads: No barrier curb overtopping and flow spread must leave at least one lane free of water in each direction

Determination of the allowable flow for the major system shall be designed in accordance with the requirements as set out in the City's Wet Weather Flow Master Guidelines in addition to the requirements set out in the City's Design Criteria for Sewers and Watermains. For major system flow route details, refer to the Drainage Plans in **Appendix C**.

4 Stormwater Management Plan

The stormwater management plan for the study area within the Don River watershed shall be developed to comply with the City of Toronto's Wet Weather Flow Management Guidelines, Toronto and Region Conservation Authority (TRCA) Stormwater Management Criteria, and MECP Stormwater Management Guidelines.

4.1 Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA)

A CLI-ECA includes performance criteria for development and retrofit scenarios for any stormwater management works within a municipality. In the City of Toronto, the ECA for the municipal SWM system is ECA Number 010-S701 dated June 2, 2025. The CLI-ECA covers the City's municipal stormwater conveyance and management network which includes storm sewers, ditches, culverts, oil-grit separators, storage facilities and stormwater management ponds. It is anticipated that the proposed works for this EA Study would be categorized as development under the CLI-ECA and subject to the approval requirements of the CLI-ECA. Any stormwater management works on municipal roadways in the City must meet the Wet Weather Flow Management Guidelines.

The Low Impact Development Stormwater Management Guidance Manual (2022) was released by the Ministry of the Environment, Conservation and Parks in January of 2022 for consultation. This manual is intended to be used as a baseline reference document in the review of stormwater management applications for approval, providing flexible guidance for implementing a holistic treatment train approach to stormwater management in Ontario.

Runoff volume control targets in Ontario, which are the local 90th percentile precipitation event, have been established within the Guidelines (2022) to maintain the natural hydrologic cycle to the greatest extent possible. The Guidelines outline a hierarchical approach to the application of measures to achieve the Runoff Volume Control Target for new development, redevelopment, linear development, and stormwater retrofit projects. The steps for applying the Runoff Volume Control Target are described as follows:

1. Control Hierarchy Priority 1 Retention – LID retention practices which utilize the mechanisms of infiltration and/or evaporation to recharge groundwater and return collected rainwater to the atmosphere. The target volume is controlled and does not become runoff.
2. Control Hierarchy Priority 2 LID Filtration – LID technologies which utilize appropriate filter media. The controlled volume is filtered and released to municipal sewer networks or surface waters at a reduced rate and volume.
3. Control Hierarchy Priority 3 Conventional Treatment – other stormwater technologies which utilize filtration, hydrodynamic separation and/or sedimentation to detain and treat runoff. The controlled volume is treated and released to municipal sewer networks or surface waters at a reduced rate.

In recognition of potential site conditions that pose challenges for LID practices, the Draft Guidelines (2022) acknowledge that stormwater management for constrained sites are to be provided to the maximum extent possible (MEP). For linear development sites with restrictions, where management of 100% of the geographically specific 90th percentile precipitation event is not feasible through

Better Site Design, Pollution Prevention, and Control Hierarchy Priorities 1 and 2, the alternative is to achieve volume control to the MEP. After the application of LID retention and filtration practices to the MEP, Control Hierarchy Priority 3 measures can be applied to meet the remaining stormwater control requirements.

4.2 Runoff Volume Control

It is understood that the Draft LID Stormwater Management Guidance Manual (2022) indicates a runoff volume control target of 27 mm – 28 mm, which is the regionally specific 90th percentile precipitation event depth. A depth of 28 mm should be used for stormwater management calculation purposes at subsequent stages of planning and design.

4.2.1 Water Quality Control

It is generally understood that watercourses within the Don River watershed require stormwater quality control to an “Enhanced” standard of treatment, which equates to 80% Total Suspended Solids (TSS) removal.

The City of Toronto’s Wet Weather Flow Management Guidelines (2006) and the MECP SWM Planning & Design Manual (2003) water quality target for TSS is also the long-term average removal of 80% of TSS on an annual loading basis from all runoff leaving the proposed development site.

4.2.2 Water Balance

Based on the City of Toronto’s Wet Weather Flow Management Guidelines (2006), the minimum on-site runoff retention is all runoff from the 5 mm rainfall event on site through infiltration, evaporation, and/or rainwater reuse. The water balance target, to the extent practicable, is to retain stormwater on-site to achieve the pre-development annual volume of overland runoff. The maximum allowable annual runoff volume from any development site is 50% of the total average annual rainfall depth.

4.2.3 Erosion Control

Based on the City of Toronto’s Wet Weather Flow Management Guidelines, for watersheds (other than the Rouge River) where new large development blocks (site area greater than 5 ha) discharge in proximity (within 100 m) of natural watercourses, the proponents are required to complete an Erosion Analysis Report to determine the erosion control criteria for the sites. For sites where this is not feasible (this condition must be reviewed and agreed by City staff), runoff from a 25 mm design storm shall be detained on-site and released over a minimum of 24 hours.

4.3 Water Quantity Control

Based upon the City’s WWFMG guidelines and the recommendations from the Toronto Basement Flooding Remediation and Water Quality Improvement Master Plan Class EA – Study Area 34 Profile File Report, appropriate quantity control measures will need to be provided in order to ensure that potential flooding along the municipal road system and private properties are mitigated. This may require that adjacent developments will overcontrol peak flow rates on-site to account for uncontrolled runoff from the road right-of-way. However, further hydrologic analysis is required during the detailed design stage to assess the post-development drainage condition and determine

the level of runoff storage required to meet the WWFMG and Basement Flooding criteria. Appropriate quantity control measures (i.e., online storage pipes) shall be implemented, if required, for the runoff from the municipal roadway, in consultation with the City of Toronto and Toronto Water.

4.4 Proposed Stormwater Management Strategy

Various Best Management Practices (BMPs) for stormwater management were reviewed and assessed for their applicability on this project. Due to the nature of the proposed works (i.e. linear transportation corridor) and the limited space within the roadway right-of-way, bioretention planters between the roadway and active transportation facilities parallel to storm sewers are proposed for quality treatment, erosion control, runoff volume control, and water balance. Oil-grit separators can also be considered for water quality treatment of existing surfaces to provide full stormwater quality treatment to the maximum extent possible of both existing and additional impervious surfaces.

The Stormwater Management plan has been prepared under the assumption that the active transportation facilities will be impervious, and bioretention systems and online storage pipes will be required to mitigate the impacts of increased runoff.

4.4.1 Bioretention Systems

Bioretention systems allow for stormwater filtration, infiltration, and evapotranspiration from tree and vegetative plantings. For roadway applications, these can take the form of sub-surface modular units that are filled with lightly compacted soil within a trench situated beneath the roadway boulevards. The bioretention system consists of a filter bed, which is a mixture of sand, fines, and organic material to support vegetation and promote evapotranspiration by allowing surface runoff to route through a surface inlet or a subsurface distribution pipe via gravity within the trench. Soil filtration, bioremediation, and evapotranspiration will occur as water filtrates through the soil from the perforated distribution pipe. The City of Toronto has successfully employed bioretention techniques on previous roadway projects associated with the addition of sub-surface modular units/soil cell systems.

Bioretention cells with street trees or other vegetative plantings are proposed for this project, and conceptual plan and profile schematics of the bioretention cell system are provided in **Appendix D**. Overflow from the bioretention systems will discharge back to the storm sewer system. The design criteria specified in the LID SWM Planning and Design Guide (STEP, 2020) shall be applied to determine the depth and footprint area for the bioretention systems.

The stone reservoir within the bioretention system below the underdrain pipe will retain water to meet the water balance and erosion control targets. Additionally, the ratio of the impervious drainage area to footprint area of the bioretention system should be between 5:1 and 20:1 to limit the rate of accumulation of fine sediments and thereby prevent clogging. Pre-treatment of the runoff directed to the bioretention system using catchbasin inserts (e.g. CB Shield) is recommended.

The bottom of the bioretention system should be one (1) metre above the seasonally high groundwater table. Further investigation should be completed during the detail design stage to confirm adequate separation at each location and the infiltration rate of the native soils using in-situ infiltration testing, to ensure the maximum allowable depth of the reservoir is not exceeded.

LID measures could also be implemented in areas with high groundwater to exclusively provide quality control through filtration, but the facilities should be lined with an impermeable liner if

adequate separation cannot be obtained. However, this would be a Priority 2 measure in the hierarchical approach for runoff volume control, as the LID would be provided only filtration, not infiltration.

During detailed design, the feasibility, location and design of the bioretention systems will need to be confirmed based on the additional available information to ensure that all design criteria can be met. Where the provided storage volume is insufficient for providing runoff volume control for both existing and additional pavement, oil-grit separators are to be implemented and sized to treat runoff from existing paved surfaces to a “Basic” level of treatment, as a minimum.

4.4.2 Online Storage Pipes

As indicated in **Section 4.3**, further hydrologic analysis is required during the subsequent design stages to assess the post-development drainage condition and determine the level of runoff storage required to meet the WWFMG and Basement Flooding criteria. Appropriate quantity control measures, such as online storage pipes, shall be implemented during detailed design, if it is determined that quantity control is required for the roadway runoff.

4.4.3 Supplemental BMP Measures

Opportunities to implement supplemental stormwater best management practice (BMP) measures to augment the treatment proposed by the bioretention systems using a treatment train approach, including measures to mitigate water temperature impacts, are to be considered at subsequent stages of planning and design.

The supplemental BMP measures shall be designed based on the site conditions and further geotechnical and hydrogeological investigations undertaken during the next phase of design. Any low impact development measures shall meet the design criteria as per City of Toronto Green Infrastructure Guidelines.

A list of potential LID measures and BMP's to support the treatment train approach that may be considered for implementation within the study corridor during the detailed design is provided as follows:

Oil-Grit Separators

Oil/grit separator (OGS) units combine a storage chamber for sediment trapping and oil separation with drainage inlets for intercepting or receiving roadway stormwater runoff. Oil/grit separator units should be Canadian ETV verified and sized to provide at least 60% of TSS removal for the Canadian ETV distribution. Oil-grit separators can be used to support a treatment train approach for water quality control, as well as for retrofits to existing pavement areas as a best-efforts approach where no quality control is currently provided.

Permeable Pavers

The use of permeable material (e.g. permeable pavement, permeable concrete) should be considered for the active transportation facilities to minimize the increased impervious surface area within the corridor. Since these are not heavy load bearing surfaces, the use of permeable pavement will not impact the functionality of the proposed design. Additional details and specifications for the permeable material are to be included in the detailed design stage.

Subsurface Exfiltration Systems

Exfiltration Systems are linear conveyance facilities parallel to storm sewers, which consist of a trench lined with geotextile fabric and clean granular fill (50 mm clear stone) and include a perforated inlet pipe connected to the upstream catchbasin or manhole. In addition to removing TSS particles and providing water balance through infiltration, the granular filter within the trench reduces water temperature impact and enhances stream base flows through groundwater recharge. It also contributes to controlling downstream erosion by reducing runoff volume and flow velocities. Where bioretention systems cannot be accommodated, exfiltration systems should be considered to maximize water balance. The feasibility of implementing this strategy will need to be reviewed at detailed design, based upon the seasonally high groundwater levels in the area.

4.5 Erosion and Sediment Control during Construction

Erosion and sediment control measures should be implemented and monitored through the construction period. Construction activities should be conducted during periods that are least likely to result in in-stream impacts to fish habitat.

Detailed erosion and sediment control plans will be required as part of the detail design component for all phases of the construction. The erosion and sediment control plans will be subject to review and approval by the various external agencies involved in the project, including the TRCA.

During construction, disturbances to watercourse riparian vegetation should be minimized. If riparian vegetation is removed or disturbed, erosion and sediment control measures such as silt fences, rock flow check dams and sedimentation ponds should be utilized to provide a maximum protection of local and downstream aquatic resources. These measures should be maintained during construction and until disturbed areas have been stabilized with seed and mulch. Additionally, topsoil should not be stockpiled close to the watercourses and water should not be withdrawn from these sensitive streams for construction purposes.

The site engineer and contractor will be responsible for delineating work areas and ensuring that erosion and sediment control measures are functional. In addition, the engineer will ensure that provisions related to fisheries and watercourse protection are met and that any required fish habitat compensation measures are implemented in accordance with the terms and conditions of the Fisheries Act Authorization.

5 Conclusions

The ReNew Golden Mile: Reconfigured & New Major Streets Environmental Assessment Study, recommends transportation improvements for five major streets, including O'Connor Drive, Golden Mile Boulevard, Craigton Drive, Thermos Road/Sinnott Road intersection, and Jonesville Crescent/Craigton Drive/Ashtonbee Road. The proposed design will include cycle tracks, pedestrian clearways, and streetscaping on both sides of the road. The proposed drainage design will include a new subsurface road drainage system, consisting of storm sewer systems with catchbasins along the curb lines to convey stormwater runoff to the various outfall locations along the corridor. The study area is within the area regulated by the TRCA, but there are no watercourse crossings for the five road corridors.

Implementation, detail design and construction of the new and reconfigured streets are expected to be completed through the planning application process in parallel with the adjacent developments. Therefore, the vertical profiles of the new streets designed as part of this EA are to be confirmed and revised as required. At the time of the preparation of this report, the drainage patterns of the roadways are understood to correspond with the discharge locations identified in the Master Servicing Study (2022).

The City of Toronto CLI-ECA for the municipal SWM system is ECA Number 010-S701 dated June 2, 2025. The CLI-ECA covers the City's municipal stormwater conveyance and management network which includes storm sewers, ditches, culverts, oil-grit separators, storage facilities and stormwater management ponds. It is anticipated that the proposed works for this EA Study would be categorized as development under the CLI-ECA and subject to the approval requirements of the CLI-ECA. Any stormwater management works on municipal roadways in the City must meet the Wet Weather Flow Management Guidelines. Recommendations from the basement flooding studies in **Section 2.6** shall also be considered and/or implemented in consultation with the City of Toronto and Toronto Water.

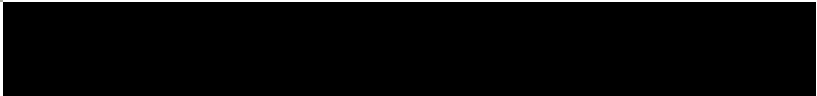
Stormwater best management practices, including bioretention systems, and online storage pipes, are proposed to provide stormwater quality treatment, water balance, erosion control, and quantity control of the runoff from the right-of-way. The available volume of runoff storage within the bioretention facility above and below the underdrain will be determined during subsequent stages of design based on the confirmed maximum allowable depth of the reservoir and the underdrain configuration. During detailed design, the feasibility, location and design of the bioretention systems will need to be confirmed based on additional available information to ensure that all design criteria can be met. This specifically includes the following:

Hydrogeological Assessments. *During the detailed design stage, in-situ infiltration rate measurements should be completed at all proposed Low Impact Development (LID) facility locations to confirm the soil infiltration rates and groundwater levels. In general, underdrains are required where native soil infiltration rates are below 15 mm/hr, and a minimum separation of 1.0 m is required between the base of the LID facility and the seasonally high groundwater table.*

Opportunities to implement supplemental BMP measures to provide additional water quality control, water temperature mitigation, and support a treatment train approach may be considered during the next phases of design in series with the proposed measures to enhance the overall water quality objectives.

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Appendix A: Excerpts from the Master Servicing Study (2022)

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PROPOSED REDEVELOPMENT OF GOLDEN MILE
EGLINTON AVENUE, SCARBOROUGH DISTRICT
CITY OF TORONTO, ONTARIO

MASTER SERVICING STUDY

WITH PREJUDICE

Prepared For:

GOLDEN MILE LANDOWNERS GROUP

(CHOICE REIT)
(COSMETICA)
(DREAM)
(KINGSETT)
(MADISON)
(STARLIGHT INVESTMENTS)
(SMARTCENTRES)
(RIOCAN)
(YORKREAL HOLDING INC.)
(MATTAMY)

Original	February 20, 2020
Revision 1	March 13, 2020
Revision 2	April 21, 2020
Revision 3	April 24, 2020
Revision 4	June 8, 2020
Revision 5	October 8, 2021 (addressed City Comments)
Revision 6	October 28, 2021 (as per Civica update; revised Outlet 5 analysis)
Revision 7	November 19, 2021 (as per Consortium Comments)
Revision 8	March 2, 2022 (as per Mediation with the City of Toronto)
Revision 9	May 31, 2022 (as per Mediation with the City of Toronto)
Revision 10	July 14, 2022 (as per discussions with City of Toronto, ECS)
Revision 11	July 20, 2022 (as per City of Toronto, ECS)

5.0 STORM DRAINAGE AND STORM WATER MANAGEMENT:

INTRODUCTION

The present GMSP site drains approximately 310 ha of land through a series of storm sewers that outlet to a series of trunk sewers or drainage ditches/creeks. The existing GMSP surface is predominately impervious. The redevelopment of the GMSP will reduce the impervious area. The SWM offered for the fully built out GMSP site will follow the City of Toronto wet weather guidelines. This Storm Water Management (SWM) Design section has been prepared in support of the intensification and redevelopment of the Golden Mile Site. It is proposed to intensify the Site with mixed used development. The SWM offered for the fully built out GMSP site will follow the City of Toronto wet weather guidelines. The Quantity control criteria of controlling flow on site up to 100 year storm to a 2 year flow calculated using a time of concentration of 10 minutes and a runoff co-efficient of 0.5. The quantity control criteria should greatly reduce the flow to the existing sewers.

In addition to contacting the City, as part of our background investigation, the following policies/Guidelines and studies will be reviewed/implemented for this Site:

- MOE Storm water Management Practices, Planning and Design Manual, March 2003.
- **CITY OF TORONTO ENGINEERING DESIGN STANDARDS AND CRITERIA MANUAL**, September, 2018.
- **CITY OF TORONTO WATER AND WASTE WATER MASTER PLAN**, by WSP and XCG, March 2017.
- **CITY OF TORONTO "Wet Weather Flow Management Guidelines"**, November 2006.
- **CITY OF TORONTO "DESIGN CRITERIA FOR SEWERS AND WATERMAINS"**, January 2021
- Basement Flooding Study Area 34 EA –Prepared by WSP and Civica, November 19, 2018.
- Golden Mile Secondary Plan (GMSP) Study – City of Toronto, prepared by SvN Architects + Planners Inc., May 2017

EXISTING SYSTEM

The Golden Mile Secondary Plan (GMSP) existing storm sewer connections drain to the following trunk /ditch/creek connections:

1. Part of South west area and North West area drains to a ditch at Victoria Park Avenue and Gattineau Hydro Corridor to the Don River.
2. North east area drains to Taylor Massey Creek at Birchmount Road and Ashtonbee Road.
3. South east area drains to storm sewer system in EA study area 34 which drains along Sinnott Road to Comstock Road then east to hydro corridor east of Birchmount Road.
4. South area drains to Storm sewer in EA study area 34 which drains to ditch west of Warden Avenue north of St. Clair Avenue to Taylor Massey Creek.
5. Part of South west area drains to Trunk sewer system in EA study area 34 at Edge Park Avenue west of Victoria Park.

Refer to Exhibit 23, for the layout of the existing storm sewers within the subject site, and the location of the sewer connections to the City's trunk storm sewer system or creek outlets.

PRE DEVELOPMENT ANALYSIS:

The premise of the analysis and evaluation is to determine the storm sub catchments discharging to the existing sewer system. If the existing storm sewers can contain the 2 year and 100 year storms then a 2D model will not be required. If there is surcharge and subsequent spill a 2D model will be added to evaluate the system.

Procedure is to create a 1D dynamic model from the City's Study area 34 model and as recorded drawings. The sub-catchment areas were determined from the City EA model and work performed by Odan/Detech on several sites within the study area.

The 2D grid is based on the potential spill paths. The topology required for 2D modelling is based on City's spot elevation grid given to Odan/Detech. Lidar info is preferred however was not made available to Odan/Detech. Lidar points are very dense and create very good DTM compared to sparser total station data which requires higher scrutiny in the creation of DTM.

The hydrology was input into the 1D model. It is not certain that all sites are free flowing or have some form of onsite controls. We are assuming that all Sites are free flowing. If some are controlled the situation will certainly be better.

POST DEVELOPMENT ANALYSIS

The flow in the redeveloped site will be under City Wet Weather control guidelines controlling flow on site up to 100 year storm to a 2 year flow calculated using a time of concentration of 10 minutes and a runoff co-efficient of 0.5. The onsite controls will greatly reduce the flows and lower the HGL in the sewers. Quantity control for the private development blocks must be over controlled, wherever possible, to cover for the proposed public roads.

The existing sewer model will be modified to show on site controls and storage.

The tributary areas in the Post developed condition are 4.69 ha greater due to adding 3.60 ha of storm runoff area to the storm sewer, from that entering the combined sewers on Victoria Park and Manville Road. This area is at Eglinton Square (Victoria Park and Eglinton Avenue) and at Manville Road and Comstock Road area. In addition some flow from Eglinton Square to Eglinton Avenue will be picked up in the post developed condition and the Craighton tot lot was included in the post developed system. This adds up to 4.69 ha (approximately).

The intent of the modelling is to show/compare the existing system to that of a fully developed GMSP with complete City wet weather flow guidelines implemented. The model will show that as development takes place the existing storm system is improved considerably including surface surcharge from the sewers. It is the intent of this report that the minor and major drainage patterns more or less mimic the existing pattern, however if a better solution such as separating storm flow from combined sewers can be achieved, this will be the preferred solution. In addition minor changes in flow tributary areas in order to achieve better site grading and reduce flows into over stressed sewers will be deemed appropriate.

It should be noted the work in this report is not a final design and that stormwater management will be further evaluated during detail design.

Exhibit 23- XPSWMM EXISTING MODEL

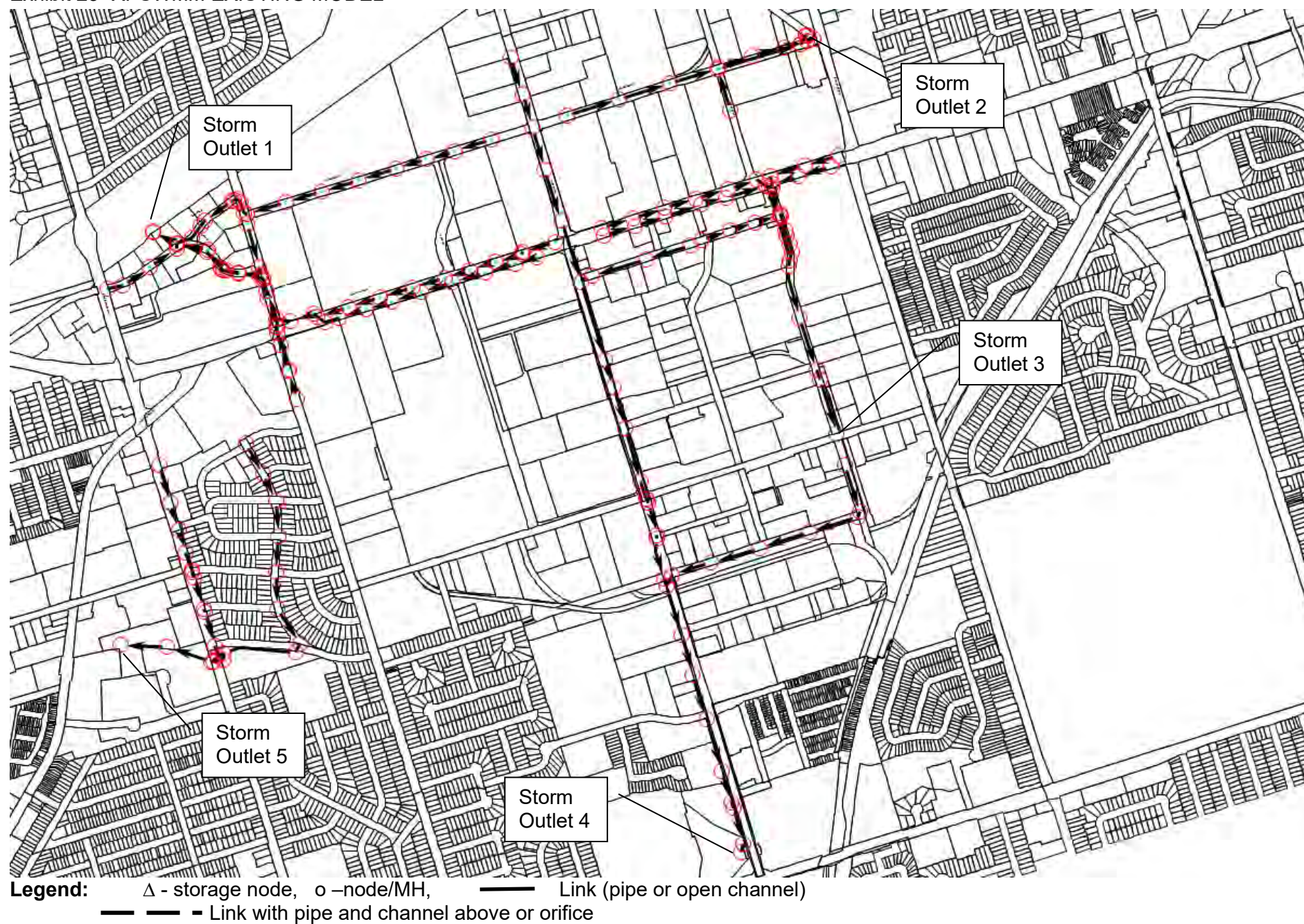


Exhibit 24- XPSWMM EXISTING MODEL TRIBUTARY AREA



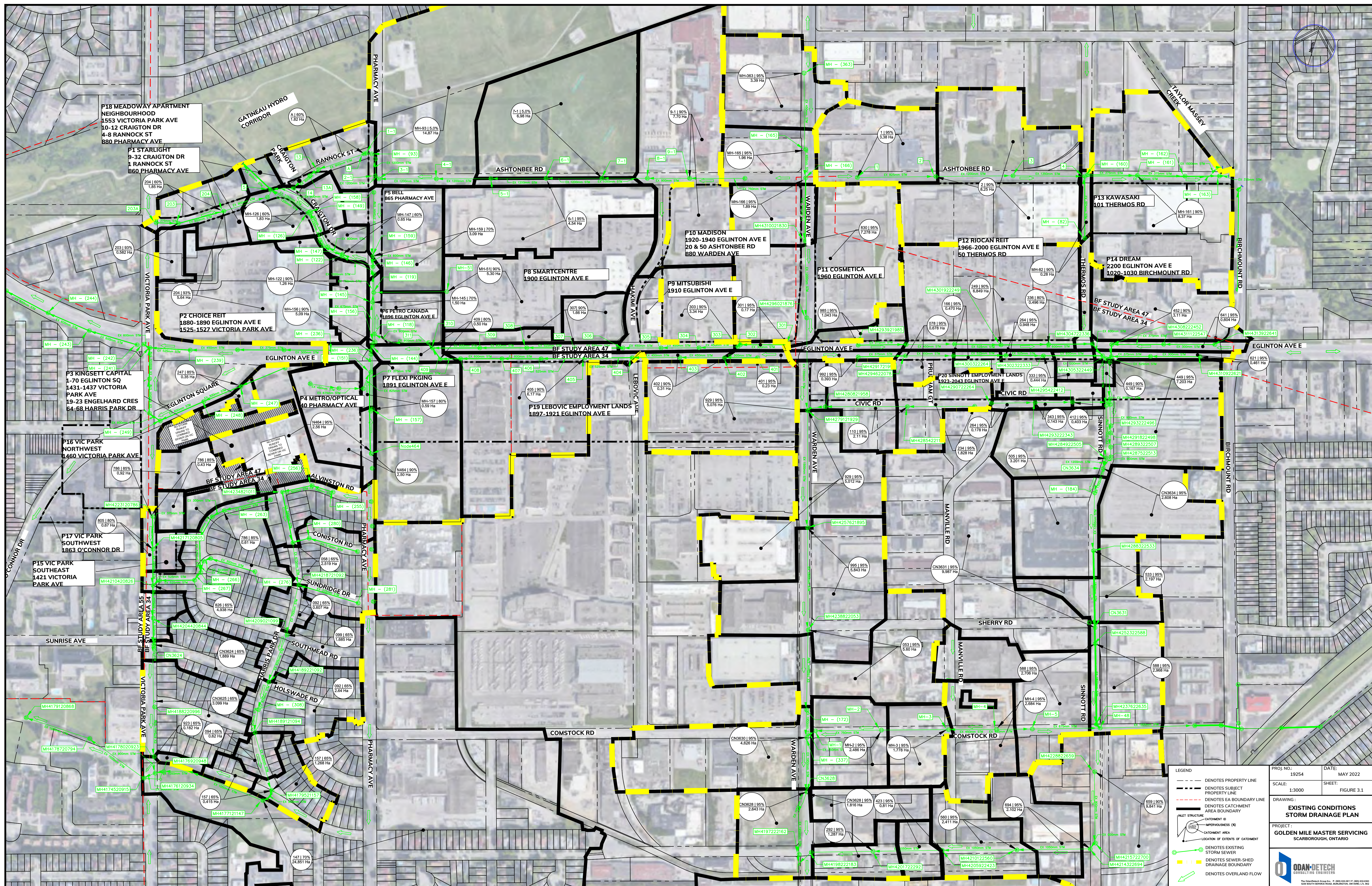
OVERLAND FLOW ROUTES DISCUSSION:

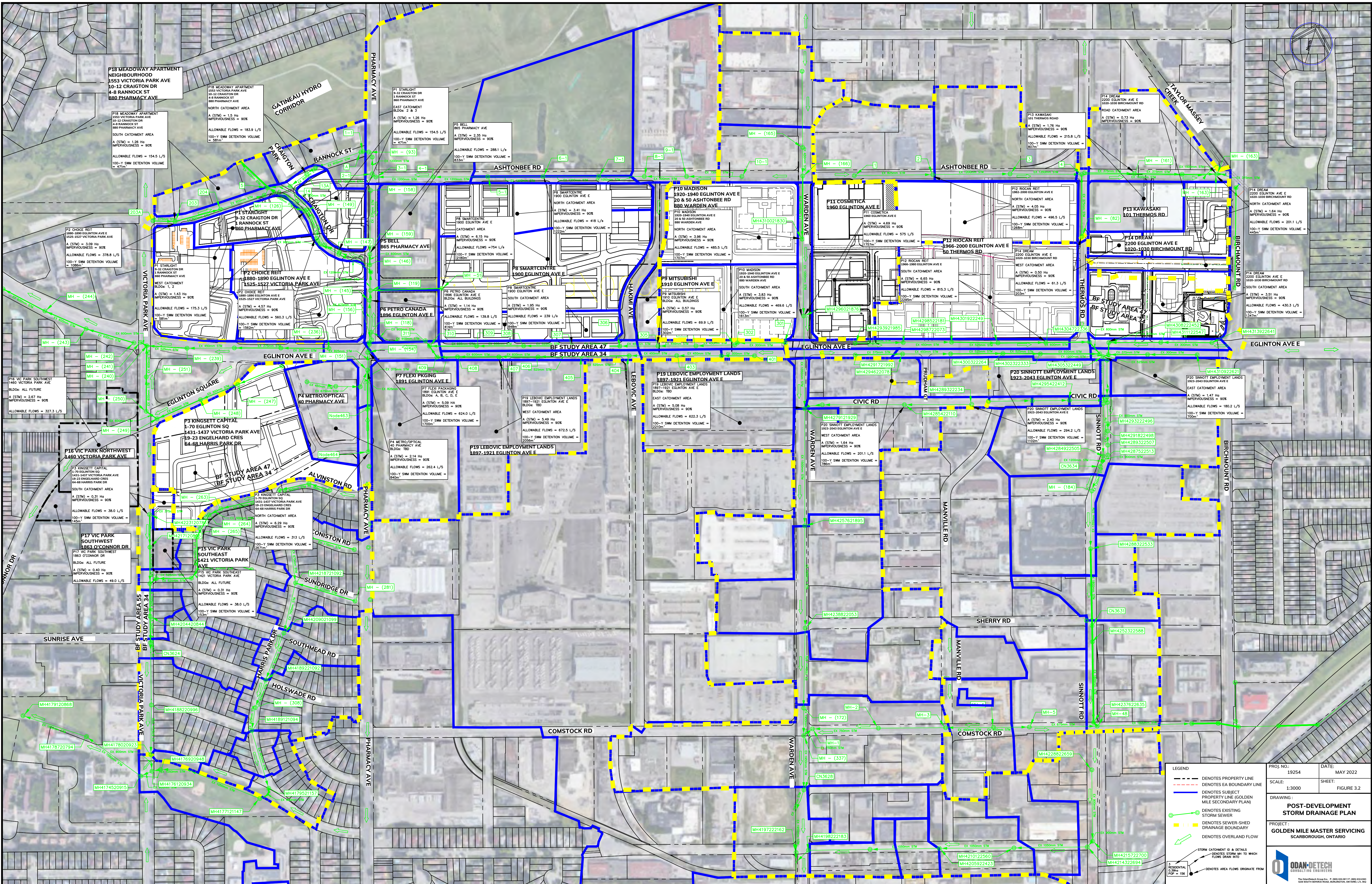
The following are the problematic areas as spills: Refer to Exhibits 28 to 31 (2D depth maps)

1. Eglinton Avenue east of Pharmacy
2. Craghton Drive west of Pharmacy
3. Pharmacy at Ashtonbee
4. Manville Road and Civic Road
5. Sinnott Road south of Civic road at the bend
6. Warden Avenue north of Eglinton and south of Ashtonbee

The above hot spots spill onto private property. Note as development proceeds and the Flow into the sewers is reduced via WWF guidelines the above all improve. Some sites are lower than the adjacent roads. The redevelopment of GMSP will greatly reduce the spill and will push the spill back to the ROW. Proper grading per City standards will call for positive drainage.

The following road profiles (exhibits 54 to 57) show why the spills occur. For plan locations of spills see Exhibits 28 to 33.





LEGEND

- DENOTES PROPERTY LINE
- - - DENOTES EA BOUNDARY LINE
- DENOTES SUBJECT PROPERTY LINE (GOLDEN MILE SECONDARY PLAN)
- DENOTES EXISTING STORM SEWER
- DENOTES SEWER-SHED DRAINAGE BOUNDARY
- DENOTES OVERLAND FLOW
- STORM CATCHMENT ID & DETAILS
- DENOTES FROM MH TO WHICH FLOW DRAIN INTO
- DENOTES AREA FLOWS ORIGINATE FROM

RESIDENTIAL DRAINAGE POP = 156

PROJ. NO. 19254
SCALE: 1:3000
DRAWING: POST-DEVELOPMENT STORM DRAINAGE PLAN
PROJECT: GOLDEN MILE MASTER SERVICING SCARBOROUGH, ONTARIO

DATE: MAY 2022
SHEET: FIGURE 3.2

ODAN-DETECH CONSULTING ENGINEERS

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Appendix B: Excerpts from the City of Toronto Basement Flooding Studies

CITY OF TORONTO

BASEMENT FLOODING REMEDIATION AND WATER QUALITY IMPROVEMENT MASTER PLAN CLASS EA - STUDY AREA 34

PROJECT FILE REPORT

NOVEMBER 19, 2018



BASEMENT FLOODING REMEDICATION AND WATER QUALITY IMPROVEMENT MASTER PLAN CLASS EA - STUDY AREA 34 PROJECT FILE REPORT

CITY OF TORONTO

PROJECT NO.: 151-06268-02

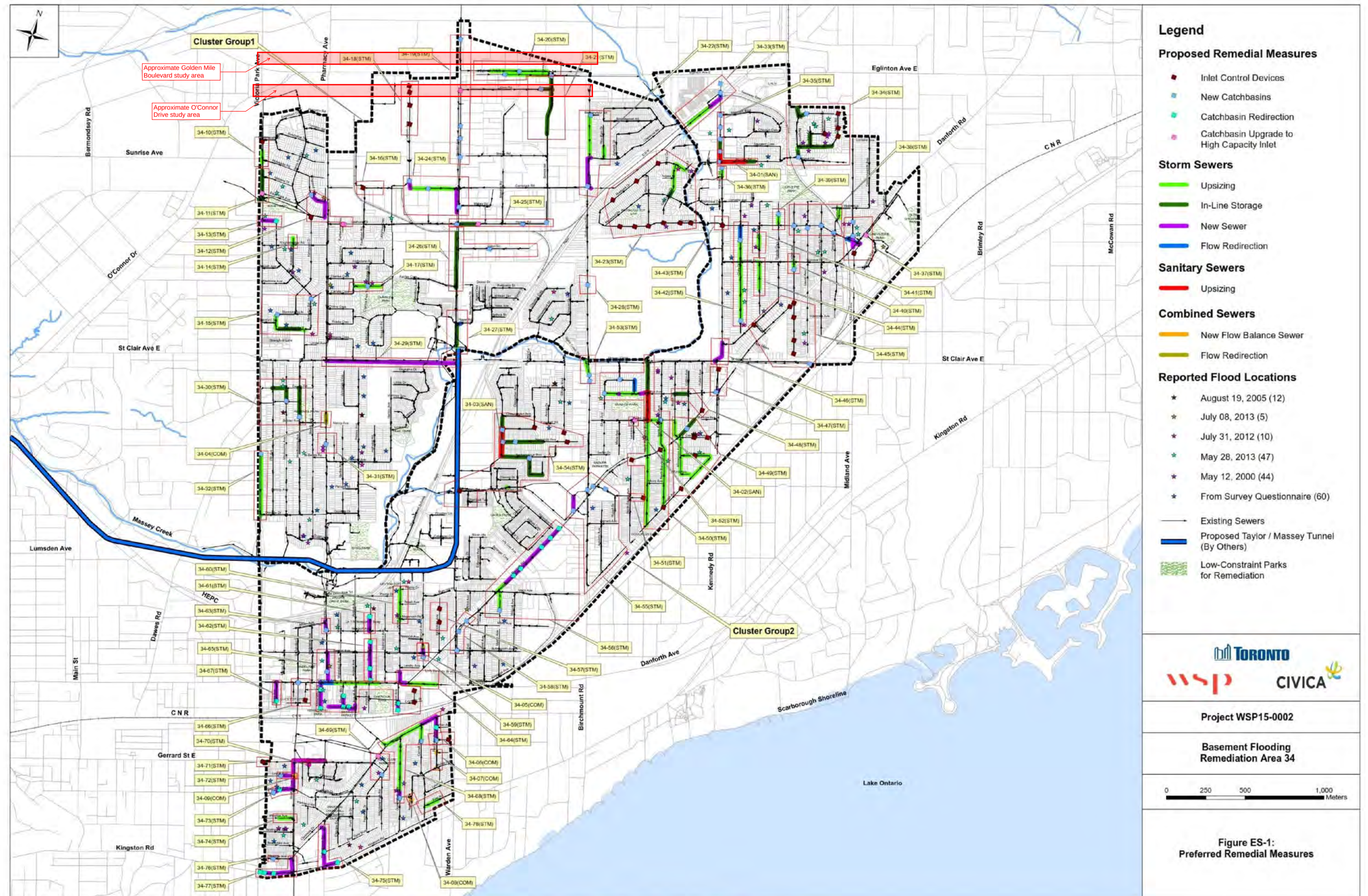
DATE: NOVEMBER 2018

WSP

100 COMMERCE VALLEY DRIVE WEST

THORNHILL, ON, CANADA L3T 0A1

WSP.COM



sewers are located in the following streets: Alvinston Road, Penaire Street, Victoria Park Avenue, August Avenue, Lucy Avenue, Gerrard Street, Manison Avenue, and along the Runnymede Lands, between the CNR and Gerrard Street.

The performance of the combined sewer overflows in Area 34 were evaluated using the typical year rainfall to determine compliance with the Ministry of Environments Procedure F-5-5. Of the 24 CSO locations, 22 meet the 90% control requirements, while 2 locations do not. These locations are shown on **Figure A-33 in Appendix A**.

4.3.4.3 STORM SEWER SYSTEM

The ramped analysis for the storm sewer system was completed up to the 100-year design storm and **Figure A34 in Appendix A** illustrates the results. As shown in the figure, the storm sewer system exceeded its capacity at multiple locations for events with a return period lower than the 100-year storm. These locations are summarized in **Attachment 4, TM#4**. The ramped analysis shows that the storm sewer capacity is exceeded at numerous locations for storms greater than the 5-year design storm; however, the majority of the storm sewers have the capacity to convey flows generated during the 100-year design storm.

The overall performance for the storm sewer system in Cluster 1, 5 and 6, west of Warden Avenue, is the 100-year design storm. In Cluster 4, south of St Claire Avenue East, the average performance for the storm sewer system is the 2-year design storm. Also, in Cluster 3, east of Kennedy Road, there are many locations where the storm system has a performance for the 2-year design storm.

The storm sewer system contains several shallow sewers within the study area, and most of these sewers are located west of Warden Avenue. Many of these shallow storm sewers are overloaded during the events with a return period lower than 100 years. The locations of the overloaded storm shallow sewers include the following streets: Chelwood Road, Chevron Crescent, Kennedy Road, Clela Drive, Hart Avenue, Midland Avenue, Eglinton Avenue East, Mystic Avenue, Mack Avenue, Danforth Avenue, Winston Avenue, St Clair Avenue East, Vernadale Crescent, Victoria Park Avenue, Alvinston Road and Edge Park Avenue.

4.3.4.4 COMBINED SEWER OVERFLOWS AND DUAL MANHOLE OVERFLOWS

The performance of CSOs and Dual Manhole Overflows (DMOs) under the five (5) historical events was analyzed to identify potential overflows that might cause the storm or the sanitary system to surcharge. For example, if the storm sewer overflows into the sanitary sewer system through a dual manhole overflow structure, the sanitary sewer system could become overloaded and cause basement flooding.

The results show that the majority of the CSOs do not overflow under the 2-year design storm, however, under the 100-year design storm, the May 12, 2000 event, the May 28, 2013 event and the August 19, 2005 event, more than 50% of the CSO structures are predicted to overflow. The locations of the CSO structures that overflow under the May 12, 2000 event contribute to the storm sewer on Danforth Avenue which is predicted to surcharge up to basement levels.

The results for DMOs indicate that during events smaller than the 5-year design storm, no overflows of the DMOs are predicted to occur. However, during the May 12, 2000 event and the May 28, 2012 event; one (1) dual manhole was predicted to overflow. The location of this DMO structure is on Marta Avenue, where the HGL in the sanitary sewer system is within basement levels.

4.3.5 IDENTIFICATION OF PROBLEM AREAS

Areas susceptible to basement flooding were defined based on historical flooding reports and the simulation results for the May 12, 2000 and the 100-year design storm. As per the Basement Flooding Design Criteria, a problem area caused by the sanitary sewer system is defined when the HGL is above basement levels under the May 12, 2000 event. For the combined and storm sewer systems, the same concept applies under the 100-year storm. Problem areas caused by the overland system are defined when, during the 100-year design event, the water level at the surface elevation is 0.15 m above the crown of the road for local roads, 0.10 m above the crown for collector road, and 0.15 m above the gutter for areas with reverse-sloped driveways. The predicted overland flow velocities were also analyzed and confirmed that these are within

the basement flooding design criteria; i.e., less than 2.0 m/s for water level up to 0.21 m above surface, and less than 3.0 m/s for water levels up to 0.09 m above surface.

As result, a total of six (6) major cluster areas were defined as flood-prone areas. Potential basement flooding caused by either system type is predicted at these cluster areas. **Figure A35 in Appendix A** shows the six (6) major cluster areas, and detailed description of the locations where basement flooding criteria are not met can be found in **Attachment 4, TM#4**.

- Cluster 1 is roughly bounded by the CNR to the north, Victoria Park to the west, and Taylor-Massey Creek to the south and east. The cluster contains predominantly combined sewers with some storm and sanitary sewers. There are several shallow storm sewers in Cluster 1 and these shallow sewers are one of the main reasons for the predicted basement flooding caused by the storm sewer during the 100-year design storm. For the combined sewer system, surcharge is expected due to lack of conveyance capacity.
- Cluster 2 is located on the north side of the study area. The cluster is roughly bounded by Eglinton Avenue East to the north, the CNR to the west, St Clair Avenue East to the south and Taylor-Massey Creek to the west. The predominant land use in the northwest corner of the Cluster is industrial, and open space (Pine Hills Cemetery) in the southeast corner. The sanitary system surcharges under the May 12, 2000 event but the HGL is not predicted to be at basement levels. Similar for the combined system, the HGL remains at acceptable levels under the 100-year design storm. However, the performance of the storm sewer of this area does not meet the City's basement flooding criteria at multiple locations and basement flooding is predicted, mainly due to bottlenecks and backwater conditions. Note that this Cluster does not contain any reverse-slope driveways.
- Cluster 3 is located in the northeast corner of the Study area roughly bounded by Eglinton Avenue East to the north, Massey Creek to the west, St Clair Avenue East to the south and Midland Avenue to the east. This Cluster does not contain any combined sewers. Under the May 12, 2000 event, high I/I rates predicted for this area and bottlenecks in sewers caused surcharging in the sanitary sewer system. Under the 100-year design storm, the permissible overland flow depth in Cluster 3 is exceeded in a number of sag areas and reverse-sloped driveways. Note that most of the areas where the overland flow depth criteria is exceeded have reported basement flooding.
- Cluster 4 is located on the east side of the study area, roughly bounded by St. Clair Avenue East to the north, Taylor-Massey Creek to the west, Lily Cup Avenue to the south and Raleigh Avenue to the west. Some locations with overloaded storm sewers and overloaded combined sewers were identified under the 100-year design storm. Basement flooding is also predicted as a consequence of excessive overland flow depth in low point areas.
- Cluster 5 is roughly bounded by Massey Creek to the north, Victoria Park Avenue to the west, the CNR to the south and Lily Cup Avenue to the east. This Cluster is mainly a combined and storm sewer area with a few sanitary sewers on Warden Avenue. The primary cause for surcharge of sewers is bottleneck in combined sewers and overloaded storm sewers. The criteria for overland flow depth is not met for some areas with reverse-sloped driveways.
- Cluster 6 is in the southern area of the study area. The cluster is bounded by the CNR to the north, Victoria Park Avenue to the west, Kingston Road to the south and Warden Avenue to the east. Cluster 6 contains mostly combined and storm sewers with a few sanitary sewers on Coalport Drive. The main contributors to basement flooding include backwater and bottlenecks in the storm sewers and combined sewers at scattered locations. The criteria for overland flow depth are not met for some areas with reverse-sloped driveways.

4.3.5.1 FACTORS CONTRIBUTING TO BASEMENT FLOODING

To determine the primary and most possible causes of basement flooding, several sources of available information were reviewed, including:

- Sewer network database;
- Digital Elevation Model (DEM);
- Groundwater elevations in relation to sewer invert elevation;
- Locations of houses with reverse-sloped driveways;
- Results for the five (5) historic storm events;
- On-line questionnaire results;
- Historical basement flooding reports;

5.2.2 DESIGN CRITERIA

The design criteria for basement flooding remediation in the study area are based the City Standard for Basement Flooding Protection and the details are listed below:

Sanitary Sewer System

- The maximum hydraulic grade line (HGL) of the sanitary system shall be maintained below basement elevation (taken as 1.8 m below the ground elevation) during a storm equivalent to the May 12, 2000 storm as gauged at the City's Oriole Yard (Station 102) located at Sheppard Avenue and Leslie Street;
- In shallow sewers where the HGL is below the obvert elevation (interior top elevation of the sewer), recommendations should be included to deepen the sewers to achieve the 1.8 m HGL freeboard requirement. If deepening the sewer is not feasible, the solution should eliminate the surcharge, such that the resultant HGL is below the existing conditions; and,
- No net peak flow rate increase in the receiving sanitary trunk sewer.

Storm and Combined Drainage System

- Design criteria shall be the City's 100-year design storm. The maximum HGL in the storm sewer (minor) system shall be maintained below basement elevation (taken as 1.8 m below the ground elevation) during the 100-year design storm;
- In shallow sewers where the HGL is below the obvert elevation, recommendations should be included to deepen the sewers to achieve the 1.8 m HGL freeboard requirement. If deepening the sewer is not feasible the solution should eliminate the surcharge, such that the resultant HGL is below the existing conditions; and,
- If storm sewers discharge to a storm trunk sewer, no peak flow rate increase in the trunk sewer as it exits the study area shall be allowed.

Overland Flow (Major System)

- Overland flow depths and velocities must not exceed 0.21 m for velocities of 2.0 m/s and 0.09 m for water velocities of 3.0 m/s for public safety.
- Surface water level shall be maintained 150 mm below the elevation of the crown of the road. This will depend on the type of the road. For the roads in Area 34, the permissible depth is 0.235m above the gutter elevation for Local roads, 0.257m for Collector roads, and 0.140m for Arterial roads.
- Surface water level should not exceed 150 mm above the gutter in areas with reverse-slope driveways; and
- For arterial roads, the centre two lanes are to remain open during the 100-year design storm.

5.2.3 EVALUATION METHODOLOGY

To evaluate alternative solutions, comparative criteria were established and applied. The criteria are based on four (4) categories: natural environment, social-cultural, technical considerations and economic considerations. A scoring system as described below was used to compare the alternative solutions based on the criteria.

5.2.3.1 EVALUATION CRITERIA AND SCORING SYSTEMS

The measure for evaluating each criterion was established, as presented in **Table 5-2**.

Scoring of the evaluation was conducted on a comparative basis for three categories:

- No or positive impact, relatively low cost: Score 3
- Neutral, relatively medium cost: Score 2
- Negative impact, relatively high cost: Score 1

The score was applied to the four categories for each criterion and the total score for each alternative was calculated. The alternative with the highest score was selected as the preferred alternative.

Figure A50 in Appendix A shows the potential locations for Low Impact Development (LID) measures. Note that water quality costs will be estimated outside of the basement flooding remedial projects.

6.3 EFFECTIVENESS OF THE PREFERRED ALTERNATIVES

The effectiveness of the preferred alternatives in relieving basement flooding problems under the target basement flooding design criteria was determined using the calibrated InfoWorks CS model. The preferred recommended remedial measures were included in the model, and simulations were carried out under the design storm conditions identified for the City's standard for basement flooding protection. Figures A51 through A54 in Appendix A show the model results of the sanitary, combined, storm sewer system and the overland system with the preferred alternative under the design storm conditions. The results are summarized in the following sections.

6.3.1 ACHIEVING CITY STANDARD FOR BASEMENT FLOODING PROTECTION

6.3.1.1 SANITARY SEWER SYSTEM

The results of the sanitary sewer system with the implementation of the preferred remedial measures under the May 12, 2000 storm are shown in Figure A51 in Appendix A. As can be seen in the figure, the sanitary system surcharges in some areas (yellow and red links). Despite a few manholes with the HGL at basement levels, these are shallow sewers operating under free-flow conditions.

6.3.1.2 COMBINED SEWER SYSTEM

The performance of the combined sewer system with the implementation of the preferred remedial measures under the 100-year event is shown in Figure A52 in Appendix A. In general, the preferred mitigation measures provide a level of protection meeting the Basement Flooding criteria for all properties in Area 34. There are a few scattered locations where the water level in the combined sewer is within 1.8 m of the ground surface. These locations are summarized in Table 6-2. As can be seen in the table, these manholes are affected by backflow from a combined subtrunk.

6.3.1.3 STORM SEWER SYSTEM

Figure A53 in Appendix A shows performance of the storm sewer system with the implementation of the preferred remedial measures under the 100-year design storm. Although the storm sewer system surcharges (yellow and red links) during the design storm, the yellow nodes seen on the figure correspond to the manholes in shallow sewers that do not surcharge, meaning that the HGL or water elevation is below basement levels. Table 6-2 presents a summary of the storm manholes that do not meet the freeboard criteria. Explanations are provided.

6.3.1.4 OVERLAND FLOW SYSTEM

The performance of the overland flow system with the implementation of the preferred remedial measures under the 100-year design storm are illustrated in Figure A54 in Appendix A. The results show that the surface flow depth ranges from 140 mm to 257 mm above the gutter depending on the type of road, and that it is contained within the municipal right-of-way. Additionally, the figure shows a few scattered properties with reverse-slope driveways, where the overland flow depth is greater than 150 mm above the gutter elevation. To reduce the risk of surface flooding, it is recommended to build a berm (suitable for traversing by vehicles) at the entrance of the reverse-slope driveways to reduce the risk of surface water entering the property.



**Toronto Basement Flooding
Capacity Studies – Bundle D Area
47: Study Report**

Final Study Report

June 13, 2022

Prepared for:

City of Toronto

Prepared by:

Stantec Consulting Ltd.

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	AL/JS/FB	20220324	DE	20220325	NO	20220328
1	Final	AL/JS/FB	20220609	DE	20220610	NO	20220610



5.0 ASSESSMENT OF EXISTING CONDITIONS

5.1 HYDROLOGIC AND HYDRAULIC MODEL DEVELOPMENT

Two stages of model development were completed; Stage 1 and Stage 2. The Stage 1 model development targeted a risk-based capacity assessment identifying high-level areas at risk (referred to as modelled flood clusters), while Stage 2 sought to confirm and update the details within these areas of focus and improve the model confidence throughout. The Stage 1 and Stage 2 model build, and existing conditions results are documented in the **Attachment #1 - TM1** and **Attachment #2 - TM2**, respectively.

5.1.1 High-Level Risk-Based Models

The Stage 1 analysis was broken up into two main components; the major overland system 2-dimensional (2D) model build, and the minor sewer system 1-dimensional (1D) model build. The objective of these initial models was to provide a 'first-cut' representation of the surface and subsurface drainage conditions at a macro-level, and gain an understanding of the system complexity, uncertainties, and initial model results from which to assess the sensitivity to capacity restrictions. Together with other physical and anecdotal characteristics, the model results supported the identification of additional field survey and investigation requirements with the ultimate objective of improving the confidence in the model build and representation of flood risk. **Figure 6.11** in **Attachment #1 -TM1** illustrates the areas defined as high-risk, or modelled flood clusters, which were targeted for field surveys and detailed model validation in Stage 2.

5.1.2 Detailed Models in Focused Area

Stage 2 integrated the field survey findings identified based on Stage 1 results, including roof downspout connectivity, dual maintenance hole connectivity, perforated maintenance hole locations, inlet/catchbasin information, reverse driveways, and outfall structures. Available record drawings (as-built and/or as-designed) were used to validate minor system details in areas identified as high-risk, or to confirm severe uncertainties identified in Stage 1. A 1D dual drainage modelling approach was adopted in Stage 2 to define the major system, integrating findings from the 2D Stage 1 overland results, and surveyed low points. Overall confidence in the model was improved through the Stage 2 model validation and updates.

5.2 BASEMENT FLOODING CRITERIA

The City's Basement Flooding criteria are summarized as follows:

- Design storms for use in assessing system performance:
 - Storm and Combined Drainage System: 100-yr 6-hr Chicago design storm per the City Model Guidelines
 - Sanitary System: equivalent to the May 12, 2000 storm as gauged at the City's Oriole Yard (Station 102) located at Sheppard Ave and Leslie St. This design standard provides an



TORONTO BASEMENT FLOODING CAPACITY STUDIES – BUNDLE D AREA 47: STUDY REPORT

Assessment of Existing Conditions June 13, 2022

enhanced level of protection against basement flooding from sanitary sewer backup for a storm event with a return frequency between 1 in 25 and 1 in 50 years.

- The maximum HGL in the sanitary and storm sewer (minor) system shall be maintained below basement elevations (assumed 1.8 m below ground elevation at centerline of road) during the respective system design storms. Measured from model node for simplicity.
- No net increase in peak wet weather flow to the combined or sanitary trunk sewers.
- Sewer Overflows:
 - Flow frequency and volume capture at combined sewer overflows (CSO) cannot increase to the environment from existing conditions, using the annual MECP Procedure F-5-5 methodology. Discharge during extreme events (>10-yr) remains acceptable if F-5-5 met.
 - Abandonment of overflow preferred, considering resulting flood risk. Raising of overflow levels to reduce spill also considered.
- For shallow sewers with obvert less than 1.8 m below ground surface, there shall be no surcharge and the proposed HGL must be lower than or equal in elevation to existing conditions.
- Avoid increases to the peak flow discharges into existing external systems. Where unavoidable, consultation with City and adjacent Study Area team may be required.
- Within road underpasses, the minor system shall be sized to convey the 25-yr storm under free flow conditions, and may be exempt from HGL freeboard criteria if no property connections exist.
- The overland flow (major) system depth on local streets shall be maintained within the right-of-way (ROW) or not be above 150 mm over the crown of the road, equating to 235 mm for most local roads with paved 8.5 to 9.0 m widths. Where reverse driveways are present, depth on local streets shall not exceed 150 mm over the gutter. Local roads with no curbs or ditches have been set to 150 mm. Ditches and simulated overland flow paths outside the ROW have generally been set to 300 mm. On collector and arterial roads, the depth as measured from the gutter varies based on width of paved area which is estimated based on number of lanes and 2% crossfall. Rural road cross-sections are variable, dependent on local topographic conditions. Arterial roads allow depth to the crown of road, while collectors allow an additional 100 mm above the crown. **Table 5-1** presents the resulting depth exceedance criteria as referenced from road gutter:

Table 5-1: Road Depth Exceedances

Number of Lanes in Right-of-Way	Local Roads	Collector Roads	Arterials Roads
Less Than 4 Lanes	235 mm	235 mm	235 mm
4 Lanes (14 m paved width)	N/A	240 mm	140 mm
5 Lanes (17.5 m paved width)	N/A	275 mm	175 mm
6 Lanes (21 m paved width)	N/A	300 mm	210 mm
7 Lanes (24.5 m paved width)	N/A	300 mm	245 mm
8 Lanes (28 m paved width)	N/A	300 mm	280 mm
Depth relative to gutter, based on road width and 2% crossfall. Maximum depth 300 mm to not exceed 150 mm over crown. If reverse driveway present, max depth is 150 mm.			

- Overland flow depths and velocity must be considered for public safety, as outlined in **Table 5-2**:



