

Executive Summary

The Basement Flooding Protection Program (BFPP) Capacity Assessment Studies Project for Study Areas 46 to 61 and 63 to 67 seeks to characterize drainage system capacity and develop solutions to reduce the risk of basement and surface flooding within the remaining BFPP Study Areas in the City. The study areas have been grouped together in six Bundles across the City; Stantec Consulting Ltd. (Stantec) is undertaking the Bundle D and Bundle F assignments.

The study was carried out to assess the sanitary and storm drainage systems to identify the potential factors, mechanisms and impacts of surface and basement flooding and to develop comprehensive flooding remediation plans that best meet the target level-of-service criteria of the City under 2041 growth conditions. Based on guidance from the City, the basement flooding protection level has been set to the equivalent of the May 12, 2000, storm event for the sanitary system and the 100-year design storm for the combined/storm minor and major systems.

The City has embarked on a new approach in an effort to meet this objective, incorporating lessons-learned and feedback from previous projects. The overall approach includes two distinct, yet integrated, phases of the project: the initial Study Phase, and the Preliminary Design Phase. The objective of this effort is to reduce the risk of future basement and surface flooding resulting from shortfalls in the capacity of the municipal drainage systems. In other words, the focus of flood remediation efforts is on publicly derived sources, such as back-up of City sewer systems, or surface flooding emanating from the public right-of-way (ROW).

The primary focus from the Study Phase was on the development of Schedule A/A+ assignments where feasible, recognizing there may be a need for additional Schedule B and/or C Environmental Assessment (EA) activities for more involved solutions negatively affecting the social or natural environments. One assignment, 64-19, was identified during the Study Phase to be a Schedule B undertaking due to a proposed storm sewer upgrade that ties into a box culvert within the ROW but leads directly to an outfall beyond the ROW.

SCOPE OF STUDY

The focus of this EA is Assignment 64-19 in Bundle F, with the geographic context of the entire Study Area 64 presented in **Figure ES. 1** below. This EA Project File reviews the assessments completed through the Study Phase for Area 64 with focus on Schedule B Assignment 64-19, with further elaboration on activities completed after the Study Phase to satisfy the Schedule B EA requirements for the assignment.

The study was carried out to assess the sanitary and storm drainage systems to identify the potential factors, mechanisms and impacts of surface and basement flooding and to develop comprehensive flooding remediation plans that best meet the target level-of-service criteria of the City. To achieve this scope, the study included the following tasks:



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- Municipal Class EA project Phase 1 activities, including agency consultation and community questionnaire.
- Comprehensive review of background data and available information to confirm existing field conditions, supplemented as required with additional field investigations.
- Identification and prioritization of the factors contributing to basement and surface flooding including interaction of the storm, sanitary and overland systems.
- Development of a Geographic Information System (GIS)-based topographical model to help define the major system surface drainage patterns and identify and quantify low lying or other problematic areas.
- Development of sanitary and storm drainage system hydrologic and hydraulic modeling tools.
- Confirmation and identification of potential basement flooding areas.
- Evaluation of various flood remediation measures and development of comprehensive cost-effective flood remediation plans to achieve the targeted hydraulic performance under future projected population.
- Where alternative flood remediation measures were developed, an assessment was completed based on hydraulic, environmental, and socio-economic factors to determine the recommended flood solution.
- Development of opinions of probable costs, implementation sequencing, and mitigation measures.

ASSIGNMENT AREA CHARACTERISTICS

Assignment 64-19 is located on Old Finch Ave and roughly bounded by Morningside Ave to the west and Baffin Crt to the east. The local sanitary sewer systems within Assignment 64-19 discharge into the Morningside Sanitary Trunk Sewer that flows north-to-south bordering the assignment area and eventually drains into Study Area 59. The storm sewer system within the Assignment 64-19 area discharges into the Morningside Tributary of Rouge River and includes 1 storm outfall (OF) structure.



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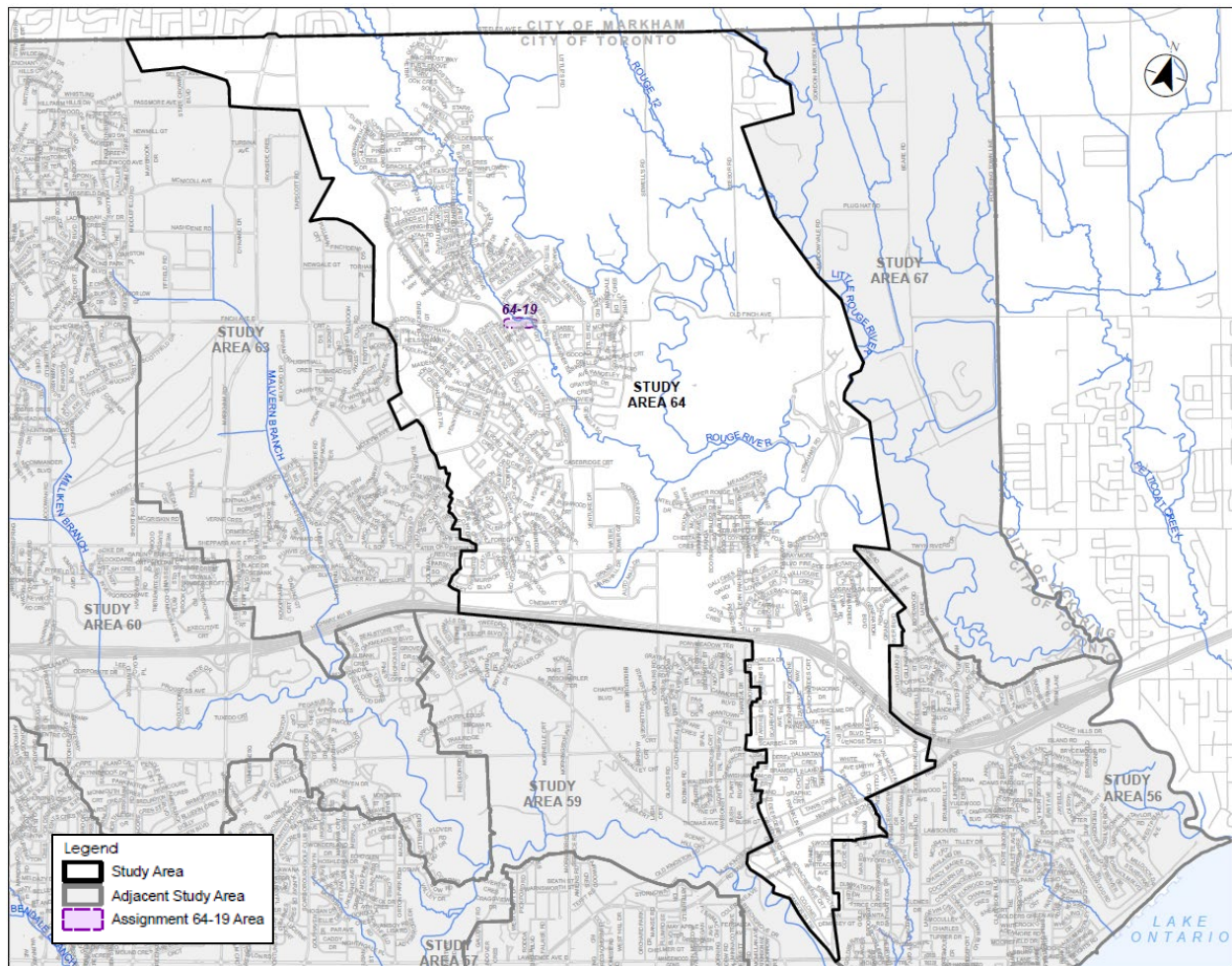


Figure ES. 1: Assignment 64-19 within Area 64

Assessment of Existing Conditions

Surface and basement flooding has occurred periodically in response to extreme storms, including the major events of the July 8, 2013, May 12, 2000, and August 19, 2005. The majority of reported flooding issues for Area 64 are private-side related, and not chronic issues resulting from surface drainage or collection system capacity. The relatively few flood complaints can be attributed to long-standing collection system and stormwater management practices in Scarborough, which include having foundation drains not connected to the sanitary sewer, implementation of the dual drainage principle in urban design since the 1970s, and consideration of the hydraulic grade line in the design of storm sewer systems.

Field investigation and inspection were conducted to identify the specific characteristics of the study area and its drainage systems. An assessment was undertaken of the existing natural and built environments, as well as a review of available data sources and any previous studies.



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Historical flooding records and the public questionnaire results show that flooding incidents have occurred throughout the entire study area, but there are areas where flooding is clustered at numerous properties which may indicate temporary inadequacy of the sewer systems and/or surface drainage systems as opposed to site-specific issues.

An integrated hydrologic-hydraulic simulation model of the storm and sanitary network was developed, calibrated to flow monitoring data, and validated against historic flood records.

The overall background review, field investigations, public consultation and hydraulic modelling analysis revealed that the storm drainage system in the assignment area operates at a 5-yr level of service. The resulting model was used as a tool to assess the hydraulic performance of the existing drainage systems, identify their current performance level, determine potential causes of deficiencies, and develop remedial measures for the basement and surface flooding issues resulting from public drainage system performance. The overland drainage system within the assignment area shows a large degree of capacity to convey large events. The major system standards in Scarborough have resulted in a resilient overland system for conveying flows to the Rouge River tributaries, including Morningside Tributary.

Collectively, these factors contribute to episodes of surface and/or basement flooding from the public system under extreme rainfall events that exceed the original design capacity. Additionally, private side drainage issues such as poor lot grading, blocked laterals, reverse-driveways, etc., can also contribute to individual property flooding.

STUDY PROCESS AND CONSULTATION

The framework of the project approach and Study phase followed the guidelines of the Municipal Class EA document disseminated by the Ontario MEA (2000, amended 2007, 2011 & 2015). By following these guidelines, the Study satisfied the requirements of the Ontario Environmental Assessment Act through completion of Phase 1 of the Class EA process and set the framework to undertake Phase 2 activities for projects identified as Schedule B or C.

From the Study phase, Assignment 64-19 was identified as a Schedule B undertaking where the following additional review and consultation measures were taken:

- Detailed alternative review, including development of an additional Alternative 3 solution;
- Public consultation; and
- Advancement in consultation with agency stakeholders.

This Project File document is intended as a summary report, documenting Phase 1 and 2 of the Class EA. A Notice of Completion is submitted to review agencies and the public to allow for comment and input on this Project File for at least 30 calendar days from date of notice. Subject to comments received and the receipt of the necessary approvals, the City of Toronto intends to continue with the preliminary/detailed design and construction of the flood remediation measures to mitigate the risk of basement and surface flooding in Assignment 64-19.



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Agency and Public Consultation

Consultation with agency stakeholders and the public was conducted with the following components:

- Notice of Commencement was posted to the City’s webpage and appeared in the September 22 and 29 Scarborough Mirror newspaper editions
- A public questionnaire was issued in Fall 2020 to addresses within the study area to help identify public-side flooding concerns
- A notice of public consultation was issued to properties within the study area by Canada Post to notify them of the opportunity to review the study recommendations. The City posted public consultation materials on a dedicated City webpage from December 16, 2022 to January 6, 2023. The presentation materials included background on the study, outline of the study process, basement flooding solutions and recommended solution.
- Through the Study Phase, the following agency stakeholders were engaged with feedback received and incorporated: Mississauga’s of the Credit First Nation, Toronto Parks, Forestry & Recreation, Toronto Water – Operations, Toronto Water – Stream Restoration Unit, Toronto Transportation Services, and Toronto and Region Conservation Authority (TRCA)
- Throughout the EA Phase, the following agency stakeholders were engaged with feedback received and incorporated: Rogers Communications (Telecon), Trans-Northern Pipelines, and TRCA

DEVELOPMENT AND EVALUATION OF ALTERNATIVES

The baseline conditions represented the starting point from which solutions were required. Baseline conditions are represented by the design storm results, incorporating projected 2041 population on the sanitary model and an assumed 75% Downspout Disconnection for the storm model reflecting the intentions of the Wet Weather Flow Management Master Plan for new development to control onsite stormwater discharges to better than pre-development conditions under large storms.

There are several storm sewersheds based on physical outfall location to watercourses or boundary conditions with adjacent Study Areas, and a number of sanitary subsewersheds connecting to the trunk. Within each sewershed, Problem Areas were defined based on the criteria infractions of the baseline condition models and became the initial basis for presentation and communication regarding solutions. These Problem Areas were in some cases compiled into Solution IDs when the problem areas and/or solutions were close in proximity or connected. Through the solutions development process and in planning for construction and solution implementation, these Solution IDs were then compiled into Assignments based on hydraulic connectivity.

The approach to solution development was premised on the principle of conveyance within the municipal ROW as a first iteration, to maximize the number of solutions that fall within the Municipal Class EA Schedule A or A+ categorization. Where the initial solutions were constrained by unfavourable requirements, fell outside of the ROW, or may lead to Schedule B/C implications, alternative solutions were reviewed and assessed. Alternatives were evaluated based on fourteen (14) criteria. Each criterion was ranked either high, medium, or low impact with a corresponding score of 1,2, or 3 respectively.



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A “low” ranking represents the lowest impact and most desirable, while a “high” ranking represents the highest impact and least desirable. Once each criterion was evaluated, the score from all criteria was totaled. Based on the total score, the most preferred alternative was the highest scored alternative and was selected for the Assignment ID.

Summary of Alternatives

Based on the performance of the storm and sanitary drainage system model, flood remedial measures were conceptually designed in the hydraulic model. Three alternatives were developed for Assignment 64-19 to relieve flooding and improve the storm system while meeting the City’s guidelines. All three alternatives involve storm conveyance upgrades. Differences between the alternatives are summarized as follows:

- Alternative 1 includes storm conveyance upgrades, including modifying and tying into the existing box culvert crossing on Old Finch Ave.
- Alternative 2 includes inline storage to avoid modifying the existing box culvert tie-in.
- Alternative 3 includes inline storage with reduced inlet capacity to decrease storage sizes and avoid modifying the existing box culvert tie-in.

Based on the evaluation criteria and ranking, Alternative 3 is the recommended solution that best mitigates surface and basement flood risks, considering impact to the public and natural environment. The effectiveness of the recommended solution in relieving surface and basement flooding problems under the target level of service was determined using the hydraulic model.

RECOMMENDED SOLUTIONS

The recommended solution for Assignment 64-19 corresponds to Alternative 3 and is presented in **Figure ES.2**. A summary of the recommended solution is outlined below:

- Reduce storm inlet capacity along Old Finch Ave to reduce required storage sizes; and
- Provide 192m of inline storm storage to avoid upsizing the last pipe segment and/or modifying the culvert it drops into.

The opinion of probable costs for the recommended Assignment 64-19 flood solution is \$4,263,743 based on version 4.1 of the City’s CET. This cost covers the total anticipated construction cost, includes 30% contingency and is exclusive of HST.

The recommended solutions result in a decrease in peak outflows to the downstream outfall by 0.08 m³/s during the 2-yr design storm and 0.28 m³/s during the 100-yr design storm.

Based on the Stage 1 Archaeological study completed for the area, there is no further work required for Assignment 64-19 as the work falls within the ROW. However, should the work extend beyond the ROW, further Stage 1 archaeology assessment is recommended.



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CONCLUSIONS

The following conclusions can be drawn from the completion of this EA Study:

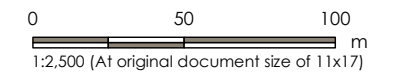
- Through the initial Study Phase completed for the entire Area 64, several capacity issues were identified. Based on the review and interpretation of available background data, field investigations and resident input, the main causes of basement and surface flooding can be attributed to the following factors:
 - The issues with the storm drainage system are due to pipes not being sized to handle high flows during extreme events.
- Alternative flood risk reduction solutions were identified at the Study Area-scale based on hydraulic connectivity (i.e., Assignments), and initially evaluated at a high-level including agency consultation to select the preferred solutions that would fall within the ROW. Through this process, one Assignment (64-19) was identified as potentially having greater environmental and social impacts due to tying into the box culvert leading directly to an outfall outside of the ROW and proceeded to completion of the Schedule B EA process with additional agency/public consultation, alternative solution review/refinement, and evaluation, as documented in this Project File.
- Through the EA process, an additional flood solution alternative was developed (Alternative 3). All three alternatives were evaluated based on social, economic, environmental and constructability criteria using a scoring method. Alternative 3 was selected as the recommended solution for Assignment 64-19.
- With the implementation of the preferred flood remedial measures, the storm drainage system can convey both the major and minor systems during the 100-year design storm within the City surface depth and HGL criteria with limitations stemming from downstream watercourse levels only. Similarly, with the proposed flood remedial measures, the sanitary drainage system can convey the May 12, 2000, event.
- Within Assignment 64-19, the storm outflow to the Morningside Tributary of the Rouge River outfall decreases by 0.08 m³/s during the 2-yr design storm and decreases by 0.28 m³/s during the 100-yr design storm.
- Assignment 64-19 is estimated at a total construction cost of \$4.3 million (2020 Canadian dollars) net to the City.
- The Stage 1 Archaeological Assessment: Basement Flooding Capacity Assessments Bundle F was undertaken to identify archaeology potential for the proposed solution extents within the Bundle F study areas. Based on the Stage 1 Assessment, there is no further work required for Assignment 64-19 as the outfall and work falls within the ROW. However, should the work extend beyond the ROW, a Stage 2 assessment is recommended.
- The Municipal Class EA Master Planning process (Phases 1 and 2) has been fulfilled through public consultation including one public information event, agency consultation, and the submission of this Project File document.

It is recommended that the Assignment proceed to preliminary design, subject to City prioritization, additional agency consultation, and commence with implementation as Capital budgeting allows.

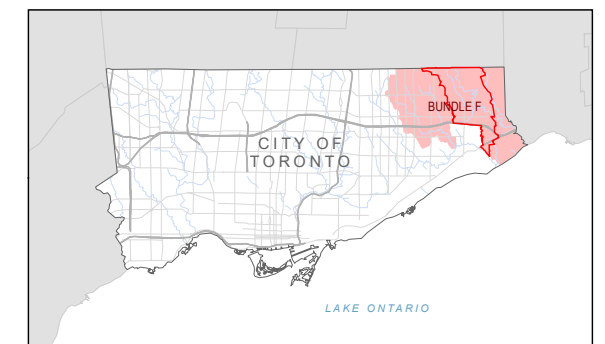


Legend

- Assignment 64-19 Area
- ▲ Outfall
- Storm Sewer
- Sanitary Sewer
- Proposed Storm Solution**
- ✖ Remove Catchbasin
- Inline Storage



- Notes**
1. Coordinate System: NAD 1983 CSRS MTM 10
 2. Contains information licensed under Toronto Water Asset Mapping User Agreement.
 3. Contains information made available under the Toronto and Region Conservation Authority Open Data Licence v 1.0, Open Government Licence – Toronto, and Open Government Licence – Ontario.



Project Location: City of Toronto
 165660138 REVA
 Prepared by KDB on 2023-06-01

Client/Project:
 CITY OF TORONTO
 BASEMENT FLOODING CAPACITY STUDIES
 BUNDLE F - ASSIGNMENT 64-19

Figure No.

ES.2

Title

Recommended Solutions