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, 63-02, was identified during the Study Phase to be a Schedule B undertaking due to work required outside of the ROW in a municipal park.

SCOPE OF STUDY

The focus of this EA is Assignment 63-02 in Bundle F, with the geographic context of the entire Study Area 63 presented in **Figure ES. 1**. This EA Project File reviews the assessments completed through the Study Phase for Area 63 with focus on Schedule B Assignment 63-02, 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:

- 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 63-02 is located in the northern region of Scarborough and is roughly bounded by Markham Rd to the west, Murison Blvd to the east, Tapscott Rd to the north and Highway 401 to the south. Within Assignment 63-02, the local sanitary sewer systems discharge into the Highland Creek Sanitary Trunk Sewer, which flows north-to-south across the assignment area. From the north, the trunk follows East Highland Creek, crosses Highway 401, and eventually drains into adjacent Study Area 60. The storm sewer system within Assignment 63-02 consists of smaller networks discharging to the Malvern Branch of Highland Creek and includes 3 storm outfall (OF) structures. The storm system also consists of one stormwater management facility within Assignment 63-02, which is a dry pond located within Rosebank Park.

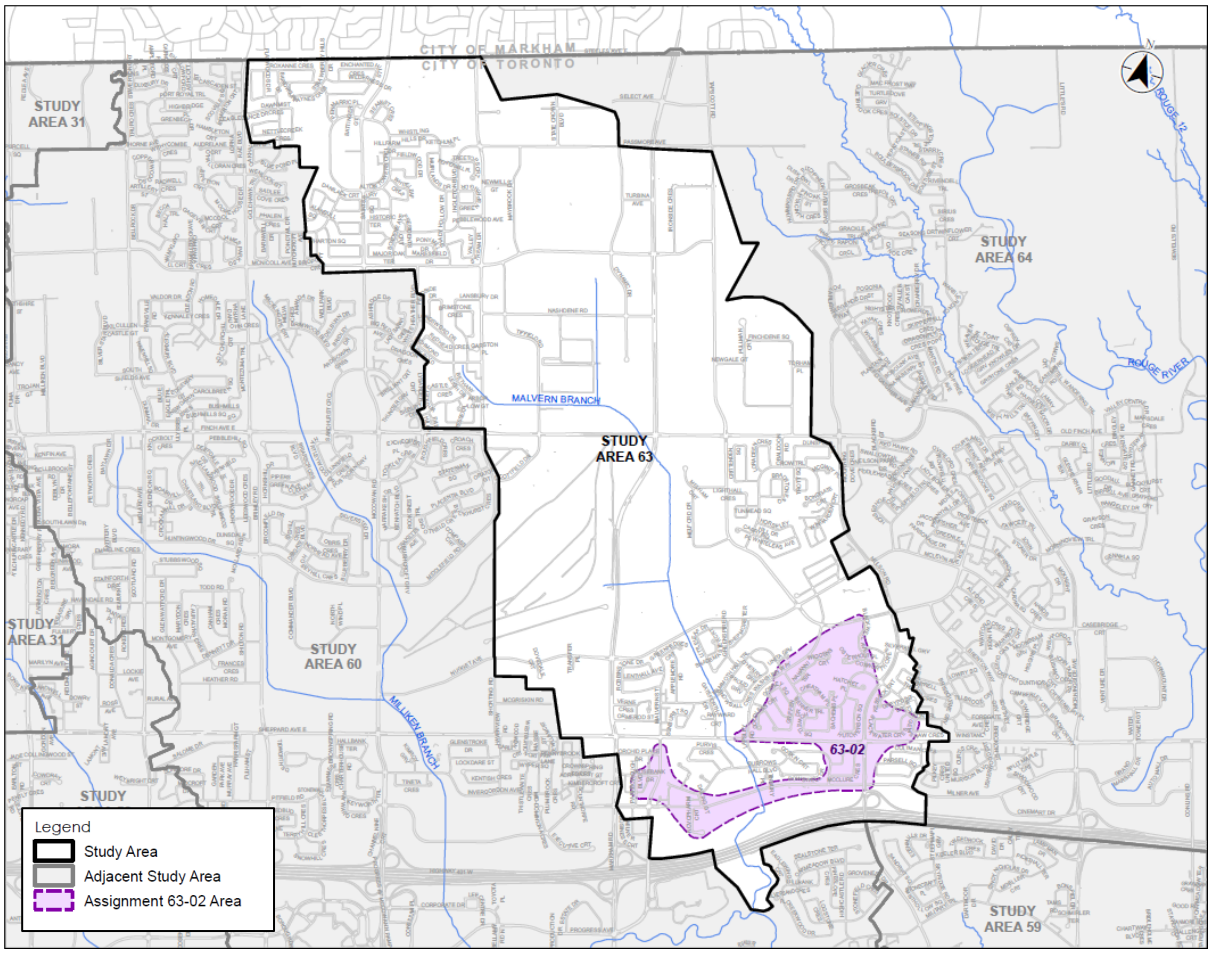


Figure ES. 1: Assignment 63-02 within entire Area 63

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 63 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.

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 there are some isolated issues are present, but suggest that the general overall system performance has good resilience to high-intensity events, up to and including the 100-yr. 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. In general, the major system standards in Scarborough have resulted in a resilient overland system for conveying flows to the storm water management facility and the East Highland Creek tributaries.

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 63-02 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 63-02.

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 Scarborough Mirror 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 12, 2022 to December 30, 2022. 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: Hydro One, Rogers Communications (Telcon), 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. 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 63-02 to relieve flooding and improve the storm and sanitary systems while meeting the City’s guidelines. All three alternatives involve storm conveyance upgrades, inline sanitary and storm storage, curb depression along the east side of Progress Ave into Rosebank Park and adding a new overland flow path along the east side of the sidewalk, to divert overland flow. Differences between the alternatives are summarized as follows:

- Alternative 1 includes upgrades to the outfall on Sheppard Ave E, to the storm sewers on private property in rear yards, and conveyance upgrades through Rosebank Park. There is no work along Berner Park Trail.
- Alternative 2 avoids work on private property and has additional inline storm storage to avoid the outfall upgrade, however, storm sewer upgrades along Berner Park Trail are proposed.
- Alternative 3 also avoids the work on private property and has additional inline storm storage to avoid the outfall upgrade. However, this alternative avoids work along Berner Park Trail.

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 63-02 corresponds to Alternative 3 and is presented in **Figure ES.2**. A summary of the recommended solution is outlined below:

- Increase storm inlet capacity and provide conveyance upgrades;
- Provide new storm sewers within Neilson Rd right-of-way (ROW) to avoid upgrades in private property. Existing line in private property to remain for rear yard drainage;
- No upgrades along Berner Park Trail (leave as-is);
- Provide approximately 290 m of inline storage in sanitary system on Sheppard Ave E within ROW;
- Provide approximately 340 m of inline storage in storm system on Sheppard Ave E to avoid outfall upgrade at East Highland Creek; and

- Depress curb along east side of Progress Ave (south of Rosebank Dr) into Rosebank Park and add new overland flow path along the east side of the sidewalk, north to the dry pond to divert overland flow from ROW.

The opinion of probable costs for the recommended Assignment 63-02 flood solution is $57,748,421 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 an increase in peak outflows to downstream existing storm outfalls within Assignment 63-02 by 0.13 m^3/s and 3.4 m^3/s during the 2-yr and 100-yr design storm respectively.

Based on the Stage 1 Archaeological study completed for the area, the recommended solution with upgrades within Rosebank Park are considered to retain archaeological potential and requires further investigation at detailed design. All other proposed solutions within the municipal ROW do not require Stage 2 archaeological works.

CONCLUSIONS

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

Through the initial Study Phase completed for the entire Area 63, 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 follow factors:

- The presence of shallow sewers which provide less potential for vertical separation from basements and sewer pipe;
- The alignment of the sanitary trunk sewer with the watercourses with potential for inflow and infiltration, resulting in elevated baseflows in the sanitary sewer that take up flow capacity;
- The storm drainage system influenced by high amounts of paved area and high-water levels in the receiving watercourse; and
- The presence of perforated MH covers.

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 (63-02) was identified as potentially having greater environmental and social impacts due to the work required in Rosebank Park 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 63-02. All alternatives required conveyance upgrades through Rosebank Park.

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.

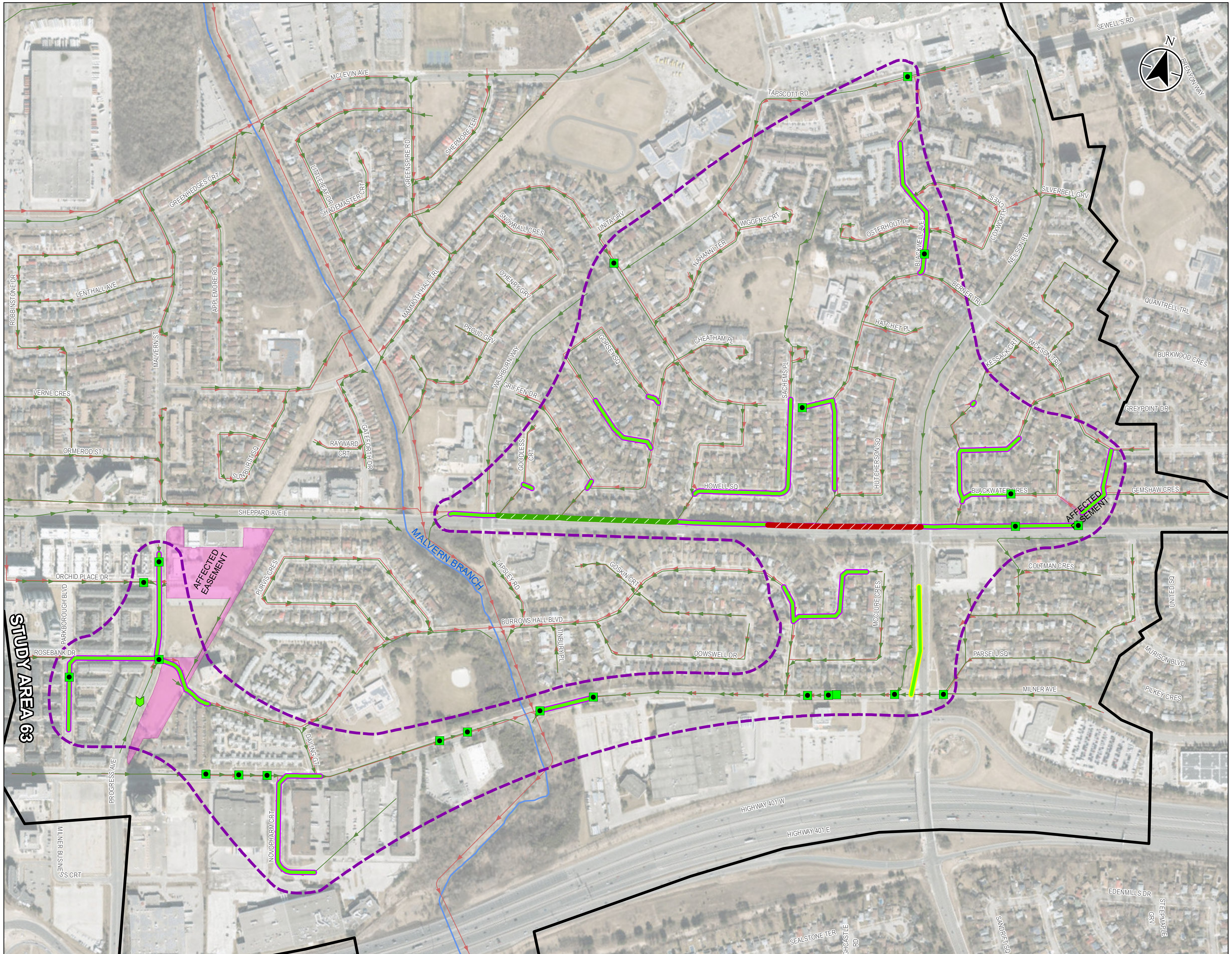
Relieving surface flooding and upsizing storm sewers will increase peak outflows to downstream existing storm outfalls, within Assignment 63-02, by 0.13 m3/s and 3.4 m3/s during the 2-yr and 100-yr design storm respectively. Aside from OF5042326623 during the 100-yr design storm, the outfalls overall experience a minimal change to the maximum velocity.

Assignment 63-02 is estimated at a total construction cost of $57.8 million (2020 Canadian dollars) net to the City.

Based on the Stage 1 Archaeological studies, the recommended solution with upgrades within Rosebank Park are considered to retain archaeological potential (and requires further investigation at detailed design). All other proposed solutions within the municipal ROW do not require Stage 2 works.

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.



Stantec

Legend

- Study Area
- Assignment 63-02 Area
- Storm Sewer
- Sanitary Sewer

Proposed Storm Solutions

- Increase Inlet Capacity
- Depress Curb
- New Storm
- Upgrade Storm
- Storm Inline Storage

Proposed Sanitary Solutions

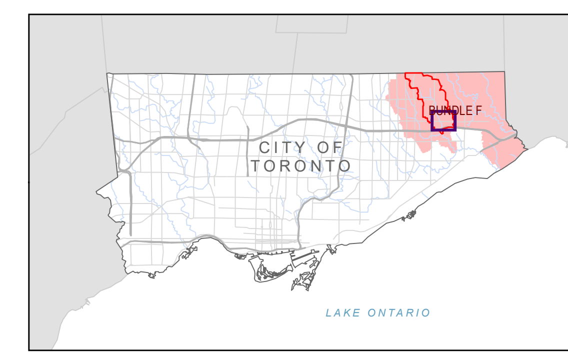
- Sanitary Inline Storage
- Affected Easement

0 100 200 m

1:7,500 (At original document size of 11x17)

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 2023-06-15

Client/Project
CITY OF TORONTO
BASEMENT FLOODING CAPACITY STUDIES
BUNDLE F - ASSIGNMENT 63-02

Figure No.
ES.2

Title
Recommended Solutions