

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, 56-02, was identified during the Study Phase to be a Schedule B undertaking due to the proposed outfall upgrades that fall outside the public ROW.

SCOPE OF STUDY

The focus of this EA is Assignment 56-02 in Bundle F, with the geographic context of the entire Study Area 56 presented in **Figure ES. 1** below. This EA Project File reviews the assessments completed through the Study Phase for Area 56 with focus on Schedule B Assignment 56-02, 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.



TORONTO BASEMENT FLOODING CAPACITY STUDIES – BUNDLE F ASSIGNMENT 56-02: EA PROJECT FILE

- 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 56-02 is located on the east side of Study Area 56. Study Area 56 is 885.9 ha in size and mainly consists of land sectioned off by Highway 401 to the north and the Canadian National Railway to the south. It also includes a small block of land north of Highway 401. Area 56 abuts the Rouge National Urban Park lands (Study Area 67) to the east, Lake Ontario to the south, Study Area 64 to the upper west, and Study Area 59 southwest of Lawrence Ave. It is bounded by Meadowvale Rd from the west and the Rouge River from the east.

In general, Area 56 was defined based on the tributary area to the Meadowvale Sanitary Trunk Sewer, which is tributary to the Highland Creek Wastewater Treatment Plant.

The general limits of Assignment 56-02 include Lake Ontario to the south, Port Union Road to the west, Ontario 401 Express to the north, and Rouge River to the east. Storm sewers within Assignment 56-02 discharge to the Rouge River, Adam's Creek, and Lake Ontario.



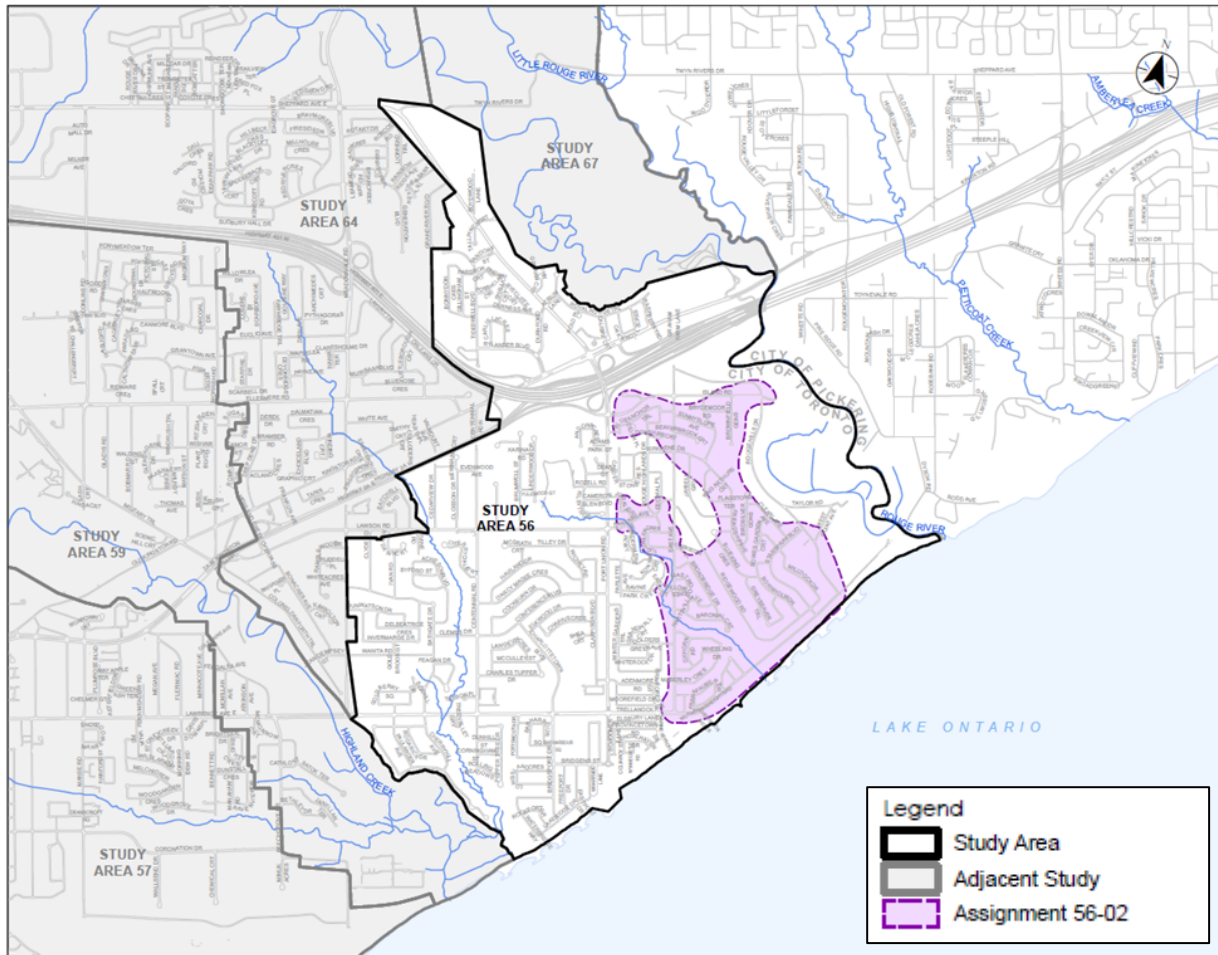


Figure ES. 1: Assignment 56-02 within entire Area 56

Assessment of Existing Conditions

System performance was assessed based on the Basement Flooding criteria and validated against flood records from historical events. The majority of reported flooding issues 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 (HGL) 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.



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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 well, with many sections of pipe indicating over 100-yr level-of-service, with some additional areas presenting sewer improvement opportunities, most predominantly in areas with shallow sewers. Within the sanitary system, there are a few pipes surcharging in the 5-yr along the subtrunks and close to the main pump station (West Rouge). The local streets sanitary system ranges from greater than 10-yr to beyond 100-yr capacity.

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 stormwater management facilities and to Lake Ontario and its 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 56-02 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 56-02.

Agency and Public Consultation

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



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- 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 1, 2022 to December 21, 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: Rogers Communications (Telcon), TransCanada 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.



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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 56-02 to relieve flooding and improve the storm system while meeting the City's guidelines. All three alternatives involve: increased storm inlet capacity; storm conveyance upgrades; disconnection of the storm system (isolate MH) along Brownfield Gdns from storm sewers through the school field; realignment of the west storm sewer line along Brownfield Gdns; abandonment of the east storm sewer line along Brownfield Gdns and connection of roofs to newly realigned sewers; a new curb and gutter system along the east side of Friendship Ave; a new storm sewer pipe connecting Brownsfield Grdns to Island Rd; storm inline storage on Friendship Ave and Brownsfield Grdns; and sanitary inline storage on East Ave, Lawrence Ave E, Starspray Blvd, Island Rd, West Point Ave, Rouge Hills Dr, Friendship Ave, and East Willow Gt. Differences between the alternatives are summarized as follows:

- Alternative 1 includes new relief/diversion sewers along Rouge Highlands Dr (from Fanfare Ave to Tudor Glen Cres), Tudor Glen Cres (to East Ave), East Ave (between Tudor Glen Cres and Broadbridge Dr) to reduce flow into sewer through residential rear yards, and along Friendship Ave, along the edge of the school property; a large, twinned box storage on Tudor Glen to avoid easement upgrades; abandoning the pipe and isolate MH through sewer easement from East Ave into outfall sewer to Adam's Creek; and upsize pipe through staired easement between Ridgewood Rd and Broadbridge Dr.
- Alternative 2 includes a new relief sewer from East Ave to Baronial Crt and a new storm sewer on Rouge Highlands Dr.
- Alternative 3 proposes reduced box storage on Tudor Glen; and a new diversion sewer to direct flows from East Ave to Broadbridge Dr.
- Alternatives 1 and 3 both include storm inline storage on Baronial Crt.
- Alternatives 2 and 3 both include a new diversion sewer to route flow from East Ave (north of East Willow Gt) west along East Willow Gt to a new outfall pipe tying into the existing outfall with a new outfall structure; and new diversion sewers along Ridgewood Rd from the easement southeast to existing 750 mm storm sewer; and a new relief sewer and curb & gutter system along the east side of Friendship Ave.

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 56-02 corresponds to Alternative 3 and is presented in **Figure ES.2**. A summary of the recommended solution is outlined below:

- Increase inlet capacity and provide conveyance upgrades throughout;
- Disconnect storm system and isolate MH along Brownfield Gdns, from sewers through the school field;



TORONTO BASEMENT FLOODING CAPACITY STUDIES – BUNDLE F ASSIGNMENT 56-02: EA PROJECT FILE

- Realign west storm sewer line along Brownfield Gdns, south of Brycemoor Rd, to drain to the north;
- Provide a new storm sewer pipe connecting Brownsfield Grdns to Island Rd;
- Provide storm inline storage on Brownfield Gdns, Friendship Ave, East Ave,
- Provide sanitary inline storage on Island Rd, East Willow Gt, West Point Ave, Rouge Hills Dr, Starspray Blvd, Lawrence Ave E, East Ave, and Friendship Ave;
- Abandon east storm sewer line along Brownfield Gdns and connect roof connections to new realigned sewers;
- New storm relief sewer along East Ave to reduce flow into sewer through residential rearyards;
- New storm relief sewer and curb & gutter system along east side of Friendship Ave, along edge of school property, to maintain overland flow within ROW;
- In-line storm storage on East Ave, Baronial Ave and Broadridge Dr;
- Reduced storm inline box storage on Tudor Glen;
- New storm diversion sewer to direct flows from East Ave to Broadbridge Dr;
- New storm diversion sewer to route flow from East Ave (north of East Willow Gt) west along East Willow Gt to new outfall pipe tying into existing outfall with new outfall structure; and
- New storm diversion sewers along Ridgewood Rd from easement southeast to existing 750mm storm sewer.

The opinion of probable costs for the recommended Assignment 56-02 flood solution is \$79,673,153 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.

With the implementation of flood solutions, there is a change to the quantity of water discharging to Adam's Creek to below existing conditions during both minor and major storm events. Overall, there is a decrease of 0.34 m³/s during the 2-yr design storm and a decrease of 0.01 m³/s during the 100-yr design storm to the storm outfalls observed in the Assignment 56-02 sewershed.

Based on the Stage 1 Archaeological studies, the recommended solution with outfall upgrades to Adam's Creek is considered to retain archaeological potential (and requires further investigation at detailed design). All other proposed solutions within the municipal right-of-way do not require Stage 2 works.

CONCLUSIONS

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

- 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 right-of-way. Through this process, one Assignment (56-02) was identified as potentially having greater environmental and social impacts due to proposed flood solutions 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



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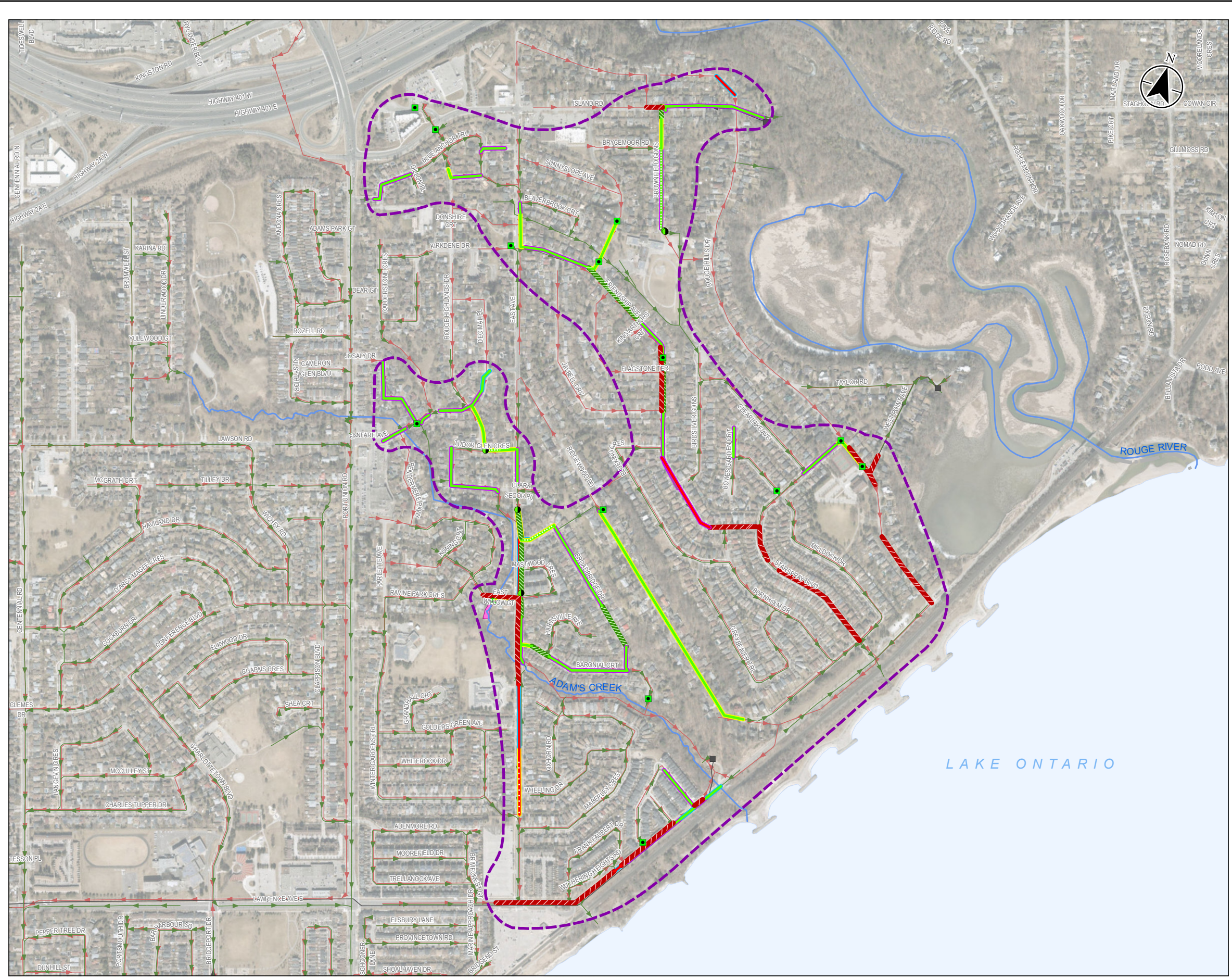
criteria using a scoring method. Due to the reduction in flow to receiving Adam's Creek as a result of a new outfall connection and increased inline storage, Alternative 3 was selected as the recommended solution for Assignment 56-02.

- 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.
- With the implementation of flood solutions, there is a change to the quantity of water discharging to Adam's Creek to below existing conditions during both minor and major storm events. Overall, there is a decrease of 0.34 m³/s during the 2-yr design storm and a decrease of 0.01 m³/s during the 100-yr design storm to the storm outfalls observed in the Assignment 56-02 sewershed.
- The recommended improvement works to help address the flooding problem in Assignment 56-02 is estimated at a total construction cost of \$80 million (2020 Canadian dollars) net to the City.
- Based on the Stage 1 Archaeological studies, the recommended solution with outfall upgrades to Adam's Creek is considered to retain archaeological potential (and requires further investigation at detailed design). All other proposed solutions within the municipal right-of-way do not require Stage 2 works.
- Protected properties and places of cultural heritage value or interest have been identified within the Assignment boundary. As such, additional assessment will be completed during the preliminary design phase to identify, evaluate, assess the impacts, and provide recommendation to mitigate the effects of the undertaking on cultural heritage resources including built heritage and cultural landscapes.
- 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.

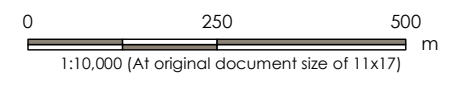


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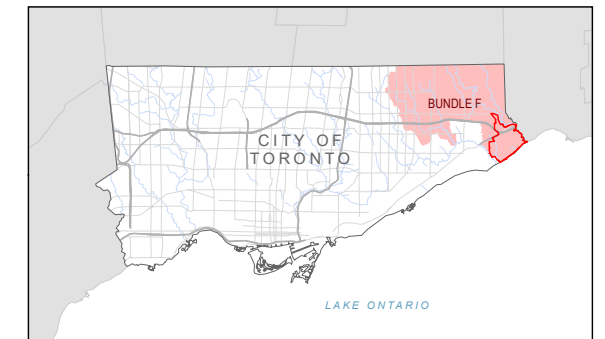


Legend

- Study Area
- Assignment 56-02 Area
- Sanitary Pumping Station
- Storm Sewer
- Sanitary Sewer
- Sanitary Forcemain
- Proposed Storm Solutions**
- Increase Inlet Capacity
- Isolate MH
- Upgrade Outfall
- New
- Realign
- Replace
- Upgrade
- Realign and Upgrade
- Inline Storage
- New Inline Storage
- Proposed Sanitary Solutions**
- New
- Realign
- Replace
- Upgrade
- Inline Storage
- Affected Easement



- 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 2023-04-06

Client/Project:
 CITY OF TORONTO
 BASEMENT FLOODING CAPACITY STUDIES
 BUNDLE F - ASSIGNMENT 56-02

Figure No.

ES.2

Title

Assignment 56-02