

To: Council in Committee of the Whole

From: Warren Munro, HBA, RPP, Commissioner,
Development Services Department

Report Number: CNCL-20-84

Date of Report: May 20, 2020

Date of Meeting: May 25, 2020

Subject: City Comments on Town of Whitby's Corbett Creek
Master Drainage Plan Study

File: B-8100-0011 2020

1.0 Purpose

The purpose of this report is to:

1. Provide City Council an overview of the Corbett Creek Master Drainage Plan Study (C.M.D.P.) prepared by The Municipal Infrastructure Group Ltd. (T.M.I.G.) dated March 2020.
2. Obtain Council approval of City staff comments on the C.M.D.P.

Attachment 1 is a map showing the location of the Corbett Creek Watershed in relation to the Town of Whitby and the City of Oshawa boundaries.

Attachment 2 is a map showing the location of the Corbett Creek Coastal Wetland Complex and a few insignificant wetlands along the Corbett Creek tributaries.

Attachment 3 is a map showing the recommended Corbett Creek Master Drainage Plan (M.D.P.).

Attachment 4 is a map showing the new floodplain limits along the East and West Tributaries of Corbett Creek.

Attachment 5 is a copy of the Executive Summary of the T.M.I.G. Study.

Due to the length of the C.M.D.P., the entire document is not attached to this Report. However, the report is available for viewing in the Development Services Department (Engineering Services, 9th Floor, Rundle Tower, contact Patrick Lee).

2.0 Recommendation

It is recommended to City Council:

1. That Report CNCL-20-84 dated May 20, 2020 be endorsed as the City's comments on the Corbett Creek Master Drainage Plan Study prepared by The Municipal Infrastructure Group Ltd. dated March 2020.
2. That a copy of the Council Resolution and Report CNCL-20-84 be forwarded to both the Town of Whitby and Central Lake Ontario Conservation Authority.

3.0 Executive Summary

On June 27, 2019, the Town of Whitby, in partnership with Central Lake Ontario Conservation Authority initiated a Municipal Class Environmental Assessment Study for the preparation of a Master Drainage Plan for the Corbett Creek Watershed.

This Study is following the Municipal Class Environmental Assessment process and has reached the end of the study process.

In order for the Town of Whitby and Central Lake Ontario Conservation Authority to file the Notice of Study Completion under the Municipal Class Environmental Assessment process, they have requested comments on the final draft report be submitted by May 29, 2020.

This report contains the recommended City comments on the Corbett Creek Master Drainage Plan Study.

4.0 Input From Other Sources

The following have been consulted in the preparation of this report:

- Central Lake Ontario Conservation Authority (C.L.O.C.A.)
- Town of Whitby

5.0 Analysis

5.1 Study Area

Corbett Creek has a small watershed that is entirely situated in the Regional Municipality of Durham with the vast majority of the drainage area located within the Town of Whitby and a small portion (about 25% of the watershed) within City of Oshawa (see Attachment 1).

Its drainage area encompasses approximately 14 square kilometres (5.4 sq. mi.), draining through two main tributaries; namely the East and the West Tributaries, which meet at the Corbett Creek Coastal Wetland before discharging into Lake Ontario.

In general, the Corbett Creek Watershed is urbanized and has a limited number of areas available for future development.

Over the years, the watershed has undergone transformation from a rural watershed to an urban watershed. As such, many vegetation communities have disappeared. The majority of the remaining natural resources are located along the watercourse riparian zone.

Other than the Coastal Wetland Complex at the mouth of Corbett Creek, (which is designated as a Provincial Significant Wetland), the remaining insignificant wetlands can be found along the Corbett Creek tributaries upstream of the Coastal Wetland Complex (see Attachment 2).

5.2 Municipal Class Environmental Assessment

This Corbett Creek Master Drainage Plan Study is being carried out in accordance with the Master Planning process Approach No. 2 as outlined in the Municipal Engineers Association "Municipal Class Environmental Assessment" document (October 2000; as amended in 2007, 2011 and 2015), in which it encourages a higher level of involvement from the general public as well as from the stakeholders and the review agencies.

In this study process, two Community Open Houses were held on September 12, 2019 and January 30, 2020, respectively. Numerous comments have been received and have guided the study team putting together a final draft report. A total of 16 residents attended the two Open Houses; 9 on September 12, 2019 and 7 on January 30, 2020. However, owing to M.F.I.P.P.A. restrictions, staff cannot determine if any of the attendees are residents of Oshawa.

The Study has now reached the final stage in the process and offered an opportunity for the public, stakeholders and review agencies to provide their final comments on the recommended Master Drainage Plan.

The Public and the reviewers are given 30 days (by May 29, 2020) to provide their final comments. After which the final report will be revised accordingly and the study will be deemed completed for filing a Notice of Study Completion.

5.3 Overview of the Corbett Creek Master Drainage Plan Study

On June 27, 2019, the Town of Whitby, in partnership with C.L.O.C.A. initiated a Municipal Class Environmental Assessment Study for the preparation of a Master Drainage Plan for the Corbett Creek Watershed.

Given the complexity and the technical nature of a Master Drainage Plan Study, T.M.I.G., a specialized Water Resources Consulting firm, was retained in mid-2019 by the Town of Whitby and C.L.O.C.A. to undertake the C.M.D.P.

The purpose of the study is to develop a Master Drainage Plan, which will provide guidance to the Town of Whitby, C.L.O.C.A. and the City of Oshawa in the continued management of the Corbett Creek Watershed and its stream corridors.

The goal of the study is to determine a long-term plan outlining the preferred methods of watershed management with respect to storm runoff to maintain or improve flooding conditions, water quality, stream erosion, water balance, and aquatic and terrestrial habitat associated with the natural heritage system.

While stormwater management controls are currently required for any new developments occurring in Ontario, a majority of the lands within the Corbett Creek Watershed were developed prior to the enactment of stormwater management regulations.

As a result, there are a number of areas within the watershed that have shown signs of creek erosion, loss of vegetation, degraded water quality and flood risk concerns.

The following is a brief summary of the general findings of the T.M.I.G. Study:

5.3.1 Channel Stability and Erosion

Urbanization has increased the overall impervious areas in the Corbett Creek Watershed.

Therefore Corbett Creek has been subjected to a various degree of impacts caused by development.

Many reaches along the creek have undergone fluvial geomorphological changes for many years to a point where the channel adjustments are having detrimental impacts to the adjacent public infrastructure or private properties.

As such, it is not uncommon to find man-made bank stabilization and erosion works along the creek. Some of them are in fair condition but some may be in need of maintenance or rehabilitation.

In the T.M.I.G. Study, the Consultant has undertaken a fluvial geomorphological investigation on the entire Corbett Creek system and found that 5 out of the 21 reaches examined are in a state of instability and recommended that corrective measures be carried out along the reaches (see Attachment 3).

If they are left unattended, the erosion will result in damages to the adjacent infrastructure or neighboring properties, particularly for those that are in proximity to the channel.

All of the erosion works identified are categorized as having medium to high priorities. The total cost of the works are estimated to be approximately \$2 million dollars.

Of the 5 reaches identified, only the EB7 reach is situated within the City boundaries. EB7 is located on property owned by the City of Oshawa and the cost of erosion works at the EB7 reach is estimated at \$500,000.

5.3.2 Flood Hazard

Since a majority of the lands within the watershed were developed prior to the adoption of the conventional stormwater management controls, the flood hazard concerns along Corbett Creek are likely related to the conveyance capacities of its channels and creek crossing structures.

In this study, T.M.I.G. has conducted a floodplain mapping update for the Corbett Creek Watershed. The mapping was refined by using a more accurate LiDAR mapping technology. The updated floodplain mapping is provided on Attachment 4 and is shown narrower than the current Regulatory Floodline mapping prepared by C.L.O.C.A. in 2006.

If adopted, there will be fewer properties impacted by the Regulatory Storm event than what has been shown in the current floodplain mapping.

There are 6 Flood Damage Centres (F.D.C.s) identified within the Corbett Creek Watershed (see Attachment 3). All of them are located within the Town of Whitby boundaries with the exception of FDC-COR6, which is located in the City of Oshawa limits.

They are all considered low risk F.D.C.s compared to other F.D.C.s found within C.L.O.C.A. jurisdiction. The common cause of the F.D.C. is undersized culvert(s) located immediately downstream.

Due to the significant costs and technical challenges required for improving the undersized culverts with the low benefits in return, this study does not recommend flood conveyance projects to be implemented at this time but rather recommends monitoring of the situation until such time as the opportunity arises to improve the culverts.

5.3.3 Water Quality

Given that the Corbett Creek Watershed is nearly fully developed and the watercourses are mainly fed by storm sewer outfalls, this study did not conduct any in-depth investigation to assess the existing water quality condition of the creeks.

An in-depth investigation is unnecessary since the water quality of the stream is expected to be the same as the water quality of a typical urban stream.

To improve the water quality in a stream, the most effective and efficient way is to implement stormwater management measures or applying development setbacks from watercourse for new developing areas of a watershed.

The Corbett Creek Watershed, however, has limited opportunities for the implementation of the aforementioned measures to existing developed areas.

Since the potential to construct new stormwater management (S.W.M.) facilities will only be feasible on the Town of Whitby owned lands, the study only identified three possible locations within Corbett Creek Watershed for the installation of the new S.W.M. enhancements, such as plunge pools, oil-grit separators, and S.W.M. ponds (see Attachment 3) with a total cost of about \$1.6 million.

5.3.4 Needs for implementing enhanced stormwater management criteria

Recognizing the fact that the Corbett Creek Watershed is almost fully developed, it is important for the Town of Whitby to pay particular attention to the future redevelopment opportunities if there is a desire to improve the overall conditions of the watershed.

Understanding that the S.W.M. criteria have to be more stringent than the current S.W.M. criteria used in Ontario to maximize the opportunities to improve the overall health condition of the Corbett Creek Watershed, T.M.I.G. has proposed the use of enhanced S.W.M. criteria in the following areas:

- Volume/Erosion Control
- Quantity Control
- Quality Control
- Water Balance

In the study, T.M.I.G. has identified that the two intensification areas within the Town of Whitby are the best candidate areas for implementing the enhanced S.W.M. criteria. The two intensification areas are located along the Dundas Street East and the Victoria Street areas as shown in Attachment 3.

5.3.5 Recommended Master Drainage Plan

Given that there are not many S.W.M. options available for improving the environmental health condition of Corbett Creek Watershed, T.M.I.G. considered the following potential feasible alternative solutions in the study:

1. Do Nothing
2. Implement Enhanced S.W.M. Criteria for redevelopment
3. Construct New S.W.M. Facilities on Town owned lands
4. Improve existing Hydraulic Structures and Conveyance Channels
5. Restore channel reaches with erosion or instability concerns

The alternative solutions were evaluated comparatively and qualitatively on the criteria related not only to the technical feasibility and the constructability of each of the options, but also to the potential impacts/benefits to the natural, social/cultural and financial environments.

After review, Alternative 1 is not recommended as it is contrary to the goal of the study. Alternative 4 is also not supported because it is cost prohibitive and outweighs the benefits that could be received from the project.

On that basis, the preferred M.D.P. for Corbett Creek Watershed includes the implementation of Enhanced S.W.M. Criteria for development and redevelopment within the intensification areas of the watershed as well as 3 stormwater management facilities and 5 watercourse rehabilitation projects. In essence, the preferred M.D.P. represents advancing Alternatives 2, 3 and 5, collectively.

5.4 Staff Comments on the Recommended Corbett Creek Watershed Master Drainage Plan

In general, staff supports the recommended M.D.P. as the preferred alternatives is practical and cost effective given where the watershed is in terms of its environmental conditions, especially when there are limited viable opportunities available.

The following are some of the additional comments that staff would like the Town of Whitby and C.L.O.C.A. to consider:

5.4.1 The Corbett Creek Master Drainage Plan Report

It is recommended for both municipalities to use the study as a resource document in considering future developments for lands located within the Corbett Creek Watershed to help inform financial decision making. An alternative financing arrangement such as a fixed payment for development in Whitby to fund infrastructure improvements needed in Oshawa should be considered. This would ensure that Oshawa taxpayers are not funding projects required as a result of Whitby development.

5.4.2 The Recommended Watercourse Rehabilitation Project

There is one creek erosion project identified to be undertaken in the M.D.P. within the City's boundaries. The project within the City of Oshawa is along the reach EB7 (see Attachment 3).

Given that the channel is still undergoing fluvial geomorphological changes because of the impact caused by the past upstream development, it is not reasonable that the City of Oshawa assume all the financial responsibility for the required creek erosion works.

As such, it is recommended that the implementation strategy of the M.D.P. should include a go-forward plan calling for future discussions between the Town of Whitby, the City of Oshawa and C.L.O.C.A. to develop/establish a mutually agreeable cost-sharing mechanism to help finance the creek protection works along the reach EB7.

5.4.3 The Flood Conveyance Improvements

While the implementation of the Flood Conveyance Improvements is not recommended as one of the preferred alternative solutions in the Corbett Creek Watershed M.D.P. as it is cost prohibitive, the creek crossings considered in the study nonetheless will need to be replaced in the fullness of time.

In this regard, it is the opinion of staff that the Corbett Creek Watershed M.D.P. should include a recommendation calling for further discussions between the Town of Whitby and the City of Oshawa to develop/establish a cost-sharing mechanism for replacing the two culvert crossings at King Street West and Monaghan Avenue along the East Tributary of Corbett Creek, when needed.

Again, it is not reasonable that the City of Oshawa assume all financial responsibility for the required creek erosion works. In that regard, it is noted that King Street West in this location is subject to the Regional Road Rationalization process currently underway. Any decision on cost sharing the replacement of culverts would need to consider road rationalization.

5.4.4 High potential area for new and/or redevelopment opportunities

In the study, the M.D.P. has recognized that there are two areas within Corbett Creek Watershed identified that they have high potential opportunities to implement the “Enhanced S.W.M. Criteria” for redevelopment.

They are the intensification areas at Dundas Street and Victoria Street (see Attachment 3).

6.0 Financial Implications

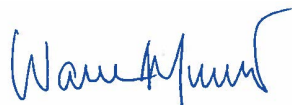
While there are no immediate financial implications associated with the recommendations in this report, the M.D.P. for Corbett Creek Watershed has identified a watercourse rehabilitation project along the Reach EB7, which will have financial implications to the City in the future.

7.0 Relationship to the Oshawa Strategic Plan

The recommendations in this report advance the Accountable Leadership and Environmental Responsibility goals identified in the Oshawa Strategic Plan.



Anthony Ambra, P.Eng., Director,
Engineering Services

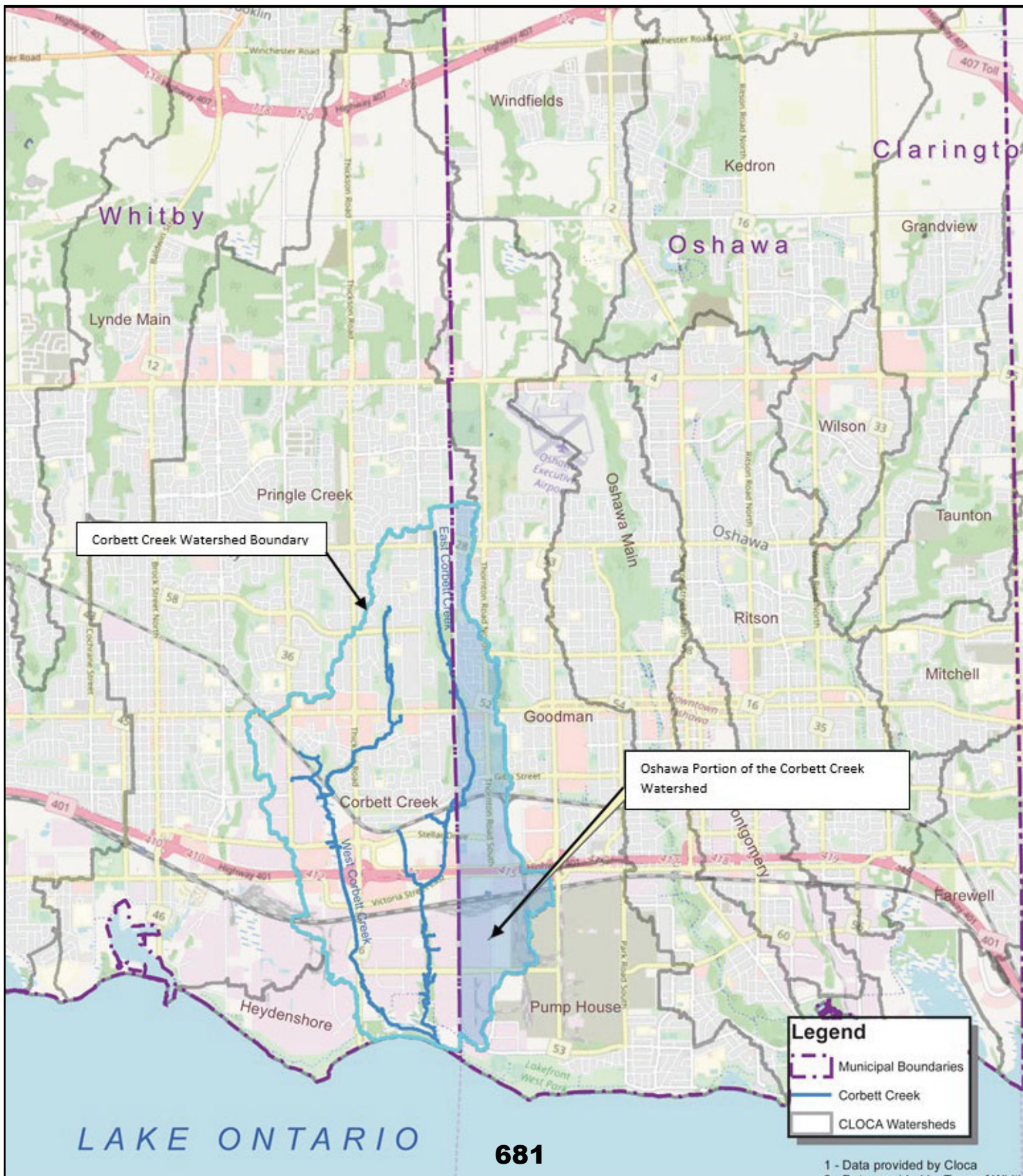


Warren Munro, HBA, RPP, Commissioner,
Development Services Department

Title: Location of the Corbett Creek Watershed
Subject: City Comments on Corbett Creek Master Drainage Plan Study
File: B-8100-0011 2020



Source: Corbett Creek Master Drainage Plan by T.M.I.G. City of Oshawa Development Services Department

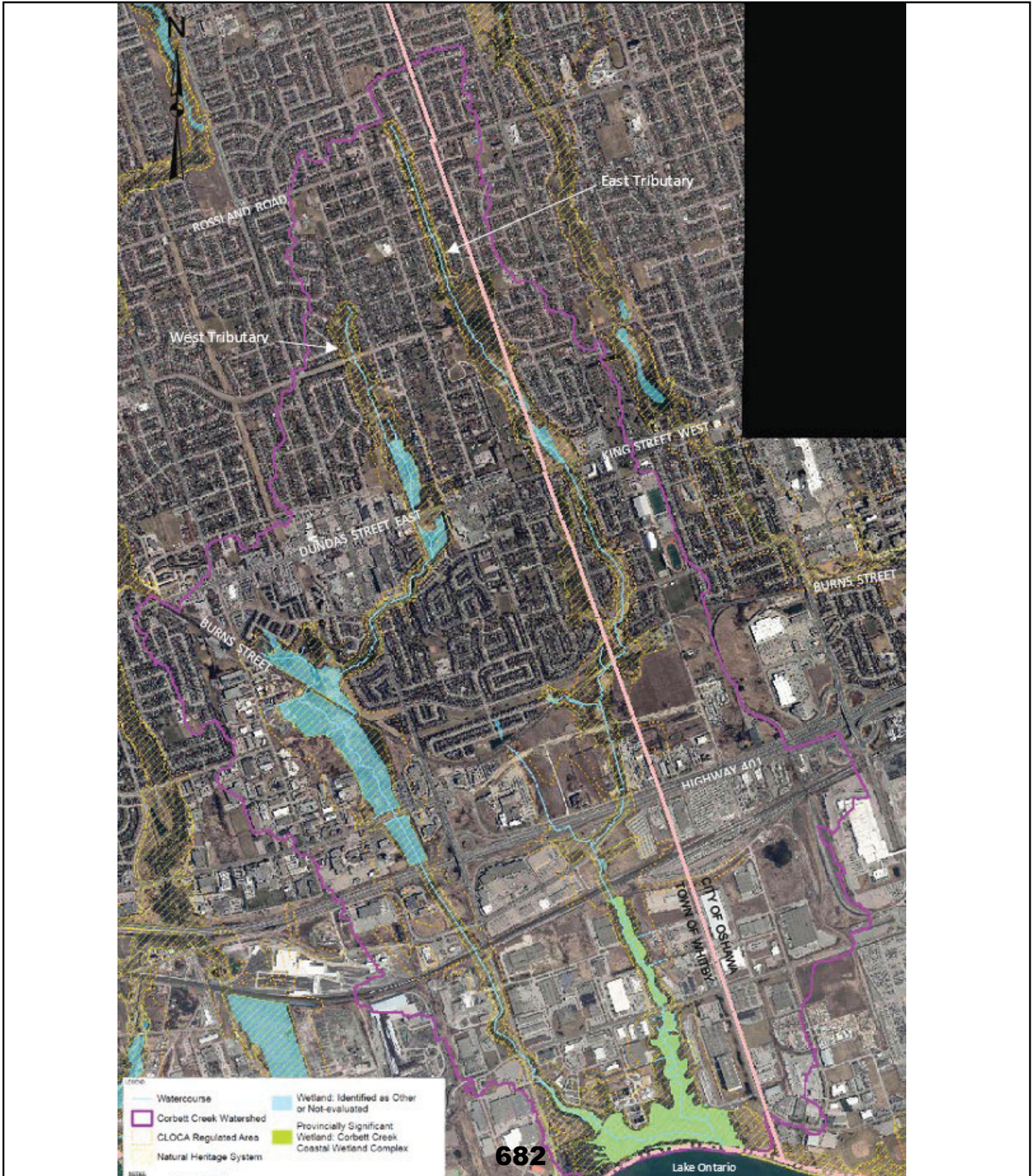


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Title: Significant Natural Features Map
Subject: City Comments on Corbett Creek Master Drainage Plan Study
File: B-8100-0011 2020



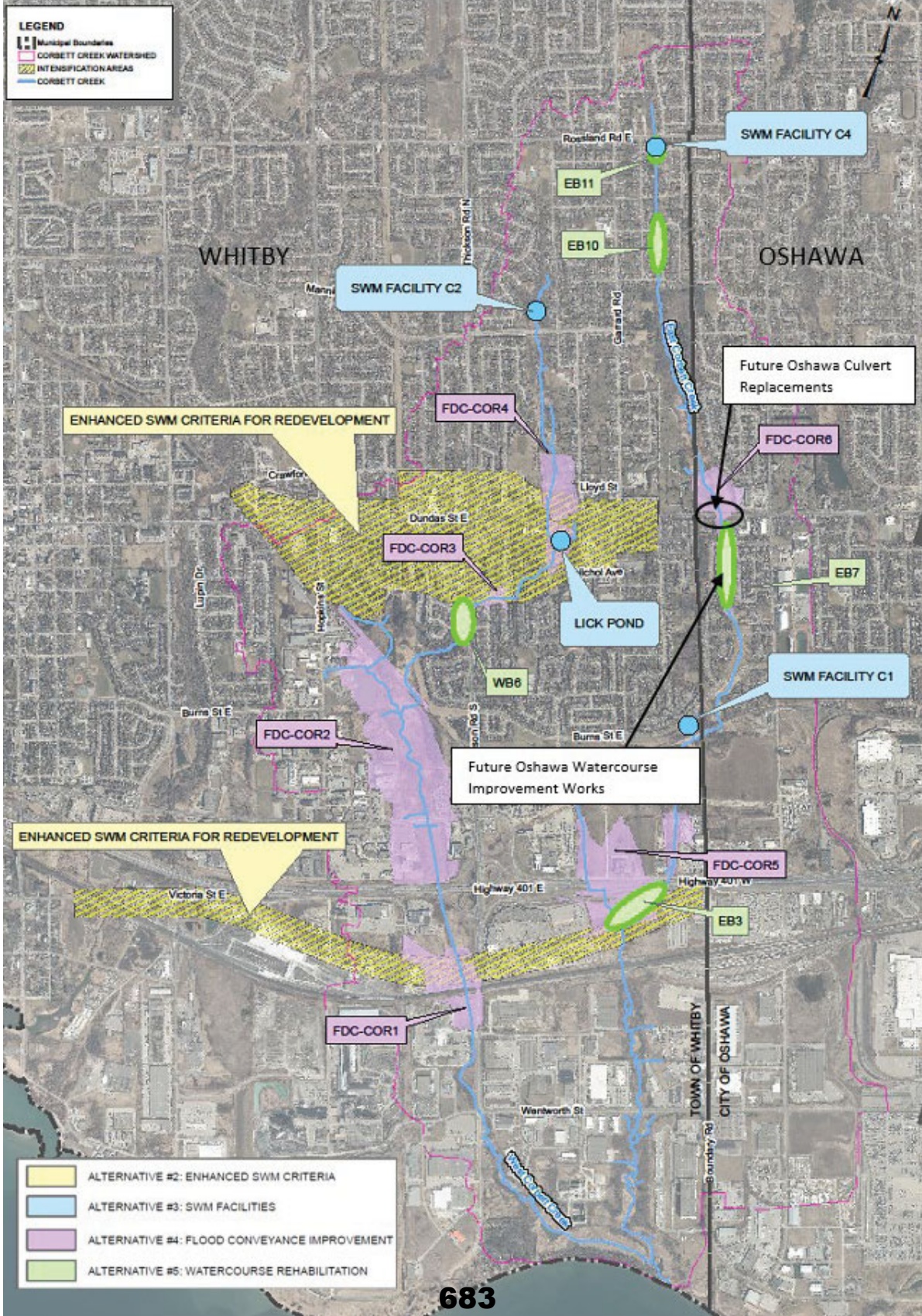
Source: Corbett Creek Master Drainage Plan by T.M.I.G.



Title: Recommended Corbett Creek Master Drainage Plan
Subject: City Comments on Corbett Creek Master Drainage Plan Study
File: B-8100-0011 2020



Source: Corbett Creek Master Drainage Plan by T.M.I.G.



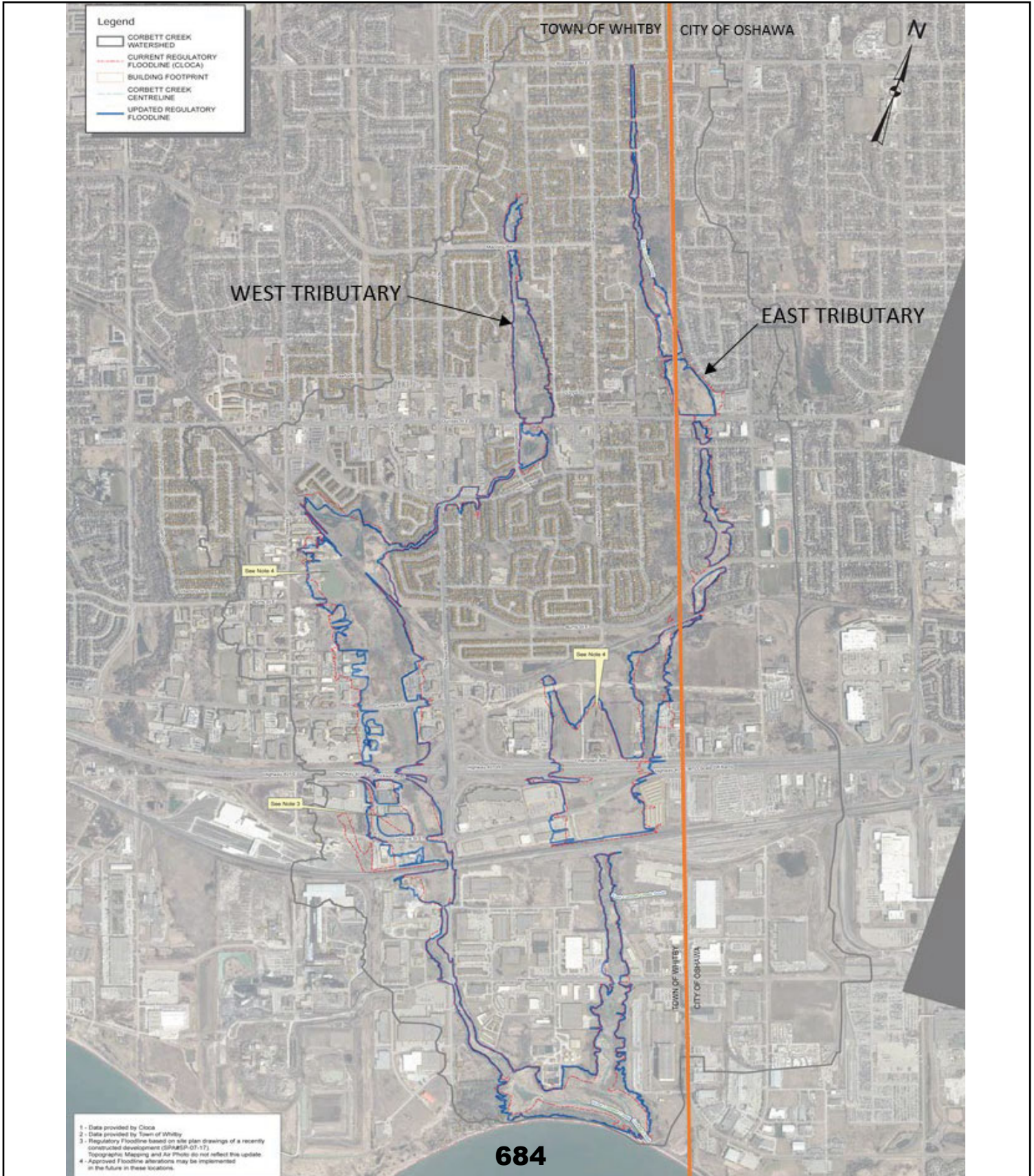
Title: New Floodplain Limits of the Corbett Creek
Subject: City Comments on Corbett Creek Master Drainage Plan Study
File: B-8100-0011 2020



City of Oshawa
Development Services Department



Source: Corbett Creek Master Drainage Plan by T.M.I.G.



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Corbett Creek Master Drainage Plan Study by T.M.I.G.

Executive Summary

Introduction

The Municipal Infrastructure Group Ltd. (TMIG), along with team members GEO Morphix Ltd. (GEO Morphix) and Palmer Environmental Consulting Group Inc. (Palmer), were retained by the Town of Whitby to prepare a Master Drainage Plan (MDP) for the Corbett Creek Watershed. The MDP was completed in partnership with the Central Lake Ontario Conservation Authority (CLOCA).

The purpose of the Corbett Creek MDP was to provide guidance to the Town, CLOCA, and the City of Oshawa in the continued management of the watershed and stream corridors with respect to flooding, creek erosion, natural environmental and resource protection, and development. The study was carried out in accordance with the Master Planning Process Approach No. 2 as outlined in the Municipal Engineers Association “Municipal Class Environmental Assessment” document (October 2000; amended 2007, 2011 and 2015).

Approach No.2 includes Phases 1 and 2 of the Municipal Class Environmental Assessment (EA) process where the level of investigation, consultation and documentation are sufficient to fulfill ‘Schedule B’ projects identified within the MDP.

Study Area

The study area (Figure ES-1) encompassed the Corbett Creek watershed in its entirety, which is located within the southeastern portion of the Town of Whitby with a portion of the catchment area within the City of Oshawa. In general, it is a small watershed with a drainage area of approximately 14 km², draining through the East and West Tributaries that combine at the Corbett Creek Coastal Wetland before discharging to Lake Ontario. The watershed maintains an elongated linear shape that is about 6.3 km long and 2.1 km wide.

In general, the Corbett Creek watershed is fully urbanized and has a very limited number of areas available for future development. The majority of the lands within the watershed were developed prior to the adoption of modern stormwater quantity and quality controls. As a result, there are a number of areas that were identified to have erosion concerns, degraded water quality and flood risk.

Purpose of the Study

The Corbett Creek watershed has experienced and will continue to experience pressures from urban land uses that impact the watershed’s form and function, which include flood potential, erosion, and natural heritage health, among other potential impacts. The problem and opportunity statement is as follows:

The Corbett Creek Master Drainage Plan is required to determine a long-term plan outlining the preferred methods of watershed management with respect to storm runoff to

maintain or improve flood conditions, water quality, erosion, water balance, and aquatic and terrestrial habitat associated with the natural heritage system.

The purpose of the Corbett Creek MDP was to provide guidance to the Town, CLOCA, and City of Oshawa in the continued management of the watershed and stream corridors with respect to flooding, creek erosion, natural environmental and resource protection, and development.

Public Consultation

A Notice of Study Commencement was prepared and circulated on June 2, 2019 to stakeholders, which included regulatory agencies, First Nations organizations, utilities, and general public through *Whitby This Week* and the Town website.

Two (2) Community Open Houses (COHs) were held in an informal open house format with display boards that presented project information. COH No. 1 was held on September 12, 2019 and provided an overview of the project, presented information on the current conditions of the watershed. COH No.2 was held on January 30, 2020 and presented technical assessments that were completed, such as the hydrology and hydraulic analyses. The recommendations for watershed management were also provided, including the infrastructure projects proposed by the MDP.

At the COHs, feedback from attendees was sought on their concerns of the watershed and on the range of potential management strategies for the watershed. In general, the feedback included concerns of high water levels at homes on Crystal Beach Boulevard (adjacent to the Corbett Creek Coastal Wetland), erosion at specific watercourse locations and overall water quality in Corbett Creek.

First Nations communities expressed their interest in archaeological investigations and site specific environmental studies. Continued consultation with First Nations communities is recommended when MDP projects proceed to detailed design and construction.

A Notice of Study Completion was issued on _____, 2020.

Recommended Master Drainage Plan

Alternatives for managing a highly urbanized watershed involve: (1) stormwater management to mitigate the impacts of runoff from development on receiving watercourses, such as flooding, poor water quality, and erosion; and (2) implementing measures to address the above noted impacts for areas that have not provided adequate stormwater controls. More specifically, the range of alternatives for the Corbett Creek watershed included:

- Maintaining the status quo and do nothing.
- Enhanced stormwater management criteria for new development or redevelopment to reduce runoff volumes and peak flow rates.
- New SWM controls, including SWM facilities or retrofits to existing facilities to provide increased water quality, water quantity, and/or erosion control.
- Hydraulic structure and watercourse conveyance improvements such as increasing the capacity of culverts or drainage conveyance systems.

- Watercourse and valleyland rehabilitation to mitigate erosion hazards and/or enhance natural features.

The preferred MDP for Corbett Creek (Figure ES-2) includes the implementation of enhanced stormwater management (SWM) criteria for development and redevelopment within the intensification areas of the watershed as well as stormwater management facilities and watercourse rehabilitation projects. The recommended enhanced SWM criteria and projects will improve water quality of stormwater runoff and address erosion concerns in the watershed.

The MDP also recognizes the importance of flood risk mitigation in the watershed due to the presence of CLOCA identified Flood Damage Centres (FDCs) and undersized culverts within the watershed. However, based on the low risk of flood occurrence and damage at the FDCs, the MDP does not recommend flood conveyance projects to be implemented at this time. This is primarily due to the significant costs and challenges to implement improvements to the undersized culverts, the majority of which are not owned by the Town of Whitby. The recommendation is to continually review flood risk, development in the watershed and new information regarding flooding and culvert capacity to assess the need for flood mitigation projects.

Enhanced SWM criteria (Table ES-1) is recommended for development and redevelopment sites within the Town OP's intensification area around Dundas Street and intensification corridor along Victoria Street.

The benefits to the watershed are relatively minor and require a long-term outlook, however, implementation has few technical challenges or negative impacts to the natural, social/cultural and financial environments.

Table ES-1 Enhanced SWM Criteria

Component	Criteria
Volume / Erosion Control	Runoff from a 5 mm rainfall event must be captured, retained or detained from all new or reconstructed impervious surfaces as a minimum requirement. For sites greater than 5 ha that propose to use a SWM pond, extended detention of the 25 mm storm for 24 hours is required, consistent with current criteria.
Quantity Control	<p>Post-development peak flow rates must not exceed the corresponding pre-development peak flow rates for the 2-year through 100-year design storm events.</p> <p>For redevelopment of existing developed sites, peak flow rates must also be controlled to the capacity allocated to the site in the design of the downstream minor and major drainage systems.</p>
Quality Control	<p>Enhanced protection, corresponding to 80% long-term average removal of suspended solids, according to the MOE Stormwater Management Planning and Design Manual (MOE, 2003). Water quality control measures to be implemented under a hierarchy of SWM practices, as follows:</p> <ol style="list-style-type: none"> (1) Low impact development measures. (2) Stormwater management facilities such as wet ponds, wetlands and hybrid ponds. (3) Manufactured treatment devices such as oil-grit separators.
Water Balance	Post-development infiltration is required to match predevelopment infiltration with remedial measures to the extent possible, which is consistent with current criteria. As a minimum, redevelopment sites are required to retain a <u>minimum</u> of 5 mm runoff on-site for infiltration, evapotranspiration or reuse.

The Corbett Creek MDP recommended projects include SWM facilities (Table ES-2) and watercourse rehabilitation at erosion hazard sites (Table ES-3).

The implementation of SWM facilities within already developed areas of the Corbett Creek watershed is recommended because of the current lack of stormwater management controls in the watershed.

The watercourse rehabilitation projects are recommended for implementation under the MDP to mitigate erosion risks.

Table ES-2 Master Drainage Plan Recommended SWM Facility Projects

Priority	Facility ID	Description	Cost
1	SWM Facility C4	Oil-grit separator and plunge pool on East Corbett Creek near intersection of <u>Rossland Road West</u> and Inglewood Place	\$470,000
2	SWM Facility C1	Oil-grit separator and wetland SWM facility on East Corbett Creek near intersection of Burns Street East and Limerick Street	\$350,000
3	SWM Facility C2	Oil-grit separators and wet pond on West Corbett Creek near Manning Road and Hazelwood Drive	\$780,000

Table ES-3 Master Drainage Plan Recommended Watercourse Rehabilitation Projects

Priority	Reach	Description	Cost
1	EB10	Valley wall protection (localized channel realignment and restoration, valley wall regrading and stabilization, valley wall toe protection with bioengineering). Culvert outlet channel restoration (scour pool, rock weirs for bed grade control, bioengineered banks).	\$500,000
2	EB11	Culvert outlet channel restoration (<u>armour stone</u> drop structures, valley slope regrading and stabilization).	\$300,000
3	EB3	Embankment toe protection with bioengineering.	\$100,000
4	WB6	Channel restoration (bed substrate and <u>armour stone</u> for bed grade control, bioengineered banks).	\$550,000
5	EB7	Channel stabilization (rock weirs for bed grade control, bioengineered banks).	\$500,000

Implementation Strategy

The implementation strategy for the Corbett Creek MDP identified the next steps for the recommended SWM criteria and projects to proceed with respect to additional studies, agency permits and approvals, timing, and Class EA process requirements. The implementation strategy is generally applicable to the detailed design and construction of capital projects identified in the MDP (i.e., SWM facilities and watercourse rehabilitation). The implementation of enhanced SWM criteria is generally more straightforward and requires the Town to inform development proponents and apply the criteria to assess development applications within the Town OP's intensification areas.

A number of future studies were recommended to enable the detailed design and construction of SWM facilities and watercourse rehabilitation. These following studies

generally apply to each project recommended in the MDP, with some exceptions that can be evaluated in detailed design. The studies include:

- Site-specific ecological assessment to confirm boundaries of vegetation communities and presence of Species at Risk and/or Species at Risk habitat, and mitigation measures. Archaeological assessments to determine archaeological potential of the project sites, with First Nations community engagement during the studies.
- Geotechnical investigations to determine subsurface soil conditions to inform the detailed design.
- Detailed topographic survey and utilities investigation.
- Natural channel design for watercourse rehabilitation sites to address ecological function and long-term erosional stability.
- There are also a number of permits and approvals required to construct the SWM facilities and watercourse rehabilitation. These include:
 - A permit will be required for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 42/06) from Central Lake Ontario Conservation Authority.
 - Engineering Approval from Durham Region for any projects located adjacent to the Region's right-of-way and other infrastructure.
 - Input and coordination with or review by a number of municipal departments at the Town of Whitby or City of Oshawa. Confirmation that the project continues to comply with all applicable Town or City policies and by-laws should be sought.
 - Depending on construction requirements, registration on the Ministry of the Environment, Conservation and Parks' Environmental Activity and Sector Registry or a Permit to Take Water will be required for construction site dewatering. It is also recommended that consultation with respect to the Endangered Species Act with MECP staff is completed during detailed design.
 - Highway Corridor Management permits from the Ministry of Transportation are required for construction works within the right-of-way of provincial highways and adjacent regulated areas.
 - A Fisheries and Oceans Canada (DFO) Self-Assessment will be undertaken during detailed design to determine if a review by DFO is warranted.
 - Approvals will be required from utility owners for protection and/or relocation of existing above and below ground utilities.

